Towards a Laboratory Analog of Molecular Pillars

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March 22, 2012

Abstract

Molecular pillars at the edge of HII regions, such as those of the Eagle and Pelican nebulae, are some of the most beautiful objects in the sky. The physics behind such pillars is determined by intense UV radiation from nearby bright young stars. The radiation causes different physical processes to come into play: hydrodynamic instability, photoionization, ablation, recombination, molecular heating and cooling. This diverse environment is amenable to coordinated study with observations, theory and modelling, and HEDLA.

We have obtained new mm-wavelength spectral line observations with the Combined Array for Research in Millimeter-wave Astronomy (CARMA) to look at the underlying structure of dense gas in these objects. Using well-established structure-finding algorithms, we examine the mass, size, density, and velocity distributions of dense clumps in the pillars. These results can be compared to simulations of photoionized pillars which capture expected morphology at various stages of evolution. The understanding of resultant dense gas distribution is crucial for designing a proper NIF target to be used in a well-scaled HEDLA experiment.