PROCESS MODELLING

RESEARCH PROJECT

LEGEND
- Tundra/Alpine
- Coniferous Forest
- Transitional Forest
- Mixed Forest/Agriculture
- Water Bodies/Impervious

Peel
Great Bear
Great Slave
Liard
Athabasca
Peace

MACKENZIE RIVER BASIN
SHOWING SUB-BASINS AND LAND COVER

100   0   100   200
kilometres
Albers Equal Area Projection
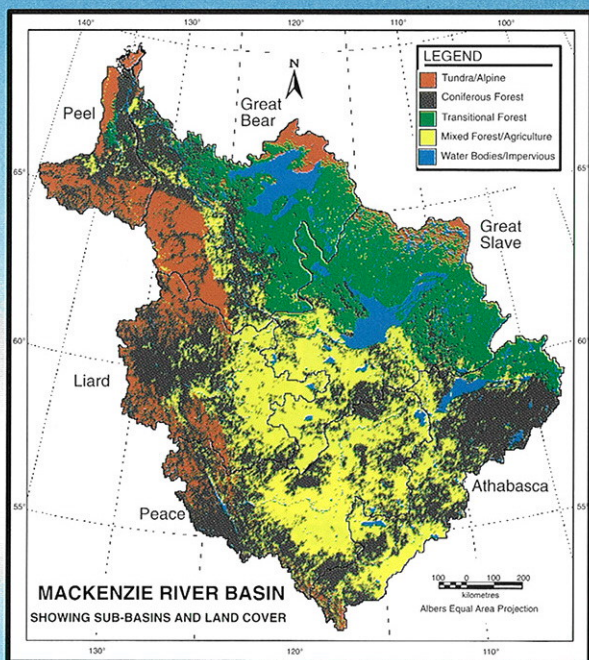
NATIONAL HYDROLOGY RESEARCH INSTITUTE

Canada

## Goal:

- To comprehend and model hydrological processes in support of effective management of sustainable water resources.

What we do:

- develop mathematical models to describe land-phase processes of the hydrological cycle such as snow accumulation and melt, evaporation and runoff.

- develop knowledge and tools to investigate the effects of climatic change on water resources.
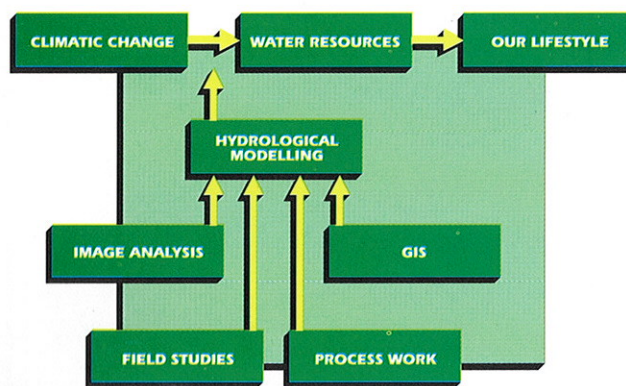

What is a hydrological model:

- A hydrological model simulates the response of a watershed to climatic variables and to land cover and land use. At NHRI, we use satellite images and geographic databases such as digital elevation models and land-cover maps to help understand hydrological processes and design models.

Our partners:

- Governments, international agencies such as CIDA, IDRC, UNESCO & FAO, utilities, universities and the private sector.

Current examples of our work:

- With B.C. Hydro, we are developing a model of the Upper Columbia River capable of simulating river flows and reservoir inputs under different climatic conditions. This work produces the kind of information that helps utility companies plan effective strategies for water management under climate variability.
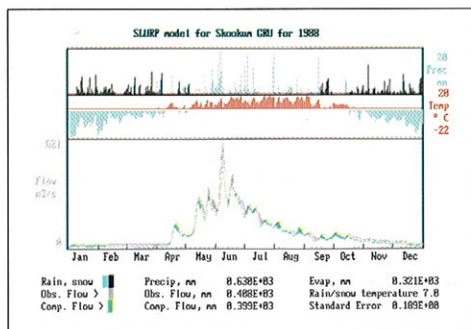
Observed and modelled streamflows, Kootenay River at Skookumchuck, 1988

