WP122000 – Non-seismic diagnostics and model atmospheres

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Main deliverables:

- Procedures for deriving stellar parameters: L, T_{eff}, radii, chemical abundances, ... Targeted accuracy: T_{eff} to within 1% and R to within 2%.
- Grid of 1D/3D model atmospheres.
- Grid of limb-darkening coefficients.

WP122100 – 3D/NLTE model atmospheres
M. Asplund (Australia)

WP122200 – Fundamental parameters, chemical abundances and 1D model atmospheres
C. Allende Prieto (Spain)

WP122300 – Limb-darkening coefficients
A. Claret (Spain)

WP122400 – Model atmospheres of M dwarfs
B. Plez (France)

WP122500 – Interstellar extinction
D. Marshall (France)

WP122100 – 3D/NLTE model atmospheres

M. Asplund (Australia)

→

Grid of 3D model atmospheres

3D/NLTE corrections for the abundances of individual lines, stellar parameters and centre-to-limb variations

WP122100 – 3D/NLTE model atmospheres

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→ Grid of 1D model atmospheres

Procedures for deriving T_{eff}, radii and detailed chemical abundances corrected for 3D/NLTE effects.

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Grid of 1D model atmospheres for M stars

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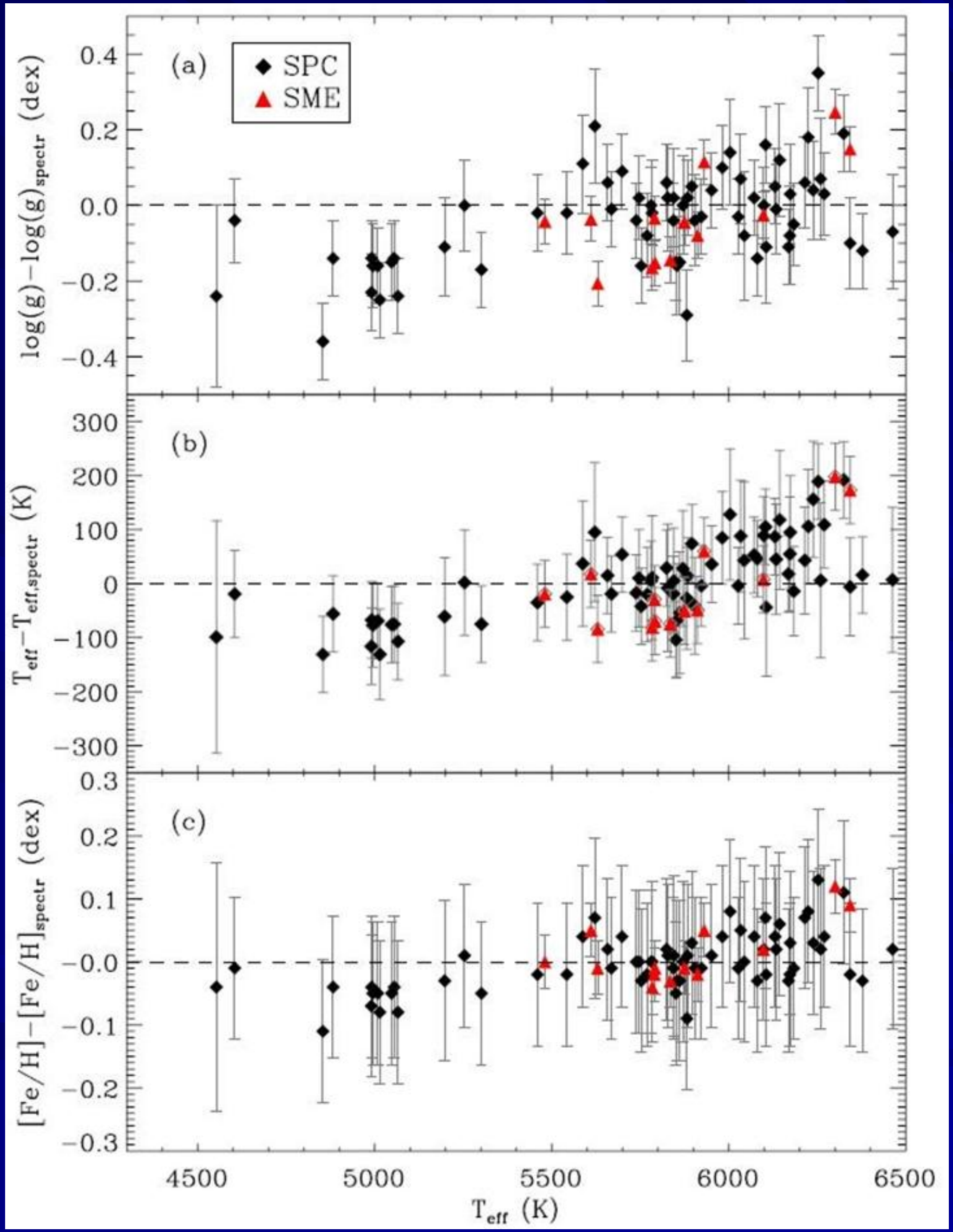
WP122500 – Interstellar extinction

D. Marshall (France)

→ A_V along line of sight

Impact on stellar and planetary parameters of fixing in spectroscopic analysis log*g* to value given by asteroseismology or transit observations



