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# The stellar survey STREGA@VST

M. Di Criscienzo[1], M. Marconi[1], I. Musella[1], M. Dall'Ora[1], M. Cignoni[2], and STREGA collaborators

[1] Osservatorio Astronomico di Capodimonte, 80100 Napoli, Italy
e-mail: dicrisci@gmail.com
[2] Space Telescope Institute, 3700 San Martin Drive, Baltimore,MD 21218,USA

**Abstract.** The main aim of the STREGA@VST survey is to unveil the Halo formation mechanism by investigating the Southern part of the Fornax stream. It will use RR Lyrae stars, LPVs and Turn-Off stars as tracers to test the presence of extended halos (extra tidal) around Fornax and Sculptor dSphS. Here we describe the current status of the this Survey.

## 1. Introduction

The STRucture and Evolution of the GAlaxy (STREGA) survey (P.I.: M. Marconi) plans to use VST telescope to investigate the Galactic halo formation mechanisms through the two following main approaches: i) tracing tidal tails and halos around stellar clusters and galaxies; ii) mapping extended regions of the southern portion of Fornax orbit to investigate the hypothesized Fornax Stream.

The VLT Survey Telescope VST, built by a large Italy-based consortium, is a 2.6-m wide field optical survey telescope for the southern hemisphere. VST is located on the VLT platform at Cerro Paranal, Chile. It operates from the u to the z band, preserving, within a corrected field of view of 1x1 degree, the excellent seeing conditions achievable at the Cerro Paranal site. The telescope is equipped with just one focal plane instrument, OmegaCAM, a large format (16k x16k pixels) CCD camera built by the international consortium of the same name.

STREGA@VST was thought as a 5-years survey, organized in two parts: the core program and a second part. In the core program we are exploring the surrounding regions (up to at least 3 tidal radii in more directions to distinguish between tidal tails and halos) of selected dSphs and GCs along Fornax orbit and in regions of particular interest for the interaction mechanism with the Galactic halo: Fornax and Sculptor (38 fields), Phoenix (3 fields), Sextans (13 fields), Pal3 (3 fields), Pal12 (1 field), $\omega$-Cen and NGC 6752 (33 and 32 fields around each GC respectively). The second part will cover strips of adjacent fields distributed transversally to Fornax orbit and will extend the observations of most interesting systems, explored in the core program, to further tidal radii.

To investigate the mechanisms of formation and evolution of the Galactic halo, the STREGA survey relies on stellar tools, in particular variables stars (RR Lyrae and Long Period Variables), thanks to their brightness and characteristic light curves , Turn-off (TO) and Main Sequence (MS) stars, that are fainter than RR Lyrae (by more than 2 mag) but at least 100 times more abundant . Moreover, the accurate sampling of the light curves of

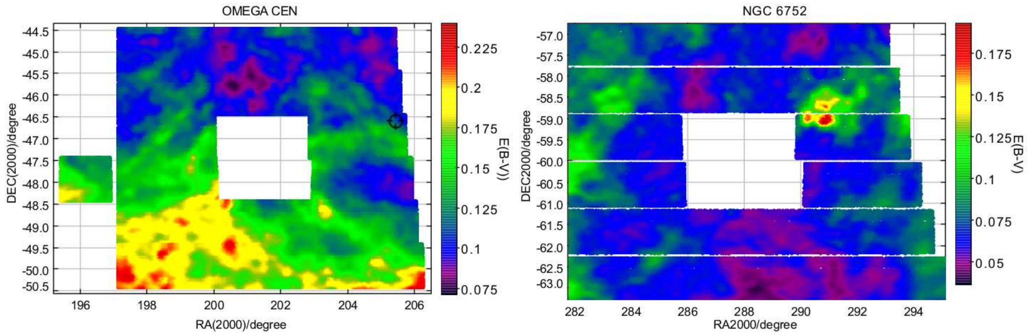


**Fig. 1.** Reddening maps of the observed fields around $\omega$ and NGC6752.

the identified RR Lyrae is a fundamental step to characterize their stellar properties providing clues on the Galactic Halo Star Formation History (Clementini et al. 2011 and references therein).

