Globular Cluster Abundance Anomalies and the Massive Binary Polluter Scenario

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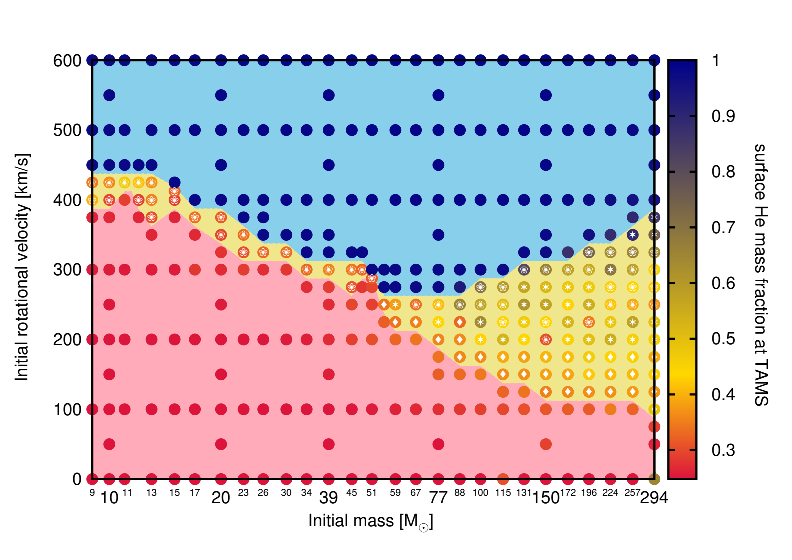
Binary systems, their evolution and environments

1-5. September 2014, Ulaan Baatar

A grid of low metallicity *single* stars

Szécsi et al. 2014 in prep.



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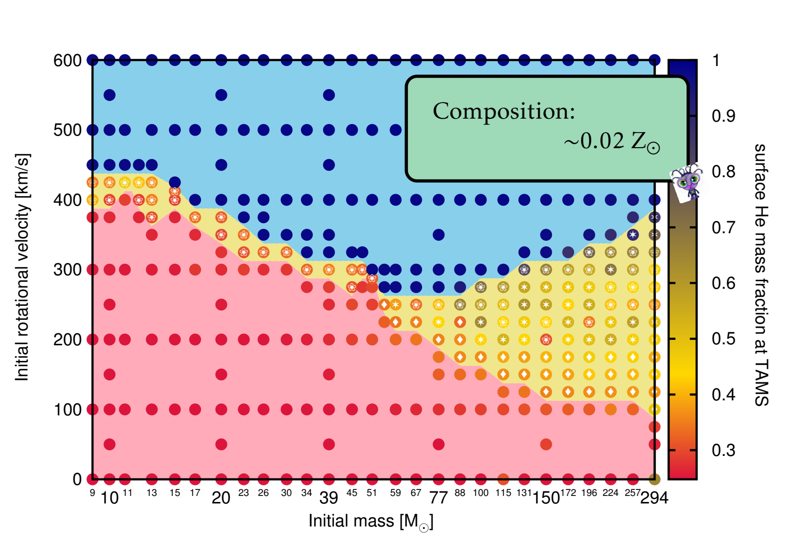

Abundance anomalies observed in Galactic Clusters (GCs)

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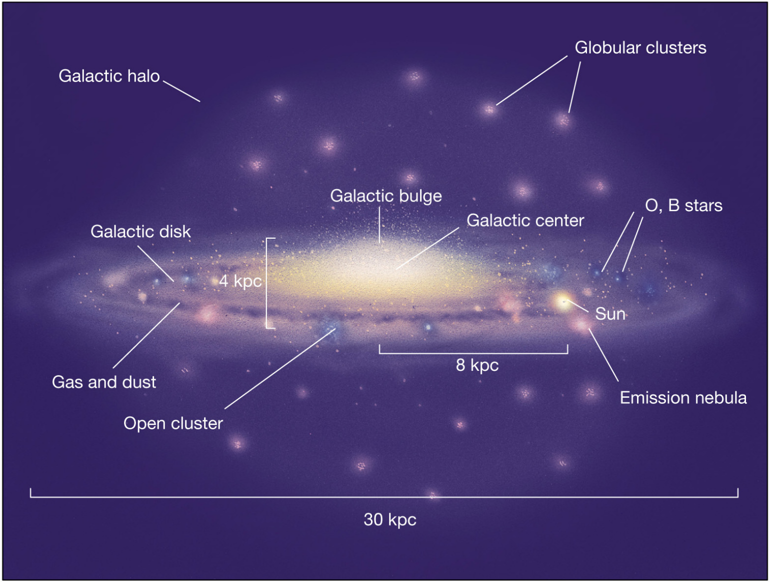

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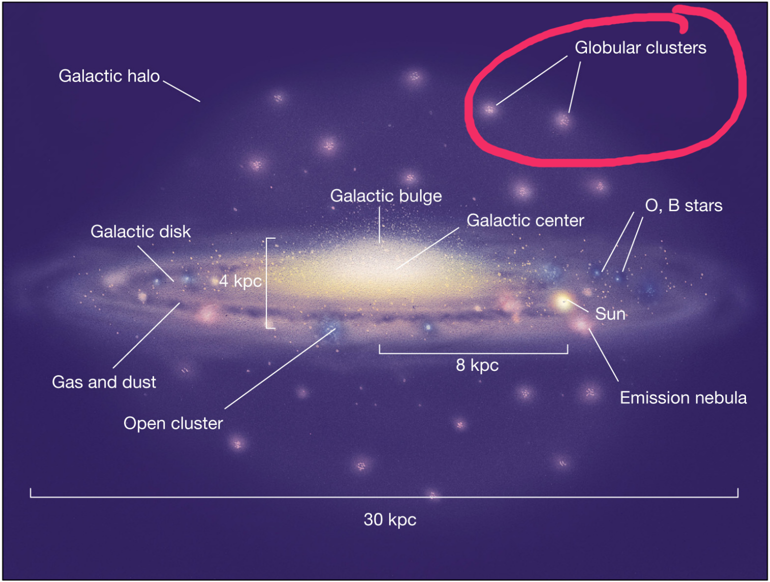

