Fundamental parameters of B Supergiants from the BCD System. I. Calibration of the (lambda_1, D) parameters into T_eff

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Effective temperatures of early-type supergiants are important to test stellar atmosphere- and internal structure-models of massive and intermediate mass objects at different evolutionary phases. However, these T_eff values are more or less discrepant depending on the method used to determine them.
We aim to obtain a new calibration of the T_eff parameter for early-type supergiants as a function of observational quantities that are: a) highly sensitive to the ionization balance in the photosphere and its gas pressure; b) independent of the interstellar extinction; c) as much as possible model-independent.
The observational quantities that best address our aims are the (lambda_1, D) parameters of the BCD spectrophotometric system. They describe the energy distribution around the Balmer discontinuity, which is highly sensitive to T_eff and log g. We perform a calibration of the (lambda_1, D) parameters into T_eff using effective temperatures derived with the bolometric-flux method for 217 program stars, whose individual uncertainties are on average |Delta T_eff|/T_eff|=0.05.
We obtain a new and homogeneous calibration of the BCD (lambda_1, D) parameters for OB supergiants and revisit the current calibration of the (lambda_1, D) zone occupied by dwarfs and giants. The final comparison of calculated with obtained T_ eff values in the (lambda_1,D) calibration show that the latter have total uncertainties, which on average are epsilon_T_eff/T_eff~0.05 for all spectral types and luminosity classes.
The effective temperatures of OB supergiants derived in this work agree on average within some 2,000 K with other determinations found in the literature, except those issued from wind-free non-LTE plane-parallel models of stellar atmospheres, which produce effective temperatures that can be overestimated by up to more than 5,000 K near T_eff=25,000 K.
Since the stellar spectra needed to obtain the (lambda_1, D) parameters are of low resolution, a calibration based on the BCD system is useful to study stars and stellar systems like open clusters, associations or stars in galaxies observed with multi-object spectrographs and/or spectro-imaging devices.

Reference: Astronomy and Astrophysics
Status: Manuscript has been accepted

Weblink: http://arxiv.org/abs/0903.5134

Comments:

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