

Lithium in Binary Systems with Evolved Components¹

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Abstract. The analysis of 72 binaries with component of luminosity class III shows that the behavior of Li abundance in such systems follows the same pattern presented by their single counterparts. Binarity seems to affect the lithium dilution in systems presenting orbital period lower than about 100 days.

1. Introduction

Stellar lithium depletion depends on different physical parameters, for example, rotation, age, metallicity and mass. Rotation, in particular, is believed to play an important role in the mechanism controlling the dilution of lithium once stars evolve along the H-R diagram. Zahn (1994) has claimed that in tidally locked binary systems, namely binaries with short orbital period, lithium depletion would be inhibited due to tidal effects. Then we should expect some link between rotation and lithium abundance in such class of binary systems, because, at least in those with short orbital period, rotation is mostly controlled by tidal effects.

The present work brings lithium abundance for a large sample of spectroscopic binary systems with evolved component, mostly of luminosity class III, along the spectral region F, G and K. On the basis of these data we study the behavior of the lithium content as a function of effective temperature, the link between rotation and lithium abundance and the possible role of tidal effects on lithium depletion in binary systems with evolved component.

2. Observations and data analysis

The present sample is composed by 72 binary systems with evolved component. Observations of the lithium I resonance line were carried out using the CAT/CES at La Silla, ESO. The Li abundances were found by comparing the observed spectra with the synthetic ones calculated in LTE, for the range 6101.7-6104.3Å. Every known atomic lines in this range were considered and the gf values of the Li 6707.81Å line were taken from Andersen, Gustafsson & Lambert (1984).

¹Based on observations made at the European Southern Observatory-ESO, La Silla, Chile

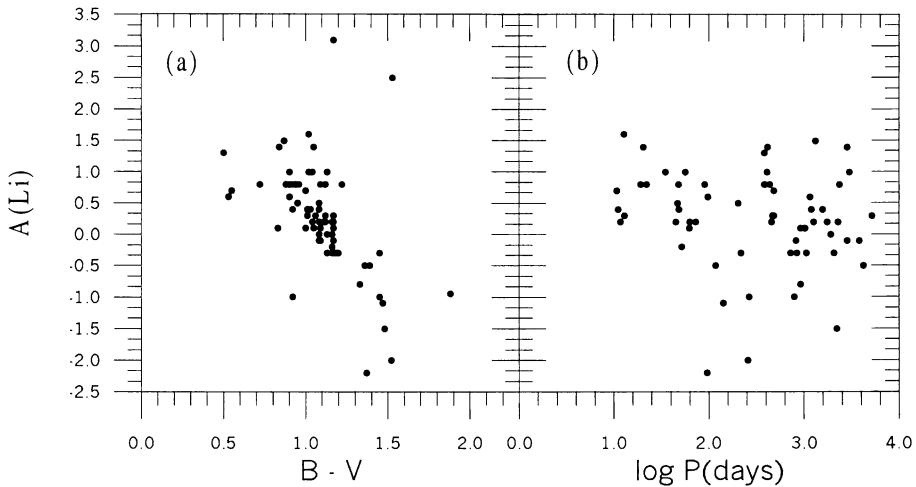


Figure 1. (a) Li abundance as a function of the color index ($B - V$) for binary systems with component of luminosity class III. (b) Li abundance versus orbital period for binary systems with component of luminosity class III.

Rotational velocities were taken from the Catalog of Rotational and Radial Velocities for Evolved Stars by De Medeiros and Mayor (1999).

3. Main Results

As shown in Figure 1a the behavior of the lithium abundance as a function of the effective temperature for binary systems with evolved component of luminosity class III, seems to follow the same feature presented by their single counterparts, namely a gradual decrease with decreasing temperatures.

Figure 1b shows that in binary systems with orbital period lower than 100 days, lithium abundance present a trend to be larger than about 0.0, in contrast with the binary systems presenting orbital period larger than 100 days. In addition, the spread in lithium abundance for binary systems with orbital period lower than about 100 days, shows also a trend to be smaller than the one for binary systems presenting orbital period larger than 100 days. Is this an indication that tidal effects are affecting the dilution of lithium?

References

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