STREGA@VST:
Structure and Evolution of the Galaxy

P.I. Ilaria Musella/Marcella Marconi

Inaf-OA Naples

Monthly Notices
of the
ROYAL ASTRONOMICAL SOCIETY

MNRAS **444,** 3809–3828 (2014) doi:10.1093/mnras/stu1691

STREGA: STRucture and Evolution of the GAlaxy – I. Survey overview and first results*

M. Marconi,[1]† I. Musella,[1] M. Di Criscienzo,[1] M. Cignoni,[2] M. Dall'Ora,[1] G. Bono,[3] V. Ripepi,[1] E. Brocato,[4] G. Raimondo,[5] A. Grado,[1] L. Limatola,[1] G. Coppola,[1] M. I. Moretti,[1] P. B. Stetson,[6] A. Calamida,[2,4] M. Cantiello,[5] M. Capaccioli,[7] E. Cappellaro,[8] M.-R. L. Cioni,[9,10] S. Degl'Innocenti,[11] D. De Martino,[1] A. Di Cecco,[4,12] I. Ferraro,[4] G. Iannicola,[4] P. G. Prada Moroni,[11] R. Silvotti,[13] R. Buonanno,[3,5] F. Getman,[1] N. R. Napolitano,[1] L. Pulone[4] and P. Schipani[1]

Why STREGA?

The outer regions of the Galactic halo seem to be quite "clumpy" (e.g. Vivas & Zinn, 2002; Newberg et al., 2002) → supporting theories based on the hierarchical formation of structures in a Cold Dark Matter cosmological scenario.

The most known examples of these phenomena are

- the observed merging of the Sagittarius dsph with the MW halo and its associated stream
- the stellar over-density in the Canis Major region
- the presence of peculiar Galactic Globular Cluster with observed tidal tails or suspected halos
- the discovery of several ultra-faint satellites of the MW from analysis of the SDSS

MW dSphs and a number of Galactic GCs appear distributed along planar alignments reflecting distinct orbital planes interpreted as the result of the disruption of larger galaxies (one of this is the Fornax Stream).

<u>Similar evidences observed also in M31</u>

STREGA main scientific goal

To investigate Galactic halo formation mechanisms

Tracing tidal tails and halos around stellar clusters and galaxies

Identifying new very faint stellar systems

Mapping extended regions of Fornax orbit → Fornax stream

Tools:

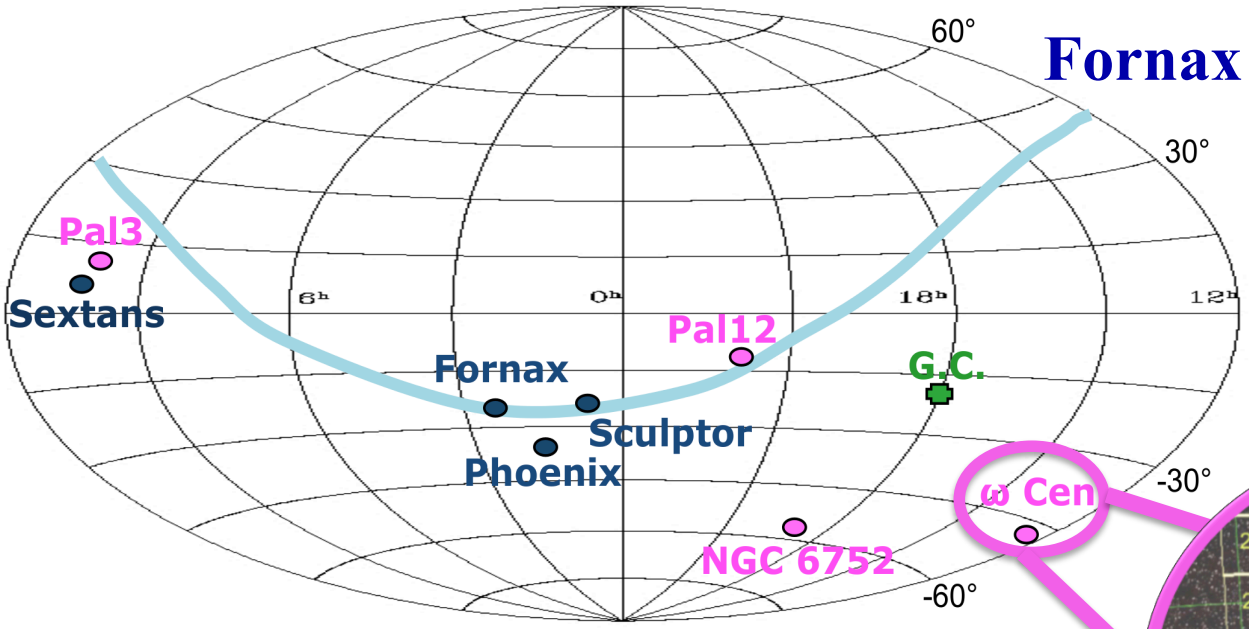
Variable stars (RR Lyrae)

