Spectroscopic analysis of PTPS stars

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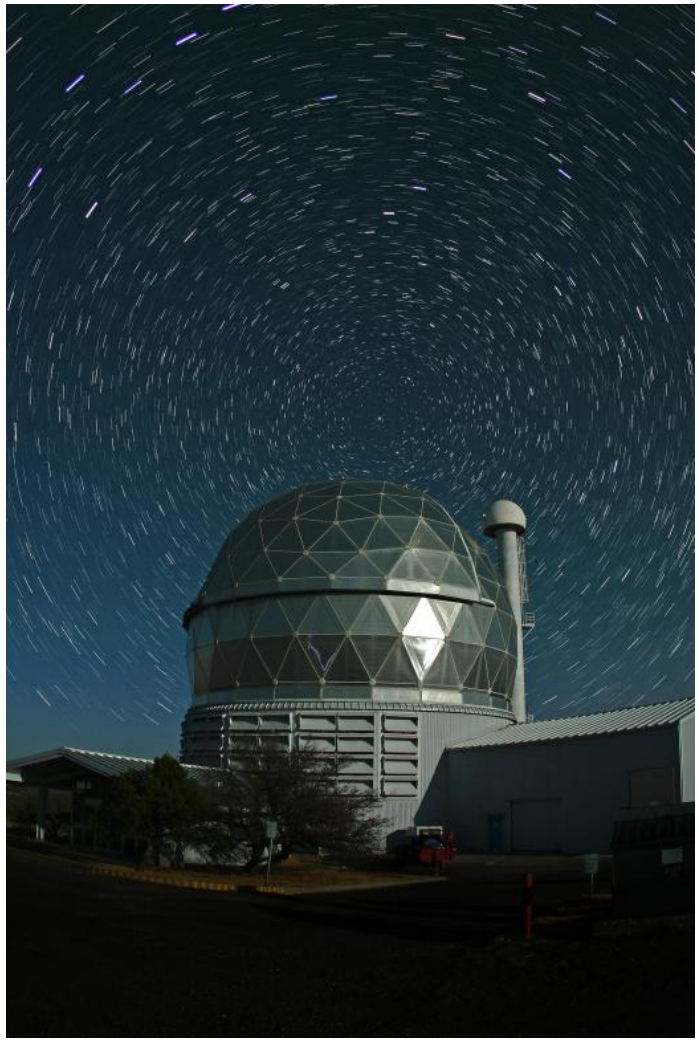
Pennsylvania-Torun Planet Search (PTPS)

Searching for:

- planets around evolved stars
- planets around intermediate-mass stars
- evolution of planetary systems
- spectroscopic analysis of observed stars
- abundances anomalies in the sample

