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A DRAMATIC CHANGE IN THE LIGHT CURVE OF V711 Tau (HR 1099)

V711 Tau (= HR 1099) is known to be one of the most active stars of the RS CVn binaries group. Its light curve shows striking amplitude variations from season to season but it maintains a nearly sinusoidal shape (Bartolini et al., 1978, Dorren et al., 1981, Dorren and Guinan, 1981). UBV photometry has been obtained since 1977-78 in a cooperative effort at Catania and Torino Observatories in order to follow the light-curve evolution and the shifts of the light minimum in orbital phase.

The purpose of this Bulletin is that of showing the rather unusual and changing light-curves during 1980-81.

In the figure the V light curves obtained in 1979-80 and 1980-81 at Catania and Torino are plotted versus the orbital phase computed with the ephemeris:

$$\text{J.D. (hel.)} = 2442766.069 + 2^{d}.83782\ E.$$

The differential magnitudes Δm (variable-comparison), were determined using 10 Tau as comparison star. The upper part of the figure shows the 1979-80 light curve, while the lower part shows the 1980-81 observations. The 1980-81 available data are grouped in three contiguous and homogeneous intervals of time in order to obtain reasonably defined light curves with small

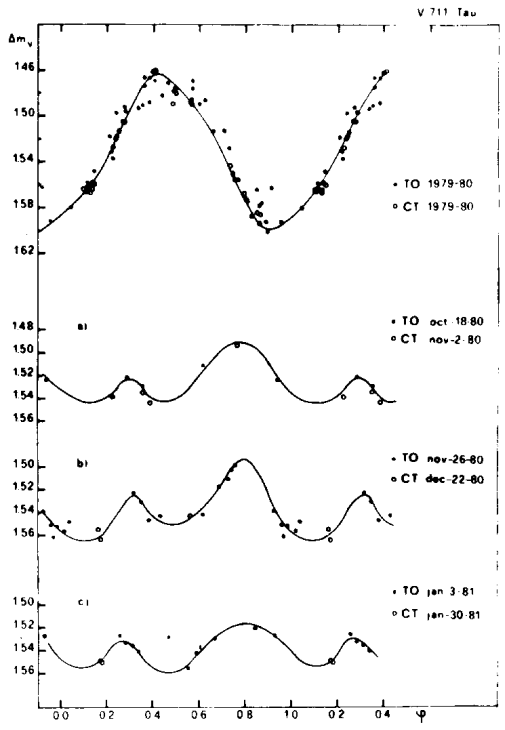

Figure 1

V light curves of V711 Tau obtained in 1979-80 and in 1980-81

dispersion. In fact no light curve was possible to obtain but a high-dispersion 0.08-magnitude band, much larger than the observation accuracy would allow, when all of the 1980-81 observations were considered for one single light curve. The reason for this apparent puzzle is readly shown in the figure: the light curve of V711 Tau is undergoing dramatic changes, not only with respect to the quasi-sinusoidal ones in the last few years, but from one interval of time to another in the same observation season. Each of the 1980-81 light curves are double-peaked and i) the amplitude, ii) the phase of the deeper light minimum and iii) its level are variable. The observed amplitude has been decreasing from $0^m.14$ to $0^m.06$,while the light

minimum migrates backwards and has brightened by about $0^m.05$.

Dorren et al. (1981) have proposed a model with two large circular spots spaced by 0.23 of the stellar circumference to explain the light curves of 1977-78 and 1979. They find the mean latitude of the spots to have moved from 48° to 15°. If we assume their model, the 1980-81 light curves would imply that the two spots have moved in longitude or a new large spot, separated by about one half of the stellar circumference with respect to the photocentre of the previous center of activity, has developed. Due to the complex double-peaked 1980-81 light curves it is very difficult to define what is the migration rate of the spots. The deepest minimum occurs about at phase $0^p.1$. If we assume that it represents the same minimum of the previous year we have a new very fast advancing migration of the wave, while it was slowing down in 1979 and 1980. On the other hand the phase of the shallow minimum is about $0^p.5$ which is difficult to explain in terms of spot migration because the migration rate would be so large that an appreciable shift would have been detected during the four months of observations.

Most probably we are witnessing the transition from one spot cycle to another with both old and new centers of activity affecting the observed light curve. If the star rotates differentially, the two minima-or maxima-will migrate on the light curve at different rates, unless the two spot centers are located at the same stellar latitude, and strong variations of the light curve should be expected until the active center of the old cycle is completely decayed. Actually three observations on February and late March 1981 show appreciable differences with respect to the other observations and probably indicate further changes of the light curve.

It is very important to trace as continuous as possible the behaviour of V711 Tau light curve in particular the migration rate of both light minima, their amplitudes and light levels in

order to make available precise observation constraints on RS CVn stars spot modelling. Therefore we urge observers of V711 Tau to intensify the efforts in order to obtain well time-resolved light-curves as early as possible in the next observation season.

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References:

Bartolini C., Guarnieri A., Piccioni A., Catalano S., Rodonó M., Brooke A.F., Hall D.S., Landis M.J., Sarma M.B.K., Olson E.C., Ranner T.R., De Bernardi C., Scaltriti., 1978, Astron. J. 83, 1510.

Dorren J.D., Siah M.J., Guinan E.F., Mc Cook G.P., 1981, Astron.J. 86, 572.

Dorren J.D., Guinan E.F., 1981, preprint.