

Modelling surface effects

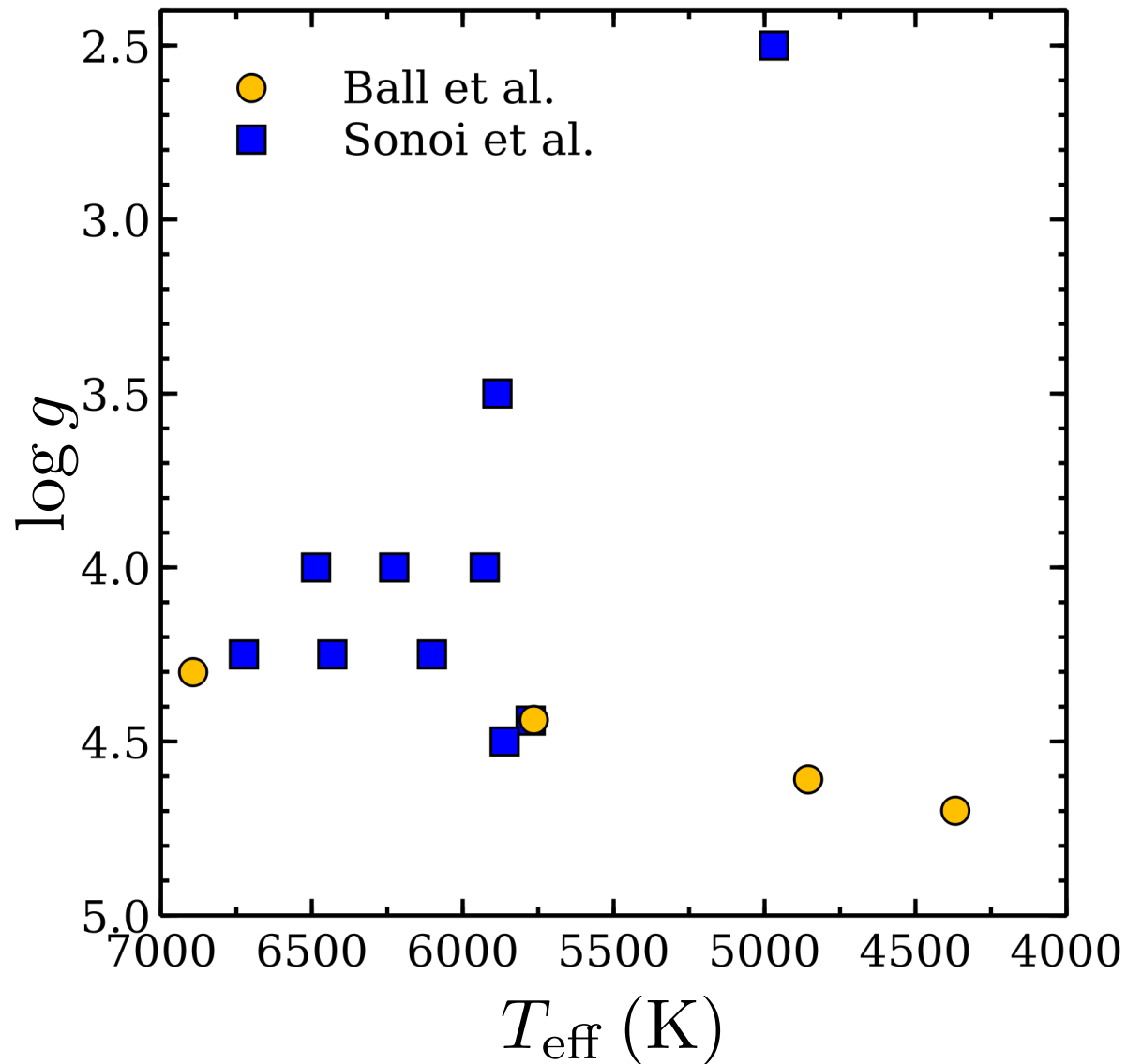
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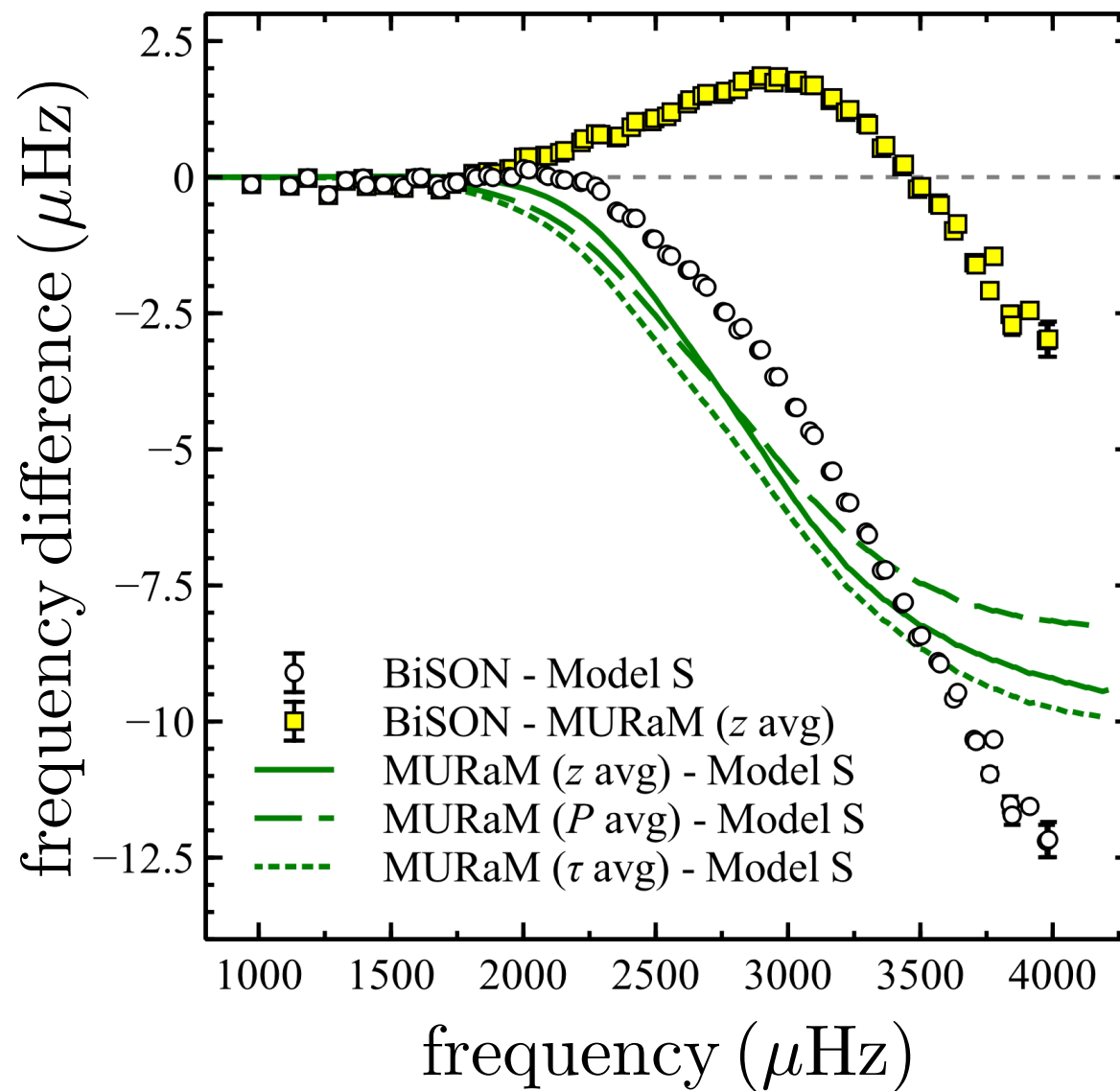
24th May 2016



