One year of Gaia ESO Survey

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The GES

■ PIs: Randich & G. Gilmore (> 300 CoIs)

Steering G: M. Asplund, J. Binney,P. Bonifacio,J. Drew,S. Feltzing, Ferguson,R. Jeffries,G. Micela, I. Negueruela,T. Prusti,H.-W. Rix, A. Vallenari

■ Goal: complementing Gaia as
 - chemical tagging   R=16.5
 - chemical labelling R=19
 - radial velocities   R=19

■ VLT/FLAMES(GIRAFFE+UVES):
 -300 nights (30n/semester) over 5 (4+1) years;
 -start 1/ 2012 (P88), end 9/2016 (P97)+;
 -visitor mode

GES-Science questions

Dynamics of the Milky Way

- Velocity distributions along the disk; resonance maps; coupling of dark halo, bar and disk
- Halo shape, density and granularity
- Streams as tracers of mass distribution and evolution

Early chemical evolution of the MW

- Streams in the halo to trace merger history
- Constrain the IMF, and star formation in the early Universe

Structure and history of the disks

- Characterization of star formation and chemistry as f(R)
- Models of the formation of thick disk
- Inter-relation between various components

Open clusters

GES Aims

- $>10^5$ Giraffe spectra (R~16,000-25,000) → RVs, [Fe/H], [X/Fe], stellar properties

- $>10^4$ UVES spectra (R~47,000) → chemical tagging

- 100 OCs in all phases of evolution (~1 Myr to several Gyr), sampling the age-distance-RGC-density-mass-metallicity parameter space
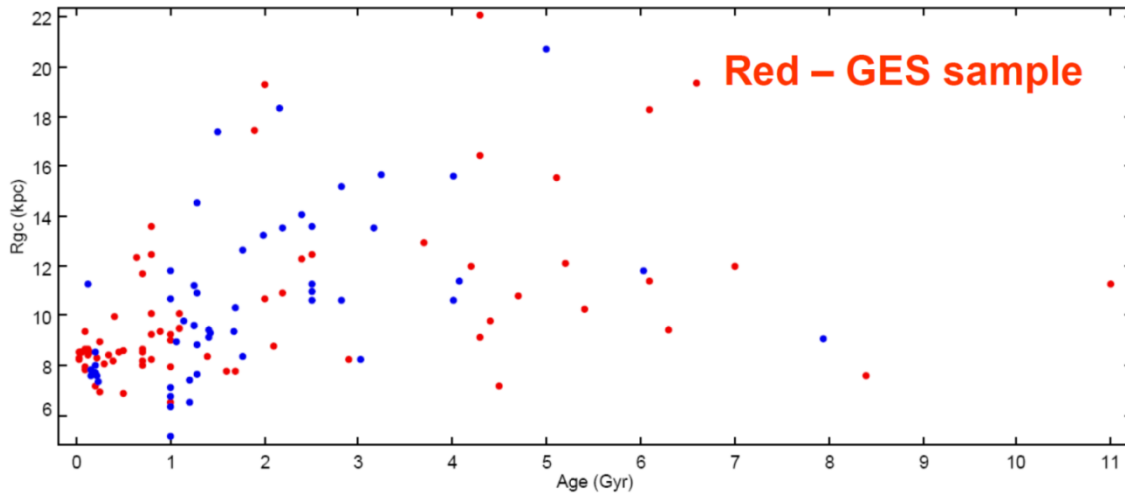
Field Star selection criteria

GIRAFFE

- Bulge: mostly giant stars (clump and RGB), I=15
- Halo /thick disc: FG TO stars (17 < r < 18); giants in known streams
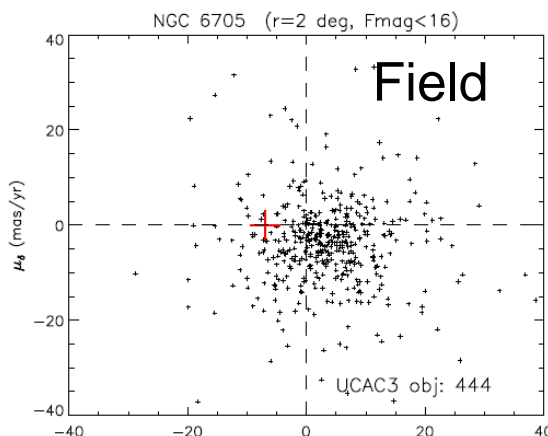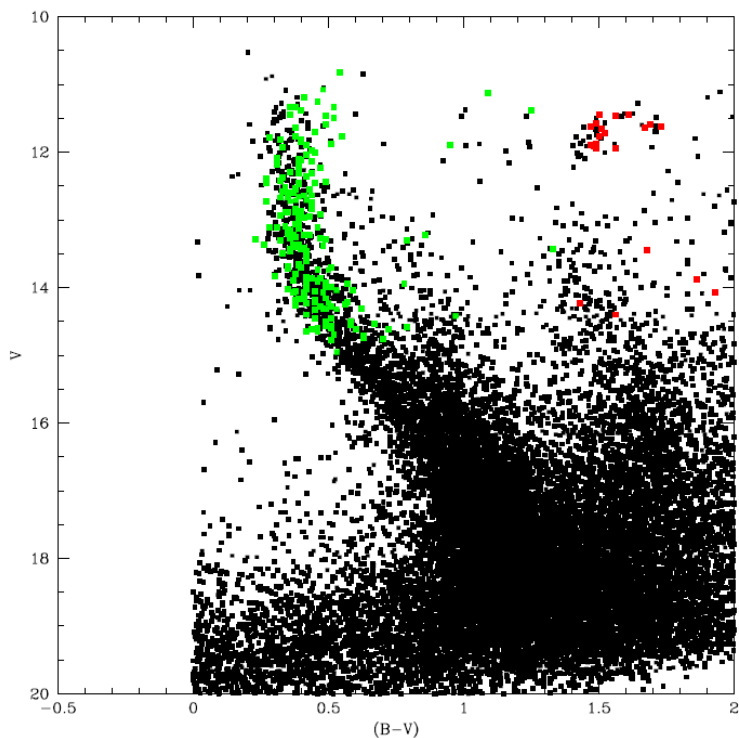- Thin disc –only RVs for dynamics; I<19

