Spectroscopic Astronomy

David Aguado

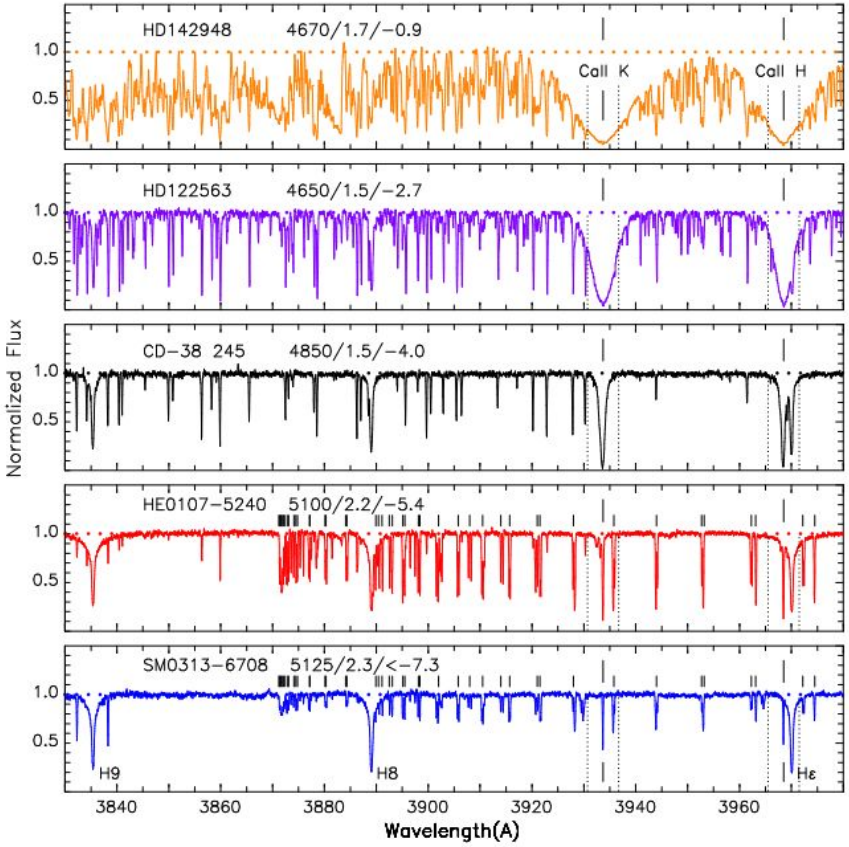
OECE 2026

BeiHang University



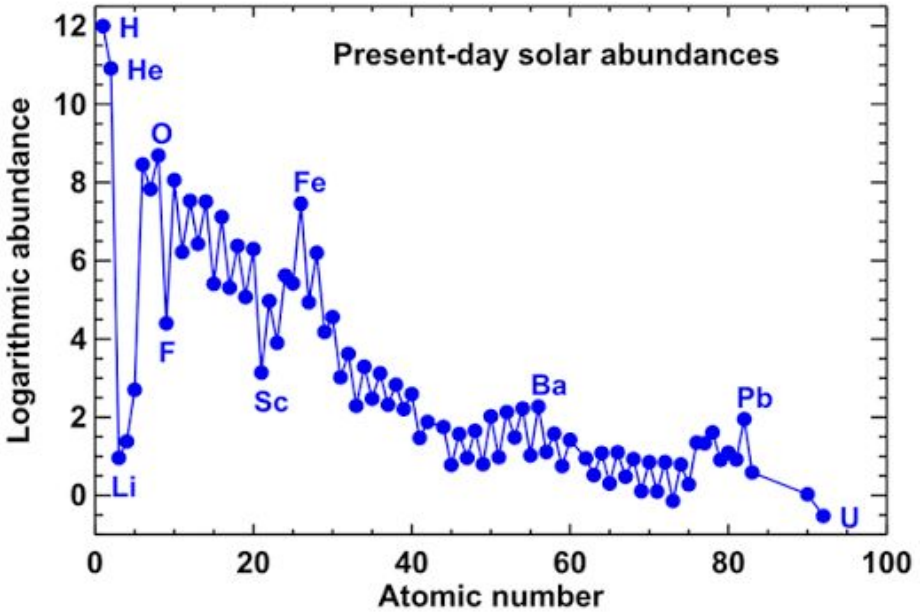
SESSION 3

Main Stellar Parameters

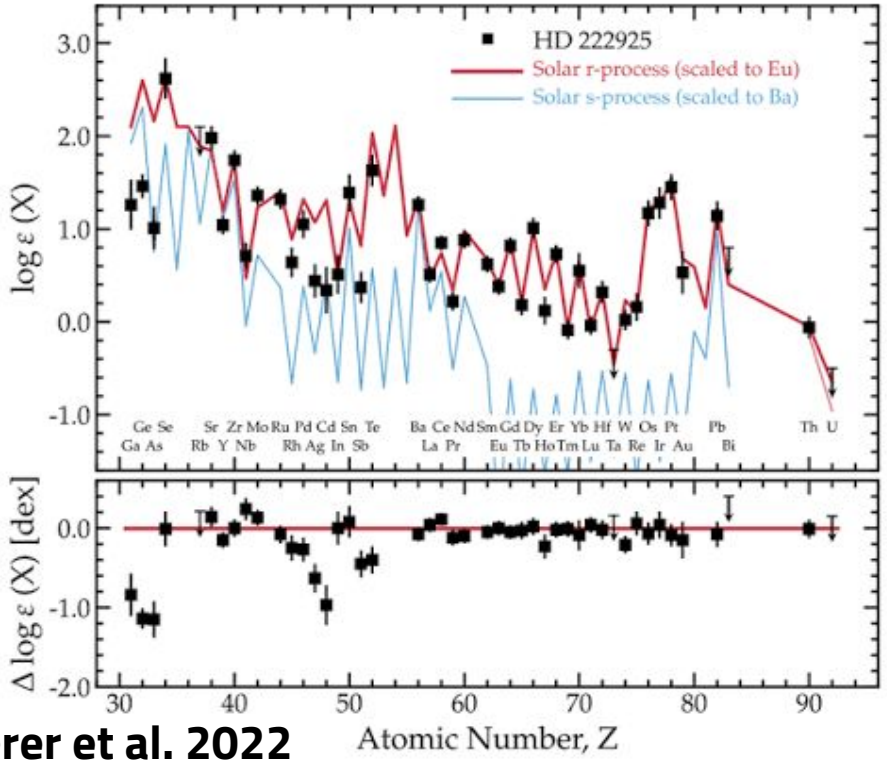


Gaia Consortium

Main Stellar Parameters

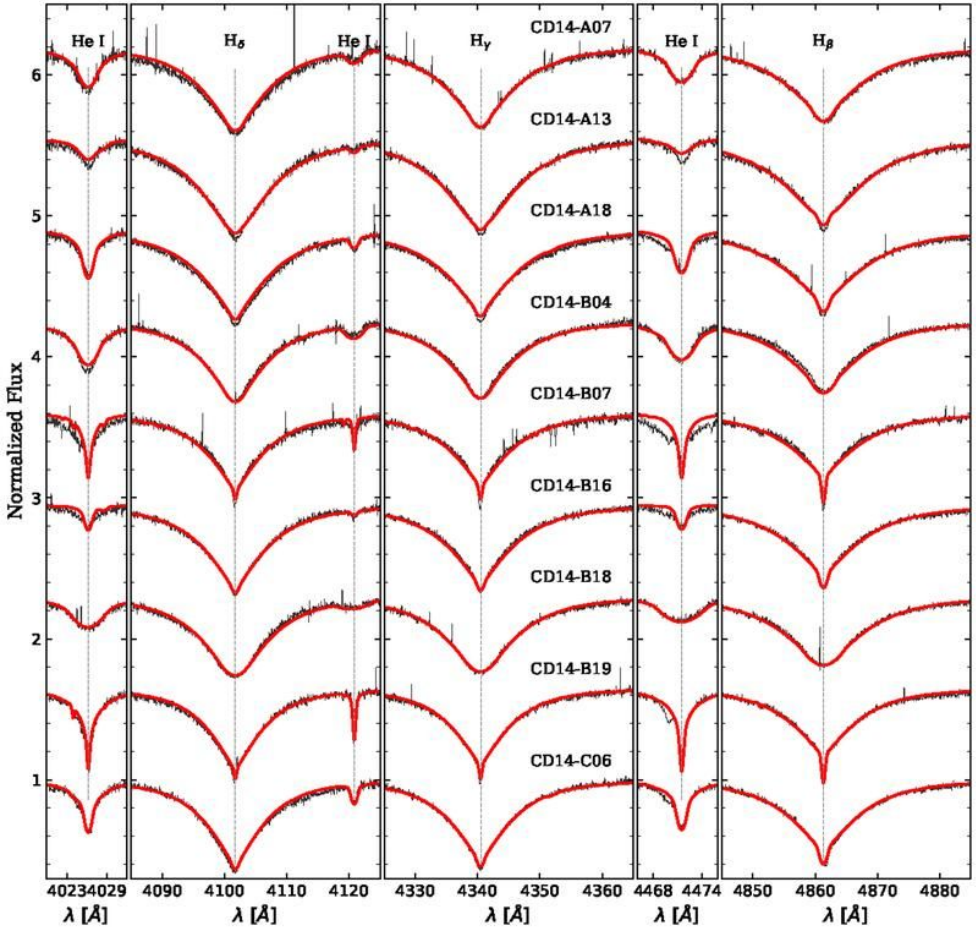


Asplund et al. 2021



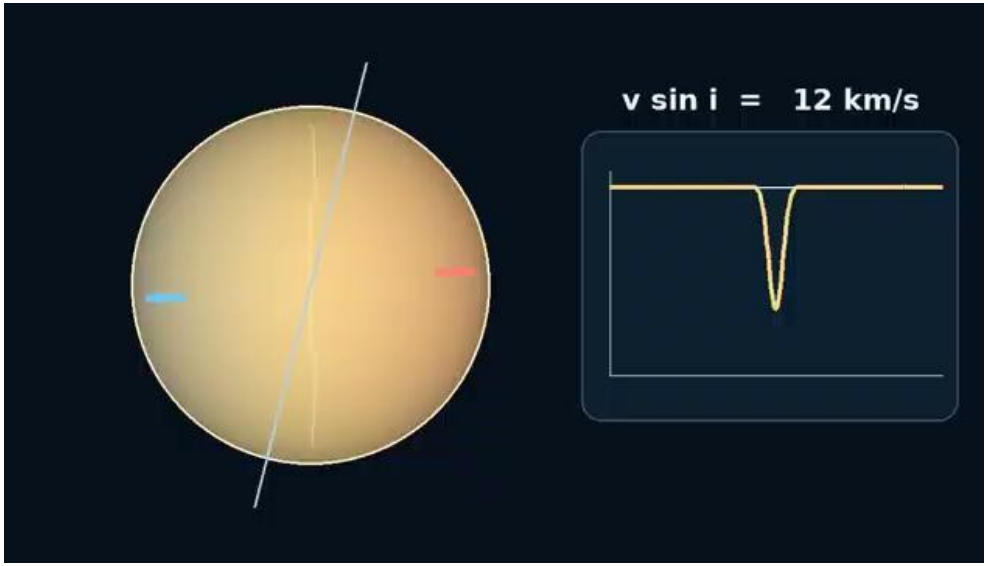
