

Proposals to the Federal IPY Program that are related to IP3

Arctic Hydra

Polar Terrestrial Freshwater :State and Flow to the
Ocean

TAWEPI

Thorpe Arctic Weather and Environmental
Prediction Initiative



Arctic Hydra: Background

- ◆ Canada cannot currently predict contributions to the Arctic Ocean from much of the NWT/NU land mass with the level of monitoring in place.
- ◆ The major river flows, such as from the Mackenzie, Thelon, Coppermine and Back are measured.
- ◆ Few of the numerous small basins draining to the Arctic Ocean are gauged, so any estimates of their contributions are likely dubious.
- ◆ Currently, there are only two active stations in the northern arctic ecozone, and one in the arctic cordillera.

Introduction

Much of northern Canada's is ungauged.

The freshwater contributions to the Arctic Ocean are not currently well defined, and calculations have not been adequately assessed.

LEGEND

- Hydrometric gauges
- Gauged flow to the ocean
- Ungauged flow to the ocean



Courtesy of Chris Spence

Approach

- ◆ Establish a measurement framework that optimizes our ability to estimate terrestrial freshwater flux into the Canadian Arctic.
- ◆ Assess freshwater flux estimates using tradition gauging and statistical methods.
- ◆ Multiple-scale near-surface observations of snow, water body, frozen soil and permafrost mass and energy fluxes at a number of research basins.
- ◆ Application of process algorithms for small to medium scales, evaluated at research basins
- ◆ Incorporation and scaling-up of improved process parameterizations into coupled land surface – hydrology models

Themes

1. Polar Hydrological Systems

- co-leads: J. Pomeroy and Ph. Marsh, U of S / EC

2. Hydrological Prediction in Arctic basins

- co-leads: A. Pietroniro and C. Spence, EC

3. Polar Great Lakes in the Arctic Hydrological Cycle

- co-leads: W. Schertzer and D. Lam, EC

4. Nutrients and sediments fluxes in the Mackenzie delta

- lead: Lance Lesak, SFU

5. The Hydro-climatology of the Canadian Arctic

- co-leads: T. Prowse and S. Dery, EC / UNBC

ThorpeX Arctic Weather and Environmental Prediction Initiative (TAWEPI)

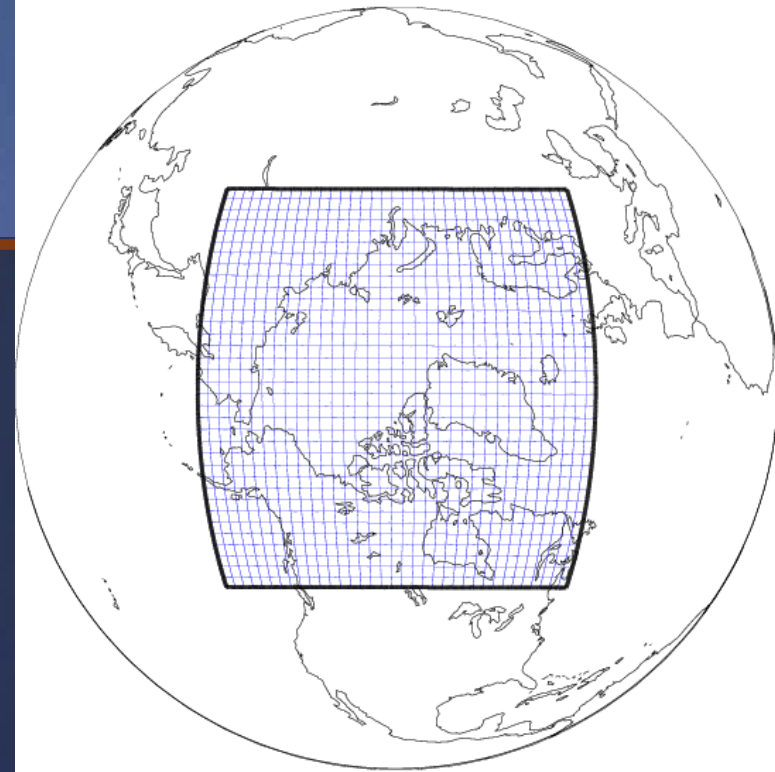
- Lead: Gilbert Brunet (Environment Canada)
- Co-Leads: Kent Moore (Toronto U.), Ron Stewart (McGill U.) and Ayrton Zadra (EC)
- Co-Investigators: H. Barker (EC), S. Cober (EC), G. Flato (EC), L. Garand (EC), P. Gauthier (EC), I. Gultepe (EC), J. Hanesiak (Manitoba U.), D. Hudak (EC), G. Isaac (EC), L. Lefaiivre (EC), Y. Lu (DFO), J. Mailhot (EC), A. Pietroniro (EC), P. Vaillancourt (EC)

