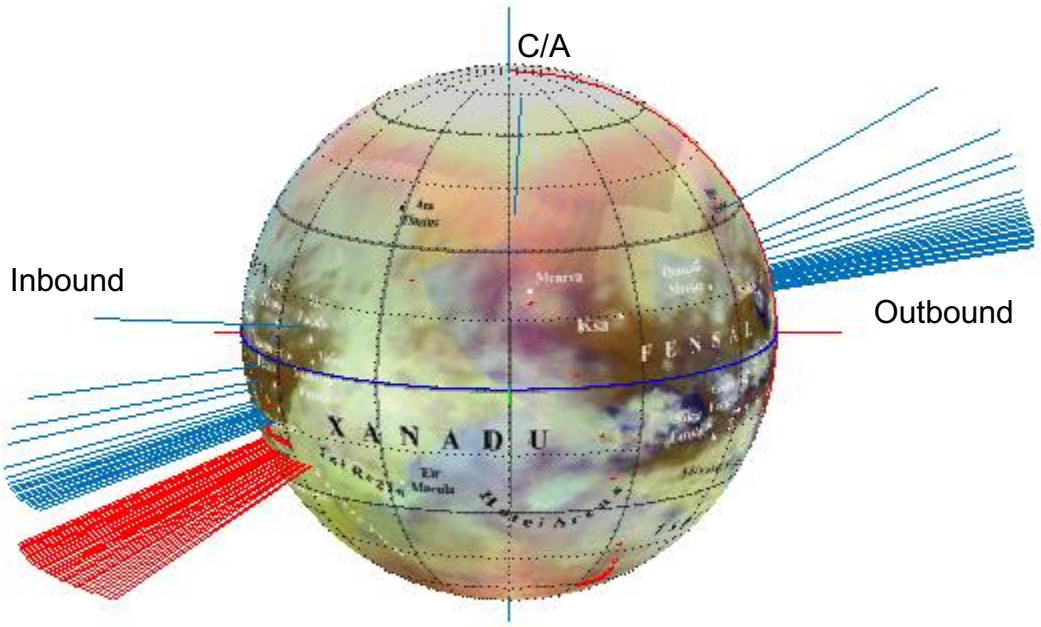
T00A – rev A – S5

Oct. 26, 2004 – 300T15:20:33 @ 1174 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T00A Science objectives: Observations of the Huygens landing site. First high resolution mapping of Titan's surface, which will enable compositional mapping within the context of geologic features. Determination of wind speeds, cloud formation and dissipation, and atmospheric structure. Search for hot spots and lightning.

-22:14	-22:00	ISS	Monitor
-22:00	-16:45	CIRS	Mid-IR Temp Map
-16:45	-15:30	ISS	Monitor
-15:30	-11:30	CIRS	Far-IR Nadir Comp
-11:30	-05:00	VIMS	Med Res
-05:00	-01:48	ISS	High Res
-01:48	-01:27	RWA to RCS Transition	
-01:27	-01:26	ISS Turn to Waypoint	NEG_Y to Titan, NEG_X to Sun
-01:26	-01:19	SP Turn to New Waypoint	NEG_Z to Titan, NEG_X to Sun
-01:19		Begin Custom Period	
-01:19	-01:15	RADAR	Turn to scatterometry
-01:15	-00:45	RADAR Scatterometry	Inbound
-00:45	-00:38	VIMS	Turn to NEG_Y to Titan, POS_X NTP
-00:38	-00:13	VIMS	High Res
-00:12	-00:06	INMS	Turn to NEG_X to Titan RAM, NEG_Z Titan
-00:06	c/a	INMS	NEG_X to RAM
2004-300T15:31:27		**CLOSEST APPROACH**	
c/a	+00:06	RADAR	High-Res SAR
+00:06	+00:16	RADAR	Low-Res SAR
+00:16	+00:30	RADAR	Altimetry
+00:30	+01:15	RADAR	Scatterometry
+01:15	+01:39	RCS to RWA Transition	
+01:39	+05:00	RADAR	Radiometry
+05:00		End Custom Period	
+05:00	+08:15	UVIS	EUVFUV



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T00A – rev A – S5

Oct. 26, 2004 – 300T15:20:33 @ 1174 km altitude

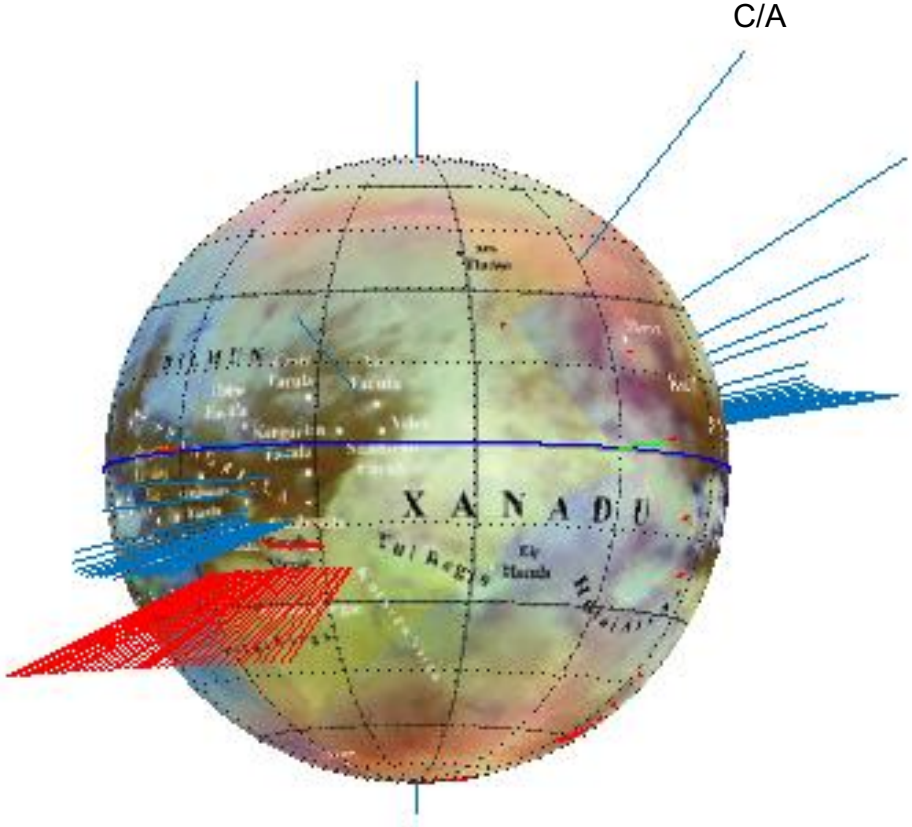
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Demonstration that VIMS can observe in 7 atmospheric windows, including the 5 micron window*

Regional mapping near 15S, 165W in the Shangri-La area*, including the Huygens landing site** and the western part of Xanadu (Tui regio)***.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

*Sotin, C., et al. (2005). Release of volatiles from a possible cryovolcano from infrared imaging, Nature, 435, 786-789.

**Rodriguez, S., et al. (2006). Cassini VIMS hyperspectral observations of the Huygens Landing Site. Planetary and Space Science 54, 1510-1523.

***Barnes, J. W., et al. (2006). Cassini observations of flow-like features in western Tui Regio, Titan. Geophys. Res. Lett., 33.

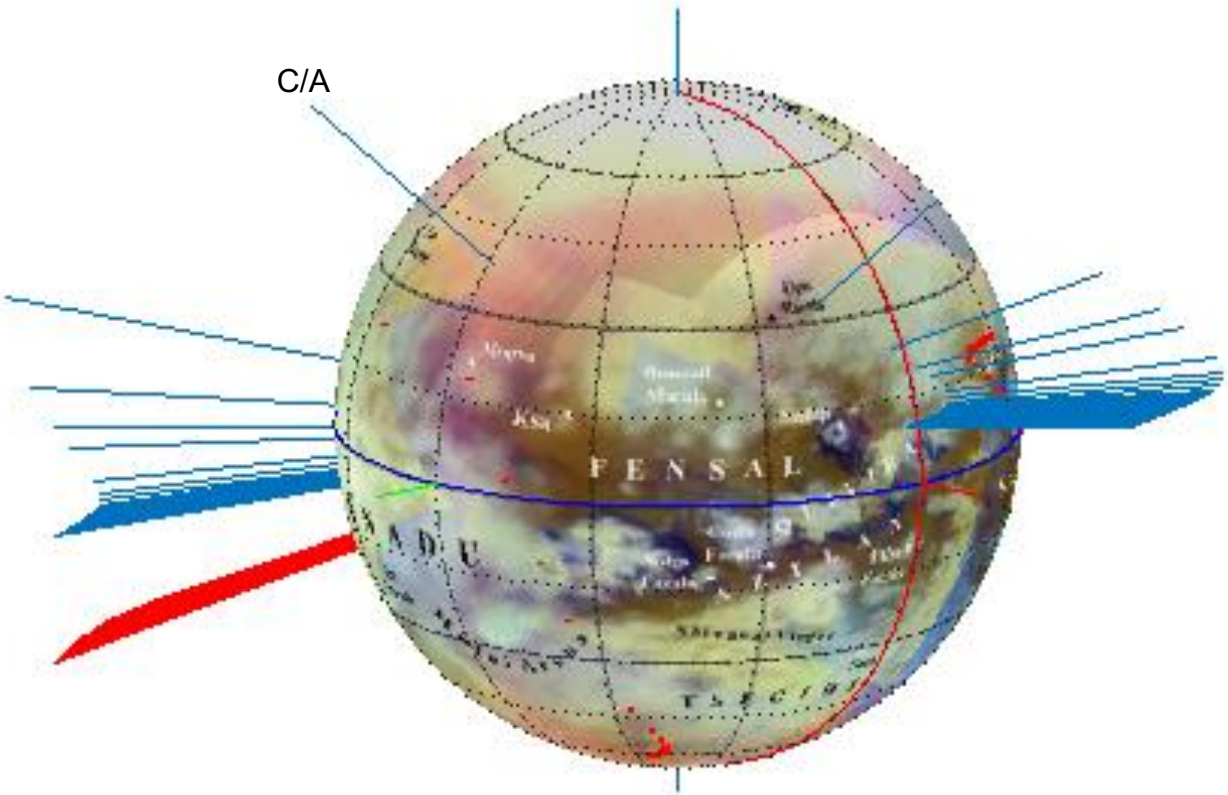
T00A – rev A – S5

Oct. 26, 2004 – 300T15:20:33 @ 1174 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T00A – rev A – S5

Oct. 26, 2004 – 300T15:20:33 @ 1174 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at southern latitudes.

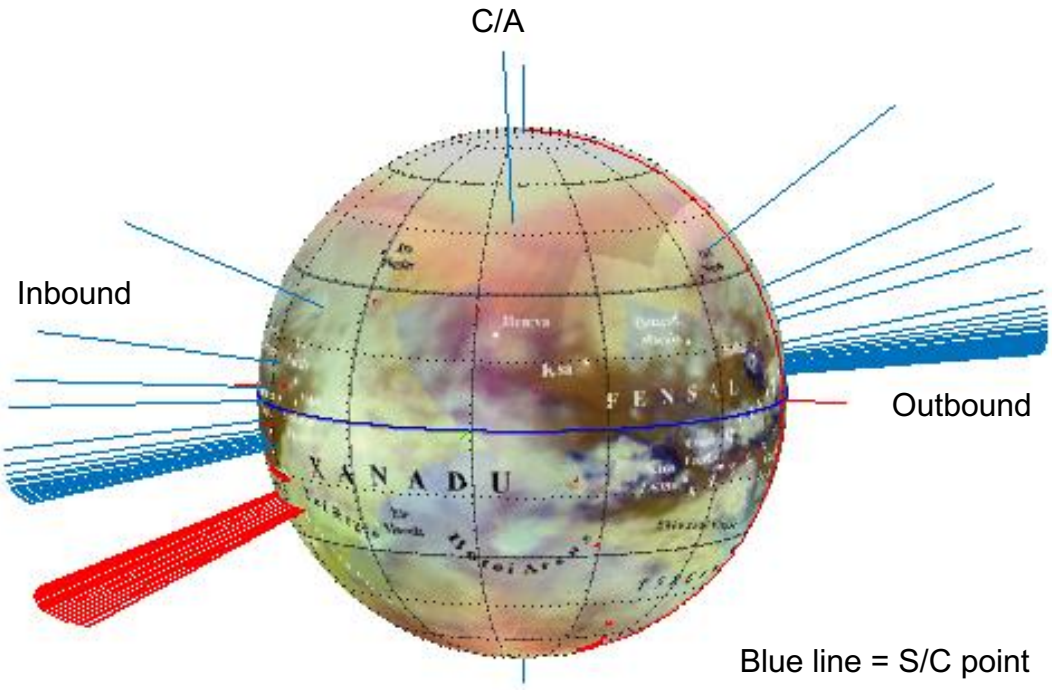
T00B – rev B – S6

Dec. 13, 2004 – 348T11:38:13 @ 1192 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T00B Science objectives: Observation of the surface of Titan at small solar phase angles; investigation of the formation and evolution of clouds on Titan. Search for lightning and hot spots and characterization of airglow.

-20:25	-12:00	CIRS Mid-IR Temp Map
-12:00	-08:00	CIRS Far-IR Nadir Comp
-08:00	-04:00	UVIS EUVFUV
-04:00	-02:00	REG MAP
-02:00		Start Custom Period
-02:00	-00:30	HI RES
-00:30	-00:09	Transition to RCS
-00:09	-00:01	Turn to UVIS occs
2004-348T11:38:13		**CLOSEST APPROACH**
-00:01	+00:27	UVIS Occs
+00:27	+00:50	Transition to RWA
+00:50	+02:30	VIMS Darkside
+02:30	+05:00	UVIS EUVFUV
+05:00		End Custom Period
+05:00	+07:00	CIRS Mid-IR Limb Int
+07:00	+10:30	VIMS darkside



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		CIRS MidIR								CIRS FarIR						UVIS		ISS				U	V	UVIS			CIRS		VIMS													

T00B – rev B – S6

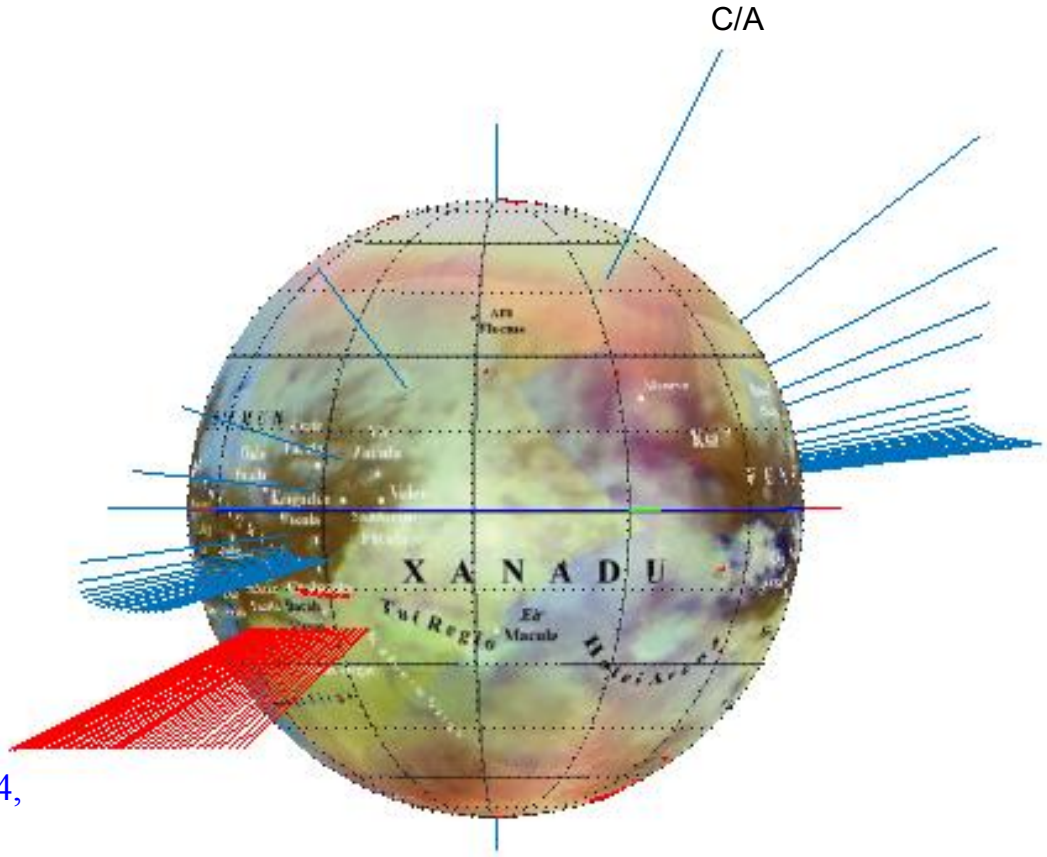
Dec. 13, 2004 – 348T11:38:13 @ 1192 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Regional mapping of Titan prior to C/A near 10N, 145 W near the eastern regions of Shangri-La*.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

*Barnes, J. W., et al. (2006). Cassini observations of flow-like features in western Tui Regio, Titan. Geophys. Res. Lett., 33.

*Rodriguez, S., et al. (2006). Cassini VIMS hyperspectral observations of the Huygens Landing Site. Planetary and Space Science 54, 1510-1523.

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		CIRS MidIR								CIRS FarIR						UVIS		ISS				U	V	UVIS			CIRS		VIMS													

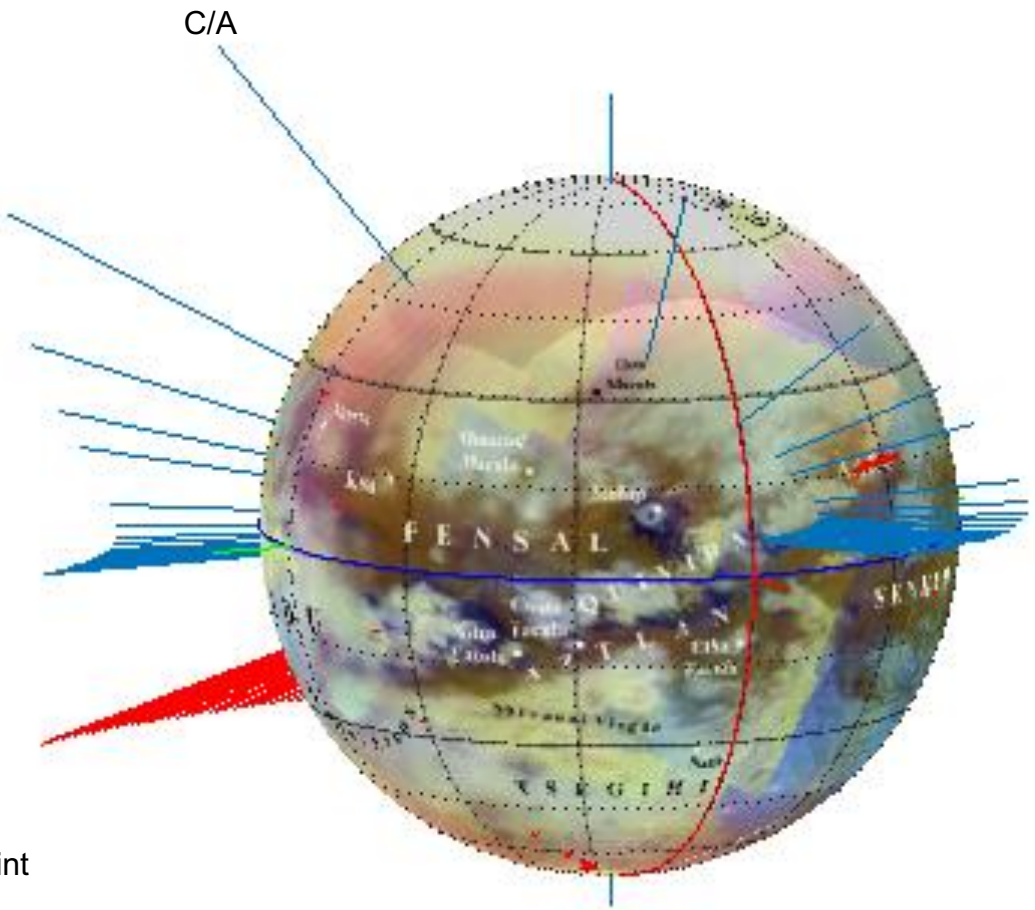
T00B – rev B – S6

Dec. 13, 2004 – 348T11:38:13 @ 1192 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		CIRS MidIR								CIRS FarIR						UVIS		ISS				U	V	UVIS			CIRS		VIMS													

T00B – rev B – S6

Dec. 13, 2004 – 348T11:38:13 @ 1192 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, geometry occurs at high southern latitudes.

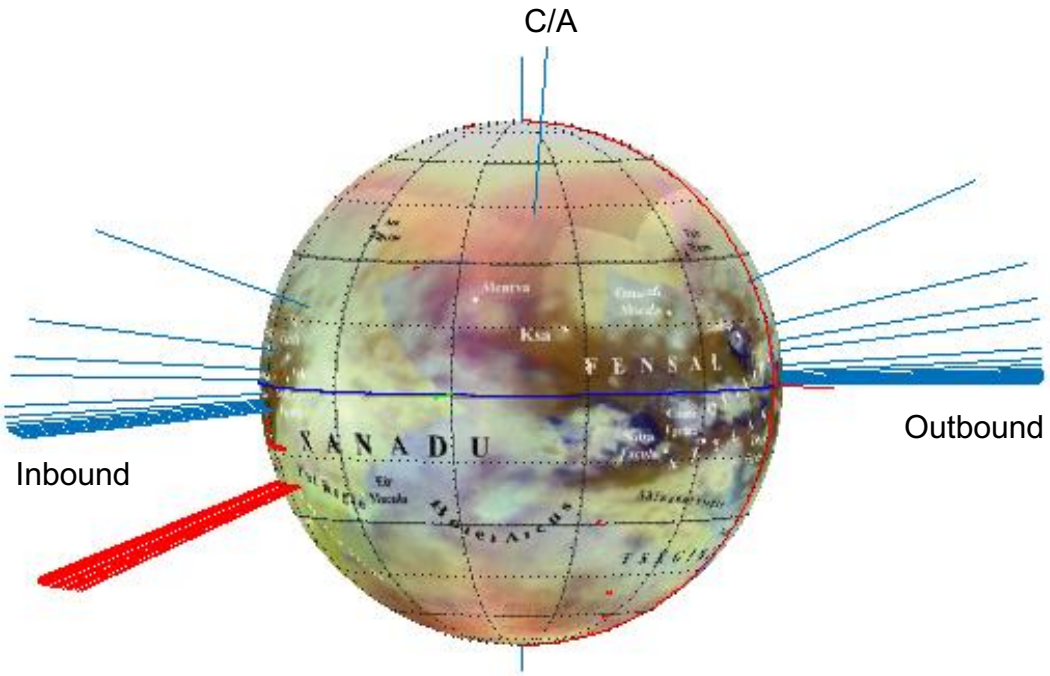
T003 – rev 3 – S8

Feb. 15, 2005 – 046T06:54:21 @ 1579 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T003 VIMS Science objectives: VIMS will image the surface of Titan at small solar phase angles, and investigate the formation and evolution of clouds on Titan. They will also search for lightning and hot spots and will attempt airglow characterization.

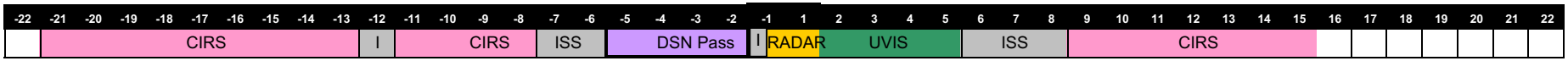
-21:00	-12:00	CIRS Mid-IR Nadir Temp Map
-12:00	-11:00	ISS MONITOR_NA
-11:00	-7:00	CIRS Mid-IR Limb
-7:00	-5:00	ISS GLOBMAP_NA_LP
		Begin Custom Period
-5:00	-4:30	SP Turn to Earth for Downlink
-4:30	-1:30	Goldstone 70m Downlink
-1:30	-1:09	ISS Turn to ISS Attitude
-1:09	-0:59	ISS NAC
-0:59	-0:38	Transition to RADAR RCS
-0:38	-0:30	RADAR Turn
-0:30	-0:16	RADAR Inbound Altimetry
-0:16	+0:16	RADAR SAR
2005-046T06:58:50		**CLOSEST APPROACH**
+0:16	+0:31	RADAR Outbound Altimetry
+0:31	+1:02	RADAR Scatterometry
+1:02	+1:10	RADAR Turn to ORS Waypoint
		End Custom Period
+1:10	+1:33	RCS to RWA Transition
+1:33	+5:00	UVIS EUV-FUV
+5:00	+8:00	ISS NIGHT_WA
+8:00	+12:00	CIRS Far-IR Nadir Comp
+12:00	+16:20	CIRS Mid-IR Nadir Temp



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T003 – rev 3 – S8

Feb. 15, 2005 – 046T06:54:21 @ 1579 km altitude

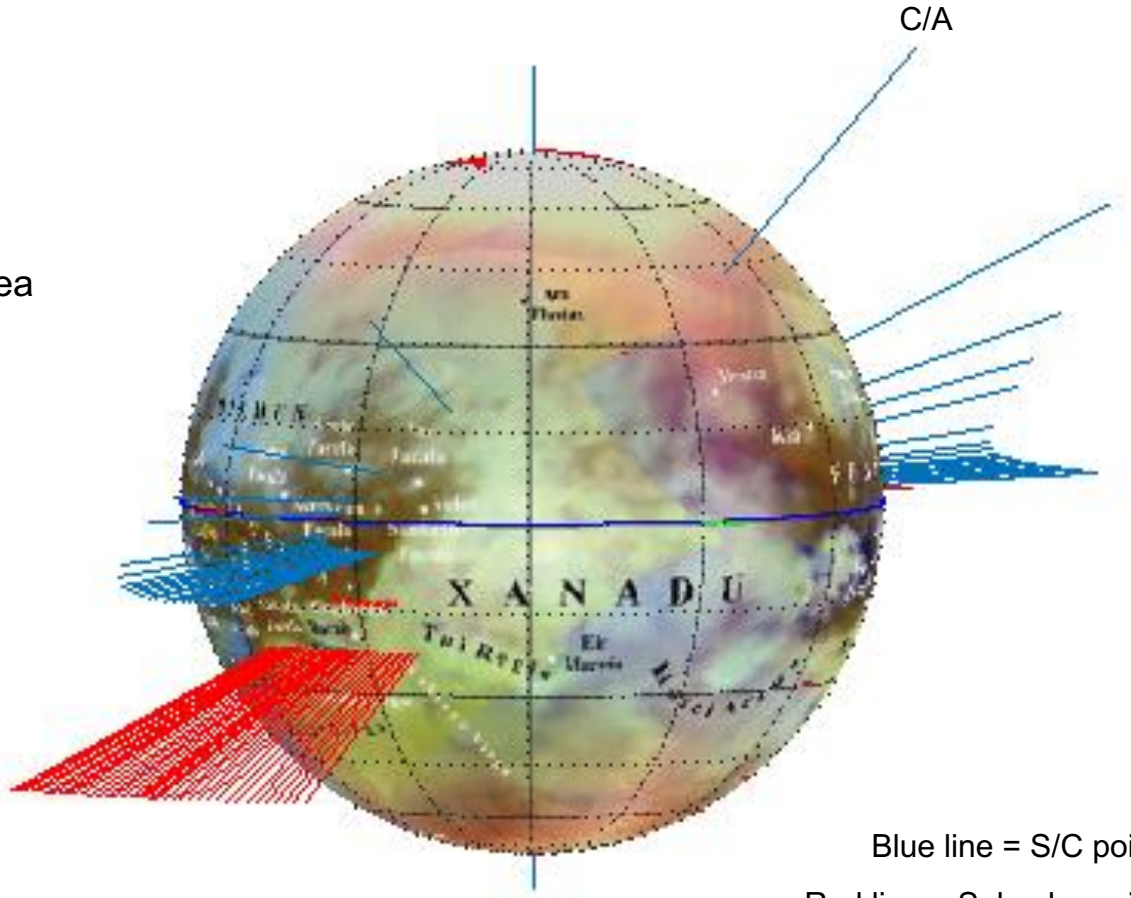
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Search for clouds.

Global mapping of Titan.

Regional mapping of the area near western Xanadu and eastern Shangri-La.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	CIRS									I	CIRS				ISS		DSN Pass				I	RADAR		UVIS			ISS			CIRS												

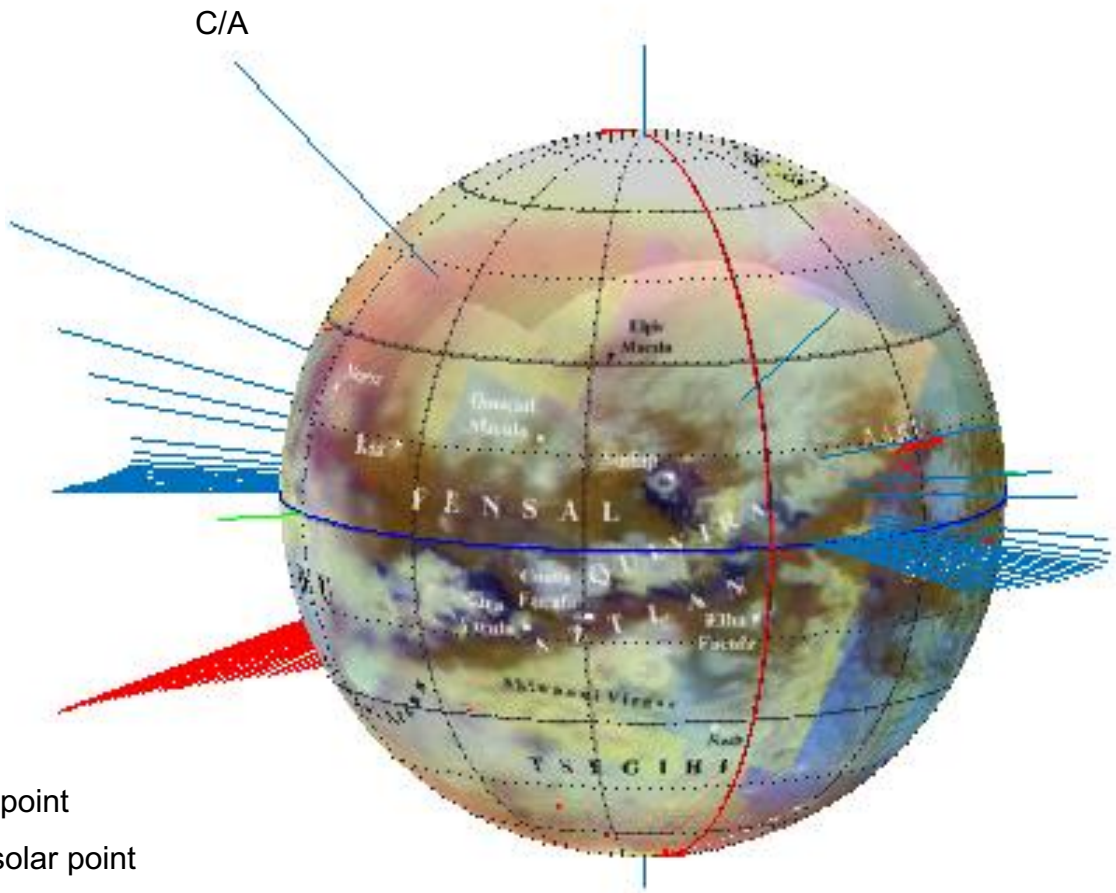
T003 – rev 3 – S8

Feb. 15, 2005 – 046T06:54:21 @ 1579 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

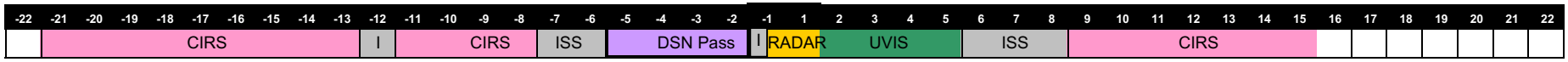
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	CIRS									I	CIRS				ISS		DSN Pass				I	RADAR			UVIS			ISS			CIRS												

T003 – rev 3 – S8

Feb. 15, 2005 – 046T06:54:21 @ 1579 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at high southern latitudes.



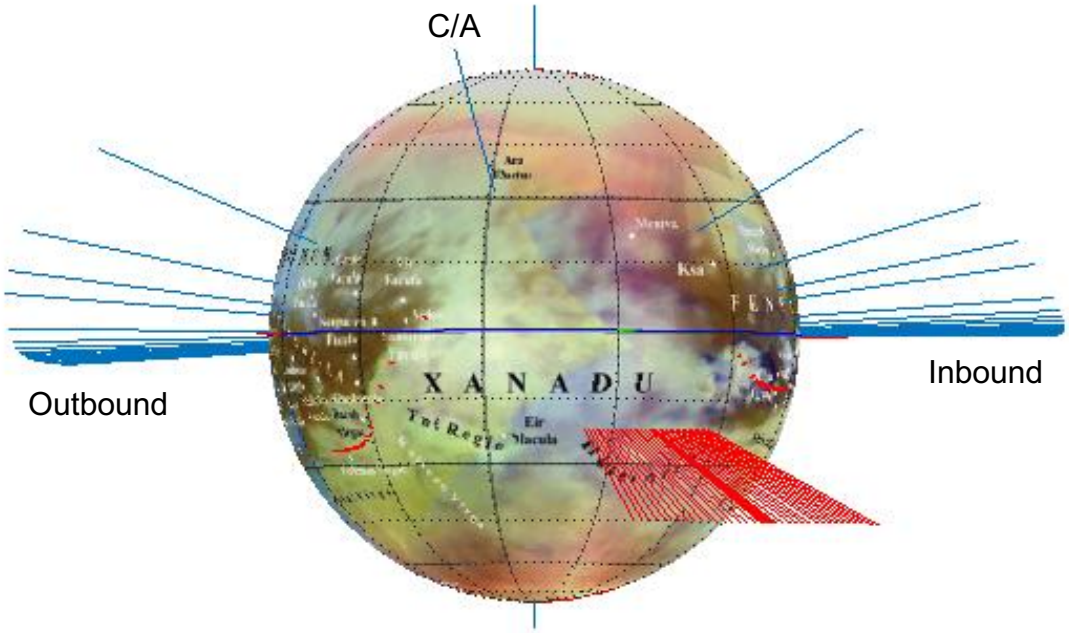
T004 – rev 5 – S9

April 1, 2005 – 091T19:55:12 @ 2404 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T004 VIMS Science objectives: Evolution of clouds and other transient features on Titan. High resolution compositional mapping of the northern hemisphere.

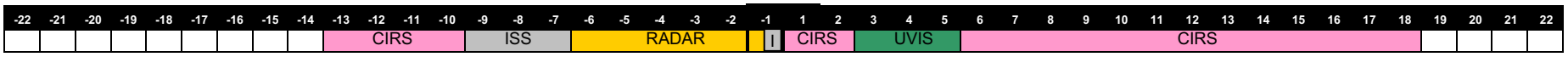
-12:30	-08:30	CIRS	FP1
-08:30	-05:30	ISS	Combined
-05:30	-00:30	RADAR	Radiometry
-00:30	C/A	ISS	High Res
2005-090T20:08:06		**CLOSEST APPROACH**	
C/A	+2:00	CIRS	FIR Limb Int
+2:00	+4:30	UVIS	EUVFUV
+4:30	+8:00	CIRS	MIDIR Limb Map
+8:00	+12:00	CIRS	FIR Limb Map
+12:00	+18:30	CIRS	MIDIR Limb Map



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T004 – rev 5 – S9

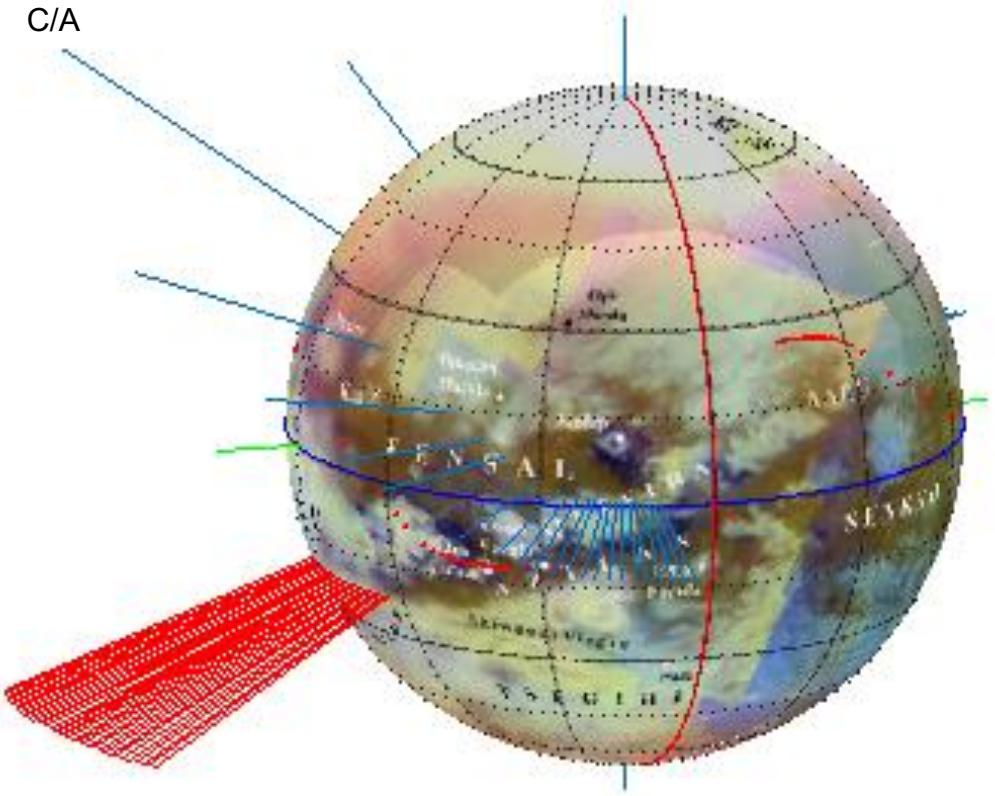
April 1, 2005 – 091T19:55:12 @ 2404 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

One hour before C/A, regional mapping of western Tui Regio and north of the Aztlan region*.

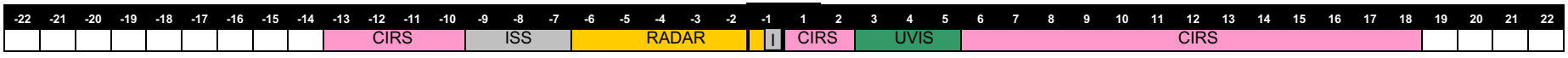


Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

*Barnes, J. W, et. al (2006). Cassini observations of flow-like features in western Tui Regio, Titan. Geophys. Res. Lett., 33.



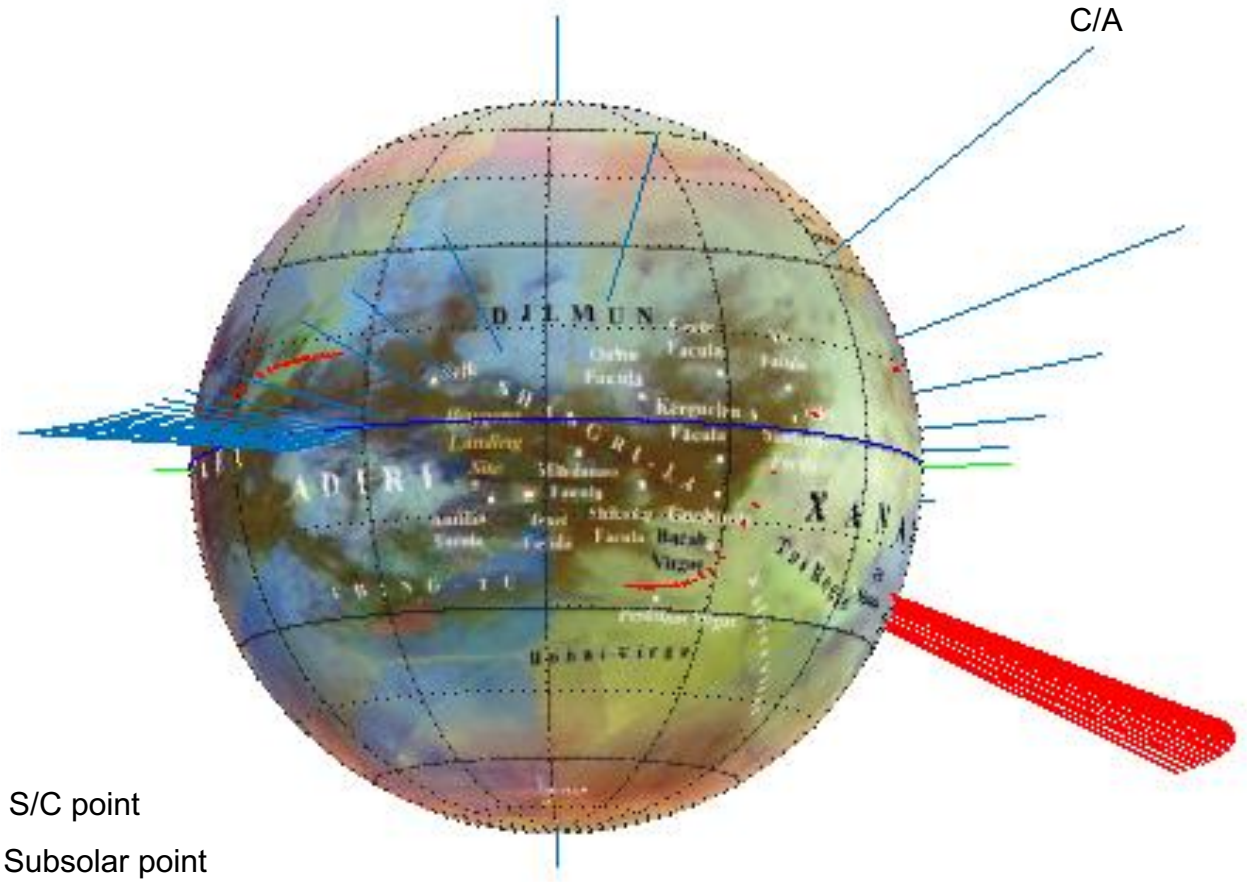
T004 – rev 5 – S9

April 1, 2005 – 091T19:55:12 @ 2404 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

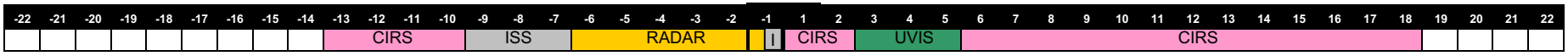
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
									CIRS				ISS				RADAR						CIRS		UVIS		CIRS															

T004 – rev 5 – S9

April 1, 2005 – 091T19:55:12 @ 2404 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry occurs at mid-southern latitudes before and after C/A.



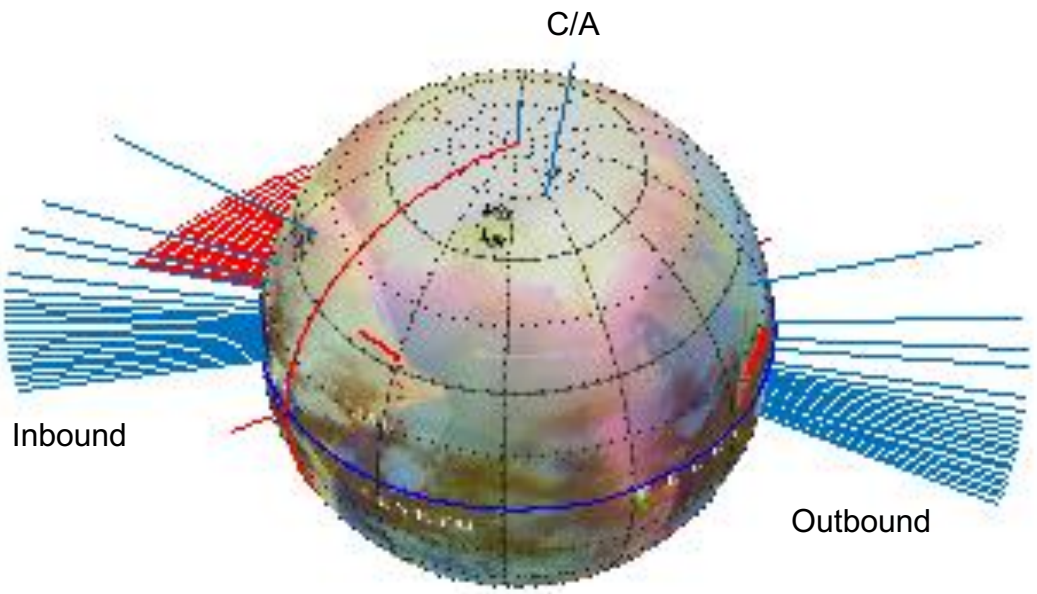
T005 – rev 6 – S10

April 16, 2005 – 106T19:11:46 @ 1027 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T005 VIMS Science objectives: VIMS will map a portion of the northern hemisphere, study cloud formation and dissipation, and attempt to correlate composition with geological features.

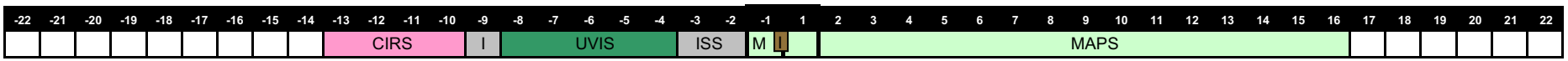
-11:55	-08:30	CIRS_006TI_FIRNADCMP002
-08:30	-08;00	ISS_006TI_PHOTOMWAC001
-08;00	-03:00	UVIS_006TI_EUVFUV001
-03:00	-01:00	ISS_006TI_HIGHRESNA001
-01:00	-00:39	RWA to RCS Transition
-00:39	-00:37	SP Turn to Waypoint
-00:37		Begin Custom Period
-00:37	-00:19	CAPS_006TI_TITANPTG001
-00:19	+00:12	INMS_006TI_T5RMPNT002
2005-106T19:14:25		**CLOSEST APPROACH**
+00:12	+16:27	CAPS_006TI_TITANPTG002



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T005 – rev 6 – S10

April 16, 2005 – 106T19:11:46 @ 1027 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

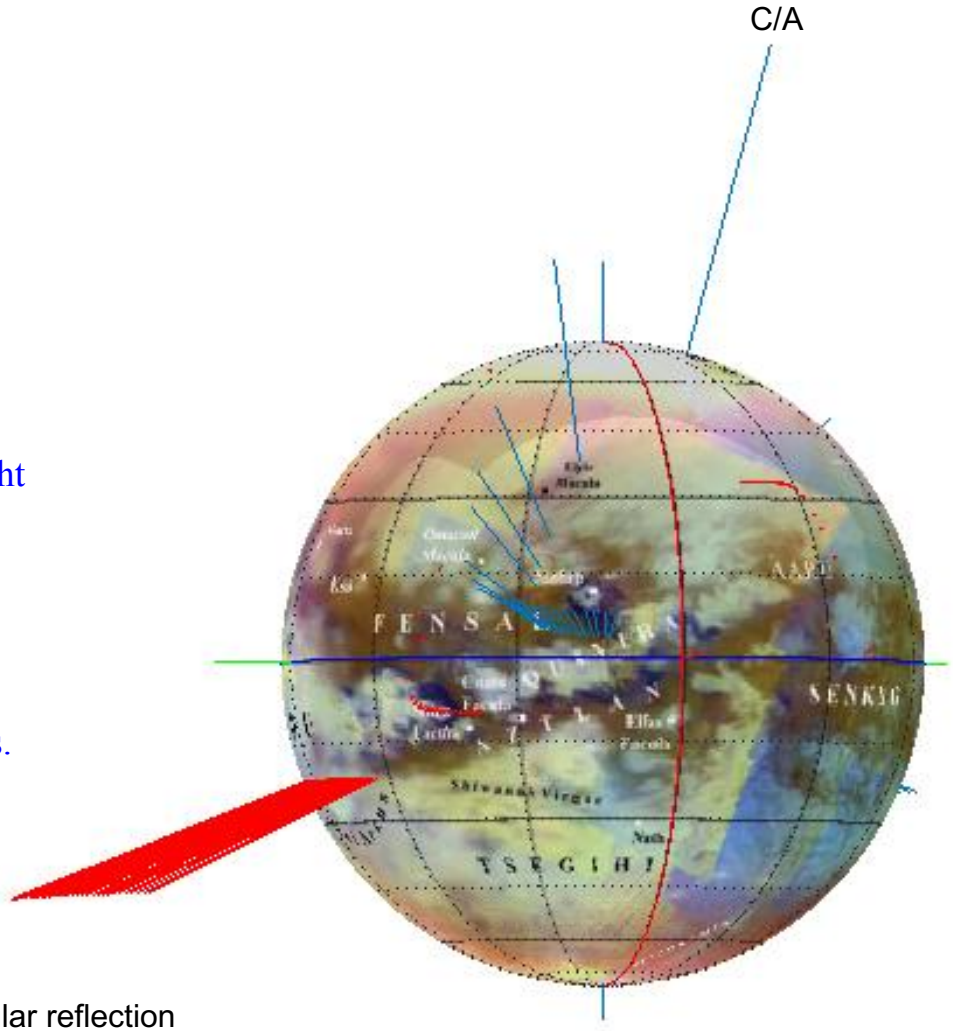
Inbound:

Global mapping of Titan.

Regional mapping* of the Fensal region, including Sinlap crater**.

*Barnes, J. W. et al. (2005). A 5-micron-bright spot on Titan: evidence for surface diversity. Science, 310, 5745, 92-95.

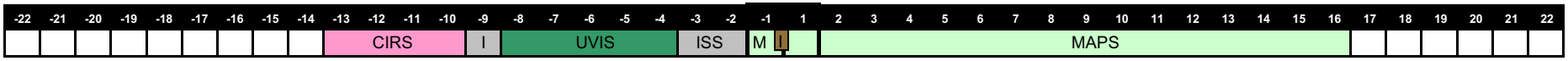
**Le Mouelic, et al. (2008). Mapping and interpretation of Sinlap crater on Titan using Cassini VIMS and RADAR data. J. Geophys. Res., 113, E04003.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



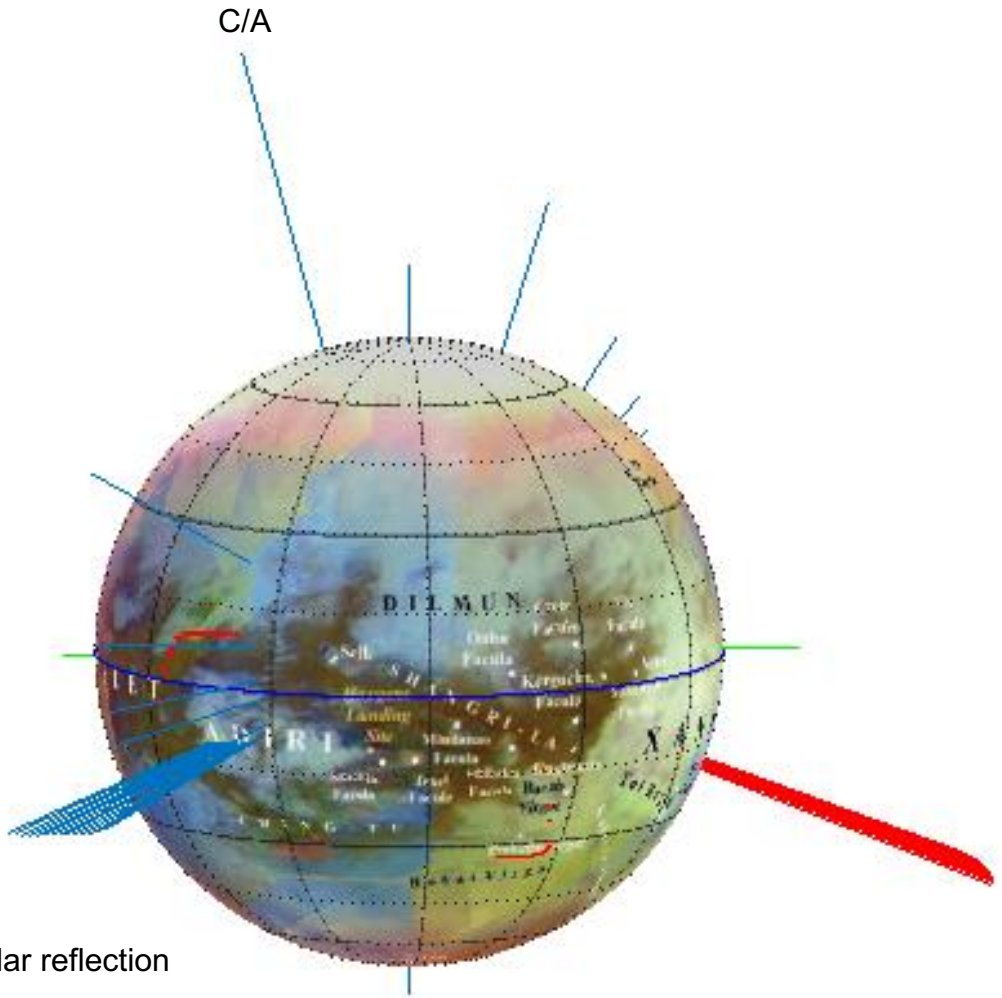
T005 – rev 6 – S10

April 16, 2005 – 106T19:11:46 @ 1027 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

No observations. CAPS and INMS are prime on the outbound.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

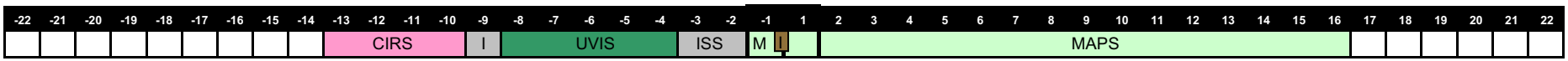
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
									CIRS				I	UVIS					ISS		M		MAPS																				

T005 – rev 6 – S10

April 16, 2005 – 106T19:11:46 @ 1027 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry occurs at mid-southern latitudes before and after C/A.



T006 – rev 13 – S13

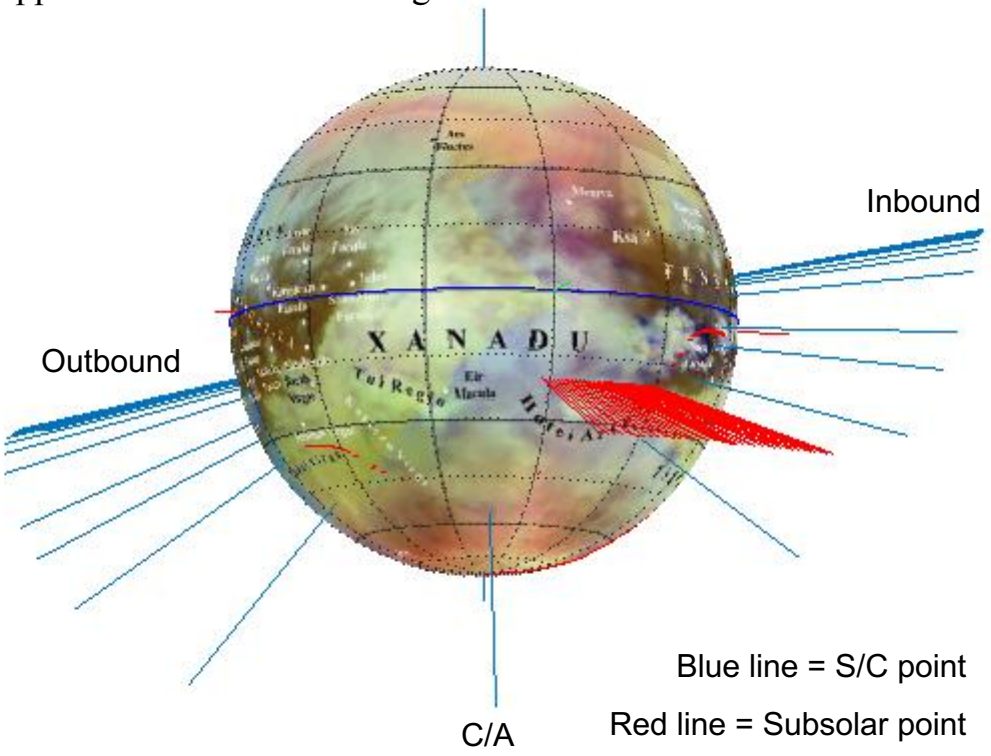
Aug. 22, 2005 – 234T08:53:37 @ 3660 km altitude

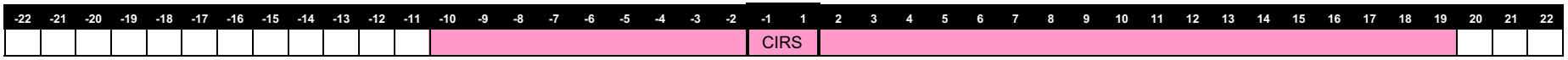
Christophe Sotin, Ken Lawrence, Tucson VIMS team

T006 VIMS Science objectives: First detailed investigation of Titan's south polar region; cloud formation and evolution; and hot spot search.

VIMS ride along with CIRS for various mapping activities. All ridealong requests concatenated into a single request. Mapping activities swapped from T7 due to G-ring avoidance initiative.

-10:48	-7:30	CIRS	FIRNADCMP
-7:30	-05:00	CIRS	MIDIRLMBMAP
-05:00	-02:15	CIRS	FIRNADMAP
-02:15	-01:15	CIRS	FIRLMBINT
-01:15	-00:45	CIRS	FIRLMBAER
-00:45	-00:10	CIRS	FIRLMBTRK
-00:10	+00:10	CIRS	High Res Map
2005-234T08:53:37		**CLOSEST APPROACH**	
+00:10	+0:45	CIRS	FIRLMBTRK
+0:45	+01:15	CIRS	FIRLMBAER
+01:15	+02:15	CIRS	FIRLMBINT
+02:15	+05:00	CIRS	FIRNADMAP
+05:00	+7:30	CIRS	MIDIRLMBMAP
+7:30	+12:00	CIRS	FIRNADCMP
+12:00	+19:03	CIRS	MIDIRTMAP





T006 – rev 13 – S13

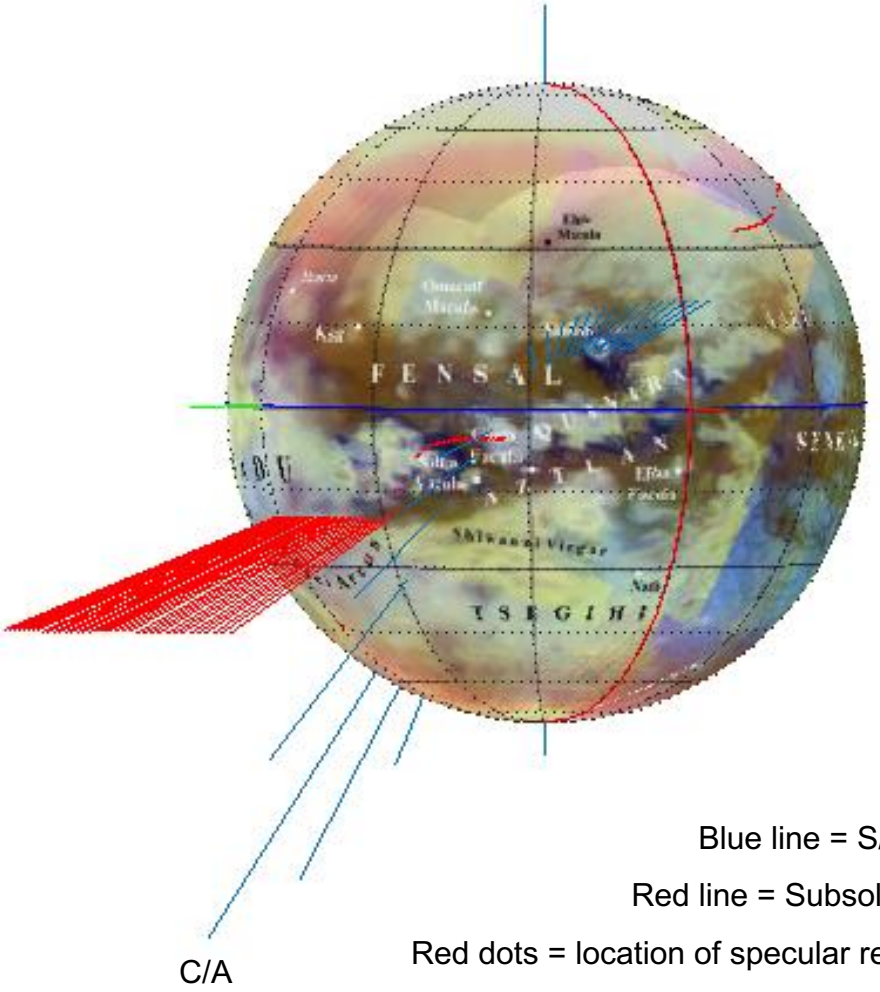
Aug. 22, 2005 – 234T08:53:37 @ 3660 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

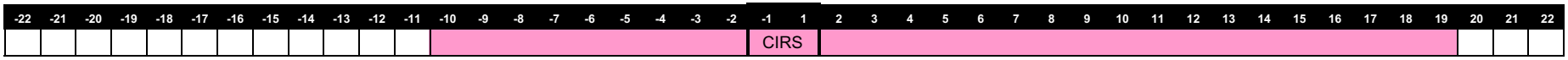
Regional mapping of Titan near the Aztlan region.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



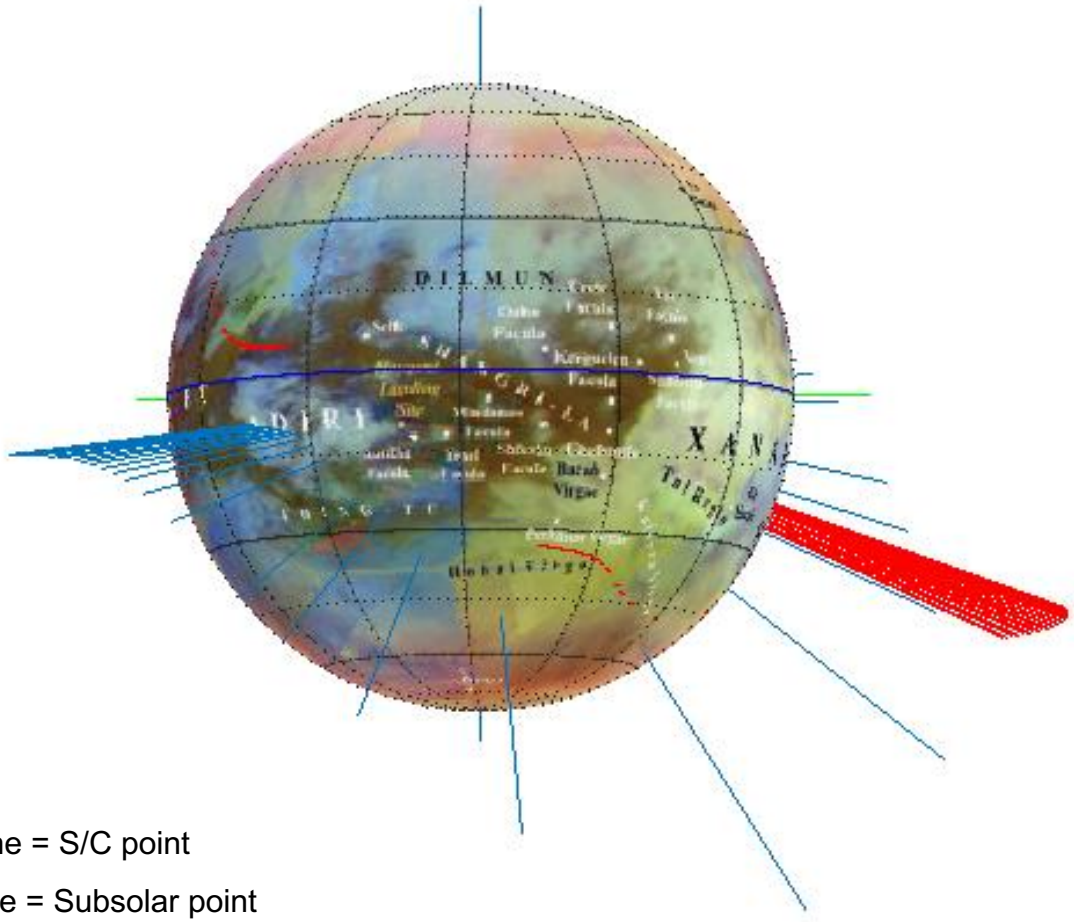
T006 – rev 13 – S13

Aug. 22, 2005 – 234T08:53:37 @ 3660 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A

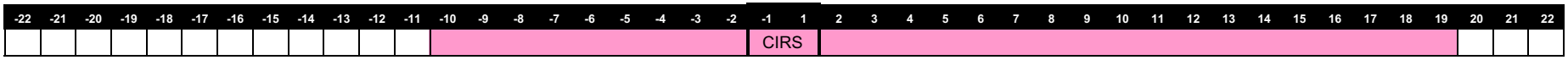
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
																					CIRS																							

T006 – rev 13 – S13

Aug. 22, 2005 – 234T08:53:37 @ 3660 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry occurs at mid-southern latitudes before and after C/A.



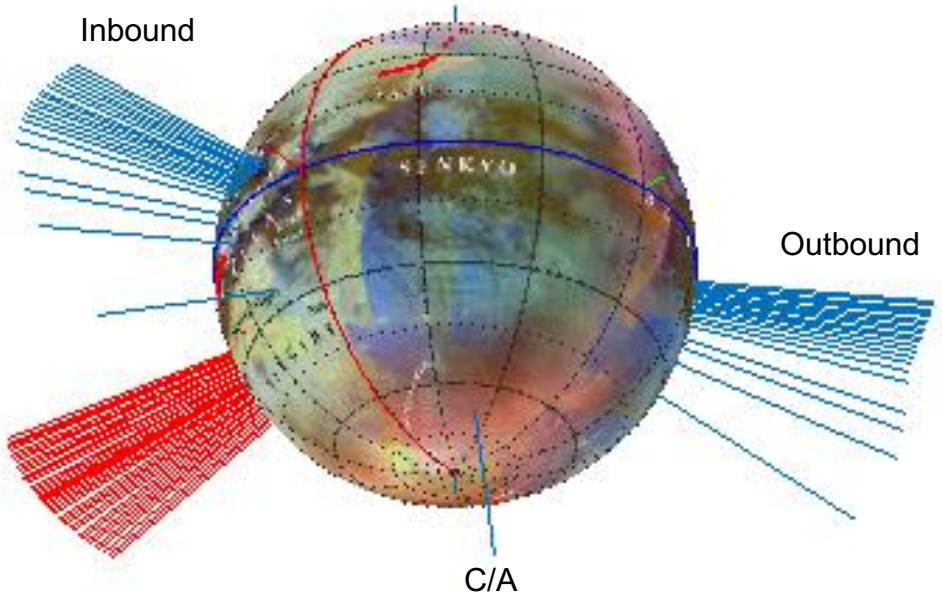
T007 – rev 14 – S14

Sep. 7, 2005 – 250T07:50:26 @ 1075 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T007 VIMS Science objectives: Global and high-resolution mapping. Cloud evolution and haze morphology.

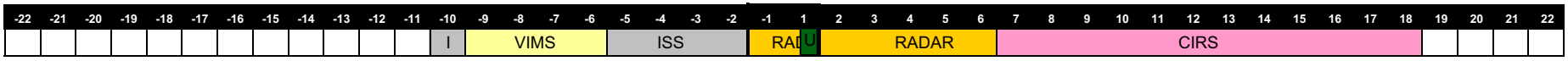
-10:30	-08:45	ISS_014TI_MONITORNA001_PRIME	
-08:45	-05:00	VIMS_014TI_MEDRES007_PRIME	
-05:00	-00:52	ISS_014TI_COMBINED001_PRIME	Global Map & High-Res NA Imaging
2005-250T06:30:14		MP_014SA_RPXDESCEN014_NA	
-00:52	-00:31	Transition from RWA to RCS	Includes VIMS Ride-along High-Res Imaging
-00:31	-00:23	SP Turn to RADAR/INMS Waypoint	NEG_Z to Titan, NEG_X to SC_RAM (0, 0, -40 deg offset)
-00:23		Begin Custom Period	
-00:23	-00:15	RADAR_014TI_TI7P1ALT001_PRIME	
-00:15	-00:06:30	RADAR_014TI_TI7P2LRES001_PRIME	
-00:06:30	+00:06:30	RADAR_014TI_TI7P3HRES001_PRIME	
2005-250T08:11:57		**CLOSEST APPROACH**	
+00:06:30	+00:15	RADAR_014TI_TI7P4LRES001_PRIME	
+00:15	+00:39	RADAR_014TI_TI7P5ALT001_PRIME	
+00:39	+01:24	UVIS_014ST_ALPPEG002_PRIME	
+01:24	+01:48	Transition from RCS to RWA	
+01:48	+05:20	RADAR_014TI_TI7P6RAD001_PRIME	
+05:20		End Custom Period	
+05:20	+05:40	SP Turn to ORS Waypoint	ISS_NAC to Titan, POS_X to NTP
+05:40	+09:00	CIRS_014TI_MIRLMBINT002_PRIME	
+09:00	+12:00	CIRS_014TI_FIRNADCMP002_PRIME	
+12:00	+18:11:52	CIRS_014TI_MIDIRTMAP005_PRIME	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T007 – rev 14 – S14

Sep. 7, 2005 – 250T07:50:26 @ 1075 km altitude

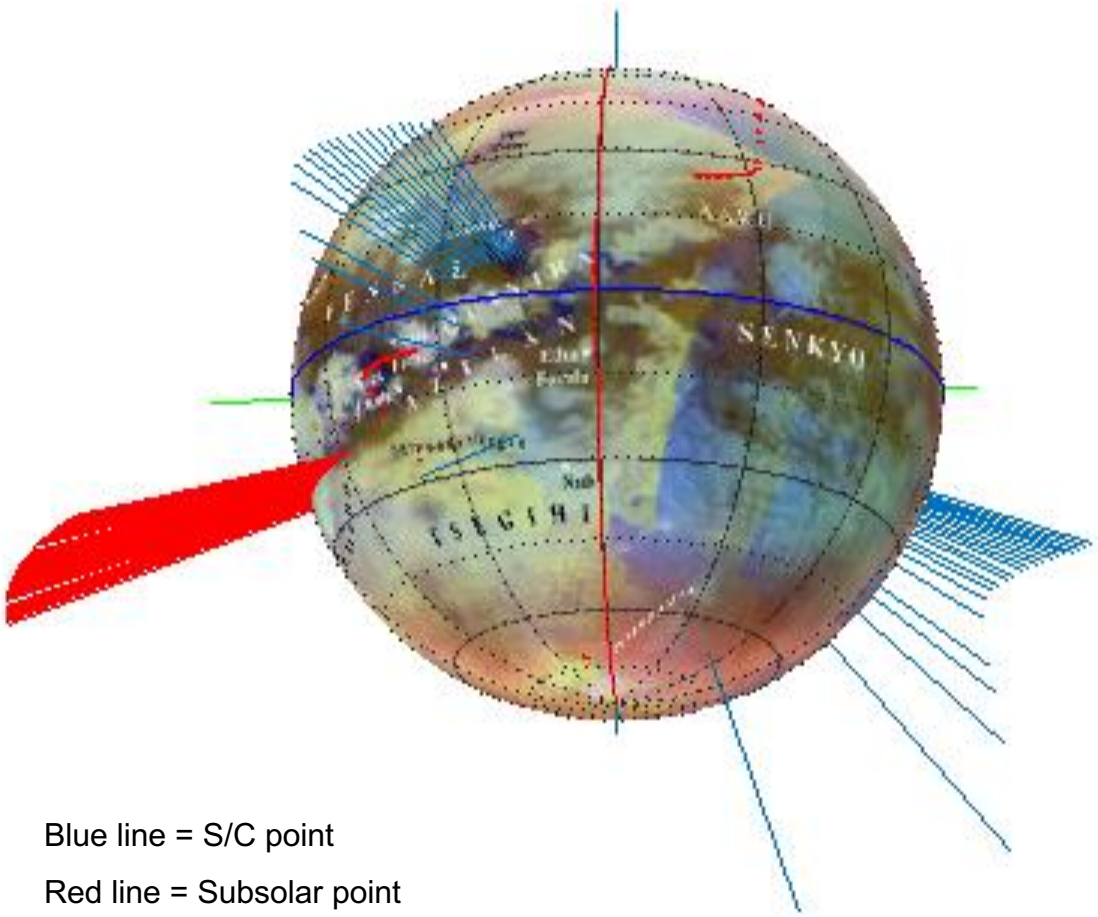
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Regional mapping of Titan while riding along with ISS.

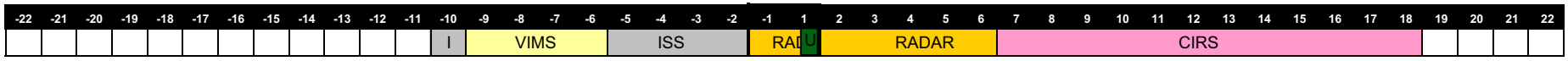
Some data lost.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T007 – rev 14 – S14

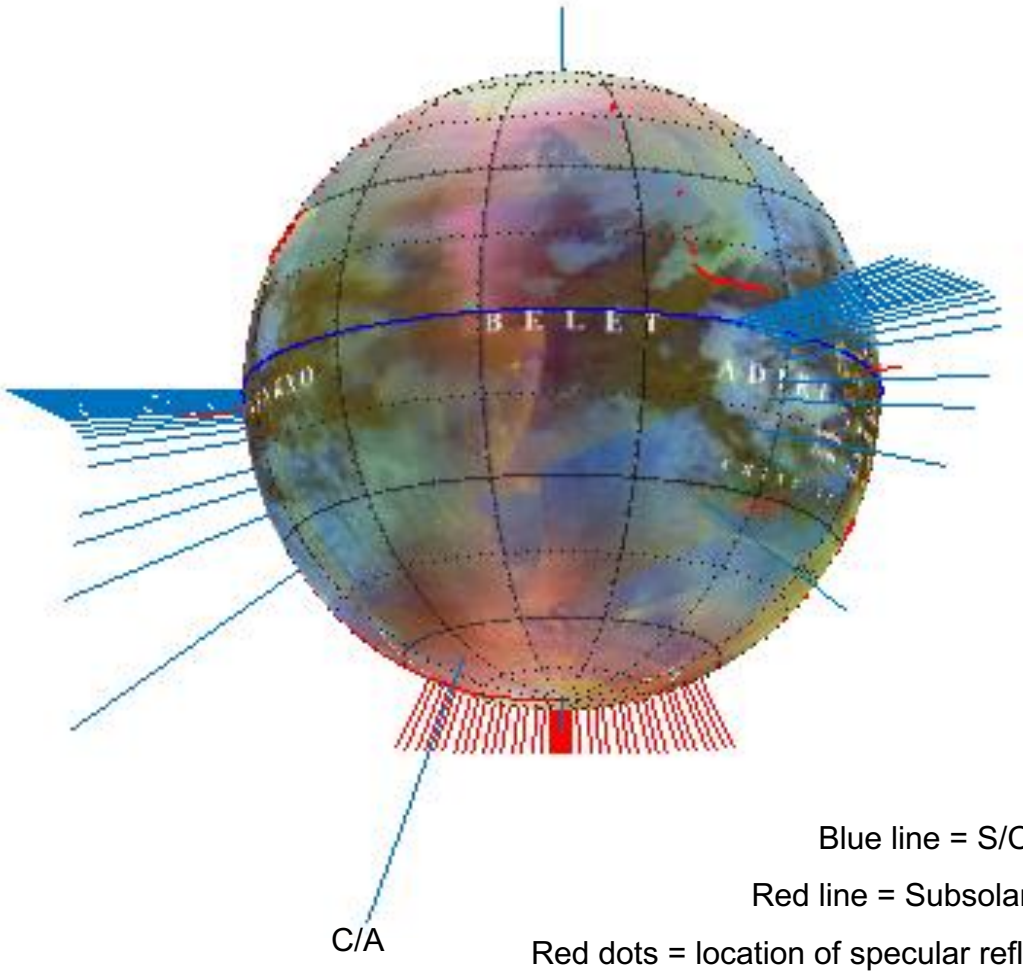
Sep. 7, 2005 – 250T07:50:26 @ 1075 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

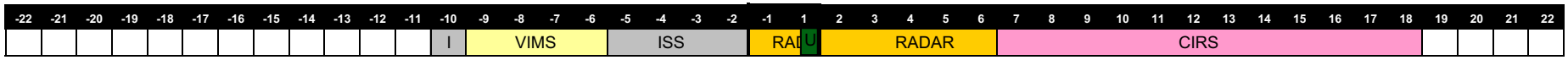
Some data lost.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

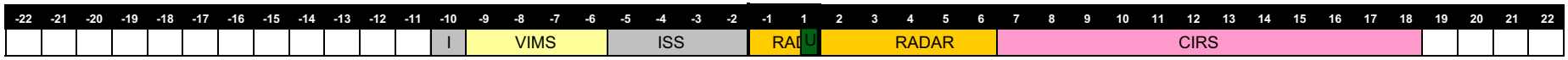


T007 – rev 14 – S14

Sep. 7, 2005 – 250T07:50:26 @ 1075 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry occurs at mid-southern latitudes before and after C/A.



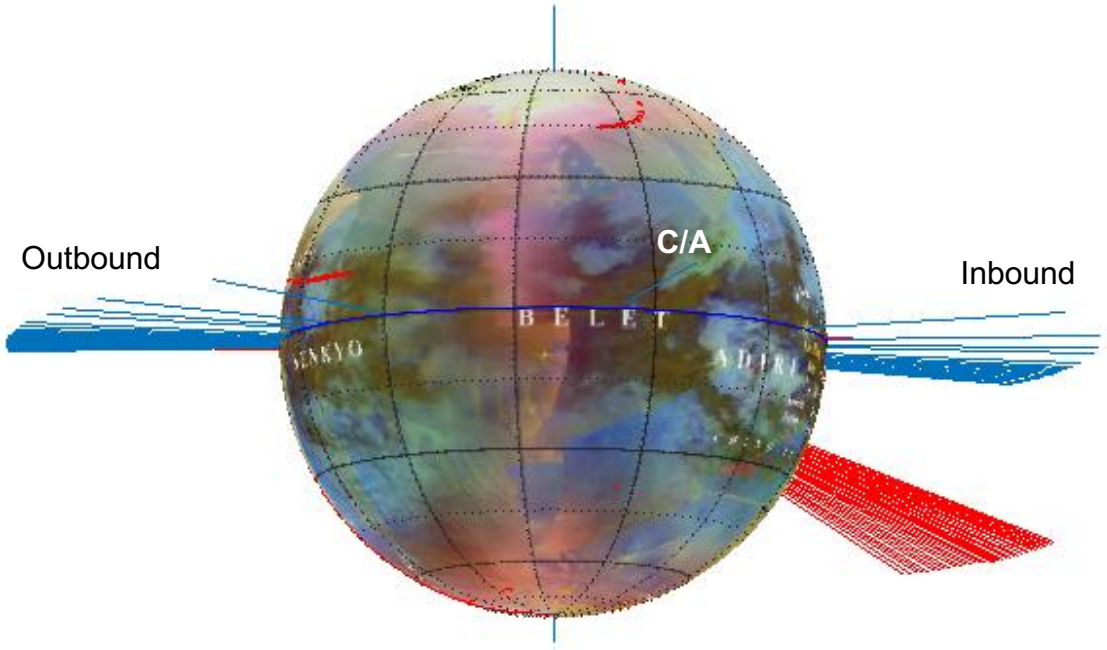
T008 – rev 17 – S15

Oct. 28, 2005 – 301T03:58:09 @ 1353 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T008 VIMS Science objectives: Global and high-resolution mapping. Cloud evolution and haze morphology.

-09:01	-08:14	ISS GLOBMAP
-08:14	-04:48	VIMS MEDRES
-04:48	-04:15	VIMS HIRES
-04:15	-03:45	SP Turn to Waypoint
-03:45	-01:43	RADAR RAD
-01:43	-01:21	Transition to RCS
-01:21	-00:32	RADAR SCAT
-00:32	-00:15	RADAR ALT
-00:15	-00:03	RADAR SAR
-00:03	+00:03	RADAR SAR
2005-301T04:15:10		**CLOSEST APPROACH**
+00:03	+00:15	RADAR SAR
+00:15	+00:32	RADAR ALT
+00:32	+01:21	RADAR SCAT
+01:21	+01:45	Transition to RWA
+01:45	+05:10	RADAR RAD
+05:10	+05:40	SP Turn to Waypoint
+05:40	+09:00	CIRS MIDIRLMBMAP
+09:00	+12:00	CIRS FIRNADCMP
+12:00	+19:48:50	CIRS MIDIRTMAP



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T008 – rev 17 – S15

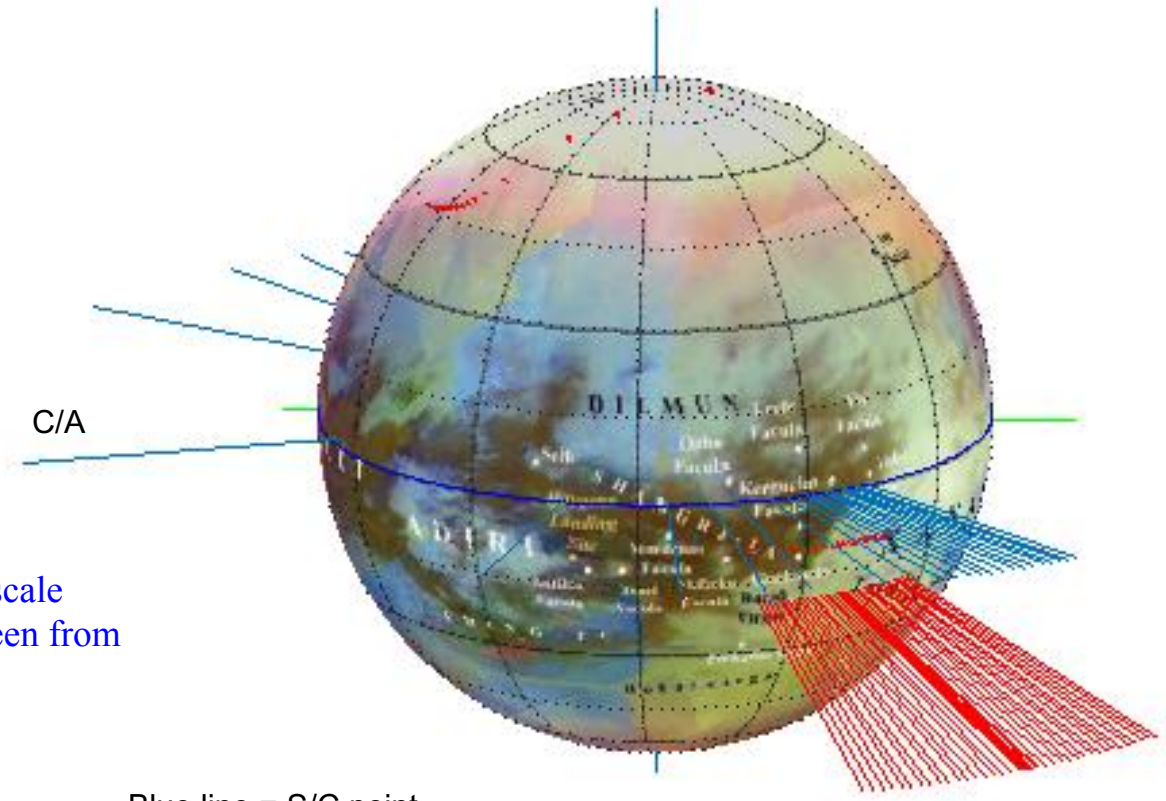
Oct. 28, 2005 – 301T03:58:09 @ 1353 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan*.

Regional mapping of the Shangri-La region.



*Barnes, J. W., et al. (2007) Global-scale surface spectral variations on Titan seen from Cassini/VIMS. Icarus, 186, 242-258.

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

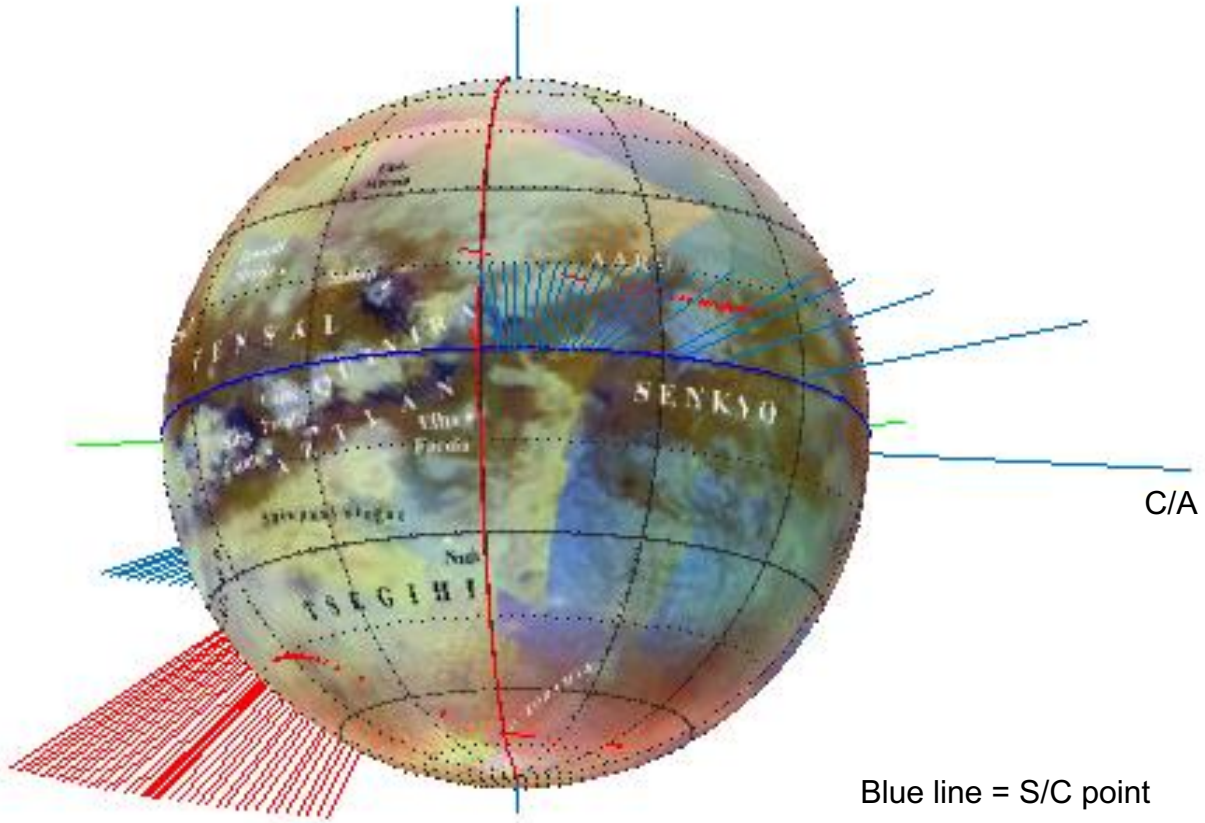
T008 – rev 17 – S15

Oct. 28, 2005 – 301T03:58:09 @ 1353 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T008 – rev 17 – S15

Oct. 28, 2005 – 301T03:58:09 @ 1353 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry occurs at mid-southern latitudes before and after C/A.

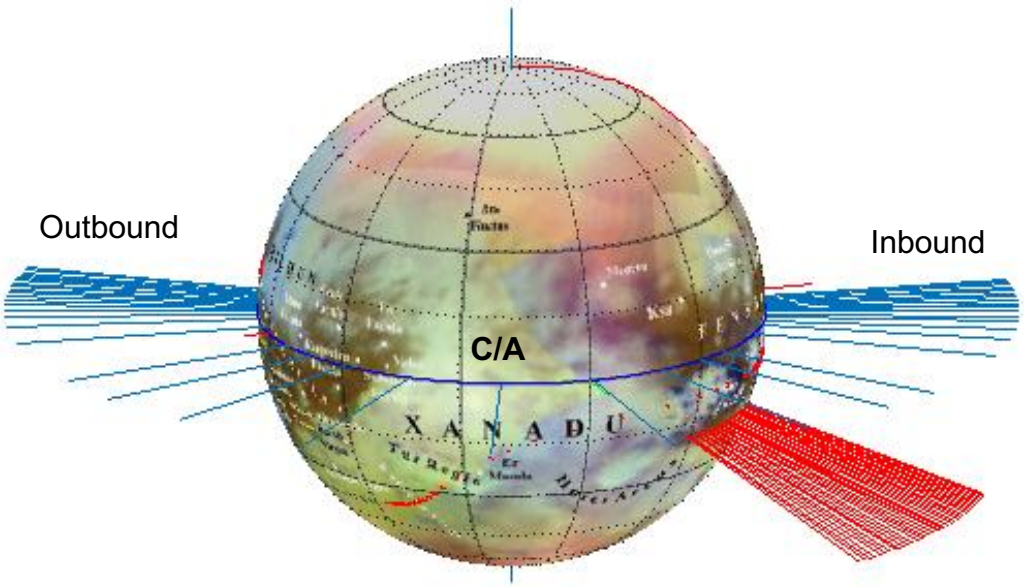
T009 – rev 19 – S17

Dec. 26, 2005 – 360T18:54:15 @ 10411 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T009 VIMS Science objectives: Global and high-resolution mapping. Cloud evolution and haze morphology.

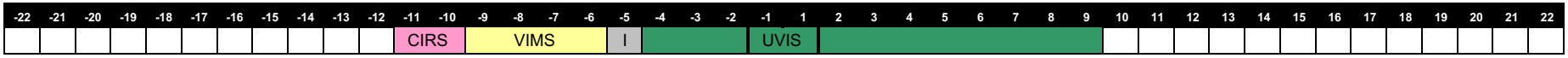
- 11:10:00	- 09:00:00	CIRS	
- 09:00:00	- 06:00:00	VIMS	Med Res Regional Map
- 06:00:00	- 04:00:00	ISS	High Res NAC
- 04:00:00	- 01:00:00	UVIS	
- 01:00:00	+ 02:30:00	MAPS	UVIS Controls Pointing
2005-360T18:59:30		**CLOSEST APPROACH**	
+ 02:30:00	+08:54:00	UVIS	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T009 – rev 19 – S17

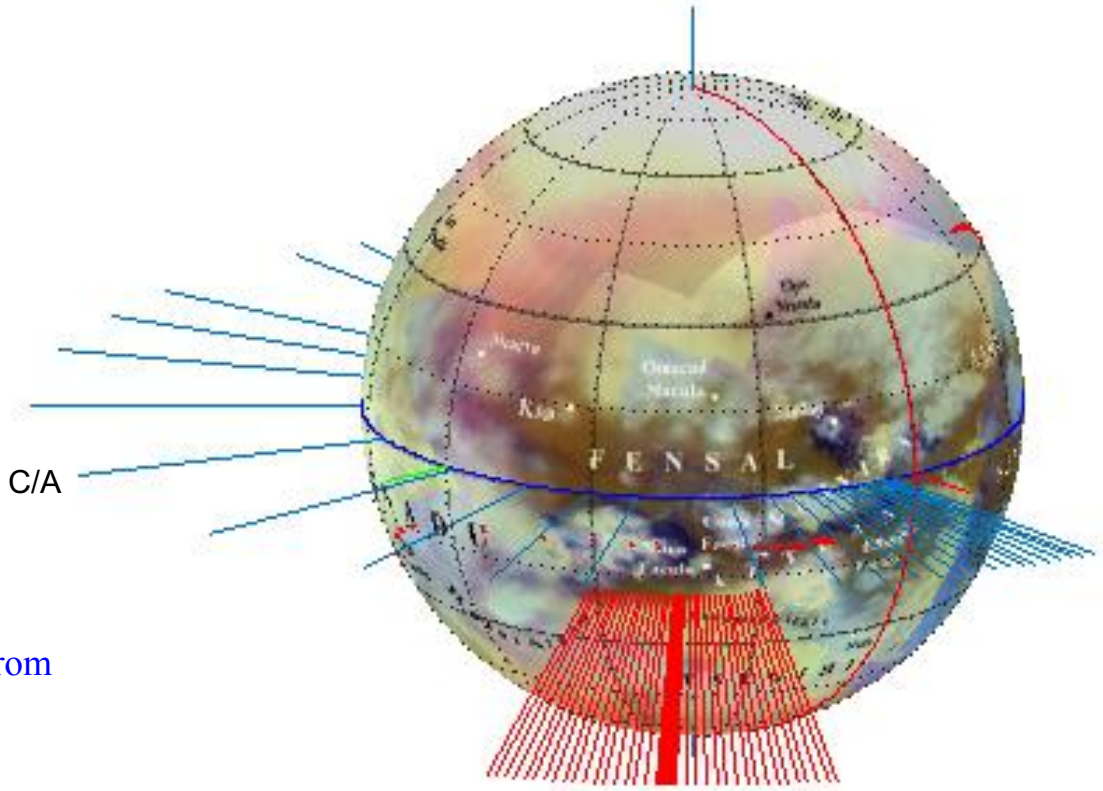
Dec. 26, 2005 – 360T18:54:15 @ 10411 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan*.

Regional mapping of the Fensal region prior to C/A.

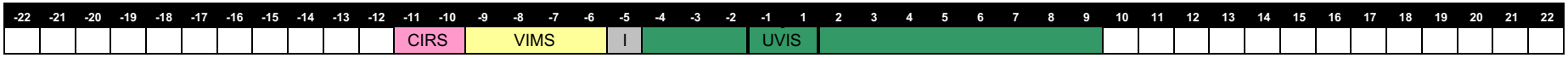


*Barnes, J. W., et al. (2007) Global-scale surface spectral variations on Titan seen from Cassini/VIMS. Icarus, 186, 242-258.

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



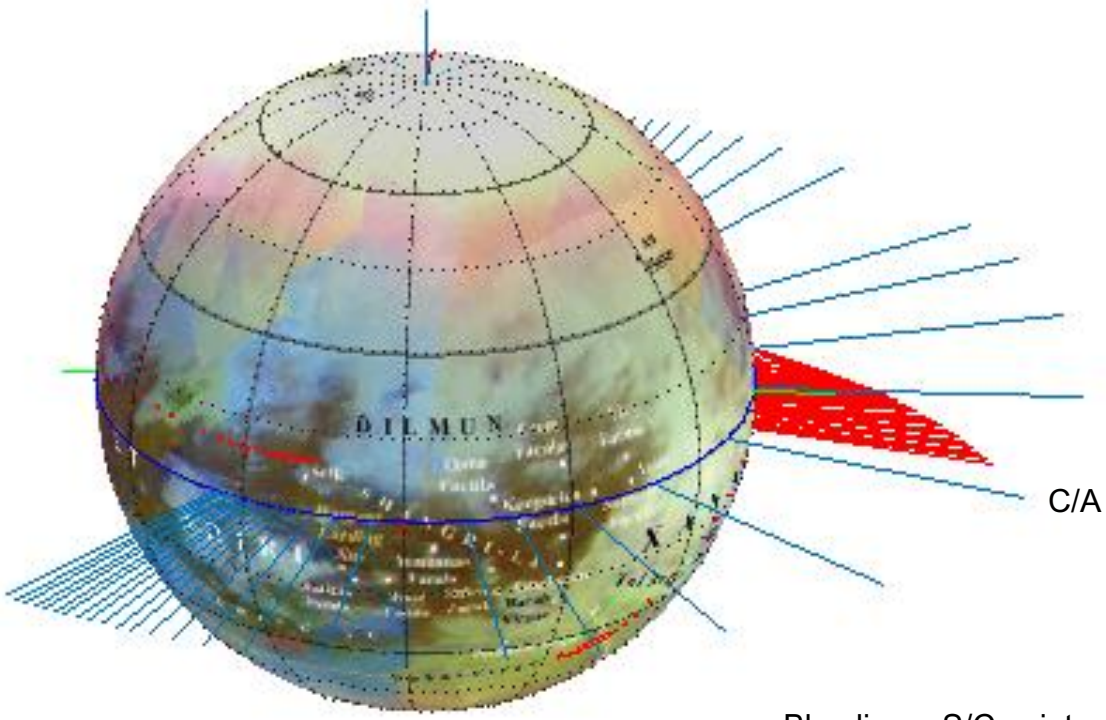
T009 – rev 19 – S17

Dec. 26, 2005 – 360T18:54:15 @ 10411 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

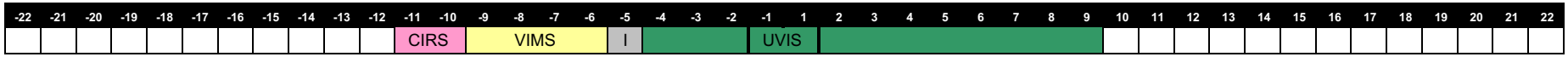
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
											CIRS		VIMS				I				UVIS																						

T009 – rev 19 – S17

Dec. 26, 2005 – 360T18:54:15 @ 10411 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry occurs at mid-southern latitudes before and after C/A.



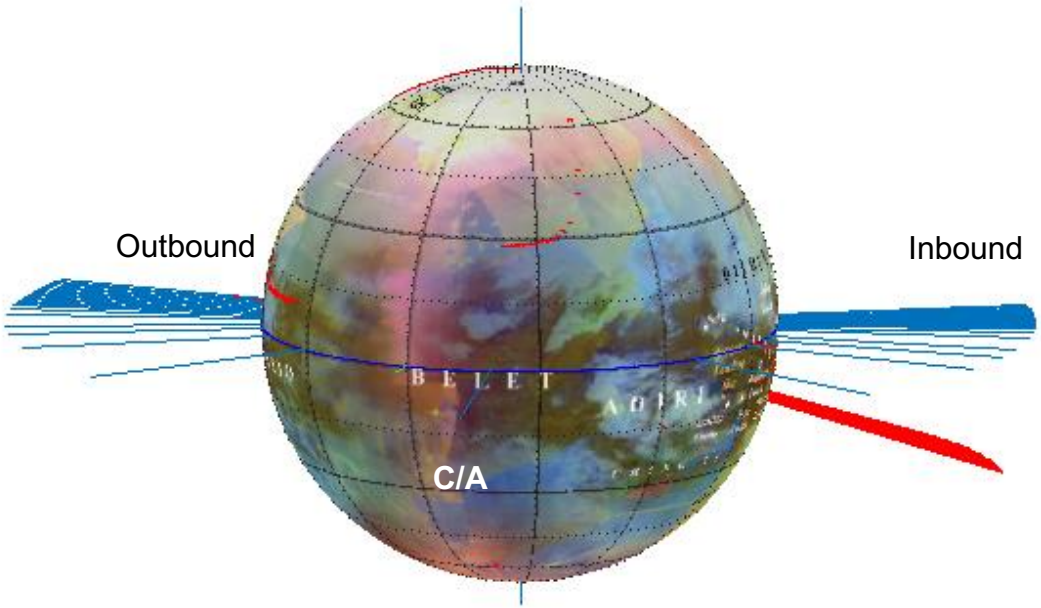
T010 – rev 20 – S17

Jan. 15, 2006 – 015T11:41:27 @ 2043 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T010 VIMS Science objectives: T10 will allow us to get new high resolution images that will help us to understand Titan's geology and the fate of CH4. We will look for cloud evolution and haze morphology. Global mapping of Titan and solar occultation.

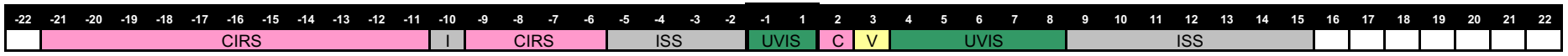
-21:18	-12:00	CIRS Mid-IR Nadir Temp Map
-12:00	-10:00	CIRS Far-IR Nadir Comp
-10:00	-9:00	ISS MONITOR_NA
-9:00	-5:00	CIRS Mid-IR Limb Temp Map
-5:00	-2:00	ISS Global Map
-2:00	-0:40	VIMS
-0:40	-0:30	Turn UVIS Solar Port to Titan
-0:30	+1:00	UVIS Solar occultation
2006-015T11:41:27		**CLOSEST APPROACH**
+1:00	+2:00	CIRS Far-IR Limb
+2:00	+3:00	VIMS Aurora
+3:00	+8:00	UVIS EUV-FUV
+8:00	+14:43	ISS NIGHT_NA



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T010 – rev 20 – S17

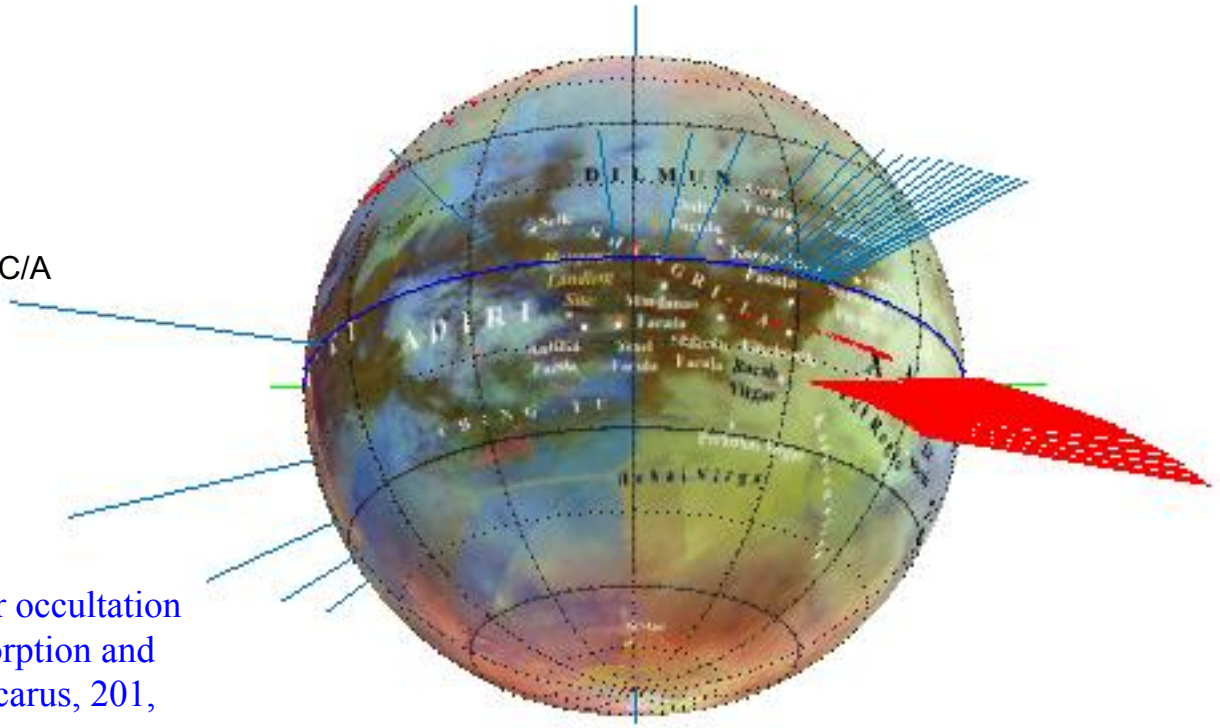
Jan. 15, 2006 – 015T11:41:27 @ 2043 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Ride along with UVIS for solar occultation*.

Obtain mosaics of the Shangri-La region.



*Bellucci A., et al. (2009). Titan solar occultation observed by Cassini/VIMS: Gas absorption and constraints on aerosol composition, Icarus, 201, 198-216.

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	CIRS											I	CIRS				ISS				UVIS		C	V	UVIS					ISS												

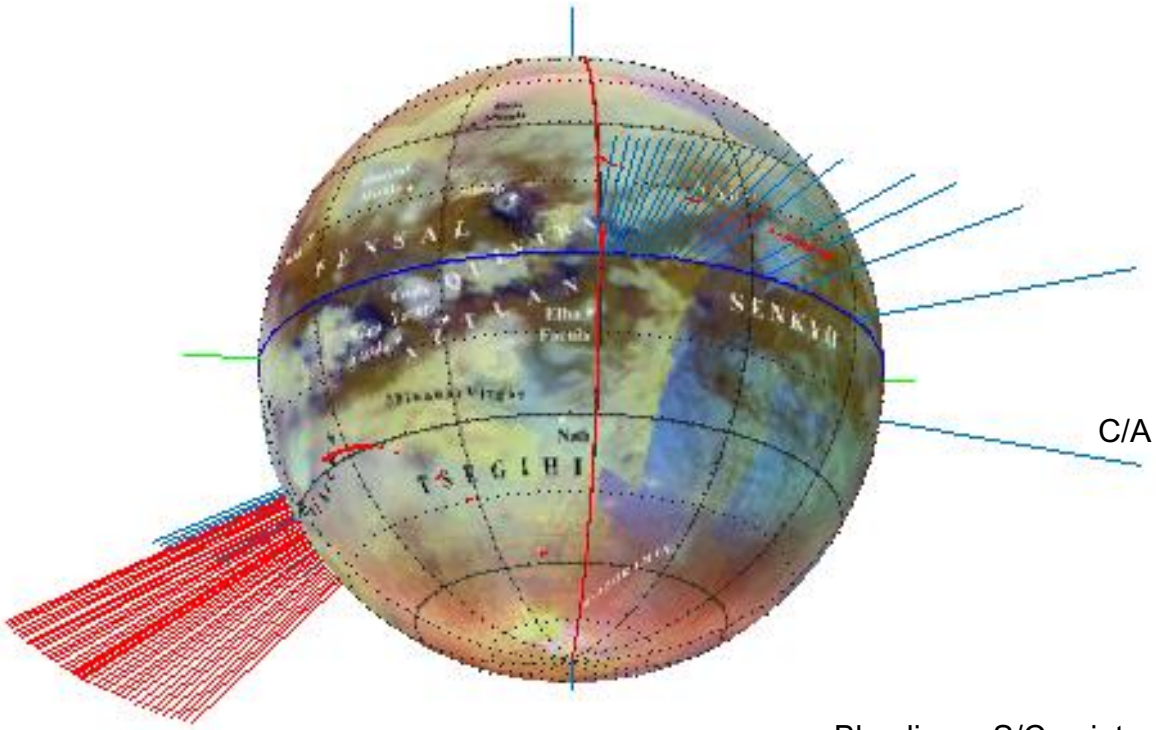
T010 – rev 20 – S17

Jan. 15, 2006 – 015T11:41:27 @ 2043 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	CIRS											I	CIRS				ISS				UVIS		C	V	UVIS					ISS												

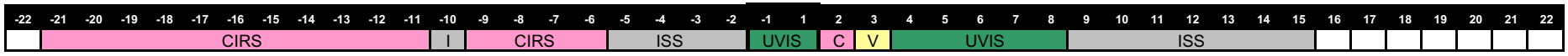
T010 – rev 20 – S17

Jan. 15, 2006 – 015T11:41:27 @ 2043 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry occurs at mid-southern latitudes before and after C/A.

Specular reflection geometry occurs at 72S, 307 W at C/A – 00:20 during the solar occultation observation.



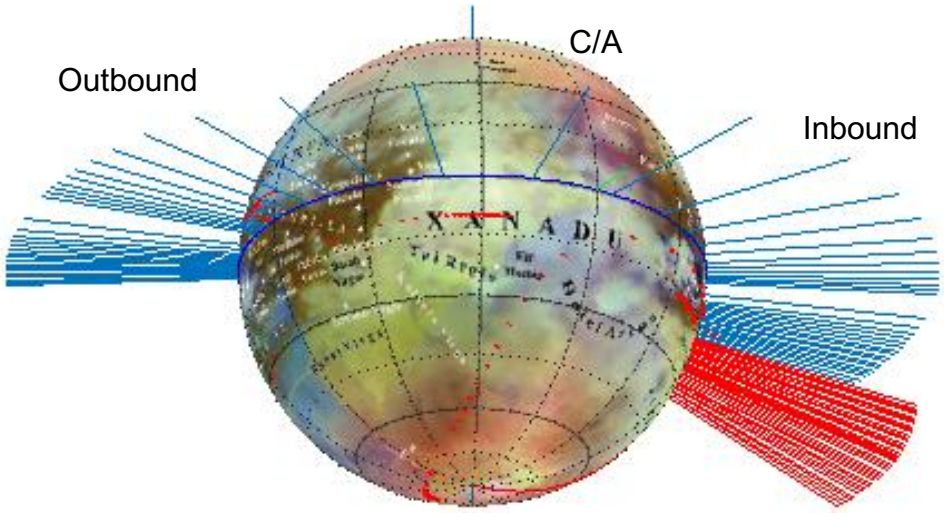
T011 – rev 21 – S18

Feb. 27, 2006 – 058T08:25:19 @ 1812 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T011 VIMS Science objectives: Monitor and global mapping; search for mid-latitude clouds and understanding of their evolution. Correlation of composition with geology; haze morphology and characterization; photometry. Search for hot spots, lightning and aurora on the dark side.

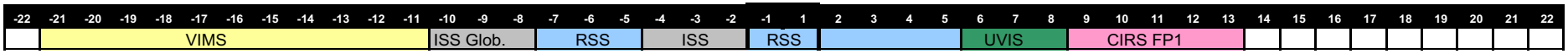
-22:30	-10:00	VIMS	Saturn-facing side; Coordinate w, CIRS, prefer 4 microrad, sec slow scan
-10:00	-07:00	ISS Global Map	5 min dwell times
-07:00	-06:30	SP Turn to Earth for Downlink	
-06:30	-04:30	RSS	Gravity Wing
-04:30	-04:00	Turn to Titan	
-04:00	-01:30	ISS	Good low phase, high resolution opportuinity; four 5x3 mosaics; 1 min dwell times
-01:30	-01:00	SP Turn to Earth for Downlink	
-01:00	+04:30	RSS	Gravity
2006-058T08:25:19		**CLOSEST APPROACH**	
+04:30	+05:00	Turn to Titan	
+05:00	+08:30	UVIS	6 microrad, sec slow continuous slew across titan; good for CIRS temperature map
+08:30	+13:10	CIRS	Long integration w, FP1; mid-sou8thern latitude at 60 degrees emissionangle; co- aligned ORS boresights on Titan, mayh choose orientation to optimize; VIMS good lighting search opportunity



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T011 – rev 21 – S18

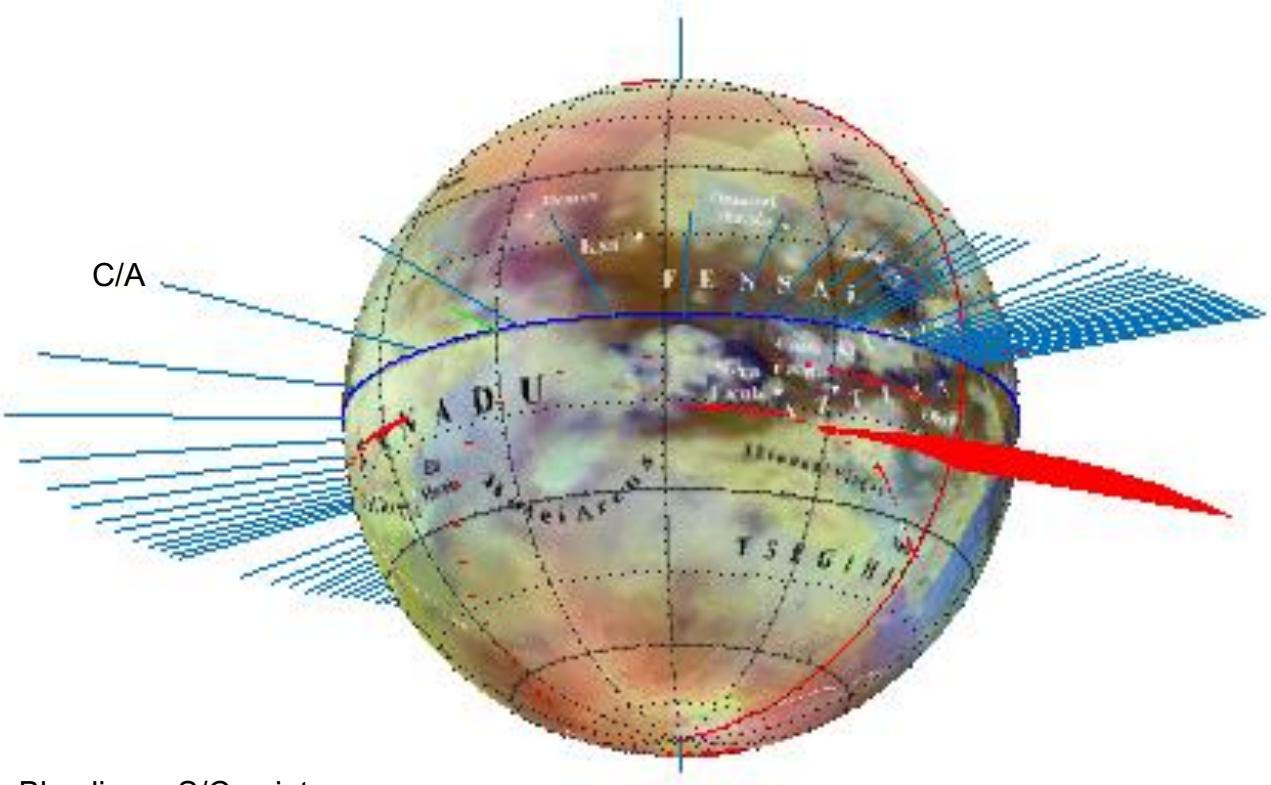
Feb. 27, 2006 – 058T08:25:19 @ 1812 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Regional mapping of the Fensal and Aztlan regions prior to C/A.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	VIMS											ISS Glob.			RSS			ISS			RSS						UVIS			CIRS FP1												

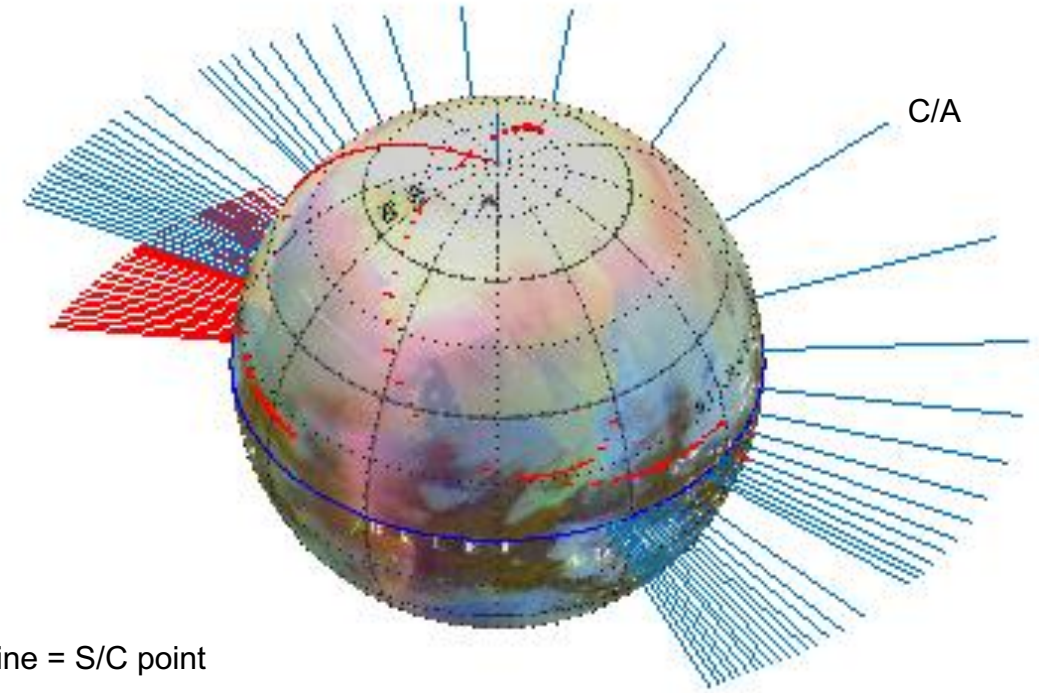
T011 – rev 21 – S18

Feb. 27, 2006 – 058T08:25:19 @ 1812 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

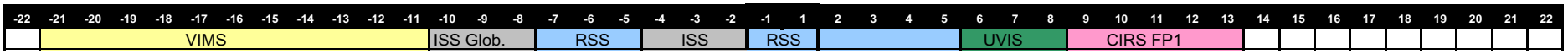
Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

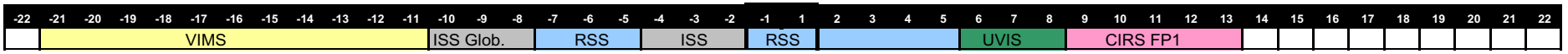


T011 – rev 21 – S18

Feb. 27, 2006 – 058T08:25:19 @ 1812 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry occurs at equatorial latitudes before C/A. After C/A, specular reflection geometry occurs at high southern latitudes.



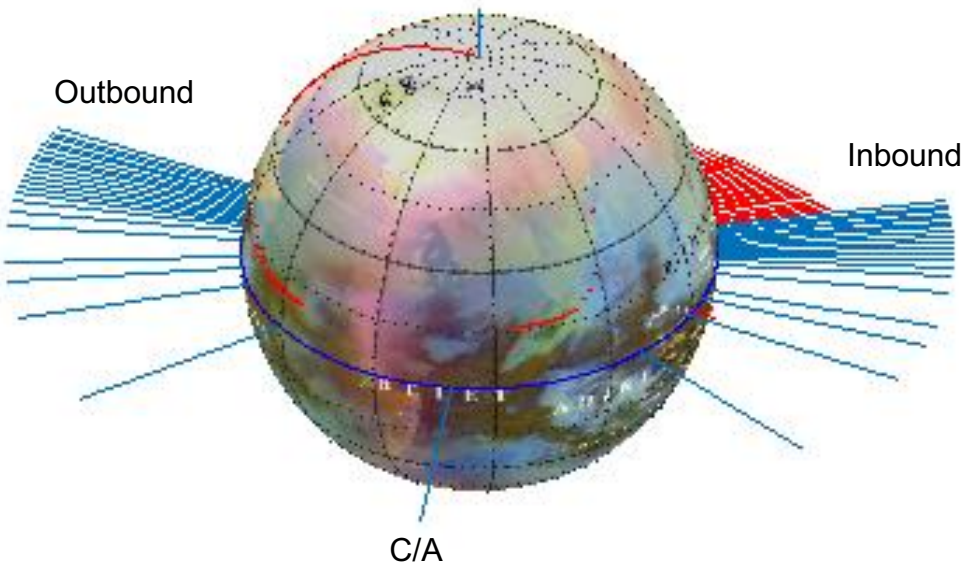
T012 – rev 22 – S19

March 19, 2006 – 078T00:05:57 @ 1949 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T012 VIMS Science objectives: Monitor and global mapping; search for mid-latitude clouds and understanding of their evolution. Correlation of composition with geology; haze morphology and characterization; photometry. Search for hot spots, lightning and aurora on the dark side

-15:24	-14:00	VIMS	GLOB MAP
-14:00	-07:00	CIRS	FIRNADCMP
-07:00	-03:10	ISS	GLOB MAP
-03:10	-02:49	Transition to RCS	
-02:49	-01:25	VIMS	REG MAP
-01:25	-01:15	Turn to Occultation attitude	RSS
-01:15	-00:06	RSS	BISTAT
-00:06	+00:45	RSS	OCC
2006-078T00:05:57		**CLOSEST APPROACH**	
+00:45	+00:57	Turn back to Waypoint	RSS
+00:57	+01:19	Transition to RWA	
+01:19	+05:30	RADAR	RADIOMETRY
+05:30	+12:20	VIMS	AURORA
+12:20	+14:01	CIRS	FIRNADCMP



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							VIMS			CIRS FP1						ISS Global				V		RSS			RADAR				VIMS Cloud Map					CIRS								

T012 – rev 22 – S19

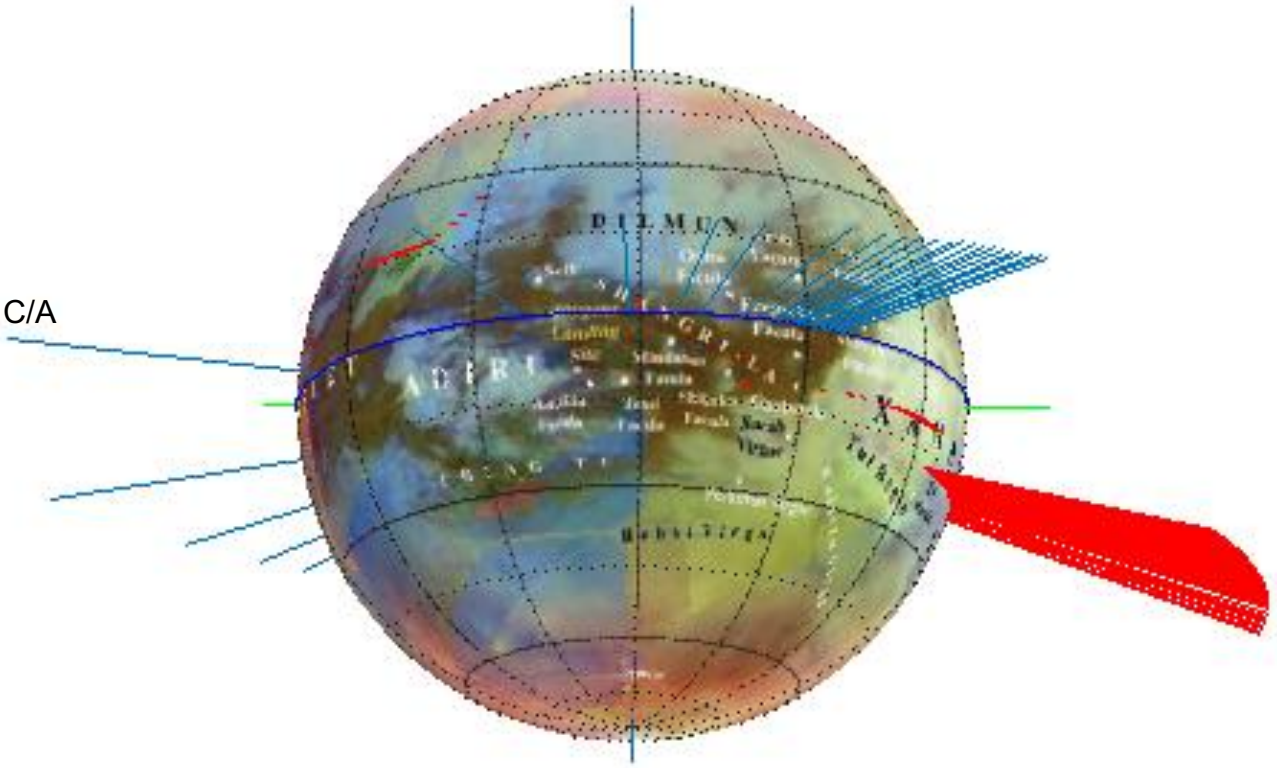
March 19, 2006 – 078T00:05:57 @ 1949 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Obtain mosaics of the northern Shangri-La region.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							VIMS		CIRS FP1							ISS Global				V	RSS		RADAR				VIMS Cloud Map							CIRS									

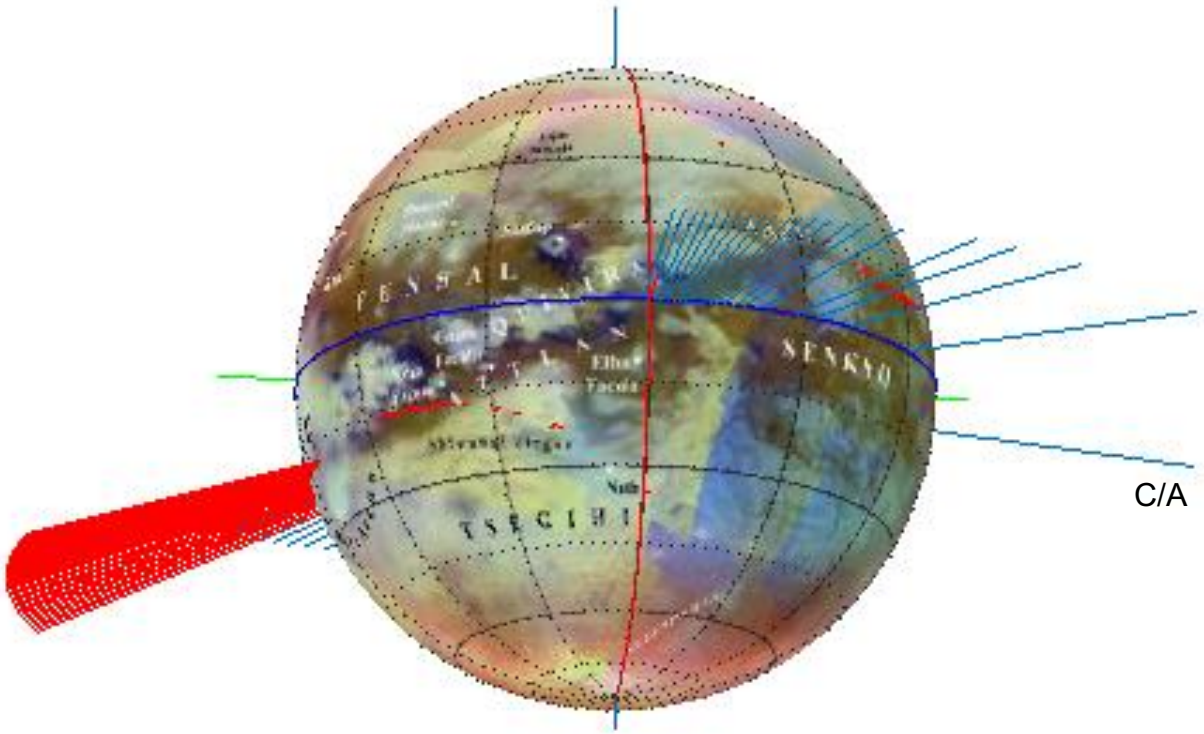
T012 – rev 22 – S19

March 19, 2006 – 078T00:05:57 @ 1949 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

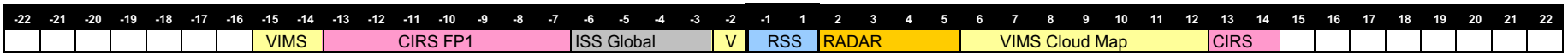
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							VIMS		CIRS FP1							ISS Global				V	RSS		RADAR				VIMS Cloud Map							CIRS									

T012 – rev 22 – S19

March 19, 2006 – 078T00:05:57 @ 1949 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry occurs at mid-southern latitudes before and after C/A.



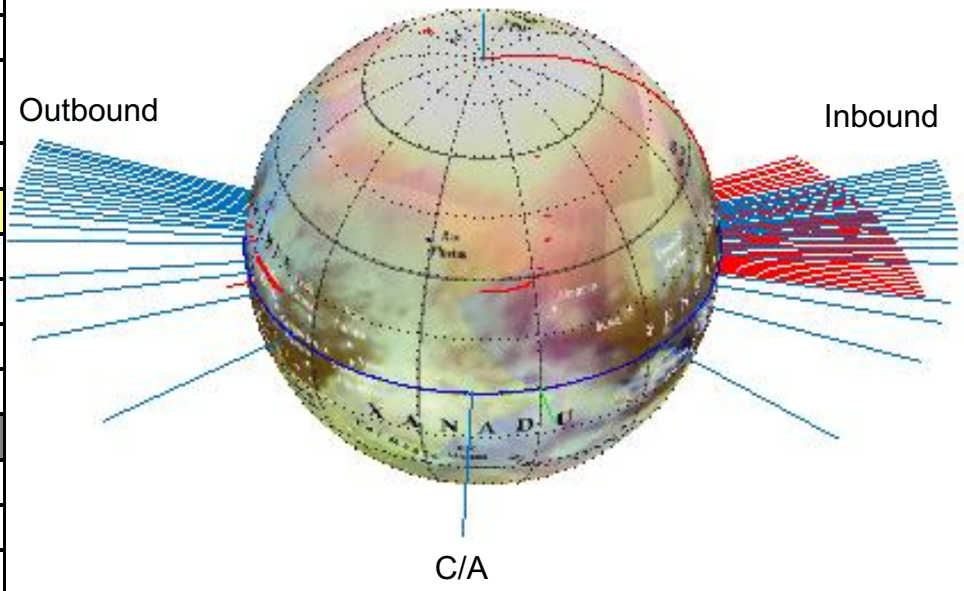
T013 – rev 23 – S20

April 30, 2006 – 120T20:53:31 @ 1856 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T013 VIMS Science objectives: Identification of geologic features including volcanoes, eolian features, and craters, and their correlation with composition. Search for shadows.

-15:24	-09:00	CIRS	Far-IR Nadir Comp
-09:00	-07:00	CIRS	Mid-IR Limb
-07:00	-06:00	VIMS	Med Res
-06:00	-04:00	CIRS	Mid-IR Limb
-04:00	-02:00	ISS	Regional Map
-02:00		Begin Custom Period	
-02:00	-01:16	ISS	High Res NAC
-01:16	-00:35	UVIS	Beta Ori Occ
-00:35	-00:07	RADAR Low-Res SAR	Inbound
-00:07	+00:07	RADAR High-Res SAR	C, A
2006-120T20:53:31		**CLOSEST APPROACH**	
+00:07	+00:15	RADAR Low-Res SAR	Outbound
+00:15	+00:30	RADAR Altimetry	Outbound
+00:30	+01:15	RADAR Scatterometry	Outbound
+01:15	+05:20	RADAR Radiometry	Outbound
+05:20		End Custom Period	
+05:20	+10:30	UVIS	EUVFUV
+10:30	+14:07	CIRS	Far-IR Nadir Comp



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T013 – rev 23 – S20

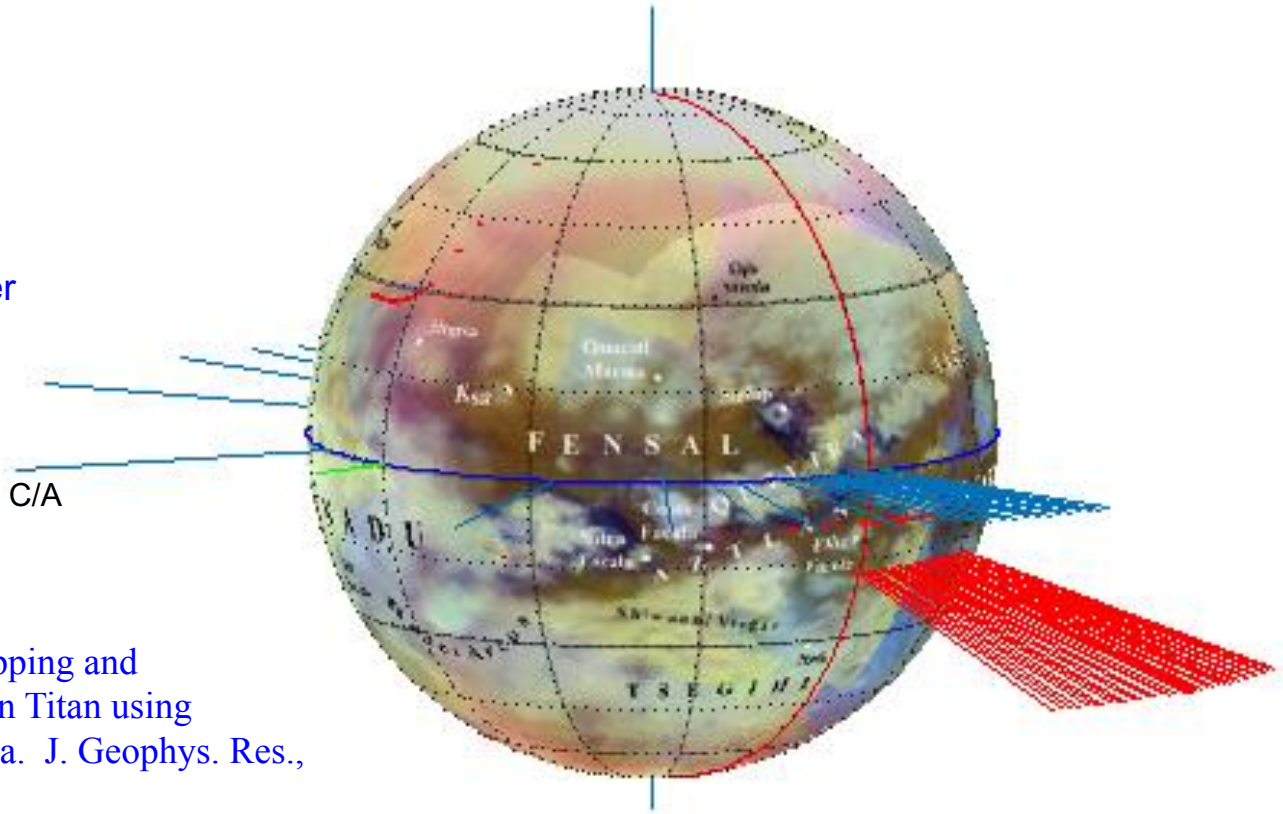
April 30, 2006 – 120T20:53:31 @ 1856 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

At one hour before C/A, obtain regional mosaic over Aztlan, near 0S, 20 W*.



*Le Mouelic, et al. (2008). Mapping and interpretation of Sinlap crater on Titan using Cassini VIMS and RADAR data. J. Geophys. Res., 113, E04003.

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
						CIRS FP1							FP3		I	CIRS		ISS Reg.		V	U		RADAR				UVIS					CIRS FP1											

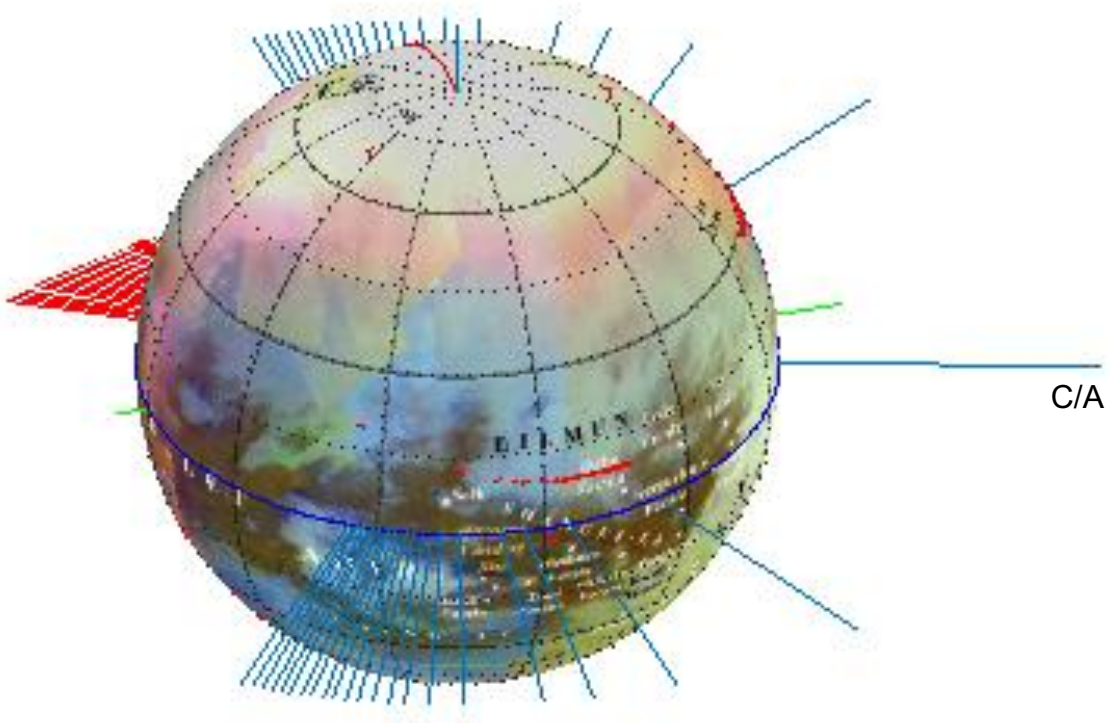
T013 – rev 23 – S20

April 30, 2006 – 120T20:53:31 @ 1856 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
						CIRS FP1							FP3		I	CIRS		ISS Reg.		V	U		RADAR				UVIS					CIRS FP1											

T013 – rev 23 – S20

April 30, 2006 – 120T20:53:31 @ 1856 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry occurs at mid-southern latitudes before and after C/A.

Specular reflection geometry occurs at 72S, 180 W (near Ontario Lacus) at C/A + 00:25 during the radar observations.

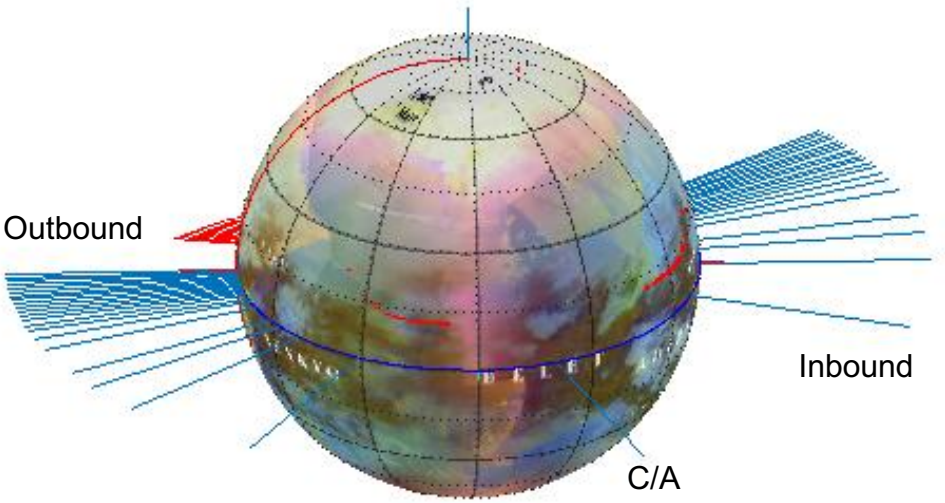
T014 – rev 24 – S20

May 20, 2006 – 140T12:18:12 @ 1879 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T014 VIMS Science objectives: Cloud evolution, photometry, search for hotspots, lightning, and aurorae. Observations will assist in deriving the phase function of the surface and the haze.

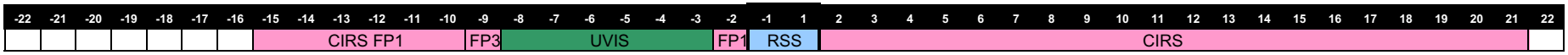
-15:30	-9:00	CIRS	Long Integration with FP1; 60deg emission angle; co-aligned ORS boresights on Titan, may choose orientation to optimize pointing
-9:00	-7:30	CIRS	Limb obs. For vertical profile of trace hydrocarbons
-7:30	-3:22	UVIS	Limb to limb slow scan
-3:22	-3:00	Transition to RCS	
-3:00	-2:30	UVIS	
-2:30		Begin Custom Period	
-2:30	-1:05	CIRS	FP1 limb integration
-1:05	-0:55	Turn (RSS)	Pick up at CIRS LAT_VIEW
-0:55	+0:55	RSS	Bistat(In) , Occ(-15:02) , Bistat(Out)
2006-140T12:18:12		**CLOSEST APPROACH**	
+0:55	+1:03	Turn (RSS)	Leave at CIRS LAT_VIEW
+1:03	+1:27	Transition to RWA	
+1:27	+2:15	CIRS	Far IR Limb integration
+2:15		End Custom Period	
+2:15	+10:00	CIRS	Limb integration followed by nadir temperature map; meteorology campaign
+10:00	+13:00	CDA	Eccentricity Scan
+13:00	+15:00	CIRS	
+15:00	+18:00	CDA	Eccentricity Scan
+18:00	+20:58	CIRS	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



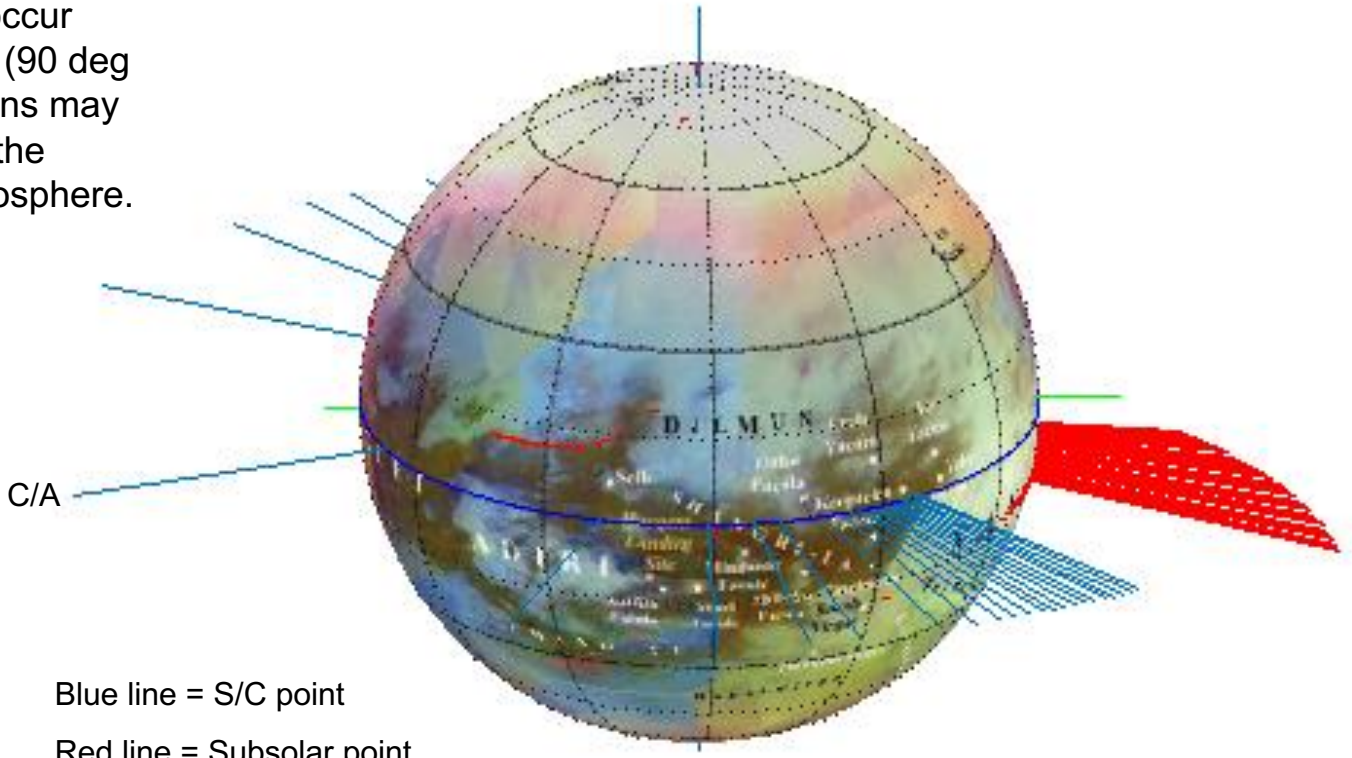
T014 – rev 24 – S20

May 20, 2006 – 140T12:18:12 @ 1879 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

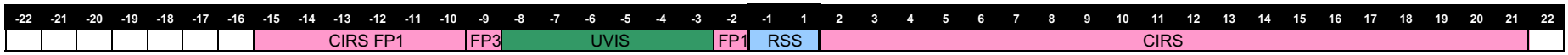
Inbound observations occur with high phase angles (90 deg or greater). Observations may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T014 – rev 24 – S20

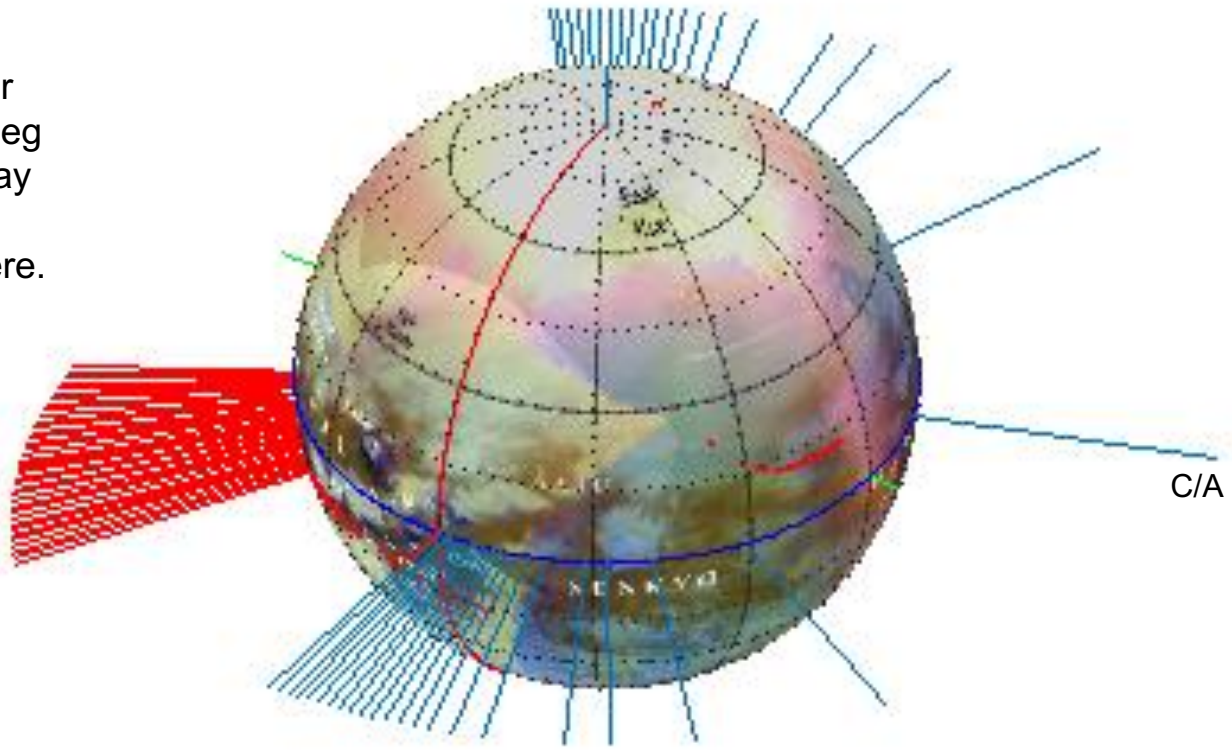
May 20, 2006 – 140T12:18:12 @ 1879 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Outbound observations occur with high phase angles (80 deg or greater). Observations may provide information on the composition of the atmosphere.

Global and limb mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

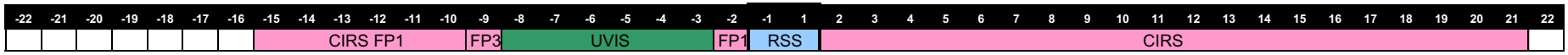
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							CIRS FP1						FP3	UVIS						FP1	RSS		CIRS																			

T014 – rev 24 – S20

May 20, 2006 – 140T12:18:12 @ 1879 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry occurs at mid-southern latitudes before and after C/A.



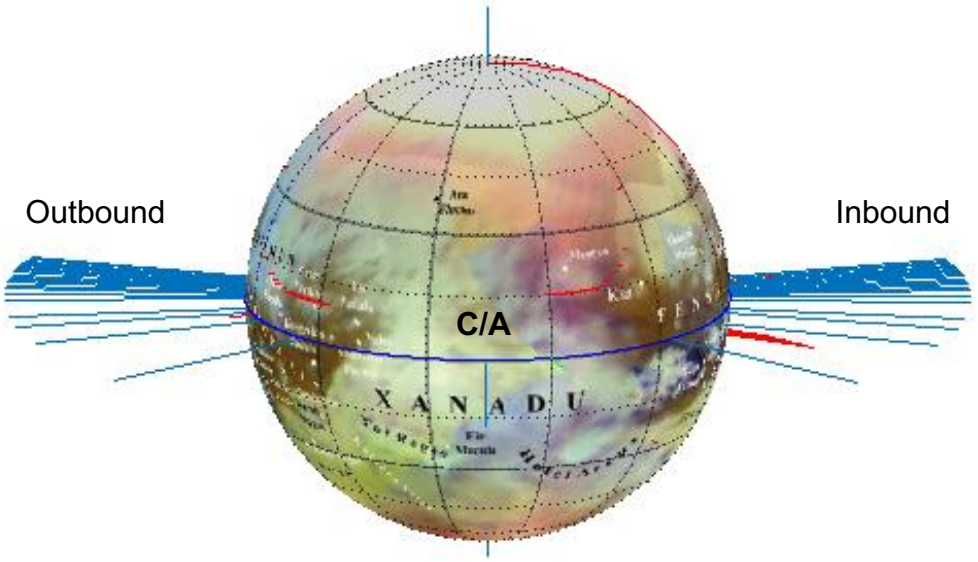
T015 – rev 25 – S21

July 2, 2006 – 183T09:12:19 @ 1906 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T015 VIMS Science objectives: Monitor and global mapping; search for mid-latitude clouds and understanding of their evolution.

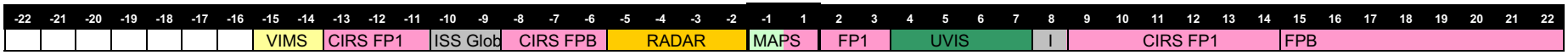
-15:05	-13:30	VIMS	Global Map
-13:30	-10:00	CIRS	FP1 long integration; 60° emision angle; co-aligned ORS boresights on Titan; may choose orientation to optimize pointing.
-10:00	-8:00	ISS	Global Map, 5 min. dwell time
-8:00	-05:20	CIRS	Limb integration
-05:20	-05:00	SP Turn to RADAR Waypoint	NEG_Z to Titan, POS_X to NTP
-05:00		Begin Custom Period	
-05:00	-01:15	RADAR	Radiometry
-01:15	-01:00	RADAR	Scatterometry
-01:00	+00:30	MAPS	NEG_X to 345, -20; POS_Z to NSP
2006-183T09:12:19		**CLOSEST APPROACH**	
+00:30	+02:30	CIRS	Limb integration
+02:30		End Custom Period	
+02:30	+08:00	UVIS	Slow scan limb to limb
+08:00	+09:00	ISS	Photometry
+09:00	+22:24	CIRS	FP1 integration



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T015 – rev 25 – S21

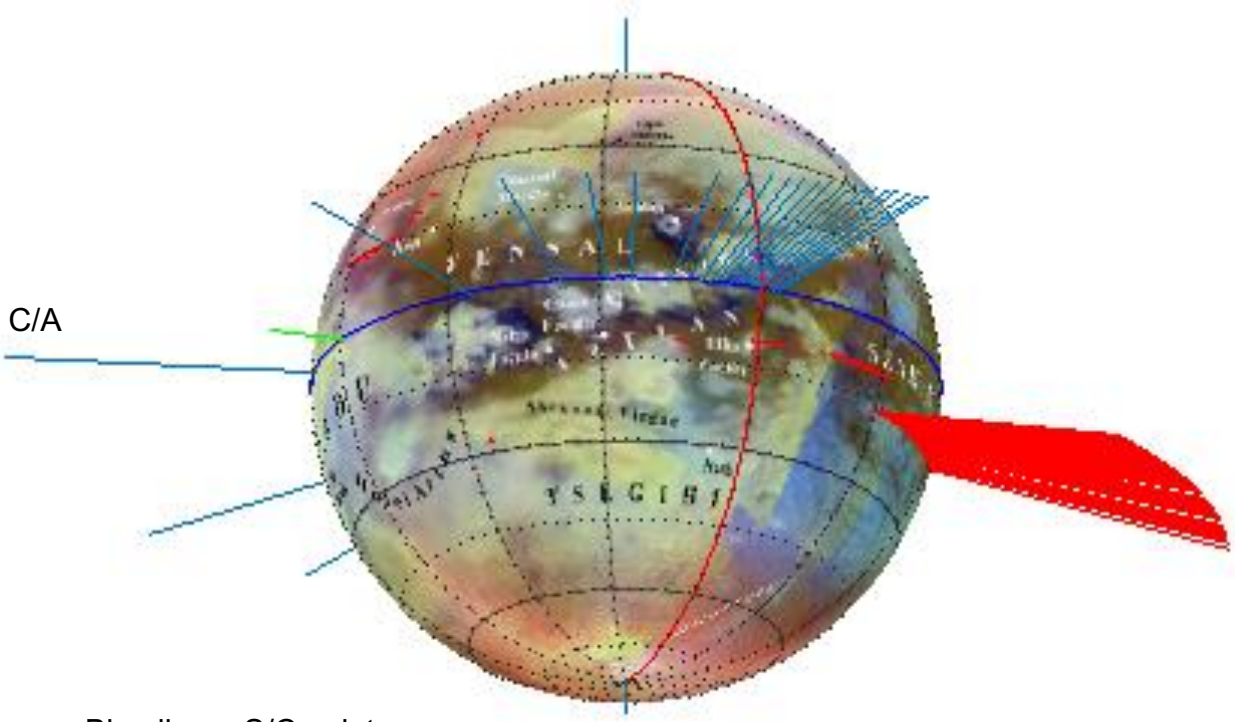
July 2, 2006 – 183T09:12:19 @ 1906 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Search for clouds.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							VIMS		CIRS FP1			ISS Glob		CIRS FPB				RADAR				MAPS		FP1			UVIS			I			CIRS FP1					FPB						

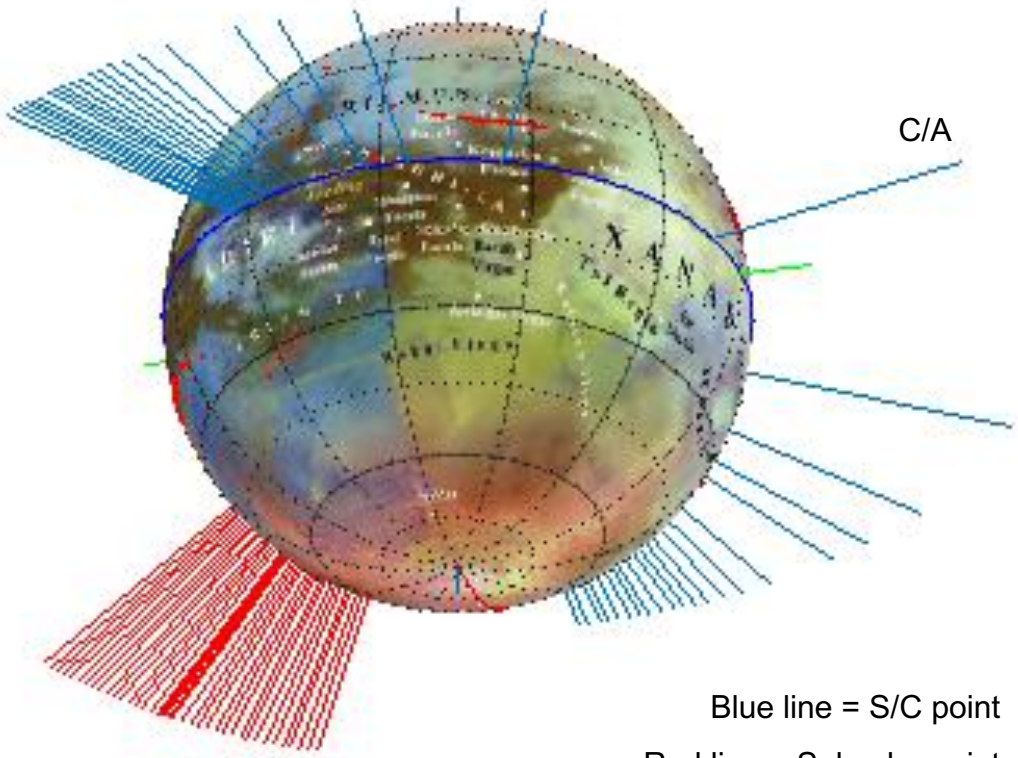
T015 – rev 25 – S21

July 2, 2006 – 183T09:12:19 @ 1906 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

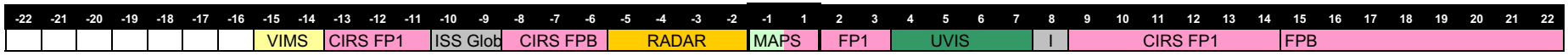
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							VIMS		CIRS FP1			ISS Glob		CIRS FPB			RADAR				MAPS		FP1		UVIS			I		CIRS FP1					FPB							

T015 – rev 25 – S21

July 2, 2006 – 183T09:12:19 @ 1906 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular reflection geometry near mid-southern latitudes before and after C/A.



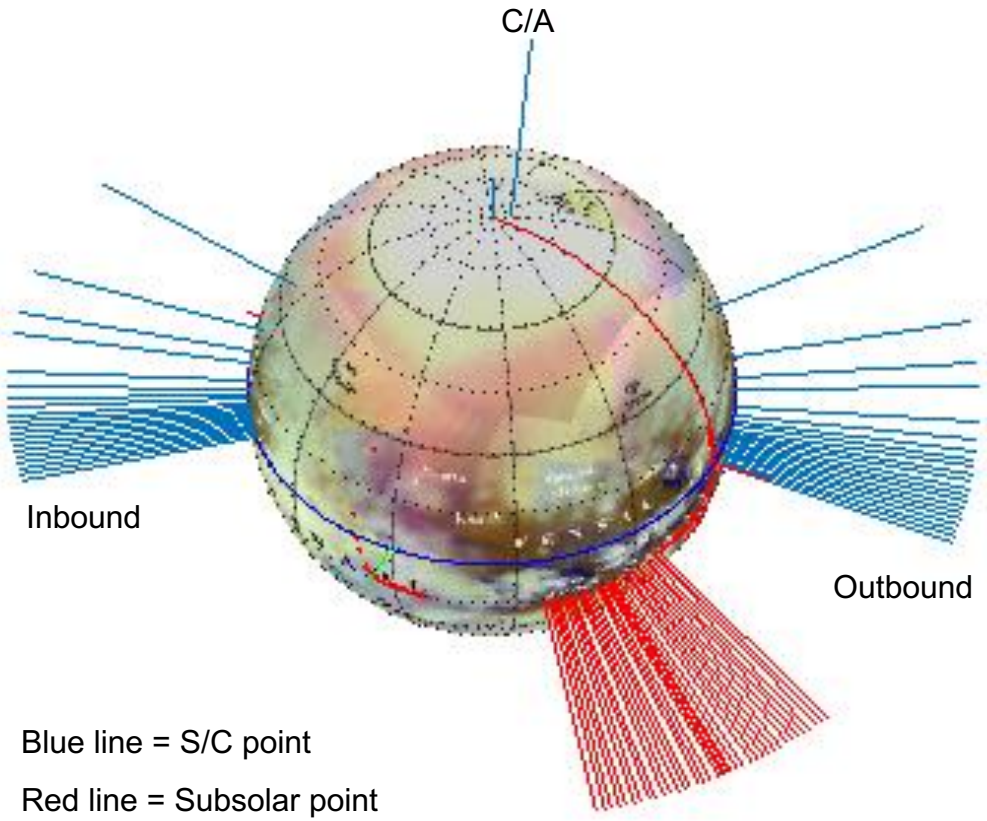
T016 – rev 26 – S22

July 22, 2006 – 203T00:25:13 @ 950 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T016 VIMS Science objectives: Monitor and global mapping; search for mid-latitude clouds and understand their evolution. Identification of geologic features including volcanoes, eolian features, and craters, and their correlation with composition. Search for shadows.

TI-23:49	TI-09:00	VIMS	slow scan mosaic
TI-09:00	TI-07:00	CIRS	
TI-07:00	TI-05:20	VIMS	
TI-05:20		Begin Custom Period	
TI-05:20	TI-05:02	RADAR Turn from VIMS attitude	
TI-05:02	TI-01:37	RADAR radiometry	
TI-01:37	TI-00:52	RADAR scatterometry	inbound
TI-00:52	TI-00:30	RWA to RCS Transition	
TI-00:30	TI-00:15	RADAR altimetry	inbound
TI-00:15	TI-00:07	RADAR low res SAR	inbound
TI-00:07	TI+00:07	RADAR high res SAR	
2006-203T00:25:13		**CLOSEST APPROACH**	
TI+00:07	TI+00:15	RADAR low res SAR	outbound
TI+00:15	TI+00:30	RADAR altimetry	outbound
TI+00:30	TI+00:38:00	UVIS Turn from RADAR attitude	
TI+00:38:00	TI+01:15	UVIS Stellar Occ	
TI+00:38:00	TI+01:00	RCS to RWA Transition	
TI+01:15	TI+01:30	CIRS Turn from UVIS attitude	
TI+01:30	TI+07:15	CIRS	Limb integration, followed by north-south scan nadir map, followed by mid-IR on limb
TI+07:15		End Custom Period	
TI+07:15	TI+12:49	VIMS	stare for cloud monitoring and lightening search



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
VIMS													CIRS		VIMS		RADAR					U	CIRS						VIMS													

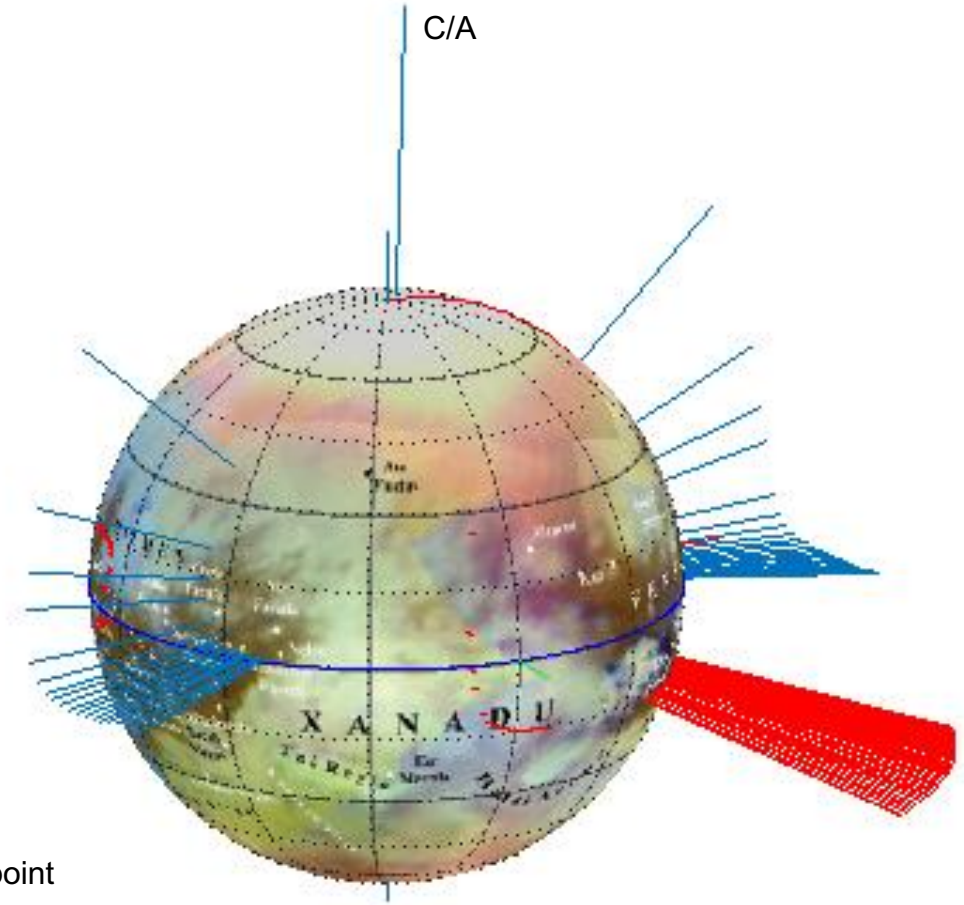
T016 – rev 26 – S22

July 22, 2006 – 203T00:25:13 @ 950 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
VIMS													CIRS		VIMS		RADAR					U	CIRS						VIMS													

T016 – rev 26 – S22

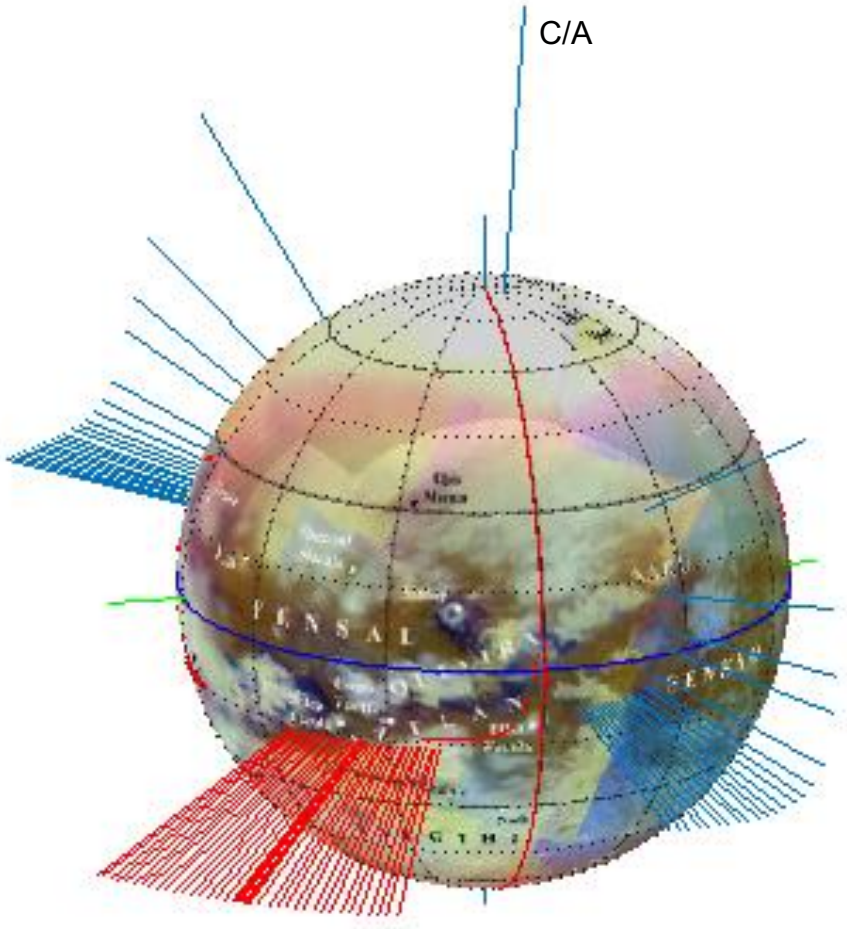
July 22, 2006 – 203T00:25:13 @ 950 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.

Search for clouds.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
VIMS													CIRS		VIMS		RADAR					U	CIRS							VIMS													

T016 – rev 26 – S22

July 22, 2006 – 203T00:25:13 @ 950 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, near southern equatorial latitudes.

Specular reflection occurs at high northern latitudes (~60N, 30 – 70 W) from C/A – 00:06 to C/A + 00:02 during Radar observations.

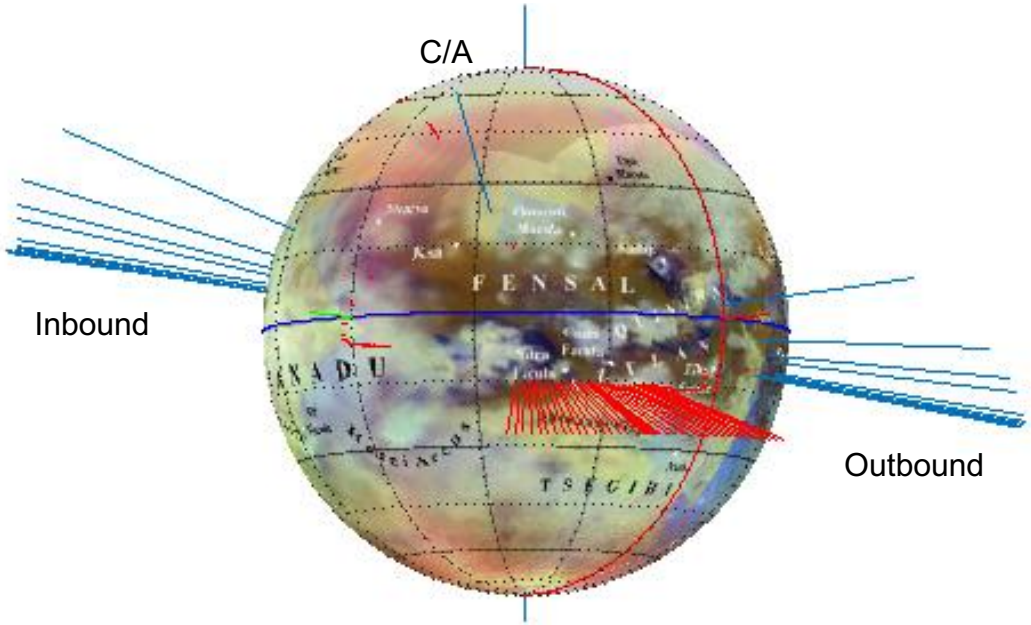
T017 – rev 28 – S23

Sep. 7, 2006 – 250T20:12:04 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T017 VIMS Science objectives: First stellar occultation: vertical structure of the atmosphere and mixing ratio of CO, CO2, and CH4. Identification of geologic features including volcanoes, eolian features, and craters, and their correlation with composition. Search for shadows. Composition, clouds; global mapping; correlation of composition with geology; haze characterization; photometry.

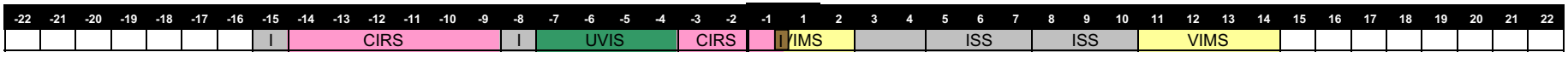
-22:20	-15:00	CIRS_028TI_MIDIRTMAP006_PRIME	
-15:00	-14:00	ISS_028TI_NIGHTNAC001_PRIME	
-14:00	-08:00	CIRS_028TI_FIRNADCMP003_PRIME	
-08:00	-07:30	ISS_028TI_PHOTOMWAC001_PRIME	
-07:30	-02:45	UVIS_028TI_EUVFUV001_PRIME	
-02:45	-02:24	Transition RWA to RCS	
-02:24	-01:24	CIRS_028TI_FIRLMBINT002_PRIME	
-01:24	-00:45	CIRS_028TI_FIRLMBAER002_PRIME	
-00:45		Begin Custom Period	
-00:45	-00:15	CIRS_028TI_FIRLMBT002_PRIME	
-00:15	-00:08	VIMS_028TI_STAROCC001_PRIME	
-00:08	+00:17	INMS	NEG_X to RAM
2006-250T20:12:04		**CLOSEST APPROACH**	
+00:17		End Custom Period	
+00:17	+00:40	Transition RCS to RWA	
+00:40	+02:00	ISS_028TI_HIGHRESNA001_PRIME	
+02:00	+04:00	ISS_028TI_REGMAPNA001_PRIME	
+04:00	+07:00	ISS_028TI_GLOBMAPNA001_PRIME	
+07:00	+10:00	ISS_028TI_MONITORNA001_PRIME	
+10:00	+13:38	VIMS_028TI_PHOTOMETR002_PRIME	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T017 – rev 28 – S23

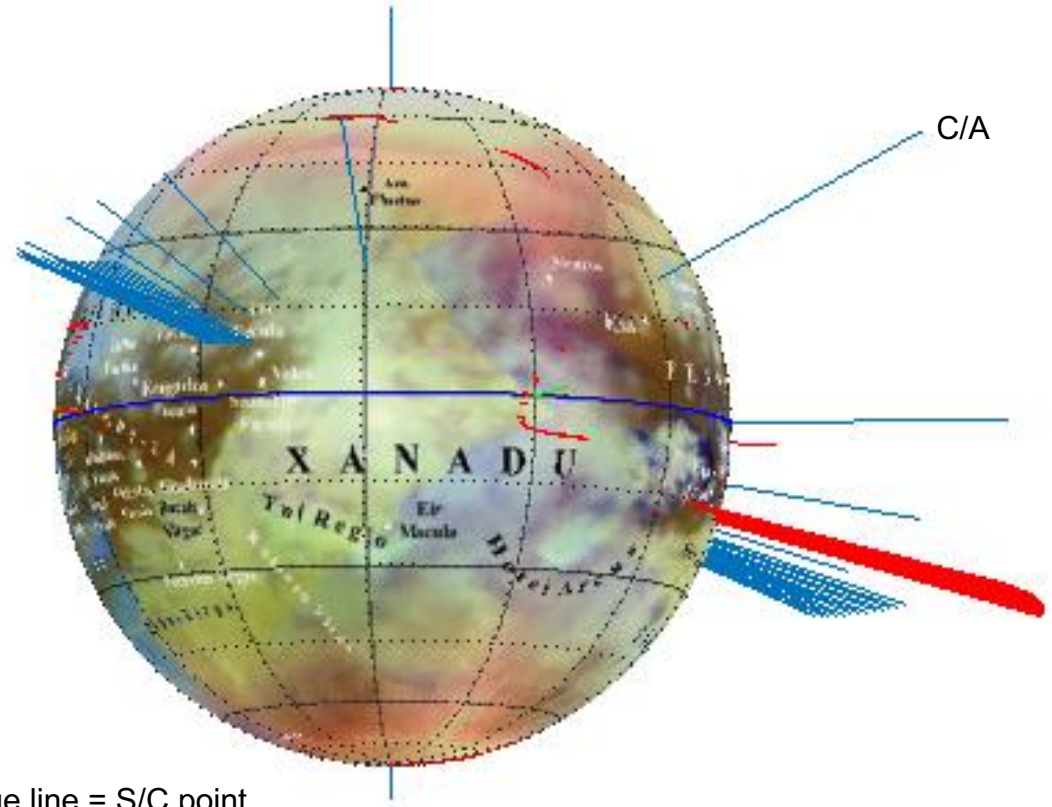
Sep. 7, 2006 – 250T20:12:04 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Stellar occultation with Alpha Canis Major 15 min prior to closest approach.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							I	CIRS						I	UVIS				CIRS			I	VIMS						ISS				ISS				VIMS								

T017 – rev 28 – S23

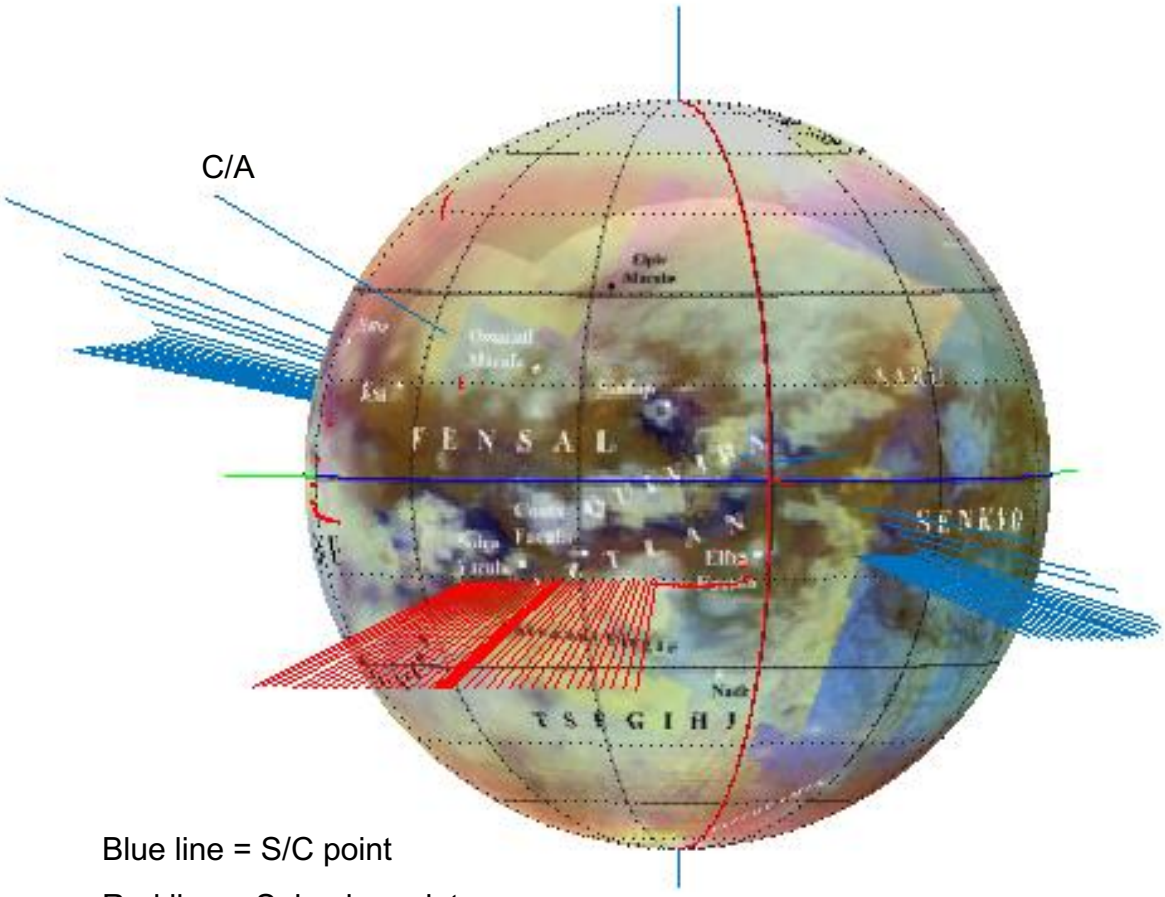
Sep. 7, 2006 – 250T20:12:04 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional mapping near Senkyo at 8S, 340 W one hour after C/A.

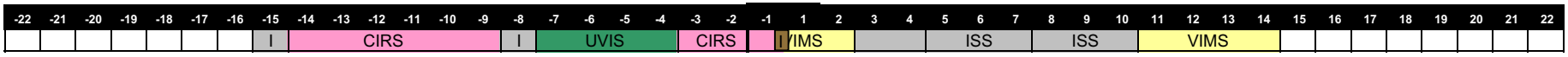
Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

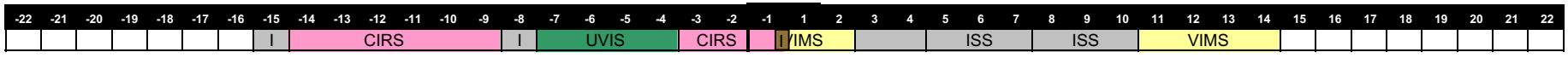


T017 – rev 28 – S23

Sep. 7, 2006 – 250T20:12:04 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry near equatorial, southern latitudes. After C/A, at mid-southern latitudes.



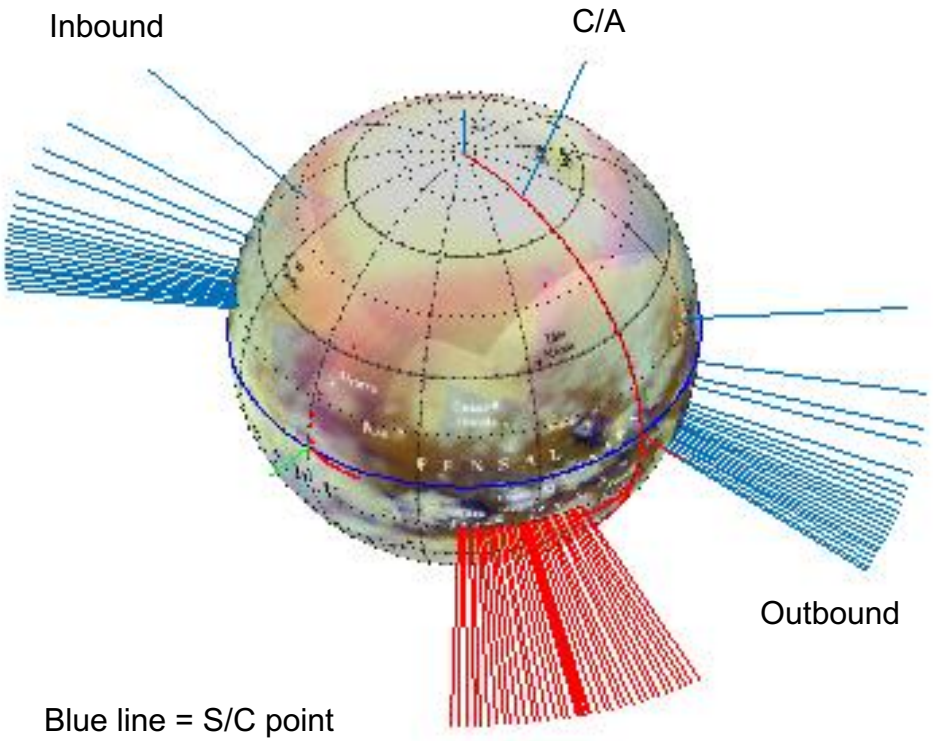
T018 – rev 29 – S24

Sep. 23, 2006 – 266T18:58:49 @ 960 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T018 VIMS Science objectives: Hi-Res mapping of geology and end members. Study of the South Pole.
Note: the VIMS prime observation was shortened by 97 min to accommodate a CIRS ring observation.

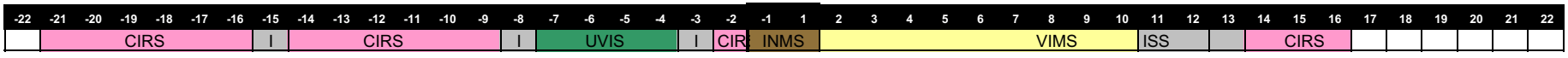
-22:00	-15:00	CIRS	Composition map
-15:00	-14:00	ISS	
-14:00	-8:30	CIRS	
-8:30	-7:30	ISS	
-7:30	-3:00	UVIS	Slow scan limb-to-limb
-3:00	-2:00	ISS	
-2:00		Begin Custom period	
-2:00	-00:45	CIRS	FP1 Limb integration
-00:45	-00:23	Transition to RCS	
-00:23	-00:15	Turn (INMS)	Custom - CIRS to INMS
-00:15	+00:15	INMS	
2006-266T18:58:49		**CLOSEST APPROACH**	
+00:15	+00:23	Turn (INMS)	INMS Custom - INMS to VIMS
+00:23	+00:47	Transition to DFPW Normal	
+00:47	+09:53	VIMS	Nested mapping
+09:53		End Custom period	
+09:53	267T06:45	ISS	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



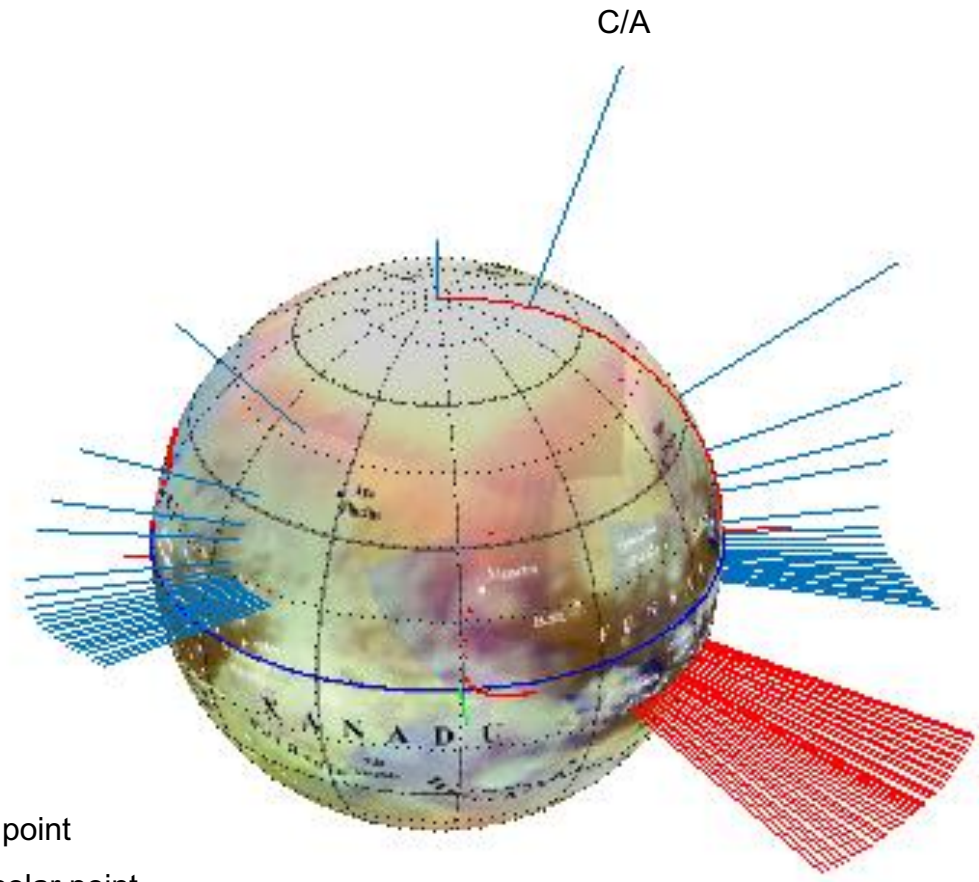
T018 – rev 29 – S24

Sep. 23, 2006 – 266T18:58:49 @ 960 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	CIRS						I	CIRS						I	UVIS				I	CIRS	INMS		VIMS										ISS			CIRS								

T018 – rev 29 – S24

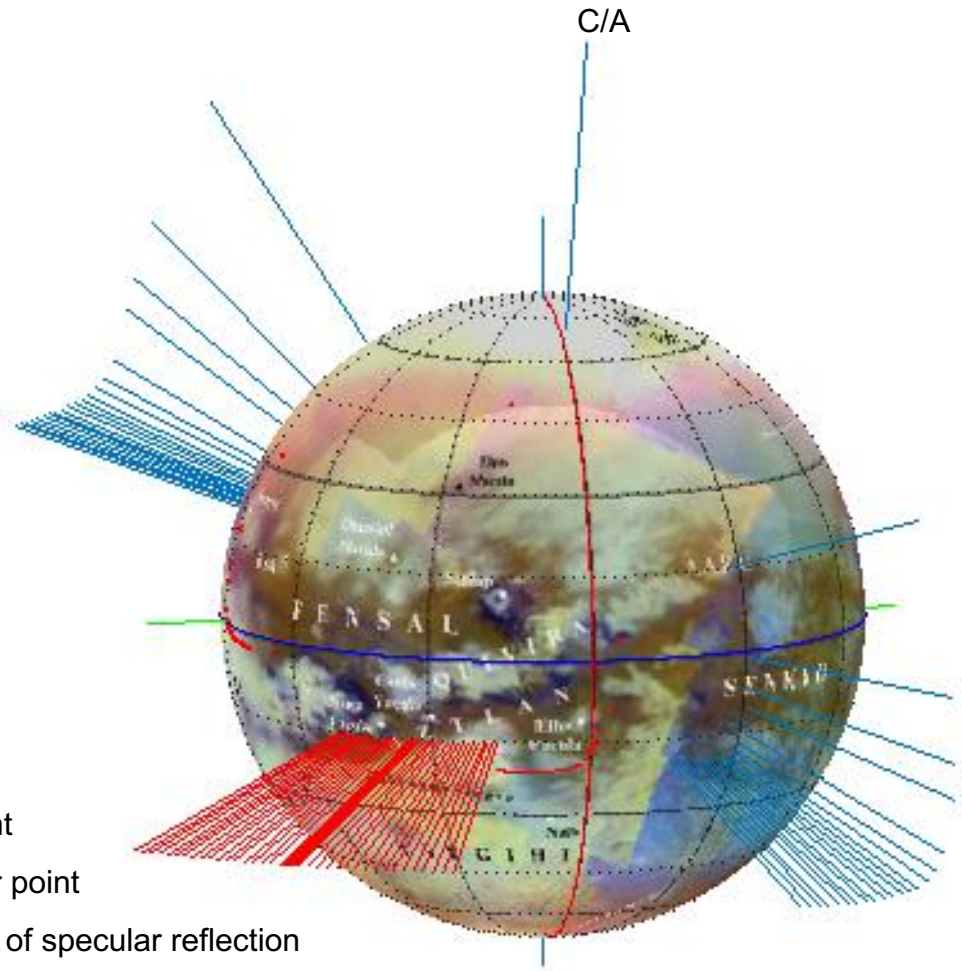
Sep. 23, 2006 – 266T18:58:49 @ 960 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional and global mapping of Titan.

The VIMS prime observation was shortened by 97 min to accommodate a CIRS ring observation.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

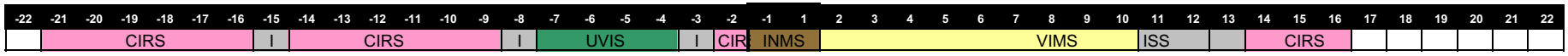
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
	CIRS						I	CIRS						I	UVIS				I	CIRS	INMS		VIMS										ISS			CIRS								

T018 – rev 29 – S24

Sep. 23, 2006 – 266T18:58:49 @ 960 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry near equatorial latitudes. After C/A, at mid-southern latitudes.



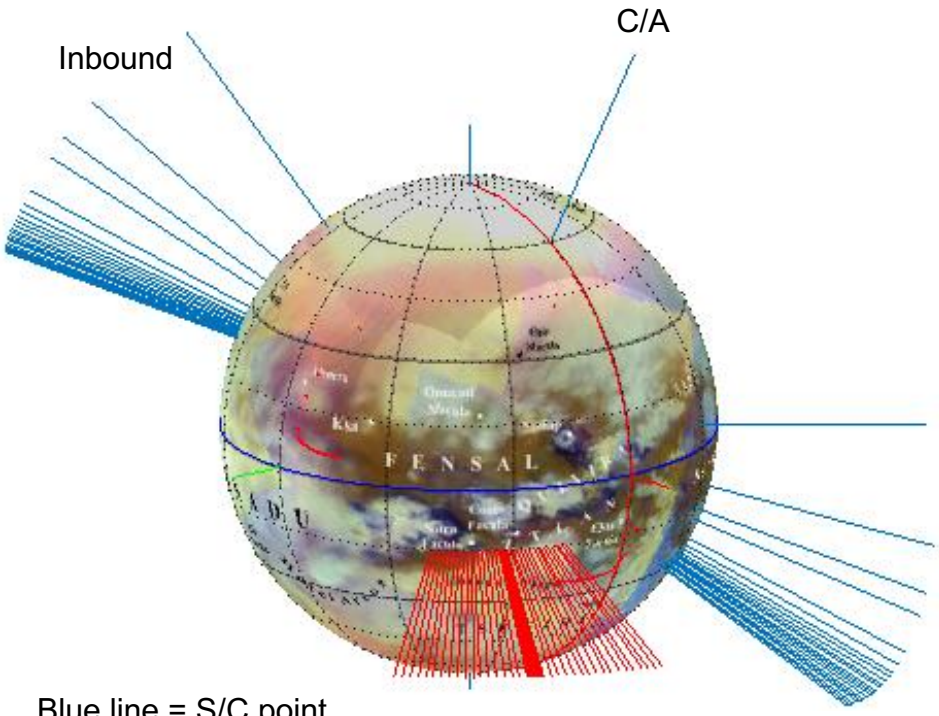
T019 – rev 30 – S24

Oct. 9, 2006 – 282T17:23:24 @ 980 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T019 VIMS Science objectives: Cloud evolution, photometry, search for hotspots, lightning, and aurorae. Observations will assist in deriving the phase function of the surface and the haze.

-21:14	-15:00	CIRS	
-15:00	-14:00	ISS	
-14:00	-09:00	CIRS	Long integration w, FP1
-09:00	-05:20	CIRS	Mid-IR limb integration
-05:20	-01:15	RADAR Radiometry	Inbound
-01:15	-00:52	RADAR Scatterometry	Inbound
-00:52	-00:30	RWA to RCS Transition	
-00:30	-00:15	RADAR Altimetry	Inbound
-00:15	-00:07	RADAR Low-Res SAR	Inbound
-00:07	+00:07	RADAR High-Res SAR	C, A
2006-282T17:23:24		**CLOSEST APPROACH**	
+00:07	+00:15	RADAR Low-Res SAR	Outbound
+00:15	+00:30	RADAR Altimetry	Outbound
+00:30	+00:54	RCS to RWA Transition	
+00:54	+01:15	RADAR Scatterometry	Outbound
+01:15	+05:20	RADAR Radiometry	
+05:20	+08:00	CIRS	
+08:00	+10:00	ISS	Global Map
+10:00	+15:51	CIRS	Long integration w, FP1



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		CIRS					I	CIRS														RADAR						CIRS				I	CIRS										

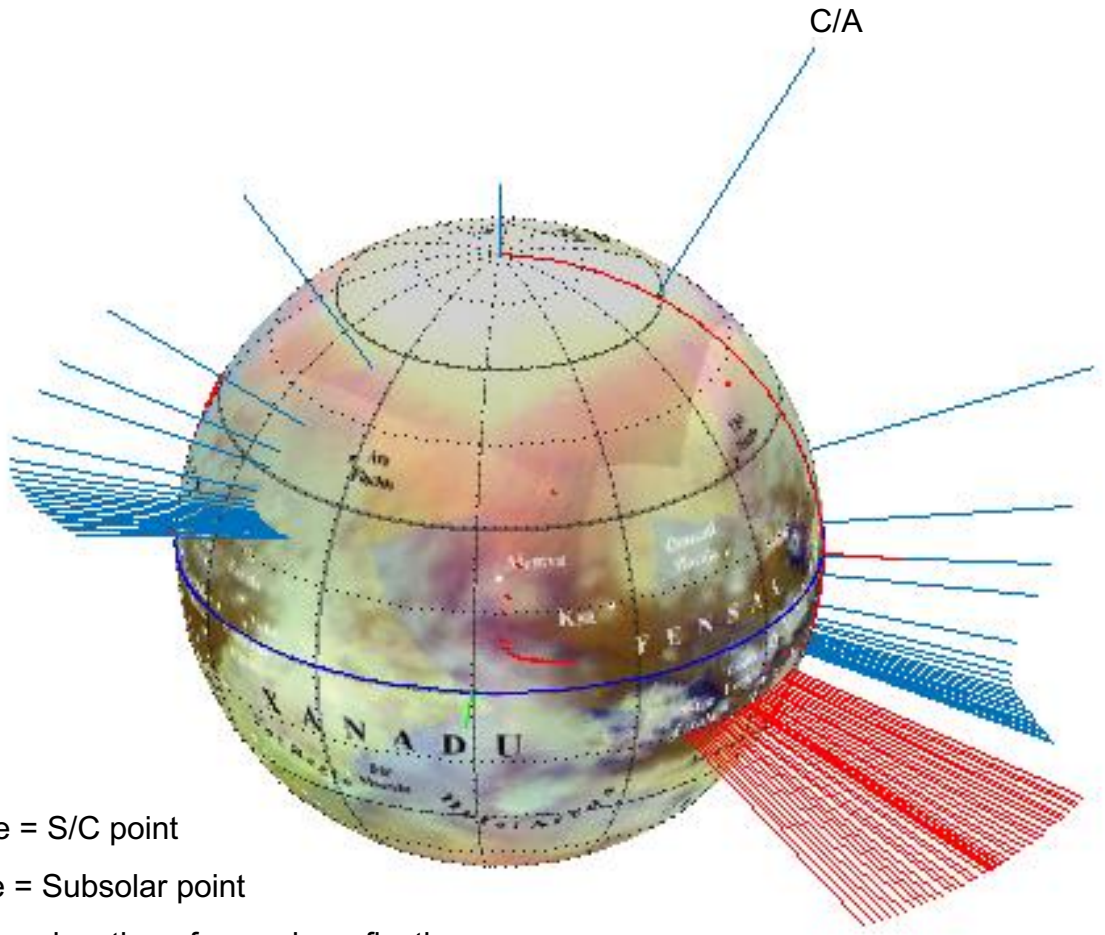
T019 – rev 30 – S24

Oct. 9, 2006 – 282T17:23:24 @ 980 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		CIRS					I	CIRS														RADAR						CIRS				I	CIRS											

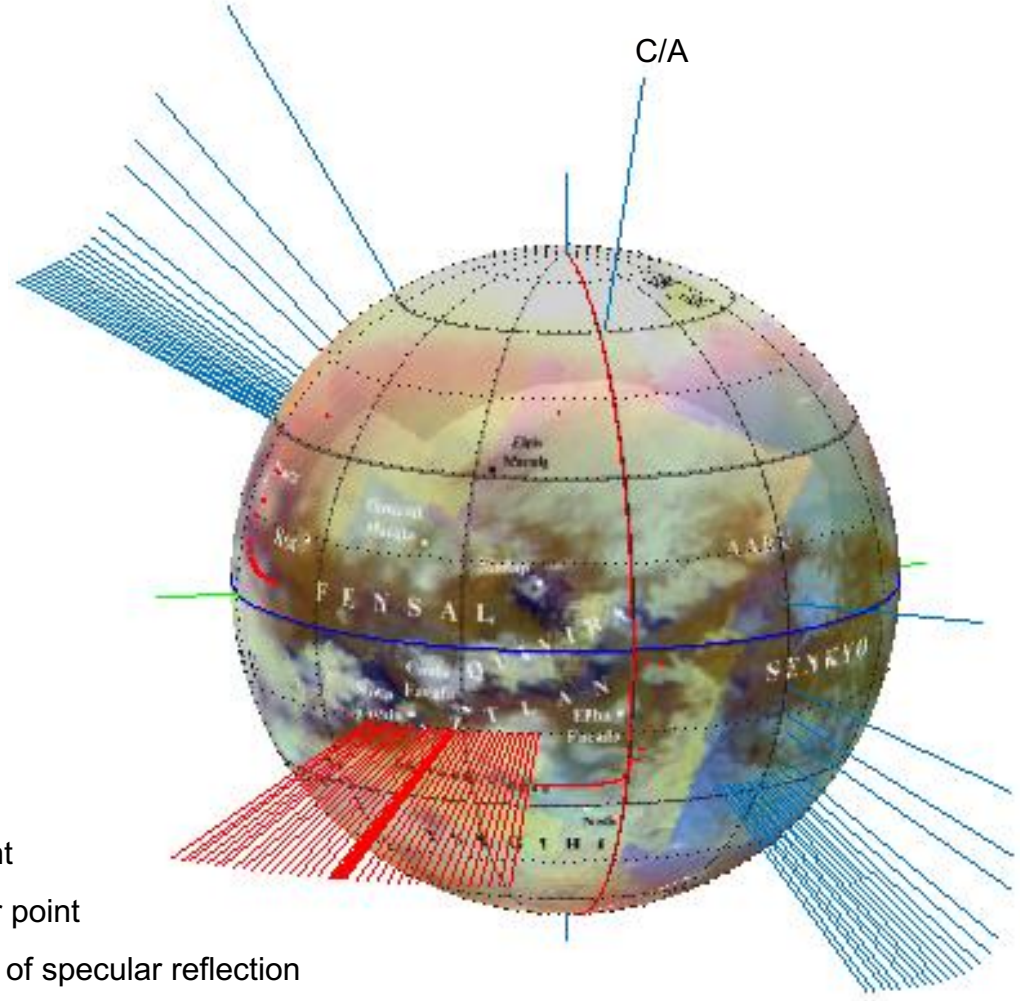
T019 – rev 30 – S24

Oct. 9, 2006 – 282T17:23:24 @ 980 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
		CIRS					I	CIRS														RADAR						CIRS				I	CIRS											

T019 – rev 30 – S24

Oct. 9, 2006 – 282T17:23:24 @ 980 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at equatorial latitudes. After C/A, at mid-southern latitudes.

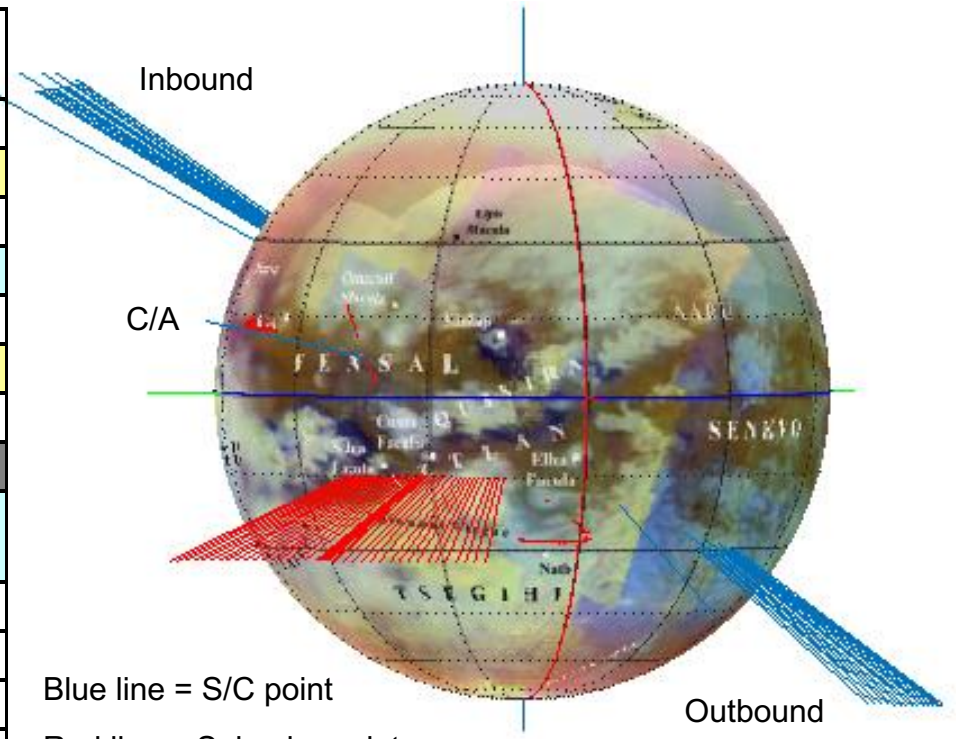
T020 – rev 31 – S25

Oct. 25, 2006 – 298T15:58:07 @ 1030 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T020 VIMS Science objectives: The main objective is to acquire high spatial resolution images of Titan's surface (500 m/pixel) in order to characterize the different units that have been discovered by either VIMS or Radar. In order to reach this objective, the pointing was designed to get a long stripe across Titan that will fly over dark and bright areas with a 64.64 cubic image at an interface between bright and dark areas.

