

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

Number 5654

Konkoly Observatory
Budapest

19 October 2005

HU ISSN 0374 – 0676

GSC 02050-00745: A NEW RR LYRAE STAR WITH BLAZHKO EFFECT

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The variability of GSC 02050-00745 ($\alpha = 16^{\text{h}}18^{\text{m}}34^{\text{s}}.35$, $\delta = +27^{\circ}28'13''.3$ (J2000.0)) was discovered and initially investigated on the plates of Moscow collection taken with the 40-cm astrograph in Crimea. The phased light curve based on the photographic observations (206 estimates, JD2441829–49930) is given in Fig. 1. The curve's shape and period permit us to consider the new variable as an RR Lyrae type star with some peculiarity. The scatter on this phased curve is fairly large both in maximum (close to phase 0.0) and in minimum, suggesting some modulation, such as multimodality or Blazhko effect. To study the effect in more detail, we undertook additional CCD observations.

Our CCD photometry was carried out using a Pictor 416XTE camera at the 50-cm reflector of the Crimean Laboratory (Sternberg Astronomical Institute). The observations in the Johnson *V* band continued for two years. 778 brightness measurements were obtained on 10 nights in 2004 (July 5–28, JD2453192–215), and additional 467 on 10 nights in 2005 (June 30 – July 20, JD2453552–572). The images were dark subtracted, flat-fielded and analyzed with the aperture photometry package developed by V.P. Goranskij. The comparison and check stars are marked in Fig. 2. The accuracy of our photometry is $0^{\text{m}}.02$.

The phased light curves for two sets of CCD observations are shown in Fig. 3. The light elements are the following:

$$\text{Max} = \text{HJD}2453558.37 + 0^{\text{d}}.508646 \times E.$$

Significant changes of the light curve shape and the amplitude of the variability (from $0^{\text{m}}.93$ in 2004 to $1^{\text{m}}.34$ in 2005) are clearly seen. The maximum brightness also shows night-to-night changes which is evident in both sets of observations (Fig. 4). This behaviour is most resembling to RR Lyrae stars with Blazhko effect. To prove the periodic nature of the effect and to determine the period of the modulation further observations are needed. The only statement we can make now is that the Blazhko period is fairly long, considerably longer than the intervals of the observations in each of the two seasons. Note that the two sets of observations were not specially planned for maximum and minimum amplitude light variation, thus the total effect may be even more significant.

Finally, all our CCD observations were analyzed with the package *VAST* developed by Sokolovsky & Lebedev (2005) which aims to detect new variable stars on series of CCD images. This investigation resulted in the discovery of a new eclipsing variable USNO-B1.0 1175-0308984 ($\alpha = 16^{\text{h}}18^{\text{m}}26^{\text{s}}.91$, $\delta = +27^{\circ}33'15''.7$ (J2000.0), marked in Fig. 2 as EW). The star is an EW variable with the following light elements:

$$\text{MinI} = \text{HJD}2453214.387 + 0^{\text{d}}.336486 \times E.$$

The corresponding phased light curve is given in Fig. 5.

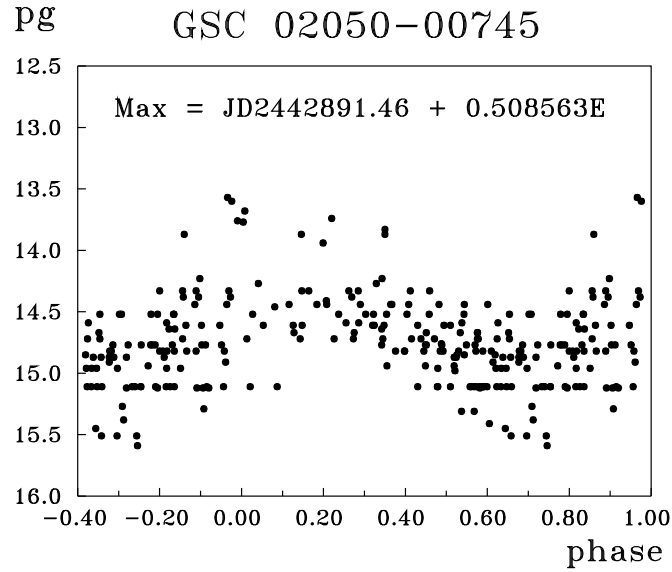


Figure 1. GSC 02050-00745. The photographic phased light curve.

