DISCOVERY OF A NEW VARIABLE STAR GSC2.3 N2X9042559

STRIGACHEV, ANTON[1]; BACHEV, RUMEN[1]; SEMKOV, EVGENI[1]

1) Institute of Astronomy, Bulgarian Academy of Sciences, 72 Tsarigradsko shosse Blvd., 1784 Sofia, Bulgaria
anton@astro.bas.bg

Abstract: We report on the discovery of a new variable star GSC2.3 N2X9042559. The shape of the light curve and the derived period lead us to the preliminary conclusion that this star is a close binary of EW type with ephemeris $HJD\_Min(R) = 2454332.478(\pm0.002)+0.3616(\pm0.0002)E$ and R magnitude range $15.3-15.8$.

A new variable star was discovered while monitoring BL Lac for the WEBT multi-site campaign for observations of blazars (Villata et al. (2004)). The observations were performed with the 50/70-cm Schmidt telescope of NAO Rozhen – Bulgaria, equipped with a CCD ST-8 camera and standard UBVRI filters. The field of view of this telescope is large (28 x 18.7 arcmin with ST-8), and the star was almost at the edge of the field, which may explain why it had not been noticed during previous monitoring vampaigns of BL Lac. The variability was found by one of us (RB) serendipitously after performing differential aperture photometry performed to all stars on the frames. The star is catalogued in The Guide Star Catalog, Version 2.3.2 (GSC2.3) (STScI, 2006) as N2X9042559. A search in SIMBAD and VIZIER databases, as well as in HIPPARCOS and TYCHO catalogues (ESA (1997)), didn't reveal any information about variability of this star.

The coordinates, the time of minimum and the derived period are given in Tab. 1. The finding chart is presented on Fig. 1. Coordinates and R-band magnitudes for two comparison stars (A-comparison and B-check star) are given in Tab. 2, also shown on Fig. 1. Their magnitudes are calibrated with standards stars of the field of BL Lac (Fiorucci & Tosti (1996)). The light curve in R-band is plotted on Fig. 2. In this figure the magnitudes are real, and phase is computed with the time of minimum and the period given in Tab. 1. The dates of observations (18, 19 and 20 August 2007) are plotted with different symbols (colors).

From the presented light curve we cannot conclude if the observed minimum is primary or secondary. However from the shape of the light curve and the derived period we could assume that this star is an eclipsing binary of W Ursae Majoris type (EW). These are eclipsing binary stars with periods less than 1 day; the components are close and in contact; light amplitudes are usually less than 1 mag; the depths of primary and secondary minima are almost equal; and both components generally belong to the same late spectral class (K-F-G or later). There is a gap in the light curve coverage just around one minimum and therefore we cannot draw a conclusion about the full amplitude, the min I/II classification, etc. Thus the conclusions concerning the newly discovered variable are preliminary.

The physical nature of this star could be revealed by further observations and detailed alalysis of its light curve in different photometric bands. With this paper we would like to stimulate its future observations and studies.

References

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Table 1: Coordinates, time of minimum (heliocentric JD) and period

GSC2.3 Ident.	RA(J2000.0)	DEC(J2000.0)	HJD(min)	σ	Period(days)	σ
N2X9042559	22 03 14.98	+42 23 30.1	2454332.478	0.002	0.3616	0.0002

Table 2: Comparison stars as indicated on Fig. 1

Ident.	RA(J2000.0)	DEC(J2000.0)	R (mag)	σ R (mag)
A	22 03 17.56	+42 22 37.0	12.79	0.04
B	22 03 18.97	+42 22 04.9	13.59	0.05