

Titan's aerosol optical properties with VIMS observations at the limb of Titan.

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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. Thanks to these progresses, we can analyze in this work the observations made at the limb of Titan in order to retrieve information on the haze properties as its vertical profiles but also the spectral behaviour between 0.88 and 5.2 μm .

1. Introduction

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 disentangle the role of the methane and of the aerosols.

2. Results

We started our study at the latitude of 55°N, with an image taken in 2006 with a relatively high spatial resolution (for VIMS) (**Figure 1 - left**). Our preliminary results show the spectral properties of the aerosols are the same whatever the altitude (**Figure 2**). This is a consequence of the large scale mixing. From limb profile between 0.9 and 5.2 μm , we can probe the haze layer from about 500 km (at 0.9 μm) to the ground (at 5.2 μm) (**Figure 1 - right**).

We find that the vertical profile of the haze layer shows three distinct scale heights with transitions around 250 km and 350 km. We also clearly see a transition around 70-90 km that may be due to the top of a condensation layer.

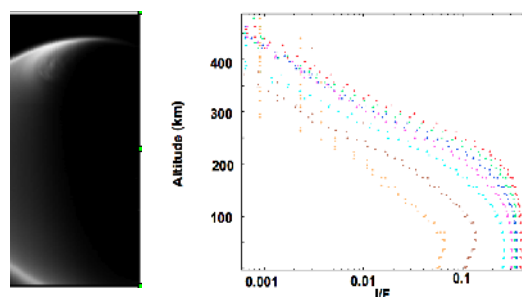


Figure 1: (Left) Image of Titan northern polar region with an extended polar cloud. The intensity coming out from the atmosphere can be used to study the atmosphere properties in the stratosphere. (Right) Vertical profiles of I/F in the 7 windows between 0.9 μm and 5.2 μm .

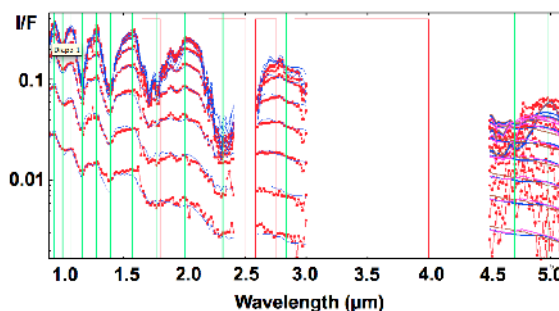


Figure 2: I/F spectra taken on the image at 7 altitudes (red spots) and a model fit (blue lines). The red boxes show the wavelengths excluded from the fit (VIMS default, and C_2H_6 absorption feature). The green lines show the wavelengths where the limb profiles are studied. **Figure 1** only displays the profiles inside the windows.