Accurate stellar parameters with the GES-CoRoT collaboration

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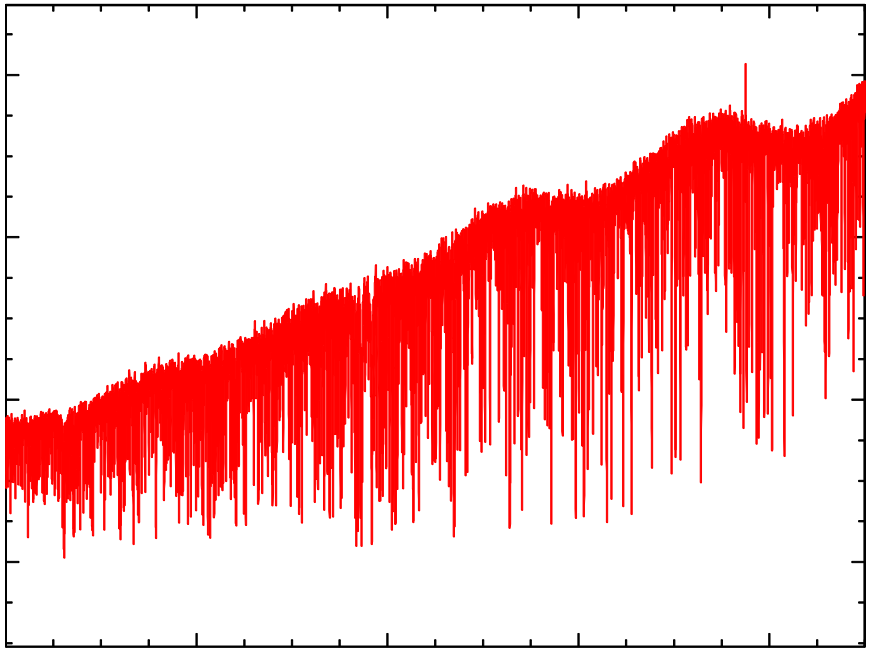
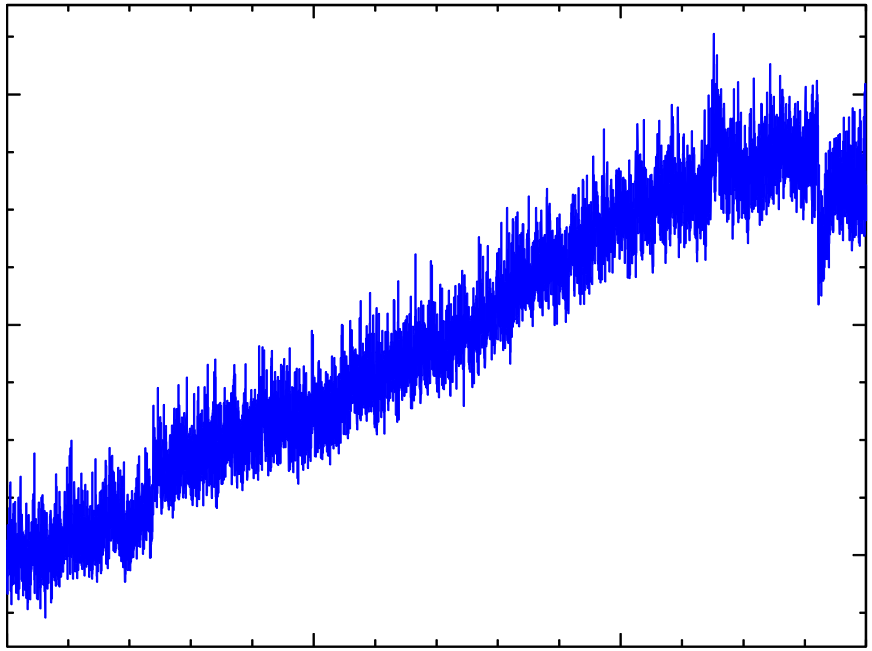
CoRoT team: Josefina Montalban, Andrea Miglio, Marica Valentini, Thierry Morel ***and all the Corot nodes***

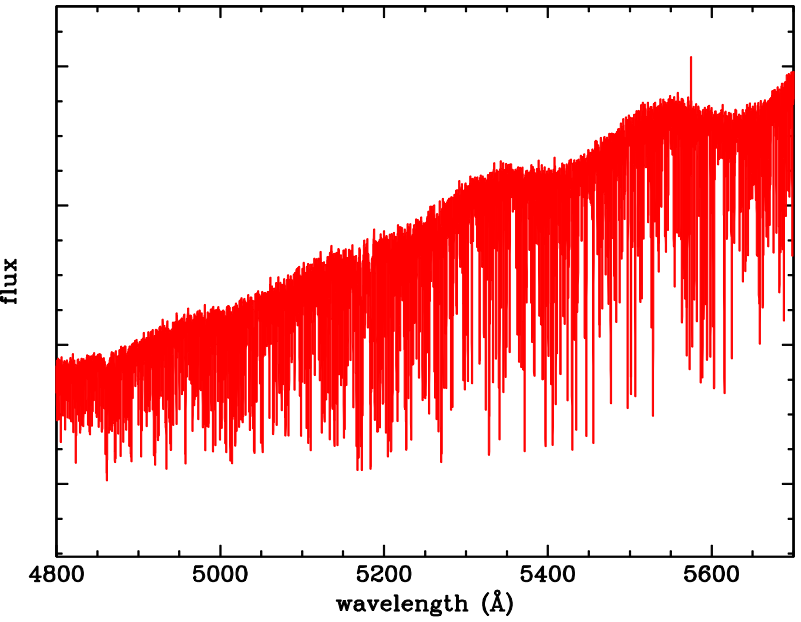
What is it about?