Main-Sequence and Turn off stars

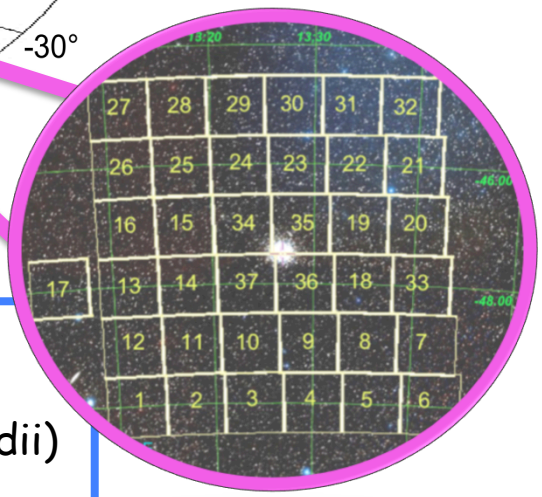
VST GTO-INAF

VST with its large field (1 sq. deg.) and its high resolution (0.21 arcsec/px) is the ideal instruments for this type of investigations

Survey plan



Fornax Orbit (Dinescu et al 2004)



A total of 150 sq. deg. in *g, r, i* bands (37 around ω Cen):

Core programme: Mapping large areas (at least up to 3 tidal radii) to trace signatures between selected stellar systems and the Galactic halo

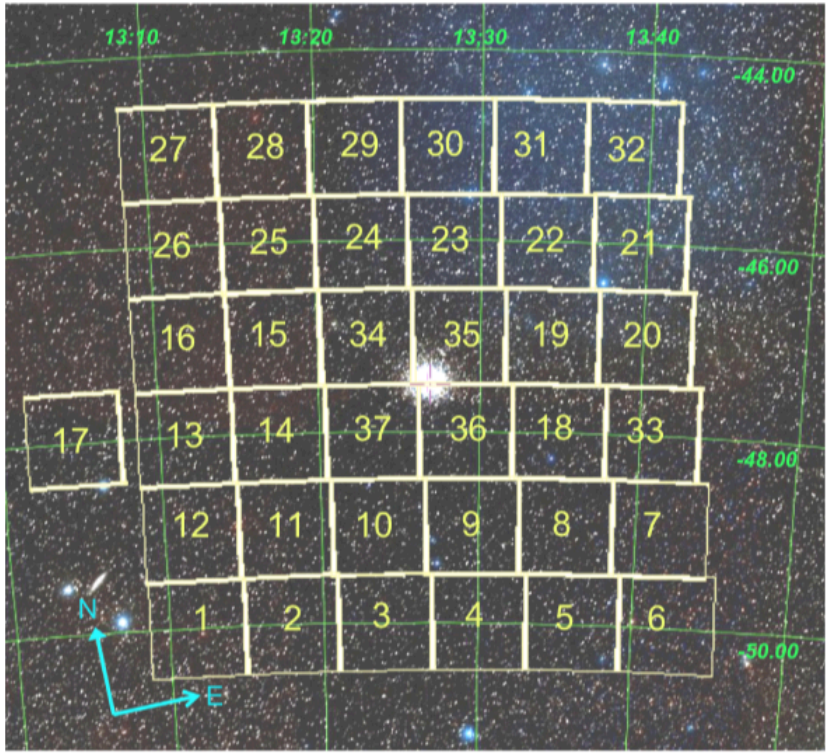
Time series at RR Lyrae magnitude level or deep exposures 2-3 mag below the TO

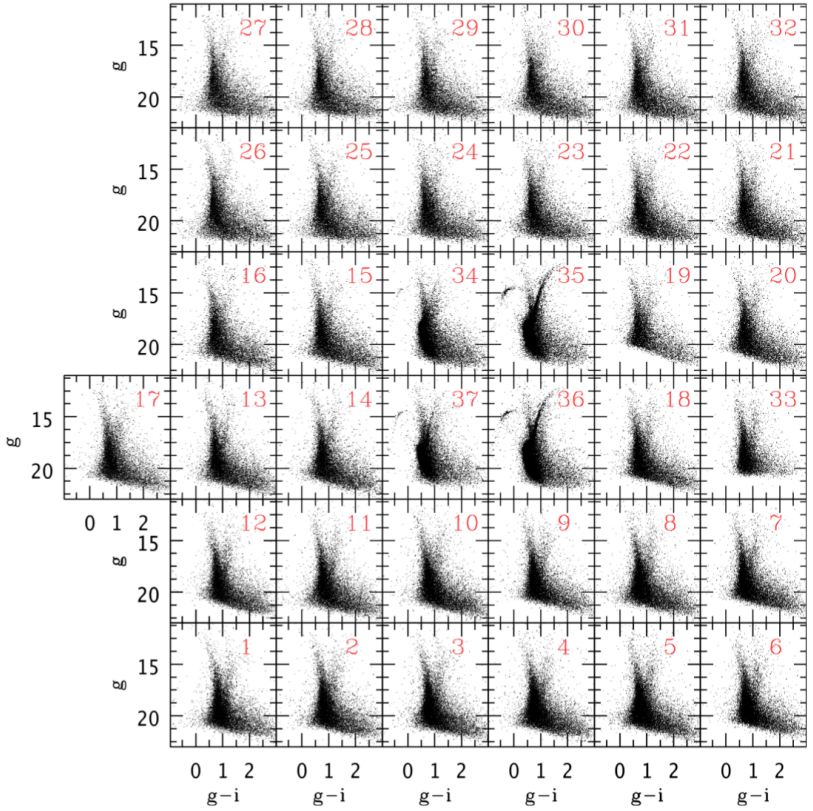
ω Cen: single CMDs

Preriduction performed with VST-TUBE, a specific imaging pipeline

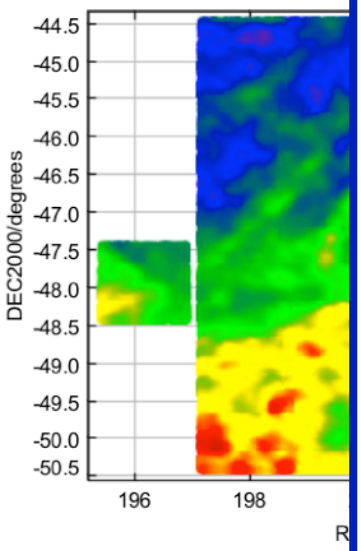
Aperture photometry with Sextractor for non-crowded fields (automatable)
PSF photometry with DAOPHOT/ALLSTAR on the central crowded fields

