

Astrometric observations of water maser sources toward the Galactic Center with VLBI

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Abstract

The Central Molecular Zone (CMZ) in the Galactic Center region shows outstanding non-circular motion unlike the Galactic disk. Although several models describing this non-circular motion are proposed, and uniform kinematic model of the CMZ orbit is not appeared. Three dimensional velocity information including proper motions will be critical to constrain the orbital models of the CMZ because most of models proposed are devised to reproduce the line-of-sight velocity profiles of the molecular clouds in this region.

To reveal the dynamics of the Galactic center region, we conducted VLBI astrometric observations of 22 GHz water maser sources toward the Galactic center with VERA. By measuring parallaxes and proper motions, we can identify whether each source is actually located in the CMZ or not, and identify the three dimensional positions and velocities in the non-circular orbit if the source is located in the CMZ. We show the results of astrometric study for several maser sources associated with molecular clouds toward the Galactic center including Sgr B2 complex and Sgr D HII region. The parallax measurement toward Sgr B2 obtained the parallax of $0.133 \text{ mas} \pm 0.038 \text{ mas}$, and its proper motions indicated that Sgr B2 complex is moving toward the positive Galactic longitude with $V = 100 \text{ km s}^{-1}$ relative to Sgr A*.