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From Starless Cores to Embedded Disks: Chemistry and Fragmentation in Early Star Formation

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The physical and chemical conditions present during planet formation are established during the earliest embedded Class 0/I phases of star formation. At this stage, protostellar systems are still being shaped by infall, outflows, irradiation, and chemical processing. Understanding how these processes set the initial conditions for star and planet formation requires observations that can resolve the small-scale structures within embedded systems. We present the first systematic high-angular resolution ($0.1''$, ~ 15 au) study of disk-scale chemistry in 19 nearby embedded protostars as part of the ALMA Large Program eDisk. Using multiple molecular tracers, we identify the distinct morphologies within these young systems. ^{12}CO and SiO trace outflows and jets, while ^{13}CO and C^{18}O trace rotating inner envelope and disk regions. The compact hot core regions are traced by DCN and CH_3OH , and are particularly prominent towards the youngest Class 0 sources. Hydrocarbons are associated with UV-irradiated outflow cavity walls, while SO and H_2CO show complex morphology, tracing various structures that include non-axisymmetric infall through streamers. Recently, we are using archival ALMA observations to investigate fragmentation in dense starless cores. This complementary study probes the structures that precede protostellar formation and will help connect the initial fragmentation of dense cores with the physical and chemical complexity observed in young embedded systems. Together, these efforts will provide a more complete view of the initial conditions of star and planet formation.

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No

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Yes

What is your career level?

Postdoctoral

Which keyword describes the area of focus of this talk?

Gas & dust

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