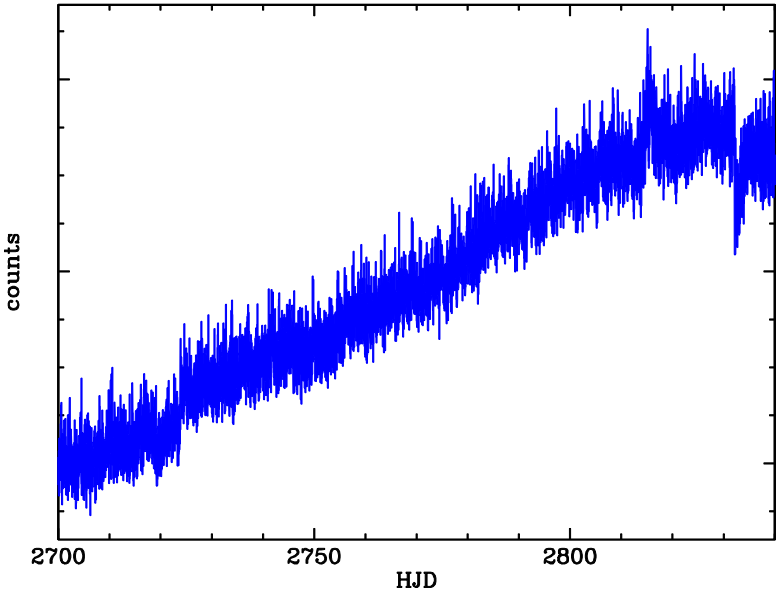




Objective:

Determine the most accurate stellar parameters from spectrum and light curve



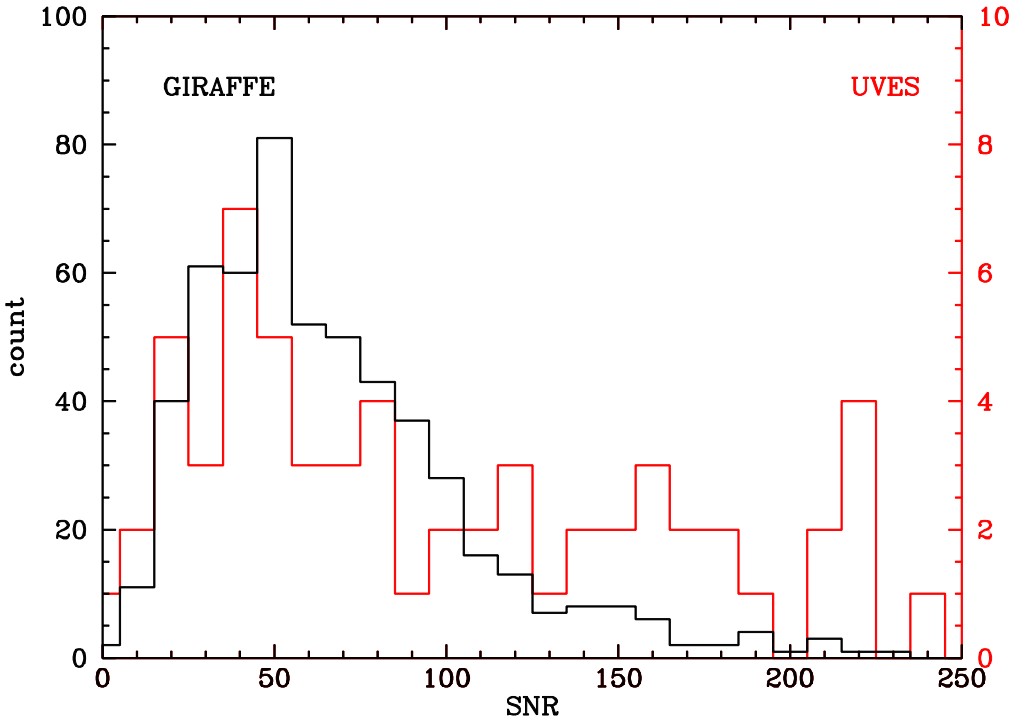


Teff (<100K)

