Arctic-HYDRA

The Arctic Hydrological Cycle Monitoring, Modelling and Assessment Program

Árni Snorraslon
Hydrological Service
Iceland
Seminar in Washington June 15, 2006

Introduction

• Overview of the key scientific issues
• Where are the gaps in observations and understanding
• How Arctic-HYDRA can serve us to fill those gaps and become a legacy of the International Polar Year
Key scientific questions:

• What is the role of the Arctic Hydrological Cycle in the global climate system?
• What are the impacts of climate variability and change on the Arctic Hydrological Cycle?
• What are the feedbacks of changes in the Arctic Hydrological Cycle on the regional and global climate?
Problem:
The future is not what it used to be!

Results from gap analysis of Arctic Hydrology

- Observational systems insufficient and deteriorating
- Areal coverage of observations uneven and insufficient, completely lacking for large areas
- Operation of observation systems very difficult and costly
- Great need to deploy and develop new measurement technologies and remote sensing applications to meet the challenges
Results from gap analysis of Arctic Hydrology

- The complexities and feedbacks of the system are enormous
- Understanding of Arctic hydrological processes is incomplete and fragmented
- Pan-Arctic integrated data assimilation and modelling needed
- Joint Pan-Arctic research needed
IPY Arctic-HYDRA Concept

- Cluster of several hydrological projects within the IPY
- Seed funding by the Nordic Council of Ministers,
- Pending application for seed funding from IASC
- Supported by WMO HWR, WMO CHy, WMO CBS, WCRP/CliC
- Participation of all Arctic Countries
- Participation of all Arctic Hydrological Services

Arctic HYDRA Core Components

- Arctic-HYCOS
- Long Term Hydrological Observatories (LTHOs).
- Pan-Arctic Synthesis (Data Integration, Modeling and Assessment)
- Product development and public outreach
Arctic HYCOS Objectives

To establish and operate:

- Regional networks for measuring basic hydrological components
- Associated hydrological information system that will provide data and information needed for water resources management and research.
Long Term Hydrological Observatories (LTHOs) “Super-sites”

- They will collect basic hydrologic data such as precipitation, stream flow, groundwater levels, etc. as well as meteorological and biogeochemical data.
- The LTHO observations will be used to improve atmospheric, hydrologic and cryospheric process representations and modelling.

Pan-Arctic Synthesis (Data Integration, Modeling and Assessment)

OBJECTIVES:

to provide a pan-Arctic quantification of the state of the hydrosphere as a contribution to the IPY snap-shot initiative.
**Arctic HYDRA Components**

(ID No: 362) Arctic HYCOS.
Á. Snorrason Hydrological Service, National Energy Authority, Iceland,

(ID No: 67) The Arctic Regional Integrated Monitoring System.
Prof. Charles Vorosmarty University of New Hampshire

(ID No: 158) Impact of Aerosols on the Arctic Hydrological Cycle
Professor Judith Curry Georgia Institute of Technology

(ID No: 201) Kuparuk River Watershed, Long Term Hydrologic Observatory, North Slope Alaska
Dr Douglas Kane University of Alaska Fairbanks, Water & Environmental Research Center

(ID No: 414) Hydrological cycle in Arctic Region.
Tetsuo Ohata Institute for Observational Research for Global Change, JAMSTE, Japan

(ID No: 197) CANADA: The Hydrological Cycle of the Canadian Polar Regions.
Dr. A. Pietroniro

(ID No: 374) Climate change sound water management, water and ice conditions of large Arctic rivers including development of water management facilities adaptation strategy.
Vladimir Gruzinov State Oceanographic Institute, Russian Federation
Major Proposed Contributions of HYDRA to IPY

1. Consolidate operational hydromet data sources and supporting data streams to deliver an integrated view of the pan-Arctic terrestrial hydrosphere in the IPY 2007-08 timeframe
2. Forward our understanding of local-to-regional scale water cycle dynamics through Long-Term Hydrological Observatories [LTHOs])
3. Develop strategies for comprehensive water cycle modeling and data assimilation through end-to-end tests based on IPY intensive observation period data
4. Help promote use of integrated scientific IPY products in applications of strategic importance to society
5. Use IPY as a steppingstone to longer-term, comprehensive water cycle studies (e.g. ICARP-II)

Hydrological Systems Components
- Climate
- Glaciers
- Hydrographic network
- Geography
- Snow
- Permafrost
- Geology
Hydrological Service
National Energy Authority

Annual runoff
1961-1990

Hadley/A2
Annual runoff (mm)

Hadley/B2
Annual runoff (mm)

Echam/A2
Annual runoff (mm)

Echam/B2
Annual runoff (mm)
National hydrograph for Finland

Daily mean discharge from the land surface of Finland (m³/s)

Arctic HYDRA

National hydrograph for Iceland

Daily mean discharge from the land surface of Iceland (m³/s)

Arctic HYDRA
Engagement of Policy and Management Communities:
Arctic-HYDRA Seeks to Articulate the Implications of
Fresh Water-Linked Change
Strategic Challenges & Strategic Opportunities

Thank you!