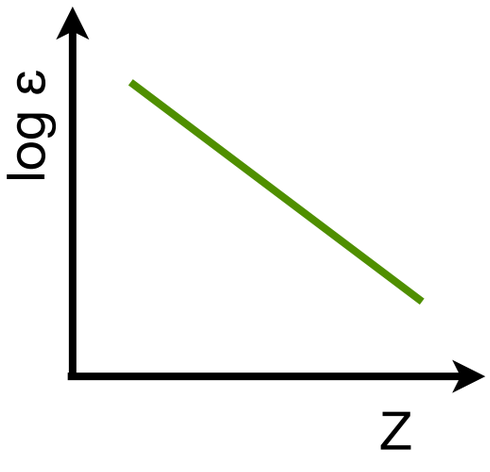
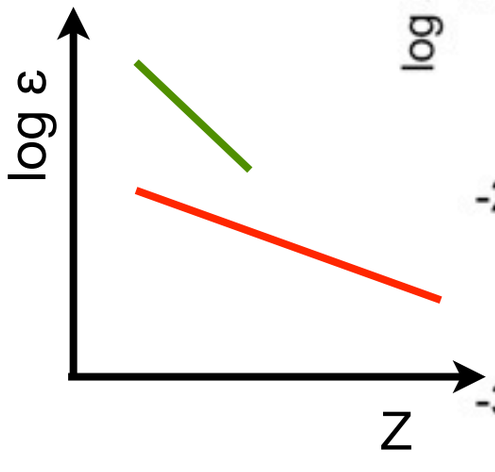
Lighter heavy elements: Sr - Ag

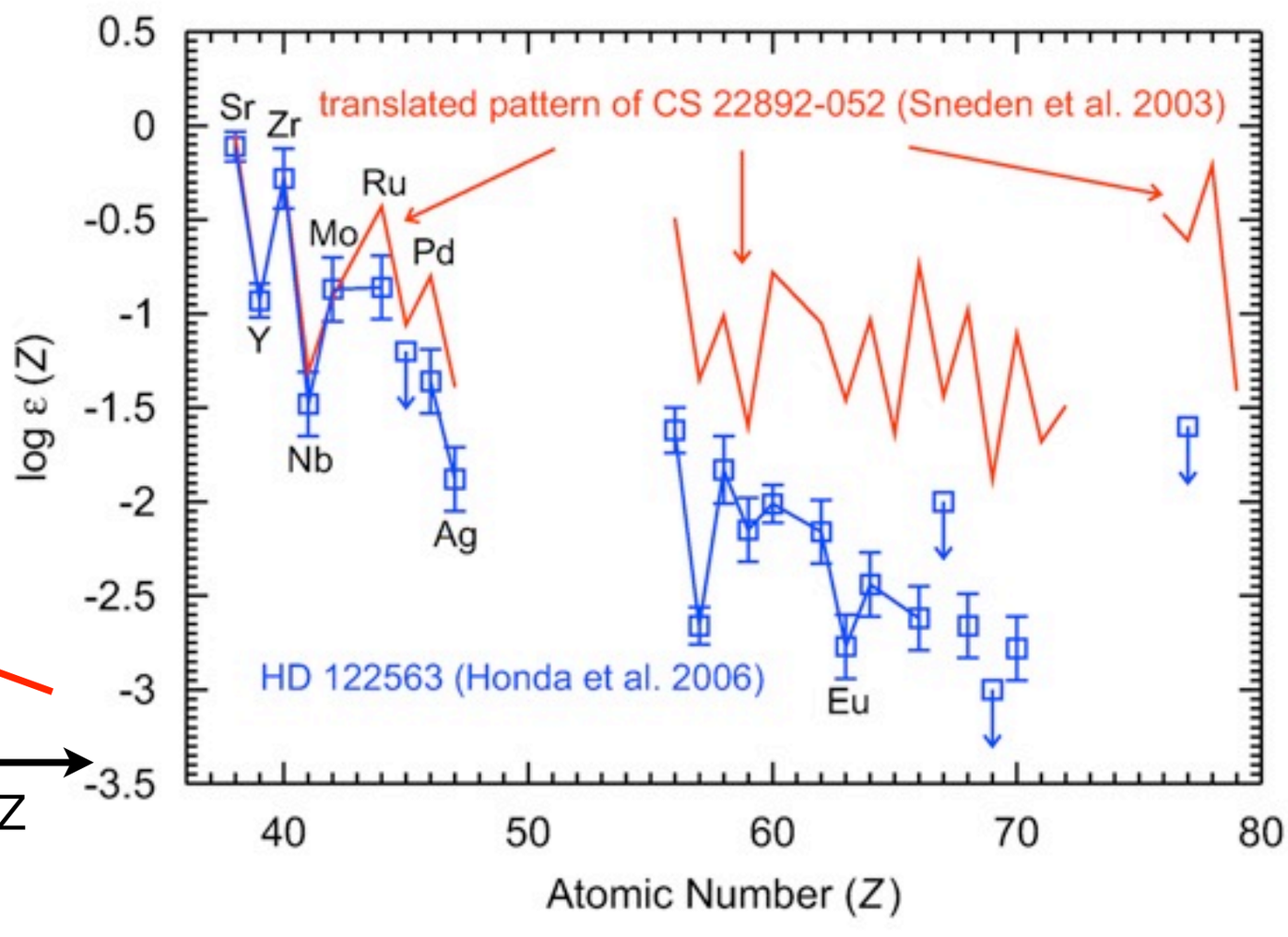
Ultra metal-poor stars with high and low enrichment of heavy r-process nuclei suggest: at least two components or sites (Qian & Wasserburg):