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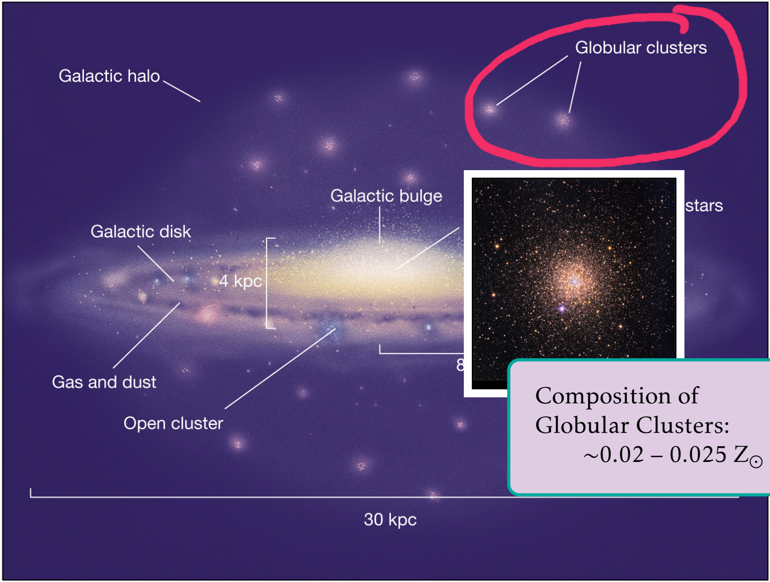

Composition of Globular Clusters:
$\sim 0.02 - 0.025\ Z_{\odot}$

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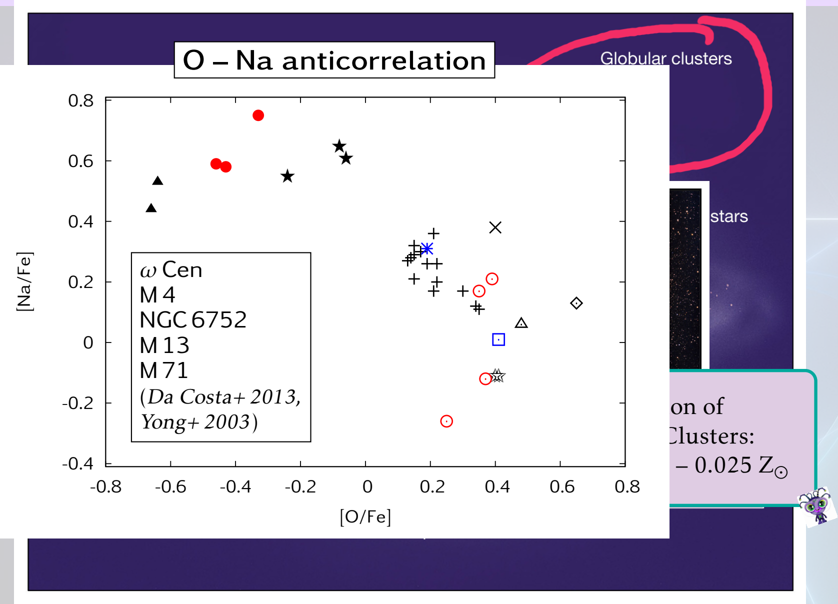

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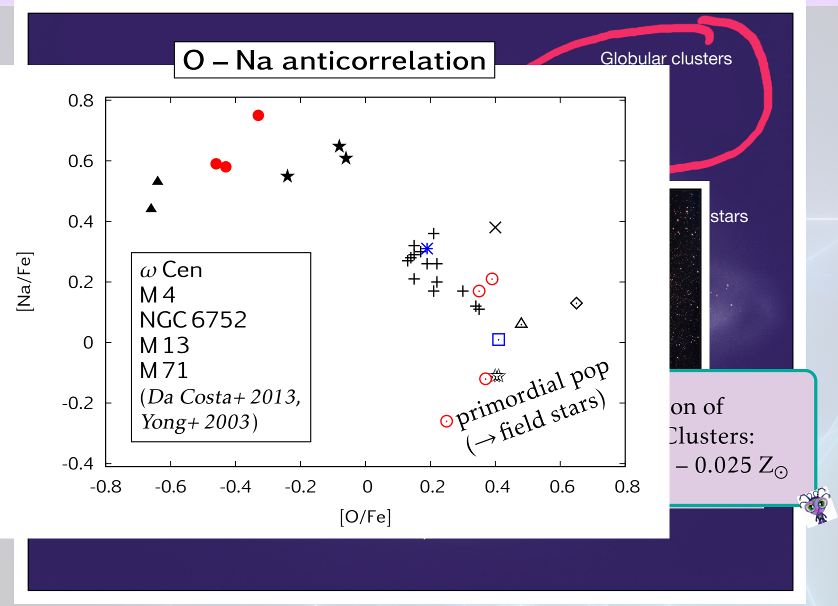

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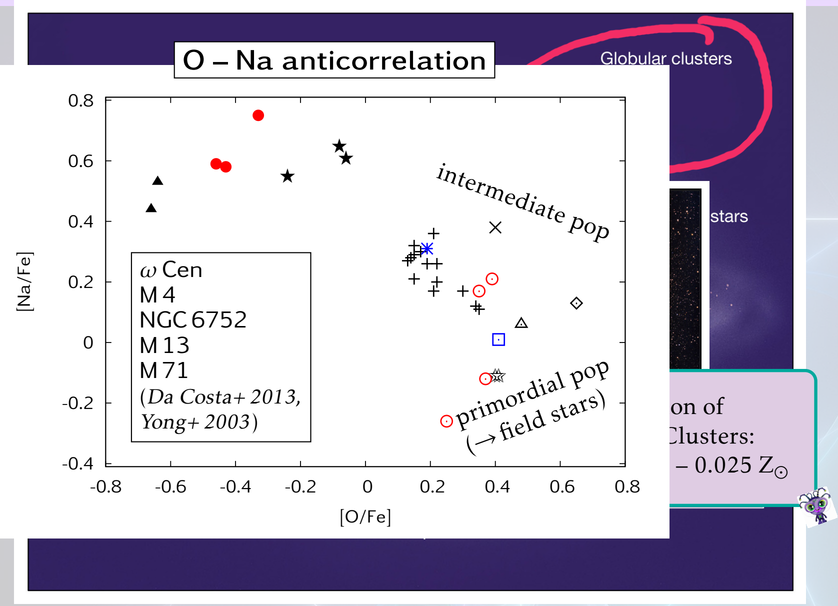

