Revista Mexicana de Astronomía y Astrofísica, Volumen 2, Agosto 1977

NOTE ON THE Am STARS IN THE α, λ PHOTOMETRY

B. HAUCK

Institut d'Astronomie de l'Université de Lausanne
and Observatoire de Genève
Received 1977 February 17

RESUMEN

La fotometría α, λ publicada por Mendoza para las estrellas Am ha sido analizada en el sistema de Ginebra. Los resultados confirman las conclusiones de Mendoza. Los vectores de luminosidad y metalicidad se muestran en el plano α, λ.

ABSTRACT

The α, λ data published by Mendoza concerning the Am stars have been analysed using the Geneva system. The results confirm Mendoza's conclusions and the blanketing and luminosity vectors in the α, λ plane are shown.

Key words: METALLIC-LINE STARS — α, λ NARROW BAND PHOTOMETRY — GENEVA SYSTEM.

I. INTRODUCTION

Mendoza (1971, 1975) has proposed the use of Λ, λ, α indices to classify the A-F stars and he obtains a very interesting scheme (1976a). The publication of measurements concerning the Hyades stars (Mendoza 1976*b*) allows us to make a comparison with the Geneva system and to complete the conclusions of Mendoza. We use the measurements published by Rufener (1976) and our own tri-dimensional representation of the A-F stars (Hauck 1973).

In Table 1 we give the value α, λ, B2-V1, Δd and Δm_2 for stars beloging to both systems. B2-V1 is a parameter of temperature, Δd ($\Delta d = d_{star} - d_{reference}$) is an indicator of luminosity and Δm_2 an indicator of blanketing.

II. THE α VERSUS B2-V1 PLANE

We have examined the relation between α and B1-V1, firstly only for normal stars of luminosity class V. We remark a small deviation for stars having a high value of Δd in the sense that these stars have a smaller value of α, a result in line with that of Mendoza (1976*a*). The same result is obtained when we plot the stars whose spectral type is followed by the suffix *n* and having a high Δd. We derive a mean relation with the normal stars having a small value of Δd and this relation is given in Figure 1. The Am stars were then located on the α versus B2-V1 diagram and it appeared clearly that they do not fit the mean relation determined by the normal stars. In the case of the Am stars, B2-V1 is independent of metallicity (Hauck 1963), so the Am characteristics affect the α-index. Since both α and B-V indices are affected by metallicity, this explains the location of the Am stars in the α versus B-V plane of Mendoza (1976*b*).

We can conclude that α is very sensitive to luminosity and sensitive to metallicity.

III. THE λ VERSUS B2-V1 PLANE

We then studied, for the λ versus B2-V1 plane, the relation between λ and B2-V1 for only normal stars of luminosity class V. Here also the stars with

TABLE 1

STARS MEASURED IN BOTH SYSTEMS

BS	HD	SP	α	λ	$B2\text{-}V1$	Δd	Δm_2
1201	24357	(dF1)	0.154	.024	.127	—.004	.000
1279	26015	F3V	.134	.010	.184	.051	.012
1292	26462	(dF4)	.151	.022	.132	.011	.000
1319	26911	F3V	.139	.011	.176	.012	.012
1331	27176	F0V	.186	.026	.075	.037	.004
1351	27397	F0IV	.184	.025	.074	.042	.004
1354	27429	F2V	.144	.021	.158	.041	.011
1356	27459	A9V	.209	.028	.025	.036	.000
1368	27628	A3m	.182	.008	.103	.076	.026
1376	27749	A1m	.197	.006	.080	.018	.042
1380	27819	A7.5V	.240	.030	—.031	.039	—.008
1385	27901	F4Vn	.134	.025	.161	.072	.015
1387	27934	A7V	.244	.038	—.053	.104	.000
1388	27946	(A5n)	.196	.028	.052	.076	—.006
1392	28024	A8Vn	.178	.028	.051	.0184	.008
1403	28226	A3m	.198	.013	.066	.043	.012
1408	28294	F0V	.158	.024	.119	.082	.000
1412	28319	A7III	.220	.036	—.015	.095	.000
1414	28355	A5m:	.228	.020	.004	.044	.007
1428	28546	A5m	.216	.013	.046	.008	.015
1430	28556	F0Vn	.201	.029	.053	.038	.001
1432	28677	F2Vn	.159	.022	.120	.057	.011
1444	28910	A8Vn	.202	.025	.045	.048	—.004
1458	29140	A5m:	.216	.017	—.017	.047	—.022
1459	29169	F5IV	.141	.013	.168	.054	.009
1472	29375	F0V	.168	.030	.099	.067	.013
1473	29388	A6Vn	.250	.034	—.065	.047	.002
1479	29488	A5Vn	.236	.033	—.038	.067	.006
1480	29499	A5m	.209	.016	.037	—.004	.025
1507	30034	F0V	.192	.028	.052	.028	—.005
1519	30210	A2m	.235	.018	—.023	.025	.024
1547	30780	(dA5)	.207	.030	.025	.089	—.002
1566	31236	(dF0)	.177	.026	.085	.051	.002
1620	32301	A7V	.231	.033	—.036	.088	—.001
1670	33204	A5m	.198	.010	.081	.041	.040
1672	33254	A2m	.224	.006	.029	.022	.032
2124	40932	A2m	.226	.017	—.024	.028	—.014

TABLE 2

Am STARS WITH SMALL Δd

BS	HD	α	λ	$B2\text{-}V1$	Δd	Δm_2
984	20320	0.198	0.016	0.023	0.045	—0.013
3619	78209	0.202	0.008	0.071	0.028	0.031
3624	78362	0.176	0.010	0.120	0.092	0.065
6555	159560	0.192	0.009	0.070	0.018	0.007
8278	206088	0.186	0.021	0.078	0.074	0.068

