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LIGHT MAXIMA OF THE RRab VARIABLE TU UMa IN EARLY 2002

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Following earlier work by Szeidl et al. (1986) and Saha and White (1990), Wade et al. (1999) published an analysis of timings of light maxima for TU UMa. They showed that a model combining a quadratic pulsation ephemeris with a light-time binary orbit of high eccentricity was most successful at describing the collected timing data. Periastron passage is predicted to occur in about 2011 (depending on what specific model is used), near which time there should be an excursion in the center-of-mass radial velocity of TU UMa. The elements of the ∼23 y binary orbit are still rather uncertain, as is the quadratic coefficient of the pulsation ephemeris. It is therefore useful to continue to collect epochs of light maximum, in order to test and refine the orbital/pulsational model.

We obtained differential light curves of TU UMa through Johnson B and V filters, using a SITe 512×512 CCD camera (6′ field of view) on the 0.41 m telescope of Braeside Observatory. Typically most of the rise to maximum, maximum light itself, and a significant portion of the decline were recorded, except for Cycle 47623 where only 1.2 h surrounding maximum was recorded, and Cycle 47702 where 1.9 h of the rise was recorded but not the maximum itself. Because of the distinctive and stable stillstand of the rising branch of the V light curve, we were nevertheless able to infer a (less certain) epoch of light maximum for Cycle 47702.

We determined five epochs of maximum light in V, using the same technique as described for Braeside observations in our previous paper (Wade et al. 1999). That is, we used a template light curve (HJD[max] = 2,450,527.7110, cycle 44413, 1997 March 20) and measured the time offset needed to bring the template and the newly observed light curve into registration.

Table 1 summarizes the new epochs of light maximum for TU UMa, giving the cycle count E on the same system as in Wade et al. (1999) and earlier papers cited therein. Column 3 gives the Julian year with 2000.00 = JD 2,451,545.0; column 4 gives $O - C$ in days relative to the linear test ephemeris used by Wade et al., HJD = $2425760.4364 + 0.5576581097E$. A least-squares linear regression of epoch upon cycle number for the five epochs shows a residual scatter of 1.2 minutes in the measured epochs, similar to that of earlier photoelectrically recorded maxima for this star.

Table 1. Light Maxima of TU UMa in early 2002.

Cycle	HJD	Year	$O-C$ (days)
	2400000+		
47623	52317.803	2002.12	+0.014
47625	52318.9185	2002.12	+0.0146
47657	52336.7628	2002.17	+0.0139
47702	52361.860:	2002.24	+0.016:
47711	52366.8770	2002.25	+0.0145

The mean $O-C$ of 21.3 minutes can be compared with the expected $O-C$ of about 20 minutes at epoch 2000.2, if model "D" of Wade et al. (1999) is adopted as the correct description of the orbital and pulsational evolution. These are consistent within the measurement error, and there is not yet a need to update the model — collection of additional epochs of maximum light in the next several years will no doubt make refinement of the model worthwhile as periastron is approached.

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