UVES parallel

- Solar neighborhood: unbiased 5000- star sample. Mv~5.5, ➔ unbiased survey to 1kpc at V=15 2000 thin disk, 2000 thick disk, 1000+ halo
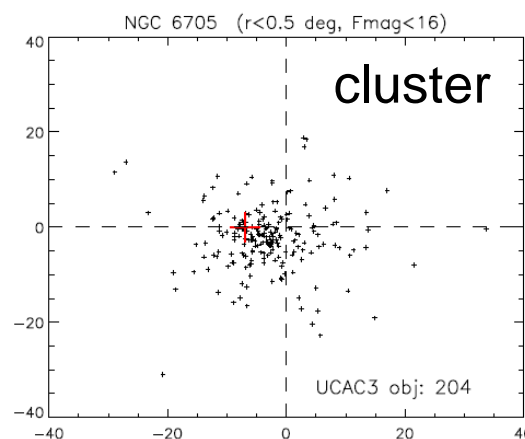
GES OC Selection

- Young: 1-100 Myr → evolution of OCs from birth to dissolution: IMF, stellar evolution : stars down to M dwarfs

  requirement: vrad< 0.3 m/s for a M star, Gaia 1% precision

                                              → dc=1.5 kpc: 30 OCs

- Intermediate age : 100-500 Myr   req. 1) → dc=700 pc : 15 Ocs

- Old age : > 500 Myr ; large dist → stellar evolution; galactic evolution : red clump stars : 50 Ocs

Which data: membership selection

Field

cluster

NGC 6705 (r=2 deg, Fmag<16)

