

Recent advances on understanding the s-process

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Introduction – Ba stars

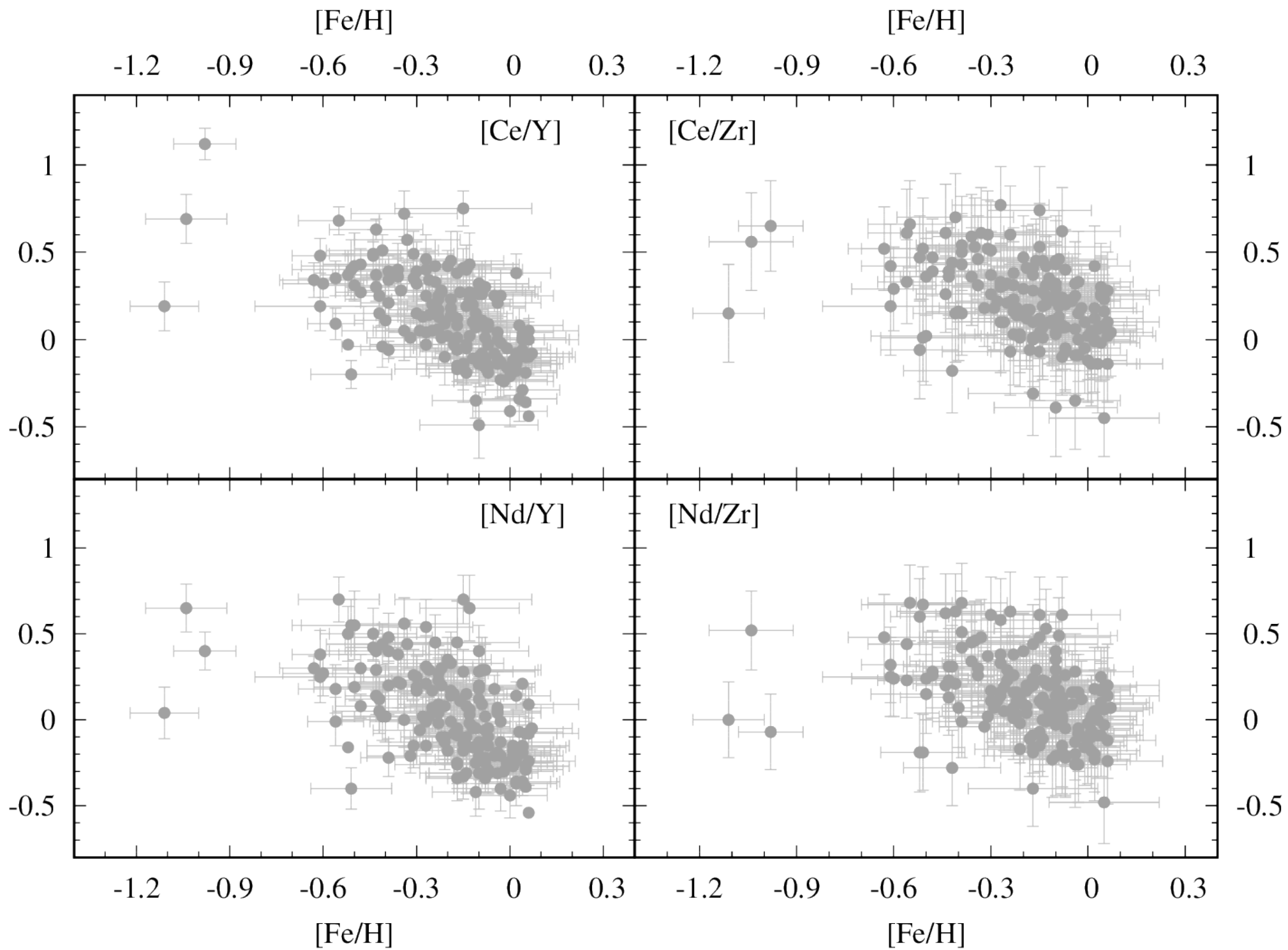
- G–K giants + dwarfs, $[\text{Fe}/\text{H}] > -1.0$
 - strong spectral features: carbon molecular bands + s-process elements
 - binary systems
 - not intrinsic overabundance!
 - mass transfer
 - test: AGB s-process nucleosynthesis
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 - $[hs/ls] \leftarrow s=? hs=? ls=?$
-

