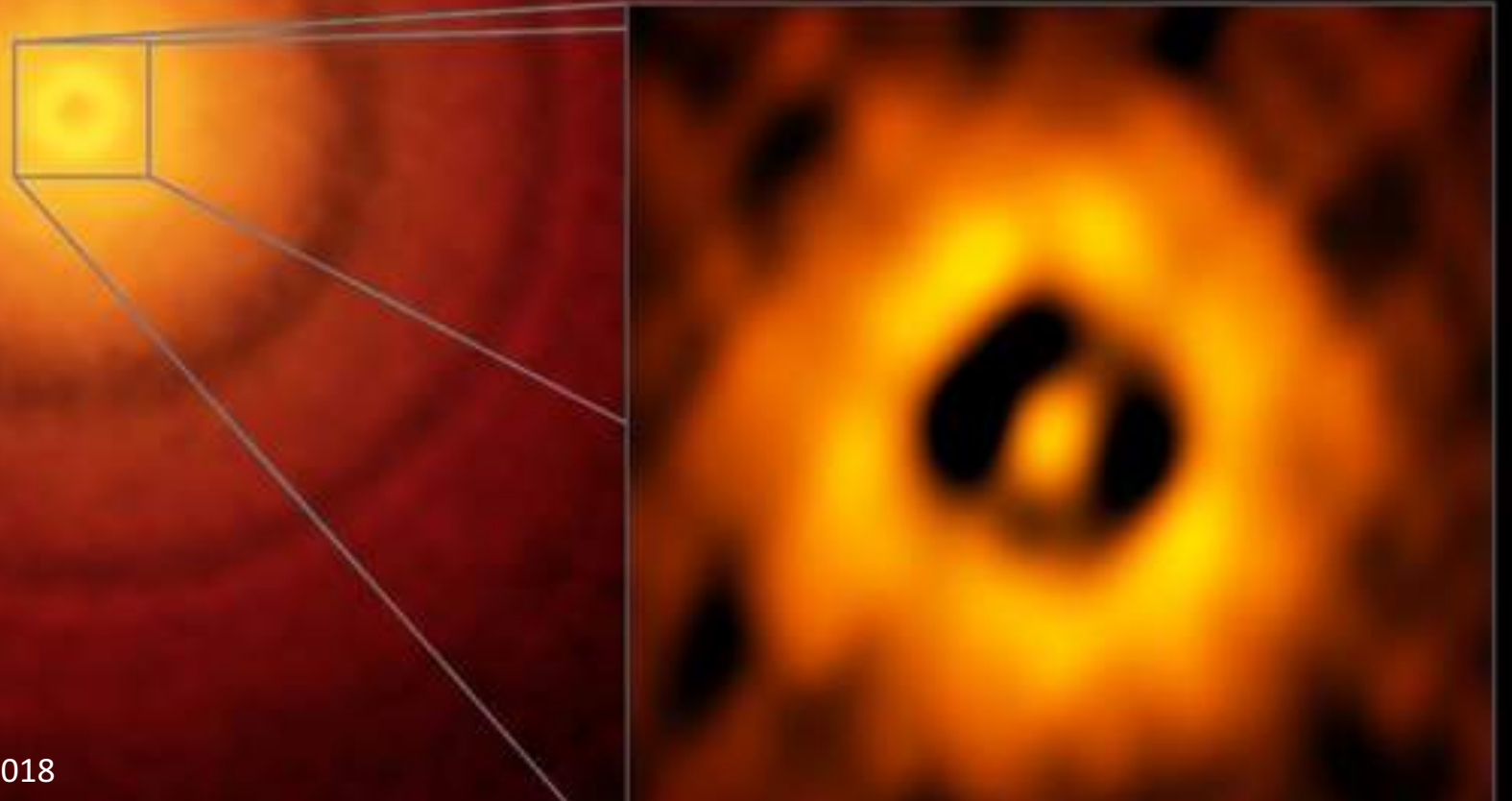
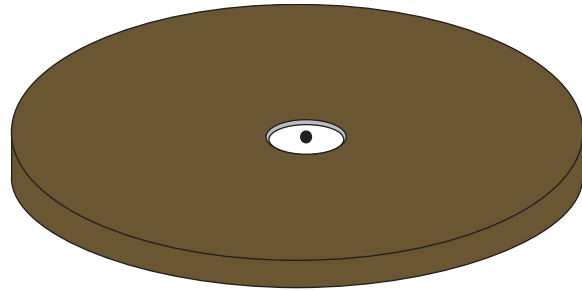


# Cavity Opening in Transitional Discs

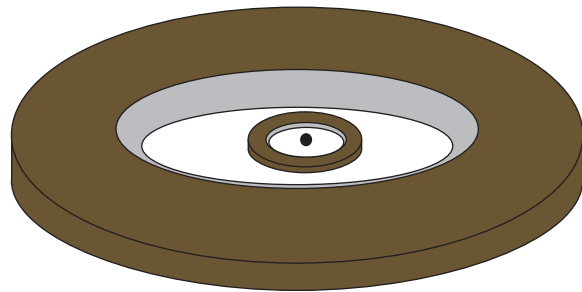
Kieran Hirsh



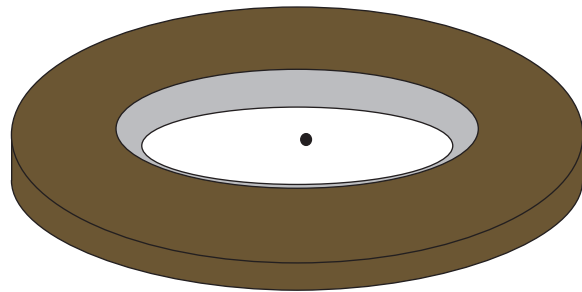
# What is a Transitional Disc?