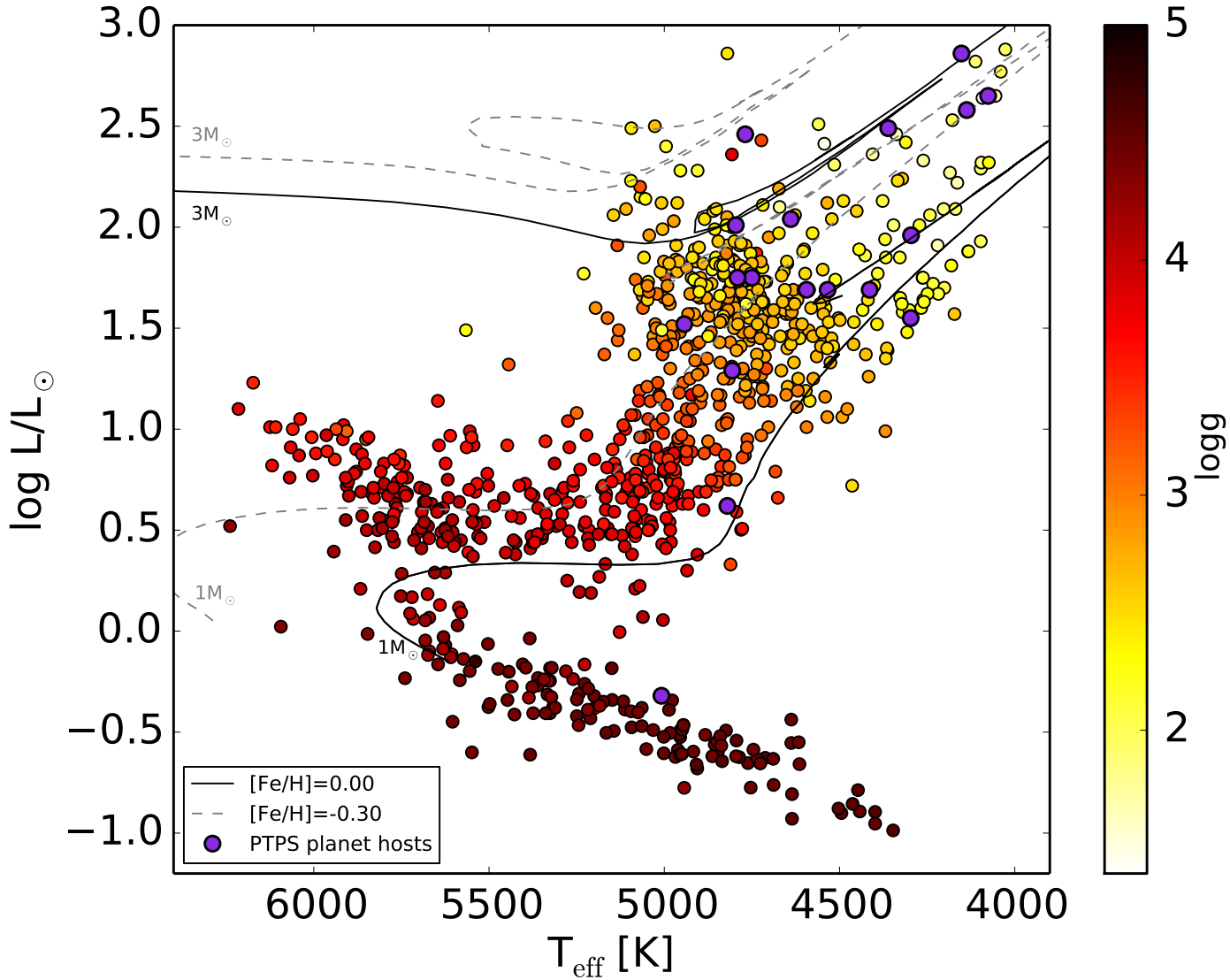
The data:

- observations taken with Hobby-Eberly Telescope and High Resolution Spectrograph (HRS) (R=60 000)
- data reduction with pipeline in IRAF/PYTHON
- radial velocities measured with ALICE code (Nowak et al., 2013)

