Stellar Rotation
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CNO abundances in Early Type Be Stars

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Abstract. High dispersion spectra in the visible range were obtained for field Be stars in both hemispheres. As Be stars form a class of Main Sequence fast rotators, we are intended to test how their chemical composition can be affected by rotation.

1. Introduction

The effect of rotation mixing on the helium and CNO abundances has already been observed in several fast rotating main sequence O type stars (eg: Howarth et al. 2001). At lower masses, studies (Gies & Lambert 1992) made on the atmospheric composition of B type stars show either that there is no clear evidence of such an effect on the carbon and nitrogen abundances or if it existed, it would not be so effective than expected from theory (Herrero & Lennon 2002). It is worth noting that the stellar samples used in most of these studies were exclusively formed with low $v \sin i$ objects showing no emission in the optical spectrum and most of them probably are slow rotators. In the present contribution, we show preliminary results of a study of the CNO chemical composition in early type Be stars of an ongoing observation program with the FEROS (ESO) and AURELIE (OHP) spectrographs.

2. Model Atmospheres

The effects of gravitational darkening due to fast rotation were taken into account in the same way as in Frémat et al. (2002) where the stellar surface is represented by a mesh of plane parallel atmosphere models. The *local* model atmospheres we used are those of Kurucz (1994) computed with ATLAS9 assuming LTE, but the level populations of the atoms and ions of interest were computed in NLTE using the TLUSTY computer code (Hubeny & Lanz, 1995).

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3. Discussion

Fundamental parameters and abundances are determined fitting the optical spectra. Resulting carbon to nitrogen ratios are reported in Fig.1 against the oxygen abundance for each of the 4 studied stars (filled squares). In the same figure we represented the average [C/N] level observed in the *nitrogen normal* stars analyzed by Gies & Lambert (1992) and the one predicted by theory for a B type star of 9 to 12 solar masses with initial equatorial rotation speed of 300 km s^{-1} (Meynet & Maeder 2000).

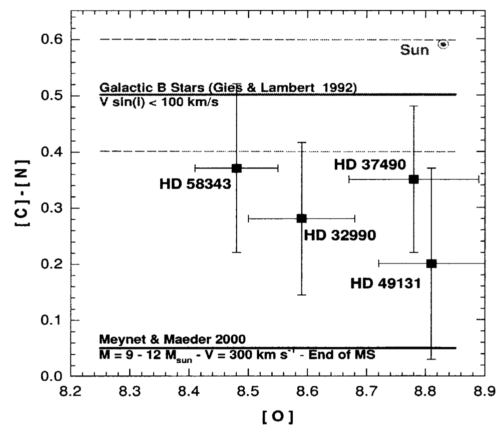

Figure 1. Abundance ratio of carbon to nitrogen [C/N]

It is expected that the location of Be stars in this figure depends on their age and on their initial angular speed. Our sample is quite small and the relative ages of the objects are not significatively different, however it is remarkable that each Be star we observed have [C/N] ratios that are systematically lower than the average value that is observed in slow rotating B type stars. This implies a lower carbon to nitrogen abundance that could be attributed to rotation mixing.

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References

Gies, D. R. & Lambert, D. L. 1992, ApJ 387, 673

Frémat, Y., Zorec, J., Hubert, A.-M., Floquet, M., Leister, N., Levenhagen, R., Chauville, J. & Ballereau, D. 2003, in: A. Maeder & P. Eenens (eds.), Stellar Rotation, Proc. IAU Symp. No. 215 (San Francisco: ASP)

Herrero, A. & Lennon, D. 2003, in: A. Maeder & P. Eenens (eds.), Stellar Rotation, Proc. IAU Symp. No. 215 (San Francisco: ASP)

Howarth, I.D. & Smith, K.C. 2001, MNRAS 327, 353

Hubeny, I. & Lanz, T. 1995, ApJ, 439, 875

Kurucz, R. 1994, CD-ROM No. 19.

Meynet, G. & Maeder, A. 2000, A&A 361, 101