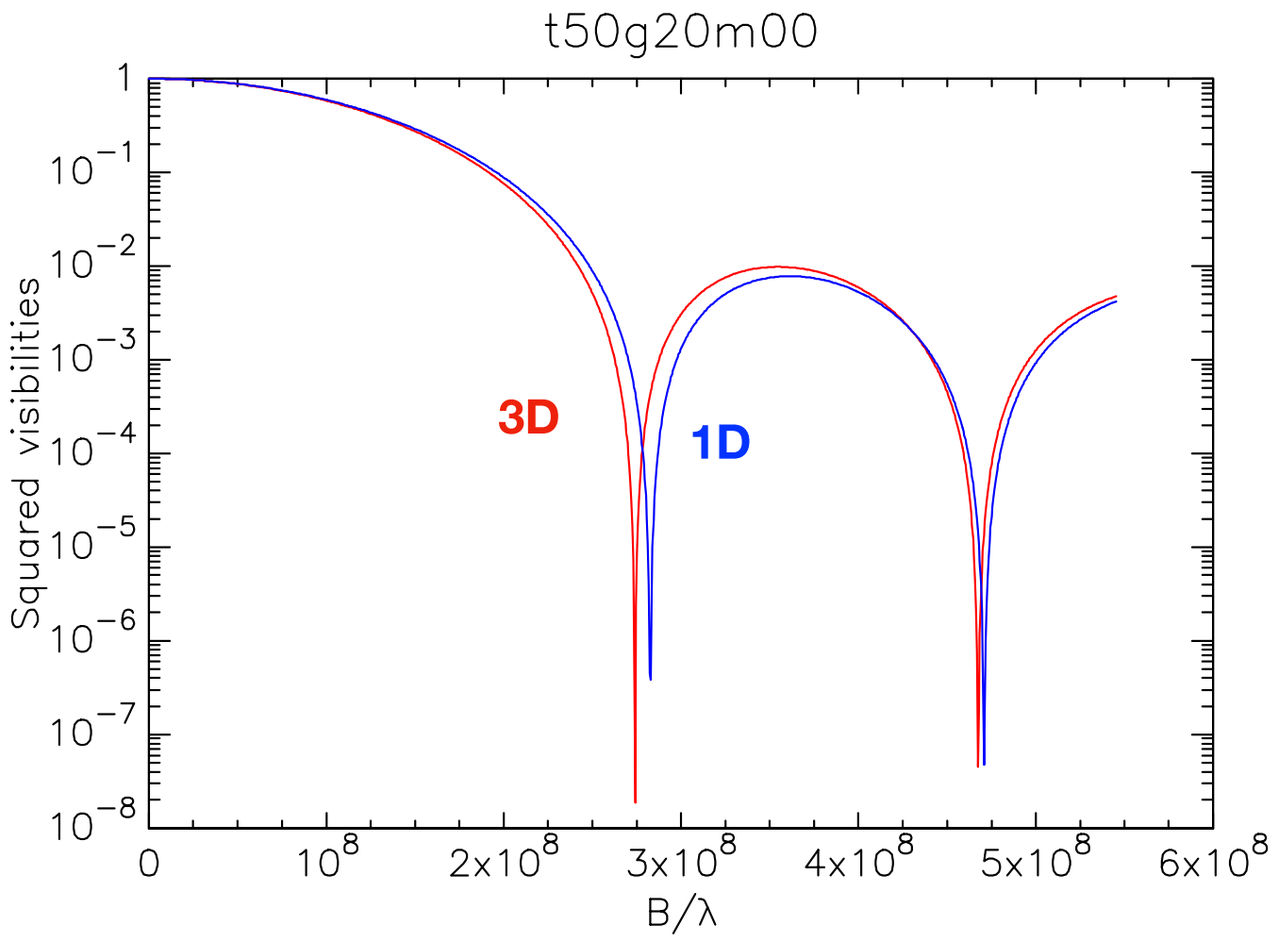
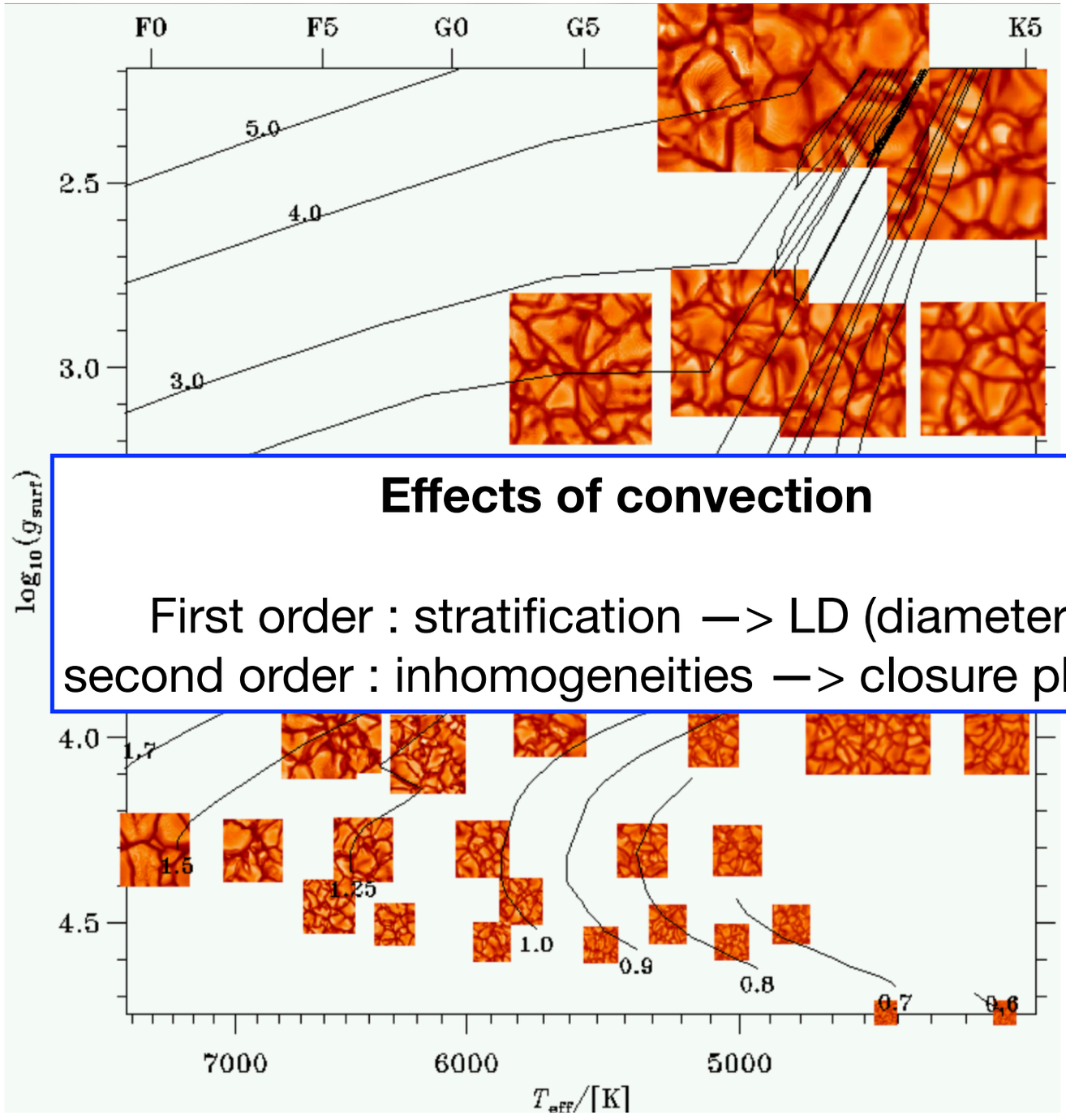
SESSION-3 : Impact of convection

