Partial report on experiment ME105 (ID19)

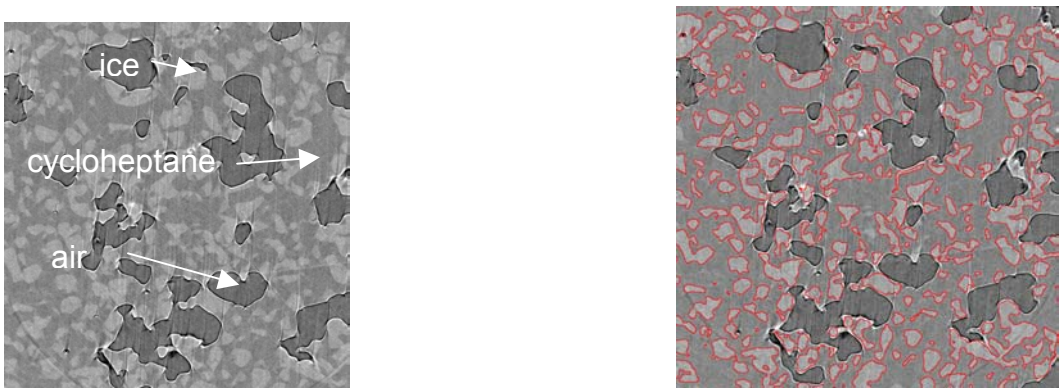
This tomography experiment was divided in two parts, using the same cryostat. The first part was devoted to low porosity ice/air samples of firn collected at different depths in Antarctica. A report on this part was already sent by J.M. Barnola (LGGE) together with his (accepted) proposal ME297. In the second part, different filling procedures and chemicals were tested for imaging low cohesion (high porosity) snow. Absorption contrast was searched in the range 10-50 keV.

Impregnation of snow samples (Météo-france/CEN)

CEN is involved in a programme of natural snow micro-imaging to provide real data for modelling the microstructure of snow (thermodynamic, then mechanical behavior). Many of snow types relevant to avalanche study are low cohesion samples that require to be strengthened before imaging. The snow strengthening itself was the object of the experiment. Six samples of the same snow (fine and compact structure chosen to enhance difficulties of impregnation: 0.5 mm grains) were filled, at air and under a partial vacuum of ~10 hPa with 3 different pure chemicals. The previous experiment HS688 showed indeed that binary mixtures were prone to undesired phase separation. Chemicals were chosen for:

- low toxicity
- very low solubility in water
- absorption contrast
- wettability with respect to ice
- melting point in the range –20°C/-2°C
- consistency at the solid state

In spite of its poor machinability at –15°C (present limit of our cold laboratory), cycloheptane (lower absorption than ice) was found to be acceptable (see Fig. 1): Ice, filler and air (undesired remaining bubbles) were successfully contoured on plane reconstructions. The best compromise of energy was 10 – 11 keV. Toward higher absorptions, 1-chloronaphtalene (m.p: -20°C) might provide better contrast (3 times the absorption of ice at 20 keV). To be operational for natural snow, the impregnation procedure needs to be improved. It should be done at air on the field for snow sampling; we have then to define a laboratory method to thaw carefully the filler (not the snow) then remove bubbles under vacuum and finally freeze it again without damage.



gray-level reconstruction plane *result of automatic contouring*

Fig. 1: contrast results with cycloheptane as a filling medium