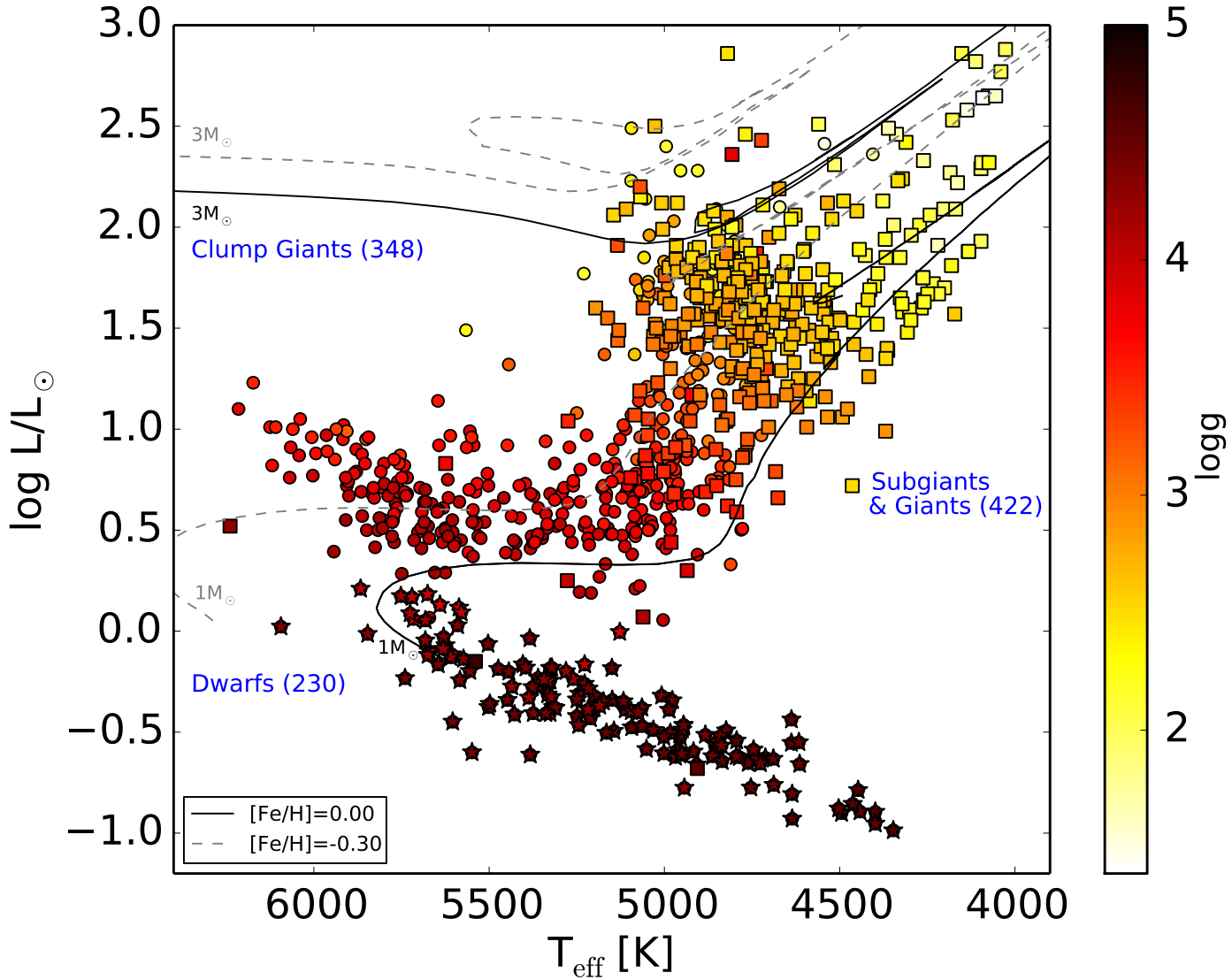


by: Frank Cianciolo/McDonald Observatory.

PTPS planets



PTPS sample (1000 stars)



Stellar parameters

Radial velocity and transit planet searches require precisely determined:

- masses
- radii

of the host star.

Therefore we need stellar:

- effective temperatures
- gravitational accelerations
- metallicities

Photometric data and parallaxes allow to estimate stellar luminosities.

Analysis method

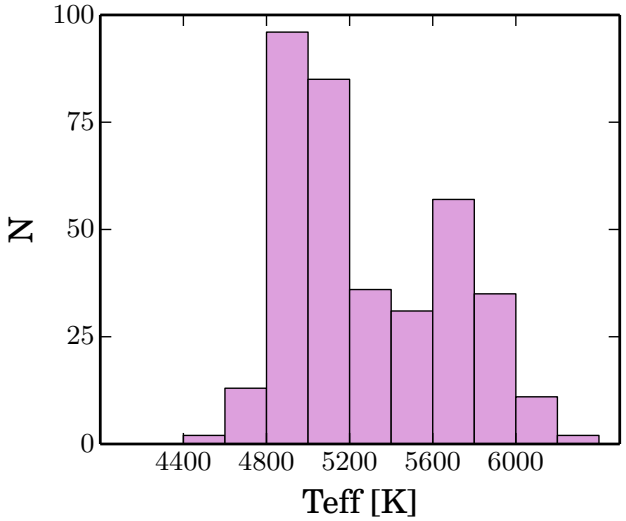
Measurements:

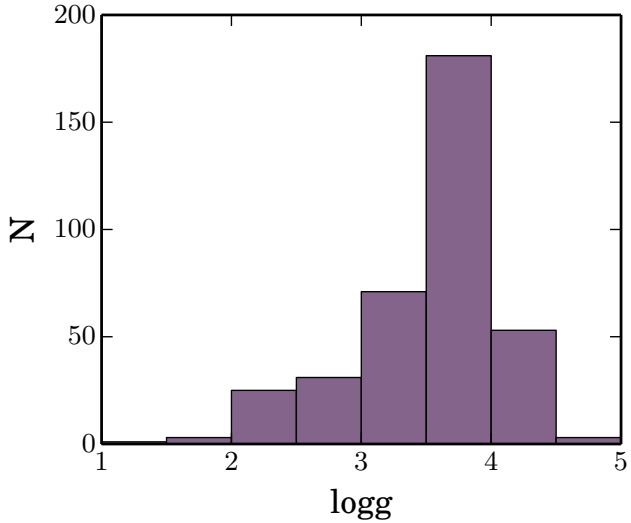
- we measure equivalent widths (EWs) of neutral (FeI) and ionized (FeII) iron absorption lines with ARES (Sousa et al.2007)
- atomic data adopted from Takeda et al. (2005a,b)
- over 200 lines of FeI and over 20 lines of FeII included in analysis

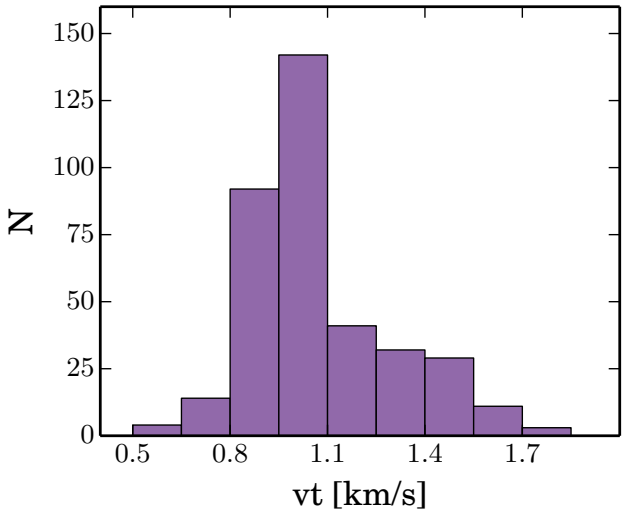
Analysis:

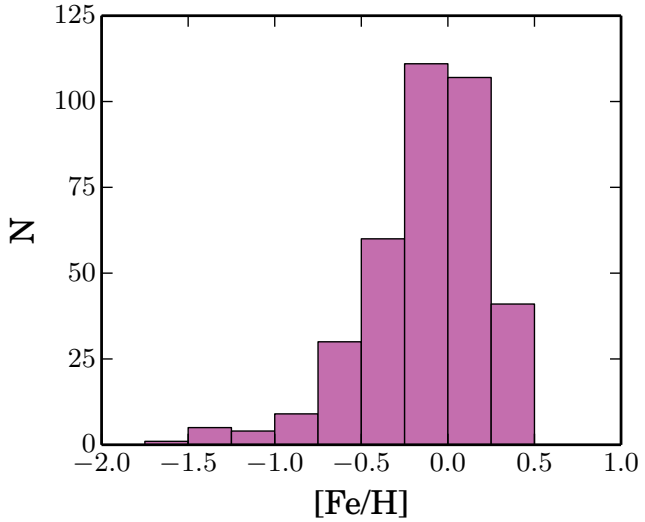
- FeI and FeII EWs analyzed with TGVIT (Takeda et al. 2005a)
- output of TGVIT:
  - Teff,
  - logg,
  - vt,
  - $[Fe/H]$
- masses, ages and luminosity determined with Bayesian approach (da Silva,2006; Górecka in prep.)