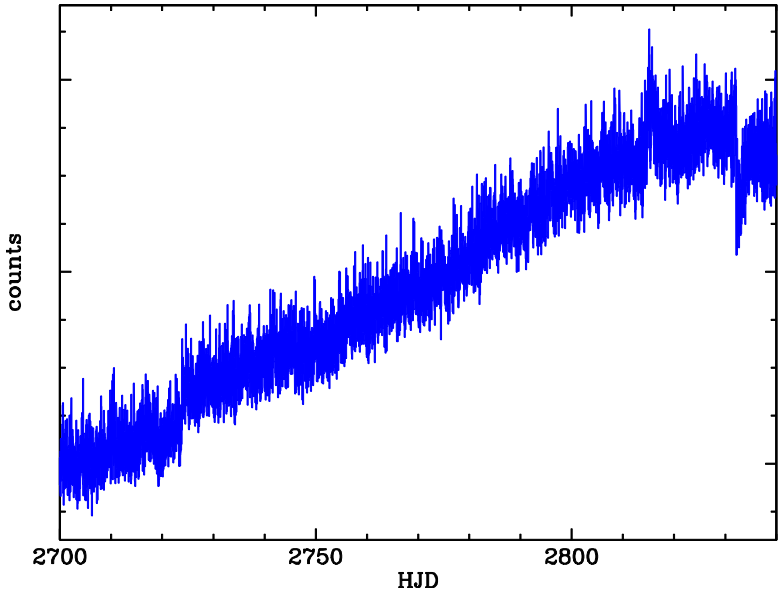
Logg (0.02-0.2)

The sample

- 506 Red giants in the Galactic center field (LRc01) selected to have both seismic CoRoT and spectroscopic (GES DR2 and DR3) data
- 461 GIRAFFE (HR10, HR15 and HR21) and 55 UVES (580) spectra



Surface gravities

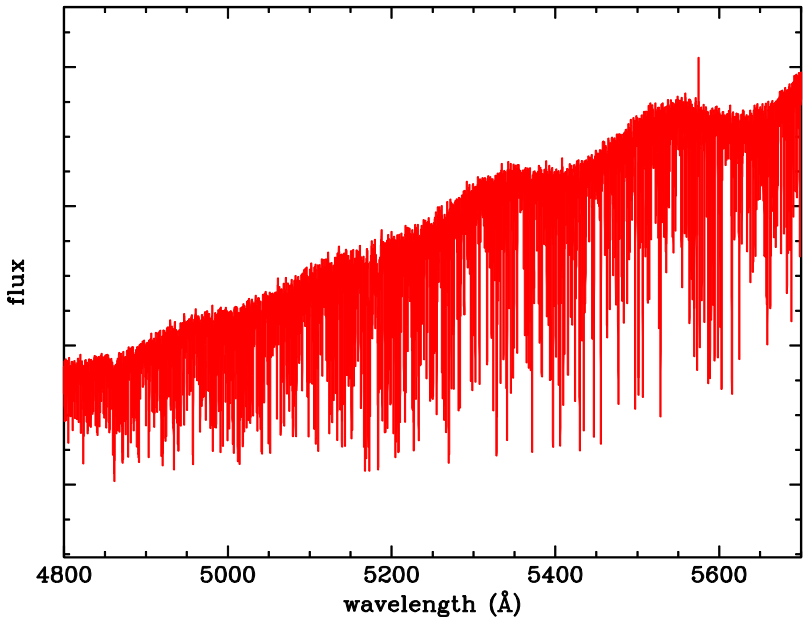


$$\log g = \log g_{\odot} + \log\left(\frac{\nu_{\rm max}}{\nu_{\rm max\odot}}\right) + \frac{1}{2}\log\left(\frac{T_{\rm eff}}{T_{\rm eff\odot}}\right)$$

