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THE SOUTHERN Be STAR PHOTOMETRIC CAMPAIGN: A FIRST REPORT

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conference paper

The Be star programme has proved useful over the years in coordinating observers, establishing a set of comparison stars, and drawing attention to Be stars which showed interesting variability. It does not, however, extend south of declination -20° where many Be stars lie.

I am now extending the programme to the southern hemisphere. I spent three weeks last spring establishing UBV values for comparison stars without reliable Johnson photometry, testing comparison stars for variability, and searching for rapid Be variables. My observations, including alternate comparison stars where spectral types indicate a possibility of variability, are now about 70% finished and will be completed next spring.

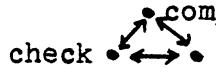
Because high-precision absolute photometry was not being attempted, the comparison and check stars with reliable Johnson photometry were used as the "standards". Generally, four measurements were made of each star. The photometric reduction coefficients were obtained by the method of Harris et al (1981), with a slight modification to allow for a different value of the air mass for each colour. The dead-time correction was obtained by Fernie (1976) for the amplifier-discriminator and counter used. After my observations had been reduced I plotted residuals in V, B-V, and U-B against air mass, hour angle, declination, colour, time, etc. No trends were found. It was also noted that the residuals for absolute photometry did not increase with air mass. The standard deviation of my measurements with respect to Johnson values was: 0.051^{m} (V); 0.022^{m} (B-V); 0.030^{m} (U-B). With respect to my means the standard deviation was: 0.026^{m} (V); 0.009^{m} (B-V); 0.013^{m} (U-B). And finally the standard deviation of my means

with respect to Johnson values was: 0.04^m (V); 0.02^m (B-V); 0.02^m (U-B). The source for Johnson photometry was Johnson et al (1966).

Two errors were found in the Bright Star Catalogue. HR 3962 (A0 III-IV) has a listed U-B value of +1.79, and HR 5206 (B2 Vp) has a listed U-B value of +0.75. My values are 0.00 and -0.75, respectively. I also found two discrepancies between my measurements and the photometry of Johnson et al (1966):

HR 5030 V = 6.05 (Johnson),
V = 6.16 ± 0.02 (Stagg, 2 measurements);
HR 5306 U-B = +1.42 (Johnson),
U-B = +1.33 ± 0.01 (Stagg, 4 measurements).

The Be stars were measured using differential photometry. To test the accuracy of the technique pairs of comparison and check stars were first measured against each other:



The average standard deviation in such measurements was: 0.011 (V); 0.010 (B-V); 0.012 (U-B). The Be star was then measured against each of the comparison and check stars:

If the standard deviation in these measurements was significantly greater, the star was placed on the list of suspected variables. (The criterion used was the F-test at the 95% significance level.) In some cases, however, it appeared that the variation could be attributed to a single , possibly "bad", observation. Such stars are either "doubtful" or are prefixed with a question mark.

In my sample two comparison stars, two check stars, and two red standards showed significant variability, but that variability could well be due to one bad observation in each case. The comparison star HR 2282 is listed in the New

Catalogue of Suspected Variable Stars, but no evidence of variability was found.

For each variable the measured range in B and V is given, as is the timescale over which this range was observed. There are enough rapid variables of substantial amplitude to keep the Be star observers busy for some time to come!

REFERENCES

Fernie, J.D., P.A.S.P., 88, 969 (1976).
Harris, W.E., Fitzgerald, M.P., Reed, B.C., P.A.S.P., 93, 507 (1981).
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SUSPECTED SHORT TIMESCALE VARIABLES (ALL Be)

HR	OTHER	B, V RANGE	TIME SCALE
?4221		0.08^m	2^h
?4823		0.04^m	1^d
?4930	(2 obs'ns)	0.03^m	2^h
5440		0.07^m	1^d
5907		0.03^m	2^h
6274		0.03^m	1^d
6304		0.07^m	1^d
6422		0.04^m	3^h
		0.05^m	1^d
6621	V3894 Sgr	0.05^m	3^h
		0.08^m	1^d
	HD 157832	0.025	2^h
	V750 Ara	0.05^m	1^d

SUSPECTED LONGER TIMESCALE VARIABLES (ALL Be)

HR	OTHER	B, V RANGE	TIME SCALE
?1772		0.09^m	5^d
2628	FU CMa	0.05^m	7^d
2794	omega CMa	0.06^m	5^d
?2911		0.025	2^d
5551	theta Cir	0.03^m	2^d

DOUBTFUL VARIABLES

HR 2794	red standard	HR 5500	Be
HR 4222	comparison	HR 5528	check
HR 4897	Be (lambda Cru)	HR 5684	check

DISCUSSION

HARMANEC: Is Omega CMa identical with 28 CMa for which Baade found periodic spectroscopic variations with the 1.36-day period?

STAGG: Yes, it is the same one.

HARMANEC: Did you see some photometric variations of this star within one week?

BAADE: One has to distinguish between rapid and slow variations. Rapid variations have at different epochs been observed to have different amplitudes between 0.007^m and 0.03^m and different quasi-periods around one day. Slow variations appear over intervals of one week as a linear trend of several mmag/day.

STAGG: From 3 observations in 2 nights I detected no significant variation. When I included a fourth observation made 3 or 4 nights later I did detect significant variation. The range I've quoted is really based on that fourth observation which could be in error by $0^m.01$-$0^m.02$. I would not put too much emphasis on any of the ranges I've indicated -- I am just telling you that these stars are rapid variables.

WAELKENS: Why did you perform your observations in the UBV system, and not in the uvby system?

STAGG: It was felt that we want to contribute to the standard program and it turns out that most people still use the UBV photometers. I guess it would be better with the uvby.

BAADE: How much of observing time do you expect to spend on your campaign in the next few years?

STAGG: I am planning on two weeks next spring.

DOAZAN: Why did you call these stars short-period variables?

STAGG: Well, I should say short time-scale, yes.