

SIMULTANEOUS PHOTOMETRY AND SPECTROSCOPY OF THE PECULIAR B[e] STAR
WITH INFRARED EXCESS HD 45677

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Abstract

U, B, V photometric observations performed in February 1977 at the European Southern Observatory (62 cm Bochum telescope) show that for the star B2IV[e] HD 45677 some of the magnitudes and related color indices may vary by as much as 0.03 mag. over one night, and about 0.1 mag. from night to night. The conclusion derived from our photometric run confirm those published by Feinstein et al (1976), namely that "A variation in V is almost systematically accompanied by a change in B-V but of opposite sign". We further find that a variation in V is well correlated with a similar change of the U-B index : such a correlation existed in the data of Feinstein and coworkers, although it had not been reported.

Our spectroscopic material, that was obtained simultaneously with the photometry mentioned above, consists of 38 spectra that cover the blue region at a dispersion of 20 \AA mm^{-1} . Such an important sample of spectrograms has not yet been analysed in great detail for intensities, radial velocities, etc. . We will only report here on striking variations that were detected in the profiles of the following lines : H_{γ} , H_{δ} , H_{ϵ} , Ca II(H) and Mg II λ 4481.

The hydrogen line profiles are complex : they consist now of a broad and shallow absorption on which is superimposed an emission line broken on its violet side by a deep and narrow absorption (P Cygni type). On each side of this absorption one observes two distinct emission wings that will be referred to as the violet and red wings. The intensity of the violet wing varied appreciably during the course of our observations : it reached a maximum (resp. minimum) value when the continuum level of the stellar flux measured via the U, B, V filters reached a minimum (resp. maximum).

The circumstellar absorption due to the H line of Ca II is blended with the violet emission wing of H_{ϵ} : when the latter appears with its maximum intensity, the Ca II absorption component is no longer visible on our spectra.

The profile of Mg II λ 4481 is closely related to that of the hydrogen lines. A deep and fairly narrow absorption component is surrounded by two emission wings : the variability of the violet wing appears to be the same as for the Balmer lines.

If the light variations observed for HD 45677 are interpreted in terms of obscuration by circumstellar dust clouds (Swings and Allen, 1971; Coyne and Vrba, 1976) it is likely that part of the stellar UV and visible radiations will be back-scattered inside the extended atmosphere surrounding the star. The excitation of all atoms and ions present in the envelope will be affected by such a process : subsequent variations of the line emissions and absorptions are bound to occur. It is expected however that this back-scattered

radiation will have a stronger influence on the excitation of atoms moving toward the observer than on that of those escaping behind the star in an opposite direction. Such a mechanism will therefore lead to a selective increase of the intensity of the blue emission wings relative to the red wings; at the same time the stellar flux observed from the earth will be fading.

A more detailed, i.e. more quantitative, analysis of our data is in progress and will be published later.

References

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