

JHKL PHOTOMETRY OF 145 SOUTHERN STARS

I. S. Glass

This is the first report on a programme of JHKL photometry of Southern stars which has been under way since January 1972 using the photometer and filters described by Glass (1973). Its object has been to set up a network of standard stars in the Southern Hemisphere tied in to the Johnson system in the Northern. For the most part, Southerly non-variable stars from the lists of Johnson et al. (1966) were selected together with others from Cousins and Stoy (1963). Most of the observations were made using the 18-inch reflector in Cape Town but L measurements were made on 3 nights with the 40-inch in Sutherland and JHKL on one with the 20-inch.

The procedure was to observe the stars at about 40° from the zenith (1.3 air masses) in order to avoid large corrections for extinction. On most of the nights all the observations were made on one side of the meridian because of limitations imposed by the mounting of the 18-inch. Each night was usually standardised by observing about 20 stars from Johnson et al. at J, H & K. The H magnitudes of these were obtained from the formula $H = 0.19J + 0.81K$ in accordance with measurements made by Becklin (private communication) and the author. Reduction was performed individually for each waveband rather than by colours. The L results were generally less well standardized due to the smaller number of stars measured by Johnson et al. at this wavelength and to the poorer quality of these measurements.

The results, given in Table I, were obtained by averaging the magnitudes obtained for each star on the various nights when it was observed. Certain nights were rejected completely or given low weights.

The L measures are less reliable than those of J, H & K. The errors for stars measured 3 or 4 times should not normally exceed $0^m.05$ for L or $0^m.02$ for J, H & K. The K magnitudes as measured by Johnson et al. and by this author have an r.m.s. difference of $+0^m.03$. The colour zero points as determined by plotting J-K and H-K against B-V for main sequence stars are about $0^m.01$ too high numerically in each case. The K-L colours are more scattered and appear to be about $0^m.03$ more negative than they should be. However it is not justifiable to alter the system at this stage since these differences may turn out to be artificial (e.g. selection effects may play a significant role).

* Received 14 March 1974; accepted 1 April 1974.

TABLE I

JHKL MEASURES OF 145 SOUTHERN STARS

BS	RA			DEC			V	J	H	K	L	wt
	1975.00							1.2 μ	1.6 μ	2.2 μ	3.4 μ	
3	0	4	3.3	- 5	50	50	4.61	2.87	2.31	2.20	2.17	2
25	0	8	8.7	-45	53	6	3.87	2.18	1.68	1.56	1.44	3
33	0	9	59.7	-15	36	12	4.88	3.94	3.70	3.65		2
74	0	18	9.2	- 8	57	4	3.55	1.66	1.07	0.92	0.80VR	2
77	0	18	46.3	-65	1	19	4.22	3.17	2.87	2.78	2.75	2
98	0	24	26.8	-77	23	42	2.80	1.72	1.40	1.32	1.30	2
180	0	40	8.7	-46	13	19	4.59	2.95	2.46	3.34	2.36	2
188	0	42	20.0	-18	7	25	2.04	0.39	-0.10	-0.23	-0.38	2
322	1	4	58.2	-46	51	8	3.31	1.81	1.37	1.26	1.17	3
334	1	7	19.8	-10	18	51	3.44	1.60	1.05	0.89		2
434	1	27	36.7	-10	18	52	4.44	2.13	1.44	1.27	1.12	2
434	1	27	36.7	-10	18	52	4.44	2.13	1.44	1.27	1.12	2
434	1	28	48.3	-10	11	26	4.84	2.45	1.71	1.56	1.43	2
472	1	36	47.0	-57	21	8	0.47	0.79	0.86	0.88	0.95	4
489	1	40	7.6	5	21	42	4.44	2.13	1.44	1.27	1.12	2
539	1	50	13.5	-10	27	29	3.73	1.91	1.36	1.22	1.12	3
585	1	58	49.5	-21	11	54	3.99	1.12	0.30	0.10	-0.01	3
591	1	57	58.9	-61	41	27	2.87	2.28	2.16	2.09	2.08	2
612	2	3	22.2	-29	24	58	4.69	4.99	5.07	5.12		1
740	2	30	54.1	-15	21	9	4.74	3.88	3.65	3.62	3.64	1
818	2	43	56.1	-18	40	8	4.46	3.59	3.38	3.32	3.38	3
841	2	48	2.6	-32	30	37	4.46	2.73	2.26	2.13	2.12	3
850	2	49	54.2	-21	6	2	4.76	3.22	2.77	2.68	2.64	3
874	2	55	12.2	- 8	59	48	3.89	2.07	1.50	1.38	1.31	3
911	3	0	58.2	3	59	3	2.52	-0.57	-1.39	-1.63	-1.87VR	2
1008	3	18	55.5	-43	9	53	4.26	2.95	2.59	2.52	2.46	4
1084	3	31	45.0	- 9	32	0	3.73	2.20	1.75	1.65	1.61	4
1136	3	42	2.9	- 9	50	9	3.52	1.99	1.53	1.45	1.41	4
1208	3	47	36.6	-74	18	58	3.24	0.17	-0.65	-0.87	-1.05	2
1231	3	56	51.7	-13	34	42	2.96	0.10	-0.72	-0.92	-1.02	7
1318	4	13	12.2	-10	18	8	4.86	2.97	2.39	2.28	2.19	4
1326	4	13	10.3	-42	21	18	3.85	2.03	1.46	1.36	1.30	4
1336	4	14	6.0	-62	32	10	3.34	1.87	1.42	1.32	1.32	6
1453	4	32	31.7	-29	48	8	4.51	2.85	2.30	2.20	2.21	3
1464	4	34	34.6	-30	36	5	3.81	2.24	1.77	1.68	1.62	4