Are Honda-like stars the outcome of one nucleosynthesis event or the combination of several?



or





Travaglio et al. 2004: solar=r-process+s-process+LEPP
Montes et al. 2007: solar LEPP ~ UMP LEPP → unique

Nucleosynthesis components

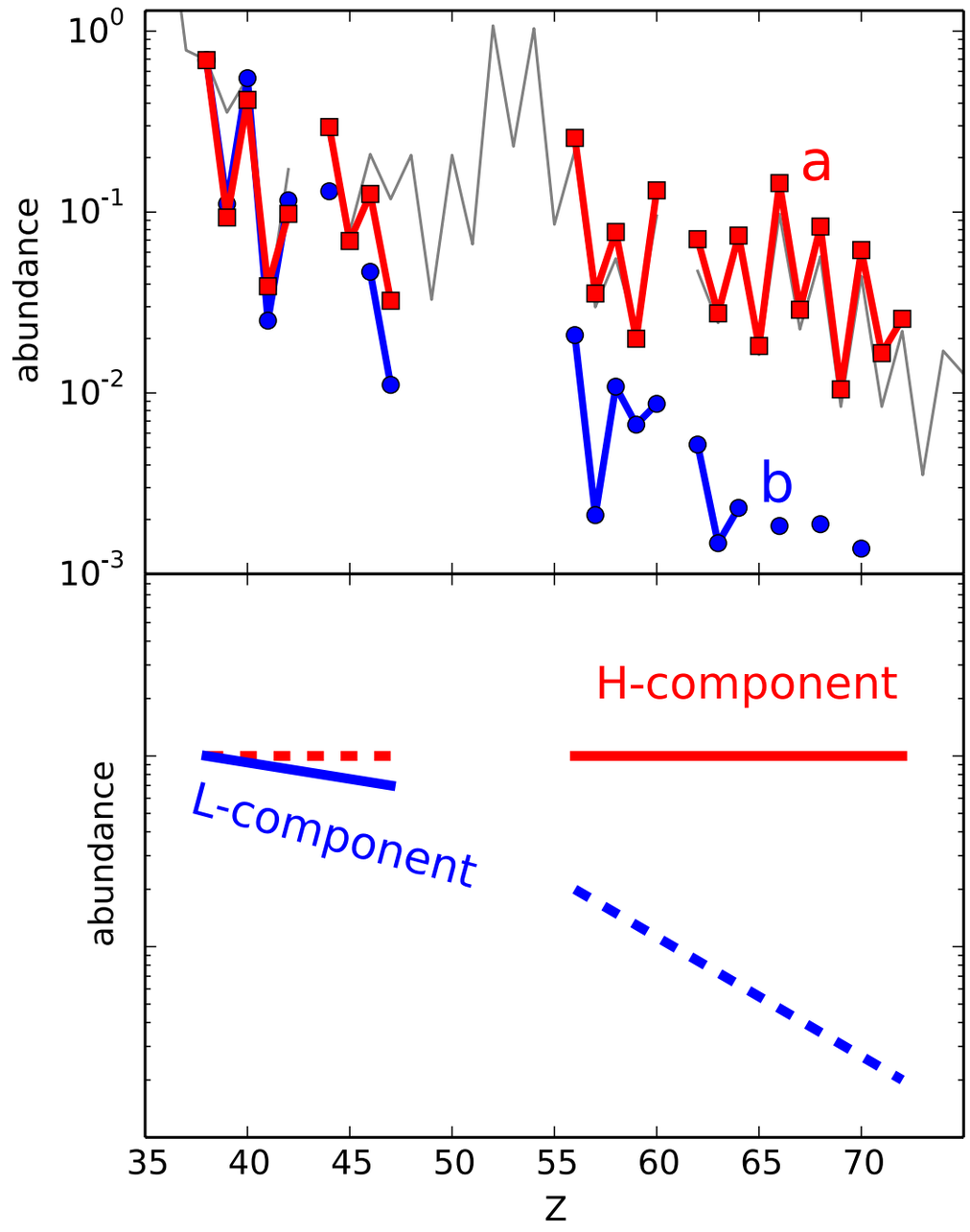
C.J. Hansen, Montes, Arcones 2014

L and H-components based on 3 methods:

M1: L-component = Honda star
H-component= Sneden star

M2: L-component = Honda - Sneden
H-component = Sneden

M3: iterative method (Li et al. 2013)
L-component = L - H
H-component = H - L

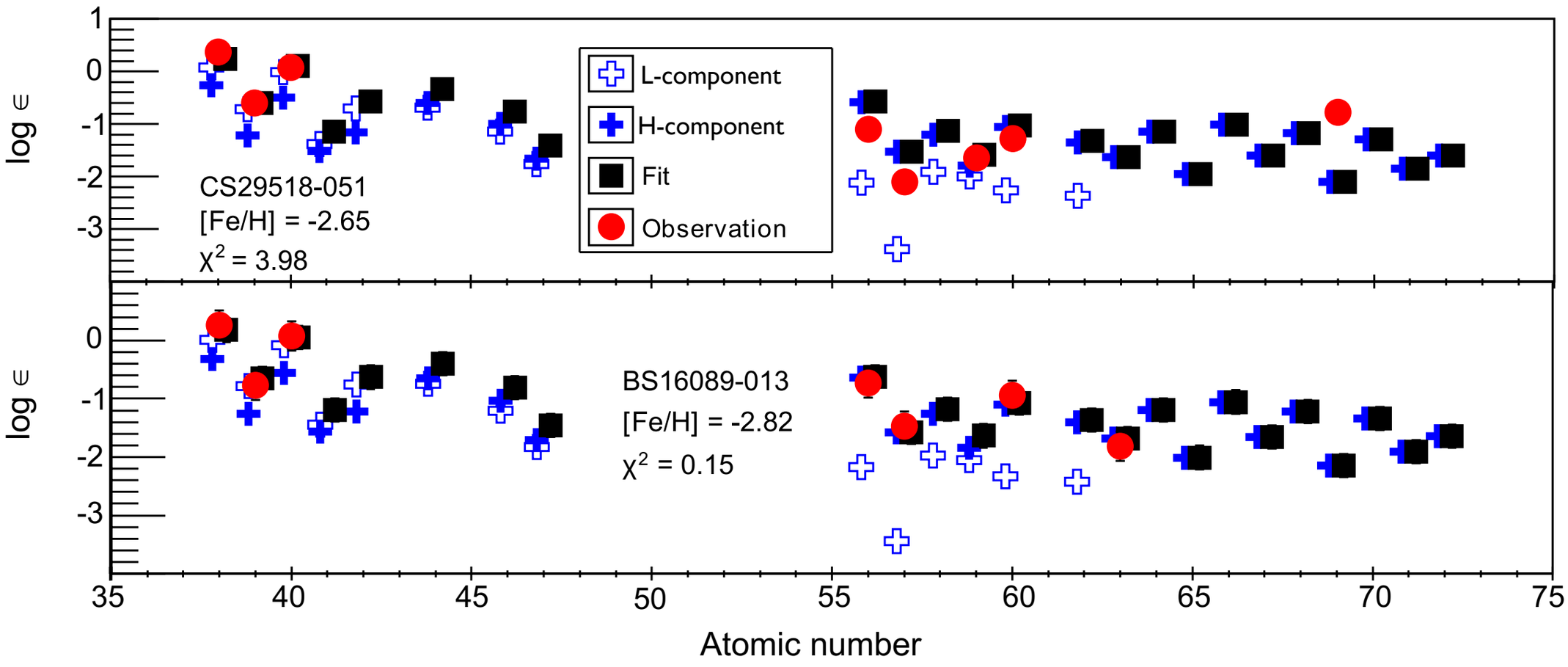


→ Component abundance pattern: Y_r and Y_L
Assumptions: Z range for components
robust pattern with in uncertainties (0.32dex)

Abundance deconvolution

big sample of stars (Frebel et al. 2010)
remove s-process, carbon enhanced, and stars with internal mixing

fit abundance as combination of components: $Y_{\mathrm{calc}}(Z) = (C_r Y_r(Z) + C_L Y_L(Z)) \cdot 10^{[\mathrm{Fe/H}]}$



