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Experiments on planetary ices at UCL

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Using a suite of techniques and equipment, we conduct several different types of experiments on planetary ices at UCL. Samples are prepared in the Ice Physics Laboratory, which consists of a 5 chamber complex of inter-connected cold rooms, controllable from +30 to -30 deg C. Within this laboratory we have a functioning triaxial deformation cell operating at low temperature (down to -90 deg C) and high pressures (300 MPa), an Automatic Ice Fabric Analyser (AIFA) and a low-temperature microscope with CCD output. Polycrystalline samples, 40mm diameter by 100mm long, are compressed in the triaxial rig with a confining pressure; single crystal specimens are compressed in a separate uniaxial creep rig which operates at zero confining pressure for surface studies. A cold stage is also available for study of ice microstructural studies on our new Jeol JSM-6480LV SEM, which also allows tensile, compression and/or bending tests, with load ranges from less than 2N to 5000N. Finally, we also use a cold stage on a new PANalytical, X'pert PRO MPD, high resolution powder diffractometer to study the structure and phase behaviour of icy materials.

Recent highlights of our work include: (1) derivation of a manufacturing process for methane clathrate at low temperatures, analysed in the X-Ray Diffraction Laboratory, for future rheological experiments, (2) analysed the growth behaviour of MS11, (3) refurbished and commenced calibration tests on the triaxial deformation cell using ice Ih, and (4) performed creep tests on gypsum and epsomite using the single crystal deformation cell. Further experiments will build on these preliminary results.