BOSTON UNIVERSITY

Boston University College of Arts & Sciences
Institute for Astrophysical Research

2019—2020 ASTROPHYSICS SEMINAR SERIES

Early High-Mass Star Formation: A comprehensive ATLAS with ALMA and SOFIA

High–mass stars are cosmic engines known to dominate the energetics in the Milky Way and other galaxies. However, they are very rare and their formation is still not well understood. High-mass, cold, dense clouds, often appearing as infrared dark clouds (IRDCs), are the nurseries of high-mass stars. I will show how IRDC studies have started to reveal the initial conditions for high–mass star formation (HMSF). What we still lack are clear–cut examples of dense clumps that are bound to form stars but have not done so yet (high–mass starless clumps: HMSCs). While scattered, small sky patch searches have been made, no systematic galaxy-wide survey that can place such searches on a statistical firm footing has ever been conducted. We have now performed a large systematic search for Cold Cores with ALMA (CoCoA). Embedded star formation will manifest via outflowing, shocked, and warm gas components with little or no evidence of cold gas towards dense cores. By weeding out such masqueraders, and revealing the extent of fragmentation in all HMSCs, a feat only achievable with a survey machine like ALMA, CoCoA aims to reveal the truly high-mass starless cores if they exist.

No measurements of magnetic fields in IRDCs in a state prior to the onset of high–mass star formation have previously been available, and prevailing HMSF theories do not consider strong magnetic fields. Our dust continuum polarization observations show that high-mass filaments are strongly magnetized and that the strong magnetic field is as important as turbulence and gravity for HMSF. I will present the results of our POLSTAR survey on the magnetic field topology in IRDCs that are at different stages of evolution.

I will conclude with my thoughts on how these observations are able to put very strong constraints on models of high-mass star formation and reveal the initial conditions for high-mass star formation.

Monday, January 27th

3:30 - 4:30 p.m.

725 Commonwealth Ave | Room 502

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