ION PROCESSING OF ASTROPHYSICAL ICES

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Abstract. Astrophysical ices, mainly composed of simple molecules such as H_2O, CO, CO_2, NH_3 and others are ubiquitous in space: they are present in comets, satellites of planets (e.g Jovian moons) and on the grains of the dense molecular clouds in the interstellar medium. They are constantly exposed to complex and diverse radiation fields and interact with solar/stellar winds, magnetospheres or/and cosmic rays (UV, X-rays, electrons, H, He and heavier ions). This induces several physico-chemical processes such as radiolysis and subsequent formation of new molecules, release of molecules to the gas phase (sputtering, desorption) and structural ice modifications.

Since several decades, laboratory studies are performed extensively to investigate energetic processing of astrophysical ice analogues. However, for a long time, those investigations were mainly focused to evaluate effects induced by weakly ionizing radiation such as UV photons and keV-MeV light ions (H, He). In the talk, I will present an overview of results obtained for swift heavy ion irradiation of ices containing small molecules as well as films of complex organic molecules (e.g. nucleobases) performed at large scale ion beam facilities such as GANIL (Caen, France) or GSI (Darmstadt, Germany) (e.g. recent reviews: Ada Bibang et al. 2019, Rothard et al. 2018). Those experiments simulate interaction with swift heavy ions from Galactic Cosmic Rays in a new energetic window. Astrophysical application of obtained results will be also discussed.

References

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