Canada DRI: the Drought Research Initiative

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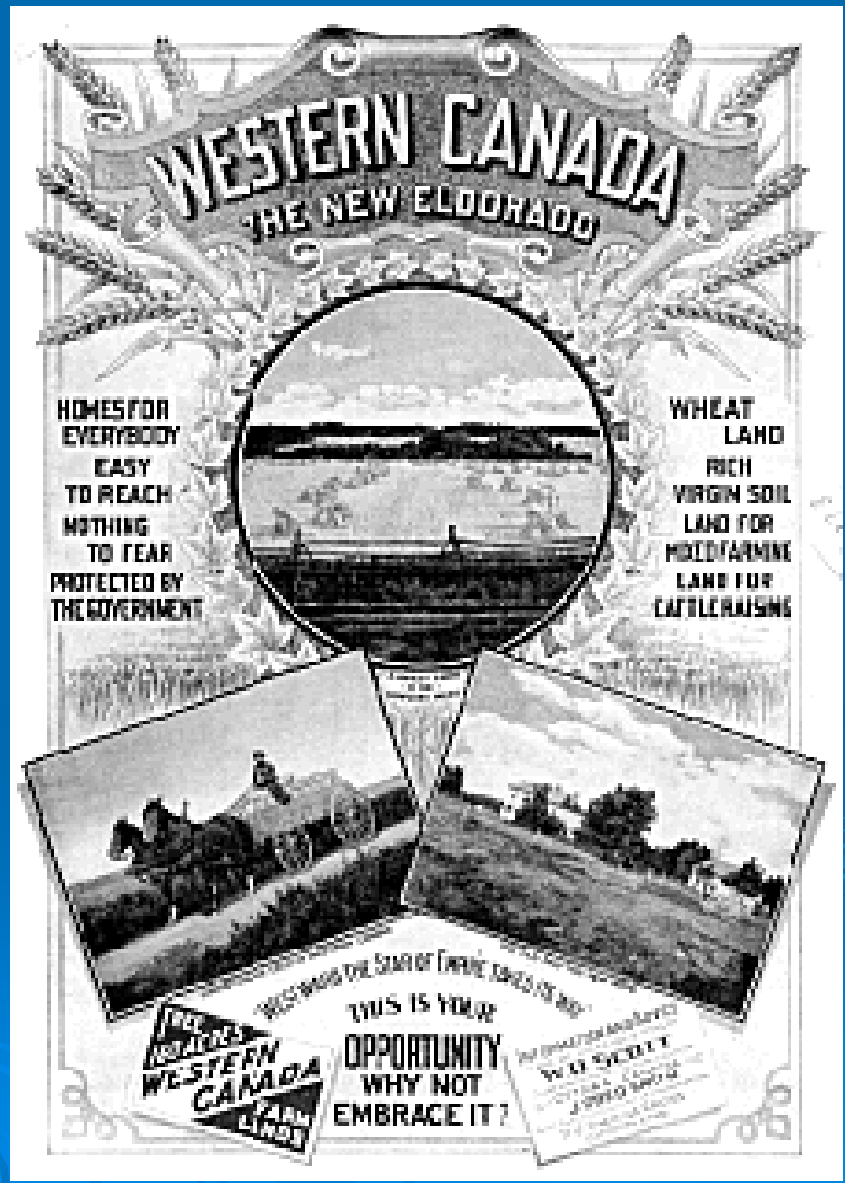
Why a Drought Research Initiative?