Roederer et al. 2022

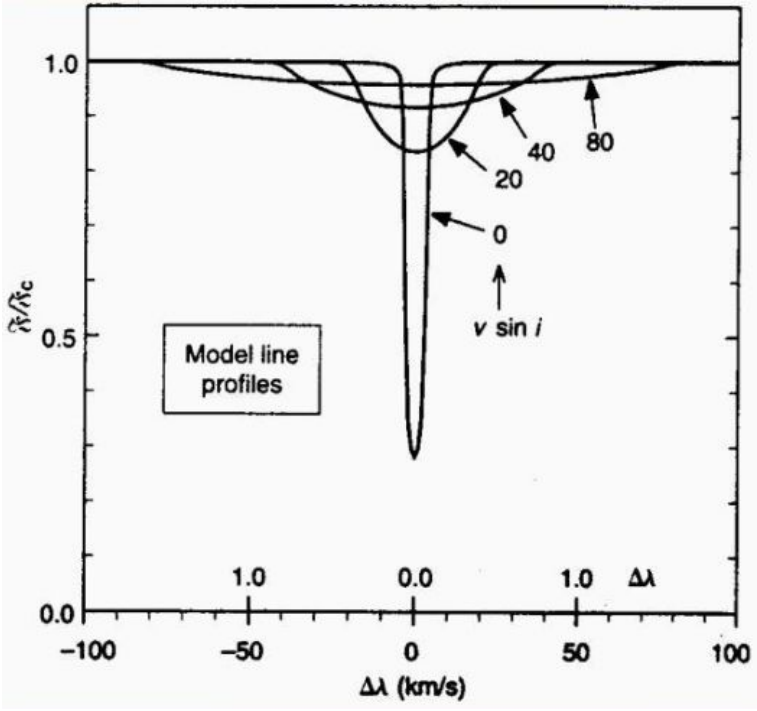
Main Stellar Parameters



Castañón Esteban et al. 2024

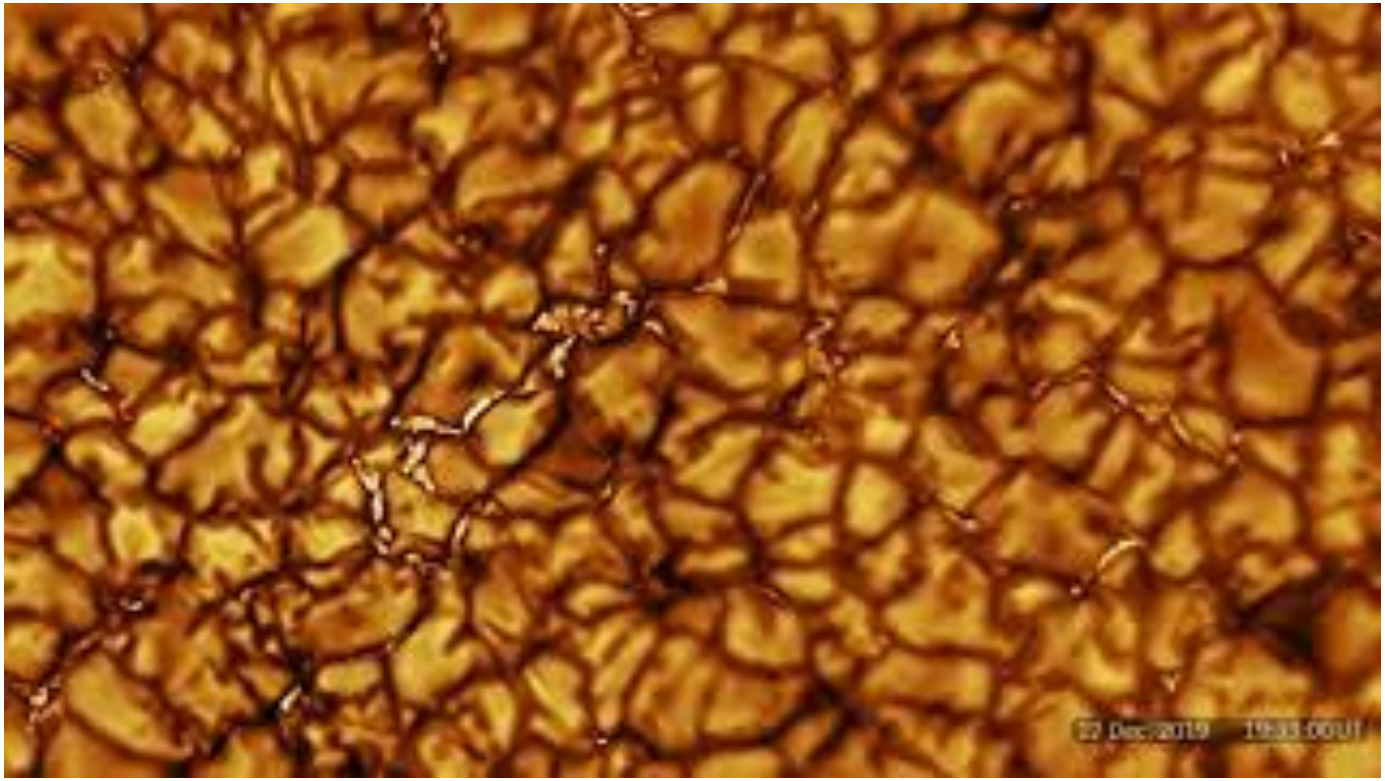
Main Stellar Parameters





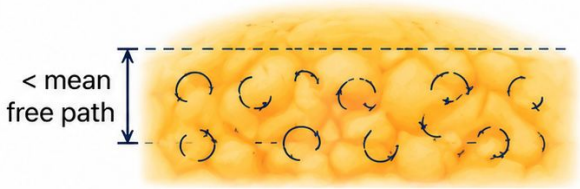
Gaia Consortium

Main Stellar Parameters

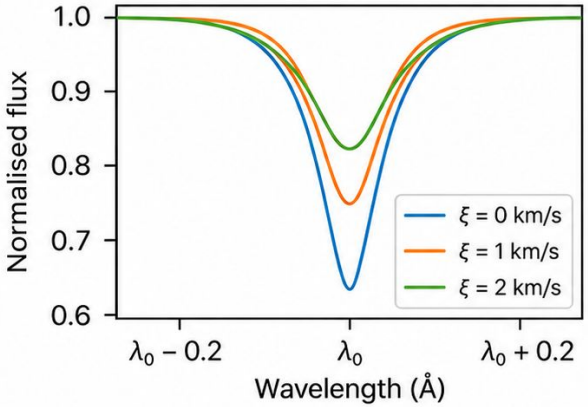


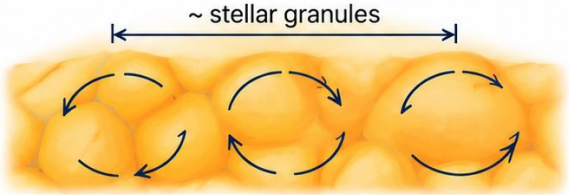
