A COMPILATION OF PHYSICAL PARAMETERS OF Ap AND Am STARS AS DERIVED FROM ENERGY DISTRIBUTION STUDIES

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Abstract. The physical parameters, such as the effective temperatures, radii, bolometric magnitudes and bolometric corrections of 87 Ap and Am stars out of the 125 compiled here are essentially based on the work done by the authors at the Kavalur Observatory. The results of the rest of the stars are from the earlier work done by one of the authors, which have been included for the sake of completion. All the results are derived from the observed energy distribution curves of the individual stars. The standardised magnitudes at various wavelengths also have been listed.

1. Introduction

The need of a knowledge of the physical parameters and the continuum energy distribution of Ap and Am stars based on homogeneous data has been strongly felt in the recent past. Therefore we present here 87 Ap and Am stars (which include also some normal stars), observed in the wavelength region $\lambda\lambda$4000–7800, using the same set of instrumentation and reduction techniques. In addition, we have compiled the results of 39 stars observed earlier by one of us (GSDB) using a different set of instrumentation but the same reduction techniques in the wavelength region $\lambda\lambda$4790–6800, one star being common between the two sets.

2. Instrumentation and Observations

The 102 cm telescope at the Kavalur Observatory has been used along with the automated spectrum scanner (Bappu, 1977) for observing 87 stars listed in Table I comprising Ap, Am, and normal stars. A reflection grating of 600 lines per mm and blazed at 7600 Å in the first order, resulting in a channel spacing of about 10 Å per channel in the wavelength range $\lambda\lambda$4000–7800 and a dry ice cooled EMI 9558 B have been(employed for the purpose. The observations of each star were divided into two parts – one from $\lambda\lambda$4000–6000 with GG 13 and the other from $\lambda\lambda$5800–7800 with either W 25 or OG 1. The exit slit was always kept at 20 Å. On each night one or two of the secondary standards of spectrophotometry (Hayes, 1970) have been observed. All the program stars chosen are brighter than 7th magnitude.

3. Results

The energy distribution curves of the program stars have been obtained and have been normalized to 5560 Å. The probable errors of the observed points are found to be less

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TABLE I
Basic data and results of the program stars

No.	HR	HD	m_{vis}	π	M_{vis}	$(B-V)$	Sp. type	θ_e	$R/R_\odot$	M_{bol}	B.C.
1	128	2888	6.58				A1VnSi	0.51			
2	149	3322	6.30			−0.11	A Si	0.44			
3	234	4778	6.14	0.007	+0.37	+0.02	A0p	0.43	2.6	−0.40	−0.77
4	465	9996	6.30			+0.10	B9p	0.56			
5	682	14392	5.58	0.011	+0.79	−0.13	B9pSi	0.53	2.6	+0.50	−0.29
6	905	18769	5.86	0.014	+1.59	+0.14	A3m	0.55	1.9	+1.35	−0.25
7	954	19832	5.67	0.010	+0.67	−0.10	B9p	0.40	2.1	−0.26	−0.93
8	976	20210	6.24			+0.27	A1m	0.62			
9	1139	23281	5.58			+0.24	A5m	0.61			
10	1368	27628	5.72	0.021	+2.33	+0.32	A3m	0.65	1.8	+2.19	−0.14
11	1376	27749	5.64	0.022	+2.35	+0.30	A1m	0.66	1.8	+2.26	−0.10
12	1403	28226	5.72	0.021	+2.33	+0.27	A3m	0.59	1.5	+2.16	−0.17
13	1428	28546	5.48	0.024	+2.38	+0.26	A5m	0.59	1.5	+2.16	−0.22
14	1483	29573	5.00	0.022	+1.71	+0.08	A2IVm	0.53	1.7	+1.43	−0.29
15	1519	30210	5.37	0.019	+1.76	+0.20	A2m	0.60	2.0	+1.61	−0.15
16	1643	32650	5.32	0.014	+1.05		B9pSi	0.43	1.9	+0.28	−0.77
17	1702	33904	3.28	0.021	−0.11	−0.11	B9p	0.42	3.1	−0.89	−0.78
18	1732	34452	5.38	0.007		−0.17 to −0.22	A0p				
19	1761	34959	6.52			−0.11	B5p	0.55			
20	2258	43819	6.14			−0.09	B9.5p	0.54			
21	2291	44691	5.64	0.008	+0.16	+0.24	A3m	0.62	4.5	−0.01	−0.16
22	2362	45827	6.43			+0.14	A0III	0.62			
23	2534	49976	6.24			+0.01	A2p	0.54			
24	2547	50204	6.24			−0.05	B9.5p	0.47			
25	2727	55719	5.30	0.005	−1.21	+0.06	Ap	0.57	7.3	−1.42	−0.22
26	2746	56022	4.86	0.006	−1.22	−0.02	A0p	0.51	6.3	−1.59	−0.37
27	2761	56455	5.82			−0.11	A0p	0.42			
28	2772	56820	6.23				A8m	0.56			
29	3398	72968	5.72	0.011	+0.93	−0.03	A1p	0.55	2.6	+0.66	−0.26
30	3410	73262	4.14	0.025	+1.13	0.00	A1Vnn	0.58	2.6	+0.90	−0.24
31	3429	73731	6.30			+0.17	Am	0.52			
32	3500	75333	5.19	0.008	−0.30	−0.10	B9p	0.41	3.4	−1.19	−0.90
33	4263	94660	6.10			−0.08	Ap(Si)	0.48			
34	4369	98088	6.14	0.010	−1.14	+0.20	F0p Sr, Cr	0.61	2.8	+0.95	−0.19
35	4685	107168	6.27	0.011	+1.48	+0.17	A8m	0.54	2.0	+1.15	−0.33
36	4766	108945	5.46	0.015	+1.34	+0.05	A3p Sr, Cr	0.56	2.2	+1.11	−0.23
37	5269	122532	6.10			−0.12		0.52			
38	5313	124224	5.00	0.010	0.00	−0.11	BpSi	0.47	3.3	−0.54	−0.54
39	5355	125248	5.89	0.012	+1.29	+0.01	A0p Cr, Eu	0.49	1.9	+0.84	−0.45
40	5422	127304	5.94	0.006	−0.17	−0.03	A0VSi	0.49	3.7	−0.60	−0.43
41	5514	130158	5.67				ASi	0.49			
42	5531	130841	2.75	0.053	+1.37	+0.15	A3IVm	0.52	2.0	+0.99	−0.38
43	5619	133652	6.01				A0Si	0.43			
44	5624	133880	5.78			−0.12	A0Si	<0.40			
45	5652	134759	4.53	0.013	+0.10	−0.09	A0pSi	0.46	3.1	−0.49	−0.59
46	5843	140160	5.33	0.015	+1.21	+0.04	A0pSr	0.55	2.3	+0.93	−0.28
47	5883	141556	3.94	0.012	−0.66	−0.05	Ap	<0.40			
48	6117	148112	4.56	0.028	+1.80	0.00	B9pCr	0.56	1.8	+1.54	−0.26

