COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 4466

Konkoly Observatory
Budapest
11 April 1997

HU ISSN 0374 – 0676

SA98-185(=HD 292574) - A NEW ECLIPSING BINARY AMONG LANDOLT'S STANDARD STARS

We present observational results of a newly discovered eclipsing binary SA98-185 (=HD 292574, $RA_{2000} = 6^h.52^m01^s.85$, $DEC_{2000} = -00°27'21''.7$, A2). It is one of well observed stars in the Landolt's (1983, 1992) standard star list, being widely used in the UBVRI photometry (for examples, Menzies *et al.* 1991 and Richer *et al.* 1985).

During the observing runs at Siding Spring Observatory (SSO) from November 5, 1996 to March 4, 1997, abnormal data points of SA98-185 were detected on February 28, 1997 (HJD2450508.07) for the first time. The brightness decreased by $\sim 0^m.06$ in the B, V, I magnitudes relative to that of the other standard stars (see Figure 2, upper panel). The field of view of SSO 40″ telescope ($f/8$) with SITe 2048 × 2048 CCD is $20'.6 \times 20'.6$ and covers the whole area of SA98 which contains many well observed standard stars.

We carried out time-series CCD observations of SA98-185 over four nights from March 13 to 29, 1997 at the Bohyunsan Optical Astronomy Observatory (BOAO) in order to detect its light variability. These observations were done with a TEK1024 CCD camera attached to the BOAO 1.8m telescope. The field of view in the CCD image is $5'.8 \times 5'.8$ at the f/8 Cassegrain focus of the telescope. Three comparison stars (SA98-193, 666 and 688; see Table 1) were monitored to check the light variability of SA98-185 (Figure 1).

The CCD preprocessings such as bias subtraction and flat fielding were made with the IRAF/CCDRED package. We adopted simple aperture photometry to obtain instrumental magnitudes, using the IRAF/DAOPHOT package (Massey & Davis 1992) and transformed to the standard system as follows:

$$B(V) = b(v) + a_1 + a_2 \times X + a_3 \times (B-V) + a_4 \times (B-V) \times X$$

where $B(V)$ and $b(v)$ are standard and instrumental magnitudes and X is the airmass. Four coefficients of a_1, a_2, a_3 and a_4 are zero level, primary extinction, color and secondary extinction term, respectively. We then obtained differential magnitudes of SA98-185 which are plotted in Figure 2 and listed in Table 2 (ΔB and ΔV in the sense Var–C1, ΔI in the sense of Var–C2).

Table 1. Photometric properties of observed stars (Landolt, 1992)

ID_{ours}	Star Name	V	B−V	U−B
Var	SA98-185	10.536	0.202	0.113
C1	SA98-193	10.030	1.180	1.152
C2	SA98-666	12.732	0.164	−0.004
C3	SA98-688	12.754	0.293	0.245

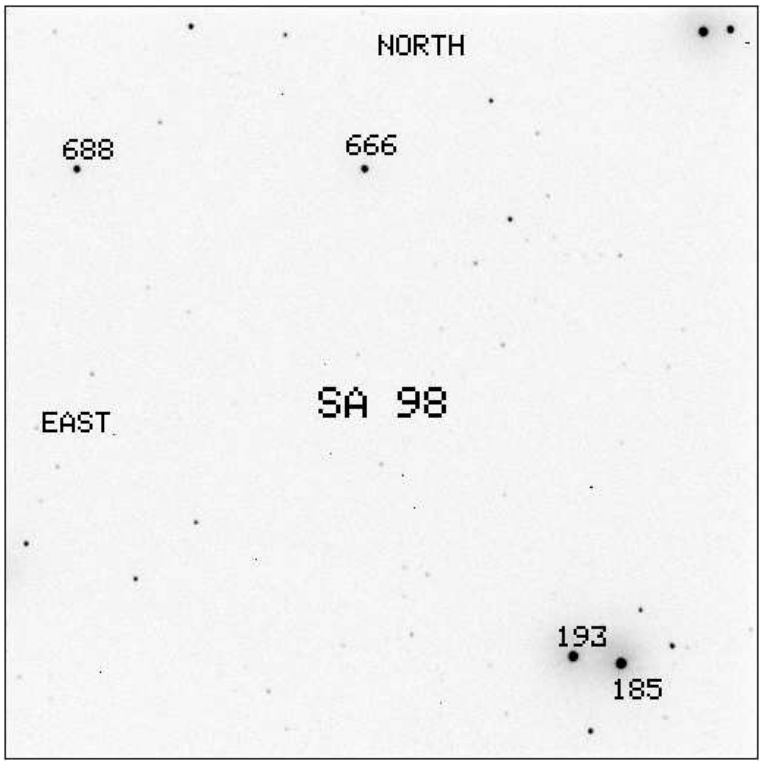

Figure 1. A CCD frame (5′.8 × 5′.8) of SA98-185 observed in the BOAO. Three comparison stars (SA98-193, 666 and 688) are denoted by their number

