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Saturn B and C ring studies at multiple wavelengths

Linda Spilker (1), Estelle Deau (1), Ryuji Morishima (1), Gianrico Filacchione (2), Matt Hedman (3), Phil Nicholson (4), Josh Colwell (5), Todd Bradley (5), and Stu Pilorz (6)

(1) Jet Propulsion Laboratory/California Institute of Technology, Pasadena, CA, USA, (linda.spilker@jpl.nasa.gov), (2) INAF-IAPS, Rome, Italy, (3) Cornell University, Ithaca, NY, USA, (4) University of Idaho, Moscow, ID, USA, (5) University of Central Florida, Orlando, FL, (6) SETI Institute, Mountain View, CA, USA

We can learn a great deal about the characteristics of Saturn's ring particles and their regoliths by modeling the changes in their brightness, color and temperature with changing viewing geometry over a wide range of wavelengths, from ultraviolet through the thermal infrared. Data from Cassini's Composite Infrared Spectrometer (CIRS), Visual and Infrared Mapping Spectrometer (VIMS), Imaging Science Subsystem (ISS) and Ultraviolet Imaging Spectrograph (UVIS) are jointly studied using data from the lit and unlit main rings at multiple geometries and solar elevations. Using multi-wavelength data sets allow us to test different thermal models by combining the effects of particle albedo, regolith grain size and surface roughness with thermal emissivity and inertia, particle spin rate and spin axis orientation. With the high spatial resolution of the Cassini data it is now possible to analyze these effects at smaller spatial scales and characterize higher optical depth regions in faint rings such as the outer C ring, where albedo differences may be present.

The CIRS temperature and ISS color variations are confined primarily to phase angle over a range of solar elevations with only small differences from changing spacecraft elevation. Color and temperature dependence with varying solar elevation angle are also observed. Brightness dependence with changing solar elevation angle and phase angle is observed with UVIS.

VIMS observations show that the IR ice absorption band depths are a very weak function of phase angle, out to $\sim$140 deg phase, suggesting that interparticle light scattering is relatively unimportant except at very high phase angles. These results imply that the individual properties of the ring particles may play a larger role than the collective properties of the rings, in particular at visible wavelengths. The temperature and color variation with phase angle may be a result of scattering within the regolith and on possibly rough surfaces of the clumps, as well as a contribution from scattering between individual particles in a many-particle-thick layer. Preliminary results from our joint studies will be presented.

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