Table I (continued)

No.	HR	HD	m_{vis}	π	M_{vis}	$(B-V)$	Sp. type	θ_e	$R/R_\odot$	M_{bol}	B.C.
49	6129	148 367	4.64	0.022	+1.35	+0.17	A3m	0.55	2.1	+1.13	−0.22
50	6176	149 822	6.28	0.008	+0.80	−0.11	B9pSiCr	0.49	2.4	+0.34	−0.46
51	6226	151 199	6.16	0.006	+0.05	+0.07	A2pSr	0.55	3.9	−0.22	−0.27
52	6234	151 525	5.24	0.012	+0.64	−0.02	B9pCr	0.51	2.7	+0.25	−0.39
53	6254	152 107	4.81	0.016	+0.83	+0.08	A2pSrCrEu	0.60	3.1	+0.66	−0.17
54	6268	152 308	6.38			−0.05	B9.5p?Cr	0.56			
55	6326	153 882	6.30	0.011	+1.51	+0.04	B9pCrEu	0.58	2.2	+1.26	−0.25
56	6662	162 724	6.08				B9	0.48			
57	6709	164 258	6.26	0.013	+1.83	+0.15	A3pSrCrEu	0.59	1.9	+1.65	−0.18
58	6870	168 733	5.39	0.008	−0.09		Ap(B7p)?	<0.40			
59	6932	170 397	5.99	0.011	+1.20	−0.02	B9pSi, Cr	0.46	1.9	+0.57	−0.63
60	6958	170 973	6.33			−0.05	A0pSi, Cr	0.56			
61	6997	172 044	5.37	0.007	−0.40	−0.10	Ap	<0.40			
62	7049	173 524	5.06	0.010	+0.06	−0.12	B9.5p?Hg?	0.44	3.1	−0.69	−0.75
63	7056	173 648	4.37	0.024	+1.27	+0.20	A4m	0.60	2.5	+1.13	−0.14
64	7167	176 232	5.90	0.012	+1.30	+0.24	F0p Sr, Eu	0.67	3.1	+1.14	−0.16
65	7230	177 517	5.90	0.007	+0.13	−0.01	B9VSi	0.55	3.8	−0.16	−0.29
66	7283	179 527	5.74	0.007	−0.03	−0.05	B9pSi	0.54	4.0	−0.35	−0.32
67	7287	179 761	5.12	0.007	−0.65	−0.07	B8p	0.46	4.3	−1.20	−0.55
68	7395	183 056	5.12	0.008	−0.36	−0.10	B9pSi	0.46	3.9	−0.99	−0.63
69	7431	184 552	5.66	0.014	+1.39	+0.19	Am	0.55	2.1	+1.13	−0.26
70	7452	184 961	6.10	0.007	+0.33	−0.07	B9p? Si, Cr	0.51	3.1	−0.05	−0.38
71	7575	188 041	5.64	0.008	+0.16	+0.20	A5p	0.62	4.5	−0.01	−0.17
72	7653	189 849	4.67	0.025	+1.66	+0.18	A4III Am?	0.53	1.8	+1.30	−0.36
73	7786	193 722	6.18	0.007	+0.41	−0.06	B9pSi	0.52	3.2	−0.03	−0.44
74	7870	196 178	5.67	0.007	−0.10	−0.15	B9pSi	0.48	3.7	−0.69	−0.59
75	7928	197 461	4.53	0.013	+0.10	+0.32	Am?	0.70	9.5	−1.10	−1.20
76	8033	199 728	6.23			−0.13	B9pSi	<0.40			
77	8097	201 601	4.64	0.018	+0.92	+0.26	Fp	0.60	3.0	+0.73	−0.19
78	8216	204 411	5.27	0.013	+0.84	+0.07	A6p	0.61	3.2	+0.66	−0.18
79	8240	205 087	6.42			−0.09	B9p	0.50			
80	8407	209 515	5.60	0.008	+0.12	−0.03	A0IVp	0.53	3.6	−0.20	−0.32
81	8434	210 071	6.20	0.010	+1.20	−0.09	A0IIISi	0.46	1.9	+0.57	−0.63
82	8708	216 608	5.58	0.020	+2.09		A3m	0.63	1.9	+1.94	−0.15
83	8861	219 749	6.27			−0.04	B9p	0.50			
84	8911	220 825	4.95	0.028	+2.19	+0.04	A0pCr, Sr, Si	0.55	1.5	+1.86	−0.33
85	8933	221 394	6.23	0.008	+0.75	+0.01	A1p	0.50	2.5	+0.34	−0.41
86	8949	221 760	4.70	0.001	−5.30	+0.08	Ap	0.55	45.7	−5.56	−0.26
87	9080	224 801	6.37	0.008	+0.89	−0.07	B9p	0.41	1.9	+0.07	−0.82

