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Characterization of the Titan's VIMS – units: Using Spectral Slopes

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Since the equatorial regions of Titan have been fully observed by the Visible and Infrared Mapping Spectrometer (VIMS) [1], the analysis of false-color composites enables distinguishing four main spectral units: the equatorial bright, brown, blue, and 5 μm-bright spectral units [2-4]. More precisely, the equatorial bright plateaus and inselbergs correspond to water-ice substrate coated by a layer of organic sediments. Moreover, the blue materials are more likely enriched in water-ice, which consist of icy particles exposition derived from the high standing plateaus and deposited into the lowlands after fluvial/pluvial processes [5] and/or impact cratering [6]. These blue materials are mainly located at the frontier of the large bright plateaus, and hence considered as transition zones to the brown areas corresponding to the radar dunes [7]. Whereas these brown dunes consist on atmospheric aerosols (i.e. tholins) [4] contaminated with particles of water-ice. Here we try to better characterize these spectral units, through VIMS observations at high resolution from TA (Oct. 2004) to T114 (Nov. 2015). Regions of interest show local transition zones between the equatorial bright areas, the blue materials, and the brown dunes, suggesting weathering and erosional processes (e.g. the Huygens landing site; areas at the east of Xanadu province; and Bohai Sinus at the south of Quivira plateau) [5,8], and impact cratering (e.g. Sinlap, Selk, Menrva, and Paxsi craters) [6,9]. Areas exposing large (i.e. Tui and Hotei Regiones) and small (e.g. Yalaing Terra, NW Belet, and NW Fensal) 5 μm-bright units – presumed evaporitic deposits – are also included in this study [9-11]. Subtle differences in the spectral behavior of these four units can be enhanced by using ratios of VIMS channels. At short wavelengths (i.e. below 2 μm), brown and blue materials seem to correspond to a granular mixture of organic sediments – similar to the atmospheric aerosols – and water-ice particles [7]. As for the 5 μm-bright units, they show paucity in water-ice at the longer wavelengths, implying that these features cannot be related to cryovolcanic processes, as it has been originally suggested for Hotei and Tui Regiones, arguing for an evaporitic origin [9-11].

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