A LONG-TERM STUDY OF THE PERIOD OF V336 AQUILAE

LYNNE BISSONNETTE
Maria Mitchell Observatory
Nantucket, MA 02554

ABSTRACT

A study of the Population I Cepheid V336 Aquilae was conducted at the Maria Mitchell Observatory on plates dating from 1925-1982. Computation of the elements shows that the period has been constant to within 8.34×10^{-7} cycles per year.

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V336 Aquilae has been classified by Petit (1960) as a Type I Cepheid, varying from magnitude 10.67 to magnitude 11.82 in the Blue (Schaltenbrand and Tammann 1971). Periods between 7.303552 and 7.304068 days have been quoted in various editions of the General Catalogue of Variable Stars (Kukarkin et al. 1958, 1969).

Brightness estimates made from Maria Mitchell Observatory's NA plates were analyzed using a period search program based on the method of Lafler and Kinman (1965) to obtain a trial period on which to base an O-C diagram. These data included estimates for the first few years, made by Marjorie Williams, which are on record at the Maria Mitchell Observatory. A conversion factor was used to correlate her estimates with the estimates made for later years. The resulting period and an arbitrary epoch were keyed into a computer program which calculates phases and plots light curves on the screen of the TRS-80 computer of the Maria Mitchell Observatory.

Two or three years' data were analyzed at a time. The phase at which maximum occured for each computer-plotted light curve was plotted against the average Julian Date. A straight line was fitted to this diagram by the least squares method. Phases were recalculated with the elements implied by this line, and twelve light curves were drawn. The phase of the maximum of each curve was found by superimposing a mean light curve, drawn on tracing paper, over the light curves. The maximum, for this purpose, was defined as a point two-tenths of a cycle after the mid-point of the light curve's rising branch (since the curve has a broad maximum).

The straight line obtained by the least squares method for the final O-C diagram shown in Figure 1, corresponds to these new elements:

$$JD_{max} = 2434173.886 + 7.304036\ E.$$
$$\pm 0.034 \quad \pm 0.000039$$

The following parabolic elements were also calculated by least squares:

$$JD_{max} = 2434173.842 + 7.30402\ E + 6.09 \times 10^{-8}\ E^2.$$
$$\pm 0.048 \quad \pm 0.00004 \quad \pm 4.76 \times 10^{-8}$$

The third term is only 1.28 times as large as its mean error. Its significance was tested by the Pringle (1975) method. There is only a 76.7% chance that the period is changing. This means that there is a 23.3% chance that the third term is due to scatter around the line. Taken at face value, the third term would imply a period

changing at the rate of 8.34×10^{-7} cycles per year.

The 3rd Edition of the General Catalogue of Variable Stars suggests that the period possibly varies. The data accumulated from NA plates indicate a constant period to within 6.1×10^{-6} days per year. It is likely that the range of values quoted in the General Catalogue of Variable Stars is the result of short intervals used for some of the earlier determinations.

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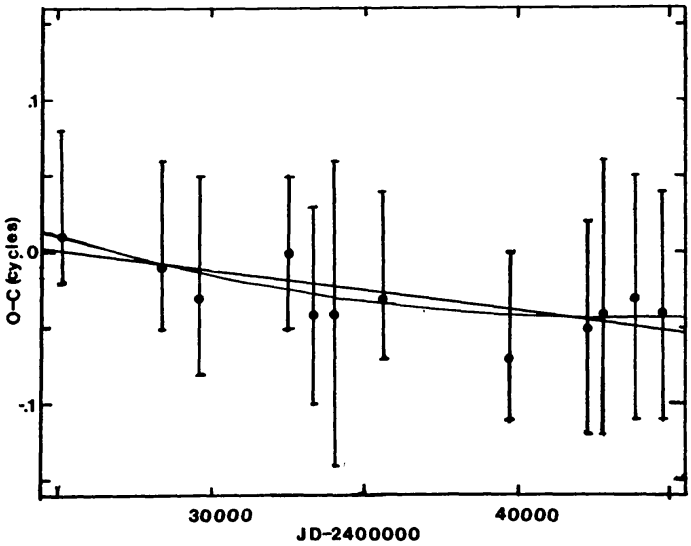

Figure 1. O-C diagram of V336 Aquilae obtained using the elements $JD_{max} = 2433436.3346 + 7.3041755\ E$.