

PHOTOMETRIC HISTORY OF THE SU UMA TYPE CATAclySMIC VARIABLE SBS 1017+533

Martha L. Hazen

Peter M. Garnavich

Harvard-Smithsonian Center for Astrophysics

60 Garden Street

Cambridge, MA 02138

Presented at the 87th Spring Meeting of the AAVSO, June 20, 1998

Abstract

A search through the Harvard College Observatory photographic plate collection has produced an historic light curve for the cataclysmic variable SBS 1017+533. Markings on two of the plates suggest it was previously discovered.

1. Introduction

Spectral classification of stars from the *Second Buryakan Sky Survey* (SBS) (Markarian and Stepanian 1983) by Balayan (1997) identified 10 cataclysmic variables (CVs). Seven of these were already well known, but three were new. Garnavich and Stanek (1999) report on two of these; the third, SBS 1017+533, is the subject of this paper.

One of us (PG) observed the area of SBS 1017+533 at the Multiple-Mirror Telescope and found the object in outburst on 1998 January 27.5 (Kato 1998). He noted that the spectrum was typical of a dwarf nova at maximum. Subsequent magnitudes posted on the computer discussion group vsnet show three outbursts with a duration of 9–10 days and a frequency of about 50 days. Vanmunster (1998) detected prominent superhumps with a period of 0.0697 day; this value was confirmed by Nogami (1998).

SBS 1017+533 is situated within 10 arcsec of, and is likely identical to, a ROSAT x-ray source, J1020.4+5304 (Snowden *et al.* 1995).

2. The search

A search through the Harvard College Observatory's photographic plate collection produced 420 plates of the area with fainter limits of $m_{pg} > 13.8$. The magnitudes m_{pg} below are based on a B-sequence derived from the USNO catalog (Monet *et al.* 1996). This sequence is shown in Figure 1, which also identifies SBS 1017+533.

On 34 of the plates there was a visible image of SBS 1017+533. Table 1 gives the m_{pg} estimated for the star on the plates where an image was visible, along with the whole Julian Date for the plate. Figure 2 plots these points against time, and also includes the bright limits for plates on which no image was seen.

3. Discussion

From the above numbers, one can determine that SBS 1017+533 was visible on about 8% of the plates. From the few cases in which more than one observation of a given outburst was available, the duration of an outburst appears to be approximately 8–12 days. The minimum spacing between successive brightenings is about 40 days. These figures are typical of an SU UMa-type CV (see discussion by Vogt 1980).

It was interesting to note that, on a pair of 16-inch Metcalf telescope plates, the variable was marked. The other markings on the plate suggest that this pair was used by W. J. Luyten in his survey for high proper motion stars that could be white dwarfs (see the discussion on Luyten in Hoffleit 1996). If Luyten did, indeed, discover the variability of this star at an earlier date, apparently no evidence was ever published.

