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# COYOTES I. Multisite *UBVRI* photometry of 24 pre-main-sequence stars of the Taurus-Auriga cloud*

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**Abstract.** — We present the results of a multi-site photometric campaign to monitor T Tauri stars in the Taurus-Auriga stellar formation region. The campaign — dubbed COYOTES, for **C**oordinated **O**bservations of **Y**oung **S**tellar **O**bjec**T**s from **E**arthbound **S**ites — yielded *UBVRI* magnitudes of 13 classical T Tauri stars, 10 weak-line T Tauri stars, and one suspected Ae Herbig star during 3 months between November 1990 and February 1991. This database is well suited to search for periodic variations from about 1 day up to around 6 weeks, significantly extending the range of timescales properly sampled for T Tauri stars. We find evidence for periodic light variability in all 24 stars of our sample. More precisely, photometric periods are detected in 18 stars at or above the 90% probability level in several photometric bands simultaneously (BD+24°676, DF Tau, DG Tau, DI Tau, DK Tau, DR Tau, GG Tau, GK Tau, IP Tau, RY Tau, GM Aur, LkCa-15, IW Tau, LkCa-4, LkCa-7, LkCa-19, TAP 26, TAP 40), while probable periods, which require confirmation, are reported for 4 other stars (DE Tau, LkCa-21, TAP 41, TAP 57NW), and upper limits on the photometric period are derived for the 2 remaining stars (SU Aur, TAP 9). Light curve analysis and the origin of the variations are discussed in a companion paper (Bouvier et al. 1993, Paper 2).

**Key words:** stars: pre-main sequence — stars: rotation — stars: activity

## 1. Introduction

T Tauri stars were originally classified as irregular variables (Herbig 1962). Their light variations span timescales from minutes to decades and amplitudes from a few magnitudes down to a few hundredths. In the last ten years, particular attention has been focused on the variability of T Tauri stars on timescales of days to weeks. Photometric studies led to the conclusion that one of the major sources of light variations at such timescales is the existence of spots on the stellar surface that modulate the stellar flux as the star rotates (e.g., Rydgren & Vrba 1983, Bouvier & Bertout 1989, Vrba et al. 1989). The resulting periodic light curves provide a direct measurement of the star's rotational period. Furthermore, multicolour light curves can be modeled in order to derive the properties of the spots (temperature and areal coverage) based on the amplitude of the rotational modulation as a function of wavelength. In this way, Bouvier & Bertout (1989) showed that cool spots on T Tauri stars have characteristics similar to spots found on other classes of active, late-type stars, such as RS CVn and BY Dra stars. They concluded that T Tauri spots are associated with regions of strong magnetic field at the stellar photosphere.

Rotation and stellar magnetism are strongly linked; rotationally induced dynamos may be responsbile for the field, while in many evolutionary scenarios, the magnetic field plays an important role in rotational braking. For this reason and others, knowing the rotational properties of T Tauri stars is considered a key step in understanding pre-main-sequence evolution.

*Based on observations collected at the European Southern Observatory, La Silla, Chile; at the Jacobus Kapteyn Telescope, operated on the island of La Palma by the Royal Greenwich Observatory in the Observatorio del Roque del los Muchachos of the Instituto de Astrofísica de Canarias; at the 1.5 m telescope of the Estacion de Observacion de Calar Alto, Instituto Geografico Nacional, which is jointly operated by the Instituto Geografico Nacional and the Consejo Superior de Investigaciones Cientificas through the Instituto de Astrofisica de Andalucia; at the 1.23 m telescope of the German-Spanish Astronomical Center, Calar Alto, operated by the Max-Planck-Institut fuer Astronomie, Heidelberg, jointly with the Spanish National Comission for Astronomy; at the Cerro Tololo Inter-American Observatory, Chile; and at the University of Toronto Telescope of Las Campanas Observatory, Chile

To date, rotational periods ranging from 1.5 to 8.5 days have been derived from the periodic light curves of some 30 T Tauri stars. The 8.5 d upper boundary merely reflects the fact that almost all existing light curves have been obtained over a timebase of two weeks at most. Therefore, the available data were sensitive only to periods shorter than about 10 d. As a result, the observed rotational period distribution of T Tauri stars is biased toward fast rotators (Bouvier 1991). To eliminate this selection effect and investigate the true distribution of rotational periods of T Tauri stars, we organised an international campaign to monitor the light variations of a sample of T Tauri stars over an interval of 3 months. The observations and data reduction are described in Sect. 2, while the photometric data themselves are listed in Sect. 3.

Owing to the large amount of photometric data collected during the campaign, the results are analysed and interpreted in a separate paper (Bouvier et al. 1993, Paper 2). We present here the full set of photometric observations collected for the 24 stars of our sample.

## 2. Observations

The light curves of 23 T Tauri stars and one suspected Herbig Ae star located in the Taurus-Auriga star forming region were monitored during 6 observing runs at 5 observatories between 15 November 1990 and 14 February 1991. In this section we describe the data acquisition and reduction procedures at each telescope.

From 15 to 22 November 1990, *UBVRI* photometry was performed at the Calar Alto 1.5-m telescope equipped with a cooled Butler C 31034 A photomultiplier tube. The stars were observed through a 24″ diaphragm and typical integration times were 30 s in each filter followed by a 20-s integration on the sky about 60″ apart. For the faintest stars, integration times were increased up to 80 s. A second observing run took place at the same observatory, during 3–15 January 1991, on the 1.23-m telescope equipped with a cooled RCA 31034A photomultiplier tube. During this run, the stars were observed through a 21″ diaphragm with typical integration times of about 45 s to 100 s per filter on target stars, and 40 s on the nearby sky. During both runs at Calar Alto, some 20 photometric standard stars from Landolt's (1983) catalogue were measured each night in order to get the final colors in the standard Cousins *UBVRI* system. The data were reduced at the Observatorio Astronómico de Madrid with a photometric reduction package based on the Harris et al. (1981) reduction technique.

Observations were performed at the ESO 1-m telescope from 26 November to 8 December 1990, with the standard Cousins *UBVRI* filter set. The telescope was equipped with the single-channel photometer coupled to a Quantacon RCA 31034 photomultiplier tube. Stars were observed through a 15.5″ diaphragm and integration times ranged from 15 to 60 s. Photometric standards from Graham's (1982) list were observed each night in order to convert the data to the Cousins system. This conversion was performed at La Silla with ESO's photometric reduction package SNOPY. Because of the bright moon crossing over the Taurus-Auriga region during part of this observing run, and because the target stars were relatively low on the Chilean horizon, the ESO data are generally of slightly lower quality than those obtained at other sites.

The COYOTES programme stars were also monitored from 25 December 1990 to 7 January 1991 with the People's photometer on the 1-m Jacobus Kapteyn Telescope at La Palma Observatory. Details on this two-channel photometer can be found in Dick & Jones (1988). The photometer is equipped with two EMI 9658 photomultipliers called Romeo and Juliet. The observing mode consists of first putting the starlight through the Romeo channel while Juliet measures a nearby sky field, then swapping channels to measure the star through Juliet and the sky through Romeo. This acquisition mode yields two independent measurements, one in each channel. The star-sky separation was 3′ and the apertures used were 14″. Photometric standards from Landolt (1983) and Gliese (1969) were observed to derive the final magnitudes in the Cousins system. Accurate primary extinction coefficients and their hourly variations were kindly provided by Dr. L. Morrison from the Carlsberg automatic meridan circle. The data from Romeo and Juliet were reduced separately using the SPIDER package on the VAX cluster of the Instituto de Astrofísica de Canarias.

To extend the coverage of four objects in our sample – DF Tau, RY Tau, GM Aur and BD+24°676 – which we felt merited special attention (see Paper 2), photometry was also obtained on 25 nights in early 1991. During 13 – 25 January 1991, the University of Toronto Southern Observatory's (UTSO) 0.6-m telescope and photometer, equipped with a Hamamatsu R943-02 tube, were used for *BVRI* measurements. During 28 January – 12 February, *UBVRI* data were collected with the 0.6-m "Lowell" telescope and photometer (RCA C31034 tube) of the Cerro Tololo Inter-American Observatory (CTIO). As with the observations from other sites, large diaphragms were employed (18″ at UTSO; 19.5″ at CTIO) and several Landolt (1983) extinction standards were monitored each night to derive transformation coefficients.

In addition to target stars and photometric standards, two comparison stars (BD+23°565 and BD+24°659) were observed each night during the whole campaign. They were later used to investigate systematic differences that might occur between observations obtained at the various sites (e.g., zero-point offsets). Figure 1 shows the nightly magnitudes of the two comparison stars during the whole COYOTES campaign. Each point in the figure is actually a nightly average of several (usually 3 or 4) measurements. The night-to-night variations are small, amounting to only a few hundredths of a magnitude in each bandpass, which lends confidence to the consistency of the photometric reductions performed at the various sites. Moreover, the light curve of BD+23°565 is well correlated with that of BD+24°659 in each filter, which indicates that the observed low-level variations are due to residual errors on the zero-point determination for each night rather than from intrinsic variability and/or measurement errors. In order to correct for these residual errors, we computed a "zero-point" light curve as the mean of the BD+23°565 and BD+24°659 light curves. This zero-point light curve, shown in Fig. 2, has a mean of zero and was substracted from the light curves of our target stars. Note that this correction is always less than a few $\times$ 0.01 mag, while the T Tauri variations in our sample typically have amplitudes of several $\times$ 0.1 mag.

### 3. The database

Our sample includes 13 classical T Tauri stars (DE Tau, DF Tau, DG Tau, DI Tau, DK Tau, DR Tau, GG Tau, GK Tau, IP Tau, RY Tau, GM Aur, SU Aur, LkCa-15), 10 weak-line T Tauri stars (IW Tau, LkCa-4, LkCa-7, LkCa-19, LkCa-21, TAP 9, TAP 26, TAP 40, TAP 41, TAP 57NW), and one suspected Herbig Ae star (BD+24°676).

The entire set of *UBVRI* photometry for these 24 stars is listed in Table 1. The headers give each star's most common name followed by its designation in Herbig & Bell's (1988) catalogue. The first column contains the Julian Date of observation; Cols. 2 to 6 list the $V$, $B$-$V$, $U$-$B$, $V$-$R$, and $V$-$I$ colors, respectively. Typical rms measurement errors in the *UBVRI* filters for a star of magnitude $V$=12.0 are 0.04, 0.03, 0.02, 0.02, and 0.03 mag, respectively. As one goes to fainter stars, the error increases rapidly in the $U$ and $B$ bands (0.2 mag error for $U$ = 15.0, 0.1 mag error for $B$ = 15.0). Therefore, some stars were too faint to yield reliable $U$- and $B$-band light curves, especially during times of bright moon (see Paper 2). We nevertheless list their $U$-$B$ and $B$-$V$ colors in Table 1, which can be used to compute average color indices for the stars. We point out, though, that all but two stars in our sample have a mean $V$ magnitude brighter than 13, so the $V$ light curves are well defined for period searches. The lack of good $U$ and $B$ curves for some stars only affects our ability to model their spot distributions based on amplitude as a function of wavelength.