BS	RA			DEC			V	J	H	K	L	wt
			1975.00					1.2μ	1.6μ	2.2μ	3.4μ	
1543	4	48	28.8	6	55	7	3.19	2.35	2.15	2.07	2.05	3
1654	5	4	24.1	-22	24	12	3.19	0.71	-0.02	-0.21	-0.27	3
1865	5	31	37.6	-17	50	20	2.57	2.03	1.92	1.85	1.82	2
1948	5	39	29.7	-1	57	6	1.77	2.20	2.27	2.31	2.33	6
1983	5	43	25.2	-22	27	19	3.58	2.69	2.47	2.42	2.40	4
2015	5	44	43.6	-65	44	41	4.34	3.85	3.75	3.71	1.82	3
2020	5	46	41.5	-51	4	9	3.85	3.55	3.51	3.47	3.49	2
2085	5	55	15.9	-14	10	16	3.71	3.08	2.94	2.90	2.92	4
2227	6	13	38.1	-6	15	57	3.98	1.84	1.19	1.02	0.96	2
2294	6	21	35.8	-17	56	32	1.98	2.53	2.62	2.65		3
2326	6	23	23.8	-52	40	52	-0.73	-1.15	-1.24	-1.30	-1.35	2
2421	6	36	16.0	16	25	8	1.92	1.91	1.89	1.89	2.06	2
2429	6	35	35.6	-19	14	1	3.96	2.25	1.74	1.61	1.57	2
2451	6	36	59.7	-43	10	24	3.17	3.30	3.37	3.38		2
2491	6	44	2.8	-16	40	50	-1.42	-1.34	-1.32	-1.35	-1.36	3
2574	6	53	1.6	-12	0	22	4.07	1.59	0.82	0.66	0.57	3
2646	7	0	43.4	-27	53	53	3.47	0.53	-0.26	-0.50	-0.68	VR 3
2693	7	7	22.4	-26	21	8	1.83	0.75	0.50	0.40	0.32	4
2701	7	8	59.1	-4	11	54	4.91	3.18	2.64	2.53	2.47	3
2749	7	13	47.8	-26	43	42	3.9	4.17	4.12	3.99		VR 3
2773	7	16	15.5	-37	3	6	2.70	-0.09	-0.86	-1.08	-1.22	2
2803	7	16	50.8	-67	54	41	3.98	2.75	2.42	2.34	2.26	1
2845	7	25	47.7	8	20	26	2.89	3.00	3.04	3.04		2
2854	7	26	48.1	8	58	8	4.32	1.84	1.07	0.91		3
2943	7	37	59.6	5	17	24	0.37	-0.40	-0.60	-0.65	-0.68	4
2970	7	40	3.1	-9	29	0	3.93	2.28	1.77	1.63	1.59	1
2993	7	42	31.8	-28	21	2	4.58	1.73	0.96	0.75		2
3045	7	48	14.5	-24	47	45	3.35	1.52	1.03	0.90		3
3314	8	24	24.6	-3	49	25	3.90	3.93	3.92	3.92	3.95	2
3484	8	45	11.6	-13	27	0	4.31	2.80	2.33	2.24	2.16	4
3614	9	3	17.4	-46	59	51	3.75	1.90	1.33	1.19	1.07	2
3685	9	12	56.0	-69	36	0	1.67	1.55	1.56	1.53	1.53	2
3699	9	16	25.2	-59	10	11	2.25	1.72	1.63	1.56	1.50	2
3718	9	20	23.1	-25	51	29	4.72	1.63	0.78	0.57	0.41	3
3842	9	37	2.6	-43	4	8	5.49	3.95	3.49	3.38		2
3871	9	43	5.1	-27	39	16	4.78	3.71	3.35	3.23	3.19	3
3903	9	50	16.4	-14	43	42	4.11	2.59	2.13	2.03	1.97	2
3982	10	7	2.5	12	5	3	1.35	1.57	1.61	1.62		2
3994	10	9	22.1	-12	13	47	3.61	1.99	1.51	1.40	1.38	2
4094	10	24	52.8	-16	42	29	3.82	1.31	0.56	0.39	0.27	2