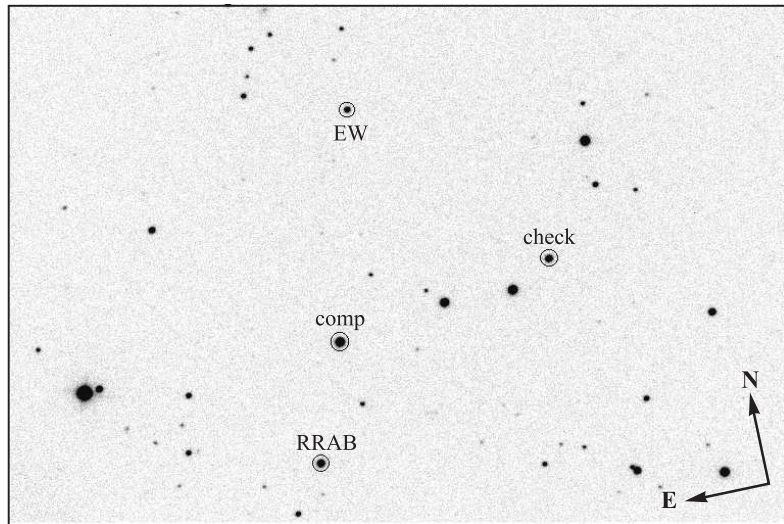


Figure 2. A V-band image ($12' \times 8'$) of the field around GSC 02050-00745 (RRAB). The comparison (comp), the check (check) stars and the newly discovered eclipsing variable (EW) are marked.

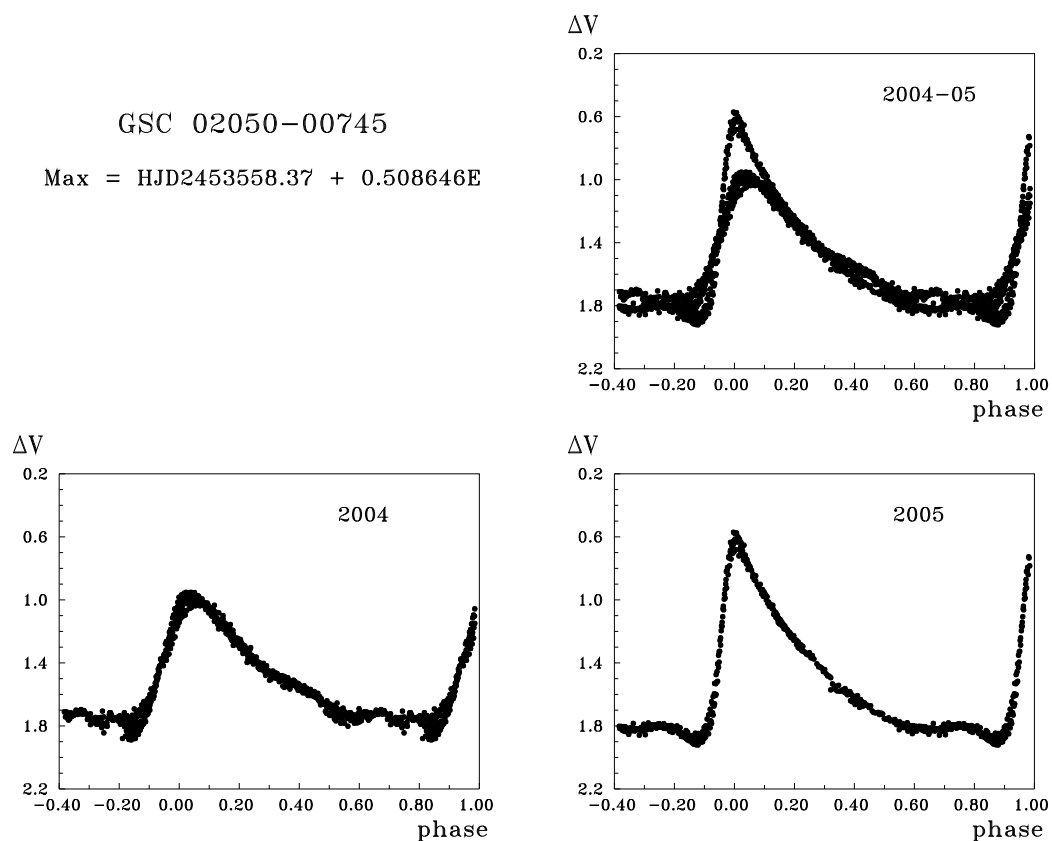


Figure 3. GSC 02050-00745. The phased light curves based on CCD observations. Two bottom panels show separate light curves for the seasons of 2004 and 2005. The changes of the light curve shape and of the amplitude of variability are clearly seen.

