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Lithium abundances in Bright Giant Stars

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1. CORAVEL and High resolution spectroscopic observations

We present new high resolution spectroscopic data of the 6707.81 Å Li I line for 117 G and K Bright Giants (class of luminosity II). We derived Lithium abundances that we analysed along the stellar parameters: Teff, M_* and Vsini. With the CORAVEL spectrometers (at Observatoire de Haute Provence [OHP] and at European Southern Observatory [ESO]), De Medeiros & Mayor (2000) obtained radial velocities and Vsini with an uncertainty of about 0.3 kms^{-1} and 2.0 kms^{-1}, respectively. CORAVEL data also provide indication on the binary nature of our sample stars (32% are binary stars).
The λ 6707.81 Å Li I line was observed with the AURELIE spectrometer at OHP ($R=\lambda/\Delta\lambda$=45,000 and S/N>60) and with the CAT/CES at ESO-La Silla ($R=\lambda/\Delta\lambda$=60,000 to 80,000 and S/N>100).
We determine lithium abundances, A(Li), by the spectral synthesis method for all the stars of the sample (for a general description see Lèbre et al. 1999 and Jasniewicz et al. 1999). We estimate that the Li and iron abundances are determined with an uncertainty lower than 0.2 dex.

2. Lithium abundance, rotational velocity, Teff and stellar mass

For Bright Giants, the distribution of their Vsini values presents a sudden discontinuity located near the F8II spectral type (de Medeiros 1989, Ph.D Geneva Obs.). The derived A(Li) do not show any peculiar feature around this spectral type (as already found by Luck & Wepfer 1995, hereafter LW95), on the contrary to what has been observed for subgiant stars (Lèbre et al. 1999; do Nascimento et al. 2000). Fig. 1 presents the A(Li) we derived for our sample stars together with the data of LW95 (mainly devoted to F and G stars). We thus confirm the slow decline in A(Li) along Teff for F/G and K Bright Giants. Moreover, for G and K stars, we found that Li depletion is more important than in the theoretical predictions as the dilution factor is of order of several hundreds, while it is expected to range between 40–60 for 3 to 9 $M_\odot$ models (Iben 1965 & 1996).

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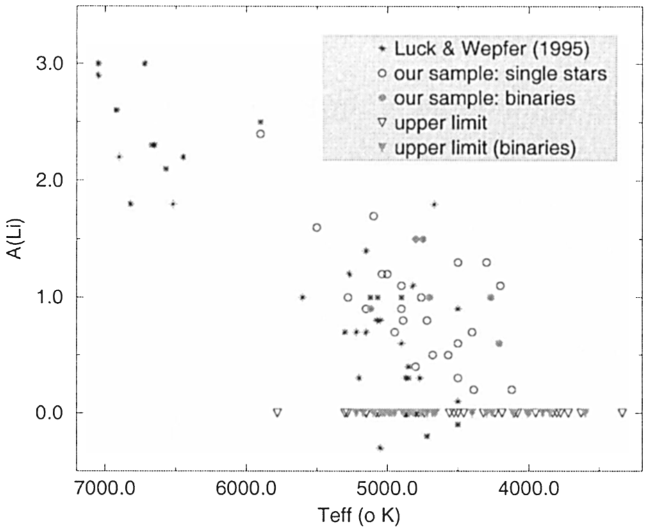

Figure 1. A(Li) along Teff for our sample stars together with the data of LW95. For our measurements upper limits are also indicated. Expected accuracy on Teff is ± 100 K for LW95 data and ± 200 K for ours. In both works, uncertainty on A(Li) is < 0.2 dex.

For our data we also infered the evolutionary status and the stellar masses, from HIPPARCOS data available at Simbad/CDS and from evolutionary tracks for 1.5 to 9 $M_{\odot}$ at solar metallicity (Schaller et al., 1992). We find no relation between mass and A(Li), and no difference between the Li behavior of single and binary Bright Giants, for a given Teff.

Up to date, only few giant stars (class of luminosity III) and Ia/Ib supergiants have been identified as "Super-Lithium Rich" stars (Brown et al. 1989). To explain these observed high values of A(Li) the most common scenario suggests that Li is produced in the inner layers of giant stars with rather well constrained mass and luminosity ranges (Sackmann & Boothroyd 1992 & 1999). Among our sample, 7 stars seem to be located in the required domain of mass and Mv,

but none of them present any sign of Li enrichment.

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