than ± 0.02 mag. These energy curves were compared with the energy curves for the Balmer-line banketed theoretical models for the case of $\log g = 4.0$ (Mihalas, 1966) and the best fit was obtained by the method of least squares for the estimation of the effective temperatures, in terms of $\theta_e = (5040/T_e)$ in each case. For $\log g > 3.0$ and $\theta_e < 0.50$, the choice of $\log g$ is virtually immaterial. For the cooler stars the error in θ_e which results from choosing $\log g = 4.0$, if the true $\log g$ were not less than 3.5, is at most ± 0.01.

TABLE II
Basic data and results from Babu (1976, 1977) and Babu and Rautela (1978)

No.	HR	HD	m_{vis}	π	Sp. type	$(B-V)$	θ_e	$R/R_\odot$	M_{bol}	B.C.
1	15	358	2.06	0.024	B9pIII	−0.07	0.43	3.6	−1.13	−0.74
2	395	8374	5.49	0.016	A1m	+0.26	0.60	2.3	+1.31	−0.20
3	478	10221	5.59	0.011	A0p	−0.06	0.51	2.6	+0.34	−0.46
4	707	15089	4.53	0.021	A5p	+0.13	0.57	2.9	+0.61	−0.24
5	873	18296	5.10	0.001	ASi	−0.01	0.41			
6	1148	23401	4.62	0.010	A2IV	+0.02	0.55	4.8	−0.67	−0.29
7	1251	25490	3.90	0.076	A1V	+0.03	0.54	2.5	+0.67	−0.30
8	1268	25823	5.19	0.010	B9p	−0.12	0.47	2.8	−0.18	−0.58
9	1339	27295	5.28	0.008	B8p	−0.05	0.49	3.8	−0.66	−0.46
10	1341	27309	5.24	0.003	ASi	−0.04	0.46			
11	1389	27962	4.30	0.019	A2IV	+0.05	0.52	2.1	+0.88	−0.36
12	1458	29140	4.26	0.030	Am	+0.18	0.60	2.2	+1.45	−0.18
13	1544	30739	4.32	0.029	A0V	+0.01	0.51	2.0	+0.95	−0.39
14	1570	31295	4.67	0.017	A0p	+0.07	0.56	2.7	+0.66	−0.23
15	1592	31647	4.93	0.016	A1V	+0.05	0.56	2.7	+0.66	−0.20
16	1672	33254	5.43	0.006	Am	+0.24	0.62	2.2	+1.53	−0.17
17	1971	38104	5.47	0.014	A0p	+0.04	0.60	2.6	+1.04	−0.16
18	2029	39283	5.00	0.012	A2p	+0.05	0.53	2.6	+0.48	−0.32
19	2033	39317	5.54	0.007	B9p	−0.04	0.55	4.5	−0.53	−0.30
20	2088	40183	1.92	0.037	A2V	+0.03	0.51	3.0	+0.01	−0.38
21	2095	40312	2.62	0.018	B9.5pV	−0.08	0.45	3.3	−0.72	−0.67
22	2143	41357	5.27	0.017	A4m	+0.23	0.60	2.4	+1.22	−0.20
23	2148	41511	4.92	0.023	A2p	+0.24	0.61	1.5	+2.31	−0.19
24	2155	41695	4.67	0.008	A1V	+0.04	0.50	2.4	+0.41	−0.41
25	2425	47152	5.51	0.009	B9p	+0.03	0.57	3.7	+0.05	−0.23
26	2714	55185	4.14	0.018	A2V	−0.01	0.54	3.2	+0.13	−0.29
27	2763	56537	3.59	0.041	A3V	+0.11	0.55	1.7	+1.55	−0.27
28	3215	68351	5.63	0.010	B9p	−0.07	0.48	2.6	+0.07	−0.56
29	3465	74521	5.66	0.011	A1p	−0.10	0.45	2.2	+0.16	−0.71
30	3572	76756	4.25	0.033	A5m	+0.17	0.56	1.8	+1.54	−0.30
31	4752	108662	5.29	0.019	A0pSi	−0.04	0.47	2.0	+0.56	−0.55
32	4825	110379	3.65	0.101	F0V	+0.36	0.64	1.5	+2.58	−0.15
33	4915	112413	2.89	0.023	B9.5p	−0.10	0.42	3.1	−0.91	−0.80
34	5105	118022	4.94	0.016	A2p	+0.04	0.52	2.4	+0.59	−0.36
35	5747	137909	3.66	0.032	F0p	+0.27	0.54	2.3	+0.85	−0.34
36	5892	141795	3.73	0.038	A2m	+0.14	0.54	1.8	+1.38	−0.25
37	6117	148112	4.56	0.028	B9p	+0.01	0.56	1.8	+1.54	−0.26
38	8278	206088	3.66	0.030	Am	+0.32	0.58	2.7	+0.81	−0.24
39	8322	207098	2.83	0.063	Am	+0.23	0.60	2.0	+1.61	−0.22