BS	RA			DEC			V	J	H	K	L	wt
	1975.00							1.2μ	1.6μ	2.2μ	3.4μ	
4102	10	23	54.3	-73	54	14	3.99	3.31	3.16	3.12		2
4232	10	48	23.4	-16	3	44	3.11	1.06	0.42	0.27	0.17	3
4257	10	52	28.2	-58	43	13	3.78	2.19	1.70	1.60	1.54	2
4357	11	12	46.8	20	39	38	2.55	2.33	2.27	2.27	2.29	1
4382	11	18	5.3	-14	38	34	3.56	1.67	1.07	0.94	0.85	3
4450	11	31	46.1	-31	43	8	3.54	2.01	1.58	1.44	1.39	3
4517	11	44	34.4	6	40	15	4.02	1.13	0.29	0.09	-0.06	3
4520	11	44	25.2	-66	35	24	3.63	3.36	3.31	3.28	3.22	3
4630	12	8	50.1	-22	28	50	3.00	0.95	0.31	0.15	0.02	3
4638	12	10	20.2	-52	13	46	3.96	4.34	4.41	4.47	4.48	1
4662	12	14	31.0	-17	24	1	2.59	2.79	2.83	2.83	2.76	3
4695	12	19	5.1	3	27	7	4.96	2.96	2.32	2.20	2.09	4
4757	12	28	34.4	-16	22	31	2.95	3.06	3.08	3.05	3.03	1
4773	12	30	57.2	-71	59	42	3.85	4.21	4.28	4.37		3
4786	12	33	4.2	-23	15	30	2.65	1.23	0.81	0.70	0.63	3
4802	12	36	19.7	-48	24	4	3.86	3.75	3.75	3.71	3.68	1
4825	12	40	23.4	-	1	18 44	2.74	2.05	1.90	1.85	1.84	1
4853	12	46	14.9	-59	33	7	1.25	1.80	1.92	1.99	2.06VR	1
4902	12	53	2.9	-	9	24 11	4.8	1.35	0.47	0.22	0.00VR	1
4952	13	6	29.2	-65	10	21	5.50	5.51	5.41	5.34		1
4989	13	12	42.0	-58	58	7	4.91	4.01	3.75	3.66	3.60	2
5020	13	17	33.5	-23	2	23	2.99	1.54	1.09	0.99	0.90	4
5028	13	19	11.1	-36	34	0	2.75	2.74	2.75	2.73	2.68	2
5132	13	38	17.6	-53	20	23	2.30	2.85	2.95	3.01	3.01	3
5249	13	57	7.6	-44	40	56	3.86	4.37	4.48	4.52	4.46	3
5287	14	4	56.5	-26	33	6	3.26	1.42	0.84	0.72	0.60	4
5288	14	5	12.2	-36	14	51	2.07	0.43	-0.09	-0.20	-0.33	2
5315	14	11	33.5	-10	9	9	4.18	1.90	1.18	1.04	0.90	2
5487	14	41	44.3	-	5	33 1	3.87	3.10	2.94	2.90	2.80	2
5531	14	49	29.5	-15	56	19	2.75	2.50	2.45	2.41	2.35	4
5649	15	10	28.7	-52	0	18	3.41	1.91	1.45	1.34	1.25	3
5685	15	15	39.5	-	9	17 0	2.61	2.78	2.83	2.85	2.85	1
5787	15	34	7.4	-14	42	6	3.91	2.20	1.65	1.55	1.44	2
5897	16	4	56.7	-36	44	8	4.21	2.30	2.17	2.12	2.06	3
6056	16	13	1.9	-	3	37 52	2.72	-0.18	-0.97	-1.19	-1.41	3
6147	16	29	42.2	-16	33	34	4.28	2.80	2.37	2.26	2.19	4
6241	16	48	32.4	-34	14	57	2.29	0.49	-0.08	-0.23	-0.34	3
6378	17	8	56.5	-15	41	43	2.43	2.31	2.30	2.27	2.31	3
6461	17	23	13.0	-55	30	29	2.84	0.58	-0.04	-0.22	-0.44	4
6630	17	48	9.2	-37	2	13	3.19	1.26	0.67	0.54	0.38	3

