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DISCUSSION OF 12 VARIABLE STARS IN A REGION AROUND $\alpha = 17^h$, $\delta = -70^\circ$

The present paper presents the results of a study of variable stars situated in Ara, Apus and in Triangulum Australe. The investigation is based on 340 plates taken by A.Van Hoof and the first author with the 10-inch Metcalf telescope of the Boyden Observatory at Bloemfontein (South-Africa).

To facilitate the identification of the variables and their comparison stars small charts are shown in Figure 1. These charts cover a field of ±30 minutes of arc square with North on top. Star no.2 is identical with BS Apus and star no.7 is identical with DZ Apus.No chart is given for these variables.

The improved values have been given in Table 1. The mean errors in the sixth column correspond with the last two decimals of the periods.

The periods P in the fifth column were used in deriving the phases according to the formula:

$$\text{Phase} = P^{-1} \times (\text{J.D.Hel.} - 24360000).$$

The brightnesses of the comparison stars have been tabulated in Table 2. The magnitudes have been derived from star-counts, made in a field of $\frac{1}{4}\square^\circ$ around each variable and compared with the tables in Groningen Publication no.43.

The data of the least-square solutions are given in Table 3.

The mean phase, the mean brightness and the numbers of observations for each point of the light curve are given in table 4.

Figure 2 shows the mean light-curves.

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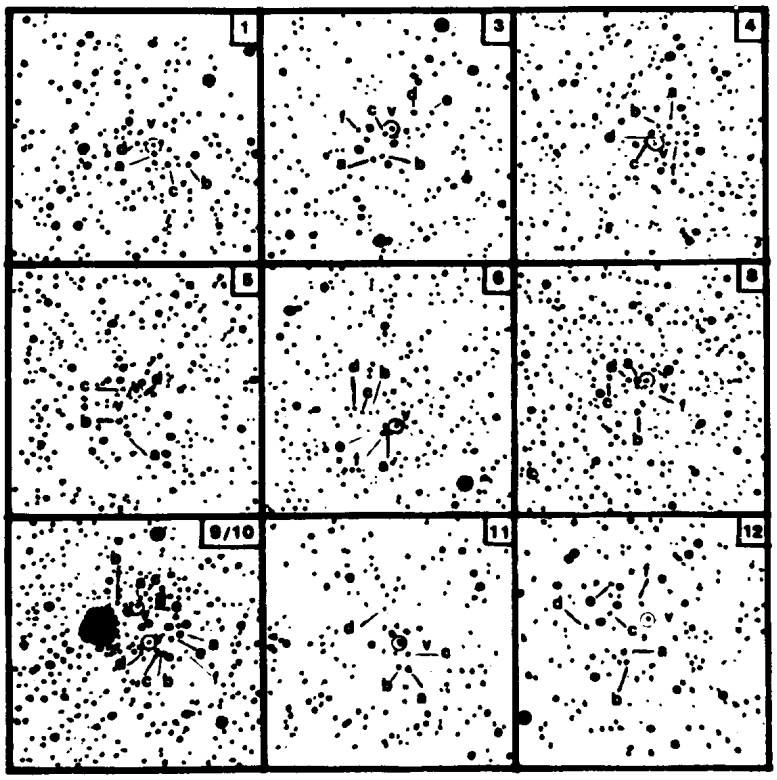


FIG. 1

TABLE 1

x	R.A.(1875)	Dec.(1875)	Type	Period	m.e.	Epoch J.D. 2437 000^d +	m.e. of single epoch	phase of epoch	n of epochs	Brightness max.	Brightness min.	n of estim.	m.e. of single estimate
	h m s	° ′		d		d	d	P		m	m		m
1	16 05 44.4	- 68 36.9	RR	0.4706768	± 29	419.932	± 0.030	.787	22	13.50	15.13	220	± .19
2	16 07 17.7	- 71 21.4	RR	0.5825555	± 39	419.947	± 0.041	.446	26	11.80	12.82	286	± .11
3	16 32 20.4	- 71 49.7	RR	0.4757793	± 37	295.980	± 0.024	.910	13	13.49	15.46	305	± .16
4	17 01 29.3	- 67 23.8	RR	0.5868458	± 30	295.672	± 0.020	.857	14	14.18	16.23	249	± .19
5	17 08 00.1	- 70 54.0	RR	0.4709907	± 23	419.638	± 0.024	.152	26	14.13	15.30	340	± .12
6	17 10 28.8	- 67 29.9	RR	0.6284849	± 56	296.086	± 0.029	.238	22	14.16	15.06	275	± .13
7	17 13 30.7	- 73 04.1	RR	0.5520642	± 31	419.714	± 0.027	.647	17	14.30	15.45	315	± .16
8	17 17 16.2	- 72 01.9	RR	0.5633189	± 39	419.946	± 0.030	.678	15	13.85	15.80	327	± .12
9	17 17 58.1	- 66 59.8	RR	0.4558950	± 17	296.031	± 0.011	.829	20	13.98	14.87	306	± .10
10	17 18 17.3	- 66 54.5	RR	0.3814870	± 50	419.997	± 0.038	.270	23	14.33	14.99	269	± .17
11	17 29 00.8	- 70 19.3	RR	0.7550246	± 58	295.613	± 0.046	.987	31	12.66	13.31	314	± .09
12	17 31 51.4	- 67 27.7	RR	0.4871444	± 51	419.991	± 0.020	.928	14	13.30	15.10	225	± .18

T A B L E 2

Comparison Stars

Var 1		Var 2		Var 3		Var 4		Var 5		Var 6	
x	m	x	m	x	m	x	m	x	m	x	m
a	13.46	a	11.77	a	13.44	a	14.00	a	14.05	a	14.02
b	14.02	b	12.16	b	13.62	b	14.22	b	14.46	b	14.29
c	14.55	c	12.64	c	13.98	c	14.45	c	15.12	c	14.61
d	15.19	d	12.90	d	14.39	d	15.63	d	15.44	d	14.73
				e	14.78	e	16.33			e	14.90
				f	16.02					f	15.06

