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MULTICOLOR PHOTOMETRY OF METALLIC-LINE STARS I.

ν^1 DRACONIS AND ν^2 DRACONIS

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RESUMEN

En este trabajo se describen observaciones fotométricas en el sistema UBVRI de BS6554 (ν^1 Dra) y BS6555 (ν^2 Dra). Actualmente se acepta que BS6555 es una estrella de la clase "metálica", Am. Pero hay discrepancia si BS6554 pertenece a este grupo espectroscópico o no. La fotometría que se obtuvo en el Observatorio Astronómico Nacional en San Pedro Mártir, B. C., indica que ambas estrellas, probablemente, son variables. La amplitud de la variabilidad es pequeña, del orden de un décimo de magnitud. A primera apreciación la variación parece irregular.

ABSTRACT

This paper describes UBVRI-photometric observations of the double star BS6554 (ν^1 Dra) and BS6555 (ν^2 Dra). Today, it is accepted that BS6555 is a metallic-line star, Am; however, there is not a general agreement as to whether BS6554 is an Am Star or not. The photometry indicates that probably both are variable stars. The variability amplitude is around 0.1 mag. At the first galance, the variables are irregular.

Key words: METALLIC LINE STARS—VARIABLE STARS—PHOTOMETRY.

I. INTRODUCTION

Titus and Morgan (1940) introduced the term "metallic-line star" (Am) for those stars, in the range A-F, which showed spectroscopic anomalies, namely, three different spectral types: one, from the K-line of CaII (the earliest), another, from hydrogen lines (intermediate) and the other, from the metallic-lines (the latest). The definition of classical metallic-line stars is based on only superficial spectroscopic features. However, the classification today is more subtle, involving narrow-band photometry or high dispersion spectra for its application. See, for instance Conti (1970).

Breger (1970) has suggested that pulsation and metallic-line phenomena are mutually exclusive in Am stars. Besell and Eggen (1972) have supplied an example of a pulsating metallic-line star, BS5491. However, Breger *et al.* (1972) found no evidence that BS5491 suffers light variation.

We were engaged in erecting and testing two telescopes at San Pedro Mártir Observatory in 1971. We observed BS6554 (ν^1 Dra) and BS6555 (ν^2 Dra) during this period.

This pair has been classified as Am by several astronomers (cf. Jaschek *et al.* 1964). Slettebak (1955) also gives the K-and metallic-line-types, A4 and A7 for BS6554 and A2 and F2 for BS6555. More recently, Cowley *et al.* (1969) classify BS6554 as an A6 V and BS6555 as an A4m. This indicates that, at least, ν^2 Draconis is a metallic-line star.

In the following sections we describe the observations, analyse the quality of the data and present the conclusions.

TABLE 1

STANDARD STARS

BS	MK	V	U−V	B−V	V−R	V−I	n
4456	B3 V	5.95	−0.81	−0.15	−0.10	−0.20	8
4550	G8 Vp	6.45	0.90	0.73	0.63	1.09	9
6603	K2 III	2.77	2.43	1.18	0.81	1.38	44
6629	A0 V	3.74	0.07	0.05	0.04	0.03	40
8622	09 V	4.89	−1.24	−0.21	−0.08	−0.30	21
8832	K3 V	5.59	1.86	0.99	0.84	1.37	20

TABLE 2

OBSERVED ATMOSPHERIC EXTINCTION

Filter Band	$\lambda_o(\mu)$	k		
		Tonantzintla	Tololo	S. Pedro M.
U	0.36	0.568		0.476
B	0.44	0.322	0.240	0.218
V	0.55	0.216	0.143	0.138
R	0.70	0.157	0.089	0.090
I	0.90	0.118	0.060	0.055
Months		Nov-Feb	Nov-Dec	June
Years		1963-4	1969	1971
nights		31	20	12

TABLE 3

PROBABLE ERROR OF A SINGLE OBSERVATION AT 1.0 AIR MASS

V	B−V	U−B	V−R	R−I
±0.015	±0.015	±0.019	±0.020	±0.018

II. THE OBSERVATIONS

The binary system BS6554 and BS6555 is well suited for accurate photometry because both stars are separated only by 62 seconds of arc and they also have similar colors. Under these conditions, the atmospheric extinction corrections are minimal, provided at least, one of them is a non variable star and the photo-electric equipment is stable.

We have made UBVRI photometry of ν^1 and ν^2 Dra at San Pedro Mártir Observatory in June 1971. Table 1 contains the standard stars observed in this program. The columns of this table give: first, the Bright Star (BS) Catalogue number (Hoffleit 1964); second, the MK type; third through seventh, the observed V magnitude and the observed U-V, B-V, V-R and V-I color indices, respectively; last, the number of independent observations.

