

Exploring new phenomena in salty ices under planetary conditions

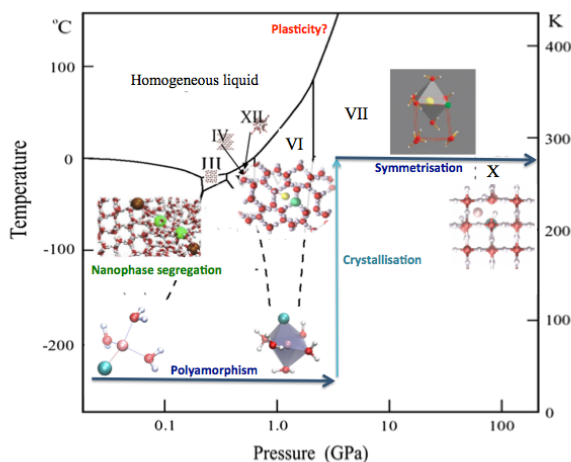
Livia E. Bove^{1,2},

¹Université P&M Curie, France,

²EPFL, Switzerland

Tuesday May 26, 14:00, Room MXC 320

Abstract: 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 sixteen known crystalline phases, three amorphous ones, and predicted exotic properties like plasticity [2], ionization [3], and superionicity [4]. In this talk I will review our recent experimental results on the intriguing effects of ionic impurities (LiCl, LiBr, NaCl) in water under extreme conditions including: nanophase segregation in the deep undercooled liquid [5], pressure-induced polyamorphism [6], salty ice crystallization under high pressure [7], and hydrogen bond symmetrisation at Mbar pressures [8]. Recent advances in the possibility to measure proton tunneling and superionicity in salty ice phases under planetary conditions will be presented [9].



P-T phase diagram of LiCl-ice. Li (yellow/orange), Cl (green/blue), Oxygen (red), Hydrogen (white).

[1] De Pater, I., and Lissauer, J.J. *Planetary Sciences*. Cambridge University Press (2004).

[2] Wang, Y., Liu, H., et al. *Nat. Comm.* 563 1566 (2011).

[3] Aragoes, L., and Vega, C., *J. Chem. Phys.* 130, 244504 (2009).

[4] Cavazzoni, C., et al., *Science* 283, 44---46 (1999).

[5] Bove, L. E., Dreyfus, C. et al., *JCP* 139, 044501 (2013) ; Ruiz, G. N., Bove, L. E. et al., *PCCP* 16, 18553, (2014).

[6] Bove, L. E., Klotz, S. et al., *Pjys. Rev. Lett.* 106, 125701 (2011); Ludl, A. A., Bove, L. E. et al., *PCCP Advance Article DOI: 10.1039/C5CP00224A*

[7] Klotz, S., Bove, L. E. et al. *Nat. Mat.* 8, 405 (2009) ; Ludl A. A., Bove, L. E., submitted (2015).

[8] Bove L. E. , Gaal, R. et al., *PNAS accepted* (2015).

[9] L.E. Bove, S. Klotz et al., *Phys. Rev. Lett.* 165901 (2009);

L.E. Bove, S. Klotz et al., *Phys. Rev. Lett.* 111, 185901, (2013);

L. E. Bove et al., *Appl. Phys. Lett.* 103, 193504 (2013).