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PHOTOMETRY OF ALPHA Ori (SEP 1988 TO APR 1990) AND A REASSESSMENT OF SOME PREVIOUSLY PUBLISHED DATA

We present photometry of alpha Ori (Betelgeuse), carried out differentially with respect to phi-2 Ori (V = 4.09, B-V = 0.95). The data were obtained using a 15-cm f/5.82 reflector and photometer employing an RCA 931A photomultiplier tube, operated at -1050 volts, and standard UBV filters. Other recent data are published by Krisciunas (1986) and Krisciunas and Fisher (1988), which we shall refer to as Paper I and Paper II.

In Table I we give the local date at sunset/UT date, the mean Universal Time of the observations, the geocentric Julian Date, the mean observed V magnitude and B-V color, and the numbers of differential v and b-v observations made. Differential extinction corrections were calculated with measured values of extinction when the stars were at high air mass and either measured or mean extinction values when the stars were high in the sky. On two of the nights (JD's 2447879 and 7880) the data were obtained at a site at elevation 75-m, 25 km south-southeast of Hilo. All other data were obtained at the 2800-m level of Mauna Kea. The mean V-band extinction at the 2800-m level is k_v = 0.18 mag/air mass. The mean reddening coefficients are k'_{bv} = 0.11, k''_{bv} = -0.07.

The coefficients for transformation to the UBV system were obtained from all-sky observations of UBV standards, and also from differential photometry of 27 and 28 LMi, for which Δ V = 0.378, Δ (B-V) = -1.03. Observations of 27 and 28 LMi from March 1986 through March 1990 give a mean V-band transformation coefficient of ε_v = -0.054 $\pm$ 0.003. All-sky results give ε_v = -0.062 $\pm$ 0.005. The mean B-V transformation coefficient is μ = 0.94.

In Fig. 1 we present the data of Table I. The check star was gamma Ori. From JD 2447415 to 7574 for gamma Ori we find < V > = 1.614, and from JD 2447599 to 7978 we find < V > = 1.647. The variations of about 0.08 mag in V for gamma Ori (see Paper II) are not confirmed.

In Paper II we mentioned that data of Fisher was 0.153 mag fainter

Table I

Photometry of alpha Ori (comp star phi-2 Ori)

Date	<UT>	Julian Date	V		B-V	n_V	n_{bv}
9/10 Sep 1988	1344	2447415.07	0.739	0.010	1.862	4	1
12/13 Nov 1988	0940	7478.90	0.757	0.009	1.893	3	1
1/2 Dec 1988	0851	7497.87	0.810	0.012	1.908	3	1
10/11 Dec 1988	0831	7506.85	0.838	0.007	1.865	3	1
16/17 Feb 1989	0647	7574.78	1.003	0.008		3	
13/14 Mar 1989	0806	7599.84	0.931	0.007		3	
25/26 Mar 1989	0717	7611.80	0.846	0.005		2	
3/4 Sep 1989	1430	7774.10	0.702	0.027		3	
11/12 Sep 1989	1446	7782.12	0.732	0.008	1.852	3	1
20/21 Sep 1989	1353	7791.08	0.723	0.015		3	
8/9 Nov 1989	1012	7839.93	0.831	0.010	1.832	3	1
4/5 Dec 1989	0824	7865.85	0.750	0.008		3	
18/19 Dec 1989	0726	7879.81	0.689	0.013		3	
19/20 Dec 1989	0831	7880.85	0.630	0.037		2	
11/12 Feb 1990	0729	7934.81	0.574	0.008		2	
20/21 Mar 1990	0654	7971.79	0.550	0.013		3	
27/28 Mar 1990	0746	7978.82	0.590	0.015		4	
17/18 Apr 1990	0620	7999.76	0.606	0.006		3	

than data presented in Paper I which was obtained during the same months by Krisciunas. This was due in part to a systematic error in Krisciunas' gain table of 0.057 mag (Paper II). I believe that the rest of the discrepancy is due to a systematic error in the adopted value of ε_V used to reduce the data from JD's 2446379 to 6533. ε_V = -0.094 had been used, a value obtained from all-sky measurements. However, ε_V = -0.052 was also obtained on 8/9 March 1986 from differential measurements of 27 and 28 LMi, which is close to the long-term average of -0.054 found from that pair. The data from Paper I from JD's 2446379 to 6533 may then be systematically in error by (-0.094) - (-0.054) = 0.040 times Δ(B-V) = 2.061 (the color difference of alpha Ori minus gamma Ori from Paper II), or an additional 0.082 mag. We give in Fig. 2 the data from September 1982 to April 1986, reduced differentially with respect to gamma Ori, using ε_V = -0.054 for all nights, and using our updated gain table. Fisher's data from Paper II are also shown in Fig. 2. The agreement is now very good.

