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Titan's Stratospheric chemistry: Spatial And Temporal Variations Of Trace Species

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Four years into the Cassini-Huygens mission, we present results obtained on Titan's chemical composition by analyzing CIRS data in the far-and mid-IR region. With respect to previous publications (Flasar et al., 2005; Coustenis et al., 2007, 2008b; Teanby et al., 2006, 2008; Vinatier et al., 2007) we improved our analysis by exploiting a considerably larger number of nadir spectra, in particular at high resolution (0.53 cm−1). The more complete coverage of Titan's disk, combined with the larger number of spectra at high resolution, allows for the inference of more precise abundances for the trace gases and for a more adequate definition of meridional variations, in particular in the northern regions.

The retrievals of the meridional variations of the trace constituents show an enhancement for some of them towards the North pole. Molecules showing a significant enhancement at northern latitudes are the nitriles (HC_3N, HCN) and the complex hydrocarbons (C_4H_2, C_3H_4). To a lesser degree, acetylene and ethane also exhibit abundance increases by factors of 1.5-2. Isotopic ratios in carbon, nitrogen and oxygen have been determined (Jennings et al., 2008, Nixon et al., 2008a,b). The D/H ratio on Titan was also determined from the CH3D band at 8.6 micron and the C_2HD band at 678 cm−1 (Coustenis et al., 2008a). We compare our results with previous inferences from earlier CIRS and Voyager1/IRIS data and from ISO data taken in 1997. The results are tied to predictions by dynamical-photochemical models (Rannou et al., 2005; Lavvas et al., 2008a,b, Crespin et al., 2008 and references therein). Finally, we will present the case for future observations from space (e.g. with the TSSM mission, http://www.lesia.obspm.fr/cosmicvision/tssm/tssm-public/ which will comprise instruments such as a Thermal Infrared Spectrometer (TIRS) or a SubMillimeter Sounder (SMS)) or from the ground, which could improve our current understanding of Titan's neutral chemistry.

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