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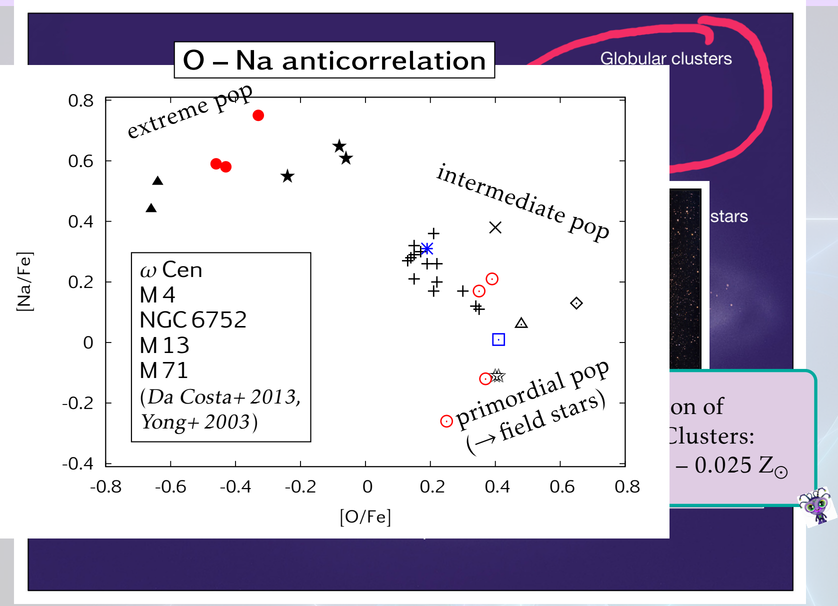

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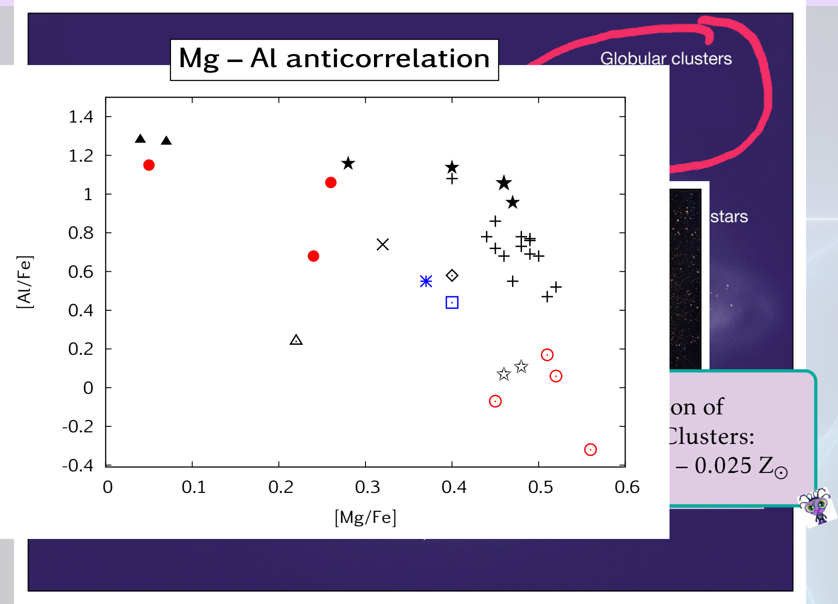

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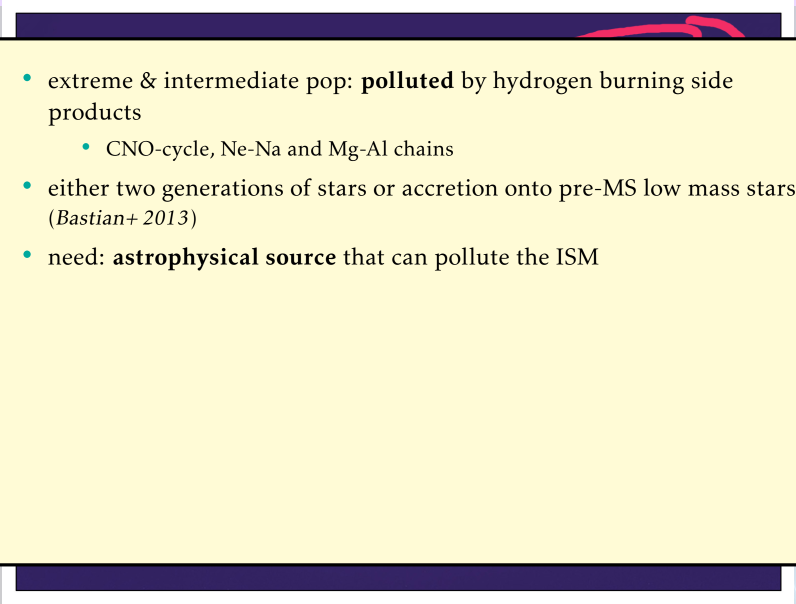

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  - **massive binaries**: non-conservative mass transfer (*De Mink+ 2009*)

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- *De Mink+ 2009*: **20 $M_{\odot}$ + 15 $M_{\odot}$ + 12 days** ($\sim$0.025 $Z_{\odot}$)

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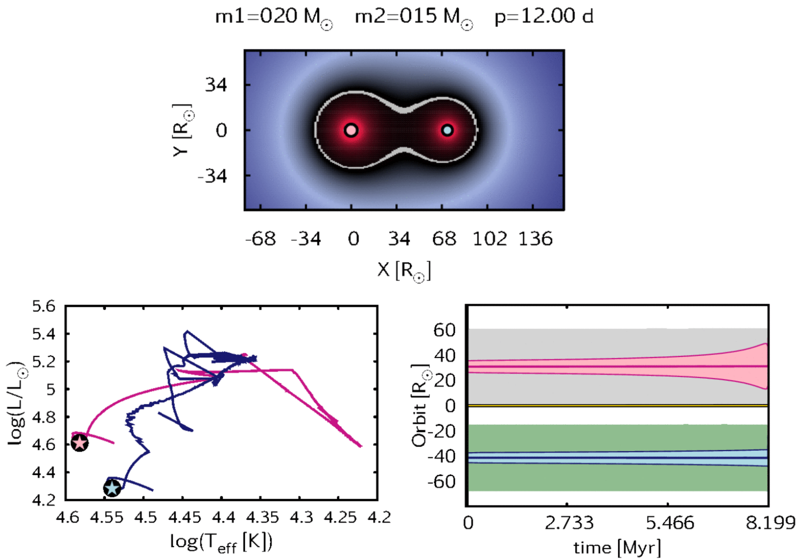

