ON THE OBSERVATIONAL DETERMINATION OF OB STANDARDS

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ABSTRACT. Observational evaluation of intrinsic energy distributions in OB spectra is difficult as these stars are usually reddened and any dereddening procedure may change from place to place in the Galaxy. We compare two-color diagrams (UV vs. visual) from two stellar complexes of the same Sp/L class. The observed differences may be caused by additional far-UV reddening of distant objects as well as by intrinsic differences between stars belonging to different complexes. We argue in favor of the first possibility which would allow one to use the same standards in all of the Galaxy.

1. INTRODUCTION

The observational determination of the intrinsic parameters of OB stars is rather difficult. In the absence of existing unreddened stars we have to apply a "dereddening procedure" in order to find their intrinsic color indices. Then, the basic questions are: is the extinction law identical in every part of the Galaxy and may it be applied after a single extinction parameter (e.g. E_{B-V}) is determined.

Recent attempts at observational determination of the extinction curve in the far-UV (FUV) (Krełowski and Strobel 1983) present a negative answer to the above questions. The extinction seems to be caused by at least two agents (grain populations of different sizes). Different proportions of these agents along possible lines of sight make the extinction law variable. E_{B-V} must not be used any longer as a single extinction parameter especially in the FUV, where reddening is caused almost exclusively by small (bare) grains which do not affect the visual light.

As was concluded by Krełowski and Strobel (1983), bare particles are related to the interstellar space by being absent inside of OB associations. Moreover, based on the most recent investigations (Kiszkurno et al. 1984), we incline to the conclusion that the

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extinction law inside a given spiral structure of the Galaxy is relatively uniform.

The present paper attempts to examine this conclusion because of the basic importance of the observational determination of the intrinsic colors of early type stars. The colors based on nearby stars (e.g. Wesselius et al. 1980) or on all observed objects of a Sp/L class (Gałęcki et al. 1983) may not be applicable to all stars of our Galaxy.

2. DATA REDUCTION AND ANALYSIS

In the presence of local variations of the extinction law (Krełowski and Strobel 1983), the intrinsic colors of early-type stars may depend on the space positions of the objects considered. To check if this is true we decided to compare the relations of UV color indices (based on the ANS bands) vs. (B-V) taken for stars of chosen Sp/L class from different regions of the Galaxy: one containing local and Sgr arms and the second the Per arm (see Table I), being independent "units" in the galactic disc (Lynga 1982).

For this purpose we have selected a sample of B0-1, V-III stars. Hotter stars are inconvenient for their total sample in the ANS Catalogue (Wesselius et al. 1982) is too small. Supergiants are found very seldom in our vicinity which makes the planned comparison impossible. Dwarfs of spectral type later than B2 become too faint to be observed at large distances in the Per arm. We decided to mix dwarfs and giants since their intrinsic UV colors seem to be almost identical (e.g. Bless and Savage 1972).

We decided to compare the relations of the color indices (33-22) and (15-18) to (B-V) for the chosen regions. We have omitted the (22-18) color index since the relations of the excesses E_{22-18} to E_{B-V} seem to be identical in all OB associations (Kiszkurno et al. 1984). If the relations (33-22) and (15-18) vs. (B-V) differ from complex to complex then observationally evaluated intrinsic colors may be affected by the contents of the samples considered and proper de-reddening procedures should differ from region to region in the Galaxy.

3. RESULTS AND CONCLUSIONS

The stars listed in Table I are displayed as open circles (Sgr+ local) and dots (Per) in two figures below. Figure 1 presents the relation between the UV color index (33-22) and (B-V). The dots representing Per arm stars are clearly situated above the relation for the second complex. They seem to form a parallel sequence. Then the intrinsic colors calculated separately for both complexes using the method of Gałęcki et al. (1983) would differ by approximately $0\overset{m}{.}25$.

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The (15-18) color index vs. (B-V) is plotted in Figure 2. We observe here no correlation in any single complex. The complexes are rather characterized by different average values of (15-18). The poor correlation observed for all points in Figure 2 is then meaningless.

The results presented above seem to suggest the following <u>two interpretations</u>: the Per arm stars are <u>additionally reddened in the FUV</u> or they are <u>intrinsically fainter in the FUV</u> than those in our vicinity. We prefer the first interpretation, as an intrinsic FUV faintness of distant stars should affect their Sp/L. We summarize our considerations as follows:

i) the spectral energy distributions of OB stars should be based on stars of the Sgr or local arm which are practically free from FUV obscuration.

ii) different stellar complexes require different dereddening procedures.

iii) OB supergiants, very rare in our vicinity, may be dereddened only using extinction curves obtained for neighboring dwarfs.