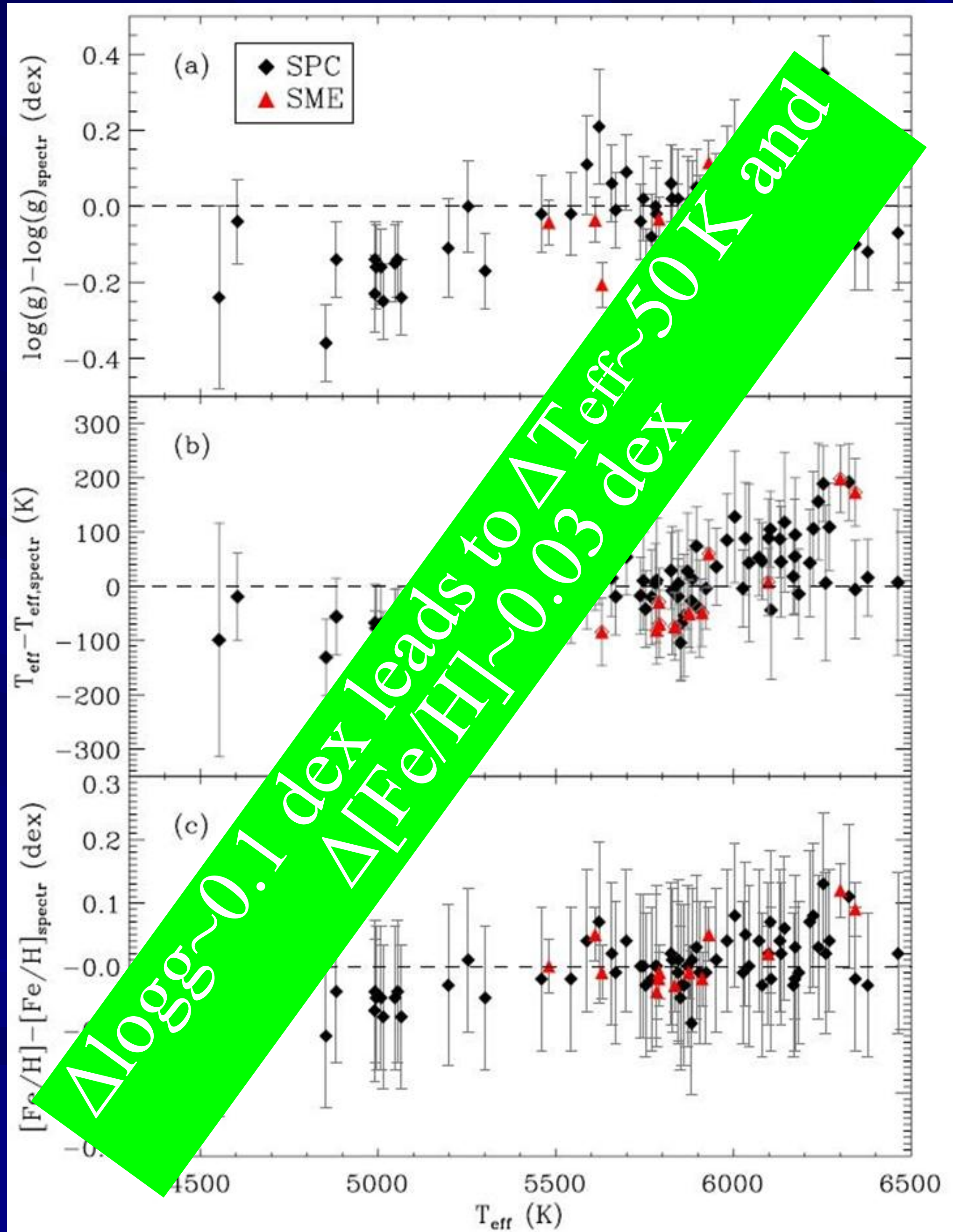
ν_{max}, $\Delta\nu$, T_{eff}, [Fe/H]

$\downarrow$

log$g$

Kepler exoplanet candidates

Huber et al. (2013)



