BOSTON UNIVERSITY

Astrophysics Seminar
Monday, April 13, 2015

Revisiting Larson's 1981 Scaling Relationships in Galactic Molecular Clouds

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Department of Astronomy

3:15 pm
Refreshments
CAS Room 500

3:30 pm
Seminar
CAS Room 502

Abstract:

For over thirty years, the Larson (1981) scaling relationships have provided the primary observational constraint to the dynamics of molecular clouds in the Milky Way. The relationships include a sub-linear scaling between velocity dispersion and size, an inverse scaling between mean density and size, and a constant ratio of virial mass to luminous cloud mass.

In my presentation, I examine these relationships in detail using molecular line data gathered over the last 15 years. Owing to the sensitivity and sampling of these new data, a fundamental plane for molecular clouds is identified that extends the Larson relationships.

I discuss the various size-line width relationships defined by observers and the connection to the velocity spectrum of interstellar turbulence. The fundamental plane emerges from the near universality of the turbulence in molecular clouds and the equipartition between gravitational and turbulent kinetic energy densities.

Finally, I show preliminary efforts to calibrate the fundamental plane of molecular clouds to estimate distances in the Milky Way.

Next Week

- *James Lowenthal*
  Smith College
- TBD

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