The extinction coefficients were derived by the procedure outlined by Mendoza (1970). Table 2 lists the mean k-coefficient for U, B, V, R, and I for Tonantzintla, Tololo, and San Pedro Mártir Observatories. Table 3 contains the probable error of a single observation at 1.0 air mass for the measurements reported in this paper.

TABLE 4a

JOURNAL OF OBSERVATIONS OF BS6554

V	U−V	B−V	V−R	V−I	J.D. 2441100+
4.9	0.309	0.36	0.266	0.364	5.6784
4.902	0.319	0.235	0.235	0.343	5.7025
4.891	0.276	0.316	0.231	0.338	5.743
4.897	0.35	0.385	0.243	0.355	5.7602
4.88	0.313	0.335	0.216	0.323	5.8081
4.891	0.303	0.25	0.228	0.343	5.8236
4.89	0.288	0.227	0.216	0.334	5.8377
4.89	0.256	0.233	0.229	0.35	5.8516
4.897	0.268	0.228	0.237	0.349	5.8655
4.902	0.266	0.23	0.209	0.337	5.9268
4.932	0.327	0.248	0.24	0.369	5.944
4.898	0.323	0.283	0.239	0.344	5.9658
4.941	0.239	0.251	0.286	0.408	7.666
4.902	0.257	0.247	0.236	0.369	7.6827
4.87	0.265	0.259	0.22	0.341	7.717
4.896	0.277	0.241	0.243	0.381	7.7308
4.897	0.278	0.241	0.247	0.381	7.7455
4.874	0.267	0.244	0.218	0.342	7.7956
4.876	0.247	0.255	0.235	0.359	7.809
4.866	0.27	0.291	0.205	0.343	7.8227
4.849	0.271	0.274	0.216	0.331	7.8366
4.968	0.266	0.164	0.283	0.404	7.8928
4.951	0.284	0.281	0.265	0.385	7.9099
4.943	0.297	0.246	0.296	0.385	7.9504
4.887	0.271	0.253	0.232	0.34	10.6587
4.889	0.258	0.247	0.235	0.37	10.673
4.901	0.27	0.252	0.249	0.388	10.7059
4.907	0.258	0.248	0.246	0.388	10.7195
4.897	0.255	0.239	0.227	0.368	10.7339
4.897	0.255	0.204	0.243	0.392	10.7705
4.883	0.247	0.246	0.244	0.382	10.7859
4.901	0.251	0.243	0.26	0.409	10.8027
4.885	0.26	0.226	0.223	0.355	10.8194
4.875	0.243	0.236	0.241	0.383	10.842
4.864	0.282	0.267	0.244	0.364	11.7575
4.872	0.26	0.237	0.251	0.363	11.7719
4.898	0.275	0.254	0.271	0.375	11.7856
4.877	0.262	0.251	0.25	0.359	11.7993
4.917	0.279	0.25	0.281	0.405	11.8122
4.921	0.278	0.255	0.279	0.407	11.8276
4.948	0.289	0.252	0.286	0.404	11.8623
4.987	0.306	0.256	0.32	0.434	11.9063
4.98	0.252	0.259	0.319	0.455	11.9223
4.958	0.311	0.247	0.289	0.455	11.9614
4.971	0.277	0.236	0.385	0.521	11.9768
4.93	0.208	0.243	0.237	0.415	12.7179
4.883	0.171	0.249	0.239	0.421	12.765
4.897	0.17	0.258	0.262	0.443	12.7962
4.866	0.179	0.264	0.242	0.426	12.8102
4.883	0.18	0.27	0.23	0.415	12.8232