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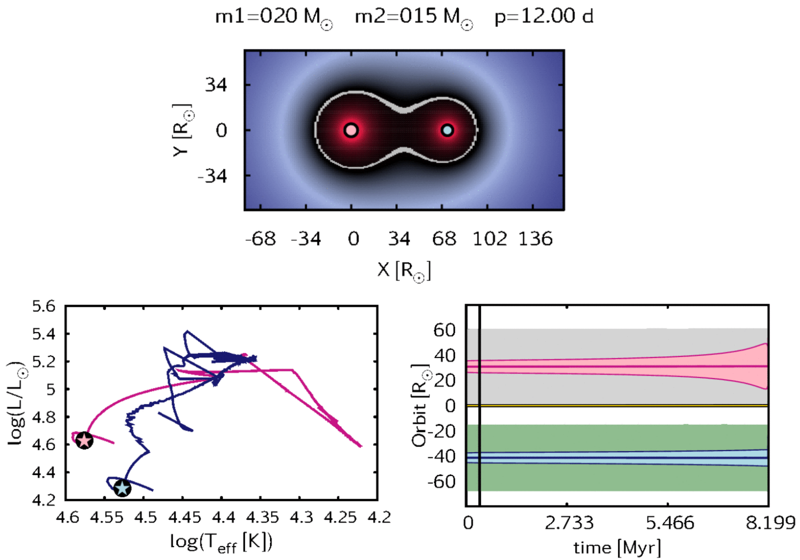

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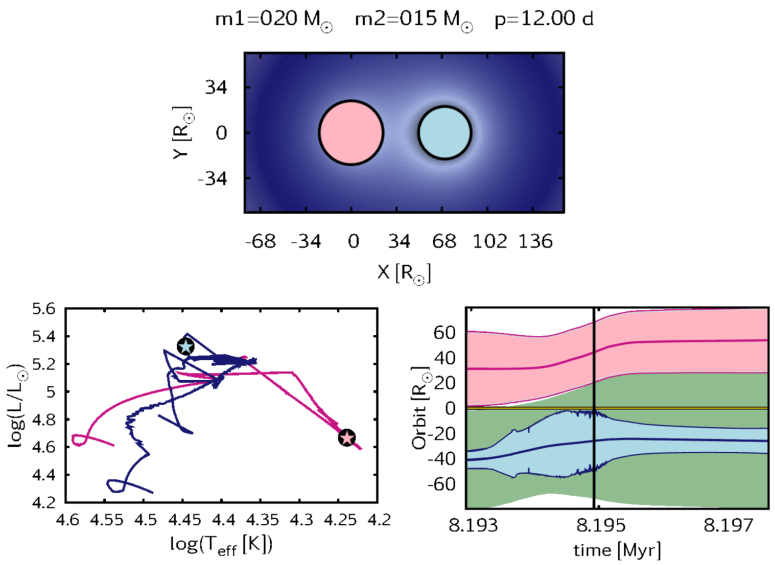

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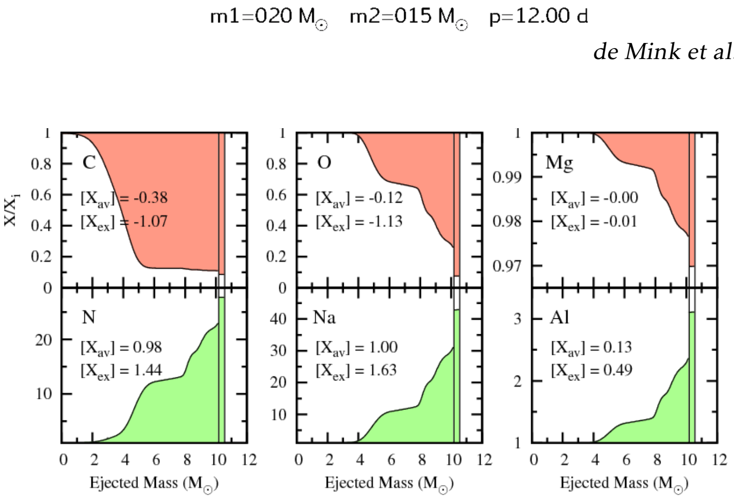

de Mink et al. 2009

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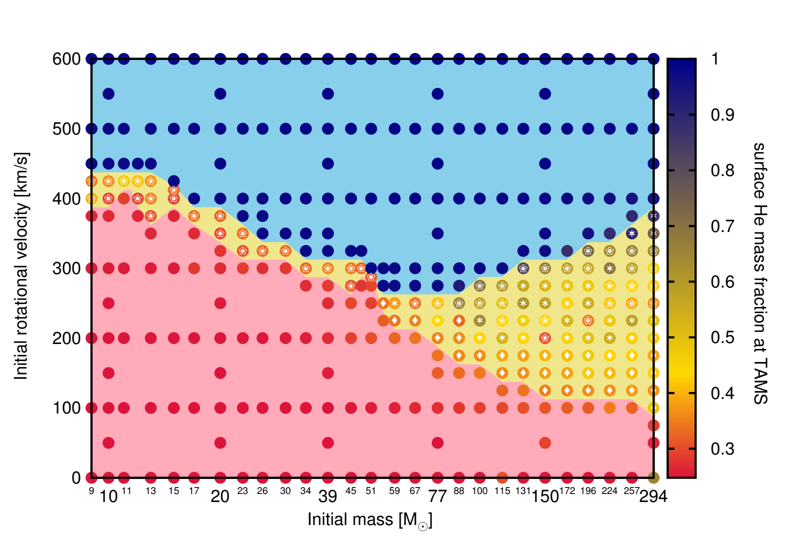

A grid of low metallicity *single* stars

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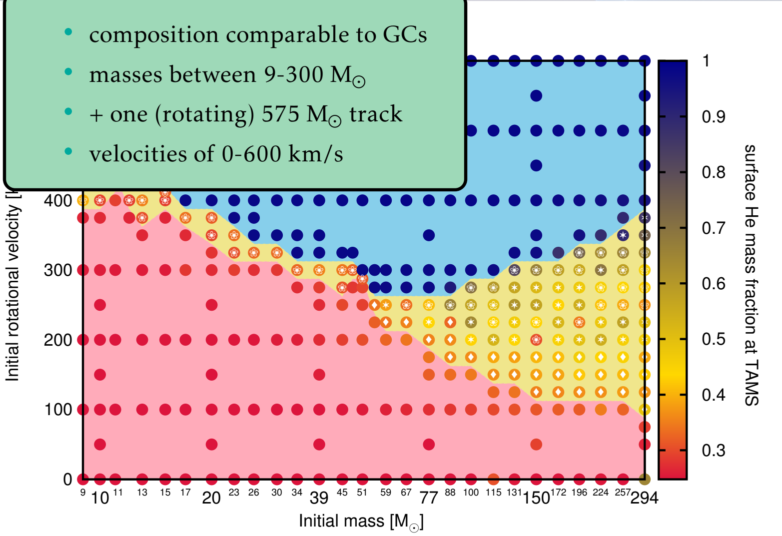
- composition comparable to GCs
- masses between 9-300 $M_\odot$
- + one (rotating) 575 $M_\odot$ track
- velocities of 0-600 km/s