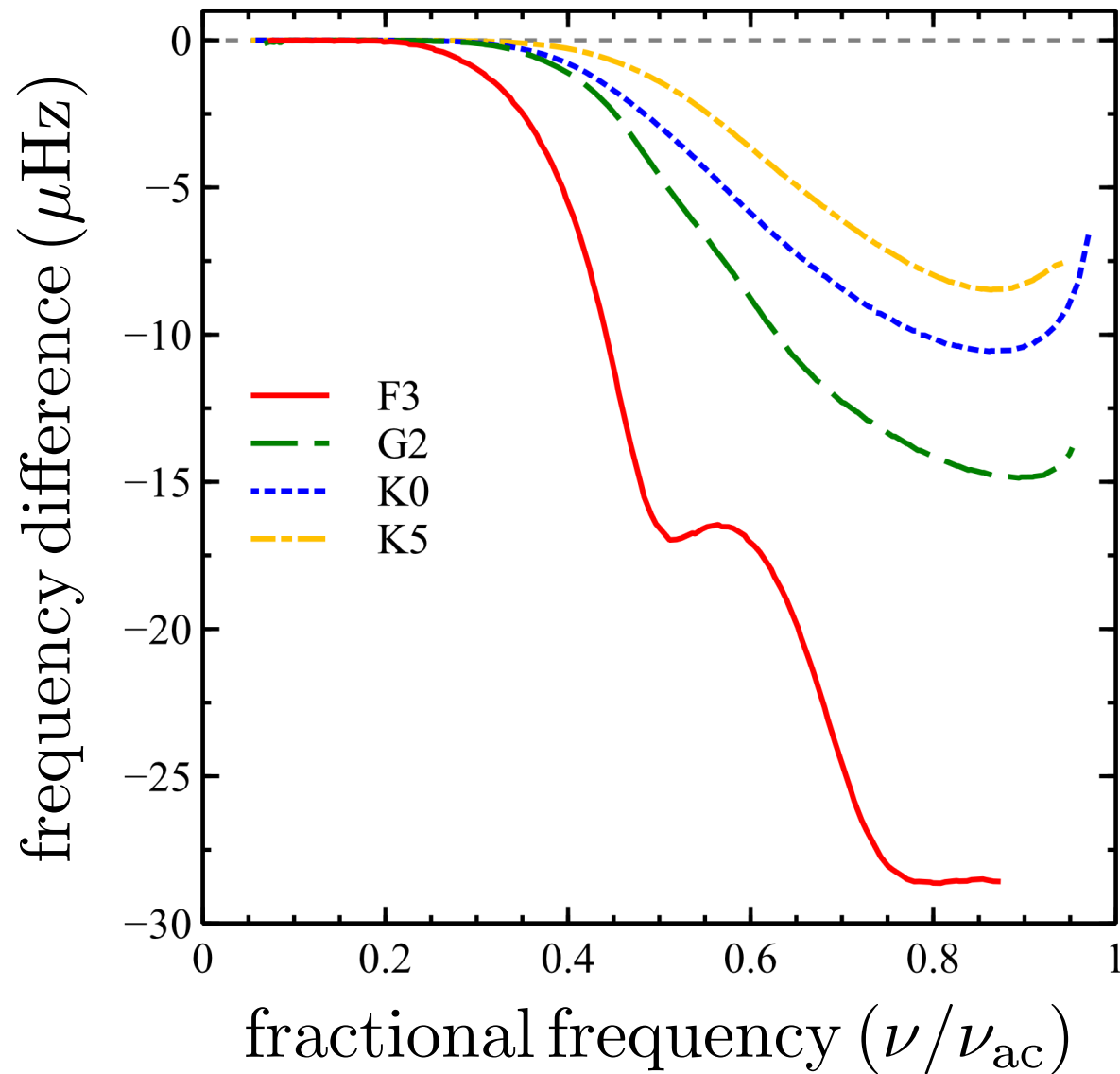
Atmospheric parameters



Model S



Calibrated MESA models



A new correction of stellar oscillation frequencies for near-surface effects

W. H. Ball¹ and L. Gizon^{2,1}