Teff provided by spectroscopists

6 nodes involved in analysing the seismic data and determining ν_{max}

Effective temperatures and metallicities

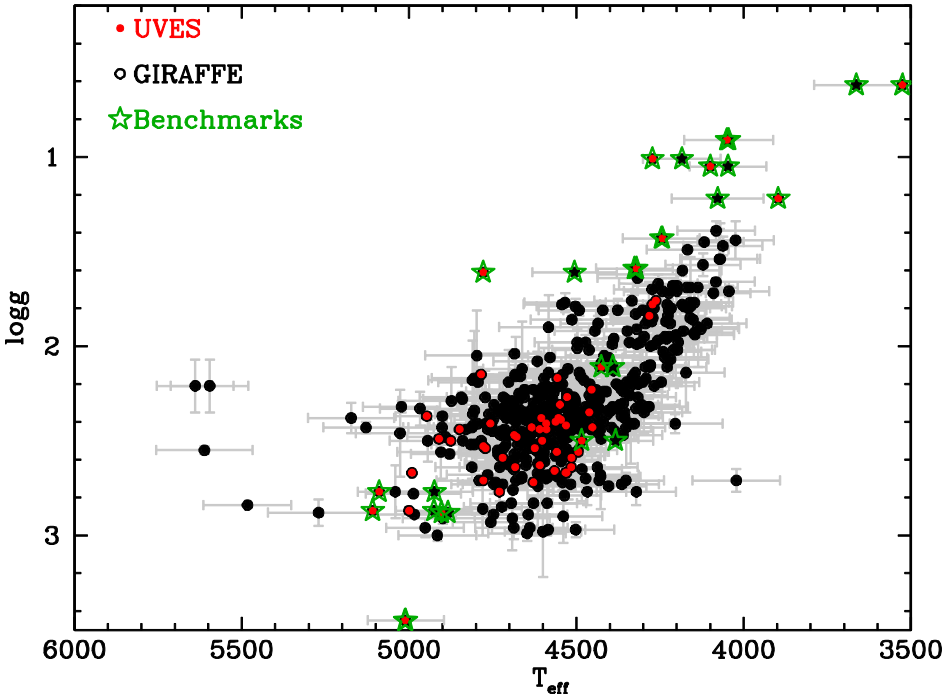


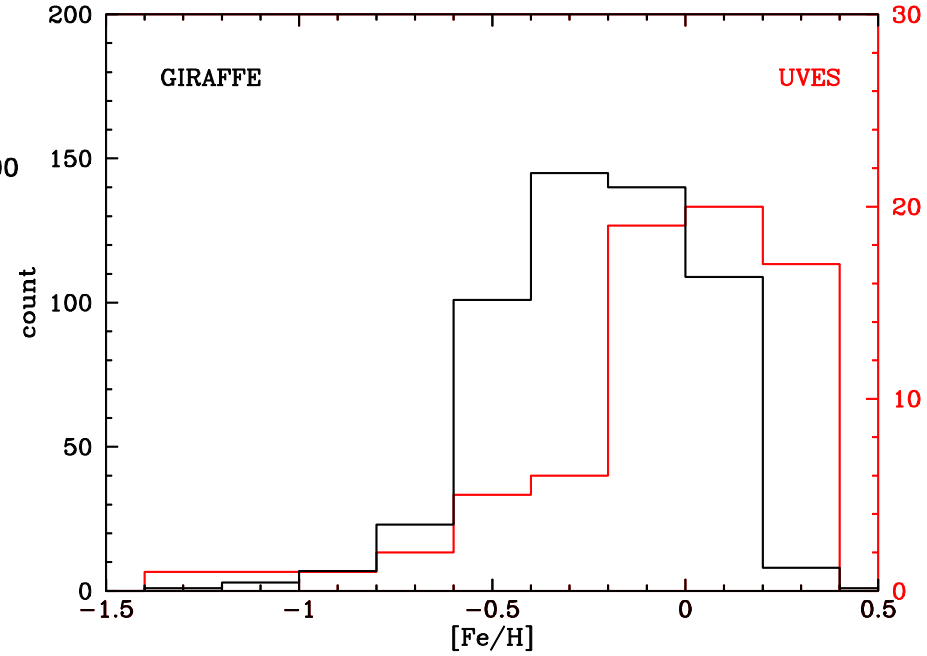
- Reduction by standard GES but 25 stars were co-added on wavelength space
- Not a standard GES analysis
- Logg (fixed) provided by seismologists
- Benchmarks to estimate our accuracy but not used for calibration

Spectroscopic methods

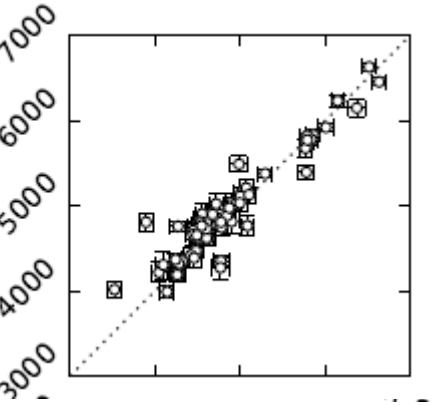
Method	Pros	Cons
Exc. balance	Provides Fe abundance and microturbulence	NLTE-3D effects
Line depth ratio	Model independent	Sensitive to heavy blends
Hα	Very sensitive to Teff	Weak in red giants
Global fitting	Uses all spectrum info	fix 1D grid do not provide Fe abundance
Spectral indices	Model independent	Require an extensive calibration
Photometry	Relies on the SED	reddening

Results (2nd iteration)