TABLE 4a—Continued

V	U−V	B−V	V−R	V−I	J.D. 2441100+
4.878	0.17	0.248	0.244	0.428	12.8364
4.85	0.252	0.251	0.186	0.318	15.8263
4.921	0.257	0.244	0.258	0.365	15.8687
4.94	0.261	0.267	0.264	0.389	15.8832
4.92	0.284	0.287	0.22	0.371	15.9072
4.97	0.25	0.203	0.315	0.432	15.9347
4.934	0.249	0.219	0.278	0.401	15.9606
4.935	0.268	0.248	0.271	0.391	15.9814
4.914	0.244	0.263	0.259	0.381	17.6981
4.876	0.247	0.252	0.213	0.335	17.7115
4.892	0.249	0.243	0.231	0.35	17.7245
4.887	0.272	0.264	0.228	0.366	17.7554
4.866	0.231	0.234	0.22	0.343	17.7684
4.869	0.236	0.265	0.207	0.325	17.7812
4.874	0.239	0.242	0.232	0.355	17.7939
4.872	0.237	0.258	0.226	0.348	17.8068
4.87	0.223	0.249	0.231	0.353	17.8212
4.939	0.265	0.216	0.257	0.38	17.8826
4.927	0.246	0.229	0.254	0.379	17.8991
4.914	0.246	0.228	0.243	0.379	17.9257
4.956	0.252	0.233	0.268	0.403	17.9505
4.94	0.269	0.238	0.26	0.388	17.9829
4.937	0.286	0.244	0.259	0.396	17.9975
4.892	0.269	0.223	0.245	0.342	19.7105
4.841	0.237	0.25	0.22	0.342	19.7444
4.88	0.231	0.197	0.231	0.374	19.7583
4.915	0.209	0.19	0.247	0.386	19.8274
4.915	0.197	0.203	0.219	0.383	19.8813
4.995	0.255	0.226	0.283	0.414	19.9154
4.911	0.252	0.261	0.253	0.374	21.7089
4.896	0.249	0.277	0.236	0.361	21.7403
4.887	0.257	0.265	0.243	0.373	21.7543
4.894	0.256	0.273	0.244	0.374	21.7673
4.883	0.248	0.258	0.267	0.371	21.7825
4.877	0.249	0.266	0.228	0.35	21.7969
4.872	0.252	0.272	0.239	0.369	21.812
4.922	0.246	0.27	0.267	0.404	21.8847
4.902	0.264	0.263	0.205	0.35	21.9002
4.897	0.218	0.239	0.235	0.397	21.9255
4.941	0.266	0.252	0.284	0.414	21.9513
4.929	0.22	0.224	0.246	0.396	21.9843
4.954	0.284	0.245	0.24	0.362	23.6945
4.91	0.268	0.248	0.253	0.382	23.7478
4.919	0.258	0.243	0.233	0.38	23.7611
4.9	0.261	0.255	0.232	0.367	23.7834
4.885	0.262	0.244	0.233	0.338	23.8041
4.909	0.283	0.238	0.254	0.372	23.8713
4.927	0.229	0.218	0.263	0.398	23.8867
4.88	0.254	0.228	0.252	0.362	23.918
4.876	0.223	0.236	0.231	0.342	23.9444

TABLE 4a—Continued

V	U−V	B−V	V−R	V−I	J.D. 2441100+
4.893	0.243	0.233	0.274	0.396	23.9798
4.885	0.226	0.225	0.259	0.386	23.9934
4.911	0.272	0.294	0.249	0.367	28.7594
4.917	0.261	0.27	0.234	0.339	28.774
4.927	0.231	0.253	0.251	0.357	28.787
4.928	0.23	0.261	0.254	0.353	28.8263
4.916	0.247	0.251	0.226	0.327	28.8702
4.903	0.261	0.264	0.2	0.304	28.8847
4.914	0.265	0.204	0.213	0.321	28.9103
4.953	0.237	0.268	0.295	0.418	28.9424
4.934	0.232	0.156	0.244	0.378	28.9786
4.91	0.261	0.256	0.25	0.351	32.6892
4.912	0.247	0.269	0.307	0.405	32.7036
4.913	0.283	0.201	0.253	0.353	32.7388
4.927	0.28	0.258	0.256	0.359	32.7531
4.912	0.277	0.265	0.247	0.357	32.7672
4.916	0.269	0.257	0.244	0.365	32.7803
4.93	0.276	0.222	0.306	0.429	32.8444
4.907	0..28	0.223	0.211	0.322	32.8579
4.914	0.291	0.238	0.218	0.367	32.8719
4.917	0.269	0.244	0.237	0.389	32.8843
4.916	0.276	0.248	0.23	0.374	32.897
4.922	0.292	0.258	0.259	0.391	32.9643

The journal of observations of BS6554 and BS6555 is listed in Tables 4a and 4b, respectively. The columns of these tables contain: first through fifth, the V magnitude, the U-V, B-V, V-R and V-I color indices, respectively; and last, the Julian Day.

III. THE QUALITY OF DATA

The photometric data for the standard stars (see Table 1), on the average, depart from the standard values (Johnson *et al.* 1966) ±0.01 mag. The probable errors quoted in Table 3 are approximately 20% larger than previous determinations (Mendoza 1967, 1970). However, the quality of the sky for photometry is excellent as indicated by the values of the extinction coefficients obtained in this observational period (cf. Table 2). Altogether, this indicates that the photometric measurements contained in Table 4 are reasonably good. Perhaps a slight instability of the photo-electric equipment was present.