from asymptotic behaviour of eigenfunctions near surface

“cubic” term

$$\delta\nu = a_3\nu^3/\mathcal{I}$$

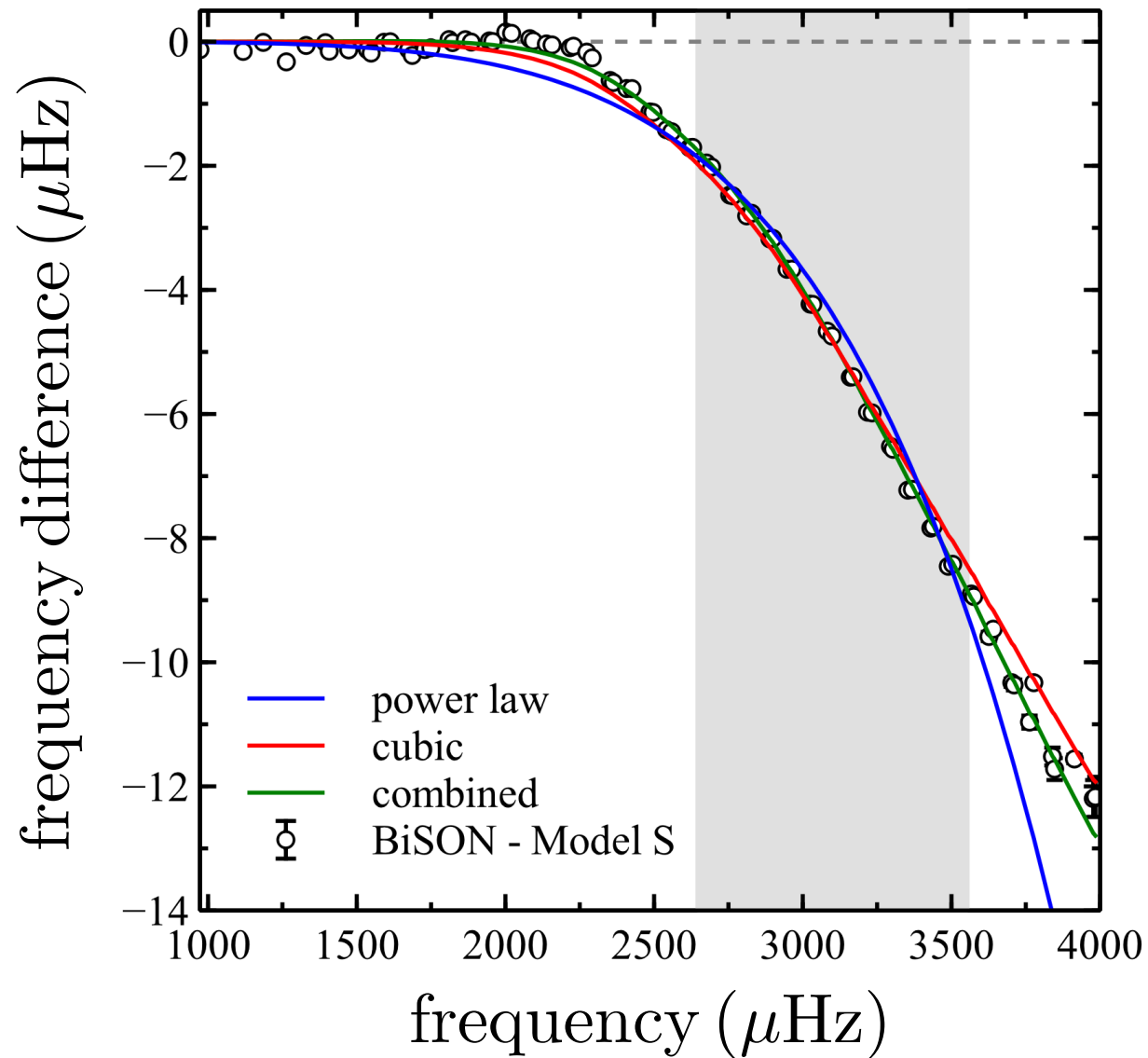
“combined” term

$$\delta\nu = \left(a_{-1}\nu^{-1} + a_3\nu^3\right)/\mathcal{I}$$

c.f. Gough (1990)

