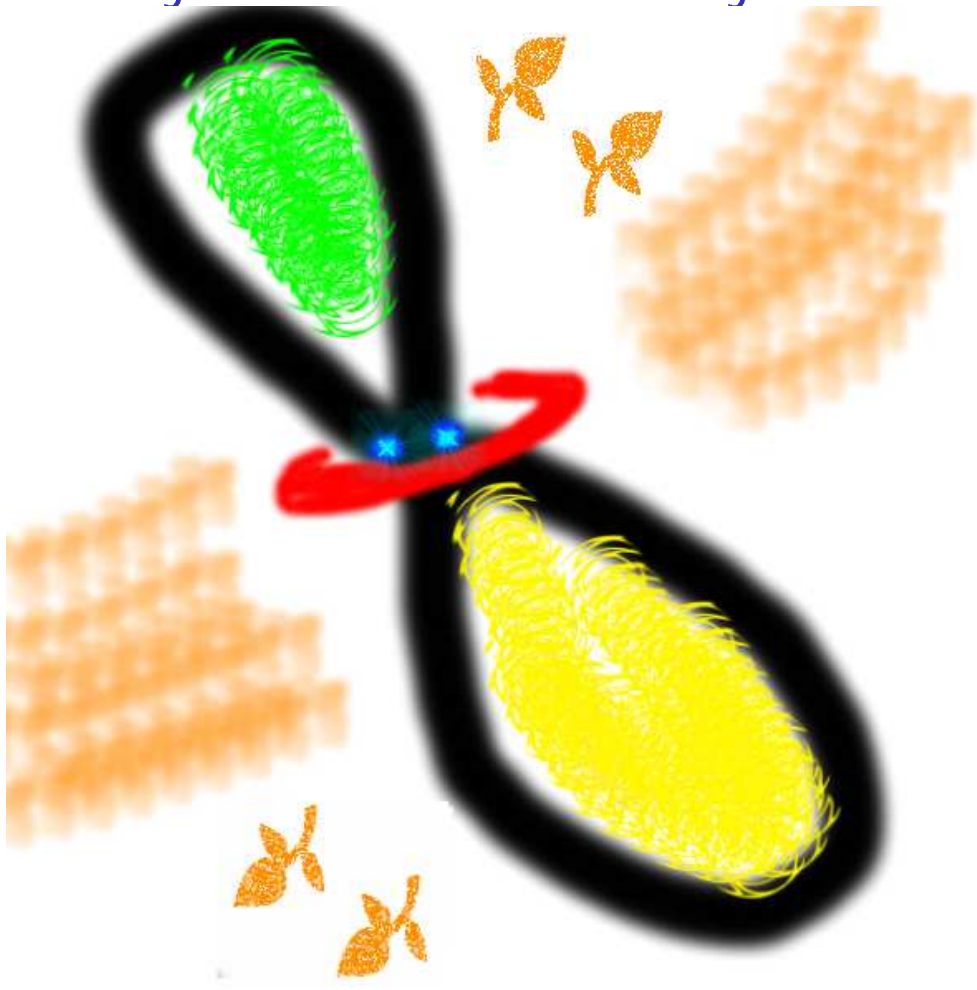
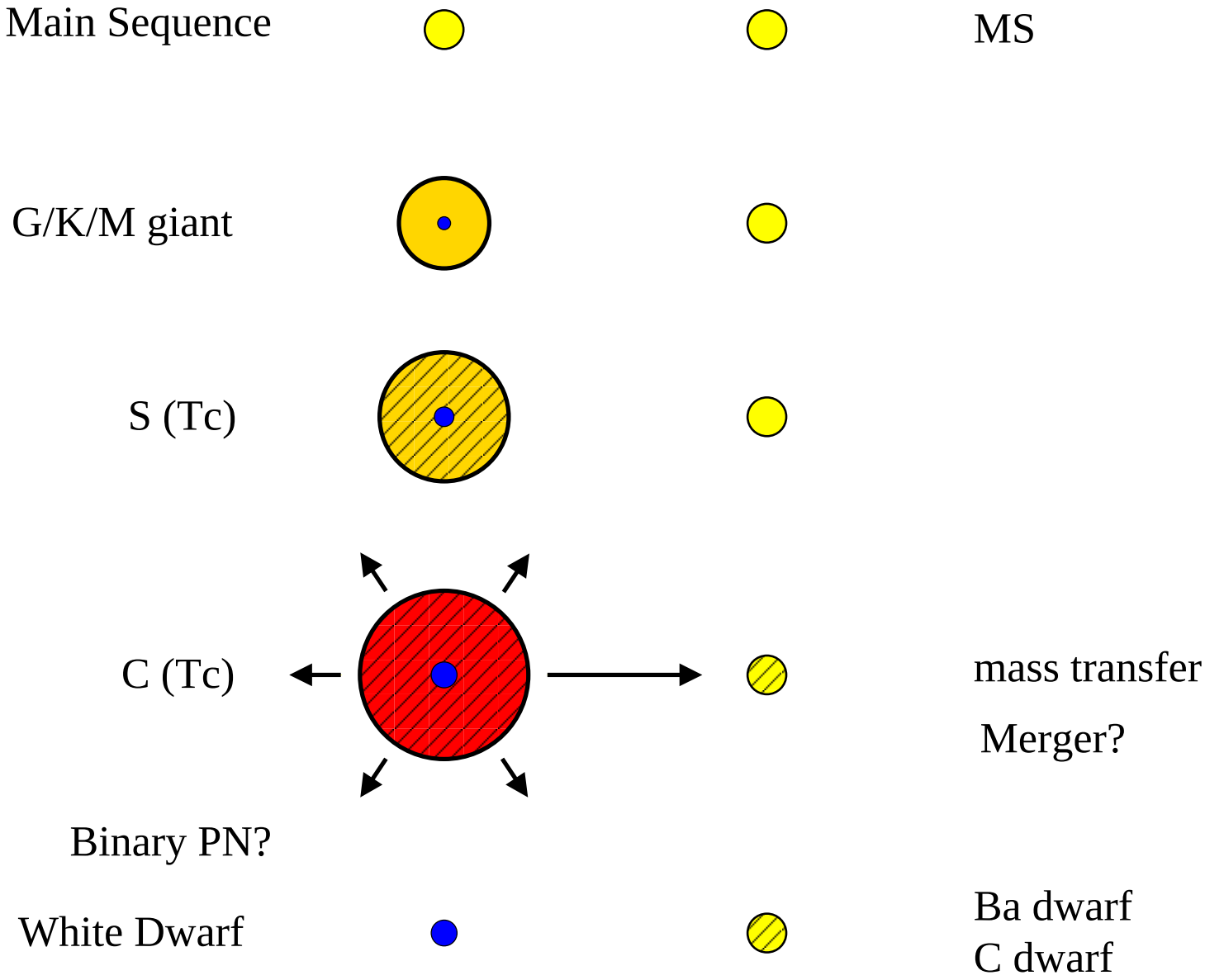
Binary AGB Nucleosynthesis



