EPSC Abstracts
Vol. 9, EPSC2014-438, 2014
European Planetary Science Congress 2014

ALMA observations of Titan

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Abstract

We report submm observations of Titan performed with the ALMA interferometer centered at the rotational frequencies of HCN(4-3) and HNC(4-3), i.e. 354 and 362 GHz. The most extended configuration of the array in cycle 0 yielded disk-resolved emission spectra of Titan with an angular resolution of 0.54x0.42 arcsec. Titan's angular surface diameter was 0.77 arcsec.
Data were acquired in June-August 2012 near the greatest eastern and western elongations of Titan at a spectral resolution of 122 kHz ($\lambda/d\lambda = 310^6$).
We have obtained maps of several nitriles present in Titan' stratosphere: HCN, HC_3N, CH_3CN, HNC and other weak lines (isotopes, vibrationally excited lines, …).

A detailed study of the relative line intensities and FWHM is ongoing. With the combination of all these detected rotational lines, we expect to constrain the spatial and vertical distribution of these species and to derive the HNC/HCN ratio as well as isotopic ratios. Moreover, Doppler lineshift measurements will enable us to constrain the zonal wind flow in the upper atmosphere.

This analysis will be presented, as well as a comparison with vertical profiles expected from photochemical models.

1. Figures

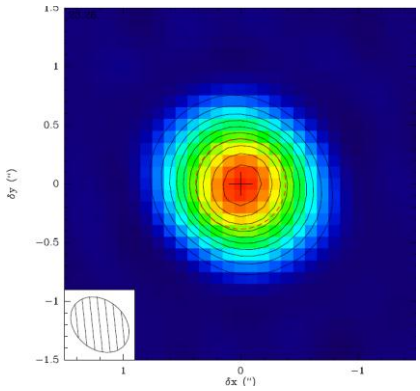

Figure 1: HCN(4-3) map of Titan performed with ALMA. Red circle corresponds to the surface radius. The beam size in shown in the lower left corner.

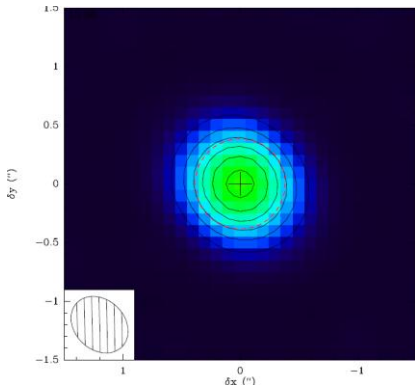

Figure 2: Continuum map of Titan at 356 GHz.

Acknowledgements

ALMA is a partnership of ESO (representing its member states), NSF (USA) and NINS (Japan), together with NRC (Canada) and NSC and ASIAA (Taiwan), in cooperation with the Republic of Chile. The Joint ALMA Observatory is operated by ESO, AUI/NRAO and NAOJ