Calibration through deep and accurate UBVRI photometry of ω Cen by Castellani et al. (2007), transformed to the SDSS ugriz photometric system by adopting the transformations by Jordi et al. (2006).

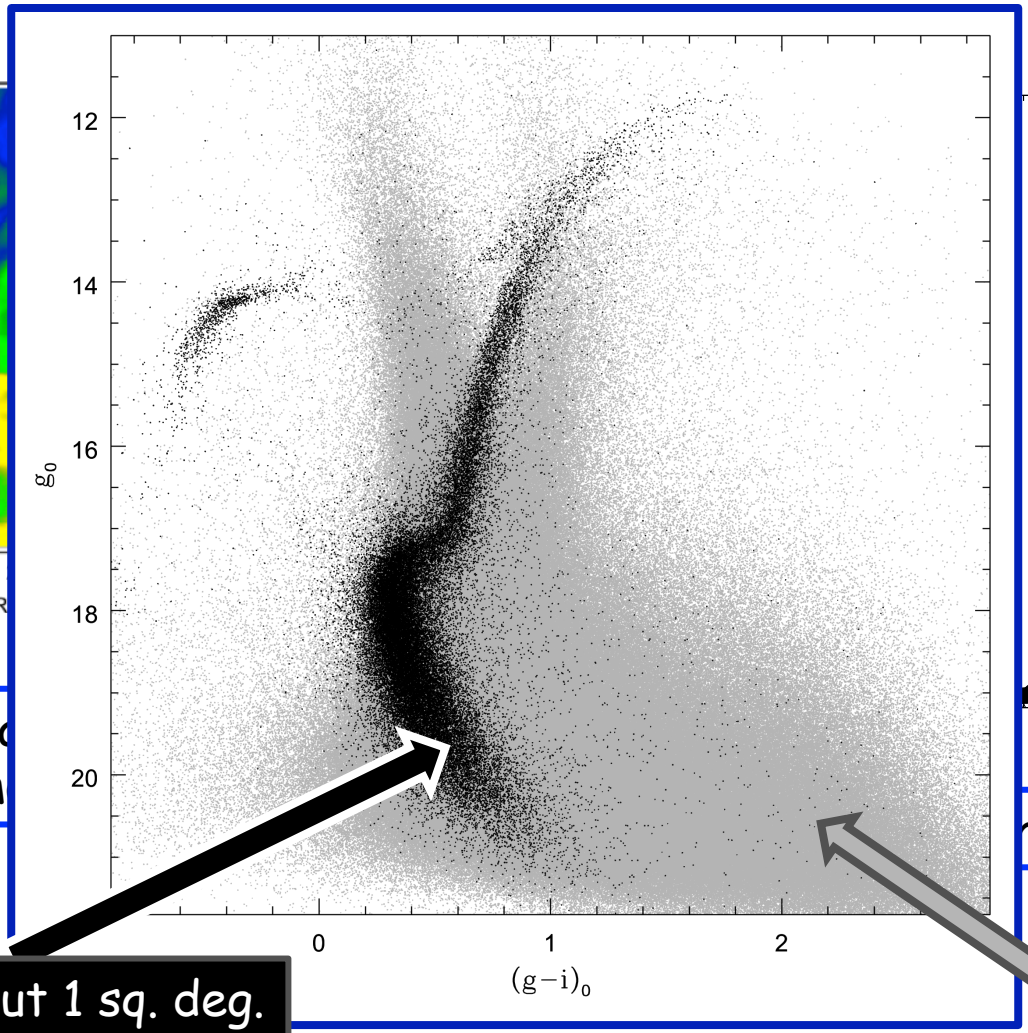




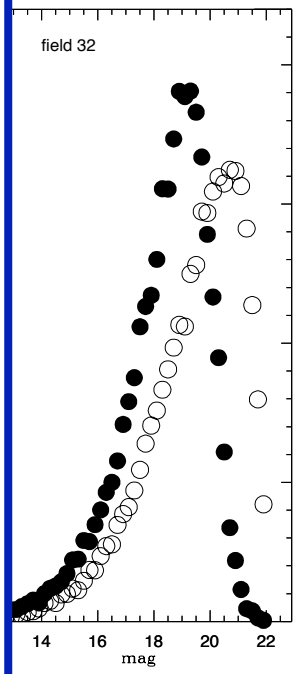
ω Cen: cumulative CMD



Differentic
Schlegel m



Best seeing



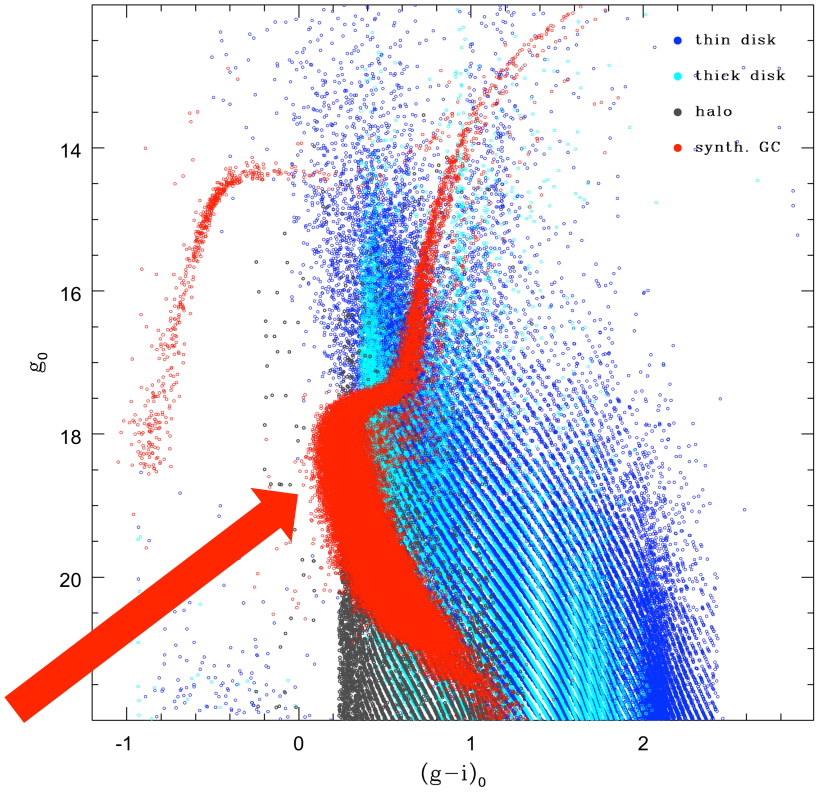
ness

Central CMD (about 1 sq. deg. Centered on ω Cen)

