Mapping the Frozen Void

Aleksi Suutarinen[1]
Helen Fraser[2]
(1) aleksi.suutarinen@open.ac.uk (2) helen.fraser@open.ac.uk

Aims

How is ice distributed in clouds of interstellar matter?
Can grain surface chemistry change on a scale of 100's of AUs?

Introduction

Frozen material on the surfaces of dust grains in clouds of interstellar matter form a rich reservoir of molecular material and their existence affects several processes from the evolution of a prestellar core to the composition of planetary systems around a young star and they may even play a role in the eventual formation of life itself.

While one is relatively easily able to get neatly spaced maps of molecular emission from observing things in the gas phase, the detection of ice requires observing the absorption of mostly near-to-mid infrared light of background stars which rudely have a habit of not even being ordered in a neat grid.

Mapping the ice is what we are doing, regardless.

Methodology

We have spectroscopic observational from the AKARI near/mid-infrared space telescope towards 16 different star-forming and pre-stellar cores, with a 10'x10' field of view containing potentially hundreds of lines of sight. Our in-house spectrum extraction software has been proven to work on the smaller 1'x1' fields of view [4] and progress is being made to upgrade it to work on the larger, 10'x10' frames. Here we present our initial results in this upgrade effort. Our main focus is the 2-5 µm near-IR regime.

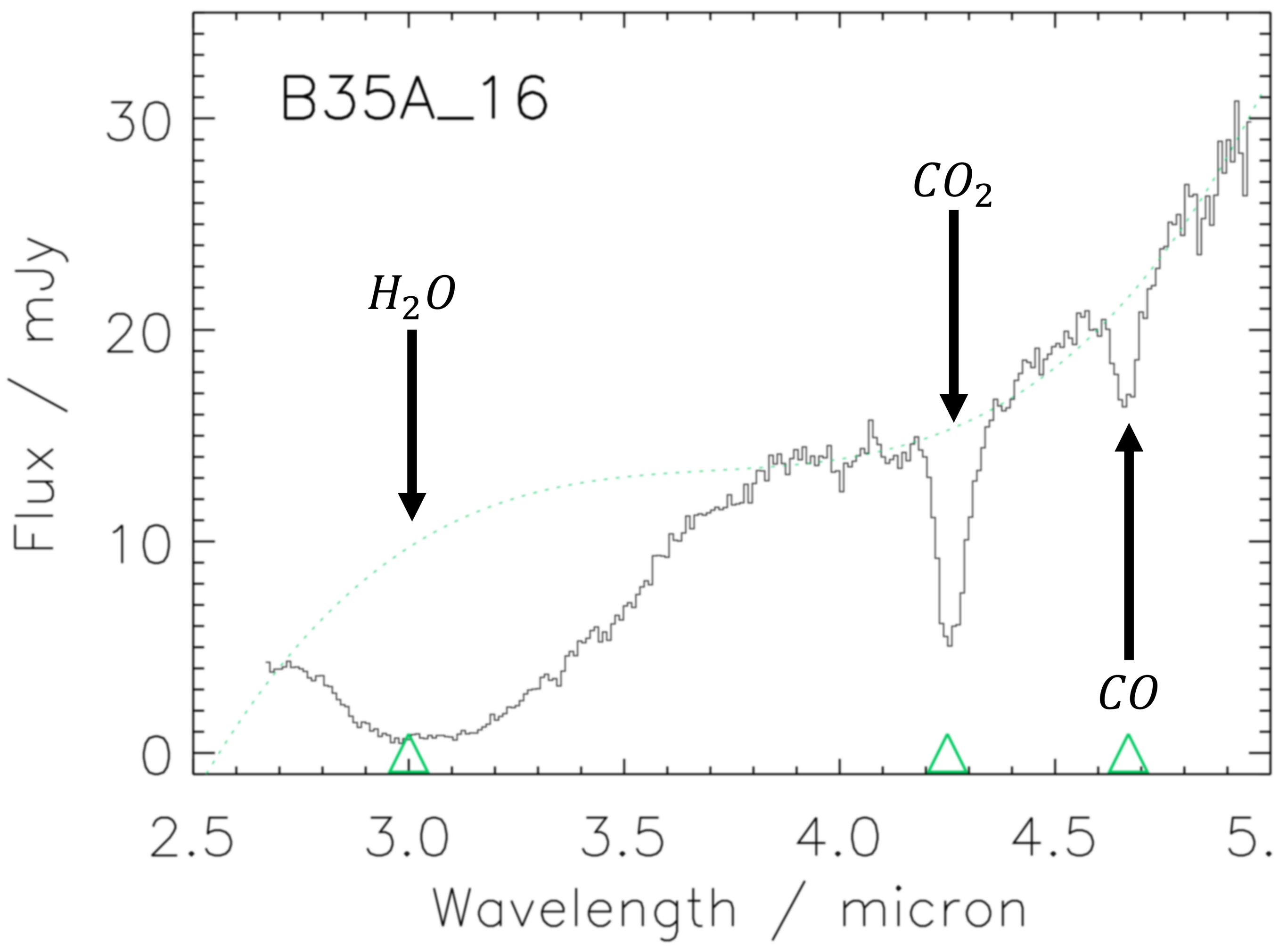

Fig. 1: An example AKARI spectrum from Barnard 35 A showing several ice absorption features. The dotted line represents a continuum fit on the emission of the background star.