-20:40	-7:30	VIMS	CLOUDMAP
-7:30	-5:30	VIMS	MEDRES
-5:30		Begin Custom period	
-5:30	-00:52	RADAR	Radiometry
-01:14	-00:52	Transition to RCS	(0.5,2.0,0.5)
-00:52	-00:10	CAPS	
-00:10		End Custom period	
-00:10	+00:20	VIMS	Composition map
2006-298T15:58:07		**CLOSEST APPROACH**	
+00:20	+00:42	Transition to DFPW Normal	
+00:42	+02:00	VIMS	HIRES
+02:00	+04:30	ISS	REGMAP
+04:30	+07:30	CIRS	MIRLMBMAP
+07:30	+08:00	VIMS	DARKSIDE
+08:00	+10:30	VIMS	COMPMAP



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
"ORS Option"							VIMS Cloud Map									RADAR							V	ISS			CIRS			I	VIMS												

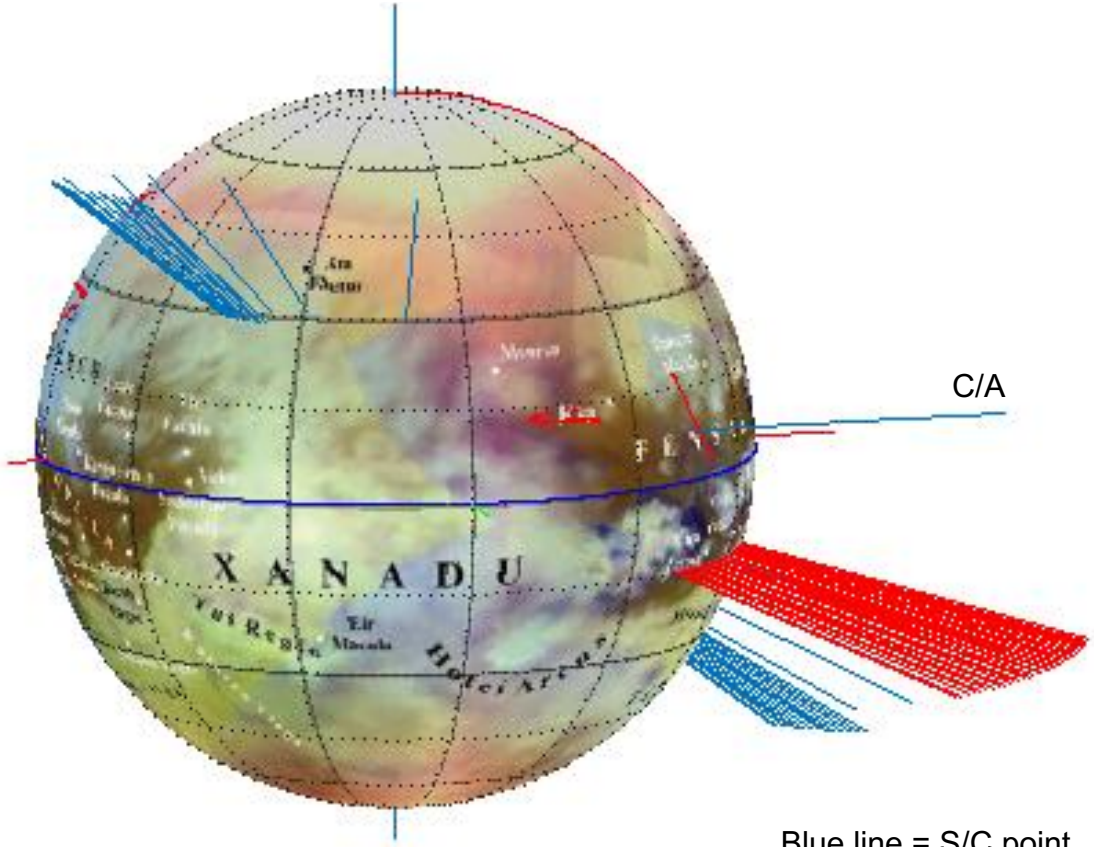
T020 – rev 31 – S25

Oct. 25, 2006 – 298T15:58:07 @ 1030 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
"ORS Option"															VIMS Cloud Map								V	ISS			CIRS		I	VIMS													
																RADAR																												

T020 – rev 31 – S25

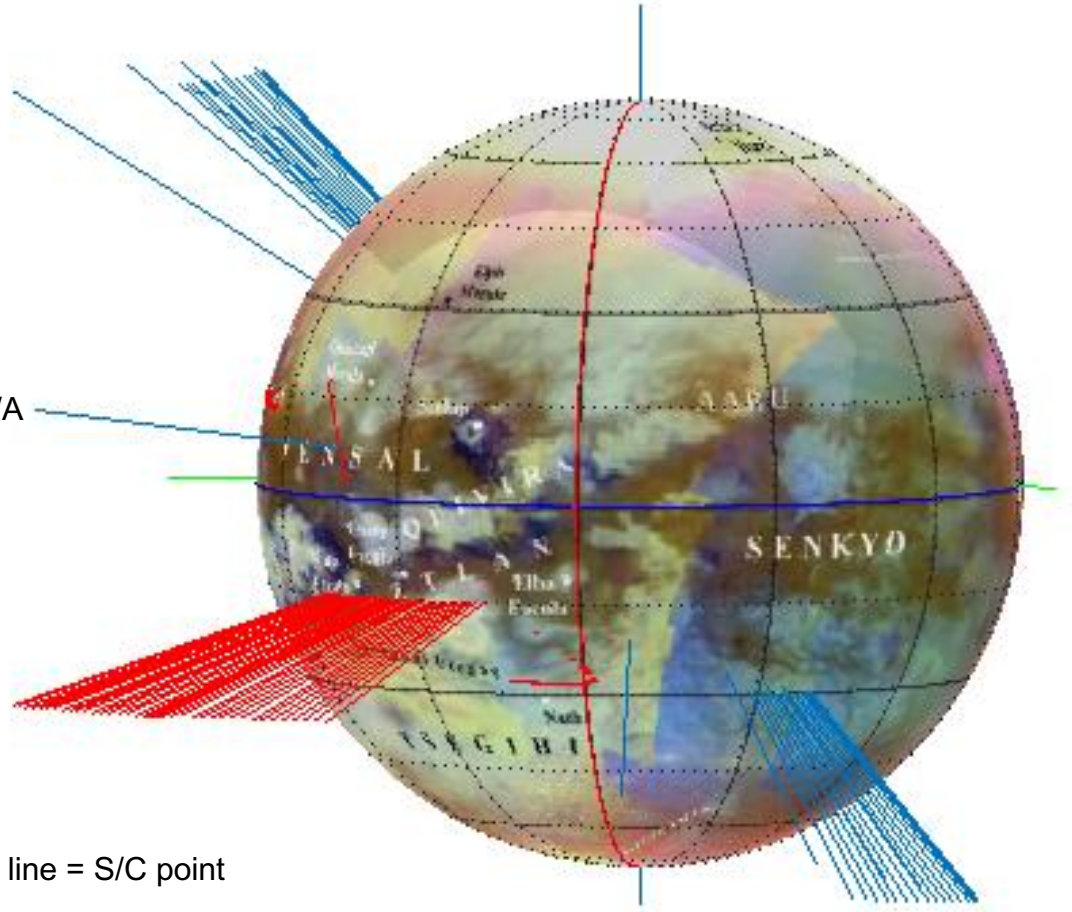
Oct. 25, 2006 – 298T15:58:07 @ 1030 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

High resolution regional mapping at closest approach east of the Fensal region and regional mapping east of Tsegihi*.

Global mapping of Titan.



*Le Corre, L., et al. (2009) Analysis of a cryolava flow-like feature on Titan; Planet. Space Sci., 57, 870-879.

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

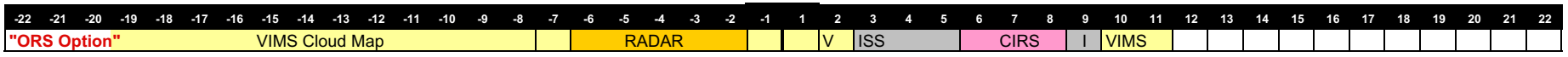
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
"ORS Option"																VIMS Cloud Map											RADAR					V	ISS					CIRS			I	VIMS														

T020 – rev 31 – S25

Oct. 25, 2006 – 298T15:58:07 @ 1030 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at mid-southern latitudes.



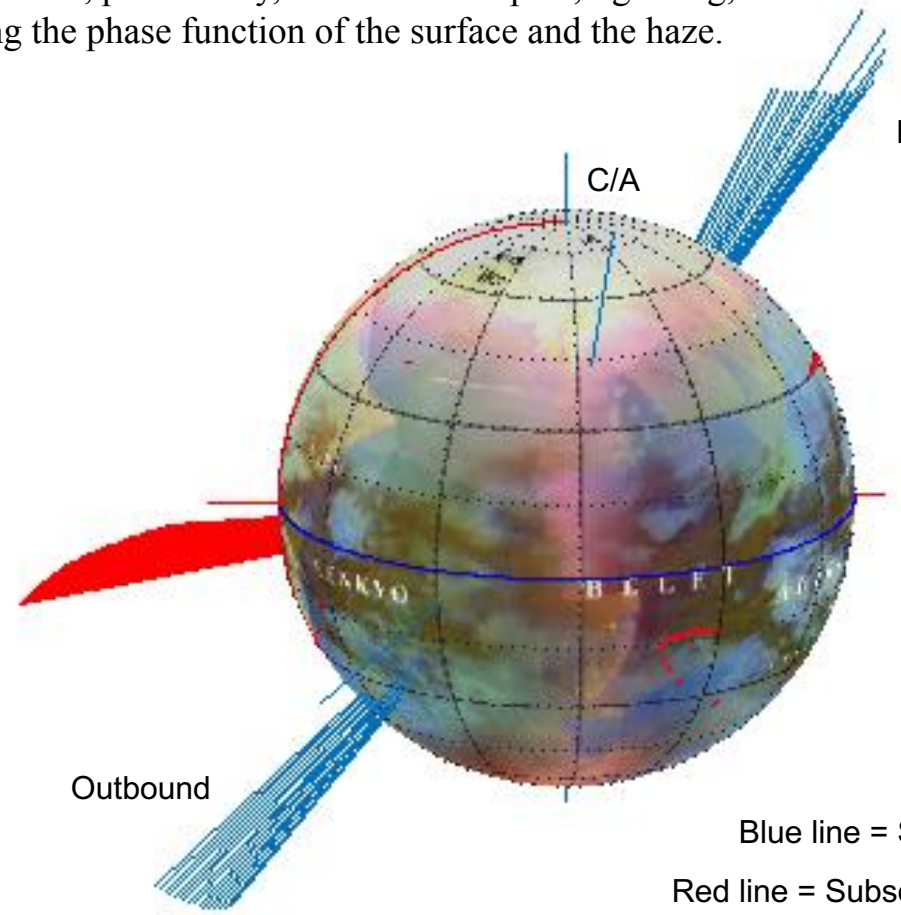
T021 – rev 35 – S26

Dec. 12, 2006 – 346T11:41:31 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T021 VIMS Science objectives: Cloud evolution, photometry, search for hotspots, lightning, and aurorae. Observations will assist in deriving the phase function of the surface and the haze.

-19:33	-15:30	CIRS
-15:30	-14:30	ISS
-14:30	-7:30	CIRS
-7:30	-2:30	UVIS
-2:30	-1:10	ISS
-1:10		Begin Custom Period
-1:10	-0:44	UVIS Stellar Occ
-0:44	-0:23	Transition to RCS
-0:23	-0:15	Turn to INMS
-0:15	0	INMS (Radar Rider)
2006-346T11:41:31		**CLOSEST APPROACH**
0	+0:07	RADAR High-Res SAR
+0:07	+0:15	RADAR Low-Res SAR
+0:15	+0:30	RADAR Altimetry
+0:30	+0:52	Transition to RWA
+0:52	+1:35	RADAR Scatterometry
+1:35	+3:30	RADAR Radiometry
+3:30	+4:00	Radar Turn to Waypoint
+4:00		End Custom Period
+4:00	+7:00	ISS
+7:00	+9:00	CIRS
+9:00	+10:28	ISS
+10:28	+13:28	CIRS *



-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
			CIRS			I	CIRS							UVIS					I	I	U		RADAR			ISS			CIRS		I												

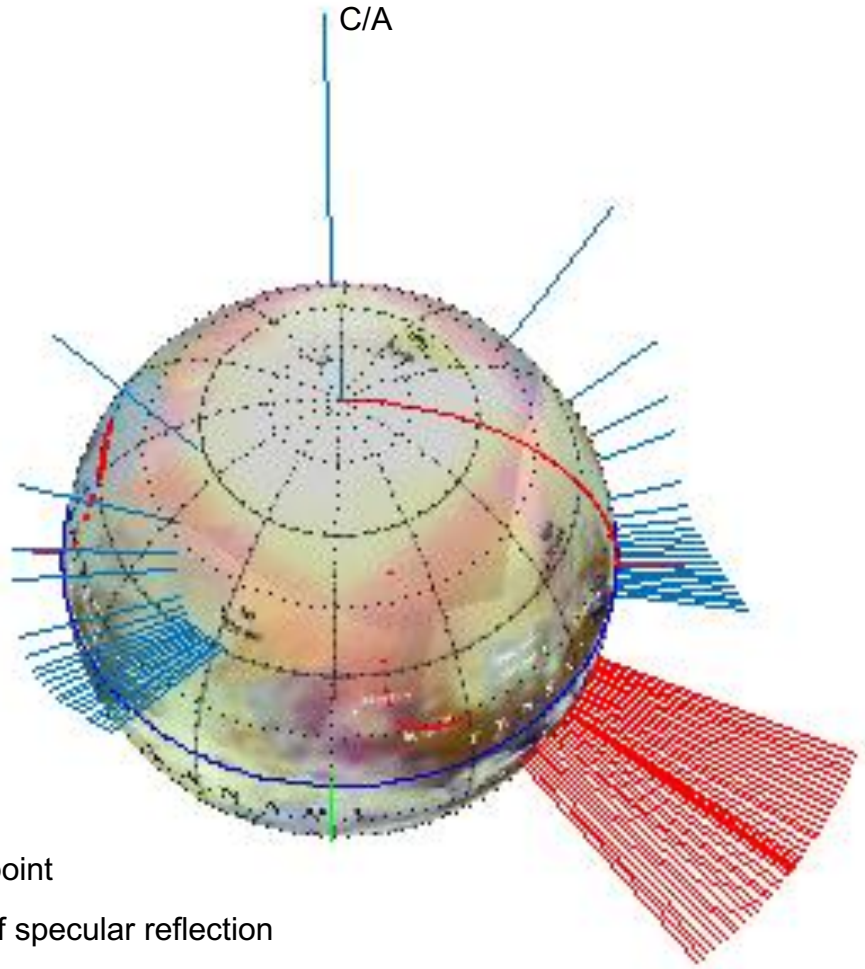
T021 – rev 35 – S26

Dec. 12, 2006 – 346T11:41:31 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
			CIRS			I															I	U		RADAR				ISS			CIRS		I											

T021 – rev 35 – S26

Dec. 12, 2006 – 346T11:41:31 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

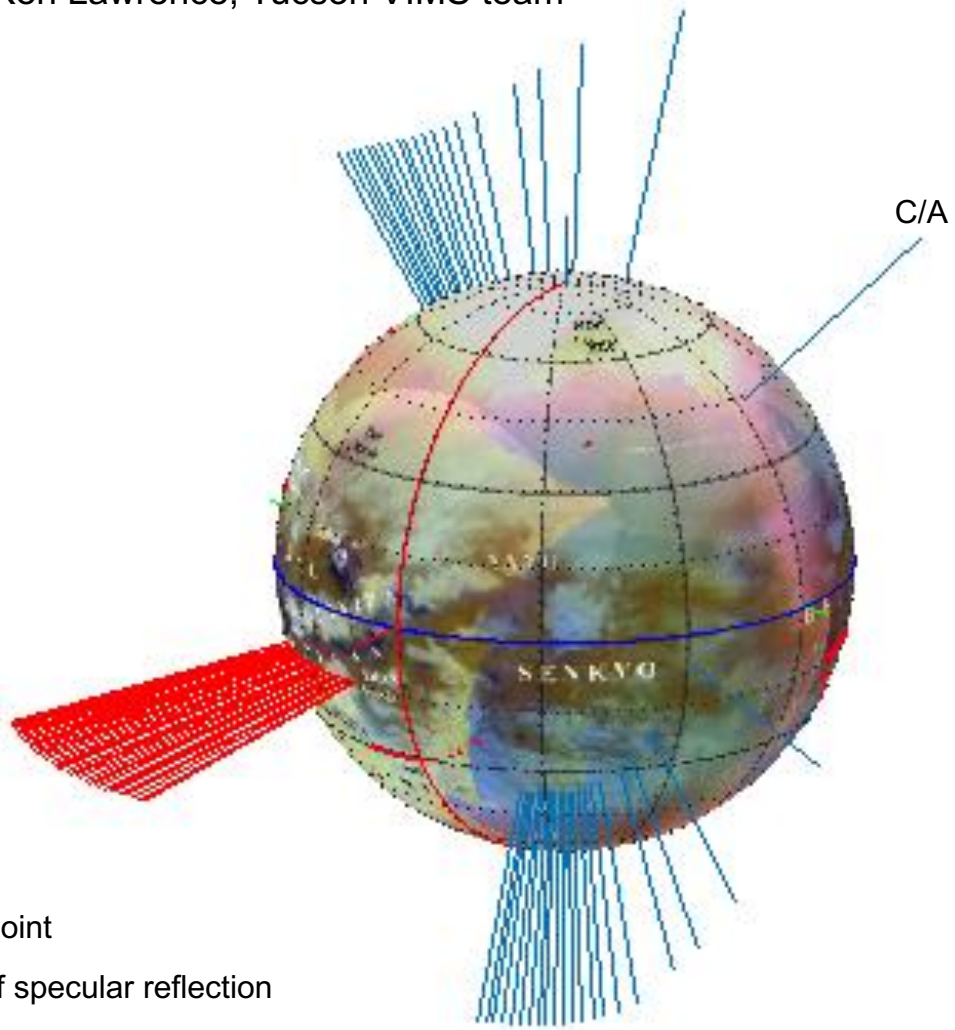
Outbound:

Regional mapping south of Senkyo near 35S, 320 W.

Global mapping of Titan.

Detection of clouds*

* Rodriguez et al. (2011) Titan's cloud seasonal activity from winter to spring with Cassini/VIMS; Icarus, 216, 89-110



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
			CIRS			I	CIRS							UVIS					I	I	U	I	RADAR			ISS			CIRS		I											

T021 – rev 35 – S26

Dec. 12, 2006 – 346T11:41:31 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at mid-southern latitudes.

Specular reflection geometry occurs at high northern latitudes from C/A – 00:18 to C/A – 00:03 but is during the INMS prime observations.

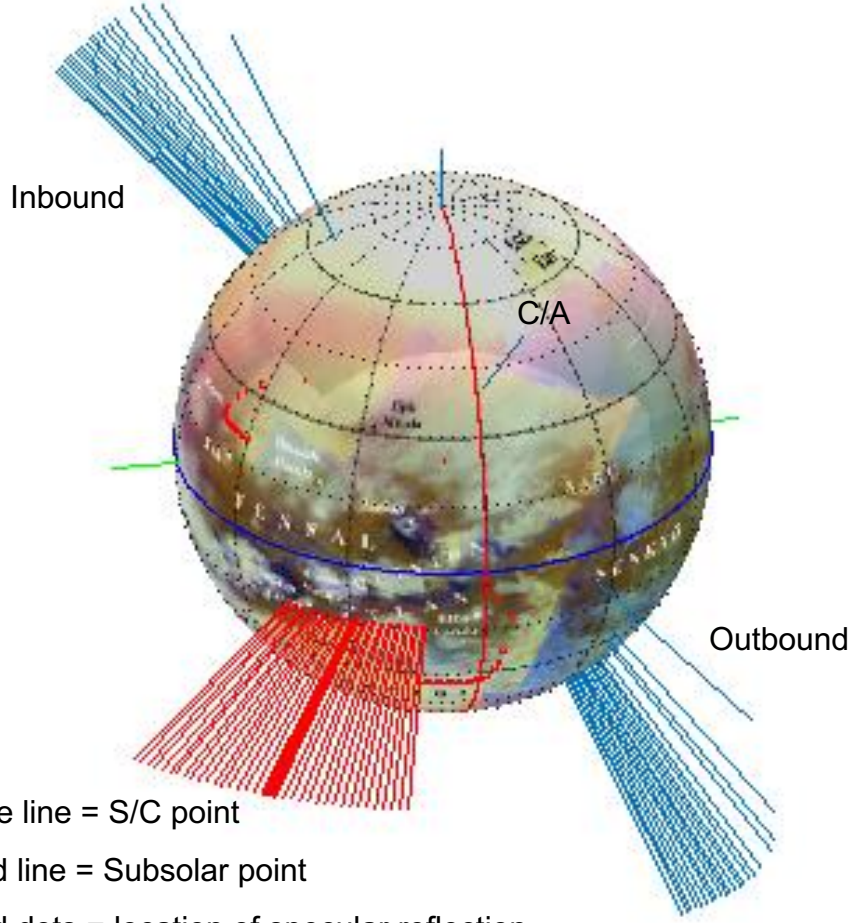
T022 – rev 36 – S26

Dec. 28, 2006 – 362T10:05:22 @ 1297 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T022 VIMS Science objectives: Cloud evolution, photometry, search for hotspots, lightning, and aurorae. Observations will assist in deriving the phase function of the surface and the haze.

-18:56	-14:00	CIRS	MID IR T MAP
-14:00	-08:30	CIRS	FIR Nadir Comp Map
-10:00	-8:00	RSS_WU	
-08:30	-08:00	RSS Turn to Earth	
-08:00	-05:30	RSS Gravity Wing	
-05:30	-02:30	CIRS	slow scan for surface T
-02:30	+01:30	RSS Gravity	
2006-362T10:05:22		**CLOSEST APPROACH**	
+01:30	+03:30	ISS	Regional Map
+03:30	+05:30	CIRS	FIR Nadir Comp Map
+05:30	+08:30	RSS Gravity Wing	NEG_Z to Titan, NEG_X to RAM
+08:30	+11:00	CIRS	FIR Nadir Comp Map



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				CIRS						FP1			RSS			CIRS					RSS		ISS Reg		CIRS			RSS		CIRS												

T022 – rev 36 – S26

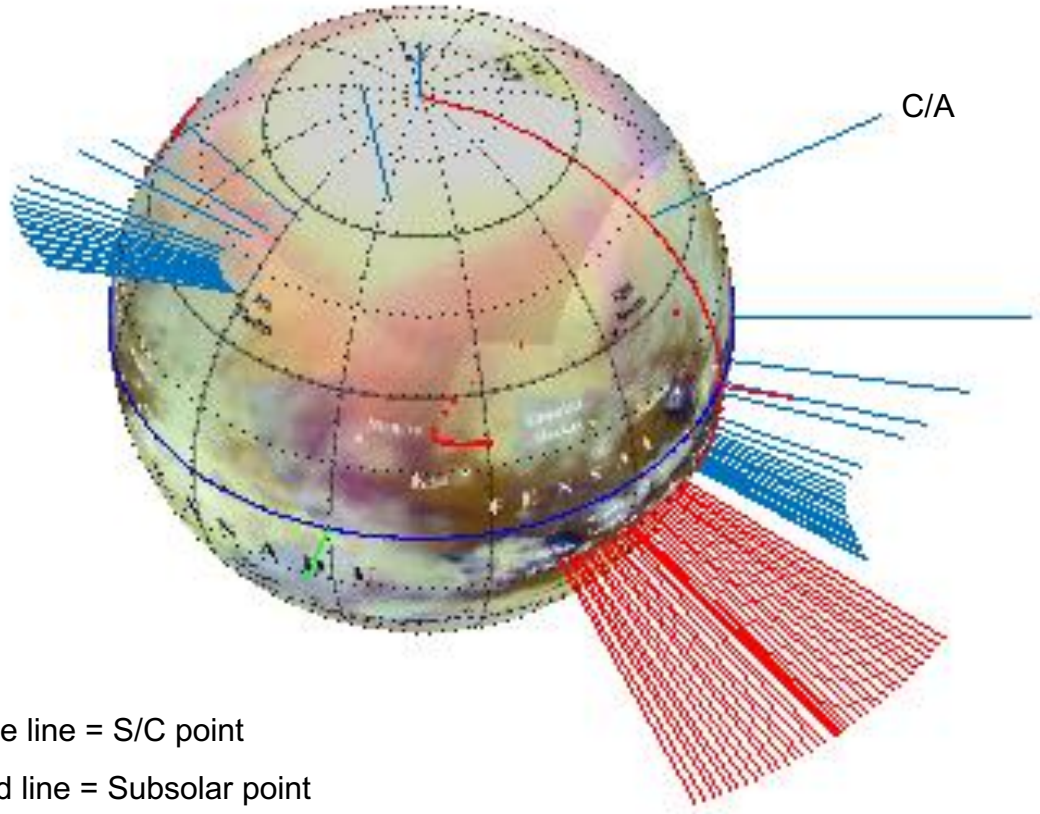
Dec. 28, 2006 – 362T10:05:22 @ 1297 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Cloud and haze characteristics.

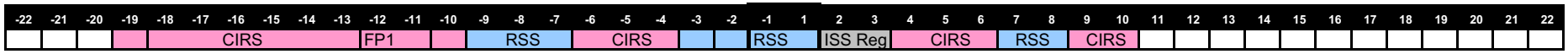
Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T022 – rev 36 – S26

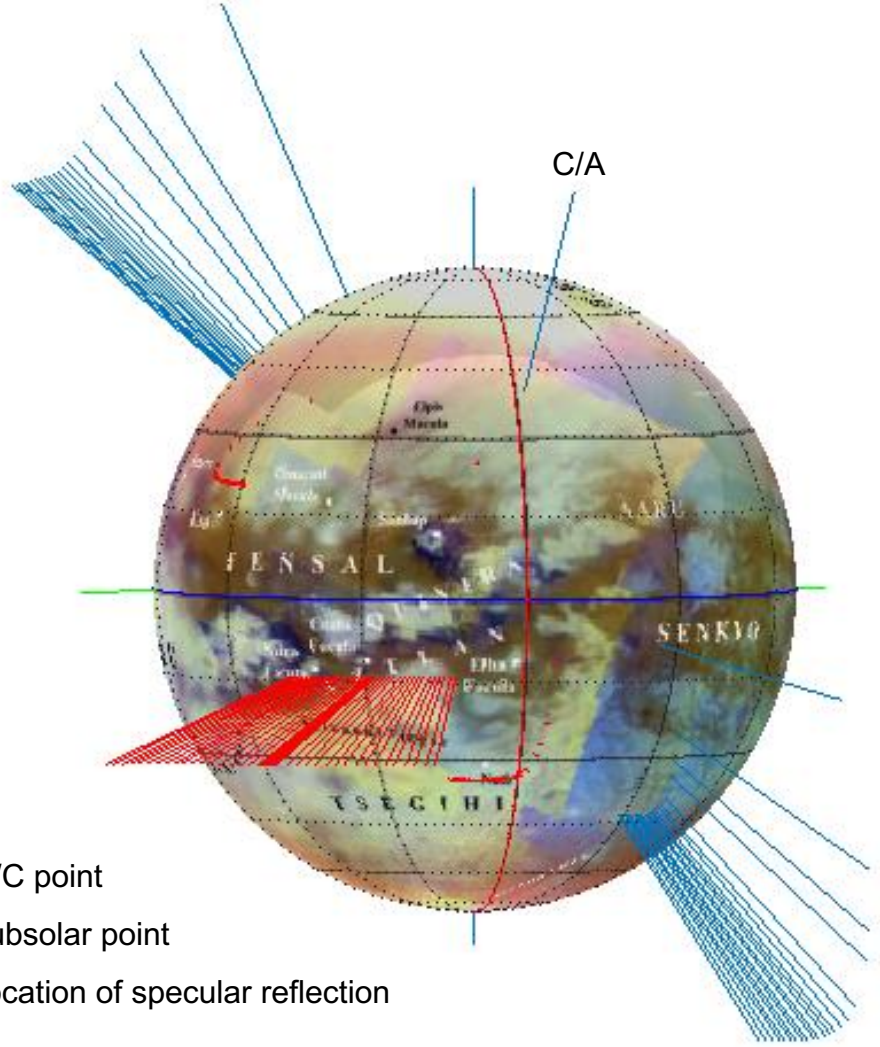
Dec. 28, 2006 – 362T10:05:22 @ 1297 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional mapping of the region east of Tsegihi near 38S, 320 W.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

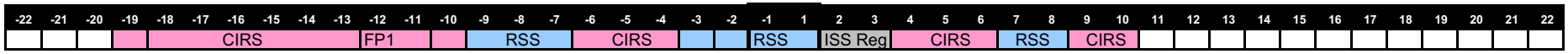
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				CIRS						FP1			RSS			CIRS					RSS		ISS Reg		CIRS			RSS		CIRS												

T022 – rev 36 – S26

Dec. 28, 2006 – 362T10:05:22 @ 1297 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at mid-southern latitudes.



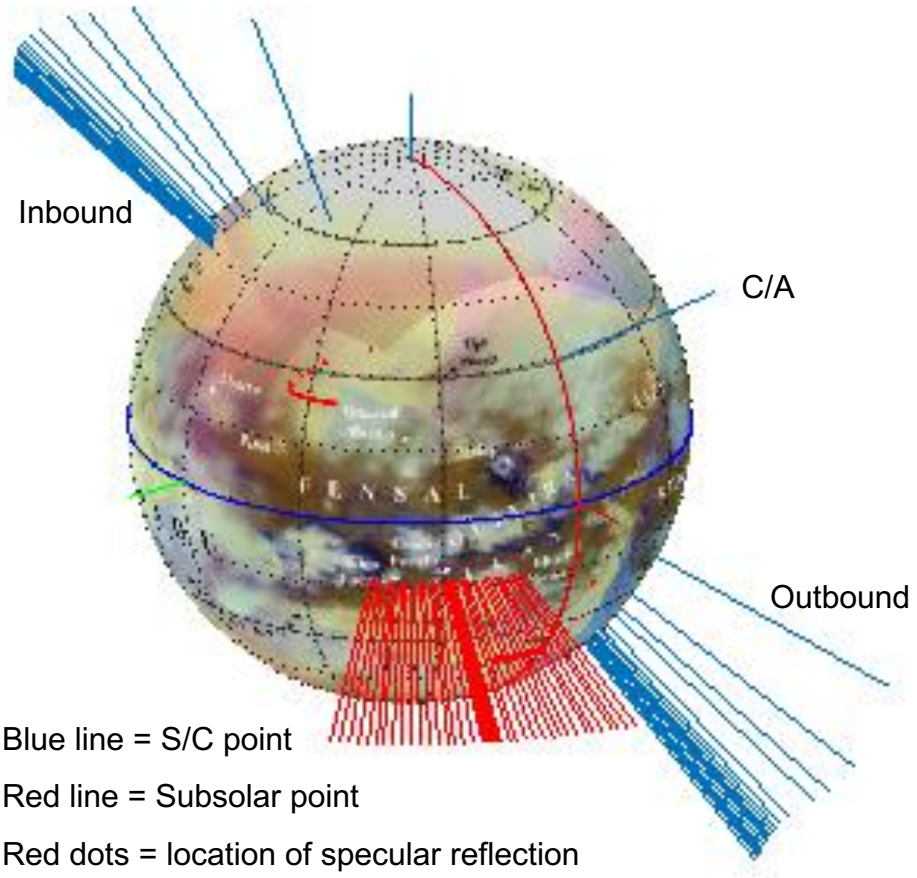
T023 – rev 37 – S27

Jan. 13, 2007 – 013T08:34:00 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T023 VIMS Science objectives: Composition and global mapping. Development and evolution of clouds. Haze characterization. Photometry.

-18:15	-16:00	CIRS	Mid-IR Temp Map
-16:00	-15:00	ISS	
-15:00	-13:00	CIRS	
-13:00	-10:00	CIRS	FP1
-10:00	-09:00	ISS	Photometry
-09:00	-05:00	CIRS	Mid-IR Limb
-05:00		Begin Custom Period	
-05:00	-01:15	RADAR Radiometry	Inbound
-01:15	-00:52	RADAR Scatterometry	Inbound
-00:52	-00:30	RWA to RCS Transition	Inbound
-00:30	-00:15	RADAR Altimetry	Inbound
-00:15	-00:07	RADAR Low-Res SAR	Inbound
-00:07	+00:07	RADAR High-Res SAR	C, A
2007-013T08:34:00		**CLOSEST APPROACH**	
+00:07	+00:15	RADAR Low-Res SAR	Outbound
+00:15	+00:30	RADAR Altimetry	Outbound
+00:30	+00:54	RADAR Scatterometry	Outbound
+00:54	+01:04	RADAR Turn to UVIS occ	
+01:04	+01:28	RCS to RWA Transition	
+01:04	+01:41	UVIS Occultation of Eta Uma	
+01:41	+02:00	RADAR Turn to radiometry	
+02:00	+05:00	RADAR Radiometry	Outbound
+05:00		End Custom Period	
+05:00	+08:00	ISS	Regional Map
+08:00	+09:00	ISS	Wide Angle
+09:00	+11:00	CIRS	FP1
+11:00	+13:00	ISS	Mosaic
+13:00	+14:00	VIMS	Stare



-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				CIRS		I	CIRS FP1					I	CIRS									RADAR	U				ISS				CIRS		ISS		V	CIRS			ISS				

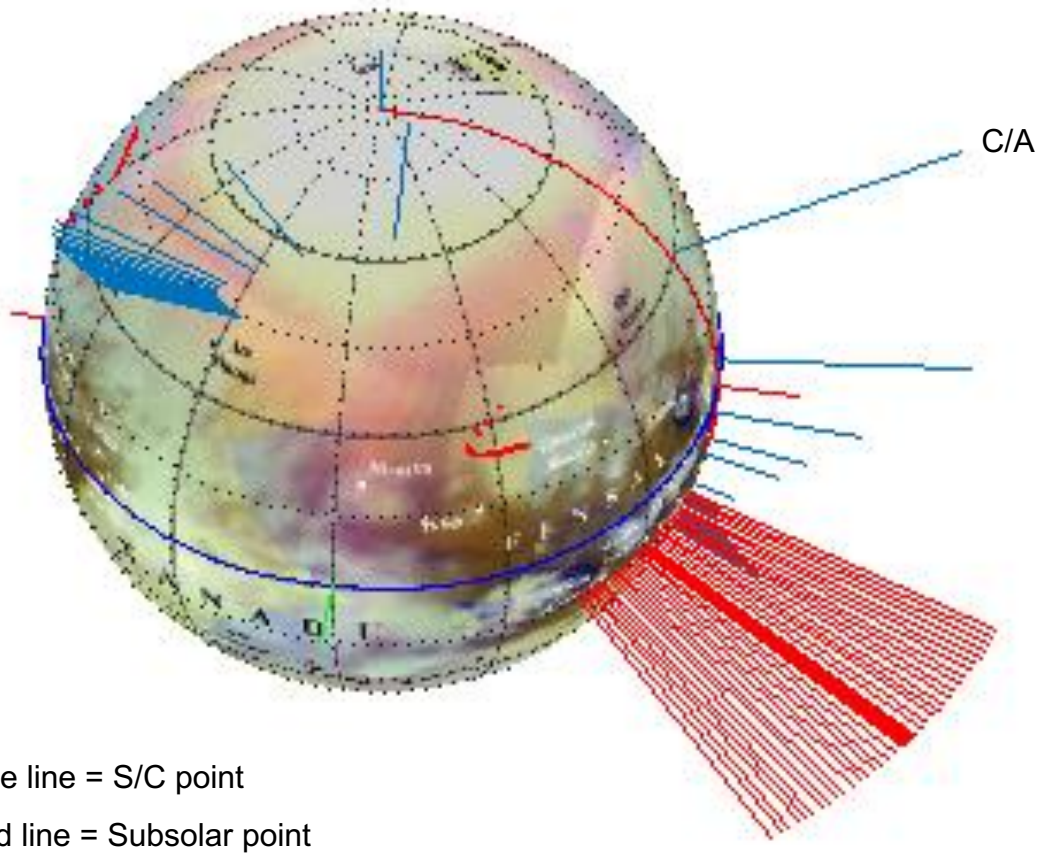
T023 – rev 37 – S27

Jan. 13, 2007 – 013T08:34:00 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				CIRS		I	CIRS FP1					I	CIRS									RADAR		U				ISS				CIRS		ISS		V	CIRS				ISS				

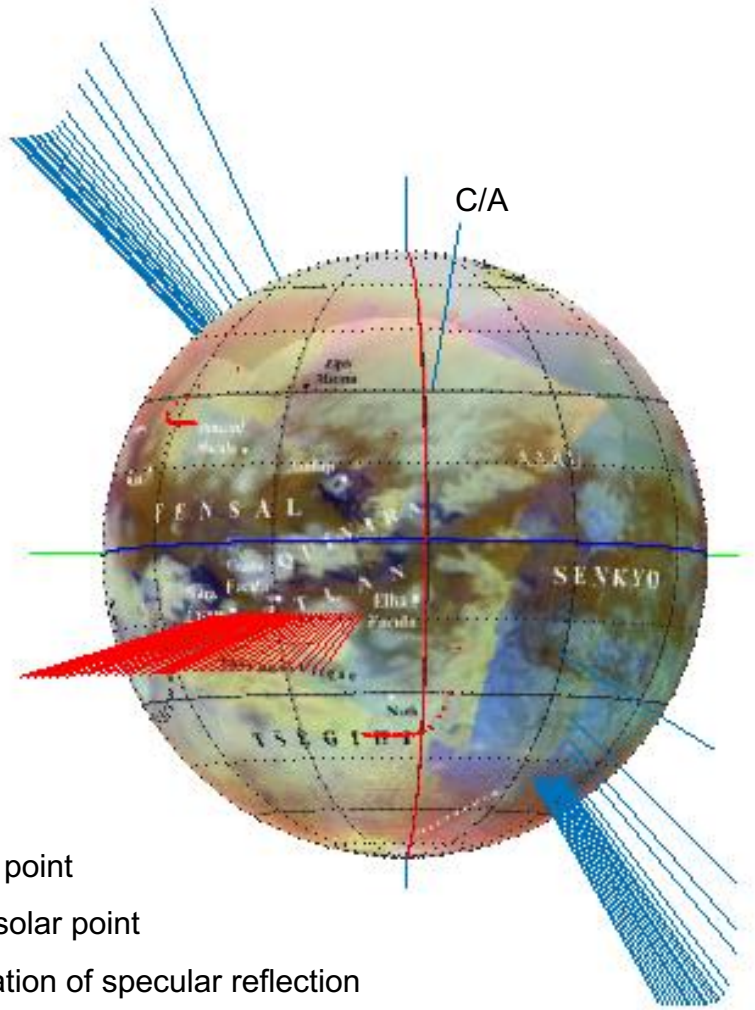
T023 – rev 37 – S27

Jan. 13, 2007 – 013T08:34:00 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				CIRS		I	CIRS FP1					I	CIRS									RADAR	U				ISS				CIRS		ISS		V	CIRS			ISS				

T023 – rev 37 – S27

Jan. 13, 2007 – 013T08:34:00 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at mid-southern latitudes.

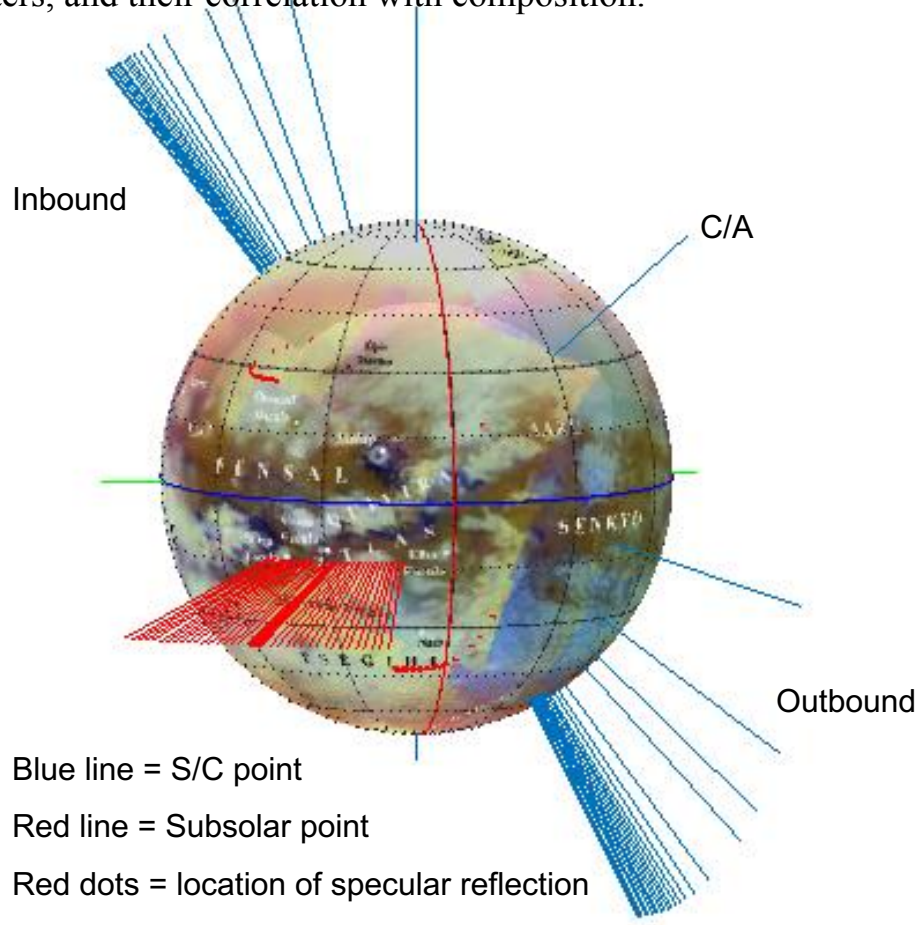
T024 – rev 38 – S27

Jan. 29, 2007 – 029T07:15:55 @ 2631 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T024 VIMS Science objectives: Stellar occultation will provide information on the structure and composition of the atmosphere. Identification of geologic features including volcanoes, eolian features, liquids and erosional features due to liquids, and craters, and their correlation with composition.

-18:15	-16:00	CIRS	Mid-IR Temp Map
-16:00	-15:00	ISS	Monitor
-15:00	-13:00	CIRS	Mid-IR Temp Map
-13:00	-10:00	CIRS	FP1 integration
-10:00	-09:00	ISS	Photometry
-09:00	-03:00	UVIS	EUVFUV slow scans
-03:00	-02:00	ISS	Regional Map
-02:00		Begin Custom Period	
-02:00	-00:23	CIRS	
-00:23	-00:17	VIMS	Stellar Occ
-00:17	+02:00	VIMS	High Res
2007-029T07:15:55		**CLOSEST APPROACH**	
+02:00		End Custom Period	
+02:00	+04:00	ISS	Regional Map
+04:00	+05:00	CIRS	
+05:00	+09:00	CIRS	Limb Map
+09:00	+14:00	CIRS	
+14:00	+19:14	CIRS	Mid-IR Temp Map



-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				CIRS		I	CIRS FP1					I	UVIS						I	CIRS		VIMS		ISS		CIRS																	

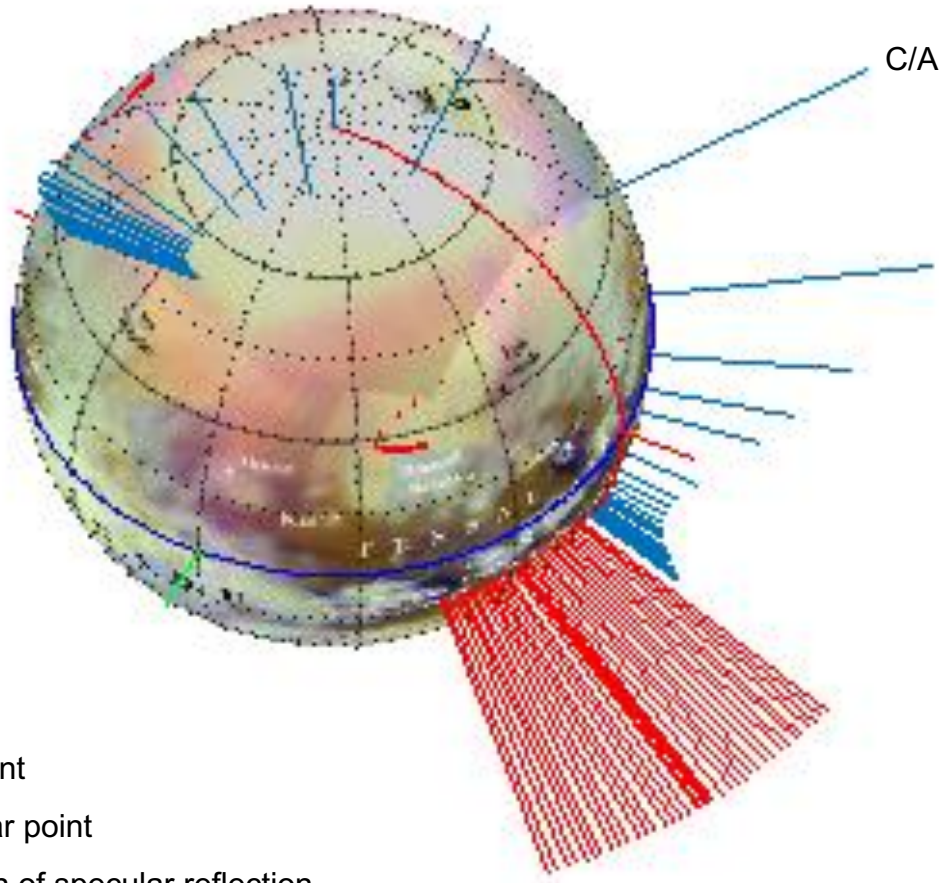
T024 – rev 38 – S27

Jan. 29, 2007 – 029T07:15:55 @ 2631 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				CIRS		I	CIRS FP1					I	UVIS						I	CIRS		VIMS		ISS		CIRS																	

T024 – rev 38 – S27

Jan. 29, 2007 – 029T07:15:55 @ 2631 km altitude

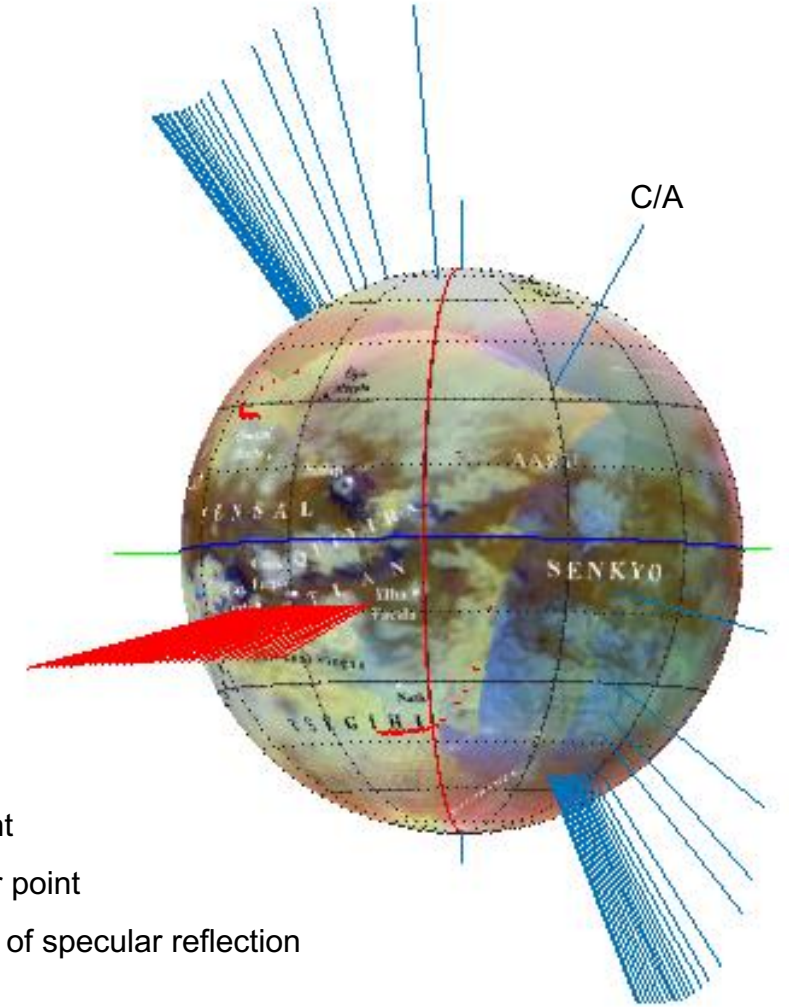
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Stellar occultation with Gamma Crucis.

Regional mapping of Titan southern hemisphere, east of Tsegihi.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

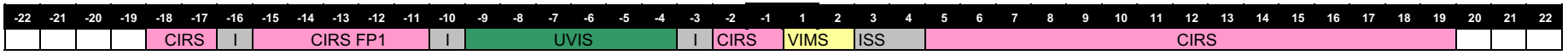
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
				CIRS		I	CIRS FP1					I	UVIS						I	CIRS		VIMS		ISS		CIRS																	

T024 – rev 38 – S27

Jan. 29, 2007 – 029T07:15:55 @ 2631 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at mid-southern latitudes.



T025 – rev 39 – S28

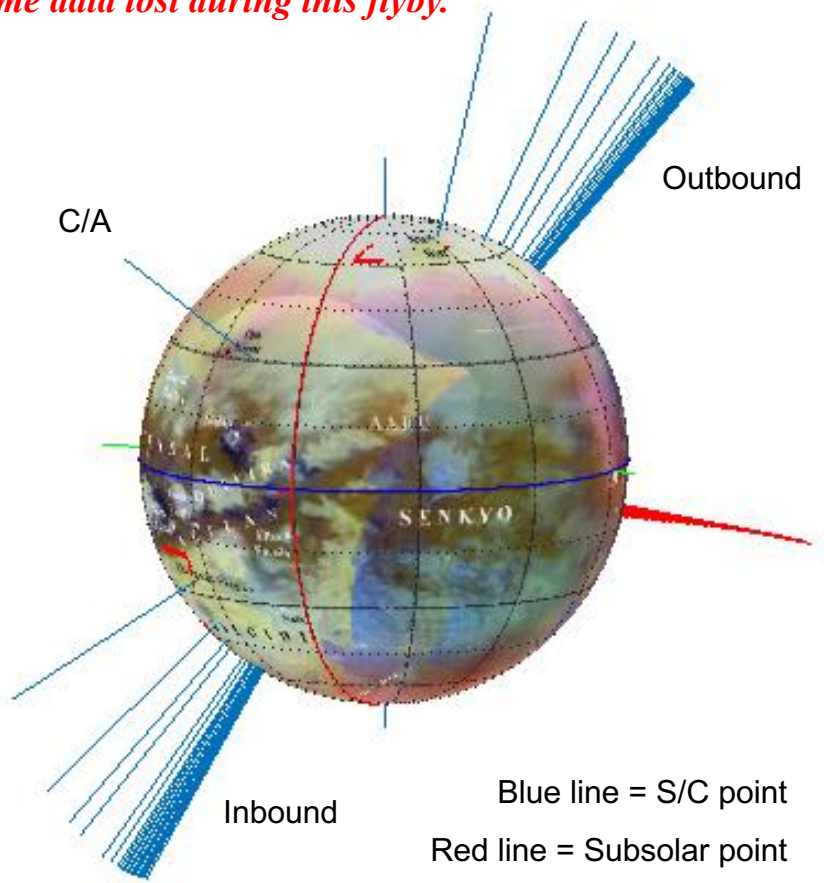
Feb. 22, 2007 – 053T03:10:59 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T025 VIMS Science objectives: VIMS will obtain their first view of the northern hemisphere.

TI-15:49	TI-15:00	ISS	monitor
TI-15:00	TI-13:00	CIRS	Mid IR temp map
TI-13:00	TI-10:00	CIRS	FP1
TI-10:00	TI-09:00	ISS	Photometry
TI-09:00	TI-08:00	CIRS	Mid IR Limb
TI-08:00	TI-05:10	CIRS	Mid IR Limb
TI-05:10	TI-04:48	SP Turn to RADAR Waypoint	POS_X to 223, -12, NEG_Z to Titan
TI-04:48	TI-01:15	RADAR	radiometry (inbound)
TI-01:15	TI-00:52	RADAR	scatterometry (inbound)
TI-00:52	TI-00:30	RWA to RCS Transition	
TI-00:30	TI-00:16	RADAR	altimetry (inbound)
TI-00:16	TI-00:06	RADAR	low-res SAR imaging (inbound)
TI-00:06	TI+00:06	RADAR	high-res SAR imaging
2007-053T03:10:59		**CLOSEST APPROACH**	
TI+00:06	TI+00:16	RADAR	low-res SAR imaging (outbound)
TI+00:16	TI+00:30	RADAR	altimetry (outbound)
TI+00:30	TI+00:52	RCS to RWA Transition	
TI+00:52	TI+01:17	RADAR	scatterometry (outbound)
TI+01:17	TI+04:49	RADAR	radiometry (outbound)
TI+04:49	TI+05:11	SP Turn to Waypoint	NAC to Titan, NEG_X to Sun
TI+05:11	TI+09:00	ISS	global mosaic
TI+09:00	TI+11:00	CIRS	FP1 stare
TI+11:00	TI+13:00	ISS	mosaic
TI+13:00	TI+14:00	VIMS	stare
TI+14:00	2006-054T00:26:00	CIRS	mid IR temp map with slow scans

Some data lost during this flyby.



-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
						I	CIRS FP1					I	CIRS								RADAR						ISS				CIRS		ISS		V	CIRS						

T025 – rev 39 – S28

Feb. 22, 2007 – 053T03:10:59 @ 1000 km altitude

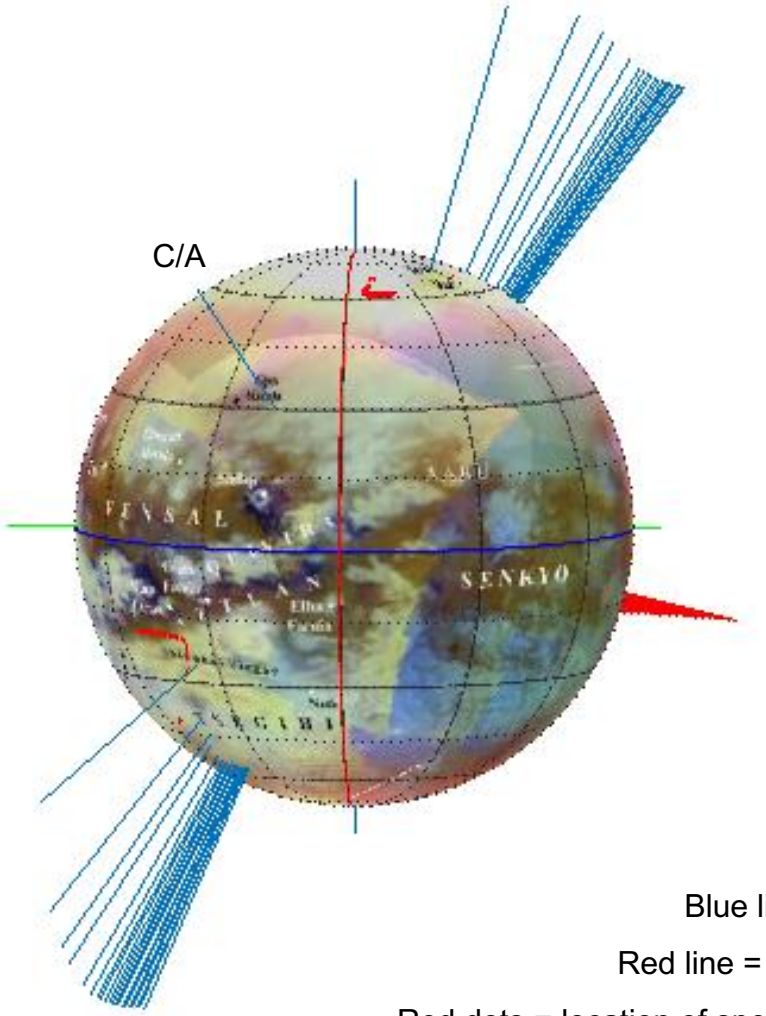
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection points near 62S, 168 W at C/A – 07:00.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.

Data on the inbound lost.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
						I	CIRS FP1					I	CIRS								RADAR						ISS				CIRS		ISS		V	CIRS						

T025 – rev 39 – S28

Feb. 22, 2007 – 053T03:10:59 @ 1000 km altitude

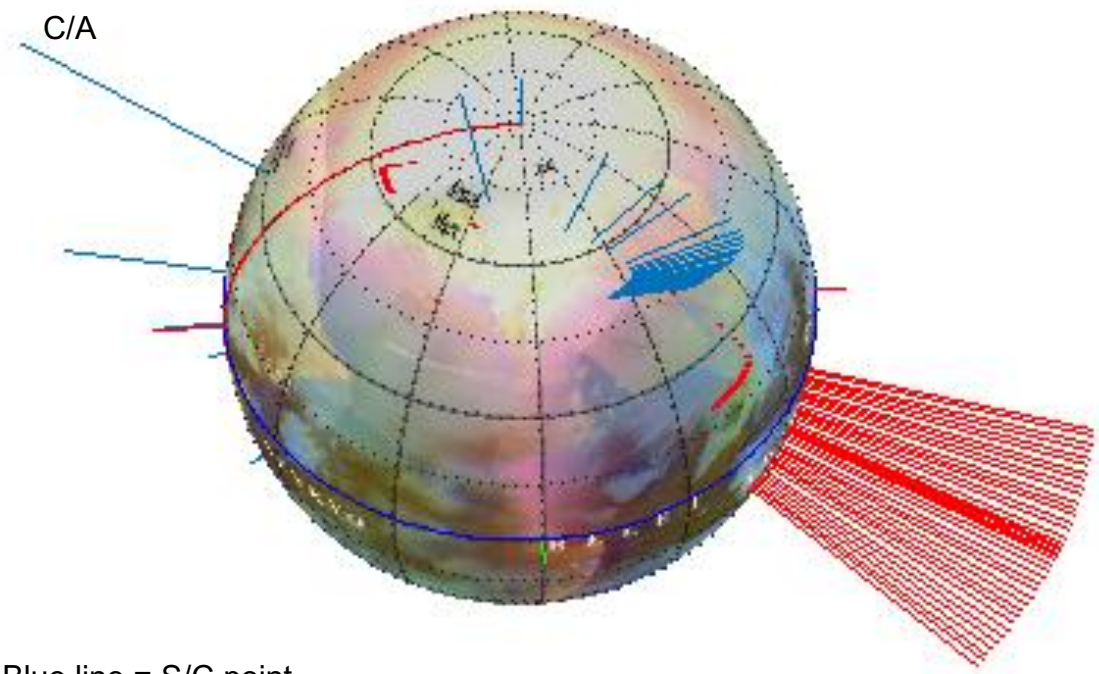
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

At C/A +00:05, specular reflection point at 66N, 263 W, but during the RADAR observations.

Global mapping of Titan.

Some data on the outbound is lost.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
						I	CIRS FP1					I	CIRS								RADAR						ISS				CIRS		ISS		V	CIRS						

T025 – rev 39 – S28

Feb. 22, 2007 – 053T03:10:59 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at southern latitudes. After C/A, at mid-northern latitudes.

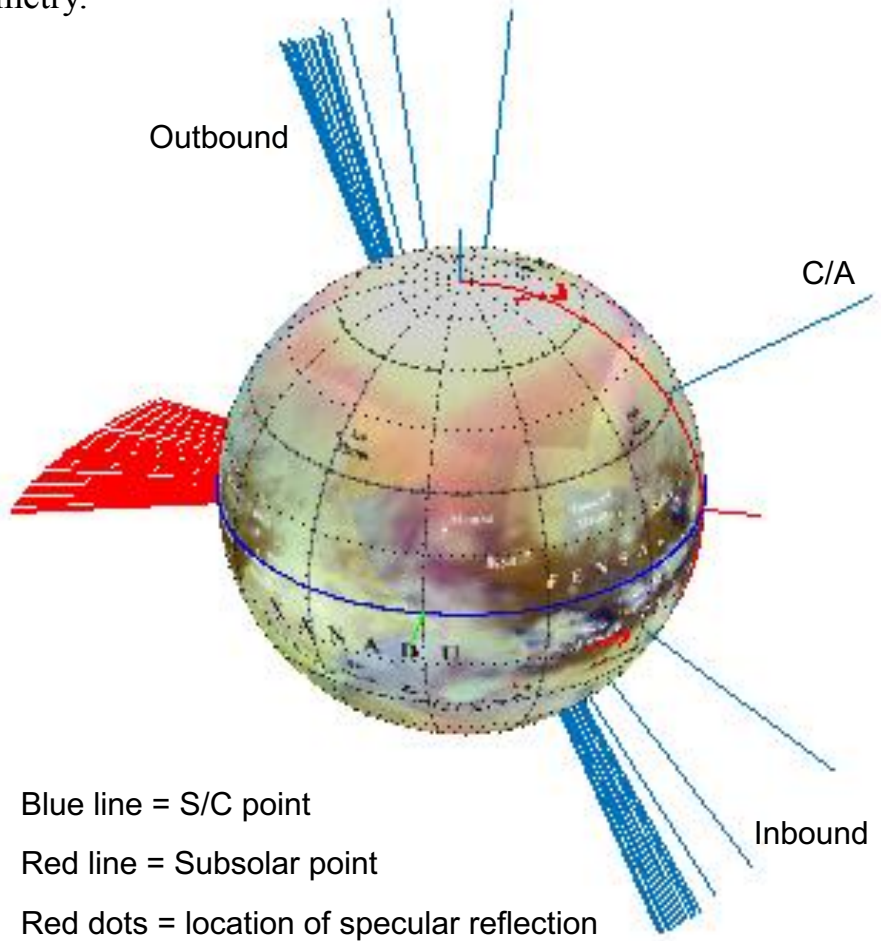
T026 – rev 40 – S28

March 10, 2007 – 069T01:47:22 @ 981 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T026 VIMS Science objectives: Composition; clouds; global mapping; development and evolution of clouds, haze characterization; photometry.

-15:41	-14:41	ISS	Polar Photom
-14:41	-13:00	CIRS	Mid-IR Temp Map
-13:00	-10:00	CIRS	FP1 Integration
-10:00	-09:00	ISS	Photometry
-09:00	-05:00	CIRS	Mid-IR Limb Map
-05:00	-01:24	CIRS	Nadir
-01:24	-01:00	RWA to RCS Transition	
-01:00	-00:47	SP Turn to Waypoint	NEG_X to SC_RAM, NEG_Y to Titan
-00:47		Begin Custom Period	
-00:47	-00:11	UVIS Solar Occ	UVIS_SOLAR to Sun, NEG_X to SC_RAM
-00:11	+00:15	INMS	
2007-069T01:49:00		**CLOSEST APPROACH**	
+00:15		End Custom Period	
+00:15	+00:23	SP Turn to Waypoint	NEG_Y to Titan, NEG_X to Sun (0,-8, 0 deg offset)
+00:23	+00:53	CIRS FIRLMBT	
+00:53	+01:23	CIRS FIRLMBAER	
+01:23	+01:46	RCS to RWA Transition	
+01:46	+02:23	CIRS FIRLMBINT	
+02:23	+04:15	ISS	Regional Map
+04:15	+05:00	CIRS	
+05:00	+08:00	UVIS	EUVFUV
+08:00	+09:00	ISS	
+09:00	+11:00	CIRS	FP1
+11:00	+13:00	ISS	Mosaic
+13:00	+15:14	VIMS	Stare



-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
						I	CIRS FP1					I	CIRS							UVIS	I	CIRS		ISS		C	UVIS			I	CIRS		ISS		VIMS							

T026 – rev 40 – S28

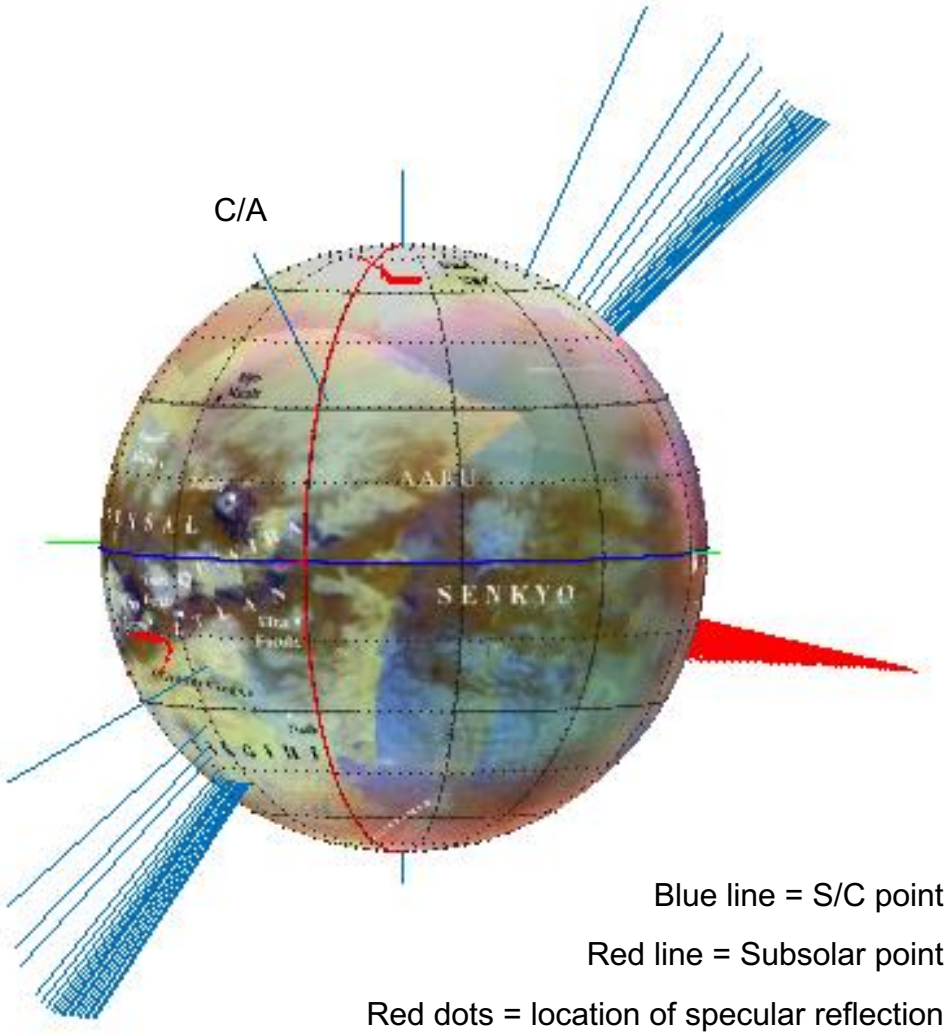
March 10, 2007 – 069T01:47:22 @ 981 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

Specular reflection geometry at high southern latitudes on the inbound at 68S, 162 W at C/A – 02:00.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
						I	CIRS FP1					I	CIRS								UVIS	I	CIRS			ISS	C	UVIS			I	CIRS			ISS	VIMS							

T026 – rev 40 – S28

March 10, 2007 – 069T01:47:22 @ 981 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

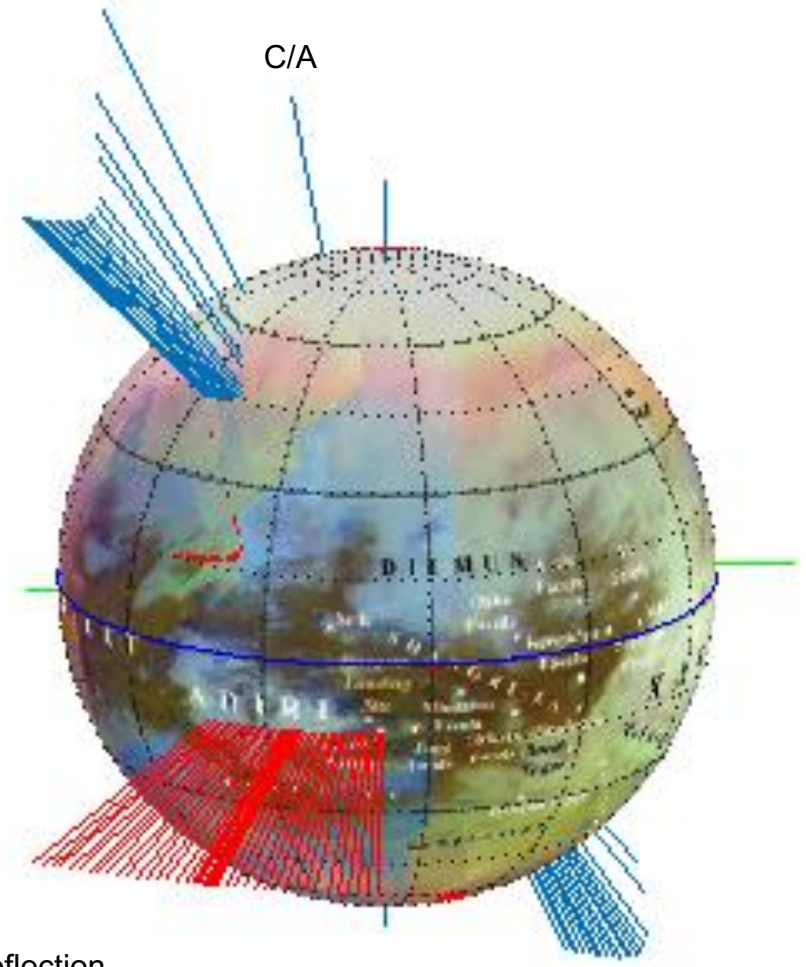
Outbound:

Regional mapping near 45N, 230 W.

Global mapping of Titan

Solar occultation*

*Maltagliati L. et al (2015) Titan's atmosphere a observed by Cassini VIMS solar occultations: CH4, CO, and evidence for C2H6 absorption; Icarus, 248, 1-24.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

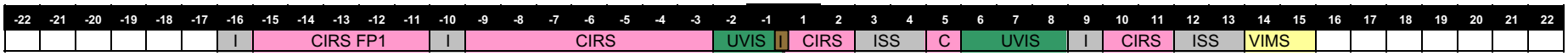
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
						I	CIRS FP1					I	CIRS							UVIS	I	CIRS		ISS		C	UVIS			I	CIRS		ISS		VIMS							

T026 – rev 40 – S28

March 10, 2007 – 069T01:47:22 @ 981 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at high southern latitudes. After C/A, at mid-northern latitudes.



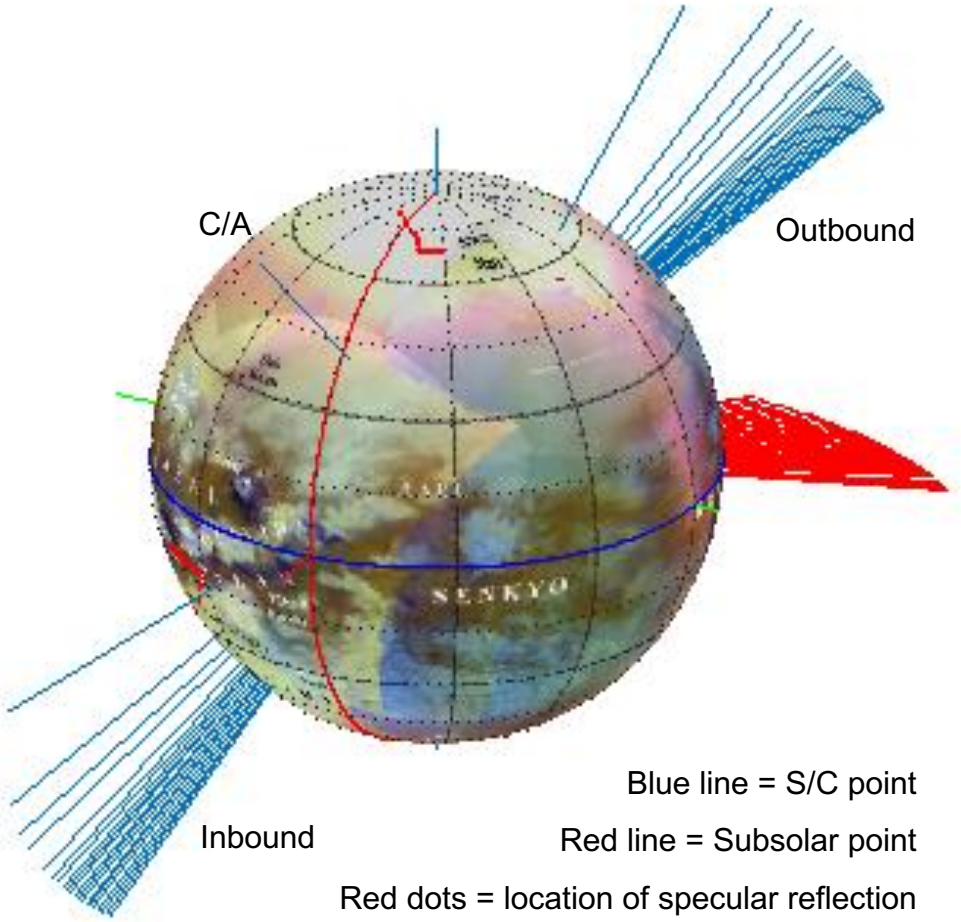
T027 – rev 41 – S28

March 26, 2007 – 085T00:21:52 @ 1010 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T027 VIMS Science objectives: VIMS will monitor cloud motion at Titan and map mid-latitude regions at moderate solar phase angles.

-15:16	-13:00	CIRS	Mid-IR Temp Map
-13:00	-10:00	CIRS	FP1
-10:00	-09:00	ISS	Photometry
-09:00	-05:00	CIRS	Mid-IR Limb
-05:00	-04:00	ISS	Regional Map
-04:00	-03:34	Transition to RCS	26 minutes (21+5)
-03:34	-01:11	UVIS	EUVFUV
-02:50	-00:50	RSS Warm-Up	
-01:11	-00:58	SP Turn to New Waypoint	
-00:58	-00:50	RSS	Turn to Bistatic
-00:50	-00:23	RSS	Bistatic
-00:23	+00:12	RSS	Occultation
2007-085T00:21:52		**CLOSEST APPROACH**	
+00:12	+00:50	RSS	Bistatic
+00:50	+01:00	RSS	Turn to waypoint
+01:00	+01:10	SP Turn to New Waypoint	
+01:10	+01:33	Transition to DFPW	23 minutes
+01:33	+03:00	CIRS	Limb
+03:00	+05:00	UVIS	EUVFUV
+05:00	+08:00	UVIS	EUVFUV
+08:00	+09:00	ISS	WAC
+09:00	+11:00	CIRS	FP1
+11:00	+13:00	ISS	Mosaic
+13:00	+14:00	VIMS	Stare
+14:00	+21:15	VIMS	Global Map



-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							CIRS FP1					I	CIRS				I	UVIS			RSS	CIRS				UVIS				I	CIRS		ISS		VIMS							

T027 – rev 41 – S28

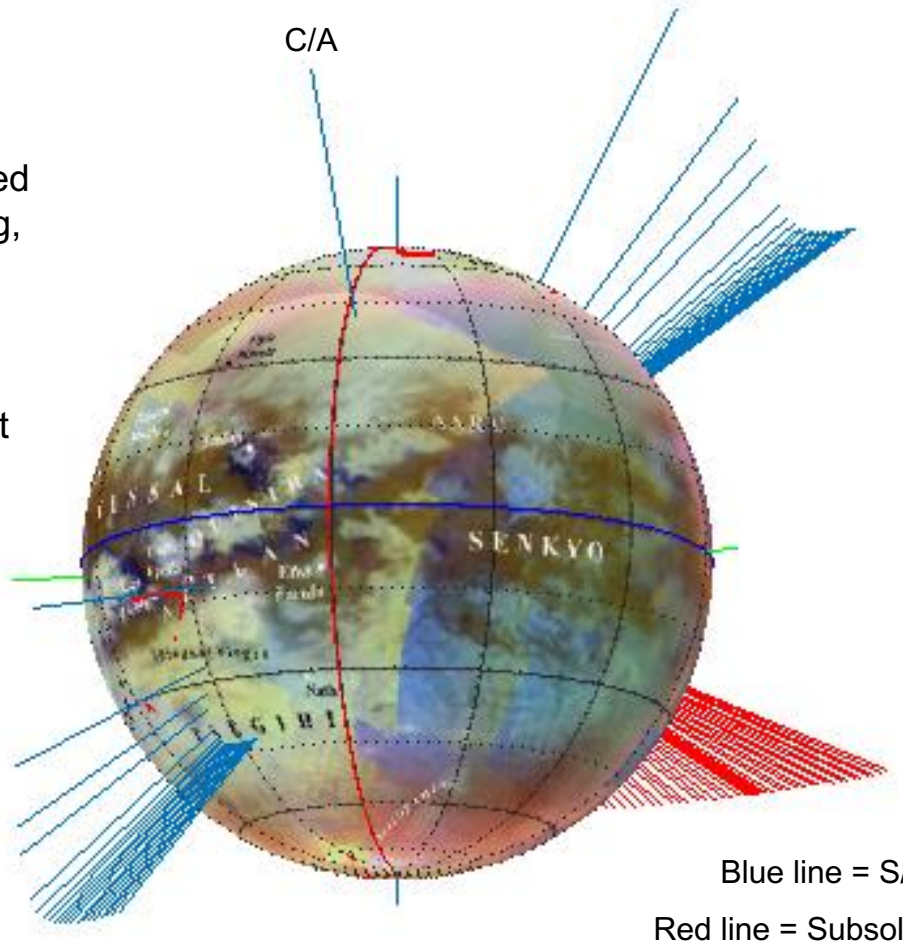
March 26, 2007 – 085T00:21:52 @ 1010 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

Specular reflection geometry occurs at high southern latitudes on the inbound at 70S, 158 W at C/A – 03:00.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							CIRS FP1					I	CIRS				I	UVIS			RSS		CIRS				UVIS			I	CIRS			ISS					VIMS				

T027 – rev 41 – S28

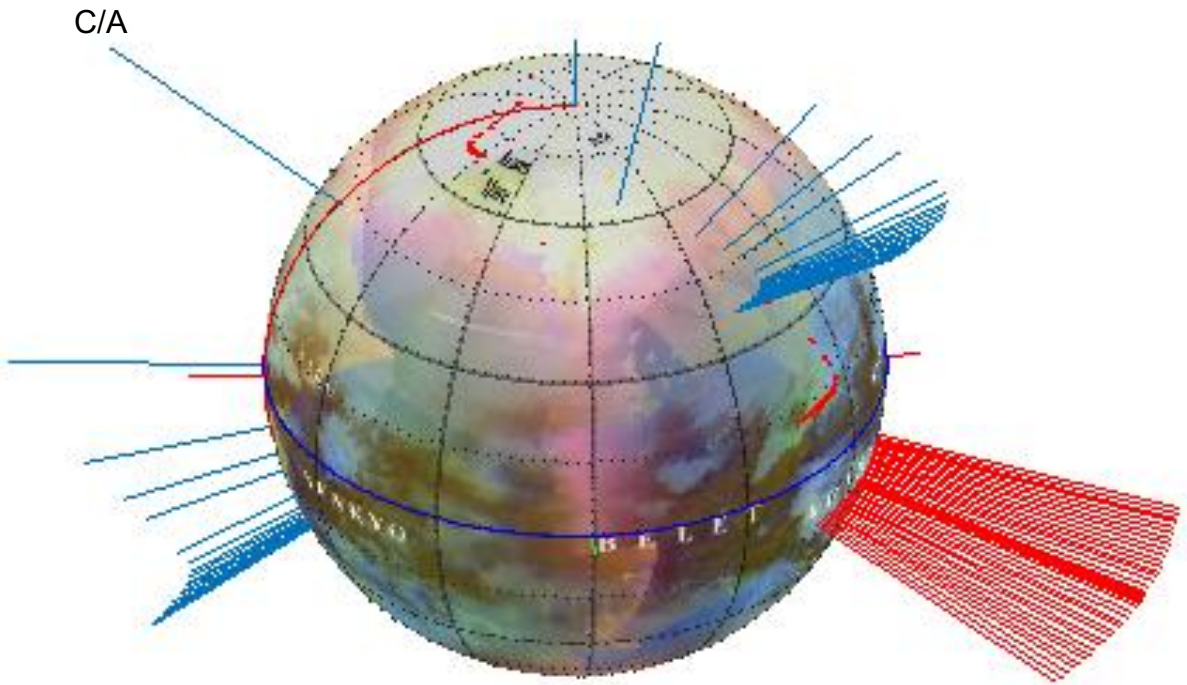
March 26, 2007 – 085T00:21:52 @ 1010 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional mapping while riding along with CIRS and UVIS.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

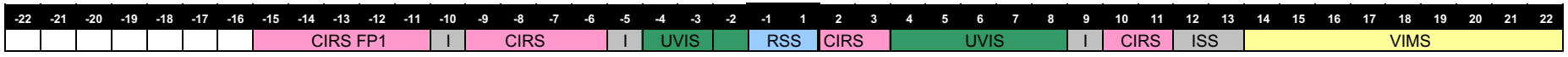
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							CIRS FP1					I	CIRS				I	UVIS			RSS		CIRS				UVIS			I	CIRS			ISS					VIMS				

T027 – rev 41 – S28

March 26, 2007 – 085T00:21:52 @ 1010 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at high southern latitudes. After C/A, at mid-northern latitudes.



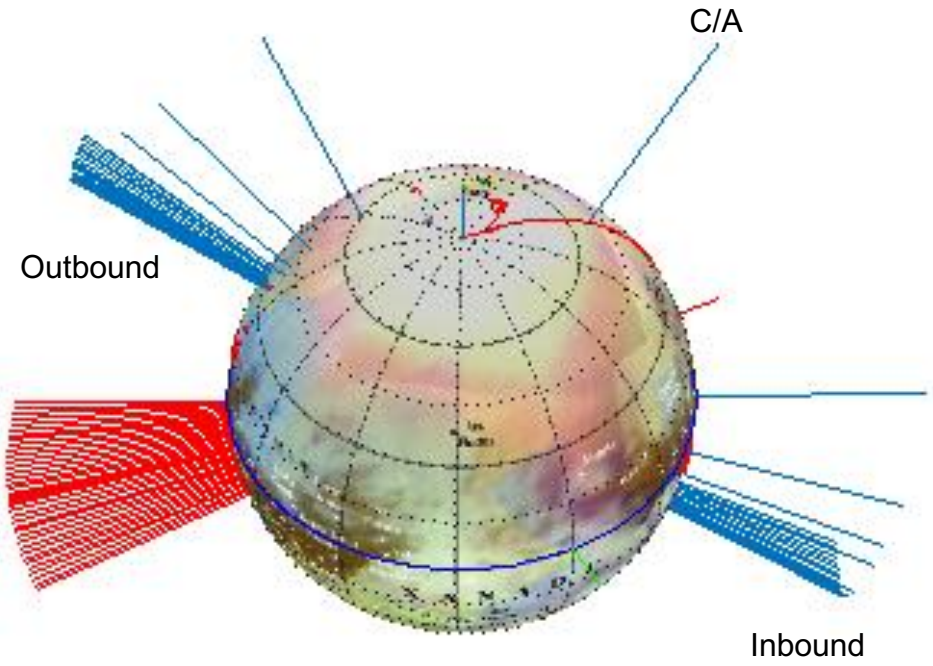
T028 – rev 42 – S29

April 10, 2007 – 100T22:58:00 @ 991 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T028 VIMS Science objectives: Monitoring of cloud motion on Titan. Mapping of mid-latitude regions at moderate solar phase angles.

-15:09	-15:00	ISS	Monitor
-15:00	-13:00	CIRS	Mid-IR Temp Map
-13:00	-09:00	VIMS	Cloud Map
-09:00	-05:10	UVIS	FUV, EUV
-05:10	-4:50	SP Turn to Waypoint	20 min turn
-04:50	-01:15	RADAR	Radiometry
-01:15	-00:52	RADAR	Scatterometry
-00:52	-00:30	RWA to RCS Transition	22 mins
-00:30	-00:16	RADAR	Altimetry
-00:16	-00:06	RADAR	Low-Res SAR
-00:06	+00:06	RADAR	High-Res SAR
2007-100T22:57:11		**CLOSEST APPROACH**	
+00:06	+00:16	RADAR	Low-Res SAR
+00:16	+00:29	RADAR	Altimetry
+00:29	+00:37	SP Turn to Waypoint	
+00:37	+01:00	RCS to RWA Transition	23 mins
+01:00	+02:00	ISS	High Res
+02:00	+04:00	ISS	Regional Map
+04:00	+05:00	CIRS	Mid IR Limb Map
+05:00	+08:36	ISS	Global Mosaic
+08:36	+09:00	ISS	WAC Photometry
+09:00	+14:00	CIRS	
+14:00	+21:14	CIRS	Mid-IR Temp Map



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T028 – rev 42 – S29

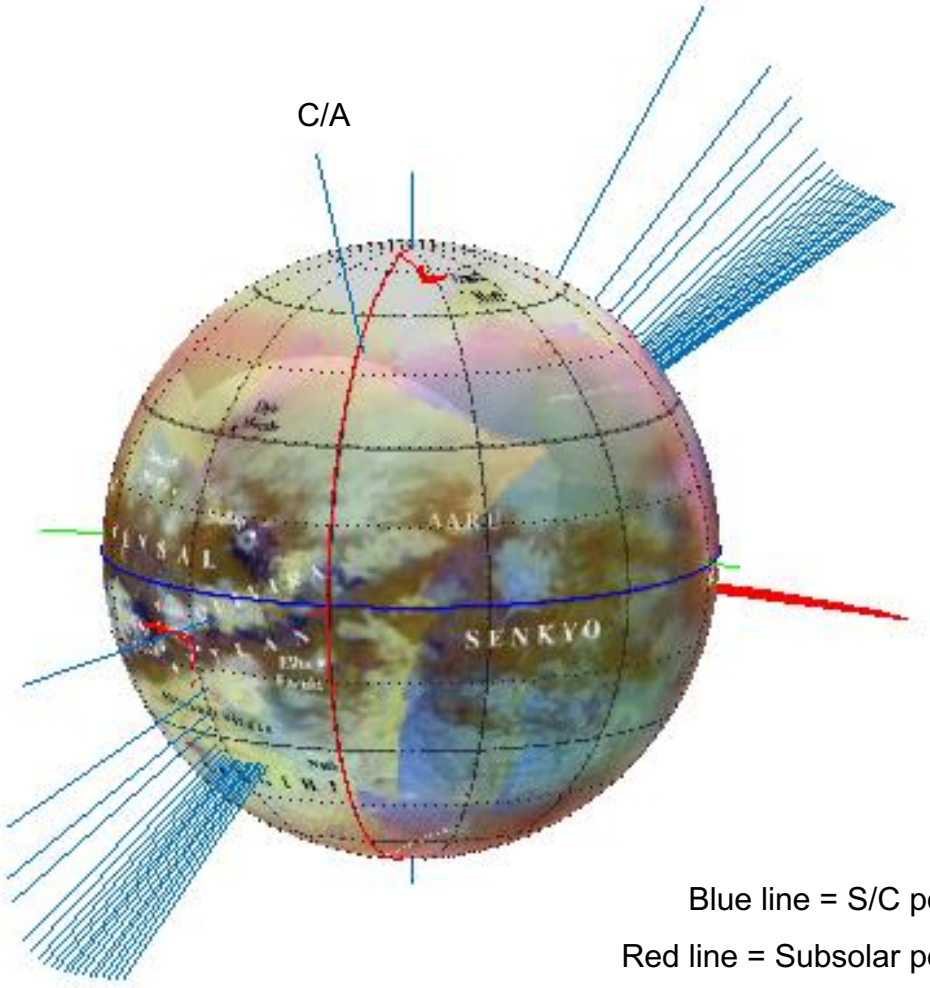
April 10, 2007 – 100T22:58:00 @ 991 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection points near 72S, 148 W at C/A – 10:00.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
						I	CIRS FP1			VIMS			UVIS									RADAR		V	ISS		C	ISS				CIRS											

T028 – rev 42 – S29

April 10, 2007 – 100T22:58:00 @ 991 km altitude

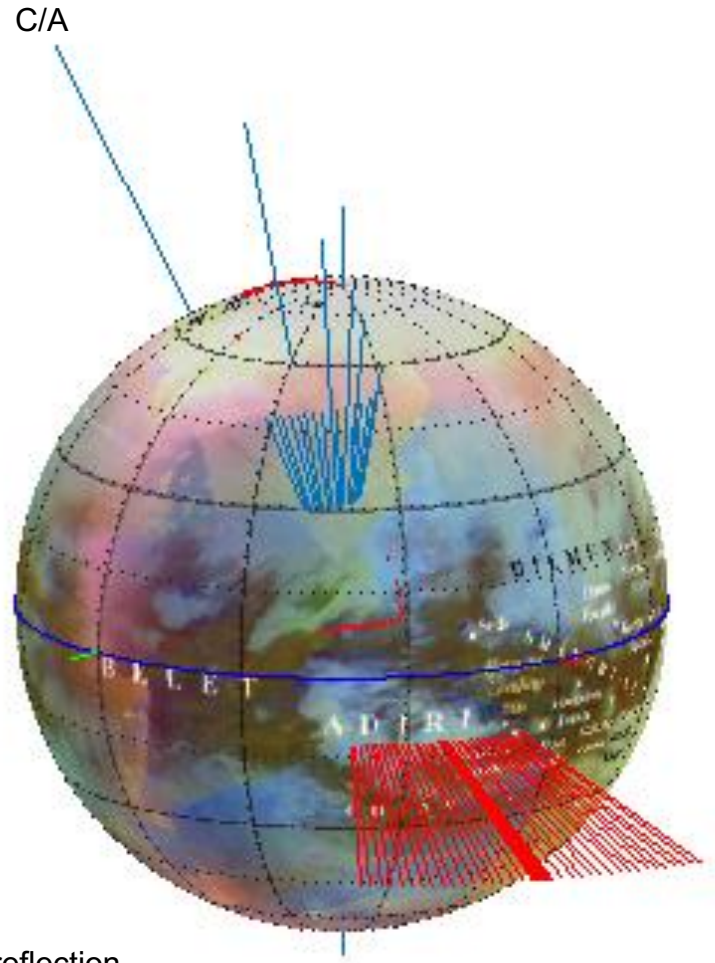
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

At C/A, specular reflection point at 63N, 266 W, but during the RADAR observations.

Regional mapping near 30N, 210 W, north of the Belet region.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
						I	CIRS FP1			VIMS			UVIS									RADAR		V	ISS		C	ISS				CIRS										

T028 – rev 42 – S29

April 10, 2007 – 100T22:58:00 @ 991 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at southern latitudes. After C/A, at low northern latitudes.

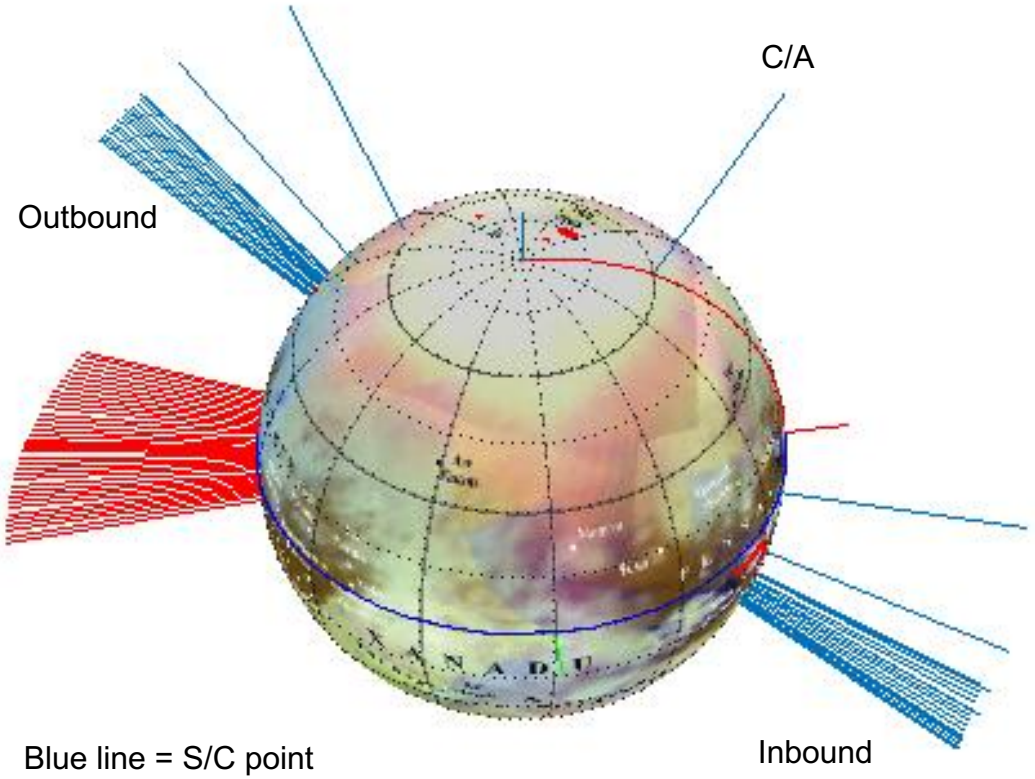
T029 – rev 43 – S29

April 26, 2007 – 116T21:32:52 @ 981 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T029 VIMS Science objectives: VIMS will obtain phase angle coverage of the northern hemisphere. Global mapping of Titan and haze observations. Search for hot spots and lightning.

-14:46	-13:00	CIRS	Mid-IR Temp Map
-13:00	-10:00	CIRS	FP1
-10:00	-09:00	ISS	Photometry
-09:00	-05:00	VIMS	Cloud Map
-05:00	-02:10	CIRS	Nadir
-02:10	-01:50	SP Turn to RADAR Waypoint	NEG_Z to Titan, NEG_X to 270, -6
-01:50	-01:15	RADAR	Radiometry
-01:15	-00:52	RADAR	Scatterometry
-00:52	-00:30	RWA to RCS Transition	
-00:30	-00:15	RADAR	Altimetry
-00:15	-00:07	RADAR	Low-Res SAR
-00:07	+00:07	RADAR	High-Res SAR
2007-116T21:32:52		**CLOSEST APPROACH**	
+00:07	+00:15	RADAR	Low-Res SAR
+00:15	+00:30	RADAR	Altimetry
+00:30	+00:54	RCS to RWA Transition	
+00:54	+01:15	RADAR	Scatterometry
+01:15	+04:50	RADAR	Radiometry
+04:50	+05:10	SP Turn to Waypoint	NAC to TI, NEG_X to Sun
+05:10	+08:00	VIMS	Regional Map
+08:00	+08:36	ISS	NAC Mosaic
+08:36	+09:00	ISS	WAC Photometry
+09:00	+11:00	CIRS	
+11:00	+13:00	ISS	
+13:00	+14:00	VIMS	
+14:00	+14:42	CIRS	Mid-IR Temp Map



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							CIRS FP1					I	VIMS				CIRS				RADAR						VIMS			I	CIRS		ISS		V	C						

T029 – rev 43 – S29

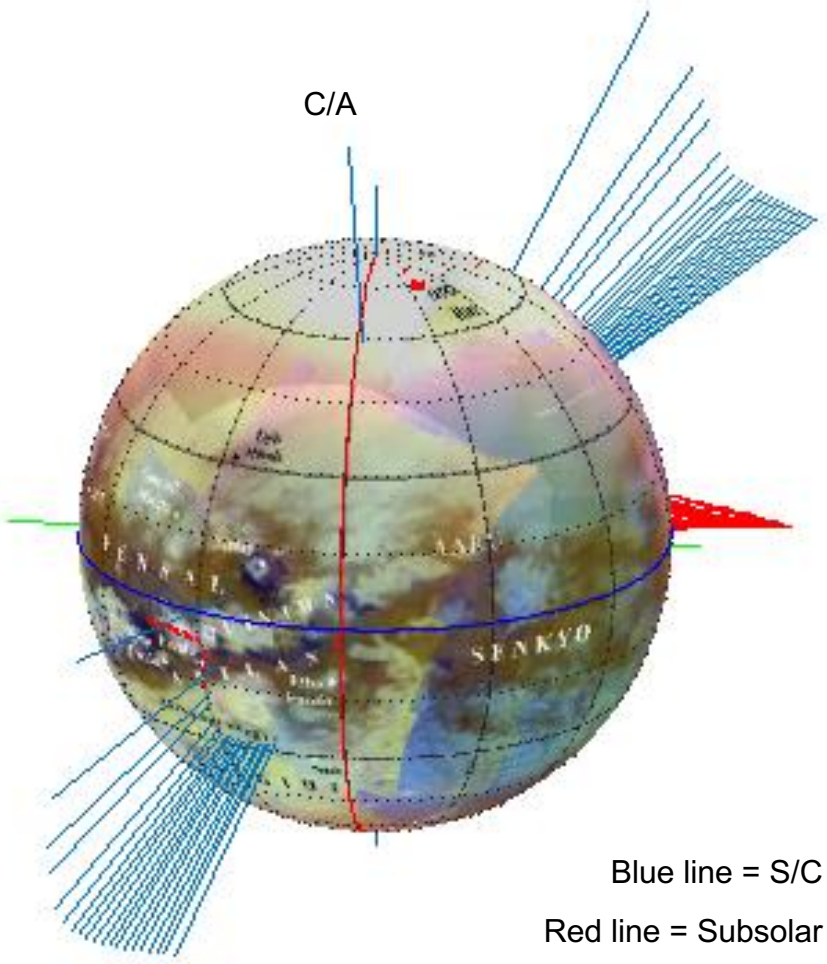
April 26, 2007 – 116T21:32:52 @ 981 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection points near 75S, 140 W at C/A – 06:00.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							CIRS FP1					I	VIMS				CIRS				RADAR							VIMS			I	CIRS		ISS		V	C							

T029 – rev 43 – S29

April 26, 2007 – 116T21:32:52 @ 981 km altitude

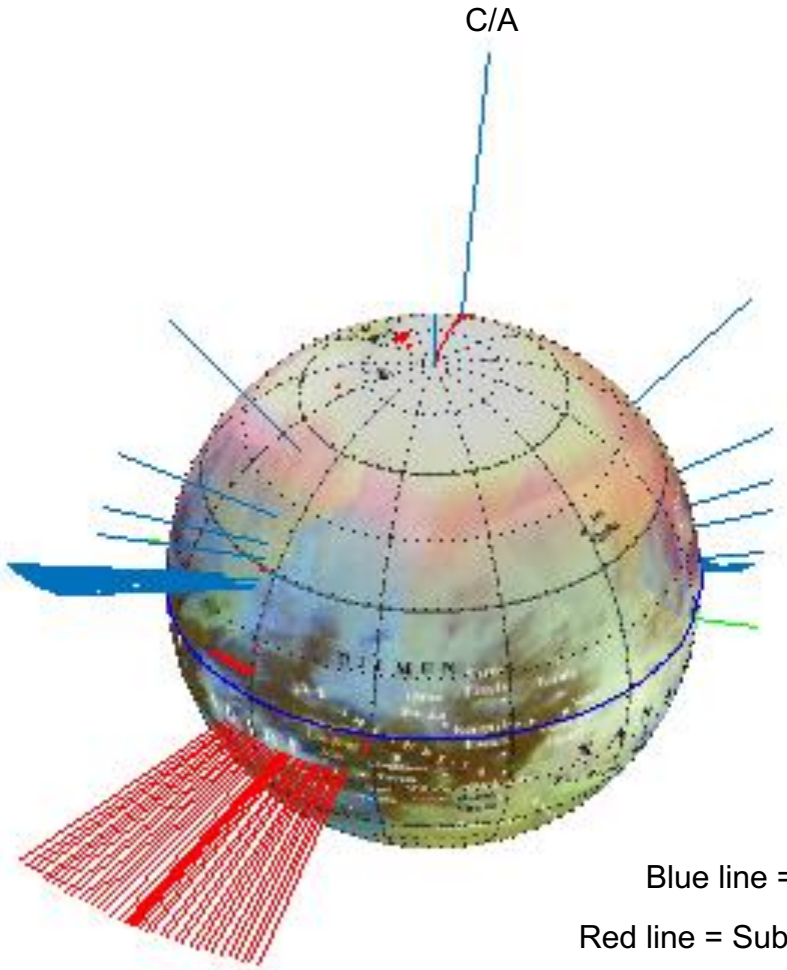
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

At C/A, specular reflection point at 69N, 251 W, but during the RADAR observations.

Regional mapping north of Adiri at 24N, 215 W.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							CIRS FP1					I	VIMS				CIRS				RADAR						VIMS			I	CIRS		ISS		V	C							

T029 – rev 43 – S29

April 26, 2007 – 116T21:32:52 @ 981 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at southern latitudes. After C/A, at equatorial latitudes.

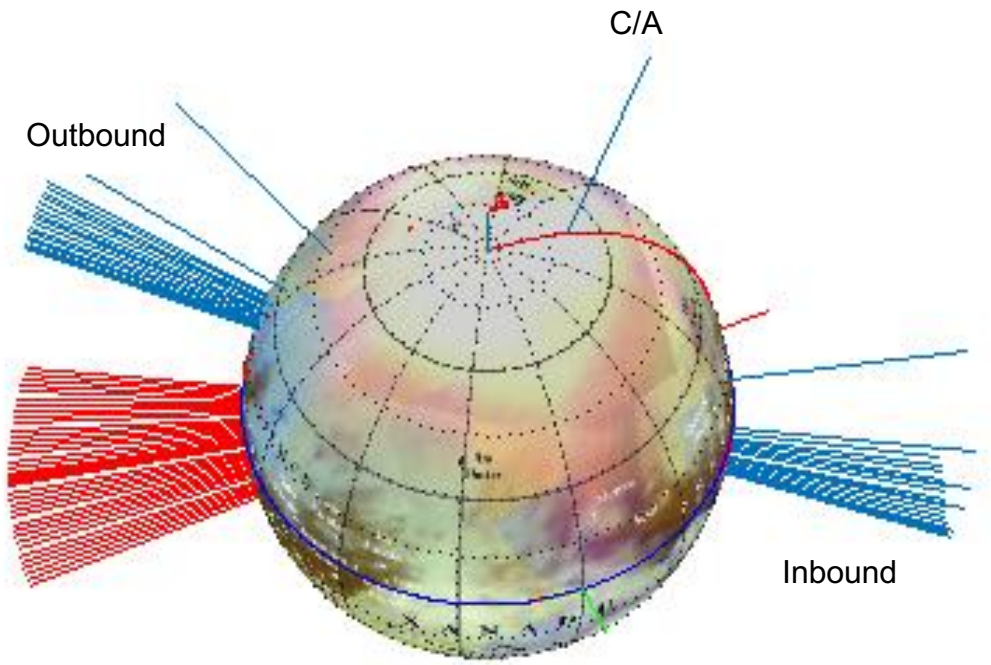
T030 – rev 44 – S30

May 12, 2007 – 132T20:08:14 @ 959 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T030 VIMS Science objectives: VIMS will obtain surface observations at small solar phase angles of the northern hemisphere.

-14:24	-13:00	CIRS	Mid-IR Temp Map
-13:00	-09:00	VIMS	Cloud Map
-09:00	-05:10	UVIS	EUVFUV
-05:10	-04:50	SP Turn to RADAR Waypoint	NEG_Z to Titan, NEG_X to 35, -15
-04:50	-01:15	RADAR	Radiometry
-01:15	-00:52	RADAR	Scatterometry
-00:52	-00:30	RWA to RCS Transition	
-00:30	-00:15	RADAR	Altimetry
-00:15	-00:07	RADAR	Low-Res SAR
-00:07	+00:07	RADAR	High-Res SAR
2007-132T20:09:58		**CLOSEST APPROACH**	
+00:07	+00:15	RADAR	Low-Res SAR
+00:15	+00:30	RADAR	Altimetry
+00:30	+00:54	RCS to RWA Transition	
+00:54	+01:15	RADAR	Scatterometry
+01:15	+04:35	RADAR	Radiometry
+04:35	+04:55	SP Turn to Waypoint	NAC to TI, NEG_X to Sun
+04:55	+08:36	ISS	Global Mosaic
+08:36	+09:00	ISS	WAC Photometry
+09:00	+11:00	CIRS	FP1
+11:00	+13:00	ISS	Mosaic
+13:00	+14:00	VIMS	Stare
+14:00	+15:19	CIRS	Mid-IR Temp Map



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							CIRS	FP1		VIMS			UVIS									RADAR						ISS				CIRS		ISS		V	C							

T030 – rev 44 – S30

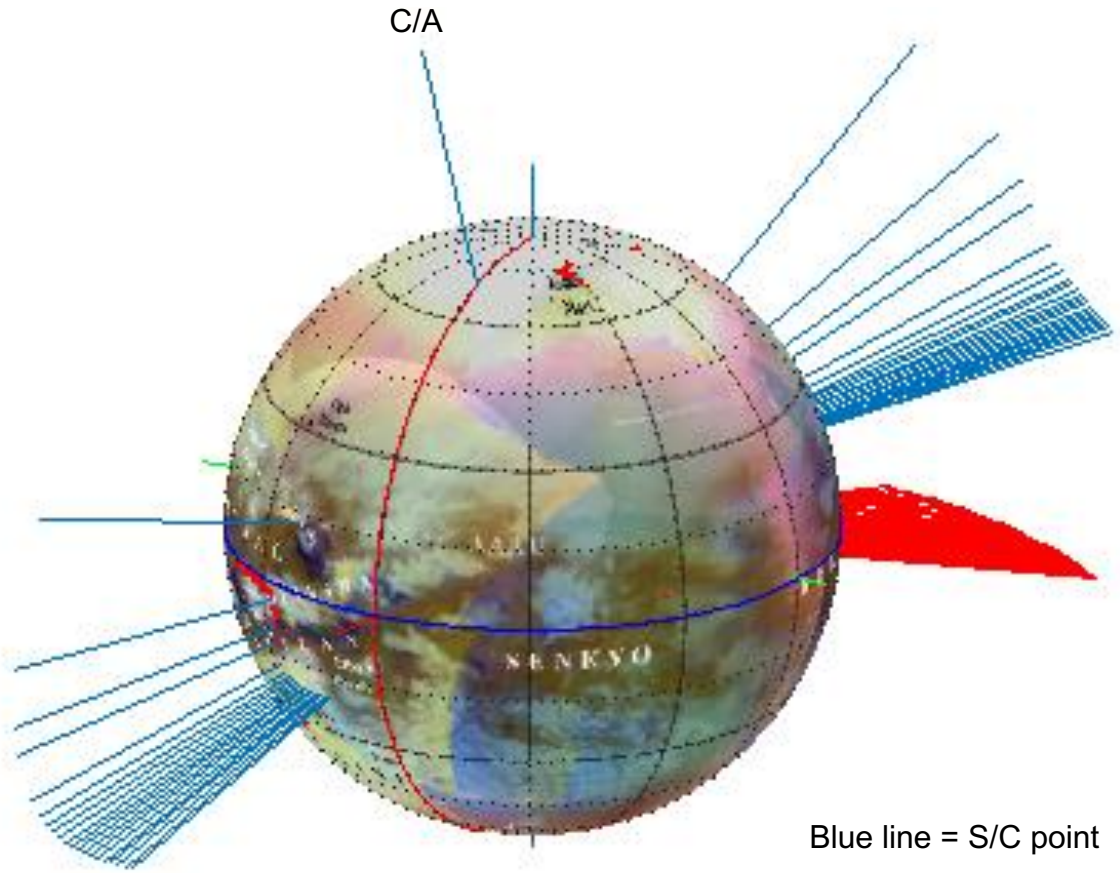
May 12, 2007 – 132T20:08:14 @ 959 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection points near 76S, 122 W at C/A – 10:00.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							CIRS FP1			VIMS			UVIS									RADAR						ISS				CIRS		ISS		V	C						

T030 – rev 44 – S30

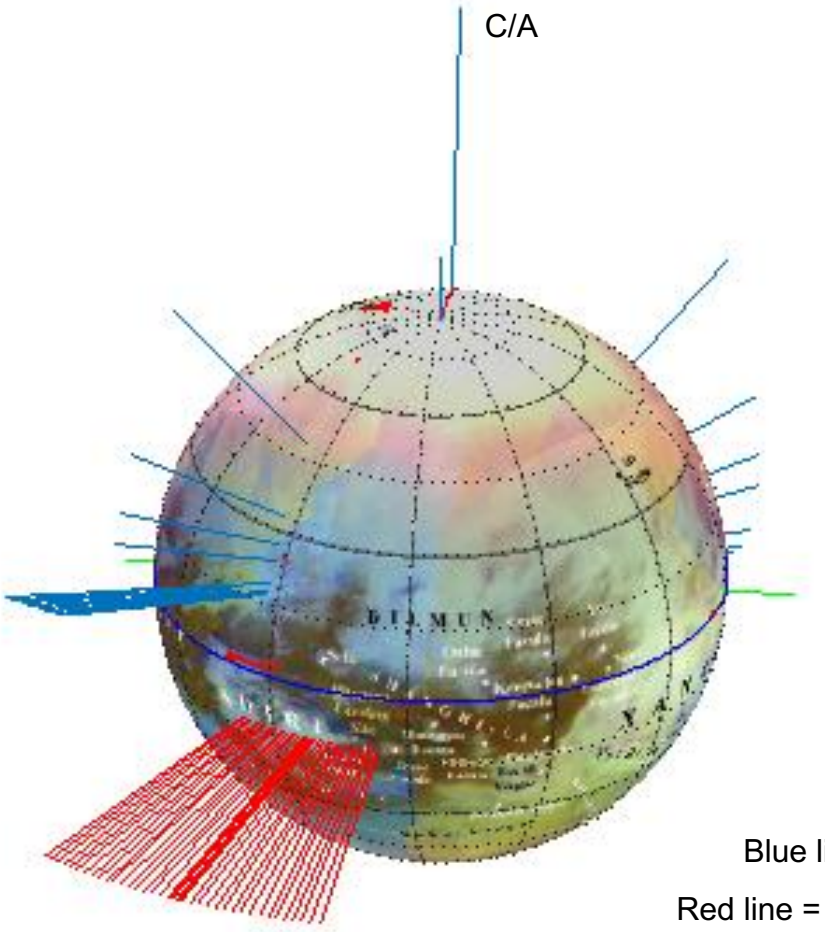
May 12, 2007 – 132T20:08:14 @ 959 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

At C/A, specular reflection point at 74N, 236 W near Ligeia Mare, but during the RADAR observations.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
							CIRS FP1			VIMS			UVIS									RADAR						ISS				CIRS		ISS		V	C								

T030 – rev 44 – S30

May 12, 2007 – 132T20:08:14 @ 959 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at southern latitudes. After C/A, at equatorial latitudes.

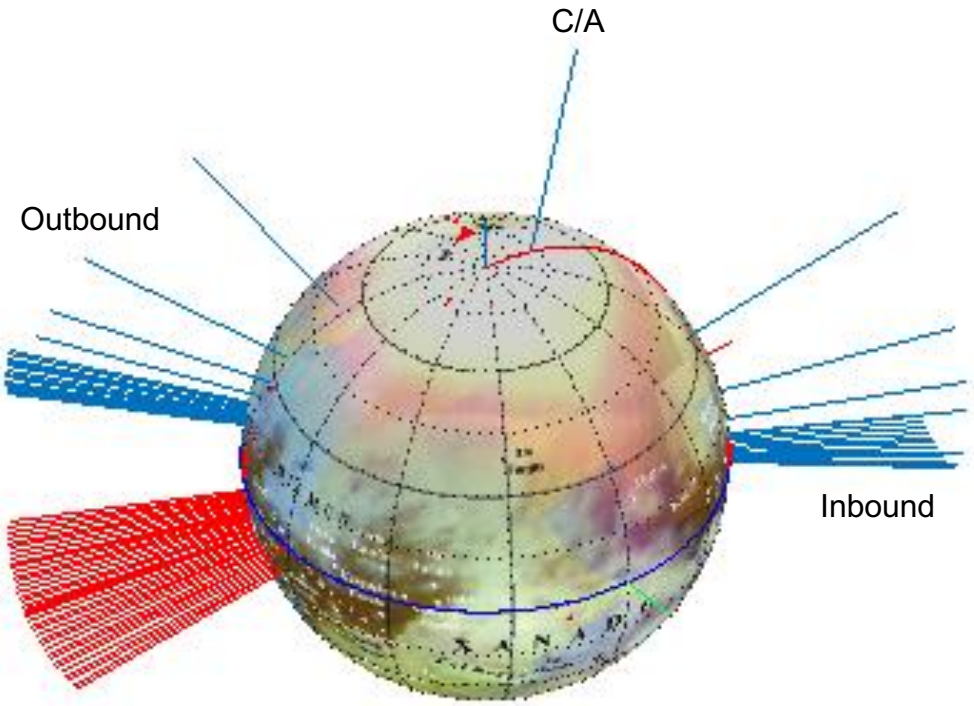
T031 – rev 45 – S30

May 28, 2007 – 148T18:51:27 @ 2299 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T031 VIMS Science objectives: Composition; clouds, global mapping; development and evolution of clouds; haze characterization; photometry.

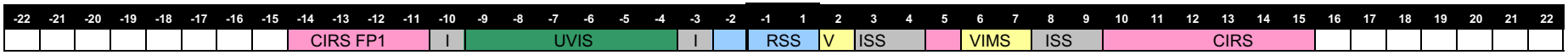
-14:09	-13:00	CIRS
-13:00	-10:00	CIRS-FP1
-10:00	-09:00	ISS
-09:00	-05:00	UVIS
-05:00	-03:00	UVIS
-03:00	-01:45	ISS
-01:45	-01:15	SP Turn to Waypoint
-01:15	+00:07	RSS Occultation
2007-148T18:51:55		**CLOSEST APPROACH**
+00:07	+00:40	RSS Bistatic Out
+00:40	+01:00	SP Turn to Waypoint
+01:00	+02:00	ISS
+02:00	+04:00	ISS-reg
+04:00	+05:00	CIRS
+05:00	+08:00	VIMS
+08:00	+09:00	ISS-W
+09:00	+15:14	CIRS



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T031 – rev 45 – S30

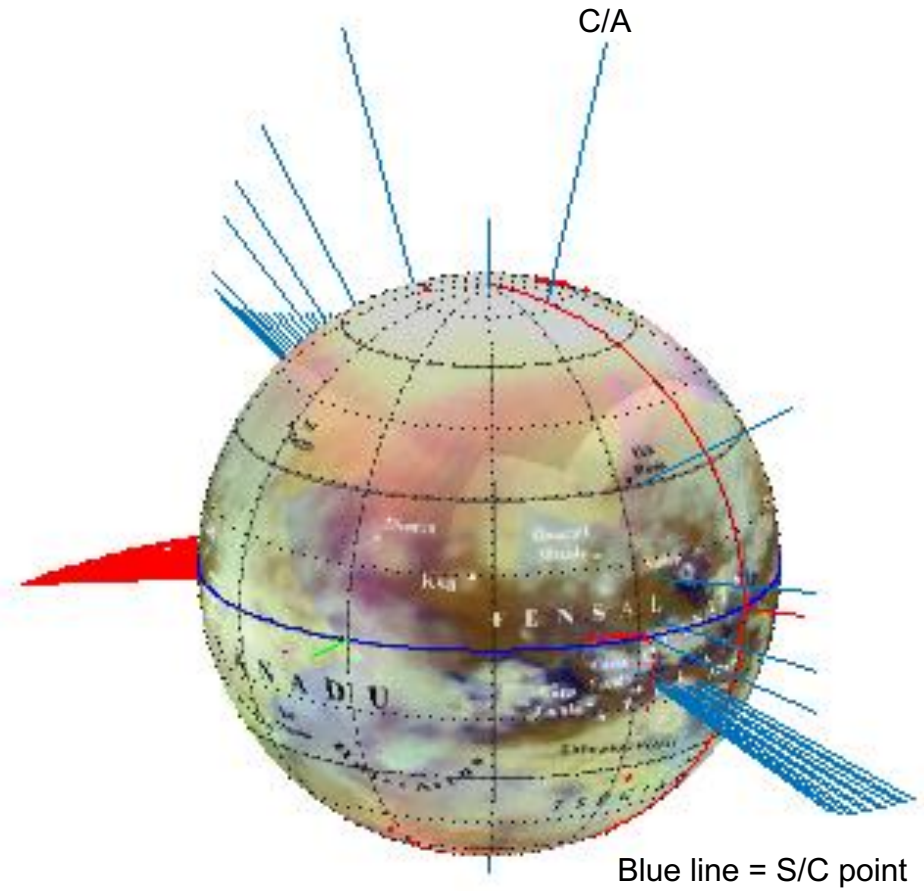
May 28, 2007 – 148T18:51:27 @ 2299 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

Specular reflection geometry occurs at high norther latitudes (76N, 199 W at C/A – 00:09), but during the RSS observing period.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
								CIRS FP1				I	UVIS						I		RSS		V	ISS			VIMS		ISS		CIRS											

T031 – rev 45 – S30

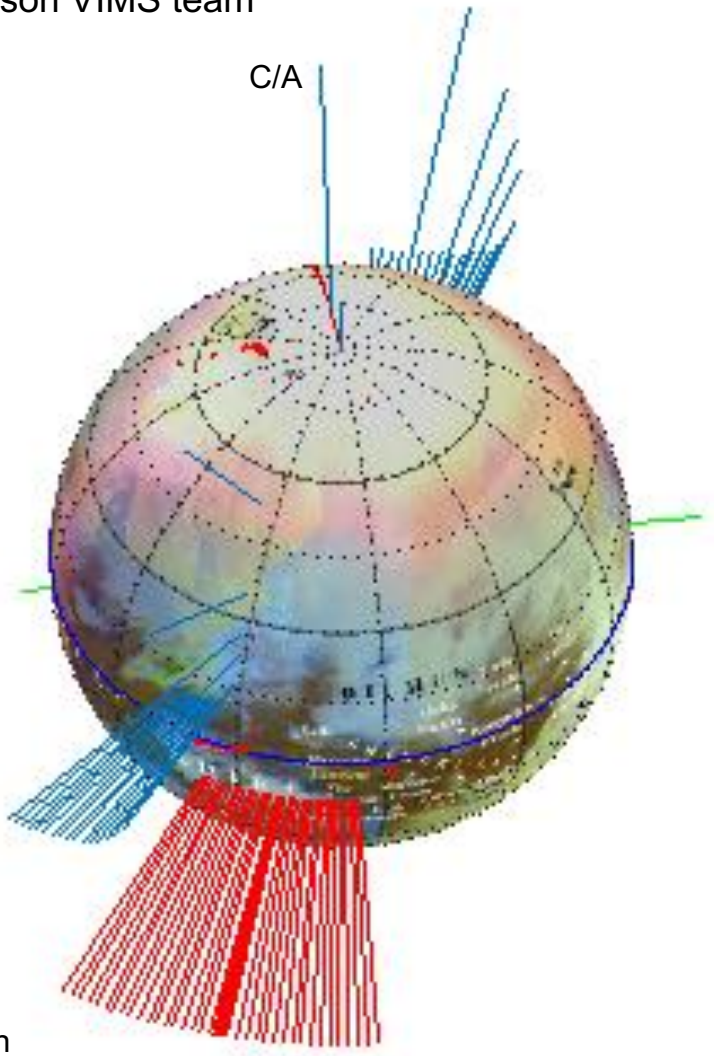
May 28, 2007 – 148T18:51:27 @ 2299 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional mapping of the area north of Adiri near 15N, 210 W.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

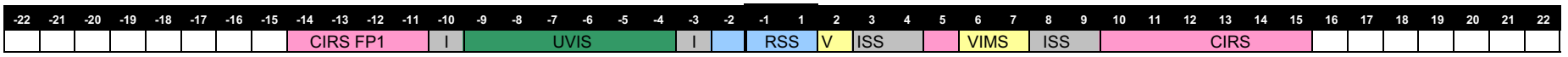
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
								CIRS FP1				I	UVIS						I		RSS		V	ISS			VIMS		ISS		CIRS										

T031 – rev 45 – S30

May 28, 2007 – 148T18:51:27 @ 2299 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular reflection geometry occurs over the small lake regions at 77N, 184 W at C/A – 00:12 during the RSS observations. Earlier, specular reflection geometry occurs at high southern latitudes. After C/A, it occurs at equatorial latitudes.



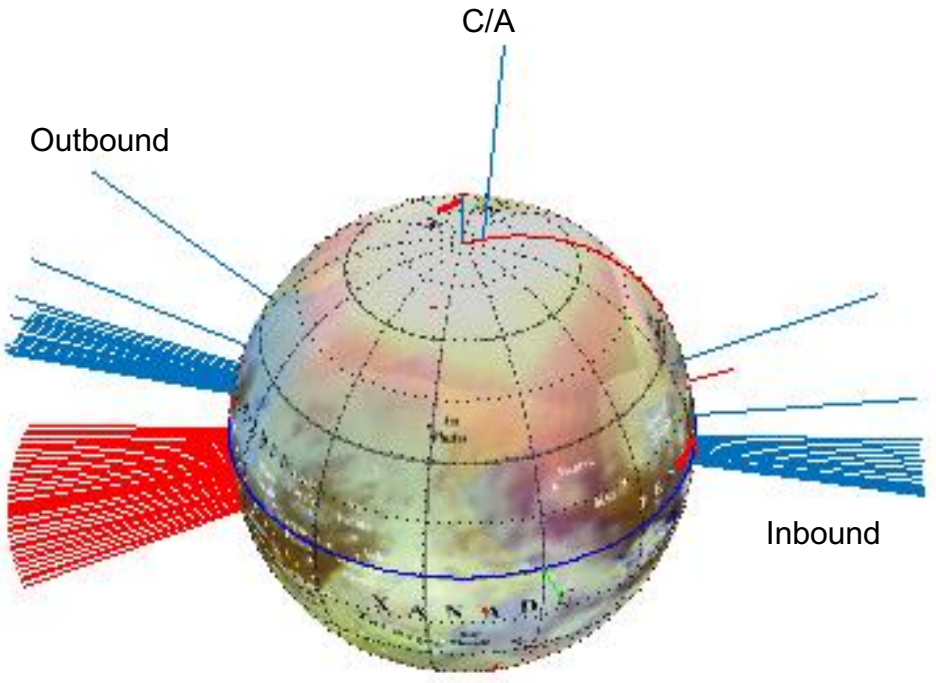
T032 – rev 46 – S31

June 13, 2007 – 164T17:47:57 @ 965 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T032 VIMS Science objectives: High resolution mapping of Titan's north pole. Global mapping and temporal change of Titan's northern hemisphere. Hot spot and lightning search.

-14:07	-13:00	CIRS	
-13:00	-09:00	VIMS	Cloud Map
-09:00	-05:00	CIRS	Mid-IR Limb
-05:00	-03:00	UVIS	EUVFUV
-03:00	-02:00	ISS	
-02:00	-01:34	SP Turn to Waypoint	26 min turn
-01:34		Begin Custom Period	
-01:34	-01:07	UVIS	Solar Occ Ingress
-01:07	-00:43	RWA to RCS Transition	
-00:43	-00:22	VIMS	Lightning Search
-00:22	-00:15	Turn (INMS)	
-00:15	+00:15	INMS	
2007-164T17:47:57		**CLOSEST APPROACH**	
+00:15	+00:22	Turn (CIRS)	CIRS Limb attitude
+00:22	+00:46	RCS to RWA Transition	
+00:46	+01:02	CIRS	Limb
+01:02	+02:00	VIMS	
+02:00		End Custom Period	
+2:00	+02:18	SP Turn to Waypoint	18 min turn
+02:18	+05:00	CIRS	
+05:00	+08:00	VIMS	Regional Map
+08:00	+09:00	ISS	NAC & WAC
+09:00	+11:00	CIRS	FP1
+11:00	+13:00	ISS	Mosaic
+13:00	+14:00	VIMS	Regional Map
+14:00	+16:15	CIRS	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
"INMS Option"								C	VIMS				CIRS				UVIS		I	UVIS	I	C	V	CIRS				VIMS			I	CIRS			ISS		V	CIRS						

T032 – rev 46 – S31

June 13, 2007 – 164T17:47:57 @ 965 km altitude

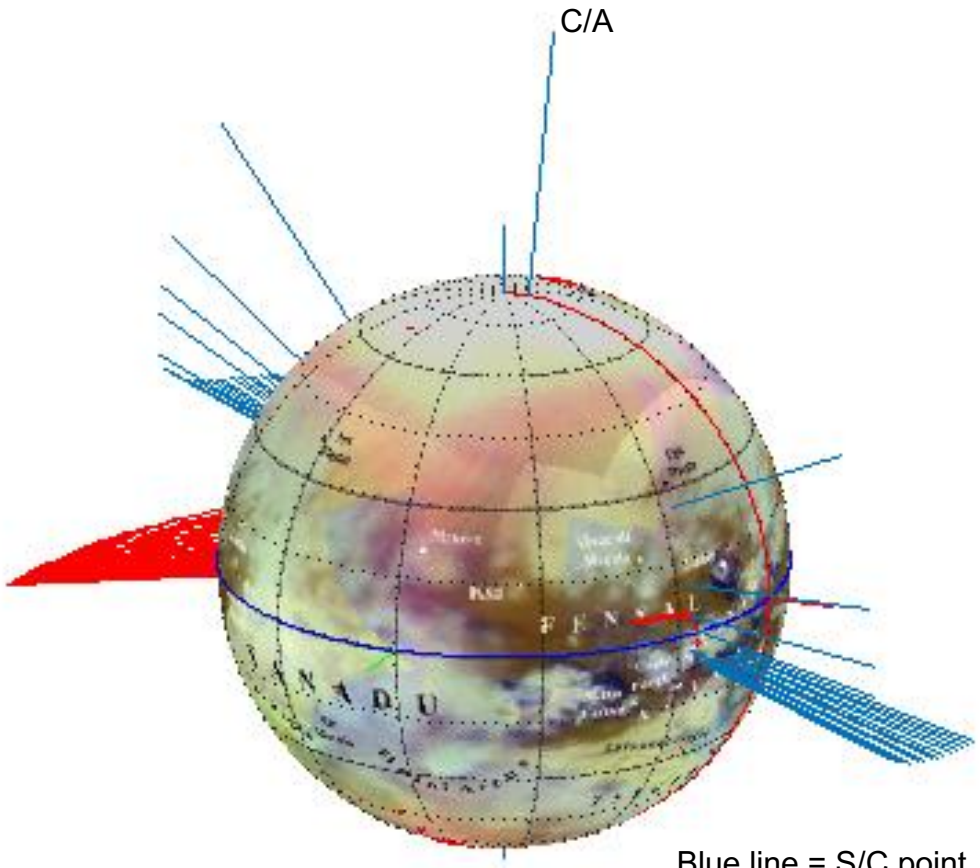
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection geometry prior to C/A (52N, 126 W at C/A – 00:21) over the small lake region.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

Solar occultation (ride along with UVIS).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
"INMS Option"								C	VIMS				CIRS				UVIS		I	UVIS	I	C	V	CIRS				VIMS			I	CIRS			ISS		V	CIRS						

T032 – rev 46 – S31

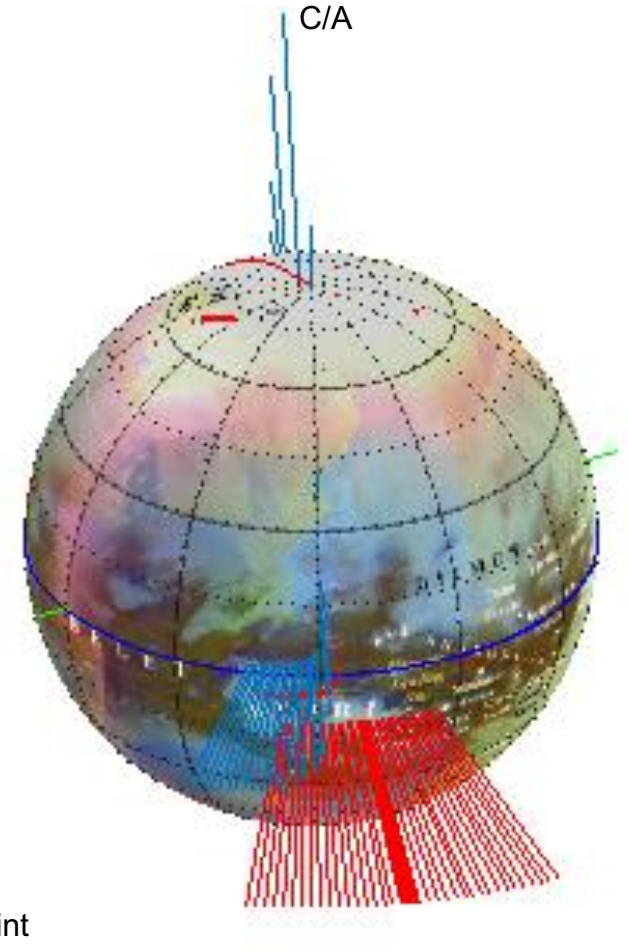
June 13, 2007 – 164T17:47:57 @ 965 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional mapping of the region north of Adiri near 5N, 210 W.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
"INMS Option"								C	VIMS				CIRS				UVIS		I	UVIS	I	C	V	CIRS				VIMS			I	CIRS			ISS		V	CIRS						

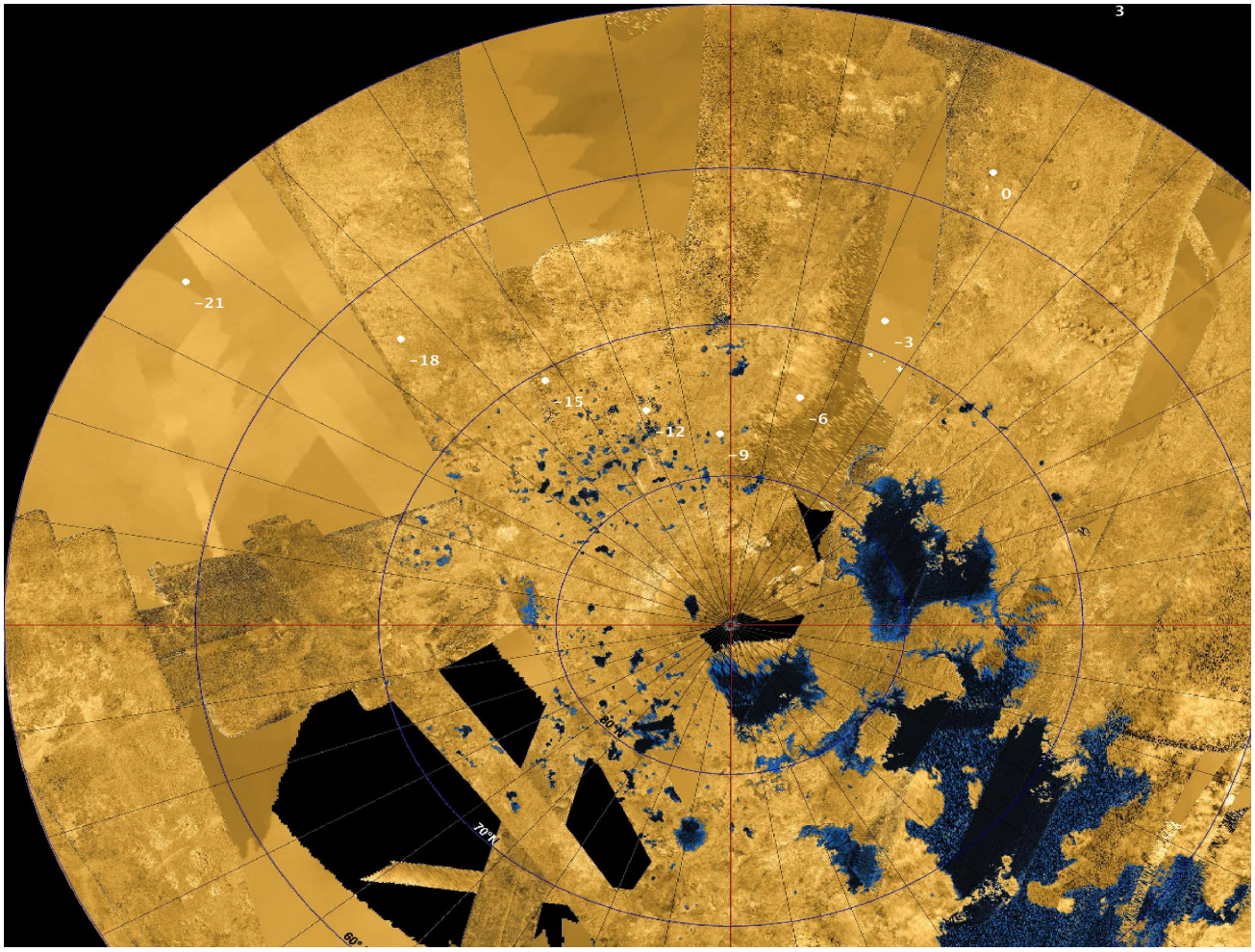
T032 – rev 46 – S31

June 13, 2007 – 164T17:47:57 @ 965 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (min)
52.53	126.4	90.0	-21
63.49	135.4	90.0	-18
70.60	147.0	90.0	-15
74.87	161.4	90.0	-12
77.18	177.2	90.0	-9
74.33	194.5	86.2	-6
68.02	203.4	79.8	-3
57.02	206.3	68.9	0



-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
"INMS Option"								C	VIMS				CIRS				UVIS		I	UVIS	I	C	V		CIRS			VIMS		I		CIRS		ISS		V	CIRS						

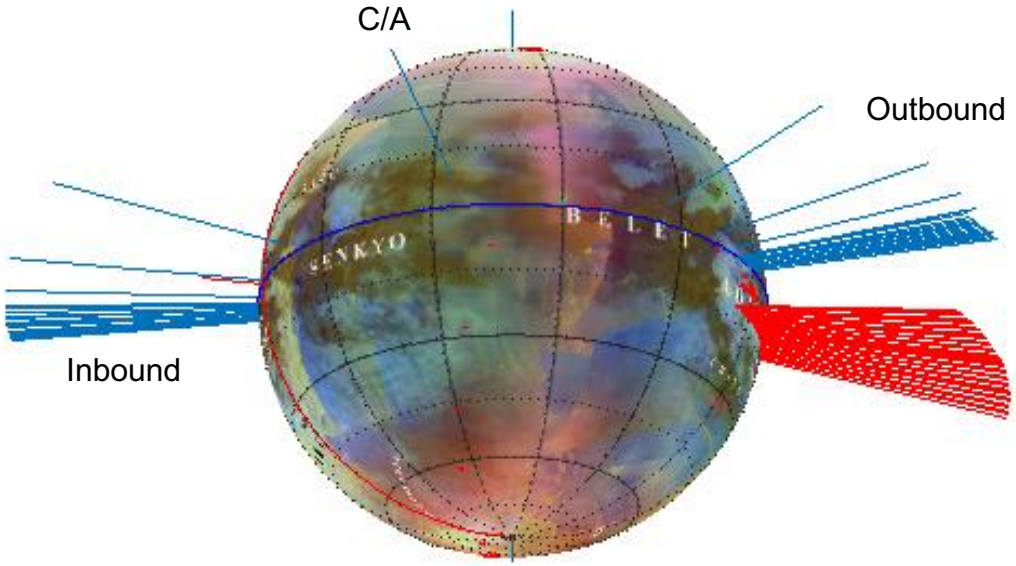
T033 – rev 47 – S31

June 29, 2007 – 180T16:59:46 @ 1932 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T033 VIMS Science objectives: VIMS will obtain a global composition map at nearly full illumination, and will perform monitoring for cloud motion and formation.

-14:15	-13:00	CIRS	
-13:00	-10:00	CIRS	FP1
-10:00	-09:00	ISS	Photometry
-09:00		end custom period	
-09:00	-05:00	RSS	Gravity
-05:00	-02:00	UVIS	EUVFUV
-02:00	+00:45	RSS	Gravity
2007-180T17:02:41		**CLOSEST APPROACH**	
+00:45		begin custom period	
+00:45	+02:00	ISS	
+02:00	+04:00	ISS	Regional Map
+04:00	+05:15	CIRS	
+05:15		end custom period	
+05:15	+08:45	RSS	Gravity
+08:45	+09:15	SP Turn to Waypoint	NAC to Titan, POS_X to NTP
+09:15	+14:00	CIRS	
+14:00	+20:00	VIMS	Global Map



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
								CIRS FP1				I	RSS				UVIS				RSS		V	ISS		C	RSS					CIRS					VIMS						

T033 – rev 47 – S31

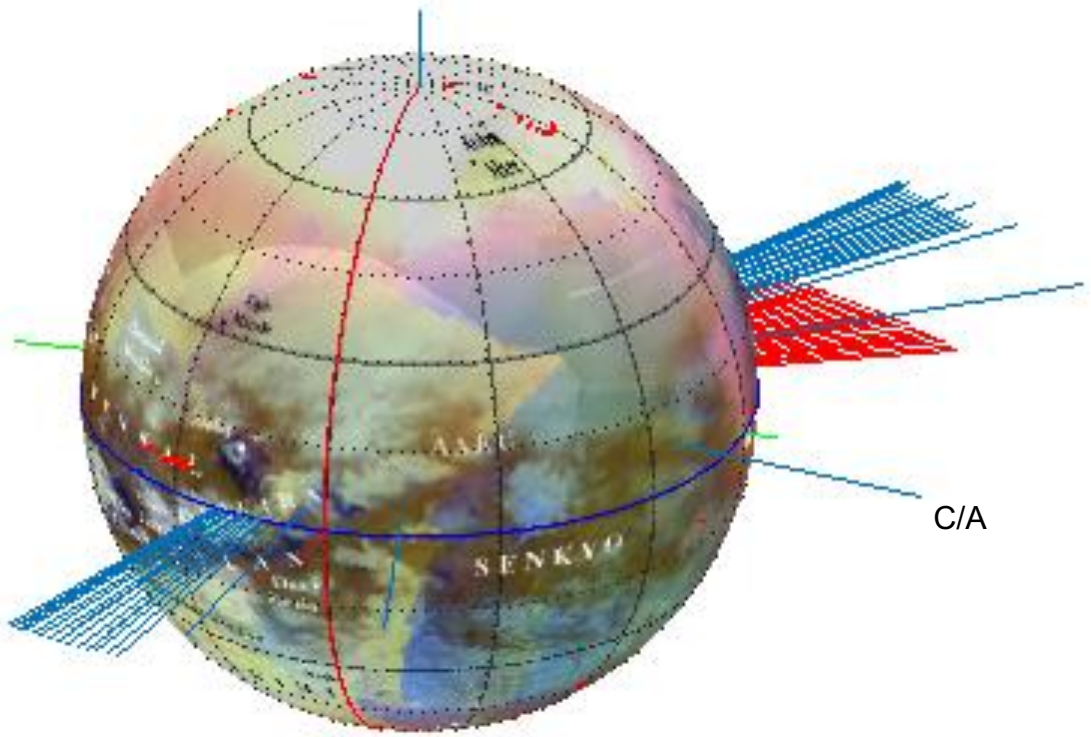
June 29, 2007 – 180T16:59:46 @ 1932 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

Specular reflection geometry occurs at high southern latitudes (66S, 91 W) at C/A -10:00



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
								CIRS FP1				I	RSS				UVIS				RSS		V	ISS		C	RSS						CIRS					VIMS						

T033 – rev 47 – S31

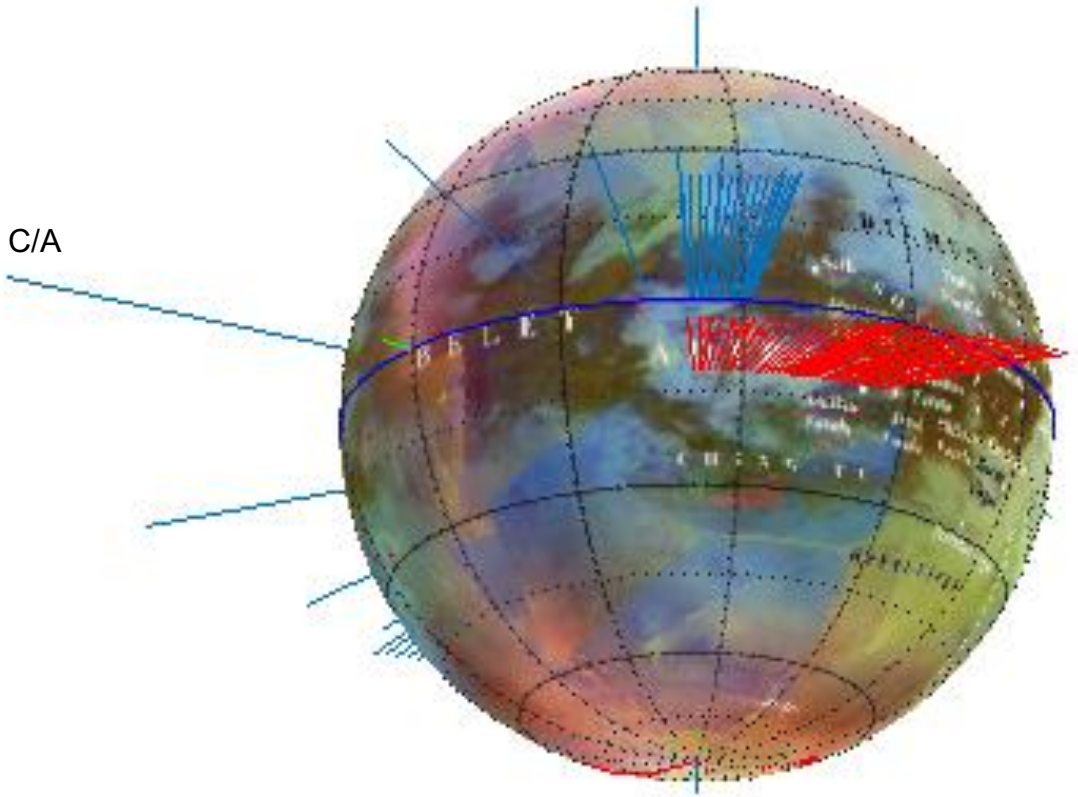
June 29, 2007 – 180T16:59:46 @ 1932 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

High resolution regional mapping north of Adiri near 5N, 245 W after C/A.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

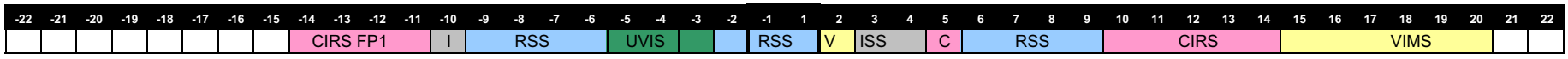
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
								CIRS FP1				I	RSS				UVIS				RSS		V	ISS		C	RSS					CIRS					VIMS						

T033 – rev 47 – S31

June 29, 2007 – 180T16:59:46 @ 1932 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at high southern latitudes. After C/A, near equatorial latitudes.



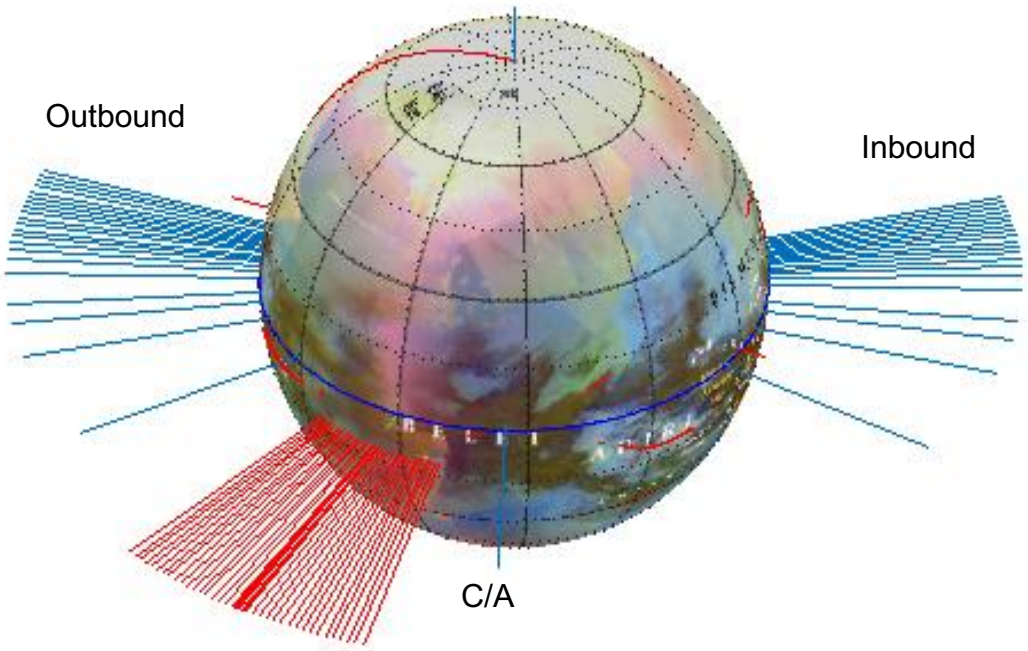
T034 – rev 48 – S32

July 19, 2007 – 200T00:39:58 @ 1332 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T034 VIMS Science objectives: Cloud evolution, photometry and phase functions. High resolution mapping for geology and composition.

-23:03	-16:00	CIRS	Mid-IR T Map
-16:00	-15:00	ISS	
-15:00	-13:00	CIRS	
-13:00	-09:00	VIMS	Cloud Map
-09:00	-05:00	UVIS	EUVFUV
-05:00	-03:51	UVIS	EUVFUV
-03:51	-03:30	Transition to RCS	(0.5,0.5,0.5)
-03:30	-03:00	UVIS	
-03:00	-01:38	ISS	
-01:38	-01:30	Turn (RSS pick up at Waypoint)	
-01:30	-00:05	RSS - leave off at Waypoint	Bistatic
-00:05	+00:29	ISS	High Res
2007-200T00:41:02		CLOSEST APPROACH	
+00:29	+00:53	Transition to RWA	
+00:53	+04:00	ISS	Regional Map
+04:00	+05:00	CIRS	
+05:00	+08:36	ISS	Global Map
+08:36	+09:00	ISS	WAC Photom
+09:00	+14:11	CIRS	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
CIRS						I	CIRS		VIMS				UVIS						I	RSS		VIMS		ISS		C		ISS				CIRS											

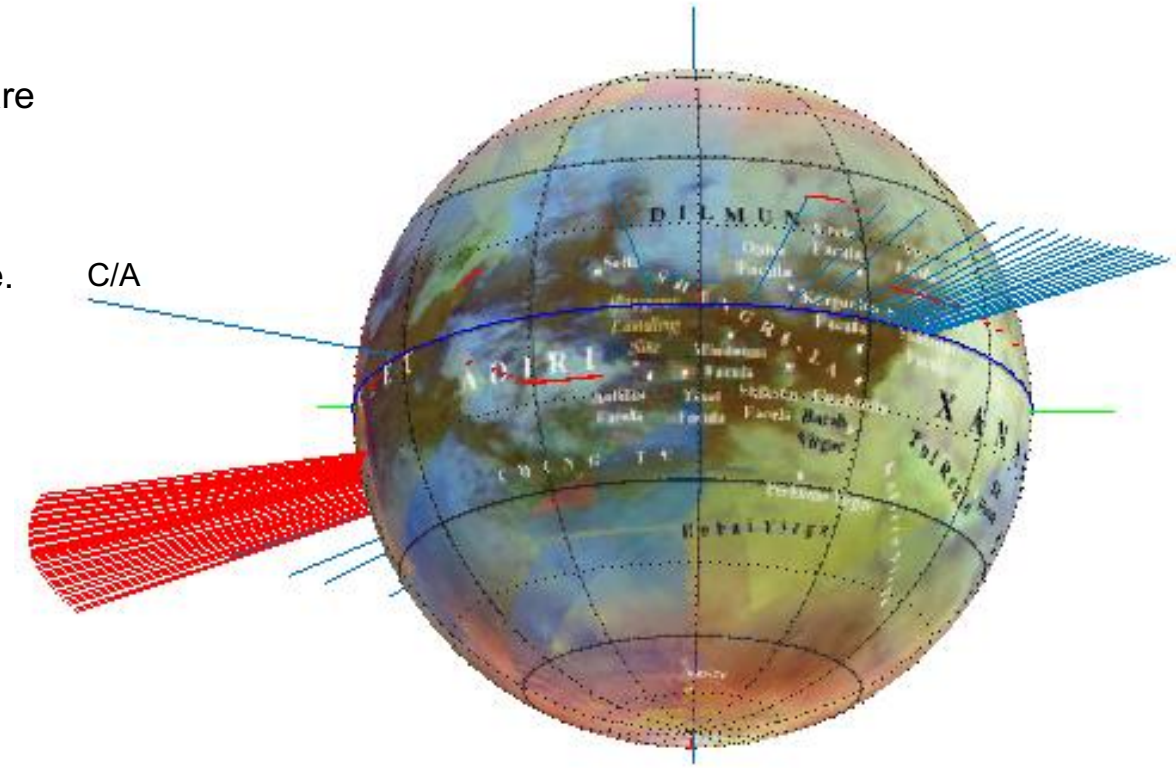
T034 – rev 48 – S32

July 19, 2007 – 200T00:39:58 @ 1332 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
CIRS						I	CIRS		VIMS				UVIS						I	RSS		VIMS		ISS		C		ISS				CIRS											

T034 – rev 48 – S32

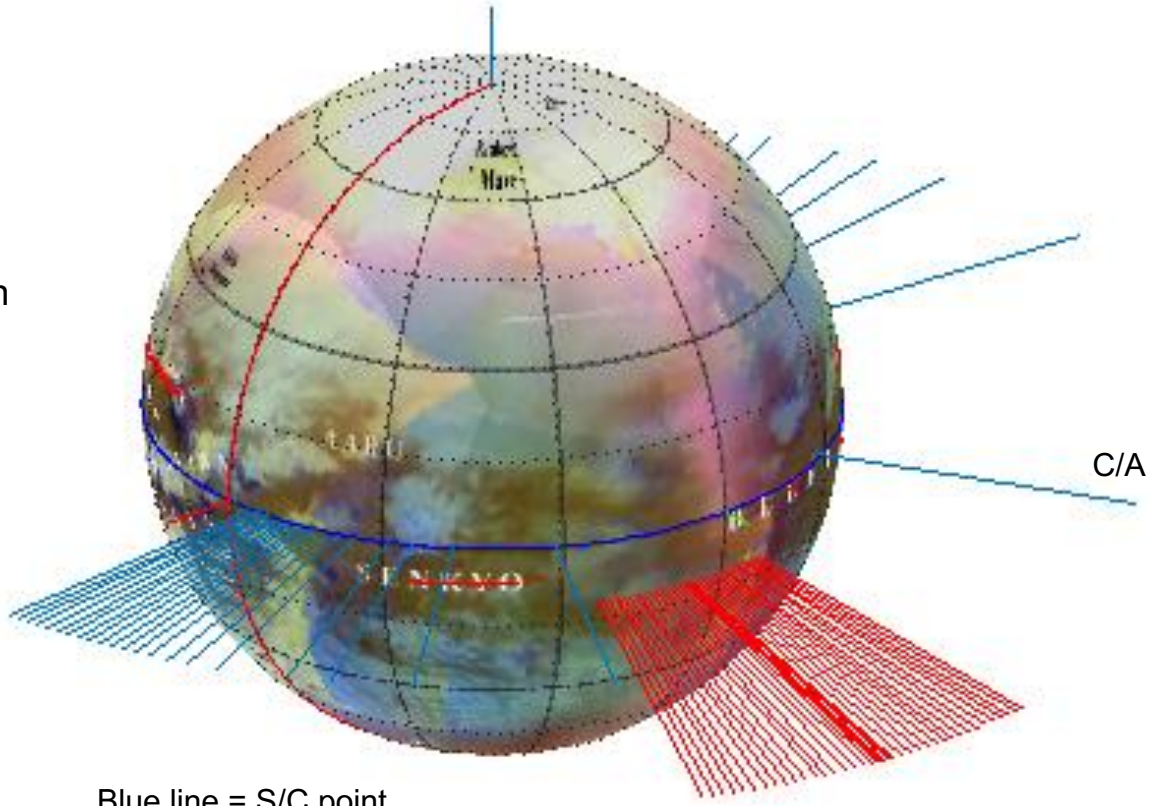
July 19, 2007 – 200T00:39:58 @ 1332 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.

Obtain regional mapping and mosaics of the Senkyo region near 00N, 330 W.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

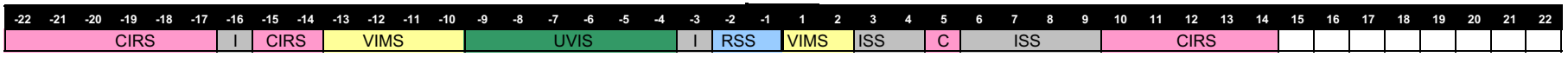
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
CIRS						I	CIRS		VIMS				UVIS						I	RSS		VIMS		ISS		C		ISS				CIRS											

T034 – rev 48 – S32

July 19, 2007 – 200T00:39:58 @ 1332 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to and after C/A, specular geometry occurs near equatorial latitudes.



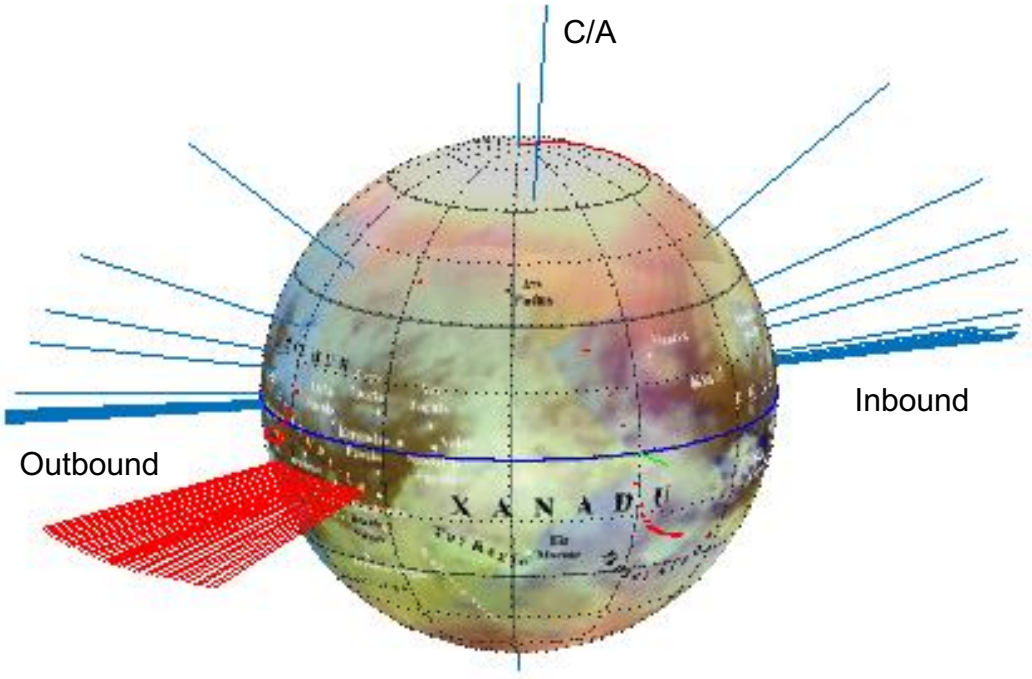
T035 – rev 49 – S33

Aug. 31, 2007 – 243T06:34:25 @ 3324 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T035 VIMS Science objectives: To understand the nature of Titan's north polar region and detect possible time-variable phenomena

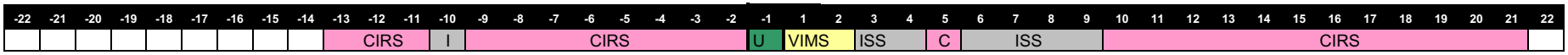
-12:15	-10:00	CIRS FP1
-10:00	-9:00	ISS Photometry
-9:00	-5:00	CIRS (mid IR limb map / limb comp)
-5:00	-2:00	CIRS (FP_1 slow scans)
-2:00		Begin Custom Period
-2:00	-1:00	CIRS
-1:00	-00:37	UVIS Occ
-00:37	-00:14	VIMS Turn to other limb (for occ)
-00:14	0	VIMS Occ
2007-243T06:32:34		**CLOSEST APPROACH**
0	+2:00	ISS
+2:00		End Custom Period
+2:00	+4:00	ISS - regional map
+4:00	+5:00	CIRS
+5:00	+9:00	ISS
+9:00	+15:00	CIRS Stare
+15:00	+21:00	CIRS scan



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T035 – rev 49 – S33

Aug. 31, 2007 – 243T06:34:25 @ 3324 km altitude

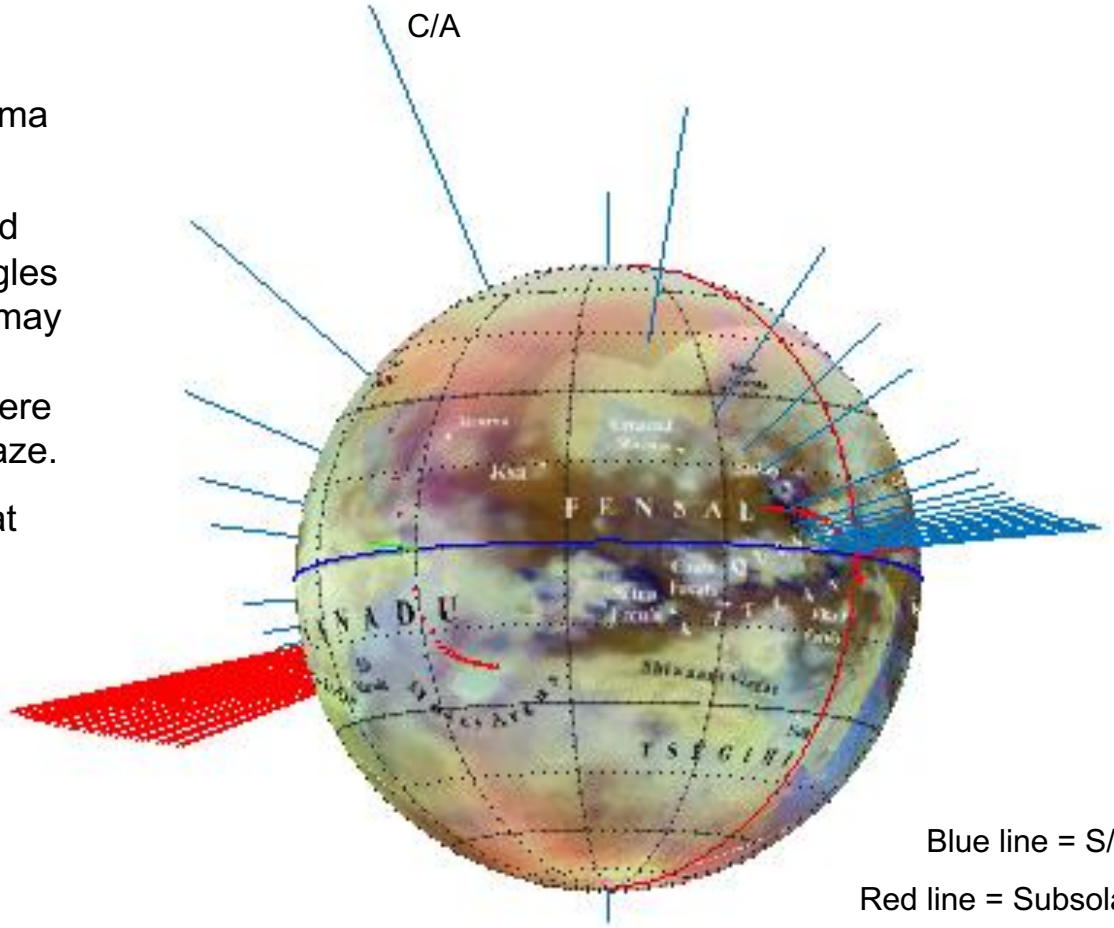
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Stellar occultations with Sigma Sagittarii and Alpha Scorpii.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.

Specular geometry occurs at 41N, 126 W at C/A - 00:10.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
									CIRS			I	CIRS									U	VIMS			ISS					C	ISS											

T035 – rev 49 – S33

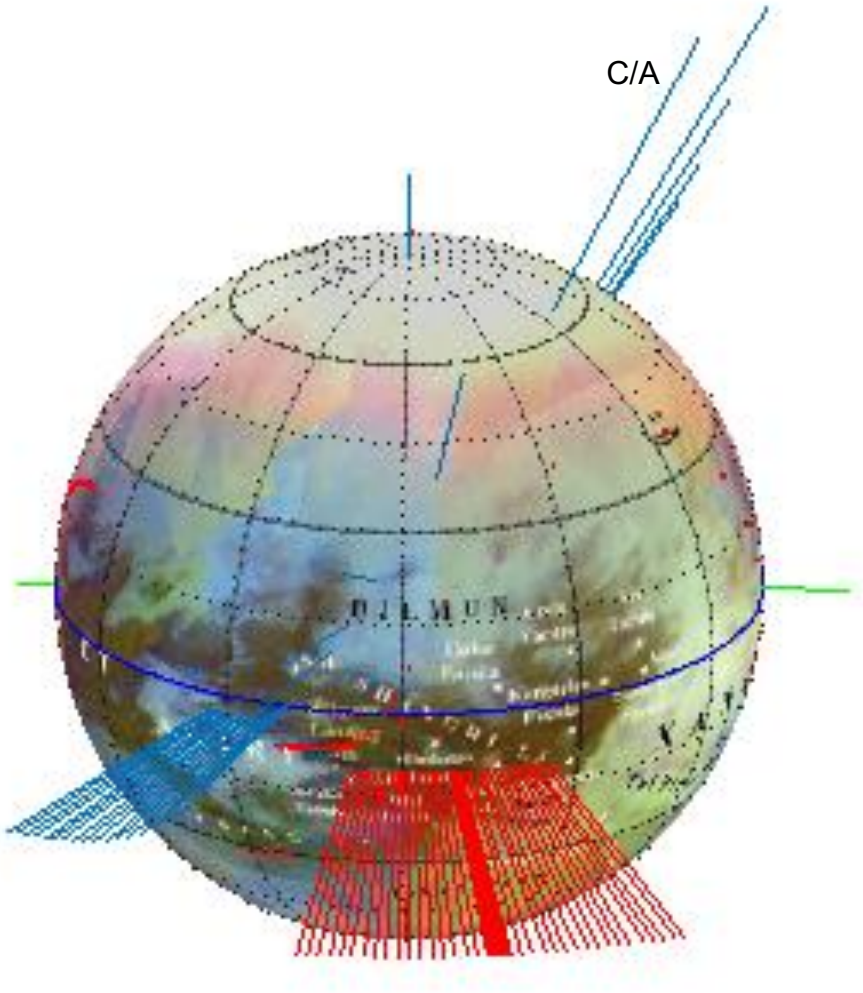
Aug. 31, 2007 – 243T06:34:25 @ 3324 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional and high resolution imaging of Titan after C/A near 15N, 190 W close to the albedo feature Dilmun.

Map the North Pole region.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

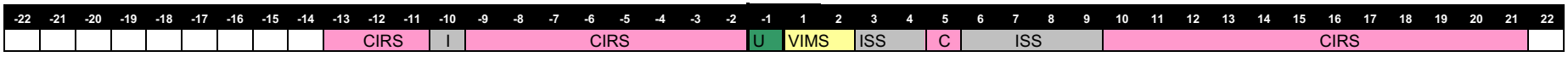
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
									CIRS			I	CIRS									U	VIMS			ISS			C		ISS													

T035 – rev 49 – S33

Aug. 31, 2007 – 243T06:34:25 @ 3324 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, near equatorial latitudes.



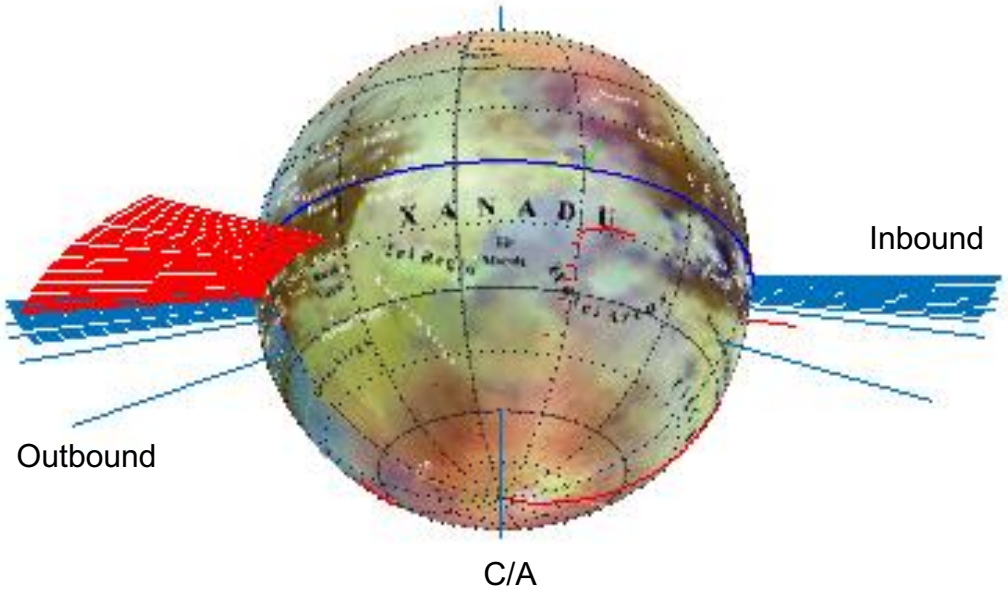
T036 – rev 50 – S34

Oct. 2, 2007 – 275T04:49:50 @ 973 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T036 VIMS Science objectives: Global maps of Titan to study cloud evolution and seek other changes.

-15:12	-10:00	CIRS	FP1
-10:00	-09:00	ISS	Photometry
-09:00	-05:11	UVIS	EUVFUV
-05:11	-04:49	SP Turn to Waypoint	
-04:49		Begin Custom Period	
-04:49	-02:00	RADAR	Radiometry
-02:00	-00:52	RADAR	Scatterometry
-00:52	-00:30	RWA to RCS Transition	
-00:30	-00:15	RADAR	Altimetry
-00:15	+00:15	RADAR	
2007-275T04:42:43		**CLOSEST APPROACH**	
+00:15	+00:30	RADAR	Altimetry
+00:30	+00:53	RCS to RWA Transition	
+00:53	+02:00	RADAR	Scatterometry
+02:00	+04:50	RADAR	Radiometry
+04:50		End Custom Period	
+04:50	+05:10	SP Turn to Waypoint	
+05:10	+08:00	VIMS	Regional Map
+08:00	+09:00	ISS	NAC & WAC
+09:00	+11:00	CIRS	FP1
+11:00	+13:00	ISS	Mosaic
+13:00	+14:00	VIMS	Regional Map
+14:00	+22:46	CIRS	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

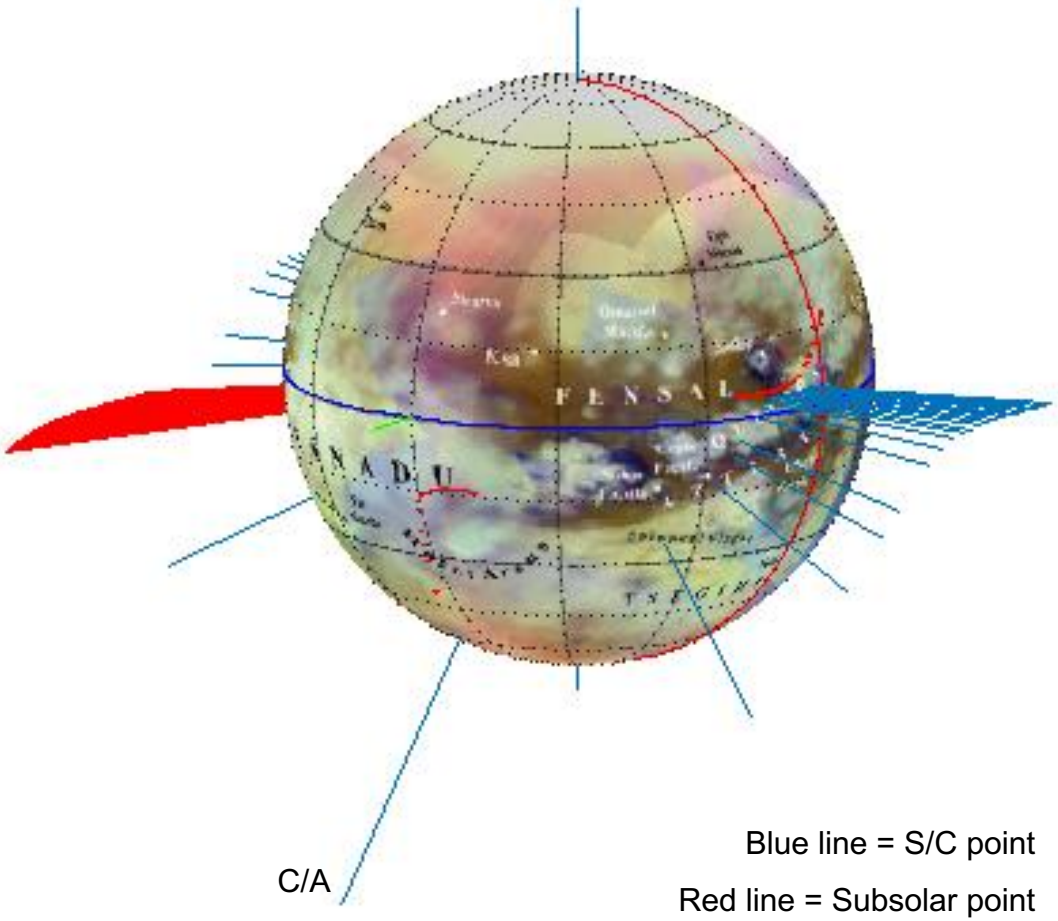
T036 – rev 50 – S34

Oct. 2, 2007 – 275T04:49:50 @ 973 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
							CIRS					I	UVIS				RADAR						RADAR					VIMS			I	CIRS				ISS		V	CIRS								

T036 – rev 50 – S34

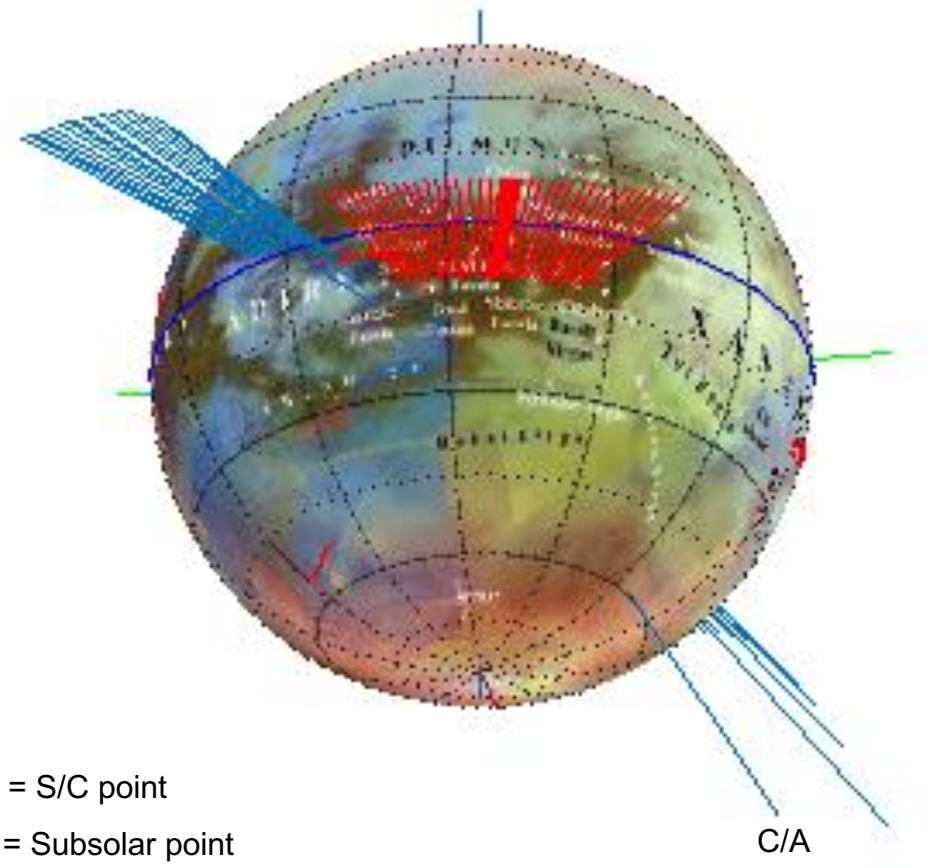
Oct. 2, 2007 – 275T04:49:50 @ 973 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.

Cloud evolution and formation.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A

T036 – rev 50 – S34

Oct. 2, 2007 – 275T04:49:50 @ 973 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, near equatorial latitudes.

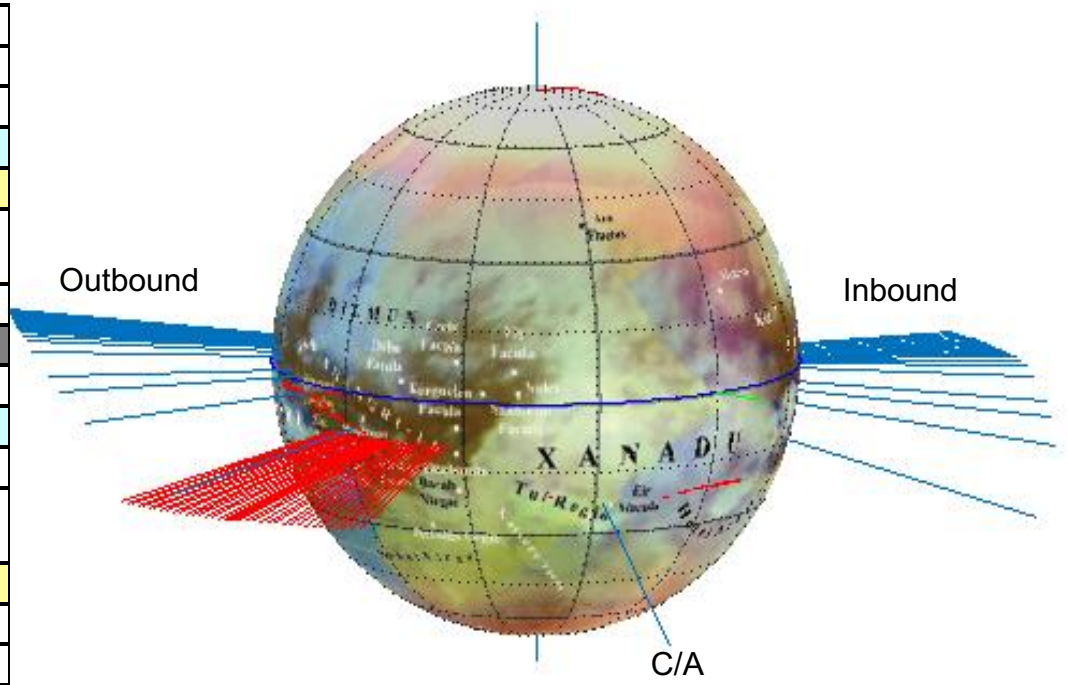
T037 – rev 52 – S35

Nov. 19, 2007 – 323T00:52:51 @ 999 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T037 VIMS Science objectives: VIMS high resolution mapping of Titan's surface at small solar phase angles for geology and composition.

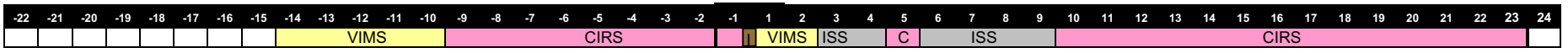
-13:55	-09:00	VIMS	Cloud Map
-09:00	-05:00	CIRS	Mid-IR Limb
-05:00	-02:00	CIRS	Limb
-02:00	-01:39	RWA to RCS Transition	21 mins
-01:39		Begin Custom Period	
-01:39	-00:15	CIRS	High-Res Limb
-00:15	+00:09	INMS	ORS to Titan
2007-323T00:47:26		CLOSEST APPROACH	
+00:09	+00:21	VIMS	Zero Phase
+00:21	+00:44	RCS to RWA Transition	23 mins
+00:44	+02:00	ISS	High Res
+02:00	+04:00	ISS	Regional Map
+04:00		End Custom Period	
+04:00	+05:00	CIRS	
+05:00	+08:36	ISS	Global Map
+08:36	+09:00	ISS	WAC Photom
+09:00	+14:00	CIRS	
+14:00	+23:19	CIRS	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



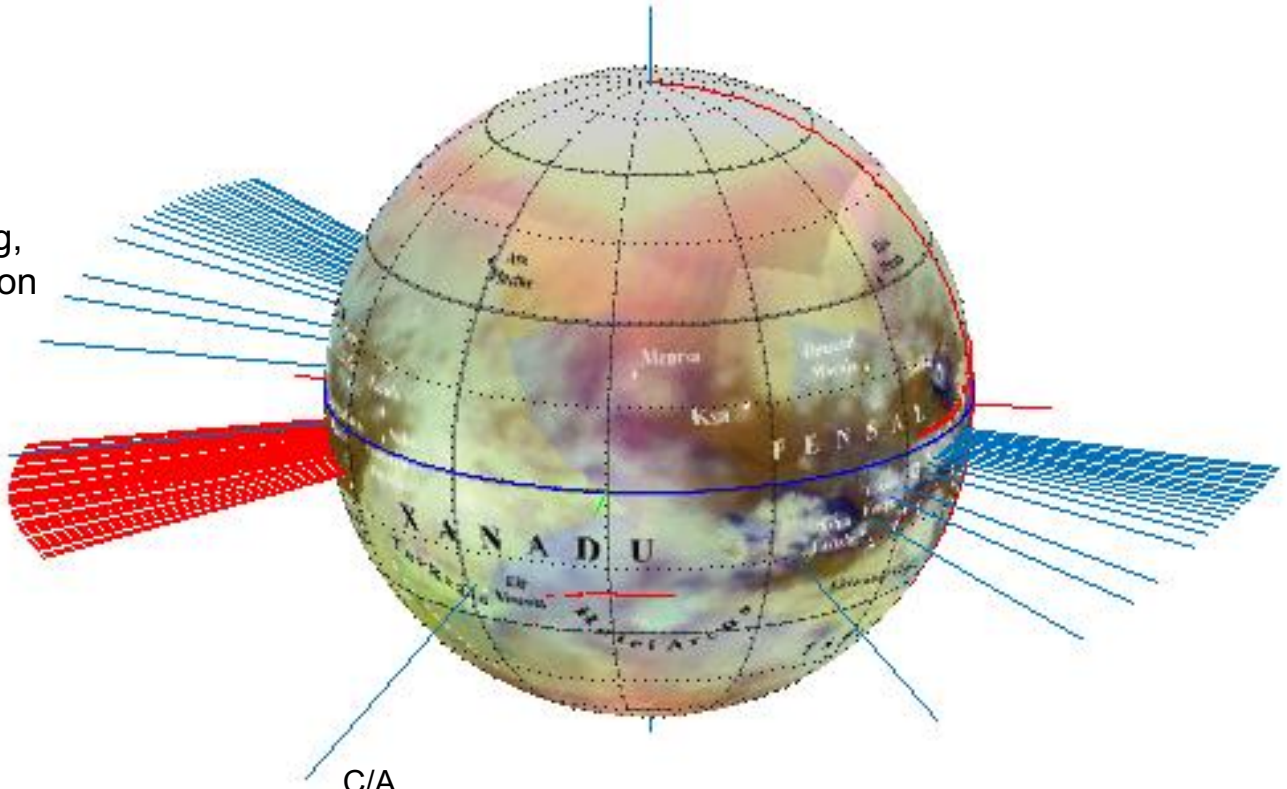
T037 – rev 52 – S35

Nov. 19, 2007 – 323T00:52:51 @ 999 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

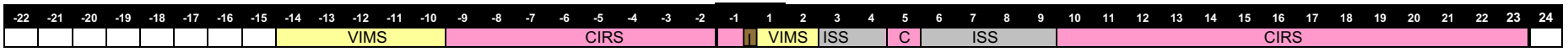


C/A

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T037 – rev 52 – S35

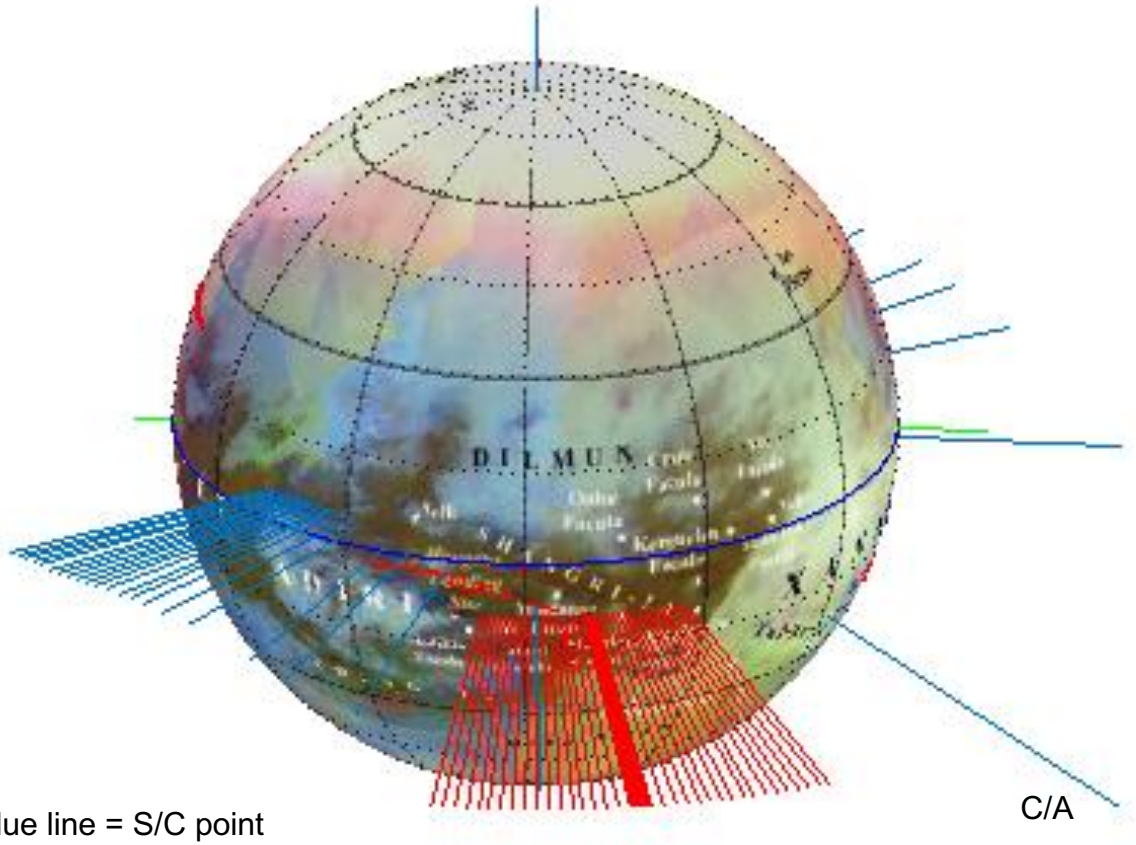
Nov. 19, 2007 – 323T00:52:51 @ 999 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.

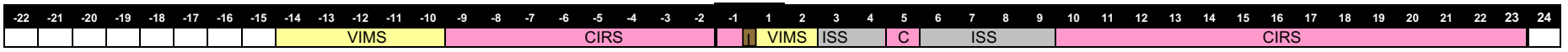
High resolution regional mapping near 3N, 205 W in the Shangri-La region. Note, low phase (~8 deg) at C/A +00:15.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

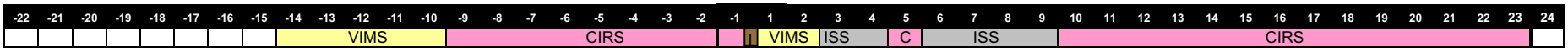


T037 – rev 52 – S35

Nov. 19, 2007 – 323T00:52:51 @ 999 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, near equatorial latitudes.



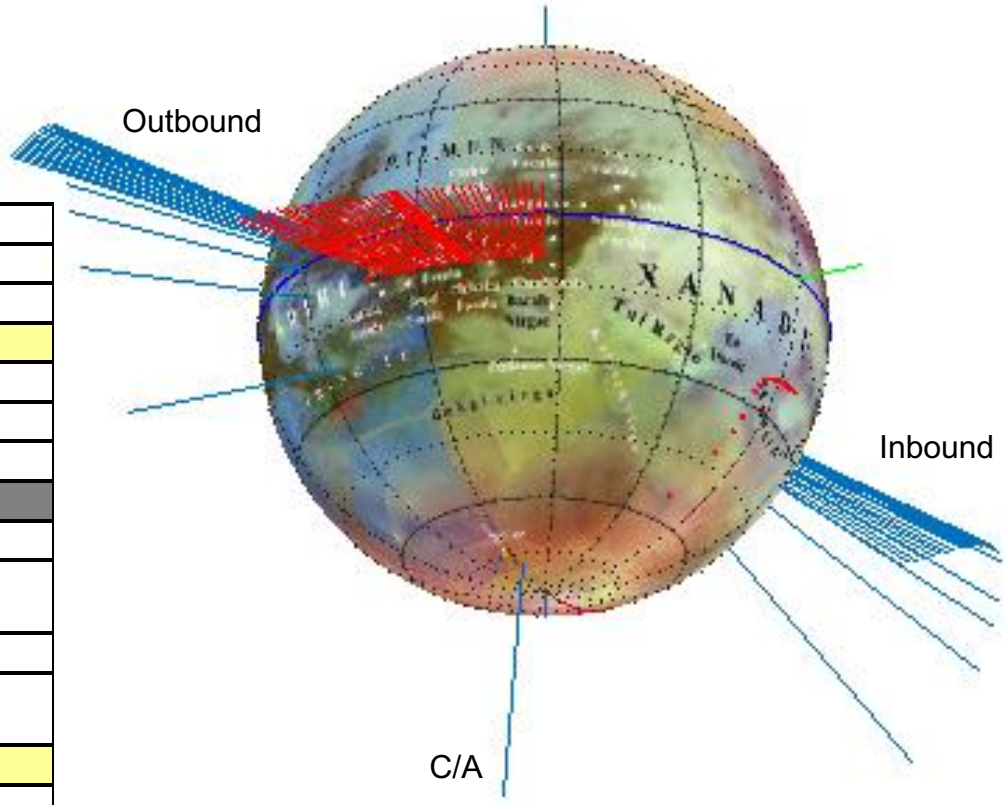
T038 – rev 53 – S35

Dec. 5, 2007 – 339T00:07:37 @ 1298 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T038 VIMS Science objectives: Development and evolution of clouds, haze characterization, photometry. Search for new types of features.

-14:07	-10:00	CIRS	FP1
-10:00	-09:00	ISS	Photometry
-09:00	-05:30	UVIS	
-05:30		Begin Custom Period	
-05:30	-02:30	CIRS	Nadir
-02:30	-00:15	CIRS	
-00:15	+02:00	VIMS	
2007-339T00:07:37		**CLOSEST APPROACH**	
+02:00	+04:00	ISS	Reg Map
+04:00	+05:00	CIRS	
+05:00	+08:00	ISS	
+08:00	+09:00	VIMS	
+09:00		End Custom Period	
+09:00	+11:00	CIRS	FP1
+11:00	+13:00	ISS	Mosaic
+13:00	+14:00	VIMS	Reg Map
+14:00	+23:37	CIRS	



-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
								CIRS				I	UVIS				CIRS						V	ISS		C					CIRS				ISS		V	CIRS								

T038 – rev 53 – S35

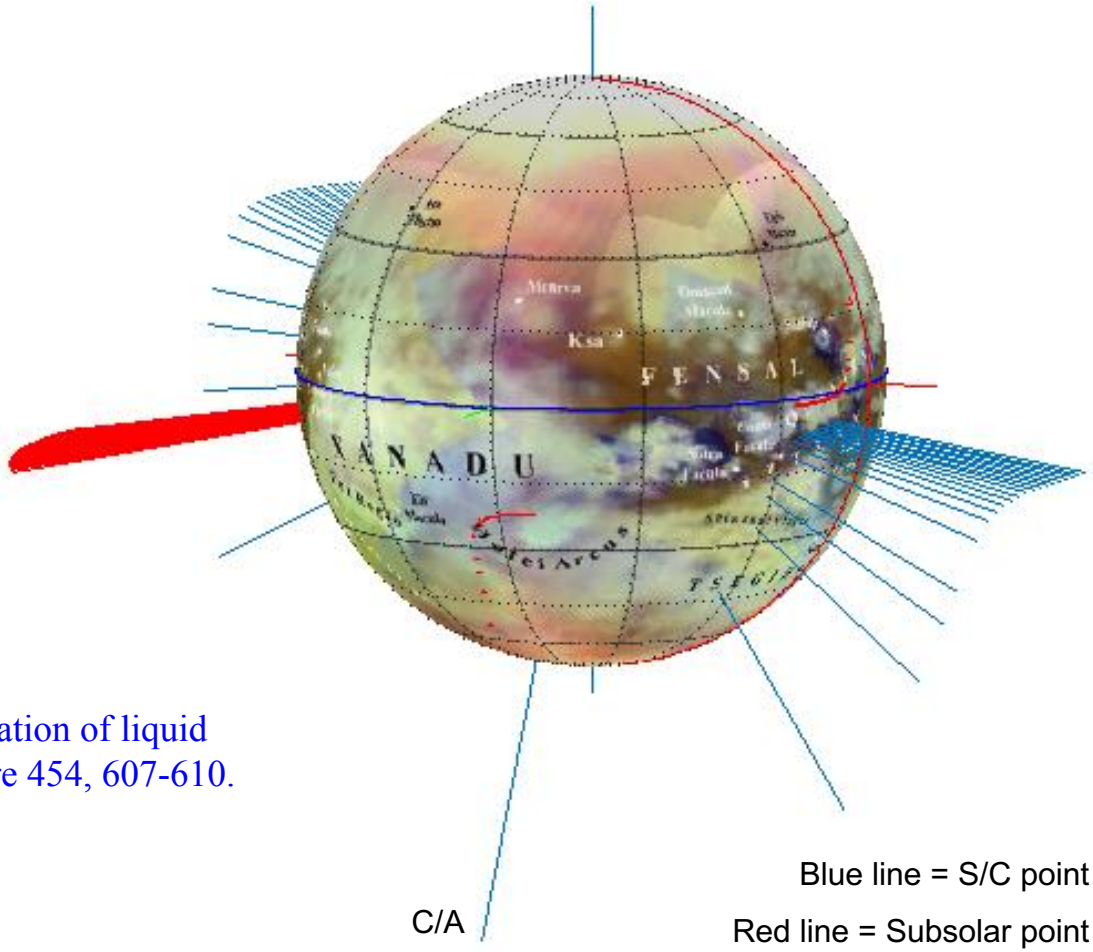
Dec. 5, 2007 – 339T00:07:37 @ 1298 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.

At C/A, obtain observations of Ontario Lacus at 72S, 183 W.*



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

*Brown, R. H., et al, (2008). Identification of liquid ethane in Titan's Ontario Lacus. Nature 454, 607-610.

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
								CIRS				I	UVIS				CIRS						V	ISS		C					CIRS		ISS		V	CIRS								

T038 – rev 53 – S35

Dec. 5, 2007 – 339T00:07:37 @ 1298 km altitude

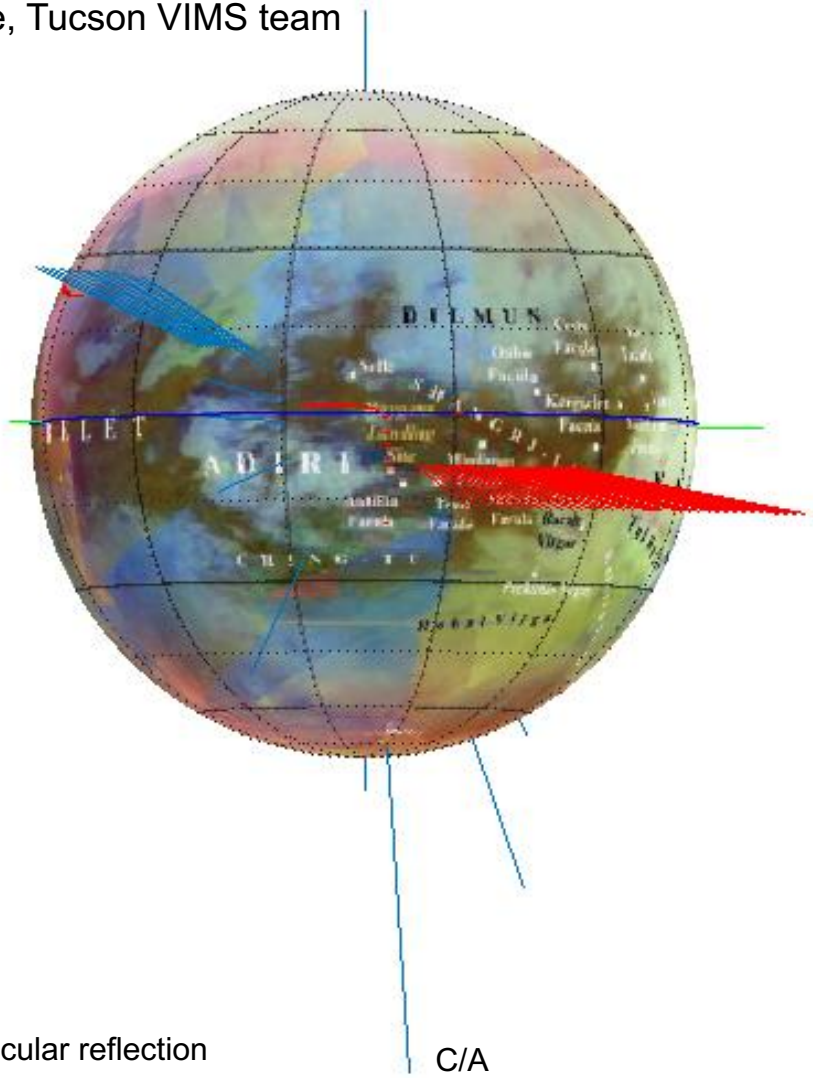
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

High resolution regional mapping after C/A near Adiri (10S, 210 W).

Search for clouds.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

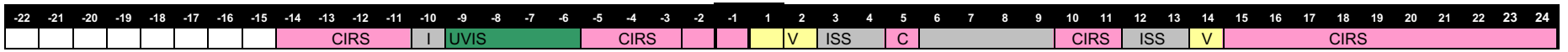
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
								CIRS				I	UVIS				CIRS						V	ISS		C					CIRS		ISS		V	CIRS								

T038 – rev 53 – S35

Dec. 5, 2007 – 339T00:07:37 @ 1298 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, near equatorial latitudes.



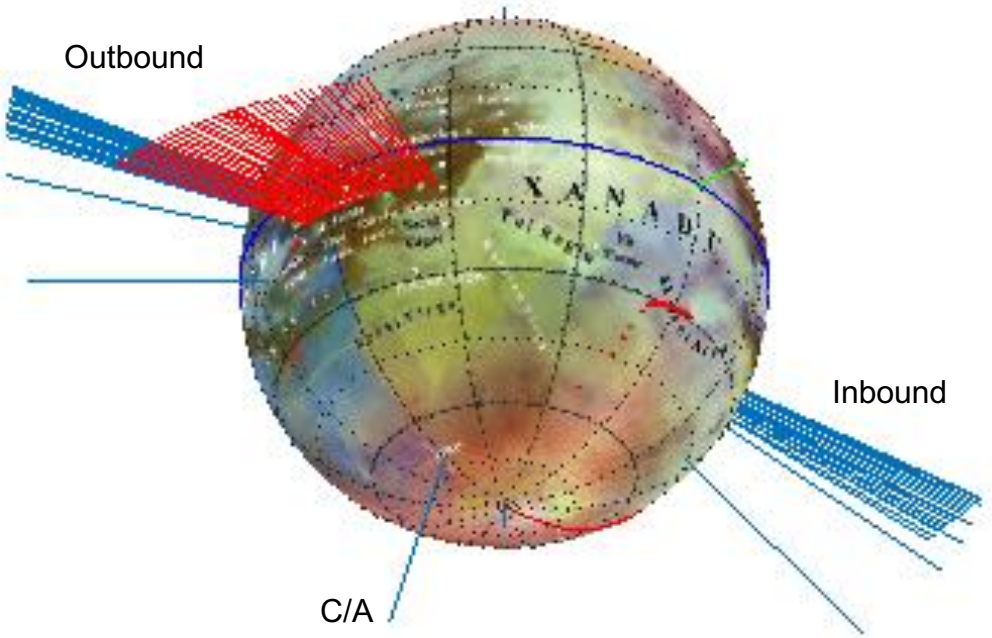
T039 – rev 54 – S36

Dec. 20, 2007 – 354T22:56:41 @ 970 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T039 VIMS Science objectives: VIMS will do mapping of the mid-latitude regions at small solar phase angles, monitoring of cloud motions on a global scale, and monitoring of the probe landing site.

-13:55	-09:00	VIMS	Cloud Map
-09:00	-05:06	CIRS	Mid-IR Limb
-05:06	-04:45	SP Turn to RADAR Waypoint	NEG_Z to Titan, NEG_X to 5, -5
-04:45	-02:00	RADAR	Radiometry
-02:00	-00:52	RADAR	Scatterometry
-00:52	-00:30	RWA to RCS Transition	
-00:30	-00:15	RADAR	Altimetry
-00:15	-00:07	RADAR	Low-Res SAR
-00:07	+00:15	RADAR	High-Res SAR
2007-354T22:57:55		**CLOSEST APPROACH**	
+00:15	+00:30	RADAR	Altimetry
+00:30	+00:54	RCS to RWA Transition	
+00:54	+02:00	RADAR	Scatterometry
+02:00	+05:00	RADAR	Radiometry
+04:45	+05:05	SP Turn to Waypoint	NAC to TI, NEG_X to Sun
+05:05	+09:00	CIRS	Limb Map
+09:00	+11:00	CIRS	FP1
+11:00	+13:00	ISS	Mosaic
+13:00	+14:00	VIMS	Regional Map
+14:00	+15:30	ISS	Rhea
+15:30	+1T00:15	VIMS	Global Map



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T039 – rev 54 – S36

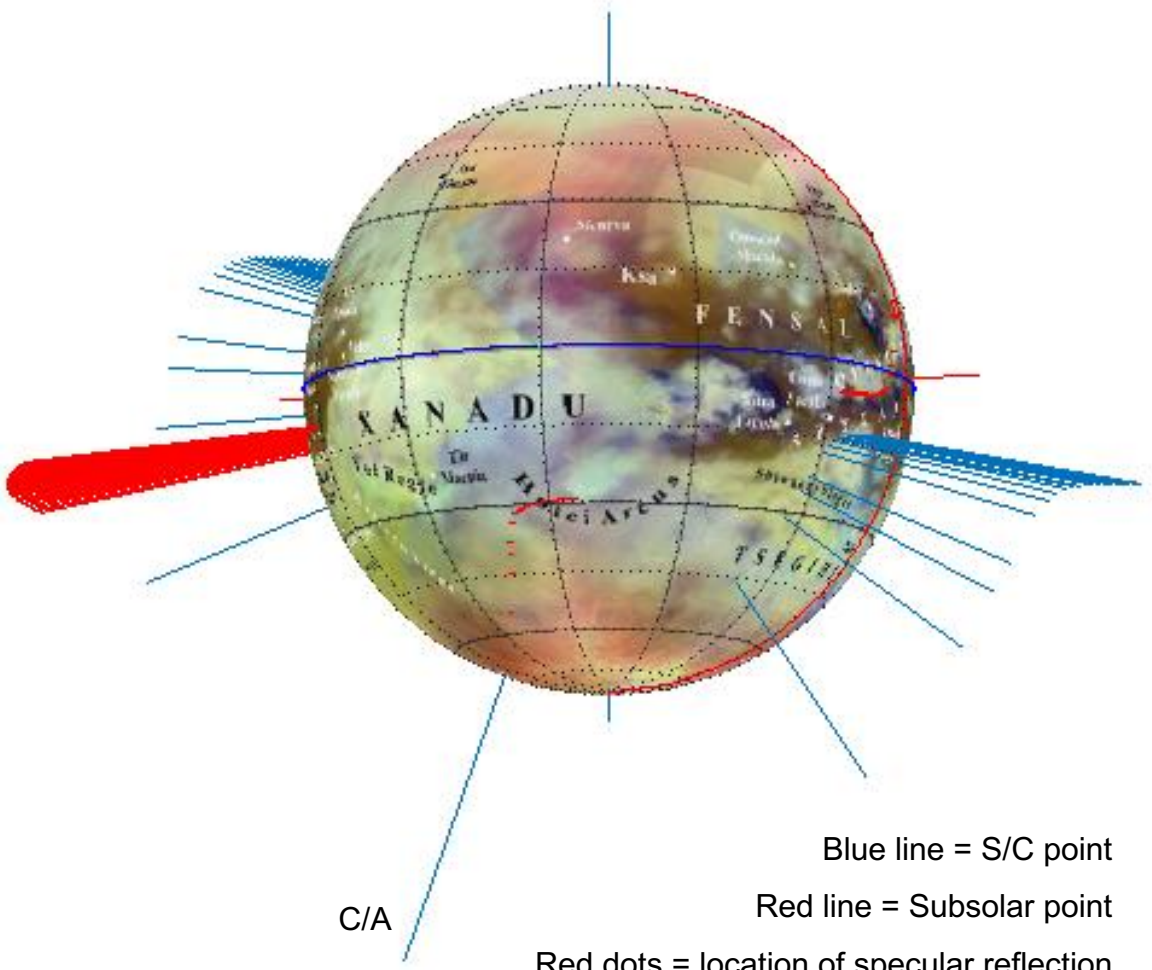
Dec. 20, 2007 – 354T22:56:41 @ 970 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
								VIMS					CIRS				RADAR						RADAR				CIRS							ISS		V	I Rhea		VIMS						

T039 – rev 54 – S36

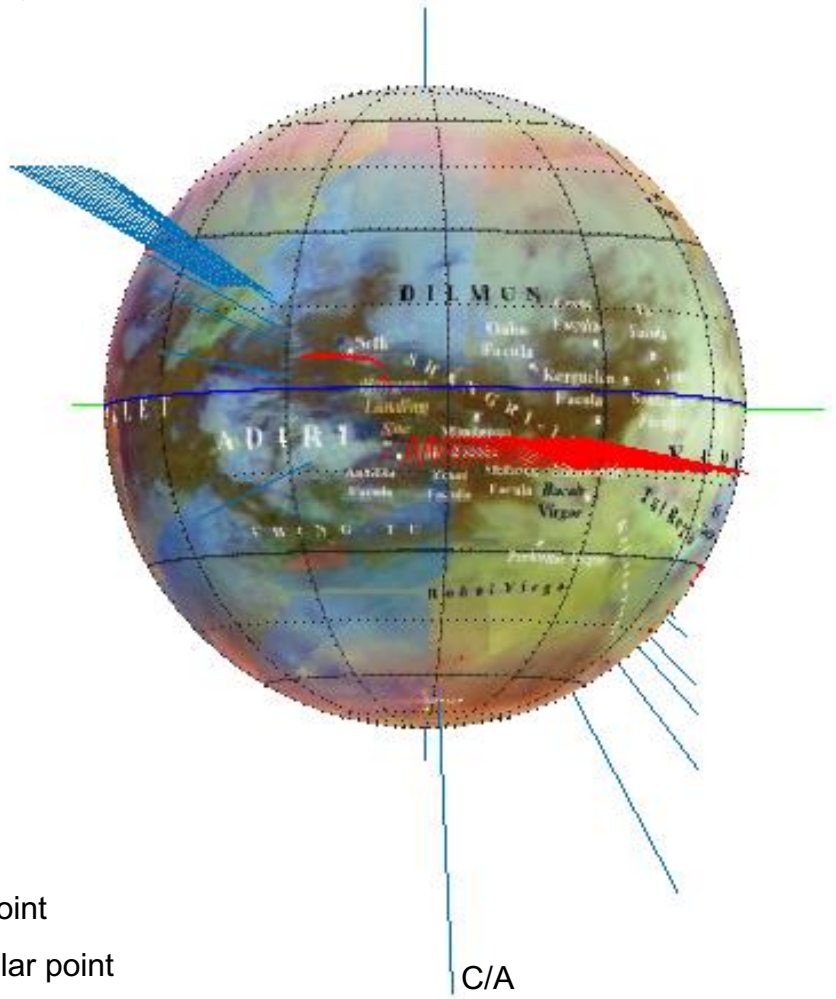
Dec. 20, 2007 – 354T22:56:41 @ 970 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Monitor mid-latitude clouds.