Results: atmospheric parameters for Subgiants & Giants

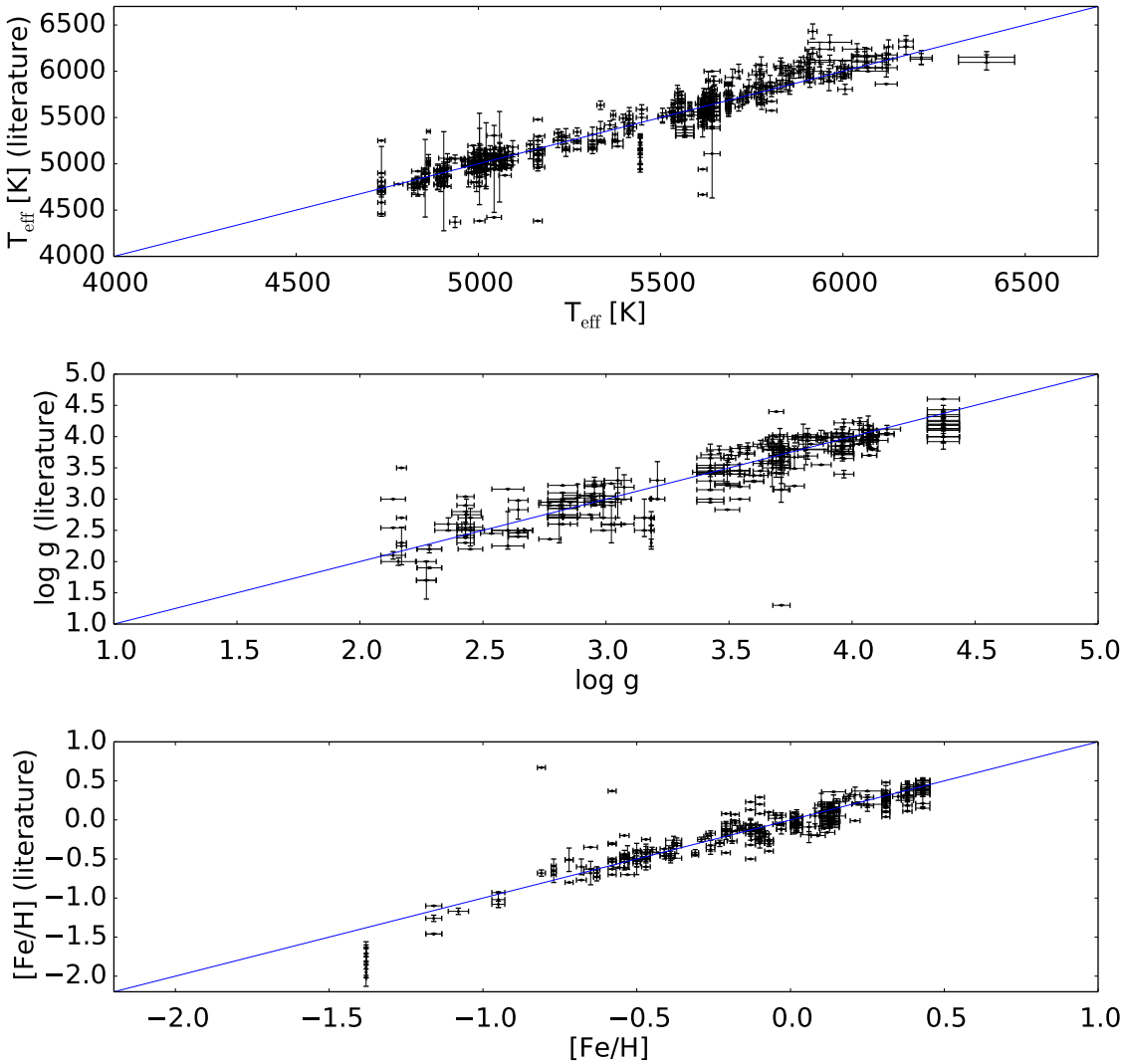