Sample data

- e. g.: Yang+ (2016): 19 stars, Allen&Barbuy (2006): 26 stars, Antipova+ (2004): 16 stars
 - de Castro et al. (2016) sample:
 - 182 giants (certain, candidate)
 - high resolution spectra (FEROS, $R = 48000$)
 - wide range in T_{eff} (4100-5400 K), mass (1-6 M_{Sun}), metallicity
 - Ba star: if $[s/\text{Fe}] \geq 0.25 \rightarrow 13$ stars rejected
 - estimated error \rightarrow first time proper error analysis
[hs/ls] \rightarrow [Ce/Y], ...
-



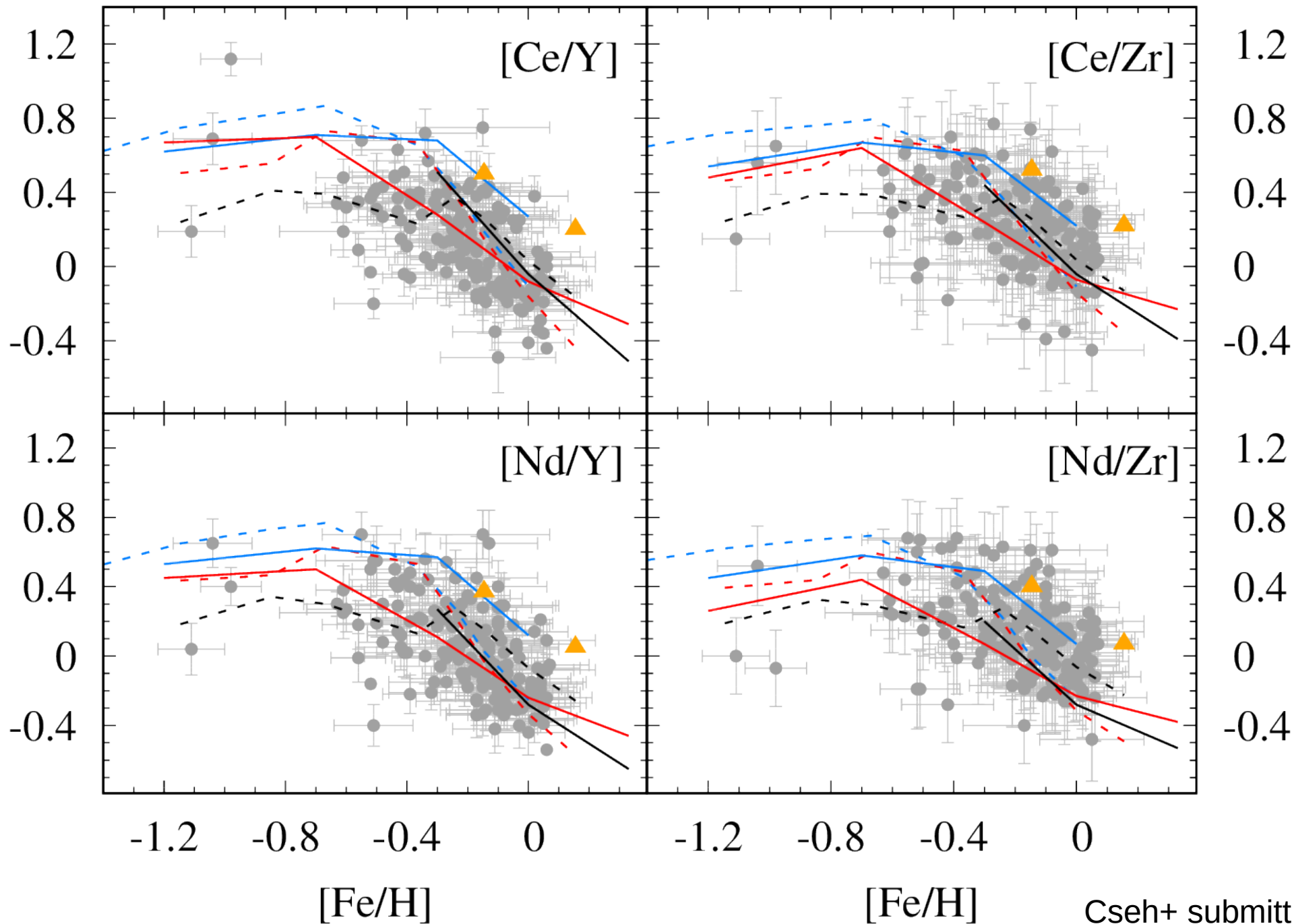
Model comparison

- final TP, without rotation, $[s/Fe] \geq 0.25$
- different metallicities, masses
- **FRUITY + Monash + NuGrid: Battino+ 2016**

