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HD 200925, A NEW SHORT PERIOD VARIABLE STAR

The discovery of a new variable star sometimes follows an unpredictable pattern. In our case, a search of variable stars with metallic lines (Am) of short period led us to the discovery of a new variable that had previously been considered as standard.

This star, HD 200925 (BD+50°3259), of spectral type F 5 III as reported by Moore and Paddock (1950) has an m_V=8.0 and (B-V)= 0.4. It was originally taken as standard along with HD 200926 (BD+49°3455) in the search for the variability of the Am star HD 200739 (BD+50°3256). Both, the Kukarkin catalogue of variable stars and the Mount Wilson catalogue of radial valocities do not report any variability in any of the previously mentioned stars.

All the reported photoelectric observations were carried out on the 33 inch telescope at the Observatorio of San Pedro Mártir, Baja California, México, during the nights from the 25th to the 28th of September, 1978. A 1P21 photomultiplier and the V filter of the original Johnson's photometer were employed. It was not necessary to change the amplification during the night.

The method followed was suggested by Warman and has already been reported (Warman et al., 1974). It consisted of the following: the sequence, C1, V C2, C1, V was followed uninterruptedly all night, with an average spanned time between successive observations of the same star of 4 minutes. Each observation consisted of 3 integrations of 10 sec of the star followed by one 10 sec integration of the sky, that was subtracted from the average of the star integrations. The instrumental magnitude was obtained by means of the well known relation m=-2.5 log I.

Table 1 shows the result of subtracting the mean of the magnitudes of the standard stars from the magnitude of the variable star. The accuracy on each observation is better than .003 mag. The time is reported in Heliocentric Julian Dates, and its precision is ,001 day. These values are plotted and shown on Figure 1. The shortest night, September 27th, was interrupted by clouds.

The analysis of the data showed that the behaviour of C1 and C2 during the four nights were constant with an accuracy of ±.003 mag. On the other hand, from Figure 1 it is easy to infer that the variation of HD 200925 is periodically repeated on the nights of the 25th and 28th of September. The period deduced from these two nights is close to 0.238 days. The mean amplitude is of 0.35 mag.

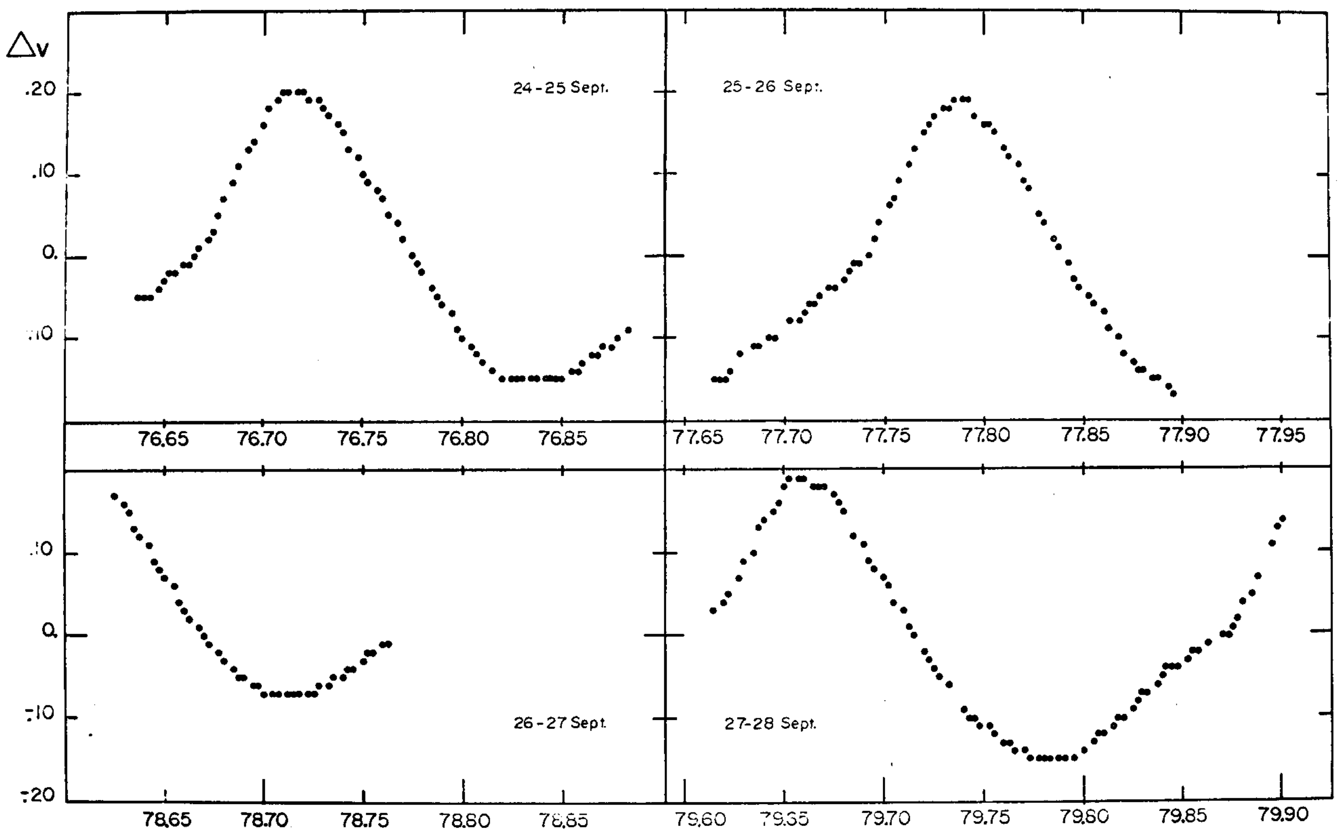
Unfortunately the data available for the light curve of the night of the 26th do not allow us to determine a period or an amplitude, but nevertheless, its behaviour matches with the nights of the 25th and 28th so we might conclude that the period and amplitude on this night have the same values as those on the two other nights. With respect to the night of the 27th, the curve of light shows a change in magnitude of lesser amplitude that cannot be precisely determined due to interruption by clouds. Nevertheless, the period seems to be the same.

