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A PERIOD ANALYSIS OF V505 SAGITTARII

The variable star V505 Sgr (HR 7571, HD 187949) was discovered to be an eclipsing binary by Hoffmeister (1934). Its first photoelectric light curves were obtained by Oosterhoff in 1950 and were analysed by Kwee (1953) and Horak (1967, 1968); meanwhile the system has been observed by Sofronitsky (1953) and Magalashvili and Razmadze (1953). Moreover, V505 Sgr was observed in 1969 by Chambliss (1972). Since it had not been observed for more than 20 years, it was included in our observational programme for 1990. But, unfortunately, only some parts of its light curves were obtained and V505 Sgr will be re-observed this year. Here a study of its period is presented.

Lause (1938) was the first to determine an ephemeris formula for V505 Sgr:

$$\text{Min I (Hel.JD)} = 2425501.376 + 1^d.1828711 \cdot E \qquad (1.1)$$

which was based on photographic and visual observations made between 1928 and 1937.

In 1953 Kwee proposed the following ephemeris for V505 Sgr:

$$\text{Min I (Hel.JD)} = 2433515.3295 + 1^d.18287141 \cdot E \qquad (1.2)$$

while Chambliss (1972), using all data up to 1972, improved equation (1.1) to the linear:

$$\text{Min I (Hel.JD)} = 2425501.4017 + 1^d.18286730 \cdot E \qquad (1.3)$$

and to the quadratic one:

$$\text{Min I (Hel.JD)} = 2425501.3706 + 1^d.18287511\ E - 4^d.288\text{x}10^{-10} \cdot E^2 \qquad (1.4)$$

All the minima times of V505 Sgr found in the literature, after Chambliss' work (1972) up to now, are given in Table I. Only three of them (IBVS No.2185, 1982; BBSAG No.59, 1982 and that given in the present work, taken with a k filter) are photoelectric, while the rest of them are visual. The successive columns of Table I give: the Hel.JD; the E_c and $(O-C)_c$ according to the linear ephemeris of Chambliss; the E_M and the corresponding $(O-C)_M$ according to Kholopov's et al. (1985) ephemeris formula and the reference.

When we combine the old minima times of V505 Sgr, given by Chambliss (1972), with the new ones (those of Table I), a least-squares solution yields to the following ephemeris formulae according to the fitting and the

Table I

New Minima Times of V505 Sagittarii

Hel. JD 2440000.+	E_C	$(O-C)_C$ days	E_M	$(O-C)_M$	Reference
2274.461	14180	+.001	-1849	-.001	Rocznik No 47, 1976
2617.490	14470	-.001	-1559	-.005	" 48, 1977
3088.274	14868	+.001	-1161	-.004	BBSAG No 31, 1977
3348.499	15088	-.004	- 941	-.010	" No 34, 1977
3348.515	15088	+.012	- 941	+.006	" " 1977
3348.517	15088	+.014	- 941	+.008	" " "
3367.446	15104	+.017	- 925	+.011	" " "
3367.410	15104	-.019	- 925	-.025	" No 35, 1977
3367.434	15104	+.005	- 925	-.001	" " "
3367.437	15104	+.008	- 925	+.002	" " "
3368.627	15105	+.016	- 924	+.009	IBVS No1502,1978
3399.360	15131	-.007	- 898	-.007	BBSAG No 35, 1977
3405.310	15136	+.029	- 893	+.023	"
3425.406	15153	+.016	- 876	+.010	"
3691.548	15378	+.013	- 651	+.006	BBSAG No 38, 1978
3704.552	15389	+.006	- 640	-.002	" " "
3717.551	15400	-.007	- 629	-.014	" " "
3717.567	15400	+.005	- 629	+.002	" " "
3717.577	15400	+.019	- 629	+.012	" " "
3723.471	15405	-.001	- 624	-.009	" " "
3730.580	15411	-.011	- 618	+.003	" " "
3730.590	15411	-.021	- 618	+.013	" " "
3742.387	15421	-.011	- 608	-.018	BBSAG No 38, 1978
3748.318	15426	+.006	- 603	-.001	" " "
4046.416	15678	+.021	- 351	+.013	" " 46, 1980
4072.434	15700	+.016	- 329	+.008	BBSAG No 44, 1979
4072.436	15700	+.018	- 329	-.002	" " "
4079.542	15706	+.027	- 323	-.021	" " "
4079.516	15706	+.001	- 323	-.007	BBSAG No 45, 1979
4091.364	15716	+.020	- 313	+.009	BBSAG No 44, 1979
4117.374	15738	+.007	- 291	-.001	" " "
4117.378	15738	+.011	- 291	+.003	" " "
4143.399	15760	+.009	- 269	+.001	BBSAG No 45, 1979
4181.245	15792	+.003	- 237	+.006	" " "
4435.572	16007	+.014	- 22	+.004	BBSAG No 49, 1980
4441.482	16012	+.009	- 17	-.000	" " "
4461.590	16029	+.010	0	-.001	IBVS No2185,1982
4499.429	16061	-.004	+ 32	-.014	BBSAG No 50, 1980
4707.604	16237	-.014	+ 208	-.024	BBSAG No 54, 1981
4816.450	16345	+.021	+ 300	-.002	BBSAG No 56, 1981
4816.462	16329	+.008	+ 300	+.010	BBSAG No 59, 1982
4835.389	16329	+.020	+ 316	+.011	BBSAG No 69, 1983
4912.276	16410	.022	+ 381	+.011	BBSAG No 57, 1981
4925.280	16421	.015	+ 392	+.005	" " "
5172.502	16630	.017	+ 601	+.005	BBSAG No 62, 1982
5172.504	16630	.019	+ 601	+.007	" " "
5178.425	16635	.026	+ 606	+.014	" " "
5191.434	16646	.023	+ 617	+.012	" " "
5543.284	16943.5	.030	+ 914.5	-.043	BBSAG No 69, 1983
5560.483	16958	.018	+ 929	+.005	" " "
5909.436	17253	.025	+1224	+.011	BBSAG No 73, 1984
5909.439	17253	.028	+1224	+.013	" No 74, "
6271.402	17559	.034	+1530	+.018	BBSAG NO 78, 1985
6297.415	17581	.023	+1552	+.008	" " "
7384.465	18500	.018	+2471	+.001	BBSAG No 90, 1989
7740.514	18801	.024	+2772	+.003	BBSAG No 92, 1989
7740.519	18801	.029	+2772	+.008	" No 93, "
7746.431	18806	.027	+2777	+.006	" No 93, "
8058.7025	19070	.021	+3041	-.005	Present Study
8102.472	19107	.025	+3078	+.003	BBSAG No 96, 1990

