

S65 Rev141 Enceladus (E12) Gravity

- S65 Rev 141 Enceladus E12 gravity
 - Enceladus gravity
 - TLM ON, coherent mode (2- and 3-way), short 1-way gap
 - Three segments, 3-hrs each: Inbound, Closest Approach (C/A), Outbound
 - Covered by all complexes
- About the Enceladus Gravity - From Nicole Rappaport

The Enceladus gravity experiment is conducted by Doppler tracking of the spacecraft for 26 hours, including Enceladus Closest Approach period. **The objective of the experiment is to detect a diapir under the south pole and determine the gravity field of Enceladus (J2 and C22)**
- What is a diapir?

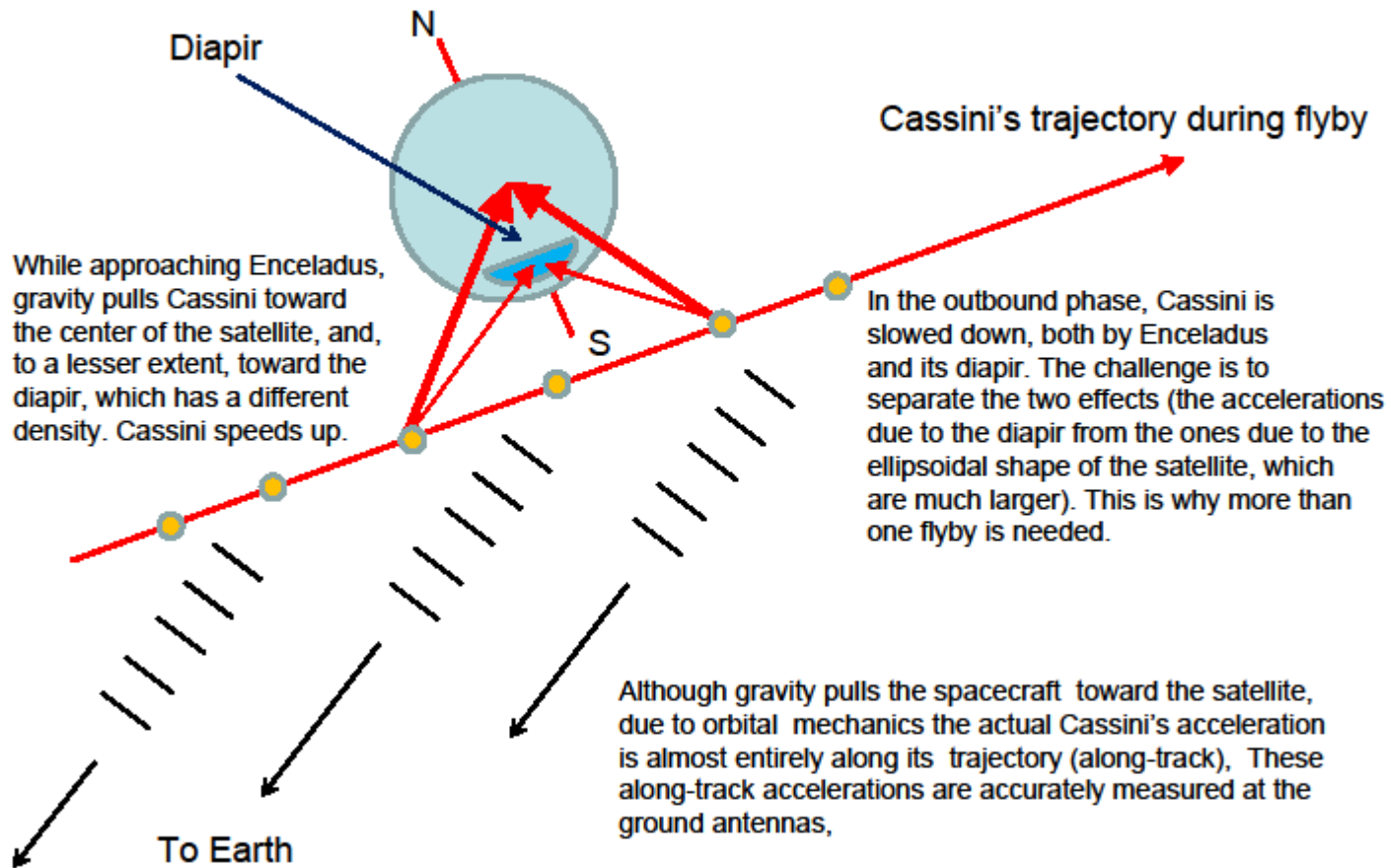
A diapir is, like a mascon, a gravity anomaly. We don't know how big and deep the diapir can be. If it's deep, then it will appear as a mass deficiency, but if it's shallow (like a spherical segment) it will be a mass concentration. In practice, it would be an underwater sea localized under the South Pole, although the presence of a global ocean cannot be completely rejected. The presence of this diapir would explain the hot spots and plumes.

