From Interstellar Clouds to Star-Forming Galaxies: Universal Processes?, E2, 1 of 2
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High Mass Star Formation: Properties of NH_3 clumps in Southern Galactic Plane

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Abstract. Massive stars are some of the most important objects in the Universe, shaping the evolution of galaxies, creating chemical elements, and hence shaping the evolution of the Universe. However, the processes by which they form, and how they shape their environment during their birth processes, are not well understood. We are using NH_3 data from the "The H_2O Southern Galactic Plane Survey" (HOPS) to define the positions of dense cores/clumps of gas in the southern Galactic plane that are likely to form stars. We did a comparative study with different methods for finding clumps and found Fellwalker to be the best for this dataset. We detected ~ 500 clumps with mean kinetic temperature ~ 20 K and virial mass ~ 680 solar masses.

Keywords. star formation, interstellar medium, HOPS, molecular transitions.

1. HOPS Region

HOPS covers 100 square degrees ($-70° < l < 30°$) of the sky. The width of the survey is $|b| \leqslant 0.5°$, centered on the Galactic plane. For our current project, we are using NH_3 (1,1) ; (2,2) molecular transition lines (Purcell *et al.*2012) in the 12 mm window with the CSIRO's 22 m Mopra Radio Telescope.

2. Clump Properties

We detected about 500 clumps in the entire HOPS region. We fitted an average spectrum to each clump and calculated the kinetic temperature (Figure 2). Consequently, we estimated the virial mass (Figure 2) of each clump assuming that the clumps are at near distances from the Sun.

3. Broad Emission Line Clump Clusters

We found three clump clusters with broad spectral lines, (see Figure 2) with widths between 50 and 100 kms^{-1}. These clump clusters are located on both sides of the central molecular zone of the Milky Way, at $l \sim 5.5$, $l \sim 350$ and $l \sim 354$. These clumps may have outflow or some other physical activity and we will be explore these in future work.

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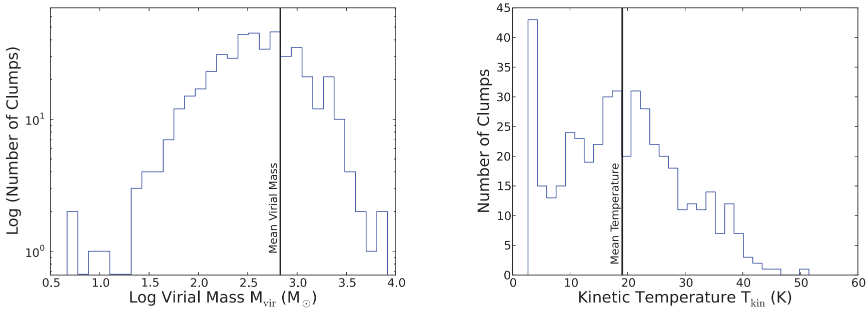

Figure 1. Distribution of kinetic temperature and virial mass obtained from the spectral fitting (Akhter *et al.*in prep.).

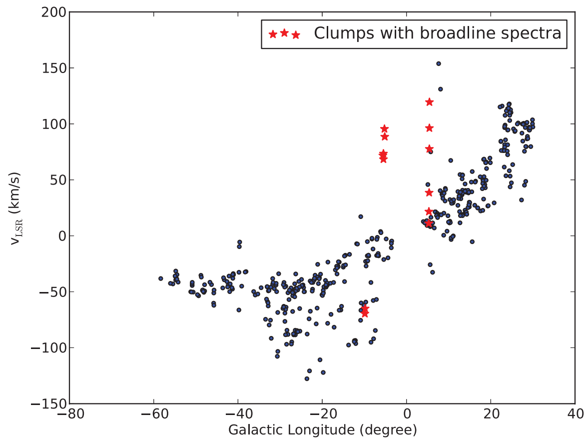

Figure 2. Distribution of $v_{\rm LSR}$ of the clumps for the entire HOPS region. "Dots" and "stars" represent clumps with narrow and broad emission lines respectively (Akhter *et al.*in prep.).

4. Future Work

Our aim is to explore the dynamical characteristics of these detected clumps. We will use the "3D Molecular Line Radiative Transfer Code" (MOLLIE) to simulate spectra for different molecules and compare them with the observations to determine the properties of the star forming cores. The aim of the project is to determine how common infall and outflow are in star forming cores, hence providing valuable constraints on the timescales and physical process involved in high mass star formation.

References

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