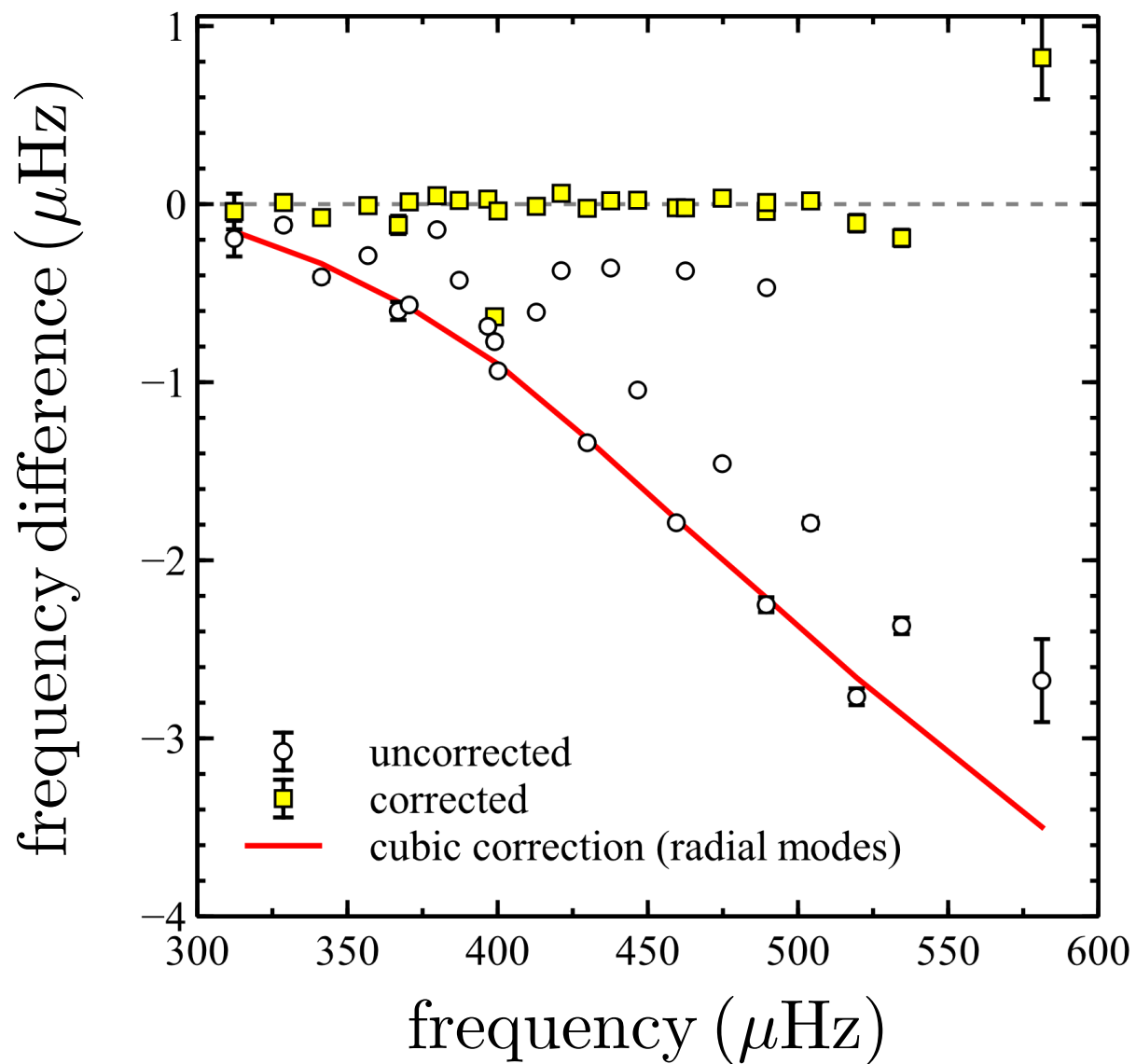
cubic term also in Libbrecht & Woodard (1990) and Goldreich et al. (1991)

Solar-calibrated model (Model S)



