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Tethys' High-Amplitude Thermal Inertia Anomaly of Probable Magnetospheric Origin

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Tethys' leading hemisphere has a newly discovered thermal anomaly. Data from Cassini's Composite Infrared Spectrometer (CIRS) instrument taken in June 2007 and September 2011 confirms that a lens-shaped region, centered on Tethys' leading hemisphere at equatorial latitudes is anomalously warmer at night and cooler during the day than its surroundings.

The local time coverage now provided by the CIRS data set is sufficient to constrain the thermal surface property variation across this region. The thermal inertia inside of the anomalous region is observed to be three times higher than that outside of the anomaly, whereas the albedo remains consistent across the region. The mapped portion of the thermally anomalous region coincides in shape and location to a region of high-energy electron deposition from Saturn's magnetosphere, which also has unusually high near-UV reflectance and low near-IR reflectance (Schenk et al., 2011).

A similar thermal anomaly was previously detected on Mimas' leading hemisphere, in a region that also undergoes high-energy electron bombardment and has high near-UV reflectance (Howett et al., 2011; Schenk et al., 2011). Therefore, high-energy electrons, which penetrate both Mimas' and Tethys' surface to the centimeter depths probed by diurnal temperature variations, also likely alter the surface texture and dramatically increase its thermal inertia.

References

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