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6 IOTA TRIANGULI: A NEW VARIABLE STAR

The bright star 6 iota Trianguli is the visual binary ADS 1697. The brighter component ($V = 5^{m}.5$) is an SB2 of spectral type G5 III and orbital period $14^{d}.732$. The fainter component ($V = 6^{m}.7$), about 4 arcseconds away, is also an SB2, of spectral type F5 V and orbital period $2^{d}.2365$. Because the former is a known RS CVn binary (Young and Koniges 1977), we obtained photoelectric photometry to see if it showed the $\sim 0^{m}.1$ distortion wave characteristic of so many binaries of this type. We did find 6 iota Tri varying by about $0^{m}.05$ but probably due to the combined effect of ellipticity and differential reflection.

We observed 6 iota Tri differentially with respect to the comparison star HD 14373 on a total of 34 nights from 2,443,741.8 to 2,444,256.7 at four different observatories. Needless to say, we all included both components of ADS 1697 in our photometry. The individual differential observations, generally three on each night, were corrected for differential atmospheric extinction with mean extinction coefficients and transformed to V of the UBV system with known transformation coefficients and a mean color difference of $\Delta(B-V) = -0^{m}.42$. Here and elsewhere Δ is in the sense variable minus comparison.

The ΔV magnitudes plotted versus phase, computed with the spectroscopically determined orbital period $14^{d}.732$ of Harper (1921), showed two maxima, of roughly equal height, and two minima, of discernably unequal depth. This suggested we might be seeing a superposition of the ellipticity effect and either the differential reflection effect or a distortion wave. Although the value $14^{d}.732$ was sufficiently precise to use for the 1.4-year span of our observations, it was not sufficiently precise to carry the initial epoch of Harper forward from 1919 to the present. Therefore we used Fourier analysis to determine the phases of the two conjunctions, as indicated by the coefficients of the terms in 2θ. At this point we were not certain whether the terms in θ were produced by the differential reflection effect or by a distortion wave. We are persuaded to believe reflection was responsible, because the terms in θ place their minimum very near one of the two conjunctions, not at a random phase somewhere between. Assuming reflection is the agent, we selected the conjunction at the deeper minimum as the conjunction with the hotter star behind. The time of this conjunction (we chose the one just before our observations began in 1978) is $2,443,729.8 \pm 0^{d}.3$.

Then we redid the Fourier analysis, expressing the light as

$$1 = A_0 + A_1 \cos\theta + A_2 \cos 2\theta + B_1 \sin\theta \ ,$$

where unit light corresponds to $\Delta V = -1^{m}.550$ and phase angle is computed with our new ephemeris for conjunction

$$JD = 2,443,729.8 + 14^{d}.732\ n \ .$$

The resulting coefficients are $A_0 = 1.001 \pm 0.001$, $A_1 = -0.016 \pm 0.002$, $A_2 = -0.014 \pm 0.002$, and $B_1 = +0.007 \pm 0.002$. If the A_1 and B_1 coefficients were attributed to a distortion wave, then its full amplitude would be $\Delta V = 0^{m}.037 \pm 0^{m}.004$ and its minimum would occur at $0^{P}.94 \pm 0^{P}.02$. We are, however, believing that this minimum so close to conjunction (which itself is uncertain by $\pm\ 0^{P}.02$) probably results from differential reflection.

Work on 6 iota Tri is not finished. The light curve should be redetermined to see if the minimum given by terms in θ remains near conjunction (confirming reflection effect) or migrates to a different phase (indicating distortion wave). A later determination of a time of conjunction, either photometrically as we have done or spectroscopically as Harper did, is needed to refine the orbital period. Because residuals from our Fourier fit, when plotted versus Julian date, gave a hint of systematic secular variations in light on a time scale of $\sim$100 days, future photometry should include secure observations of a check star, something we confess not having done.

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