Simultaneous seismic modelling of multiple stars using correlated parameters

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Astronomy & Astrophysics

Kepler observations of the asteroseismic binary HD 176465

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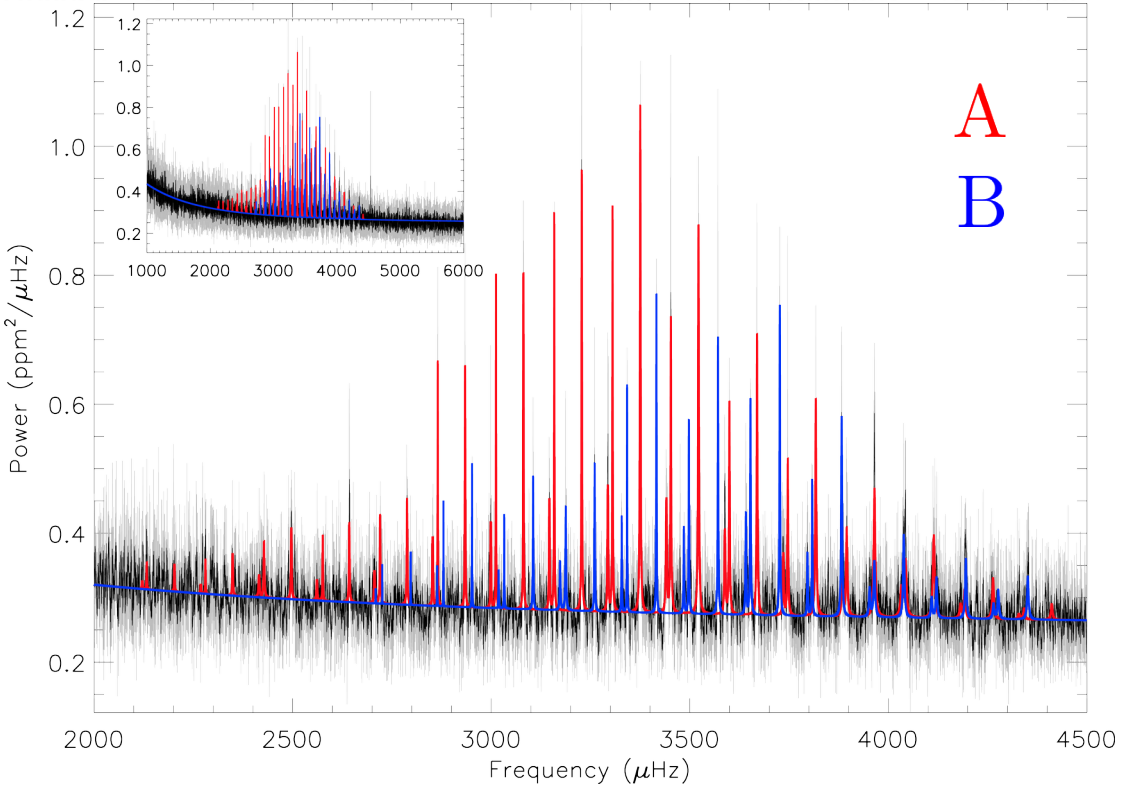

