



Metallicity Calibration of LAMOST data with APOGEE Spectra

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Why & How

Why [Fe/H] calibration?

- Chemical composition: [Fe/H] , [X/Fe], ...
- distance determinations

How to calibrate

- APOGEE high resolution spectra
- SAGE: uvby high precision photometric data

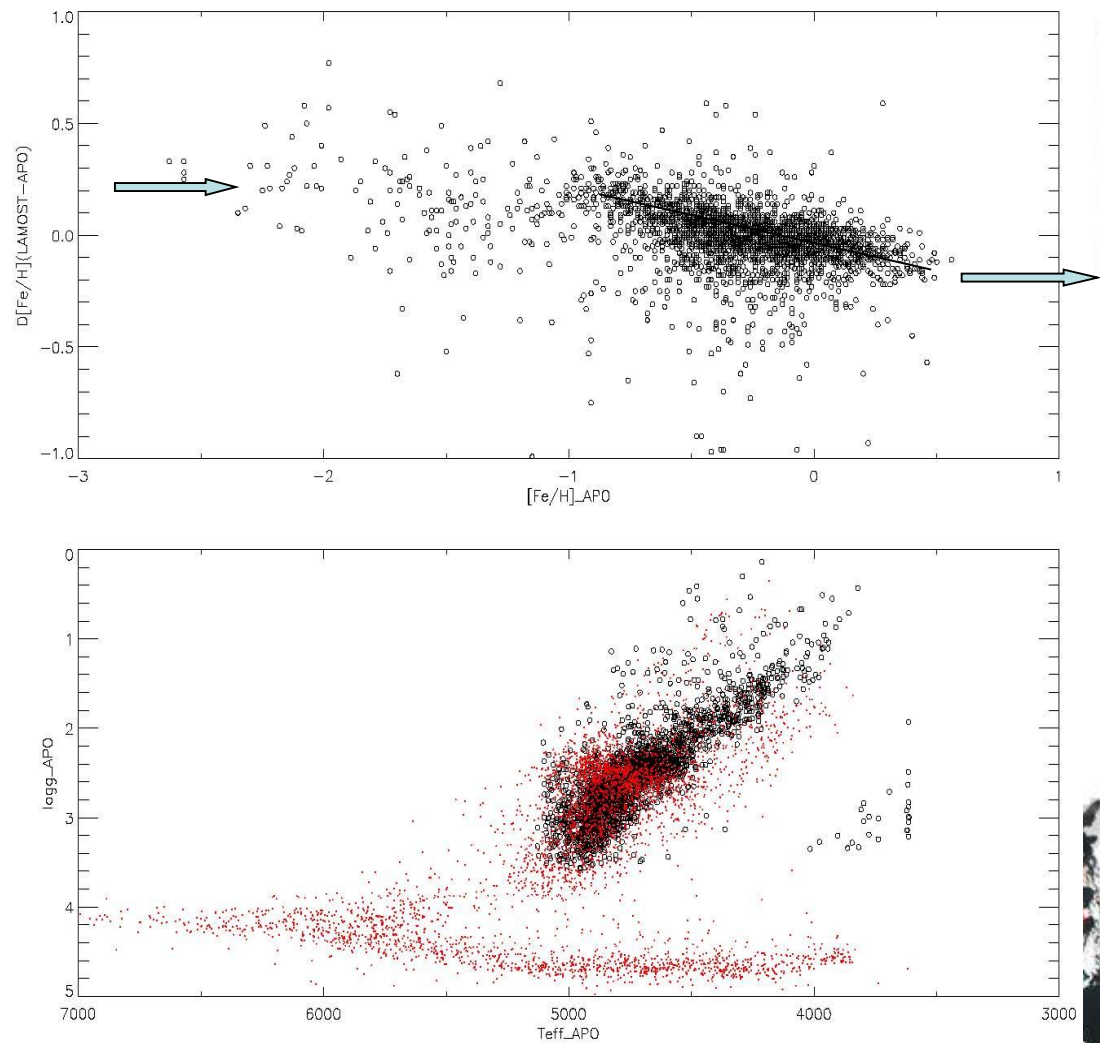
Comparison: APOGEE and LAMOST

- ~4000 COM stars (giants+dwarfs)
- statistics is good

But not perfect

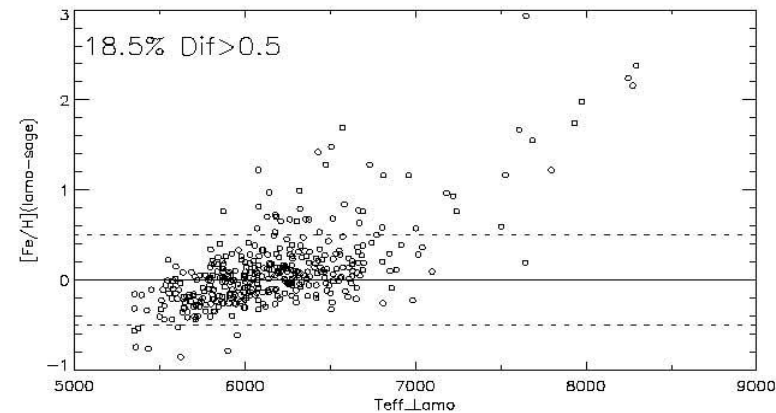
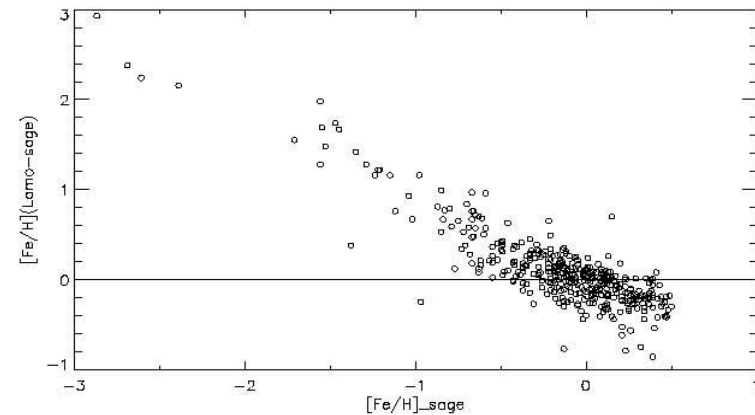
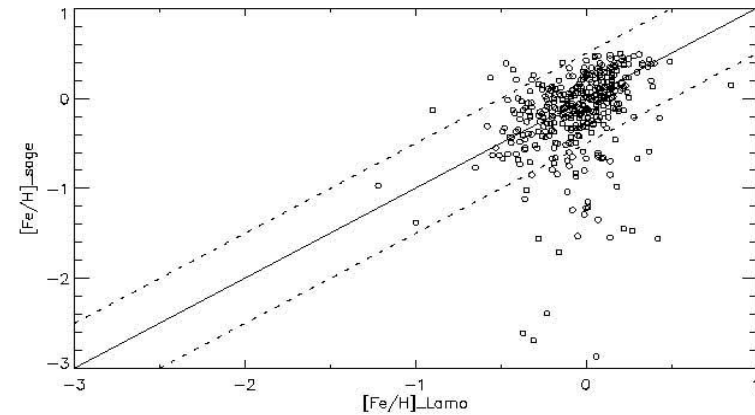
- large star-to-star scatters
- systematic trend