The radii of these stars have been calculated from the relation (Gray, 1967),

$$R/R_\odot = 44.33 \times 10^6 (F_v/\mathscr{F}_v)^{1/2}\, p^{-1}, \tag{1}$$

where p is the parallax of the star, while F_v and $\mathscr{F}_v$ are its observed and corresponding computed monochromatic fluxes (in erg s^{-1} cm^{-2} Hz^{-1}). These calculations, for each star, were done at all the wavelengths mentioned therein and the average was adopted

as its radius. In case of Am stars the values at shorter wavelengths (less than 5000 Å) were not considered because of blanketing effects. The uncertainties in these averages in each case is less than 2% indicating that the radii are essentially uniform in this wavelength region. Most of the stars have the value of $R/R_\odot$ in the range of 1.5 and 5.0 though there are some exceptions.

Using the derived effective temperatures and radii, we calculated the bolometric magnitude M_{bol} from the relation (cf. Allen, 1973)

$$M_{bol} = 42.36 - 10 \log T_e - 5 \log R/R_\odot. \quad (2)$$

With the available data of m_{vis} and parallax, absolute magnitudes M_{vis} were computed and hence bolometric corrections.

Since the errors involved in the determination of radii are mainly due to the errors in parallax measurements, which are of the order of 20–30%, the determination of M_{bol} also will have similar errors. Same is the case with M_{vis}.

All these results have been tabulated in Table I. Columns 2 and 3 give the HR number and the HD number. The data for column 4, m_{vis}, has been taken from Hoffleit (1964). Column 5 gives π the parallaxes which are taken from Bečvář (1964). $(B - V)$ and spectral types have been taken from either Blancó *et al.* (1970) or Cowley *et al.* (1969). For the sake of completion Table II is the compilation of the results of the stars obtained earlier by one of us (Babu, 1976, 1977; Babu and Rautela, 1978).

Table III and Table IV represent the standardised absolute magnitudes, converted

TABLE III
Observed magnitudes of the Ap stars normalised to 5560 Å

Lambda	HR	15	128	149	234	465	478	682	707
	HD	358	2888	3322	4778	9996	10221	14392	15089
4040			−0.280	−0.367	−0.217	−0.045			
4170			−0.251	−0.344	−0.236	−0.083			
4260			−0.249	−0.312	−0.260	−0.125		−0.305	
4460			−0.222	−0.282	−0.259	−0.159		−0.261	
4570			−0.190	−0.263	−0.237	−0.165		−0.260	
4790		−0.159	−0.150	−0.197	−0.186	−0.155	−0.203	−0.217	−0.119
5000		−0.082	−0.129	−0.142	−0.139	−0.115	−0.124	−0.159	−0.082
5260		−0.056	−0.064	−0.071	−0.052	−0.053	−0.070	−0.068	−0.042
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.066	0.053	0.068	0.071	0.060	0.034	0.072	0.021
6060		0.114	0.090	0.112	0.111	−0.029	0.087	0.107	0.054
6440		0.196	0.163	0.203	0.205	0.107	0.159	0.191	0.117
6800		0.264	0.213	0.231	0.283	0.164	0.210	0.261	0.149
7100			0.303	0.329	0.319	0.204		0.322	
7530			0.327	0.369	0.410	0.317		0.395	
7780			0.403	0.460	0.442	0.303		0.456	
Remarks					UV deficiency	UV deficiency			

Table III (continued)

Lambda	HR	873	954	1 148	1 251	1 268	1 339	1 341	1 544
	HD	18 296	19 832	23 401	25 490	25 823	27 295	27 309	30 739
4040			−0.373						
4170			−0.347						
4260			−0.337						
4460			−0.290						
4570			−0.278						
4790		−0.088	−0.230	−0.216	−0.162	−0.158	−0.200	−0.180	−0.152
5000		−0.050	−0.161	−0.105	−0.096	−0.116	−0.141	−0.129	−0.111
5260		−0.015	−0.093	−0.084	−0.051	−0.045	−0.065	−0.055	−0.050
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.065	0.067	0.028	0.052	0.071	0.069	0.064	0.043
6060		0.135	0.114	0.041	0.091	0.118	0.102	0.110	0.096
6440		0.212	0.224	0.130	0.147	0.178	0.179	0.179	0.163
6800		0.285	0.284	0.179	0.199	0.268	0.245	0.262	0.223
7100			0.325						
7530			0.409						
7780			0.488						
Remarks			Inter-stellar reddening	UV excess					

Table III (continued)