All 24 stars we monitored show evidence for periodic light variations with photometric periods ranging from 1.2 to 24.0 days. In Paper 2, we argue that in 20 of the 24 stars, these periodicities are due to the modulation of the stellar flux by surface spots, while in the 4 remaining stars (BD+24°676, RY Tau, LkCa-21, TAP 26) it probably results from the orbital motion of a binary system. The resulting distribution of rotational periods indicates that weak-line T Tauri stars tend to rotate faster than classical T Tauri stars by a factor of 2 on average. The interpretation of these results and their implications for the rotational evolution of young stars are discussed in Paper 2.

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**Table 1.** *UBVRI* photometry

| Julian Date - 2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| | | BD+24°676 | | | |
| 8212.59 | 10.52 | 1.11 | .36 | .82 | 1.70 |
| 8213.58 | 10.46 | 1.13 | .39 | .82 | 1.72 |
| 8214.54 | 10.43 | 1.14 | .39 | .83 | 1.72 |
| 8214.68 | 10.41 | 1.14 | .37 | .85 | 1.73 |
| 8215.54 | 10.39 | 1.13 | .34 | .84 | 1.72 |
| 8223.63 | 10.41 | 1.15 | .34 | .87 | 1.75 |
| 8223.73 | 10.40 | 1.15 | .35 | .87 | 1.74 |
| 8226.74 | 10.50 | 1.11 | .32 | .86 | 1.74 |
| 8228.74 | 10.56 | 1.05 | .33 | .84 | 1.71 |
| 8230.65 | 10.46 | 1.14 | .35 | .83 | 1.70 |
| 8230.76 | 10.46 | 1.12 | .35 | .85 | 1.72 |
| 8232.74 | 10.39 | 1.15 | .37 | .85 | 1.75 |
| 8233.73 | 10.44 | 1.14 | — | .87 | 1.75 |
| 8252.45 | 10.41 | 1.16 | .43 | .88 | 1.73 |
| 8252.45 | 10.40 | 1.18 | .38 | .88 | 1.71 |
| 8256.63 | 10.52 | 1.11 | .24 | .89 | 1.78 |
| 8259.55 | 10.30 | 1.15 | .39 | .88 | 1.75 |
| 8259.55 | 10.29 | 1.19 | .35 | .89 | 1.74 |
| 8260.55 | 10.35 | 1.15 | .34 | .88 | 1.79 |
| 8260.55 | 10.33 | 1.18 | .33 | .87 | 1.78 |
| 8261.58 | 10.38 | 1.17 | .41 | .88 | 1.77 |
| 8261.58 | 10.40 | 1.17 | .39 | .87 | 1.77 |
| 8262.57 | 10.44 | 1.14 | .35 | .85 | 1.72 |
| 8262.58 | 10.44 | 1.14 | .32 | .85 | 1.71 |
| 8263.40 | 10.49 | 1.11 | .33 | .82 | 1.68 |
| 8263.40 | 10.50 | 1.09 | .33 | .84 | 1.70 |
| 8264.40 | 10.49 | 1.11 | .34 | .83 | 1.71 |
| 8264.40 | 10.48 | 1.12 | .33 | .84 | 1.73 |
| 8266.56 | 10.44 | 1.19 | .32 | .86 | 1.80 |
| 8267.47 | 10.40 | 1.18 | .38 | .86 | 1.77 |
| 8270.58 | 10.37 | — | — | .86 | 1.75 |
| 8271.56 | 10.46 | 1.17 | .37 | .84 | — |
| 8272.56 | 10.50 | 1.15 | .31 | .83 | 1.71 |
| 8272.58 | 10.50 | 1.13 | — | .85 | 1.72 |
| 8273.60 | 10.49 | 1.17 | — | .86 | 1.74 |
| 8274.58 | 10.44 | 1.16 | — | .86 | 1.73 |
| 8275.58 | 10.37 | 1.19 | — | .86 | 1.72 |
| 8276.58 | 10.34 | 1.20 | — | .86 | 1.73 |
| 8277.59 | 10.38 | 1.19 | — | .86 | 1.76 |
| 8278.58 | 10.39 | 1.15 | — | .86 | 1.75 |
| 8279.57 | 10.42 | 1.12 | — | .87 | 1.75 |

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8280.58 | 10.44 | 1.08 | — | .83 | 1.73 |
| 8286.63 | 10.45 | — | — | .89 | 1.75 |
| 8287.59 | 10.47 | — | — | .87 | 1.75 |
| 8288.62 | 10.47 | 1.14 | .36 | .86 | 1.74 |
| 8289.58 | 10.49 | 1.15 | .38 | .84 | 1.71 |
| 8290.61 | 10.51 | 1.12 | .35 | .85 | 1.72 |
| 8291.59 | 10.50 | 1.14 | .35 | .85 | 1.73 |
| 8293.61 | 10.43 | 1.17 | .34 | .86 | 1.74 |
| 8294.59 | 10.39 | 1.16 | .37 | .86 | 1.75 |
| 8295.62 | 10.40 | 1.14 | .36 | .87 | 1.76 |
| 8296.60 | 10.43 | 1.13 | .35 | .85 | 1.72 |
| 8297.60 | 10.49 | 1.10 | .35 | .84 | 1.70 |
| 8298.60 | 10.56 | 1.08 | .31 | .82 | 1.68 |
| 8299.58 | 10.56 | 1.08 | .35 | .82 | 1.66 |
| | | DE Tau (HBC 33) | | | |
| 8212.42 | 12.97 | 1.33 | -.32 | 1.11 | 2.33 |
| 8213.39 | 12.91 | 1.32 | -.42 | 1.08 | 2.28 |
| 8214.50 | 12.84 | 1.25 | -.54 | 1.04 | 2.18 |
| 8215.41 | 12.87 | 1.34 | -.41 | 1.07 | 2.23 |
| 8223.68 | 13.09 | 1.40 | — | 1.16 | 2.41 |
| 8228.67 | 13.16 | 1.56 | -.87 | 1.10 | 2.48 |
| 8228.71 | 13.15 | 1.59 | -.73 | 1.13 | 2.46 |
| 8230.73 | 13.06 | 1.38 | -.39 | 1.07 | 2.37 |
| 8232.67 | 13.15 | 1.52 | -.71 | 1.16 | 2.47 |
| 8233.64 | 12.94 | 1.30 | -.67 | 1.08 | 2.32 |
| 8233.71 | 12.90 | 1.28 | -.60 | 1.05 | 2.26 |
| 8252.54 | 12.88 | 1.16 | -.40 | 1.04 | 2.16 |
| 8252.54 | 12.93 | 1.24 | -.45 | 1.06 | — |
| 8259.49 | 12.99 | 1.33 | -.20 | 1.10 | 2.25 |
| 8259.49 | 12.94 | 1.32 | -.12 | 1.07 | 2.20 |
| 8259.50 | 12.97 | 1.24 | -.22 | 1.09 | 2.23 |
| 8260.43 | 12.93 | 1.32 | -.47 | 1.06 | 2.27 |
| 8260.43 | 12.90 | 1.24 | -.48 | 1.05 | 2.27 |
| 8261.47 | 12.82 | 1.30 | -.45 | 1.07 | 2.24 |
| 8261.48 | 12.81 | 1.23 | -.47 | 1.02 | 2.19 |
| 8262.50 | 12.79 | 1.27 | -.50 | 1.04 | 2.18 |
| 8262.50 | 12.76 | 1.20 | -.46 | 1.02 | 2.17 |
| 8263.52 | 12.83 | 1.27 | -.35 | 1.04 | 2.18 |
| 8263.53 | 12.81 | 1.29 | -.37 | 1.04 | 2.19 |
| 8264.56 | 12.86 | 1.27 | -.40 | 1.06 | 2.25 |
| 8264.56 | 12.84 | 1.31 | -.43 | 1.02 | 2.27 |
| 8266.40 | 12.93 | 1.32 | -.25 | 1.11 | 2.32 |

**Table 1.** continued

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8267.36 | 12.91 | 1.38 | -.16 | 1.16 | — |
| 8272.39 | 12.87 | 1.36 | -.17 | 1.09 | 2.24 |

DF Tau (HBC 36)

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8212.47 | 11.79 | 1.02 | -.38 | .91 | 2.00 |
| 8213.47 | 11.97 | 1.03 | -.25 | .93 | 2.05 |
| 8214.38 | 12.06 | 1.15 | -.26 | .98 | 2.08 |
| 8215.43 | 12.01 | 1.09 | -.15 | .95 | 2.06 |
| 8223.65 | 12.04 | 1.14 | -.12 | .93 | 2.09 |
| 8226.67 | 11.91 | 1.06 | -.50 | .91 | 2.10 |
| 8228.63 | 12.02 | 1.06 | -.27 | .95 | 2.10 |
| 8228.69 | 12.09 | 1.01 | -.28 | .98 | 2.14 |
| 8230.63 | 12.54 | 1.37 | .06 | 1.07 | 2.37 |
| 8232.63 | 12.64 | 1.46 | .20 | 1.11 | 2.47 |
| 8233.61 | 12.47 | 1.37 | -.07 | 1.08 | 2.39 |
| 8233.66 | 12.45 | 1.30 | -.23 | 1.11 | 2.39 |
| 8252.50 | 12.18 | 1.10 | -.03 | 1.00 | 2.05 |
| 8252.50 | 12.16 | 1.10 | -.04 | 1.00 | 2.01 |
| 8259.53 | 12.28 | 1.17 | .01 | 1.04 | 2.12 |
| 8259.53 | 12.26 | 1.16 | -.07 | 1.05 | 2.09 |
| 8260.52 | 12.15 | 1.10 | -.28 | .98 | 2.10 |
| 8260.53 | 12.13 | 1.12 | -.30 | .98 | 2.09 |
| 8261.57 | 12.25 | 1.17 | -.20 | 1.05 | 2.21 |
| 8261.57 | 12.23 | 1.19 | -.23 | 1.05 | 2.22 |
| 8262.41 | 12.10 | 1.05 | -.12 | .97 | 2.06 |
| 8262.41 | 12.10 | 1.08 | -.15 | .99 | 2.06 |
| 8263.55 | 12.20 | 1.15 | -.44 | 1.04 | 2.16 |
| 8263.55 | 12.18 | 1.14 | -.44 | 1.04 | 2.09 |
| 8264.60 | 11.84 | 1.01 | -.45 | .94 | 2.01 |
| 8264.60 | 11.84 | 1.01 | -.44 | .93 | 2.03 |
| 8266.42 | 11.62 | 1.02 | -.18 | .86 | 1.91 |
| 8267.43 | 12.49 | 1.34 | .12 | 1.16 | 2.41 |
| 8272.42 | 12.00 | 1.15 | -.13 | 1.00 | 2.10 |
| 8292.62 | 11.92 | .98 | -.46 | .98 | 2.04 |
| 8293.63 | 12.06 | 1.05 | -.36 | 1.00 | 2.11 |
| 8295.64 | 12.44 | 1.18 | .00 | 1.11 | 2.28 |
| 8296.62 | 12.11 | 1.18 | -.24 | 1.05 | 2.17 |
| 8297.62 | 11.72 | .93 | -.29 | .91 | 1.92 |
| 8298.62 | 11.81 | .81 | -.38 | .62 | 1.61 |
| 8299.60 | 11.86 | .92 | -.27 | .90 | 1.95 |

