SACRAMENTO STATE

Department of Physics and Astronomy

Physics & Astronomy Colloquium

Spring 2010

The Simple Model:

Fitting analytic solutions of the equation transfer to observations reveals infall rates for star-forming molecular clouds

Stars like the Sun form from molecular clouds with very low densities that can stretch over several parsecs in space. As part of the earliest phase of star formation these clouds are compressed and begin to collapse into one or more dense stars under the influence of gravity. We can detect signs of molecular cloud infall by looking for the blue-asymmetric spectral line infall signature at millimeter and submillimeter wavelengths. Unfortunately it is hard to determine the exact rate of infall, the parts of the clouds that are infalling, or the structure within the cloud without constructing an elaborate physical model and using a radiative transfer simulation to predict the radiation emitted from the modeled cloud. This sort of simulation can take many minutes or even hours to produce. By making a few simple assumptions it is possible to construct a model collapsing cloud whose radiative emission can be analytically calculated in less than a second. These models are much easier to fit to observations, and are remarkably accurate at gauging a cloud's infall rate. This is a case where, contrary to conventional wisdom, constructing a simple model and using proper assumptions yield better results than trying to construct the most physically realistic model possible.

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Thursday, March 18, 2010
4:00-5:20 PM - MND 1015

Open and free to all students, faculty, and public