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## V842 Her: A W UMa STAR WITH CONSTANT PERIOD

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The poorly-studied variable star V842 Herculis = BD +50° 2255 = NSV 7457 = BV 103 is a late-type contact binary system showing remarkable spot activity (Vandenbroere, 1993, Torres & Melendo, 1996). The light-curve shows the so-called O'Connell-effect (the heights of the two maxima differ from each other,  $\Delta V = V_{MaxII} - V_{MaxI}$ ). Its rate is variable: Vandenbroere (1993) and Torres & Melendo (1996) found  $\Delta V = 0$ <sup>m</sup>1 and  $\Delta V = 0$ <sup>m</sup>03 magnitudes, respectively. The light curve has been analysed by Torres & Melendo (1996). The radial velocity curve has been constructed by Rucinski & Lu (1999).

According to Filatov (1960) the star was an RR Lyr variable but Vandenbroere (1993) has clearly showed that the object was a W UMa star. Vandenbroere (1993) also reviewed the history of the star by 1993, and suspected a period increase. Filatov (1960) published several moments of maxima and based on these moments Vandenbroere (1993) found the following ephemeris

$$Max = HJD \ 2430850.002 + 0.4190076 \times E \tag{1}$$

valid for 1943-1959. For the early 1990s Vandenbroere (1993) obtained the following ephemeris from her own new observations:

$$Min = HJD \ 2447643.1786 + 0^{d}.4190306 \times E$$
(2)

This period is longer by almost 2 seconds than that of given by Eq. (1).

Later, Torres & Melendo (1996) published a different ephemeris based on their 1996 observations:

$$Min = HJD \ 2450177.4767 + 0.41906 \times E \tag{3}$$

which period is again longer than the previously mentioned ones.

Since these values suggest about 30 sec/century period variation we decided to observe the system. Note that the highest rates of similar long term period increases in W UMa stars are 2.7 seconds/century for V839 Oph (Wolf et al., 1996), 3.1 seconds/century for UZ Leo (Hegedüs & Jäger, 1992) and 5.3 seconds/century for XY Boo (Molík & Wolf, 1998).

V842 Herculis was observed on four nights in April and May, 2000 with the 60/90/180 cm Schmidt-telescope of Konkoly Observatory. The detector is described in Bakos (1998). The CCD-frames were corrected for cosmic-ray events, and they were bias-subtracted and flat-fielded. Individual instrumental magnitudes were determined by the IRAF/DAOPHOT

package. The following stars were used as comparison stars: GSC 3497-31, 3497-51, 3497-239, 3497-346 and 3497-349. The data can be requested from the author.

List of the available minima (visual and CCD ones) and the corresponding O - C values are found in Table 1.

In two cases we had to change the type of minima from primary to secondary or vice versa, because the published types seemed to be wrong. The period was constant between JD 2 490 000 and JD 2 452 000. New ephemeris was determined based on CCD/PE minima tabulated in Table 1:

$$Min I = HJD \ 2450177.48(16) + 0.419037(9) \times E$$
(4)

and the corresponding residuals are listed in Table 1 as  $O - C_1$ . Note that the period remains the same when all minima are taken into account. Since period variation was suspected, a parabolic ephemeris was also computed using CCD/PE minima:

$$Min I = HJD \ 2450177.48(02) + 0.419035(8) \times E + 1.047 \cdot 10^{-9} \times E^2$$
(5)

The corresponding residuals are listed in Table 1 as  $O - C_2$ . This ephemeris would yield a rate of period variation of ~ 8 sec/century.

In the following analysis only the CCD/PE minima were used. The sum of squares of residuals is  $5.7 \cdot 10^{-4} d^2$  and  $4.1 \cdot 10^{-4} d^2$  for the linear and the parabolic ephemeris, respectively. In the case of the parabolic representation, one can estimate the period to be 0.4190206 at the time of Filatov's observations (see above). Thus, there is a 1 second discrepancy between this estimation and the period determined by Vandenbroere (1993) for that time.

Taken into account this, and the fact that the sums of squares of residuals are not significantly different for linear and parabolic approximations, we can state that the period of V842 Her has been constant in the last decade. However, sudden period change or changes in the past cannot be excluded. To solve the question of the period variation of this rather bright system further accurate CCD observations are needed.



Figure 1. O-C diagram of V842 Herculis. Squares and crosses are denoting CCD and visual minima, respectively. Dotted line: linear ephemeris (Eq. (4)), solid line: parabolic ephemeris (Eq. (5)).



Figure 2. Differential R light curve of V842 Her.

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Min <sub>HJD</sub> -	Е	Type	Error	$O - C_1$	$O - C_2$	Reference
-2400000		of obs.				
49074.600	-2632	vis	0.004	+0.026	+0.015	BBSAG 105
49075.430	-2630	vis	0.002	+0.018	+0.007	"
49076.459	-2627.5	vis	0.003	-0.001	-0.012	"
49124.459	-2513	vis	0.001	+0.020	+0.009	"
49124.65948	-2512.5	$\mathbf{PE}$	0.00012	+0.0106	+0.0001	Diethelm, 1994
$49205.367^{*}$	-2320	vis	0.006	+0.053	+0.044	BBSAG 105
49237.375	-2243.5	vis	0.005	+0.005	-0.004	"
49296.265	-2103	vis	0.003	+0.020	+0.013	BBSAG 107
49780.662	-947	vis	0.002	+0.009	+0.008	BBSAG 110
49799.508	-902	vis	0.004	-0.001	-0.003	"
49929.4182	-592	CCD	0.0012	+0.007	+0.009	BBSAG 109
50144.3803	-79	CCD		+0.0027	+0.0039	Agerer & Huebscher, 1997
50144.5898	-78.5	CCD		+0.0027	+0.0039	"
50151.5038	-62	CCD		+0.0025	+0.0038	"
50171.6089	-14	CCD	0.0002	-0.0062	-0.0048	Melendo & Torres, $2000$
50177.4766	0	CCD	0.0004	-0.0050	-0.0036	"
50178.5247	2.5	CCD	0.0004	-0.0045	-0.0031	"
50200.535	55	vis	0.003	+0.006	+0.008	BBSAG 115
50207.4404	71.5	CCD	0.0004	-0.0024	-0.0009	Melendo, 2000
50228.5892	122	CCD	0.0027	-0.0150	-0.0134	"
50516.4872	809	CCD	0.0005	+0.0039	+0.0064	Agerer & Huebscher, 1998
50538.486	861.5	vis	0.006	+0.003	+0.006	BBSAG 115
50541.4204	868.5	CCD	0.0010	-0.0044	+0.0068	Agerer & Huebscher, 1998
50556.499	904.5	vis	0.002	-0.002	+0.0001	BBSAG 116
51030.441	2035.5	vis	0.005	+0.008	+0.009	BBSAG 121
$51327.534^*$	2744.5	vis	0.004	+0.003	+0.002	"
51425.388	2978	vis	0.003	+0.012	+0.001	"
51430.412	2990	vis	0.004	+0.007	+0.005	"
51664.4431	3548.5	CCD	0.0002	+0.0054	+0.0012	this paper
51668.4211	3558	CCD	0.0006	+0.0026	-0.0017	"
51722.475	3687	vis	0.003	+0.001	-0.004	Vandenbroere, 2000

Table 1: List of minima of V842 Herculis

Abbreviations: vis: visual, PE: photoelectric

Asterisk means that published type of minimum was changed.