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Type I Bursts

Recurrence Time

vs

Accretion and Spin Rate

PRINCETON UNIVERSITY

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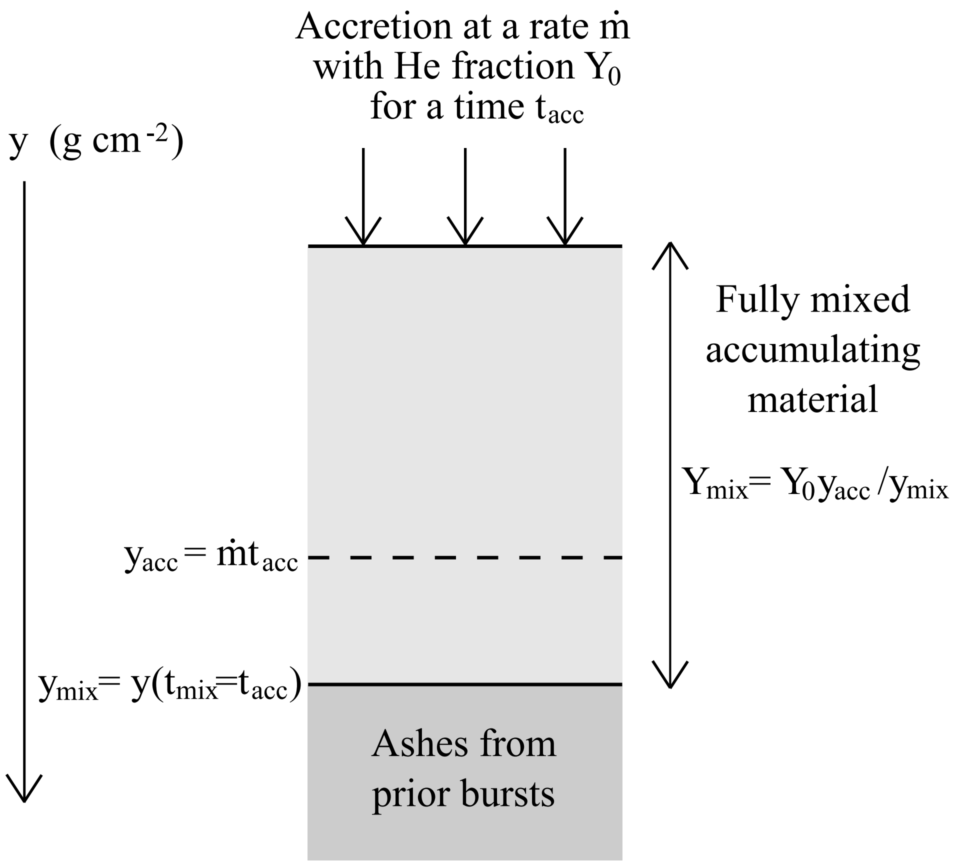
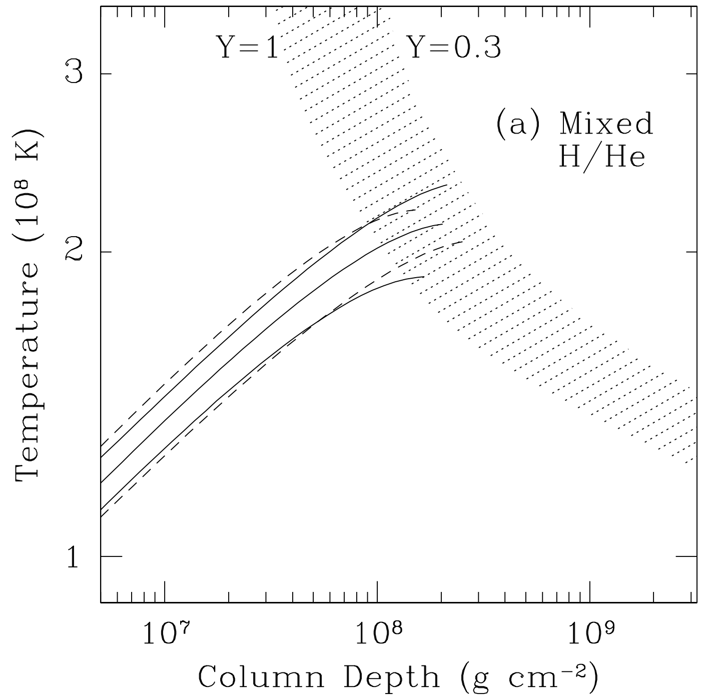
Type I Bursts: Theory

