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A new sample of red supergiants in the Inner Galaxy

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Abstract. We carried out a pivot experiment to select distant luminous late-type stars on the basis on their 2MASS and GLIMPSE photometry. Low-resolution infrared spectra enabled us to measure the equivalent widths (EWs) of their CO band-heads at 2.293 μm, and to confirm an extraordinarily high detection rate of red supergiants (RSGs), .i.e. 61% (Messineo *et al.* (2016)).

Keywords. Galaxy: disk, stars: late-type, supergiants

1. Overview of our survey

RSGs are an important probe of Galaxy formation and evolution. Star formation is coupled with the Galactic potential and occurs in preferential locations, such as the two end sides of the Bar where a large number of RSGs have been detected. These locations contain an extraordinary number of RSGs that are easily detectable. Inspired by these findings, we tried to detect individual RSGs, independently of clusters.

Approximately one hundred targets were selected from the 2MASS and GLIMPSE North I surveys, by following the prescriptions of Messineo *et al.* (2012) with $Q1$ and $Q2$ extinction-free colors. We selected stars with $0.1 < Q1 < 0.5$ mag and $0.5 < Q2 < 1.5$ mag. This range includes about 46% of known RSGs (Messineo *et al.* (2012)). Low-resolution HK spectra were collected with the SofI spectrograph on the ESO-NTT 4m-telescope. The EW of the CO band-head at 2.293 μm is a good indicator of temperature. Giants and supergiants follow two distinct relations, and late-type RSGs have large EWs. Contaminating AGB Miras can be classified by the shape of their continuum that is affected by broad H_2O absorption. The spectroscopic analysis has resulted in an extraordinarily large number of new RSGs, obtaining a detection rate of $> 60\%$.

Distances vary from 3.6 to 8.6 kpc; they were estimated with surrounding clump stars (primary indicators of distance) by deriving a relation between reddening and distance for a given line-of-sight. Luminosities confirm that the sample is dominated by RSGs with initial masses from 12 to 20 $M_{\odot}$. In conclusion, we successfully searched for RSGs and we increased by about 25% the number of previously known RSGs with $|b| < 1^{\circ}$ and $10^{\circ} < l < 65^{\circ}$. Only about 1.5% of these RSGs are found in clusters.

References

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