TABLE 4b

JOURNAL OF OBSERVATIONS OF BS6555

V	U−V	B−V	V−R	V−I	J.D. 2441100+
4.873	0.397	0.318	0.254	0.346	5.6941
4.857	0.423	0.423	0.231	0.346	5.7105
4.872	0.385	0.304	0.242	0.343	5.7508
4.888	0.393	0.285	0.27	0.377	5.7681
4.851	0.386	0.305	0.211	0.348	5.8153
4.858	0.396	0.274	0.229	0.332	5.8311
4.856	0.371	0.281	0.267	0.365	5.8446
4.856	0.373	0.284	0.245	0.36	5.8586
4.864	0.364	0.272	0.239	0.361	5.8723
4.859	0.383	0.288	0.233	0.34	5.9352
4.914	0.357	0.266	0.218	0.409	5.9531
4.899	0.4	0.3	0.242	0.381	5.9738
4.893	0.351	0.3	0.262	0.393	7.674
4.893	0.335	0.257	0.283	0.417	7.6899
4.892	0.328	0.28	0.295	0.425	7.7238
4.887	0.327	0.283	0.272	0.41	7.7378
4.892	0.32	0.302	0.296	0.425	7.7531
4.851	0.315	0.315	0.262	0.398	7.8025
4.832	0.34	0.29	0.232	0.365	7.8159
4.839	0.333	0.294	0.242	0.371	7.8297
4.841	0.316	0.285	0.25	0.379	7.8443
4.926	0.359	0.3	0.284	0.425	7.9014
4.947	0.354	0.296	0.292	0.429	7.9177
4.927	0.359	0.334	0.292	0.434	7.9602
4.866	0.321	0.29	0.246	0.374	10.6656
4.877	0.313	0.231	0.248	0.397	10.68
4.881	0.336	0.278	0.259	0.405	10.7128
4.873	0.326	0.3	0.268	0.419	10.7265
4.882	0.311	0.249	0.271	0.428	10.7408
4.86	0.318	0.275	0.267	0.391	10.7775
4.859	0.328	0.25	0.249	0.408	10.7937
4.877	0.324	0.243	0.274	0.43	10.8103
4.886	0.313	0.219	0.273	0.433	10.8286
4.85	0.318	0.268	0.231	0.392	10.8496
4.868	0.331	0.286	0.286	0.415	11.7651
4.861	0.344	0.289	0.274	0.386	11.7791
4.869	0.34	0.286	0.288	0.408	11.7923
4.867	0.341	0.293	0.271	0.403	11.8056
4.858	0.365	0.315	0.267	0.392	11.82
4.869	0.364	0.272	0.254	0.383	11.8352
4.925	0.376	0.324	0.305	0.427	11.8703
4.952	0.372	0.288	0.319	0.449	11.9144
4.933	0.401	0.303	0.446	0.585	11.9316
4.947	0.355	0.265	0.311	0.472	11.9687
4.942	0.351	0.279	0.337	0.472	11.9851
4.93	0.242	0.265	0.281	0.279	12.7252
4.855	0.243	0.281	0.334	0.519	12.7718
4.849	0.247	0.299	0.245	0.453	12.8037
4.857	0.243	0.291	0.254	0.434	12.8167
4.852	0.252	0.284	0.259	0.442	12.8298

TABLE 4b—Continued

V	U−V	B−V	V−R	V−I	J.D. 2441100+
4.855	0.239	0.295	0.257	0.414	12.8428
4.846	0.311	0.284	0.229	0.355	15.8337
4.916	0.294	0.267	0.297	0.415	15.8759
4.919	0.294	0.262	0.292	0.407	15.8907
4.911	0.349	0.268	0.256	0.386	15.9137
4.915	0.355	0.293	0.383	0.518	15.9419
4.898	0.341	0.292	0.279	0.398	15.9728
4.883	0.372	0.315	0.294	0.41	15.9885
4.858	0.322	0.3	0.229	0.355	17.7047
4.872	0.315	0.241	0.269	0.395	17.7182
4.871	0.294	0.276	0.258	0.395	17.7307
4.858	0.302	0.29	0.249	0.382	17.7618
4.848	0.3	0.256	0.24	0.368	17.7749
4.86	0.309	0.275	0.257	0.388	17.7875
4.856	0.31	0.294	0.261	0.395	17.8001
4.841	0.308	0.29	0.254	0.38	17.8143
4.836	0.305	0.289	0.23	0.359	17.8281
4.918	0.292	0.201	0.281	0.421	17.8891
4.912	0.282	0.209	0.264	0.41	17.9084
4.899	0.296	0.242	0.271	0.401	17.9325
4.926	0.349	0.265	0.298	0.426	17.9577
4.911	0.353	0.252	0.285	0.417	17.9908
4.906	0.362	0.283	0.262	0.41	18.0043
4.869	0.349	0.268	0.255	0.384	19.7181
4.839	0.322	0.275	0.229	0.351	19.7517
4.886	0.341	0.289	0.172	0.386	19.7881
4.872	0.321	0.265	0.257	0.401	19.8344
4.911	0.34	0.259	0.216	0.423	19.8927
4.875	0.348	0.308	0.253	0.382	21.7156
4.871	0.325	0.27	0.258	0.379	21.7471
4.873	0.319	0.307	0.276	0.408	21.7608
4.857	0.32	0.302	0.258	0.383	21.7754
4.861	0.321	0.303	0.303	0.434	21.7902
4.855	0.328	0.31	0.254	0.375	21.8049
4.852	0.312	0.299	0.249	0.385	21.8192

