

New Photometric Observations of P Cygni

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We present the results of the new photometric observations of the famous hypergiant P Cygni. New observations were obtained in 2014 using the 48 cm Cassegrain telescope of the Abastumani Astrophysical Observatory, Georgia. We reveal some interesting behaviors of the B,V,R,I light curves, and also report new results on the periodicity of P Cygni's variation. The latter result is based on the analysis of the photometric data (U,B,V filters) collected at the Abastumani Observatory between 1937 and 1983.

Photometric observations of P Cygni in 2014

We observed P Cygni in July 23 – October 20, 2014 with the 48 cm Cassegrain telescope and standard B,V,R,I filters. HD 228793 has been used as a comparison star. We find spectral observations of the star by Alexandre Senterne¹ with the HARPS-N spectrograph, attached to the TNG. During the observations the star underwent light variations with the mean amplitude of approximately 0.1 magnitudes in all pass-bands, and the period of this change was approximately 70 (67.8) days. There is also a relation between brightness and the H α EW variability. The cause of this feature may be a variability rate of the stellar wind that is very strong, which, on the other hand, maybe due to the pulsation of the star.

Colour behavior of P Cygni

Long-term photometric observations of P Cygni give us the possibility to trace the B-V and U-B colour variability of the star. It is accepted that P Cygni is gradually reddening. But this behavior is very impressive in the observations of Kharadze and Magalashvili, because B-V varies from 0.0 to 0.4. It means that the star seems to be of late A, early F spectral type, with temperature between 7500–9000 K. But according to the 2014 spectral observations by A. Senterne¹, the temperature of P Cygni is $T_{\text{eff}} = 21000 \text{ K}$ ($T_{\text{eff}} = 18200 \text{ K}$ by Najarro et al. 1997). After correcting for the reddening by 0.5 (Najarro 2001), we have B-V values from -0.5 to -0.1 in 1951–1983. In 2014's observations the colour of the star corresponds to the early B-spectral type (B1), and it seems that the problem is resolved. However, the B-V colour shift by ~ 0.55 during 1951–2014 is an observed fact (B-V varied in the range of 0.4–0.55 during the observational run of 2014).

P Cygni's fate

It seems that P Cygni has been a late O-spectral type star at the first half of the 20th century (the top part of the Fig. 1). If the colour behavior of P Cygni will have the same character in future, then in 80–120 years the star will reach the “constant temperature outburst phase” and may undergo the next great eruption, or even supernova explosion. See the bottom part of Fig. 1 (from Smith et al. 2004).

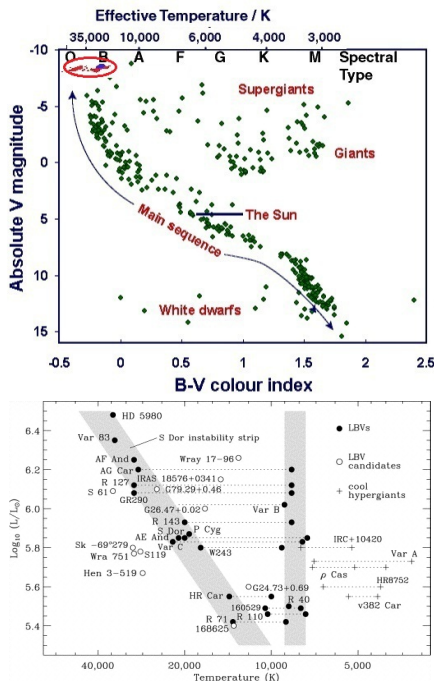


Fig. 1: P Cygni in the HR diagram

References

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¹<http://www.spectro-aras.com/forum/viewtopic.php?f=17&t=996>