Geophysical Research Abstracts
Vol. 13, EGU2011-10064, 2011
EGU General Assembly 2011


# Saturn's rings spectrophotometric modeling by CASSINI-VIMS data

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Physical properties of particulate media can be inferred by means of the spectral analysis and the study of photometric behavior under different observation conditions. In order to obtain quantitative results it is necessary to apply a radiative transfer model to the data, which is able to constrain the composition and the physical characteristics of the sample. Different radiative transfer models have been developed (Hapke, 1993; Lumme and Bowell, 1981; Drossart, 1993; Shkuratov et al., 1999), which are currently used to invert remote sensing data of planetary surfaces. In this work we apply the Hapke model to Saturn rings spectra, by using the same method adopted to study Rhea's and Enceladus' surfaces (Ciarniello et al., submitted; Ciarniello et al., 2010). Our dataset is represented by radial mosaics of the rings, composed by hyperspectral images taken by Cassini-VIMS in the 0.35-5.12 $\mu$m spectral range. The mosaics span the 73500-141100 km radial range thus covering C, B, Cassini division and A rings, with a spatial radial resolution of 400 km. We have analyzed 8 radial mosaics with solar phase angle comprised in the 12°-136° range. This allows to give a preliminary description of the phase function, with the exception of the opposition effect surge, for several rings regions. Moreover this spectral analysis allows us to constrain the amounts of contaminants (which are assumed to be responsible for the strong reddening observed in UV region of the Saturn's rings spectra), the grain size distribution of the icy particles (which mainly affects the water ice band depths and IR continuum slope) and the mixing modality between ice and contaminants. Various grain size distributions have been investigated (monodisperse, power law and lognormal) involving the contribution of particles smaller than the wavelength that are modeled by using Mie theory. We have tested four different organic contaminants (amorphous carbon and three different types of tholins) and three possible mixtures: areal, intimate and intraparticle. The main results are discussed and compared to the previous ones obtained for Rhea and Enceladus in order to point out differences or similarities both in the scattering processes and in the composition.
This work is supported by an Italian Space Agency (ASI) grant.