TURBULENCE IN MOLECULAR CLOUDS: 13CO MOPRA OBSERVATIONS OF THE GIANT MOLECULAR CLOUD ASSOCIATED WITH RCW106

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A comprehensive theory of star formation, that can be applied from the smallest to the largest scales, remains one of the major unsolved problems of astrophysics. Although much has been learnt in the past decade about how low-mass stars form in isolated mode, this type of star formation accounts for only about 10 per cent of all stars formed. Recently (e.g. MacLow & Klessen 2004), a new `turbulent\' model for star formation has been suggested that potentially provides a unified explanation of star formation from the smallest to the largest scales, from small dark molecular clouds to starburst galaxies. However, this model is based on numerical simulations that are highly dependent on initial conditions and these must be constrained by observations. To this end, we have instigated a multi-molecular line survey of a Giant Molecular Cloud (GMC) complex in the southern Galactic Plane, that will help provide these constraints. The GMC complex we have chosen, which is associated with the H-alpha region RCW106, is hitherto relatively uninvestigated and contains regions of both high- and low-mass star formation. By observing this GMC in molecular lines that are tracers of differing density conditions (e.g. 13CO, C18O, CS, HCN, HNC, HCO+, N2H+), we will be able to investigate the power spectra of the turbulence distribution from low-mass to high-mass star-forming regions. We are using the newly-available on-the-fly mapping capability of the ATNF Mopra Telescope to make these molecular line observations. I will discuss the way in which this Mopra survey will be used in conjunction with other observational programs to determine the role of turbulence in massive star formation. I will present the first results from our study, which commenced in the Winter 2004 observing season, when over a 10-week observing period we mapped a ~1 degree square region of the GMC in 13CO. The data we are obtaining through this ongoing Mopra survey will also enable a precursor study of the science that will become more widely-available with the advent of the Atacama Large Millimetre Array (ALMA).

References

Mac Low M & Klessen R S, ``Control of star formation by supersonic turbulence\'\', 2004, RvMP, 76, 125