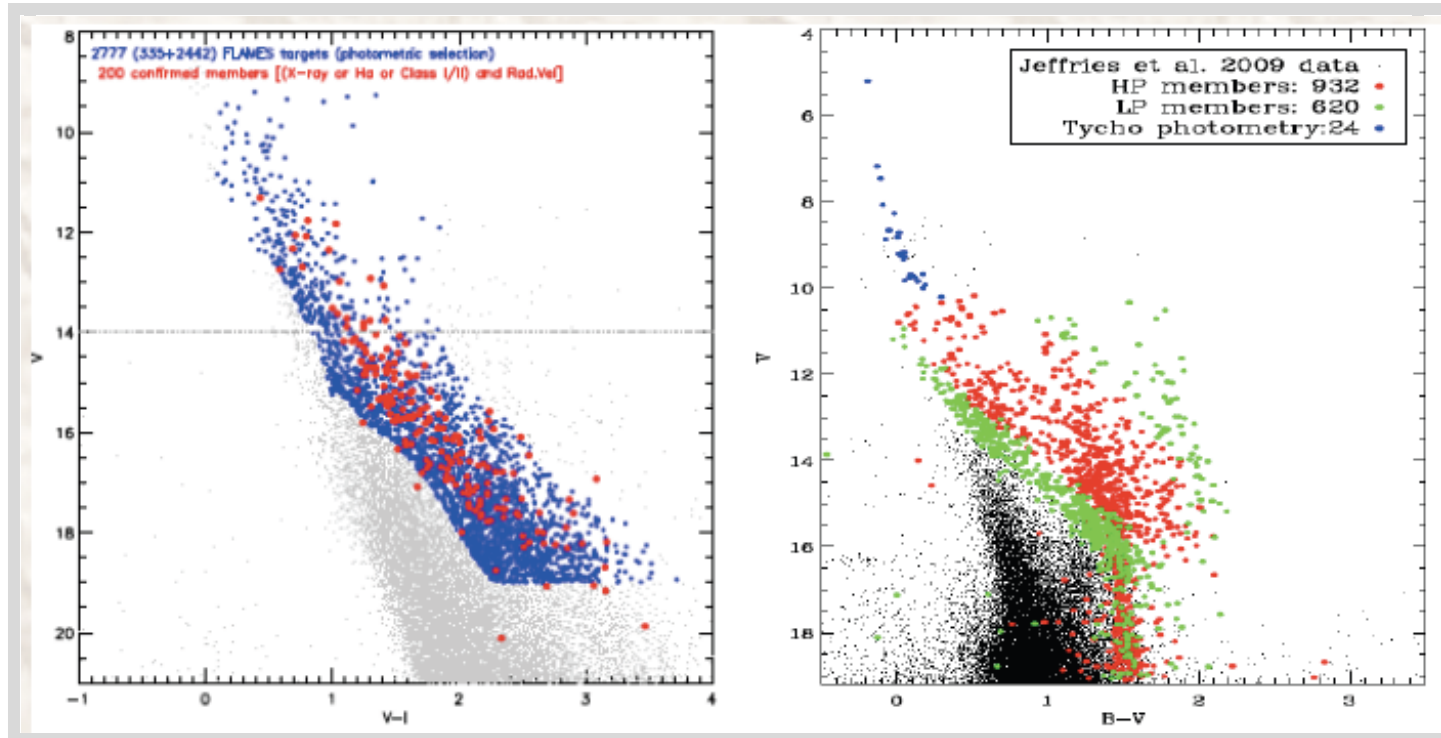NGC 6705 (r<0.5 deg, Fmag<16)
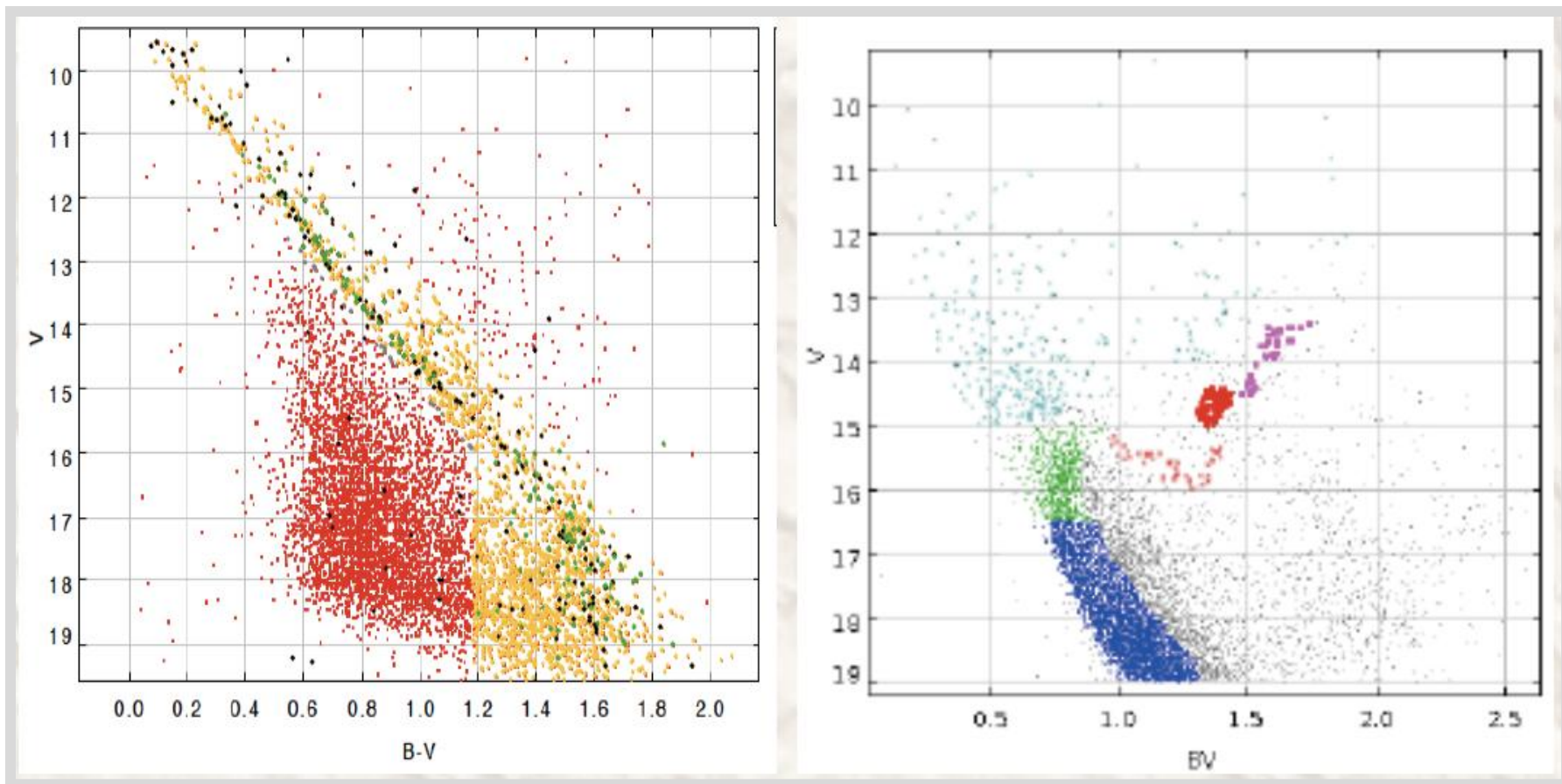
UCAC3 obj: 444

UCAC3 obj: 204

see E. Alfaro talk

D=1800 pc,
Age=250 Myr
[Fe/H]=+0.1,

UCAC4 (Smart+2012)

BV (Zaggia + 2012)

Wide criteria for star selection: trace halo of stars

Which stars: Young OCs

Which stars: Old OCs

Observation status

- 14 completed observing runs

  - 2 additional runs scheduled in ESO P91

- Weather: 80-85 % 'useful'