No data for dwarfs in APOGEE database

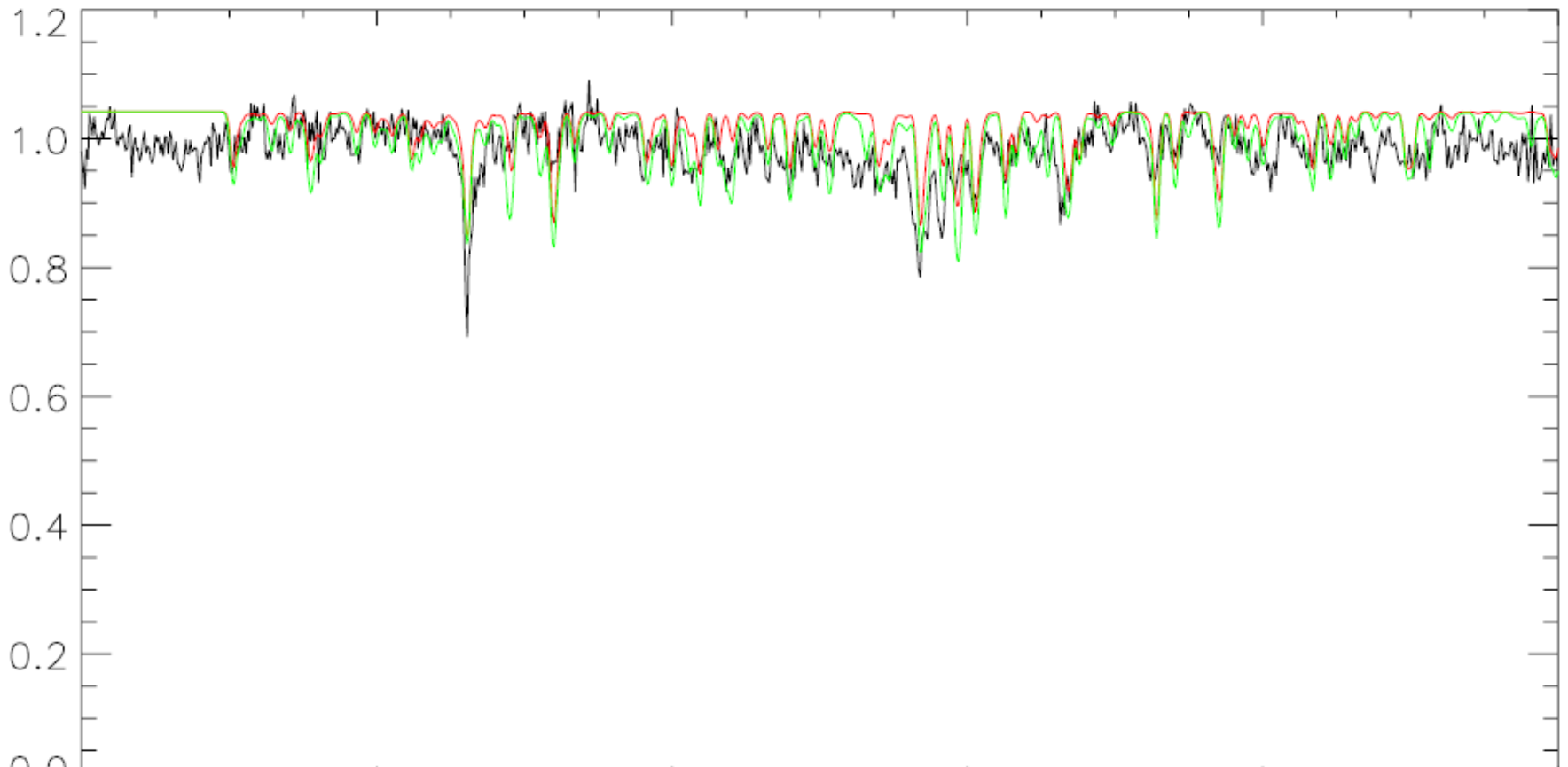


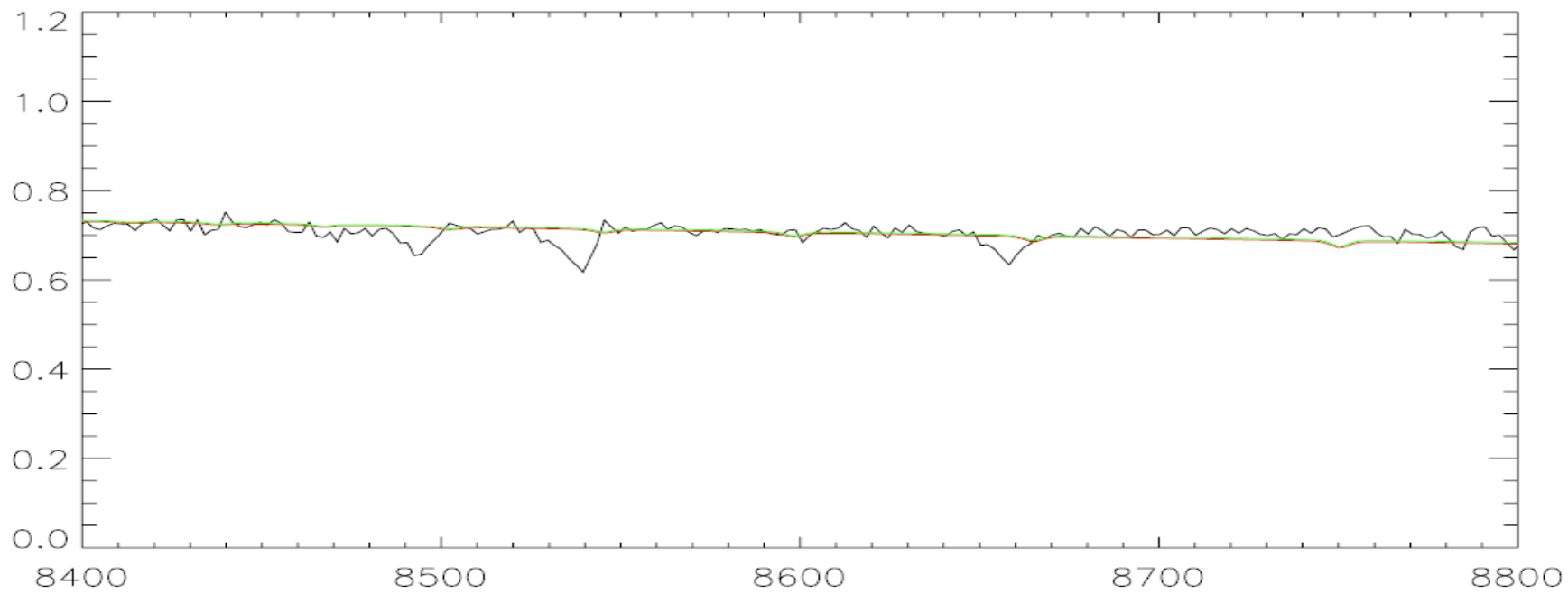
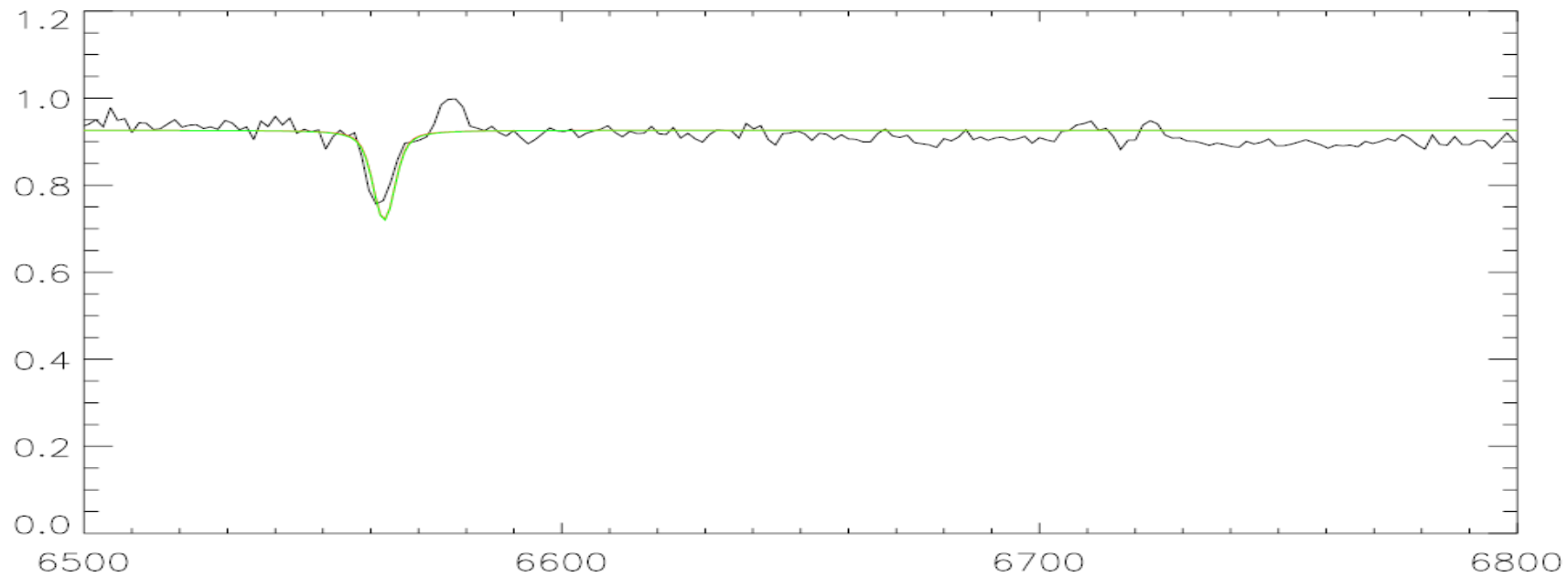
Sage vs LAMOST

- Casagrande et al. 2014: **uvby photometric survey** for Kepler field
- **418** common stars
- clear trend
- large deviation for **metal poor stars** again