- ***To better understand the physical characteristics of and processes influencing Canadian Prairie droughts, and to contribute to their better prediction***

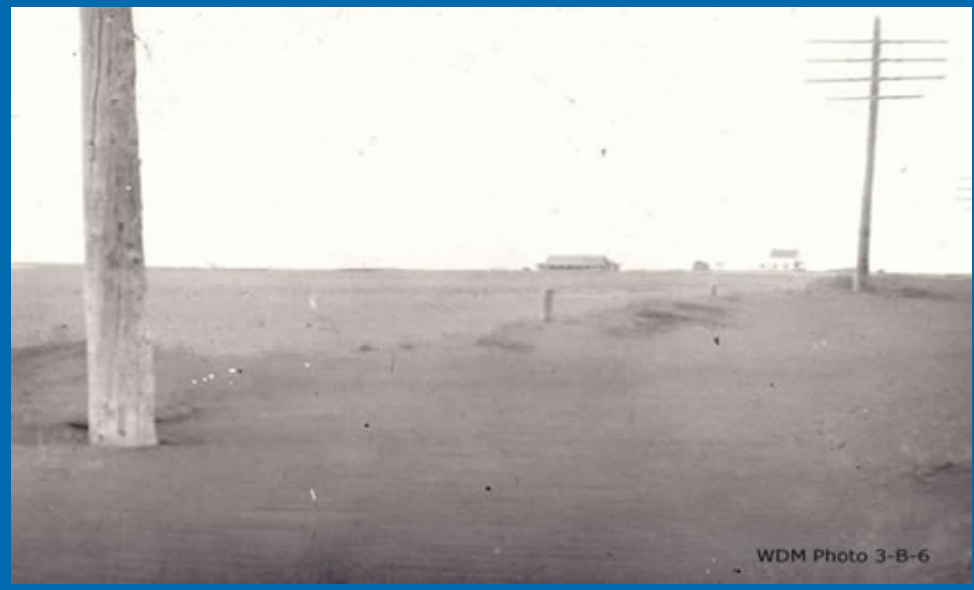
Why the Canadian Prairies?

- Recurrent drought has restricted sustainable development in the Canadian Prairies
- Substantial decline in rural population since early 1930s



"Saskatchewan,
Saskatchewan,
there's no place like
Saskatchewan; we
sit and gaze across
the plain and
wonder why it
never rains…"

These words from
the song
Saskatchewan
were written during
the 1930s.



Why DRI now?

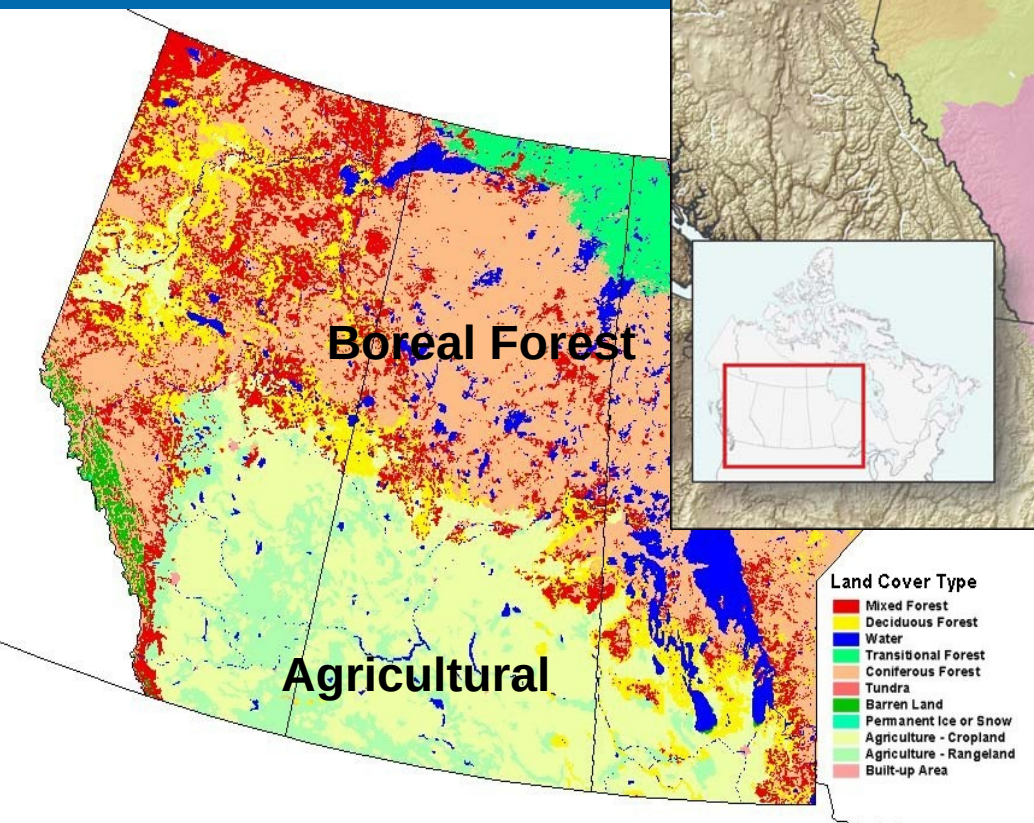
- **The 1999-2004 drought was one of the worst natural disasters that Canada has ever suffered!**
- Convergence of modelling and observational technologies
- DRI runs from 2005-2010.

