IU AURIGAE: THE ORBITAL INCLINATION CONTINUES TO INCREASE

The eclipsing binary IU Aurigae is remarkable in that it has
well-defined eclipses which have increased steadily in depth over
the last few decades. This behavior has been interpreted as a
manifestation of the increasing orbital inclination that results
from precession of the plane of the eclipsing binary in a triple
system (Mayer 1971, Eaton 1978). I have observed this star in yellow
light during Winter 1978-79 to monitor the rate of increase of the
eclipse depths. I find that the depths of both eclipses have continued
to increase at a rate consistent with that found by Mayer (1971, 1976).
Interpreted through my previous light curve solution (Eaton 1978), the
increased eclipse depths indicate that the orbital inclination is
continuing to increase by about 0.5 degree/year.

The Figure shows yellow observations for the epoch 1979.0 obtained
at the Black Moshannon Observatory of Pennsylvania State University.
Small dots represent individual measurements obtained during eclipses
while the larger dots correspond to the averages of several (typically
four) observations at phases out of eclipse. The solid curve is a
smoothed representation of my previous yellow observations (Epoch
1974.9). Phases for the 1979 data have been computed with the latest
non-linear elements of Mayer (1976). These elements are beginning
to reach the limits of their uncertainties; a series of well-determined
times of minimum next season would make it possible to increase their
accuracy significantly. Although I was unable to observe a complete
eclipse, we can estimate a time of minimum for this year by comparing
two observations at phase 0.063 obtained on JD2443848 with those
around phase 0.933 obtained on JD2443853. It is $JD_e 2443853.844 \pm 0.004$.

This star should continue to undergo light curve changes for
the next decade. The present inclination being about 85°, the
eclipses will increase in depth to totality over the next eight
years. Eclipses should be total for a period of a little more than
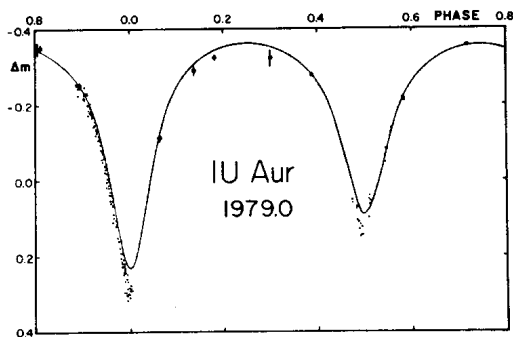four years after that. In other words, my solution predicts a

Figure. Recent yellow observations of IU Aur obtained to monitor the light curve changes. The magnitude differences are with respect to HD35619 and are within 0.001 mag of V magnitude differences.

central eclipse at about 1989. However, the present solutions are uncertain in that aliasing between inclination and third light makes it difficult to determine the inclination at any particular epoch to better than about two degrees. So observations should be obtained every couple of yeras from now on to monitor the light curve changes. A complete light curve for this binary near $i = 90^{\circ}$ will be especially useful in obtaining a more definitive solution to the light variation. This is desirable in order to study the triple-system interaction, to determine the limb-darkening coefficients of a B0 star, and to define better the degree of gravity darkening of this star.

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References:

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