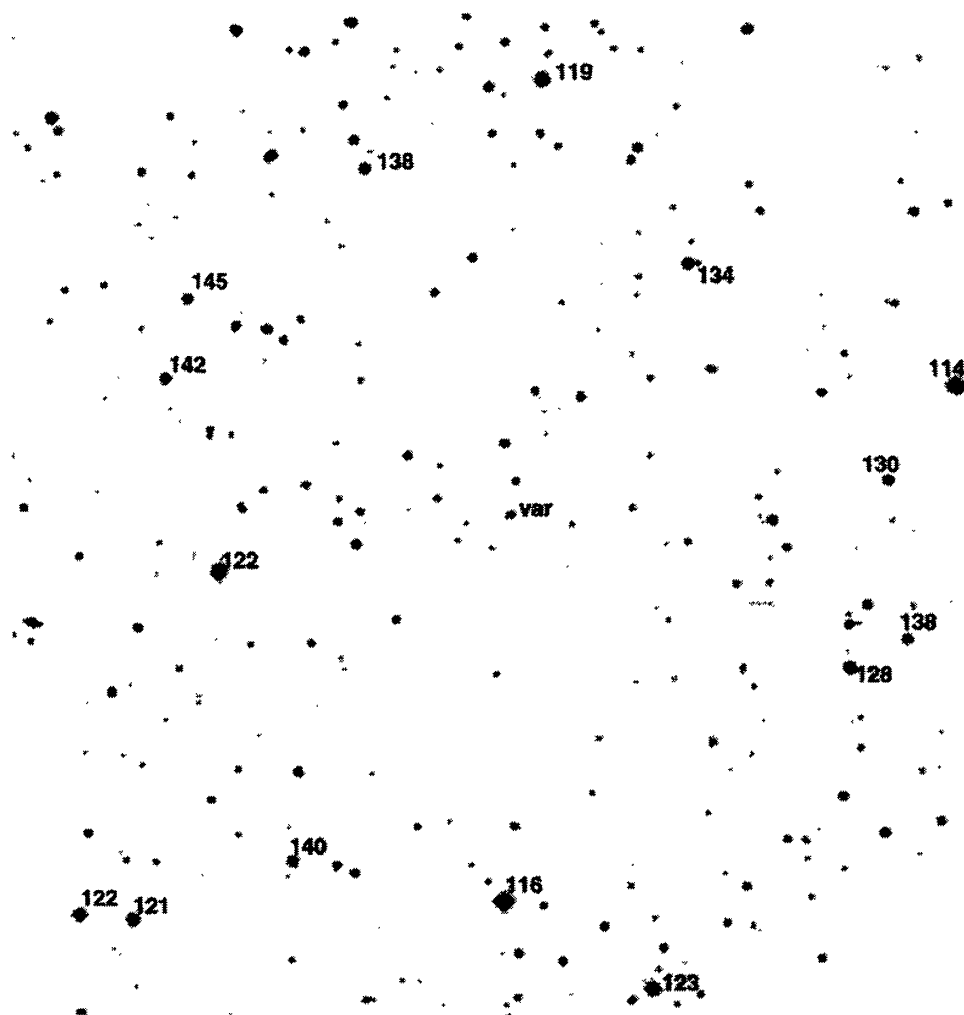


Figure 1. Chart of the area of SBS 1017+533, identifying that star and giving the magnitudes from the USNO catalog, without decimals, used for the comparison stars. The chart is from the Digitized Sky Survey (produced at the Space Telescope Science Institute under U. S. Government Grant NAG W-2166). The field is 0.5 x 0.5 degree, with north up and east left.

Table 1. Photographic magnitudes for the maxima of SBS 1017+533 found on Harvard plates (Julian Dates + 2,400,000).

<i>JD</i>	<i>m_{ps}</i>	<i>JD</i>	<i>m_{ps}</i>	<i>JD</i>	<i>m_{ps}</i>	<i>JD</i>	<i>m_{ps}</i>
23169	12.7	29612	13.1	31583	14.7:	45784	12.9
26284	12.2	29612	12.8	33279	12.1	45998	14.0:
26750	14.0	29651	13.0:	34093	14.7::	46139	13.0
27918	14.4	29657	13.0:	42427	12.6	46408	12.6
28161	12.8	29658	13.9	43169	12.8	46415	13.4
28165	12.9	29981	13.0::	43512	13.0	46474	13.6
28167	13.2	29987	13.4	43987	13.7	46606	12.7
28168	13.7	29987	13.6	44732	14.5::	46612	13.8:
29245	14.5:	29988	13.6				

