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The SuperMALT Project

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The SuperMALT project is a follow up of the MALT90 survey with the goal of observing a subsample of 76 MALT90 clumps (**25 pre-stellar or quiescent (Q)**, **26 proto-stellar (P)** and **25 HII clumps (HII)**) in high excitation molecular lines and key isotopomers (see Table 1) using the Apex 12m telescope. This survey is made with an angular resolution of $\sim 20''$ and a velocity resolution of ~ 0.1 km/s.

Table 1: Molecular lines observed in SuperMALT. The OTF maps are 2'x2' in size.

Species	Frequency (MHz)	Observing Mode	Tracer
HCO ⁺ (3-2)	267557.633	OTF	Density
HCN(3-2)	265886.431	OTF	Density
HNC(3-2)	271981.111	OTF	Density, Cold Chemistry
N ₂ H ⁺ (3-2)	279511.760	OTF	Density, Chemically robust
HCO ⁺ (4-3)	356734.242	OTF	Density
HCN(4-3)	354505.473	OTF	Density
HNC(4-3)	362630.303	OTF	Density
N ₂ H ⁺ (4-3)	372672.480	OTF	Density
H ¹³ CO ⁺ (3-2)	260255.342	Point	Column Density
HN ¹³ C(3-2)	261263.390	Point	Column Density

The SuperMALT Sample

- Reliable detection ($\geq 5\sigma$) in key molecular transitions (i.e. N₂H⁺, HCN, HNC, HCO⁺(1-0) in MALT90.
- Masses between 400 to $10^4 M_{\odot}$ and distances 3-5 kpc
- Representative of various evolutionary stages

The Project Goals

- Study morphology and line profiles with evolutionary stages.
- Study molecular abundances and chemistry with evolutionary stages.
- Combine MALT90 data with SuperMALT to model the
- molecular emissions to characterize physical and chemical properties with evolutionary stages of the clumps.