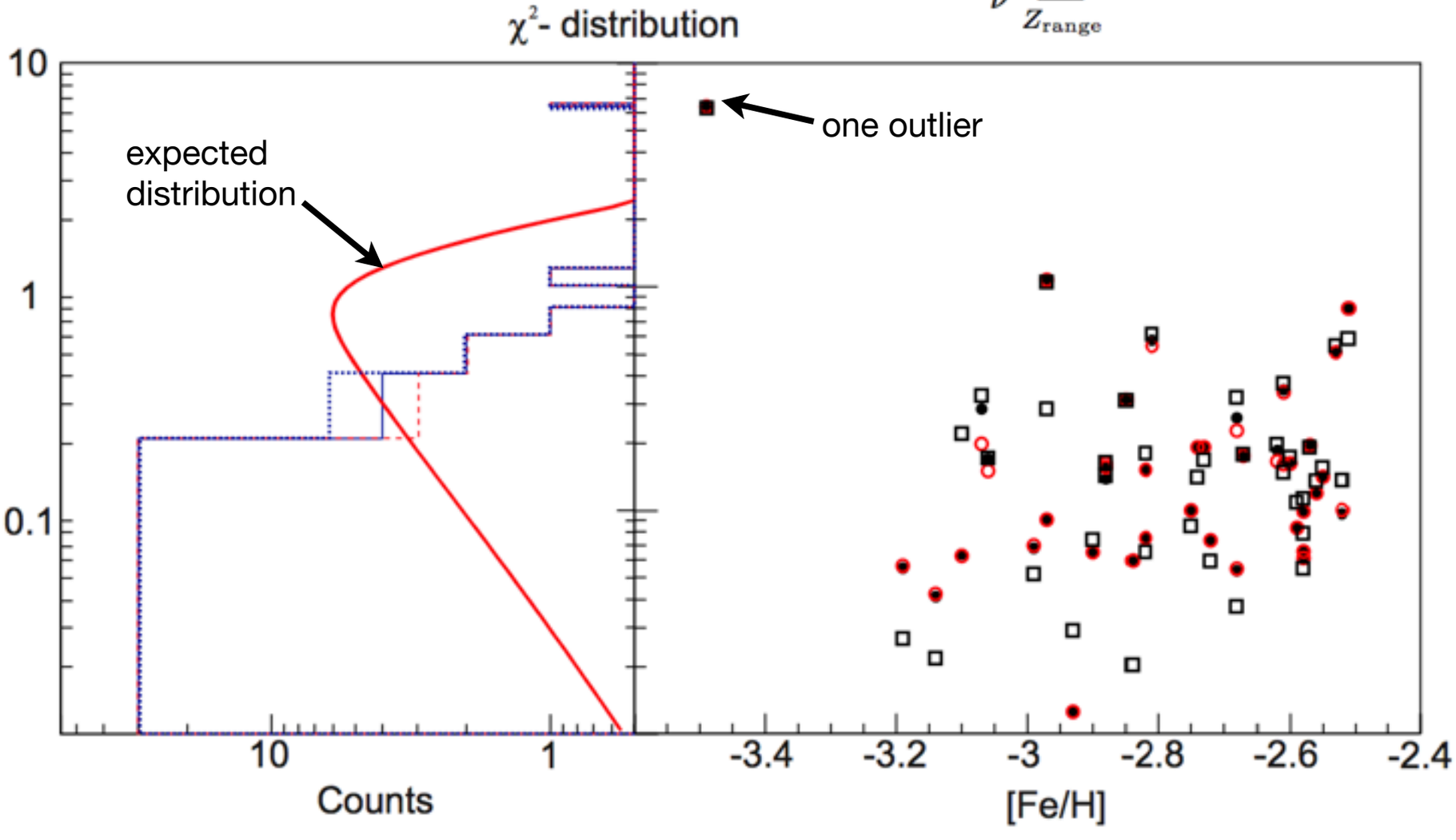
Abundance deconvolution

big sample of stars (Frebel et al. 2010)
remove s-process, carbon enhanced, and stars with internal mixing

fit abundance as combination of components: $Y_{\rm calc}(Z) = (C_r Y_r(Z) + C_L Y_L(Z))$

$$\chi^2 = \frac{1}{\nu} \sum_{Z_{\rm range}} \left(\log Y_{\rm observed}(Z) - \log Y_{\rm calc}(Z)\right)^2 / \Delta(Z)^2,$$

0.32 dex
(obs. + method)



