

Northern RiSCC

Northern Regional impacts and Sensitivity to Climate Change, a Canadian contribution to the International Polar Year

Observations over the 20th century and numerical simulations of future climate trends have drawn attention to the extreme vulnerability of northern ecosystems to global change. The greatest changes in climate over the last few decades have taken place in the polar regions, but with large variations between different sectors. The western Canadian Arctic has warmed substantially while the eastern Arctic has shown little change or even cooling. Despite variance in predictions among global circulation models, all converge on the central conclusion that future climate change will occur earliest and most intensely at high northern latitudes. This is likely to have substantial, but as yet poorly understood impacts on north polar ecosystems.

Northern RiSCC will bring together Canada's leading researchers in the terrestrial sciences and collaborators from many of the IPY nations to examine how northern ecosystems will respond to future change. The scientific approach will be a nested design of complementary time and space scales: paleo-environmental studies to establish Holocene records and thus a historical context for interpreting modern-day variability; annual observations and experiments at a few fixed, land-based stations (including lake monitoring sites) to investigate coupling and feedback processes; remote sensing techniques to scale up these process relationships; and coastal transects using the Canadian research icebreaker CCGS Amundsen to define climate-related gradients, to elucidate mechanisms via onboard experiments and measurements, and to ground-truth the satellite data. This newly refitted ship includes multiple laboratories and state-of-the-art equipment that offer excellent research opportunities; e.g., onsite geochemical analysis and fluorescence microscopy; controlled growth experiments in environmental incubators; radio-isotopic assays; optimal preservation of ice cores and biological material in low-temperature freezers; direct measurement of climate state and rate variables; and real-time data acquisition via onboard satellite reception. The ship is also equipped with a helicopter, barge, air-boat and launch for shore access in ice-containing waters (further details at: <http://www.amundsen.quebec-ocean.ulaval.ca/>).

The transect region has been selected to encompass the broadest range of ecozones in Northern Canada, from boreal forest to extreme polar desert, and to use this striking gradient of climates as an approach to elucidate climate impacts on ecosystem coupling processes and feedbacks throughout the circumpolar Arctic region.

Strengths of this program in the context of IPY are that it addresses the vital concern of present and future change in the polar regions, and that it is directly linked to the Antarctic program **RiSCC** (Regional Sensitivity to Climate Change). The latter is an existing multinational biological program under the auspices of SCAR (Scientific Committee on Antarctic Research). The objectives of RiSCC are to develop and apply a set of standardised protocols to evaluate how climate change will impact coastal land, lake and wetland ecosystems throughout the Subantarctic and Antarctica (website at www.riscc.aq). Our proposal for Northern RiSCC has been endorsed by the International RiSCC program as a unique Canada-led contribution to the bipolar understanding of global change, and both programs will benefit from bipolar comparisons including the use of some common methods and approaches.

Northern RiSCC has been initiated under the auspices of ArcticNet:
http://www.arcticnet.ulaval.ca/index_en.asp

Preliminary sampling will be well underway by 2007-8. ArcticNet is a multi-sectorial program (social, health and natural sciences) which means that Northern RiSCC is assured of excellent links to other research disciplines, and to Northern aboriginal communities and concerns.

The exact cruise plans for 2007-8 beyond are still under discussion, and will also hinge on international priorities. For example, multinational work along the Labrador, western Greenland coast has been suggested as a valuable adjunct to the planned N-S south transects within the Canadian Arctic Archipelago.

Links are currently being developed with other IPY nations, for example through the proposed European IPY program "**Polar freshwater ecosystems as sensors of climate change**" (A. Quesada et al., Spain and several other nations).

For further information on Northern RiSCC:

<http://www.geog.ubc.ca/~ghenry/N-RiSCC/home.htm>

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