

THE BEHAVIOUR OF λ 4686 LINE OF He II IN WOLF-RAYET BINARIES

B. S. Shylaja
Indian Institute of Astrophysics
Koramangala, Bangalore 560034, India

SUMMARY Being one of the brightest lines in emission in the optical region of Wolf-Rayet (WR) stars, the λ 4686 line of He II has attracted the attention of many investigators (Sahade, 1958; Ganesh and Bappu, 1967). Here, the binaries with subgroup WN components have been chosen, with periods ranging from 1.64d to 21.63d, for understanding the effect of the companion on the formation of this line.

Spectrophotometric data used for the total flux measures in this line in two short period systems CQ Cep and HD 50896, clearly show the enhancements of fluxes at phases corresponding to the eclipse of the components. Such an increase in flux may be inferred from differences in line profiles in many other binaries as well. Sudden sporadic brightening, general positive shift of the γ value in the radial velocity (RV) curves (with reference to the N IV line of λ 4058, chosen to represent the true motion of the WN component) and eccentric orbital solutions from the RV curves are other peculiar features of this line. Another interesting point that results from a comparison of various RV curves is the amplitude K , which is smaller than that of N IV line at λ 4058 in short period systems and appears to be larger in long period systems. Systems with periods around 4d show little difference in K between these two RV curves. From the line profile studies of the eclipsing system V444 Cyg (Sahade, 1958), it was possible to infer the concentration of line emitting material towards the inner Lagrangian point. This may be taken to mean that the line emitting region is extended. The red shift of the γ velocity has been explained by electron scattering processes (Auer & van Blerkom, 1972). The amplitude difference may be due to the contribution from the companion, or due to the line emitting material distributed nearer to the companion, or due to the multiple structure of the line profile. The likelihood of line emitting material nearer to the companion is possible in a wind dominant Roche surface as has been calculated by Niemela (c.f. Sahade & Wood, 1980), which can explain the increase in flux at eclipses as well (Shylaja, 1986). The same effect can explain the decrease of eclipse depth in case of V444 Cyg, dip in the λ 4680 light curve of HD 90657 and the asymmetric distribution in HD 5980.

Thus it appears that the peculiarity is mainly due to the large

extended line emitting region, multiple component line profile and the distortion caused by strong stellar winds. Since the proximity of the companion is responsible for the distortion of the line emitting region, which in turn may result in the other two factors mentioned, it may lead to the inequality $K(4686) < K(4058)$ for short period binaries only.

A detailed investigation will be published elsewhere.

References

- Auer, L.H., van Blerkom, D., 1972, *Astrophys.J.*, 178, 175.
 Ganesh, K.S. Bappu, M.K.V., 1967, *Kodaikanal Obs.Bull.*, Ser A, 185, 104.
 Sahade, J., 1958, *Mem.Soc.Roy.Sci.*, Liege, Ser 4e, 20, p.46.
 Sahade, J., Wood, F.B., 1980, in *Interacting Binary Stars*, Pergamon Press, p.101.
 Shylaja, B.S., 1986, *J.Astrophys.Astron* (in press).

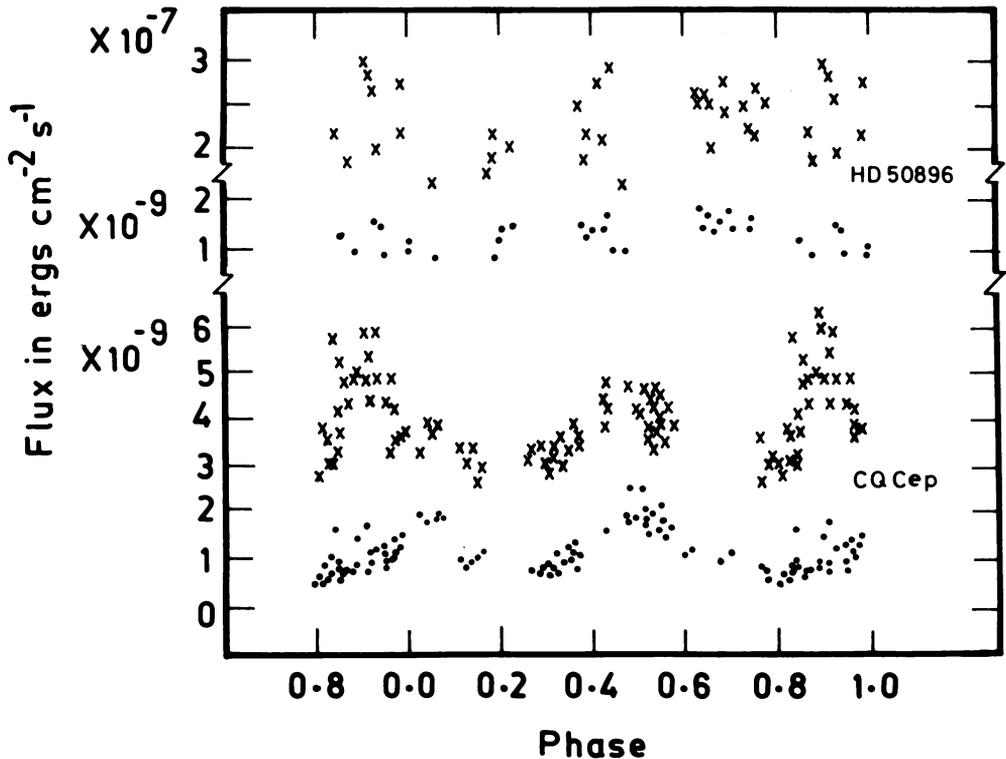


Figure 1. Variation of the fluxes of λ 4686 (crosses) and λ 4058 (dots) with orbital phase in case of two binaries CQ Cep and HD 50896.