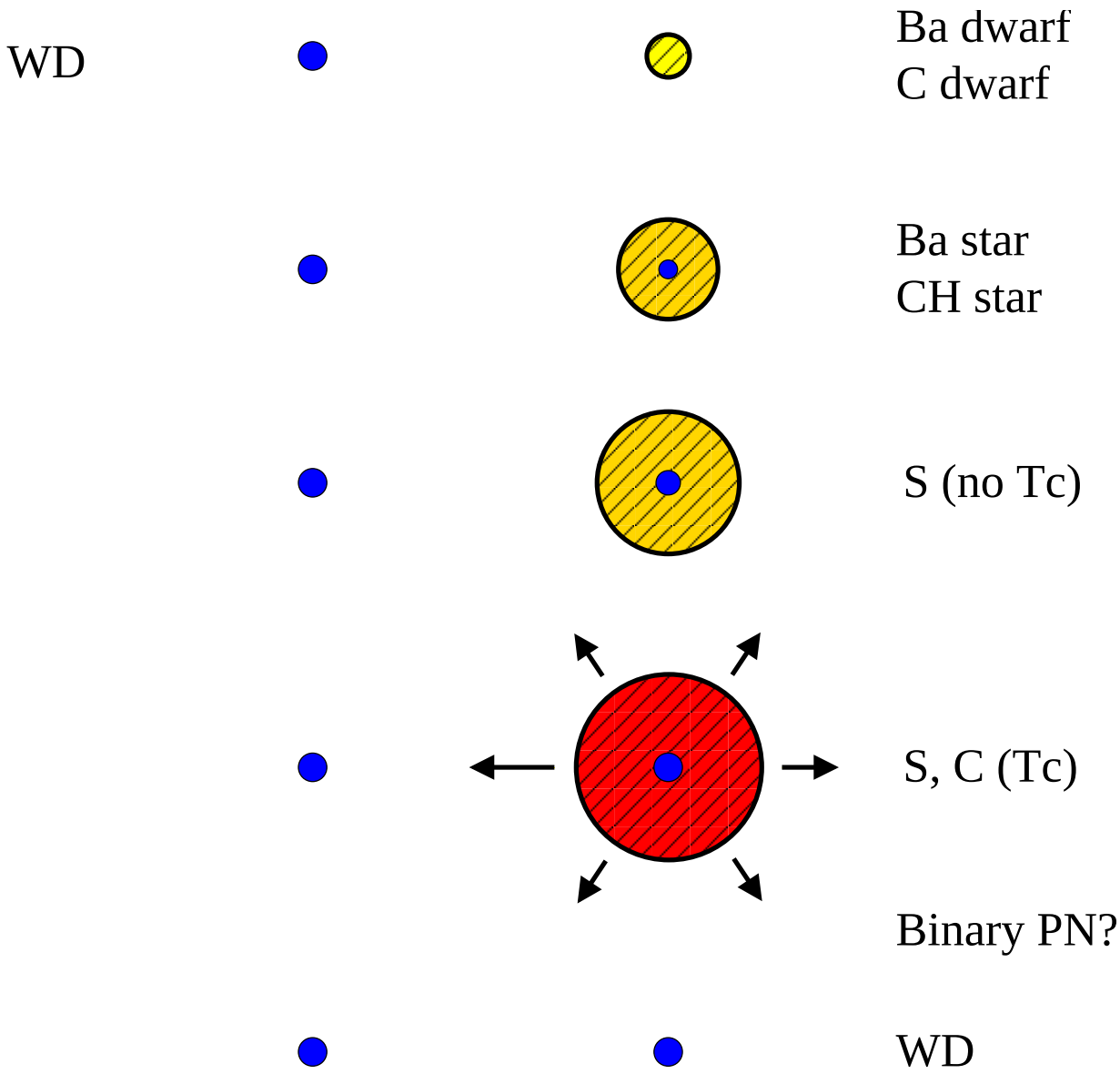
Rob Izzard
Utrecht University

Mass Transfer Scenarios (Primary)



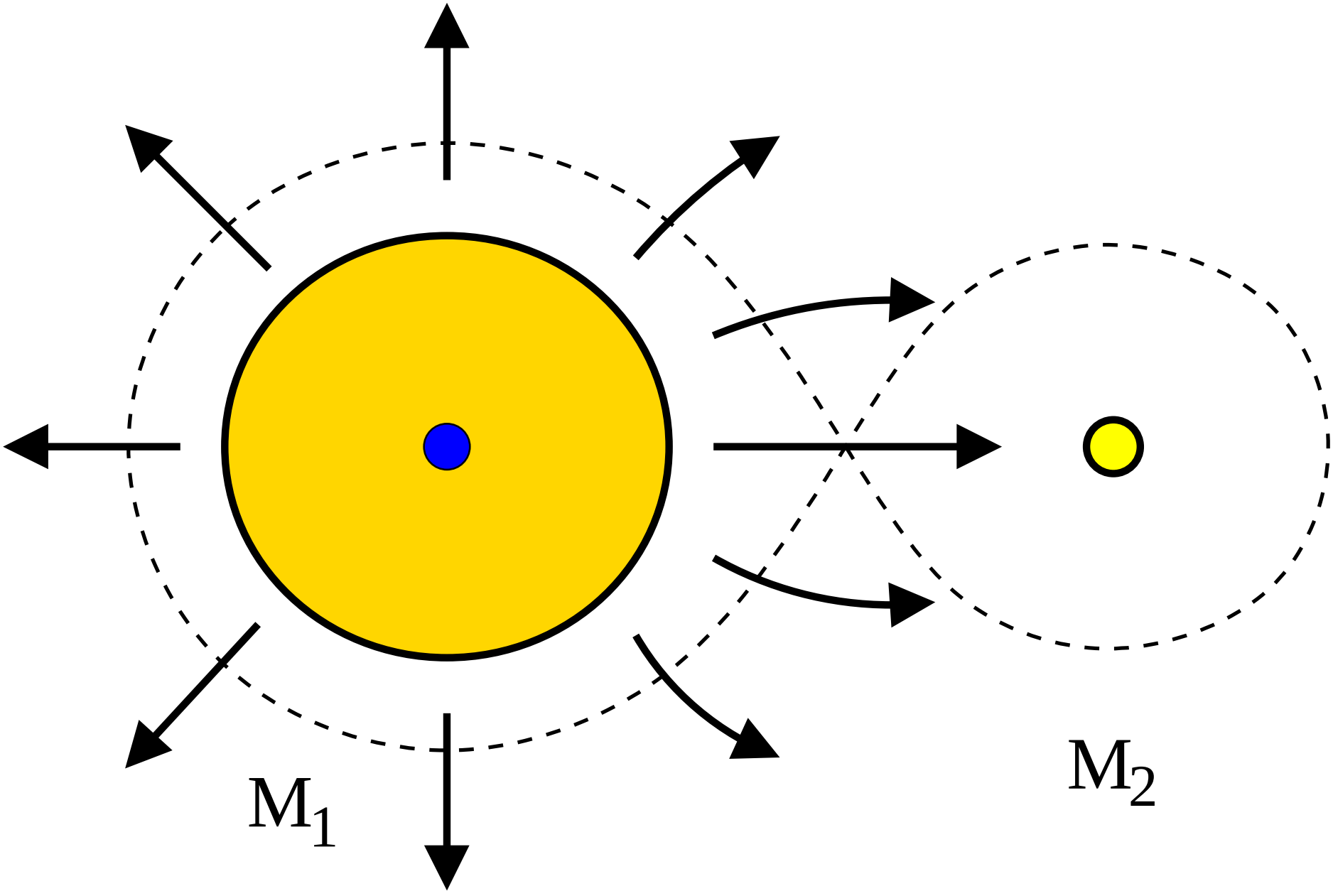
Jorissen 1999 IAUS 191,437/Pols 2005

Mass Transfer Scenarios (Secondary)

