

V3821 SGR AND A NEARBY CARBON STAR

Dorrit Hoffleit
 Yale University
 Department of Astronomy
 New Haven, CT 06520

Received: June 25, 1991

Abstract

Star No. 4007 in Stephenson's *Catalogue of Cool Galactic Carbon Stars* is close to V3821 Sgr. The question has been raised, are they the same star? No: the two are separated by 76 seconds of arc. A provisional period for V3821 Sgr has been determined.

That early determinations of the coordinates of variable stars may be seriously in error has recently been demonstrated by Carlos Lopez (1989). Hence, when W. Bidelman at the Warner and Swasey Observatory called my attention to the fact that there was a carbon star (No. 4007 in Stephenson's catalogue, 1989) suspiciously near the published position of V3821 Sgr, an apparently eclipsing variable star I had discovered at Harvard in about 1935, Dr. van Altena offered the services of his volunteer assistants, members of the Astronomical Society of New Haven, to measure the positions of numerous stars in their vicinity. The identity of the carbon star was obvious when the yellow and blue plates taken at El Leoncito were blinked. Measurements on the yellow plate by Christopher Predom and Robert DeMartino clearly verified the position of the carbon star and indicated another star in the position of the variable, 76" preceding the carbon star. However, that in itself could not immediately be accepted as confirmation that the variable was indeed a different star from the carbon star; the region in Sagittarius is so crowded that it would be almost inevitable that some star would be found in a designated position.

All my record books of the work I had done on this star were at the Maria Mitchell Observatory. Director Belserene sent me copies of the relevant pages so that I could verify the identification of the variable. I then visited Harvard Observatory in order to check the original discovery plates and sample a few critical maxima and minima. Consequently it became obvious that the carbon star and the variable are in fact different stars. The relatively few plates I sampled did not reveal any significant variation of the carbon star.

The positions Predom and DeMartino ascertained for this variable, the carbon star, and a few other variables in their vicinity are shown in Table 1. The first line for each star gives the new position, the second the previously published coordinates, both for equinox 1950.

Imants Platais became interested in these stars and gave helpful comments and contacted V. M. Blanco and D. J. MacConnell (who, with O. R. Hansen, were original or independent investigators of the spectrum of the carbon star). Both provided marked charts showing the position of the carbon star. The one by MacConnell (in yellow light) is reproduced in Figure 1 where all but one of the stars listed in Table 1 are marked. (NSV 10784 is off the southern edge.)

In 1955 Jean Andersen at Harvard had estimated the magnitudes of the variable on some 100 selected plates, but not ascertained its period. It appeared to be an Algol type eclipsing binary. Seven years later, at the Maria Mitchell Observatory, I went quickly through all the available plates, not estimating magnitudes but simply recording the brightness at maximum as M, at minimum as m, with a few estimates

called med, which could represent either very uncertain or actually intermediate magnitudes. Among about 230 Harvard plates taken between 1924 and 1951 I found 12 minima, and among 130 Nantucket plates taken between 1957 and 1962, 4 additional minima. From these I ascertained a reciprocal period 1.332625/day, or the following formula for phase of minimum in days:

$$JD_{\min} = 2427239.548 + 0.7503986 E. \quad (1)$$

Mrs. Andersen's observations are represented by this period in Figure 2a, the maxima and minima recorded by myself on Harvard plates in Figure 2b.

This period has not been adequately tested for spurious effects. As many more plates have accumulated at the Maria Mitchell Observatory since 1962, Dr. Belserene graciously plans to have one of her summer research assistants estimate the magnitudes on all of the Nantucket plates. She plans to select a better sequence than the somewhat distant one we previously used at Harvard for provisionally estimating sample magnitudes for several variables simultaneously. We shall look forward to the new Nantucket results at a future meeting.

Table 1. New Positions for Carbon Star No. 4007 and Several Variable Stars

<i>Star</i>	<i>R. A. (1950) Dec.</i>		<i>Remarks</i>
4007	18 23 27.98 27.7	-22 06 02.5 07.	visual mag. 10.0
V3821 Sgr	18 23 22.56 24.	-22 06 10.3 06.2	13.7 - 14.6pg, EA IBVS 660 Chart 75c
V2548 Sgr	18 23 26.57 28.	-22 04 03.8 04.1	14.5 - 16.4pg, SR 159d IBVS 660 Chart 82
NSV 10781	18 23 07.64 09.	-22 08 18.5 08.3	12.8 - 13.9pg IBVS 660 Chart 75a
NSV 10782	18 23 10.73 11.	-22 07 34.8 07.5	14.0 - 14.5pg IBVS 660 Chart 75b
NSV 10784	18 23 17.21 18.	-22 13 55.8 14.8	14.4 - 15.1pg IBVS 660 Chart 79

References

- Hansen, O. L., and Blanco, V. M. 1975, star 20482.
 Hoffleit, D. 1972, *Inform. Bull. Var. Stars.*, No. 660.
 Lopez, C. E. 1989, *J. Amer. Assoc. Var. Star Obs.*, 18, 139.
 Stephenson, C. B. 1989, *Pub. Warner and Swasey Obs.*, 3, No. 2.