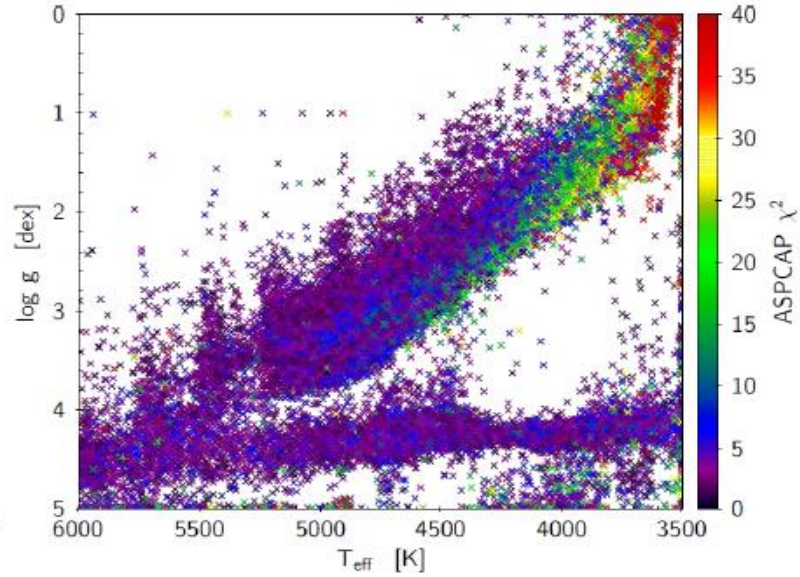
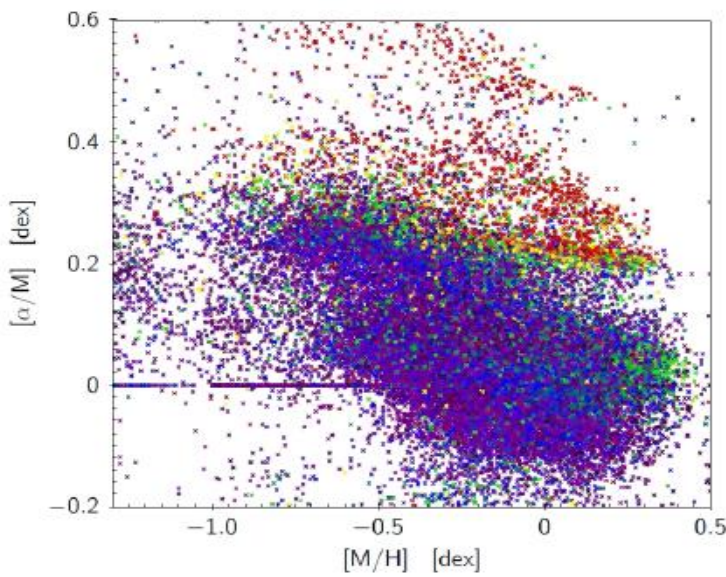


- A common star with same T_{eff} but different $[\text{Fe}/\text{H}]$, $\Delta > 0.5$ dex
- **APO: 5085/2.81/-1.73**
- **Lamost Dr1: 5052/3.11/-1.18**



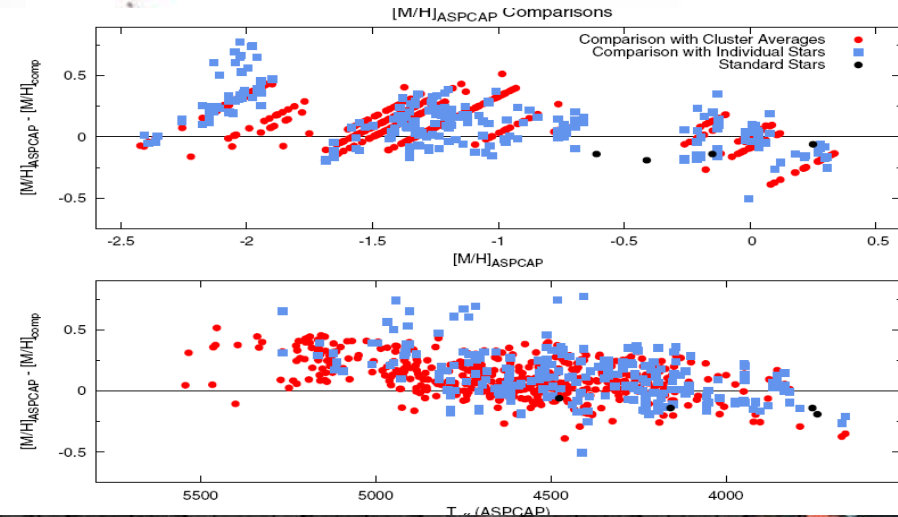
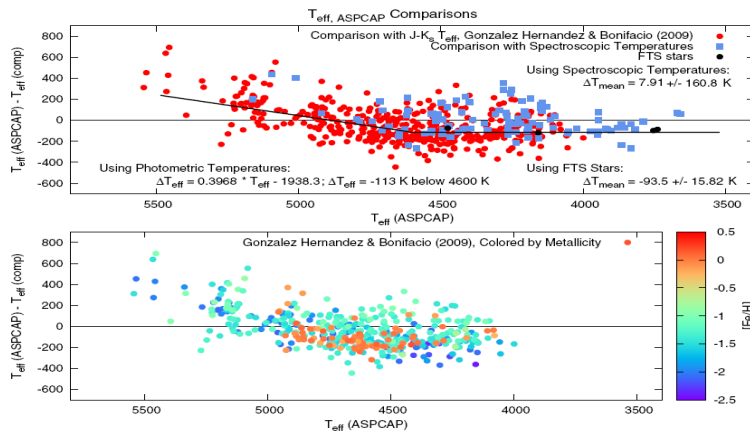