Var 7		Var 8		Var 9		Var 10		Var 11		Var 12	
x	m	x	m	x	m	x	m	x	m	x	m
a	14.21	a	13.34	a	13.85	a	14.15	a	12.63	a	13.15
b	14.56	b	13.86	b	14.02	b	14.34	b	12.83	b	13.47
c	14.87	c	14.20	c	14.24	c	14.59	c	13.18	c	13.98
d	15.39	d	14.50	d	14.73	d	14.76	d	13.45	d	14.30
		e	14.76	e	14.83	e	15.15			e	14.82
		f	15.05	f	14.97					f	15.18

T A B L E 3

J.D. max.	t	O - C
Var 1		
2436 788.240	0	-0.0433
2437 131.395	729	-0.0117
132.334	731	-0.0140
133.265	733	-0.0244
134.296	735	0.0652
135.211	737	0.0389
136.606	740	0.0219
141.283	750	-0.0079
142.216	752	-0.0163
143.213	754	0.0394
157.265	784	-0.0289
164.321	799	-0.0331
190.234	854	-0.0073
437.356	1379	0.0094
469.325	1447	-0.0276
486.324	1483	0.0270
492.421	1496	0.0052
755.536	2055	0.0119
2438 265.251	3138	-0.0160
2439 265.480	5263	0.0249
2440 365.451	7600	0.0243
742.400	8401	-0.0387
Var 2		
2436 095.225	0	0.0088
786.237	1186	0.1100
790.258	1193	0.0531
833.280	1267	-0.0340
836.224	1272	-0.0028
2437 132.205	1780	0.0400
133.265	1782	-0.0651
134.470	1784	-0.0252
136.215	1787	-0.0279
140.264	1794	-0.0568
143.213	1799	-0.0206
437.399	2304	-0.0251
486.369	2388	0.0103
490.424	2395	-0.0126
790.436	2910	-0.0167
793.372	2915	0.0065
2438 178.472	3576	0.0373
262.294	3720	-0.0287
265.251	3725	0.0156
940.413	4884	-0.0043
2439 265.512	5442	0.0288
268.456	5447	0.0600
293.418	5490	-0.0279
2440 338.529	7284	-0.0215
383.362	7361	-0.0453
386.363	7366	0.0430

J.D. max.	t	O - C
Var 3		
2436 038.4708	0	-0.0247
041.3205	6	-0.0297
064.2116	54	0.0240
807.3913	1616	0.0364
839.2256	1683	-0.0065
2437 132.2913	2299	-0.0209
133.2650	2301	0.0013
143.2346	2322	-0.0205
162.3264	2362	0.0402
192.2611	2425	0.0008
486.3022	3043	0.0103
2438 262.2937	4674	0.0045
2439 268.5446	6789	-0.0167
Var 4		
2436 046.2808	0	0.0037
100.2682	92	0.0013
110.2463	109	0.0030
806.2442	1295	0.0018
867.2617	1399	-0.0127
894.2590	1445	-0.0103
2437 134.2962	1854	0.0070
135.4686	1856	0.0057
137.2124	1859	-0.0111
138.3800	1861	-0.0172
141.3045	1866	-0.0269
144.2782	1871	0.0126
790.4363	2972	0.0534
2440 365.4514	7360	-0.0107
Var 5		
2436 036.338	0	0.0000
038.253	4	0.0310
046.238	21	0.0092
052.328	34	-0.0237
069.276	70	-0.0313
078.267	89	0.0108
110.267	157	-0.0165
111.224	159	-0.0015
833.280	1692	0.0258
873.280	1777	-0.0084
874.241	1779	0.0106
2437 131.395	2325	0.0037
132.334	2327	0.0007
133.265	2329	-0.0103
136.606	2336	0.0338
141.283	2346	0.0009
142.216	2348	-0.0081
147.372	2359	-0.0330
157.265	2380	-0.0308

T A B L E 3 (continued)

J.D. MAX.	t	O - C
Var 5 (cont)		
2437 158.251	2382	0.0132
190.257	2450	-0.0081
199.258	2469	0.0440
432.341	2964	-0.0133
439.404	2979	-0.0152
2439 265.500	6856	0.0501
2440 386.373	9236	-0.0348
Var 6		
2436042.2456	0	-0.0126
49.2187	11	0.0472
52.3388	16	0.0249
64.2223	35	-0.0329
69.2650	43	-0.0180
788.2193	1187	-0.0505
871.2852	1319	0.0554
2437128.2809	1728	0.0008
131.4381	1733	0.0156
133.2757	1736	-0.0323
134.5323	1738	-0.0327
135.2110	1739	0.0175
136.4728	1741	0.0224
140.2429	1747	0.0216
145.2574	1755	0.0082
194.2453	1833	-0.0257
439.3712	2223	-0.0090
755.5140	2726	0.0059
760.5020	2734	-0.0339
784.4348	2772	0.0164
2438178.4680	3399	-0.0104
506.5686	3921	0.0211
Var 7		
2436 036.273	0	0.0315
038.465	4	0.0153
041.213	9	0.0030
046.217	18	0.0384
068.236	58	-0.0252
110.225	134	0.0069
2437 134.275	1989	-0.0221
135.404	1991	0.0027
139.289	1998	0.0233
141.433	2002	-0.0410
192.250	2094	-0.0138
432.384	2529	-0.0278
437.388	2538	0.0076
787.374	3172	-0.0151
792.354	3181	-0.0036
2439 268.545	5855	-0.0323
2440 338.529	7793	0.0514