TABLE 4b—Continued

V	U−V	B−V	V−R	V−I	J.D. 2441100+
4.882	0.326	0.288	0.253	0.386	21.8921
4.871	0.32	0.29	0.239	0.38	21.9081
4.881	0.328	0.283	0.273	0.409	21.9322
4.913	0.314	0.289	0.288	0.431	21.9582
4.908	0.292	0.284	0.275	0.402	21.9925
4.933	0.344	0.282	0.284	0.423	23.7025
4.888	0.337	0.29	0.273	0.411	23.7542
4.88	0.342	0.288	0.252	0.395	23.7694
4.875	0.32	0.271	0.271	0.411	23.7974
4.852	0.343	0.295	0.252	0.387	23.8107
4.896	0.31	0.247	0.287	0.42	23.8784
4.892	0.346	0.263	0.271	0.432	23.8936
4.841	0.321	0.298	0.256	0.367	23.9273
4.849	0.3	0.276	0.266	0.401	23.9513
4.862	0.313	0.265	0.294	0.384	23.987
4.889	0.335	0.308	0.271	0.378	28.7672
4.892	0.314	0.305	0.269	0.361	28.7805
4.888	0.313	0.304	0.261	0.375	28.7971
4.884	0.297	0.29	0.242	0.371	28.8325
4.88	0.31	0.275	0.215	0.337	28.8767
4.894	0.324	0.285	0.239	0.367	28.8924
4.91	0.279	0.282	0.241	0.354	28.9182
4.911	0.337	0.307	0.233	0.357	28.9498
4.894	0.314	0.281	0.32	0.425	32.6968
4.895	0.326	0.279	0.283	0.389	32.7112
4.897	0.332	0.288	0.273	0.382	32.7456
4.892	0.394	0.302	0.263	0.389	32.7597
4.894	0.355	0.293	0.268	0.388	32.7737
4.891	0.342	0.281	0.255	0.37	32.7865
4.89	0.358	0.284	0.244	0.371	32.8511
4.902	0.345	0.269	0.265	0.393	32.8654
4.887	0.352	0.275	0.254	0.381	32.8782
4.888	0.358	0.279	0.262	0.403	32.8906
4.893	0.348	0.283	0.263	0.395	32.9039
4.902	0.355	0.279	0.33	0.449	32.9704

A simple statistical analysis of the observations gives the standard deviations for both the standard and program stars. The values are contained in Table 5. These quantities for BS6554 and BS6555 are, on the average, 1.3 times larger than those of the standard stars. This can also be shown in the plots of the magnitude (or colors) *versus* Julian Day (González 1974). In addition, these graphs, as well as Table 4, indicate amplitudes of the variations of around 0.1 mag.

It should be pointed out that values obtained from differences of magnitude and colors of ν^1 and ν^2 Draconis show scatter similar to the original observations. This is shown in Tables 5 (last row) and 6. Graphs derived from Tables 4 and 6 will be given by González (1974).

IV. CONCLUSION

We have presented UBVRI-photometry of the double star BS6554-5. At least one of the components is an Am (BS6555). The observational data given above, indicate that probably both stars show small light variation of approximately 0.1 mag. Perhaps BS6554 has a larger amplitude than BS6555 by a few hundredths of a magnitudes.

An indication of the variability in V and B-V of this binary is found in the literature (Blanco *et al.*

TABLE 5

STANDARD DEVIATIONS

BS	σ(V)	σ(B−V)	σ(U−B)	σ(V−R)	σ(R−I)	n
			Standard Stars			
4456	0.014	0.021	0.016	0.032	0.026	8
4550	0.017	0.026	0.030	0.024	0.019	9
6603	0.019	0.022	0.025	0.023	0.018	44
6629	0.023	0.018	0.028	0.021	0.021	40
8622	0.019	0.020	0.029	0.023	0.015	21
8832	0.020	0.024	0.022	0.021	0.013	20
			ν^1 Dra and ν^2 Dra			
6554	0.029	0.029	0.035	0.028	0.019	123
6555	0.027	0.025	0.034	0.032	0.025	120
Δ	0.023	0.032	0.029	0.027	0.027	190