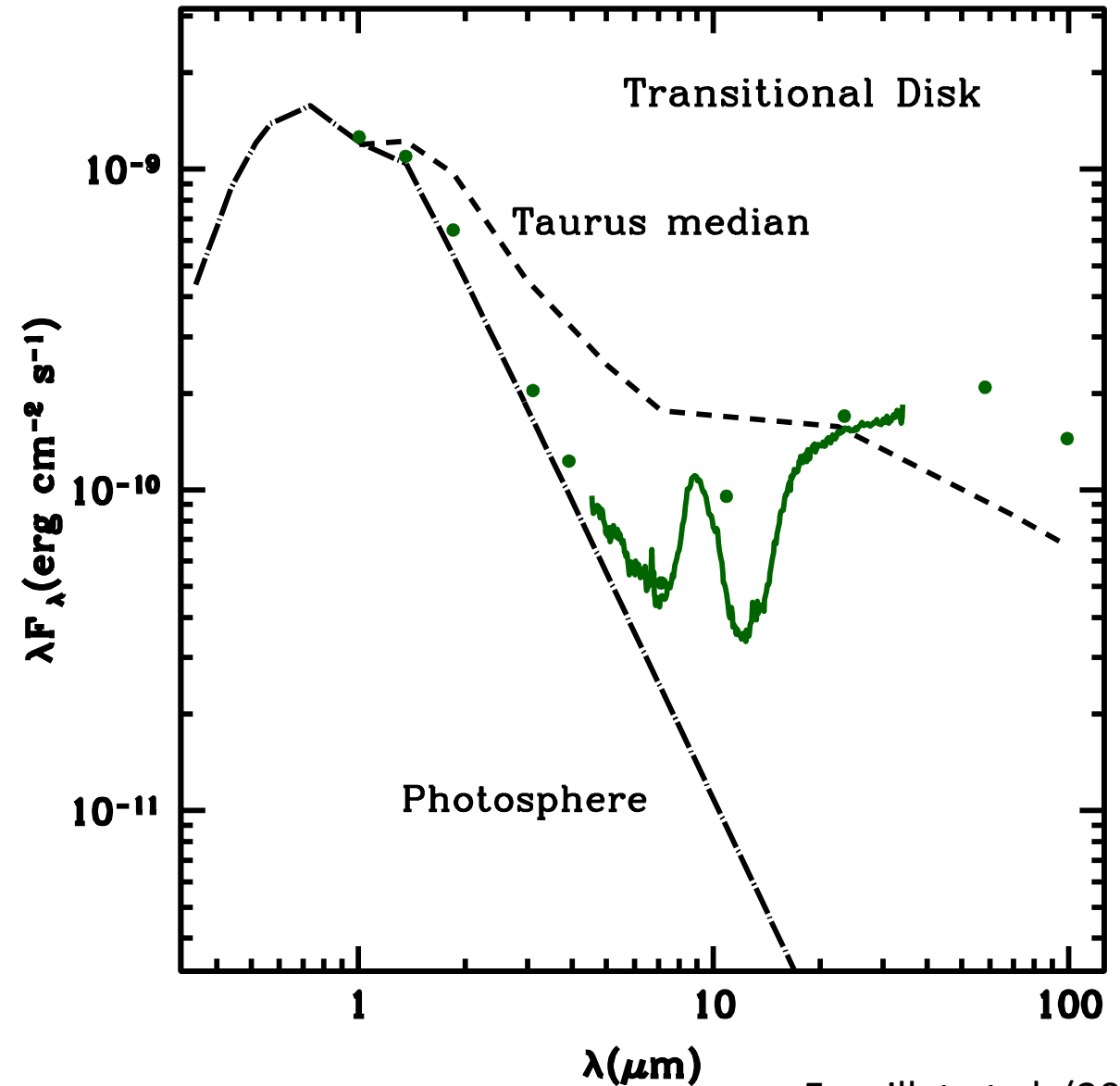
Full Disk



Pre-Transitional Disk



Transitional Disk

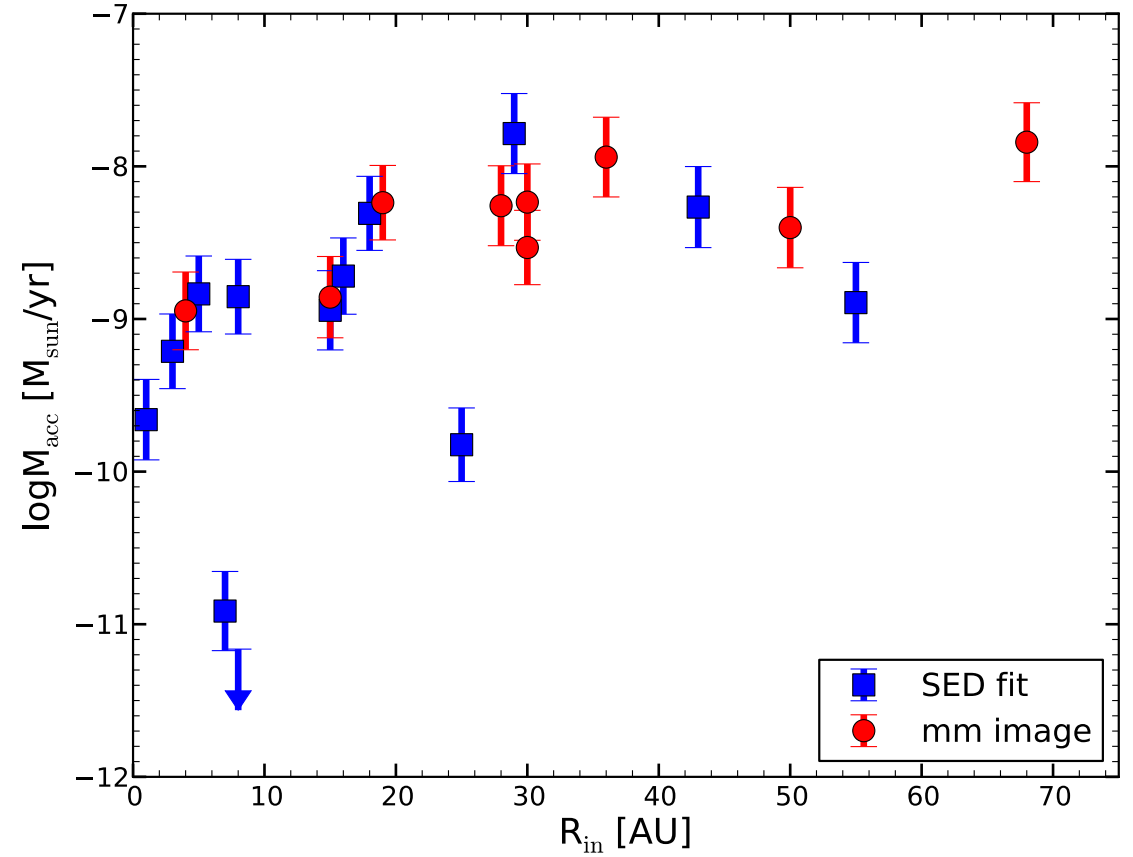


# What is a Transitional Disc?



HD 135344B

ESO, Stoler et al. (2017)

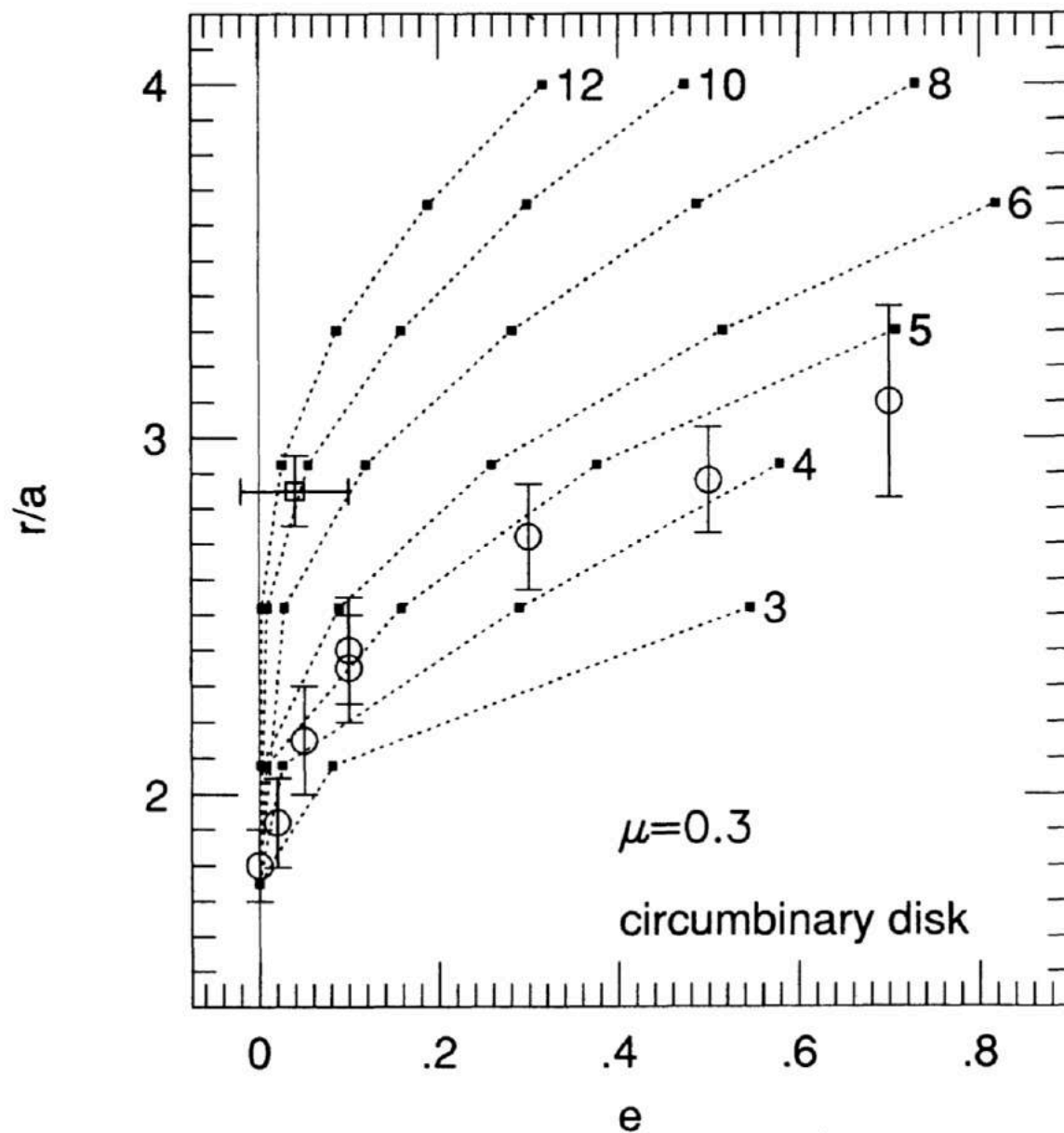


Manara et al. (2014)

