STUDY OF THE HeI λ4471 LINE-PROFILE OF Be STARS(*)

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Abstract. In this paper we study the veiling effect and the strength of an extra emission-like component filling partially the HeI λ4471 line of Be stars. It is shown that this component is roughly correlated with the emission in the continuum and in the Hγ line.

1. The HeI λ4471 line and the emission in the continuum and in the Hγ line

For a set of 36 Be stars observed on february 1990 at the ESO (La Silla-Chile) with the Echelle Spectrograph at the 1.52 m telescope (resolution $\simeq$ 35000, S/N $\simeq$ 150-200), and using the Didelon's (1982) calibration of photospheric lines, we compare the measured equivalent width W^{obs}_{HeI} of the observed HeI λ4471 line with those corresponding to the spectral type of the studied stars $W^{Sp.Type}_{HeI}$. We can see that $W^{obs}_{HeI} < W^{Sp.Type}_{HeI}$ and that the stronger deviations are seen for the hottest Be stars, where also the emission phenomenon is generally stronger. This deviation may be due: a) to a veiling produced by the emission excess in the continuum, b) to some emission-like phenomenon in the line: this phenomenon can be a real emission, a perturbing effect due to some velocity field on the stellar surface (Zorec, this issue), or perturbations due to non-radial pulsations (Waelkens 1990), etc. Within this picture we have : $|W^{th}_{HeI\ 4471}| = (1+r)\times(|W^{obs}_{HeI\ 4471}|+|W_e|)$, where $r = \Delta F_c/F_c$ is the emission excess in the continuum and $|W_e|$ is the absolute value of the equivalent width due to an extra component filling the photospheric line. To obtain the veiling factor and the V sin i parameter, we look for the best fit between the wings of the observed HeI λ4471 line and the theoretical one (Stoeckley and Mihalas 1973). In Fig. 1 is shown the relation between W_e and veiling factor 1+r for 16 over 36 studied stars where $W_e \neq 0$. The error bars correspond to imposed uncertainties of 15% in the adopted T_{eff} and log g parameters.

Using simultaneous observations of the Hγ line we can prove that there is a correlation between $|W_e|$ and the equivalent width of the emission in the Hγ line. When $W_e \neq 0$, the V sin i parameters we obtained are systematically smaller than those derived using the FWHI-method or by fitting the full line profile: $(\Delta V\ sin\ i/V\ sin\ i)\% \sim 143 \times W_e \leq 30\%$.

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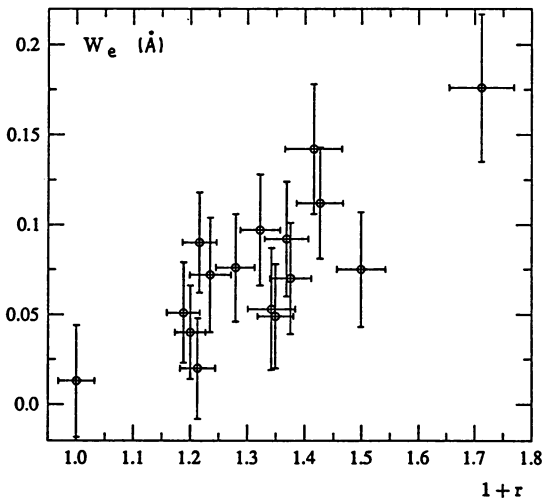

Fig. 1. Relation between W_e and the veiling factor 1 + r

2. Conclusion

The extra component producing the W_e value seems to show a kind of statistical correlation both with the emission in the Balmer Hγ line and with the emission excess in the continuum. Only the hottest stars of our sample ($T_{eff} \geq 21000$ K) have $W_e \neq 0$. This may imply that the observed HeI λ4471 line profile of Be stars are somewhat filled up by a real emission. It can also be due to some effect (photospheric velocity fields, or other activity on the stellar surface) which has to be correlated with the emission power of Be stars. Our results also indicate that the V sin i of Be stars may be systematically overestimated up to 30 % due to the perturbing effects acting on the photospheric HeI λ4471 line.

(*) *Observations obtained at the ESO, Chile and at the OHP, France*

References

Didelon, P.: 1982, *Astron. Astrophys Suppl.* **50**, 199

Stoeckley, T.R., Mihalas, D.: 1973, *Limb Darkening and Rotation Broadening of HeI and MgII Line Profiles in Early-Type Stars*, NCAR-TN/STR-84

Waelkens, C.: 1990, in L.A. Wilson and R. Stalio, ed(s)., *Angular Momentum and Mass Loss for Hot Stars*, Kluwer Acad. Publ., 235

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