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ON THE TYPE OF VARIABILITY OF S Vul

Visual observations carried out by Beyer (1930) indicated a variation in the form of the light curve and amplitude from cycle to cycle. The photoelectric observations (Fernie, 1970; Mahmoud and Szabados, 1980), however, indicated that S Vul was a classical cepheid. On the other hand, the 25 year cycle in the O-C diagram in the last paper reminds us of UU Her variables separated as a new type by Sasselov (1984). The aim of this paper is to discuss the type of variability of S Vul.

The variable S Vul was observed photoelectrically in the UBVR Johnson-system by one of us (L.N.B.) with the 60 and 48 cm telescopes of the Mount Majdanak observatory at Tashkent Astronomical Institute. The mean accuracy of the observations is $\sigma = \pm 0^{m}.01$. The observations carried out in the period 1983-1985 are listed in Table I. The individual light curves are plotted in Figure 1. The variations of the light curve from cycle to cycle do not exceed $0^{m}.04$ which fall in the interval $\pm 2\sigma$. We consider that these variations are not real. The mean light and colour curves are shown in Figure 2. The period of $68^{d}.78$ was obtained by the observational data listed in Table I. The observational properties of S Vul are given in Table II. The variable S Vul is a member of the Vul OB association and probably of a new small unstudied open cluster (Turner, 1985). The absolute magnitude obtained by Turner (1980) from the distance modulus of Vul OB2 association is given in Table II.

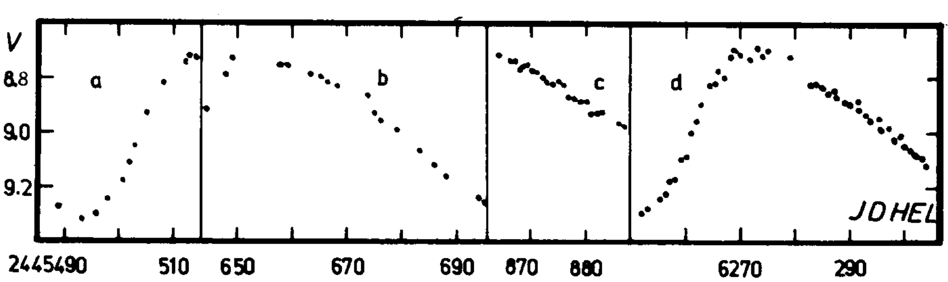

Figure 1

Table I

J.D.Hel. 2440000+	V	U–B	B–V	V–R
5489.301	9.27	1.86	2.10	1.62
5493.262	9.32	1.86	2.14	1.61
5496.430	9.30	1.83	2.08	1.60
5498.453	9.24	1.75	2.02	1.58
5501.441	9.18	1.58	1.97	1.56
5502.457	9.11	1.59	1.93	1.54
5503.457	9.05	1.58	1.89	1.52
5505.457	8.93	1.52	1.82	1.49
5508.457	8.82	1.36	1.78	1.43
5512.453	8.74		1.72	1.42
5513.445	8.72	1.39	1.70	1.40
5514.445	8.73	1.30	1.71	1.40
5644.219	8.91		1.82	
5646.183				1.41
5648.148	8.78	1.43	1.73	1.42
5649.176	8.72	1.34	1.73	1.43
5658.113	8.75	1.43	1.77	1.44
5659.113	8.75	1.44	1.81	1.44
5663.113	8.78	1.49	1.86	1.50
5665.129	8.80	1.46	1.88	1.47
5666.101	8.81	1.52	1.90	1.49
5667.129		1.57	1.89	1.46
5668.117	8.83	1.55	1.94	1.49
5674.125	8.86	1.66	1.99	1.54
5675.113	8.92	1.64	2.02	1.56
5676.098	8.95	1.60	2.03	1.55
5679.125	8.98	1.76	2.06	1.56
5683.105	9.06	1.74	2.08	1.59
5686.090	9.11		2.11	1.60
5688.113	9.16			1.62
5694.074	9.23		2.07	1.62
5695.070	9.25		2.08	1.64
5864.304	8.72	1.46	1.75	1.42
5866.348	8.74	1.49	1.78	1.43
5867.320	8.74	1.51	1.79	1.44
5868.250	8.77	1.51	1.80	1.46
5869.304	8.76	1.59	1.80	1.47
5870.289	8.78	1.56	1.82	1.46
5871.258	8.78	1.60	1.82	1.47
5872.277	8.80	1.62	1.84	1.49
5873.270	8.81	1.62	1.86	1.49
5874.265	8.82	1.63	1.88	1.49
5875.258	8.82	1.68	1.88	1.48
5876.258	8.83	1.68	1.89	1.50
5877.281	8.88	1.71	1.88	1.54
5878.254	8.88	1.74	1.90	1.52
5879.262	8.89	1.74	1.92	1.53
5880.270	8.89	1.75	1.93	1.54
5881.250	8.94	1.82	1.92	1.55

