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Alessandro Coletta - Fragmentations of ALMAGAL dense clumps in young protoclusters

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A large fraction of stars forms in clusters which also include high-mass stars (Mstar ≥ 8 Msun). Yet the physical mechanisms regulating the fragmentation of dense molecular clumps into star-forming cores and its outcome are still under debate. Millimeter/sub-millimeter wavelength observations are ideal probes for this investigation. The ALMAGAL large project survey offers the possibility to study the high-mass star formation process with an unprecedented level of detail and statistical significance, featuring high-resolution ALMA millimeter observations of more than 1000 dense clumps selected from the Herschel Infrared Galactic Plane Survey (Hi-GAL) at different Galactic locations (from the Central Bar to spiral arms in the outer Galaxy), which cover a wide range of masses ($\sim 10^2 < M < 10^4$ Msun), heliocentric distances (~2-8 kpc), surface densities (~0.1-15 g cm^{-2}) and evolutionary stages (from IRDCs to HII regions, with the evolutionary indicator $\sim 0.05 < L/M < 500$ Lsun/Msun). In this talk, we present results of the analysis carried out on 1.4 mm ALMA continuum images of the whole ALMAGAL sample, with a maximum angular resolution of ~0.15"(≤ 1000 AU at ~6 kpc distance) allowing to reveal dense fragments down to the typical core scale. We performed the compact source extraction procedure with the CuTEx algorithm to obtain the catalog of dense fragments, and applied the same procedure on populations of injected synthetic sources in order to estimate the flux completeness limit and photometric accuracy of our catalog. We characterized the revealed population of fragments in terms of detection statistics and numerical distribution, and derived their main physical parameters, also taking into account potential observational biases that could affect our results. We report a total of ~6000 detections distributed in ~80% of the targets, each showing a number of fragments between 1 and ~50 (with a median of ~5). The estimated sizes of the fragments range from ~800 to ~3000 AU, and masses from $\sim 10^{-2}$ to $\sim 10^2$ Msun, respectively. Thanks to the robust statistics available we are able to properly address the relationships that link the degree of fragmentation, the mass distribution and spatial density of the cores, to the density and evolutionary stage of the hosting clumps. These results will also be discussed in the framework of current numerical simulations of clump fragmentation.

Session Classification: Milky Way