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DIFFERENTIAL UBV PHOTOMETRY OF THE CP3 STAR HD 89822

The CP3 star HD 89822 (HR4072, A0 HgSiSr) was selected from the paper of Gerbaldi, Floquet and Hauck (1985) to investigate the photometric period amongst Hg-Mn spectroscopic binaries. The membership of HD 89822 among the CP3 group has been definitely confirmed by Aikman (1976). Winzer (1974) found no evidence of significant variations and Catalano and Leone (1991) discovered a period of 7.5586 days which is substantially different from the known spectroscopic binary period of 11.5741 days. They used the same comparison stars as Winzer (HR 4026, HR 4215).

The observations have been carried out at Skalná Pleso and Stará Lesná observatories with the photoelectric photometers attached to 0.6 m reflectors. The comparison star was HD 88983 (HR 4026, A8III) and the observations were made in the sequence 3xS-3xV-3xS. Each observation of the star was followed by the sky background recording and the observations were corrected for differential extinction. The observations were made in overall number of 41 nights. Duration of a typical night run was 1.5 hour.

However, weather conditions enabled us to obtain quality observations needed for searching for periodicities of low amplitudes around 0.02-0.03 mag as few as 10 nights and 15 nights for Skalná Pleso and Stará Lesná observatories respectively. Table 1 lists the instrumental magnitudes in each filter. The night averages are given with corresponding rms errors. Raw data will be published elsewhere (Zboril 1994).

Catalano and Leone (1991) were able to fit their observations of HD 89822 by two sinusoidal light curves represented by the function

$$\Delta m = A_0 + A_1 \cdot \sin(2\pi((t - t_0/p) + \phi_1)) + A_2 \cdot \sin(2\pi((t - t_0/p) + \phi_2)) \quad (1)$$

where:

Δm is the magnitude difference in each filter, t Julian date of the observation, t_0 is the initial epoch, p period in days and A_i, ϕ_i amplitudes and phases given in Table 2.

They also established ephemeris elements

$$JD(\Delta U_{\min}) = 2441417.90 + 7.5586 \times E \quad (2)$$

We determined the coefficients A_0 for our photometric systems as mean values of all nights considered in both observatories.

Figures 1,2 give our observations in U and B filters against light curve according to formula 1 with the coefficients given in the Table 2 phased with respect to the above ephemeris formula.

The largest amplitudes (around 0.03 mag) can be expected in U and B filters according to the values of A_1 in the Table 2 but we detect no variations within 0.01 mag in both filters respectively when data phased considering the period 7.5586 days. This goes for

Table 1: Journal of observations
Skalnáté Pleso JD = 244 00000+

U filter			B filter			V filter		
8534.58	-1.253	± 0.001	8534.58	-1.022	± 0.001	8534.58	-0.833	± 0.001
8562.64	-1.254	0.001	8562.64	-1.022	0.001	8562.64	-0.832	0.001
8588.65	-1.253	0.002	8588.65	-1.022	0.003	8588.65	-0.832	0.002
8625.51	-1.259	0.001	8625.51	-1.029	0.001	8625.51	-0.837	0.001
8643.57	-1.258	0.001	8643.57	-1.027	0.001	8643.57	-0.831	0.003
8680.57	-1.257	0.001	8680.57	-1.028	0.001	8680.57	-0.840	0.001
8723.45	-1.262	0.005	8723.45	-1.022	0.003	8723.45	-0.827	0.003
8758.41	-1.255	0.002	8758.41	-1.023	0.002	8758.41	-0.835	0.002
8759.39	-1.258	0.001	8759.39	-1.028	0.001	8759.39	-0.839	0.002
8993.69	-1.259	0.002	8993.69	-1.028	0.002	8993.69	-0.843	0.002
Stará Lesná JD = 244 00000+								
8274.54	-1.239	0.002	8274.54	-1.004	0.001	8274.54	-0.826	0.001
8331.43	-1.243	0.003	8331.43	-1.002	0.002	8331.43	-0.822	0.002
8350.54	-1.248	0.004	8350.54	-1.013	0.003	8350.54	-0.834	0.002
8645.71	-1.251	0.006	8645.71	-1.017	0.002	8645.71	-0.835	0.004
8646.63	-1.230	0.004	8646.63	-1.011	0.001	8646.63	-0.830	0.001
8683.52	-1.245	0.003	8683.52	-1.007	0.001	8683.52	-0.826	0.001
8691.53	-1.230	0.003	8691.53	-1.008	0.001	8691.53	-0.827	0.001
8692.52	-1.236	0.006	8692.52	-1.007	0.001	8692.52	-0.826	0.001
8701.53	-1.246	0.006	8701.53	-1.014	0.003	8701.53	-0.837	0.002
8993.63	-1.237	0.003	8993.63	-1.006	0.001	8993.63	-0.825	0.001
9023.36	-1.227	0.008	9023.36	-1.012	0.005	9023.36	-0.827	0.006
9030.66	-1.242	0.003	9030.66	-1.007	0.001	9030.66	-0.827	0.001
9031.37	-1.223	0.006	9031.37	-0.997	0.002	9031.37	-0.822	0.001
9149.44	-1.244	0.004	9149.44	-1.004	0.002	9149.44	-0.828	0.003
9178.43	-1.255	0.008	9178.43	-1.011	0.004	9178.43	-0.828	0.005

