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1990 AND 1991 UBVRI PHOTOMETRY OF HD 199178 = V1794 Cyg

HD 199178, an FK Comae star of spectral class G5 III-IV, has been previously studied by Bopp et al. (1983) and Houvelin et al. (1987). We performed new photometry on 6 nights between 16 May and 26 May 1990 and on 11 nights between 12 May and 26 May 1991.

We used the 24 inch telescope at Mount Laguna Observatory, which is operated by San Diego State University. The photometer has a Hamamatsu GaAs phototube, operating at −1450 volts, and a standard UBVRI filters. SAO 50313 was our comparison star, and SAO 50326 was our check. We find no evidence for variability in our comparison.

To compute the phase we use:

$$C=2444395.7 + 3^{d}.337 \times E \text{ (Bopp et al. 1983).}$$

Our V light curves (Figure 1) show that the phase of minimum light migrated from about 0.5 to about 0.8 from 1990 to 1991. The two minima are roughly the same magnitude; however during 1991 the star is brighter at maximum light. The amplitude of variability decreases from about 0.06 mag to about 0.04 mag between 1990 and 1991. Hence, we conclude that the major starspot or spot group both migrated in longitude and shrank between 1990 and 1991.

The color curves are in Figures 2-4. The B−V, V−R and V−I curves generally show minima at minimum light as one would expect if the light variations are caused by cooler dark spots. However, the color variations are small making this interpretation difficult. The U−B curves are quite curious. The 1991 U−B curve is about 0.08 magnitudes brighter than the 1990 curve. It is initially tempting to assume that this color difference is caused by a significant increase in the stellar temperature between 1990 and 1991. The shrinking of the major spot group between 1990 and 1991 would tend to cause the average temperature to increase, but the spot does not appear to have shrunk enough to cause the observed difference in the U−B colors.

What about the colors? For a G5 III star a change of 0.08 magnitudes in U−B would correspond to a change of about 0.04 magnitude in B−V, if the color change were entirely