Regional and global mapping.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
								VIMS					CIRS				RADAR						RADAR				CIRS							ISS		V	I Rhea		VIMS						

T039 – rev 54 – S36

Dec. 20, 2007 – 354T22:56:41 @ 970 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, near equatorial latitudes.

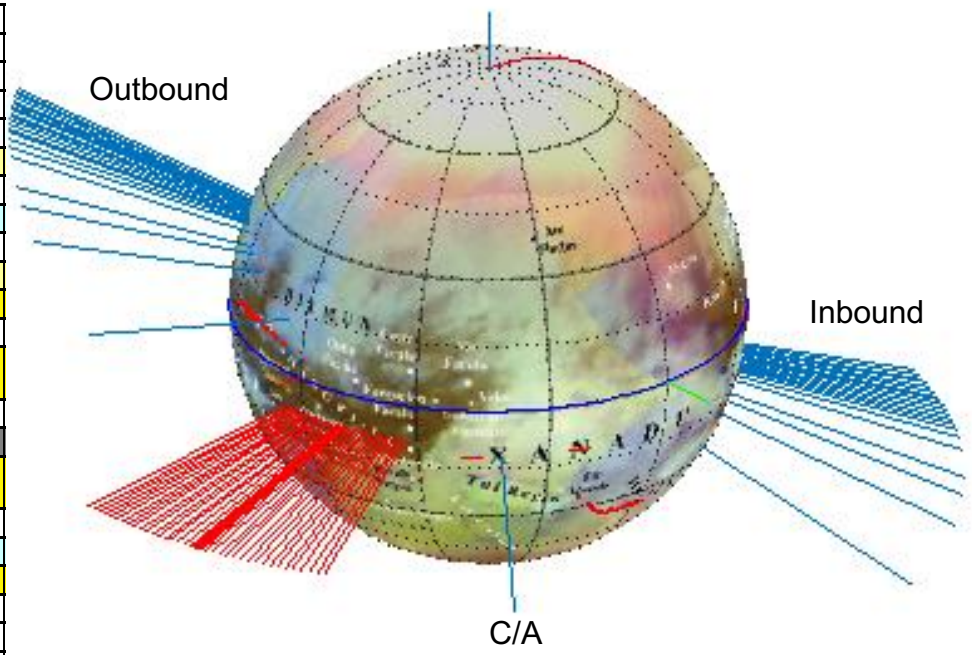
T040 – rev 55 – S36

Jan. 5, 2008 – 005T21:26:24 @ 1014 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T040 VIMS Science objectives: High resolution spectral mapping of the landing site at small solar phase angles, which will minimize airmass and maximize surface illumination. Search for changes in the landing site since the beginning of mission. Study cloud formation and evolution. Search for volatile transport since the beginning of mission.

-13:23	-10:00	CIRS	FP1
-10:00	-09:00	ISS	Photometry
-09:00	-05:00	UVIS	EUVFUV
-05:00	-03:00	UVIS	EUVFUV
-03:00	-02:00	ISS	
-02:00		BEGIN Custom Period	
-02:00	-01:05	CIRS	
-01:05	-00:44	RWA to RCS Transition	21 mins
-00:44	-00:28	UVIS	Stellar occ
-00:28		END Custom Period	
-00:28	-00:23	SP Turn to VIMS Occ	5 min
-00:23	-00:08	VIMS	Stellar occ
-00:08	-00:05	SP Turn to INMS Attitude	3 Min
-00:05	+00:10	INMS	
2008-005T21:30:20		**CLOSEST APPROACH**	
+00:10	+00:17	SP Turn to VIMS Attitude	7 min
+00:17	+00:36	VIMS	Landing site
+00:36	+00:57	RCS to RWA Transition	00:21:05 dur
+00:57	+01:12	SP Turn to ORS Attitude	15 mins
+01:12	+02:00	VIMS	High Res
+02:00	+04:00	ISS	Regional Map
+04:00	+05:00	CIRS	
+05:00	+07:00	VIMS	Regional Map
+07:00	+09:00	ISS	NAC & WAC
+08:40	+14:00	ISS	
+09:00	+14:00	CIRS	
+14:00	+1T00:14	CIRS	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
									CIRS			I	UVIS						I	C	U	I	VIMS			ISS		C	VIMS		ISS														

T040 – rev 55 – S36

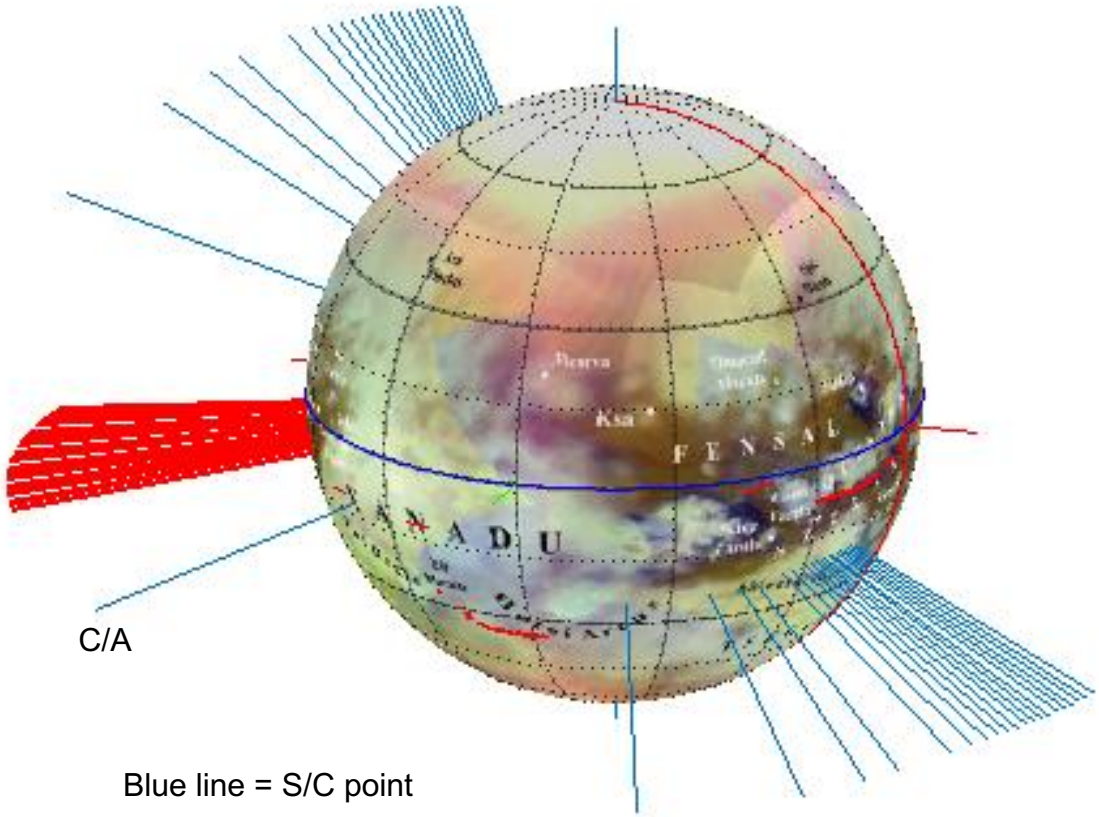
Jan. 5, 2008 – 005T21:26:24 @ 1014 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.

Stellar occultation of alpha Bootes prior to C/A.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
									CIRS			I	UVIS						I	C	U	I	VIMS		ISS		C	VIMS		ISS		CIRS													

T040 – rev 55 – S36

Jan. 5, 2008 – 005T21:26:24 @ 1014 km altitude

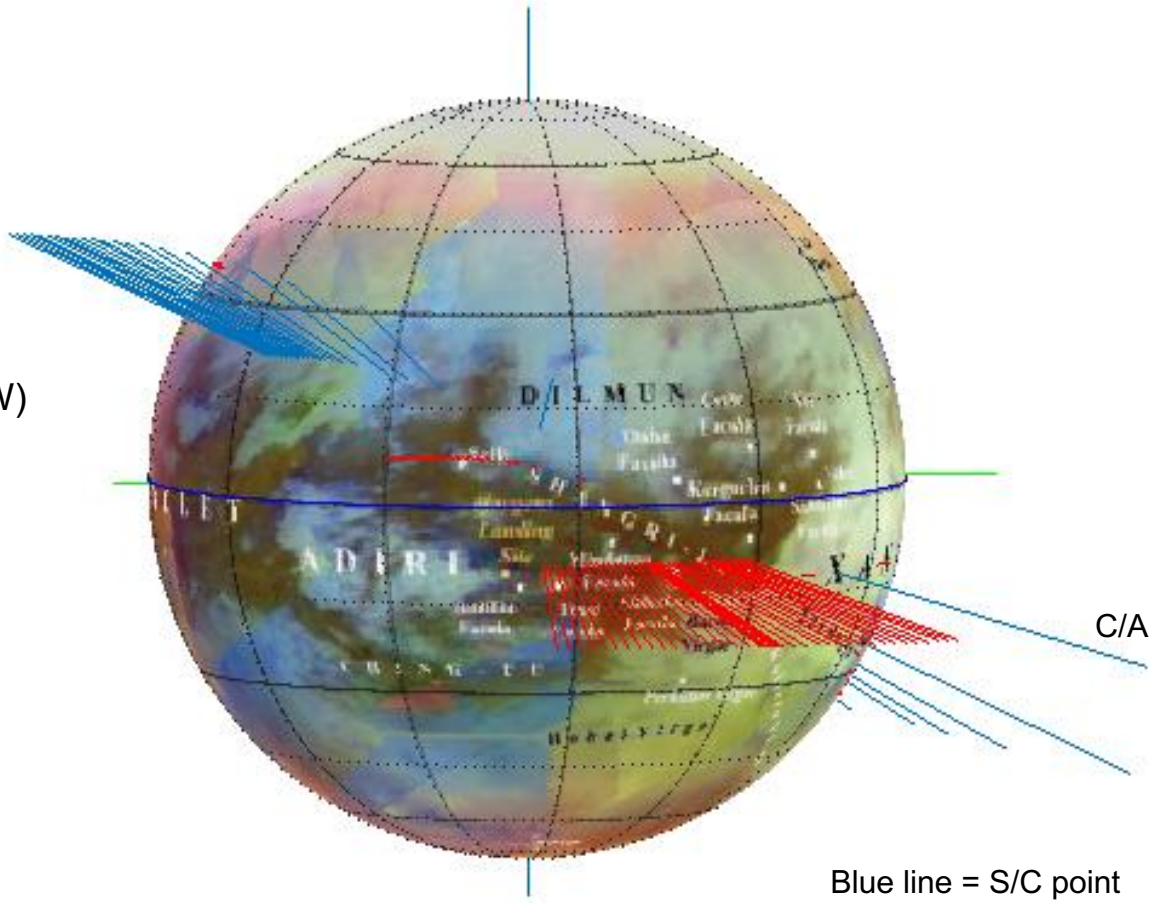
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

High resolution regional mapping near the Huygens Landing Site (10.6S, 192.4 W) at C/A +00:15.

Search for clouds.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

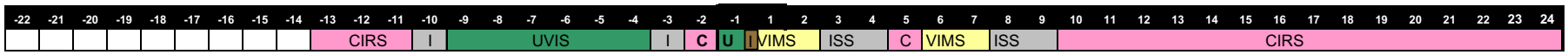
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
									CIRS			I	UVIS						I	C	U	I	VIMS			ISS			C	VIMS			ISS							CIRS							

T040 – rev 55 – S36

Jan. 5, 2008 – 005T21:26:24 @ 1014 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at lower northern latitudes.



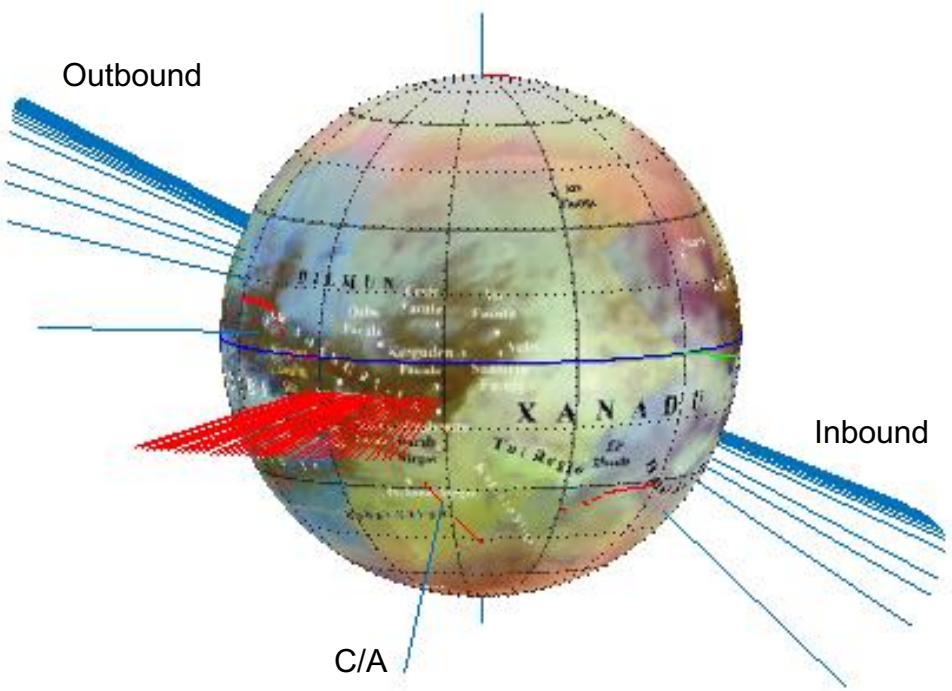
T041 – rev 59 – S38

Feb. 22, 2008 – 053T17:39:08 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T041 VIMS Science objectives: VIMS will determine time scales for cloud formation and dissipation and perform spectral mapping of dark region.

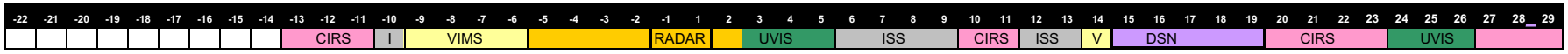
-13:03	-10:00	CIRS	FP1
-10:00	-09:00	ISS	Photometry
-09:00	-05:15	VIMS	Cloud Map
-05:15	-04:45	SP Turn to RADAR Waypoint	NEG_Z to Titan, NEG_X to 30, +42
-04:45	-02:00	RADAR	Radiometry
-02:00	-00:52	RADAR	Scatterometry
-00:52	-00:30	RWA to RCS Transition	
-00:30	-00:15	RADAR	Altimetry
-00:15	+00:15	RADAR	SAR
2008-053T17:32:06		**CLOSEST APPROACH**	
+00:15	+00:30	RADAR	Altimetry
+00:30	+01:12	RADAR	Scatterometry
+01:12	+01:21	SP Turn to Waypoint	NAC to Titan, NEG_X to Sun
+01:21	+01:44	RCS to RWA Transition	
+01:21	+02:30	UVIS	Stellar occ
+02:30	+05:00	UVIS	
+05:00	+08:36	ISS	Global Map
+08:36	+09:00	ISS	WAC Photom
+09:00	+11:00	CIRS	FP1
+11:00	+13:00	ISS	Mosaic
+13:00	+14:00	VIMS	Regional Map
+14:00	+14:30	SP Turn to Downlink	
+14:30	+18:30	Goldstone 70M Downlink	
+18:30	+19:00	SP Turn to Waypoint	NAC to Titan, POS_X to NTP
+19:00	+22:45	CIRS	
+22:45	+1T01:15	UVIS	Stellar occ
+1T01:15	+1T03:55	CIRS	
+1T03:55	+1T06:10	UVIS	Stellar occ
+1T06:10	+1T07:55	CIRS	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



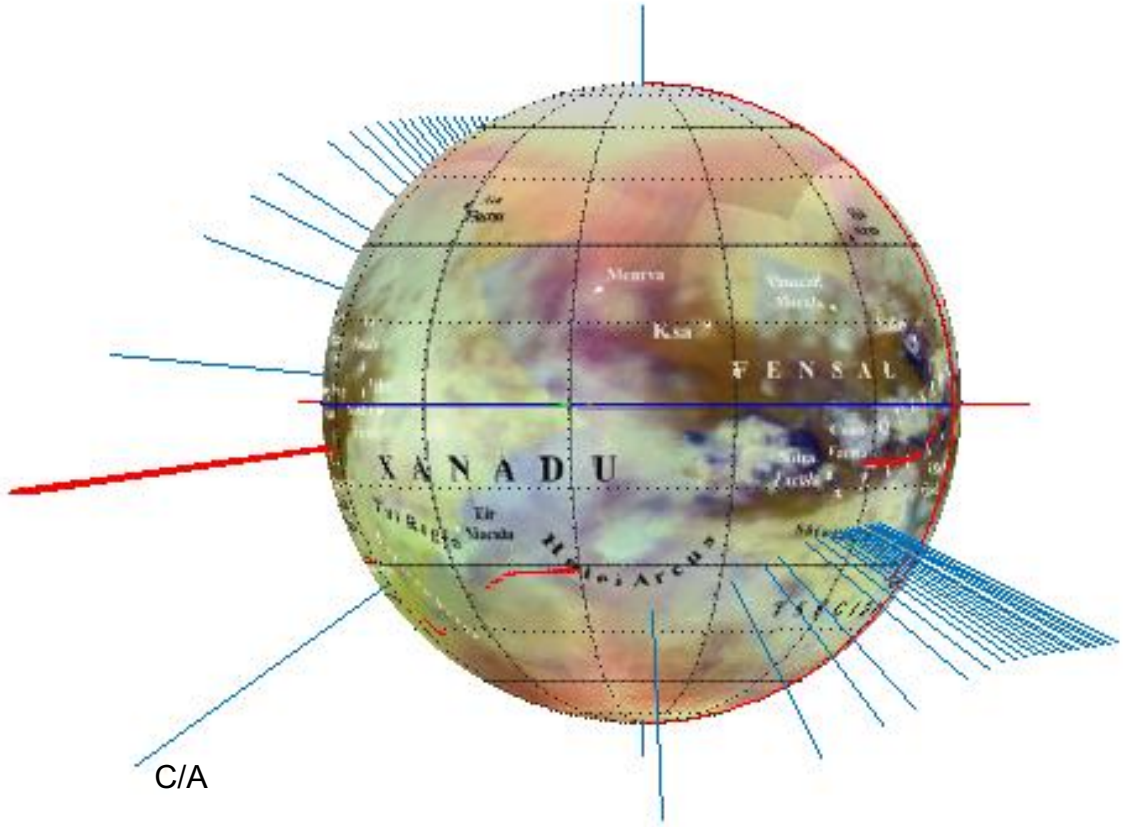
T041 – rev 59 – S38

Feb. 22, 2008 – 053T17:39:08 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

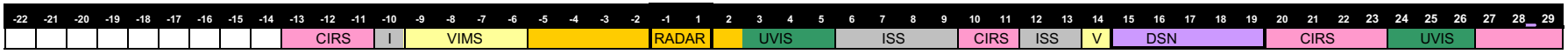
Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T041 – rev 59 – S38

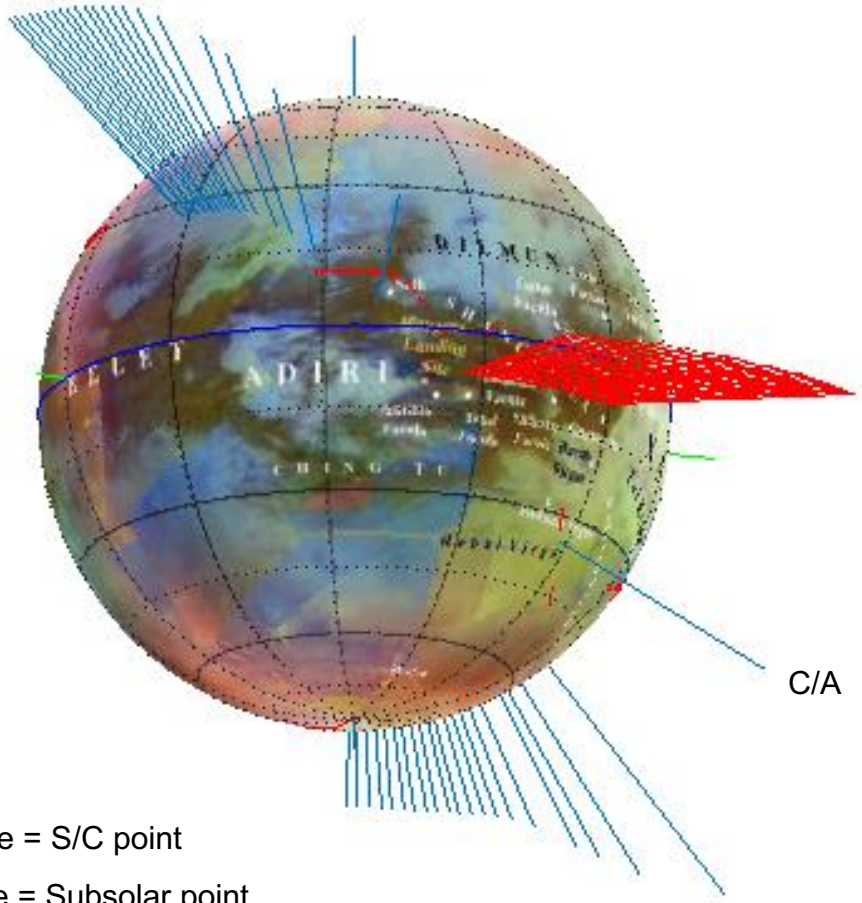
Feb. 22, 2008 – 053T17:39:08 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.

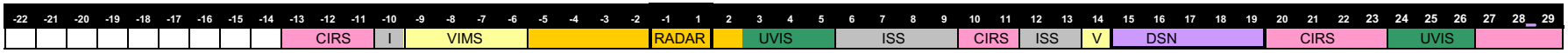
Monitor the evolution
and formation of clouds.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

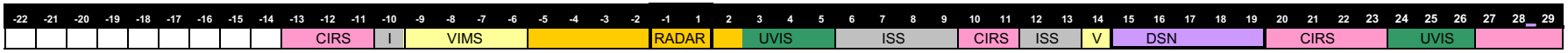


T041 – rev 59 – S38

Feb. 22, 2008 – 053T17:39:08 @ 1000 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at lower northern latitudes.



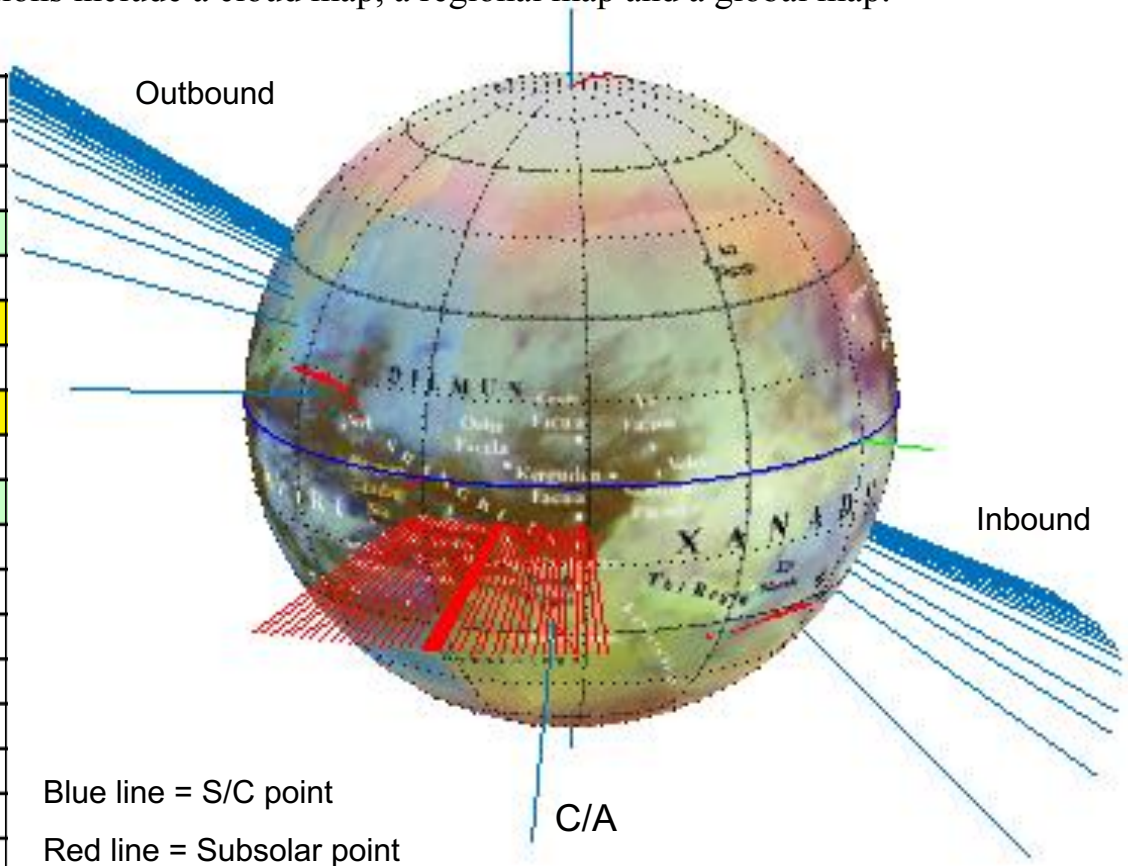
T042 – rev 62 – S39

March 25, 2008 – 085T14:36:12 @ 999 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T042 VIMS Science objectives: Small phase angle, high resolution imaging of the probe landing site, just past closest approach. Other observations include a cloud map, a regional map and a global map.

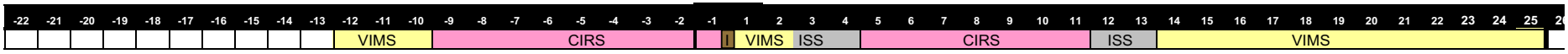
-12:15	-09:00	VIMS	Cloud Map
-09:00	-05:00	CIRS	Mid-IR Limb
-05:00	-02:00	CIRS	Nadir
-02:00	-01:59	RWA to RCS Transition	
-01:59	-00:21	CIRS	Limb
-00:21	-00:15	SP turn to WP	
-00:15	+00:15	INMS	
+00:15	+00:27	SP turn to WP	
+00:27	+00:46	VIMS	Landing site
+00:46	+01:08	RCS to RWA Transition	
+01:08	+02:00	VIMS	
+02:00	+04:00	ISS	Reg Map
+04:00	+05:00	CIRS	
+05:00	+09:00	CIRS	Limb Map
+09:00	+11:00	CIRS	FP1
+11:00	+13:00	ISS	Mosaic
+13:00	+14:00	VIMS	Reg Map
+14:00	+1T00:59	VIMS	Global Map



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T042 – rev 62 – S39

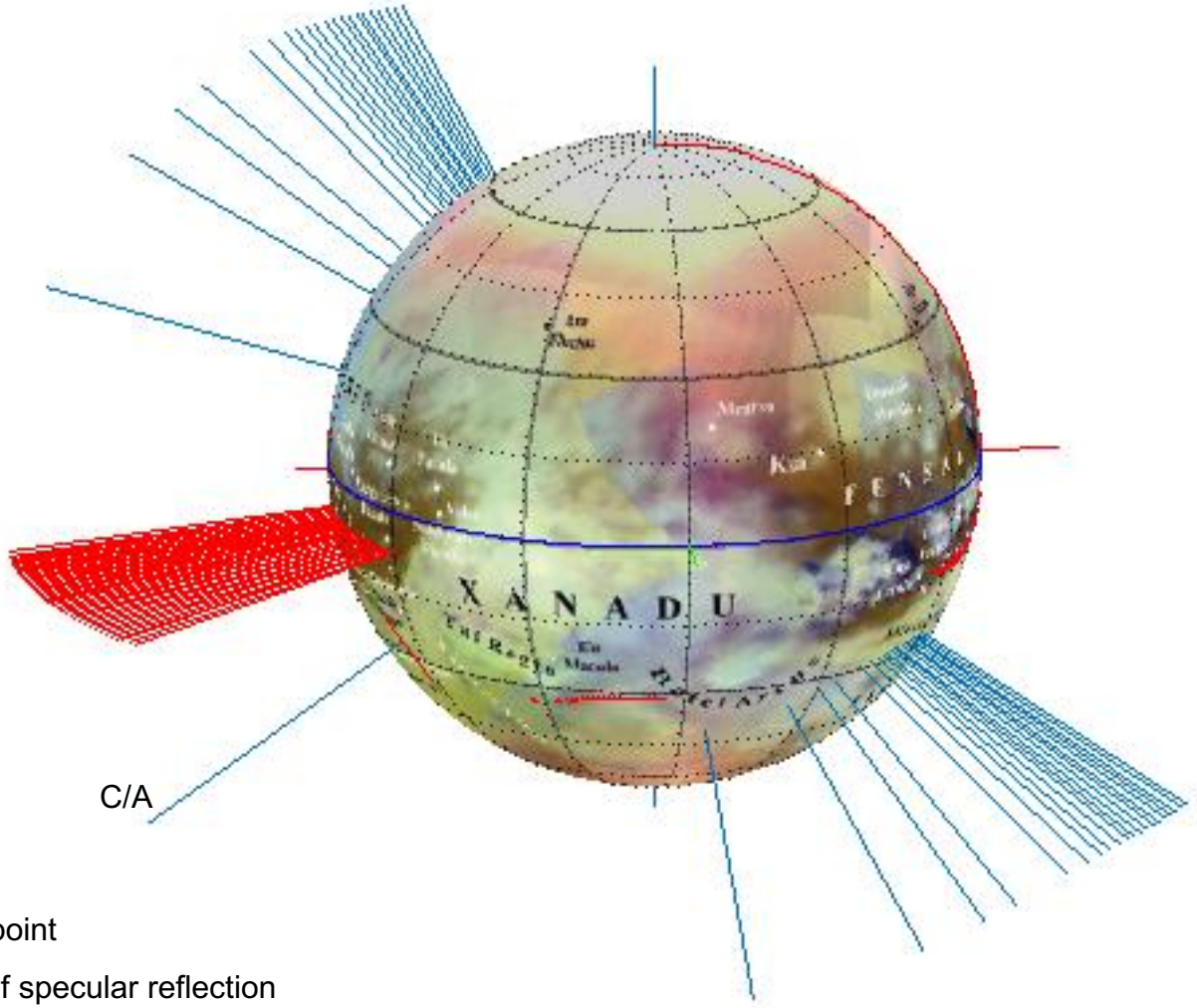
March 25, 2008 – 085T14:36:12 @ 999 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

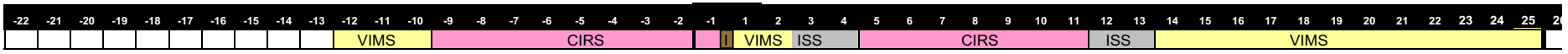
Cloud monitoring.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T042 – rev 62 – S39

March 25, 2008 – 085T14:36:12 @ 999 km altitude

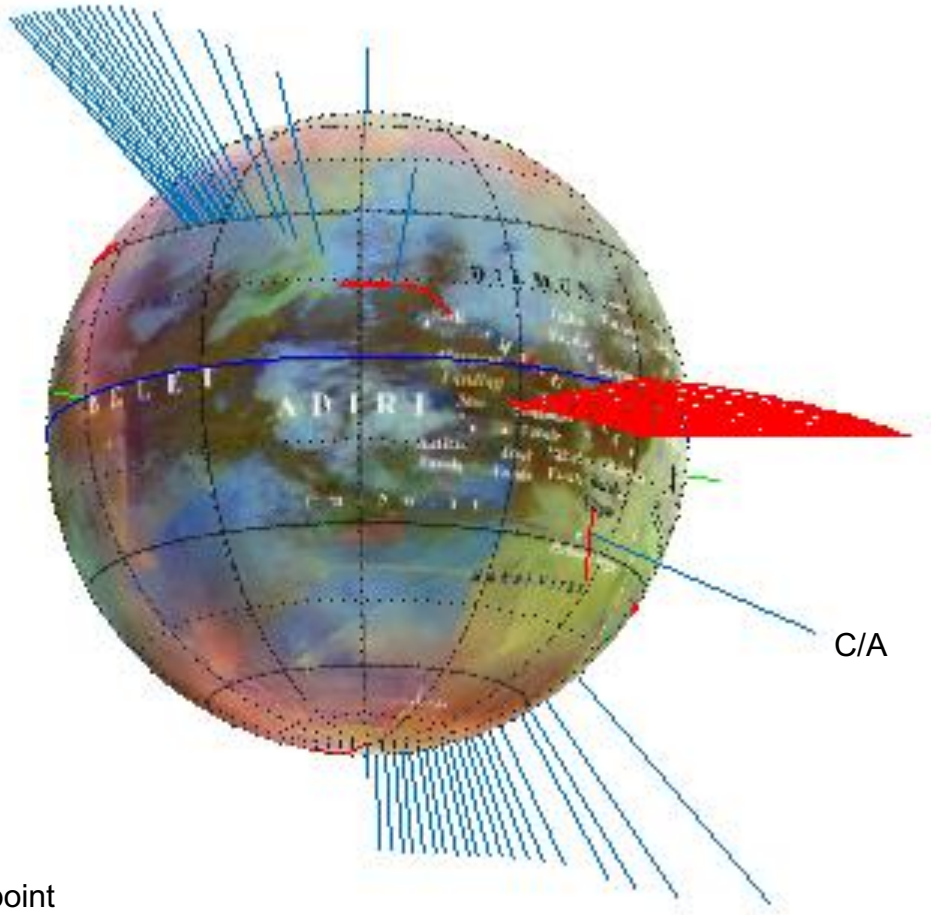
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observe the Huygens Landing Site (10.6 S, 192.4 W) at high resolutions.

Regional and global mapping of Titan.

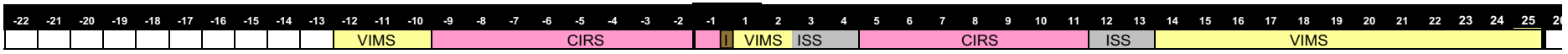
Monitor clouds.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

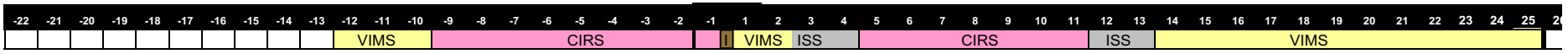


T042 – rev 62 – S39

March 25, 2008 – 085T14:36:12 @ 999 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A at mid-northern latitudes.



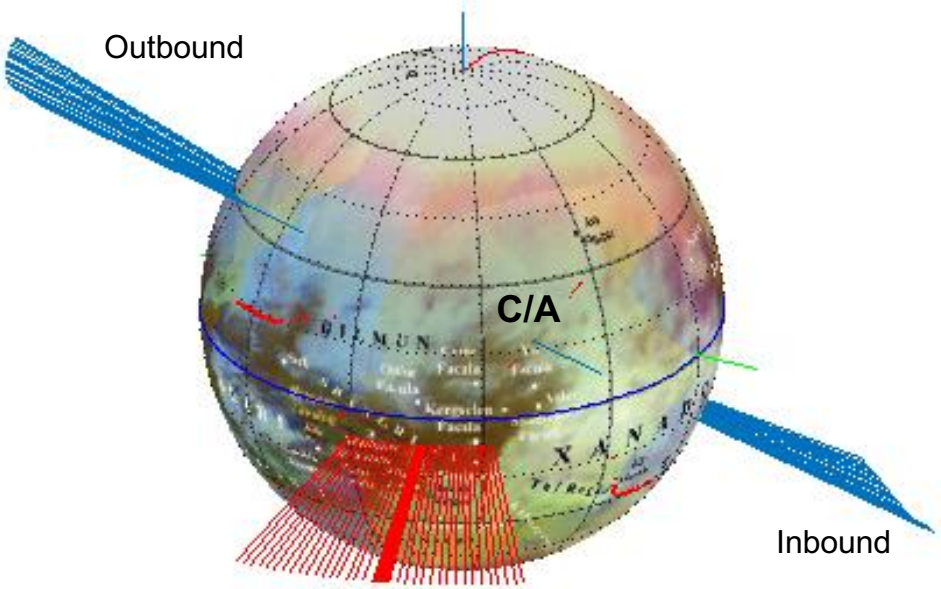
T043 – rev 67 – S40

May 12, 2008 – 133T10:09:59 @ 1001 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T043 VIMS Science objectives: Time scales for cloud formation and dissipation

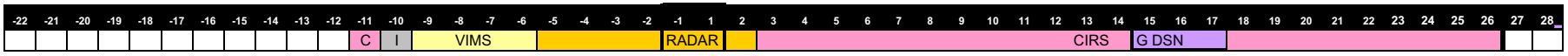
-10:54	-10:00	CIRS	FP1
-10:00	-09:00	ISS	Photometry
-09:00	-05:07	VIMS	Cloud Map
-05:07	-04:53	SP turn to waypoint	11 min turn
-04:53	-02:00	RADAR	Radiometry
-02:00	-00:52	RADAR	Scatterometry
-00:52	-00:30	RWA to RCS Transition	
-00:30	-00:15	RADAR	Altimetry
-00:15	-00:07	RADAR	Low-Res SAR
-00:07	+00:07	RADAR	High-Res SAR
+00:07	+00:15	RADAR	Low-Res SAR
+00:15	+00:30	RADAR	Altimetry
+00:30	+00:54	RCS to RWA Transition	
+00:54	+01:50	RADAR	Scatterometry
+01:50	+02:10	SP turn to waypoint	18 min turn
+02:10	+05:00	CIRS	
+05:00	+09:00	CIRS	Limb Map
+09:00	+14:00	CIRS	
+14:00	+14:30	SP Turn to Earth	
+14:30	+16:15	Downlink to Goldstone	
+16:15	+16:45	SP Turn back to Titan	
+16:45	+1T02:19	CIRS	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T043 – rev 67 – S40

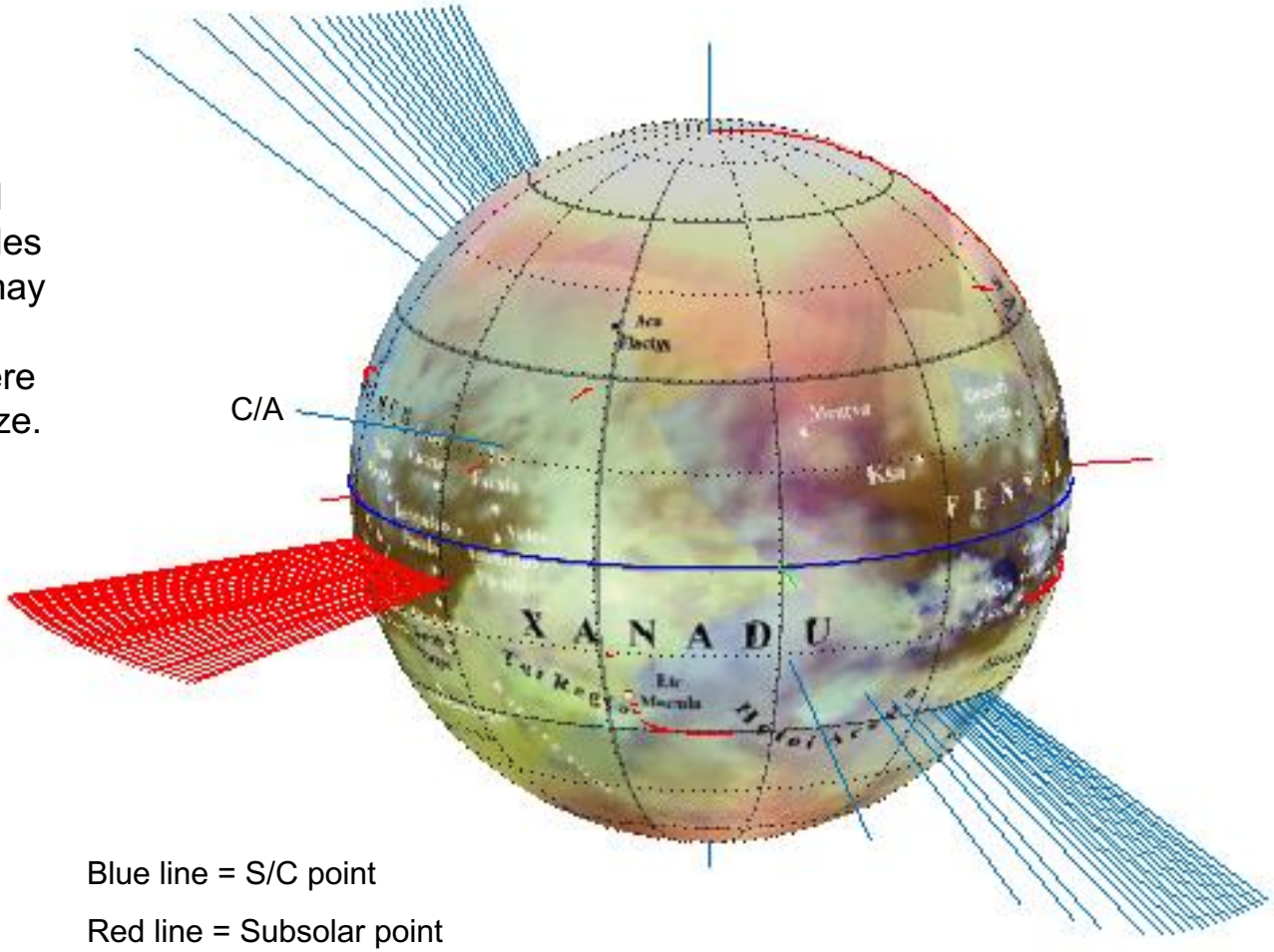
May 12, 2008 – 133T10:09:59 @ 1001 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere and characteristics of the haze.

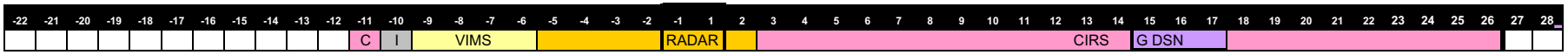
Monitor cloud formation and evolution.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T043 – rev 67 – S40

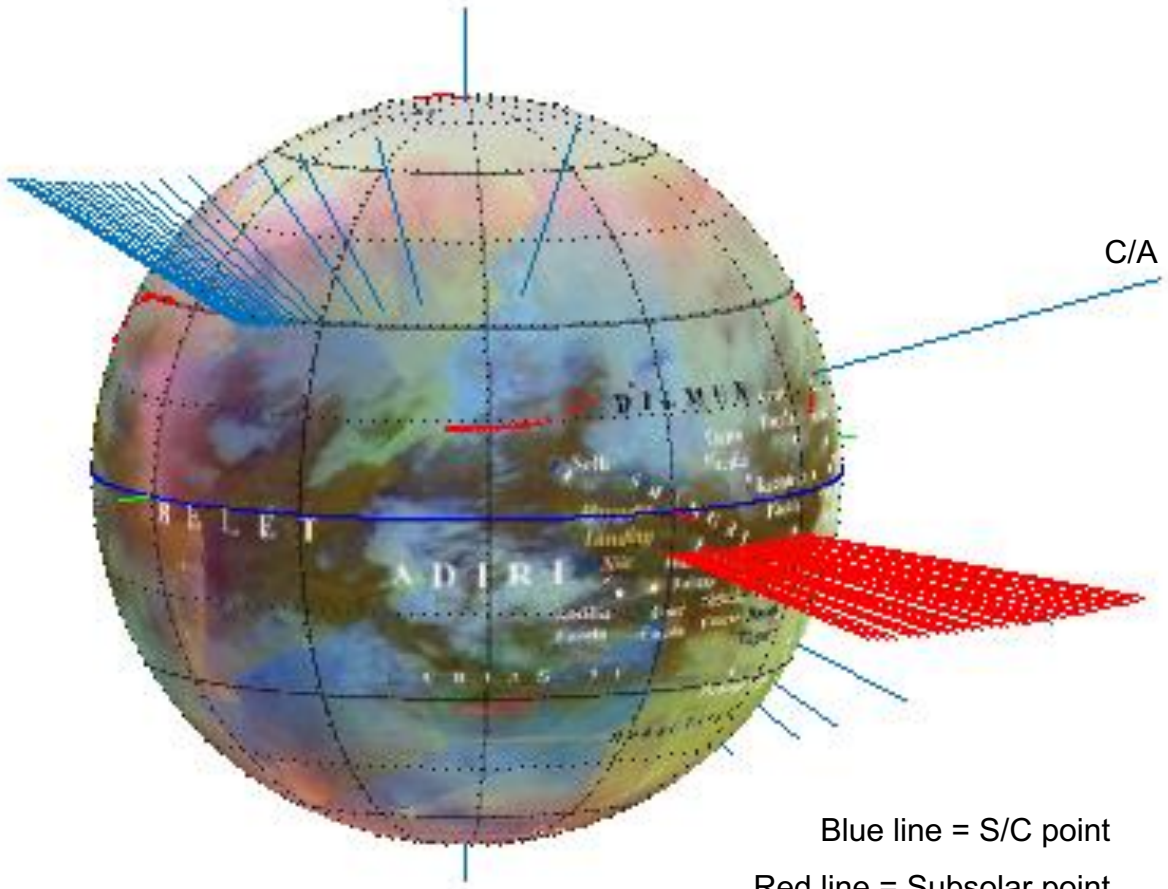
May 12, 2008 – 133T10:09:59 @ 1001 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.

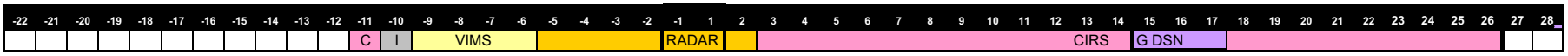
Monitor cloud formation and evolution.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

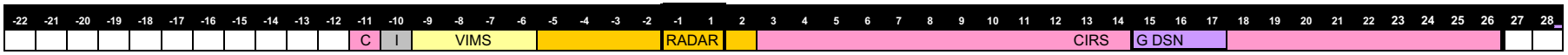


T043 – rev 67 – S40

May 12, 2008 – 133T10:09:59 @ 1001 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A at mid-northern latitudes.



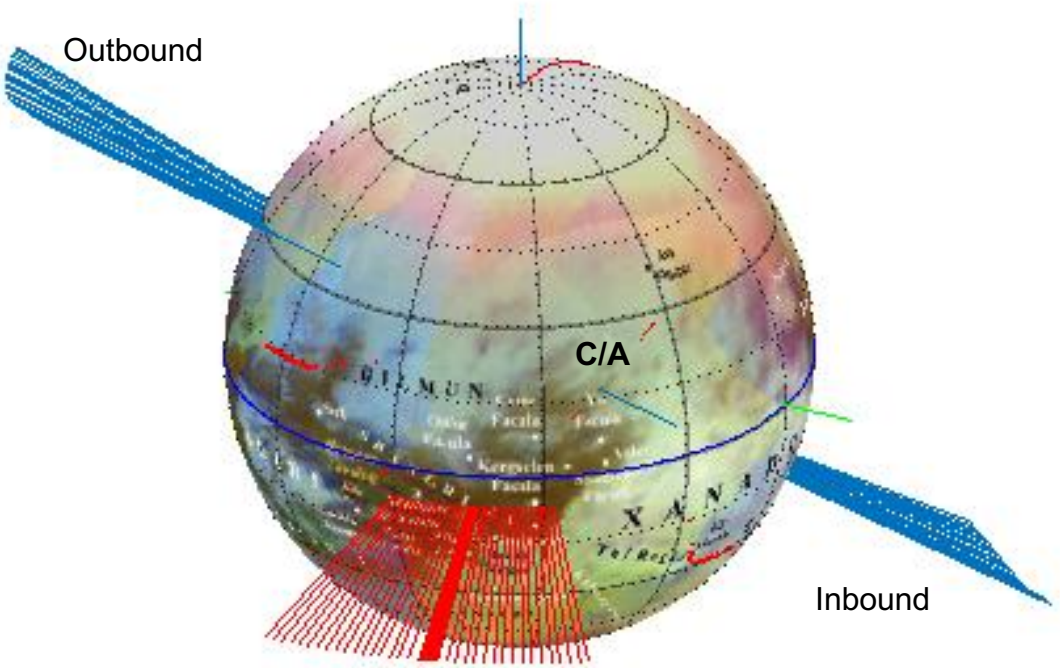
T044 – rev 69 – S40

May 28, 2008 – 149T08:33:21 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T044 VIMS Science objectives: Cloud map, regional map

148T05:13	148T05:29	OD Uncertainty Dead Time	
-1T03:05	-1T00:05	CIRS-Rings Observation	Rings
-1T00:05	-16:00	CIRS	Mid-IR Temp Map
-16:00	-15:00	ISS	
-15:00	-13:00	CIRS	
-13:00	-09:00	VIMS	Cloud Map
-09:00	-05:00	UVIS	EUVFUV
-05:00	-03:00	UVIS	EUVFUV
-03:00	-02:00	ISS	
-02:00	-01:39	Transition RWA to RCS	
-01:39	-01:31	SP Turn to Waypoint	
-01:31	-0:30	RADAR	Scatterometry
-0:30	-0:15	RADAR	Altimetry
-0:15	-0.07	RADAR	SAR
-0.07	+0.07	RADAR	Hi-SAR
+0.07	+0:15	RADAR	SAR
+0:15	+0:30	RADAR	Altimetry
+00:30	+00:54	Transition RCS to RWA	
+0:54	+01:38	RADAR	Scatterometry
+01:38	+04:37	RADAR	Radiometry
+04:35	+05:05	RADAR Turn to RADAR Waypoint	30 min turn
+05:05	+05:24	SP turn to new waypoint	19 min turn
+05:24	+08:36	ISS	Global Map
+08:36	+09:00	ISS	WAC Photom
+09:00	+11:00	CIRS	FP1
+11:00	+13:00	ISS	Mosaic
+13:00	+14:00	VIMS	Regional Map
+14:00	+16:00	VIMS	Global Map
+16:00	+16:30	SP Turn to Earth for Downlink	
+16:30	+18:30	Goldstone 70m	
+18:30	+1T02:53	VIMS	Global Map



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T044 – rev 69 – S40

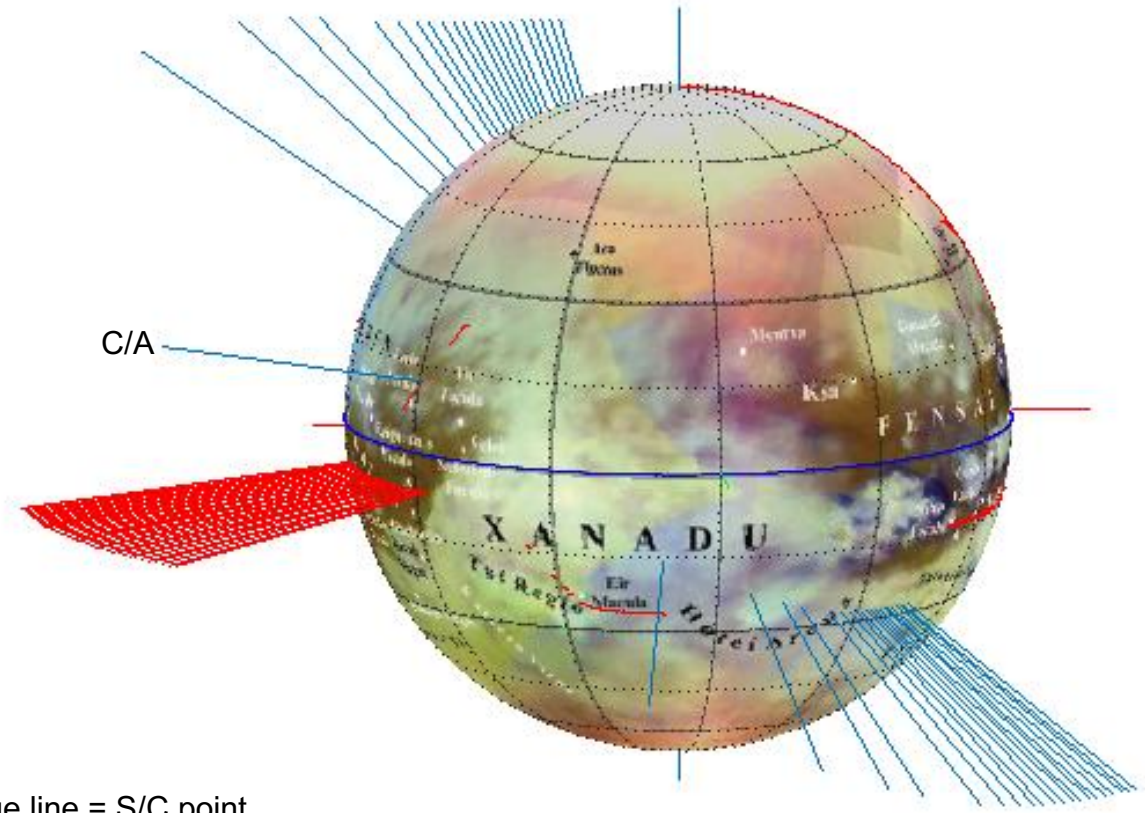
May 28, 2008 – 149T08:33:21 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Monitor the evolution of clouds.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
CIRS						I	CIRS				VIMS					UVIS					I	RADAR						ISS				CIRS		ISS			VIMS			G70			VIMS							

T044 – rev 69 – S40

May 28, 2008 – 149T08:33:21 @ 1400 km altitude

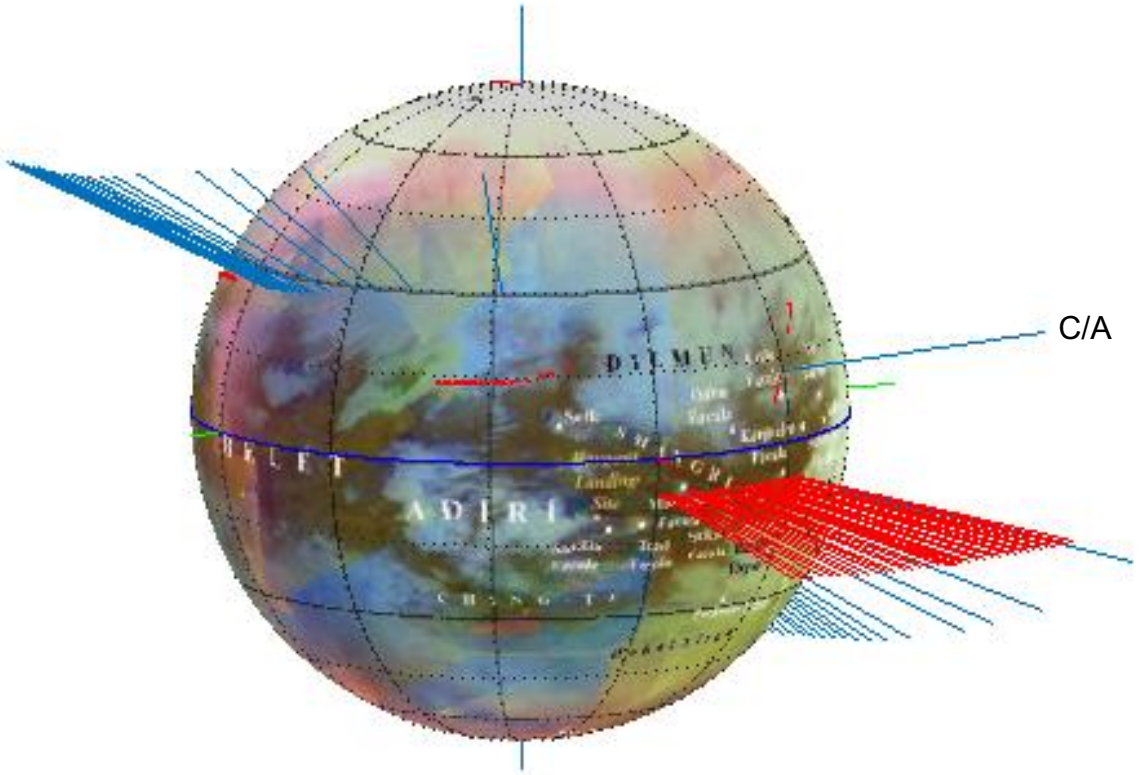
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional mapping of Titan while riding along with ISS.

Monitor cloud evolution.

Global mapping of Titan during VIMS' prime observations.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
CIRS						I	CIRS			VIMS			UVIS						I	RADAR						ISS				CIRS		ISS		VIMS		G70		VIMS									

T044 – rev 69 – S40

May 28, 2008 – 149T08:33:21 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at mid-northern latitudes.

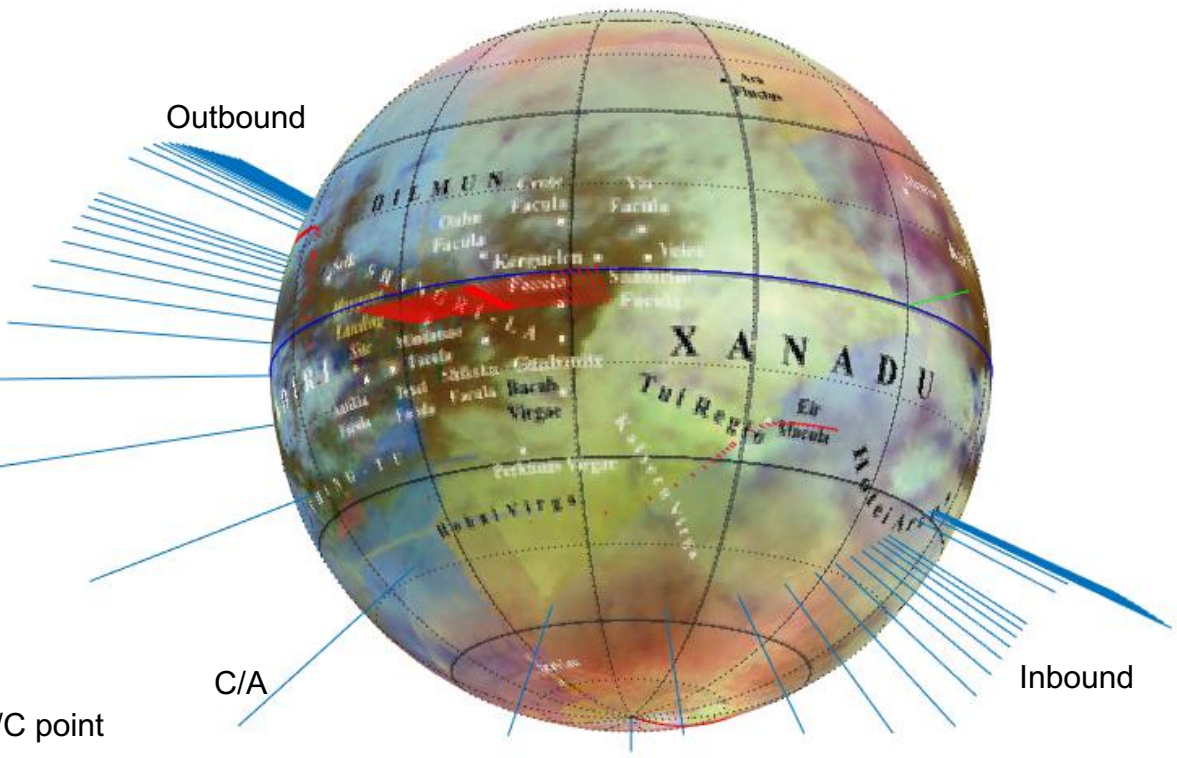
T045 – rev 078 – S42

July 31, 2008 – 213T02:13:11 @ 1614 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T045 VIMS Science objectives: T45 is a gravity flyby.

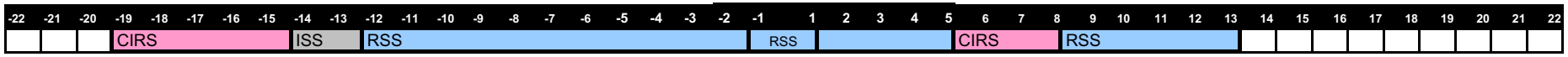
-18:07:50	-14:00	CIRS	Template A (Pos X to NTP Sec.)
-14:00	-12:00	ISS	Template D2
-12:00	-11:30	SP Turn to Earth (was ISS)	
		NEW WAYPOINT	Neg-Z to Earth, Pos-X to NTP
-11:30	0	RSS	Gravity; Neg_Z to Earth, Pos_X to NTP
2008-213T02:12:50		CLOSEST APPROACH	Neg_Z to Earth, Pos_X to NTP (Secondary is needed by CAPS)
0	+04:45	RSS	Gravity, secondary for CAPS +/- 2 hours
+04:45	+05:15	CIRS Turn to CIRS attitude - Titan	
+05:15	+07:45	CIRS	piece of Template R
+07:45	+08:15	CIRS Turn to Earth	
+08:15	+12:53:10	RSS	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



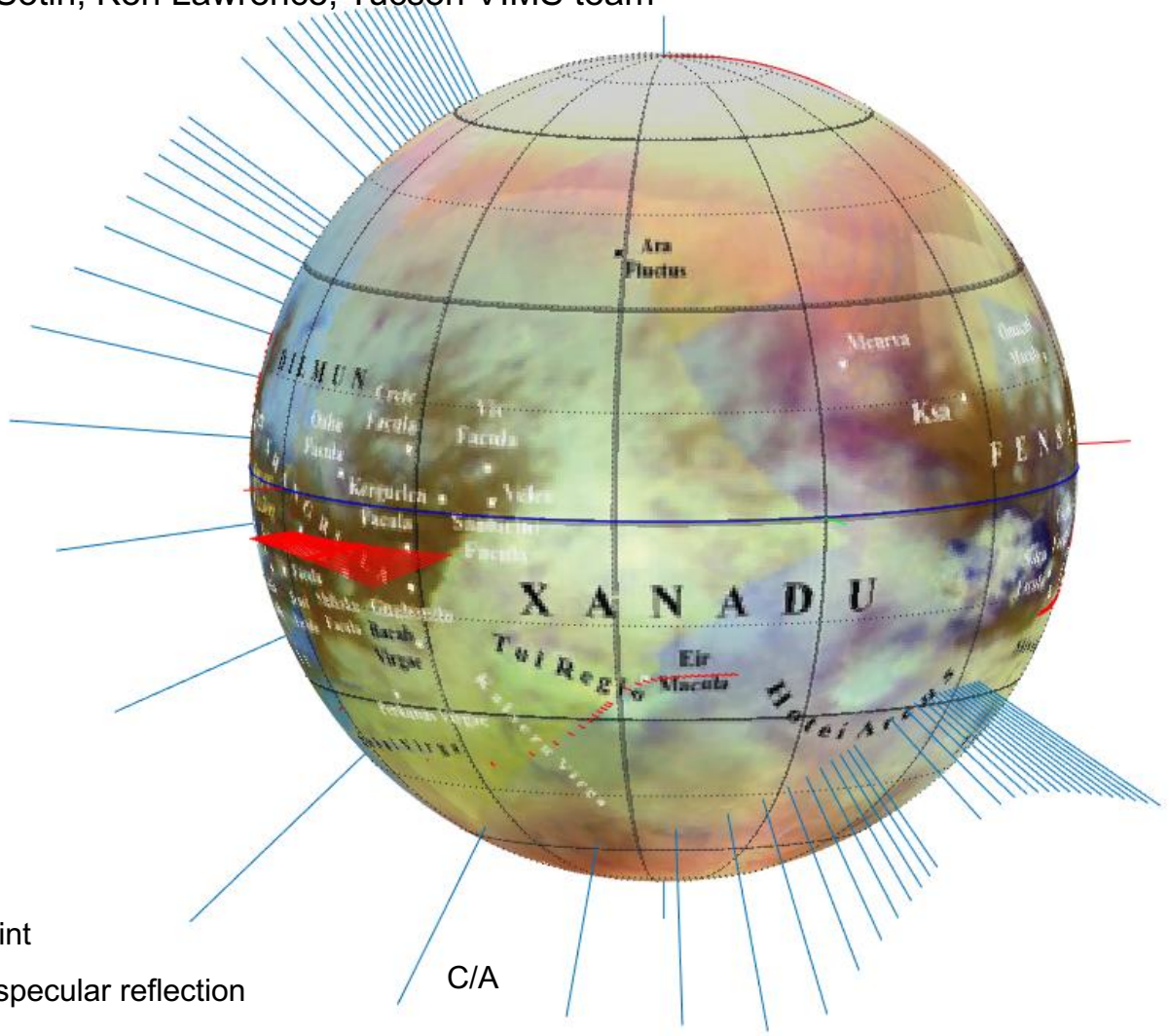
T045 – rev 078 – S42

July 31, 2008 – 213T02:13:11 @ 1614 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Cloud and global mapping of Titan.

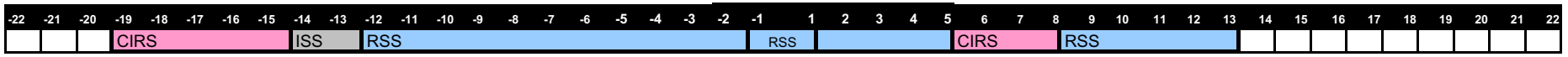


Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A



T045 – rev 078 – S42

July 31, 2008 – 213T02:13:11 @ 1614 km altitude

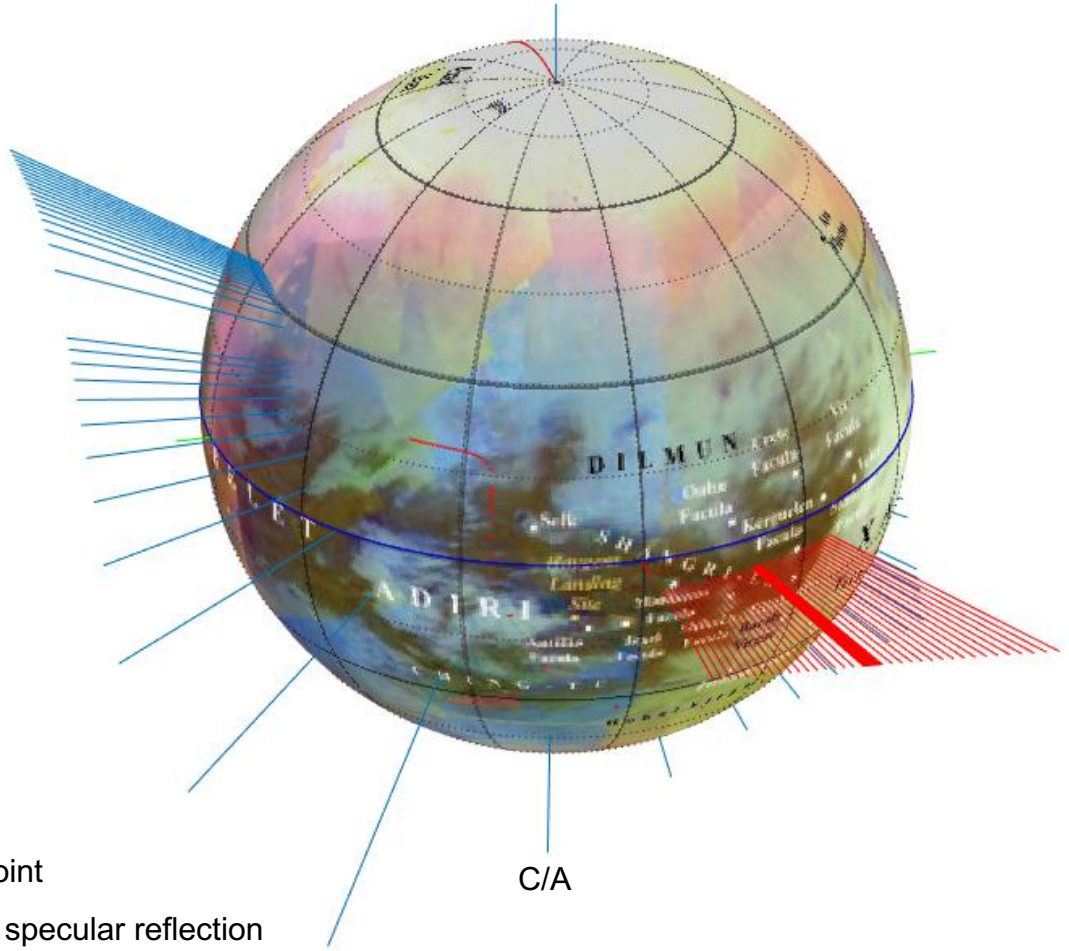
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Cloud monitoring and global mapping of Titan.

Observations on the outbound are obtained with phase angles of near 90 deg, but may provide information on the composition of the atmosphere.

Specular reflection geometry occurs in the mid-northern latitudes near 15N, 210 W at C/A + 06:00.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

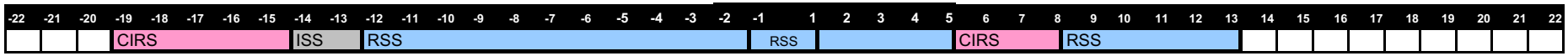
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
			CIRS					ISS		RSS												RSS					CIRS			RSS													

T045 – rev 078 – S42

July 31, 2008 – 213T02:13:11 @ 1614 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at mid-northern latitudes.



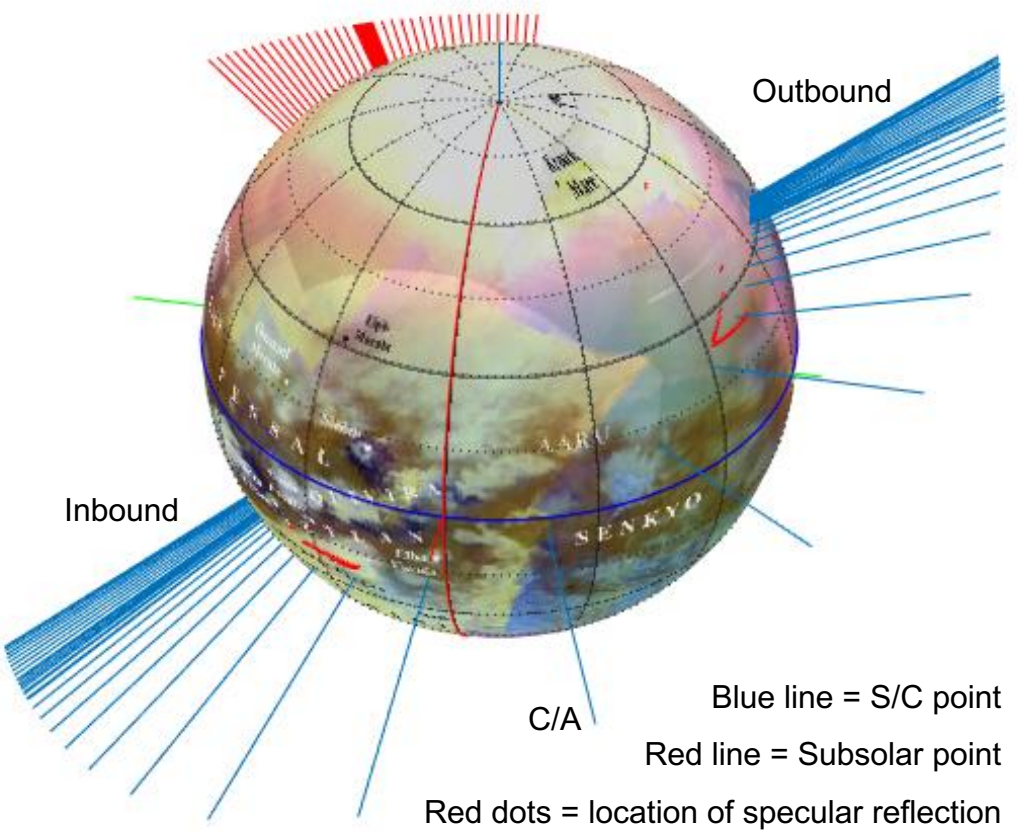
T046 – rev 091 – S45

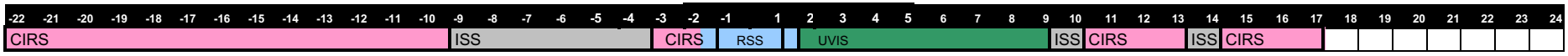
Nov. 3, 2008 – 308T17:35:23 @ 1105 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T046 VIMS Science objectives: High phase angle on the inbound (84 deg). VIMS will ride along with ISS and CIRS and will monitor clouds over Hotei region and do limb observations. On the outbound, it is dark.

C/A-21:17:50	-13:00	CIRS	Template A
-13:00	-09:00	CIRS	Template C
-09:00	-05:00	ISS	Template H
-05:00	-03:30	ISS	Template S2
-03:30	-03:29	RWA to RCS Transition	
-03:29	-01:28	CIRS	Template S2
-01:28	-01:26	SP Turn to WP	NEG_Z to Earth, POS_X to 72.61/51.84
-01:26	-00:14	RSS Bistatic	Neg_Z to Titan, NEG_X to SUN
-00:14	0	RSS Occ	Neg-Z to Earth, POS_X to Plasma_RAM
2008-308T17:34:50		CLOSEST APPROACH	NEG_Z to Earth, NEG_X to RAM (Check 1:Neg-Y to RAM 2:Neg-X to Co-Rotating Plasma RAM for contamination)
0	+00:19	RSS Occ	Neg-Z to Earth, POS_X to Plasma_RAM
+00:19	+01:20	RSS Bistatic	Neg-Z to Titan, NEG_X to SUN
+01:16:25	+01:17:05	Turn to Waypoint Part 1	NEG_Z to Earth, POS_X to 72.61/51.84 (0,0,-1.9995) offset (34.898 mrad)
+01:17:05	+01:29	Turn to Waypoint Part 2	NEG_Y to Titan, NEG_X to NTP
+01:29	+01:51	RCS to RWA Transition	
+01:51	+09:00	UVIS	Template X
+09:00	+10:00	ISS	Template N
+10:00	+13:00	CIRS	Template N
+13:00	+14:00	ISS	Template M2
+14:00	C/A + 15:38:10	CIRS	Template M2





T046 – rev 091 – S45

Nov. 3, 2008 – 308T17:35:23 @ 1105 km altitude

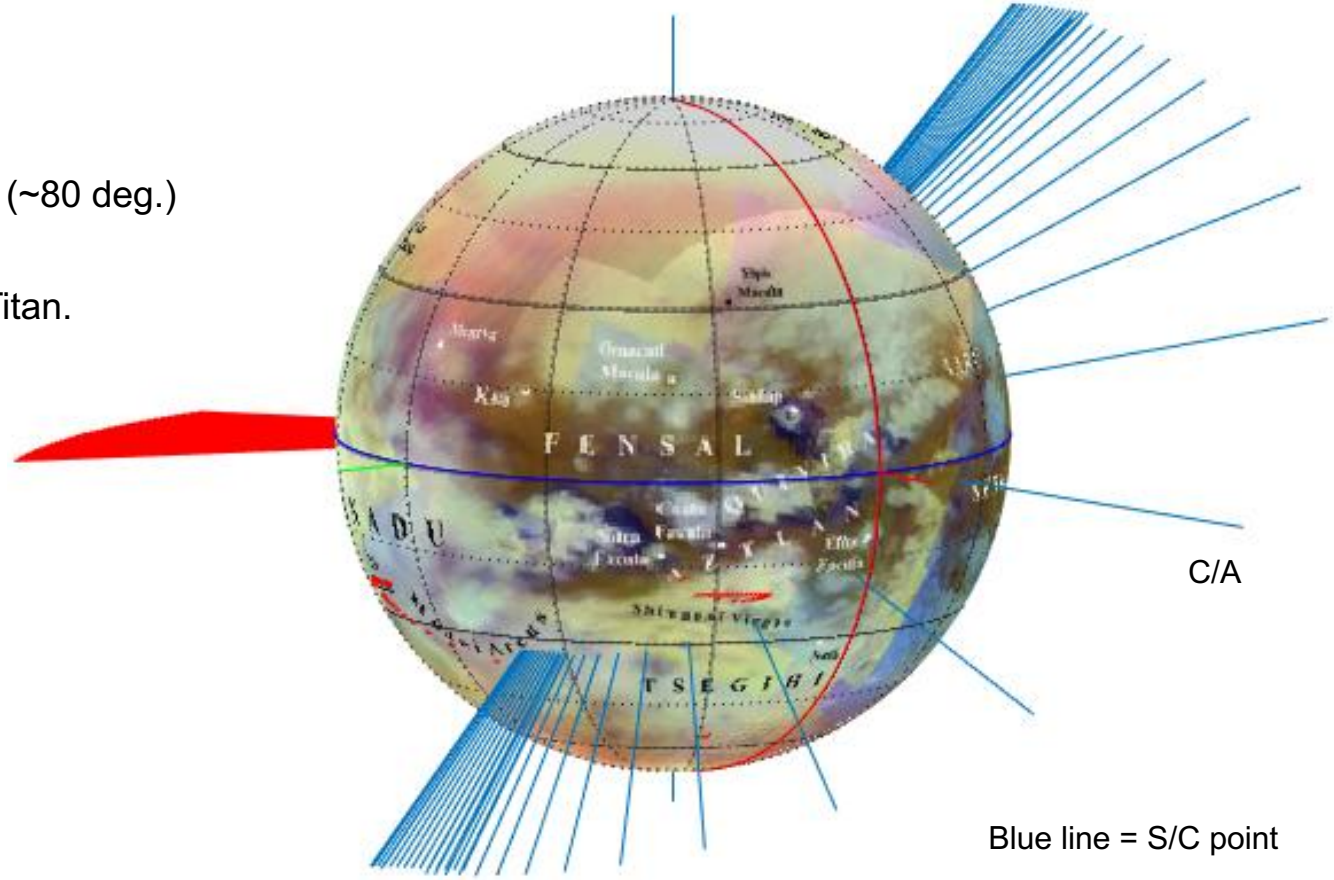
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Large phase angles (~80 deg.) on the inbound.

Global mapping of Titan.

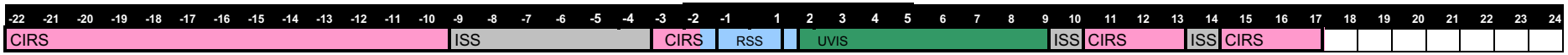
Monitor clouds



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T046 – rev 091 – S45

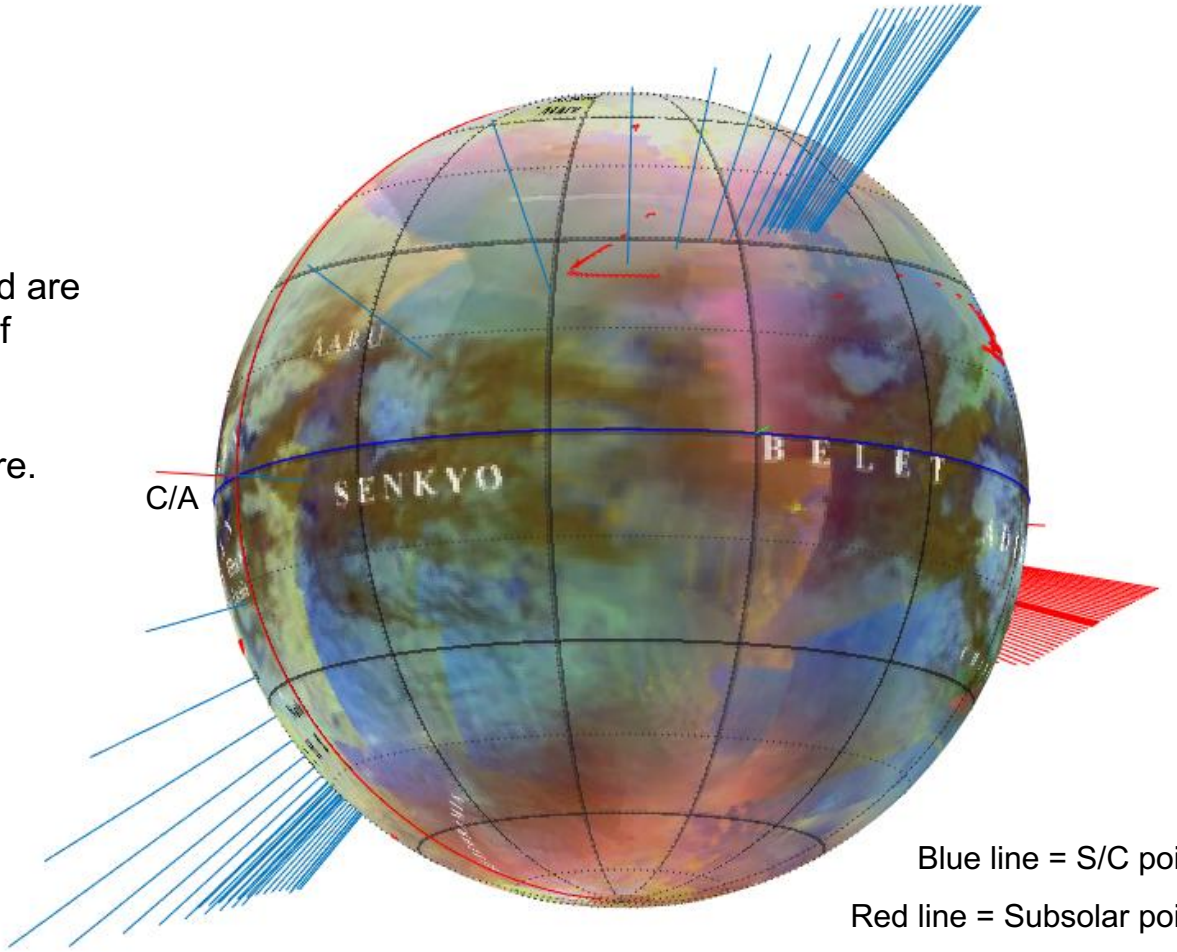
Nov. 3, 2008 – 308T17:35:23 @ 1105 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Cloud monitoring.

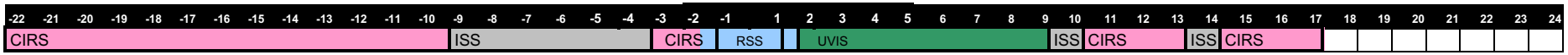
Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

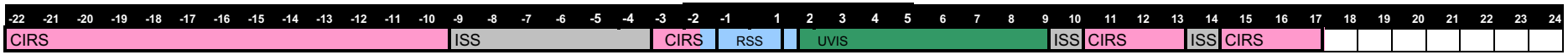


T046 – rev 091 – S45

Nov. 3, 2008 – 308T17:35:23 @ 1105 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at mid-northern latitudes.



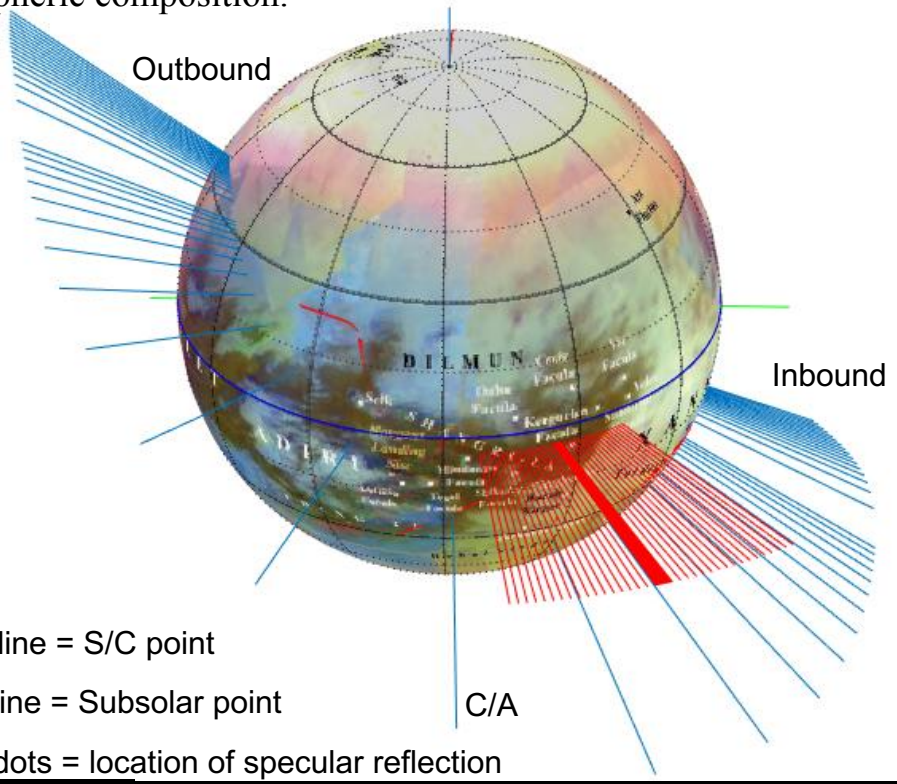
T047 – rev 093 – S45

Nov. 19, 2008 – 324T15:56:28 @ 1023 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T047 VIMS Science objectives: For the first time of the Cassini mission, VIMS will be able to image the Huygens landing site (10.3276 S 192.5207 W) at closest approach with a resolution of less than a kilometer per pixel and a phase angle of 30 deg. It will cover areas that have already been observed with radar allowing for a joint study of geological features including dunes and circular features that are either impact craters or volcanic caldeiras. During the stellar occultations before and after closest approach, VIMS will get information on the atmospheric composition.

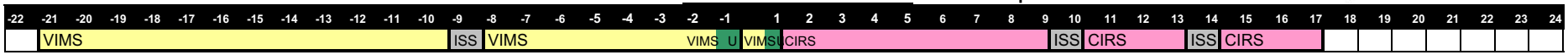
2008-323T19:019:00	-13:00	VIMS	Template B
-13:00	-09:00	VIMS	Template V
-09:00	-08:00	ISS	Template I
begin custom period			
-08:00	-05:00	VIMS	Template I
-05:00	-02:00	VIMS	Template Y
-02:00	-01:10	VIMS	
-01:10	-00:58	Turn to UVIS Stellar Occ attitude	
-00:58	-00:25	UVIS Stellar Occ	
-00:47	-00:25	RWA to RCS Transition	
-00:25	-00:15	Turn to VIMS attitude	extra time goes to VIMS
-00:15	0	VIMS	VIMS must get landing site coverage
2008-324T15:56:28		CLOSEST APPROACH	Neg_Y to Titan, Neg_X to Sun w/ Offset (0,50,0)
0	+00:20	VIMS	(T20-like observations)
+00:20	+00:24	Turn to UVIS Stellar Occ attitude	extra time goes to VIMS
+00:24	+01:02	UVIS Stellar Occ	Beta CMA
+00:40	+01:02	RCS to RWA Transition	
+01:02	X	Turn to CIRS attitude	turns done by CIRS
X	+02:00	CIRS	
+02:00	+05:00	CIRS	Template T
+05:00	+09:00	CIRS	Template R
+09:00	+10:00	ISS	Template N
end custom period			
+10:00	+13:00	CIRS	Template N
+13:00	+14:00	ISS	Template M2
+14:00	C/A+16	CIRS	Template M2



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T047 – rev 093 – S45

Nov. 19, 2008 – 324T15:56:28 @ 1023 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Cloud and global mapping of Titan.

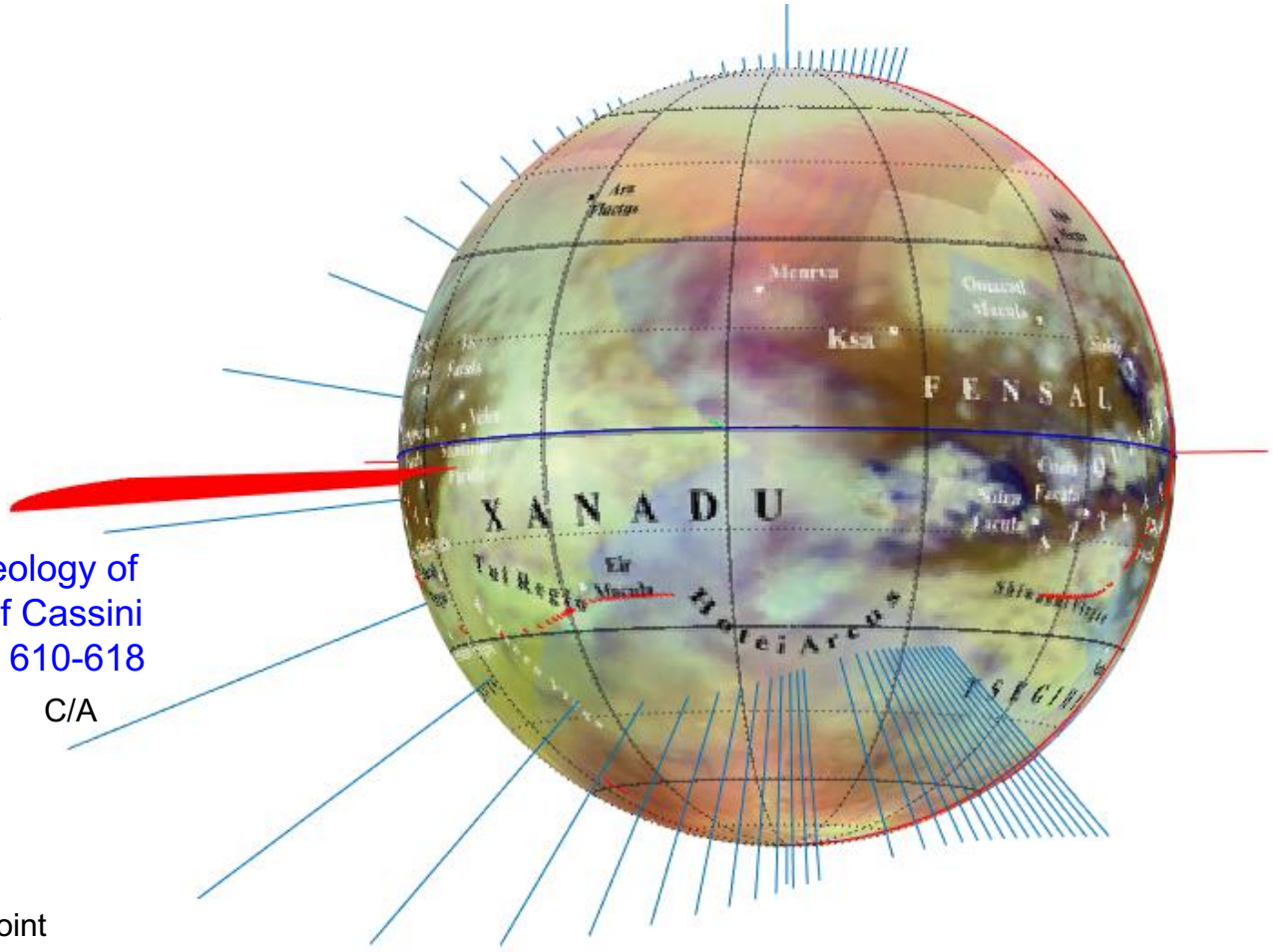
Regional and high-resolution mapping of Hotei Regio*.

“Noodle” mode observations of the Huygens Landing Site (10S, 192 W) at C/A.

Stellar occultation.

*Soderblom et al. (2009) The geology of Hotei Regio, Titan: correlation of Cassini VIMS and RADAR. Icarus, 204, 610-618

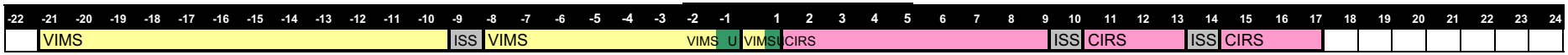
C/A



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T047 – rev 093 – S45

Nov. 19, 2008 – 324T15:56:28 @ 1023 km altitude

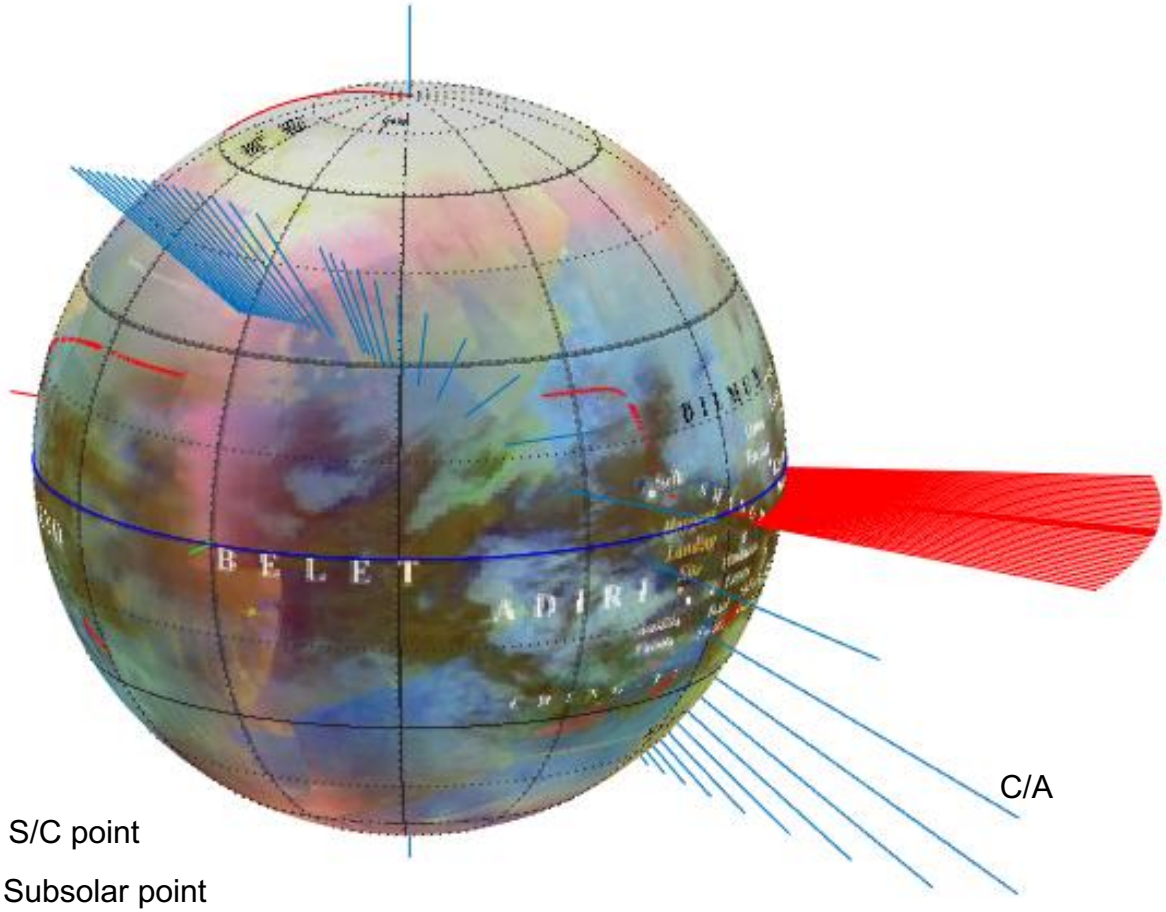
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Cloud monitoring and global mapping of Titan.

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

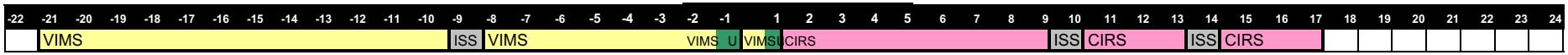
Specular reflection points occur in the mid-northern latitudes near 23N, 205 W at C/A + 09:00.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

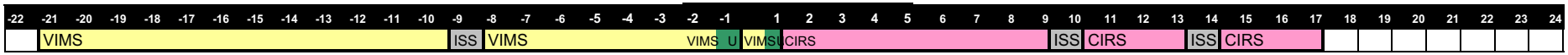


T047 – rev 093 – S45

Nov. 19, 2008 – 324T15:56:28 @ 1023 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at mid-northern latitudes.



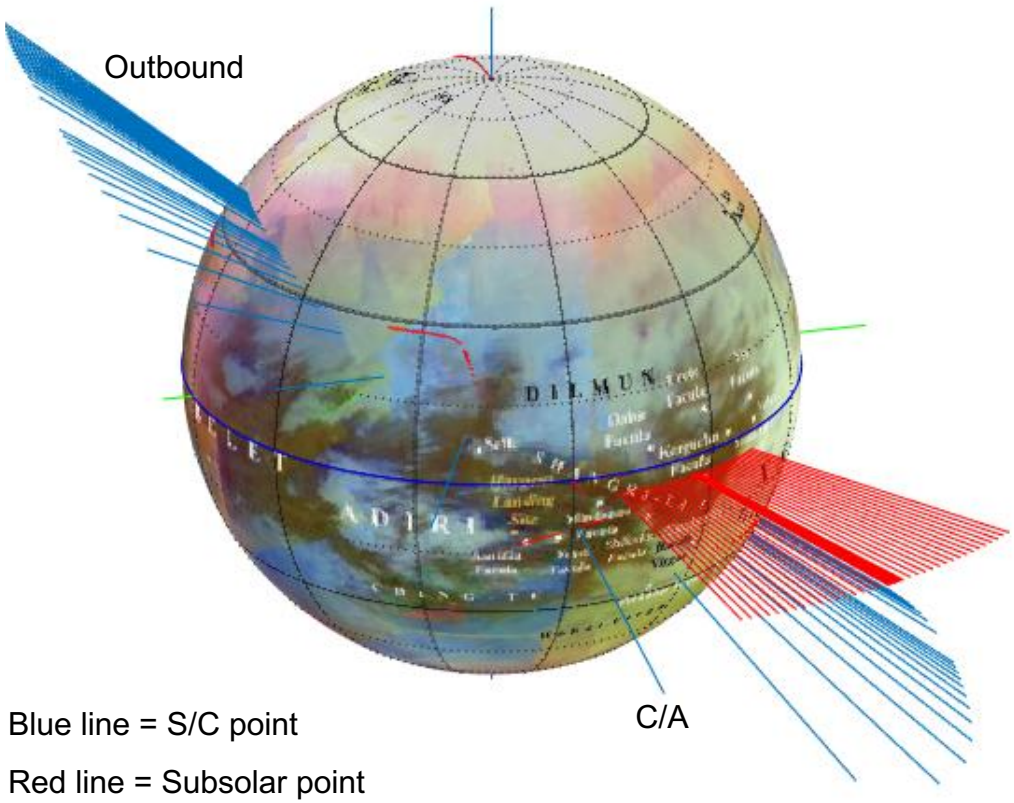
T048 – rev 095 – S46

Dec. 5, 2008 – 340T14:25:45 @ 971 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T048 VIMS Science objectives: 80 deg phase angle on the inbound to do some global mapping and cloud observations of an area in the southern hemisphere between longitudes 30 to 90 West. VIMS will cover Tsegihi and Hotei Regio where brightness variations have been observed previously.

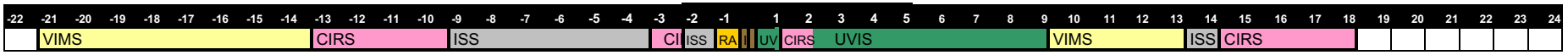
C/A - 0T20:04:12	-13:00	VIMS	Template B
-13:00	-09:00	CIRS	Template C
-09:00	-05:00	ISS	Template H
-05:00	-03:00	ISS	Template S2
-03:00	-02:00	CIRS	Template S2
-02:00	-01:12	ISS	
-01:12	-01:11	RWA to RCS Transition	
-01:11	-00:50	ISS	sit/stare
		begin custom period	
-00:50	-00:42	SP Turn to RADAR attitude	NEW WAYPOINT
-00:42	-00:18	RADAR	HiSAR + Altimetry
-00:18	-00:09:40	RADAR	SAR over Tui Regio
-00:09:40	-00:05	SP Turn to INMS attitude	TURN TIME IS 4:50 - NEW WAYPOINT
-00:05	0	INMS	Must be at INMS attitude by -00:06 (1600km),
2008-340T14:25:12		CLOSEST APPROACH	Neg_X to RAM, Neg_Z to Titan Need to look at the heating....
0	+00:15	INMS	Need to worry about CIRS/VIMS cool down
+00:15	+00:20	SP Turn to UVIS Stellar Occ	NEW WAYPOINT
+00:20	+00:44	RCS to RWA Transition	
+00:20	+00:55	UVIS Stellar Occ	Epsilon Canis Majoris
		end custom period	
+00:55	+01:00	SP Turn to CIRS attitude	NEW WAYPOINT
+01:00	+02:15	CIRS Limb Integration	Far IR
+02:15	+09:00	UVIS EUV FUV	Template X
+09:00	+13:00	VIMS	Template O
+13:00	+14:00	ISS	Template M2
+14:00	C/A + 17:6:48	CIRS	Template M2



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T048 – rev 095 – S46

Dec. 5, 2008 – 340T14:25:45 @ 971 km altitude

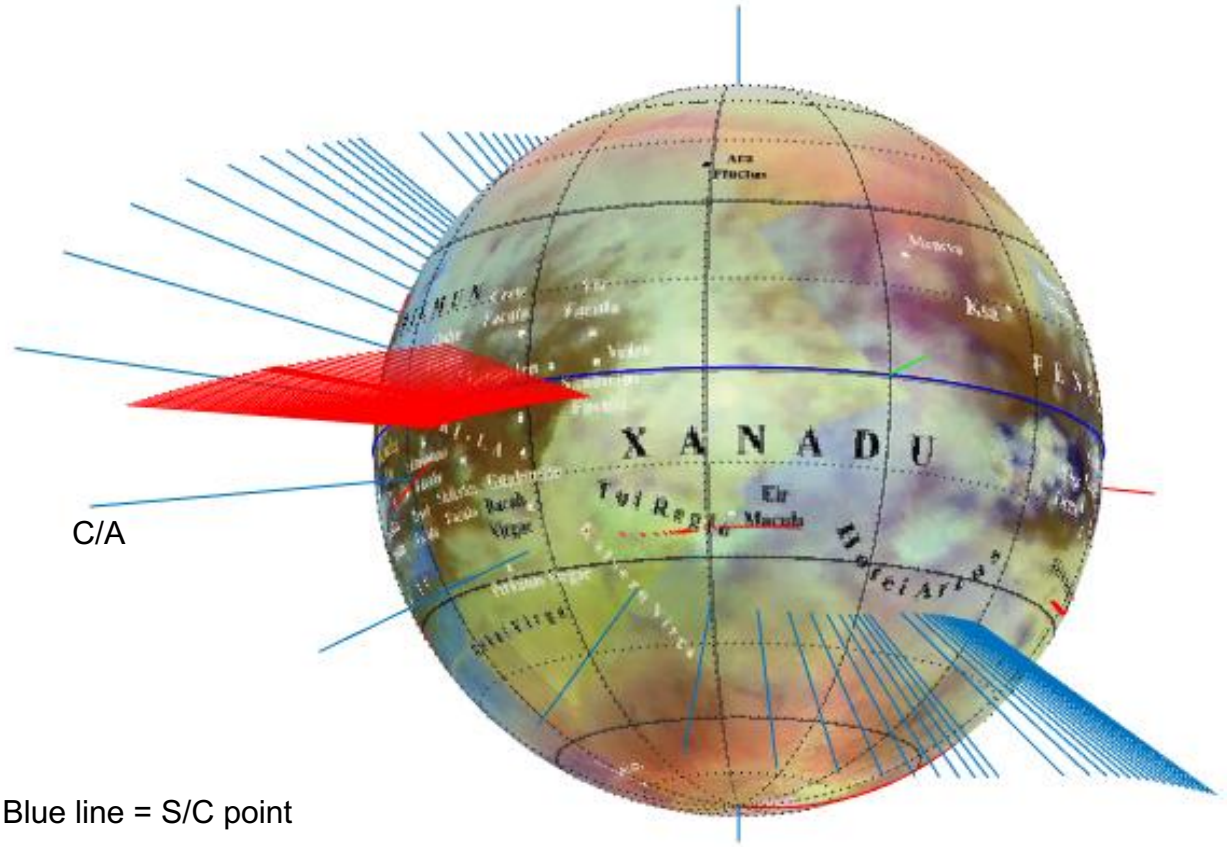
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Cloud and global mapping of Titan.

Observations south of Hotei Arcus and Tui Regio near 38S, 80 W.

Possible stellar occultation.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T048 – rev 095 – S46

Dec. 5, 2008 – 340T14:25:45 @ 971 km altitude

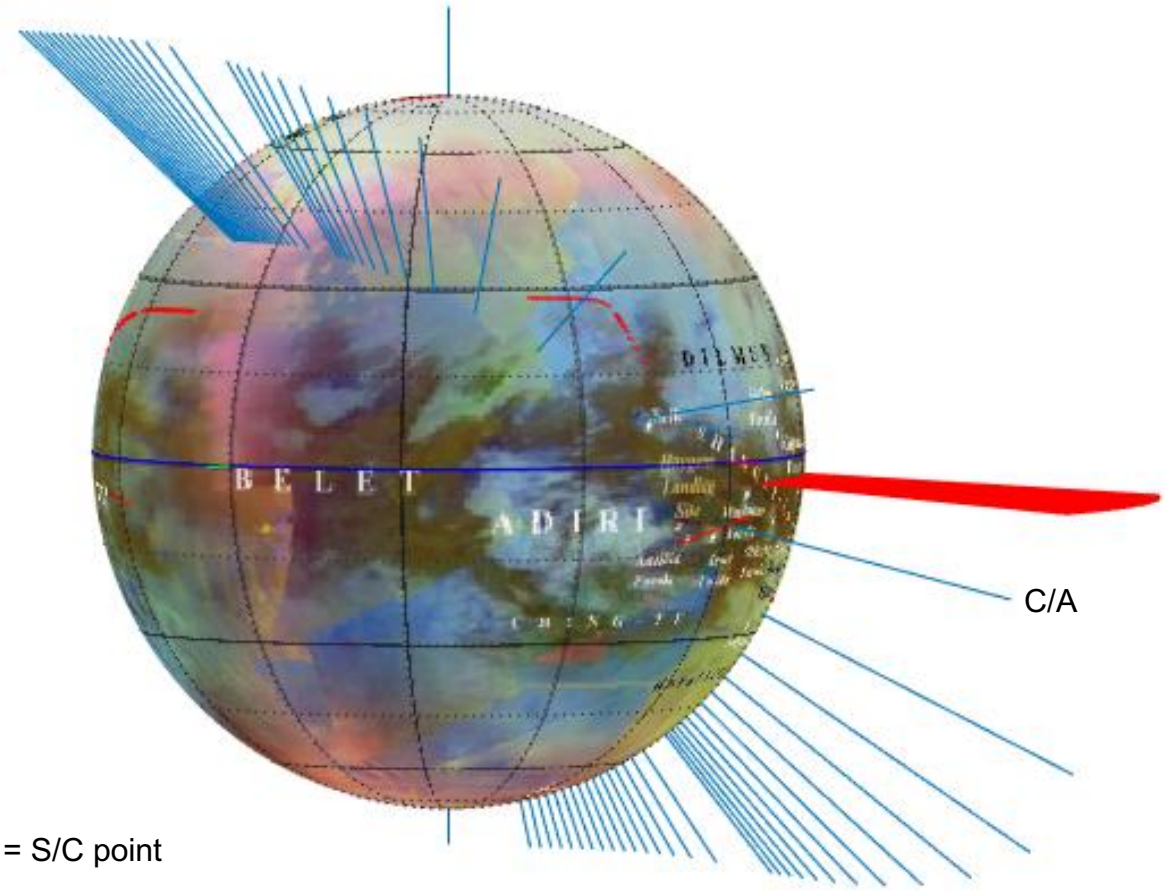
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Cloud monitoring and global mapping of Titan.

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

Specular reflection geometry occurs in the mid-northern latitudes near 28N, 208 W at C/A + 09:00.



Blue line = S/C point

Red line = Subsolar point

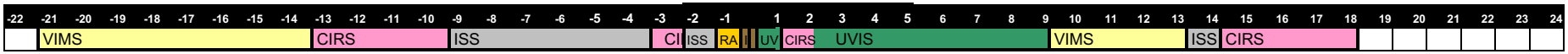
Red dots = location of specular reflection

T048 – rev 095 – S46

Dec. 5, 2008 – 340T14:25:45 @ 971 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at mid-northern latitudes.



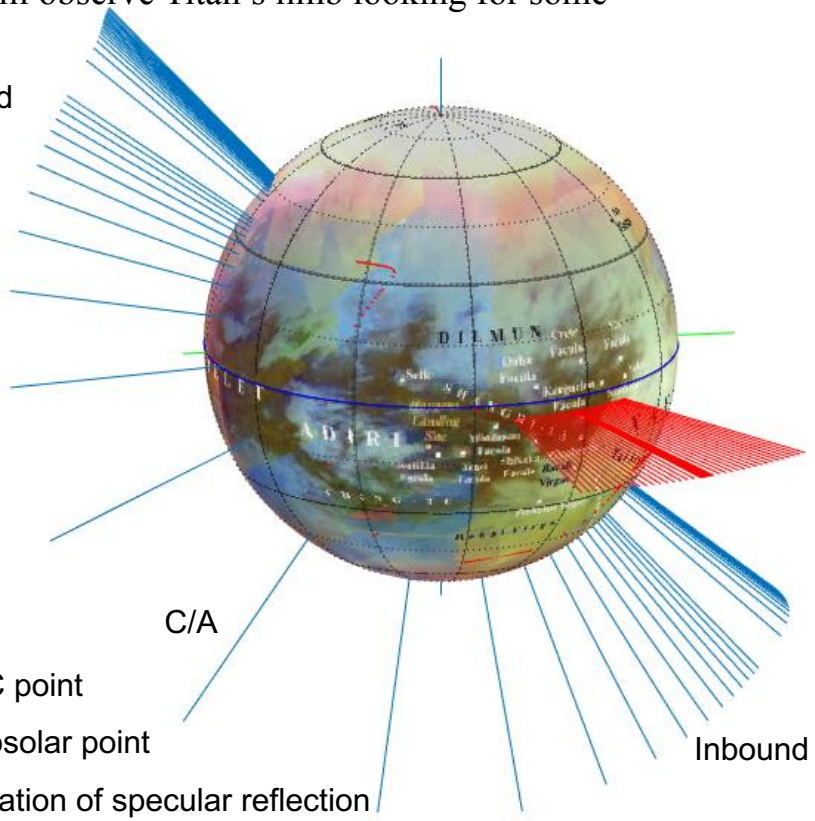
T049 – rev 097 – S46

Dec. 21, 2008 – 356T12:59:52 @ 971 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T049 VIMS Science objectives: VIMS will acquire mid-resolution and high resolution South of Xanadu (45 to 120 W). We expect VIMS to point to Hotei region and to acquire a 2x2 mosaic at 10 km/pixel of this 5 micron bright region. It will then map a part of the Southern hemisphere that has never been mapped at 5 km/pixel. Observation of the bright side will end up by a glance at Ontario lake (-70-75; 180-190 W) if pointing is possible. On the dark side, VIMS will observe Titan's limb looking for some more CO and CH4 emission features.

C/A - 19:35:20	-13:00	CIRS	Template A
-13:00	-09:00	CIRS	Template C
-09:00	-05:00	ISS	Template H
-05:00	**-03:00**	ISS	Template S2
-03:00	**-02:00**	CIRS	Template S2
-02:00	**-00:46**	**VIMS**	
-00:46	**-00:45**	RWA to RCS Transition	
-00:45	-00:24	VIMS	
-00:24	**-00:07**	**RADAR**	**SAR**
-00:07	**0**	**RADAR**	**Altimetry over Ontario**
2008-356T12:59:20		**CLOSEST APPROACH**	**NEG_Z to Titan, NEG_X to RAM**
0	**+00:18**	**RADAR**	**SAR**
+00:18	**+00:30**	**RADAR**	**Altimetry**
+00:30	**+00:50**	**RADAR**	**HiSAR + Alt (Radiometry?)**
+00:50	**+01:12**	**RCS to RWA Transition**	
+01:12	**+02:00**	**RADAR**	**Radiometry**
+02:00	**+05:30**	**RADAR**	**Template L**
+05:30	**+09:00**	**CIRS (FP3/FP4)**	**Template R**
+09:00	+13:00	VIMS	Template O
+13:00	+13:30	ISS (stare)	Template M2
+13:30	+17:00	CIRS	Template M2
+17:00	+17:30	ISS (stare)	Template M2



T049 – rev 097 – S46

Dec. 21, 2008 – 356T12:59:52 @ 971 km altitude

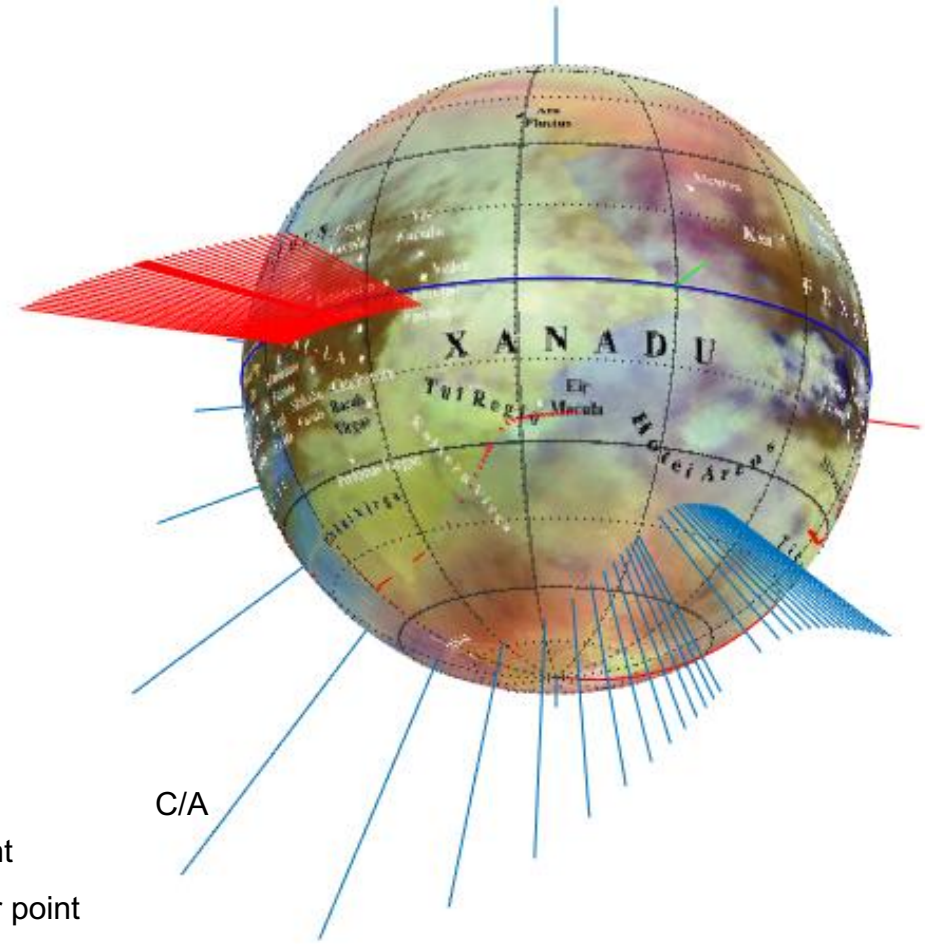
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Cloud and global mapping of Titan.

Acquire mosaics of the regions south of Xanadu and Hotei Arcus (45S, 90 W).

Attempt observations of Ontario Lacus (72S, 183 W).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T049 – rev 097 – S46

Dec. 21, 2008 – 356T12:59:52 @ 971 km altitude

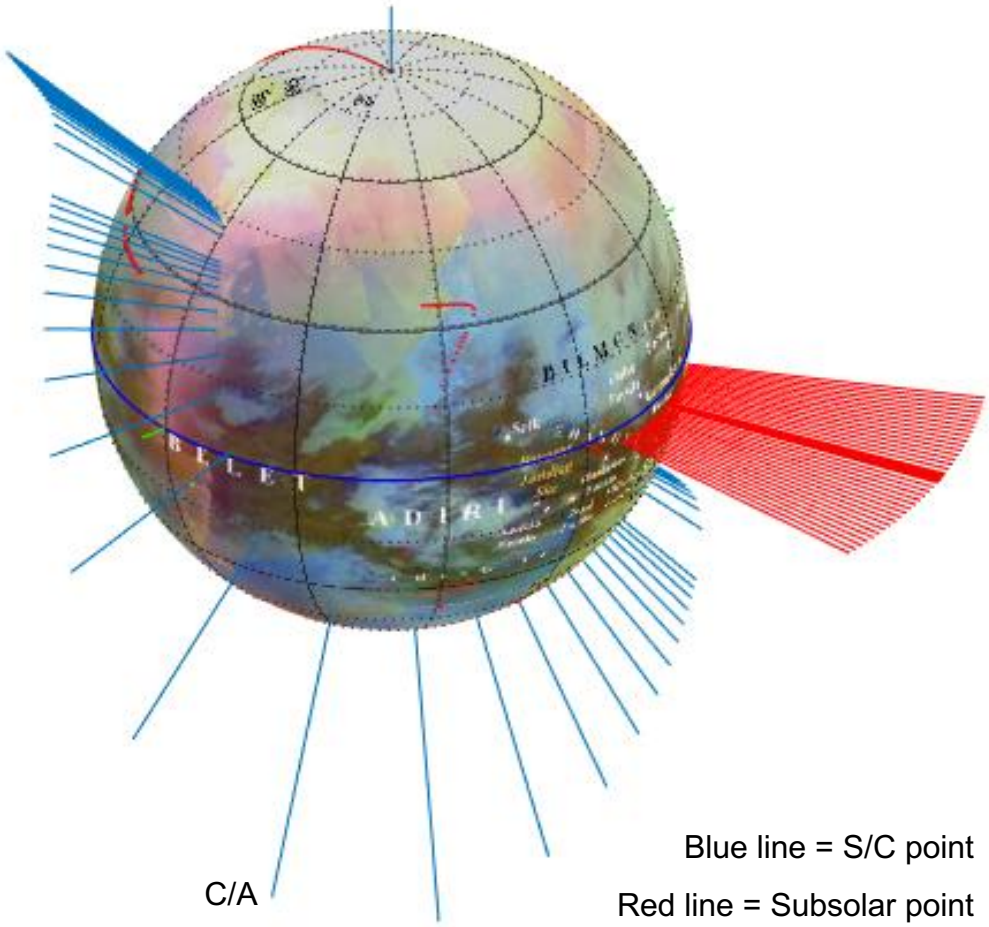
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Cloud monitoring and global mapping of Titan.

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

Specular reflection geometry occur in the mid-northern latitudes near 34N, 206 W at C/A + 09:00.

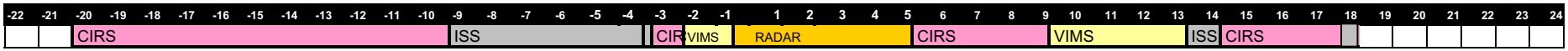


T049 – rev 097 – S46

Dec. 21, 2008 – 356T12:59:52 @ 971 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at mid-northern latitudes.



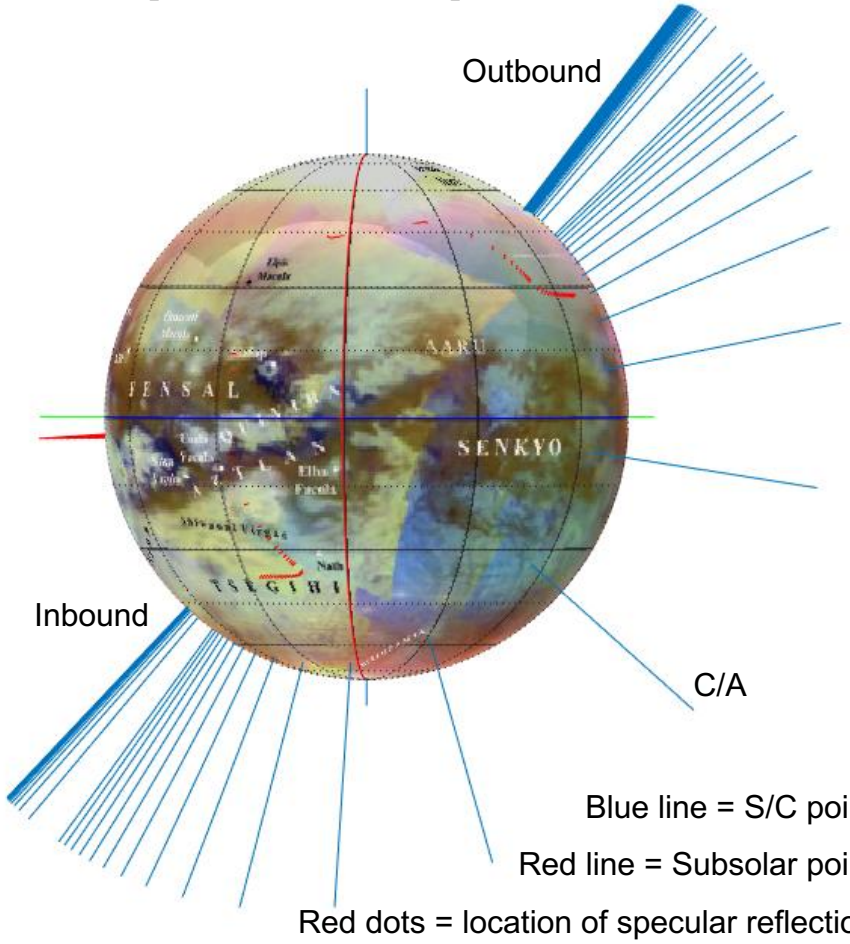
T050 – rev 102 – S47

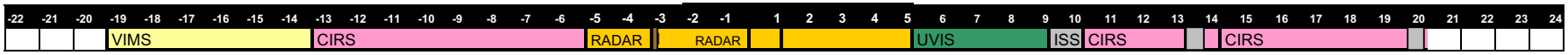
Feb. 7, 2009 – 038T08:50:52 @ 967 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T050 VIMS Science objectives: During T50, VIMS will observe Titan from a large distance and will conduct cloud mapping. It will ride along with other instruments to probe Titan?s atmosphere at the limb.

C/A - 18:36:20	-13:00	VIMS	Template B
-13:00	-09:30	CIRS	Template C (short)
-09:30	-05:30	CIRS	Template F (full)
		Begin custom period	
-05:30	-05:00	RADAR Turn to RADAR attitude	
-05:00	**-02:00**	RADAR	Template L
-02:00	**-01:12**	**RADAR**	**Scatterometry/Radiometry**
-01:12	**-00:50**	**RWA to RCS Transition**	
-00:50	**-00:30**	**RADAR**	**Hi-SAR**
-00:30	**-00:18**	**RADAR**	**Altimetry**
-00:18	**-00:12**	**Turn to INMS attitude**	**Check turn times**
-00:12	**0**	**INMS**	
2009-038T08:50:20		**CLOSEST APPROACH**	**+/- 3 mins RADAR SAR Ride along NEG_X to RAM, NEG_Z to Titan**
0	**+00:12**	**INMS**	
+00:12	**+00:18**	**Turn to RADAR attitude**	**Check turn times**
+00:18	**+00:30**	**RADAR**	**Altimetry**
+00:30	**+00:50**	**RADAR**	**Hi-SAR**
+00:50	**+01:14**	**RCS to RWA Transition**	
+01:14	**+02:00**	**RADAR**	**Scatterometry/Radiometry**
+02:00	**+05:30**	RADAR	Template L
+05:30	+06:00	RADAR Turn to Waypoint attitude	
		end custom period	
+06:00	+09:00	UVIS	Template P
+09:00	+10:00	ISS	Template N
+10:00	+13:00	CIRS	Template N
+13:00	+13:30	ISS (stare)	Template M2
+13:30	C/A + 18	CIRS	Template M2
C/A + 18	**C/A + 18:33:40**	ISS (stare)	Template M2





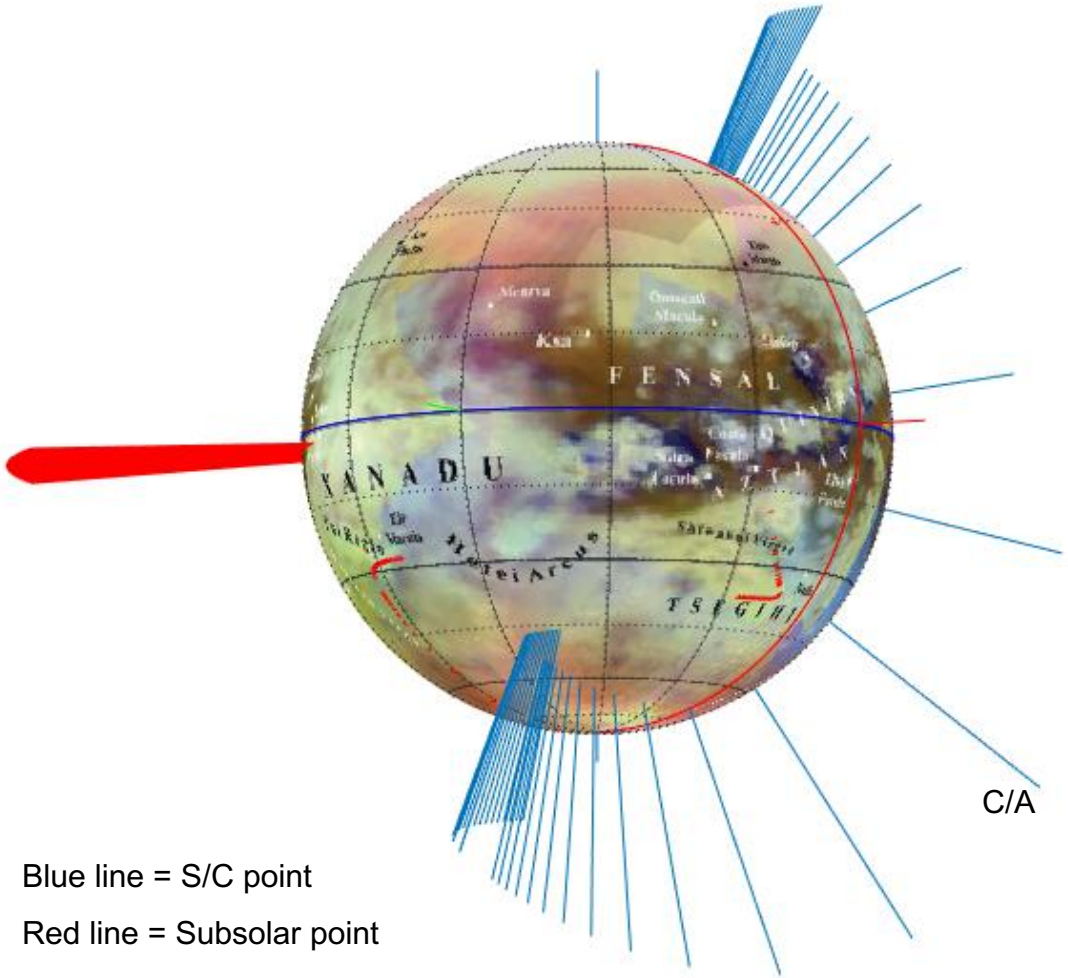
T050 – rev 102 – S47

Feb. 7, 2009 – 038T08:50:52 @ 967 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

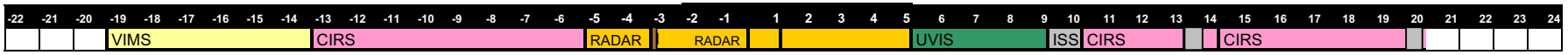
Cloud and global mapping.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T050 – rev 102 – S47

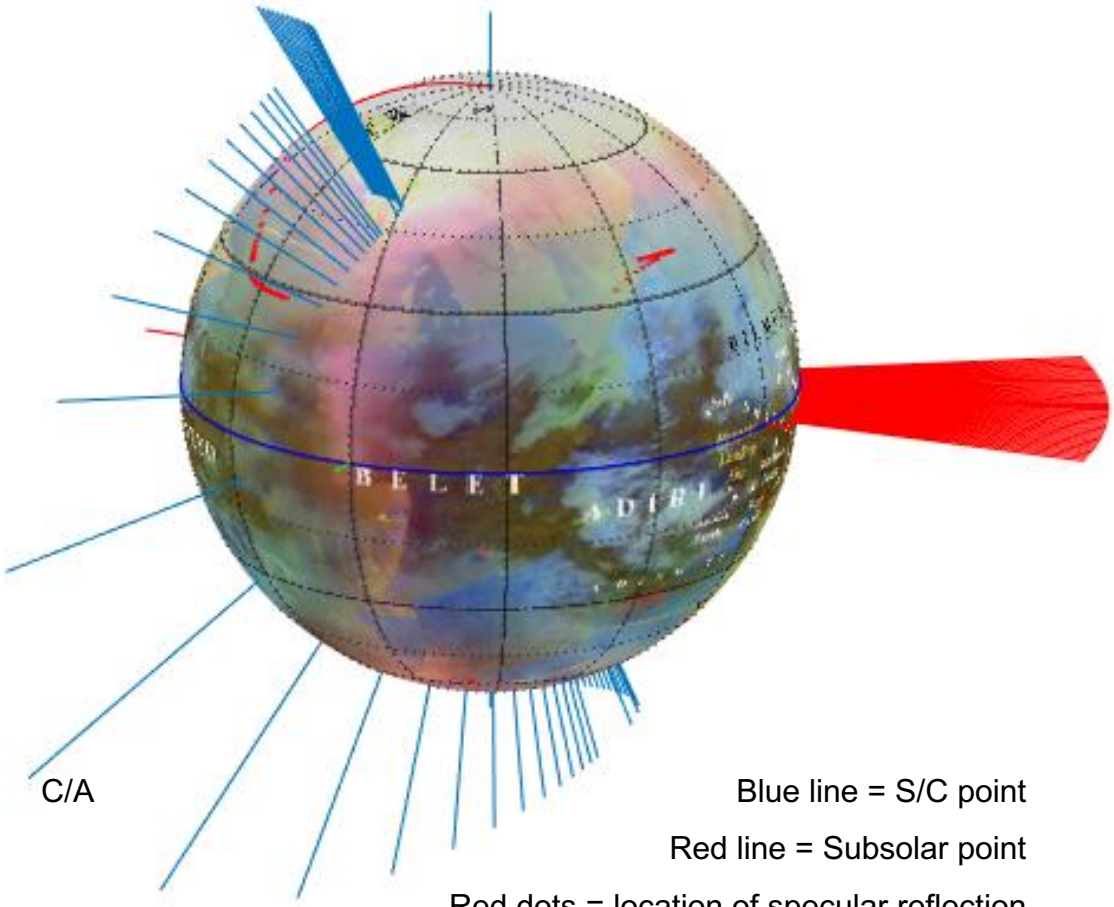
Feb. 7, 2009 – 038T08:50:52 @ 967 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Cloud and global mapping of Titan.

Specular reflection points near
37N, 200 W at C/A + 10:00.

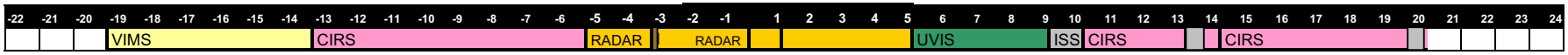


C/A

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

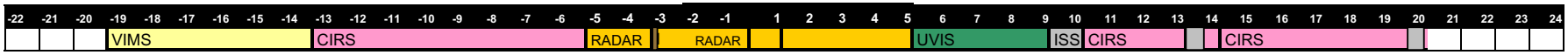


T050 – rev 102 – S47

Feb. 7, 2009 – 038T08:50:52 @ 967 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at mid-northern latitudes.



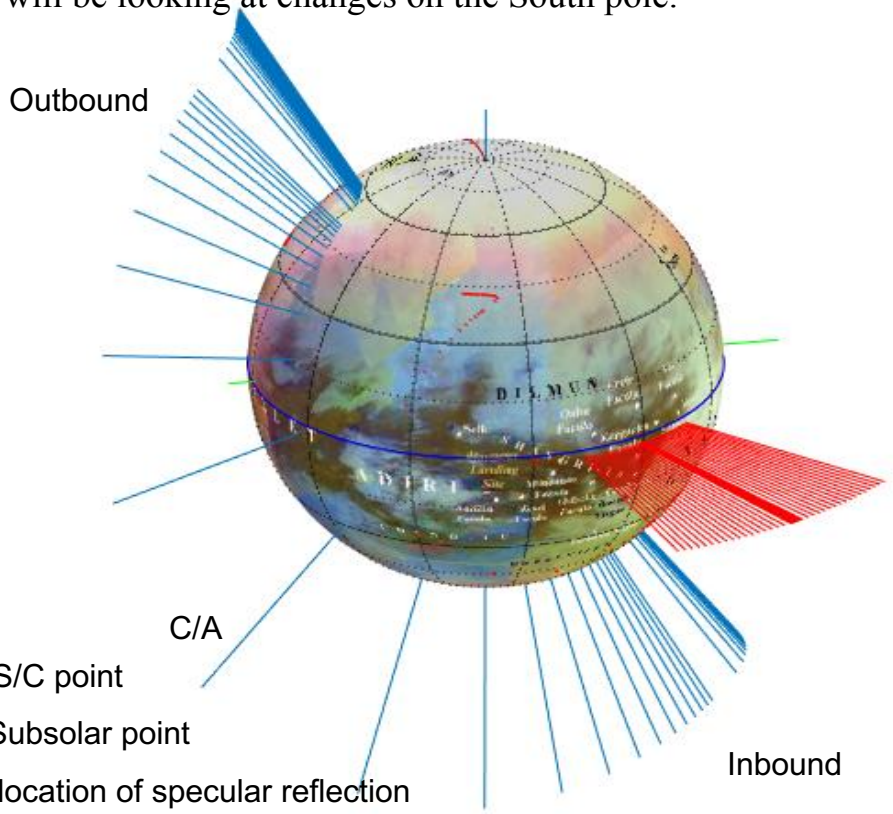
T051 – rev 106 – S49

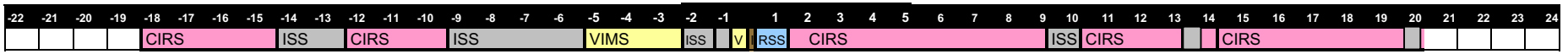
March 27, 2009 – 86T04:43:37 @ 963 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T051 VIMS Science objectives: VIMS will monitor tropical clouds. VIMS will do a mosaic of an area West of Tsegihi (30-60South, 60-100 W) at a resolution between 5 and 10 km per pixel. Then, VIMS will point to Ontario lake (-75, 180W) 20 minutes before closest approach and will perform the same kind of pointing with different emergence angles that has been successful during the T38 observation in order to obtain high quality spectra of the lake surface (VIMS106_HIGHRES001_PRIME). VIMS will be looking at changes on the South pole.

C/A - 17:43:5	-14:00	CIRS	Template A
-14:00	-12:00	ISS	Template D2
-12:00	-09:00	CIRS	Template D2
-09:00	-05:00	ISS	Template H
-05:00	-02:00	VIMS	Template Y
		begin custom period	
-02:00	-00:52	ISS	
-00:52	-00:30	RWA to RCS Transition	Push in to C/A for ISS (?)
-00:30	-00:15	VIMS	Neg_Y to Titan; Neg X to Sun
-00:15	X	Turn to VIMS C/A attitude	
X	0	VIMS	Neg_Y to Titan; Neg_X to RAM
2009-086T04:43:05		CLOSEST APPROACH	
0	+00:15	INMS	Neg_X to RAM, Neg_Y to Titan
+00:15	+00:23	Turn to RSS Bistat Attitude	
+00:23	+01:20	RSS Bistat	Xband to Titan; then Xband to Earth (secondary to be determined)
+01:20	+01:28	RSS turn to Neg Y to Titan, Neg X to RAM	IF NECESSARY
		end custom period	
+01:28	+01:52	RCS to RWA Transition	
+01:52	+05:00	CIRS	Template T
+05:00	+09:00	CIRS	Mid-IR Limb Template R
+09:00	+10:00	ISS	Template N
+10:00	+13:00	CIRS	Template N
+13:00	+13:30	ISS (stare)	Template M2
+13:30	C/A + 18:42	CIRS	Template M2
C/A + 18:42	C/A + 19:12	ISS (stare)	Template M2





T051 – rev 106 – S49

March 27, 2009 – 86T04:43:37 @ 963 km altitude

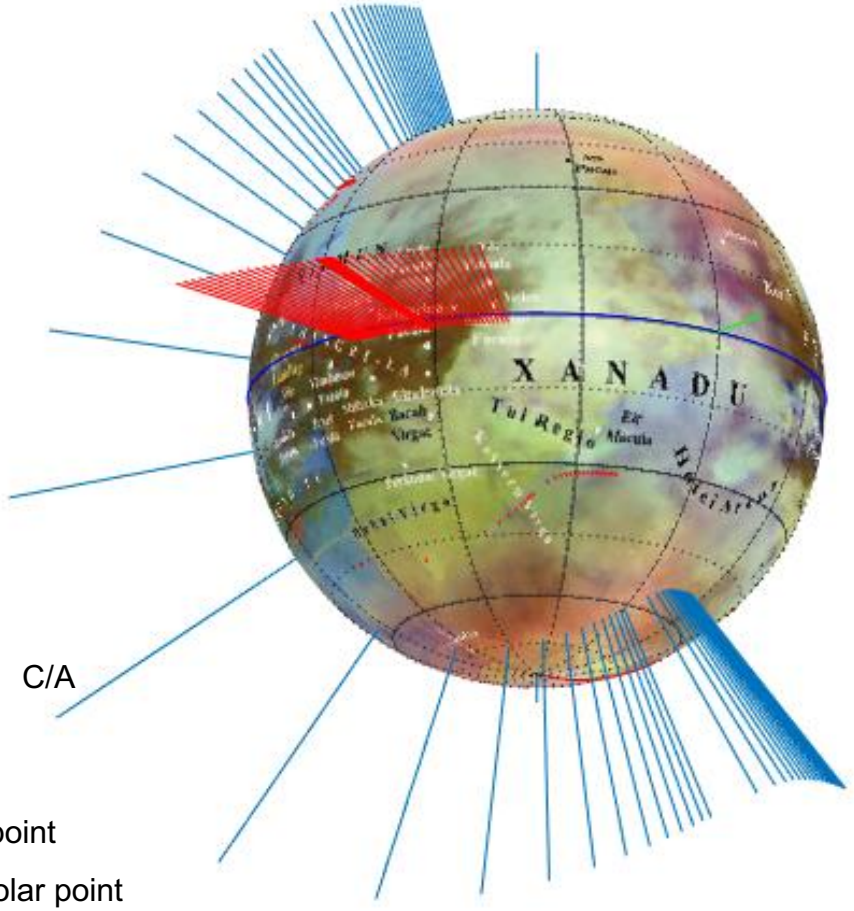
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global and high resolution, regional mapping of Titan.

Observe Ontario Lacus (72S, 183 W) and the south polar regions.

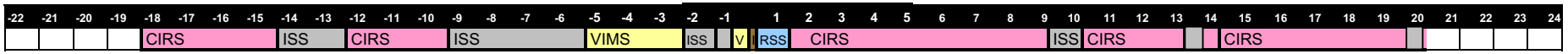
Obtain mosaics of the region near Tsegihi (40S, 10 W).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T051 – rev 106 – S49

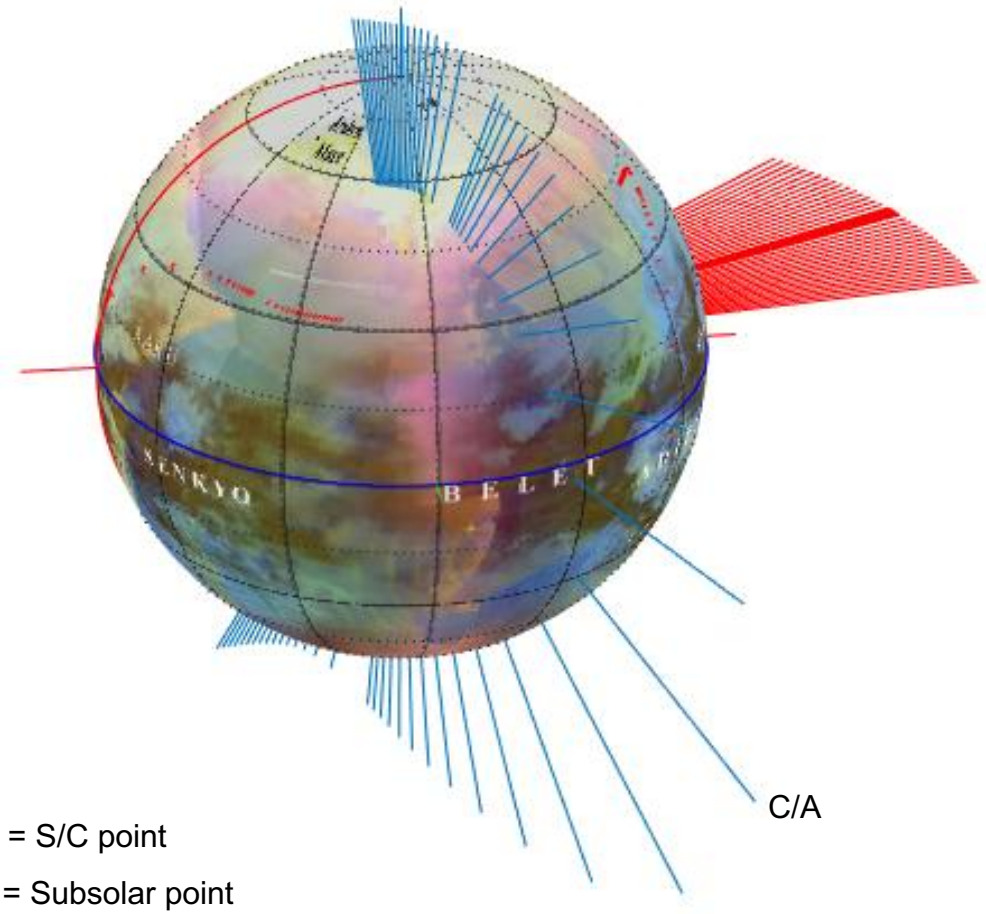
March 27, 2009 – 86T04:43:37 @ 963 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Cloud monitoring.

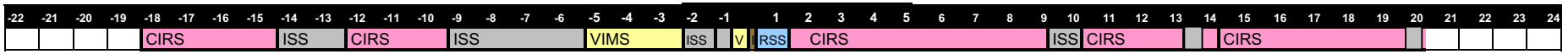
Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

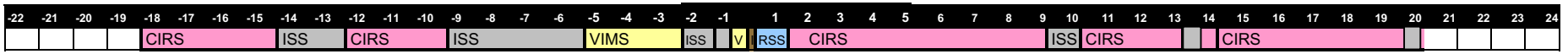


T051 – rev 106 – S49

March 27, 2009 – 86T04:43:37 @ 963 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-southern latitudes. After C/A, at mid-northern latitudes.



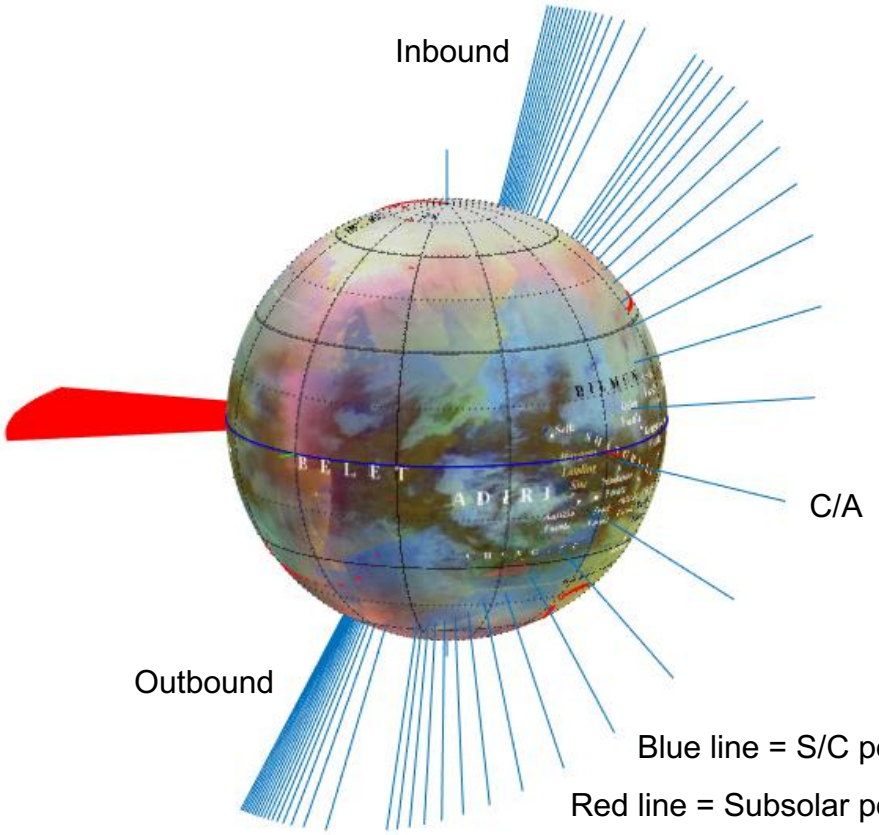
T052 – rev 108 – S49

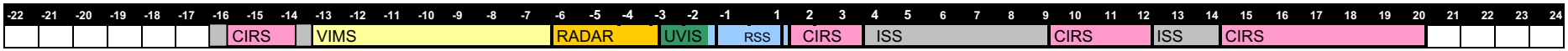
Apr. 4, 2009 – 94T01:47:48 @ 4147 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T052 VIMS Science objectives: T52 is not a high-priority flyby for VIMS. Day-time observations occur with CIRS ridealong 2 hours after closest approach. A monitoring of tropical clouds will be achieved and we may get images at 20 km/pixel resolution of an area located in the southern hemisphere close to the South pole (30-90 South, 240 – 300 W).

C/A - 15:18:13	-13:30	CIRS	Template M2
-13:30	-13:00	ISS	Template M2
-13:00	**-09:00**	VIMS	Template O
-09:00	**-06:20**	VIMS	Template Q*
-06:20		Begin custom period	
-06:20	**-05:50**	Turn to RADAR attitude	
-05:50	**-4:20**	RADAR	Template L
-4:20	**-04:19**	**RWA to RCS Transition**	**RSS Bistatic + Occ requires RCS because of turn times**
-04:19	**-03:20**	RADAR	Template L
-3:20	**-01:20**	**UVIS Stellar Occ**	
-01:20	**-00:22**	**RSS Bistat**	
-00:22	**0**	**RSS Occ**	
2009-094T01:47:48		**CLOSEST APPROACH**	
0	**+00:12**	**RSS Occ**	
+00:12	**+01:28**	**RSS Bistat**	
+1:28		End custom period	
+01:28	**+01:52**	**RCS to RWA Transition**	**VIMS pointing (waypoint is fine)**
+01:50	+3:30	CIRS	Template S2
+3:30	+5:00	ISS	Template S2
+5:00	+09:00	ISS	Template H
+09:00	+12:00	CIRS	Template D2
+12:00	+14:00	ISS	Template D2
+14:00	C/A + 21:36:47	CIRS	Template A





T052 – rev 108 – S49

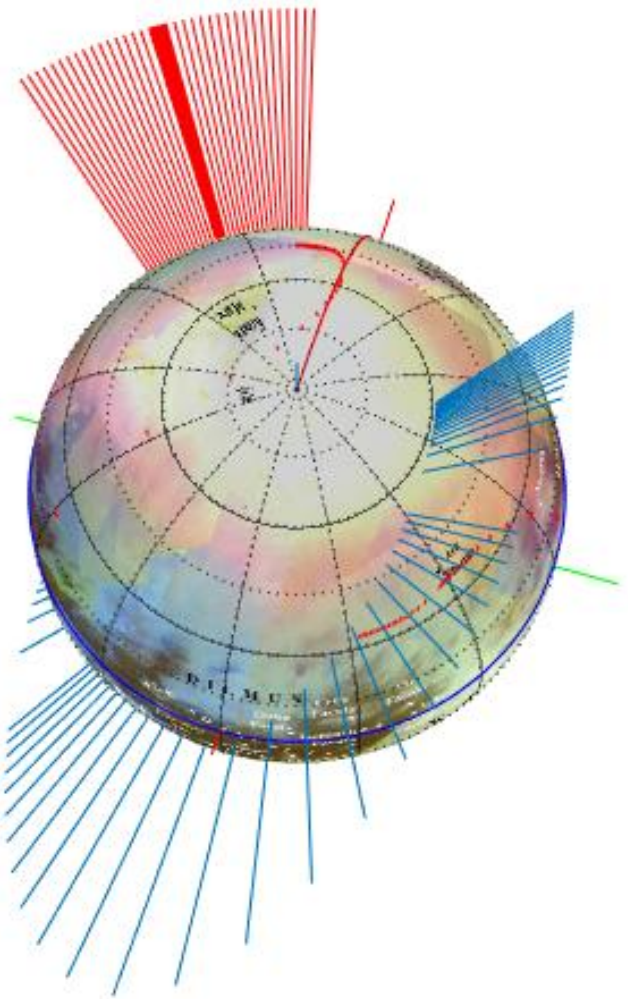
Apr. 4, 2009 – 94T01:47:48 @ 4147 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection at mid-northern latitudes (44N, 350 W) during VIMS prime observation.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

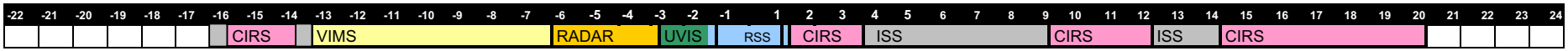


Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A



T052 – rev 108 – S49

Apr. 4, 2009 – 94T01:47:48 @ 4147 km altitude

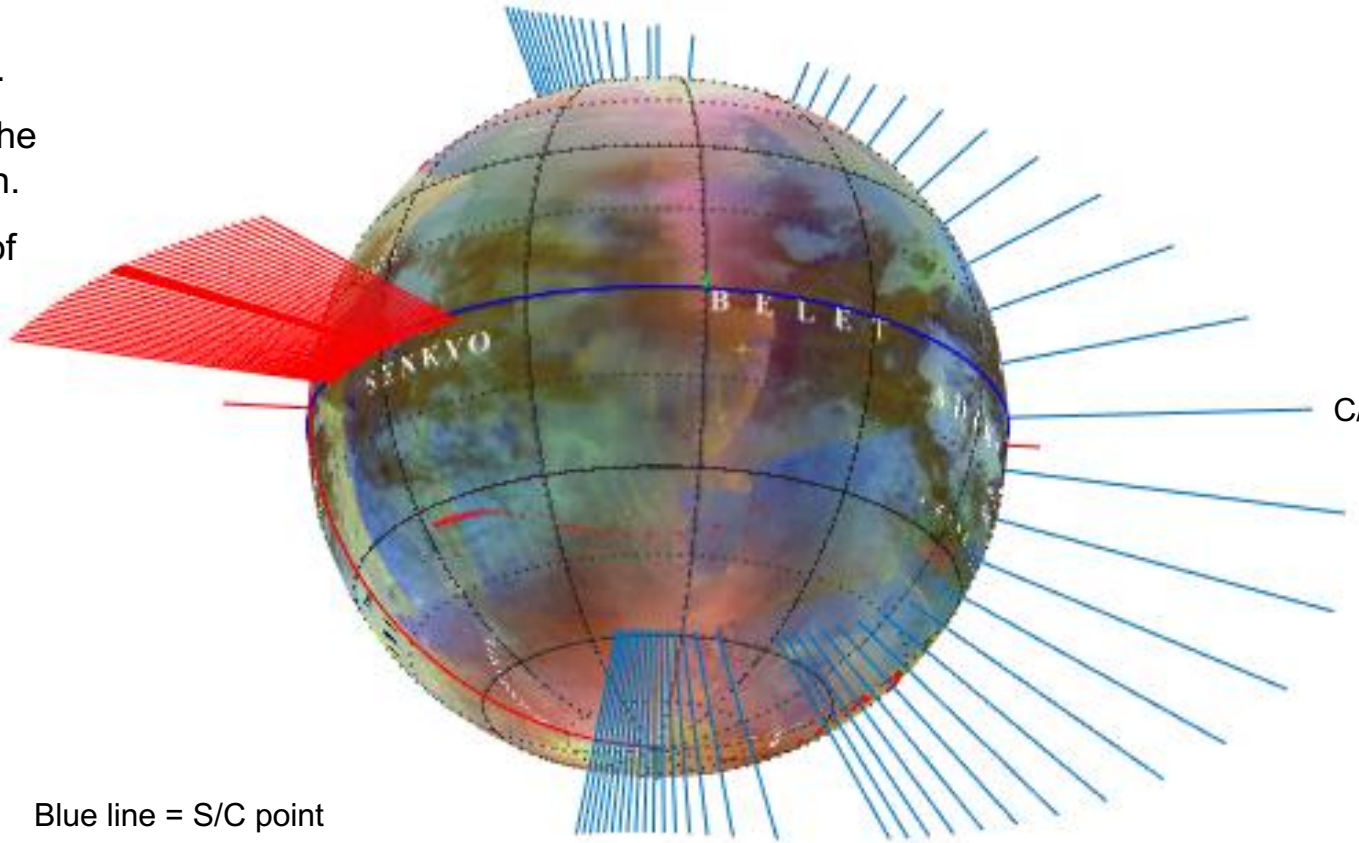
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Cloud monitoring.

Observations of the South Pole region.

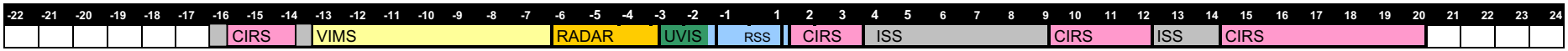
Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



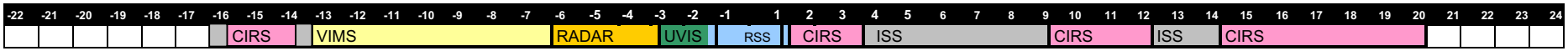
T052 – rev 108 – S49

Apr. 4, 2009 – 94T01:47:48 @ 4147 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular reflection geometry occurs at high northern latitudes at C/A - 00:40 -> C/A - 00:10, but this is during the RSS observations.

Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at mid-southern latitudes.



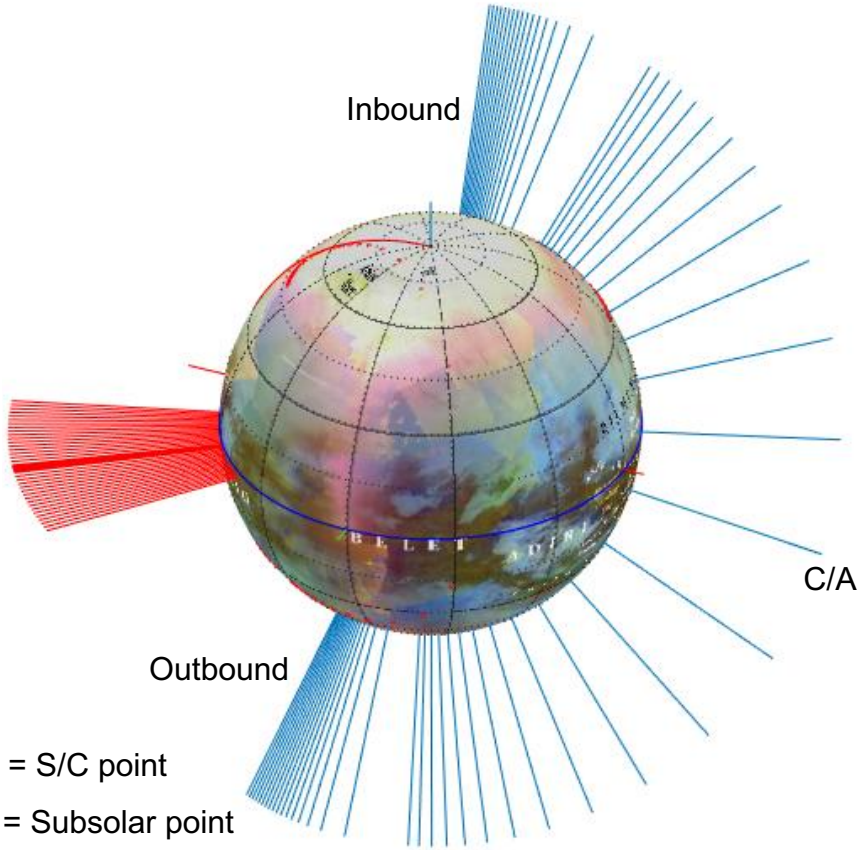
T053 – rev 109 – S49

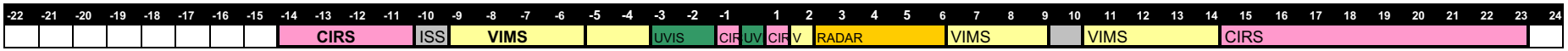
Apr. 20, 2009 – 110T00:20:46 @ 3599 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T053 VIMS Science objectives: VIMS will get information on the composition of Titan's atmosphere during the stellar and the solar occultations before and during closest approach. After closest approach, it will acquire a mosaic of the southern hemisphere between 240-300 west longitudes at a resolution of 20 km/pixel. It will look for changes in the atmosphere.

C/A - 15:7:3	-13:00	CIRS	Template M4
-13:00	-10:00	CIRS	Template N
-10:00	-09:00	ISS	Template N
-09:00	-05:00	VIMS	Template Q
-05:00	**-03:00**	VIMS	Template Y
begin custom period			
-03:00	**-01:35**	**UVIS**	**Stellar Occ (Alpha Eri)**
-01:35	**-00:10**	**CIRS**	
-00:10	**0**	**UVIS**	**Solar Occ**
2009-110T00:20:03		**CLOSEST APPROACH**	**UVIS Solar Port to SUN, Neg-X to Co-Rotation RAM(?)**
0	**+00:26**	**UVIS**	**Solar Occ**
+00:26	**+01:15**	**CIRS**	
+01:15	**+01:35**	**Turn to VIMS**	**Turn time goes to VIMS**
+01:35	**+02:00**	**VIMS**	
end custom period			
+02:00	+06:00	RADAR	Template L*
+06:00	+08:30	VIMS	Template I
+08:30	+09:00	ISS	Template I
+09:00	+14:00	VIMS	Template V
+14:00	C/A + 22	CIRS	Template A





T053 – rev 109 – S49

Apr. 20, 2009 – 110T00:20:46 @ 3599 km altitude

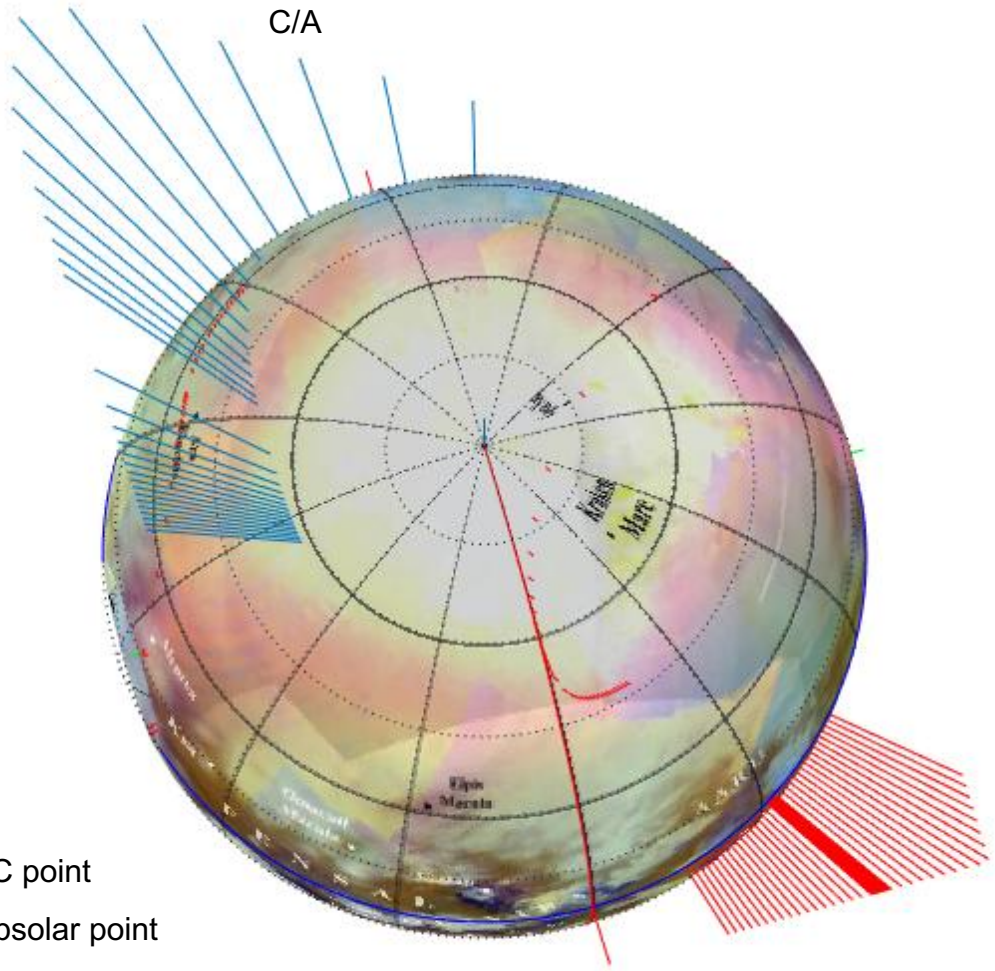
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

VIMS prime observations begin at C/A – 09:00 for global and regional mapping.

Specular reflections occur in north polar regions, including Kraken and Ligeia Mares prior to C/A.

Ridealong with UVIS for solar occultation during C/A and stellar occultation at C/A -03:00



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

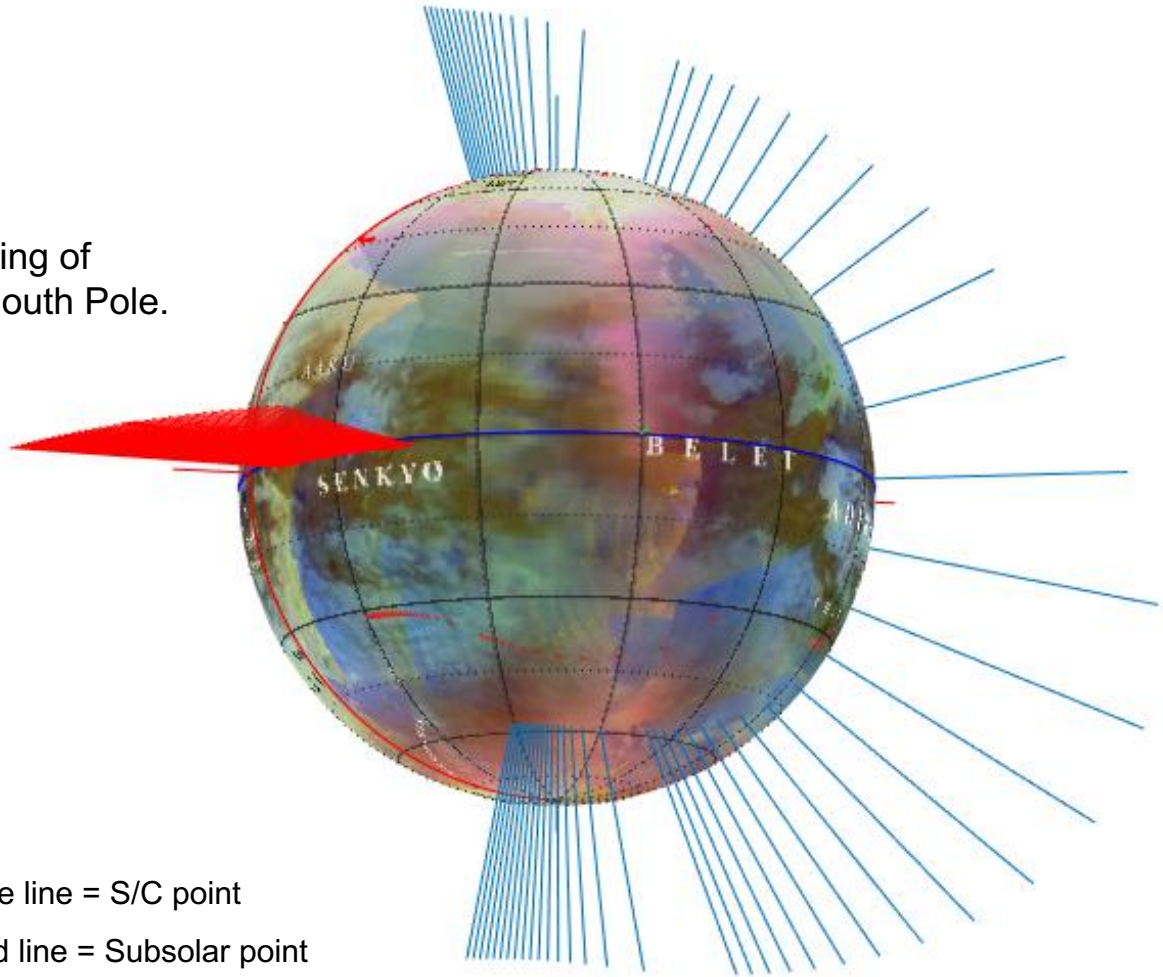
T053 – rev 109 – S49

Apr. 20, 2009 – 110T00:20:46 @ 3599 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional and global mapping of Titan, particularly Titan's South Pole.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

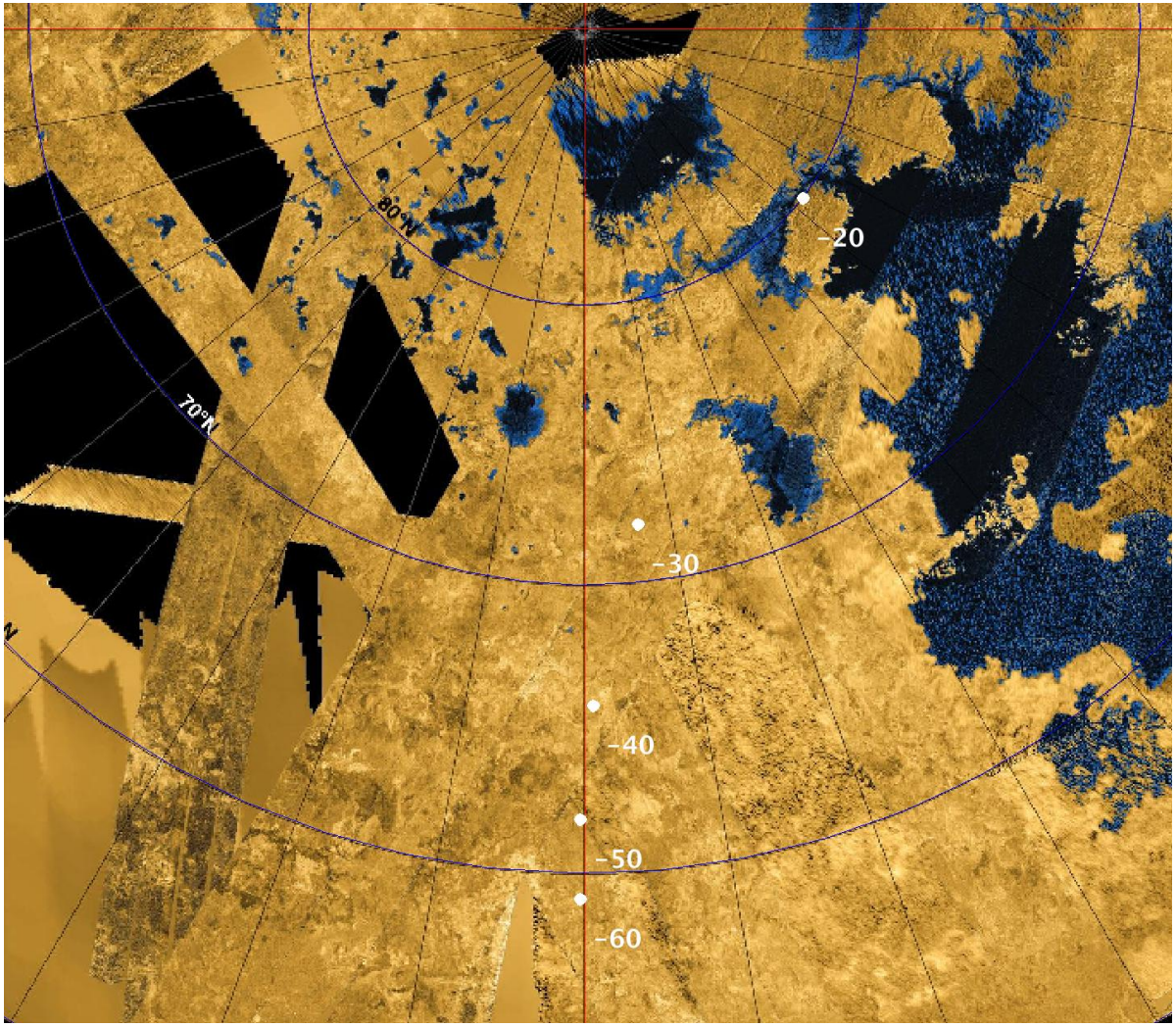
T053 – rev 109 – S49

Apr. 20, 2009 – 110T00:20:46 @ 3599 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (min)
59.14	360.3	66.3	-3600	-60.0
61.84	360.3	68.4	-3000	-50.0
65.77	359.3	71.3	-2400	-40.0
72.03	353.9	75.6	-1800	-30.0
79.99	307.7	82.1	-1200	-20.0



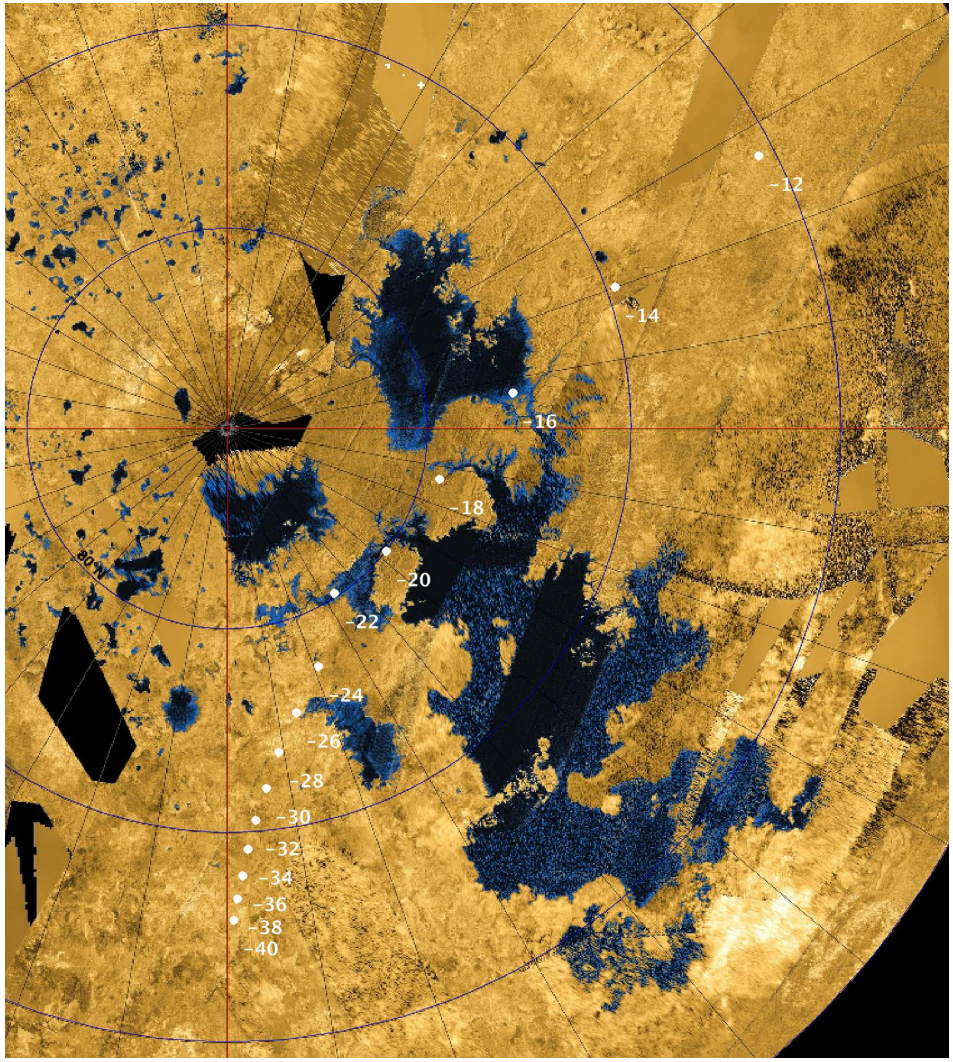
T053 – rev 109 – S49

Apr. 20, 2009 – 110T00:20:46 @ 3599 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (min)
65.77	359.3	71.3	-2400	-40.0
66.78	358.8	72.0	-2280	-38.0
67.89	358.1	72.8	-2160	-36.0
69.15	357.2	73.6	-2040	-34.0
70.55	355.9	74.6	-1920	-32.0
72.03	353.9	75.6	-1800	-30.0
73.71	351.0	76.7	-1680	-28.0
75.45	346.4	77.9	-1560	-26.0
77.30	339.1	79.2	-1440	-24.0
80.20	327.0	81.8	-1320	-22.0
79.99	307.7	82.1	-1200	-20.0
79.13	283.4	83.7	-1080	-18.0
75.69	262.8	85.4	-960	-16.0
69.58	249.9	87.1	-840	-14.0
60.76	242.8	88.7	-720	-12.0



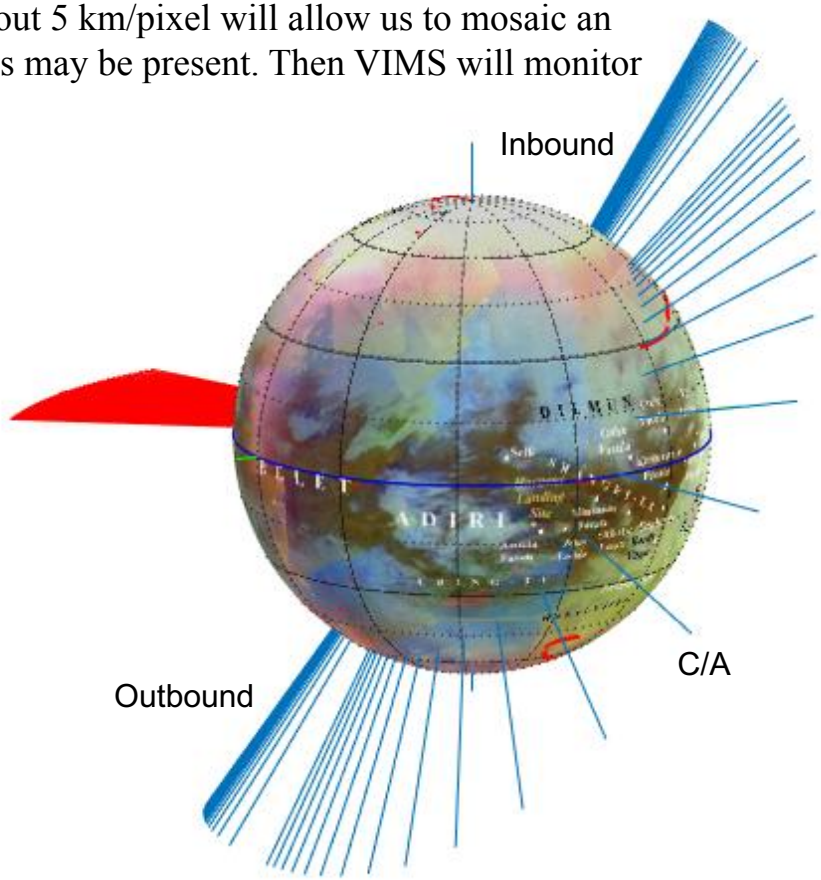
T054 – rev 110 – S50

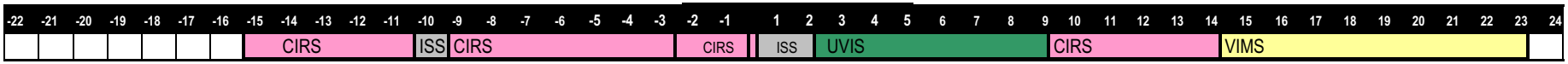
May 5, 2009 – 125T22:54:16 @ 3242 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T054 VIMS Science objectives: On the inbound, the phase angle is much larger than 90 degrees and VIMS ridealong observations will provide information on Titan's atmosphere composition. After C/A, VIMS will observe the South Pole region and will look for variations at the surface and in the atmosphere. During the ridealong observation with ISS, high resolution images at about 5 km/pixel will allow us to mosaic an area between 250 and 260 long and 60 to 70 S lat where lakes may be present. Then VIMS will monitor the tropical clouds in the Southern hemisphere.

C/A - 14:42:29	-13:00	CIRS	Template M4
-13:00	-10:00	CIRS	Template N
-10:00	-09:00	ISS	Template N
-09:00	-05:10	CIRS	Template R
-05:10	-04:50	SP turn to WP	NEG_Y to Titan, NEG_X to RA/Dec (58, 24)
-04:50		Begin custom period	
-04:50	-02:15	CIRS	Template T
-02:15	**0**	**CIRS**	
2009-125T22:54:16		**CLOSEST APPROACH**	
0	**+00:25**	**CIRS**	
+00:25	**+02:00**	**ISS**	
+02:00		End custom period	
+02:00	**+09:00**	**UVIS**	**Template X**
+09:00	**+14:00**	**CIRS**	**Template C**
+14:00	**C/A + 22:27:00**	**VIMS**	**Template B**





T054 – rev 110 – S50

May 5, 2009 – 125T22:54:16 @ 3242 km altitude

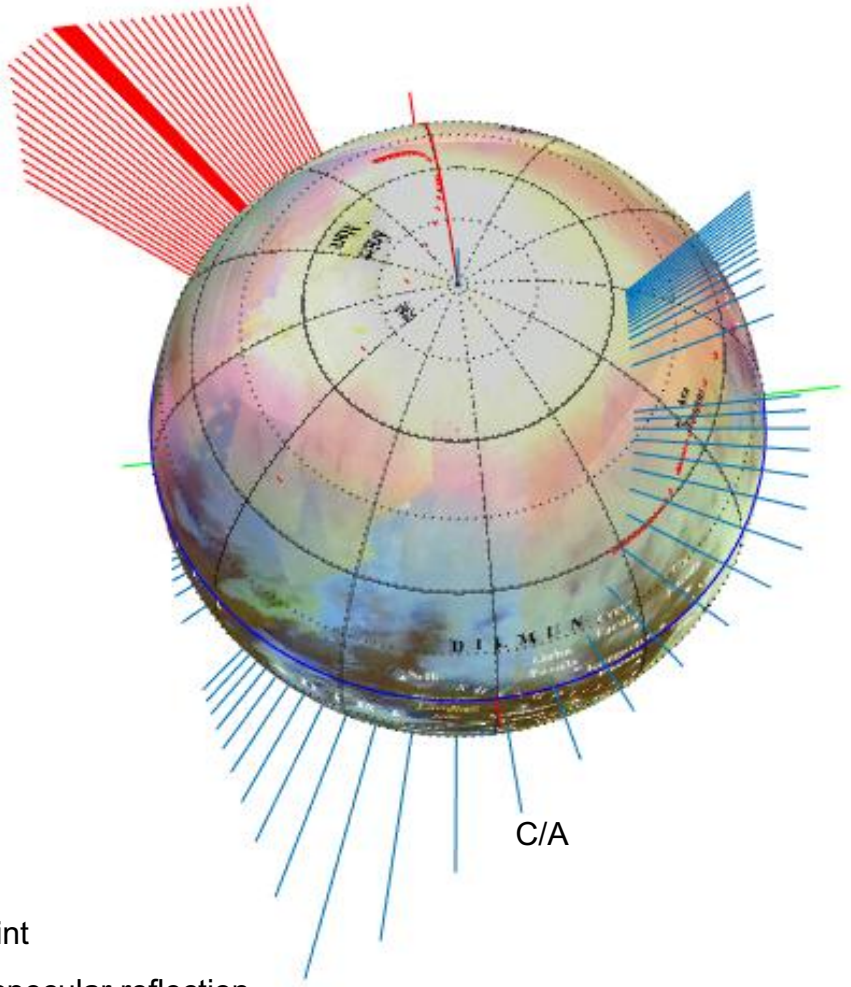
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection at mid-northern latitudes on the inbound (~50N, 350 W).

Specular reflection over northern latitudes, including Ligeia Mare, prior to closest approach (78N, 263 W at C/A – 00:18).

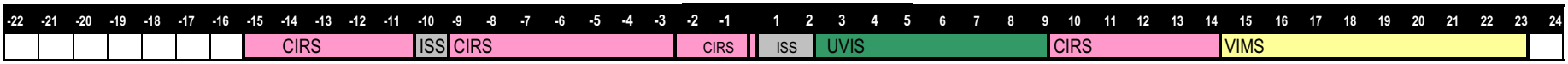
Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T054 – rev 110 – S50

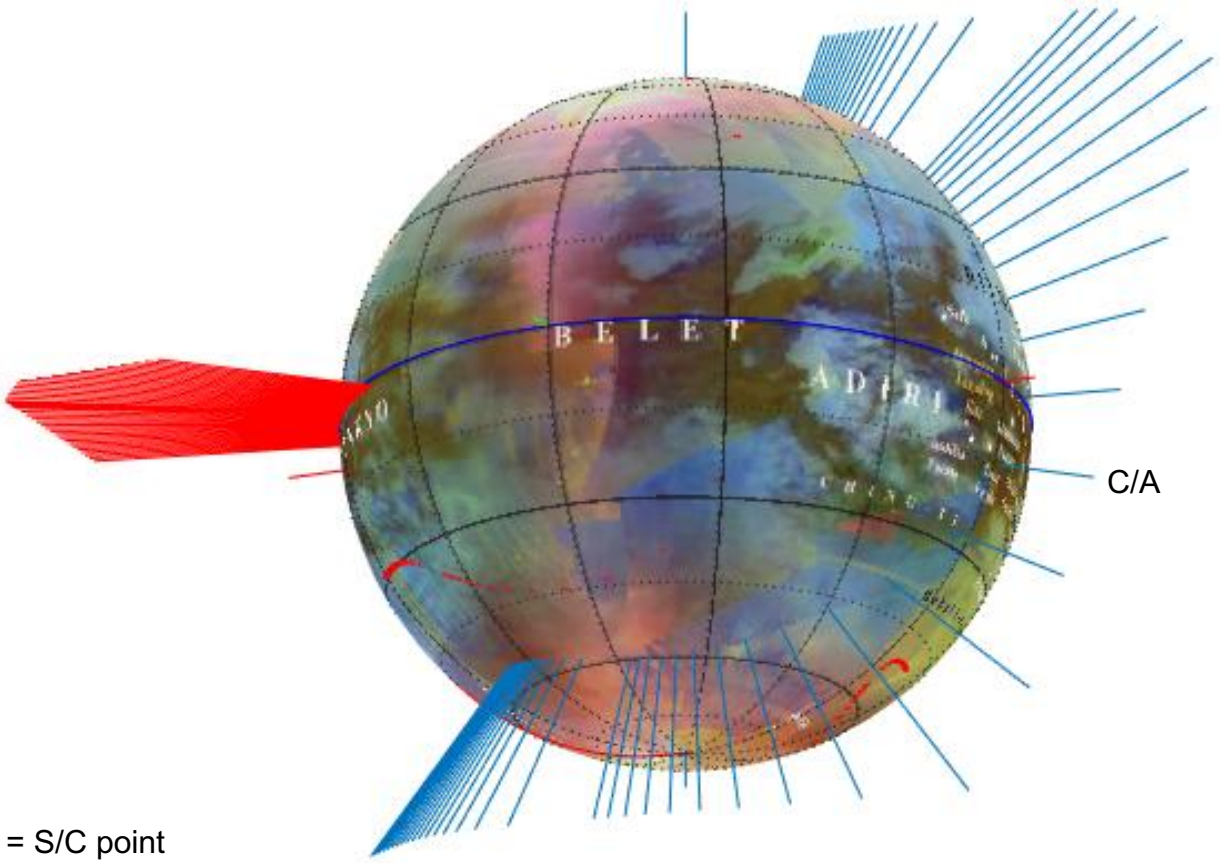
May 5, 2009 – 125T22:54:16 @ 3242 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional and global mapping of Titan.

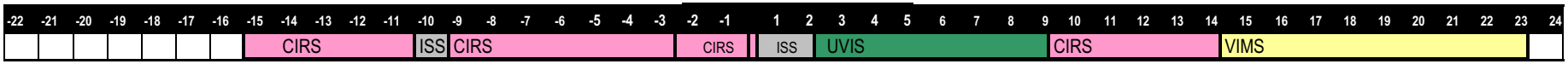
Obtain observations of the South Pole of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



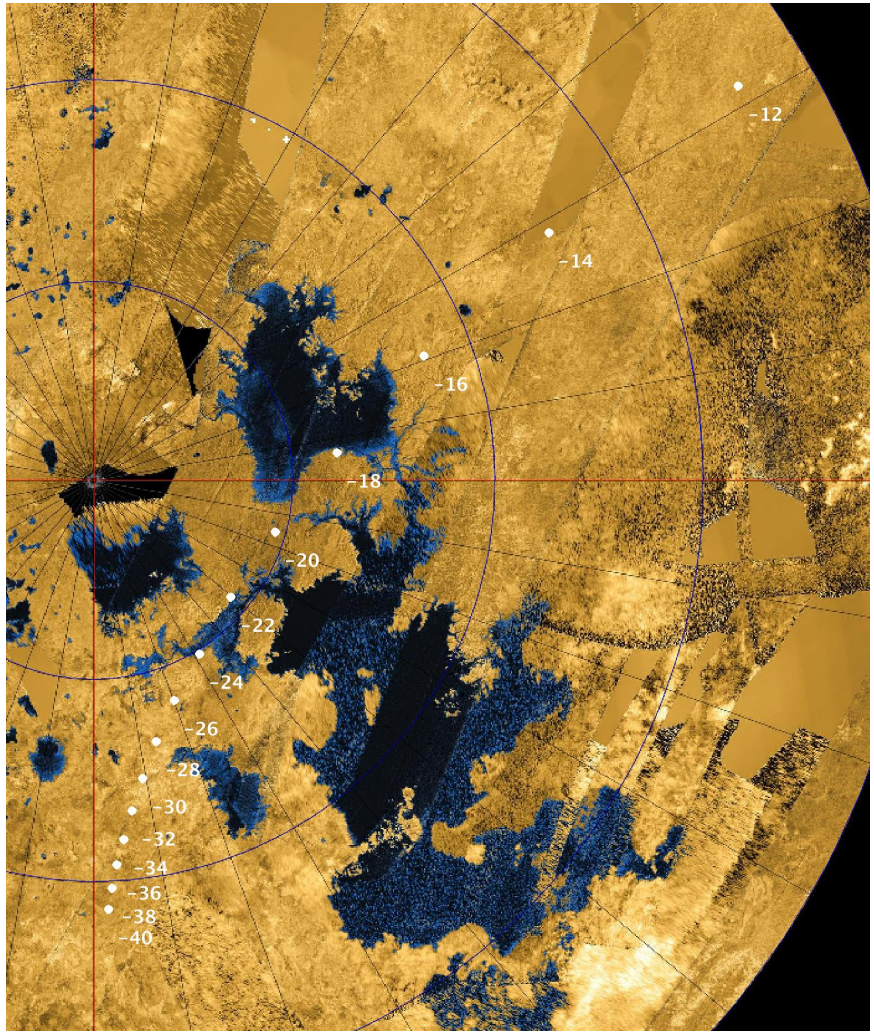
T054 – rev 110 – S50

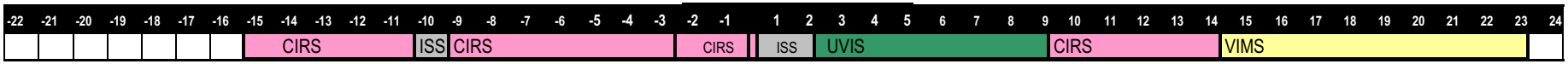
May 5, 2009 – 125T22:54:16 @ 3242 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (min)
62.10	359.6	68.4	-3600	-60.0
68.63	358.1	73.3	-2400	-40.0
69.66	357.5	74.0	-2280	-38.0
70.78	356.6	74.8	-2160	-36.0
71.99	355.3	75.6	-2040	-34.0
73.37	353.5	76.6	-1920	-32.0
74.87	350.8	77.6	-1800	-30.0
76.54	346.7	78.7	-1680	-28.0
78.25	340.0	79.9	-1560	-26.0
79.79	328.8	81.1	-1440	-24.0
80.96	310.5	82.6	-1320	-22.0
80.54	285.8	84.2	-1200	-20.0
77.74	263.5	85.8	-1080	-18.0
72.38	249.3	87.5	-960	-16.0
64.35	241.4	89.1	-840	-14.0
53.26	238.5	90.0	-720	-12.0





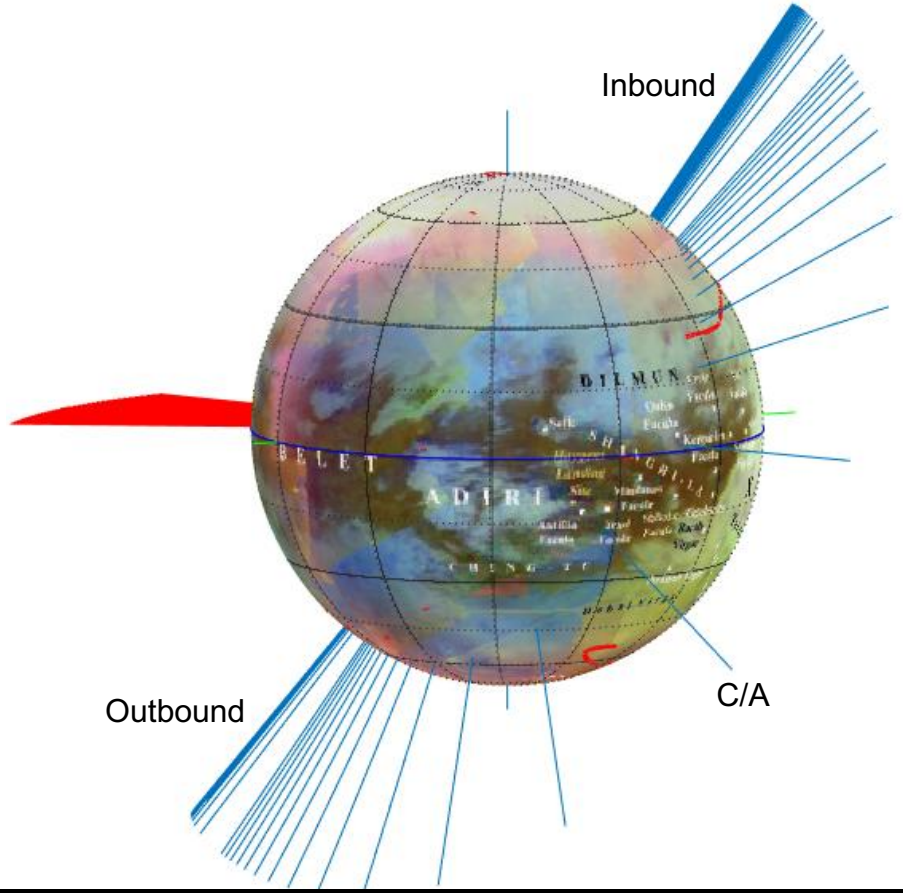
T055 – rev 111 – S50

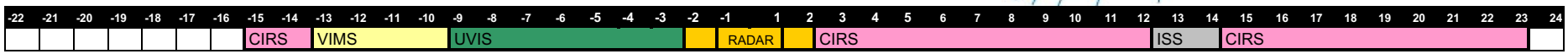
May 21, 2009 – 141T21:26:42 @ 966 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T055 VIMS Science objectives: On the inbound, the phase angle is much larger than 90 degrees and VIMS ridealong observations will provide information on Titan's atmosphere composition. After C/A, VIMS will observe the South Pole region riding along with CIRS far from Titan. Only cloud monitoring will be possible.

C/A - 14:16:52	-13:00	CIRS	Template M4
-13:00	-09:00	VIMS Cloud Map	Template O
-09:00	-02:30	UVIS	Template X
-02:30	-02:00	Turn to RADAR Attitude	
-02:00	-01:12	RADAR	Scatterometry/Radiometry
-01:12	-00:50	RWA to RCS Transition	
-00:50	-00:30	RADAR	Hi-SAR
-00:30	-00:18	RADAR	Altimetry
-00:18	0	RADAR SAR	
2009-141T21:26:42		CLOSEST APPROACH	Neg_Z to Titan, Neg_X to RAM
0	+00:18	RADAR SAR	
+00:18	+00:30	RADAR	Altimetry
+00:30	+00:50	RADAR	Hi-SAR
+00:50	+01:14	RCS to RWA Transition	
+01:14	+02:00	RADAR	Scatterometry/Radiometry
+02:00	+02:30	Turn to CIRS attitude	
+02:30	+05:00	CIRS	Template E
+05:00	+09:00	CIRS	Template F
+09:00	+12:00	CIRS	Template D2
+12:00	+14:00	ISS	Template D2
+14:00	C/A + 22	CIRS	Template A





T055 – rev 111 – S50

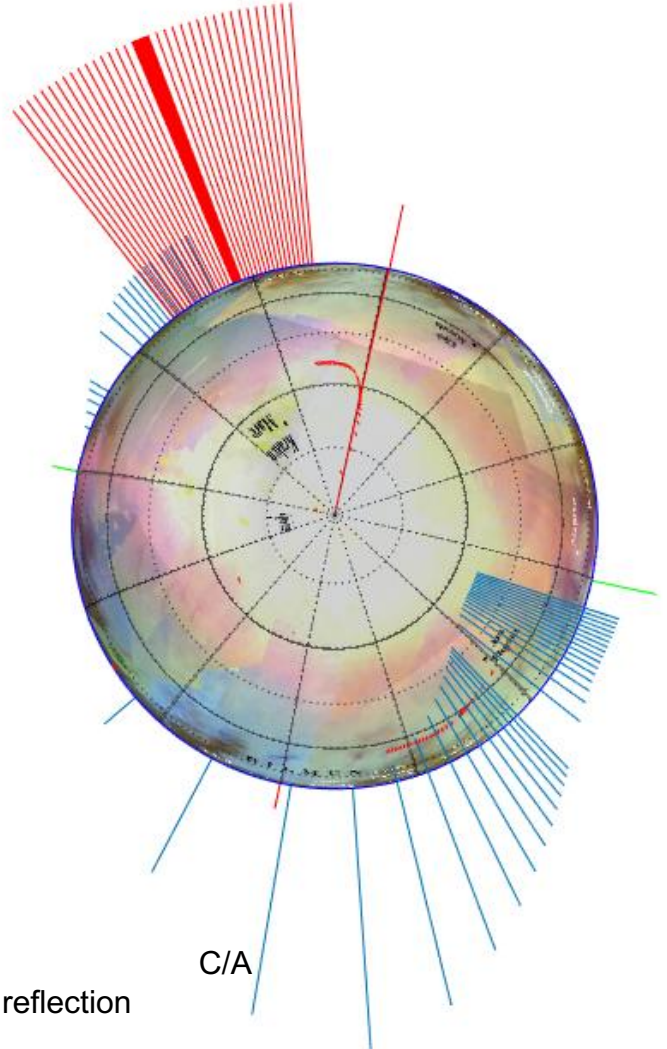
May 21, 2009 – 141T21:26:42 @ 966 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection occurs at 54N, 348 W at C/A – 10:00.

