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Anomalous emission at 3.28 μm in the Titan upper atmosphere

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Earliest Cassini VIMS limb observations of Titan taken in October 26th, 2004 show a strong methane non-LTE limb emission at high atmospheric altitudes. During that pass at Titan, VIMS vertical resolution was about 110 km and the analyzed spectral interval corresponds to the methane emission band centered around 3.33 micron. A detailed analysis of the radiances versus altitudes shows an anomalous emission above 900 km at wavelengths close to the methane R branch (3.28 micron). The nature of such emission is under investigation. Different spectral databases and codes have been used for calculating the expected CH_4 non-LTE limb emissions. The "anomalous" emission could not be reproduced using all the known CH_4 bands. Its spectral position hints at a molecule containing C-H or C-N bonds. A lot of molecules and ions observed in Titan's atmosphere have been tested unsuccessfully. Benzene (C_6H_6), the phenyl radical (C_6H_5) or other aromatic species, given their spectral features and modeled abundances in the upper atmosphere, could be candidates for such emission. We choose the observation on Oct. 26th, 2004 for its very good signal to noise ratio and because of the favorable illumination (low phase angle) of the atmosphere as seen from the Cassini spacecraft. Other observations also show the same feature.