The multi-purpose nature of the STREGA survey involves a few secondary objectives including single white dwarfs (WDs) and interacting binaries (IBs), above the Galactic plane, most of them accreting compact objects with low-mass donor companions. This program will also be complementary to the VPHAS+ Galactic plane survey that will map the disk population of IBs. As for single white dwarfs, our relatively deep fields at various Galactic latitudes will allow to study the poorly known WD space density at different latitudes, including thin disk, thick disk and spheroid populations, complementing the recent statistical studies based on much larger, but shallower, WD samples from the SDSS and SuperCOSMOS surveys (De Gennaro et al. 2008; Rowell & Hambly 2011). Similarly to IBs and especially for the halo candidates, multi-epoch observations and follow-up IR photometry and/or spectroscopy will allow to confirm the true nature of these objects.

## 2. Status of the survey

Observations have started at the end of 2011. However, also due to technical and scheduling problems, only a minor part of observations have been gathered so far. In particular, actually, the only completed runs concern the fields around $\omega$-Cen, NGC 6752 and Pal 12.

Due to the relatively short distance modulus of the globular clusters $\omega$-Cen ($\approx$13.7 mag according Del Principe et al. 2006) and NGC6752 ($\approx$13.2 mag according to Milone et al. 2013) the exposure times at the RR Lyrae magnitude level in these systems are too short, comparable with 1 sec. In these cases variability should be investigated, depending on the obtained results, with suitable follow up observations on the most interesting fields. On the other hand, VST is the ideal instrument to perform a map of extra-tidal stellar populations or of an extended halo around $\omega$-Cen and NGC6752 through the observations down to TO and fainter MS stars. The data reduction have made use of VST-Tube pipeline (Grado et al 2012) specificaly developed for the data coming from VST telescope.

Data were analyzed with SExtractor software which is particularly suited for wide fields images being fast, fully automatizable, and also able to give accurate results for stellar photometry in not crowed fields after having checked the SExtactor aperture photometry by comparing with accurate PSF-based one for selected images.

We estimated the reddening by interpolating on the Schlegel, Finkbeiner & Davis (1998) maps on a grid covering the whole FoV covered by 33 and 32 fields around $\omega$ Cen and NGC 6752 respectively and the only one field around Pal 12. As shown in Fig.1 we find that in the first two cases the reddening changes significantly as we are at low galactic latitudes and do not take it into account these differences

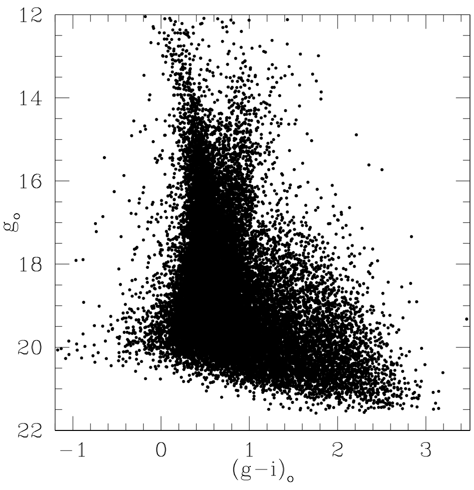


**Fig. 2.** g-(g-i) CMD of stars observed in one VST-field around $\omega$ Cen.

could skew the results. In the case of Pal 12 the reddening differences are expected to be very small and we can consider ΔE(B-V) ~ 0.

In this way we have produced the dereddened Color-Magnitude diagrams (CMDs) for all the investigated fields and actually we are investigating the signature of overdensities associated with varius CMD features, in particular HB, and TO/MS stars (Marconi et al. 2013 and Di Criscienzo et al. 2013 in preparation).

In Fig.2 we present a tipical Color-Magnitude diagram for one field around $\omega$ Cen. In order to search stars associated to the central globular cluster it is important to describe the main features see in the CMD and to realize which kind of stars they contain. Since the low galactic latitude in this case the lines of sight are mainly populated by thin and thich disk stars with only a minor fraction of halo stars. to the central globular cluster it is important to describe the main features see in the CMD and to realize which kind of stars they contain.In particular at the bright end (g< 16 mag) the CMD is dominated by thin and thick disk stars with the blue plume composed mainly from thin disk stars and red plume by red giant branch stars of both the disk. At the fainter magnitude (g>18mag) the halo component dominated the stars count especially at blue colors. In principle these observations can also been used to check and eventually calibrate Galactic Models star counts in particular for the HB component of the Halo component as in the case of the fields around NGC6752 (see Marconi et al. 2013 in preparation).

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