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Non-LTE Effects in Berylium Abundances

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Abstract. In this work we analyze the beryllium-iron chemical diagram from the point of view of non-LTE effects. Be abundances were re-calculated by considering non-LTE corrections in ionization equilibrium (logg) and Fe abundances ([Fe/H]). These corrections seem do not affect the linear relation between Be-Fe for metal-poor stars already found in the literature for LTE derived abundances.

1. Introduction

The analysis of the trends of abundances of light elements with respect to [Fe/H] for the oldest metal-poor stars is a direct way to provide some clues on their production mechanism and evolution.

In a recent work on non-LTE effects in iron abundances, Thévenin & Idiart (1999) (TI99) obtained that for metal-poor dwarf stars Fe abundances ([Fe/H]) are affected by significant non-LTE effects and, moreover, surface gravities (logg) derived by LTE analysis also need corrections. This logg corrections should be crucial for beryllium abundances determination, since Be II resonance lines normally used to estimate Be abundances are much sensitive to this stellar parameter.

In this work we examine the consequences of non-LTE corrections to logg and [Fe/H] for logN(Be/H) vs. [Fe/H] (or Be-Fe) diagram. In section 2 we present a short summary of our results obtained in TI99 for Fe and in section 3 the results for Be abundances .

2. Non-LTE Corrections for [Fe/H] and logg

TI99 performed statistical equilibrium calculations for Fe I and Fe II to estimate non-LTE effects in iron abundances. The main results are showed in figure 1 (see TI99 for details).

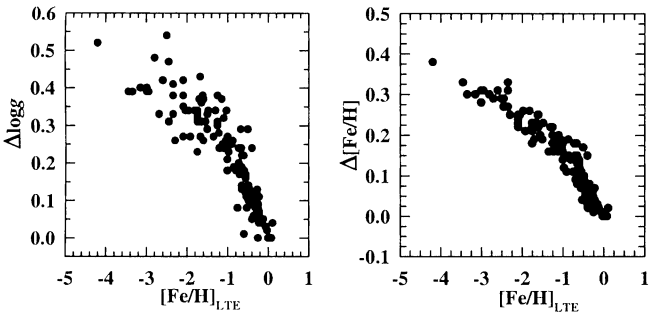

Figure 1. Amplitude of non-LTE logg and [Fe/H] corrections in function of LTE [Fe/H] for 136 subgiant to subdwarf stars.

3. Results for Be/H

We re-estimate N(Be/H) abundances for 21 stars also analised by Boesgaard et al.(1999) using T_{eff}, logg and [Fe/H] given by TI99. Be abundances were calculated assuming LTE conditions, since the non-LTE corrections are negligible for Be II lines considered here ($\lambda\lambda$ 3130 and 3131), as demonstrated by Garcia Lopez et al. (1995), for example. Figure 2 shows our results.

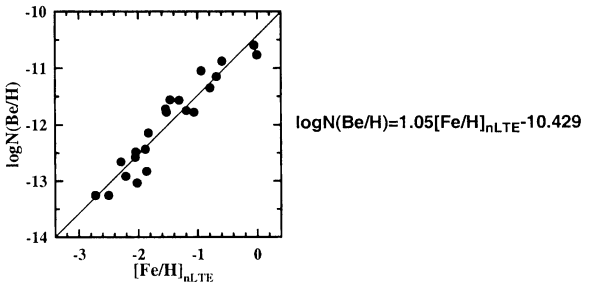

Figure 2. Derived Be abundances vs. non-LTE corrected [Fe/H].

We conclude that for the range of metal-poor objects -3 < [Fe/H] < -1.5, non-LTE corrections for [Fe/H] compensate changes in Be abundances (as result of logg corrections) in the Be-Fe diagram, recovering the same linear behavior of LTE derived abundances (Boesgaard et al.1999). Similar results are found for Boron (see Primas 1999, this colloquium).

References

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Primas F., 1999, this colloquium

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