BLANKETING HYPOTHESIS AND LIGHT VARIATIONS OF HD 27309

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ABSTRACT. The influence of variable blanketing on the photometric variations of hot, silicon Ap star HD 27309 has been estimated. Spectrum variations in the visible are not the principal reason for the observed light variability, but flux redistribution from UV into visible fit well the observational data. An reference is made on the fulfillment of the variable blanketing assumptions at least for silicon Ap stars.

I. INTRODUCTION

As suggested by Peterson (1970) the photometric variations of the Ap stars could be produced by flux redistribution from shorter into longer wavelengths. Following Peterson's hypothesis the observed photometric variability of these stars is naturally caused by the spectrum variations. In the framework of the variable blanketing the light changes in a given band are connected with a total flux balance between energy redistributed into this band from shorter ones and energy blocked by the spectral lines in the same band. The observational data are in qualitative agreement with Peterson's assumptions, but any quantitative analysis gives ambiguous results (Schoeneich, 1981).

To check the variable blanketing hypothesis investigations of Ap stars with well established photometric and spectral behaviour are needed. One of these stars is the bright, Si-type star HD 27309.

C. R. Cowley et al (eds.), Upper Main Sequence Stars with Anomalous Abundances, 291–294.

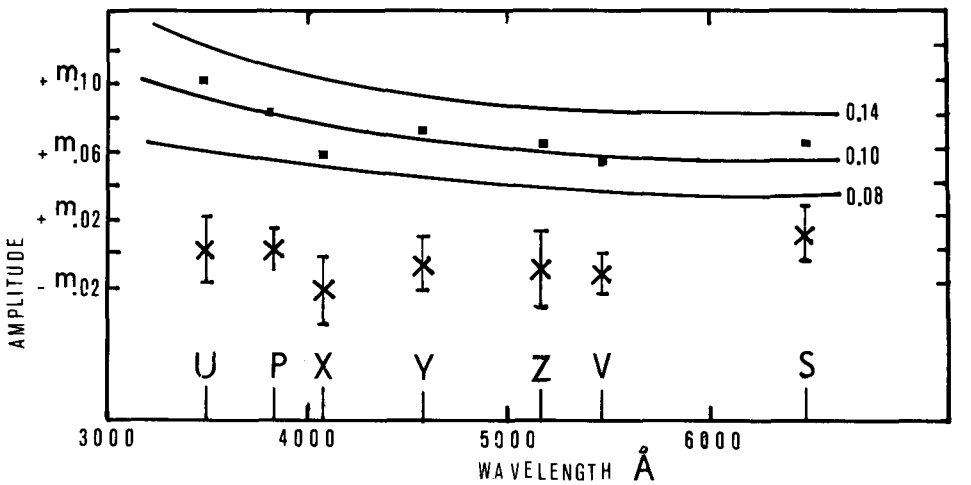

Fig.I. Observed and computed relations "amplitude - wavelength" for the Ap star HD 27309. Full squares represent the observed relation from Musielok et al. (1980); crosses with error bars - computed relation if only the spectrum variations in the visible are assumed; solid lines represent simulation results for the flux redistribution from the UV into the visible for three different values of the integral blocking coefficient.

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2. OBSERVATIONAL DATA AND COMPUTATIONS

It is well known from Musielok et al. (1980) that HD 27309 exhibits a single-wave photometric variations with amplitudes up to 0.1 in the U-band of the Vilnius system. Jamar (1978) has found UV-flux variations in antiphase with the photometric ones. The amplitude of this UV-changes reaches 0.5. As shown recently by Iliev (1983a) HD 27309 is a moderate spectrum variable in the visible. The intensities of the Si, Fe and Ti lines vary by about 40 percent over the cycle of the star in phase with the photometric variations. Thus, light and spectrum changes are in qualitative agreement with the assumptions of Peterson's hypothesis.

During 1980-82 spectroscopic observations of HD 27309 were carried out at six-meter telescope with the main stellar spectrograph. Twenty spectrograms on IIaO and I03aF emulsions were obtained with dispersions of 7, 9 and 14 A/mm and spectral resolution of about 0.25 A in the wavelengths region 3300-6600 AA. The region of the Vilnius system is approximately the same.

After the usual reducing procedure line blocking coefficients in 25 A intervals were measured. Using the classical formula of Wildey et al. (1962) blanketing corrections for all bands of the Vilnius system are computed. The response curves are taken from Straizis and Zdanavicius (1970). The observed and computed relations "amplitude of light variations - wavelength" for HD 27309 are shown in figure 1. It should be pointed out that blanketing process means flux-redistribution or backwarming plus line blocking. This motivates the need to take into account not only the first or the second mechanism of flux variations.

3. DISCUSSION AND CONCLUSIONS

It becomes clear from figure 1 that the spectrum variations only in the visible region are not the cause for the observed light changes. The behaviour of the continuum is more crucial. The simulation results for the flux redistribution process from the UV-region for three different values of the integral blocking coefficient η are also shown in figure 1. The results for $\eta = 0.10$ fit well the observational data. Such value of the integral coefficient is in good agreement with Jamar's (1978) results. Thus, the photometric behaviour of HD 27309 is caused mainly by flux redistribution from UV into the visible.

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It is important to mention that the results obtained for HD 27309 are very similar to these for HD 170000 (Musielok, 1981) and for HD 19832 and HD 184905 (Iliev, 1983b). This fact gives strong evidence in support of the variable blanketing hypothesis at least for hot, silicon Ap stars.

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