Poster: The instantaneous flow of gas into stars: mass accretion onto low mass stars in high mass star forming clouds

- Tom Megeath

Protostars directly trace the flow of interstellar gas mass into stellar mass. While over time the majority of the gas flows onto the low mass stars populating the peak of the IMF, the instantaneous rate at which mass flows into these low mass stars has been largely overlooked. We use surveys of low to intermediate mass protostars with Spitzer and Herschel to estimate this instantaneous rate, concentrating on the Orion A cloud. This cloud hosts the massive Integral Shaped Filament (ISF), which is a site of massive star formation and is forming the Orion Nebula Cluster. Using measured luminosities from SEDs, and applying corrections for inclination and extinction, we estimate the total, instantaneous accretion rate onto the entire population of protostars. The resulting total accretion rates are ∼0.0015 Msun per year for the entire Orion A cloud and ∼0.001 Msun per year in the ISF alone, a few times higher than accretion rates typically proposed for a single massive star. The detected protostars in the ISF have systematically higher luminosities than less active regions of Orion A, indicating that the accretion rates onto the low mass protostars are elevated in this dense environment. This implies that over its 2 Myr lifetime, the Orion Nebula Cluster could form through sustained star formation in the ISF without the need for bursts. Using Herschel/SPIRE maps of Orion A, we find that the mass of gas currently in the high density core of the ISF containing the protostars is not sufficient to sustain this rate, and we argue that the flow of gas into the core of the ISF plays an important role in regulating star formation within the Orion Nebula Cluster. Finally, we discuss how we can extrapolate our understanding of low mass star formation in nearby regions to massive, distant clusters where low mass protostars are difficult/impossible to detect and study.

Clusters