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PHOTOGRAPHIC OBSERVATIONS OF FIVE DHK VARIABLES

Kaiser (1991) reported the discovery of four new variable stars and confirmed the variability of four stars previously listed in the New Catalogue of Suspected Variable Stars (Kholopov et al. 1982). I have examined these stars on the Harvard patrol plates, and this report presents results for the five variables in Lyra, Sagitta, and Cygnus. Equatorial coordinates, and a finding chart for DHK 21, can be found in Kaiser (1991).

For speed and convenience, estimates on the Harvard plates were made using step values for the comparison stars. Comparison star magnitudes were determined later, using blue-sensitive films exposed with the 25-cm astrograph (f/6.3 Cooke triplet) of Indiana University's Goethe Link Observatory. Magnitudes were estimated with an image scale calibrated to nearby photoelectric B sequences from the Guide Star Photometric Catalogue I (Lasker, Sturch, et al. 1988).

DHK 19 - BD +40°3449, HD 172740, SAO 47682, IRC +40324 (LYR)

Spectral type M. This star was estimated on 208 plates of the Damon series for the interval 1973-1989. The variations are semi-regular with an extreme range of 9.2-10.5 ptg. Discrete Fourier Transform analysis found a weak frequency peak representing a period of 68.3 days, which supersedes the initial estimate of 60 days in the discovery report. A 2000-day sample of the light curve is shown in Figure 1. The field was photographed only once or

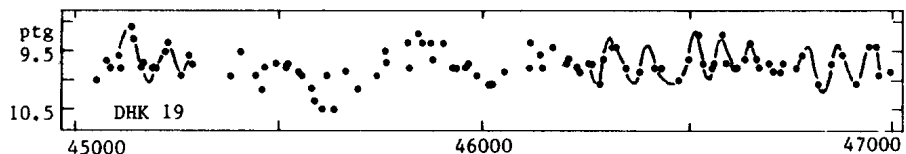


Figure 1. JD 2400000+

twice per month. With only 2-4 plates per 68-day cycle, the semi-regular variations are not obvious, so several cycles have been marked on the light curve with a freehand line. As often occurs with SR-type variables, the amplitude and the mean magnitude vary with time and the characteristic 68-day cycles occasionally disappear or undergo a phase shift.

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The remaining four variables were observed on the same wide-angle Damon patrol plates with field center in Cygnus. Due to limited time, these variables were estimated only on the 42 plates exposed during the 2000-day interval JD 2441900-43900.

DHK 20 - NSV 12930, BD +16°4199, HD 192446, IRC +20460 (SGE)

Spectral type S. Variability was first noted by Weber (1958). The variations show an extreme range of 9.8-11.2 ptg. DFT analysis of all the observations found no definite periodicity in trials of periods from 10-950 days. However, while the earlier portion of the light curve (Figure 2) shows rather confused, almost irregular variations, the light curve from JD 2443300-900 shows shorter, more regular cycles. DFT analysis of this very small data set found a strong frequency peak for the period 102.4 days. This variable is probably SR type but, like DHK 19, the characteristic cycles are often lost or disturbed.

DHK 21 - BD +46°2892 (CYG)

Spectral type M5. Variability is semi-regular with an extreme range of 11.4-12.3 ptg (Figure 2). DFT analysis found a period of 466.4 days, which supersedes the value of 400 days in the discovery report. Identification of this variable with BD +46°2892 was made by Bidelman (1992), based on the match between the BD atlas and the finding chart in the discovery report. A SIMBAD database search for stars at the position published by Kaiser found AG +46°1602. The AG Catalogue (AGK2, 1952) identifies this star as BD +46°2892, so Bidelman appears to be correct. A slightly improved position from the AGK2 is 20h 14m 16s, +46° 45.2' (1950).

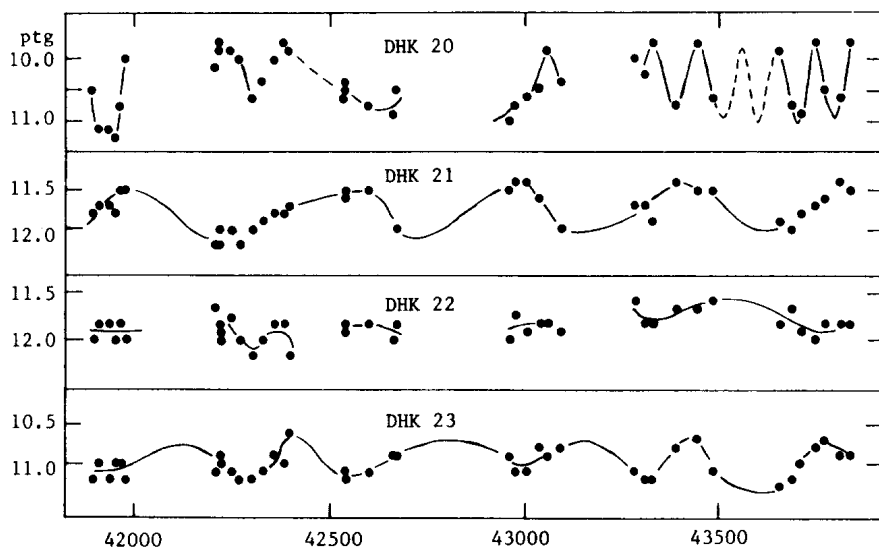


Figure 2. JD 2400000+

DHK 22 - BD +31°4024, HD 332077, SAO 69757 (CYG)

Spectral type M9 or (probably) S. The observations show an extreme range of 11.6-12.2 ptg (Figure 2). DFT analysis found no definite periodicity in trials of periods from 10-950 days, so classification as type Lb, as suggested in the discovery report, is consistent with the observations.

DHK 23 - NSV 13178, BD +31°4152 (CYG)

Spectral type MIIIe. This variable was first reported by Espin (1900). According to the NSV Catalogue, variability was confirmed by Sandig (1950), but Erleksova (1955) found that the star was constant. I found semi-regular variations with an extreme range of 10.7-11.2 ptg. DFT analysis indicates a period of 344.1 days, which supersedes the initial estimate of 340 days in the discovery report. Although the amplitude is only 0.5 magnitude, the semi-regular cycles of 280-400 days are readily apparent (Figure 2).

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