DG Tau (HBC 37)

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8212.51 | 11.85 | .98 | -.44 | .86 | 1.81 |
| 8213.49 | 11.79 | .95 | -.45 | .85 | 1.78 |
| 8214.39 | 11.63 | .95 | -.43 | .82 | 1.71 |
| 8215.44 | 11.97 | 1.02 | -.38 | .89 | 1.82 |
| 8215.63 | 11.98 | 1.00 | -.41 | .90 | 1.83 |
| 8223.65 | 11.99 | .98 | -.45 | .91 | 1.83 |
| 8226.67 | 11.84 | 1.01 | -.47 | .88 | 1.82 |
| 8230.64 | 11.91 | 1.00 | -.41 | .88 | 1.80 |
| 8232.63 | 11.80 | .95 | -.48 | .86 | 1.79 |
| 8233.61 | 11.90 | .96 | -.44 | .88 | 1.80 |
| 8233.66 | 11.91 | 1.00 | -.49 | .87 | 1.81 |
| 8259.52 | 12.08 | .98 | -.30 | .91 | 1.84 |
| 8259.52 | 12.07 | 1.03 | -.44 | .93 | 1.85 |
| 8260.53 | 12.14 | 1.00 | -.46 | .90 | 1.88 |
| 8260.53 | 12.12 | 1.03 | -.44 | .91 | 1.90 |
| 8261.56 | 12.03 | .99 | -.43 | .90 | 1.86 |
| 8261.56 | 12.03 | 1.00 | -.45 | .90 | 1.88 |
| 8262.41 | 11.91 | .96 | -.39 | .87 | 1.80 |
| 8262.41 | 11.91 | .98 | -.41 | .89 | 1.81 |
| 8263.55 | 11.83 | .99 | -.39 | .87 | 1.79 |
| 8263.55 | 11.81 | .98 | -.37 | .87 | 1.78 |
| 8264.60 | 11.72 | .97 | -.43 | .85 | 1.78 |
| 8264.61 | 11.75 | .85 | -.35 | .85 | 1.81 |
| 8266.48 | 11.96 | 1.06 | -.33 | .88 | 1.85 |
| 8267.43 | 11.88 | 1.04 | -.35 | .87 | 1.84 |
| 8272.45 | 12.15 | 1.03 | -.30 | .90 | 1.88 |

DI Tau (HBC 39)

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8212.51 | 12.84 | 1.59 | 1.51 | 1.05 | 2.12 |
| 8213.49 | 12.79 | 1.61 | 1.41 | 1.03 | 2.09 |
| 8214.52 | 12.81 | 1.61 | 1.55 | 1.03 | 2.07 |
| 8215.45 | 12.81 | 1.60 | 1.51 | 1.05 | 2.10 |
| 8223.66 | 12.85 | 1.66 | — | 1.00 | 2.05 |
| 8228.64 | 12.74 | 1.63 | 1.26 | .99 | 2.05 |
| 8230.64 | 12.85 | 1.73 | — | 1.01 | 2.11 |
| 8232.64 | 12.87 | 1.61 | 1.01 | 1.01 | 2.12 |
| 8232.71 | 12.87 | 1.61 | 1.66 | 1.02 | 2.13 |
| 8233.62 | 12.85 | 1.58 | 1.40 | 1.00 | 2.09 |
| 8259.51 | 12.77 | 1.56 | 1.55 | 1.03 | 2.02 |
| 8259.51 | 12.84 | 1.50 | .99 | 1.07 | 2.04 |
| 8260.48 | 12.88 | 1.51 | — | 1.04 | 2.11 |
| 8260.48 | 12.82 | 1.58 | 1.13 | 1.04 | 2.09 |
| 8261.48 | 12.87 | 1.66 | 1.85 | 1.08 | 2.14 |
| 8261.48 | 12.87 | 1.50 | 1.13 | 1.05 | 2.12 |
| 8262.49 | 12.90 | 1.57 | 1.67 | 1.06 | 2.11 |
| 8262.49 | 12.90 | 1.50 | 1.29 | 1.04 | 2.08 |

**Table 1.** continued

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8263.55 | 12.86 | 1.61 | 1.50 | 1.04 | 2.09 |
| 8263.56 | 12.89 | 1.38 | 1.27 | 1.03 | 2.05 |
| 8264.47 | 12.86 | 1.56 | 1.48 | 1.04 | 2.09 |
| 8264.47 | 12.85 | 1.60 | 1.48 | 1.04 | 2.12 |
| 8266.49 | 12.82 | 1.59 | 1.61 | 1.05 | 2.11 |
| 8272.46 | 12.83 | 1.60 | 1.55 | 1.04 | 2.07 |

DK Tau (HBC 45)

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8212.52 | 12.54 | 1.34 | .28 | .99 | 1.98 |
| 8213.50 | 13.29 | 1.27 | -.02 | 1.05 | 2.14 |
| 8214.41 | 12.80 | 1.19 | .04 | .95 | 1.94 |
| 8215.49 | 13.45 | 1.32 | -.06 | 1.12 | 2.23 |
| 8223.67 | 12.68 | 1.29 | — | .94 | 1.98 |
| 8226.70 | 12.27 | 1.25 | .15 | .91 | 1.94 |
| 8228.64 | 12.19 | 1.13 | .21 | .86 | 1.85 |
| 8228.69 | 12.16 | 1.24 | .05 | .87 | 1.85 |
| 8230.66 | 12.22 | 1.05 | -.10 | .79 | 1.73 |
| 8232.64 | 12.30 | 1.19 | .20 | .84 | 1.82 |
| 8233.61 | 11.92 | 1.09 | -.08 | .83 | 1.74 |
| 8233.67 | 11.94 | 1.10 | -.06 | .80 | 1.75 |
| 8252.51 | 12.08 | 1.09 | .15 | .87 | 1.68 |
| 8252.51 | 12.09 | 1.08 | .18 | .87 | 1.69 |
| 8259.52 | 12.43 | .97 | .12 | .86 | 1.70 |
| 8259.52 | 12.42 | .98 | .07 | .87 | 1.67 |
| 8260.53 | 12.14 | 1.02 | -.01 | .85 | 1.71 |
| 8260.53 | 12.11 | 1.05 | .02 | .85 | 1.71 |
| 8261.57 | 12.19 | 1.24 | .26 | .93 | 1.84 |
| 8261.57 | 12.18 | 1.24 | .23 | .93 | 1.84 |
| 8262.42 | 12.66 | 1.22 | .12 | .98 | 1.93 |
| 8262.42 | 12.69 | 1.22 | .11 | .99 | 1.93 |
| 8263.56 | 13.20 | 1.38 | .31 | 1.07 | 2.08 |
| 8263.56 | 13.26 | 1.04 | .48 | 1.05 | 2.07 |
| 8264.61 | 14.07 | 1.52 | .19 | 1.18 | 2.30 |
| 8266.50 | 12.86 | 1.45 | .37 | 1.04 | 2.12 |
| 8267.45 | 12.10 | 1.31 | .29 | .93 | 1.90 |
| 8272.47 | 14.08 | 1.26 | .04 | 1.10 | 2.19 |

DR Tau (HBC 74)

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8212.60 | 11.91 | .81 | -.40 | .68 | 1.41 |
| 8213.60 | 11.02 | .70 | -.34 | .57 | 1.24 |
| 8214.55 | 11.16 | .73 | -.55 | .62 | 1.31 |
| 8214.69 | 11.23 | .75 | -.64 | .63 | 1.35 |
| 8215.58 | 11.77 | .81 | -.60 | .69 | 1.45 |
| 8223.78 | 12.09 | .88 | .00 | .66 | 1.44 |
| 8226.76 | 11.84 | .72 | -.69 | .65 | 1.43 |
| 8226.76 | 11.84 | .74 | -.69 | .66 | 1.44 |
| 8227.70 | 11.56 | .75 | -.64 | .65 | 1.42 |
| 8227.76 | 11.56 | .73 | -.61 | .66 | 1.40 |
| 8228.61 | 11.32 | .75 | -.66 | .62 | 1.32 |
| 8230.78 | 11.41 | .74 | -.28 | .56 | 1.26 |
| 8232.61 | 12.01 | .83 | -.43 | .67 | 1.49 |
| 8232.78 | 11.86 | .81 | -.57 | .69 | 1.49 |
| 8233.77 | 11.74 | .75 | -.61 | .64 | 1.40 |
| 8252.49 | 11.40 | .75 | -.09 | .59 | 1.26 |
| 8252.49 | 11.42 | .75 | -.13 | .59 | 1.25 |
| 8256.53 | 11.07 | .69 | -.44 | .56 | 1.22 |
| 8259.47 | 11.94 | .81 | -.38 | .70 | 1.46 |
| 8259.47 | 11.93 | .82 | -.42 | .71 | 1.45 |
| 8260.47 | 11.81 | .78 | -.43 | .68 | 1.46 |
| 8260.47 | 11.80 | .79 | -.44 | .68 | 1.46 |
| 8261.53 | 11.42 | .72 | -.31 | .60 | 1.30 |
| 8261.53 | 11.43 | .73 | -.31 | .61 | 1.31 |
| 8262.57 | 11.84 | .79 | -.31 | .66 | 1.42 |
| 8262.57 | 11.83 | .80 | -.33 | .66 | 1.42 |
| 8263.51 | 11.82 | .76 | -.56 | .68 | 1.45 |
| 8264.45 | 11.10 | .73 | -.61 | .65 | 1.39 |
| 8264.45 | 11.09 | .76 | -.62 | .65 | 1.41 |
| 8266.54 | 11.25 | .79 | -.40 | .61 | 1.36 |
| 8267.54 | 11.49 | .82 | -.48 | .64 | 1.37 |

GG Tau (HBC 54)

