

Precise spectroscopic stellar parameters for the PLATO targets

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PLATO 2.0 Science Workshop
29 July 2013

ESTEC, Noordwijk



FCT

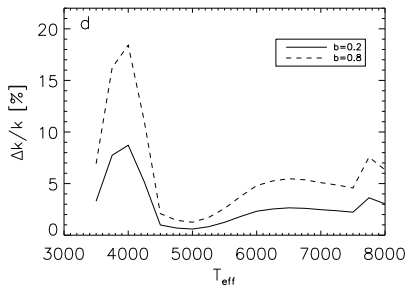
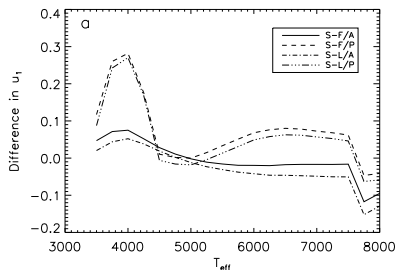
Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR



- 1 Introduction
- 2 Deriving stellar parameters
 - Spectroscopic analysis
 - FGK stars
 - Surface gravity from transits
 - M stars
- 3 Conclusions

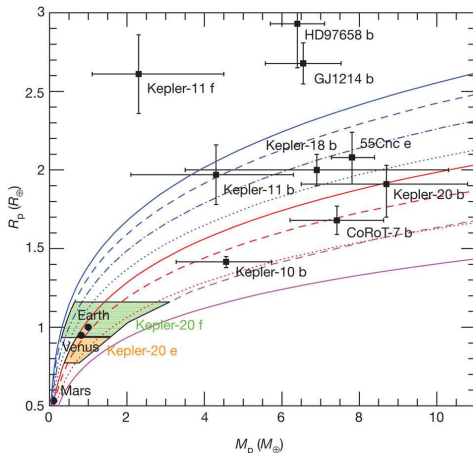
Introduction

- $M_p \propto M_*^{2/3}$ and $R_p \propto R_*$
- M_* and R_* dependent on T_{eff} , $[Fe/H]$, and $\log g$
- limb darkening of transit fit dependent on T_{eff}



(Csizmadia et al. 2013)

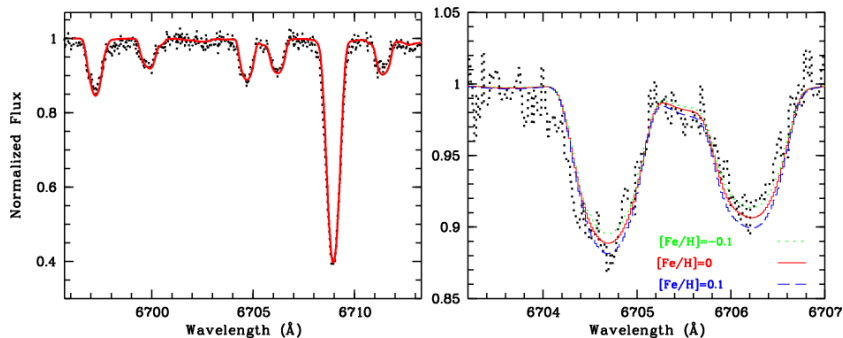
Introduction



(Fressin et al. 2012)

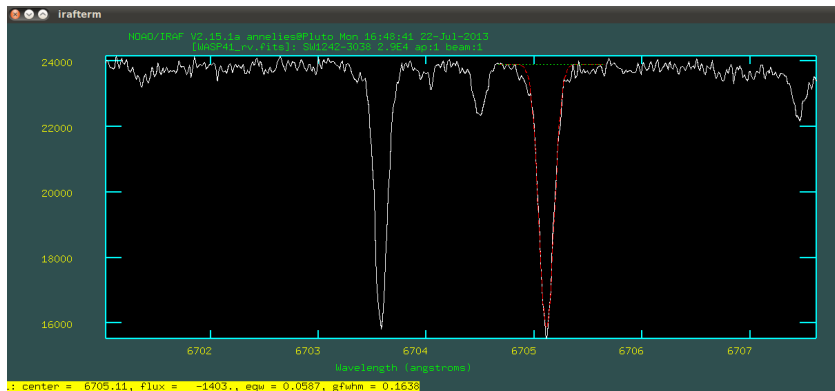
Precise stellar parameters crucial for precise planetary parameters

Spectroscopic analysis (I)



