BOSTON UNIVERSITY

ASTROPHYSICS SEMINAR SERIES

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"Importance of atomic hydrogen in molecule and star formation"

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Refreshments at 3:15pm in CAS 500
Talk begins at 3:30pm in CAS 502

Abstract:
Recent observations of galaxies on parsec and kilo-parsec scales show a remarkably uniform neutral hydrogen (HI) surface density. The steady-state models for H2 formation explain this HI saturation as a threshold surface density required to shield molecular hydrogen (H2) against photo dissociation, and predict it should depend only on metallicity. However, several important questions remain regarding the role of HI in H2 shielding. For example, while the theoretical shielding HI comes purely from the cold neutral medium (CNM), the observed HI is a mixture of both cold and warm HI (CNM and WNM), and could be underestimated due to the presence of high optical depth HI.

We study the role of atomic hydrogen in H2 and star formation using a two-way approach. First, we compare H2 and CO distributions in the Perseus molecular cloud on sub-pc scales with predictions from MHD and PDR models to constrain the importance of diffuse HI envelopes (via dust shielding) on the abundance of carbon monoxide (CO) and spatial variations of the CO-to-H2 conversion factor. Second, with the recent upgrade of the Karl Jansky Very Large Array, we are constraining the temperature distribution of the WNM with very deep HI absorption observations. Future HI observations with the Australian SKA Pathfinder will resolve HI envelopes around giant molecular clouds in the Magellanic Clouds and probe directly the importance of HI in molecular gas formation at sub-solar metallicities.