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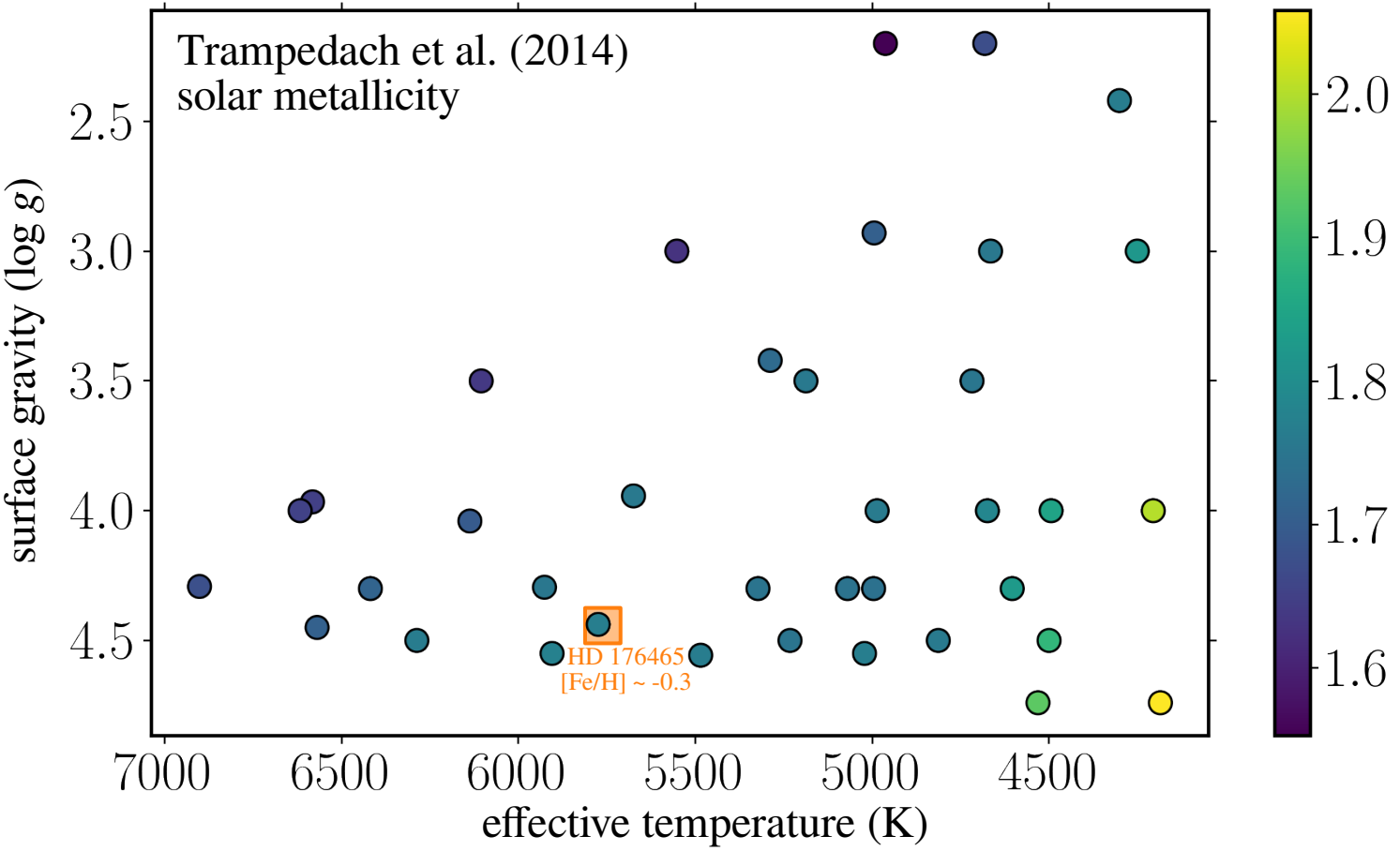
	A	B	
$M/M_\odot$	0.95 ± 0.03	1.02 ± 0.07	primary ↔ secondary
t/Gyr	3.2 ± 0.2	2.9 ± 0.4	
α	1.57 ± 0.11	2.05 ± 0.28	α totally different