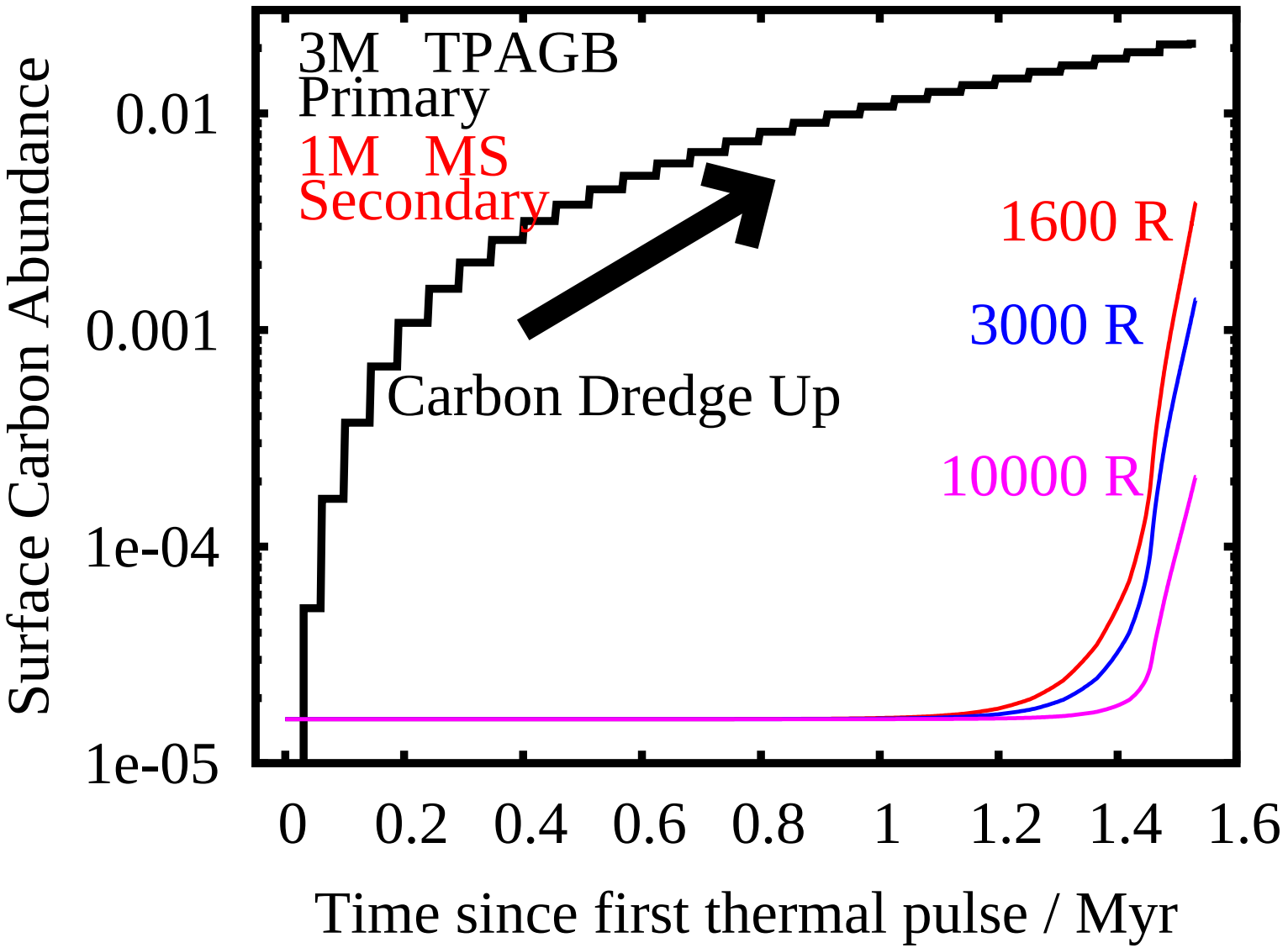


Jorissen 1999 IAUS 191,437

Wind Accretion

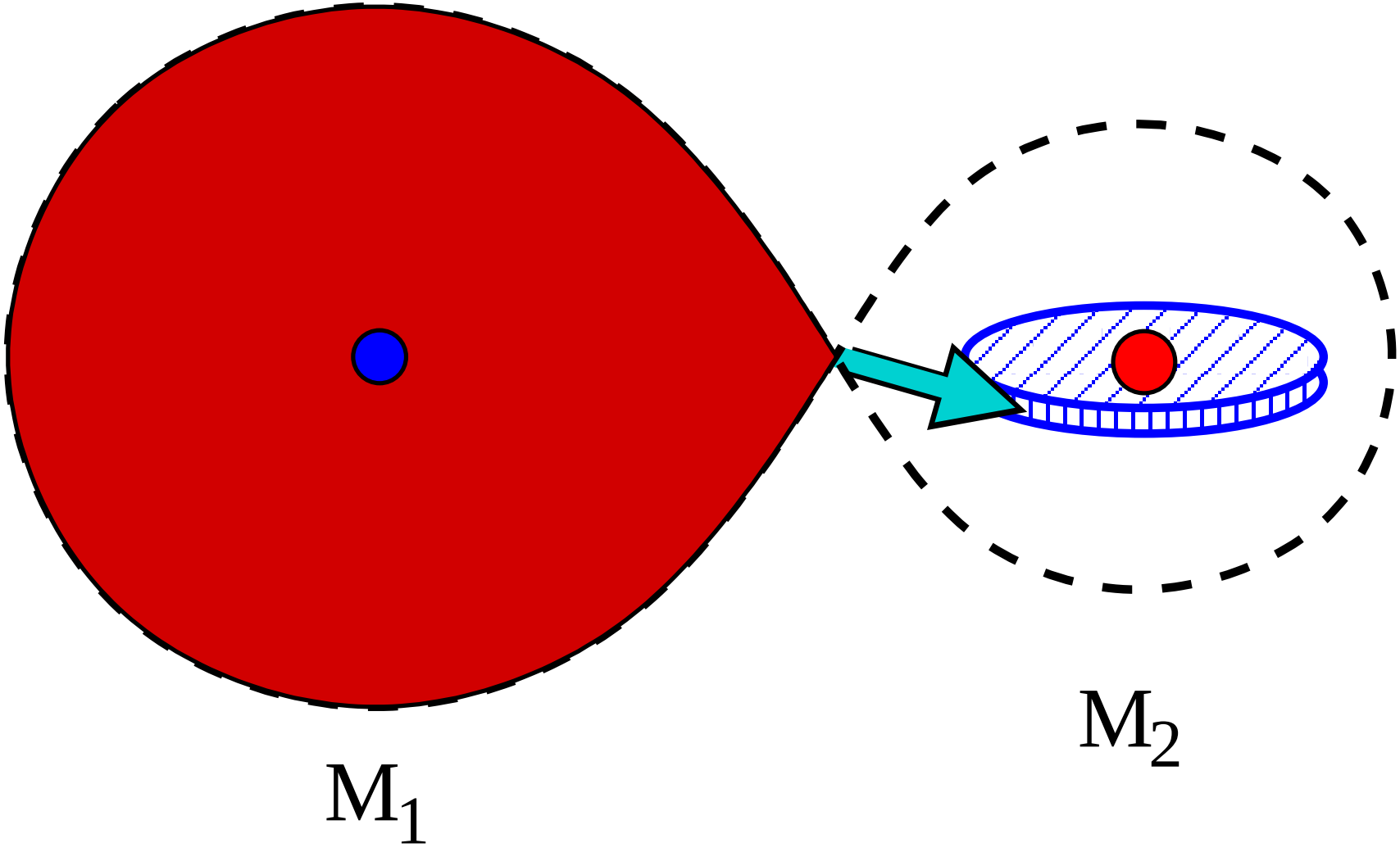


Wind Accretion: $3 + 1\,M_{\odot}$, $Z = 0.004$

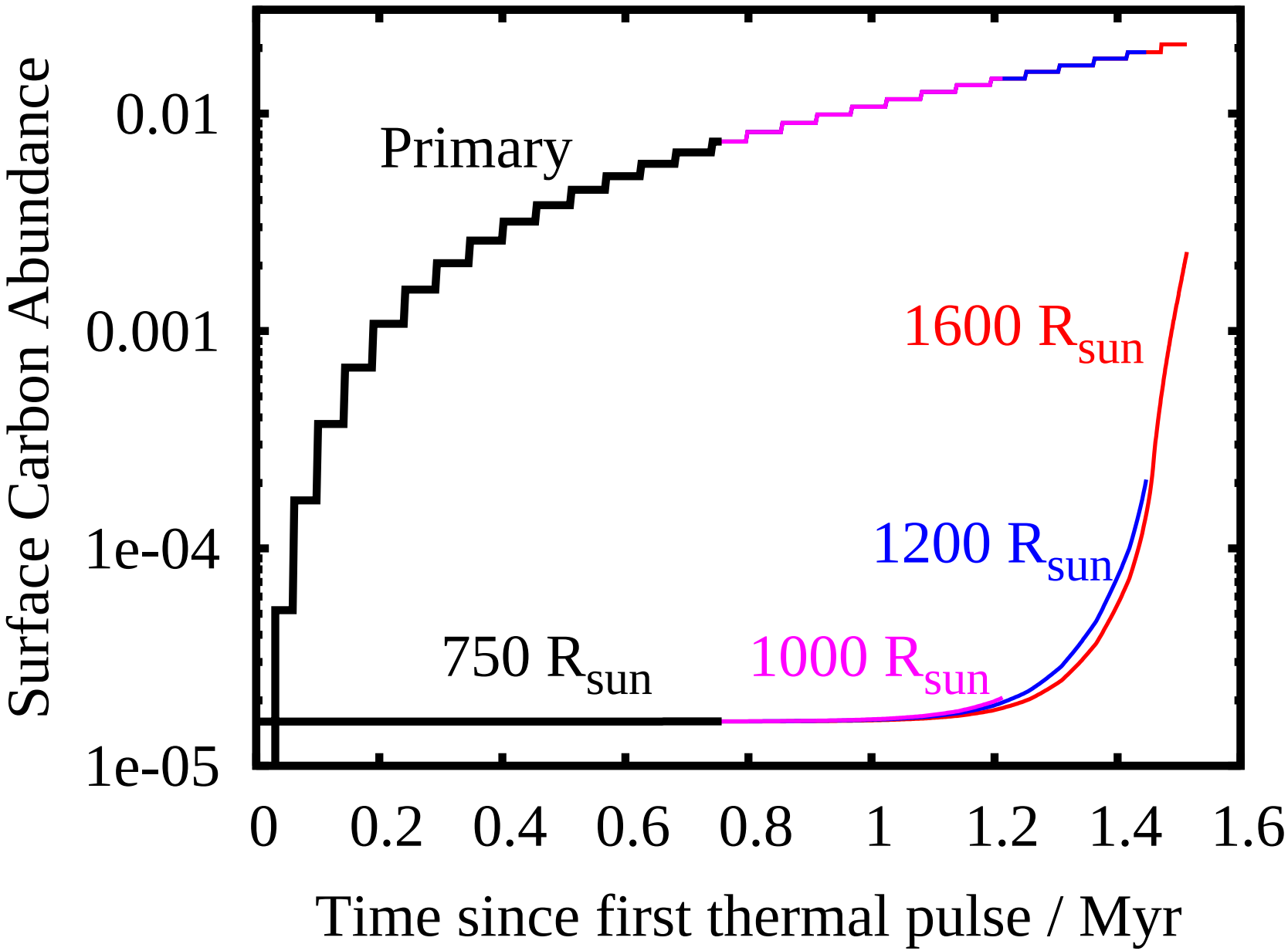


