# Photoevaporation creates new pathways for accretion onto planets

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## The interplay between accreting planets and photoevaporative disk winds

### INTRODUCTION

- Planet-induced substructures and disk winds are two of the most important aspects that define the structure and the evolution of protoplanetary disks.
- We combine both in a single model with the goal to study their interactions.
- One of our main questions is: **How does the wind affect accreting planets?**

### METHODS

- We use the **EUV + X-ray photoevaporation** model by Picogna et al. (2019) in 3D hydrodynamic simulations of a disk that is hosting a **Jupiter-like planet.**
- Using passive scalars and Lagrangian particles we trace the gas and study the path it takes before it is accreted onto the planet.
- Accretion is implemented by removing a fraction of the gas inside 0.5 $R_{Hill}$ from the planet at every timestep.

### RESULTS

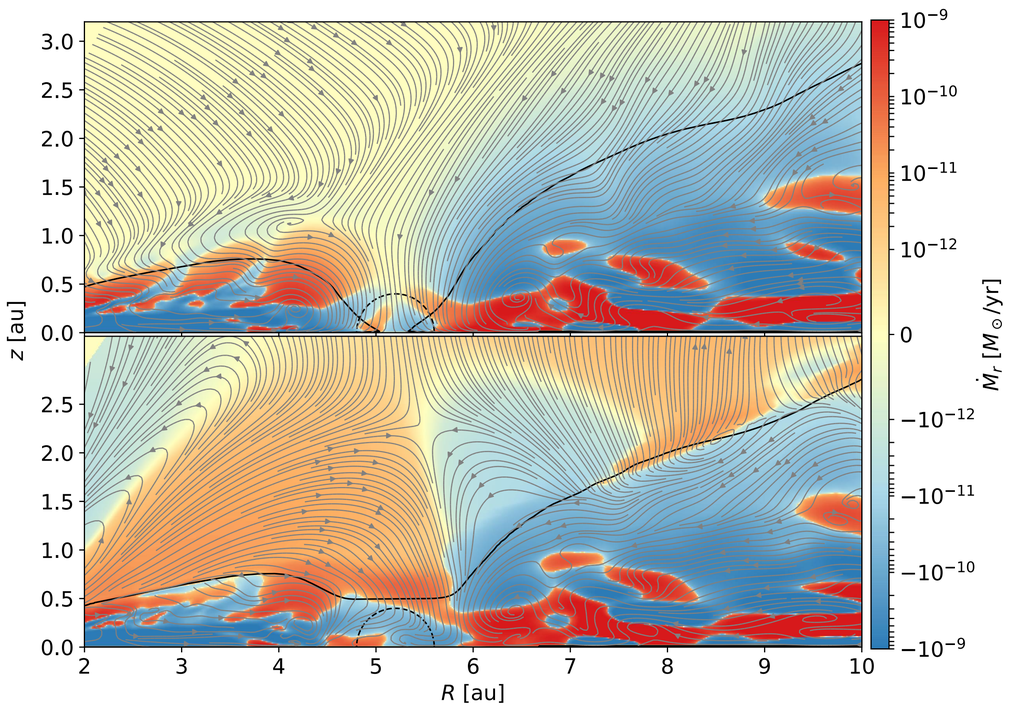


**Fig. 1:** Radial mass-flux integrated along the azimuth overlain by the velocity field. The black solid line shows the density contour for $10^{-15}$ g/cm$^3$. The black dashed line indicates $R_{Hill}$ around the planet.

- Photoevaporation (PE) transports gas from the inner disk surface radially outwards, where it can fall back into the gap (Fig. 1).
- This leads to a **factor 2 increase in the planet's accretion rate** in our model (Fig. 2).