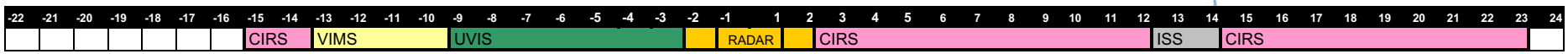
Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



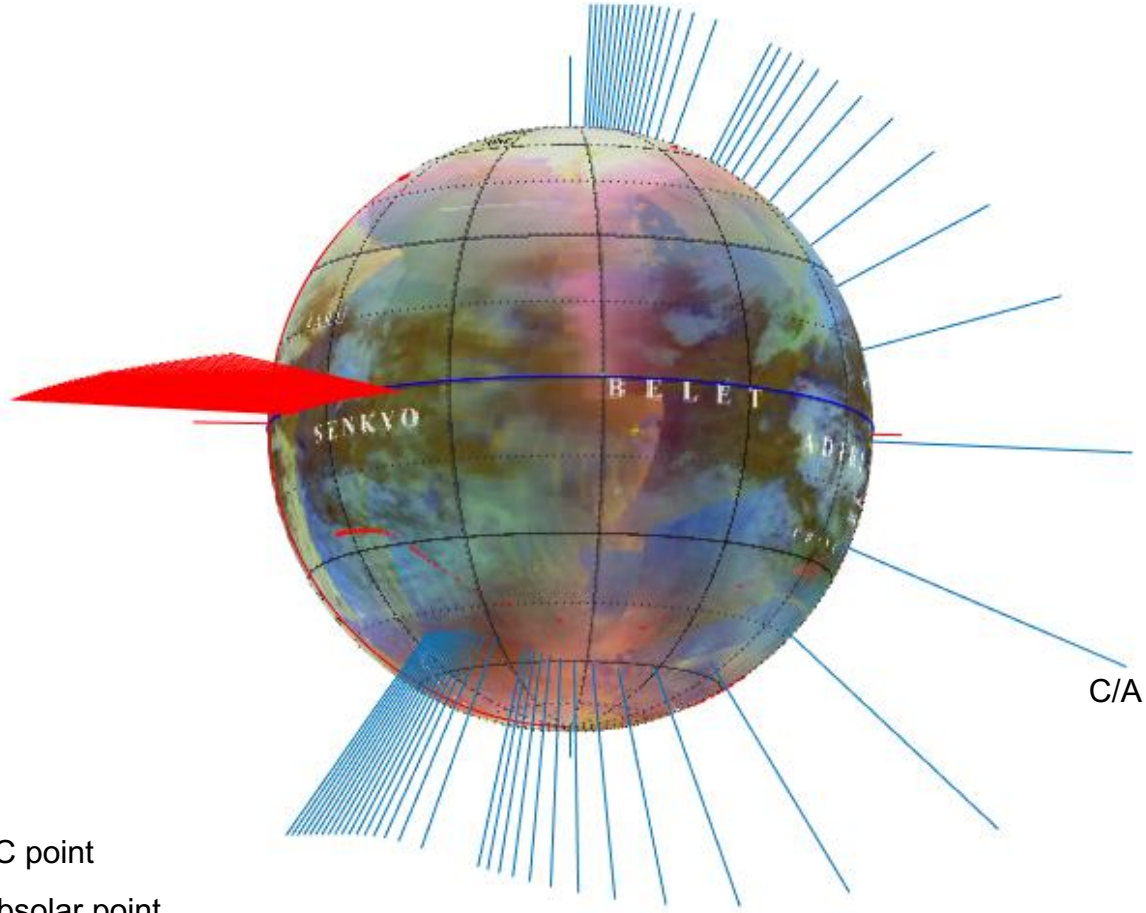
T055 – rev 111 – S50

May 21, 2009 – 141T21:26:42 @ 966 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

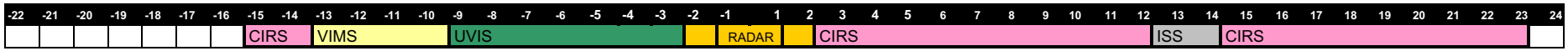
Global mapping of Titan and cloud monitoring.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



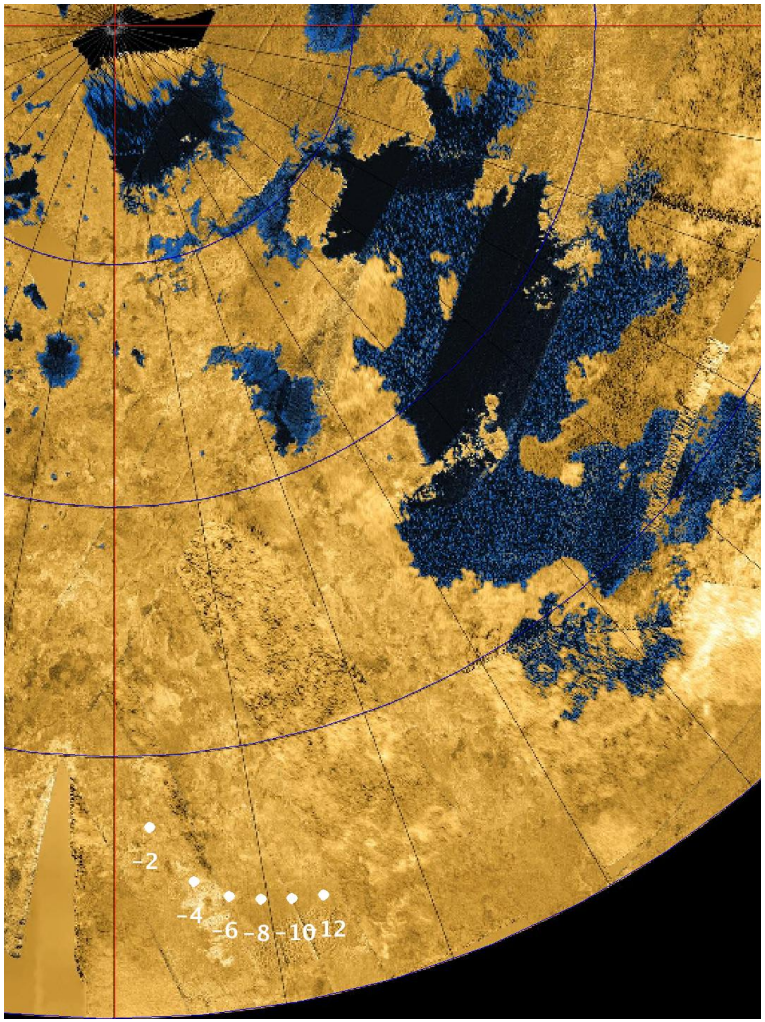
T055 – rev 111 – S50

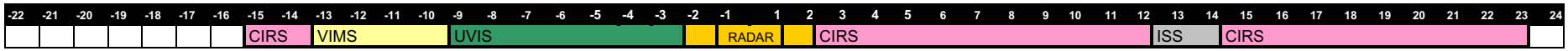
May 21, 2009 – 141T21:26:42 @ 966 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
53.75	346.5	60.8	-43200	-12.0
53.86	348.5	60.9	-36000	-10.0
54.05	350.5	61.1	-28800	-8.0
54.34	352.5	61.4	-21600	-6.0
55.05	354.7	62.0	-14400	-4.0
57.24	357.5	64.1	-7200	-2.0





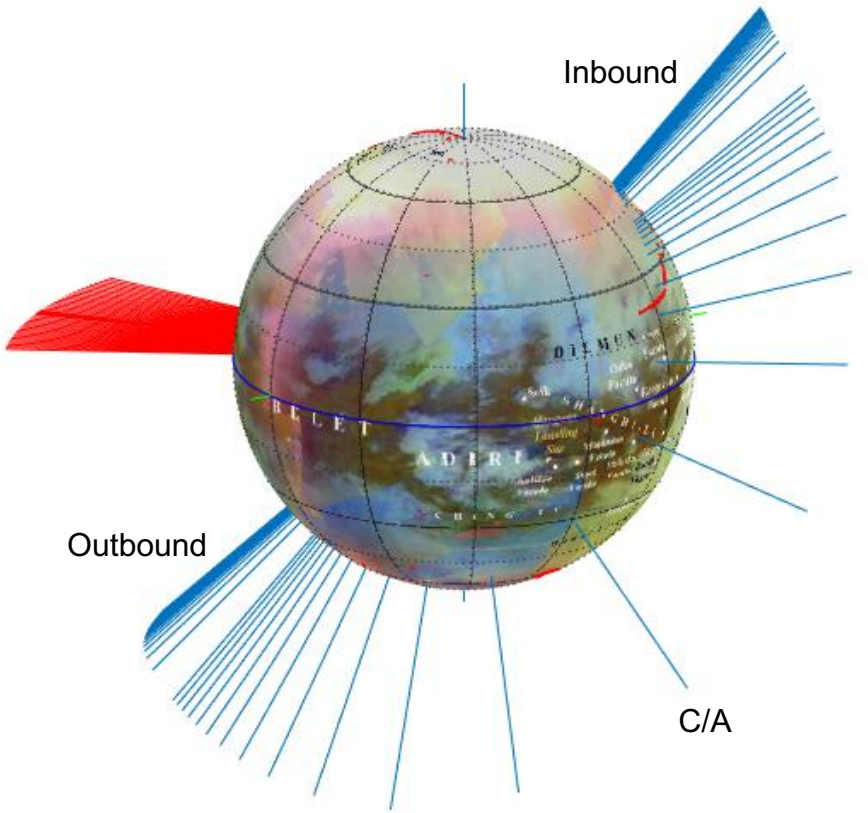
T056 – rev 112 – S50

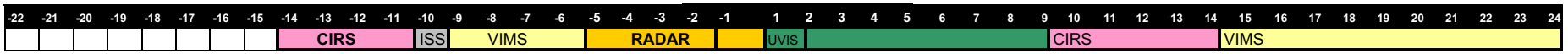
June 6, 2009 – 157T20:00:01 @ 968 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T056 VIMS Science objectives: On the inbound, the phase angle is much larger than 90 degrees and VIMS ridealong observations will provide information on Titan's atmosphere composition. After C/A, VIMS will be ridealong with UVIS for a stellar occultation that will provide information on the composition of Titan's atmosphere. The South Pole region will be observed as VIMS is riding along with UVIS (then CIRS) far from Titan.

C/A - 13:52:12	-13:00	CIRS	Template M4
-13:00	-10:00	CIRS	Template N
-10:00	-09:00	ISS	Template N
-09:00	-05:10	VIMS	Template Q
begin custom period			
-05:10	**-02:00**	RADAR	Template L
-02:00	**-01:12**	**RADAR**	**Scatterometry/Radiometry**
-01:12	**-00:50**	**RWA to RCS Transition**	
-00:50	**-00:30**	**RADAR**	**Hi-SAR**
-00:30	**-00:18**	**RADAR**	**Altimetry**
-00:18	**0**	**RADAR**	**SAR**
2009-157T20:00:01		**CLOSEST APPROACH**	**NEG_Z to Titan, NEG_X to RAM**
0	**+00:18**	**RADAR**	**SAR**
+00:18	**+00:24**	**RADAR**	**Altimetry (Hi-SAR?)**
+00:24	**+00:32**	**Turn to UVIS Stellar Occ**	**RADAR turns to UVIS occ attitude**
+00:32	**+00:56**	**RCS to RWA Transition**	
+00:32	**+01:41**	**UVIS Stellar Occ**	**Eta Ursa Majoris**
end custom period			
+01:41	**+05:00**	**UVIS**	**Template X**
+05:00	**+09:00**	**UVIS**	**Template X**
+09:00	+14:00	CIRS	Template C
+14:00	C/A + 23:02:48	VIMS	Template B





T056 – rev 112 – S50

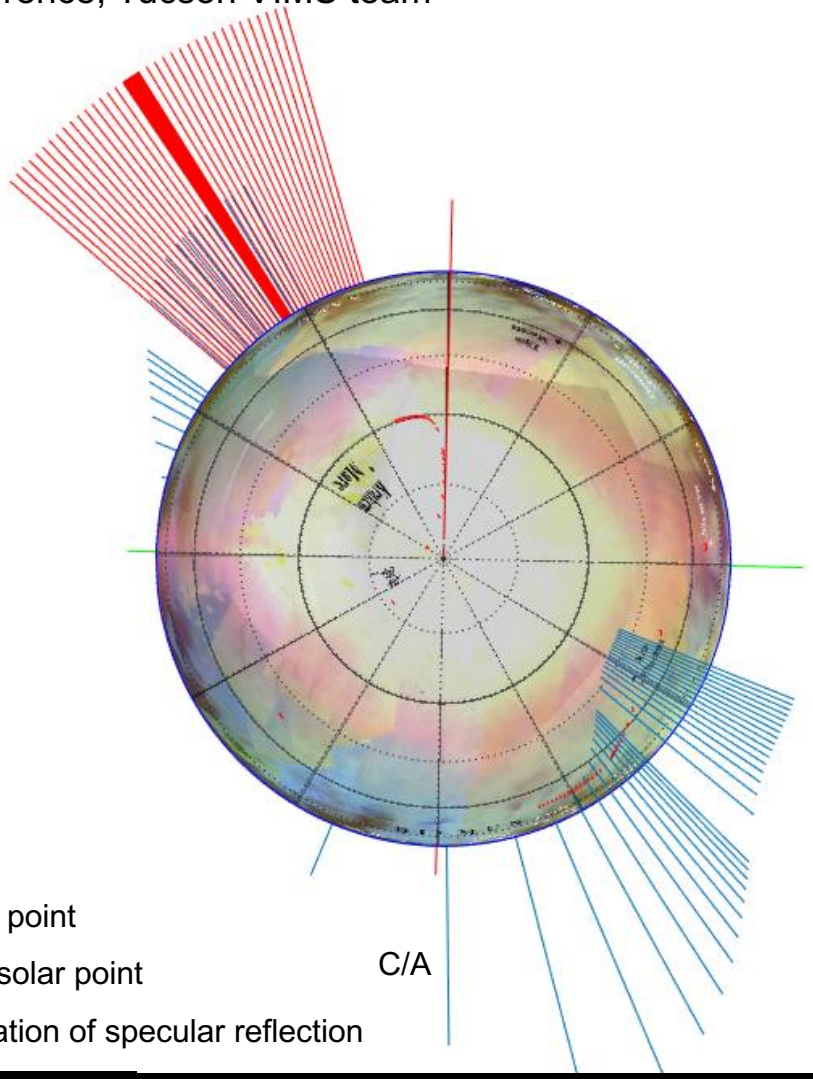
June 6, 2009 – 157T20:00:01 @ 968 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection occurs at ~60N, 345 W at C/A – 12:00.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

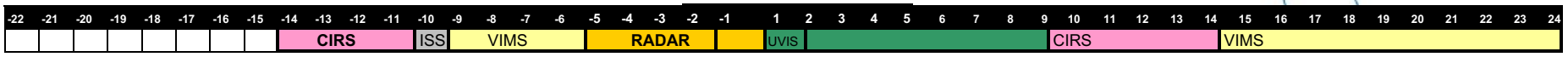


Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A



T056 – rev 112 – S50

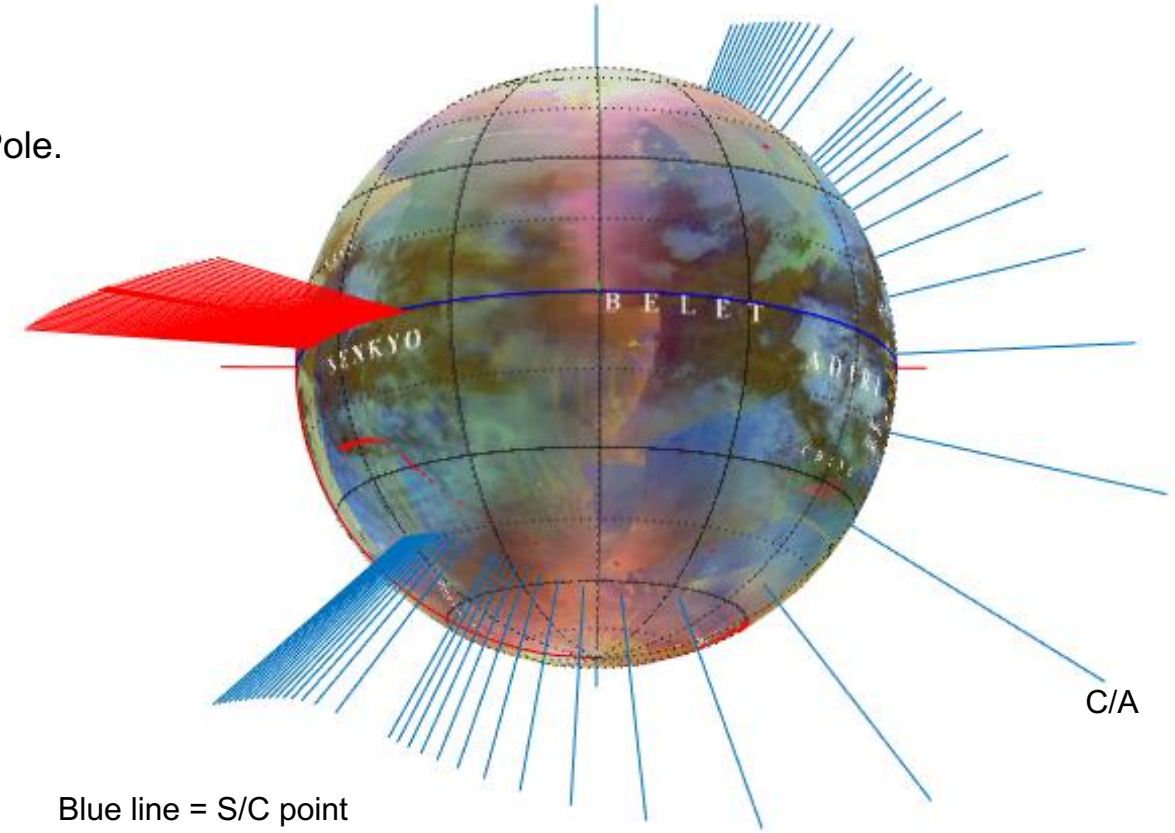
June 6, 2009 – 157T20:00:01 @ 968 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Obtain cubes of Titan's South Pole.

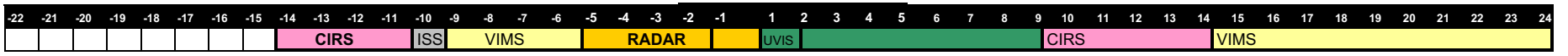
Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



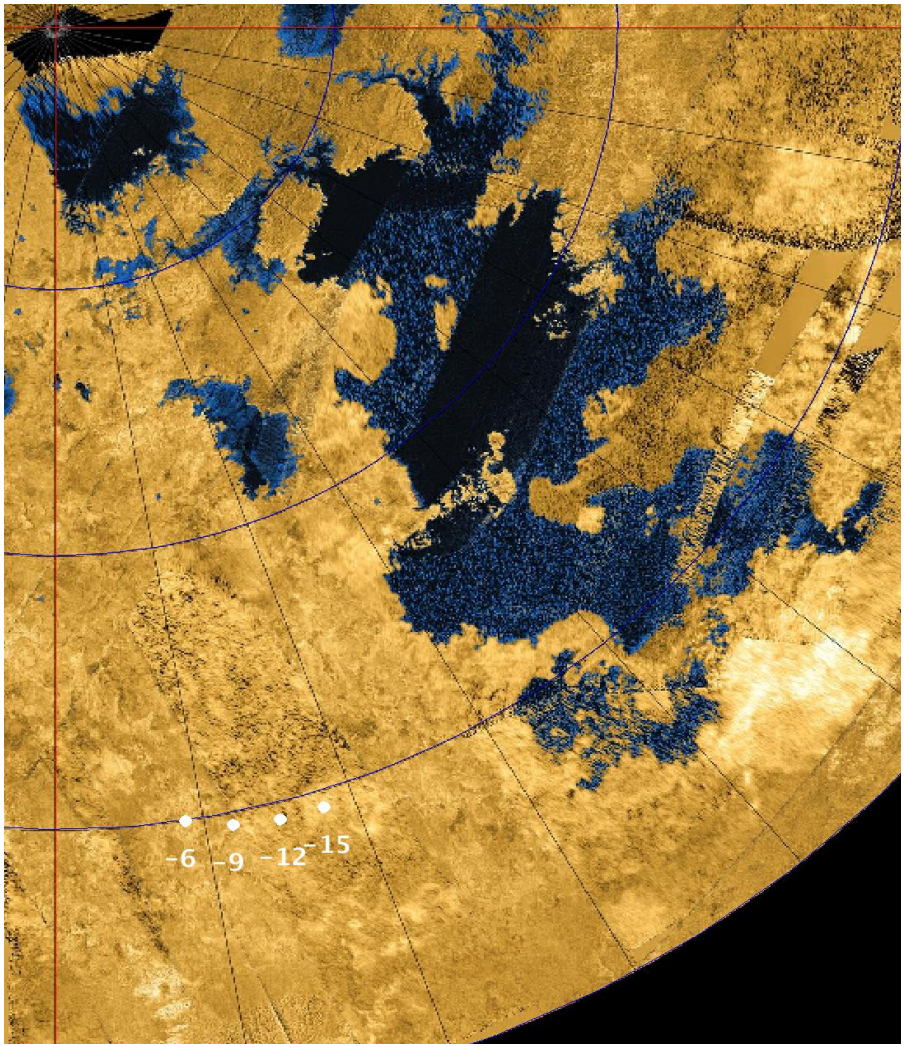
T056 – rev 112 – S50

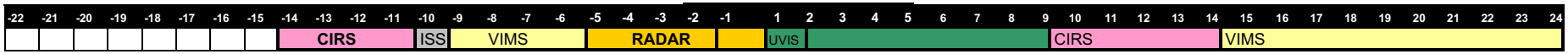
June 6, 2009 – 157T20:00:01 @ 968 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
59.40	342.1	64.8	-54000	-15.0
59.38	345.1	64.9	-43200	-12.0
59.57	348.2	65.1	-32400	-9.0
59.99	351.3	65.5	-21600	-6.0





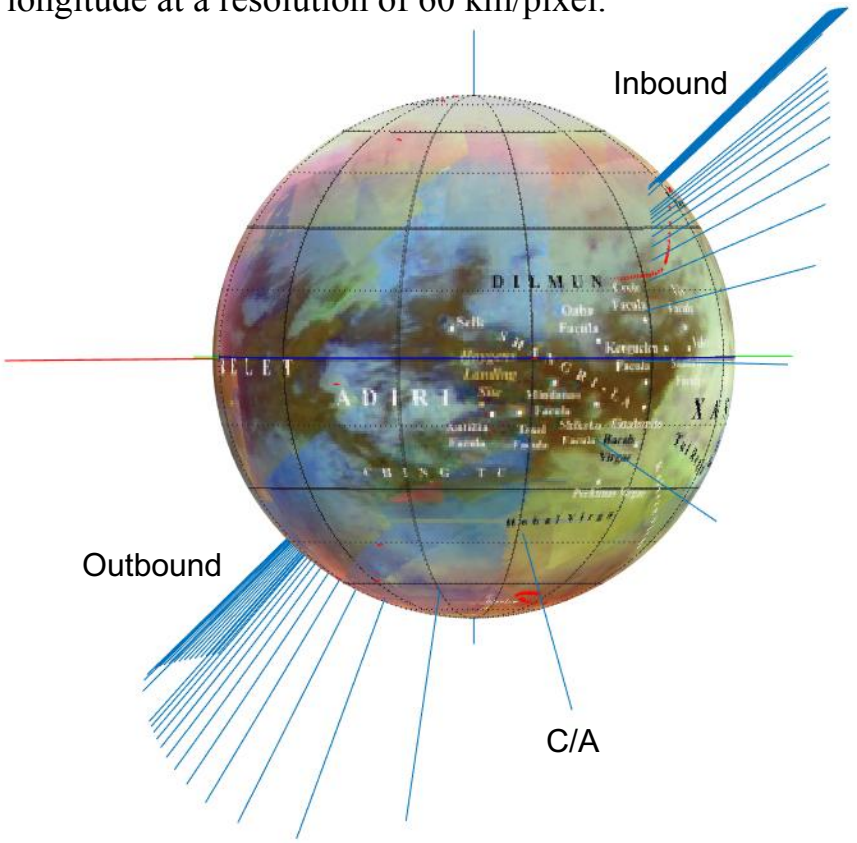
T057 – rev 113 – S51

June 22, 2009 – 173T18:32:36 @ 955 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T057 VIMS Science objectives: On the inbound, the phase angle is much larger than 90 degrees and VIMS ridealong observations will provide information on the composition of Titan's atmosphere. After radar observations, VIMS will be ridealong and will map a new area in the southern hemisphere between 60 and 30 degrees south latitude and 60 and 120 East longitude at a resolution of 60 km/pixel.

C/A - 13:26:47	-13:00	CIRS	Template M4
-13:00	-10:00	CIRS	Template N
-10:00	-09:00	ISS	Template N
-09:00	-03:27	UVIS	Template X
-03:27	-03:26	RWA to RCS Transition	
-03:26	-02:15	UVIS	Template X
-02:15	-01:10	CIRS	
Begin custom period			
-01:10	-00:20:48	RSS Occ	XBAND to Earth, NEG_X to TITAN_SC_RAM
-00:20:48	0	INMS (RADAR-designed)	RADAR @ C/A +/- 3 min Ridealong
2009-173T18:31:47		**CLOSEST APPROACH**	**Neg_X to Titan_SC_RAM, NEG_Z to Titan**
0	+00:12:30	INMS (RADAR-designed)	
+00:12:30	+00:30	RADAR	Altimetry
+00:30	+00:50	RADAR	Hi-SAR
+00:50	+01:14	RCS to RWA Transition	
+01:14	+02:00	RADAR	Scatterometry/Radiometry
+02:00	+5:30	RADAR	Template L
End custom period			
+05:30	+08:30	UVIS	Template G
+08:30	+09:00	ISS	Template G
+09:00	+14:00	VIMS	Template V
+14:00	C/A + 22	CIRS	Template A



T057 – rev 113 – S51

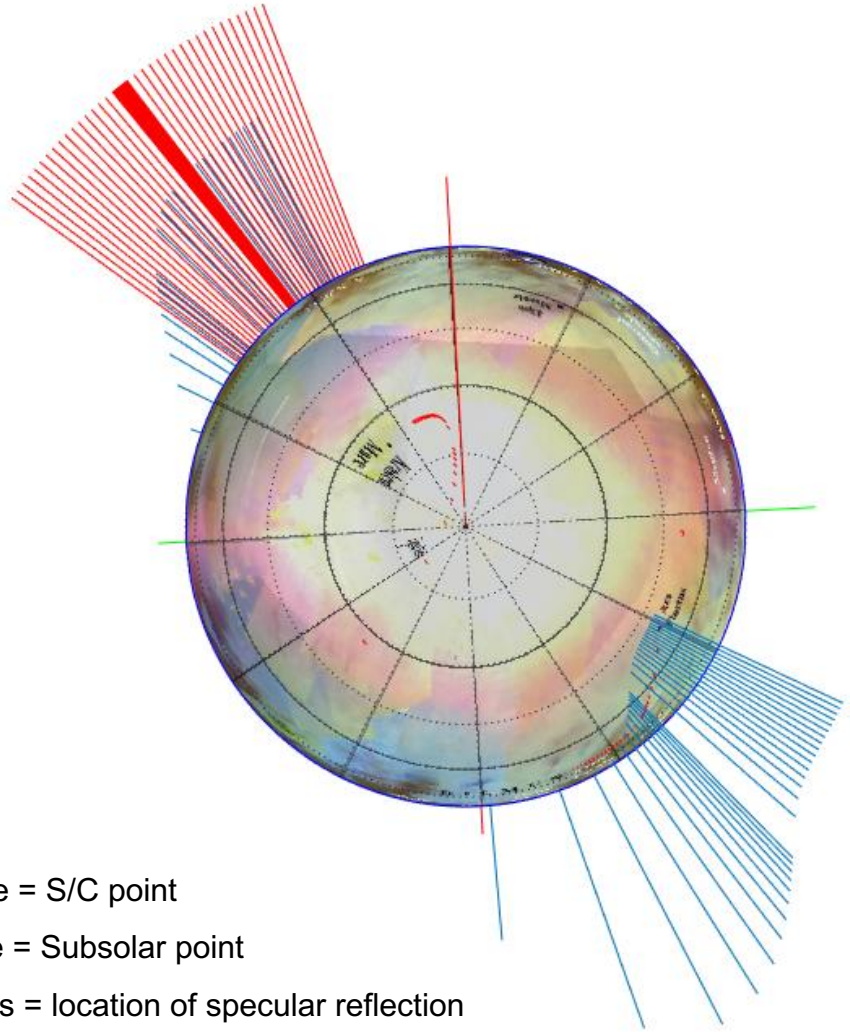
June 22, 2009 – 173T18:32:36 @ 955 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection occurs at ~65N/346W at C/A – 09:00.

Observations on the inbound are obtained during Titan's night, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

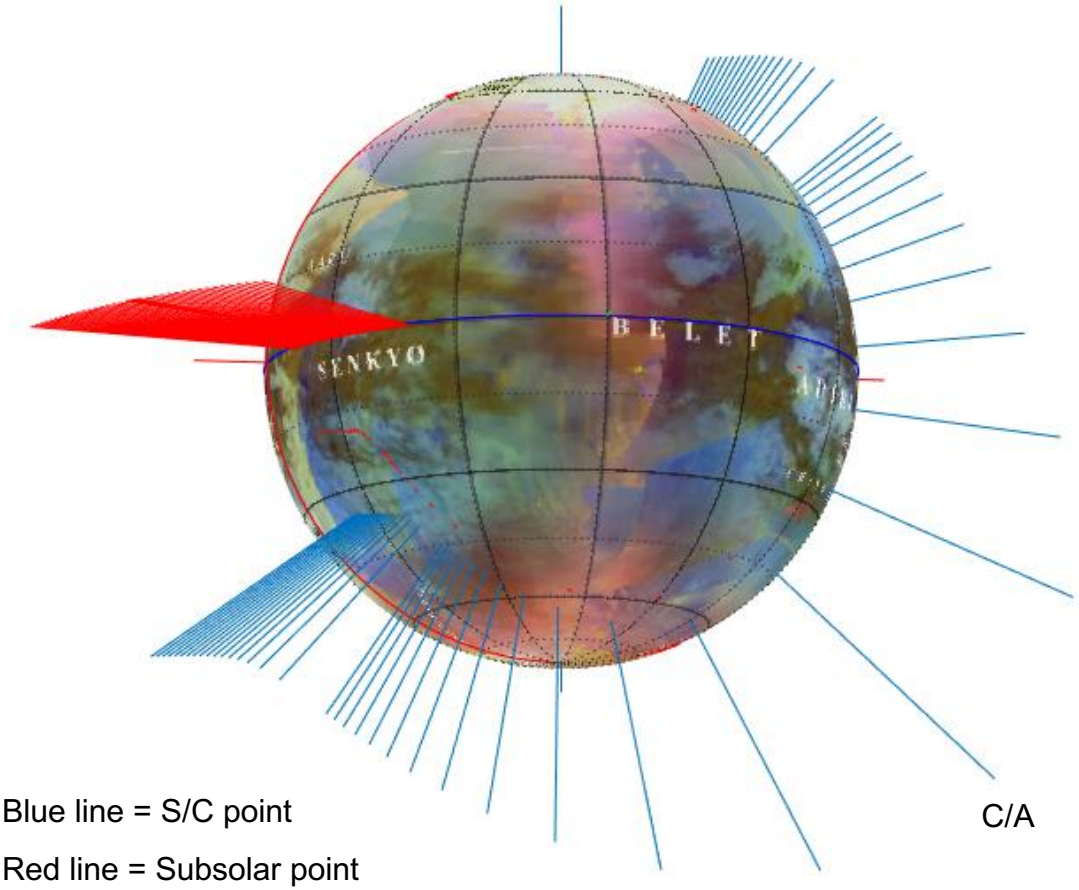
T057 – rev 113 – S51

June 22, 2009 – 173T18:32:36 @ 955 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.

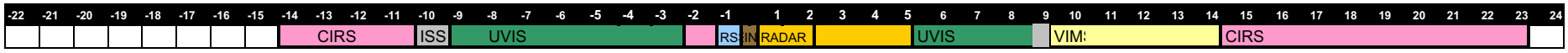


Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A



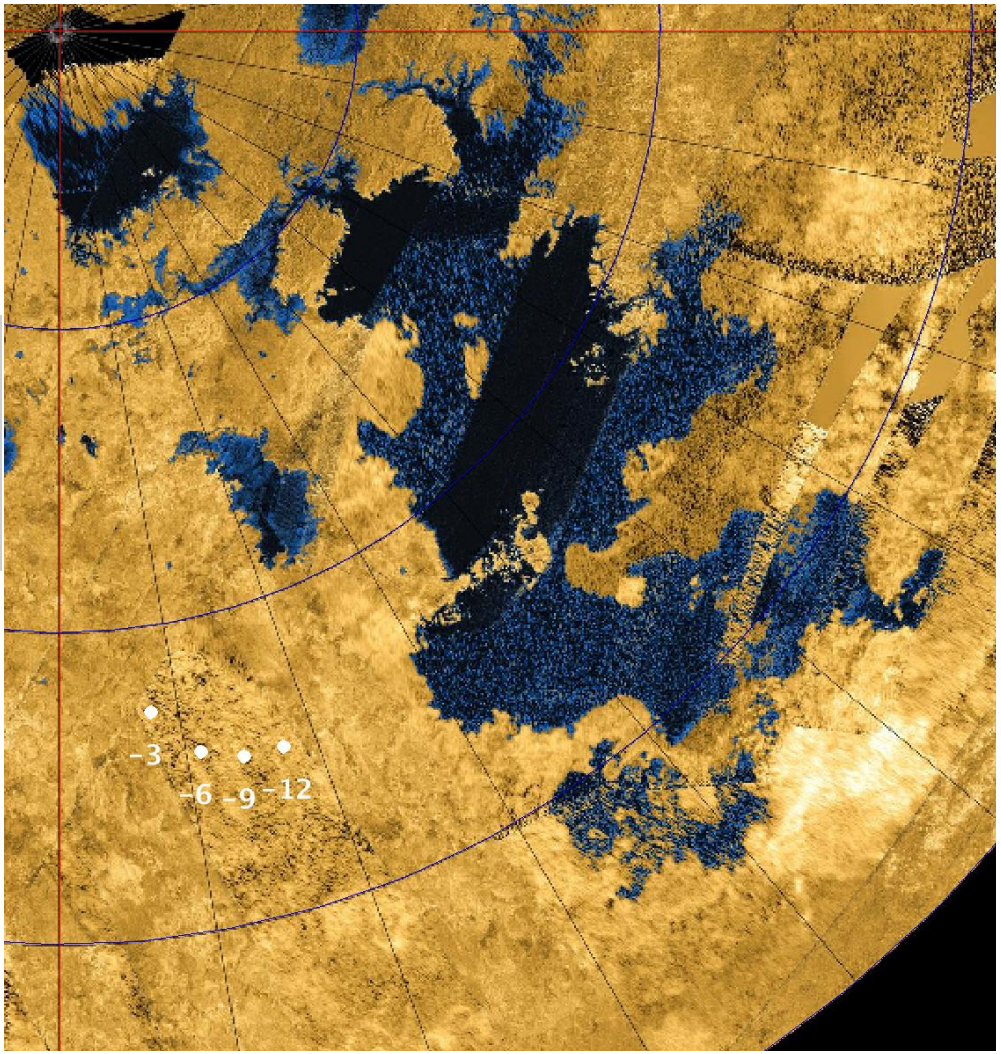
T057 – rev 113 – S51

June 22, 2009 – 173T18:32:36 @ 955 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
65.19	342.6	69.0	-43200	-12.0
65.26	345.7	69.1	-32400	-9.0
65.69	348.9	69.6	-21600	-6.0
67.22	352.4	71.0	-10800	-3.0



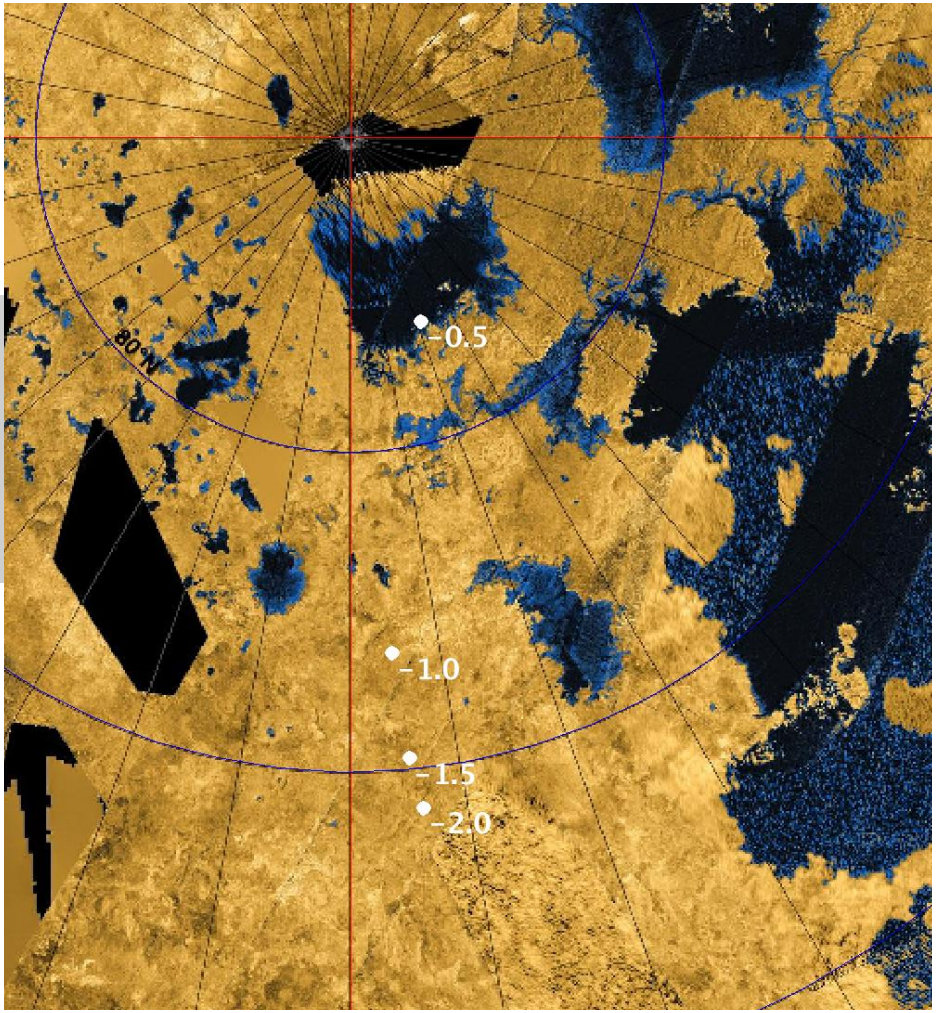
T057 – rev 113 – S51

June 22, 2009 – 173T18:32:36 @ 955 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Reflection:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
68.78	353.8	72.4	-7200	-2.0
70.35	354.6	73.8	-5400	-1.5
73.64	355.4	76.7	-3600	-1.0
83.74	339.0	84.5	-1800	-0.5



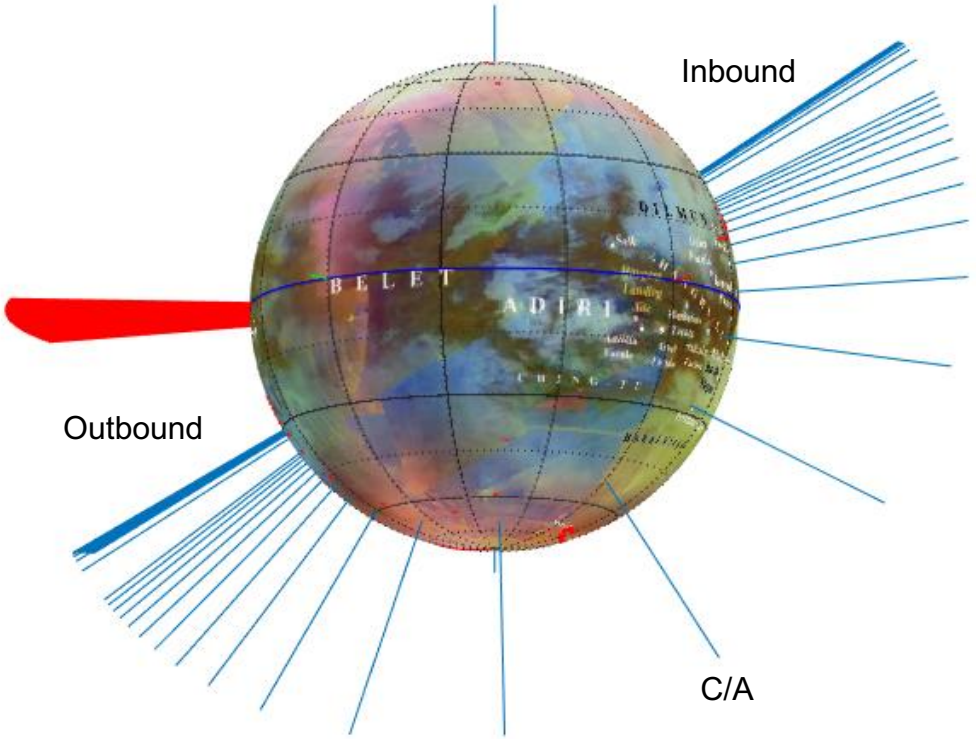
T058 – rev 114 – S51

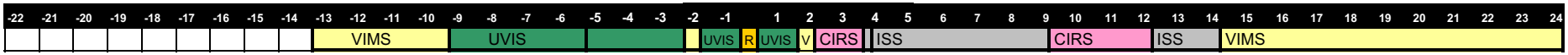
July 8, 2009 – 189T17:04:04 @ 966 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T058 VIMS Science objectives: On the inbound, the phase angle is much larger than 90 degrees and VIMS ridealong observations will provide information on the composition of Titan's atmosphere. After radar observations, VIMS will be ridealong with UVIS for a stellar occultation that will provide information on the composition of Titan's atmosphere. Then the new area mapped during T57 will be observed at a better resolution of 20 km/pixel.

-12:19:04	-09:00	VIMS	Template O
-09:00	-05:10	UVIS	Template X
-05:10	-02:20	UVIS	Template X
-02:20	-01:32	VIMS	
begin custom period			
-01:32	-00:27	UVIS Solar Occ	on wheels, includes turn to occ attitude
-00:27	-00:14:30	Turn to RADAR	Transition to RCS @ -00:27 (1 min.)
-00:14:30	0	RADAR SAR	
2009-189T17:04:03		CLOSEST APPROACH	NEG_Z to Titan, NEG_X to Titan_SC_RAM
0	+00:18	RADAR SAR	
+00:18	+00:26	Turn to UVIS attitude	
+00:26	+00:48	Transition to RWA at +00:26	UVIS occ during transition (UVIS rider)
+00:48	+01:25	UVIS Stellar Occ	prime request starting at +00:48
end custom period			
+01:25	+02:00	VIMS	
+02:00	+3:30	CIRS	Template S2
+3:30	+5:00	ISS	Template S2
+5:00	+09:00	ISS	Template H
+09:00	+12:00	CIRS	Template D2
+12:00	+14:00	ISS	Template D2
+14:00	C/A + 23	VIMS	Template B





T058 – rev 114 – S51

July 8, 2009 – 189T17:04:04 @ 966 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

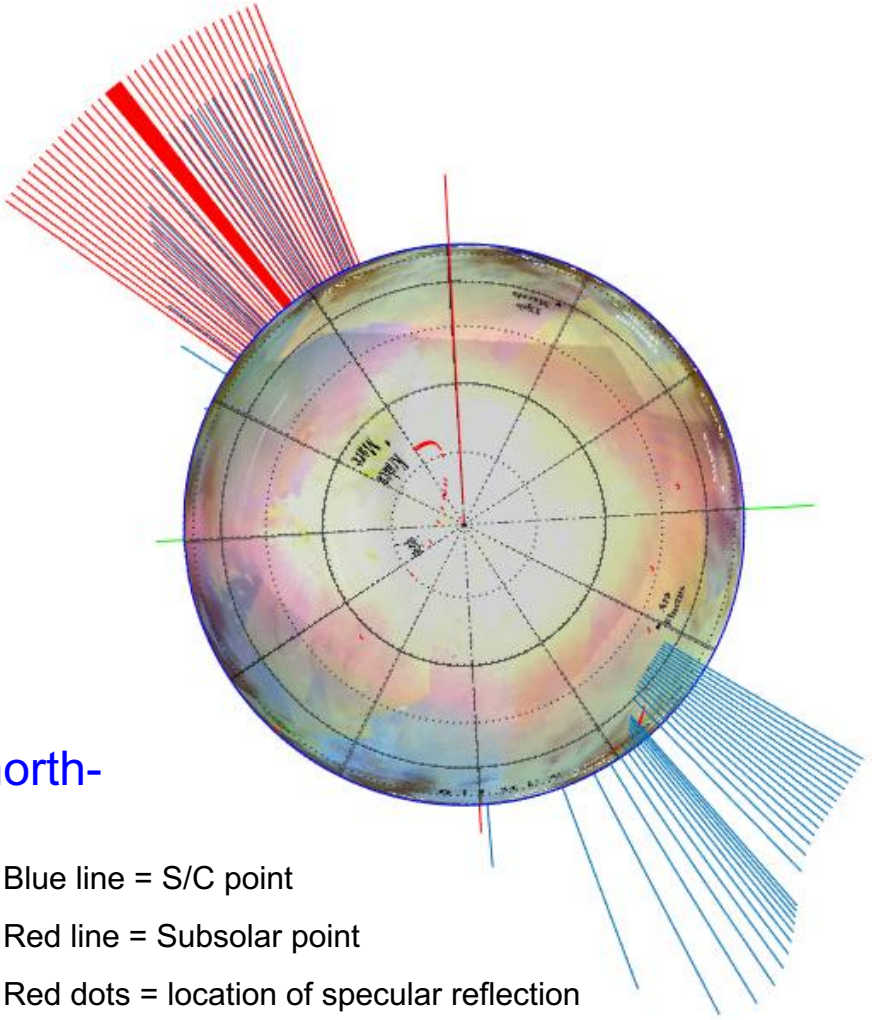
VIMS prime at C/A – 12:19 for cloud mapping of Titan.

Specular reflection occurs at 73N, 337 W at C/A -12:00*.

Ridealong with UVIS for solar occultation.

VIMS prime at C/A – 02:20 for hi-resolution regional mapping.

*Stephan, K., et al, 2010. Specular scattering on Titan: Liquids in the north-polar region. GRL 37, L02204.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T058 – rev 114 – S51

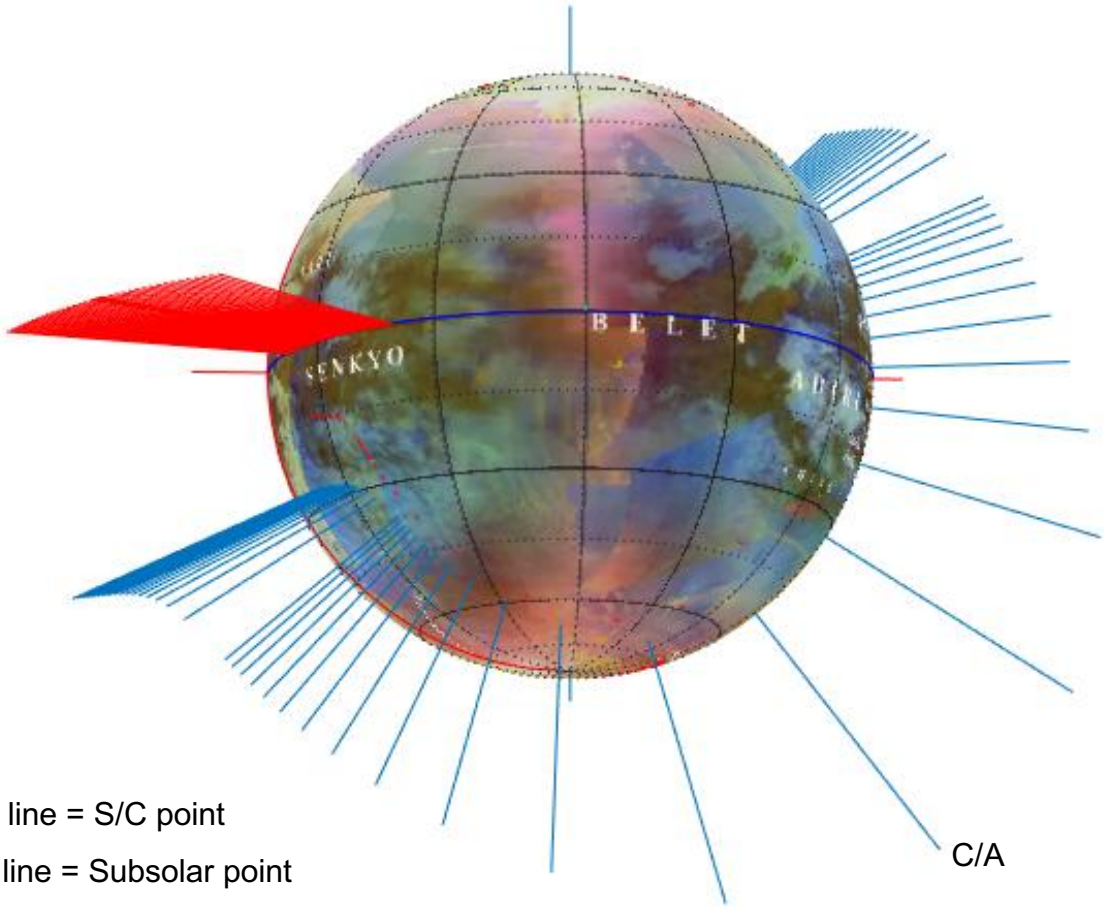
July 8, 2009 – 189T17:04:04 @ 966 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Ridealong with UVIS for stellar occultation.

VIMS prime at C/A + 01:25 for hi-resolution regional mapping and global mapping at C/A + 14:00.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

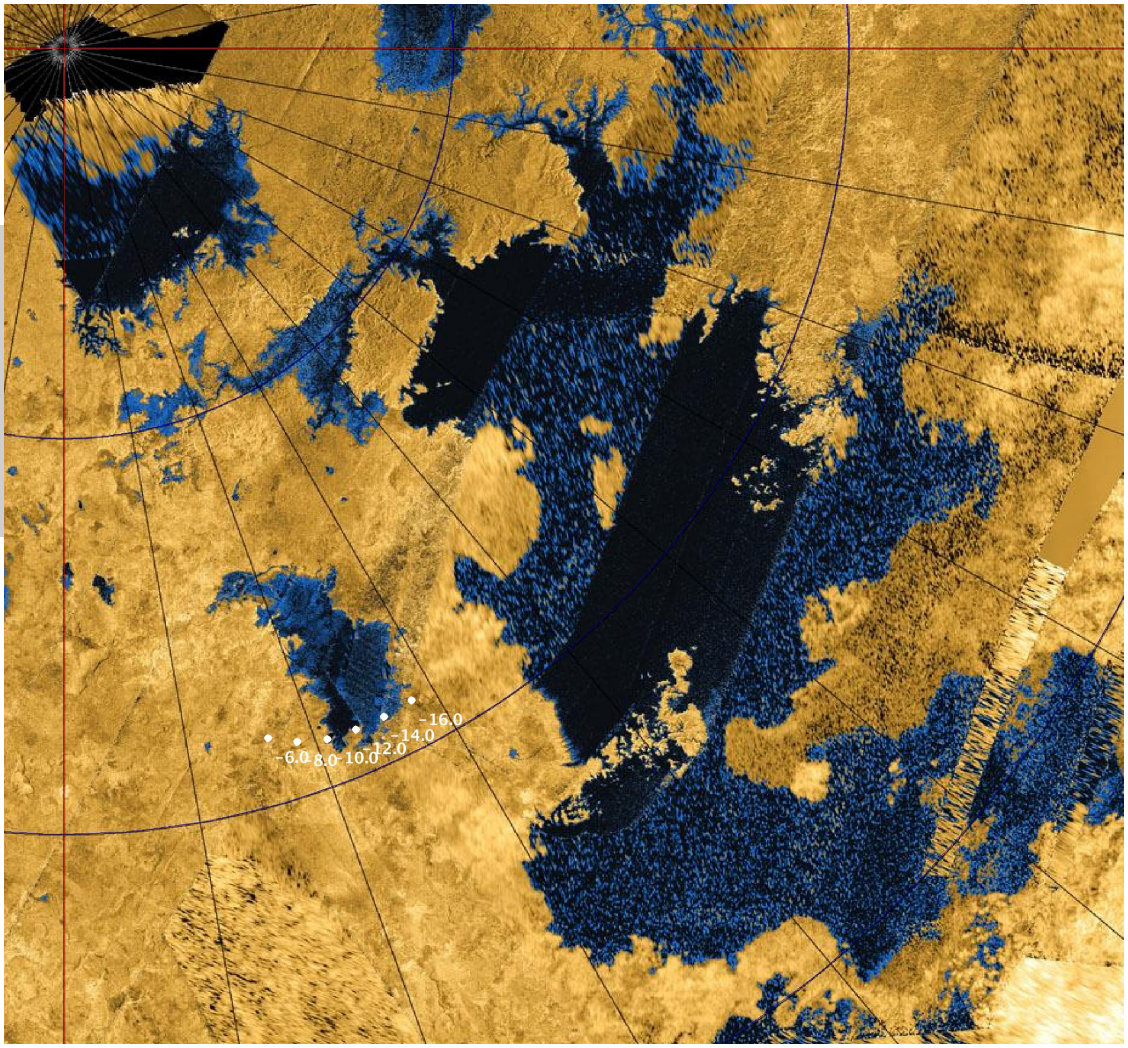
T058 – rev 114 – S51

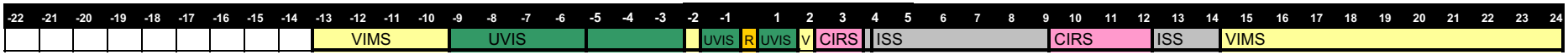
July 8, 2009 – 189T17:04:04 @ 966 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
71.18	331.9	73.0	-57600	-16.0
71.14	334.4	73.1	-50400	-14.0
71.13	336.8	73.1	-43200	-12.0
71.18	339.1	73.2	-36000	-10.0
71.37	341.4	73.5	-28800	-8.0
71.67	343.5	73.8	-21600	-6.0





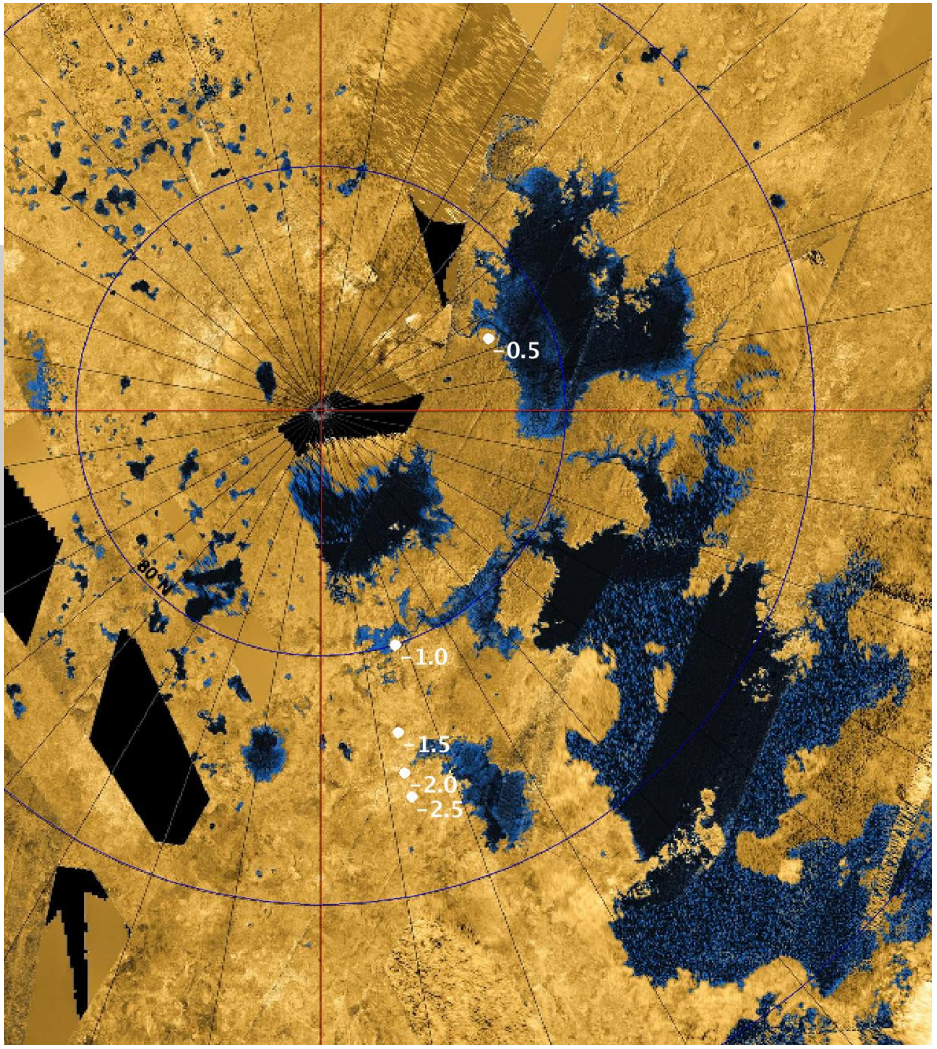
T058 – rev 114 – S51

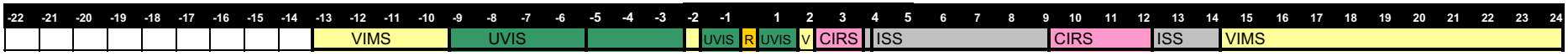
July 8, 2009 – 189T17:04:04 @ 966 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
73.89	346.8	75.8	-9000	-2.5
74.90	347.0	76.6	-7200	-2.0
76.55	346.5	78.0	-5400	-1.5
80.00	342.4	80.9	-3600	-1.0
82.56	246.5	88.7	-1800	-0.5
-65.53	250.3	83.1	0	0.0





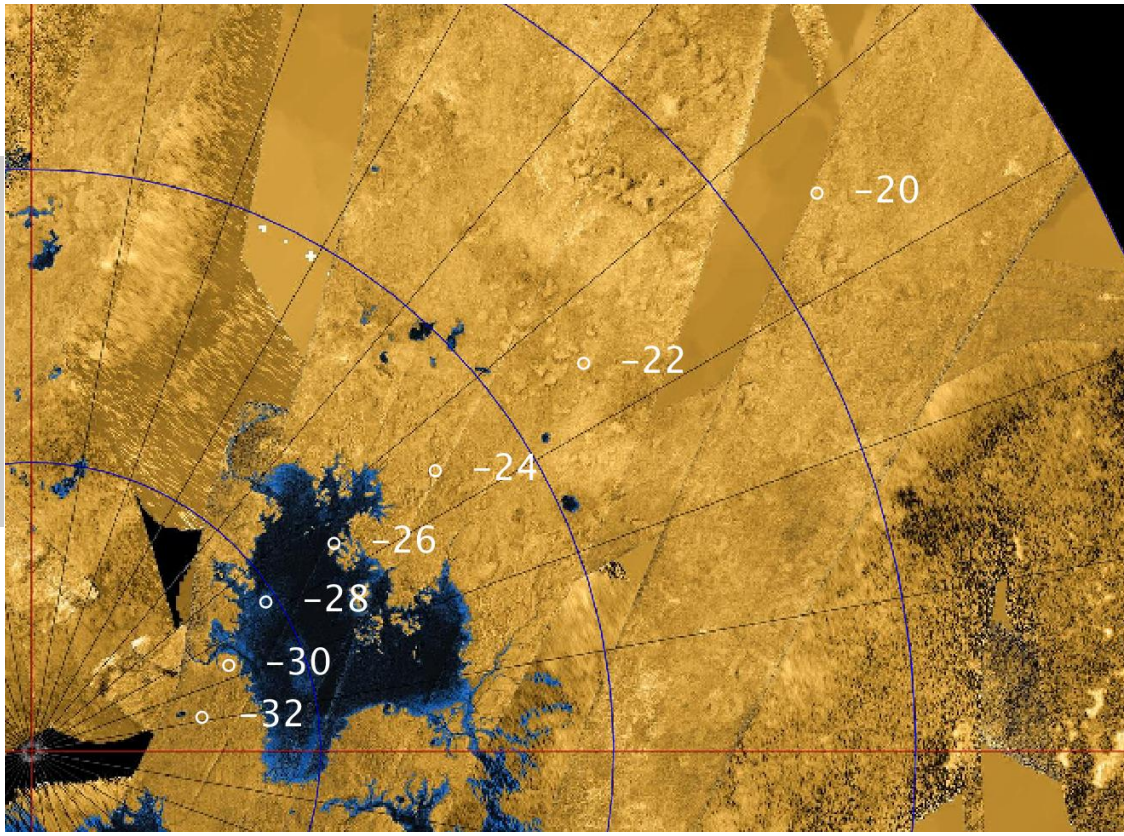
T058 – rev 114 – S51

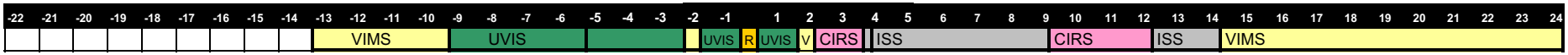
July 8, 2009 – 189T17:04:04 @ 966 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (hr)	Time (min)
83.99	258.8	87.8	-1920	-32
82.56	246.5	88.7	-1800	-30
80.39	237.5	89.7	-1680	-28
77.32	235.5	90.0	-1560	-26
73.07	235.2	90.0	-1440	-24
66.90	234.9	90.0	-1320	-22
57.46	234.6	90.0	-1200	-20





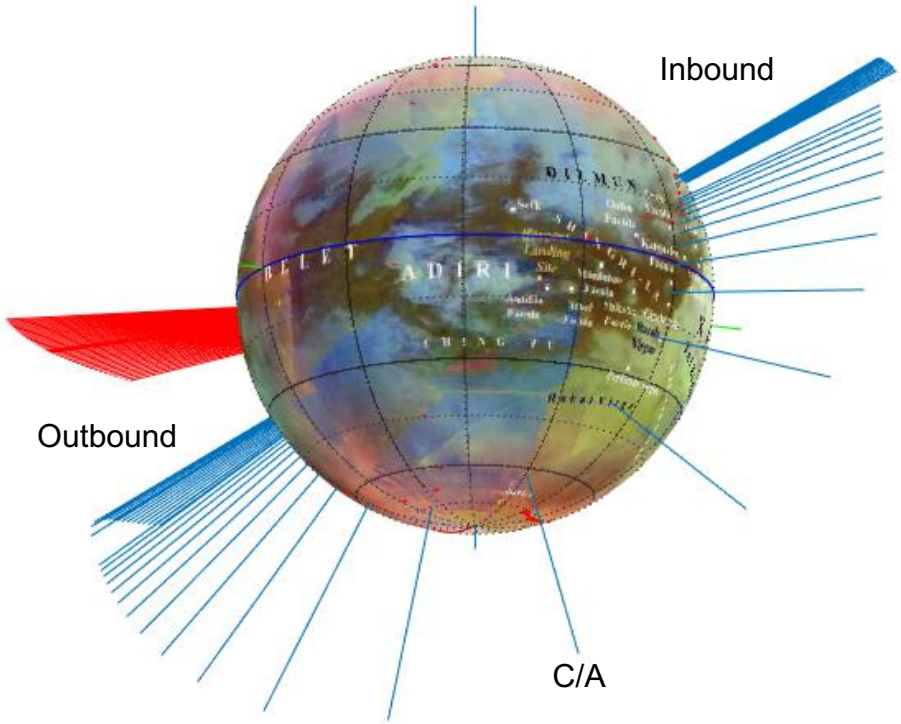
T059 – rev 115 – S52

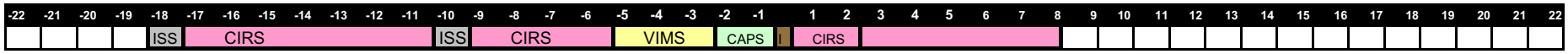
July 24, 2009 – 205T15:34:04 @ 956 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T059 VIMS Science objectives: On the inbound, the phase angle is larger than 90 degrees and VIMS prime observations will provide information on the composition of Titan's atmosphere. After C/A, VIMS will be riding along with CIRS and will observe the same area that has been observed at T58.

C/A - 16:46:56	C/A - 16	ISS	Template M3
C/A - 16	-13:00	CIRS	Template M3
-13:00	-10:00	CIRS	Template N
-10:00	-09:00	ISS	Template N
-09:00	-05:00	CIRS	Template R
-05:00	**-02:00**	VIMS	Template Y
begin custom period			
-02:00	**-00:47**	**CAPS**	
-00:47	**-00:46**	**RWA to RCS Transition**	
-00:46	**-0019**	**CAPS**	
-00:19	**0**	**INMS**	
2009-205T15:34:04		**CLOSEST APPROACH**	**Neg_X to RAM, Neg_Z to Titan RADAR @ +/- 3 mins**
0	**+00:15**	**INMS**	
+00:15	**+02:15**	**CIRS**	
end custom period			
+02:15	**+02:39**	**RCS to RWA Transition**	
+02:39	+05:00	**CIRS**	**Template E**
+05:00	+07:00	CIRS	Template F





T059 – rev 115 – S52

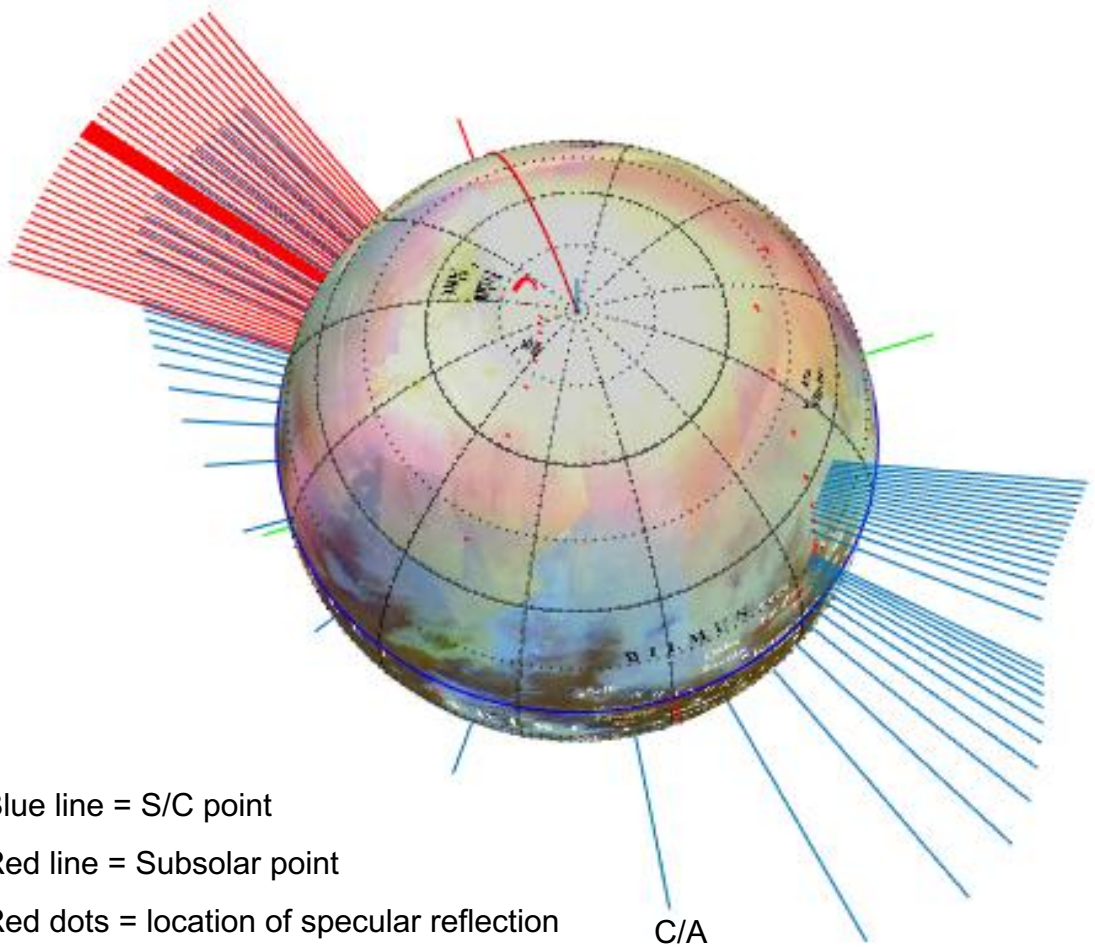
July 24, 2009 – 205T15:34:04 @ 956 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection occurs near 77N, 312W at C/A – 18:00 on Kraken Mare.

Observations on the inbound are obtained during Titan's night, but may provide information on the composition of the atmosphere.

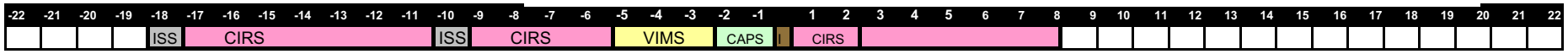


Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A



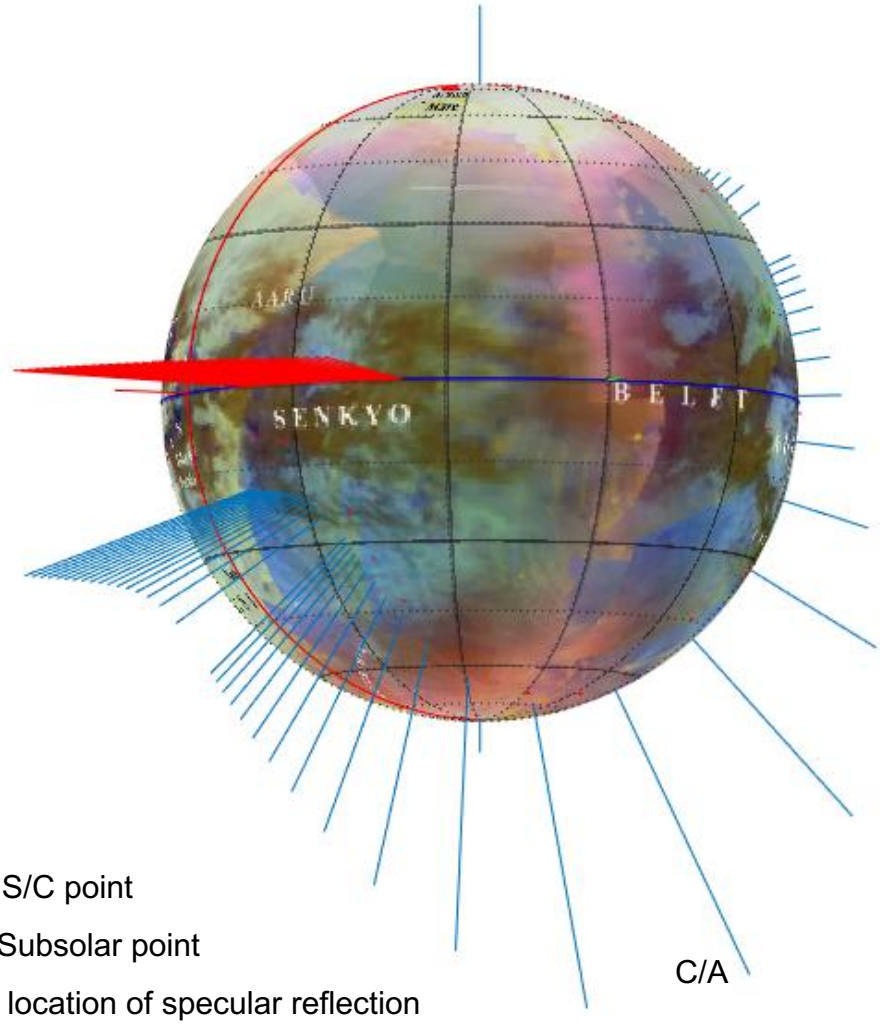
T059 – rev 115 – S52

July 24, 2009 – 205T15:34:04 @ 956 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Ridealong with CIRS for global mapping of Titan.

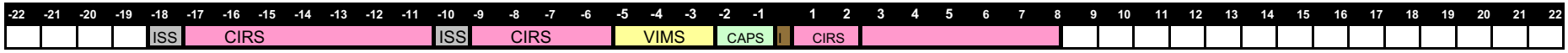


Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A



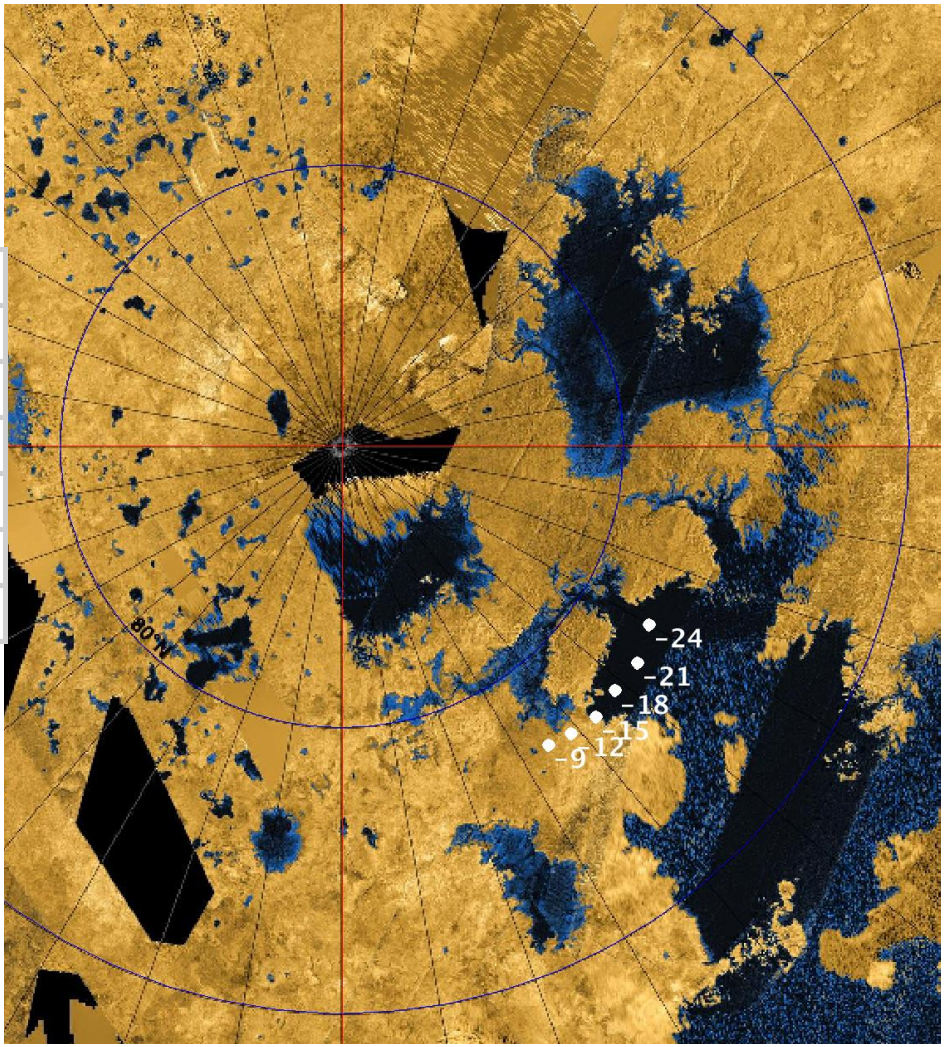
T059 – rev 115 – S52

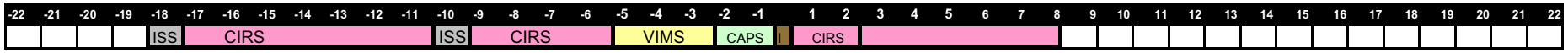
July 24, 2009 – 205T15:34:04 @ 956 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
77.41	300.1	77.5	-86400	-24.0
77.03	306.2	77.2	-75600	-21.0
77.02	311.8	77.2	-64800	-18.0
76.85	316.8	77.1	-54000	-15.0
76.99	321.4	77.3	-43200	-12.0
77.12	325.3	77.4	-32400	-9.0





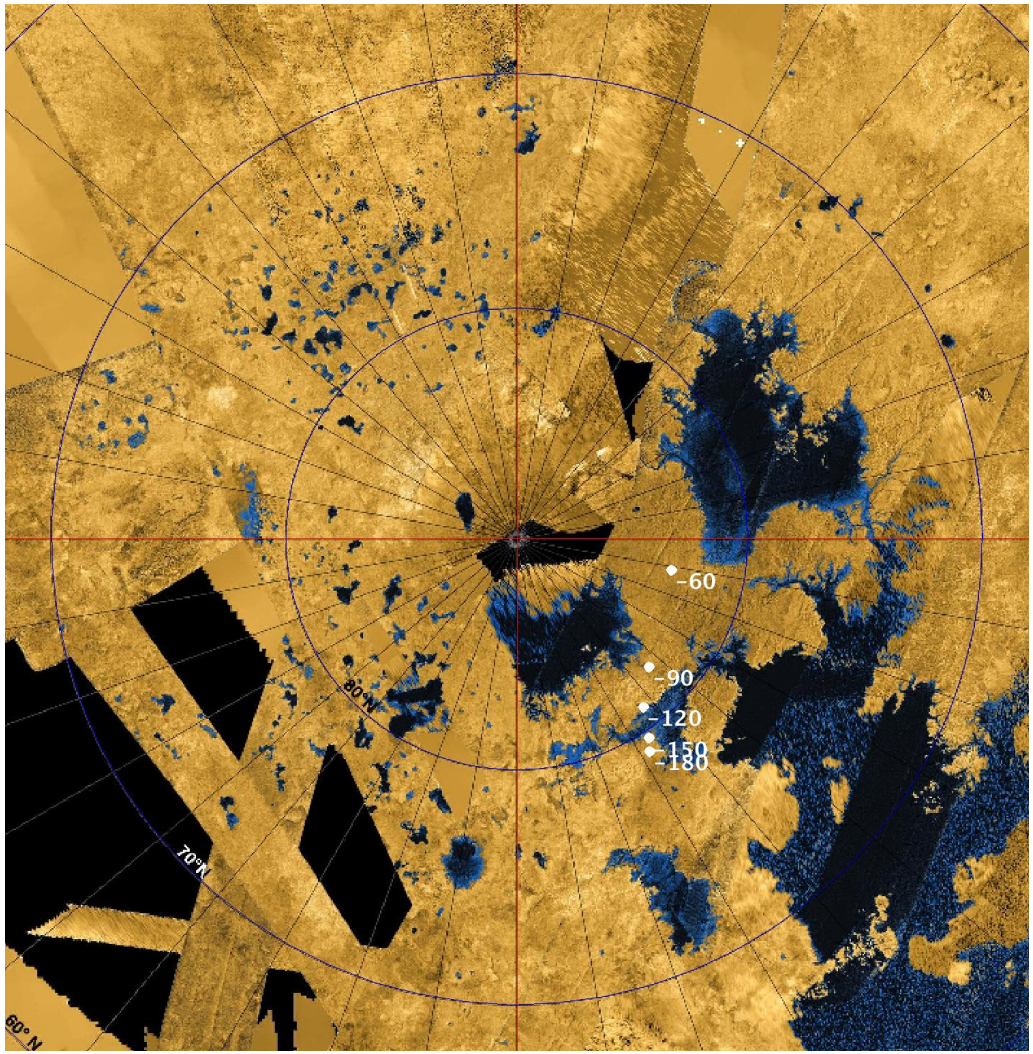
T059 – rev 115 – S52

July 24, 2009 – 205T15:34:04 @ 956 km altitude

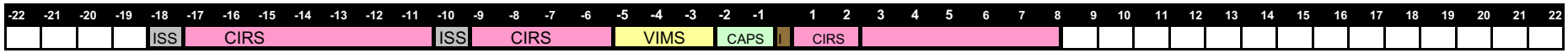
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
79.17	328.0	79.36	-10800	-3.0
79.66	326.4	79.81	-9000	-2.5
80.90	323.1	81.01	-7200	-2.0
82.05	314.1	82.23	-5400	-1.5
83.18	281.3	84.99	-3600	-1.0



Note: Time on plot expressed as minutes.



T060 – rev 116 – S52

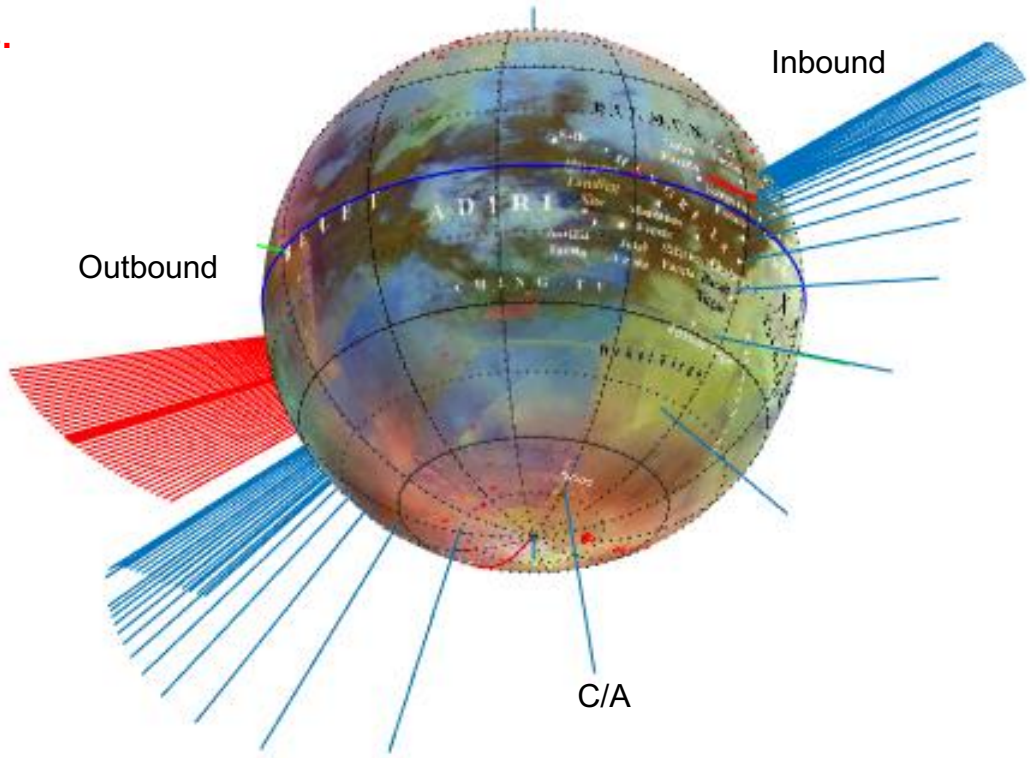
Aug. 9, 2009 – 221T14:03:54 @ 971 km altitude

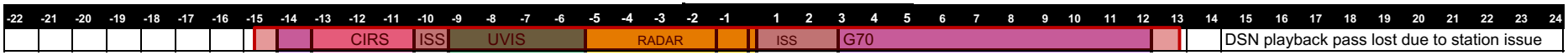
Christophe Sotin, Ken Lawrence, Tucson VIMS team

T060 VIMS Science objectives: On the inbound, the phase angle is much larger than 90 degrees and VIMS prime observations will provide information on the composition of Titan's atmosphere. After C/A, VIMS will be riding along with ISS and will obtain several cubes at 10 km/pixel resolution in the southern hemisphere over the area mapped during T58.

Data loss due to DSN station issues.

C/A - 12:02:04	-10:00	CIRS	Template N
-10:00	-09:00	ISS	Template N
-09:00	-05:10	UVIS	Template P
begin custom period			
-05:10	-05:00	Turn to RADAR attitude	
-05:00	-02:00	RADAR	Template L
-02:00	-01:12	RADAR	Scatterometry/Radiometry
-01:12	-01:11	RWA to RCS Transition	
-01:11	-00:30	RADAR	Hi-SAR
-00:30	-00:18	RADAR	Altimetry
-00:18	0	RADAR	SAR
2009-221T14:03:53		CLOSEST APPROACH	
0	+00:18	RADAR	SAR
+00:18	+00:26	RADAR Turn to ISS attitude	Check turn times Neg_Y to Titan, Pos_Z to NTP
end custom period			
+00:26	+00:48	RCS to RWA Transition	
+00:48	C/A + 02:07:56	ISS	



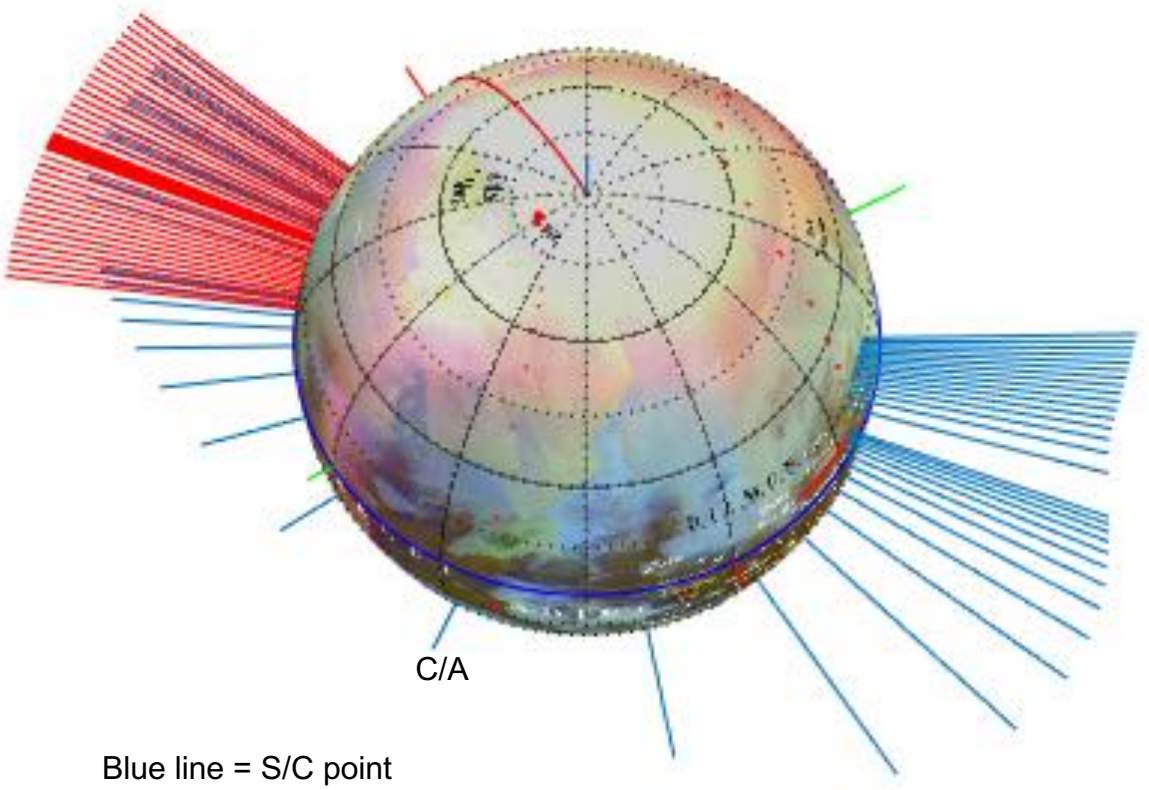


T060 – rev 116 – S52

Aug. 9, 2009 – 221T14:03:54 @ 971 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

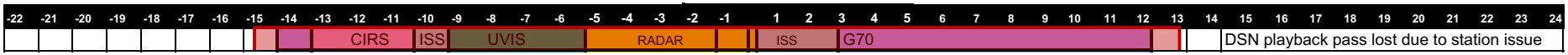
Inbound:



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



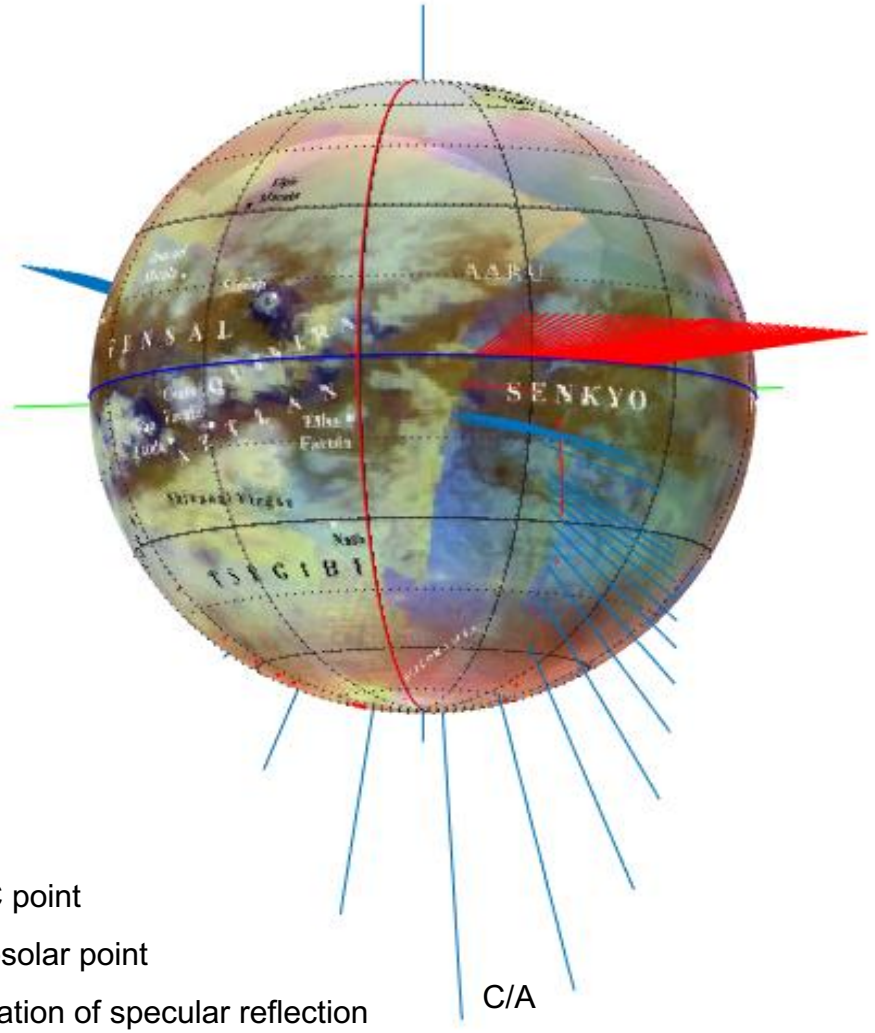
T060 – rev 116 – S52

Aug. 9, 2009 – 221T14:03:54 @ 971 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

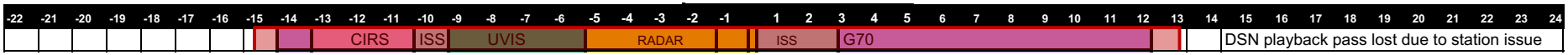
Regional and global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



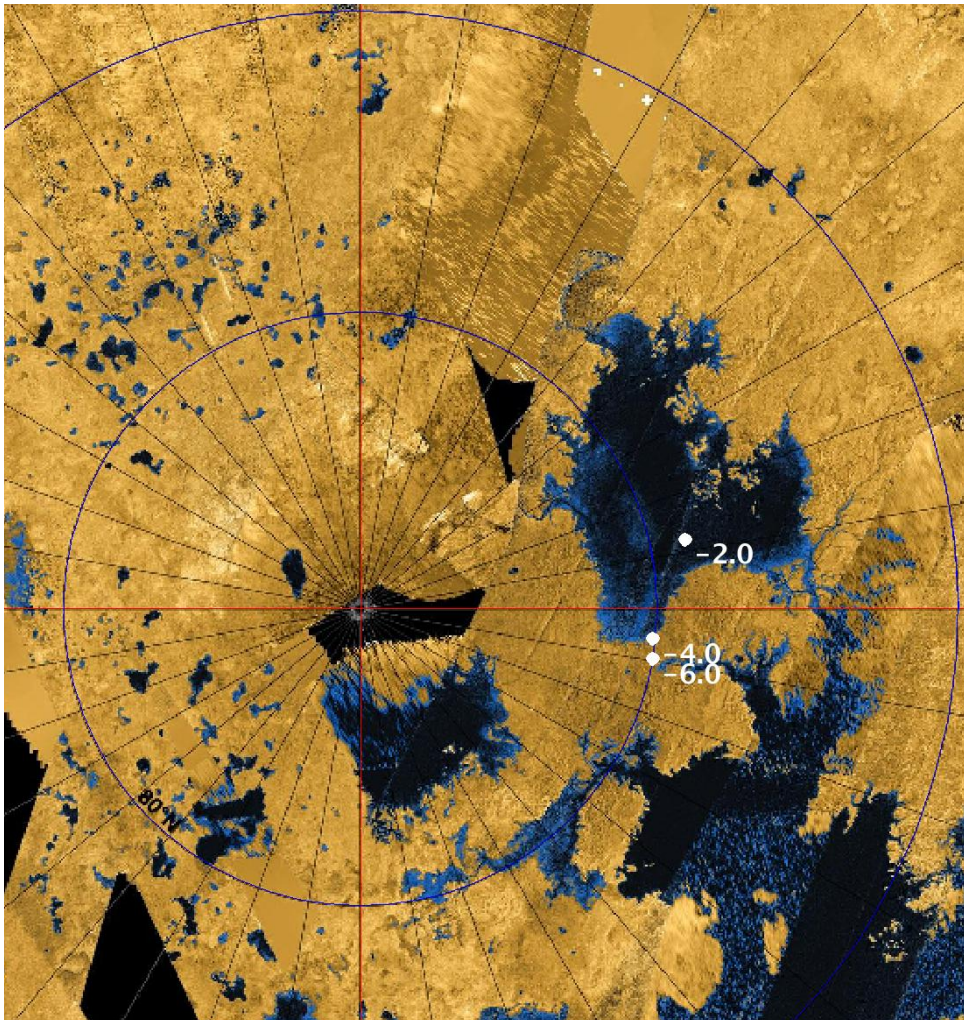
T060 – rev 116 – S52

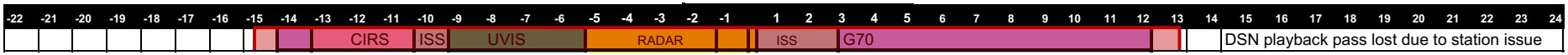
Aug. 9, 2009 – 221T14:03:54 @ 971 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
80.02	279.7	82.0	-21600	-6.0
80.10	275.8	82.7	-14400	-4.0
78.82	257.9	84.9	-7200	-2.0



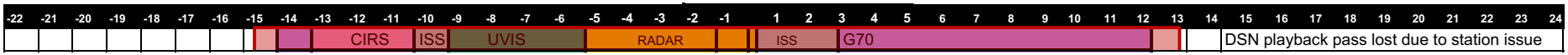


T060 – rev 116 – S52

Aug. 9, 2009 – 221T14:03:54 @ 971 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Data loss due to DSN station issues.



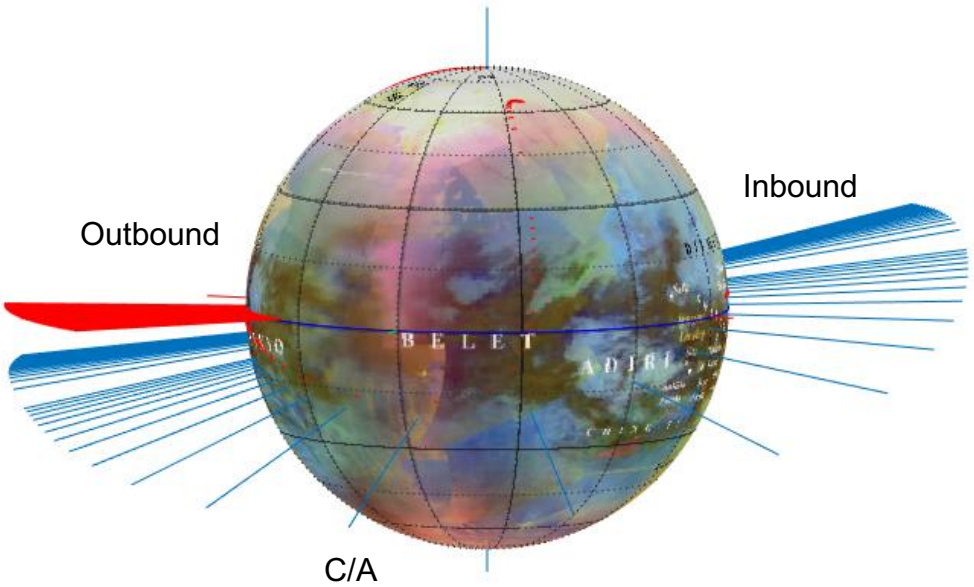
T061 – rev 117 – S53

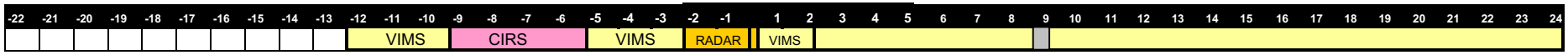
Aug. 25, 2009 – 237T12:51:39 @ 961 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T061 VIMS Science objectives: T61 outbound is a very good opportunity for optical instruments because the phase angle is about 10 degrees. VIMS will observe the southern hemisphere at longitudes similar to those observed at T57, T58, T59 and T60. The resolution can be as good as 5 km/pixel at the beginning of the observation. From T57 to T61, VIMS will observe the same area with different phase angles, which should provide a phase curve. This area was not observed during the prime mission. Just after C/A, after radar, VIMS will be able to point to an area (-30, 345) where Northeast-Southwest lineaments have been observed during the prime mission and where clouds may be orogenic.

C/A - 11:51:48	-09:00	ISS	Replaced VIMS (found a safe observation)
-09:00	-05:10	CIRS	Template R
-05:10	-02:20	VIMS	Template Y
-02:20	-01:12	RADAR	Scatterometry/Radiometry
-01:12	-01:11	RWA to RCS Transition	
-01:11	-00:30	RADAR	Hi-SAR
-00:30	-00:18	RADAR	
-00:18	0	RADAR	SAR over landing site/Stereo on Dunes
2009-237T12:51:38	(080806 ref traj.)	CLOSEST APPROACH	NEG_Z to Titan, NEG_X to Titan_SC_RAM
0	+00:15	RADAR	SAR
+00:15	+00:23	Turn back to WP	Check turn times Neg_Y to Titan (-10.5, 0, 0), NEG_X to Sun
+00:23	+00:44:05	RCS to RWA Transition	
+00:44:05	+02:00	VIMS	
+02:00	+05:00	VIMS	Template Y
+05:00	+08:30	VIMS	Template I
+08:30	+09:00	ISS	Template I
+09:00	+14:00	VIMS	Template V
+14:00	C/A + 25	VIMS	Template B





T061 – rev 117 – S53

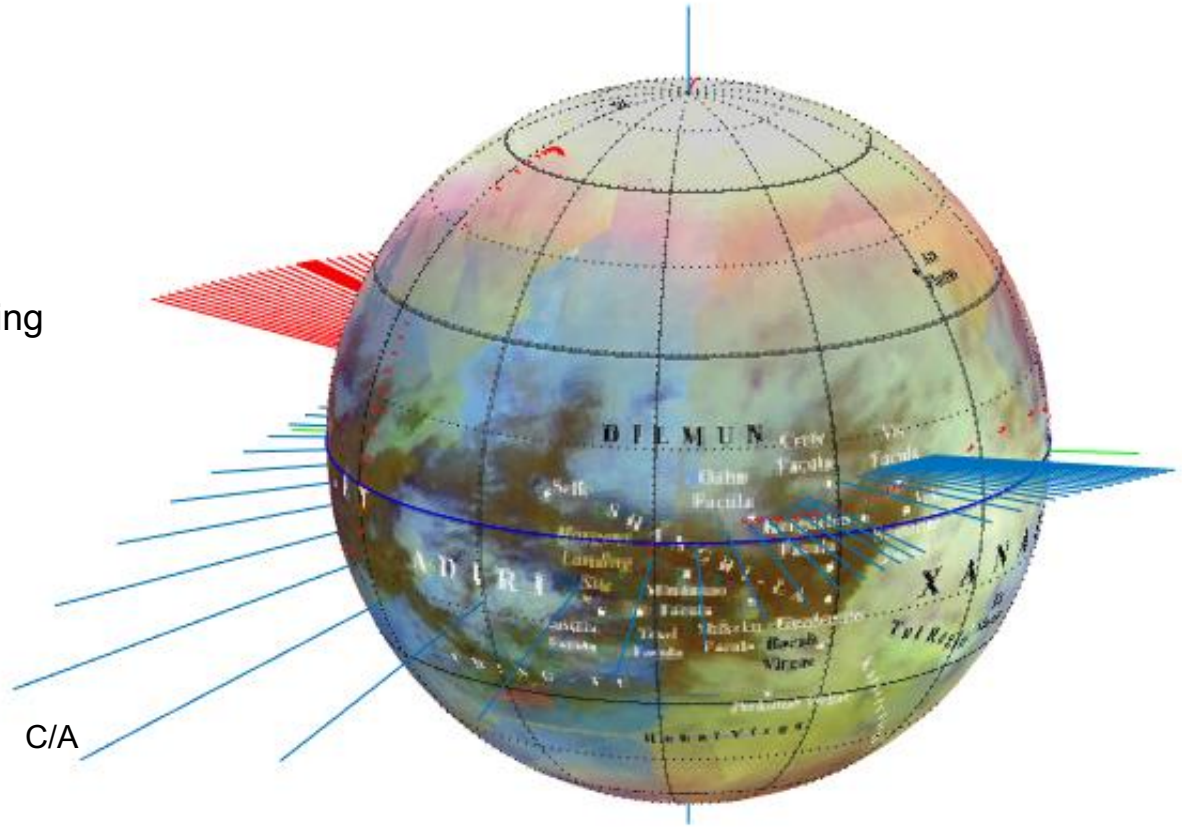
Aug. 25, 2009 – 237T12:51:39 @ 961 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection geometry at 65N, 235 W at C/A – 09:00.

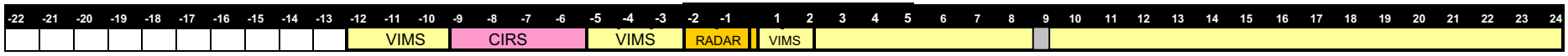
Limb mapping of Titan while riding along with CIRS.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T061 – rev 117 – S53

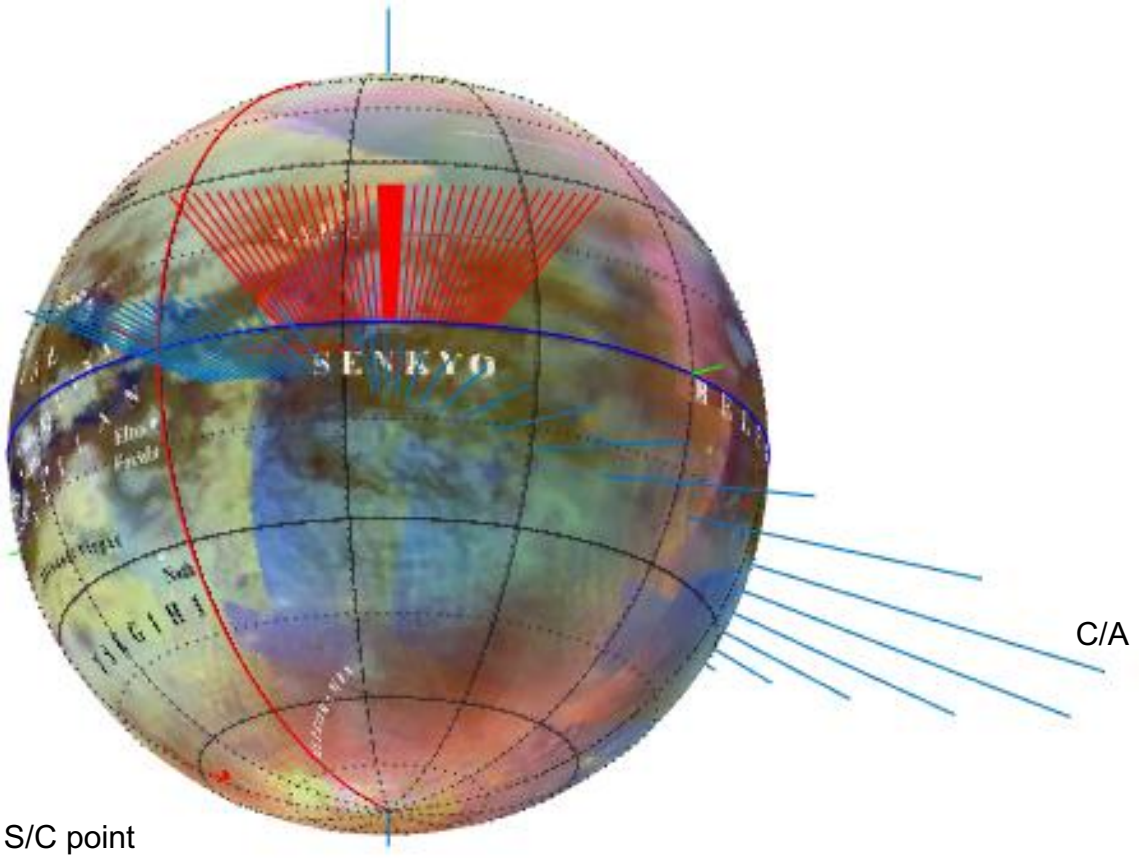
Aug. 25, 2009 – 237T12:51:39 @ 961 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

High and medium resolution regional mapping of Titan.

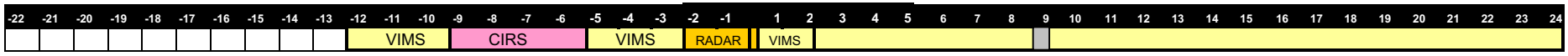
Global mapping of Titan



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



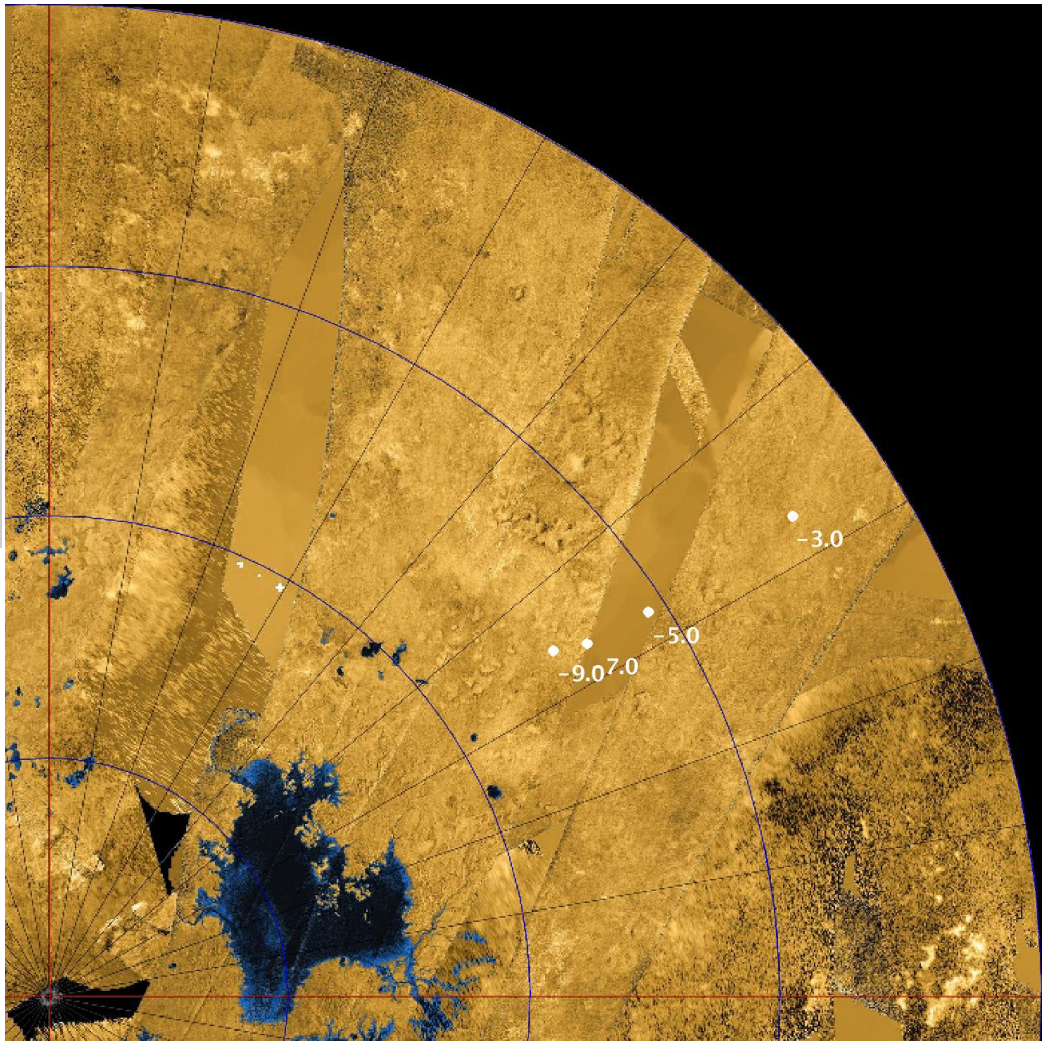
T061 – rev 117 – S53

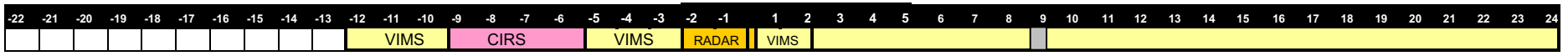
Aug. 25, 2009 – 237T12:51:39 @ 961 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
64.73	235.5	84.8	-32400	-9.0
63.47	236.7	84.9	-25200	-7.0
60.75	237.3	85.1	-18000	-5.0
54.06	237.1	85.4	-10800	-3.0





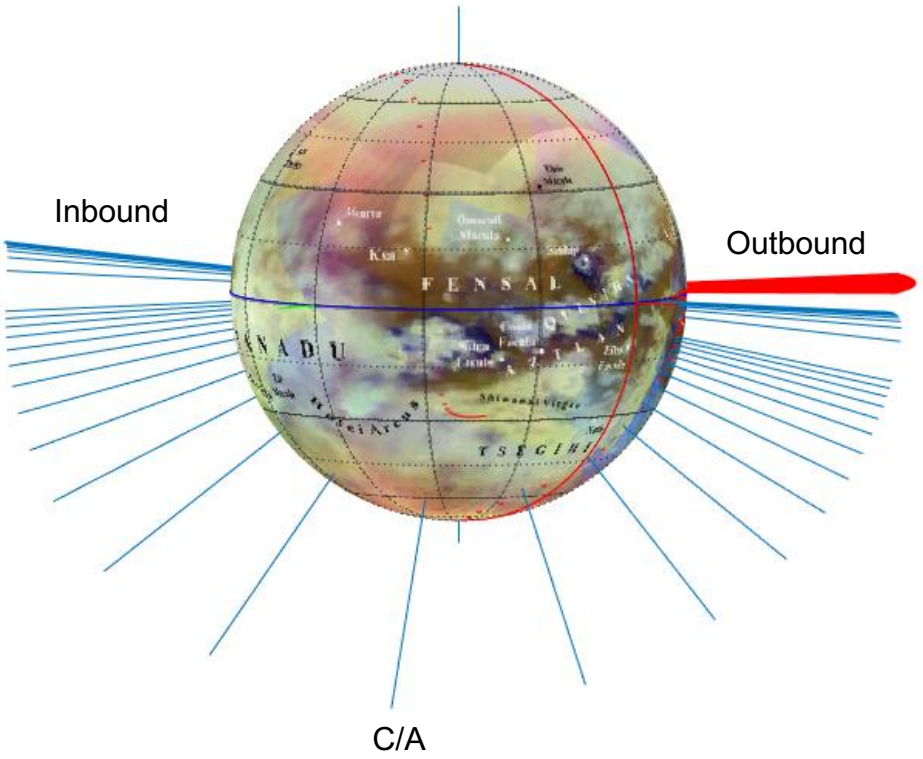
T062 – rev 119 – S54

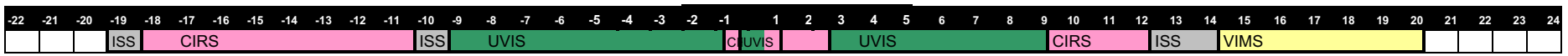
Oct. 12, 2009 – 285T08:36:25 @ 1299 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T062 VIMS Science objectives: VIMS will observe the formation, evolution, and decay of clouds, particularly mid-latitude and equatorial clouds. In ridealong mode, a solar occultation will provide information on the vertical structure and compostition of Titan's atmosphere and haze layer (outbound is close to the South pole). VIMS will also obtain a global map of the western region of Senkyo.

C/A - 17:51:04	C/A - 17:21:04	ISS	Template M3
C/A - 17:21:04	-13:00	CIRS	Template M3
-13:00	-10:00	CIRS	Template N
-10:00	-09:00	ISS	Template N
begin custom period			
-09:00	**-02:09**	UVIS	Template X
-02:09	**-01:47**	RWA to RCS Transition	
-01:47	**-00:51**	**UVIS Solar Occ Ingress**	**Near Equator**
-00:51	**-00:48**	**Turn to CIRS attitude**	
-00:48	**-00:22**	**CIRS**	**Slow limb scan or limb int;**
-00:22	**-00:18**	**Turn to UVIS attitude**	
-00:18	**0**	**UVIS Solar Occ Egress**	**Southern Latitudes**
2009-285T08:35:04		**CLOSEST APPROACH**	**UVIS Solar Occ Port to Sun, ???**
0	**+00:25**	**UVIS Solar Occ Egress**	**Time to stay on Sun point being looked at**
+00:25	**+00:35 (check)**	**Turn to CIRS attitude**	Neg_Y to Titan, Neg_Z to NTP (or 2nd to minimize turn times) Less turn time goes to CIRS
+00:35 (check)	**+02:15**	**CIRS**	
end custom period			
+02:15	**+02:39**	**RCS to RWA**	
+02:39	**+05:00**	UVIS	Template X
+05:00	**+09:00**	UVIS	Template X
+09:00	**+12:00**	CIRS	Template D2
+12:00	**+14:00**	ISS	Template D2
+14:00	C/A + 19	VIMS	Template B





T062 – rev 119 – S54

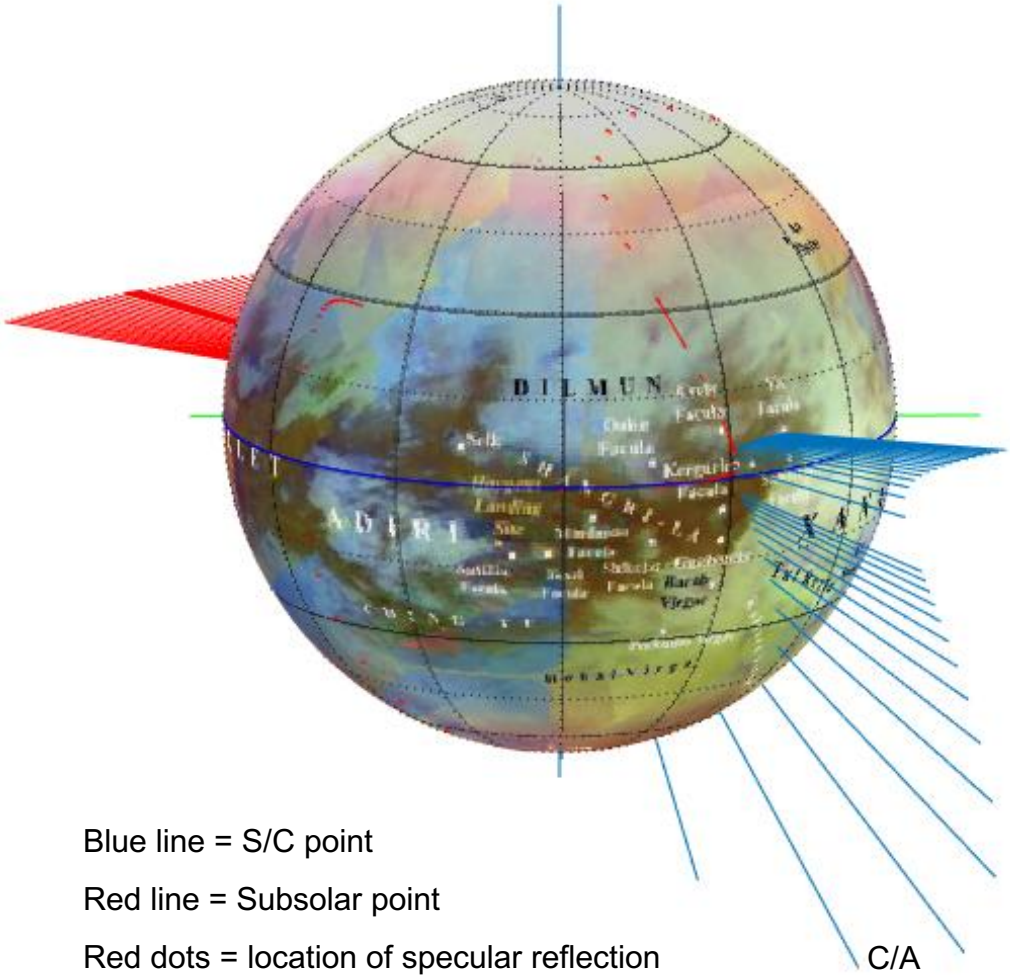
Oct. 12, 2009 – 285T08:36:25 @ 1299 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Solar occultation.

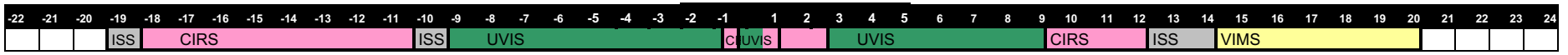
Cloud evolution and formation.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T062 – rev 119 – S54

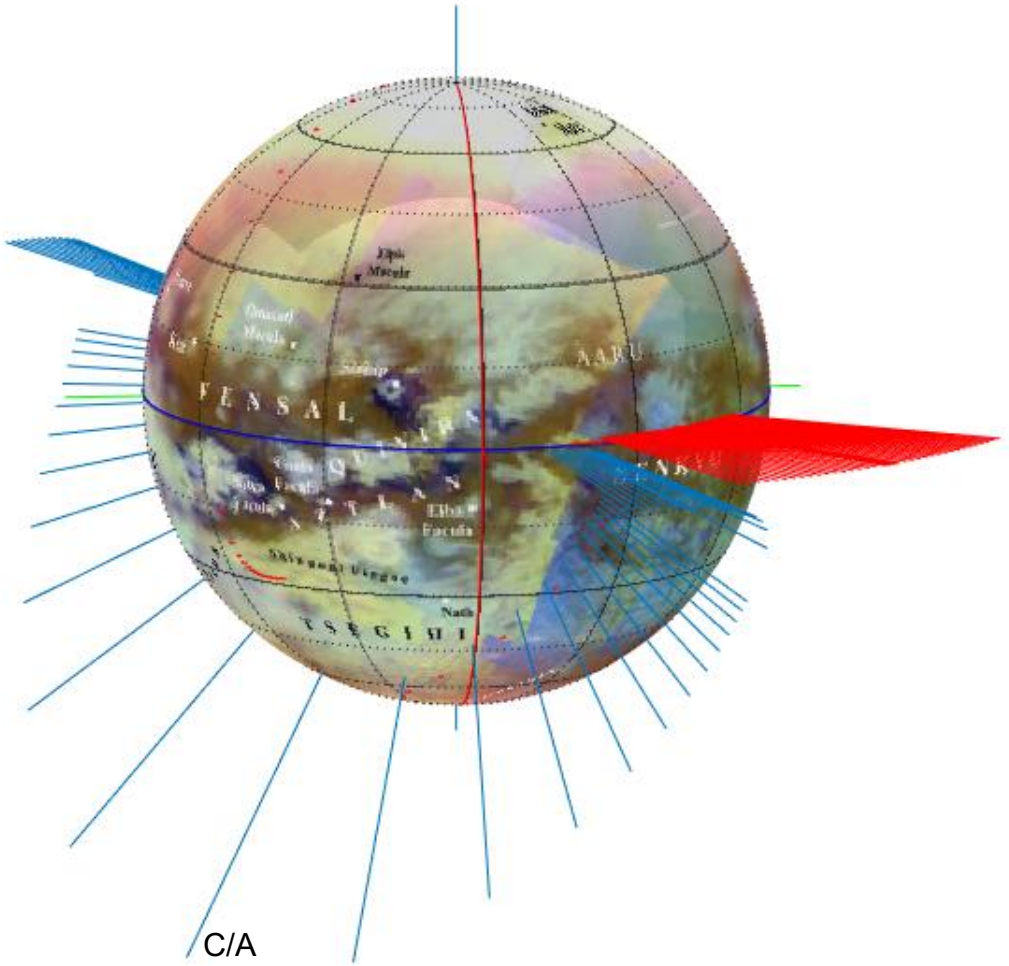
Oct. 12, 2009 – 285T08:36:25 @ 1299 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.

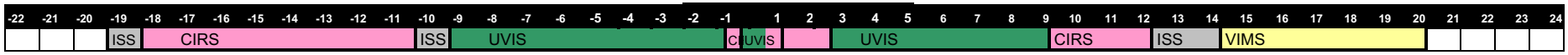
Mid-latitude and equatorial cloud monitoring and mapping.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

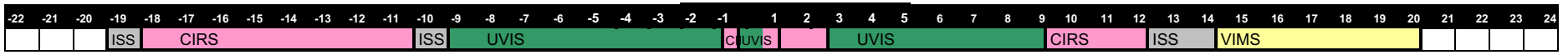


T062 – rev 119 – S54

Oct. 12, 2009 – 285T08:36:25 @ 1299 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at equatorial latitudes. At C/A specular geometry point is at ~55N, 9 W.



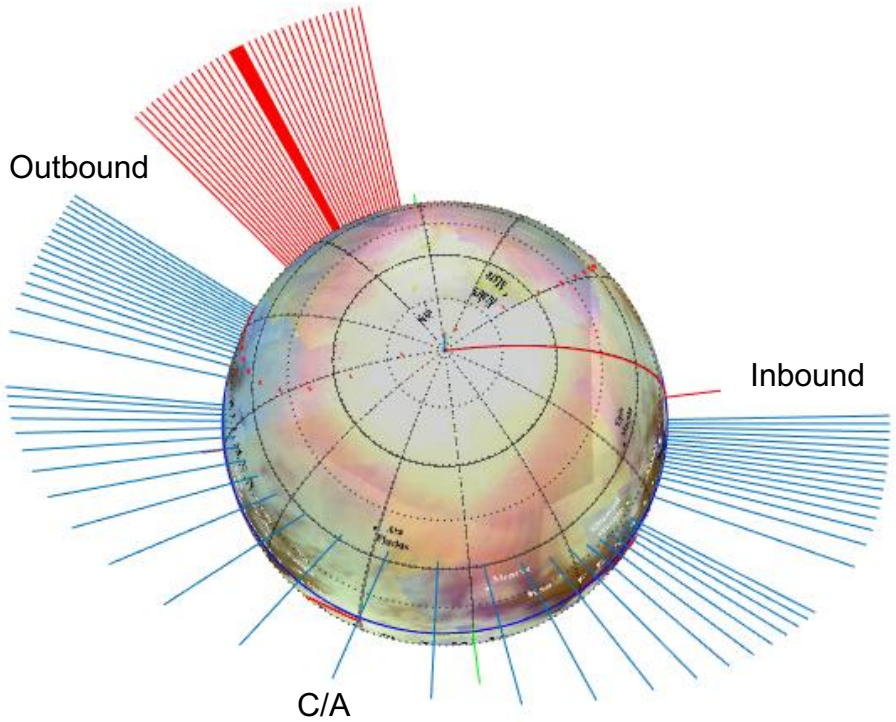
T063 – rev 122 – S55

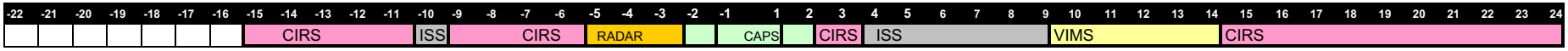
Dec. 12, 2009 – 346T01:03:15 @ 4847 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T063 VIMS Science objectives: This flyby will allow VIMS to monitor the cloud cover during the inbound. After C/A, VIMS will be ridealong with ISS to acquire a mosaic of Shangri-La and Belet at a resolution of 40 km per pixel. Then, VIMS will acquire a global map for cloud monitoring.

C/A - 13:57:18	-10:00	CIRS	Template M4
-10:00	-09:00	ISS	Template N
-09:00	-05:00	CIRS	Template R
-05:00	**-02:05**	RADAR	Template L
-02:05	**0**	**CAPS**	NEG_Y to 36.467/-12.267, NEG_X to Sun
2009-346T01:03:14		**CLOSEST APPROACH**	**NEG_X to DustRAM, NEG_Z to NSP**
0	**+02:45**	**CAPS**	
+02:45	**+3:45**	CIRS	Template S2
+3:45	**+9:00**	ISS	Template S2
+09:00	+14:00	VIMS	Template V
+14:00	C/A + 23	CIRS	Template A(Z)





T063 – rev 122 – S55

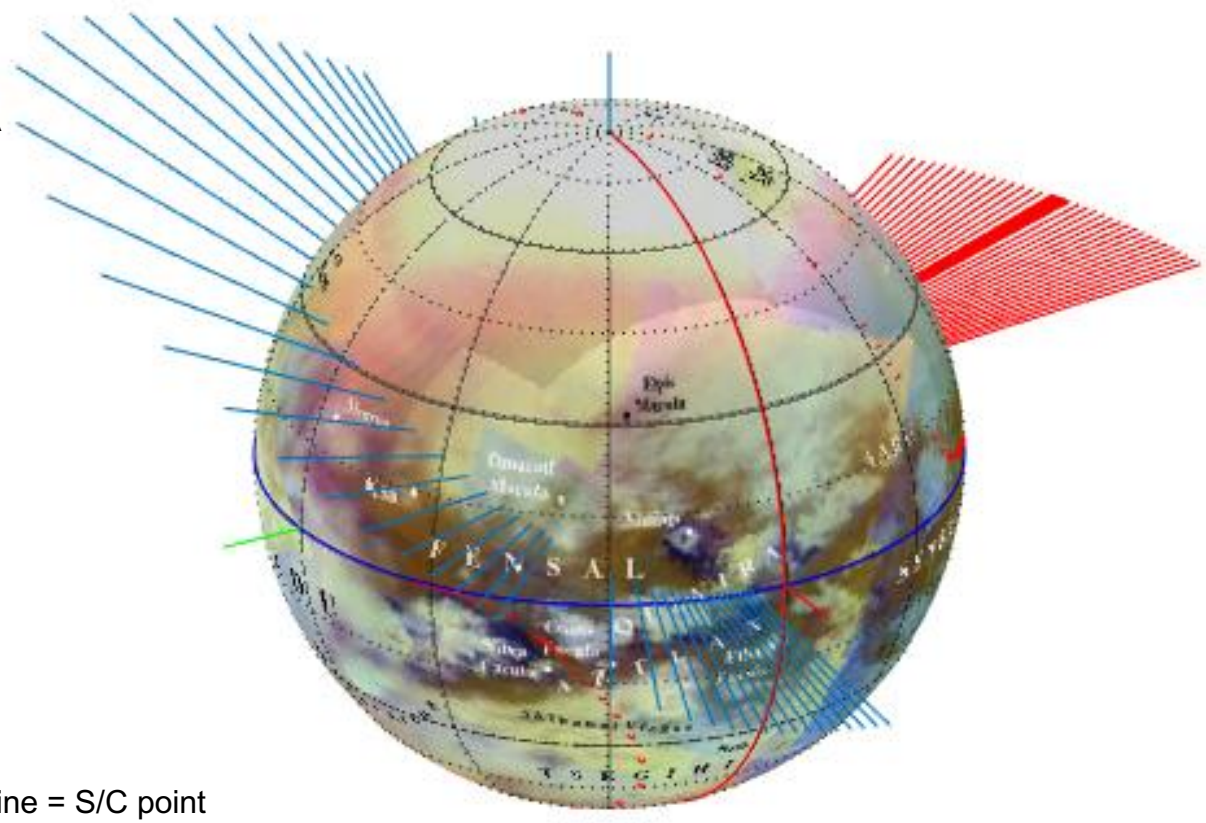
Dec. 12, 2009 – 346T01:03:15 @ 4847 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

C/A

Inbound:

Cloud mapping and monitoring.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
							CIRS					ISS		CIRS			RADAR					CAPS			CIRS	ISS						VIMS					CIRS									

T063 – rev 122 – S55

Dec. 12, 2009 – 346T01:03:15 @ 4847 km altitude

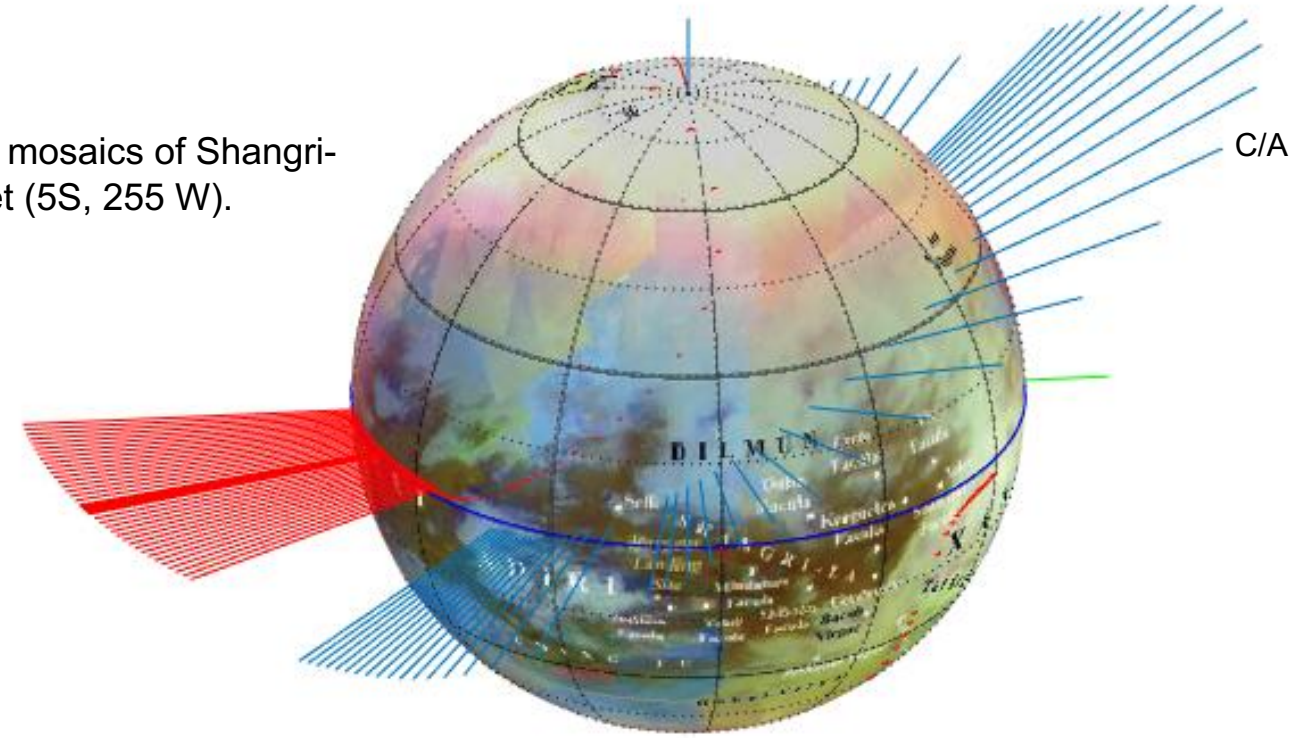
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Acquire regional mapping mosaics of Shangri-La (10S, 165 W) and Belet (5S, 255 W).

Global mapping of Titan.

Cloud monitoring.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

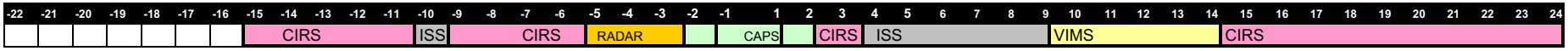
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
							CIRS					ISS	CIRS				RADAR				CAPS			CIRS	ISS						VIMS					CIRS									

T063 – rev 122 – S55

Dec. 12, 2009 – 346T01:03:15 @ 4847 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular geometry before and after C/A occurs near equatorial latitudes.



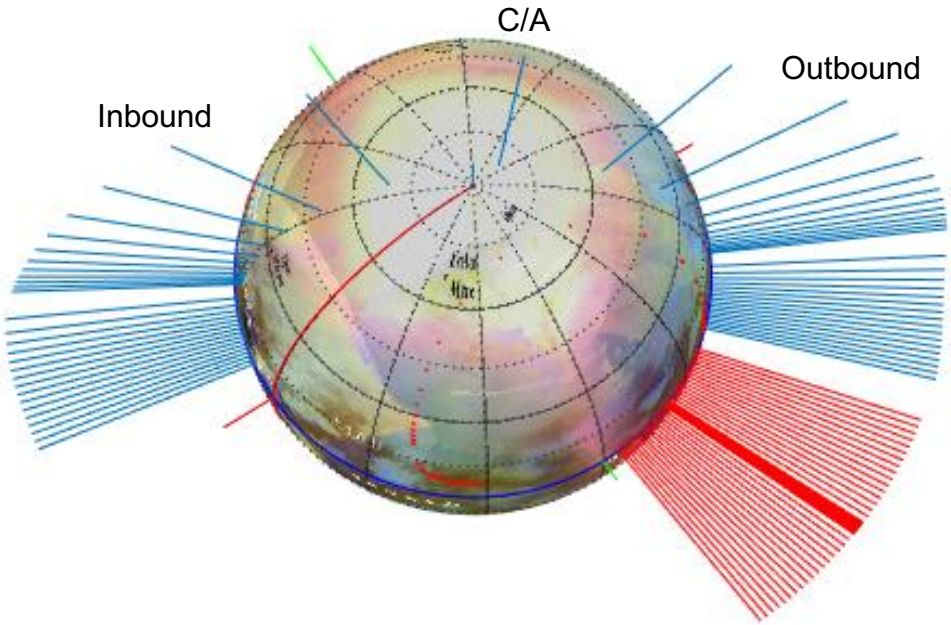
T064 – rev 123 – S56

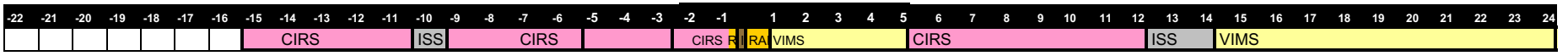
Dec. 28, 2009 – 362T00:17:00 @ 951 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T064 VIMS Science objectives: This flyby will allow VIMS to acquire a mosaic of Titan between 160 and 300 long at a resolution of 20 km/pixel. VIMS will keep monitoring for mid-latitude clouds and will survey the evolution of the North polar hood.

C/A - 14:09:35	-13:00	CIRS	Template M4
-13:00	-10:00	CIRS	Template N
-10:00	-09:00	ISS	Template N
-09:00	-05:00	CIRS	Template R
-05:00	-02:15	CIRS	Template T
-02:15	-01:16	CIRS	NEG_Y to Titan, NEG_X to SUN
-01:16	**-01:15**	RWA to RCS Transition	Transition to RCS @ -01:16 (1 min.)
-01:15	-00:38	CIRS	NEG_Y to Titan, NEG_X to SUN
begin custom period			
-00:38	-00:30	Turn to RADAR attitude	NEG_Z to Titan, NEG_X to RAM
-00:30	-00:18	RADAR Altimetry	*Needed turn time provided by RADAR*
-00:18	-00:12	Turn to INMS attitude	NEG_X to RAM, NEG_Z to Titan
-00:12	0	INMS	SAR will begin @ C/A - 3 mins
2009-362T00:16:59		CLOSEST APPROACH	NEG_Z to Titan, NEG_X to RAM
0	+00:18	RADAR SAR	
+00:18	+00:30	RADAR Altimetry	
+00:30	+00:50	RADAR HiSAR	
+00:50	+00:58	Turn to VIMS attitude	NEG_Y to Titan, NEG_X to SUN
end custom period			
+00:58	+01:22	RCS to RWA Transition	
+01:22	+02:00	VIMS	
+02:00	+05:00	VIMS	Template Y
+05:00	+09:00	CIRS	Template F
+09:00	+12:00	CIRS	Template D2
+12:00	+14:00	ISS	Template D2
+14:00	C/A + 23	VIMS	Template B(Z)





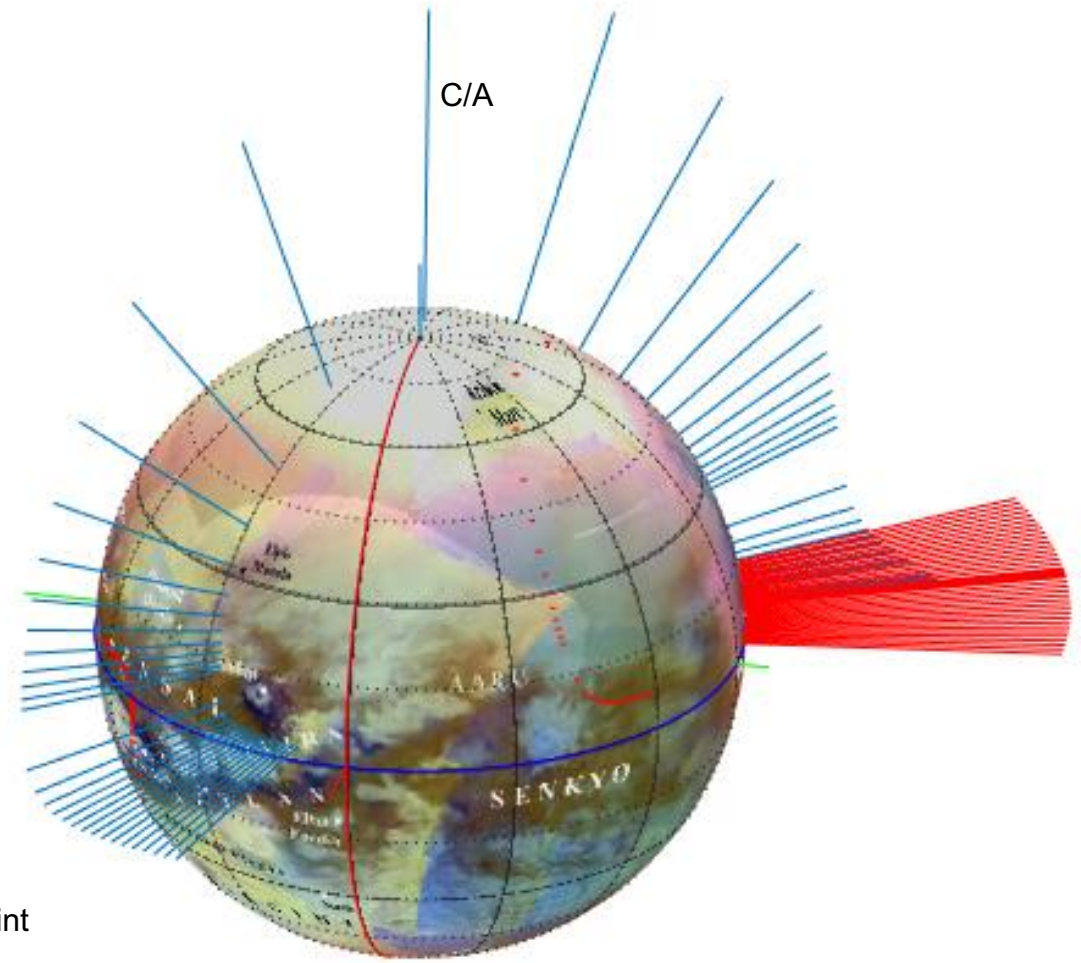
T064 – rev 123 – S56

Dec. 28, 2009 – 362T00:17:00 @ 951 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

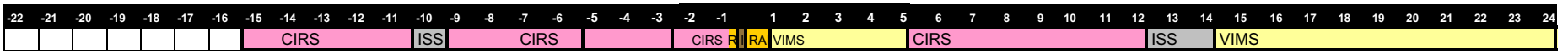
Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T064 – rev 123 – S56

Dec. 28, 2009 – 362T00:17:00 @ 951 km altitude

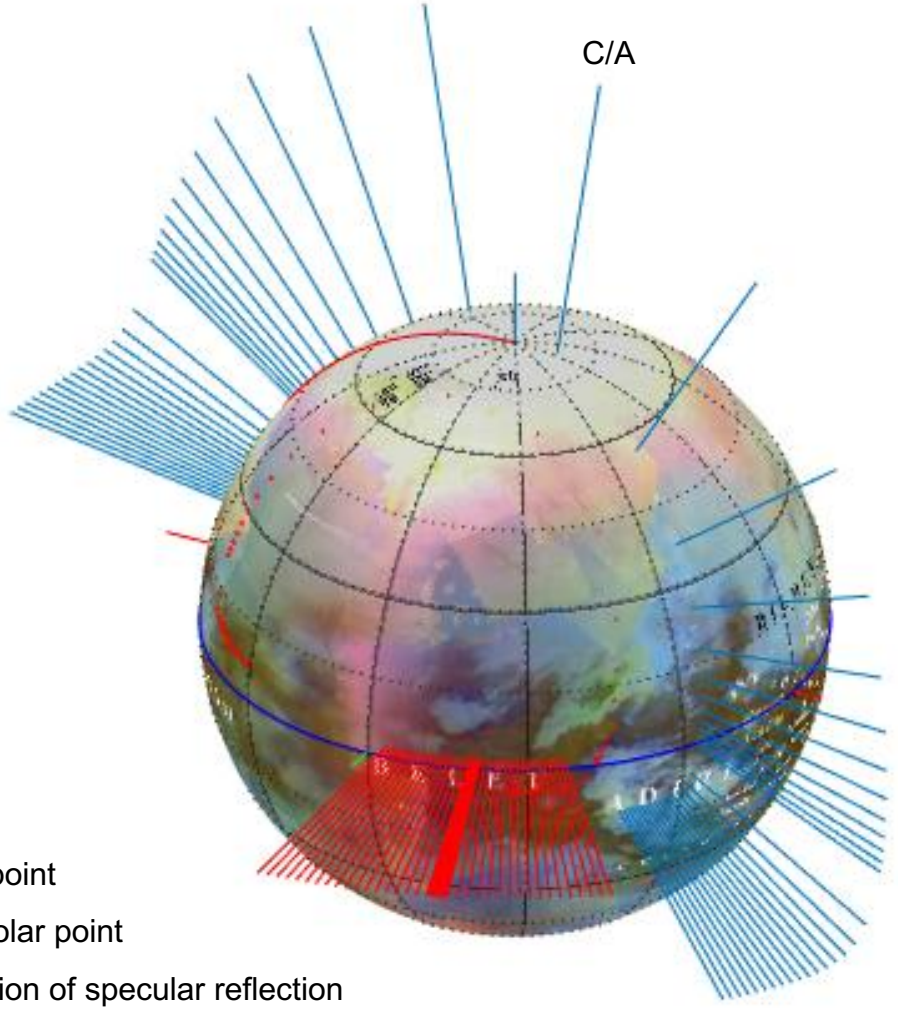
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

High resolution, regional and global mapping of Titan, including the Huygens Landing Site (10.6S, 192.4 W).

Cloud monitoring.

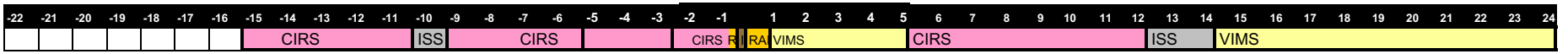
Evolution of the north polar hood.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



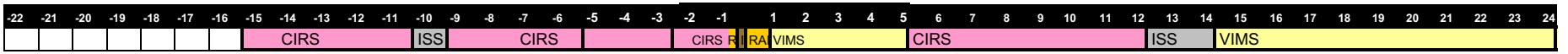
T064 – rev 123 – S56

Dec. 28, 2009 – 362T00:17:00 @ 951 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes during the VIMS observations. Specular geometry occurs near equatorial latitudes before and after C/A.

Note, Specular reflection geometry occurs over Kraken Mare (61N, 309 W) from C/A – 00:14 to C/A – 00:02 during the RADAR observations.



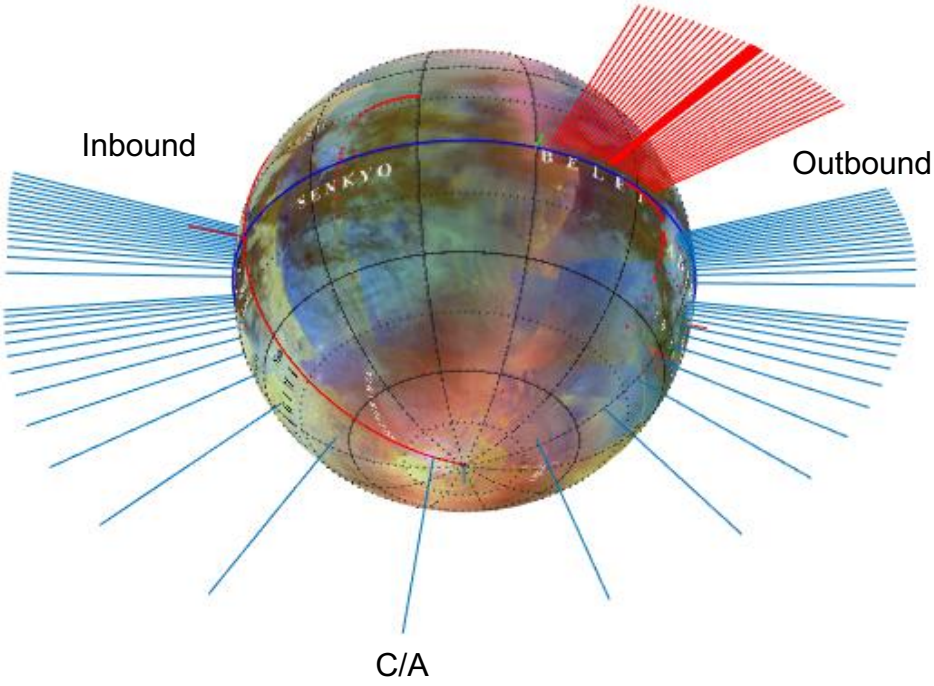
T065 – rev 124 – S56

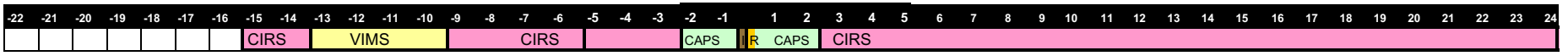
Jan. 12, 2010 – 012T23:10:37 @ 1074 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T065 VIMS Science objectives: During this flyby, VIMS will be ridealong with CIRS on the outbound where the phase angle is about 45 degrees. It provides a good opportunity to get a mosaic of the equatorial area between 160 and 270 long (Western portion of Shangri-la, Adiri, landing site) at a resolution of 25 to 30 km/pixel. VIMS will keep monitoring for mid-latitude clouds. On the inbound, will look at the terminator.

C/A - 14:2:56	-13:00	CIRS	Template M4
-13:00	-09:00	VIMS	Template O
-09:00	-05:00	CIRS	Template R
-05:00	-02:15	CIRS	Template T
-02:15	-02:14	RWA to RCS Transition	
		begin custom period	
-2:14	-00:23	CAPS	NEG_X to DustRAM, NEG_Z to Titan Transition to a 2nd of NEG_Z to NTP outside -00:30
-00:23	0	INMS	NEG_X to RAM, NEG_Z to Titan '@ RADAR attitude at C/A
2010-012T23:11:56		CLOSEST APPROACH	NEG_X to RAM, NEG_Z to Titan
0	+00:16	RADAR	SAR of Lacus Ontario
+00:16	+01:36	CAPS	transition to a 2nd of NEG_Z to NTP outside +00:30 Transition to RWA @ +1:36
+01:36	+2:00	RCS to RWA Transition	
+02:00	+05:00	CIRS	Template E
		end custom period	
+05:00	+09:00	CIRS	Template F
+09:00	+14:00	CIRS	Template C
+14:00	C/A + 23	CIRS	Template A(Z)





T065 – rev 124 – S56

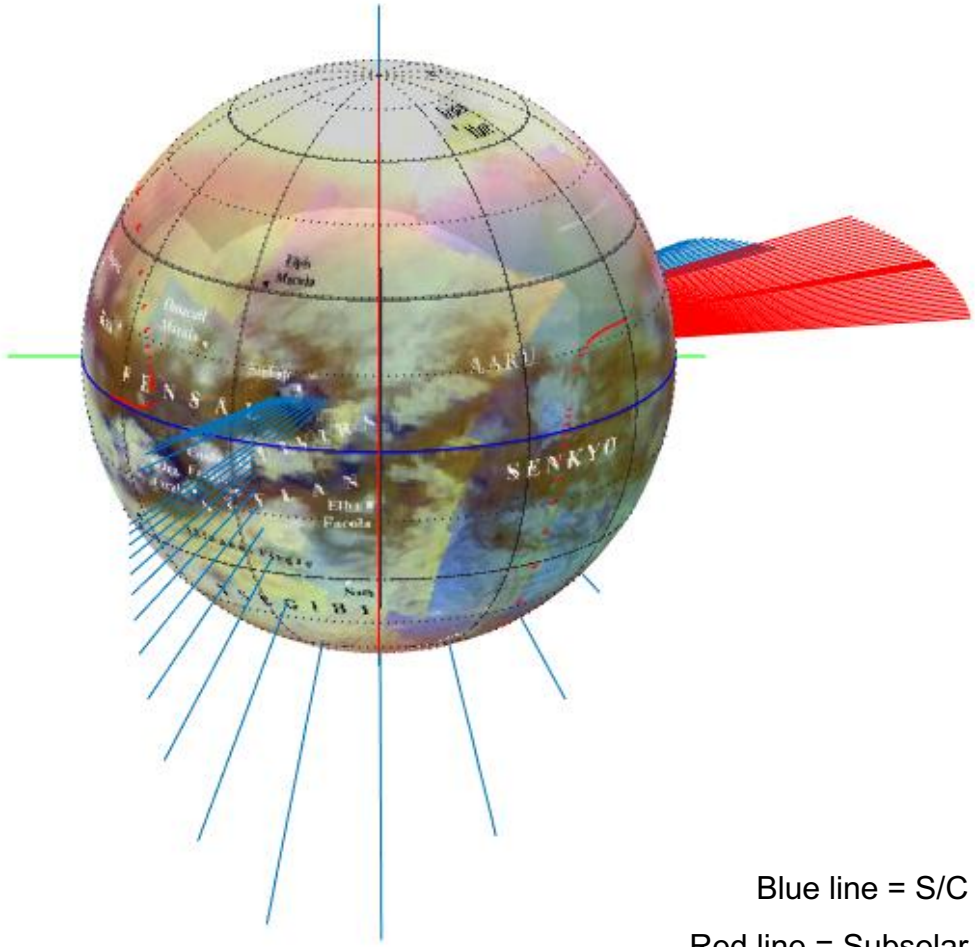
Jan. 12, 2010 – 012T23:10:37 @ 1074 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Cloud mapping.

Observations taken at the terminator.

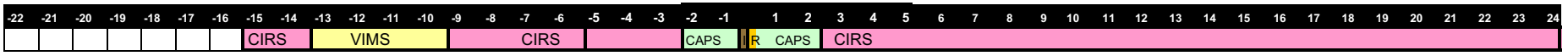


C/A

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T065 – rev 124 – S56

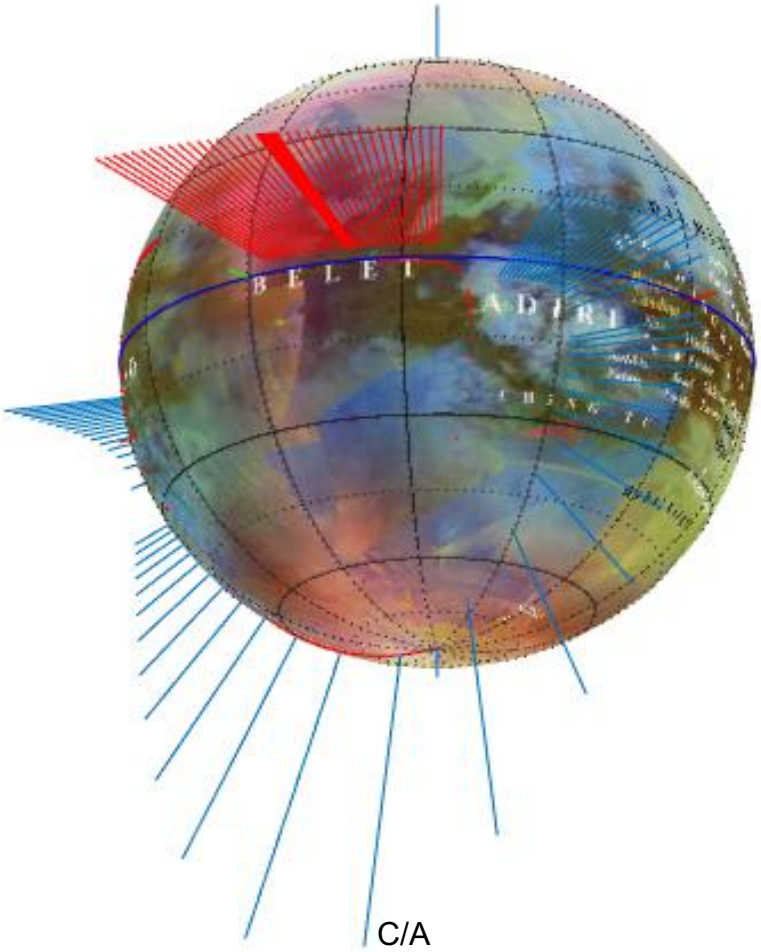
Jan. 12, 2010 – 012T23:10:37 @ 1074 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Acquire mosaics of the equatorial region west of Sangri-la (10S, 165S), Adiri (10S, 210 W) and the Huygens landing site (10.6S, 192.4 W) at resolutions of 25 – 30 km/px.

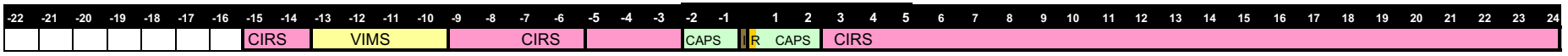
Monitor for mid-latitude clouds.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

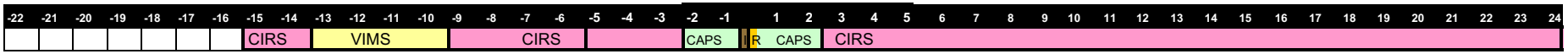


T065 – rev 124 – S56

Jan. 12, 2010 – 012T23:10:37 @ 1074 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular geometry occurs at equatorial latitudes before and after C/A.



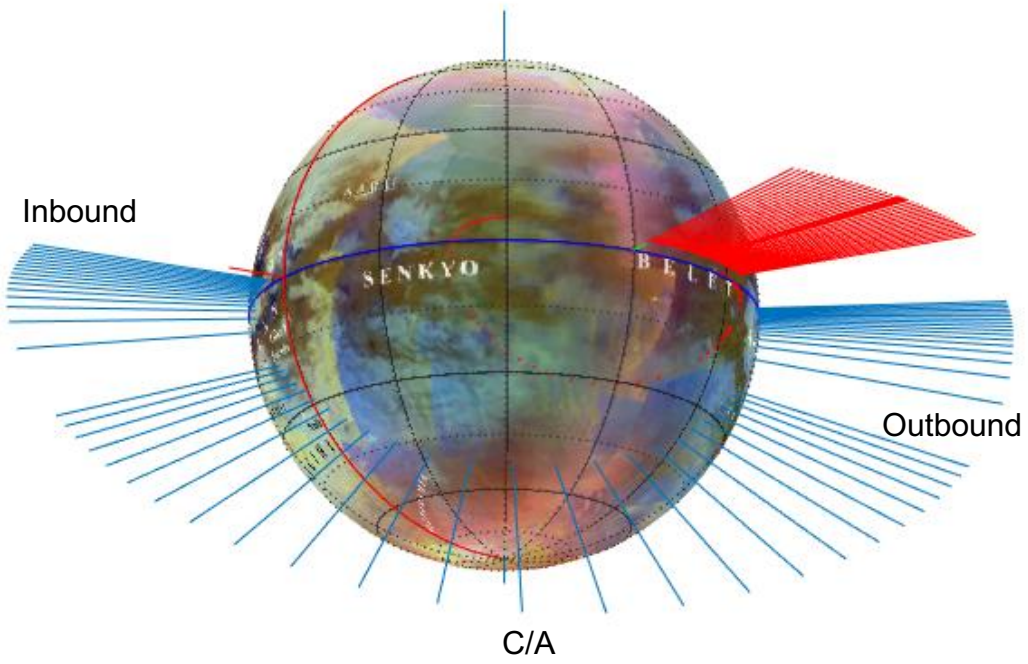
T066 – rev 125 – S57

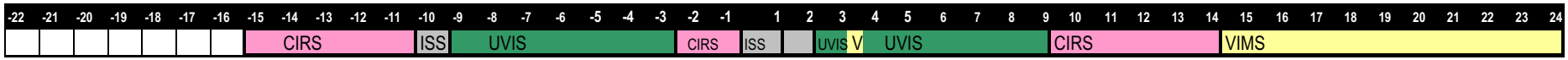
Jan. 28, 2010 – 028T22:28:50 @ 7487 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T066 VIMS Science objectives: During this flyby, VIMS will be ridealong with ISS at closest approach and will mosaic an area located South of Adiri with a resolution between 5 and 20 km/pixel. VIMS will keep monitoring for mid-latitude clouds on the outbound. There is a possibility for stellar occultation when VIMS is ridealong with UVIS.

C/A - 14:21:31	-10:00	CIRS
-10:00	-09:00	ISS
-09:00	-2:30	UVIS
begin custom period		
-2:30	-1:22	CIRS
-1:22	-00:48:30	CIRS
-00:48:30	-00:15	CIRS
-00:15	0	ISS
2010-028T22:32:31		CLOSEST APPROACH
0	+02:00	ISS
end custom period		
+02:00	+09:00	UVIS
+09:00	+14:00	CIRS
+14:00	C/A + 23	VIMS





T066 – rev 125 – S57

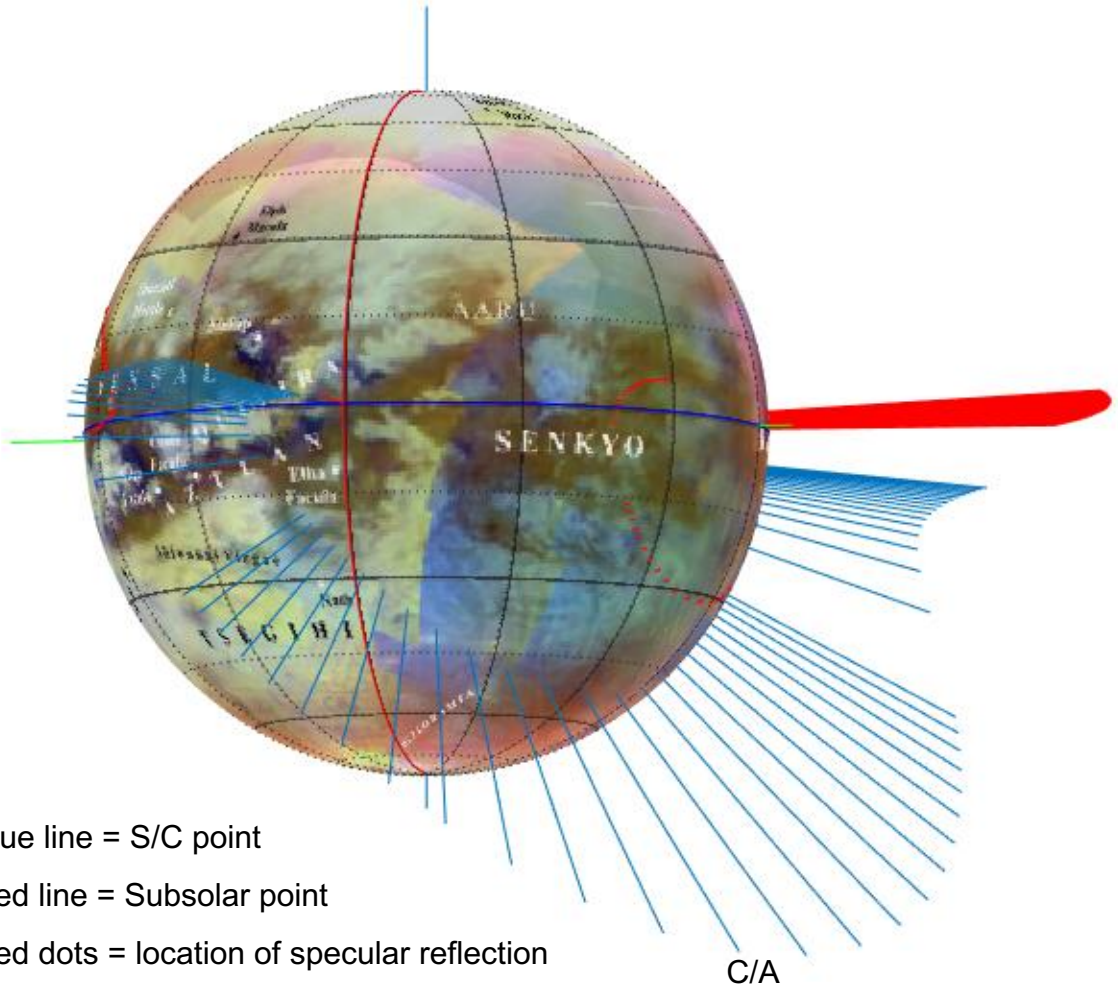
Jan. 28, 2010 – 028T22:28:50 @ 7487 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Regional mapping of Titan.

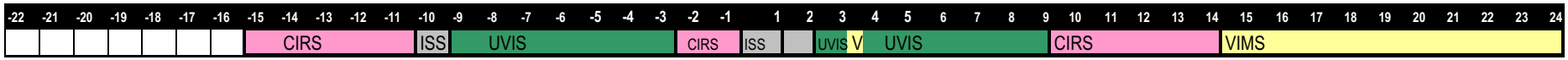
Stellar occultation of Alpha Tau.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T066 – rev 125 – S57

Jan. 28, 2010 – 028T22:28:50 @ 7487 km altitude

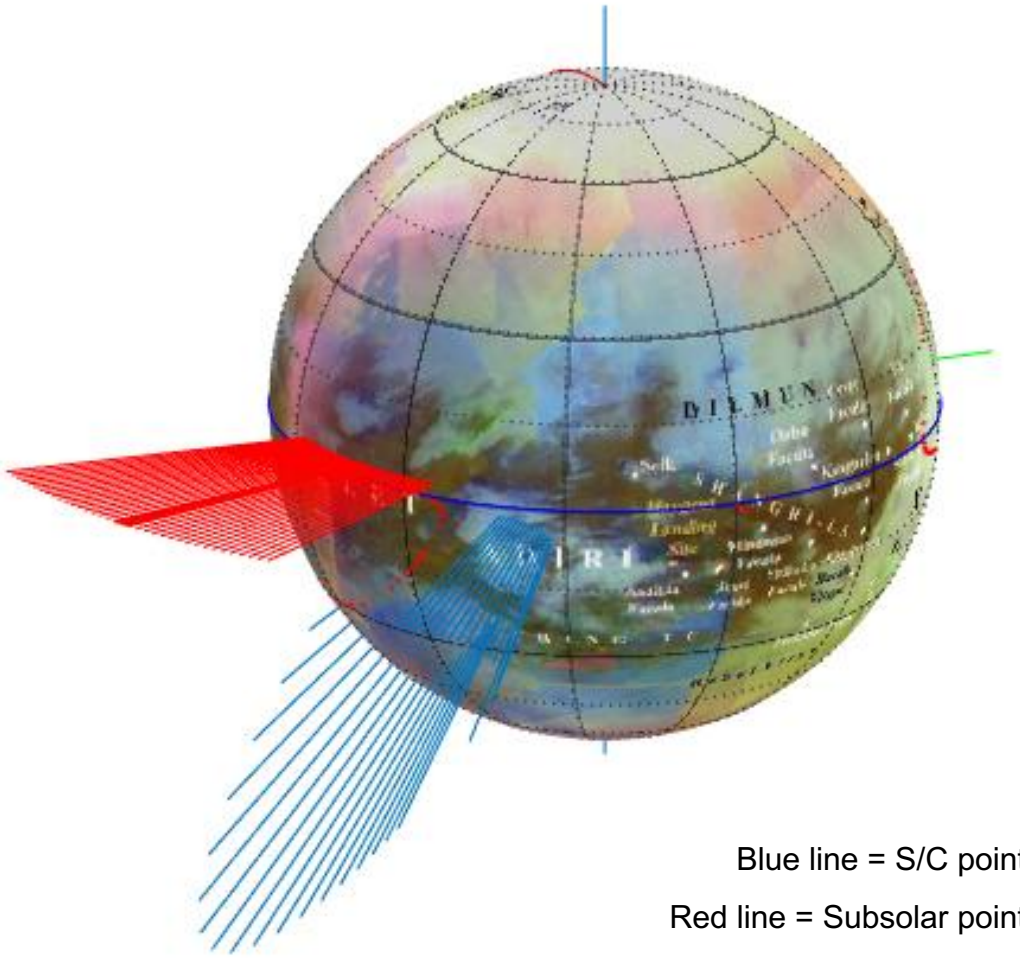
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Acquire mosaics south of Adiri (10S, 210 W) at resolutions of 5 – 20 km/px.

Monitor for mid-latitude clouds.

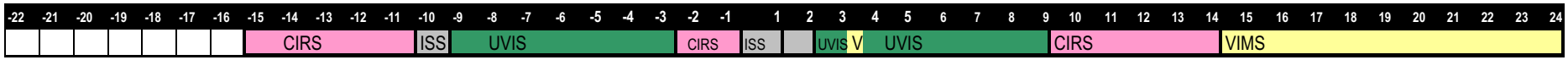
Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

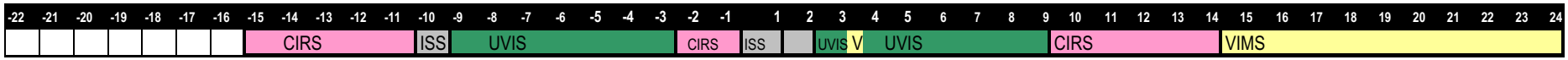


T066 – rev 125 – S57

Jan. 28, 2010 – 028T22:28:50 @ 7487 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular geometry occurs at equatorial latitudes before and after C/A.



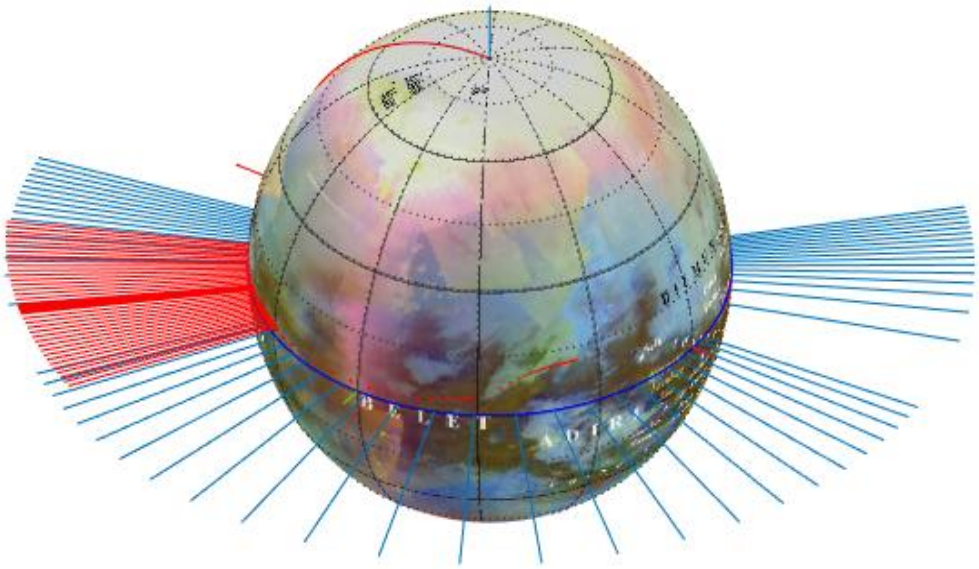
T067 – rev 129 – S59

Apr. 5, 2010 – 095T15:50:39 @ 7437 km altitude

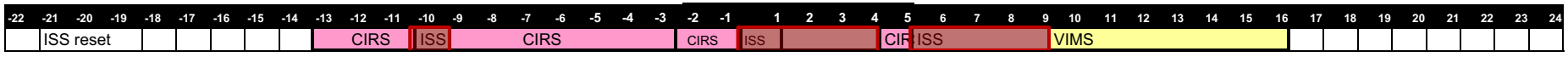
Christophe Sotin, Ken Lawrence, Tucson VIMS team

T067 VIMS Science objectives: During this flyby, VIMS will be ridealong with ISS at closest approach and will mosaic the equatorial terrains from Belet to Senkyo with a resolution from 4 to 20 km/pixel. It will allow VIMS to get higher resolution images on a circular feature about 500 km in diameter observed during T34.

C/A - 12:06:21	-10:00	CIRS
-10:00	-09:00	ISS
-09:00	-05:00	CIRS
-05:00	-02:15	CIRS
-02:15	-01:15	CIRS
-01:15	-00:45	CIRS
-00:45	-00:15	CIRS
-00:15	-00:10	Turn to ISS attitude
-00:10	0	ISS
2010-095T15:50:38		CLOSEST APPROACH
0	+02:00	ISS
+02:00	+04:00	ISS
+04:00	+05:00	CIRS
+05:00	+09:00	ISS
+09:00	+14:00	VIMS
+14:00	C/A + 14:48:39	VIMS



C/A



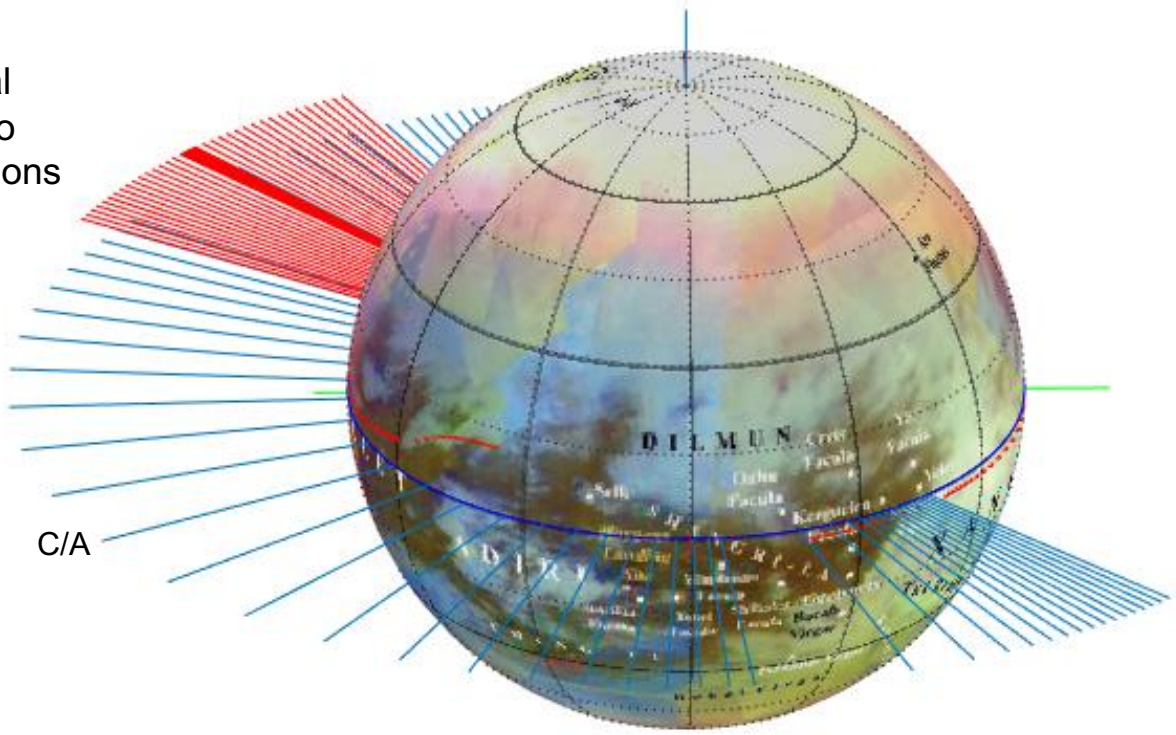
T067 – rev 129 – S59

Apr. 5, 2010 – 095T15:50:39 @ 7437 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

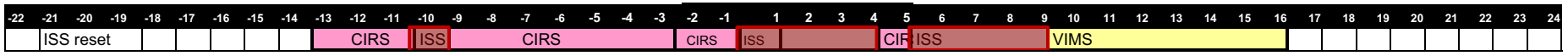
Acquire mosaics of the equatorial terrains from Belet (5S, 255 W) to Senkyo (5S, 320 W) with resolutions from 4 – 20 km/px.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T067 – rev 129 – S59

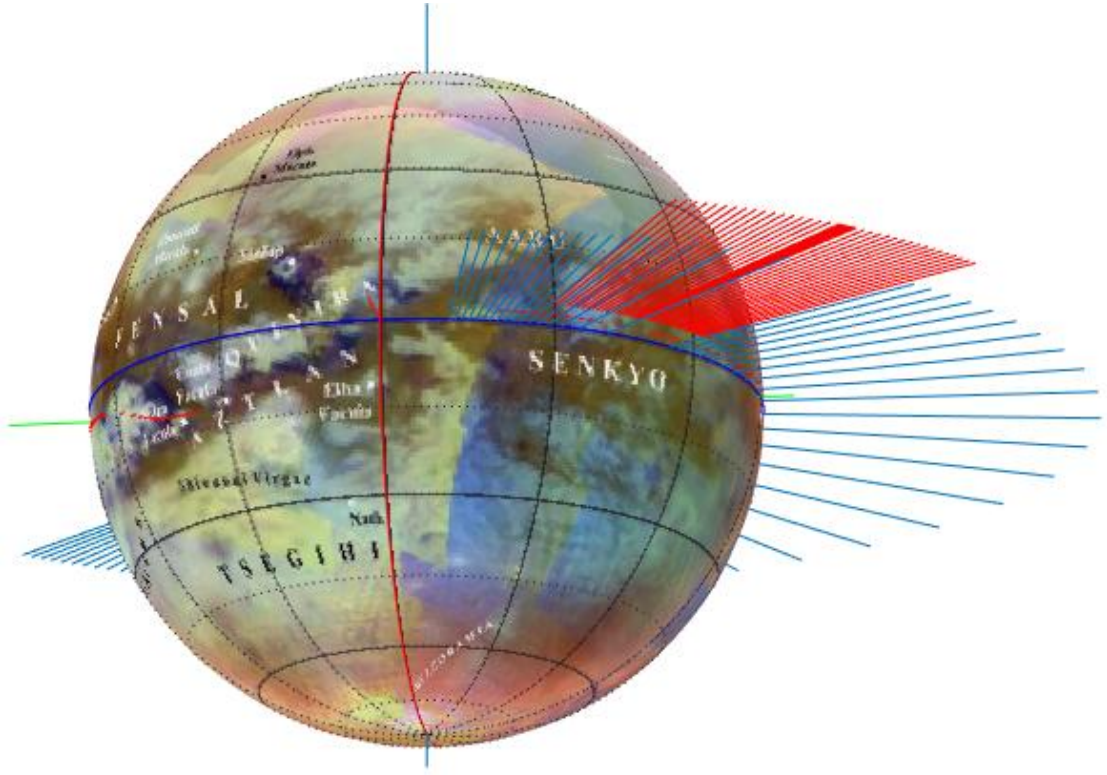
Apr. 5, 2010 – 095T15:50:39 @ 7437 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.

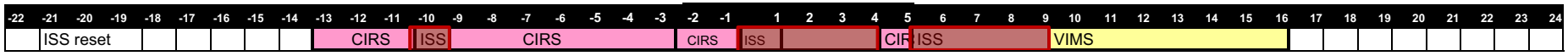
Cloud monitoring.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

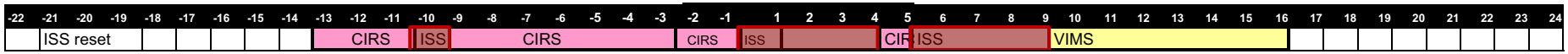


T067 – rev 129 – S59

Apr. 5, 2010 – 095T15:50:39 @ 7437 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular geometry occurs at equatorial latitudes before and after C/A.



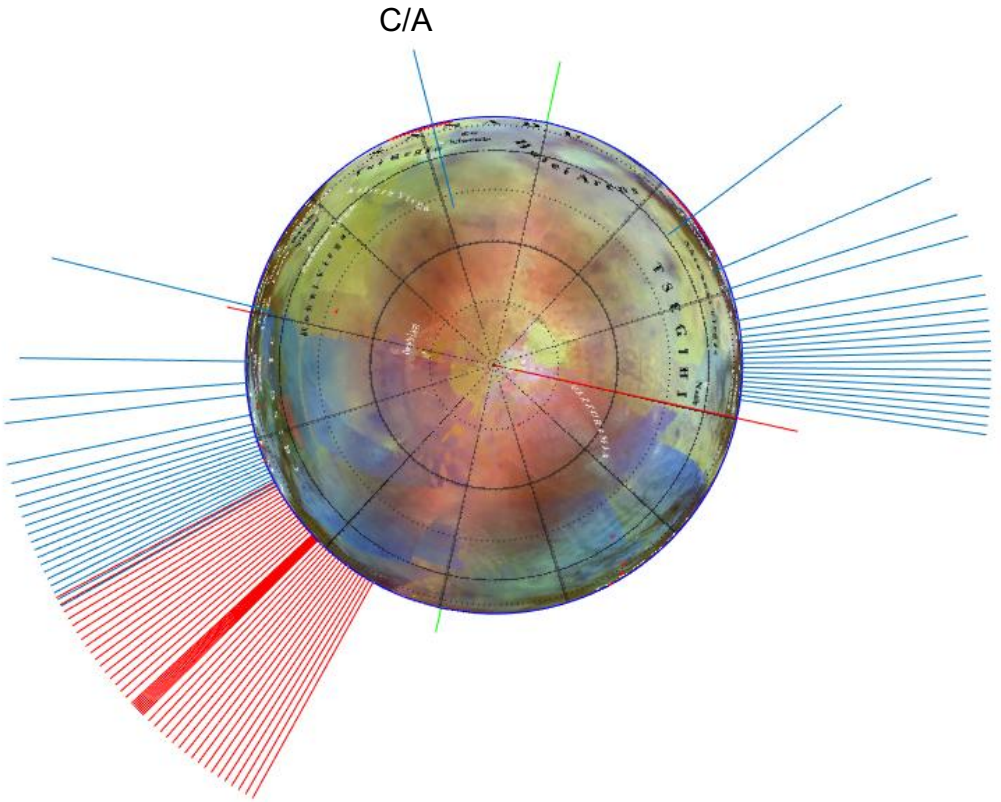
T068 – rev 131 – S60

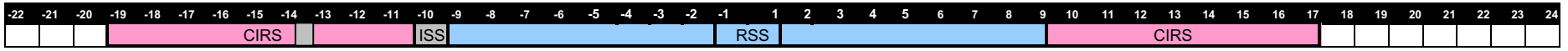
May 20, 2010 – 140T03:24:21 @ 1398 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T068 VIMS Science objectives: RSS is prime during the inbound and outbound portions of the flyby. VIMS will ridealong with CIRS and ISS for global mapping.

C/A - 19:14:16	-13:30	CIRS
-13:30	-13:00	ISS
-13:00	-10:00	CIRS
-10:00	-09:00	ISS
-09:00	**-08:20**	SP Turn to Earth for downlink
-08:20	**0**	**RSS**
2010-140T03:24:16		**CLOSEST APPROACH**
0	**+08:35**	**RSS**
+08:35	+09:00	**SP Turn to WP**
+09:00	+14:00	CIRS
+14:00	C/A + 17:40:44	CIRS





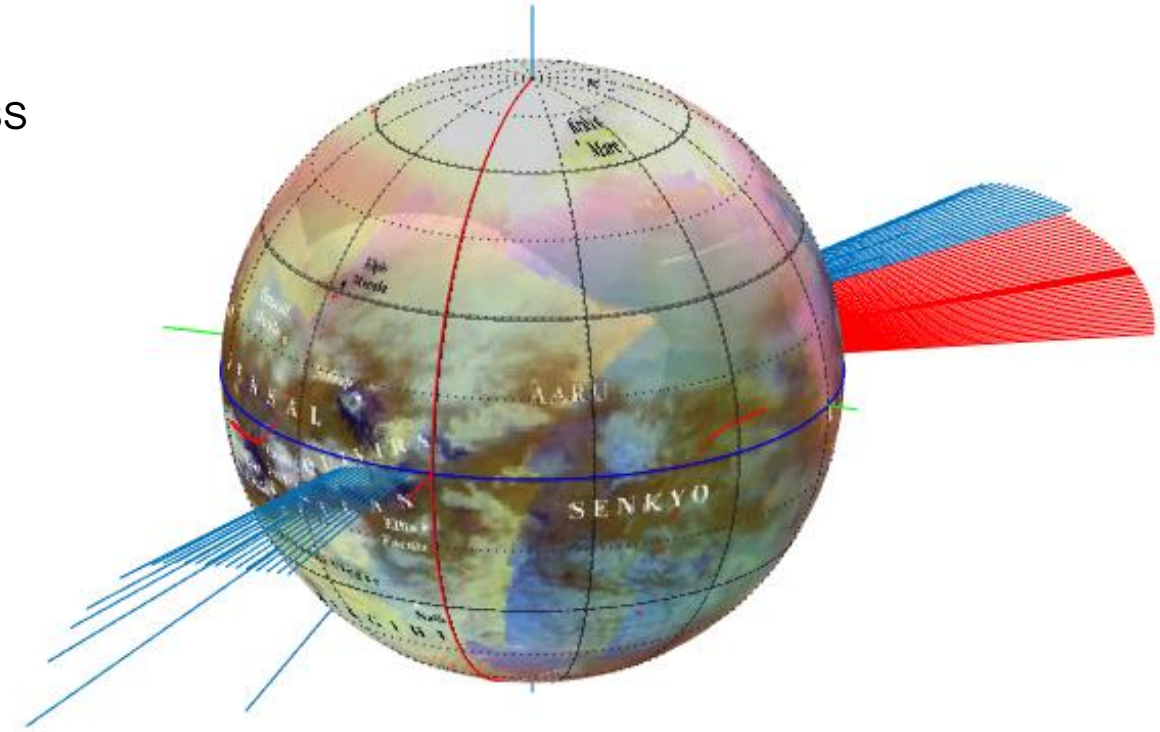
T068 – rev 131 – S60

May 20, 2010 – 140T03:24:21 @ 1398 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

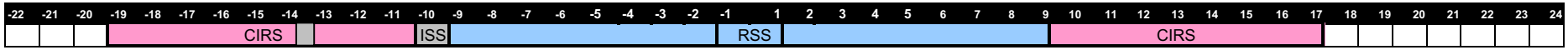
Ridealong with CIRS and ISS
for global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



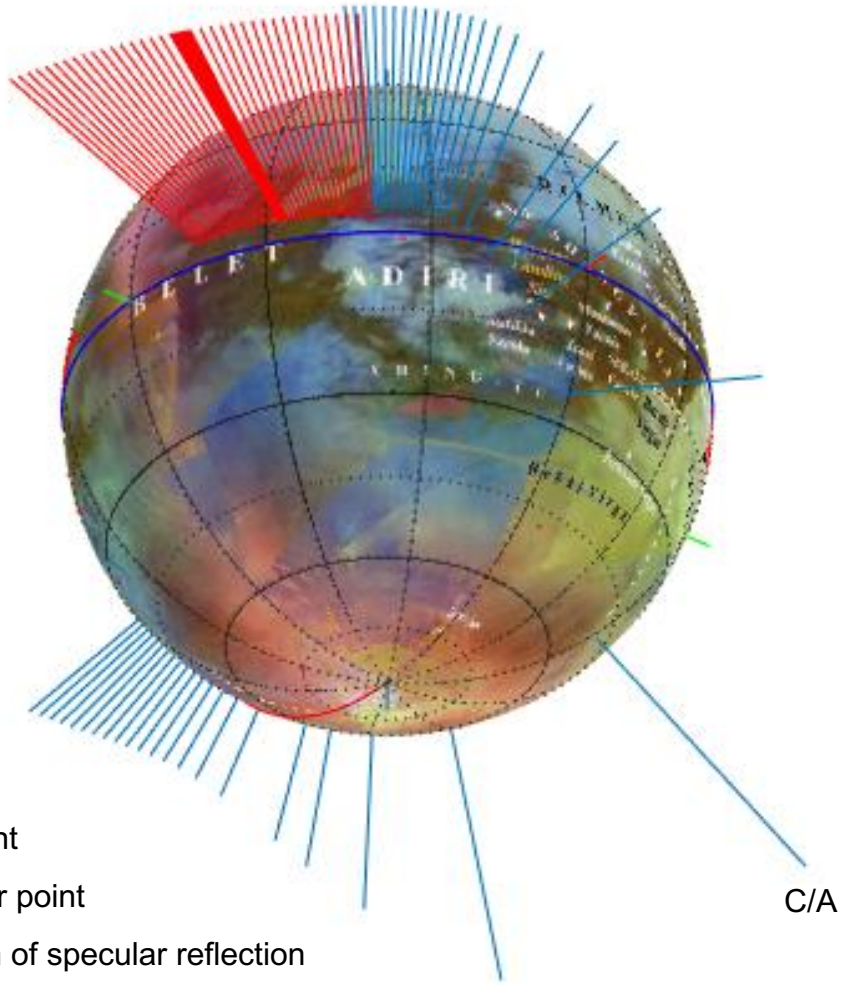
T068 – rev 131 – S60

May 20, 2010 – 140T03:24:21 @ 1398 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

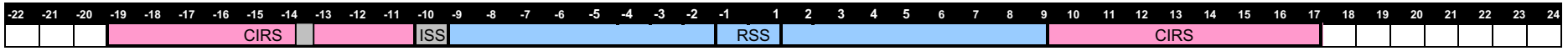
Ridealong with CIRS for global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

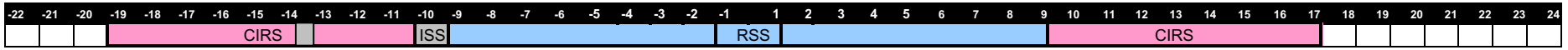


T068 – rev 131 – S60

May 20, 2010 – 140T03:24:21 @ 1398 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Specular geometry occurs near equatorial latitudes before and after C/A.



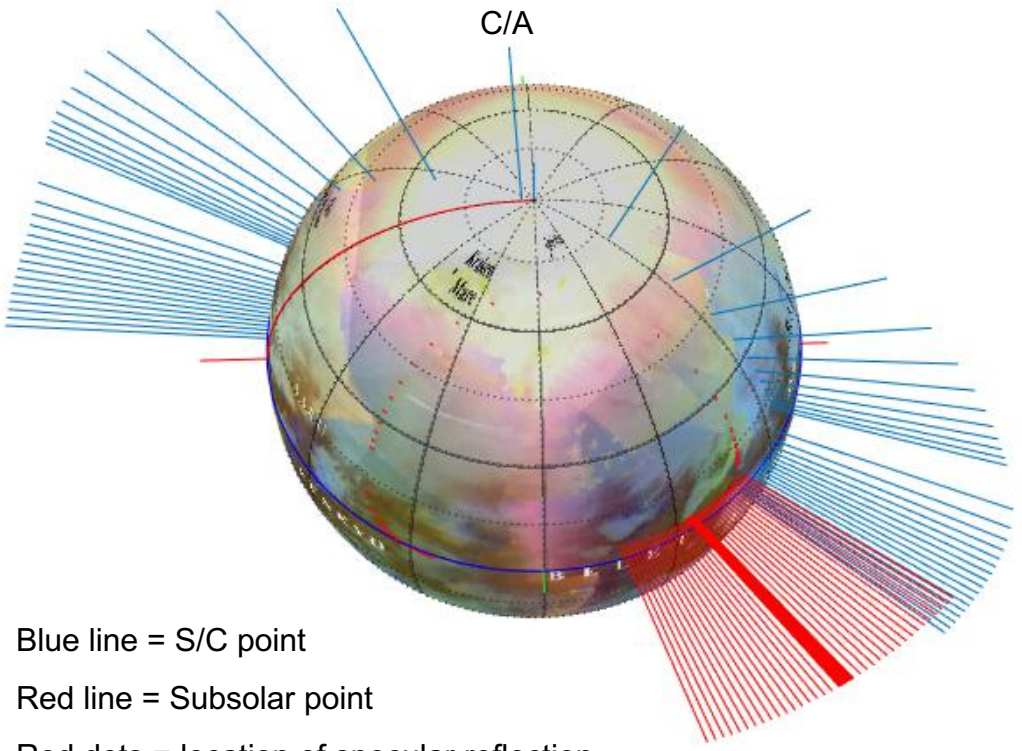
T069 – rev 132 – S60

Jun. 5, 2010 – 156T02:26:28 @ 2042 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T069 VIMS Science objectives: During this flyby, VIMS will be prime at C/A and will observe the North-pole area. A mosaic of Kraken Mare (70-75 N, 225 W) may be obtained if the North polar hood has vanished. A mosaic of an area North of Adiri will be obtained at a resolution of 10 km per pixel.

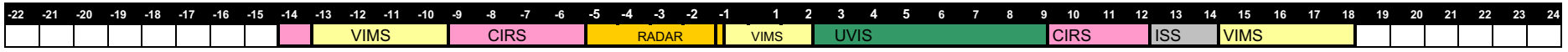
C/A - 13:18:25	-09:18	VIMS
-09:18	-05:00	CIRS
-05:00	**-02:00**	RADAR
-02:00	**-00:15**	**RADAR**
-00:15	**0**	**VIMS**
2010-156T02:26:27		**CLOSEST APPROACH**
0	**+02:00**	**VIMS**
+02:00	+09:00	UVIS
+09:00	+12:00	CIRS
+12:00	+14:00	ISS
+14:00	C/A + 17:36:35	VIMS



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T069 – rev 132 – S60

Jun. 5, 2010 – 156T02:26:28 @ 2042 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

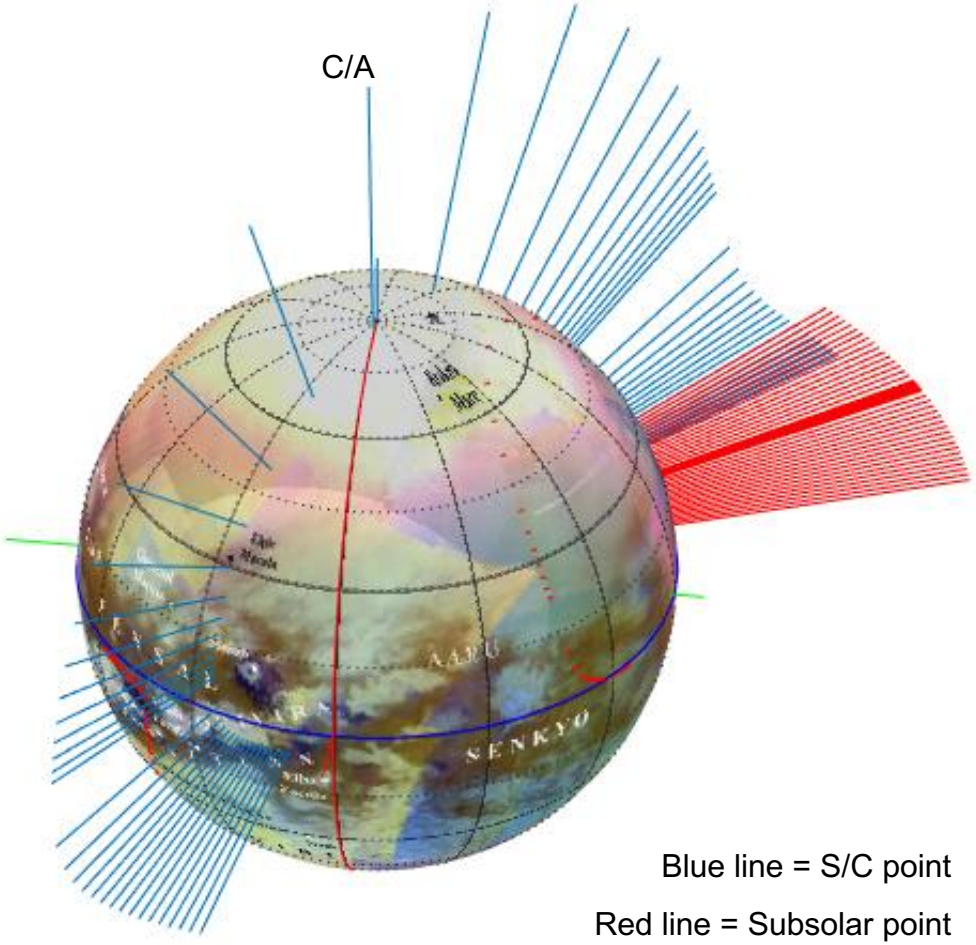
Inbound:

Regional mapping of northern lakes and latitudes*.

Attempt to acquire mosaic of Kraken Mare (68N, 310 W).

Specular reflection occurs on Kraken Mare at C/A – 00:14 at 59N, 303 W

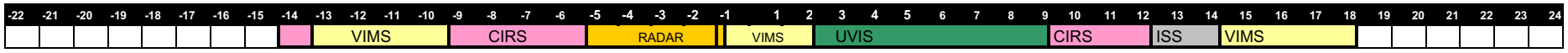
*Sotin, C., et al., 2012. Observations of Titan's Northern Lakes at 5 microns: Implications for the Organic Cycle and Geology. Icarus, 221, 2, 768-786.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T069 – rev 132 – S60

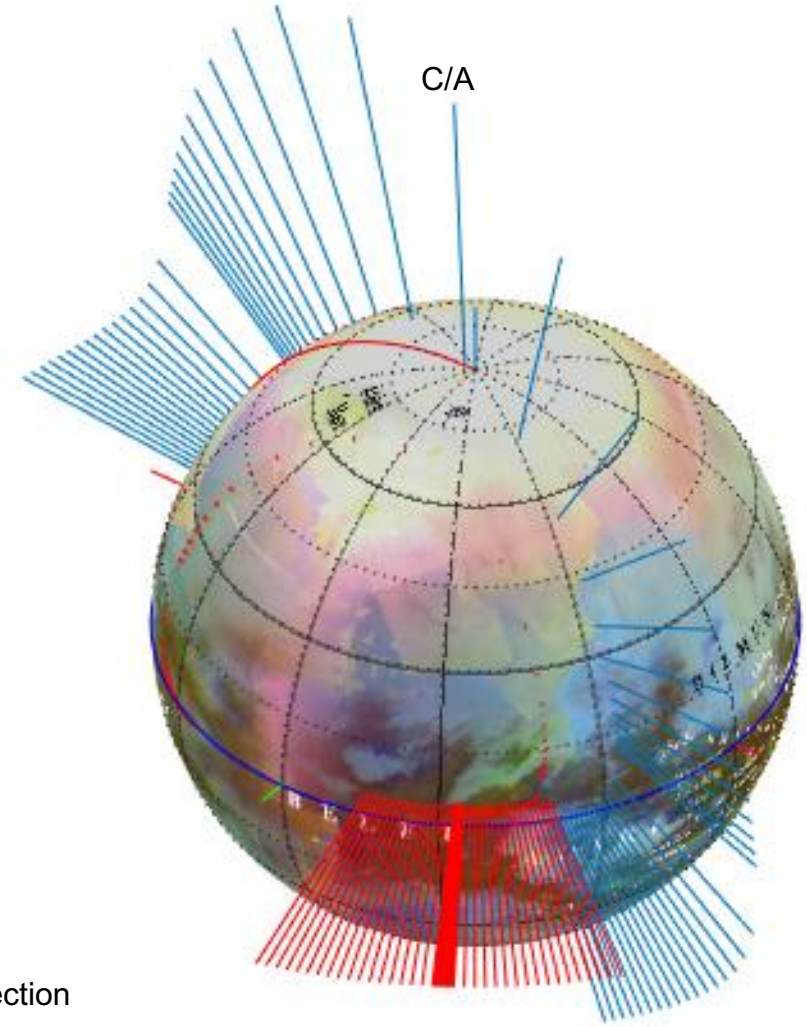
Jun. 5, 2010 – 156T02:26:28 @ 2042 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Mosaic the area north of Adiri (10S, 210 W) at resolutions ~10 km/px.

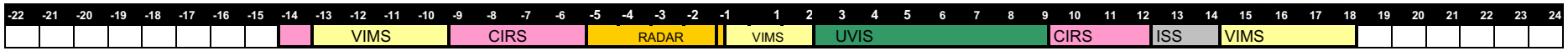
Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



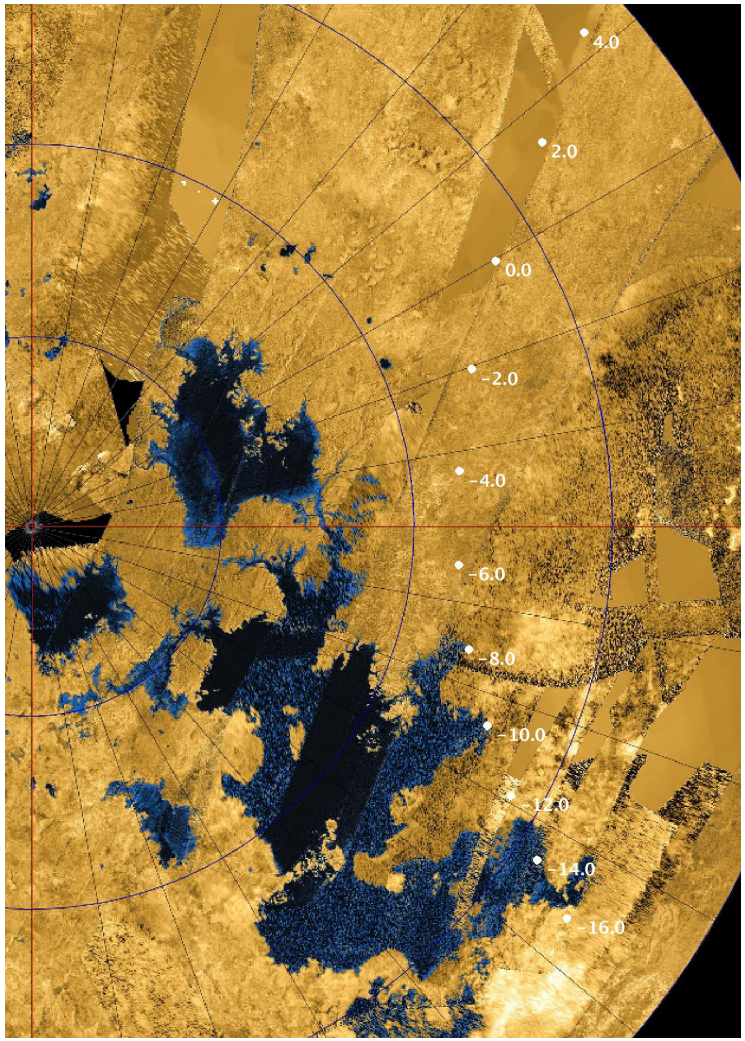
T069 – rev 132 – S60

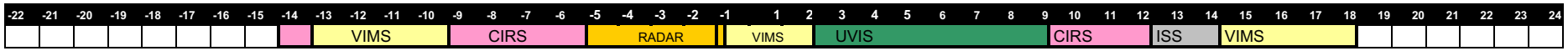
Jun. 5, 2010 – 156T02:26:28 @ 2042 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (min)
56.00	306.2	75.2	-960	-16.0
58.81	303.4	74.5	-840	-14.0
61.57	299.3	73.5	-720	-12.0
64.18	293.6	72.2	-600	-10.0
66.36	285.7	70.5	-480	-8.0
67.64	275.1	68.3	-360	-6.0
67.52	262.6	65.4	-240	-4.0
65.69	250.3	61.8	-120	-2.0
62.30	240.2	57.7	0	0.0
57.18	233.0	52.6	120	2.0
52.28	228.2	48.1	240	4.0





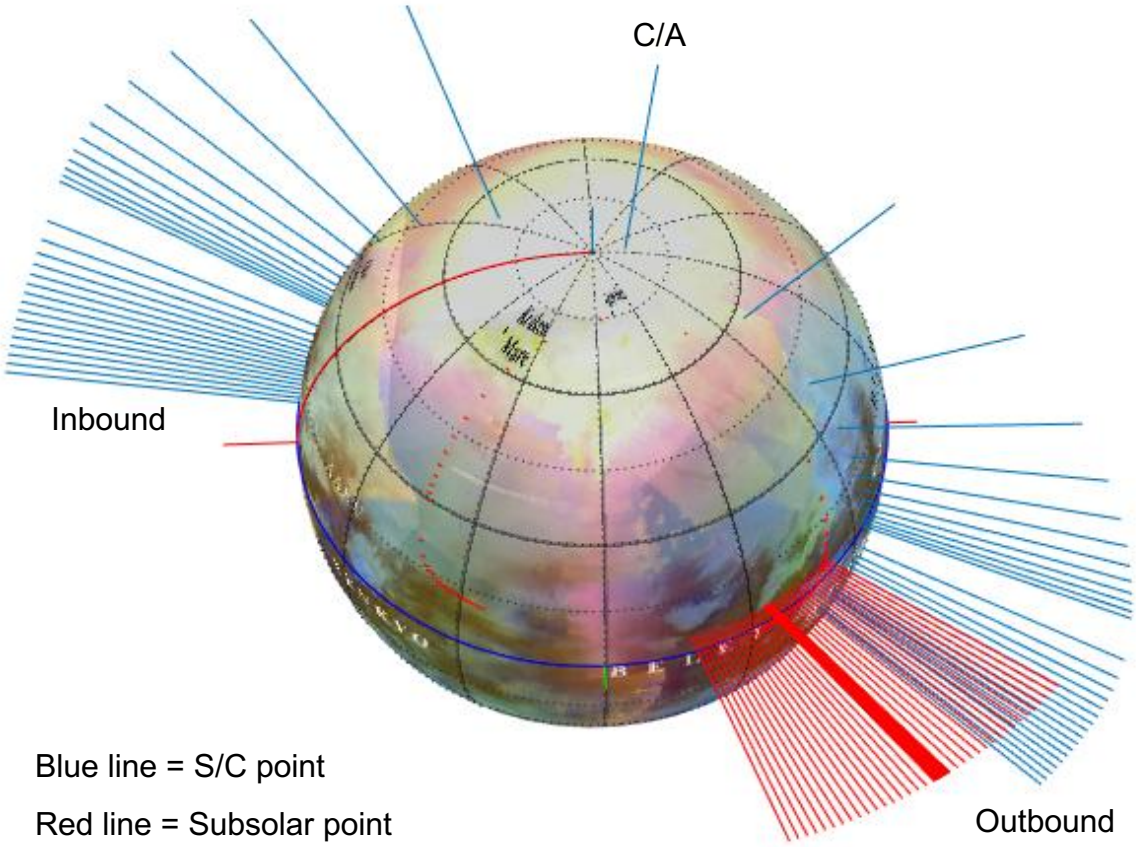
T070 – rev 133 – S60

Jun. 21, 2010 – 172T01:27:18 @ 878 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T070 VIMS Science objectives: VIMS will ride along with UVIS just after C/A for stellar occultation. Then VIMS will perform a mosaic of Adiri at 20 km per pixel.

