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Saturn ring temperature variations with approaching ring equinox

L. Spilker (1), C. Leyrat (2), A. Flandes (1), N. Altobelli (3), S. Pilorz (4), C. Ferrari (5), and S. Edgington (1)

(1) Jet Propulsion Laboratory California, M/S 230-205, Pasadena, United States (linda.j.spilker@jpl.nasa.gov, +1 818 393-4495), (2) Observatoire de Paris - LEISIA, Meudon, France, (3) European Space Agency/European Space Astronomy Center ESA/ESAC, Madrid, Spain , (4) CEA Saclay/University Paris 7, France, (5) SETI Institute, Mountain View, CA, USA

Cassini's Composite Infrared Spectrometer (CIRS) has acquired a wide-ranging set of thermal measurements of Saturn's main rings (A, B, C and Cassini Division) at solar elevations ranging from less than one degree to 24 degrees. At Saturn equinox in August the solar elevation angle will reach zero as the sun traverses from the south to north side of the rings.

For the data acquired to date, temperatures were retrieved for the lit and unlit rings over a variety of ring geometries that include solar elevation, as well as spacecraft elevation, phase angle and local hour angle. To first order, the largest temperature changes on the lit face of the rings are driven by variations in phase angle while differences in temperature with changing spacecraft elevation and local time are a secondary effect.

Decreasing ring temperature with decreasing solar elevation are observed for both the lit and unlit faces of the rings after phase angle and local time effects are taken into account. As the solar elevation continues to decrease, the ring temperatures are decreasing in a non-linear fashion. The difference in temperature between the lit and unlit sides of the rings is decreasing also with decreasing solar elevation.

Using ring thermal models developed by Leyrat we extrapolate to the expected minimum ring temperatures at equinox for our planned CIRS ring observations.

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