# Binaries

$$-m\pi^2 \left[ \Sigma \left( \frac{dD}{d \ln r} \right)^{-1} |\Psi_{m,N}|^2 \right] \gtrsim 3\pi\alpha h^2 \Sigma \Omega^2 r^4 \quad T_{m,N}^{LR} \gtrsim T_\nu$$

$$\frac{r_{LR}}{a} = \left( \frac{m+1}{N} \right)^{\frac{2}{3}}$$

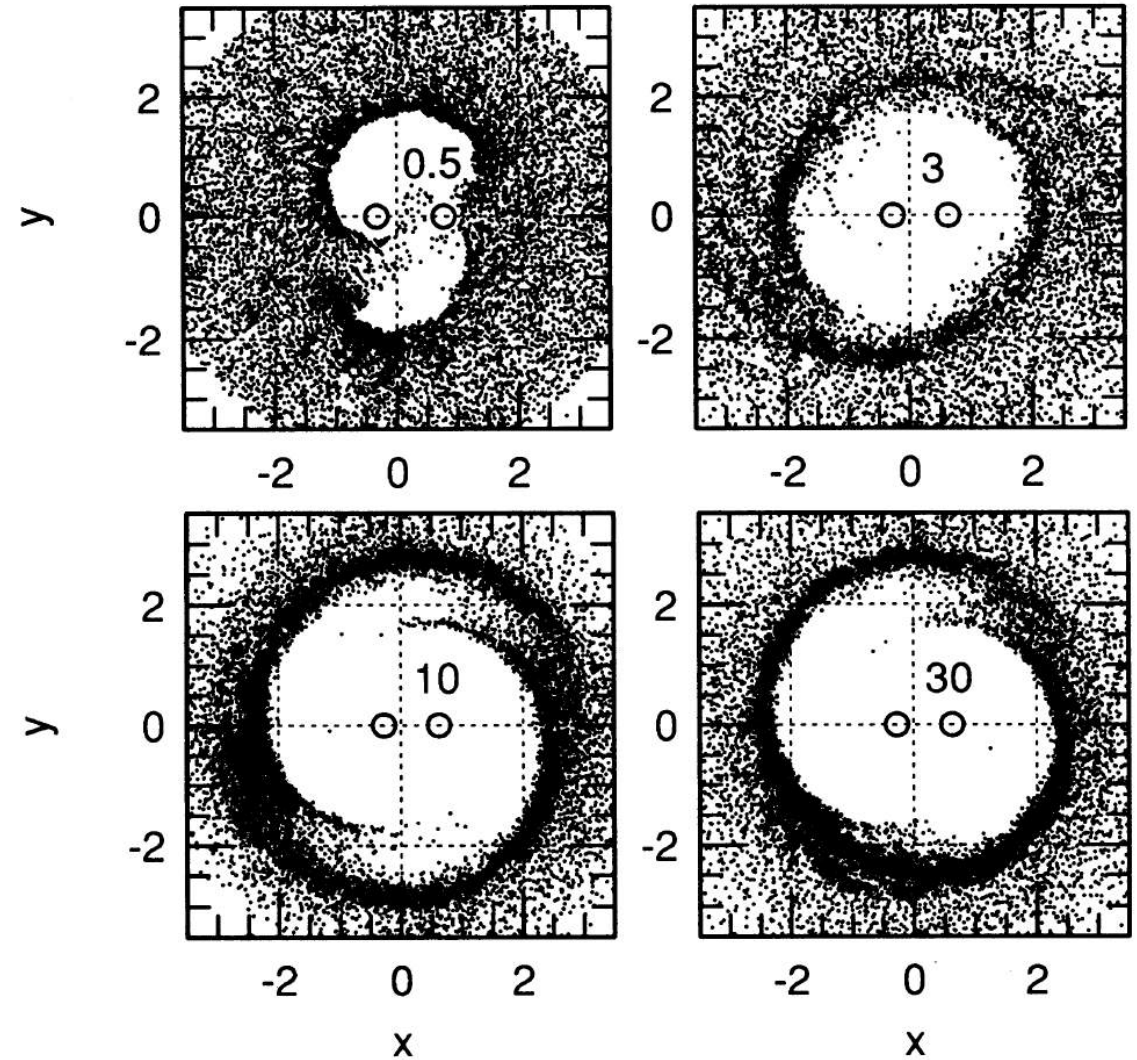


# Binaries

$$-m\pi^2 \left[ \Sigma \left( \frac{dD}{d \ln r} \right)^{-1} |\Psi_{m,N}|^2 \right] \gtrsim 3\pi\alpha h^2 \Sigma \Omega^2 r^4$$

