OBSERVATIONAL CONSTRAINTS ON COOL DISK MODELS OF Be STARS

A.M. Hubert, M. Floquet, J. Chauville, M.Th. Chambon
UA 337, Observatoire de Meudon, France

1 INTRODUCTION

At first we examine the main characteristics of 3 well-known shell stars (EW Lac, ζ Tau, 48 Lib) before and during their variable shell phase (long time scale V/R and RV cycles). For that we have investigated a) recent studies of our Meudon working group, based on long sequences of spectroscopic observations (Hubert et al. 1983, 1986a; Mon 1984) b) previous data found in the literature c) additional information by a reexamination of line profiles obtained from our material. For ζ Tau and 48 Lib the selected cycles have been chosen among the most representative ones in the history of their respective shell episode. For EW Lac, which entered an active phase in 1977, we have studied the only recently observed cycle of shell feature variations. A summary of the 3 V/R shell stars characteristics during 1) the pre variable shell phase 2) the variable shell phase is reported elsewhere (Hubert et al. 1986b); we only give here general trends of it, **Table 1.**

2 CONSTRAINTS ON CURRENT MODELS

We only discuss the validity of cool disk models which explain the V/R variations.

2.1 Non axisymmetrical elliptic disk

The quasi-sinusoïdal shift of the peaks and the outer edges of the Hβ emission line, the variation of the central depth of the metallic and high Balmer lines support this model.

The variation of the width at half maximum, the asymmetry of the profiles of the high Balmer lines are not explained by it.

2.2 Rotating pulsating envelope (variable radial outflow)

The phase lags between the RV curves of shell lines, the V/R curves of Hβ, Hγ, Hδ emission lines (in the case of EW Lac), the asymmetry of shell line profiles in the negative phase of the RV curve support this model.

The variation of the strength of shell lines as well as the asymmetry of them in the positive part of the descending branch of the RV curve are in complete disagreement with it.

https://doi.org/10.1017/S0252921100116197 Published online by Cambridge University Press

Table 1 Summary of the 3 V/R variable shell stars comparison

PRE VARIABLE SHELL PHASE
- RV fluctuations
- V/R fluctuations (no data for 48 Lib)
- Changes of the shell lines strength (id.)

VARIABLE SHELL PHASE

Radial velocity and V/R ratio :
- Phase difference in the RV curve of shell lines
- Faint quasi-sinusoïdal shift of the peaks and outer edges of R and V emission Hβ line in phase with the RV curve of the absorption core (no data for ζ Tau)
- Highly ionized resonance lines RV always negative, not following low-ionized UV and visible shell lines ones
- Phase lags between V/R curves of Hβ, Hγ, Hδ emission lines (only for EW Lac)

Shell line profiles :

first Balmer lines
- Hβ "blue-cored" on the descending branch of the RV curve (chiefly when RV shell $\lesssim$ RV star)
- Hβ "red-cored" at RV maximum and on the descending branch of the RV curve (RV shell $>$ RV star)

strongest metallic lines and high Balmer lines
- Strong blue-winged profiles on the descending branch of the RV curve (chiefly when RV shell $\sim$ RV star)
- Slight red-winged profiles on the ascending branch of the RV curve when RV shell $\gtrsim$ RV star
- Maximum strength (width, central depth) when RV shell = RV star on the descending branch of the RV curve
- Minimum strength and symmetric profiles on the ascending curve when RV shell $\lesssim$ RV star
- "Red-cored" Hβ line and blue-winged metallic lines at RV maximum and on the descending branch of the RV curve (RV shell $>$ RV star)

3 CONCLUSIONS

EW Lac, ζ Tau, 48 Lib present at one and at the same time signatures of geometrical (elliptic non axisymmetrical disk) and physical (variable radial flux) models.

References

Hubert-Delplace, A.M., Mon, M., Ungerer, V., Hirata, R., Paterson-Beeckmans F., Hubert, H., Baade, D. (1983). Astron. Astrophys. 121, 174.

Hubert, A.M., Floquet, M., Chauville, J., Chambon, M.Th. (1986 a,b) Astron. Astrophys. submitted.

Mon, M. (1984), Thèse de 3ème cycle, Univ. de Paris VII.

https://doi.org/10.1017/S0252921100116197 Published online by Cambridge University Press