- Wide range of targets observed

  - 10 clusters observed/started young & old, massive & low mass stars, evolved & MS stars

  - Several MW fields –thick disc, halo, bulge

  - Several calibration fields & benchmark stars

Survey Status- Reduction pipeline

- Pipeline reduced spectra (single and co-added, single orders and merged spectra)

- Problems still present: e.g., format in progress, ripples in the merged UVES spectra, shape of continuum in Giraffe spectra, systematic differences in RV between HR21 and HR10; telluric lines

- After a first preliminary internal release of spectra in the summer (beta-testing)
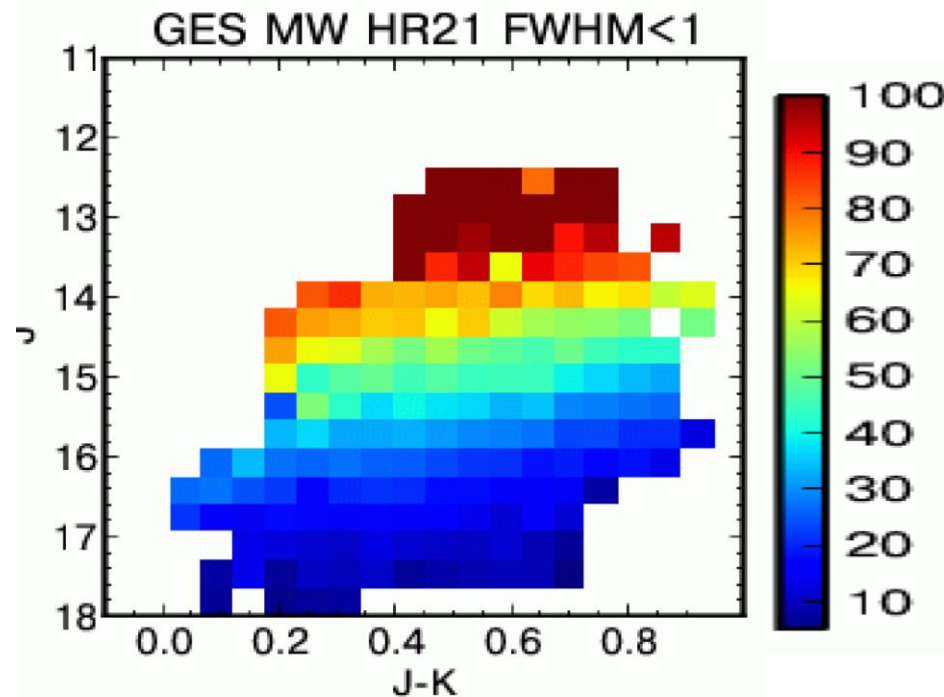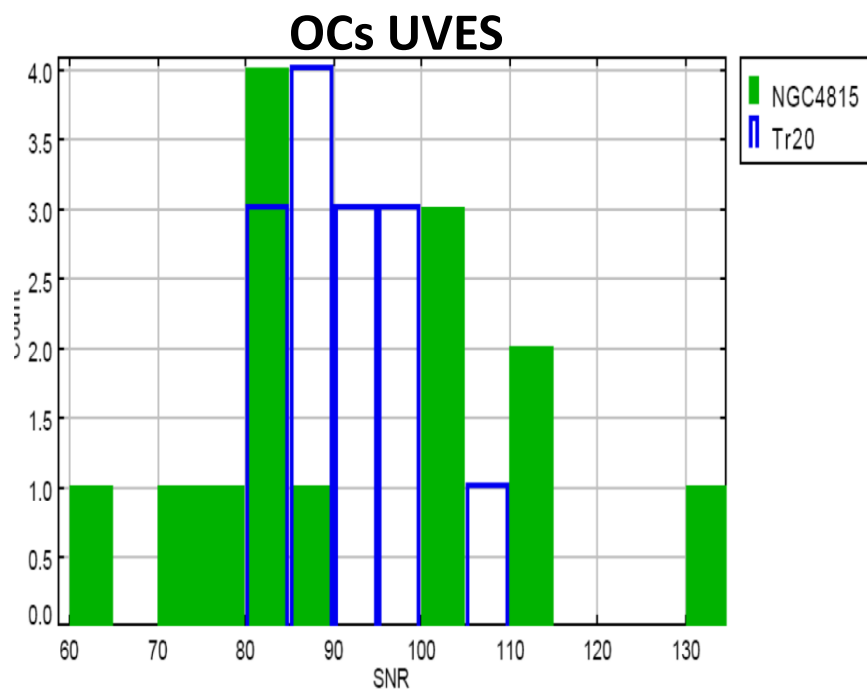
- **DR1 at the end of Oct. 2012**

  Giraffe data: Dec 2011-Sept. 2012

  UVES data   : Dec 2011 – June 2012 (only 580nm)

