HD STARS SOUTH OF $\delta = -53°$ HAVING PECULIAR ABUNDANCES: STATISTICS AND NOTATION

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Abstract. The HD stars between $\delta = -90°$ and $-53°$ have been classified on the MK system, using Michigan 4°+6° objective-prism Schmidt plates (108 Å mm^{-1}) taken at Cerro Tololo, Chile, and the results are published in Vol. 1 of the *University of Michigan Catalogue, Catalogue of Two-Dimensional Types for the HD Stars.* First, various statistics on the 32 500 normal stars and 2500 peculiar stars found are presented. Peculiar/normal ratios for various types of stars are given, along with discussion of the assumptions made. About 40% of the peculiar stars are of the Am or Ap types, and these will be covered in detail. Secondly, what notation to use for spectral types of stars with peculiar abundances is discussed and an explanation given of the notation used in Vol. 1 of the *Michigan Catalogue* for Am, Ap, strong and weak CN, weak metal, and other categories of peculiar stars.

DISCUSSION

Osborn: What about the 4% of the stars that could not be classified? Was this due to identification problems or to overlap problems?

Houk: These stars were almost all either too badly overlapped or too underexposed. They are still listed in the catalogue, with previously published type, usually HD types, given. A few stars were too overexposed to classify on our plates and Garrison and Hagen kindly provided spectral types for stars brighter than 4.75. We have had no insoluble identification problems so far; we used transparent computer plots of the HD stars to Schmidt scale, which are placed under the plate during classification.

Hack: I was surprised to see such a low percentage of Ap stars. Did you include He-weak, Mn stars, hot Si (λ 4200) stars among the Ap stars?

Houk: Only the Si (λ 4200) stars. The others either weren't looked for or don't have a spectral type containing 'Ap' which was the code the computer searched for in forming this list.

Rudkjøbing: When in the Am case we find the ratio by numbers of these 'peculiar' stars to the normal ones to be about 30 to 70, then an inclusion of very mild cases might perhaps change the ratio to that of about equally numerous groups. It would then be questionable which of these two groups should in fact be termed 'peculiar'.

Houk: The ratio is 30 to 100. It is true that within the A5-A9 IV-V range the metallic-line characteristic is very widespread.

Keenan: (1) These statistics are very valuable because they provide reliable percentages for many of the groups for the first time.

(2) The small number of barium stars suggests the question: How weak can the Ba line be on Warner's scale and still be detected on your plates?

Houk: I don't know what they would be on Warner's scale. Other characteristics such as strong Sr, CN and CH in the barium stars are more likely to be noticed than the Ba line, though I found a couple of late Ba stars that did have the 4554 line without showing these other characteristics.

Morgan: I imagine that Hg Mn stars would be very difficult to recognise on your plates.

Houk: Yes, they are. At first I tried to do so, so several such types will be found in the catalogue, but I soon stopped even trying to pick them out. Therefore no statistics should be done on these.

Mendoza: How many stars show Ca II in emission?

Houk: I don't know. In this table all the *'e'* stars are counted but most Ca II emission stars don't

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have H in emission so tradition is followed and a 'p' added to the spectral type rather than an *'e'* for Ca II emission.

Bidelman: When the desirability of reclassifying the HD stars was first brought up at the Saltsjöbaden conference, a well-known astronomer commented that this was all very well but that he doubted that any man could be found to do the job. Well, we found a woman!

Houziaux: Do you have an idea of the minimum equivalent width you can detect with your objective prism spectra? This may affect a great deal your statistics on peculiar objects. Furthermore, for emission-line objects, as the $H\alpha/H\beta$ intensity ratio is usually fairly high, there may be many more emission-line objects than the ones where you can detect $H\beta$ emission.

Houk: I really have no idea. For a number of the stars for which I remarked that $H\beta$ was possibly slightly filled in, Nelson Irvine checked available $H\alpha$ plates and found that in almost every case $H\alpha$ was in emission. So I think that I was able to detect these marginal cases quite reliably.

Williams: **Did you find any S stars?**

Houk: Yes, four; however a number of other earlier and/or underexposed ones were undoubtedly classified as M. They are not very conspicuous on our plates except at the latest types.

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