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QUANTITATIVE STELLAR SPECTRAL CLASSIFICATION. II. EARLY TYPE STARS

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In a previous work, Stock & Stock (1999) published a method for the derivation of the absolute magnitude, intrinsic color, and metallicity index from the equivalent widths of aborption lines in stellar spectra. Use was made of a library of stellar spectra made available by Jones (1999). Of these stars those were rejected for which the Hipparcos Parallax Catalogue gives parallax errors larger than 20% of the parallax itself.

Due to this restriction the number of remaining O- and B-type spectra was too small to be included. In view of this fact, we started an observing program concentrated on O- and B-type stars. The spectral range covered is from 3950 Å to 5750 Å. Two grating positions were used, one yielding usable spectra from 3950 Å to 4900 Å, the other from 4800 Å to 5750 Å. In the following we distinguish these as the B- and V-spectra. The observing list was made up with the Bright Star Catalogue in combination with the Hipparcos Parallax Catalogue, selecting all O- and B-stars brighter than the 6th apparent V-magnitude. Of these 116 stars were observed, resulting in 72 stars with B-spectra only, 39 stars with B- and V-spectra, and 5 stars with V-spectra only. A total of 11 measurable absorption lines was found in the B-spectra, and only 4 in the V-spectra. Three of these are common to both the B- and the V-spectra. The wavelengths of thess lines were taken from the Multiplet Table by Moore (1972).

Intrinsic colors $(B-V)_0$ were deduced from the MK-types. The respective relations may be found, for instance, in tables given by Allen (1973). These colors can be compared with the observed colors and a reddening effect can be found. If interpreted as due to absorption by interstellar or circumstellar material the effect on the apparent V-magnitude can be estimated. For this purpose we use the usually adopted relation

$$A_V = 3.0E(B-V) \ , \qquad (1)$$

where A_V is the absorption in the V-band, and $E(B-V)$ the reddening of the $(B-V)$-color.

For the relation between the physical parameters M_V or $(B-V)_0$ with the equivalent widths we adopt second order polynomials with two or three independent variables, the latter being the equivalent widths of two or three absorption lines. Thus the equation for the absolute magnitude with three lines has the form:

$$\begin{aligned} M_V = \ & a_{000} + a_{100}w_1 + a_{010}w_2 + a_{001}w_3 + \\ & a_{200}{w_1}^2 + a_{110}w_1w_2 + a_{101}w_1w_3 + \\ & a_{020}{w_2}^2 + a_{011}w_2w_3 + a_{002}{w_3}^2 \ , \end{aligned} \qquad (2)$$

where $w1$, $w2$, and $w3$ are the equivalent widths of the three respective absorption lines. The coefficients a_{ijk} have to be determined by least squares.

The best solutions were obtained with polynomials of three lines, reproducing the absolute magnitudes with an average residual of about 0.40 magnitudes and the intrinsic colors with an average residual of 0.016 magnitudes.

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