Mass loss in LPCODE and MESA stellar evolution codes

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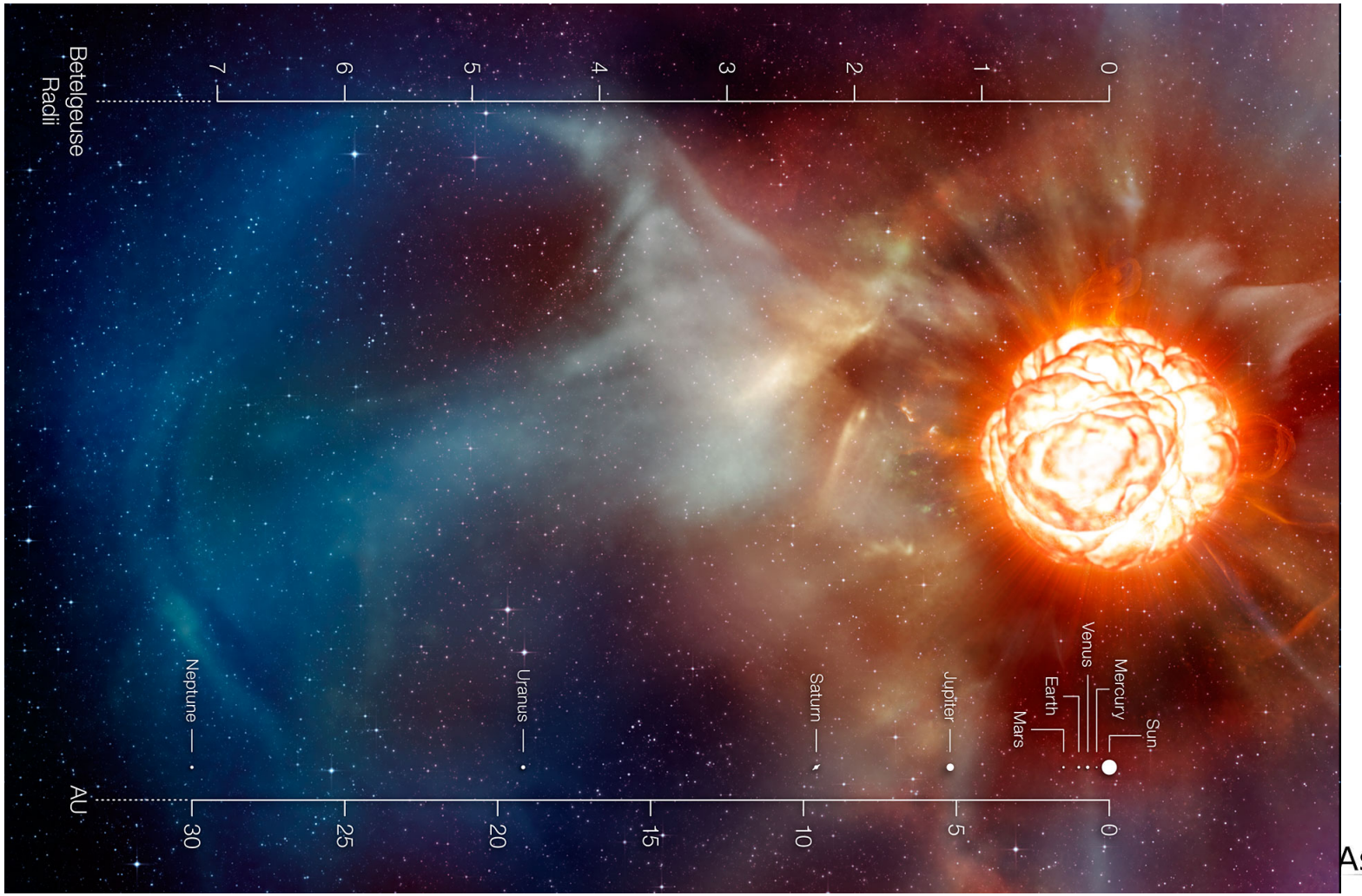
Introduction



Goal

- To learn about mass loss in stellar evolution
- To compare evolutionary models
- To study the M_i - M_f relation as a function of Z