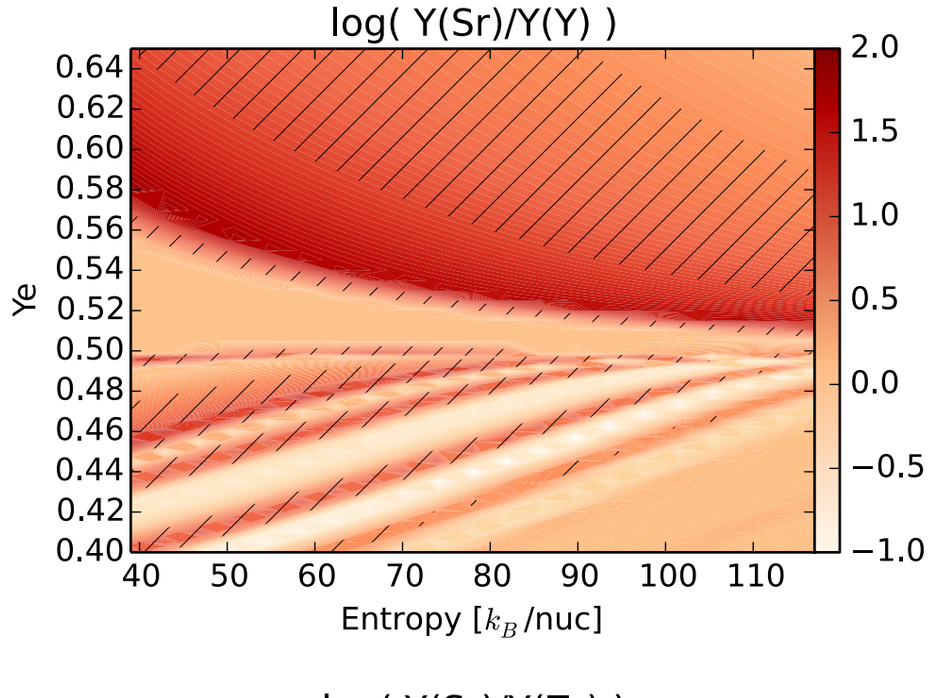
L-component: constraining conditions

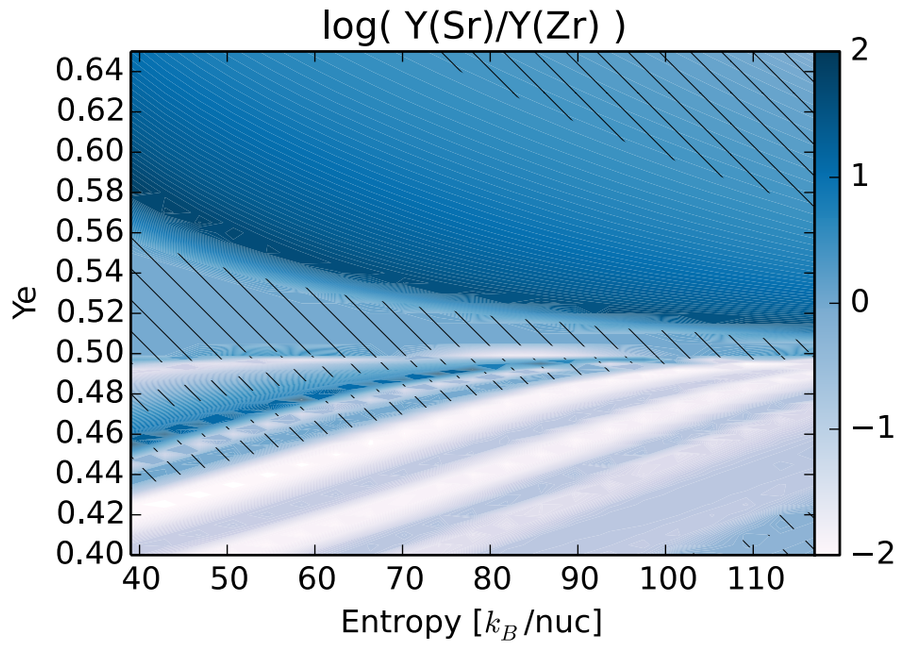
L-component abundance ratios:

Sr/Y = 6.13 (//)

Sr/Zr = 1.22 (\\)

Sr/Ag = 48.2





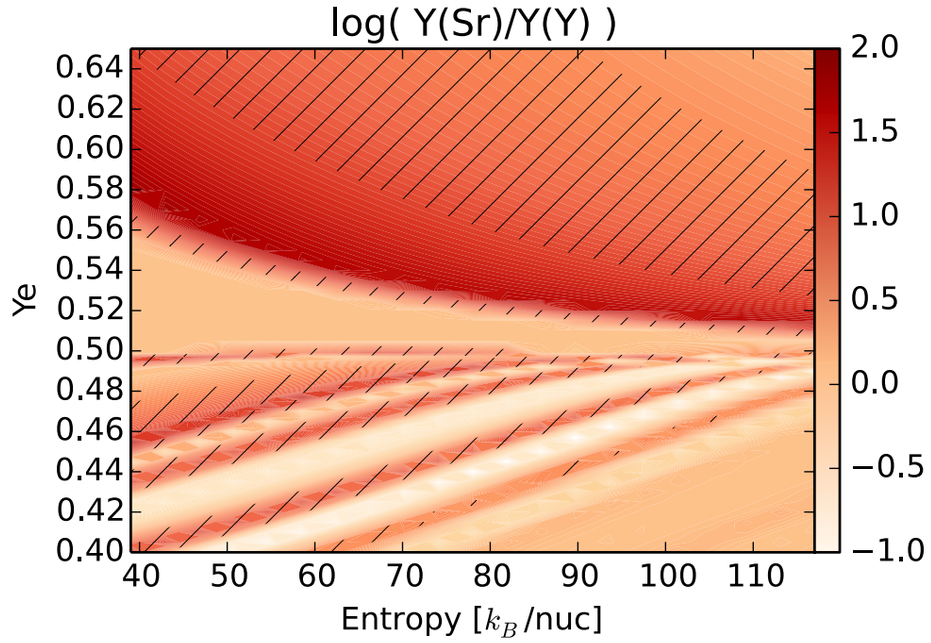
L-component: constraining conditions

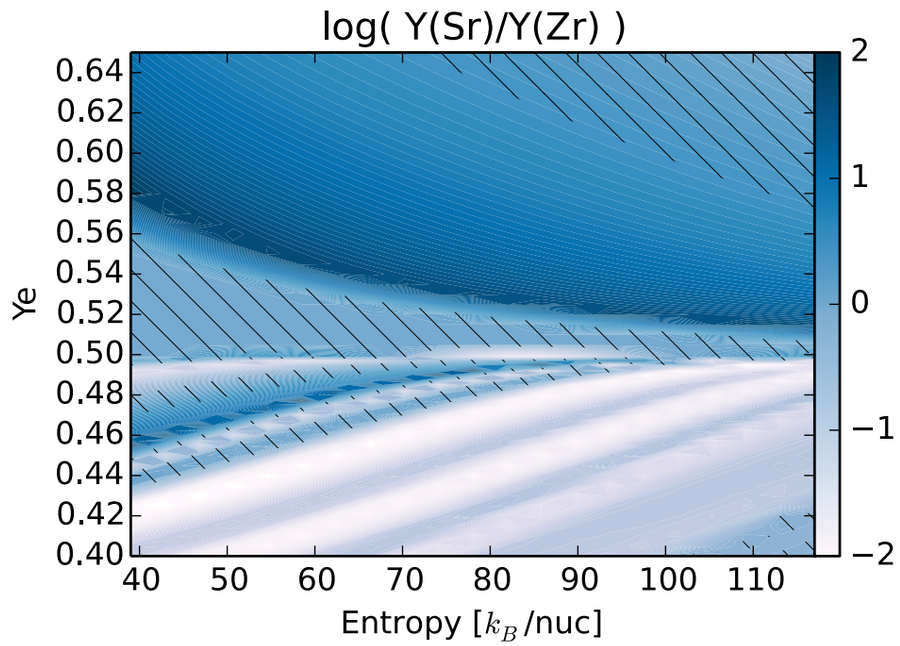
L-component abundance ratios:

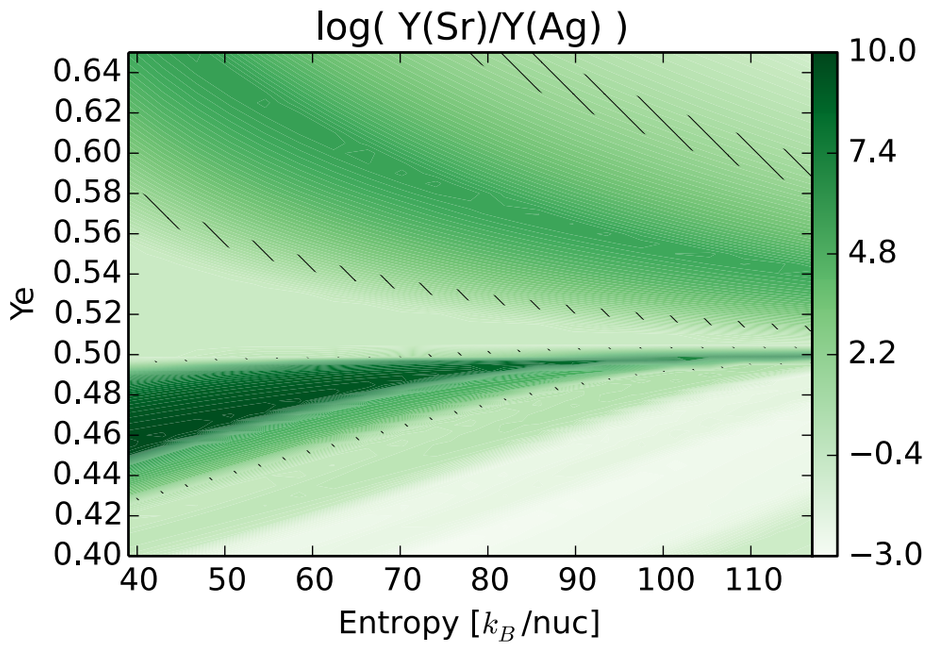
Sr/Y = 6.13 (//)

Sr/Zr = 1.22 (\\)