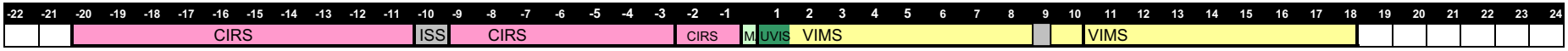
C/A - 13:21:17	-13:00	CIRS
-13:00	-10:00	CIRS
-10:00	-09:00	ISS
-09:00	-05:00	CIRS
-05:00	**-02:15**	CIRS
		begin custom period
-02:15	**-01:15**	**CIRS**
-01:15	**-01:14**	**RWA to RCS Transition**
-01:14	**-00:29**	**CAPS**
-00:29	**0**	**Engineering prime; MAG**
2010-172T01:27:43		**CLOSEST APPROACH**
0	**+00:27**	**Engineering prime; MAG**
+00:27	**+00:48:05**	**RCS to RWA Transition**
+00:48:05	**+01:07**	**UVIS Stellar Occ**
+01:07	**+02:00**	**VIMS**
		end custom period
+02:00	**+05:00**	VIMS
+05:00	+08:30	VIMS
+08:30	+09:00	ISS
+09:00	+14:00	VIMS



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



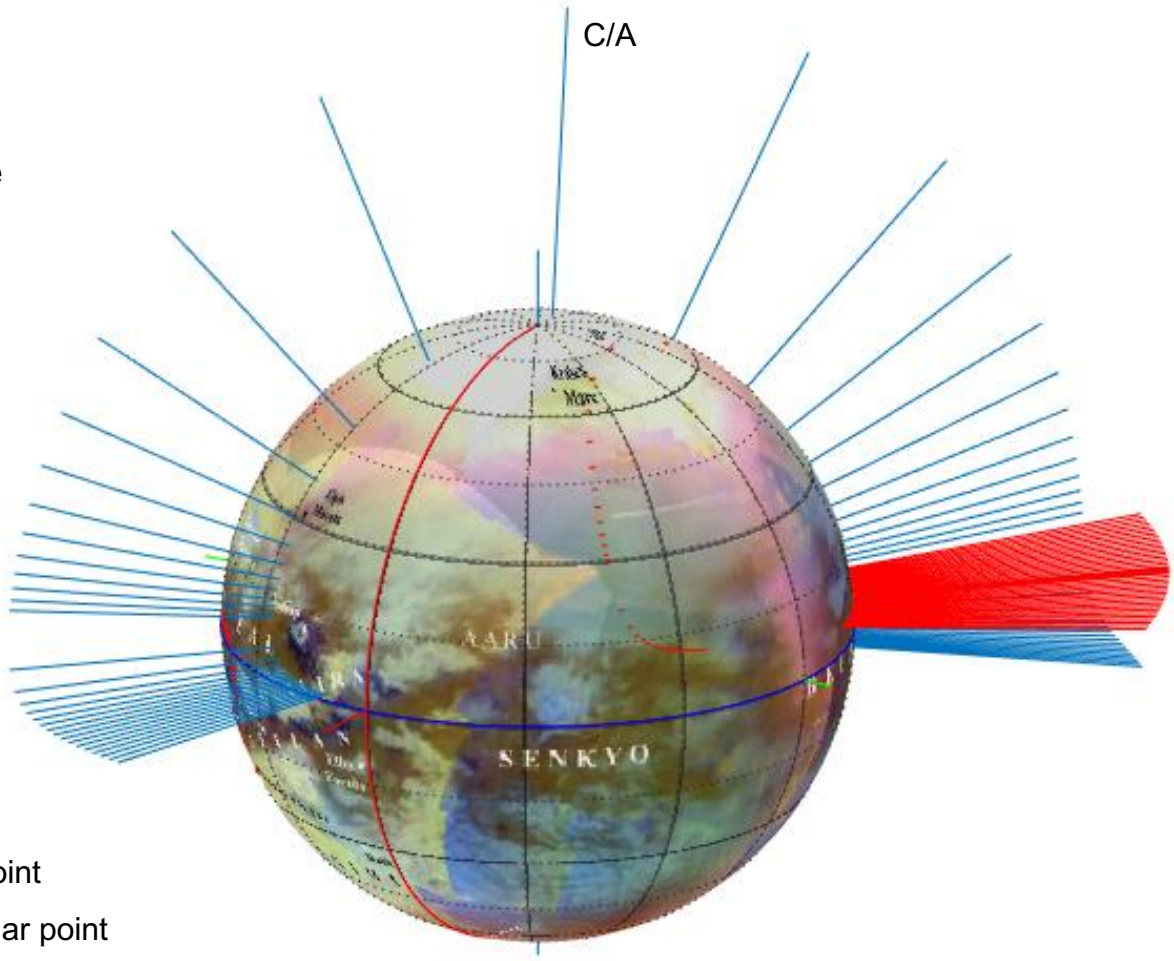
T070 – rev 133 – S60

Jun. 21, 2010 – 172T01:27:18 @ 878 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

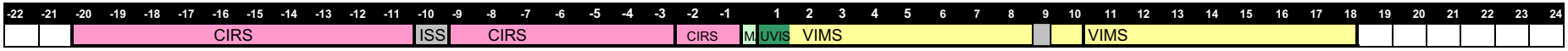
Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T070 – rev 133 – S60

Jun. 21, 2010 – 172T01:27:18 @ 878 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

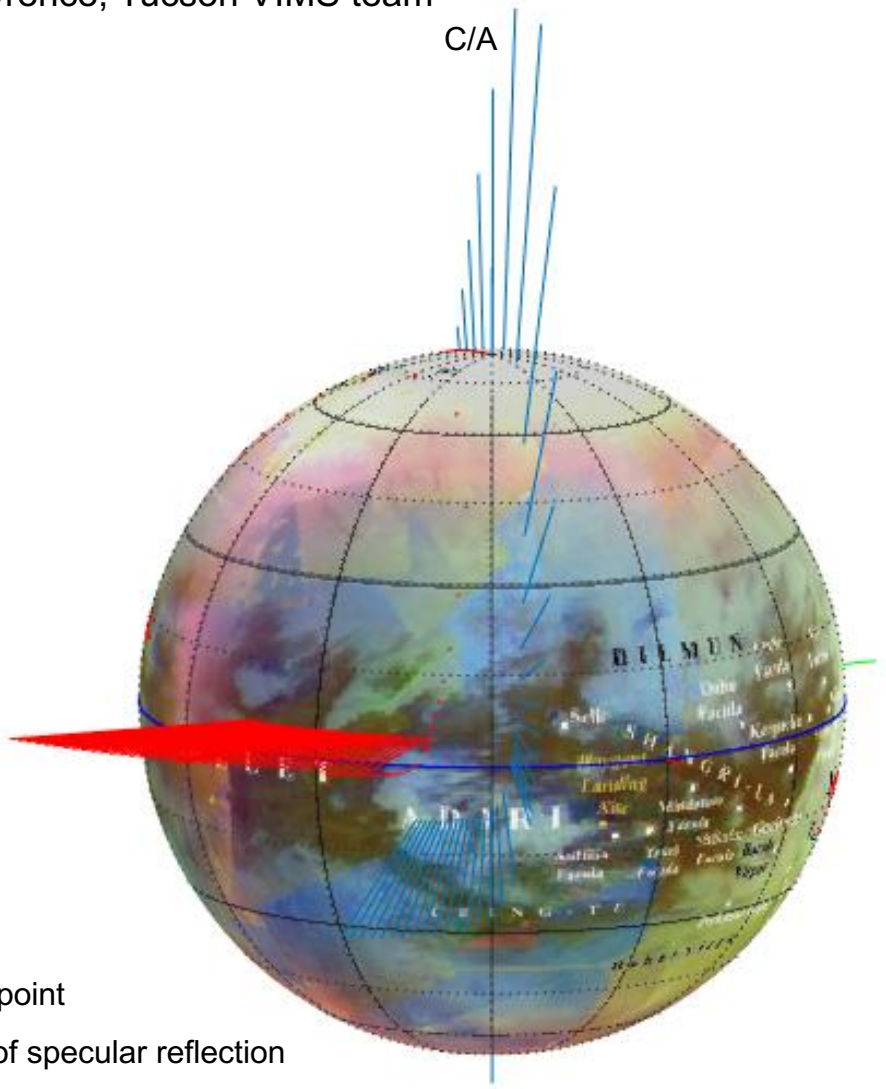
Ridealong with UVIS for stellar occ.

Regional mapping of the northern latitudes and Selk crater.

Mosaic of Adiri at 10S, 210 W.

Global mapping.

Note: stellar occultation did not occur.
RCS/RWA occurred during this time instead.



-22 -21 -20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

CIRS | ISS | CIRS | CIRS | M | UVIS | VIMS | VIMS

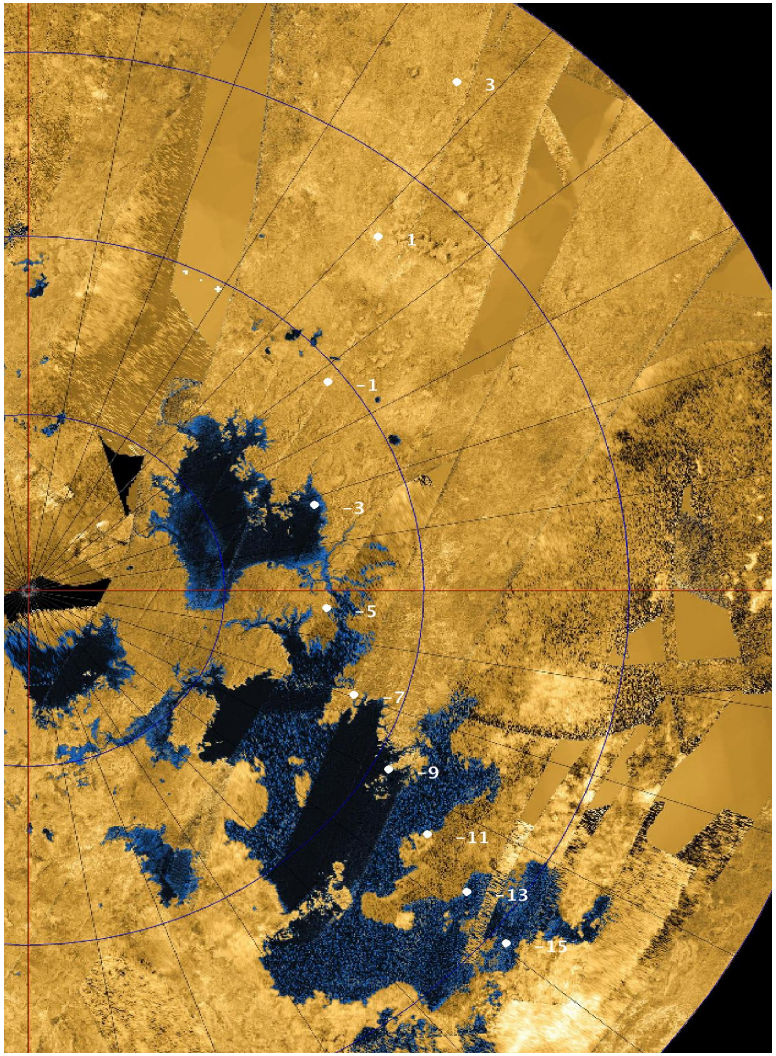
T070 – rev 133 – S60

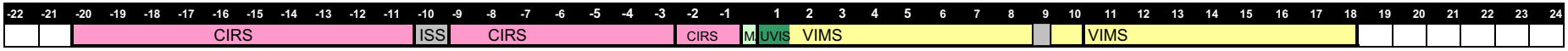
Jun. 21, 2010 – 172T01:27:18 @ 878 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular reflection geometry

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (min)
59.17	309.5	77.5	77.5	-900	-15.0
62.33	307.5	77.3	77.2	-780	-13.0
65.71	304.3	76.8	76.8	-660	-11.0
69.20	299	76.1	76.1	-540	-9.0
72.49	289.6	75.0	75.0	-420	-7.0
74.85	273.7	73.2	73.2	-300	-5.0
74.69	251.5	70.4	70.3	-180	-3.0
70.81	232.1	65.9	65.8	-60	-1.0
63.53	221.5	59.6	59.8	60	1.0
54.82	217	52.2	52.0	180	3.0





T071 – rev 134 – S61

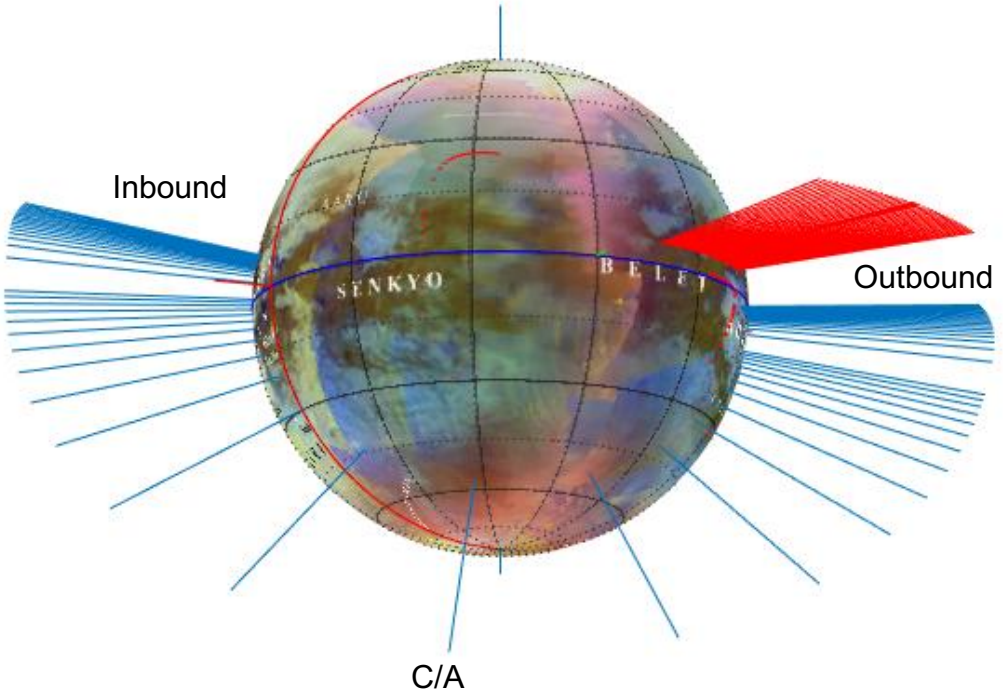
July 7, 2010 – 188T00:22:45 @ 1004 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T071: Global mapping of Titan will allow the VIMS to detect the presence of clouds and monitor the changes in the cloud formation after the equinox.

Data lost from C/A +06:00 to end of segment.

C/A - 13:15:00	-9:00	CIRS	N, M4
-09:00	-06:00	CIRS	R1
-06:00	-02:15	RADAR	L
-02:15	**-00:49**	**CAPS**	
-00:49	**-00:48**	RWA to RCS Transition	
-00:48	**-00:18**	**CAPS**	
-00:18	0	**INMS**	**RADAR ridealong**
2010-188T00:22:45		**CLOSEST APPROACH**	**Neg_X to RAM, Neg_Z to Titan**
0	**+00:18**	**INMS**	**RADAR ridealong**
+00:18	**+00:28**	**CAPS**	
+00:28	**+00:50**	RCS to RWA Transition	
+00:50	**+02:15**	**CAPS**	
+02:15	+06:00	RADAR	L
+06:00	+09:00	VIMS	I1
+09:00	+14:00	VIMS	V ISS ridealong
+14:00	+17:35	VIMS	B ISS ridealong



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T071 – rev 134 – S61

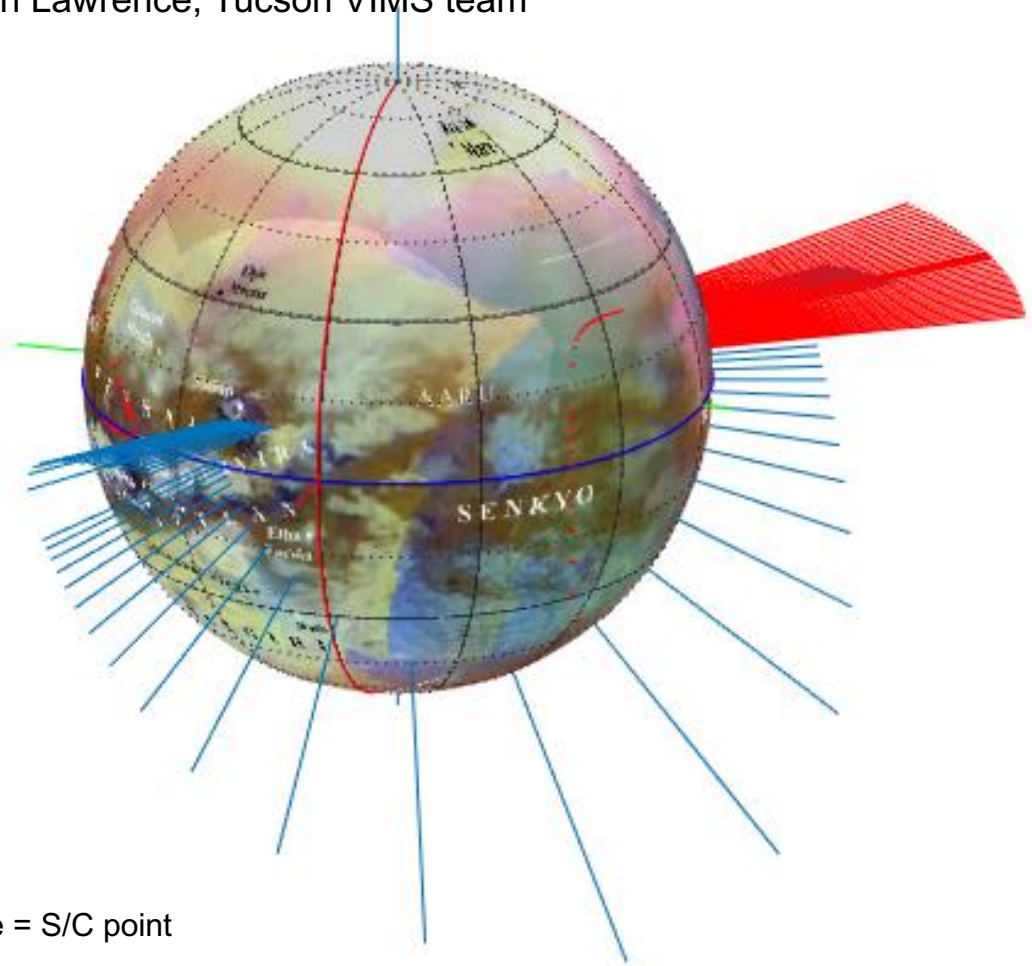
July 7, 2010 – 188T00:22:45 @ 1004 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Cloud monitoring.

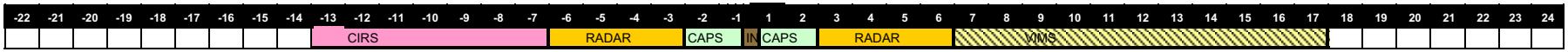
Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T071 – rev 134 – S61

July 7, 2010 – 188T00:22:45 @ 1004 km altitude

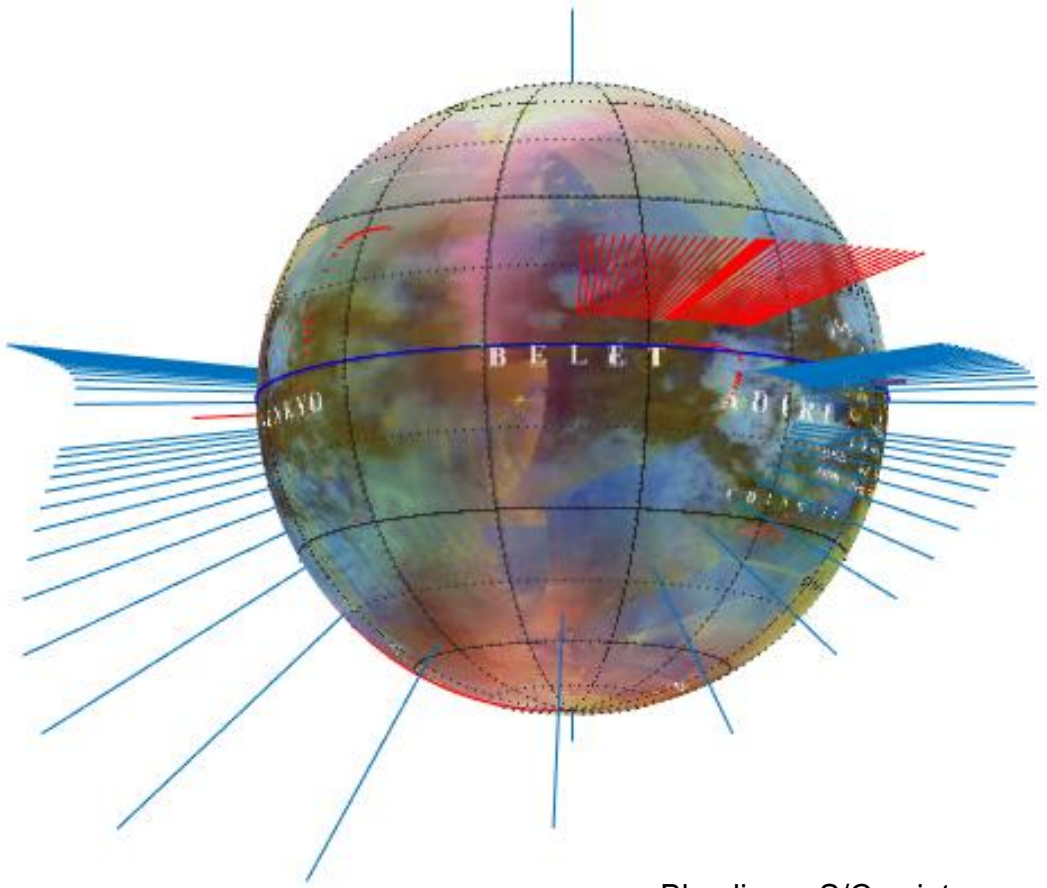
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.

Monitor cloud formation.

Data lost from C/A + 06:00 to end of observing segment.

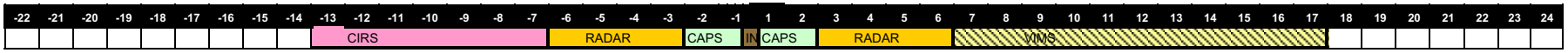


C/A

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

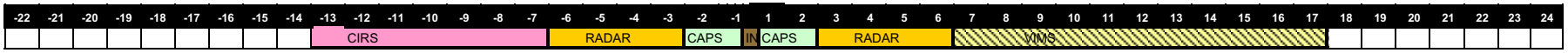


T071 – rev 134 – S61

July 7, 2010 – 188T00:22:45 @ 1004 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at equatorial latitudes.



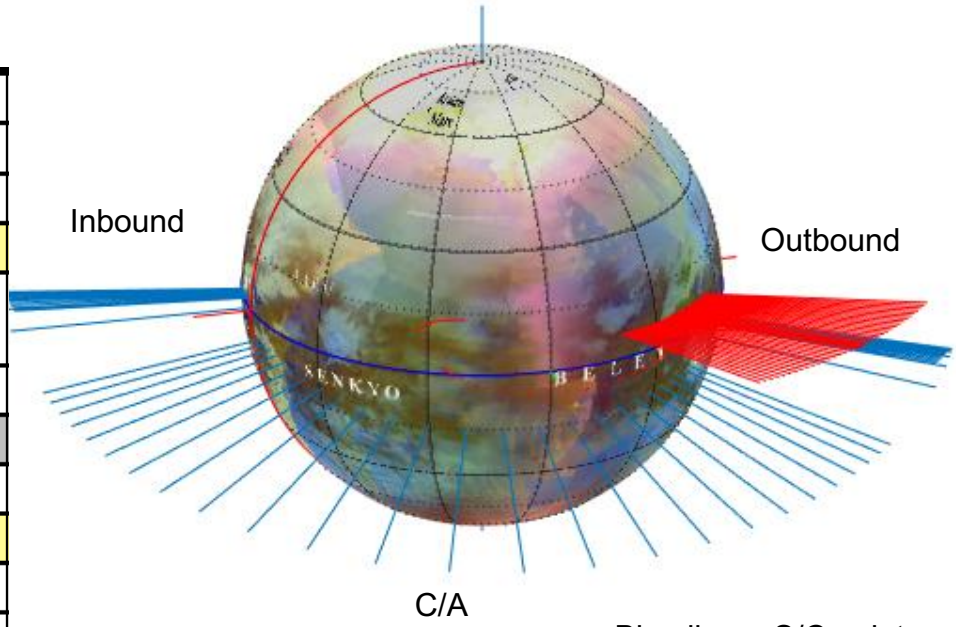
T072 – rev 138 – S63

Sept. 24, 2010 – 267T18:38:41 @ 8178 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T072: During this high altitude flyby (8175 km at C/A), VIMS will map an equatorial region of the trailing hemisphere known as Belet at a resolution of 5 km/pixel. The phase angle is high (60° at C/A) but VIMS has shown that it can acquire good quality mosaics at 2 microns. This mosaic will complement the mosaics that will be obtained during T66 and T67 when VIMS is ridealong with ISS. Then VIMS will perform a global mapping of Titan looking for clouds at northern mid-latitudes and near the poles.

C/A -12:26:00	-09:00	CIRS	N
-09:00	-05:00	CIRS	R
-05:00	-02:15	CIRS	T
begin custom period			
-02:15	**-00:15**	**CIRS**	**CIRS will turn to VIMS attitude**
-00:15	**0**	**VIMS**	
2010-267T18:38:41		**CLOSEST APPROACH**	**NEG_Y to Titan,**
0	**+02:15**	**VIMS**	
end custom period			
+02:15	+05:00	UVIS	X
+05:00	+09:00	UVIS	X
+09:00	+14:00	VIMS	V ISS riding along
+14:00	+22:25	VIMS	B ISS riding along



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T072 – rev 138 – S63

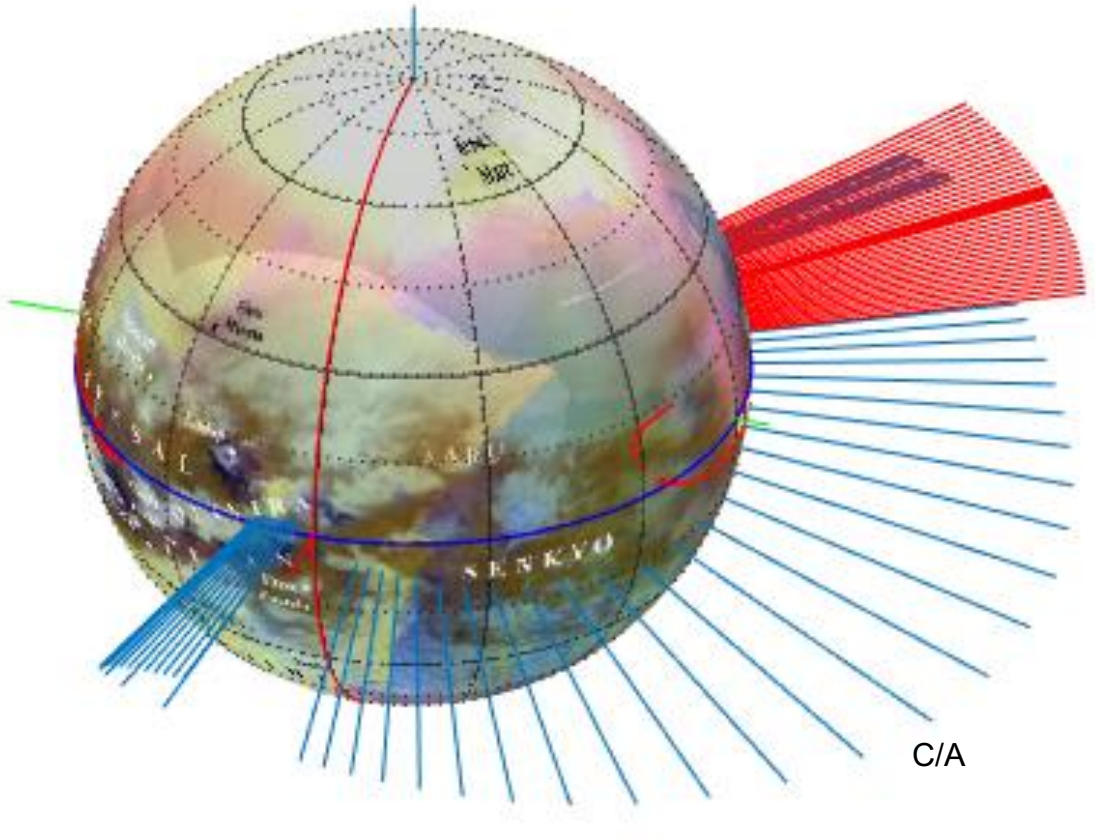
Sept. 24, 2010 – 267T18:38:41 @ 8178 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

At C/A, regional mapping at a resolution of 5 km/px near the Belet region (14S, 290 W).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T072 – rev 138 – S63

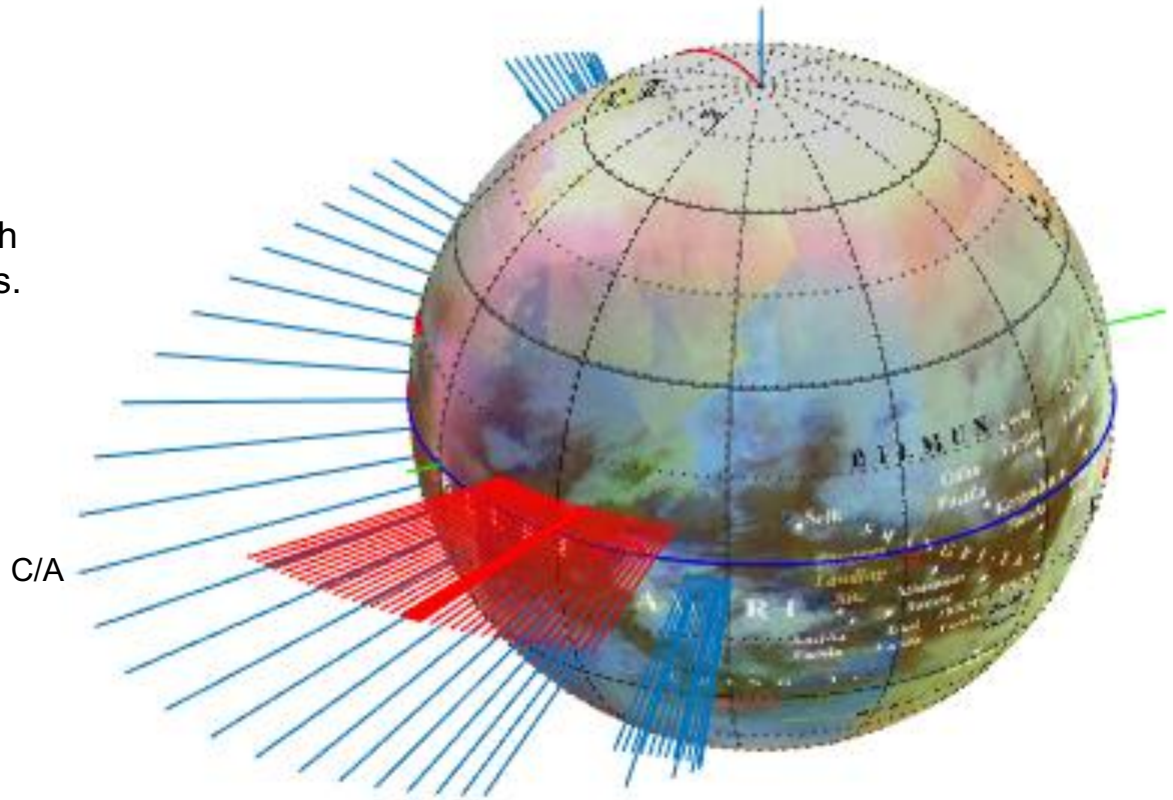
Sept. 24, 2010 – 267T18:38:41 @ 8178 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.

Search of clouds near the north pole and mid-northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T072 – rev 138 – S63

Sept. 24, 2010 – 267T18:38:41 @ 8178 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at equatorial latitudes.

T073 – rev 140 – S64

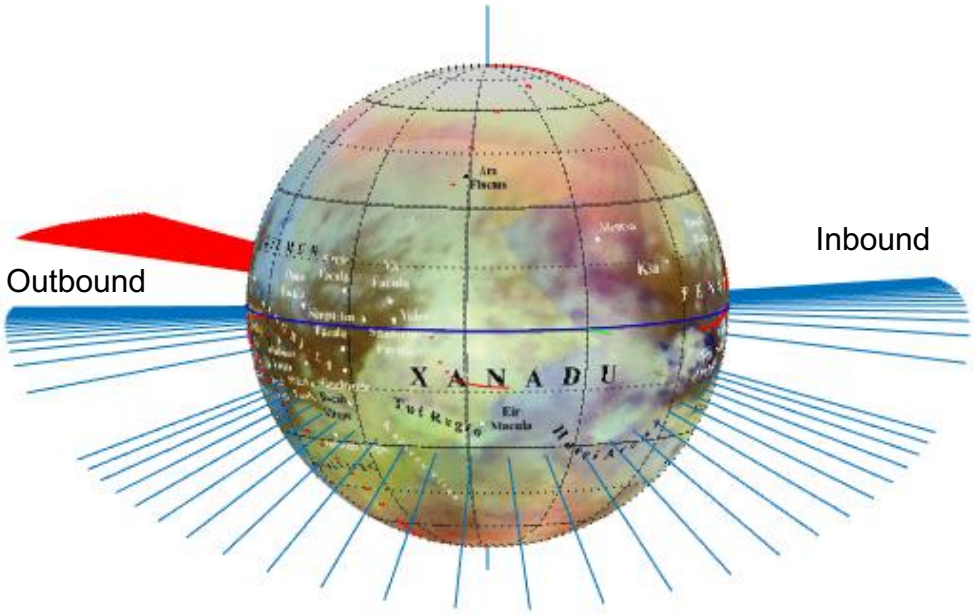
Nov. 11, 2010 – 315T13:37:02 @ 7926 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T073: At C/A, VIMS will ridealong with CIRS and will map the Huygens Landing Site at medium resolution. Then, VIMS will acquire a mosaic of the areas known as Shangri-La and Adiri at a resolution of 10 km/pixel. It will also be looking for clouds at mid latitudes.

Flyby lost due to spacecraft safing.

C/A-16:23:01	-13:00	CIRS	M4 (TC1b)
-13:00	-09:00	CIRS	M (TC1b)
-09:00	-05:00	CIRS	R (TN1c)
-05:00	-02:15	CIRS	T (TN2c, TC1b)
-02:15	-00:25	CAPS	CAPS turn to CIRS attitude (TC2a)
-00:25	0	CIRS	waypoint is CIRS primary attitude, CAPS pick. CIRS on point at -00:15 (TN1c)
2010-315T13:37:01		CLOSEST APPROACH	
0	+02:15	CIRS	TN1c
+02:15	+05:00	VIMS	Y (TC1a, TN2c)
+05:00	+09:00	VIMS	I (TC1a, TN2c)
+09:00	+14:00	VIMS	V (TC1a, TN2c)
+14:00	C/A+18:31:59	VIMS	B (TC1a, TN2c)



T073 – rev 140 – S64

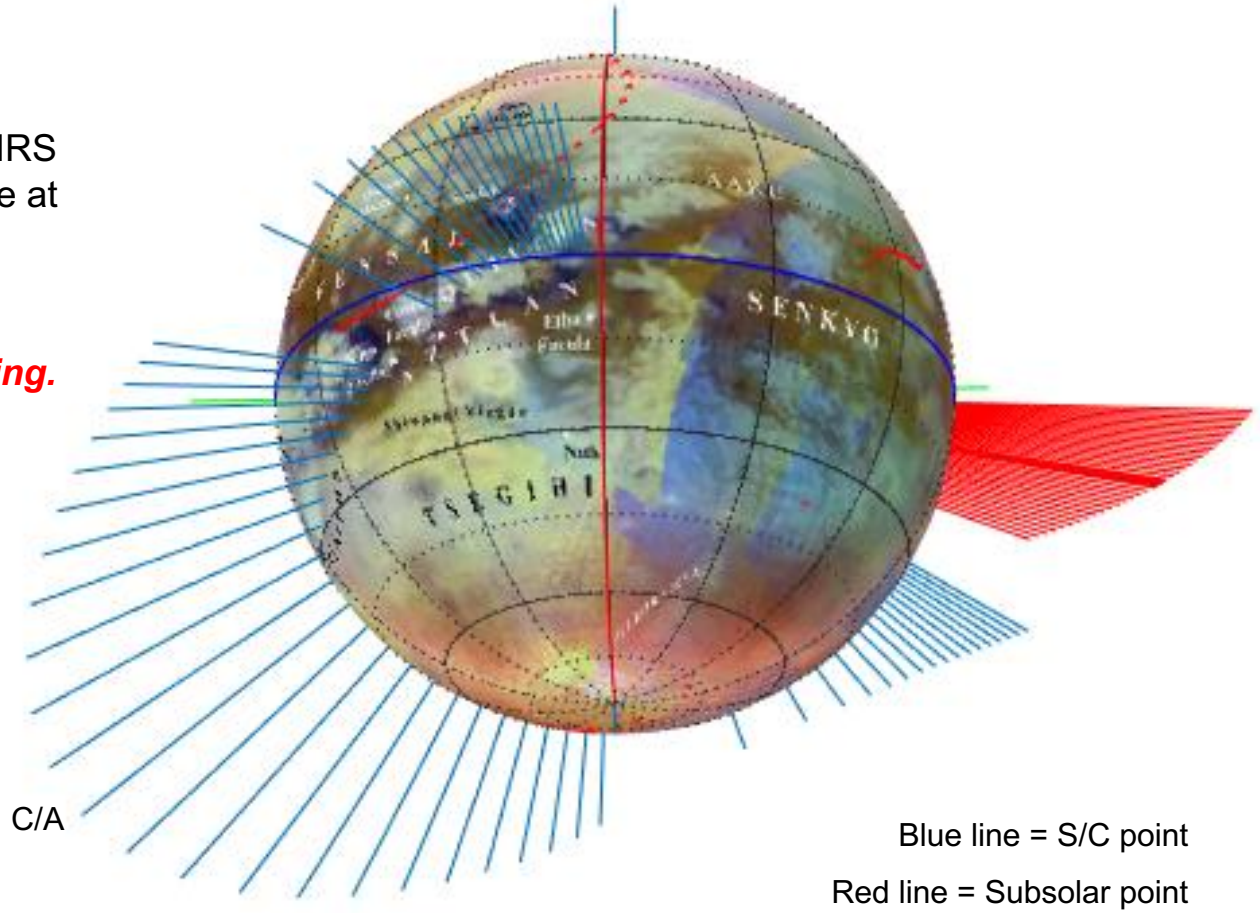
Nov. 11, 2010 – 315T13:37:02 @ 7926 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

At C/A, VIMS will ridealong with CIRS and map the Huygens Landing Site at medium resolution.

Flyby lost due to spacecraft safing.



C/A

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T073 – rev 140 – S64

Nov. 11, 2010 – 315T13:37:02 @ 7926 km altitude

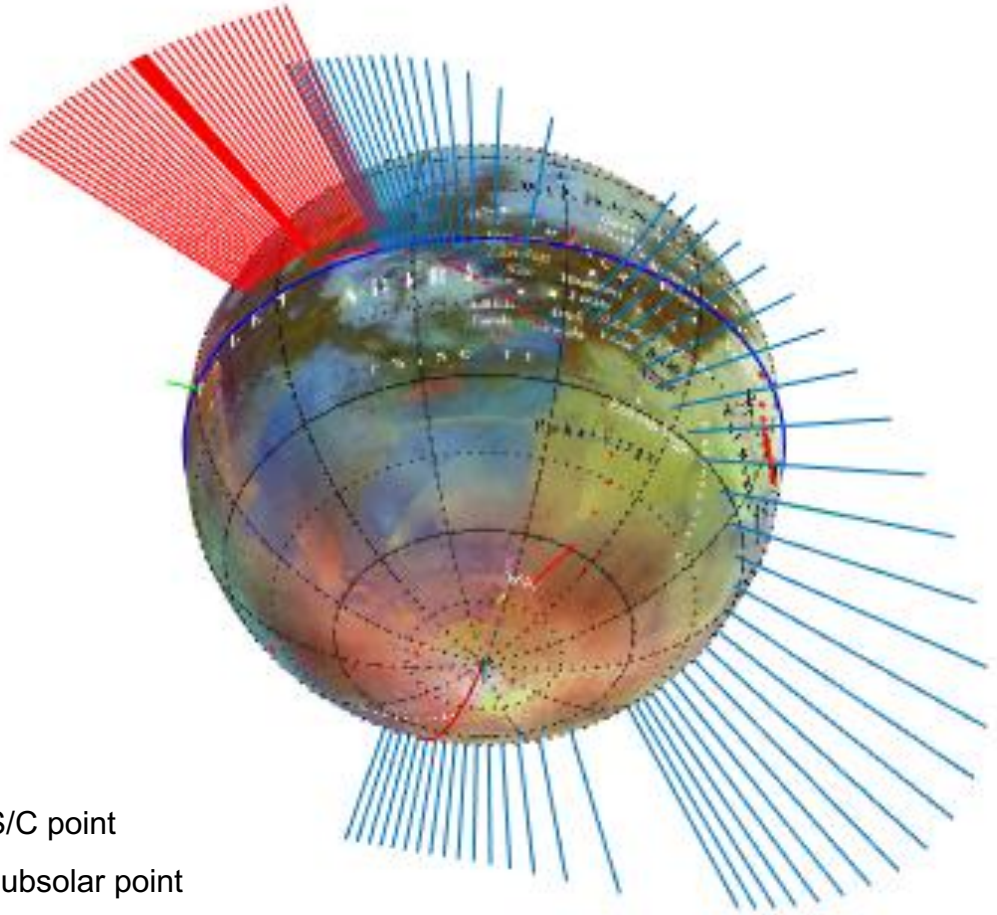
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Acquire mosaics near Shangri-La and Adiri at 9S, 190 W at resolutions of ~10 km/px.

Look for clouds at mid-latitudes.

Flyby lost due to spacecraft safing.



C/A

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T073 – rev 140 – S64

Nov. 11, 2010 – 315T13:37:02 @ 7926 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, near equatorial latitudes.

T073 – rev 140 – S64

Nov. 11, 2010 – 315T13:37:02 @ 7926 km altitude

Post Flyby Note: No data return due to spacecraft safing event.

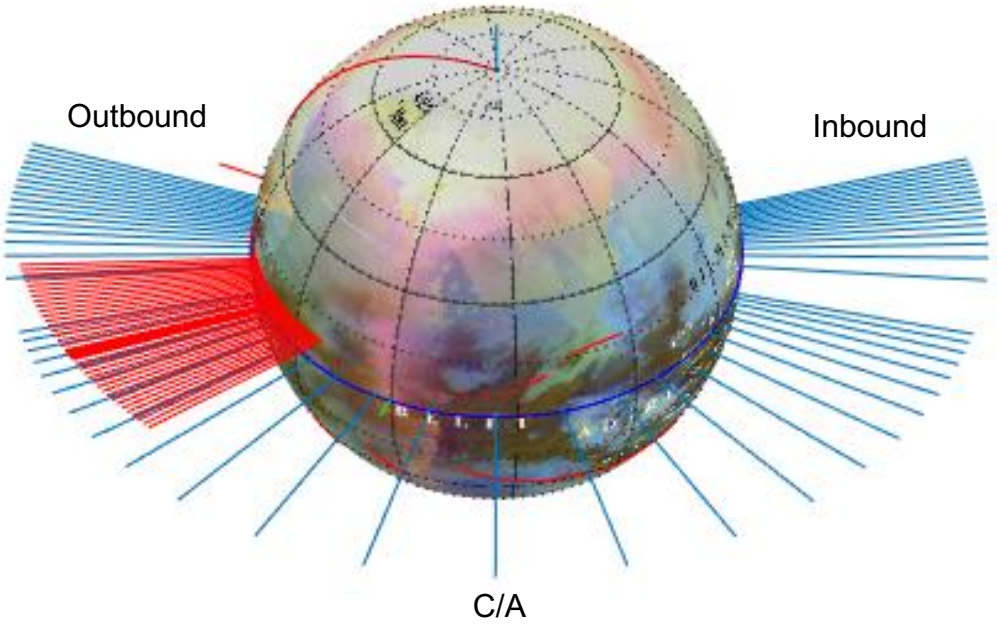
T074 – rev 145 – S66

Feb. 18, 2011 – 049T16:04:11 @ 3651 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T074: CAPS is prime on the inbound and outbound. VIMS will ride along with CIRS and take cubes for global mapping of Titan.

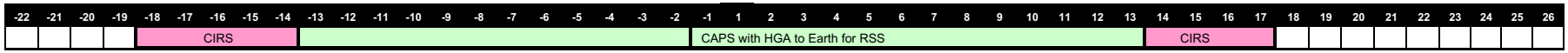
C/A-18:38:11	-12:00	CIRS	M4
-12:00	-09:00	CAPS	RSS rides along with CAPS
-09:00	-05:00	CAPS	RSS rides along with CAPS
-05:00	-02:15	CAPS	RSS rides along with CAPS
-02:15	**0**	**CAPS**	RSS rides along with CAPS
2011-049T16:04:11		**CLOSEST APPROACH**	**POS_Y to corotation**
0	**+02:15**	**CAPS**	RSS rides along with CAPS
+02:15	+05:00	**CAPS**	RSS rides along with CAPS
+05:00	+09:00	CAPS	RSS rides along with CAPS
+09:00	+12:00	CAPS	RSS rides along with CAPS
+12:00	C/A+18:31:49	CIRS	A2



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



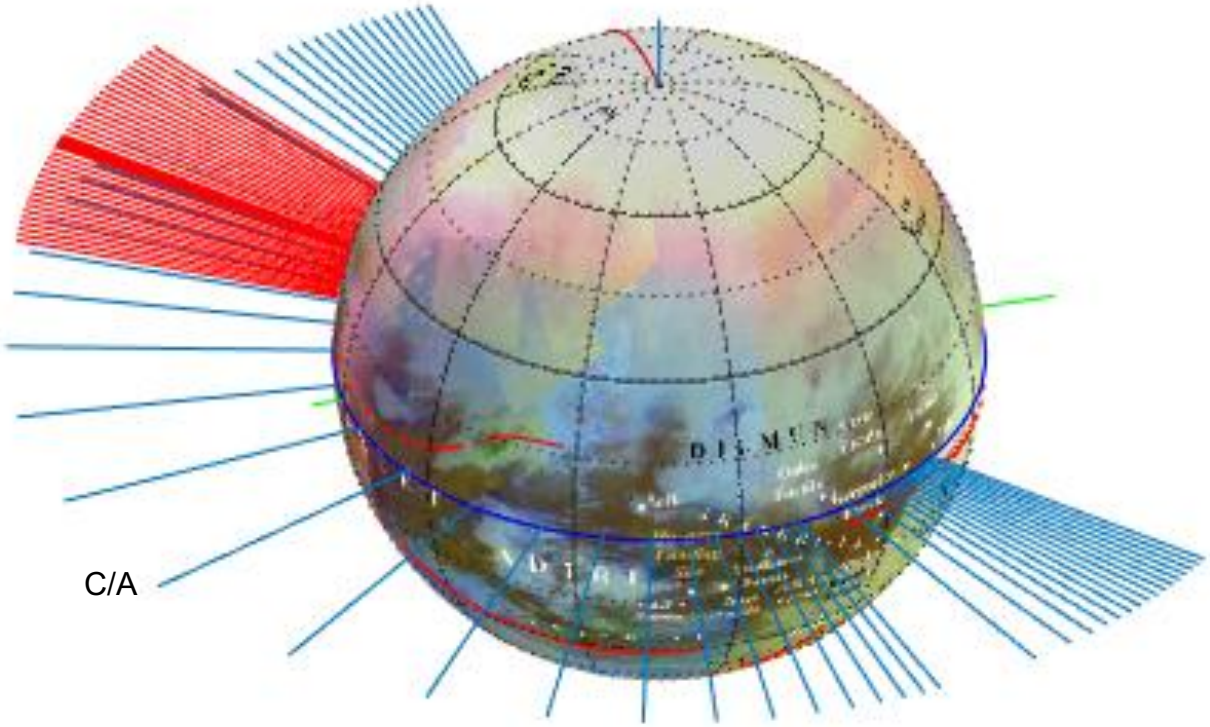
T074 – rev 145 – S66

Feb. 18, 2011 – 049T16:04:11 @ 3651 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Ridealong with CIRS for global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
				CIRS																	CAPS with HGA to Earth for RSS															CIRS												

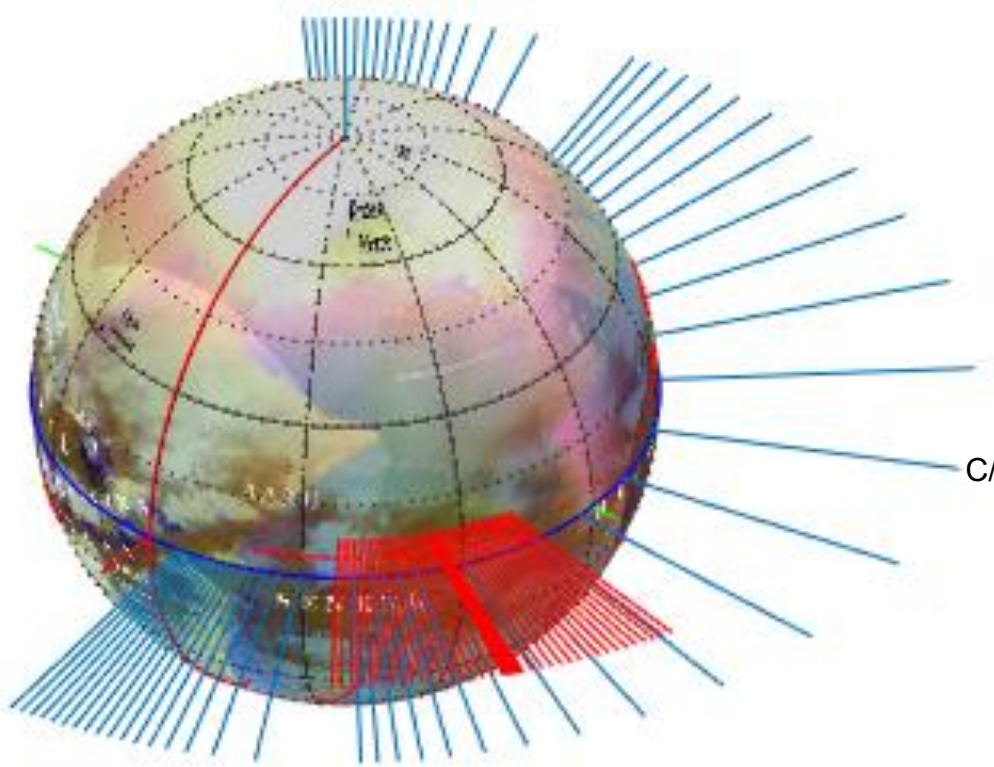
T074 – rev 145 – S66

Feb. 18, 2011 – 049T16:04:11 @ 3651 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Ridealong with CIRS for global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

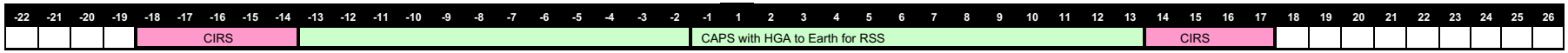
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
				CIRS																	CAPS with HGA to Earth for RSS															CIRS													

T074 – rev 145 – S66

Feb. 18, 2011 – 049T16:04:11 @ 3651 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, near equatorial latitudes.



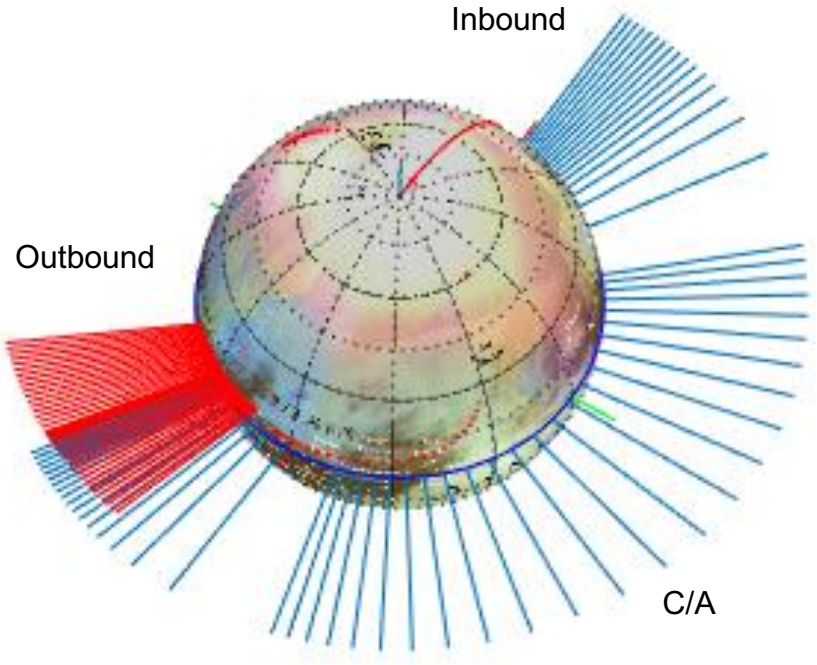
T075 – rev 147 – S67

April 19, 2011 – 109T05:00:39 @ 10053 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T075: CAPS is prime during the inbound and through C/A + 02:30. VIMS will ridealong with UVIS and take cubes for global mapping of Titan.

C/A-17:47:39	-13:00	CAPS	Z extended (TN1c, TC1a)
-13:00	-09:00	CAPS	Z extended (TN1c, TC1a)
-09:00	-05:00	CAPS	Z (TN1c, TC1a)
-05:00	-02:15	CAPS	Z (TN1c, TC1a)
-02:15	**0**	**CAPS**	**(TN1c, TC1a)**
2011-109T05:00:39		**CLOSEST APPROACH**	**POS_Y to corotation**
0	**+02:30**	**CAPS**	**(TN1c, TC1a)**
+02:30	+09:00	**UVIS**	**X (TN1c, TC1b)**
+09:00	C/A+17:37:21	UVIS	X extended (TN1c, TC1b)



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

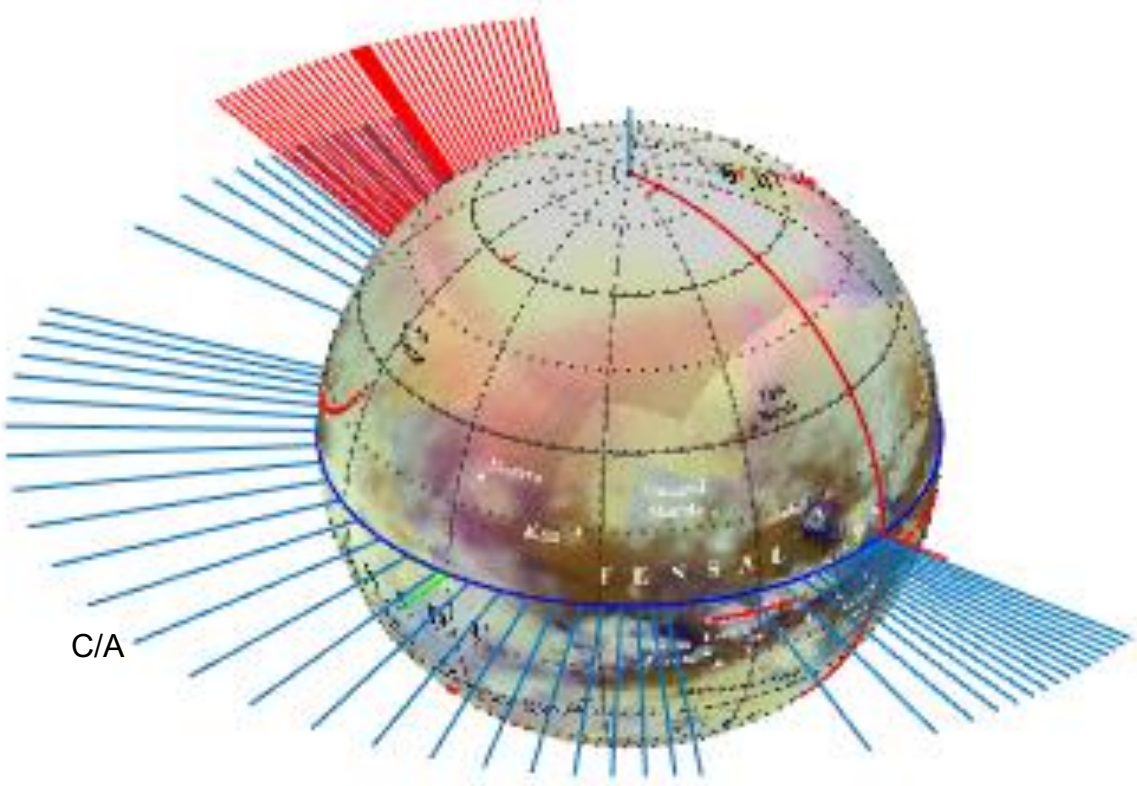
T075 – rev 147 – S67

April 19, 2011 – 109T05:00:39 @ 10053 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

CAPS is the prime instrument.
No ridealong observations.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

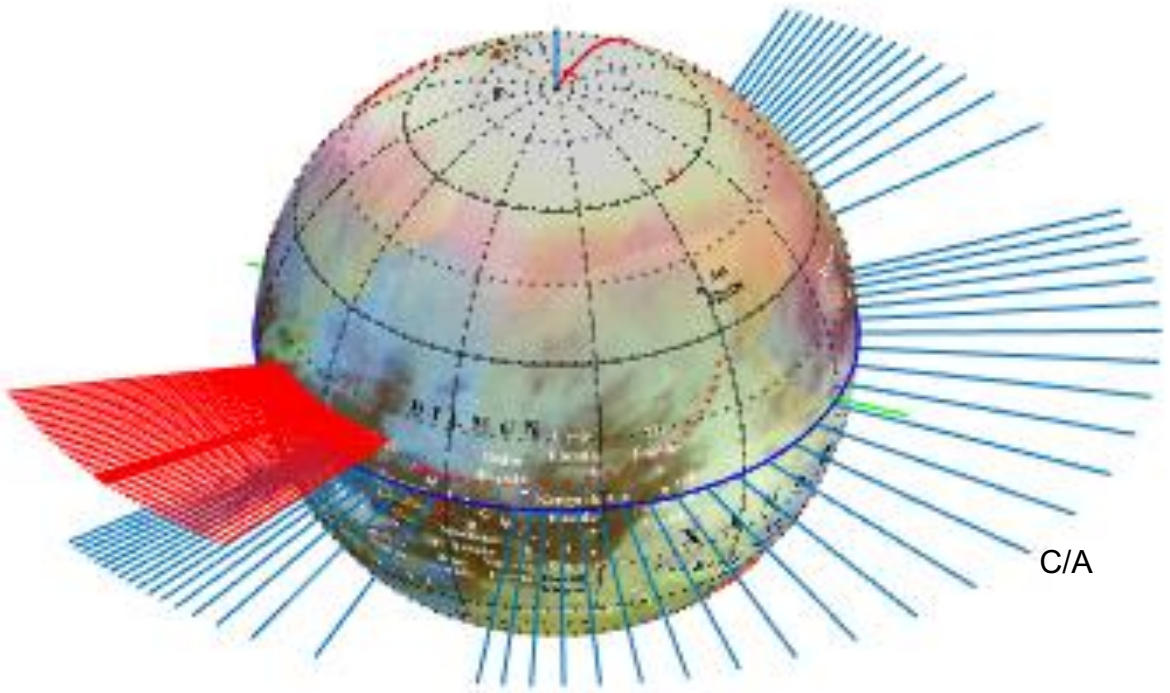
T075 – rev 147 – S67

April 19, 2011 – 109T05:00:39 @ 10053 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Ridealong with UVIS for global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T075 – rev 147 – S67

April 19, 2011 – 109T05:00:39 @ 10053 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

After C/A, there is no specular reflection geometry at high northern latitudes during the UVIS ridealong observations. The specular reflection geometry occurs near equatorial latitudes.

Prior to C/A, during the CAPS observations, the geometry for specular reflection occurs over Kraken and Punga Mares. Unable to view this due to spacecraft orientation.

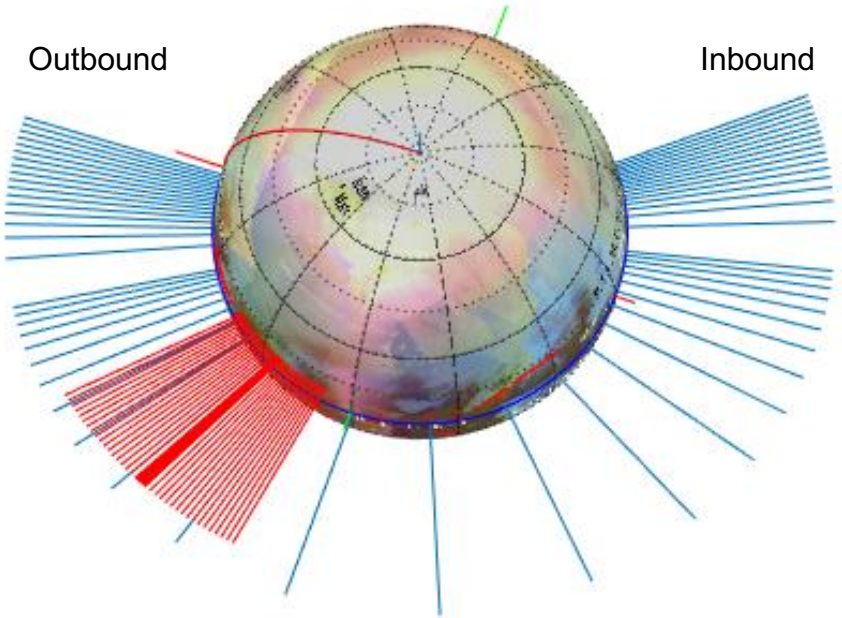
T076 – rev 148 – S68

May 8, 2011 – 128T22:53:44 @ 1873 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T076: During this flyby, VIMS is prime at closest approach (1800 km) and will acquire high resolution images of Adiri and its limits with the surrounding dune fields. (TN1) Later during the flyby, the VIMS will stare at Titan to continue its mapping of the cloud coverage in order to detect any seasonal change in the cloud distribution before and after the equinox (TC1).

C/A-13:11:45	-13:00	CIRS	M4
-13:00	-09:00	CIRS	N1
-09:00	-05:00	CIRS	R
-05:00	-02:15	CIRS	T
begin custom period			
-02:15	-01:15	CIRS	TC1b (-02:15 to -01:15), TM1c (inside -01:15)
-01:15	-00:10	CIRS	CIRS turns to VIMS attitude
-00:10	0	VIMS	on point at -00:10 TC1a
2011-128T22:53:45		CLOSEST APPROACH	
0	+02:15	VIMS	TC1a
end custom period			
+02:15	+03:00	VIMS	TN1a (new territory)
+03:00	+09:00	UVIS	truncated X
+09:00	+14:00	VIMS	V
+14:00	C/A+22:13:15	CIRS	A2



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T076 – rev 148 – S68

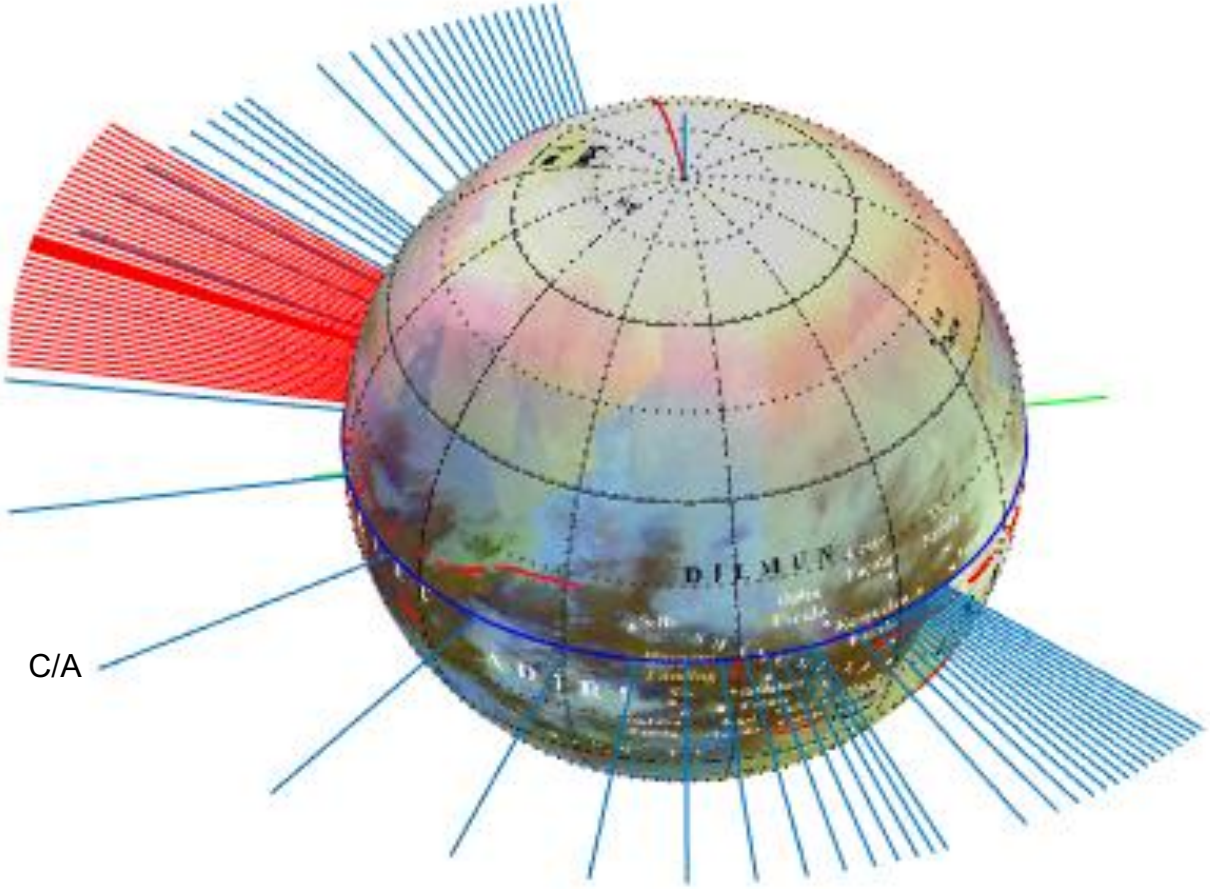
May 8, 2011 – 128T22:53:44 @ 1873 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

At C/A, acquire high resolution images at 0S, 248W of the Adiri region and the surrounding dune fields (TN1).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

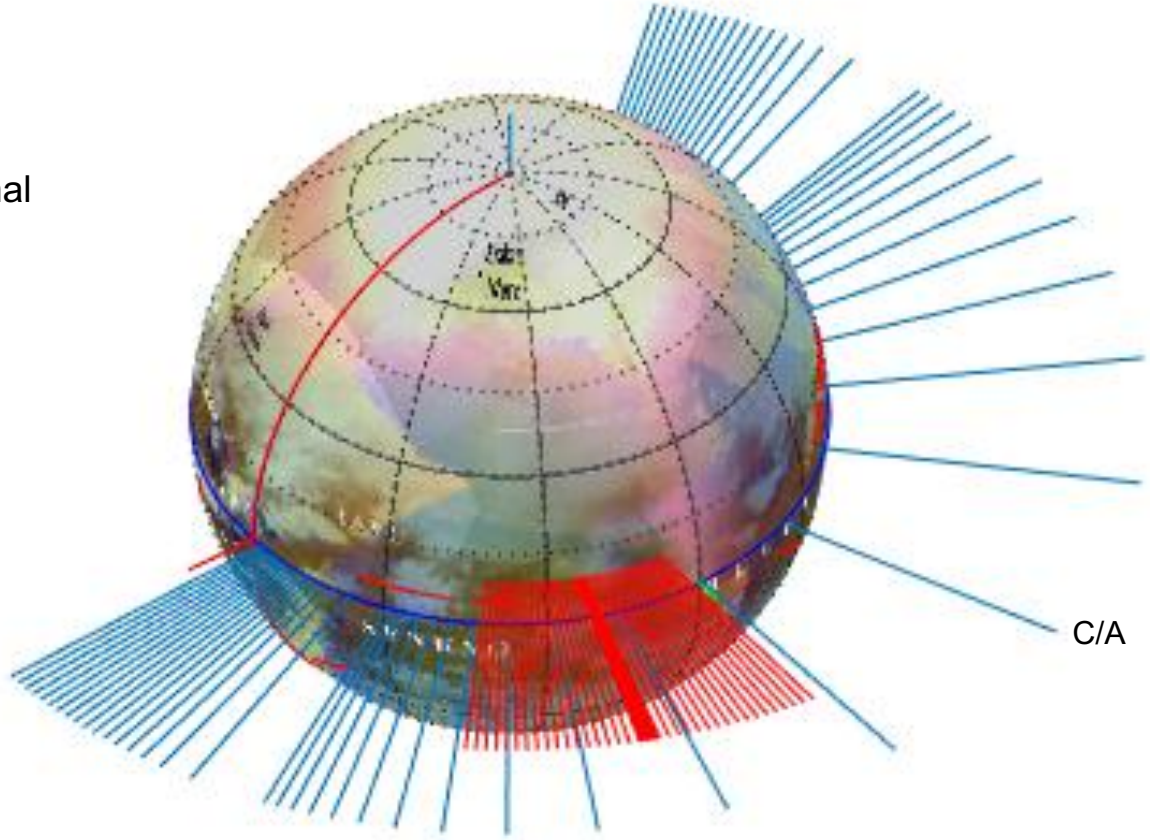
T076 – rev 148 – S68

May 8, 2011 – 128T22:53:44 @ 1873 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Cloud mapping to detect seasonal changes after the equinox.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T076 – rev 148 – S68

May 8, 2011 – 128T22:53:44 @ 1873 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, near equatorial latitudes.

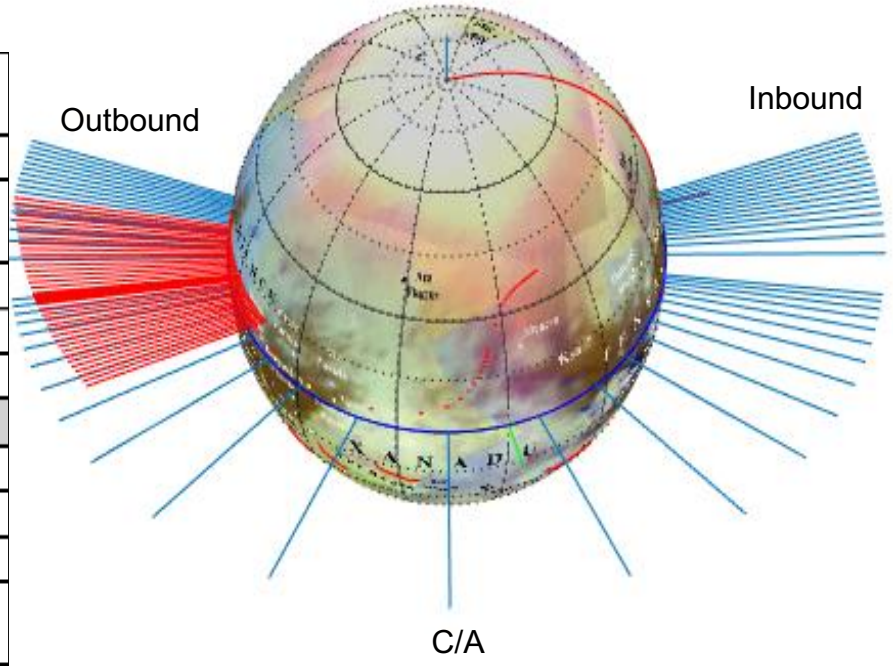
T077 – rev 149 – S68

June 20, 2011 – 171T18:32:01 @ 1359 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T077: During this flyby, VIMS will stare at Titan during its prime observation in order to continue its mapping of the cloud coverage to detect any seasonal change in the cloud distribution before and after the equinox.

C/A-12:05:01	-09:00	UVIS	X extended
-09:00	-02:30	UVIS	X
-02:30	-01:12	RADAR scatterometry/radiometry	
-01:12	-00:30	RADAR HiSAR	
-00:30	-00:18	RADAR Altimetry	
-00:18	0	RADAR SAR	
2011-171T18:32:01		CLOSEST APPROACH	NEG_Z to Titan, NEG_X to RAM
0	+00:18	RADAR SAR	
+00:18	+00:30	RADAR Altimetry	
+00:30	+01:12	RADAR HiSAR	
+01:12	+02:30	RADAR scatterometry/radiometry	
+02:30	+05:00	CIRS	E
+05:00	+09:00	CIRS	F
+09:00	+14:00	VIMS	V
+14:00	C/A+23:44:59	CIRS	A2



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

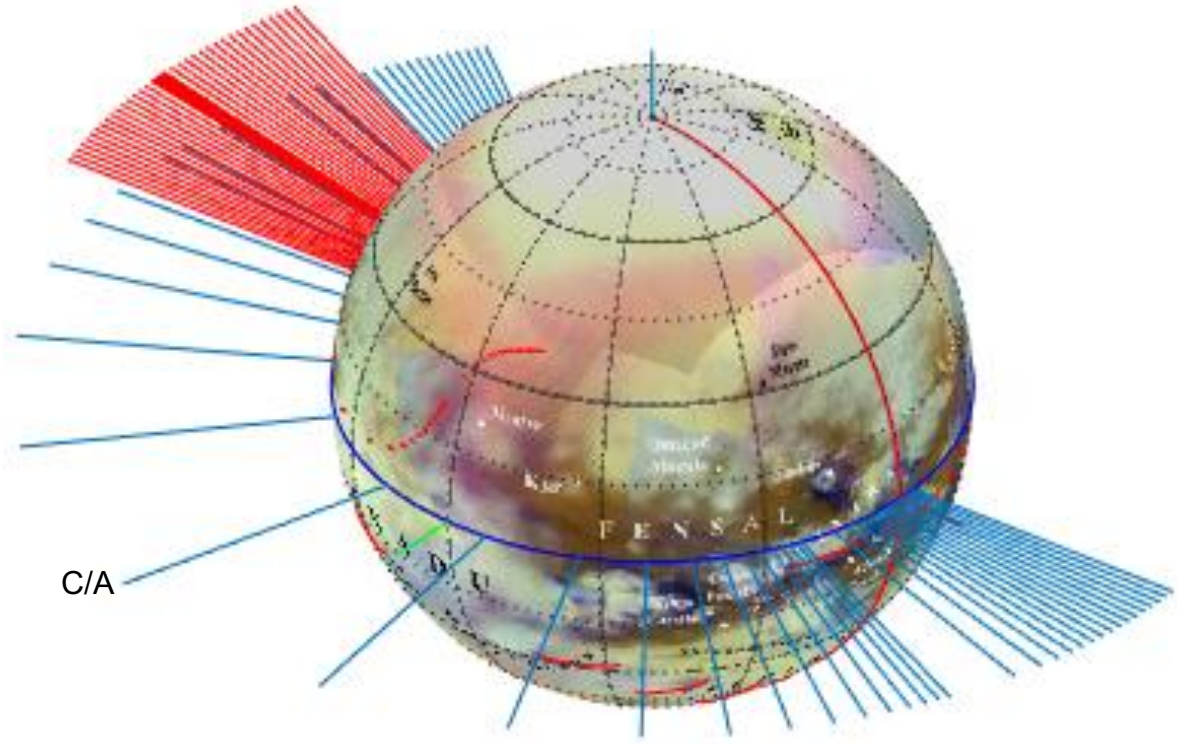
T077 – rev 149 – S68

June 20, 2011 – 171T18:32:01 @ 1359 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

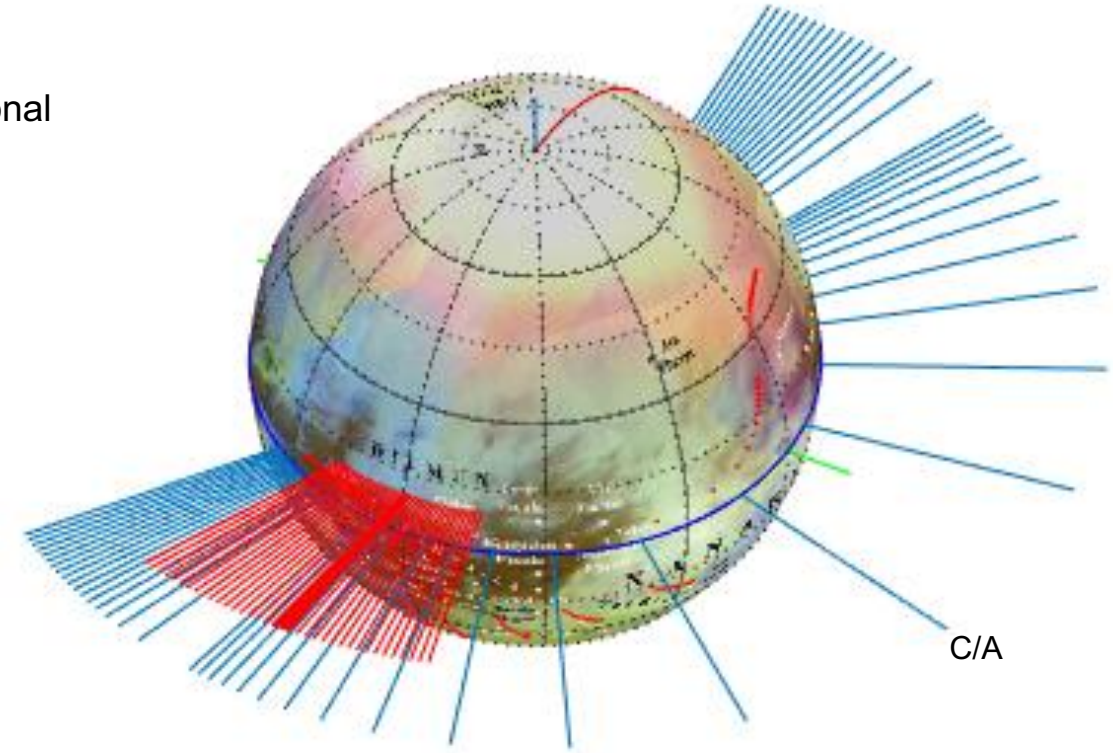
T077 – rev 149 – S68

June 20, 2011 – 171T18:32:01 @ 1359 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Cloud mapping and detect seasonal changes after the equinox.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T077 – rev 149 – S68

June 20, 2011 – 171T18:32:01 @ 1359 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, near equatorial latitudes.

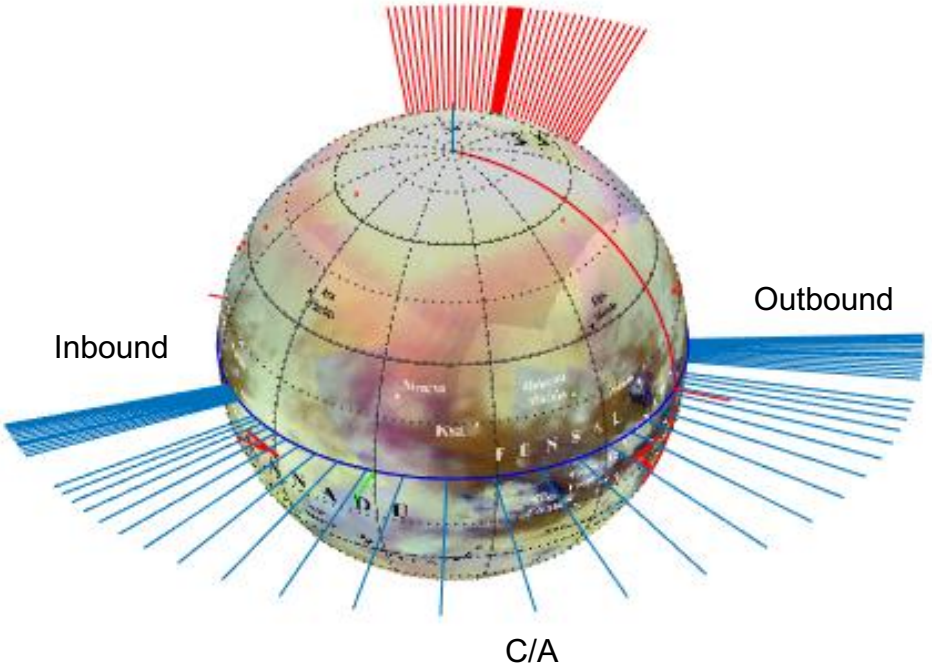
T078 – rev 153 – S70

Sept. 12, 2011 – 255T02:50:06 @ 5821 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T078: During this flyby, VIMS and UVIS are prime at closest approach (5800 km) for a stellar occultation followed by a solar occultation. It will allow VIMS to acquire spectral information about Titan's atmosphere to determine its composition and the density of the aerosol layer (TC1). During the ridealong observations with CIRS and UVIS, VIMS will observe the cloud coverage (TC1).

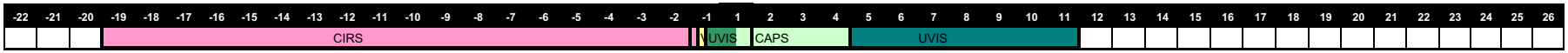
C/A-19:08:06	-13:00	CIRS	M4 (TC1b)
-13:00	-09:00	CIRS	N1 (TC1b)
-09:00	-05:00	CIRS	R (TN1c)
-05:00	-02:15	CIRS	T (TN2c, TC1b)
begin custom period			
-02:15	-00:43	CIRS	TN1c
-00:43	-00:27	VIMS occ	occ at -00:32 to -00:25 (TN1c)
-00:27	0	UVIS solar occ	occ at -00:03 to +00:24 (TC1a, TC1b, TN1c)
2011-255T02:50:06		CLOSEST APPROACH	UVIS_SOL_OFF to Sun, -X to Pole North Pole Dir
0	+00:29	UVIS solar occ	TC1a, TC1b, TN1c
+00:29	+04:00	CAPS	TC2a
end custom period			
+04:00	C/A+11:31:54	UVIS	X modified ((TN1c, TC1b)



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



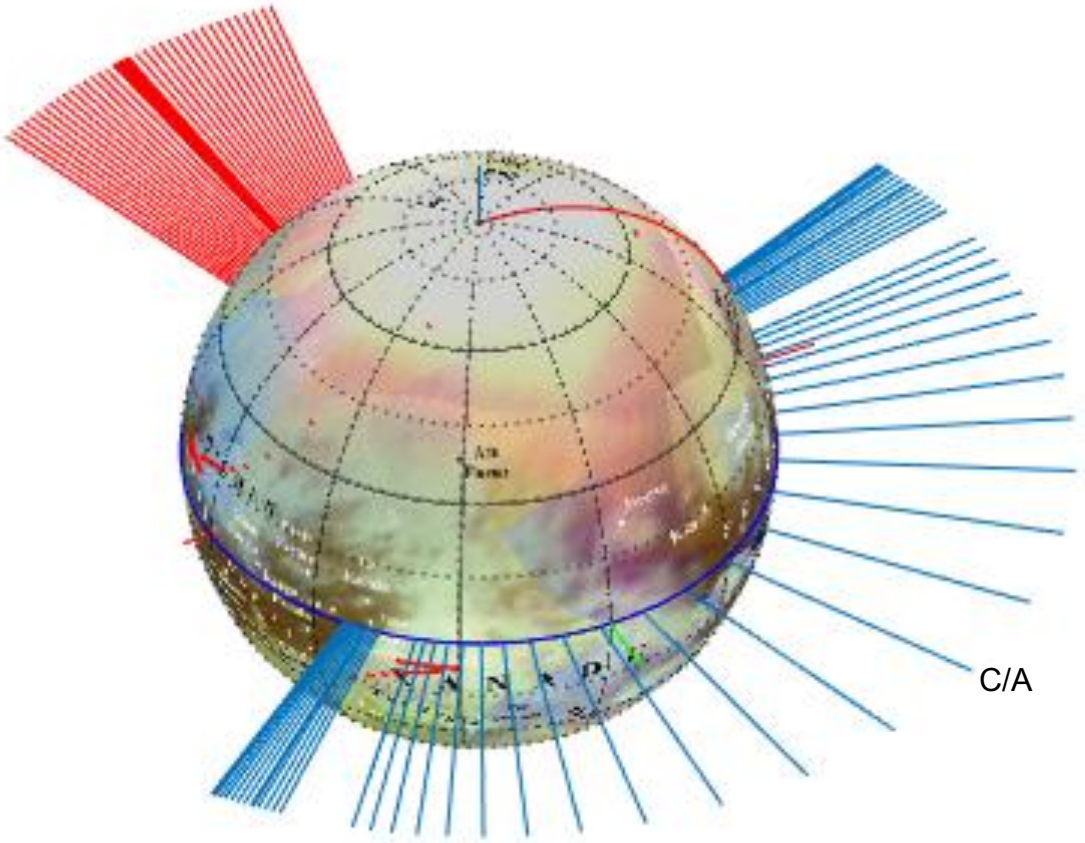
T078 – rev 153 – S70

Sept. 12, 2011 – 255T02:50:06 @ 5821 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

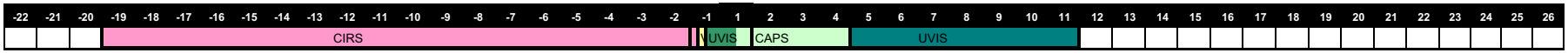
Solar and stellar occultation of R-Aqr will provide constraints on the composition and spectral properties of Titan's atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T078 – rev 153 – S70

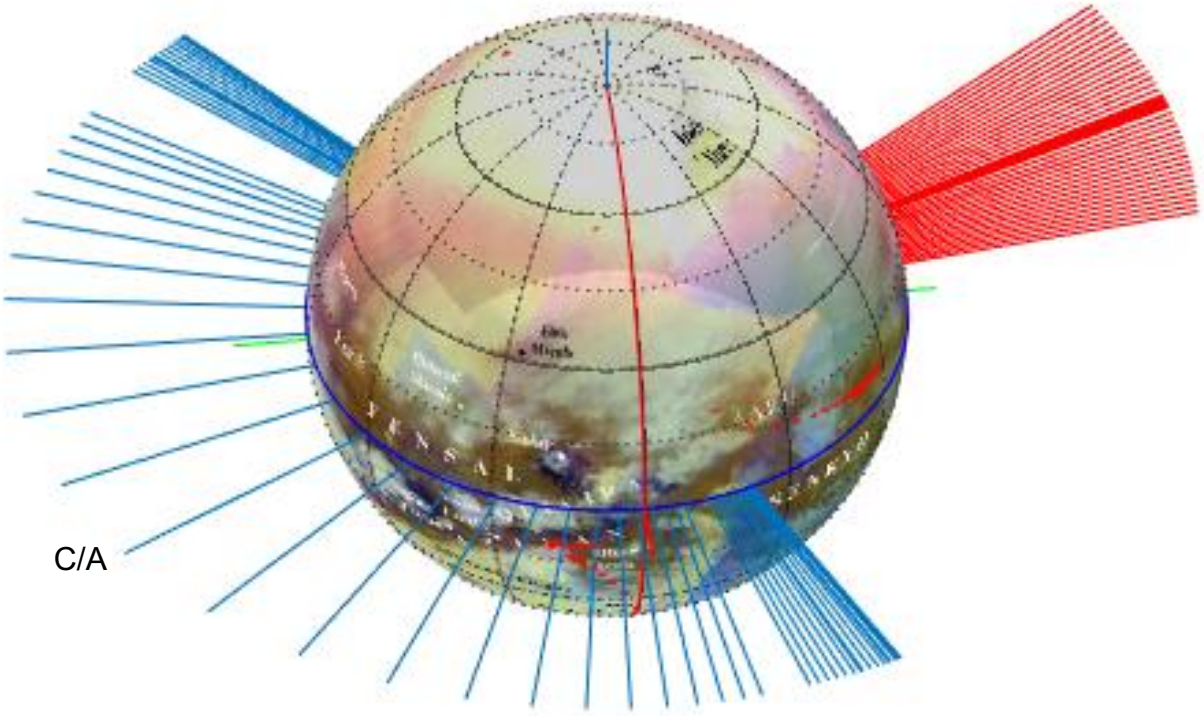
Sept. 12, 2011 – 255T02:50:06 @ 5821 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Monitor clouds.

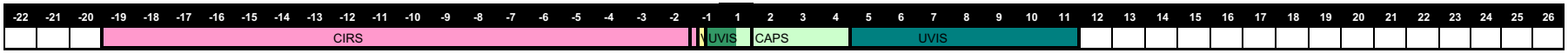
Global mapping.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

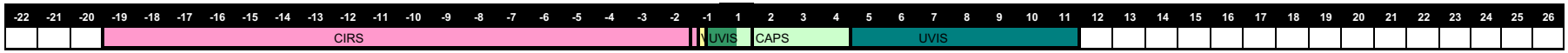


T078 – rev 153 – S70

Sept. 12, 2011 – 255T02:50:06 @ 5821 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to and after C/A, specular geometry occurs near equatorial latitudes.



T079 – rev 158 – S71

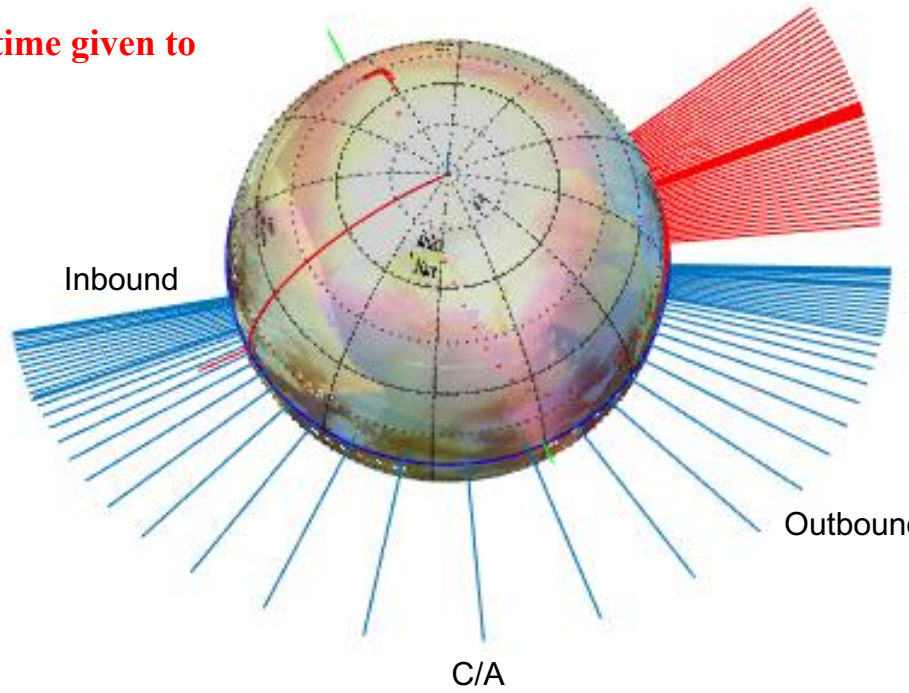
Dec. 13, 2011 – 347T20:11:24 @ 3583 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T079: CAPS is prime during closest approach (3586 km). VIMS to conduct global mapping at 100 km/pixel resolution. Cloud mapping of Titan.

Original timeline, below, modified and CAPS time given to CIRS and VIMS.

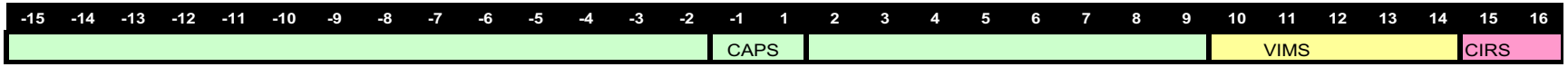
C/A-15:51:24	-13:00	CAPS	TC2a
-13:00	-09:00	CAPS	TC2a
-09:00	-02:15	CAPS	Z TC2a
-02:15	**0**	**CAPS**	**TC2a**
2011-347T20:11:24		**CLOSEST APPROACH**	**POS_Y to COROT (Tc2a)**
0	**+02:15**	**CAPS**	**TC2a**
+02:15	+08:20	**CAPS**	**Z TC2a**
+08:20	+09:00	SP Turn to WP	NEG_Y to Titan, NEG_X to NEP
+09:00	+14:00	VIMS	V TC1a, TC1b
+14:00	C/A+16:28:36	CIRS	A TC1b



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



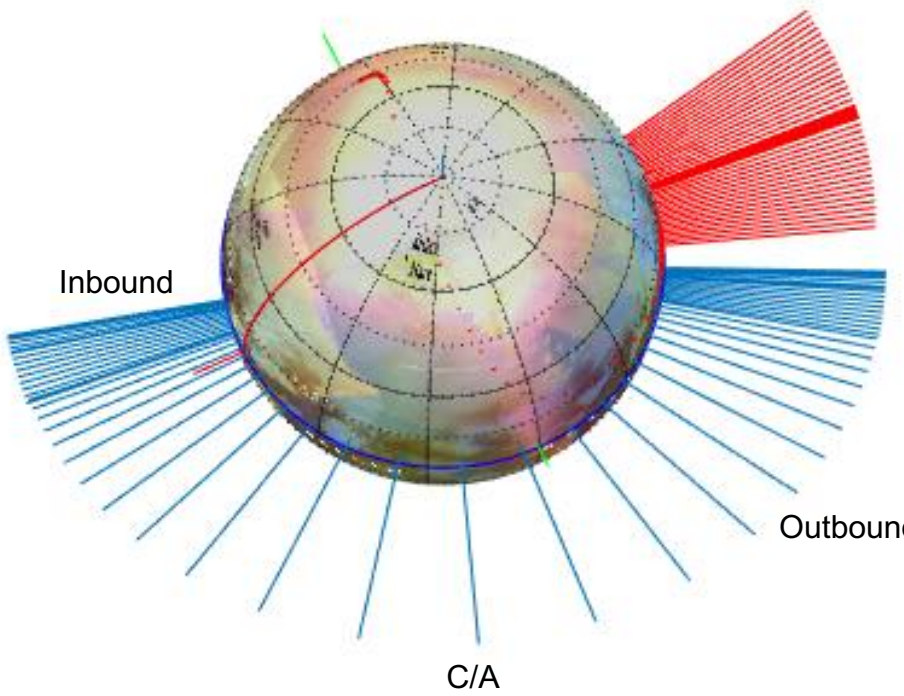
T079 – rev 158 – S71

Dec. 13, 2011 – 347T20:11:24 @ 3583 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T079: Alternate timeline below.

C/A-15:51:24	0	CIRS	
2011-347T20:11:24		**CLOSEST APPROACH**	
0	**+08:20**	**VIMS**	**VIMS picks up at NEG_Y to Titan/NEG_ X to NTP**
End Custom Period			
+08:20	+09:00	SP Turn to WP	NEG_Y to Titan, NEG_X to NEP
+09:00	+14:00	VIMS	V TC1a, TC1b
+14:00	C/A+16:28:36	CIRS	A TC1b
C/A+16:28:36	**2011-348T12:55:00**	**OD Uncertainty Dead Time**	
2011-348T12:55:00	**2011-348T13:35:00**	SP Turn to Earth for downlink	
2011-348T13:35:00	2011-348T15:05:00	Y-Bias window	
2011-348T15:05:00	**2011-349T02:35:00**	Canberra 70M	
2011-349T02:35:00	**2011-349T03:15:00**	SP Turn to WP	NEG_Y to Titan, POS_Z to NTP
2011-349T03:15:00	2011-349T06:15:00	ISS	TC1a
2011-349T06:15:00	2011-349T09:15:00	ISS	TC1a
2011-349T09:15:00	2011-349T12:15:00	ISS	TC1a
2011-349T12:15:00	2011-349T15:15:00	ISS	TC1a
2011-349T15:15:00	2011-349T18:15:00	ISS	TC1a
2011-349T18:15:00	2011-349T21:15:00	ISS	TC1a
2011-349T21:15:00	2011-349T23:15:00	RADAR	3 hours warmup needed, activity is 2 hours. TN2c
2011-349T23:15:00	2011-350T00:10:00	ISS	TC1a



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T079 – rev 158 – S71

Dec. 13, 2011 – 347T20:11:24 @ 3583 km altitude

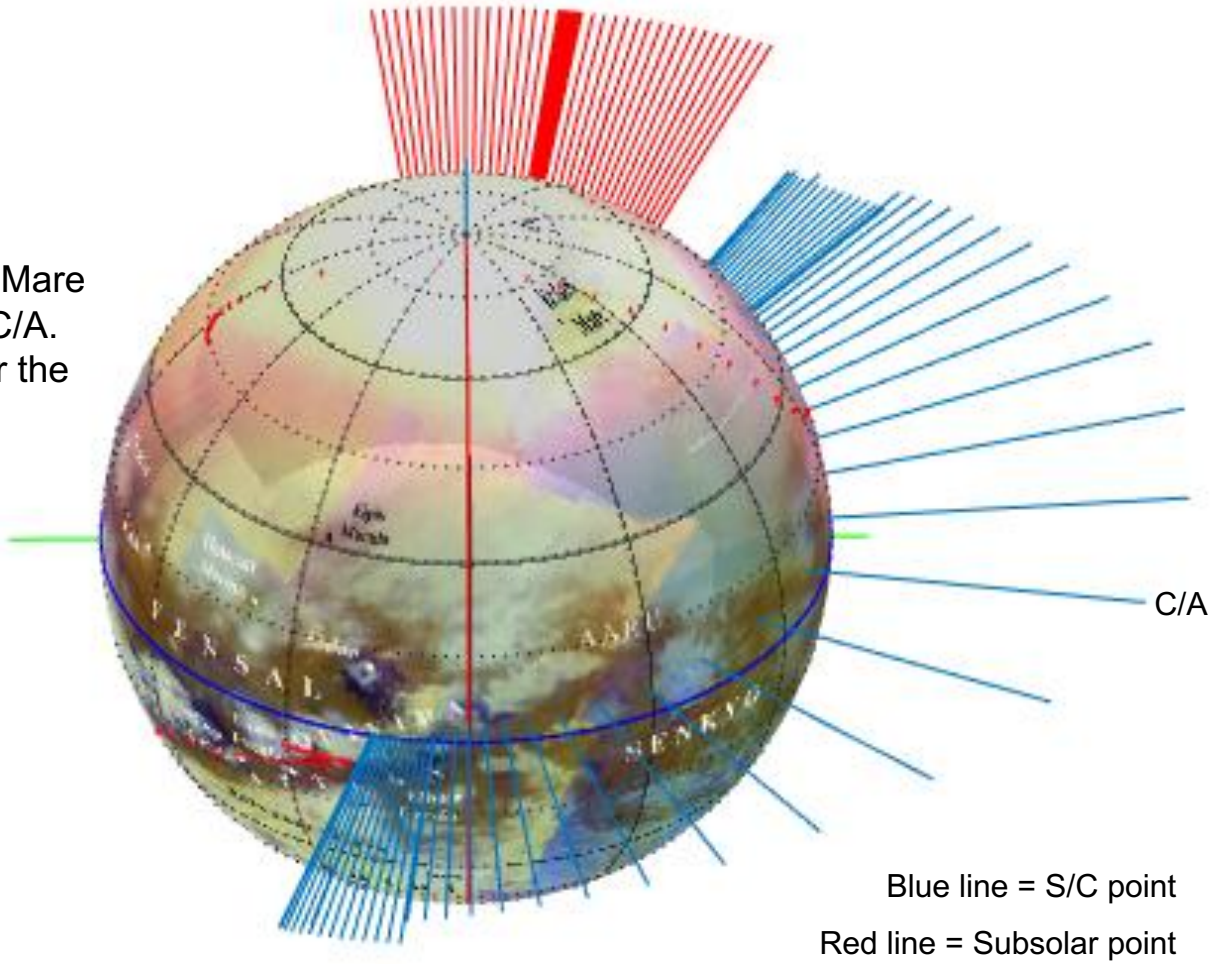
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Acquire images of Kraken Mare (68N, 310 W) near C/A – 02:00.

Specular reflection over Kraken Mare approximately one hour before C/A. Possible specular reflection over the small lakes prior to this.

Global mapping of Titan.



T079 – rev 158 – S71

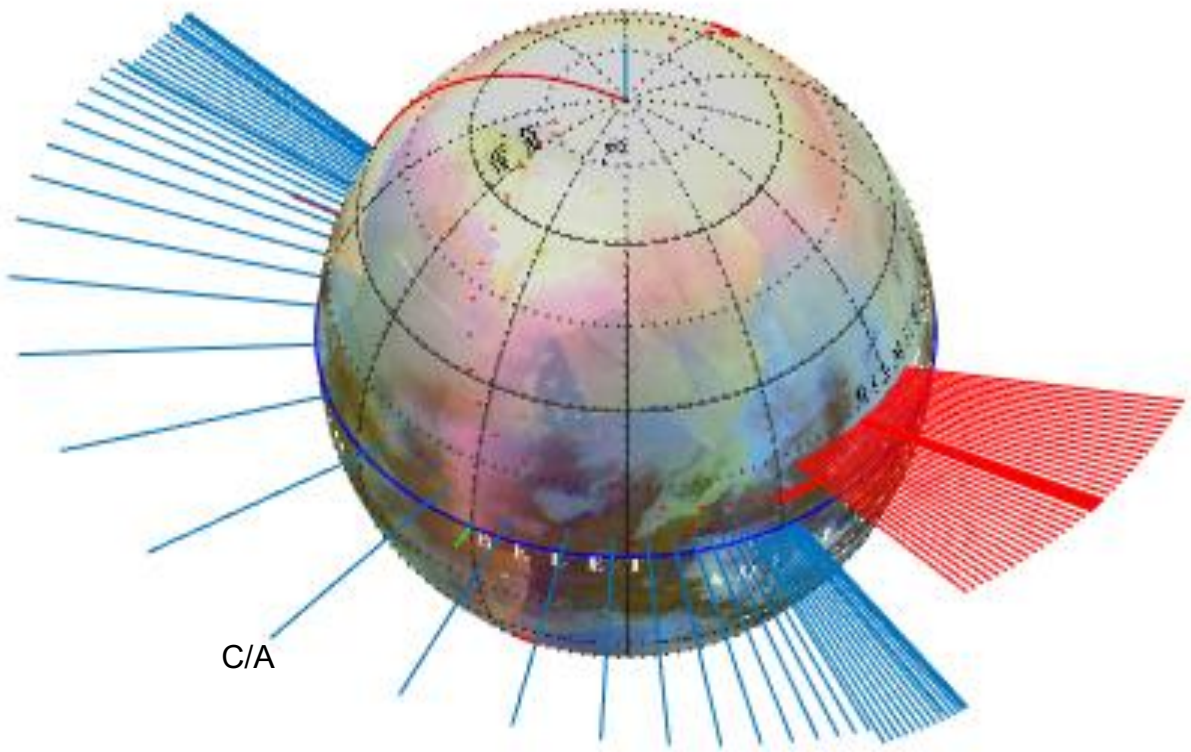
Dec. 13, 2011 – 347T20:11:24 @ 3583 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Acquire mosaics of regions near Adiri and Belet .

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

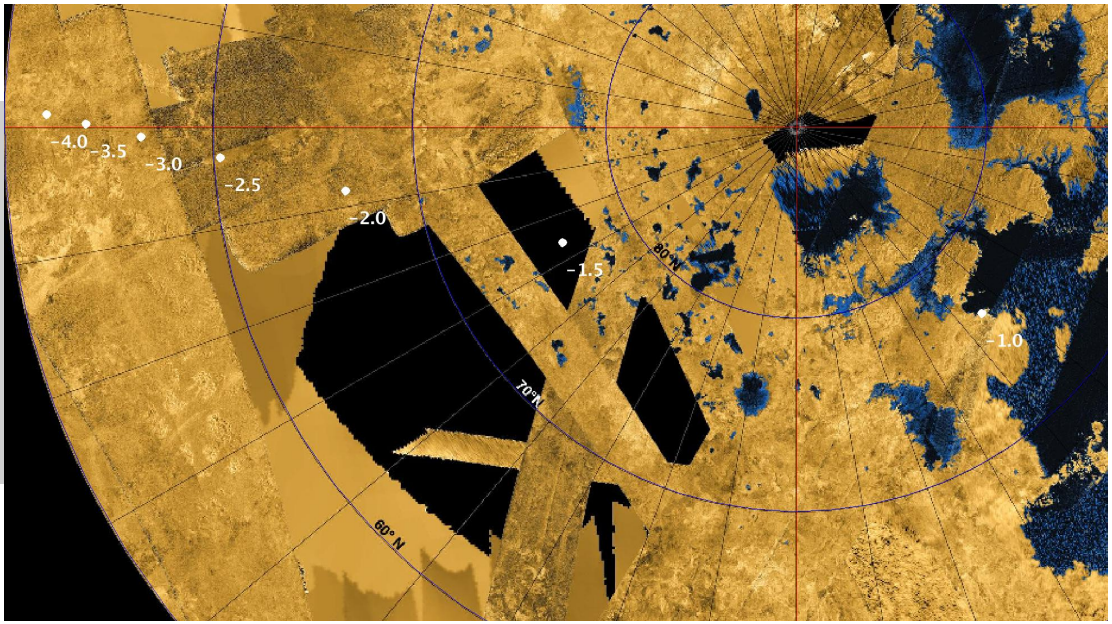
T079 – rev 158 – S71

Dec. 13, 2011 – 347T20:11:24 @ 3583 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
51.98	91.0	82.6	82.7	-14400	-4.0
53.85	90.3	83.0	82.9	-12600	-3.5
56.47	89.2	83.3	83.3	-10800	-3.0
60.32	87.0	83.8	83.8	-9000	-2.5
66.36	82.0	84.4	84.4	-7200	-2.0
76.34	63.9	85.2	85.2	-5400	-1.5
76.26	315.1	86.0	86.0	-3600	-1.0
42.41	282.0	84.3	84.2	-1800	-0.5



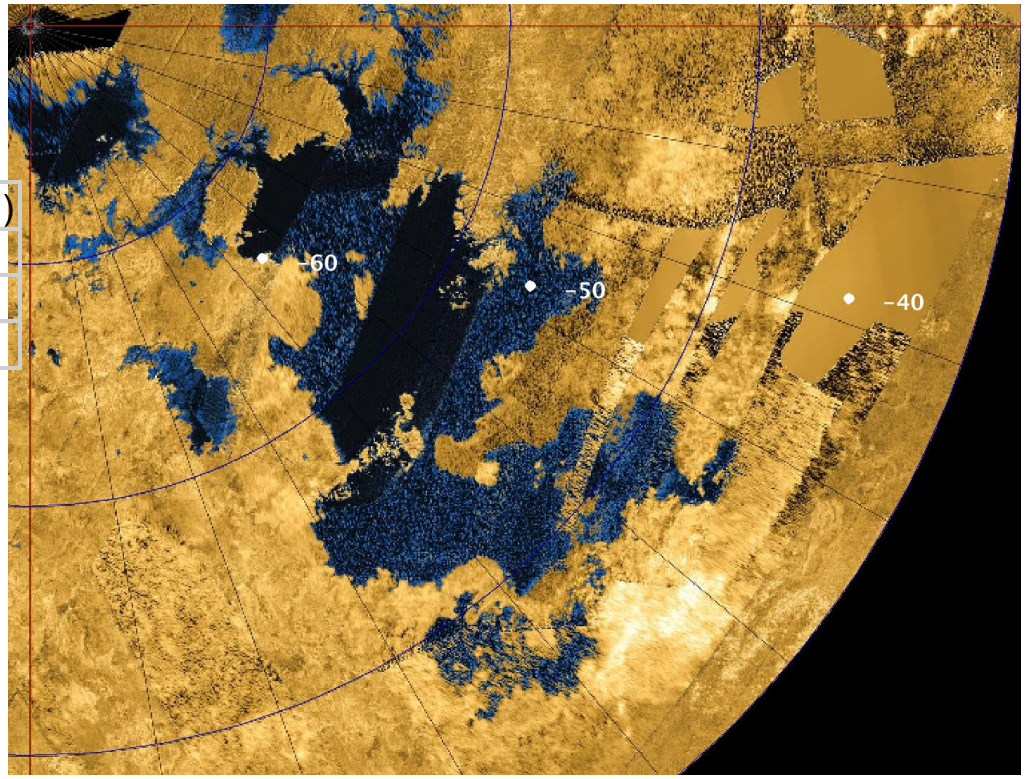
T079 – rev 158 – S71

Dec. 13, 2011 – 347T20:11:24 @ 3583 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (min)
76.26	315.1	86.0	86.0	-3600	-60.0
66.65	297.5	86.0	86.0	-3000	-50.0
54.86	288.4	85.6	85.5	-2400	-40.0



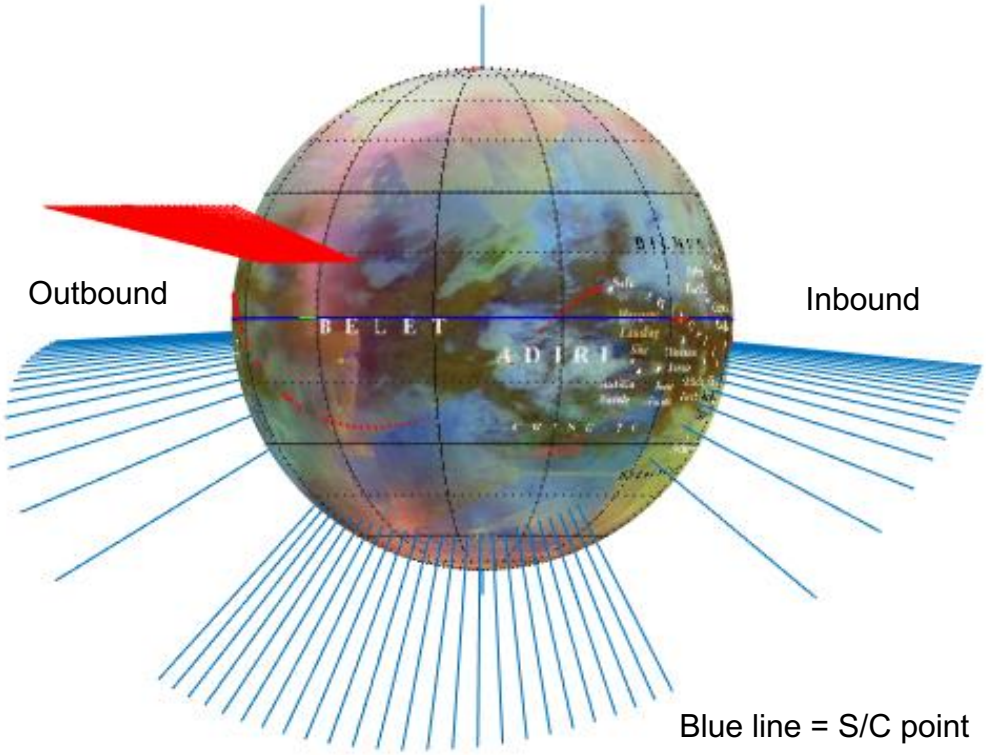
T080 – rev 159 – S71

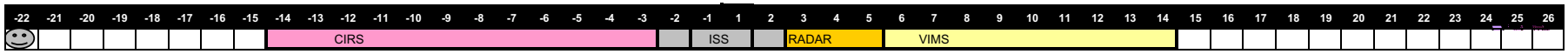
Jan. 2, 2012 – 002T15:13:38 @ 29,514 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T080: During this flyby, VIMS will ridealong with ISS at closest approach (29415km). Stellar occultations of CW Leo and R Leo which will constrain the composition and the spectral properties of Titan's atmosphere.

C/A-13:56:38	-13:00	CIRS	M4
-13:00	-09:00	CIRS	N1
-09:00	-05:00	CIRS	R
-05:00	-02:30	CIRS	T
-02:30	-02:15	CIRS	
-02:15	**0**	**ISS**	
2012-002T15:13:38		**CLOSEST APPROACH**	**NEG_Y to Titan**
0	**+02:15**	**ISS**	
+02:15	+05:00	RADAR	L
+05:00	+09:00	VIMS Stellar Occ	
+09:00	+14:00	VIMS	V
+14:00	C/A+14:44:22	VIMS	





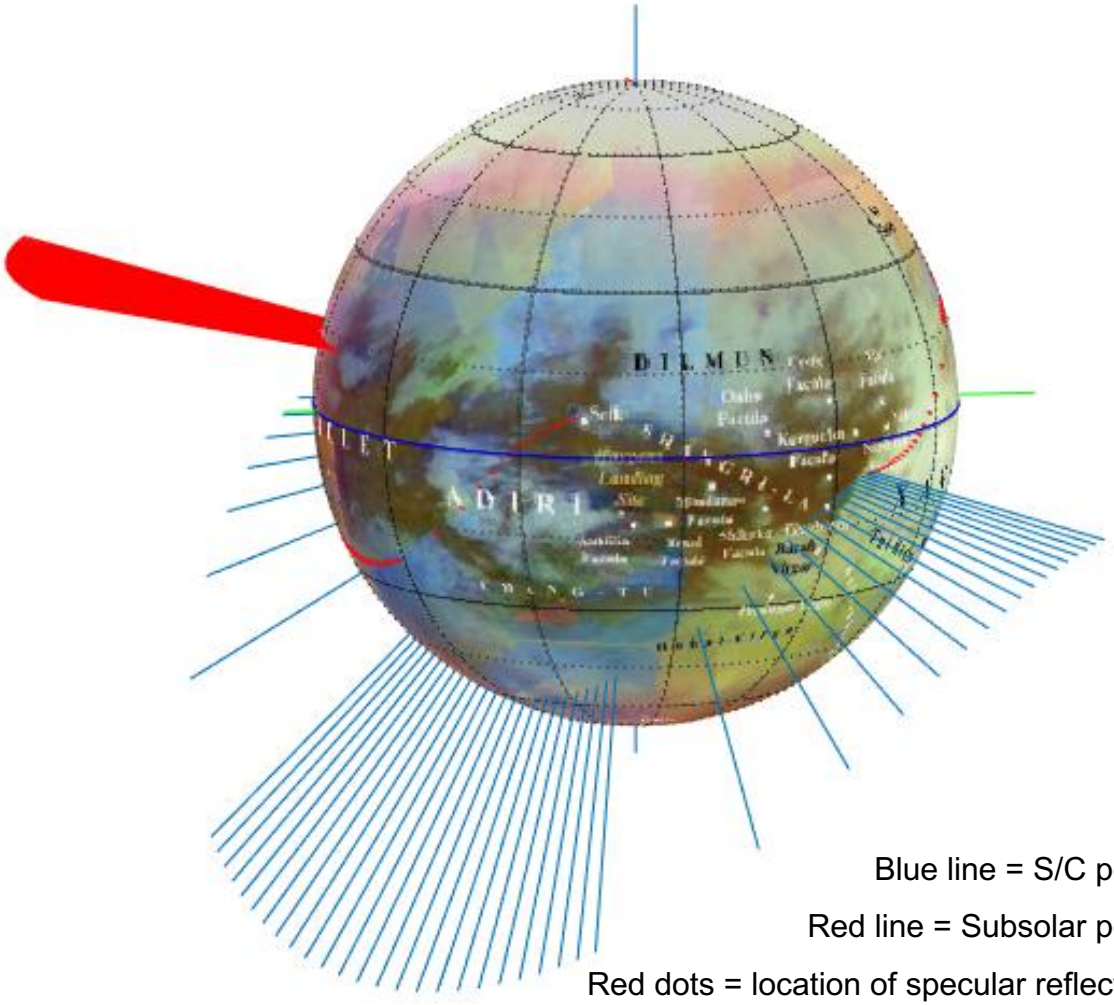
T080 – rev 159 – S71

Jan. 2, 2012 – 002T15:13:38 @ 29,514 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A

-22 -21 -20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

CIRS ISS RADAR VIMS

T080 – rev 159 – S71

Jan. 2, 2012 – 002T15:13:38 @ 29,514 km altitude

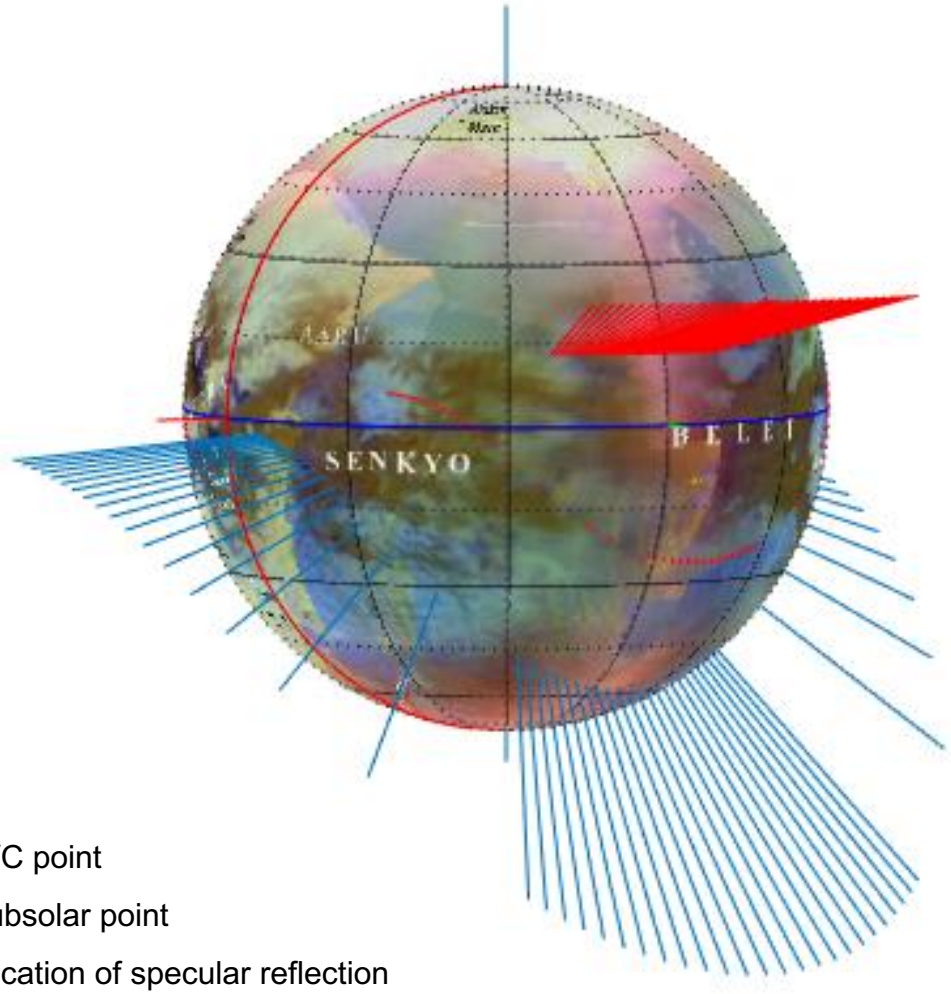
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Attempt observations of Ontario Lacus (72S, 183W).

VIMS prime stellar occultation observation of CW Leo and R Leo. These observations will constrain the composition and spectral properties of Titan's atmosphere.

Global mapping of Titan.

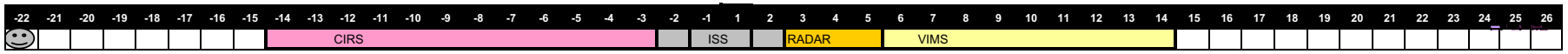


Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A

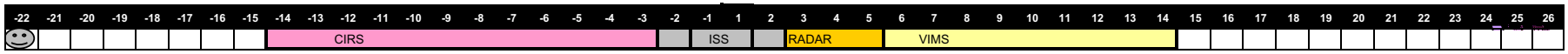


T080 – rev 159 – S71

Jan. 2, 2012 – 002T15:13:38 @ 29,514 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry occurs near equatorial latitudes. After C/A, at mid-southern latitudes.



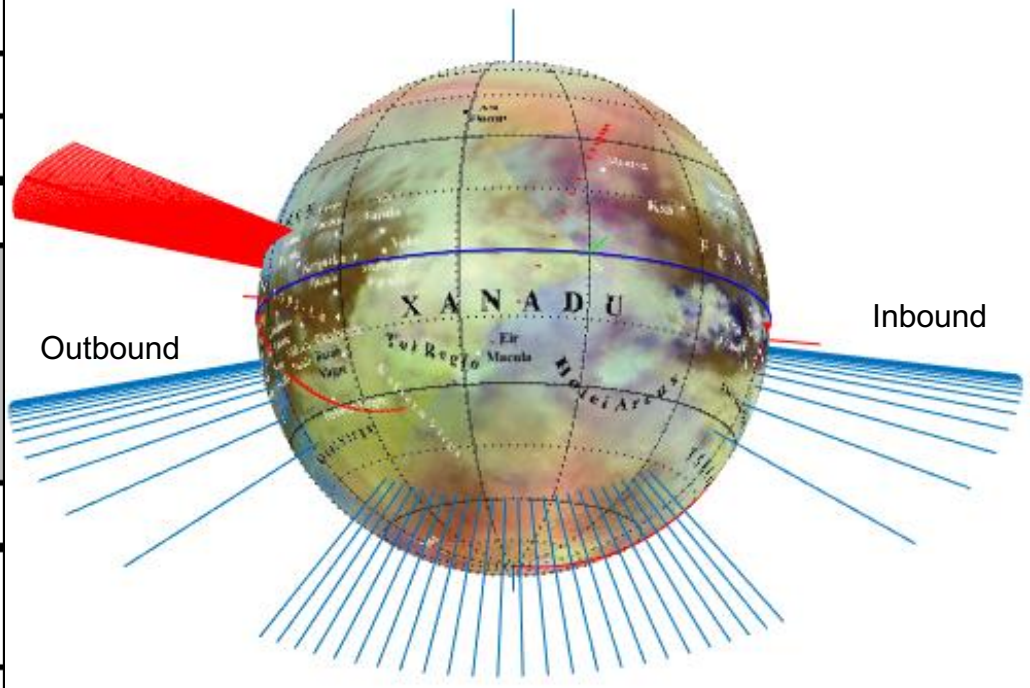
T081 – rev 160 – S72

Jan. 30, 2012 – 030T13:39:48 @ 31,130 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T081: During this flyby, VIMS will ridealong with ISS at closest approach (31131km) to look for lakes in the South Pole area.

C/A-14:03:47	-13:00	CIRS	part M4(TC1b)
-13:00	-09:00	CIRS	N1(TC1b)
-09:00	-02:15	UVIS	X(TN1c, TC1b)
-02:15	**0**	**ISS**	
2012-030T13:39:47		**CLOSEST APPROACH**	**NEG_Y to Titan**
0	**+02:15**	**ISS**	
+02:15	+03:00	**ISS**	
+03:00	+09:00	UVIS	modified X(TN1c, TC1b)
+09:00	+14:00	CIRS	C(TC1a, TC1b)
+14:00	C/A+14:36:13	CIRS	TC1b



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T081 – rev 160 – S72

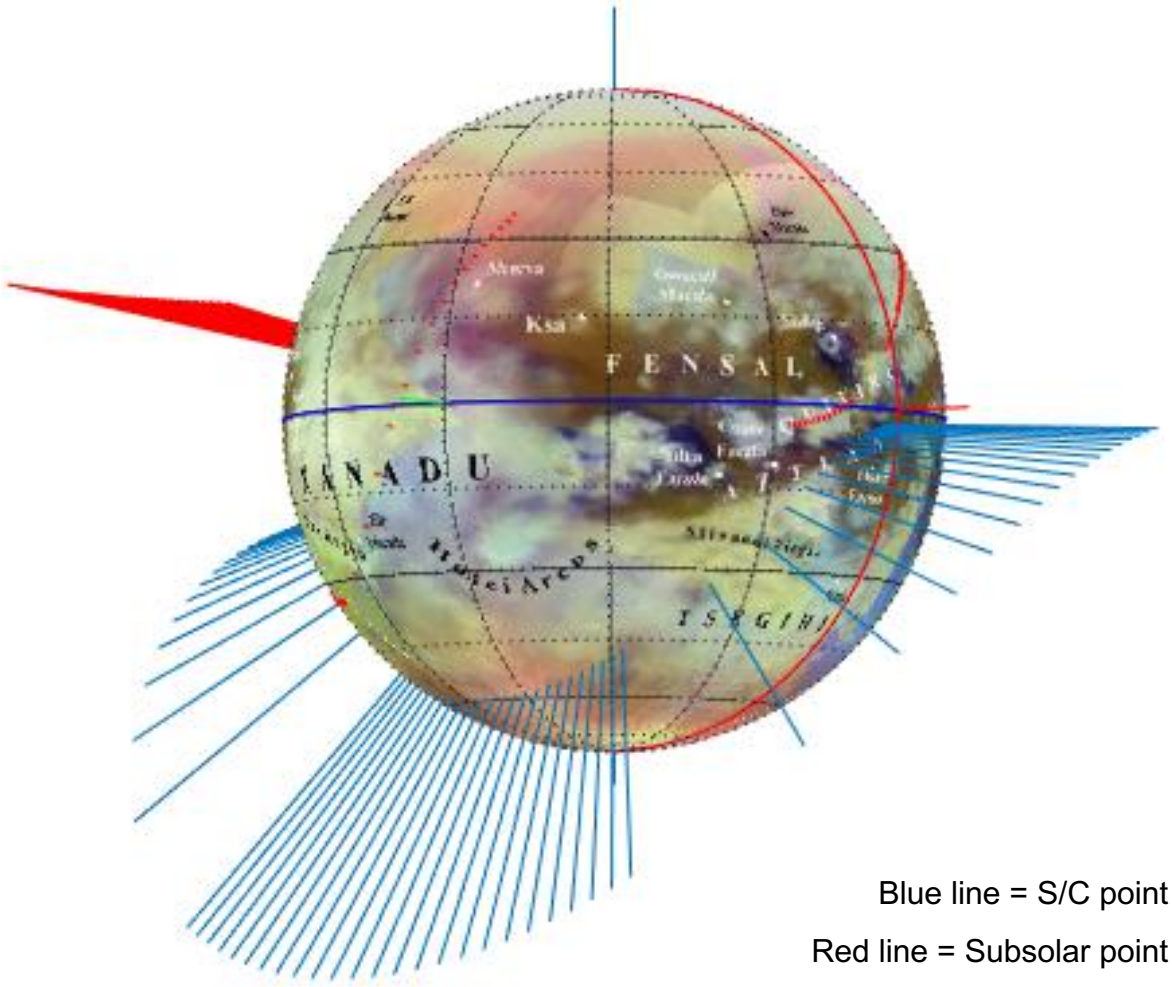
Jan. 30, 2012 – 030T13:39:48 @ 31,130 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Monitor cloud coverage.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

C/A

Red dots = location of specular reflection

T081 – rev 160 – S72

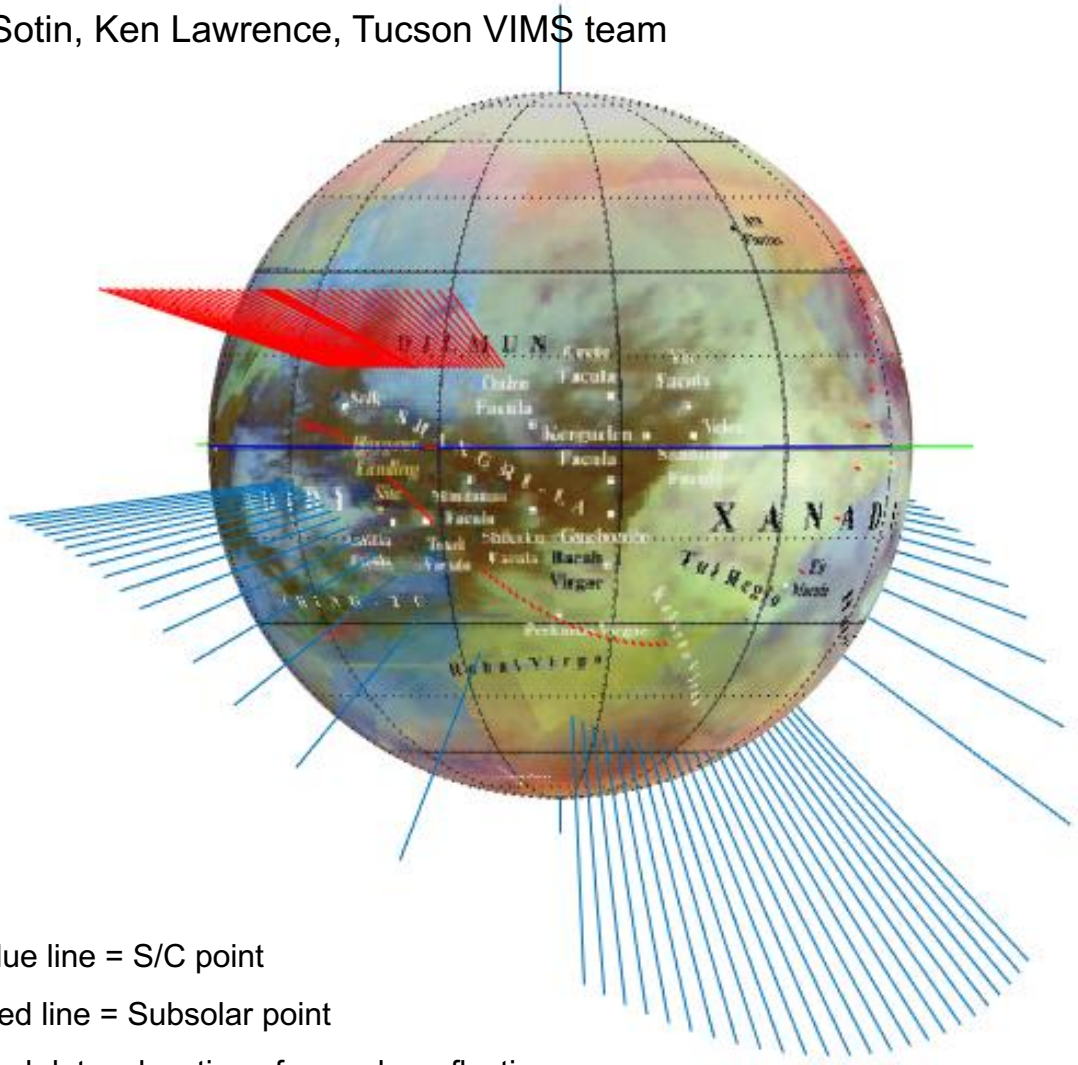
Jan. 30, 2012 – 030T13:39:48 @ 31,130 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Attempt observations of Ontario Lacus at 72S, 183 W (last possible optical observations).

Ridealong with ISS at C/A to obtain regional mapping at moderate resolutions (~15m/px).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T081 – rev 160 – S72

Jan. 30, 2012 – 030T13:39:48 @ 31,130 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry occurs at mid-northern latitudes. After C/A, at equatorial latitudes.

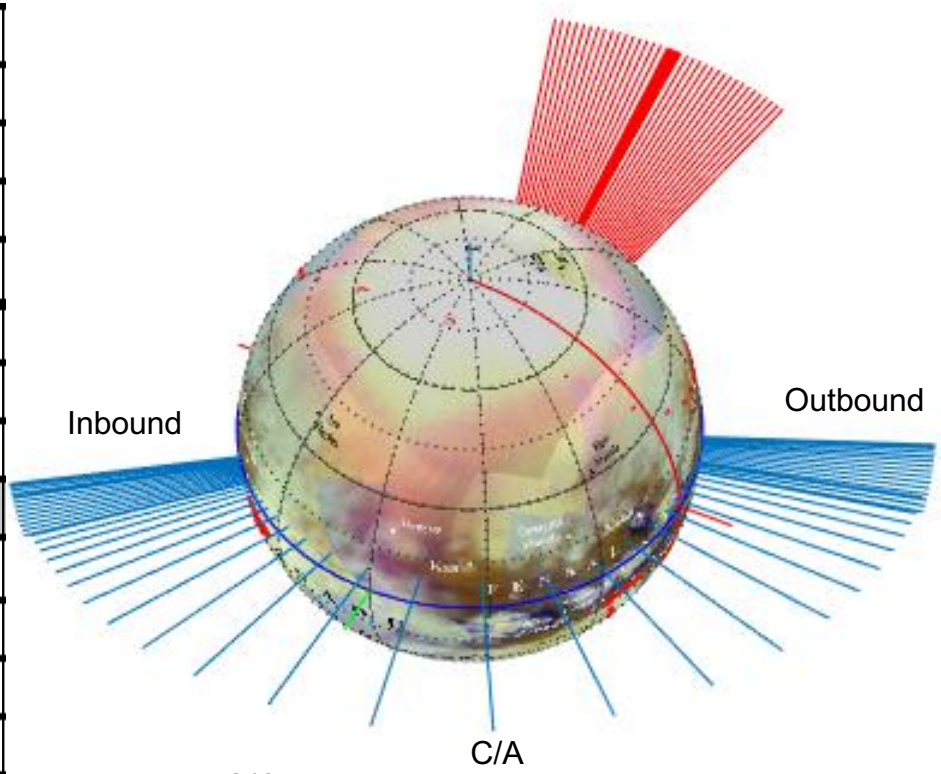
T082 – rev 161 – S72

Feb. 19, 2012 – 050T08:43:17 @ 3803 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T082: VIMS will ridealong with CIRS during closest approach (3803 km). Detection of clouds to monitor climatic changes after the equinox.

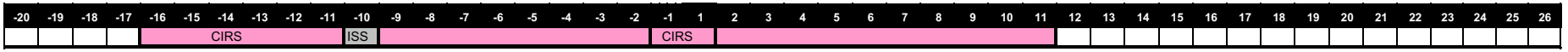
C/A-16:49:17	-12:00	CIRS	M4 TC1b
-12:00	-10:00	CIRS	N TN1c
-10:00	-09:00	ISS	N TN1c
-09:00	-05:00	CIRS	R TN1c or Tc1b, decided in implementatio
-05:00	-02:15	CIRS	T TN2c (surface temperature)
-02:15	-01:15	CIRS	TN1c
-01:15	-0:45	CIRS	TN1c
-00:45	0	CIRS	TN1c
2012-050T08:43:17		CLOSEST APPROACH	NEG_Y to Titan
0	+00:45	CIRS	TN1c
+00:45	+01:15	CIRS	TN1c
+01:15	+02:15	CIRS	TN1c
+02:15	+05:00	CIRS	E TN2c (surface temperature)
+05:00	+09:00	CIRS	F TC1b OR TN1c
+09:00	C/A+11:05:43	CIRS	modified C TN1c



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T082 – rev 161 – S72

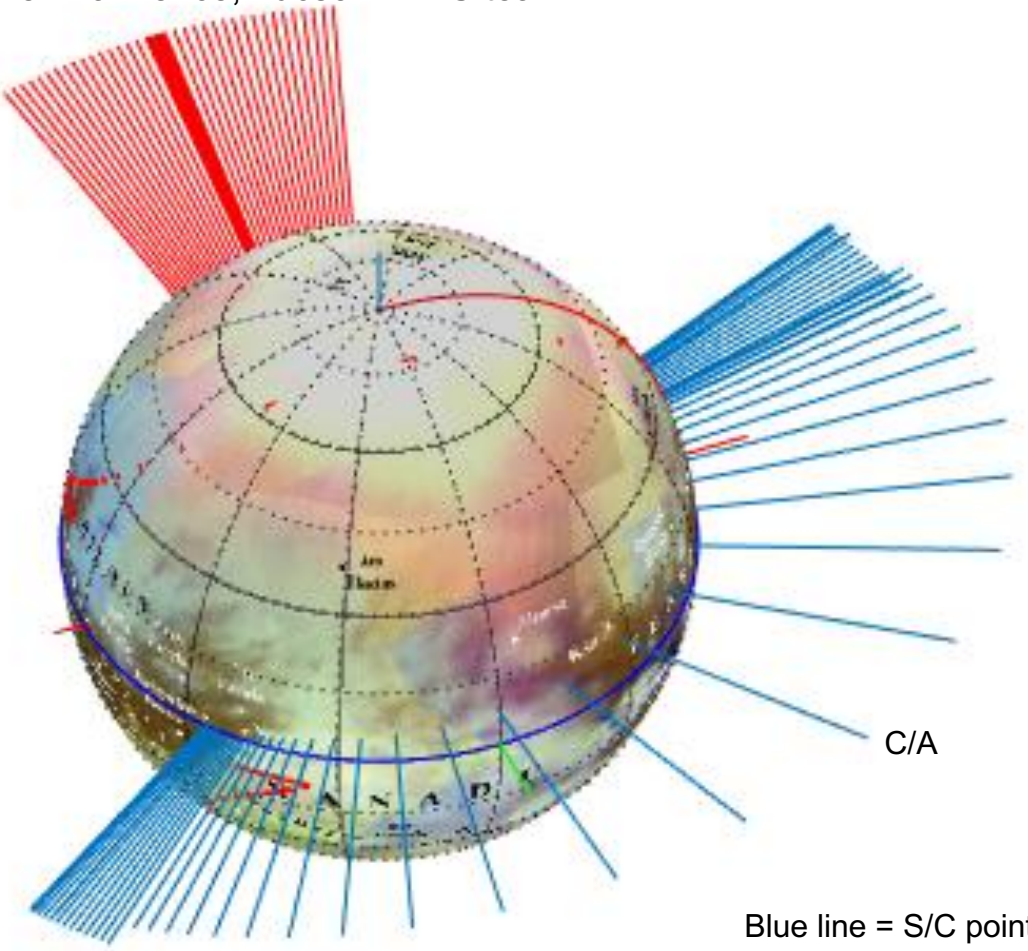
Feb. 19, 2012 – 050T08:43:17 @ 3803 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Detection of clouds to monitor climatic changes after the equinox.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
				CIRS						ISS										CIRS																									

T082 – rev 161 – S72

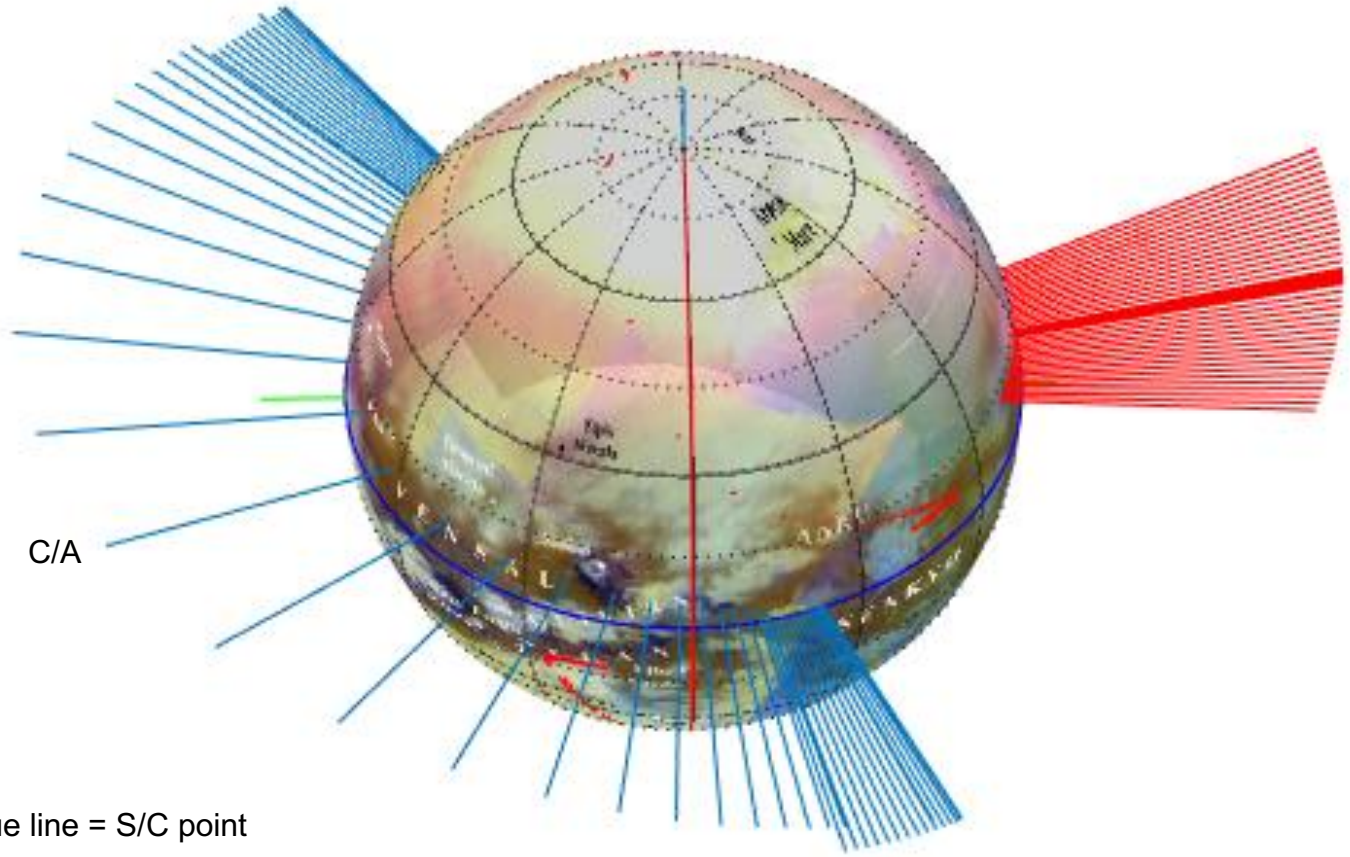
Feb. 19, 2012 – 050T08:43:17 @ 3803 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional mapping while riding along with CIRS during C/A.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
				CIRS						ISS										CIRS																									

T082 – rev 161 – S72

Feb. 19, 2012 – 050T08:43:17 @ 3803 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, near equatorial latitudes.

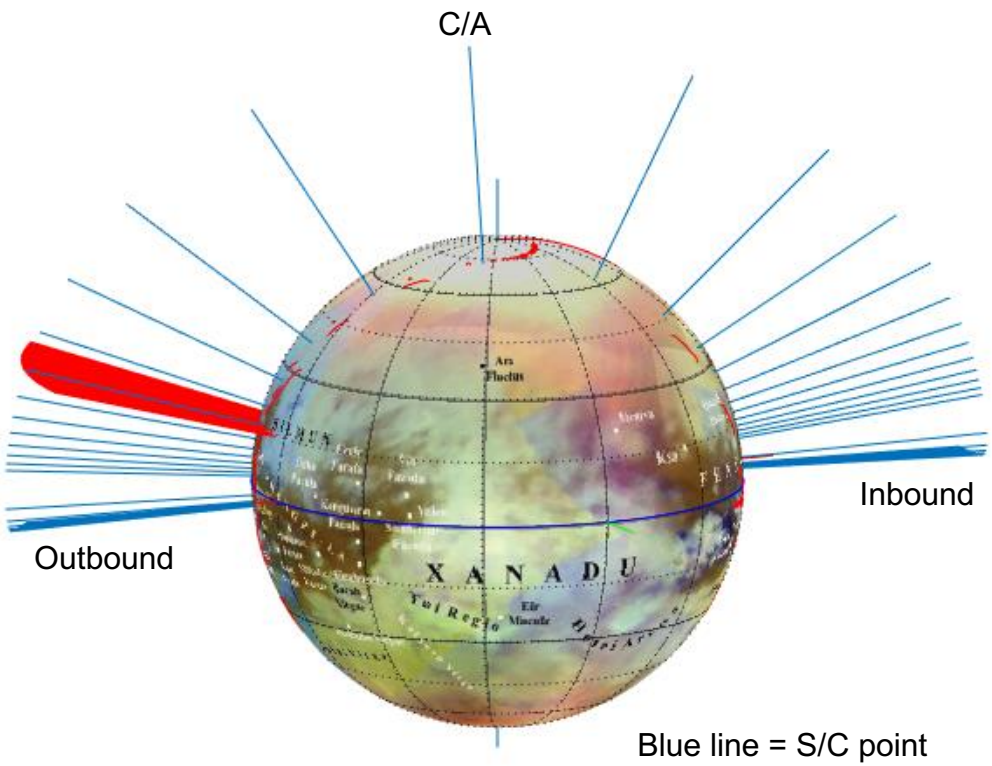
T083 – rev 166 – S73

May 22, 2012 – 143T01:10:11 @ 953 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T083: Radar and INMS are prime at closest approach (955 km). Detection of clouds to monitor climatic changes after the equinox. Look for specular reflection on the Northern lakes.

begin custom period			
C/A-15:44:11	-09:00	VIMS	O extended
-09:00	-05:15	CIRS	R
-05:15	-05:00	CIRS	
-05:00	-02:15	CIRS	T
-02:15	**-01:12**	RADAR	
-01:12	**-01:11**	RWA to RCS Transition	
-01:11	**-00:30**	RADAR HiSAR	
-00:30	**-00:15**	**RADAR Altimetry**	
-00:15	**0**	**RADAR**	**INMS on point at -00:15**
2012-143T01:10:11		**CLOSEST APPROACH**	**NEG_X to RAM, NEG_Z to Titan**
0	**+00:18**	**RADAR SAR**	**INMS ride along**
+00:18	**+00:30**	**RADAR Altimetry**	
+00:30	**+00:50**	**RADAR HiSAR**	
+00:50	**+01:12**	RCS to RWA Transition	
+01:12	**+02:15**	**RADAR scatterometry/radiometry**	
+02:15	**+06:00**	**RADAR**	**L+I1**
+06:00	+09:00	VIMS	I1
+09:00	C/A+14:35:49	CIRS	C
end custom period			



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T083 – rev 166 – S73

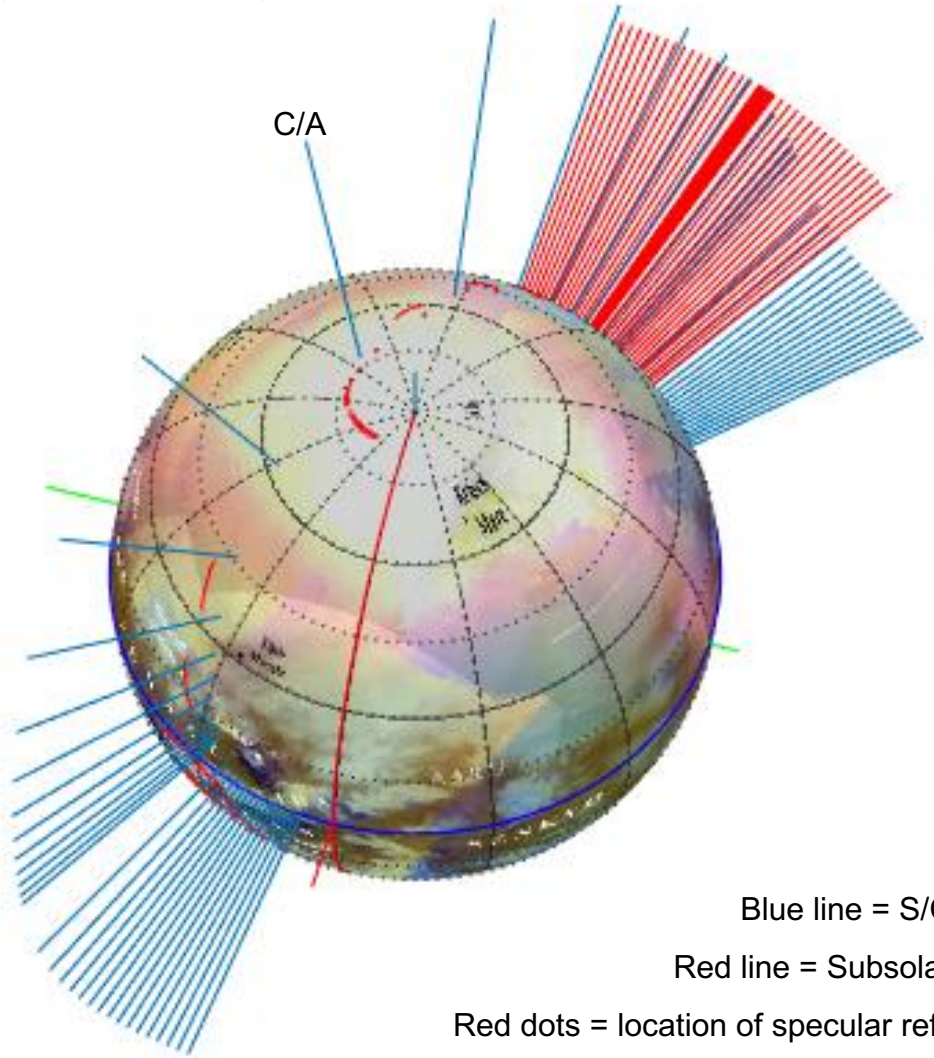
May 22, 2012 – 143T01:10:11 @ 953 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Prior to C/A, specular reflection geometry occurs near 80N, 54 W near Neagh Lacus.

Detection of clouds to monitor climatic changes after the equinox.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

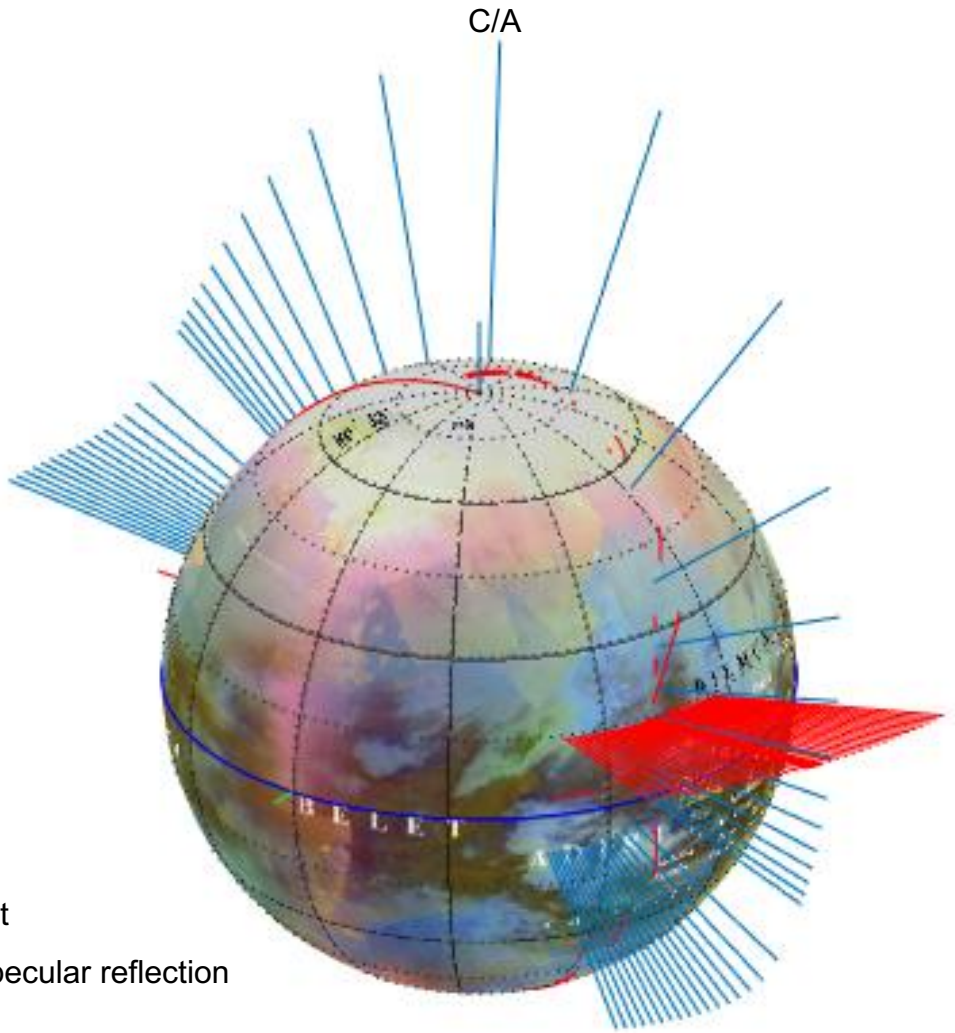
T083 – rev 166 – S73

May 22, 2012 – 143T01:10:11 @ 953 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

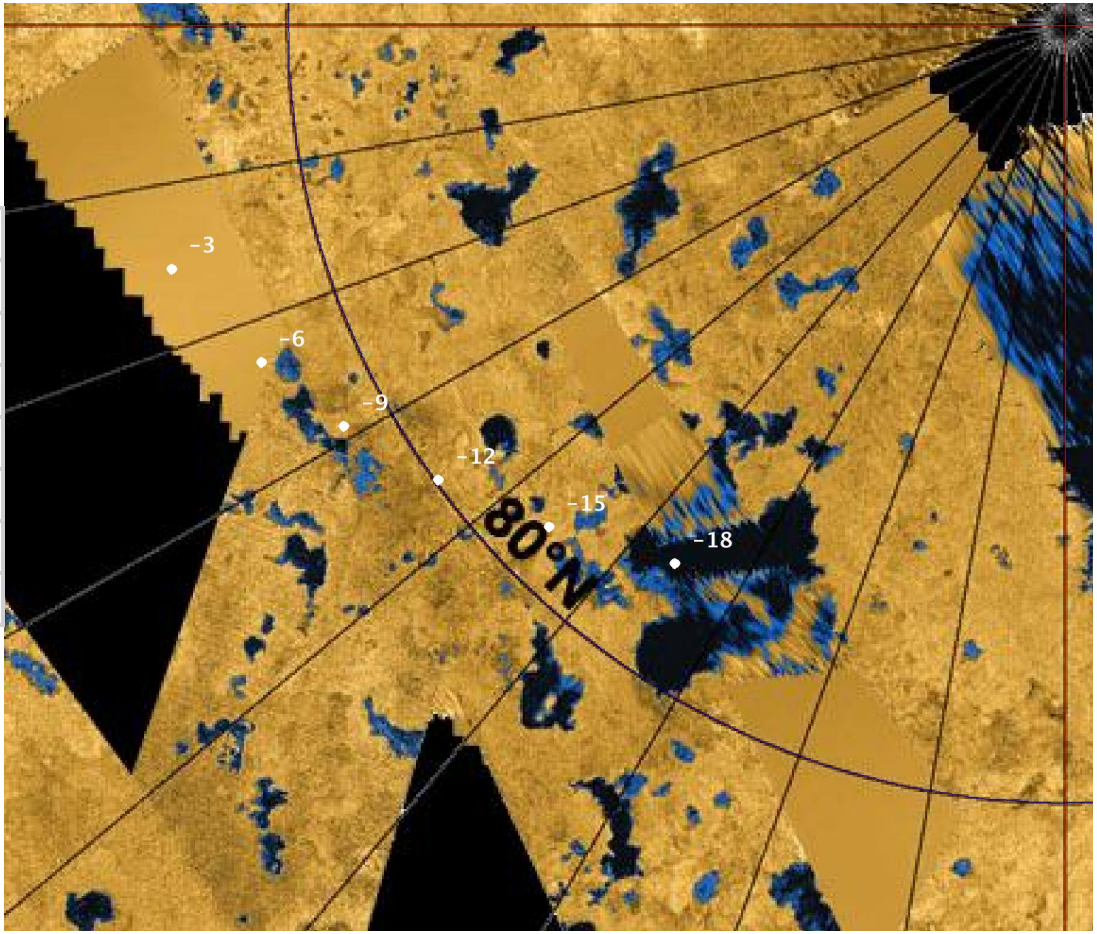
T083 – rev 166 – S73

May 22, 2012 – 143T01:10:11 @ 953 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
81.45	36.0	82.8	82.8	-64800	-18.0
80.74	45.9	82.7	82.7	-54000	-15.0
80.04	54.1	82.7	82.7	-43200	-12.0
79.39	61.0	82.6	82.6	-32400	-9.0
78.80	67.3	82.5	82.5	-21600	-6.0
78.10	74.8	82.2	82.2	-10800	-3.0



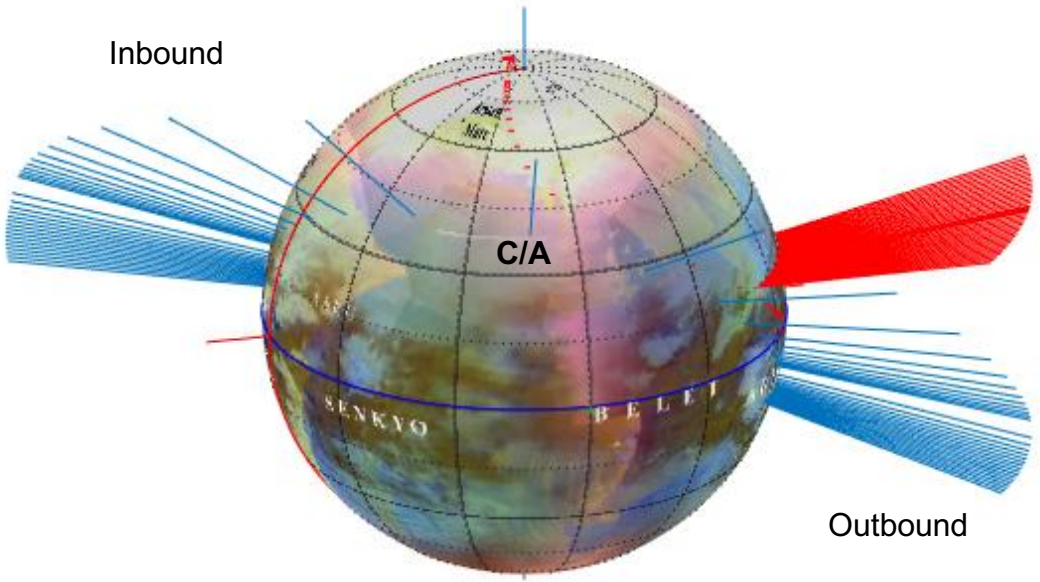
T084 – rev 167 – S73

June 6, 2012 – 159T00:07:21 @ 959 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T084: Radar is prime at closest approach (959 km). Detection of clouds to monitor climatic changes after the equinox. Look for specular reflection on the Northern lakes.

C/A-15:43:21	-13:00	CIRS	M4 (Tc1b)
-13:00	-09:00	VIMS	O (TN1a)
-09:00	-05:00	CIRS	R (Tn1c)
-05:00	-02:15	CIRS	T (TN2c)
-02:15	**-01:12**	**RADAR scatterometry/radiometry**	TN1a
-01:12	**-00:31**	RADAR HiSAR	TC1a, TN1a, TN2b
-00:31	**-00:30**	RWA to RCS Transition	
-00:30	**-00:18**	**RADAR Altimetry**	**TN2b**
-00:18	0	**RADAR SAR**	**INMS ride along (TC1a, TN1a, TN2b, MC2a)**
2012-159T00:07:21		**CLOSEST APPROACH**	**NEG_Z to Titan, NEG_X to RAM**
0	**+00:18**	**RADAR SAR**	**INMS ride along (TC1a, TN1a, TN2b, MC2a)**
+00:18	**+00:30**	**RADAR Altimetry**	**TN2b**
+00:30	**+00:50**	**RADAR HiSAR**	TC1a, TN1a, TN2b
+00:50	**+01:12**	RCS to RWA Transition	
+01:12	**+02:15**	**RADAR scatterometry/radiometry**	TN1a
+02:15	+09:00	**UVIS**	**X (TN1c)**
+09:00	+14:00	CIRS	C (TN1c)
+14:00	C/A+21:11:39	CIRS	A2 (TC1a, TC1b, TN2c, TN2d)



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T084 – rev 167 – S73

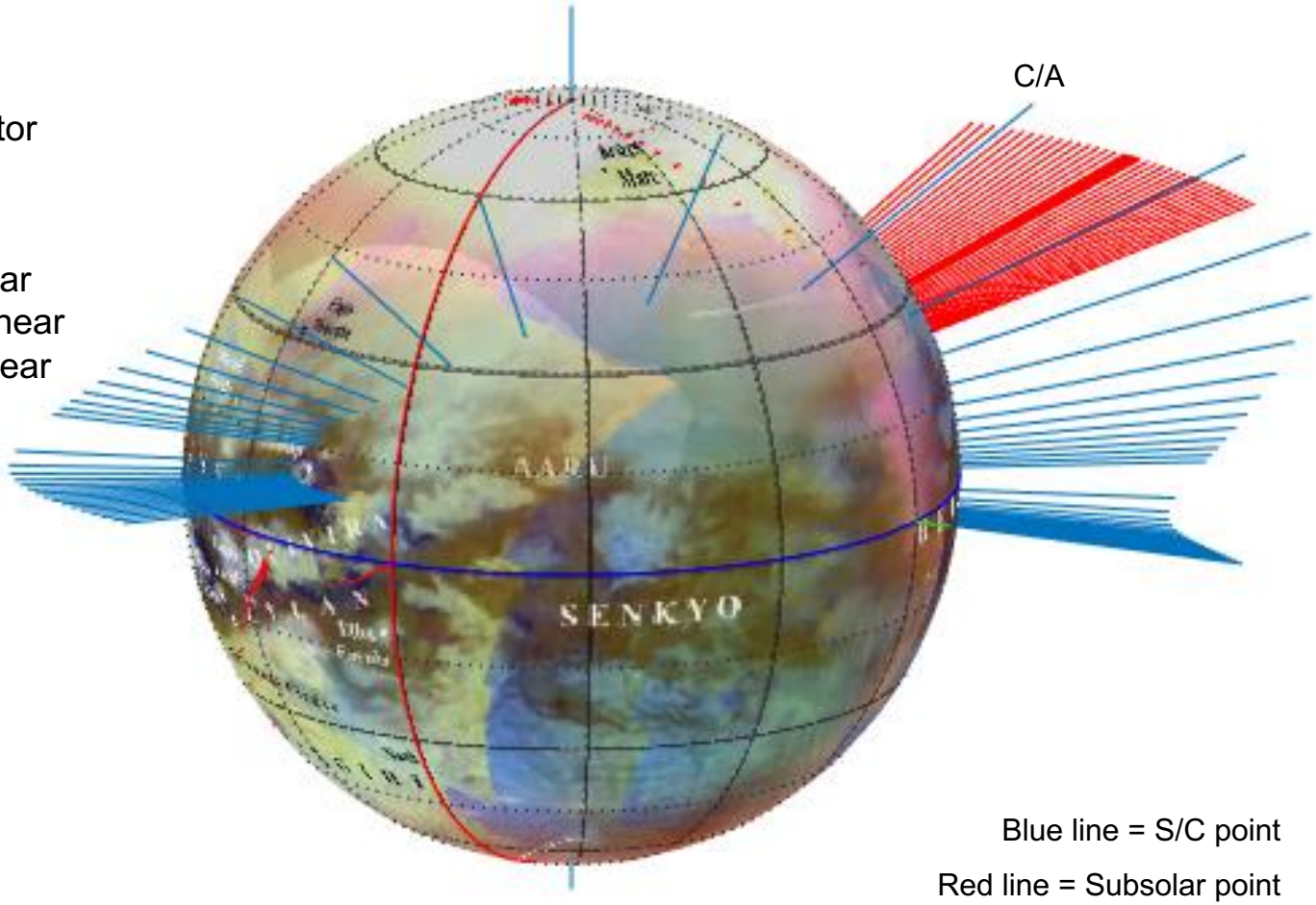
June 6, 2012 – 159T00:07:21 @ 959 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Detection of clouds to monitor climatic changes after the equinox.

Prior to C/A, look for specular reflection geometry occurs near 83N, 35 W at C/A – 12:00 near Neagh Lacus.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T084 – rev 167 – S73

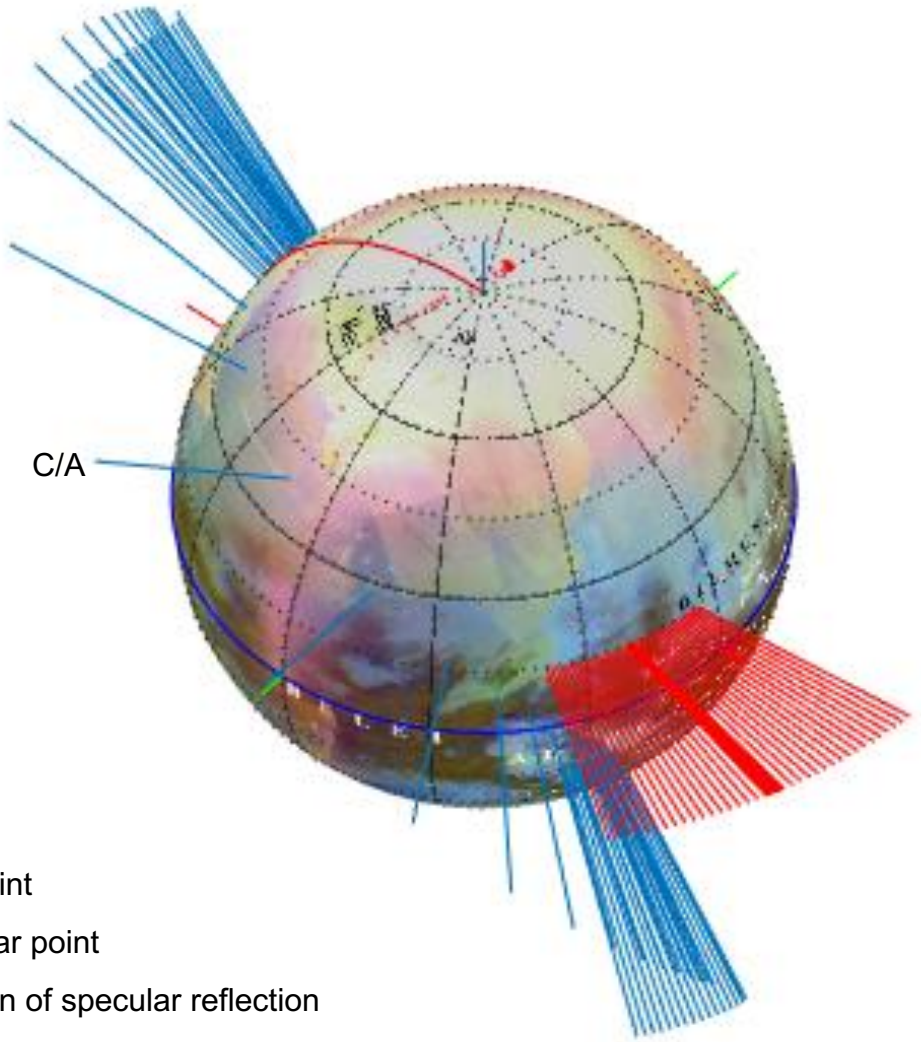
June 6, 2012 – 159T00:07:21 @ 959 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

After C/A, look for specular reflection near 81N, 78 W at C/A + 10:00 over the small lake region.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

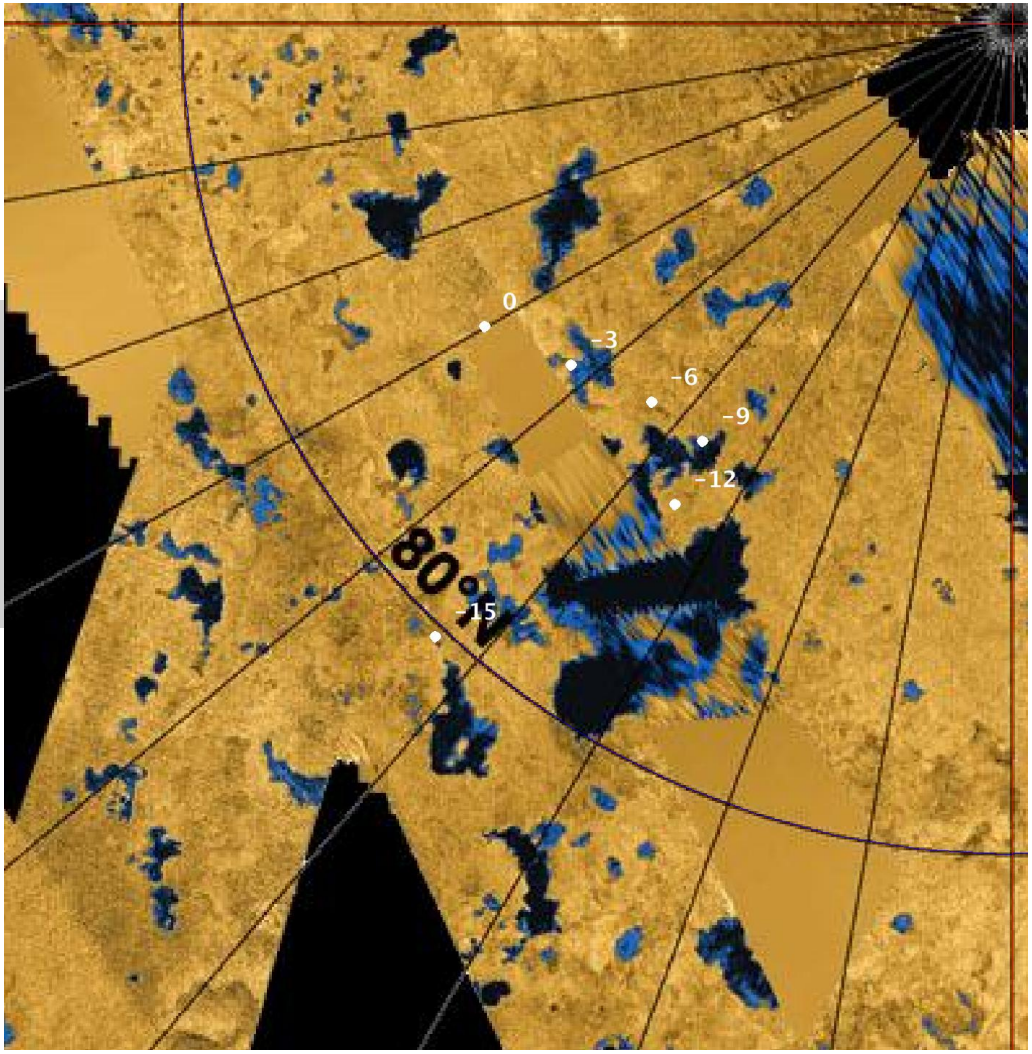
T084 – rev 167 – S73

June 6, 2012 – 159T00:07:21 @ 959 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
79.87	43.3	80.6	80.6	-54000	-15.0
82.92	35.1	80.0	80.0	-43200	-12.0
83.73	36.6	79.6	79.6	-32400	-9.0
83.70	43.7	79.3	79.3	-21600	-6.0
83.27	52.3	79.0	79.0	-10800	-3.0
82.66	60.2	78.8	78.8	0	0



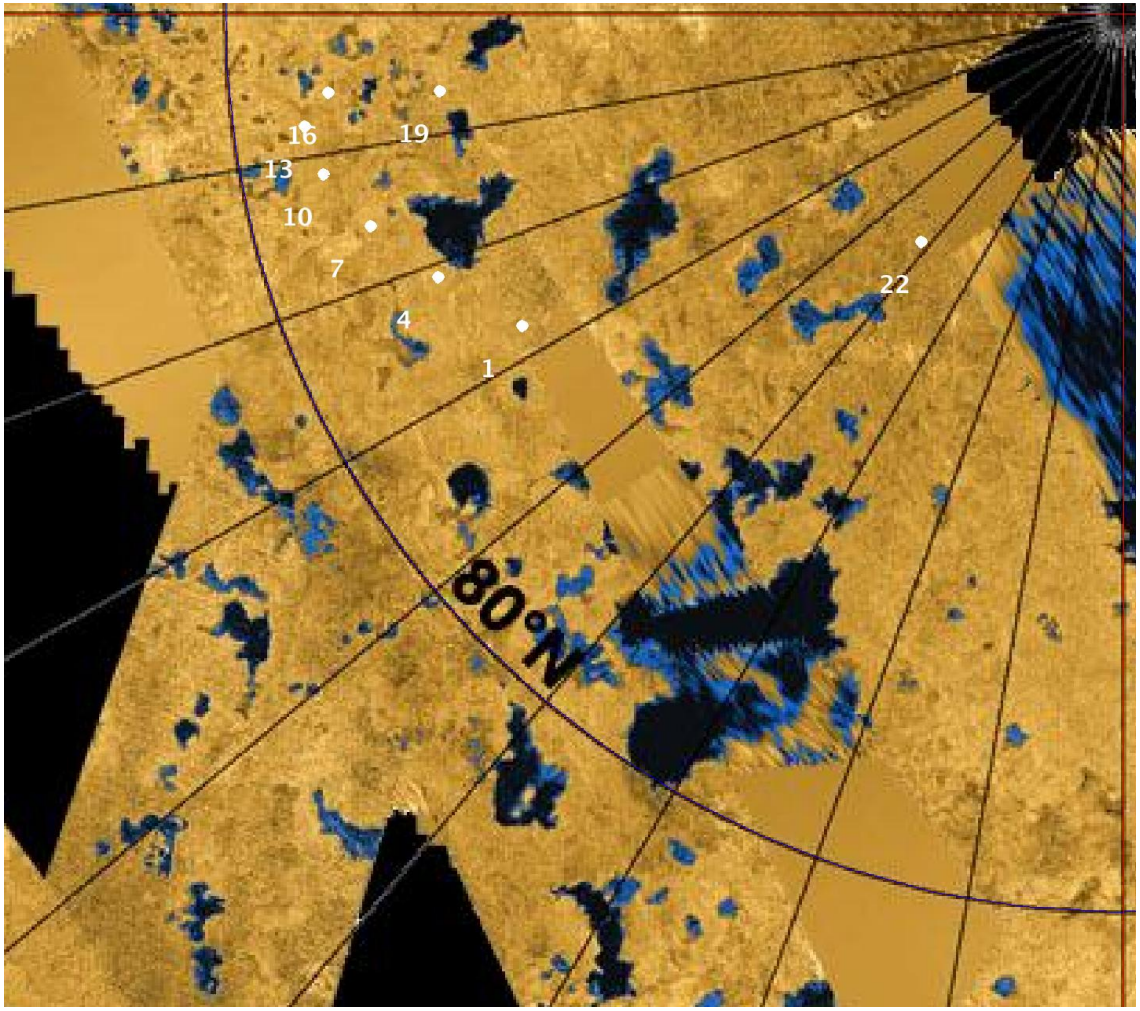
T084 – rev 167 – S73

June 6, 2012 – 159T00:07:21 @ 959 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
82.45	62.6	78.7	78.7	3600	1.0
81.82	69.0	78.6	78.6	14400	4.0
81.28	74.3	78.4	78.5	25200	7.0
80.91	78.7	78.4	78.4	36000	10.0
80.79	82.2	78.3	78.3	46800	13.0
81.10	84.4	78.3	78.3	57600	16.0
82.32	83.6	78.3	78.3	68400	19.0
86.60	41.7	78.4	78.4	79200	22.0



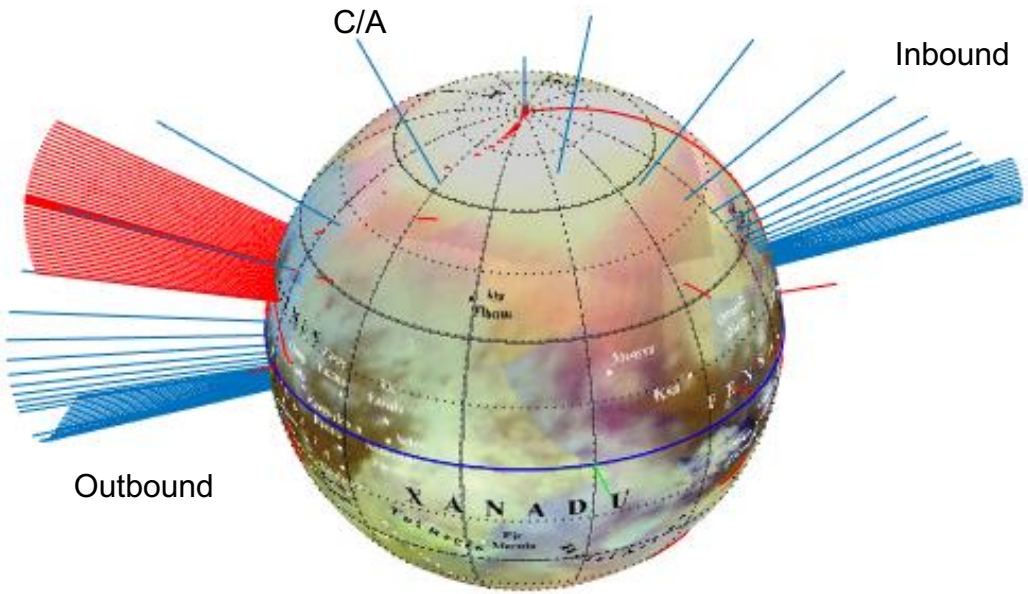
T085 – rev 169 – S74

July 24, 2012 – 206T20:03:07 @ 1013 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T085: CIRS and VIMS are prime at closest approach (1012 km). Detection of clouds to monitor climatic changes after the equinox. Look for specular reflection on the Northern lakes. VIMS is prime at C/A and will acquire 1km/pix images of the Huygens landing site to look for geological changes and spin rate determination by comparing with previous T47 observation.

C/A-22:30:08	-13:00	CIRS	M4 (Tc1b)
-13:00	-09:00	CIRS	N1(Tc1b, TN1c aerosol)
-09:00	-05:00	VIMS	Q (TN1a)
-05:00	-02:30	VIMS	Y (TN1c)
begin custom period			
-02:30	**-00:45**	CIRS	(TN1c)
-00:45	**-00:44**	RWA to RCS Transition	1 min engineering, CIRS then can turn
-00:44	**-00:10**	CIRS	CIRS turns to VIMS attitude
-00:10	**0**	VIMS	**(TC1a, TN1a)**
2012-206T20:03:08		**CLOSEST APPROACH**	(Tc2a)
0	**+00:45**	VIMS	**(TC1a, TN1a)**
+00:45	**+01:07**	RCS to RWA Transition	
+01:07	**+02:15**	VIMS	(TC1a, TN1a)
end custom period			
+02:15	+05:00	**CIRS**	E (TN2c)
+05:00	+09:00	CIRS	F (TC1b OR TN1c)
+09:00	+14:00	VIMS	V(TC1a, TC1b)
+14:00	C/A+21:39:52	VIMS	B (TC1a)



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T085 – rev 169 – S74

July 24, 2012 – 206T20:03:07 @ 1013 km altitude

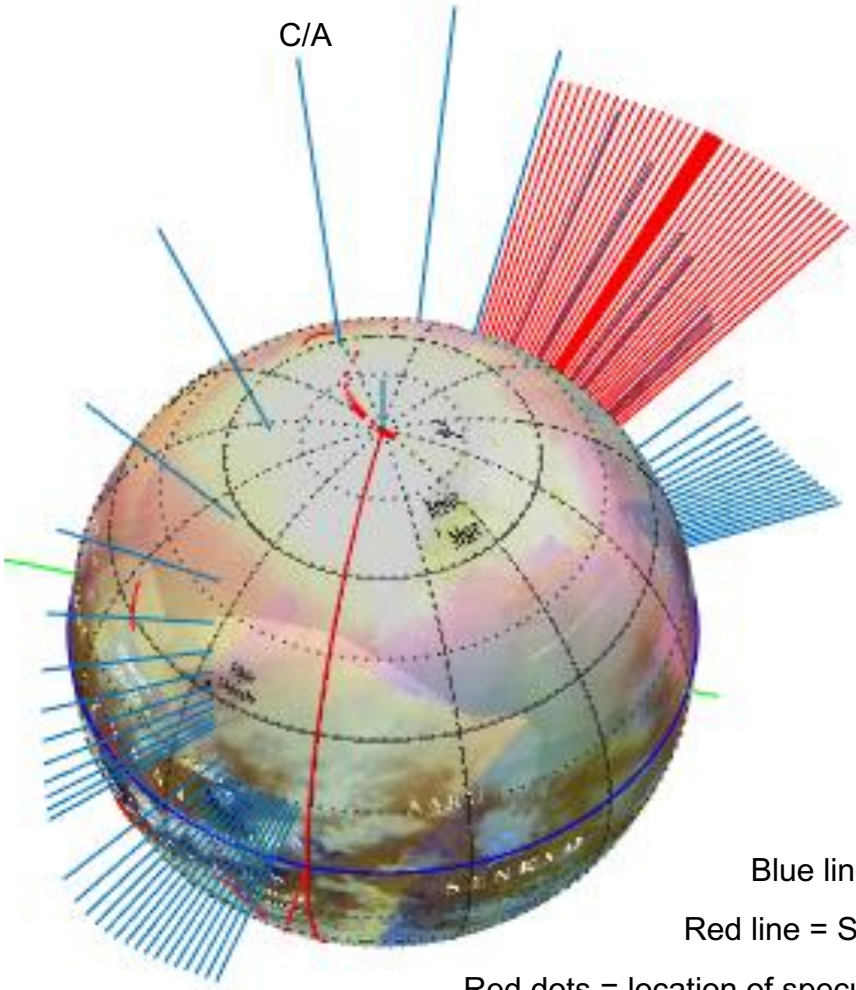
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Monitor clouds and climatic changes after the equinox.

Look for specular reflection on the Northern lakes.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T085 – rev 169 – S74

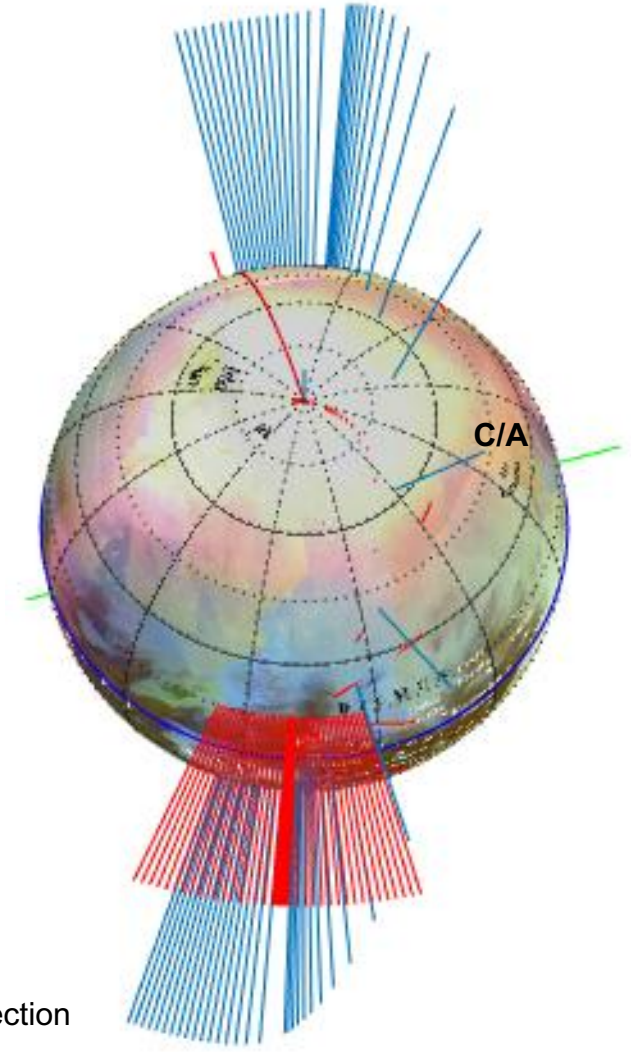
July 24, 2012 – 206T20:03:07 @ 1013 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

After closest approach, VIMS will acquire 1 km/px images of the Huygens landing site (10.3 S, 192.5 W)

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

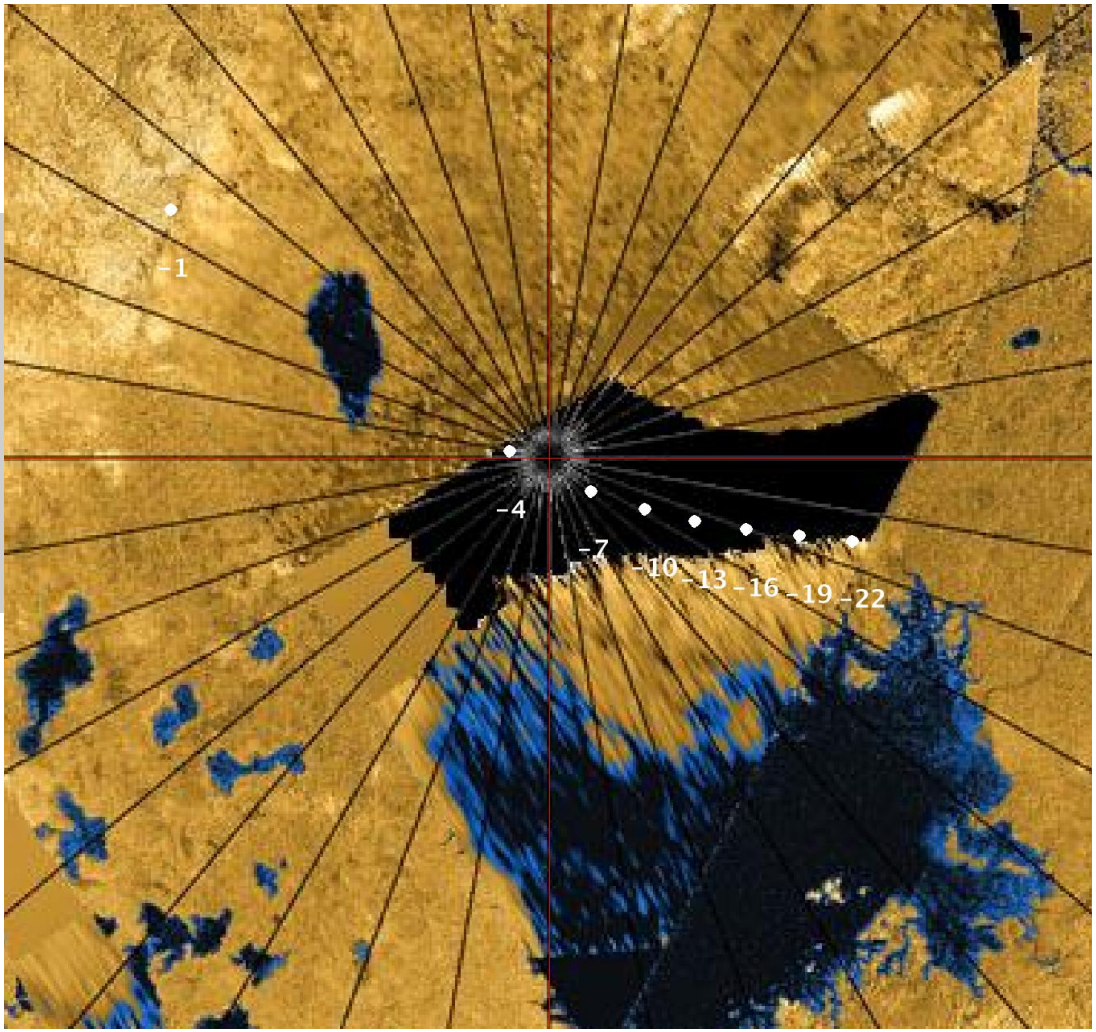
T085 – rev 169 – S74

July 24, 2012 – 206T20:03:07 @ 1013 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

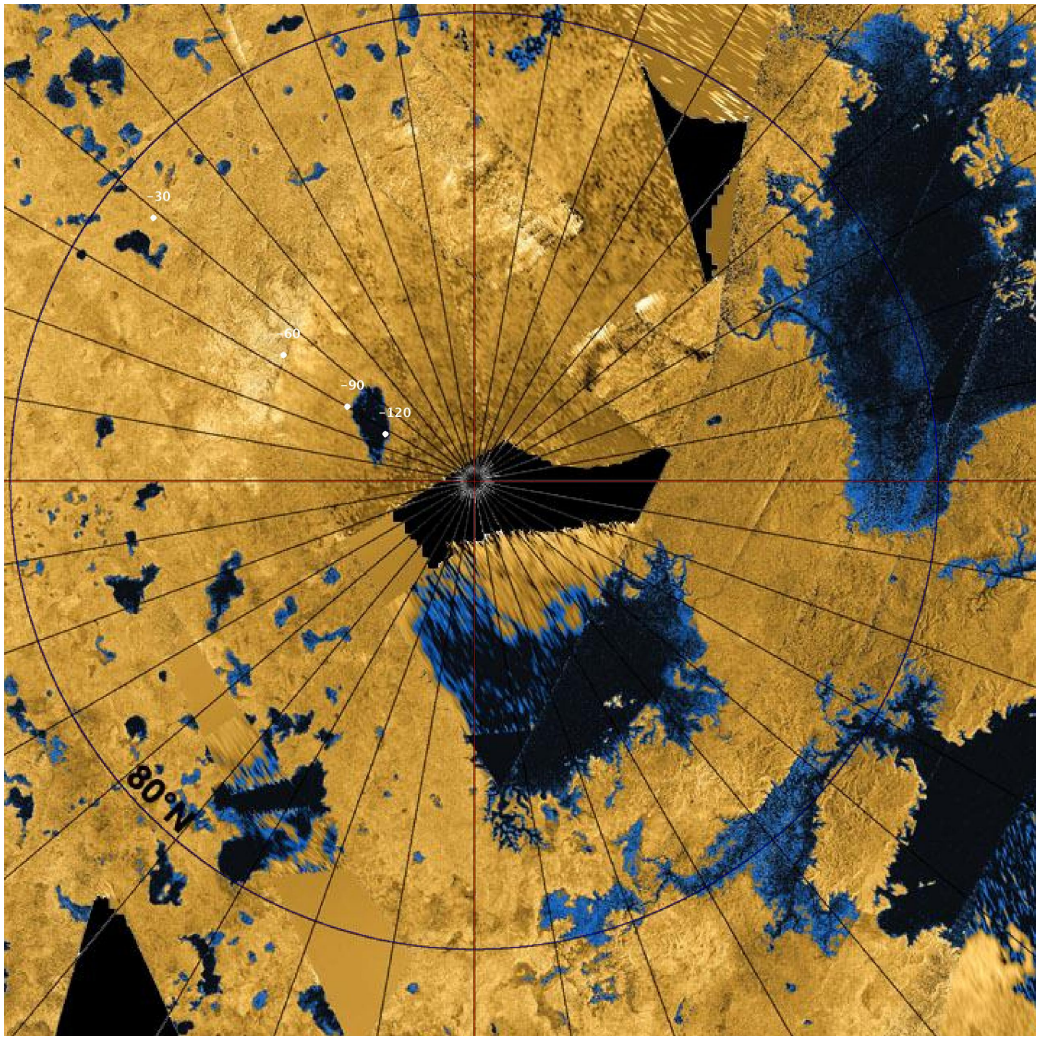
Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
86.59	285.3	75.7	75.7	-79200	-22
87.16	287.3	75.5	75.5	-68400	-19
87.73	290.0	75.3	75.3	-57600	-16
88.28	293.5	75.2	75.2	-46800	-13
88.83	298.4	75.1	75.1	-36000	-10
89.43	308.8	74.9	74.9	-25200	-7
89.55	99.7	74.7	74.7	-14400	-4
85.07	123.2	73.4	73.4	-3600	-1



T085 – rev 169 – S74

July 24, 2012 – 206T20:03:07 @ 1013 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team



Specular Geometry*:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
87.83	117.6	74.3	74.3	-7200	-2.0
86.83	120.1	74.0	74.0	-5400	-1.5
85.07	123.2	73.4	73.4	-3600	-1.0
81.08	129.1	71.7	71.7	-1800	-0.5

*Barnes, J. W. et al. “Cassini/VIMS observes rough surfaces on Titan’s Punga Mare in specular reflection,” Planetary Science, 3 (2014).

Note: Time on plot expressed as minutes.

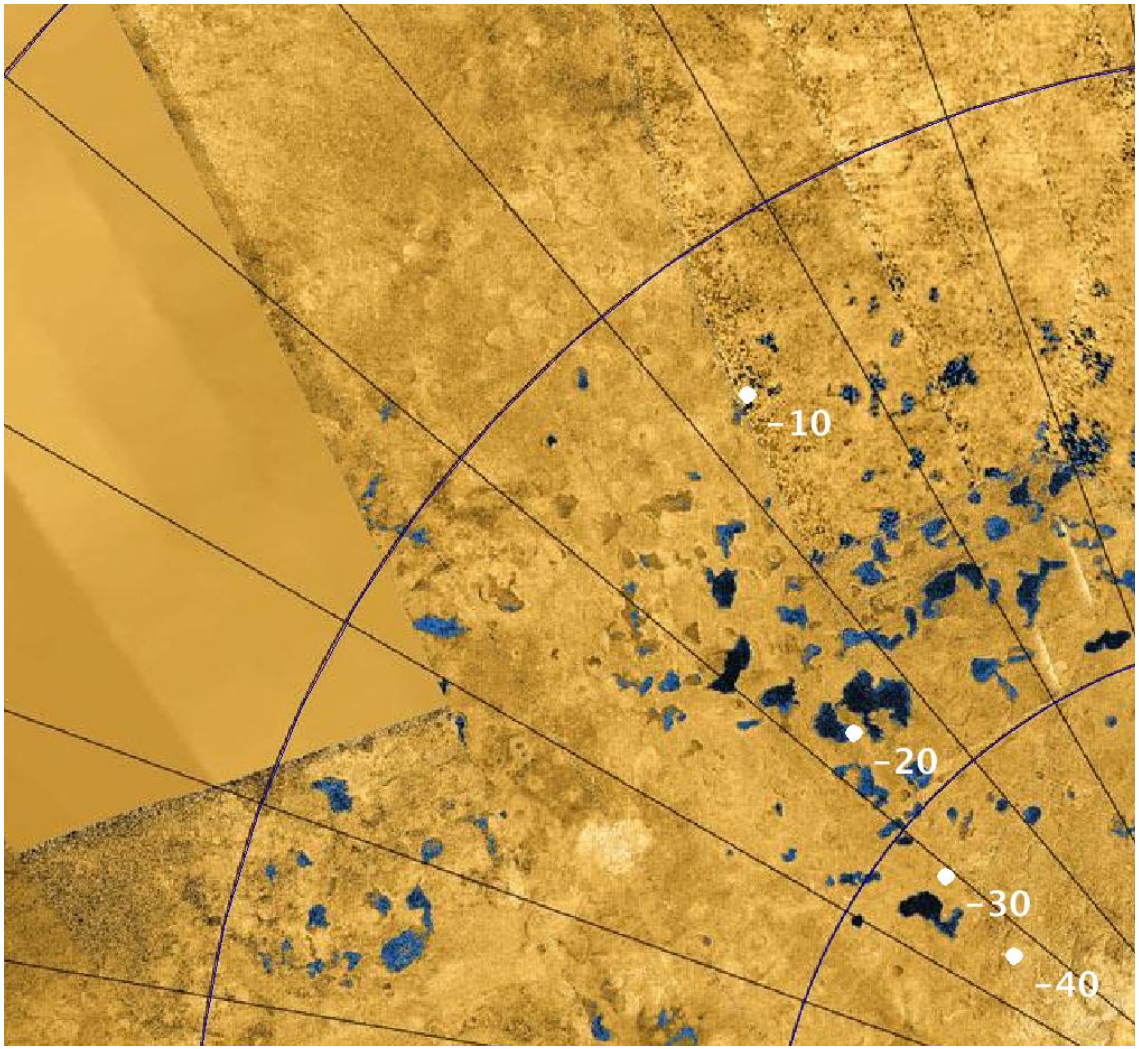
T085 – rev 169 – S74

July 24, 2012 – 206T20:03:07 @ 1013 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Reflection:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (min)
82.9	126.4	72.6	72.6	-2400	-40
81.1	129.1	71.7	71.7	-1800	-30
78.2	133.6	70.0	70.1	-1200	-20
72.6	143.5	65.4	65.4	-600	-10



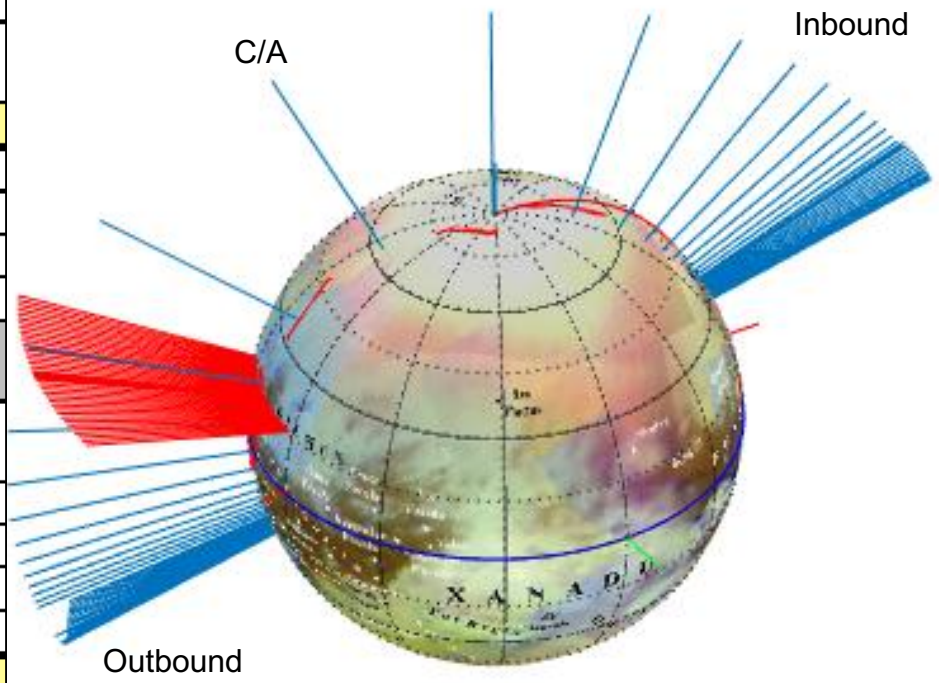
T086 – rev 172 – S75

Sept. 26, 2012 – 270T14:35:38 @ 956 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T086: CIRS and INMS are prime during closest approach (956 km). Detection of clouds to monitor climatic changes after the equinox. Look for specular reflection on the Northern lakes.

C/A-13:24:39	-13:00	CIRS	N1 extended, TN1c
-13:00	-09:00	CIRS	N1, TN1c
-09:00	-02:15	UVIS	X, TN1c
begin custom period			
-02:15	-00:50	CIRS	TN1c
-00:50	-00:49	RWA to RCS Transition	
-00:49	-00:18	CIRS	CIRS turn to INMS attitude, TN1c
-00:18	0	INMS	RADAR riding along, TC2a
2012-270T14:35:39		CLOSEST APPROACH	NEG_X to RAM, NEG_Z to Titan (Tc2a)
0	+00:18	INMS	RADAR riding along, RADAR turn to CIRS attitude, TC2a
+00:18	+00:35	RADAR altimetry	TN2a
+00:35	+01:15	CIRS	on CIRS point at +00:35, TN1c
+01:15	+01:37	RCS to RWA Transition	
+01:37	+02:15	CIRS	TN1c
end custom period			
+02:15	+09:00	UVIS	X, TN1c
+09:00	+14:00	CIRS	C, TN1c
+14:00	C/A+28:45:21	CIRS	A2, TN1c



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T086 – rev 172 – S75

Sept. 26, 2012 – 270T14:35:38 @ 956 km altitude

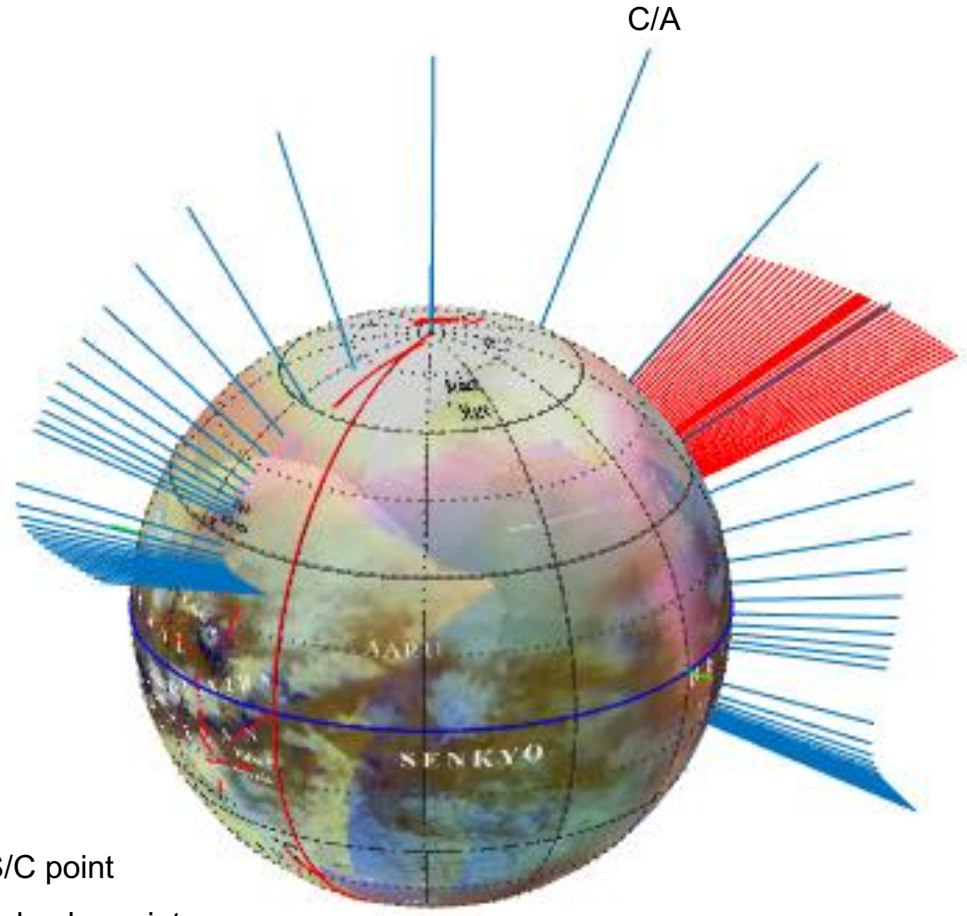
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Look for specular reflection in the small lake region (83N, 125W at C/A – 13:00) prior to C/A.