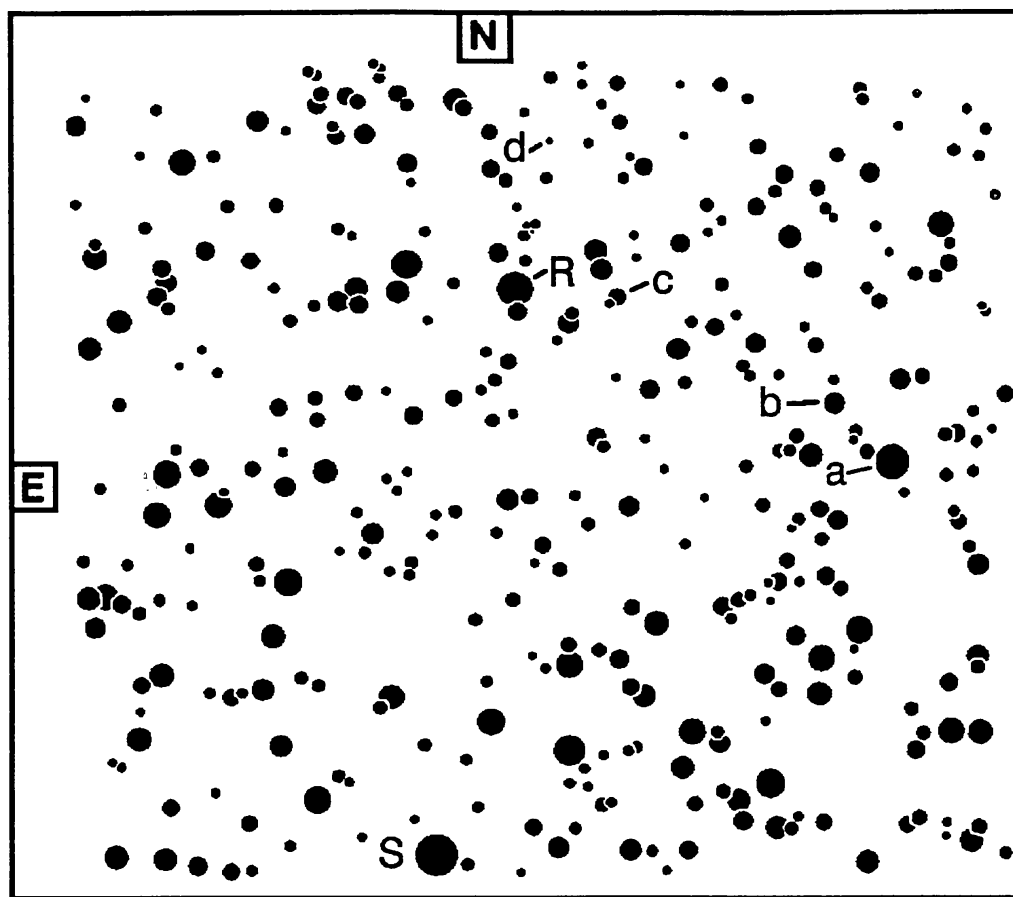


Figure 1. Photovisual chart of region of carbon star 4007 (R). Marked are the variables V3821 Sgr (c), V2548 Sgr (d), NSV 10781 (a), NSV 10782 (b), and SAO 186817 (S).

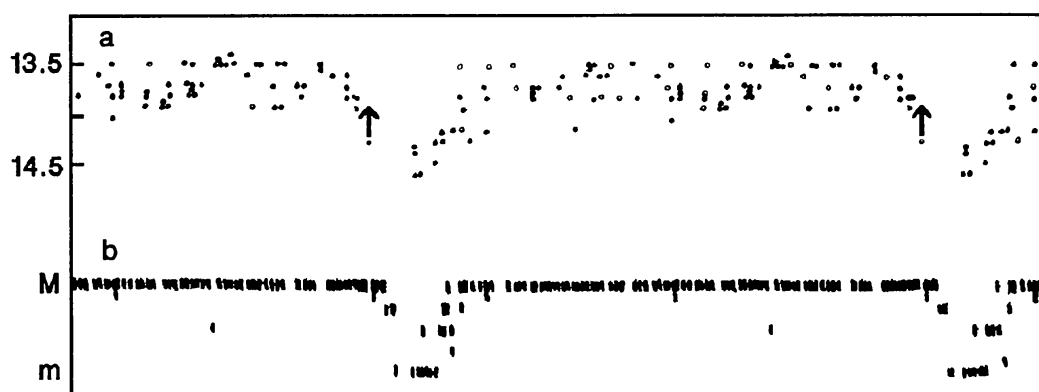


Figure 2. Observations on Harvard plates fitted to reciprocal period 1.332635/day. a) magnitude estimates by J. Andersen; b) quick qualitative estimates on the same and additional plates by D. Hoffleit. (The arrow on the upper curve indicates disagreement between the two observers.)