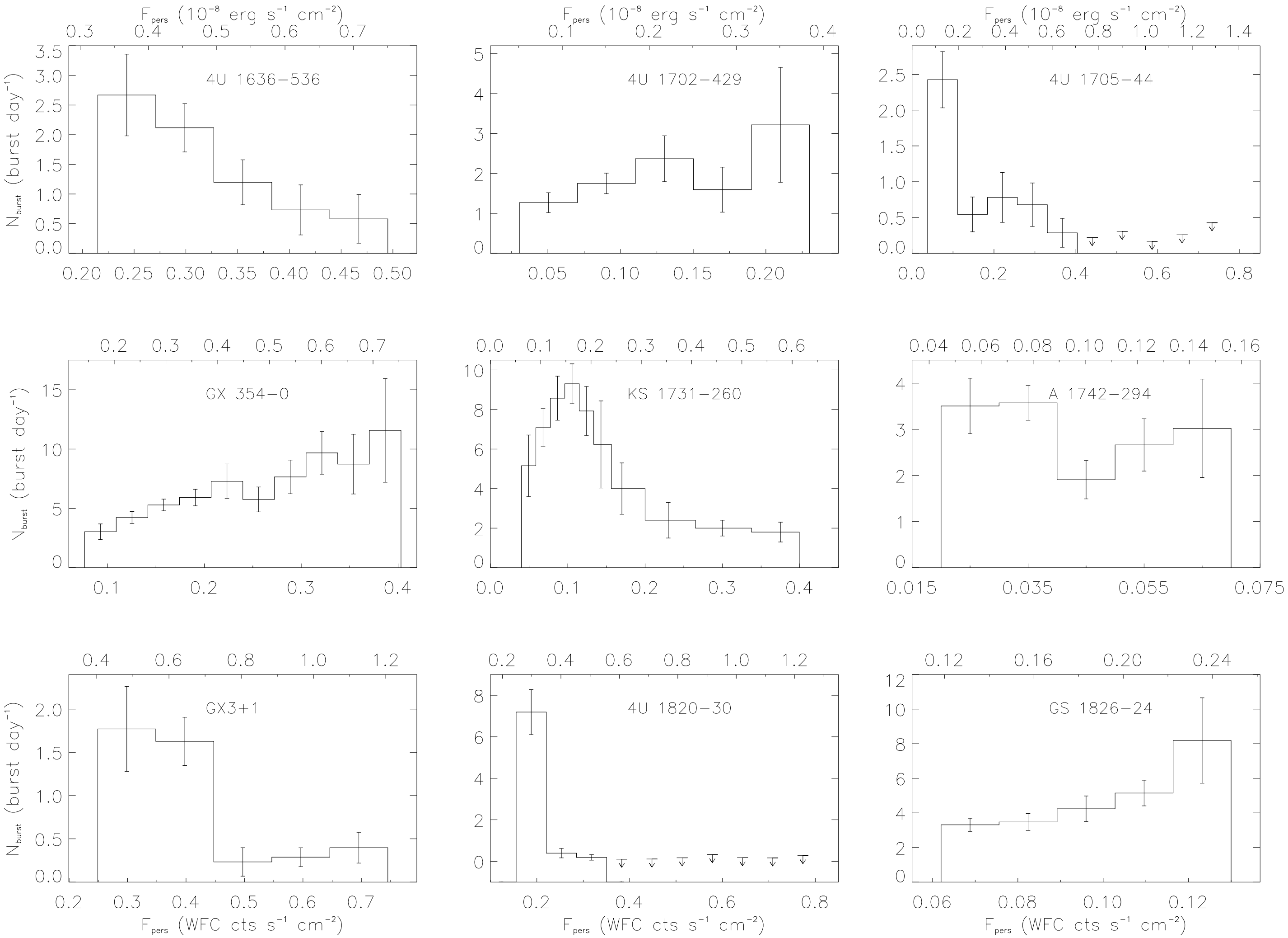


(Piro & Bildsten, 2007)



(Cumming & Bildsten, 2000)

