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**AN OPTICAL FLARE OF THE RS CV_n
SYSTEM V711 TAU IN 1989**

The non-eclipsing system V711 Tau(=HR 1099) is a famous solar-like active binary star. In the 1989 observing season, the RS CV_n star V711 Tau was selected as one of the main targets by the MUSICOS (Multi-site Continuous Spectroscopy) program and its probable flare activity was monitored simultaneously by photometry and spectroscopy. At Beijing Astronomical Observatory, photoelectric photometry of the system was carried out in UBV and H_{β} bands with the 60-cm telescope from early November to the end of 1989. Three nights, from December 14 to 17, were among the MUSICOS program and the photoelectric photometry was made simultaneously with the high S/N spectroscopic H_{α} observations at the newly installed 2.16 m telescope of Beijing Observatory. An unusual optical flare was detected in the UBV bands by us on the very night of joint observing, December 14/15.

The photoelectric photometry started on 9 November but the data distribution was insufficient to cover effectively the whole orbital cycle of V711 Tau until 26 December. A total of data secured on 8 nights was synthesized into the light curves using the ephemeris given by Fekel (1983):

$$\text{Min.}I(J.D.Hel.) = 2442766.080 + 2.^d83774 * E. \quad (1)$$

The light curves obtained with 12 Tau (V=5.57, gG6) as the comparison star have been transformed into the UBV system as shown in Figure 1 and 2. The H_{β} observations were performed with the H_{β} wide (190 Å) and narrow (32 Å) interference filters of the Strömrgren system. The observed β' index has been transformed into β through a linear formula:

$$\beta = 1.119\beta' + 0.474 \quad (2)$$

, where the coefficients were determined by using 10 standard stars, while the ΔH_{β} light curves (Figure 2) are given as the magnitude difference between the variable and the comparison star 10 Tau in the local photometric system.

In addition to the migrating distortion wave, a conspicuous new feature is a flare event towering aloft near the bottom of the distortion wave. The unusual optical flare happened on one single night of observing, 14/15 December, and the amplitudes of it are 0.18, 0.27 and 0.61 mag in V,B and U, respectively. The largest flare variation is in the u band as is usual with dM_e flare stars. However, the wide-band flare events are rarely observed in RS CVn systems because of the high brightness level in the continuous spectrum of G and K

