AOGS 2006

One Year of Cassini/VIMS Observations of Titan: Geological Implications

SEBASTIEN RODRIGUEZ[1], CHRISTOPHE SOTIN[1], STEPHANE LE MOUELIC[1], GABRIEL TOBIE[1], OLIVIER GRASSET[1], BONNIE J. BURATTI[2], ROBERT H. BROWN[3], RALF JAUMANN[4], ROGER N. CLARK, KEVIN H. BAINES[2], TOM B. MCCORD[6], ROBERT M. NELSON[2]

[1] *Nantes University, France*

[2] *NASA/Jet Propulsion Laboratory, USA*

[3] *University of Arizona, USA*

[4] *DLR/Institute of Planetary Exploration, Germany*

[5] *U. S. Geological Survey, USA*

[6] *University of Washington, USA*

The origin of methane in Titan's atmosphere is one of the main questions that observations by the Cassini-Huygens mission will try to answer. Mapping the surface reveals the features that will enable us to draw the geological history of Saturn's largest moon. Among the instruments onboard Cassini able to map the surface, the Visual and Infrared Mapping Spectrometer (VIMS) [1] has already observed Titan during 10 flybys since its orbit insertion around Saturn on July 1st 2004. Despite scattering by haze particles and strong absorption of light by methane contained in the atmosphere, there are several infrared windows that allow observations of its surface. Although the ISS camera onboard Cassini has an excellent spatial resolution [2], the haze particles in Titan's atmosphere limits the resolving power of surface features to several kilometers. On the other hand, the VIMS has a much lower nominal spatial resolution (1 km at 2, 000 km from Titan) but is less affected by scattering in the infrared windows. The best compromise between signal to noise and scattering is obtained at 2.03 μm. During the first close Titan flyby on October 26th 2004, VIMS was able to take images a few tens of minutes before closest approach with a high spatial resolution ($\sim$2 km/pixel) and observed a feature that is interpreted as a cryovolcanic dome [3]. If confirmed, this feature would agree with the hypothesis that methane is released in the atmosphere by the destabilization of methane-clathrates contained in the crust and brought close to the surface by subsolidus convection in the outer ice crust [4]. Several other images have been obtained between 2 and 1 hour before closest approach (spatial resolution between 20 and 10 km per pixel). Among those observations is the Huygens landing site [5] that helps us understand Titan's composition by comparing the information of the VIMS with that obtained in situ by the Huygens probe. Among all the observations, one can note very few impact craters, which implies a very young surface. Geological implications of these observations and comparison between VIMS and radar images are currently under investigation. More VIMS images will be acquired during 2006 and will allow us to test the different hypothesis concerning Titan's evolution and the fate of methane in its atmosphere. References: [1] Brown R. H. et al (2003), Icarus, 164, 461. [2] Porco C. C. et al. (2005), Nature 434, 159-168. [3] Sotin C. et al. (2005), Nature, 435, 786-789. [4] Tobie G. et al. (2006), Nature, in press. [5] Rodriguez S. et al., P&SS, accepted.