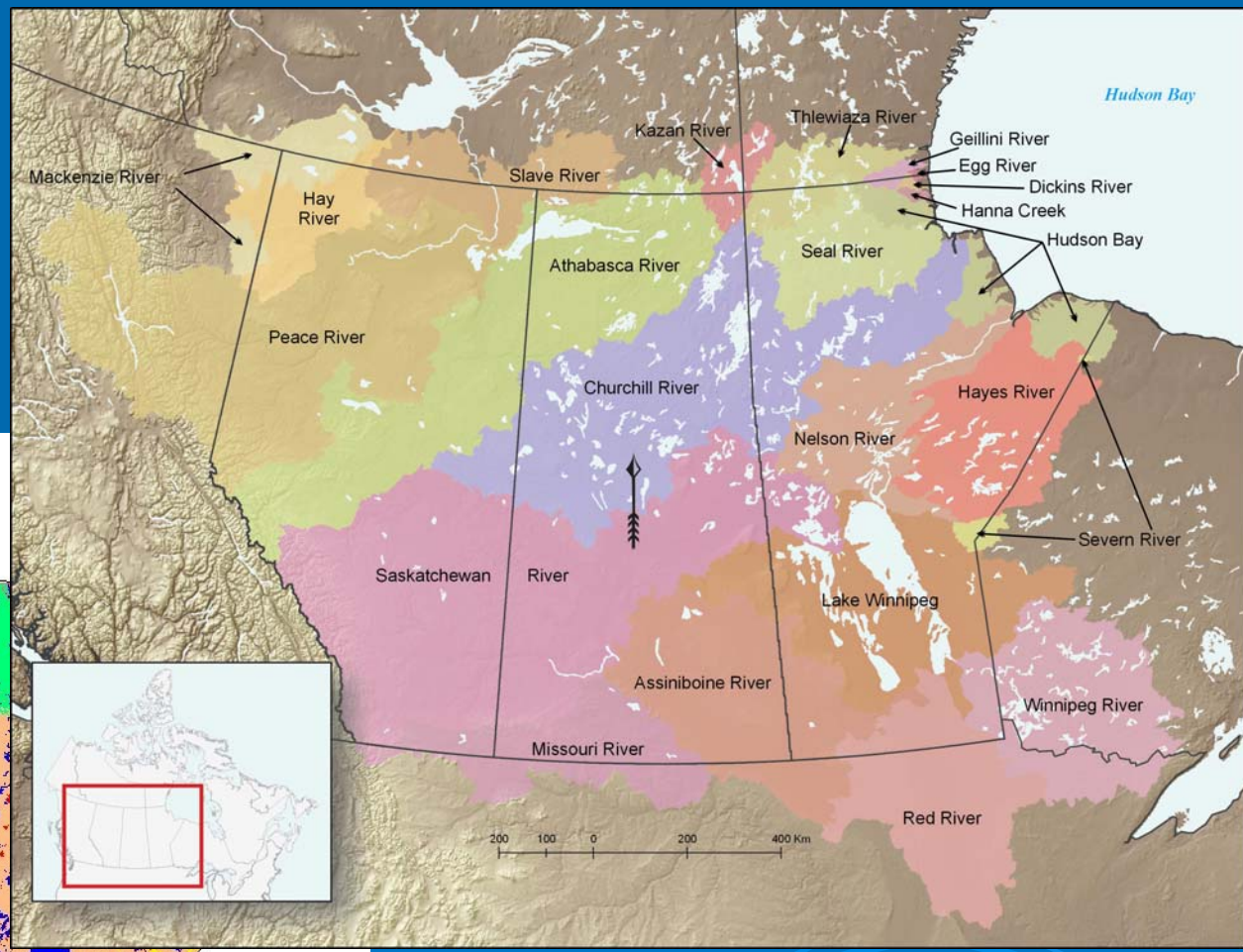
Salt storm in reservoir, Alberta, April 2004

