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OBSERVATIONS OF FOUR DHK RED VARIABLES

Kaiser has found light variations in a number of stars not officially designated as variables (Kaiser et al. 1990; see that reference for positions, magnitudes, etc.). I have used the Harvard College Observatory photographic plate collection to investigate the light changes of the red variables DHK 6, 8, 10, and 12. Figure 1 is a finding chart for DHK 10, which is not included in the BD or SAO atlases. Light curves for all four stars appear in Figure 2.

DHK 6 = BD +23°3694, HD 344531, IRC +20415, NSV 12178 (Vul)

DHK 6 is an independent discovery by Kaiser of a variable first reported by Strohmeier et al. (1956) as BV 142. The spectral type is M0. Estimates on 116 blue plates of the Damon patrol series from 1972-1988 produce a light curve with significant variations but no clear periodicity, supporting the tentative NSV classification of type Lb (Kholopov et al. 1982).

DHK 8 = BD -2°5597, SAO 145577, IRC +00507 (Aqr)

The spectral type is M5. Estimates on 124 blue plates of the Damon patrol series, 1970-1988, indicate that this variable is type SR. Seven pairs of maxima or minima yield a well-defined mean period of 343 $\pm$12 days (standard deviation).

DHK 10 = IRC 00085, NSV 2622 (Ori)

This is an independent discovery of a variable first reported by Neugebauer and Leighton (1969) as varying from 6.10-6.69 in the I band. The spectral type is M4. Estimates on 89 blue plates of the Damon patrol series, 1972-1988, suggest periodic behavior, but each cycle differs in shape, amplitude, and length. This variable is probably type SR, but the period is poorly defined at about 200 $\pm$100 days.

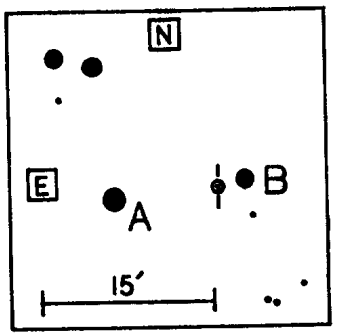

Figure 1. Finding chart for DHK 10.
A = BD $-4^{\circ}1235$, SAO 132515, 6.4 m_v
B = BD $-4^{\circ}1233$, SAO 132509, 9.0 m_v

DHK 12 = BD $+29^{\circ}3730$, HD 18680, SAO 68801, IRC +30391, NSV 12387 (Cyg)

This is an independent discovery by Kaiser of a variable first reported by Lee (1970), who measured a mean magnitude of 7.62 V, +1.70 B-V, and spectral type of M4.0 III. Estimates on 114 blue plates of the Damon patrol series, 1972-1988, do not show variations significantly greater than the observational scatter.

However, variability is confirmed by my photoelectric measures (Table I) with a 28-cm Schmidt-Cassegrain telescope and Optec SSP-3 photometer, using Phi Cyg (4.69 V, +0.97 B-V) as the comparison star. Each observation is the mean of three or four differential measures, corrected for extinction and transformed to the Johnson V system.

Table I

HJD 2447796.550	+2.992 ΔV	$\pm$0.011 σ_1
802.538	+3.009	$\pm$0.015
810.594	+3.039	$\pm$0.011
821.547	+3.138	$\pm$0.004
861.503	+2.820	$\pm$0.003
869.505	+2.890	$\pm$0.012

Together, the photoelectric and photographic observations suggest that the amplitude does not exceed $0^m.4$. The above observations show the star dimming by

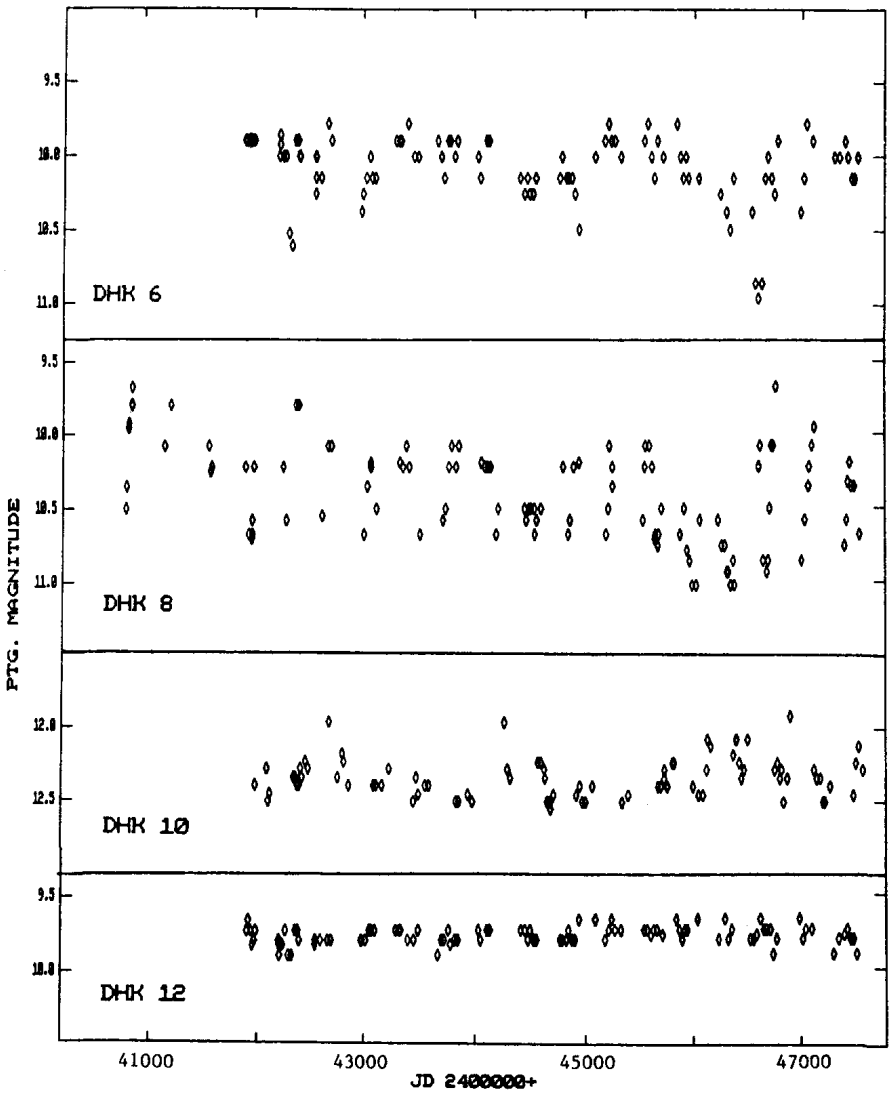

Figure 2. Photographic light curves for DHK 6, 8, 10, 12.

$0^m.15$ in 25 days and brightening by $0^m.32$ during the 40-day observational gap, after which it was dimming again. This suggests that the type is SRb with a period of about 60 days, rather than the slow, irregular variation of type Lb. However, more extensive photoelectric observations are needed to confirm the classification and define the period.

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Some of the information in this report was obtained from the SIMBAD data retrieval system, database of the Strasbourg, France, Astronomical Data Center. I wish to thank curator Martha Hazen for extensive use of the Harvard College Observatory photographic plate collection, for this and other variable star projects. Daniel H. Kaiser, the discoverer, provided computer graphing of the light curves.

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