L. Bigot, A. Chiavassa, T. Morel, S. Borgniet, C. Lanthermann



Impact of convection across HR diagram

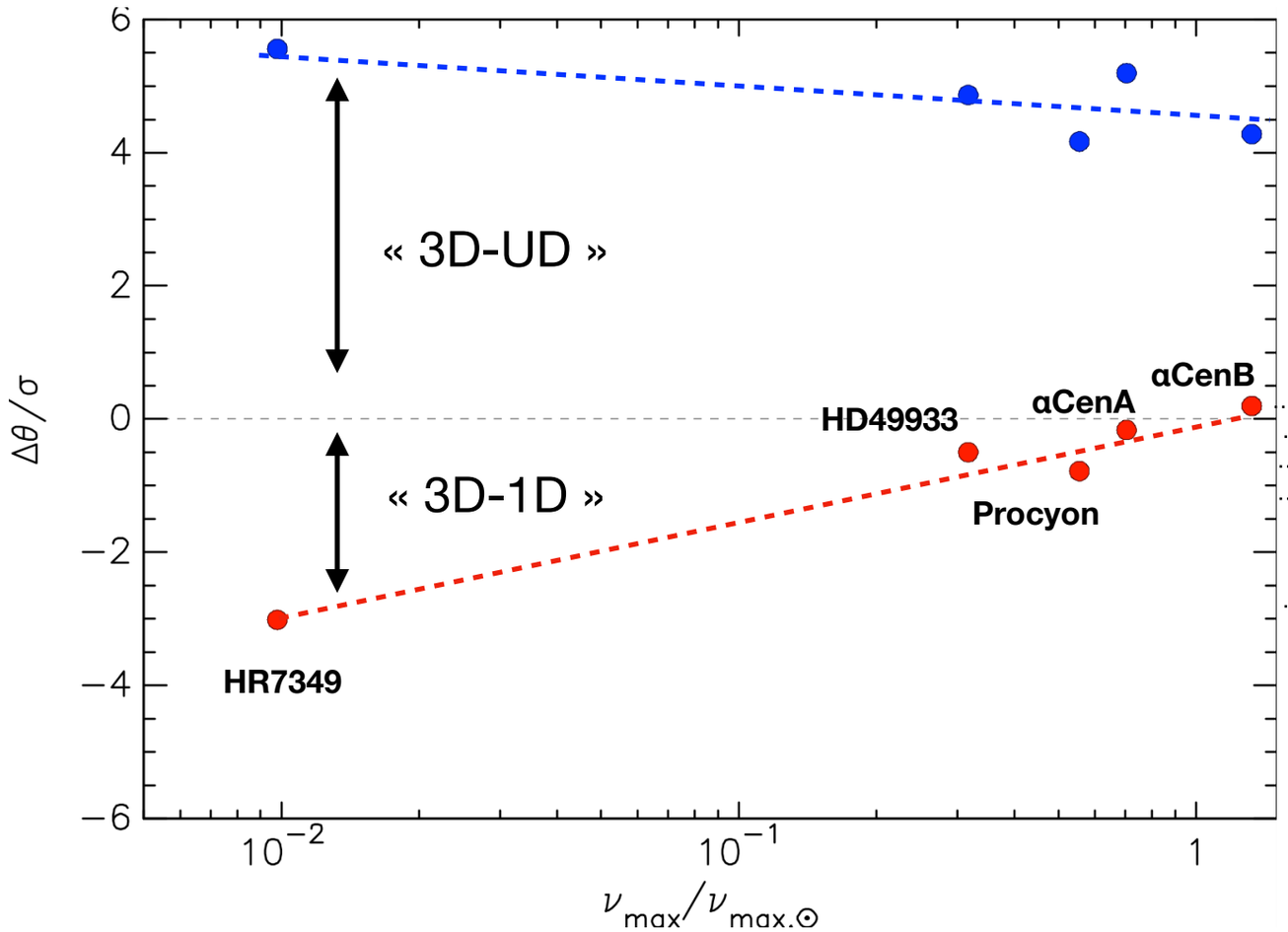


Effects of convection

First order : stratification —> LD (diameters)
second order : inhomogeneities —> closure phases

@ Regner Trampedach

Impact of convection on angular diameters



Data from

Bigot+ 2006
Kervella+ 2017
Bigot+ 2011
Chiavassa, +2012

Bigot+ in prep

General rule : $\theta_{\rm UD} < \theta_{\rm 3D} < \theta_{\rm 1D}$

Bigot et al. (in prep)