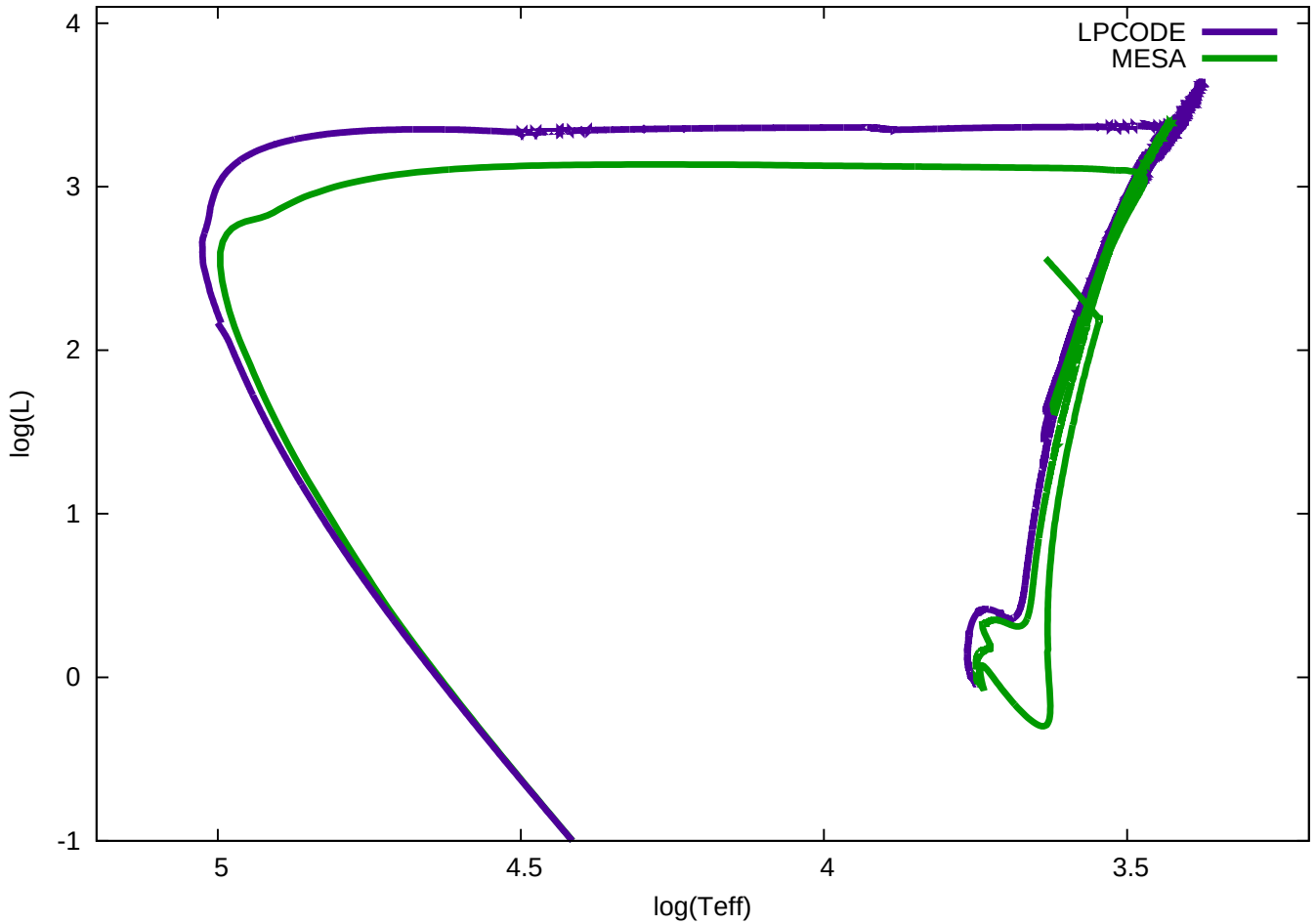
Stellar evolution codes

Mass

Metallicity

LPCODE	MESA
La Plata	Free
$0.5 \leq \frac{M_*}{M_\odot} \leq 7$	$\sim 100 M_\odot$

Comparing evolutionary tracks



$$M_i = 1.1 M_\odot$$
$$Z_i = 2 Z_\odot$$

Mass loss

$$L^{\alpha} \quad M^{\beta} \quad R^{\gamma} \quad T_{eff}^{\delta} \quad Z^{\epsilon} \quad P^{\zeta}$$

