JCMT SCUBA-Diving in Nearby Molecular Clouds: The Case for Large Systematic Surveys with FIRST.

D. Johnstone
Dept. of Astronomy, University of Toronto, Toronto, ON, Canada, M5S 3H8
johnstone@astro.utoronto.ca

I will present results from two sub-millimetre surveys of nearby molecular clouds: ρ Oph, Taurus, Orion A and Orion B. Combining large area (100's of square arcminute) JCMT continuum emission images at 450μm (8") and 850μm (14"), sensitive to $\sim 0.01\,M_{\odot}$ condensations, with molecular line data (CO isotopes, CS, formaldehyde, etc.) allows for a glimpse into the physical properties of molecular clouds on small scales. Both barely resolved condensations and large scale features are visible in the maps, revealing the variety of dynamical events which operate in star forming regions. I will discuss the important physics associated with these regions, as evidenced by the survey results: the formation of filamentary structures with threaded magnetic fields, sculpting of the medium by outflows, shocks in jets, and the temperature and dust emission properties of both large scale and compact structures. I will also present a model of the many compact clumps found in the dust continuum images in order to derive their physical properties - mass, temperature, and bounding pressure. The cumulative mass function for the clumps in both Orion and ρ Oph is remarkably similar to the stellar IMF. These results will be used to argue for a strong multi-wavelength and multi-instrument survey component to the FIRST mission in order to best unlock the secrets of star formation in molecular clouds.