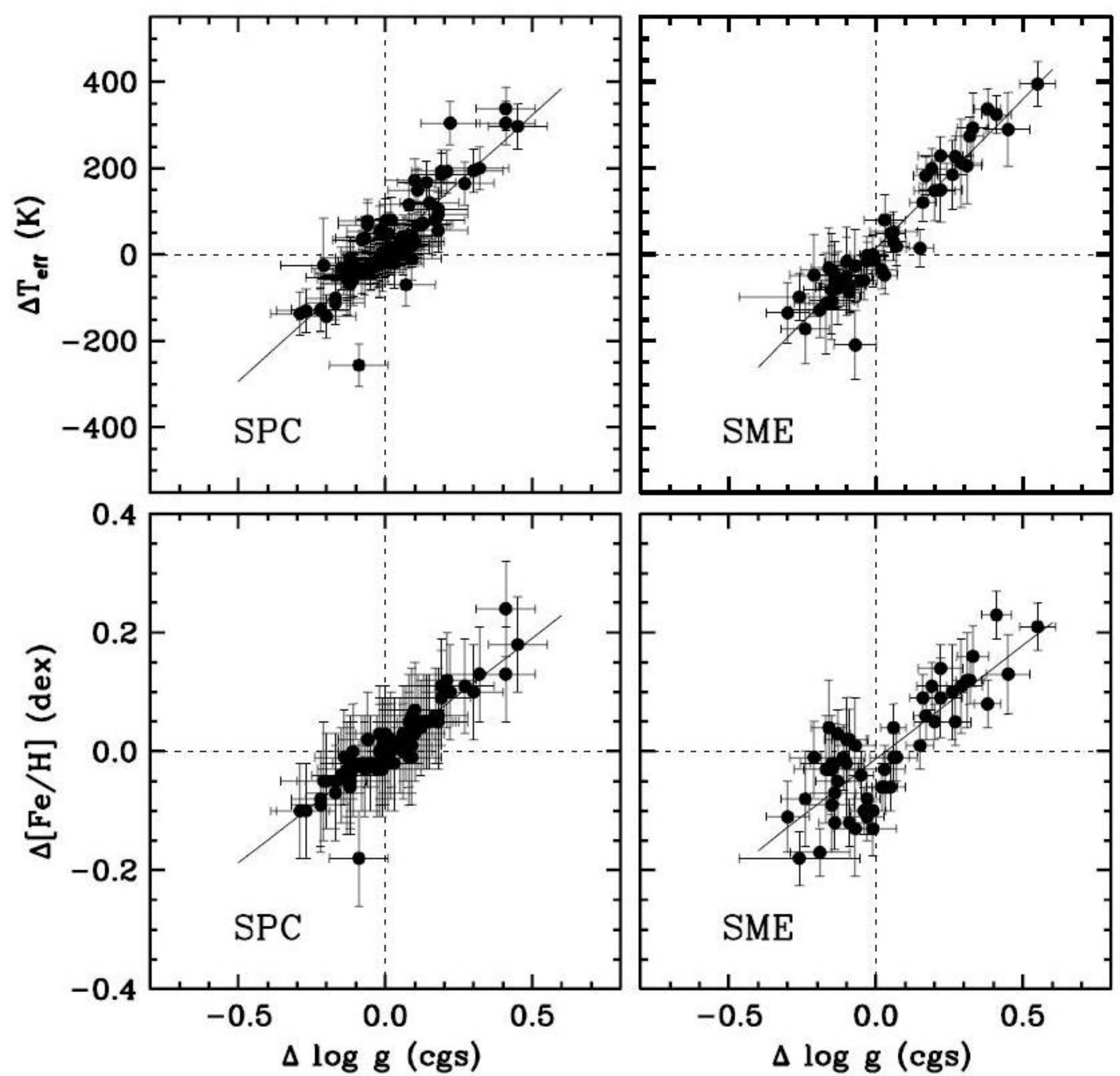
ν_{max}, $\Delta\nu$, T_{eff}, [Fe/H]

$\downarrow$

log*g*

Kepler exoplanet candidates

Huber et al. (2013)



