COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 3285

Konkoly Observatory
Budapest
17 January 1989
HU ISSN 0374-0676

PROFILE VARIATION OF THE He 6678 LINE IN ZETA TAURI

The problem of the spectroscopic and photometric short-term variability of Be stars (a few hours to about two days) received, in these last years, the interest of an increasing number of astronomers. The physical reasons of this variability are not yet clear, but in our opinion non-radial pulsation could be preferred among the other causes invoked by various authors (see two extensive overviews on this matter: Percy, 1986 and Baade, 1987).

In the framework of these problems, some years ago we began a campaign of spectroscopic observations of a few Be stars which in the past showed variability. At first we used photographic plates as the detector, but beginning from 1985 we are able to employ a reticon spectrophotometer. Till now we observed more or less systematically the following objects: Kappa Dra, Theta CrB, omicron And, 28 Cyg, omega Ori.

Zeta Tauri is the Be primary of a binary system with a period of 131.91 days (Hynek and Struve, 1942). Delplace and Chambon (1976) pointed out strong instabilities on a time scale of years in its shell and Bahng (1976) emphasized possible variations in H-alpha emission within a few minutes.

With the aim to throw light on the short-term variability of Zeta Tauri, during the period January 17-24, 1983 we obtained eighty-five grating photographic spectrograms with an inverse dispersion of about 35 Å/mm. Fourty-four of them were collected in the range between 4000 Å and 5000 Å and the other forty-one between 6000 Å and 7000 Å. We used a Boller and Chivens spectrograph applied to the 137 cm. reflector of Merate Observatory.

The results concerning the blue part of this material have been presented (Bossi et al., 1987). Here we show the preliminary results about the profile variations of the He 6678 line, which seems to be very useful in the research of non-radial pulsations in Be stars.