Results

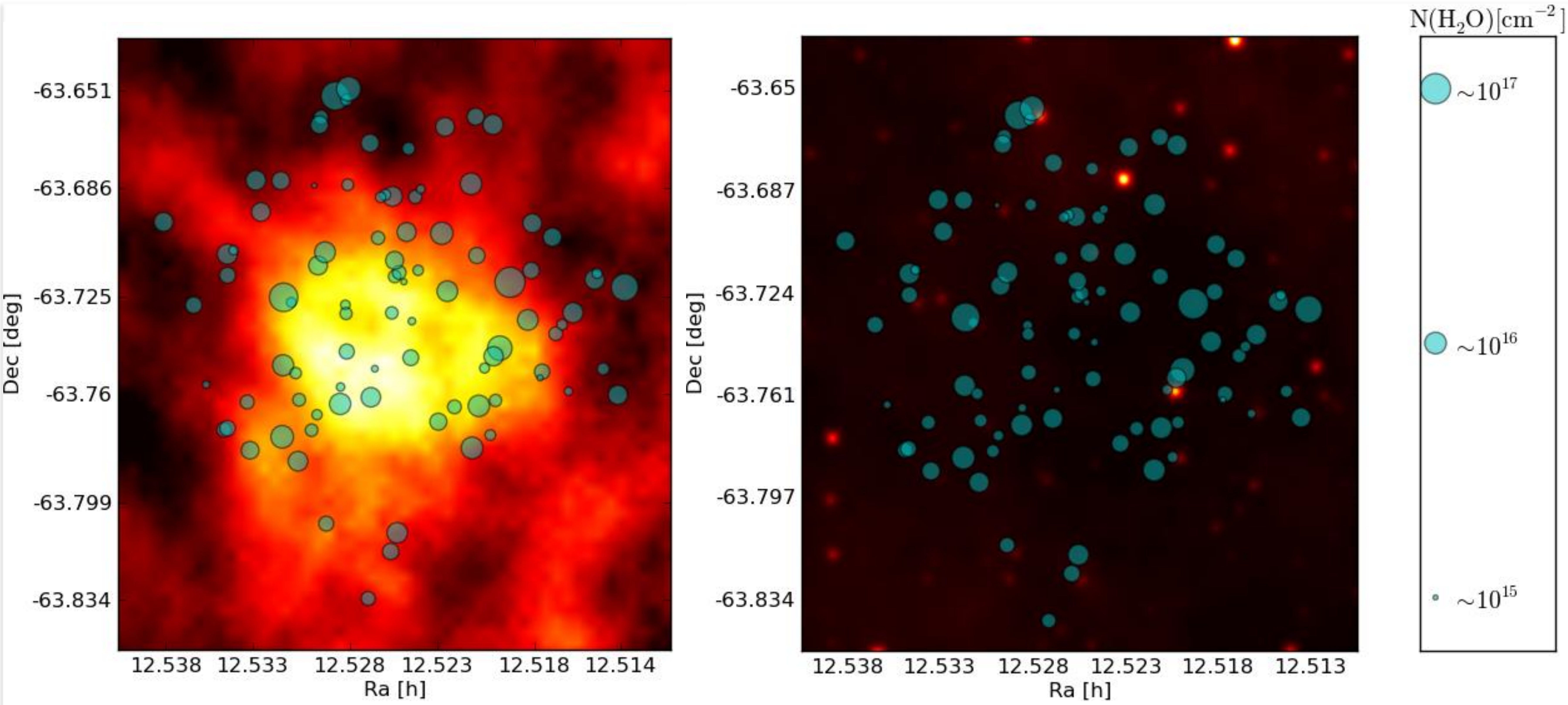

Fig. 2: The column density of water ice overlaid as a scatter plot on top of (left) 500µm Herschel SPIRE and (right) 12µm WISE archive data of the Southern Coalsack (DC 300.7-01.0)

Conclusions

- Frozen H_2O, CO_2 and CO are abundant in the clouds we have looked at.
- We note a non-correlation between the water ice and dust column densities.
- The abundance of water ice varies greatly in the spatial scales we have observed.

[1] K. M. Pontoppidan ApJ 2004, 678, 1005 [2] P. Sonnentrucker et al. ApJ 2008, 672, 361 [3] Shimonishi et al. AJ 2013, 145, 32 [4] Noble et al. ApJ 2013, in press