COMMISSIONS 27 AND 42 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Number 5301

Konkoly Observatory
Budapest
2 August 2002

HU ISSN 0374 – 0676

TY Leo IS NOT AN ECLIPSING BINARY STAR

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Discovery of the variable star TY Leo was announced by Hoffmeister (1933). He noted 5 minima and classified it as Algol-type. He included a finding chart. The eclipse ephemeris of Rugemer (1933) is Min I = 2425742.47 + 1.18466 E. Popper (1996) included the star in his program of spectroscopy of lower main-sequence eclipsing binary stars. On his 3 spectrograms, he saw no evidence of a second component, and noted that the lines are unusually sharp for the reported period of 1.2 days.

We have thoroughly observed TY Leo recently, both photometrically and spectroscopically, including visual estimates from the Harvard plate collection during the years from 1920 to 1951. We do not find it to be variable in light or radial velocity. Details of the observations are given below.

We have determined an accurate position for the star identified in Hoffmeister's finder chart from the Hubble Guide Star Catalogue: RA 10:52:27.06, Dec −05:05:17.1 (J2000). These coordinates are confirmed by measurements of the Digital Sky Survey.

CHSL observed by differential photometry with the URSA WebScope at the University of Arkansas (see Lacy et al. 2001 for a description of the observatory). Differential V magnitudes were obtained from Nov. 22, 2001 to Apr. 29, 2002 UT. A total of 1213 magnitudes were measured relative to the comparison star GSC 4920 499, which is in the same frame as TY Leo. The constancy of the comparison star was verified by differential measurements of GSC 4920 465, also in the same frame as TY Leo and the comparison star. The photometric measurements are plotted as a time series (Fig. 1) and as a light curve phased according to the ephemeris of Rugemer (1933; Fig. 2). No significant variations are seen. The standard error of an observation is 0.015 mag.

GT performed spectroscopic observations of TY Leo with an echelle spectrograph on the 1.5-m Tillinghast reflector at the F. L. Whipple Observatory (Mt. Hopkins, Arizona) over a period of 126 days. The single-order spectra cover 45 Å centered at 5187 Å, with a resolving power of $\lambda/\Delta\lambda = 35,000$. Radial velocities were obtained by cross-correlation with a synthetic template based on the latest model atmospheres by R. L. Kurucz, optimized to match the star. From this optimization an effective temperature of 6100 K was derived (SpT approximately F8V), along with a negligible rotational broadening. No significant variations are seen in the radial velocity, nor any sign of double lines in the spectra indicating binarity. The mean radial velocity is −10.20 km/s with a standard

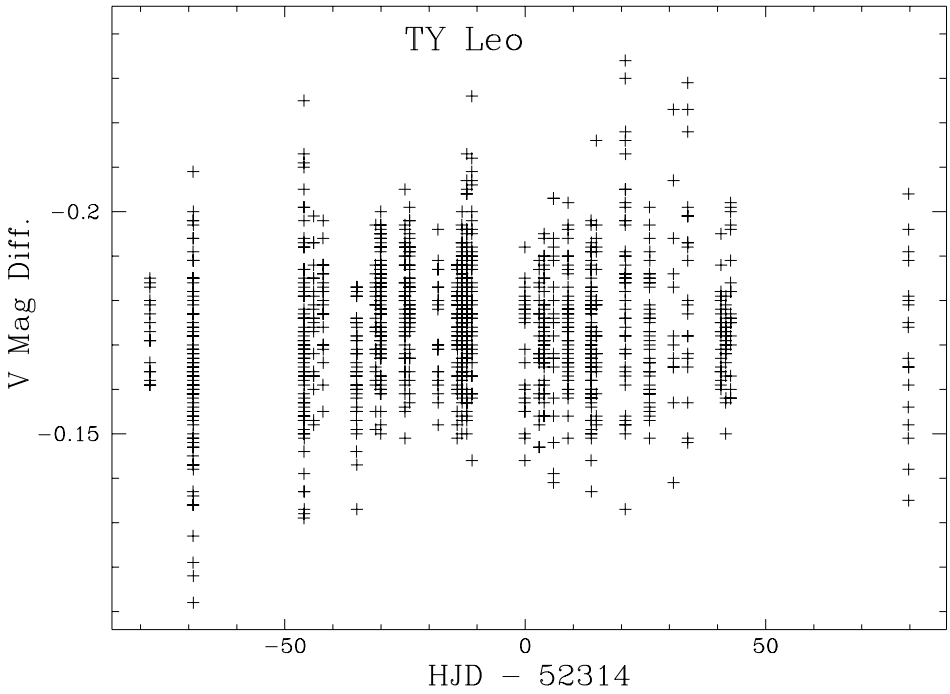

Figure 1. Time series of V-band differential photometric magnitudes of TY Leo.

deviation of 0.55 km/s. The individual radial velocity measurements (converted to the heliocentric frame) are listed below, and shown in Fig. 3.

PRG estimated the brightness of the star visually on 217 plates of the Harvard plate collection (AC Series) from January 1920 to December 1951. Good comparison stars are present in the field. No significant variations in the brightness of TY Leo are seen.

