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Alessio Traficante - The SQUALO-ALMA project: clump-fed accretion mechanism in high-mass star-forming objects

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The formation mechanism of the most massive stars is far from completely understood. It is still unclear if the formation is core-fed or clump-fed, i.e. if the process is an extension of what happens in low-mass stars, or if the process is more dynamical such as a continuous, multiscale accretion from the gas at parsec (or even larger) scales. In this context I will present the results obtained from the 1.3 mm continuum data of the SQUALO (Star formation in QUiescent And Luminous Objects) project (Traficante+23, MNRAS, 520, 2306. doi:10.1093/mnras/stad272). SQUALO is an ALMA survey designed to investigate the properties of 13 massive clumps selected at various evolutionary stages and with the common feature that they all show evidence for accretion at the clump scale. Our observations identify 55 fragments with masses in the range 0.4 ≤ M ≤ 309 M⊠, with evidence that the youngest clumps already present some degree of fragmentation. The data show that physical properties such as mass and surface density of the fragments and their parent clumps are tightly correlated. Quite interestingly, the minimum distance between fragments decreases with evolution, suggest a scenario in which massive clumps first fragment under the influence of non-thermal motions driven by the competition between turbulence and gravity. With time gravitational collapse takes over and the fragments organize themselves into more thermally supported objects while continuing to accrete from their parent clump. Overall, our results support a dynamical, clump-fed scenario in which the properties of the parent clumps at the parsec scales strongly influence the formation history of the inner fragments identified with a resolution of few thousands of AU.

Session Classification: Milky Way