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Latitudinal variations in nitrile and hydrocarbon abundances in Titan's stratosphere derived from Cassini CIRS data

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Cassini has been returning data from the Saturnian system since orbital insertion on 1st July 2004. The Composite InfraRed Spectrometer (CIRS) has successfully returned thousands of infrared spectra at resolutions from 0.5–15 cm^{-1}. Mapping sequences taken during the T0 (2/7/04) and Tb (12/12/04) flybys provide almost complete global coverage of Titan at 2.5 cm^{-1} spectral resolution (with the exception of the very far north). The 600–1000 cm^{-1} spectral region is rich in emission features from hydrocarbons and nitriles, which we have used to retrieve the spatial distribution of HCN in Titan's stratosphere. First, the segment of the mid-IR spectrum from 1230-1360 cm^{-1} was used to retrieve temperature. Second, 600–1000 cm^{-1} was used to obtain mixing ratios of HCN, HC_3N, and various hydrocarbons as a function of latitude and longitude. Contribution functions peak at around 1 mbar for temperature and 10 mbar for the chemical species, well into the stratosphere. The retrieved mixing ratios tend to show a marked increase in abundance towards the northern (winter) pole, which has implications for photochemistry and dynamics. The observed variations with longitude are much smaller than those in latitude, so large numbers of spectra have been averaged into latitude bins to obtain mean spectra with reduced noise. The retrieved HCN abundance is fairly constant with a volume mixing ratio of around 1.5×10^{-7} for 90-20S. More northerly latitudes indicate a steady increase, reaching around 6×10^{-7} at 60N, where the data coverage stops. This variation is consistent with previous measurements and indicates downwelling over the north pole. The variation of HC_3N and hydrocarbons will also be discussed.