Dissecting the G333 Giant Molecular Cloud
The Mopra DQS Survey

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We have undertaken a molecular line mapping survey of the G333 GMC-complex – the DQS survey – using the 22-m Mopra millimetre-wave telescope in Australia, equipped with a new 8 GHz bandwidth digital filter bank (the MOPS). We have mapped the spatial and velocity distribution of ~20 different molecules and isotopomers emitting in the 3mm-band. Our aim is to obtain a comprehensive picture of star formation through an entire GMC, with an emphasis on the role of turbulence in its regulation. In this poster we present an overview of the results, including some of the specific investigations underway on interesting objects found at early stages of the star formation process.

Overview:
The DQS survey takes in a 1°x2° (80x40pc) region covering the ~106M⊙ G333 GMC (including RCW 106), 3.6kpc away in the southern Galactic Ring. This includes the complete range of phenomenon associated with star formation. It uses a 35′ (0.6pc) beam and 0.1 km/s spectral resolution. The first measurements, of the 13CO line, used an SIS receiver and 64 MHz correlator (see Bains et al. 2006, MN, 367, 1609). With the commissioning of the MOPS 8 GHz spectrometer (see figure to right), allowing the simultaneous measurement of 8 lines, we have now obtained velocity cubes in ~20 molecular species.

The Mopra Molecular Line Maps
Velocity-integrated maps of the molecular line emission from 12 species in the DQS. These maps were obtained with just 2 separate settings of the MOPS correlator, and made using on-the-fly (OTF) mapping. The overall map is a mosaic of individual scans each covering 5°x5°, scanned in both RA and Dec directions. See Lo et al. 2008 for further description and analysis.

Collect and Collapse?
One example of an intriguing source within the DQS: A ring of PAHs emission seen by Spitzer at 8µm (L) appears to be expanding into and compressing molecular gas (C18O; C), with a velocity gradient of ~4 km/s across it, seen in the slices in both C18O and CS (R) – collect and collapse star formation at work? Further analysis will be presented in Cunningham et al. 2008.

Gas and Dust: massive cold, dense cores
Three views of the DQS: (L) 3D velocity cube in the 13CO line (velocity axis in red), revealing the ~5 km/s velocity width of individual cores and a ~0.2 km/s gradient along the 70pc-long axis of the GMC (5 x galactic rotation) – see Bains et al. 2006 and Wong et al. 2008. (C) Spitzer GLIMPSE view, at 3.6+4.5+8.0µm, overlaid with the Mopra N2H+ contours revealing where the dense gas cores are. (R) Dust emission – 21µm image (MSX) overlaid by contours of 1.2mm (SEST/SIMBA; Mookerjea et al. 2004) – seen to have a similar distribution to dense gas tracers such as N2H+. Many dust cores are only seen at 1mm, showing that they are extremely cold (i.e. < 50K). See Burton et al. 2008 for further analysis, with a particularly cold core with evidence for an outflow examined in detail in Lo et al. 2007, MN, in press.