LPCODE	MESA
Reimers - RGB	Vink - RGB
Vasiliadis & Wood - AGB	van Loon - AGB

$$M_i = 2M_{\odot}$$
$$Z_i = 0.04$$
$$L_* = 1536L_{\odot}$$
$$M_* = 1.03M_{\odot}$$
$$R_* = 150R_{\odot}$$
$$T_{eff} = 2910K$$

Mass loss

Vassiliadis & Wood - $\dot{M} = 10^{-7.83}\left[\frac{M_\odot}{yr}\right]$

$$log\dot{M}\left[\frac{M_\odot}{yr}\right] = -11.4 + 0.0125\left[P - 100\left(\frac{M}{M_\odot} - 2.5\right)\right] \quad (1)$$

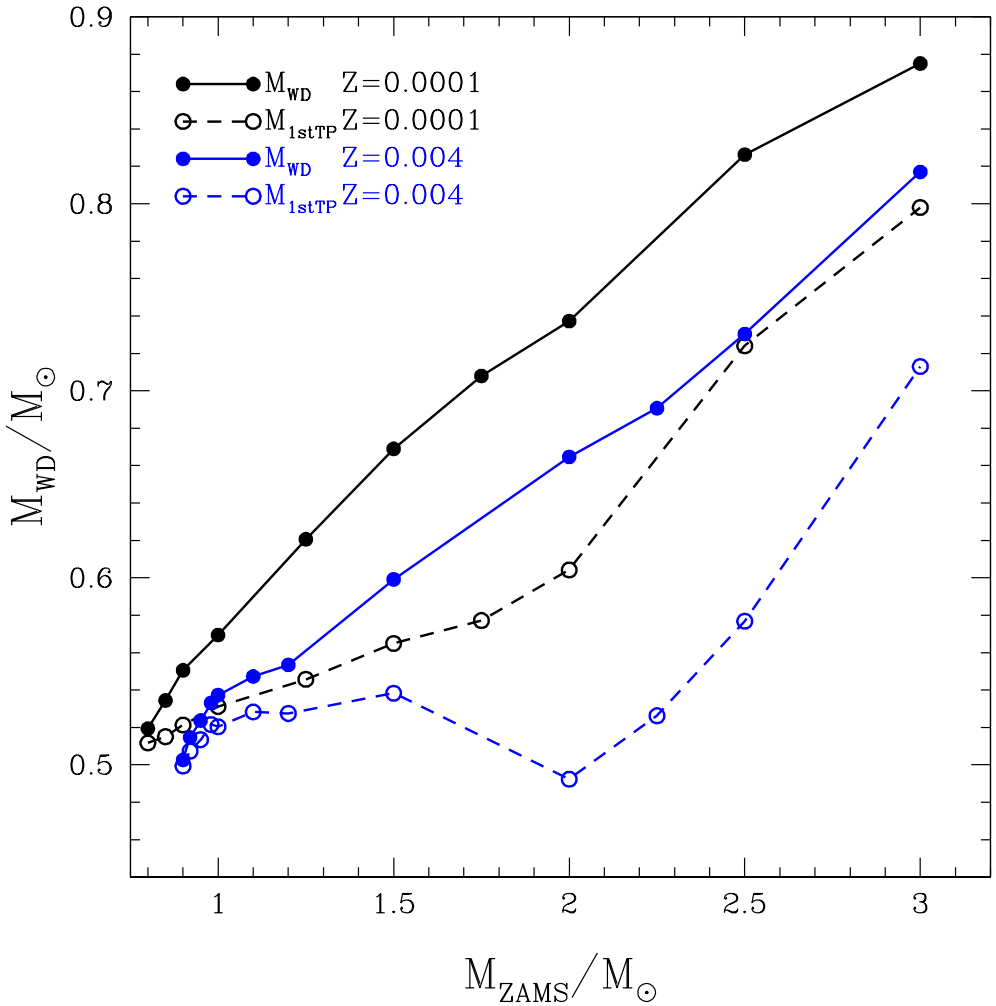
$$logP\,[days] = -2.07 + 1.94log\frac{R}{R_\odot} - 0.9log\frac{M}{M_\odot} \quad (2)$$