Lambda	HR	1 570	1 592	1 643	1 702	1 732	1 761	1 971	2 029
	HD	31 295	31 647	32 650	33 904	34 452	34 959	38 104	39 283
4040				−0.530	−0.362	−0.469			
4170				−0.478	−0.342	−0.418	−0.291		
4260				−0.457	−0.319	−0.404	−0.278		
4460				−0.390	−0.268	−0.376	−0.217		
4570				−0.341	−0.235	−0.325	−0.191		
4790		−0.094	−0.158	−0.275	−0.170	−0.259	−0.174	−0.113	−0.153
5000		−0.085	−0.083	−0.190	−0.135	−0.185	−0.122	−0.074	−0.107
5260		−0.037	−0.041	−0.093	−0.068	−0.065	−0.065	−0.020	−0.059
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.048	0.043	0.095	0.061	0.064	0.073	0.056	0.042
6060		0.093	0.078	0.132	0.111	0.097	0.129	0.067	0.055
6440		0.142	0.127	0.190	0.177	0.180	0.222	0.085	0.154
6800		0.192	0.174	0.251	0.294	0.238	0.310	0.146	0.223
7100				0.309	0.344	0.270	0.357		
7530				0.420	0.405	0.348	0.449		
7780				0.437	0.448	0.363			
Remarks				UV excess		5200 feature; UV excess (or sp. binary)			

Table III (*continued*)

Lambda	HR	2033	2088	2095	2148	2155	2258	2362	2425
	HD	39317	40183	40312	41511	49695	43819	45827	47152
4040							−0.282	−0.067	
4170							−0.214	−0.041	
4260							−0.213	−0.027	
4460							−0.173	−0.026	
4570							−0.165	−0.022	
4790		−0.130	−0.162	−0.167	−0.067	−0.152	−0.135	−0.058	−0.140
5000		−0.087	−0.114	−0.151	−0.039	−0.102	−0.124	−0.024	−0.099
5260		−0.063	−0.052	−0.080	−0.032	−0.056	−0.046	−0.026	−0.020
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.054	0.047	0.044	0.009	0.053	0.052	0.017	0.047
6060		0.062	0.088	0.097	0.031	0.111	0.063	0.020	0.076
6440		0.130	0.164	0.164	0.074	0.170	0.163	0.051	0.131
6800		0.186	0.239	0.238	0.120	0.263	0.202	0.120	0.175
7100								0.128	
7530								0.140	
7780								0.183	
Remarks									

Table III (*continued*)

Lambda	HR	2534	2547	2714	2727	2746	2761	2763	3215
	HD	49976	50204	55185	55719	56022	56455	56537	68351
4040		−0.289	−0.304		−0.155	−0.216	−0.413		
4170		−0.243	−0.317		−0.132	−0.246	−0.349		
4260		−0.243	−0.280		−0.159	−0.219	−0.349		
4460		−0.217	−0.255		−0.145	−0.207	−0.291		
4570		−0.203	−0.218		−0.131	−0.186	−0.242		
4790		−0.159	−0.153	−0.195	−0.107	−0.125	−0.189	−0.134	−0.222
5000		−0.104	−0.128	−0.099	−0.072	−0.103	−0.164	−0.094	−0.142
5260		−0.033	−0.054	−0.045	−0.017	−0.035	−0.080	−0.055	−0.015
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.047	0.052	0.031	0.017	0.058	0.055	0.052	0.042
6060		−0.024		0.075	0.026	0.096	0.114	0.082	0.092
6440		0.105		0.145	0.117	0.175	0.184	0.132	0.157
6800		0.203		0.197	0.182	0.237	0.258	0.197	0.229
7100		0.269			0.206	0.269	0.351		
7530		0.314			0.252	0.322	0.389		
7780		0.368			0.287	0.372	0.489		
Remarks		5200 feature?			5200 feature				

Table III (*continued*)

Lambda	HR	3 398	3 410	3 465	3 500	4 263	4 369	4 752	4 766
	HD	72 968	73 262	74 521	75 333	94 660	98 088	108 662	108 945
4040		−0.151	−0.127		−0.385	−0.397	0.093		−0.241
4170		−0.139	−0.124		−0.323	−0.338	0.008		−0.219
4260		−0.157	−0.119		−0.305	−0.297	−0.009		−0.184
4460		−0.152	−0.105		−0.274	−0.295	−0.030		−0.185
4570		−0.146	−0.105		−0.255	−0.287	−0.030		−0.163
4790		−0.088	−0.087	−0.196	−0.201	−0.231	−0.045	−0.170	−0.135
5000		−0.080	−0.063	−0.153	−0.152	−0.152	−0.020	−0.086	−0.100
5260		−0.007	−0.025	−0.060	−0.086	−0.057	−0.009	−0.071	−0.042
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.057	0.032	0.065	0.064	0.024	0.022	0.048	0.074
6060		0.070	0.058	0.087		0.172	0.052	0.103	0.122
6440		0.140	0.087	0.186		0.178	0.068	0.180	0.184
6800		0.198	0.149	0.234		0.241	0.113	0.236	0.253
7100		0.223	0.191			0.326	0.144		0.295
7530		0.306	p.233			0.396	0.182		0.371
7780		0.332	0.247				0.212		
Remarks		5200 feature				4200 feature	UV Deficiency; compared with HR 7575		4200 feature

Table III (*continued*)

