Stellar Populations as Building Blocks of Galaxies
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TCS-CAIN: NIR survey of the Galactic plane

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Abstract. We present TCS-CAIN, a NIR survey of the Galactic plane, recently made public at the Instituto de Astrofísica de Canarias, and some results derived from it: with star counts derived directly from it the structure of the inner the Milky Way can be dissected, and with low resolution spectra, (part of a follow-up program), its nature, specifically the metallicity distribution in the inner 4 kpc of the Galaxy, further understood.

Keywords. Surveys, Stars: abundances, Galaxy: abundances, Galaxy: structure, Galaxy: bulge

1. Introduction: The catalogue

TCS-CAIN is a deep multicolor NIR survey. Mapping selected areas along the Galactic plane, it reachs deeper than 2MASS or DENIS. The main scientific goal of TCS-CAIN is to study the structure of the Milky Way, mainly bulge/bar and disk, so the fields to observe have been choosed to sample well enough the $0° < l < 35°$ zone and to give enough coverage both in l and b of the disk.

The body of the catalogue comprises about 500 fields, 4.25'x4.25' each, obtained using JHKs photometry in the TCS Telescope (1.5m, Tenerife, Spain), and yielding 10 million source points, with limiting magnitudes of 17 (J), 16.5 (H) and 15.2 (Ks), with a photometric precision of 0.1 mag (against 2MASS data). The spatial resolution is 1", with astrometric errors of 0.15" for the position of the point sources.

2. Results: The bar

Hammersley *et al.* (2000) used data obtained from TCS-CAIN to isolate giants in a CM diagram, and analyzing star counts in several lines of sight, spotted an overdensity present from l=27° to l=5° at different magnitudes. Assuming an extinction law, the magnitude of this overdensities can be translated into distances along the different LOS, rendering a enlongated feature that runs from l=5° to l=27°, with a position angle of 43°±7° and a half-length of 4kpc, wich was interpreted as a bar.

This structure can be traced further making use of the red clump stars. Since their luminosity function is rather narrow, they present a well defined clump in a CMD. Using this, it is possible to extract star density and intestellar extinction isolating this clump on a CMD (see López-Corredoira *et al.* (2002) for details).

We can obtain a magnitude estimate for the red clump stars fitting a second order polinomial plus a gaussian function to the dereddened magnitude histogram of the selected stars, being the estimate the one given by the maximum of the gaussian component. Since with TCS-CAIN we have a good coverage of the inner parts of the Milky Way, we can apply this analysis to several fields in various lines of sight, and compare them with

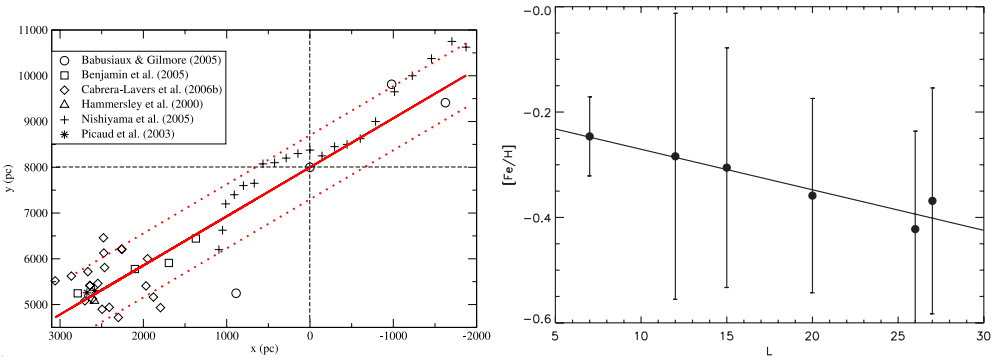

Figure 1. Left: Distance estimations for the red clump giants. Data are taken from Nishiyama *et al.* (2005), Babusiaux & Gilmore(2005), Benjamin *et al.* (2005), Picaud *et al.* (2003), López-Corredoira *et al.* (2007) and Hammersley *et al.* (2000). A feature with an angle of 43° and a width of 1 kpc is marked. Right: Variation of the mean metallicity with Galactic longitude, for our sample. The straight line marks the best fit, with a slope of -0.005 dex·degree^{-1}.

similar studies, as can be seen in Fig. 1, left panel. Clear traces of a long structure appear along the plane, reaching almost l=30° and with an angle of 43°±3°, in concordance with that proposed by Hammersley *et al.* (2000).

3. Spectroscopic survey: Metallicity of inner Galactic Sources

With low resolution (R=500) spectra in the HK band obtained with the TNG telescope (3.7m, La Palma,Spain) of the selected sources (along l=7°, 12°, 15°, 20°, 26° and 27°), and using the procedure developed by Ramirez *et al.* (1997), we can establish the spectral type of the sample of stars, and what's more important, their metallicity.

These results, obtained with a first sample of 106 stars, allow us to see the metallicity distribution in the inner Milky Way. As is expected, near the bulge we obtain a mean value for [Fe/H] of -0.24 dex. As we move away, the metallicity decreases steadily, until it reachs values of -0.4 dex, near those of the inner disk (Fig. 1, right panel).

This project will be countinued with the new NIR-MOS instrument of the GTC (10m, La Palma, Spain), EMIR. As a part of its central observational program, it will yield ∼1000 of these spectra for selected sources, to which the same kind of analisys will be performed, yielding a detailed study of the physical conditions on the inner parts of the Milky Way.

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