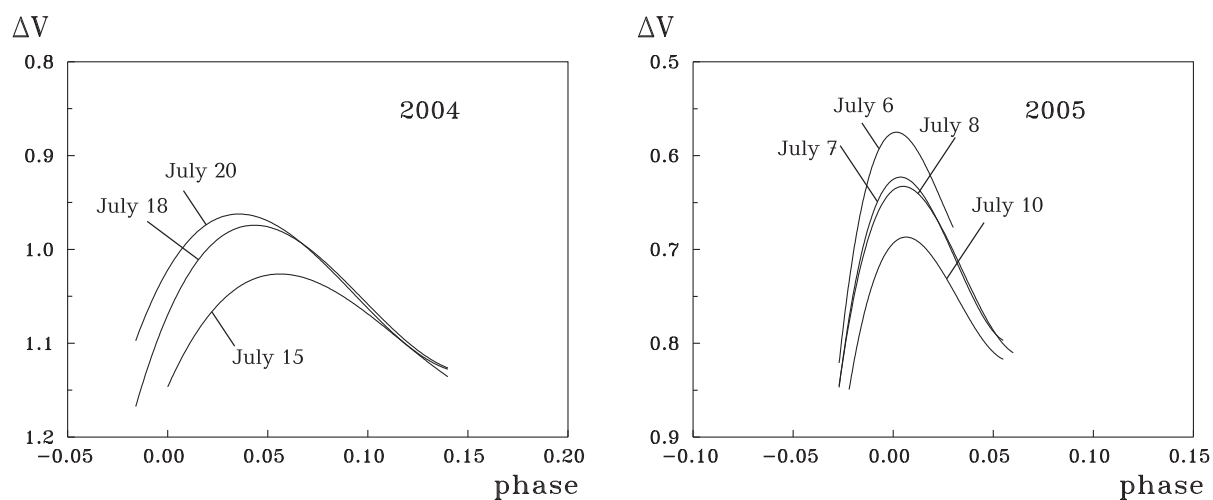


Figure 4. GSC 02050-00745. Night-to-night variations in the height of maxima for the two seasons of observations.

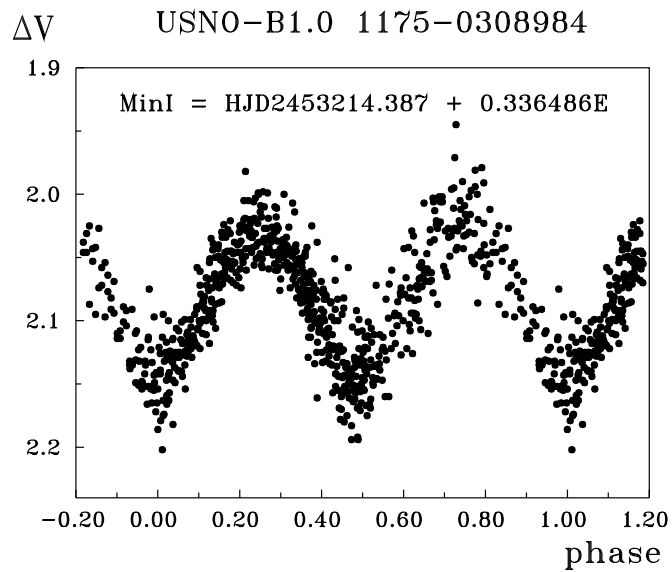


Figure 5. USNO-B1.0 1175-0308984. The phased light curve of the newly discovered eclipsing variable.

Acknowledgements: Two of the authors (S. Antipin and K. Sokolovsky) are grateful to the Russian Foundation of Basic Research (grant No. 05-02-16688) for partial support of this study.

Reference:

Sokolovsky, K., Lebedev, A., 2005, in *12th Young Scientists' Conference on Astronomy and Space Physics*, Kyiv, Ukraine, April 19–23, 2005, eds.: Simon, A.; Golovin, A., p.79 (VAST: <http://saistud.sai.msu.ru/poisk>)