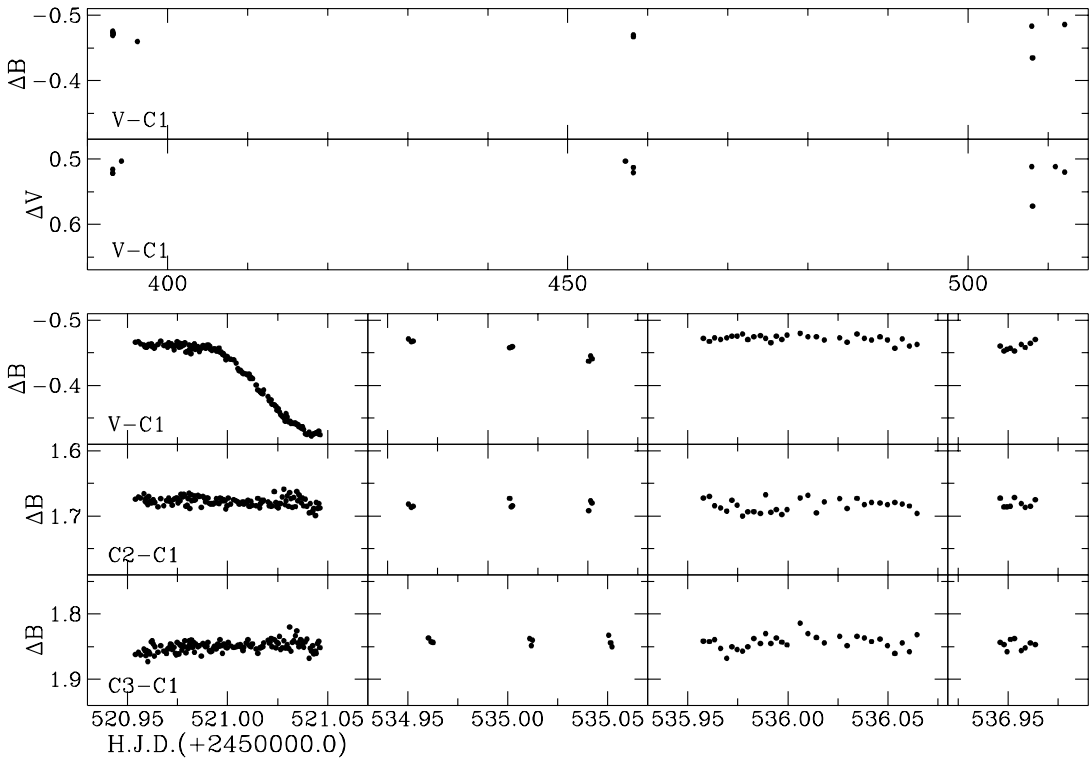

Figure 2. Light variations of SA98-185 observed at SSO (upper panel) and BOAO(lower panel). It is noted that the brightness of SA98-185 decreased by about $0^{m}.06$ in B and V near HJD 2450508.07 and by $0^{m}.14$ in B near HJD 2450521.04