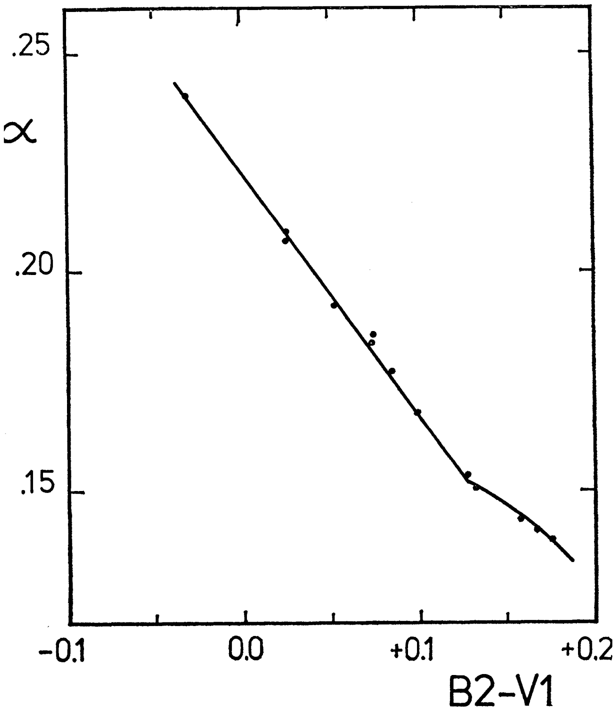

FIG. 1. The sequence of normal Hyades stars with small Δd and Δm_2 values in the α, B2−V1 plane.

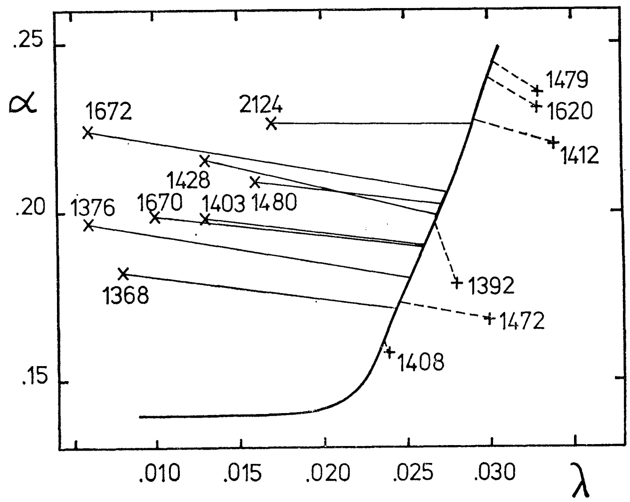

FIG. 2. Location of the Am stars and stars with high Δd value in the α, λ plane. The vectors of blanketing or of luminosity derived as indicated in the text are drawn for each star.

a high Δd value are slightly separated from the normal stars, having a higher value of λ. The greater Δm_2, the smaller is λ. Hence we reach the same conclusions as Mendoza.

IV. THE α VERSUS λ PLANE

We have plotted in the α versus λ plane only normal stars with small value of Δd and Δm_2. Thus we can derive a very sharp relation, indicated on Figure 2 by the full line. We then plotted the Am stars and some stars with a high value of Δd. Using the relation α versus B2-V1 for the normal stars and adopting the fact that B2-V1 is not affected by metallicity, we derive for the Am stars a value of α free of differential blanketing. With this value, it is possible to locate the corrected position of the Am star on the α versus λ relation and so we obtain a blanketing vector in the α versus λ plane. The blanketing vectors are fairly well parallel, except in the case of BS 1428 and BS 2124, but the latter star is IDS 46-17 and its duplicity is the cause of it. We also used the values given by Mendoza (1976*c*) to check this. We have retained only Am stars with small values of Δd in order to avoid a luminosity effect (see below). The data are given in Table 2. Except in the case of BS 984 we obtain the same result.

We apply the same procedure in order to obtain the "luminosity vector" of stars having a high value of Δd. It is difficult to secure a result in this case, except the fact that a luminosity effect affects both indices. It would be inviting to say that the slope changes with the temperature, but this does not agree with the vector of BS 1472. However, this star is IDS 114-68 and perhaps its duplicity is the cause of its position.

V. CONCLUSIONS

Using the value obtained for the Hyades stars with our tri-dimensional representation it is possible to obtain the relations for stars having no effects of metallicity and luminosity and to derive the vectors of blanketing and luminosity in the α, λ plane. Thus our results are in fact only a confirmation of the previous results of Mendoza showing the possibility to segregate the Am from the normal stars with the α, λ narrow band photometry.

REFERENCES

Hauck, B. 1963, *Pub. Obs. Genève*, No. 68.
Hauck, B. 1973, in *Problems of Calibration of Absolute Magnitudes and Temperature Scales*, IAU *Symposium* 54, eds. B. Hauck and B. E. Westerlund (Dordrecht: D. Reidel), 117.
Mendoza, E. E. 1971, Bol. Obs. Tonantzintla y Tacubaya, **6**, 137.
Mendoza, E. E. 1975, *Pub. A.S.P.*, **87**, 505.
Mendoza, E. E. 1976*a*, in *Abundance Effects in Classification*, IAU *Symposium* 72, eds. B. Hauck and P. C. Keenan (Dordrecht: D. Reidel), 364.
Mendoza, E. E. 1976*b*, *Rev. Mex. Astron. Astrof.*, **1**, 363.
Mendoza, E. E. 1976*c*, *Rev. Mex. Astron. Astrof.*, **2**, 29.
Rufener, F. 1976, *Astron. Astrophys. Suppl.*, **26**, 275.