Single star approach
to the Massive Binary Polluter Scenario

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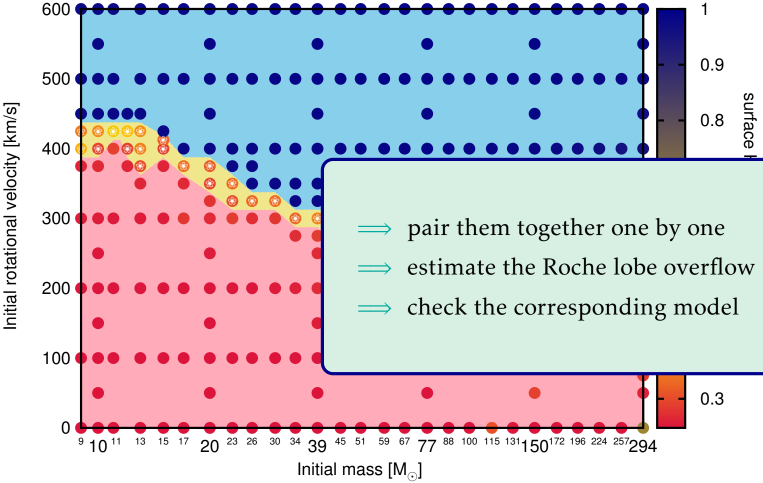

⟹ pair them together one by one

⟹ estimate the Roche lobe overflow

⟹ check the corresponding model

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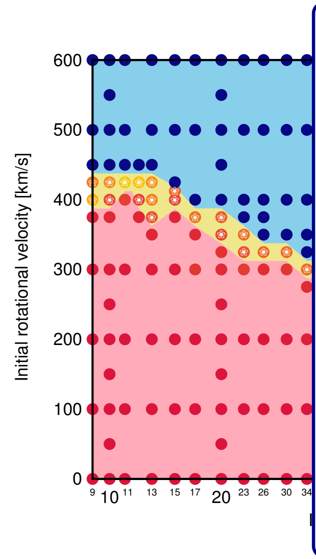

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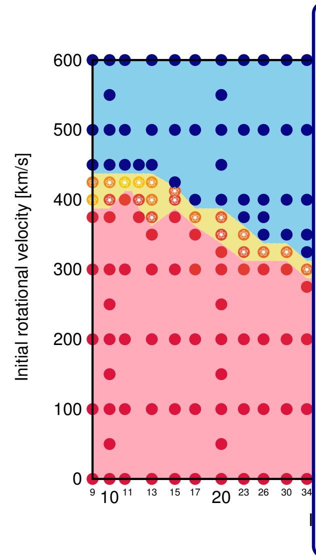

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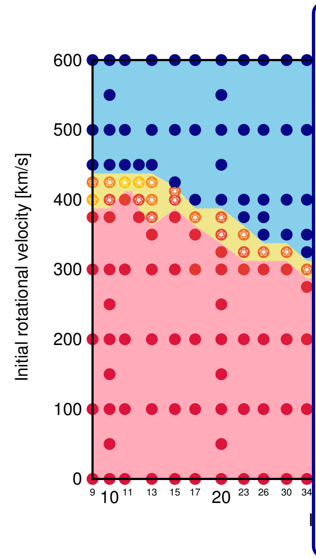

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$\Longrightarrow$ initial orbital separation: $A = 72\ R_\odot$

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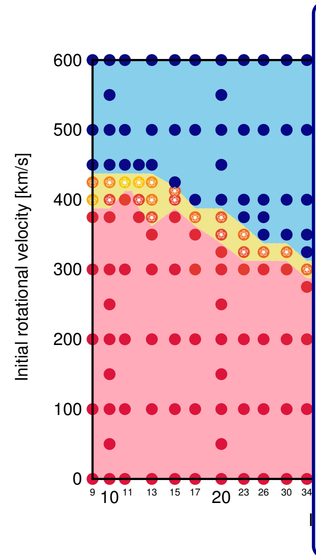

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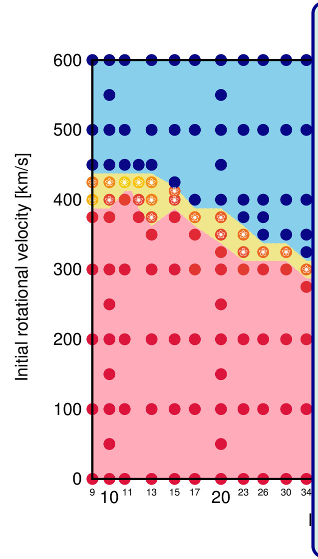

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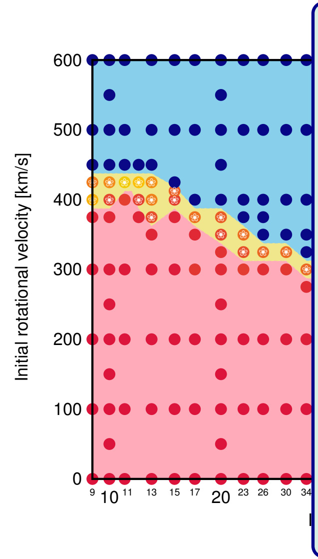

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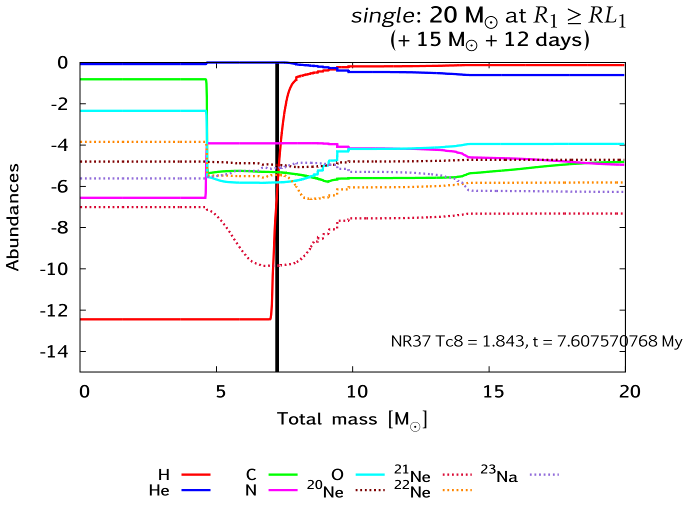
⟹ when $R_1 \geq RL_1$: check size and composition of the primary envelope