Gaia Consortium

Main Stellar Parameters

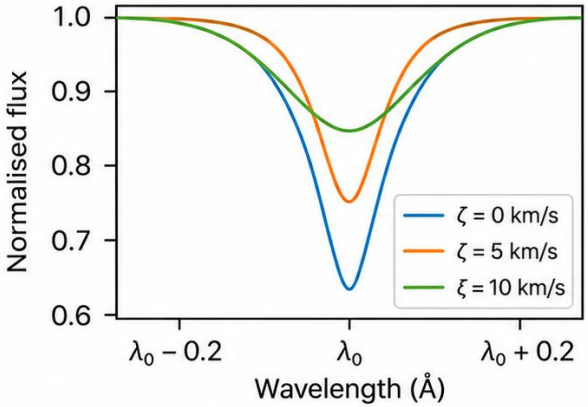


- Affects the strength of saturated lines (more absorption in strong lines).
- Does not strongly change the overall line shape.

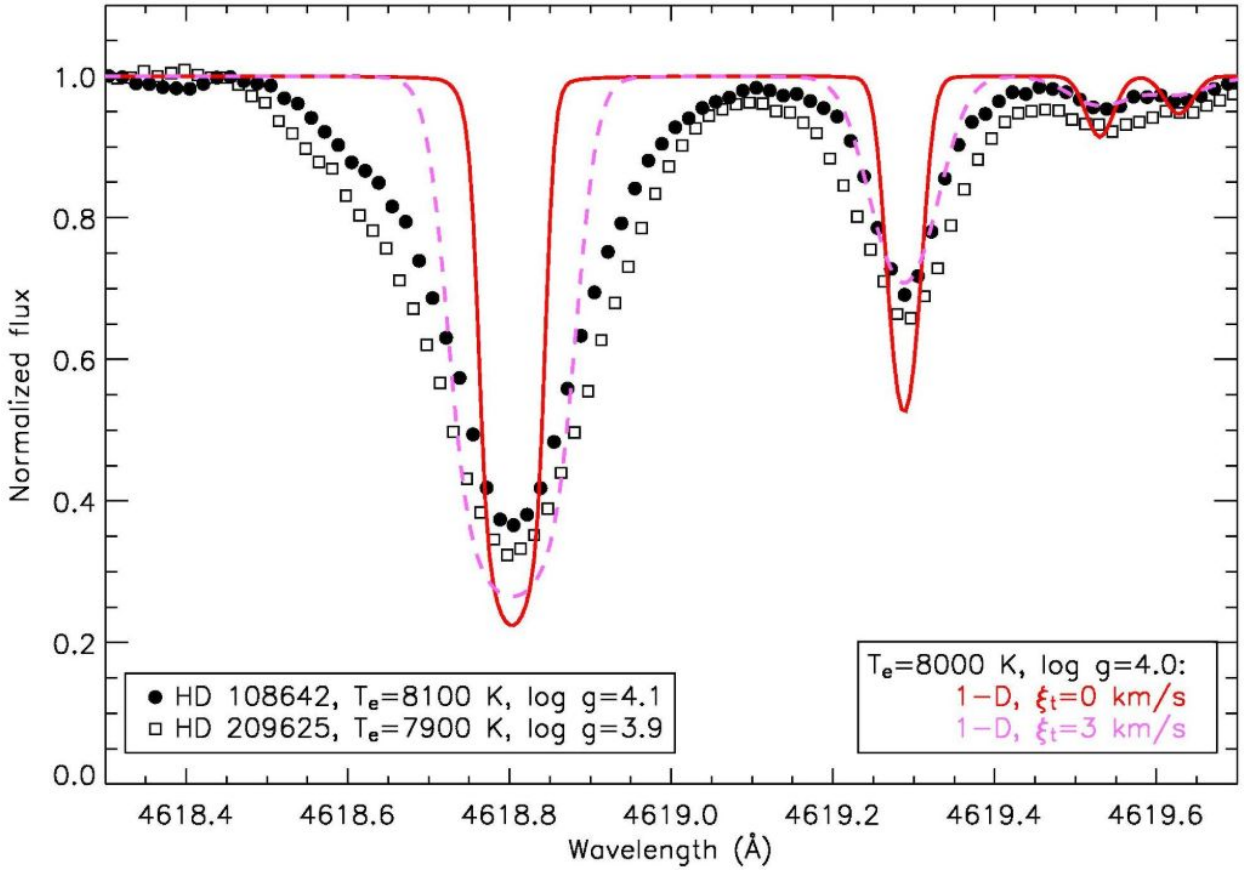




- Broadens the line profile (similar to rotation).
- Does not significantly change the line equivalent width.

