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From Astrochemistry to Astrobiology: the importance of cosmic ices for the exogeneous delivery of organic matter onto telluric planets toward the onset of Prebiotic Chemistry

Louis Le Sergeant d'Hendecourt^{1,2}

¹Equipe ASTRO, PIIM, UMR CNRS 7345, Centre de Saint Jérôme – case 252, Université d'Aix-Marseille,, 13397 Marseille - France ²Equipe Astrochimie & Origines, IAS, UMR CNRS 8617, Bât 121, Campus d'Orsay, Université Paris-Sud, 91405 Orsay cedex, France

* ldh@ias.u-psud.fr

Introduction: Ices made of simple molecules are ubiquitously detected in the infrared spectra of many astrophysical environments such as molecular clouds [1,2] out of which stars and planetary systems do form, together with many icy debris (asteroids, comets, dust...). Ices may also undergo efficient energetic processing, including ultraviolet irradiation at the turbulent edges of protoplanetary disks [3]. Such icy materials can be straightforwardly simulated in laboratory non-directed experiments in which the photo and thermal evolution of these ices are performed using, in our case, vacuum ultraviolet irradiation, following the classical methods of “matrix isolation techniques” [4]. These laboratory ices may then be used as templates for the astrophysical ones, where a complex radical chemistry develops, leading to the formation of a complex organic matter, soluble (in water and classical organic solvents) and insoluble [5], similar to what is indeed observed in primitive carbonaceous chondritic meteorites and known as SOM and IOM. More specific molecules such as amino acids [6] sugars [7,8] and even nucleobases [9] make these materials particularly attractive for the possible onset of a “true” prebiotic evolution at the surface of a telluric planet if adequate conditions are met (mostly liquid water, organic chemistry, free energy...). Global analytical methods using very high resolution mass spectrometry of the soluble organic residues [10,11] reveal the extreme complexity of these organic materials which parallels the one observed in the Murchison chondrite for example [12] or within the Paris meteorite, as far as specific “biological molecular bricks” are considered [13].

I will replace the importance of extraterrestrial ice evolution toward the making-of the organic matter within the general framework of *Astrochemistry* i.e. the chemical evolution of the Galaxy [14] and show, under which conditions and conceptual considerations, the exogeneous delivery of volatiles and organic matter on telluric planets such as the Earth, as postulated a long time ago [15], should be considered as a serious possibility for the starting-up of a *Prebiotic Chemistry* on telluric planets and thus of importance for *Astrobiology*. A brief presentation of an ongoing new non-directed experiment will be briefly presented.

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