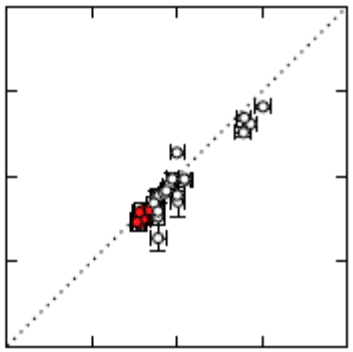




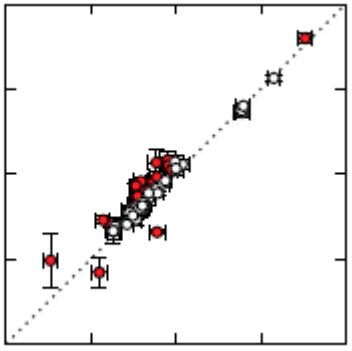
Relative errors



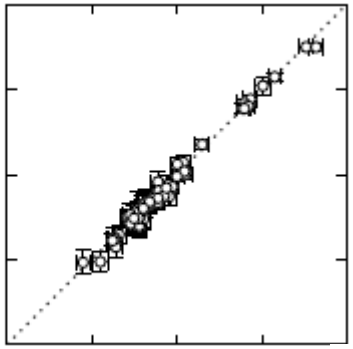
Exc. A



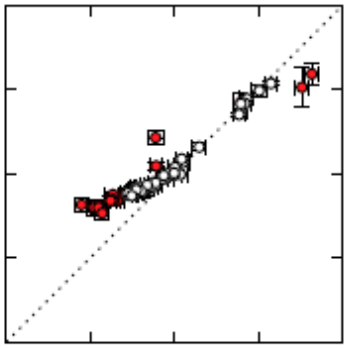
Hα



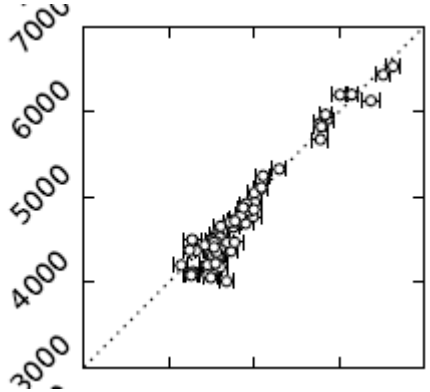
Exc. B



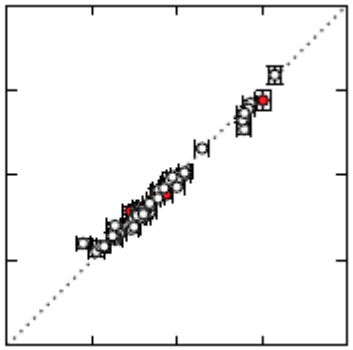
Exc. C



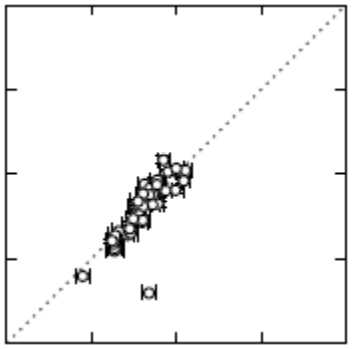
Line depth



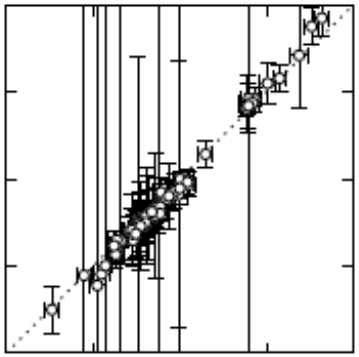
spectral ind.