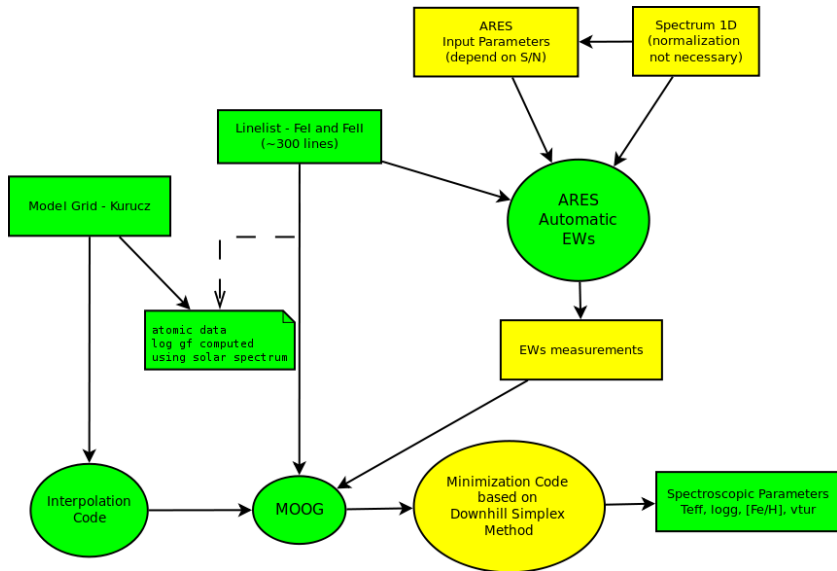
Spectral synthesis

Spectroscopic analysis (II)



Individual spectral line analysis

FGK stars - overview our method



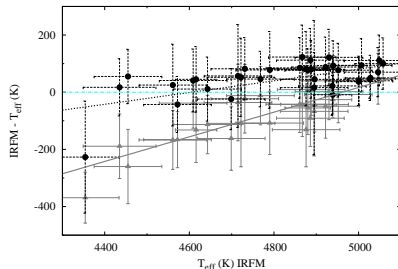
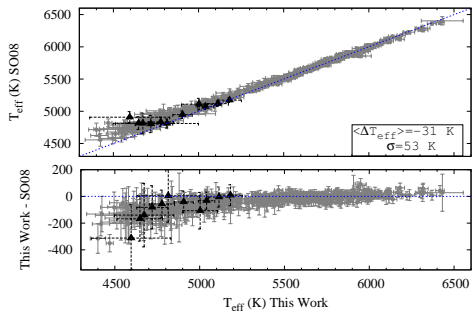
Stellar parameters - homogeneously derived

- **High resolution** spectroscopy
- Equivalent widths of FeI and FeII lines with **ARES**
- Imposing excitation and ionization equilibrium assuming LTE, using the **MOOG** code $\Rightarrow T_{eff}, [Fe/H]$
 $\log g, \xi_t$
- Stellar evolutionary models from the **Padova** group through their webinterface OR with calibration of Torres et al. (2010) $\Rightarrow M_{\odot}$

Carefully chosen line list set

- ① Sousa et al. 2008 + Tsantaki et al. 2013

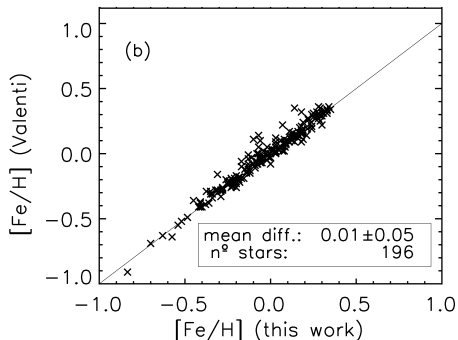
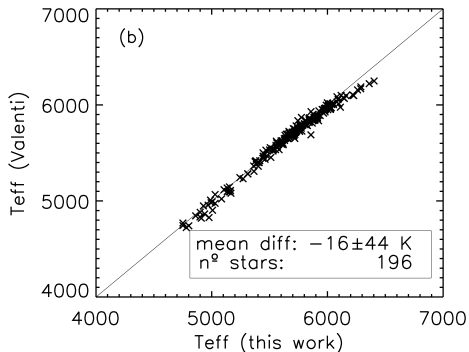
SO08 + TS13 line list set



(Tsantaki et al. 2013)