We conclude that TY Leo is not an eclipsing binary star. The failure to detect eclipses cannot in this case be due to nodal regression such as that of V907 Sco (Lacy et al. 1999) because no radial velocity variation is detected. It seems that the most probable cause is a mis-identification of the star by the discoverer (Hoffmeister), i.e., the star identified in the finder chart is not the variable star he discovered.

PRG would like to thank Alison Doane, curator of the Astronomical Photograph Collection at the Harvard College Observatory, for the use of the plates.

References:

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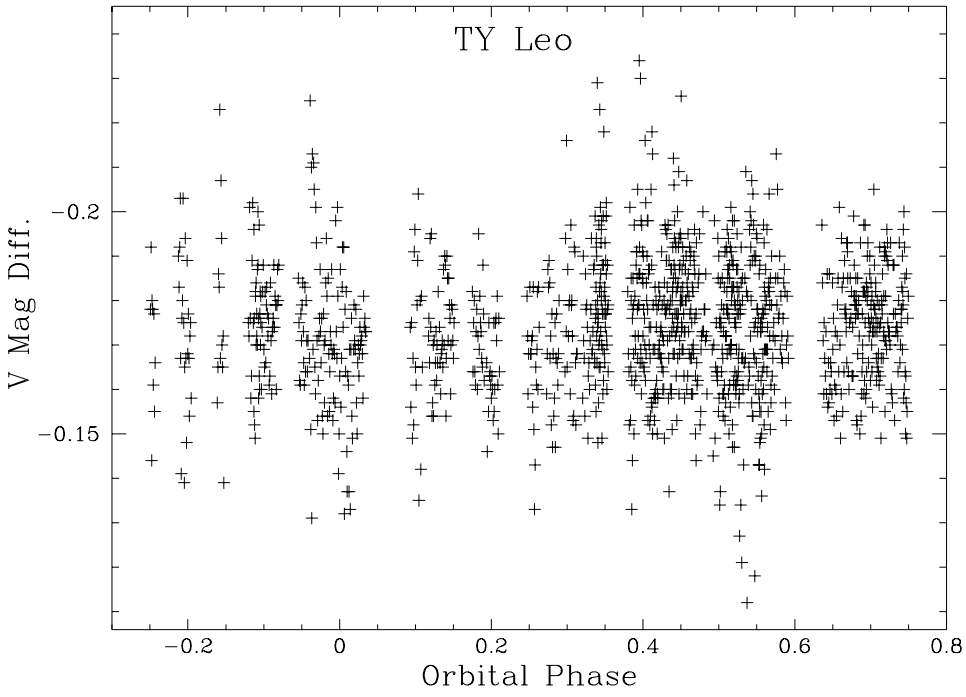

Figure 2. Light curve of TY Leo based on the measurements above, phased by the ephemeris of Rugemer (1933).

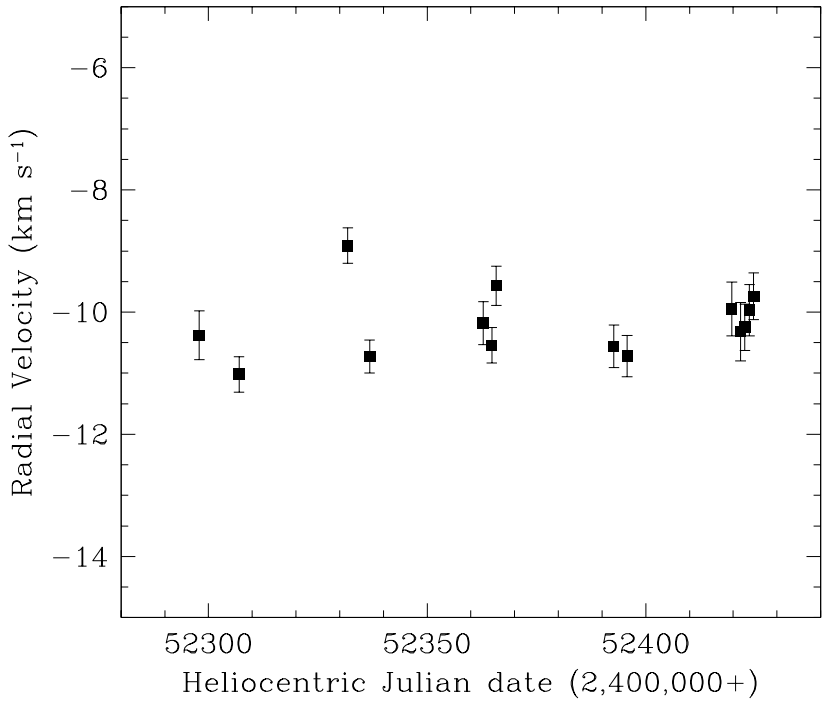

Figure 3. Radial velocity measurements of TY Leo.

Table 1.

HJD −2400000	RV	err
52297.9157	−10.38	0.40
52307.0030	−11.02	0.29
52331.8587	−8.91	0.29
52336.8387	−10.73	0.27
52362.8528	−10.18	0.35
52364.8030	−10.54	0.29
52365.8057	−9.57	0.32
52392.6965	−10.56	0.35
52395.7443	−10.72	0.34
52419.6835	−9.95	0.44
52421.6699	−10.32	0.48
52422.6698	−10.25	0.38
52423.6948	−9.97	0.42
52424.6635	−9.74	0.38