Lambda	HR	4 825	4 915	5 105	5 269	5 313	5 355	5 422	5 514
	HD	110 379	112 413	118 022	122 532	124 224	125 248	127 304	130 158
4040					−0.342	−0.302	−0.325	−0.330	−0.335
4170					−0.289	−0.248	−0.252	−0.259	−0.265
4260					−0.242	−0.239	−0.233	−0.255	−0.233
4460					−0.202	−0.204	−0.226	−0.219	−0.219
4570					−0.163	−0.175	−0.216	−0.199	−0.196
4790		−0.011	−0.176	−0.174	−0.141	−0.141	−0.202	−0.148	−0.178
5000		−0.002	−0.107	−0.100	−0.075	−0.099	−0.140	−0.094	−0.121
5260		−0.004	−0.057	−0.080	−0.042	−0.037	−0.052	−0.046	−0.043
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.028	0.066	0.037	0.077	0.058	0.051	0.050	0.055
6060		0.045	0.131	0.073	0.134	0.086	0.091	0.097	0.101
6440		0.068	0.208	0.150	0.218	0.191	0.152	0.173	0.139
6800		0.087	0.290	0.212	0.296	0.265	0.225	0.252	0.240
7100					0.368	0.323	0.274	0.287	0.276
7530					0.439	0.407	0.355	0.375	0.372
7780						0.471	0.403	0.406	0.426
Remarks							4200, 5200 features	4200 feature	4200 feature; 5200 feature?

Table III (*continued*)

Lambda	HR	5619	5624	5652	5747	5843	5883	6117	6176
	HD	133652	133880	134759	137909	140160	141556	148112	149822
4040		−0.481	−0.568	−0.328		−0.138	−0.417	−0.224	−0.299
4170		−0.367	−0.484	−0.249		−0.131	−0.355	−0.165	−0.248
4260		−0.330	−0.455	−0.231		−0.134	−0.322	−0.141	−0.244
4460		−0.303	−0.403	−0.212		−0.131	−0.270	−0.114	−0.241
4570		−0.278	−0.370	−0.170		−0.122	−0.232	−0.133	−0.216
4790		−0.224	−0.325	−0.124	0.061	−0.116	−0.180	−0.102	−0.176
5000		−0.184	−0.200	−0.071	0.072	−0.089	−0.124	−0.060	−0.127
5260		−0.048	−0.064	−0.030	0.044	−0.033	−0.067	−0.016	−0.040
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		−0.019	0.092	0.095	0.044	0.054	0.082	0.039	0.048
6060		0.047	0.155	0.156	0.074	0.080	0.127	0.006	0.104
6440		0.123	0.259	0.206	0.133	0.143	0.196	0.200	0.143
6800		0.208	0.352	0.283	0.175	0.202	0.267	0.223	0.220
7100		0.266	0.411	0.351		0.259	0.337	0.256	0.275
7530		0.359	0.498	0.438		0.283	0.419		0.342
7780				0.485		0.334	0.477		0.443
Remarks		Broad 5200 feature; 4200 feature	5200 feature	4200 feature				Broad feature from 4200–4500	5200, 4200 features

Table III (*continued*)

Lambda	HR	6226	6234	6254	6268	6326	6662	6709	6870
	HD	151199	151525	152107	152308	153882	162724	164258	168733
4040		−0.199	−0.348	−0.248	−0.277	−0.179	−0.390	−0.079	−0.610
4170		−0.210	−0.303	−0.209	−0.229	−0.163	−0.321	−0.099	−0.495
4260		−0.208	−0.267	−0.200	−0.224	−0.167	−0.279	−0.134	−0.432
4460		−0.184	−0.238	−0.156	−0.199	−0.139	−0.282	−0.181	−0.349
4570		−0.167	−0.220	−0.101	−0.172	−0.116	−0.240	−0.161	−0.311
4790		−0.106	−0.191	−0.058	−0.154	−0.101	−0.186	−0.147	−0.260
5000		−0.079	−0.130	−0.032	−0.106	−0.086	−0.130	−0.119	−0.171
5260		−0.024	−0.066	−0.012	−0.041	−0.018	−0.056	−0.037	−0.086
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.042	0.023	−0.013	0.050	0.045	0.165	0.055	0.119
6060		0.073	0.049	−0.005	0.076	0.056	0.130	0.088	0.160
6440		0.142	0.111	0.085	0.138	0.116	0.186	0.158	0.232
6800		0.179	0.185	0.109	0.209	0.139	0.277	0.209	0.335
7100		0.215	0.325	0.145	0.276	0.157	0.339	0.265	0.400
7530		0.307	0.350	0.194	0.319	0.212	0.464	0.311	0.463
7780		0.315	0.341	0.237		0.267			
Remarks		5200 feature	4200 feature	5200 feature		5200 feature		UV Deficiency; 5200 feature	

Table III (*continued*)

Lambda	HR	6932	6958	6997	7049	7167	7230	7283	7287
	HD	170397	170973	172044	173524	176232	177517	179527	179761
4040		−0.363	−0.242	−0.502	−0.377	0.113	−0.230	−0.307	−0.313
4170		−0.246	−0.204	−0.435	−0.361	0.085	−0.212	−0.249	−0.261
4260		−0.248	−0.175	−0.393	−0.310	0.057	−0.176	−0.211	−0.238
4460		−0.225	−0.179	−0.351	−0.250	0.023	−0.144	−0.177	−0.184
4570		−0.192	−0.158	−0.315	−0.223	0.033	−0.130	−0.153	−0.178
4790		−0.159	−0.129	−0.244	−0.176	0.045	−0.089	−0.132	−0.137
5000		−0.104	−0.066	−0.178	−0.126	0.019	−0.068	−0.088	−0.088
5260		−0.028	−0.020	−0.089	−0.072	0.007	−0.033	−0.030	−0.050
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.043	0.091	0.081	0.044	0.009	0.063	0.038	0.089
6060		0.118	0.130	0.155	0.109	0.008	0.090	0.088	0.134
6440		0.174	0.222	0.278	0.169	0.023	0.141	0.133	0.204
6800		0.214	0.270	0.348	0.217	0.024	0.180	0.176	0.287
7100		0.310	0.316	0.422	0.302	0.049	0.231	0.229	0.344
7530		0.450	0.397	0.496	0.364	0.079	0.273	0.283	0.418
7780		0.403			0.411		0.356	0.326	0.482
Remarks		5200 & 4200 features	4200 feature; Broad 5200 feature	4200 feature		5200 feature	4200 feature		