Table 2. Differential magnitudes of SA98-185

HJD	Δ B	HJD	Δ B	HJD	Δ B	HJD	Δ V	HJD	Δ I
2450000.+		520.9896	−0.459	521.0369	−0.334	2450000.+		2450000.+	
393.1518	−0.469	520.9902	−0.462	521.0374	−0.336	393.1430	+0.522	393.1231	−2.215
393.1547	−0.476	520.9909	−0.460	521.0380	−0.333	393.1456	+0.522	393.1255	−2.223
393.1577	−0.473	520.9915	−0.455	521.0389	−0.326	393.1487	+0.516	393.1303	−2.238
393.2190	−0.472	520.9921	−0.454	521.0396	−0.325	394.2323	+0.503	393.1328	−2.236
393.2219	−0.472	520.9928	−0.455	521.0401	−0.331	457.2027	+0.503	393.1366	−2.207
396.2363	−0.460	520.9934	−0.456	521.0407	−0.328	458.1895	+0.521	393.1390	−2.240
458.2010	−0.467	520.9943	−0.453	521.0413	−0.325	458.1919	+0.513	393.2301	−2.230
458.2034	−0.470	520.9951	−0.453	521.0419	−0.323	507.9734	+0.512	393.2326	−2.235
507.9708	−0.483	520.9957	−0.457	521.0425	−0.325	508.0717	+0.572	394.2025	−2.223
508.0690	−0.435	520.9962	−0.451	521.0430	−0.326	510.9329	+0.512	396.2302	−2.209
512.0770	−0.486	520.9968	−0.451	521.0438	−0.327	512.0799	+0.520	457.2037	−2.203
520.9539	−0.466	520.9974	−0.448	521.0443	−0.328	534.9655	+0.503	458.1924	−2.220
520.9554	−0.467	520.9980	−0.448	521.0449	−0.327	534.9661	+0.512	458.1947	−2.204
520.9565	−0.464	520.9986	−0.445	521.0455	−0.330	534.9664	+0.513	507.9776	−2.221
520.9581	−0.462	520.9991	−0.439	521.0461	−0.325	535.0140	+0.516	508.0757	−2.162
520.9587	−0.459	520.9997	−0.444	534.9604	−0.471	535.0155	+0.520	508.9356	−2.233
520.9591	−0.458	521.0003	−0.441	534.9618	−0.467	535.0159	+0.517	509.0682	−2.221
520.9596	−0.458	521.0015	−0.440	534.9627	−0.468	535.0530	+0.521	510.9347	−2.225
520.9601	−0.460	521.0030	−0.439	535.0109	−0.458	535.0540	+0.523	511.0626	−2.203
520.9605	−0.463	521.0042	−0.434	535.0118	−0.459	535.0544	+0.522	511.9300	−2.247
520.9612	−0.462	521.0051	−0.426	535.0124	−0.460	535.9592	+0.497		
520.9619	−0.463	521.0058	−0.422	535.0504	−0.437	535.9621	+0.507		
520.9623	−0.460	521.0064	−0.423	535.0514	−0.445	535.9649	+0.504		
520.9628	−0.460	521.0070	−0.420	535.0521	−0.441	535.9677	+0.503		
520.9633	−0.457	521.0076	−0.418	535.9577	−0.472	535.9707	+0.499		
520.9637	−0.459	521.0081	−0.418	535.9608	−0.467	535.9733	+0.504		
520.9652	−0.463	521.0093	−0.418	535.9634	−0.473	535.9759	+0.502		
520.9666	−0.468	521.0102	−0.416	535.9663	−0.470	535.9785	+0.497		
520.9681	−0.461	521.0107	−0.418	535.9694	−0.473	535.9815	+0.497		
520.9694	−0.462	521.0112	−0.411	535.9720	−0.476	535.9843	+0.506		
520.9700	−0.458	521.0117	−0.413	535.9747	−0.476	535.9874	+0.504		
520.9705	−0.465	521.0123	−0.410	535.9773	−0.479	535.9902	+0.499		
520.9710	−0.463	521.0143	−0.401	535.9800	−0.470	535.9928	+0.510		
520.9714	−0.463	521.0151	−0.393	535.9830	−0.475	535.9955	+0.504		
520.9719	−0.464	521.0160	−0.392	535.9862	−0.477	535.9982	+0.504		
520.9723	−0.461	521.0165	−0.389	535.9889	−0.472	536.0009	+0.505		
520.9732	−0.454	521.0170	−0.388	535.9915	−0.466	536.0037	+0.507		
520.9738	−0.461	521.0175	−0.387	535.9942	−0.475	536.0081	+0.517		
520.9743	−0.461	521.0180	−0.393	535.9969	−0.470	536.0120	+0.509		
520.9748	−0.467	521.0202	−0.383	535.9996	−0.477	536.0161	+0.504		
520.9752	−0.462	521.0207	−0.377	536.0024	−0.476	536.0200	+0.505		
520.9757	−0.458	521.0212	−0.377	536.0061	−0.480	536.0238	+0.507		
520.9762	−0.465	521.0217	−0.378	536.0100	−0.474	536.0275	+0.505		
520.9767	−0.459	521.0223	−0.371	536.0142	−0.474	536.0317	+0.510		
520.9772	−0.463	521.0233	−0.370	536.0182	−0.469	536.0363	+0.507		
520.9776	−0.462	521.0241	−0.367	536.0258	−0.473	536.0400	+0.512		
520.9781	−0.462	521.0247	−0.362	536.0296	−0.466	536.0441	+0.499		
520.9786	−0.465	521.0253	−0.364	536.0345	−0.478	536.0479	+0.518		
520.9792	−0.451	521.0259	−0.359	536.0382	−0.472	536.0516	+0.519		
520.9798	−0.452	521.0265	−0.355	536.0418	−0.470	536.0551	+0.513		
520.9802	−0.452	521.0273	−0.352	536.0461	−0.474	536.0589	+0.522		
520.9807	−0.462	521.0281	−0.350	536.0498	−0.470	536.0626	+0.524		
520.9811	−0.455	521.0287	−0.345	536.0534	−0.457	536.0663	+0.530		
520.9816	−0.449	521.0292	−0.357	536.0571	−0.471	536.9469	+0.534		
520.9820	−0.460	521.0298	−0.351	536.0608	−0.460	536.9487	+0.530		

