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THE NATURE OF V986 OPHIUCHI

The photometric variability of the early type star V986 Ophiuchi (HD 165174, HR 6747, 18 02 05 + 01 55 (1950), Sp 09.5 III) is well documented (Jerzykiewicz, 1975) although its true nature and interpretation remain elusive. Photometry has revealed a dominant variation of amplitude $0^m.014$ in both B and V with a period of $0^d.2907$. The amplitude is not constant and whilst its behaviour is reminiscent of the beat phenomenon seen in some β Cephei variables, Jerzykiewicz (1975) was unable to account satisfactorily for his observations in this way.

In 1978 we obtained both photometric and spectroscopic observations of V986 Ophiuchi. The photometric data are rather sparse but from them we conclude that the amplitudes of the $0^d.2907$ variation on JD 2443729 in the Strömgren system were $\Delta u = 0^m.021$, $\Delta v = 0^m.017$, $\Delta b = 0^m.017$ and $\Delta y = 0^m.015$ (each $\pm\ 0^m.002$) although the data do not cover a full period. There are indications that the data obtained on JD 2443732 and 2443733 would require a period nearer $0^d.4$.

During seven nights we obtained 53 spectra at a reciprocal dispersion of 15 Å/mm using the coudé spectrograph of the 1.9 metre reflector at the South African Astronomical Observatory. The high rotational velocity of this star (vsini ∿ 290 km/s, Watson 1972) which is apparent in Figure 1 makes accurate radial velocity determination difficult. However highly broadened systems have been successfully investigated (cf Pike et al. 1978 for investigation of α Trianguli).

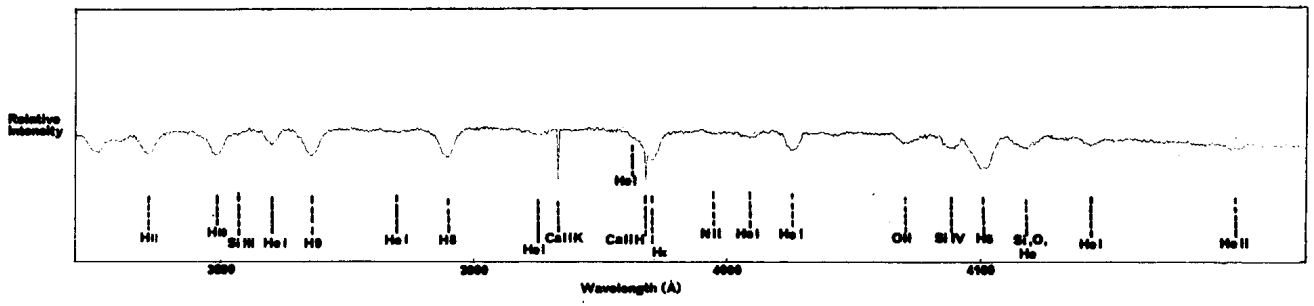

Fig.1 Part of the spectrum of V986 Ophiuchi. This plot is the intensity summation of nine spectra.

The spectra were measured on a PDS microdensitometer and analysed using the techniques described by Pike (1977). Fifteen lines including interstellar Ca II H and K were measured in each spectrum by fitting parabolae to density scans of the line profiles. The standard error of a single plate using 13 stellar lines is on average 15 km/s although the error on each nightly mean velocity is always < 2 km/s. The radial velocities of the interstellar lines are equally consistent. The errors on individual plates might be expected to mask any velocity variations associated with the $0^d.2907$ period. However on JD 2443732 a downward trend in the velocities was observed. A free-hand attempt to reconcile this with a sinusoidal variation of 10 km/s full amplitude and period of $0^d.2907$ yields a date for the downward crossing of zero relative velocity as JD 2443732.33 ± 0.01. Photometry was also obtained on this night and shows maximum light also occurring at JD 2443732.33 ± 0.01. This follows the known relationship between photometric and radial velocity variations of β Cephei stars. The velocities on other nights show no significant trends. On the two other nights for which we have photometry the star was on the descending branch of the light curve and therefore by the relationship mentioned above no significant velocity variations would be expected.

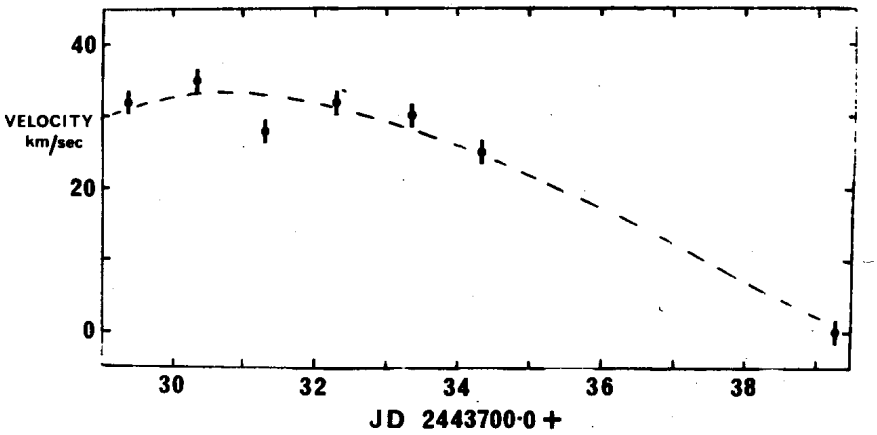

Fig. 2 The nightly mean velocities of V986 Ophiuchi.

We have calculated the nightly mean velocities of V986 Ophiuchi and plotted these in Figure 2. Radial velocities of this star published by Plaskett and Pearce (1931) show a very similar range. We conclude that V986 Ophiuchi is contained in a binary system with a period of approximately 20 days and a total amplitude $2K \sim 40$ km/s. This interpretation may account for the complicated light curve by providing for tidally induced effects as described by Fitch (1969).

At this stage our conclusions are tentative but we intend to pursue the matter in the forthcoming observing season. It is clear that much would be gained by having observations that cover a longer continuous period than is possible from one site. We would therefore be pleased to hear from anyone able to obtain data at a different longitude and who would be willing to collaborate in observing this star.

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