IMPACT OF EVOLUTIONARY STATUS ON COOL GIANT STELLAR ACTIVITY LEVELS

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Since the beginning of the past century, ideas regarding spectral features as indicators of stellar activity began to settle down, spurred by the UV emission taking place in the middle of Ca II H and K absorption lines observed in several stars, which resembles the behavior of magnetically disturbed solar regions (Eberhard & Schwarzschild 1913). Such a feature became standard chromospheric activity proxy after the introduction of the *S-index* in the dedicated long-term monitoring program at Mt. Wilson (Duncan et al. 1991), and its wide usage has made it possible to find activity prevalence all across the HR diagram i.e. in all stages of evolution. Of particular relevance is the central helium burning phase in intermediate-mass stars, as it serves as a relatively stable transitional stage between the Main Sequence and the Asymptotic Giant Branch, and hence as the ideal place to explore the demeanor of activity aiming to explain the decidedly heterogeneous set of observations of both MS and AGB groups.

In this work, the physical parameters of a sample composed of 28 late-type stars (spectral types G and K) were determined using recent parallaxes from Gaia DR3 together with analysis of the medium-resolution spectra (R approximately 21000) obtained in a dedicated observing program managed in the TIGRE, a robotic telescope in central Mexico (Schmitt et al. 2014).

Through comparisons with well-tested evolutionary tracks computed with the Eggleton code in its updated version (Pols et al. 1998), mass values and stages of evolution were also derived, which in turn were put into perspective together with measurements of the S-index indicator of chromospheric magnetic activity.

Four of the stars in the sample belong to the open cluster M41, so their coeval nature has made it possible to impose additional constraints to model their evolution, and thanks to this, the permanence of the activity exhibited during the relatively stable central helium-burning stage has been explored in good detail, whereas the non-cluster stars offer an insight into peripheral stages of evolution.

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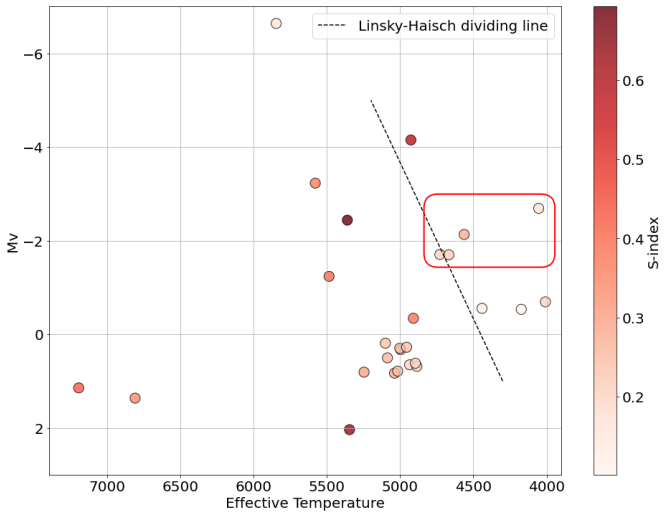

Fig. 1. The Linsky-Haisch Dividing Line location in the HR diagram alongside the stellar sample. M41 giants are framed in red.

Evidence points to a correlation between the state of evolutionary advancement within the horizontal branch and a sustained decline in activity, analogous to what has long been known to occur among cool main-sequence stars, and just as it was discovered to occur in the four Hyades K giants (Schröder et al. 2020). Moreover, the presented measurements mirror the behavior of more energetic activity tracers such as coronal X-ray emission depicted at both sides of the Lisky-Haisch dividing line (Fig. 1), remarking the key role of these particular late stages of evolution in activity development and progression.

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