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H_2O maser observation using the 26-meter Nanshan Radio Telescope of the XAO

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Abstract. In the past few years, we have performed a 22 GHz H_2O maser survey towards hundreds of BGPS sources using the 25-meter Nanshan Radio Telescope (NSRT) of the Xinjiang Astronomical Observatory, and detected more than one hundred masers. Our aim is to study star formation activities associated with these sources, as well as search for any correlations that may exist between 22 GHz H_2O masers and the evolutionary stage of high-mass star formation regions. The NSRT has been upgraded and have now an effective diameter of 26 meter. Besides, cryogenically cooled dual-beam receiver systems covering seven millimeter-wave observing bands have been installed on the NSRT. For the next step of maser observation, we will continue to do H_2O and SiO masers survey of massive dust clumps and monitor some maser sources.

Keywords. masers, stars: formation, radio lines: ISM

1. Introduction

Many unbiased pilot surveys for Galactic water masers suggest that interstellar H_2O masers are very abundant, are the most popular maser species, and one of the most sensitive and reliable tracers of newly forming massive young stellar objects in the Milky Way (MW) (e.g., Caswell & Breen 2010, Walsh *et al.* 2011). At the early stage of star formation, H_2O maser act as a good probe for discovering invisible stars which are shielded by the dust in the surrounding molecular cloud, and also for measuring the physical parameters of the environment. Very long baseline interferometry (VLBI) observations of H_2O masers are used to measure accurate distances via their trigonometric parallax (Hachisuka *et al.* 2006). Moreover, they have also been successfully used to infer properties of the magnetic field in the massive star-forming region W75N (Surcis *et al.* 2011). Therefore, finding more interstellar H_2O masers is important to understand high-mass star formation and construct the MW's structure.

In this paper, we focus on 22 GHz H_2O masers that were observed using the previous 25-meter Nanshan Radio Telescope (NSRT) of the Xinjiang Astronomical Observatory. In the past few years, we have performed a maser survey towards hundreds of Bolocam Galactic Plane Survey (BGPS) sources (Xi *et al.* 2015, Xi *et al.* 2016). After the completion of the upgrade, the NSRT has become a 26 meter effective diameter radio telescope with high-precision tracking and pointing. We have also installed a cryogenically cooled dual-beam receiver systems covering seven millimeter-wave observing bands on it. In the next months, we are planning to do an H_2O maser survey in single-pointing mode towards 481 molecular clouds identified by Du *et al.* (2016), of which 457 probably belong

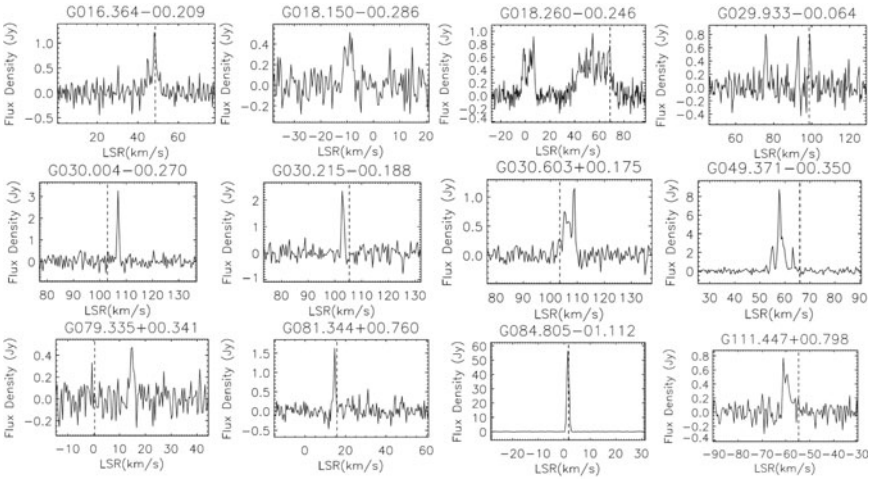

Figure 1. Examples of newly detected H_2O masers.

to the Outer arm. The molecular clouds with H_2O masers will then be used to delineate the Outer arm through VLBI observation using the trigonometric parallax method.

2. Results

We have performed an H_2O maser survey towards BGPS sources twice, once for 221 BGPS sources in the v1.0 catalogue that have 1.1mm fluxes exceeding 5 Jy and once for 274 BGPS sources located at $85° < l < 193°$. Finally, we detected 132 H_2O masers in total, of which 17 are new (Fig. 1). The detection rates of H_2O masers are 48.4 per cent and 9 per cent, respectively for the two samples (see Xi *et al.* 2015 and Xi *et al.* 2016 for details). In addition, we obtained the position of the new H_2O masers using OTF observations. Moreover, we found that the detection rate of H_2O masers is correlated with the continuum emission fluxes of BGPS sources at FIR, sub-millimetre and millimetre wavelengths.

Acknowledgements

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