Table 2 (cont.)

HJD	Δ B	HJD	Δ B	HJD	Δ B	HJD	Δ V
2450000.+		520.9896	−0.459	521.0369	−0.334	2450000.+	
520.9825	−0.456	521.0304	−0.344	536.0645	−0.462	536.9502	+0.523
520.9830	−0.462	521.0310	−0.345	536.9461	−0.460	536.9519	+0.524
520.9834	−0.464	521.0316	−0.342	536.9480	−0.453	536.9548	+0.522
520.9839	−0.455	521.0324	−0.342	536.9495	−0.456	536.9577	+0.516
520.9851	−0.459	521.0330	−0.341	536.9512	−0.457	536.9598	+0.513
520.9859	−0.452	521.0338	−0.343	536.9532	−0.452	536.9626	+0.510
520.9868	−0.457	521.0346	−0.340	536.9566	−0.463	536.9643	+0.514
520.9877	−0.461	521.0351	−0.340	536.9586	−0.458		
520.9883	−0.461	521.0357	−0.337	536.9612	−0.465		
520.9890	−0.457	521.0363	−0.337	536.9636	−0.470		

Light variations of SA98-185 were clearly detected on one night (HJD 2450521.0). Its brightness started decreasing at HJD 2450520.99, then reached minimum near HJD 2450521.042 and then slightly increased again (Figure 2). The light curves are similar to that of an Algol-type eclipsing binary (Hoffmeister *et al.* 1985). Its binary nature can be also deduced from the SSO data which showed a similar brightness decrease of about $0^m.06$ in all filters (B, V and I).

Light variations of SA98-185 have not been reported before (Kholopov *et al.* 1988). The UBVRI photometry performed by Landolt (1992) for 37 nights (45 data points) did not show any peculiarity of SA98-185 and gave very low mean errors of magnitudes and colors (for example, V=10.536±0.0018). However, our observations suggest that it is a detached eclipsing binary with a minimum brightness near HJD 2450521.042, and an amplitude of at least $0^m.14$ in the blue band.

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References:

Hoffmeister, C., Richter, G., Wenzel, W., 1985, in *Variable stars*, p. 201
Kholopov, P.N., Samus', N.N., Frolov, M.S., Goranskij, V.P., Gorynya, N.A., Kireeva, N.N., Kukarkina, N.P., Kurochkin, N.E., Medvedeva, G.I., Perova, N.B., Shugarov, S.Yu. 1985-1988, *General Catalogue of Variable Stars*, 4th Edition (Moscow: Nauka Publishing House)
Landolt, A.U., 1983, *AJ*, **88**, 439
Landolt, A.U., 1992, *AJ*, **104**, 340
Massey, P., Davis, L.E., 1992, *A User's Guide to Stellar CCD photometry with IRAF*
Menzies, J.W., Marang, F., Laing, J.D., Coulson, I.M., Engelbrecht, C.A., 1991, *MNRAS*, **248**, 642
Richer, H.B., Pritchet, C.J., Crabtree, D.R., 1985, *ApJ*, **298**, 240

ERRATUM

In the printed version the affiliation for author S.-G. LEE was erroneously given as "3".