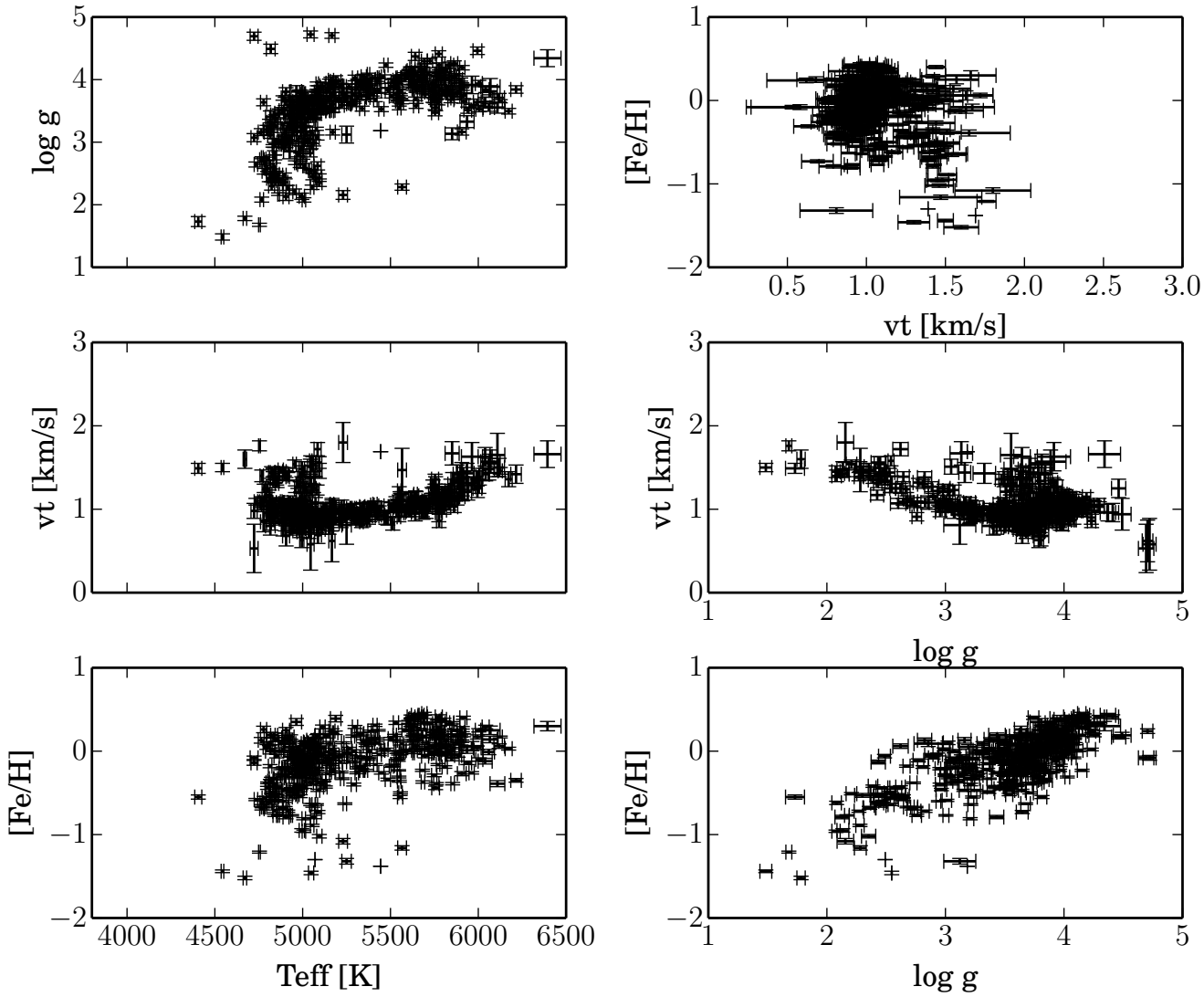