BS	RA			DEC			V	J	H	K	L	wt
	1975.00							1.2μ	1.6μ	2.2μ	3.4μ	
6698	17	57	38.9	- 9	46	9	3.34	1.74	1.28	1.16	1.05	2
6746	18	4	12.0	-30	25	33	2.98	1.31	0.79	0.68	0.55	2
6879	18	22	30.6	-34	23	3	1.83	1.77	1.79	1.75	1.71	4
6913	18	26	25.5	-25	26	2	2.84	1.09	0.55	0.43	0.32	3
6973	18	33	50.7	- 8	15	46	3.85	1.67	1.01	0.85	0.73	4
7120	18	53	36.2	-22	42	3	4.98	2.83	2.18	2.03	1.89	5
7150	18	56	14.3	-21	08	27	3.51	1.64	1.08	0.95	0.83	4
7193	19	0	20.6	- 5	46	31	4.02	2.21	1.65	1.53	1.43	3
7234	19	5	22.7	-27	42	30	3.32	1.39	0.77	0.63	0.56	1
7264	19	8	16.5	-21	3	53	2.90	2.11	1.91	1.84	1.76	3
7340	19	20	13.3	-17	53	4	3.93	3.51	3.42	3.39	3.37	2
7665	20	6	16.9	-66	14	50	3.55	2.35	2.03	1.93	1.90	4
7754	20	16	39.9	-12	37	4	3.56	2.04	1.59	1.47	1.41	5
7773	20	19	16.5	-12	50	19	4.76	4.84	4.90	4.85		1
7869	20	35	48.7	-47	22	48	3.11	1.47	0.97	0.87	0.78	4
7950	20	46	19.3	- 9	35	7	3.77	3.73	3.73	3.69	3.61	2
7980	20	50	19.8	-27	0	50	4.11	1.24	0.44	0.23	0.04	2
7986	20	52	51.9	-58	32	9	3.65	1.76	1.20	1.06	0.91	4
8167	21	20	51.3	-16	56	0	4.29	2.83	2.38	2.23	2.18	1
8181	21	24	23.6	-65	28	50	4.21	3.27	3.00	2.90	2.85	2
8278	21	38	42.3	-16	46	33	3.67	3.19	3.09	3.02	2.80	3
8414	22	4	29.9	- 0	26	0	2.93	1.47	1.09	0.97	0.86	2
8425	22	6	39.7	-47	4	58	1.74	2.02	2.07	2.09	2.14	4
8499	22	15	30.8	- 7	54	0	4.17	2.61	2.12	2.03	1.92	4
8551	22	26	35.3	4	34	18	4.79	3.01	2.43	2.35	2.46	2
8709	22	53	19.4	-15	57	14	3.26	3.11	3.08	3.08	3.17	3
8728	22	56	16.2	-29	45	18	1.15	1.02	1.03	0.99	0.95	2
8812	23	8	6.8	-21	18	0	3.67	1.69	1.09	0.95	0.84	3
8848	23	15	58.6	-58	22	3	3.99	3.20	3.01	2.98	2.95	2
8892	23	21	39.4	-20	14	14	3.96	2.07	1.48	1.36	1.31	3