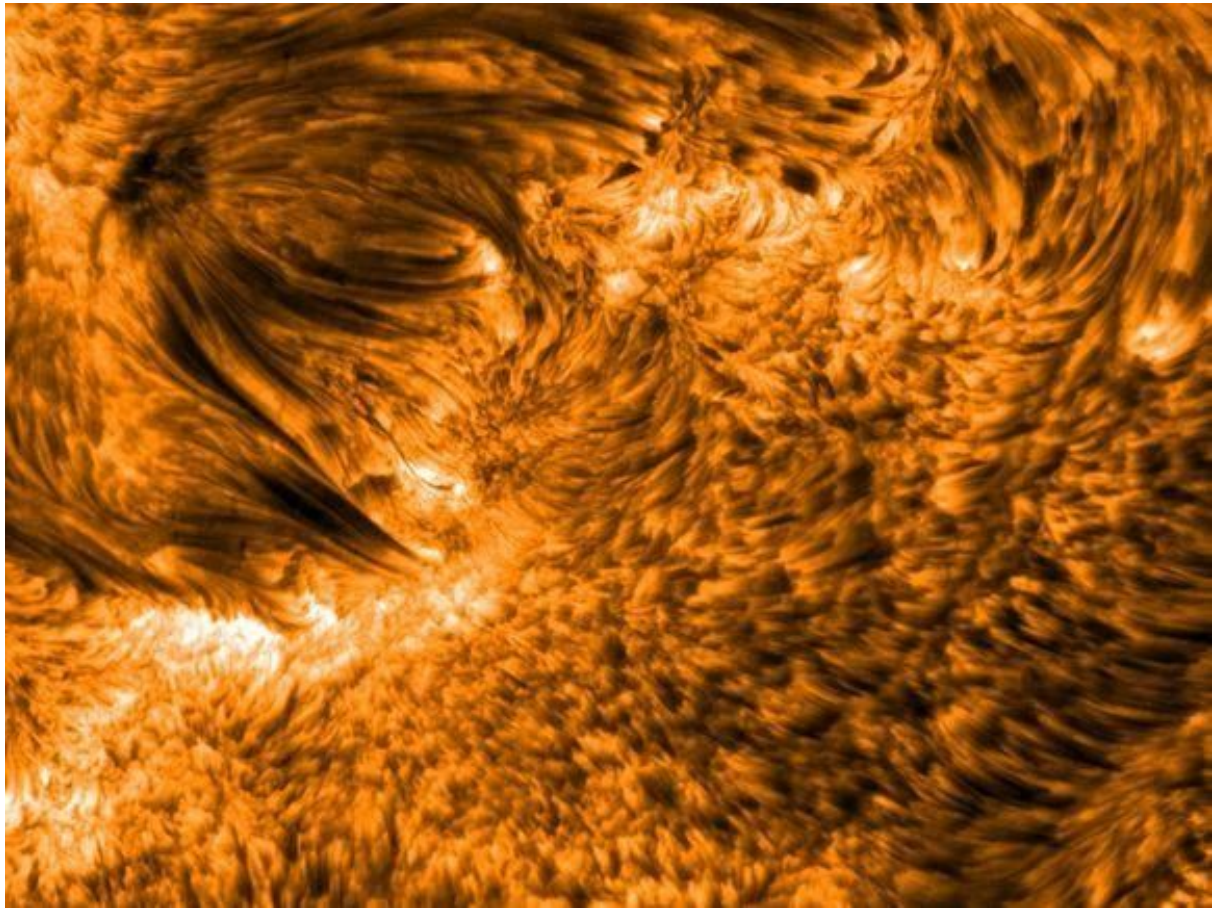


1D vs 3D approach



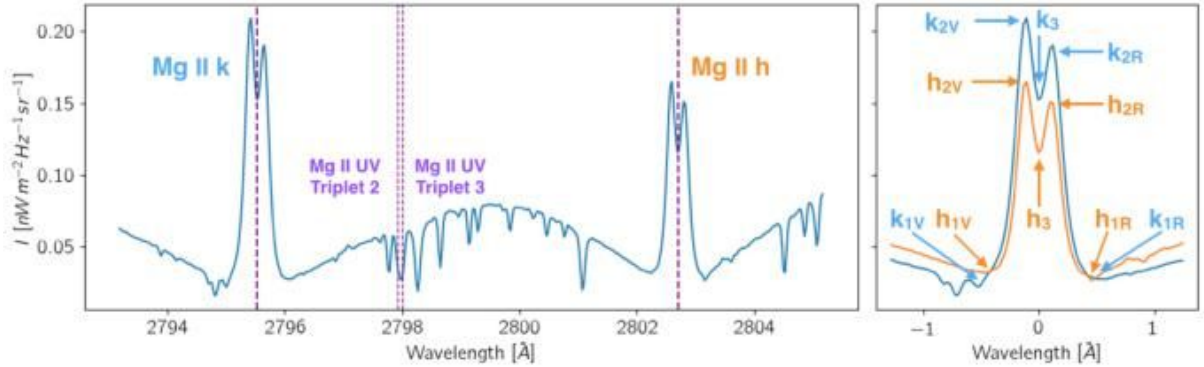
Freytag webpage

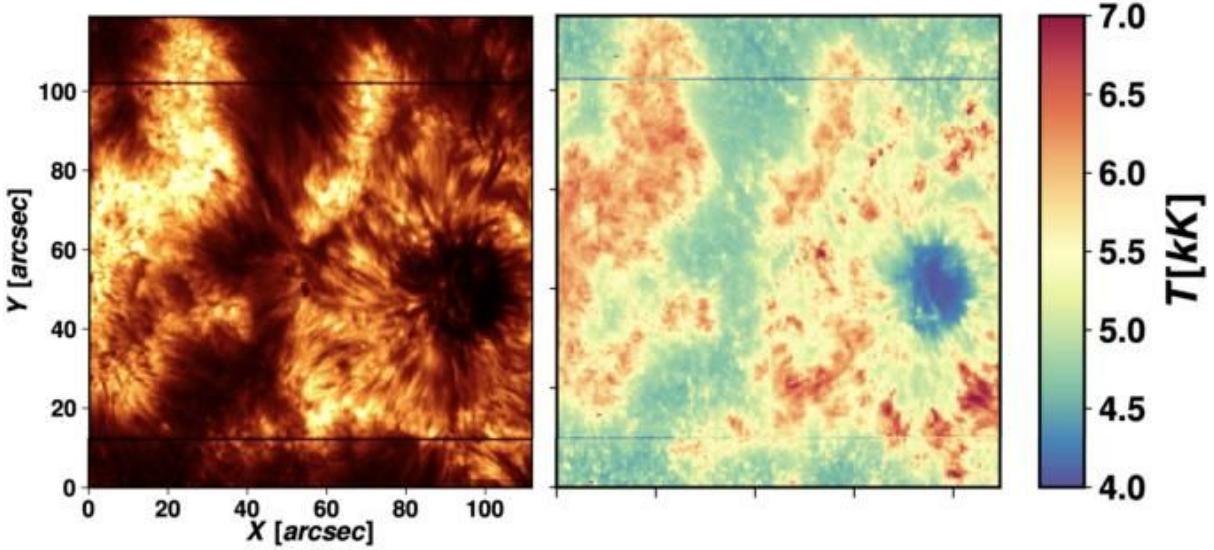
LTE vs NLTE approach



wired.jp

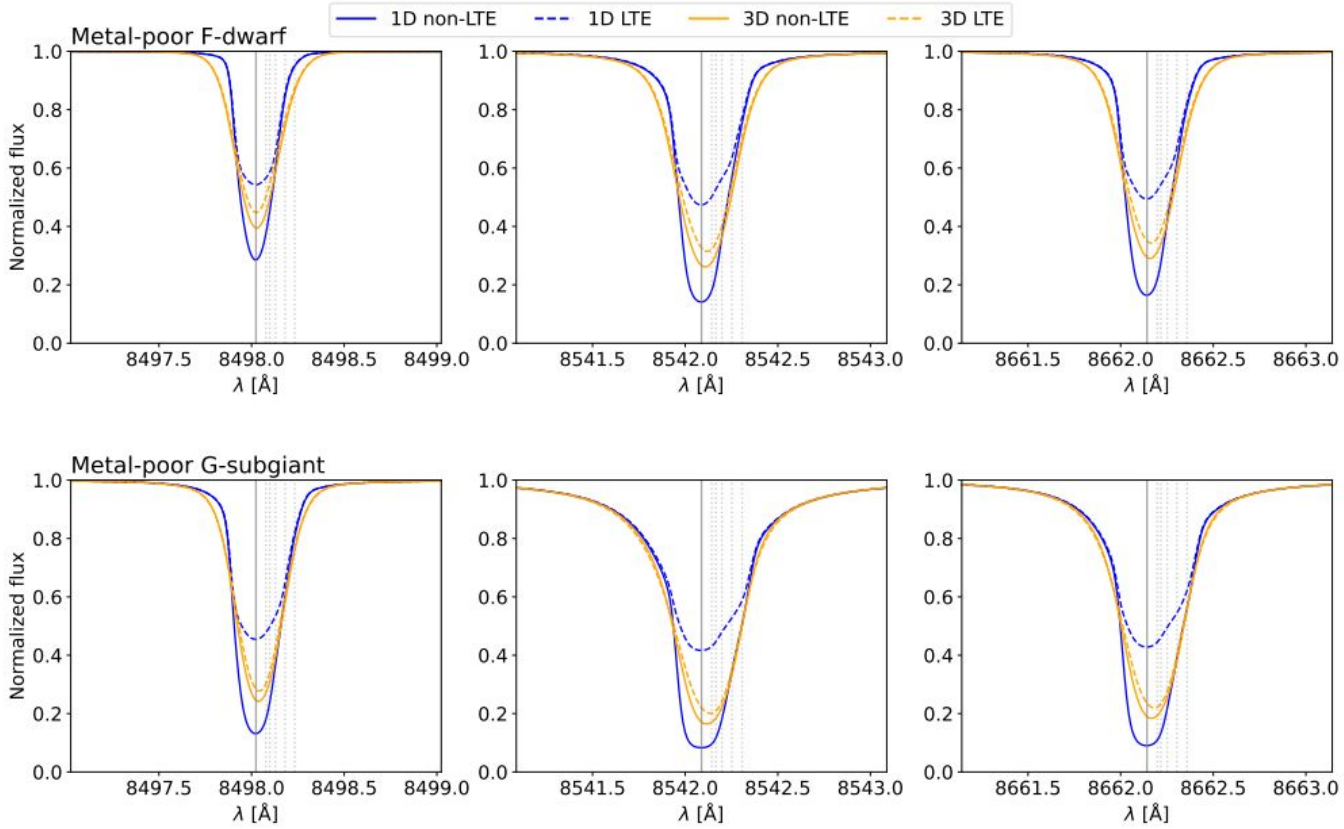
LTE vs NLTE approach





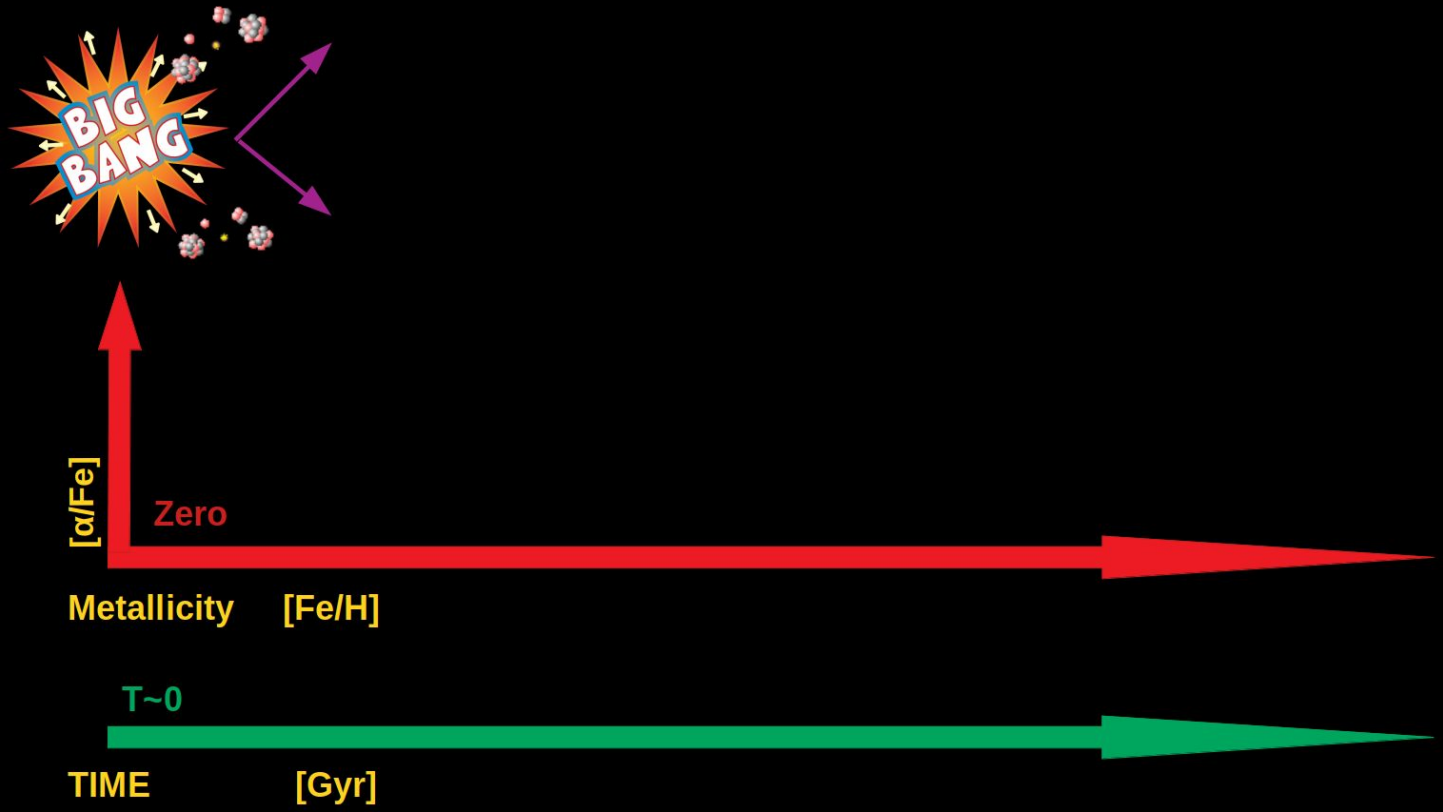
IRIS data