Table III (*continued*)

Lambda	HR	7395	7452	7575	7786	7870	8033	8097	8216
	HD	183056	184961	188041	193722	196178	199728	201601	204411
4040		−0.420	−0.276	0.038	−0.383	−0.414	−0.463		−0.159
4170		−0.334	−0.247	−0.003	−0.339	−0.385	−0.397		−0.178
4260		−0.308	−0.235	0.010	−0.311	−0.334	−0.387	0.005	−0.171
4460		−0.271	−0.207	−0.052	−0.291	−0.306	−0.325	−0.045	−0.183
4570		−0.243	−0.198	−0.061	−0.248	−0.265	−0.294	−0.062	−0.160
4790		−0.211	−0.135	−0.086	−0.200	−0.224	−0.224	−0.056	−0.125
5000		−0.124	−0.103	−0.059	−0.162	−0.153	−0.142	−0.039	−0.107
5260		−0.052	−0.042	0.011	−0.074	−0.054	−0.066	0.018	−0.038
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.022	0.064	0.023	0.005	0.020	0.058	0.008	−0.005
6060		0.078	0.079	0.045	0.061	0.087	0.101	0.014	0.044
6440		0.127	0.160	0.099	0.128	0.171	0.220	0.069	0.065
6800		0.220	0.222	0.142	0.183	0.232	0.319	0.079	0.095
7100		0.267	0.276	0.182	0.228	0.309	0.392	0.124	0.153
7530		0.309	0.360	0.228	0.318	0.394	0.471	0.184	0.210
7780			0.399				0.565	0.244	0.246
Remarks			5200 feature	5200 & 4200 features	5200 & 4200 features	5200 & 4200 features			5200 feature

Table III (*continued*)

Lambda	HR	8 240	8 407	8 434	8 861	8 911	8 933	8 949	9 080
	HD	205 087	209 515	210 071	219 749	220 825	221 394	221 760	224 801
4040		−0.377	−0.326	−0.428	−0.345		−0.208	−0.196	−0.335
4170		−0.325	−0.314	−0.388	−0.300		−0.191	−0.186	−0.279
4260		−0.314	−0.290	−0.354	−0.273	−0.129	−0.212	−0.187	−0.284
4460		−0.305	−0.281	−0.325	−0.282	−0.135	−0.214	−0.180	−0.270
4570		−0.274	−0.244	−0.290	−0.251	−0.126	−0.195	−0.178	−0.254
4790		−0.210	−0.191	−0.205	−0.155	−0.097	−0.186	−0.140	−0.215
5000		−0.171	−0.164	−0.179	−0.150	−0.076	−0.116	−0.098	−0.149
5260		−0.057	−0.087	−0.083	−0.075	−0.027	−0.036	−0.042	−0.057
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.026	0.048	0.038	0.044	0.043	0.062	0.051	0.057
6060		0.074	0.097	0.086	0.105	0.099	0.093	0.075	0.095
6440		0.169	0.131	0.177	0.162		0.192	0.143	0.232
6800		0.185	0.180	0.155	0.239	0.200	0.229	0.213	0.303
7100		0.284	0.270	0.316	0.291	0.266	0.265	0.205	0.298
7530		0.383	0.353	0.401	0.344	0.297	0.381	0.305	0.399
7780		0.418	0.376	0.446	0.388	0.335	0.360	0.333	0.458
Remarks		4200 feature; Broad 5200 feature				4200 & 5200 features	UV Deficiency	UV Deficiency	4200 & 5200 features

TABLE IV

Observed magnitudes of the Am stars normalized to 5560 Å

Lambda	HR	395	905	976	1 139	1 368	1 376	1 389	1 403
	HD	8 374	18 769	20 210	23 281	27 628	27 749	27 962	28 226
4040			−0.040	0.157	0.022	0.199	0.230		0.164
4170			−0.071	0.115	0.032	0.175	0.169		0.115
4260			−0.075	0.060	0.019	0.139	0.134		0.062
4460			−0.091	−0.021	−0.030	0.062	0.042		0.022
4570			−0.103	−0.030	−0.040	0.043	0.029		−0.009
4790		0.022	−0.091	−0.031	−0.030	0.015	0.001	−0.149	0.006
5000		0.031	−0.055	−0.024	−0.031	−0.005	0.001	−0.079	−0.019
5260		−0.001	−0.033	−0.005	−0.016	0.005	−0.002	−0.054	−0.017
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		−0.003	0.035	0.019	0.023	0.011	0.003	0.049	0.031
6060		0.023	0.060	−0.015	−0.014	0.036	0.033	0.091	0.037
6440		0.051	0.157	0.068	0.079	0.035	0.037	0.159	0.100
6800		0.099	0.201	0.096	0.116	0.041	0.040	0.219	0.130
7100			0.220	0.137	0.147	0.073	0.072		0.150
7530			0.304	0.145	0.180	0.106	0.081		0.200
7780			0.328	0.179	0.216	0.120	0.110		0.259

