

Molecular Cloud and Star Formation from Galaxy to Sub-Cloud Scale A Detailed Study of Andromeda and NGC6822

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I summarize results from a large CARMA survey to image CO(1-0) emission at high sensitivity and resolution (20pc, 1km/s) in the nearby Andromeda galaxy (M31). This survey augments a new extensive set of multi-wavelength data including Galex, Hubble, Spitzer, Herschel, VLA photometry and spectroscopy that provide an unprecedented knowledge of the stars, dust, and gas in M31. We are able to measure the properties of 800 giant molecular clouds (GMCs) and perform a statistical study of GMC properties across a wide range of environments. We determine the requirements for GMC formation, measure their lifetimes, and study the timescale and efficiency of feedback. Using extinction modeling of Hubble data, we construct for the first time 3D morphology and dynamics of GMCs in an external galaxy allowing us to test models of molecular cloud growth via cloud collision.

New high-resolution (2pc, 1km/s) ALMA CO(2-1) observations of the Local Group dwarf galaxy NGC6822 allow for the first time to study the sub-structure of extragalactic GMCs and to study the effect of low-metallicity on cloud structure and the star formation process. I will present first results from this survey that will inform us on the star formation process at low metallicities that remains an essential but so far poorly constrained regime.