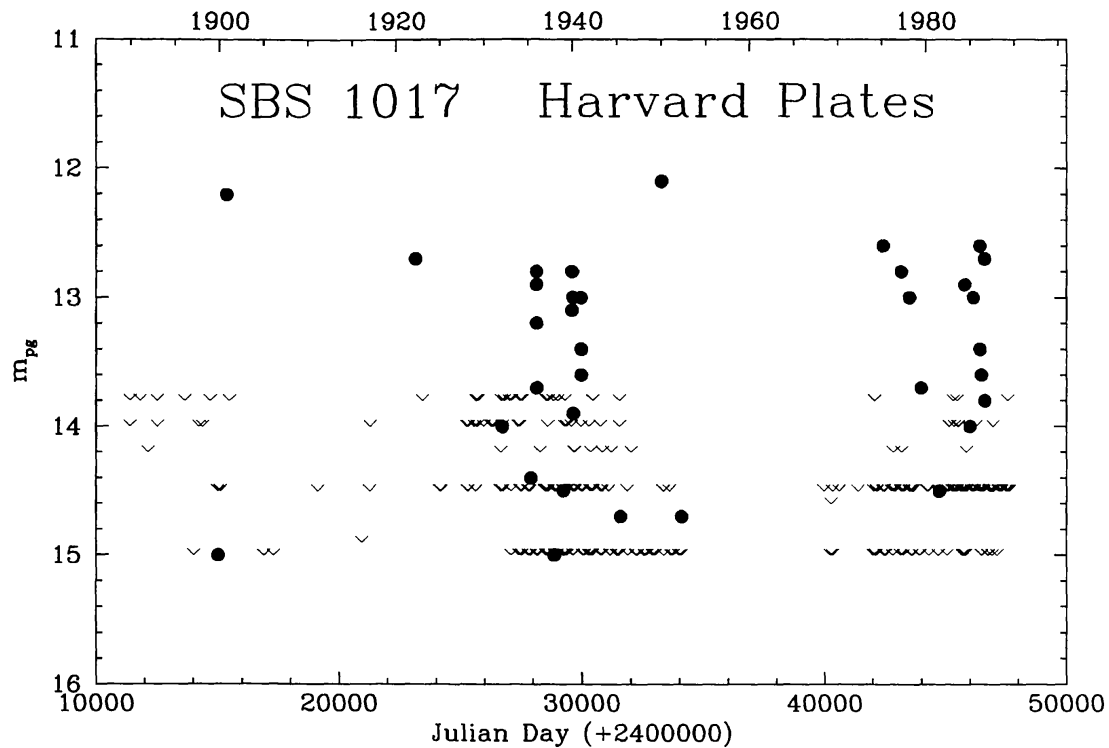


Figure 2. Historical light curve of SBS 1017+533 as derived from Harvard College Observatory plates. The symbol “v” is used to denote brighter limits for the plates on which the star was not visible.

References

- Balayan, S. K. 1997, *Astrophys.*, **40**, 101.
 Garnavich, P. M., and Stanek, K. Z. 1999, *J. Amer. Assoc. Var. Star Obs.*, **27**, 79.
 Hoffleit, D. 1996, *J. Amer. Assoc. Var. Star Obs.*, **24**, 43.
 Kato, T. 1998, *vsnet-alert*, No. 1441.
 Markarian, B. E., and Stepanian, D.A. 1983, *Astrofizika*, **19**, 639.
 Monet, D., *et al.* 1996, *USNO-SA1.0*, U.S. Naval Observatory, Washington, DC.
 Nogami, D. 1998, *vsnet-alert*, No. 1452.*
 Snowden, S. L., Freyberg, M. J., Plucinsky, P. P., Schmitt, J. H. M. M., Trümper, J., Voges, W., Edgar, R. J., McCammon, D., and Sanders, W. T. 1995, *Astrophys. J.*, **454**, 643.
 Vanmunster, T. 1998, *vsnet-alert*, No. 1448.*
 Vogt, N. 1980, *Astron. Astrophys.*, **88**, 66.

* *vsnet-alert* is a feature of “vsnet,” an electronic list devoted to variable stars; URL: <http://www.kuastro.kyoto-u.ac.jp>