J.D. max.	t	O -C
Var 8		
2436 035.295	0	-0.0130
066.270	55	-0.0205
097.273	110	0.0000
782.239	1326	-0.0298
839.226	1427	0.0620
845.340	1438	-0.0205
2437 134.339	1951	-0.0041
136.606	1955	0.0096
142.237	1965	0.0075
147.351	1974	0.0516
437.356	2489	-0.0526
758.508	3059	0.0076
784.424	3105	0.0109
2439 235.523	5681	0.0005
2440 386.373	7724	-0.0099
Var 9		
2436026.3572	0	-0.0067
033.2040	15	0.0017
038.2305	26	0.0133
069.2113	94	-0.0067
079.2530	116	0.0053
100.2355	162	0.0166
110.2463	184	-0.0023
782.2389	1658	0.0011
833.2798	1770	-0.0182
839.2256	1783	0.0010
2437131.4381	2424	-0.0152
132.3772	2426	0.0121
133.2650	2428	-0.0119
138.2728	2439	-0.0189
190.2565	2553	-0.0073
432.3514	3084	0.0074
437.3670	3095	0.0082
469.2817	3165	0.0102
793.4144	3876	0.0016
2438265.2721	4911	0.0080
Var 10		
2436035.2278	0	0.0284
038.2526	8	0.0013
041.2560	16	-0.0472
046.2592	29	-0.0034
049.2830	37	-0.0315
051.2559	42	0.0340
064.2545	76	0.0621
067.2404	84	-0.0039
078.2673	113	-0.0402
109.2311	194	0.0232
788.2296	1974	-0.0251

T A B L E 3 (continued)

J.D. max.	t	O - C
Var 10 (cont)		
2436806.2220	2021	0.0374
2437134.2747	2881	0.0113
135.4686	2884	0.0607
136.5372	2887	-0.0152
137.2983	2889	-0.0170
141.4334	2900	-0.0783
143.4493	2905	0.0302
145.2789	2910	-0.0477
169.3242	2973	-0.0360
192.2611	3033	0.0116
790.4685	4601	0.0475
795.3772	4614	-0.0032
Var 11		
2436036.2734	0	0.0417
038.4376	3	-0.0591
042.2349	8	-0.0370
051.2990	20	-0.0332
064.2116	37	0.0440
067.2191	41	0.0314
079.2639	57	-0.0042
110.2250	98	0.0010
788.2400	996	0.0039
874.2409	1110	-0.0680
2437132.4631	1452	-0.0642
133.2650	1453	-0.0173
136.2796	1457	-0.0228
139.2886	1461	-0.0339
158.2510	1486	0.0528
170.3000	1502	0.0214
192.2614	1531	0.0871
195.2564	1535	0.0620
432.3621	1849	0.0900
469.3033	1898	0.0350
490.4343	1926	0.0253
792.3755	2326	-0.0428
795.3879	2330	-0.0504
2438174.4793	2832	0.0183
196.3810	2861	0.0244
258.2287	2943	-0.0412
261.2272	2947	-0.0626
264.2611	2951	-0.0473
2439265.5004	4277	0.0290
268.5130	4281	0.0213
2440390.4547	5767	-0.0030

J.D. max.	t	O - C
Var 12		
2436786.2366	0	0.0207
803.2432	35	-0.0228
2437134.5215	715	-0.0027
135.4686	717	-0.0298
136.4728	719	0.0001
138.4229	723	0.0016
144.2889	735	0.0219
145.2574	737	0.0161
162.3050	772	0.0136
759.5047	1998	-0.0257
760.4913	2000	-0.0134
2438178.4680	2858	-0.0066
198.4439	2899	-0.0036
262.2936	3030	0.0301

T A B L E 4

n	phase	m	n	phase	m	n	phase	m	n	phase	m
	Var 1			Var 2 (cont)			Var 3 (cont)			Var 5 (cont)	
	p	m_v									
10	.005	14.42	10	.735	12.27	5	.933	13.69	5	.165	14.21
10	.092	14.69	10	.755	12.61	5	.959	13.87	5	.177	14.15
10	.148	14.94	10	.786	12.65	5	.987	13.81	5	.196	14.45
10	.184	14.97	10	.815	12.64				5	.212	14.35
10	.208	15.11	10	.849	12.70		Var 4		5	.232	14.42
10	.246	15.09	10	.883	12.72				10	.246	14.58
10	.295	15.04	10	.927	12.74	10	.021	15.43	10	.264	14.57
10	.325	15.09	10	.964	12.82	10	.057	15.45	10	.301	14.73
10	.369	14.95	6	.994	12.72	10	.109	15.69	10	.329	14.80
10	.401	15.08				10	.148	15.79	10	.376	15.04
10	.433	15.12		Var 3		10	.189	16.00	10	.421	14.98
10	.463	15.13				10	.237	16.15	10	.453	15.08
10	.541	15.01	5	.008	13.81	10	.277	16.08	10	.487	15.09
10	.610	15.04	5	.033	14.20	10	.320	16.09	10	.513	15.13
5	.651	14.59	5	.055	14.24	10	.364	16.16	10	.540	15.18
5	.678	14.19	5	.076	14.38	10	.397	16.11	10	.571	15.23
5	.703	13.83	5	.091	14.39	10	.444	16.09	10	.599	15.21
5	.745	13.57	5	.108	14.25	10	.521	16.23	10	.622	15.21
10	.775	13.62	5	.126	14.75	10	.560	16.13	10	.649	15.27
10	.809	13.73	5	.142	14.64	10	.596	16.17	10	.673	15.26
10	.841	13.82	10	.168	14.76	10	.645	16.24	10	.689	15.24
10	.871	14.00	10	.191	14.66	10	.721	16.13	10	.707	15.30
10	.906	14.14	10	.220	14.71	10	.748	15.70	10	.727	15.28
10	.943	14.35	10	.250	14.75	5	.768	15.81	10	.752	15.20
			10	.282	14.84	5	.777	15.30	10	.768	15.23
	Var 2		10	.330	14.90	5	.789	15.06	10	.793	15.26
			10	.365	15.19	5	.807	14.46	10	.821	15.27
10	.024	12.77	10	.395	15.31	5	.818	14.38	10	.854	15.28
10	.060	12.79	10	.434	15.31	5	.826	14.24	10	.901	15.21
10	.098	12.79	10	.464	15.46	5	.837	14.22	10	.937	15.25
10	.133	12.80	10	.492	15.18	5	.855	14.18	10	.966	15.30
10	.176	12.69	10	.522	15.17	5	.868	14.20	10	.992	15.23
10	.220	12.68	10	.542	15.40	5	.882	14.27			
10	.260	12.64	10	.569	15.45	5	.899	14.33		Var 6	
10	.288	12.50	10	.589	15.42	5	.924	14.34			
10	.322	12.17	10	.615	15.34	5	.944	14.50	10	.010	15.06
10	.361	11.97	10	.637	15.17	5	.960	15.54	10	.042	15.06
10	.401	11.80	10	.660	15.29	9	.988	14.90	10	.079	15.04
10	.440	11.86	10	.689	15.36				5	.120	14.90
10	.466	11.88	10	.715	15.41		Var 5		5	.137	14.87
10	.498	12.06	10	.744	15.45				5	.156	14.67
10	.525	11.95	10	.765	15.33	10	.014	15.23	5	.166	14.53
10	.563	12.05	10	.792	14.98	10	.040	15.11	5	.176	14.37
10	.605	12.28	5	.812	14.57	10	.071	14.56	5	.192	14.43
10	.635	12.41	5	.834	14.01	5	.099	14.23	5	.210	14.43
10	.675	12.50	5	.864	13.49	5	.127	14.20	5	.229	14.16
10	.708	12.50	5	.895	13.55	5	.147	14.18	5	.246	14.24