van Loon - $\dot{M} = 10^{-6}\left[\frac{M_\odot}{yr}\right]$

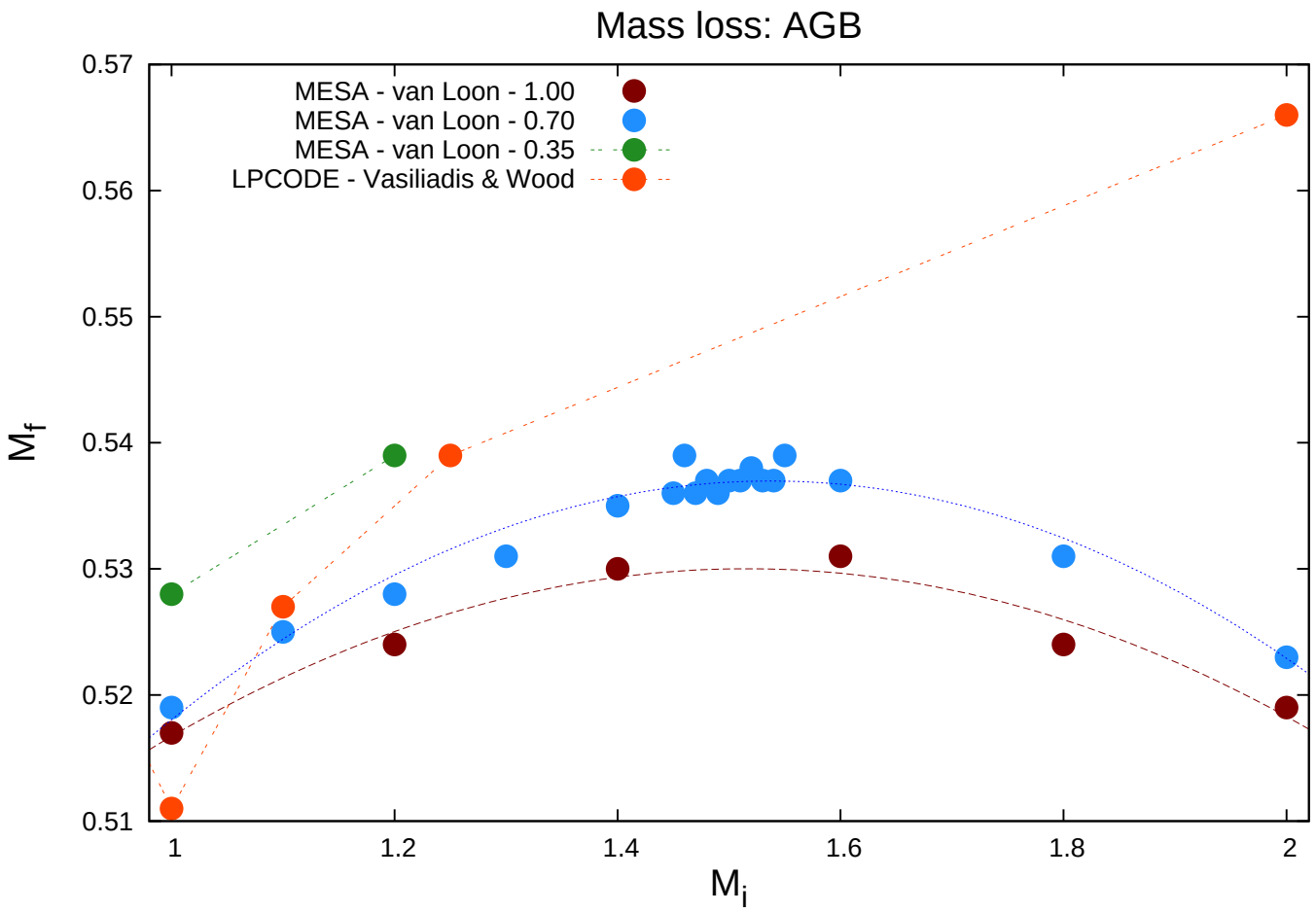
$$log\dot{M}\left[\frac{M_\odot}{yr}\right] = -5.65 + 1.05log\left(\frac{L}{10^4 L_\odot} - 6.3log\left(\frac{T_{eff}}{3500K}\right)\right) \quad (3)$$