Sr/Ag = 48.2







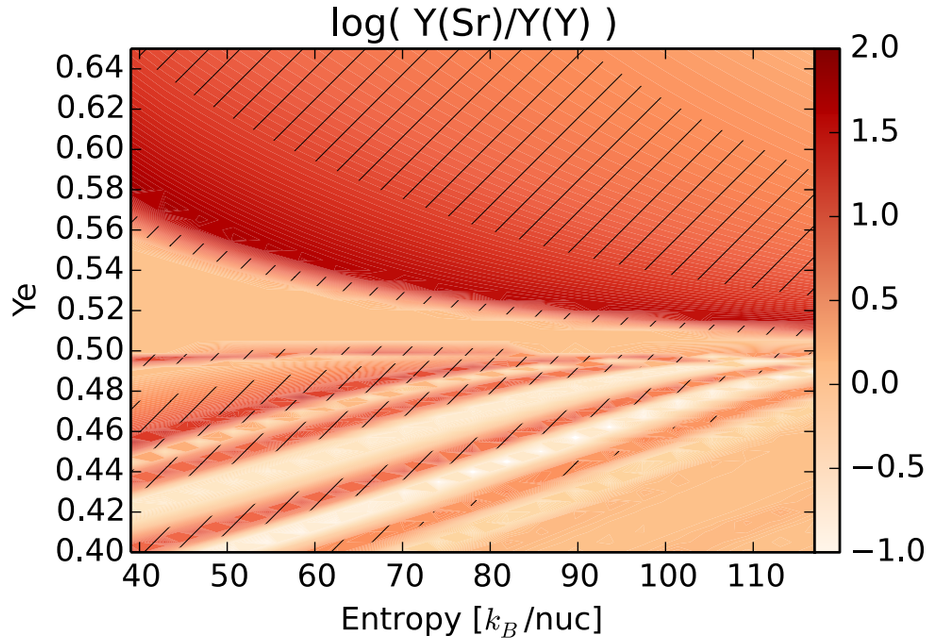
L-component: constraining conditions

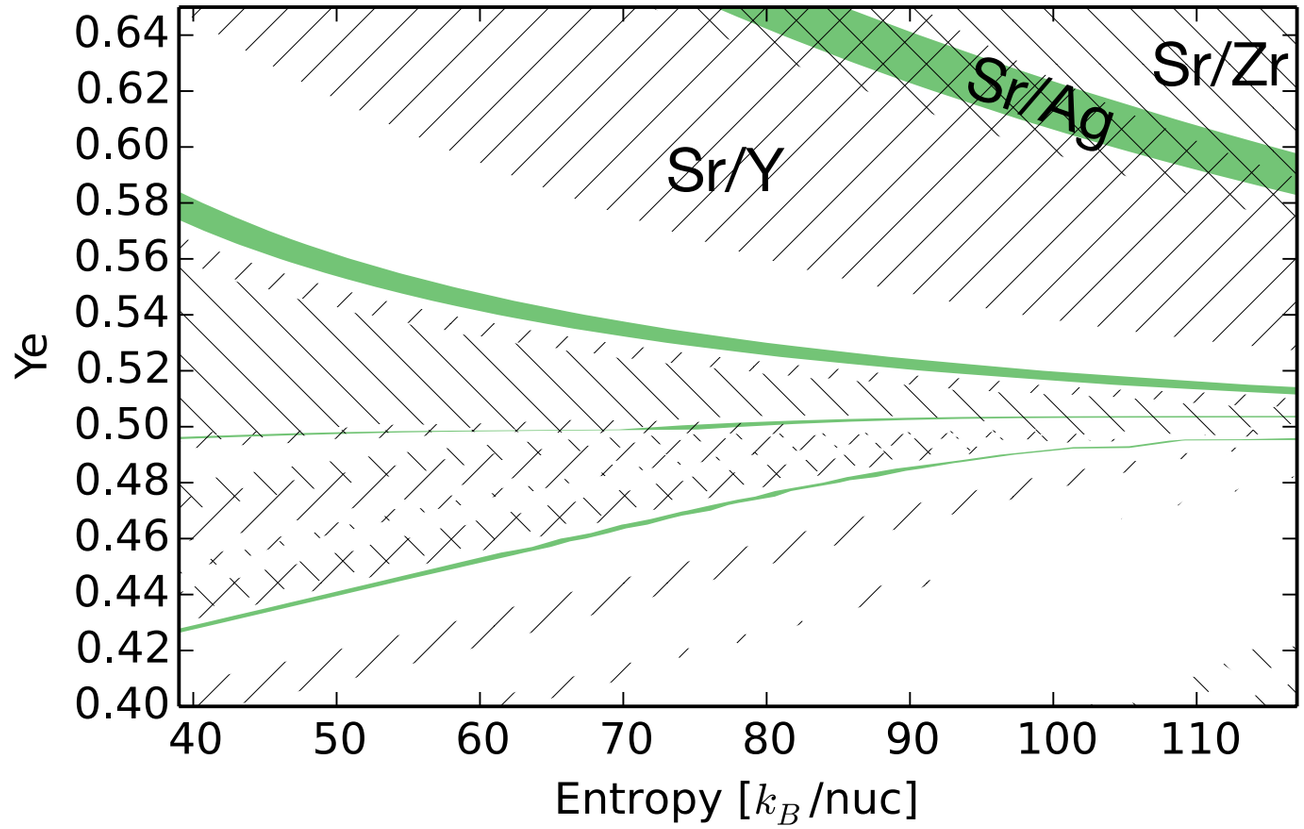
L-component abundance ratios:

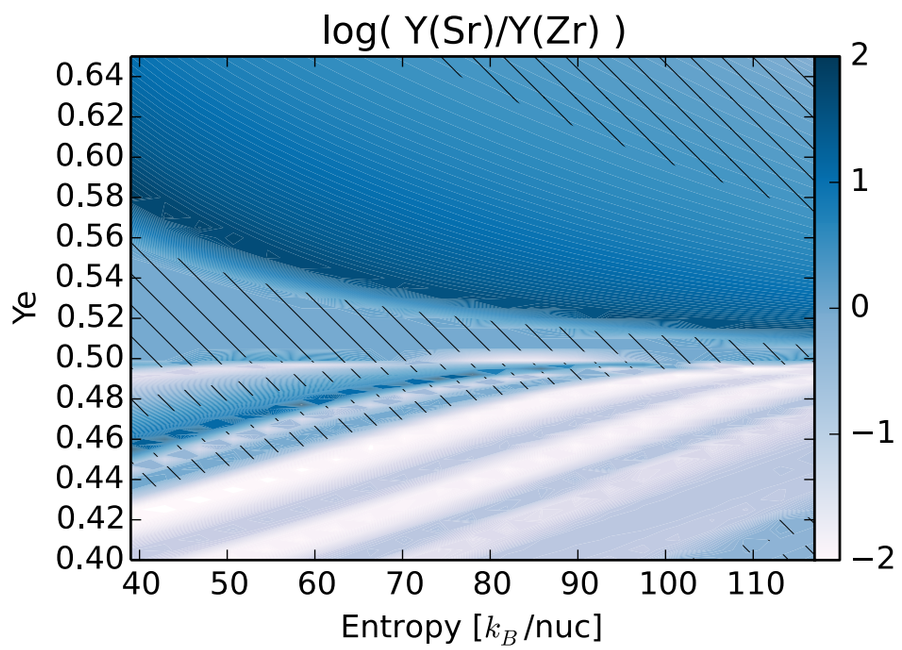
Sr/Y = 6.13 (//)

