COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
NUMBER 850

Konkoly Observatory
Budapest
1973 November 30

HIGH SPEED PHOTOMETRY OF THE X-RAY BINARY HD 153919

HD 153919, an O6F star (Thackeray and Walker, 1973), lies in the error box of the variable X-ray source 2U 1700-37 (Giacconi et al, 1972).

Photometric observations in the UBV system (Penny, Olowin, Penfold and Warren, 1973) made at the SAAO have confirmed that the star is optically variable with a period of 3.4120 days equal to that of the X-ray source. The variation has two minima of equal depth, but of differing shape. One minimum is coincident with the X-ray occultation, which occurs at phase 0.68 ± 0.02. Both the X-ray and V-band data from Penny et al are presented in Fig.1.

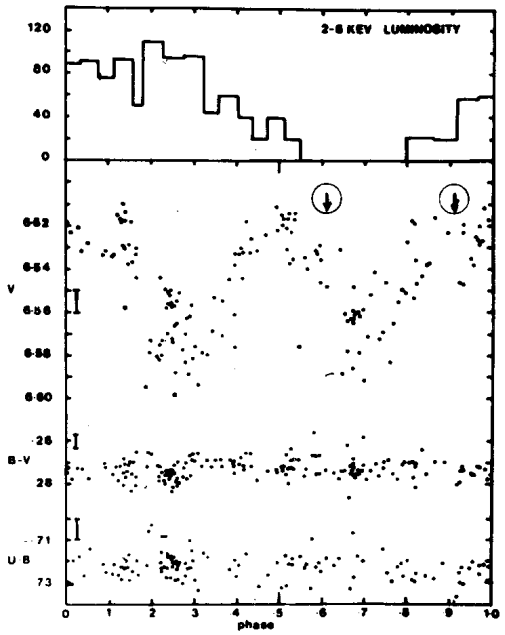
Due to the rapid fluctuations observed in similar objects such as the black hole candidate Cyg X-1, a pilot attempt was made to monitor the star with a high-speed photometric system. This was done at the SAAO observing station at Sutherland using a 50cm telescope and a computer supported photometer with an uncooled EMI photomultiplier designed at the University of Cape Town.

Integrations of one second duration in the V band were made for 1.14 hours on 11 May 1973 and integrations of 100ms duration using a clear aperture for 350 seconds were made on the night of 12 May 1973. The observations refer to phases 0.61 and 0.91 respectively of the X-ray source according to the ephemeris calculated by Penny, et al, and are indicated by arrows in fig.1.

The resulting observations were subject to spectral analysis by performing a fast Fourier transform using the Cooley-Tukey algorithm on a set of equally spaced data points. The input was normalized to remove the instrumental sensivity as well as smoothed to remove any linear trends. This normalization allows the comparison of power spectra taken with different instruments, sampling intervals and data lengths. The procedure is similar to that used by Robinson and Warner, 1972.

The power spectra of the observations of HD 153919 made on the nights in question reveal no coherent periodicities for all frequencies investigated. The power level at frequencies higher than

Figure 1



Optical and X-ray variations of HD 153919 from Penny, et al.

0.01 HZ represents the constitution to the signal from photon counting noise and scintillation. There are no significant power peaks above this general trend within the interval defined by the frequency $.02 \leqslant HZ \leqslant 5$. For periods shorter than 100 second the lack of large spikes in the power spectrum indicates that at the epoch of observations, the power spectrum is due entirely to stochastic processes.

This lack of significant power during the period of observation demonstrates either the lack of intrinsic variability of the object, or that it was observed during a quiescent phase. Further observations are being made in order to resolve this question.

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