TABLE 4 (continued)

n	phase	m
	Var 6 (con)	
5	.260	14.43
5	.272	14.29
5	.279	14.46
5	.299	14.68
5	.315	14.56
5	.350	14.63
5	.376	14.82
5	.393	14.89
10	.429	14.86
10	.475	14.95
10	.522	15.03
10	.561	14.98
10	.597	15.03
10	.612	15.02
10	.679	15.02
10	.714	15.03
10	.767	15.06
10	.811	15.06
10	.843	15.06
10	.874	15.06
10	.906	15.05
10	.939	15.01
10	.964	15.06
10	.990	15.06
	Var 7	
10	.018	15.39
10	.051	15.36
10	.094	15.39
10	.132	15.36
10	.172	15.41
10	.199	15.39
10	.231	15.40
10	.259	15.41
10	.293	15.38
10	.318	15.40
10	.345	15.40
10	.371	15.39
10	.405	15.41
10	.435	15.39
10	.466	15.32
10	.491	15.11
10	.516	15.11
10	.545	14.93
10	.566	14.54
10	.598	14.40
10	.634	14.32
10	.675	14.44
10	.716	14.56
10	.749	14.60
10	.772	14.71

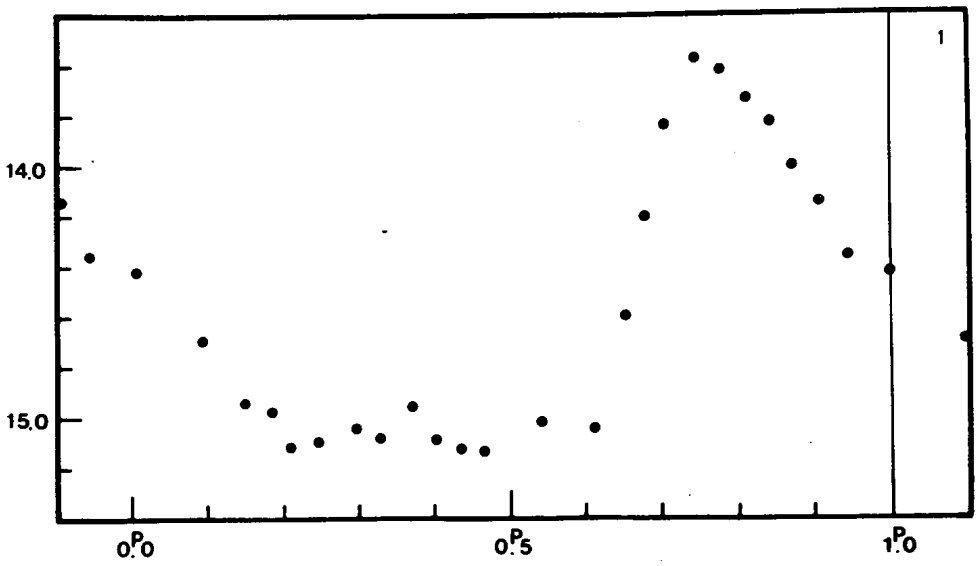
n	phase	m
	Var 7 (con)	
10	.795	14.67
10	.818	14.79
10	.850	15.00
10	.894	15.15
10	.930	15.18
10	.966	15.26
5	.991	15.37
	Var 8	
10	.020	14.54
10	.053	14.68
10	.108	14.67
10	.131	14.65
10	.160	14.66
10	.188	14.72
10	.219	14.70
10	.250	14.78
10	.278	14.71
10	.311	14.71
10	.340	14.71
10	.366	14.75
10	.397	14.77
10	.428	14.73
10	.454	14.76
10	.478	14.71
10	.513	14.70
10	.533	14.60
10	.564	14.45
10	.600	14.22
10	.637	14.00
10	.669	13.99
10	.715	14.11
10	.751	14.11
10	.777	14.06
10	.799	14.24
10	.826	14.28
10	.858	14.42
10	.895	14.36
10	.919	14.38
10	.943	14.41
10	.971	14.55
7	.993	14.62
	Var 9	
10	.012	14.74
10	.060	14.75
10	.101	14.80
10	.139	14.82
10	.195	14.81
10	.227	14.80

