MAGNETIZATION OF STARS VS. THE EFFECTIVE TEMPERATURE

V.D. Bychkov[1], L.V. Bychkova[1], J. Madej[2]

[1] Special Astrophysical Observatory of the Russian Academy of Sciences
Nizhnij Arkhyz, 369167 Russia, *vbych@sao.ru*

[2] Warsaw University Observatory
Al. Ujazdowskie 4, 00-478 Warsaw, Poland, *jm@astrouw.edu.pl*

ABSTRACT. Using all published magnetic measurements there were detected some dependences of frequency of occurrence of magnetic field value for all types of peculiarity (Bychkov et al., 2003a, 2008). On the basis of it we normalized these dependences for the most "non-magnetic" Am-stars and we draw the relative "magnetization" (MA) for peculiarity types for Ap-stars (Bychkov et al., 2003b). At the same time chemically peculiar stars neatly block to the two groups: "weak" - magnetic (Am and Hg-Mn stars) and "strong" - magnetic (SrCrEu, Sr, Si, He-w and He-r stars). "Strong" - magnetic group outnumbers "weak" - magnetic group on magnetic activity on average 5-10 times more, as shown in Fig. 3. This is mathematical expression of well-known observing fact. One of the most important and simpliciter measurable physical characteristic of stars atmospheres is effective temperature. This paper is devoted to the dependence of "magnetization" on T_{eff}.

Key words: Stars: magnetic fields of stars: fundamental parameters

1. Starting data and dependences

Fig. 1 shows T_{eff} distribution of "magnetic" Ap-stars and Fig. 2 shows the same distribution of "non-magnetic" Ap-stars. These distributions base on the same extracts, which were used for construction of dependences (Bychkov et al., 2003a, 2008). Effective temperatures were taken from Hauk & North (1993), Glagolevskij (1994, 2002), Sokolov (1998) or were counted up on dependences from Paunzen et al. (2005). In Fig. 1 one can clearly see the dependence of stars distribution for different types of peculiarity. The T_{eff} dependence of relative MA is shown in Fig. 3.

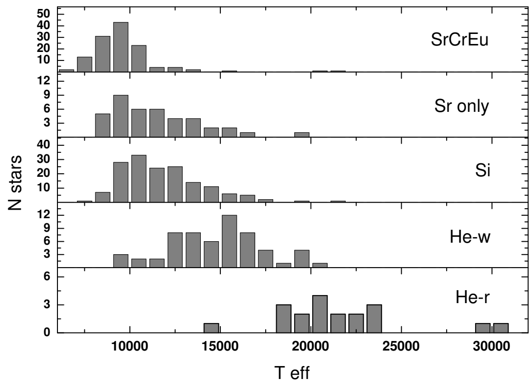

Figure 1: Quantity of stars for each type vs. T_{eff}

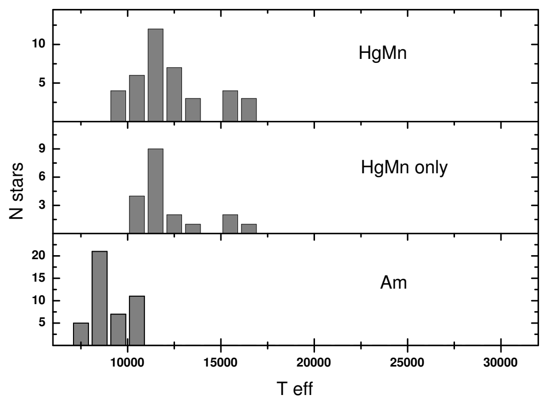

Figure 2: Quantity of stars for each type vs. T_{eff}

2. Discussion

As shown in Fig. 3 MA for "strong" - magnetic stars group distinctly decrease with increasing of T_{eff}. As all members of "strong" - magnetic Ap-stars locate on

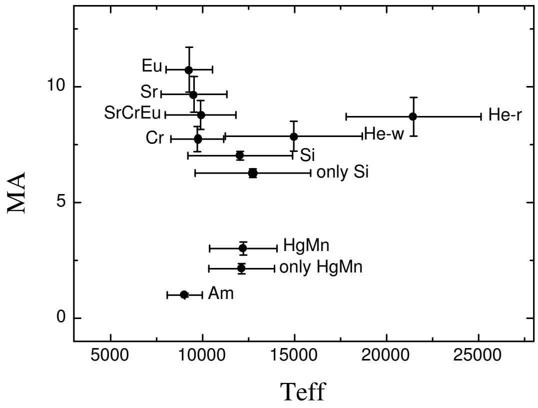

Figure 3: Magnetization MA vs. T_{eff}

the main sequence, one can see with T_{eff} increasing the increasing of stars mass and the decreasing of stars age. For example, He-r stars are almost two orders younger and 6 times more massive then SrCrEu stars on average. All of these contrary to hypothesis of "relic mechanism" of magnetic field origin (Moss 1989, 2001; Landstreet & Mathys 2000). If relic mechanism would work, the situation would be opposite: the younger and more massive the stars will have the strong magnetic fields. Haiashi phase, in which convective destroys relic magnetic field, is most strong in low-massive stars with strong magnetic fields. Arguably, "relic mechanism" gives only initial, inoculating magnetic field. There are two unsolved problems:

1. Why strong magnetic fields are observed solely in some types of chemically peculiar stars?
2. Does common mechanism for origin of magnetic fields exist for all these stars?

Acknowledgements. This work was supported by grant No. N203 4061 33 from the Polish Committee for Scientific Research.

References

Bychkov V.D., Bychkova L.V., Madej J.: 2003, *A&A*, **407**, 631.

Bychkov V.D., Bychkova L.V., Madej J.: 2005, *A&A*, **430**, 1143.

Bychkov V.D., Bychkova L.V., Madej J., 2008, *MNRAS, (in press).*

Lebedev V.S., Bychkov V.D., Bychkova L.V., Madej J.: 2006, *Proc. Inter. Conf. "Physics of magnetic stars"*, 169.