Detection of clouds to monitor climatic changes after the equinox.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T086 – rev 172 – S75

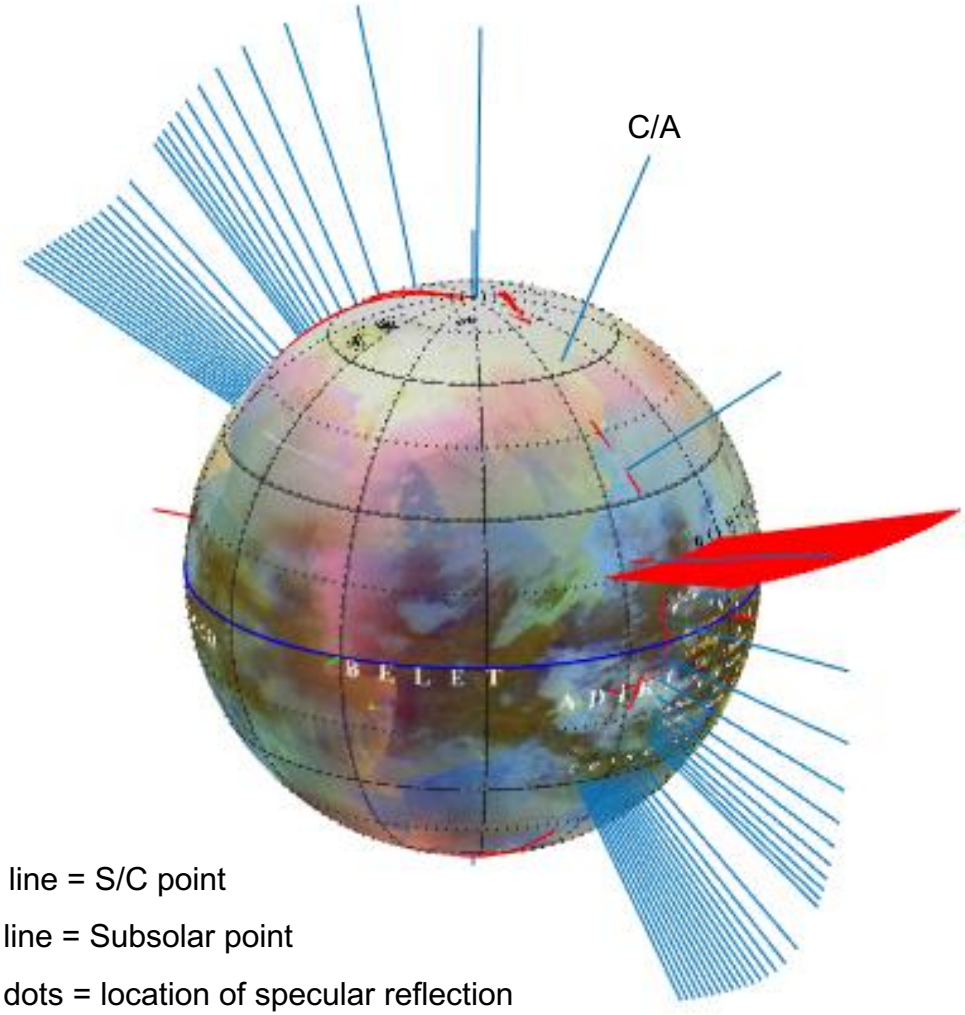
Sept. 26, 2012 – 270T14:35:38 @ 956 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Regional mapping near Adiri (30S, 210 W) at resolutions of 10 km/px.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

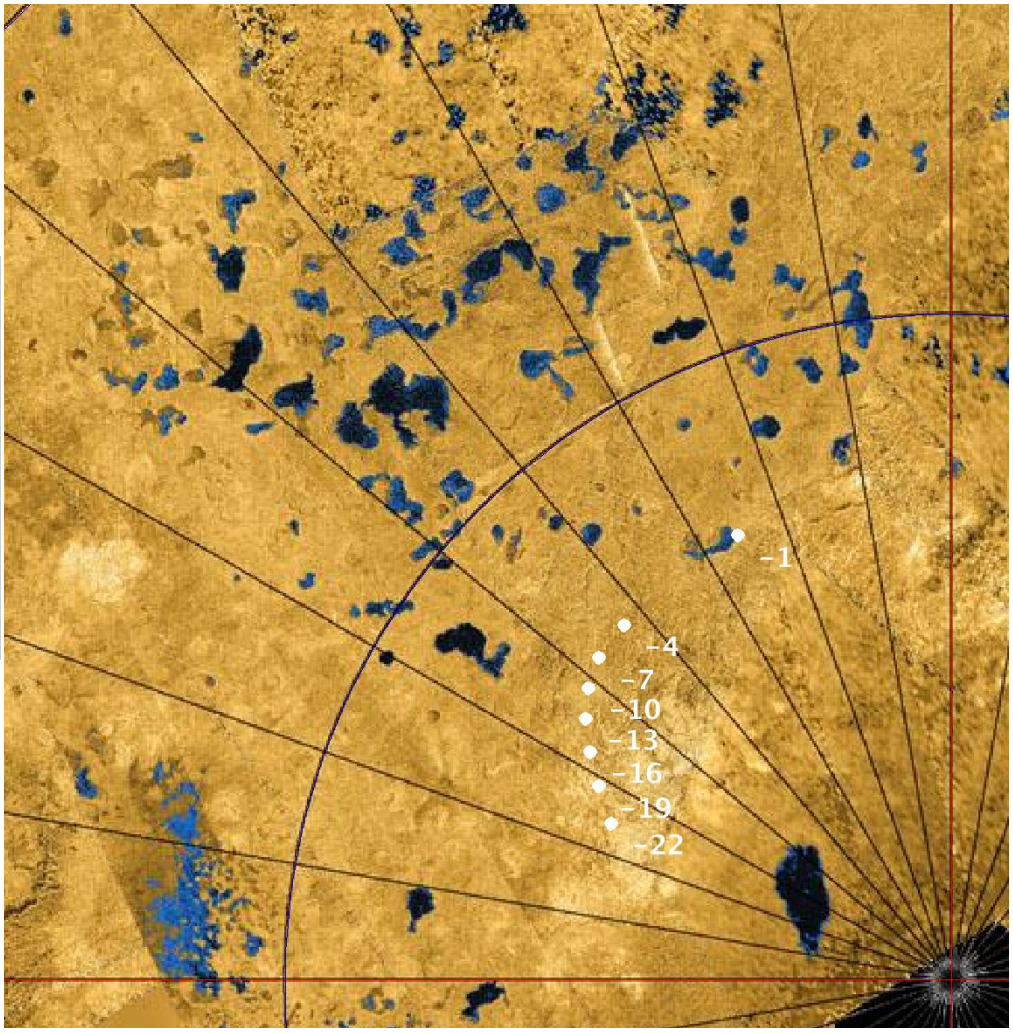
T086 – rev 172 – S75

Sept. 26, 2012 – 270T14:35:38 @ 956 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
84.37	114.7	71.3	71.3	-79200	-22
83.95	118.8	71.0	71.0	-68400	-19
83.57	122.3	70.8	70.8	-57600	-16
83.25	125.6	70.5	70.6	-46800	-13
82.99	128.8	70.4	70.4	-36000	-10
82.82	132.4	70.2	70.2	-25200	-7
82.74	137.3	69.9	69.9	-14400	-4
82.59	154.3	68.4	68.4	-3600	-1



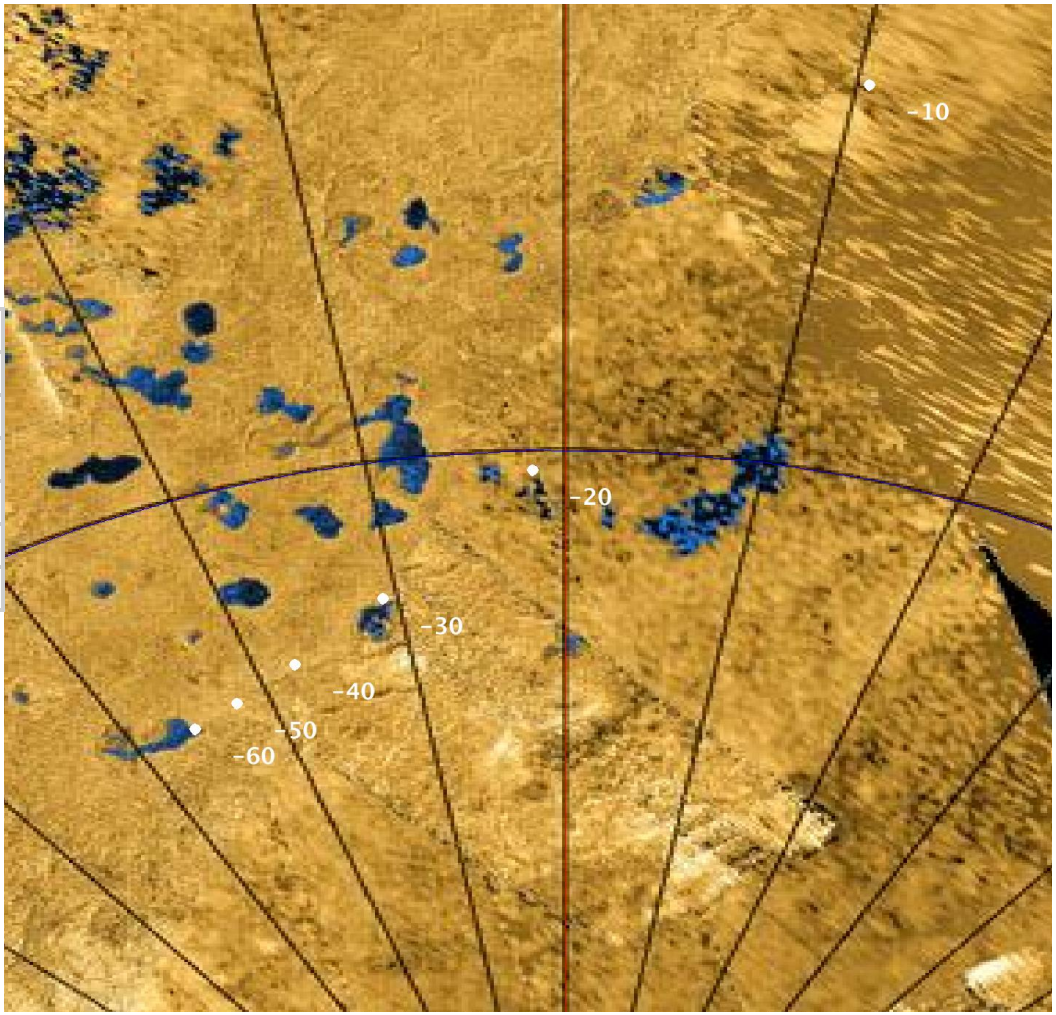
T086 – rev 172 – S75

Sept. 26, 2012 – 270T14:35:38 @ 956 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (min)
82.59	154.3	68.4	68.4	-3600	-60
82.45	157.8	68.1	68.1	-3000	-50
82.19	162.5	67.5	67.5	-2400	-40
81.61	169.1	66.5	66.5	-1800	-30
80.23	178.3	64.7	64.6	-1200	-20
75.45	190.4	59.5	59.6	-600	-10



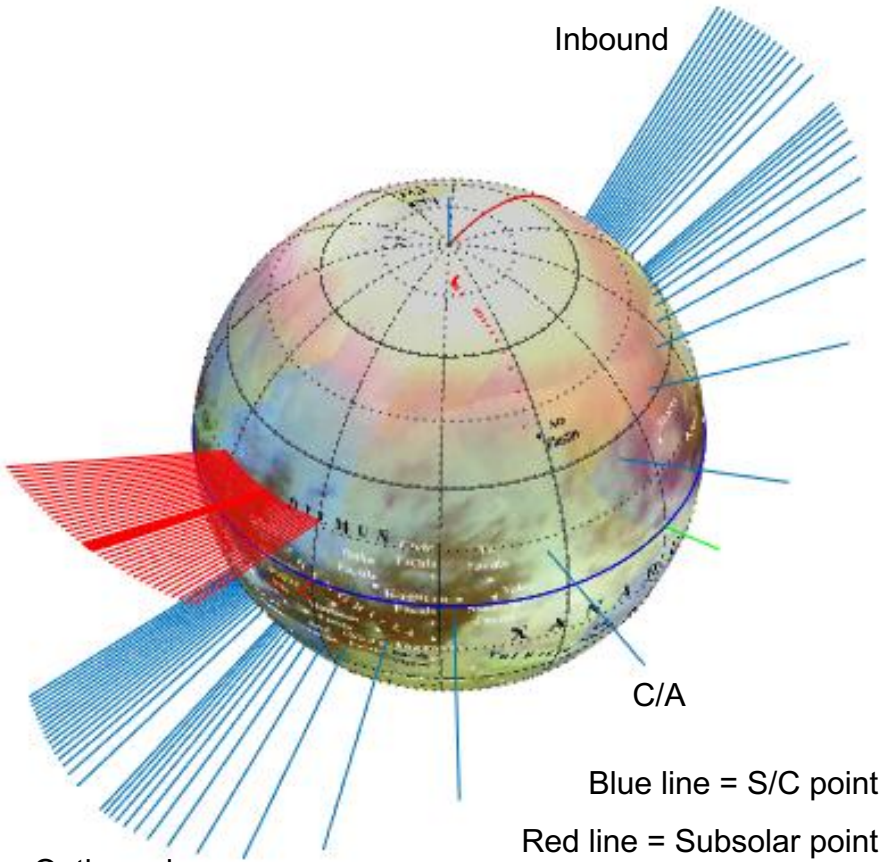
T087 – rev 174 – S76

Nov. 13, 2012 – 318T10:22:08 @ 973 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T087: INMS is prime at closest approach (973 km). Detection of clouds to monitor climatic changes after the equinox. Look for specular reflection on the Northern lakes

C/A-19:26:09	-13:00	CIRS	M4 (TC1b)
-13:00	-09:00	VIMS	O (TN1a Specular reflection of lakes--depending on geometry)
-09:00	-07:05	VIMS	Q (TN1a Specular reflection of lakes--depending on geometry)
-07:05	**-05:00**	VIMS	KA band warm up for NAV Q (TN1a Specular reflection of lakes--depending on geometry)
-05:00	**-04:20**	SP Turn to Earth for downlink	
-04:20	**+01:55:51**	**Madrid 34M, NAV/INMS**	**HGA to Earth, NEG_X to RAM** Tc2a
2012-318T10:22:09		**CLOSEST APPROACH**	**XBAND to EARTH, NEG_X to RAM (Tc2a)**
+01:55:51	**+04:30**	**Goldstone 34M, NAV/INMS**	(Tc2a)
+04:30	**+05:00**	**SP Turn to WP**	Tc2a
+05:00	+09:00	VIMS	I (TC1a and TN2c)
+09:00	+14:00	CIRS	C (TN1c)
+14:00	C/A+19:13:51	CIRS	A2 (TC1b)



T087 – rev 174 – S76

Nov. 13, 2012 – 318T10:22:08 @ 973 km altitude

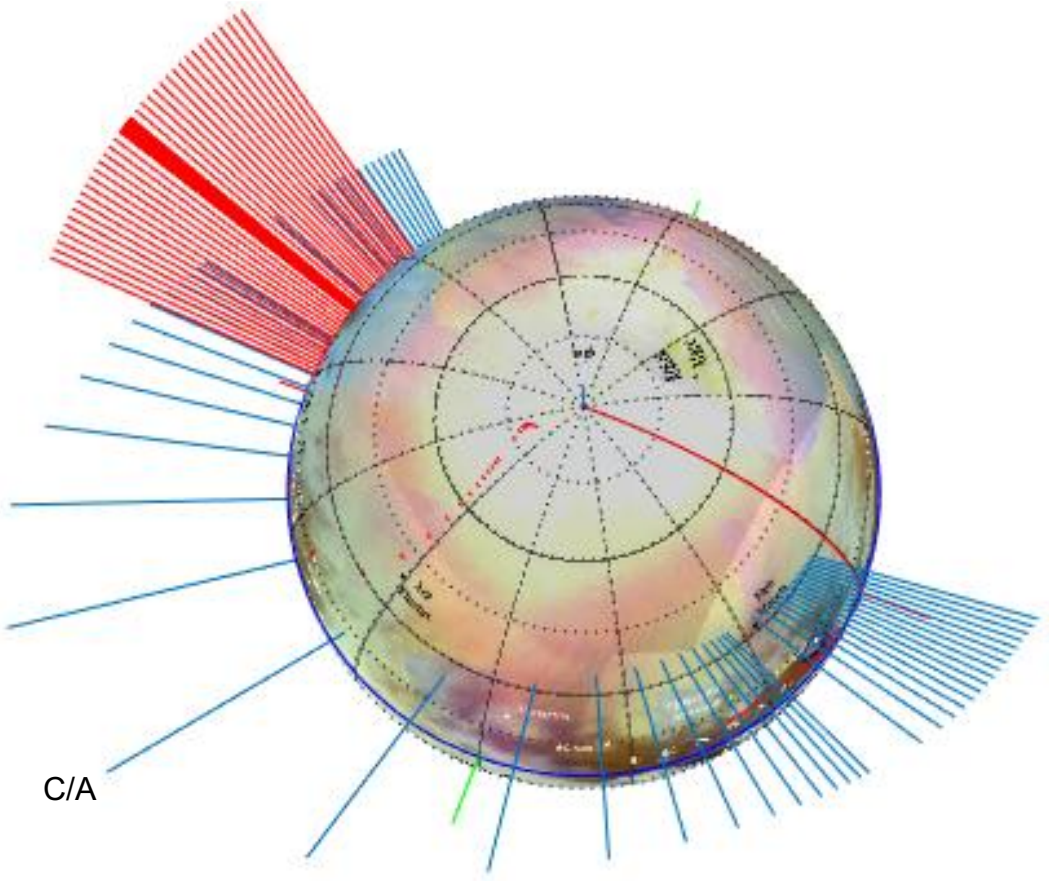
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Specular reflection occurs near the small lakes at 79N, 141 W 10 hours before C/A.

Monitor clouds and climatic changes after the equinox.

Observations on the inbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T087 – rev 174 – S76

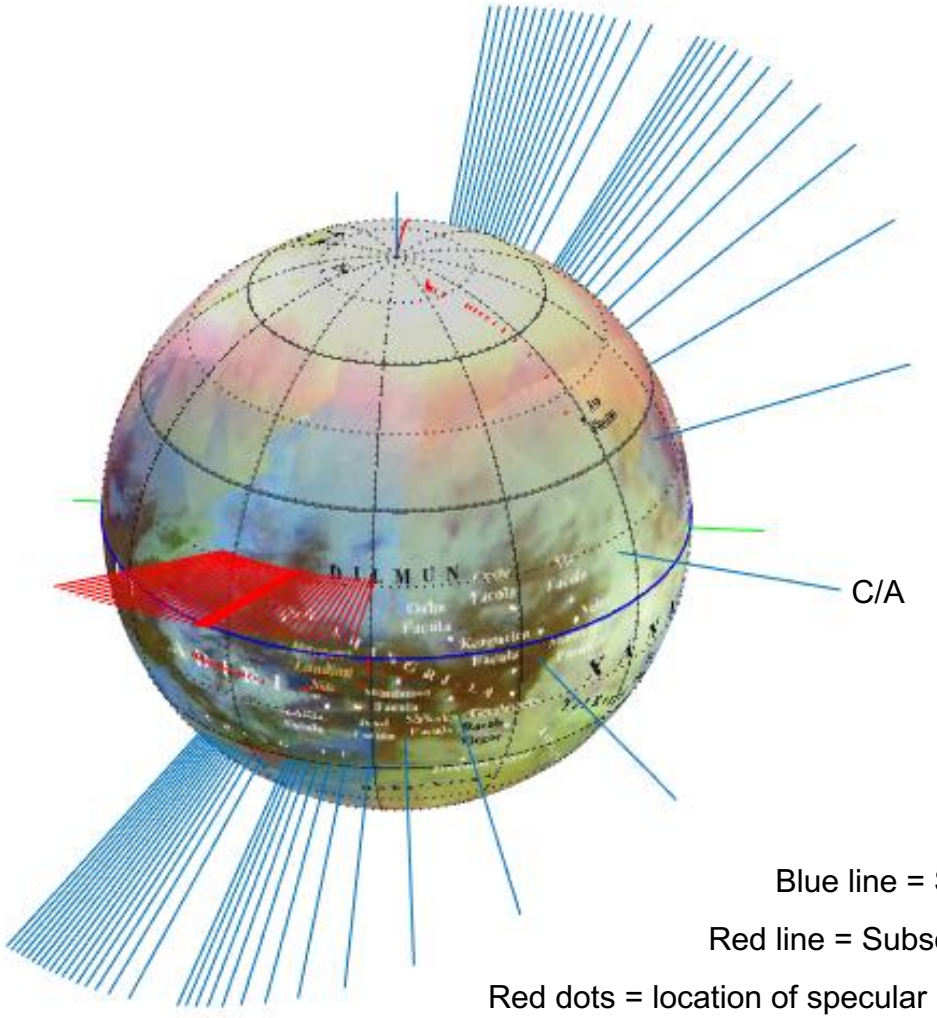
Nov. 13, 2012 – 318T10:22:08 @ 973 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Monitor the south polar vortex.

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

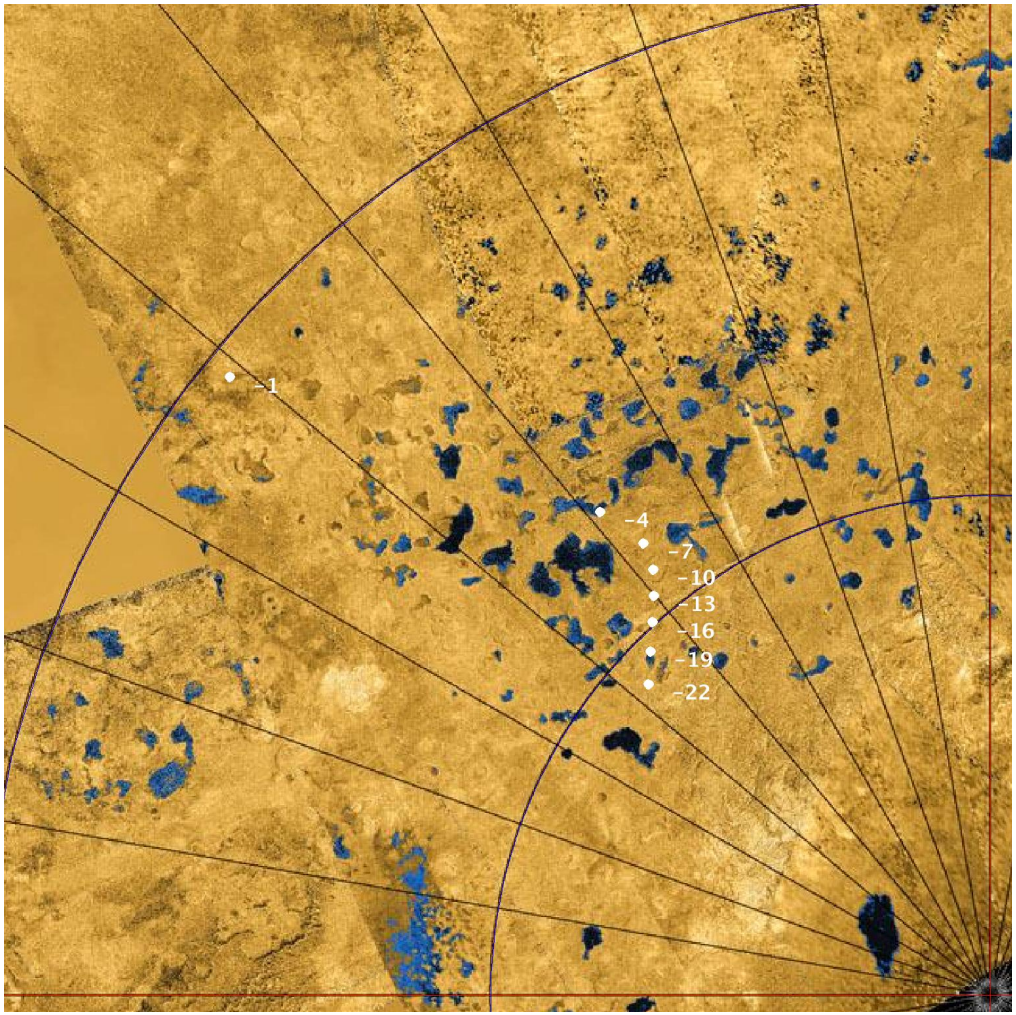
T087 – rev 174 – S76

Nov. 13, 2012 – 318T10:22:08 @ 973 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
80.75	132.3	66.6	66.6	-79200	-22
80.32	135.3	66.3	66.3	-68400	-19
79.92	137.8	66.1	66.1	-57600	-16
79.54	139.9	65.9	65.9	-46800	-13
79.13	141.6	65.7	65.7	-36000	-10
78.61	142.5	65.7	65.7	-25200	-7
77.58	141.1	65.7	65.7	-14400	-4
70.52	129.1	66.1	66.2	-3600	-1



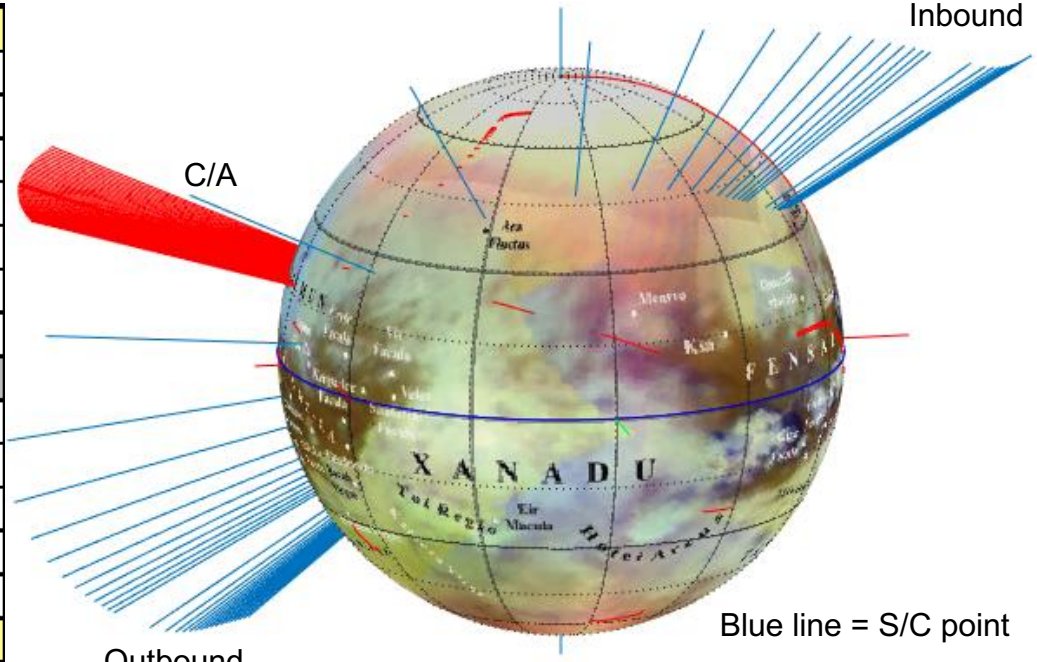
T088 – rev 175 – S76

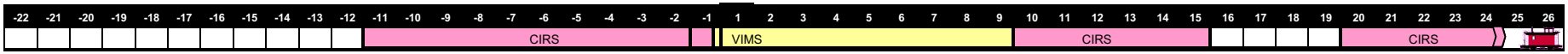
Nov. 29, 2012 – 334T08:57:59 @ 1014 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T088: During this flyby, CIRS and VIMS are prime at closest approach (1014km). On the inbound, VIMS is ridealong with CIRS and will look at specular reflection in the South of the lake area (70 N, 130 W). 10 minutes before C/A, the high SSC latitude should allow VIMS to image Punga Mare and compare its shorelines with those observed by the radar instrument several years ago. Just at C/A, VIMS will be able to image two faculae (Tortola and Santorini). It will then acquire a mosaic of the area where changes were observed by ISS in Fall 2010. VIMS will also keep monitoring cloud activity that is predicted by Global Circulation Models at mid-northern latitudes

begin custom period			
C/A-11:30:00	-9:00	CIRS	part N1 TC1b, TN1c
-09:00	-05:00	CIRS -FP1	R TN1c
-05:00	-02:15	CIRS	T TN2c
-02:15	-00:45	CIRS	
-00:45	-00:44	RWA to RCS Transition	
-00:44	-00:15	CIRS	CIRS will turn to VIMS attitude
-00:15	0	VIMS	
2012-334T08:57:00		CLOSEST APPROACH	NEG_Y to Titan, (Tc2a)
0	+01:00	VIMS	
+01:00	+01:22	RCS to RWA Transition	
+01:22	+02:15	VIMS	
+02:15	+05:00	VIMS	Y TC1a, TN2c
+05:00	+09:00	VIMS	I TC1a, TN2c
end custom period			
+09:00	+14:00	CIRS	C TN1c
+14:00	C/A + 25:43:00	CIRS	A2 TC1a, TN2d





T088 – rev 175 – S76

Nov. 29, 2012 – 334T08:57:59 @ 1014 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

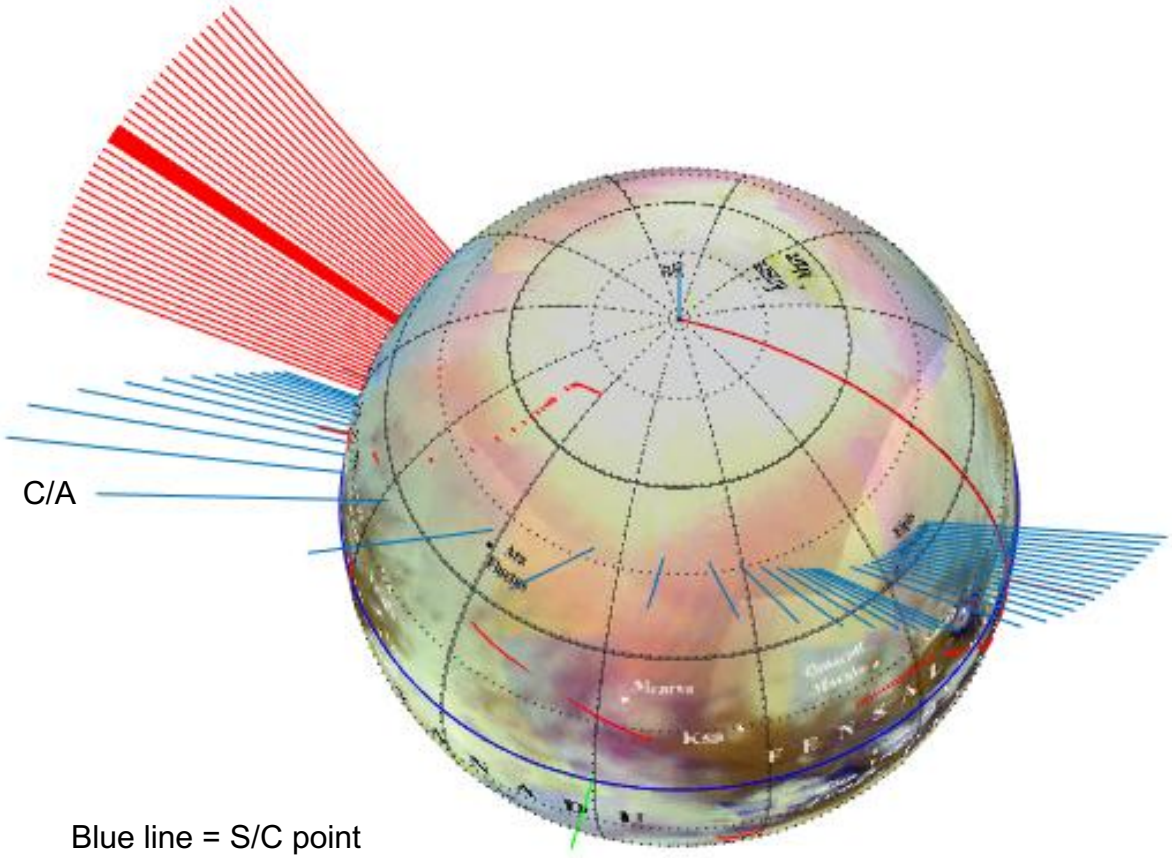
Riding along with CIRS, VIMS will look for specular reflection near 70N, 130 W, south of the small lakes.

Acquire images of Punga Mare (85N, 340W).

At C/A, VIMS will image Tortola (9N, 143W) and Santorini (2N, 145W) faculae.

Continue to monitor cloud activity at mid-northern latitudes.

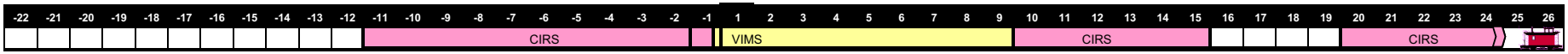
Note: Faculae were missed but this flyby provides unique observations of same point at different phase angles



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T088 – rev 175 – S76

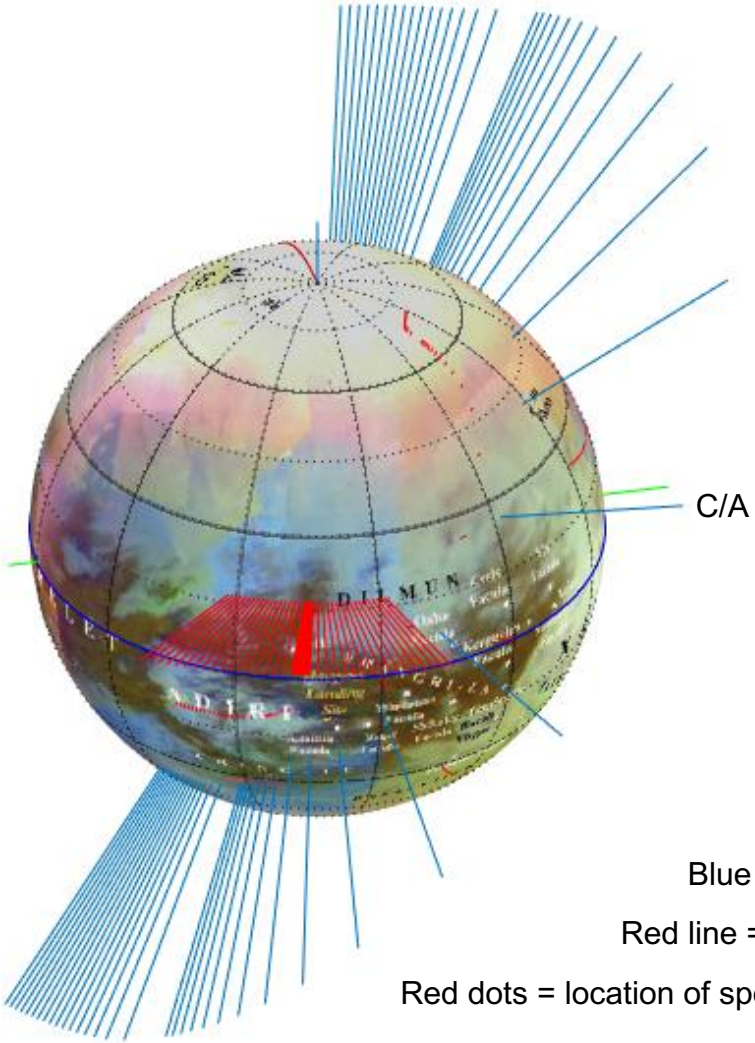
Nov. 29, 2012 – 334T08:57:59 @ 1014 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Monitor the south polar vortex.

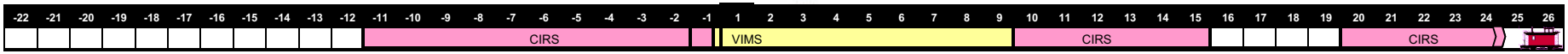
Global mapping of Titan



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



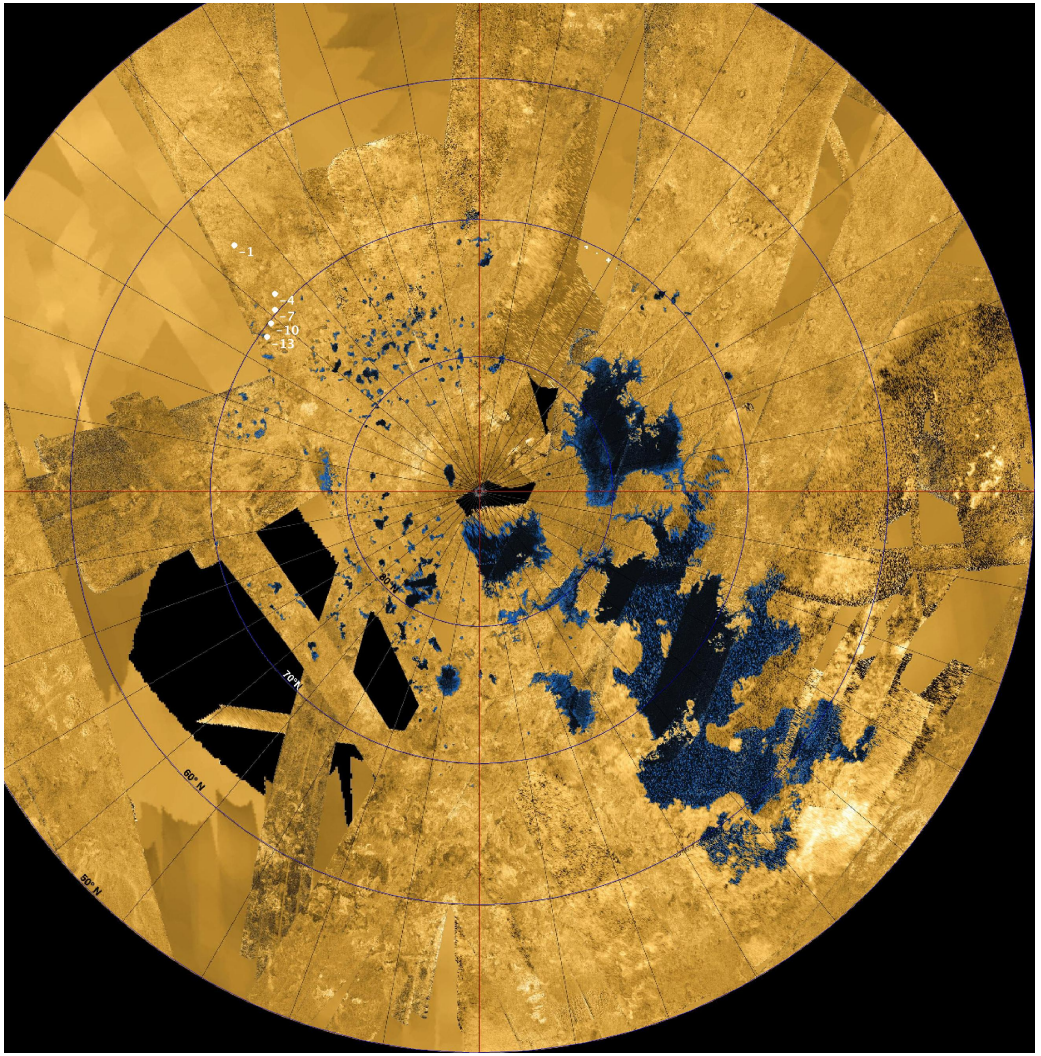
T088 – rev 175 – S76

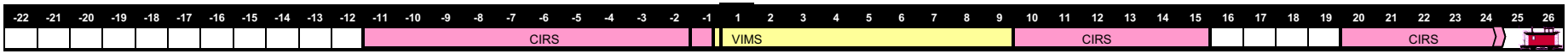
Nov. 29, 2012 – 334T08:57:59 @ 1014 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
70.52	125.7	63.4	63.4	-46800	-13
70.18	128.6	63.2	63.2	-36000	-10
69.76	131.3	63.0	63.0	-25200	-7
68.97	133.7	62.8	62.8	-14400	-4
64.46	134.8	61.7	61.7	-3600	-1





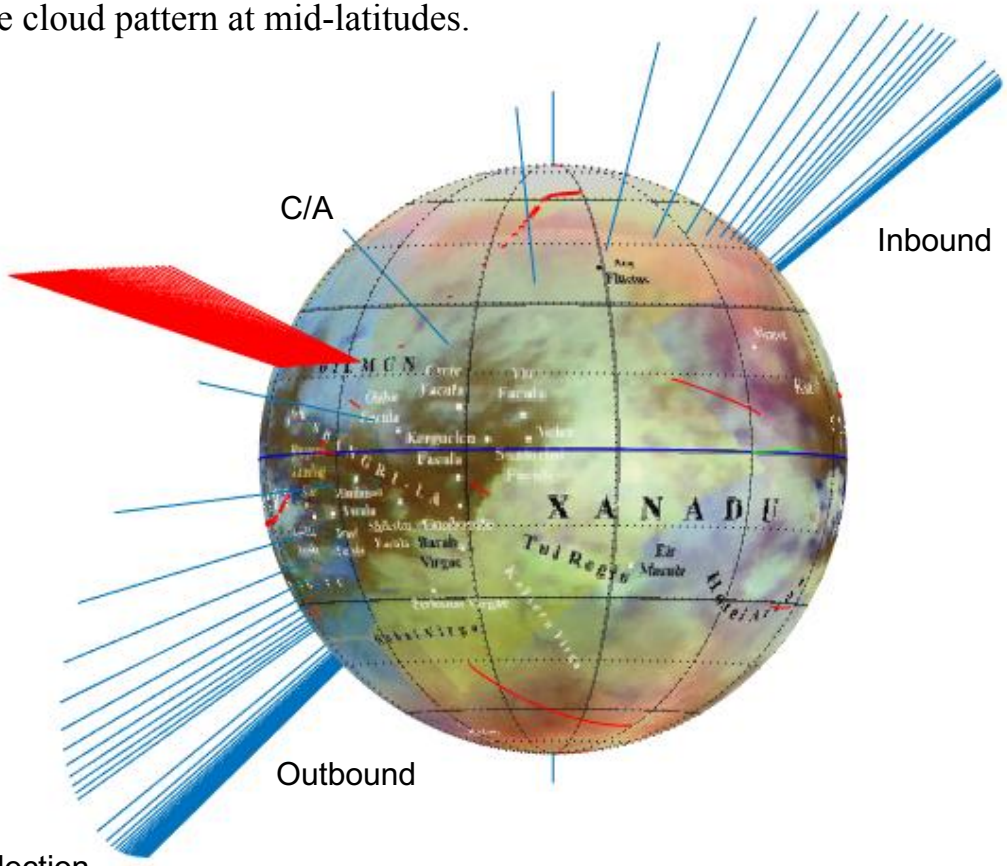
T089 – rev 181 – S77

Feb. 17, 2013 – 048T01:56:35 @ 1978 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T089: RSS flyby; closest approach: 1978 km. Inbound, VIMS will observe the illuminated North Pole area as CIRS prime observations permit. This will provide data to monitor the evolution of the polar hood. Outbound, VIMS will look for the evolution of the cloud pattern at mid-latitudes.

C/A-16:35:36	-14:05	CIRS	
-14:05	-12:00	RSS	RSS Warm UP
-12:00	0	RSS Gravity	(TN1b)
2013-048T01:56:36		CLOSEST APPROACH	XBAND to EARTH, POS_X to NEP (Tc2a for CAPS)
0	+12:00	RSS Gravity	(TN1b)
+12:00	C/A+20:19:24	CIRS	A3



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T089 – rev 181 – S77

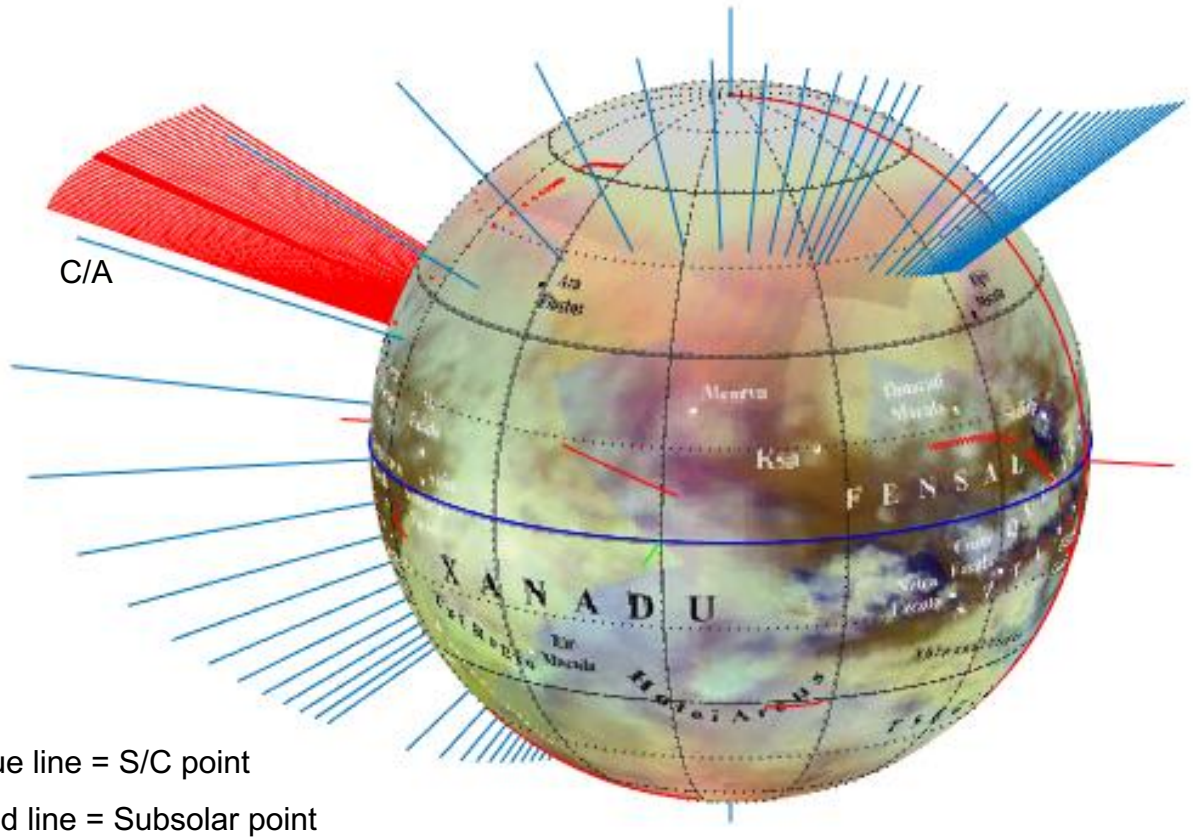
Feb. 17, 2013 – 048T01:56:35 @ 1978 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

VIMS will observe the North Polar region and monitor the evolution of the north polar hood.

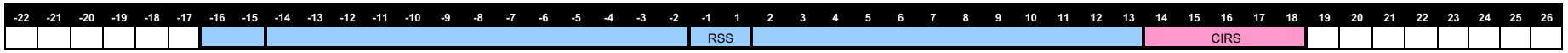
Specular reflection points are located at 63N, 123 W are C/A – 15:00



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T089 – rev 181 – S77

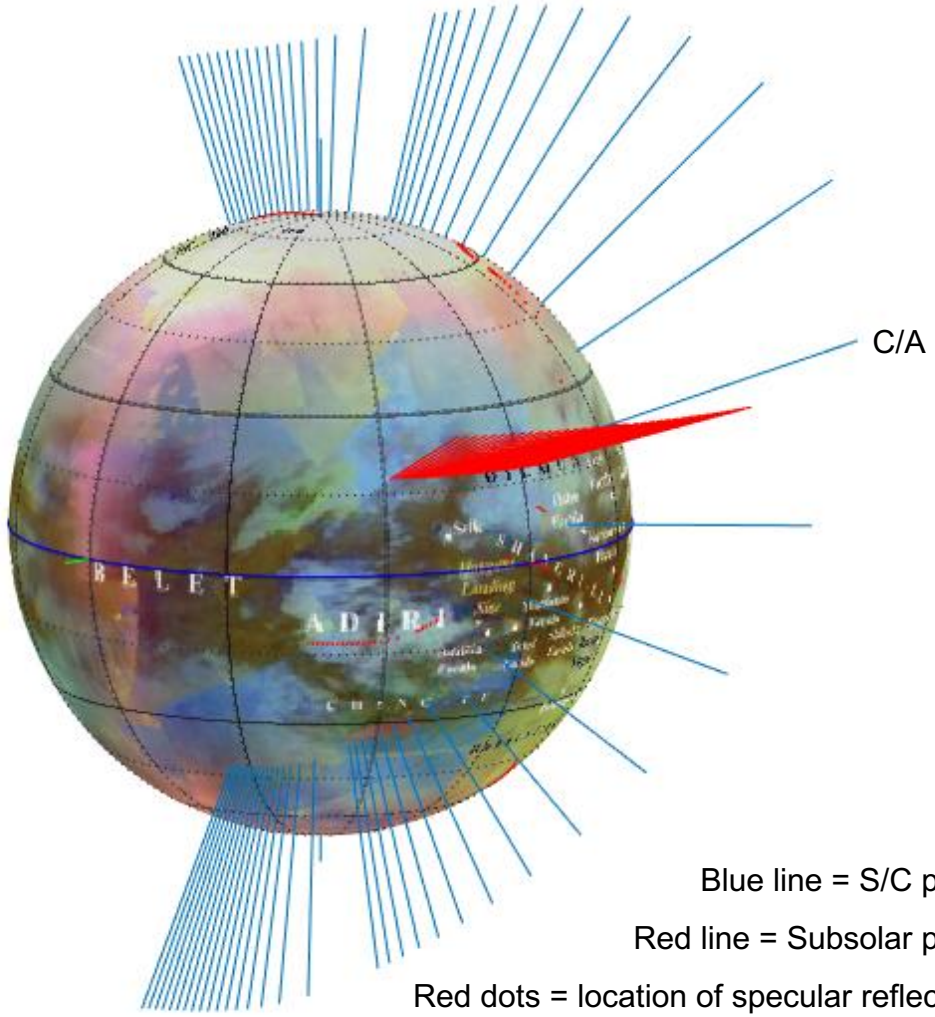
Feb. 17, 2013 – 048T01:56:35 @ 1978 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

VIMS will look for mid-latitude clouds.

Monitor the South Polar vortex.



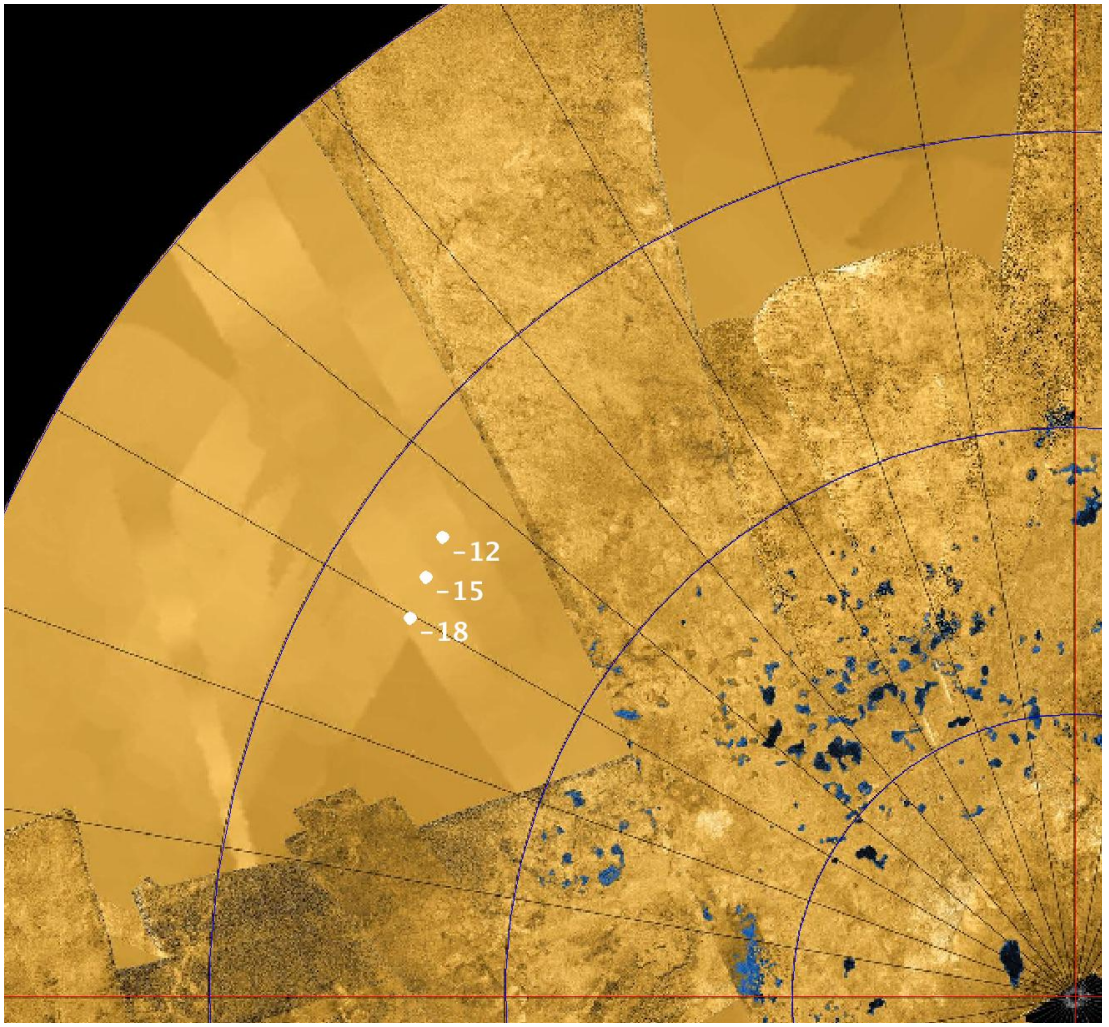
T089 – rev 181 – S77

Feb. 17, 2013 – 048T01:56:35 @ 1978 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
63.35	119.7	58.9	58.8	-64800	-18
63.07	122.9	58.6	58.6	-54000	-15
62.79	126.0	58.4	58.4	-43200	-12



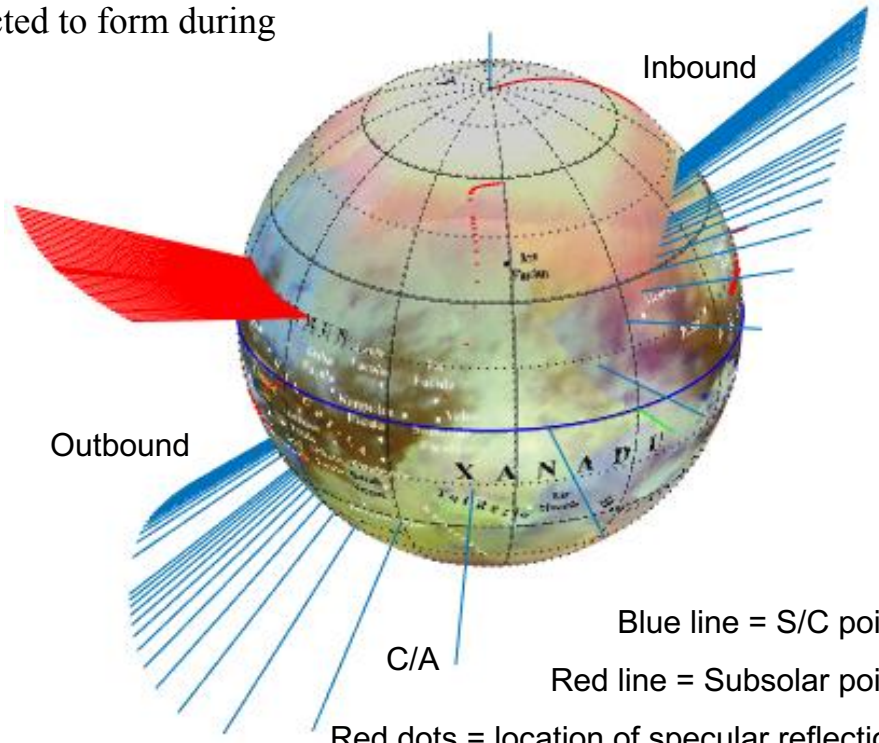
T090 – rev 185 – S78

April 5, 2013 – 095T21:43:31 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T090: CIRS and VIMS are the prime instruments at closest approach for this flyby (1400 km). On the inbound, VIMS will ridealong with CIRS and will be able to image the Northern Pole area of Titan and monitor the evolution of the large mare (TC1a and TN1a). During its prime observation, VIMS will image Mnerva (20.1, 87.2 W), the western part of Xanadu, including Tui regio (TN1a), with a sampling of less than 5 km / pixel. Then a challenging observation of Ontario Lacus will be made before realizing a mid-res (10 km / pixel) mosaic centered at southern mid-latitude South of Adiri looking for surface and cloud evolution. The VIMS instrument will also be looking at clouds at northern mid-latitudes that are expected to form during Titan's Spring according to Global Circulation Models.

begin custom period			
C/A-15:47:31	-13:00	CIRS	M3 (Tc1b)
-13:00	-09:00	CIRS	N1 (Tc1b, TN1c aerosol)
-09:00	-05:00	CIRS	R (TN1c or Tc1b, decided in implementation)
-05:00	-02:15	CIRS	TN2c (surface temperature)
-02:15	**-00:15**	**CIRS**	CIRS turn to VIMS attitude TN1c
-00:15	**0**	**VIMS**	**TC1a, TN1a**
2013-095T21:43:31		**CLOSEST APPROACH**	**NEG_Y to Titan, on wheels (Tc2a)**
0	**+02:15**	**VIMS**	**TC1a, TN1a**
+02:15	**+05:00**	**VIMS**	**Y (TC1a, TN1a (depending on pointing) and TN2c)**
+05:00	+09:00	VIMS	I (TC1a and TN2c)
end custom period			
+09:00	+14:00	CIRS	C (TN1c)
+14:00	C/A+19:52:29	CIRS	A3 (Tc1b)



T090 – rev 185 – S78

April 5, 2013 – 095T21:43:31 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

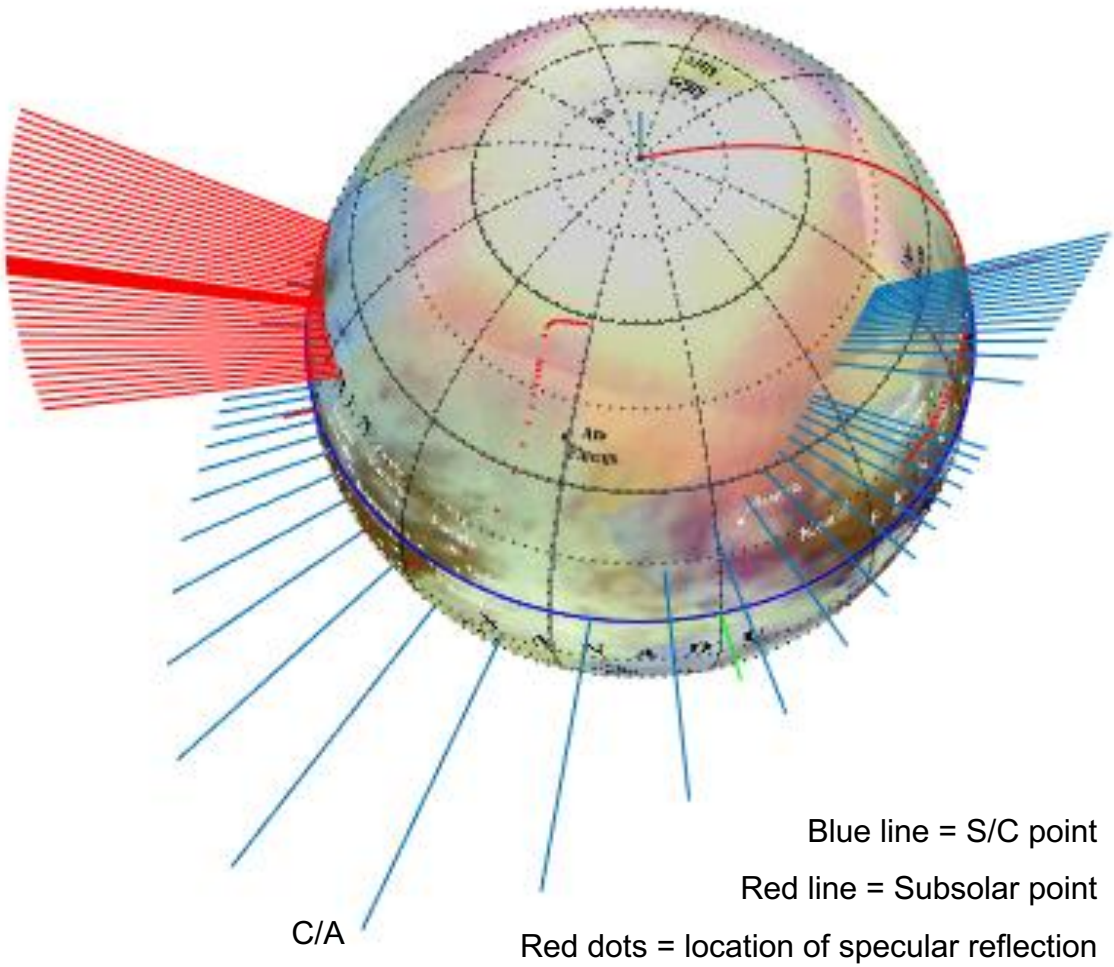
Inbound:

Image the North Pole area of Titan and monitor the evolution of the large mare (TC1a and TN1a).

During the prime observation, VIMS will image Mnerva (20.1N, 87.2 W), the western part of Xanadu, including Tui regio at resolutions of less than 5 km/px (TN1a).

Specular reflection geometry occurs near 53N, 123 W beginning 16 hours before C/A.

Search for clouds at mid-northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T090 – rev 185 – S78

April 5, 2013 – 095T21:43:31 @ 1400 km altitude

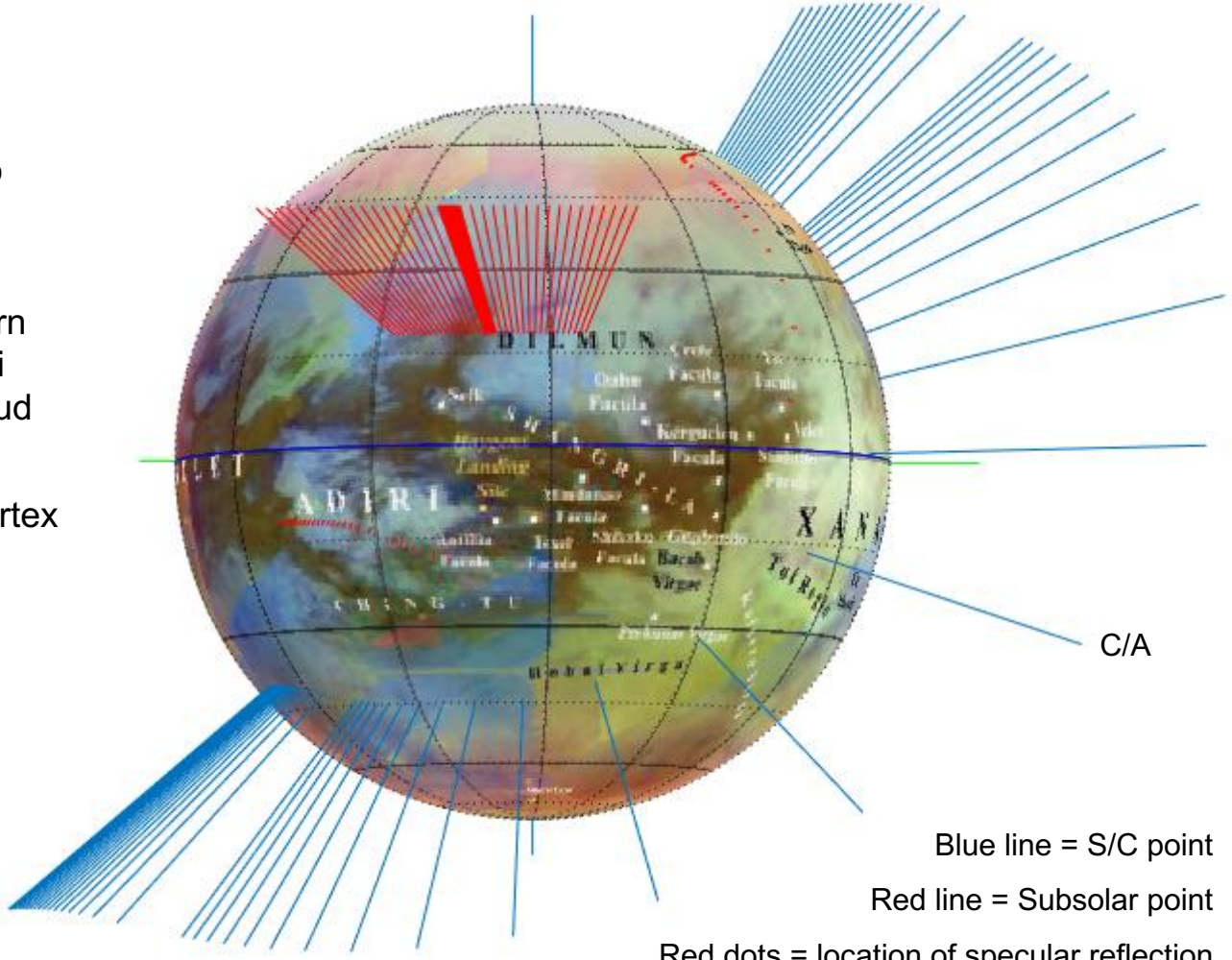
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Attempt to observe Ontario Lacus (70S, 183 W).

Mid-resolution (10km/px) mosaic centered at southern mid-latitudes, south of Adiri looking for surface and cloud evolution.

Monitor the South Polar vortex



-22 -21 -20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

CIRS VIMS CIRS

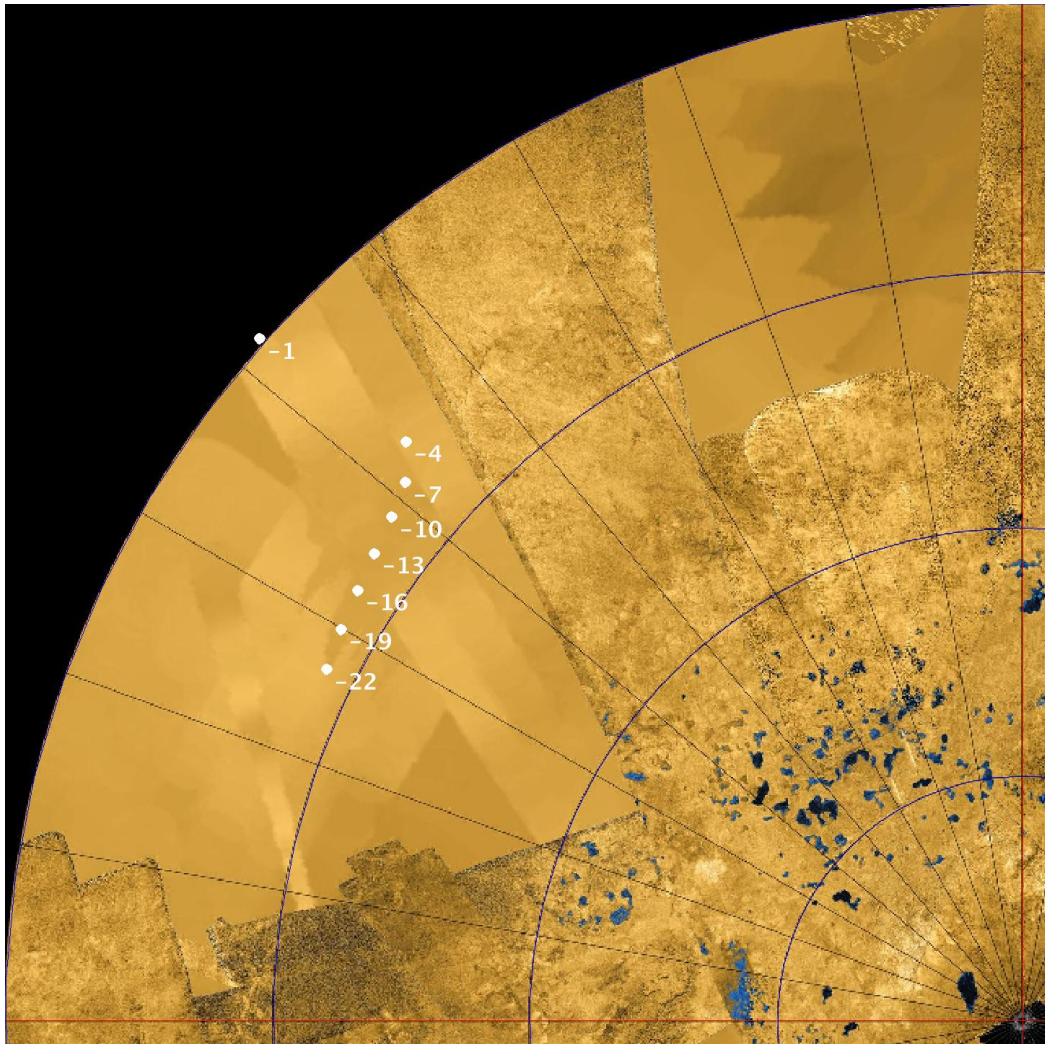
T090 – rev 185 – S78

April 5, 2013 – 095T21:43:31 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
58.8	116.8	55.4	-79200	-22
58.6	119.9	55.2	-68400	-19
58.3	122.9	55.0	-57600	-16
58.1	126.8	54.9	-46800	-13
57.8	128.6	54.7	-36000	-10
57.3	131.1	54.7	-25200	-7
56.3	133.2	54.7	-14400	-4
49.8	131.8	55.1	-3600	-1



-22 -21 -20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

CIRS VIMS CIRS

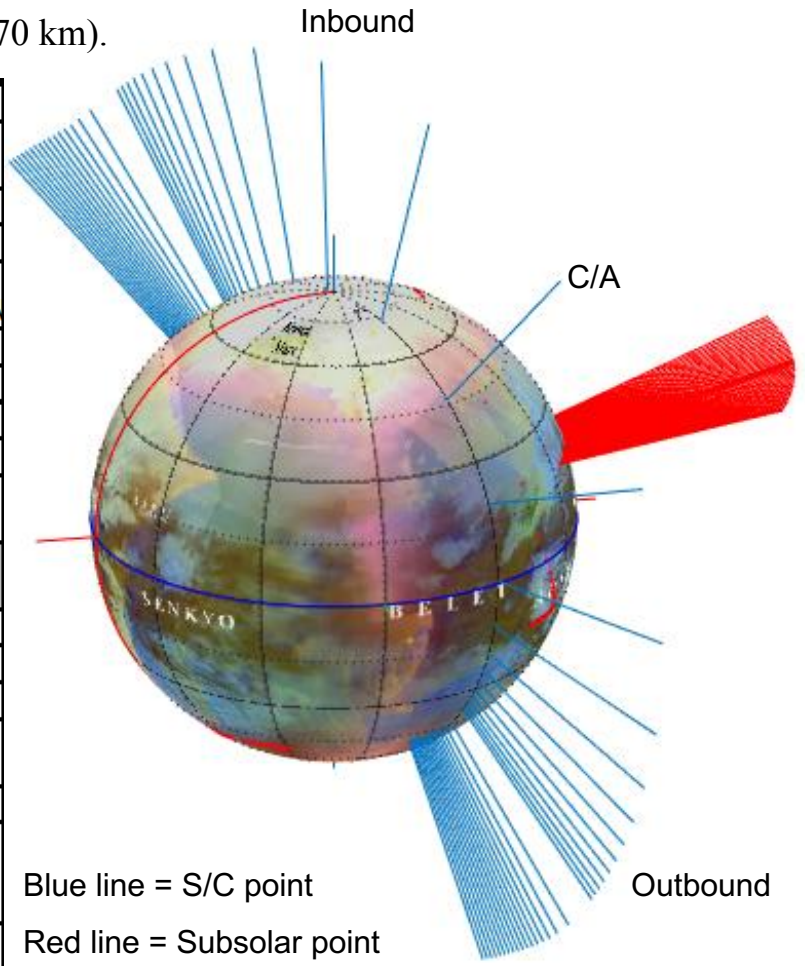
T091 – rev 190 – S78

May 23, 2013 – 143T17:32:55 @ 970 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T091: During this flyby, radar is prime during closest approach (970 km).

C/A-14:51:55	-13:00	CIRS	M3 (Tc1b)
-13:00	-09:00	CIRS	N1 (Tc1b, TN1c aerosol)
-09:00	-06:00	CIRS	R1 (TN1c or Tc1b, decided in implementation)
-06:00	-02:15	RADAR	R1+L (TN2c)
-02:15	-01:12	RADAR scatterometry/radiometry	CAPS pick secondary except for SAR (TN2c, TN
-01:12	-00:31	RADAR HiSAR	TC1a, TN1a, TN1b, TN2b
-00:31	-00:30	RWA to RCS Transition	
-00:30	-00:18	RADAR Altimetry	TN2b
-00:18	-00:10	RADAR SAR	secondary NEG_X to RAM
-00:10	0	RADAR Altimetry	TN2b
2013-143T17:32:55		CLOSEST APPROACH	NEG_Z to Titan, CAPS riding along picking secondary when possible (Tc2a)
0	+00:30	RADAR Altimetry	TN2b
+00:30	+00:50	RADAR HiSAR	TC1a, TN1a, TN1b, TN2b
+00:50	+01:12	RCS to RWA Transition	
+01:12	+02:15	RADAR scatterometry/radiometry	(TN2c, TN1a)
+02:15	+06:00	RADAR	L+H1 (TN2c)
+06:00	+09:00	ISS	H1 (TC1a, TN1a, TN2c (Could also be TC1b and/or TN1c, depending on geometry, or TN2d, depending on timing.))
+09:00	+14:00	CIRS	C (TN1c, TN2c(VIMS rider--add for any VIMS later than +02:00)
+14:00	C/A+22:03:05	CIRS	A2 (Tc1b)



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T091 – rev 190 – S78

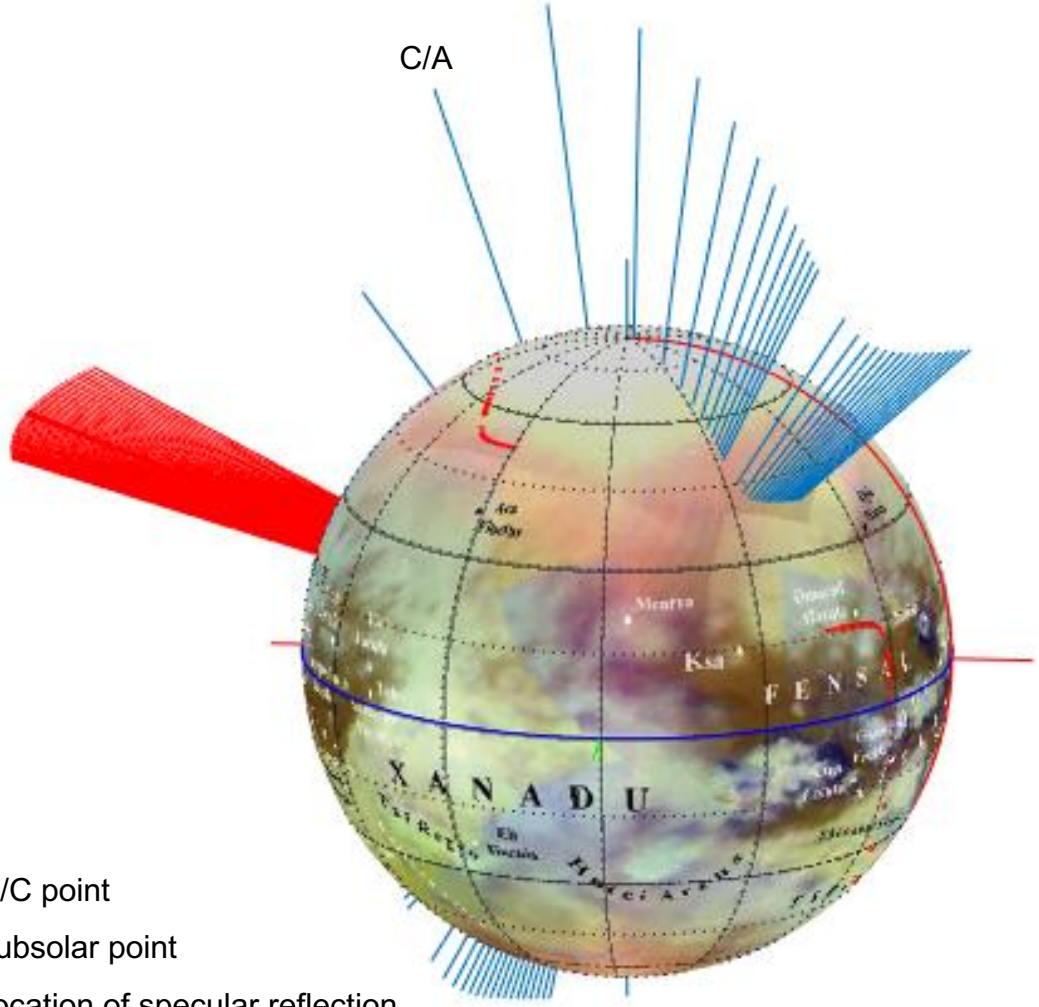
May 23, 2013 – 143T17:32:55 @ 970 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations of the North Pole area.

Specular reflection geometry occurs near 52N, 120 W beginning 15 hours before C/A.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

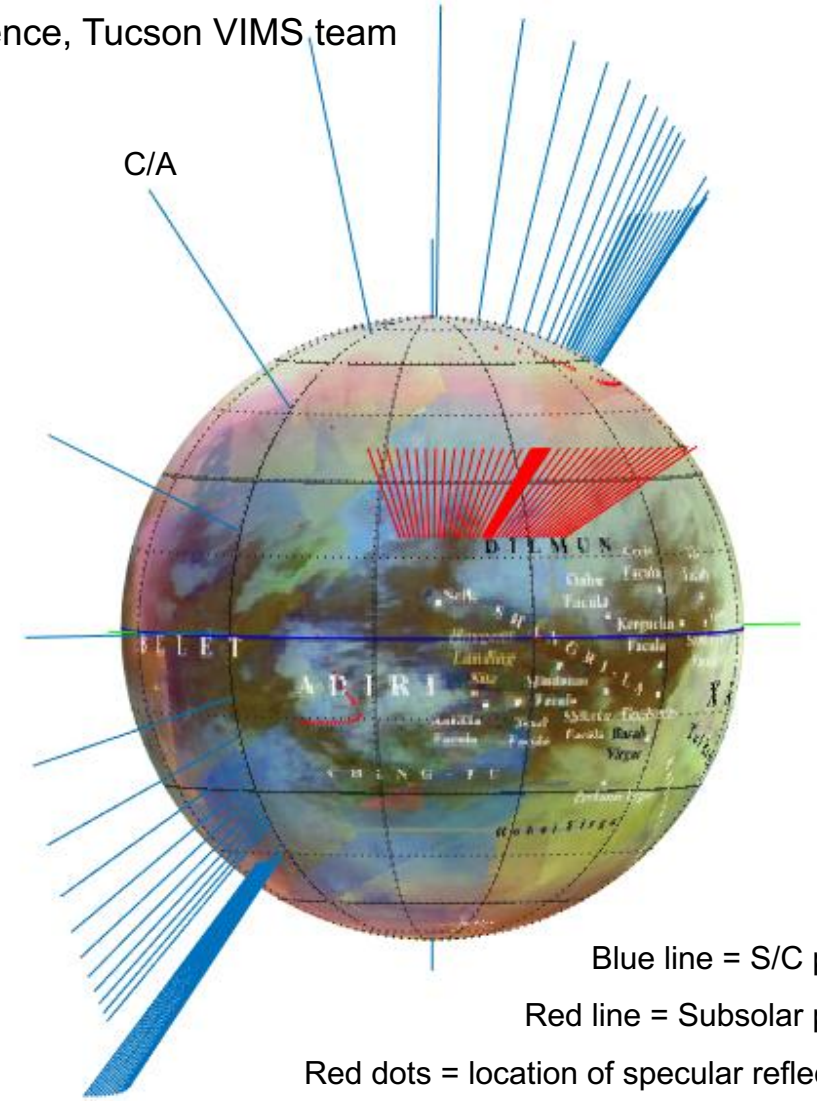
T091 – rev 190 – S78

May 23, 2013 – 143T17:32:55 @ 970 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Monitor the evolution of the South Polar Vortex



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

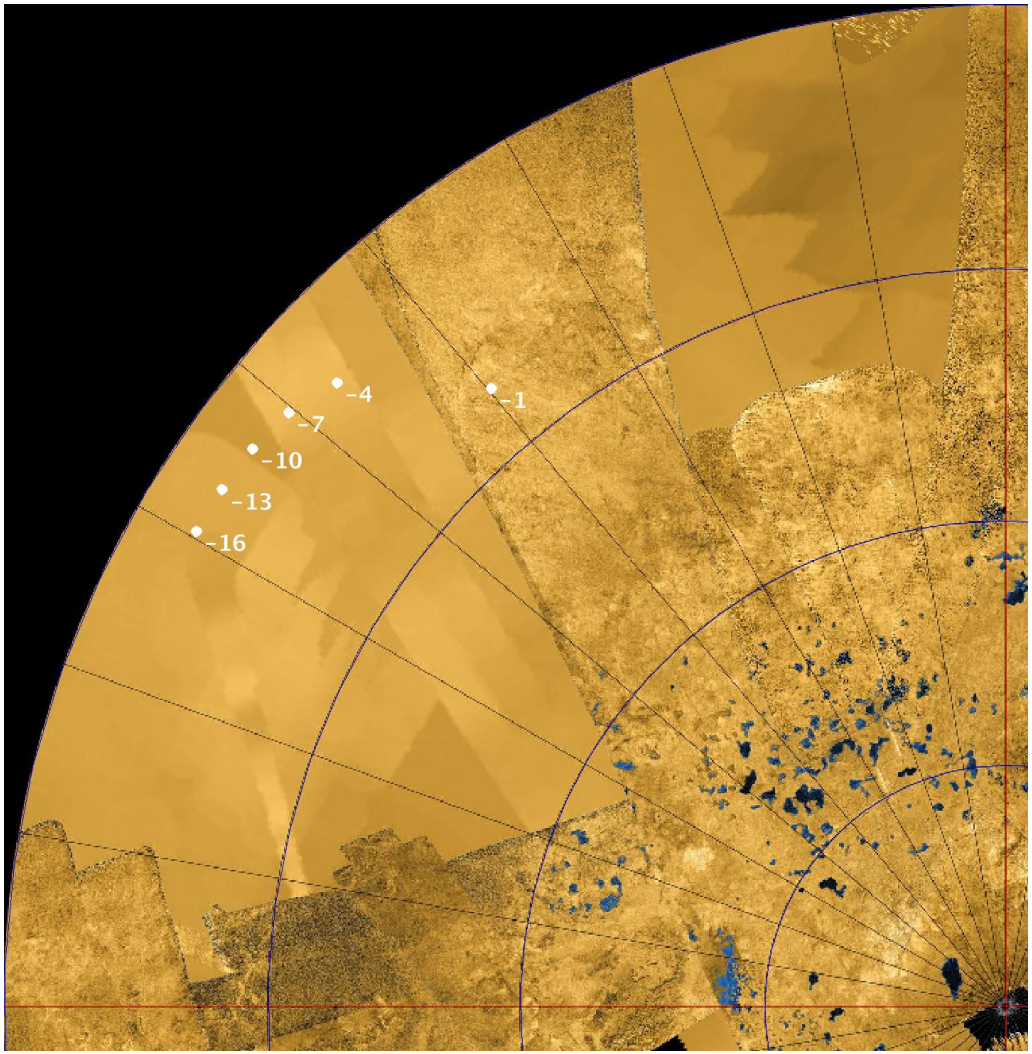
T091 – rev 190 – S78

May 23, 2013 – 143T17:32:55 @ 970 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
52.3	120.4	52.8	-57600	-16
52.3	123.4	52.7	-46800	-13
52.4	126.5	52.5	-36000	-10
52.6	129.6	52.5	-25200	-7
53.2	133.0	52.3	-14400	-4
57.4	140.2	51.8	-3600	-1



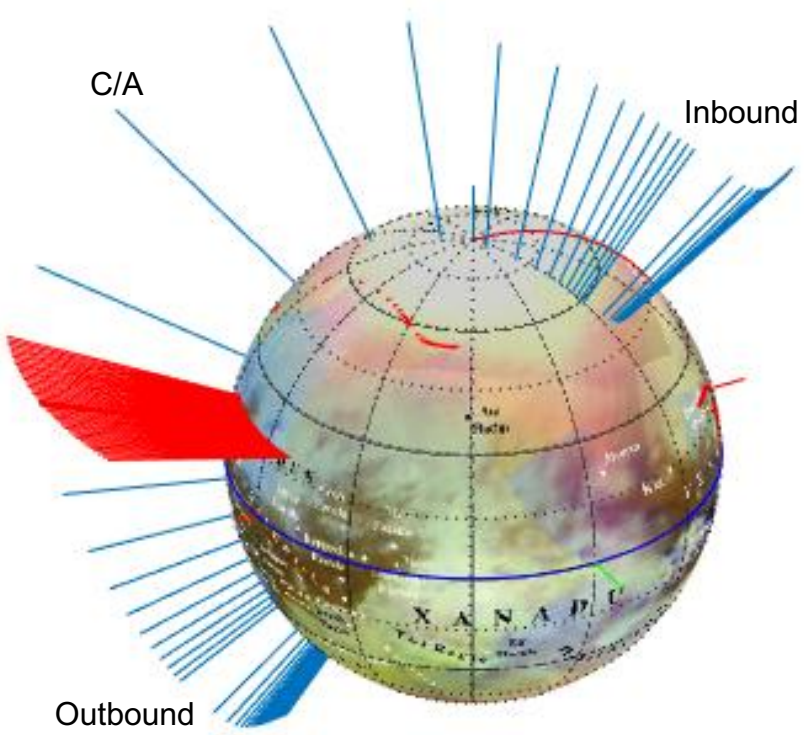
T092 – rev 194 – S79

July 10, 2013 – 191T13:21:47 @ 964 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T092: Radar is prime at closest approach (964 km) during this flyby. On the inbound, while riding along with ISS and CIRS, VIMS will observe the North Pole area and will continue to monitor the evolution of the cloud system. The specular reflection geometry happens at (55.28, 133.9N)-(55.45, 137.2W) during the period -9 to -6 hours before C/A. On the outbound, VIMS is prime at +1:35 and will acquire a mosaic over the southern mid-latitude terrains South of Adiri and Belet with instrument footprint starting at 5 km/pixel. It will also monitor the evolution of the cloud system on the South Pole.

C/A-14:00:47	-12:00	ISS	D2 extended (TC1a, TC1b, TN1a, TN2c)
-12:00	-09:00	CIRS	Reverse D2 (TN1c)
-09:00	-06:00	CIRS	R1 (TN1c or Tc1b, decided in implementation)
begin custom period			
-06:00	-02:15	RADAR	L+R1 (TN2c)
-02:15	**-01:12**	**RADAR scatterometry/radiometry**	**TN2c, TN1a**
-01:12	**-00:31**	**RADAR HiSAR**	TC1a, TN1a, TN1b, TN2b
-00:31	**-00:30**	RWA to RCS Transition	TC1a, TN1a, TN1b, TN2b
-00:30	**-00:18**	**RADAR Altimetry**	**TN2b**
-00:18	**0**	**RADAR SAR**	TC1a, TN1a, TN1b, TN2b
2013-191T13:21:47		**CLOSEST APPROACH**	**NEG_Z to Titan, NEG_X to RAM, INMS riding along at C/A (Tc2a)**
0	**+00:18**	**RADAR SAR**	**INMS ride along, TC1a, TN1a, TN1b, TN2b**
+00:18	**+00:30**	**RADAR Altimetry**	**TN2b**
+00:30	**+00:50**	**RADAR HiSAR**	TC1a, TN1a, TN1b, TN2b
+00:50	**+01:00**	**RADAR**	**TN2c, TN1a**
+01:00	**+01:22**	RCS to RWA Transition	**On VIMS point at +01:00**
+01:22	**+02:15**	**VIMS**	**TC1a, TN2c**
+02:15	**+05:00**	**VIMS**	**Y, TN1c**
+05:00	+09:00	VIMS	I, TC1a, TN2c
end custom period			
+09:00	C/A+13:54:13	ISS	TC1a, TN1a, TN2c



T092 – rev 194 – S79

July 10, 2013 – 191T13:21:47 @ 964 km altitude

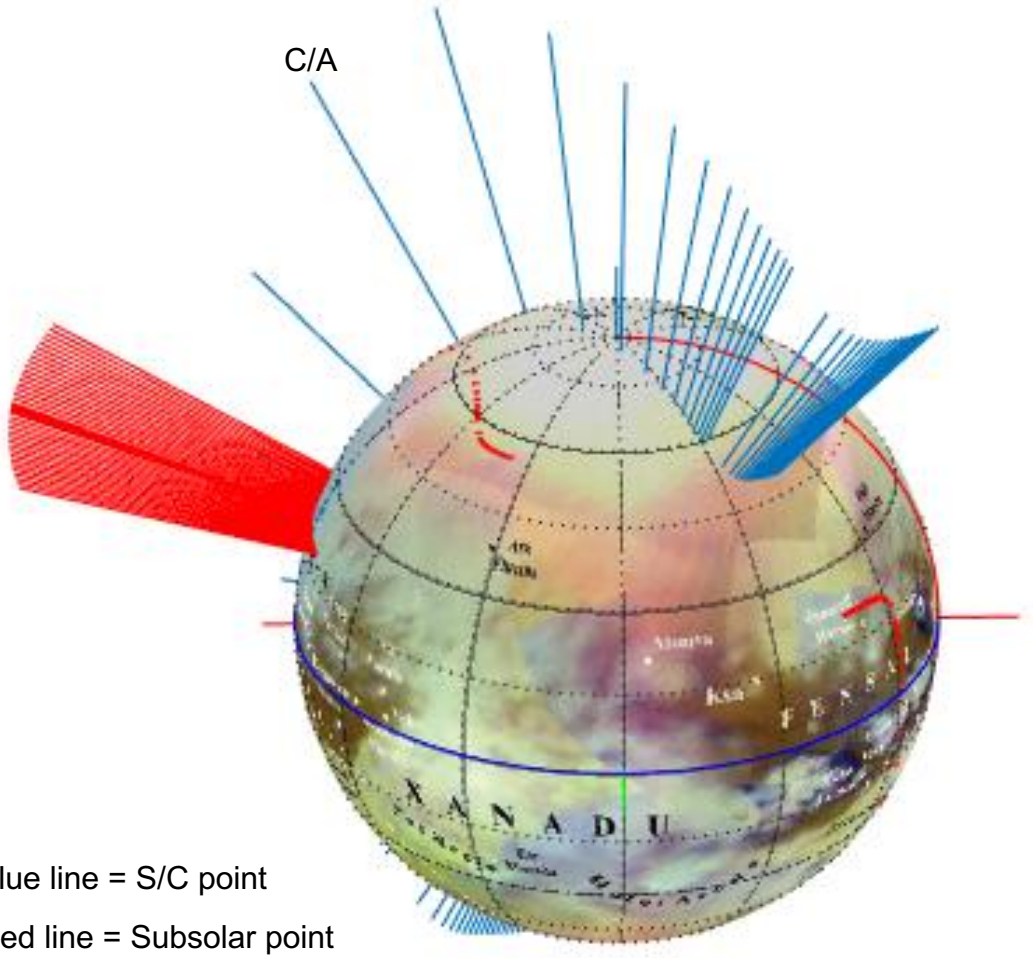
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

VIMS goes to “sleep” at C/A – 06:00 during the radar observations.

Observations of the North Pole area and continue to monitor the cloud system.

Specular reflection geometry occurs near 55N, 130 W beginning 13 hours before C/A.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T092 – rev 194 – S79

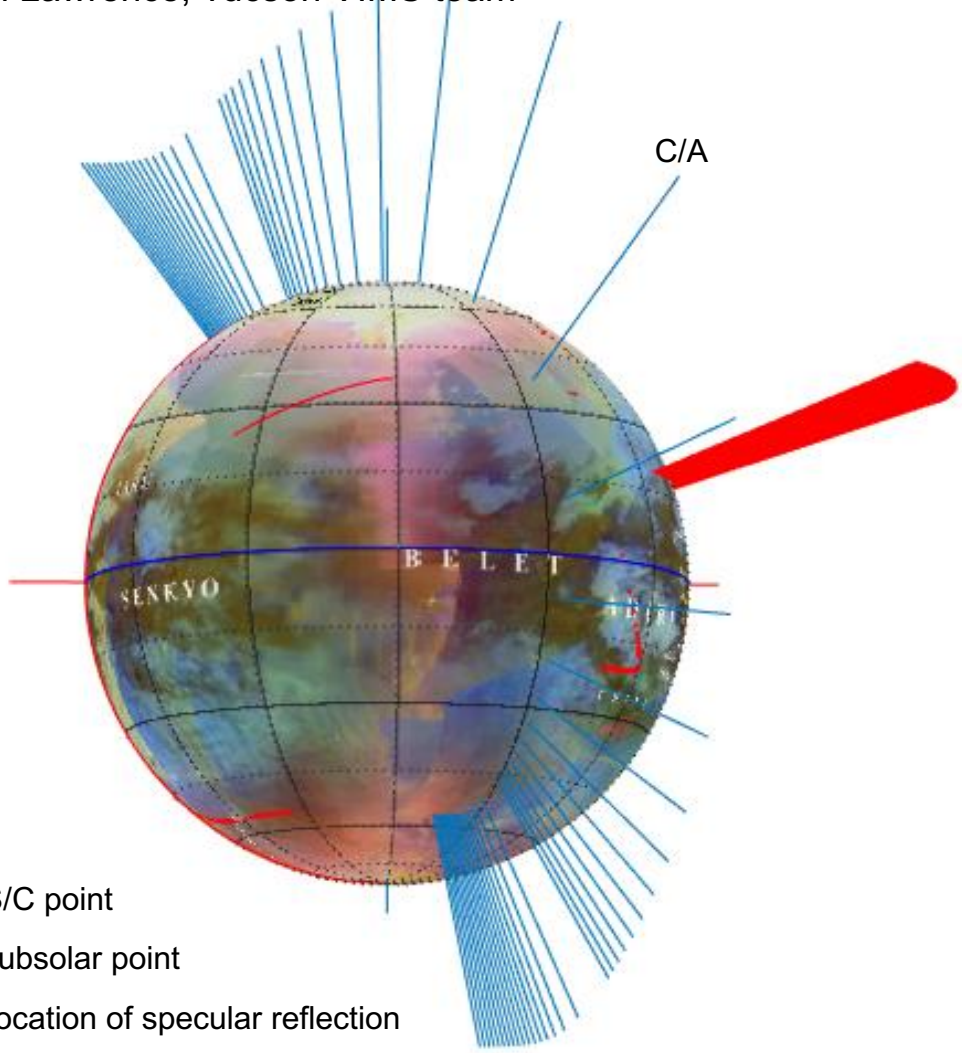
July 10, 2013 – 191T13:21:47 @ 964 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Mosaic of Titan with instrument resolutions beginning at 5 km/px of the southern mid-latitudes south of Adiri and Belet.

Monitor the evolution of the cloud system at the South Pole



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

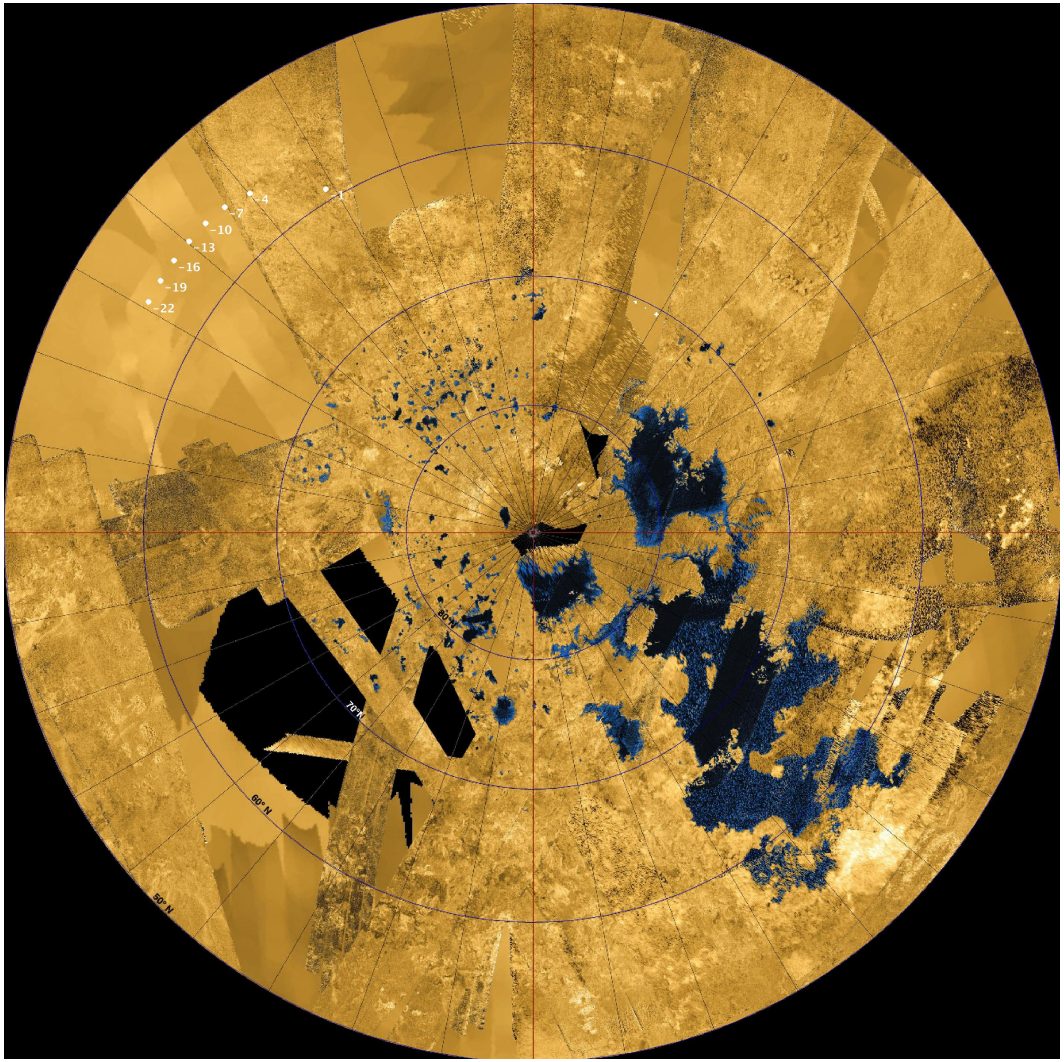
T092 – rev 194 – S79

July 10, 2013 – 191T13:21:47 @ 964 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
55.7	120.9	49.5	-79200	-22
55.6	124.0	49.3	-68400	-19
55.6	127.1	49.2	-57600	-16
55.5	130.2	49.0	-46800	-13
55.6	133.3	48.9	-36000	-10
55.7	136.5	48.8	-25200	-7
56.2	140.1	48.6	-14400	-4
59.1	148.8	47.8	-3600	-1



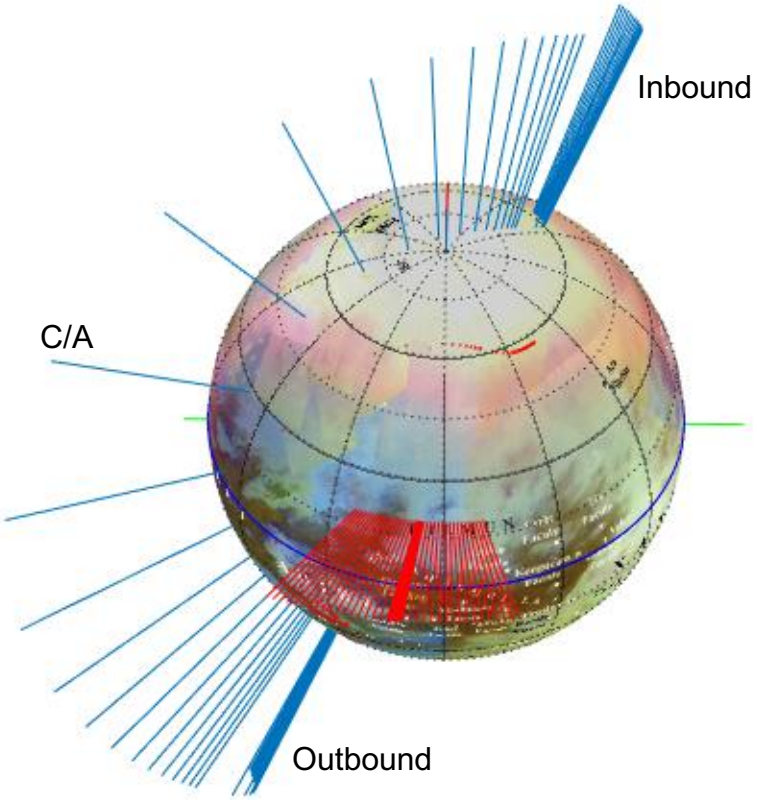
T093 – rev 195 – S79

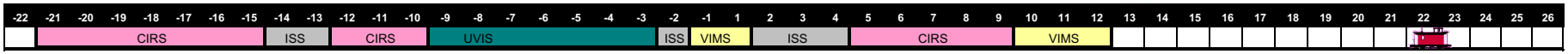
July 26, 2013 – 207T11:56:22 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T093: During this flyby, VIMS is prime at closest approach (1400 km) and will acquire images of Punga Mare and Ligeia Mare on the inbound. Earlier in this flyby, observation of specular reflection will be possible if liquid bodies are present in the area between (57.3N, 131.2W) and (58.4 N, 151.7W). A pushbroom mode will be used to acquire high resolution images of the Belet dune fields. On the outbound, VIMS will acquire a mosaic along meridian 270 W which has not been well covered so far. It will also monitor the formation of clouds at northern mid-latitudes as it is predicted by Global Circulation Models.

C/A-22:22:23	-14:00	CIRS	A2 (Tc1b)
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
-12:00	-09:00	CIRS	D2 (TN1c)
-09:00	-02:15	UVIS	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
begin custom period			
-02:15	**-01:00**	**ISS**	(TC1a, TN1a, TN2c, TN2d)
-01:00	**-00:30**	**VIMS**	ISS delivers to VIMS pointing at -1:00 (TC1a, TN1a, TN1c, TC1b)
-00:30	**0**	**VIMS**	(TC1a, TN1a, TN1c, TC1b)
2013-207T11:56:23		**CLOSEST APPROACH**	**NEG_Y to Titan (Tc2a)**
0	**+00:10**	**VIMS**	(TC1a, TN1a, TN1c, TC1b)
+00:10	**+01:00**	**VIMS**	VIMS delivers to ISS pointing at +01:00 (TC1a, TN1a, TN1c, TC1b)
+01:00	**+02:15**	**ISS**	(TC1a, TN1a, TN2c, TN2d)
+02:15	**+4:00**	**ISS**	using a 'lit J' template (TC1a, TN1a (Could also be TC1b and/or TN1c, depending on geometry, or TN2c and TN2d, depending on timing.))
end custom period			
+4:00	+05:00	**CIRS**	using a 'lit J' template (TC1b or TN1c)
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
+09:00	C/A+12:47:37	VIMS	O (TN1a (Specular reflection of lakes-depending on geometry))





T093 – rev 195 – S79

July 26, 2013 – 207T11:56:22 @ 1400 km altitude

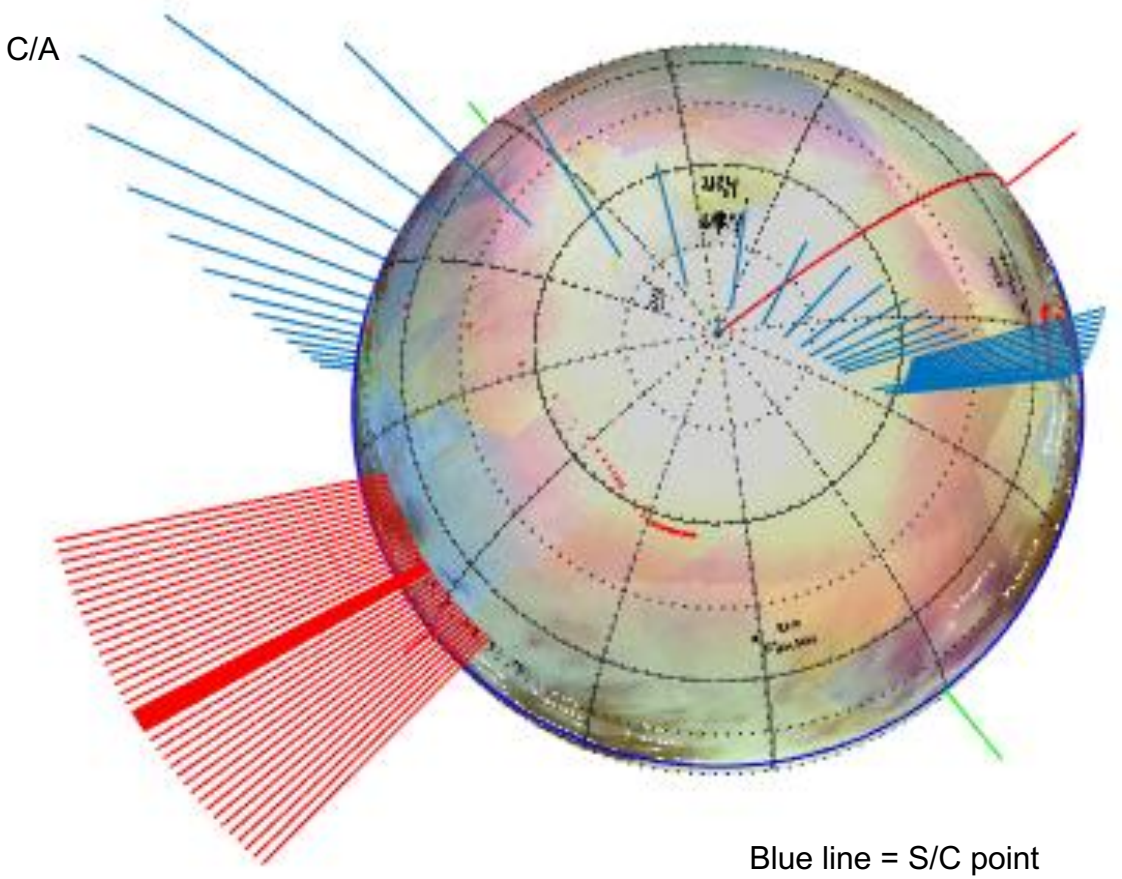
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Acquire images of Punga Mare and Ligeia Mare prior to C/A.

Evolution of the small lakes, south of Ligeia Mare (TN1a).

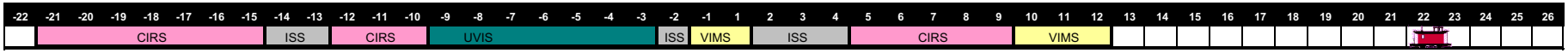
Specular reflection will be possible if liquid bodies are present in the area between 57N, 131W and 58N, 150 W.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T093 – rev 195 – S79

July 26, 2013 – 207T11:56:22 @ 1400 km altitude

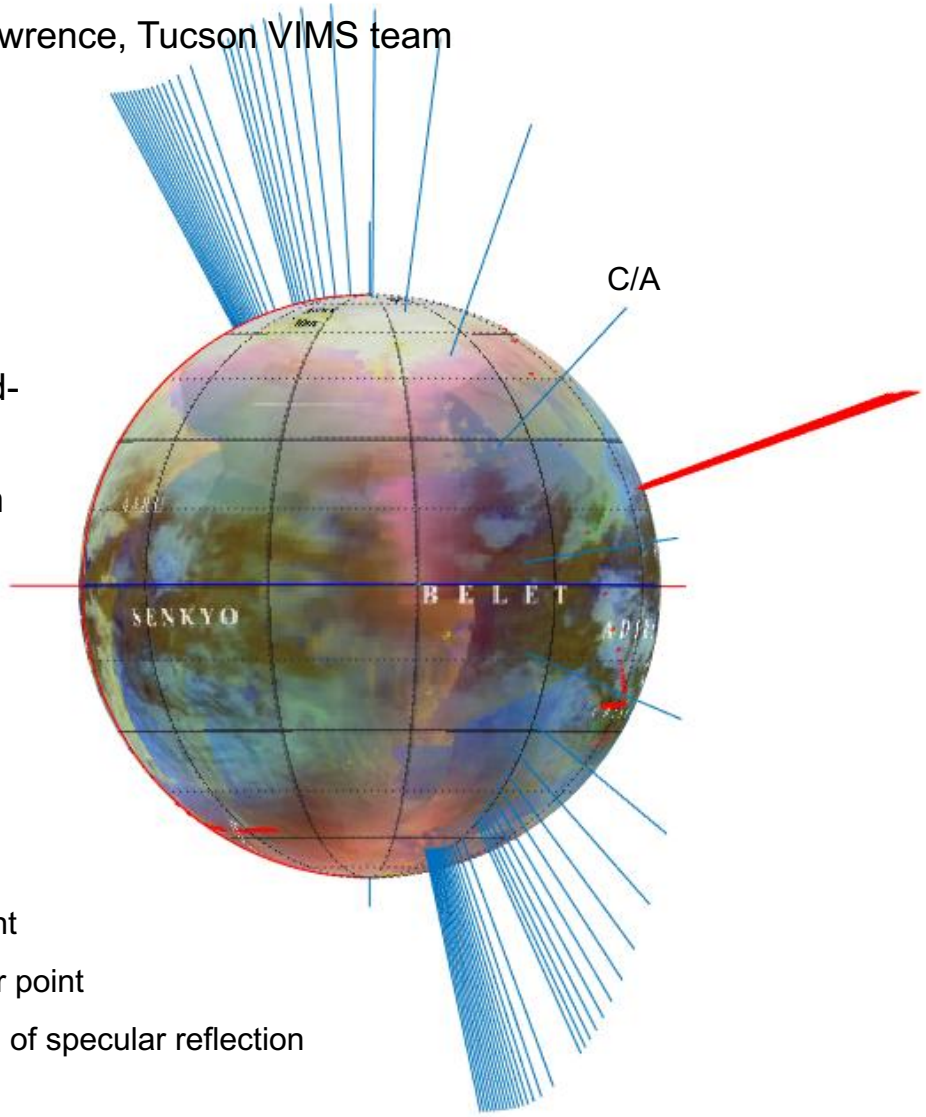
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

"Noodle" mode observations after C/A across the Belet dune field (TN1a).

Acquire a 10 km/px mosaic of the southern mid-latitudes along the meridian at 270 W (TN1a).

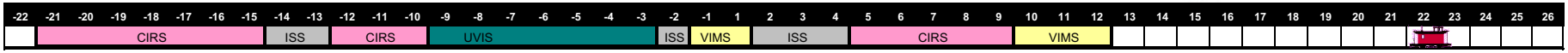
Monitor the formation of clouds at mid-northern latitudes (TC1a).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



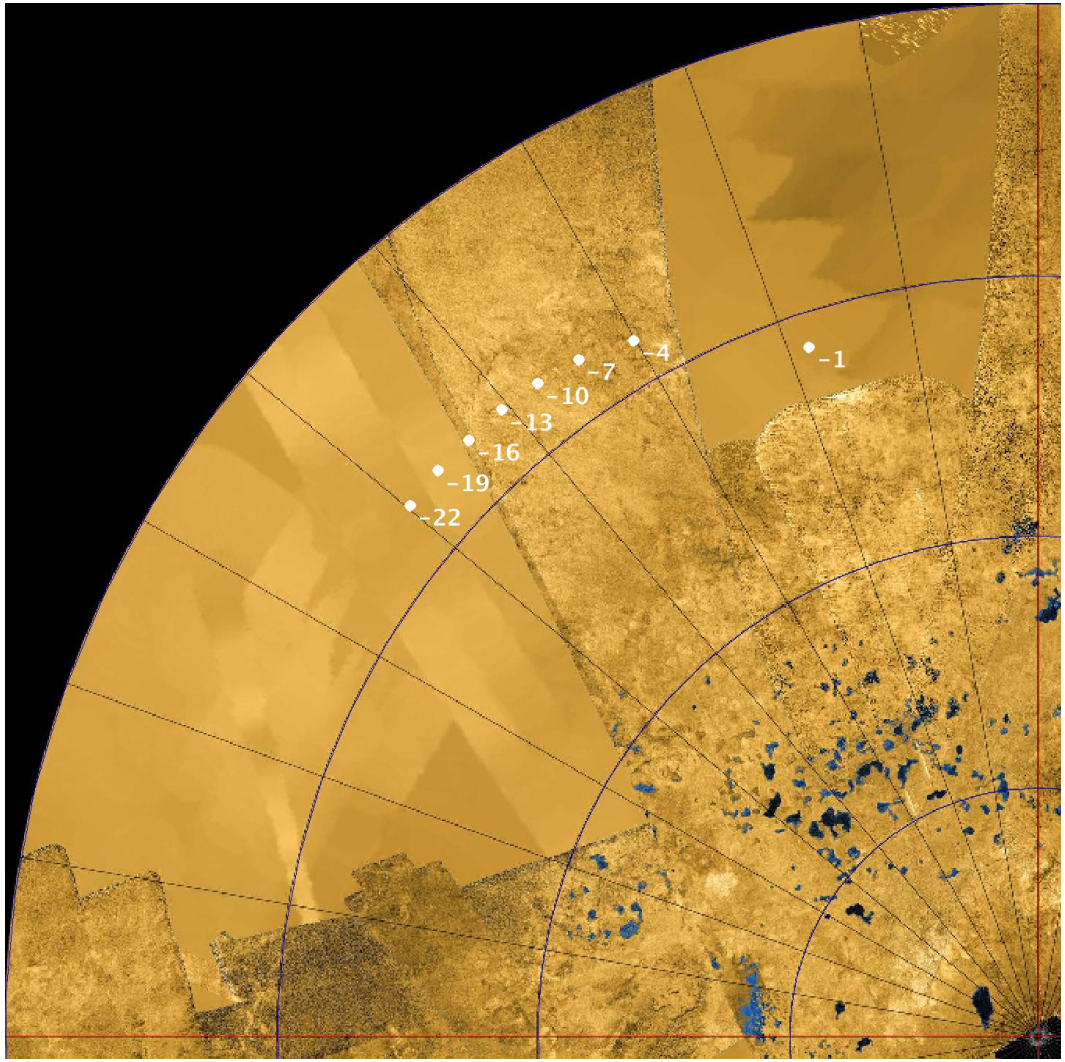
T093 – rev 195 – S79

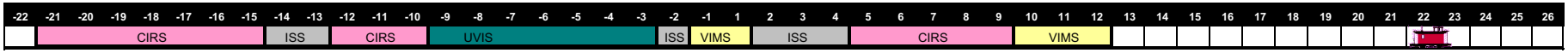
July 26, 2013 – 207T11:56:22 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
57.67	130.2	46.0	-79200	-22
57.60	133.3	45.9	-68400	-19
57.59	136.3	45.8	-57600	-16
57.58	139.4	45.7	-46800	-13
57.66	142.5	45.6	-36000	-10
57.84	145.8	45.6	-25200	-7
58.33	149.8	45.5	-14400	-4
61.28	161.6	45.0	-3600	-1





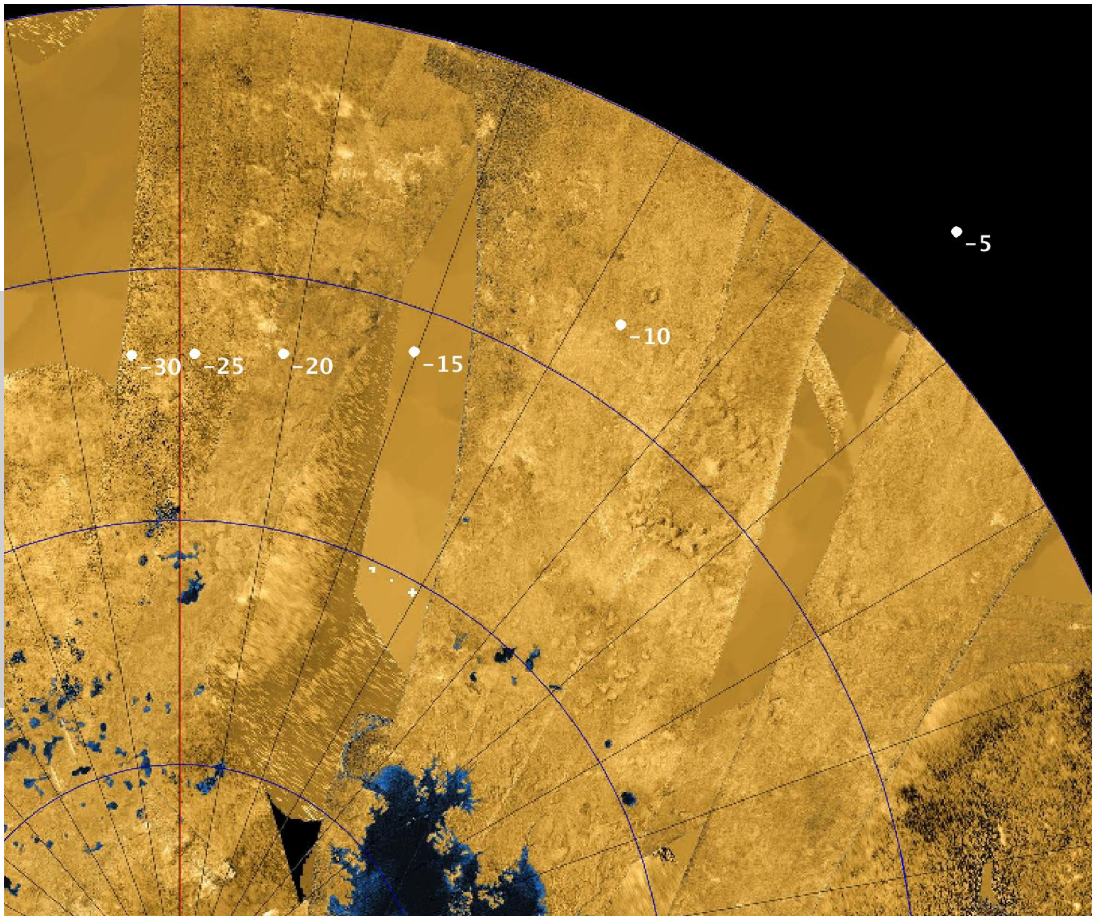
T093 – rev 195 – S79

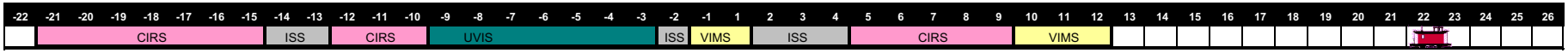
July 26, 2013 – 207T11:56:22 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (min)
63.33	175.7	44.4	-1800	-30
63.35	181.3	44.0	-1500	-25
63.04	189.0	43.7	-1200	-20
61.68	199.7	43.4	-900	-15
57.15	212.9	42.8	-600	-10
46.55	225.1	42.0	-300	-5
28.67	230.7	41.8	0	0





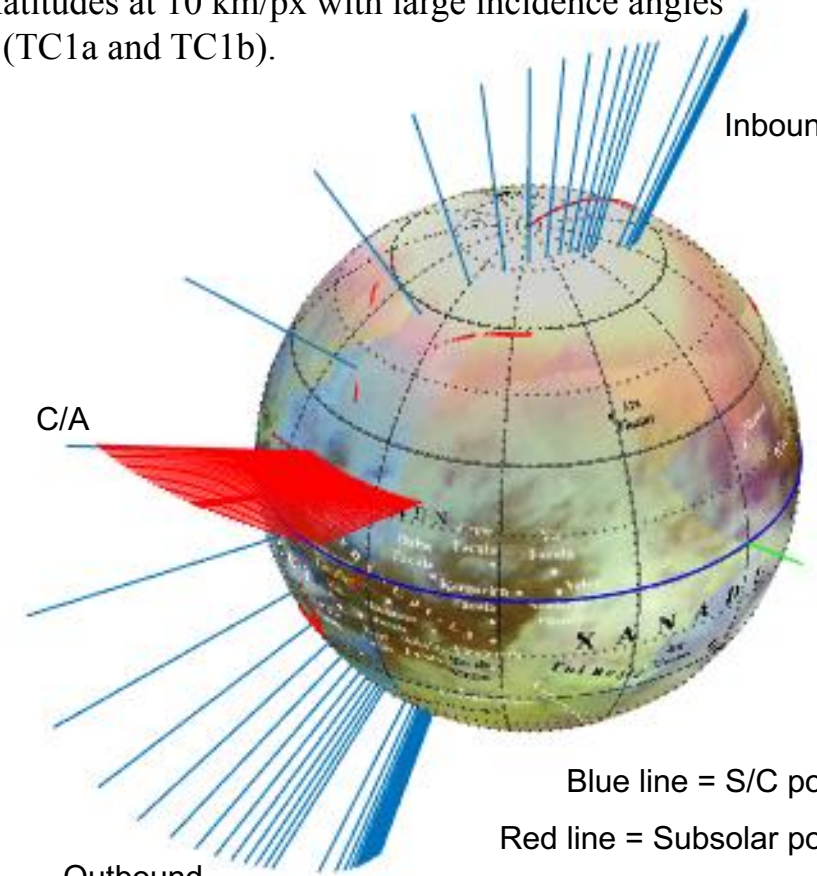
T094 – rev 197 – S80

Sept. 12, 2013 – 255T07:43:56 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T094: VIMS and CIRS are prime at closest approach (1400 km) during this flyby. Acquire images of Punga, Ligeia Mare and the small lakes south of Ligeia (TC1a and TN1a). Noodle mode observations across Adiri and the dune fields after C/A (TN1a). Mosaic of the mid-southern latitudes at 10 km/px with large incidence angles (TN1a). Monitor the evolution of the South Pole cloud system (TC1a and TC1b).

C/A-22:45:56	-14:00	CIRS	A2 (Tc1b)
-14:00	-09:00	CIRS	C (TN1c)
begin custom period			
-09:00	-05:00	ISS	H (TC1a, TN1a, TN2c (Could also be TC1b and/or TN1c, depending on geometry, or TN2d, depending on timing.))
-05:00	-02:15	ISS	J1 (TC1a, TN1a (Could also be TC1b and/or TN1c, depending on geometry, or TN2c and TN2d, depending on timing.))
-02:15	**-01:00**	**ISS**	**hand off at waypoint**
-01:00	**-00:30**	**VIMS**	(TC1a, TN1a)
-00:30	**0**	**VIMS**	(TC1a, TN1a)
2013-255T07:43:56		**CLOSEST APPROACH**	**NEG_Y to Titan (Tc2a)**
0	**+00:40**	**VIMS**	**(TC1a, TN1a) VIMS turning to CIRS attitude**
+00:40	**+02:15**	**CIRS**	**TN1c**
end custom period			
+02:15	**+09:00**	**UVIS**	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
+09:00	C/A+11:39:04	VIMS	O (TN1a (Specular reflection of lakes- depending on geometry))



T094 – rev 197 – S80

Sept. 12, 2013 – 255T07:43:56 @ 1400 km altitude

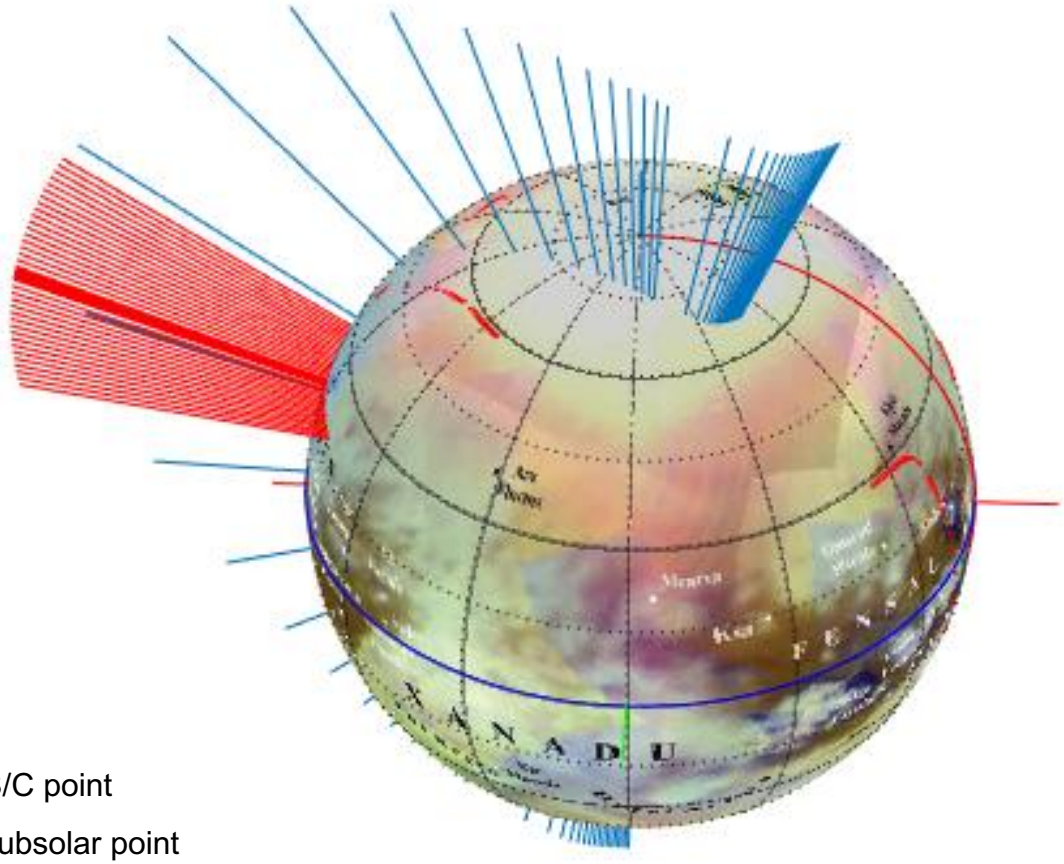
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Acquire images of Punga, Ligeia Mare and the small lakes south of Legeia (TC1a and TN1a).

”Noodle” mode observations across Adiri.

Specular reflection geometry occurs at latitudes less than 60 degrees.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T094 – rev 197 – S80

Sept. 12, 2013 – 255T07:43:56 @ 1400 km altitude

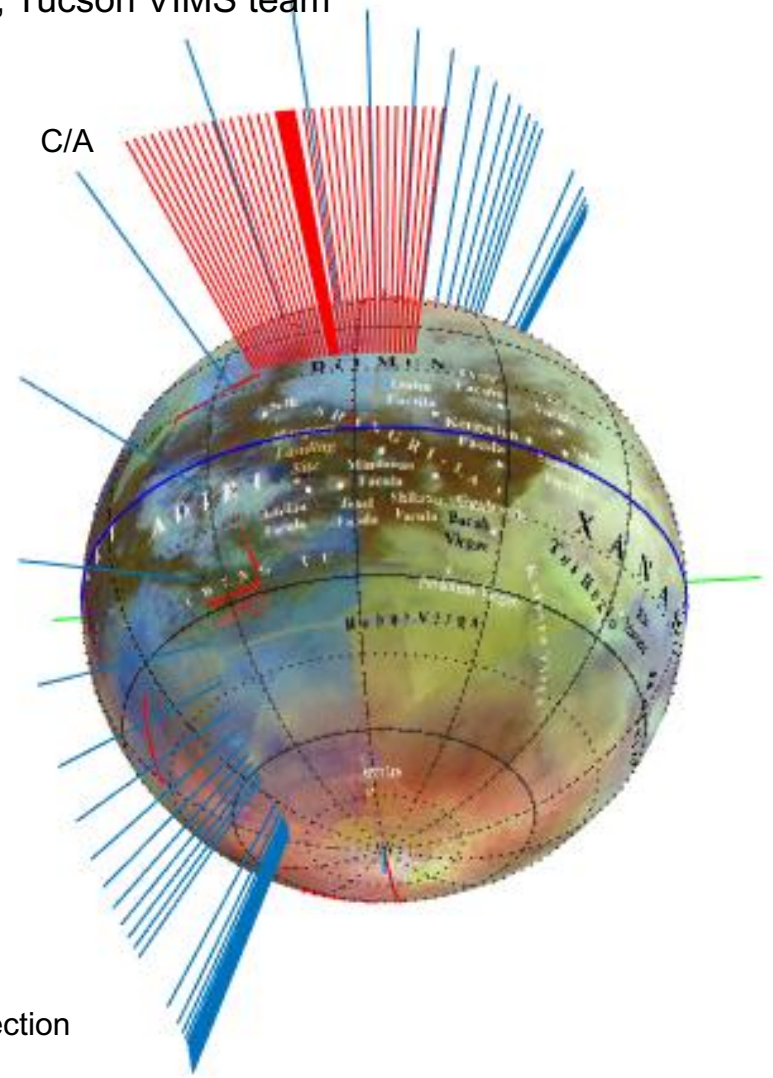
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

”Noodle” mode observations across Adiri and the dune fields (TN1a).

Mosaic of the mid-southern latitudes at 10 km/px with large incidence angles (TN1a).

Monitor the evolution of the cloud system at the South Pole (TC1a and TC1b).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

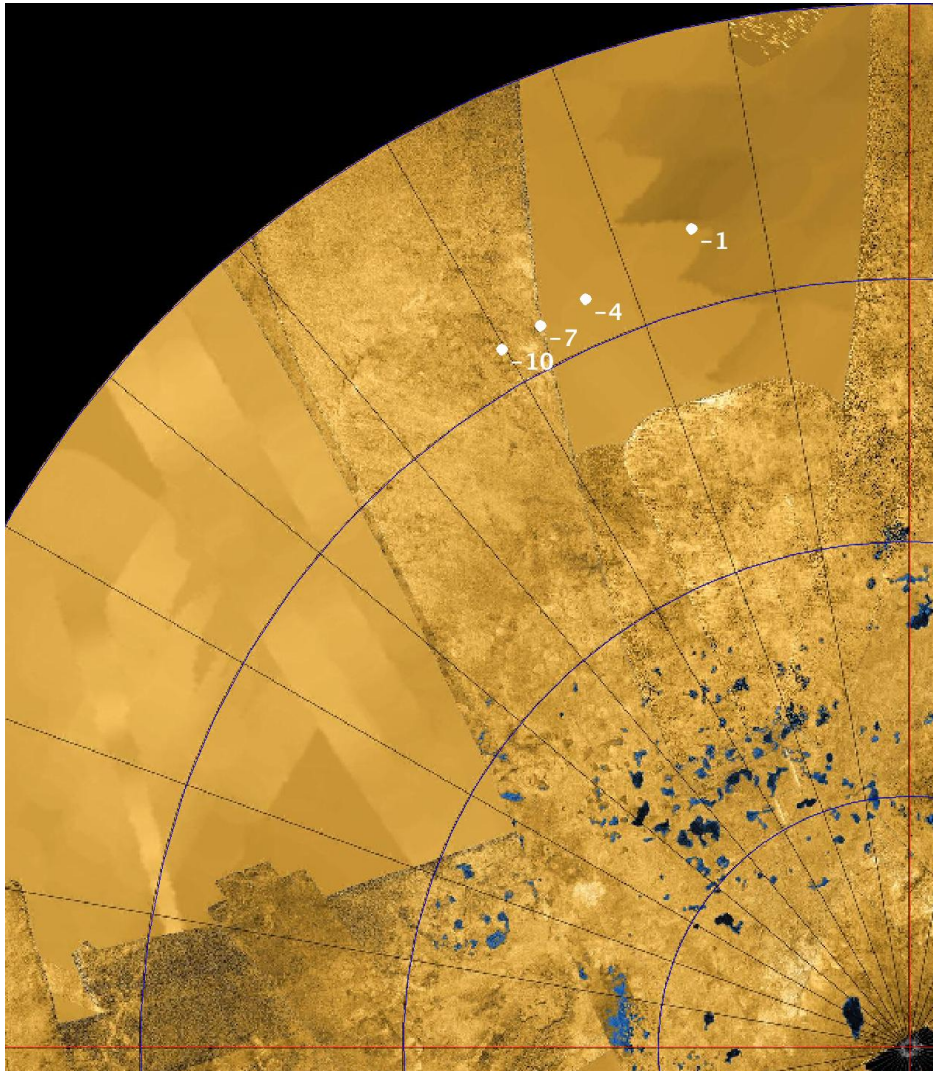
T094 – rev 197 – S80

Sept. 12, 2013 – 255T07:43:56 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
58.51	149.7	42.7	-36000	-10
58.43	152.9	42.5	-25200	-7
58.28	156.6	42.1	-14400	-4
57.10	165.1	39.5	-3600	-1



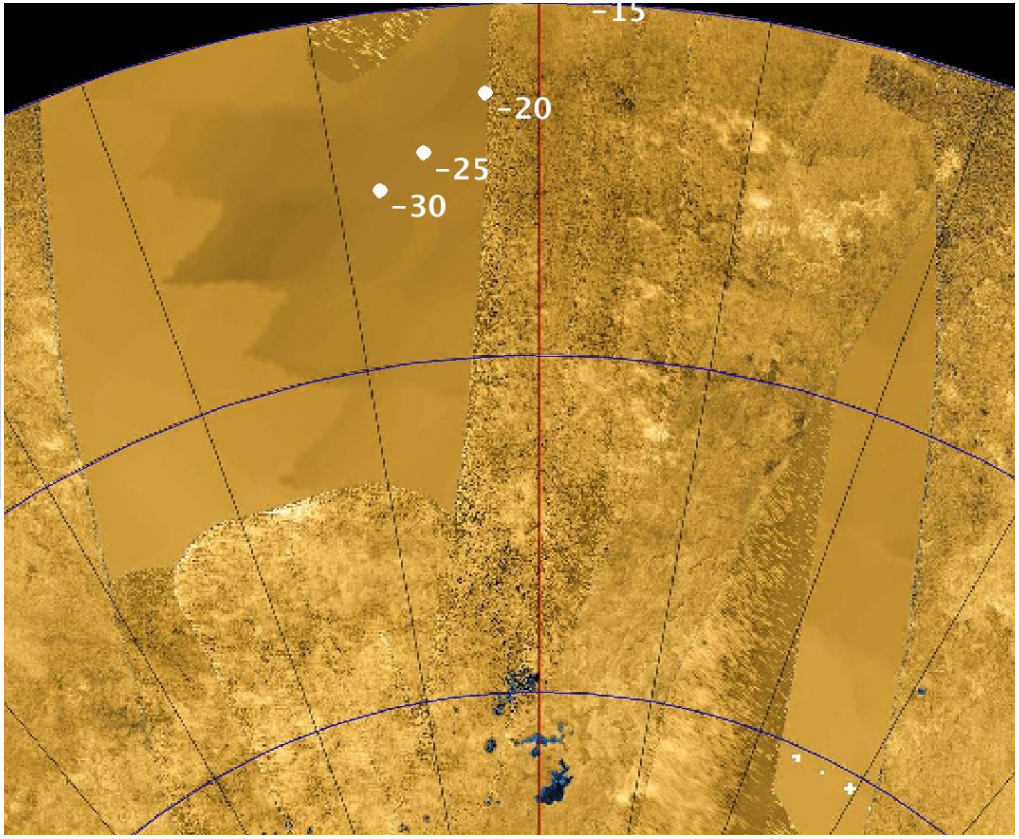
T094 – rev 197 – S80

Sept. 12, 2013 – 255T07:43:56 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (min)
54.95	172.1	36.1	-1800	-30
54.04	174.4	34.9	-1500	-25
52.48	177.5	33.0	-1200	-20
49.79	181.7	30.0	-900	-15



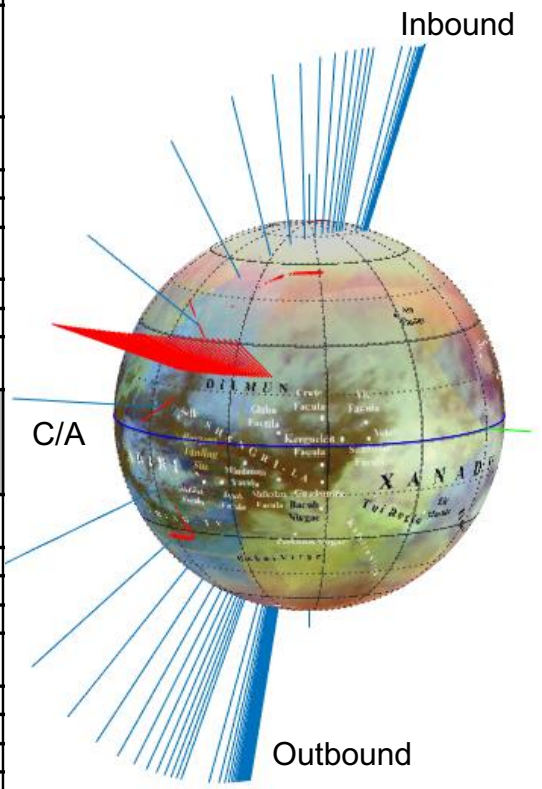
T095 – rev 198 – S80

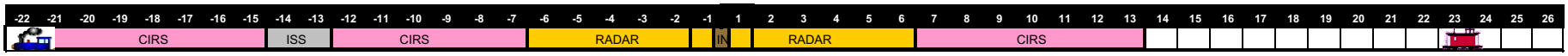
Oct. 14, 2013 – 287T04:56:27 @ 961 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T095: Radar and INMS are the prime instruments at closest approach during this flyby (961 km). The instrument will be "sleeping" from -6 hours and +6 hours relative to C/A to allow for enough power for the RADAR warmup. On the inbound, wing, VIMS will ride along with CIRS, acquiring low spatial resolution images of the Northern Polar area where long integration times will be used to map the lake areas. VIMS will also look for the presence of clouds in the northern hemisphere. The surface area for seeing specular reflection at 5 microns is located at latitudes lower than 60 degrees. On the out-bound wing, VIMS will look for the presence of clouds in the southern hemi-sphere and will monitor the evolution of the southern polar vortex.

C/A-21:46:27	-14:00	CIRS	A2 (Tc1b)
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
-12:00	-09:00	CIRS	D2 (TN1c)
-09:00	-06:00	CIRS	F1 (TC1b OR TN1c)
-06:00	-02:15	RADAR	L+F1 (TN2c, TN2c)
-02:15	**-01:00**	**RADAR scatterometry/radiometry**	(TN2c,TN1a)
-01:00	**-00:31**	**RADAR HiSAR**	(TN1a, TN1b, TN2c)
-00:31	**-00:30**	RWA to RCS Transition	
-00:18	**0**	**INMS**	**RADAR ridealong (TN1a, TN1b, TN2b, TN1c, MC2a)**
2013-287T04:56:27		**CLOSEST APPROACH**	**NEG_X to RAM, NEG_Z to Titan(Tc2a)**
0	**+00:18**	**INMS**	**RADAR ridealong (TN1a, TN1b, TN2b, TN1c, MC2a)**
+00:18	**+00:30**	**RADAR Altimetry**	**(TN2b)**
+00:30	**+00:52**	RCS to RWA Transition	
+00:52	**+01:12**	**RADAR HiSAR**	**(TN1a, TN1b, TN2c)**
+01:12	**+02:15**	**RADAR scatterometry/radiometry**	**(TN1a,TN2c)**
+02:15	+06:00	**RADAR**	**L+R1 (TN2c, TN2c)**
+06:00	+09:00	CIRS	R1 (TN1c or Tc1b, decided in implementation)
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+13:53:33	CIRS	M4 (Tc1b (TN1c on outbound))





T095 – rev 198 – S80

Oct. 14, 2013 – 287T04:56:27 @ 961 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

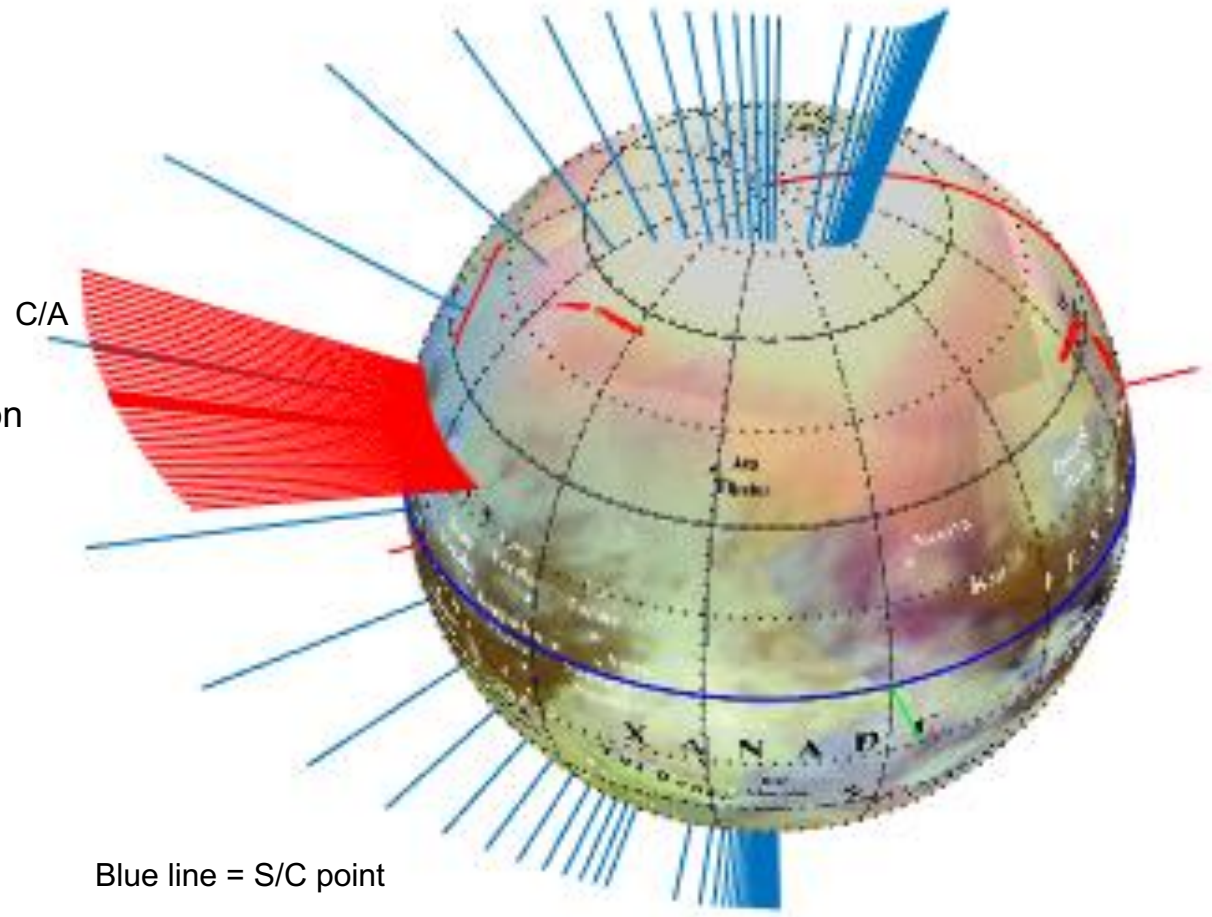
Inbound:

In “sleep” mode beginning at C/A – 06:00

Acquire low spatial resolution images of the Northern Polar region to map the lake area.

Look for the presence of clouds in the northern hemisphere.

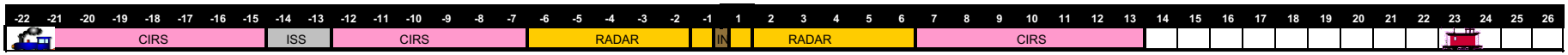
Specular reflection geometry occurs at latitudes lower than 60 degrees.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T095 – rev 198 – S80

Oct. 14, 2013 – 287T04:56:27 @ 961 km altitude

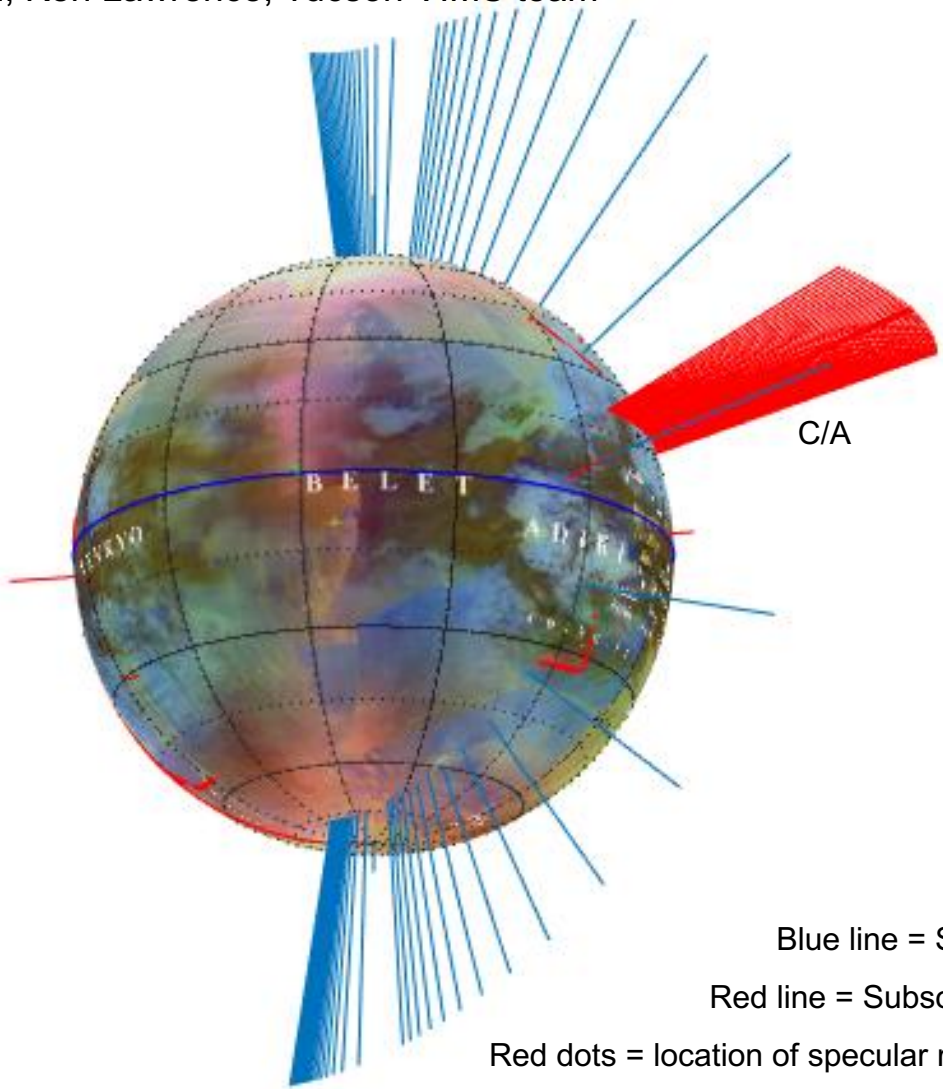
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

In “sleep” mode until C/A + 06:00

Look for the presence of clouds in the southern hemisphere

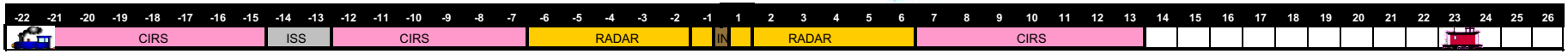
Monitor the evolution of the southern polar vortex.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



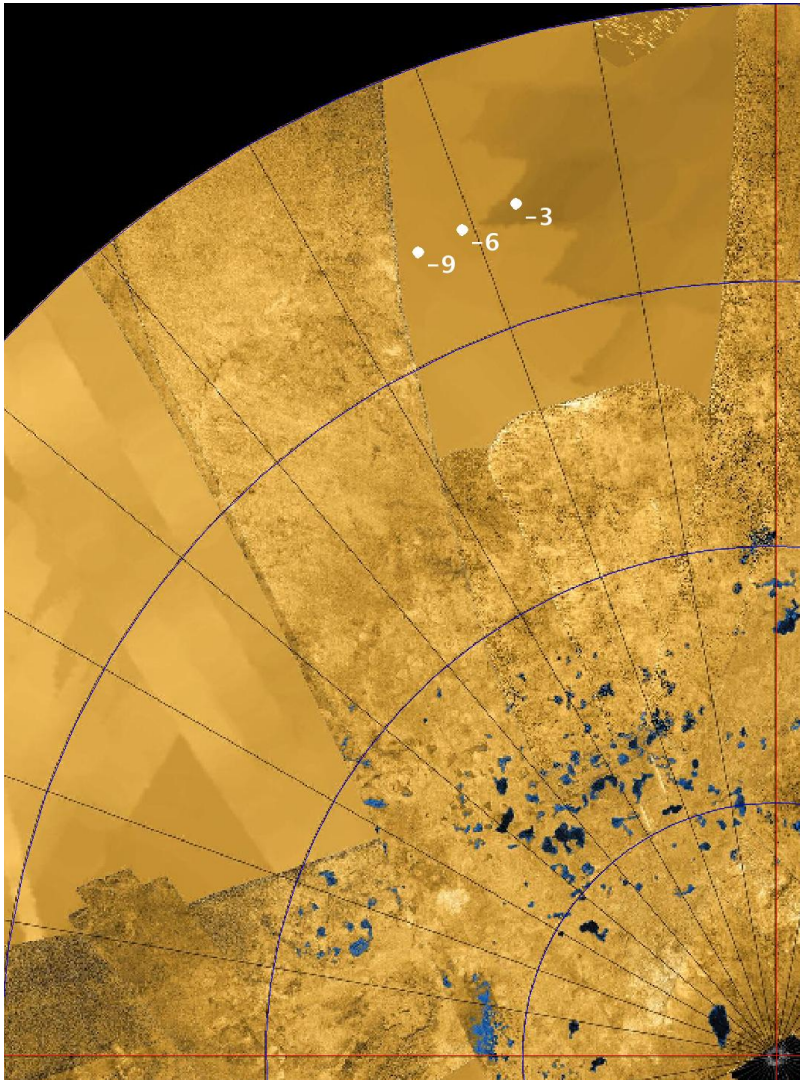
T095 – rev 198 – S80

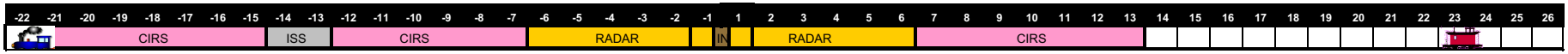
Oct. 14, 2013 – 287T04:56:27 @ 961 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
56.16	156.0	38.5	-32400	-9
56.02	159.2	38.3	-21600	-6
55.76	163.0	37.8	-10800	-3





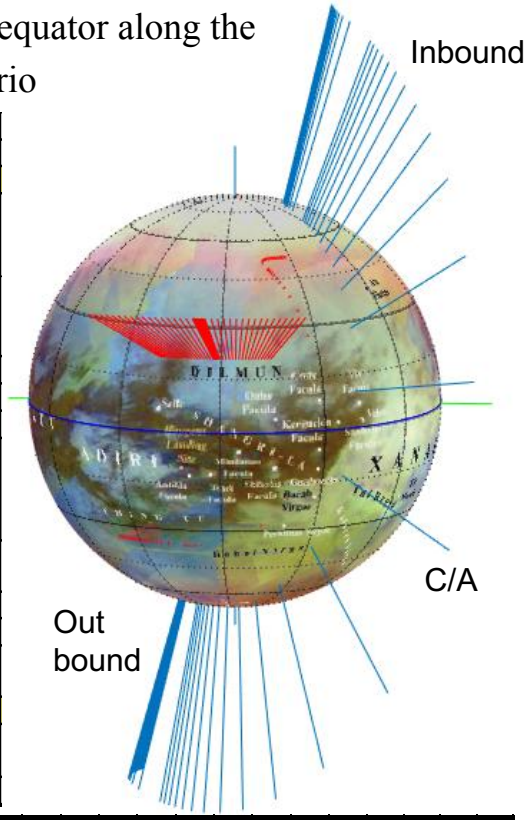
T096 – rev 199 – S81

Dec. 1, 2013 – 335T00:41:19 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T096: VIMS is prime at closest approach (1400 km) during this flyby. During the inbound, VIMS will ride along with ISS to acquire a medium resolution mosaic of high northern latitudes. It will also look for clouds over the North Pole to monitor the evolution of the cloud system as Titan approaches summer solstice. VIMS will also look for specular reflection in an area located between latitudes 53N and 48 N and between longitudes 130 W – 163 W. During closest approach VIMS will first acquire a high resolution map of the northern seas and lakes. It will then use the noodle mode to acquire high-resolution swath over terrains from high northern latitudes to the equator along the western edge of Xanadu. Then, at the end of its prime observation, it will stare to Ontario lacus (72.5 S, 182.5 W) which will be on the terminator. VIMS will then ride along with CIRS and UVIS to image Titan's southern hemisphere at high incidence angle. It will also look at clouds to follow the evolution of the cloud system over the South Pole.

C/A-20:01:19	-14:00	CIRS	A2 (Tc1b)
-13:00	-09:00	CIRS	C (TN1c)
begin custom period			
-09:00	-05:00	ISS	H (TC1a, TN1a, TN2c (Could also be TC1b and/or TN1c, depending on geometry, or TN2d, depending on timing.))
-05:00	-02:15	ISS	J1 (TC1a, TN1a (Could also be TC1b and/or TN1c, depending on geometry, or TN2c and TN2d, depending on timing.))
-02:15	**-01:00**	**ISS**	(TC1a, TN1a, TN2c, TN2d)
-01:00	**-00:30**	**VIMS**	(TC1a, TN1a, TN1c, TC1b)
-00:30	**0**	**VIMS**	**(TC1a, TN1a, TN1c, TC1b)**
2013-335T00:41:19		**CLOSEST APPROACH**	**NEG_Y to Titan, NEG_X to COROT helps eliminate heating and rotation, use RA/DEC that's equiv to orbit normal (Tc2a)**
0	**+00:30**	**VIMS**	**VIMS turns CIRS attitude, (TC1a, TN1a, TN1c, TC1b)**
+00:30	**+02:15**	**CIRS**	**TN1c**
+02:15	+05:00	**CIRS**	T (TN2c (surface temperature))
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
end custom period			
+09:00	+13:00	VIMS	O (TN1a (Specular reflection of lakes- depending on geometry))
+13:00	C/A+13:53:41	VIMS	



T096 – rev 199 – S81

Dec. 1, 2013 – 335T00:41:19 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

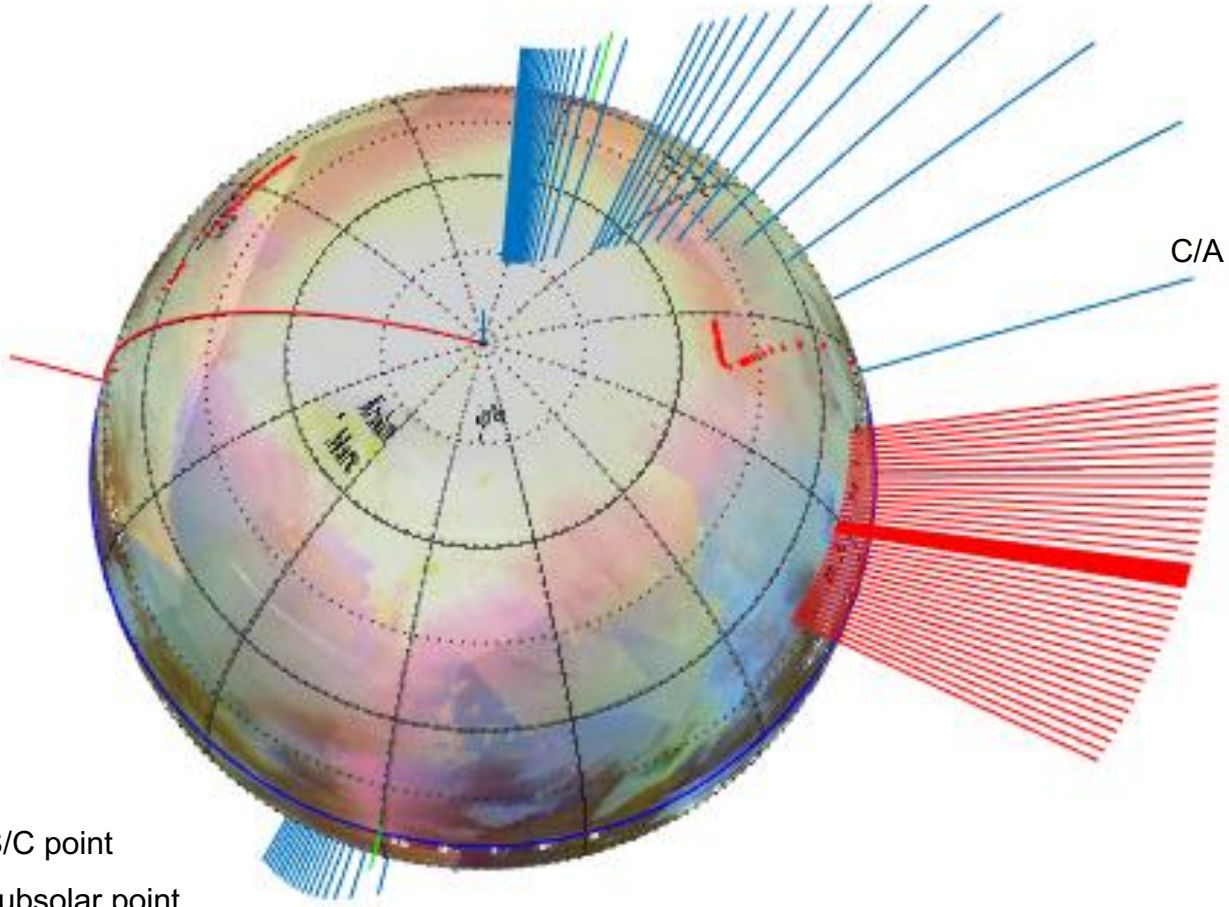
Inbound:

Ridealong with ISS to acquire medium resolution mosaic of high northern latitudes.

Look for clouds over the North Pole and monitor the evolution of the cloud system as Titan approaches the summer solstice.

Look for specular reflection in the area located between latitudes 53 – 48N, 130 – 163 W.

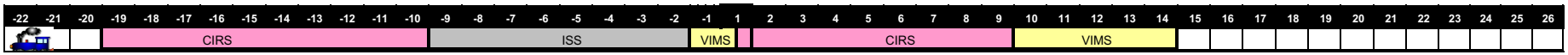
During closest approach, acquire high resolution maps of the northern seas and lakes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T096 – rev 199 – S81

Dec. 1, 2013 – 335T00:41:19 @ 1400 km altitude

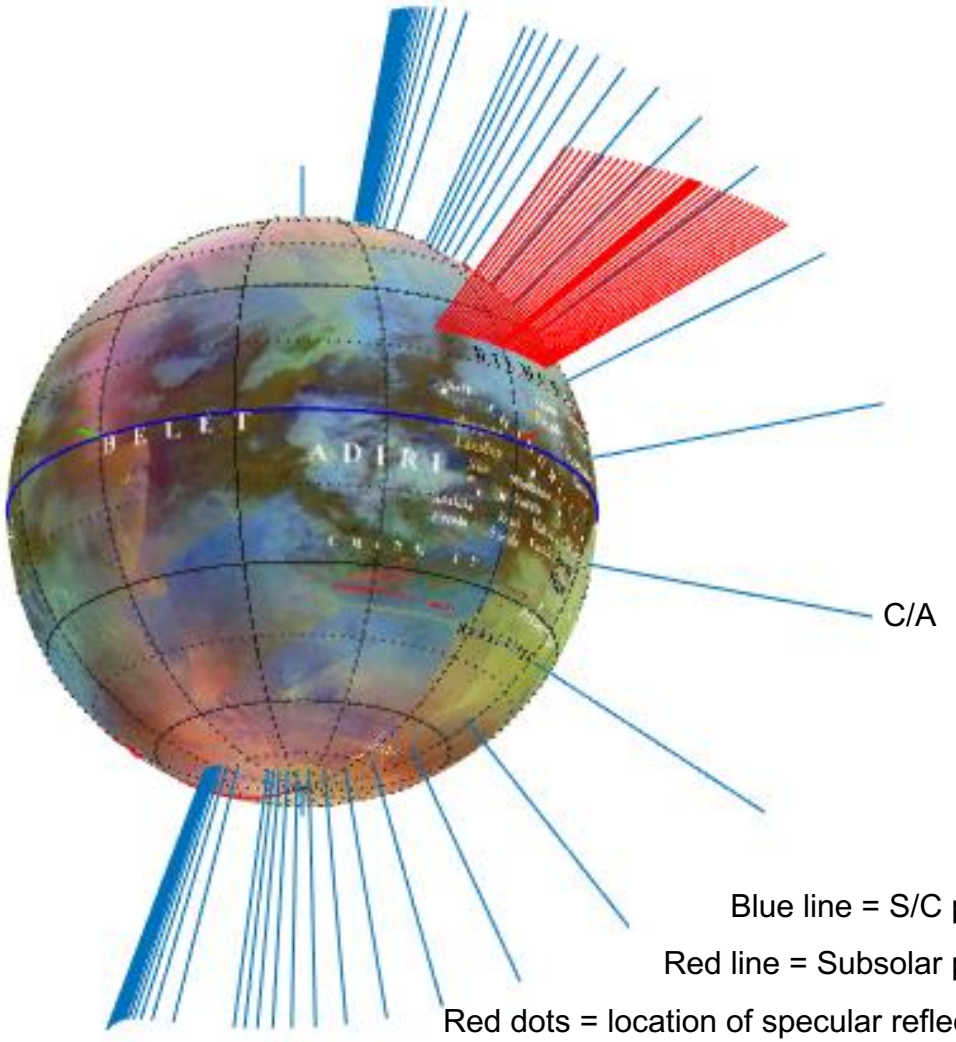
Christophe Sotin, Ken Lawrence, Tucson VIMS team

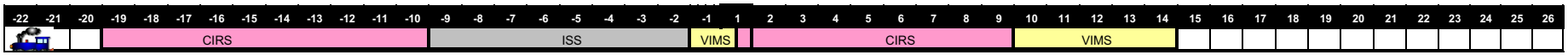
Outbound:

Acquire images in the “noodle mode” from the high northern latitudes to the equator along the western edge of Xanadu.

Observe the clouds over the South Pole to follow their evolution.

Attempt to observe Ontario Lacus (70-75S, 175-190 W 15 – 30 min after closest approach. It will be on the terminator.





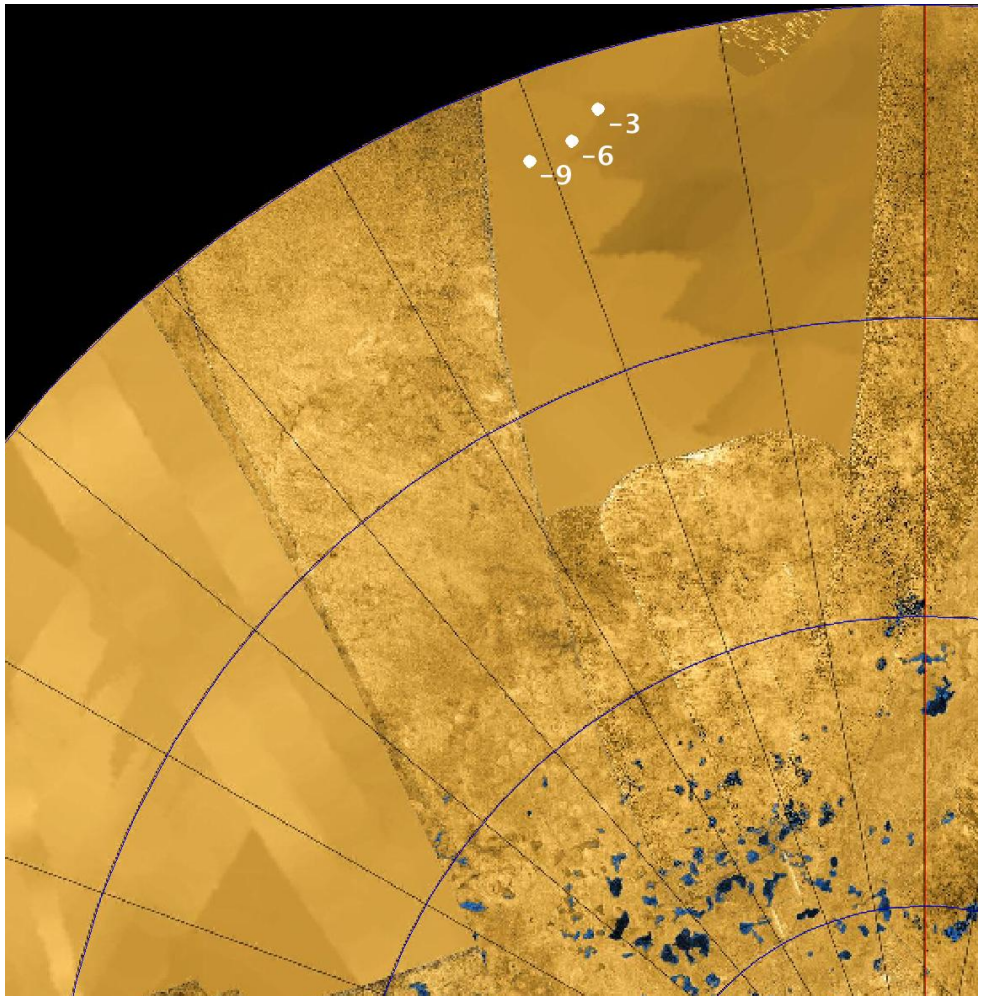
T096 – rev 199 – S81

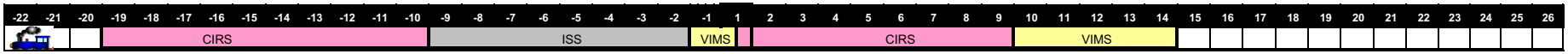
Dec. 1, 2013 – 335T00:41:19 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
52.61	159.0	33.66	-32400	-9
52.48	161.4	33.64	-21600	-6
51.77	163.2	33.26	-10800	-3





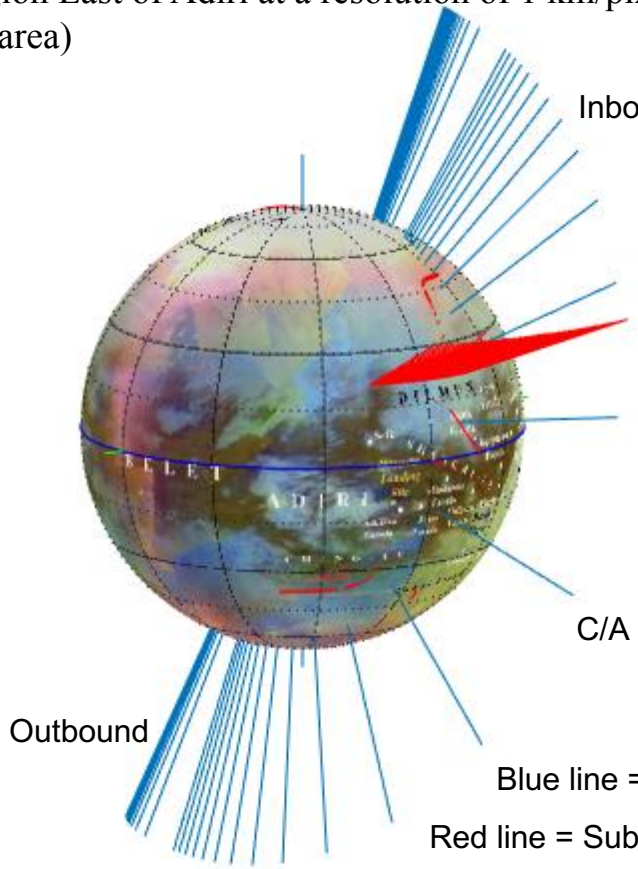
T097 – rev 200 – S82

Jan. 1, 2014 – 001T21:59:41 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T097: During this flyby, VIMS is the prime instrument during closest approach from Titan's surface (1400km). During the inbound, VIMS will map the lakes and seas of the North Pole area. As the spacecraft moves from the North Pole to the South Pole, the pushbroom will be used to map the equatorial region East of Adiri at a resolution of 1 km/pixel. VIMS will also look for clouds during both the inbound (North Pole area) and the outbound (high southern latitudes).

C/A-19:16:42	-14:00	CIRS	A3 (Tc1b)
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
-12:00	-09:00	CIRS	D2 (TN1c)
-09:00	-02:15	UVIS	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
begin custom period			
-02:15	0	VIMS	(TN1a)
2014-001T21:59:42		CLOSEST APPROACH	NEG_Y to Titan (Tc2a)
0	+00:30	VIMS	VIMS will turn to CIRS attitude
+00:30	+02:15	CIRS	(TC1b, TN1c)
End custom period			
+02:15	+09:00	UVIS	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
+09:00	+09:22	SP Turn to WP	SP turn to CIRS-chosen attitude NEG_Y to Titan, POS_Z to NTP
+09:22	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+16:23:18	CIRS	M4 (Tc1b (TN1c on outbound))



T097 – rev 200 – S82

Jan. 1, 2014 – 001T21:59:41 @ 1400 km altitude

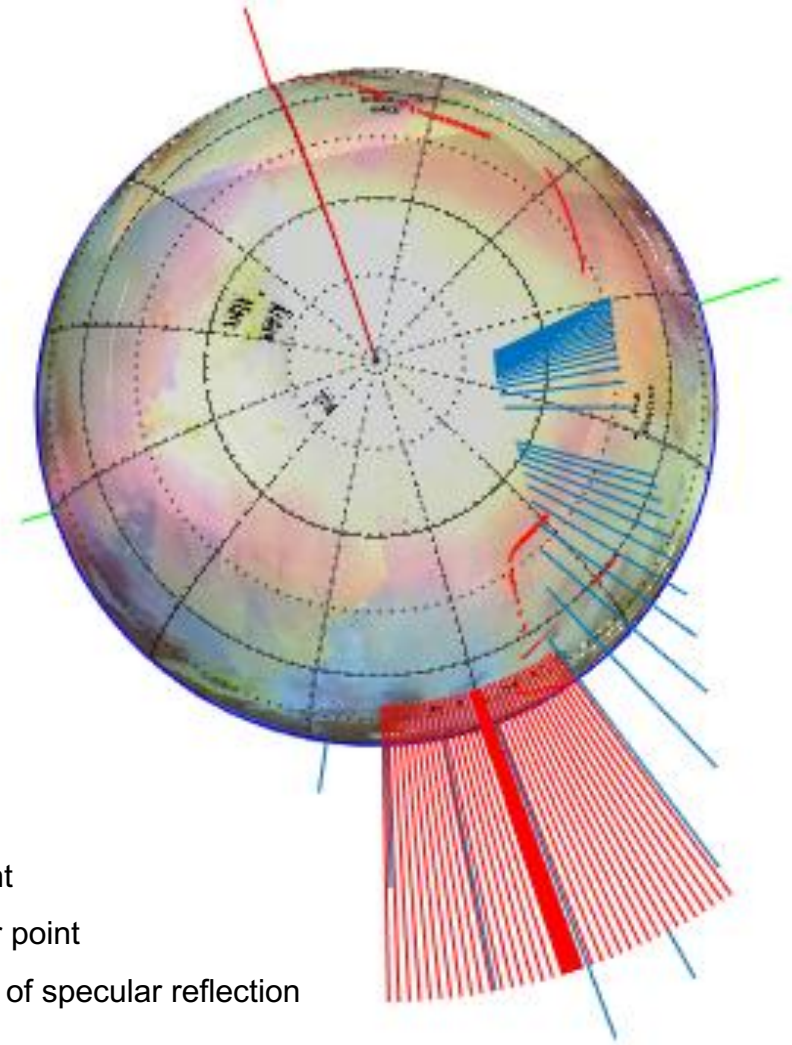
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations of the Northern seas and lakes (TN1a).

Attempt to observe the Huygens Landing Site (10.58 S, 192.37 W) about 10 min prior to closest approach.

Looks for clouds at the high northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T097 – rev 200 – S82

Jan. 1, 2014 – 001T21:59:41 @ 1400 km altitude

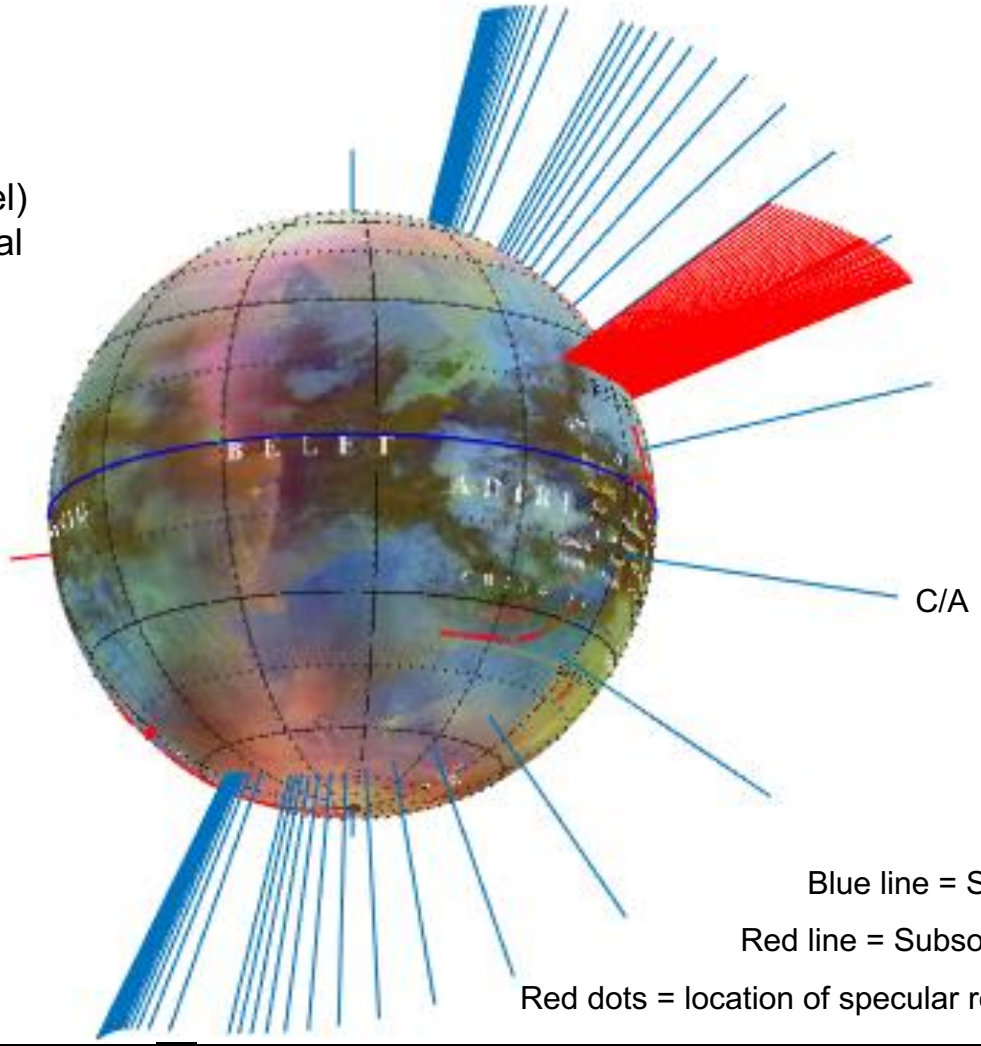
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Obtain a high resolution (1 km/pixel) pushbroom mosaic of the equatorial region east of Adiri.

Look for clouds at high southern latitudes.

Attempt to observe Ontario Lacus (72S, 183 W).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T097 – rev 200 – S82

Jan. 1, 2014 – 001T21:59:41 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at mid-southern latitudes.

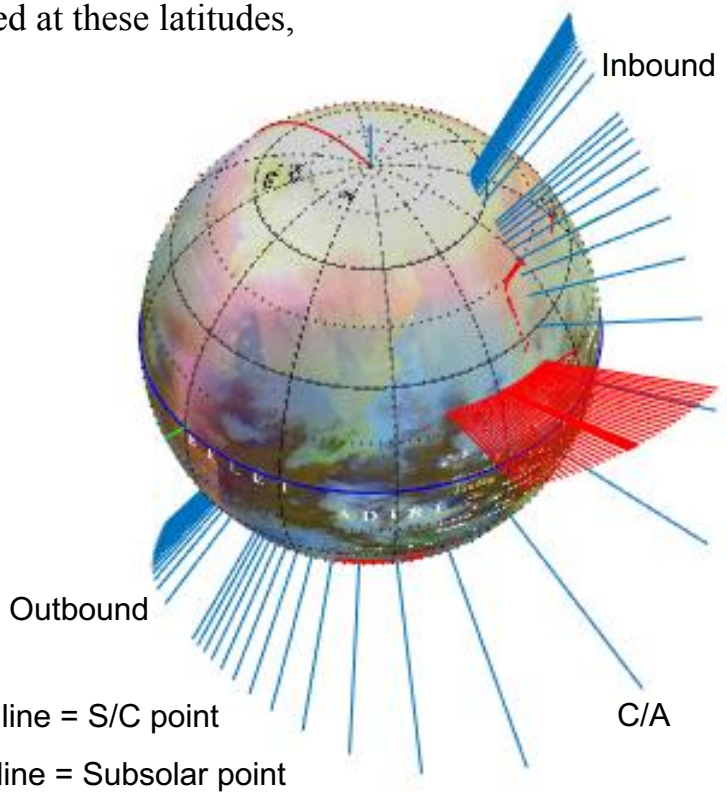
T098 – rev 201 – S82

Feb. 2, 2014 – 033T19:12:38 @ 1236 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T098: There are no VIMS prime observations during this flyby. On the inbound, VIMS will ride along with CIRS and ISS to map the lakes and seas of the North Pole (TC1a and TN1a) and to monitor cloud formation at high northern latitudes (TC1a). On the outbound, VIMS will ride along with CIRS and will observe the evolution of the south polar vortex (TC1b). The geometry for specular reflection is obtained at 44N and 40S on the inbound and outbound, respectively. Although liquid surfaces are not expected at these latitudes, VIMS will observe these regions at 5 microns (TC1a and TN1a).

C/A-18:25:38	-14:00	CIRS	A3 (Tc1b)
-14:00	-09:00	CIRS	C (TN1c)
-09:00	-06:00	ISS	H1 (TC1a, TN1a, TN2c (Could also be TC1b and/or TN1c, depending on geometry, or TN2d, depending on timing.))
-06:00	-02:15	RADAR	L+H1 (TN2c, TN2c)
-02:15	**-01:12**	**RADAR scatterometry/radiometry**	
-01:12	**-00:31**	**RADAR HiSAR**	TC1a, TN1a, TN1b, TN2b
-00:31	**-00:30**	RWA to RCS Transition	
-00:30	**-00:18**	**RADAR Altimetry**	TN2b
-00:18	**0**	**RADAR SAR**	TC1a, TN1a, TN1b, TN2b
2014-033T19:12:38		**CLOSEST APPROACH**	**NEG_Z to Titan (Tc2a)**
0	**+00:18**	**RADAR SAR**	TC1a, TN1a, TN1b, TN2b
+00:18	**+00:36**	**RADAR Altimetry**	TN2b
+00:36	**+00:58**	RCS to RWA Transition	
+00:58	**+01:18**	**RADAR HiSAR**	TC1a, TN1a, TN1b, TN2b
+01:18	**+02:15**	**RADAR scatterometry/radiometry**	TN2c, TN1a
+02:15	+06:00	**RADAR**	L+R1 (TN2c, TN2c)
+06:00	+09:00	CIRS	R1 (TN1c or Tc1b, decided in implementation)
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+18:59:22	CIRS	M4 (Tc1b (TN1c on outbound))



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T098 – rev 201 – S82

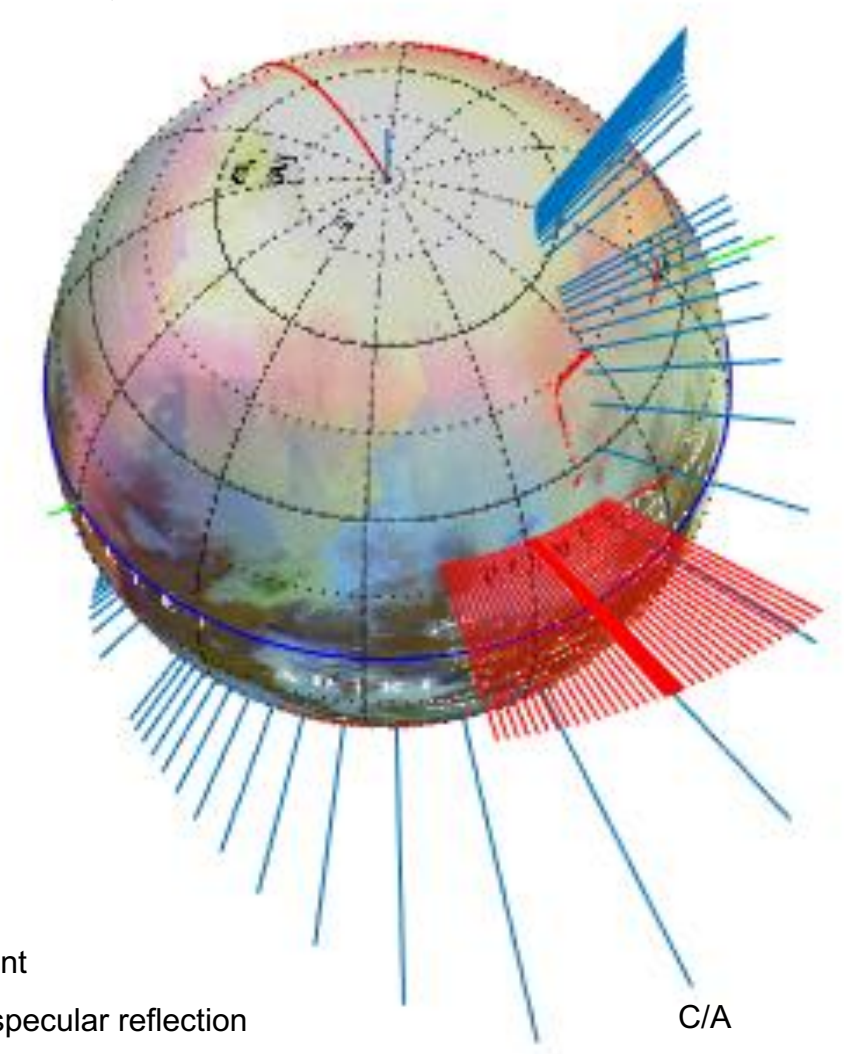
Feb. 2, 2014 – 033T19:12:38 @ 1236 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

VIMS will ridealong with CIRS and ISS to map the lakes and seas of the North Pole (TC1a and TN1a).

Monitor the formation of clouds at high northern latitudes (TC1a).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A

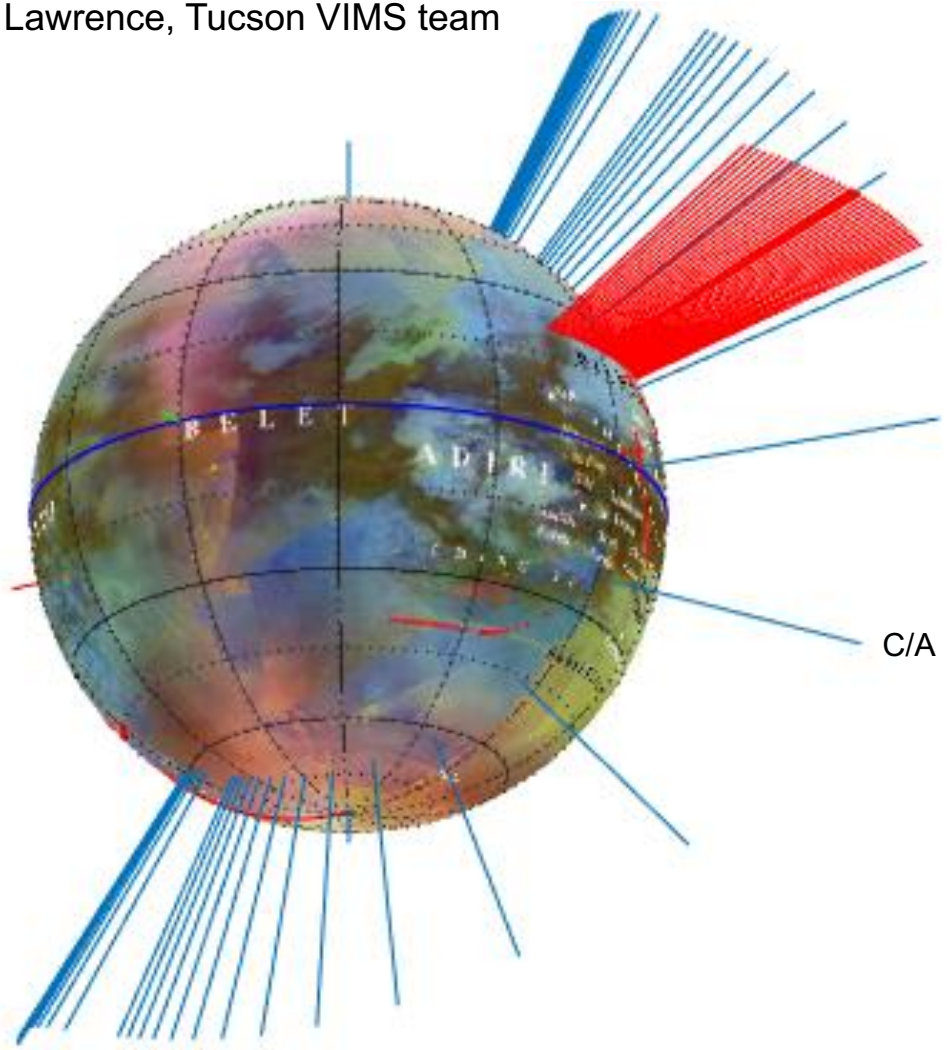
T098 – rev 201 – S82

Feb. 2, 2014 – 033T19:12:38 @ 1236 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Ridealong with CIRS and observe the evolution of the south polar vortex (TC1b).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T098 – rev 201 – S82

Feb. 2, 2014 – 033T19:12:38 @ 1236 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at mid-southern latitudes.

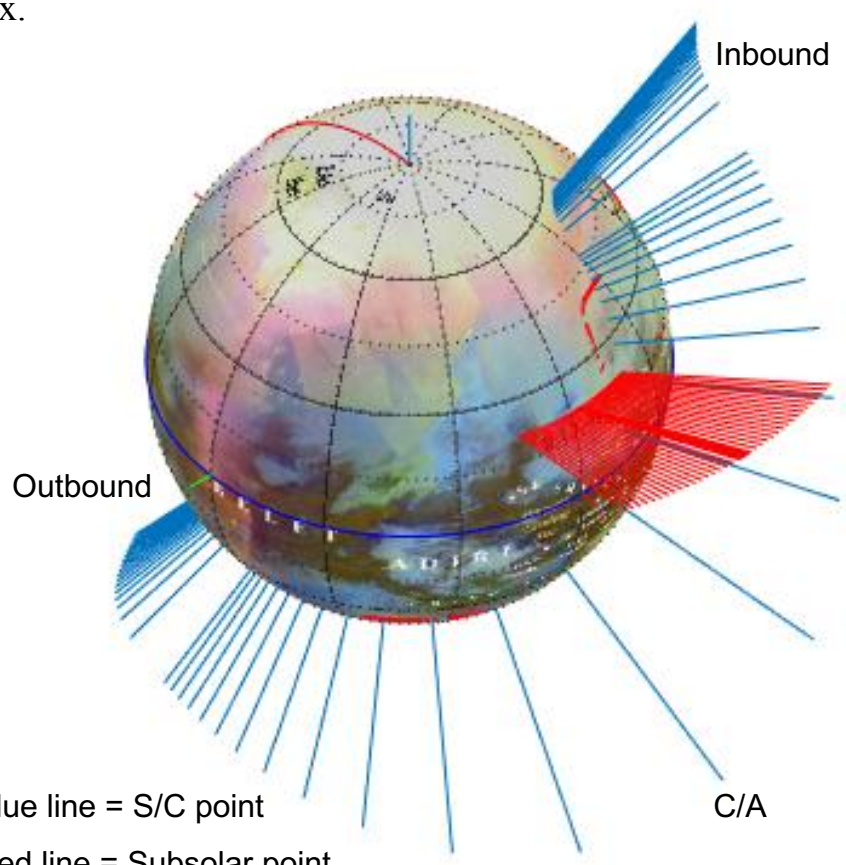
T099 – rev 202 – S82

March 6, 2014 – 065T16:26:47 @ 1500 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T099: T99 is a RSS flyby and VIMS will only have distant observations of Titan that will be used to monitor cloud formations and the evolution of the South Polar vortex.

Start Time	End Time	Prime Activity	Obs. Detail
2014-064T21:56:00	2014-064T22:36:00	SP Turn to WP	XBAND to Earth, NEG_X to NTP
2014-064T22:36:00	C/A-17:35:47	OD Uncertainty Dead Time	
C/A-17:35:47	-14:05	ISS	(TC1a, TC1b, TN1a, TN2c, TN2d)
-14:05	-12:00	RSS	Warm up RSS
-12:00	0	RSS Gravity	CAPS riding along (TN1b)
2014-065T16:26:47		CLOSEST APPROACH	XBAND to EARTH, POS_X to NSP (Tc2a)
0	+12:00	RSS Gravity	CAPS riding along (TN1b)
+12:00	C/A+19:19:13	CIRS	(TC1b)
C/A+19:19:13	2014-066T12:01:00	OD Uncertainty Dead Time	
2014-066T12:01:00	2014-066T12:41:00	SP Turn to Earth for downlink	
2014-066T12:41:00	2014-066T21:41:00	Canberra 70 M	



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

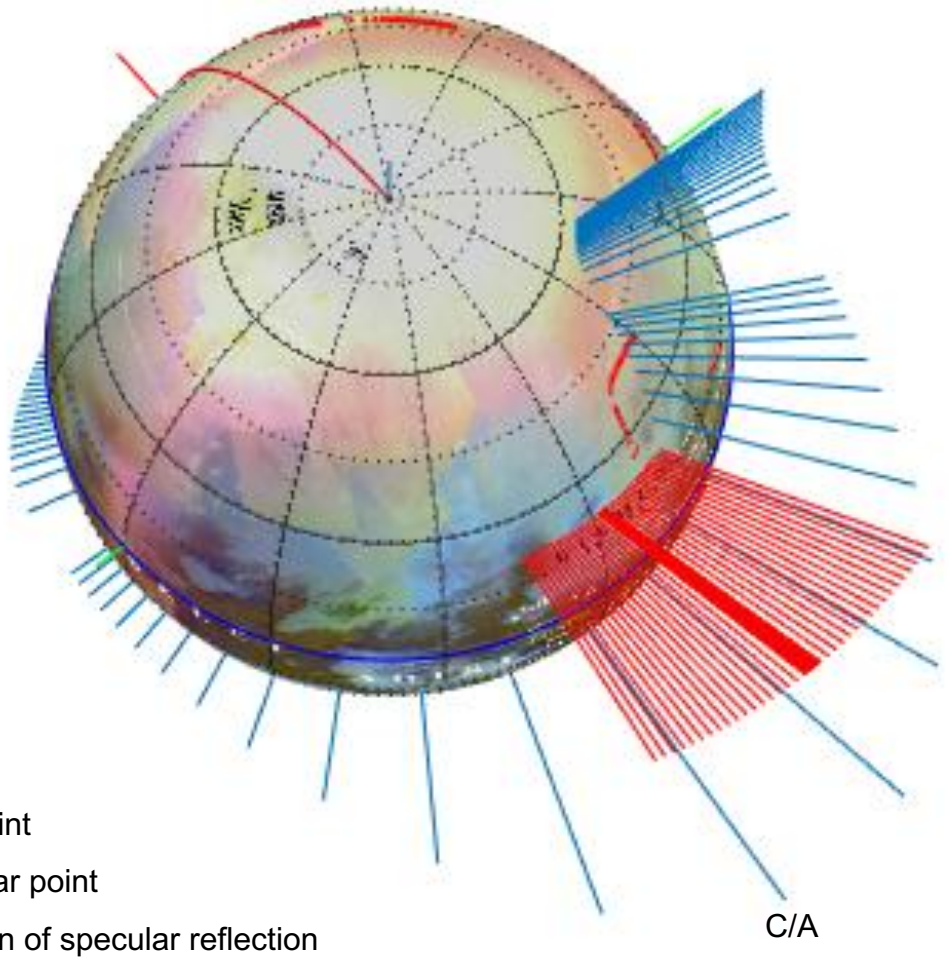
T099 – rev 202 – S82

March 6, 2014 – 065T16:26:47 @ 1500 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Monitor the evolution of the mid-latitude northern clouds and South Polar Vortex.

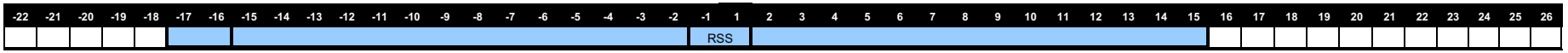


Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A



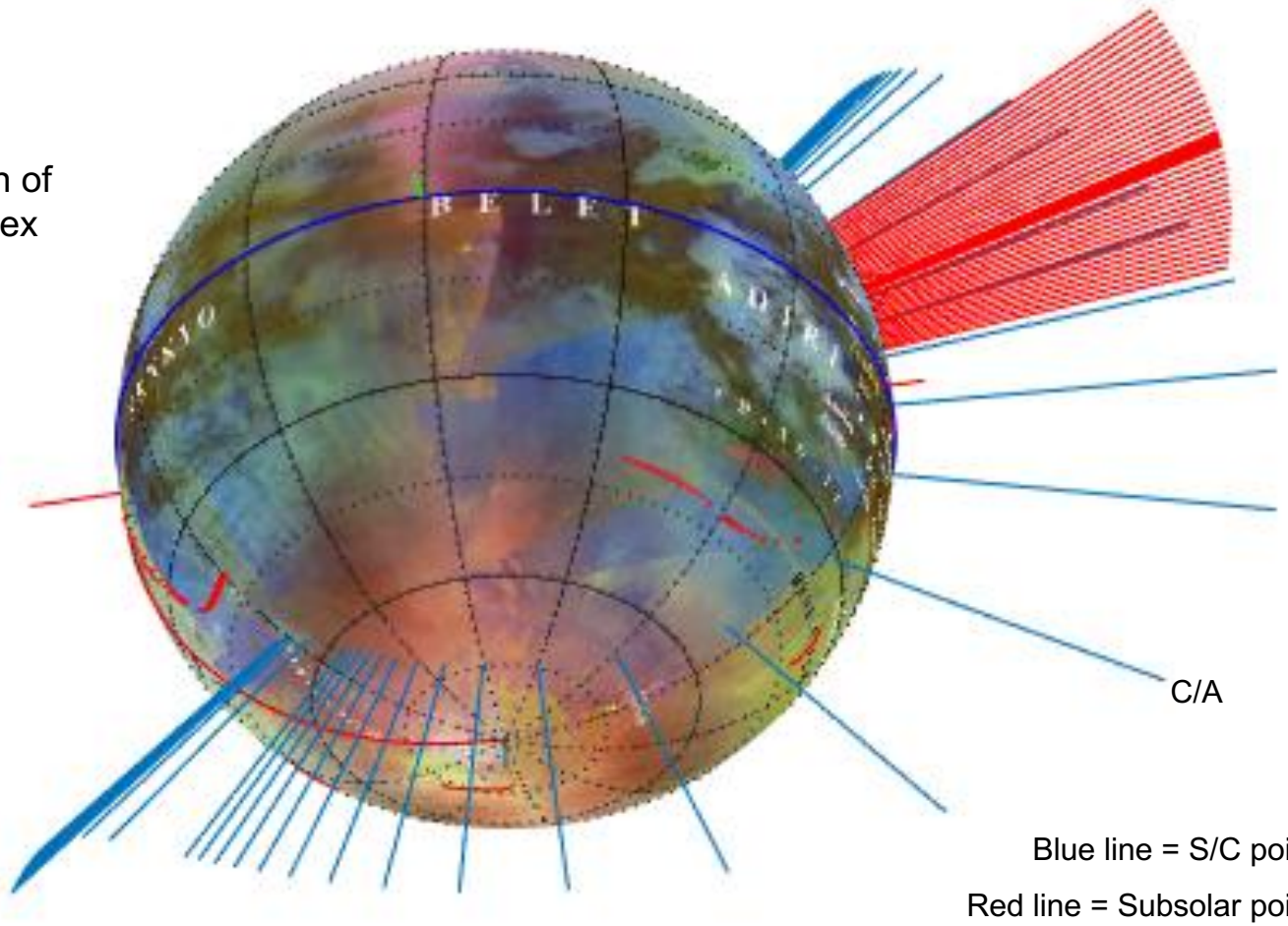
T099 – rev 202 – S82

March 6, 2014 – 065T16:26:47 @ 1500 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

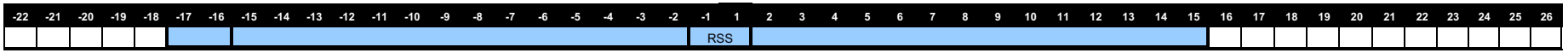
Monitor the evolution of the South Polar Vortex and clouds.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T099 – rev 202 – S82

March 6, 2014 – 065T16:26:47 @ 1500 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at mid-southern latitudes.

T100 – rev 203 – S83

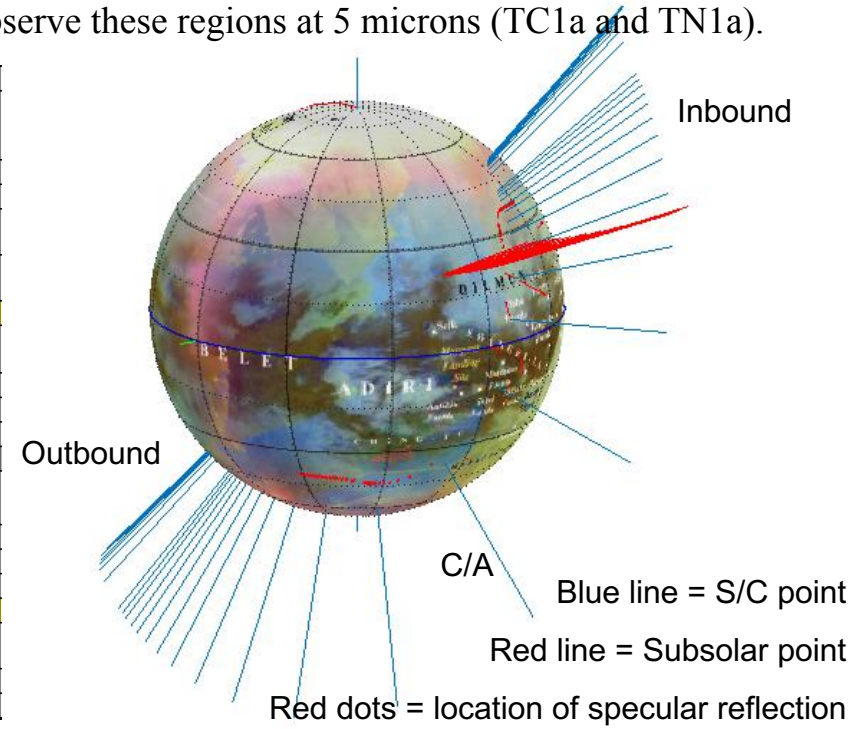
April 7, 2014 – 097T13:41:14 @ 963 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T100: A combination of VIMS, INMS and CIRS are prime during this flyby's closest approach (963 km).

During the inbound, VIMS will map the lakes and seas of the North Pole area (TC1a and TN1a) at medium resolution (20 km/pixel at best). It will also acquire long integration time images of these areas. One hour before closest approach, VIMS will observe a stellar occultation that provides information on the composition of Titan's atmosphere (TC1a) at high northern latitude. It will attempt to acquire a high resolution image (5 km/pixel) before handing off to INMS. On the outbound, VIMS will monitor the evolution of the polar vortex at the South Pole (TC1b). The geometry for specular reflection is obtained at 36N and 40S on the inbound and outbound, respectively. Although liquid surfaces are not expected at these latitudes, VIMS will observe these regions at 5 microns (TC1a and TN1a).

C/A-17:01:15	-14:00	CIRS	A3 (Tc1b)
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
-12:00	-09:00	CIRS	D2 (TN1c)
-09:00	-05:00	VIMS	I (TC1a and TN2c)
-05:00	-02:15	VIMS	Y (TC1a, TN1a (depending on pointing) and TN2c)
-02:15	**-01:22**	**CIRS**	
begin custom period			
-01:22	**-00:33**	**VIMS**	**stellar occ -01:02 to -00:53**
-00:33	**-00:32**	RWA to RCS Transition	
-00:32	**-00:12**	**VIMS**	**VIMS turning to INMS attitude**
-00:12	**0**	**INMS**	**on point at -00:15**
2014-097T13:41:14		**CLOSEST APPROACH**	**NEG_X to RAM, (Tc2a)**
0	**+00:09**	**INMS**	**INMS turns to CIRS attitude**
+00:09	**+01:15**	**CIRS**	
+01:15	**+01:37**	RCS to RWA Transition	
+01:37	**+02:15**	**CIRS**	
end custom period			
+02:15	+09:00	**UVIS**	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+21:23:45	CIRS	M4 (Tc1b (TN1c on outbound))



-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
					CIRS			ISS		CIRS			VIMS								CIR	VI	IN	CIRS								UVIS								CIRS									

T100 – rev 203 – S83

April 7, 2014 – 097T13:41:14 @ 963 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

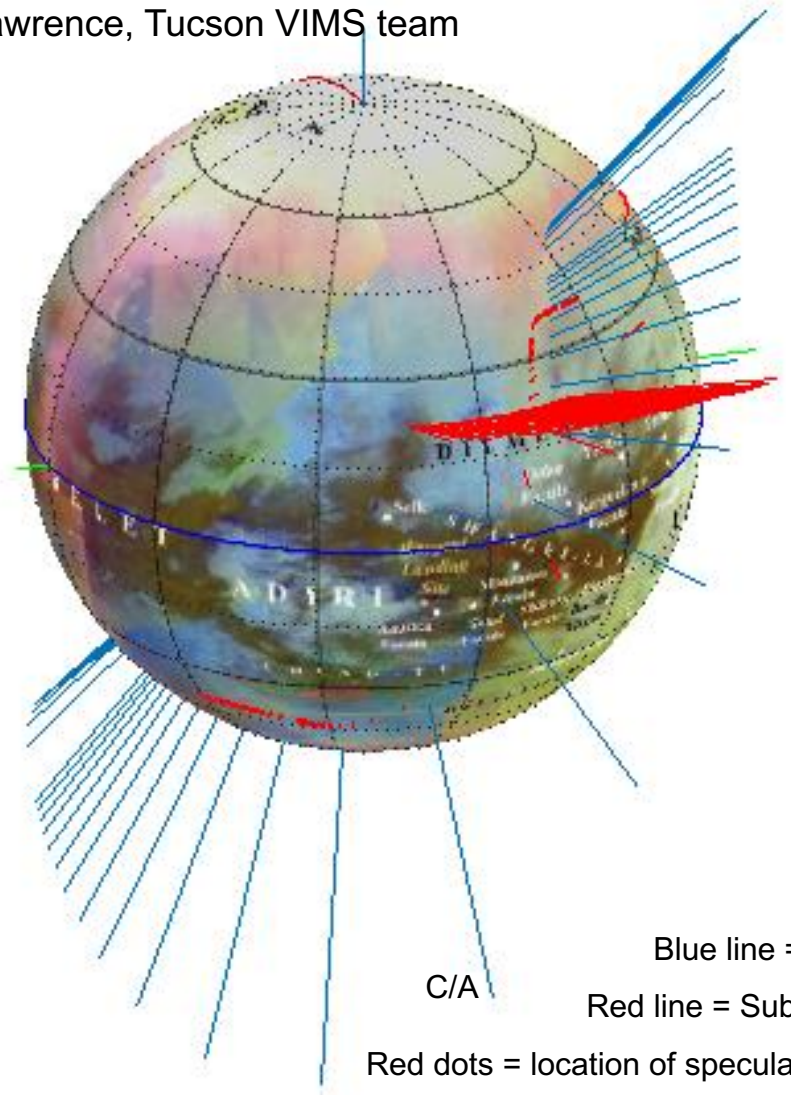
Medium resolution (20 km/pixel at best) maps of the North Pole area while prime between -9:00 and -2:00.

