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ANOTHER OPINION ON THE VARIABILITY OF TAU Cas

The bright star Tau Cas (HR 9008 = HD 223165; K1 IIIa) has been suspected to be a light and radial velocity variable. Commonly used as a comparison star for the variable supergiant star Rho Cas, Tau Cas has generated controversy insofar as light variations have been claimed by some observers, but not seen by others. The star is listed in the New Catalogue of Suspected Variable Stars (Kholopov et al., 1982) with a possible amplitude of 0.3 magnitudes in an unspecified color system. With this possible variation in mind, the British Astronomical Society's Variable Star Section has recommended against its usage as a comparison for Rho Cas, though the AAVSO continues to allow this. Percy (1985) has examined the history of claims of variability for Tau Cas, added some observations of his own, and has argued persuasively that there is no compelling evidence to believe that the star varies in either radial velocity or light output over any range larger than several hundredths of a magnitude. Recently, Leiker and Hoff (1988) and Leiker, Hoff and Tuttle (1989) have published observations of their own which they interpret to mean that Tau Cas is subject to a small degree of variability.

In an attempt to add some illumination to this question, the author has examined the observations of Tau Cas obtained at the Corralitos Observatory over the past three years in conjunction with the primary project of observing Rho Cas. All data was taken with Observatory's 0.6-m. telescope and single channel photon-counting photometer, utilizing an ambient temperature EMI 9924A photomultiplier tube. As a comparison star for both Tau and Rho Cas, HR 9010 (HD 223173; K3 IIb; $V = 5.51$; $B-V = +1.65$) was used. It should be noted that this is the same star used by Percy and Leiker et al. Forty-three values for V and $B-V$ were obtained for Tau Cas. These are displayed in Table I and graphically in Figure 1. Also, Figure 1 superimposes those magnitudes published by Leiker and Hoff and Leiker, Hoff and Tuttle which correspond to nearly simultaneous observation by their group and the Corralitos.

Initially, a superficial examination of the diagram would seem to lend strength to the argument that Tau Cas is a variable star, particularly in

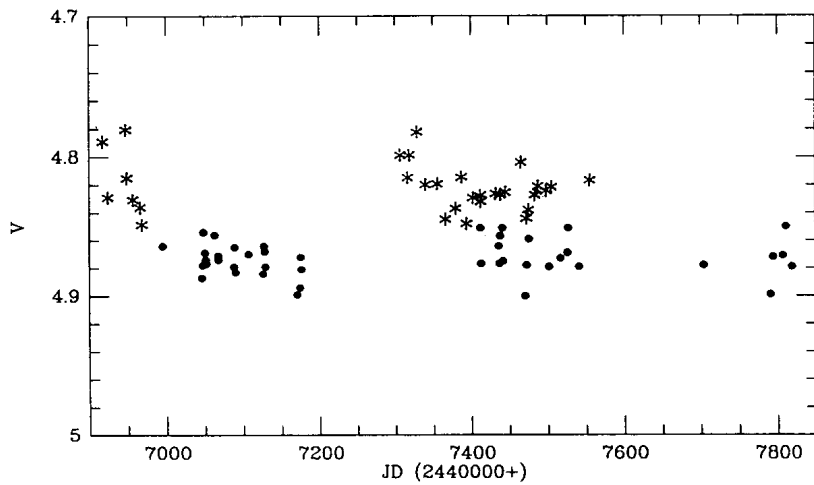


Figure 1 Magnitudes for Tau Cas. Asterisks represent those of Leiker and Hoff, filled circles those of Halbedel.

