

# Laboratory studies of light scattering by well-controlled and characterized ice samples

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Over the past 8 years, we have developed LOSSy – the Laboratory for Outflow Studies of Sublimating Materials – at the University of Bern. The aim of this laboratory is to produce ice and dirty ice samples that are reproducible and that can be characterized with an array of different instruments. This has primarily been for planetary science, although applications to Earth-orbiting remote sensing and studies of proto-planetary discs have also been looked at.

Ice particles of varying sizes can be produced using different setups. These setups use nebulizers with different characteristics. The surface structure of the resulting material can be investigated using scanning electron microscopy and optical coherence tomography. A spectro-goniometer (PHIRE-2) can then be used to determine the reflectance properties over the full hemisphere. Both the sample and the goniometer can be maintained at low temperature (typically  $-30^{\circ}\text{C}$ ) during these measurements. A thermal vacuum chamber (SCITEAS) is also available for space simulation and VIS–NIR hyperspectral measurements can be made while the sample evolves under different conditions. A system has also been developed to measure the polarization of icy samples at multiple wavelengths in the visible and  $3^{\circ}$ – $30^{\circ}$  phase angles (with direct applications to icy satellite observations). Approaches to determine the properties of the samples at sub-mm wavelengths have also been developed. The presentation will show some of our latest results.