Type I Bursts: Observations



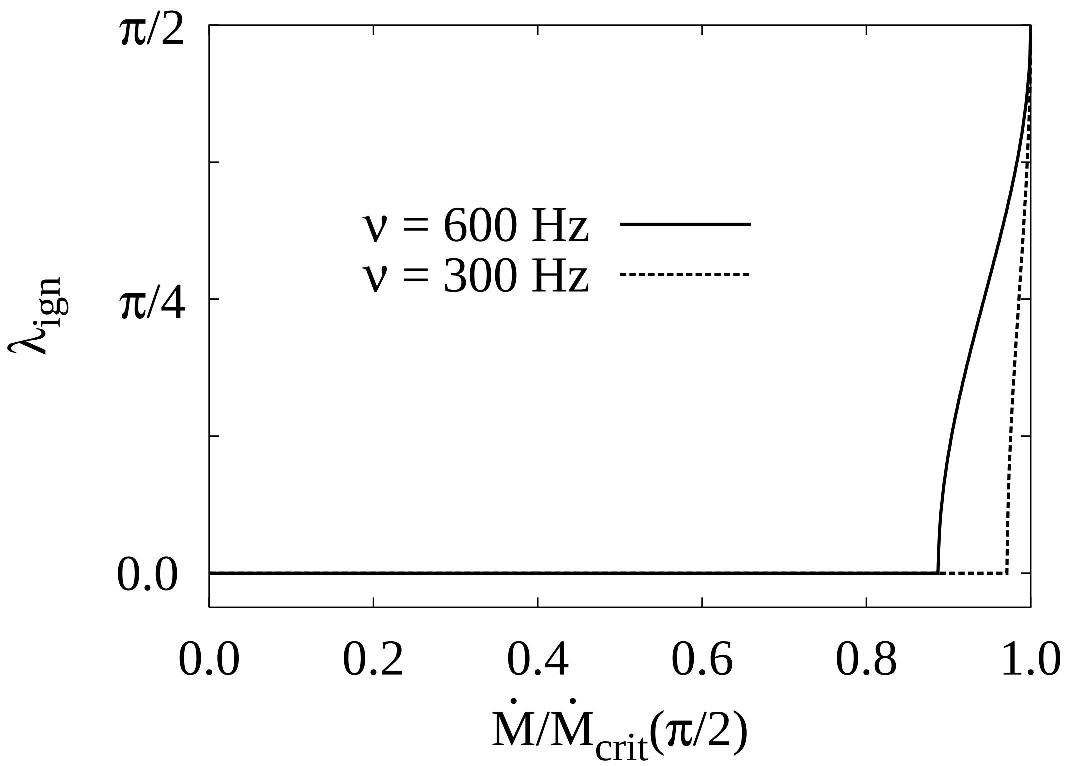
(Cornelisse et al., 2003)

Type I Bursts: Observations

Bursts stabilize at too low $\dot{m}$

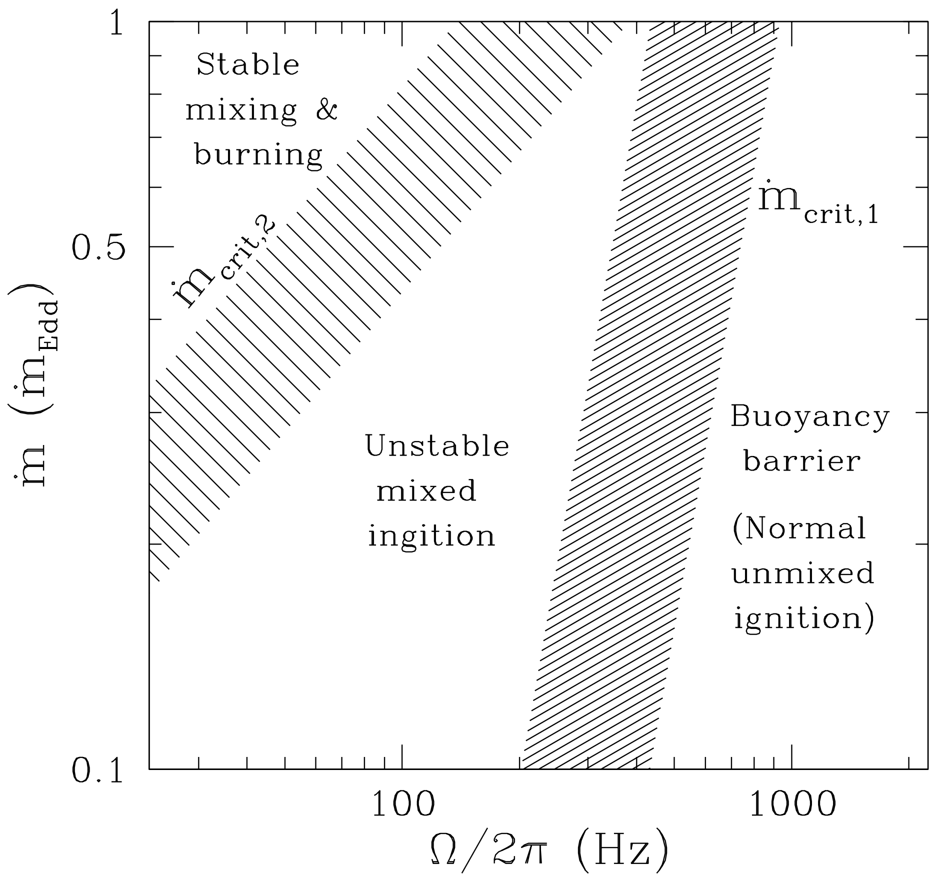
Burst rate does not increase with $\dot{m}$

