

## **SALLUIT, NUNAVIK: A COMMUNITY ON PERMAFROST FACING THE CHALLENGE OF CLIMATE CHANGE**

M. Allard, Centre d'études nordiques, Université Laval, Canada

R. Fortier, Centre d'études nordiques, Université Laval, Canada

O. Gagnon, Centre d'études nordiques, Université Laval, Canada

Y. Michaud, Geological Survey of Canada, Quebec Division, Canada

M. Douma, Geological Survey of Canada, Quebec Division, Canada

### **ABSTRACT**

Located on the southern shore of Hudson Strait, the 1100 people village is built principally on ice-rich post-glacial marine clays on the floor of a steep-walled valley. The region lies in the continuous permafrost zone and the village was built during a period, since the 1940s, when the climate was generally cooling. The climate trend, however, switched to fast warming during the 1990s. Mean annual air temperatures raised from about -9 C in 1990 to about -7 C in 2003. Mean annual temperatures at depths between 1 and 15 m went from -6 C to about -4.5 C. Two active layer detachment failures that occurred in late summer 1998 close to a residential area prompted the launching of a study leading to a high precision spatial and in depth characterization of permafrost conditions as well as to an assessment of potentially suitable terrain for construction in order to meet the needs of a fast growing population. The 22 cores that were drilled, the geophysical soundings and the cone penetration tests that were performed revealed that the permafrost in the terrain surrounding the village contains as much as over 200% (per dry weight) of ice in the first 2 m below permafrost table. Salt content in some layers can be as high as 42 per mil. Bedrock outcrops and ice-poor coarse-grained soils were also mapped. All landforms indicative on terrain instability (tension cracks, active layer failure, diffuse flow area, thermal erosion gullies, etc) were mapped. The compilation of the gathered terrain information was made in a GIS based on a digital elevation model. As the recent climate trend appears likely to continue, important differential ground settlements and slope instability are predictable. Ground salinity in the silts will make the soil weaker when the temperature profile raises to about -2 C. The suitable terrain for further expansion is limited in the valley. The planning of a development strategy for the coming years will be a task that will require some delicate decision making and that can make use of the study results.

### **RESUME**

Salluit, Nunavik: une communauté dans une région de permafrost faisant face au déficit du changement climatique