TS13 better for cool stars

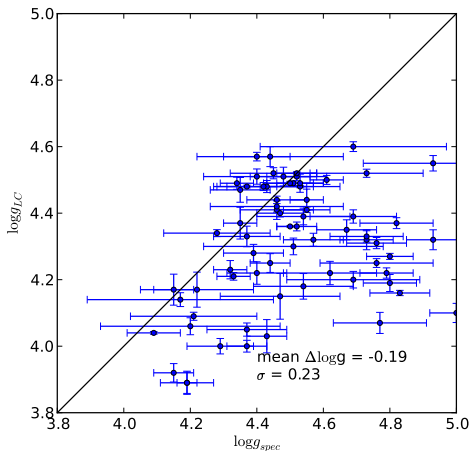
Comparison with other works



(Sousa et al. 2008)

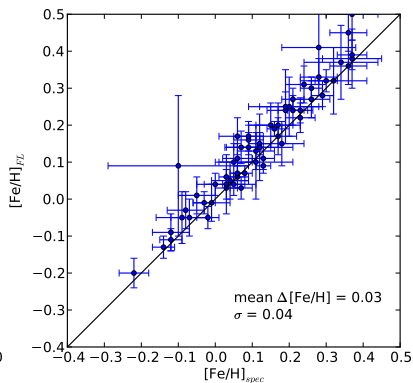
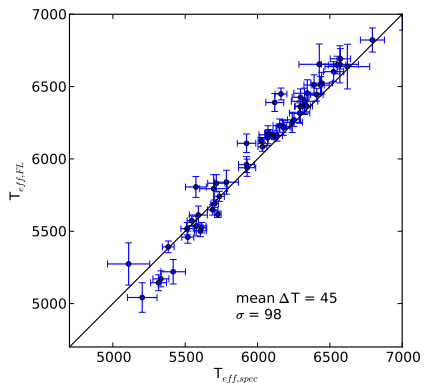
Comparing well with spectral synthesis results

Photometric surface gravity



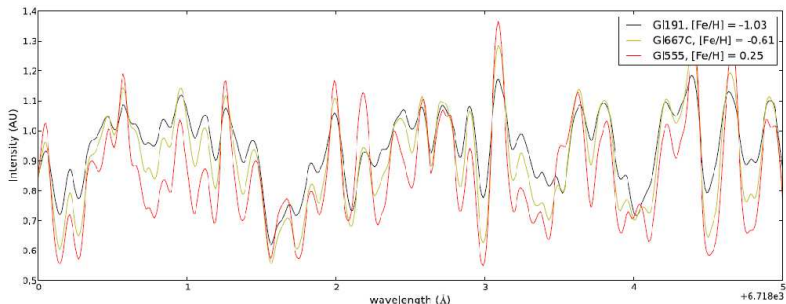
Spectroscopic surface gravity not well constrained and less precise
Transit light curve can provide independent $\log g$ measurement

Effect on temperature and metallicity



Small trends, but better constrained than with spectral synthesis

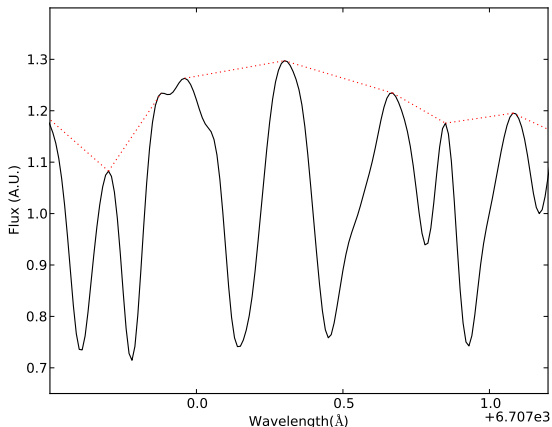
M stars difficult to spectroscopically analyse



(V. Neves)

HARPS GTO calibration sample of 55 M stars

M stars - calibration for T_{eff} and $[Fe/H]$



(Neves et al. 2013)

Peak-to-peak EWs of 4441 lines / features.

$[Fe/H]$ from Neves et al. (2012), T_{eff} from IRFM (Casagrande et al. 2008)

Conclusions

- Precise stellar parameters are crucial for the precise determination of planetary parameters
- Homogeneous characterization is essential for uniform statistical analyses
- The bright targets from PLATO enable us to get high resolution high SN spectra
- Our long-standing spectroscopic method to analyse FGK stars provides precise and accurate results
- The calibration method for M stars provides precise results, but the accuracy depends on the photometry
- Surface gravity from transit fitting is more precise

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Thank you!