Drifting soil in fields, Saskatchewan, April 2002

THE CANADIAN PRAIRIES

Landcover tied to climate & soils with distinctive land atmosphere interactions



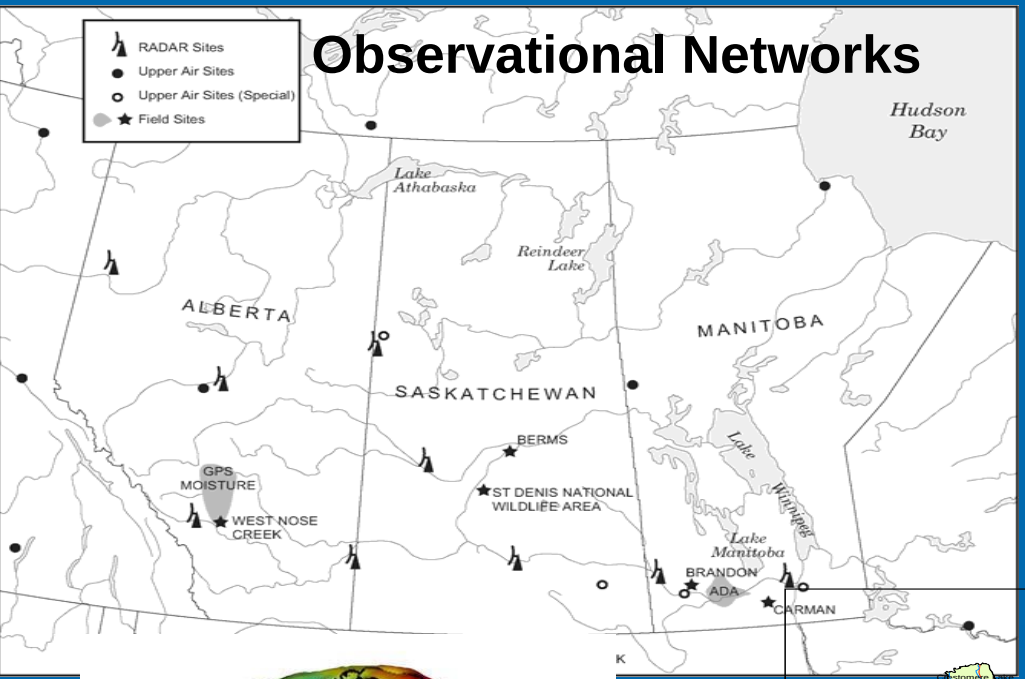


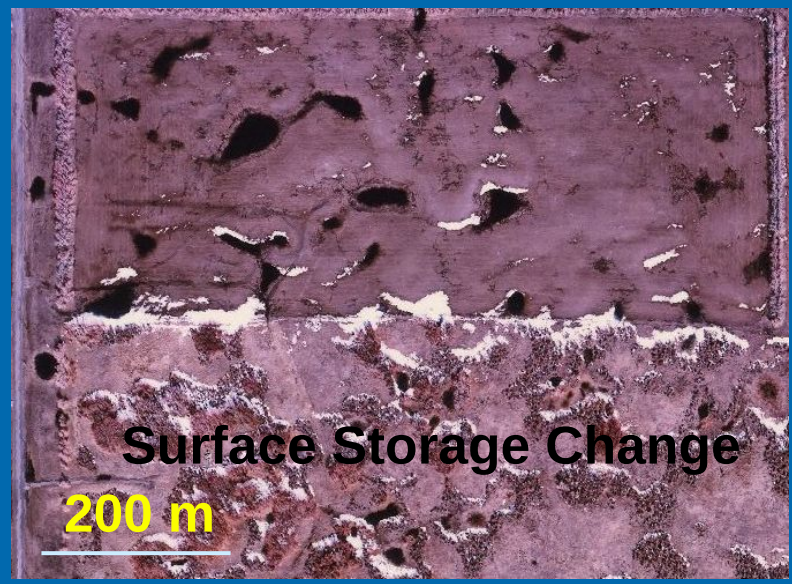
Water flows west to northeast through major ‘exotic’ rivers that derive most water from mountain runoff and deliver to Hudson Bay and Arctic Ocean

