# LITHIUM, ROTATION, AND ACTIVITY IN CHAMAELEON T TAURI STARS

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**ABSTRACT.** We present preliminary lithium abundances based on high-resolution spectra of 28 late-type stars, identified as weak-T Tauri star candidates in the sample of optical counterparts of sources from the ROSAT all-sky survey in the Chamaeleon star forming region. Here we report first results on the correlation between lithium abundance, projected rotational velocity, and effective temperature for the objects which have been confirmed to be *bona fide* pre-main sequence stars. The connection of rotation with activity indicators is also studied.

## 1. Introduction

Alcalá et al. (1995) undertook a low-resolution study of a sample of optical counterparts of sources from the ROSAT All-Sky Survey in the Chamaeleon star forming region. They found about 70 new T Tauri candidates. Recently, these stars have been reobserved at high resolution (Covino et al. 1997), allowing to refine the spectral type classification and improve the measurements of H$\alpha$ and Li I $\lambda$670.8 nm equivalent widths. Using a selection criterion based on the comparison of the Li I $\lambda$670.8 nm equivalent width with Pleiades stars of similar spectral type, Covino et al. (1997) confirm more that 50% of the stars in their sample as *bona fide* pre-main sequence (PMS) stars, while the remaining part seems mostly composed by active, young, foreground main sequence stars (possibly Pleiades-like).

Here we present preliminary lithium abundances for the objects in the Covino et al. sample in which the Li doublet has been detected, not considering spectroscopic binaries.

## 2. Discussion

Abundances have been derived from equivalent widths and effective temperatures in Covino et al. using curves of growth by Pavlenko & Magazzù (1996).

Figure 1 shows the lithium abundance vs. effective temperature. We see a clear separation in the diagram between PMS and other objects, which seem to follow the behaviour observed in Pleiades cluster (see e.g. Soderblom 1996). A dot indicates those objects with radial velocity consistent with the radial velocity of the stars and gas in

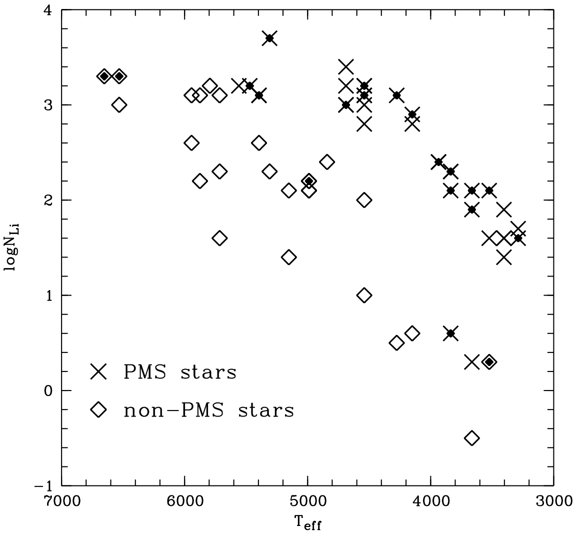


Fig. 1. Lithium abundance vs. effective temperature. Crosses represent stars confirmed to be PMS stars by Covino et al (1997); diamonds indicate those stars recognized to be non-PMS, field stars. Small black dots mark all the stars whose radial velocity is consistent with that of the Cha I cloud (in the range $12 \div 18$ km/s).

the Cha I cloud. Three M stars classified as PMS by Covino et al. here seem not to follow the trend defined by PMS stars.

In Figure 2 we show the Li abundance versus the projected rotational velocity ($v \sin i$). This figure confirms, on the basis of a larger sample, the results presented in Martín et al. (1994) for weak T Tauri stars in different associations: there are no fast rotators ($v \sin i > 40 - 50$ km s$^{-1}$) with low-lithium abundance, and there is a wide abundance spread among slow rotators. There is only one object which makes an exception to this pattern, but it is not a PMS star. Moreover its spectrum is quite noisy and it cannot be excluded that we are dealing with a spectroscopic binary. Our results support the conclusion by Martín et al. about an evidence for an inhibiting process of Li depletion associated with rapid rotation.

The relationship between stellar activity and rotation is examined in Figure 3, where the X-ray luminosity is used as coronal activity diagnostics, for the following different groups of stars:

1. stars in our sample, confirmed as PMS stars;
2. non-PMS stars (i.e. recognized as contaminating active foreground main sequence stars);
3. classical TTS in Chamaeleon.

We note that the PMS show a smaller spread in the X-ray activity level compared to the more heterogeneous sample of non-PMS stars and a larger average X-ray flux compared to the TTS belonging to the Cha I dark cloud. No obvious correlation is seen,

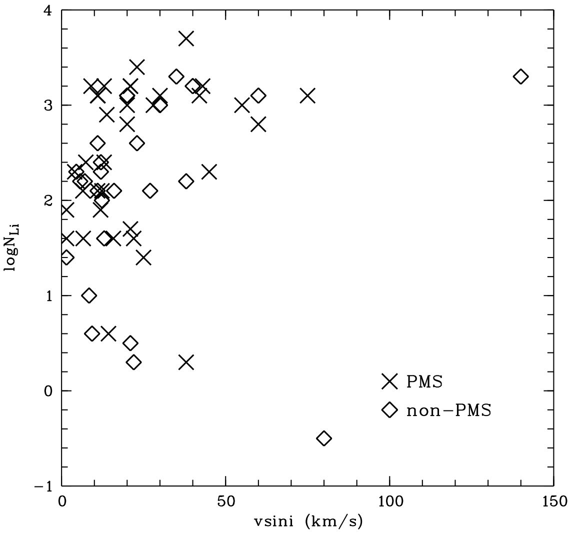


Fig. 2. Lithium abundance versus $v \sin i$. Symbols are the same as for Fig. 1.

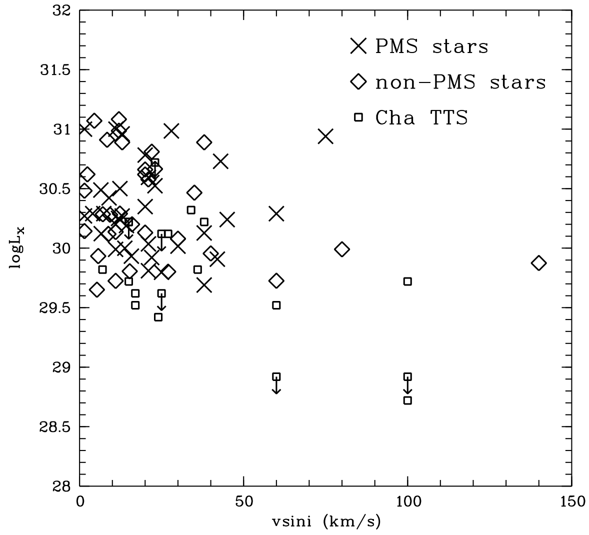


Fig. 3. X-ray luminosity versus $v \sin i$. Same symbols as for Fig. 1. In addition, Cha I classical T Tauri stars (squares). Upper limits are indicated by arrows.

but a very weak trend for the X-ray activity to become lower at higher rotation rates. This very likely reflects the dependence of X-ray activity on spectral type and the fact that faster rotators dominate among earlier spectral type stars.

**References**

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