# Titan observations with ISO

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Observations of Titan in the thermal infrared (2.36-45.2 $\mu$m) were performed by ISO, in Jan. and Dec. 1997, with resolving powers between 1500 and 3000 in the Grating mode and up to 30000 in the Fabry-Perot mode. These were the first observations from space of Titan since the Voyager encounters in the early 80s.

Two pure rotational water lines were observed using the ISO/SWS/Grating (R=2000) at 39.4 and 43.9 $\mu$m, with fluxes of about 2 Jy over a continuum of 60 Jy [1], with S/N$\sim$8. The flux observed can be reproduced with a constant abundance of $\sim 4 \times 10^{-10}$, or with a recent photochemical profile [2] multiplied by a factor of *0.4*. This yields a $H_2O$ vapor mole fraction of about $10^{-8}$ at the 400 km altitude level (column density of $2.5 \times 10^{14}$ mol cm$^{-2}$). The inferred water influx at Titan at 700 km of altitude is : $(0.8 - 2.8) \times 10^6$ mol cm$^{-2}$s$^{-1}$, compatible with the $CO_2$ observed abundance and similar to that found at Saturn [3]. This suggests that infalling material from Saturn rings may not be the dominant source of Saturn's water.

The analysis of the 233-1500 cm$^{-1}$ spectrum of ISO/SWS has provided the thermal and compositional structure of Titan on a disk-average [4]. In particular, observations of the $CH_3D$ band at 1150 cm$^{-1}$ significantly improved the determination of the D/H ratio in Titan's stratosphere. The new value of $\sim 1 \times 10^{-4}$, is lower than in comets and suggests that Titan's atmosphere is not of cometary origin, but rather formed by outgassing from the interior.

We have also tested available vertical profiles and inferred upper limits for a few likely candidates in Titan's stratosphere (such as benzene and allene) [4].

We have also acquired CAM/CVF data of Titan in the 5 to 9 micron range, showing mainly the $\nu_4$ methane band at 7.7 $\mu$m, as well as PHT-S measurements in the 2.5-5 and 6-12 $\mu$m ranges, showing the various hydrocarbon signatures and also the 3 micron methane window. Current status of the analysis of PHT-S and CAM data of Titan shall also be presented.

**References**

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