LTE vs NLTE approach

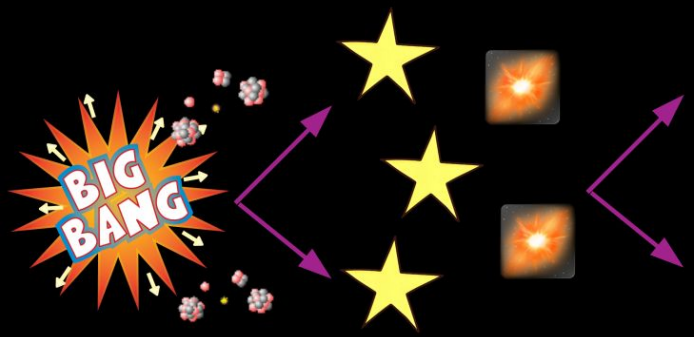


Lagae et al 2026

Chemical Evolution



Chemical Evolution



[α/Fe]

Zero

-7?

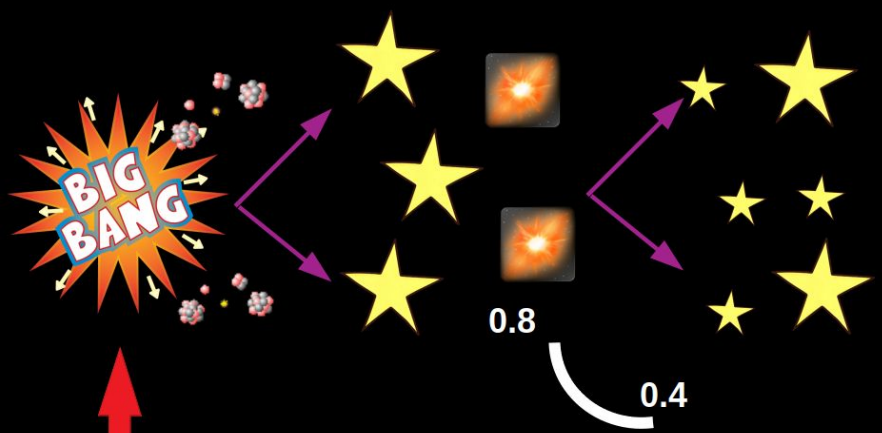
Metallicity [Fe/H]

T~0

0.2-0.4

TIME [Gyr]

Chemical Evolution



[α/Fe]

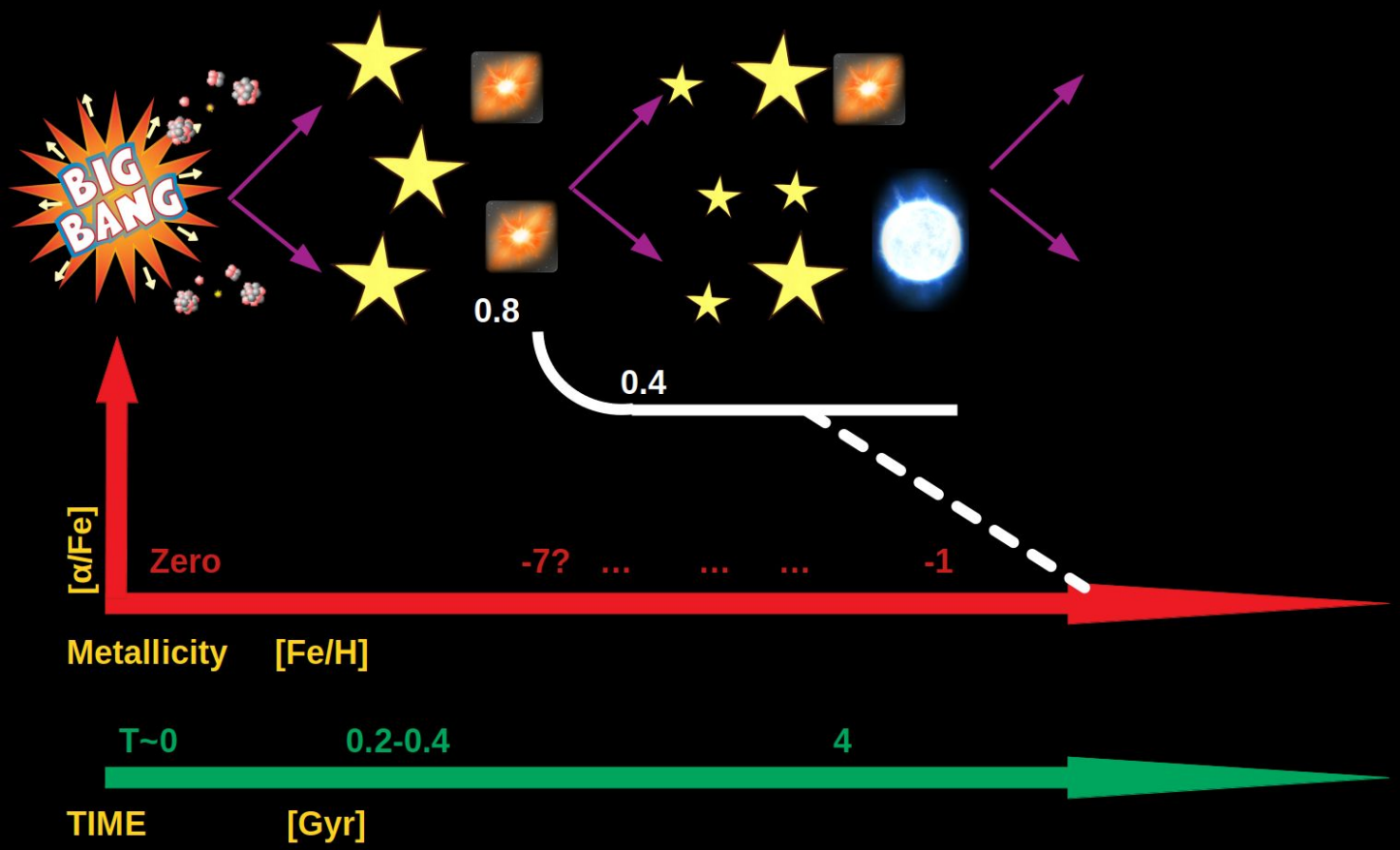
Zero -7? ...

