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VIMS cartography of Titan: cleaning out the atmosphere and constraining the surface spectrum

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The atmosphere of Titan has been puzzling the scientists for centuries. The presence of methane will perhaps find an answer thanks to the Cassini-Huygens mission. Mapping the surface is compulsory to understand the geological phenomenon ruling the topography of Saturn's satellite. VIMS (Visual and Infrared Mapping Spectrometer [Brown et al. (2003)]) is one of the tools we can use to recover both images of the surface features and hints about its chemical composition. One problem we face is the absorption and diffusion of the solar light by the atmospheric methane and aerosols. The presence of "windows" of low methane absorption allow us to probe down to the surface, with little contribution by the atmosphere. Yet the scattering by the aerosols and the remnant absorption by the methane can be corrected : we use here a radiative transfer model code by Rannou et al. (2005), updated version of the McKay et al. (1989) taking into account the microphysical evolution of the fractal aerosols. This model compares fairly well with the atmospheric transmission data VIMS could acquire on the first flyby of Titan by Cassini.

After correction, we can deduce both the qualitative surface spectrum by inversion of the geometrical albedo, and also the atmosphere-free appearance of Titan's surface. We present here band ratios as in [Rodriguez et al., 2006] and some hints about the chemical composition of several geomorphological areas we can distinguish on our maps.