Investigating the origin of stellar masses with ALMA-IMF

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The main goal of the ALMA-IMF Large Program (Motte et al. 2022) is to determine if and how the origin of the stellar initial mass function (IMF) depends on cloud characteristics and evolution. We surveyed 15 massive protoclusters, including W51 and W43, and covering a wide variety of Galactic environments and evolutionary stages (Motte et al. 2022; Galvan-Madrid et al. 2024). ALMA-IMF provides the community with an unprecedented database (Ginsburg et al. 2022; Cunningham et al. 2023, see http://www.almaimf.com) with high legacy value for protocluster clouds (60 pc^2 covered at 2000 AU resolution), cores (about 1000 cores with 0.15-200 M_{sun}, Louvet et al. 2024), and filaments. Many ALMA-IMF cores qualify as protostellar as they drive outflows (Nony et al. 2020, 2023; Towner et al. 2024; Valeille-Manet et al. 2025) and hot cores (several tens of hot cores, Brouillet et al. 2022; Bonfand et al. 2024). ALMA-IMF regions display a wide range of dynamical events as currently investigated toward cores and along filaments (Cunningham et al. 2023; Álvarez-Gutiérrez et al. 2024).

I will present ALMA-IMF results, obtained from our homogenous sample of cores, that indicate that the mass distributions of cores (CMFs) in these massive environments of the Milky Way present an excess of high-mass cores (Motte et al. 2018a; Pouteau2022; Louvet et al. 2024) with respect to the canonical IMF (e.g., Kroupa et al. 2013). We propose that the CMF deviates from the canonical IMF form when and where a burst of star formation develops (Nony et al. 2023; Pouteau et al. 2023; Armante et al. 2024). Based on the combined analysis of the core distribution (CMF, mass segregation) and cloud structure (PDF), we propose an evolutionary sequence of massive protoclusters, which is in line with the dynamical scenarios of cloud and star formation (e.g., Motte et al. 2018a; Vazquez-Semadeni et al. 2019).