- **DR2 at the end of this month** →All data acquired until Dec. 2012
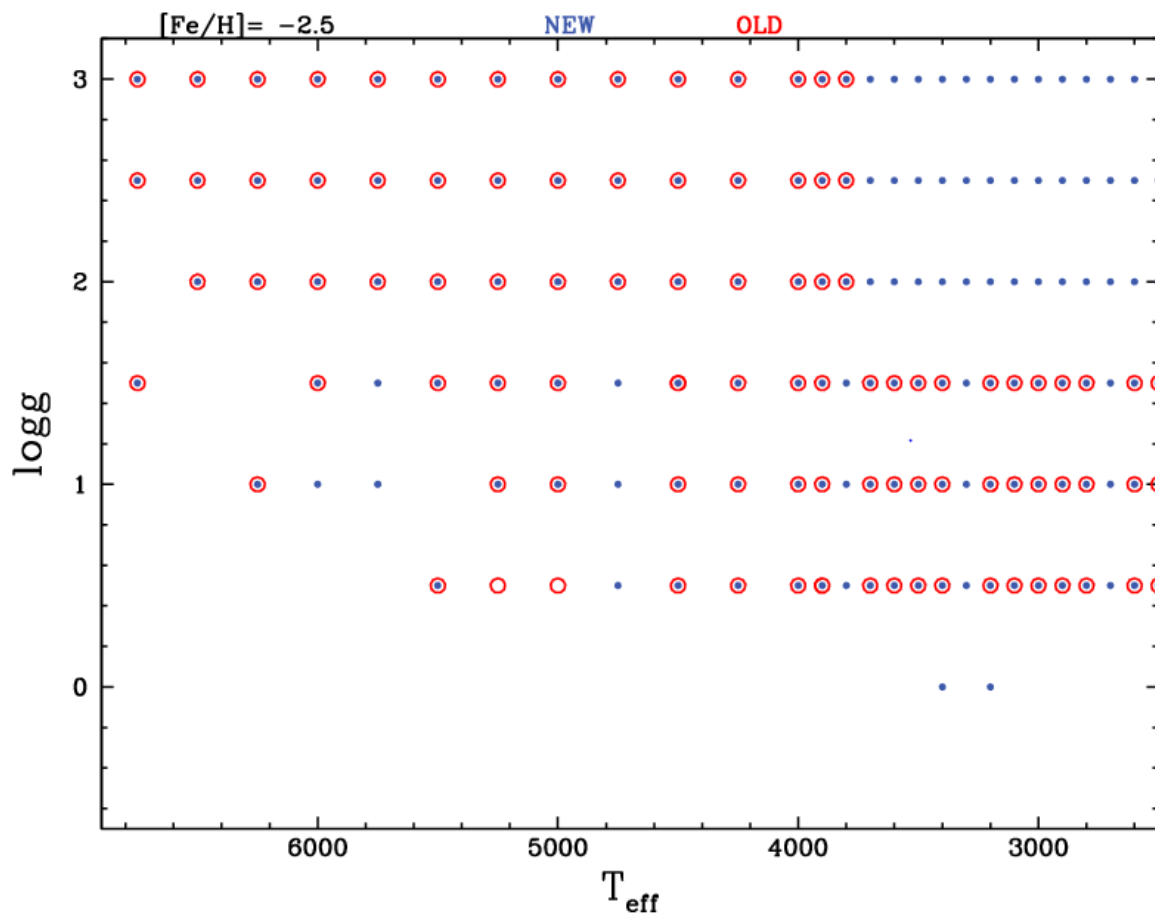
Data Quality

OCs UVES

- NGC4815
- Tr20

GES MW HR21 FWHM<1

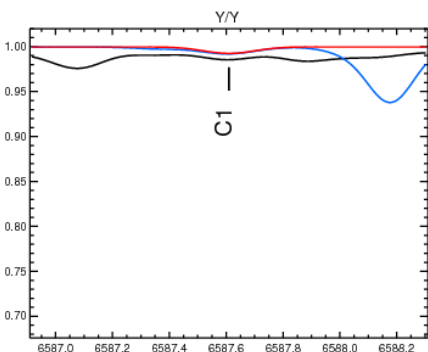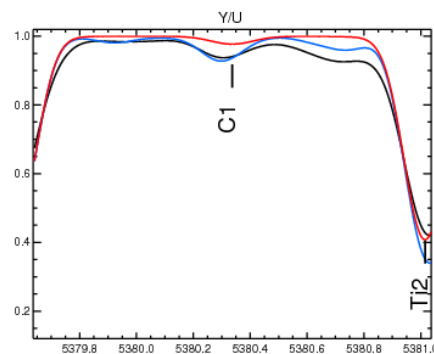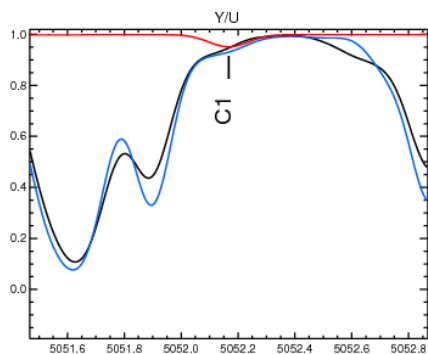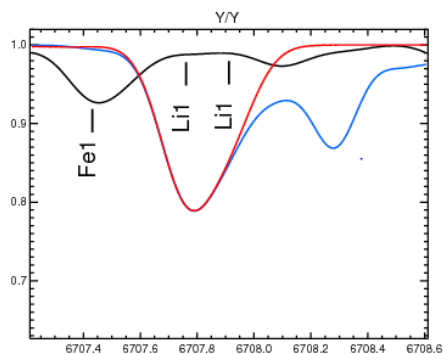- UVES S/N at 6000 A°, co-added spectra