Table IV (continued)

Lambda	HR	1428	1458	1483	1519	1672	2143	2291	2772
	HD	28546	29140	29573	30210	33254	41357	44691	56820
4040		0.121		−0.153	0.036			0.117	
4170		0.087		−0.117	0.023			0.134	0.176
4260		0.038		−0.140	−0.013			0.080	0.116
4460		−0.013		−0.134	−0.059			0.043	0.063
4570		−0.034		−0.131	−0.061			0.019	0.031
4790		−0.040	−0.053	−0.124	−0.076	−0.027	−0.064	0.015	0.010
5000		−0.038	−0.028	−0.071	−0.063	−0.016	−0.016	0.001	0.019
5260		−0.016	−0.014	−0.044	−0.026	−0.012	−0.008	0.006	0.012
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.023	0.040	0.043	0.025	0.022	−0.004	0.033	−0.001
6060		0.049	0.048	0.022	0.051	0.036	0.009	0.027	0.038
6440		0.081	0.099	0.152	0.100	0.073	0.049	0.049	0.106
6800		0.128	0.142	0.226	0.119	0.097	0.092	0.095	0.167
7100		0.174		0.251	0.153			0.148	0.221
7530		0.248		0.318	0.199			0.154	0.288
7780		0.219		0.365	0.214			0.180	

Table IV (continued)

Lambda	HR	3429	3572	4685	5531	5892	6129	7056	7431
	HD	73731	76756	107168	130841	141795	148367	173648	184552
4040		−0.016		−0.018	−0.108		−0.023	−0.110	−0.058
4170		−0.057		0.003	−0.096		−0.024	−0.099	−0.057
4260		−0.066		−0.003	−0.096		−0.019	−0.090	−0.062
4460		−0.080		−0.048	−0.088		−0.042	−0.082	−0.107
4570		−0.078		−0.053	−0.067		−0.050	−0.057	−0.110
4790		−0.075	−0.111	−0.035	−0.055	−0.067	−0.047	−0.042	−0.092
5000		−0.056	−0.060	0.003	−0.027	−0.026	−0.019	0.012	−0.054
5260		−0.007	−0.019	0.012	−0.013	−0.014	−0.011	0.043	−0.007
5560		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5840		0.023	0.012	0.043	0.048	0.040	0.015	−0.033	−0.025
6060		0.098	0.049	0.081	0.123	0.084	0.090	−0.011	−0.010
6440		0.165	0.107	0.149	0.155	0.143	0.127	0.143	0.074
6800		0.215	0.152	0.213	0.207	0.189	0.179	0.109	0.109
7100		0.259		0.254	0.270		0.246	0.142	0.159
7530		0.302		0.286	0.321		0.290	0.203	0.192
7780		0.396		0.367	0.372		0.329	0.243	0.256
Remarks				5200 feature			5200 feature	5200 feature	4200 feature; 5200 feature

Table IV (continued)

Lambda HR	7653	7928	8278	8322	8708
HD	189849	197461	206088	207098	216608
4040		0.164			0.145
4170		0.129			0.088
4260	−0.034	0.112			0.073
4460	−0.073	0.050			−0.015
4570	−0.111	0.031			−0.028
4790	−0.113	0.019	−0.036	−0.127	−0.007
5000	−0.083	0.004	0.009	−0.009	−0.020
5260	−0.048	0.002	0.024	0.017	−0.006
5560	0.000	0.000	0.000	0.000	0.000
5840	0.046	−0.002	−0.002	0.023	0.013
6060	0.091	0.006	0.022	0.037	0.040
6440	0.148	−0.009	0.066	0.075	0.050
6800	0.185	−0.019	0.111	0.125	0.072
7100	0.260	0.000			0.078
7530	0.344	0.019			0.185
7780	0.358	0.006			0.156

into Hayes and Latham (1975) calibration of α Lyrae for Ap and Am stars, respectively, which also include the stars from the Table II. Notes on some of the stars follow the tables.

References

Allen, C. W.: 1973, *Astrophysical Quantities*, Athlone Press, London.
Babu, G. S. D.: 1976, *Astrophys. Space Sci.* **43,** 57.
Babu, G. S. D.: 1977, *Astrophys. Space Sci.* **50,** 343.
Babu, G. S. D. and Rautela, B. S.: 1978, *Astrophys. Space Sci.* **58,** 245.
Bappu, M. K. V.: 1977, *Kodaikanal Obs. Bull., Ser. A* **2,** 64.
Bečvář, A.: 1964, *Atlas of the Heavens – II Catalogue*, Sky Publ. Corp., Cambridge, Mass.
Blanco, V. M., Demers, S., Douglas, G. G. and Fitzgerald, M. P.: 1970, *Photoelectric Catalogue*, Publ. U.S. Naval Obs. (2nd Ser.), Vol. XXI.
Cowley, A., Cowley, C., Jaschek, M. and Jaschek, C.: 1969, *Astron. J.* **74,** 375.
Gray, D. F.: 1967, *Astrophys. J.* **149,** 317.
Hayes, D. S.: 1970, *Astrophys. J.* **159,** 165.
Hayes, D. S. and Latham, D. W.: 1975, *Astrophys. J.* **197,** 593.
Hoffleit, D.: 1964, *Catalogue of Bright Stars* (3rd ed.), Yale University Obs., New Haven, Connecticut.
Mihalas, D.: 1966, *Astrophys. J. Suppl.* **13,** 1.