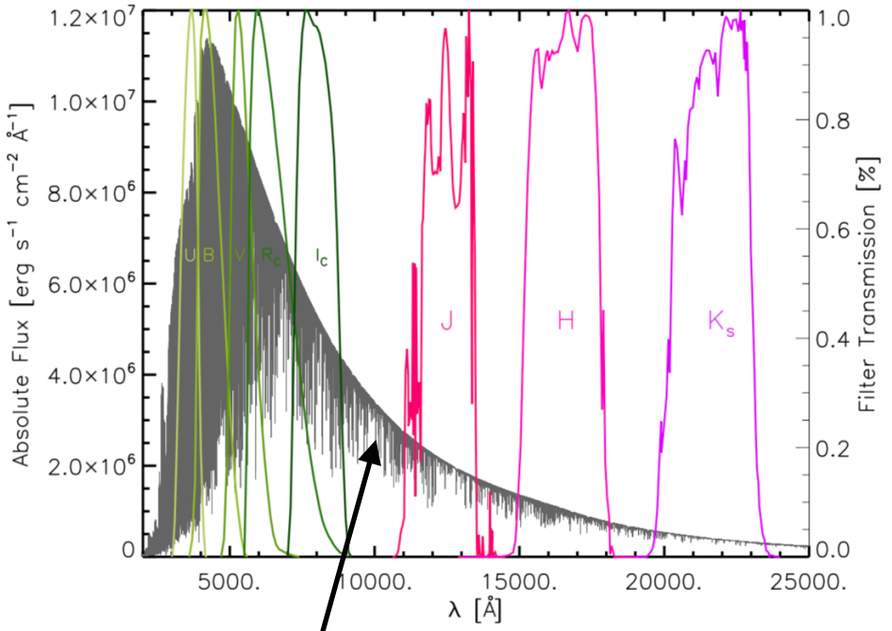
Impact of convection on surface brightness

$$\theta = \mathcal{F}(V, K)$$

3D corrections on θ

3D corrections on colors

Work in progress ….
… but probably small effect



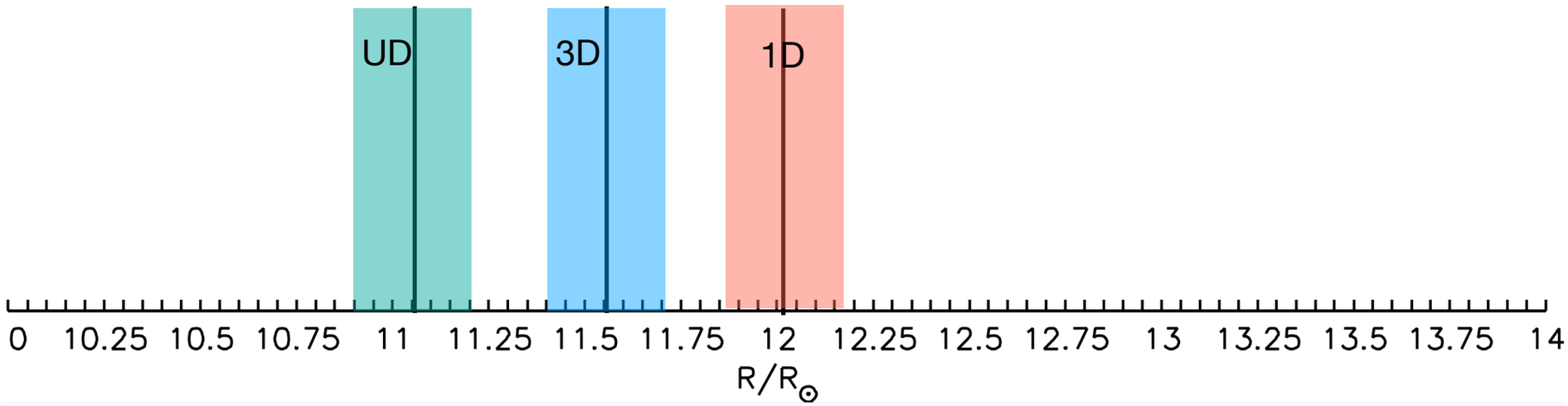
3D/1D spectra

Constraining convection (3D) with interferometry …

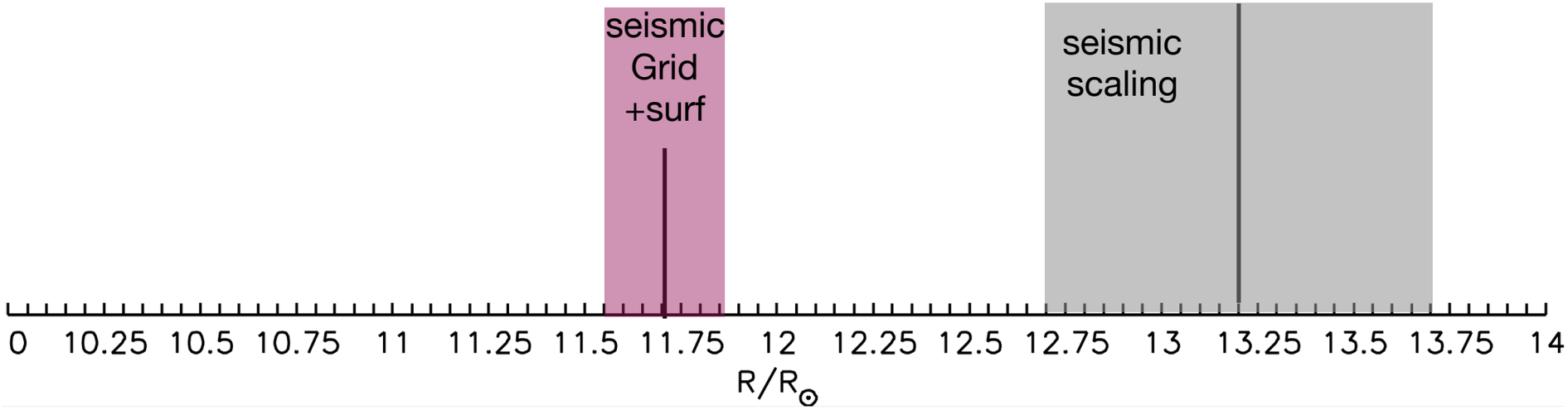
… by measuring angular diameters ?