Monitoring cloud formation at high northern latitudes.

Obtain long time exposures on the lake district.

Stellar occultation (α Sco) at -1:02 for 9 minutes (-0:53). Observation starts at -1:22. Probe atmosphere at 62N latitude.

If time permits, possible high resolution image of an area of interest after the stellar occ (great phase angle of less than 20 deg.).



-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
					CIRS			ISS		CIRS			VIMS								CIR	VI	IN	CIRS				UVIS				CIRS																

T100 – rev 203 – S83

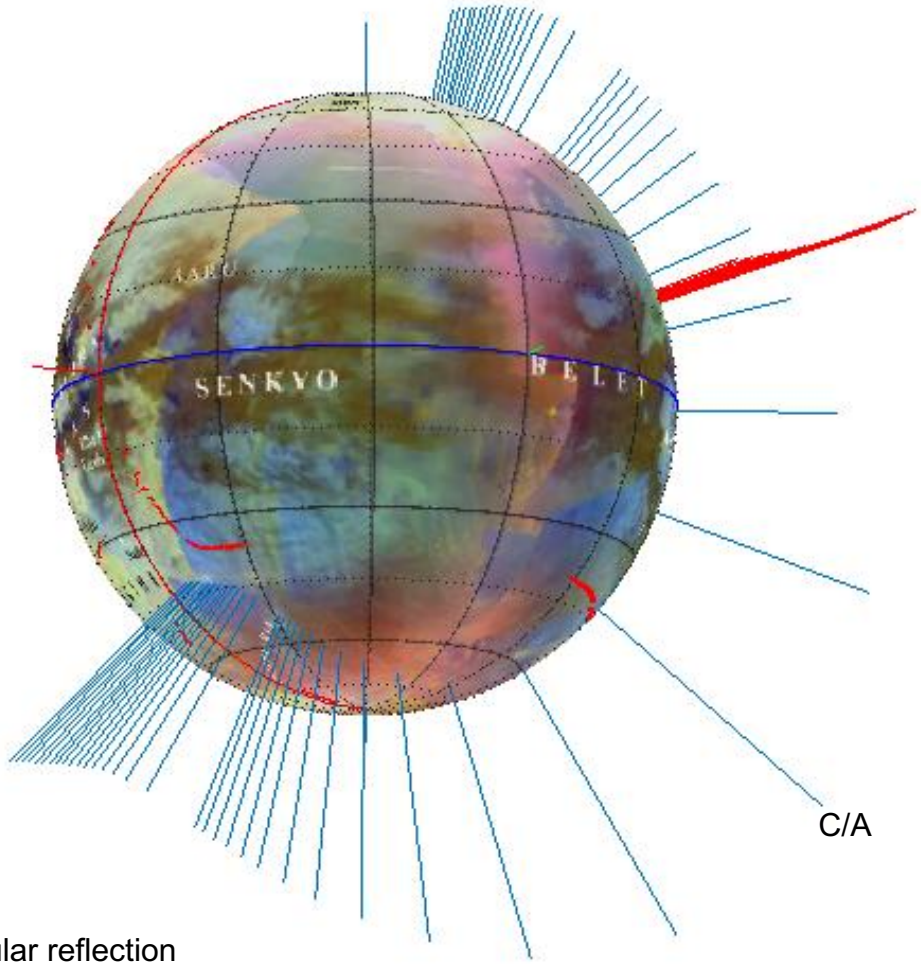
April 7, 2014 – 097T13:41:14 @ 963 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Ridealong observations with UVIS and CIRS.

Observations of the evolution of the South Polar vortex.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T100 – rev 203 – S83

April 7, 2014 – 097T13:41:14 @ 963 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry at mid-northern latitudes. After C/A, at mid-southern latitudes.

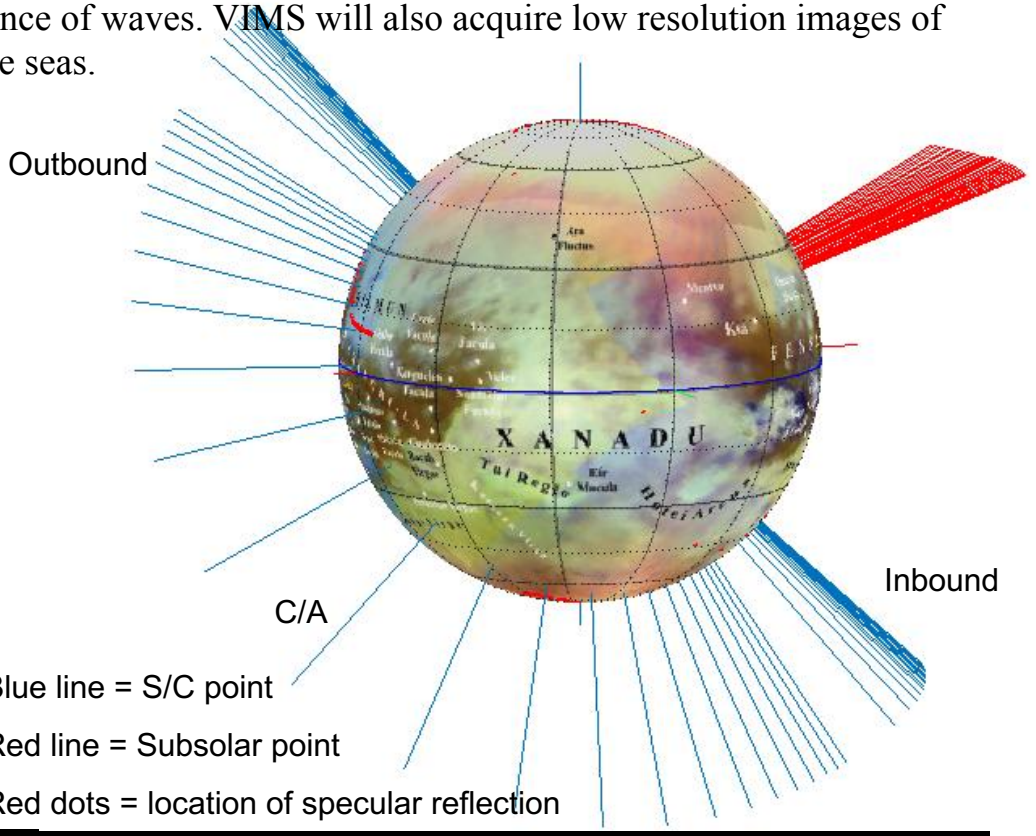
T101 – rev 204 – S83

May 17, 2014 – 137T16:12:15 @ 2994 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T101: RSS is prime during closest approach (2994 km). On the inbound, VIMS will ride along with CIRS and UVIS and monitor the evolution of the South Polar Vortex and cloud activity at high latitudes. VIMS will acquire low resolution (100 km/pixel at best) images while riding along with CIRS and UVIS between the ingress and egress of the stellar occultation. The stellar occultation will provide information on the atmospheric composition while riding along with UVIS. On the outbound, VIMS will ride along with CIRS. The geometry for specular reflection is achieved on Kraken Mare and will provide unique observations on the presence of waves. VIMS will also acquire low resolution images of the North Pole area and will monitor the evolution of the seas.

C/A-22:16:16	-18:30	CIRS	A (Tc1b)
-18:30	-17:40	ISS	D (TC1a, TC1b, TN1a, TN2c)
-17:40	-17:00	SP Turn to WP (occ star)	UVIS_FUV to 206.885/49.313, POS_Z to NEP (0.082,0,0) offset
-17:00	-14:00	UVIS Occ	Eta Ursa Majoris (ingress) (TN1c)
-14:00	-08:45	UVIS	X modified (TN1c, ISS ridealong is photon WAC (TN1c and TC1a))
-08:45	-04:16	UVIS	Eta Ursa Majoris (egress) (TN1c)
-04:16	-04:15	RWA to RCS Transition	
-04:15	-04:05	SP Turn to WP (RSS waypoint)	XBAND to Earth, NEG_Y to NSP
-04:05	-02:10	RSS warm up	
-02:10	**-00:12**	RSS Bistat	(TN1a)
-00:12	**0**	RSS occ	RSS occ time -00:12 to +00:25 (TN2c, TN2d)
2014-137T16:12:15		**CLOSEST APPROACH**	**XBAND to EARTH, (Tc2a)**
0	**+00:25**	RSS occ	(TN2c, TN2d)
+00:25	**+02:10**	RSS Bistat	(TN1a)
+02:10	+2:23	SP turn to WP	NEG_Y to Titan, NEG_Z to Earth
+02:23	+02:45	RCS to RWA Transition	
+02:45	+05:00	CIRS	modified T (TN2c (surface temperature))
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+15:53:45	CIRS	M4 (Tc1b (TN1c on outbound))



T101 – rev 204 – S83

May 17, 2014 – 137T16:12:15 @ 2994 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

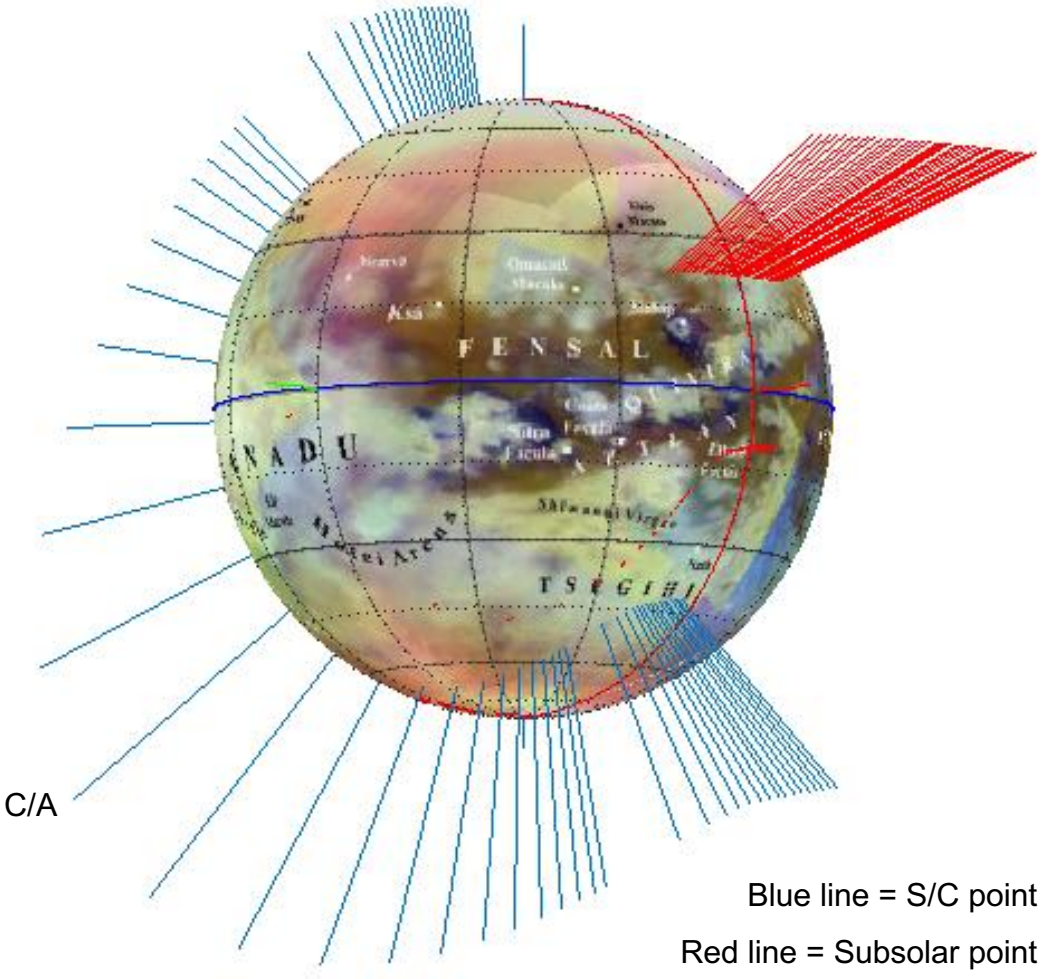
Inbound:

Observations of the evolution of the vortex at the South Pole.

Low resolution (100 km/pixel at best) maps of Titan while riding along with CIRS and UVIS between the ingress and the egress of the stellar occultation.

Stellar occultation while riding along with UVIS – probing the atmospheric composition during ingress and egress.

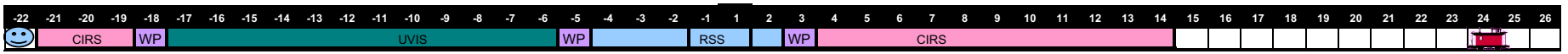
Monitoring cloud activity at high northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T101 – rev 204 – S83

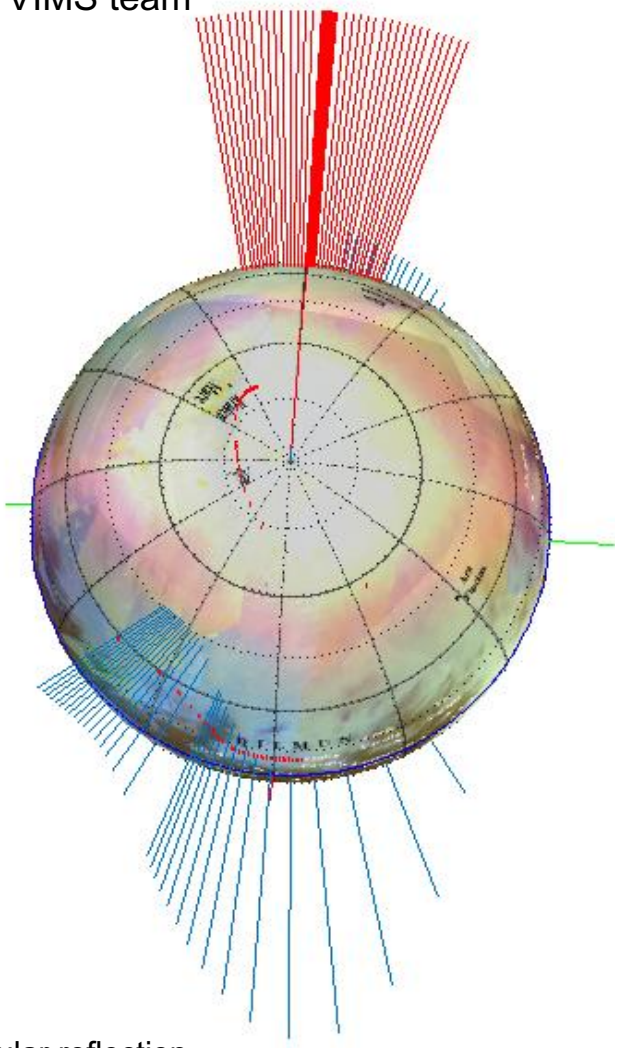
May 17, 2014 – 137T16:12:15 @ 2994 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Specular Reflection geometry occurs over Kraken Mare at 70N, 318 W at C/A + 05:00.

Low resolution (100 km/pixel at best) maps of the North Pole area while riding along with CIRS.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

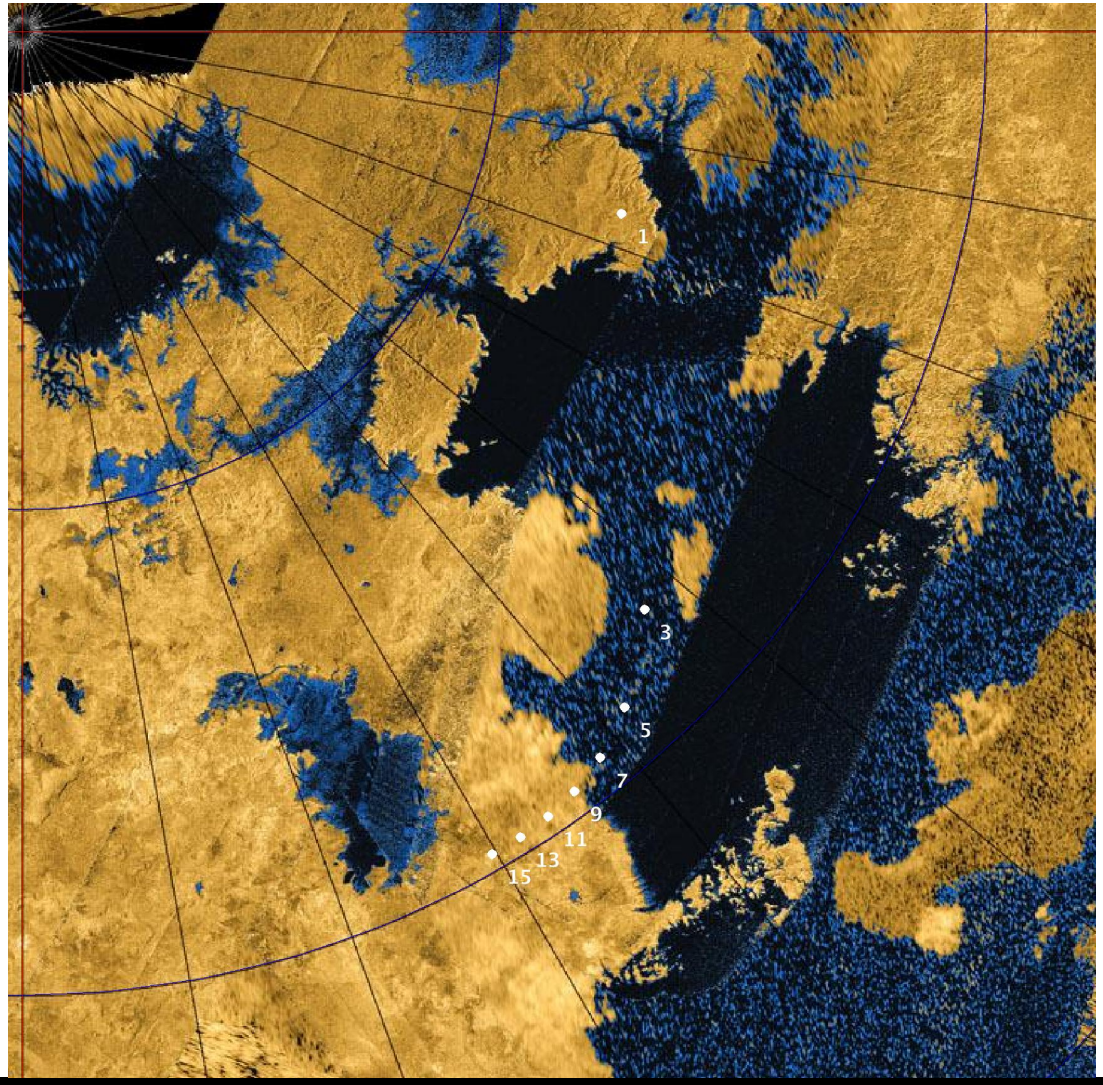
T101 – rev 204 – S83

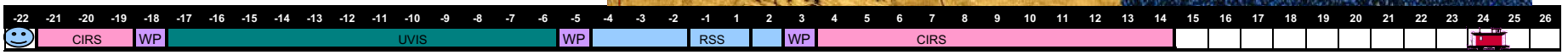
May 17, 2014 – 137T16:12:15 @ 2994 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (hr)
76.94	286.90	65.1	1
72.35	312.90	57.5	3
71.21	318.30	56.0	5
70.74	321.50	55.4	7
70.51	324.00	55.1	9
70.41	326.20	54.9	11
70.35	328.30	54.8	13
70.35	330.30	54.8	15





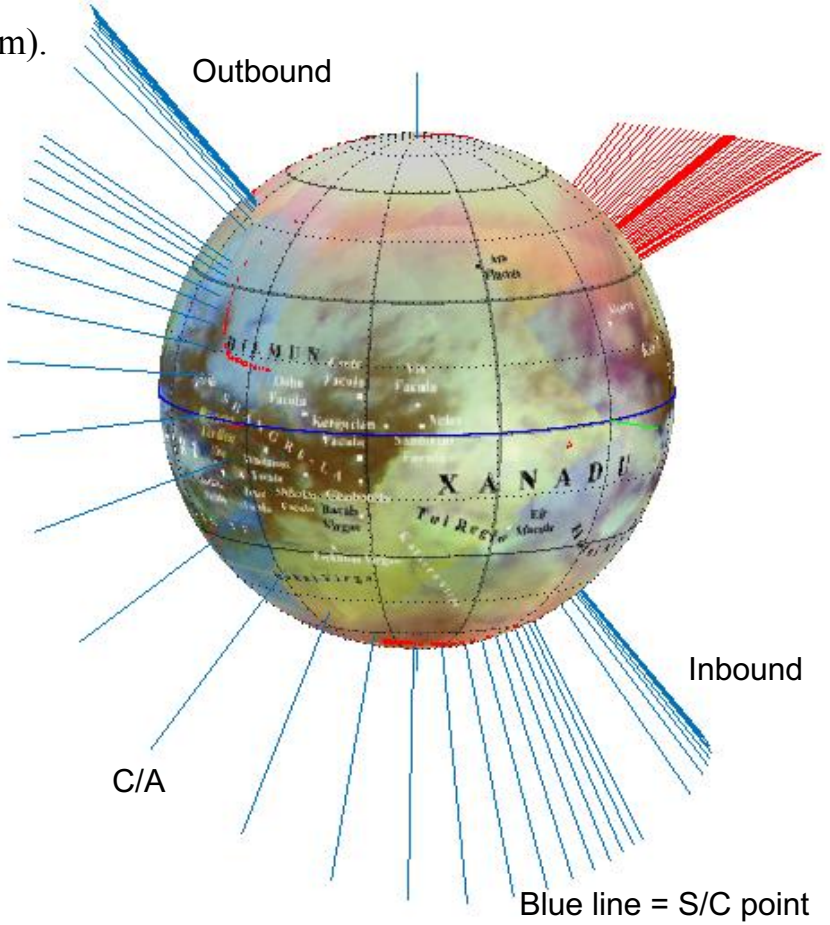
T102 – rev 205 – S84

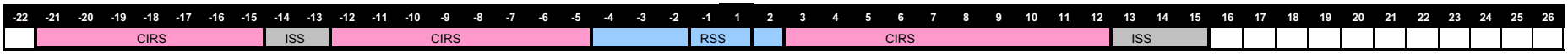
June 18, 2014 – 169T13:28:25 @ 3659 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T102: This flyby, RSS is prime at closest approach (3659 km).

C/A-21:49:25	-14:00	CIRS	A3 (Tc1b)
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
-12:00	-09:00	CIRS	D2 (TN1c)
-09:00	**-04:36**	CIRS	F modified (TC1b OR TN1c)
-04:36	**-04:35**	RWA to RCS Transition	
-04:35	**-04:25**	SP turn to RSS WP	XBAND to EARTH / POS Y to Saturn
-04:25	**-02:10**	RSS warm up	
-02:10	**-00:13**	RSS Bistat	(TN1a) Xband to Earth
-00:13	**0**	RSS occ	(TN2c,TN2d)
2014-169T13:28:25		**CLOSEST APPROACH**	**XBAND to EARTH (Tc2a)**
0	**+00:24**	RSS occ	(TN2c, TN2d)
+00:24	**+02:10**	RSS Bistat	(TN1a)
+02:10	**+02:33**	RCS to RWA Transition	
+02:33	**+03:03**	SP Turn to WP	NEGY to Titan / NEG Z to NEP
+03:03	+05:00	**CIRS**	T modified (TN2c (surface temperature))
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
+09:00	+12:00	CIRS	D2 reversed (TN1c)
+12:00	C/A+15:05:35	ISS	D2 reversed (TN1c)





T102 – rev 205 – S84

June 18, 2014 – 169T13:28:25 @ 3659 km altitude

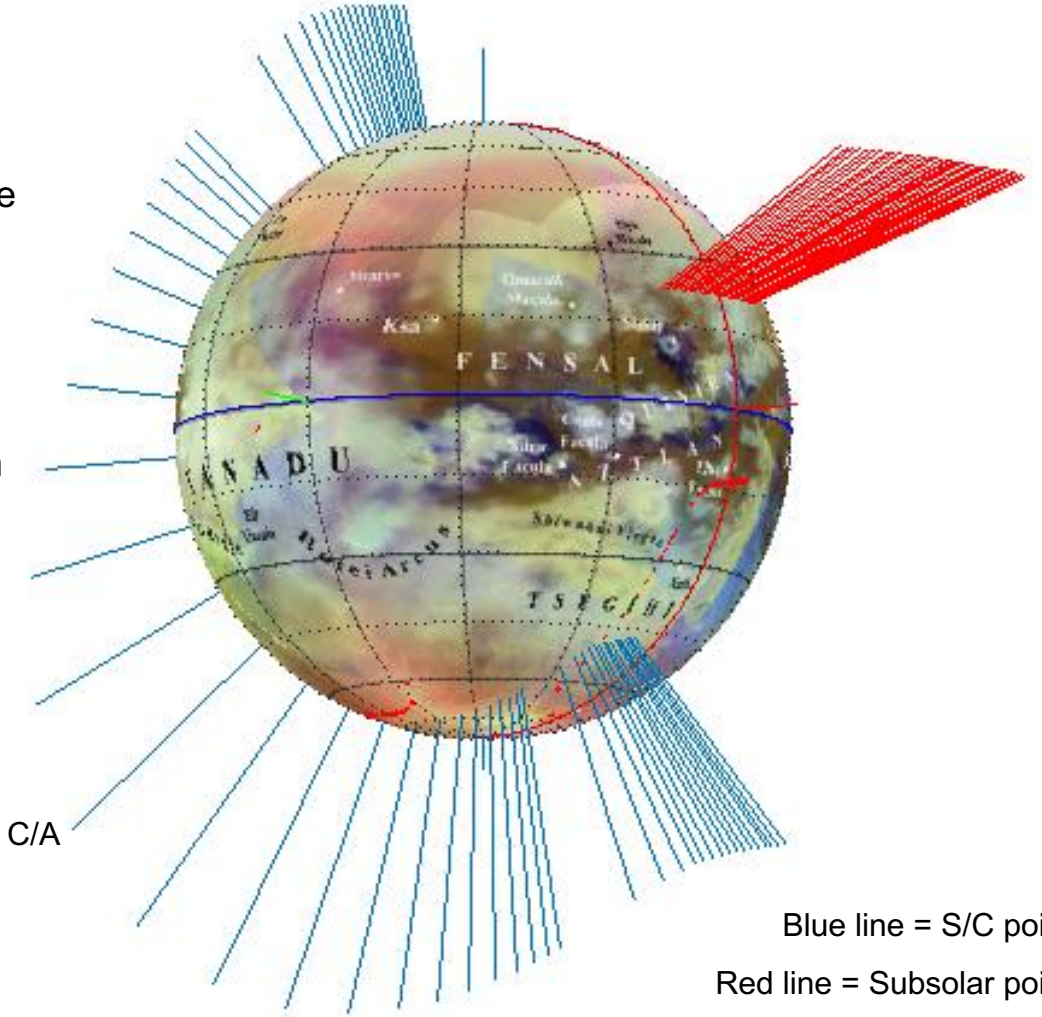
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Ride along with ISS to take images of the southern hemisphere at low resolution (150 km/pixel).

Ridealong with CIRS to take low resolution images of the surface.

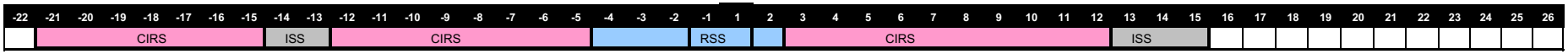
Monitoring cloud activity at high northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T102 – rev 205 – S84

June 18, 2014 – 169T13:28:25 @ 3659 km altitude

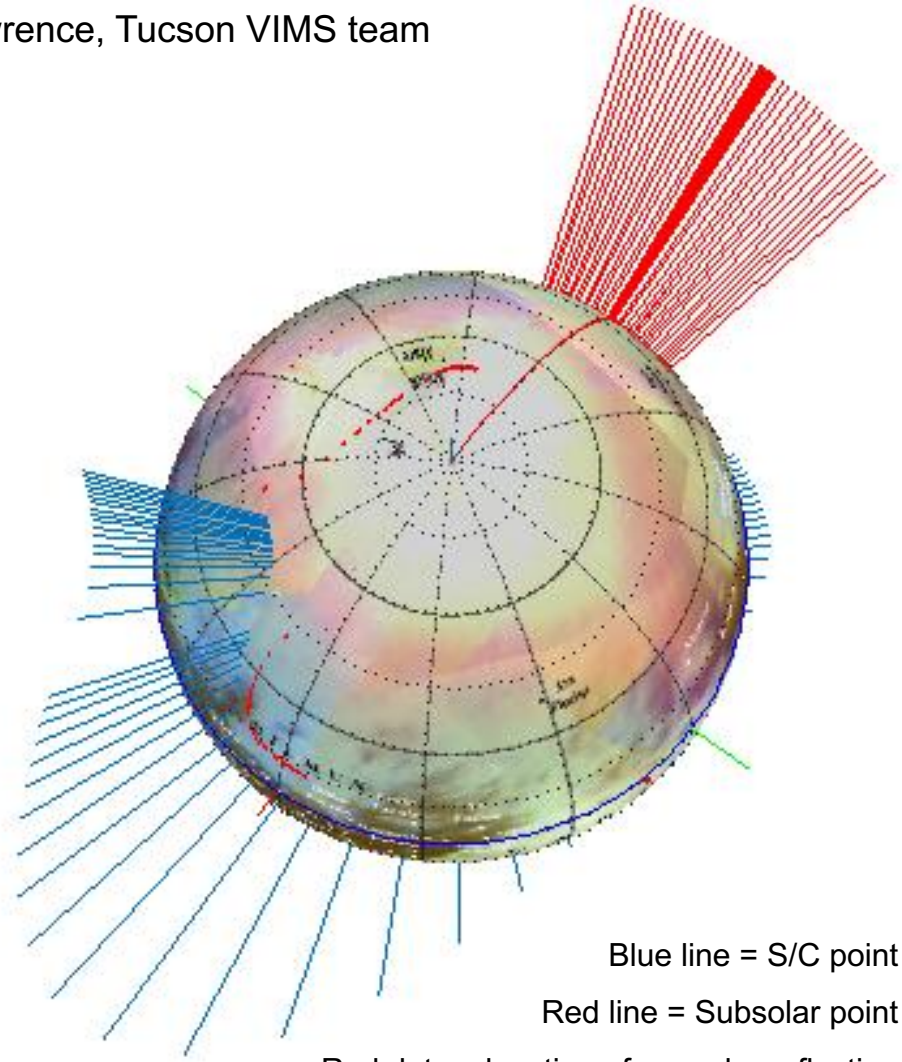
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Specular reflection geometry over Kraken Mare at 70N, 315 W at C/A + 03:00.

Low resolution (100 km/pixel at best) maps of the North Pole area while riding along with CIRS and ISS.

Looking for clouds at high northern latitudes.

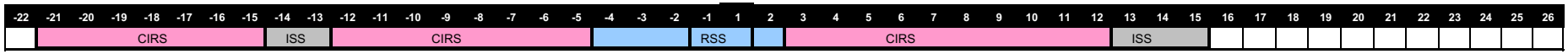


Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A



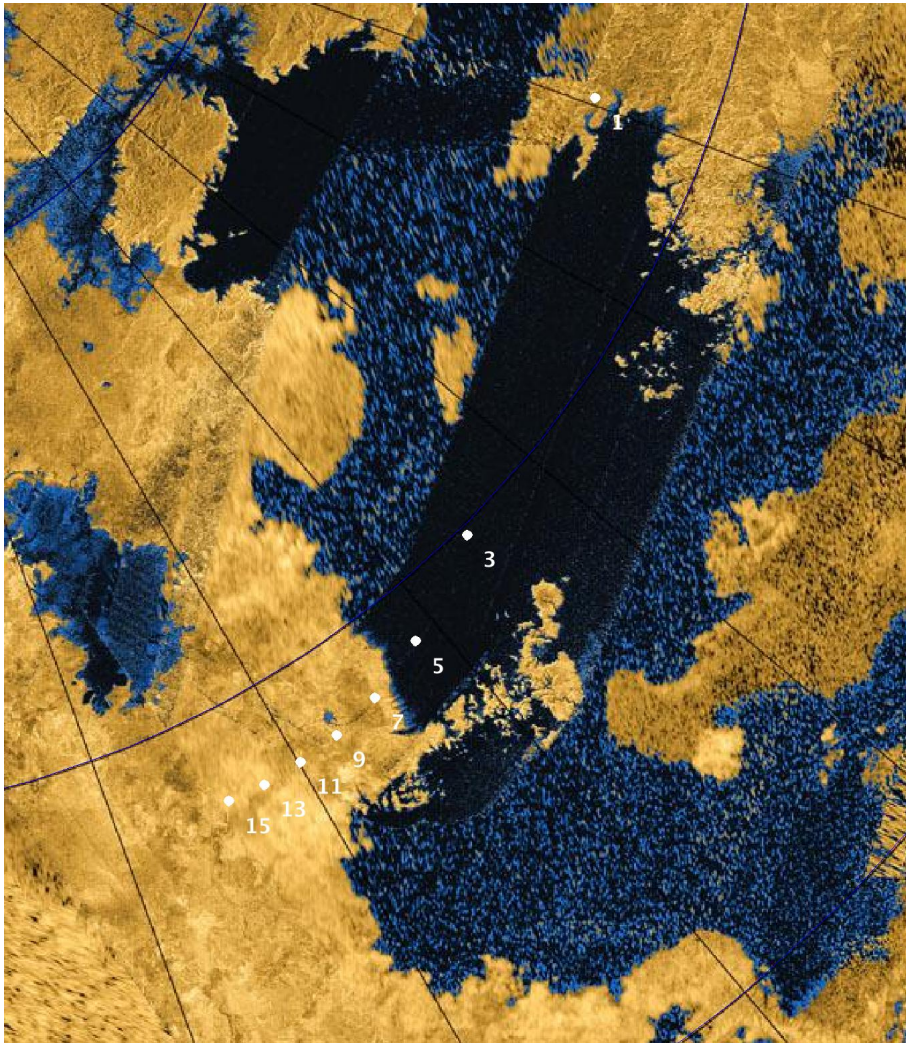
T102 – rev 205 – S84

June 18, 2014 – 169T13:28:25 @ 3659 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
72.33	289.50	63.0	3600	1
69.84	315.50	54.9	10800	3
68.98	321.40	53.3	18000	5
68.59	324.90	52.5	25200	7
68.39	327.60	52.2	32400	9
68.32	329.90	52.0	39600	11
68.27	332.10	51.9	46800	13
68.30	334.10	51.9	54000	15



-22 -21 -20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

CIRS ISS CIRS RSS CIRS ISS

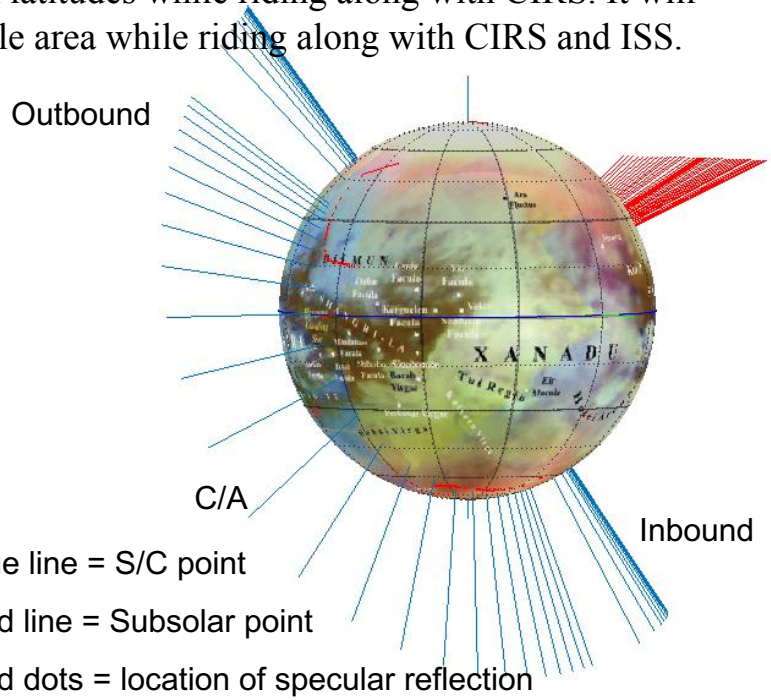
T103 – rev 206 – S84

July 20, 2014 – 201T10:40:58 @ 5103 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T103: On the inbound, VIMS will ridealong with ISS and CIRS and will take images of the southern hemisphere at low resolution (150 km/pixel). It will also look for specular reflection at the equator. During the prime observation, VIMS will acquire a mosaic of the southern hemisphere between the equator and 60 S at a resolution of 25 km/pixel. VIMS will image a high-elevation area centered at (45S, 15W) according to the recently released topographic map (TN1a). VIMS will also monitor the evolution of the South polar vortex (TC1a). VIMS will observe the ingress and egress solar occultation while riding along with UVIS in order to continue the monitoring of the haze density in Titan's atmosphere (TC1a). On the outbound, VIMS will monitor specular reflection on Kraken Mare (TN2d) and will be looking for clouds at high northern latitudes while riding along with CIRS. It will also take low resolution (100 km/pixel at best) maps of the North Pole area while riding along with CIRS and ISS.

C/A-21:19:59	-14:00	CIRS	A3 (Tc1b)
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
-12:00	-09:00	CIRS	D2 (TN1c)
-09:00	-05:00	VIMS	I (TC1a and TN2c)
-05:00	**-02:15**	VIMS	Y (TC1a, TN1a (depending on pointing) and TN2c)
-02:15	**-01:40**	**CIRS**	(TN1c)
-01:40	**-00:45**	**CIRS**	K (TN1c)
-00:45	**0**	**UVIS**	**Ingress Solar occ -00:25 to -00:04 (TN1c)**
2014-201T10:40:59		**CLOSEST APPROACH**	**solar port to SUN (Tc2a)**
0	**+00:10**	**UVIS**	**Solar occ (TN1c)**
+00:10	**+00:31**	**UVIS**	**Egress Solar occ (TN1c)**
+00:31	**+00:50**	**UVIS**	**UVIS limb stare (TN1c)**
+00:50	**+03:00**	**UVIS**	**Stellar occ Apl. Eri. Ingress (TN1c)**
+03:00	**+05:00**	**CIRS**	**T modified (TN2c (surface temperature))**
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
+09:00	+12:00	CIRS	D2 reversed (TN1c)
+12:00	C/A+15:19:01	ISS	D2 reversed (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))



T103 – rev 206 – S84

July 20, 2014 – 201T10:40:58 @ 5103 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

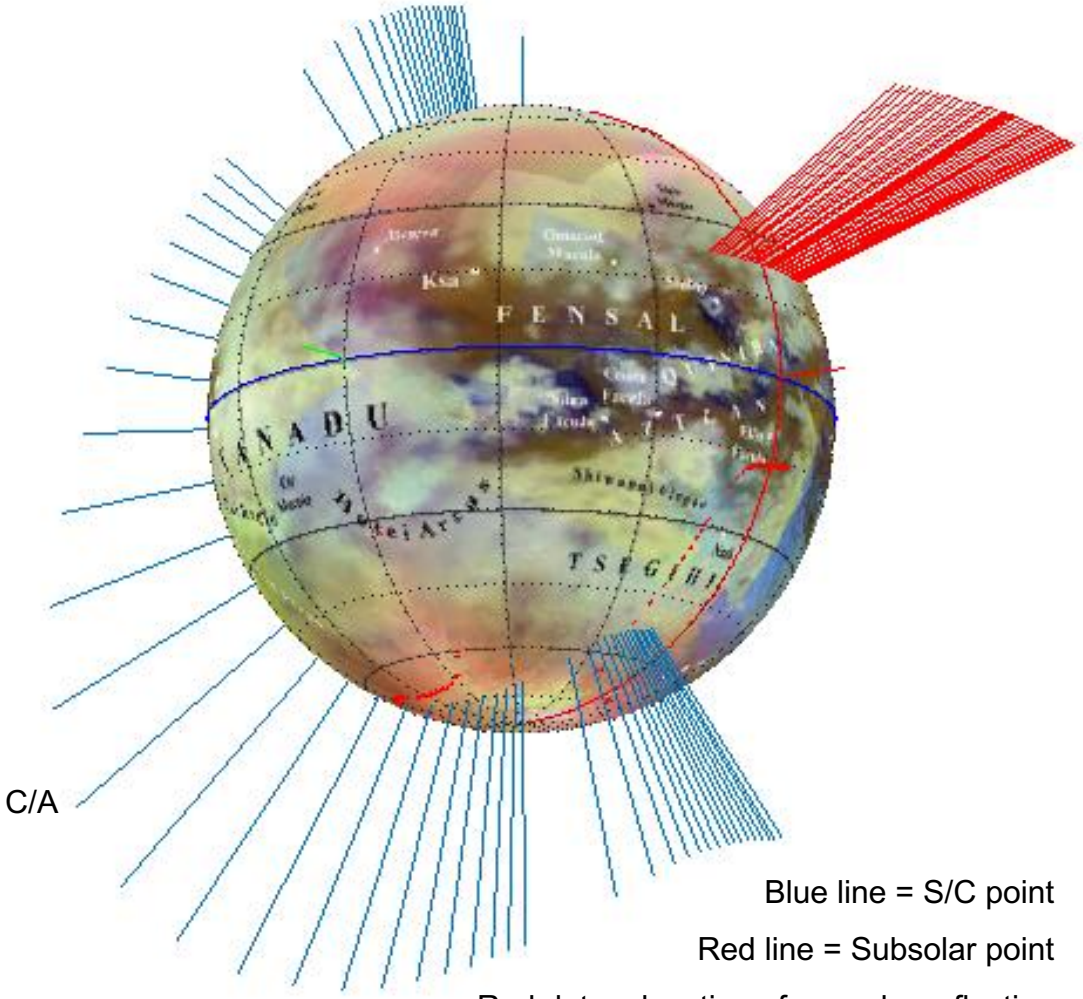
Inbound:

Specular reflection at the equator and southern latitudes.

Ride along with ISS to take images of the southern hemisphere at low resolution (150 km/pixel).

During the prime observation, VIMS will acquire a mosaic of the southern hemisphere between the equator and 60 S at a resolution of 25 km/pixel. VIMS will image a high-elevation area centered at (45S, 15W) according to the recently released topographic map. VIMS will also monitor the evolution of the South polar vortex.

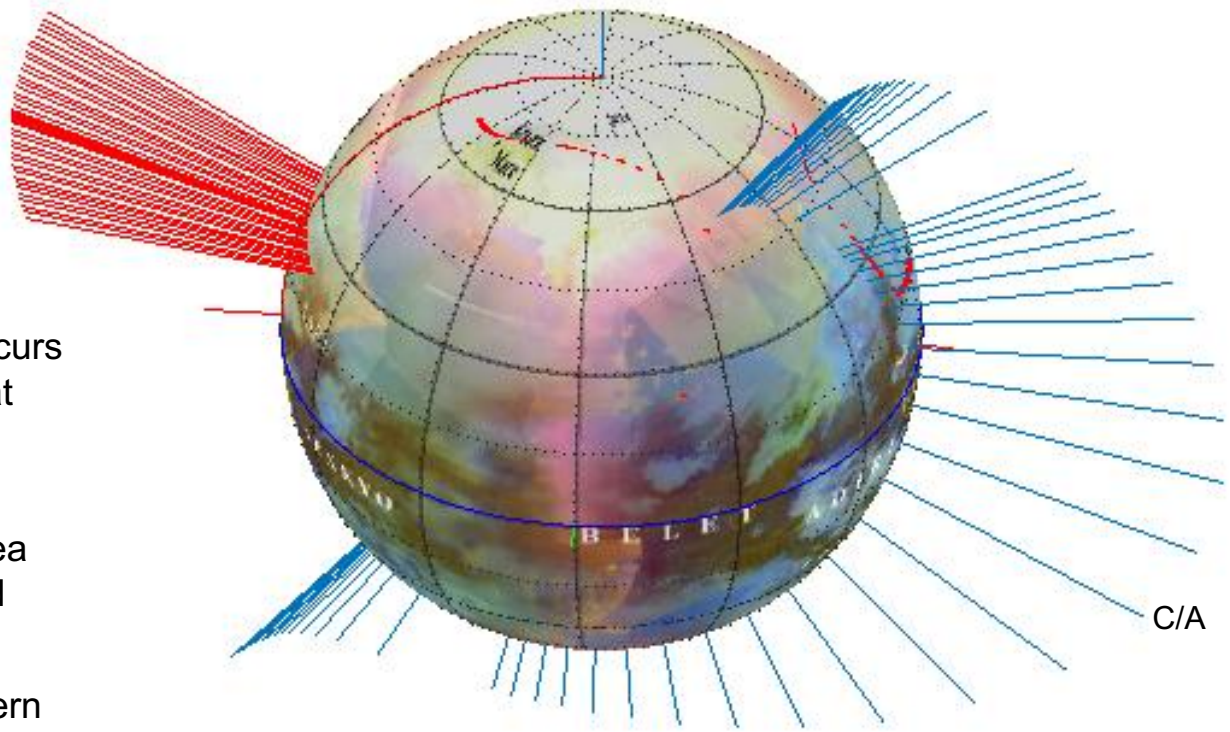
Ingress and egress solar occultation while riding along with UVIS.



T103 – rev 206 – S84

July 20, 2014 – 201T10:40:58 @ 5103 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team



Outbound:

Specular reflection geometry occurs on Kraken Mare at 68N, 315W at C/A +03:00.

Low resolution (100 km/pixel at best) maps of the North Pole area while riding along with CIRS and ISS.

Looking for clouds at high northern latitudes.

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

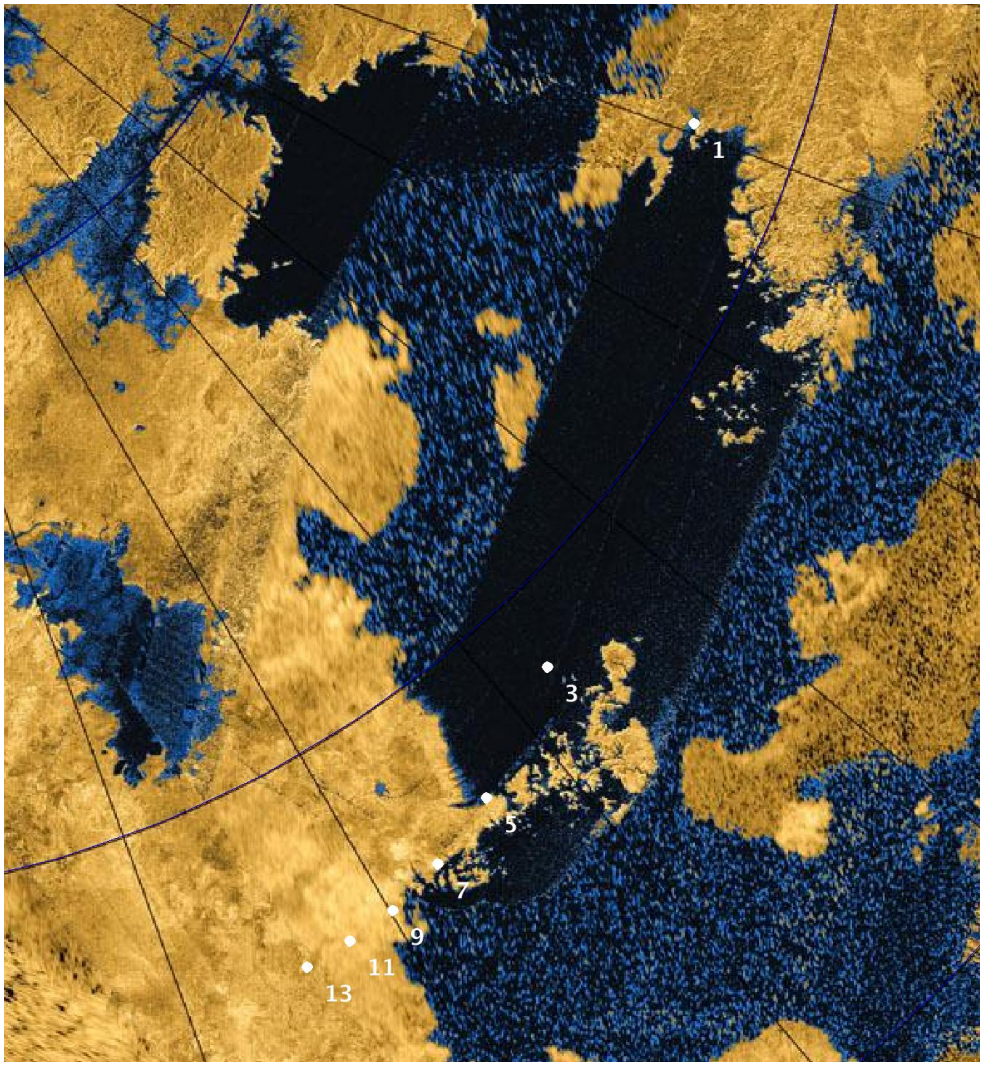
T103 – rev 206 – S84

July 20, 2014 – 201T10:40:58 @ 5103 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
71.89	289.4	62.35	3600	1
68.68	317.5	53.07	10800	3
67.59	323.6	51.16	18000	5
67.12	327.1	50.38	25200	7
66.85	329.9	49.93	32400	9
66.74	332.2	49.74	39600	11
66.67	334.4	49.60	46800	13



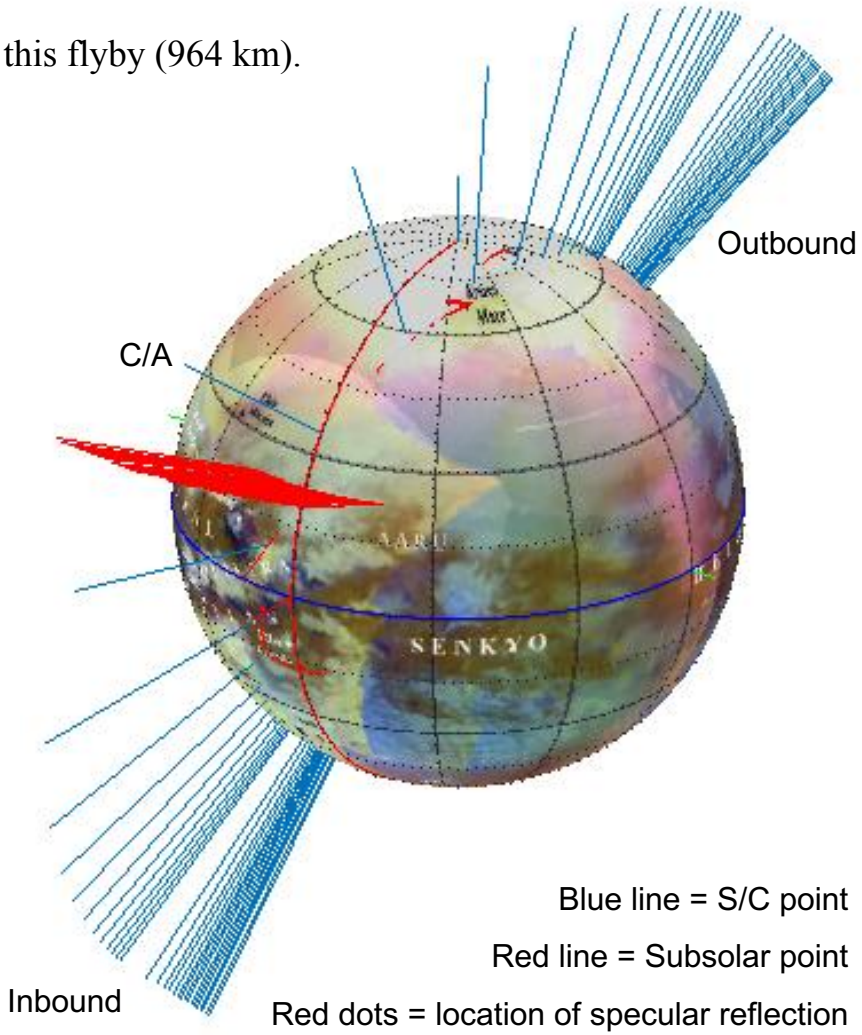
T104 – rev 207 – S85

Aug. 21, 2014 – 233T08:09:09 @ 964 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T104: Radar and INMS are prime at closest approach during this flyby (964 km).

C/A-20:53:09	-14:00	CIRS	A3 (Tc1b)
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
-12:00	-09:00	CIRS	D2 (TN1c)
-09:00	-06:00	VIMS	11,Radar warmup start @ -09:00 (TC1a and TN2c)
-06:00	**-02:15**	Radar	L (TN2c)
-02:15	-01:12	**RADAR scatterometry/radiometry**	TN2c, TN1a
-01:12	-00:31	**RADAR HiSAR**	TC1a, TN1a, TN1b, TN2b
-00:31	-00:30	RWA to RCS Transition	
-00:30	**-00:18**	**RADAR Altimetry**	TN2b
-00:18	**0**	**INMS**	TC2a
2014-233T08:09:09		**CLOSEST APPROACH**	**NEG_X to RAM, NEG_Z to Titan (Tc2a)**
0	**+00:18**	**RADAR SAR**	TC1a, TN1a, TN1b, TN2b
+00:18	**+00:39**	**RADAR Altimetry**	TN2b
+00:39	**+01:00**	RCS to RWA Transition	
+01:00	**+02:15**	**VIMS**	(TC1a, TN1a, TN1c, TC1b)
+02:15	+05:00	**VIMS**	Y (TC1a, TN1a (depending on pointing) and TN2c)
+05:00	+09:00	VIMS	Q (TN1a (Specular reflection of lakes-depending on geometry))
+09:00	+12:00	CIRS	D2 reversed (TN1c)
+12:00	+14:00	ISS	D2 reversed (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
+14:00	C/A+16:16:51	CIRS	M4 (Tc1b (TN1c on outbound))



T104 – rev 207 – S85

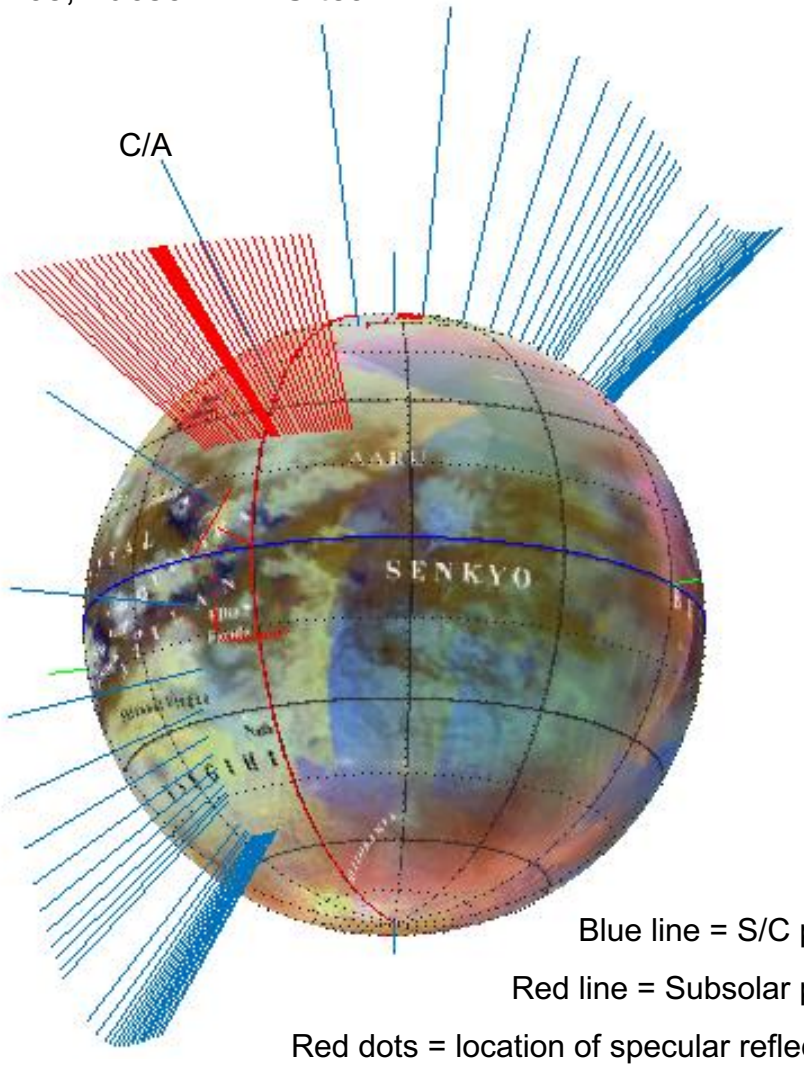
Aug. 21, 2014 – 233T08:09:09 @ 964 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Ride along with ISS to take images of the southern hemisphere at low resolution (150 km/pixel).

During the prime observation, VIMS will acquire a mosaic of the southern hemisphere between the equator and 60 S at a resolution of 100 km/pixel. VIMS will also monitor the evolution of the South polar vortex.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T104 – rev 207 – S85

Aug. 21, 2014 – 233T08:09:09 @ 964 km altitude

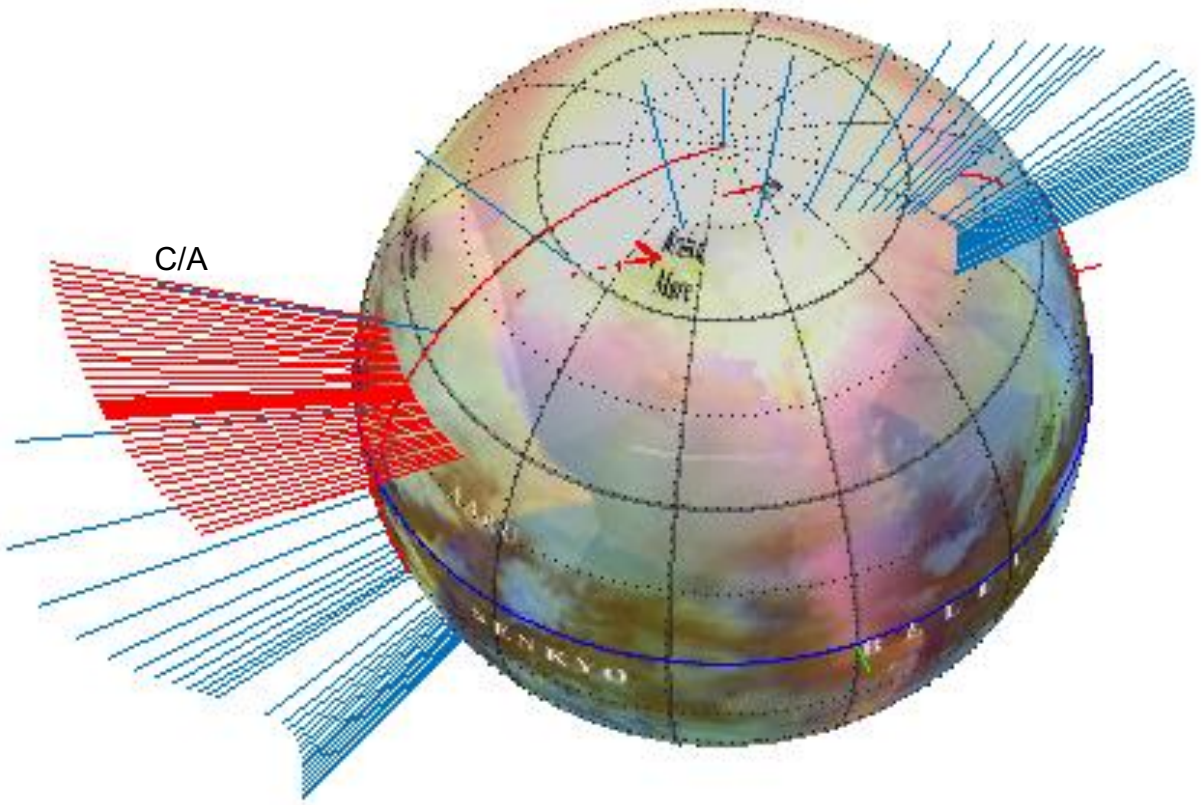
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Specular reflection geometry occurs over Kraken Mare at (67-69N; 320-330W).

Medium resolution (15 km/pixel) maps of the North Pole area during the prime observation (60N; 210W).

Looking for clouds at high northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

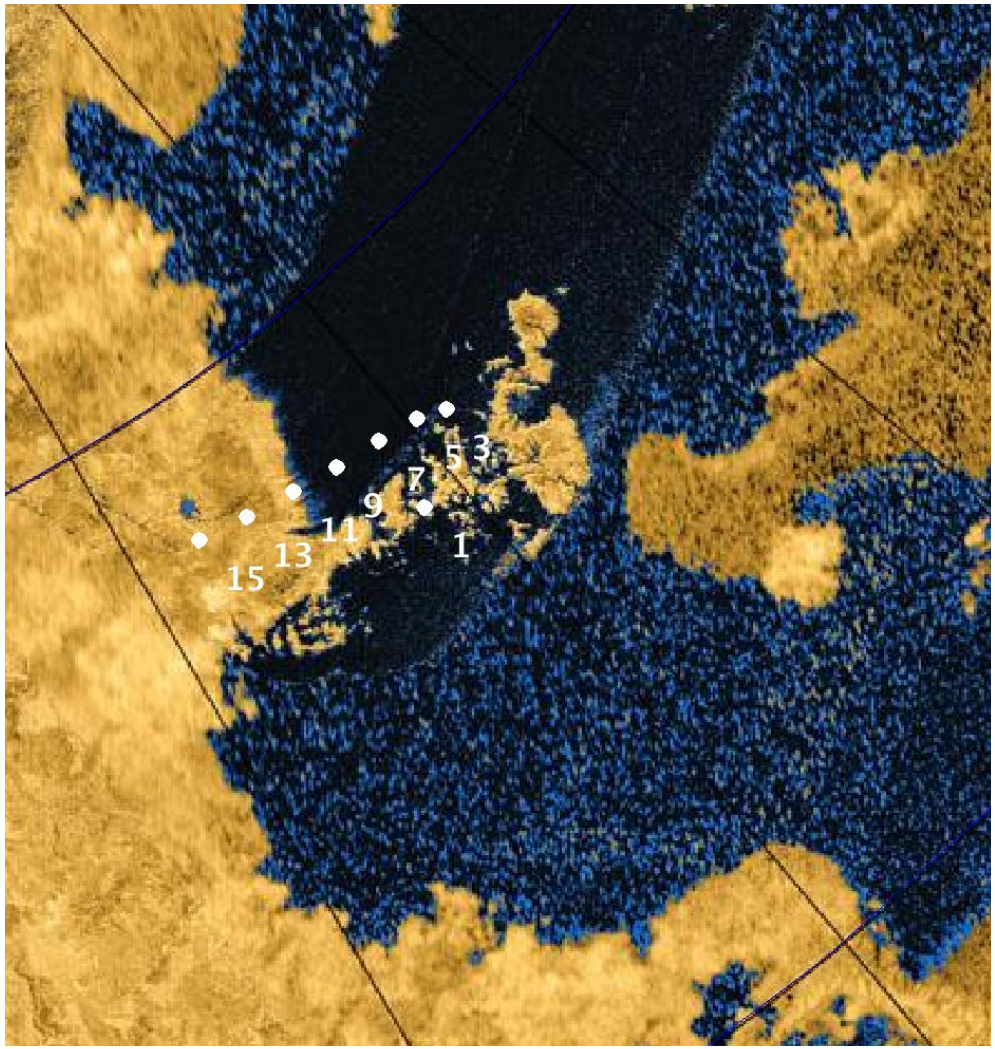
T104 – rev 207 – S85

Aug. 21, 2014 – 233T08:09:09 @ 964 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
67.11	321.30	49.92	3600	1
67.85	318.80	51.67	10800	3
67.99	319.70	52.04	18000	5
68.08	321.10	52.24	25200	7
68.14	322.70	52.35	32400	9
68.22	324.30	52.48	39600	11
68.28	326.00	52.58	46800	13
68.37	327.70	52.68	54000	15



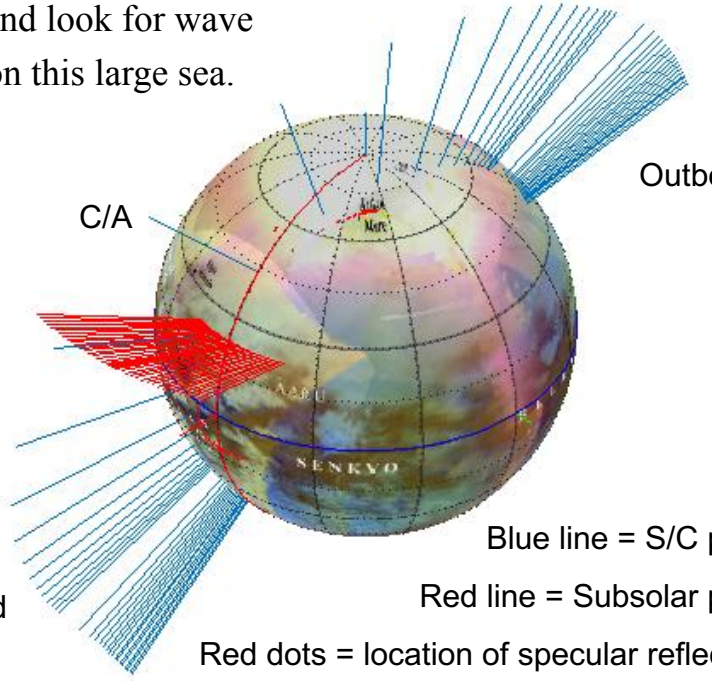
T105 – rev 208 – S85

Sep. 22, 2014 – 265T05:23:19 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T105: VIMS and CIRS are prime at closest approach (1400 km) during this flyby. On the inbound, VIMS will ride along with CIRS and UVIS. It will monitor the evolution of the vortex at the South Pole and the cloud activity at high latitudes. VIMS will acquire low resolution (100 km/pixel at best) images of Titan while riding along with CIRS and UVIS. It will then acquire medium resolution images (20 to 5 km per pixel) for a mosaic of Tsegihi and the dune fields of Fensal. A high-resolution image of Sinlap crater may be possible before recording a high resolution South-North swath between -5 min and +5 min across the mid-northern latitudes. On the outbound, VIMS will observe the seas and lakes of the northern polar area, including Kraken and Ligeia at resolution better than 5 km/pixel. It will look for the evolution of evaporitic material. Finally, while riding along with CIRS, it will look for specular reflection on Kraken Mare and look for wave activity on this large sea.

C/A-20:11:20	-14:00	CIRS	A2 (Tc1b)
-14:00	-09:00	CIRS	C (TN1c)
-09:00	-05:15	CIRS	F (TC1b OR TN1c)
-05:15	-03:00	UVIS stellar occ	Eta Ursa Majoris (TN1c)
-03:00	-02:15	UVIS	(TC1b)
-02:15	**-00:30**	**VIMS**	(TN1a, TC1a)
-00:30	**0**	**VIMS**	(TN1a, TC1a)
2014-265T05:23:20		**CLOSEST APPROACH**	**NEG_Y to Titan (Tc2a)**
0	**+00:30**	**VIMS**	(TC1a, TC1b)
+00:30	**+01:15**	**CIRS**	
+01:15	**+02:15**	**CIRS**	
+02:15	+05:45	**CIRS**	modified T (TN2c (surface temperature))
+05:45	+07:15	UVIS	P (TC1b)
+07:15	+09:15	CIRS	modified R (TN1c or Tc1b, decided in implementation)
+09:15	+12:00	CIRS	N1 (Tc1b, TN1c aerosol)
+12:00	C/A+14:43:40	CIRS	M4 (Tc1b (TN1c on outbound))



T105 – rev 208 – S85

Sep. 22, 2014 – 265T05:23:19 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observations of the evolution of the vortex / polar hood at the South Pole.

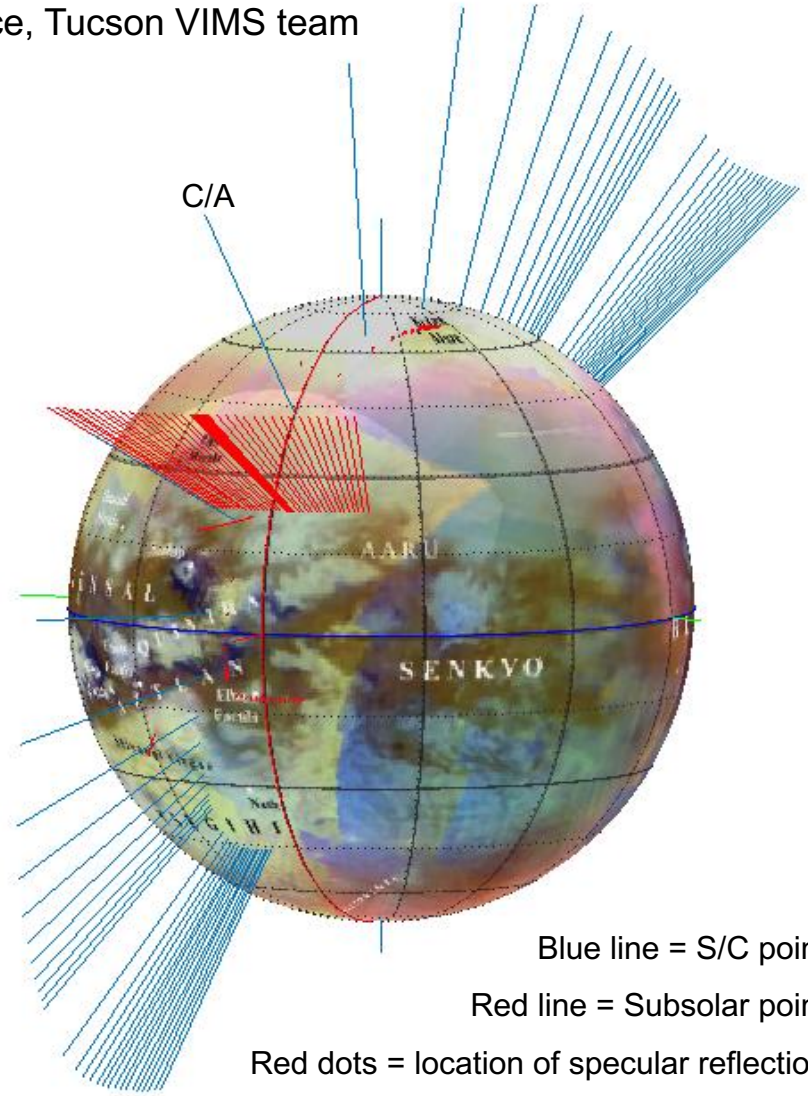
Low resolution (100 km/pixel at best) maps of Titan while riding along with CIRS and UVIS.

Medium resolution images (20 to 5 km per pixel) for a mosaic of Tsegihi and the dune fields of Fensal.

High-resolution image of Sinlap crater (11N,16W) between -10 and -5 min.

High resolution South-North swath between -5 min and +5 min across the mid-northern latitudes.

Monitoring cloud activity at high northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T105 – rev 208 – S85

Sep. 22, 2014 – 265T05:23:19 @ 1400 km altitude

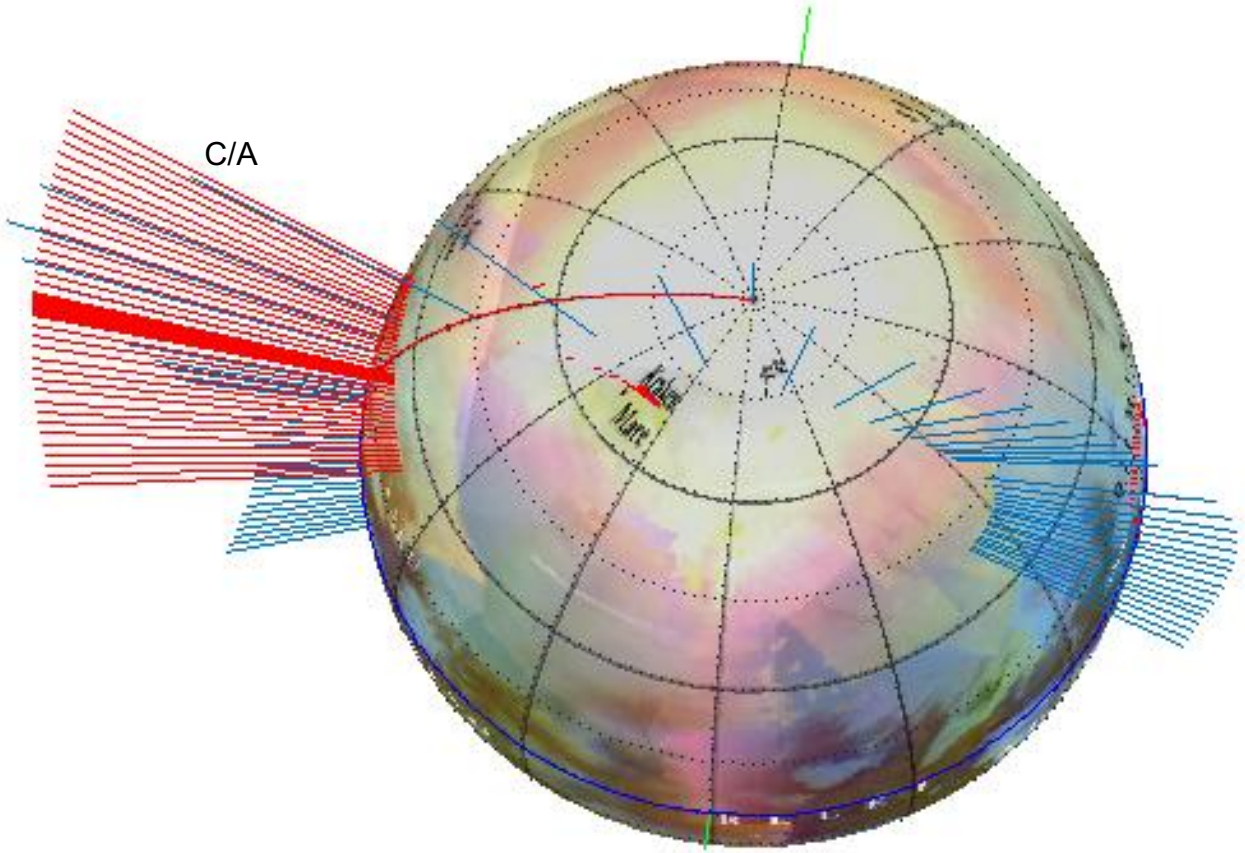
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Specular reflection geometry across Kraken Mare (69N,310W). Collaborative observation with CIRS.

Observations of Kraken and Ligeia at resolution better than 5 km/pixel. Evolution of the lakes and the evaporitic material.

Monitoring cloud activity at the mid-northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

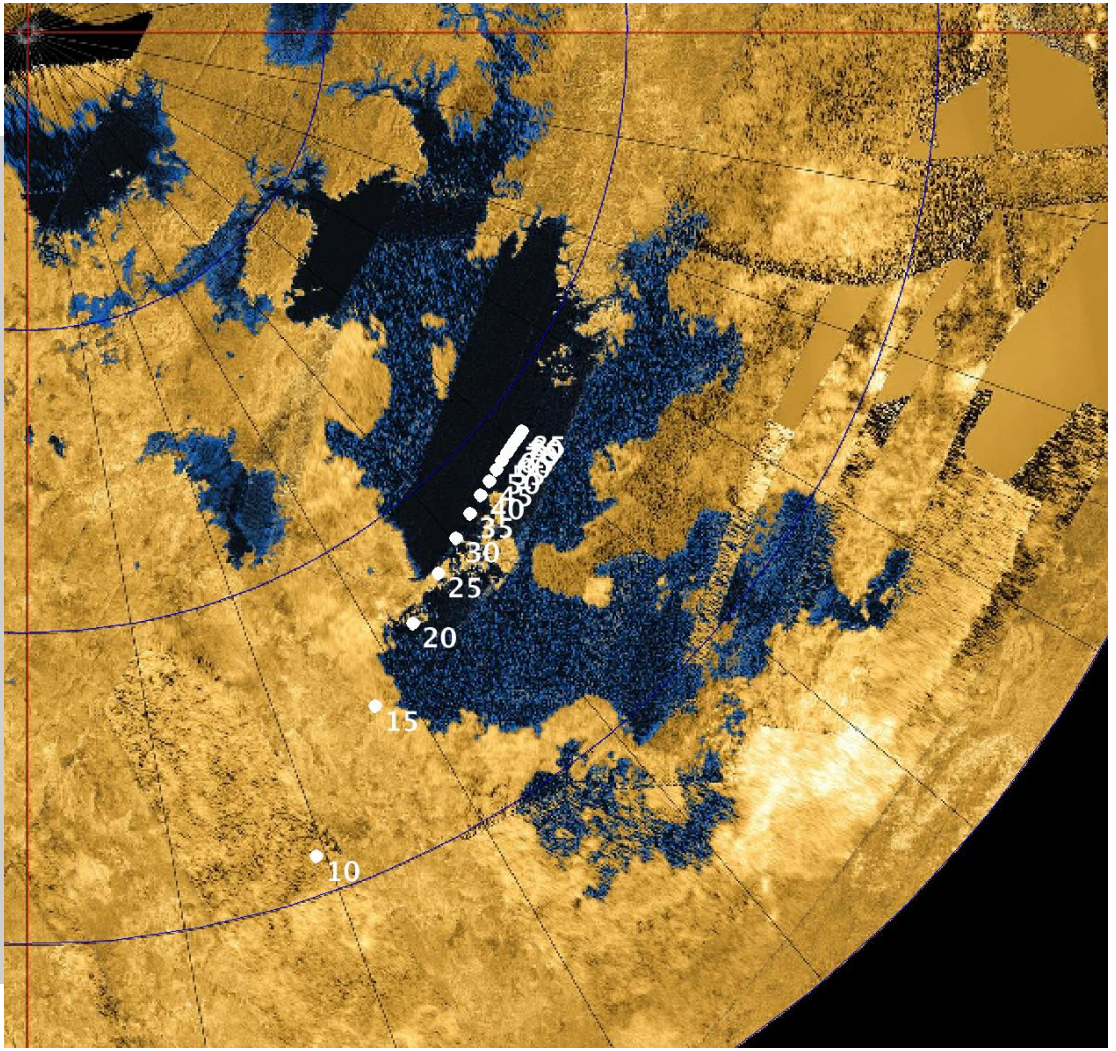
T105 – rev 208 – S85

Sep. 22, 2014 – 265T05:23:19 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (min)
61.23	340.7	39.6	39.7	10
64.88	332.7	44.6	44.5	15
66.59	326.9	47.4	47.3	20
67.44	322.8	49.1	49.1	25
67.96	319.7	50.3	50.3	30
68.26	317.4	51.1	51.1	35
68.46	315.6	51.8	51.8	40
68.58	314.2	52.3	52.3	45
68.68	313.0	52.7	52.7	50
68.73	312.1	53.0	53.0	55
68.78	311.3	53.3	53.3	60
68.80	310.7	53.5	53.5	65
68.83	310.1	53.8	53.7	70
68.83	309.7	53.9	53.9	75
68.84	309.3	54.0	54.1	80
68.86	308.9	54.2	54.2	85



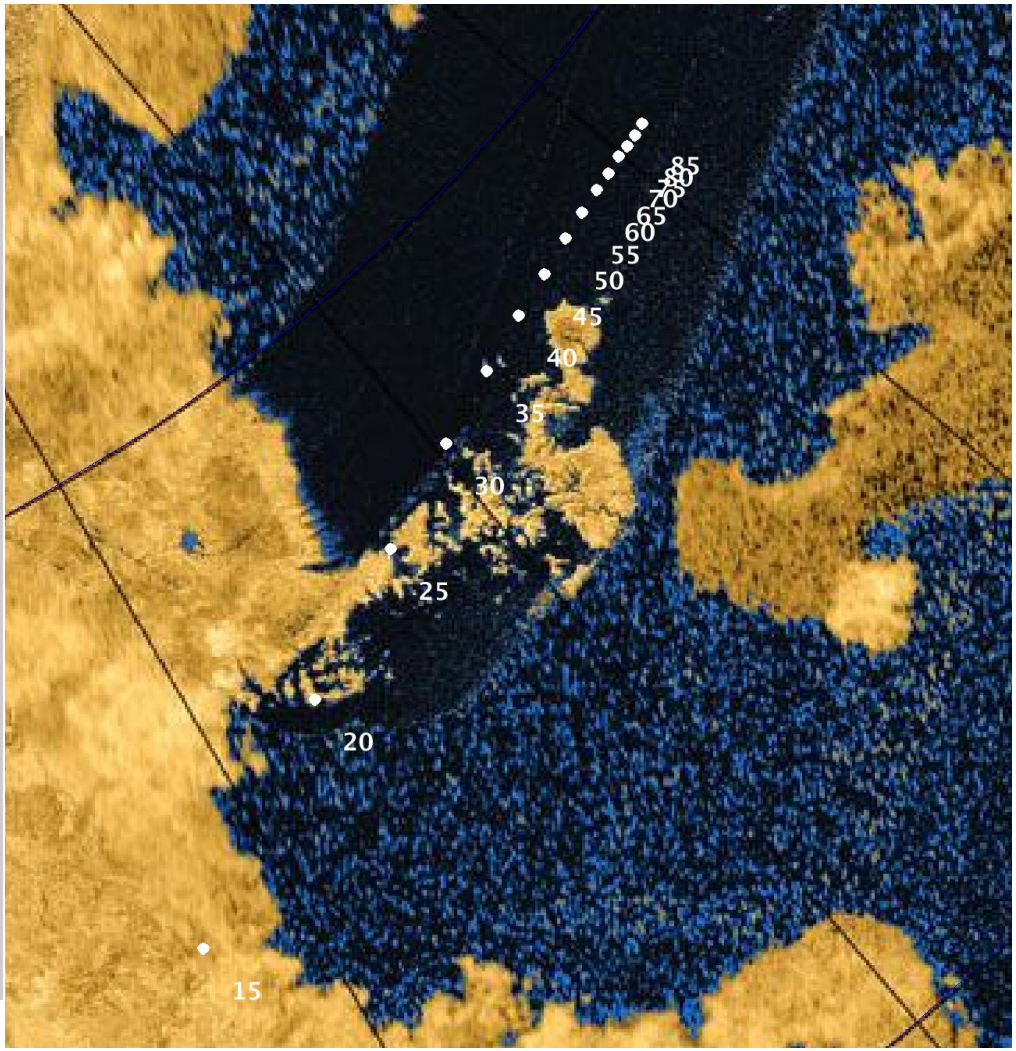
T105 – rev 208 – S85

Sep. 22, 2014 – 265T05:23:19 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (min)
61.23	340.7	39.6	39.7	10
64.88	332.7	44.6	44.5	15
66.59	326.9	47.4	47.3	20
67.44	322.8	49.1	49.1	25
67.96	319.7	50.3	50.3	30
68.26	317.4	51.1	51.1	35
68.46	315.6	51.8	51.8	40
68.58	314.2	52.3	52.3	45
68.68	313.0	52.7	52.7	50
68.73	312.1	53.0	53.0	55
68.78	311.3	53.3	53.3	60
68.80	310.7	53.5	53.5	65
68.83	310.1	53.8	53.7	70
68.83	309.7	53.9	53.9	75
68.84	309.3	54.0	54.1	80
68.86	308.9	54.2	54.2	85



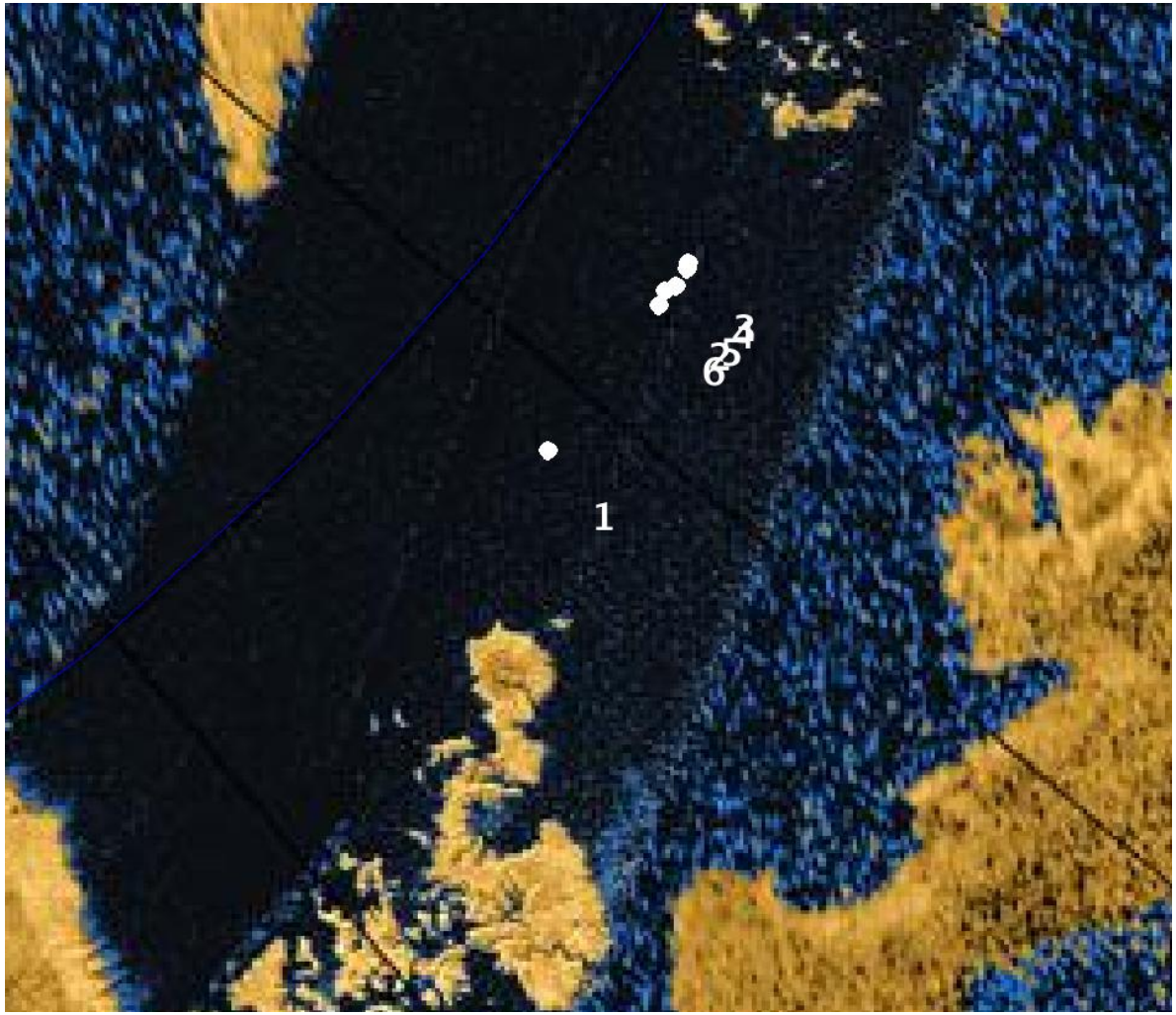
T105 – rev 208 – S85

Sep. 22, 2014 – 265T05:23:19 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (hr)
68.78	311.3	53.3	53.3	1
68.86	307.5	54.8	54.8	2
68.84	306.8	55.3	55.3	3
68.83	306.9	55.6	55.6	4
68.82	307.3	55.8	55.8	5
68.83	307.8	55.9	55.9	6



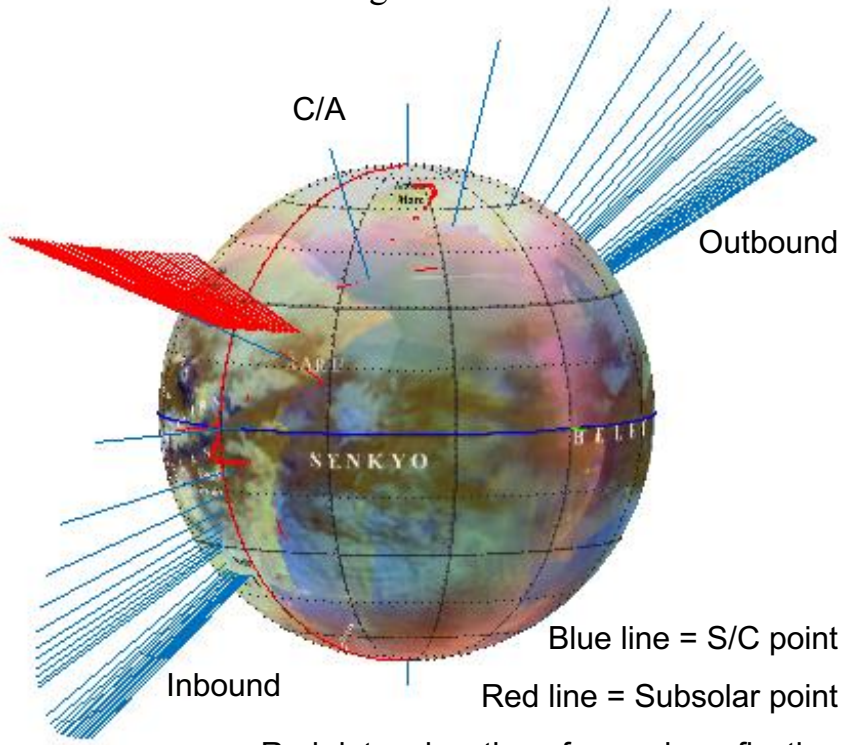
T106 – rev 209 – S86

Oct. 24, 2014 – 297T02:40:30 @ 1013 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T106: RSS is prime during closest approach (1013 km). On the inbound, VIMS will observe the evolution of the vortex / polar hood at the South Pole and will acquire low resolution (30 km/pixel at best) maps of Tsegihi and the dune fields of Aztlan. On the outbound, VIMS will look for specular reflection on the eastern shore of Kraken Mare (70-72N, 293-299W) during its prime observation and a collaborative observation with CIRS. It will monitor cloud activity at the mid northern latitudes and will acquire global view of the seas and lakes located at the North Pole.
NOTE: VIMS accepted to start its observation at +02:47 – RSS ends at +02:25 – Changes made on 3/20/2014

C/A-19:30:30	-14:00	CIRS	A3 (Tc1b)
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or
-12:00	-09:00	CIRS	D2 (TN1c)
-09:00	-05:00	CIRS	F (TC1b OR TN1c)
-05:00	-03:26	VIMS	Y (TC1a, TN1a (depending on pointing) and TN2c)
-03:26	-03:25	RWA to RCS Transition	
-03:25	-01:00	**RSS warm up**	
-01:00	**0**	**RSS Bistatic**	**(TN1a)**
2014-297T02:40:30		**CLOSEST APPROACH**	**XBAND to Titan (Tc2a)**
0	**+02:10**	**RSS Bistatic**	**(TN1a)**
+02:10	**+02:32**	RCS to RWA Transition	
+02:32	+05:00	**VIMS**	Y (TC1a, TN1a (depending on pointing) and TN2c)
+05:00	+09:00	VIMS	Q (TN1a (Specular reflection of lakes-depending on geometry))
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+16:09:30	CIRS	M4 (Tc1b (TN1c on outbound))



T106 – rev 209 – S86

Oct. 24, 2014 – 297T02:40:30 @ 1013 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

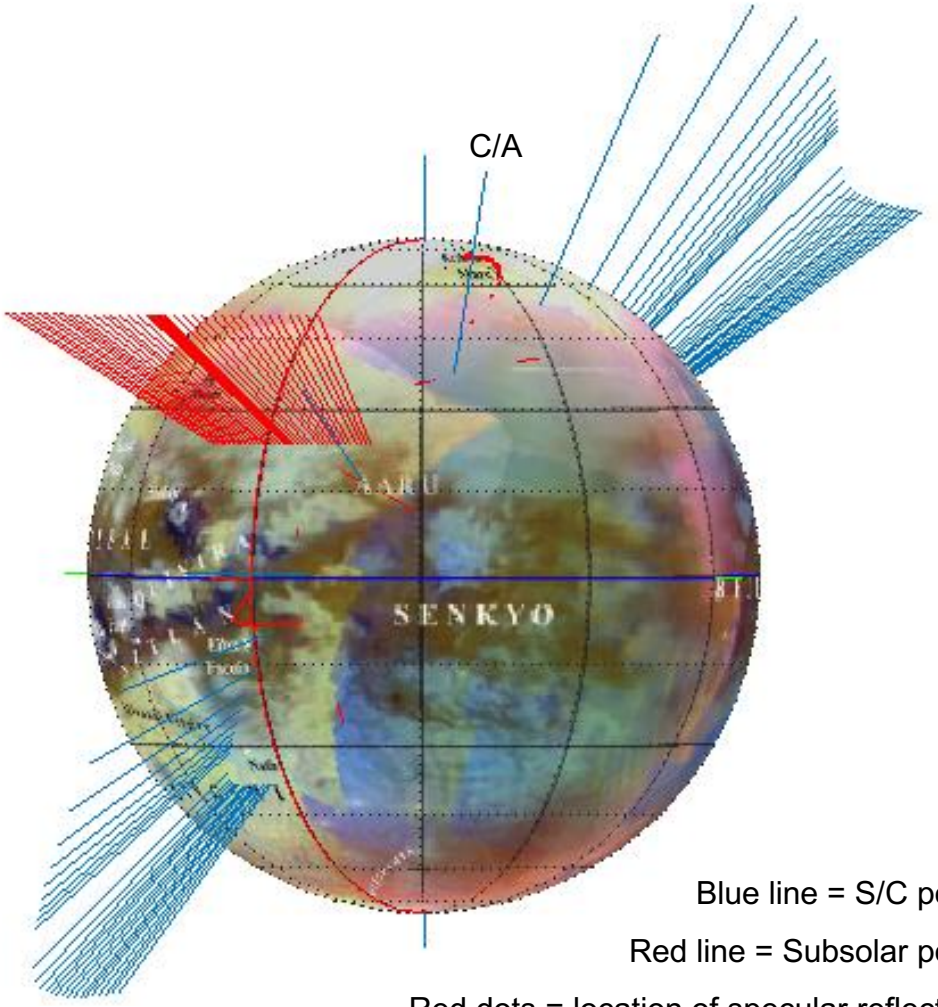
Inbound:

Observations of the evolution of the vortex / polar hood at the South Pole.

Medium resolution images (30-50 km/pixel) of Tsegihi and the dune fields of Aztlan.

Monitoring cloud activity at high northern latitudes.

On the inbound, specular reflection geometry occurs near the equator at southern latitudes (7-8S; 348-4 W).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T106 – rev 209 – S86

Oct. 24, 2014 – 297T02:40:30 @ 1013 km altitude

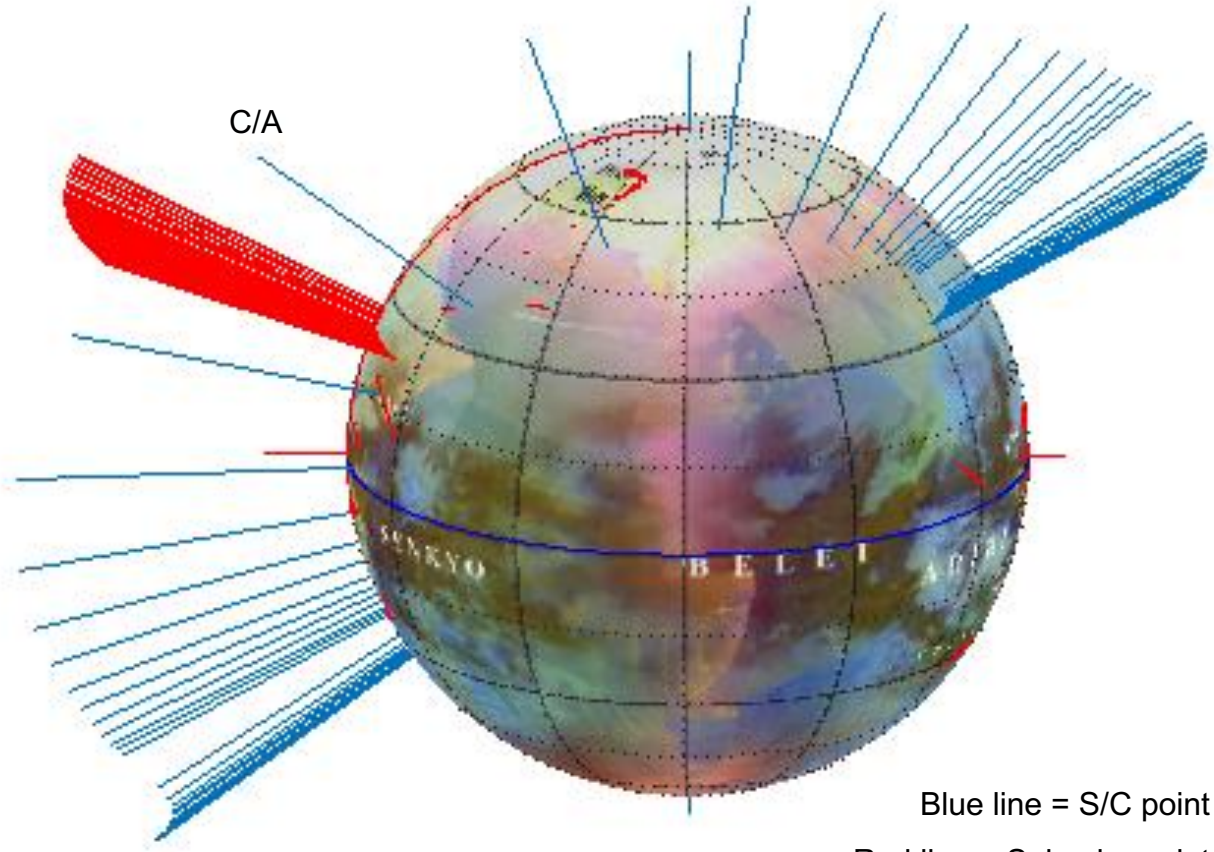
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Specular reflection geometry across Kraken Mare (70-72N, 293-299W) during prime and collaborative observation with CIRS.

Global view of the North Pole area.

Monitoring cloud activity at the mid-northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

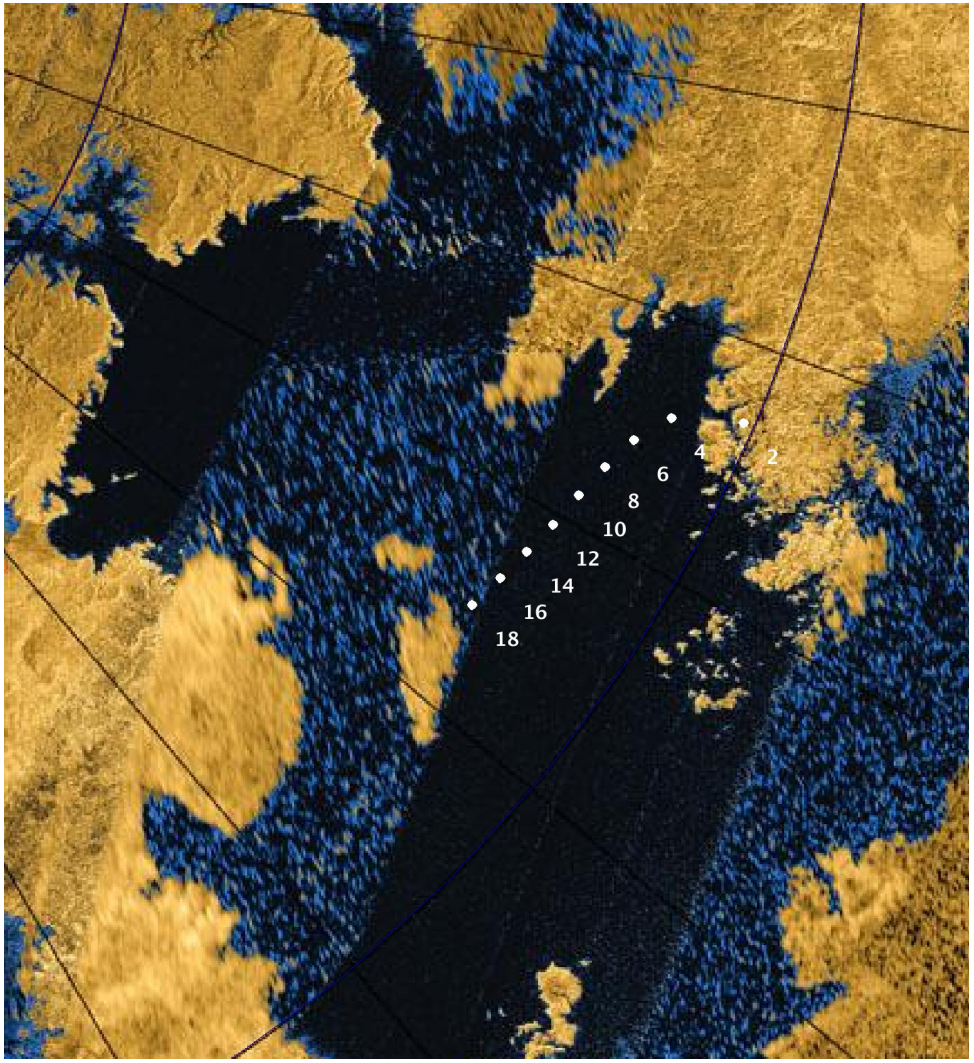
T106 – rev 209 – S86

Oct. 24, 2014 – 297T02:40:30 @ 1013 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
70.16	293.10	59.4	7200	2
71.08	294.10	59.9	14400	4
71.42	295.60	60.1	21600	6
71.61	297.20	60.2	28800	8
71.75	298.80	60.4	36000	10
71.85	300.50	60.5	43200	12
71.96	302.10	60.6	50400	14
72.08	303.70	60.7	57600	16
72.18	305.40	60.8	64800	18



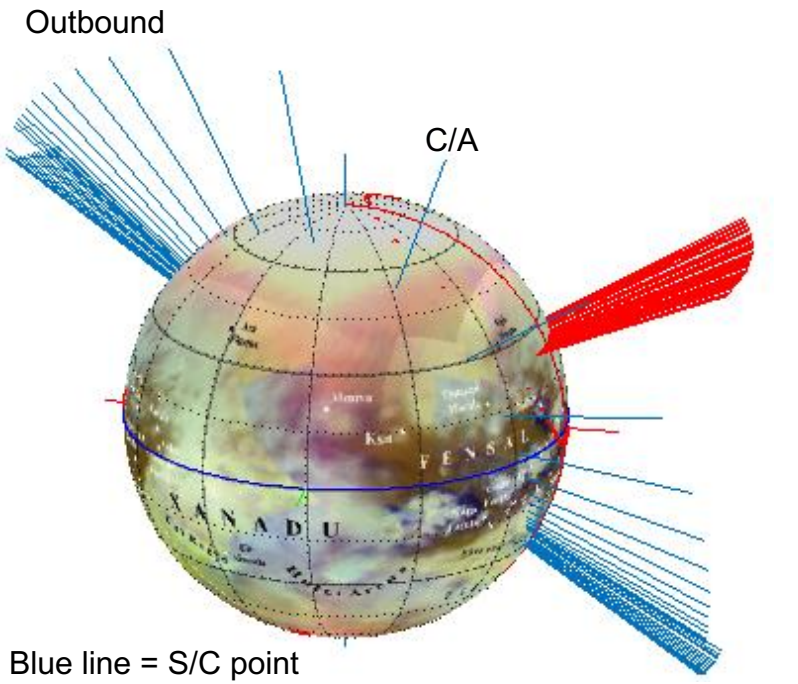
T107 – rev 210 – S86

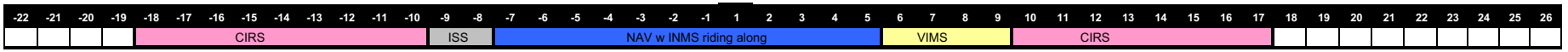
Dec. 10, 2014 – 344T22:26:35 @ 980 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T107: NAV/INMS are the prime instruments during this flyby (980 km). On the inbound, VIMS will ridealong with CIRS and ISS and will acquire low resolution images (50 km/pixel) of the sub-Saturn hemisphere, observe the evolution of the South Pole vortex, and monitor cloud activity. On the outbound, VIMS will acquire global images of the North Pole area and will monitor the cloud activity at high northern latitudes. It will also look for specular reflection in an area between Ligeia mare and Kraken Mare.

C/A-18:01:35	-14:00	CIRS	A3 (Tc1b)
-14:00	-09:00	CIRS	C (TN1c)
-09:00	-07:05	ISS	(TN1a)
-07:05	**-05:00**	ISS	(TN1a) KA band warm up for RSS
-05:00	**-04:20**	SP Turn to Earth for downlink	
-04:20	**0 ?**	**Canberra 34m, NAV/INMS**	**HGA to Earth, NEG_X to RAM Tc2a**
2014-344T22:26:35		**CLOSEST APPROACH**	**XBAND to EARTH, NEG_X to RAM (Tc2a)**
0 ?	**+04:30**	**Canberra 34m, NAV/INMS**	**Tc2a**
+04:30	**+05:00**	**SP Turn to WP**	
+05:00	+09:00	VIMS	Q (TN1a (Specular reflection of lakes-depending on geometry))
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+17:38:25	CIRS	M4 (Tc1b (TN1c on outbound))





T107 – rev 210 – S86

Dec. 10, 2014 – 344T22:26:35 @ 980 km altitude

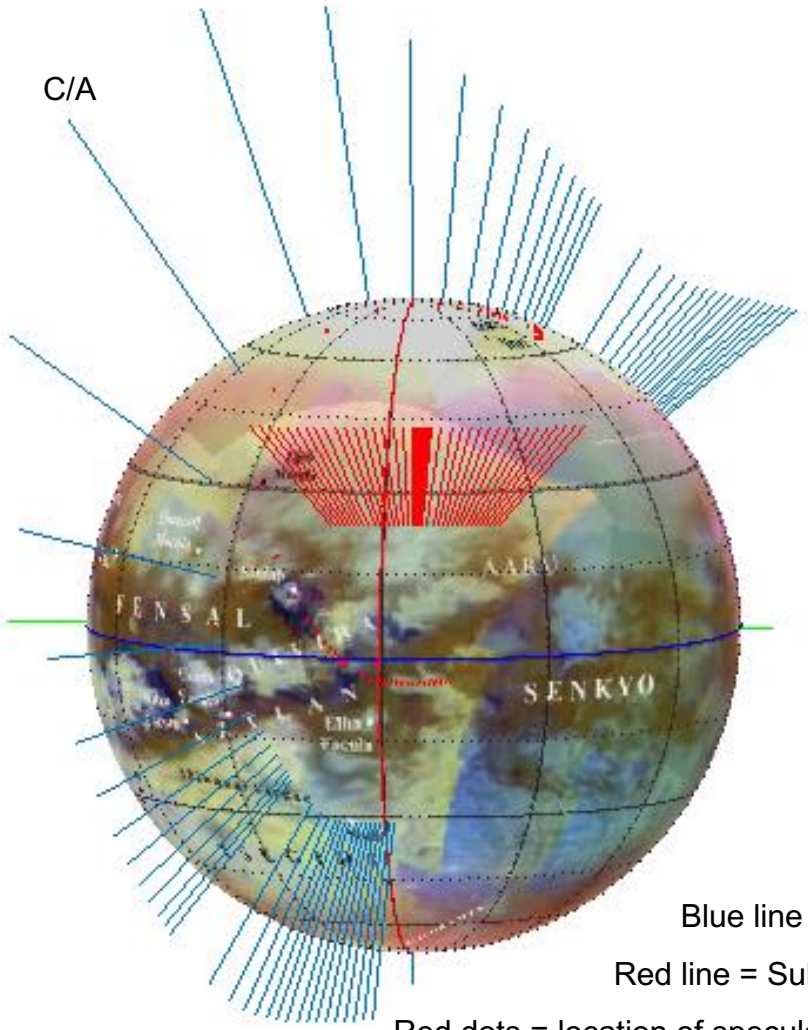
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Monitor the South Polar Vortex.

Map the equatorial regions south of Aztlan near 30S, 10W.

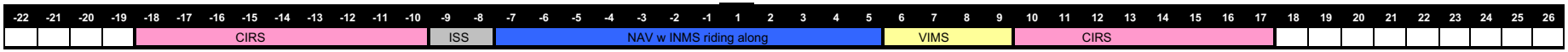
Specular reflection geometry near southern equatorial regions (08S, 355 W at C/A - 08:00).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T107 – rev 210 – S86

Dec. 10, 2014 – 344T22:26:35 @ 980 km altitude

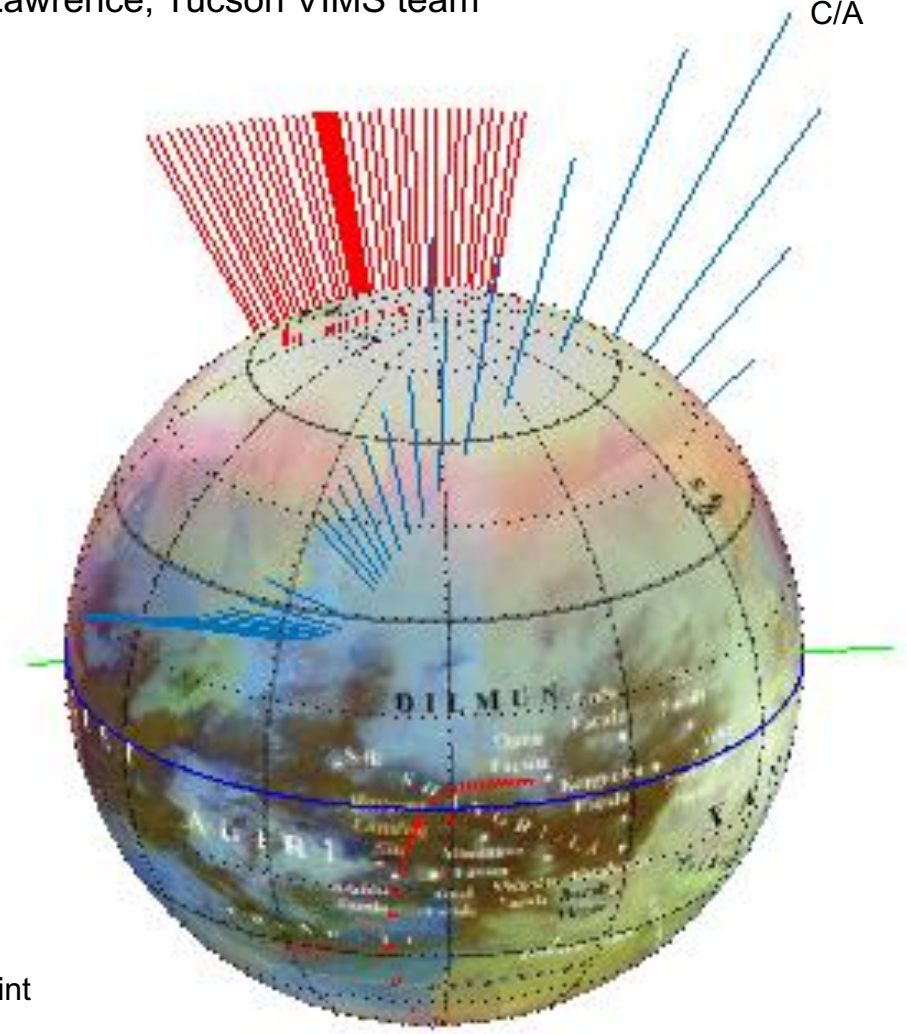
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Global views of the North Pole region.

Specular reflection geometry near Kraken Mare at 65N, 282 W at C/A + 06:00.

Monitor cloud activity at mid-northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
				CIRS									ISS		NAV w INMS riding along												VIMS				CIRS															

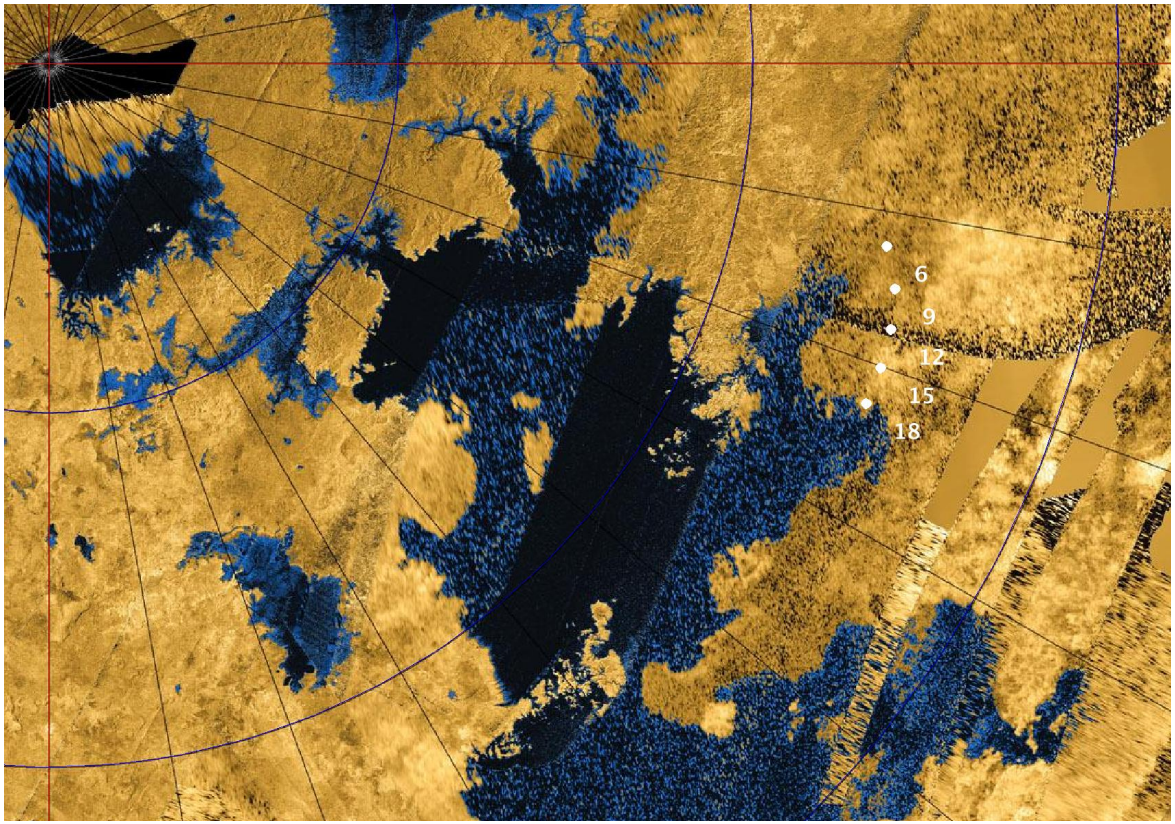
T107 – rev 210 – S86

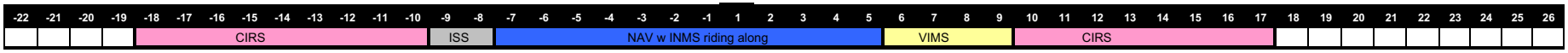
Dec. 10, 2014 – 344T22:26:35 @ 980 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (hr)
65.76	282.3	63.1	63.0	6
65.27	284.9	63.1	63.1	9
65.07	287.5	63.2	63.2	12
65.00	290.1	63.3	63.3	15
65.01	292.6	63.4	63.5	18





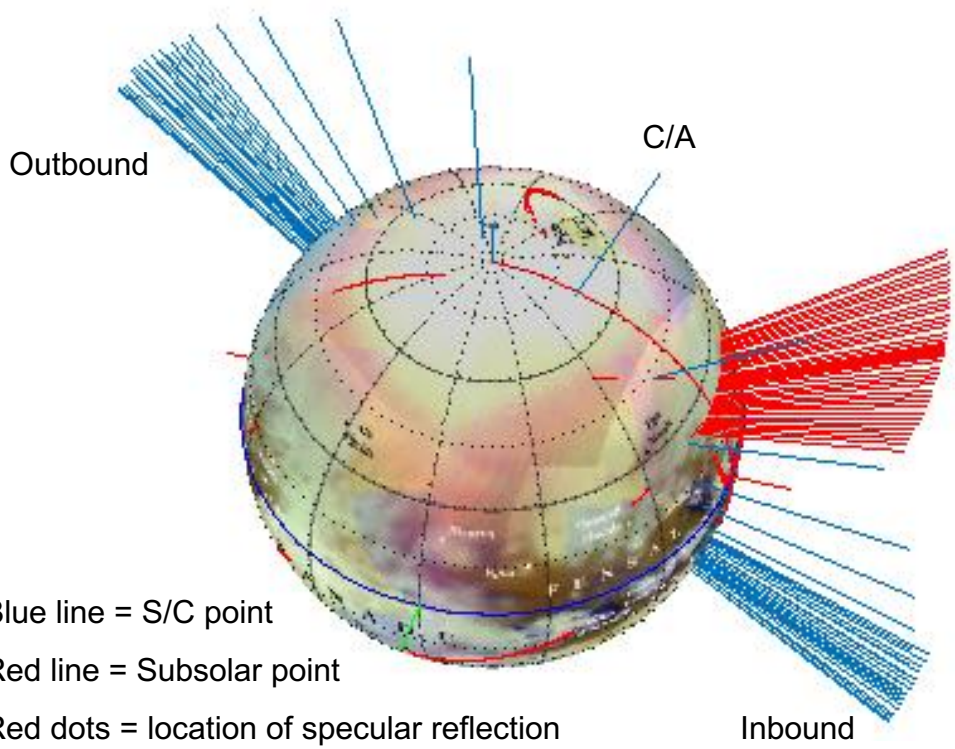
T108 – rev 211 – S87

Jan. 11, 2015 – 011T19:48:35 @ 970 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T108: During this flyby, radar is prime during closest approach (970 km). On the inbound, during its prime observation, VIMS will monitor the evolution of the South Polar vortex (TC1b) and will look for the presence of clouds at Northern latitudes (TC1a). It will also obtain a mosaic of the sub-Saturn hemisphere with long integration time of the equatorial area to look for spectral signatures in the 5-µm band (TN1a). On the outbound, VIMS will ridealong with CIRS and may obtain low resolution images of the Northern Pole. No specular reflection observations are expected since the geometry is achieved on areas where liquids have not been observed by the radar instrument.

C/A-17:06:35	-16:18	NONE	
-16:18	-12:33	UVIS_URDELCET	RINGS PIE (2015-011T03:30:00 - 2015-01T07:15:00)
-12:33	-09:00	CIRS	C modified (TN1c)
-09:00	-05:00	CIRS	F (TC1b OR TN1c)
-05:00	**-02:15**	VIMS	Y ; RADAR Warm UP @ 5:15 (TC1a, TN1a (depending on pointing) and TN2c)
-02:15	**-01:12**	**RADAR scatterometry/radiometry**	
-01:12	**-01:11**	RWA to RCS Transition	
-01:11	**-00:30**	**RADAR HiSAR**	
-00:30	**-00:18**	**RADAR Altimetry**	
-00:18	**0**	**RADAR SAR**	**INMS riding (TC1a, TN1a, TN1b, TN2b, TN2c (little))**
2015-011T19:48:35		**CLOSEST APPROACH**	**NEG_Z to Titan (Tc2a)**
0	**+00:18**	**RADAR SAR**	**INMS riding (TC1a, TN1a, TN1b, TN2b, TN2c (little))**
+00:18	**+00:30**	**RADAR Altimetry**	
+00:30	**+00:50**	**RADAR HiSAR**	
+00:50	**+01:12**	RCS to RWA Transition	
+01:12	**+02:15**	**RADAR scatterometry/radiometry**	
+02:15	+05:00	**RADAR**	**L +R1 (TN2c, TN2c)**
+05:00	+09:00	**CIRS**	R1 (TN1c or Tc1b, decided in implementation)
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+19:03:25	CIRS	M4 (Tc1b (TN1c on outbound))



T108 – rev 211 – S87

Jan. 11, 2015 – 011T19:48:35 @ 970 km altitude

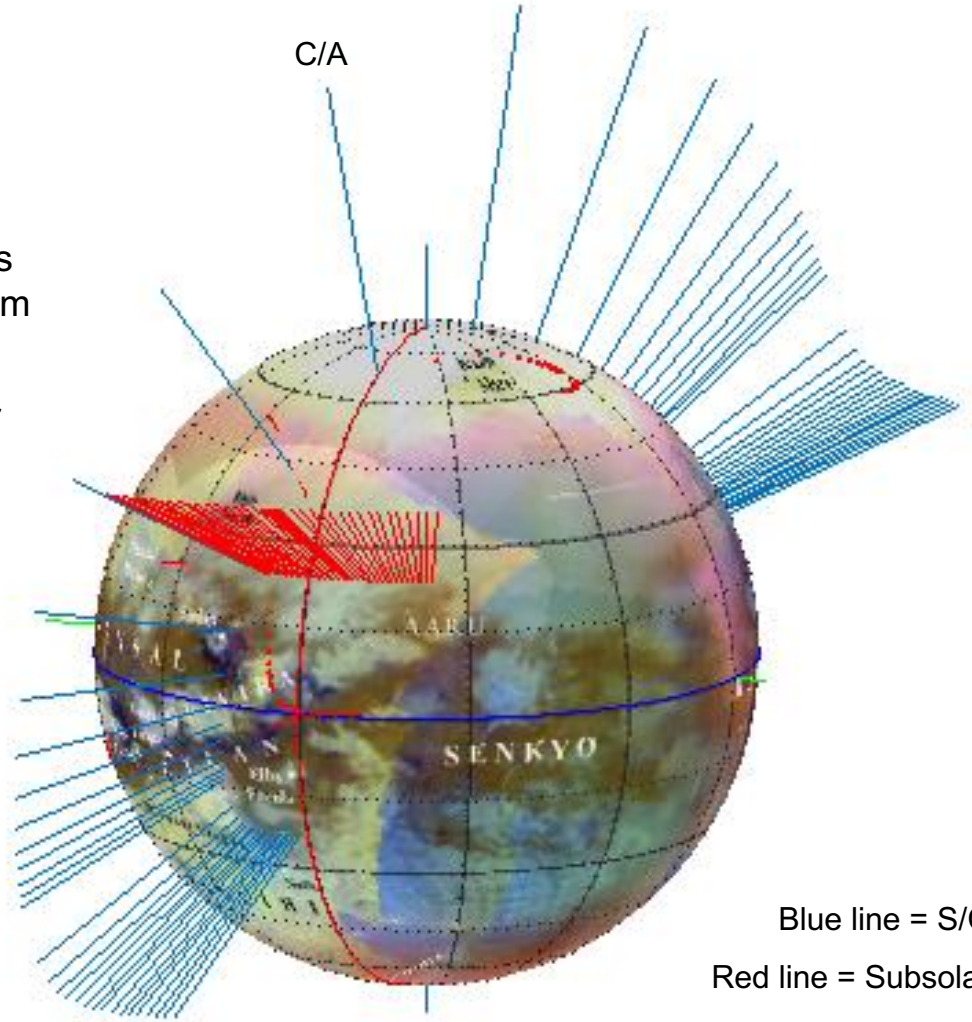
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Obtain mosaics of the equatorial regions to look for spectral signatures in the 5-μm band (TN1a).

Monitor the evolution of the South Polar vortex (TC1b).

Look for the presence of clouds at northern latitudes (TC1a).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T108 – rev 211 – S87

Jan. 11, 2015 – 011T19:48:35 @ 970 km altitude

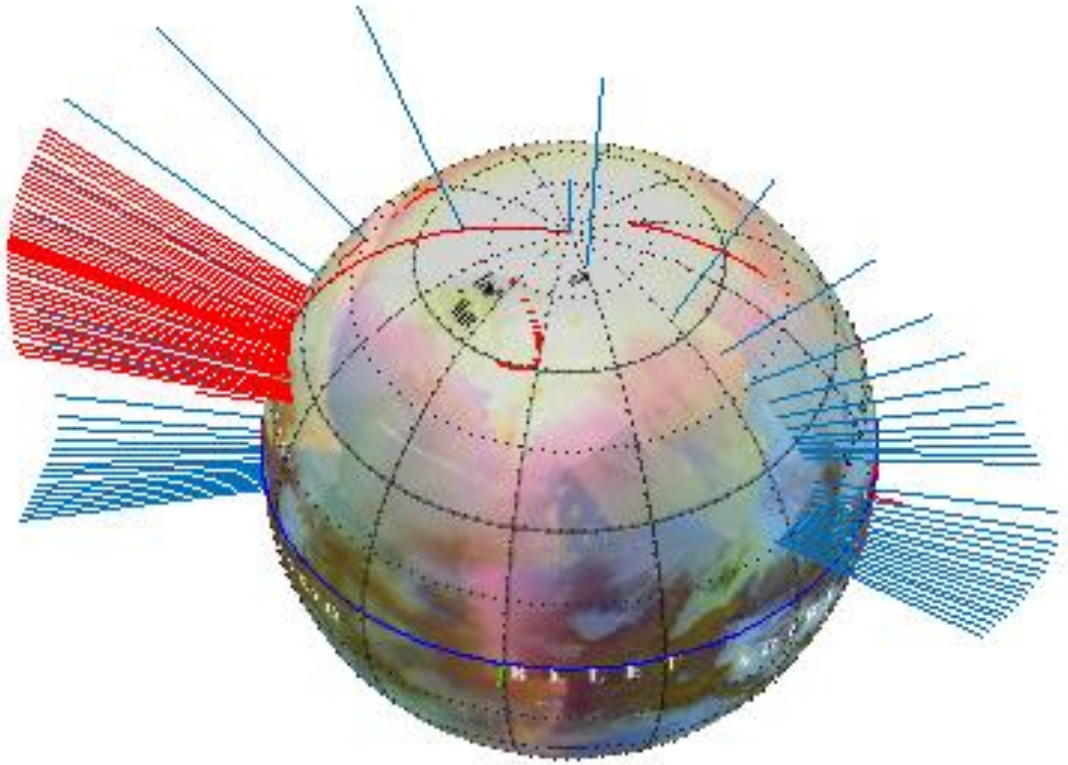
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Specular reflection is not anticipated since the geometry occurs over areas where liquids have not been observed by the radar instrument.

Ridealong with CIRS and obtain low resolution images of the North Pole region.

C/A



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

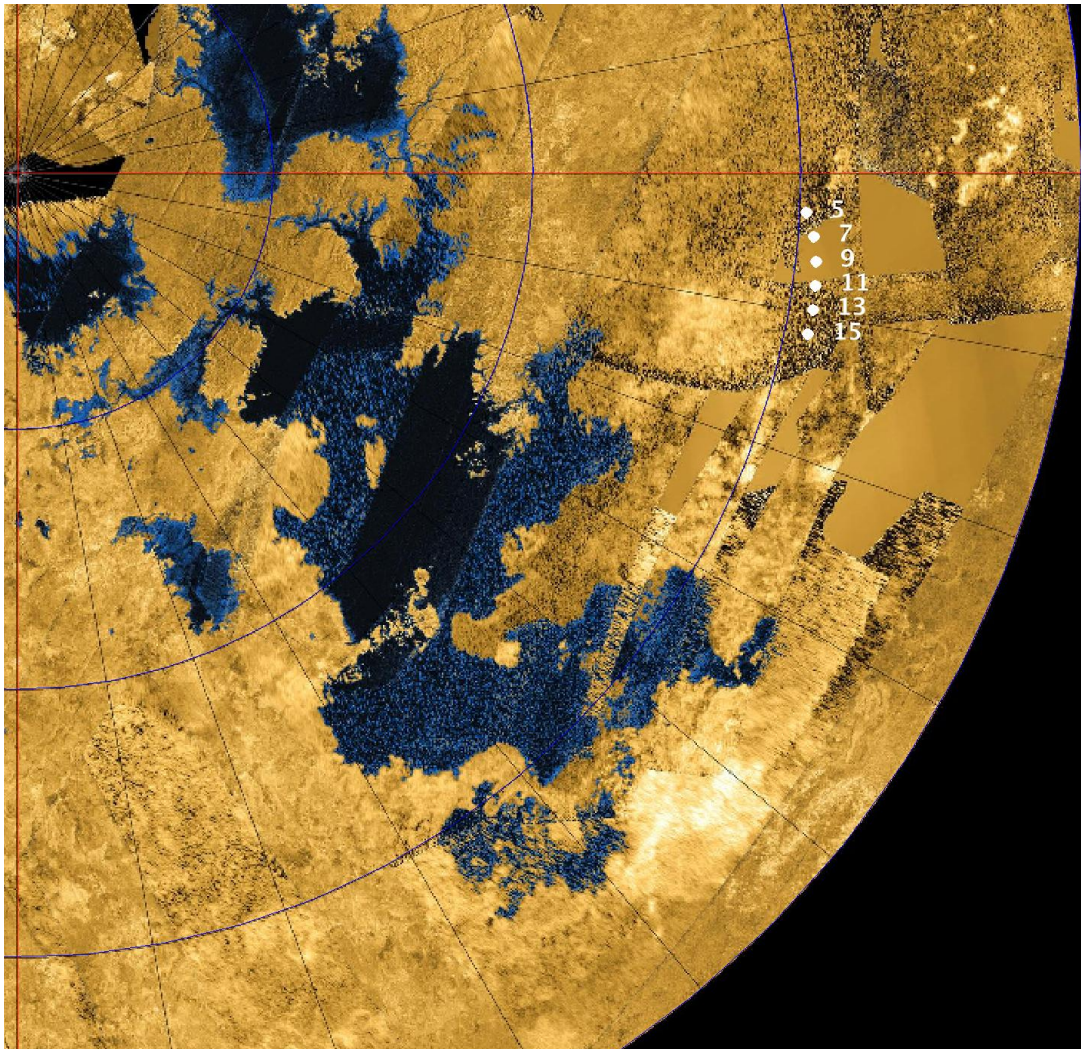
T108 – rev 211 – S87

Jan. 11, 2015 – 011T19:48:35 @ 970 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (hr)
59.79	272.8	66.6	66.6	5
59.45	274.5	66.7	66.7	7
59.28	276.3	66.8	66.8	9
59.19	278.0	66.9	66.9	11
59.15	279.7	67.0	66.9	13
59.16	281.5	67.0	67.1	15



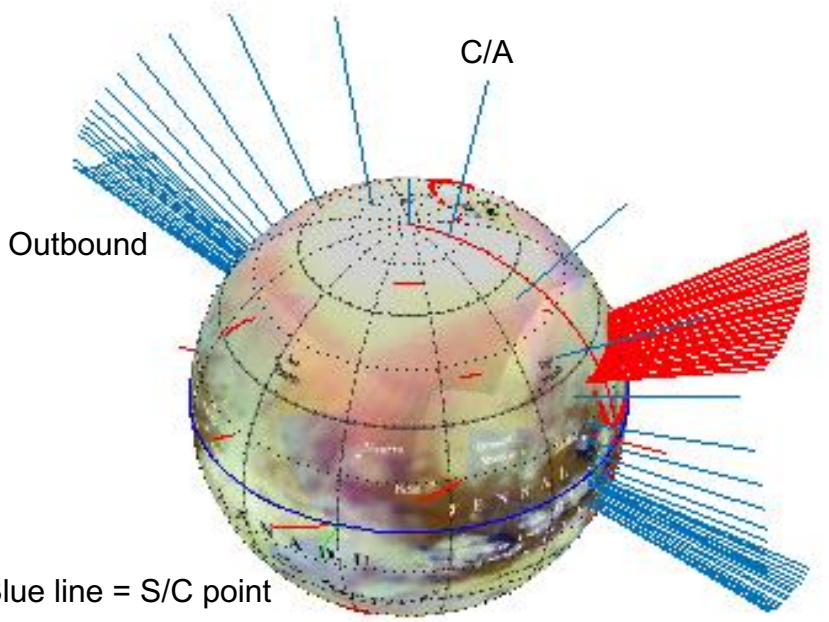
T109 – rev 212 – S87

Feb. 12, 2015 – 043T17:08:04 @ 1200 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T109: On the inbound, VIMS will image the South Pole to witness the evolution of the South Polar vortex. It will then make a mosaic of the sub-Saturn tropical zone that include dunes fields and plateaus. It will also look for clouds at northern mid-latitudes. Then, the VIMS will use the push-broom mode to take a high resolution swath across the polar cap North of 60 deg. This path will cross Punga Mare and possibly Kivu Lacus. On the outbound, VIMS will first look for specular reflection on the northeastern tip of Kraken Mare and across the straight that links Kraken and Ligeia. It will then acquire a mosaic of the North Pole area that includes seas and mare before handing off to CIRS.

C/A-16:22:05	-14:00	VIMS	B (TC1a)
-14:00	-09:00	VIMS	V (TC1a, TC1b)
-09:00	-02:15	UVIS	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
begin custom period			
-02:15	**-00:30**	**VIMS**	
-00:30	**-00:29**	RWA to RCS Transition	
-00:29	**0**	**VIMS**	
2015-043T17:08:05		**CLOSEST APPROACH**	**NEG_Y to Titan (Tc2a)**
0	**+00:30**	**VIMS**	**VIMS hand off at CIRS attitude**
+00:30	**+01:15**	**CIRS**	**TC1a**
+01:15	**+01:37**	RCS to RWA Transition	
+01:37	**+02:15**	**CIRS**	**TC1a**
end custom period			
+02:15	+09:00	**UVIS**	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+21:17:55	CIRS	M4 (Tc1b (TN1c on outbound))



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T109 – rev 212 – S87

Feb. 12, 2015 – 043T17:08:04 @ 1200 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

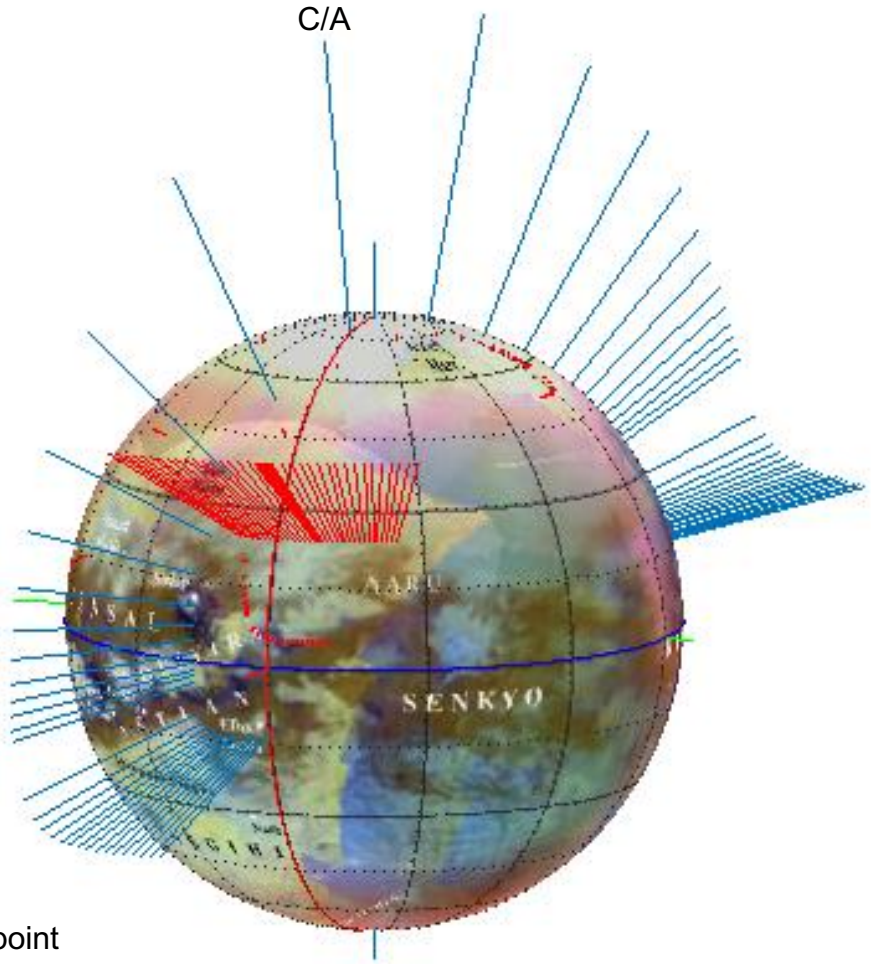
South Pole to witness the evolution of the South Polar vortex.

Mosaic of the sub-Saturn tropical zone that include dunes fields and plateaus.

Clouds at northern mid-latitudes.

Push-broom mode to take a high resolution swath across the polar cap North of 60 deg. This path will go across Punga mare and possibly Kivu lacus.

Specular geometry near the equator (5N; 350 – 0 W).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T109 – rev 212 – S87

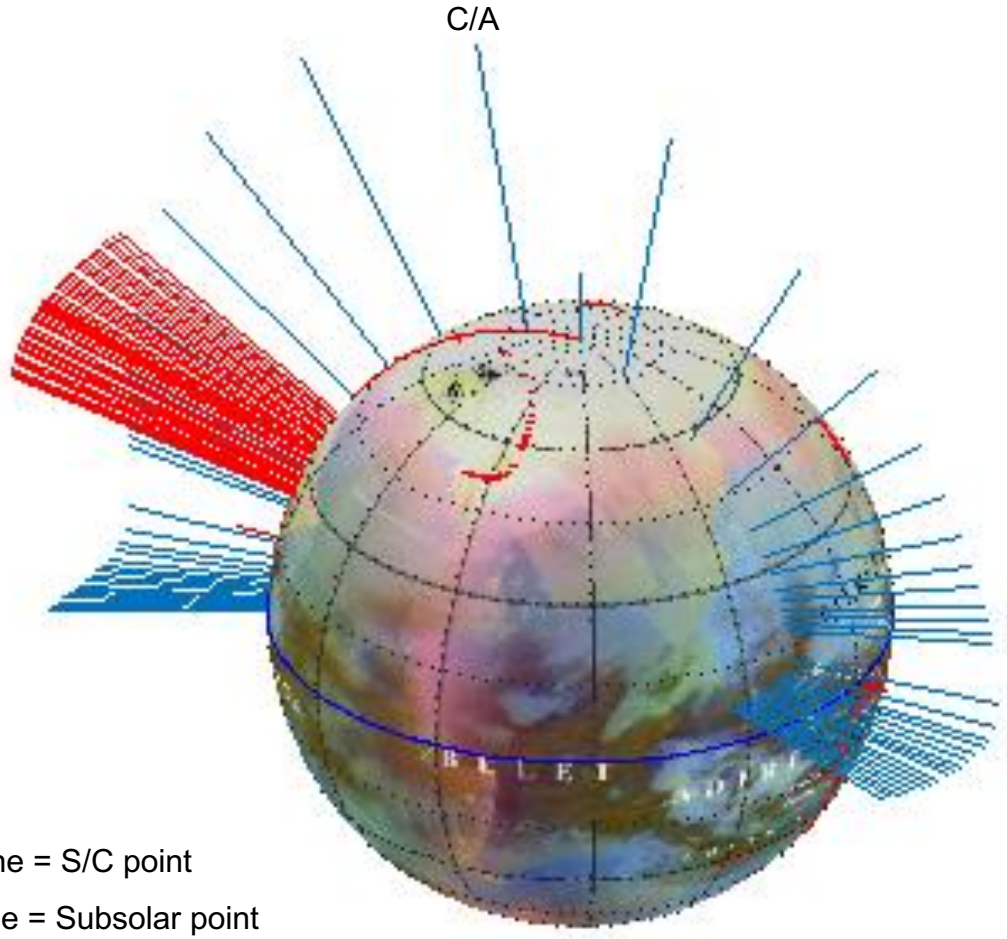
Feb. 12, 2015 – 043T17:08:04 @ 1200 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

VIMS will first look for specular reflection on the northeastern tip of Kraken Mare and across the straight that links Kraken and Ligeia.

It will then acquire a mosaic of the North Pole area that includes seas and mare before handing off to CIRS.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

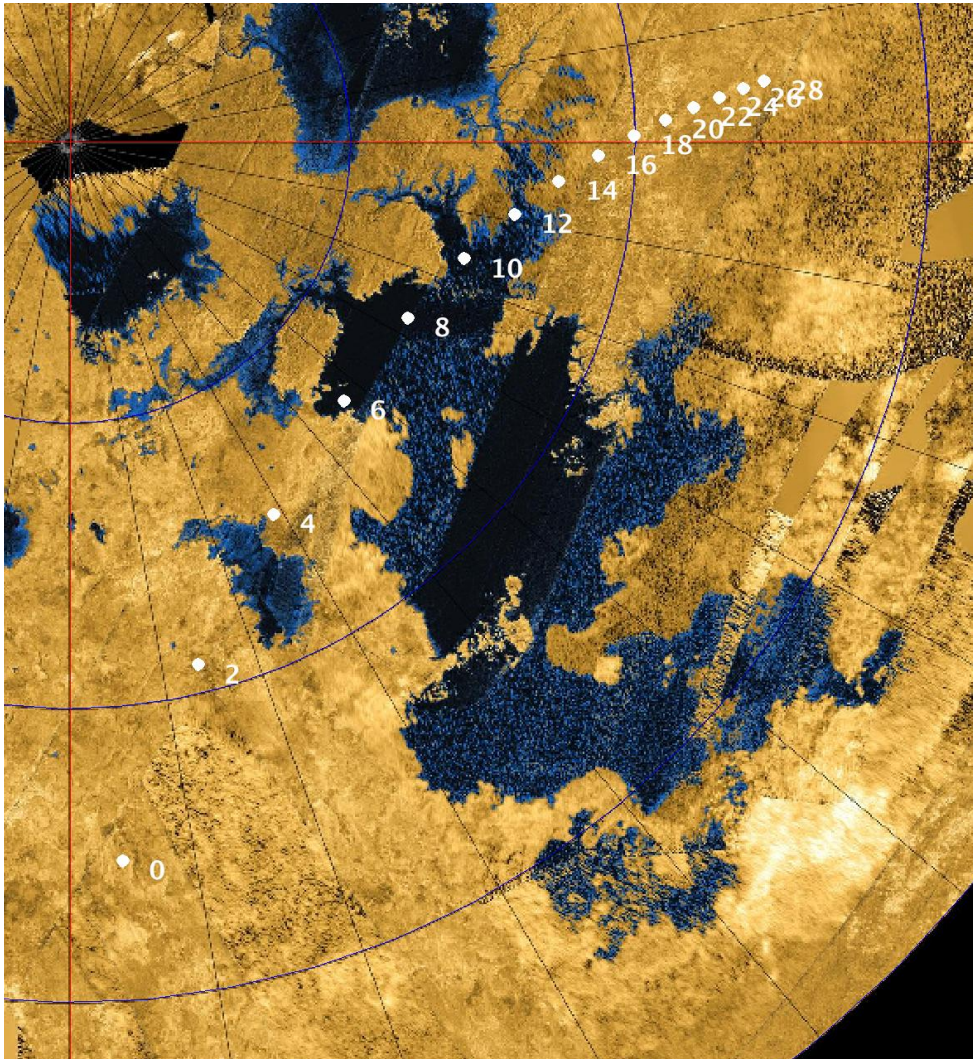
T109 – rev 212 – S87

Feb. 12, 2015 – 043T17:08:04 @ 1200 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (min)
64.71	355.8	40.8	40.5	0	0
70.99	346.2	47.0	46.6	120	2
74.96	331.3	51.9	51.9	240	4
76.63	313.3	55.7	55.7	360	6
76.49	297.5	58.5	58.5	480	8
75.42	286.4	60.5	60.5	600	10
74.04	279.2	62.0	62.0	720	12
72.63	274.5	63.2	63.1	840	14
71.30	271.4	64.1	64.0	960	16
70.08	269.3	64.8	64.7	1080	18
68.97	267.8	65.3	65.3	1200	20
67.97	266.8	65.8	65.8	1320	22
67.07	266.0	66.2	66.2	1440	24
66.25	265.4	66.5	66.5	1560	26
65.50	264.9	66.8	66.8	1680	28



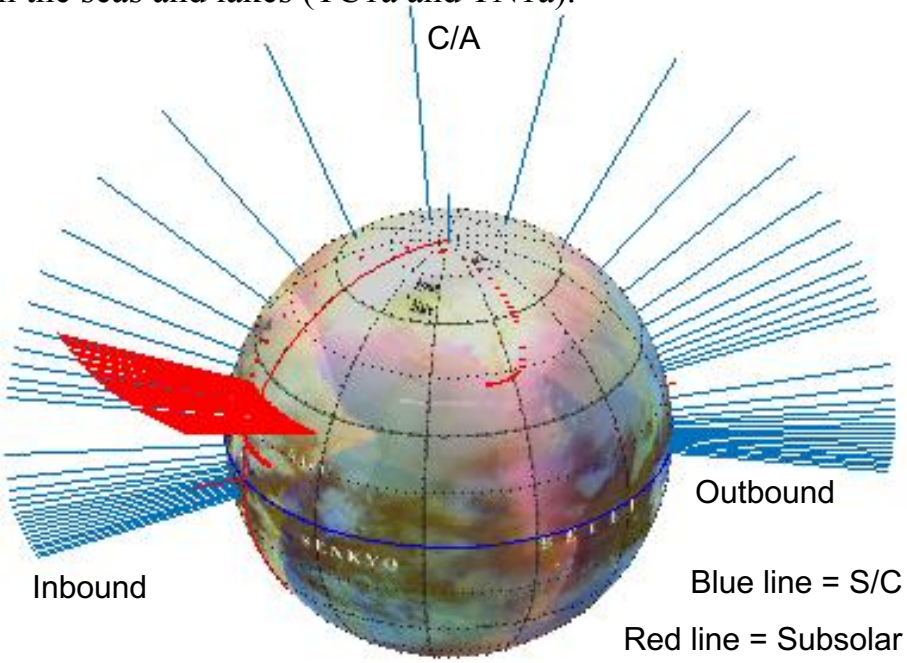
T110 – rev 213 – S88

March 16, 2015 – 075T14:29:49 @ 2275 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T110: During this flyby, CIRS and VIMS are prime at closest approach (2275km). On the inbound, VIMS will monitor the evolution of the south polar vortex (TC1b) and look for clouds at high northern latitudes (TC1a). It will also acquire a medium resolution (10 km/pixel) mosaic of the dune fields and bright plateaus on the Saturn facing side of Titan. Then the pushbroom mode will be used to acquire an high resolution swath up to the North Polar lakes (TC1a). A high resolution (less than 5 km per pixel) mosaic of part of the North polar area will be acquired to look for changes as summer solstice approaches (TC1a and TN1a). On the outbound, VIMS will ride along with CIRS and look for opportunities to observe specular reflections on the seas and lakes (TC1a and TN1a).

C/A-15:39:49	-14:00	CIRS	A (Tc1b)
-14:00	-09:00	CIRS	C (TN1c)
-09:00	-05:00	CIRS	F (TC1b OR TN1c)
-05:00	-02:15	VIMS	Y (TC1a, TN1a (depending on pointing) and TN2c)
-02:15	**0**	**VIMS**	
2015-075T14:29:49		**CLOSEST APPROACH**	**NEG_Y to Titan (Tc2a)**
0	**+00:30**	**VIMS**	**VIMS hands off at CIRS attitude**
+00:30	**+02:15**	**CIRS**	
+02:15	**+05:00**	**CIRS**	T (TN2c (surface temperature))
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+21:30:11	CIRS	M4 (Tc1b (TN1c on outbound))



T110 – rev 213 – S88

March 16, 2015 – 075T14:29:49 @ 2275 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

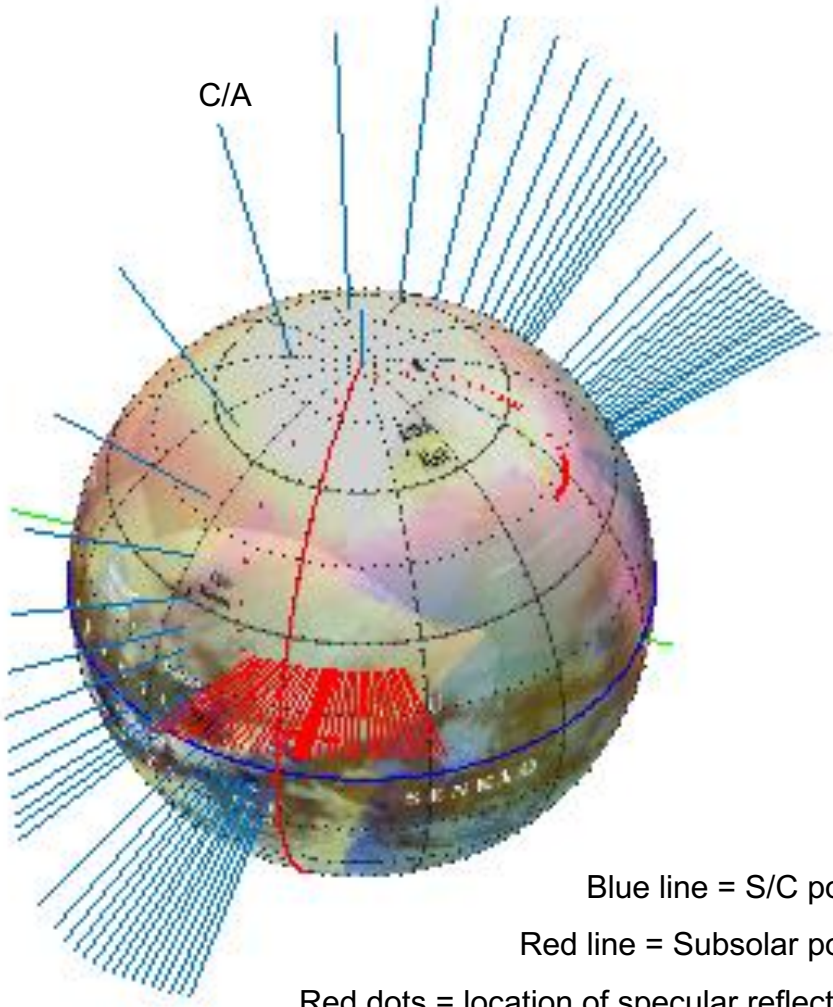
Monitor the evolution of the south polar vortex (TC1b).

Look for clouds at high northern latitudes (TC1a).

Acquire medium resolution (10 km/pixel) mosaic of the dune fields and bright plateaus on the Saturn facing side of Titan.

Pushbroom mode will be used to acquire a high resolution swath up to the North Polar lakes (TC1a).

Acquire high resolution (less than 5 km/pixel) mosaic of portions of the North Pole regions to look for changes as the summer solstice approaches (TC1a and TN1a).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

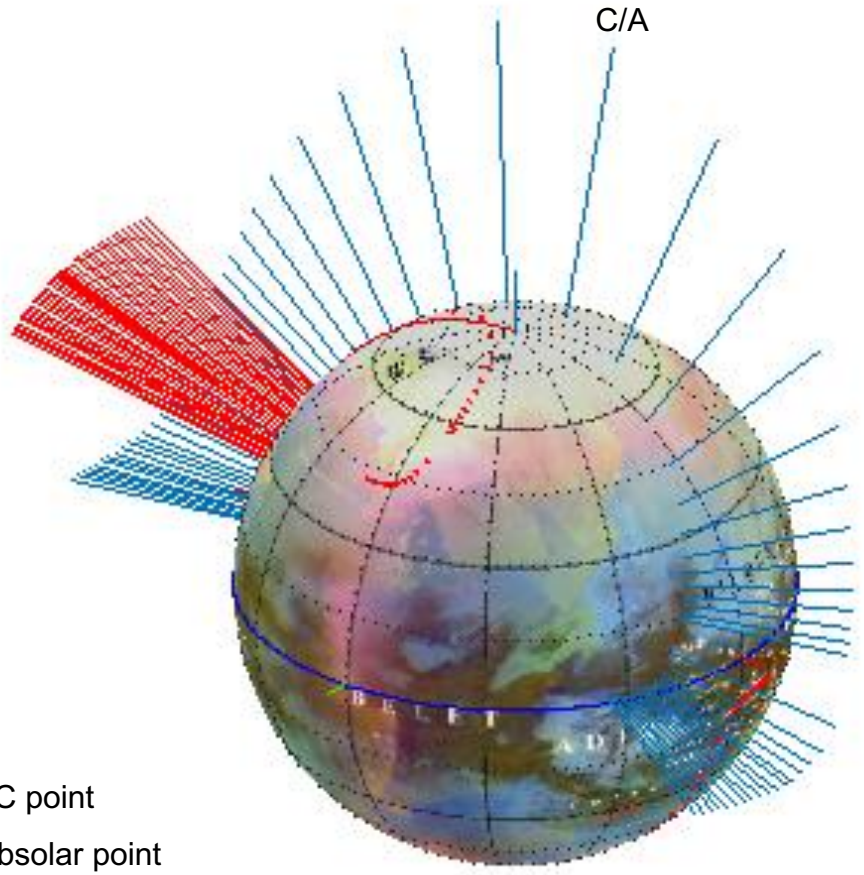
T110 – rev 213 – S88

March 16, 2015 – 075T14:29:49 @ 2275 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

VIMS will ride along with CIRS and look for opportunities to observe specular reflections on the seas and lakes (TC1a and TN1a).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

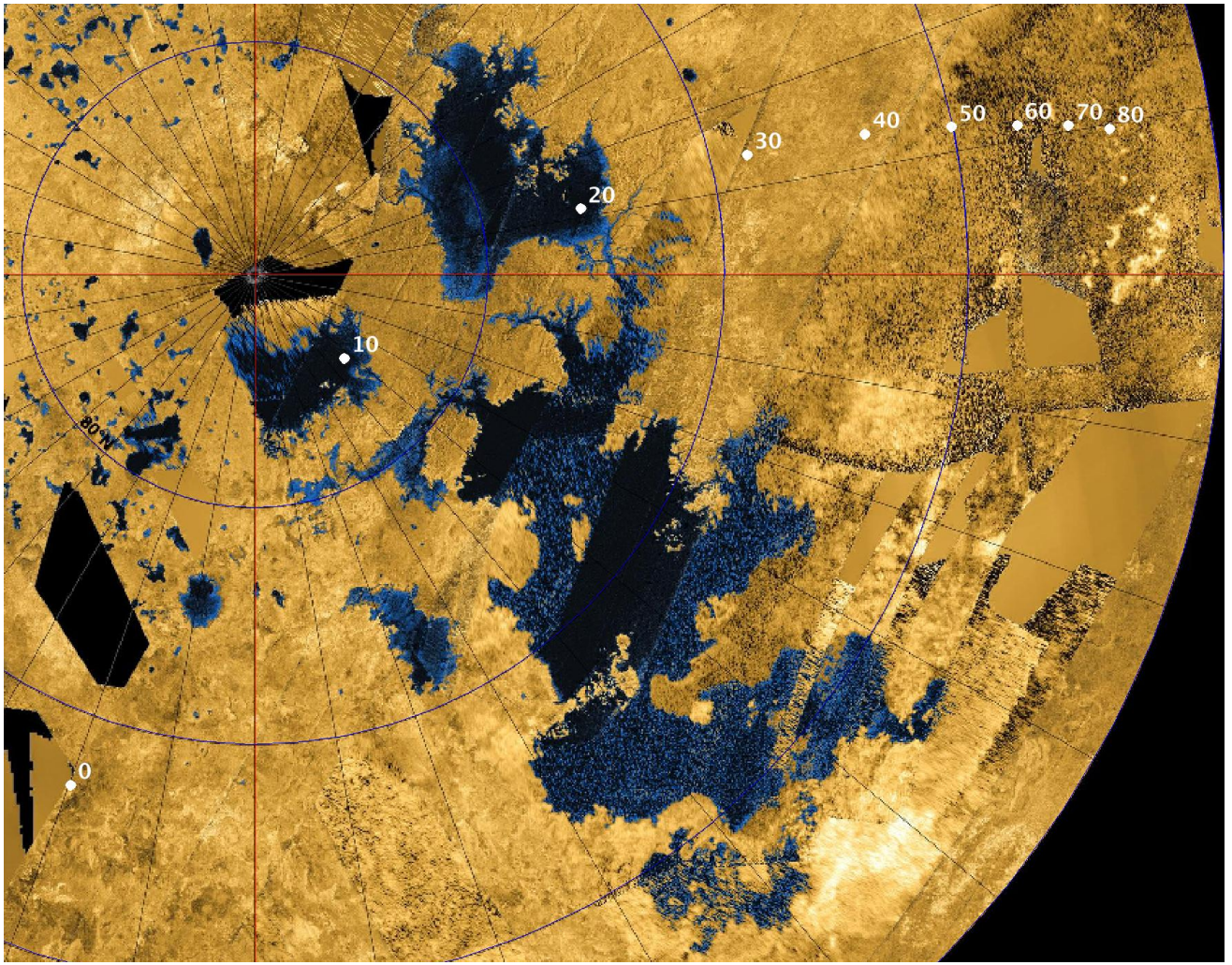
T110 – rev 213 – S88

March 16, 2015 – 075T14:29:49 @ 2275 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (min)
66.97	379.9	46.59	0	0
84.74	313.1	61.59	600	10
75.78	258.5	66.97	1200	20
68.47	256.3	69.03	1800	30
63.55	257.0	69.99	2400	40
60.08	258.0	70.48	3000	50
57.50	258.9	70.78	3600	60
55.51	259.6	71.02	4200	70
53.95	260.3	71.14	4800	80



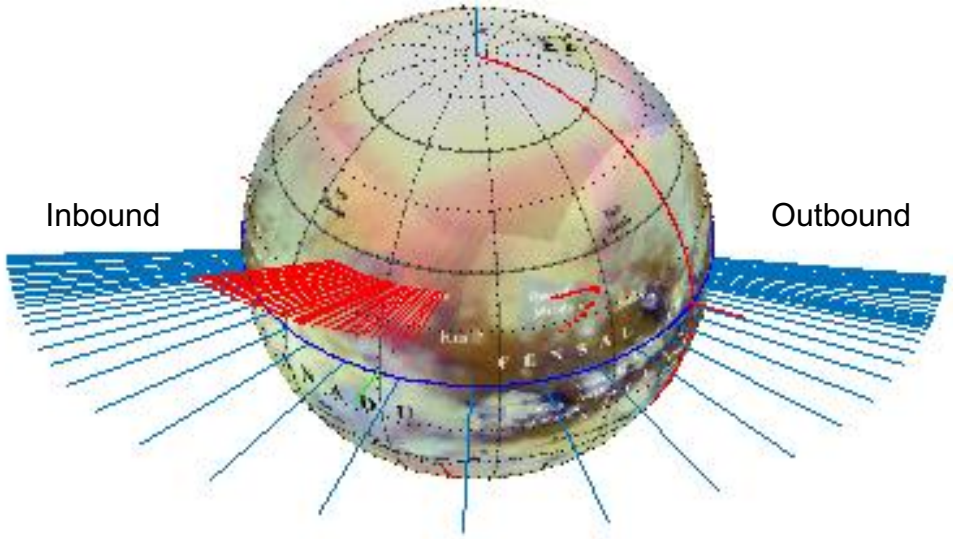
T111 – rev 215 – S89

May 7, 2015 – 127T22:50:24 @ 2722 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T111: VIMS and CIRS are prime at closest approach during this flyby (2722 km). During this equatorial flyby, VIMS will observe the evolution of the South Polar Vortex (TC1b) and will monitor the evolution of the cloud coverage at mid northern latitudes (TC1a). It will construct a mosaic of Xanadu at 10 km resolution (TN1a) taking advantage of the low value of the phase angle (< 30 degrees). High resolution images of Mnerva will be acquired at closest approach (TN1a). On the outbound, VIMS will ride along with CIRS and will continue monitoring of the cloud activities (TC1a). It will also acquire images of the North Polar seas (TC1a and TN1a) if CIRS' observation geometry permits it.

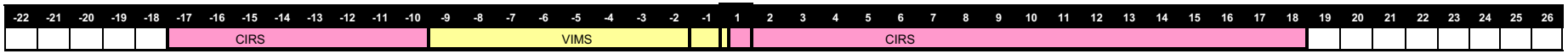
C/A-17:40:25	-14:00	CIRS	A3 (Tc1b)
-14:00	-09:00	CIRS	C (TN1c)
-09:00	-05:00	VIMS	I (TC1a and TN2c)
-05:00	-02:15	VIMS	Y (TC1a, TN1a (depending on pointing) and TN2c)
-02:15	**0**	**VIMS**	(TC1a, TN1a)
2015-127T22:50:25		**CLOSEST APPROACH**	**NEG_Y to Titan (Tc2a)**
0	**+00:10**	**VIMS**	**VIMS hand off at CIRS attitude** (TC1a, TN1a)
+00:10	**+02:15**	**CIRS**	**(TN1c)**
+02:15	+05:00	**CIRS**	T (TN2c (surface temperature))
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+18:29:35	CIRS	M4 (Tc1b (TN1c on outbound))



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T111 – rev 215 – S89

May 7, 2015 – 127T22:50:24 @ 2722 km altitude

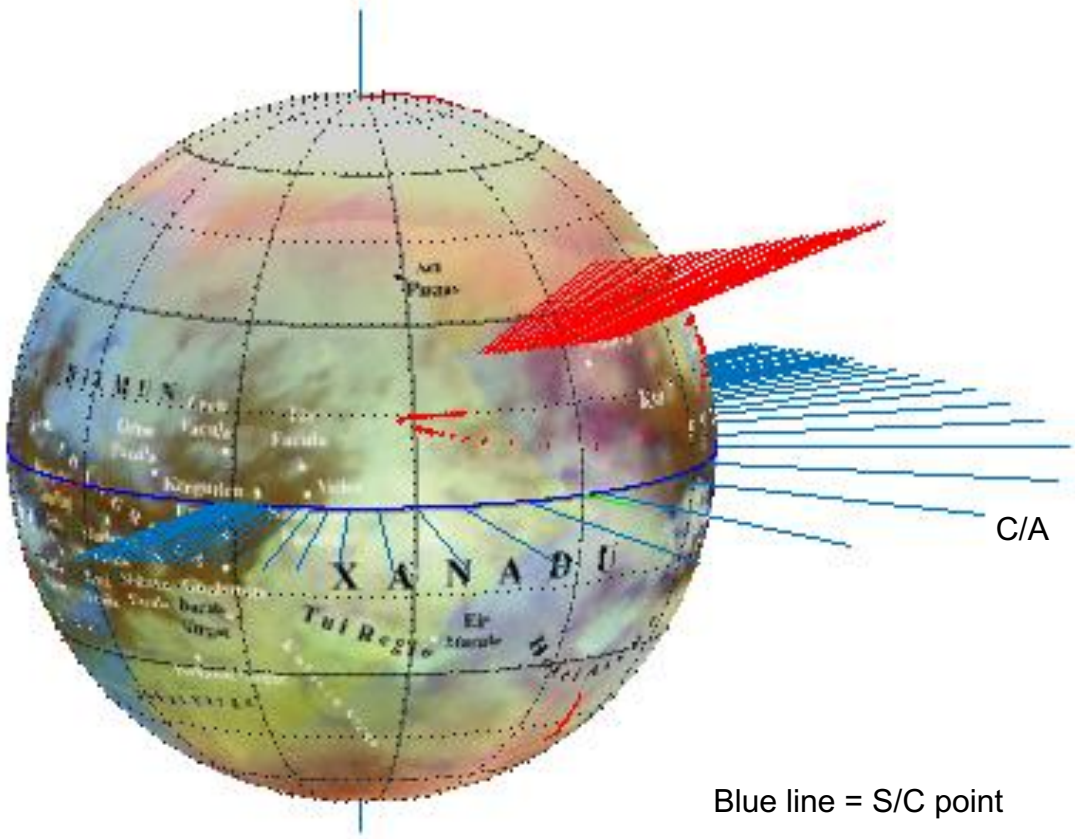
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observe the evolution of the South Polar Vortex (TC1b) and monitor the evolution of the cloud coverage at mid-northern latitudes (TC1a).

Acquire a mosaic of Xanadu at 10 km resolution (TN1a) taking advantage of the phase angle (<30 degrees).

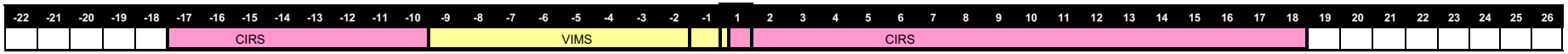
High resolution images of Mnerva will be acquired at closest approach (TN1a).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T111 – rev 215 – S89

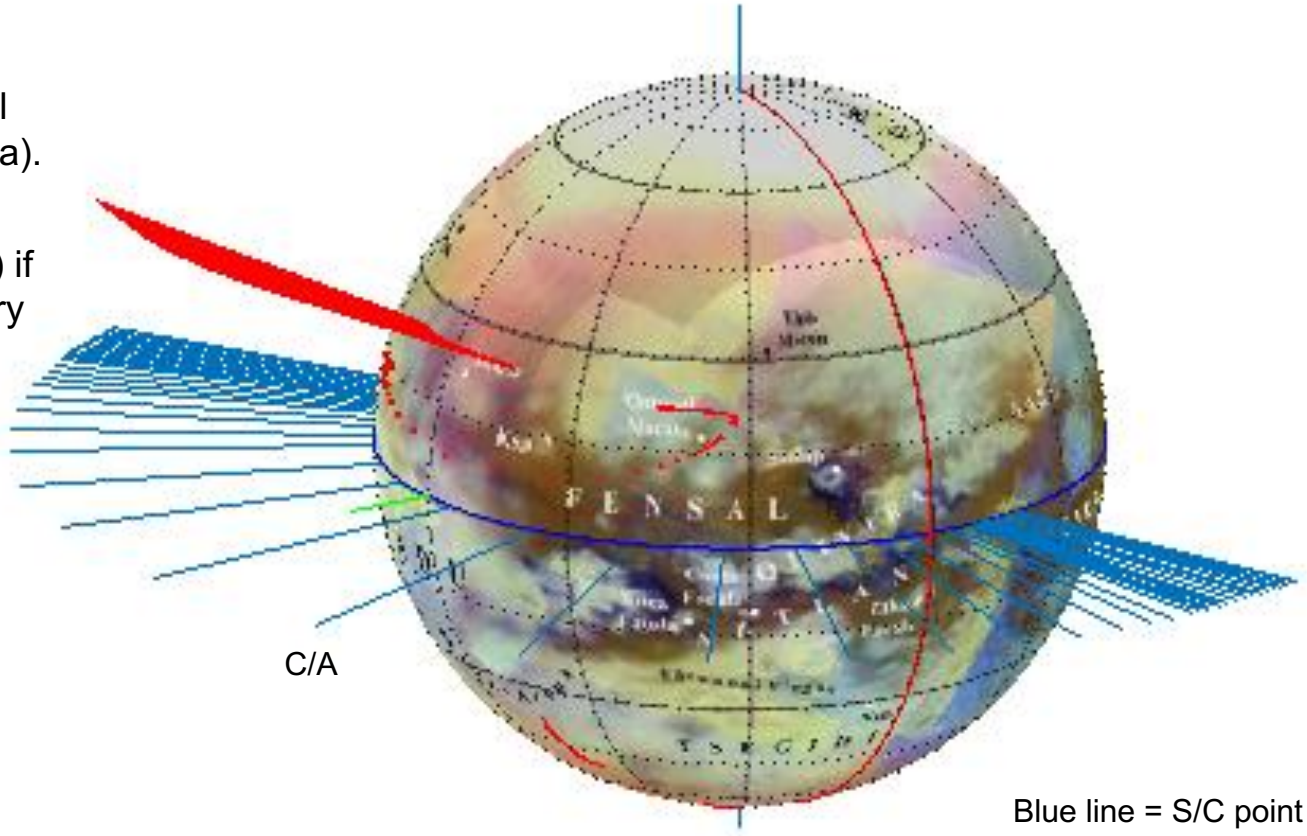
May 7, 2015 – 127T22:50:24 @ 2722 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Ridealong with CIRS and will monitor cloud activities (TC1a).

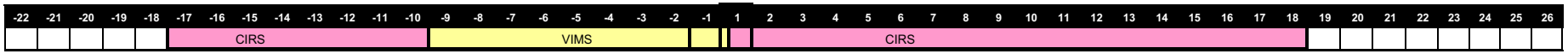
Acquire images of the North Polar seas (TC1a and TN1a) if the CIRS' observing geometry permits.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

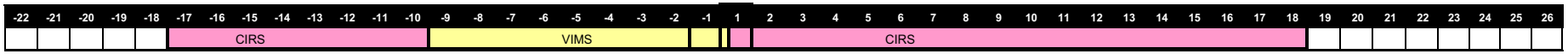


T111 – rev 215 – S89

May 7, 2015 – 127T22:50:24 @ 2722 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to and after C/A, specular geometry occurs at mid-northern latitudes.



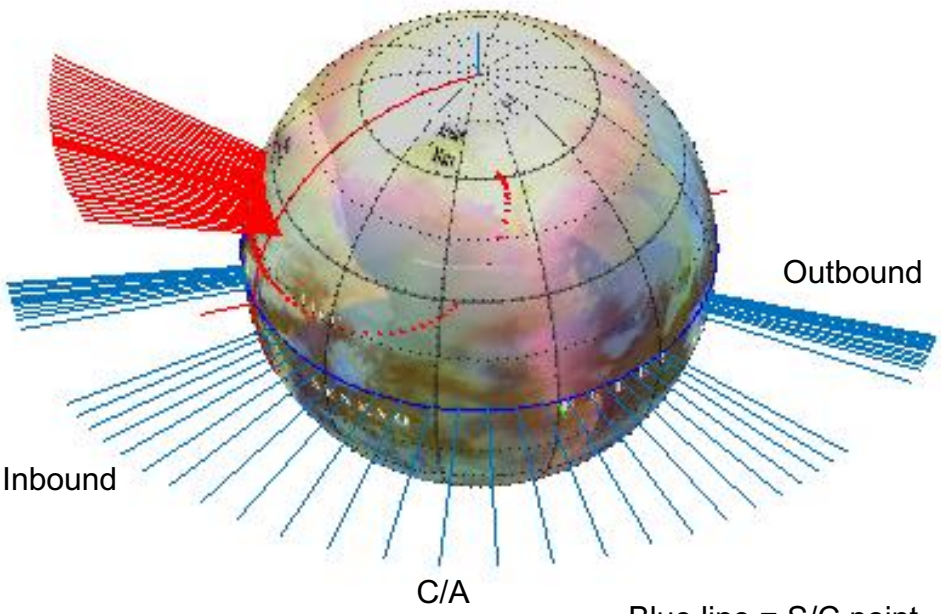
T112 – rev 218 – S89

July 7, 2015 – 188T08:09:51 @ 10,953 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T112: VIMS will be riding along with ISS on the inbound and will acquire a mosaic of the sub-Saturn tropical zone that includes the dune fields of Fensal and Aztlan and the Qilvira plateau. It will also observe the evolution of the South Polar vortex and will look for the formation of clouds at northern mid-latitudes. On the outbound, VIMS will take images of the North Polar area with the seas being illuminated (TC1a and TN1a).

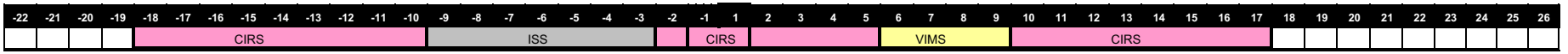
C/A-19:42:51	-14:00	CIRS	A3 (Tc1b)
-14:00	-09:00	CIRS	C (TN1c)
-09:00	-05:00	ISS	H (TC1a, TN1a, TN2c (Could also be TC1b and/or TN1c, depending on geometry, or TN2d, depending on
-05:00	-02:15	ISS	J1 (TC1a, TN1a (Could also be TC1b and/or TN1c, depending on geometry, or TN2c and TN2d, depending on timing.))
-02:15	0	CIRS	TN1c
2015-188T08:09:51		CLOSEST APPROACH	NEG_Y to Titan (Tc2a)
0	+02:15	CIRS	TN1c
+02:15	+05:00	CIRS	T (TN2c (surface temperature))
+05:00	+09:00	VIMS	Q (TN1a (Specular reflection of lakes-depending on geometry))
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+16:53:09	CIRS	M4 (Tc1b (TN1c on outbound))



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T112 – rev 218 – S89

July 7, 2015 – 188T08:09:51 @ 10,953 km altitude

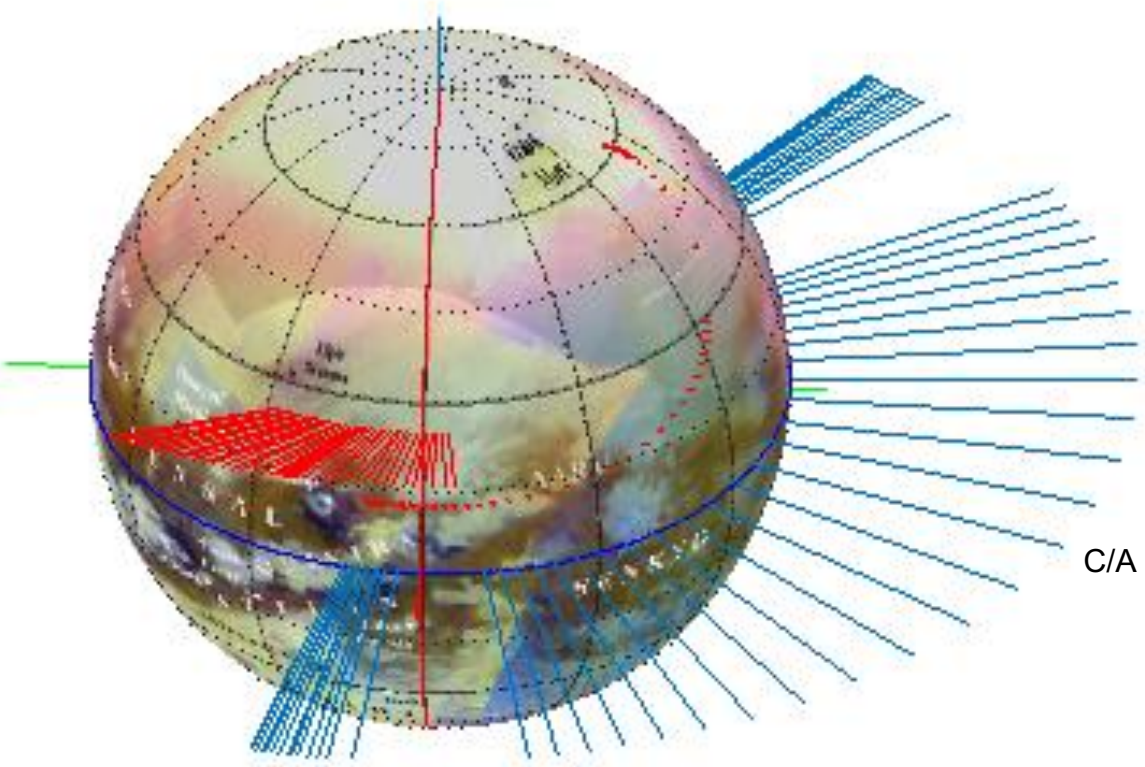
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Acquire a mosaic of the sub-Saturn tropical zone that includes the dune fields of Fensal and Aztlen and the Oilvira plateau.

Observe the evolution of the South Polar vortex.

Will look for the formation of clouds at northern mid-latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
				CIRS																	CIRS						VIMS				CIRS																

T112 – rev 218 – S89

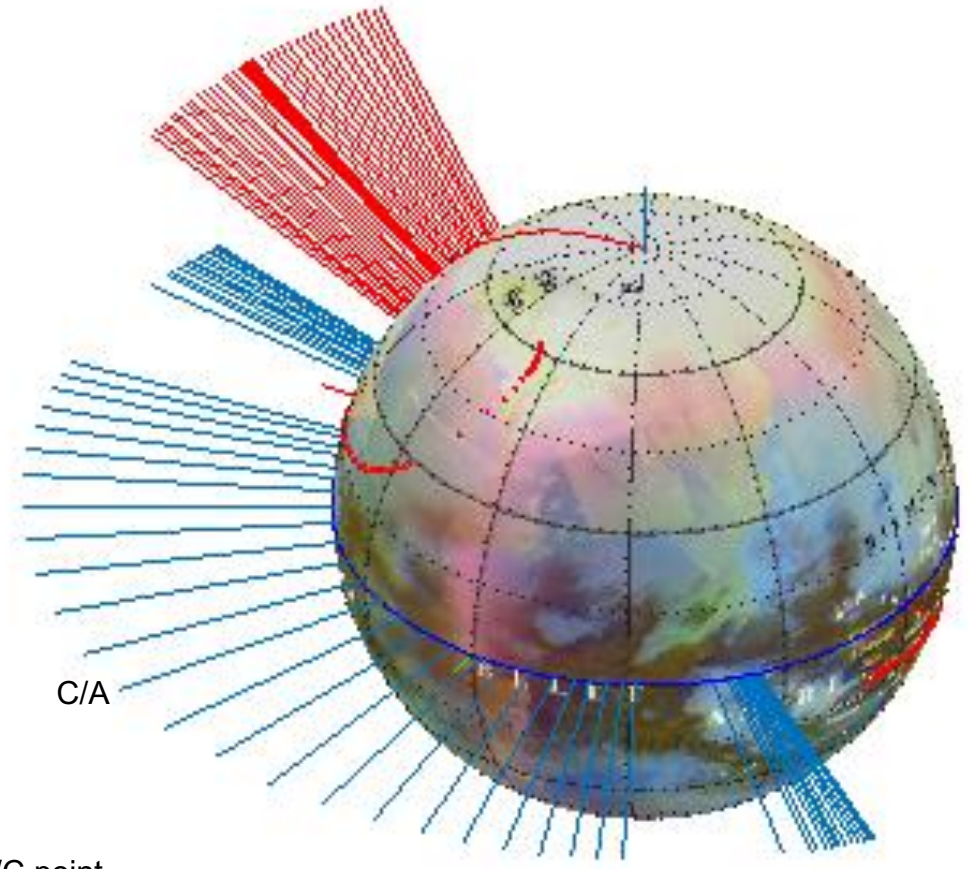
July 7, 2015 – 188T08:09:51 @ 10,953 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Acquire images of the North Polar area with the seas being illuminated (TC1a and TNa1).

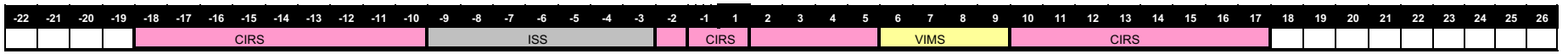
Specular reflection occurs, if liquids are present, in the area of 55N, 277 W 6 hours after C/A.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



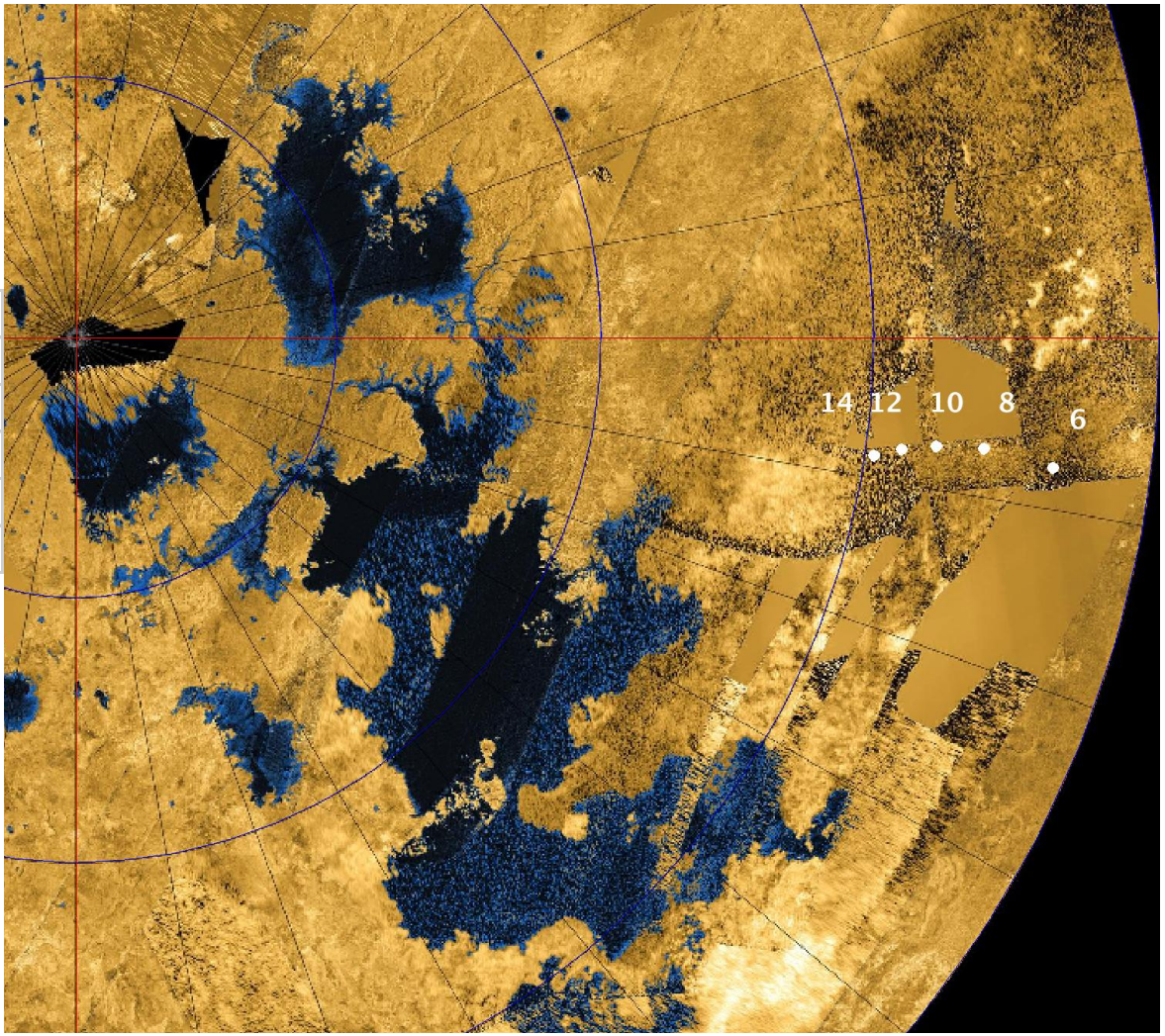
T112 – rev 218 – S89

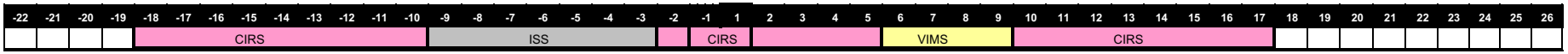
July 7, 2015 – 188T08:09:51 @ 10,953 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
53.39	277.60	75.6	21600	6
55.87	277.00	75.9	28800	8
57.54	277.20	76.1	36000	10
58.75	277.70	76.2	43200	12
59.71	278.40	76.4	50400	14





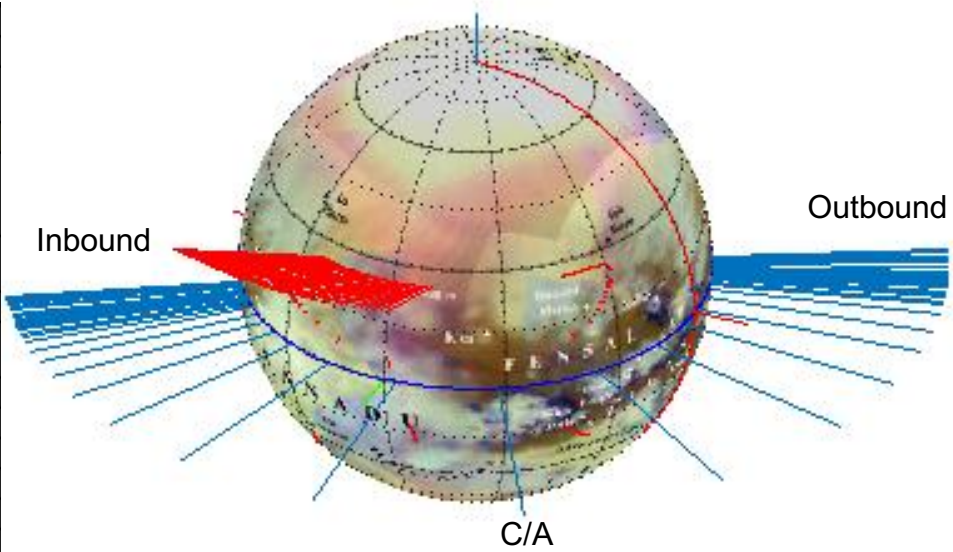
T113 – rev 222 – S91

Sept. 28, 2015 – 271T21:37:13 @ 1036 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T113: A combination of CAPS, Radar and INMS are prime during closest approach (1036 km). Note, prime instruments were redefined because CAPS is not operating. Master timeline reflects those changes. On the inbound, VIMS will ride along with ISS to observe the evolution of the South Polar vortex, to map the tropical regions of Shangri-La, and to monitor the formation of clouds at high northern latitudes. VIMS will then acquire a mosaic of 4 images that covers the transition from the dune fields to Xanadu (TN1a) with a footprint resolution better than 20 km/pixel. A view of the Tui region will allow us to look for variations at the surface (TC1a). On the outbound, VIMS will ride along with CIRS and will look at the Northern Pole area (TN1a).

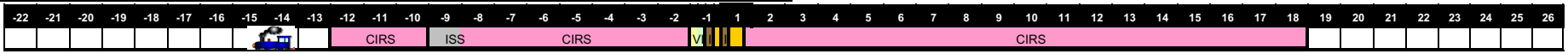
C/A-12:10:14	-10:00	CIRS	C truncated (TN1c)
-10:00	-09:00	ISS	TN1a
-09:00	-02:00	CIRS	F (TC1b OR TN1c)
Begin custom period			
-02:00	-01:00	VIMS	Z (TC2a)
-01:00	-00:35	INMS	(TN1c, MC2a)
-00:35	-00:34	RWA to RCS Transition	
-00:34	0	RADAR	Inbound altimetry (TN2b), SAR (TC1a, TN1a, TN1b, TN2b, TN2c)
2015-271T21:37:14		CLOSEST APPROACH	(Tc2a)
-00:00	+00:15	INMS	(TN1c, MC2a)
+00:15	+00:30	RADAR	Outbound altimetry (TN2b)
+00:30	+00:52	RCS to RWA Transition	
+00:52	+01:37	RADAR	Outbound HiSAR (TC1a, TN1a, TN1b, TN2c)
+01:37	+2:30	CIRS	(TN1c)
+02:30	+9:00	CIRS	(TC1b)
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+18:44:46	CIRS	M4 (Tc1b (TN1c on outbound))
End custom period			



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T113 – rev 222 – S91

Sept. 28, 2015 – 271T21:37:13 @ 1036 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

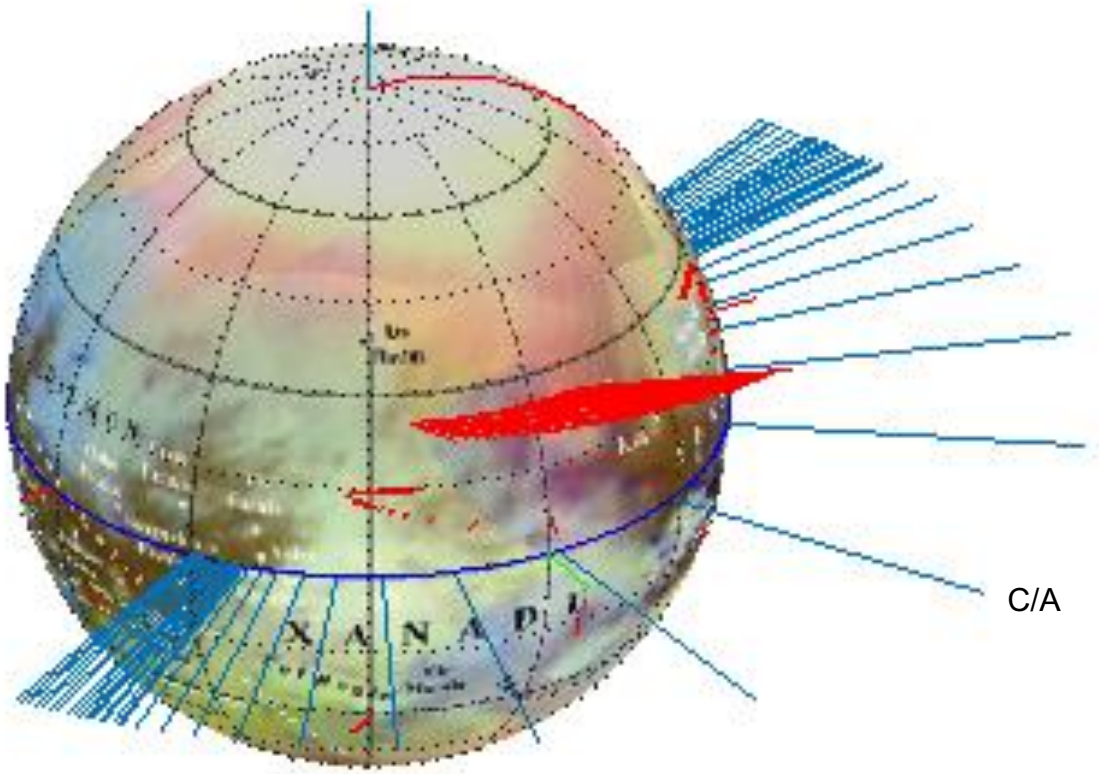
Observe the evolution of the South Polar Vortex.

Map the tropical regions of Shangra-La (10S, 165 W).

Monitor the formation of clouds at high northern latitudes.

Acquire mosaics of the transitional region of the dune fields near Xanadu at 1S, 100 W at resolutions of 20 km/px (TN1a).

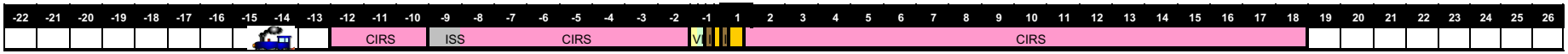
Observe the Tui Regio (24S, 125 W) area.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T113 – rev 222 – S91

Sept. 28, 2015 – 271T21:37:13 @ 1036 km altitude

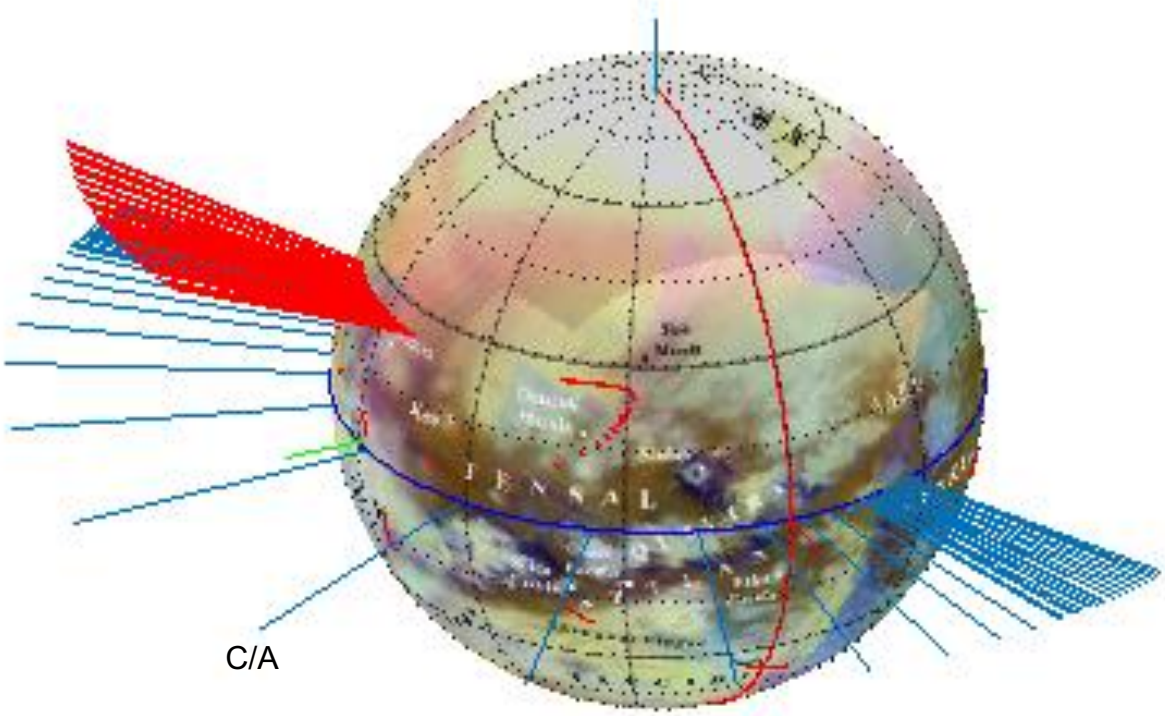
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observe the North Polar region (TN1a) if the CIRS observing geometry permits.

Clouds at high northern mid-latitudes.

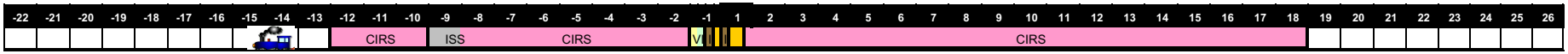
Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

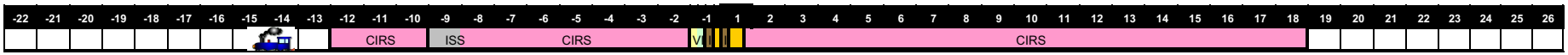


T113 – rev 222 – S91

Sept. 28, 2015 – 271T21:37:13 @ 1036 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to and after C/A, specular geometry occurs at mid-northern latitudes.



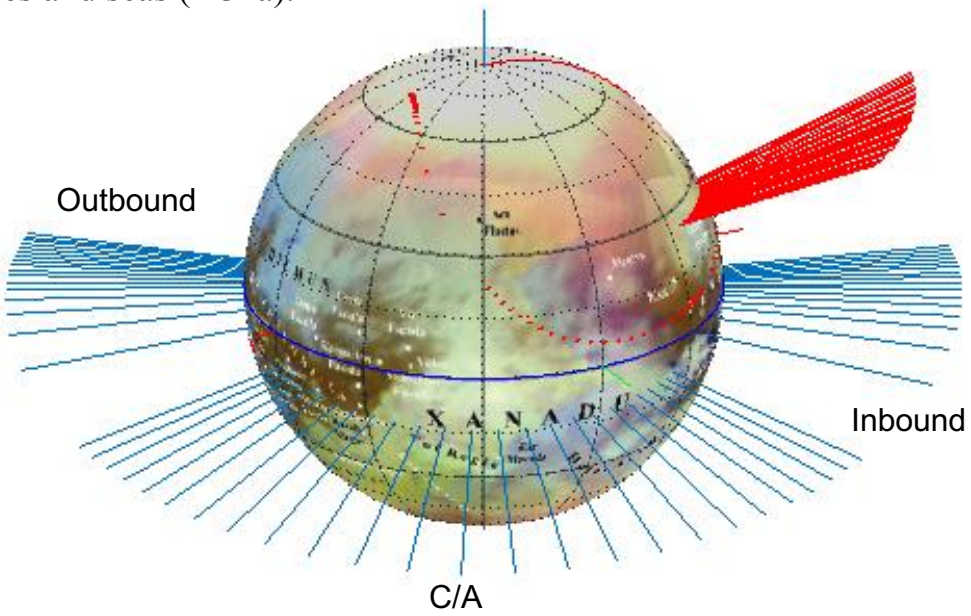
T114 – rev 225 – S91

Nov. 13, 2015 – 317T05:46:32 @ 11,920 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T114: VIMS will ridealong with ISS and CIRS during closest approach (11920km). VIMS will monitor the formation and evolution of clouds at high latitudes and will monitor the evolution of South polar vortex. VIMS will ride along with ISS and CIRS during closest approach at about 12,000 km altitude and will acquire a mosaic of Titan's surface. On the outbound, during the prime observation, VIMS will map the North pole area at high emission angle and will monitor the evolution of the lakes and seas (TC1a).

C/A-22:52:32	-14:00	CIRS	A2 (Tc1b)
-14:00	-09:00	VIMS	V (TC1a, TC1b)
-09:00	-05:00	CIRS	F (TC1b OR TN1c)
-05:00	-02:15	VIMS	Y (TC1a, TN1a (depending on pointing) and TN2c)
-02:15	**0**	**ISS**	**(TN1a)**
2015-317T05:46:32		**CLOSEST APPROACH**	**NEG_Y to Titan (Tc2a)**
0	**+00:15**	**ISS**	**ISS hand off at waypoint**
+00:15	**+00:45**	**CIRS**	**TN1c**
+00:45	**+01:15**	**CIRS**	**TN1c**
+01:15	**+02:15**	**CIRS**	**TN1c**
+02:15	+09:00	**UVIS**	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
+09:00	C/A+10:47:28	VIMS	O (TN1a (Specular reflection of lakes-depending on geometry))



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T114 – rev 225 – S91

Nov. 13, 2015 – 317T05:46:32 @ 11,920 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

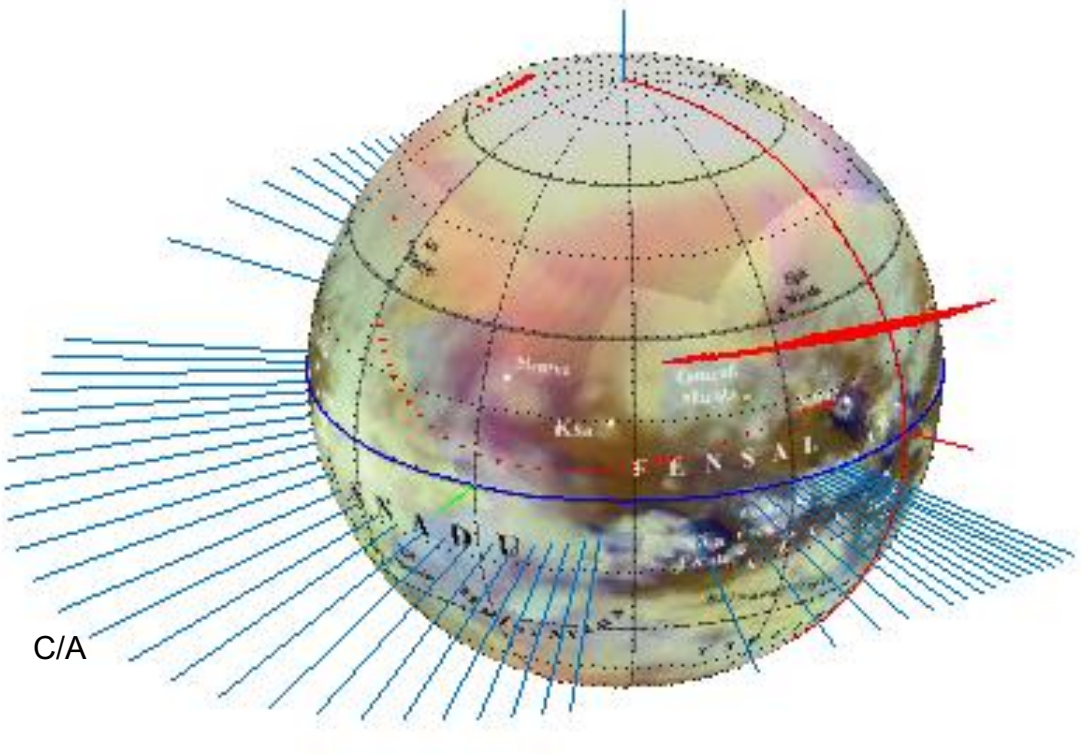
Inbound:

Global mapping of Titan including a global mosaic centered at 1S, 30 W near the Fensal region at medium resolutions (~40 km/px) two hours prior to C/A.

Monitor the evolution and formation of clouds at northern mid-latitudes.

Monitor the South Polar Vortex.