Metallicity [Fe/H]

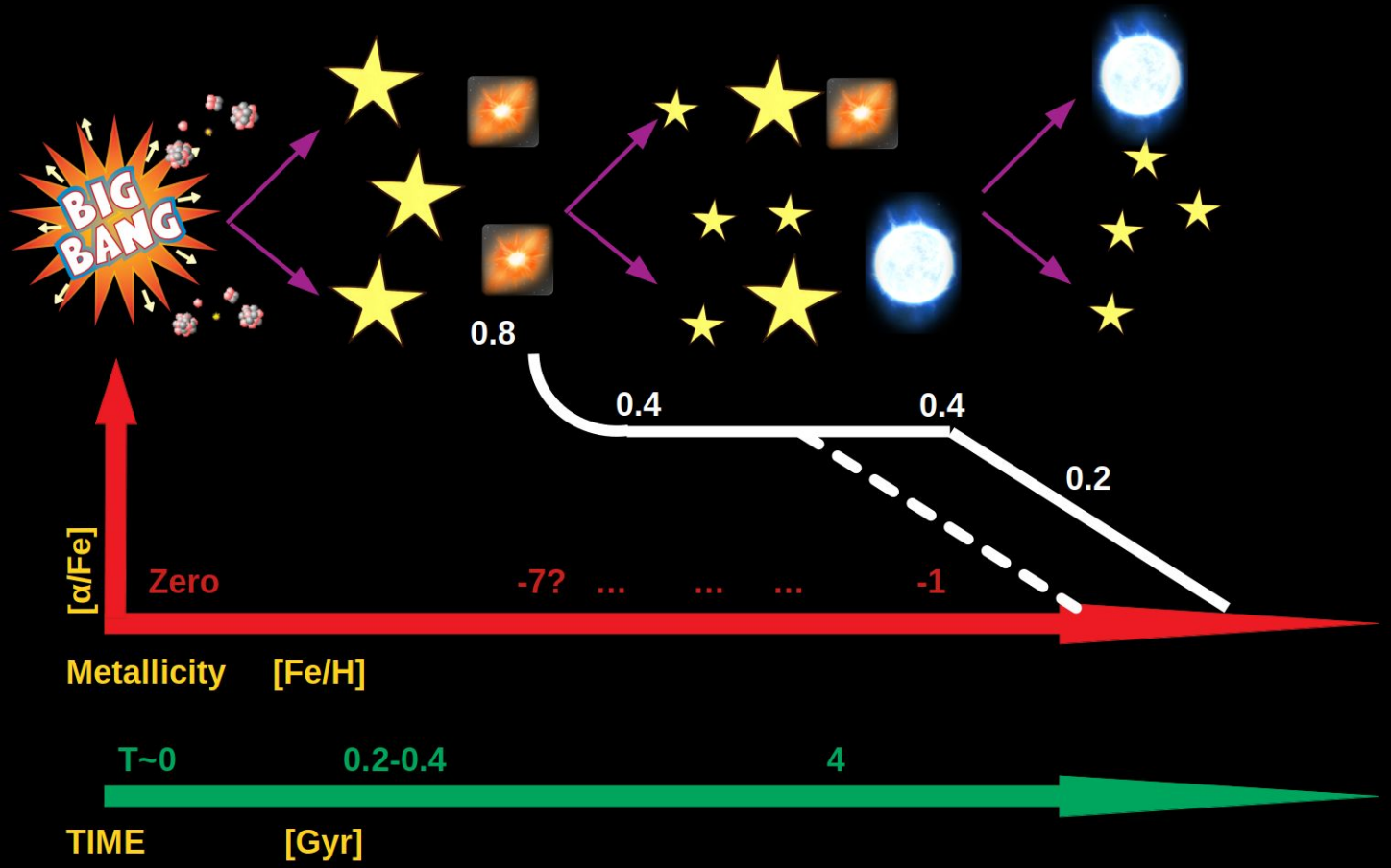
T~0 0.2-0.4

TIME [Gyr]