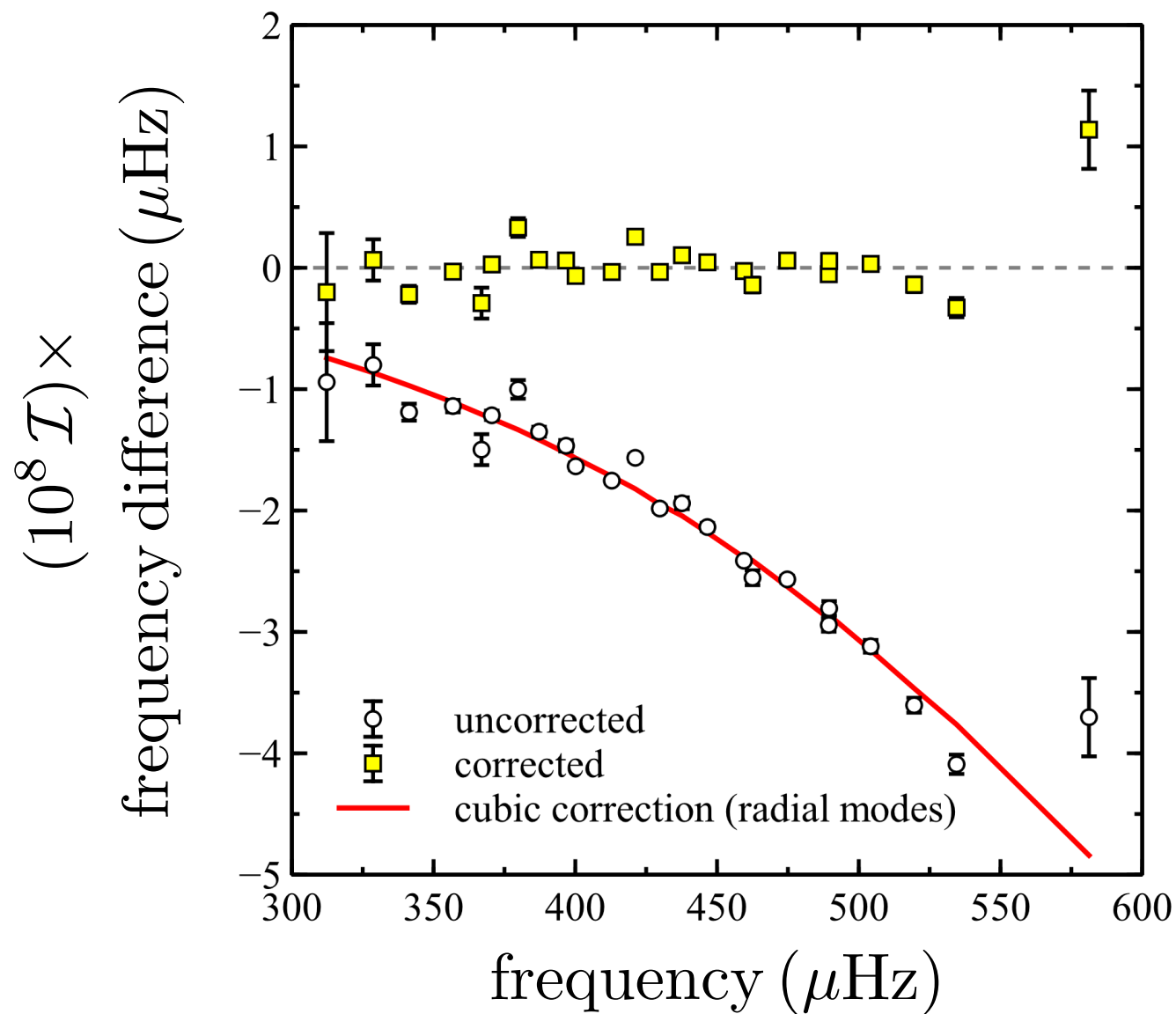
KIC 9574283

$\log g = 3.58$, $T_{\text{eff}} = 5120$ K



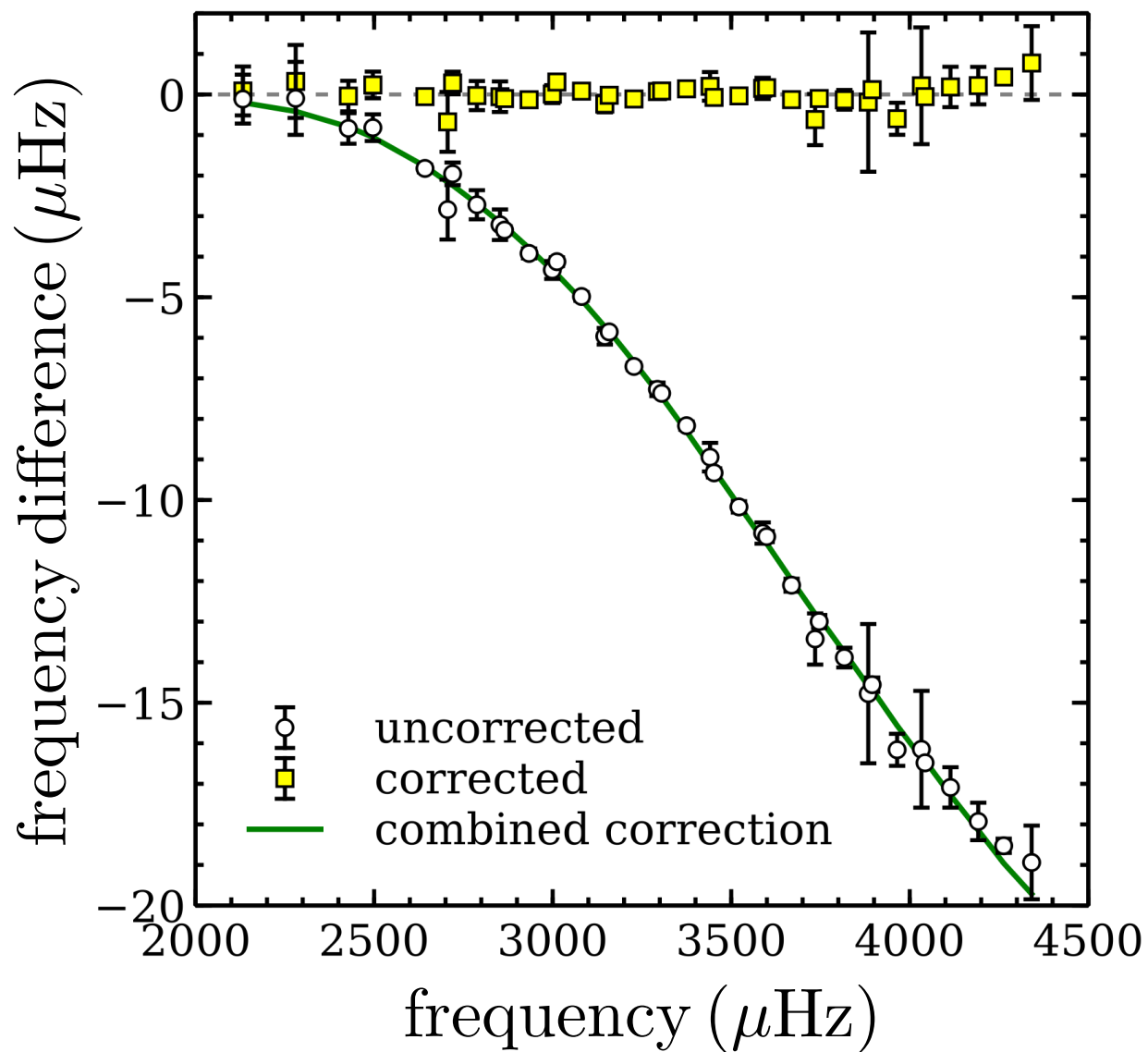
