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Saturn s cloud/aerosols vertical structure at global and local scales from Cassini/VIMS data

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A simple Radiative Transfer model has been developed for the Saturn's atmosphere and applied to the VIMS images data. VIMS (Visible Infrared Mapping Spectrometer) is one of the instruments on board the Cassini spacecraft, orbiting the ringed planet since July 2004, still sending data to the Earth. VIMS is an image spectrometer able to show simultaneously the scene and spectral information of the target under observation, covering the visible and near infrared part of the electromagnetic spectrum. In order to test the model, we simulated the infrared radiance spectra inside a hot spot that, for its particular dynamical structure, is characterized by low optical depths.
This cloudless condition is in contrast with the surrounding atmosphere, where the contribution of aerosols affects the signal. The results show the existance of different cloud layers in the surrounding atmosphere in order to fit the data. The near-infrared part (1.0-3.5 microns) of the VIMS spectra is very sensitive to the aerosols vertical distribution in the upper troposphere and lower stratosphere. Inversion techniques have been optimized and applied to these data, showing a three-layers stratification of scatterers: a lower-stratospheric layer located just above the tropopause (pressure levels of 60-100 mbar), a stable upper-tropospheric layer at pressure levels between 400-600 mbar, and a thicker cloud layer whose top lays just below the 1 bar level. Regional and spectral variation of these distribution are investigated.