ABSTRACT The phase-lag technique of estimating distance to OH-IR sources is briefly described. Preliminary results are presented from a study of nine OH-IR sources in the galactic centre direction.

1. INTRODUCTION

OH-IR sources offer a promising new method to determine the galactic distance scale because their distances can be estimated in a direct way. The twin-peaked OH 1612 MHz maser emission comes from a thin shell of OH which is produced when H₂O molecules in the cool circumstellar envelope are photodissociated by the surrounding UV radiation field (Goldreich & Scoville 1976; Huggins & Glassgold 1982). The OH is excited by far infrared radiation from the star and inner dust shell to produce the 1612 MHz maser (Elitzur 1982). The angular radius of the OH maser shell can be measured accurately with radio interferometers such as MERLIN of the VLA (Diamond et al. 1985). As the masers are pumped by the infrared radiation so they follow the stellar cycle of the long-period variable star. This gives rise to a phase-lag (typically a few weeks) between the emission from the near and far sides of the shell. The phase-lag can be determined by monitoring the OH emission, and together with the angular size measurement this yields the stellar distance (Herman 1983). The method involves only the one assumption of a spherically symmetric maser shell, and this assumption can be checked directly from the data. The phase-lag should vary linearly with velocity across the OH spectrum, and the OH channel maps should show slices through the shell with apparent radius related in a simple way to the velocity. In the best cases the stellar distances can be determined to ~5%.
2. OBSERVATIONS

A collaborative project was started in 1985 at Jodrell Bank and Hartebeesthoek Radio Astronomy Observatory to study two groups of OH-IR sources and measure their distances. The first group of optically visible stars are also being monitored simultaneously at near infrared wavelengths at SAAO. These data will provide an independent check on the established period-luminosity relation for long period variables (Feast 1987). The second group of nine OH-IR sources which I want to talk about today lie within three degrees of the galactic centre. Most are believed to be galactic bulge sources because of their high velocities. OH monitoring observations are being carried out fortnightly at Hartebeesthoek, with backup at Jodrell Bank to cover the inevitable gaps. This is the most intensive OH-IR monitoring experiment undertaken to date, but covers only a small number of sources.

MERLIN observations have been made of the sources using four telescopes, with an angular resolution of 0.3x0.6 arcsec. Some of the unresolved sources were reobserved this year with longer baselines to Cambridge. This gives an improved angular resolution of 0.2x0.4 arcsec.

\[ \text{OH}357.7-0.1 \text{ 1612 MHz} \]

light curve of blue shifted peak

\[ \text{OH}357.7-0.1 \text{ 1612 MHz} \]

light curve of red shifted peak

Fig. 1 OH "light curve" for OH357.7-0.1, showing the peak flux densities of the red- and blue-shifted peaks as functions of time.