$$T_{m,N}^{LR} \gtrsim T_\nu$$

$$\frac{r_{LR}}{a} = \left( \frac{m+1}{N} \right)^{\frac{2}{3}}$$

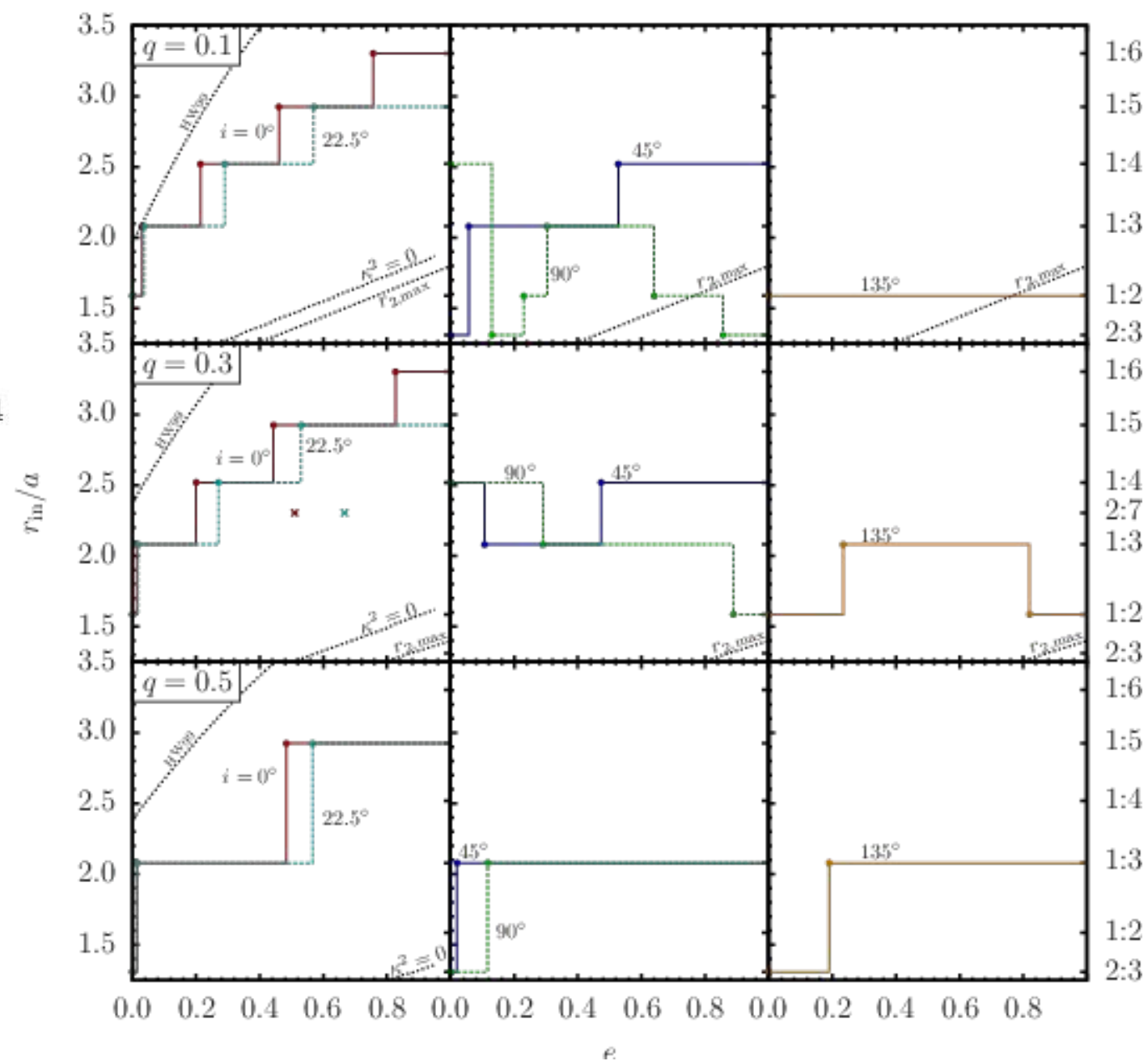


# Binaries

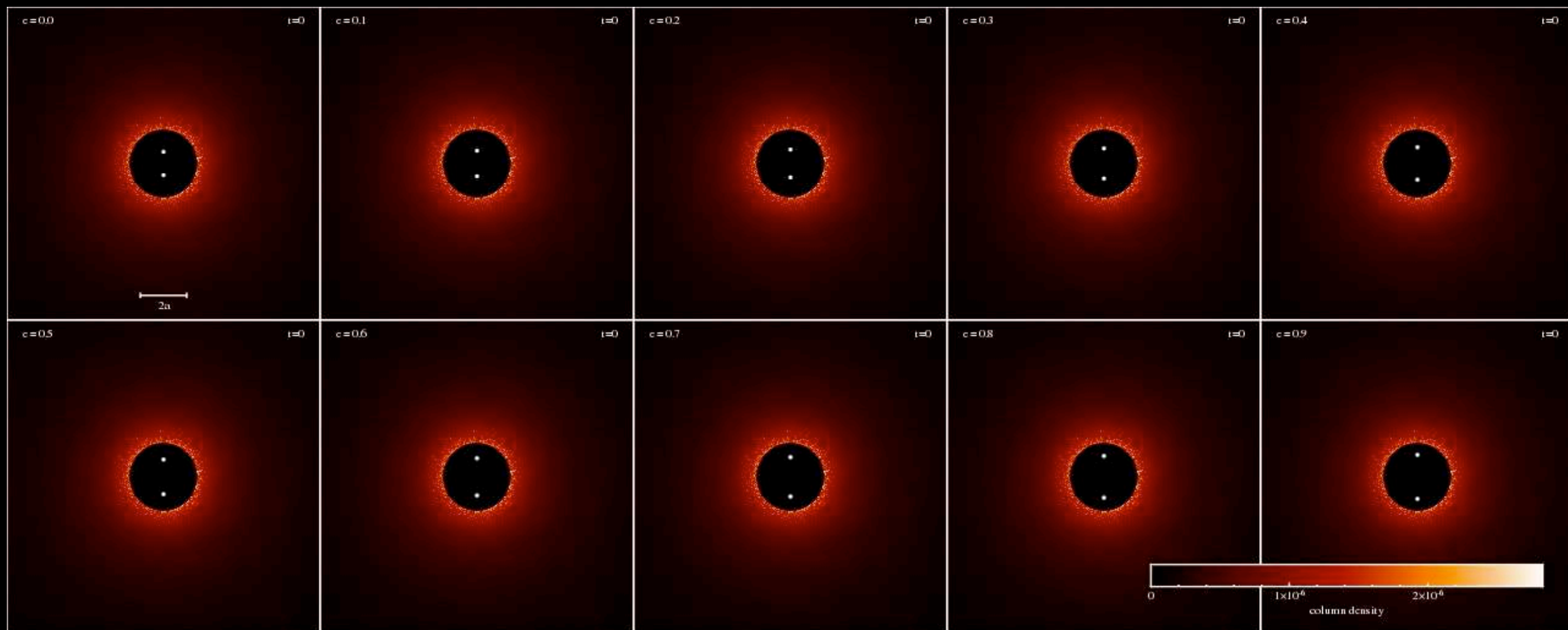
$$-m\pi^2 \left[ \Sigma \left( \frac{dD}{d \ln r} \right)^{-1} |\Psi_{m,N}|^2 \right] \gtrsim 3\pi\alpha h^2 \Sigma \Omega^2 r^4$$

$$T_{m,N}^{LR} \gtrsim T_\nu$$

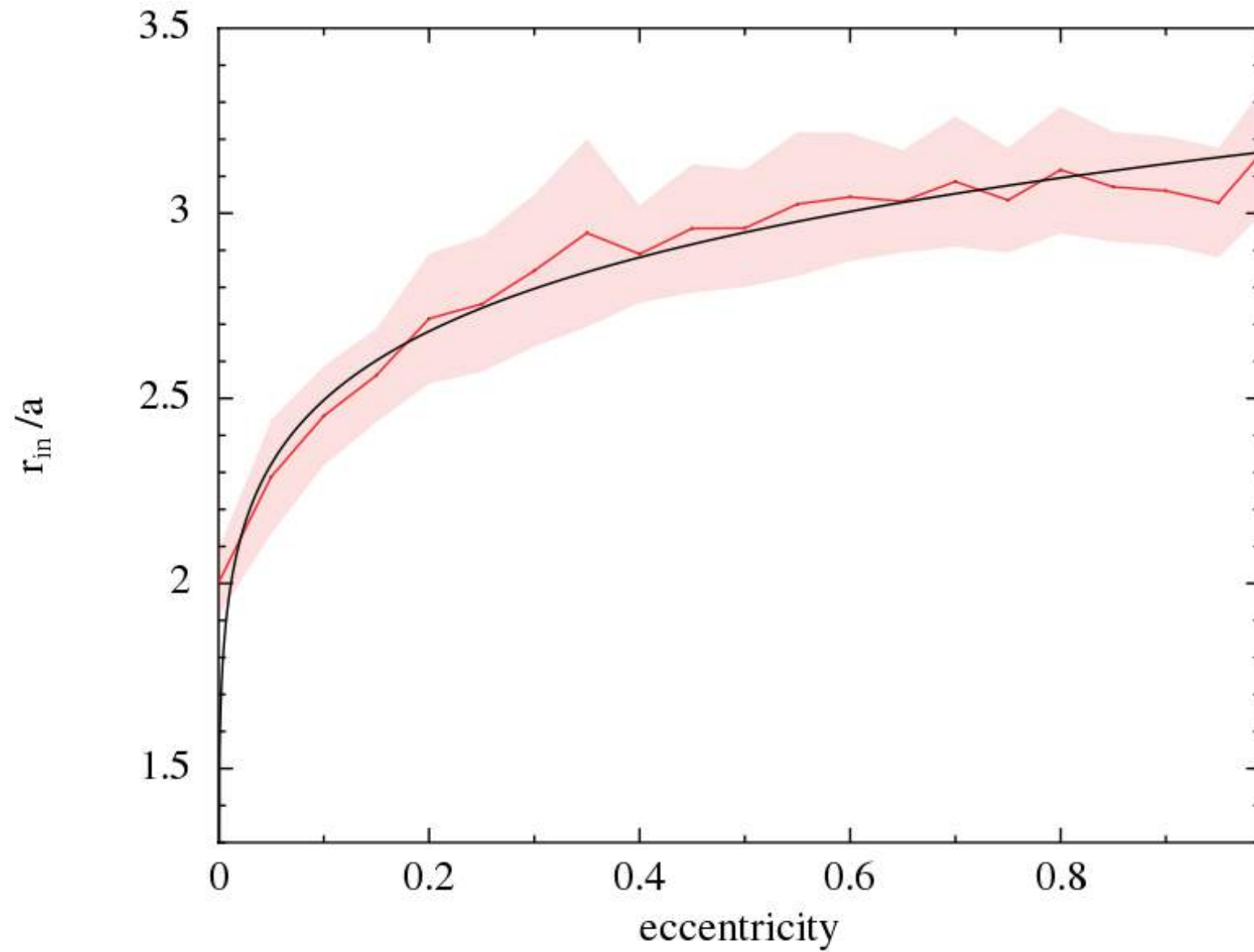
$$\frac{r_{LR}}{a} = \left( \frac{m+1}{N} \right)^{\frac{2}{3}}$$



