

## ALMA2019: Science Results and Cross-Facility Synergies



Contribution ID: 26

Type: not specified

# Probing with ALMA the evolution of cores on the cusp of star formation

*Monday, October 14, 2019 3:25 PM (15 minutes)*

Contributed talk

Abstract:

“While clearly a vital step in the process of star formation, the transition from prestellar core to first hydrostatic core (FHSC) or protostar has not been well studied observationally. Even with ALMA, dense condensations within starless cores are very rarely detected in large surveys. Here, we present Atacama Large Millimeter/submillimeter Array (ALMA) observations from Cycles 0, 2 and 6 toward two highly evolved dense cores, Oph A SM1N and N6, within the Ophiuchus molecular cloud. Although apparently starless based on Spitzer and Herschels surveys, and despite a lack of outflow signatures in CO data in single-dish and ALMA observations, we detect compact continuum structures toward both SM1N and N6. These sources are candidates for the youngest protostars or FHSCs in the Ophiuchus molecular cloud. In particular, N6 contains a clear, low-luminosity point source embedded within extended dense gas. With matched resolution and sensitivity to large-scale structure from 850 micron to 3 mm, we model directly the SEDs of both the extended and compact features of both sources, and investigate the variation in dust emissivity and temperature at small radii. We furthermore confirm the first (and thus far only) H<sub>2</sub>D<sup>+</sup> detection with ALMA toward SM1N, and along with observations of additional deuterated species (NH<sub>2</sub>D, N<sub>2</sub>D<sup>+</sup>), discuss the implications for chemical models of highly evolved starless and extremely young protostellar cores.”

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**Session Classification:** ISM, SF