External photoevaporation of circumstellar disks constrains planet formation timescales (paper *in prep.*)

Francisca Concha-Ramírez, Martijn Wilhelm, Simon Portegies Zwart
Leiden Observatory

fconcha@strw.leidenuniv.nl
@franconchar

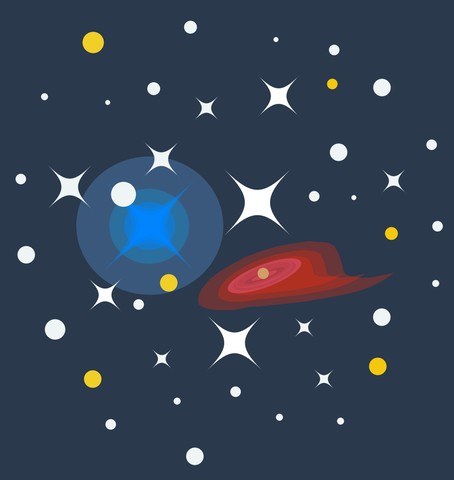
Introduction

During their first million years of evolution, circumstellar disks are immersed in an environment high in stellar and gas densities, which can be hostile for their survival. Studying how the environment affects the early evolution of the disks is important to constrain planet formation timescales.

We performed **simulations** of young star clusters where circumstellar disks are present. The disks were subject to **viscous spreading**, **dynamical truncations**, **external photevaporation** from OB stars and **supernovae**.

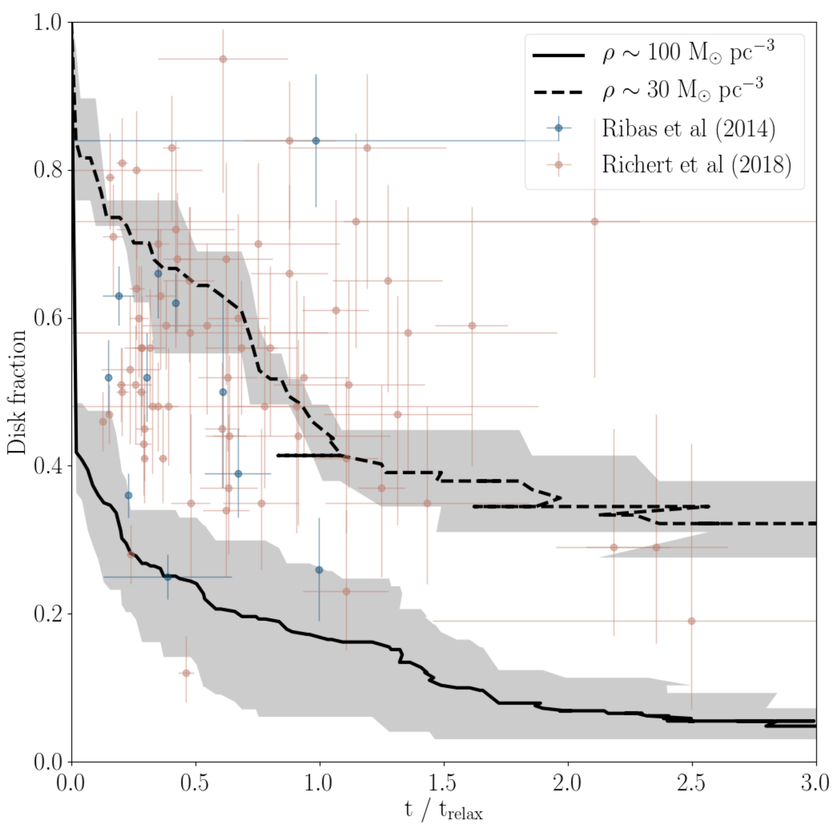
Model

- Regions of **30** and **100 $M_\odot$ pc^3**
- Circumstellar disks modeled using **VADER** (Krumholz and Forbes 2015)
- Photoevaporation mass loss calculated using the **FRIED grid** (Haworth *et al.* 2018)
- Stellar dynamics modeled with **ph4**, stellar evolution with **SeBa** (Toonen *et al.* 2012)
- All the codes brought together and evolved simultaneously using **AMUSE** (Portegies Zwart and McMillan 2019)

