Geophysical Research Abstracts, Vol. 9, 04840, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04840

Distribution of icy particles across Enceladus' surface as derived from Cassini-VIMS measurements

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Compositionally, the surface of Enceladus is built up almost completely by water ice [1]. As the band depths of water ice absorptions are sensitive to the size of particles, absorption depths can be used to map variations of icy particles across the surface [2]. The Visual and Infrared Mapping Spectrometer VIMS [3] observed Enceladus with high spatial resolution during two Cassini flybys in 2005 (orbit 4 and 11). Based on these data we measured the band depths of water ice absorptions at 1.04, 1.25, 1.5 and 2 μm. These band depths were compared with water ice models that represent theoretically calculated reflectance spectra for a range of particle diameters between 2 μm and 1 mm [4, 5]. The good agreement between the experimental (VIMS) and model values supports the assumption that pure water ice characterizes the surface of Enceladus and thus that variations in band depth correspond to variations in particle diameters within a given observation. Our measurements show that the particle diameter of water ice increases toward younger regions with the largest particles in relatively "fresh" surface material. The smallest particles were generally found in relatively old densely cratered terrains and the larger ones in younger, tectonically resurfaced areas [2]. The largest particles ($\sim$ 0.2mm) are concentrated in the so called "tiger stripes" of

the south polar area. In general, the particle diameters are strongly correlated with geologic features and surface ages suggesting a evolution that is caused by cryovolcanic resurfacing.

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