



Titan: Surface Compositional from the Cassini VIMS

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The surface composition of Titan is of great importance for understanding both the internal evolution of Titan and of the atmosphere. The Visual and Infrared Mapping Spectrometer (VIMS) investigation on Cassini is observing the surface from 0.35 to 5.11 μm with spatial resolution down to a few km during each flyby of the spacecraft as it orbits Saturn. The surface can be observed through the dense, hazy and absorbing atmosphere only in narrow “windows” between strong methane bands. Our search for spectral diversity using the six methane windows in the near infrared suggests that spectrally distinct units exist on the surface of Titan and that most of the surface can be modeled using only a few spectral units, three in this analysis. There are small regions with unusual spectra that may be due to low signal and high noise and/or may be exotic materials of interest. Further, one spectral unit appears associated mostly with the atmosphere and may provide a method for removing some of the atmospheric effects (mostly scattering) using spectral mixing analysis. We also searched within the methane windows for spectral features associated with Titan and its surface. Only the 5- μm , and, to a lesser extent, the 2- μm window provide a reasonable opportunity for this. We find evidence so far for only one spectral feature near 4.92 μm for the 5- μm -bright Tui Regio region and show that the absorption feature seems to be related to the material that also is responsible for the unusual spectral contrast in the 2.8- μm window and the high brightness in the 5- μm window (1). We are in the process of searching other 5- μm -bright regions for this same feature and we are attempting to identify the material responsible. Other spectral features have been reported within the

5- μm window associated with surface materials, but we so far are unable to confirm these in our analysis. These results are consistent with the early analysis that treated only the Ta data set (1). In our spectral feature search process, we explored in detail the noise characteristics of the VIMS data within the 5- μm window, which has generally very low signal (4-20 DN), due to the measurement conditions and low illumination levels. We find noise of nearly Gaussian statistics except for some erratic darks and noise spikes, and the general data set seems well behaved. We also made an attempt to improve on the standard VIMS data calibration.

1. McCord, T. B. et al., and the Cassini VIMS Team, 2006. Composition of Titan's Surface from Cassini VIMS. *Planetary and Space Science* 54, 1524-1539.

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