Thomas et al (1973) have set up a smaller network of bright Southern stars of which some are variable. Although they have altered the zero points of their system from that of Johnson in order to accord with a new calibration, the relative magnitudes of the 4 stars in common with this programme agree within the stated errors. Table II gives the mean differences between the systems.

TABLE II

*Relationship between system of Thomas et al (1973)
and that of Glass (this paper)*

$$\begin{aligned} J_G &= J_T + 0.05 \pm .01 \text{ (2 stars)} \\ H_G &= H_T + 0.13 \pm .01 \text{ (2 stars; } \alpha \text{ Cet excluded)} \\ K_G &= K_T + 0.06 \pm .01 \text{ (4 stars)} \\ L_G &= L_T + 0.01 \pm .03 \text{ (4 stars)} \end{aligned}$$

I would like to thank Dr. A.W.J. Cousins for much useful advice concerning this programme. The University of Cape Town supplied liquid nitrogen and also allowed the use of their computer for the reductions. This work was done during a long term visit by the author to the S.A. Astronomical Observatory from the Royal Greenwich Observatory, Herstmonceux.

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1974 March 13

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BOOK REVIEW

RR LYRAE VARIABLES IN THE MAGELLANIC CLOUDS

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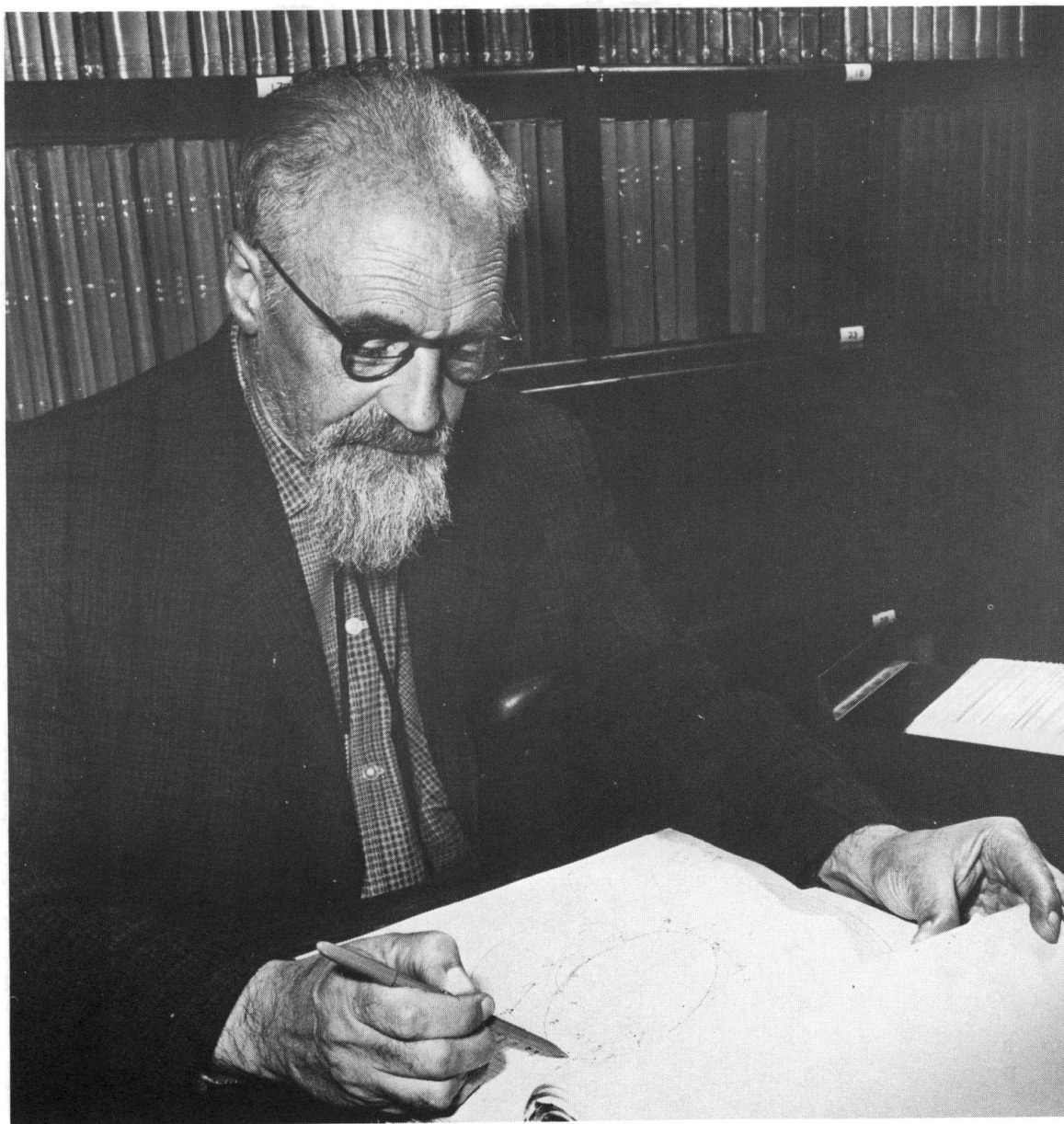