α from calibration to simulations



Between two common extremes

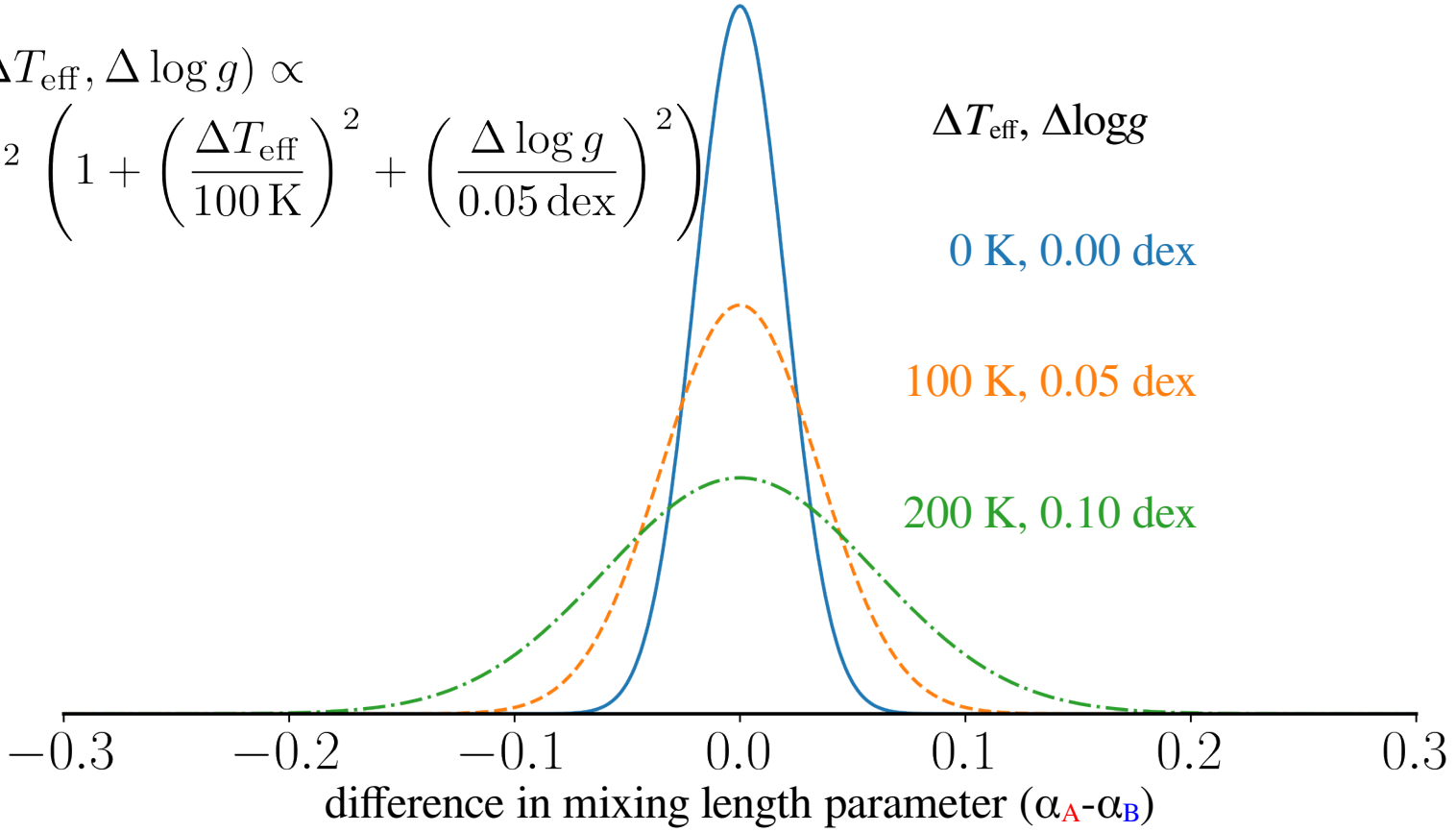
$\alpha = \alpha_{\odot}$

similar stars should have similar α

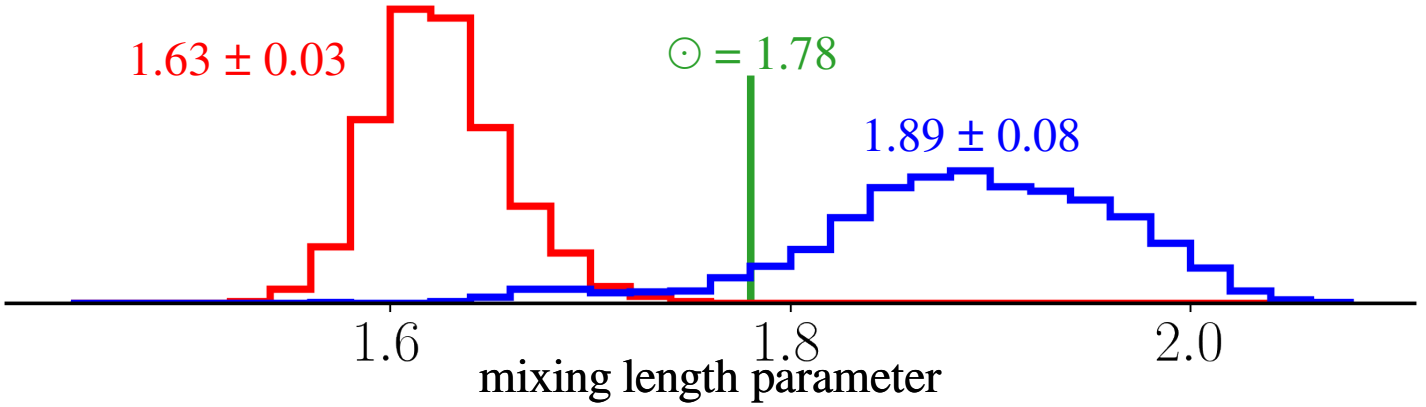
α free
(within a grid)

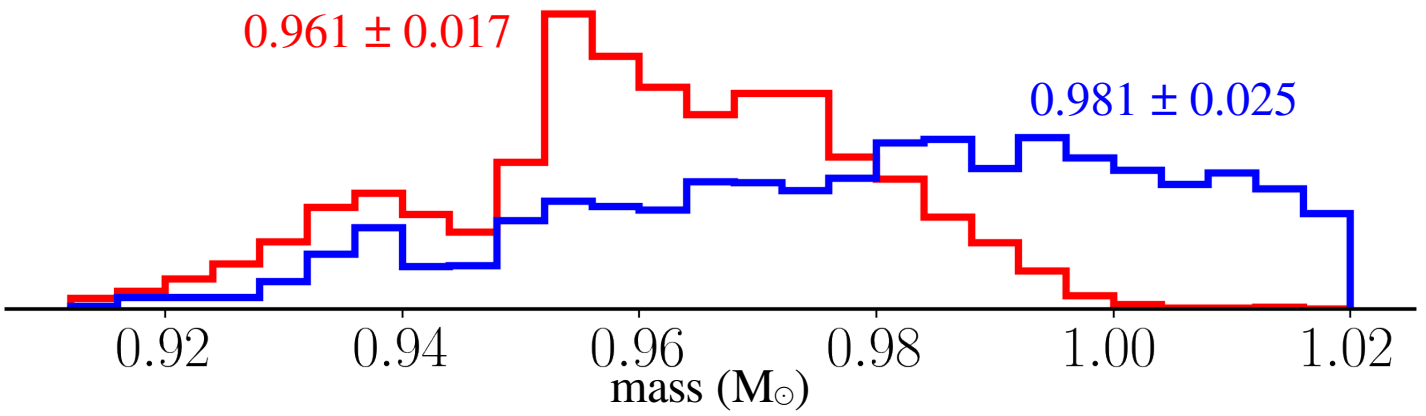
Similar stars should have similar $\alpha_{\rm MLT}$

$$\log P_\alpha(\Delta T_{\rm eff}, \Delta \log g) \propto 0.02^2 \left(1 + \left(\frac{\Delta T_{\rm eff}}{100\,{\rm K}}\right)^2 + \left(\frac{\Delta \log g}{0.05\,{\rm dex}}\right)^2\right)$$