THORPEX and IPY

- ◆ THORPEX (THE Observing System Research and Predictability EXperiment)
 - WWRP initiative
 - Improve prediction of high-impact weather events
- ◆ International Polar Year (IPY) 2007-2008
 - Get a better picture of conditions at the poles and how they interact with and influence the oceans, atmosphere and land masses

TAWEPI's Polar-Gem

- ◆ Regional Numerical Weather Prediction (NWP) system over the Arctic in support of the IPY projects
- ◆ Twin of the operational Environment Canada regional GEM model (used for 1-2 day forecasts) but displaced and extended over the Arctic and surrounding regions.
- ◆ **EXPECTED ADVANCES:**
 - Improvement of environmental forecasting from few hours to two day
 - Unprecedented high resolution time series of analyses of environment parameters

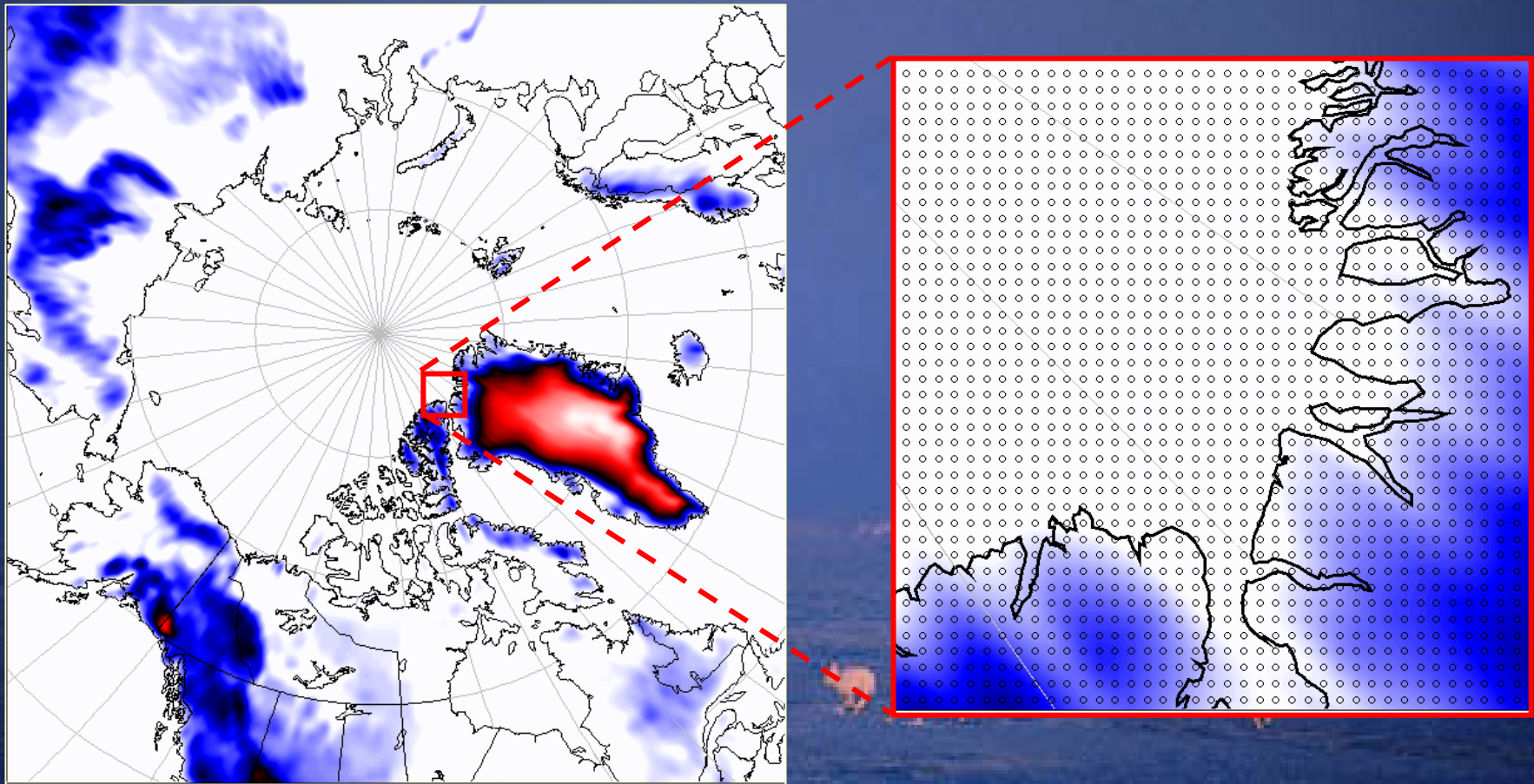