# Eccentricity

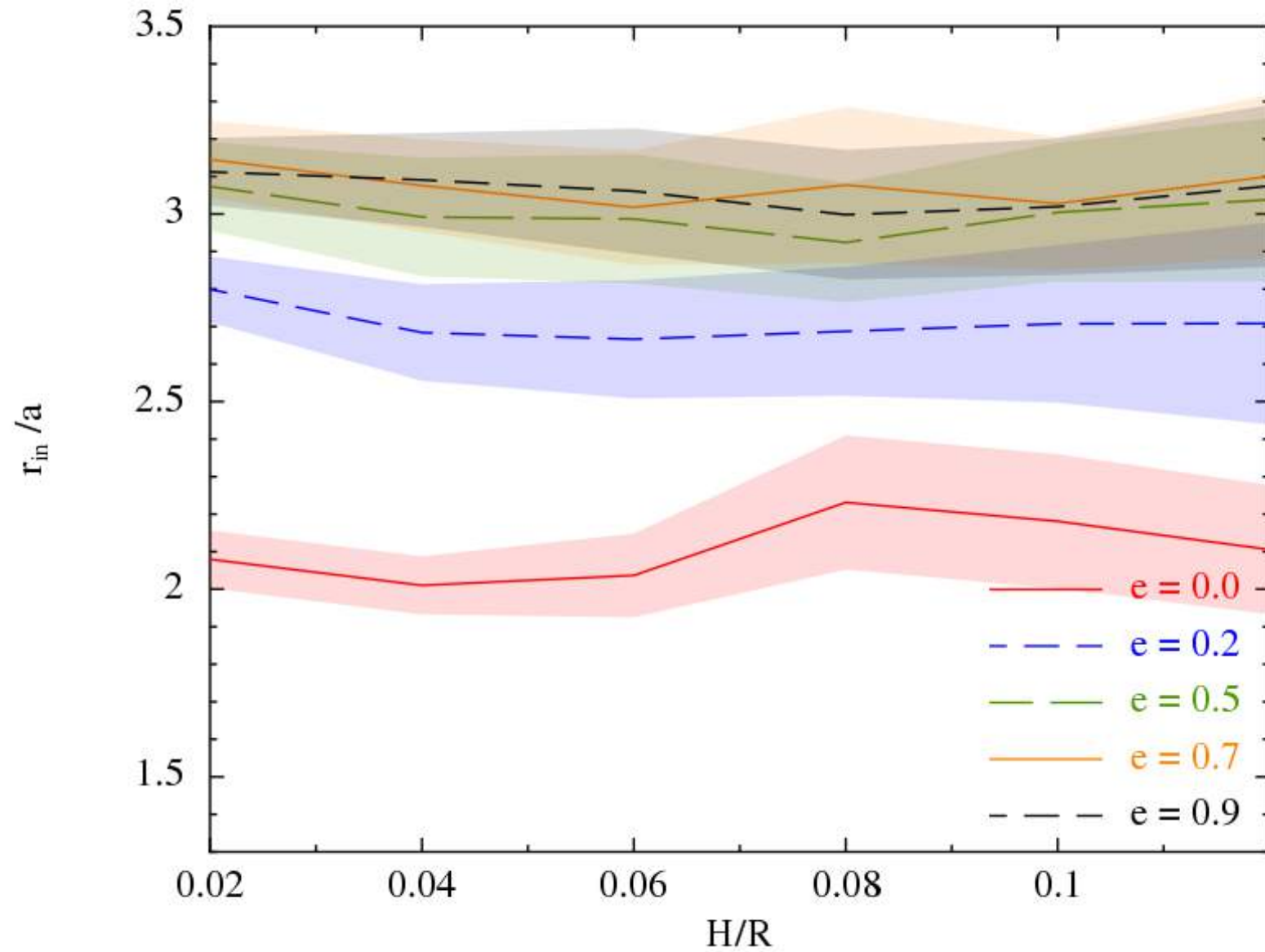


# Eccentricity

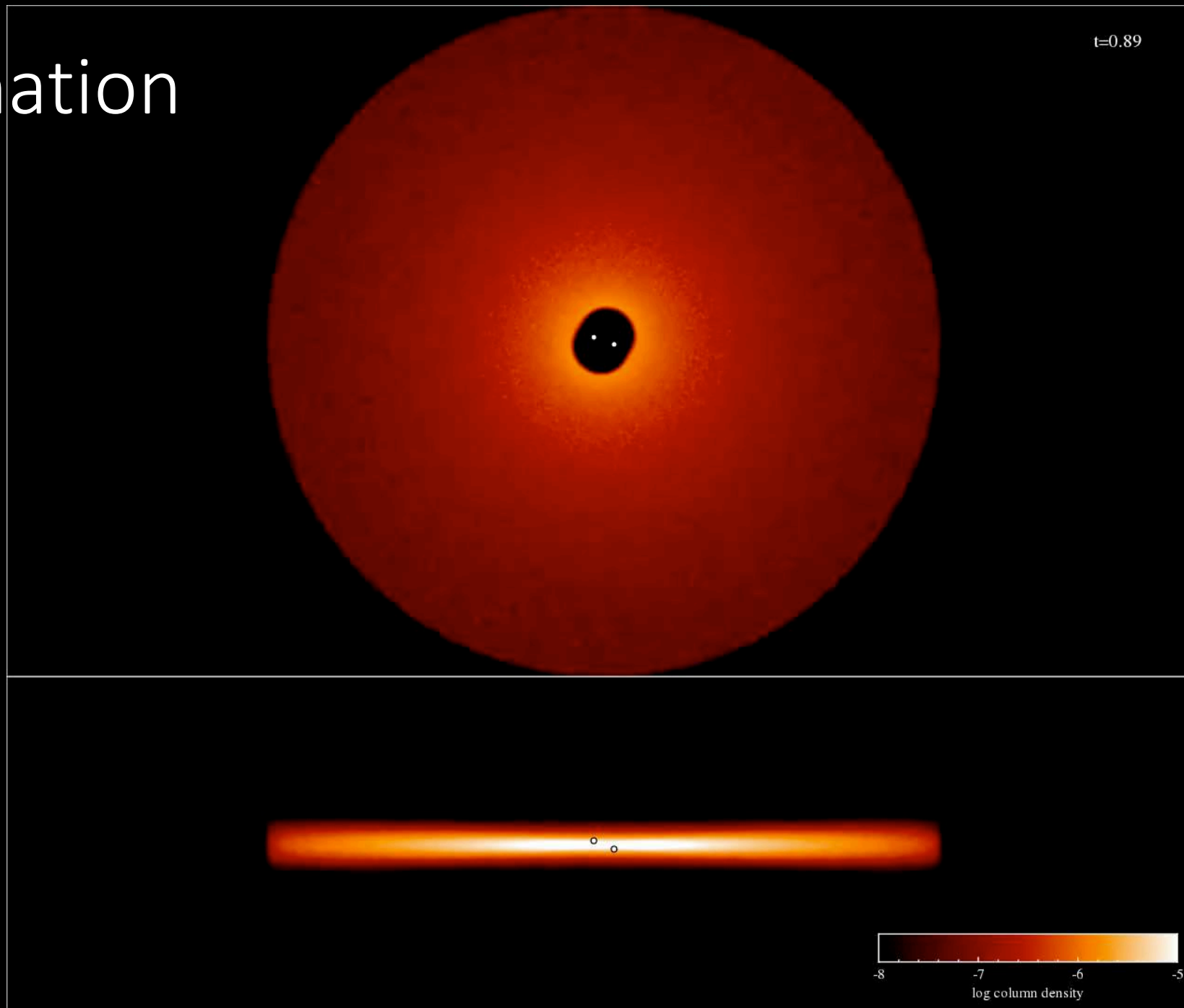




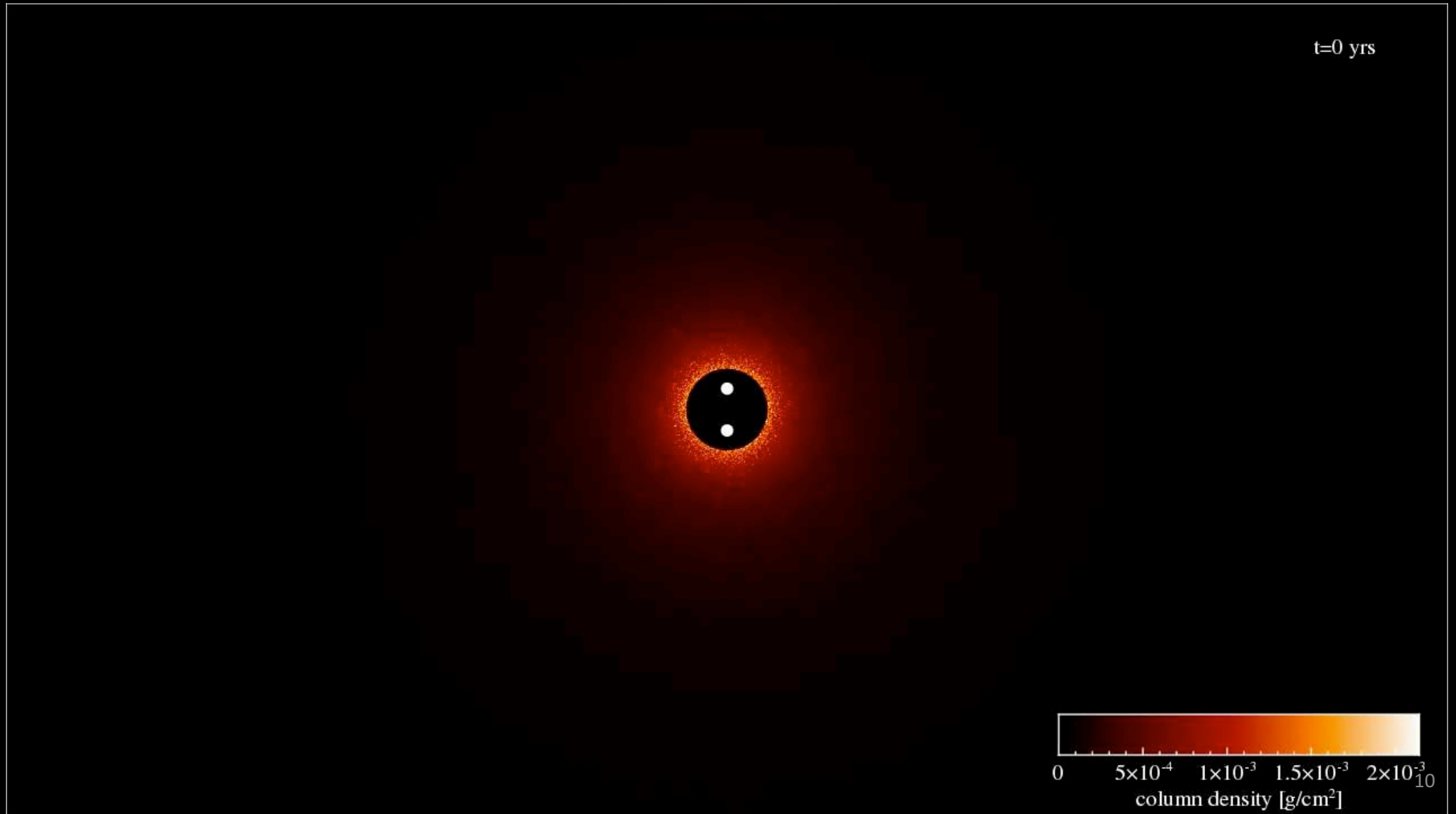