Izzard et al. 2006 A&A 460, 565

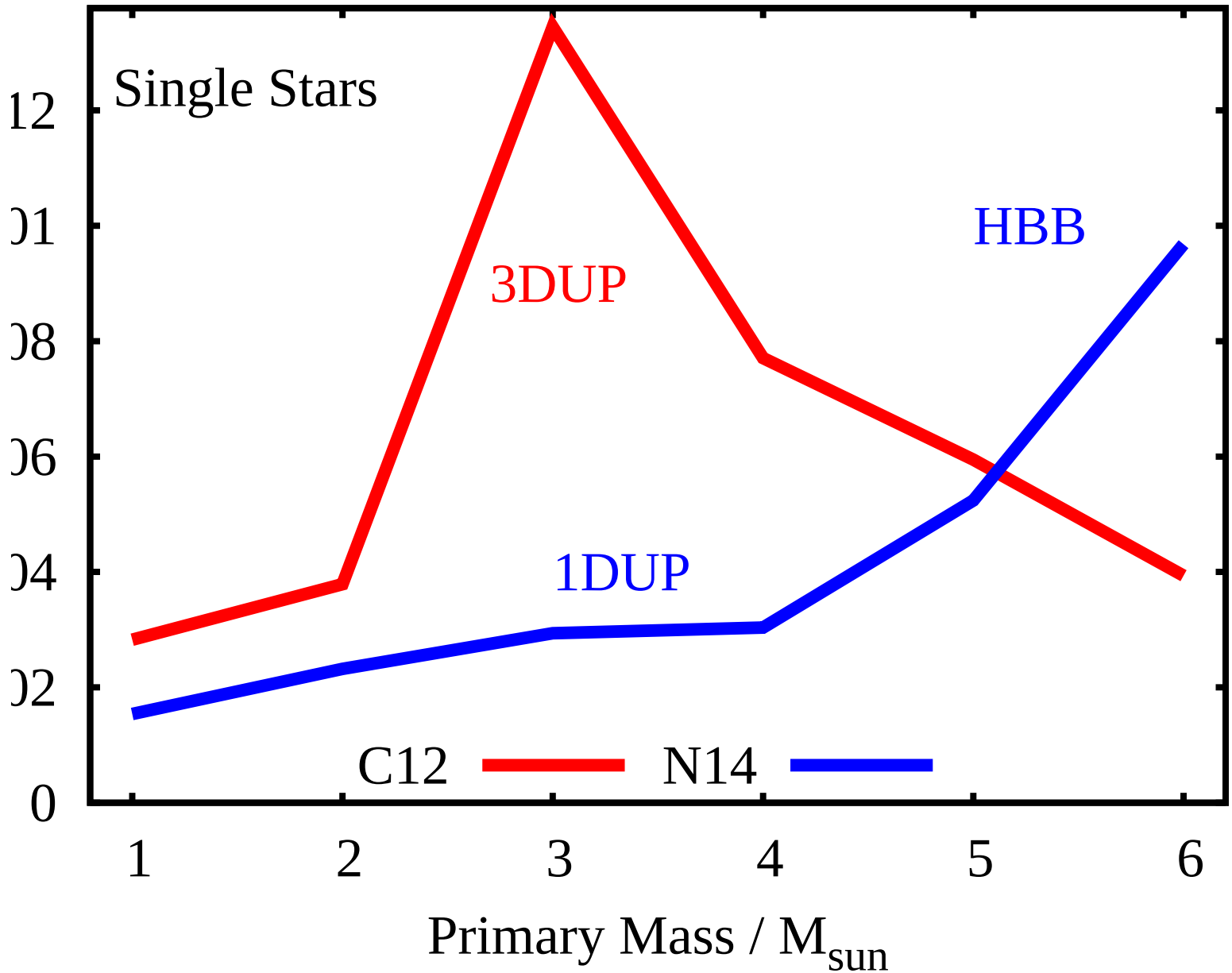
Roche Lobe Overflow



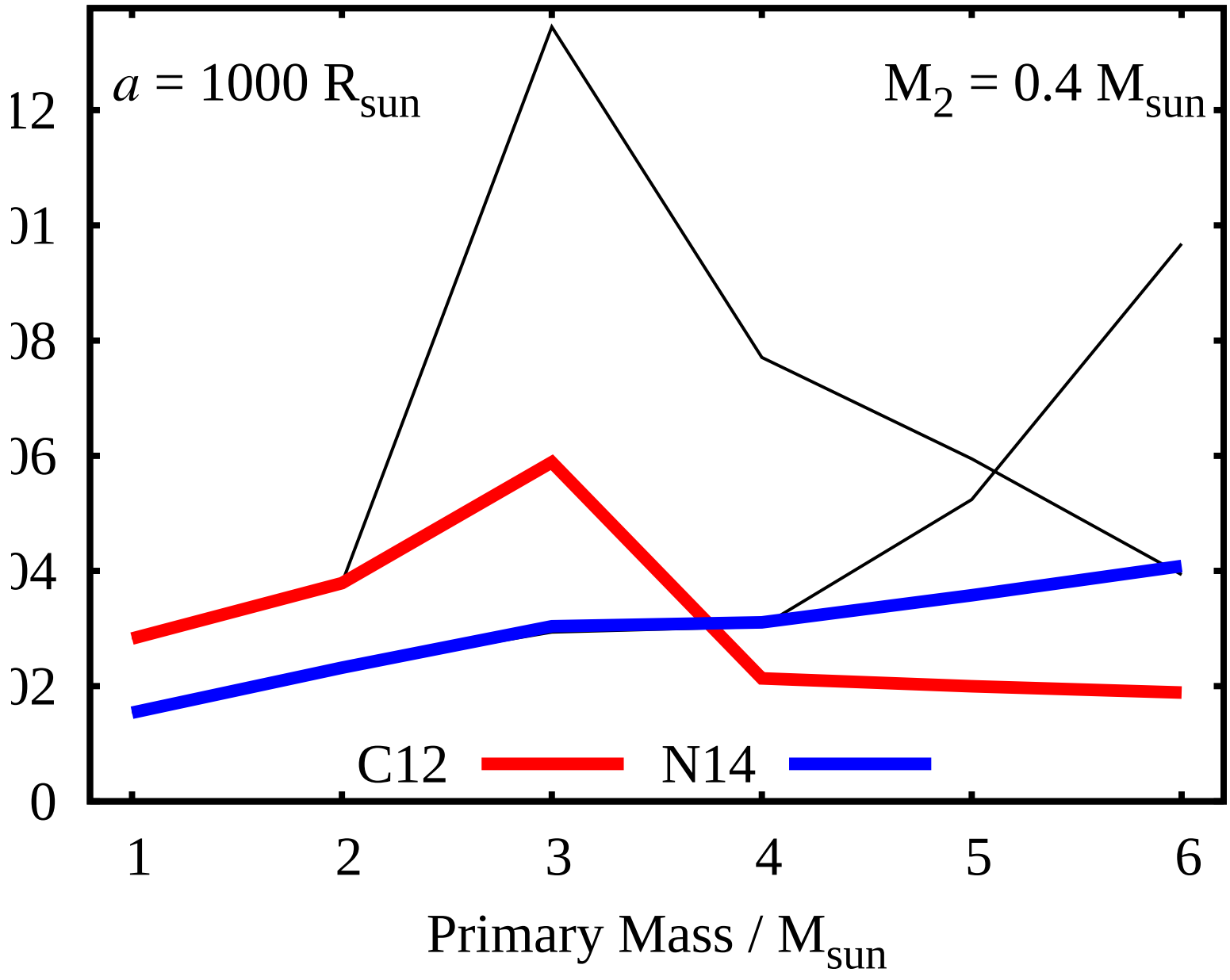
RLOF $3 + 1\,M_{\odot}$, $Z = 0.004$



End-AGB C and N $Z = 0.02$



End-AGB C and N