n	phase	m
	Var 9 (con)	
10	.258	14.81
10	.286	14.85
10	.322	14.84
10	.350	14.84
10	.384	14.84
10	.411	14.84
10	.441	14.84
10	.461	14.85
10	.493	14.84
10	.523	14.83
10	.564	14.83
10	.597	14.83
10	.628	14.84
10	.656	14.84
10	.691	14.87
10	.736	14.79
5	.776	14.30
5	.788	14.15
5	.806	14.01
5	.820	13.98
5	.829	13.98
5	.841	14.14
5	.853	14.04
5	.866	14.11
5	.875	14.29
5	.897	14.25
5	.907	14.46
10	.923	14.54
10	.951	14.66
11	.973	14.67
	Var 10	
10	.023	14.58
10	.058	14.47
10	.089	14.44
10	.121	14.47
10	.159	14.40
10	.190	14.36
10	.224	14.36
10	.257	14.33
10	.296	14.39
10	.333	14.41
10	.364	14.37
10	.398	14.44
10	.434	14.48
10	.468	14.48
10	.509	14.57
10	.544	14.63
10	.587	14.61
10	.626	14.73
10	.660	14.87

n	phase	m
	Var 10 (con)	
10	.700	14.90
10	.729	14.88
10	.772	14.89
10	.816	14.99
10	.855	14.93
10	.892	14.88
10	.940	14.71
9	.968	14.68
	Var 11	
5	.006	12.68
5	.016	12.70
5	.032	12.71
5	.041	12.77
5	.047	12.76
5	.059	12.81
5	.076	12.80
5	.092	12.80
10	.116	12.84
10	.145	12.94
10	.196	12?87
10	.241	13.03
10	.276	13.03
10	.300	13.05
10	.326	13.07
10	.353	13.03
10	.381	13.07
10	.404	13.20
10	.432	13.21
10	.468	13.13
10	.524	13.21
10	.556	13.22
10	.588	13.18
10	.619	13.19
10	.652	13.27
10	.676	13.30
10	.706	13.30
10	.728	13.31
10	.750	13.24
10	.781	13.11
10	.824	12.85
5	.857	12.82
5	.879	12.74
5	.896	12.69
5	.912	12.66
5	.933	12.66
5	.943	12.68
5	.957	12.71
9	.979	12.69

T A B L E 4 (continued)

