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Lithium depletion in a [Fe/H]= −3.4 star?

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Abstract. We present a determination of the lithium abundance from high quality spectra in an extremely metal poor star where the lithium line had not been detected.

1. Introduction

Very few halo stars are known to have a low lithium abundance in their atmospheres. Four are well established:

G66-30	[Fe/H] = −1.61	A(Li) < 1.5
G122-69	[Fe/H] = −2.52	A(Li) < 1.2
G139-8	[Fe/H] = −2.56	A(Li) < 1.5
G186-26	[Fe/H] = −2.80	A(Li) < 1.1

Moreover it has been claimed that, in CS 29527-15, an extremely metal poor star with [Fe/H]= −3.4, the lithium line would not be detectable: less than 10mÅ (Thorburn, 1994, Norris et al. 1997). As a consequence, CS29527-15 could be the most metal poor star with a very low lithium abundance in its atmosphere.

2. Observations

Since the cause of the lithium depletion in these stars is unknown, it is interesting to check the lithium abundance in CS 29527-15. We present here a new

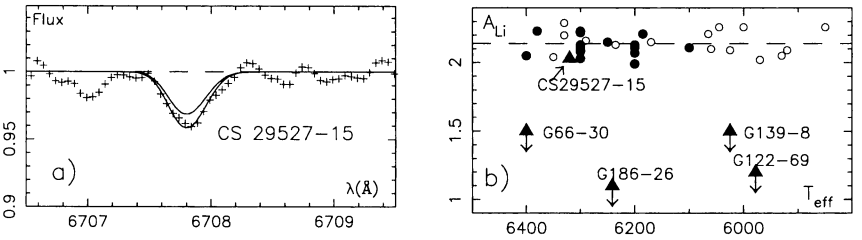

Figure 1. **a)** Comparison of the observed spectrum (crosses) with synthetic spectra computed with A(Li)=1.9 and 2.03.
b) A(Li) versus Teff. The filled circles represent known stars with [Fe/H]< −2.5, the open circles the stars with −2.5 <[Fe/H]< −1.6. The triangles represent the 5 stars with previously undetected lithium lines.The dashed line is the mean value of the lithium abundance in the halo stars (plateau). As is clearly seen, CS29527-15 has normal lithium abundance.

measurement of the lithium abundance in this star. Five spectra have been obtained with the EMMI spectrograph fed by the NTT, which represent a total exposure time of 10 hours. The resulting spectrum has a resolution of 30000 and the signal to noise ratio of ≈ 150.

3. Analysis and Discussion

The model has been interpolated in the grid of Edvardsson et al. (1993) computed with an updated version of the MARCS code with improved UV line blanketing. The temperature estimated from the profile of the wings of the hydrogen lines (T_{eff} = 6250K), is in rather good agreement with the value deduced from the $(B-V)_o$ color of the star (T_{eff} = 6320K following Norris et al. 1997). We adopted T_{eff} = 6300K.

In Fig.1a the synthesized profiles of the lithium line computed with different lithium abundances are compared to the observations. The best agreement is obtained for A(Li)= 2.03 ± 0.03. (This corresponds to an equivalent width of 16 ± 2mÅ). As is clearly seen in Fig.1b, CS29527-15 has normal lithium abundance.

Currently G 186-26 ([Fe/H]= −2.80) remains the most metal poor-star with a very low (A(Li) < 1.1) lithium abundance.

Different hypotheses have been considered to explain the lithium depletion: binarity, progeny of blue stragglers now evolving redward, (cf. Norris et al. 1997), but none of them can explain the low lithium abundance in every case.

References

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