Acquire mosaics of Titan's surface in the Xanadu region at 14S, 103 W.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T114 – rev 225 – S91

Nov. 13, 2015 – 317T05:46:32 @ 11,920 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

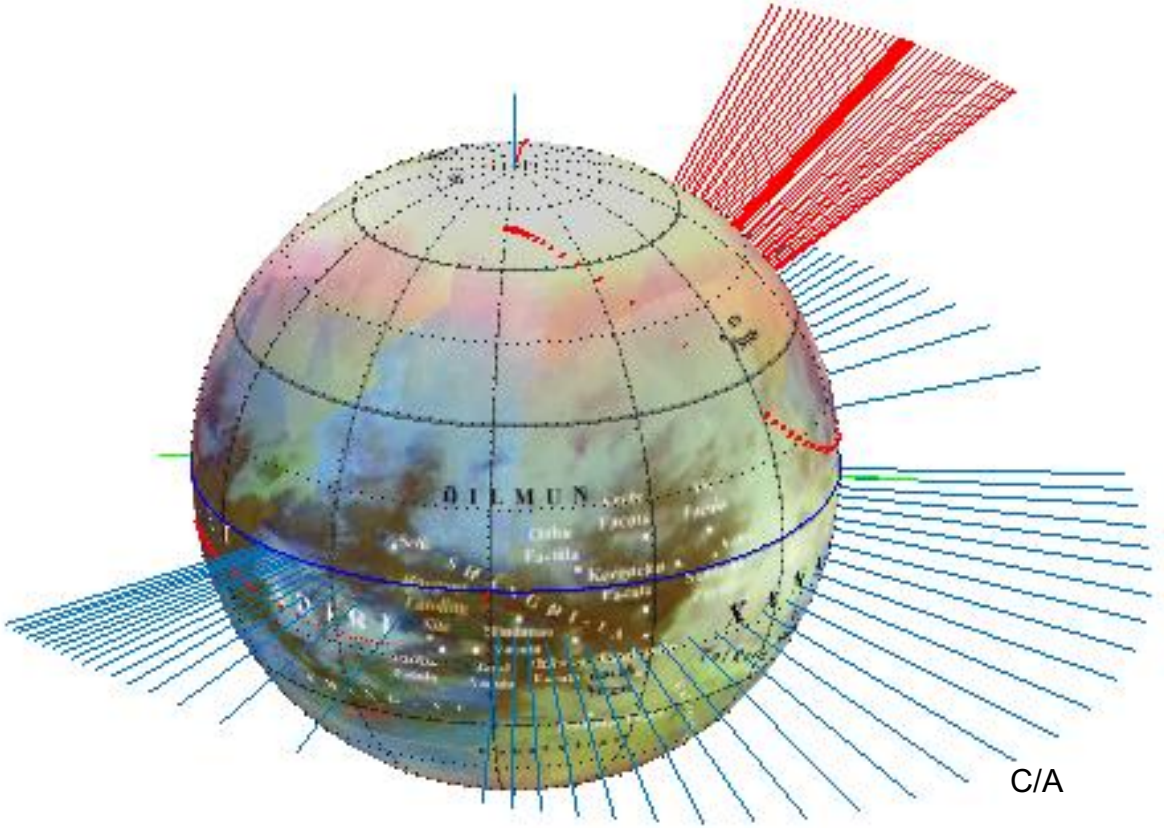
Outbound:

Map the North pole and monitor the evolution of the lakes (TC1a).

Specular reflection occurs near 65N, 160 W at C/A +07:00.

Global mapping of Titan.

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

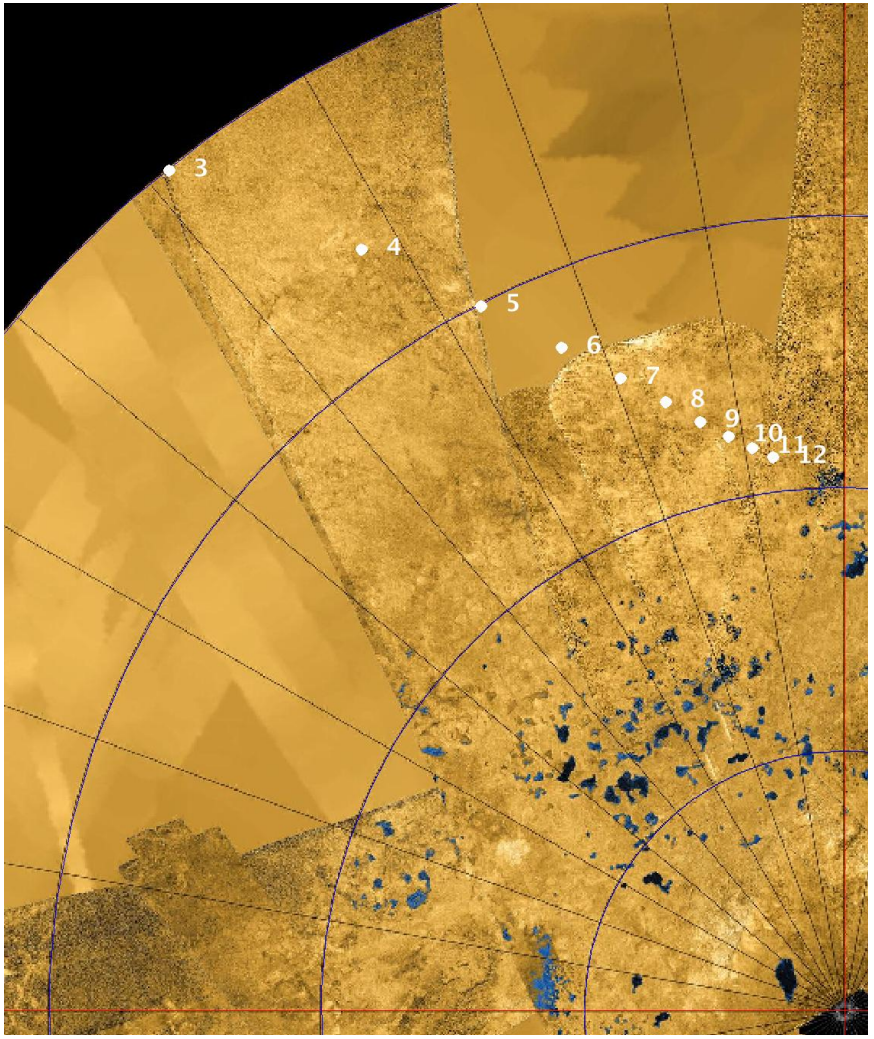
T114 – rev 225 – S91

Nov. 13, 2015 – 317T05:46:32 @ 11,920 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Time (sec)	Time (hr)
50.10	141.2	77.3	10800	3
56.22	147.6	77.5	14400	4
60.10	152.7	77.6	18000	5
62.71	156.9	77.6	21600	6
64.53	160.5	77.6	25200	7
65.87	163.6	77.5	28800	8
66.90	166.2	77.5	32400	9
67.66	168.6	77.4	36000	10
68.25	170.7	77.4	39600	11
68.71	172.6	77.4	43200	12



-22 -21 -20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

CIRS | VIMS | CIRS | VIMS | ISS | CIRS | UVIS | VIMS

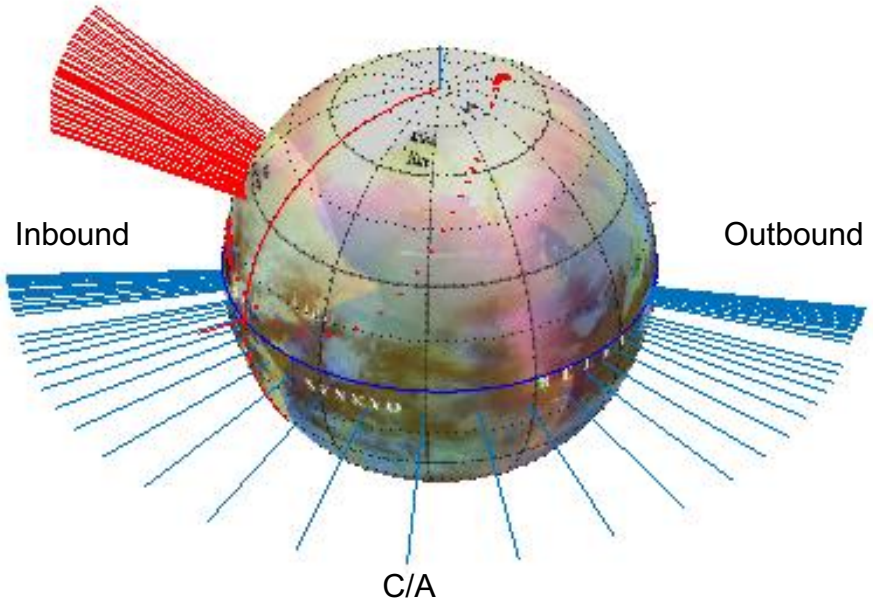
T115 – rev 230 – S92

Jan. 16, 2016 – 016T02:20:25 @ 3817 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T115: CIRS is prime at closest approach during this flyby (3817 km). On the inbound, VIMS will ride along with CIRS and UVIS and will monitor the formation and evolution of clouds as well as the South polar vortex. On the outbound, during the prime observation, VIMS will map the North pole area at high emission angle and will monitor the evolution of the lakes and seas (TC1a).

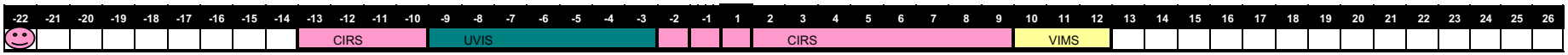
C/A-13:24:25	-09:00	CIRS	C extended (TN1c)
-09:00	-02:15	UVIS	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
-02:15	-01:15	CIRS	TN1c (Limb vertical sounding of stratospheric compounds)
-01:15	-00:45	CIRS	TN1c (Limb scanning for aerosol abundance)
-00:45	0	CIRS	TN1c (Limb scanning for temperature)
2016-016T02:20:25		CLOSEST APPROACH	NEG_Y to Titan (Tc2a)
0	+00:45	CIRS	TN1c (Limb scanning for temperature)
+00:45	+01:15	CIRS	TN1c (Limb scanning for aerosol abundance)
+01:15	+02:15	CIRS	TN1c (Limb vertical sounding of stratospheric compounds)
+02:15	+05:00	CIRS	T (TN2c (surface temperature))
+05:00	+09:00	CIRS	R (TC1b. VIMS rider (TN2c))
+09:00	C/A+11:45:35	VIMS	O (TC1a, TC1b. CIRS rider (TN1a))



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T115 – rev 230 – S92

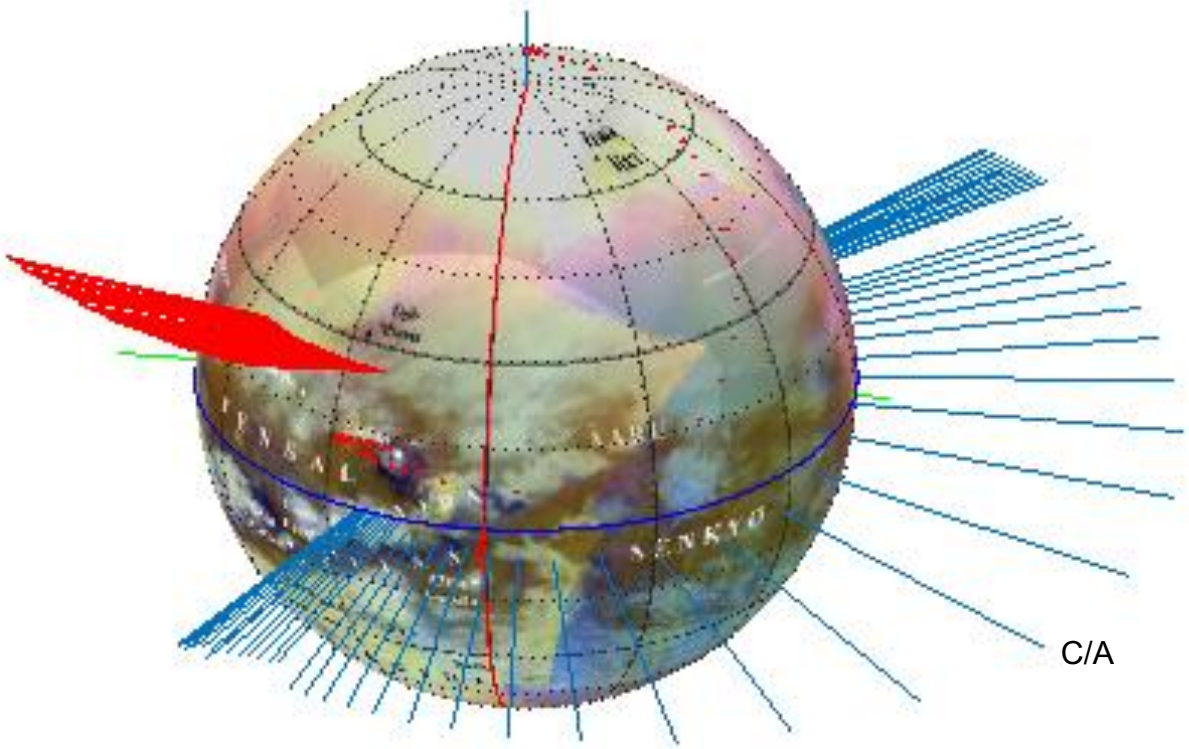
Jan. 16, 2016 – 016T02:20:25 @ 3817 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observe and monitor the South Polar Vortex.

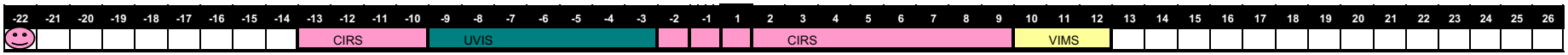
Cloud monitor and mapping.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T115 – rev 230 – S92

Jan. 16, 2016 – 016T02:20:25 @ 3817 km altitude

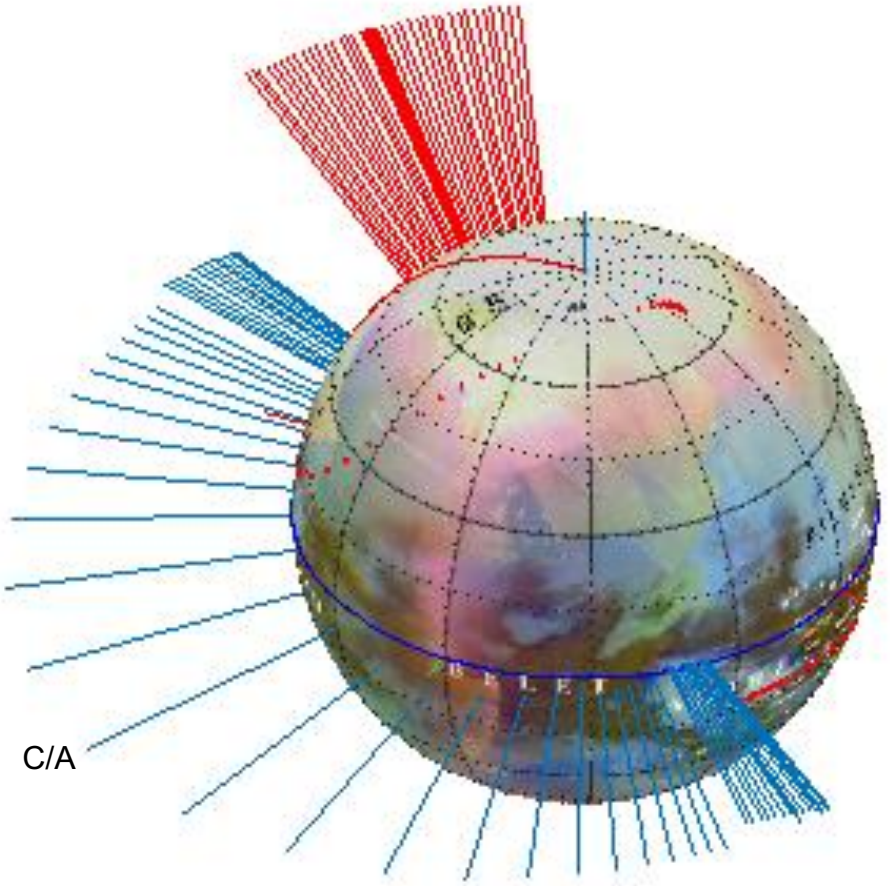
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observe the North Pole region of Titan.

Monitor the evolution of the lakes and seas of Titan.

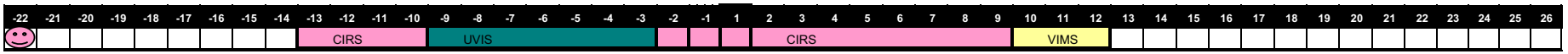
Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



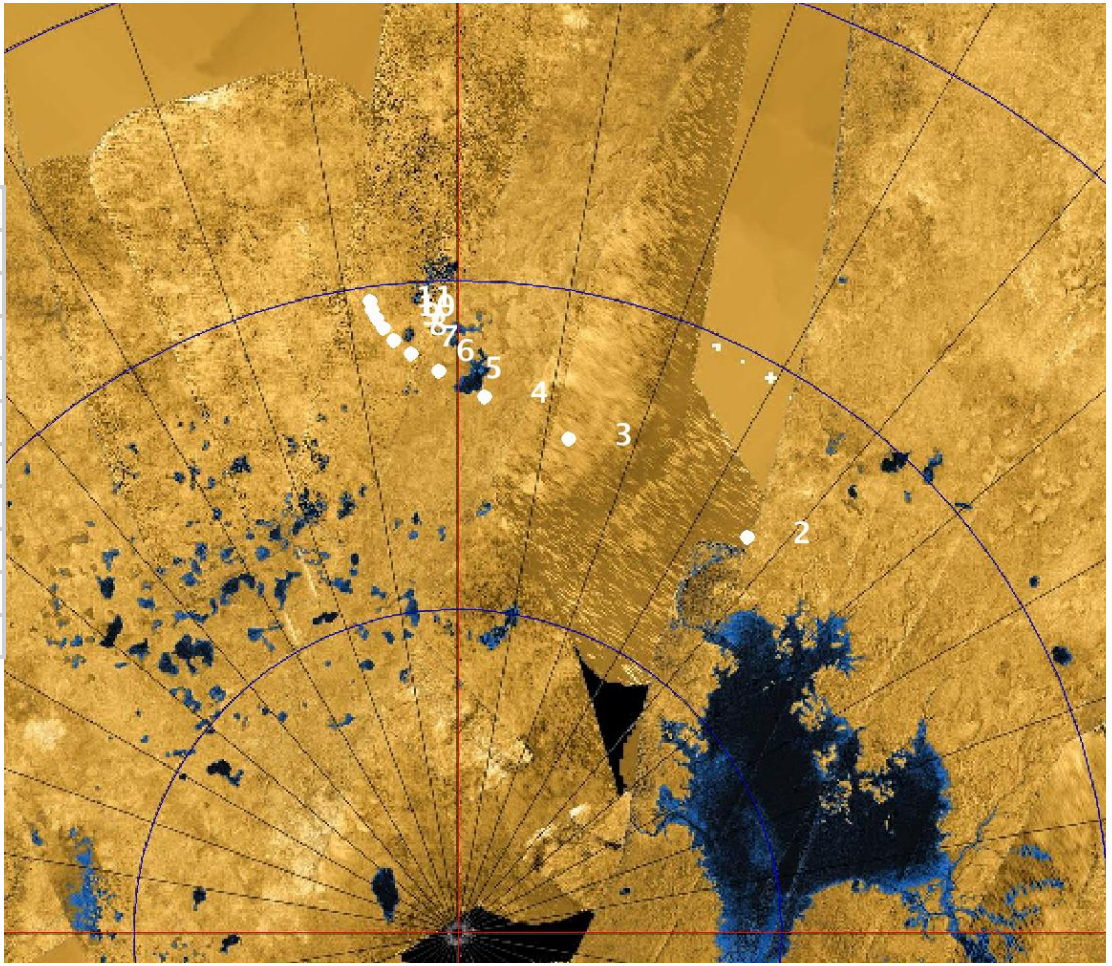
T115 – rev 230 – S92

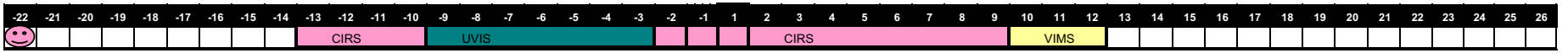
Jan. 16, 2016 – 016T02:20:25 @ 3817 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
74.92	216.1	79.3	79.5	7200	2.0
74.42	192.6	78.3	78.2	10800	3.0
73.49	182.8	77.6	77.6	14400	4.0
72.73	178.0	77.2	77.2	18000	5.0
72.16	175.3	76.9	76.9	21600	6.0
71.68	173.8	76.7	76.7	25200	7.0
71.30	172.9	76.6	76.5	28800	8.0
70.97	172.4	76.4	76.4	32400	9.0
70.69	172.1	76.3	76.3	36000	10.0
70.43	172.0	76.2	76.2	39600	11.0





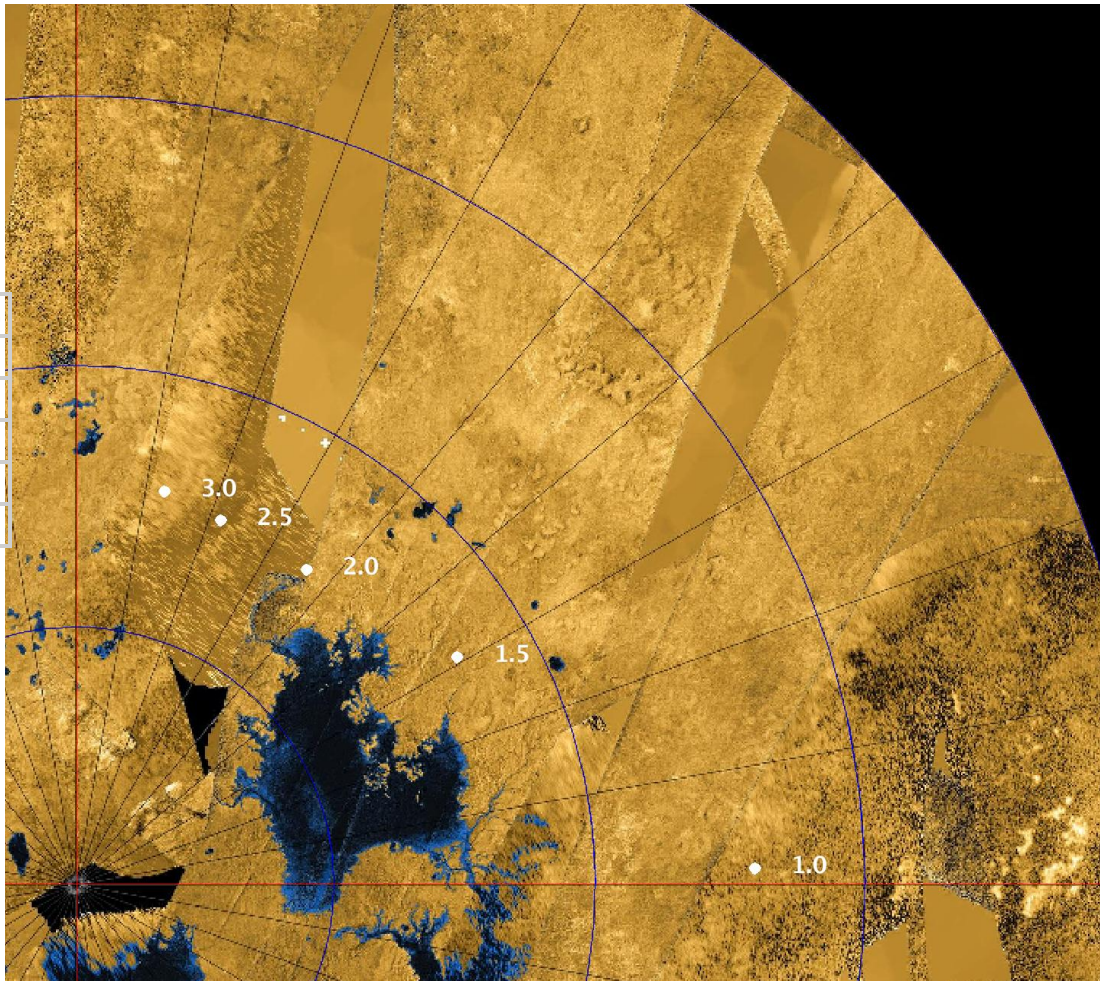
T115 – rev 230 – S92

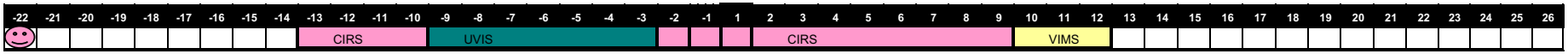
Jan. 16, 2016 – 016T02:20:25 @ 3817 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
64.03	268.6	81.9	81.8	3600	1.0
72.86	239.1	80.4	80.4	5400	1.5
74.92	216.1	79.3	79.5	7200	2.0
74.83	201.6	78.7	78.7	9000	2.5
74.42	192.6	78.3	78.2	10800	3.0





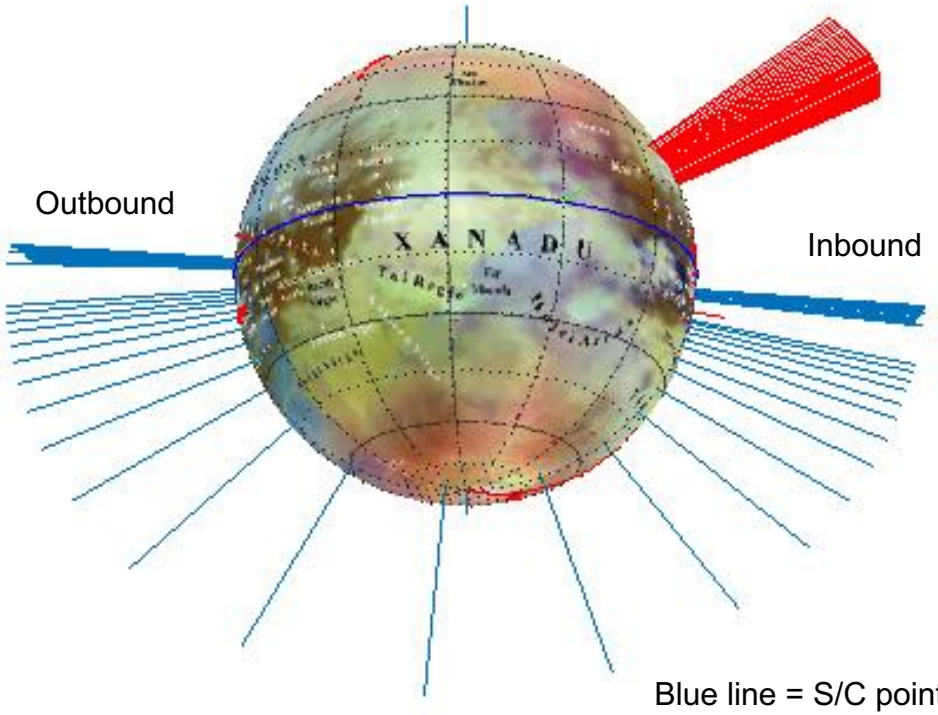
T116 – rev 231 – S92

Feb. 1, 2016 – 032T01:00:06 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T116: UVIS will be prime during this flyby's closest approach (1400 km). No VIMS prime observations. However, VIMS will ride along with UVIS for solar occultation observations that monitor the evolution of the haze layer (TC1). On the outbound, VIMS will ride along with ISS to monitor the evolution of the North Pole clouds (TC1a). It will also ride along with CIRS for monitoring the evolution of lakes and seas on the North Pole and look for specular reflection on lakes (TC1a).

C/A-13:03:06	-09:00	CIRS	C extended (TN1c)
-09:00	-05:00	CIRS	F (TC1b OR TN1c)
-05:00	**-02:30**	CIRS	E (TN2c (surface temperature))
-02:30	**-01:12**	CIRS	
-01:12	**0**	UVIS solar Occ	TN1c occ time= -00:10:01 to +00:27:59
2016-032T01:00:06		**CLOSEST APPROACH**	**solar port to sun (TN2a)**
0	**+00:28**	UVIS Solar Occ	**TN1c occ** **time= -00:10:01 to +00:27:59**
+00:28	**+02:05**	**UVIS stellar occ EpsOri**	**TN1c occ** **time= +00:40:59 to +1:52:59**
+02:05	**+03:20**	ISS	TC1a, TC1b
+03:20	**+05:00**	UVIS	**TN1c or TN2d**
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
+09:00	C/A+13:04:54	CIRS	N1 (Tc1b, TN1c aerosol)



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T116 – rev 231 – S92

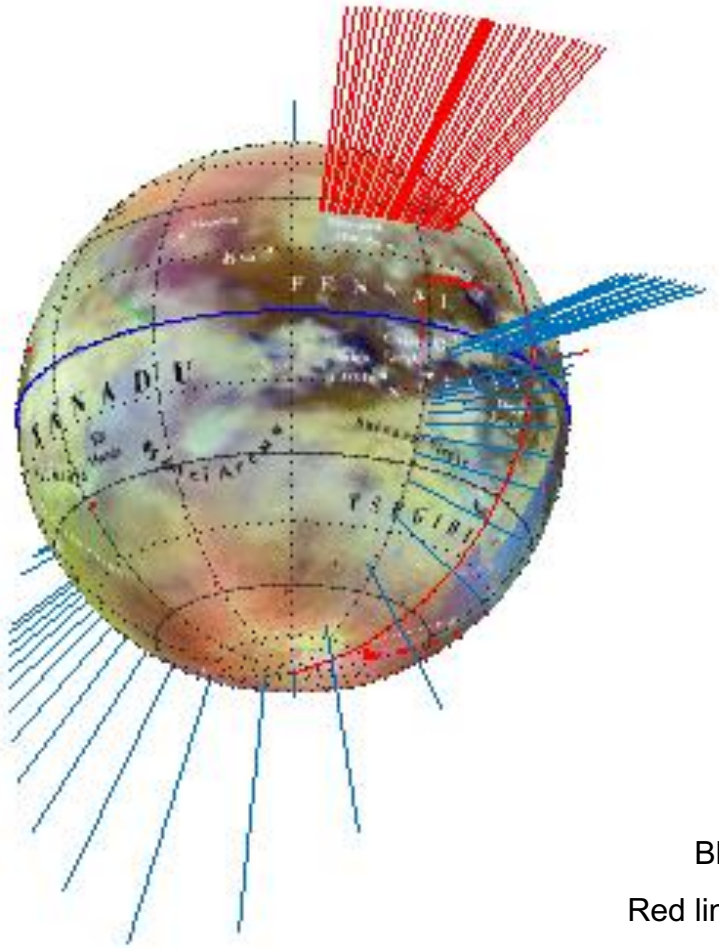
Feb. 1, 2016 – 032T01:00:06 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Ridealong with UVIS for solar occultation observations.



C/A

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T116 – rev 231 – S92

Feb. 1, 2016 – 032T01:00:06 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

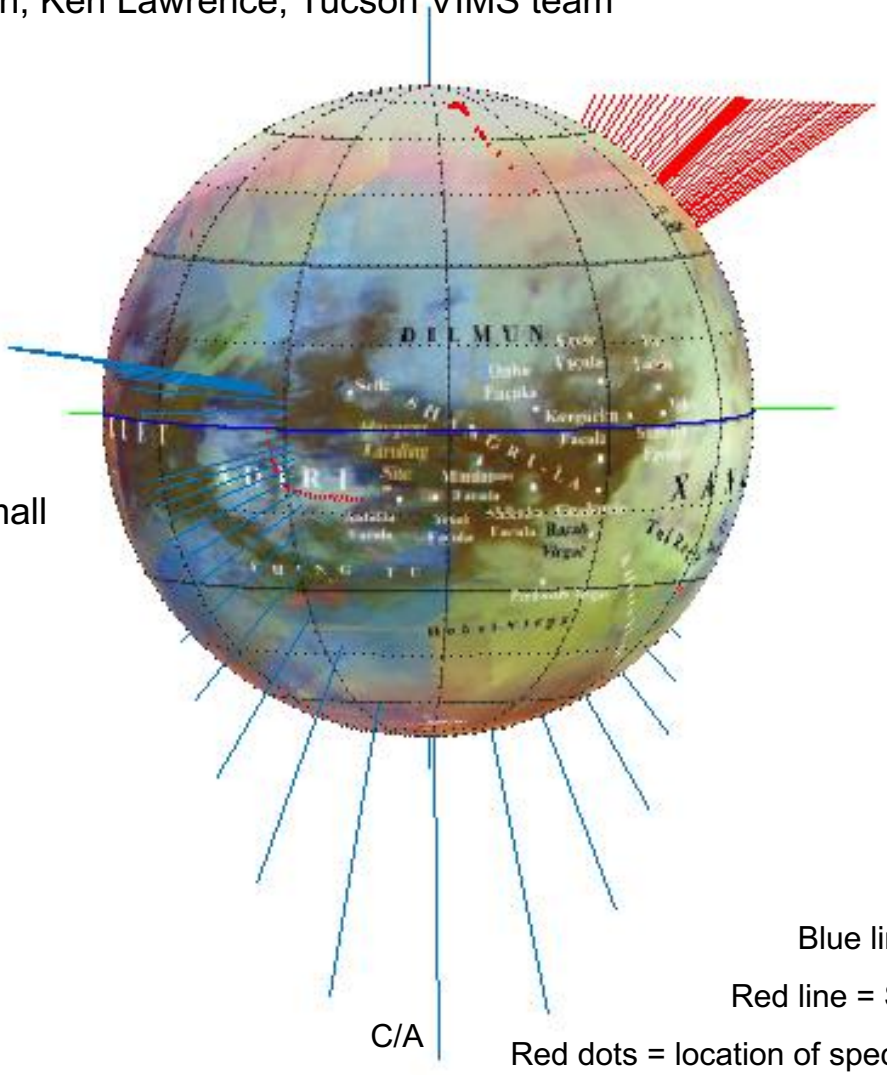
Outbound:

Monitor the clouds at high northern latitudes.

Observe and monitor the lakes and seas in at the north polar regions.

Specular reflection occurs on the small lakes at 73N, 163W at C/A + 05:00.

Possible stellar occultation (with Epsilon Orion).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

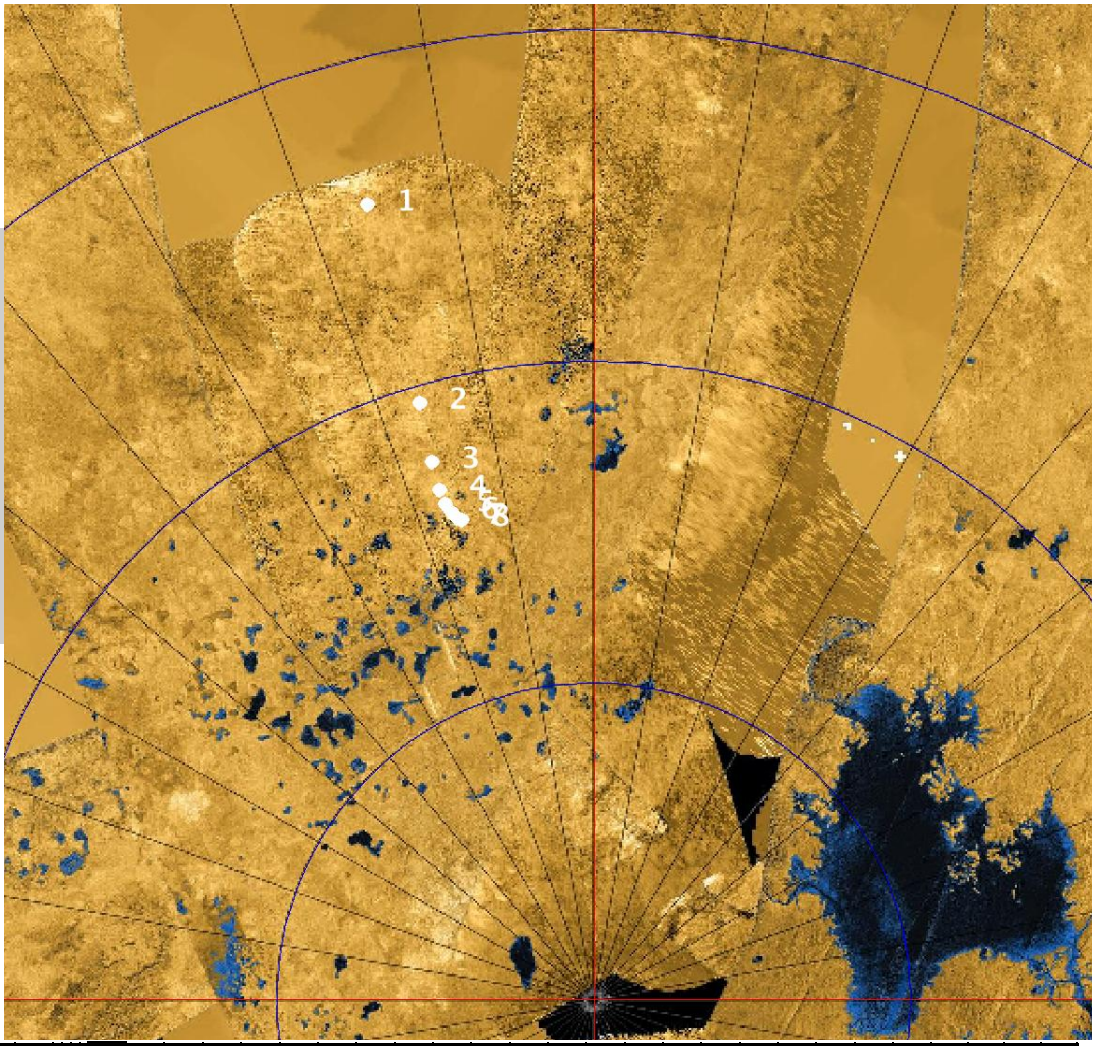
T116 – rev 231 – S92

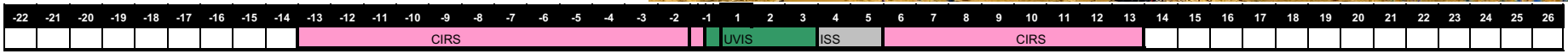
Feb. 1, 2016 – 032T01:00:06 @ 1400 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
-54.09	45.9	80.4	80.6	0	0
64.28	164.1	80.9	80.9	3600	1
70.51	163.7	76.3	76.3	7200	2
72.37	163.2	74.8	74.8	10800	3
73.25	163.1	74.0	74.0	14400	4
73.74	163.3	73.5	73.5	18000	5
74.03	163.7	73.2	73.2	21600	6
74.23	164.1	73.0	73.0	25200	7
74.35	164.6	72.8	72.8	28800	8





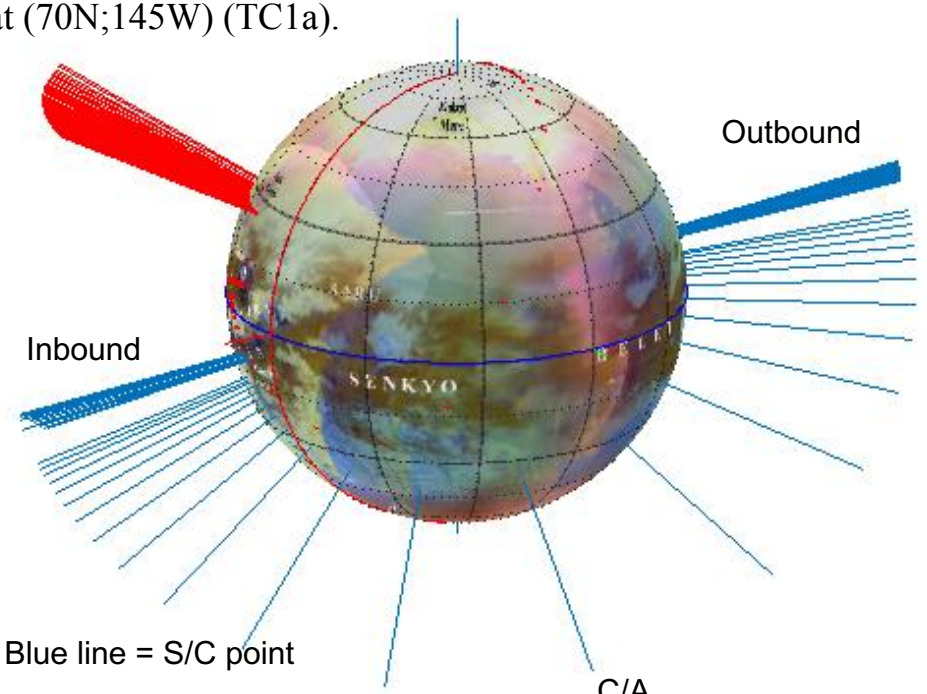
T117 – rev 232 – S93

Feb. 16, 2016 – 047T23:49:42 @ 1018 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T117: RSS is prime at closest approach (1018 km). On the inbound VIMS will ridealong with CIRS and will monitor the evolution of the South Polar vortex (TC1b). During the prime period, it will acquire a mosaic at 40 km footprint of the tropical region located at the subsaturn hemisphere. Long integration time will be used to help identify the composition of the dune fields of Aztlan and Fensal (TN1a). It will also look for clouds at high northern latitudes (TC1a). On the outbound, VIMS will ridealong with CIRS and will monitor the evolution of the North Pole area. It will look for specular reflection on the small lakes located at (70N;145W) (TC1a).

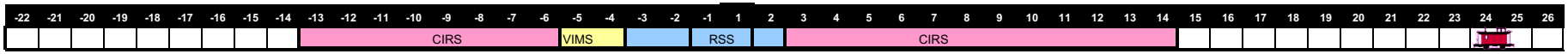
C/A-12:53:04	-09:00	CIRS	C truncated (TN1c)
-09:00	-05:00	CIRS	F (TC1b OR TN1c)
-05:00	-03:26	VIMS	Y truncated (TC1a, TN1a (depending on pointing) and TN2c)
-03:26	-03:25	RWA to RCS Transition	
-03:25	-03:05	VIMS	Y truncated (TC1a, TN1a (depending on pointing) and TN2c)
-03:05	**-02:25**	SP Turn to WP	NEG_Z to Earth / NEG_Y to Saturn (0.0, 0.0, -9.5 deg offset)
-03:05	**-01:00**	**RSS warm up**	(TN1a)
-01:00	**0**	**RSS occ**	(TN2c, TN2d)
2016-047T23:49:42		**CLOSEST APPROACH**	**XBAND to EARTH, LUB (Tc2a)**
0	**+00:34**	**RSS occ**	(TN2c, TN2d)
+00:34	**+02:10**	**RSS Bistat**	(TN1a)
+02:10	**+02:32**	RCS to RWA Transition	
+02:32	**+05:00**	**CIRS**	T (TN2c (surface temperature))
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+14:20:18	CIRS	M4 (Tc1b (TN1c on outbound))



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T117 – rev 232 – S93

Feb. 16, 2016 – 047T23:49:42 @ 1018 km altitude

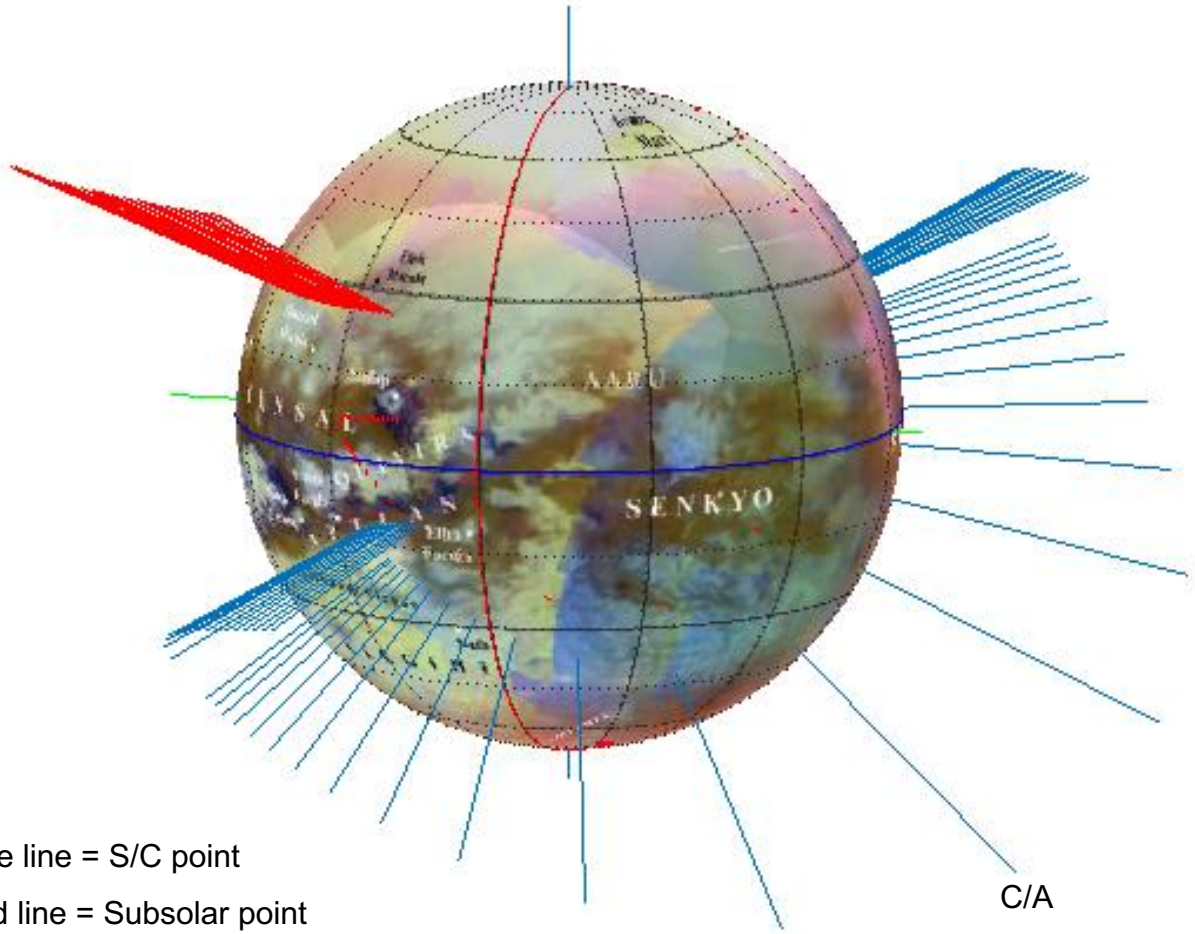
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Monitor cloud evolution and activity including the South Polar Vortex (TC1b).

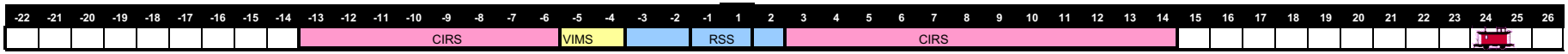
Obtain mosaics at 10S 15 W east of the Aztlan and Fenzal regions (TN1a).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T117 – rev 232 – S93

Feb. 16, 2016 – 047T23:49:42 @ 1018 km altitude

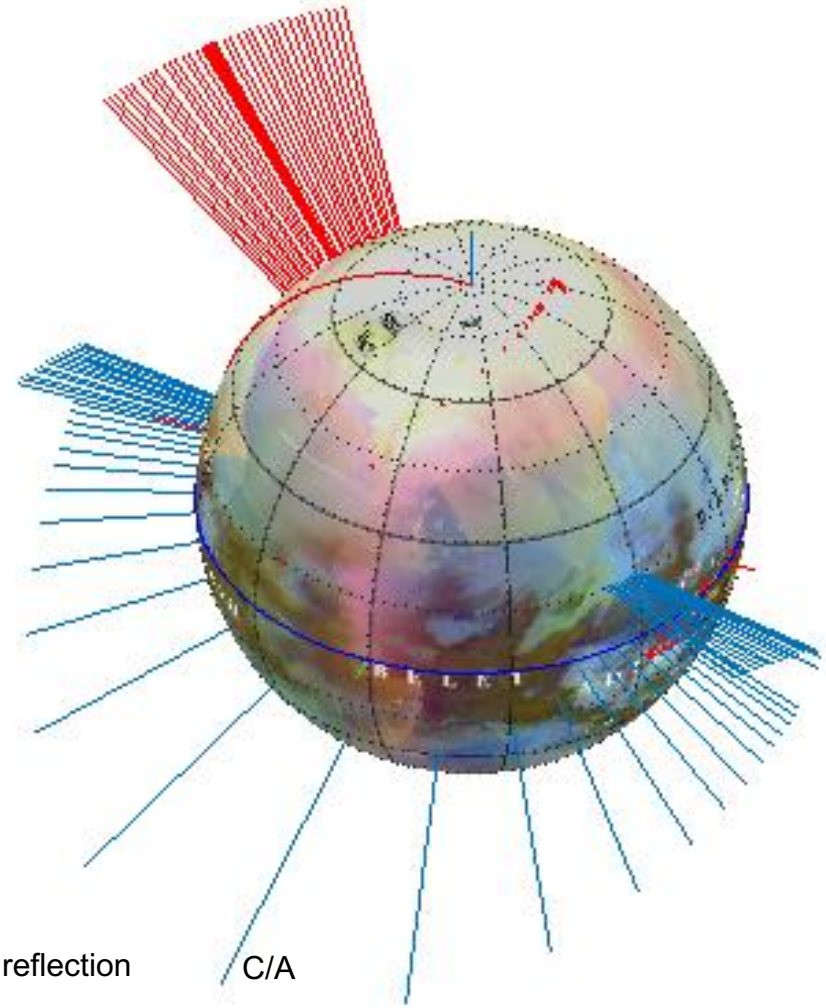
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Specular reflection geometry occurs over the small lakes at 73N, 153 W at C/A + 02:00 (TC1a).

Observe Titan's North Pole (TC1a).

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.

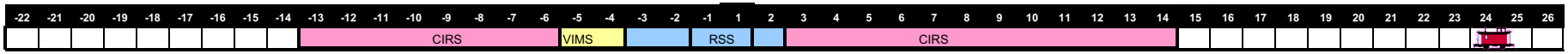


Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A



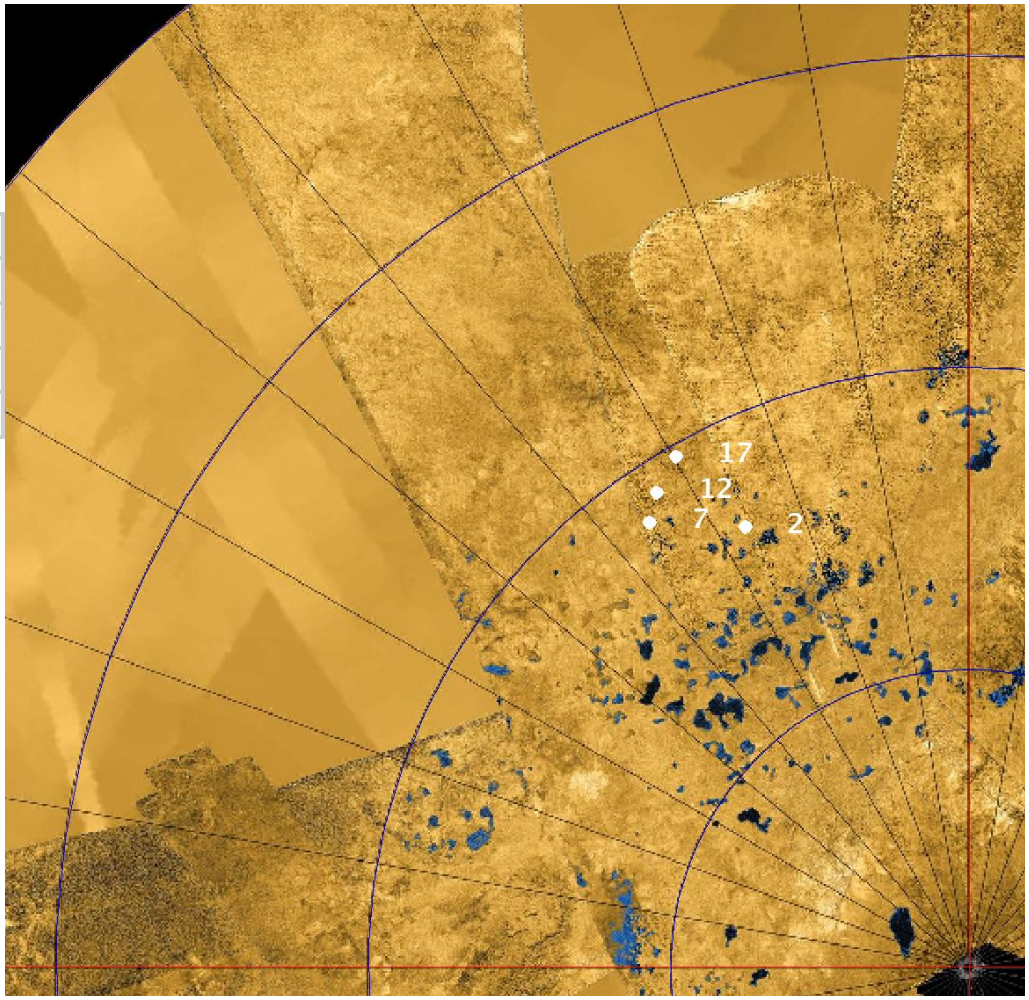
T117 – rev 232 – S93

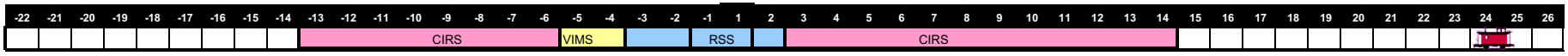
Feb. 16, 2016 – 047T23:49:42 @ 1018 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
73.49	153.1	72.0	72.0	7200	2.0
71.71	144.3	69.1	69.1	25200	7.0
71.04	146.7	68.6	68.6	43200	12.0
70.36	150.2	68.4	68.4	61200	17.0





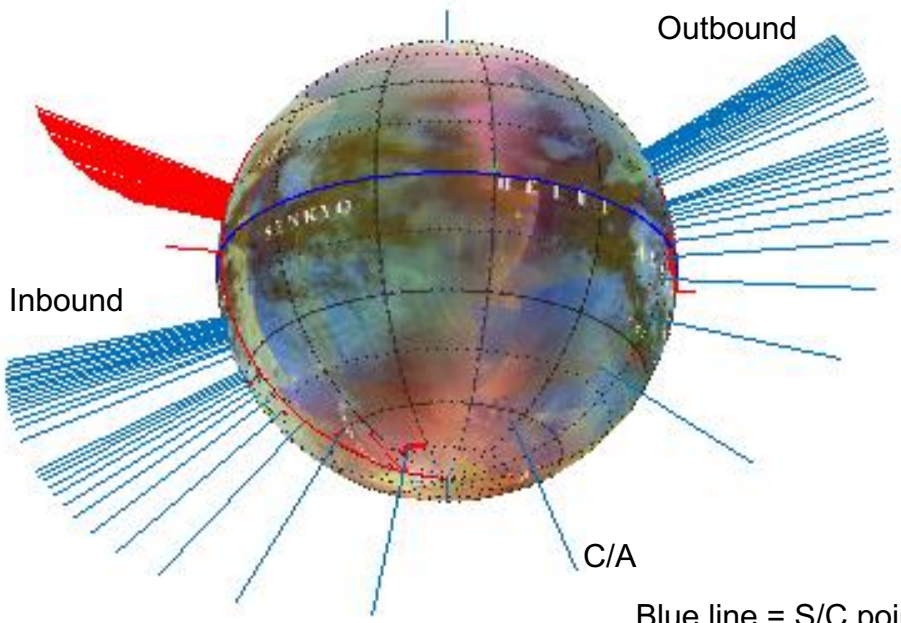
T118 – rev 234 – S93

April 3, 2016 – 094T19:42:42 @ 990 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T118: UVIS is prime at closest approach during this flyby (990 km). On the inbound VIMS will ridealong with ISS to map Titan's surface at medium resolution and to look for the formation of clouds at mid northern latitudes (TC1a). Before and after closest approach, VIMS will ridealong with UVIS to monitor a solar occultation on the ingress and the egress to obtain information on the evolution of the haze density (TC1a). On the outbound VIMS will look for specular reflection on the small lakes above 70 North and will map the northern hemisphere at low resolution (TN1a).

C/A - 23:43:42	-14:00	CIRS	A2 (Tc1b)
-14:00	-09:00	CIRS	C (TN1c)
-09:00	-02:15	UVIS	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
-02:15	**-01:15**	**ISS**	
Begin custom period			
-01:15	**-00:45**	**VIMS**	
-00:45	**-00:30**	**UVIS solar occ**	**(TC1b(1c))**
-00:30	**-00:29**	RWA to RCS Transition	
-00:29	**0**	**UVIS solar occ**	**INMS riding (TC1b(1c))**
2016-095T19:48:00		**CLOSEST APPROACH**	**Solar port to SUN, NEG_X to RAM (Tc2a)**
0	**+00:09**	**UVIS solar occ**	**INMS riding (TC1b(1c))**
+00:09	**+00:31**	RCS to RWA Transition	
+00:31	**+01:05**	**UVIS solar occ**	**(TC1b(1c))**
+01:05	**+02:15**	**CIRS**	**(TN1c)**
End custom period			
+02:15	+09:00	UVIS	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
+09:00	+13:00	VIMS	O (TN1a (Specular reflection of lakes-depending on geometry))
+13:00	C/A + 16:48:18	VIMS	O extended (TN1a (Specular reflection of lakes-depending on geometry))



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T118 – rev 234 – S93

April 3, 2016 – 094T19:42:42 @ 990 km altitude

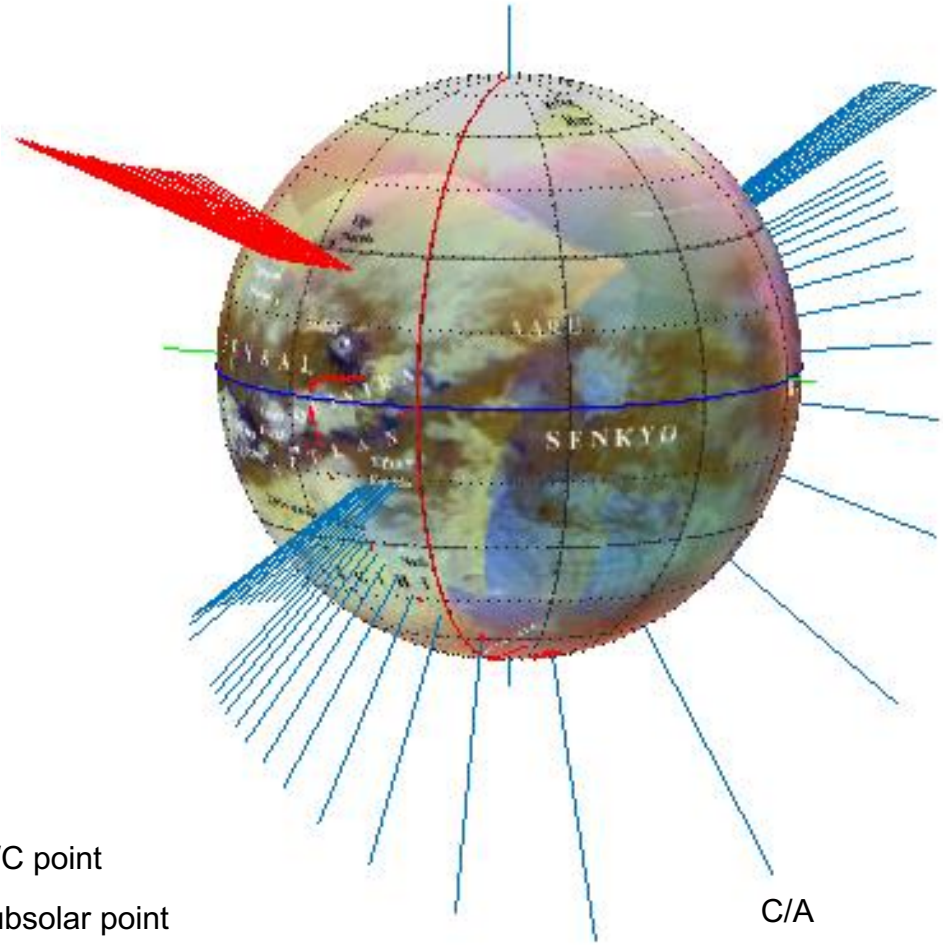
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Monitor clouds at mid-northern latitudes (TC1a).

Solar occultation while riding along with UVIS (TC1a).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T118 – rev 234 – S93

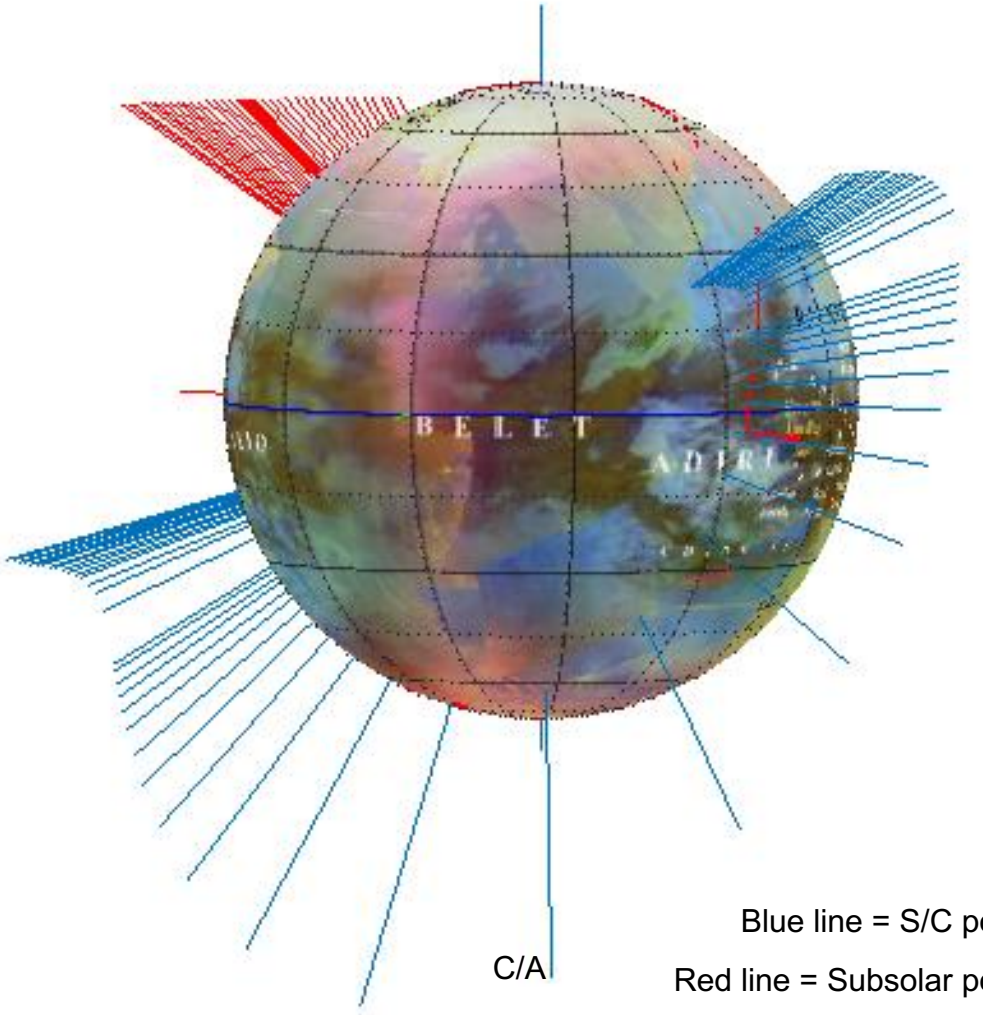
April 3, 2016 – 094T19:42:42 @ 990 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Specular reflection geometry over the small lakes at 71N, 148 W at C/A + 01:00.

Observations on the outbound are obtained with phase angles of greater than 90 deg, but may provide information on the composition of the atmosphere.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

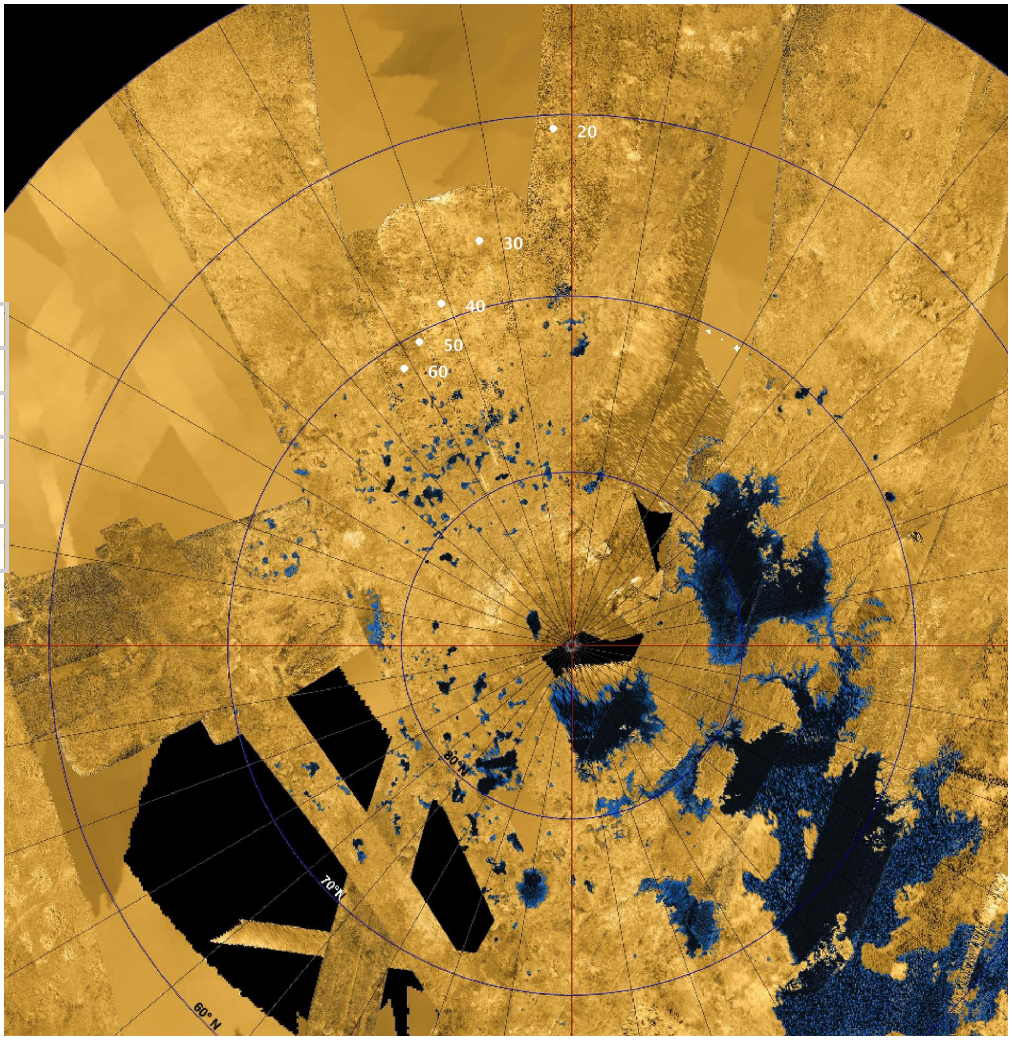
T118 – rev 234 – S93

April 3, 2016 – 094T19:42:42 @ 990 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (min)
60.75	177.9	88.2	88.2	1200	20
66.29	166.9	80.8	80.8	1800	30
69.02	158.8	76.7	76.7	2400	40
70.48	152.9	74.1	74.1	3000	50
71.36	148.4	72.4	72.4	3600	60



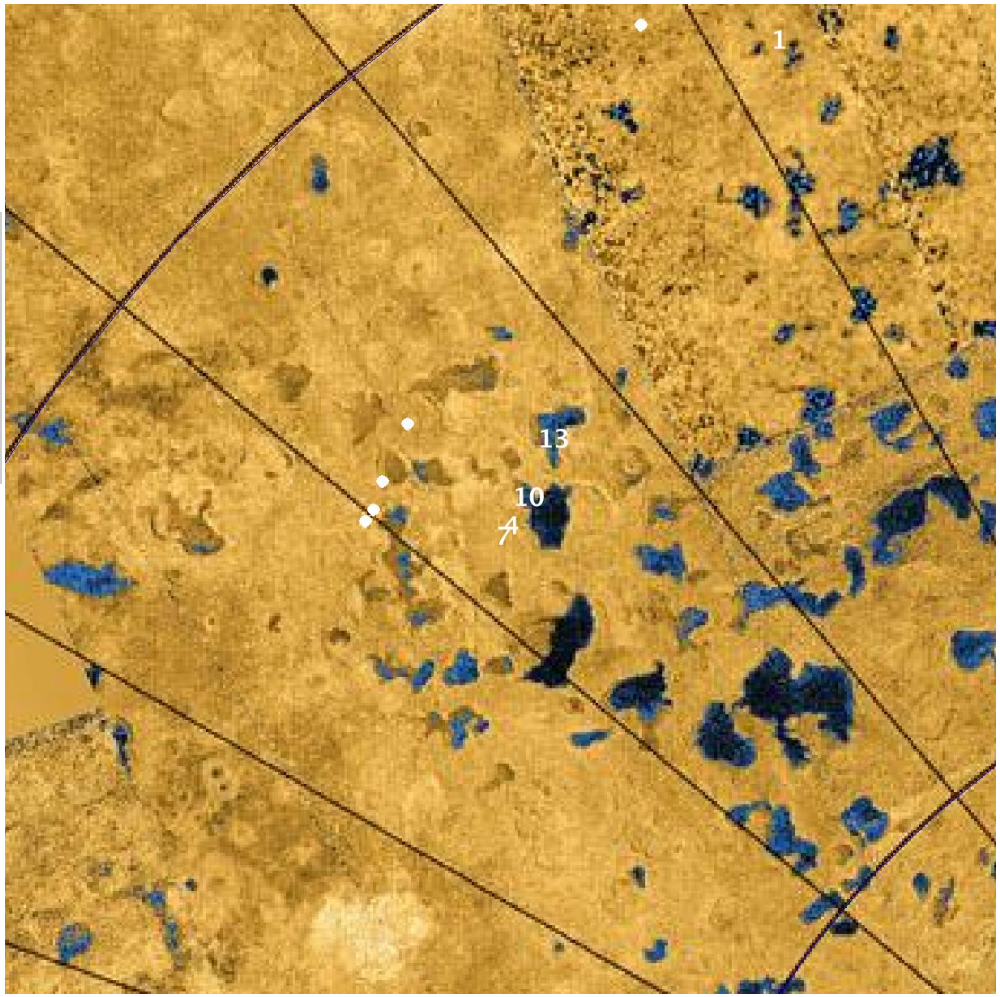
T118 – rev 234 – S93

April 3, 2016 – 094T19:42:42 @ 990 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
71.36	148.4	72.4	72.4	3600	1.0
73.42	130.2	65.7	65.8	14400	4.0
73.43	129.7	64.8	64.8	25200	7.0
73.30	131.2	64.4	64.5	36000	10.0
73.09	133.4	64.3	64.3	46800	13.0



T119 – rev 235 – S94

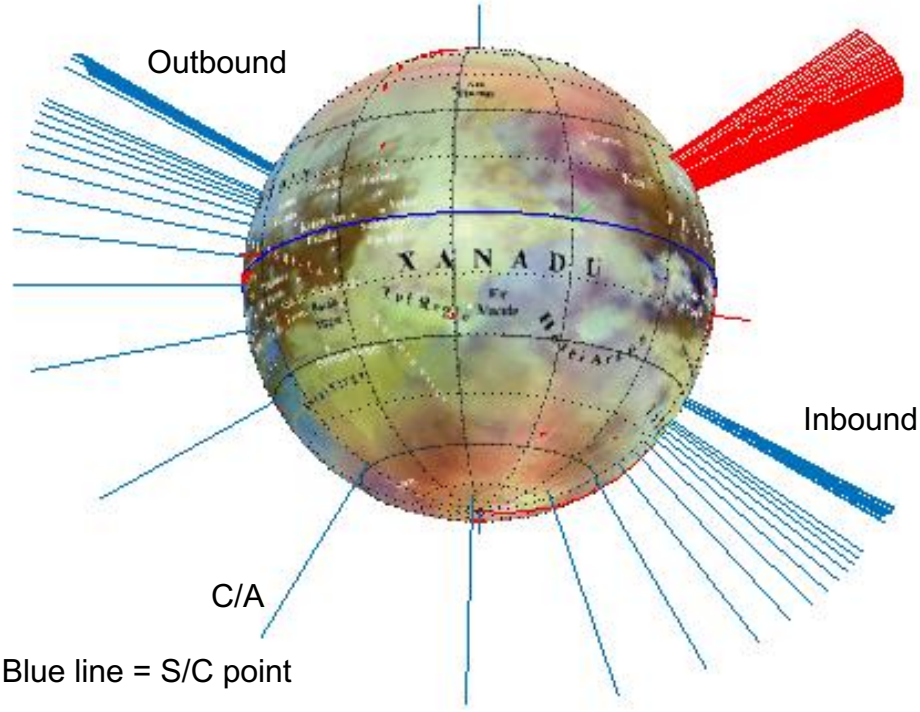
May 6, 2016 – 127T16:54:37 @ 971 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T119: CAPS, INMS and RSS are prime during this flyby's closest approach (971km). VIMS will ridealong with CIRS on the inbound and will monitor the evolution of the polar vortex and at the formation of clouds at high northern latitudes (TC1a). On the outbound, VIMS will look for specular reflection at northern latitudes.

C/A-20:51:46	-14:00	CIRS	A3 (Tc1b)
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
-12:00	-09:00	CIRS	D2 (TN1c)
-09:00	-05:00	CIRS	F (TC1b OR TN1c)
Begin custom period			
-05:00	**-02:18**	**CIRS**	(TN2c) RSS warmup @ -02:18. Surface temperature map looking at polar collar. **Use MIMI-preferred secondary NEG_Z to Earth**
-02:18	**-02:17**	RWA to RCS Transition	
-02:17	**-01:15**	**CIRS**	(TC1b) **Use MIMI-preferred secondary NEG_Z to Earth**
-01:15	**-00:45**	**CIRS**	(TC1b) **Use MIMI-preferred secondary NEG_Z to Earth**
-00:45	**-00:15**	**CIRS**	(TC1b) **Use MIMI-preferred secondary NEG_Z to Earth**
-00:15	**0**	**INMS**	(TN1c, MC2a) **Use MIMI-preferred secondary NEG_Z to Earth**
2016-127T16:54:37		**CLOSEST APPROACH**	**(Tc2a)**
0	**+00:08:39**	**INMS**	(TN1c, MC2a) **Use MIMI-preferred secondary NEG_Z to Earth**
+00:08:39	**+00:27**	**RSS occ**	(TN2c, TN2d) **MIMI prefers NEG_X to RAM secondary**
+00:27	**+02:10**	**RSS Bistat**	(TN1a)
+02:10	**+02:32**	RCS to RWA Transition	
End custom period			
+02:32	+05:00	**VIMS**	Y (TC1a, TN1a (depending on pointing) and TN2c)
+05:00	+09:00	VIMS	Q (TN1a (Specular reflection of lakes-depending on geometry))
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+16:24:23	CIRS	M4 (Tc1b (TN1c on outbound))

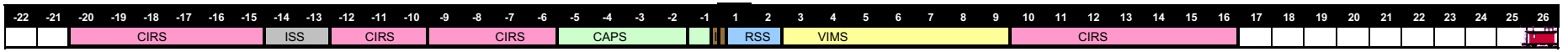
Note: Original timeline reallocated CAPS time from C/A-05:00 – C/A-00:15 to CIRS.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T119 – rev 235 – S94

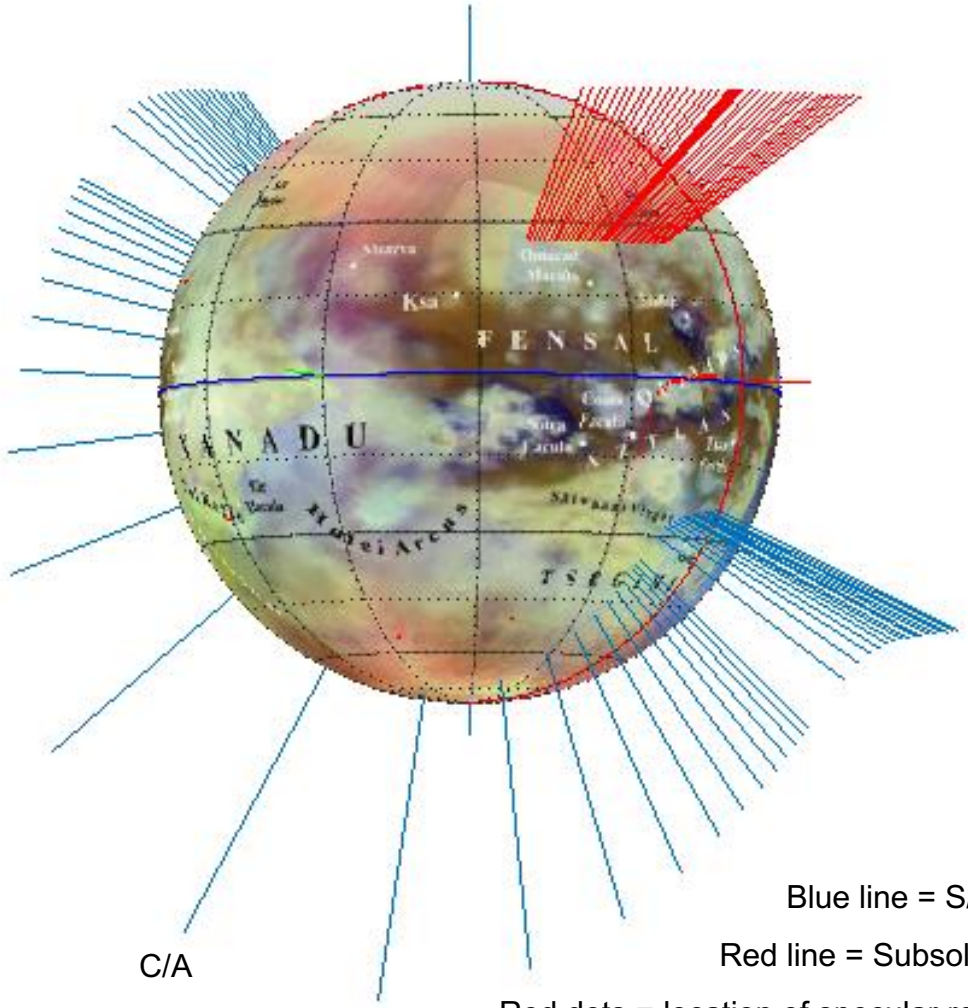
May 6, 2016 – 127T16:54:37 @ 971 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Observe and monitor the South Polar Vortex.

Monitor cloud activity at high northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T119 – rev 235 – S94

May 6, 2016 – 127T16:54:37 @ 971 km altitude

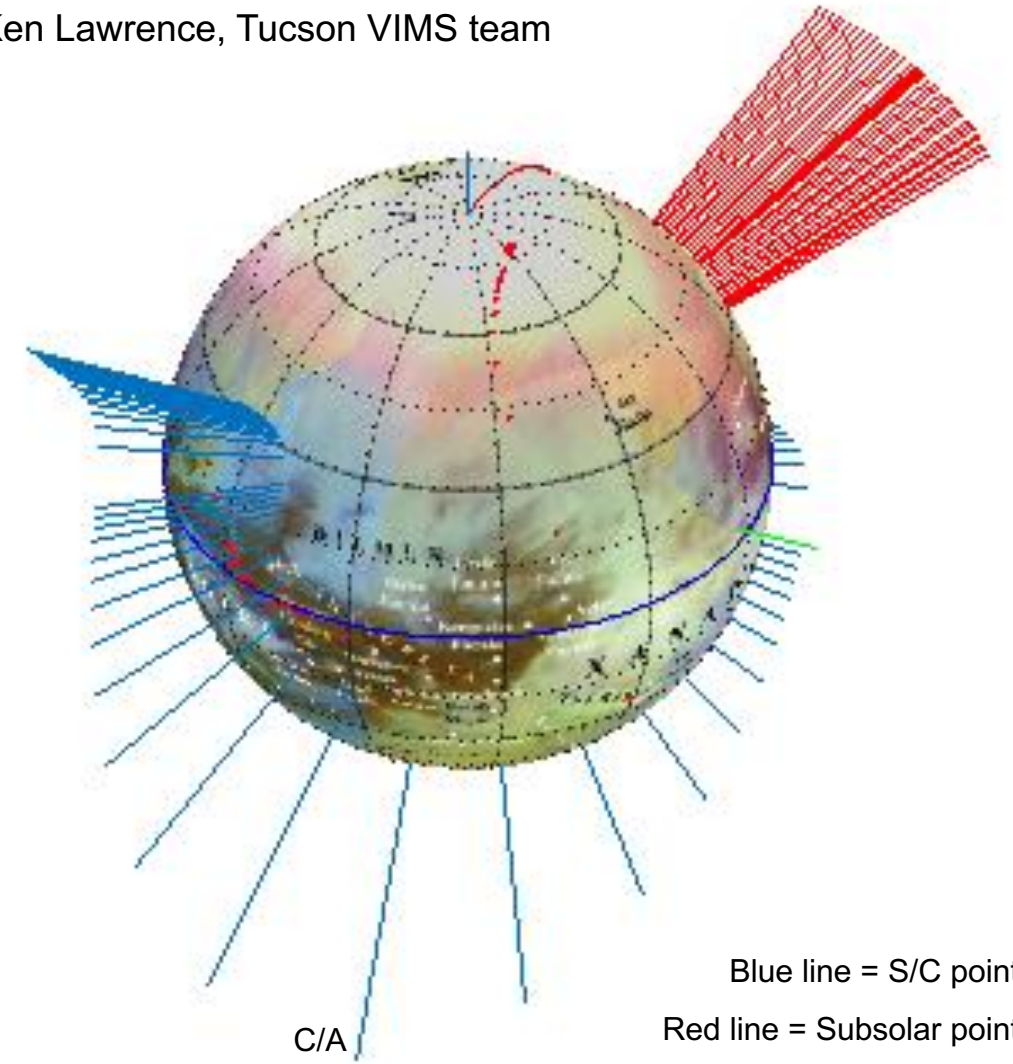
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Specular reflection occurs at 77N, 121 W at C/A + 00:02:00

Obtain global views of the North Pole region.

Monitor cloud activity at mid-northern latitudes.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

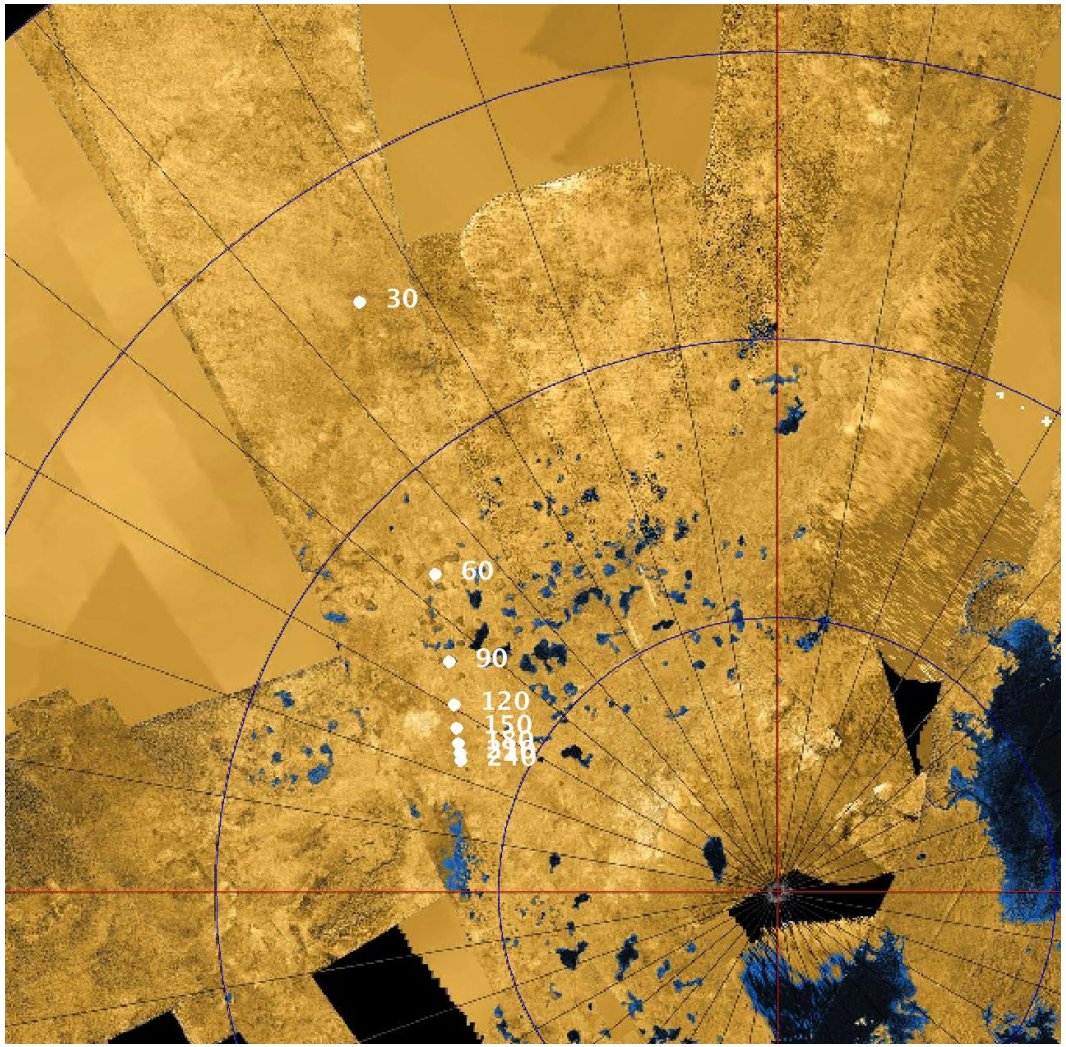
T119 – rev 235 – S94

May 6, 2016 – 127T16:54:37 @ 971 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (min)
64.16	145.1	75.4	75.4	30
73.18	133.3	67.7	67.7	60
75.56	125.4	65.0	65.0	90
76.54	120.5	63.6	63.6	120
77.05	117.4	62.8	62.8	150
77.34	115.3	62.2	62.2	180
77.53	113.9	61.9	61.8	210
77.66	112.9	61.6	61.6	240



-22 -21 -20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

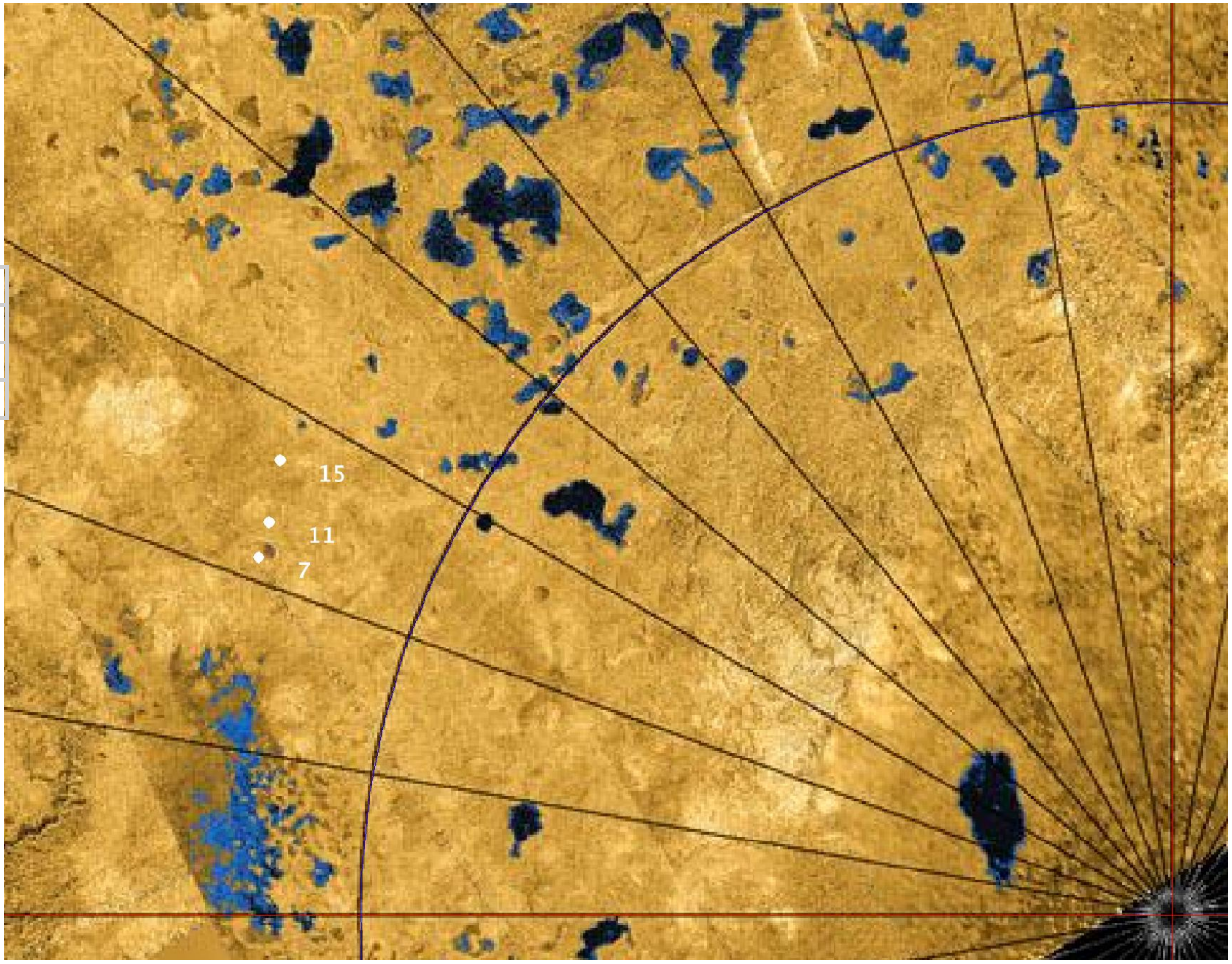
CIRS | ISS | CIRS | CIRS | CAPS | RSS | VIMS | CIRS

T119 – rev 235 – S94

May 6, 2016 – 127T16:54:37 @ 971 km altitude

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (hr)
77.93	111.4	60.7	60.7	7
77.88	113.5	60.3	60.3	11
77.68	117.0	60.2	60.2	15



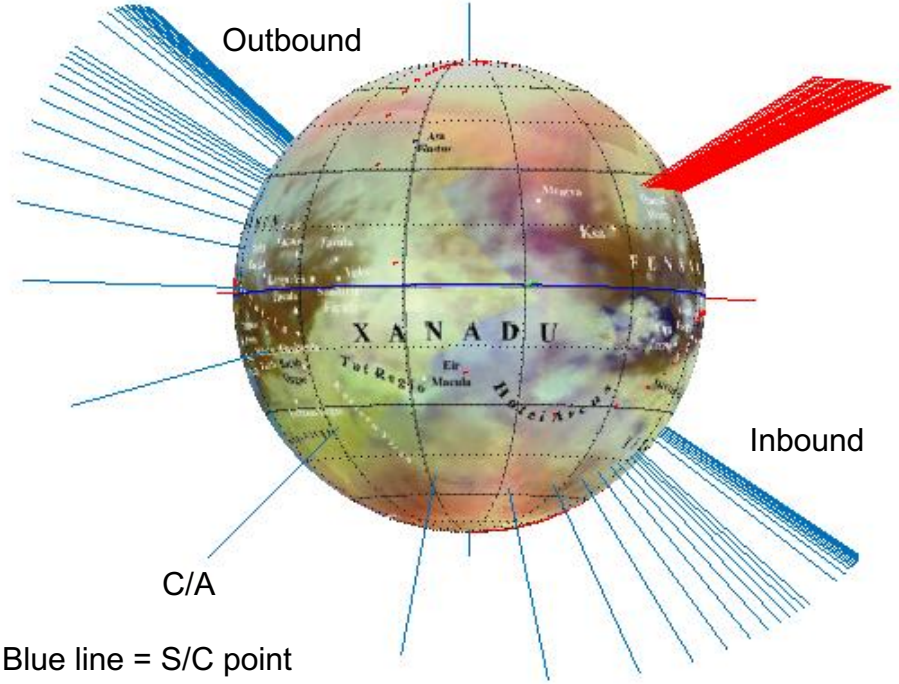
T120 – rev 236 – S94

June 7, 2016 – 159T14:06:17 @ 975 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T120: A combination of radar and INMS will be prime at closest approach during this flyby (975 km). VIMS will ride along with CIRS inbound (Titan's sub-Saturnian hemisphere at mid-southern latitudes over Tsegihi) and will observe the evolution of the South polar vortex (TC1b). On the outbound (high phase angle over Titan's anti-Saturnian hemisphere at mid-northern latitudes) VIMS will image Titan's surface (TN1a) and atmosphere (TC1a, TC1b, TN2c) and will look at specular reflection on the lakes and seas of the North Pole area (TC1a).

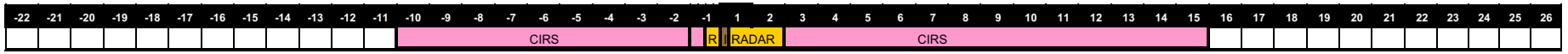
C/A-10:26:18	-09:00	CIRS	F extended (TC1b OR TN1c)
-09:00	-05:00	CIRS	F (TC1b OR TN1c)
-05:00	**-02:30**	CIRS	E (TN2c (surface temperature))
-02:30	**-01:15**	**CIRS**	TN1c
-01:15	**-01:14**	RWA to RCS Transition	
-01:14	**-00:30**	**CIRS**	CIRS turns to RADAR attitude
-00:30	**-00:18**	**RADAR**	TN2b
-00:18	**0**	**RADAR SAR**	TN1a, TN1b, TN2b, TN2c
2016-159T14:06:18		**CLOSEST APPROACH**	**NEG_Z to Titan, NEG_X to RAM (Tc2a)**
0	**+00:15**	**RADAR**	TN1c, TC2a
+00:15	**+00:30**	**RADAR**	TN1c, TC2a
+00:30	**+00:52**	RCS to RWA Transition	
+00:52	**+01:37**	**RADAR HiSAR**	TN1a, TN1b, TN2b, TN2c
+01:37	**+02:15**	**RADAR scatterometry/radiometry**	TN1a
+02:15	+05:00	**CIRS**	T (TN2c (surface temperature))
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+16:58:42	CIRS	M4 (Tc1b (TN1c on outbound))



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



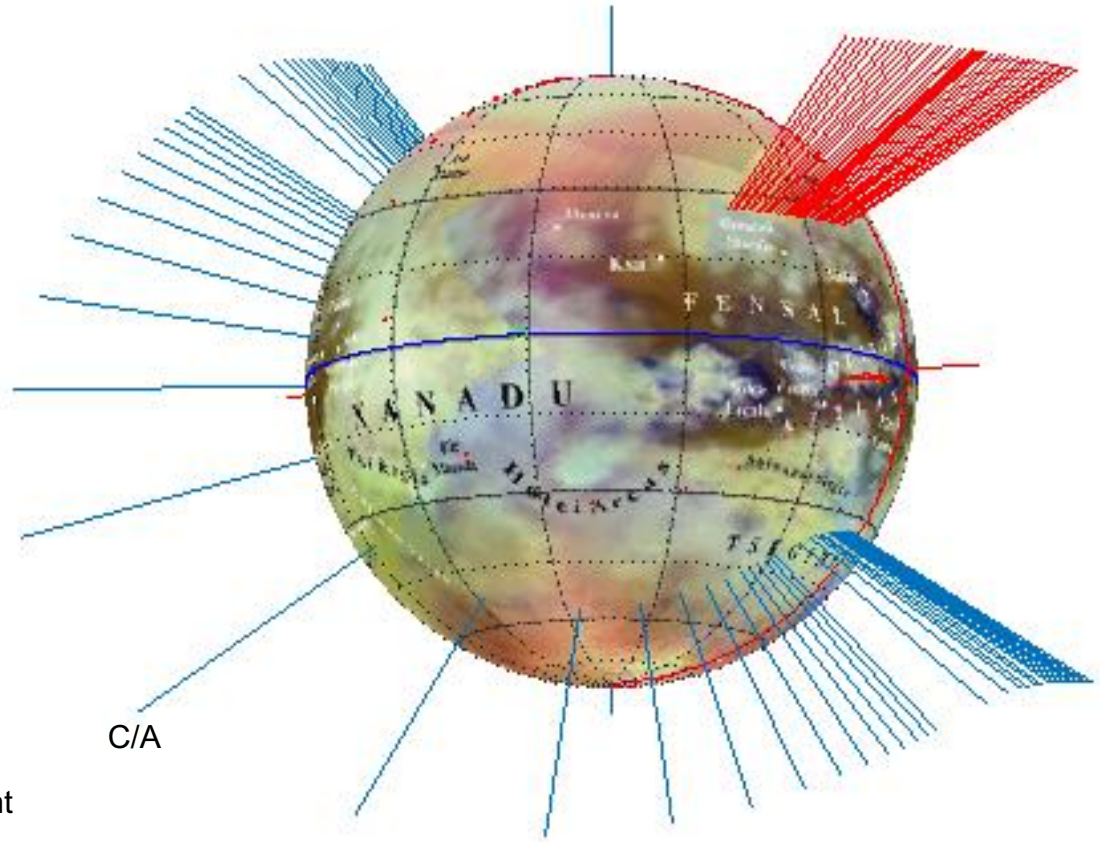
T120 – rev 236 – S94

June 7, 2016 – 159T14:06:17 @ 975 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Monitor the evolution of the South Polar Vortex.

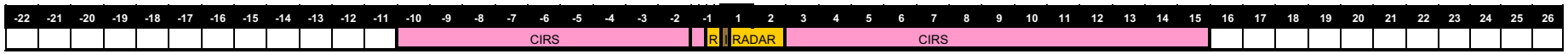


C/A

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T120 – rev 236 – S94

June 7, 2016 – 159T14:06:17 @ 975 km altitude

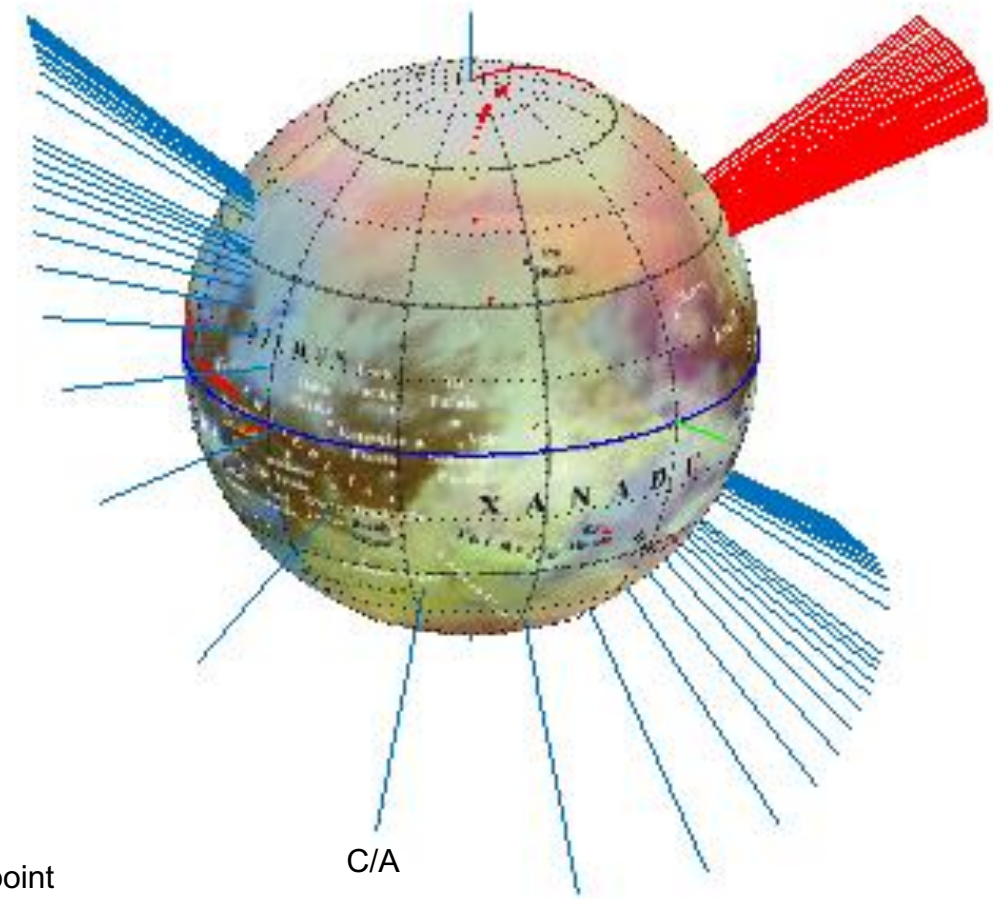
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Image the northern lakes and seas. Possible views of Kraken and Ligeia Mares.

Specular reflection geometry occurs at 82N, 76 W at C/A + 04:00.

Monitor the evolution of clouds at high northern latitudes.

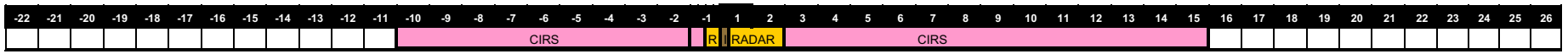


C/A

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



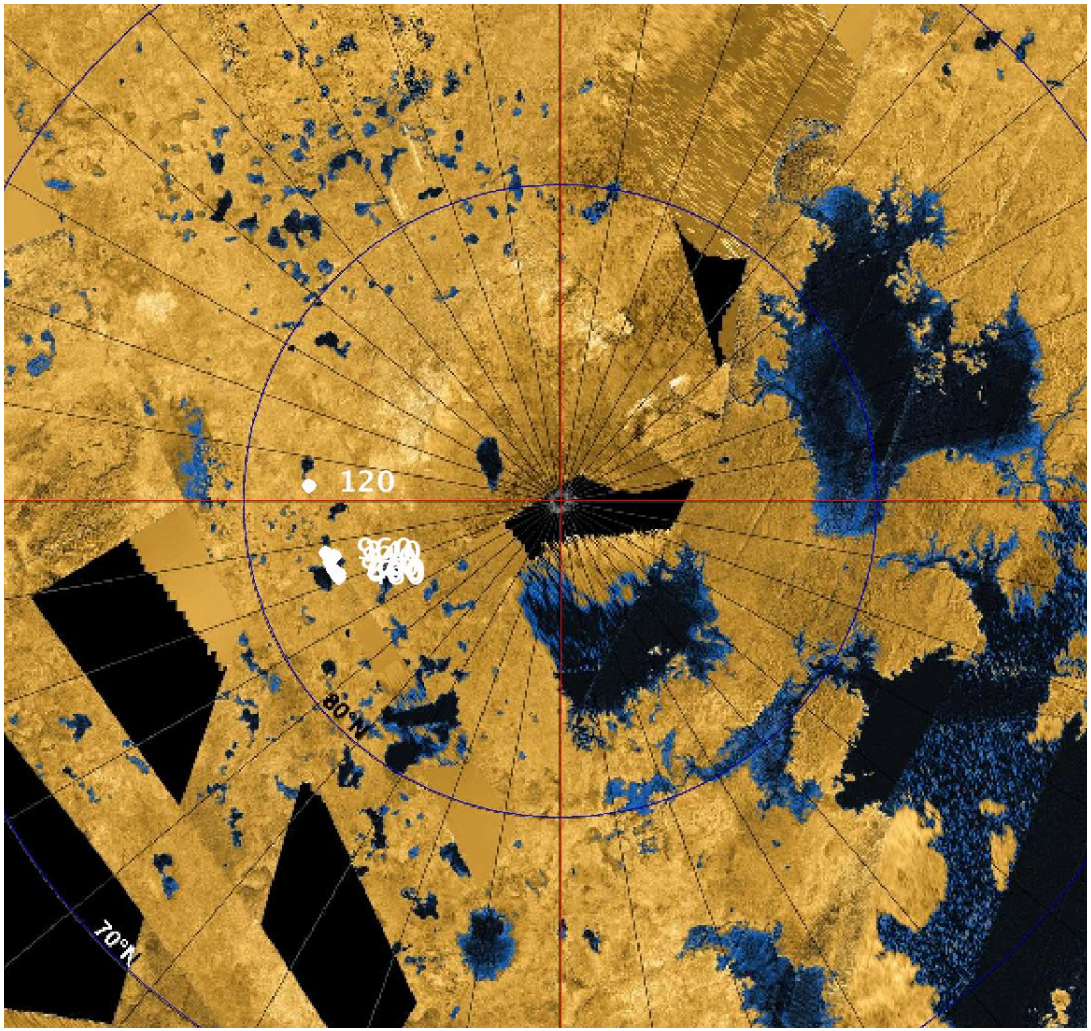
T120 – rev 236 – S94

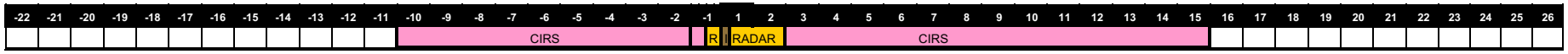
June 7, 2016 – 159T14:06:17 @ 975 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (min)
82.01	93.5	60.0	60.0	120
82.64	76.4	58.3	58.3	240
82.63	71.9	57.8	57.8	360
82.57	71.0	57.5	57.5	480
82.53	71.7	57.4	57.4	600
82.50	73.2	57.3	57.3	720
82.45	75.2	57.3	57.3	840
82.41	77.6	57.3	57.3	960





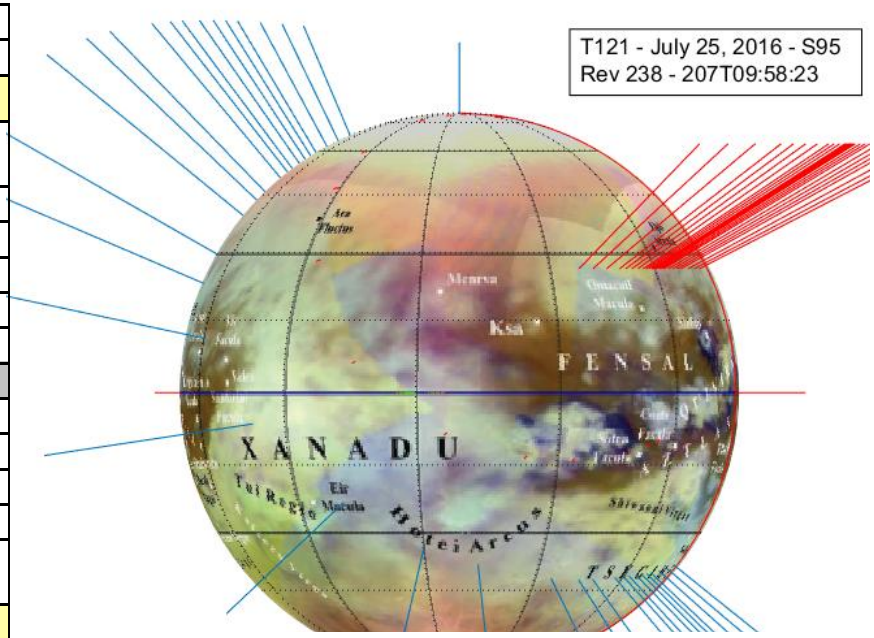
T121 – rev 238 – S95

July 25, 2016 – 207T09:58:23 @ 976 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T121: Radar will be prime at closest approach during this flyby (976 km). VIMS will monitor a stellar occultation before C/A. Such observations are used to determine the composition of Titan's atmosphere and to monitor any changes that may happen (TC1a). After C/A, VIMS will map Titan's North Pole area. It will monitor cloud activity at the mid northern latitudes and will acquire global views of the seas and lakes located at the North Pole (TC1a and TN1a). It will look at specular reflection on the lakes (TC1a).

C/A-09:42:40	-05:00	CIRS	F extended (TC1b OR TN1c)
-05:00	-02:15	CIRS	E TN2c
Begin custom period			
-02:15	**-01:03**	**VIMS stellar occ -01:20 to -00:20**	TN1c
-01:03	**-01:02**	**ENGR: RADWU to RADRWA**	
-01:02	**-01:01**	RWA to RCS Transition	
-01:01	**-00:30**	**RADAR HiSAR**	RADAR turning from VIMS attitude
-00:30	**-00:18**	**RADAR Altimetry**	TN2b
-00:18	**0**	**RADAR SAR**	TC1a, TN1a, TN1b, TN2b
2016-207T09:58:23		**CLOSEST APPROACH**	**NEG_Z to Titan, NEG_X to RAM (Tc2a)**
0	**+00:18**	**RADAR SAR**	TC1a, TN1a, TN1b, TN2b
+00:18	**+00:30**	**RADAR Altimetry**	TN2b
+00:30	**+00:52**	RCS to RWA Transition	
+00:52	**+01:37**	**RADAR HiSAR**	TC1a, TN1a, TN1b, TN2b
+01:37	**+02:15**	**RADAR scatterometry/radiometry**	TN2c, TN1a
End custom period			
+02:15	**+05:00**	**VIMS**	Y (TN1c)
+05:00	+09:00	VIMS	Q (TN1a)
+09:00	+12:30	CIRS	N1 (TN1b, TN1c aerosol)
+12:30	C/A+17:33:37	CIRS	M4 (TC1b, TN1c on outbound)



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T121 – rev 238 – S95

July 25, 2016 – 207T09:58:23 @ 976 km altitude

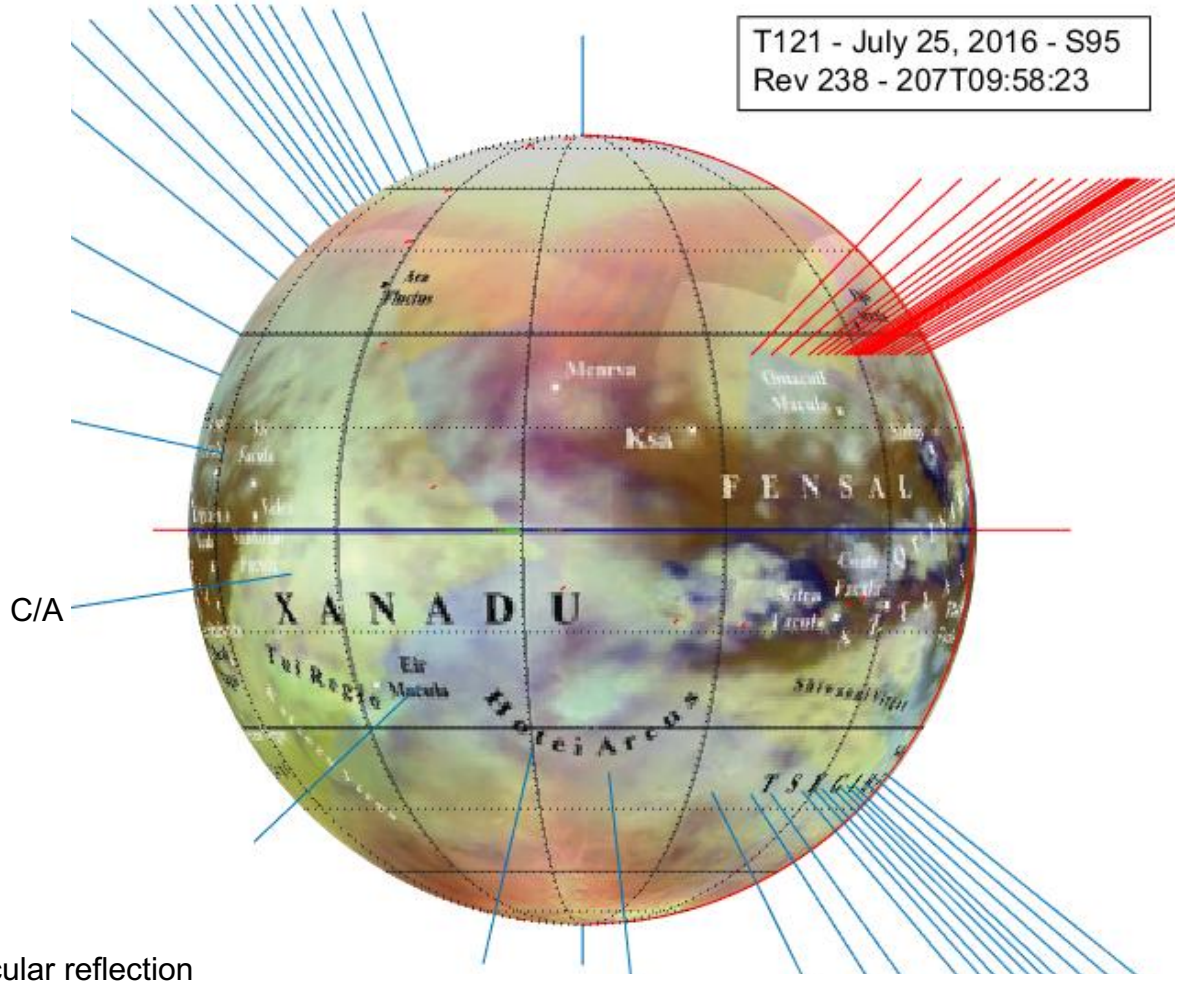
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Stellar occultation of 30 Hercules during the VIMS prime observation.

Regional mapping of Titan.

Ride along with CIRS looking for cloud activity.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22 -21 -20 -19 -18 -17 -16 -15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

CIRS | VIM | RADAR | VIMS | CIRS

T121 – rev 238 – S95

July 25, 2016 – 207T09:58:23 @ 976 km altitude

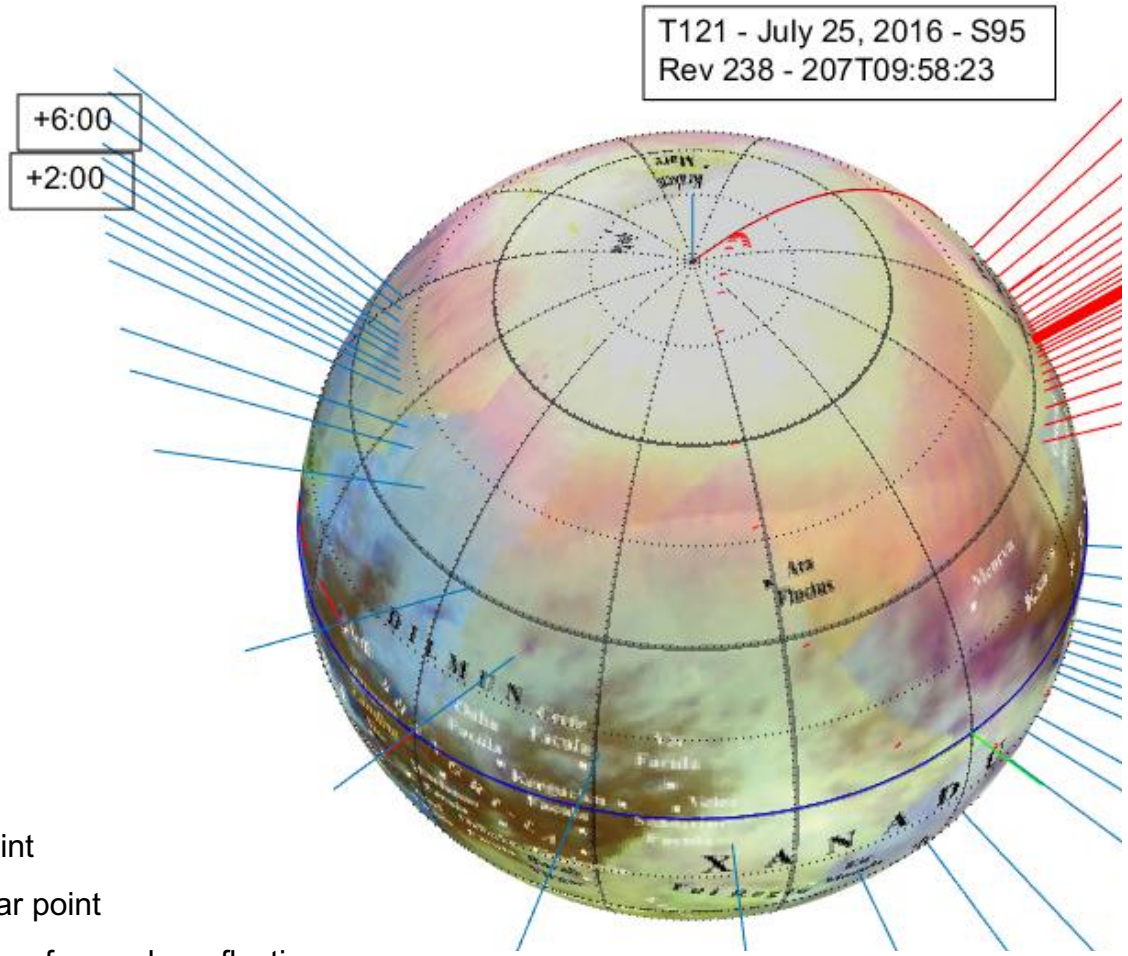
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Search for specular reflection near Punga Mare at 82N, 6 W at C/A +03:00.

Observe the North Pole and lakes.

Search for cloud activity.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

C/A

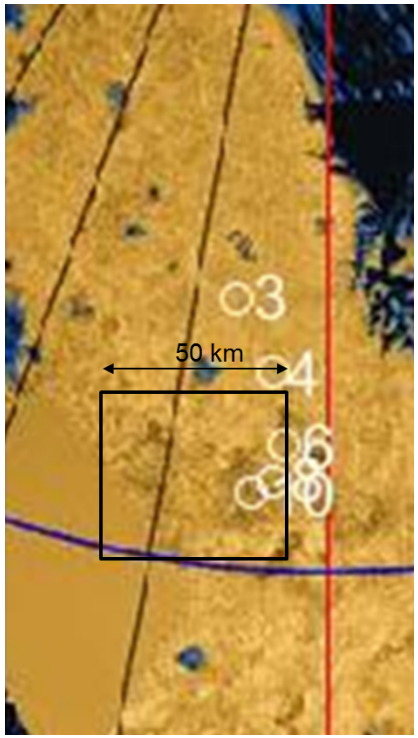
T121 – rev 238 – S95

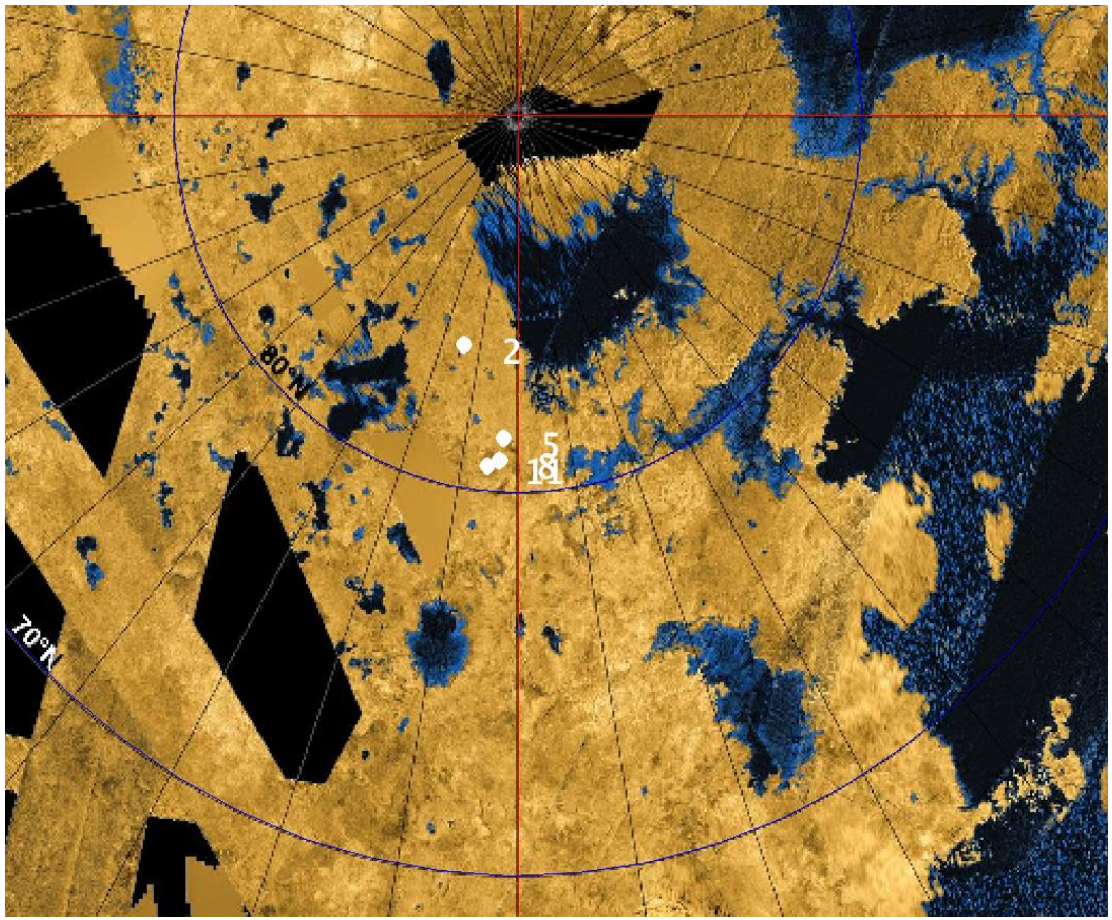
July 25, 2016 – 207T09:58:23 @ 976 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
83.72	14.5	57.7	57.6	7200	2.0
81.44	2.9	56.5	56.5	18000	5.0
80.86	3.5	56.2	56.2	28800	8.0
80.69	5.6	56.1	56.1	39600	11.0





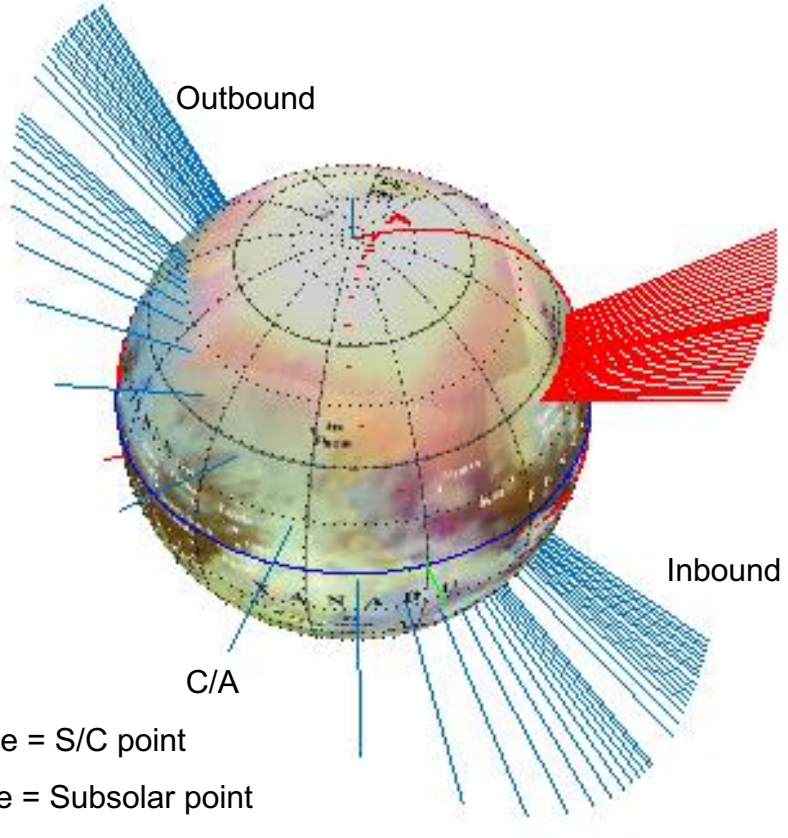
T122 – rev 239 – S95

Aug. 10, 2016 – 223T08:30:53 @ 1698 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T122: RSS will be prime at closest approach (1599 km). VIMS will ridealong with ISS on the outbound. It will monitor cloud activity (TC1a). It will also look at specular reflection on the lakes located near the North Pole (TC1a).

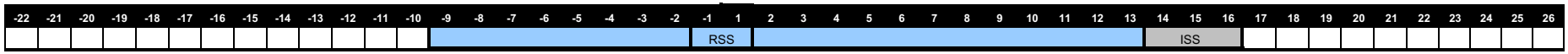
Start Time	End Time	Prime Activity	Obs. Detail
2016-222T22:25:00	2016-222T23:05:00	SP Turn to WP	X-band to Earth/RA-Dec:123/-57
2016-222T23:05:00	C/A-09:17:15	OD Uncertainty Dead Time	
C/A-09:17:15	0	SP/RSS Gravity	Warm up RSS during downlink (TN1b). CDA Riding along.
2016-223T08:30:53		CLOSEST APPROACH	XBAND to EARTH, NEG_X to NSP (Tc2a)
0	+12:00:00	SP/RSS Gravity	(TN1b)
+12:00:00	C/A+17:59:07	ISS	(TC1a/TN1a)
C/A+17:59:07	2016-224T02:45:00	OD Uncertainty Dead Time	
2016-224T02:45:00	2016-224T03:25:00	SP Turn to Earth for downlink	X-band to Earth/RA-Dec:(0.0,0.0,-9.5 deg. offset)
2016-224T03:25:00	2016-224T12:25:00	Canberra 70M	MIMI.NEG_Y to Saturn (0,0,-9.5)



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



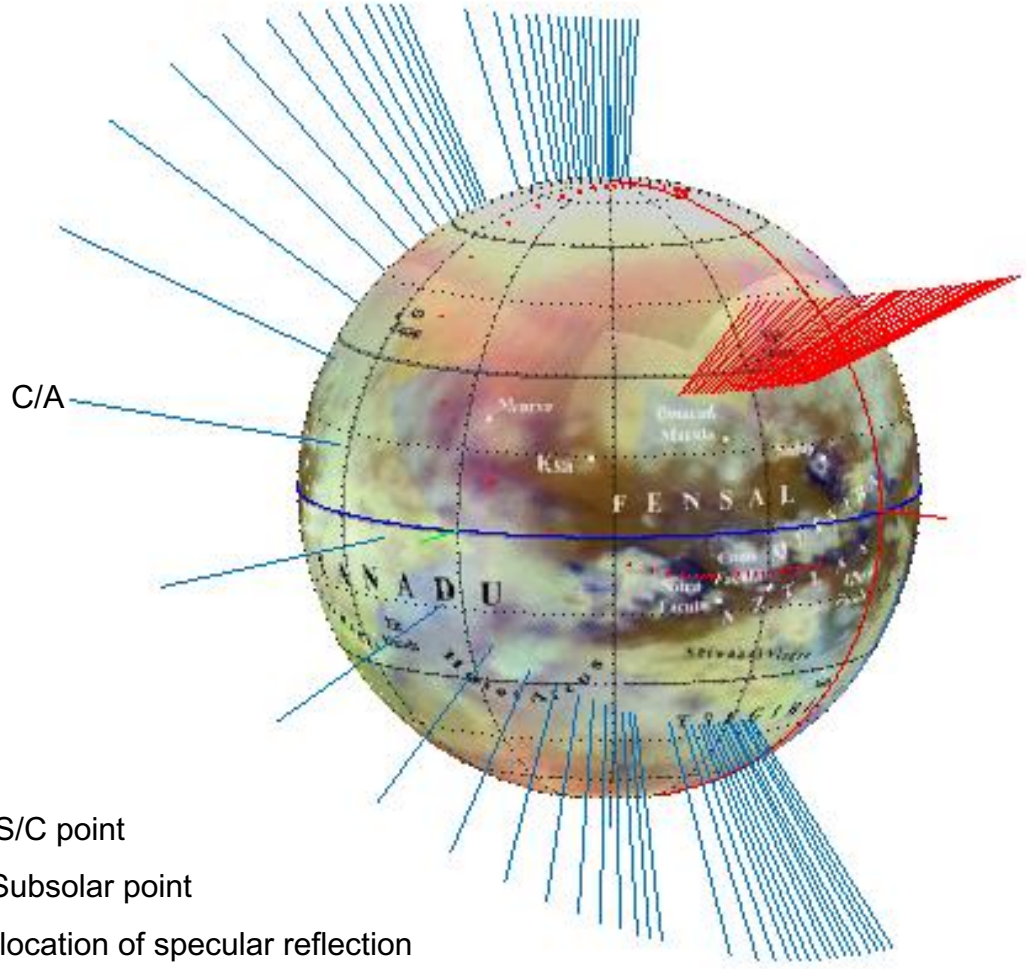
T122 – rev 239 – S95

Aug. 10, 2016 – 223T08:30:53 @ 1698 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

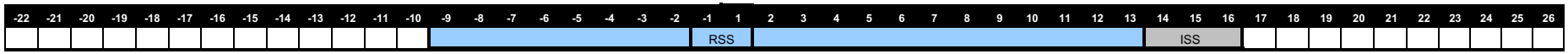
RSS is the prime instrument on the inbound.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T122 – rev 239 – S95

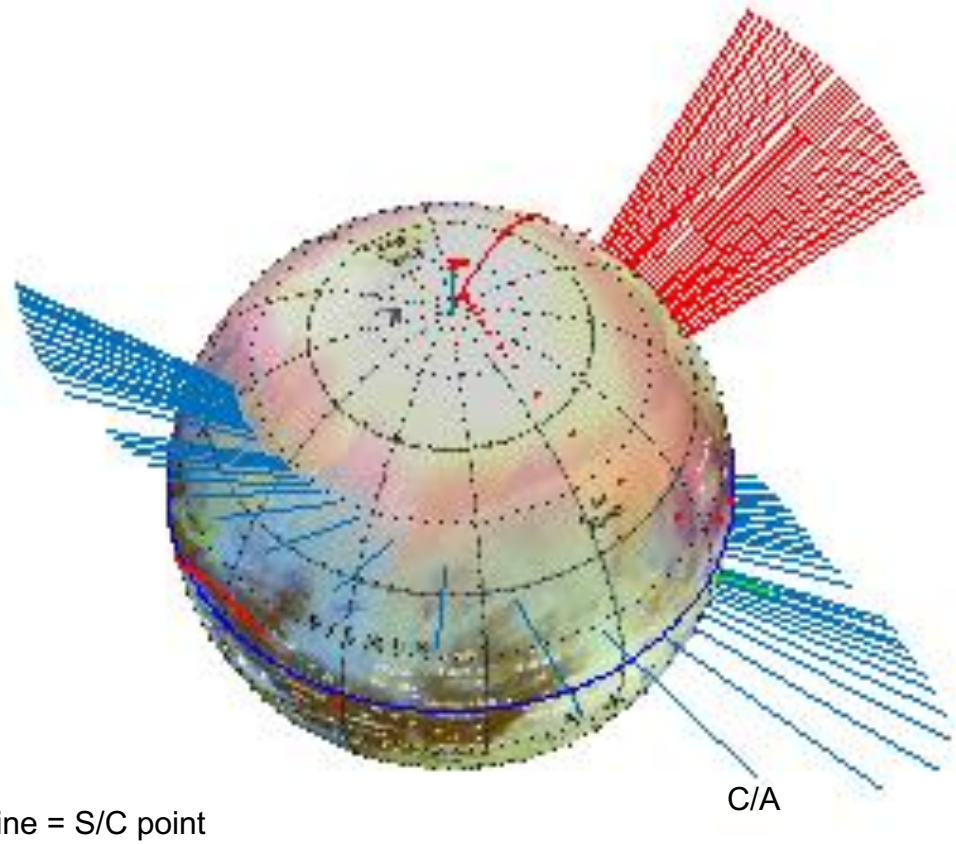
Aug. 10, 2016 – 223T08:30:53 @ 1698 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Specular reflection geometry is located near 75N, 346 W at C/A + 14:00.

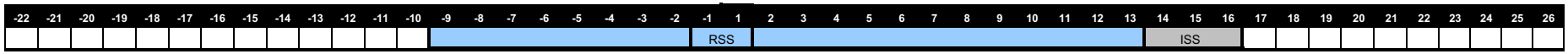
Monitor cloud activity and evolution.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



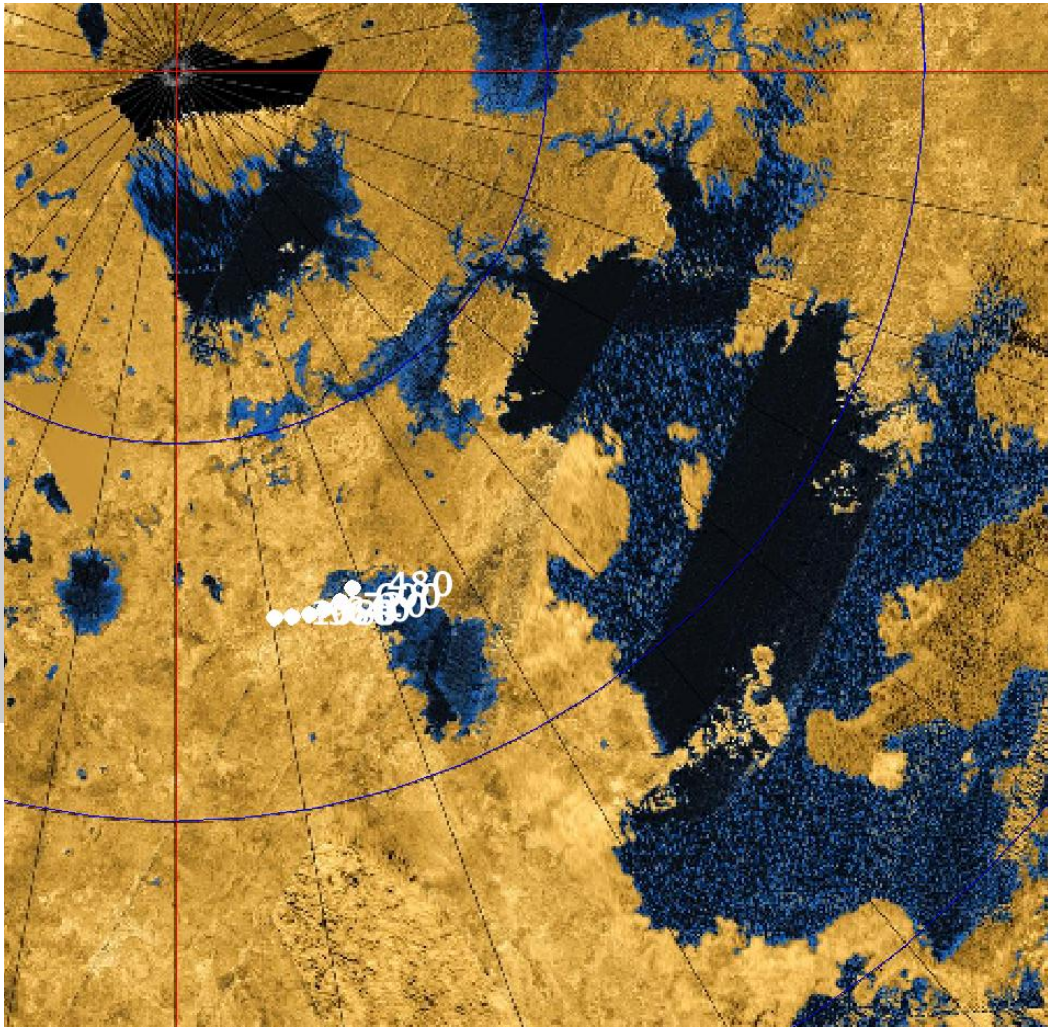
T122 – rev 239 – S95

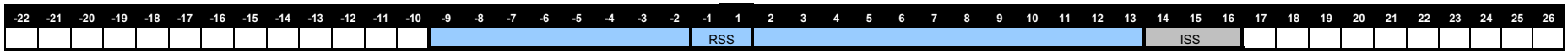
Aug. 10, 2016 – 223T08:30:53 @ 1698 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (hr)
75.36	341.2	56.1	56.1	8
75.15	342.8	56.0	56.0	10
75.05	344.5	56.0	56.0	12
75.03	346.2	56.1	56.0	14
75.06	348.0	56.1	56.1	16
75.13	349.8	56.1	56.1	18





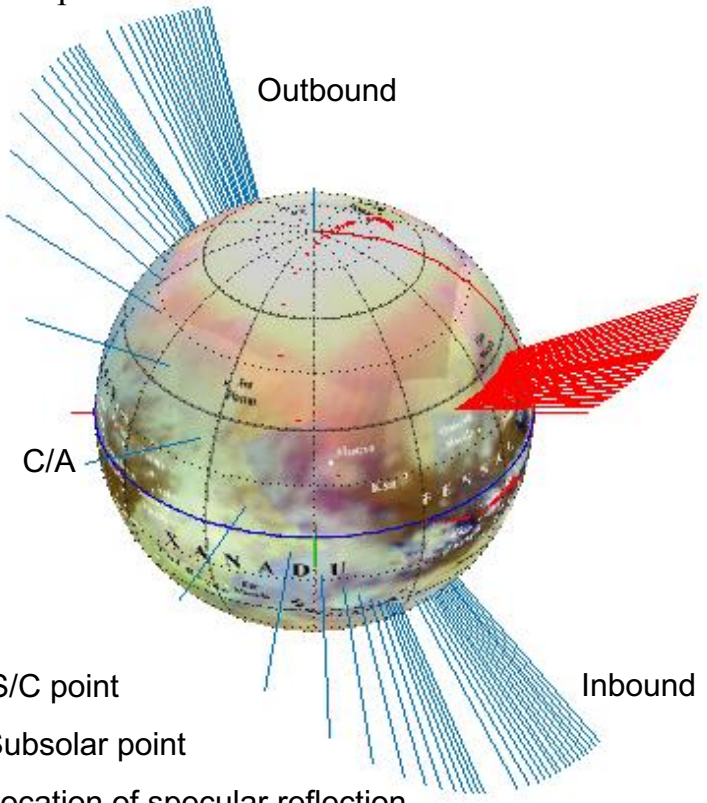
T123 – rev 243 – S96

Sep. 27, 2016 – 271T04:16:59 @ 1774 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T123: VIMS and CIRS will be the prime instruments at closest approach during this flyby (1737 km). During the inbound, VIMS will monitor cloud activity (TC1a) and the evolution of the south polar vortex (TC1b). It will also observe the Arcturus ingress occultation at 271T03:45:28 that will provide information on the atmospheric composition and its evolution (TC1a). After the occultation, VIMS will take a high resolution image/noodle of an area on Xanadu (TN1a). On the outbound, VIMS will ride along with UVIS and will look for specular reflection on Titan seas to monitor the evolution of the liquid hydrocarbon reservoirs (TC1a).

C/A-18:09:01	-14:00	CIRS	A3 (Tc1b)
-14:00	-09:00	VIMS	V (TC1a, TC1b)
-09:00	**-02:15**	UVIS	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
-02:15	**-00:53**	**VIMS**	
-00:53	**-00:20**	**VIMS occ -00:43 to -00:30**	
-00:20	**0**	**VIMS**	
2016-271T04:23:01		**CLOSEST APPROACH**	**NEG_Y to Titan (Tc2a)**
0	**+00:15**	**VIMS**	**VIMS turn to CIRS attitude**
+00:15	**+02:15**	**CIRS**	
+02:15	**+09:00**	**UVIS**	X (TN1c. ISS ridealong is photon WAC (TN1c and TC1a))
+09:00	C/A+17:36:01	VIMS	O (TN1a (Specular reflection of lakes-depending on geometry))



T123 – rev 243 – S96

Sep. 27, 2016 – 271T04:16:59 @ 1774 km altitude

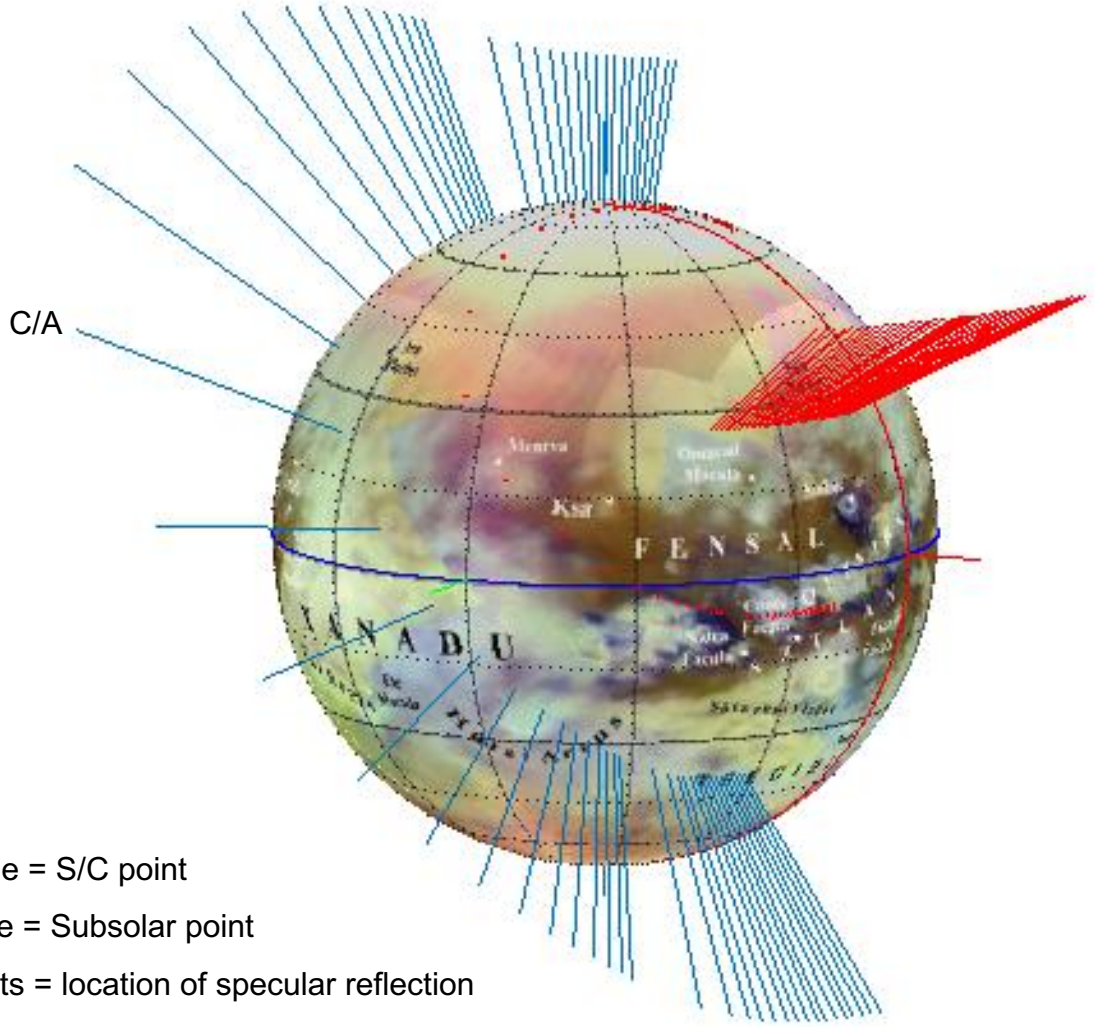
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Monitor cloud activity including the evolution of the South Polar Vortex (TC1a).

Global and regional mapping of Titan including Xanadu at 15S 100 W prior to C/A.

Stellar occultation of Alpha Bootes (Arcturus).



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T123 – rev 243 – S96

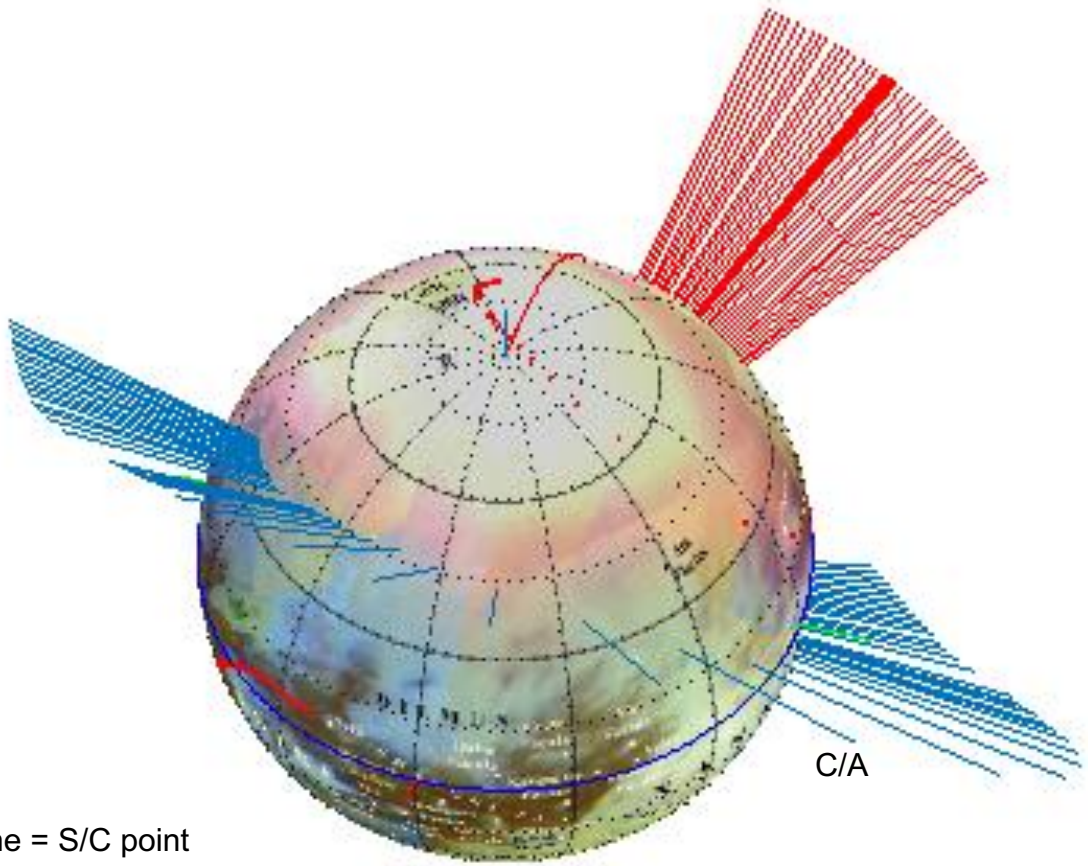
Sep. 27, 2016 – 271T04:16:59 @ 1774 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Observations of the North Pole region including Kraken Mare

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

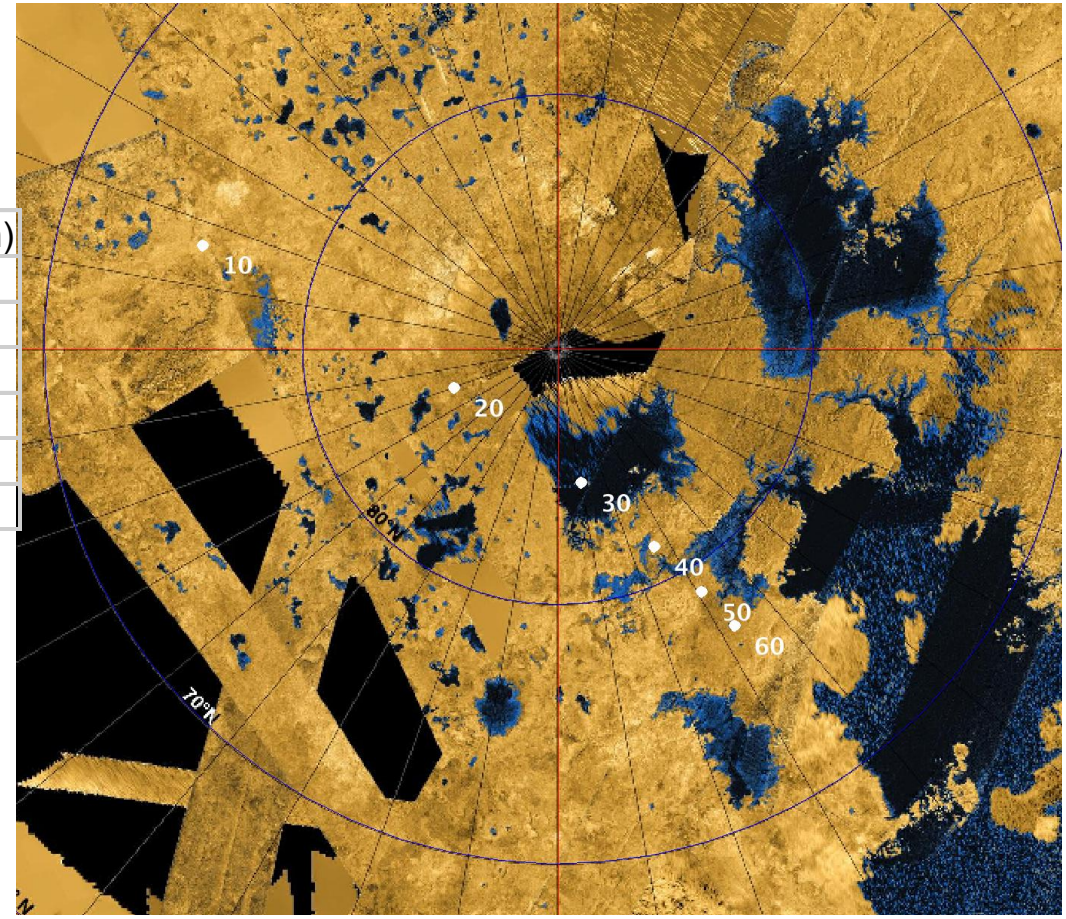
T123 – rev 243 – S96

Sep. 27, 2016 – 271T04:16:59 @ 1774 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (min)
75.52	106.4	61.6	61.6	600	10
85.66	70.0	60.3	60.3	1200	20
84.72	350.3	59.4	59.4	1800	30
81.41	333.9	58.7	58.7	2400	40
78.97	329.3	58.2	58.2	3000	50
77.18	327.4	57.9	57.9	3600	60



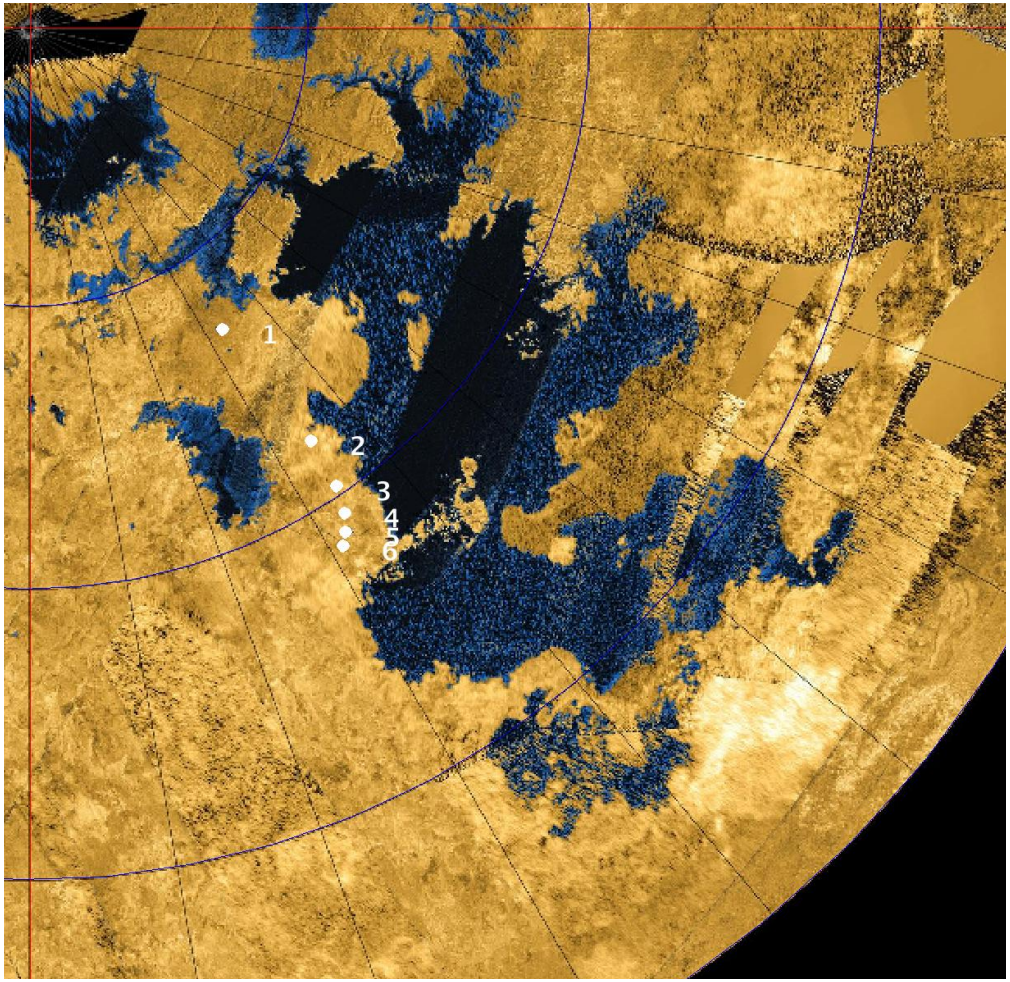
T123 – rev 243 – S96

Sep. 27, 2016 – 271T04:16:59 @ 1774 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
77.18	327.4	57.9	57.9	3600	1
72.16	325.7	56.9	56.9	7200	2
70.33	326.2	56.5	56.5	10800	3
69.39	327.0	56.3	56.3	14400	4
68.83	327.9	56.2	56.2	18000	5
68.46	328.8	56.1	56.1	21600	6



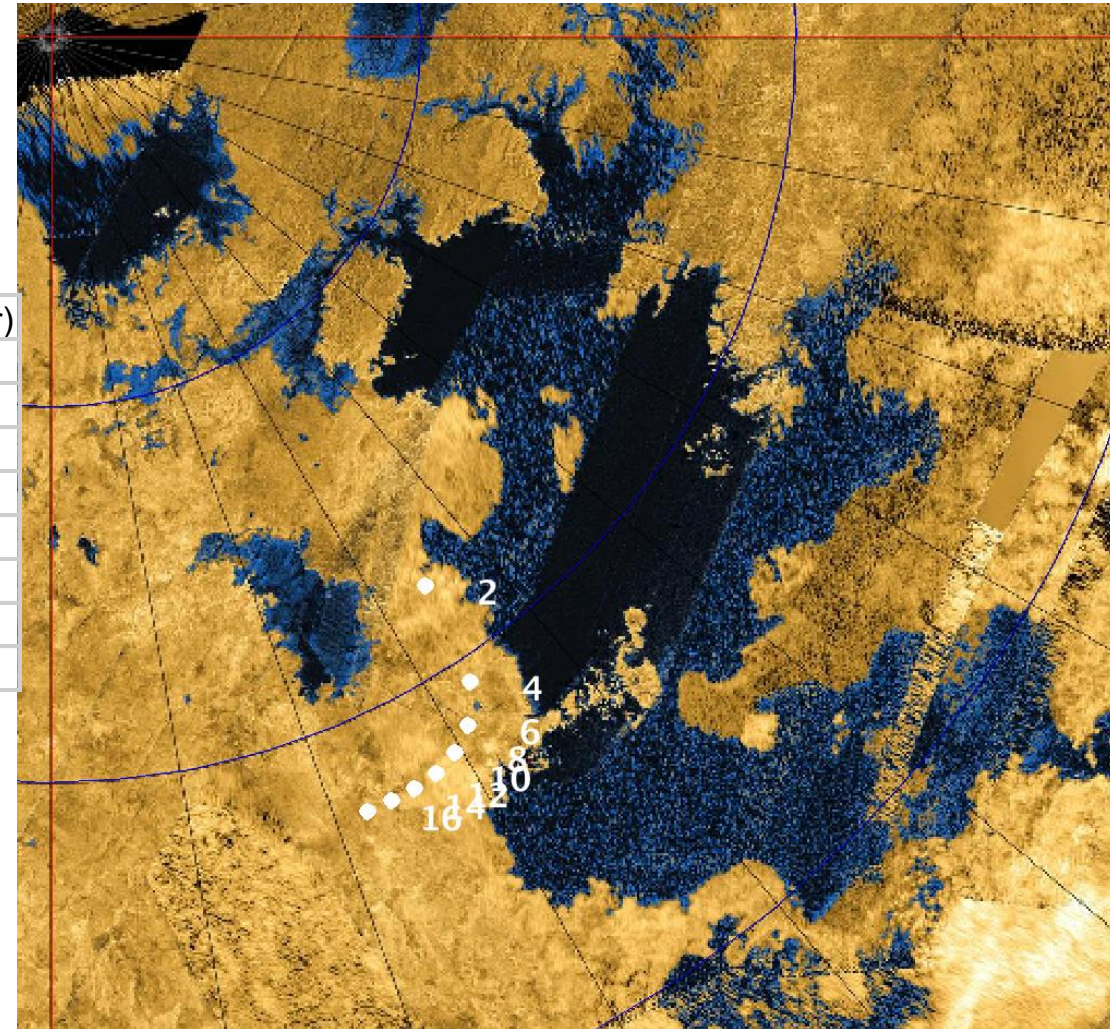
T123 – rev 243 – S96

Sep. 27, 2016 – 271T04:16:59 @ 1774 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
72.16	325.7	56.9	56.9	7200	2
69.39	327.0	56.3	56.3	14400	4
68.46	328.8	56.1	56.1	21600	6
68.01	330.6	56.0	56.0	28800	8
67.78	332.4	56.0	56.0	36000	10
67.67	334.2	56.0	56.0	43200	12
67.62	336.0	56.0	56.0	50400	14
67.63	337.8	56.0	56.0	57600	16



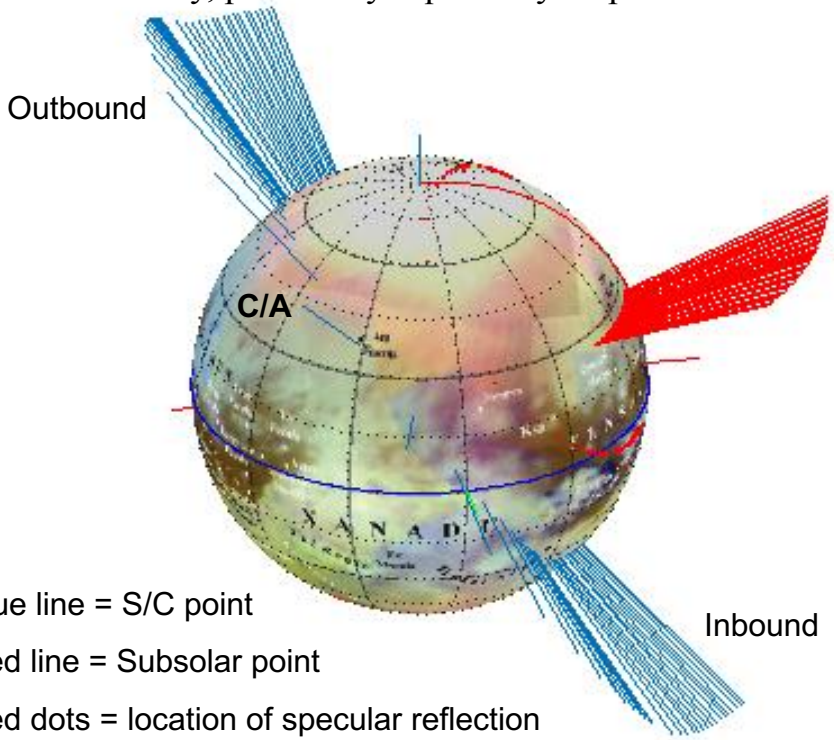
T124 – rev 248 – S96

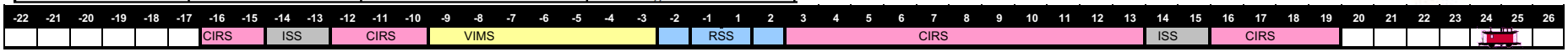
Nov. 13, 2016 – 318T23:55:56 @ 1584 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T124: RSS will be prime at closest approach (1582 km). On the inbound, VIMS will acquire a mosaic that includes the eastern part of Xanadu, Hotei Arcus, Menrva, and the North Pole (TN1a). It will monitor cloud activity (TC1a) and the evolution of the south polar vortex (TC1b). On the outbound, VIMS will ride along with CIRS and will look for specular reflection on Kraken Mare to monitor the evolution of the liquid hydrocarbon reservoirs (TC1a). Additionally, there will be cooperative observation while CIRS and ISS are prime on the outbound in order to look for specular reflection, in particular on the South of Kraken where a dark body, potentially liquid may be present.

C/A-16:31:56	-14:00	CIRS	A truncated (Tc1b)
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
-12:00	-09:00	CIRS	D2 (TN1c)
-09:00	-05:00	VIMS	I (TC1a and TN2c)
-05:00	**-03:26**	VIMS	Y modified (TC1a, TN1a (depending on pointing) and TN2c)
-03:26	**-03:25**	RWA to RCS Transition	
-03:25	**-02:43**	VIMS	
-02:43	**-01:00**	**RSS warm up**	
-01:00	**0**	**RSS Bistatic**	(TN1a)
2016-318T23:55:56		**CLOSEST APPROACH**	**XBAND to Titan, LUB (Tc2a)**
0	**+02:10**	**RSS Bistatic**	(TN1a)
+02:10	**+02:32**	RCS to RWA Transition	
+02:32	**+05:00**	**CIRS**	T (TN2c (surface temperature))
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
+09:00	+12:00	CIRS	D2 (TN1c)
+12:00	+14:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
+14:00	C/A+18:53:04	CIRS	M3 (Tc1b (TN1c on outbound))





T124 – rev 248 – S96

Nov. 13, 2016 – 318T23:55:56 @ 1584 km altitude

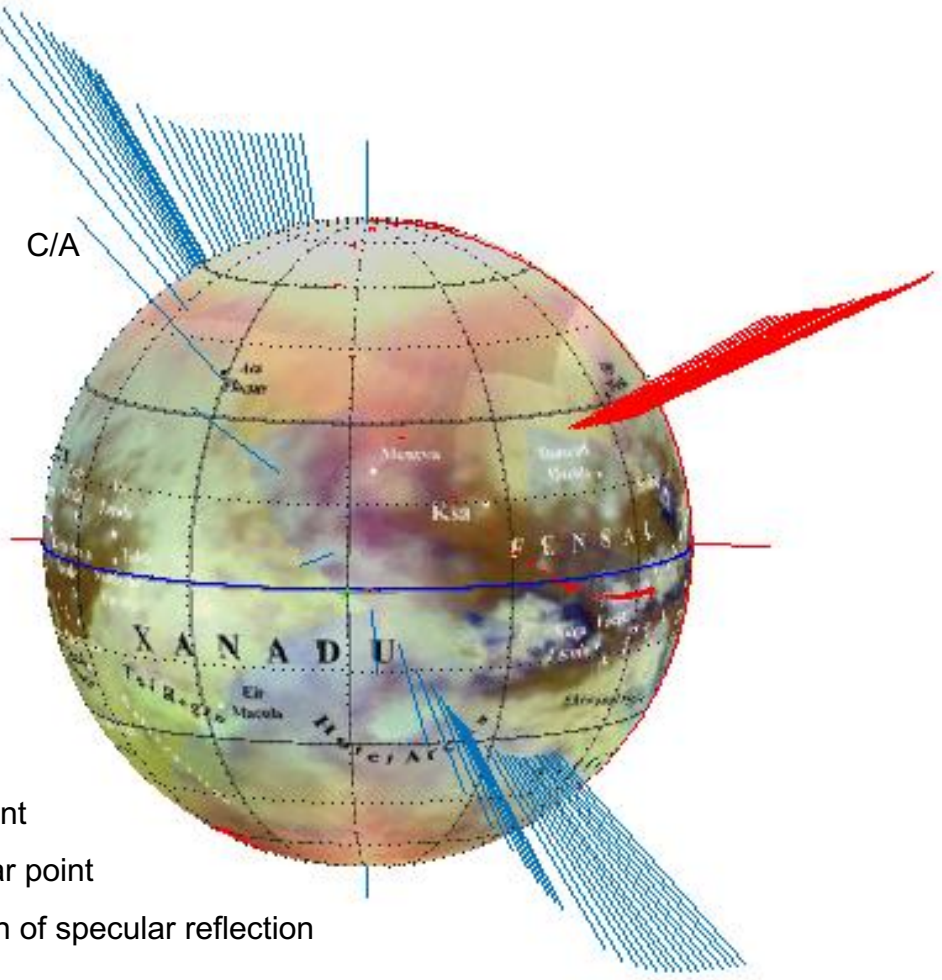
Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Global mapping of Titan.

Monitor cloud activity including the South Polar Vortex (TC1a).

Obtain mosaics of Hotei Arcus, Xanadu and Menrva.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
						CIRS		ISS		CIRS			VIMS									RSS		CIRS													ISS		CIRS									

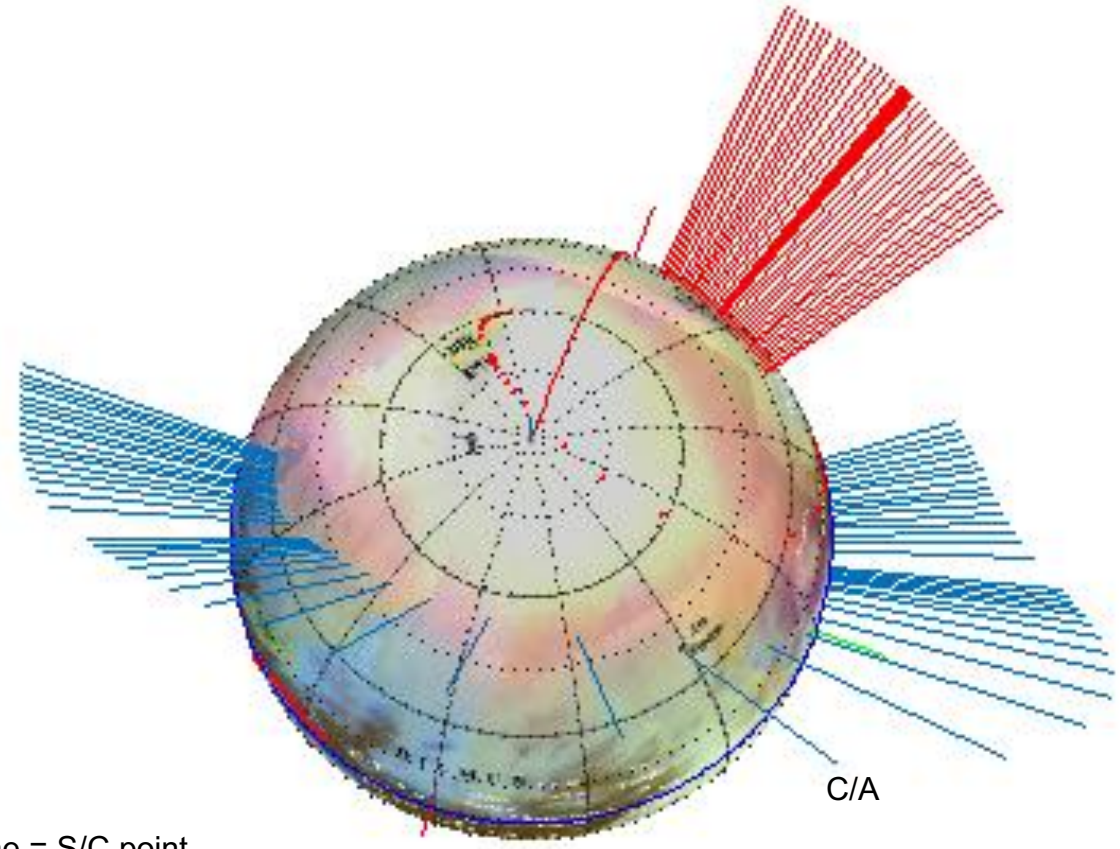
T124 – rev 248 – S96

Nov. 13, 2016 – 318T23:55:56 @ 1584 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

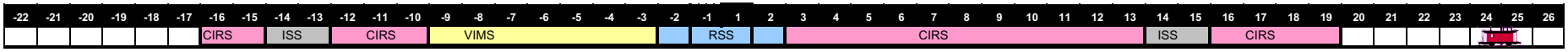
Look for specular reflection over Kraken Mare. Specular reflection geometry occurs at 64N, 319 W at C/A + 02:00.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



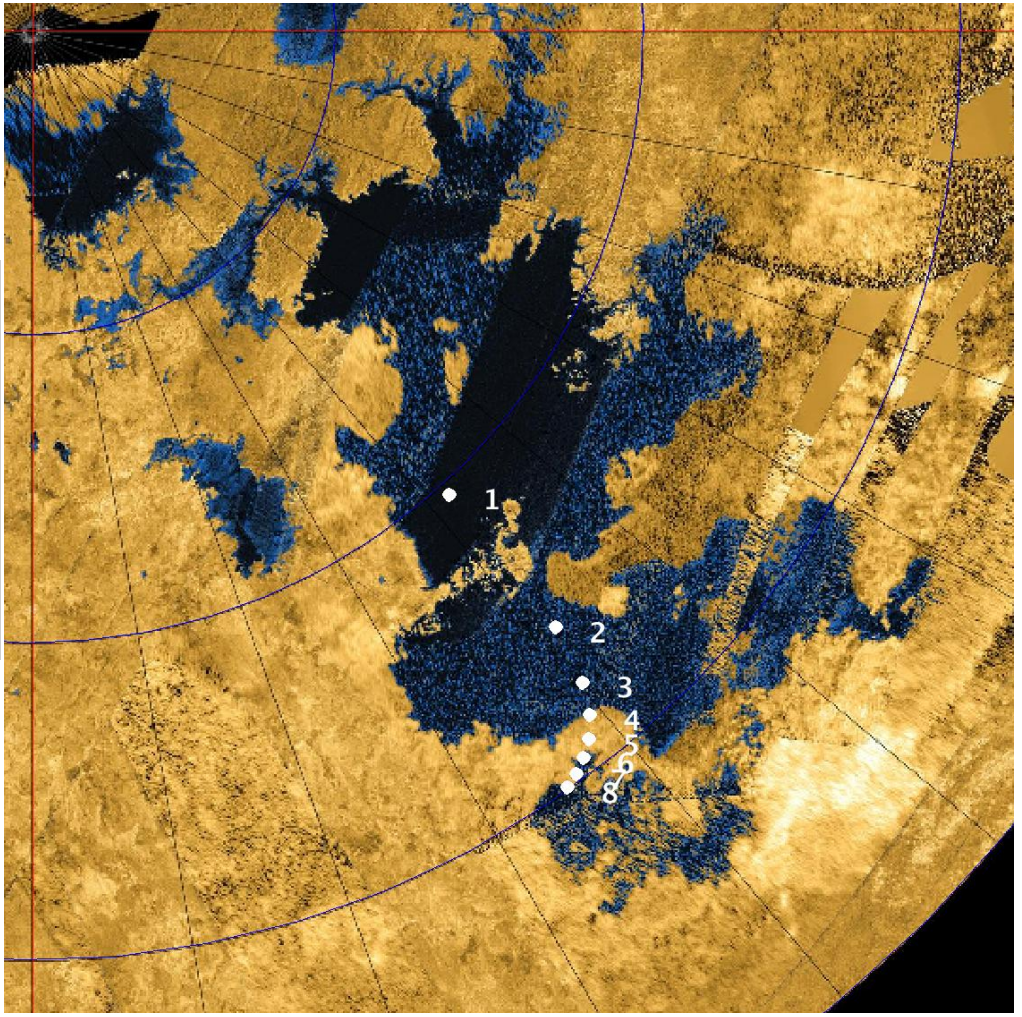
T124 – rev 248 – S96

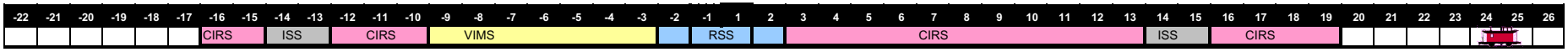
Nov. 13, 2016 – 318T23:55:56 @ 1584 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (hr)
69.63	318.0	57.7	57.7	3600	1.0
64.24	318.7	56.9	56.9	7200	2.0
62.38	319.8	56.7	56.7	10800	3.0
61.45	320.8	56.5	56.5	14400	4.0
60.90	321.8	56.5	56.4	18000	5.0
60.53	322.8	56.4	56.4	21600	6.0
60.28	323.8	56.4	56.4	25200	7.0
60.10	324.7	56.4	56.4	28800	8.0





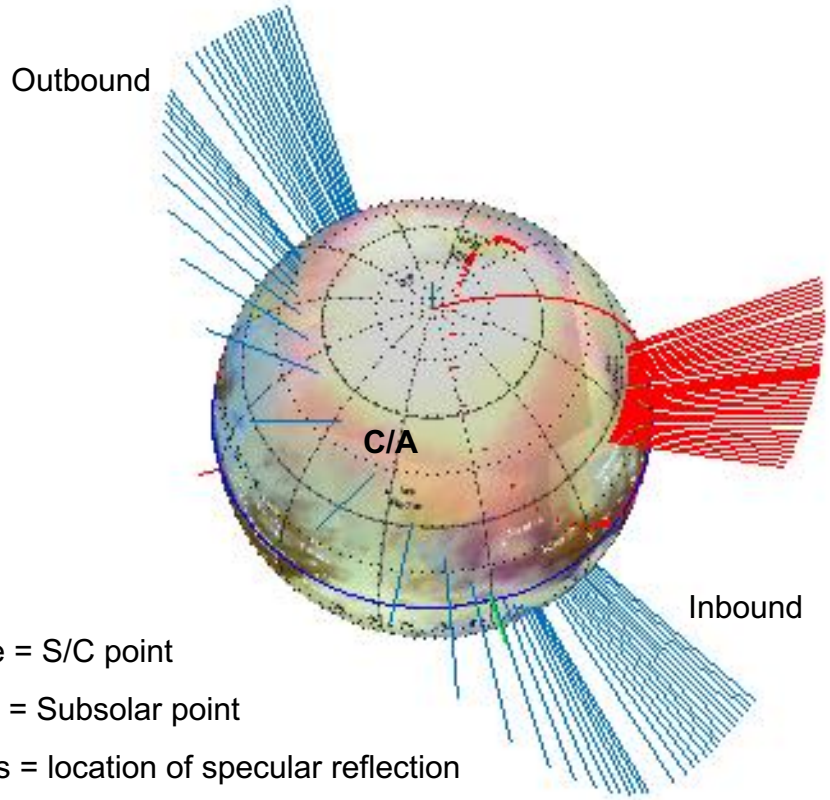
T125 – rev 250 – S97

Nov. 29, 2016 – 334T22:14:32 @ 3158 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T125: A combination of ISS, VIMS and CIRS will be prime during closest approach during this flyby (3223 km). On the inbound, VIMS will acquire a mosaic that includes the eastern part of Xanadu, Hotei Arcus, Menrva, and the North Pole (TN1a). It will monitor cloud activity (TC1a) and the evolution of the south polar vortex (TC1b). On the outbound, VIMS will ride along with CIRS and will look for specular reflection on Kraken mare, including the throat of Kraken, to monitor the evolution of the liquid hydrocarbon reservoirs (TC1a).

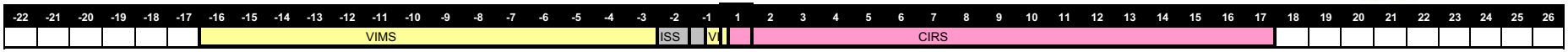
C/A-15:57:20	-14:00	VIMS	B (TC1a)
-14:00	-09:00	VIMS	V (TC1a, TC1b)
-09:00	-05:00	VIMS	I (TC1a and TN2c)
-05:00	**-02:15**	VIMS	Y (TC1a, TN1a (depending on pointing) and TN2c)
-02:15	**-00:30**	**ISS**	**TN1a, hand off at wp**
Begin custom period			
-00:30	**0**	**VIMS**	
2016-334T22:14:32		**CLOSEST APPROACH**	**NEG_Y to Titan (Tc2a)**
0	**+00:15**	**VIMS**	**TN1a, VIMS turning to CIRS attitude**
+00:15	**+00:45**	**CIRS**	**TN1c**
+00:45	**+01:15**	**CIRS**	**TN1c**
+01:15	**+02:15**	**CIRS**	**TN1c**
+02:15	+05:00	**CIRS**	T (TN2c (surface temperature))
+05:00	+09:00	CIRS	R (TN1c or Tc1b, decided in implementation)
+09:00	+13:00	CIRS	N1 (Tc1b, TN1c aerosol)
+13:00	C/A+19:33:28	CIRS	M3 (Tc1b (TN1c on outbound))
End custom period			



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T125 – rev 250 – S97

Nov. 29, 2016 – 334T22:14:32 @ 3158 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

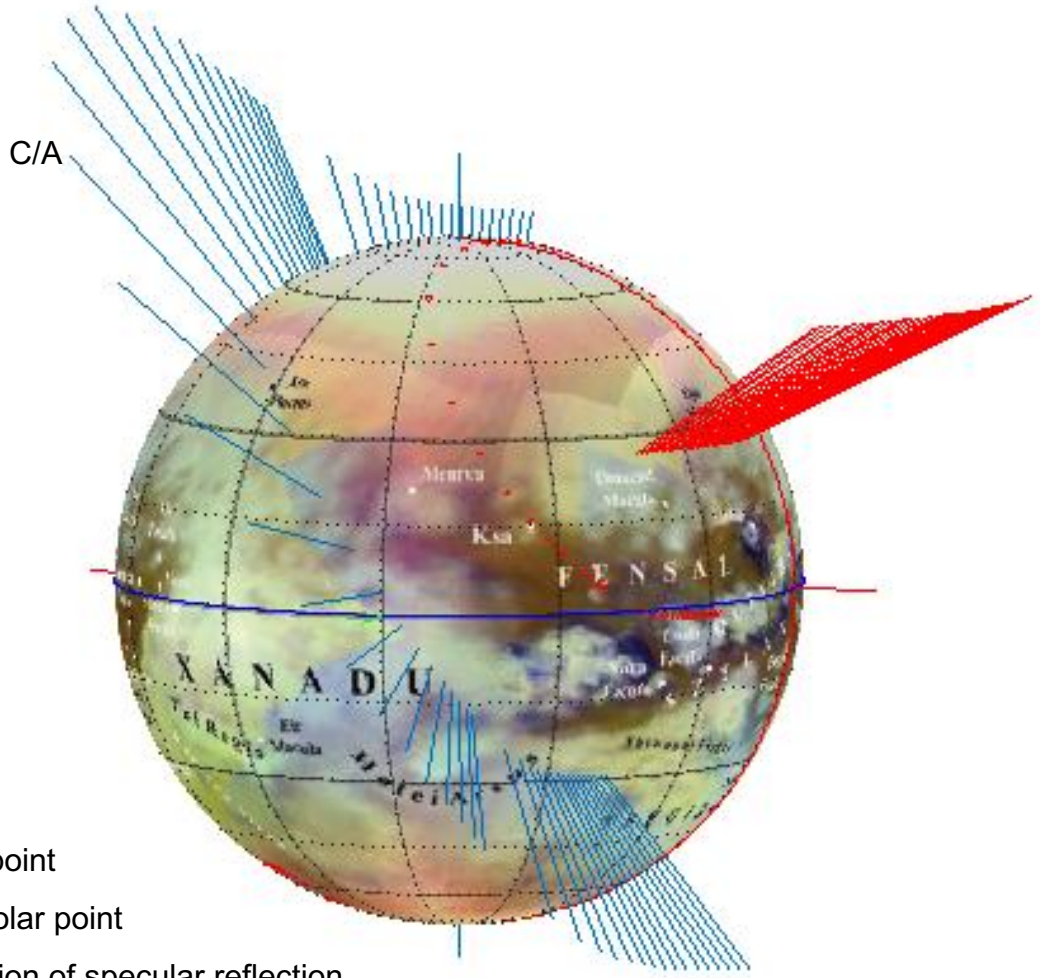
Inbound:

Mosaic the eastern regions of Xanadu, Hotei Arcus, and Menrva.

Regional mapping and mosaics of the North Pole (TN1a).

Monitoring cloud activity (TC1a) and the evolution of the south polar vortex (TC1b).

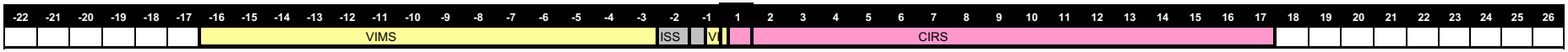
Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



T125 – rev 250 – S97

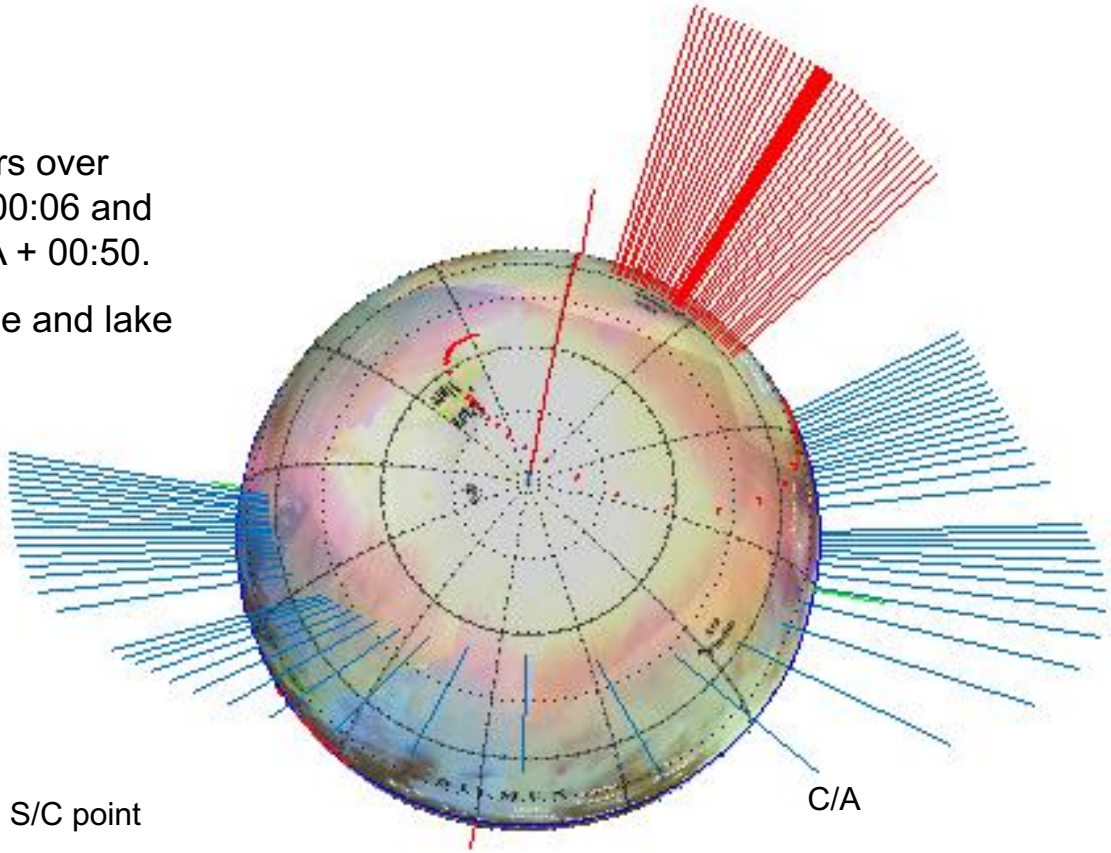
Nov. 29, 2016 – 334T22:14:32 @ 3158 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Outbound:

Specular reflection geometry occurs over Ligeia Mare at 84N, 6 W at C/A + 00:06 and Kraken Mare at 70N, 317 W at C/A + 00:50.

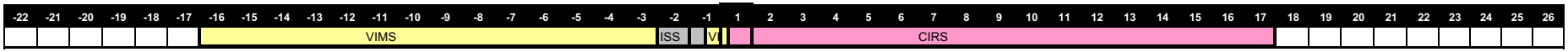
Regional mapping of the North Pole and lake regions.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection



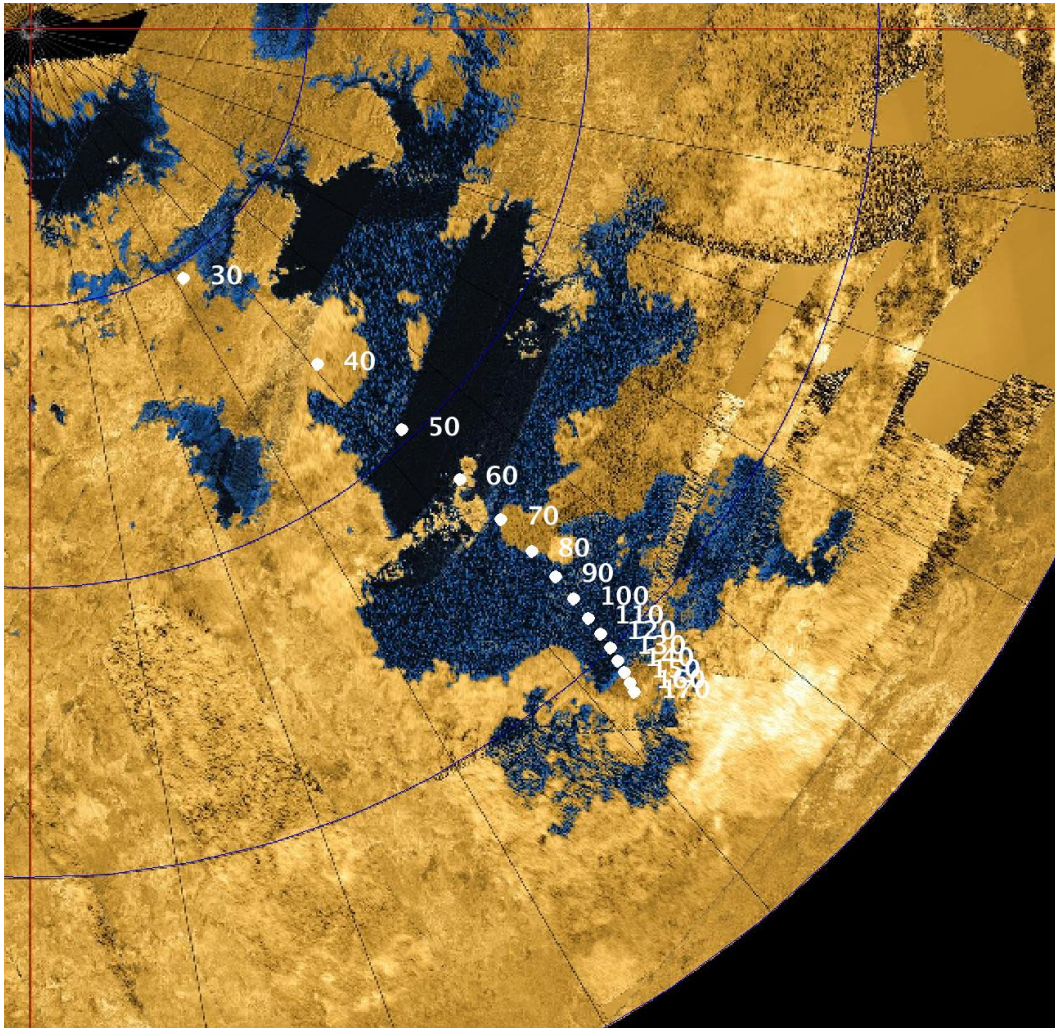
T125 – rev 250 – S97

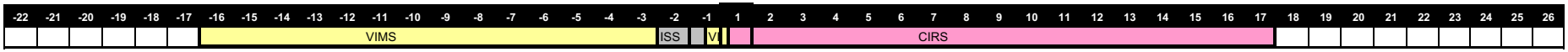
Nov. 29, 2016 – 334T22:14:32 @ 3158 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (min)
79.45	328.5	57.9	57.9	1800	30
74.16	319.5	57.9	57.9	2400	40
70.44	317.2	57.7	57.7	3000	50
67.79	316.4	57.6	57.6	3600	60
65.81	316.2	57.5	57.5	4200	70
64.28	316.2	57.4	57.4	4800	80
63.08	316.2	57.3	57.3	5400	90
62.10	316.4	57.2	57.2	6000	100
61.29	316.6	57.1	57.2	6600	110
60.62	316.7	57.1	57.1	7200	120
60.04	316.9	57.1	57.0	7800	130
59.54	317.1	57.0	57.0	8400	140
59.11	317.3	57.0	57.0	9000	150
58.73	317.5	56.9	56.9	9600	160
58.39	317.7	56.9	56.9	10200	170





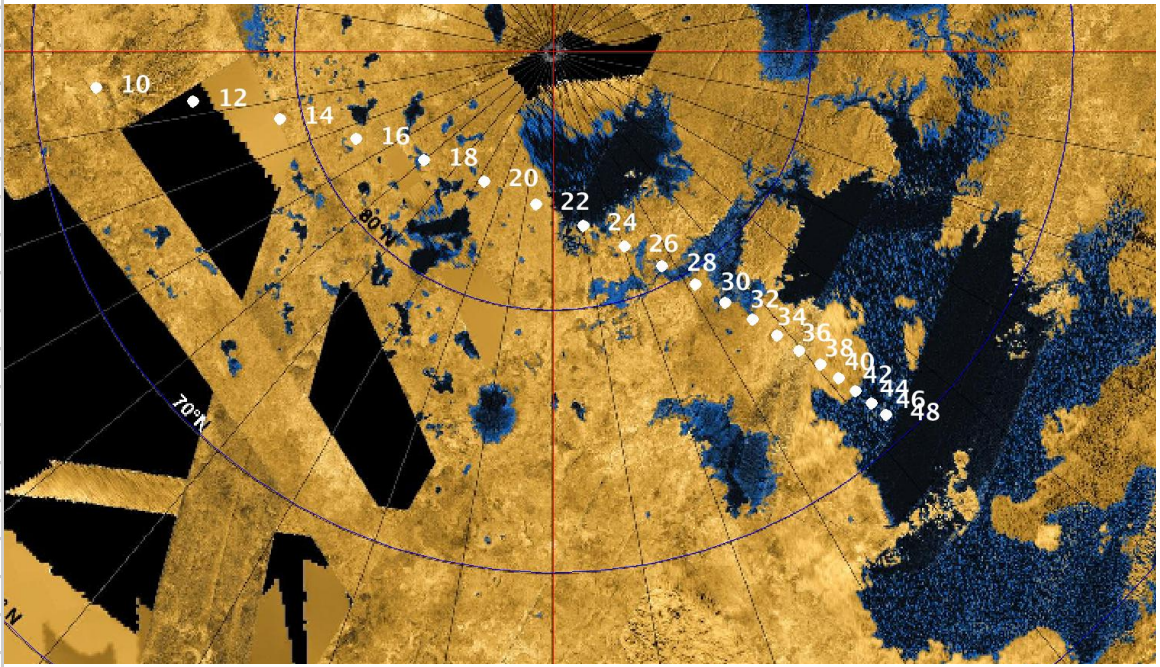
T125 – rev 250 – S97

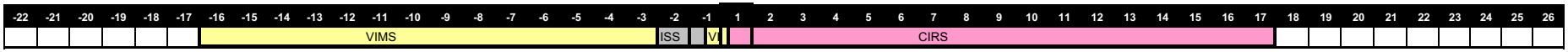
Nov. 29, 2016 – 334T22:14:32 @ 3158 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Specular Geometry:

Lat	Lon (W)	Inc	Ems	Time (sec)	Time (min)
72.36	85.6	56.1	56.1	600	10
75.98	82.2	56.6	56.6	720	12
79.11	76.3	57.0	57.0	840	14
81.66	66.2	57.3	57.3	960	16
83.46	50.1	57.5	57.5	1080	18
84.31	28.2	57.7	57.6	1200	20
84.06	6.5	57.8	57.8	1320	22
83.18	350.2	57.9	57.9	1440	24
81.98	339.8	57.9	57.9	1560	26
80.71	333.0	57.9	57.9	1680	28
79.45	328.5	57.9	57.9	1800	30
78.24	325.5	57.9	57.9	1920	32
77.11	323.3	57.9	57.9	2040	34
76.05	321.7	57.9	57.9	2160	36
75.07	320.5	57.9	57.9	2280	38
74.16	319.5	57.9	57.9	2400	40
73.30	318.8	57.8	57.8	2520	42
72.51	318.3	57.8	57.8	2640	44
71.78	317.8	57.8	57.8	2760	46
71.08	317.5	57.7	57.8	2880	48





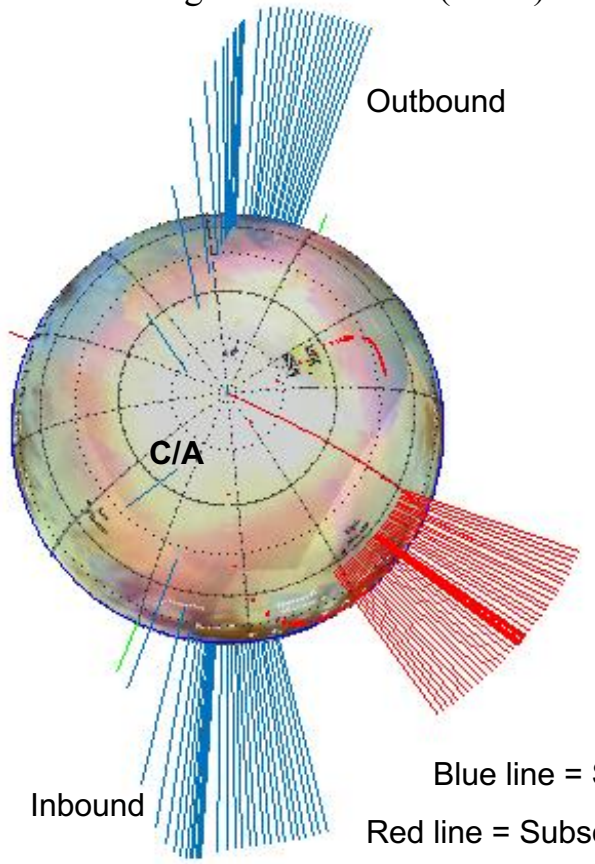
T126 – rev 270 – S99

April 22, 2017 – 112T06:08:08 @ 979 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

T126: Radar will be prime at closest approach during this flyby (979 km). On the inbound, VIMS will ride along with ISS and CIRS and will look for clouds in the northern hemisphere (TC1a). On the outbound, VIMS will take images of the North Pole with very large emission angles, looking for clouds forming above the seas (TC1a). It will also get limb images that are used to characterize Titan's haze (TC1a).

C/A - 0T16:43:09	-14:00	CIRS	A (Tc1b)
-14:00	-12:00	ISS	D2 (TC1a, TC1b, TN1a, TN2c (Could also use TN1c for limb haze layer, depending on geometry if along limb, or TN2d, depending on timing.))
-12:00	-09:00	CIRS	D2 (TN1c)
-09:00	-06:00	ISS	H1 (TC1a, TN1a, TN2c (Could also be TC1b and/or TN1c, depending on geometry, or TN2d, depending on timing.))
-06:00	-02:15	RADAR	H1+ L (TN2c ,TN2c)
-02:15	**-01:12**	RADAR scatterometry/radiometry	(TN1a, TN2c)
-01:12	**-00:31**	RADAR HiSAR	(TN1a)
-00:31	**-00:30**	RWA to RCS Transition	
-00:30	**-00:15**	**RADAR Altimetry**	(TN2b)
-00:15	**0**	**INMS***	RADAR Needs to get entire northern lake region. RADAR ride along (TC1a, TN1a, TN1b, TN2b, TN2c)
2017-112T06:08:08		**CLOSEST APPROACH**	**NEG_X to RAM, NEG_Z to Titan (Tc2a)**
0	**+00:18**	**RADAR SAR**	INMS ride along. RADAR SAR+Close Altimetry (TC1a, TN1a, TN1b, TN2b, TN2c)
+00:18	**+00:30**	**RADAR Altimetry**	(TN2b)
+00:30	**+00:52**	RCS to RWA Transition	
+00:52	**+01:30**	RADAR HiSAR	(TN1a)
+01:30	**+02:35**	RADAR scatterometry/radiometry	(TN1a, TN2c)
+02:35	+06:00	RADAR	L+Q1 (TN2c ,TN2c)
+06:00	+09:00	VIMS	Q1 (TN1a (Specular reflection of lakes-depending on geometry))
+09:00	+13:00	VIMS	O (TN1a (Specular reflection of lakes-depending on geometry))
+13:00	+22:53	CIRS	M2 (Tc1b (TN1c on outbound))



T126 – rev 270 – S99

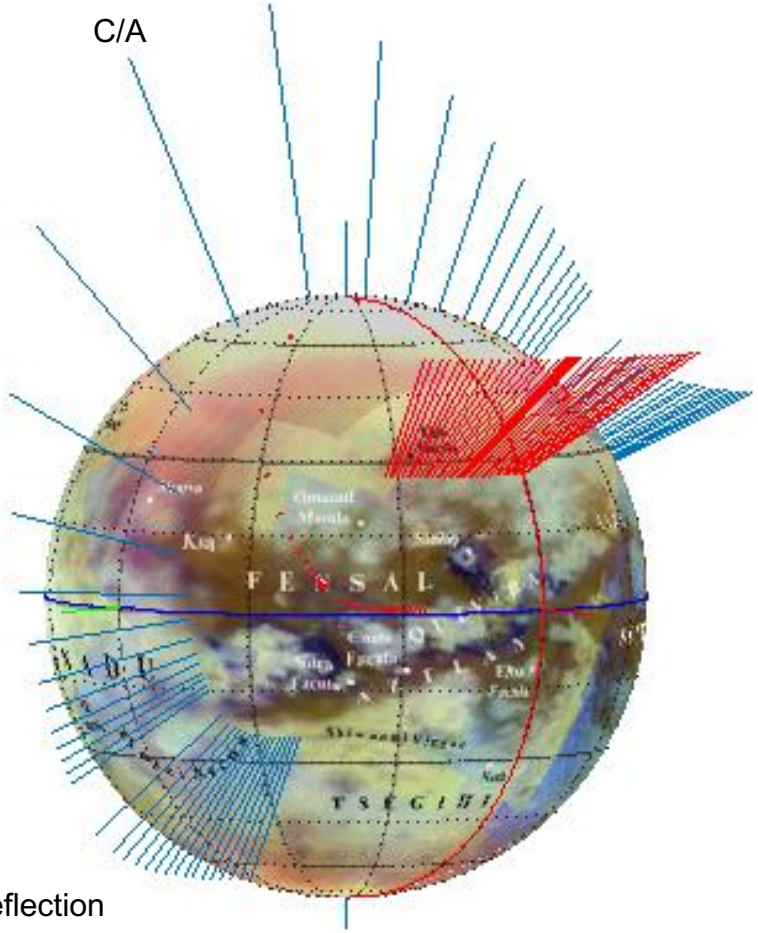
April 22, 2017 – 112T06:08:08 @ 979 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

Inbound:

Monitoring cloud activity (TC1a) and the evolution of the south polar vortex (TC1b).

Global mapping of Titan.



Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

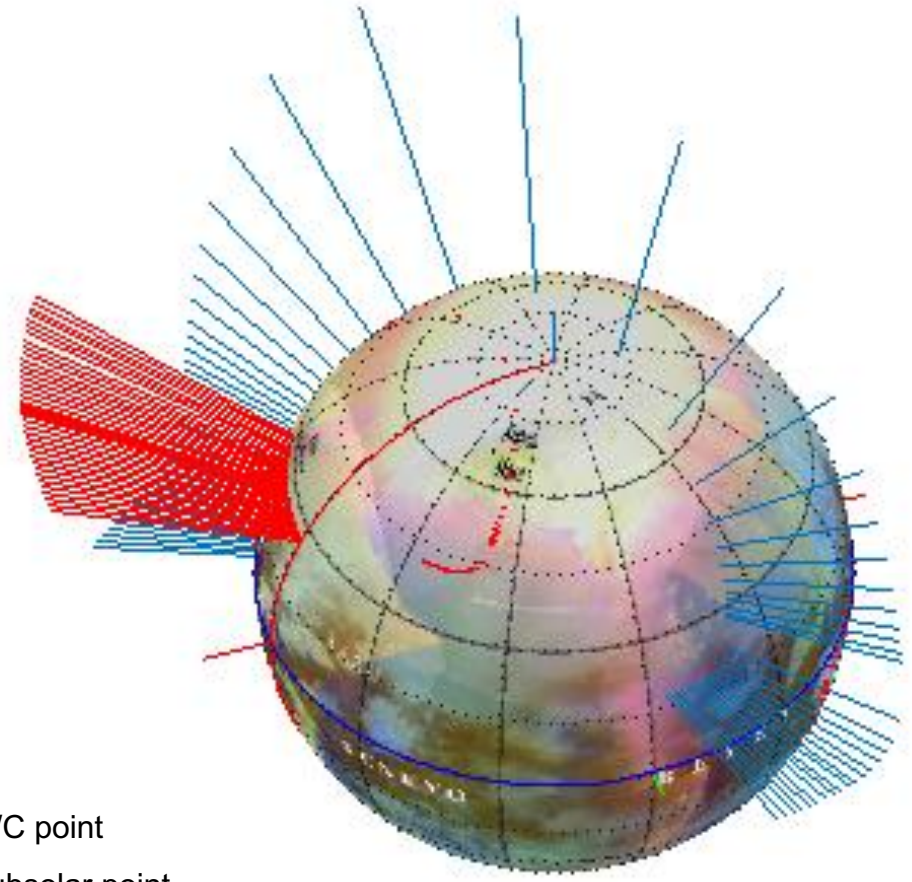
-22	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
	D/L unknown				CIRS			ISS		CIRS			ISS									RADAR						VIMS								CIRS									D/L unknown			

T126 – rev 270 – S99

April 22, 2017 – 112T06:08:08 @ 979 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

C/A



Outbound:

North Pole observations during the ride along with CIRS.

Specular reflection geometry occurs in the mid-northern latitudes (42 N, 315 W) at C/A + 06:00. No liquids are expected at these latitudes.

Blue line = S/C point

Red line = Subsolar point

Red dots = location of specular reflection

T126 – rev 270 – S99

April 22, 2017 – 112T06:08:08 @ 979 km altitude

Christophe Sotin, Ken Lawrence, Tucson VIMS team

No specular reflection geometry at high northern latitudes. Prior to C/A, specular geometry occurs at equatorial latitudes. After C/A, at mid-northern latitudes.

Specular reflection geometry occurs over Kraken Mare at C/A, but this is during the Radar observation.