

BH LYN: UBVRI AND CCD PHOTOMETRY OF THE ECLIPSING CATAclySMIC VARIABLE

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ABSTRACT. We report preliminary results of the UBVRI photoelectric and R CCD observations obtained in the Crimean astrophysical observatory and the Astronomical observatory of the Athens University. The light curve represents well-pronounced eclipses with a total duration of the most sharp phase of 0^m.422. At the eclipse, the color index U–B becomes smaller by 0^m.2 than outside eclipse, contrary to other colors, where the color indices become larger. This indicates a presence of uneclipsed source of ultraviolet emission, possibly the wind from the accretion disc.

Key words: Stars: variable: cataclysmic: BH Lyn

1. Introduction

PG 0818+513 (=BH Lyn) was detected as an UV - excess object ($V=15^m.58$, $B-V=0^m.15$, $U-B=0^m.77$) by Green et al. (1982, 1986), who classified it as a cataclysmic variable (CV). Andronov (1986) discovered its photometric variability and suspected that it is an eclipsing CV. Richter (1989) confirmed the eclipsing nature of the star. The 224-minute orbital period was determined by Andronov et al. (1989) using the method for determining the photometric period using moments of characteristic events (Andronov, 1991).

Thorstensen et al. (1991) confirmed the period from the emission lines, however, noting a significant ($\sim 57^\circ$) phase lag in respect to the eclipse. He classified the star as belonging to the subgroup of SW Sex-type stars,

also containing DW UMa, V1315 Aql and PX And.

Hoard and Szkody (1997) estimated the masses of the white and red dwarfs in the system as $M_{wd} = 0.7M_\odot$, $M_2 = 0.3M_\odot$ and the inclination angle $i = 79^\circ$. Hellier (2000) currently reviewed the properties and models of the SW Sex-type stars.

Our observations span a 14-year interval, and will be discussed elsewhere. In this paper, we present a sample light curve and its brief discussion.

2. Observations

The UBVRI observations have been obtained at the 1.25m telescope AZT-11 of the Crimean astrophysical observatory using the 5-color photometer-polarimeter. The time resolution in the photometric mode is 12 sec.

The CCD observations have been carried out at the 1.2m telescope at the Kryonerion observatory.

5-color photometry

One of the light curves is shown in Fig.1 in the instrumental system. One may note prominent eclipses. To smooth the observations, we have applied the method of running parabolae using the program OO described by Andronov (2001). The basic points used as the characteristics are the top of the hump at time .4105-.4151 (instrumental brightness m_0), the first and second minima and brightness m_3 at $t = .44396$ after the first minimum. Here times are expressed as time-2448245, and

magnitudes as differences from the hump value. These results are listed below:

| m_0 | t_1 | m_1 | t_2 | m_2 | m_3 |
|-------|--------|-------|--------|-------|-------|
| 4.693 | .43489 | 1.249 | .58997 | 1.446 | 0.260 |
| 5.531 | .43480 | 1.441 | .59040 | 1.545 | 0.188 |
| 5.884 | .43421 | 1.349 | .59055 | 1.498 | 0.169 |
| 5.898 | .43421 | 1.080 | .59041 | 1.051 | 0.203 |
| 5.759 | .43344 | 0.746 | .59055 | 0.640 | 0.192 |

One may note significant difference between the values of brightness in two subsequent minima which is strongly wavelet-dependent and reaches 0^m197 in U and -0^m106 in I. The hump is the largest in U (0^m26) and is in the range $0^m17..0^m20$ in other colors. For both minima, the depth is maximal in B (1^m35-1^m50) and minimal in I (0^m75-0^m64). The minima timings in different filters differ no more than for 58 seconds, i.e. within error estimates.

Despite the system becomes "redder" in red colors, the U-B color becomes smaller than at the hump by -0^m19 and 0^m10 for first and second minima, respectively. This argues for a presence of an extended region of ultraviolet emission, which is not completely eclipsed. It is interesting to note that, in addition to the ultraviolet continuum, there is a source of another emission (i.e. of the H α lines), which is less eclipsed than the underlying optical continuum (Thorstensen et al., 1991). This is a common feature of the SW Sex-type stars (Dhillon et al., 1992; Hoard and Szkody, 1997).

Such behaviour may be explained by a presence of wind from the accretion disc.

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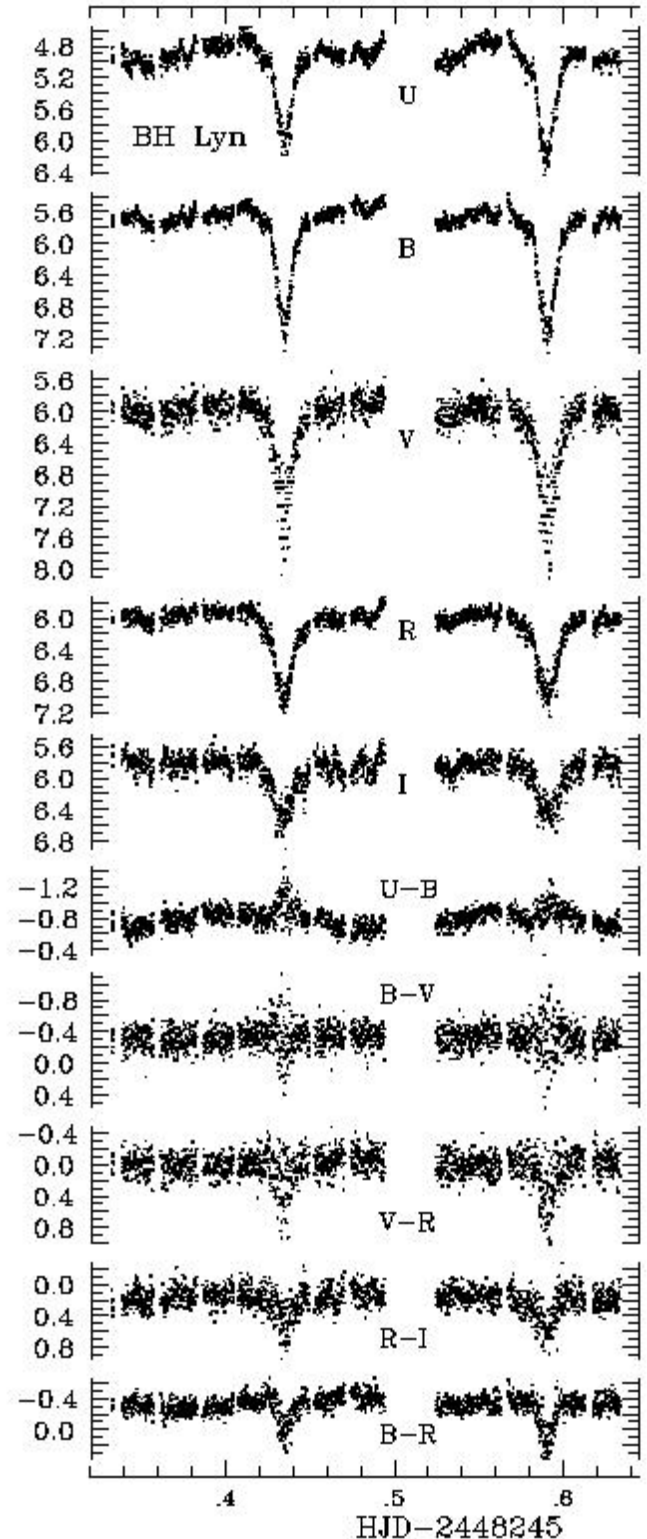


Figure 1: UBVR observations of BH Lyn in the instrumental system and instrumental colors.