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Tethys – Geological and Spectral Properties

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Despite the spectral dominance of H_2O ice on Tethys' surface, distinct spectral variations derived by the Cassini VIMS instrument could be detected. The ice infrared absorption strengths are very different from what was expected from the visible albedo derived from Voyager and Cassini camera data. Although on Tethys, the major ice absorptions at 1.5 and 2μm are general stronger on the leading hemisphere of the satellite similar to that seen on the neighboring satellites Dione and Rhea, the detailed mapping shows a more complex pattern. Two relatively narrow N/S trending bands enriched in H_2O ice of relatively large particle size separate the Saturn-facing and the anti-Saturnian hemisphere. The largest impact crater Odysseus (33°N/129°W) is included in the N/S trending band of deeper H_2O absorptions on the leading hemisphere, whereas the geologically older and fourth largest impact crater Penelope (11°S/249°W) is excluded from the 'icy' band on the trailing hemisphere – supporting an exogenic origin of these bands. The oval shaped dark albedo unit observed by Voyager in the equatorial region of Tethys' leading hemisphere, which could be related to magnetospheric 'dust' impacting the surface, exhibits slightly surpressed H_2O ice absorptions compared to their surrounding regions. Variations in the spectral slope from the visible to the ultra-violet wavelength range are similar to the variations observed by Cassini ISS. The spectral slope is steepest (i.e. the effect of an ultra-violet absorber other than H_2O ice is strongest) on the leading as well on the trailing hemisphere. No spectral properties could be exclusively associated with Tethys' extended graben system Ithaca Chasma. Local variations, i.e. local deepening of H_2O ice absorptions, are mostly related to several probably fresh impact craters and to locations where topographic slope is high like crater walls. However, only a few such fresh impact craters could be observed.