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CASSINI/VIMS observations of cryo-volcanic features on Titan: implications for the methane cycle

C. Sotin (1), L. Le Corre(2), S. Le Mouélic(2), J.W. Barnes (3), R.H. Brown (4), R. Jaumann (5), J. Soderblom (4), K. Baines (1), B. Buratti (1), R. Clark (6)

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

After more than 3 years in the Saturnian system, the Cassini spacecraft has performed more than 40 Titan flybys. The Visual and Infrared Mapping Spectrometer (VIMS) can observe Titanąęs surface in 7 infrared windows, which allows us to map surface features at different wavelengths in the near infrared. Although most of the observations are taken at spatial resolution coarser than 5 km/pixel, some dedicated flybys have allowed us to image specific targets at resolution down to a few hundred meters, similar to radar resolution. Both modes reveal surface features that can be interpreted as cryo-volcanic features. These features include dome-shaped areas (Sotin et al., 2005), flow channels and 5 ČÝm bright large areas such as Tui region and Hotei region (Barnes et al., 2005, 2007). Using the model developed by Tobie et al. (2006), we calculate the amount of methane that could be released in such areas. We show that large areas could release an amount of methane that is comparable with the one present in the atmosphere. On the other hand, the small dome-shaped structures, that could be the surface expression of upwelling plumes, would provide a very small amount. Such structures are not very common but it must be noted that VIMS only mapped 2 percent of Titanąęs surface with a kilometric resolution. The volcanic sources of methane are included into a global model describing sources and sinks of methane within Titan, including transformation in the atmosphere into ethane and heavier hydrocarbons and production in the deep interior by serpentinization.