KIC 9574283

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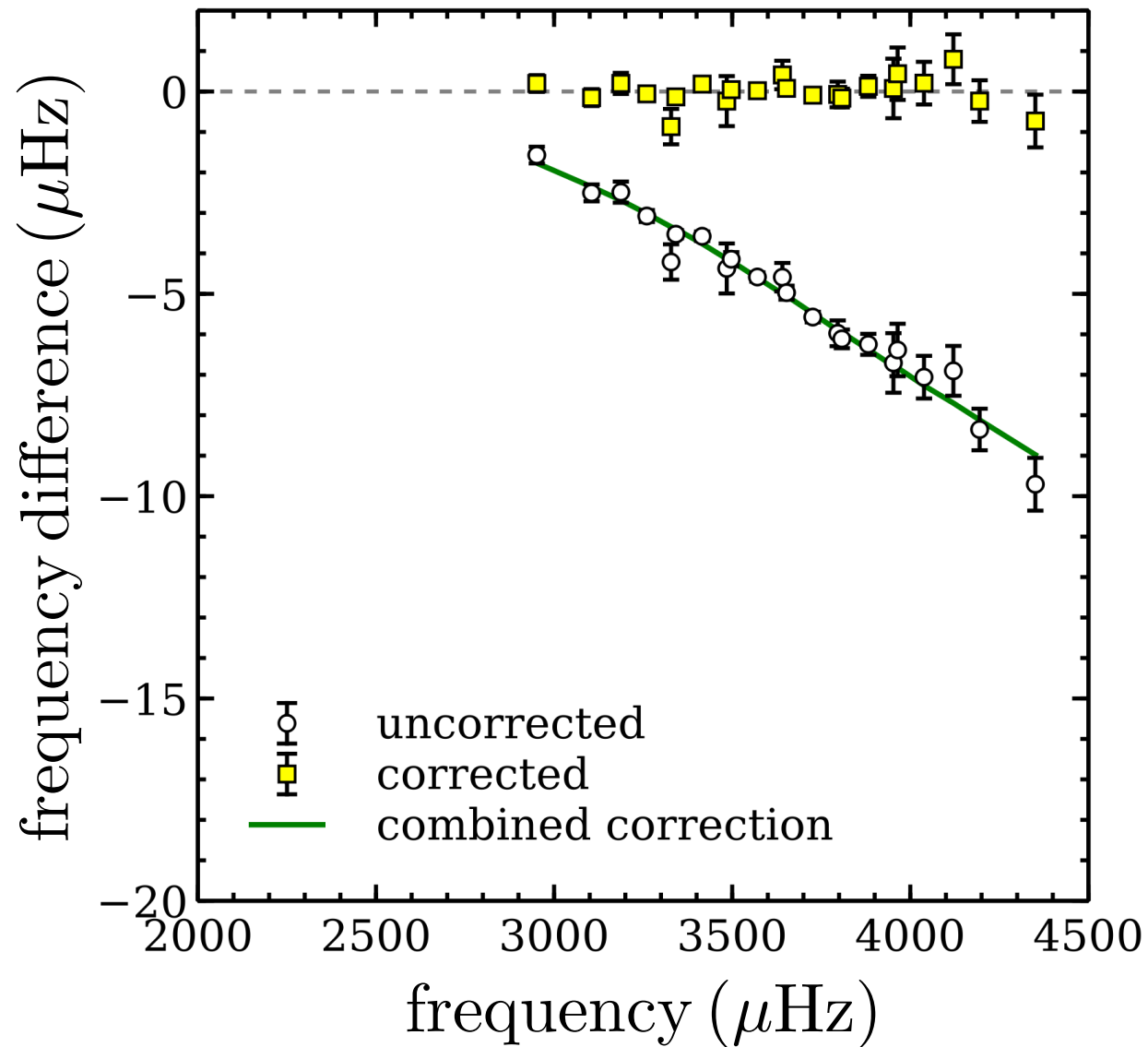
HD 176465A: free α_{MLT}