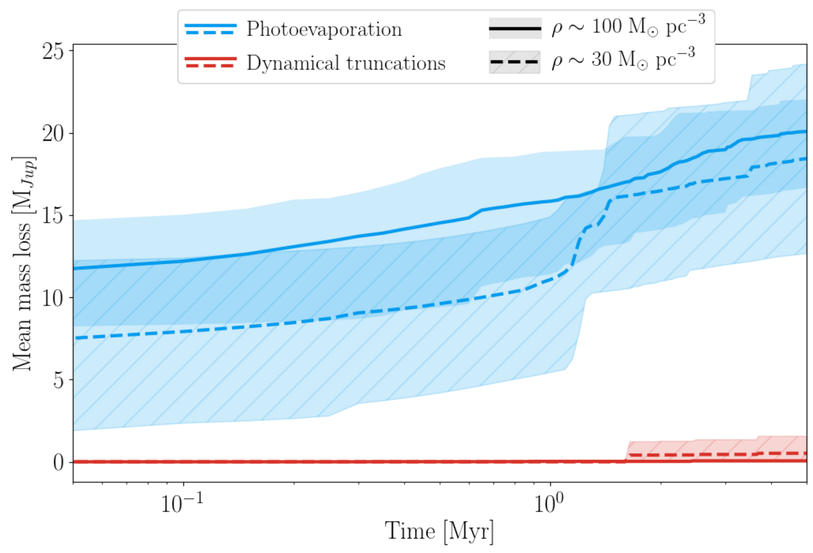


External photoevaporation destroys between **60-80%** of circumstellar disks **before 1 Myr** of evolution.

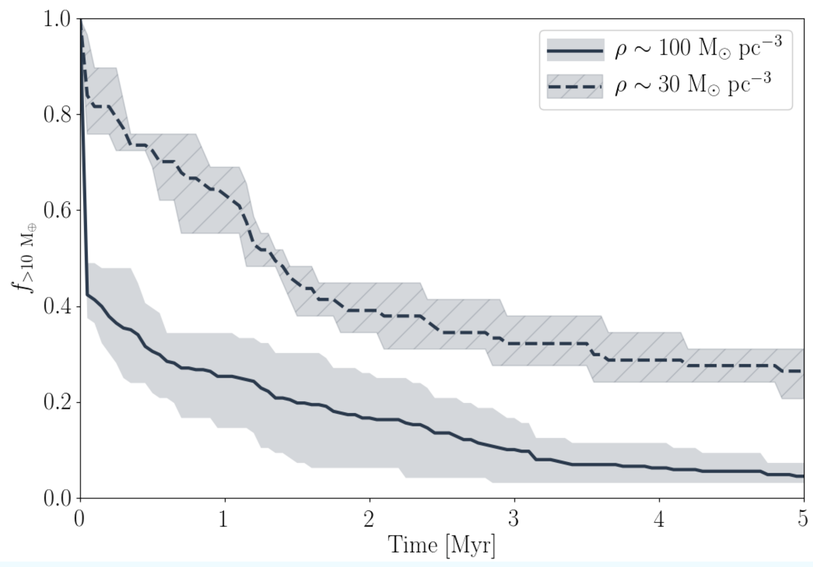
Results & conclusions



In the 100 $M_\odot$ pc^3 region, ~80% of disks are destroyed before 1 Myr of evolution. In the 30 M⊙ pc3 region, ~60% of disks are destroyed in the same timescale. **Planets need to form very quickly** to survive in such conditions.



Compared to photoevaporation, dynamical truncations are not an important process in defining final disk sizes and masses.



Within surviving disks, the fraction with **masses >10 M⊕** also drops quickly. This is the dust mass reservoir necessary for the formation of gas giant cores.

References
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AMUSE
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