

30 Years of Photodissociation Regions:

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Extreme PDRs and XDRs: A multi-wavelength view into protoplanetary disks

I. Kamp¹, and the DIANA team

¹ Kapteyn Astronomical Institute, University of Groningen, The Netherlands

e-mail: kamp@astro.rug.nl

Protoplanetary disks offer a unique laboratory to study PDRs and XDRs over an extreme range of physical and irradiation conditions. The FP7 DIANA project (Disc Analysis, PI P. Woitke) has compiled to date the most extensive multi-wavelength database of protoplanetary disks to model them with state-of-the-art radiation thermo-chemical disk models. New features in the codes include 2D X-ray radiation transport, surface chemistry, PAH charge exchange and adsorption, and extensive mid-IR to far-IR cooling (H₂O, CO, CO₂, CH₄, etc., overall more than 40000 lines).

I will discuss in this talk the interplay between cosmic rays, X-rays and UV in disks and how this changes the disk chemistry and emerging line fluxes. Example of this are (1) the interplay between adsorption processes and element abundance for the abundance of molecular ions (Rab et al. 2015, Kamp et al. 2015) (2) Water in T Tauri versus Herbig disks (Antonellini et al. 2015), (3) disks in low mass versus high mass star forming regions (Vicente et al. 2013, 2015), and (4) surface chemistry versus gas phase chemistry.

By combining the radiation thermo-chemical disks models with our multi-wavelength datasets we will constrain the overall disk structure and composition. By building a large sample analysed in an homogeneous way (Woitke et al. 2015), we can search e.g. for differences between T Tauri and Herbig disks in terms of their gas content or dust composition and what the consequences are for the planetary systems forming around them.

REFERENCES

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