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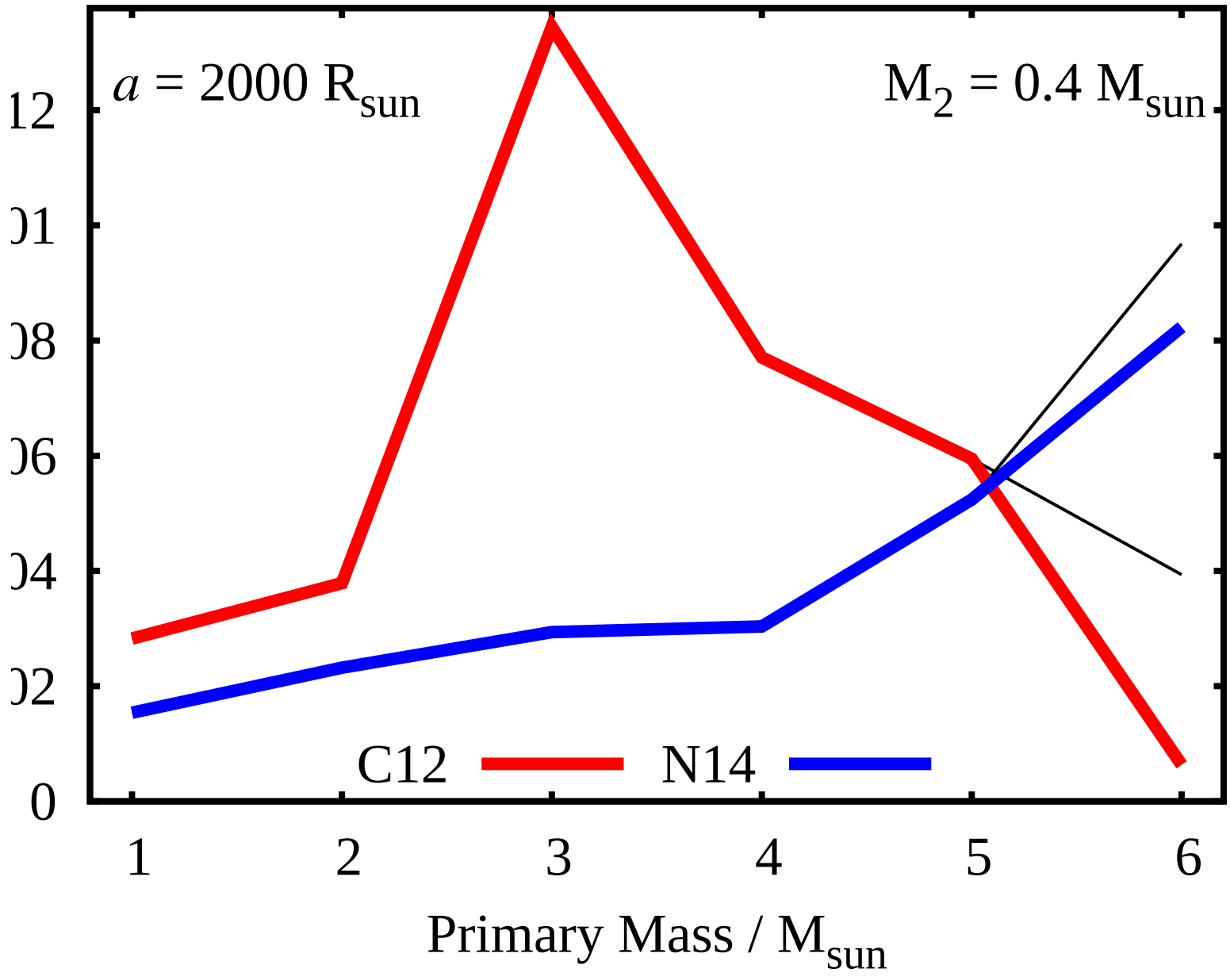
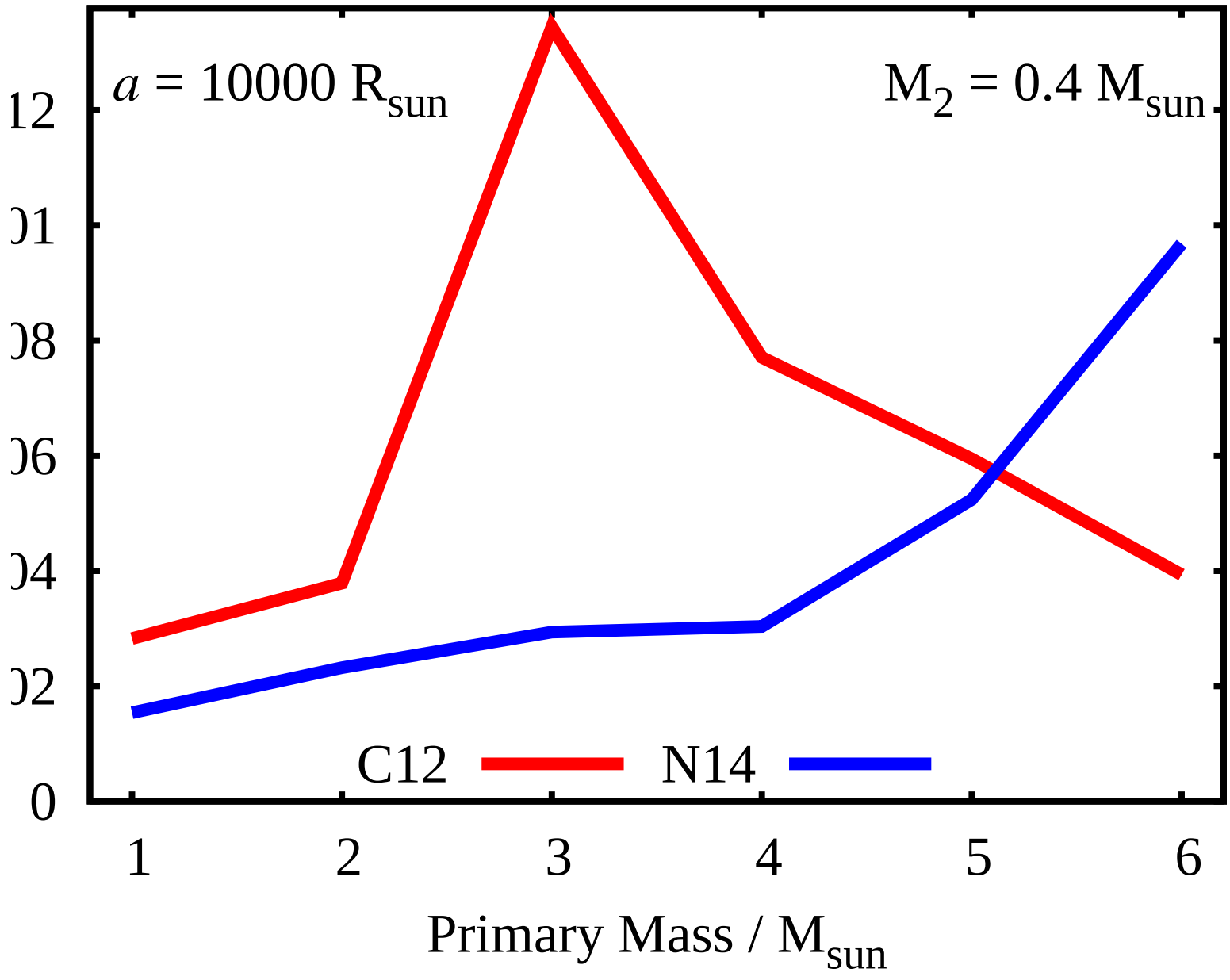
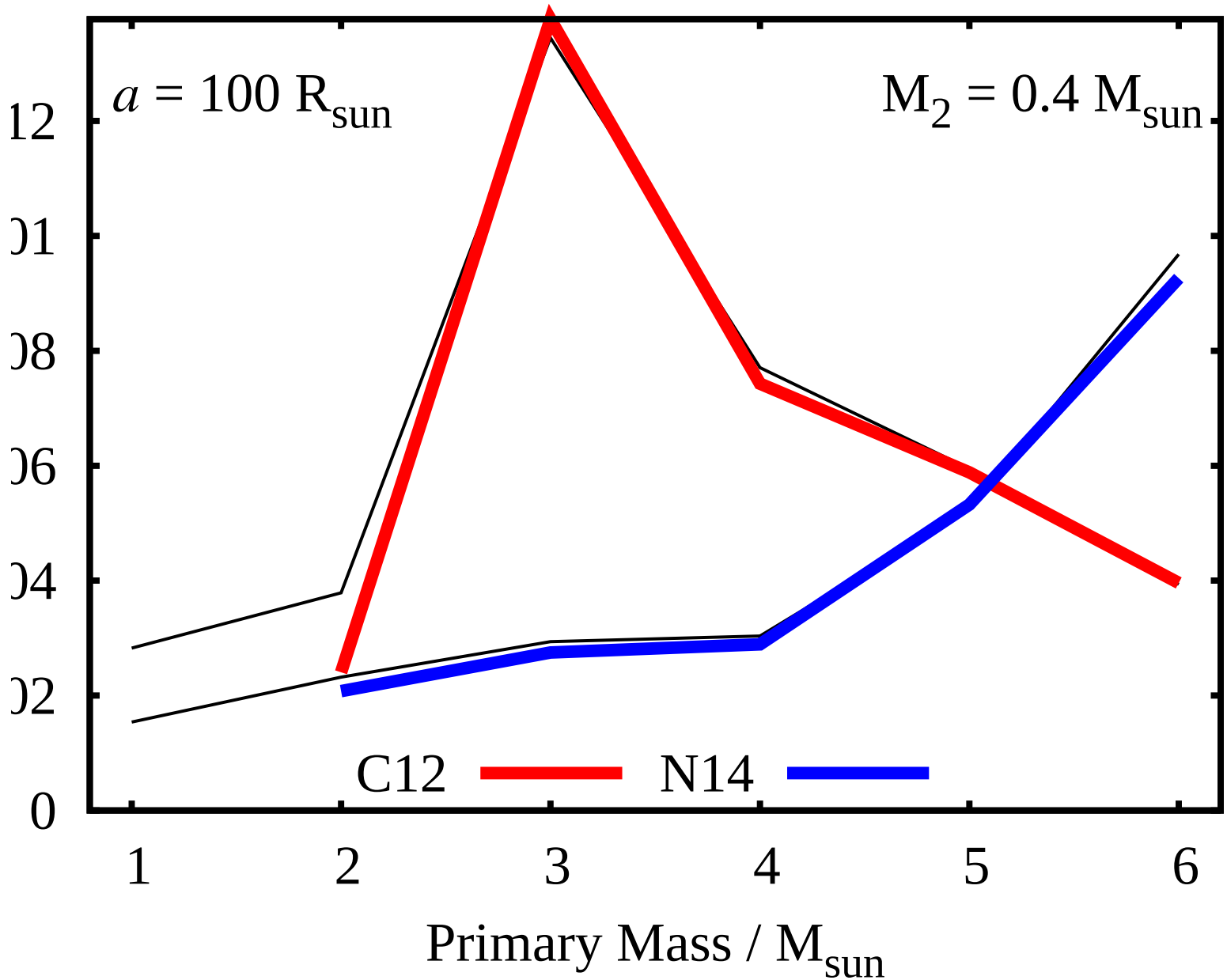


End-AGB C and N



End-AGB C and N: Close→mergers(?)