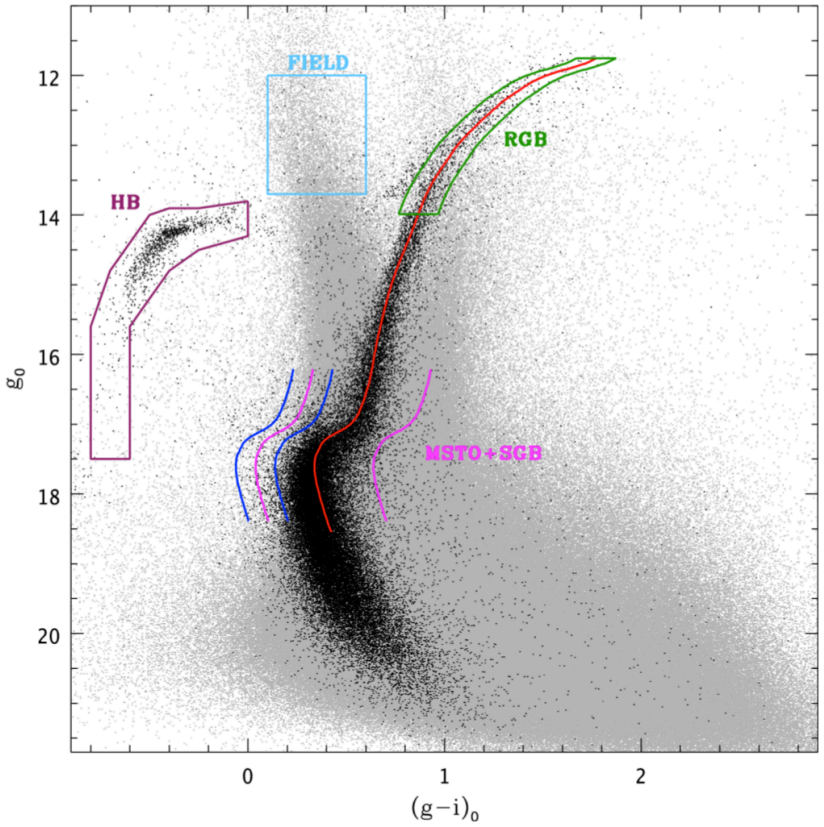
Cumulative CMD

Tools

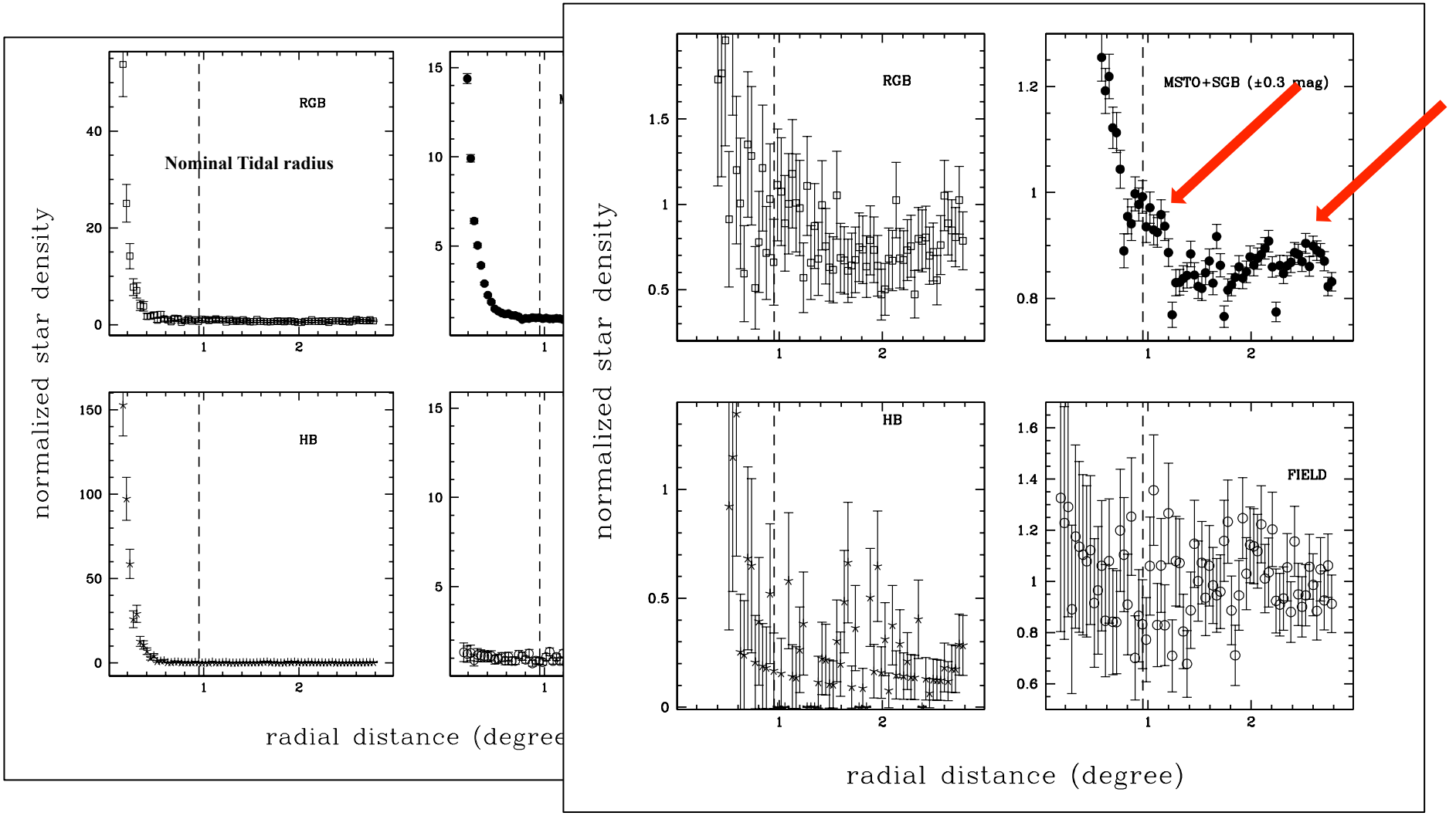
Theoretical tools: Galactic simulations (blue, cyan and grey dots, updated Castellani et al. 2002) compared with the synthetic CMD of ω Cen (red dots, SPOT