THE VARIABILITY OF WATER MASER EMISSION ASSOCIATED WITH LONG PERIOD VARIABLE STARS

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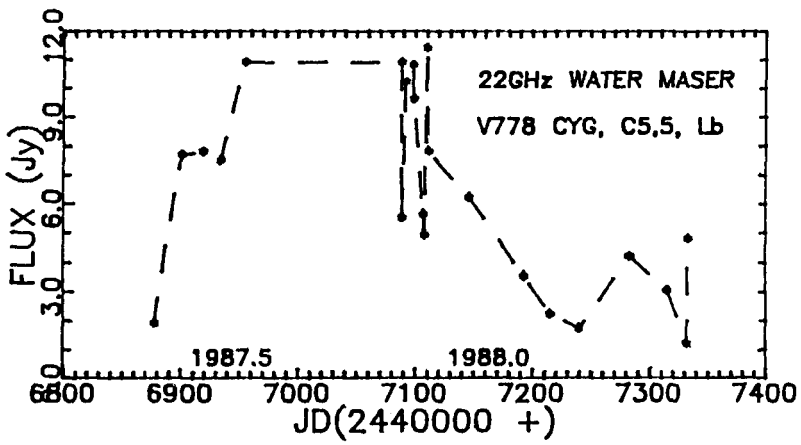
Since March 1988 we have monitored the 22.2 GHz H_2O maser line of 12 long period variable stars (LPV) with the 37 m telescope at the Haystack Observatory. We include the two Carbon stars V778 Cyg and EU And. The maser flux from V778 Cyg has varied by at least a factor of 5 from its detection level of 1.9 Jy on 1987 March with a possible period of a year. Figure 1 plots the 22GHz flux as a function of Julian date. We do not yet know whether the period will repeat. V778 Cyg also has shown variations in the intensity (by a factor of ~ 2) on a time scale as short as 15 hours. The water maser flux from EU And has decreased from its detection value of 8 Jy in 1986 November staying relatively weak at the 2-3 Jy level during the last year. We interpret both V778 Cyg and EU And as binaries, each with an M star component with a thick circumstellar shell and a C star component. The C star is brighter in the visual region where the system is classified whereas the M star is brighter at wavelengths > 5 μm. The circumstellar shell is the source of the strong silicate emission seen in the IRAS LRS spectra and of the water maser emission.

The first detected short period Miras, R Cet (P=166^d) and RZ Sco (P=157^d) show cyclic variations in the intensity of the maser emission. The maximum intensity for R Cet occurs progressively later at longer wavelengths, peaking in the infrared at phase 0.12 (in J), at 0.18 (in K) and between phase 0.20-0.25 at the radio (22.2 GHz) water maser line. However, the magnitude and the maximum of the maser flux appears to vary to a greater extent from cycle to cycle than does the visual lightcurve. Besides the above four stars we have also monitored the following eight stars: RX Boo (SRb, P=340^d), V CVn (SRa, P=192^d), AC Cyg (SRb, P=142^d), S Per (SRc, P=822), R Ser (Mira, P=356^d), T UMa (Mira, P=257^d), and T Vir (Mira, P=339^d). Preliminary indications are that many of the variables show maximum maser flux at phases between 0.2-0.3.



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