Consequences of Mass Loss on the Final Fates of Massive Stars

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Fast Outflows in Massive Stars
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Stellar evolution + mass loss recipes

Stellar evolutionary tracks

- hydrodynamic simulation of an isolated, rotating gas sphere (= star)
- nuclear burning, 1D

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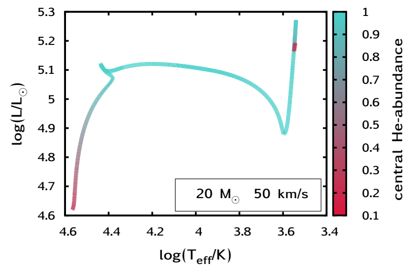

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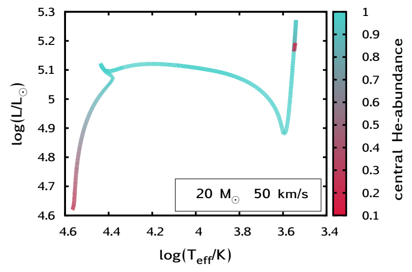

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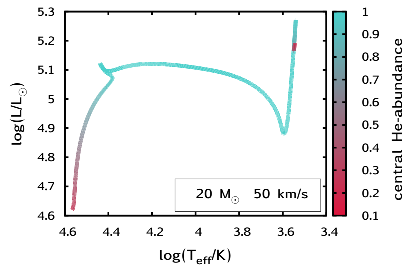

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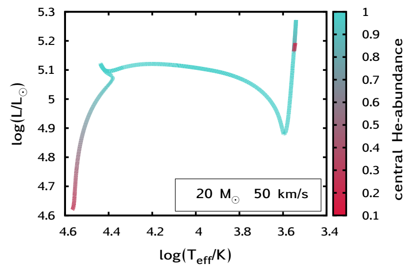

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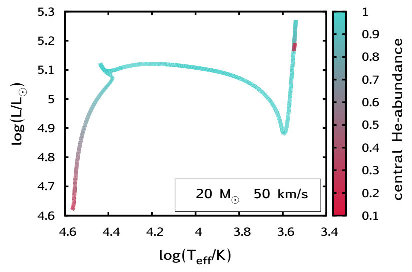

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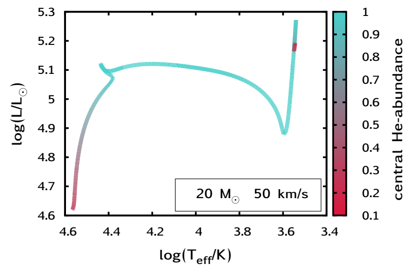

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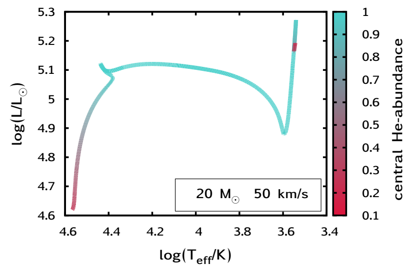

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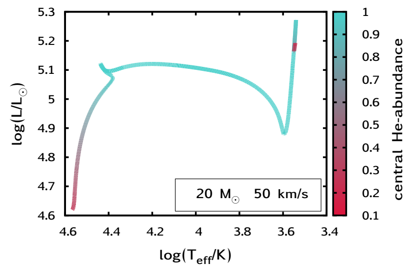