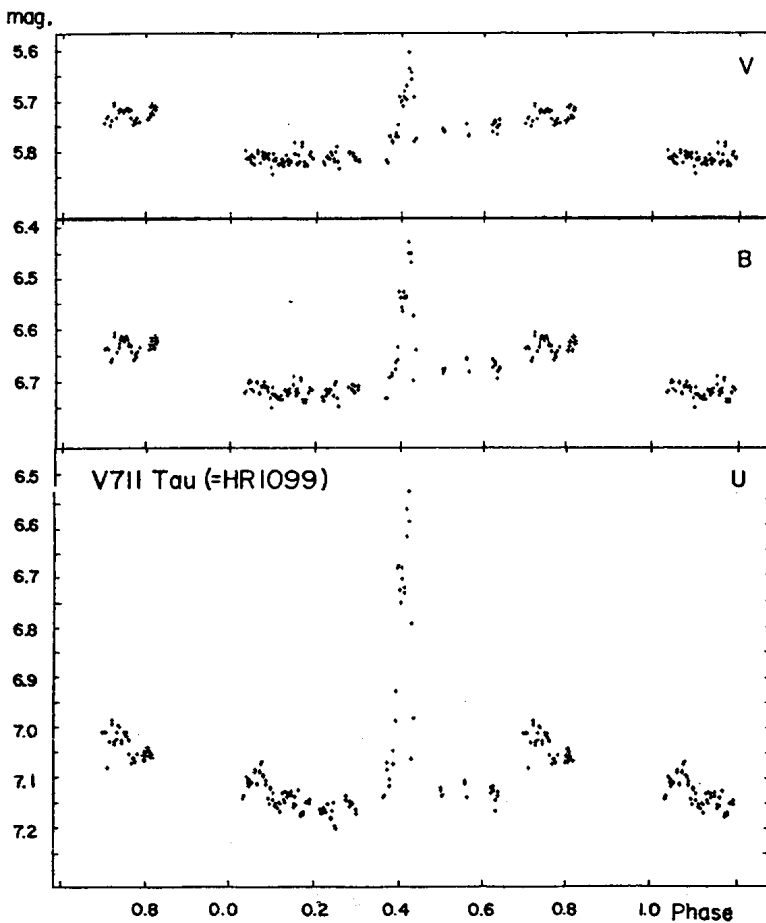


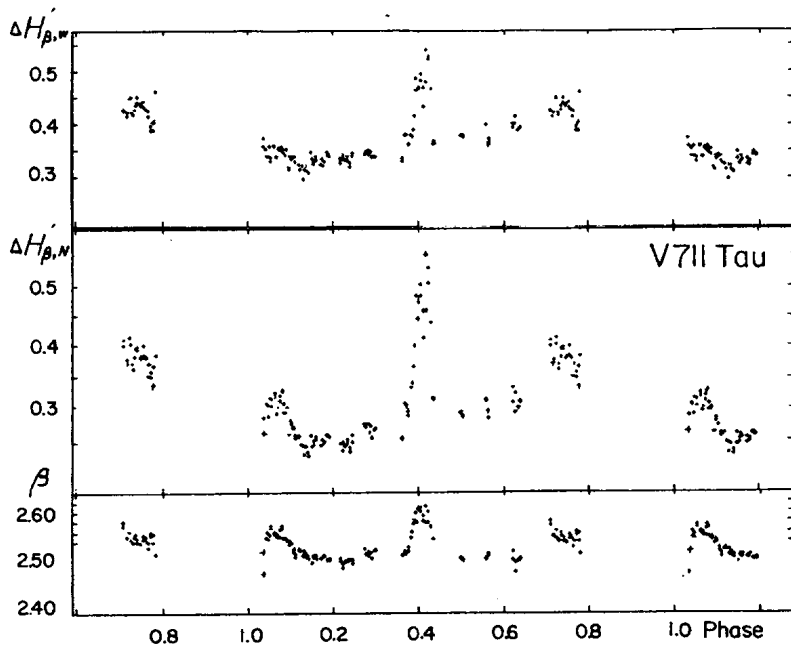
Figure 1. An optical flare of V711 Tau on December 14/15, 1989

Table 1. Characteristics of the flare of V711 Tau

U.T. (Dec.12,1989)	band	T_a (h)	T_d (h)	D (h)	Ampl. (mag.)
15:30	U	2.31	0.75	4.75	0.61
	B	2.40	0.73	4.13	0.27
	V	2.40	0.73	4.38	0.18

stars as pointed out by Agrawal et al.(1988). The large flare observed by us may be the first one to be caught in HR 1099 . Table 1 lists the characteristics of the flare of V711 Tau on 14/15 Dec. 1989.

Though there is a phase gap of about 0.2 in the light curves without observations, the distortion wave is clearly presented which shows an amplitude of about 0.12 mag in V with the minimum brightness at around phase 0.18 and the maximum near phase 0.80, respectively. The distortion wave has been shifted towards smaller phases since 1986 when Joshi et al.(1989) observed this system. The distorted light curve of V711 Tau is usually

Figure 2. H β light curves and the optical flare of V711 Tau in 1989

explained by researchers (Rodono et al., 1986 and so on) based on spot model. The obvious asymmetry in the light curves obtained by us implies that it could be caused by more than a single spot on the K IV component. The position of the optical flare on the light curves is closer to the minimum than to the maximum light. It suggests that the flare happened just after the largest spot had passed the meridian and the flare activity region may be located in or near the spotted area on the component. A detailed analysis of the spot solution is necessary to understand better the nature of the variations in the light curves of V711 Tau.

The simultaneous high S/N CCD spectrogram obtained by Catala and Zhai reveals that the equivalent width of the H_{α} emission line had increased much on 14/15 December at the same time when the large optical flare appeared in the UBV wide bands. The detailed results of the spectroscopic and photometric observations of this flare event will be given in another paper in the near future.

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