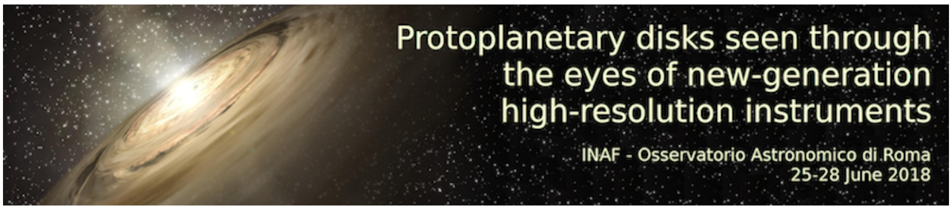


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# The dispersal of planet-forming discs. A new generation of X-ray photoevaporation models

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The modality of disc dispersal is thought to be of fundamental importance to planet formation, yet the responsible mechanism is still largely unconstrained.
Photoevaporation from the central star is currently a promising avenue to investigate, but the models developed to date do not yet have enough predictive power for a piecewise comparison with the observations.
Wind profiles and rates play a very important role in understanding disc dispersal as well as in the feedback of this process on planet formation and migration (e.g. Ercolano et al. (2015), Ercolano & Pascucci (2017), Jennings et al. (2018)).

We started in Munich a joint project, together with ESO, Max-Planck Institute, the University of Heidelberg, and Tuebingen, to improve our understanding of the transition discs population from both a theoretical and observational point of view.

Our work focuses on creating new and improved hydrodynamical models of wind profiles from stellar irradiation at different wavelengths (EUV, X-rays, FUV) in order to have better constraints for current and future observations.

The prescription to model X-ray disc photoevaporation used in the last decade is based on fits to the hydrodynamical models by Owen et al. (2010).
A major limitation of this approach is that the temperature in the wind is determined independently of the local column density.
In this study we released this limitation by running a set of hydrodynamical simulation with the modern code PLUTO (Mignone et al., 2007), where the temperature is a function not only of the local density but also of the column density.
We provide several fits of the total mass-loss rate as a function of star's X-ray luminosity and disc cavity for transition discs which can be used as simple prescriptions in population synthesis models of planet formation, as well as line profiles produced within the wind for different inclinations.
We find that the total mass-loss rate is increased by a factor 2 with respect to the previous models and the X-ray photoevaporation can explain a larger fraction of observed transition discs.
Although these differences are small, they can significantly impact planet formation (e.g. via streaming instability) and the final parking place of planets during their migration.

We are expanding this study by probing also the effect of different stellar masses and metallicity depletion in the outer disc.
A major effort is also directed towards an implementation of a realistic chemical network into PLUTO, by adopting the chemistry package KROME (Grassi et al., 2014), in order to determine the temporal and spatial evolution of some of the key chemical species locked into ices (CO, H2O, CH3OH) when coupled with the dynamics of a protoplanetary disk.

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