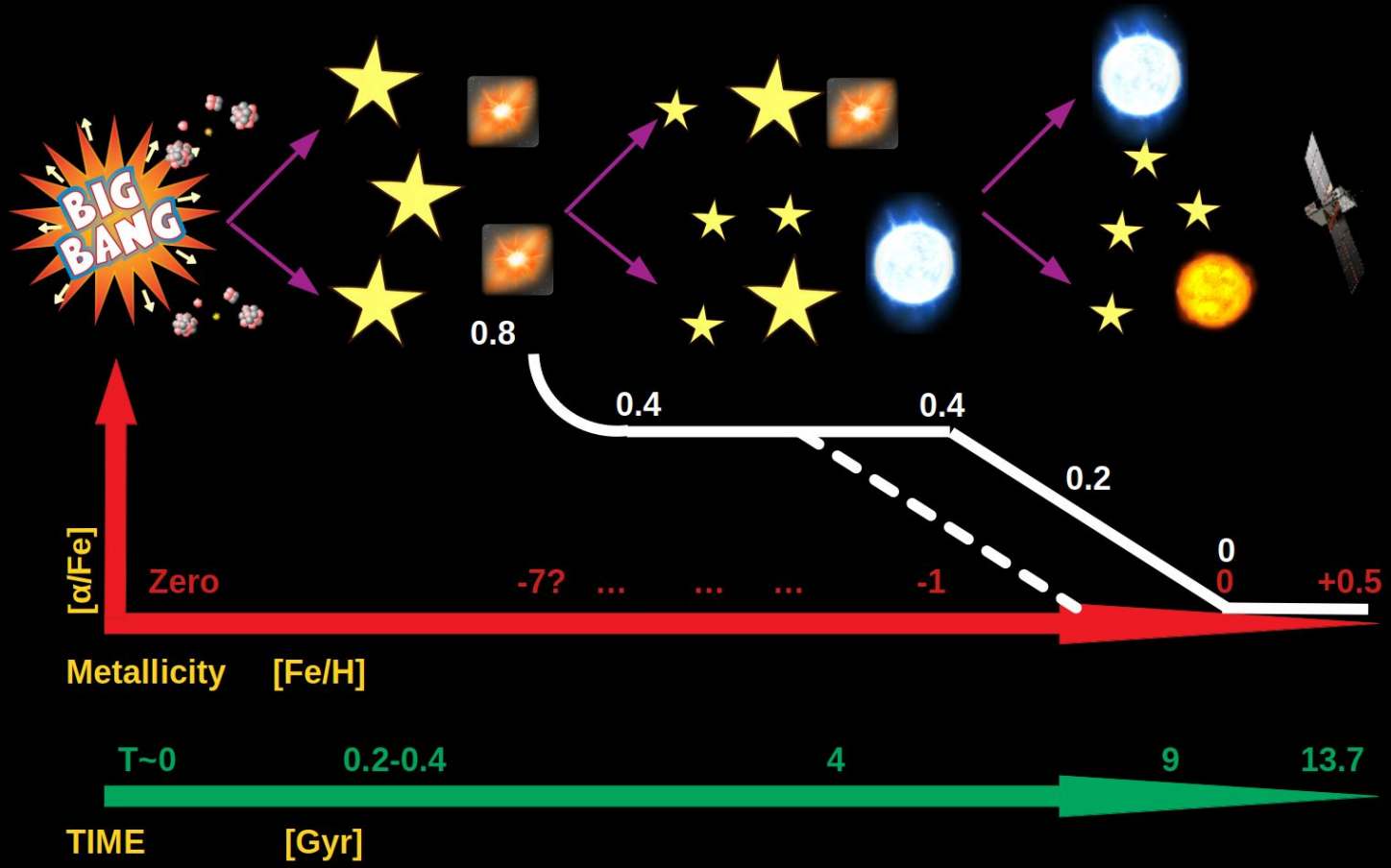
Chemical Evolution



Chemical Evolution



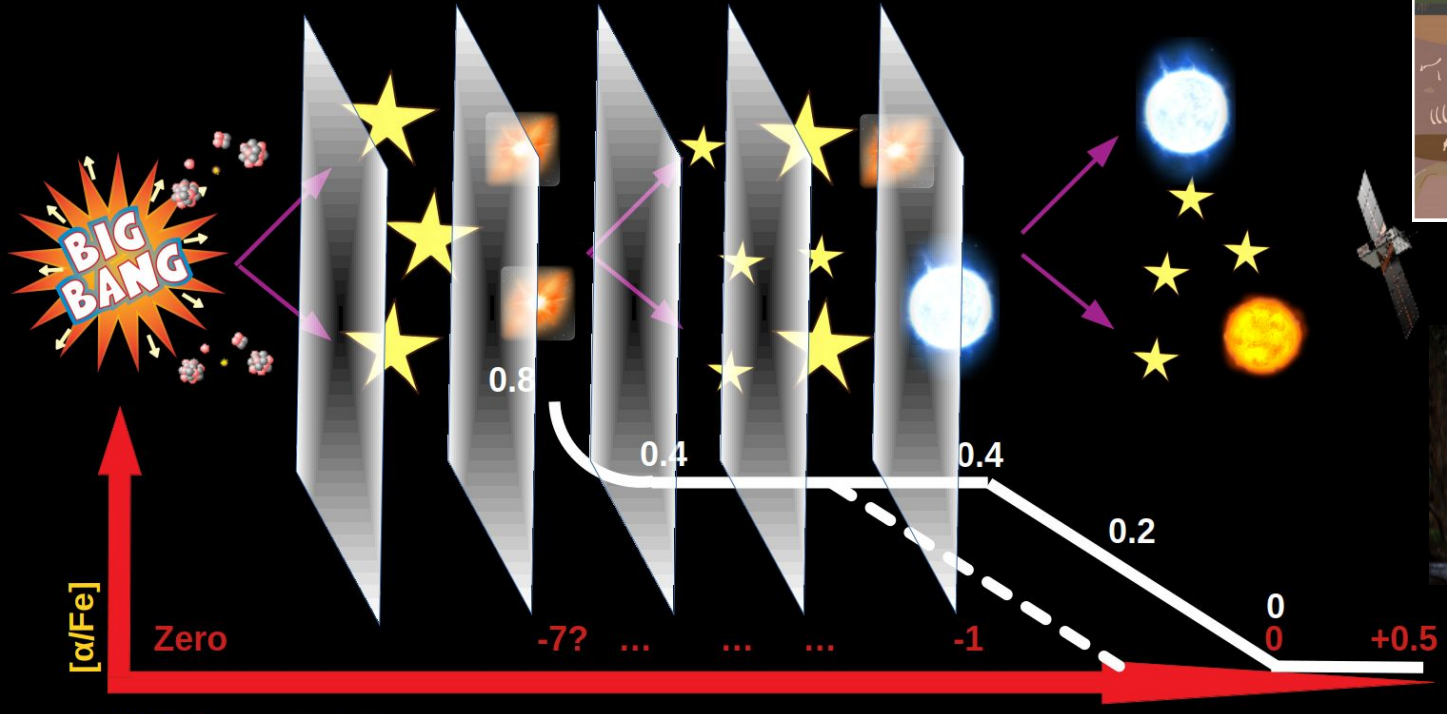
Chemical Evolution



Chemical Evolution







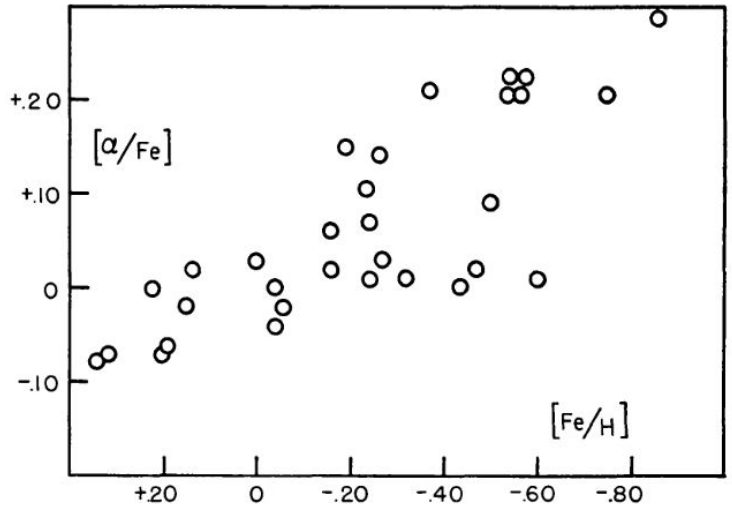
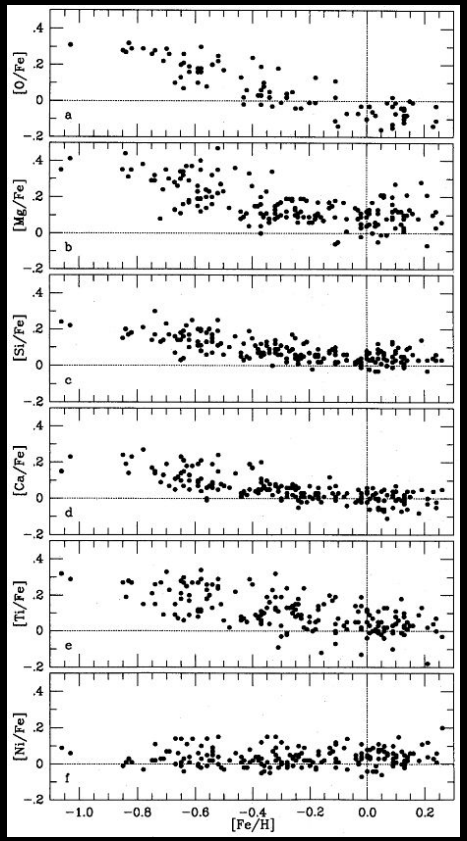


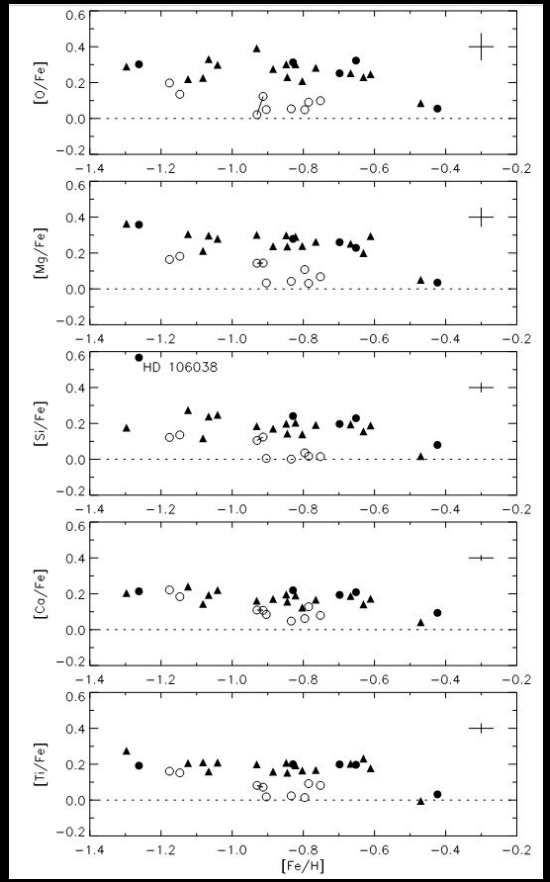
FIG. 14.—The ratio of the α-elements to iron plotted against the ratio of iron to hydrogen

Wallerstein 1962

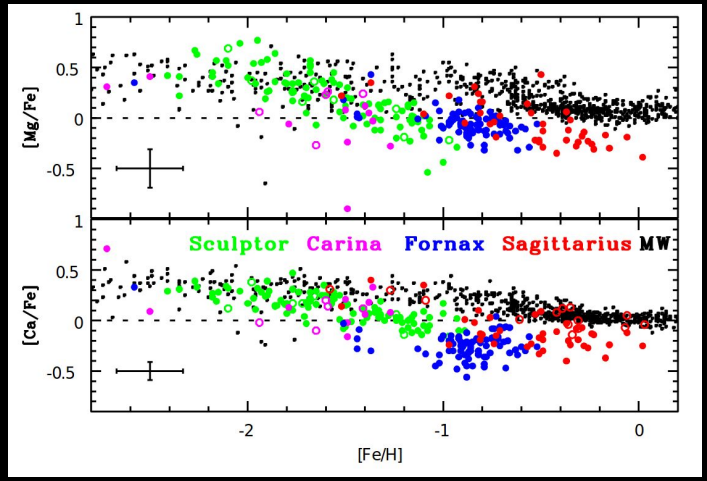
"(...) seven stars show an excess of Mg, Si, Ca, and Ti with respect to the iron peak elements as well as the other light elements, Na and Sc. These four elements are all formed by the addition of successive α-particles to Ne."