Burst rate vs accretion rate

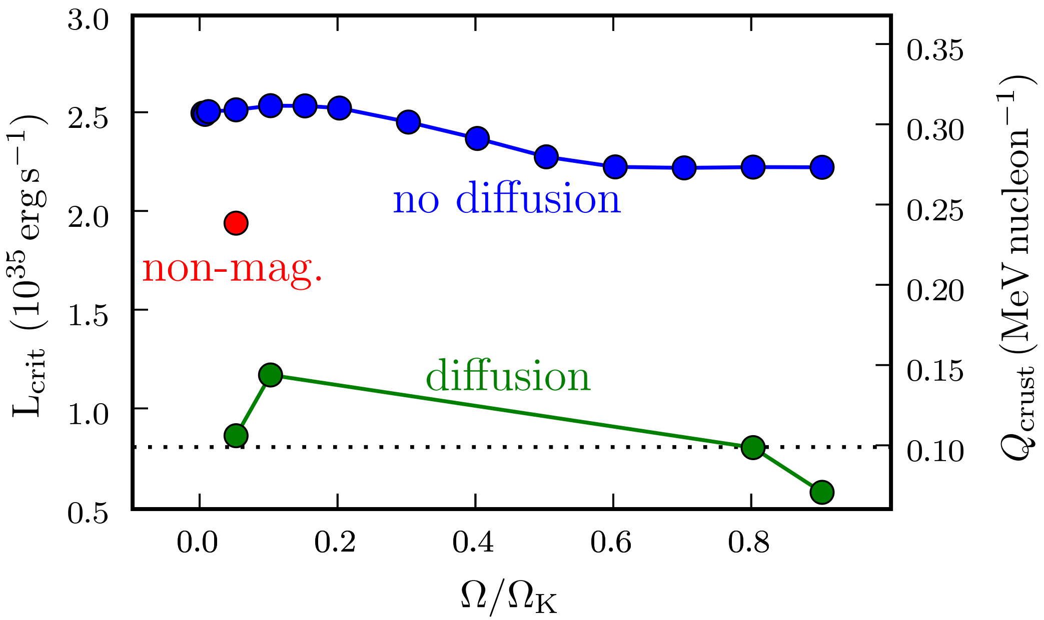


(Cooper & Narayan, 2007)

Burst rate vs accretion rate



(Piro & Bildsten, 2007)



(Keek et al., 2009)