APOGEE pars should be improved



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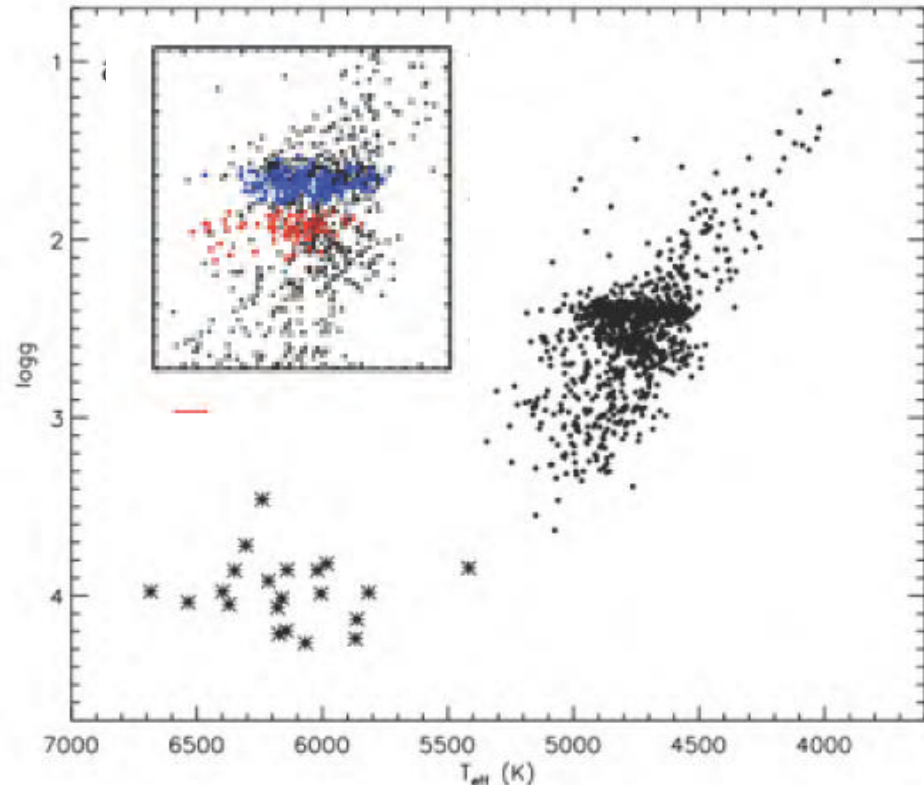
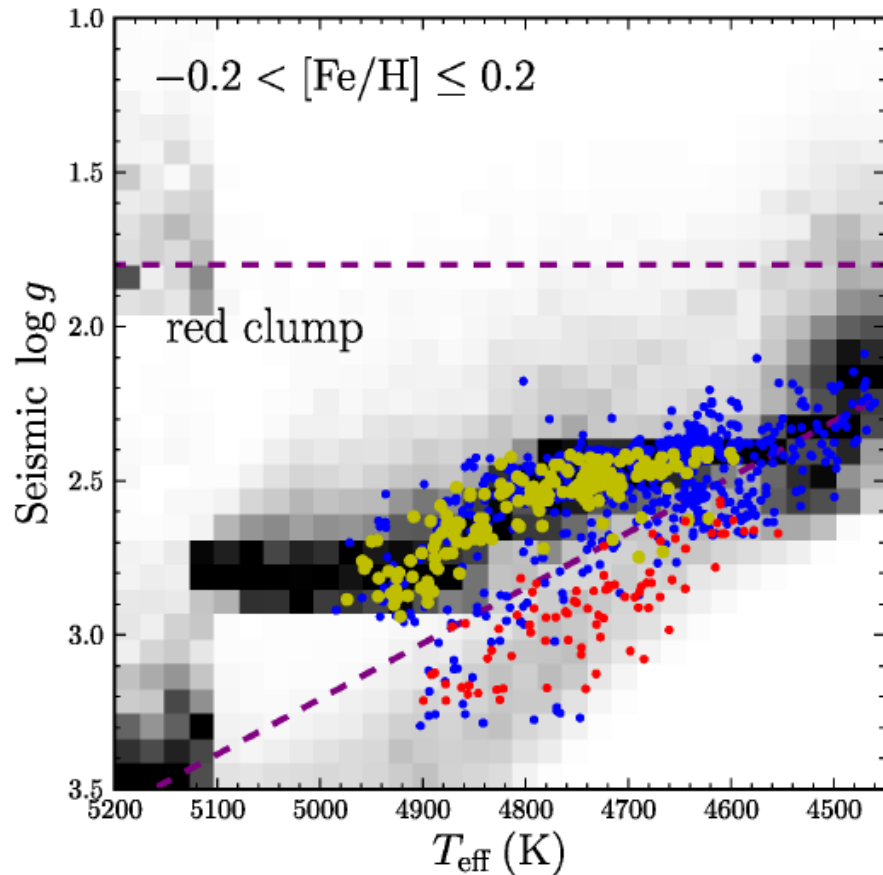
MÉSZÁROS ET AL.



Parameters Discrepancies

- RC stars: SAGA vs APOGEE

Bovy et al. 2014 vs Casagrande et al.



[Fe/H] test from 9 Stars in M13

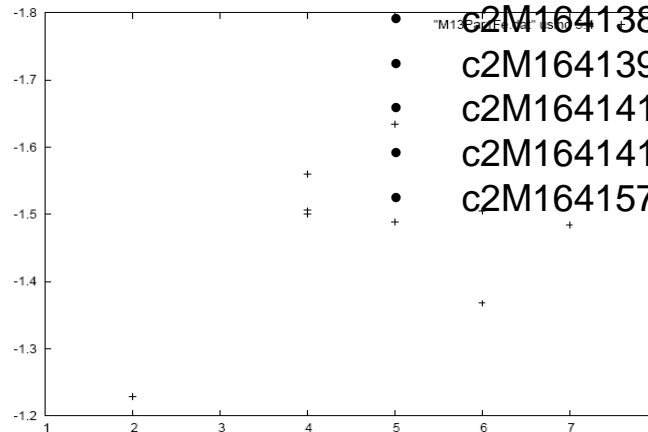
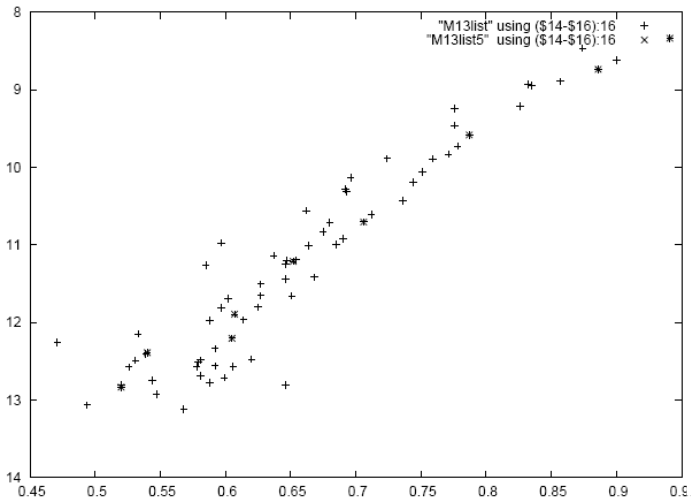
- EWs of individual lines+Abundtest8+Kurucz models
- 4-8 Fe lines (EW<120)
- [Mg/Fe] is bad, but [Si/Fe] is reliable

Mg/Fe:3

- c2M16404298+3627418: 0.063 3
- c2M16405539+3635433: 0.111 3
- c2M16410260+3626158: -0.251 3
- c2M16411511+3623538: -0.027 3
- c2M16413870+3625380: 0.016 3
- c2M16413961+3627381: 0.049 4
- c2M16414113+3628499: 0.113 3
- c2M16414196+3626518: 0.209 3
- c2M16415742+3623154: -0.076 3