Polar-GEM grid

700 X 700 grid points
resolution: 10-15 km

Note: Figure shows every 20 grid points only.

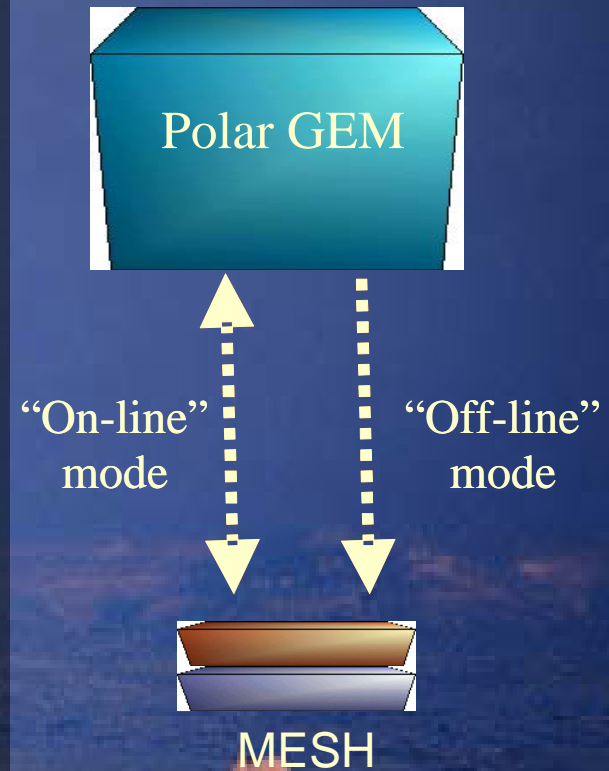
Polar-GEM domain with topography (color) and zoom over northern Greenland showing high resolution grid



TAWEPI Environmental Prediction sub-project in hydrology

Leads: Dr. A. Pietroniro and Dr. V. Fortin, EC

- ◆ Coupling Polar-GEM to a high-resolution land surface model and hydrological prediction system for the Canadian Arctic hydrographic basin and archipelago
- ◆ **EXPECTED ADVANCES:**
Improved calibration, validation and prediction capabilities of cold processes in the land-surface and in hydrological models.



Conclusion

“Know the enemy, know yourself; your victory will never be endangered. Know the ground, know the weather; your victory will then be total”

The Art of War, Sun Tzu, 500 BC