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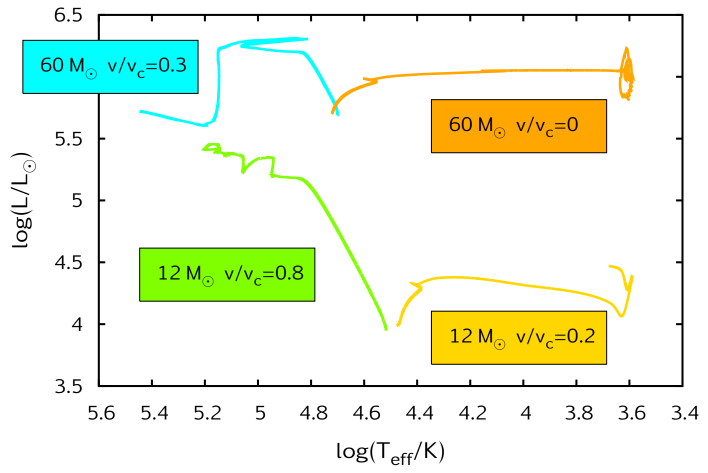
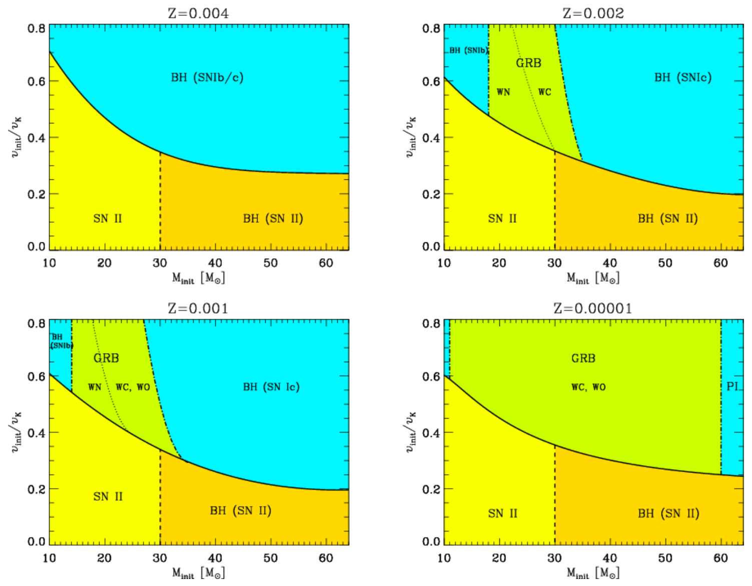
→ mass loss rate has a feedback on the evolution!

Yoon et al. 2006: low Z tracks on the HRD



Yoon'06: lGRB and SN progenitors at different Z



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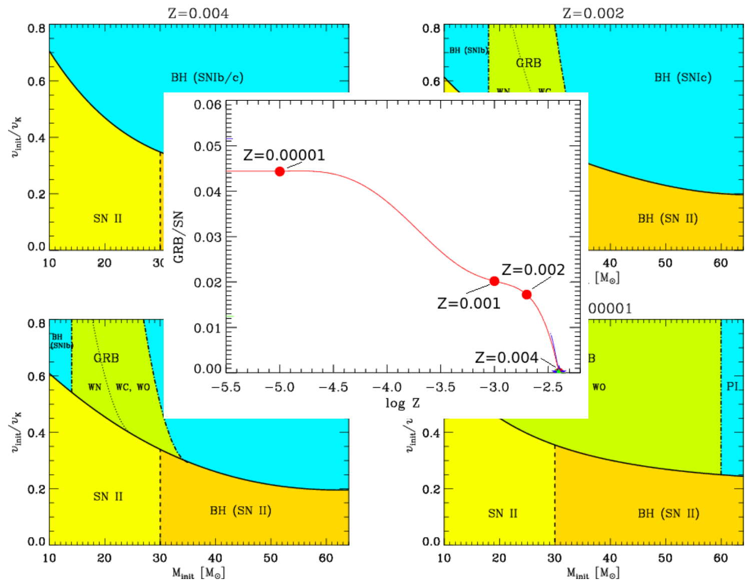

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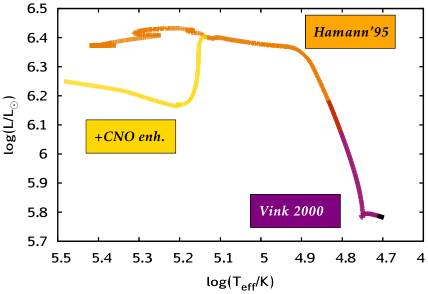
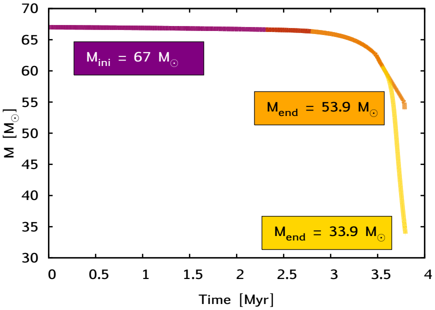
  - How much does it effect the final fate predictions?