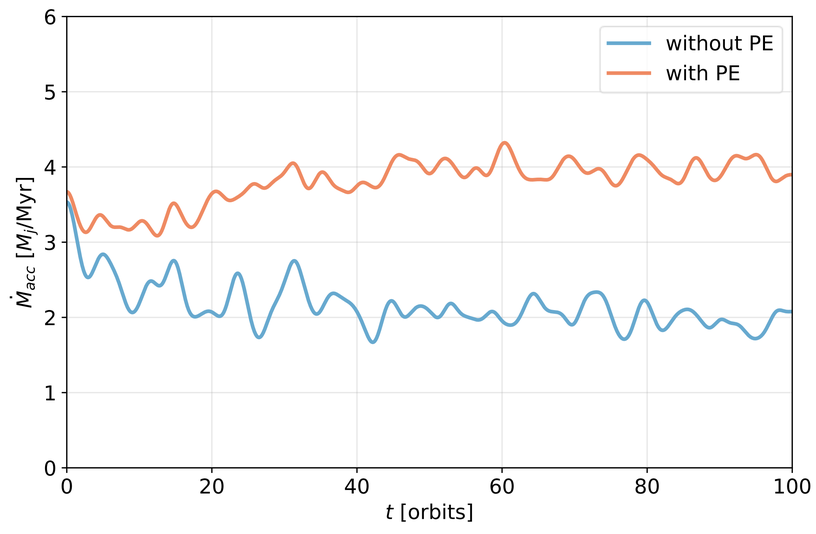


**Fig. 2:** Comparison of the accretion rate onto the planet. Accretion and photoevaporation were first switched on at t = 0.

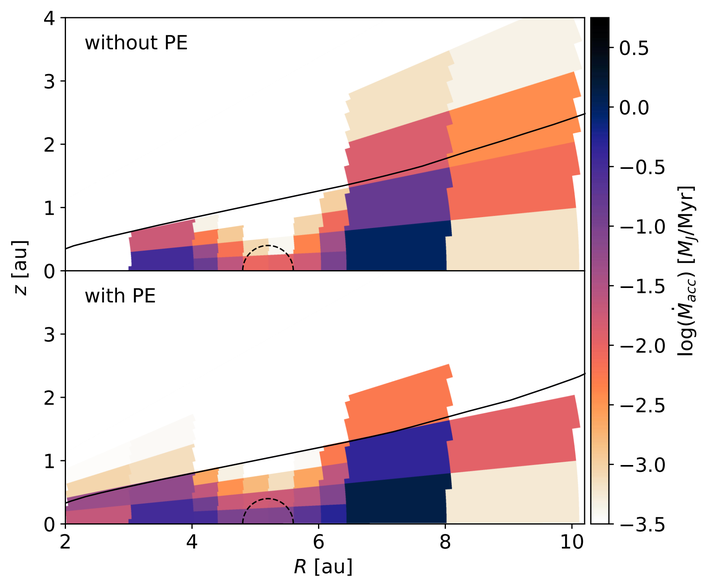


**Fig. 3:** Contribution of the spherical rings defined by the colored cross-section to the accretion rate onto the planet. The black dashed line indicates the disk-wind interface.

- In our photoevaporation model the **planet accretes gas that originated inside *R* = 3 au at a rate of 7.2·10$^{-2}$ $M_J$/Myr** (Fig. 3).

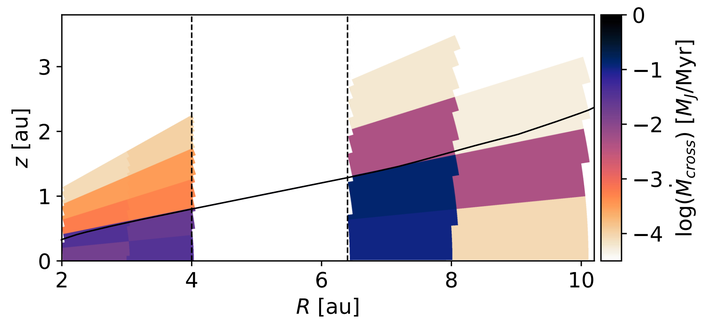


**Fig. 4:** As Fig. 3 but for the rates at which gas crosses both the black dashed lines from the inside out and vice versa.

- Photoevaporation transports mass from inside R = 3 au to outward of 6.5 au at a rate of 4.5·10$^{-11}$ $M_\odot$/yr (Fig. 4).

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**Keep an eye out for the upcoming paper!**

**In the meantime, take a look at our previous paper to learn how the presence of a planet can affect the observational diagnostics of the wind**