

THE PERIOD OF EF COMAE BERENICES

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Abstract

The RR Lyrae star EF Comae Berenices was studied for the interval 1964-1991 on plates of the Maria Mitchell Observatory. A new period, related to the previously published period, was found. Both are most likely spurious relatives of an as yet undiscovered period.

EF Comae Berenices is an RR Lyrae star, subclass ab. Elements are listed by Kinman *et al.* (1966) at the Lick Observatory as

$$JD_{\max} = 2437736.566 + 0.47680 E. \quad (1)$$

They published the photographic magnitude range of the star as magnitude 15.0 to 17.0. The apparent brightness was determined by comparing EF Com to five comparison stars whose magnitudes were given by Kinman *et al.* (1966). Current data were gathered from the photographic plates at the Maria Mitchell Observatory (MMO) from 1964 to 1991 using the same comparison stars. These stars and the variable can be seen in Figure 1.

The data from the MMO does not support the Lick period of 0.47680 day. A light curve of the MMO data using the period and epoch published by Kinman *et al.* (1966) showed more scatter than could be attributed to observational errors in the magnitude estimates.

Different elements were found using a Fourier spectrum program which attempted to fit a sine curve to the data. Several possible periods, previously thought to be spurious, were used to form light curves of both Lick data and the MMO data. These periods include 1.147193, 0.915816, 0.477378, and 0.322578 days. All of these light curves, except 0.477378, also displayed more scatter than could be attributed to observational errors in the magnitude estimates. The Lick data still displayed large amounts of scatter using the 0.477378 day period. As a result, I decided to refine the MMO data period using an O-C graph.

Figure 2 shows the O-C graph of the MMO data, excluding the Lick data. In Figure 2, C is defined as

$$JD_{\max} = 2446796.886 + 0.477378 E. \quad (2)$$

The values of O-C and the lengths of the error bars were determined by inspection. The line which best satisfies the data points was calculated using a least squares method. The positive slope indicates that the star has a constant period somewhat larger than the original period found by the Fourier spectrum program.

The new elements of EF Com found for the MMO data are:

$$JD_{\max} = 2443753.555 + 0.4773851 E. \quad (3)$$

$$\quad \quad \quad \pm 0.006 \quad \pm 0.0000011$$

There is no evidence for a change in period.

A trial period of 0.476763 day, related to 0.477385 by the equation

$$0.476763 = 1/(1/0.477385 + 1/365.25), \quad (4)$$

was also used for light curves of both the Lick data and the MMO data. The Lick data showed less scatter than the light curve using the previously published 0.47680 day period. The MMO data still displayed large amounts of scatter. A light curve of the Lick data using the new period and epoch given in equation (3) was also made. This showed excessive amounts of scatter.

Light curves of the MMO data based on the elements in equation (3) also show large amounts of scatter, although less than any of the other periods mentioned. This scatter, along with the knowledge of equation (4) suggests the possibility that both the Kinman *et al.* period, 0.476763 day, and the MMO period, 0.477385 day, are spurious periods of a third period, as yet undiscovered.

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References

Kinman, T. D., Wirtanen, C. A., and Janes, K. A. 1966, *Astrophys. J. Suppl.*, 13, 379.

