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Mopra Central Molecular Zone Carbon Monoxide Survey Status

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Abstract. We present an update on the Mopra Central Molecular Zone Carbon Monoxide (CO) survey, with data taken in 2016 extending the original $3.5^\circ \geqslant l \geqslant 358.5^\circ$, $+1.0^\circ \geqslant b \geqslant -0.5^\circ$ to $4.0^\circ \geqslant l \geqslant 358.0^\circ$, $+1.0^\circ \geqslant b \geqslant -1.0^\circ$. Using the four simultaneously observed lines of ^{12}CO, ^{13}CO, $C^{18}O$, and $C^{17}O$ Nyquist sampled at $0.6'$ spatial and 0.1 km/s spectral resolution, we are building an optical-thickness-corrected three-dimensional model of the diffuse gas, and making cloud mass estimates. This data, as part of the Mopra Southern Galactic Plane CO Survey (Braiding *et al.* (2015), Burton *et al.* (2013)), is at the highest resolution available across such a widespread region, and includes the Sagittarius A, Sagittarius B2, Sagittarius C, and G1.3 cloud complexes, as well as Bania's Clump 2.

Keywords. ISM: clouds, Galaxy: center, radio lines: ISM.

The Central Molecular Zone (CMZ, Morris & Serabyn (1996)) is an ideal target for molecular line studies. As the name suggests, molecular species are detected broadly across this region, when they would normally be confined to the scales of individual giant molecular cloud cores.

Existing surveys at 3mm (Jones *et al.* (2012)), 7mm (Jones *et al.* (2013a)), and 12mm (Purcell *et al.* (2012), Walsh *et al.* (2011)) have all been undertaken by the Mopra radio telescope, but these did not include the diffuse gas tracer Carbon Monoxide (CO), a common proxy for molecular Hydrogen (H_2). The Mopra Southern Galactic Plane Survey (Burton *et al.* (2013), Braiding *et al.* (2015)), of which the CMZ is a subset, is mapping from $l = 265^\circ$ up to $l = 10^\circ$ at $b \leqslant 0.5^\circ$ and extending to $b \leqslant 1.0^\circ$.

The optically thin isotopologue lines $C^{18}O$ and ^{13}CO will be used respectively to correct the optically thick ^{13}CO and ^{12}CO in the CMZ dataset. This will allow the column density of different clouds to be calculated. The distribution and dynamics of the diffuse emission will also be modelled, potentially using software such as `SCOUSE` (Henshaw *et al.* (2016)).

Synergies with the High Energy and Very High Energy (VHE) regimes also exist for this dataset, as both Fermi (Ajello *et al.* (2016)) and H.E.S.S. (Aharonian *et al.* (2006), HESS Collaboration (2016)) utilise gas data when modelling the distribution of target material available for the hadronic production of γ-rays. The next generation VHE observatory, the Cherenkov Telescope Array, will have both greater sensitivity and resolution than current instruments (Bernlöher *et al.* (2013)), such that the Mopra CO Survey will provide a legacy dataset for corresponding future analyses.

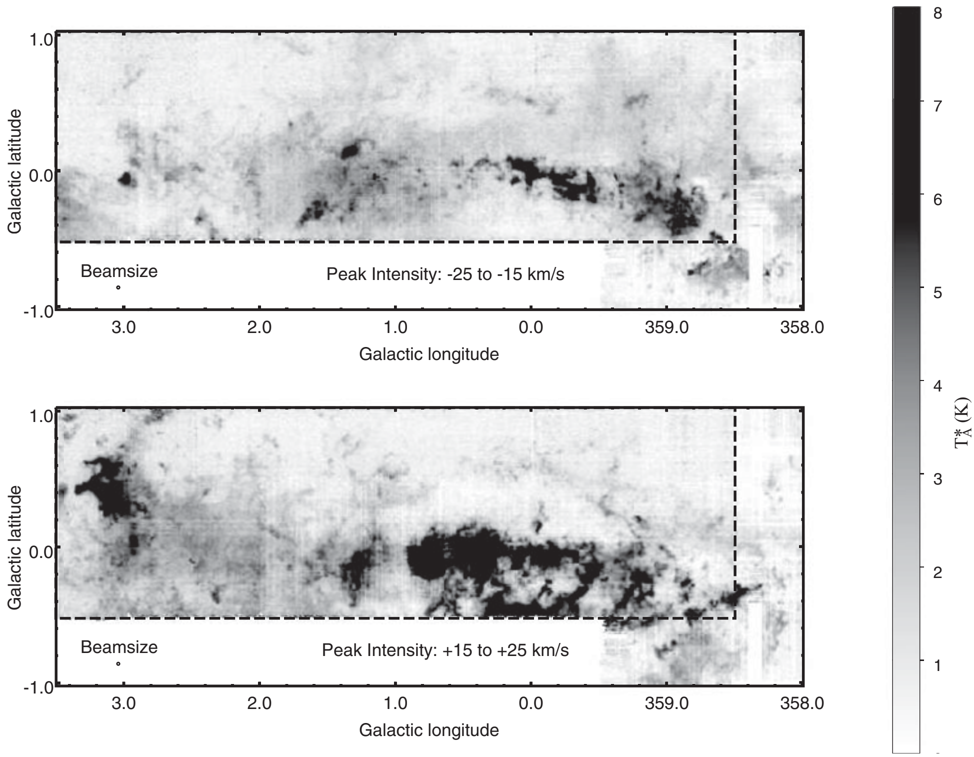

Figure 1. Peak intensity of the Mopra CMZ ^{12}CO data in two 10 km/s intervals. The average peak T_{rms} of this data is 1.6 K.

In Figure 1 the original extent of the survey is shown within the dashed line; outside this area is extension data which has only undergone preliminary cleaning. In both intervals it is evident that structures of interest continue beyond the initial observing area, motivating the extension. Further, although only 20 km/s separate the intervals, a rapid change in structure has taken place, indicating that the resolution of the Mopra CMZ CO Survey is capturing many intricacies of the molecular gas dynamics.

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