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ECLIPSE OBSERVATIONS OF EQ Tau

EQ Tau (G1, V=11.9, $03^h48^m12^s.9$, $+22°18'49''$, J2000) is a poorly studied W UMa eclipsing binary with a period of 0.34 days. This system is on the AAVSO list of eclipsing binaries (Baldwin and Samolyk 1993) but to our knowledge has had no previously published light curve or ephemeris. The AAVSO reference reports eclipse minima observations (chiefly by G. Samolyk) during the period JD 2442832 (1976) to 2448694 (1992). An O−C plot using the AAVSO observations indicates that the published period of 0.34134848 days (Brancewicz and Dworak, 1980) was slightly long, but it was not clear whether the period was constant or whether there was a small period derivative.

The present note describes CCD photometry of EQ Tau done using the University of Iowa Automated Telescope Facility located in Iowa City, IA. The system consists of an 18cm refractor, a Spectrasource HPC-1 CCD camera (format 512×512 binned pixels, $3''.00$ per pixel) and a Johnson R-band filter. We used the nearby GSC stars at $03^h48^m31^s.3$, $+22°12'43''$, and $03^h48^m16^s.2$, $+22°17'28''$, J2000) as check and comparison stars respectively. Each observation consisted of 45 second exposures of a field containing EQ Tau as well as the check and comparison star. This cycle was repeated every 5 minutes for several hours each night. The differential aperture photometry was performed by an automated procedure after aligning all images to a common stellar reference. No air mass or color corrections were applied. The system was observed during three epochs (1 Dec 1994, 8 Feb 1995, 25 Feb 1995). By combining all three epochs, we obtained the nearly complete light curve as shown in Figure 1. The minimum at phase 0.5 occurred at heliocentric Julian date 2,449,687.607±0.007. Note the ∼0.05 magnitude depression present between phase 0.7-0.85 in both February epochs only. We believe this is not an artifact and may have been due to an active region on the stellar surface which developed since the December 1994 observations.

The O−C measurements available from the AAVSO compilation clearly showed that the previously available ephemeris:

$$JD_{min} = 2,440,203.325 + 0.34134848 \times E$$

was slightly in error, although it was unclear whether the deviation could be better fit with a linear or a quadratic dependence. The present observations are in better agreement with a linear fit and new ephemeris given by

$$JD_{min} = 2,440,203.342 + 0.34134750(\pm 0.00000015) \times E$$

where the period uncertainty represents the 90% confidence bounds. A plot of the AAVSO observations, along with the minimum reported in this note, is shown in Figure 2.

Interesting parties can obtain the raw photometry data from the authors at the following e-mail addresses: *rlm@astro.physics.uiowa.edu* or *uwb@astro.physics.uiowa.edu.*

