

Title:

Ancient Relics & Infant Titans: Probing Massive Star Cluster Formation with ALMA

Abstract:

Observationally constraining the physical conditions that gave rise to ancient globular star clusters has been a long-standing challenge, yet we know these extreme objects were formed prolifically in the early universe. Now with the ALMA Observatory on-line, we can begin to probe the birth environments of analogous massive clusters in a variety of “local” galaxies with sufficient angular resolution. I will give an overview of ALMA observations of galaxies in which candidate proto-super star cluster molecular clouds have been identified. These new data probe the physical conditions that give rise to super star clusters, providing information on their densities, pressures, and temperatures. In particular, the observations indicate that these clouds may be subject to external pressures of $P/k > 10^8 \text{ K cm}^{-3}$, which is consistent with the prevalence of optically observed adolescent super star clusters in interacting galaxy systems and other high pressure environments. ALMA observations also enable an assessment of the molecular cloud chemical abundances in the regions surrounding super star clusters. Molecular clouds associated with existing super star clusters are strongly correlated with HCO⁺ emission, but appear to have relatively low ratio of CO/HCO⁺ emission compared to other clouds, indicating that the super star clusters are impacting the molecular abundances in their vicinity.