J.D.Hel. 2440000+	V	U–B	B–V	V–R
5882.258	8.93	1.84	1.95	1.54
5883.262	8.92	1.80	1.95	1.54
5886.258	8.97	1.88	1.98	1.56
5887.250	8.98	1.98	1.99	1.56
6252.192	9.29	2.01	2.04	1.60
6253.194	9.28	2.00	2.03	1.61
6255.263	9.25	1.90	2.00	1.59
6256.248	9.23	1.86	1.98	1.57
6257.261	9.18	1.81	1.97	1.56
6258.192	9.17	1.80	1.95	1.54
6259.222	9.10	1.72	1.91	1.54
6260.197	9.09	1.70	1.90	1.51
6261.225	9.00	1.63	1.86	1.50
6262.190	8.96	1.58	1.82	1.49
6263.196	8.90	1.53	1.80	1.46
6264.195	8.83	1.49	1.79	1.47
6265.183	8.82	1.49	1.76	1.45
6266.199	8.78	1.45	1.75	1.44
6267.207	8.80	1.44	1.74	1.43
6268.213	8.73	1.45	1.73	1.40
6269.197	8.71	1.43	1.72	1.41
6270.463	8.72	1.45	1.71	1.42
6272.465	8.73	1.42	1.71	1.42
6273.461	8.68	1.44	1.72	1.39
6274.464	8.72	1.48	1.70	1.44
6275.470	8.71	1.49	1.76	1.43
6279.459	8.73		1.77	1.45
6283.267	8.83	1.58	1.86	1.48
6285.234	8.84	1.63	1.87	1.50
6286.218	8.86	1.64	1.89	
6287.212	8.86	1.67	1.90	1.50
6288.251	8.87	1.70	1.90	1.52
6289.250	8.89	1.69	1.92	1.52
6290.223	8.90	1.71	1.94	1.50
6291.210	8.89	1.76	1.95	1.52
6292.230	8.92	1.75	1.96	1.53
6293.350	8.94	1.79	1.96	1.55
6294.208	8.95	1.76	1.96	1.55
6295.191	8.95	1.79	1.99	1.54
6296.191	8.99	1.84	1.97	1.55
6297.199	8.98	1.84	1.99	1.55
6298.220	9.03	1.89	1.98	1.57
6299.187	9.02	1.87	2.00	1.56
6300.187	9.05	1.89	2.03	1.56
6301.209	9.07	1.94	2.02	1.59
6302.216	9.08	1.86	2.06	1.57
6303.180	9.09	1.94	2.03	1.59
6304.160	9.12	1.91	2.05	1.58

Table II

P	V	U–B	B–V	V–R	A_V	A_B	E_{B-V}	Sp.type	M_V	Radius
68.78	8.96	1.57	1.87	1.52	0.60	1.11	0.78	F8–G8	-6.9	250 $R_\odot$

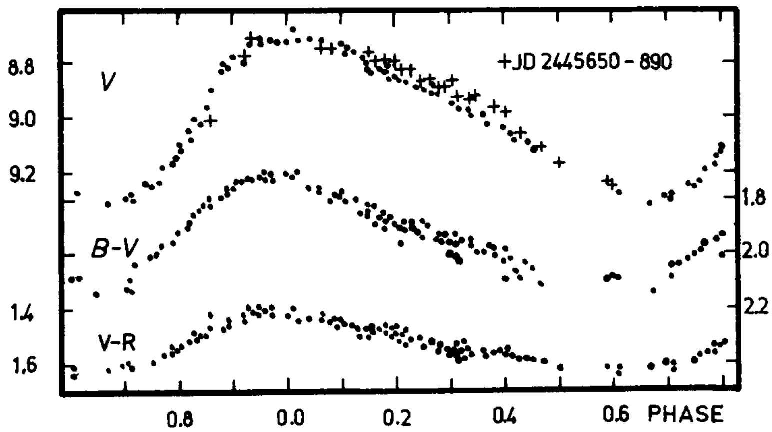

Figure 2

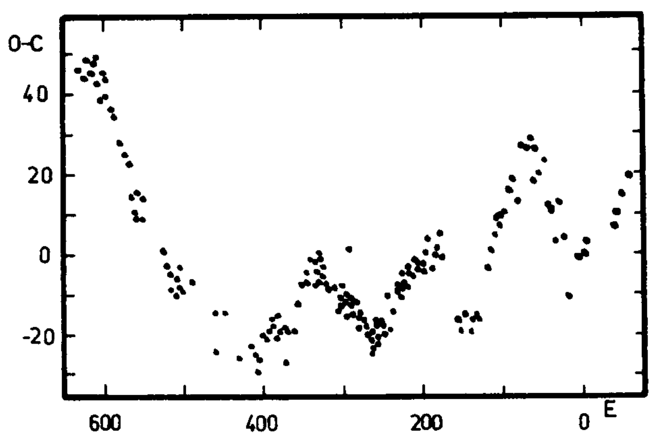

Figure 3

The radius of S Vul is obtained by Wesselink method (Ivanov, 1984). The observational data in Table II do not contradict the period - luminosity, period - radius and period - colour relations for the classical cepheids. The spectral type in the maximum and minimum is also in the cepheid spectral region. The position of S Vul in the period - amplitude diagram is near the extension of the envelope of the period - amplitude diagram to the long period region (Berdnikov and Ivanov, 1986). Consequently all the properties in Table II are typical of the cepheid variables.

Figure 3 represents the O-C diagram constructed by Mahmoud and Szabados (1980). We added the last four points based on observations in Table I. The new photoelectric observations support the presence of a 25 year long cycle. Such instabilities in the period are similar to the variables of UU Her type. It is possible that instability in the period is inherent to the classical cepheids with very long period.

We emphasize that S Vul is a classical cepheid and not a semiregular SRd star as classified in the General Catalogue of Variable Stars. We are planning further observations of S Vul.

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