- Giraffe S/N co-added spectra

Towards a common metallicity scale

- New delivery of Marcs Models

- microtur=1 P models
- microtur=2 S models

- [Fe/H]= -5 − 1
- Extension to Teff=2500

- Marcs Model interpolator

A Common line list
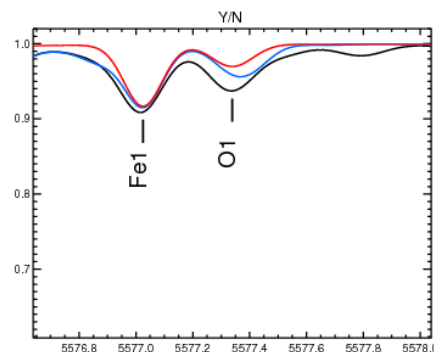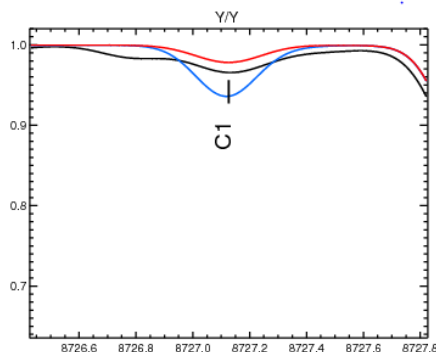


Arcturus

Kitt Peak R=47000

evaluated line

all components

- M. Asplund & collaborators

- 1313 lines selected from   Vald line list ; revised Log(gf); Van-der-Waals-broadening

- Classifications based on transition probability log(gf) quality and line blending on Sun and Arcturus (SME)

Calibration objects

Well studied open & globular clusters

Targets observed by other surveys (e.g. Apogee)