Burst rate vs accretion rate

$$\ln R \propto \alpha \ln \dot{M}$$

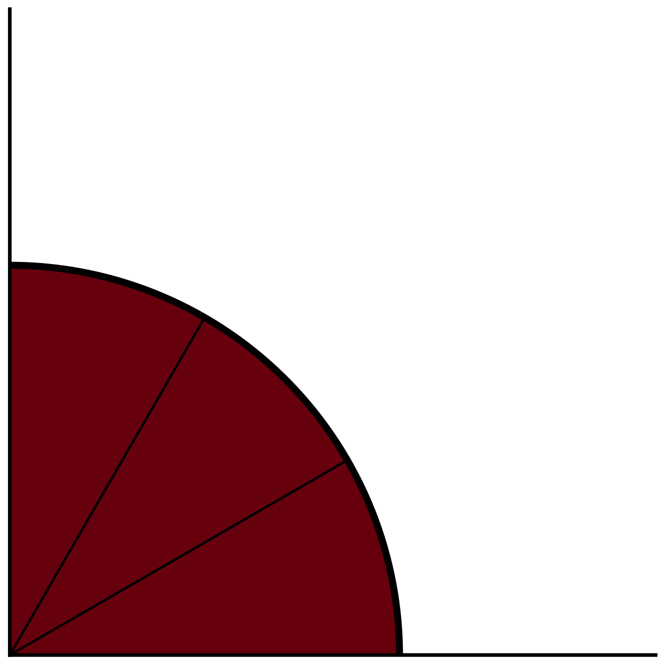
$$\ln \dot{M} \leq \ln \dot{M}_h$$

Burst rate vs accretion rate

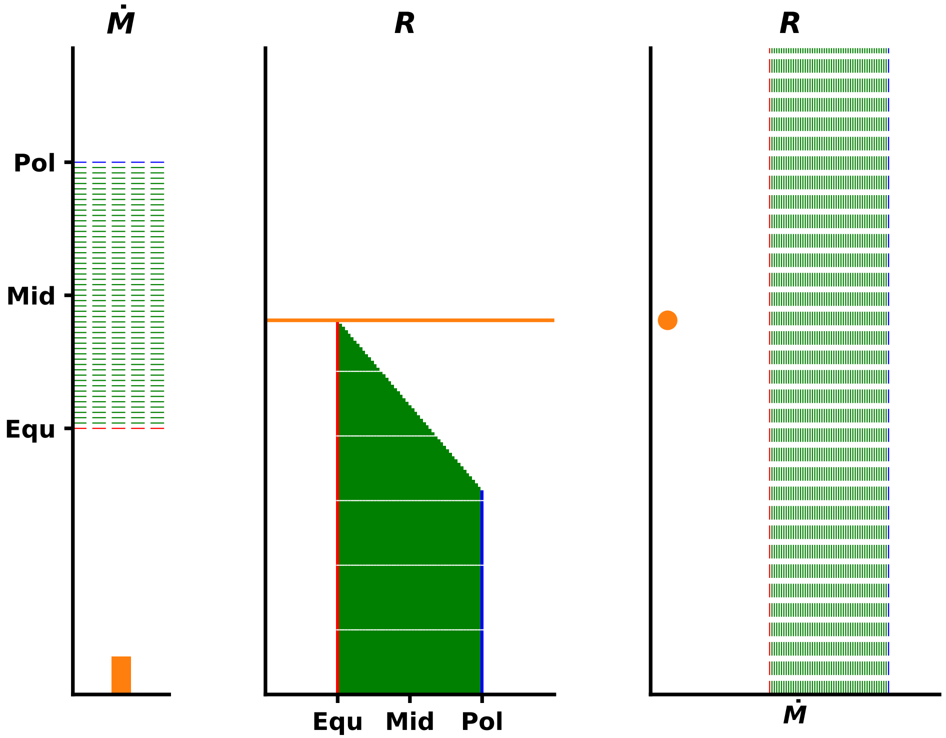
$$\ln \mathrm{R} \propto \alpha \ln \dot{\mathrm{M}} + \beta \ln \bar{f}(\theta; \nu)$$

$$\ln \dot{\mathrm{M}} \leq \ln \dot{\mathrm{M}}_{\mathrm{h}} + \gamma \ln \bar{f}(\theta; \nu)$$