n	phase	m
	Var 12	
10	.025	13.68
10	.057	13.94
10	.098	14.01
10	.133	14.24
10	.217	14.56
10	.272	14.85
10	.318	14.89
10	.360	14.93
10	.394	14.93
10	.433	14.94
10	.479	15.08
10	.522	15.09
10	.554	15.06
10	.593	15.07
10	.623	15.06
10	.652	14.97
10	.681	14.99
10	.718	15.05
10	.746	15.07
10	.797	14.80
5	.837	13.95
5	.879	13.37
5	.910	13.30
5	.950	13.38
5	.981	13.52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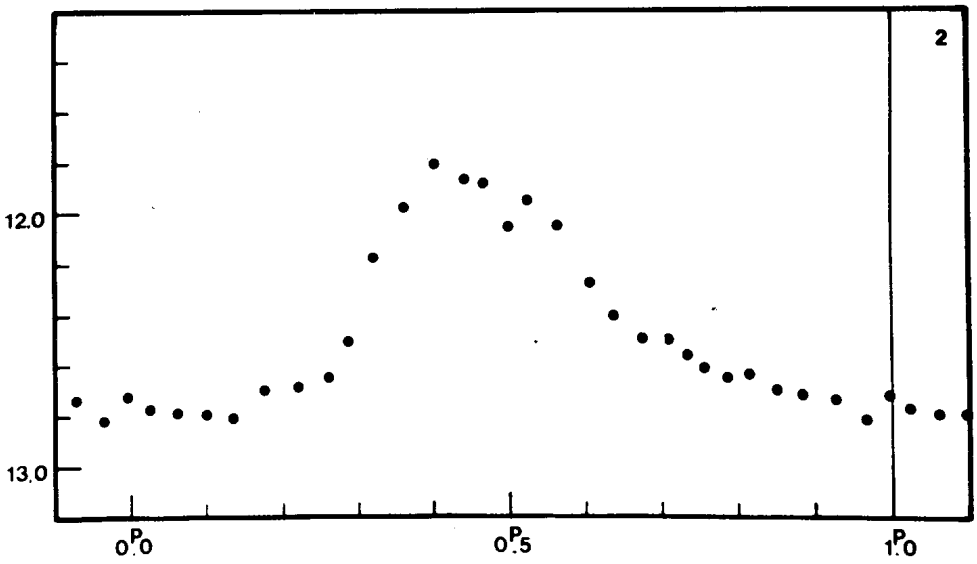