In Paper I and previously published papers we reduced the alpha Ori data using gamma Ori as the comparison star. The great difference in color of these two stars leaves open the possibility of large systematic errors in the results owing to any error in the transformation coefficient. Using

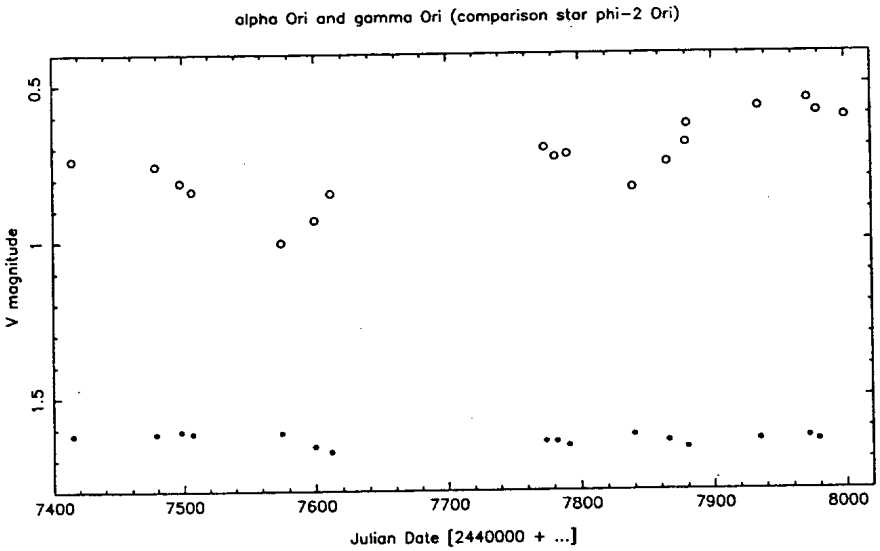

Figure 1. Photometry of alpha Ori (open circles) and gamma Ori (large dots). Comparison star was phi-2 Ori.

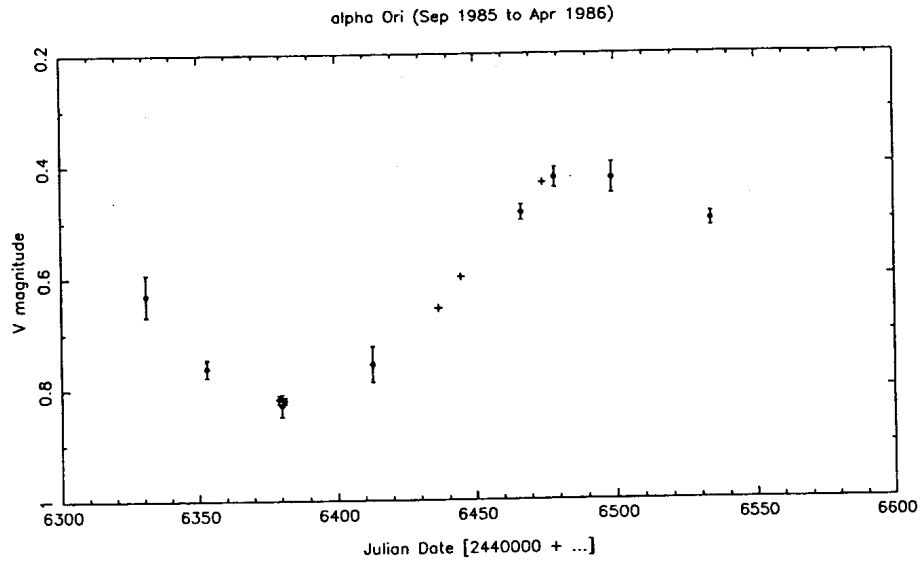

Figure 2. Dots: photometry of alpha Ori reduced with respect to gamma Ori. Pluses: data of Fisher from Paper II (reduced with respect to phi-2 Ori).

phi-2 Ori as the comparison star, as was done in Paper II and here, cuts any such systematic error in half.

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