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8212.55 | 12.22 | 1.37 | -.07 | 1.02 | 2.03 |
| 8213.54 | 12.26 | 1.37 | -.05 | .99 | 1.97 |
| 8214.46 | 12.29 | 1.39 | .07 | .99 | 1.95 |
| 8215.52 | 12.31 | 1.40 | .12 | 1.01 | 1.96 |
| 8223.61 | 12.31 | 1.43 | — | 1.02 | 2.04 |
| 8223.77 | 12.35 | 1.45 | .29 | 1.05 | 2.05 |
| 8226.75 | 12.27 | 1.43 | .11 | 1.03 | 2.03 |
| 8227.68 | 12.19 | 1.35 | .05 | .99 | 1.96 |
| 8227.75 | 12.27 | 1.31 | -.01 | 1.08 | 2.05 |
| 8228.60 | 12.25 | — | — | 1.08 | 2.07 |
| 8230.78 | 12.18 | 1.39 | .00 | 1.03 | 2.06 |
| 8232.60 | 12.23 | 1.36 | -.06 | 1.00 | 2.00 |
| 8232.78 | 12.25 | 1.41 | .01 | 1.01 | 2.03 |
| 8233.77 | 12.28 | 1.40 | -.06 | 1.01 | 2.00 |
| 8252.48 | 12.26 | 1.42 | .28 | 1.00 | 1.95 |
| 8252.49 | 12.26 | 1.42 | .24 | .99 | 1.94 |
| 8259.47 | 12.14 | 1.39 | .31 | 1.00 | 1.98 |

**Table 1.** continued

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8259.47 | 12.14 | 1.43 | .24 | 1.01 | 1.98 |
| 8260.46 | 12.15 | 1.40 | .23 | 1.01 | 2.05 |
| 8260.46 | 12.15 | 1.42 | .11 | 1.02 | 2.08 |
| 8261.55 | 12.09 | 1.35 | .01 | 1.01 | 2.04 |
| 8261.55 | 12.07 | 1.39 | .01 | .99 | 2.03 |
| 8262.55 | 12.12 | 1.29 | -.06 | .96 | 1.96 |
| 8262.56 | 12.11 | 1.31 | -.12 | .96 | 1.93 |
| 8263.50 | 12.19 | 1.36 | .05 | .99 | 1.96 |
| 8263.50 | 12.19 | 1.30 | .09 | .99 | 1.96 |
| 8264.47 | 12.24 | 1.38 | .28 | .98 | 1.97 |
| 8264.47 | 12.25 | 1.40 | .23 | .98 | 2.00 |
| 8266.52 | 12.30 | 1.44 | .20 | 1.05 | 2.09 |
| 8267.53 | 12.27 | 1.45 | .32 | 1.03 | 2.05 |
| 8272.51 | 12.24 | 1.40 | .00 | 1.01 | 1.99 |
| | | GK Tau (HBC 57) | | | |
| 8212.58 | 12.16 | 1.29 | .26 | .92 | 1.83 |
| 8213.55 | 12.17 | 1.32 | .17 | .93 | 1.86 |
| 8214.47 | 12.72 | 1.45 | .60 | 1.00 | 1.98 |
| 8215.53 | 12.58 | 1.46 | .68 | .99 | 1.95 |
| 8223.62 | 12.68 | 1.50 | — | .94 | 1.79 |
| 8226.73 | 12.13 | 1.24 | -.01 | .92 | 1.82 |
| 8228.62 | 13.22 | 1.21 | -.23 | 1.14 | 2.23 |
| 8228.74 | 13.11 | 1.35 | .16 | 1.03 | 2.16 |
| 8230.62 | 12.33 | 1.35 | .49 | .90 | 1.62 |
| 8232.62 | 12.49 | 1.46 | .80 | .96 | 1.96 |
| 8232.75 | 12.73 | 1.53 | 1.23 | 1.01 | 2.02 |
| 8233.72 | 12.85 | 1.57 | 1.03 | 1.05 | 2.10 |
| 8252.54 | 12.53 | 1.46 | .25 | 1.02 | 1.92 |
| 8252.54 | 12.53 | 1.45 | .38 | 1.02 | 1.89 |
| 8259.53 | 12.15 | 1.38 | .38 | .95 | 1.81 |
| 8259.53 | 12.19 | 1.37 | .40 | .99 | 1.83 |
| 8260.49 | 12.34 | 1.28 | .18 | .94 | 1.81 |
| 8260.49 | 12.32 | 1.28 | .16 | .96 | 1.83 |
| 8262.52 | 12.52 | 1.55 | .78 | 1.05 | 2.01 |
| 8262.52 | 12.52 | 1.48 | .57 | 1.04 | 1.97 |
| 8263.57 | 12.33 | 1.57 | .78 | 1.02 | 1.96 |
| 8263.57 | 12.33 | 1.63 | .65 | 1.02 | 1.94 |
| 8264.49 | 12.22 | 1.38 | .39 | .99 | 1.89 |
| 8264.49 | 12.20 | 1.41 | .41 | 1.00 | 1.92 |
| 8266.55 | 12.28 | 1.32 | .43 | .92 | 1.87 |
| 8267.46 | 12.41 | 1.41 | .55 | .97 | 1.92 |
| 8271.55 | 12.45 | 1.48 | .78 | .95 | — |

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8272.52 | 12.44 | 1.41 | .23 | .97 | 1.93 |
| | | IP Tau (HBC 385) | | | |
| 8212.47 | 13.38 | 1.58 | .93 | 1.01 | 2.06 |
| 8214.50 | 13.04 | 1.34 | .52 | .96 | 1.91 |
| 8223.70 | 13.08 | 1.23 | — | .93 | 1.95 |
| 8228.65 | 13.19 | 1.32 | .69 | 1.00 | 2.00 |
| 8228.70 | 13.39 | 1.34 | .29 | 1.05 | 2.13 |
| 8230.67 | 13.06 | 1.44 | 1.01 | .91 | 1.91 |
| 8232.65 | 13.13 | 1.50 | .96 | .94 | 1.98 |
| 8233.62 | 12.99 | 1.41 | .92 | .90 | 1.90 |
| 8233.68 | 13.00 | 1.42 | .77 | .92 | 1.94 |
| 8252.53 | 13.08 | 1.26 | .67 | .96 | 1.87 |
| 8252.54 | 13.08 | 1.30 | .78 | .96 | 1.85 |
| 8260.42 | 13.18 | 1.47 | .65 | .99 | 1.99 |
| 8260.42 | 13.12 | 1.25 | .46 | .95 | 1.93 |
| 8261.43 | 13.23 | 1.39 | .52 | .99 | 2.01 |
| 8261.43 | 13.20 | 1.41 | .57 | .99 | 1.99 |
| 8262.51 | 13.12 | 1.41 | .63 | .98 | 1.94 |
| 8262.51 | 13.13 | 1.26 | .40 | .96 | 1.92 |
| 8263.53 | 13.09 | 1.32 | .44 | .96 | 1.88 |
| 8263.53 | 13.07 | 1.26 | .34 | .95 | 1.86 |
| 8264.56 | 13.26 | 1.43 | .77 | .99 | 1.97 |
| 8266.42 | 12.98 | 1.43 | .89 | .94 | 1.89 |
| 8272.41 | 13.00 | 1.44 | .79 | .97 | 1.90 |
| | | RY Tau (HBC 34) | | | |
| 8212.43 | 10.37 | 1.11 | .59 | .77 | 1.54 |
| 8213.40 | 10.38 | 1.10 | .58 | .75 | 1.51 |
| 8214.36 | 10.41 | 1.09 | .60 | .76 | 1.51 |
| 8215.37 | 10.40 | 1.10 | .60 | .76 | 1.52 |
| 8223.69 | 10.21 | 1.10 | .56 | .74 | 1.52 |
| 8226.71 | 10.15 | 1.09 | .52 | .74 | 1.52 |
| 8228.67 | 10.14 | 1.08 | .55 | .75 | 1.52 |
| 8230.68 | 10.20 | 1.07 | .52 | .74 | 1.49 |
| 8230.74 | 10.18 | 1.07 | .55 | .74 | 1.50 |
| 8232.70 | 10.20 | 1.08 | .62 | .73 | 1.50 |
| 8233.65 | 10.20 | 1.10 | .61 | .73 | 1.49 |
| 8256.63 | 10.26 | 1.06 | .57 | .76 | 1.50 |
| 8259.54 | 10.24 | 1.07 | .61 | .77 | 1.48 |
| 8259.54 | 10.26 | 1.09 | .60 | .78 | 1.49 |
| 8260.43 | 10.22 | 1.08 | .61 | .76 | 1.51 |
| 8260.44 | 10.20 | 1.08 | .61 | .76 | 1.52 |
| 8261.58 | 10.29 | 1.09 | .63 | .78 | 1.53 |
| 8261.58 | 10.29 | 1.10 | .62 | .77 | 1.54 |

**Table 1.** continued

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8262.43 | 10.30 | 1.07 | .61 | .76 | 1.49 |
| 8262.43 | 10.31 | 1.13 | .55 | .77 | 1.50 |
| 8263.38 | 10.16 | 1.08 | .58 | .75 | 1.48 |
| 8263.38 | 10.17 | 1.06 | .58 | .76 | 1.48 |
| 8264.40 | 10.09 | 1.06 | .57 | .74 | 1.49 |
| 8264.40 | 10.08 | 1.07 | .57 | .75 | 1.49 |
| 8266.40 | 10.14 | 1.04 | .55 | .68 | 1.42 |
| 8267.36 | 10.06 | 1.04 | .57 | .68 | 1.43 |
| 8270.61 | 10.09 | 1.07 | — | .75 | 1.48 |
| 8272.39 | 9.97 | 1.01 | .44 | .68 | 1.41 |
| 8272.60 | 10.02 | 1.03 | — | .73 | 1.44 |
| 8273.62 | 10.06 | 1.07 | — | .77 | 1.49 |
| 8274.60 | 10.01 | 1.05 | — | .76 | 1.48 |
| 8275.59 | 10.04 | 1.06 | — | .74 | 1.46 |
| 8276.59 | 10.17 | 1.06 | — | .76 | 1.50 |
| 8277.60 | 10.16 | 1.10 | — | .76 | 1.49 |
| 8278.59 | 10.09 | 1.07 | — | .75 | 1.51 |
| 8279.59 | 10.08 | 1.03 | — | .74 | 1.47 |
| 8280.60 | 10.10 | 1.03 | — | .75 | 1.50 |
| 8285.59 | 10.24 | 1.08 | .73 | .72 | 1.44 |
| 8286.64 | 10.31 | — | — | .76 | 1.50 |
| 8287.60 | 10.41 | 1.11 | .55 | .76 | 1.51 |
| 8288.62 | 10.31 | 1.10 | .61 | .75 | 1.51 |
| 8289.59 | 10.12 | 1.10 | .62 | .75 | 1.49 |
| 8290.62 | 10.09 | 1.05 | .58 | — | — |
| 8291.60 | 10.03 | 1.07 | .48 | .74 | 1.47 |
| 8292.60 | 9.91 | 1.04 | .46 | .73 | 1.42 |
| 8293.62 | 9.90 | 1.03 | .51 | .73 | 1.45 |
| 8294.60 | 10.05 | 1.07 | .52 | .72 | 1.42 |
| 8295.63 | 9.99 | 1.05 | .42 | .71 | — |
| 8296.61 | 9.91 | 1.06 | .46 | .70 | 1.41 |
| 8297.61 | 9.97 | 1.06 | .56 | .72 | 1.43 |
| 8298.60 | 10.05 | 1.06 | .50 | .74 | 1.47 |
| 8299.59 | 10.08 | 1.05 | .57 | .73 | 1.47 |

