Preliminary results from the VERA monitoring of the water fountain source IRAS 18113–2503

Gábor Orosz¹, Hiroshi Imai¹, José F. Gómez², J. Ricardo Rizzo³, Olga Suárez⁴, Ross Burns¹

¹Graduate School of Science and Engineering, Kagoshima University, 1-21-35 Korimoto, Kagoshima 890-0065, Japan
²Instituto de Astrofísica de Andalucía, CSIC, Apartado 3004, E-18080 Granada, Spain
³Centro de Astrobiología, CSIC-INTA, E-28850 Madrid, Spain
⁴Laboratoire Lagrange, UMR 7293, Université de Nice Sophia-Antipolis, CNRS Observatoire de la Côte d’Azur, 06300, Nice, France
*Contact: gabor.orosz@gmail.com

Water fountain sources are evolved stars with morphologically and kinematically highly collimated fast jets traced by water maser emission (Imai et al. 2002). Interferometric observations showed that the maser emission is shock-excited in bipolar outflows, which are likely driven by magnetohydrodynamical processes (Vlemmings et al. 2006). Water fountain sources are believed to be associated with a very short transitory phase in late stellar evolution (~1000 years) after the asymptotic giant branch period, which should play an important role in the sculpting of the intricately shaped planetary nebulae (Sahai and Trauger 1998). Due to the short lifespans of water fountain sources, only about a dozen have been discovered so far, which makes the detailed study of each one important.

This water fountain is located towards the Galactic Centre in the Galactic thick disk, with jets spanning a very large line-of-sight velocity range of ~500 km/s. Both of the lobes show a high velocity dispersion as well, ~170 km/s. The blue- and redshifted water masers are clustered in two distinct O1 × O1 regions in the sky, separated by 0.12, with PA = −14º (Gómez et al. 2011). In order to measure the secular motion and parallactic distance to the water fountain, we started monitoring the brighter blueshifted lobe of the source with the Japanese VLBI Exploration of Radio Astrometry (VERA) network. Here we present preliminary results derived from the first two epochs, with a time separation of 69 days.

Based on the direction and line-of-sight velocity of the water fountain star, it has two possible kinematic distances. We can calculate the proper motion caused by the Galactic rotation at the two distances, then subtract it from our observed absolute maser proper motions (we did not model the effect of the parallactic motion). When we subtract the far distance proper motion, the residual motion matches the expected outflow from the VLA measurements of Gómez et al. 2011. However, when we subtract the near distance proper motion, the residual vectors are in complete disagreement with previous results. Thus D = 9.4 kpc is more likely.