Cristallo+ 2016,
Cristallo+ 2015,
Straniero+ 2014,
Piersanti+ 2013,
Cristallo+ 2011,
Cristallo+ 2009

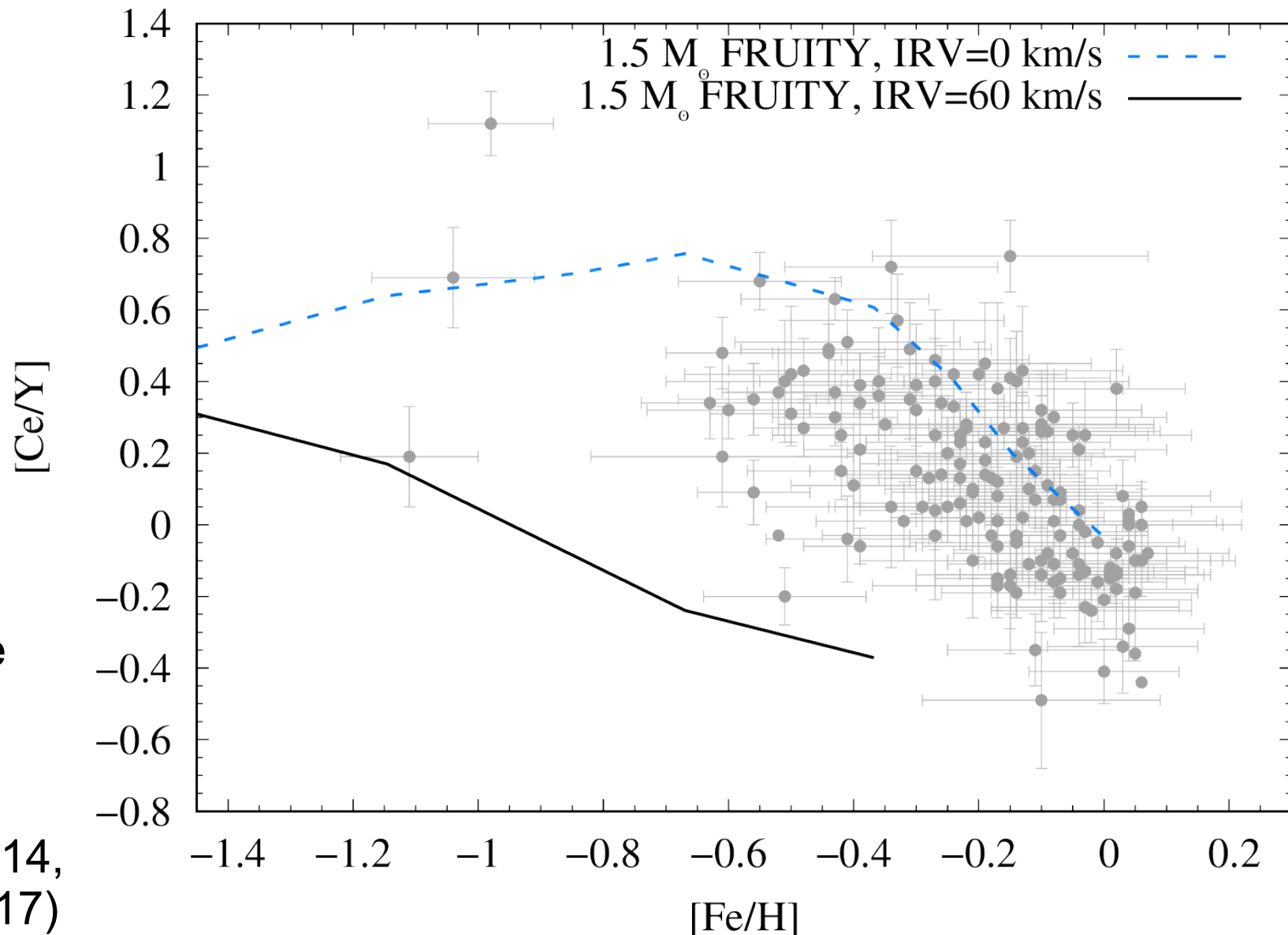
Karakas+ 2018,
Karakas & Lugaro 2016,
Fishlock+ 2013

