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UBV OBSERVATIONS OF HD5303

In 1983 a call was issued to potential participants in an international programme of observation of RS CVn and UV Ceti-type stars (Rodono et al., 1983). Carter Observatory (New Zealand) responded to this call with a plan to carry out flare patrol of some stars of the UV Ceti-type, and also some broad band monitoring of examples of both kind of object. Most of the standard broad band photometry was carried out at the Black Birch outstation (near Blenheim), though some work was also done at the Mt John University Observatory (near Lake Tekapo).

Included in the programme was the 7th magnitude southern variable HD5303 (Collier et al., 1981), which Hearnshaw and Oliver (1977) found to be a member of the RS CVn class. Photometry of the system, apart from that reported by Collier et al. (op.cit.), has also been presented previously by Thompson (1982), Coates et al. (1982, 1983a, b) and Rucinski (1983). Budding (1984) preliminarily reported no obvious indications of the "wave-like variation" towards the latter end of 1983 over the phase range from secondary to primary minimum, and supported the essential validity of the period determination of Coates et al. (1983b). (Some details on instrumentation and procedure are also given in that account.)

Over 19 nights of observation, between Aug. 29, 1983 and March 20, 1984, UBV photometry was carried out using the 41 cm Ruth Crisp telescope at Black Birch. Reductions have been carried out using the VAX computer operated by the Applied Maths Division of DSIR (NZ) in the University of Wellington. Analysis of these reduced data is now underway with the same facilities.

Reduced light curves in the local UBV system are shown in Figure 1. This local colour system is reasonably close to the standard one-nominal calibration coefficients (Hardie, 1962) are $\varepsilon = \mp 0.16$; μ, $\psi = 1.07$- but a newer calibration involving a number of standard star observations dispersed through the above-mentioned interval, is also in progress.

The main comparison star was HD5210. Though Innis et al. (1984) appear to have found some discrepancies between HD5210 and HD5499 on some nights, HD5210 appears to have been sensibly constant during the observations reported here. When checked against HD5370 in 18 good quality distributed observations, we obtain:

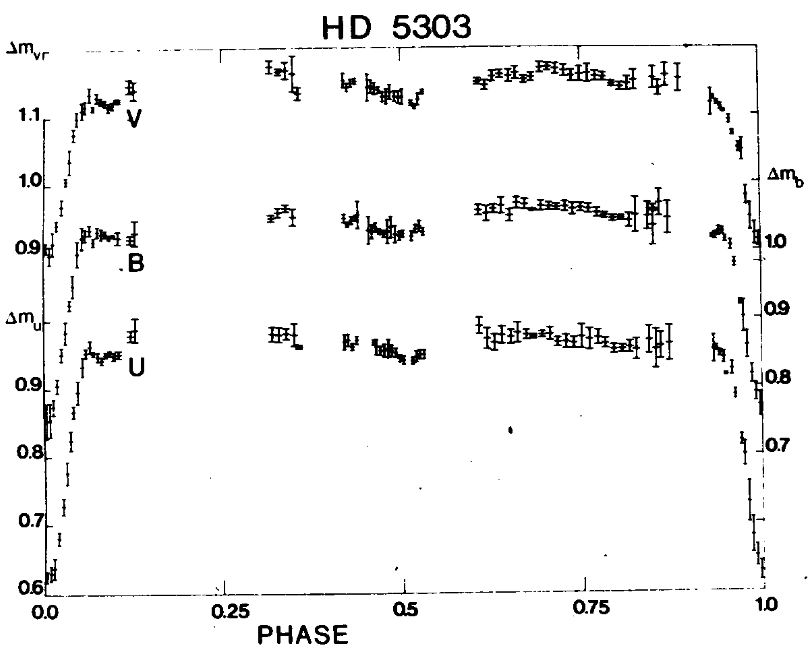

Figure 1

dV=0.247, (s.d.=0.007), dB=0.325 (s.d.=0.005), and dU=0.307 (s.d.=0.008). Eight reliable checks against HD4815 yield: dV=3.520 (s.d.=0.010), dB=2.798 (s.d.=0.006), dU=1.529 (s.d.=0.008). Unfortunately, we have not made many checks against HD 5499, but the few readings of that star that were taken do suggest that it may be HD5499 which is the source of the discrepancies.

Times of primary minima can be given as

1. HJD 2445578.9392 ± 0.0004

2. HJD 2445606.9165 ± 0.0002

3. HJD 2445757.993 ± 0.005

These times were determined by the folding paper method. Their accuracies are based on the agreement between the 3 filter results. The third one (Feb.27) shows greater scatter due to incomplete coverage, and higher air masses affecting the photometry. From the most reliable of these estimates (the second) and the epoch quoted by Coates et al. (1983b), we are able to derive an improved period of 2.797672 days.

The greater spread which can be seen in the error bars (which correspond to s.d. of data points within each bin) around phase 0.82 is related to the largish airmass (>2) for the night (March 20) when this data was gathered. A similar situation applies to the greater spread and apparent discrepancies at phase 0.32; though it is just possible that there is some real systematic difference in the differential magnitudes between the values of Sep. 2 and Feb. 28 (∿6 month interval).

Apart from these effects, everything alse looks like a reasonably normal eclipsing binary light curve for a pair of intermediate type stars. The slight "hook" effect after primary minimum, noticed by Coates et al. (1984), seems to be also there in Figure 1. Another noticeable feature of Figure 1 is the rounding of the regions between minima ("ellipticity effect"), which seems to be more marked as we move from the U to the V data. This implies that the cooler star is the more distorted one. This may be in keeping with the standard RS CVn binary configuration (Popper and Ulrich, 1977), in which the more massive component is slightly evolved towards the giant branch. The effect of the G star's expansion must, however, outweigh the proportional effect of its greater mass in disturbing the form of the F-type optical primary.

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