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Identifying star-forming cores in 13CO emission maps: Evolution stages of molecular clumps

Multi-tracer surveys have revealed the hierarchical nature of molecular clouds, showing how high-density, small-scale features are always nested within more rarefied, larger envelopes. This structural hierarchy is, however, a non-trivial one: over-densities can always be found when smaller scales are resolved. The highest density in the hierarchy of cloud structure correspond to the site of star formation. We use the SCIMES (Spectral Clustering for Molecular Emission Segmentation) algorithm to identify the densest regions (the leaves of the dendrogram) of the 13CO emission maps of the CO Heterodyne Inner Milky Way Plane Survey (CHIMPS; JCMT). To identify star-forming clumps at different stages of their evolution, we match the CHIMPS leaves with the sources in the ATLASGAL (APEX Telescope Large Area Survey of the Galaxy), which provides a catalog of clumps with their physical properties and evolution stages (YSO, protostellar core, quiescent, massive-star forming). Our study indicates that most leaves contain one single type of ATLASGAL source, with young stellar objects being by far the most dominant.

Section

Star Formation

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