1991 $BVR_C I_C$ LIGHT CURVES AND PERIOD STUDY FOR THE VERY SHORT PERIOD, ACTIVE W UMa SYSTEM, V743 SAGITTARII

RONALD G. SAMEC[1,*], MIIN W. LOOI[2], BRIAN CARRIGAN[2]

[1] Bob Jones University, Greenville, SC 29614 USA

[2] Millikin University, Decatur, IL 62522 USA

[*] Visiting Astronomer, Cerro Tololo InterAmerican Observatory, National Optical Astronomy Observatories, which are operated by the Association of Universities for Research in Astronomy, Inc. under contract with the National Science Foundation.

As a part of our continuing study of the characteristics of very short period eclipsing binaries and as a follow up to the preliminary report of 1990 (Samec and DeWitt), we have obtained well-covered BVRI light curves of V743 Sagittarii [HV 10263, RA (2000) = $17^h 43^m 56^s\!.1$, D (2000) = $-28°29'54''$]. The early papers contain forty-eight timings of minimum light (Plaut 1958 and Swope 1940, Samec and DeWitt 1990). A further summary of the observing history of this neglected variable has been given previously (Samec and DeWitt 1990).
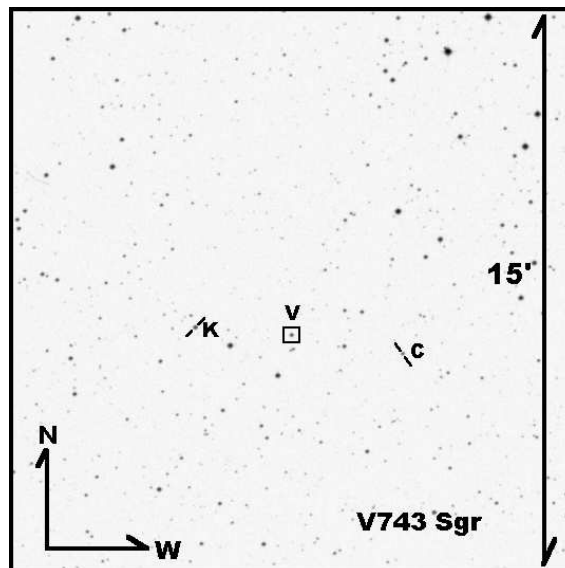

Figure 1. Finding chart (modified from the Digital Sky Survey image) of 743 Sgr, V, the comparison star, C, and the check star, K.

Our present observations were taken at Cerro Tololo InterAmerican Observatory with the 1.0 m Yale Reflector Telescope in conjunction with a Ga-As PMT on May 13 to 20,

1991. The comparison [RA (2000) = $17^h43^m42^s6$, D (2000) = $-28°30'26''$], and check stars, [RA (2000) = $17^h44^m7^s9$, D (2000) = $-28°29'40''$] are given C, and K in Figure 1 along with the variable, V. Some 350 observations were taken in each pass band. Four new epochs of minimum light were determined from the observations made during two primary and two secondary eclipses. MWL has redetermined the four earlier times of minimum light from Samec and DeWitt (1990). These minima are given in Table 1 along with their probable errors in parentheses. An improved linear ephemeris was calculated, using all available data:

$$J.D.\ Hel\ Min\ I = 2448392.7141(24) + 0^d276635806(57) \times E$$
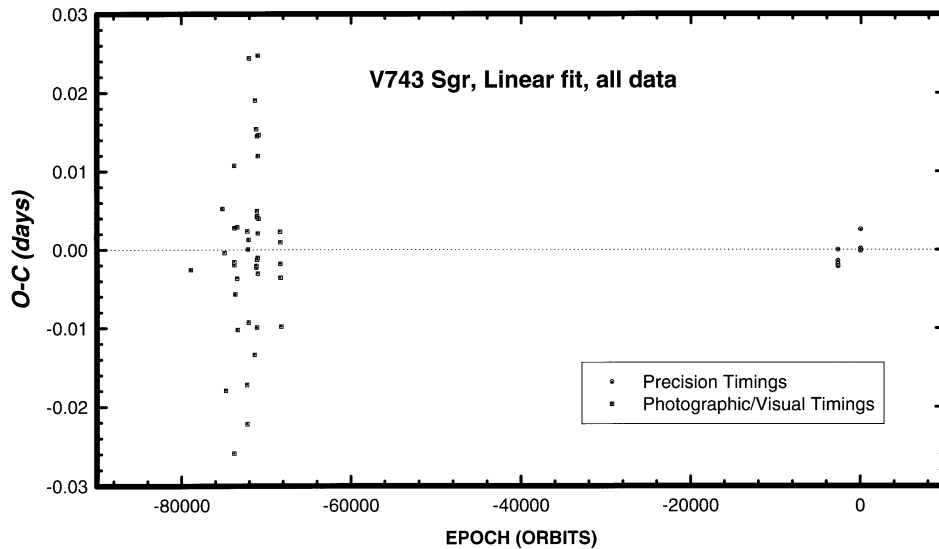
Figure 2. O−C residuals for all available timings of minimum light as calculated from the improved ephemeris.

The O−C residuals calculated from this ephemeris and all available timings of minimum light are shown in Figure 2. More timings of minimum light are needed to determine the period behavior of this system, both from photographic archives to fill in the large gap in the observations and from telescopic observations. Many W UMa binaries with a good data base show definite nonlinear period changes (usually quadratic), and this one may be no exception.

