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PERIOD AMBIGUITY RESOLVED FOR HD 8358

Although UBV photometry of Fekel, Hall, and Henry (1984) succeeded in discovering that the chromospherically active G-type star HD 8358 was variable with a range of $0^m.14$ in V, they were not able to determine the photometric period unambiguously because their observations had been made only once each night at very nearly 1-day intervals. The three possible periods were $0^d.520 \pm 0^d.001$, $1^d.085 \pm 0^d.002$, and $12^d.75 \pm 0^d.25$. With all three periods the light curve shape was asymmetric in the same sense: rapid rise to maximum followed by a stillstand between maximum and minimum.

In this paper we present V-band photometry obtained with the Barksdale 14-inch reflector on 26 nights during the last three months of 1984. The individual ΔV magnitudes have been sent to the I.A.U. Commission 27 Archive for Unpublished Observations of Variable Stars (Breger 1985), where they are available as file no. 151. Each of the 636 values of ΔV is based on an intercomparison between variable and comparison star and has been corrected for differential atmospheric extinction and transformed differentially to V of the UBV system. The comparison star was BD - 0^o212 = SAO 109848 and Δ is in the sense variable minus comparison. Because on most nights HD 8358 was observed continuously for a large fraction of the night (up to 7.7 hours), this photometry suceeds in removing the ambiguity in the period: the shortest of the three, $P = 0^d.52$, is correct.

Figure 1 is a plot of all 636 individual ΔV values, phase being computed with $P = 0^d.520$. Here we see immediately that the light curve is now double-humped, i.e., markedly different from the shape two years earlier, seen in figure 1 of Fekel, Hall, and Henry (1984).

To refine the period, we fit the light curve by least squares using a Fourier series containing only terms in 2θ. The smallest sum of the squares of the residuals occurred at $P = 0^d.52006 \pm 0^d.00007$. The resulting full amplitude was $0^m.065$. Light minima, taken at the middle of Barksdale's observing season, occurred at JD(hel.) 2446012.6919 and 2446012.9519. And the rms deviation was $\pm 0^m.033$, which is quite large and needs to be discussed.

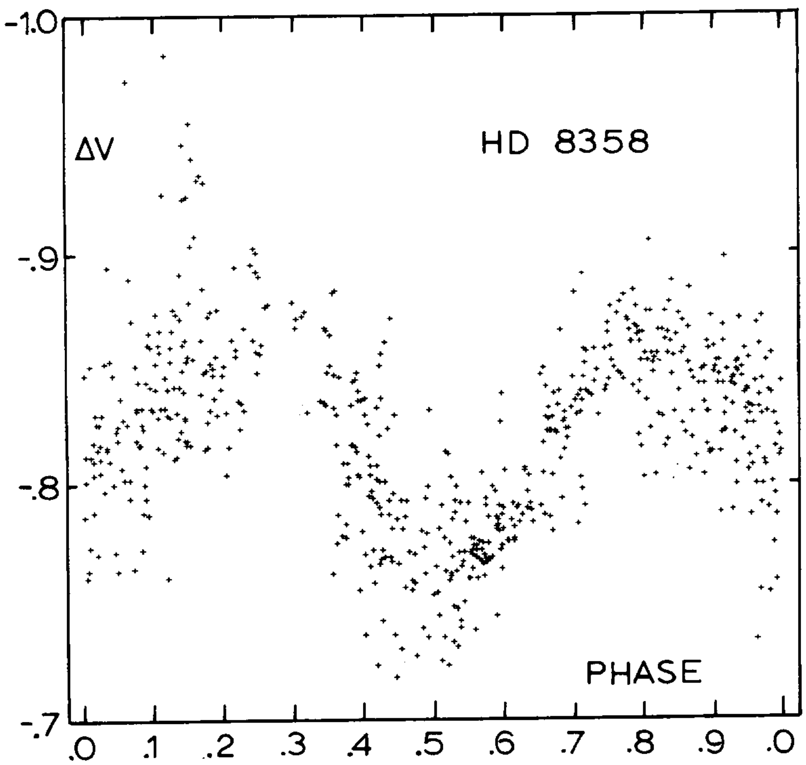

Figure 1

Light curve of the chromospherically active star HD 8358, where phase is computed with a 0.52-day period. The double-humped shape indicates two spot groups were present in late 1984. The large scatter, produced in part from intrinsic cycle-to-cycle changes, is discussed in the text.

Three factors are responsible for the large rms deviation. (1) A sin 2θ curve is an imperfect description of the mean light curve shape. (2) The data were not purged or sanitized in any way prior to analysis, so a few nights of inferior photometric quality probably were included. (3) The light curve underwent intrinsic changes in shape during the 144 orbital cycles which were observed; overlays of separate plots for individual nights demonstrated that the brightness at both maxima and both minima changed as much as $0\overset{m}{.}05$, with no obvious trend or pattern of repetition.

While this paper was in preparation, we received a preprint from Bopp et al. (1985) presenting extensive photometric, spectroscopic, and far-ultraviolet observations of HD 8358. Perhaps we can say here that they, too, found the light curve shape to change dramatically on a variety of time scales.

The light curve changes are surely a consequence of starspot activity. The double-humped shape seen in our Figure 1 indicates two spot groups were present in late 1984. The dramatic changes in shape and the rapidity of those changes make HD 8358 a good candidate for the study of starspot evolution. The rapidity itself, however, will require that future monitoring be extensive and as nearly uninterrupted as possible, in order to maintain proper cycle count from season to season and to define interesting multiple periodicities which may be present.

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