Composition and size of primary envelope



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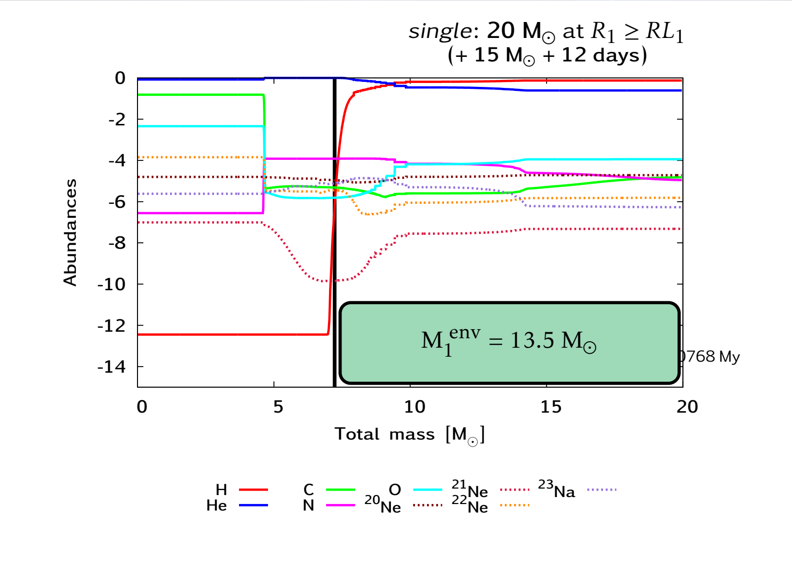

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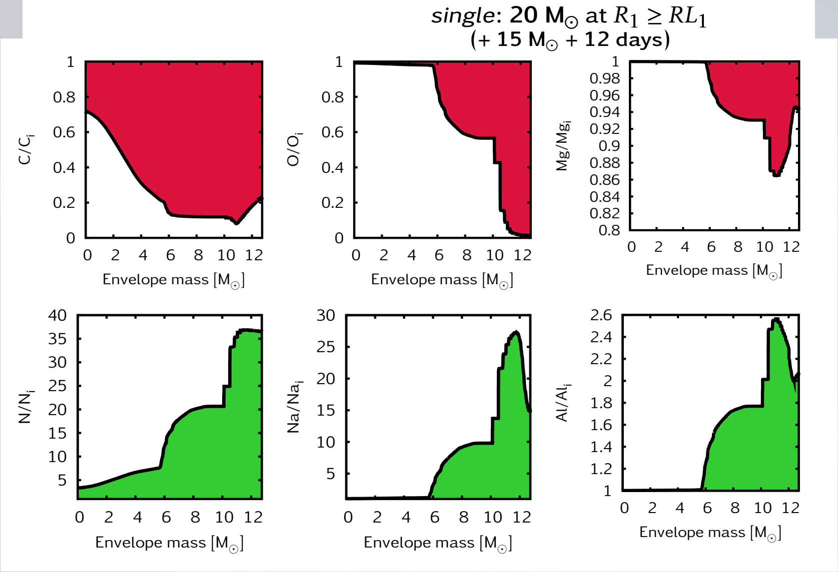

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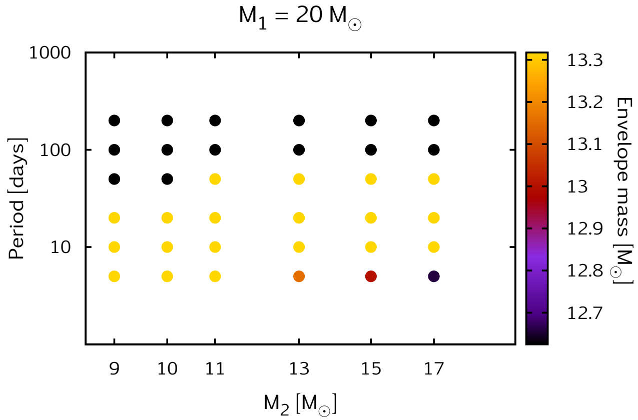
- give **constraints on the massive binary polluter scenaro** even without detailed binary simulations

Single star approach: size of primary envelope



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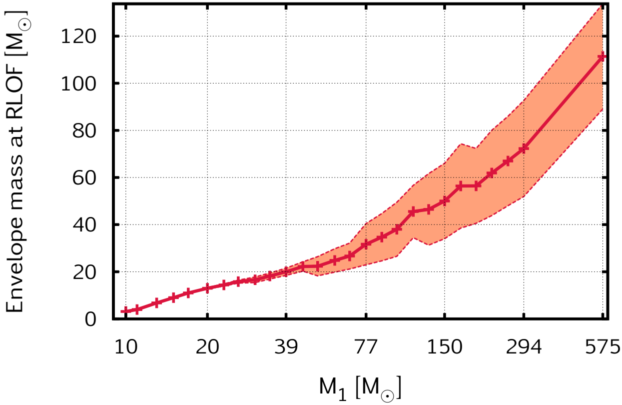

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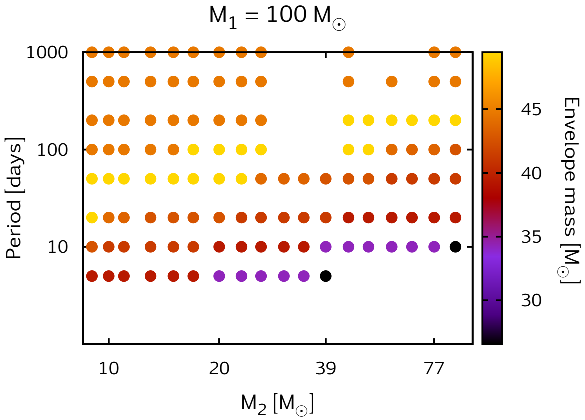

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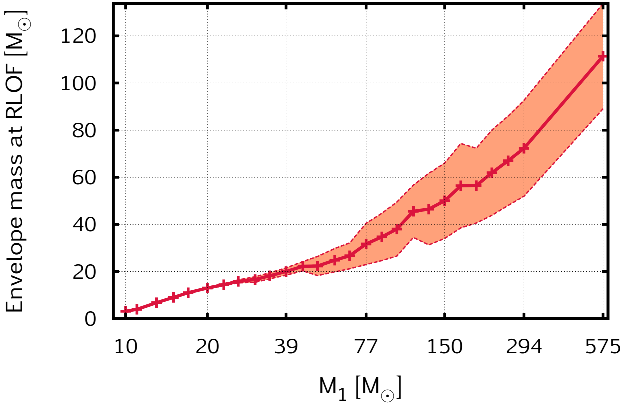