a/R_*

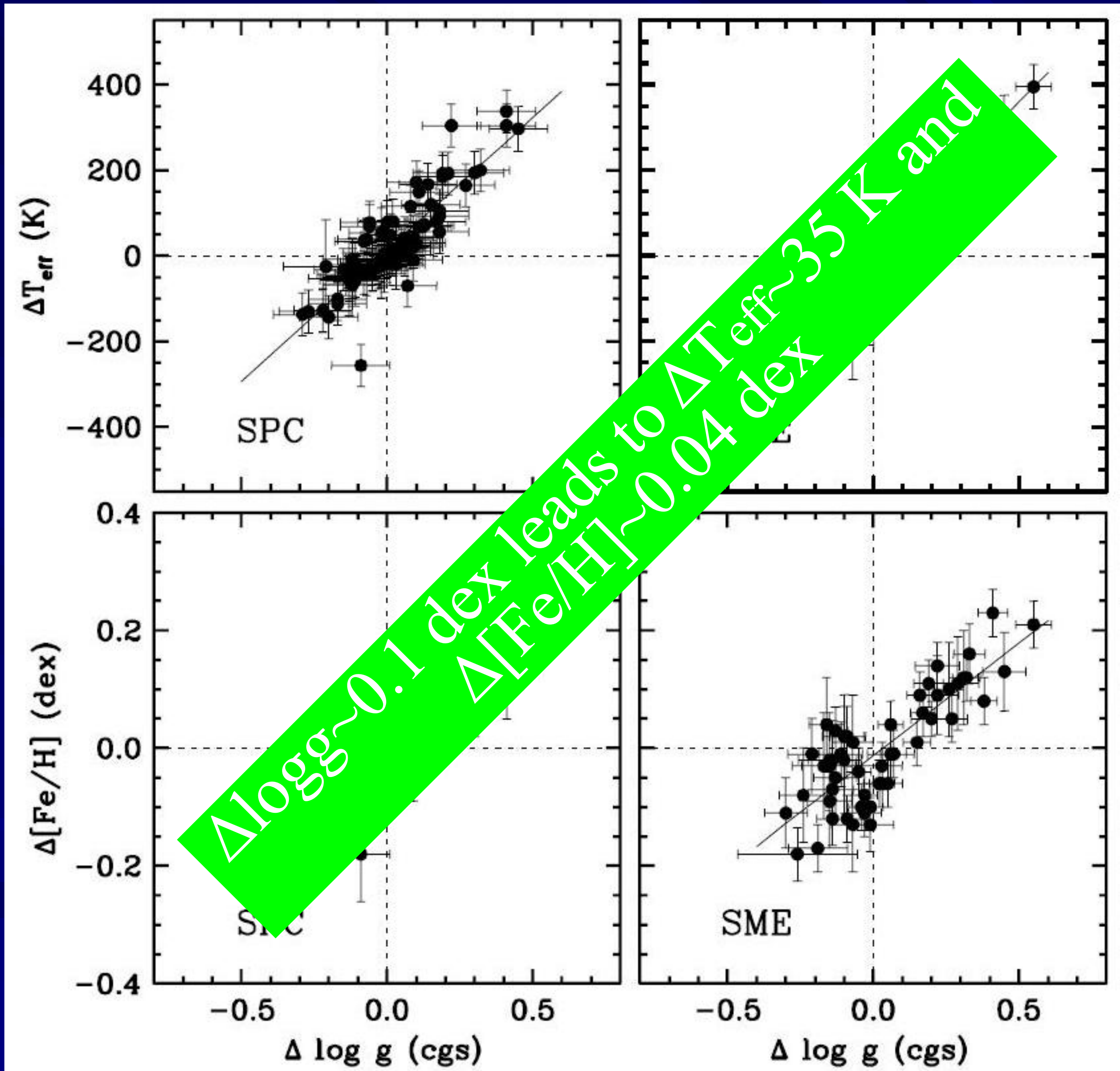
ρ_*

(+Teff, [Fe/H])

log*g*

Transiting planet hosts

Torres et al. (2012)



Δlogg~0.1 dex leads to ΔTeff~35 K and Δ[Fe/H]~0.04 dex

a/R_*

↓

ρ_*

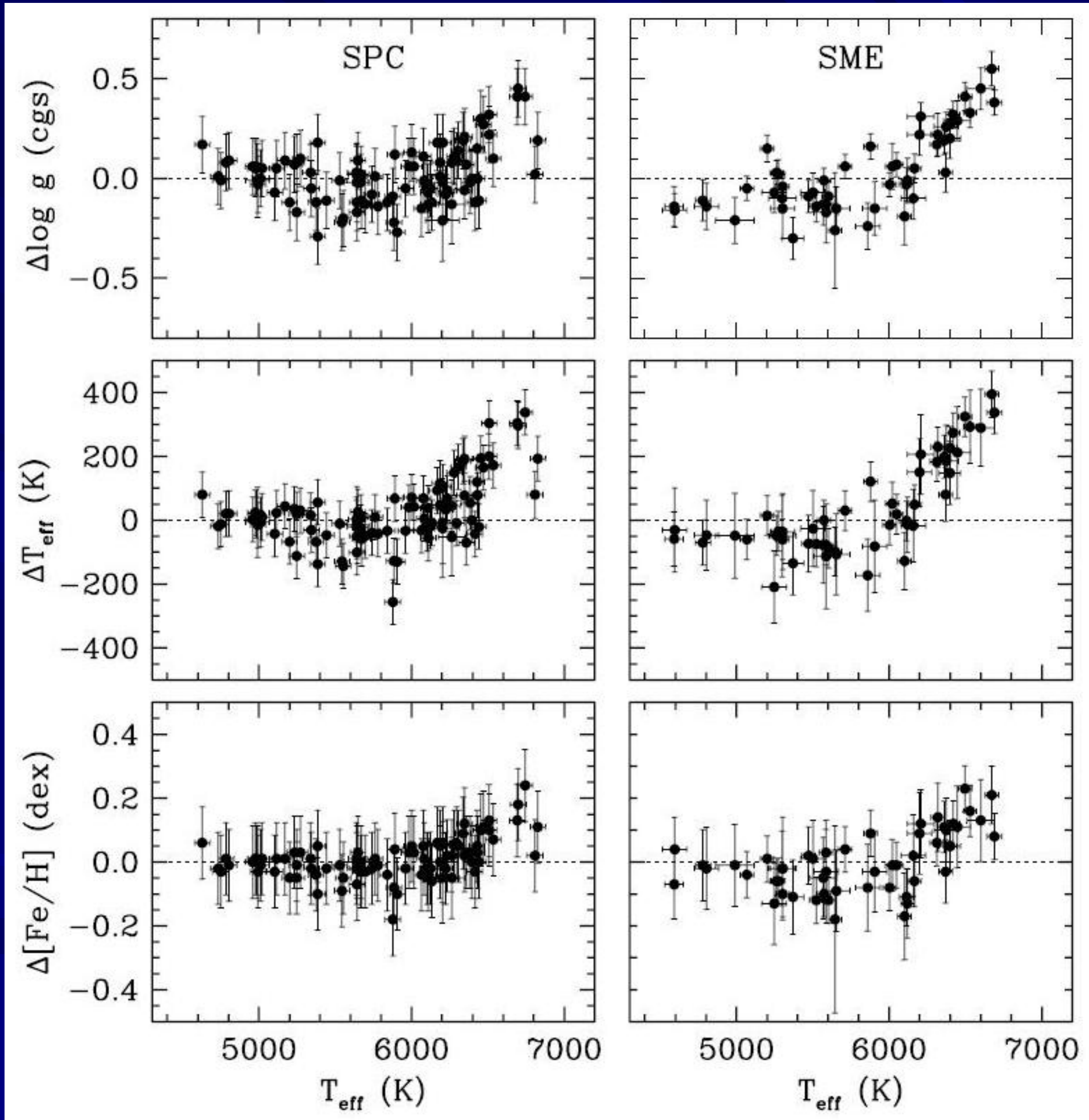
(+Teff, [Fe/H])

