The dynamics of photodissociation regions: from the observed tracers to a dynamical model.

Bron E.[1,2], Agúndez M.[1], Goicoechea J. R.[1], Cernicharo J.[1], Joblin C.[3], Wu R.[2]

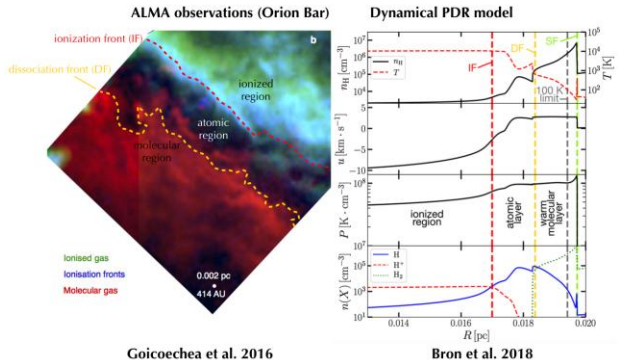
[1] *Instituto de Física Fundamental-CSIC, Calle de Serrano 123, 28006 Madrid, Spain*

[2] *LERMA, Observatoire de Paris, PSL Research University, CNRS, Sorbonne Universités, UPMC Univ. Paris 06, F-92190, Meudon, France*

[3] *IRAP, Université de Toulouse, CNRS, UPS, CNES, 9 Av. colonel Roche, BP 44346, 31028 Toulouse Cedex 4, France*

Photodissociation regions (PDR) constitute the skin layer of molecular clouds in star forming regions, where dense molecular gas is submitted to dissociating and ionizing UV photons. The rich emission spectrum emitted in this warm, partially molecular layer (numerous ionic, atomic and molecular lines, PAH emission) dominates large parts of the infrared and submm spectrum of a whole galaxy. Tracers emitted in these regions (e.g. C^+, C, mid/high-J CO) are increasingly used in extragalactic observations to trace the star formation cycle in other galaxies, but result from a complex interplay of physical and chemical processes: chemistry in the gas and on grain surfaces, (de)excitation processes of the atoms and molecules, heating and cooling balance, etc. Their interpretation thus requires detailed astrochemical models.

I will present how recent Herschel [1,2] and ALMA [3,5] observations have changed our understanding of the processes governing the emission of these regions, and have in particular revealed the important role of gas dynamics in shaping these interfaces. In order to answer the new questions raised by these observations, we have developed a new hydrodynamical PDR code, the *Hydra* PDR code [4]. I will show how taking the photoevaporation dynamics into account naturally explains several problematic aspects of the observations, such as a strong and recurrent correlation between the gas pressure in the PDR and the UV field intensity illuminating it, or the strong density gradients at the edge of the PDR.



Références :

[1] Joblin C., Bron E., Pinto C., Pilleri P., Le Petit F., Gerin M., Le Bourlot J., Fuente A., Berné O., Goicoechea J. R., Habart E., Köhler M., Teyssier D., Nagy Z., Montillaud J., Vastel C., Cernicharo J., Röllig M., Ossenkopf-Okada V., Bergin E. A., A&A, subm. (2018) https://arxiv.org/abs/1801.03893

[2] Wu R., Bron E., Onaka T., Le Petit F., Galliano F., Languignon D., Nakamura T., Okada Y., A&A, subm. (2018) https://arxiv.org/abs/1801.01643

[3] Goicoechea, J. R., Cuadrado S., Pety J., Bron E., Black J. H., Cernicharo J., Chapillon E., Fuente A., Gerin M., A&A, 601, L9 (2017)

[4] Bron E., Agúndez M., Goicoechea J. R., Cernicharo J., A&A, subm. (2018) https://arxiv.org/abs/1801.01547

[5] Goicoechea J. R., Pety J., Cuadrado S., Cernicharo J., Chapillon E., Fuente A., Gerin M., Joblin C., Nuria M., Pilleri P., Nature, 537, 7619, p207 (2016)