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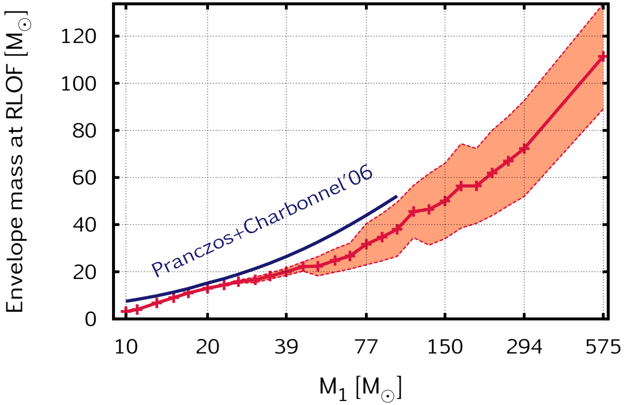

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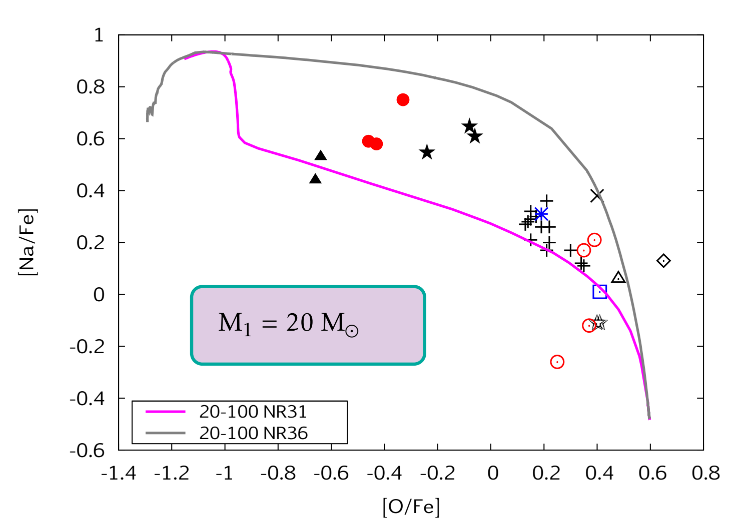

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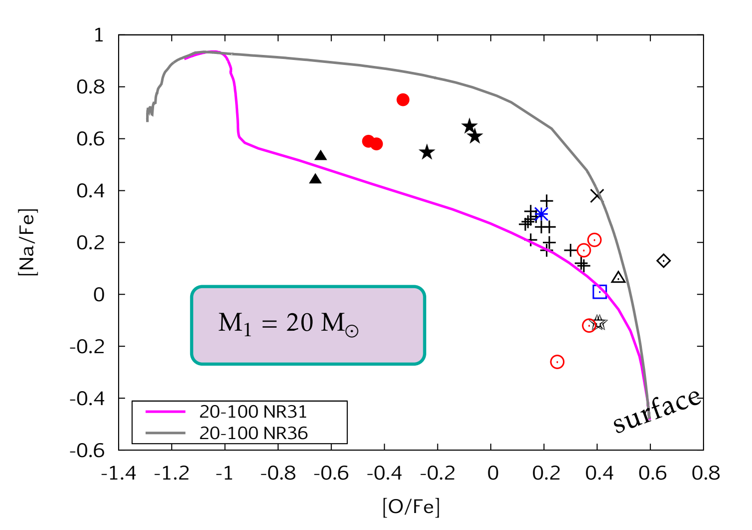

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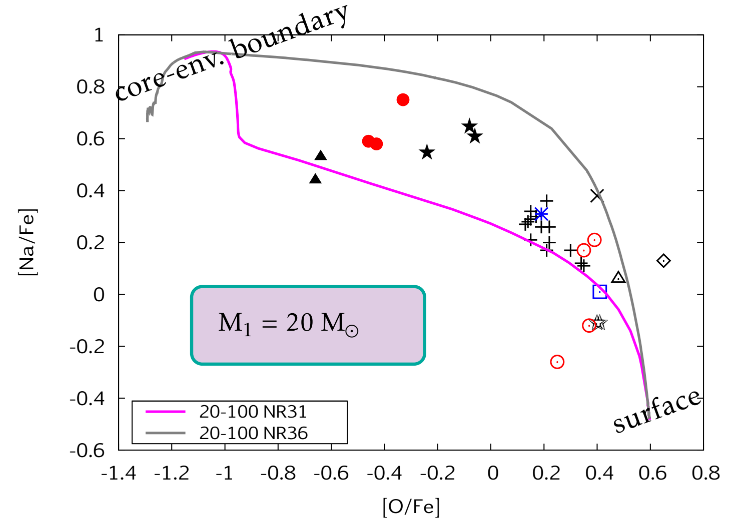

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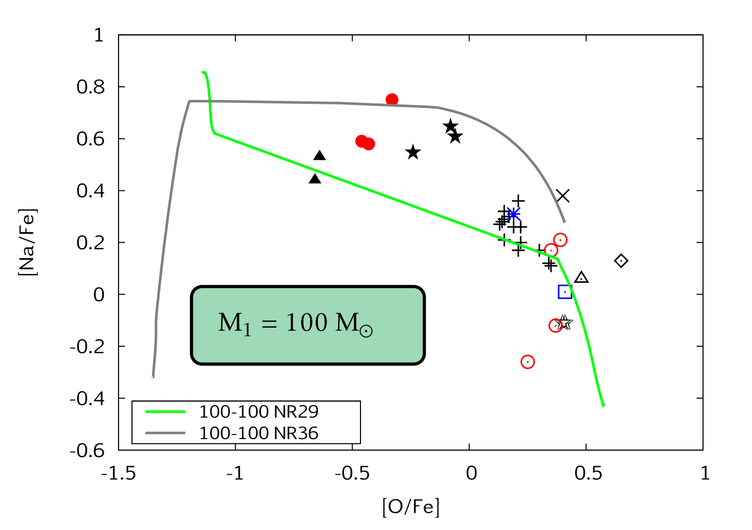