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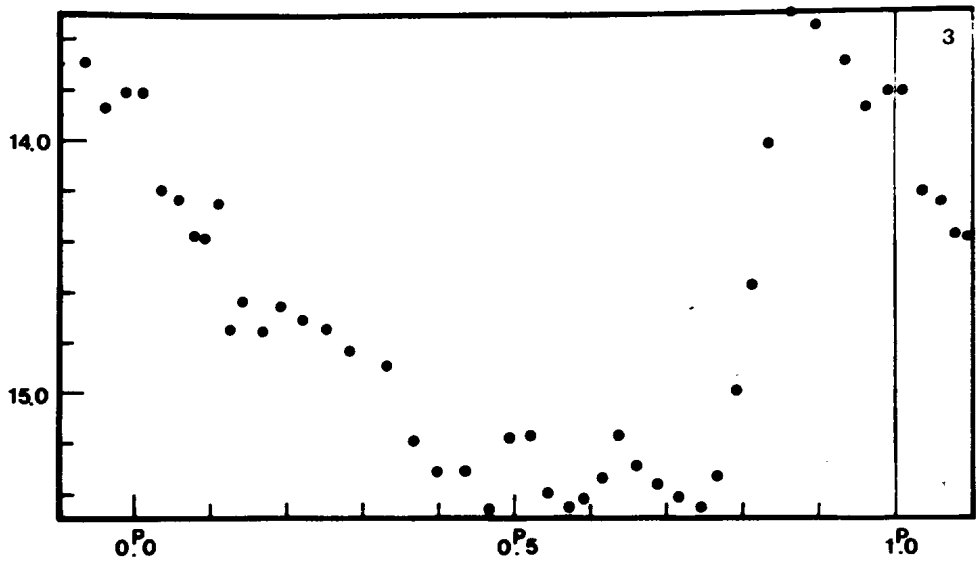
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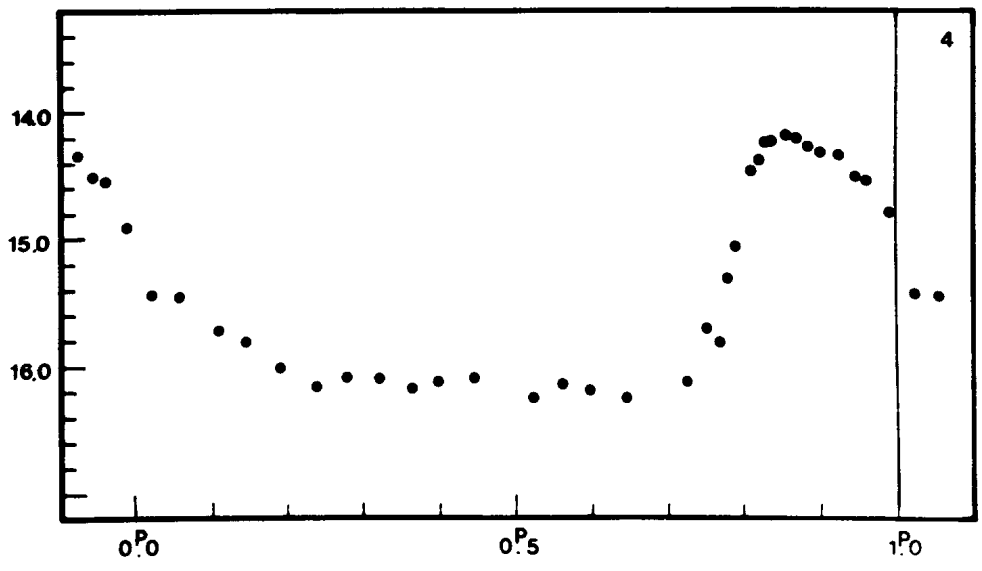
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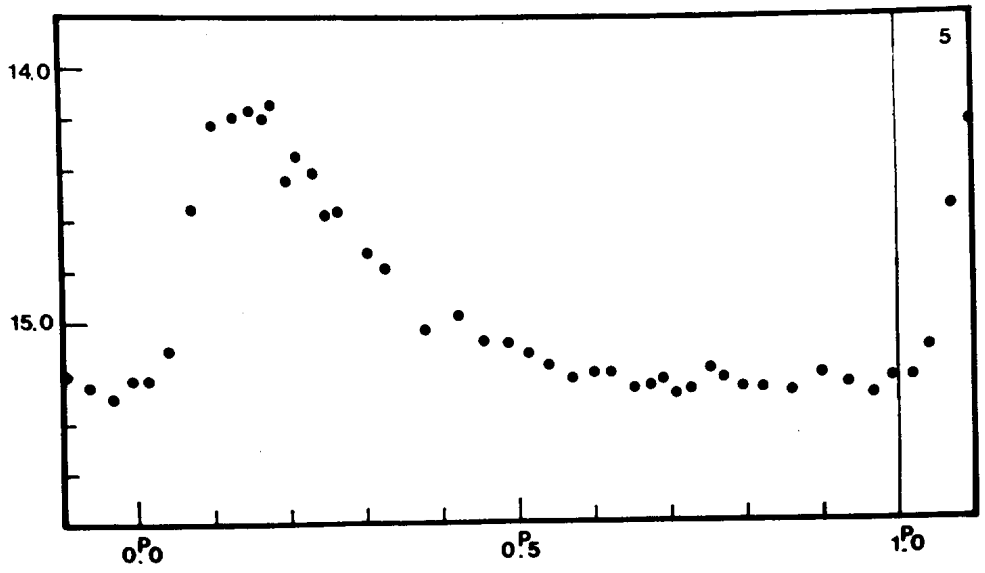
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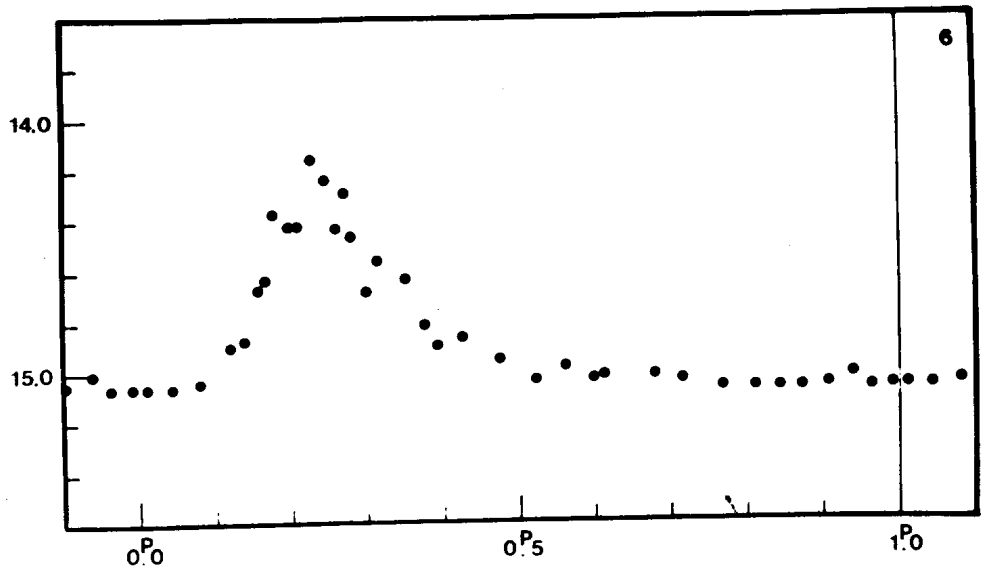
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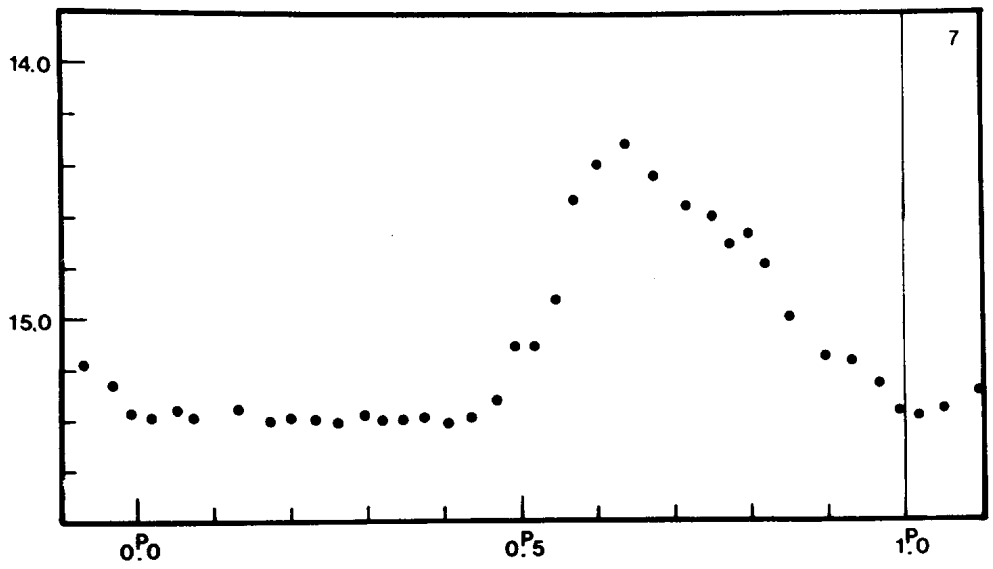
