SHORT-TERM SPECTROSCOPIC VARIATIONS OF THE SOUTHERN Be STAR 48 Lib

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1. Introduction

48 Lib (B3IV, vsin i=395 km/s) is a well known Be shell star. Cuypers et al. (1989) found a period of 0.4017 d, the single wave light curve being asymmetric. Rapid variations in the radial velocity of metallic shell lines have been found by Ringuelet-Kaswalder (1963) with a period of 0.115 d.

For the first time, we have searched for multiperiodic spectroscopic variations in the HeI-MgII $\lambda\lambda$4471-4481 photospheric lines of 48 Lib.

2. Observational data and reduction

Observations were performed at La Silla (ESO) observatory from 10 to 14 June 1989 with the CAT+CES+CCD (R=50000 and S/N<250). The mean exposure time was 30 min. Reductions have been done with eVe package on the Vax 4500 of the Paris-Meudon observatory.

First, we scanned the profiles every 3px, i.e. 0.102Å (the element of spectral resolution). Fourier Transform and Clean algorithms were then applied on each time series data at each λ. Due to the observing window, frequencies higher than 12.0 c/d and lower than 0.3 c/d cannot be detected. Accuracy on frequency determination is 0.3 c/d.

Second, we have searched for moving bumps on residuals obtained by subtracting a nightly mean profile from each spectrum.

3. Results

3.1. Periodogram

On the HeI line we clearly see 3 frequencies: 10.6, 3.1 and 1.3 c/d. The frequency 10.6 c/d is present on a large part of the profile and the variation of the complexe phase of the power spectrum across the line profile gives a lower value of the modal number m=6.3. The frequency 1.3 c/d is less

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important but is present on the two lines. The situation is less clear for the MgII line and the periodogram is difficult to interpret. Different frequencies appear on small parts of the line profile. On the blue part, 3 frequencies are present: 6.5, 7.5 and 8.5 c/d. It would be reasonable to assume that the true frequency is ν=7.5 c/d and the two other ones are aliases at $\pm$1 c/d. On the red part, it appears ν=3.7 c/d which is half the above period 7.5 c/d. But we do not find ν=10.6 c/d as on the HeI line. It should be kept in mind that the λ4481 MgII line is strongly influenced by NLTE (that is envelope effects). This periodogram does not display the value ν=2.49 c/d found by Cuypers et al. (1989) in photometry, but ν=1.25-1.30 c/d, which was a secondary peak in their analysis, is present on the two lines.

3.2. Residuals

Five bumps can be followed on the 2 lines, on the 13-14 June 1989, crossing the profiles from blue to red. Bumps acceleration a_0 and intervals δt between two consecutive bumps at the line center have been computed. In the frame of Non Radial Pulsations, modal values m can be deduced from a_0 and δt. For both lines the frequency associated to the mean interval δt=0.0975 d (ν=10.6 c/d), that is the NRP frequency in the corotating frame, is very close to one of the frequency found on the periodogram for the HeI line. The m value computed with vsin i=395 km/s and the mean value of the acceleration a_0=3161 km/s/d is m=8.

4. Conclusion

A frequency ν=10.6 c/d is found either in the periodogram of HeI line and in residuals analysis of the two lines. In the frame of NRP, it corresponds to a sectorial mode m=8. The periodogram, which is different for HeI and MgII, displays two other frequencies for the HeI line (3.1 and 1.36 c/d), and three frequencies for MgII (7.5, 3.7 and 1.25 c/d; the first one could be an harmonic of the second one). The photometric frequency found by Cuypers et al. (1989) is apparent in the periodogram on MgII line only. This could also be linked to some envelope phenomenon. 48 Lib is a good candidate for multifrequency, but further multisites observations performed with higher S/N at different phases of the envelope activity are needed to study the frequency stability and to explain the variable mass loss through NRP.

References

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