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Dr. W. H. van den Bos at work on a double star orbit (See p. 60)

MONTHLY NOTES OF THE ASTRONOMICAL SOCIETY OF SOUTHERN AFRICA

Volume 33, No. 5

South African Astronomical Observatory,

1974 May 31

Cape of Good Hope.

NOTICES

NOMINATIONS:

The following nominations for full membership of the Society have been received:

Mr. L.M. Daffue, No. 1 Somerset Way, Vanderbijlpark 1900, Tvl.

Professor J.F. de Wet, P. O. Box 13145, Humewood 6013, Port Elizabeth.

Mr. E. Erasmus, 103 Level Street, Krugersdorp 1740, Tvl.

Mr. P.J. Kriel, 91 Magazyn Street (Box 845), Pietersburg 0700, Tvl.

Mr. P.D. Raggett, Oak Flats, 10 Oak Street, Observatory 7900, Cape.

Mr. E.W. Sawyer, Geological Survey, P.O. Box 2168, Windhoek 9100, S.W. Africa.

Mr. P.W. Schmitt, 72 Palmyra Road, Newlands 7700, Cape.

TIME SIGNALS: Values of DUT1 ($\approx$ UT1 - UTC) disseminated with ZUO time signals:

As from	Jan	17	at	00 00	hours UTC:	+0.6 second
	Feb	14	at	00 00	hours UTC:	+0.5 second
	Mar	28	at	00 00	hours UTC:	+0.4 second
	May	02	at	00 00	hours UTC:	+0.3 second
	June	06	at	00 00	hours UTC:	+0.2 second

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For further details write to The Regional Director, The British Council, 91 Parliament Street, Cape Town, 8001.

The closing date for applications is 31st July, 1974.