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VLBI OBSERVATIONS OF H_2O AND SIO MASERS IN LATE TYPE STARS

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ABSTRACT The results of a VLBI observation between Kashima 34 m and Nobeyama 45 m are presented. Water maser at 22.235 GHz and SiO masers at 43 GHz in some late type stars are mapped almost simultaneously. Data reduction is still on the way, then we report mainly for the blocking model of H_2O maser.

INTRODUCTION

From the single dish observations by using Kashima's 34 m telescope, we found that the H_2O masers in late type stars change their spectra (see Figure 1) with the star evolves (Takaba et al. 1992). The systematic changes of maser spectra can be explained by the beaming model. In the nearest region of the star, the gas motion must be highly random because of the super sonic gas outflow. Then maser is beamed toward the rim and the velocity coincided with the stellar systemic velocity. When the maser's emitting regions lie at more than 10 times of the stellar radius, it forms dust and gas/dust start expansion by the radiation pressure. In these cases, maser is beamed toward the line of sight and the maser emission splits into two peaks. The 43 GHz band SiO masers are thought to be excited by the stellar infrared radiation and the maser emitting region is always close to the star. The collisional excitation model of H_2O maser was proposed by Deguchi (1977). Cooke and Elitzur (1985) showed that the excitation of H_2O maser quenches when the gas density becomes too large because of the radiative processes. Then H_2O maser emitting region expands as the mass loss rate increases and we observe double peaked spectra. We also found that red shifted components are weak compared to blue shifted components in most of the IRC/AFGL objects, this is explained by a blocking model of the central star.

OBSERVATIONS

Observations were made among 4-7 June 1992. The system noise temperature at 22 GHz were about 200 K including sky noise in both stations. We used K-4 type data recorders developed in CRL. The correlation was done by using the NAOCO (National Astronomical Observatory Correlator), which is able to process 512 lags for each 16 channel.

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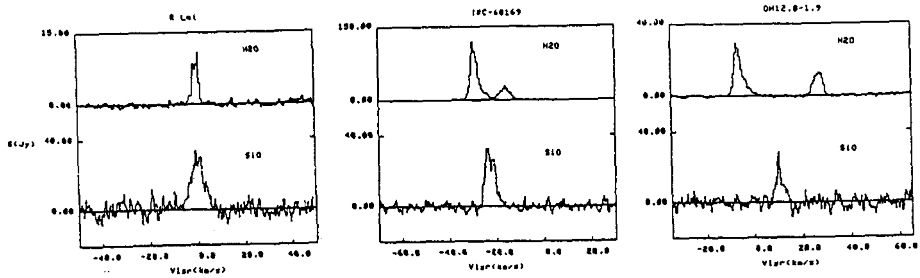

FIGURE I SiO and H_2O masers spectra in late type stars

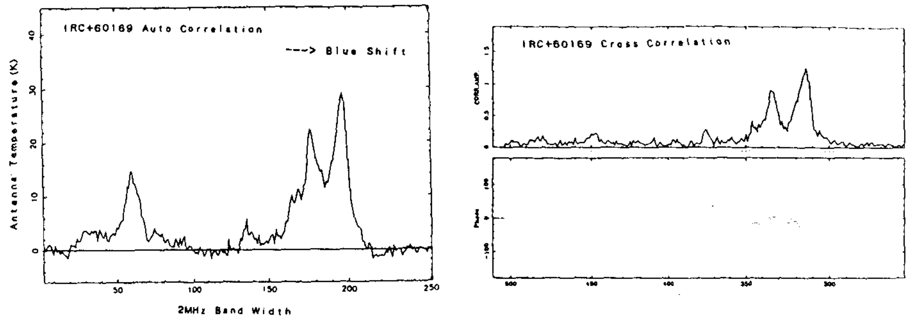

FIGURE II H_2O maser spectra of IRC+60169. Autocorrelation (left) and crosscorrelation (right)

RESULTS

Figure 2 shows an auto-correlation spectra (left) and a cross correlation spectra (right)in IRC+60169. The red shifted components are highly resolved out by the VLBI, which suggest that the compact red components are masked by the central star.

The IRC+60169 were mapped by the KNIFE, we will be able to obtain the spatial distribution of each component.

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