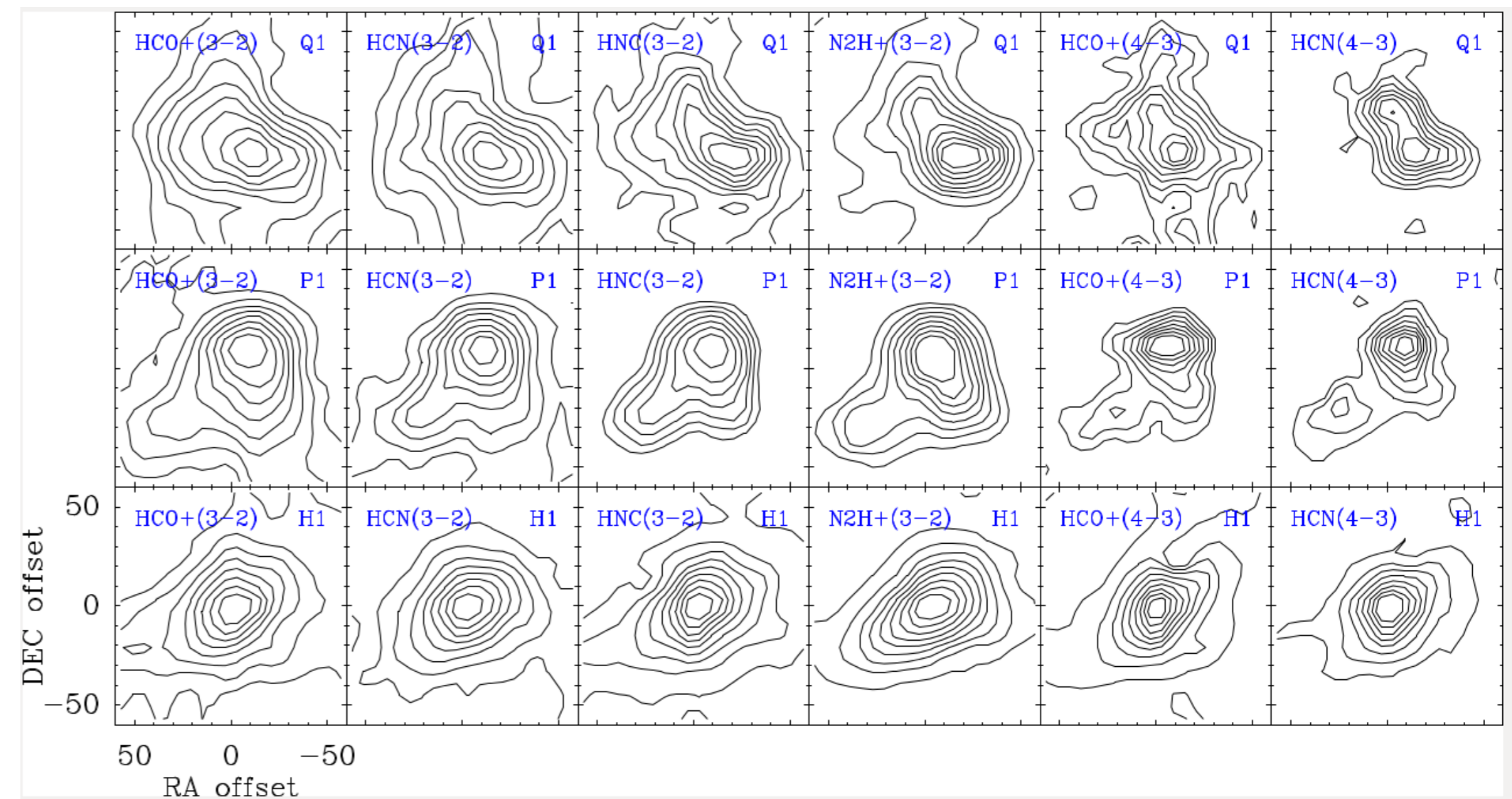
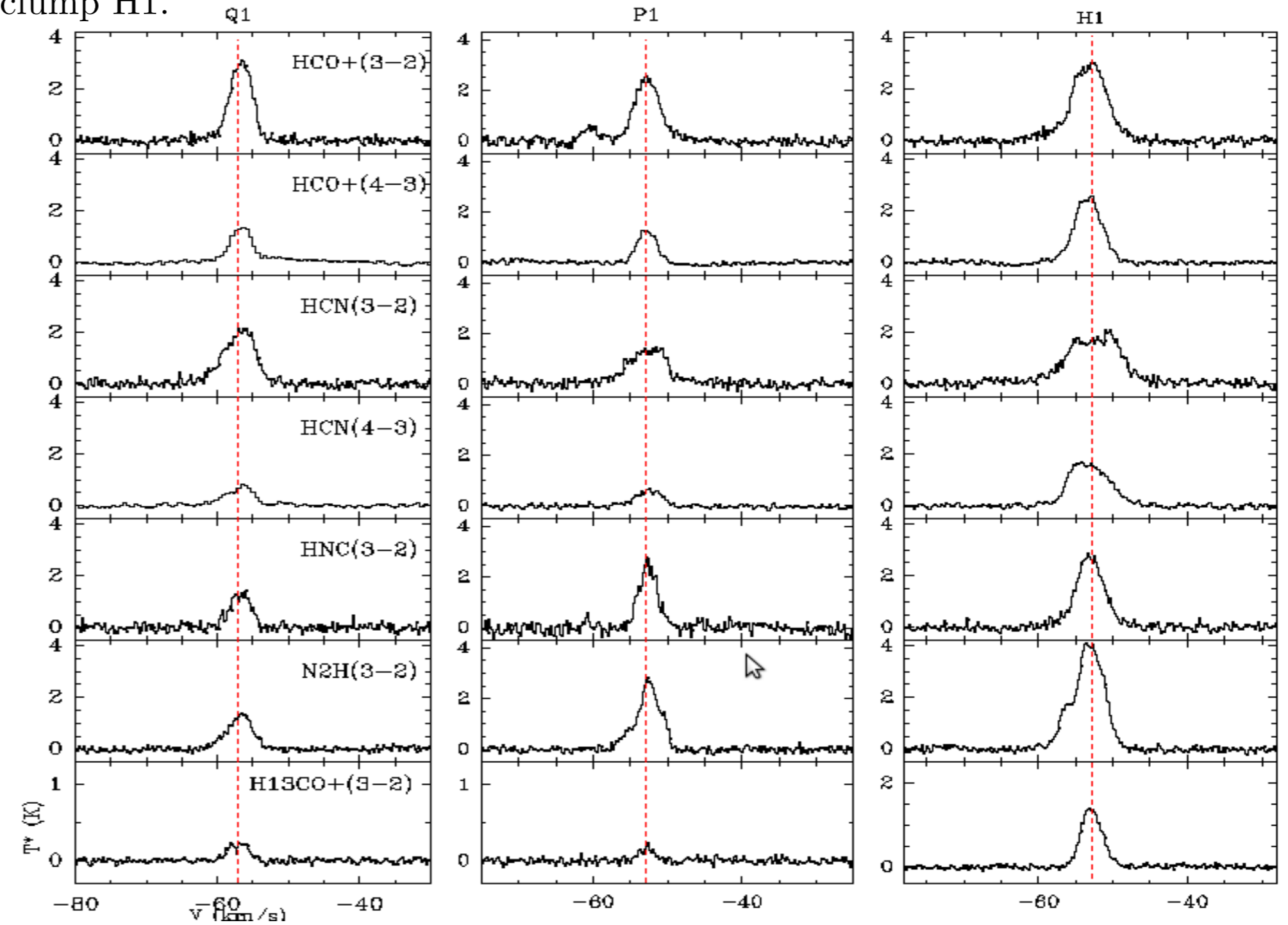
Observation Status

First phase completed (corresponding to J = 3-2 lines) and second phase is in progress using Chilean, European and Swedish time for Apex observations.

SuperMALT Team: Peter Schilke, Jill Rathborne, James Jackson, Jonathan Foster, Timea Csengeri, Laura Gomez, Andres Guzman, I. Jimenez-Serra, Steve Longmore, Diego Mardones, Alvaro Sanchez-Monge, Elise Servajean, Leonardo Testi, James Urquhart, K. Wang, Friedrich Wyrowski +, Webpage: <http://home.strw.leidenuniv.nl/~ycontreras/supermalt.html>

Early Science Results

Fig: (Top) Line profiles of 6 different molecular lines towards three different types of clumps. Name of the species for each row are shown. (Bottom) contour maps of the molecular emission of clump Q1 (left), clump P1 (middle), and clump H1.



Y. Contreras, S. Neupane, G. Garay et al (in submission)