Triggered Star Formation in a Turbulent ISM
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The Mopra DQS survey of the G333 region

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Any successful model of star formation must be able to explain the low star forming efficiency of molecular clouds in our Galaxy. If the collapse of gas is regulated only by gravity, then the star formation rate should be orders of magnitude larger than the 1 $M_\odot$ per year within our galaxy. The standard model invokes magnetic fields to slow down the rate of collapse, but does not explain star formation in cluster mode, or the lack of observed variations in the chemistry of molecular clouds if they are long-lived entities.

Turbulent models invoke turbulence to regulate star formation, but require continuous injection of energy into the ISM to counter the rapid decay of turbulence observed in numerical simulations (Stone, Gammie & Ostriker 1998). The sources and their relative importance are as yet unclear but probably include outflows due to massive star formation, expanding supernova bubbles and large-scale galactic flows of gas.

We are using the Mopra telescope to survey a 1.5×1 degree region around G333.6-0.2 (the DQS) in a number of molecules tracing different densities, to examine the relationship between turbulence and star formation. A multi-line dataset will also allow us to look at the relationship between interstellar chemistry and turbulence.

During 2004, we observed ^{13}CO, and in Bains *et al.* (2006) we present analysis of the structure using clumpfind and comparison to the 1.2-mm continuum. During 2005, we observed C^{18}O and CS in the dense regions. A new digital filterbank (MOPS) has recently been installed that allows up to 8 different simultaneous 138 MHz bands of 4096 channels over 8 GHz in the zoom mode. We observed CS and C^{34}S in 2005 simultaneously with a (2 band) prototype of this system, and in the 2006 Winter season we are observing 8 bands including HC_3N, HNC, HCN, HCO^+, C_2H, H^{13}CN and H^{13}CO$^+$ and expect to observe another 8 bands by the end of the season.

Comparing the distribution of molecular transitions that trace gas of different densities can help in constraining the turbulent driving scales and strengths (Ballesteros-Paredes & Mac Low 2002). Strongly driven turbulence (i.e. greater energy injection into the ISM) leads to larger density fluctuations about the mean density than weakly driven turbulence.

We are using a variety of methods to characterise and compare the spatial and velocity structure in the DQS region: Power spectra (Jones *et al.* 2006, these proceedings); Gaussclumps (Stutzki & Guesten 1990; Kramer *et al.* 1998); Delta variance (Stutzki *et al.* 1998; Bensch, Stutzki, & Ossenkopf 2001); Velocity channel analysis (VCA) (Lazarian & Pogosyan 2000); Cross correlation of emission from different tracers.

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