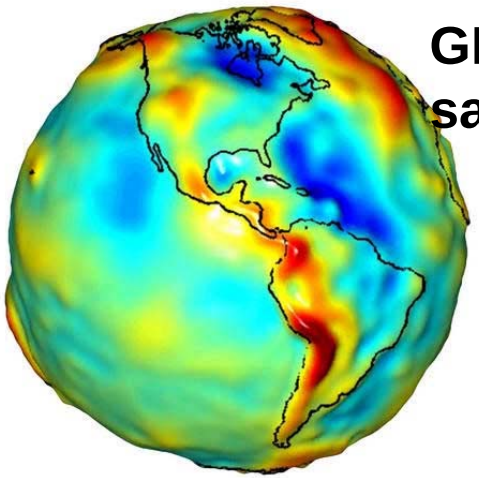
DRI THEMES

1. Quantify the physical features,
   - flows of water and energy into and out of the region, and
   - storage and redistribution within the region
2. Improve the understanding of processes and feedbacks governing the
   - formation,
   - evolution,
   - cessation and
   - structure of the drought
3. Assess and reduce uncertainties in the prediction of drought
4. Compare the similarities and differences of current drought to previous droughts and those in other regions
5. Apply our progress to address critical issues of importance to society

1. QUANTIFY THE DROUGHT



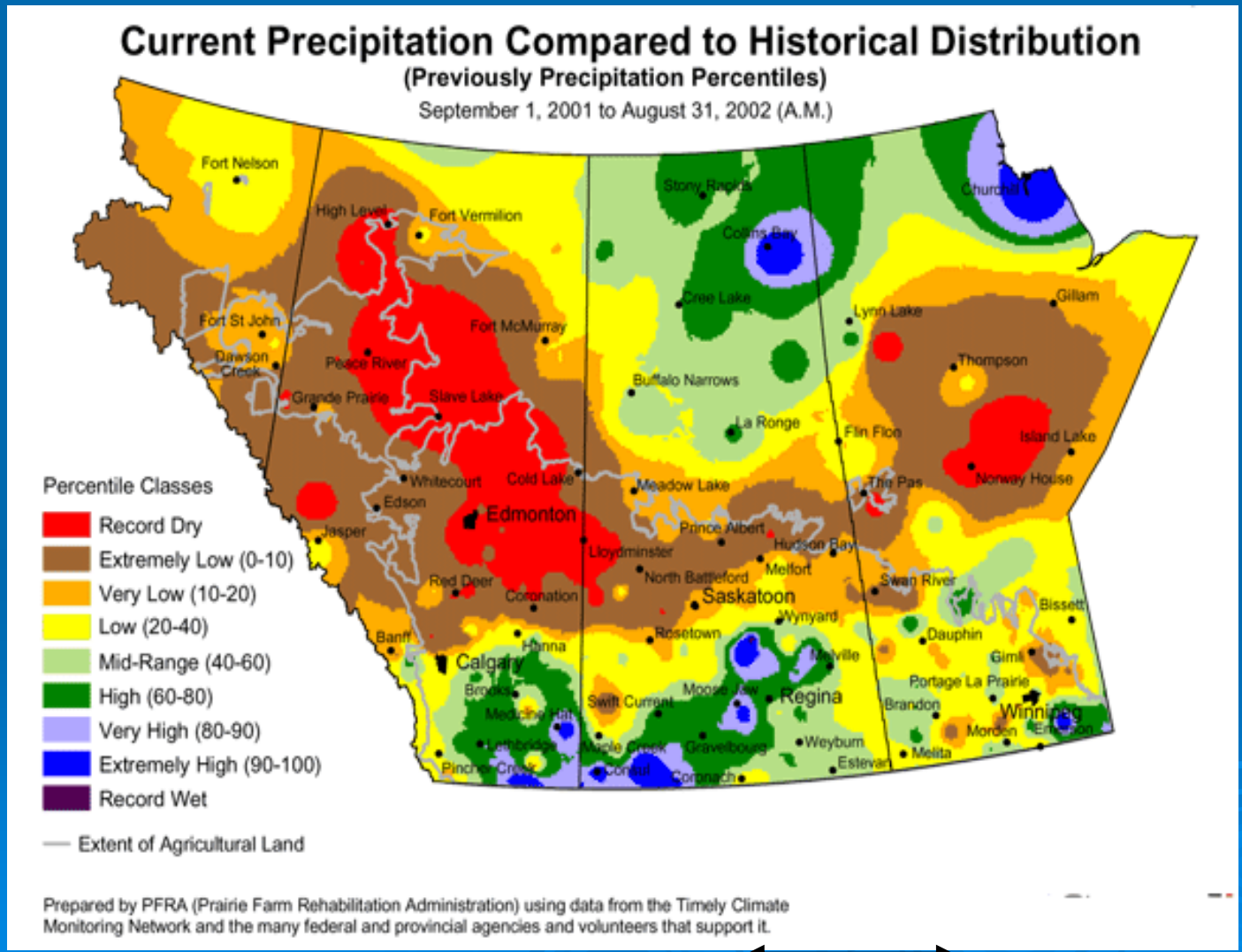




GRACE satellite

Wells in South Saskatchewan