Global Effect On AGB Yields

Less nuclear processing

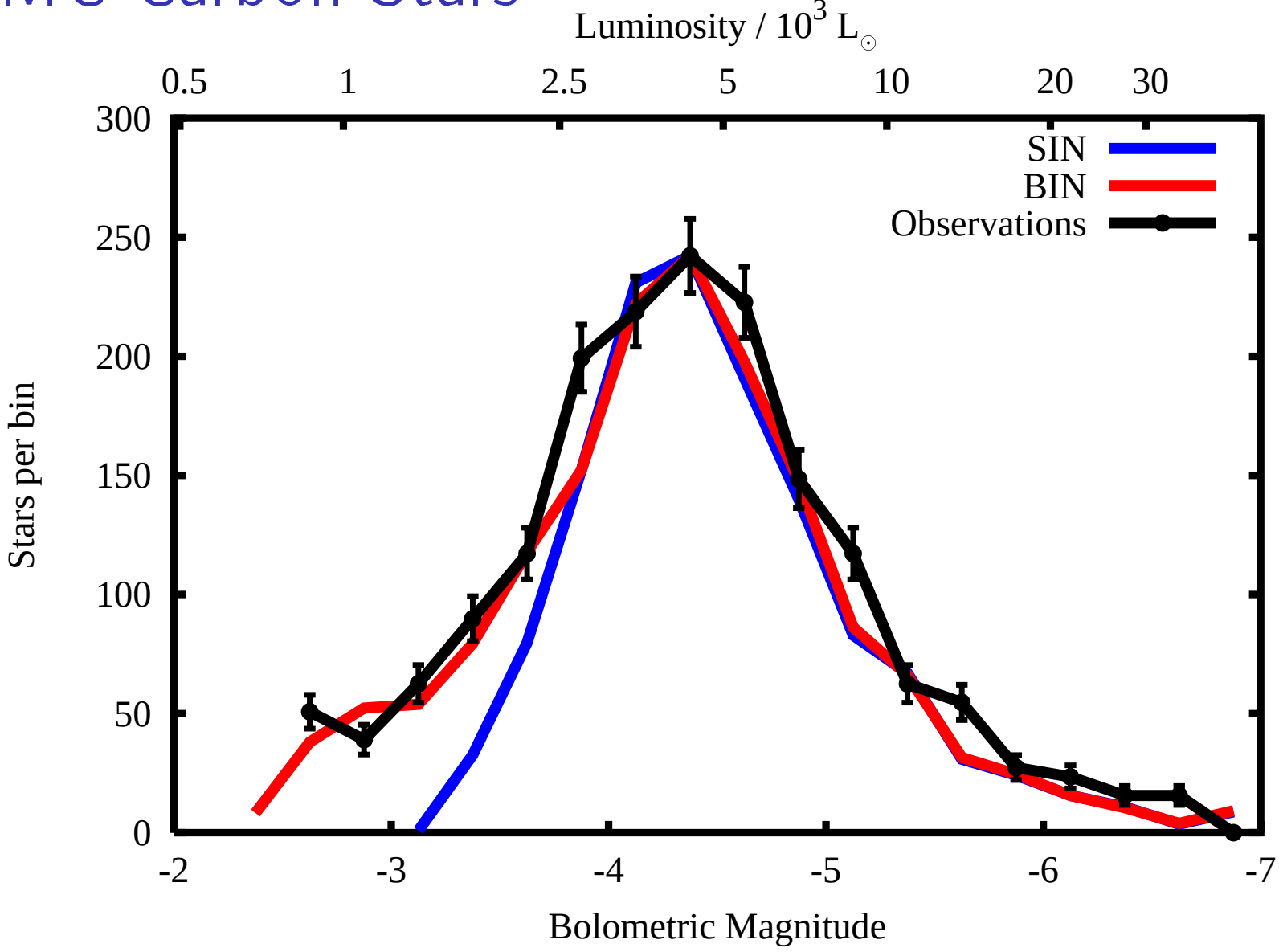
- More H
- Less He, C, N, Ne, Mg, Ba etc.

Second hand evidence: Companions to AGB Stars

Much of our understanding comes companion stars which *accrete AGB material*: a few examples...

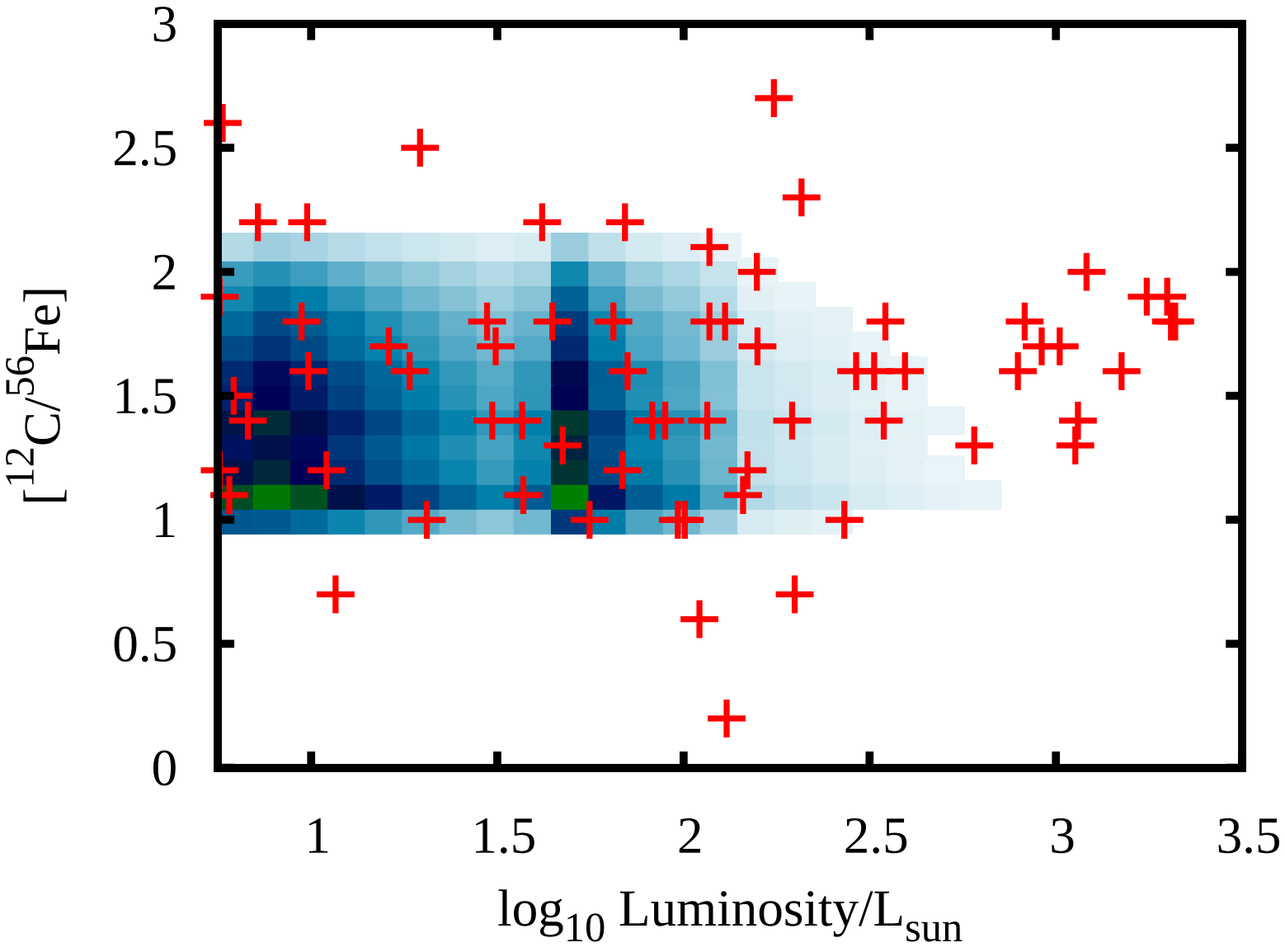
- Extrinsic carbon stars (CH stars)
- CEMPs
- Barium stars