Line depth

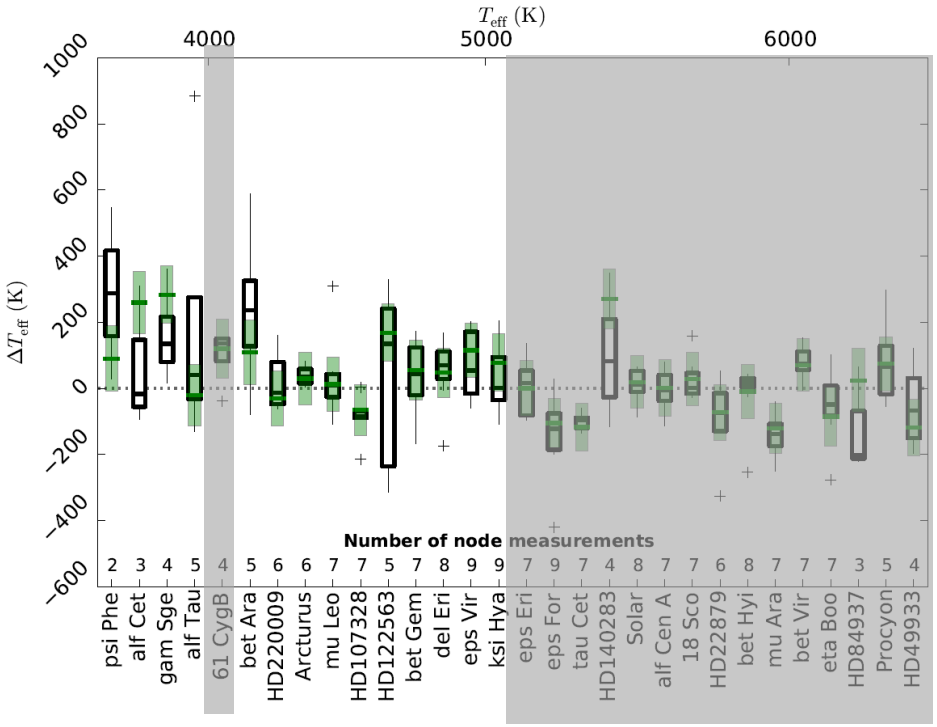


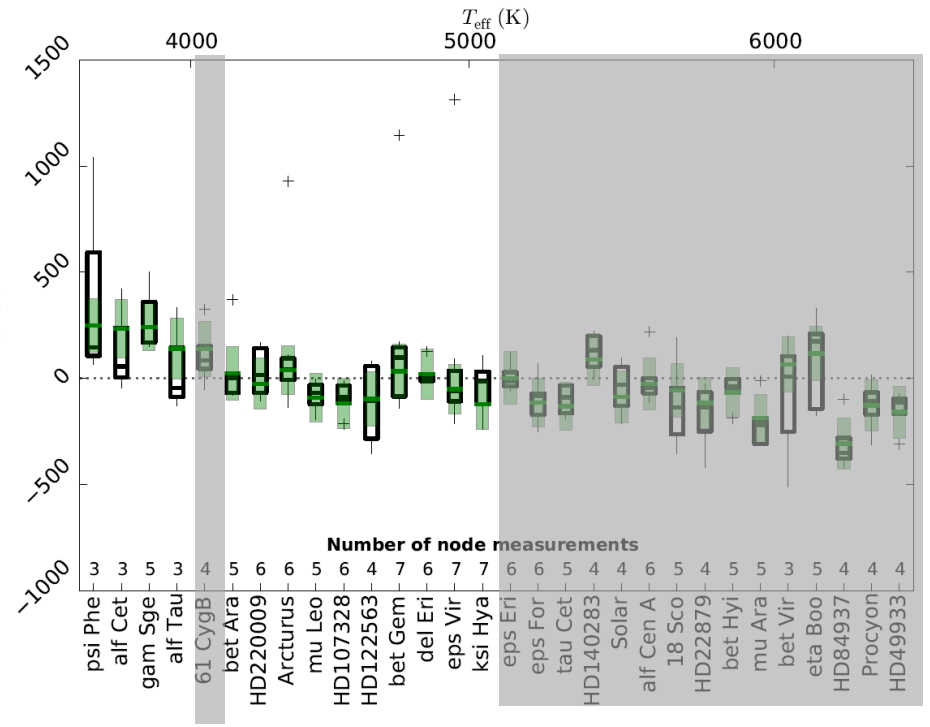
Photometry



Global fit

Absolute error estimate





σ_{Teff}(UVES)=80K

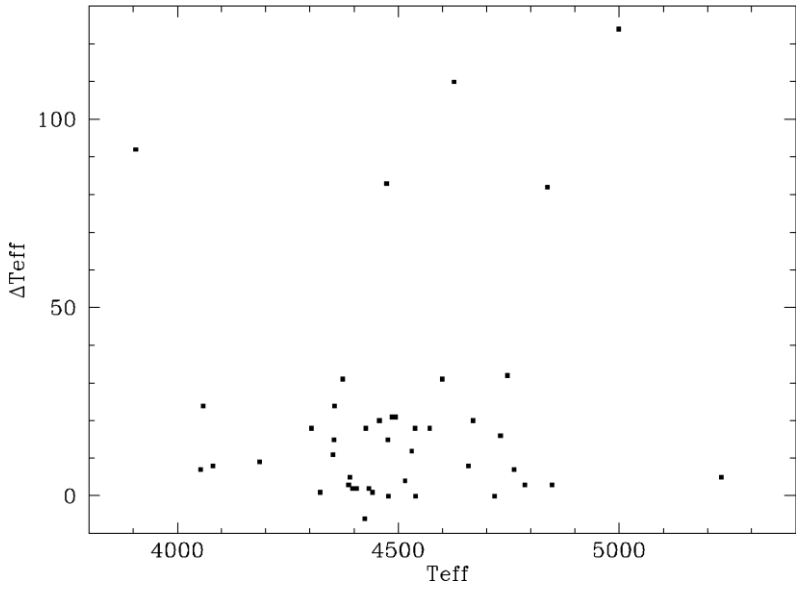
σ_{Fe}(UVES)=0.06

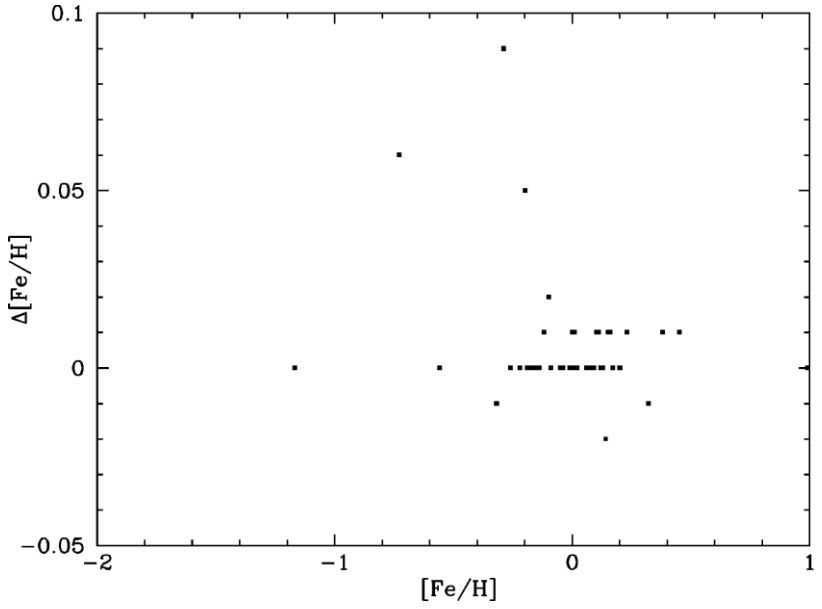
σ_{Teff}(GIRAFFE)=115K

σ_{Fe}(GIRAFFE)=0.2

Very satisfying, and it will still improve!

