

OLD AND NEW OBSERVATIONAL DATA FOR P CYGNI

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Abstract. We present results of old and new photometric observations of P Cygni. The old data (1951–1983) were collected by E. Kharadze and N. Magalashvili at the Abastumani Astrophysical Observatory, Georgia; we recovered and recalculated them, and concluded that the star should undergo its next great eruption in some 100 years. New observations, obtained in 2014 using the Abastumani 48-cm Cassegrain telescope, demonstrated interesting behaviour in the light-curve.

Keywords: UVB photometry, stars: Luminous Blue Variable Stars, individual: P Cygni

1 Introduction

P Cygni, the massive early-type Luminous Blue Variable with a history of some 400 years of investigations, had been observed photoelectrically with the 33-cm reflector of the Abastumani Astrophysical Observatory from its very establishment. The telescope was equipped with an electro-photometer which had a maximum spectral sensitivity at 4350 Å. The photometric system was similar to that of Johnson (Beradze et al. 2015). From 1951 N. Magalashvili and E. Kharadze observed P Cyg regularly with this telescope, using B and V filters from 1951–1960 and UBV filters after 1961. Kharadze and Magalashvili continued observing the star until 1983. From 1968 they used the same filters and the same photometer but on the Abastumani 48 cm Cassegrain telescope. We had the opportunity to process those observations and to calculate reliable brightness variations of the target star using 36 Cyg as comparison star; see Fig.1 (Beradze et al. 2018) (Kochiashvili et al. 2018). At first glance we can see that during 1974–1983 the star dimmed in the U band while brightening in the B and V bands (the last third part of Fig. 1). The middle part of the figure represents the time interval of 1961–1967, when the colour behaviour of the star was different; whilst brightening in V , the star became fainter in B and U .

2 Colour behaviour of P Cygni

Long-term photometric observations of P Cyg have given us an opportunity to trace its $B - V$ colour variability. It is known that the star is gradually reddening; however, that behaviour is particularly impressive as seen in the observations of Kharadze and Magalashvili, because after correcting for an initial reddening of 0.5 in $B - V$, the $B - V$ values vary from -0.5 to -0.1 between 1951 and 1983. Those colour indices correspond to an early-B type (Kochiashvili et al. 2017).

3 Photometric observations of P Cygni in 2014

We observed P Cygni on 2014 July 23–October 20 with the 48-cm Cassegrain telescope and standard B, V, R, I filters. HD 228793 ($V=9.9$, $B=10.16$) was used as a comparison star (see Fig. 2). During those observations P Cyg underwent light variations with a mean amplitude of ~ 0.1 mag in all pass-bands, during a period of ~ 68 days (Beradze et al. 2018) (Kochiashvili et al. 2017).

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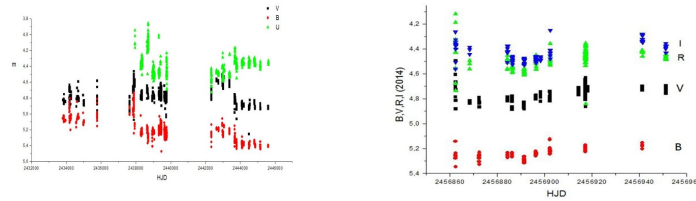


Fig. 1. Left: *UBV* observations of P Cyg made by E. Kharadze and N. Magalashvili during 1951–1983. 36 Cygni (HD 193369) was used as a comparison star. **Fig.2 Right:** Observations of P Cyg in 2014.

4 Conclusions

We have presented observations of P Cyg obtained between 1951–1983 and in 2014 at the Abastumani Astrophysical Observatory, including unpublished observations obtained by Kharadze and Magalashvili. These observations are very significant for the following reasons: 1. they represent homogenous data of more than 30 years; 2. The simultaneous *UBV* observations enable us to trace the colour behaviour of the star; 3. The observations by Kharadze and Magalashvili are unique because they are the only existing data of P Cyg observed with *UBV* filters between 1951 and 1983. But we still need more observational data and detailed analyses, because some questions still remain unanswered, e.g. concerning a possible binary nature of the star. The mechanism of the great eruptions in P Cyg and other LBVs are still not established. The connection between stellar rotation, pulsation and magnetic fields in P Cyg are (so far) also not very clear.

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