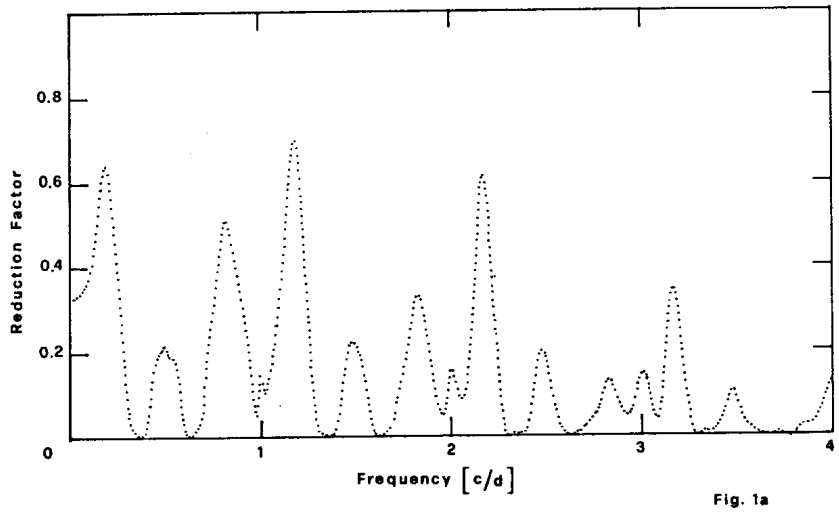

Figure 1a

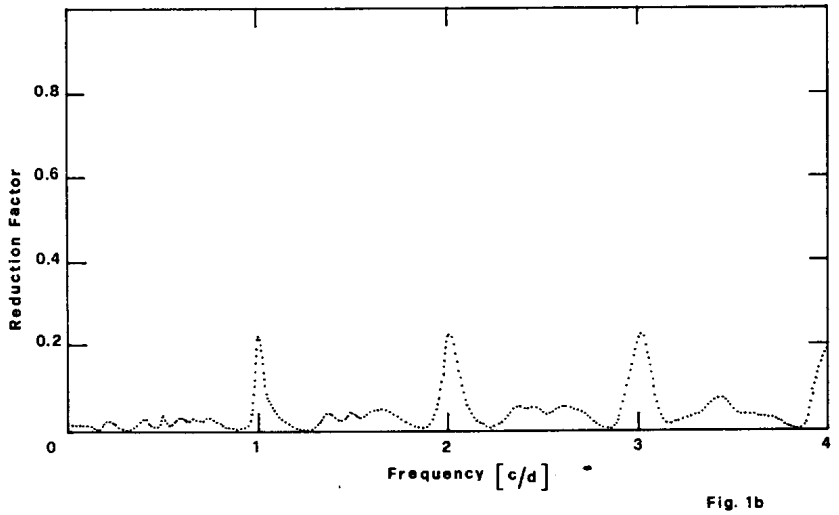

Figure 1b

Data reduction has been done as follows. First of all we calculated the asymmetry parameter $A = \frac{HWL-HWR}{HWL+HWR}$ for every spectrum: here HWL and HWR are the left and the right width at half height obtained by fitting the lines by means of two gaussian curves. Table I shows the obtained values of this parameter and the related observational epochs.

Table I

J.D. 24453..	A	J.D. 24453...	A
52.281	.123	52.304	.301
52.321	.216	52.338	.117
52.358	.241	52.379	.284
52.400	.235	52.422	.308
52.443	.229	52.465	.170
53.292	.343	53.339	.211
54.293	.044	54.362	.086
54.408	-.116	54.481	-.230
55.281	-.147	55.303	.081
55.324	.100	55.342	-.203
55.361	-.119	55.381	-.210
55.402	-.232	55.428	.010
55.453	-.267	55.484	-.313
57.314	.085	57.349	.214
57.383	.227	57.420	-.015
58.318	.253	58.337	.192
58.358	.317	58.383	.225
58.475	.245	58.496	-.010
59.326	.110	59.376	.233
59.396	.105	59.415	-.094
59.470	-.098		

Then we performed the spectral analysis of these data. Figure 1a represents the frequency spectrum calculated between 0 c/d and 4 c/d, which turned out to be the only interesting frequency range as regards the research of possible periodicities. On the vertical axis the reduction factor of the data variance is shown. The greatest peak corresponds to the frequency $f = 1.18$ c/d ($P = 0.85$ days). Figure 1b is the frequency spectrum obtained after subtracting the found period P: as one can see, all the peaks present in Figure 1a disappear, except for the small ones corresponding to the

integer values of the frequency which could be due to observational effects. The probability that the period P is due to noise comes out to be very small, as we can see by means of the method proposed by Stobie et al. (1977).

So we confide that profile variations were present in He 6678 line between January 17-24, 1983, in spite of the fact that we employed a detector (the photographic plate) with low signal to noise ratio. The found period P = 0.85 days is in very good accordance with the short-term variability of Be stars (Percy, 1986).

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References:

Baade, D., 1987, Proc. IAU Coll. No. 98 "Physics of Be stars" A.Slettebak and T.P. Snow (eds) Cambridge Univ. Press, Cambridge, P. 361.

Bahng, J.D.R., 1976, "Be and shell stars" A. Slettebak ed. Dordrecht Reidel, p. 41.

Bossi, M., Guerrero, G., Scardia, M., 1987, Proc. IAU Coll. No. 98 "Physics of Be Stars" A. Slettebak and T.P. Snow eds. Cambridge Univ. Press, Cambridge, p. 99.

Delplace, A.M., and Chambon, M.T., 1976, "Be and shell stars" A. Slettebak ed. Dordrecht-Reidel p. 79.

Hynek, J.A., and Struve, O., 1942, Astrophys. J. 96, 425.

Percy, J., 1986, "Highlights of Astronomy" J.P. Swings ed. p. 265.

Stobie, R.S., Pickup, D.A., Shobbrook, R.R., 1977, Monthly Not. R. Astron. Soc., 179, 389.