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PHOTOMETRIC VARIATIONS IN THE Ap STAR HD 215441

Photometric variations of the peculiar class A (Ap) magnetic stars have been theorized to occur due to the rotational modulation of an inhomogeneous distribution of emmittant flux, as opposed to effective temperature variations of the stars as a whole. This process has been shown to occur in the one Ap star α^2 CVn by Cohen (1970) and Molnar (1973). However, calculations of the effective temperature variation of the other highly magnetic (maximum field strength ≈ +32 kilogauss) Ap star HD 215441 (Babcock's star) have left uncertainties as to the applicability of the flux redistribution theory to it. Stępień (1968) calculated a variation of 1300 K in effective temperature, while far-ultraviolet photometry by Leckrone (1974) indicated a variation of no more than 100 K, indicating the existence of a flux redistribution mechanism.

The lack of agreement in these values indicated that, as for α^2 CVn, spectrophotometric observations of the star over its period and consequent effective temperature determinations would be of interest. No basis of data has yet been obtained in support of Leckrone's conclusion that the star undergoes flux redistribution, in terms of observations of the star's continuum over its period.

Observations of HD 215441 over half its period were made in the region from λ7650 to λ8950 using the 256 photodiode array direct mode Reticon spectrometer system developed by the University of California at Los Angeles Department of Astronomy. The instrument was mounted at the cassegrain foci of the 16 inch reflector of the University and the 24 inch reflector of the Table Mountain Observatory facility of the Jet Propulsion Laboratory.

Figure 1 shows a composite of the scans obtained (non-flux calibrated) from phase 0.0 at the top to phase 0.5 at bottom. Phases were calculated using the ephemeris of Preston (1969).

Following the full reduction and sky subtractions for the individual scans, the count per channel values of each scan were divided into those of the scan for phase 0.0 across the entire scan range in an effort to detect any slope variation of the continuum as a function of phase. Figure 2 shows the results

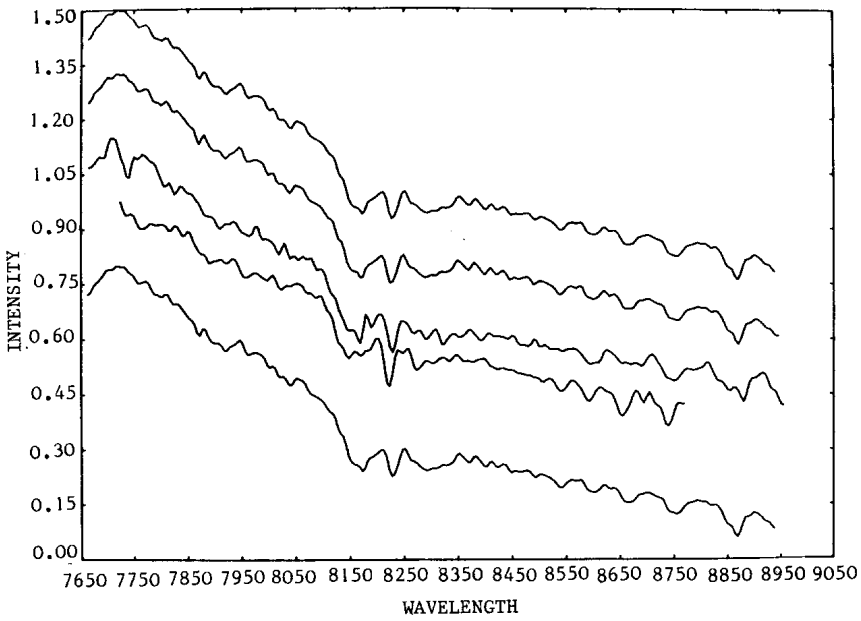

Figure 1

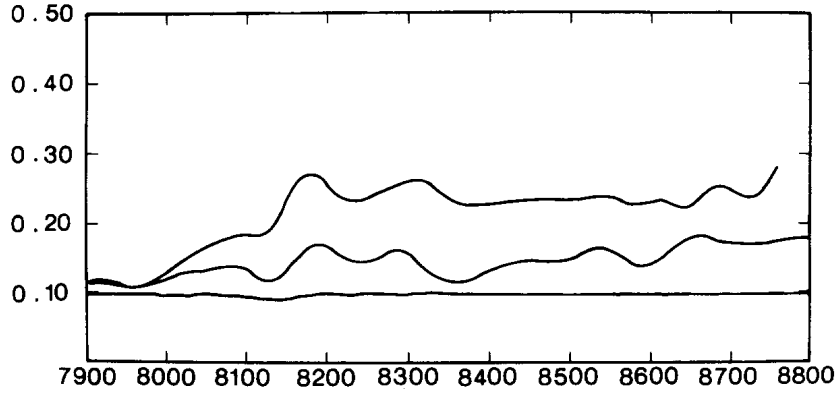

Figure 2

of the divisions where the zero point of the abscissa is arbitrary.

For the wavelength region λ8100 - λ8800 the flat nature of the scan divisions is indicative of negligible slope variations and consequent effective temperature variations over the phases covered in this study. It thus appears that some form of flux redistribution is responsible for the photometric variations of the star, as no form of large temperature variation is indicated by the data obtained here.

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