# Scale Height



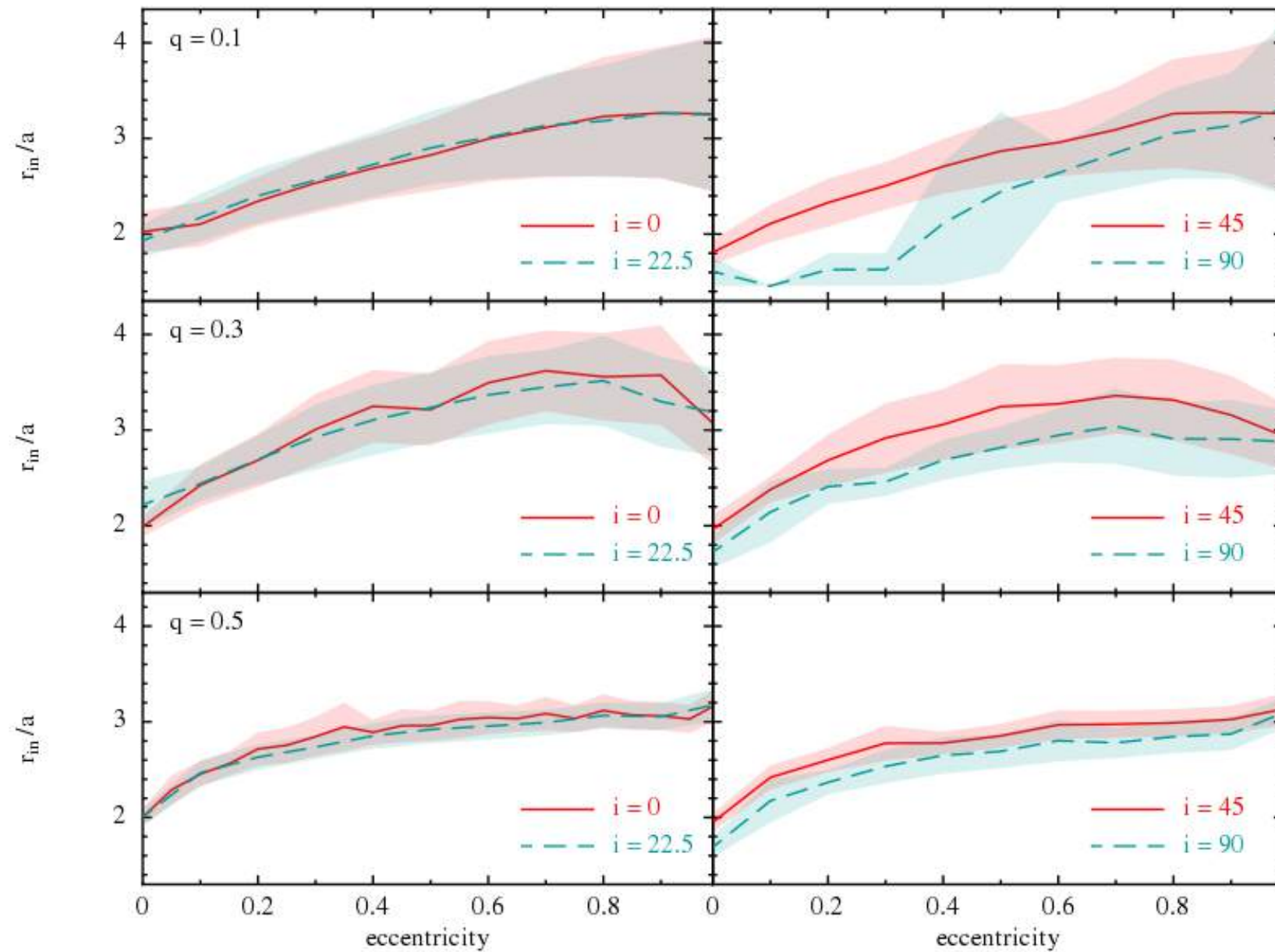
# Inclination



# Polar Orbit



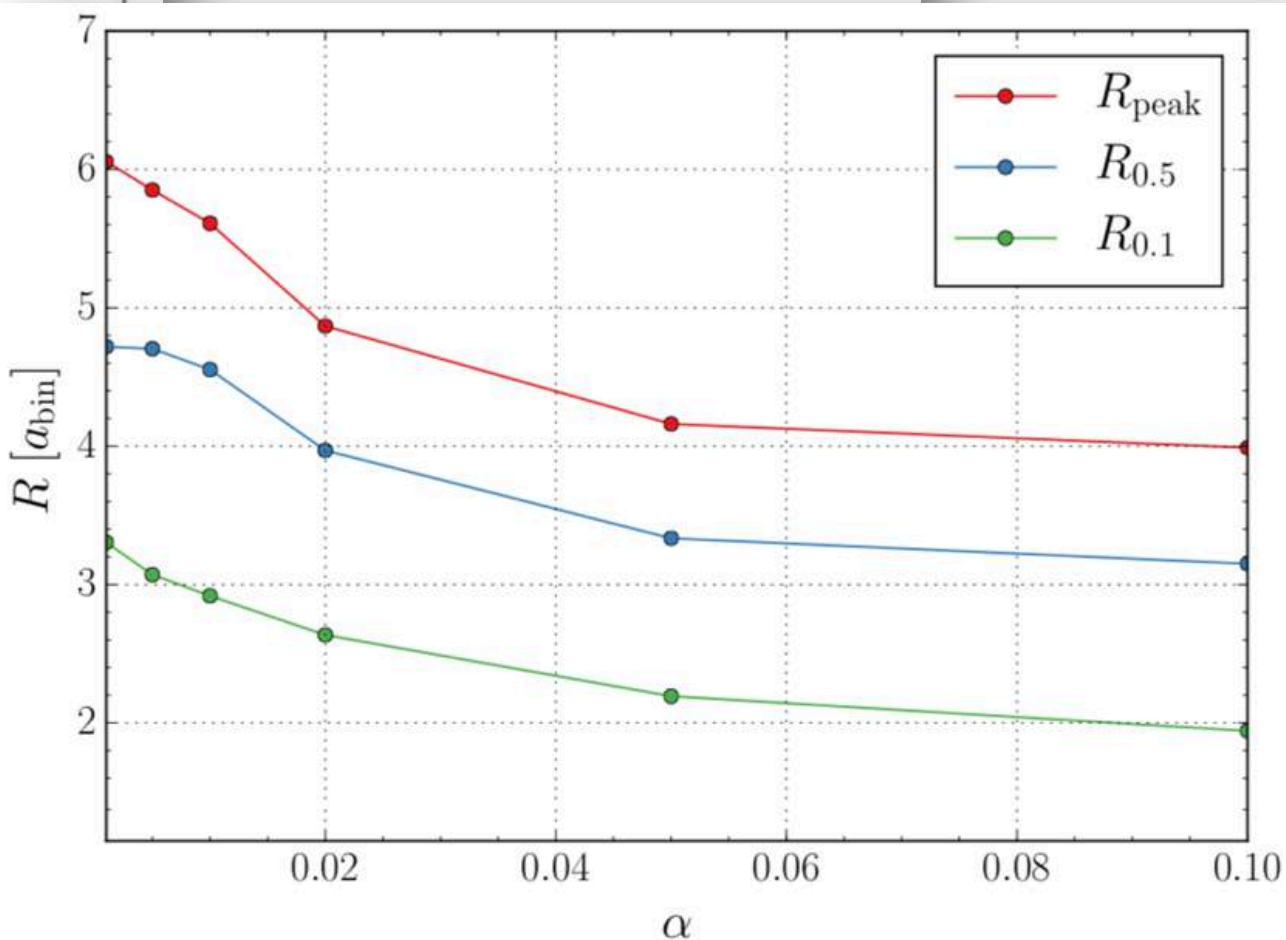
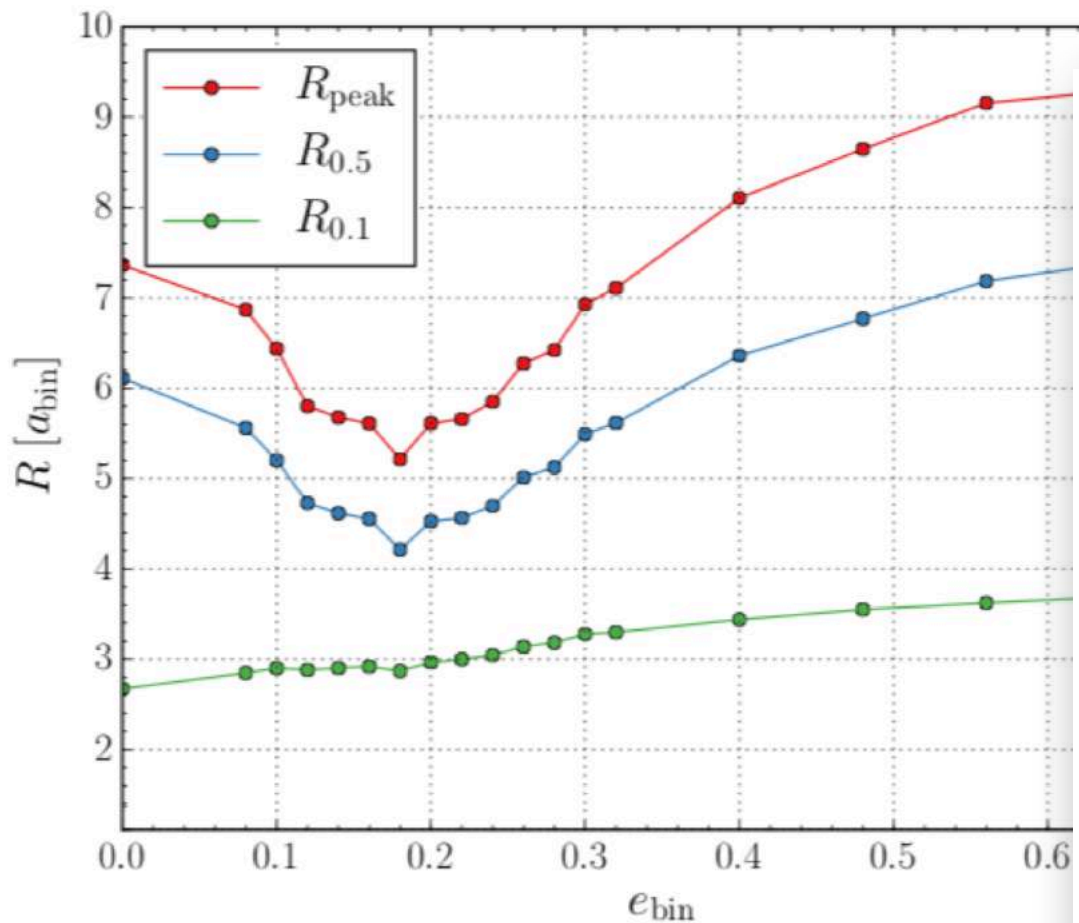
# Inclination