FRUITY 1.5M_⊙ - - - - FRUITY 4.0M_⊙ - - - - Monash 1.5M_⊙ ———— Monash 4.0M_⊙ ————
 FRUITY 3.0M_⊙ - - - - NuGrid 3.0M_⊙ ▲ Monash 3.0M_⊙ ———— Monash 3.0M_⊙ ————



...with rotation

Cseh+ submitted

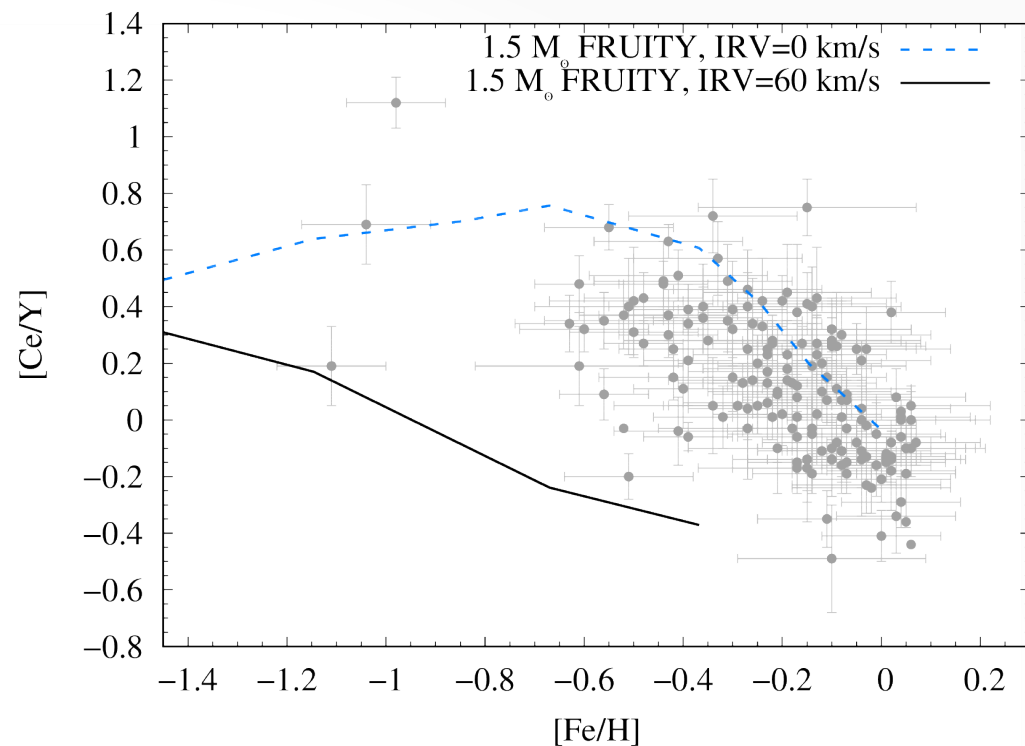


- rotation: minor effect
- coupling: to slow down the core in giants
- agreement with asteros.

(Cantiello+ 2014, Hermes+ 2017)

