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Lithium abundances in southern associations containing young stars

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1. Introduction

In a recent paper, da Silva *et al.* (2009), we report results of Li abundance analysis for nine young stellar associations, defined in Torres *et al.* (2008), from a high-resolution optical spectroscopic survey searching for associations containing young stars (SACY), among optical counterparts of ROSAT All-Sky X-ray sources in the Southern Hemisphere. They have applied a convergence method in the (UVW) velocity space and have determined nine nearby young associations in the sample. As they are young and with different ages, those associations form an interesting laboratory to test the Li depletion theory, as a function of the star age.

2. Analysis

For this research, most of the spectroscopic observations were performed with the high-resolution (RP$\sim$ 50000) FEROS spectrograph Kaufer *et al.* (1999) at the 1.5m ESO telescope at La Silla (Chile). A smaller set of data ($\sim$ 30%) was collected at the coudé spectrograph attached to the 1.60m telescope at the Observatório do Pico dos Dias, LNA, Brazil, with a RP$\sim$ 9000. To obtain the Li abundance we used a LTE code and the atmospheric models of Kurucz and Castelli (www.user.oat.ts.astro.it/castelli). A larger part of the stars effective temperatures Teff were determined from the (V-I_c) color index. The other atmosphere model parameters, not determined by us, were fixed a priori: the metalicity as 0.1 and log g as 4.5, for dwarfs, and 4.0, for sub-giants. The used spectral classification is that of Torres *et al.* (2008). The microturbulence velocity also was fixed as 2 km/s. We presented in da Silva *et al.* (2009) our determination of Li abundance for nine associations, discovered or better determined in the SACY analysis, the associations of ϵ Chamaleontis (ϵ ChA)(6, 6), TW Hydrae (TWA)(8, 9), β Pictoris (β PA)(10, 1), Octans (OctA)(20?,8), Tucana-Horologium (THA)(45, 7), Columba (ColA)(30, 4), Carina (CarA)(30, 5), Argus (ArgA)(40, 3), AB Doradus (ABDA)(70,2). The numbers between parenthesis are the association age in My and its number on Fig. 1, respectively. The main data of those associations (i.e., number of members, mean distance and age) were determinated by Torres *et al.* (2008). The results for those associations presented in da Silva *et al.* (2009) are final but for ABDA and ColA. These two associations have few new members discovered from recent observations at La Silla (ESO). Their final results will be presented very soon in a next paper. However, the introduction of these new members do not change significantly their mean curves (see below).

3. Implications

Fig. 1 shows the mean curves of the diagrams (Teff vs. Li abundance) of those associations. In da Silva *et al.* (2009) is shown that the errors of the Li abundance determination can not

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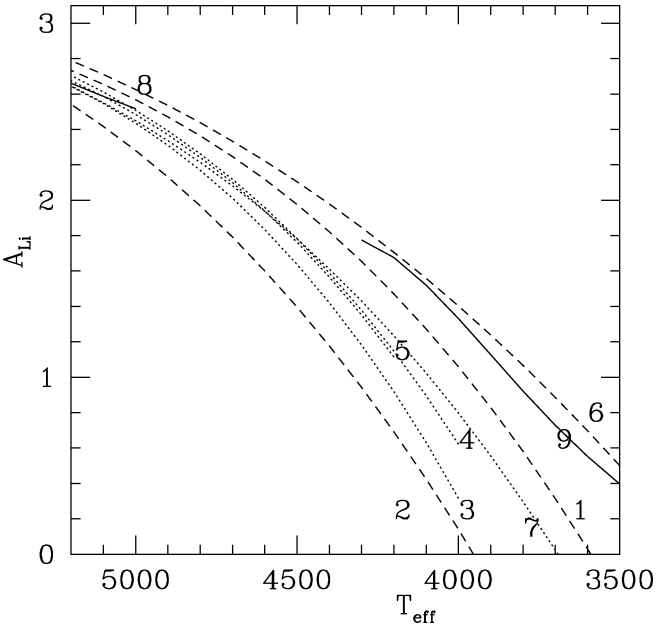

Figure 1. The mean curves for the young associations.

explain the dispersion of the points for a given Teff. Then, this dispersion is real. Stars with vsin(i) smaller than 20 km/s are, in average, under those of vsin(i) larger, shown a larger Li depletion. The diagrams of the stellar Li abundances vs Teff corresponding to the program associations above show, for Teff < 5000 K, a clear separation among the stars associations. As we can see on Fig. 1, the curve of ϵ ChA, what has ~ 6 My, is upper the other curves; that of ColA, with ~ 30 My, is in the middle and the curve corresponding to AB Dor, with ~ 70 My, is below the other ones. In da Silva *et al.* (2009) we showed that the AB Dor stars are in the band corresponding to the Pleiades stars (~ 100 My), given one more evidence that those associations have the same age, what is in agreement with a recent 3D Galactic dynamical analysis indicating a common origin of these two groups (Ortega *et al.* 2007). We showed also the importance of the rotational velocity in the Li depletion: stars with larger rotational velocity have a Li depletion smaller than stars with smaller rotational velocity.

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