GM Aur (HBC 77)

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8259.56 | 12.06 | 1.23 | .65 | .88 | 1.56 |
| 8259.56 | 12.04 | 1.25 | .49 | .89 | 1.55 |
| 8259.56 | 12.05 | 1.17 | .65 | .88 | 1.56 |
| 8259.56 | 12.07 | 1.20 | .44 | .90 | 1.57 |
| 8260.47 | 12.02 | 1.12 | .35 | .87 | 1.56 |
| 8260.47 | 11.96 | 1.17 | .31 | .85 | 1.55 |
| 8261.49 | 12.01 | 1.22 | .48 | .88 | 1.58 |
| 8261.49 | 12.00 | 1.23 | .43 | .87 | 1.56 |
| 8261.60 | 12.03 | 1.21 | .52 | .88 | 1.58 |
| 8261.60 | 12.01 | 1.22 | .51 | .87 | 1.58 |
| 8262.58 | 12.09 | 1.25 | .56 | .88 | 1.60 |
| 8262.59 | 12.10 | 1.23 | .57 | .88 | 1.59 |
| 8263.51 | 12.14 | 1.25 | .47 | .88 | 1.55 |
| 8263.51 | 12.16 | 1.20 | .52 | .89 | 1.59 |
| 8263.59 | 12.15 | 1.24 | .54 | .89 | 1.61 |
| 8263.59 | 12.13 | 1.24 | .54 | .88 | 1.60 |
| 8264.41 | 12.16 | 1.22 | .56 | .89 | 1.62 |
| 8264.41 | 12.16 | 1.26 | .58 | .88 | 1.63 |
| 8264.54 | 12.15 | 1.23 | .52 | .89 | 1.63 |
| 8264.54 | 12.13 | 1.26 | .47 | .88 | 1.62 |
| 8264.54 | 12.15 | 1.25 | .49 | .89 | 1.63 |
| 8264.54 | 12.12 | 1.29 | .54 | .88 | 1.62 |
| 8267.56 | 12.08 | 1.26 | .67 | .83 | 1.56 |
| 8271.62 | 11.99 | 1.27 | .60 | .76 | — |
| 8272.59 | 11.97 | 1.18 | .40 | .79 | 1.50 |
| 8275.61 | 12.00 | 1.17 | — | .81 | 1.55 |
| 8276.61 | 12.07 | 1.22 | — | .82 | 1.57 |
| 8277.62 | 11.96 | 1.23 | — | .81 | — |
| 8278.61 | 11.98 | 1.15 | — | .80 | 1.53 |
| 8279.60 | 11.92 | 1.05 | — | .77 | 1.49 |
| 8280.62 | 11.94 | 1.06 | — | .77 | 1.48 |
| 8285.61 | 12.28 | 1.26 | .44 | .87 | 1.60 |
| 8286.65 | 12.35 | 1.79 | 1.46 | 1.12 | 1.81 |
| 8287.61 | 12.17 | 1.37 | .50 | .90 | 1.64 |
| 8288.63 | 12.22 | 1.25 | .78 | .93 | 1.63 |
| 8289.60 | 12.01 | 1.23 | .54 | .86 | 1.54 |
| 8290.63 | 12.01 | 1.19 | — | .88 | 1.54 |
| 8291.61 | 12.01 | — | — | .87 | 1.53 |
| 8292.62 | 12.03 | 1.15 | .07 | .88 | 1.54 |
| 8293.64 | 12.01 | 1.08 | .15 | .86 | 1.52 |
| 8295.64 | 11.95 | 1.05 | .16 | .82 | 1.50 |
| 8296.63 | 11.94 | 1.13 | .36 | .85 | 1.50 |
| 8297.63 | 12.04 | 1.19 | .48 | .86 | 1.55 |
| 8298.63 | 12.11 | 1.23 | .41 | .86 | 1.55 |
| 8299.62 | 12.09 | 1.21 | .33 | .88 | 1.56 |

SU Aur (HBC 79)

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8212.63 | 9.16 | .89 | .38 | .53 | 1.04 |
| 8213.65 | 9.13 | .88 | .42 | .53 | 1.05 |
| 8214.56 | 9.19 | .90 | .42 | .54 | 1.05 |

**Table 1.** continued

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8214.71 | 9.21 | .90 | .41 | .53 | 1.07 |
| 8215.61 | 9.15 | .89 | .39 | .53 | 1.06 |
| 8223.72 | 9.12 | .89 | .37 | .53 | 1.06 |
| 8226.69 | 9.09 | .90 | .37 | .53 | 1.04 |
| 8226.72 | 9.09 | .89 | .37 | .53 | 1.06 |
| 8227.69 | 9.12 | .90 | .41 | .53 | 1.04 |
| 8227.72 | 9.13 | .90 | .44 | .53 | 1.04 |
| 8228.72 | 9.12 | .89 | .40 | .52 | 1.04 |
| 8230.69 | 9.15 | .91 | .43 | .53 | 1.05 |
| 8232.68 | 9.12 | .88 | .40 | .53 | 1.06 |
| 8232.72 | 9.12 | .89 | .39 | .53 | 1.05 |
| 8233.69 | 9.16 | .90 | .40 | .54 | 1.06 |
| 8252.58 | 9.10 | .88 | .40 | .53 | 1.00 |
| 8252.58 | 9.10 | .88 | .41 | .52 | 1.01 |
| 8259.57 | 9.07 | .88 | .40 | .52 | 1.01 |
| 8260.58 | 9.12 | .87 | .38 | .53 | 1.05 |
| 8260.58 | 9.10 | .93 | .36 | .52 | 1.04 |
| 8261.61 | 9.12 | .90 | .39 | .54 | 1.05 |
| 8261.61 | 9.11 | .90 | .41 | .53 | 1.04 |
| 8262.59 | 9.08 | .88 | .40 | .52 | 1.02 |
| 8262.59 | 9.07 | .89 | .40 | .52 | 1.02 |
| 8263.59 | 9.09 | .89 | .36 | .52 | 1.02 |
| 8263.59 | 9.08 | .90 | .38 | .52 | 1.02 |
| 8264.54 | 9.10 | .89 | .40 | .53 | 1.03 |
| 8264.54 | 9.09 | .91 | .39 | .52 | 1.03 |
| 8267.55 | 9.10 | .88 | .41 | .51 | 1.03 |
| 8271.63 | 9.09 | .90 | .41 | .49 | — |
| 8272.60 | 9.12 | .87 | .38 | .52 | 1.04 |
| | | LkCa-15 (HBC 419) | | | |
| 8212.58 | 12.27 | 1.25 | .58 | .82 | 1.57 |
| 8213.55 | 11.96 | 1.16 | .33 | .76 | 1.48 |
| 8214.47 | 12.16 | 1.26 | .58 | .81 | 1.55 |
| 8214.66 | 12.24 | 1.30 | .64 | .84 | 1.58 |
| 8215.54 | 12.17 | 1.28 | .73 | .81 | 1.57 |
| 8223.62 | 12.29 | 1.25 | — | .84 | 1.61 |
| 8223.75 | 12.19 | 1.24 | .53 | .78 | 1.53 |
| 8226.75 | 12.50 | — | — | .96 | 1.70 |
| 8228.61 | 12.34 | 1.25 | .89 | .80 | 1.60 |
| 8228.75 | 12.36 | 1.34 | .49 | .87 | 1.64 |
| 8230.77 | 12.06 | 1.18 | .61 | .77 | 1.49 |
| 8232.73 | 12.03 | 1.28 | .69 | .80 | 1.54 |
| 8233.74 | 12.04 | 1.23 | .72 | .77 | 1.52 |
| 8252.51 | 12.27 | 1.28 | .69 | .84 | 1.54 |
| 8252.51 | 12.28 | 1.26 | .74 | .83 | 1.53 |
| 8259.48 | 12.03 | 1.18 | .65 | .78 | 1.48 |
| 8259.48 | 12.08 | 1.18 | .58 | .81 | 1.50 |
| 8260.48 | 12.06 | 1.19 | .60 | .80 | 1.53 |
| 8260.48 | 12.02 | 1.20 | .57 | .79 | 1.52 |
| 8261.55 | 12.10 | 1.21 | .59 | .81 | 1.55 |
| 8261.55 | 12.09 | 1.22 | .59 | .81 | 1.53 |
| 8262.57 | 12.87 | 1.31 | .42 | .90 | 1.72 |
| 8262.57 | 12.89 | 1.24 | .34 | .90 | 1.71 |
| 8263.58 | 12.64 | 1.31 | .84 | .87 | 1.67 |
| 8263.58 | 12.64 | 1.28 | .74 | .88 | 1.68 |
| 8264.48 | 12.35 | 1.23 | .56 | .85 | 1.62 |
| 8264.48 | 12.37 | 1.21 | .57 | .84 | 1.65 |
| 8266.56 | 12.08 | 1.25 | .65 | .80 | 1.55 |
| 8267.46 | 12.07 | 1.26 | .65 | .78 | 1.52 |
| 8271.56 | 11.91 | 1.24 | .52 | .76 | — |
| 8272.55 | 12.18 | 1.25 | .58 | .79 | 1.52 |
| | | IW Tau (HBC 420) | | | |
| 8212.59 | 12.83 | 1.49 | 1.19 | 1.01 | 2.10 |
| 8213.59 | 12.78 | 1.48 | 1.19 | 1.00 | 2.08 |
| 8214.54 | 12.68 | 1.49 | 1.18 | 1.00 | 2.00 |
| 8214.68 | 12.68 | 1.47 | 1.23 | 1.01 | 2.05 |
| 8215.57 | 12.61 | 1.46 | 1.31 | .99 | 2.01 |
| 8226.75 | 12.65 | 1.49 | 1.30 | .93 | 2.03 |
| 8228.75 | 12.78 | — | — | .99 | 2.16 |
| 8230.65 | 12.68 | 1.58 | 1.37 | .96 | 2.05 |
| 8230.76 | 12.66 | 1.41 | 1.69 | .93 | 2.03 |
| 8232.75 | 12.66 | 1.48 | 1.25 | .95 | 2.07 |
| 8233.73 | 12.74 | 1.49 | 1.39 | .95 | 2.07 |
| 8252.52 | 12.75 | 1.41 | 1.18 | 1.00 | 1.96 |
| 8252.52 | 12.73 | 1.47 | 1.18 | 1.00 | 1.94 |
| 8259.48 | 12.62 | 1.38 | 1.22 | .98 | 1.91 |
| 8259.49 | 12.62 | 1.45 | 1.15 | 1.01 | 1.95 |
| 8260.51 | 12.71 | 1.47 | 1.12 | 1.01 | 2.02 |
| 8260.51 | 12.68 | 1.45 | .95 | .98 | 2.01 |
| 8261.54 | 12.79 | 1.48 | 1.15 | 1.02 | 2.08 |
| 8261.54 | 12.79 | 1.45 | 1.06 | 1.03 | 2.08 |
| 8262.53 | 12.80 | 1.50 | 1.48 | 1.00 | 2.04 |
| 8262.53 | 12.81 | 1.43 | 1.00 | 1.00 | 2.03 |
| 8263.54 | 12.78 | 1.47 | 1.30 | 1.01 | 2.01 |
| 8263.54 | 12.75 | 1.40 | 1.08 | 1.00 | 2.08 |