SMC Carbon Stars



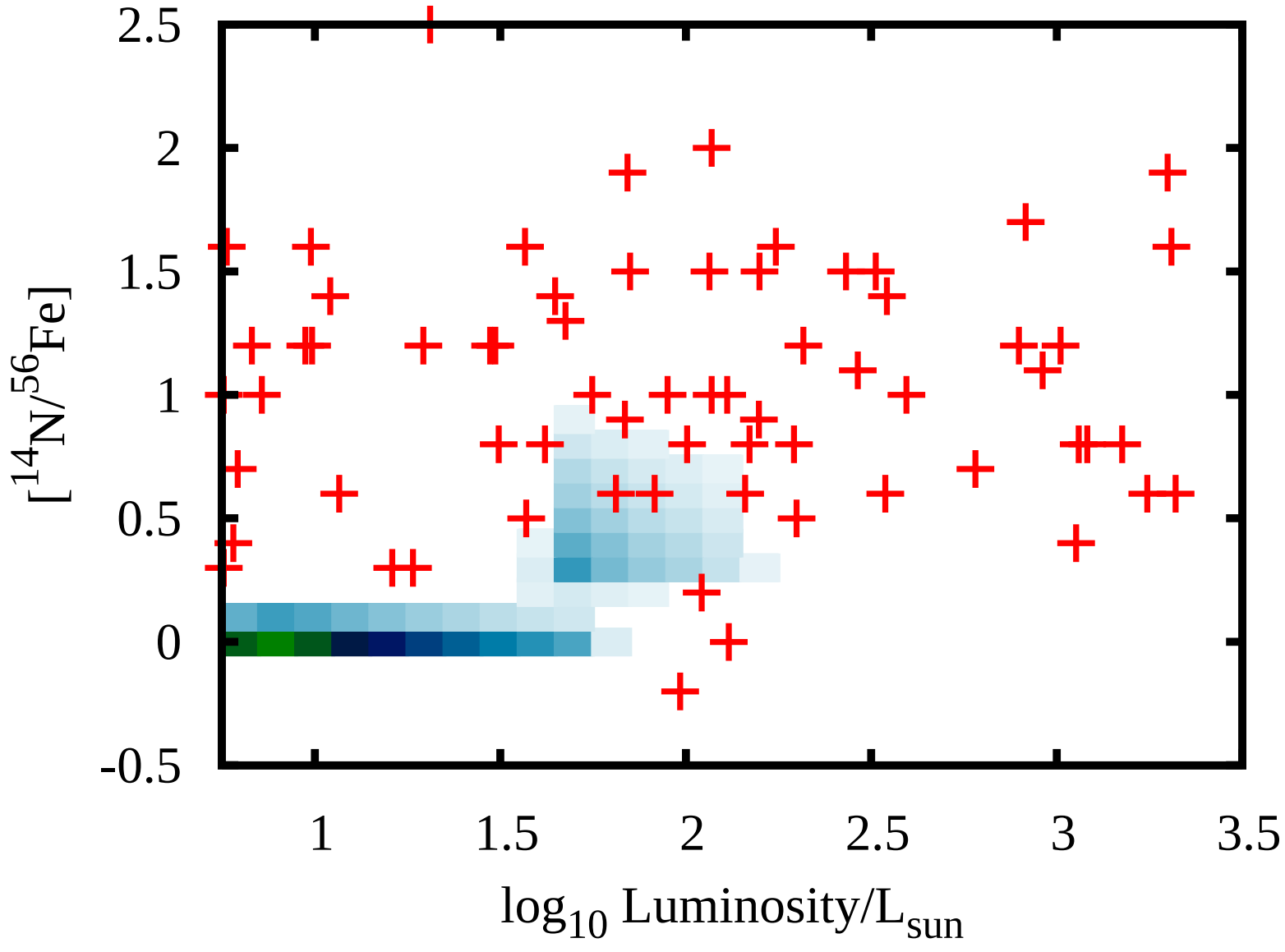
Izzard & Tout 2004 MNRAS 350, L1

Halo Carbon Stars : C vs L

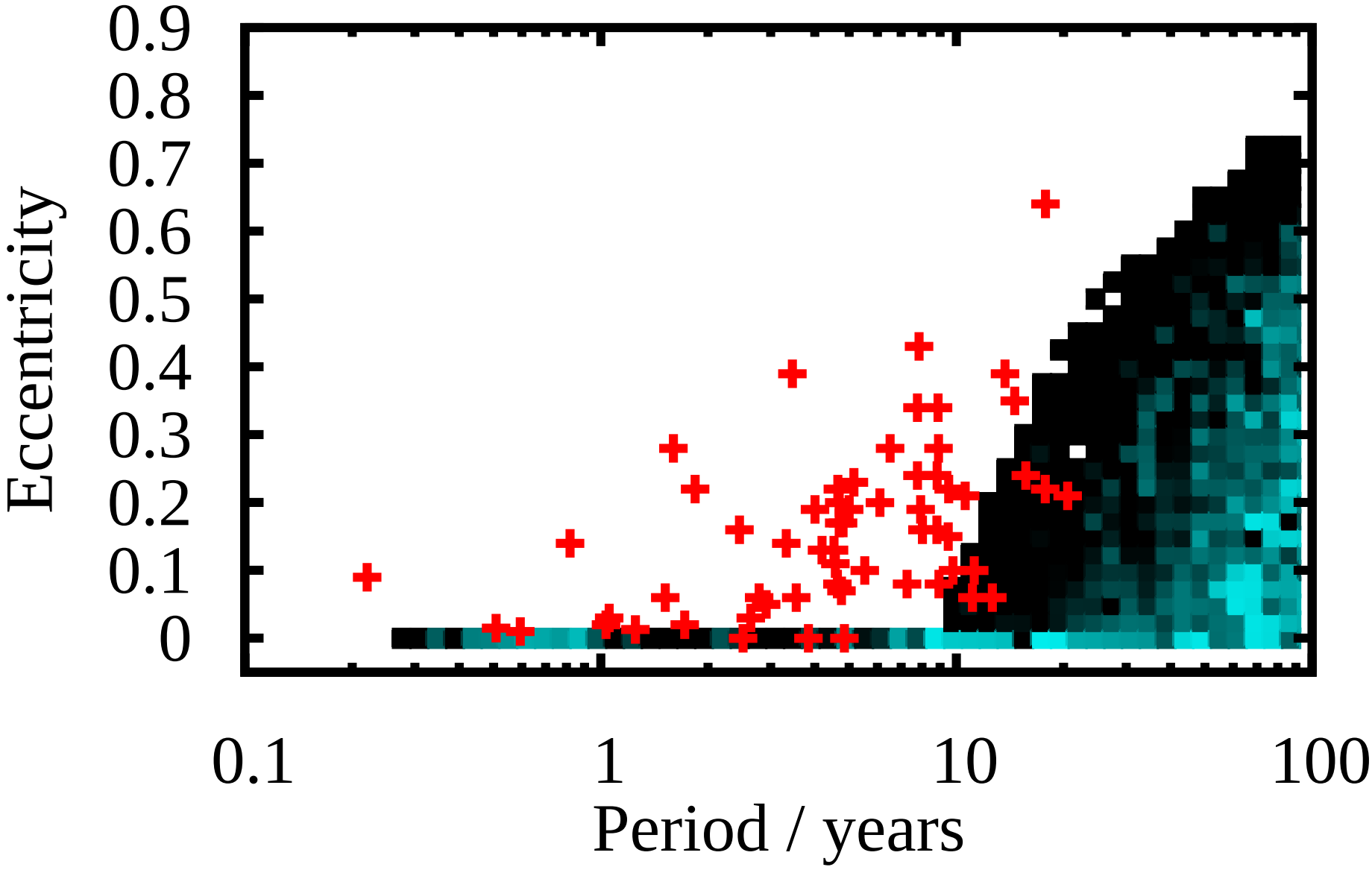


Data from Lucatello, Beers, Christlieb 2006 ApJL 652,L37

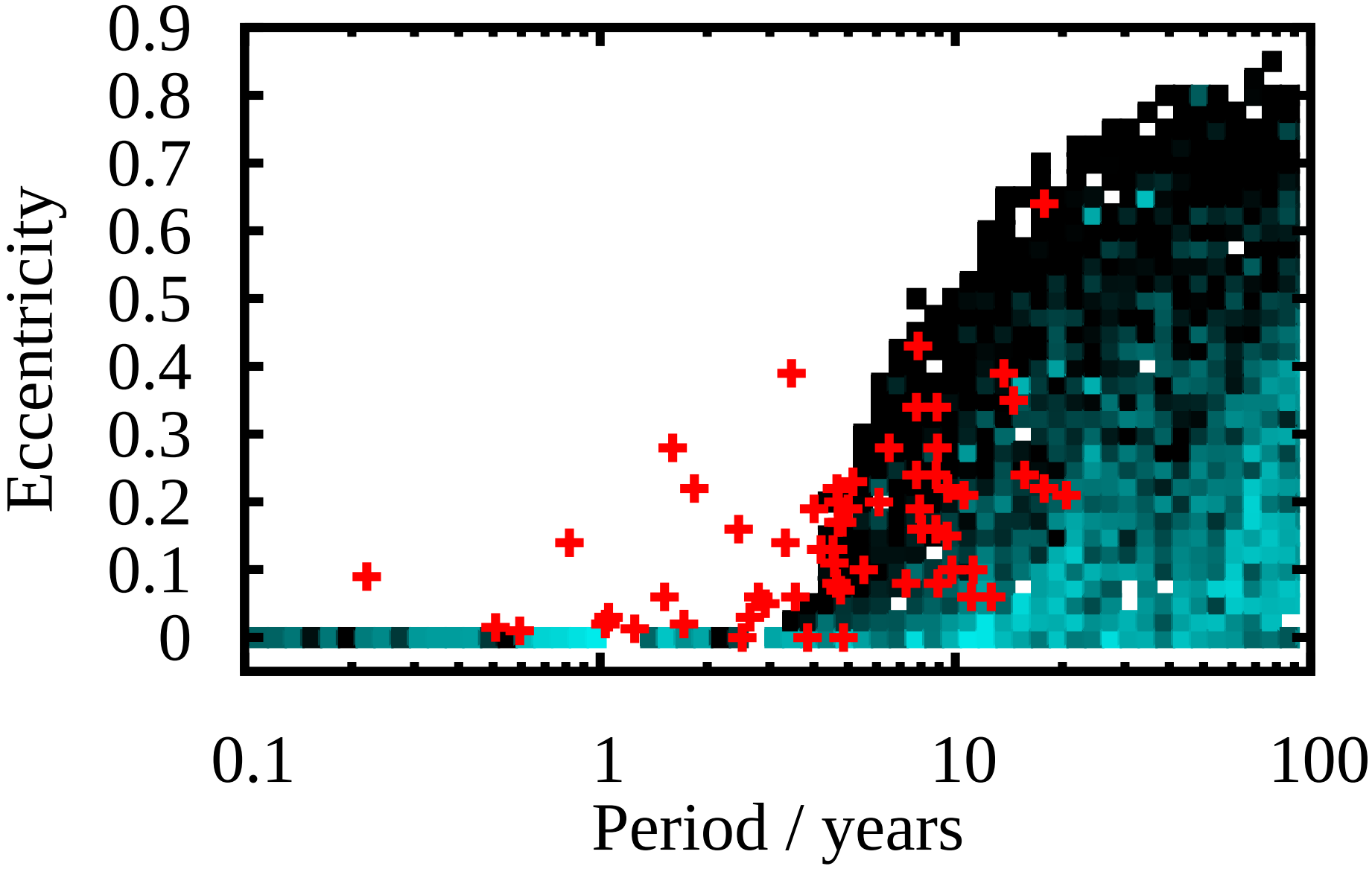
Halo Carbon Stars : N vs L



Barium Stars: Old problem

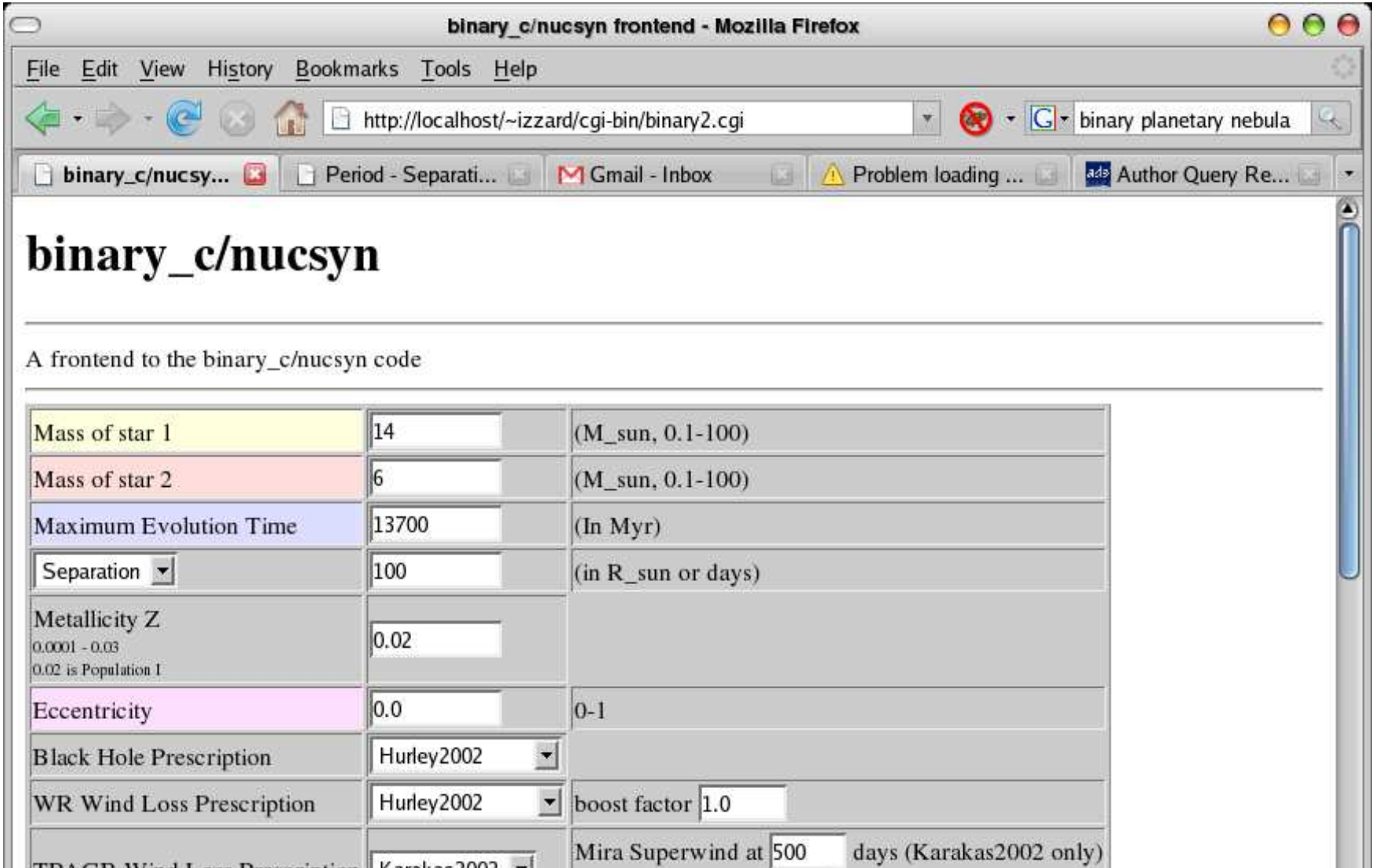


Barium Stars: New solution (Axel Bonacic)



Try It Yourself

http://www.phys.uu.nl/~izzard/cgi-bin/binary2.cgi



Try It Yourself

