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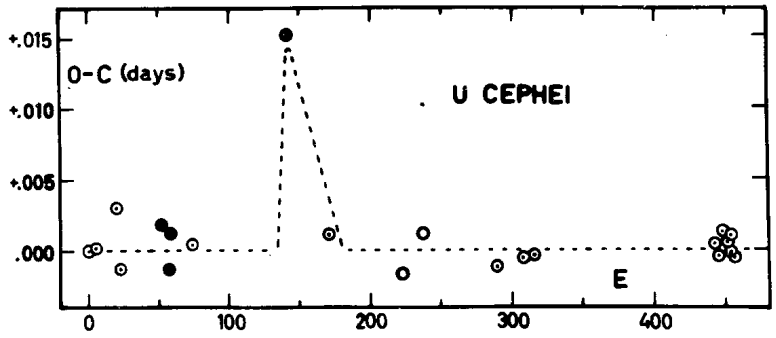
A RECENT VERY LARGE PERIOD INCREASE IN U CEPHEI ?

Recently Bakos and Tremko (1973) made the interesting observation that in 20 days in August 1969 the period of U Cephei increased by about $0^d.0015$. Such an increase is extremely large, as they pointed out, corresponding to $\Delta P/P = + 6 \times 10^{-4}$. Additional times of minimum, obtained since 1969, suggest that this very large increase is not well established.

The figure below is an O-C diagram based on the ephemeris

$$JD(hel.) = 2440086^d.4915 + 2^d.493047\ E + 7^d.8 \times 10^{-8}\ E^2 .$$

The filled circles are the four times of Bakos and Tremko. The open circles are two heretofore unpublished times of my own. The circled



points are the 16 photoelectric times later than JD 2440000 listed in Table 14 of Batten (1973).

My two new times of primary minimum are

$$JD\ (hel.) = 2440644^d.9351 \pm 0^d.0002$$

and $$JD\ (hel.) = 2440679^d.8413 \pm 0^d.0003$$

In both cases the error is based on the standard deviation of separate determinations in U,B, and V. But the external errors could be larger, as much as $\sim \pm 0^d.001$. The second time was determined by the tracing paper method. The first time was determined with the help of the second, since only the falling branch was observed, and

hence should be relatively less reliable. To avoid an asymmetry at the bottom of the light curve (rising branch brighter) the lowest $\sim 0^m.3$ was not used.

The problem is that the later limes continue to be satisfied by the pre-1969 ephemeris. The broken line, which is the O-C curve which would be required by the interpretation of Bakos and Tremko, implies that three large period changes occurred within approximately 100 days. The first change is drawn to occur, as they suggest, 20 days before their last time of minimum. Such an interpretation is possible but would have the following implications which should be appreciated:

1. The three period changes are very large: $\Delta P/P = 7.5 \times 10^{-4}$, -9.0×10^{-4}, $+1.5 \times 10^{-4}$. These are between one and two orders of magnitude larger than the alternate period changes of $\Delta P/P \sim 10^{-5}$ which are characteristic of similar binary systems.

2. The time scale of $\sim$100 days is much shorter than the 5 - 10 year time scale for alternate period changes observed in U Cephei in the past.

3. After a sequence of three very large changes the period has returned, seemingly by coincidence, to very nearly its original value.

The case for a large period increase rests on only one time of minimum. Therefore (although admittedly the other three points of Bakos and Tremko fit very well in the O-C diagram, their average deviation being only a bit more than $\pm 0^d.001$) a reasonable alternate interpretation would be that the last time is, for some reason, in error by $\sim 0^d.01$.

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