Initial-to-final mass relation

Romero, *et. al*, 2015

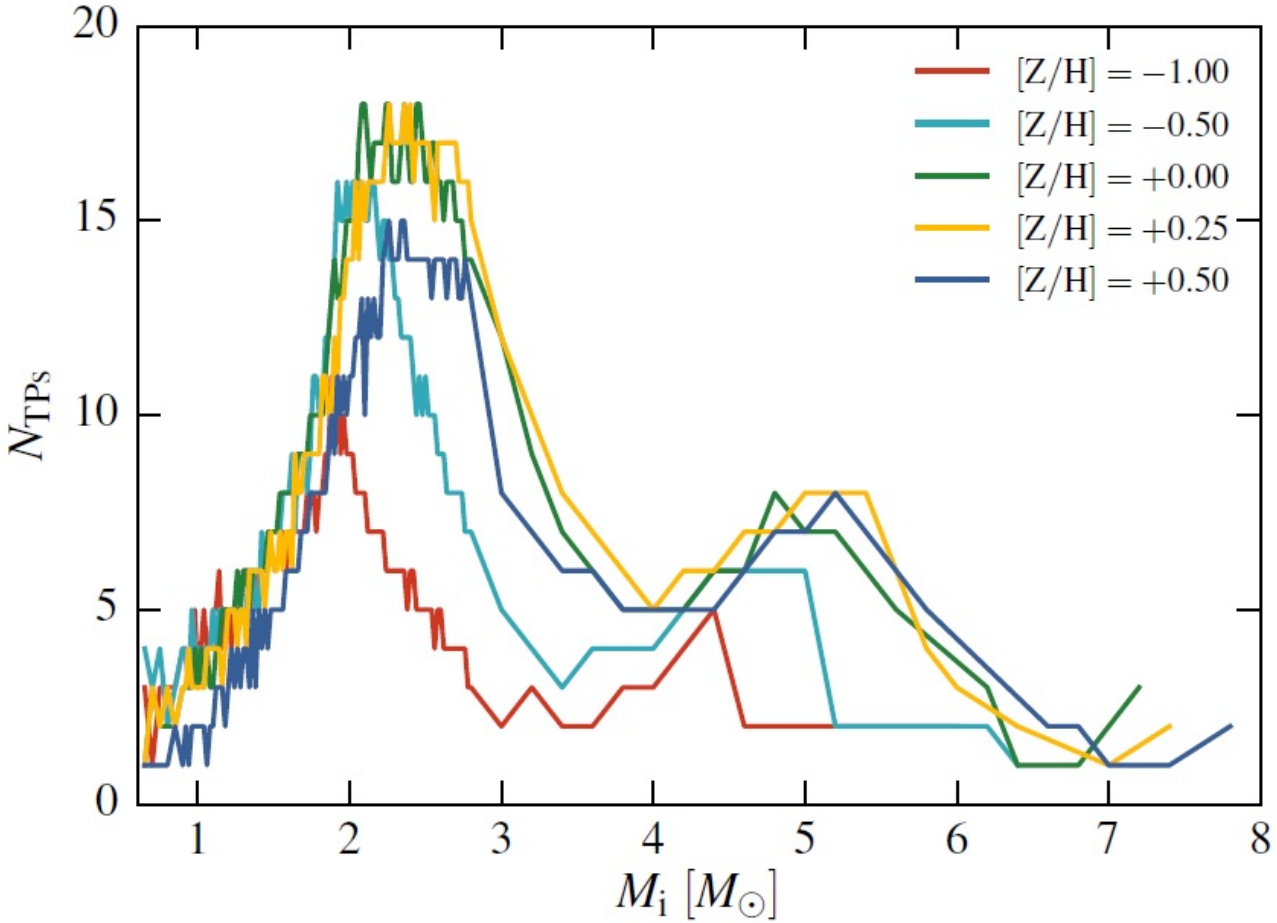


Results and discution

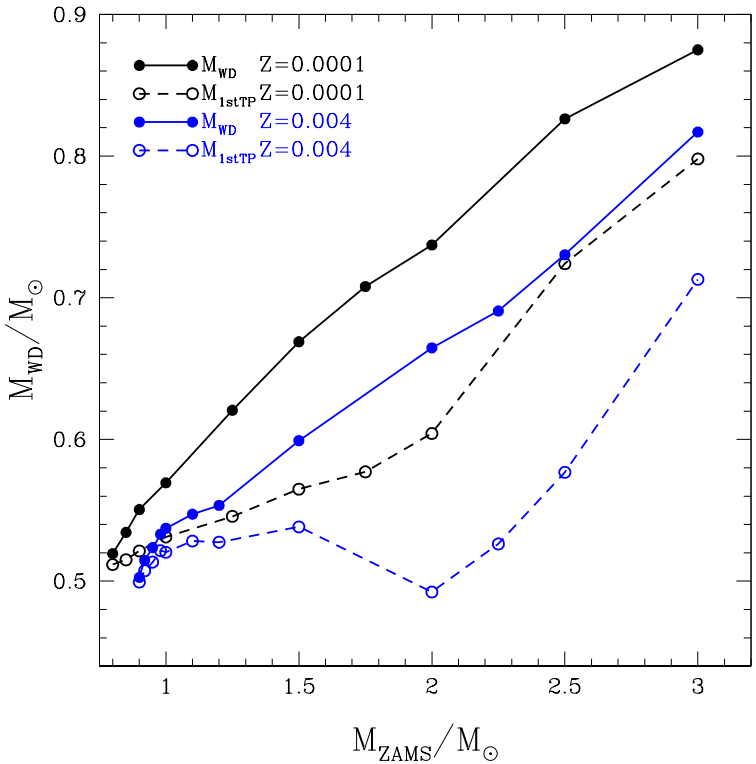


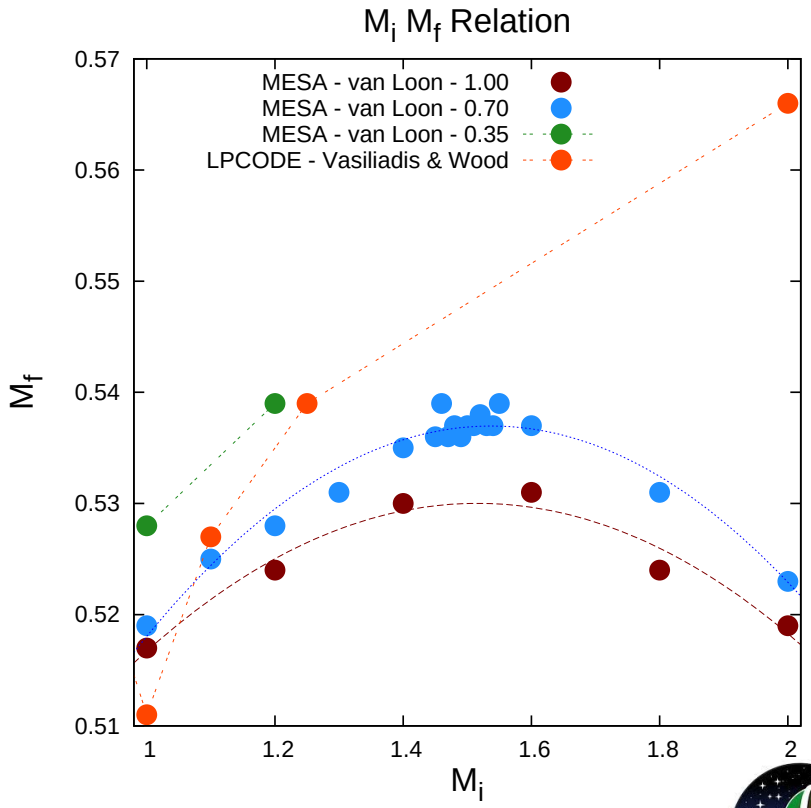
Number of thermal pulses

Choi, *et. al*, 2016



Discusion


M_{WD} Z=0.0001
M_{1stTP} Z=0.0001
M_{WD} Z=0.004
M_{1stTP} Z=0.004
$M_{WD}/M_\odot$
$M_{ZAMS}/M_\odot$


M_i M_f Relation
MESA - van Loon - 1.00
MESA - van Loon - 0.70
MESA - van Loon - 0.35
LPCODE - Vasiliadis & Wood
M_f
M_i

Conclusion

Attention!

Nonphysical results

References

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