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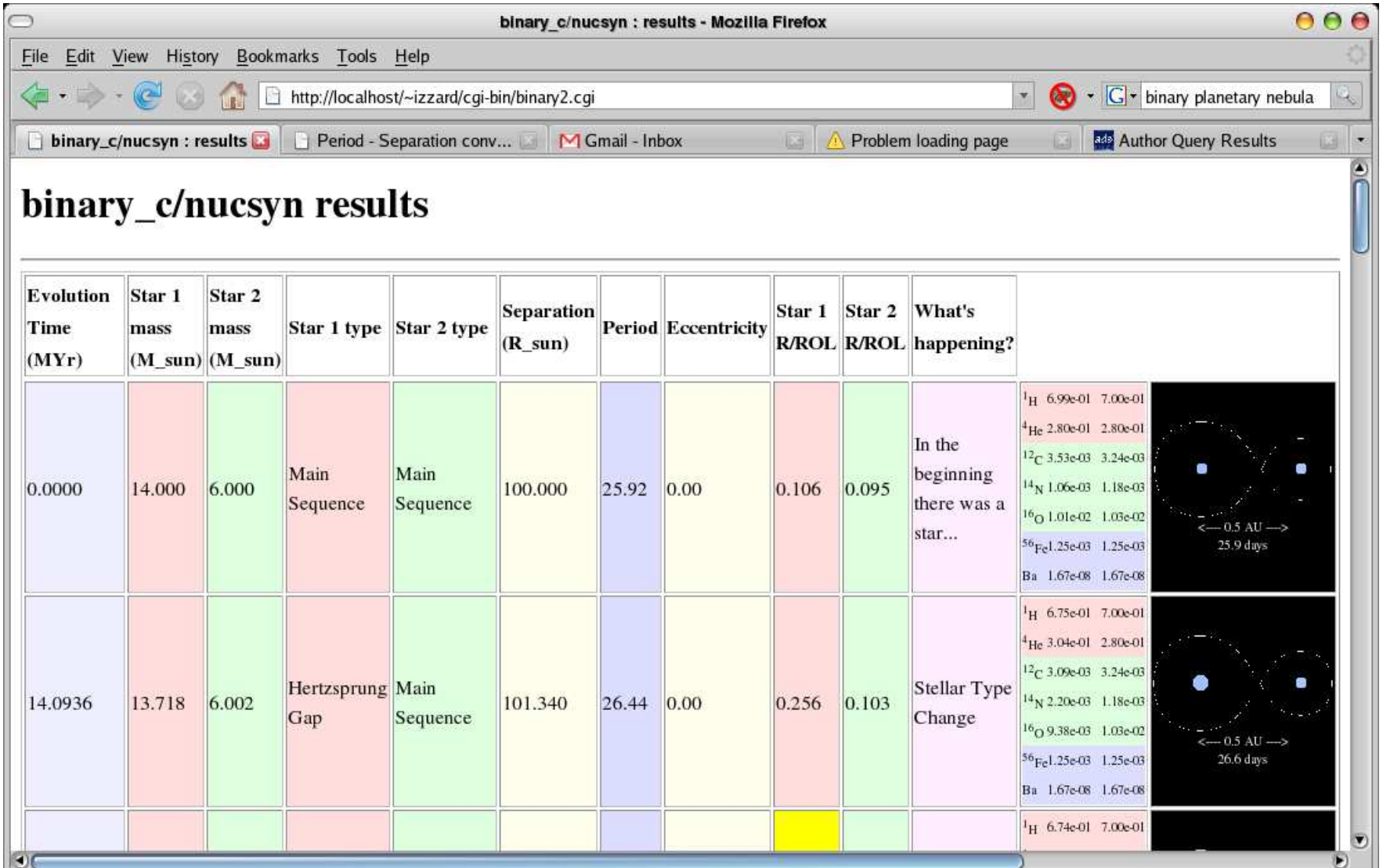

Conclusions

- Binary stars reduce the effect of third dredge up and hot bottom burning
  - Final abundances and yields: reduced nuclear processing.
- Not simple! RLOF/wind, mergers/common envelope ejection
- Quantitative. . . ?
- Secondary accretion: Some progress with Ba stars
- CEMPs are a problem (different solution?)
- PNe abundances can help constrain dredge up and HBB?

http://www.phys.uu.nl/~izzard/cgi-bin/binary2.cgi