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A PHOTOMETRIC ANOMALY AROUND THIRD CONTACT IN EPSILON AURIGAE

Beginning on the night of JD 2445646, the Automatic Photoelectric Telescope at Fairborn Observatory West in Phoenix, Arizona began observing the long-period eclipsing binary epsilon Aurigae. Although these observations are continuing, this paper provides results through JD 2445785. During this time, 144 group observations were made on 79 different nights, while observations were not made on 60 nights, primarily due to poor weather. Each group observation consisted of 33 different 10-second observations in three bandpasses of the variable, comparison star, check star, and sky. The total telescope time devoted to this variable was about 19.7 hours, while the total time spent actually integrating starlight was about 13.2 hours. Thus we see that roughly one third of the telescope time is needed to move the telescope, acquire the stars, and change the filters. Often 3 or 4 group observations were made on the clear nights prior to JD 2445700, but there were some six gaps in the observations due to extended cloudy weather. After JD 2445700 there were fewer group observations per night, because the telescope's observing program had been expanded from 29 to 71 different groups, but this was compensated for somewhat by the greater percentage of clear nights.

Individual magnitudes, including differential check minus comparison magnitudes, are available from the I.A.U. Commission 27 Archive for Unpublished Observations of Variable Stars (Breger 1982). File No. 131 contains the observations prior to JD 2445700, while file No. 136 contains the remainder. The comparison star used for all observations was HD 32655, while the check star was HD 31964. The difference between the comparison star and the check star remained sufficiently constant during the period of observation to inspire confidence in the photometry.

The operation of the Automatic Photoelectric Telescope and the reduction of the data have been discussed by Boyd, Genet, and Hall (1984 ab). The data have been corrected for differential extinction and transformed to the standard UBV system.

In the light curves in Figure 1 each point is an average of three separate differential magnitudes taken one after another. There it can be

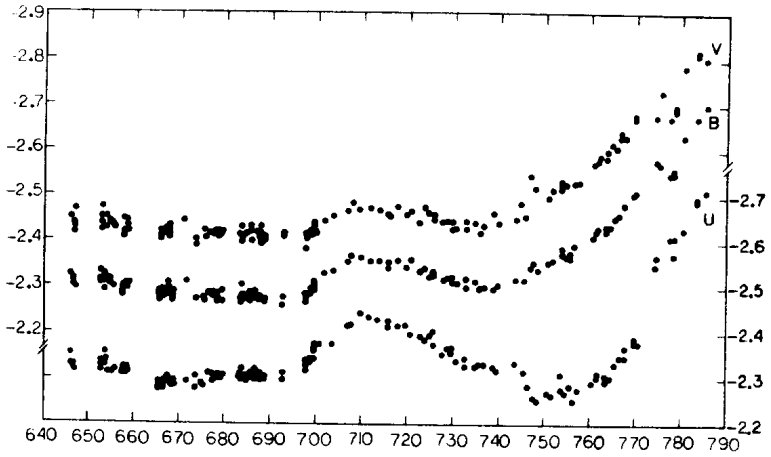

Figure 1

Observations of epsilon Aurigae made by the Automatic Photoelectric Telescope before, during, and after third contact. The ordinate is differential magnitude in the sense variable minus comparison and the abscissa is the last three digits of the Julian date. An anomalous brightening, most pronounced and persistent in the U, began around JD 2445695.

seen that an anomalous brightening began about JD 2445695 and peaked about 15 days later. This peak was most pronounced in the U, as was the 40-day decline of $0^{m}.18$. Recovery from the decline started first in the V and was followed shortly by a recovery in B, but there was a pronounced delay of almost 25 days before the recovery began in U. While the anomaly began with a decided color shift towards the blue, it ended with a definite shift to the red. This color reversal and its occurrence so near third contact may help interpret the enigma that is epsilon Aurigae.

The beginning of this anomaly has been independently observed and previously reported by Oki, Sekiya, and Hirayama (1984). We wish to thank Robert E. Stencel for first bringing this anomaly to our attention.

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