Title: Titan's mid-latitude surface regions with Cassini VIMS and RADAR

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Abstract

The Cassini-Huygens mission instruments have revealed Titan to have a complex and dynamic atmosphere and surface. Data from the remote sensing instruments have shown the presence of diverse surface terrains in terms of morphology and composition, suggesting both exogenic and endogenic processes [1]. We define both the surface and atmospheric contributions in the VIMS spectro-imaging data by use of a radiative transfer code in the near-IR range [2]. To complement this dataset, the Cassini RADAR instrument provides additional information on the surface morphology, from which valuable geological interpretations can be obtained [3]. We examine the origin of key Titan terrains, covering the mid-latitude zones extending from 50ºN to 50ºS. The different geological terrains we investigate include: mountains, plains, labyrinths, craters, dune fields, and possible cryovolcanic and/or evaporite features. We have found that the labyrinth terrains and the undifferentiated plains seem to consist of a very similar if not the same material, while the different types of plains show compositional variations [3]. The processes most likely linked to their formation are aeolian, fluvial, sedimentary, lacustrine, in addition to the deposition of atmospheric products though the process of photolysis and sedimentation of organics. We show that temporal variations of surface albedo exist for two of the candidate cryovolcanic regions. The surface albedo variations together with the presence of volcanic-like morphological features suggest that the active regions are possibly related to the deep interior, possibly via cryovolcanism processes (with important implications for the satellite’s astrobiological potential) as also indicated by new interior structure models of Titan and corresponding calculations of the spatial pattern of maximum tidal stresses [4]. However, an explanation attributed to exogenic processes is also possible [5]. We will report on results from our most recent research on the surface properties of Titan.[1] Solomonidou et al. Icarus, accepted. [2] Solomonidou et al. JGR 119, 1729–1747, 2014. [3] Lopes et al. Icarus, in rev. [4] Sohl et al. JGR 119, 1013-1036, 2014. [5] Moore & Pappalardo, Icarus 212, 790-806, 2011.

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