COROT fields

Standard stars

Gaia-GES Calibration

- (Gaia) RV standards
- (Gaia) Benchmark stars → GBOG Group collaboration
- Stars having direct measurements of ang. diameter, Fbol, mass (Lebzelter+ 2012) → reference metallicity
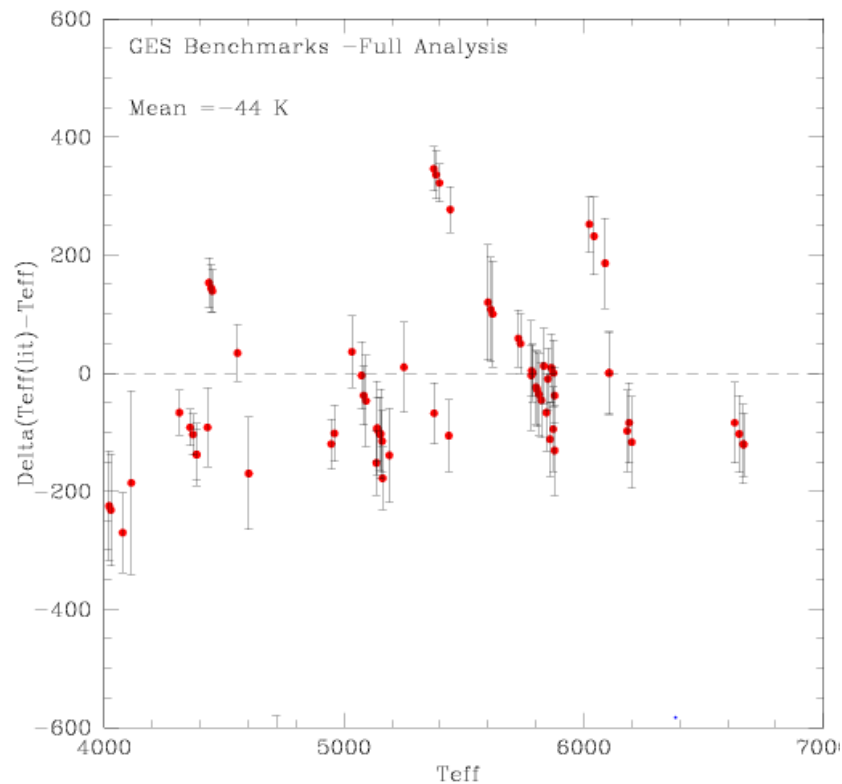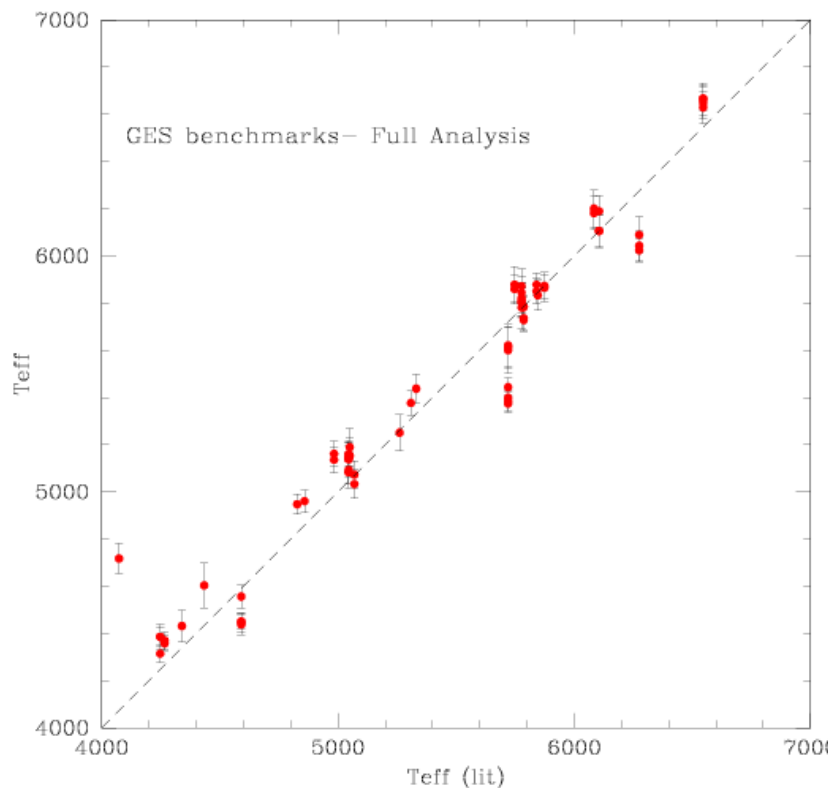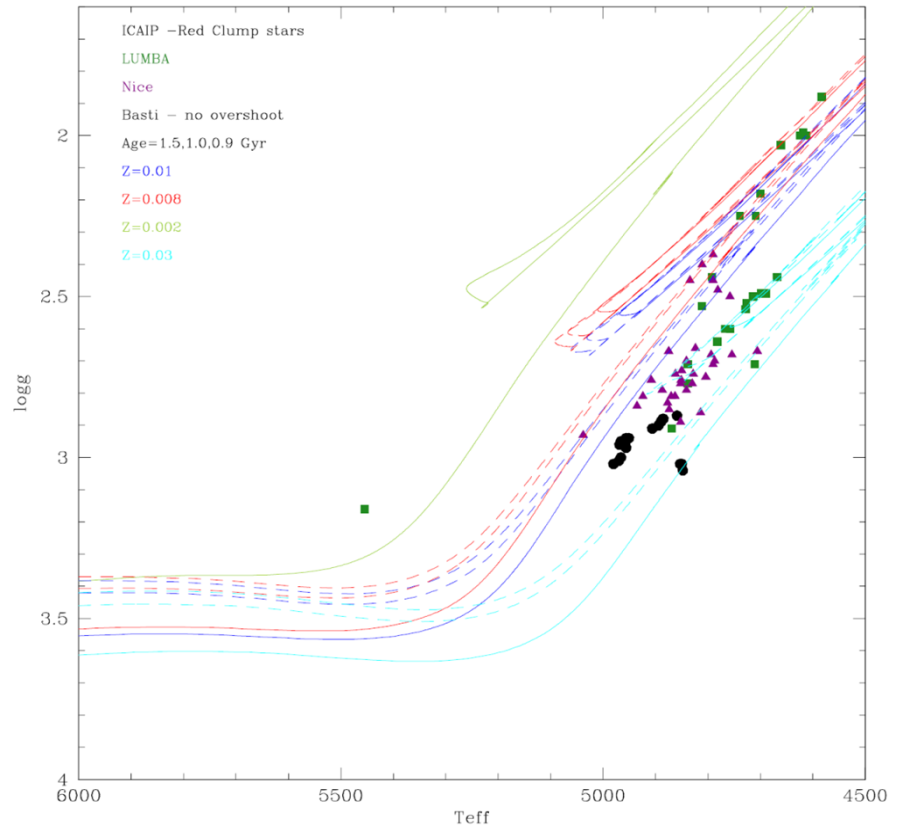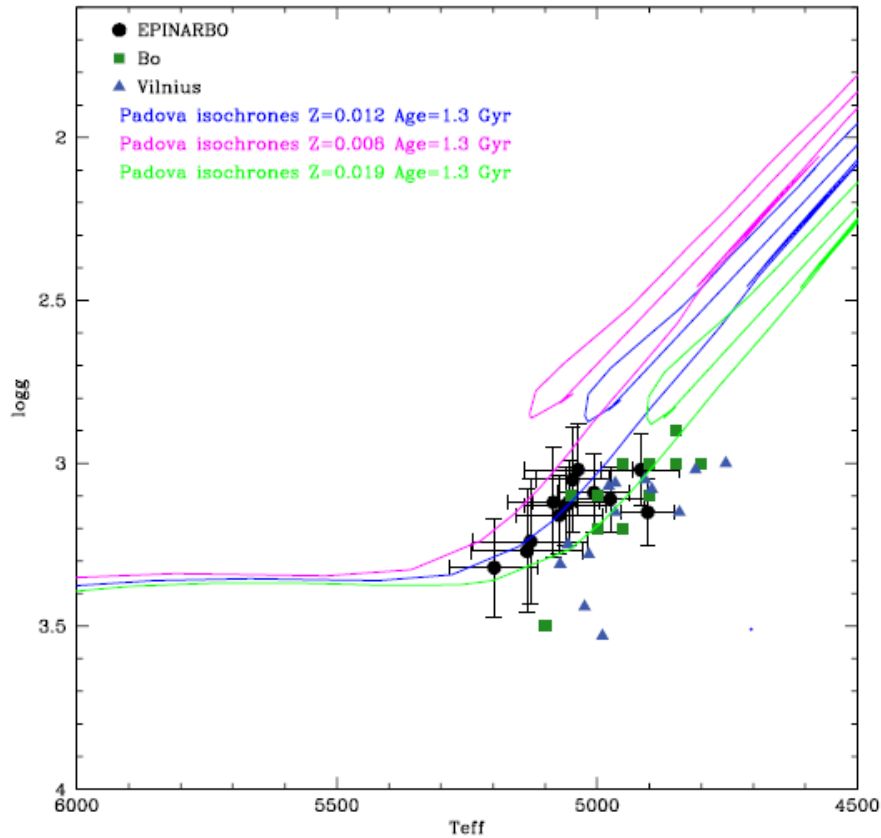
Science Verification and sanity checks

