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Exploring new phenomena in ice, salty ice, and ice clathrates under extreme conditions

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Compressed water is overspread on Earth at depth and in the extra-terrestrial space, both interstellar and on outer planets and moons (ice bodies) [1]. Under the conditions experienced in these celestial bodies water displays an incredibly rich phase diagram, including seventeen known crystalline phases and three amorphous states, and predicted exotic properties like plasticity [2], ionization [3], and superionicity [4].

In this talk I will review some of our recent experimental results on pure ice, salty (LiCl, LiBr, NaCl) ices, and ice (H₂, CH₄) clathrates under extreme conditions including: new dynamical effects in ice VII [5], salty ice crystallization under high pressure [6,7], hydrogen bond symmetrisation in salt-doped ices at Mbar pressures [8,9], methane ultra fast diffusion and locking in methane hydrates [10,11].

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Significance statement

The behaviour of high pressure ice phases, either pure or ion and gas filled is of paramount importance for the description of the interior of ice bodies in our universe and gives deeper insights on both quantum effects and hydrophobic/hydrophilic interactions in ice.

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