- We are designing a model for the Mackenzie Basin to help evaluate methods of using data from atmospheric general circulation models in the study of the hydrology and water resources of the North.
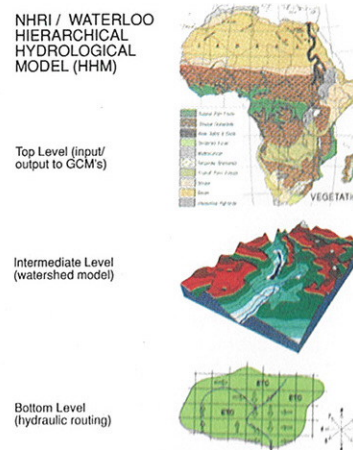
- With the University of Waterloo, NHRI is creating a three-level hierarchical model (HHM) to work interactively with atmospheric general circulation models.

NHRI / WATERLOO HIERARCHICAL HYDROLOGICAL MODEL (HHM)

Top Level (input/output to GCM's)

Intermediate Level (watershed model)

Bottom Level (hydraulic routing)

Three components of the HHM operate at different spatial and temporal scales but use common concepts and a common database to provide a continuum from one scale to another

- Project scientists are developing algorithms and procedures for the RADARSAT satellite, to be launched in 1995, and are using ERS-1 data in snowmelt, soil moisture and wetland studies.
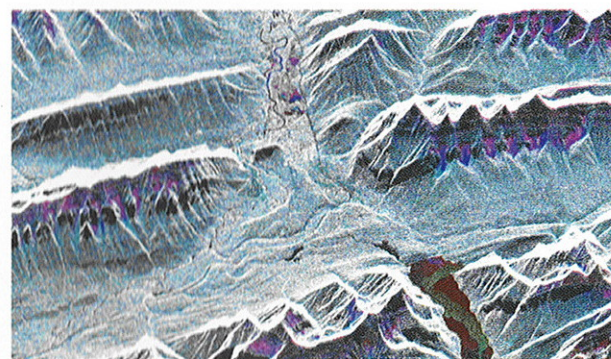
False colour multi-temporal ERS-1 synthetic aperture radar image of the Banff, Alberta area

- Glaciers play an important hydrological role because of their storage capacities and modifying influence on streamflow. Work is progressing on an advanced glacier component for the SLURP watershed model using remotely-sensed data and long-term, glacier mass-balance data.
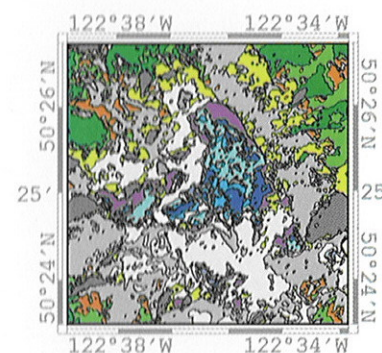

Classified Landsat image of Place Glacier

- With a consortium of Canadian consulting companies, we are developing an environmental and ecosystem model (DEEP)

able to simulate ecosystems and model the effects of climatic change on the environment. This model will give Canadian companies a worldwide lead in environmental modelling.

- Evaporation and evapotranspiration are among the most difficult components of the hydrological cycle to estimate over large areas. Current research includes a large-scale field study of evaporation at Quill Lake, Saskatchewan and a study using satellite data for the feedback relationship between surface temperature and vapour pressure deficit.
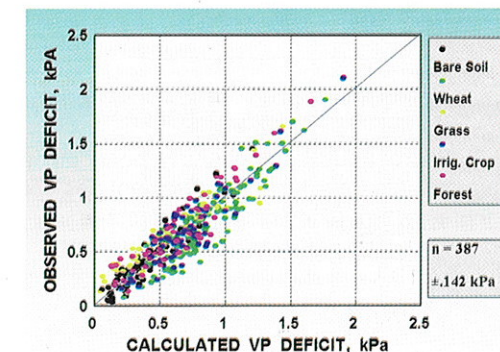
Observed and modelled vapour pressure deficit over different land covers

Inquiries:

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CANADA'S GREEN PLAN

Cover Diagram:

Land cover distribution for the Mackenzie Basin (data from NOAA AVHRR sensor)