HR7349 Red Giant (K1III)

VEGA +Gaia (DR2)

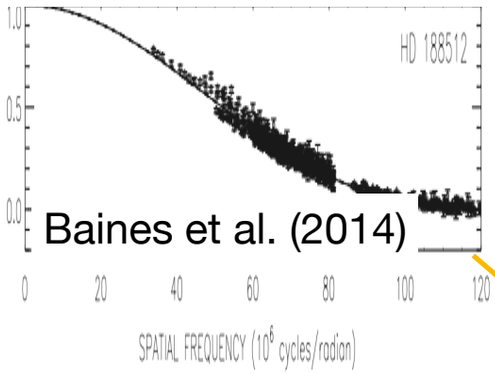


COROT

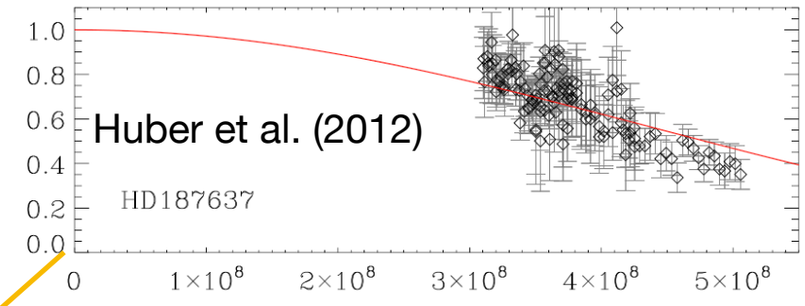


Bigot et al. (VEGA Team) (in prep)

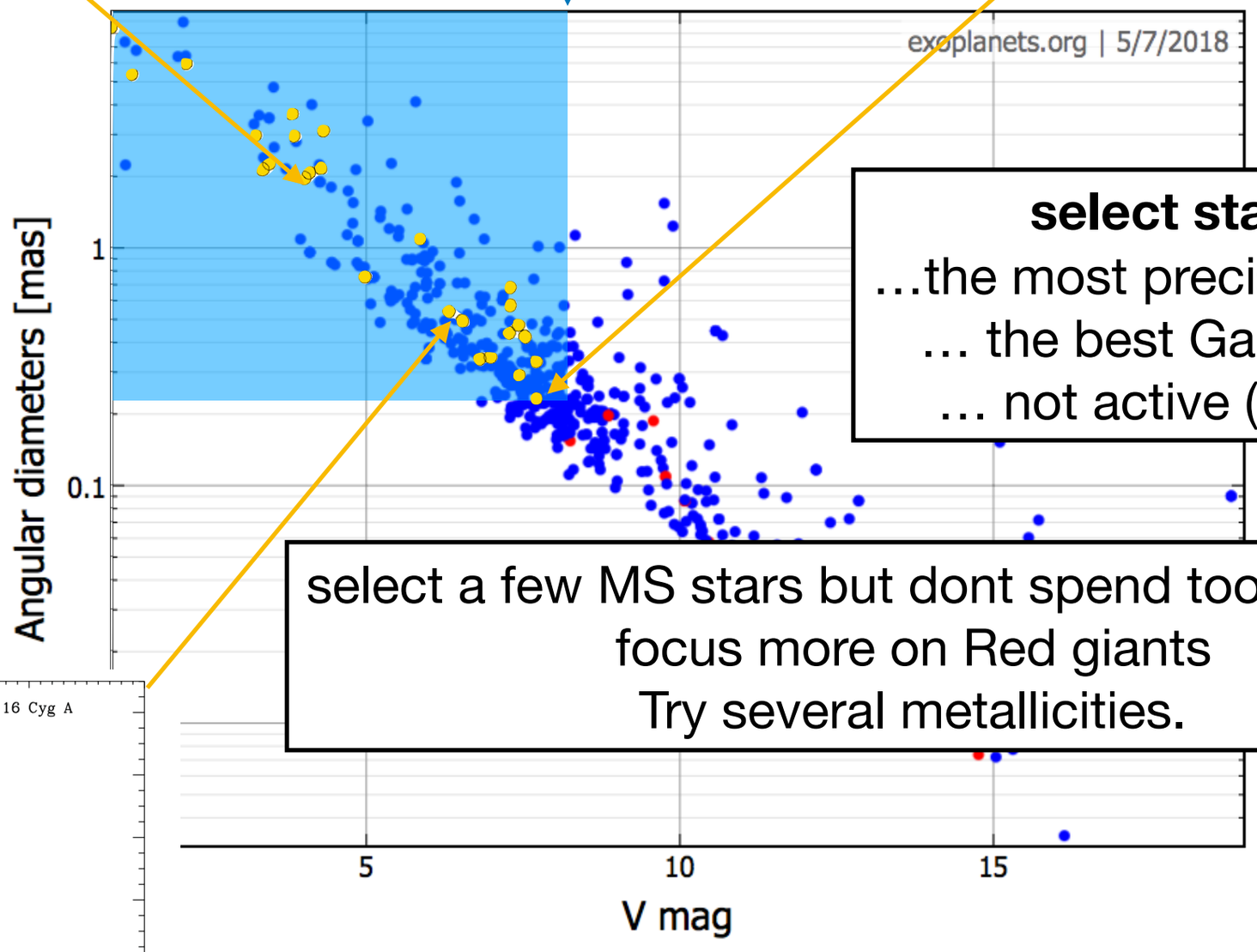
selections of 200 stars for SPICA … to test convection….?



