SPECTRAL ENERGY DISTRIBUTION OF Be STARS

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Measurements

During two observation periods in Nov./Dec. 1981 and April/May 1985, absolute spectral energy distributions of 41 southern and equatorial Be stars were photometrically measured at 10 Å spectral resolution in the wavelength range between 3200 Å and 8500 Å, using the scanning spectrophotometer attached to the 61 cm telescope of the University of Bochum at La Silla/Chile. Spectral fluxes of the program stars have been determined with an error of $0^m.03$ or less.

Results

1. For the first time the double structure of the Balmer discontinuity - well known from the analysis of photographic spectrograms (cf., e.g. Barbier and Chalonge, 1941) - has been resolved by means of photoelectric spectrophotometry. The energy distributions of 30 program stars clearly reveal a second Balmer discontinuity in emission; 9 stars (all of them late-type Be stars or stars with no or very small Hα emission during the period of the observations) have just the single stellar Balmer discontinuity, and in the spectra of HR 5941 (48 Lib) and HR 5440 (η Cen) a second Balmer discontinuity in absorption is found.

2. The first (stellar) Balmer discontinuity is well suited to determine the effective temperature of the underlying star.

3. The second Balmer discontinuity d (see Fig. 1) is a parameter for the additional radiation of the Be star envelope near the Balmer series limit. In contrast to previous investigations (e.g. Schild, 1978) a clear correlation to the Hα emission line equivalent width is found (Fig. 2). Late-type Be stars ($T_e \leq 16000$ K) systematically deviate from the average relation thus indicating a dependence of this correlation on physical parameters of the underlying stars.

4. A comparison of the observed energy distributions to the results of model computations (Kurucz, 1979) reveals continuous radiation of the envelope not only in the Balmer continua, but also in the red parts of the Paschen continua of most program stars. The observed energy distributions can be quantitatively explained as a superposition of photospheric radiation of a normal B star and hydrogen free-free and bound-free radiation emitted from an extended circumstellar envelope with $T_e \simeq 10^4$ K.

5. Assuming this physical process to be responsible for the Be star envelope radiation, the effects of interstellar reddening and of circumstellar envelope excess radiation can be separated in the observed energy distributions and quantitative values can be determined

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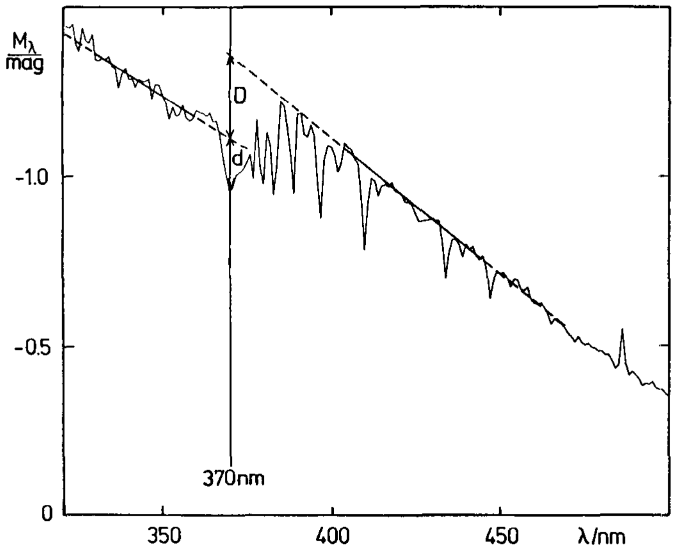

Fig. 1: Definition of stellar Balmer jump D and envelope Balmer jump d

for interstellar reddening E_{B-V}, envelope continuous emission in the photometric V band as well as effective temperature and surface gravity of the underlying star. Several more detailed publications of this work are in press (Kaiser, 1986) or in preparation.

References

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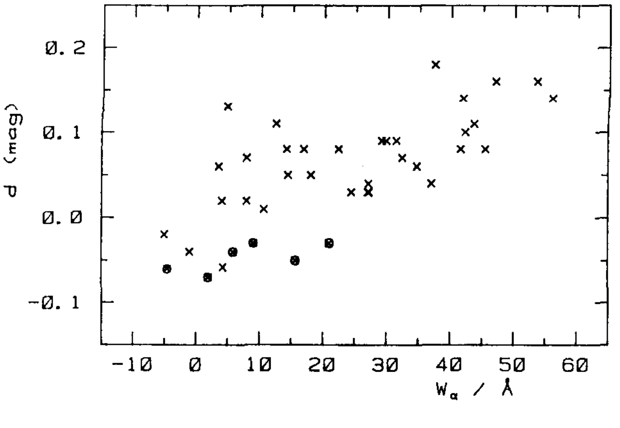

Fig. 2: Hα equivalent width W_α vs. envelope Balmer jump d. Values for stars with T_{eff} < 16000 K are marked by ⊠

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