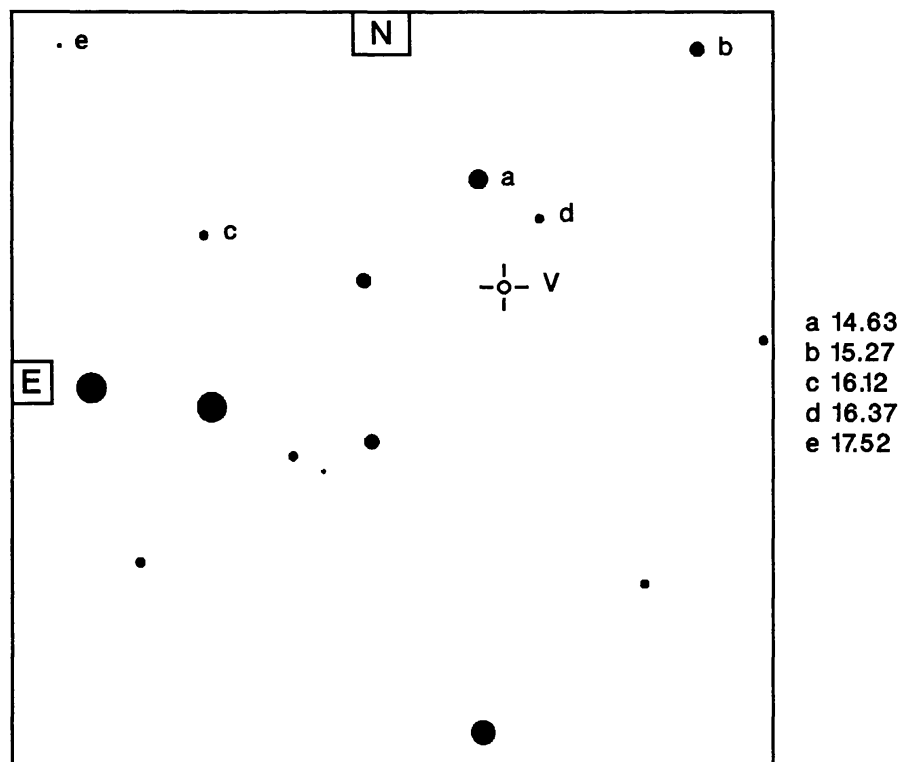


Figure 1. Finding chart of EF Com and the sequence stars. Each side of the chart is 16 arcminutes. Magnitudes are photographic.

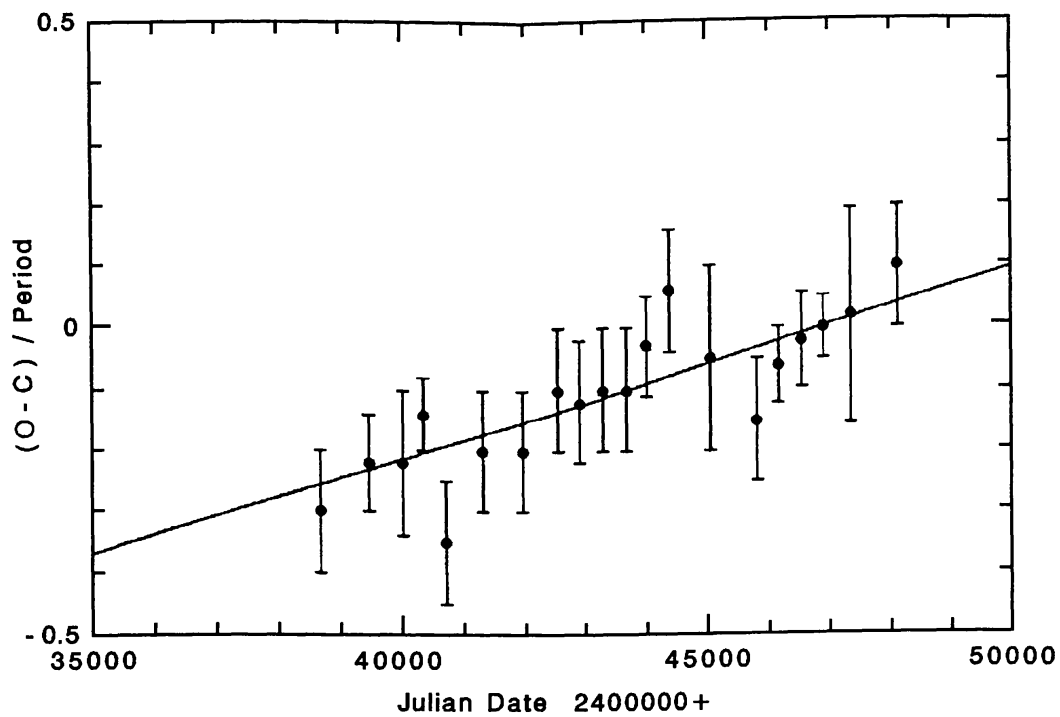


Figure 2. O-C diagram of EF Com, where C is defined by the elements in equation (2). The line represents the refined elements in equation (3).