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BP OCTANTIS - A VARIABLE Am STAR

Bessell and Eggen (1972) reported short period variations of the Am star BP Oct (= HR 5491 = HD 129723 = DM -87°235); they indicated a period of about 0.08 day and a visual light range of 0.02 to 0.04 mag. Breger et al. (1972) observed BP Oct on one night and found no evidence of short period variability; from the spectrum they concluded that it was a classical Am star situated near the main sequence. There was no indication of spectral variation. Eggen (1973) also found that BP Oct did not vary, and suggested that he may have observed it during a low amplitude phase of the star.

We observed BP Oct in the Johnson V band on 13 nights during 1982 using the 0.41 m telescope at the Monash Observatory and the 0.41 m telescope at Siding Spring Observatory. Data taken on single nights confirm that no short period variations exist. Figure 1 illustrates V band measurements

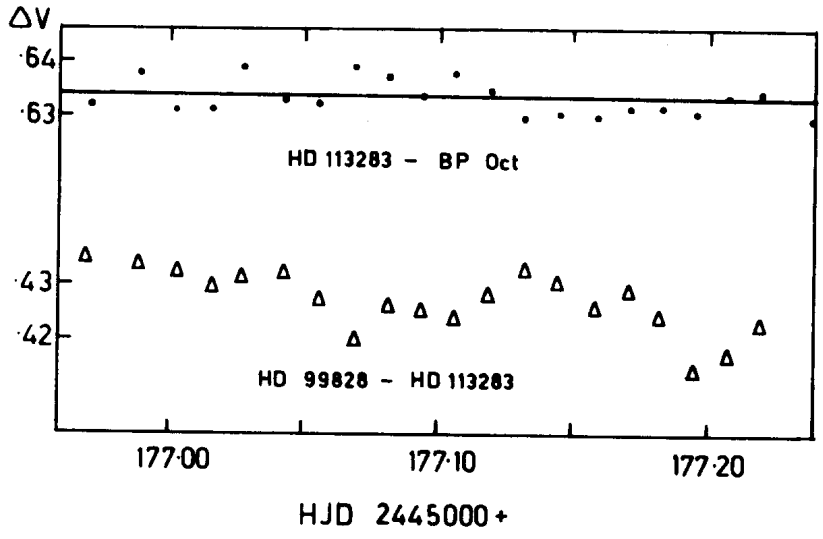

Figure 1

taken on HJD 2445177 where the r.m.s. variations were small. Fourier analysis of 95 measurements taken between HJD 2445068 and 2445177 also indicates that no short period variations (< 0.3 day) occur for BP Oct. However there is strong evidence for longer period variations (∿ 3 day). Table I gives the average magnitude difference for each night. HD 113282 (= DM -86°283) was chosen as the primary standard, differences between HD 113283 and HD 106461 (= DM -87°196) and HD 99828 (= DM -88°109) are also given for some nights. Because all stars were observed through similar air masses that remained essentially constant, differential extinction

Table I

No.	HJD (+244500)	HD 113282 - BP Oct	HD 113283 -HD 106461	HD 113283 -HD 99828	No. meas.	σ	σ_{mean}	Place
1	68.113	.612	.467		15	.009	.002	M
2	112.052	.635	.463		5	.010	.004	S
3	112.929	.624	.467		11	.011	.004	S
4	113.939	.622	.464		7	.008	.003	S
5	114.118	.628	.461		10	.012	.004	S
6	114.994	.637	.466		7	.010	.004	S
7	152.080	.620	.491		20	.006	.001	M
8	177.096	.634		-0.428	20	.005	.001	M
9	203.912	.618	.472	-0.428	5	.010	.004	M
10	225.169	.624			5	.003	.003	M
11	233.144	.626			5	.002	.001	M
12	234.135	.632			5	.006	.003	M
13	235.208	.624	.495		3	.010	.006	M
14	236.129	.621	.480		3	.004	.003	M

Notes to Table I Column 1 gives the number of the data point as it appears in figure 2. Column 2 lists the Heliocentric Julian Date while the next 3 columns give average magnitude differences. Column 6 lists the number of measurements from which the average was derived. Note that each measurement at the telescope is the average of about 100 seconds on the star. Columns 7 and 8 give the r.m.s. error in a single measurement and the r.m.s. error of the mean. 'S' in column 9 denotes measurements made at Siding Spring, 'M' denotes measurements at Monash.

corrections were small and colour corrections to the extinction were negligible.

Magnitude differences between HD 113283 and HD 106461 appeared to vary for measurements taken at the Monash Observatory. We later confirmed both photometrically and visually that a 10½ mag. star was sometimes being included in the aperture during measurement of HD 106461. This did not occur for the Siding Spring measurements as a smaller aperture was used. Colour corrections between measurements taken at Siding Spring Observatory and Monash Observatory were found to be negligible.

Figure 2 is a phase plot for data given in Table I. This best fit for

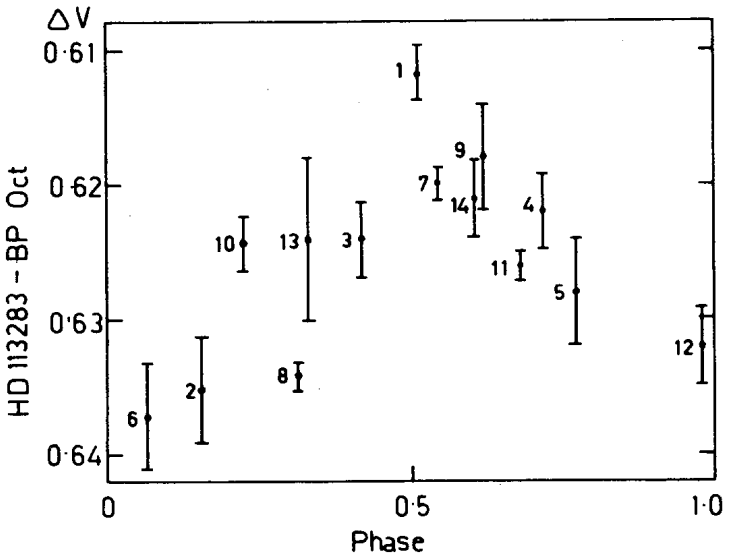

Figure 2

P = 3.225 day was obtained via a trial and error method programmed into a mini-computer. Intermediate and narrow band indices from several sources (Bessell and Eggen, 1972; Lindemann and Hauck, 1973; Grønbech and Olsen, 1976 and Eggen, 1979) are consistent with one another and indicate $M_V = 2.9 \pm 0.3$, log $g = 4.20 \pm 0.08$ and $T_e = 7480\,K \pm 100\,K$. Using our measured B-V of 0.29 for BP Oct and the (B-V),T_e calibration of Böhm-Vitense (1981) we calculate $T_e = 7480 \pm 200$ K in agreement with T_e determined from the c_1,(b-y) calibrations of Breger (1974).

Considering the position of BP Oct in the HR diagram, our reported 3 day variations are not consistent with radial pulsation. Binarity is not indicated and rotational phenomena can be discounted on the basis of slow rotation of Am stars. We tentatively suggest that, for some Am stars, the diffusion mechanism described by Baglin (1975) may lengthen rather than stop pulsation. Non-radial g-modes of pulsation responsible for longer period variations in ZZ Ceti stars are discussed by Unno et al.(1979), however, they do not give 1.5 $M_\odot$ models with which to compare our observations.

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