Triggered Star Formation in a Turbulent ISM
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Angular power spectra of Galactic HI

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Abstract. As an alternative to identifying and then studying particular features seen in Galactic HI 21-cm images, studies of the angular power spectra of the emission provide a concise, statistical description of HI emission. The angular power spectra of several fields near $l = 140^\circ$, from the Canadian Galactic Plane Survey, as observed with the DRAO Synthesis Telescope, have been analysed in this way. The derived power spectra, which typically cover angular scales from about 0·15 to 0·9 degree, are generally well-fitted by a simple power-law dependence on angular scale.

Keywords. ISM: structure, turbulence, techniques: interferometric, radio lines: ISM

Images of Galactic HI emission show a variety of features over a wide range of scales. Rather than investigate particular features identified as 'interesting' by eye – which usually represent a small subset of an observed HI data 'cube' – I have made a study of a statistical description of the whole of the HI observed in several fields, using angular power spectra.

The 21-cm HI data are taken from the Canadian Galactic Plane Survey (CGPS, see Taylor *et al.* 2003), which measures Galactic HI emission using the DRAO Synthesis Telescope. This interferometer has baselines between ≈13 and 600 mm – i.e. an angular resolution of ≈1 arcmin – and an ≈2° field of view. The method used to analyze the data is to derive an angular power spectrum for the HI emission, over a range of different angular scales, from the observed visibilities (which extends an earlier study of one field made by Green 1993). This method is in contrast to other studies of the angular power spectrum of HI emission, e.g. Dickey *et al.* 2001, which work from mosaiced images, which have been synthesised from the observed visibilities, and then back Fourier transformed. These angular spectra may be related to the underlying turbulence in the ISM. The method estimates the angular power spectrum of noise, as observed in velocity channels where there is no HI emission, and the appropriately scaled noise power spectrum is removed from the observed visibilities. The 'noise removed' visibilities are then averaged in logarithmically spaced annular bins in the *uv*-plane, which is very well sampled by the DRAO Synthesis Telescope observations.

Several fields in the Galactic plane, near $l = 140^\circ$ which are free from obvious HII regions and SNRs have been analysed, with HI emission typically measured over angular scales from ≈ 0·15 to 0·9 degree. Generally the angular power spectra are well described by simple power laws, with power $\propto r^{-(2{\cdot}5 \text{ to } 3{\cdot}0)}$ (where r is radius in the *uv*-plane). However, unlike the studies of the HI in the inner Galaxy (Dickey *et al.* 2001), preliminary results do not show a clear steepening of the angular power spectra when the velocity over which the analysis is made is increased.

References

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