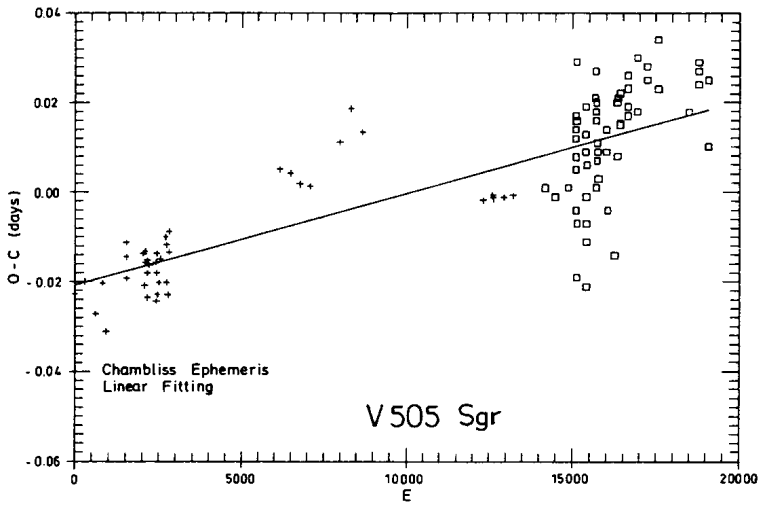

Figure 1: The (O-C) diagram of V505 Sgr according to Chambliss (1972) ephemeris formula. A linear least-squares fitting has been applied to all the data (+: old data; □: new ones).

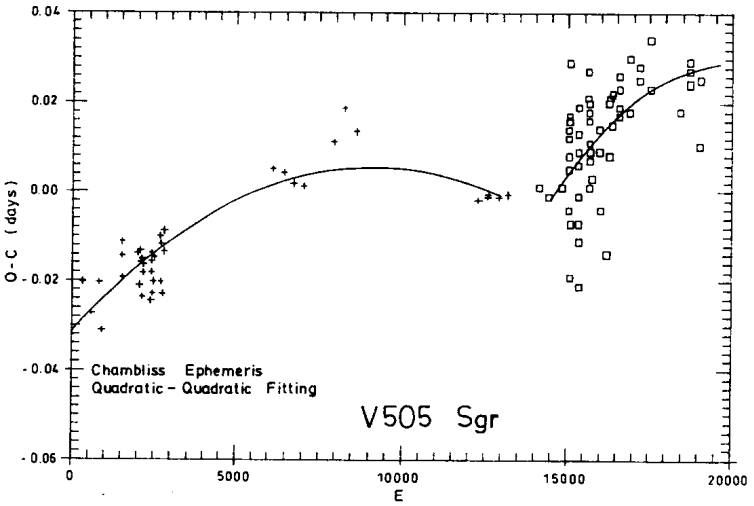

Figure 2: The (O-C) diagram of V505 Sgr according to Chambliss (1972) ephemeris formula. Both the old (+) and the new (□) data have been approached by a quadratic least-squares fitting but each one separately from the other.

ephemeris used. Thus, for the Chambliss (1972) ephemeris and linear fitting, we find:

$$\text{Min I (Hel.JD)} = 2425501.3809 + 1^{d}.182869365 \cdot E \qquad (1.5)$$

and for quadratic:

$$\text{Min I (Hel.JD)} = 2425501.3501 + 1^d.18287707\ E - 4^d.283\times10^{-10}\cdot E^2 \quad (1.6)$$

while for Kholopov's et al. (1985) ephemeris and linear fitting, we have:

$$\text{Min I (Hel.JD)} = 2444461.5932 + 1^d.18286942\cdot E \quad (1.7)$$

and for quadratic:

$$\text{Min I (Hel.JD)} = 2444461.5933 + 1^d.18286963\ E + 1^d.49\times10^{-11}\cdot E^2 \quad (1.8)$$

The corresponding (O-C) diagram of V505 Sgr for linear fitting and Chambliss (1972) ephemeris is presented in Figure 1, where crosses (+) denote the old data and squares (□) the new ones. (One can get an almost identical diagram for quadratic fitting, without any visible difference. The same is true for Kholopov's et al. (1985) ephemeris).

But, if we consider the old and the new data of V505 Sgr separately, then we get Figure 2. In this a quadratic - quadratic least-squares fitting has been applied both to the old data (which according to Chambliss (1972) is much better than the linear one) as well as to the new ones.

Unfortunately, there are not minima times of V505 Sgr from $3000E_c$ to $6000E_c$ and from $9000E_c$ to $12000E_c$, moreover most of the data are visual exhibiting large scatter. Thus, new minima times of V505 Sgr are needed, and especially photoelectric ones, in order its period behaviour to be examined further.

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