Si/Fe:6-7

- c2M16404298+3627418: 7 0.241
- c2M16405539+3635433: 7 0.337
- c2M16410260+3626158: 7 0.197
- c2M16411511+3623538: 6 0.419
- c2M16413870+3625380: 7 0.287
- c2M16413961+3627381: 7 0.356
- c2M16414113+3628499: 6 0.455
- c2M16414196+3626518: 7 0.352
- c2M16415742+3623154: 6 0.431

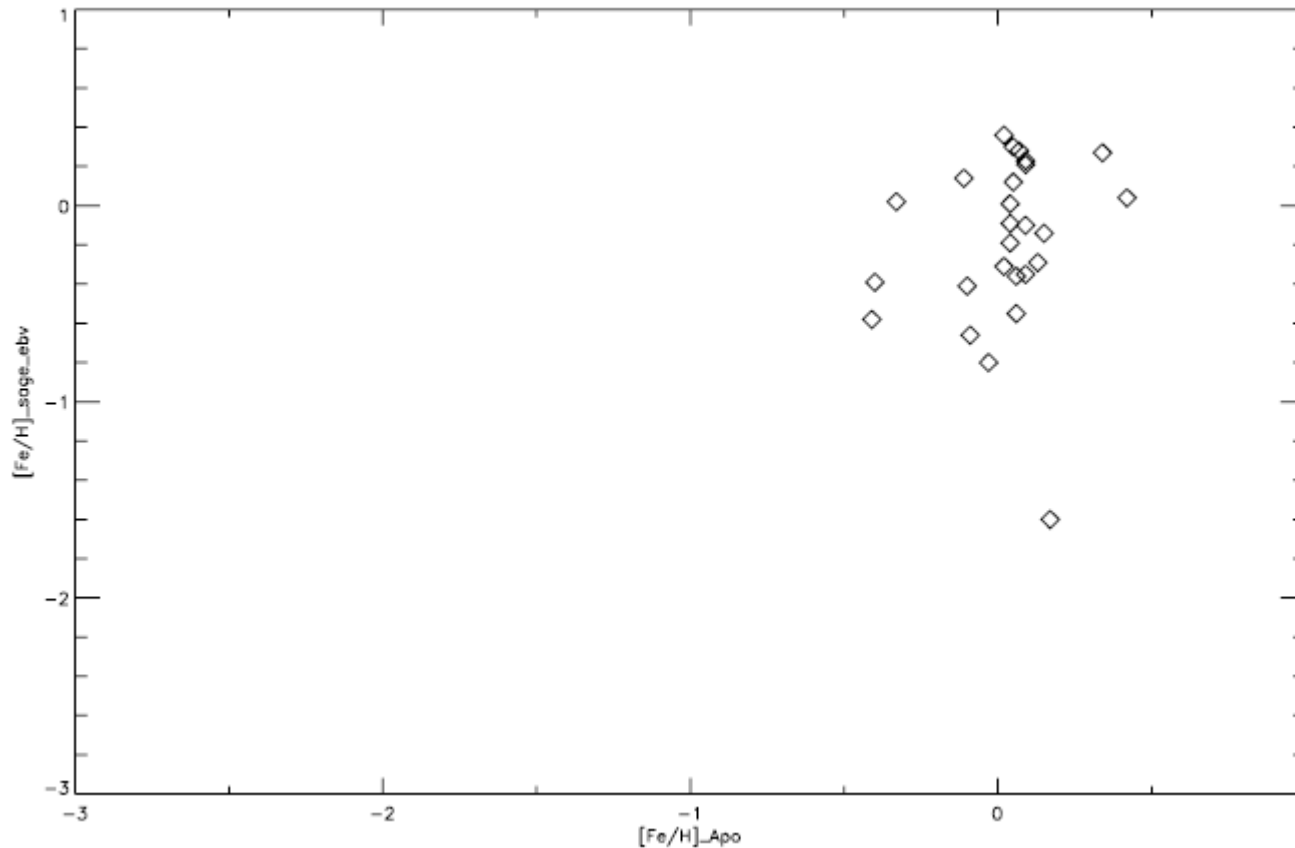


On going: Procedure

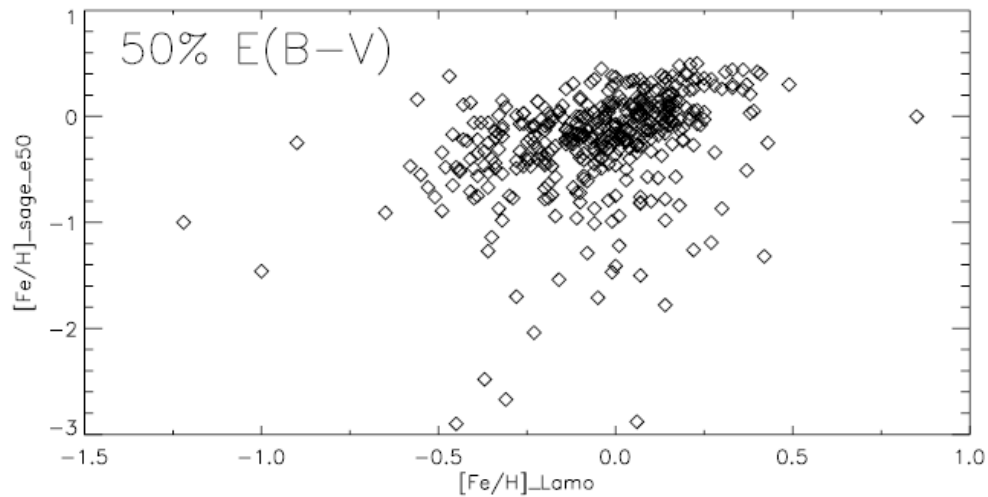