# But...

## Circumbinary disks: Numerical and physical behaviour

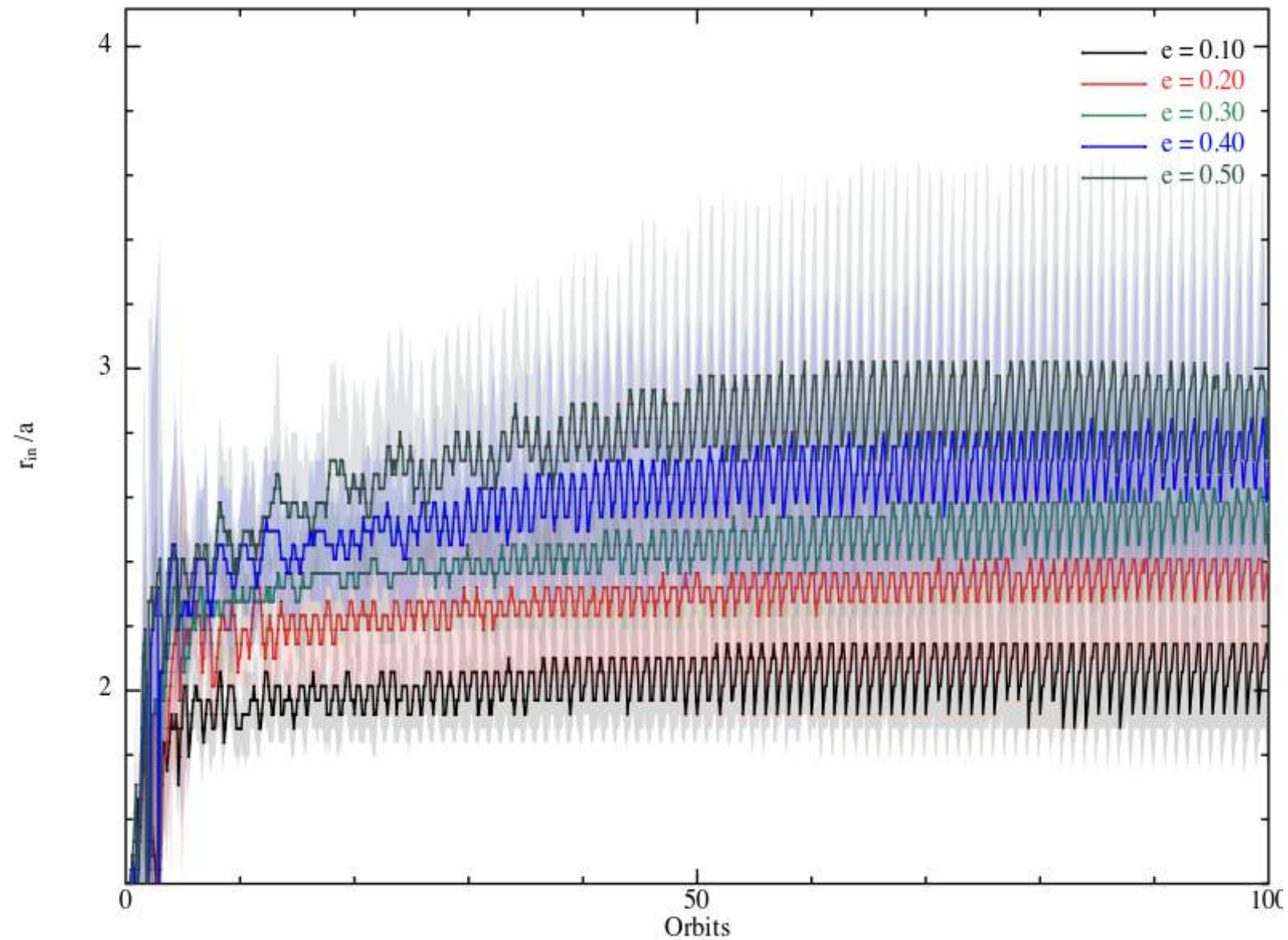
and Giovanni Picogna<sup>2</sup>



For varying binary eccentricities  $e_{\text{bin}}$  we find two separate minima around  $e_{\text{crit}} \approx 0.18$  where the gap is smallest with the short period. Circular binaries create the most eccentric disks.

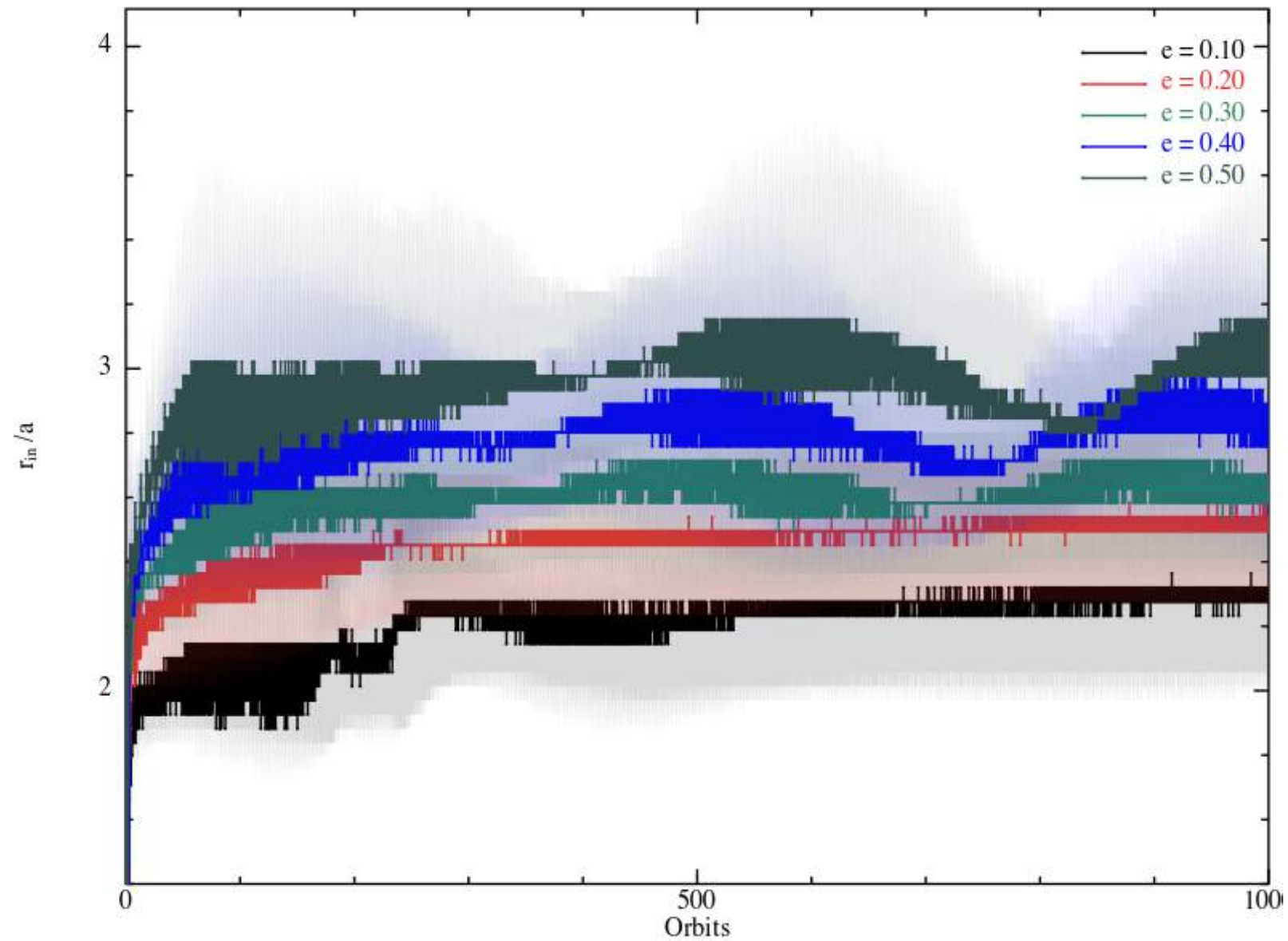
**Key words.** Hydrodynamics – Methods: numerical – Planets and satellites: formation – Protoplanetary disks – Binaries: close