Magnitude limit ~ 7.5



Angular size limit ~0.2 mas



select stars with

…the most precise frequencies

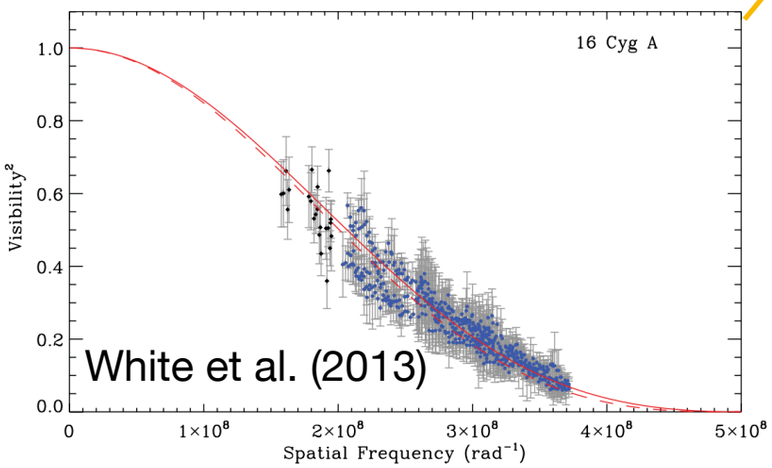
… the best Gaia parallaxes

… not active (check H&K)

select a few MS stars but dont spend too much time

focus more on Red giants

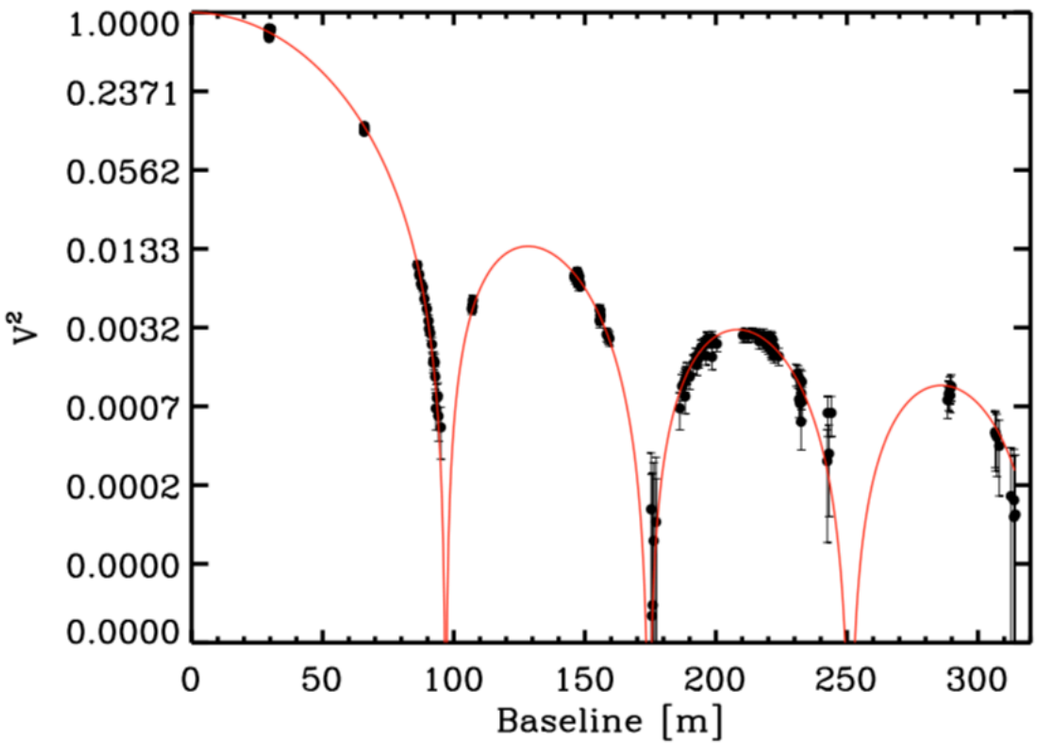
Try several metallicities.

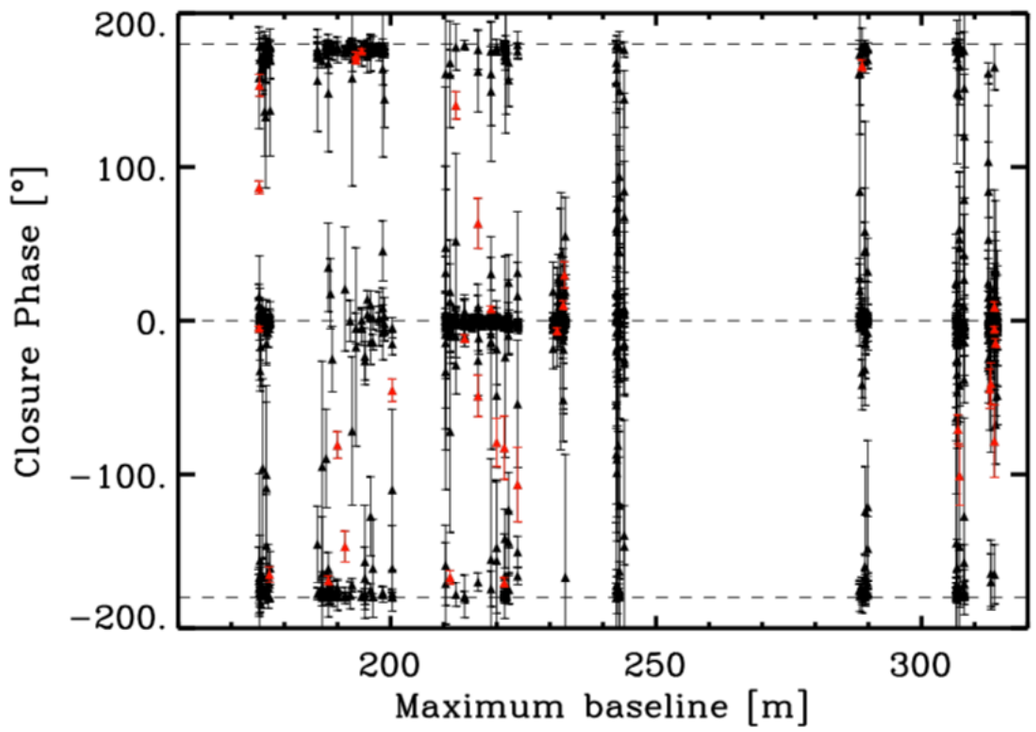


Constraining convection (3D) with interferometry …

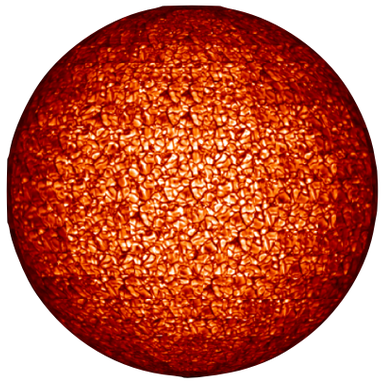
… a more direct constraint on convection