↓

log$g$

Transiting planet hosts

Torres et al. (2012)



a/R_*

$\downarrow$

ρ_*

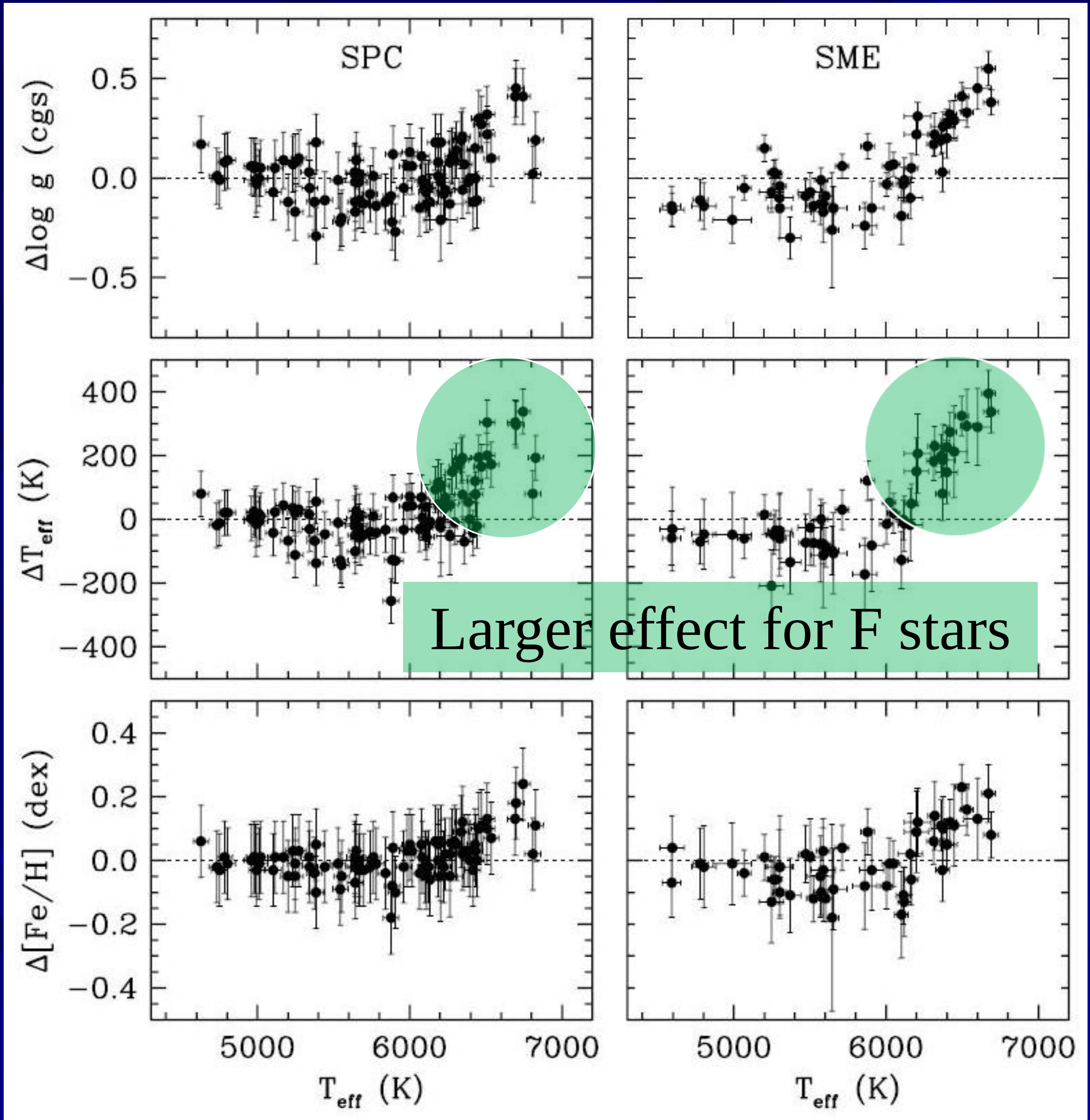
(+Teff, [Fe/H])

$\downarrow$

$\log g$

Transiting planet hosts

Torres et al. (2012)



