INFRARED SPECKLE INTERFEROMETRY OF OH-STARS

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We have begun a co-ordinated programme of high angular-resolution radio and infrared measurements to study the physical structure of the circumstellar envelopes surrounding high mass-loss OH-stars. Here we give near-infrared (NIR) angular diameters for 5 stars. For each of these stars the spatial distribution of the OH maser emission at 1612 MHz or 1665 MHz has been previously mapped[1,2,3].

The observations were taken in September 1983 using the 3.8m UKIRT telescope on Mauna Kea with the speckle-slit system and broadband UKT5 photometer in the K(2.2μm), L'(3.8μm) and M(4.8μm) bands. The NIR speckle observing technique used was similar to that described by Dyck & Howell (1982)[4]. For each source, between 6 and 18 visibility profiles were obtained giving the source visibility in the north-south direction as a function of spatial frequency. Averaged visibility functions and model fits to the data are shown in Fig.1.

The circumstellar envelopes of VX Sgr, NML Cyg and OH39.7+1.5 were partially resolved between 2.2μm and 4.8μm. For these sources we have obtained angular diameters by fitting a two-component model to our visibility data. The model assumes a point source contribution to the NIR emission from the stellar photosphere and a Gaussian distribution of the extended emission from the circumstellar envelope. Results are given in Table 1 where the columns are:

1) source name
2) stellar classification
3) near-infrared wavelength (λ)
4) best-fit percentage stellar contribution (A)
5) best-fit FWHM of the extended emission (α)
6) adopted stellar distance (D)
7) linear diameter of the infrared emission (d_{IR})
8) ratio of the OH-1665 MHz to infrared diameters (d_{1665}/d_{IR})
9) ratio of the OH-1612 MHz to infrared diameters (d_{1612}/d_{IR})

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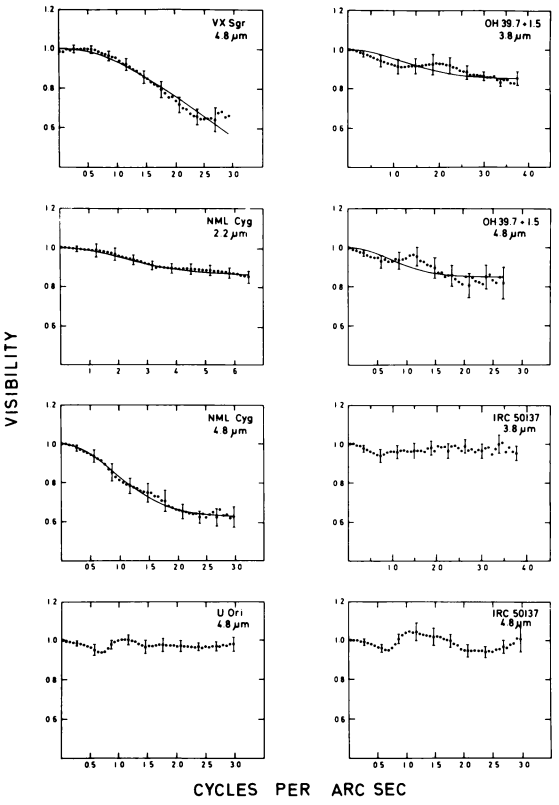

Figure 1. Near infrared visibility curves obtained for 5 OH-stars using speckle interferometry.

Table 1

SOURCE	CLASS	λ (μm)	A (%)	α (arcsec)	D (kpc)	d_{IR} (10^{15} cm)	$\frac{d_{1665}}{d_{IR}}$	$\frac{d_{1612}}{d_{IR}}$
VX Sgr	M4eIa-M9.5	4.8	11^{+23}_{-11}	0.15±0.03	1.7	3.8±0.8	0.4+1.3	11.1±2.4
NML Cyg	M6Ia	2.2	86±10	0.17±0.01	2.0	5.1±0.2	-	12.4±1.2
NML Cyg	M6Ia	4.8	62±10	0.42±0.01	2.0	12.5±0.3	-	5.0±0.5
OH39.7+1.5	OH-IR	3.8	85±10	0.32±0.05	0.8	3.7±0.6	-	9.2±1.5
OH39.7+1.5	OH-IR	4.8	85±10	0.52±0.13	0.8	6.2±1.6	-	5.5±1.5
IRC 50137	M10	3.8	*	<0.08	0.8	<1.0	-	>25.0
IRC 50137	M10	4.8	*	<0.10	0.8	<1.2	-	>20.0
U Orionis	M6e-M9e	4.8	*	<0.10	0.3	<0.5	>4.0	-

*Unresolved

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