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The Padova Survey of Local Group galaxies ⋆

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Abstract. The main results of an ongoing survey of the resolved stellar populations of Local Group dwarf galaxies are presented. Based both on deep optical color-magnitude diagrams and wide field data, the evolution of the star formation and its spatial variations are investigated by means of synthetic stellar populations. Radial age gradients and extremely varied star formation histories are found among the galaxies in our sample.

Key words. galaxies: dwarf – galaxies: Local Group

1. Introduction

Studies of resolved stellar populations in the dwarf galaxies of the Local Group have revealed a surprisingly complex picture of their star formation histories (SFH) (Mateo 1998). No two dwarf galaxies with the same SFH are found in the Local Group, and the processes that control both their star formation and their chemical evolution are far from being understood.

Recently, the high angular resolution of HST and the large light collecting area of 8-10m class telescopes has allowed the construction of deep color-magnitude diagrams (CMD) even for the farthest objects, while the introduction of wide-field cameras has made it possible to survey a significant fraction of nearby galaxies in an affordable amount of telescope time.

Taking advantage of all these possibilities, we have undertaken a survey of the resolved stellar populations in the dwarf galaxies of the Local Group. At present, our sample comprises the Carina, Sextans, Sculptor, Leo I, Leo II, and Fornax dwarf spheroidals (dSph), the dwarf irregulars (dIrr) NGC 6822 and SagDIG, and the 'transition' object Phoenix.

Deep VLT and EMMI data have been obtained for the distant objects, while wide field images secured with the WFI camera at the ESO/MPG 2.2-m telescope are available for the Milky Way satellites.

2. Results

Most of the data have already been reduced at the time of writing, and analyzed us-

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ing synthetic stellar populations. By tracing the spatial distributions of the different stellar populations, significant age or metallicity gradients have been detected. In addition, the large photometric databases allowed new estimates of both distance and metallicity.
An almost continuous star formation was derived for the *Phoenix* galaxy, a transition object between the gas-rich dIrr's and the dwarf spheroidals, which are almost devoid of gas. A similar scenario was derived from a wide-field CMD of the *Fornax* dSph. The exceptionally large sample (more than 500.000 stars) allowed the detection of extremely short-lived evolutionary phases, such as the RGB and AGB bumps, and He burning stars in the blue-loop phase. The RGB and the AGB bumps were detected in the *Sextans* and *Sculptor* dwarf spheroidal galaxies, as well. In both cases, the nature and position of the bumps were used to investigate the possible presence of multiple stellar populations – the results will be presented in forthcoming papers.
In the case of the *Leo I* dSph, a galaxy dominated by an intermediate age population, a small old stellar component was revealed by Held et al. (2000). A search for variable stars based on WFI images, conducted in collaboration with G. Clementini et al., resulted in the detection of a large number ($\geq$ 50) RR Lyrae variables (Held et al. 2001). The presence of a vertical extension of the red clump, populated by relatively young He burning stars, suggested that an extended star formation also took place in *Leo II* dSph.
Our study of *Carina* was focussed on the spatial and color distribution of He burning and red giant stars (Rizzi et al. 2003). A clear concentration of intermediate age red clump stars, indicative of an age gradient, was detected in this galaxy.
The spatial variations in the mean ages of the stellar populations were also studied in the dwarf irregular galaxies *SagDIG* and *NGC 6822*. Evidence of substructure was revealed by deep EMMI photometry of the SagDIG dIrr, with a clear association of younger stars with the peaks of H I emission, and RGB stars defining a red halo with an extended morphology (Momany et al. 2002).
We are currently extending this database both with near infrared imaging (especially suited to study the evolved stellar components) and with intermediate and high resolution spectroscopy, with the aim of simultaneously modeling both the star formation and the chemical evolution of the galaxies in our sample.

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