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DELTA ERIDANI: A VERY BRIGHT NEW VARIABLE STAR

This is a very bright star ($V = 3^m.5$) in which Wilson (1963) reported Ca II H and K emission of intensity 1 on his 1-to-5 scale and which Keenan and Pitts (1980) recently classified KO+ IV. Examining the catalogue of Abt and Biggs (1972) and a few others we noted that published radial velocity measures seem to indicate a variation somewhat larger than can be accounted for by the expected uncertainties. These three facts made us suspect delta Eridani might be an RS CVn-type binary and therefore might be photometrically variable, as are most members of that class. The Fourth Edition of the Yale Bright Star Catalogue notes delta Eridani as "VAR?" but with no accompanying bibliographic reference.

Henry observed delta Eridani photoelectrically on 13 nights with the No. 4 16-inch at Kitt Peak National Observatory and on 4 nights with the 24-inch at Dyer Observatory; Renner observed on 9 nights with the 10-inch at Scuppernong Observatory; Fisher observed on 7 nights with his 12.5-inch in San Antonio, Texas; and Landis observed on 6 nights with his 8-inch in Locust Grove, Georgia. All observers used epsilon Eridani as the comparison star, obtained 2 or 3 differential measures on each night, corrected for extinction, and transformed to V of the UBV system.

Examination of our photometry showed that delta Eridani is variable with an amplitude of about $0^m.02$ and a period of about 10 days. The figure below is a plot of nightly means of the ΔV values from Kitt Peak, where Δ is in the sense variable minus comparison. A bit more than one complete cycle seems to be defined. The other observations, spread out over longer intervals of time and/or somewhat lower in accuracy, do not define this small-amplitude variation as well but are consistent with a total range of about $0^m.02$.

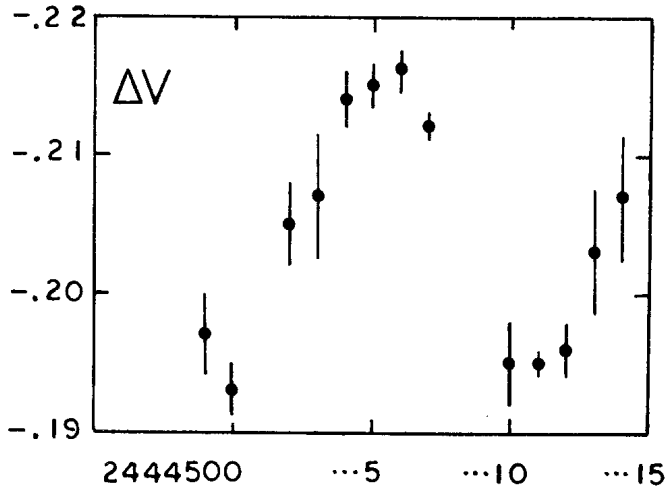

Figure 1

In the RS CVn binaries the period of any slow light variation (not attributable to eclipse, ellipticity, or reflection) is taken to be a measure of the rotation period of one star presumed to be darkened unevenly with starspots. Moreover, in all known RS CVn binaries except one (lambda Andromedae) the rotation is synchronous with the orbital motion to within a few percent (Hall 1981). Therefore we argue that, if delta Eridani indeed is a binary system, the orbital period should be around 10 days also. Spectroscopic observers will enjoy obtaining spectrograms of this bright star to check our prediction. The total radial velocity variation might, however, be quite small because of the small orbital inclination. A KO subgiant with a radius of 5 $R_\odot$ and a rotation period of 10 days would have an equatorial velocity of 25 km/sec. The value of V sin i = 2.2 km/sec measured by Smith (1979) therefore would imply an orbital inclination of only $i = 5^\circ$. An inclination this small could, we point out, help explain why the light variation in delta Eridani is so small in amplitude.

If delta Eridani proves to be a binary, it will be the second brightest RS CVn binary known, with only alpha Aurigae being brighter.

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