code: Teramo Stellar POpulation Tools, Raimondo et al. 2005).



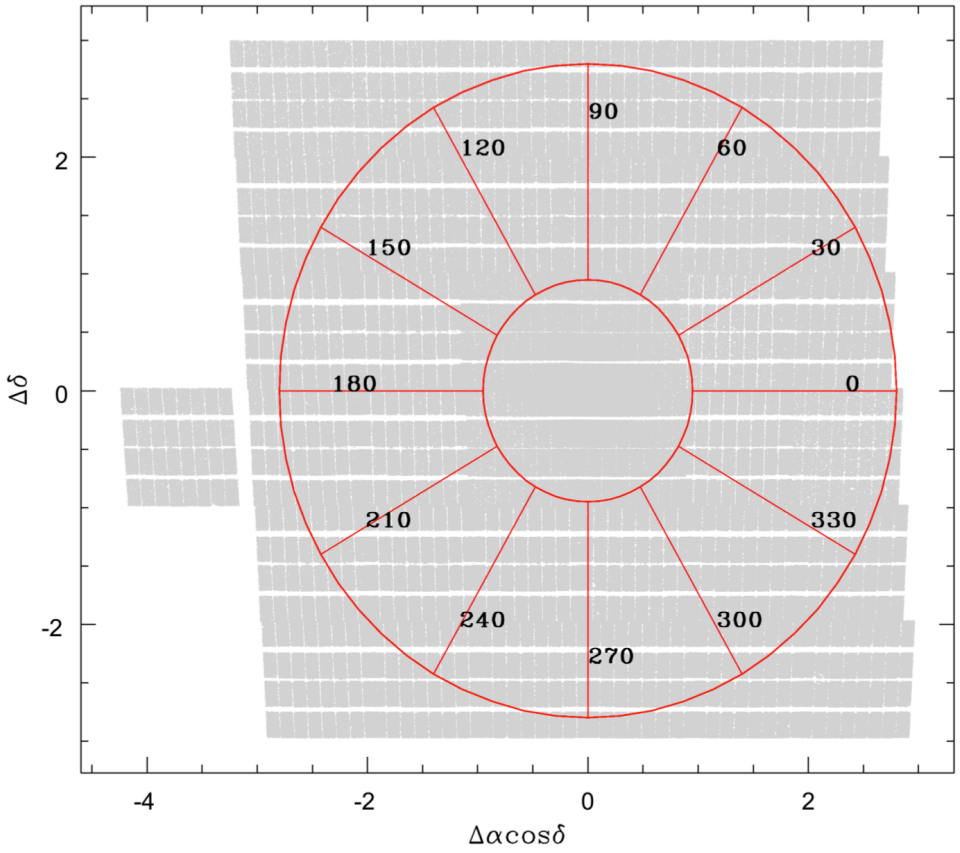
Observational tools: To detect extra-tidal stars, we performed star counts on the area observed around ω Cen in various evolutionary phases……..