Closure Phases





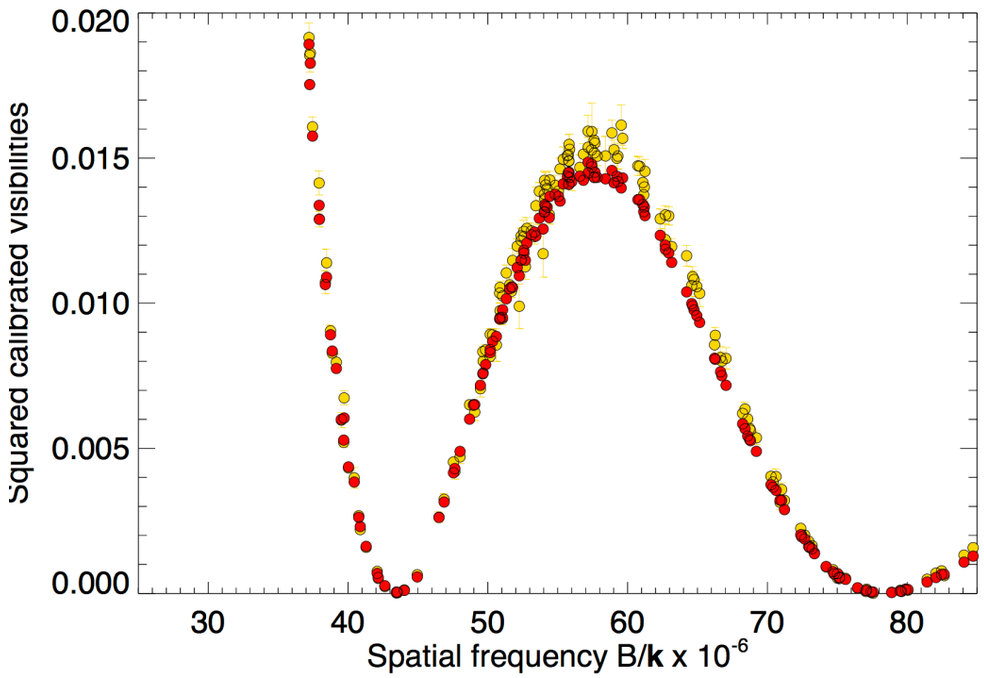
K2III- red giant



Chiavassa et al. (2017)

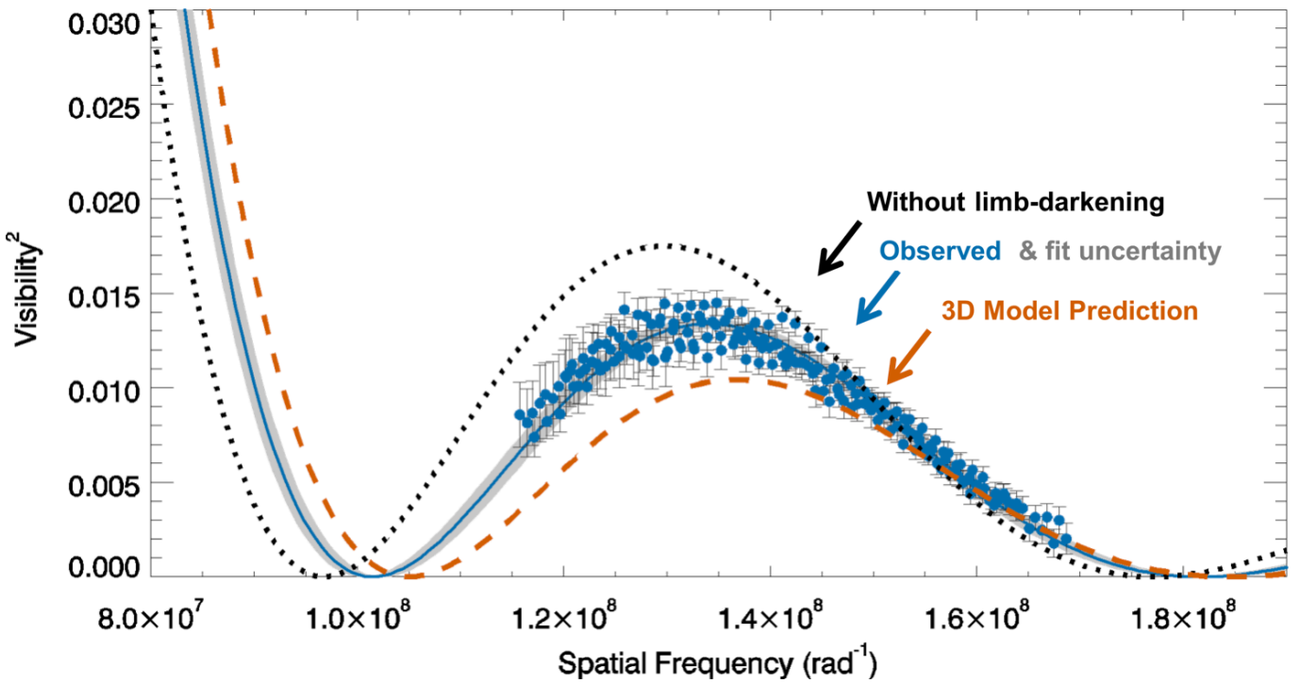
Can we trust in 3D models …

dwarf K0 αCenB



(adapted from Kervella et al. 2017)

