

# The Australia Telescope campaign to study southern class I methanol masers

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**Abstract.** The Australia Telescope Compact Array (ATCA) and the Mopra facility have been used to search for new southern class I methanol masers at 9.9, 25 ( $J = 5$ ) and 104 GHz, which are thought to trace more energetic conditions in the interface regions of molecular outflows, than the widespread class I masers at 44 and 95 GHz. One source shows a clear outflow association.

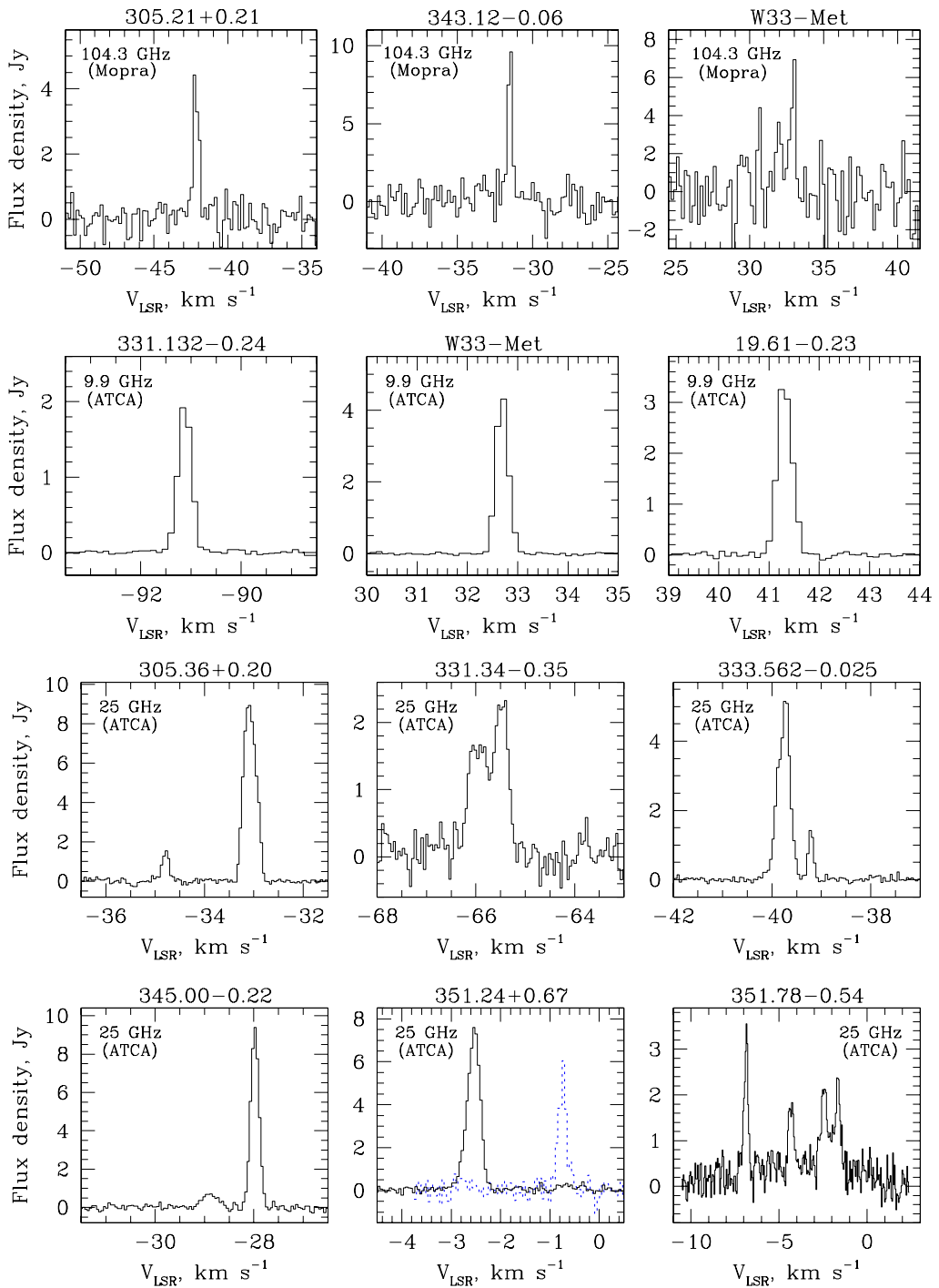
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A number of surveys have been carried out to investigate various class I methanol masers and to search for an association with the other constituents of a typical massive star-forming region. The ATCA 9.9 GHz and Mopra 104 GHz surveys indicate that these masers are rare (three detections out of 40 targets and two detections out of 69 targets, respectively) confirming the results of the previous searches (Slysh *et al.* 1993; Voronkov *et al.* 2005). In contrast, there were 67 detections at 25 GHz ( $J = 5$ ) out of 102 targets observed (ATCA observations, but no accurate positions were measured for the majority of the sources), although these masers were also previously believed to be rare following a survey of Menten *et al.* (1986). Unlike the spectra of the 44 GHz masers, the spectra of 9.9, 25 and 104 GHz masers appeared to be quite simple (small number of components) and no significant correlation between the flux densities has been found. This is in line with the theoretical prediction that these masers require more energetic conditions (higher temperatures and densities) to form (Sobolev *et al.* 2005). Only one source, G343.12-0.06 (IRAS 16547-4247), was active in all observed transitions. Its detailed observations showed a remarkable association with a jet-driven molecular outflow (see Voronkov *et al.* 2006 for details). The spectra of detections are given in Fig. 1. The 25 GHz spectra are given only for the sources with measured accurate positions. A table with the absolute positions of maser spots is available in the poster which is available from the M. Voronkov, or can be downloaded from the maser meeting website.

## References

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**Figure 1.** The spectra of the 104 GHz (top row), 9.9 GHz (second row) and 25 GHz (two bottom rows) maser detections. The 25 GHz spectra are given only for the sources with measured accurate positions. The dotted (blue) spectrum for G351.24+0.67 corresponds to an offset component (see the poster referred to in the text).