- Encouraged to post Science Projects on the wiki -14 categories :

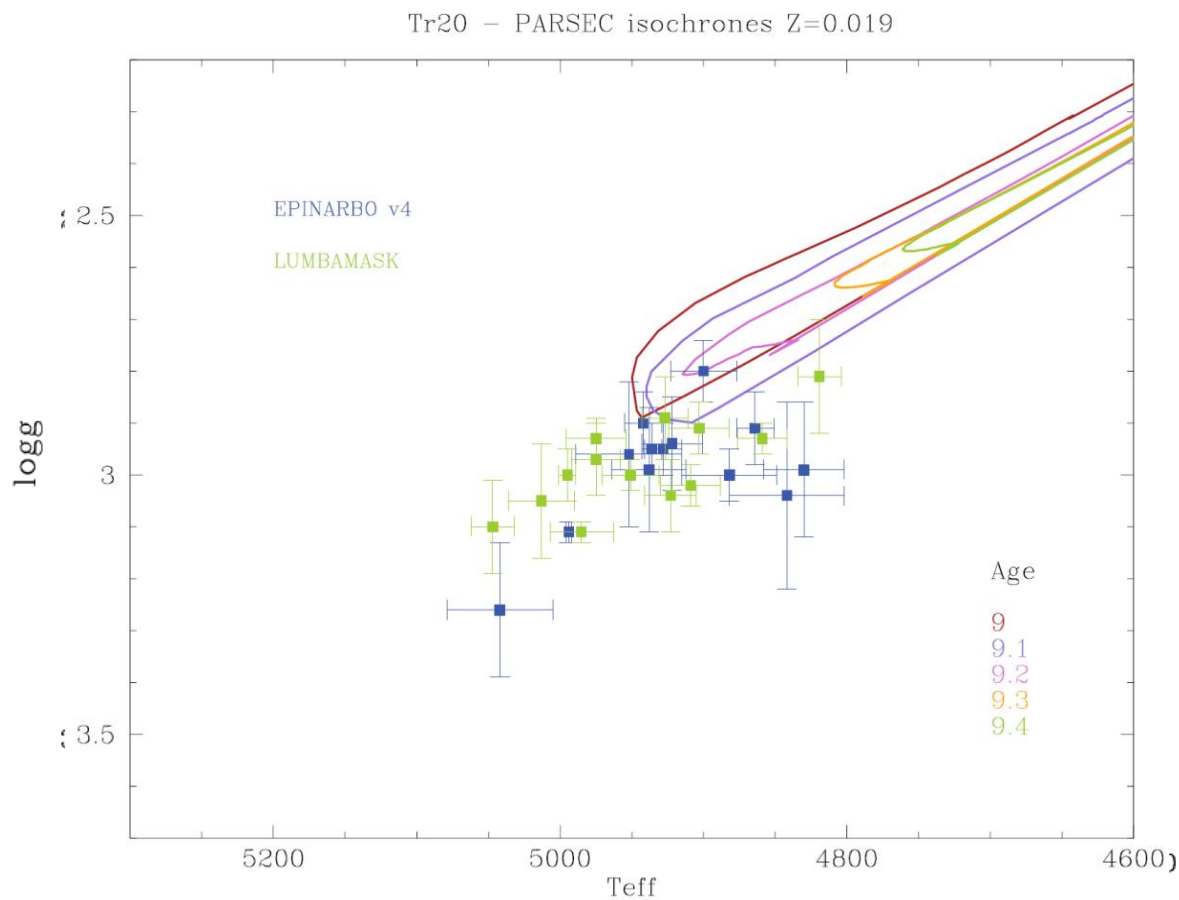 (http://camd08.ast.cam.ac.uk/GESwiki/Gesproj)

- Large variety of projects already posted in all science areas

- GES First results Meeting → April: 8-11, 2013, Nice

OCs as tests: August data analysis

OCs as tests: Tr20

Tr20 – PARSEC isochrones Z=0.019

see S. Blanco talk

Data release to ESO

- First Semester Advanced Data Product Release: **1/2013**

   - data for all targets completed to the relevant S/N prior to 30-06-2012.

   - Products: reduced 1-D spectra, associated variance spectra, RVs, variability information

- First Annual Advanced Data Product Release**: 06/2013**

   - data for all targets completed prior to 31-12-2012.

   -**Products**: astrophysical parameters, element abundances, complementary data as appropriate, and uncertainties,

Conclusions

- GES first year of observations has been a success, but a lot of work ahead

- Several MW fields and 10 clusters observed

- Reduction pipeline is in place

- Analysis with several methods

- Next challenge is the homeogeneization