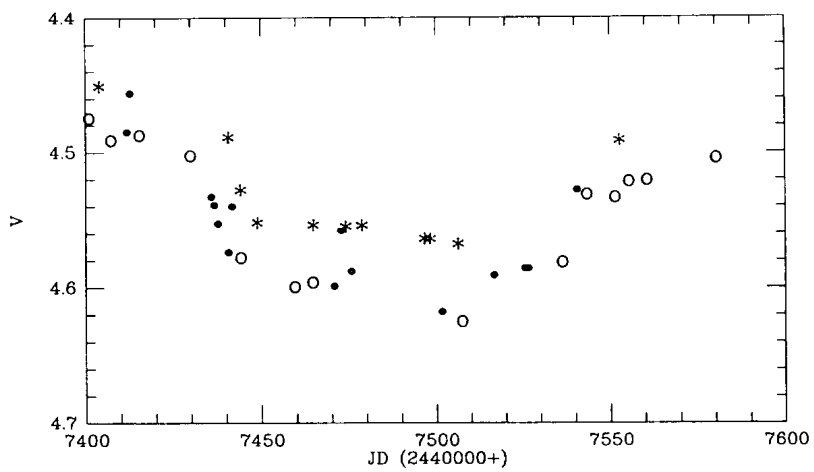


Figure 2 Magnitudes for Rho Cas. Asterisks represent those of Leiker and Hoff, open circles those of Milton, and filled circles those of Halbedel.

Table I

Julian Date (2440000 +)	V	B-V	Julian Date (2440000 +)	V	B-V
6994.9388	4.864	+1.072	7411.9007	4.851	+1.089
7045.8541	4.887	1.106	7412.7889	4.877	1.102
7046.8291	4.878	1.102	7435.8792	4.864	1.104
7047.8236	4.854	1.103	7436.7507	4.877	1.096
7049.7556	4.869	1.071	7437.7208	4.857	1.116
7050.8486	4.874	1.086	7440.7646	4.851	1.093
7051.7069	4.877	1.070	7441.7257	4.875	1.102
7062.8014	4.856	1.096	7470.6993	4.900	1.075
7066.7938	4.871	1.094	7472.6931	4.878	1.115
7067.6924	4.874	1.093	7475.6604	4.859	1.103
7087.8312	4.879	1.089	7501.6861	4.879	1.134
7088.7785	4.865	1.095	7516.6187	4.873	1.133
7089.6299	4.883	1.100	7525.6194	4.869	1.116
7106.7076	4.870	1.103	7526.6076	4.851	1.124
7125.6986	4.884	1.097	7540.5903	4.879	1.103
7126.6313	4.864	1.075	7703.9146	4.878	1.100
7127.6472	4.868	1.096	7790.7653	4.899	1.101
7128.6264	4.879	1.092	7793.8264	4.872	1.102
7170.6160	4.899	1.070	7806.7792	4.871	1.084
7173.6062	4.894	1.084	7810.7458	4.850	1.090
7174.5840	4.872	1.094	7818.7514	4.879	1.086
7175.5917	4.881	1.090			

MEAN V = 4.873 SE = 0.013 MEAN B-V = +1.096 SE = 0.015

the first observing season when the Leiker and Hoff magnitudes suggest a brightening early in the season and later are consistently brighter than those from the Corralitos. However, this trend continues in the second season and leads this investigator to conclude that it results from a difference in the color transformations or magnitude zero points between the two observatories. In order to investigate this idea further, same season values for Rho Cas made at the Corralitos were plotted against the previously published magnitudes by Leiker, Hoff and Milton (1989). Graphically, these appear in Figure 2. It can be seen that the Corralitos values are in substantial agreement with those of Milton, but that the Leiker and Hoff magnitudes are once again consistently brighter than those from the other two sources. Therefore, it would seem reasonable to conclude that their brighter magnitudes for Tau Cas probably do not reflect variability as such when integrated into a uniform data set with the Corralitos observations.

Working now solely from the Corralitos data, this author concludes that from those observations alone, Tau Cas has shown no variability over the time period JD 2446994 - 7818, in agreement with Percy's analysis. The mean magnitude of 4.873 is in accord with the published value of $V = 4.87$ for the star in the Bright Star Catalogue, and its standard error of 0.013 is consistent with the accuracies found for other stars with the Corralitos telescope - photometer system. While certainly not ruling out the possibility of variability for Tau Cas on a lower level than can be observed with the Corralitos system or at times other than when it was observed there, this author considers that the star is essentially constant and hence, will continue to use it as a comparison for Rho Cas in the future.

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