Contribution ID: **38** Type: **not specified**

Tracing B-fields in protostellar targets across spatial scales with ALMA, SOFIA, BLAST, and APEX.

Tuesday, 15 October 2019 10:10 (15 minutes)

Contributed talk

Abstract:
"To understand the formation of stars and protoplanetarydisks in magnetized molecular clouds we require both (a) polarization maps of B-fields in protostellar infall envelopes, from ALMA, and (b) larger-scale B-field maps that serve to reveal the linkages - if any - between these envelope fields and the fields of the parent clouds. We will present new results from two ongoing programs in this area. First, in the densest portion of the South Ridge of the Vela C molecular cloud (d = 900 pc), we have traced magnetic fields nearly continuously from the 30 pc scale to the 1500 AU scale, via the combination of stratospheric polarimetry from BLAST, new APEX/PolKa polarimetry, and our very new ALMA Band 4 polarimetry results (PI: L. Fissel, NRAO) released to us in Spring 2019.
We find a surprising agreement between the B-field orientations across three orders of magnitude in spatial scale, suggesting a relatively strong magnetic field that guides the collapse. Secondly, in the nearby stellar nurseries in Ophiuchus (d = 140 pc), the initial result from our program of synergistic polarimetric observations with ALMA and SOFIA reveals a more disordered field with only tenuous links across scales. This initial result is for the binary protostar IRAS 16293-2422 (lead on SOFIA polarimetry: F. Encalada, U. of Illinois). With these two ongoing research programs, we aim to determine the importance of magnetic fields for guiding infall and braking protoplanetary disk rotation across a range of star forming environments. Additional targets in Ophiuchus are scheduled to be observed with SOFIA's polarimeter in July of this year, and the upgraded version of BLAST is scheduled for launch in December of this year. "

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Session Classification: ISM, SF