

# Statistics on the spectral classification of CP2 stars in the Southern Sky

M. Rode, H.M. Maitzen and E. Paunzen

*Institut für Astronomie der Universität Wien, Türkenschanzstr. 17, A-1180  
Wien*

**Abstract.** A number of about 1500 spectroscopically classified CP2 stars in the southern sky ( $\delta = -90^\circ$  to  $-12^\circ$ ) was extracted from the Michigan Catalogue (Vols. I-IV).

This sample was compared with the classification from Bidelman & Mc Connell (1973). We confirmed the spectral classification with the known photometric peculiarity indices in the Geneva system and in the 3-filter  $\Delta a$  system (Maitzen 1976). 10% of these stars show discordance between their respective types from the Michigan and Bidelman catalogues. Several objects were measured with a CCD in the  $\Delta a$  system in spring 1995. Eight stars are peculiar in  $\Delta a$ . Furthermore, we have investigated the galactic distribution of all programme stars. We conclude that the distribution resembles the one of early-type stars, where the hotter (= Silicon) stars are more concentrated towards the galactic plane than the cooler (= Strontium) objects.

## 1. Search and statistics for classified CP2 stars

About 30.000 stars with B, A and early F type classification were extracted from the Michigan catalogue of two dimensional spectral types for the HD stars (Nancy Houk et al., 1975-1988; hereafter MC). In the southern sky region from  $\delta_{1900} = -90^\circ$  to  $-12^\circ$ , 1500 objects are classified as CP2 stars. The limiting magnitude of this survey is 11, the maximum of the distribution of magnitudes is between 8.5 and 10 for both subgroups.

74% of all extracted CP2 stars are members of the Si-subgroup. They are more concentrated towards the galactical plane than the cooler stars. In the galactic area from  $b = -15^\circ$  to  $b = +15^\circ$ , there are 84% of all hotter silicon stars and 58% of all SrCrEu stars. As expected, this result is in accordance with the galactic distribution of main sequence stars. A tendency to clustering for the investigated stars was not found.

Bidelman & MacConnell (1973; hereafter BC) list 781 CP2 objects. Their classification is based on the same objective-prism plates as the sample of the Michigan catalogue. Most of the compared stars have the same or a similar spectral classification in MC and BC.

Photometric values are given for 981 stars in the Geneva system (Rufener 1988) as well as in the 3-filter  $\Delta a$  system (Maitzen & Vogt 1983).

430 out of 645 BC stars with known Geneva photometric indices, have a significant peculiarity.

75% of 339 BC-stars are peculiar in  $\Delta a$ . Three quarters of this sample are members of the Si subgroup.

HD 134185 was classified as F0/2 V in MC (F2 V in the Geneva catalogue), but as Si in BC. Si may be a typographical error meaning Sr, but the photometric  $\Delta a$  value confirms non-peculiarity.

The spectral class of HD 91756 is given as Fm  $\delta$  Del in MC, (A0) in the Geneva catalogue and Ap(SrCr) in BC. The Geneva peculiarity index  $\Delta(V1-G)$  shows no significant value for this star.

HD 110072 is identified as Ap(SrCr) in MC and BC but as K0 in the Geneva Catalogue and the Simbad database. The photometric values in the Geneva catalogue point to a late A-type star.

A total of 78 stars are identified as non-CP2 stars in MC but as Si, Sr or SrCrEu in BC. The spectral classification and photometric values in the Geneva catalogue are also different for these objects. Therefore, we started an observing run with  $\Delta a$  photometry for a sample of them.

## 2. The $\Delta a$ measurements

Only 29 of the discrepant stars are peculiar in the Geneva photometric system. 21 objects with known Geneva indices were measured with a CCD in the  $\Delta a$  system by H.M. Maitzen and E. Paunzen (Maitzen *et al.* 1997).

Observations were performed with the 61-cm Bochum telescope at ESO-La Silla on three nights from 29 to 31 May 1995. The three filters  $g_1$ ,  $g_2$  and  $y$  were used; their characteristics are listed in the following table.

Filter	$\lambda_c[\text{\AA}]$	FWHM [ $\text{\AA}$ ]	transmission
$g_1$	5027	222	66 %
$g_2$	5205	107	50 %
$y$	5509	120	54 %

$$a = g_2 - (g_1 + y)/2$$

$$\Delta a = a_0 - a$$

We regard a star as photometrically peculiar if  $\Delta a \geq 0.018$  or  $\Delta a \leq -0.018$  mag. To check the peculiarity found this way, the Geneva criterion  $\Delta(V1-G) > 0.010$  mag (North & Cramer 1981) may be applied. We were unable to find here a significant influence of interstellar reddening on the  $a$ -values, which might be expected from the relatively blue wavelength of  $g_2$  compared to those of  $g_1$  and  $y$ . Obviously the rather low amount of reddening did not succeed in producing sensible differential effects on the  $a$ -values.

Eight candidate stars (HD 84629, HD 86170, HD 128075, HD 129460, HD 142778, HD 142960 and HD 167444) are to be regarded as photometrically peculiar.

Comparing the classification performances of both sources (MC and BC) with the help of the new available photometric evidence, one notes that for eleven B-type stars with a giant luminosity class according to MC, the BC-peculiarity assignments are in better agreement with our results than the MC types. Only in three cases are the Geneva-based  $\log g$  values (North & Kroll 1989) typical of giants while the  $\Delta a$  index shows no peculiarity.

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