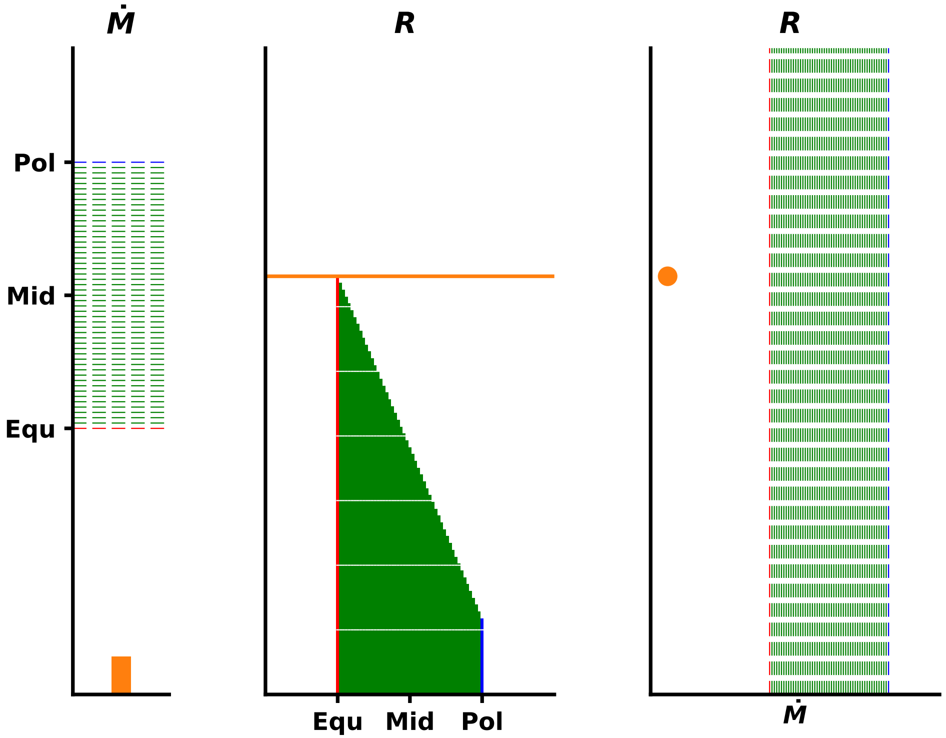
Burst rate vs accretion rate



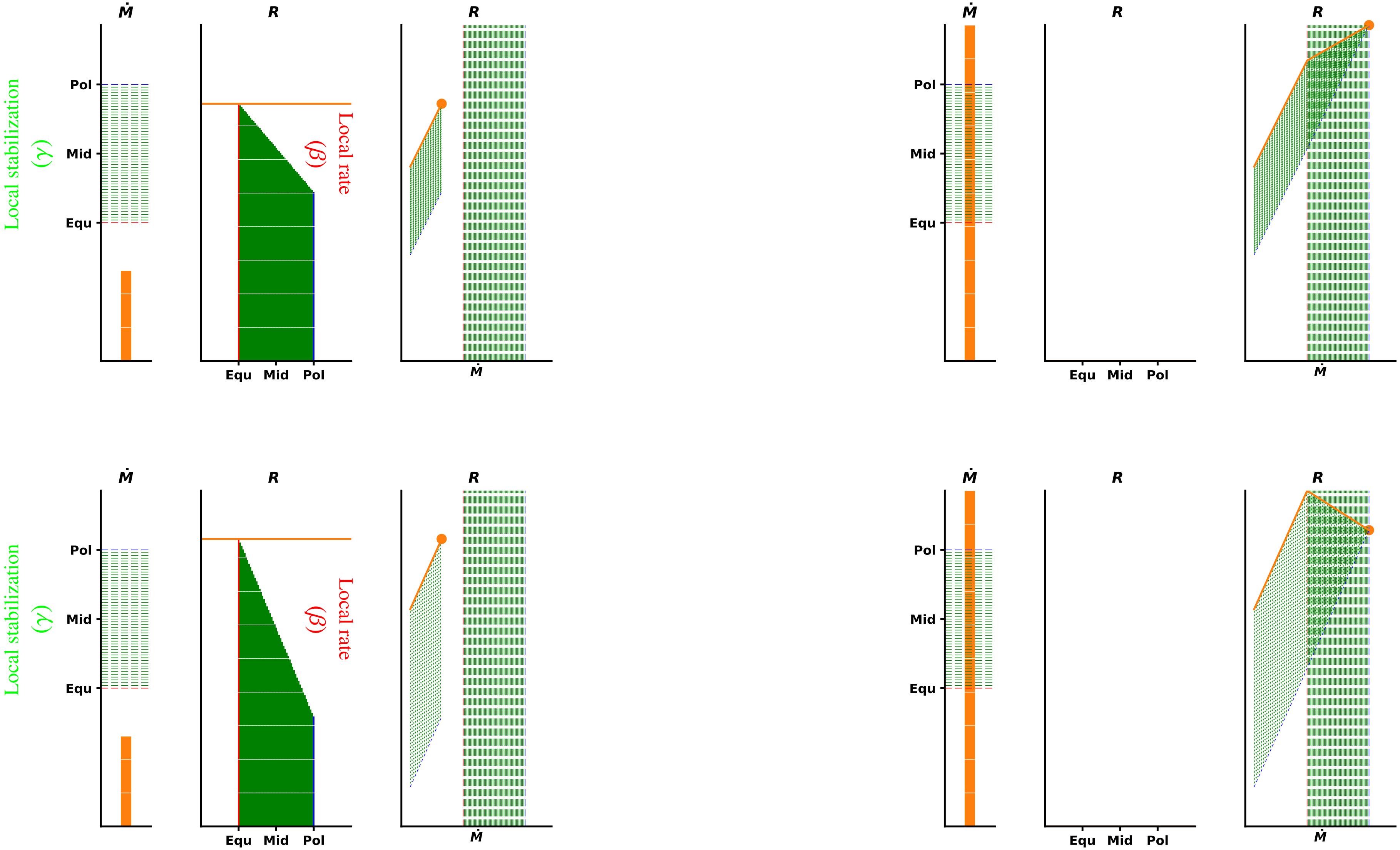
Burst rate vs accretion rate



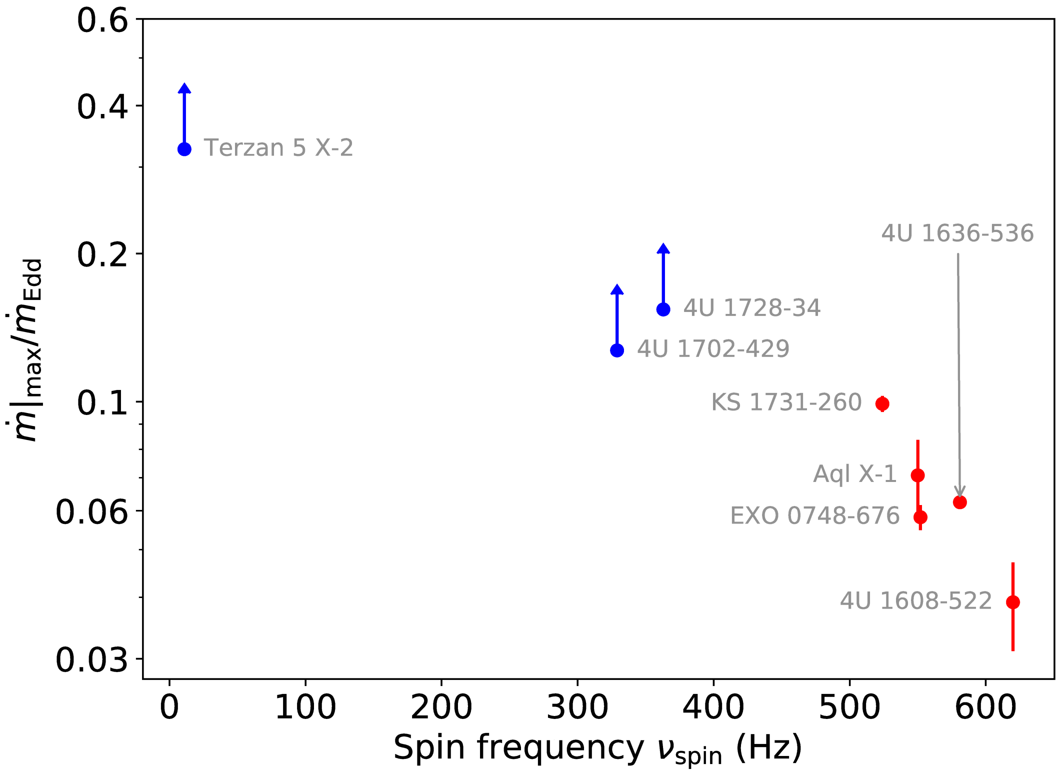
Burst rate vs accretion rate



Burst rate vs accretion rate



Burst rate vs accretion rate



(Galloway et al., 2018)

Burst rate vs accretion rate

- Local conditions affect the burning regime and the recurrence time. In particular:
- Rotational induced mixing increases reaction rate and stabilization.
- Latitudinal dependence of local conditions can explain decreasing burst rate.
- (Relatively) Easy to test, puts strong constraints.

Key Points

$\rightarrow$ NS are not one dimensional, MHD is important.

$\leftarrow$ However, effects could be modelled in 1D, patching together different configurations.