subgiant K0 η Cep

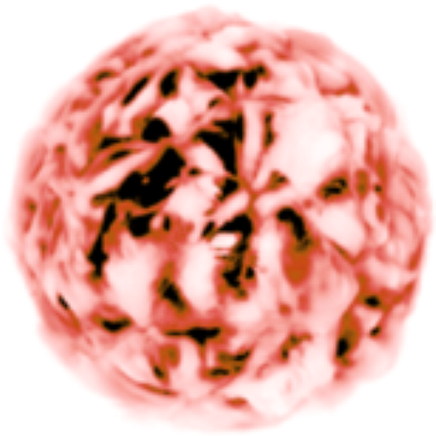


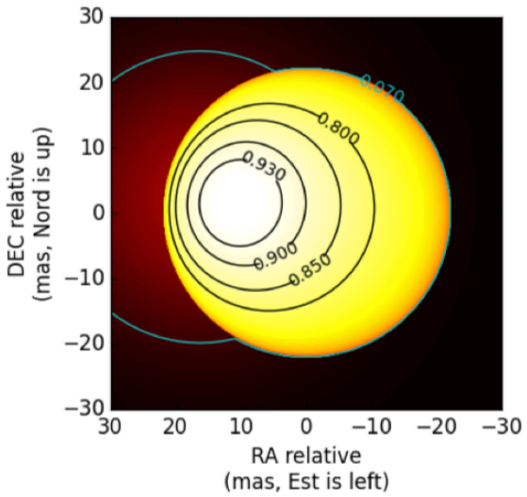
(White et al. in prep)

