

Astrometry of H₂O Masers in Massive Star-forming Region S255IR-SMA1

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We report the astrometric results of H₂O masers in S255IR-SMA1 with VERA (VLBI Exploration of Radio Astrometry). The annual parallax was measured to be 0.563 ± 0.036 mas, corresponding to the source distance of $D = 1.78^{+0.12}_{-0.11}$ kpc. Maser morphology and its proper motion appear to trace a U-shaped bow shock propagating away from MYSO. These results are reported in Burns et al. (2016) [1], in detail.

Whether or not the outflows of low- and high-mass stars are produced in the same way is not well known. S255IR-SMA1 is the brightest source of molecular line emission in the S255IR star-forming region and its stellar mass is estimated to be $\sim 20 M_{\odot}$. S255IR-SMA1 is an ideal target to study the relationship between outflows and jets in an MYSO. We pursue VLBI observations aimed at measuring the annual parallax, distribution and proper motions of H₂O masers in S255IR-SMA1.

The observations were carried out using VERA from 23 Nov. 2008 to 11 Aug. 2010. S255IR-SMA1 and the positional reference source J0613+1708 with the separation of 0.87° were simultaneously observed with the dual beam. The correlation processing was done using Mitaka FX correlator.

Figure 1 shows the annual parallax of S255IR-SMA1. The parallax was obtained to be $\pi = 0.563 \pm 0.036$ mas, corresponding to a source distance of $D = 1.78^{+0.12}_{-0.11}$ kpc. Figure 2 shows the distributions and internal proper motions of H₂O masers. The elongated NE-SW morphology and bipolar outward motions of masers suggest that they are associated with an ejection event from an MYSO. The 3D velocity of each jet lobe is estimated to be 19 km s^{-1} with respect to the MYSO, with a position angle of 49° . The maser group in SW appear to trace a U-shaped bow shock structure. This structure is well reproduced by the jet-driven outflow model with a jet radius of about 6 AU.

Reference

[1] Burns, R. A., et al.: 2016, *MNRAS*, **460**, 283.

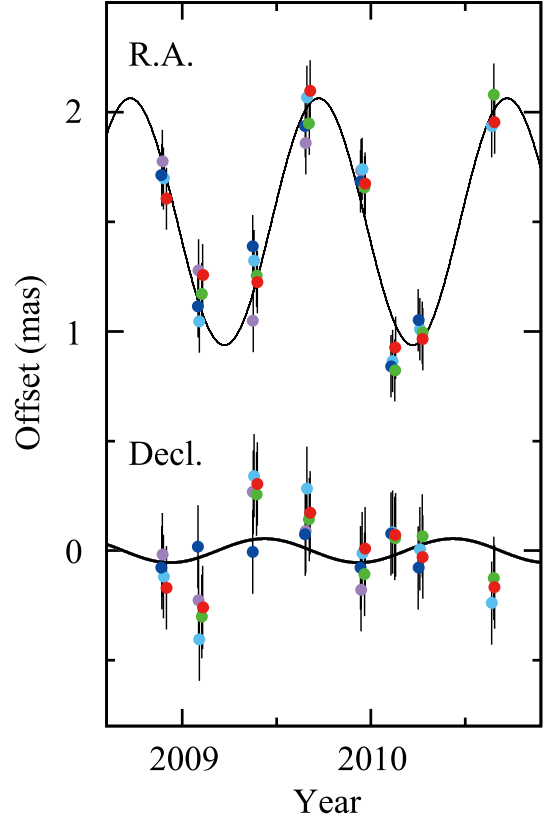


Figure 1: Annual parallax of S255IR-SMA1.

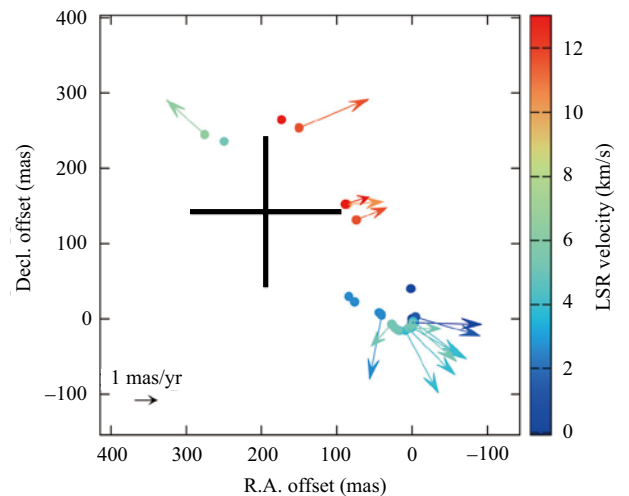


Figure 2: Distributions and internal proper motions of H₂O masers in S255IR-SMA1. The color indicates the LSR velocity. The black cross indicates the position of the centimetre continuum source. 1 mas yr^{-1} corresponds to 8.4 km s^{-1} at 1.78 kpc .