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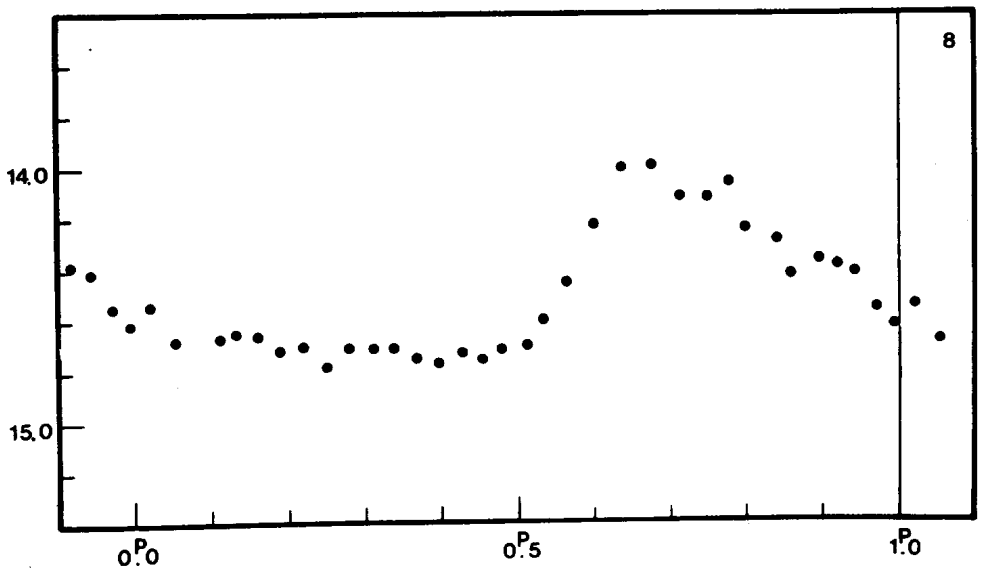
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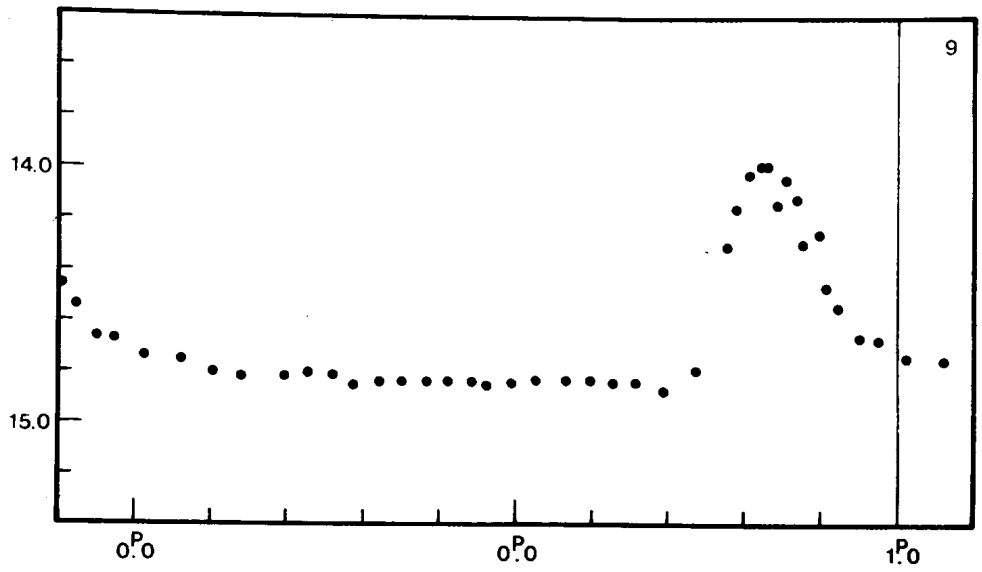
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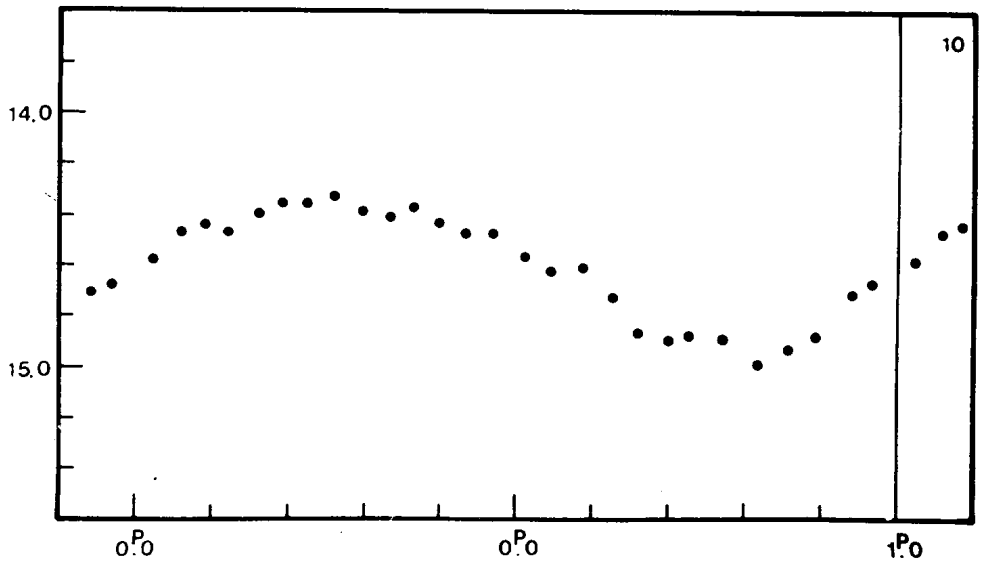
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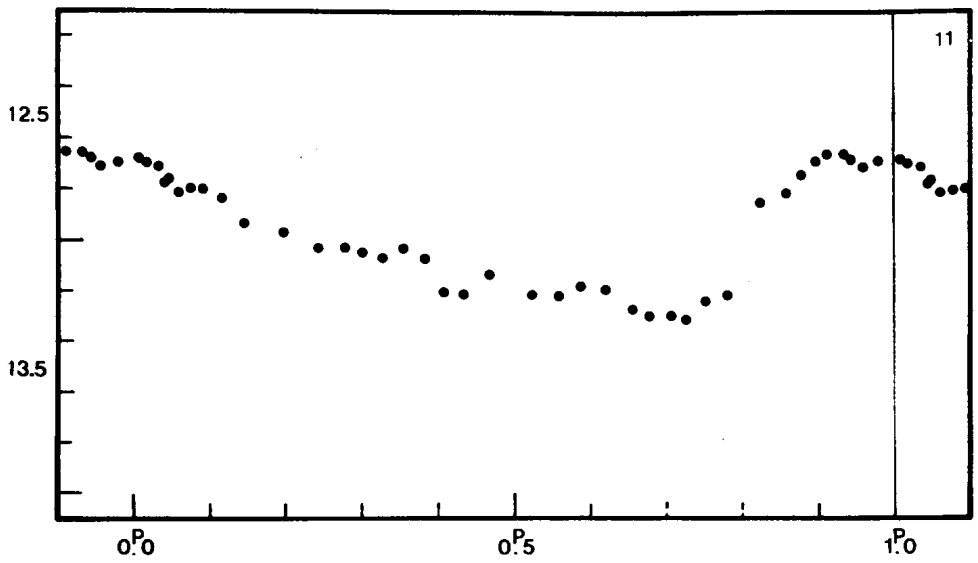
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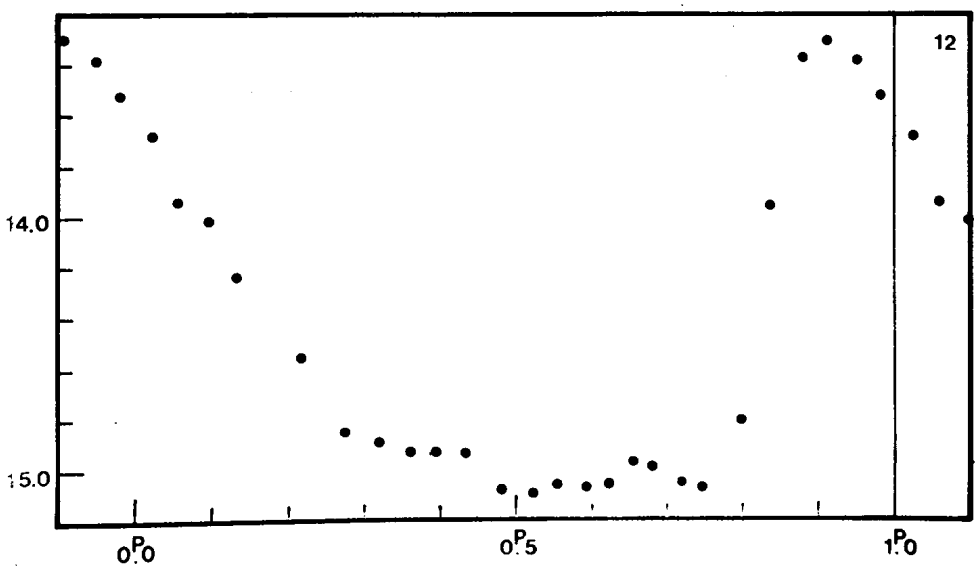
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