TABLE I

Photometric Data for B0-1, V-III Stars

	HD/BD	B-V	15-18	22-33	HD/BD	B-V	15-18	22-33
L	34748	-0.11	-0.19	-0.73	13745	+0.17	+0.04	+0.73
	34989	-0.13	-0.26	-0.87	14014	+0.14	+0.05	+0.86
	35149	-0.15	-0.16	-0.90	14250	+0.32	-0.07	+1.60
	35299	-0.21	-0.22	-1.21	14331	+0.17	+0.13	+0.76
	35439	-0.20	-0.18	-1.15	14605	+0.27	-0.01	+0.87
	36351	-0.18	-0.25	-1.11	14707	+0.55	+0.25	+2.57
	36591	-0.20	-0.24	-1.15	15642	+0.08	+0.04	+0.27
	36695	-0.17	-0.22	-1.18	56°473	+0.25	+0.01	+1.00
	36960	-0.25	-0.24	-1.35	59°357	+0.47	-0.03	+2.24
	37303	-0.22	-0.25	-1.27	59°456	+0.55	+0.11	+2.55
	37481	-0.23	-0.24	-1.27	56°482	+0.30	+0.07	+1.47
	37744	-0.20	-0.24	-1.16	56°484	+0.32	+0.08	+1.29
	113791	-0.19	-0.22	-1.17	56°589	+0.41	+0.13	+1.95
	141637	-0.05	-0.21	-0.58	236633	+0.40	+0.17	+1.67
	144217	-0.07	-0.23	-0.55	236815	+0.22	-0.01	+0.95
	144470	-0.04	-0.27	-0.38	237007	+0.33	-0.09	+1.54
S	164018	+0.65	+0.02	+2.61	59°510	+0.56	+0.11	+2.66
	164637	-0.05	-0.16	-0.45	63° 87	+0.52	+0.02	+2.17
	165285	+0.31	-0.16	+1.03	53°2820	+0.10	+0.02	+0.21
	166539	+0.25	-0.23	+0.86	53°2833	+0.23	+0.09	+0.91
	152217	+0.16	-0.07	+0.45	54°2790	+0.20	-0.03	+0.66
	152245	+0.12	-0.14	+0.22	55°2795	+0.31	+0.10	+1.42
P	1544	+0.16	-0.04	+0.54	56°2903	+0.22	-0.12	+1.16
	2451	+0.19	-0.05	+0.68	57°2581	+0.61	+0.11	+2.53
	13036	+0.53	+0.24	+2.09	60°2525	+0.29	0.00	+1.20

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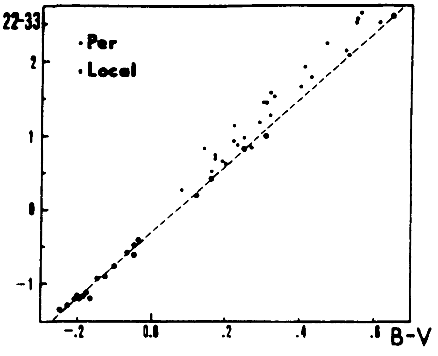

Fig. 1. Two-color diagram for stars from the complexes considered.

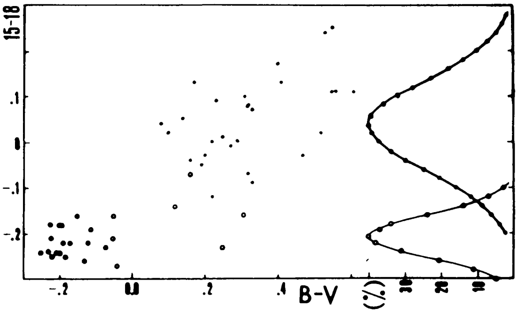

Fig. 2. Gaussian curves characterize the distributions of FUV colors for both complexes.

DISCUSSION

TOBIN: Problems resulting from interstellar reddening can be minimized by studying the unreddened or little-reddened apparently normal B stars found at high galactic latitudes.

KREŁOWSKI: These studies can not solve problems resulting from local discrepancies caused by the dust associated with young stars.

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