HK LACERTAE

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HK Lac was observed at Konkoly Observatory between 1976-1981, the details of its story have been described in a previous paper (Oláh, 1979).

The aim of this investigation is to give a possible description of the strong variations in the light curve of the star.

Searching for a more accurate period, it became obvious that the same period was not applicable to all the data. Therefore, a new period was derived for each different cycle by the Lafler-Kinman method. Unfortunately, due to the small number of data in the data sets these newly derived periods have an error of about 0.1 day.

For the starspot modelling the method of Budding (1977) was used with some modifications. Since none of the observed light curves were symmetrical, the existence of two spots had to be assumed.

A serious complication of the modelling was the fact that the median brightness of the star was strongly varying (Oláh, 1979), which is clearly seen in Figure 1. As in the case of II Peg (Bopp and Noah, 1980) it was necessary to suppose a generally spotted band around the star which was

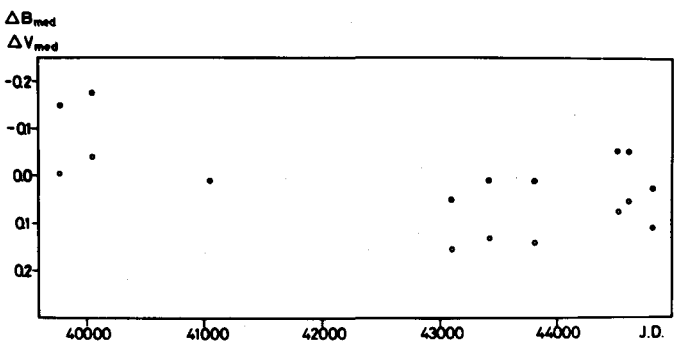

Figure 1. Median brightness variation of HK Lac

P. B. Byrne and M. Rodonò (eds.), Activity in Red-Dwarf Stars, 403–405.

responsible for the general dimming of the star. For this reason the 1.0 (maximum) level of the intensity curve was fixed to the individual maxima in each cycle.

The orbital inclination of the system was chosen as 60°: as the unseen companion is not visible in the spectra at all (Vogt, 1981), therefore, it is at least 2^{m} fainter than the primary component and, knowing the mass function (Gorza and Heard, 1971) the lower limit of the inclination can be calculated. On the other hand, there is no eclipse in the system and this fact gives an upper limit of about 80° for i.

The limb darkening coefficient was taken from the table of Manduca et al. (1977) as 0.75 and 0.85 in V and B colour, respectively.

The flux ratio 0.4 in V and 0.36 in B was used supposing that the temperature of the spots were 2000° cooler than the surface temperature of the star. This supposition does not contradict the result of Vogt (1981).

The calculations of the spots' sizes and locations were performed in V and B colours separately. As final results, the weighted mean values (V:B = 2:1) of the two runs were accepted. (This ratio is about equal to the ratio of the standard deviations in the V and B observations.)

Because of the relatively small number of observations and the different scatter in B and V, the results of the two series of calculations are slightly different. The small differences in the total γ values (angular extents of the spots which basically define the light amplitude) determined from the V and B light curves can be explained to some extent if we assume that the temperature of the spots is not always the same, on the contrary it is varying from cycle to cycle.

The strong variations in the observed light curves and in the periods show that the locations and the sizes of the spots are considerably different in consequent cycles, as it is also seen from the calculated values of λ, β and γ (Table 1). It is important to note that not only the

Table 1

P	λ_1	λ_a	β_1	β_a	γ_1	γ_a	J.D.
$25^{d}.3$	39°	174°	41°	42°	$17^{\circ}.5$	19°	39751-819*
25.3	201	264	69	0	23.5	10	40004-099*
25.0	310:	316:	9:	24:	19:	6.5:	43045-108
24.8	267	42	37	18	20.5	19.5	43355-482
25.0	351	79	59	- 8	33	11	43713-881
25.3	298	35	41	31	17.5	14	44502-561
24.0	256	17	21	29	18	23.5	44605-638
24.4	332	1	34	42	20.5	7.5	44783-873

*Blanco, Catalano (1970) (their calculated period was used)

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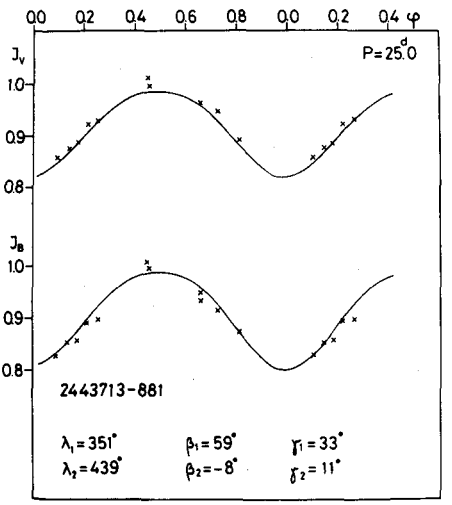
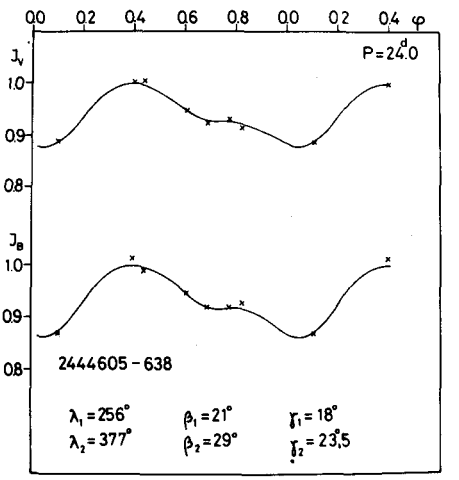
motion of the spots in latitude (β) can shorten or lengthen the period (because of the differential rotation) but if the motion of the spots is fast enough in the longitudinal direction (λ) it can give rise to changes of the period, too.

Figures 2 and 3 display two examples of the light curve fitting.





Figures 2 and 3. Light curve fitting of HK Lac

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