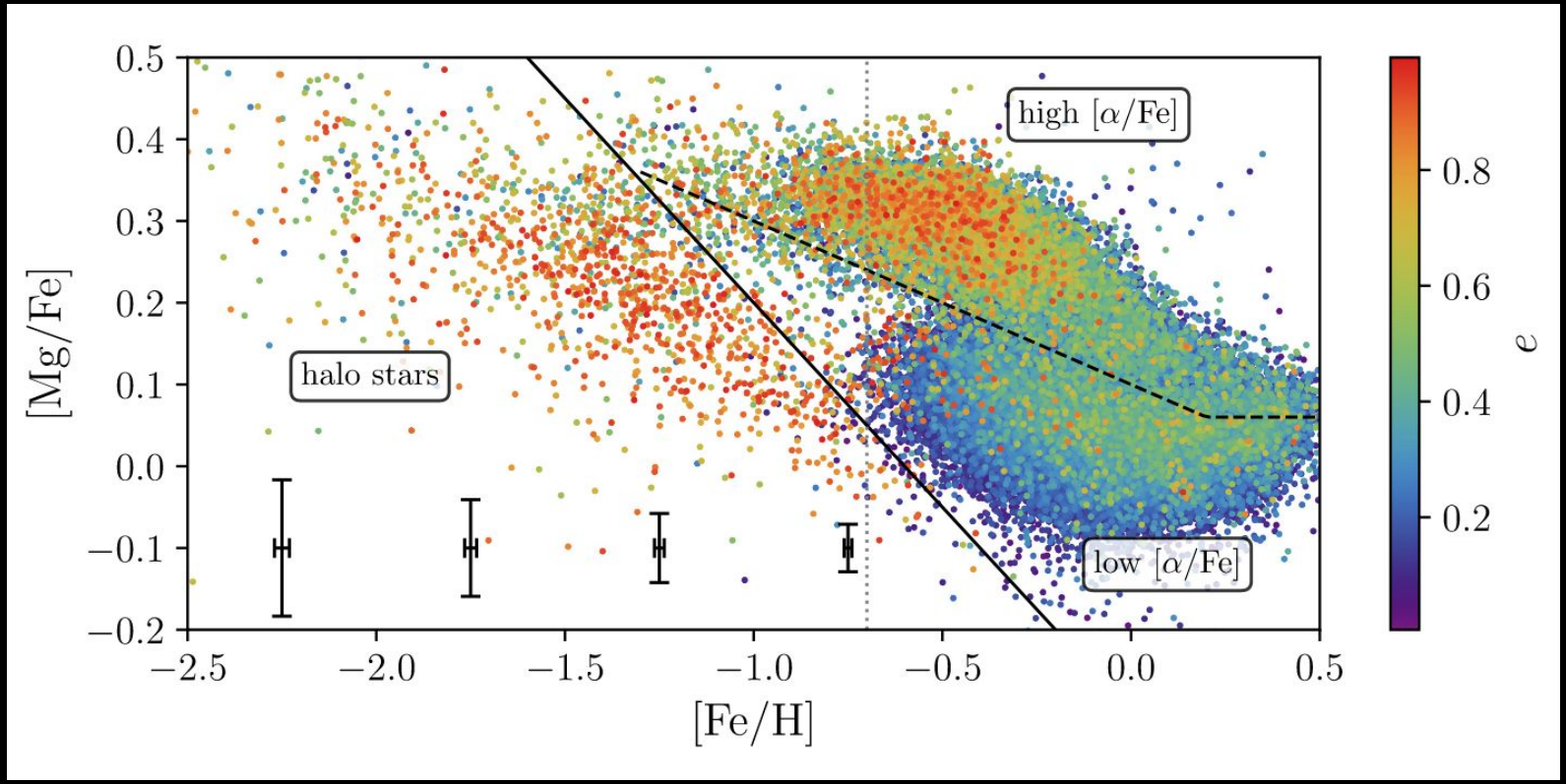
Edvardsson et al. 1993



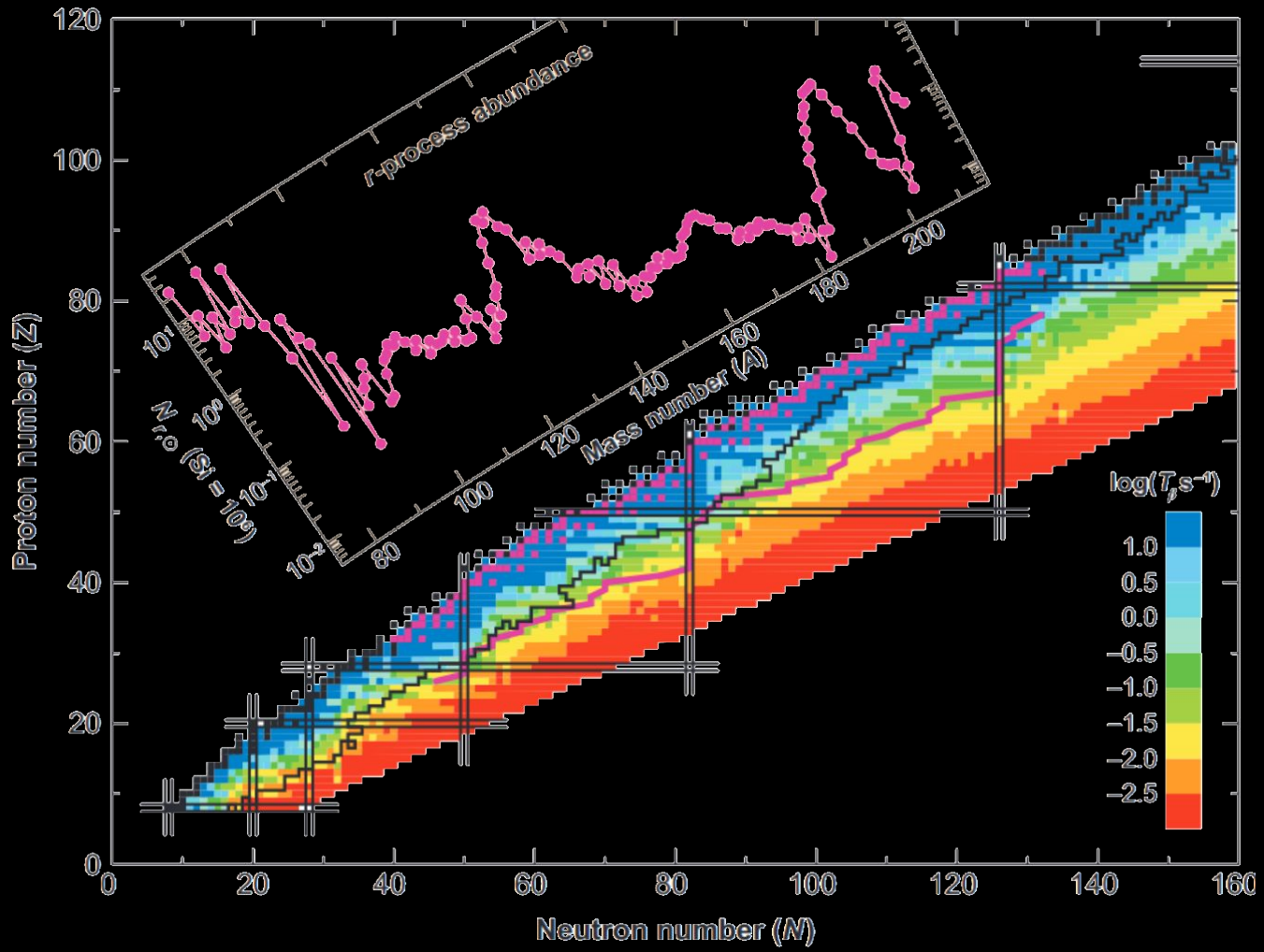
Nissen & Schuster 1997



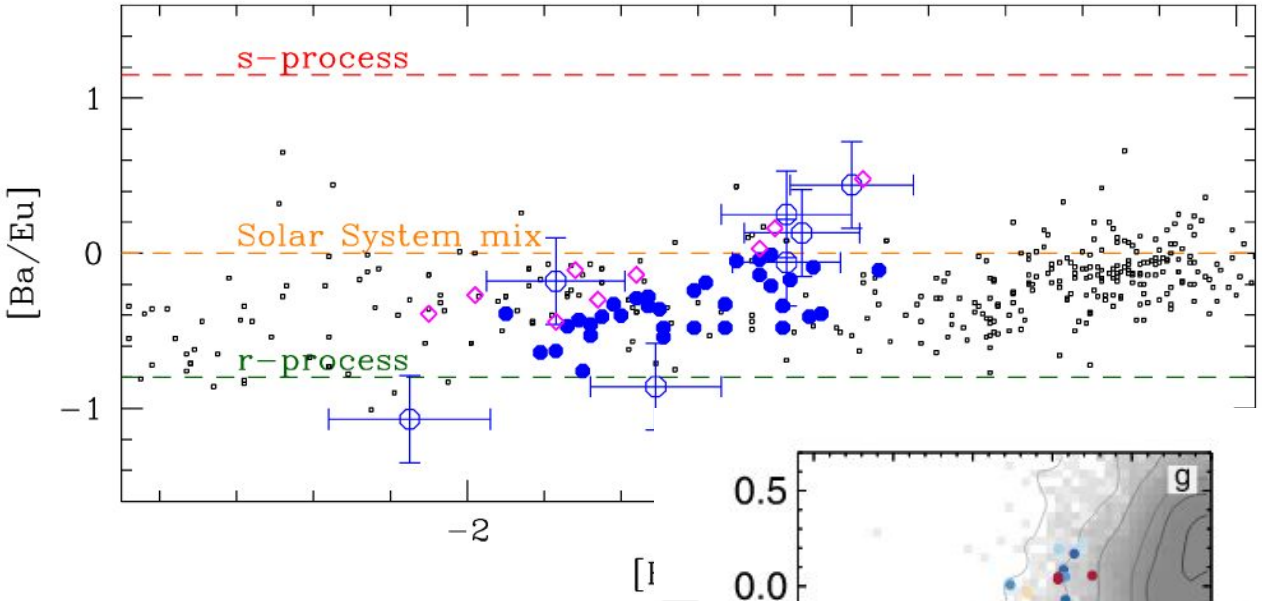
Tolstoy et al. 2009



Mackereth et al. 2019



Moler et al. 2007



DA+ 2021

Hill et al. 2019