Skalnáté Pleso observatory (1783m above sea level), while the observations from Stará Lesná observatory are of larger scatter (900m above sea level). Since there is a gap around phase 0.45 the observations are being continued to improve the phase diagram. Anyhow, we should point out that we did not consider HR 4215 as another comparison star for its considerable distance from HD 89822. The quality of the data observed due to various altitudes warn us when searching for low amplitude variations.

Our data (Skalnáté Pleso) are probably consistent with the latest observations of Adelman and Pyper (1993) using Four College APT who considered both comparison stars as in Winzer's thesis. They also do not confirm the light variability of this star in Strömrgren

Table 2: Parameters of the light curve fit

Filter							A_0 coeff.	
	A_0	A_1	A_2	ϕ_1	ϕ_2	σ	Sk. Pleso	St. Lesná
U	-1.23739	0.01629	0.00301	-0.229	-0.773	0.008	-1.240	-1.257
B	-1.01655	-0.01563	0.00209	0.220	0.111	0.007	-1.008	-1.025
V	-0.82746	-0.00955	0.00473	-0.320	0.863	0.008	-0.828	-0.835

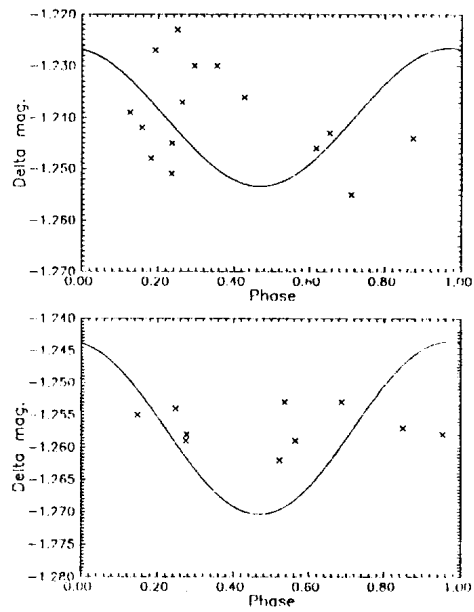


Figure 1: The U filter observations at Skalná Pleso (bottom) and Stará Lesná observatories

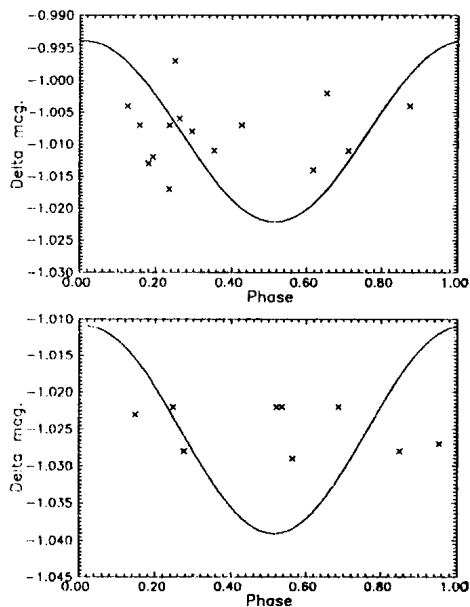


Figure 2: The B filter observations at Skalná Pleso (bottom) and Stará Lesná observatories

system. Thus, we cannot probably confirm the period of 7.5586 days predicted by Catalano and Leone (1991).

Moreover, Adelman and Pyper's (1993) observations of another Hg-Mn star (HR 1331) do not give evidence for photometric variability of CP3 stars and this provoke us to reconsider the constancy in light of these objects.

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