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Seasonal and latitudinal variations of Titan's trace stratospheric gases from Cassini/CIRS and other observations

Georgios Bampasidis (1,2) and the and 11 co-authors Team

(1) National & Kapodistrian University of Athens, Faculty of Physics, Astrophysics, Astronomy & Mechanics, Athens, Greece (gbabasid@phys.uoa.gr), (2) LESIA, Observatoire de Paris-Meudon 5, place Jules Janssen 92195 Meudon Cedex France

In operation since July 2004, the Cassini/Huygens mission has significantly improved our perspective of Saturn's largest moon, Titan. Indeed, numerous publications have already revealed its uniqueness within the Saturnian System and the Solar System in general [e.g. 1, and references therein]. Focusing on its dense nitrogen atmosphere, rich in organic constituents, Cassini's Composite InfraRed Spectrometer (CIRS) [2] has measured its detailed stratospheric composition both in medium (2.5 cm-1) and high (0.5 cm-1) resolution [e.g. 3, 4]. In this paper, we will present a recent analysis of CIRS spectra in two ways: We study the variations of Titan's stratospheric structure during the Cassini/Huygens mission and we search for new species by averaging all the spectra obtained from the beginning of the Cassini tour until late 2010.
Our work method consists in first making averages of spectra to derive the temperature profiles as a function of latitude by using the n4 methane band at 1306 cm-1 [5]. We then inject these temperature profiles in our line-by-line radiative transfer code to infer a model simulation that we compare to the observations. Once the best possible fit is obtained in the emission bands and the continuum, we infer the abundances of these trace gases as a function of time or latitude as in previous studies [e.g. 3, 4, 6, 7, 8].
We then also compare these results with other inferences from the Voyager missions [e.g. 9, 10] and other ground/space –based observations [e.g. 11] to obtain information as to the seasonal effects on Titan. From the large averages we try to identify new species in Titan's stratosphere (or establish upper limits) and to improve on the isotopic ratios [e.g. 12, 13, 14]. We will present a progress report on our results.
Studying Titan's organic budget by the Cassini-Huygens instrumentation will enable scientists not only to understand the origin, evolution and dynamics of its atmosphere, but also to investigate its astrobiological potential [e.g. 15].

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