

REVISED ELEMENTS FOR AE COMAE BERENICES

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Abstract

The RR Lyrae variable star AE Com was analyzed using photographic plates from the Maria Mitchell Observatory. Revised elements are:

$$JD_{\max} = 2441332.501 + 0.496909 E.$$

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An analysis of the RR Lyrae variable AE Comae Berenices was conducted to see if any changes in the star's elements had occurred since the publication of elements (Meinunger and Wenzel 1968):

$$JD_{\max} = 2438134.395 + 0.496910 E. \quad (1)$$

A star suspected to be AE Com was located on the photographic plates of the Maria Mitchell Observatory (MMO), though the published finder chart (Hoffmeister 1964) shows only three stars and did not give much confidence that the suspected star was really AE Com. Inspection of several photographic plates, however, showed that the suspected star did seem to vary in brightness, and was likely to be AE Com.

The magnitude was estimated by comparing the variable star to five sequence stars. The sequence stars' photographic magnitudes had been determined by photographic transfer using an iris photometer and seven comparison stars chosen from the TON 1542 field, whose magnitudes and finder chart had been published by Angione (1971).

Four light curves were plotted from the data with phases calculated using equation (1). They resemble the light curve for AE Com published in Meinunger and Wenzel (1968). The light curves indicated that the phase shift for the studied time period, 1964-1989, was very small. The small shift in phase shows that the published elements given in equation (1) computed the observed time of maximum very well. There remains no doubt that the suspected variable star is AE Com.

The range of photographic magnitude for AE Com is between approximately 14.6 and 16.2. The star remains near maximum for only a brief period of time, and not enough data near maximum magnitude were available to obtain an accurate shape of that part of the light curve.

To determine the amount of revision to AE Com's elements, equation (1), an O-C graph was plotted using data published in Meinunger and Wenzel (1968) and the four phase shifts obtained from the light curves. The published data contained Julian Dates of maxima and O-C estimates for fifteen individual observations during 1962-1966. I combined the published data into three mean points: an average O-C value from the 1962-1963 data set, an average O-C value from the 1964 data set, and a separate data point from 1966.

The O-C plot with the seven points (Figure 1) indicates that either a line or a parabola fits the plotted points well. The least-squares parabola implies the following new elements:

$$JD_{\max} = 2441332.495 + 0.4969084 E + 0.176 \times 10^{-9} E^2. \quad (2)$$

$$\pm 0.003 \quad \pm 0.0000004 \quad \pm 0.074 \times 10^{-9}$$

Residuals from the parabola indicate a mean error in (O-C)/P of ± 0.010 .

The least-squares line gives:

$$JD_{\max} = 2441332.501 + 0.4969090 E. \quad (3)$$

$$\pm 0.003 \quad \pm 0.0000004$$

The residuals from the line indicate a mean error in (O-C)/P of ± 0.014 .

The parabola fits the points only slightly better than does the line, and according to an F-test (Pringle 1975) there is a 7.6 percent chance that the parabola is a better representation due only to the scatter in the data.

The differences in results between the parabola and line are small enough to disregard the parabolic elements and use the new linear elements to predict future maxima with sufficient accuracy.

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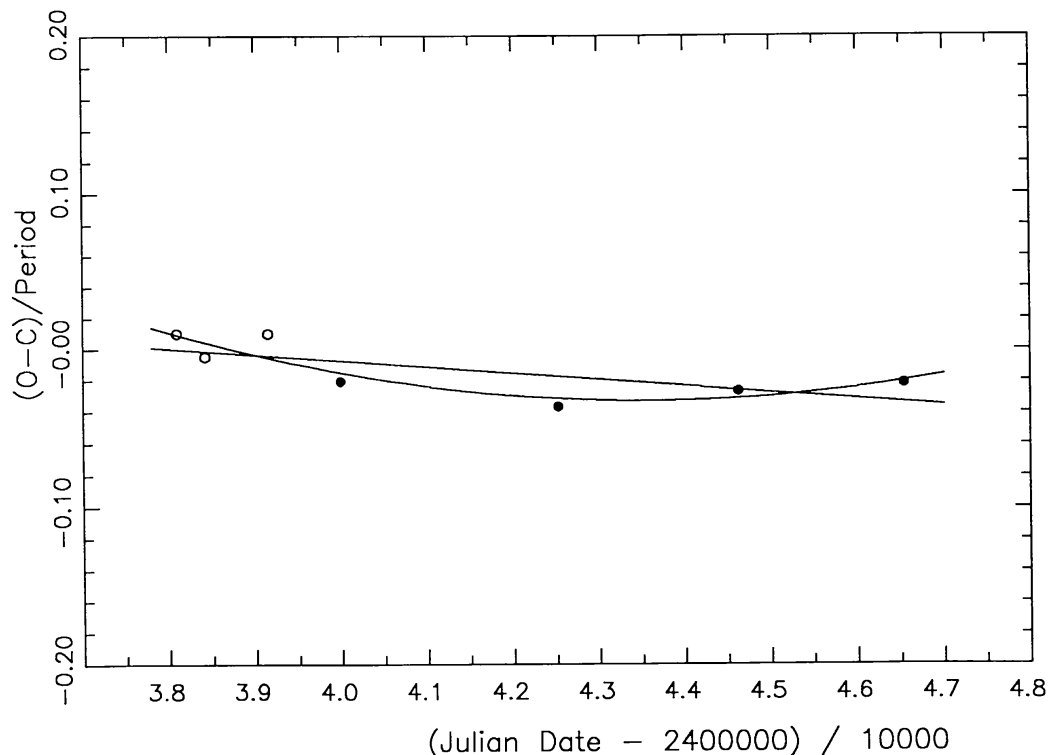


Figure 1. O-C plot for AE Com with the open points indicating the averaged points from the published data and the filled points indicating data from the four light curves analyzed at the Maria Mitchell Observatory.