ACTIVITY OF THE Be STAR 28 CYGNI: 1985 – 1991

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1. Introducing the star 28 Cyg

28 Cyg (V1624 Cyg, HD 191 610, HR 7708; B2e, $v \sin i$ = 310 km s^{-1}) has been the target of several observational projects, and in 1988 of a large international campaign. This attention was inspired by several photometric studies and especially by the 1985 nearly simultaneous optical and UV spectroscopic monitoring by Peters & Penrod (1988). They found that the line-profile variations were controlled by two frequencies, 1.45 c/d, and 7.43 c/d, which they identified with sectorial pulsations of modes $l = 2$, $m = +2$ and $l = 10$, $m = +10$. Rapid changes (0.5 to 1 hr) of the C IV wind profile were found; its equivalent width appeared to correlate with the phase of the $l = 2$ mode. Pavlovski & Ružić (1990) - who independently analysed Hvar 1985 UBV photometry of 28 Cyg - found periodic light variations with a double-wave light curve and a frequency of 1.54 c/d. However – because of the residual scatter around the mean light–curve – the authors tentatively suggested possible multiperiodicity (1.54, 1.33, and 0.95 c/d).

Bossi, Guerrero & Zanin (1993) obtained series of reticon He I λ6678 line profiles and challenged the multimodal pulsations claimed by previous studies. They found periodic changes both in the equivalent width (f = 1.36 c/d) and shape of the profile (f = 2.72 c/d). Also the equivalent width and symmetry of the Hα emission line varied with f = 1.32 and 2.11 c/d, respectively. The authors located the source of this activity into a region close to the star. Hahula & Gies (1991) published preliminary results of a large observational study of line-profile variations of 28 Cyg. They confirmed the frequency of 1.54 c/d, and attributed it to $l = 2$ non-radial pulsation mode.

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2. New period analysis: data 1985 - 1991

Since 1985, the Be star 28 Cyg was regularly observed at Hvar Observatory and the University of Toronto Campus. Also, some additional data were supplied from the Automatic Photometric Telescope at MtHopkins in 1990 and 1991.

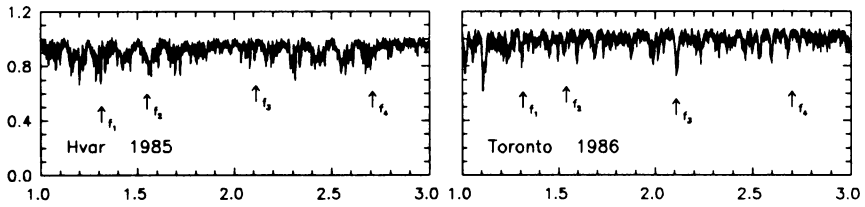

Fig. 1 ϑ–statistics for observations of 28 Cyg in 1985 and 1986, respectively. Frequencies identified by previous authors are denoted by arrows.

The ϑ–statistics and power spectra were calculated for each season and each observing station, respectively. For the 1985 season, complemented by additional Hvar and Toronto observations, the CLEANed spectrum (algorithm by Roberts et al. 1987) shows two prominent peaks at 1.32 and 1.55 c/d, in accordance with the original result. However, an examination of frequency spectra from different seasons reveals that the 1.55 c/d frequency, also found by Hahula & Gies from spectroscopy, does not remain the most prominent one. It is present, however, in almost all frequency spectra, along with 1.36, 2.11 and 2.72 c/d found by other investigators (Fig. 1).

One possible interpretation is that the variations of 28 Cyg are controlled by two principal frequencies: f_a=1.45 c/d and f_b=0.09 c/d. Note that the following relations hold within the accuracy of the frequency determinations: f_a-f_b=1.36 c/d, f_a+f_b=1.54 c/d, 2(f_a-f_b)=2.72 c/d, 2+f_b=2.11, and 6+f_a=7.43 c/d. This could indicate that f_a is the principal frequency whose amplitude is being modulated in about a 10-day cycle and, perhaps, also secularly. Another possibility is that some kind of stochastic variations disturbs single- or multiple-periodic changes of the star at certain epochs. A large, well-organized multilongitude photometric campaign would help to solve the problem.

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