The difficulty is in separating the global gravity field (J2, C22) from a local effect in the line of sight acceleration. I am not sure that the three flybys will be sufficient but the experiment **MUST** be attempted, without any promise to anyone. We should at least be able to give a combination of upper limits on the size of the diapir and the density contrast between the diapir and the surrounding ice.
- Detecting a diapir requires at least three flybys:

E9 (Apr 2010), E12 Nov 2010), E19 (May 2012)

From Luciano Iess

Measurement principle



DSN Antennas

- DSN Coverage

	Pre	BOT	EOT	Post								
10 333 0230	0400	1100	1115	DSS-55 CAS	TP RS141-KDWN	4806 N750	1A1	GSE				
10 333 0300	0400	1300	1315	DSS-63 CAS	TKG PASS	4806 N003	1A1	GSE (TLM)				
10 334 0010	0140	0405	0420	DSS-34 CAS	TP RS141-E12GRV	4807 N750	1A1	GRAV				
10 334 0155	0325	1305	1320	DSS-55 CAS	TP RS141-E12GRV	4807 N750	1A1	GRAV				
10 334 0945	1115	2125	2140	DSS-26 CAS	TP RS141-E12GRV	4807 N750	1A1	GRAV				
10 334 1600	1730	2145	2200	DSS-34 CAS	TP RS141-E12GRV	4808 N750	1A1	GRAV				

DSS-26 instead of DSS-25 at Goldstone since DSS-25 is unavailable

- Receivers scheduled
 - 2 closed-loop receivers per antenna
 - Closed-loop data are prime, open-loop are backup
- LCP data are enhancement. Prime are RCP

ORTs

ORT on DOY 324 (11/20 local) over DSS-26, DSS-55 and DSS-34, X- and Ka-band

10 324 1045 1215 2115 2130 DSS-26 CAS RS141-GRVORT SEQ 4797 N750 1A1

10 324 1145 1315 1415 1430 DSS-55 CAS RS141-GRVORT SEQ 4797 N750 1A1

10 324 1605 1735 2115 2130 DSS-34 CAS TP RS141-GRVORT 4798 N750 1A1

- DSS-26 was prime
- Spacecraft was on thrusters as part of safing recovery
- Collected pointing data (monopulse) to update the 4th-order blind pointing model
- DSS-26 subreflector was fixed at 45 degrees
- DSS-26 monopulse was enabled at 12:25:33 and it remained enabled during the 1-way portion of the pass. After switching 2-way, monopulse was enabled at 15:18:44 but it drove the antenna off, so monopulse was disabled, and the offsets were cleared at 15:31:50. (DR #: G110775)
- DSS-55 reported that, due to large fluctuations of the wind speed, the LQG coefficients were not loaded. Monopulse worked nominally
- DSS-34 monopulse nominal. No change in signal strength seen as monopulse was enabled.

ORT on DOY 329 (11/25 local) over DSS-26 and DSS-34, X- and Ka-band

10 329 1015 1145 2045 2100 DSS-26 CAS TP RS141-GRVORT 4802 N750 1A1

10 329 1545 1715 2045 2100 DSS-34 CAS TP RS141-GRVORT 4803 N750 1A1

- DSS-26 is prime
 - NOPEs requested that a monopulse on-point phase cal be conducted. Approved by sequence leads
- Spacecraft should be back in nominal mode and on reaction wheels
- Collect pointing data (monopulse) to update the 4th-order blind pointing model

Misc

Support schedule:

- GSEs will be partially supported and then scripted
- David Rochblatt real-time support not required since there will be no Monopulse offsets decisions during experiment. Need to have good pointing models in case monopulse is problematic

Unramped uplink predicts

- Not possible during prime observation (based on analysis by Sandy)

Monopulse

- Plan to enable throughout gravity segments
- Watch for monopulse enables at low Elevation angles. Wait till ~10 degrees

SNT

- Enable X only at all BWG stations throughout

Open-loop Receivers Status?

DSN Equipment Status (DSS-26, DSS-34, DSS-55)?

DSS-55 LQG file?

- Has it been tested during Cassini track?