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CNO ABUNDANCE DETERMINATION IN MASSIVE FAST ROTATING STARS

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Be stars are early-type Main Sequence objects which have shown at least once some emission in the hydrogen line series. Their most important characteristic is fast rotation, which on average reach ∼ 90% of the critical rate, i.e. $\Omega/\Omega_c \sim 0.90$. Since a number of them have masses $M > 15M_\odot$, they are ideal targets to study the effects of rotational mixing on the atmospheric CNO abundance and to perform comparisons with the predictions obtained from recent evolutionary models with rotation.

We initiated the study of FEROS spectra obtained for great a number of Galactic Be stars. From this sample, we selected few interesting Be stars because of (1) the quality of the available data; (2) their intermediate $V\sin i$ values; and (3) their weak emission characteristics at the observation epoch. The studied sample encompasses at present α Eri, HR 2249, HR 6929 and ϵ Cap.

To account for the effects of gravitational darkening, synthetic spectra were computed by using the FASTROT computer code (Frémat et al. 2005). In this code, the stellar surface is replaced by a mosaic of local plane-parallel model atmospheres that reflect the temperature and density lowering from pole to equator. For effective temperatures lower than 15000 K, these plane-parallel models were computed in LTE, while for higher temperatures they were taken from the BSTAR2006 and OSTAR2002 grids calculated by Lanz & Hubeny (2002, 2006).

Stellar parameters were obtained by fitting the observed hydrogen and helium lines with our synthetic spectra in a wavelength domain that ranges from 3950 to 4600 Å and by assuming different value for the inclination angle. Gravitational darkening mainly affects the stellar parameters and the apparent evolutionary status of stars. However, depending on the inclination (Figure 1) and stellar mass, some transitions may become quite sensitive to Ω/Ω_c (e.g. the Si III and the O II lines), while other lines (e.g. N II lines) seem less affected, but see more details on this in Frémat et al. (2005).

According to the comparisons we have made until now between synthetic spectra and observations, we found no significant evidence for nitrogen enrichment, except for ϵ Cap which seems to have a nitrogen abundance about 20 times higher than found in the Sun's photosphere. Though ϵ Cap is the most evolved star in our sample, the overabundance is too high to be due only to turbulent diffusion. Therefore we think that it could be related to the presence of its fainter K-type companion. We are analysing now the most evolved Be stars in our sample.

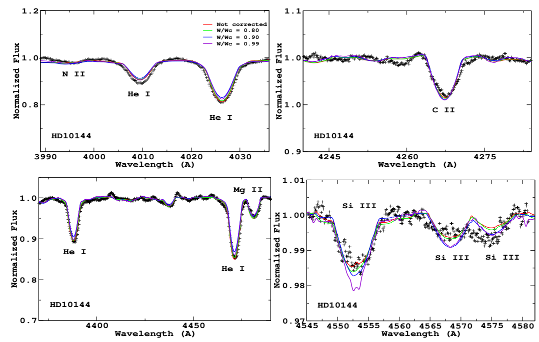

Fig. 1. Comparison of the FEROS data (crosses) obtained for α Eri with synthetic spectra computed for different inclination angle and Ω/Ω_c values. The apparent derived parameters are: $T_{\rm eff}$=15800±1200 K, log g=3.35±0.15, $V\sin i$=227±15 km s^{-1}. The adopted parameters of the non-rotating counterparts of the star are listed in the table below.

Ω/Ω_c	i [deg]	$T^o_{\rm eff}$ [K]	$\log g_o$	$V\sin i_{\rm true}$ [km s^{-1}]
0.80	69	17056	3.63	236
0.90	55	17111	3.62	247
0.99	49	17050	3.58	271

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