

Looking at the key atmospheric gases in Titan with Herschel/PACS and APEX/SHFI

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Abstract

In the Framework of the Herschel Guaranteed Time Key program "Water and related chemistry in the Solar System" (HssO) [1], the Photodetector Array Camera and Spectrometer (PACS) [2] onboard the Herschel Space Observatory [3] is delivering far-infrared and sub-millimetre spectroscopic observations of Titan atmosphere (covering the 51 - 220 μm range) with medium spectral resolution (a resolving power from 940 to 5500 depending of the wavelength) and high sensitivity. On the other hand, high spectral resolution with ground-based telescopes allows to resolve the line shapes sufficiently to improve the accuracy retrieving abundance profiles. In this contribution we will present (1) high S/N spectrum of Titan recorded by Herschel/ PACS grating spectrometer during June (reported by [4]) and December 2010, and constraints on both the temperature and the key abundances in Titan's atmosphere. (2) CO(2-1) and HCN(3-2) line observations as seen by APEX / Swedish Heterodyne Facility Instrument (SHFI) -channel separation of 122kHz and bandwidth of 1GHz- during March and June 2008 as an exploration of the capabilities of this instrument.

1. Results

The PACS spectrum shows many lines due to H_2O , HCN, CH_4 , and CO. By means of a line-by-line radiative transfer code we present the PACS observations and synthetic spectrum of Titan. The combined initial analysis of key rotational lines yields constraints on both the temperature and the abundances in Titan's atmosphere.

We explored the capabilities of APEX / SHFI for Titan's atmospheric observations, the search of nitriles

and CO appears favorable in the sub-millimeter range explored with this instrument. The CO mixing ratio estimation derived with APEX / SHFI is consistent with other authors, however, the retrieved HCN vertical profile requires future observations with higher S/N [5].

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References

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