3D models produce too strong limb darkened intensities

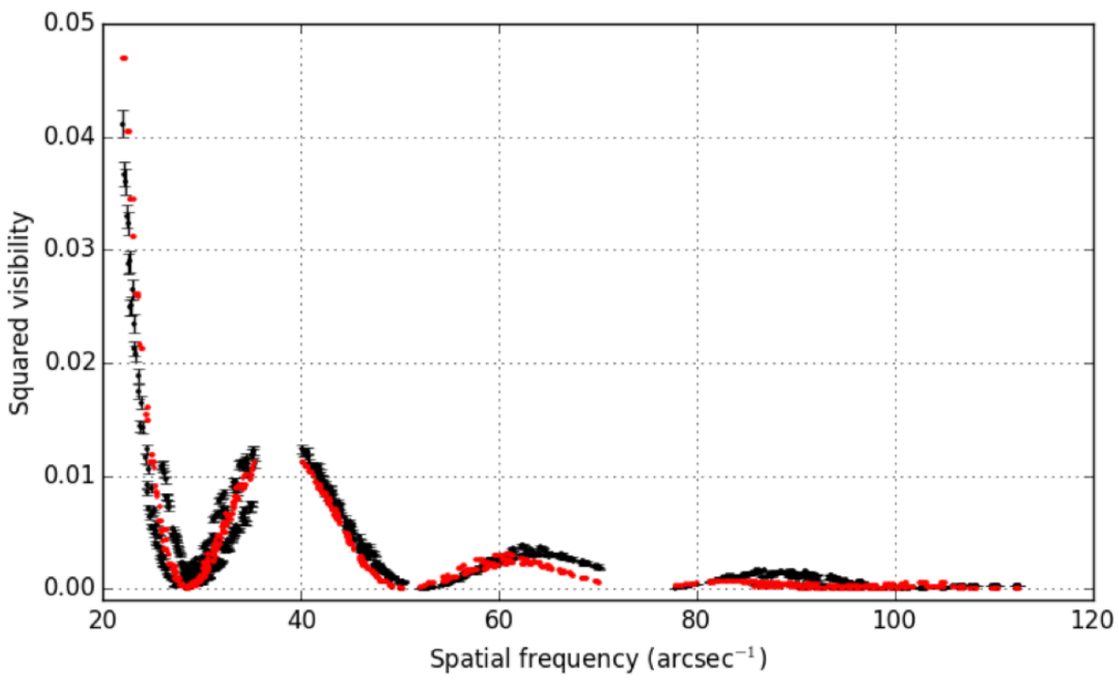
Can we trust in 3D models …

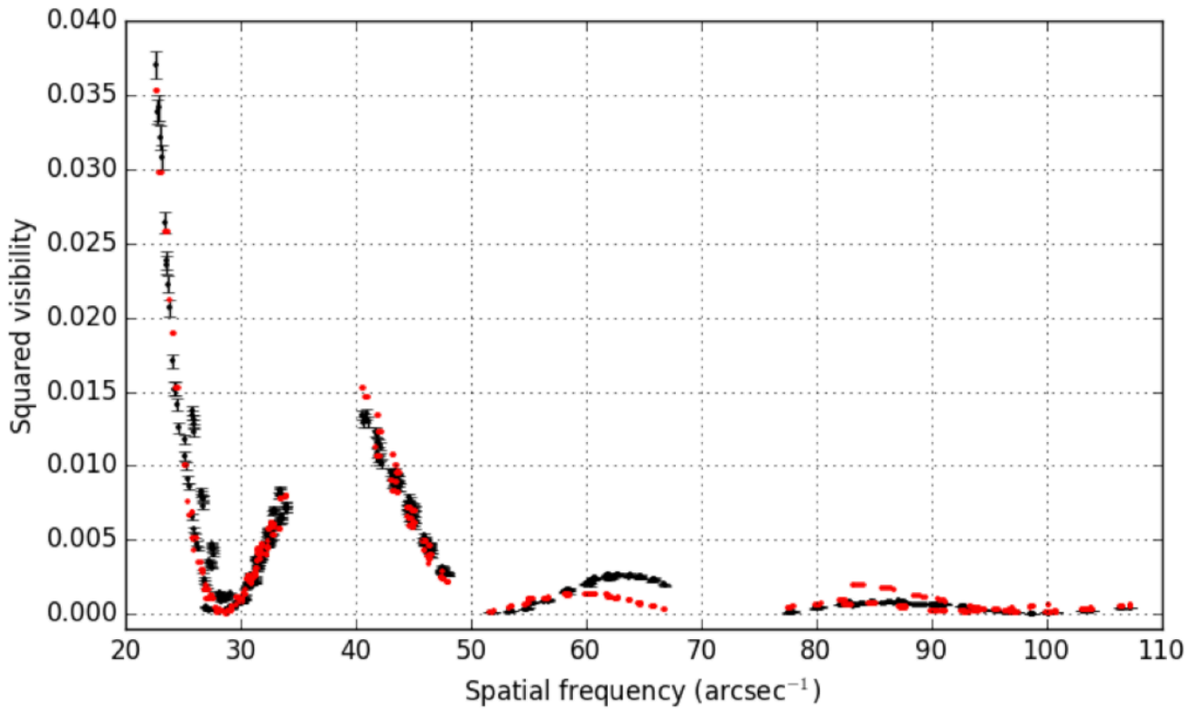
Betelgeuse





More evolved … more challenging …



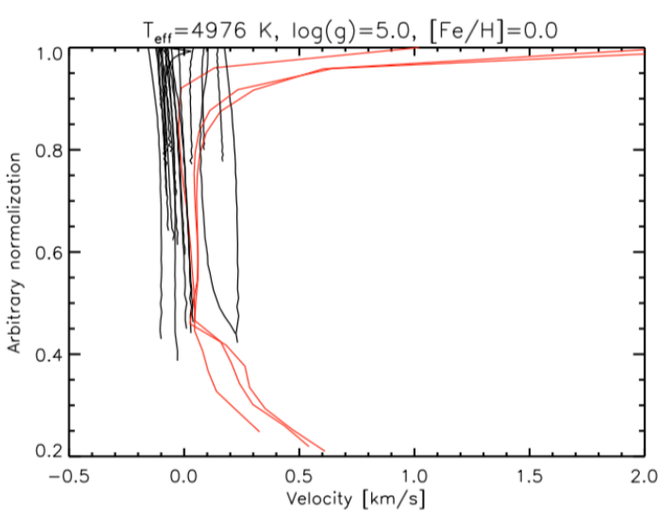


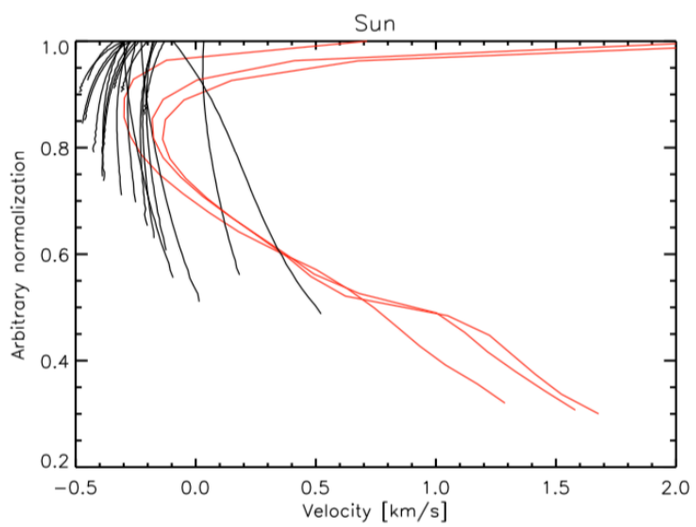
… need of monitoring
… with CHARA baseline, limited to 2-3 mas

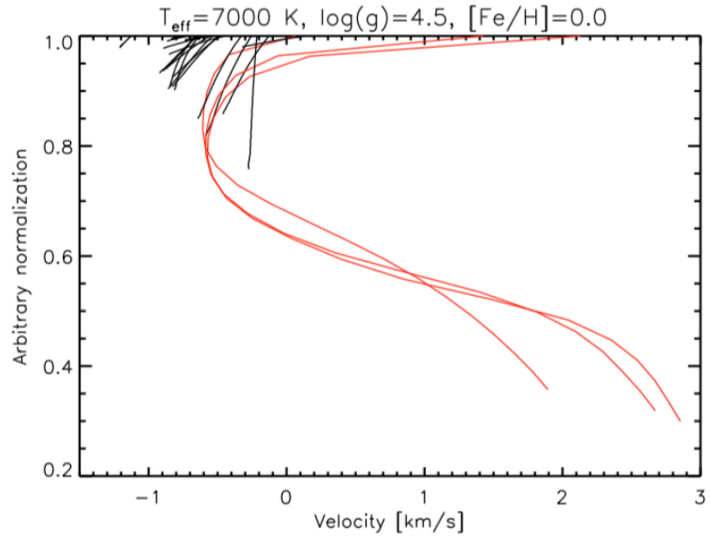
Montarges et al. (2017)

Complementary techniques

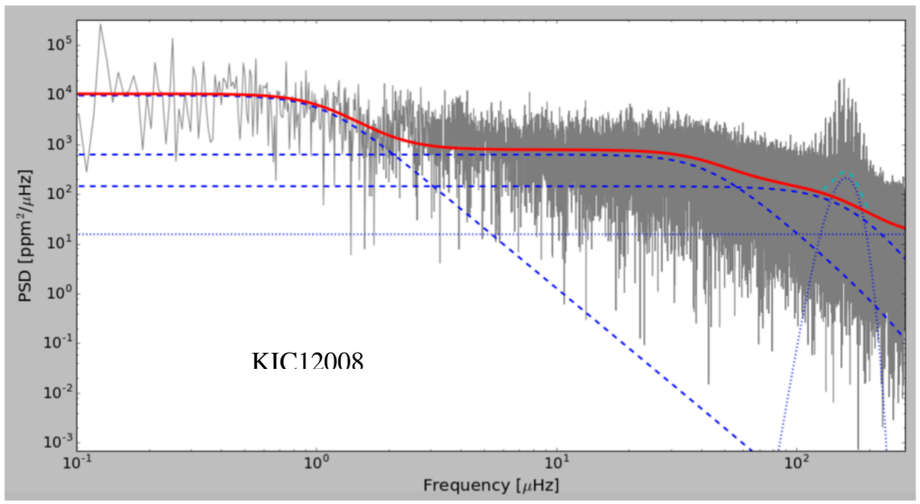
High resolution spectroscopy (> 80000) : bisectors







Power spectrum of light curves (KEPLER, TESS, PLATO …)



P-mode linewidths