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A NEW V/R CYCLIC CHANGE OF Hα in ζ Tau

Since the late 1970s, we have monitored the object. The observations reported in this paper were made with the grating spectograph of the 2.16 m telescope at the Xinglong Station of Beijing Astronomical Observatory during 1990 December - 1994 April. The detector was a CCD with 512×512 (or 576×384) pixels. The reciprocal linear dispersion of the spectra was 50Å mm^{-1} at Hα. One pixel corresponds to 1.35Å (or 1.15Å). The S/N-ratio at the continuum was >150. The observational and data reduction techniques have already been described by Guo and Guo (1992). Our results showed that the Hα profiles underwent a cyclic change (c.f. Figure 1). The 1990 December 25 Hα profile appeared as a single emission peak of asymmetric top and no visible central reversal. The profiles become distinct double emission peaks during 1991-1993. It is of interest to note that the 1994 April 28 profile become again a single emission peak, such as on 1990 December 25. In addition, the V/R ratio of Hα was larger (in 1990), equal to (around the beginning of 1992) and less (during 1992 November and 1993 October) than 1. Table 1 lists the results of the Hα measurements in the different observing periods. Throughout our observations no appreciable change in the Hα profiles obtained within each night has been detected. Hence we show only the mean profile measurements for each given night. It can be seen from the table that the equivalent width (Wα) and the full-width-at-half-maximum (FWHM) reached the maximum when the violet emission component is equal to the red one, and that the intensities (I_v) of the violet emission component declined gradually, while the intensities (I_r) of the red one rose slowly during our observing period.

Table 1

Date UT	No. of profiles	Wα (Å)	FWHM (Å)	I_v	I_a	I_r
1990 Dec 25.727	5	−19.7	10.69		(2.40)*	
1991 Oct 09.876	20	−20.1	10.69	2.96	1.60	2.17
1991 Dec 16.674	15	−22.5	10.69	2.85	2.02	2.30
1991 Dec 27.717	4	−22.3	10.69	2.78	2.02	2.24
1992 Feb 26.620	4	−24.4	11.08	2.78	2.02	2.66
1992 Feb 27.644	6	−23.8	11.04	2.78	2.03	2.65
1992 Nov 14.804	3	−23.8	10.50	2.52	2.04	3.25
1992 Nov 15.809	6	−24.0	10.32	2.52	2.06	3.33
1993 Oct 28.659	2	−21.8	10.52	2.09	1.95	2.84
1994 Apr 28.495	6	−22.3	10.50		(2.69)*	

$\star$ values in paranthesis are central intensity of the emission line

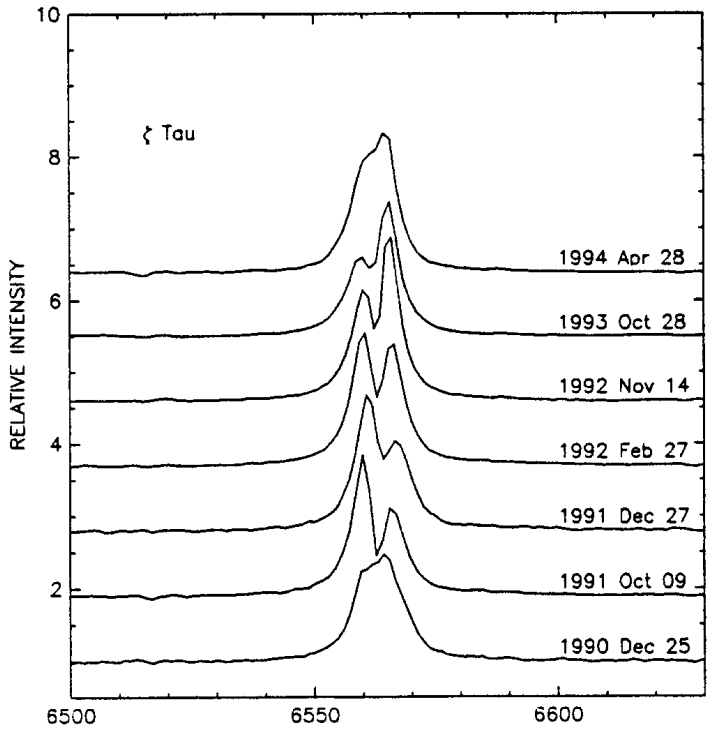

Figure 1

Since the beginning of 1960s, the cyclic variations of the radial velocity of the Balmer absorption lines and the V/R ratio of the Balmer emission lines have been observed successively in the star on numerous occasions (Hubert-Deplace et al., 1982). Mon et al. (1992) showed the cyclic variations had terminated and the star seemed to have entered a new quiet phase around 1982. Our spectroscopic observations also indicate that the V/R cyclic variations of Hα had vanished since 1982 (Yulian Guo et al., 1994). Our results show that after their disappearance for several years, a new V/R cyclic variation of Hα emerged once again at the end of 1990 and lasted for about 3.5 years. It seems that the cyclic variations of the star were very complicated, not only the duration and the amplitude of each cycle are different but the cyclic variation is sometimes disappearance and at other times reappearance. Therefore, it is necessary to make further observations and discussions.

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