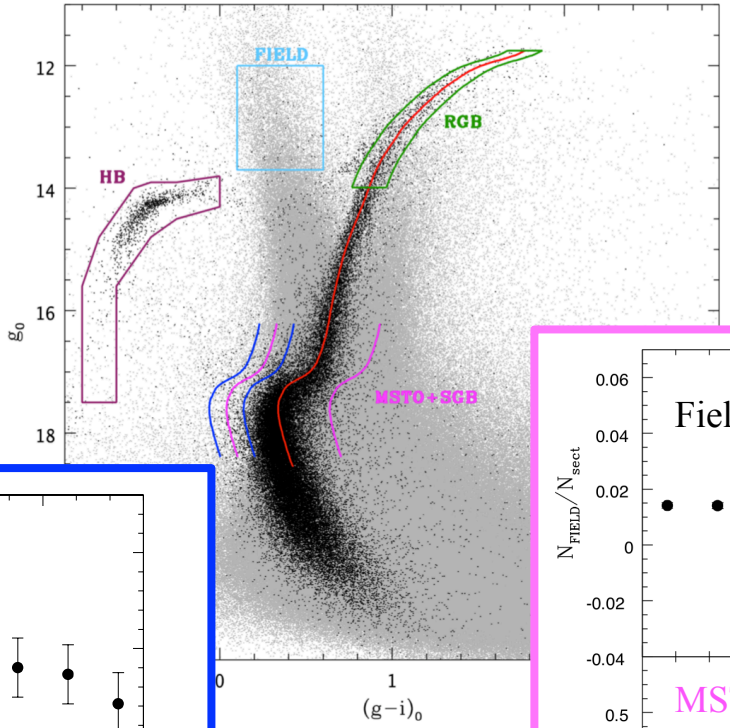
Radial star counts. I

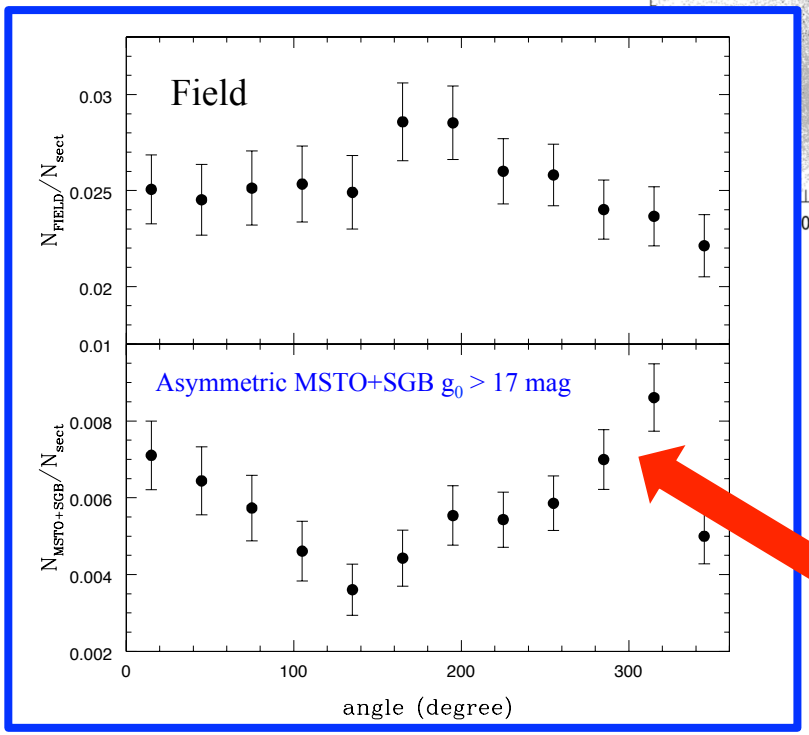


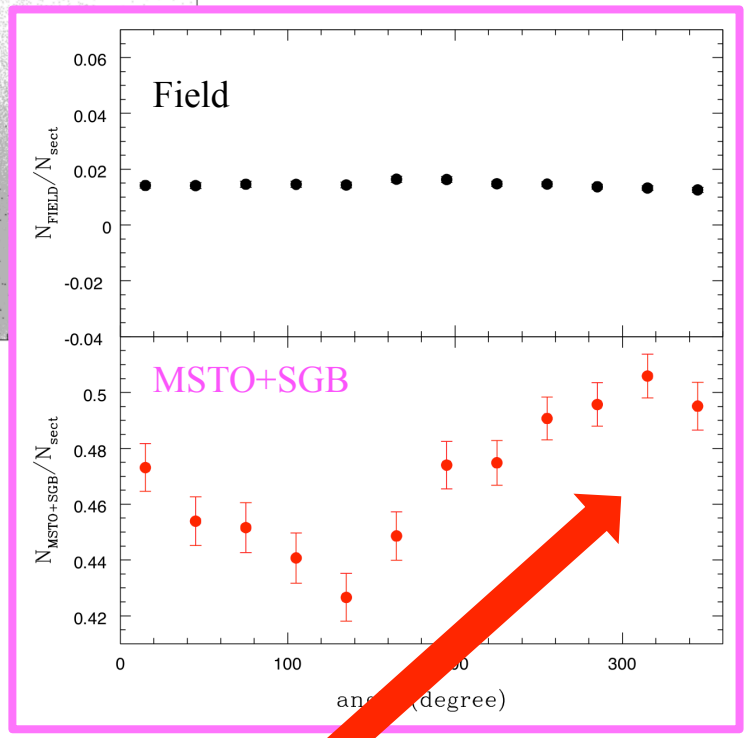
Angular Star Counts



Angular Star Counts

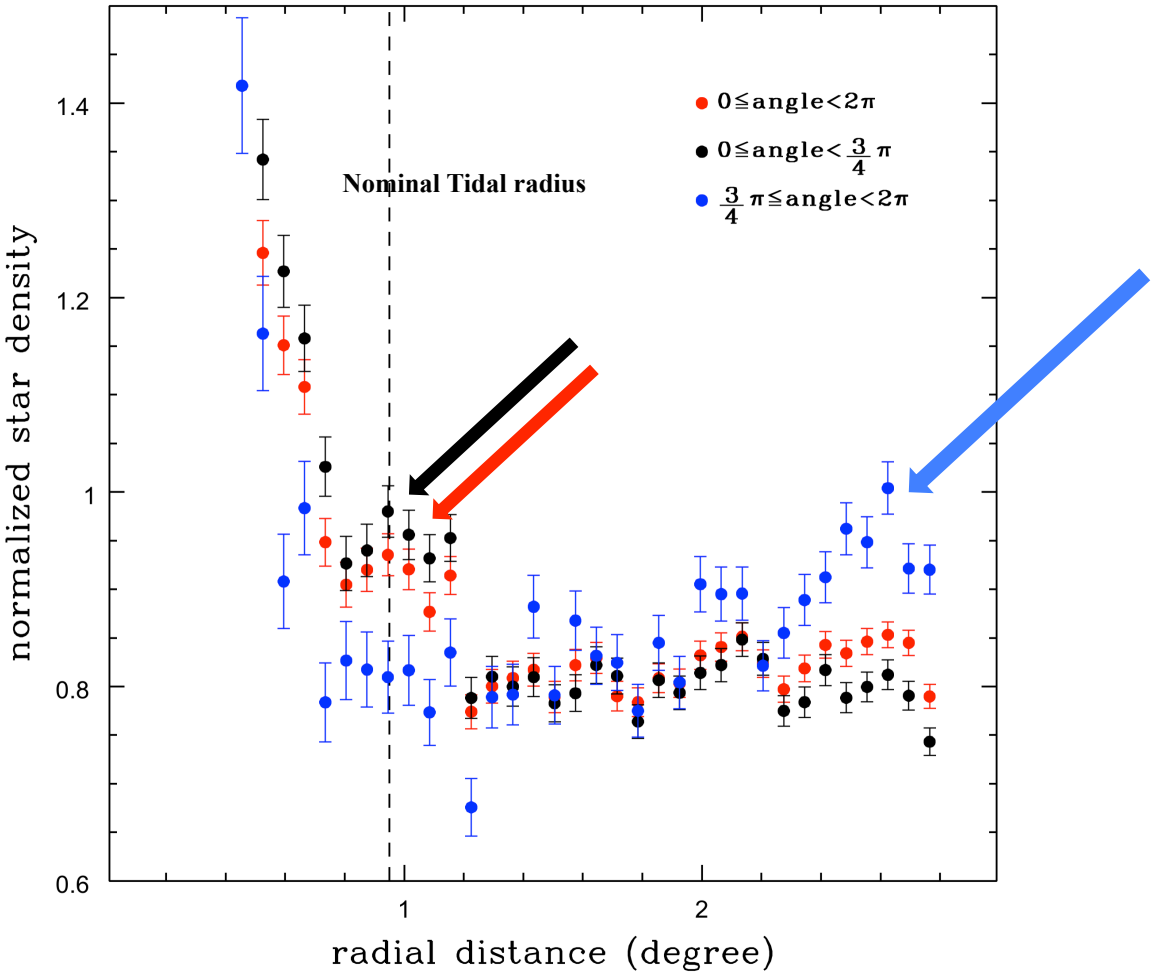




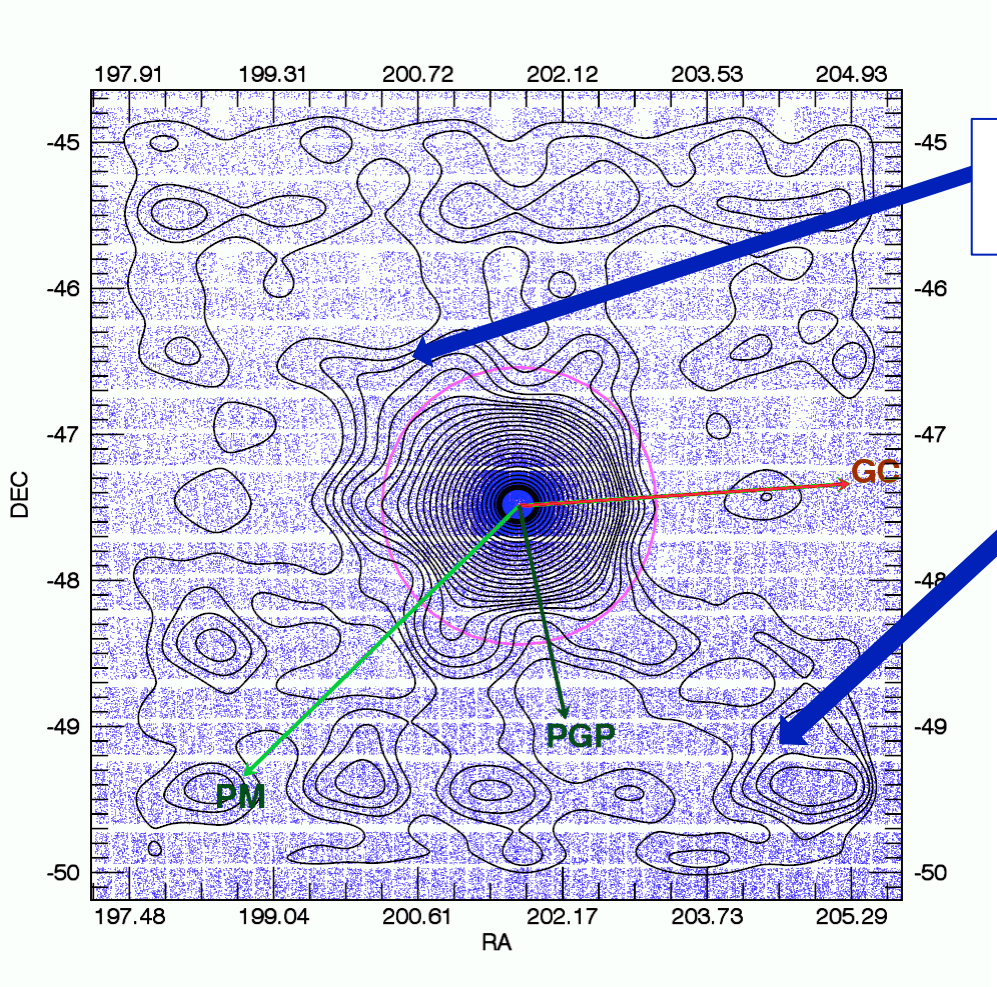


SE direction

Radial Star Counts. II



Isocontours