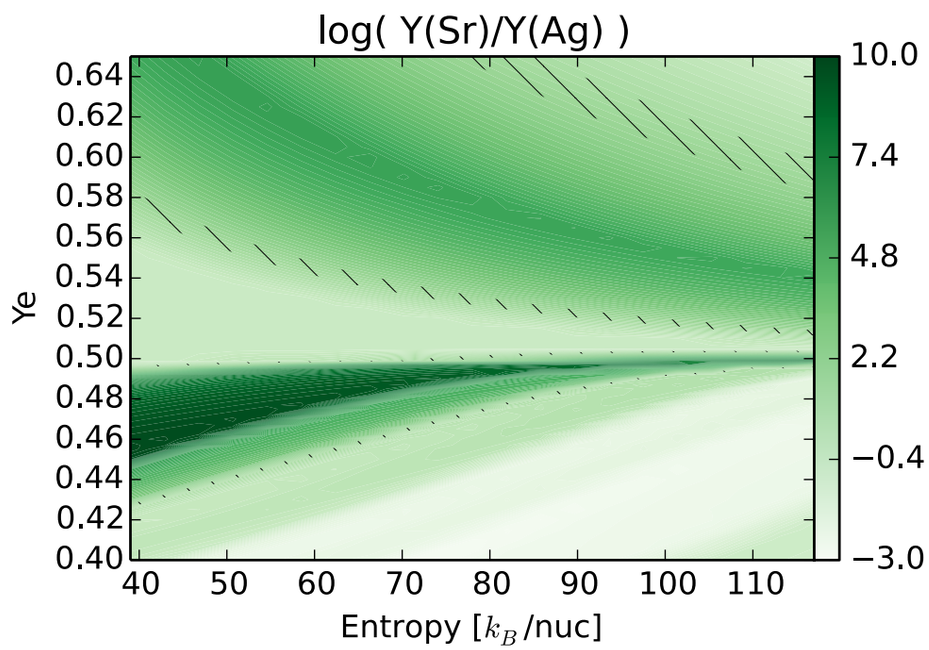
Sr/Zr = 1.22 (\\)

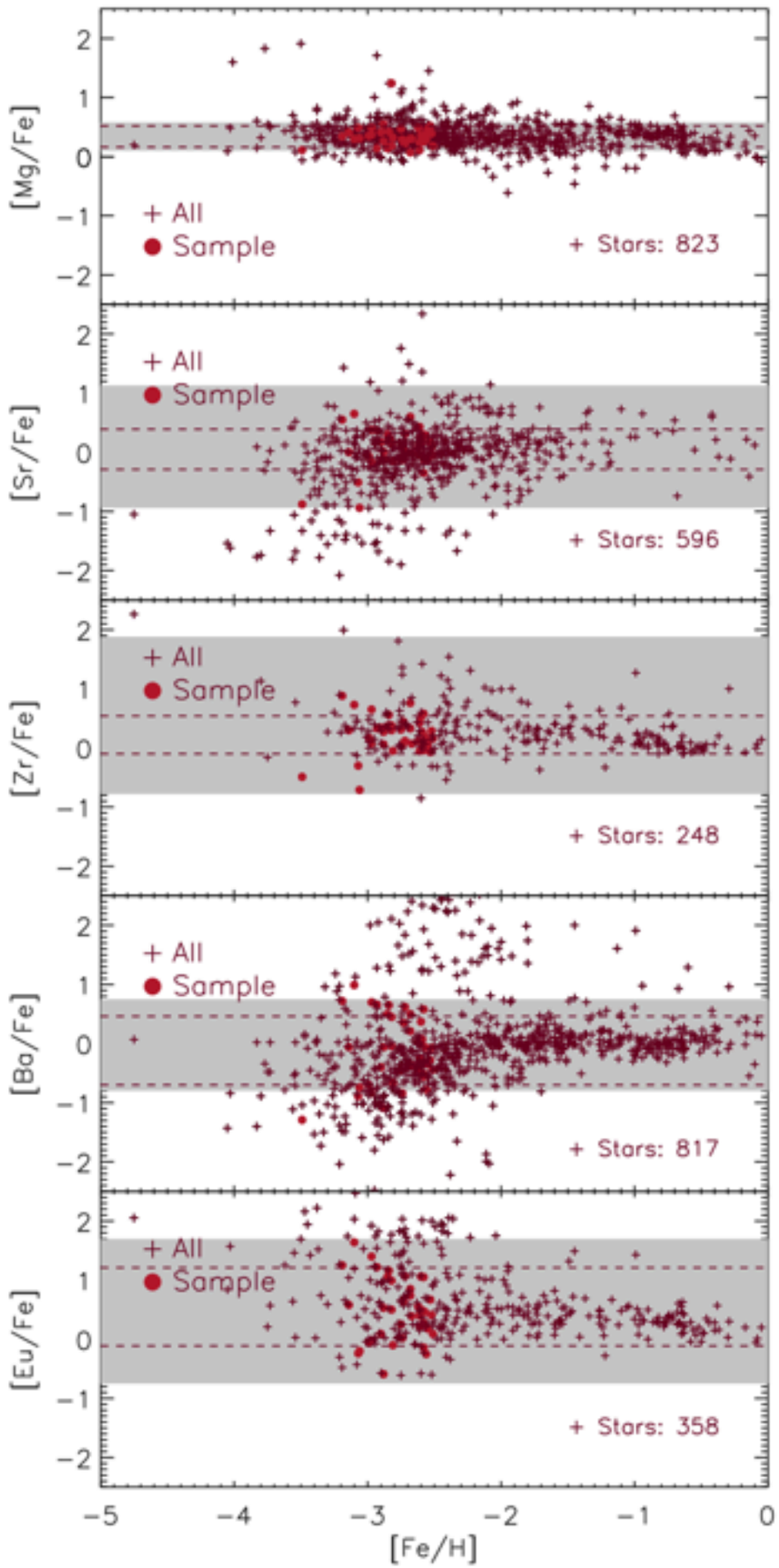
Sr/Ag = 48.2










[Mg/Fe]
[Sr/Fe]
[Zr/Fe]
[Ba/Fe]
[Eu/Fe]
+ All
Sample
+ Stars: 823
+ Stars: 596
+ Stars: 248
+ Stars: 817
+ Stars: 358
[Fe/H]