



## Ground-based observations of Titan in the near-infrared

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We have observed Titan from 1991 to 2005, between 0.8 and 2.5  $\mu\text{m}$ , with the Fourier Transform Spectrometer (FTS) at the Canada France Hawaii Telescope (CFHT). We also present a selected sample of the spectra we acquired with the NACO adaptive optics system, at the ESO Very Large Telescope (VLT) on January 16, 2005, in the K band between 2.03 and 2.40  $\mu\text{m}$  (Negrão *et al.*, 2007). Our spectra, include the *Huygens* landing site and surrounding dark and bright areas.

We used these observations, together with an updated version of the microphysics and radiative transfer model of Rannou *et al.* (2003), to perform studies on Titan's atmosphere and surface.

The CFHT observations allow to explore the surface using five methane windows at 0.94, 1.08, 1.28, 1.58 and 2  $\mu\text{m}$ . Surface albedos at the methane windows were obtained, allowing to study the longitudinal variation of the surface reflectivity. We also bring some constraints on Titan's surface composition by comparing the surface albedo with the spectra of some ices and Titan's aerosol laboratory analogs. A mixture of water ice and "tholins" seems to be compatible with the calculated CFHT disk averaged surface albedo. Furthermore, the analysis of the VLT/NACO data seems to indicate a strong decrease of Titan's surface albedo between 2.03 and 2.12  $\mu\text{m}$  in the *Huygens* landing site area. This is compatible with the presence of ices such as  $\text{CH}_4$  and  $\text{H}_2\text{O}$  at the surface.

A comparative study of the methane absorption coefficients currently available from different sources was also performed demonstrating the great sensitivity of surface inferences to this model parameter (Negrão *et al.*, 2006). Based on our results, we recommend the methane absorption coefficients produced by Boudon *et al.* (2006) and Irwin *et al.* (2006) for future studies of Titan.

These results are useful for completeness and interpretation of the recent *Cassini-Huygens* mission's recordings.

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Boudon, V. *et al.*, 2006. The Vibrational Levels of Methane Obtained from Analyses of High-Resolution Spectra. *J. Quant Spectrosc.*, 98, 394-404.

Irwin, P. G. J. *et al.*, 2006. Improved near-infrared methane band models and k-distribution parameters from 2000 to 9500  $\text{cm}^{-1}$  and implications for interpretation of outer planet spectra. *Icarus*, 181, 309-319.