With and without CNO enhanced mass loss

$67\ M_\odot$ $v/v_c=0.3$ tracks from *Szécsi et al. 2014*





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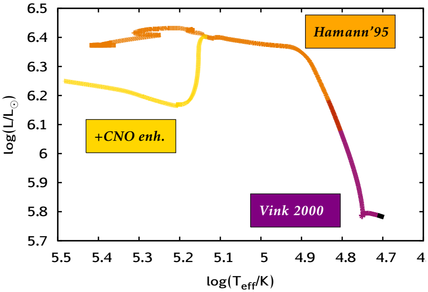

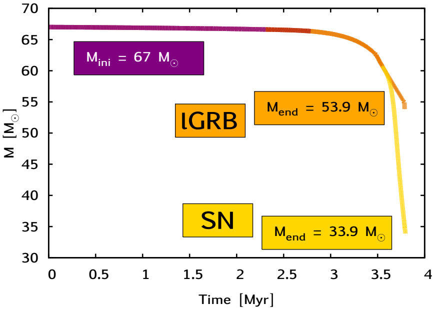

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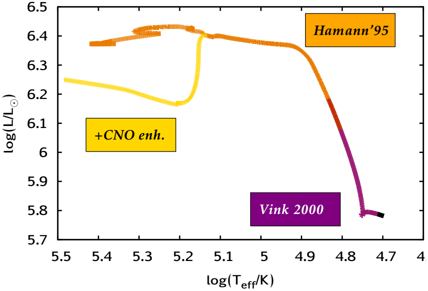

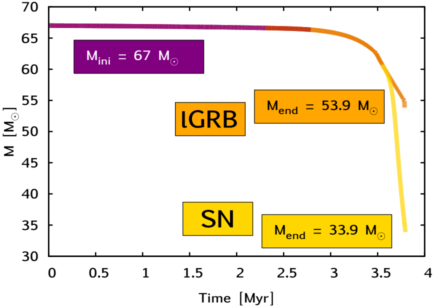

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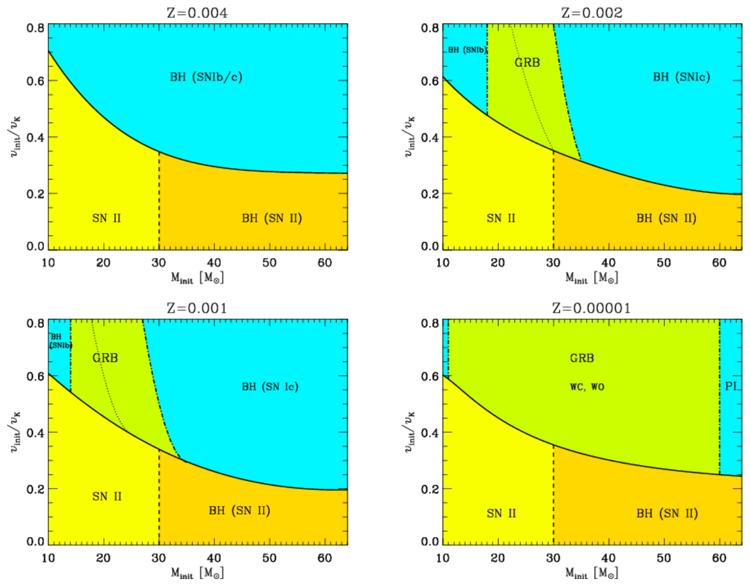
- If CNO enh. massloss is unreasonable: more lGRBs and less SNe →