a/R_*

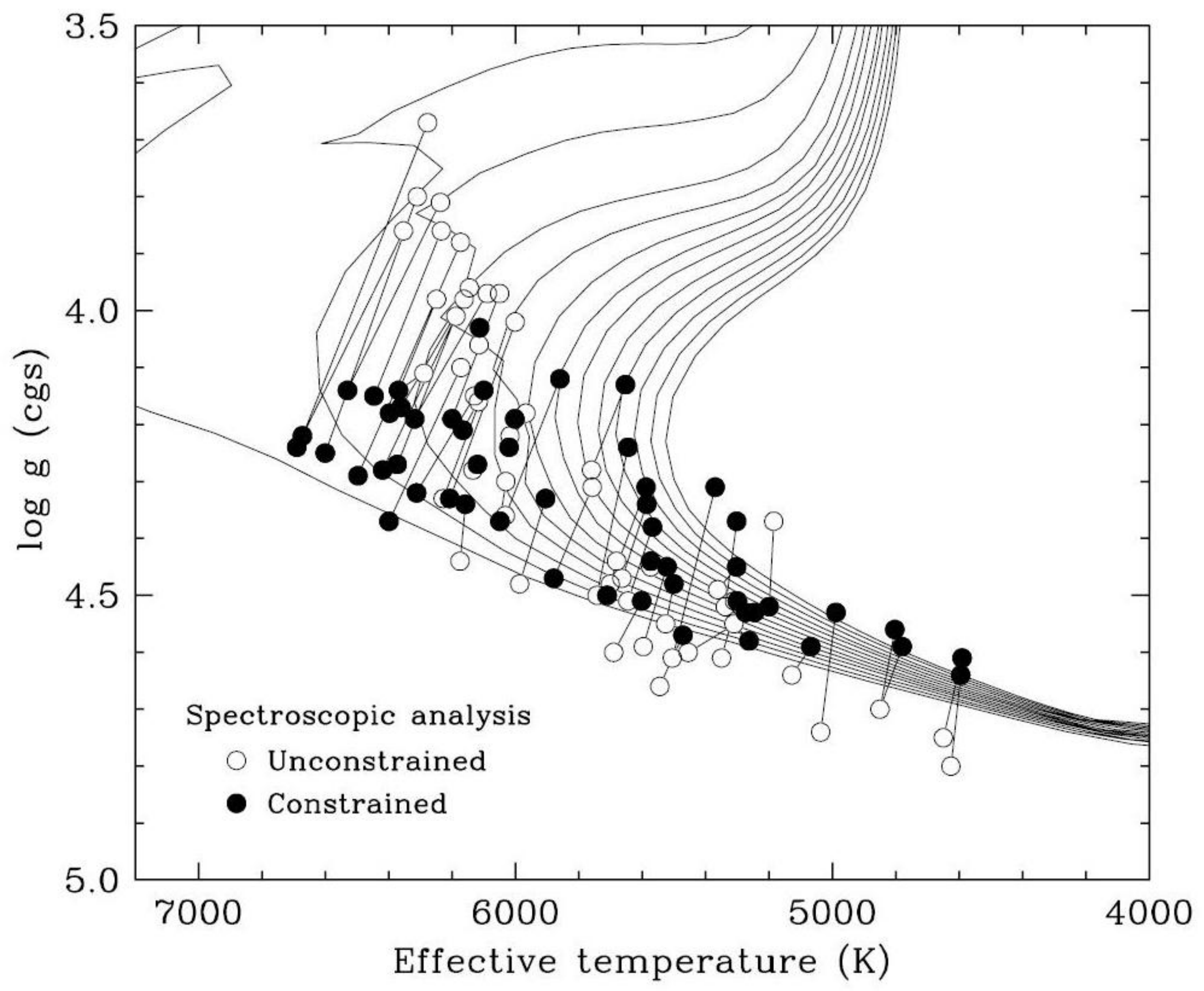
ρ_*

(+Teff, [Fe/H])

log*g*

Transiting planet hosts

Torres et al. (2012)



a/R_*

ρ_*

(+Teff, [Fe/H])