# More Orbits

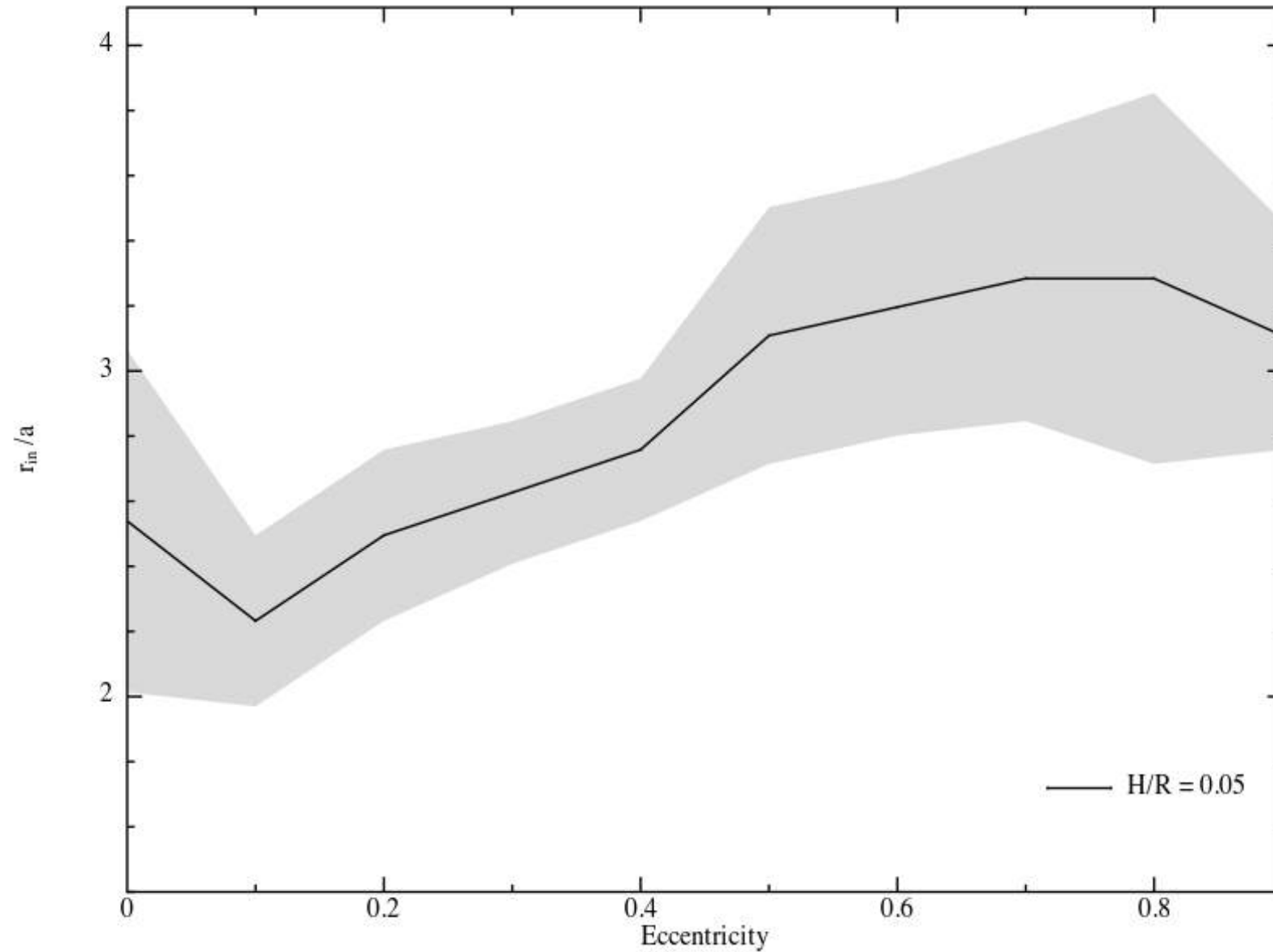




# MORE Orbits

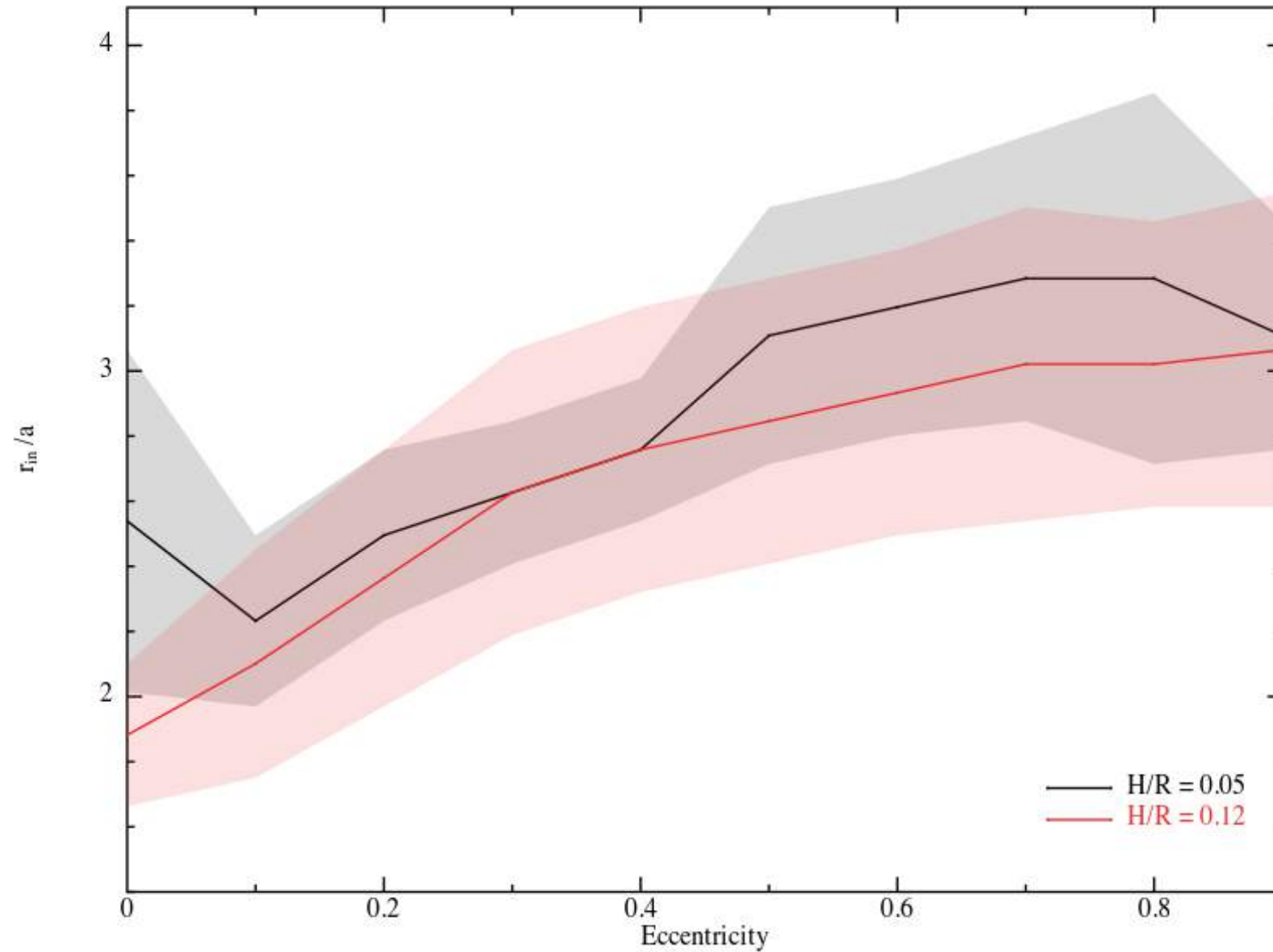


# Eccentricity





# Scale Height



# Summary

- ~~• Binary eccentricity sets cavity size.~~
- ~~• Disc Viscosity has no effect on cavity size.~~
- Be rigorous in your research unless you enjoy wasting time.
- On the dynamical timescale viscosity has no effect on cavity size.
- On the viscous timescale... I'm not sure yet.