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Titan's tropospheric methane and lower atmospheric haze distribution from HST/STIS observations

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Titan's lower atmospheric haze profile indirectly provides evidence for atmospheric circulation and condensation processes (*i.e.*, methane rain and clouds). Results from observations of Titan acquired with the Space Telescope Imaging Spectrograph instrument on board HST, aimed at exploring the aerosol vertical structure in the lower atmosphere and tropospheric methane abundance, are presented. High spatial resolution visible to near-infrared spectral images of Titan at $L_s = 240^\circ$ in November 2000 were obtained. These HST/STIS spectra of Titan at 122 wavelengths between 0.6 μm and 1 μm were utilized to explore the altitude sensitivity below 100 km by exploiting the transition between optically thick haze at shorter wavelengths and optically thin haze at longer wavelengths. Analysis of the STIS data suggests a reduction in haze concentration above Titan's tropopause that varies in degree as a function of latitude. Titan's methane abundance profile is fairly consistent with latitude and longitude and there is evidence for local areas of methane saturation in the troposphere. Analysis of these observations indicate a clearing in haze abundance at altitudes in Titan's upper troposphere/lower stratosphere. Our results suggest that a methane and haze profile at one location on Titan would not be representative of global conditions. The implications of our results for generalizing from the Cassini-Huygens DISR haze and GCMS methane *in situ* measurements will also be discussed.