CASSINI SOST SEGMENT

Rev 223 (E20) Handoff Package

Segment Boundary 2015-286T17:31:00 to 2015-289T07:31:00

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Science Highlights

Notes & Liens

CIRS Dione: CIRS will make slow nighttime scans of Dione's wispy terrain to search for anomalously warm regions, which are indicative of endogenic activity. Such activity has been tentatively predicted on Dione but never seen, observing these region at night prevents weak endogenic signatures from being washed out by higher daytime passive surface temperatures.

E20: ISS_223EN_ENCEL001_PIE is a collaborative design with CIRS, UVIS, and VIMS. The primary objective of this observation is to provide illuminated coverage of the north-polar region of Enceladus at close range (< 5,000 km). The ORS platform begins observing the illuminated anti-Saturn hemisphere of Enceladus from a range just over 107,000 km at a phase angle of 27 deg. At this point, the spacecraft is viewing Enceladus from above the equator and Enceladus is smaller than a NAC field of view. During this approach period, the ORS instruments will share observing time. ISS and VIMS will stare at Enceladus and obtain multi-color imaging of the surface as the spacecraft closes-in and moves from the equator over north polar latitudes with the aim to reexamine the equatorial region to search for geologic changes (due to E-ring bombardment and plume fall out) and to get observations of a northern region of Enceladus that currently lacks high-spatial resolution coverage. CIRS will make observations to help derive the north-polar heat flow (for comparison to the active south polar region). VIMS observations will allow them to look for volatiles. Cassini remains pointed at Enceladus until 2015-287T10:33, at which point it is moving too quickly relative to the surface of Enceladus to stably track it. At that time, the spacecraft is viewing Enceladus from 25-degree latitude at range of 4,819 km and the phase angle is 5.6 deg. The best NAC spatial resolution obtained is about 28 m/pixel. The spacecraft begins a series of long turns such that, after closest approach it can be pointed back at Enceladus by 2015-28711:31:30. Then, Cassini is viewing the sub-Saturn hemisphere of Enceladus from above the equator and in Saturn-shine at a phase angle of 148-degrees, with a range of 25,600 km. CIRS will then be able to obtain thermal scans of the non-illuminated hemisphere.

After its Enceladus encounter Cassini is crossing the orbit of the small moon Pallene. This moon is leaving a dust trail of surface material released by the surface bombardment of E ring grains and interplanetary dust. Previous CDA measurements already indicated that this dust trail leaves a detectable footprint in the E ring. The rev 223 observation is dedicated to have a detailed look on number densities and size distribution of the Pallene grains which give precious information on the impact ejecta process responsible for the trail as well as on surface properties of the moon.

The first Enceladus plume observation (ISS_223EN_PLUJTL001_PIE) is just 1:15 h long, but catches the 'bump' in the plume activity, which is still unexplained. The second plume observation, ISS_223EN_PLUJTL002_PIE, is 7 hours long at 155 degrees phase and good resolution. We'll be able to observe the plume fade out over the 7 hours, as Enceladus starts near the peak of its activity, which will slowly decrease over the observation. The particular shape of this drop in activity will be used to constrain the interior models of Enceladus, as well as the type of forcing it is undergoing.

With ISS_223OT_HATPOLA027_PRIME at the start and ISS_223OT_HATPOLB028_PRIME at the end of the segment, Hati, one of Saturn's 38 known outer or irregular moons, is observed for a total of ~12 hrs from a distance of ~12 million kilometers. Hati appears as a sub-pixel sized dot in the data, but the long observation time allows to derive a rotational lightcurve. These observations are part of a campaign to determine the pole orientation and approximate shape of this satellite, joining other observations in revs 182, 220, 224, and 228. Hati is the fastest known rotator of all moons in the solar system where a rotation period is reliably known. We already know that it has a relatively elongated shape (one equatorial dimension is at least 1.6x larger than the other), thus Hati's rotation might be close to disruption, with almost zero gravity near the tips.

UVIS_ZETAORI PIE: Occultations by UV-bright stars sense atomic and molecular hydrogen and some light hydrocarbons in Saturn's upper atmosphere. They are especially valuable because they provide detailed vertical profiles of these constituents and temperature in the region of the atmosphere (pressures around 1 nbar) where the heating mechanism is still unexplained, and where much of the conversion of methane to other hydrocarbons occurs. No other instrument senses this region. The near-equatorial samples are also important for mission operations because they give a measure of the density of the atmosphere where the orbiter will sample in the final five orbits. Previous UV occultations in this region showed expansion of the atmosphere until about 2011 and a small amount of shrinkage after that time. If the atmosphere is too dense when the orbiter enters it will tumble. If too rarefied the INMS instrument will not obtain a good in situ measure of the constituents.

Notes

- Pointing:
  - The initial Saturn waypoint has SRU FOV issues from 287T10:29-10:44: this is in a custom period, and the actual prime pointing will be Enceladus and they know to watch for SRU issues
  - ISS ENCEL PIE was lengthened from original PIE request
  - ISS Plume PIE is a combination of two PIE requests
- Data Volume: no issues
- DSN:
  - 1st Canberra pass is 8 hours long due to UVIS PIE that follows. Goldstone pass preceding it was added during PIE negotiations; timing of each was adjusted during integration, and the short Goldstone was downgraded (to DSS26 as DSS25 is in maintenance). Final Canberra pass was upgraded as this is a targeted flyby and the following XD segment could not accept a lot of carryover. There is no dual playback as the DSN station pattern does not accommodate it well.
- Resource checker: none
- Opmodes: N/A
- Hydrazine: N/A
- Special Activities: None
- Liens: SPLAT item opened on the ISS ENCEL PIE, target motion is >60 degrees, so they should include a quiescent period (and watch for SRU issues)