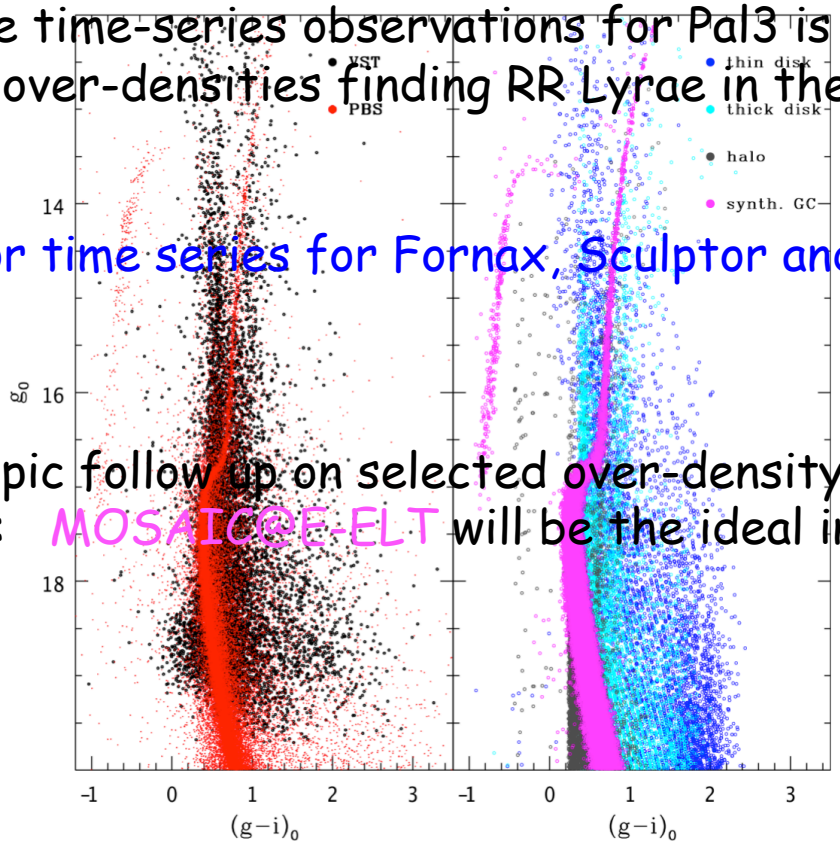


Asymmetric, elongated shape

Our results are in agreement with current measurement and prediction about the cluster ellipticity profile and orientation

Future

- Reduction is completed for Pal12 and is in progress for NGC 6752
- Similar analysis for Pal 12 and NGC 6752
- Reduction of the time-series observations for Pal3 is in progress and we aim to trace over-densities finding RR Lyrae in the region out of tidal radius
- Observations for time series for Fornax, Sculptor and Phoenix are in progress



Spectroscopic follow up on selected over-density regions is mandatory: MOSAIC@E-ELT will be the ideal instrument