Titan's Surface Composition at the Huygens Landing Site from DISR Spectra

B. Schmitt (1), **S. Douté** (1), E. Quirico (1), E. Lellouch (2), S.E. Schröder (3), J.-M. Bernard (1), B. Bézard (2), M.G. Tomasko (4) and the DISR Team.

(1) Laboratoire de Planétologie de Grenoble, CNRS-UJF, Grenoble, France, (2) LESIA, Observatoire de Paris, Meudon, France, (3) Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau, Germany, (4) Lunar and Planetary Laboratory, Tucson AZ, USA (Bernard.Schmitt@obs.ujf-grenoble.fr).

The composition of the surface of Titan is largely unknown, although water ice mixed with some dark component has been suspected from ground based observations of the surface reflectance in the atmospheric methane windows. Atmospheric organic aerosols and/or condensates are likely to sediment on the surface, but no spectral identification of either of these materials has been possible before the Huygens mission to Titan.

The Descent Imager/Spectral Radiometer (DISR) aboard the Huygens probe recorded complete visible and near infrared spectra (480-1600 nm) of the surface of Titan near the landing site during the last tens of meters of the descent and from a few tens of centimetres after landing. The surface spectra have a relatively low albedo, peaking around 0.18 near 830 nm, a red slope in the visible range, a quasi-linear decrease of the reflectivity in the near-infrared with a broad absorption near 1540 nm. The featureless "blue slope" of the near-infrared spectra is very unusual and has no known equivalent on any other object in the Solar System. In addition no published laboratory data of ices or organic materials display such a spectral behaviour.

Laboratory studies and numerical simulations of the DISR spectra have been performed to understand the nature and composition of the materials constituting the surface of Titan. In particular, near-infrared transmission spectra of liquid and solid hydrocarbon condensates as well as reflectance spectra over the solar spectrum (0.3-4 μm) of several types of aerosols analogues ("tholins") and organic materials have been recorded with the LPG facilities. Using these laboratory optical constants and reflectance spectra as inputs of a radiative transfer code, numerical simulations of Titan's surface reflectance spectra are performed in order to identify the different components present at the surface (ices, liquids and solid organics, tholins, ...) and to infer their abundances. The inferred surface composition will be compared to that of the stratosphere, where condensates and aerosols form.