**Table 1.** continued

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8264.49 | 12.68 | 1.45 | 1.22 | 1.00 | 2.02 |
| 8264.49 | 12.66 | 1.47 | 1.17 | .98 | 2.04 |
| 8266.57 | 12.68 | 1.53 | 1.18 | 1.05 | 2.17 |
| 8267.48 | 12.74 | 1.46 | 1.18 | 1.03 | 2.14 |
| 8272.57 | 12.69 | 1.49 | 1.03 | 1.00 | 2.06 |
| | | LkCa-4 (HBC 370) | | | |
| 8212.36 | 12.56 | 1.42 | 1.25 | .95 | 1.93 |
| 8213.35 | 12.64 | 1.43 | 1.10 | .95 | 1.95 |
| 8214.34 | 12.47 | 1.42 | 1.21 | .94 | 1.90 |
| 8215.34 | 12.47 | 1.42 | 1.23 | .93 | 1.90 |
| 8226.73 | 12.67 | 1.35 | 1.71 | .89 | 2.01 |
| 8228.65 | 12.45 | 1.44 | 1.51 | .94 | 1.95 |
| 8228.70 | 12.42 | 1.46 | 1.29 | .90 | 1.91 |
| 8230.72 | 12.64 | 1.43 | .96 | .90 | 1.97 |
| 8232.67 | 12.61 | 1.47 | 1.29 | .90 | 1.96 |
| 8233.64 | 12.65 | 1.42 | .88 | .91 | 1.95 |
| 8233.71 | 12.65 | 1.43 | 1.13 | .91 | 1.97 |
| 8252.52 | 12.52 | 1.41 | 1.15 | .95 | 1.85 |
| 8252.52 | 12.52 | 1.41 | 1.32 | .94 | 1.83 |
| 8259.44 | 12.56 | 1.44 | 1.38 | .96 | 1.87 |
| 8259.44 | 12.58 | 1.29 | 1.13 | .95 | 1.84 |
| 8260.41 | 12.68 | 1.42 | 1.25 | .94 | 1.91 |
| 8260.41 | 12.64 | 1.39 | 1.02 | .94 | 1.93 |
| 8261.42 | 12.59 | 1.46 | 1.23 | .96 | 1.96 |
| 8262.40 | 12.43 | 1.39 | 1.25 | .93 | 1.87 |
| 8262.40 | 12.46 | 1.38 | 1.18 | .94 | 1.87 |
| 8263.52 | 12.68 | 1.41 | 1.18 | .94 | 1.90 |
| 8263.52 | 12.68 | 1.38 | 1.22 | .96 | 1.90 |
| 8264.55 | 12.64 | 1.39 | 1.17 | .95 | 1.95 |
| 8264.55 | 12.62 | 1.44 | 1.23 | .94 | 1.97 |
| 8266.37 | 12.66 | 1.42 | 1.17 | .93 | 1.94 |
| 8272.38 | 12.41 | 1.41 | 1.22 | .94 | 1.88 |
| | | LkCa-7 (HBC 379) | | | |
| 8212.41 | 12.46 | 1.37 | 1.23 | .94 | 1.98 |
| 8213.39 | 12.66 | 1.39 | 1.14 | .96 | 2.06 |
| 8214.36 | 12.52 | 1.37 | 1.18 | .93 | 1.97 |
| 8215.40 | 12.27 | 1.36 | 1.14 | .91 | 1.89 |
| 8223.68 | 12.58 | 1.45 | — | .90 | 2.00 |
| 8226.70 | 12.25 | 1.45 | .83 | .86 | 1.91 |
| 8228.67 | 12.33 | 1.39 | .76 | .89 | 1.96 |
| 8228.73 | 12.34 | 1.35 | 1.06 | .90 | 1.95 |
| 8230.72 | 12.67 | 1.42 | 1.36 | .91 | 2.09 |
| 8232.66 | 12.24 | 1.38 | 1.23 | .86 | 1.88 |

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8233.63 | 12.25 | 1.39 | 1.04 | .86 | 1.90 |
| 8233.70 | 12.25 | 1.39 | 1.26 | .86 | 1.89 |
| 8252.53 | 12.67 | 1.39 | 1.03 | .96 | 1.95 |
| 8252.53 | 12.68 | 1.34 | 1.14 | .97 | 1.94 |
| 8256.60 | 12.55 | 1.31 | — | 1.01 | 2.00 |
| 8259.45 | 12.56 | 1.50 | — | .94 | 1.88 |
| 8259.46 | 12.60 | 1.24 | — | .92 | 1.90 |
| 8260.41 | 12.35 | 1.33 | 1.37 | .92 | 1.88 |
| 8260.41 | 12.30 | 1.30 | 1.11 | .91 | 1.88 |
| 8261.42 | 12.24 | 1.34 | .91 | .90 | 1.85 |
| 8261.43 | 12.23 | 1.33 | .87 | .91 | 1.85 |
| 8262.40 | 12.32 | 1.30 | .89 | .90 | 1.84 |
| 8262.40 | 12.32 | 1.31 | .89 | .92 | 1.86 |
| 8263.39 | 12.54 | 1.32 | 1.05 | .93 | 1.93 |
| 8263.39 | 12.54 | 1.30 | 1.00 | .94 | 1.94 |
| 8264.55 | 12.69 | 1.34 | 1.11 | .96 | 2.03 |
| 8264.56 | 12.69 | 1.37 | 1.00 | .96 | 2.04 |
| 8266.38 | 12.28 | 1.33 | 1.09 | .90 | 1.89 |
| 8267.35 | 12.22 | 1.35 | 1.04 | .92 | 1.93 |
| 8272.38 | 12.24 | 1.35 | 1.14 | .91 | 1.86 |
| | | LkCa-19 (HBC 426) | | | |
| 8212.61 | 10.90 | 1.02 | .60 | .59 | 1.16 |
| 8213.64 | 10.93 | 1.02 | .62 | .60 | 1.18 |
| 8214.55 | 10.83 | 1.03 | .61 | .58 | 1.14 |
| 8214.70 | 10.85 | 1.01 | .61 | .58 | 1.15 |
| 8215.58 | 10.95 | 1.03 | .58 | .61 | 1.19 |
| 8227.69 | 10.78 | 1.00 | .62 | .57 | 1.12 |
| 8227.72 | 10.81 | 1.00 | .63 | .58 | 1.14 |
| 8228.71 | 10.99 | 1.07 | .54 | .63 | 1.19 |
| 8230.68 | 10.94 | 1.06 | .67 | .59 | 1.16 |
| 8232.68 | 10.86 | 1.04 | .60 | .59 | 1.16 |
| 8232.72 | 10.89 | 1.00 | .63 | .61 | 1.18 |
| 8233.69 | 10.94 | 1.03 | .63 | .59 | 1.18 |
| 8252.46 | 10.90 | .95 | .64 | .66 | 1.20 |
| 8252.46 | 10.83 | .99 | .62 | .63 | 1.15 |
| 8259.55 | 10.90 | .99 | .66 | .63 | 1.17 |
| 8259.55 | 10.90 | 1.00 | .65 | .64 | 1.18 |
| 8260.46 | 10.95 | .99 | .62 | .64 | 1.22 |
| 8261.59 | 10.87 | 1.01 | .64 | .64 | 1.21 |
| 8261.59 | 10.87 | 1.01 | .66 | .63 | 1.19 |
| 8262.58 | 10.97 | 1.01 | .69 | .64 | 1.21 |
| 8262.58 | 10.97 | 1.02 | .67 | .64 | 1.21 |

**Table 1.** continued

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8263.60 | 10.82 | 1.00 | .61 | .62 | 1.17 |
| 8263.60 | 10.82 | .95 | .69 | .62 | 1.17 |
| 8264.62 | 11.01 | 1.01 | .67 | .65 | 1.25 |
| 8264.62 | 11.00 | 1.02 | .66 | .65 | 1.25 |
| 8267.54 | 10.86 | 1.00 | .68 | .57 | 1.14 |
| 8272.57 | 10.84 | 1.01 | .58 | .58 | 1.14 |
| LkCa-21 (HBC 382) | | | | | |
| 8212.44 | 13.45 | 1.57 | 1.01 | 1.16 | 2.48 |
| 8213.41 | 13.44 | 1.58 | 1.23 | 1.14 | 2.44 |
| 8214.37 | 13.40 | 1.59 | .98 | 1.11 | 2.37 |
| 8215.38 | 13.45 | 1.61 | 1.23 | 1.15 | 2.44 |
| 8223.69 | 13.42 | 1.68 | — | 1.03 | 2.45 |
| 8228.68 | 13.51 | 1.44 | — | 1.12 | 2.54 |
| 8228.73 | 13.60 | 1.46 | — | 1.13 | 2.59 |
| 8230.74 | 13.45 | 1.66 | — | 1.03 | 2.46 |
| 8232.71 | 13.42 | 1.72 | — | 1.04 | 2.48 |
| 8233.65 | 13.47 | 1.60 | — | 1.05 | 2.48 |
| 8233.72 | 13.50 | 1.60 | — | 1.09 | 2.50 |
| 8252.53 | 13.57 | 1.45 | 1.07 | 1.14 | 2.32 |
| 8252.53 | 13.52 | 1.59 | 1.38 | 1.13 | 2.29 |
| 8260.43 | 13.59 | — | — | 1.17 | 2.47 |
| 8260.43 | 13.46 | — | — | 1.09 | 2.34 |
| 8261.47 | 13.55 | — | — | 1.18 | 2.46 |
| 8261.47 | 13.52 | 1.42 | .84 | 1.12 | 2.39 |
| 8262.47 | 13.52 | 1.53 | 1.21 | 1.12 | 2.37 |
| 8262.48 | 13.53 | 1.53 | 1.12 | 1.13 | 2.39 |
| 8263.53 | 13.53 | 1.55 | 1.28 | 1.13 | 2.37 |
| 8263.53 | 13.50 | 1.49 | 1.12 | 1.12 | 2.36 |
| 8264.48 | 13.49 | 1.53 | 1.14 | 1.13 | 2.39 |
| 8264.48 | 13.49 | 1.56 | 1.28 | 1.13 | 2.43 |
| 8266.41 | 13.48 | 1.55 | 1.29 | 1.16 | 2.51 |
| 8267.37 | 13.40 | 1.65 | 1.18 | 1.21 | 2.56 |
| 8272.40 | 13.49 | 1.62 | 1.12 | 1.18 | 2.45 |
| TAP 9 (HBC 351) | | | | | |
| 8212.34 | 12.14 | 1.07 | .80 | .68 | 1.37 |
| 8213.34 | 12.20 | 1.09 | .72 | .69 | 1.38 |
| 8214.34 | 12.22 | 1.09 | .79 | .70 | 1.39 |
| 8215.34 | 12.17 | 1.09 | .81 | .68 | 1.37 |
| 8223.58 | 12.15 | 1.08 | — | .66 | 1.34 |
| 8223.71 | 12.20 | 1.10 | — | .68 | 1.35 |
| 8226.59 | 12.15 | 1.04 | .93 | .69 | 1.35 |
| 8227.70 | 12.19 | 1.04 | .83 | .68 | 1.39 |
| 8227.73 | 12.20 | 1.06 | .80 | .70 | 1.37 |

