PERIOD AND AMPLITUDE OF V1670 SAGITTARII

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Abstract

The period and light curve of V1670 Sagittarii are
consistent with its classification as a Type II Cepheid. The
amplitude is variable. Short- and long-term behavior of the
period are discussed.

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V1670 Sagittarii has been classified as a possible Cepheid with
elements JD_{max} = 2426104 + 29.65 n (Hoffleit 1957).

Magnitudes for V1670 Sagittarii for the years 1957-1981 were
obtained from Maria Mitchell Observatory plates, and were used with
previously determined Harvard College Observatory plate magnitudes for
the years 1922-1935. The best long-term period was found to be
29.6756 $\pm$ 0.0008 days, which falls within the period range for Type
II Cepheids. An epoch of maximum is JD 2443336.599. A finder chart
is shown in Figure 1.

The star varies on the average from photographic magnitude 13.5
to 15.2. The amplitude of variation is not constant, and the star was
observed as bright as 12.9 and as faint as 15.5 magnitudes. No
systematic variation in amplitude was detected. In particular,
alternate minima are not specifically different in depth, indicating
that the variable is probably not an RV Tauri star.

There is a definite shoulder in the descending branch of the
light curve, similar to those observed in the descending branches of
some Type II Cepheids (Payne-Gaposchkin 1954). The long-term shape of
the light curve is stable, although there is some indication that the
broadness of the maximum varies. There is a large amount of scatter,
especially near the maximum, which could be partially explained by a
changing light-curve.

Somewhat cyclic deviations in Observed minus Computed values are
observed on the (O-C) diagram in Figure 2. The deviation cycle seems
to repeat about every 11 years. The period appears to be constant for
no more than about 4 years. Stretches of both apparently longer
period and apparently shorter period than the long-term "average"
period of 29.6756 days are present. It seems reasonably certain that
these deviations from constant (O-C) are non-random, but it is not
clear to what extent they are periodic. There are marked
discontinuities in the apparently cyclic pattern.

Magnitude versus phase was plotted, grouping together the
observations in the years indicating shorter than average period
(having negative slope on the (O-C) diagram), with each stretch of
years plotted separately. The same was done for those years
indicating longer than average period (having positive slope) and
nearly average period (zero slope). The maximum for the years of
longer period was somewhat broader than that for the years of shorter
period; the maximum for the years of average period and positive (O-C)
was somewhat broader than that for the years of average period and
negative (O-C). Thus, half the cycle is characterized by a somewhat
broader maximum in the light curve. One explanation for this effect

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could be the presence of two or more different, but similar, periods or light curve shapes beating with each other. This phenomenon has been observed in RR Lyrae stars.

In summary, the long-term period of V1670 Sagittarii falls in the range of periods for Type II Cepheids. The long-term stability versus short-term variability of period and light curve, and the presence in the descending branch of a shoulder similar to shoulders observed in the descending branches of some Type II Cepheids both also suggest classification of this variable as a Type II Cepheid.

REFERENCES

Hoffleit, D. 1957, Astron. Journ. 62, 120.

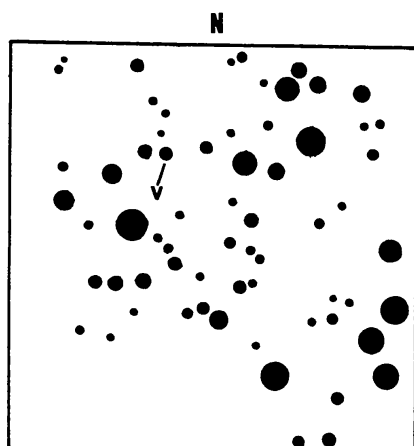Payne-Gaposchkin, C. 1954, Variable Stars and Galactic Structure, The Athlone Press, London.

Figure 1. Finder chart for V1670 Sagittarii. The coordinates of the variable are $\alpha = 18^h 27^m 23^s$, $\delta = -23° 46\!.0$ (1950). The field is about 15' square. North is up; east is to the left.
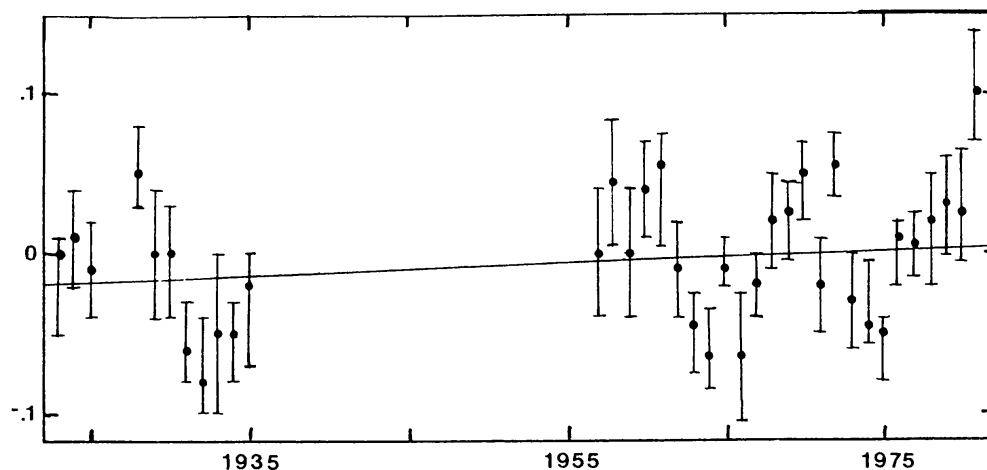

Figure 2. (O-C) diagram for V1670 Sagittarii. Bars indicate largest possible uncertainty in (O-C) for a given year. The deviations from (O-C) = 0 appear to be non-random, and there is some indication of systematic deviation with a period of about 11 years.