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Observation at 2 µm of Titan's the limb.

P. Rannou (1), B. Seignovert (1), M. Rey (1) , L. Maltagliati, (2) and S. Lemouelic (3)
(1) GSMA, Université de Reims Champagne-Ardenne, FRANCE, (2) Nature Publishing Group, London, UK (3)LPGN, Université de Nantes, FRANCE - (contact : pascal.rannou@univ-reims.fr)

Abstract

The study of Titan properties with remote sensing relies on a good knowledge of the atmosphere properties. The in-situ observations made by Huygens combined with recent advances in the definition of methane properties enable to model and interpret observations with a very good accuracy. However, the amount of opacity in the 2 µm window remains ambiguous and the cut-off setup to use in order to fit peculiar window is significantly different from what is needed in other windows. Our scope in this work is to study the methane lines cut-off and to get information about Titan's surface spectrum.

1. Results

To study the haze layer and more generally the source of opacities in the stratosphere, we use some observation made at the limb of Titan by the VIMS instrument onboard Cassini. We used a model in spherical geometry and in single scattering, and we accounted for the multiple scattering with a parallel plane model that evaluate the multiple scattering source function at the plane of the limb.

Our scope is to retrieve informations about the vertical distribution of the haze, its spectral properties, but also to obtain details about the shape of the methane windows to disantangle the role of the methane and of the aerosols. We study the latitude of 45°N, with an image taken in 2006 with a relatively high spatial resolution (for VIMS) **(Figure 1 - left)**.

We find that the vertical profile of the haze layershows three distinct scale heights with transitions around 250 km and 350 km.

We also find that the shape of the 2 µm depends on the continuum absorption of the methane window (controlled by the setup of line profile cut-off) and on another absorption centered around 2.05 µm which clearly shows up in data. Our tests show that it is possible to use the same cut-off parameters at 2 µm than elsewhere provided we include an absorption feature around 2.05 µm. The different way to treat this absorption produces similar fit of the atmosphere intensity **(Figure 1 - right)**, but, on the other and, the retrieved surface reflectivity can differ a lot **(Figure 2)**.

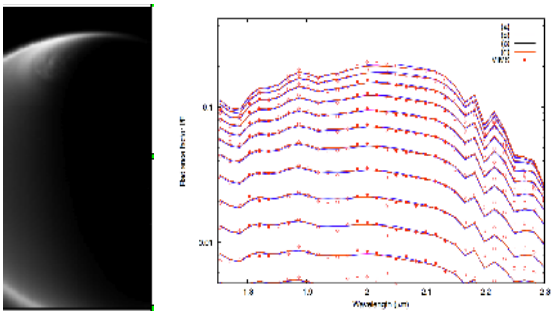

Figure 1: *(**Left**) Image of Titan northern polar region with a extended polar cloud. We a vertical profile composed with the-pixels inside the white rectangle.(**Right**) Spectral variation of I/F in in the 2- µm windows at several altitudes between 100 and 400 km. Lines from (a) to (d) are correspond to models.*

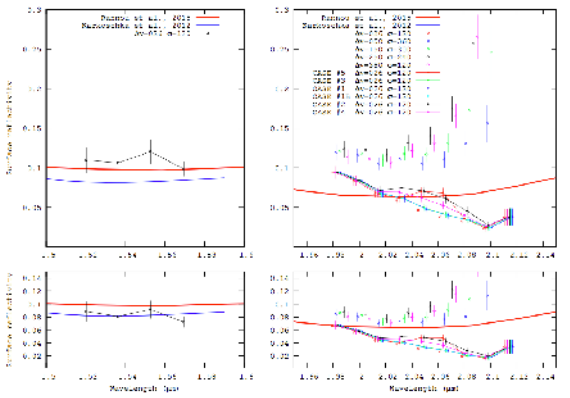

Figure 2: *Surface reflectivities retrieved with our model at 1.6 µm and 2 µm, with different setup of the model. Different setup of the cut-off of the line profiles and different absorption at 2.03 µm are assumed.*