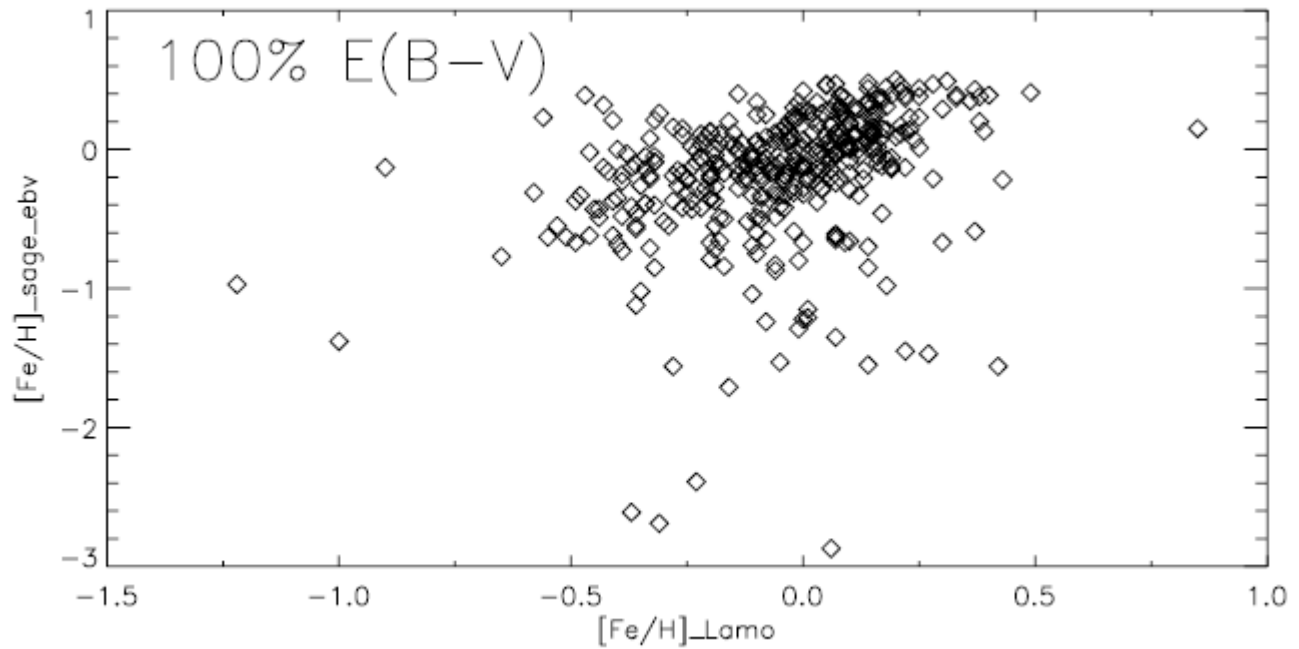
- More accurate $[Fe/H]$, $[Si/Fe]$ +updated T_{eff} , $\log g$ for 4000 APOGEE/LAMOST common stars
- accurate Pars + LAMOST spectra as a training sample
- predict parameters for other LAMOST stars

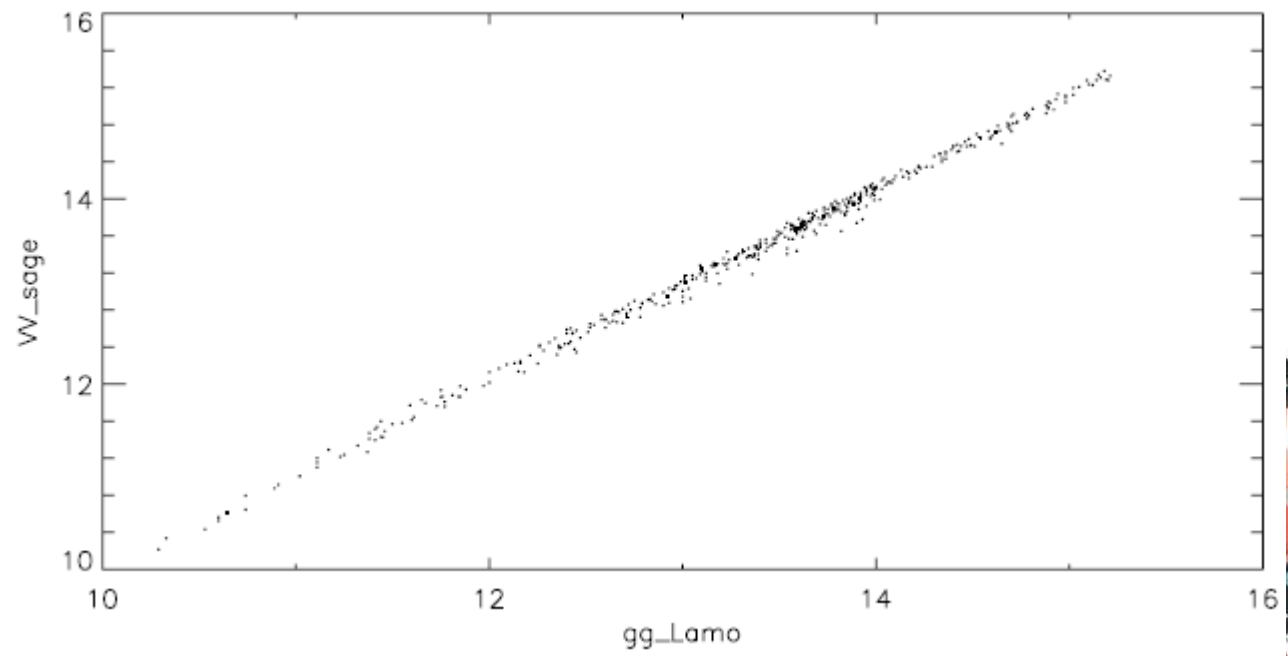
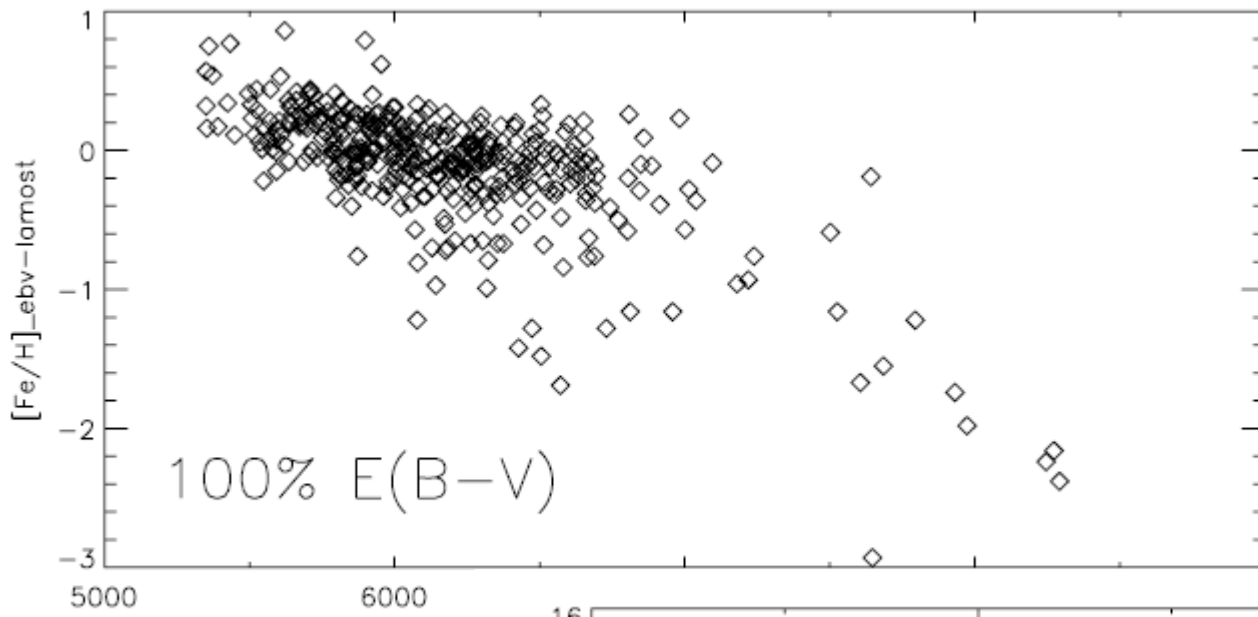
Preliminary result from uvby for dwarfs