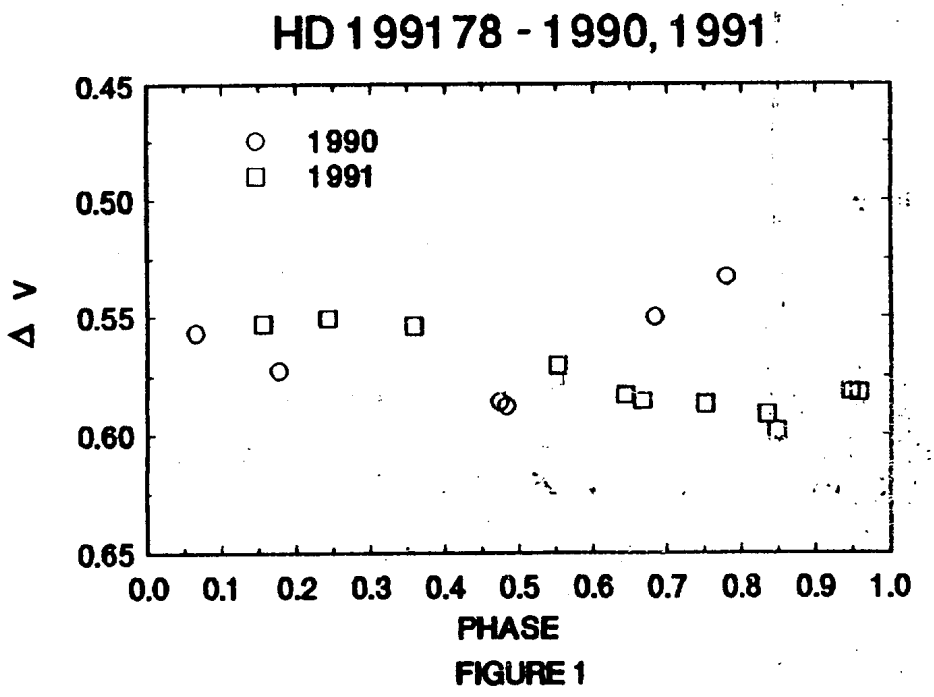

FIGURE 1

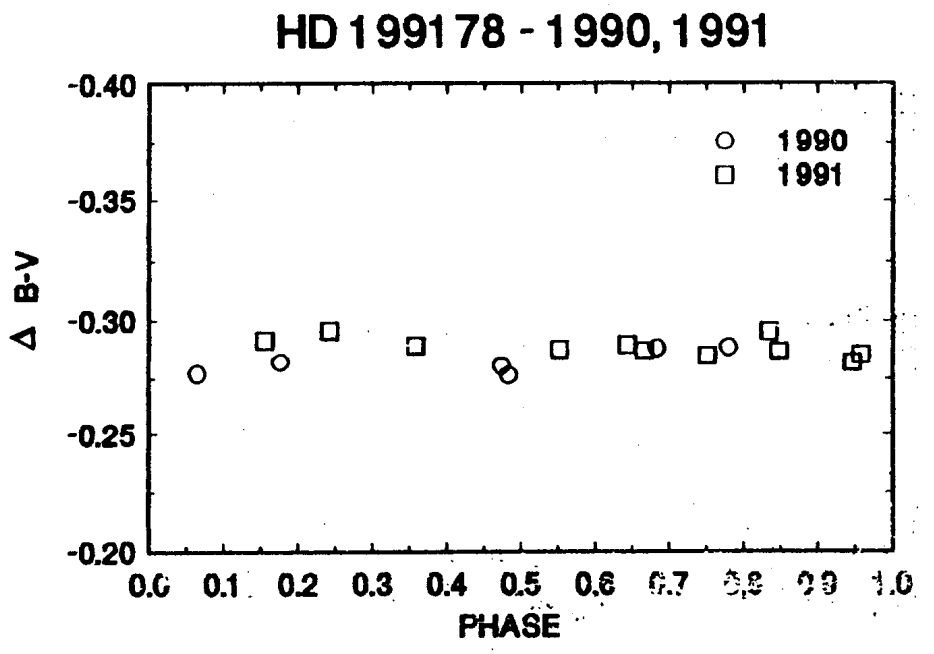

FIGURE 2

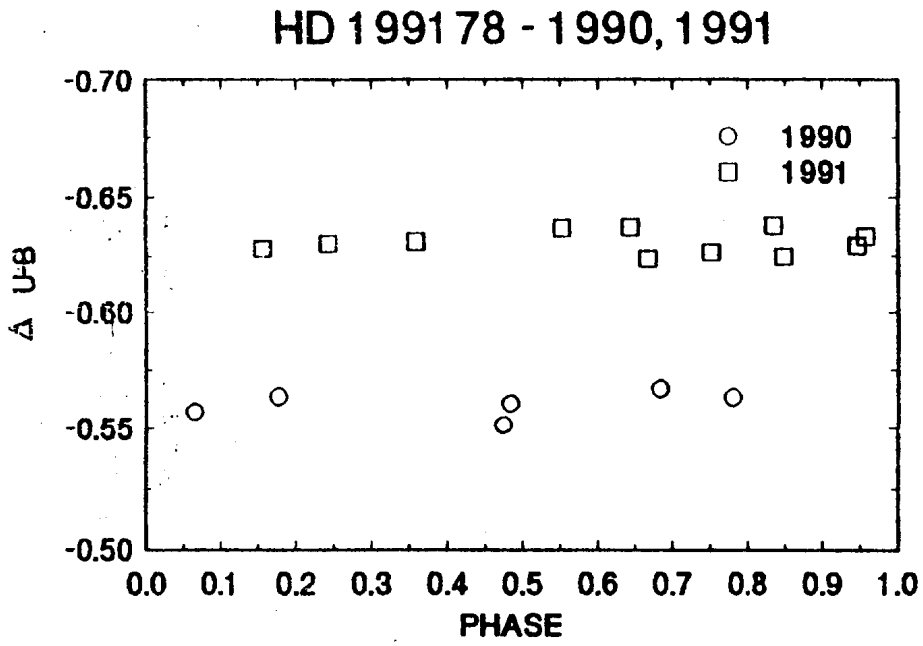

FIGURE 3

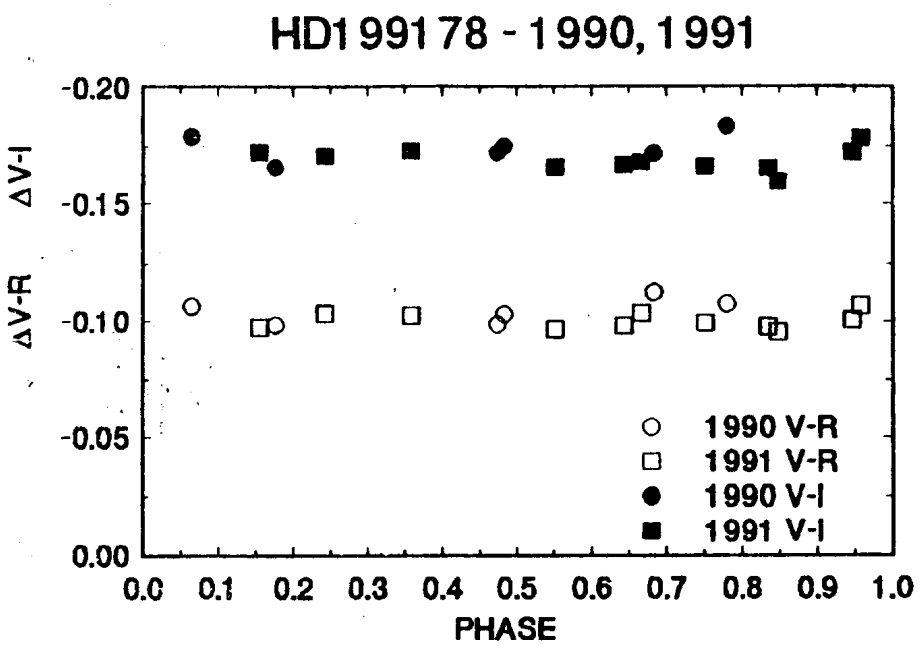

FIGURE 4

caused by a temperature change (Novotny, 1973). Close examination of the B−V color curve shows that the 1991 data are on the average roughly 0.01 to 0.02 magnitudes brighter than the 1990 data. Therefore a temperature change can only partially explain the brightness increase in the U−B color. We do however note that Bopp et al. (1983) observe ultraviolet emission lines in HD 199178; perhaps the effects of changes in the strength of this emission between 1990 and 1991 contribute to the color change.

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