On considering the nature of the variability of this star, one might infer that, if it were an eclipsing star, the lesser variation in the amplitude of the night of the 27th could be interpreted as a secondary minimum commonly presented by the W Ursae Majoris type stars. If, on the other hand, this were a pulsating star, its spectral type, (F5 III), its period (0.24), the amplitude of its variation and the shape of the curve lead us to catalogue it as a δ Scuti type star (as suggested by Payne-Gaposchkin, 1979).

Unfortunatly ubvyβ photometric data do not exist for this star. However, given the spectral type we can infer (Mihalas, 1968) both the Mv and the B-V for its luminosity class (III); values of 1.0 and 0.4, respectively, were obtained. Interpolating in the B-V vs. b-y calibration (Crawford, 1966) a value of 0.23 for b-y was derived. These inferred values of Mv and b-y fix the position of this star within the limits of the instability strip, and when combined with the estimated period, their relationship

TABLE I. PHOTOMETRY OF HD 200925 IN THE V FILTER

HEL JD	D MAG	HEL JD	D MAG	HEL JD	D MAG	HEL JD	D MAG	HEL JD	D MAG
2443700.0 +									
		76.8144	-0.137	77.7825	0.184	78.6908	-0.052	79.7215	-0.026
		76.8207	-0.142	77.7860	0.189	78.6943	-0.057	79.7257	-0.041
76.6367	-0.052	76.8242	-0.142	77.7894	0.189	78.6978	-0.062	79.7285	-0.051
76.6408	-0.042	76.8276	-0.147	77.7929	0.189	78.7012	-0.067	79.7320	-0.061
76.6436	-0.047	76.8311	-0.152	77.7957	0.174	78.7047	-0.072	79.7083	39.000
76.6471	-0.042	76.8346	-0.152	77.7999	0.164	78.7082	-0.072	79.7389	-0.086
76.6499	-0.032	76.8374	-0.152	77.8026	0.159	78.7117	-0.072	79.7424	-0.096
76.6526	-0.022	76.8415	-0.147	77.8061	0.149	78.7151	-0.072	79.7451	-0.101
76.6561	-0.017	76.8450	-0.147	77.8096	0.134	78.7186	-0.072	79.7486	-0.106
76.6596	-0.012	76.8485	-0.147	77.8131	0.119	78.7221	-0.072	79.7528	-0.111
76.6624	-0.007	76.8512	-0.147	77.8165	0.109	78.7256	-0.067	79.7556	-0.116
76.6658	-0.002	76.8547	-0.142	77.8200	0.094	78.7283	-0.062	79.7590	-0.126
76.6686	0.008	76.8582	-0.137	77.8235	0.079	78.7325	-0.057	79.7625	-0.131
76.6721	0.023	76.8610	-0.132	77.8269	0.054	78.7360	-0.052	79.7660	-0.136
76.6742	0.033	76.8644	-0.122	77.8304	0.039	78.7394	-0.047	79.7695	-0.141
76.6769	0.048	76.8679	-0.117	77.8346	0.024	78.7422	-0.042	79.7729	-0.146
76.6804	0.068	76.8707	-0.112	77.8381	0.009	78.7457	-0.037	79.7764	-0.151
76.6846	0.088	76.8749	-0.107	77.8415	-0.011	78.7492	-0.027	79.7799	-0.146
76.6887	0.113	76.8783	-0.097	77.8443	-0.026	78.7526	-0.022	79.7833	-0.146
76.6922	0.128	76.8818	-0.087	77.8478	-0.036	78.7554	-0.017	79.7868	-0.146
76.6950	0.143			77.8519	-0.051	78.7589	-0.012	79.7903	-0.146
76.6992	0.163			77.8554	-0.061	78.7624	-0.007	79.7938	-0.146
76.7026	0.178	77.6644	-0.151	77.8596	-0.071			79.7972	-0.141
76.7068	0.188	77.6679	-0.146	77.8631	-0.086			79.8007	-0.136
76.7103	0.198	77.6707	-0.146	77.8672	-0.101	79.6160	0.029	79.8042	-0.131
