

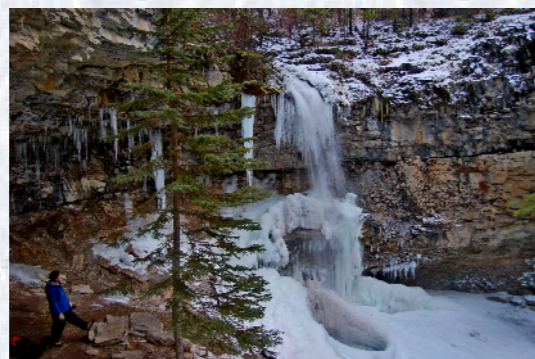


Improved Processes & Parameterisation
for Prediction in Cold Regions



The IP3 Research Network: Enhancing understanding of water resources in Canada's cold regions

IP3, Improved Processes and Parameterisation for Prediction in Cold Regions, is a research network funded by the Canadian Foundation for Climate and Atmospheric Sciences for 2006-2010. IP3 is comprised of several dozen investigators and collaborators from across Canada, the US, and Europe. IP3 is devoted to an improved understanding of surface water and weather systems in cold regions, particularly Canada's Rocky Mountains and western Arctic.



These issues are of key importance to agriculture, regional planning and policy making, streamflow forecasting, water management, environmental conservation, and urban and industrial development in the Prairies and North.



Canadian Foundation for Climate
and Atmospheric Sciences (CFCAS)
Fondation canadienne pour les sciences
du climat et de l'atmosphère (FCSCA)

Why IP3?

Canada's cold regions are important weather generators and water sources for both regional use and freshwater supply to the oceans. To accurately forecast the behaviour of weather and water including extreme events such as floods resulting from high precipitation and snow melt in the Rockies, predictive models require improvement to address the following:

- Changing annual flow and peak discharge in streams and rivers
- Difficulty in forecasting the spring freshet and seasonal runoff from mountain headwaters to streams and reservoirs
- Increasing consumptive use of Rocky Mountain water in Prairie Provinces
- Uncertainty in engineering design for resource development (oil & gas, diamond and other mines) and restoration activities in small- to medium-sized 'ungauged' basins
- The need to enhance the representation of cold regions processes in coupled atmospheric-hydrological models to reduce uncertainty in:

Atmospheric impacts on water resources
Simulation of land-atmosphere interaction
Cycling and storage of water
Prediction of future climate change

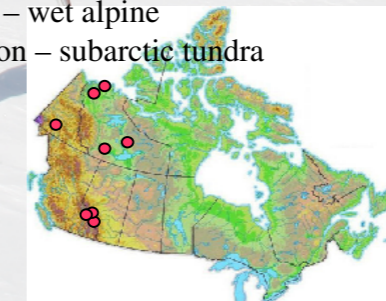
All photos provided by IP3 participants



IP3 Research Basins

IP3 investigators conduct intense field campaigns and install permanent monitoring stations to collect hydrological and meteorological data for analysis and application to modelling problems. This work is being accomplished in a series of highly instrumented, small (10-200 km²) research basins that characterize Canada's cold regions:

Trail Valley Creek, NWT – arctic tundra
Havikpak Creek, NWT – taiga woodland
Baker Creek, NWT – subarctic shield lakes
Scotty Creek, NWT – permafrost wetlands
Peyto Creek, AB – glacierized alpine
Marmot Creek, AB – subalpine forest
Lake O'Hara, BC – wet alpine
Wolf Creek, Yukon – subarctic tundra
cordillera



Planned Final Outputs

Processes

Improved understanding of cold regions hydrology at landscape element scales:

- Soil physics for organic and frozen soils
- Hillslope flow over permafrost
- Turbulent transfer over snow and glacier ice in complex terrain
- Shortwave and longwave radiation in vegetation canopies on snow-covered slopes

Unique observational archive of research basin data

Parameterisation

More effective incorporation of cold regions processes into hydrological/meteorological models:

- Runoff and streamflow, including 'fill and spill' of small lakes
- Advection, evaporation, and ice effects on small lakes
- Blowing snow redistribution and other mass, phase, and radiation changes in snow

Prediction

Enhanced environmental predictive capability in cold regions, at multiple spatial scales, in response to greater water resource demands:

- Improved streamflow prediction in ungauged basins with less calibration of model parameters from gauged flows
- Improved weather forecasts and climate prediction due to rigorous model development and testing
- MESH – Land surface hydrology model for Environment Canada's Global Environmental Multiscale model (GEM)
- CRHM – Cold Regions Hydrology Model for individual applications

To learn more about IP3, please visit www.usask.ca/ip3 or contact us at ip3.network@usask.ca, 306-966-4907. We welcome inquiries regarding new collaborations and partnerships.