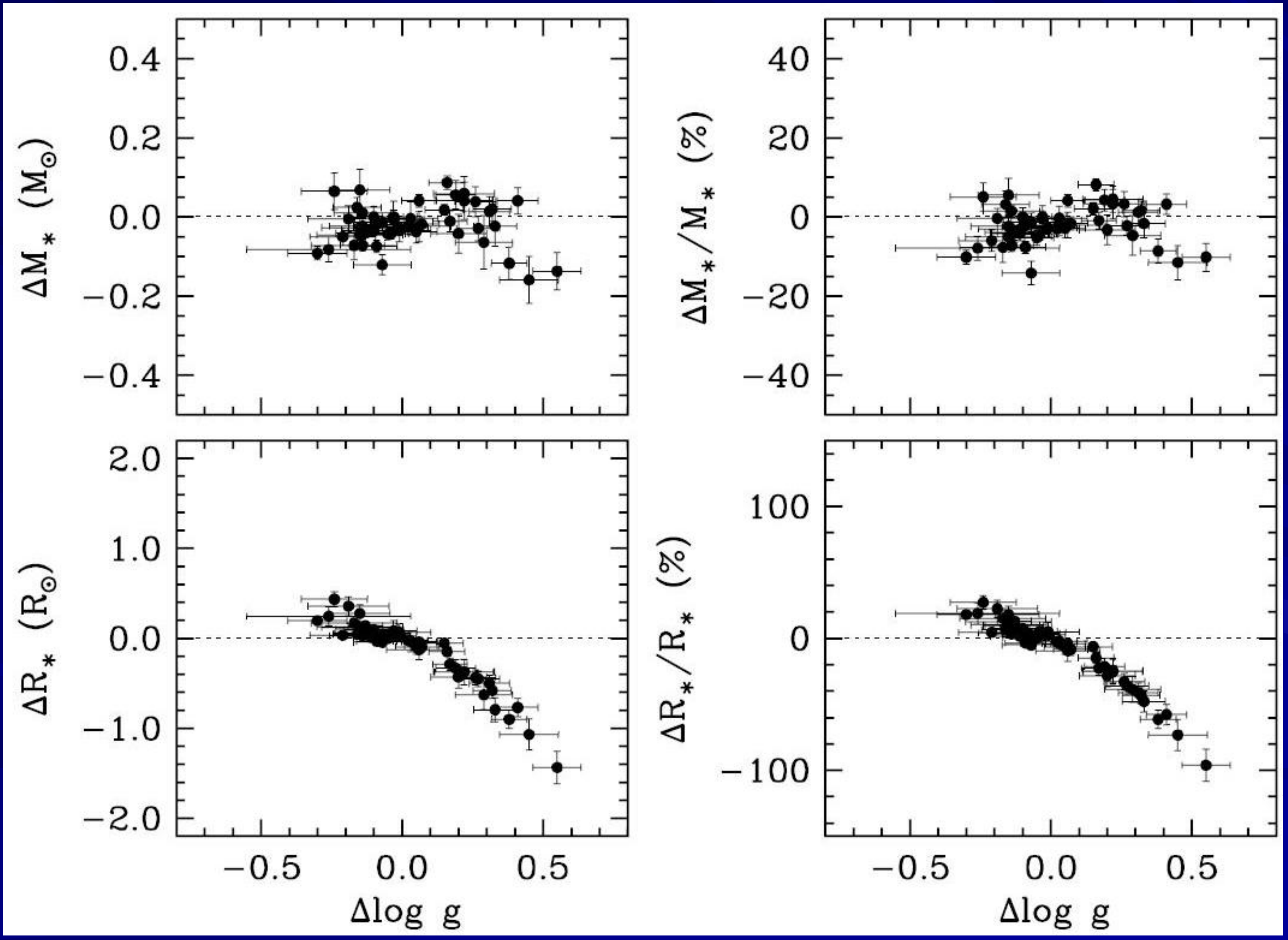
log*g*

Transiting planet hosts

Torres et al. (2012)

Method 1
logg: from photometry
Teff and [Fe/H]: recomputed using logg constraint

Method 2
logg, Teff, and [Fe/H]: from spectroscopy (no constraints)



$R_p \propto R_*$
$M_p \propto M_*^{2/3}$

Torres et al. (2012)

