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Titan's chemical composition from current and future exploration

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Our understanding of Titan's atmospheric chemical composition has recently been enhanced by the data returned by the Cassini instruments. Spectra recorded by the Composite Infrared Spectrometer (CIRS) aboard the Cassini spacecraft became available during the Titan flybys spanning three years now since SOI (Flasar et al., 2005; Teanby et al., 2006, 2007; Vinatier et al., 2007; Nixon et al., 2008; Coustenis et al., 2007,2008a). The spectra characterize various regions on Titan with a variety of emission angles, and they pertain to the region between 70 and 500 km in altitude roughly. The 3 CIRS focal planes (covering the 10-1500 cm^{-1} spectral range with apodized resolutions of 2.54 or 0.53 cm^{-1}) give access to the thermal structure and the composition of Titan, containing several signatures of identified molecules: hydrocarbons, nitriles, H_2O and CO_2, as well as some unidentified features. The meridional variations of the trace constituents and tied to predictions by dynamical-photochemical models (Crespin et al., 2008; Lavvas et al., 2007). I will review our current understanding of the chemical composition in Titan's stratosphere from CIRS and compare it to inferences from other Cassini-Huygens instruments, and I will then refer to future desired such investigations, which could be possible with a mission such as TandEM (one of ESA's Cosmic Vision selections, Coustenis et al., 2008b).

References : Coustenis et al., 2007, Icarus, 189, 35; 2008a, Icarus, in press; 2008b, Astrophys. Instr. Methods, in press; Crespin et al., 2008, Icarus, in press; Flasar et

al., 2005, Science 308, 975; Nixon et al., 2008, Icarus, in press; Lavvas et al., 2007, Plan. Space Sci., in press; Teanby et al., 2006, Icarus 181, 243; 2007, Icarus, in press; Vinatier et al., 2007, Icarus, 188, 120.