Note to Table 5:
Δ = BS6555 − BS6554

TABLE 6

DIFFERENCES BETWEEN BS 6555 AND BS 6554

ΔV	ΔB−V	ΔU−B	ΔV−R	ΔR−I	J.D. 2441100+
-0.027	-0.043	0.130	-0.012	-0.006	5.6862
-0.029	0.083	-0.005	0.019	-0.016	5.6983
-0.045	0.188	-0.084	-0.004	0.007	5.7065
-0.019	-0.012	0.121	0.011	-0.006	5.7469
-0.025	-0.081	0.116	-0.001	-0.011	5.7555
-0.009	-0.100	0.143	0.027	-0.005	5.7641
-0.029	-0.030	0.103	-0.005	0.030	5.8117
-0.040	0.055	0.028	-0.017	0.022	5.8194
-0.033	0.024	0.069	0.001	-0.012	5.8273
-0.032	0.047	0.061	0.013	-0.015	5.8344
-0.034	0.054	0.029	0.051	-0.020	5.8411
-0.034	0.048	0.067	0.038	-0.023	5.8481
-0.034	0.051	0.066	0.016	-0.006	5.8551
-0.041	0.056	0.049	0.008	0.003	5.8620
-0.033	0.044	0.052	0.002	0.010	5.8689
-0.043	0.058	0.059	0.024	-0.021	5.9310
-0.073	0.040	0.016	-0.007	-0.022	5.9386
-0.018	0.018	0.012	-0.022	0.062	5.9485
0.016	-0.017	0.051	-0.021	0.086	5.9594
0.001	0.017	0.060	0.003	0.034	5.9698
-0.048	0.049	0.063	-0.024	0.009	7.6700
-0.009	0.053	0.041	0.026	-0.002	7.6783
-0.009	0.010	0.068	0.047	0.001	7.6863
0.022	0.021	0.042	0.075	0.009	7.7204
-0.004	0.039	0.012	0.052	-0.008	7.7273
-0.009	0.042	0.012	0.029	0.000	7.7343
-0.010	0.042	0.007	0.025	0.004	7.7416
-0.005	0.061	-0.019	0.049	-0.005	7.7493
-0.023	0.071	-0.023	0.044	0.012	7.7990
-0.025	0.060	0.008	0.027	0.012	7.8057
-0.044	0.035	0.058	-0.003	0.009	7.8124
-0.034	-0.001	0.071	0.027	-0.005	7.8193
-0.027	0.003	0.060	0.037	-0.009	7.8262

TABLE 6 — Continued

ΔV	ΔB−V	ΔU−B	ΔV−R	ΔR−I	J.D. 2441100+
-0.010	0.020	0.042	0.026	0.014	7.8331
-0.008	0.011	0.034	0.034	0.014	7.8404
-0.042	0.136	-0.043	0.001	0.020	7.8971
-0.025	0.019	0.056	0.019	0.021	7.9056
-0.004	0.015	0.055	0.027	0.017	7.9138
-0.016	0.088	-0.026	-0.004	0.053	7.9553
-0.021	0.037	0.013	0.014	0.020	10.6621
-0.023	0.043	0.020	0.011	-0.007	10.6693
-0.012	-0.016	0.071	0.013	0.014	10.6765
-0.020	0.026	0.040	0.010	0.007	10.7093
-0.026	0.030	0.048	0.013	0.004	10.7161
-0.034	0.052	0.016	0.022	0.009	10.7230
-0.024	0.061	0.010	0.041	0.010	10.7302
-0.015	-0.010	-0.046	-0.044	0.016	10.7373
-0.037	0.071	-0.008	0.024	-0.025	10.7740
-0.023	0.029	0.042	0.023	-0.014	10.7817
-0.024	0.004	0.077	0.005	0.021	10.7898
-0.042	0.007	0.070	-0.011	0.010	10.7982
-0.024	0.000	0.073	0.014	0.007	10.8065
-0.008	0.017	0.047	0.051	0.024	10.8148
0.001	-0.007	0.060	0.050	0.028	10.8240
0.011	-0.017	0.087	0.032	0.018	10.8353
-0.025	0.032	0.043	-0.010	0.019	10.8458
0.004	0.019	0.030	0.042	0.009	11.7613
-0.004	0.049	0.022	0.035	0.017	11.7685
-0.011	0.052	0.032	0.023	0.000	11.7755
-0.037	0.035	0.034	0.003	0.008	11.7823
-0.029	0.032	0.033	0.017	0.016	11.7889
-0.008	0.035	0.043	0.038	0.011	11.7958
-0.010	0.042	0.037	0.021	0.023	11.8024
-0.050	0.043	0.019	-0.010	0.008	11.8089
-0.059	0.065	0.021	-0.014	0.001	11.8161
-0.063	0.060	0.027	-0.012	-0.003	11.8238
-0.052	0.017	0.069	-0.025	0.001	11.8314
-0.023	0.072	0.015	0.019	0.004	11.8663