Method 1

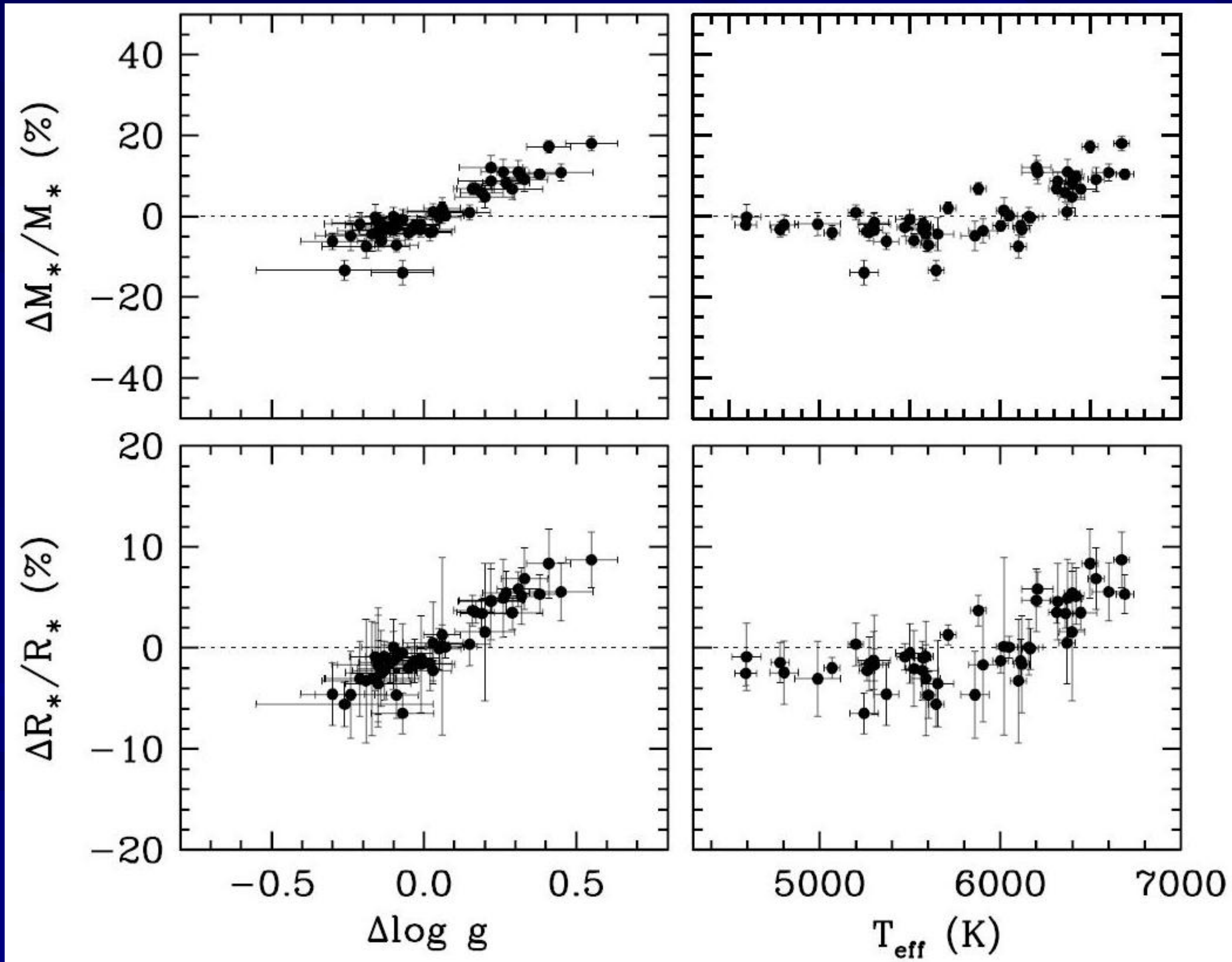
logg: from photometry

Teff and [Fe/H]: recomputed using logg constraint

Method 2

logg: from photometry

Teff and [Fe/H]: *not* recomputed using logg constraint

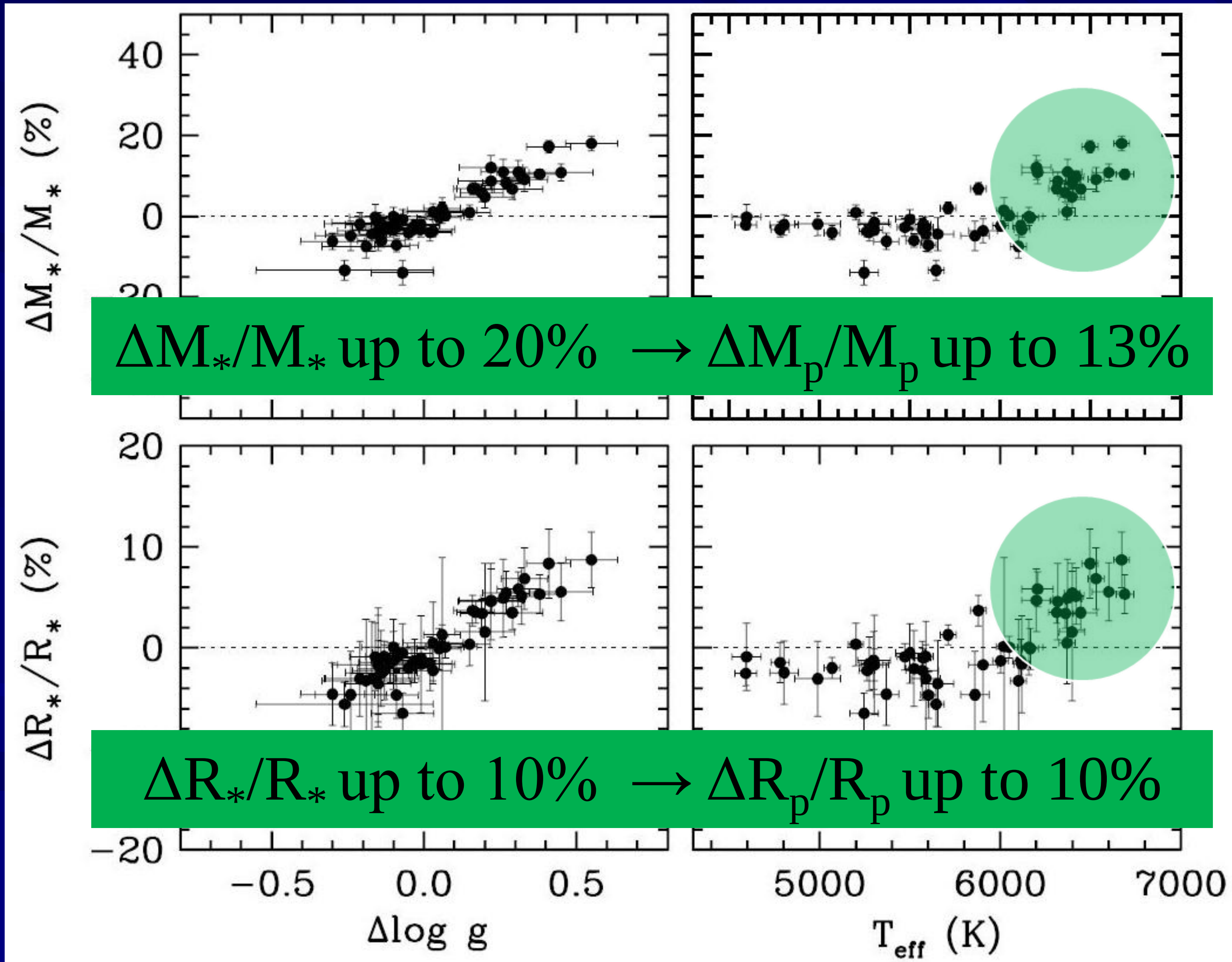


$R_p \propto R_*$

$M_p \propto M_*^{2/3}$

Torres et al. (2012)

Method 1	**Method 2**
logg: from photometry	logg: from photometry
Teff and [Fe/H]: recomputed using logg constraint	Teff and [Fe/H]: *not* recomputed using logg constraint



$\Delta M_*/M_*$ up to 20% $\rightarrow$ $\Delta M_p/M_p$ up to 13%

$\Delta R_*/R_*$ up to 10% $\rightarrow$ $\Delta R_p/R_p$ up to 10%

$R_p \propto R_*$
$M_p \propto M_*^{2/3}$

Torres et al. (2012)

Conclusions

- Procedure adopted for deriving parameters of PLATO planet hosts will be to fix gravity to the more accurate asteroseismic or photometric estimate
- Can lead to relatively large differences with respect to unconstrained spectroscopic results (up to ΔTeff ~ 200 K and Δ[Fe/H] ~ 0.1 dex)
- Once logg fixed in spectroscopic analysis, necessary to iterate and recompute T_{eff} and [Fe/H]
- Will significantly impact the planetary parameters (mass and radius)