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AUTOMATIC PHOTOELECTRIC TELESCOPE: FOURTH QUARTER 1983 OBSERVATIONS

The Automatic Photoelectric Telescope at Fairborn Observatory West in Phoenix, Arizona began operation on the night of 12-13 October 1983. Photometry from this date through the end of 1983 was confined to a small test program of 29 groups of stars, with each group consisting of a variable, a comparison star, a check star, and a sky position. During this time 1352 group observations were made. Since each group observation consisted of a sequence of 33 different 10-second observations, there was a total of 44616 observations. Beginning with the first day of 1984, the observing program was expanded to include 71 groups.

Automatic photoelectric telescopes in general have been discussed by Boyd and Genet (1983). The details of the 25-cm telescope at Fairborn Observatory West and its computerized electronic operating system are given by Boyd, Genet, and Hall (1984). Specifics on the mechanics of the mount and drive are given by Boyd, Genet, and Trueblood (1984). And a complete listing of the software is provided by Trueblood and Genet (1984).

The individual differential magnitudes have been sent to the I.A.U. Commission 27 Archive for Unpublished Observations of Variable Stars, where they are available (Breger, 1982) as File No. 131, which contains three parts. Part I is a summary of the contents of the file. Part II is a listing of detailed information on the 29 groups of stars observed. Part III contains the actual observational results. Data on specific variables can be requested, if the entire contents of the file are not needed.

Table I lists the 29 groups observed. The first column is the group number. The second is the group name. The third is the number of times the group was observed during the quarter. And the last is the number of pages of reduced data in File No. 131. Most of the 29 groups contain an RS CVn-type binary, either known to be or suspected of being photometrically variable. Six (18, 24, 25, 26, 27, 28) are semi-regular variables. Three (5, 16, 23) are red-blue star pairs used to determine our transformation coefficients. One (R Sct) is an RV Tau variable. One (59 d Ser) is a variable of unknown type. One (5 Cet) is a recently discovered long-period giant eclipsing binary. And the last is the familiar epsilon Aur.

TABLE I

The 29 Groups Observed

number	group name	number of observations	number of pages
1	lambda And	60	2
2	39 AY Cet	36	1
3	sigma Gem	73	3
4	V711 Tau	96	3
5	27 & 28 LMi	51	2
6	HR 9024	58	2
7	HR 7428	23	1
8	IM Peg	61	2
9	HR 7275	34	2
10	HR 6469	4	1
11	DK Dra	15	1
12	R Sct	2	1
13	12 BM Cam	93	3
14	33 Psc	63	2
15	5 Cet	40	2
16	HD 210419 & 210434	43	2
17	59 d Ser	1	1
18	FS Com	15	1
19	HK Lac	51	2
20	AR Lac	45	2
21	29 Dra	1	1
22	53 UMa B	0	0
23	51 & 52 Aur	81	3
24	CE Tau	76	3
25	TV Psc	45	2
26	RZ Ari	81	3
27	rho Per	108	3
28	IN Hya	13	1
29	epsilon Aur	83	3

TABLE II

Sequence of 10-Second Integrations Within a Group

	U	B	V
check	1	2	3
sky	4	5	6
comparison	7	8	9
variable	10	11	12
comparison	13	14	15
variable	16	17	18
comparison	19	20	21
variable	22	23	24
comparison	25	26	27
sky	28	29	30
check	31	32	33

TABLE III

Coefficients Used in Data Reduction

	U	B	V
k'	$0^m.77$	$0^m.47$	$0^m.36$
k"	$-0^m.036$	$-0^m.036$	$0^m.0$
ε	+0.01	-0.05	-0.05

Table II specifies the sequence in which the 33 10-second integrations were made for each group.

Table III contains the values of the extinction coefficients (both primary and color-dependent) and the transformation coefficients used to reduce the photometric data.

Part II of File No. 131 contains the information on each group needed by the Automatic Photoelectric Telescope to locate the group and make the photometric measurements. First: the group name, usually the name of the variable or suspected variable in the group. Second: the diameter of the diaphragm used, in seconds of arc; the three choices available were 45, 60, and 90 arcseconds. Third: the HD number of the variable, comparison, and check star. Fourth: the equatorial coordinates (epoch 2000) of those three stars and the sky position, which usually was midway between the variable and the comparison. Fifth: the approximate V magnitude of those three stars, which was used by the telescope to locate the star and confirm the identification.

Part III of the file contains the fully reduced differential magnitudes, corrected for differential atmospheric extinction and transformed differentially to the UBV system. As the sequence in Table II shows, the variable was bracketted three times by comparison star measures. The resulting three differential magnitudes are listed separately, for each of the three bandpasses. Also the mean of those three and the (internal) error of that mean is listed, for each bandpass. If any group observation yielded a mean error greater than 0.02 magnitude, the results were discarded and hence do not appear in the file; this was the mechanism whereby bad photometric data (resulting from thin clouds and/or faulty centering in the diaphragm) were purged. The entry "check-minus-comp" is simply the difference between the average of the (two) check star measures and the average of the (four) comp star measures. Since there was no purging in this case, a few of these check-minus-comp values will appear discordant, generally as a result of faulty centering of the check star. The heliocentric Julian date refers to

the middle of the three variable stars observations. The phase has been computed with the ephemeris specified at the top of each page in the file, unless no ephemeris was available.

Often a group was observed more than once on the same night. This happened naturally as a result of commands issued by the operating system, which is programmed to control the telescope in such a way as to make maximum use of available observing time and to obtain maximum coverage of all stars above the horizon at some time during the night.

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