Our dereddening transformations indicate that V743 Sgr is a K0 spectral type variable. The BVRI light curves and the B−V and U−B color curves of V743 Sgr are shown as Figure 3 and 4 as differential standard magnitudes (variable−comparison) versus phase. The eclipse duration is ≈ 22 minutes (0.055P) for this very short period binary. Our simultaneous light curve solution (Wilson, 1990 and 1994) gave a component temperature difference of 354K, a mass ratio of 0.314 and a fill-out of 11%. A large polar cool star spot was determined. Also, the system has an active convective envelope with constantly changing spots as indicated by a comparison of our 1989 curves with the present, 1991 curves. For instance, the primary eclipse is definitely shallower and the O'Connell effect has reversed, in just two years! Do very short period W UMa systems mimic their larger cousins, the RS CVn-type binaries with regard to spot evolution? Only patrol projects of individual binaries will reveal the answer to this question.
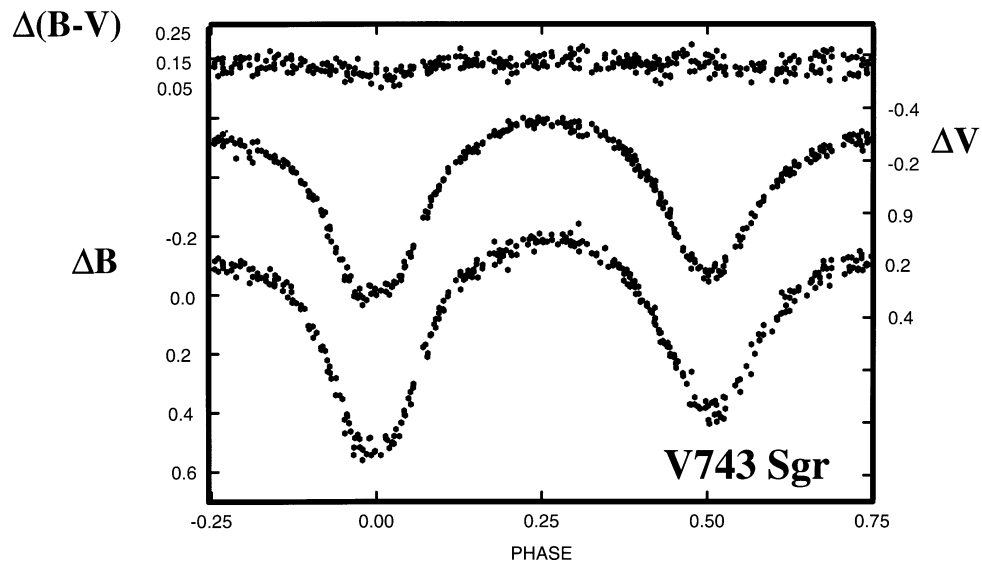
Figure 3. B, V light curves and B−V color curve for V743 Sgr as standard magnitude differences, variable minus comparison star.
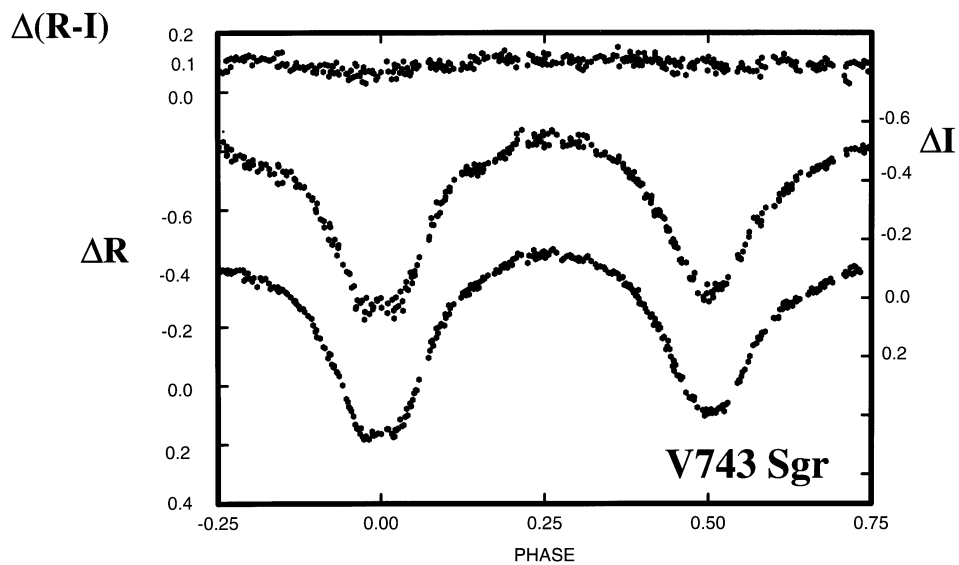
Figure 4. R, I light curves and R−I color curve for V743 Sgr as standard magnitude differences, variable minus comparison star.

Table 1: Epochs of Minimum Light, V743 Sgr

JD Hel. 2440000+	Min	Cycles	O−C	Source
7655.8946(4)	II	−2663.5	−0.0000	SD
7656.8614(1)	I	−2660.0	−0.0015	SD
7657.6909(1)	I	−2657.0	−0.0019	SD
7658.6588(8)	II	−2653.5	−0.0021	SD
8392.7142(3)	I	0.0	0.0001	PO
8392.8550(8)	II	0.5	0.0026	PO
8393.6849(6)	II	3.5	0.0026	PO
8393.8205(4)	I	4.0	−0.0002	PO

Sources: SD: Samec and DeWitt 1990,
PO: Present Observations

References:

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