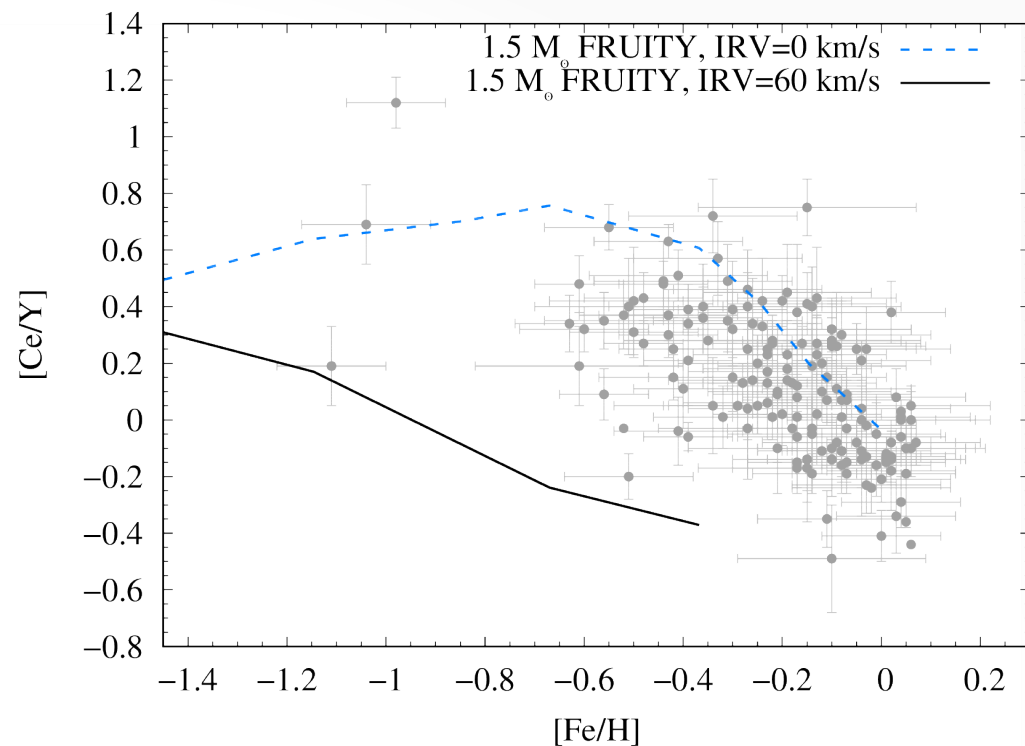
Summary

- new Ba star observations
→ split elements, own error bar
- trend agrees with models
- rotational mixing: minor effect
→ in agreement with asteroseismology (Cantiello+ 2014, Hermes+ 2017)



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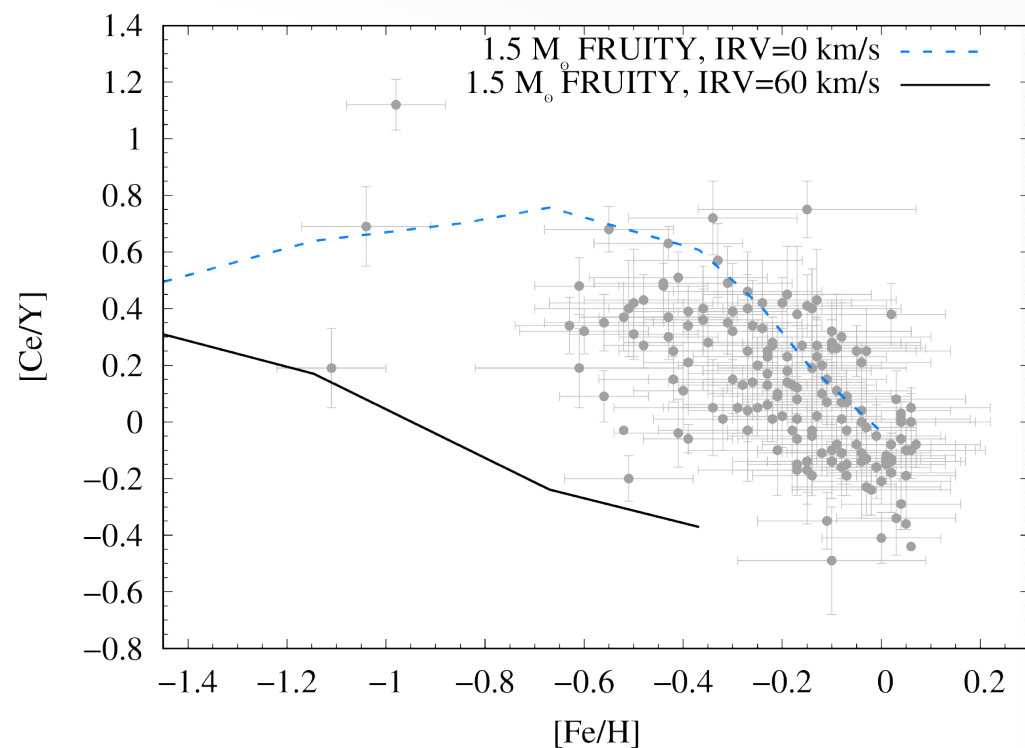
future plans:

- other elements, individual stars
- comparison with other s-process enhanced stars

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Thank you for your attention!



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