THE NATURE OF BALMER LINE VARIABILITY IN CHEMICALLY PECULIAR STARS

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Photoelectric measurements of the β-index were made for six Ap-stars (56 Ari, 41 Tau, ϕ Dra, HD 188041, HD 215441, HD 221568) and one He-rich star (HD 184927). For all these stars the minimum of β occurs at a phase of maximum light at a wavelength longward of the null-wavelength region. Such coincidence can be explained by the blanketing mechanism proposed by Kodaira (1973) for the explanation of the Hγ line variations in HD 221568. According to Kurucz (1979), for stars hotter than 9000K an increase of metal abundance in the atmosphere causes an increase of the visible flux and an simultanous decrease of equivalent widths of Balmer lines. The same changes of the visible flux and equivalent widths of Balmer lines can be obtained using a model atmosphere with a suitable higher temperature. Using the Kurucz (1979) model atmospheres, temperature differences were calculated, which are necessary to obtain the observed decrease of the β-index and the increase of the flux in a given photometric band.

The relation between these temperature differences is given on Fig. 1, where the solid line is drawn assuming the "Balmer line" and the "photometric" temperature differences to be equal. Only the helium variable star HD 184927 evidently does not fulfill this relation. Applying the model atmospheres of Osmer and Peterson (1974) to the uvby photometry of Bond and Levato (1977) and spectroscopic measurements of Levato and Malaroda (1979), one can show, that within the observational errors the variations of the observed quantities (including the variations of hydrogen lines) can be explained as a consequence of variations of the relative helium to hydrogen content. This effect works also in the case of the Ap-star CU Vir. The measured variations of the equivalent width of the Hγ line (Riabchikova, 1972) and β-index (Weiss et al., 1976) are too large compared to the photometric variations (Weiss et al., 1976) -- ($\Delta T_{\text{Balmer lines}} = 645K$; $\Delta T_{\text{photometry}} = 260K$).

Khokhlova (1972) has determined the variations of the relative helium to hydrogen content for CU Vir. Applying to her data the model atmospheres of Klinglesmith (1971), one can calculate the variations of the Hγ line caused only by variations of the relative helium to hydrogen content and subtract these variations from the observed ones. The remaining variations of the hydrogen lines require an increase of the effective temperature of only 340K. This is marked by the arrow on Fig. 1.

CONCLUSIONS.

1) The Balmer line variations in Ap-stars can be explained by the blanketing mechanism.
2) In the case of helium variables, the Balmer lines are also affected by variations of the

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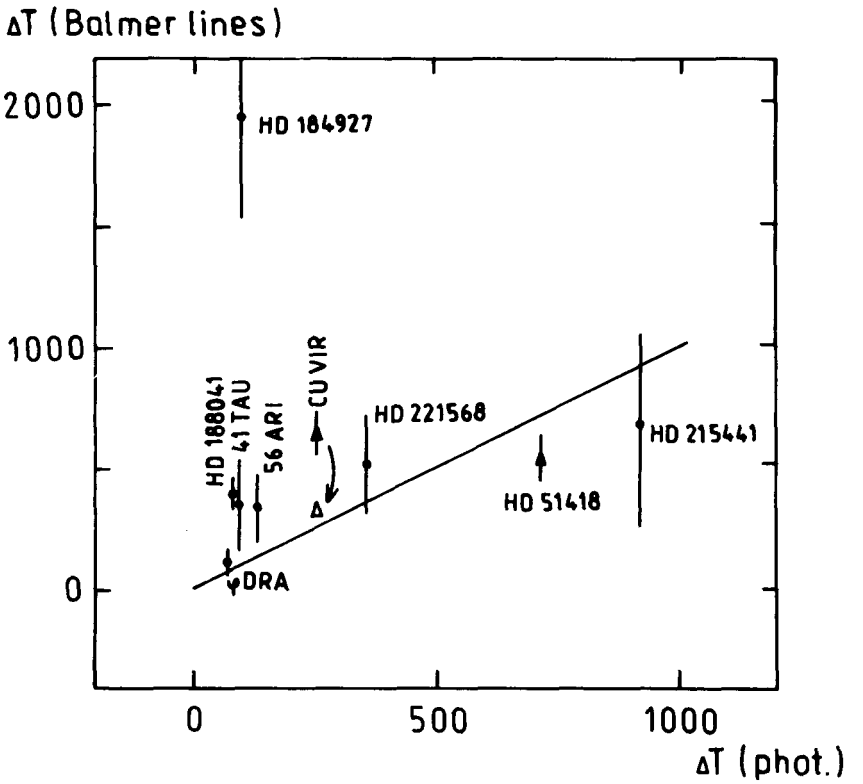

Figure 1. The relation between the "Balmer line" and "photometric" temperature differences. (● – present paper; ▲ – confirmed results of other investigations: HD 51418 – Gulliver and Winzer (1973), and Hardorp (1975); CU Vir – Riabchikova (1972) and Weiss et al. (1976).

relative helium to hydrogen content.

3) The quantitative dependence between the Balmer lines and the light variations gives strong support to the blanketing mechanism as the source of light variations in Ap-stars.

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