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Mapping the kinematics and chemistry of the Solar neighborhood with a 61cm telescope

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Abstract. The 61cm Varese telescope and its Multi Mode Spectrograph operated in the Echelle mode is used to observe nearby Red Clump stars in the Solar neighborhood, with more distant ones being targeted by Asiago 1.22m and 1.82m telescopes. So far high resolution, high S/N spectra of 260 program RC stars have been obtained (85 on a 2^{nd} epoch) providing radial velocities accurate to 0.7 km/s, $T_{\rm eff}$ to 56 K, $\log g$ to 0.21 dex, and [M/H] to 0.11 dex.

Key words: Galaxy: kinematics and dynamics – Galaxy: solar neighborhood

1. The project

The ARCS (Asiago Red Clump Spectroscopy) survey started at Asiago Astronomical Observatory with the aim of measuring radial velocities, atmospheric parameter and chemical abundances of $\sim$1600 Red Clump stars in the solar neighborhood. The Red Clump (RC) is a compact and prominent feature of the HR color-magnitude diagram of most Galactic stellar populations, superimposed on the red giant branch (RGB) and formed by stars in the central helium burning stage that follow He ignition in an electron-degenerate core (Faulkner & Cannon 1973, Girardi et al. 1998). This particular condition ensures common properties for RC stars such as absolute magnitude, closely similar spectra and photometric colors, no intrinsic variability and well understood stellar atmospheres (e.g. Arcturus = α Boo). The aim of the ARCS survey is to provide accurate multi-epoch radial velocities, atmospheric parameters ($T_{\rm eff}$, $\log g$, [M/H]) and individual chemical abundances for the program RC stars. Combined with Hipparcos/Tycho-2 parallaxes and proper motions, they allow to compute the space velocity and infer the Galactic orbit of the program stars, and to compare the results with predictions of current models for the Galactic structure and evolution, including the space arrangement and origin of streams and moving groups in the Solar neighborhood. The program RC stars are distributed along the celestial equator in a 10° wide strip and lie closer than 1 kpc. This sample is split according to distance in an onion-like structure composed of five shells, and results for two such shells have already been published, based on observations gathered with the Asiago 1.82m and 1.22m telescopes (Valentini &

Munari 2010; Saguner et al. 2011). The innermost shell is currently investigated with the Multi Mode Spectrograph mounted on the Varese 61cm telescope and operated in the Echelle mode (cf. Munari & Valisa, these proceedings).

2. Results

So far we have collected high resolution (RP=18 000), high S/N Echelle spectra of 261 RC stars in 77 nights distributed over a period of two years. To assess internal errors, a second epoch spectrum has been obtained for 85 of them after about one month. Each night spectra of three IAU radial velocity standards are obtained to derive via cross-correlation the RV of the program stars. Spectra of 50 RC stars well-studied in literature were also obtained to investigate external errors and trends in atmospheric parameters and chemistry derived via MOOG and χ^2 fitting to synthetic spectra. The standard error of measured radial velocities is 0.7 km/s, 56 K for $T_{\rm eff}$, 0.21 dex on $\log g$, and 0.11 dex on [M/H].

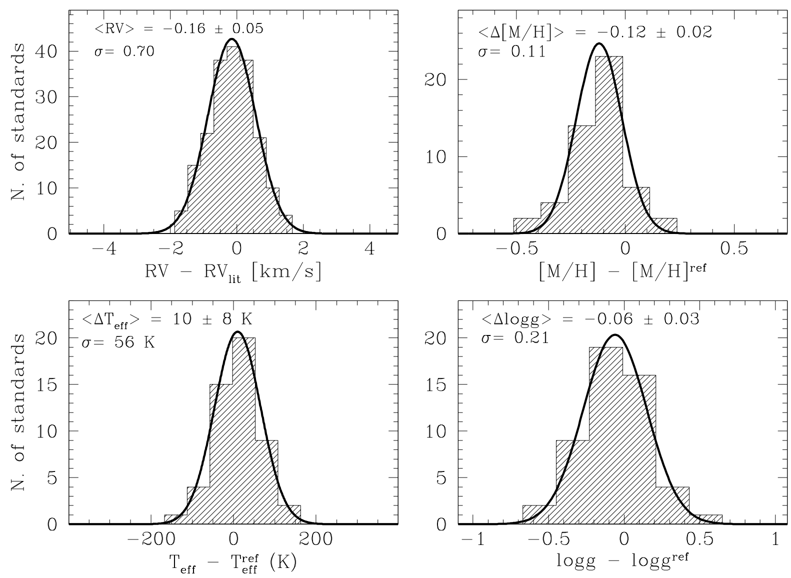

Figure 1. Distribution of shifts in RV for 215 measurements of IAU standards and in atmospheric parameters ($T_{\rm eff}$, $\log g$, [M/H]) for 50 template RC stars from literature.

References

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