TABLE 6 — Continued

ΔV	ΔB−V	ΔU−B	ΔV−R	ΔR−I	J.D. 2441100+
-0.035	0.032	0.034	-0.001	0.016	11.9103
-0.028	0.029	0.091	0.000	-0.006	11.9183
-0.047	0.044	0.105	0.127	0.003	11.9269
-0.011	0.018	0.026	0.022	-0.005	11.9650
-0.024	0.029	0.049	-0.074	0.025	11.9727
-0.029	0.043	0.031	-0.048	-0.001	11.9809
0.000	0.022	0.012	0.044	-0.180	12.7215
0.047	0.016	0.055	0.042	-0.184	12.7451
-0.028	0.032	0.040	0.095	0.003	12.7684
-0.048	0.041	0.036	-0.017	0.027	12.7999
-0.017	0.035	0.033	0.003	0.024	12.8069
-0.009	0.027	0.037	0.012	-0.004	12.8134
-0.026	0.021	0.042	0.024	-0.005	12.8199
-0.031	0.014	0.058	0.029	-0.002	12.8265
-0.026	0.036	0.046	0.015	-0.001	12.8331
-0.023	0.047	0.022	0.013	-0.027	12.8396
-0.004	0.033	0.026	0.043	-0.006	15.8300
-0.005	0.023	0.014	0.039	0.011	15.8723
-0.024	0.000	0.033	0.033	-0.007	15.8795
-0.021	-0.005	0.038	0.028	-0.010	15.8869
-0.009	-0.019	0.084	0.036	-0.021	15.9104
-0.055	0.090	0.015	0.068	0.018	15.9383
-0.036	0.073	0.019	0.001	-0.004	15.9667
-0.037	0.044	0.029	0.008	-0.001	15.9771
-0.052	0.067	0.037	0.023	-0.004	15.9849
-0.056	0.037	0.041	-0.030	0.004	17.7014
-0.018	0.048	0.027	0.016	0.004	17.7081
-0.004	-0.011	0.079	0.056	0.004	17.7148
-0.020	-0.002	0.068	0.037	0.007	17.7213
-0.021	0.033	0.012	0.027	0.018	17.7276
-0.029	0.026	0.004	0.021	-0.005	17.7586
-0.008	0.056	0.015	0.029	0.010	17.7651
-0.018	0.022	0.047	0.020	0.005	17.7716
-0.021	-0.009	0.073	0.033	0.010	17.7781
-0.009	0.010	0.063	0.050	0.013	17.7843
-0.014	0.033	0.037	0.025	0.008	17.7907
-0.018	0.052	0.018	0.029	0.011	17.7970
-0.016	0.036	0.037	0.035	0.012	17.8034
-0.031	0.032	0.039	0.028	0.004	17.8105
-0.029	0.041	0.044	0.023	0.004	17.8177
-0.034	0.040	0.042	-0.001	0.007	17.8245
-0.021	-0.015	0.042	0.024	0.017	17.8858
-0.009	-0.028	0.074	0.027	0.015	17.8941
-0.015	-0.020	0.056	0.010	0.021	17.9037
-0.015	0.014	0.036	0.028	-0.006	17.9291
-0.030	0.032	0.065	0.030	-0.007	17.9541
-0.029	0.014	0.070	0.025	0.004	17.9868
-0.026	0.008	0.059	0.026	-0.005	17.9941
-0.031	0.039	0.037	0.003	0.011	18.0009
-0.023	0.045	0.035	0.010	0.032	19.7143
-0.002	0.025	0.060	0.009	0.000	19.7480
-0.041	0.078	0.013	-0.002	-0.021	19.7550
0.006	0.092	0.018	-0.059	0.071	19.7732
-0.029	0.099	0.033	-0.075	0.075	19.8077
-0.043	0.075	0.037	0.010	0.005	19.8309
-0.004	0.056	0.087	-0.003	0.043	19.8870
-0.084	0.032	0.052	0.067	0.076	19.9040
-0.036	0.047	0.049	0.000	0.008	21.7122
-0.025	-0.007	0.083	0.022	-0.004	21.7437
-0.016	0.005	0.063	0.015	-0.009	21.7507
-0.014	0.042	0.020	0.033	0.002	21.7575