76.7137	0.203	77.6735	-0.141	77.8707	-0.116	79.6201	0.044	79.8070	-0.121
76.7172	0.203	77.6783	-0.116	77.8742	-0.131	79.6236	0.054	79.8104	-0.116
76.7200	0.198	77.6853	-0.111	77.8776	-0.136	79.6271	0.074	79.8139	-0.111
76.7235	0.193	77.6887	-0.106	77.8811	-0.136	79.6306	0.094	79.8174	-0.101
76.7269	0.188	77.6915	-0.101	77.8846	-0.146	79.6340	0.104	79.8208	-0.101
76.7297	0.183	77.6957	-0.096	77.8881	-0.151	79.6375	0.129	79.8243	-0.091
76.7332	0.173	77.7033	0.081	77.8915	-0.161	79.6403	0.144	79.8271	-0.081
76.7367	0.163	77.7068	-0.076	77.8950	-0.171	79.6438	0.154	79.8306	-0.071
76.7401	0.148	77.7096	0.066			79.6465	0.164	79.8333	-0.066
76.7436	0.133	77.7124	-0.061			79.6500	0.179	79.8368	-0.061
76.7471	0.123	77.7158	-0.056	78.6262	0.173	79.6535	0.189	79.8396	-0.051
76.7506	0.103	77.7186	-0.046	78.6290	0.158	79.6576	0.194	79.8424	-0.041
76.7533	0.093	77.7228	0.041	78.6318	0.148	79.6604	0.189	79.8458	-0.036
76.7568	0.078	77.7256	-0.036	78.6353	0.133	79.6639	0.184	79.8486	-0.036
76.7603	0.068	77.7290	0.026	78.6387	0.118	79.6667	0.184	79.8521	-0.031
76.7631	0.048	77.7325	0.021	78.6415	0.108	79.6708	0.172	79.8556	-0.021
76.7665	0.038	77.7353	0.011	78.6450	0.093	79.6743	0.174	79.8583	-0.016
76.7707	0.018	77.7387	-0.006	78.6485	0.083	79.6771	0.164	79.8618	-0.011
76.7742	0.003	77.7415	0.004	78.6512	0.068	79.6799	0.154	79.8333	45.000
76.7776	-0.012	77.7450	0.024	78.6540	0.058	79.6861	0.124	79.8688	-0.001
76.7804	-0.022	77.7485	0.039	78.6575	0.038	79.6896	0.109	79.8715	0.004
76.7839	-0.037	77.7519	0.059	78.6603	0.033	79.6931	0.094	79.8743	0.014
76.7881	-0.052	77.7554	0.074	78.6631	0.023	79.6958	0.084	79.8778	0.024
76.7908	-0.062	77.7582	0.094	78.6665	0.008	79.6993	0.069	79.8806	0.039
76.7943	-0.072	77.7624	0.114	78.6700	0.003	79.7021	0.059	79.8840	0.054
76.7978	-0.087	77.7658	0.129	78.6735	-0.007	79.7056	0.044	79.8875	0.074
76.8012	-0.097	77.7693	0.149	78.6769	-0.022	79.7090	0.029	79.8938	0.109
76.8047	-0.107	77.7721	0.159	78.6804	-0.027	79.7125	0.014	79.8972	0.129
76.8075	-0.122	77.7756	0.174	78.6846	-0.032	79.7153	-0.001	79.9000	0.144
76.8110	-0.127	77.7790	0.179	78.6874	-0.047	79.7188	-0.016		


Δv
.20
.10
0.
-.10
-.20
24-25 Sept.
25-26 Sept.
26-27 Sept.
27-28 Sept.
76.65 76.70 76.75 76.80 76.85
77.65 77.70 77.75 77.80 77.85 77.90 77.95
78.65 78.70 78.75 78.80 78.85
79.60 79.65 79.70 79.75 79.80 79.85 79.90

is consistant with the PLCR as in Breger (1978). Perhaps the only conclusion that can be made at this time is (if this is a pulsating star) the agreement between the long observed period and the luminosity class (III).

At any rate, it would be desirable to obtain more data, both photometric and spectroscopic, in order to decide between the eclipsing or pulsating nature of this star.

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S.F. GONZALEZ BEDOLLA and
JOSE H. PENA
Instituto de Astronomía
Universidad Nacional Autónoma de
México, Apartado Postal 70-264
México 20, D. F., México

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