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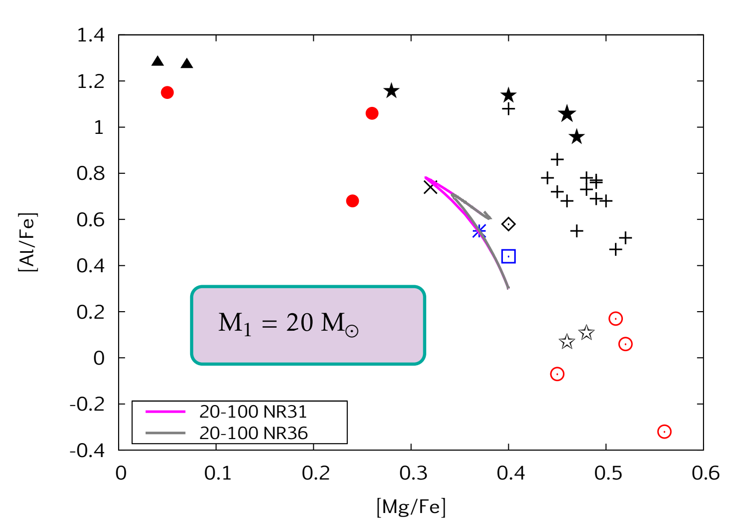

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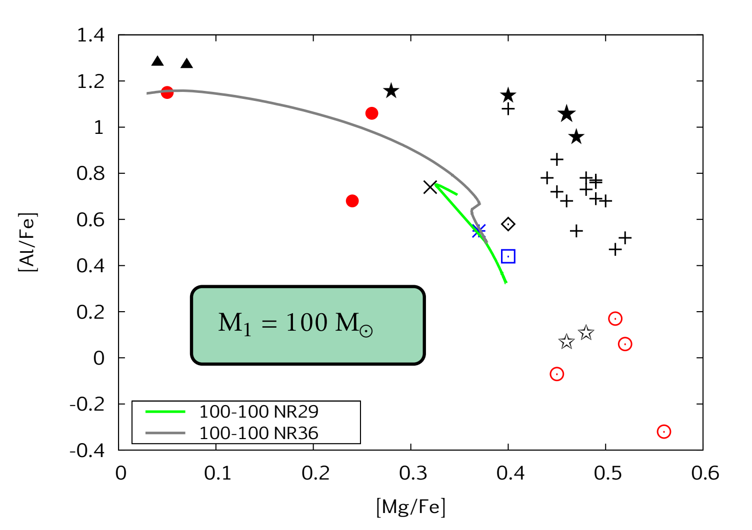

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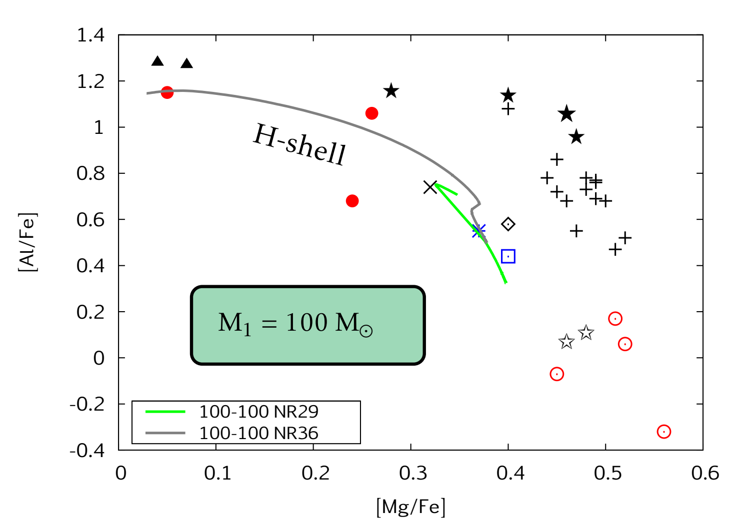

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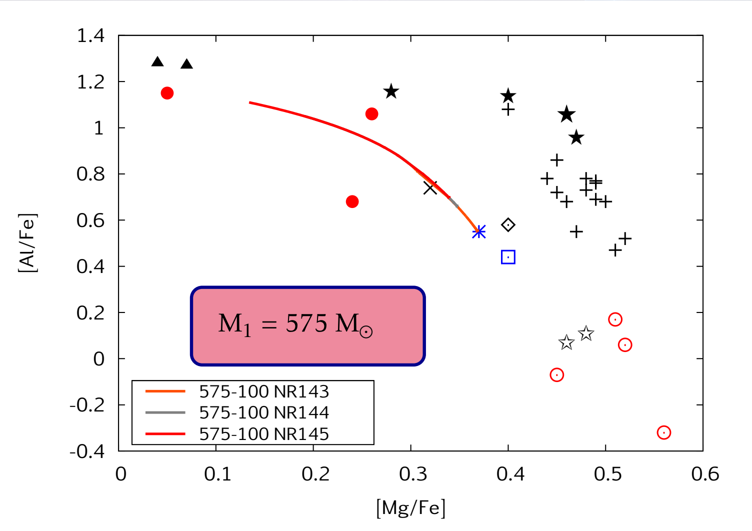

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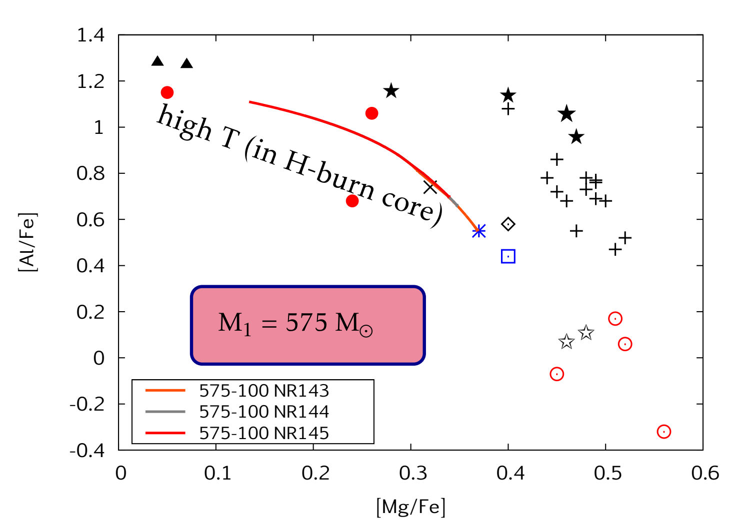

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  - **extended** for higher masses (up to $\sim$575 $M_\odot$)

Final notes

Work in progress, first steps presented.

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- mass budget; effects of rotation
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Open to suggestions, comments and questions!

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Thank you for your attention!

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