TABLE 6 — Continued

ΔV	ΔB−V	ΔU−B	ΔV−R	ΔR−I	J.D. 2441100+
-0.021	0.034	0.029	0.032	0.002	21.7640
-0.037	0.029	0.035	0.014	-0.005	21.7713
-0.026	0.044	0.028	0.009	0.021	21.7789
-0.022	0.045	0.028	0.036	0.027	21.7863
-0.016	0.037	0.035	0.075	0.009	21.7935
-0.022	0.044	0.035	0.026	-0.001	21.8009
-0.017	0.038	0.038	0.014	-0.009	21.8084
-0.020	0.027	0.033	0.010	0.006	21.8156
-0.040	0.018	0.062	-0.014	-0.004	21.8884
-0.020	0.025	0.037	0.048	-0.012	21.8961
-0.031	0.027	0.029	0.034	-0.004	21.9041
-0.016	0.044	0.066	0.038	-0.026	21.9288
-0.028	0.037	0.011	0.004	0.013	21.9547
-0.021	0.060	0.012	0.029	-0.023	21.9884
-0.021	0.037	0.023	0.044	0.009	23.6985
-0.022	0.042	0.027	0.020	0.009	23.7510
-0.031	0.047	0.032	0.040	-0.009	23.7576
-0.039	0.045	0.039	0.019	-0.004	23.7652
-0.020	0.033	0.048	0.020	0.008	23.7764
-0.025	0.016	0.043	0.039	0.005	23.7904
-0.010	0.027	0.031	0.038	0.035	23.8007
-0.033	0.051	0.030	0.019	0.030	23.8074
-0.013	0.009	0.018	0.033	0.015	23.8748
-0.031	0.029	0.052	0.024	-0.002	23.8825
-0.035	0.045	0.072	0.008	0.026	23.8901
-0.039	0.070	-0.003	0.004	0.001	23.9226
-0.027	0.040	0.037	0.035	0.024	23.9478
-0.031	0.032	0.038	0.020	-0.032	23.9834
-0.023	0.040	0.047	0.035	-0.037	23.9902
-0.022	0.014	0.049	0.022	-0.011	28.7633
-0.028	0.038	0.036	0.037	0.002	28.7706
-0.025	0.035	0.018	0.035	0.013	28.7772
-0.035	0.052	0.031	0.018	0.014	28.7837
-0.039	0.051	0.031	0.010	0.008	28.7920
-0.044	0.029	0.038	-0.012	0.030	28.8294
-0.036	0.024	0.039	-0.011	0.021	28.8734
-0.023	0.011	0.038	0.015	0.018	28.8807
-0.009	0.021	0.042	0.039	0.024	28.8885
0.004	0.078	-0.064	0.028	0.005	28.9142
-0.042	0.039	0.061	-0.062	0.001	28.9461
-0.023	0.151	0.045	-0.011	-0.010	28.9642
-0.016	0.025	0.028	0.070	0.004	32.6930
-0.018	0.012	0.055	0.013	0.007	32.7002
-0.017	0.010	0.069	-0.024	0.008	32.7074
-0.016	0.087	0.038	0.020	0.009	32.7422
-0.030	0.030	0.022	0.017	0.006	32.7493
-0.035	0.044	0.070	0.007	0.023	32.7564
-0.020	0.037	0.080	0.016	0.016	32.7634
-0.018	0.028	0.050	0.021	0.010	32.7704
-0.022	0.036	0.050	0.022	-0.001	32.7770
-0.025	0.024	0.049	0.011	0.006	32.7834
-0.040	0.062	0.020	-0.062	0.004	32.8477
-0.017	0.061	0.017	0.033	0.016	32.8545
-0.005	0.046	0.019	0.054	0.017	32.8616
-0.012	0.031	0.023	0.047	-0.021	32.8686
-0.027	0.037	0.024	0.036	-0.022	32.8750
-0.030	0.031	0.052	0.017	-0.025	32.8812
-0.029	0.035	0.054	0.025	-0.011	32.8874
-0.028	0.031	0.051	0.032	-0.003	32.8938
-0.023	0.035	0.037	0.033	-0.012	32.9504
-0.020	0.021	0.042	0.071	-0.013	32.9673

TABLE 7

CATALINA OBSERVATIONS

V	U−V	B−V	V−R	V−I	J.D. 2438000+
			BS6554		
4.896	0.335	0.289	0.260	0.442	152.9288
4.909	0.239	0.238	0.203	0.335	165.8982
4.925	0.239	0.259	0.225	0.341	183.8666
4.831	0.333	0.297	0.260	0.371	224.7539
			BS6555		
4.919	0.239	0.247	0.253	0.418	152.9365
4.879	—	0.278	0.240	0.364	165.9032
4.893	0.320	0.297	0.241	0.367	183.8725
4.914	0.250	0.233	0.230	0.326	203.7949
4.862	0.254	0.263	0.244	0.347	224.7603

1968; Jaschek *et al.* 1972). Catalina photometry (Johnson *et al.* 1966) includes BS6554 and BS6555. This data is reproduced in Table 7. Here also variability can be inferred.

TABLE 8

MEAN MAGNITUDE AND COLORS

BS	V	U−V	B−V	V−R	V−I
6554	4.91	0.26	0.25	0.25	0.37
6555	4.88	0.33	0.28	0.27	0.40

Finally Table 8 contains the mean values of BS6554 and BS6555 as derived from Table 4.

We intend to obtain more multicolor photometry of BS6554-5 and other Am stars in order to study the possible existence of multi-periods, and the nature of their light curves, if any. Those of ν^1 and ν^2 Dra, at the first glance look like irregular variables; perhaps a Fourier analysis will tell otherwise.

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