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Geology of Titan from Cassini/VIMS images at T20 and T24

L. Le Corre (1), S. Le Mouélic (1), C. Sotin (1), R.H. Brown (2), J. Barnes (3), B. Buratti (4), L.A. Soderblom (5), R. Jaumann (6), K.H. Baines (4), R. Clark (7), and the VIMS Science team

(1) Laboratoire de Planétologie et Géodynamique, Université de Nantes, France, (2) Lunar and Planetary Lab and Stewart Observatory, University of Arizona, Tucson, USA, (3) NASA Ames Research Center, Moffett Field, USA, (4) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, USA, (5) USGS, Flagstaff, USA, (6) DLR, Institute of Planetary Research, Berlin, Germany, (7) USGS, Denver, USA.

(lucille.le-corre@univ-nantes.fr)

The Visual and Infrared Mapping Spectrometer (VIMS) allows us to construct maps of Titan revealing the morphology of surface features and their spectral characteristics within 7 infrared windows. It acquires 64*64 pixels images in 352 spectral channels from 0.3 to 5 μm. The best spatial resolution was obtained during the T20 flyby (25 October 2006), reaching up to 500m/pixel during the closest approach phase. This resolution is similar to the one we have for the images acquired in SAR mode by the RADAR instrument.

Several units have been recognized in T20 and T24 flybys using false color composite images of band ratios, namely, dark terrains with longitudinal dunes, bright regions cut by dark channels, very bright terrains at 5 microns, and “blue” terrains likely to be enriched in water ice content.

We look in particular at the correlation between VIMS images and radar SAR passes. The former is mainly sensitive to the first tens of micrometers of Titan’s surface. The latter provides complementary information about topography and roughness of surface and subsurface, with a penetration depth of several centimeters. A possible cryovolcanic flow-like feature located near Menrva crater can be identified in T3 radar swath:

bright materials seem to flow out from a circular feature with bright rims. Moreover, it is striking to see that in infrared sharp boundaries of a bright flow are found at the same location than the rough material (bright in radar). This kind of correlation between VIMS and radar images can be also noted for T24 images on a large bright area, but it is not systematic. Thereby, both correlations and lack of correlations between bright and dark areas can be found in the T20 data set. One of the best example found so far is the match between the dunes observed by both data sets. Bright regions in infrared appear to be covered by sinuous dark channels related to methane rainfalls and may be filled with organic material, reminding those observed by DISR. Finally, we will also present the T34 flyby which will be achieved by the end of July 2007, unveiling new terrains from Senkio, Belet, to Adiri, ending at Huygens landing site.