Geophysical Research Abstracts
Vol. 17, EGU2015-14067-1, 2015
EGU General Assembly 2015

Comparison of Cassini/VIMS and Huygens/DISR observations: Implications for Titan's geology and atmospheric haze

Christophe Sotin (1), Eric Karkoschka (2), Ken Lawrence (1), Stephane LeMouelic (3), Sebastien Rodriguez (4), Anezina Solomonidou (1), Jason Barnes (5), Robert Brown (5), Bonnie Buratti (1), Randy Kirk (6), Jason Soderblom (7), Larry Soderblom (6), Kevin Baines (1), Roger Clark (8), and Phil Nicholson (9)

(1) Jet Propulsion Laboratory / California Institute of Technology, Pasadena, CA, USA (christophe.sotin@jpl.nasa.gov), (2) Department of Planetary Sciences, University of Arizona, Tucson, AZ, USA, (3) Laboratoire de Planetologie et Geodynamique, Universite de Nantes, Nantes, France, (4) Laboratoire AIM, Université Paris 7, Paris, France, (5) University of Idaho, Moscow, ID, USA, (6) United States Geological Survey, 2255 N., Flagstaff, AZ, USA, (7) Massachusetts Institute of Technology, Cambridge, MA, USA, (8) Planetary Science Institute, Tucson, AZ, USA, (9) Department of Astronomy, Cornell University, Ithaca, NY, USA

The Huygens probe made in situ observations of Titan's atmosphere and surface in an area of Titan now known as a high equatorial plateau named Adiri surrounded by dune fields. These observations, made in January 2005, provide ground truth for remote sensing observations. This study focuses on the comparison between observations made by the Visual and Infrared Mapping Spectrometer (VIMS) on Cassini spacecraft and the Descent Imager / Spectral Radiometer (DISR) on the Huygens probe. Two of the DISR instrument suite are relevant to the comparison with VIMS: the high resolution imager (HRI) and the Downward-Looking Infrared Spectrometer (DLIS) whose spectral range overlaps with the VIMS instrument between 0.9- and 1.6-μm. The comparison provides key information that can be applied to the VIMS data set which globally covers Titan's surface.
The VIMS instrument can observe Titan's surface in 7 spectral atmospheric windows centred at 0.93, 1.08, 1.27, 1.59, 2.01, 2.7-2.8 and 5 microns [1]. Determining the spectral properties of the surface, and therefore the composition, requires the removal of the atmospheric contribution which includes absorption and scattering by atmospheric molecules and haze particles. Radiative transfer models have been using the DISR derived opacities to retrieve the surface albedo of Titan's surface. Light curves derived from VIMS solar occultation observations show that the atmospheric opacities above 80 km are in very good agreement with the DISR observations. However, the extrapolation of the DISR-derived opacities below 80 km at wavelengths above 1.6-μm predicts opacities much larger than those derived from the VIMS solar occultation observations. At 5-μm, the DISR extrapolation predicts a value of the optical depth three times larger than the value derived from the VIMS observations. The radiative transfer model used to retrieve the surface albedo [2] must be corrected accordingly. The VIMS instrument acquired one high resolution image of the Huygens Landing Site. On this image, the VIMS footprint is identical to the DLIS footprint when the Huygens probe was at 18 km altitude. The DLIS and VIMS images match very well, which allows a precise determination of the location of the two DLIS spectra taken at 18 km altitude. The comparison of the VIMS and DLIS surface albedo shows a good agreement at 1.27- and 1.59-μm. On the other hand, the DLIS surface albedo values at 0.92- and 1.08-μm are much larger than the VIMS values. We are currently investigating the reasons of this difference.

This work has been performed at the Jet Propulsion Laboratory, California Institute of Technology, under contract to NASA.

[1] Sotin C. et al. (2005) Nature, 435, 786–789. {2] Hirtzig M. et al. (2013) Icarus, 226, 470-486.