

PHOTOELECTRIC PHOTOMETRY OF THE CARBON STAR V614 MONOCEROTIS

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Abstract

As part of the Small Amplitude Red Variable (SARV) Photoelectric Photometry Program, the carbon star V614 Monocerotis was recently observed to determine period(s) and amplitudes more accurately.

Photoelectric observations of V614 Mon (HD 52532, BD-03 1685, SAO 134049) were made to determine its periodicity and amplitude range more accurately, as only sparse data regarding these parameters are found in existing literature. V614 Mon is a carbon star of subclass J, with a spectral type of R5 (C4, 5J). The major characteristic of J-class carbon stars is the high strength (50%) of the C-12 C-13 isotopic carbon band at 6168 Angstroms relative to the normal band at 6122 Angstroms (Eggen 1972; Gordon 1971; Yamashita 1966). It is also classified as an SRb semiregular variable with a period of about 60 days, a varying visual amplitude ranging from 0.10 to 0.35 magnitude, and a B-V value of +1.74 (Eggen 1972; Kholopov *et al.* 1985; Hirshfeld and Sinnott 1985).

The observations were made by the author on 31 separate nights from JD 2448209 (November 14, 1990) to JD 2448358 (April 12, 1991) as part of the Small Amplitude Red Variable (SARV) Photoelectric Photometry Program for the AAVSO. The detector was a silicon PIN photodiode in a solid-state SSP-3 photoelectric photometer, which was mated to an f/10 8-inch Schmidt-Cassegrain telescope. The observations were made through an SSP-3 Schott visual filter, with the variable star measurements flanked by comparison star and sky readings. A check star was observed on 90 percent of the nights. The comparison and check stars used were HR 2655 (V=5.62, B-V=1.29, K3III) and HR 2622 (V=6.30, B-V=0.57, G0 IV-III), respectively. The magnitude difference between these two stars varied randomly by only 0.03 or 0.04 magnitude. The data were reduced with computer programs written by the author, with all comparison and sky readings being interpolated. Also taken into account in the programs were atmospheric extinction, transformation to V of the standard UBV system, and corrections to heliocentric time. The standard deviation for all of the observations was less than 0.035 magnitude. The resulting differential magnitudes were converted to V magnitudes by adding the adopted V magnitude (5.62) for the comparison star HR 2655.

The resulting light curve (Figure 1) is constructed from the data in Table 1. It represents the most complete continuous light curve on this star published to date. Previous sources indicate a maximum brightness of visual magnitude 7.2, whereas these most recent observations indicate a maximum brightness of V=7.3. It is noted that the maximum range, occurring between JD 2448297 and JD 2448341, is 0.24 magnitude in V, which falls within the limits of previously reported ranges. No 60-day period, or any regular period, is easily discernible. If various portions of the light curve are extracted and some interpolations and extrapolations made, several periods are possible:

1. Peaks occurring just before JD 2448205 and around 2448297 indicate a period

- of about 92 days;
2. The minima around JD 2448222 and 2448333 are separated by about 111 days;
 3. The various extrema around JD 2448261, 2448297, 2448334, and 2448370 indicate a half-period of 36-37 days.

Additional observations will be made to confirm possible persistent periodicities. A multiplicity of apparent periods is, of course, a major characteristic of semiregular SRb variable stars. Thus these observations support the classification of V614 Mon as an SRb variable star with a small amplitude range, but with as yet inaccurately known period(s).

Table 1. V614 Monocerotis Light Curve Data

<i>JD 2440000+</i>	<i>V Magnitude</i>	<i>JD 2440000+</i>	<i>V Magnitude</i>
8209.767	7.34	8297.606	7.30
8211.731	7.38	8302.57	7.32
8234.705	7.44	8311.533	7.38
8235.707	7.43	8314.620	7.48
8245.677	7.39	8316.530	7.50
8251.660	7.37	8321.514	7.49
8261.619	7.39	8323.517	7.52
8270.627	7.38	8325.527	7.52
8274.620	7.38	8327.529	7.52
8279.680	7.35	8337.540	7.52
8280.716	7.36	8341.524	7.54
8282.610	7.36	8346.530	7.50
8285.59	7.33	8348.528	7.48
8288.583	7.35	8354.533	7.41
8290.583	7.31	8358.536	7.35
8296.595	7.30		

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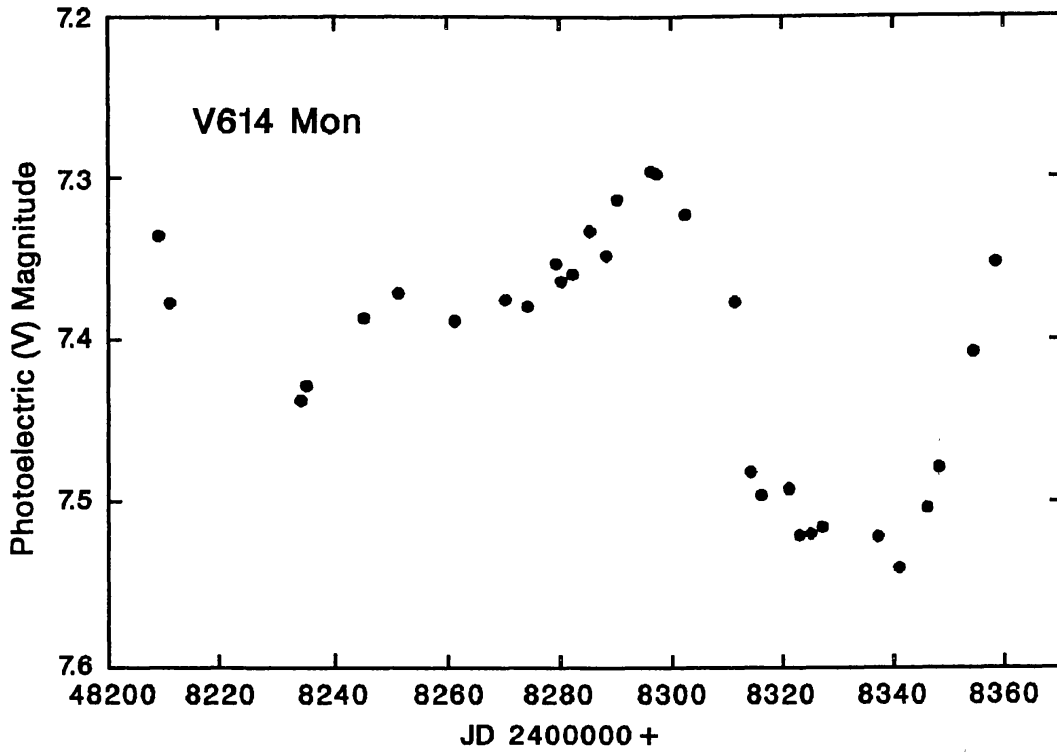


Figure 1: Photoelectric (V) magnitude vs. Julian Date for V614 Monocerotis.