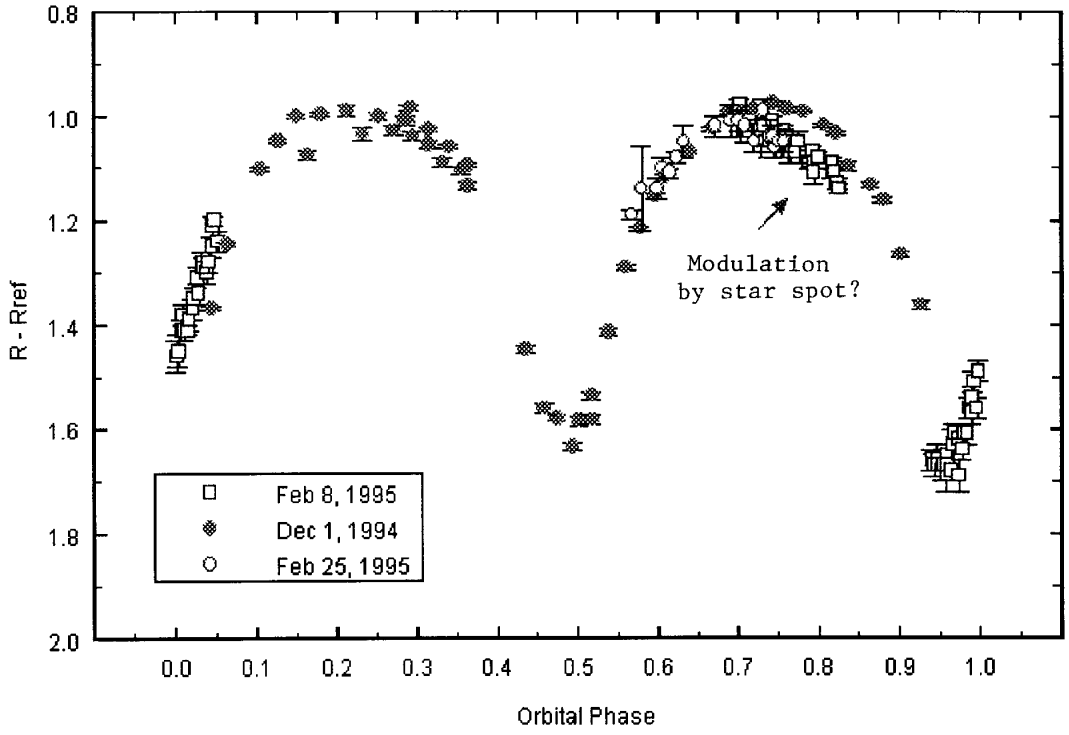

Figure 1. Light curve of EQ Tau. The depression evident near phase 0.7-0.8 seen during February 1995 may have been caused by a starspot.

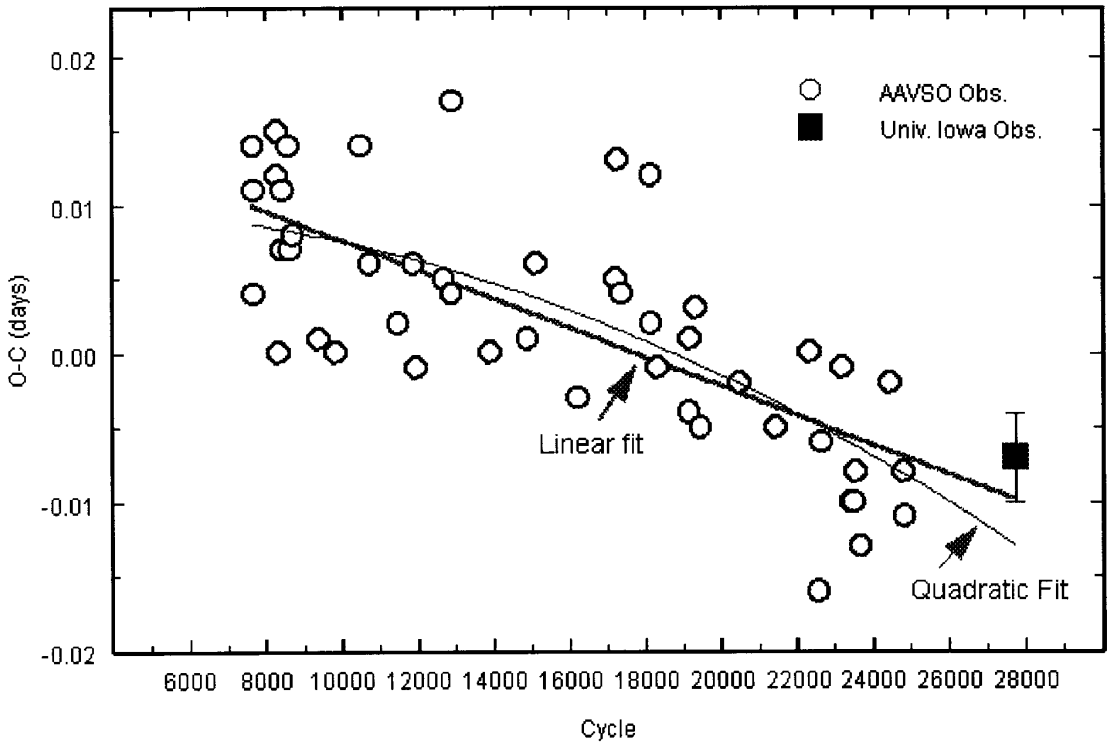

Figure 2. O−C plot for EQ Tau using JD=2,440,213.325+0.34134848·N, where N is the cycle number. A least-squares linear and quadratic fit is also shown. The linear fit represents the new ephemeris 2,440,203.342 + 0.34134750·N.

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