Canada’s potential role in a SCAR multi-disciplinary Antarctic permafrost research program.

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Canada’s potential contributions in a SCAR Antarctic permafrost program.

- Expertise in field-based, experimental and numerical modeling of permafrost studies across all permafrost zones, from:
  1) permafrost thermal regime; 2) ground ice related processes; 3) stock and fate of soil organic carbon; 4) weathering and water movement in permafrost
- Established multi-disciplinary approach to permafrost studies.
- World-class laboratory facilities, from bulk sediment properties to isotopic analyses of nano-quantities.
- Polar Knowledge Canada and Canadian Committee on Antarctic Research are evaluating the potential for a Canadian Antarctic Research Program

Abstract
Antarctica is an important region where we can improve our understanding of physico-chemical and biological processes in extreme cold and dry environments. Despite Canada not having a formal Antarctic research program, scientists in Canada have been actively involved in multi-disciplinary Antarctic permafrost research for several decades. Research has been conducted by our teams through collaborations with international partners (US, NZ, RJ) through field-based observations, monitoring and sampling in southern Victoria Land (McMuro Dry Valleys) and Domeing Maiz Land (Bungen Hills) to McMurdo Dry Valleys, the lab experiments, and numerical modeling of processes.

Based on past and current contributions to Antarctic permafrost research (40+ peer-reviewed publications), Canadians can help define the priorities of a new multi-disciplinary SCAR Antarctic permafrost program.

Ongoing permafrost-related research activities include:
1) distribution, origin and stability of ground ice in permafrost and its role in shaping landscapes;
2) physico-chemical weathering in cold-dry regions;
3) soil biogeochemistry (major and trace ions, C-N-S), microbial communities and their role in biogeochemical cycles, and bioremediation strategies;
4) permafrost thermal regime;
5) ground ice related processes;
6) stock and fate of soil organic carbon;
7) weathering and water movement in permafrost.

Perennially ice-covered lakes and hydrological and microbial processes
Lake Untersee appears to be a remarkable closed system lake since its last H2O influx. This is due to the possibility of carbon dioxide additions from snowmelt. Glacial ice, and to a lesser extent, sedimentation. Its high pH and low partial pressure of CO2 may be generated through either glacier imports and weathering of lake biochemistry. Geochemical and radiocarbon analyses of both glacier inputs and carbon reservoirs provide insights to the cycling of nutrients and solutes and how life has thrived in this extreme system and perhaps has modified the system.

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