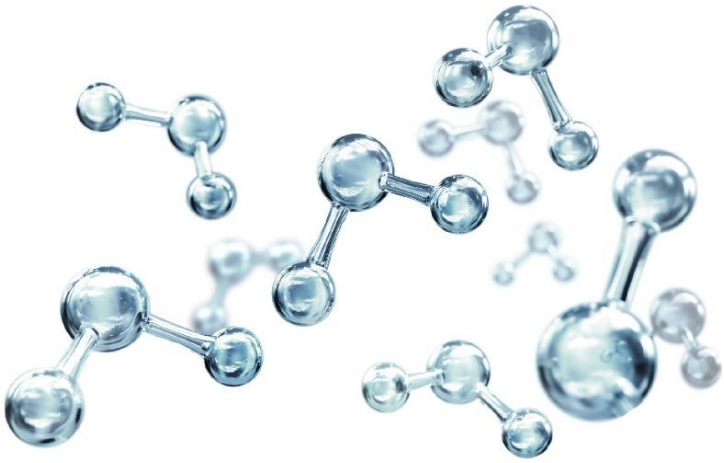
Seminar

CMWS Centre for Molecular Water Science

5th of June 2025
12:00 h

Zoom Virtual Meeting:

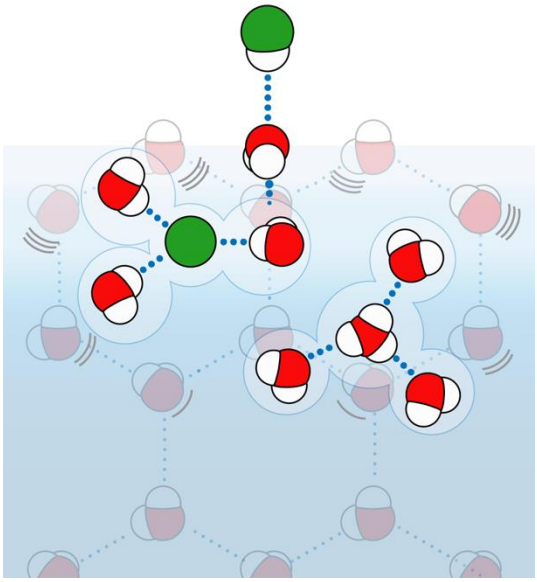
https://tuhh.zoom.us/j/82631283465
Meeting-ID: 826 3128 3465
Password: 978444



Dr. Thorsten Bartels-Rausch

Paul Scherrer Institute

Ice and Snow in Atmospheric Chemistry: Interfacial solvation and acid-base chemistry



Earth's surface snow and ice clouds are active players in atmospheric chemistry, impacting the composition and chemical reactivity of the lowermost atmosphere and transferring toxins from the atmosphere to the aquatic environment [1] .

On a molecular level, premelting at ice surfaces has raised considerable interest [2-4]. Premelting, interfacial disorder, or the quasi-liquid layer (QLL) results from internal energy and flexibility in the hydrogen bonding network. For example, [5] linked efficient chlorine activation during the stratospheric ozone depletion at 186 K to premelting, and [6] described efficient interfacial nitrate photolysis at temperatures up to 268 K relevant to renoxification.

Here, I present results from fundamental, well-controlled laboratory-based experiments. The research is taking full advantage of the Near Ambient Pressure Photoelectron spectroscopy at PSI/SLS [7]. I will elaborate on the ability of atmospheric trace gases to modify the hydrogen bonding network at the air-ice interface upon adsorption. Focus is placed on the interfacial acid-base chemistry and interfacial solvation [8-12].

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3. Bartels-Rausch, T., et al., **Atmospheric Chemistry and Physics**, 10.5194/acp-14-1587-2014 (2014)
4. Slater, B. and A. Michaelides, **Nature Reviews Chemistry**, 10.1038/s41570-019-0080-8 (2019)
5. McNeill, V.F., et al., **Proceedings of the National Academy of Sciences**, 10.1073/pnas.0603494103 (2006)
6. McFall, A.S., et al., **Environmental Science & Technology**, 10.1021/acs.est.8b00095 (2018)
7. Ammann, M., et al., *X-Ray Excited Electron Spectroscopy to Study Gas–Liquid Interfaces of Atmospheric Relevance*, in *Physical Chemistry of Gas-Liquid Interfaces*. 2018, Elsevier. p. 135–166.
8. Richter, C., et al., **Faraday Discussions**, 10.1039/D4FD00169A (2024)
9. Waldner, A., et al., **Physical Chemistry Chemical Physics**, 10.1039/C8CP03621G (2018)
10. Kong, X., et al., **J. Phys. Chem. Lett.**, 10.1021/acs.jpclett.7b01573 (2017)
11. Bartels-Rausch, T., et al., **ACS Earth and Space Chemistry**, 10.1021/acsearthspacechem.7b00077 (2017)
12. Krepelova, A., et al., **Journal of Physical Chemistry A**, 10.1021/jp3102332 (2012)