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Titan's surface compositional units from the Cassini visual and infrared mapping spectrometer (VIMS)

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Titan, the largest satellite of Saturn, has a thick atmosphere containing methane that obscures the surface except for absorption windows at some IR wavelengths. In addition, scattering by a high altitude haze reduces surface visibility, especially at visible wavelengths, but scattering decreases into the IR, making the VIMS especially powerful for surface studies. Chemistry models of the atmosphere suggest deposits of organic liquids and solids (1). Groundbased telescopic observations of Titan's integral disk suggest the presence of water ice (2). The Cassini VIMS obtained spectra in the 0.35 to 5.1-μm range that include narrow windows in the methane spectrum near 1.6, 2.0, 2.8, and 5.0 μm where the surface is observed with approximate spatial resolution up to about 100 x 200 km during the Saturn orbit insertion phase on June 30 and 30 x 60 km during the T_a encounter on October 26 2004. Surface albedo features appear in these windows and some differ in spectral properties, especially a bold (bright) feature at Lat. -26, Long. 118, indicating compositional differences (3). We have analyzed Titan's spectra in an attempt to identity the surface materials. The spectra were calibrated to I/F as seen by VIMS and then were analyzed using radiative transfer models to remove the effects of the atmosphere (2) to estimate surface I/F values. This modeling is expected to become more accurate when we can incorporate the Huygens results. These are then compared with candidate material reflectances at each of the spectral windows. Preliminary results agree with previous groundbased data analyses (2), including the presence of water ice. There are differences in spectral

reflectance among the surface regions analyzed so far, suggesting other constituents than water ice, especially at Lat. -26, Long. 118, are present. We also find that the 2.8-μm window has atmosphere absorptions in addition to those previously considered (3), including a broad feature obscuring the long-wavelength portion beginning just longward of about 2.80 μm and a narrow feature in the short-wavelength half near 2.75 μm; These complicate the radiative transfer modeling needed to determine surface albedo in this (dirty) window, which is unfortunately important for distinguishing H_2O/O-H from N-H absorptions.