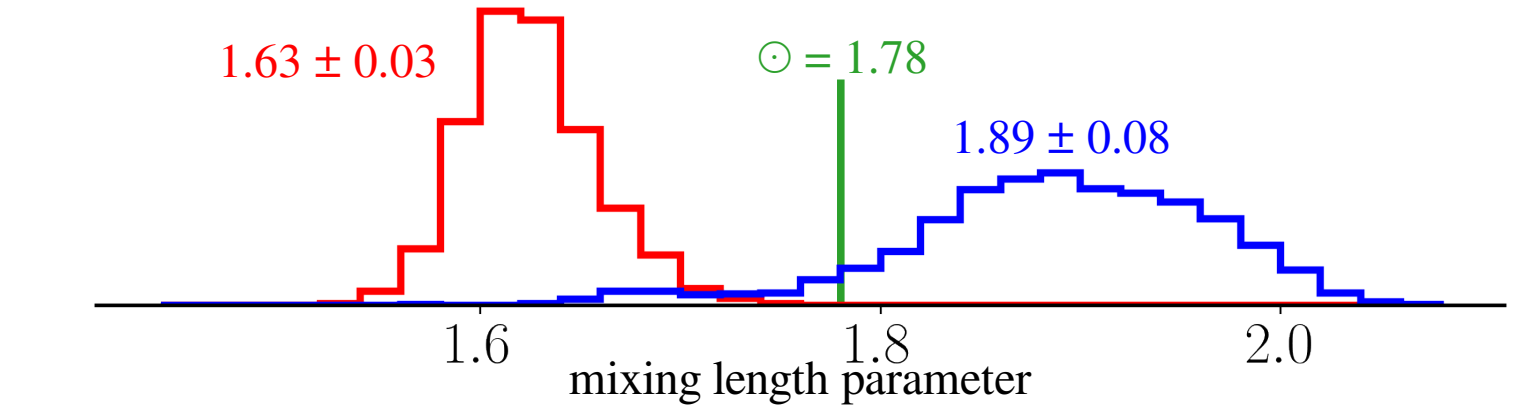


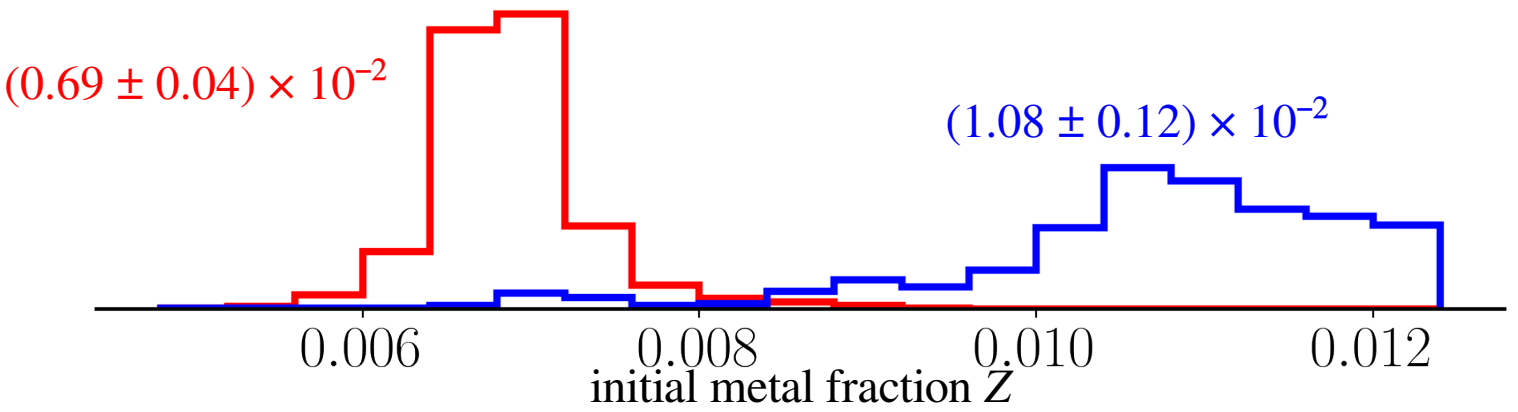
α_{MLT} free to vary



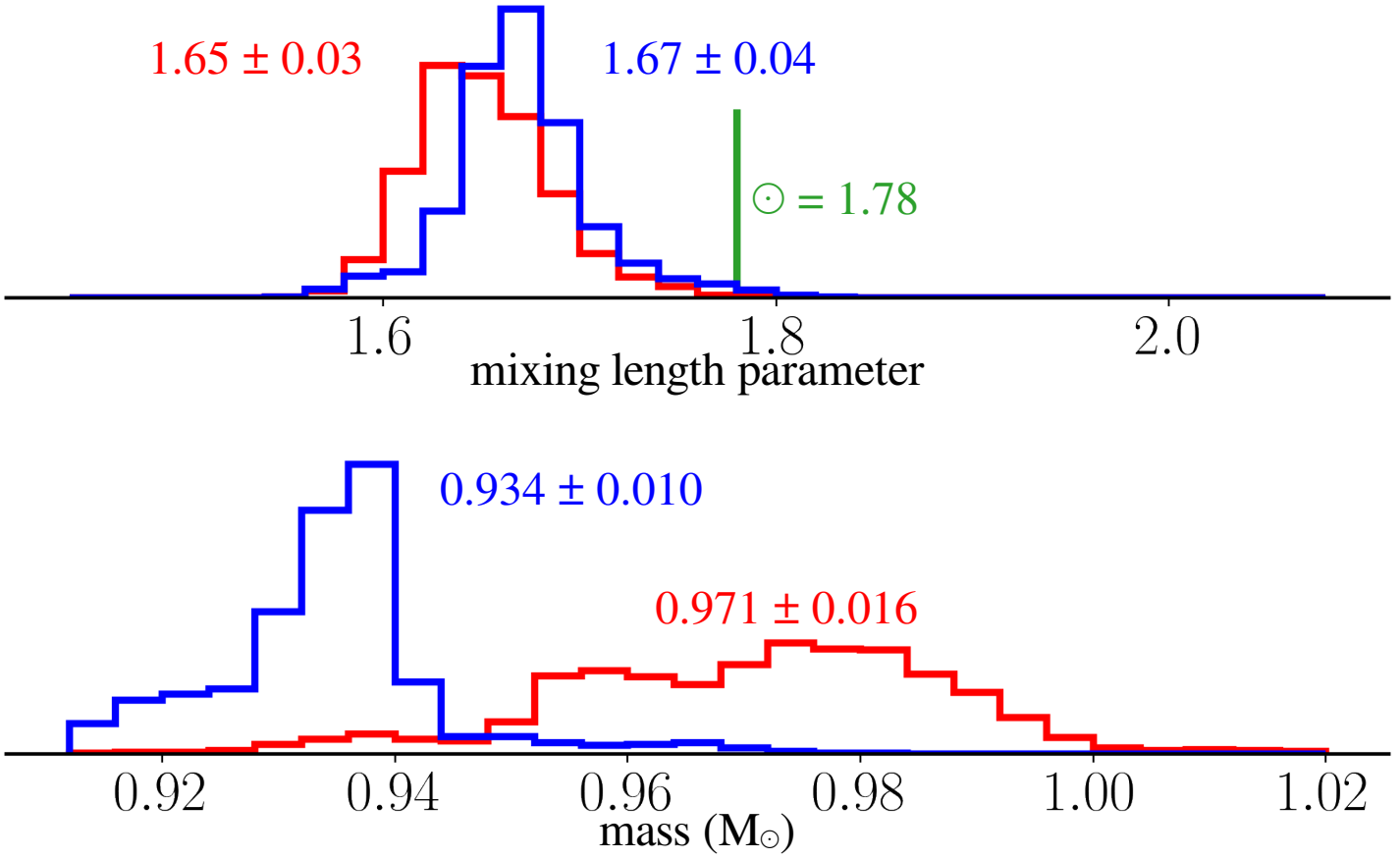


α_{MLT} free to vary

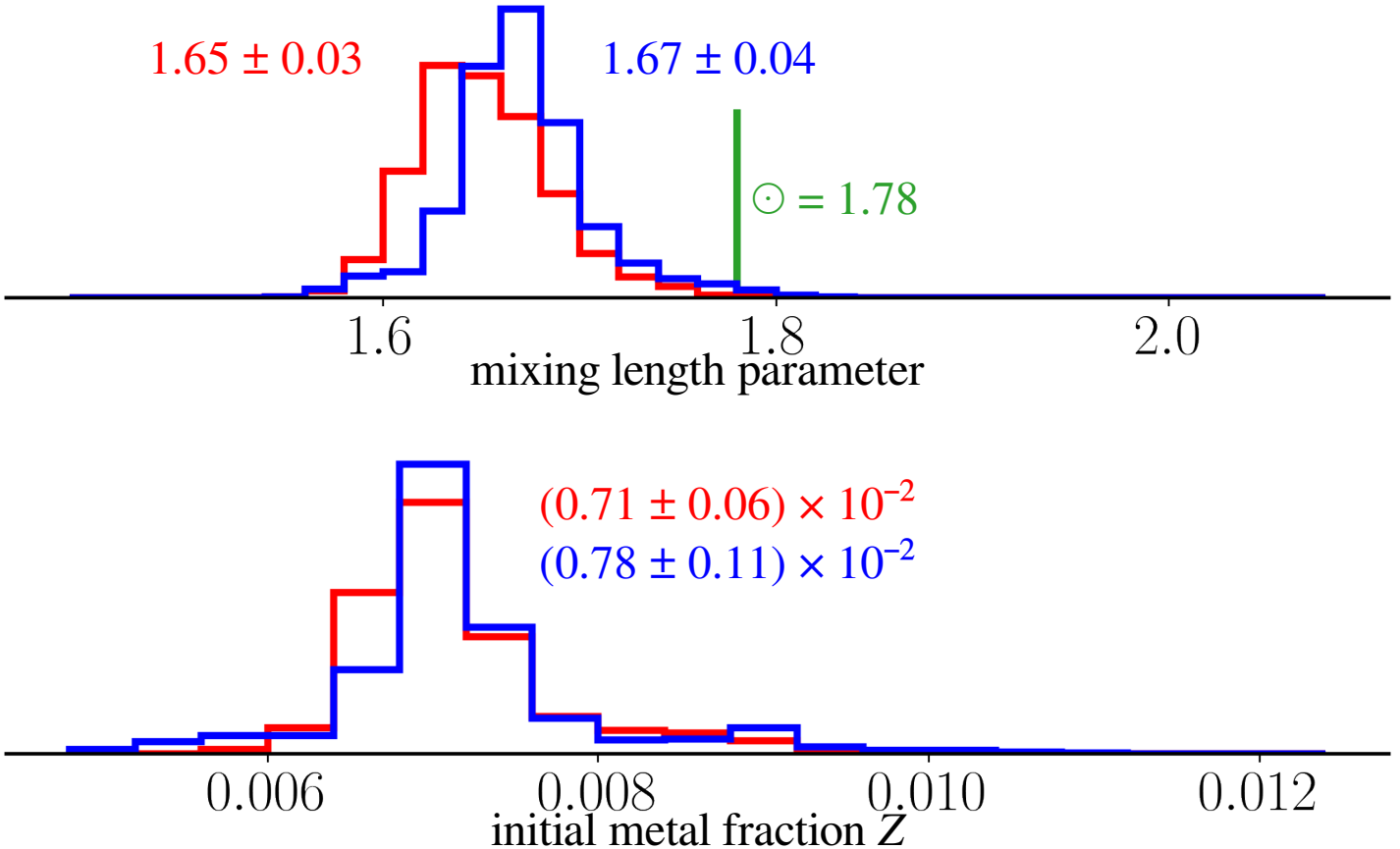




α_A similar to α_B



α_A similar to α_B



Looking ahead

- Scalability? How many stars can one constrain simultaneously?
- Does parameter space blow up?
- Other parameters (e.g. overshooting)?

Similar stars should have similar $\alpha_{\rm MLT}$

$$\log P_\alpha(\Delta T_{\rm eff}, \Delta \log g) \propto 0.02^2 \left(1 + \left(\frac{\Delta T_{\rm eff}}{100\,{\rm K}}\right)^2 + \left(\frac{\Delta \log g}{0.05\,{\rm dex}}\right)^2\right)$$