- 123 common stars(SAGA vs APO)



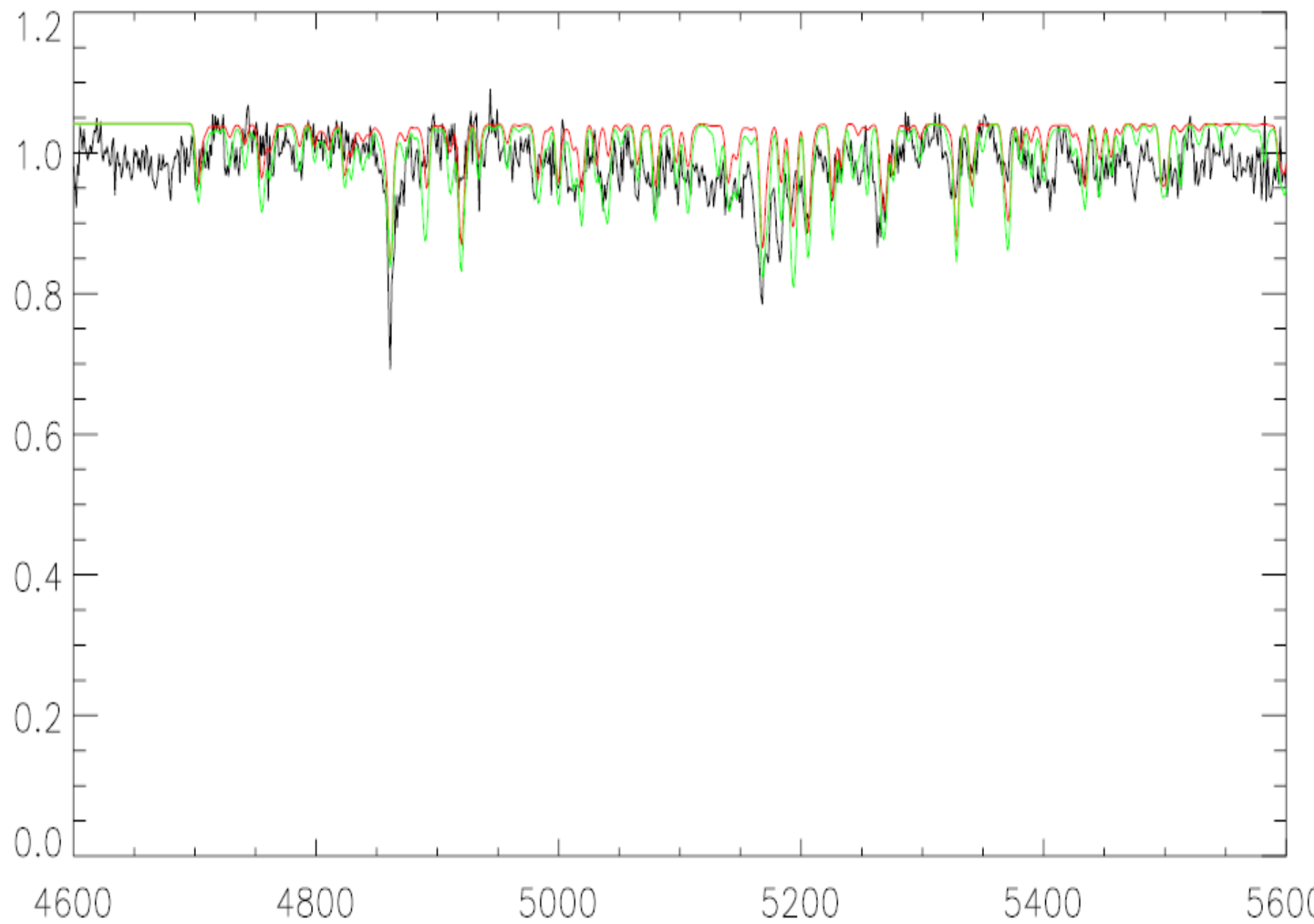
- 503 common stars with LAMOST





On going: APOGEE need more works

- derive accurate $[Fe/H]$ from individual Fe and Si lines by abundance analysis (EWs)
- fixed $[Fe/H]$ and $[a/Fe]$, match theoretical spectra to get T_{eff} and $\log g$
- recalculate $[Fe/H]$ by abundance analysis using EWs
- repeat this procedure
- APOGEE: mostly for giants
- SAGE: mostly for dwarfs



END!