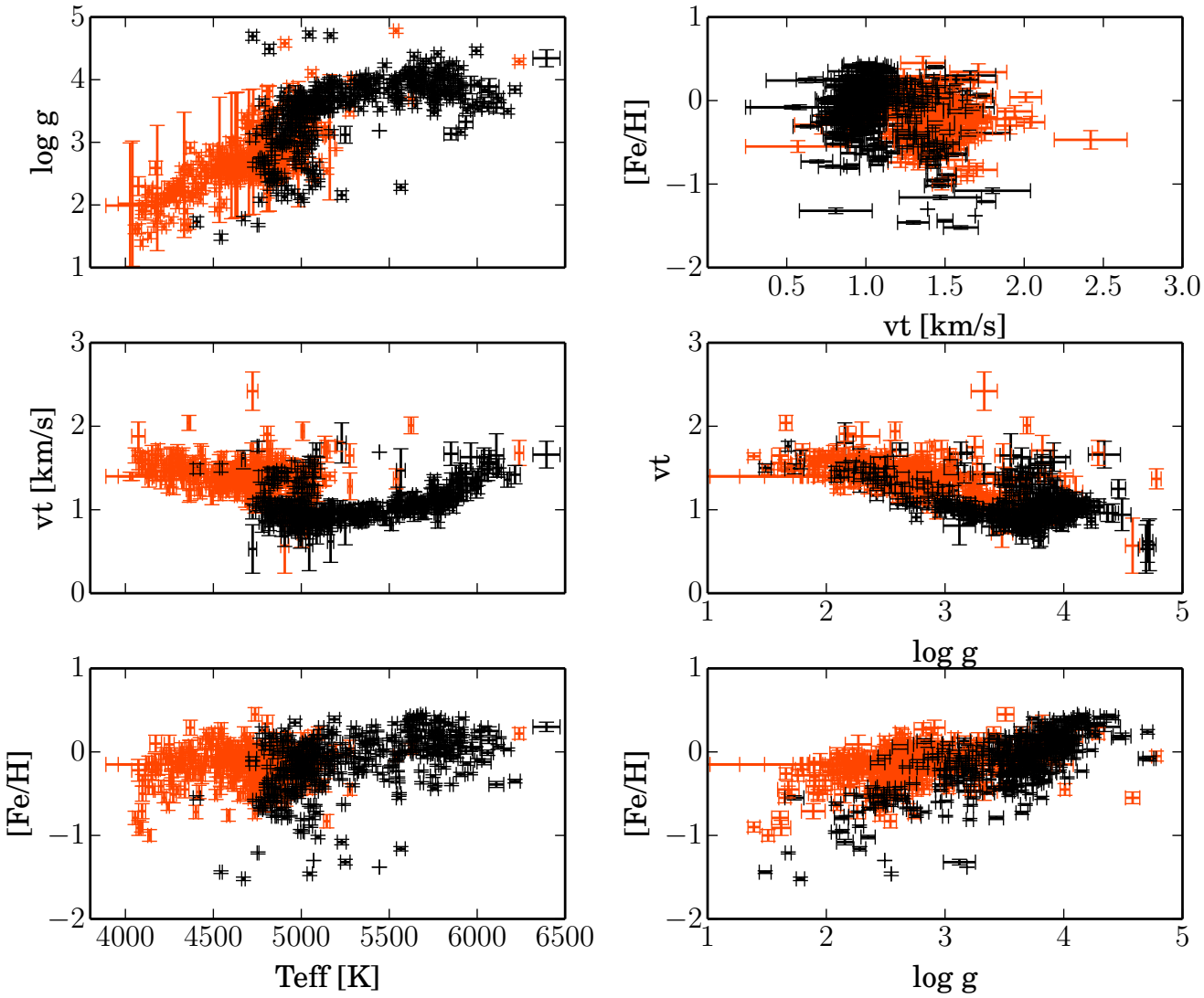
Results: comparison with PASTEL (Soubiran et al., 2010)