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8228.58 | 12.22 | 1.13 | .85 | .70 | 1.39 |
| 8230.61 | 12.22 | 1.14 | .79 | .67 | 1.37 |
| 8230.76 | 12.21 | 1.10 | .70 | .68 | 1.38 |
| 8232.60 | 12.16 | 1.10 | .71 | .67 | 1.37 |
| 8233.60 | 12.19 | 1.09 | .76 | .67 | 1.36 |
| 8252.47 | 12.19 | 1.07 | .71 | .70 | 1.31 |
| 8252.47 | 12.18 | 1.08 | .74 | .70 | 1.34 |
| 8256.50 | 12.18 | 1.10 | .77 | .70 | 1.33 |
| 8259.43 | 12.20 | .98 | .90 | .71 | 1.36 |
| 8259.43 | 12.18 | 1.07 | .69 | .71 | 1.35 |
| 8259.44 | 12.16 | 1.08 | .82 | .69 | 1.36 |
| 8259.44 | 12.18 | 1.06 | .69 | .71 | 1.36 |
| 8260.39 | 12.22 | 1.07 | .74 | .71 | 1.41 |
| 8260.39 | 12.19 | 1.08 | .77 | .71 | 1.39 |
| 8261.40 | 12.23 | 1.14 | .79 | .70 | 1.38 |
| 8262.39 | 12.18 | 1.06 | .78 | .70 | 1.35 |
| 8262.39 | 12.20 | 1.04 | .76 | .70 | 1.37 |
| 8263.38 | 12.19 | 1.07 | .75 | .69 | 1.35 |
| 8263.38 | 12.19 | 1.05 | .77 | .70 | 1.37 |
| 8264.38 | 12.23 | 1.12 | .76 | .70 | 1.38 |
| 8264.38 | 12.23 | 1.09 | .80 | .70 | 1.39 |
| 8266.34 | 12.19 | 1.06 | .80 | .65 | 1.32 |
| 8267.33 | 12.21 | 1.08 | .74 | .69 | 1.39 |
| 8272.32 | 12.18 | 1.06 | .74 | .68 | 1.35 |
| TAP 26 (HBC 376) | | | | | |
| 8212.40 | 12.21 | 1.11 | .92 | .70 | 1.37 |
| 8213.36 | 12.19 | 1.11 | .90 | .68 | 1.33 |
| 8214.35 | 12.23 | 1.13 | .92 | .70 | 1.34 |
| 8215.36 | 12.22 | 1.11 | .90 | .69 | 1.33 |
| 8223.75 | 12.26 | 1.11 | .85 | .70 | 1.32 |
| 8228.59 | 12.22 | 1.05 | 1.01 | .68 | 1.31 |
| 8228.76 | 12.25 | 1.17 | .86 | .71 | 1.36 |
| 8230.61 | 12.21 | 1.14 | .83 | .68 | 1.32 |
| 8232.76 | 12.20 | 1.10 | .89 | .70 | 1.34 |
| 8252.47 | 12.21 | 1.11 | .89 | .71 | 1.29 |
| 8252.47 | 12.21 | 1.10 | .84 | .70 | 1.32 |
| 8256.50 | 12.28 | 1.09 | — | .72 | 1.34 |
| 8256.59 | 12.30 | 1.07 | — | .71 | 1.29 |
| 8259.44 | 12.32 | — | — | .77 | 1.37 |
| 8259.45 | 12.29 | — | — | .71 | 1.22 |
| 8260.45 | 12.20 | 1.12 | .97 | .71 | 1.35 |
| 8260.45 | 12.18 | 1.11 | .80 | .69 | 1.33 |

**Table 1.** continued

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8261.52 | 12.26 | 1.12 | .70 | .71 | 1.38 |
| 8261.52 | 12.23 | 1.12 | .80 | .71 | 1.35 |
| 8262.44 | 12.20 | 1.07 | .91 | .70 | 1.32 |
| 8262.44 | 12.20 | 1.09 | .87 | .70 | 1.31 |
| 8263.43 | 12.19 | 1.11 | .89 | .69 | 1.31 |
| 8263.43 | 12.20 | 1.09 | .88 | .71 | 1.33 |
| 8264.45 | 12.24 | 1.10 | .89 | .71 | 1.35 |
| 8264.45 | 12.24 | 1.11 | .96 | .71 | 1.39 |
| 8266.53 | 12.26 | 1.10 | .90 | .67 | 1.33 |
| 8272.50 | 12.20 | 1.08 | .90 | .66 | 1.29 |

TAP 40 (HBC 392)

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8212.53 | 12.59 | 1.17 | .95 | .73 | 1.41 |
| 8213.51 | 12.55 | 1.17 | .96 | .72 | 1.39 |
| 8214.42 | 12.51 | 1.16 | .95 | .73 | 1.38 |
| 8215.50 | 12.58 | 1.15 | 1.00 | .73 | 1.39 |
| 8223.76 | 12.54 | 1.21 | .83 | .71 | 1.34 |
| 8227.64 | 12.54 | 1.09 | 1.18 | .74 | 1.40 |
| 8227.74 | 12.51 | 1.21 | .67 | .74 | 1.35 |
| 8228.59 | 12.52 | 1.23 | — | .70 | 1.33 |
| 8230.70 | 12.53 | 1.20 | .94 | .71 | 1.34 |
| 8230.79 | 12.52 | 1.18 | 1.17 | .71 | 1.38 |
| 8232.77 | 12.59 | 1.20 | 1.07 | .71 | 1.37 |
| 8233.76 | 12.54 | 1.16 | 1.10 | .72 | 1.36 |
| 8252.48 | 12.59 | 1.18 | 1.03 | .74 | 1.36 |
| 8252.48 | 12.58 | 1.20 | 1.11 | .75 | 1.38 |
| 8259.46 | 12.65 | 1.18 | .95 | .79 | 1.41 |
| 8260.45 | 12.60 | 1.22 | 1.21 | .73 | 1.43 |
| 8260.45 | 12.60 | 1.12 | .93 | .75 | 1.43 |
| 8261.54 | 12.52 | 1.19 | 1.01 | .75 | 1.39 |
| 8261.55 | 12.54 | 1.15 | .92 | .75 | 1.44 |
| 8262.48 | 12.53 | 1.17 | 1.03 | .72 | 1.38 |
| 8262.49 | 12.57 | 1.14 | 1.03 | .75 | 1.41 |
| 8263.50 | 12.63 | 1.14 | 1.05 | .75 | 1.40 |
| 8263.50 | 12.62 | 1.13 | 1.04 | .74 | 1.41 |
| 8264.46 | 12.52 | 1.16 | .97 | .73 | 1.40 |
| 8264.46 | 12.54 | 1.16 | .98 | .74 | 1.41 |
| 8266.51 | 12.59 | 1.17 | .94 | .69 | 1.36 |
| 8267.52 | 12.56 | 1.13 | 1.05 | .70 | 1.38 |
| 8272.48 | 12.56 | 1.16 | .96 | .71 | 1.36 |

TAP 41 (HBC 397)

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8212.53 | 12.10 | 1.22 | 1.01 | .76 | 1.48 |
| 8213.53 | 12.08 | 1.22 | 1.04 | .75 | 1.45 |
| 8214.42 | 12.07 | 1.21 | .99 | .75 | 1.44 |
| 8215.52 | 12.13 | 1.23 | 1.06 | .76 | 1.48 |
| 8223.60 | 12.10 | 1.24 | — | .73 | 1.43 |
| 8223.77 | 12.13 | 1.25 | .96 | .76 | 1.45 |
| 8227.64 | 12.15 | 1.14 | — | .79 | 1.48 |
| 8227.75 | 12.16 | 1.19 | 1.02 | .75 | 1.51 |
| 8228.59 | 12.11 | — | — | .75 | 1.47 |
| 8230.71 | 12.10 | 1.24 | 1.09 | .74 | 1.45 |
| 8230.79 | 12.10 | 1.26 | 1.02 | .74 | 1.46 |
| 8232.77 | 12.08 | 1.24 | 1.19 | .74 | 1.46 |
| 8233.76 | 12.09 | 1.23 | 1.06 | .75 | 1.45 |
| 8252.48 | 12.12 | 1.22 | 1.01 | .79 | 1.47 |
| 8252.48 | 12.14 | 1.18 | 1.10 | .78 | 1.46 |
| 8260.46 | 12.12 | 1.20 | 1.12 | .77 | 1.48 |
| 8260.46 | 12.11 | 1.19 | .93 | .77 | 1.48 |
| 8261.52 | 12.16 | 1.27 | 1.09 | .80 | 1.52 |
| 8261.52 | 12.17 | 1.24 | 1.11 | .80 | 1.52 |
| 8262.56 | 12.15 | 1.23 | 1.07 | .79 | 1.50 |
| 8262.56 | 12.14 | 1.23 | .98 | .77 | 1.47 |
| 8263.54 | 12.12 | 1.25 | 1.04 | .77 | 1.48 |
| 8263.54 | 12.13 | 1.19 | 1.00 | .77 | 1.47 |
| 8263.57 | 12.15 | 1.23 | 1.10 | .78 | 1.49 |
| 8264.46 | 12.07 | 1.22 | 1.05 | .77 | 1.48 |
| 8264.47 | 12.09 | 1.21 | 1.05 | .77 | 1.49 |
| 8266.51 | 12.13 | 1.24 | 1.09 | .74 | 1.46 |
| 8267.52 | 12.12 | 1.21 | .93 | .74 | 1.47 |
| 8272.49 | 12.11 | 1.19 | 1.04 | .75 | 1.43 |