lGRB rate of Yoon'06 – *REVISED*



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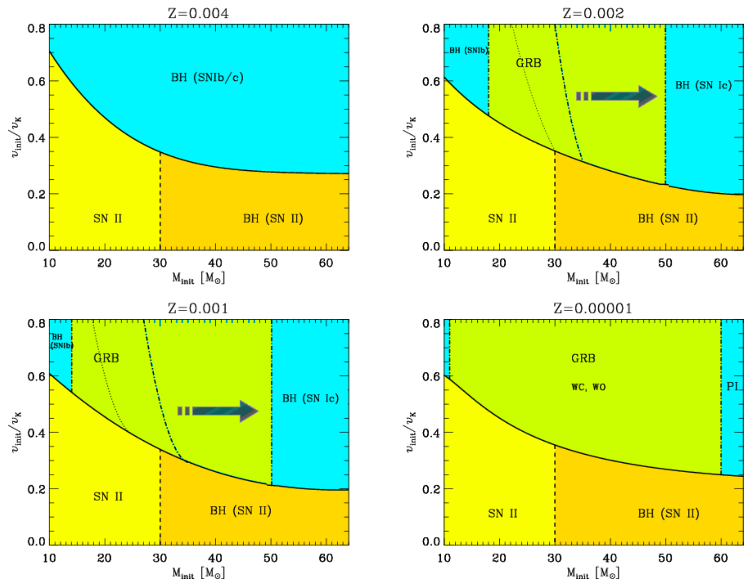

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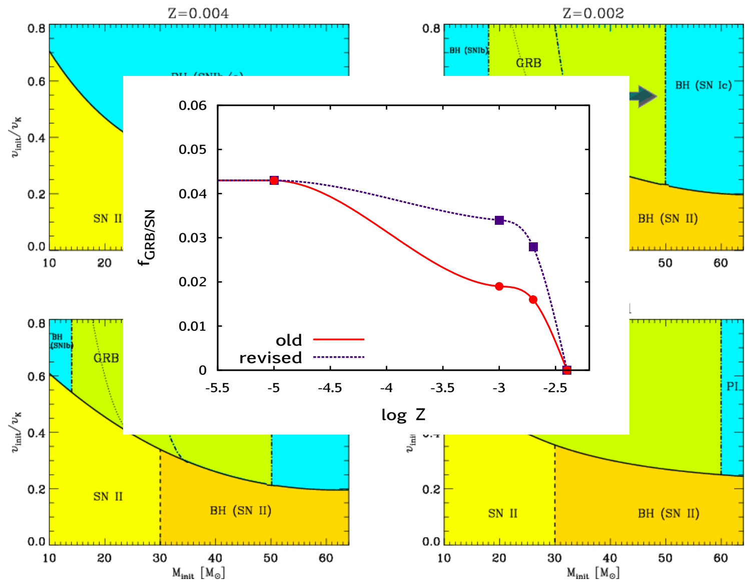

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Which WR mass loss prescription is more valid?

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- Waiting for comments and questions!

Thank you for your attention!

WR wind mass loss rates

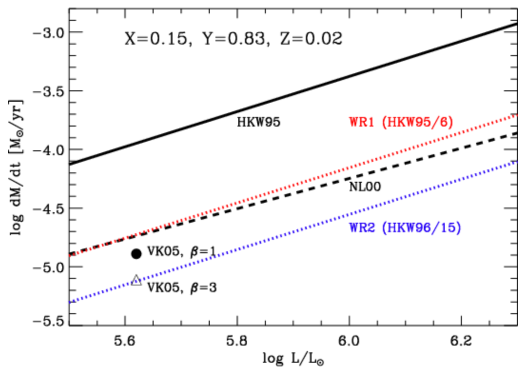

Fig. 1. of *Yoon & Langer 2005*

Wolf-Rayet wind mass loss rates as a function of the stellar luminosity for a given surface composition.

Hamann et al. 1995: HKW95 (solid)
Nugis & Lamers 2000: NL00 (dashed)

HKW/6
HKW/15

Vink & de Koter 2005: VK05
(mass loss rate for WN stars)