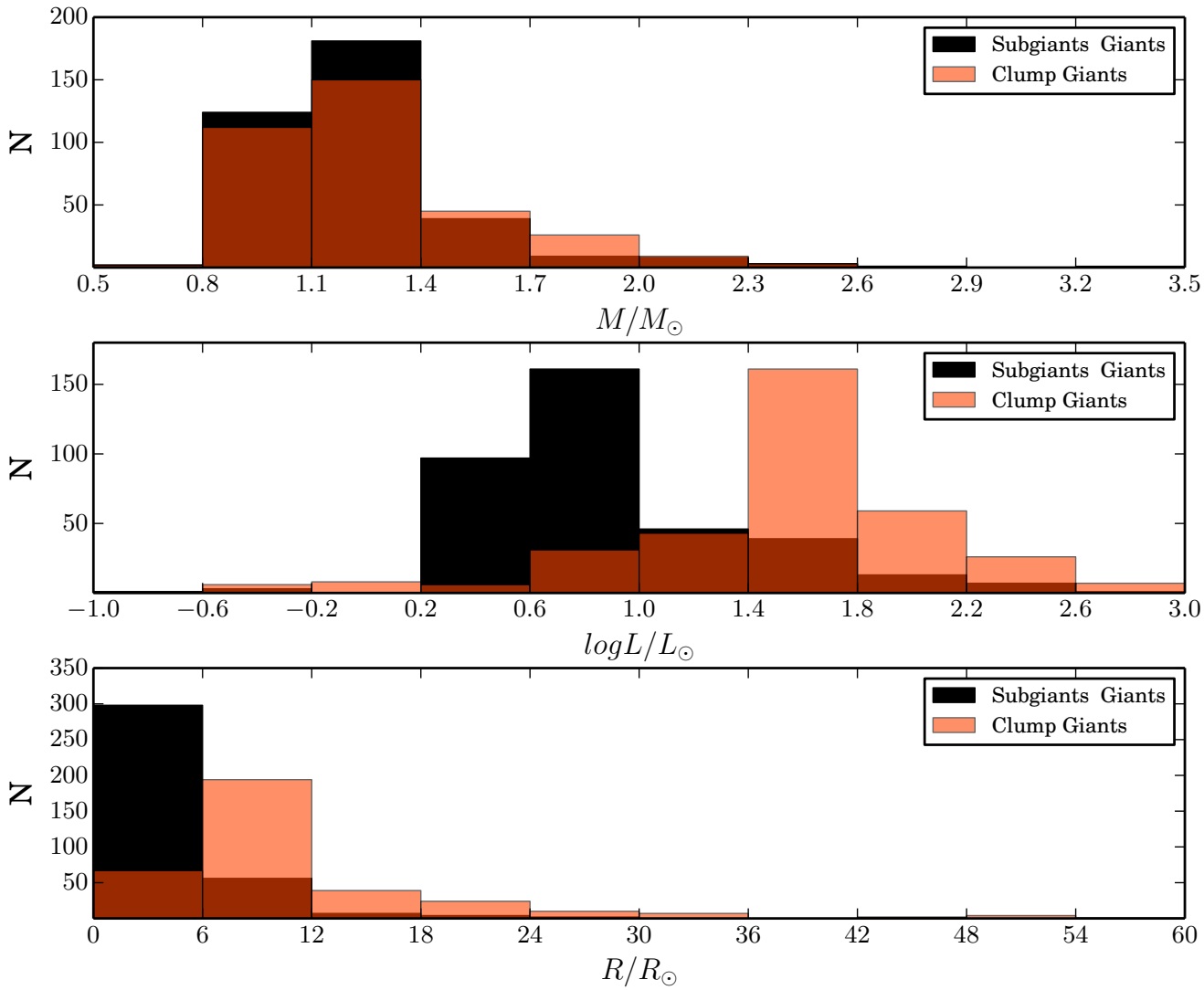
Results: relations between atmospheric parameters



Results: synergy with Clump Giants sample



Results: stellar parameters



Conclusions

- planet search techniques critically rely on basic data of the observed stars
- precise radial velocity planet search needs precise masses of the host stars
- teff, logg and metallicity are needed to determined stellar masses
- teff, logg and luminosity are very important to describe evolutionary stage
- stellar parameters are also important for statistical analysis of observed stars and planetary systems.