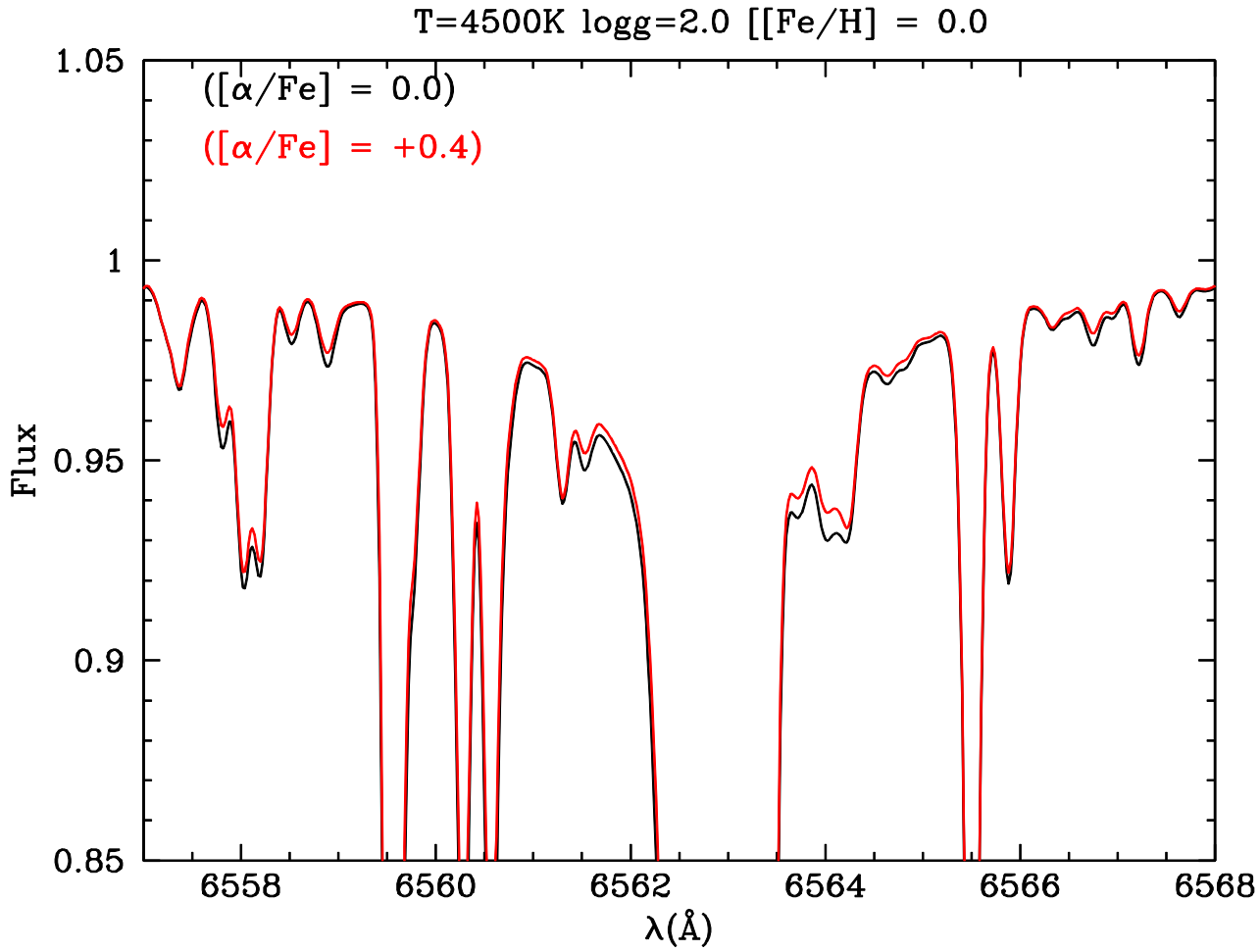
NLTE effects on Fe lines





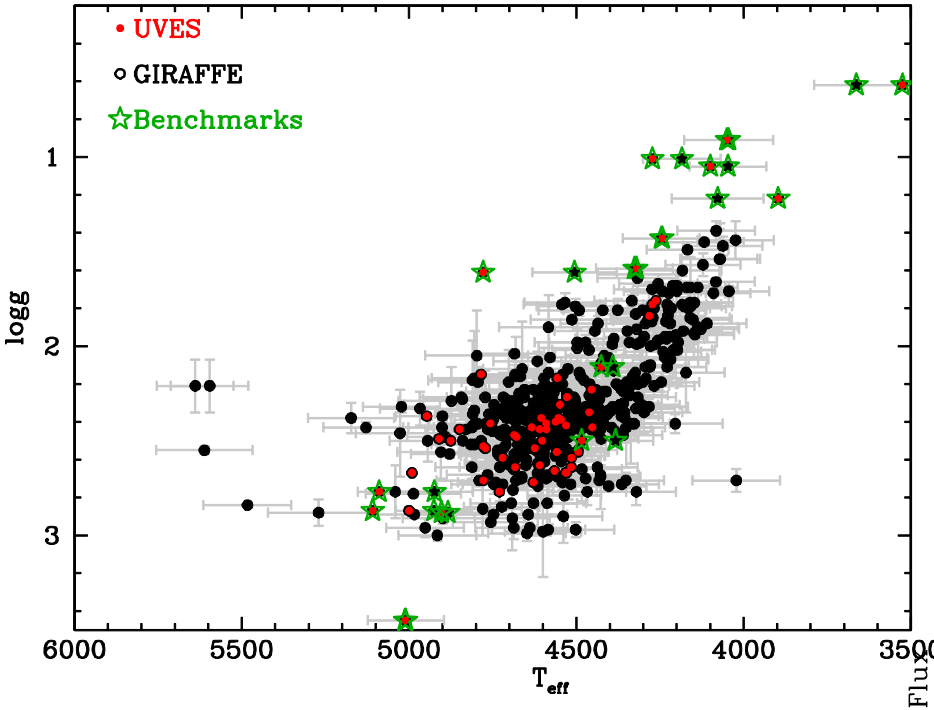
They do not seem to affect significantly our recommended Teff but we will definitely provide them.

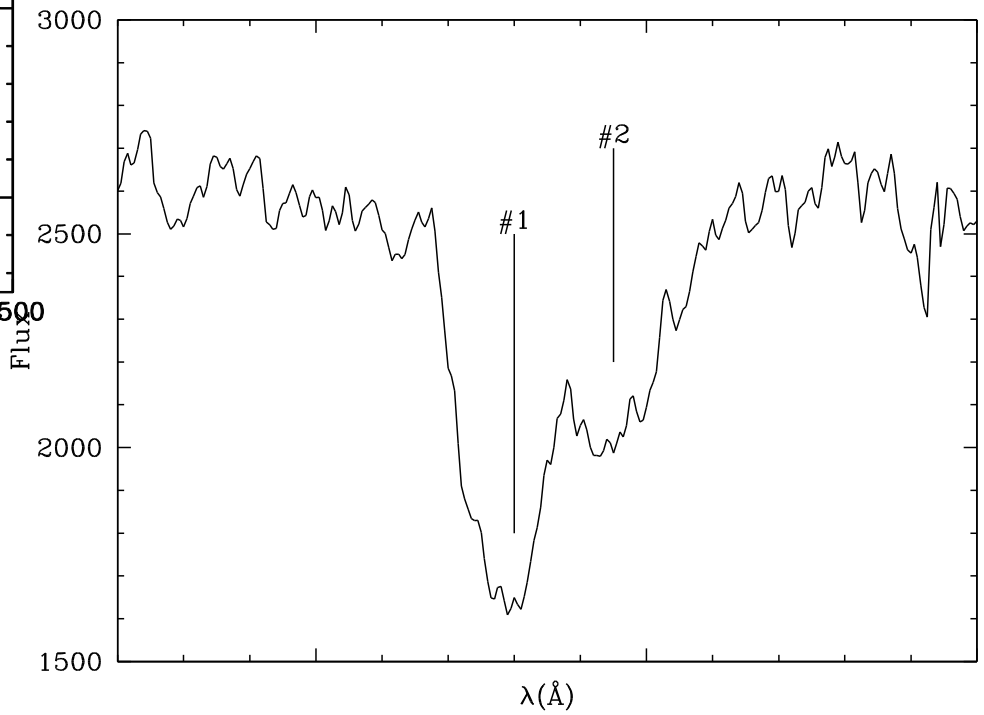
Alpha elements abundance effect



Although the effect seems small, we are running tests to evaluate the impact

Outliers


• UVES
○ GIRAFFE
☆Benchmarks
logg
1
2
3
6000
5500
5000
4500
4000
3500
T_eff


3000
2500
2000
1500
Flux
#1
#2
λ(Å)

Conclusions

Good parameters suitable for survey calibration (GES,…) and great science (See M. Valentini's talk)

We will provide (soon)

- ✓ Abundances
- ✓ equivalent widths
- ✓ rotational velocities
- ✓ NLTE corrections,
- x Parallaxes (wait for Gaia!)
- x Interferometry (to faint)
- ✓ Comparison with other surveys
- ✓ flags
- ✓ and errors!

3 iterations we are now beginning the 3rd and last one!

You can stay tuned at