$\log g = 4.46$, $T_{\text{eff}} = 5830$ K



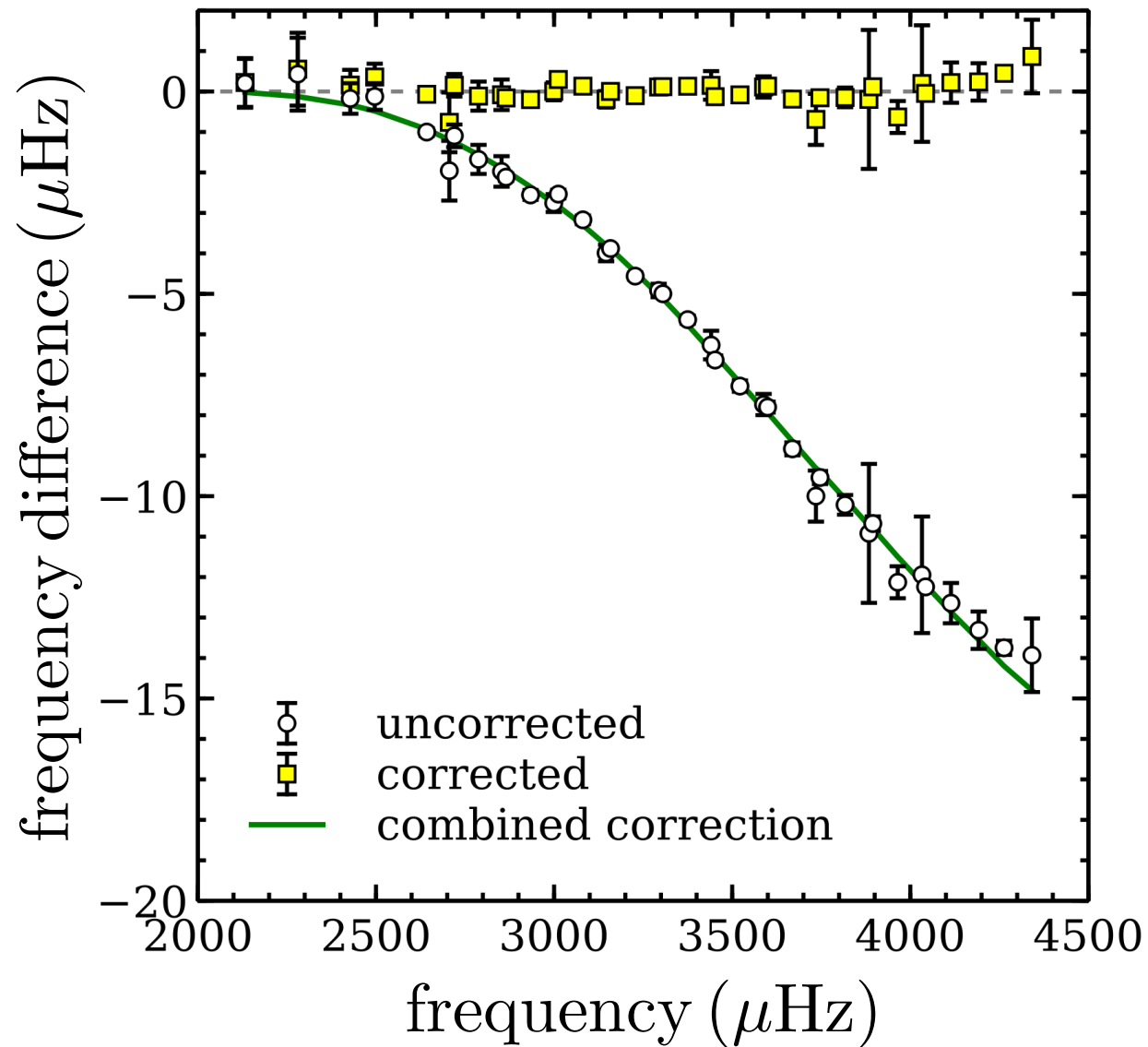
HD 176465B: free α_{MLT}

$\log g = 4.49$, $T_{\text{eff}} = 5740$ K



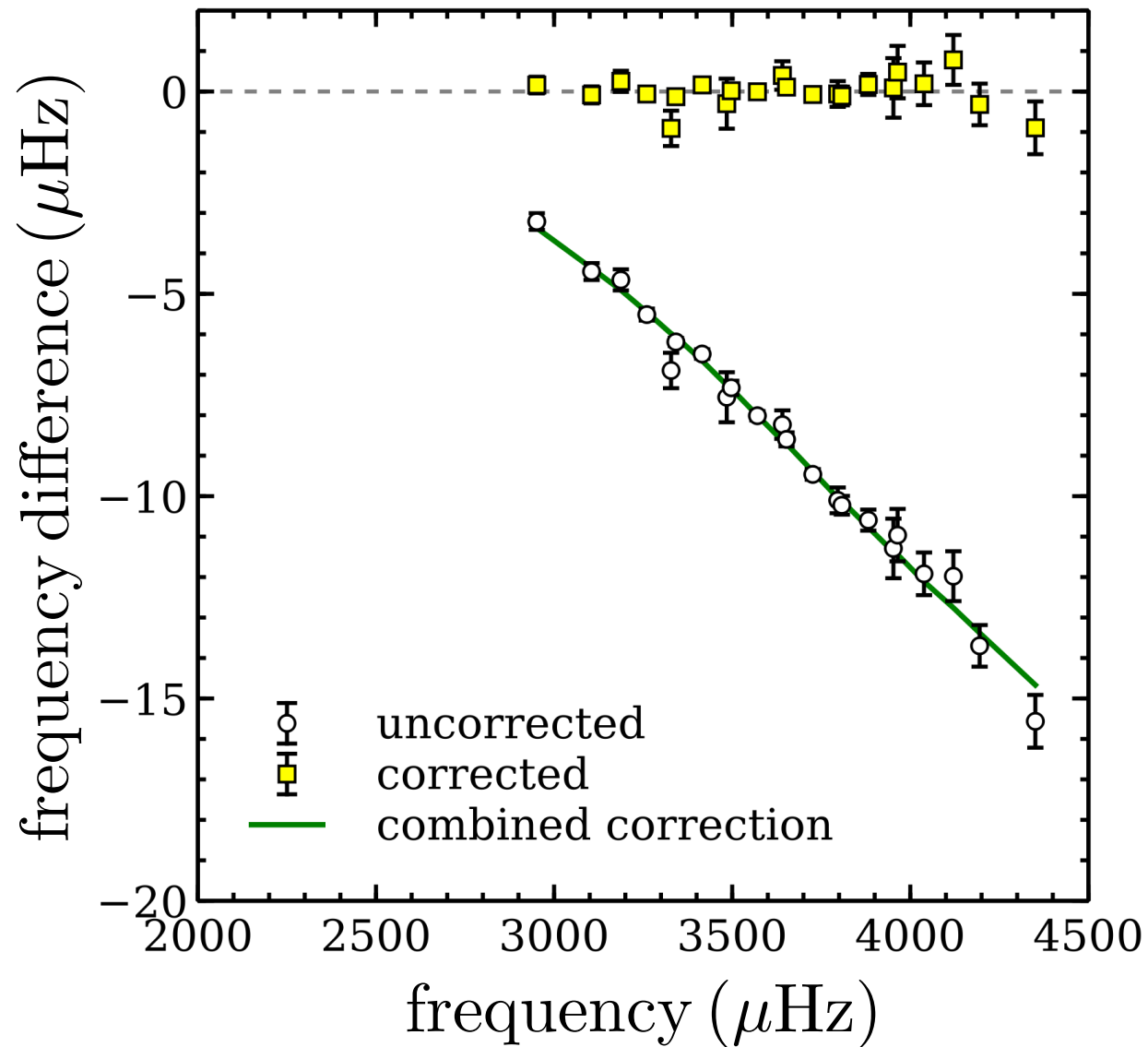
HD 176465A: solar α_{MLT}

$\log g = 4.46$, $T_{\text{eff}} = 5830$ K



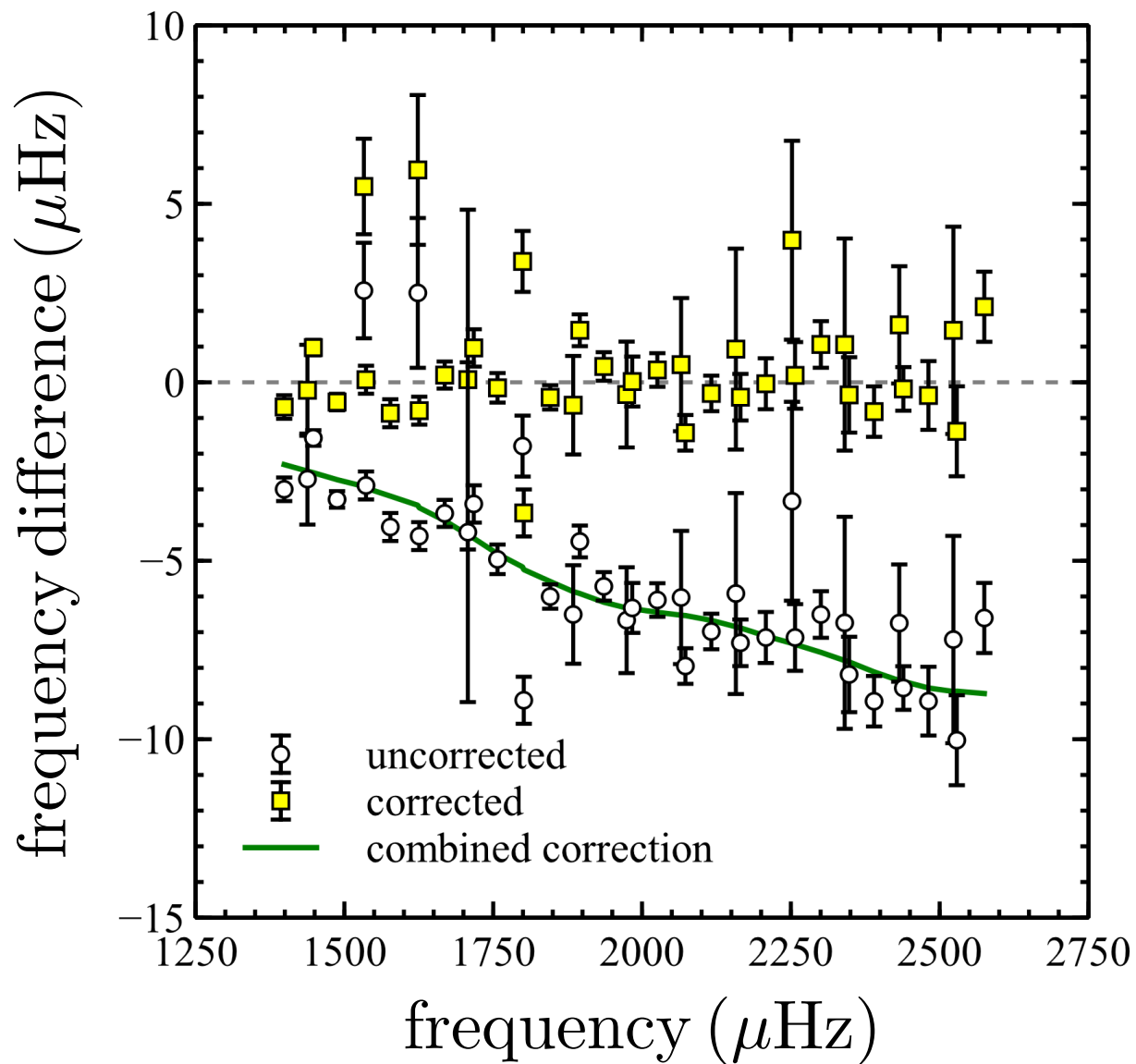
HD 176465B: solar α_{MLT}

$\log g = 4.49$, $T_{\text{eff}} = 5740$ K



KIC 11081729

$\log g = 4.27$, $T_{\text{eff}} = 6548$ K



Some remarks

- Averaged 3D simulation data can be “patched” onto 1D stellar models
but structure is only part of the problem!
- Parametrizations fit well (near Sun, certainly)
but risk of contrived parameters
and unclear what happens in F-stars