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Determination of orbital parameters for a symbiotic star R AquariiCheulhong Min, Mareki Honma, Katsunori M. Shibata, Tomoya Hirota (NAOJ/SOKENDAI),
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R Aquarii (R Aqr) is one of the closest and most studied symbiotic binary stars composed of an AGB star (Mira variable) and a white dwarf showing prominent characteristics of jet-like features and two hour-glass like nebulae. These phenomena are closely related to the binary orbit and a mass-loss from the AGB star. However, the orbital parameters in R Aqr and mass-loss mechanism in AGB stars are subjects still under debate.

A radial velocity analysis has been widely used for determining orbital parameters, but its inclination cannot be measured. SiO masers in AGB stars are generally known to be formed within the dust formation region which is very closed to the photosphere about $2 \sim 4R_*$ showing a ring-like distribution. VLBI observations of SiO masers allow to determine the position of the AGB star as well as full orbital parameters combining with radial velocity. In this presentation, we report preliminary results of VERA observations from 2005 to 2014.

Throughout our observations, we measured a distance of 218_{-11}^{+12} pc yielding the highest accuracy. Combining VERA astrometry with radial velocity data, we directly estimated preliminary full orbital parameters, which provide implications for the phenomena in R Aqr. In addition, we found kinematic motions of SiO maser shells probably due to shock propagation. Our results give constraints on the inner-most region of current dynamic atmosphere models for understanding the mass-loss mechanism in AGB stars.