TAP 57NW (HBC 427)

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8212.67 | 11.60 | 1.28 | 1.10 | .78 | 1.53 |
| 8213.66 | 11.55 | 1.26 | 1.06 | .77 | 1.52 |
| 8214.56 | 11.53 | 1.26 | 1.05 | .78 | 1.50 |
| 8214.71 | 11.56 | 1.25 | 1.08 | .78 | 1.51 |
| 8215.62 | 11.59 | 1.27 | 1.08 | .78 | 1.53 |
| 8215.70 | 11.61 | 1.25 | 1.07 | .78 | 1.54 |
| 8223.72 | 11.56 | 1.25 | 1.00 | .77 | 1.54 |
| 8226.69 | 11.60 | 1.26 | 1.24 | .82 | — |
| 8226.72 | 11.60 | 1.29 | 1.05 | .79 | — |
| 8227.70 | 11.55 | 1.27 | .97 | .77 | 1.51 |
| 8227.72 | 11.60 | 1.16 | .95 | .80 | 1.52 |
| 8230.69 | 11.62 | 1.29 | 1.13 | .77 | 1.53 |
| 8232.69 | 11.53 | 1.28 | 1.13 | .76 | 1.51 |
| 8232.73 | 11.54 | 1.29 | 1.10 | .77 | 1.53 |
| 8233.69 | 11.57 | 1.27 | 1.14 | .76 | 1.53 |

**Table 1.** continued

| Julian Date -2,400,000 | V | B-V | U-B | V-R | V-I |
|---|---|---|---|---|---|
| 8252.58 | 11.57 | 1.23 | 1.11 | .81 | 1.51 |
| 8252.59 | 11.56 | 1.23 | 1.15 | .81 | 1.50 |
| 8260.58 | 11.60 | 1.20 | 1.05 | .79 | 1.56 |
| 8260.58 | 11.53 | 1.28 | 1.10 | .78 | 1.51 |
| 8261.60 | 11.54 | 1.25 | 1.12 | .81 | 1.55 |
| 8261.60 | 11.53 | 1.25 | 1.08 | .80 | 1.54 |
| 8262.61 | 11.60 | 1.25 | 1.14 | .81 | 1.56 |
| 8262.62 | 11.58 | 1.26 | 1.10 | .80 | 1.55 |
| 8263.60 | 11.63 | 1.26 | 1.15 | .81 | 1.56 |
| 8263.60 | 11.60 | 1.28 | 1.10 | .80 | 1.54 |
| 8264.62 | 11.64 | 1.25 | 1.10 | .81 | 1.57 |
| 8264.62 | 11.63 | 1.25 | 1.06 | .81 | 1.59 |
| 8267.58 | 11.64 | 1.28 | 1.16 | .80 | 1.57 |

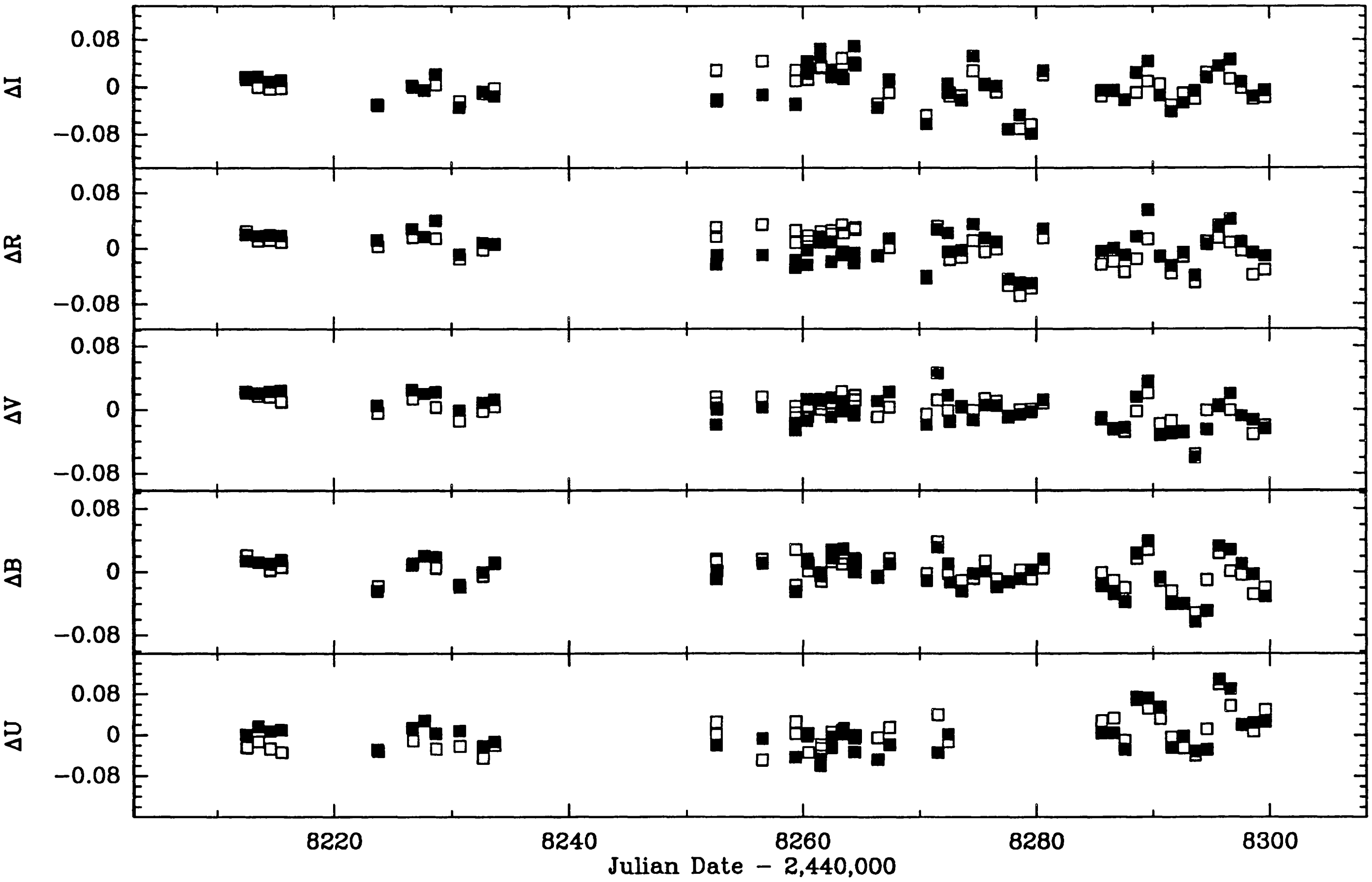


**Fig. 1.** COYOTES light curves of the two comparison stars: BD+23°565 (filled squares) and BD+24°659 (empty squares)

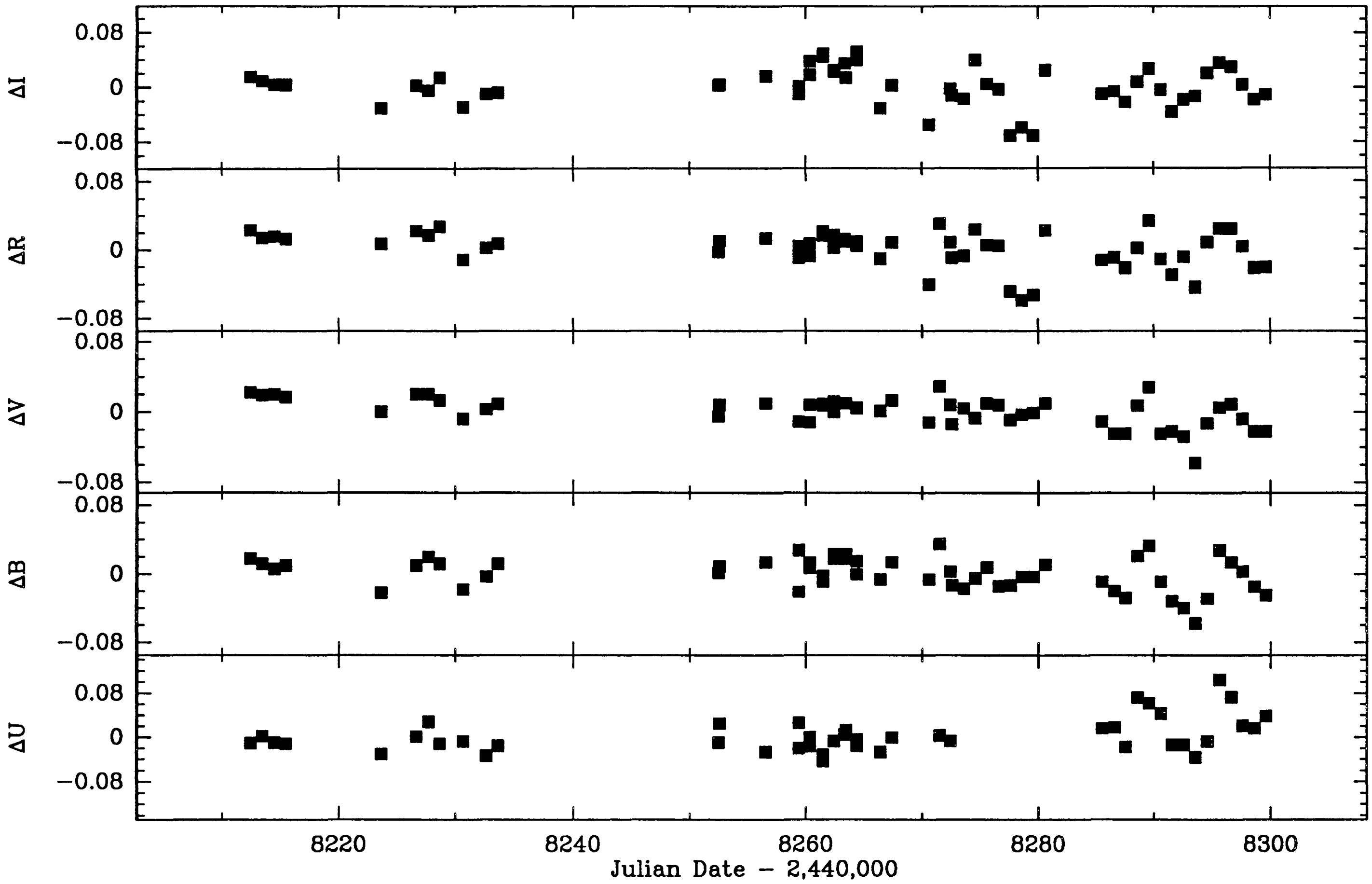


**Fig. 2.** COYOTES "zero-point" light curve (see text)