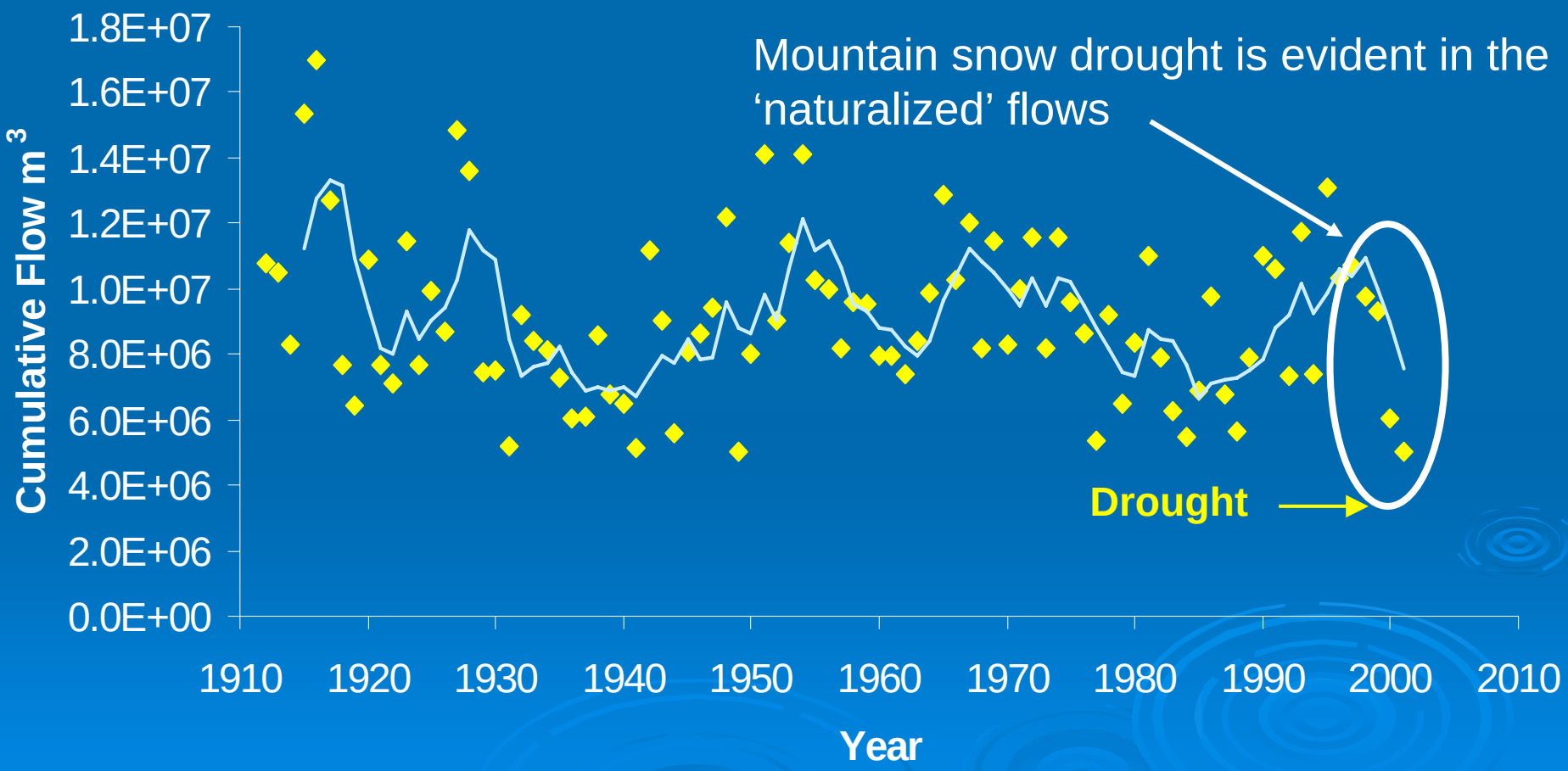
PRECIPITATION ANOMALIES



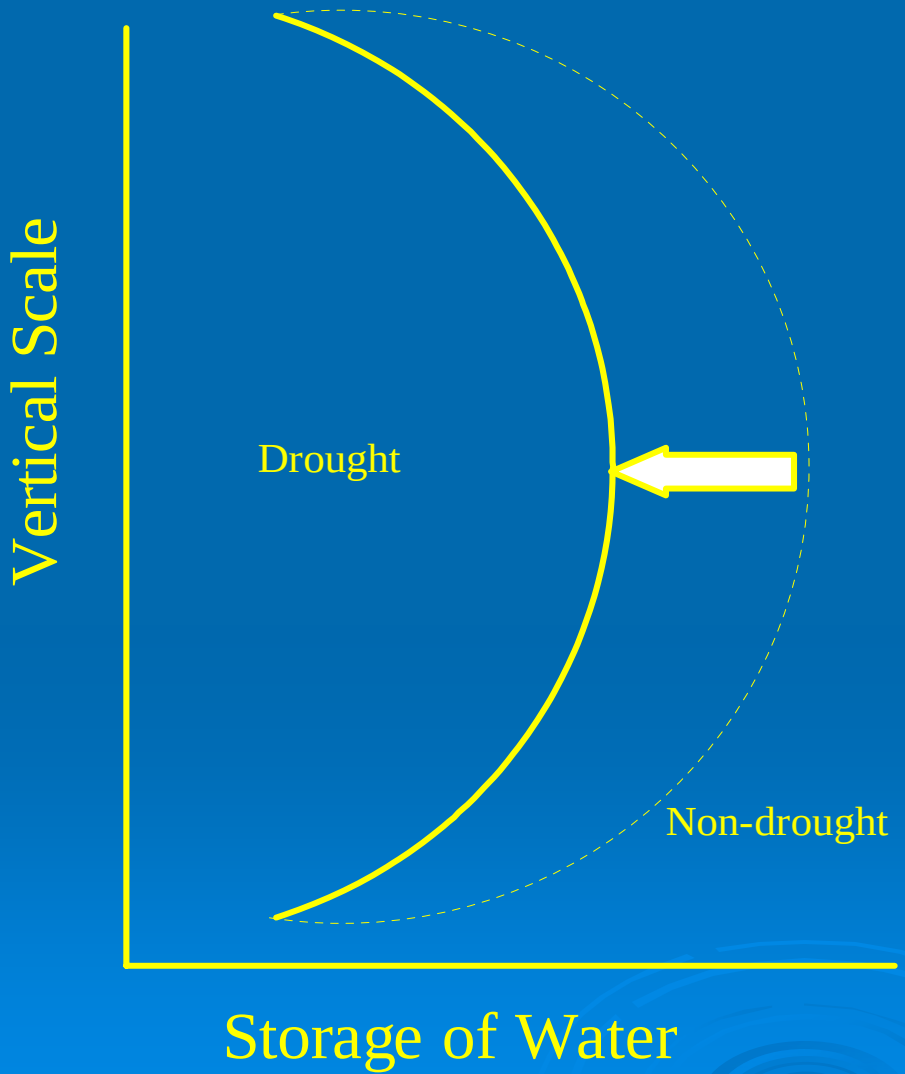
2001/02

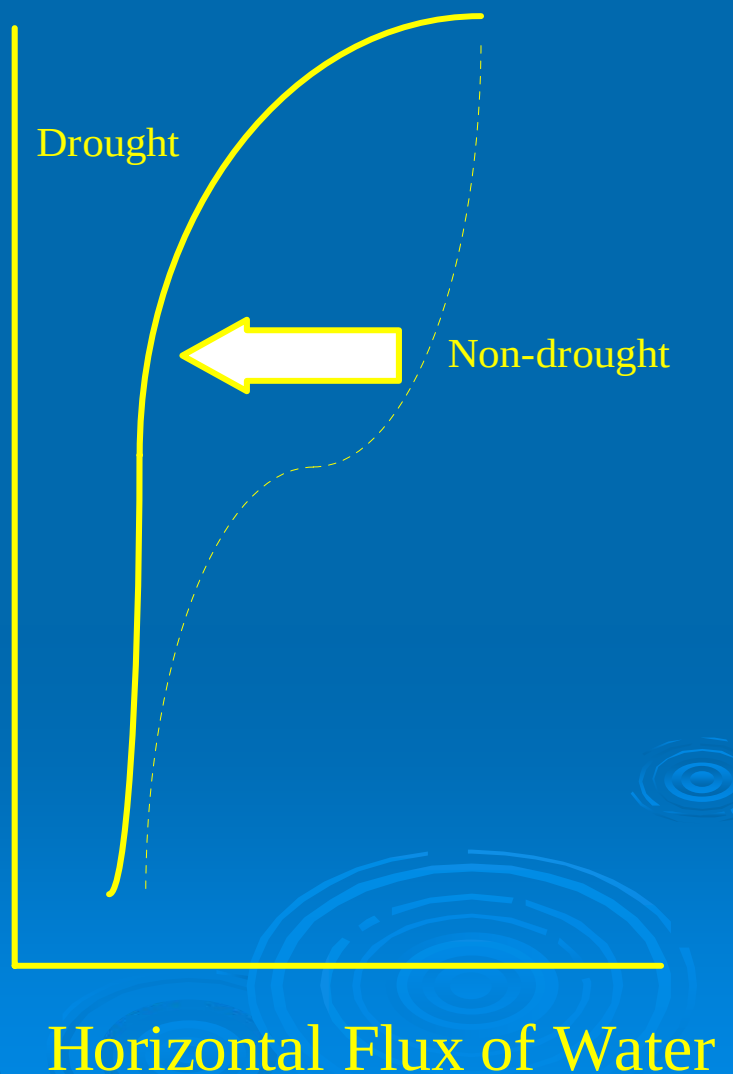
500 km

‘NATURALIZED’ FLOWS OF THE SOUTH SASKATCHEWAN RIVER ENTERING SASKATCHEWAN

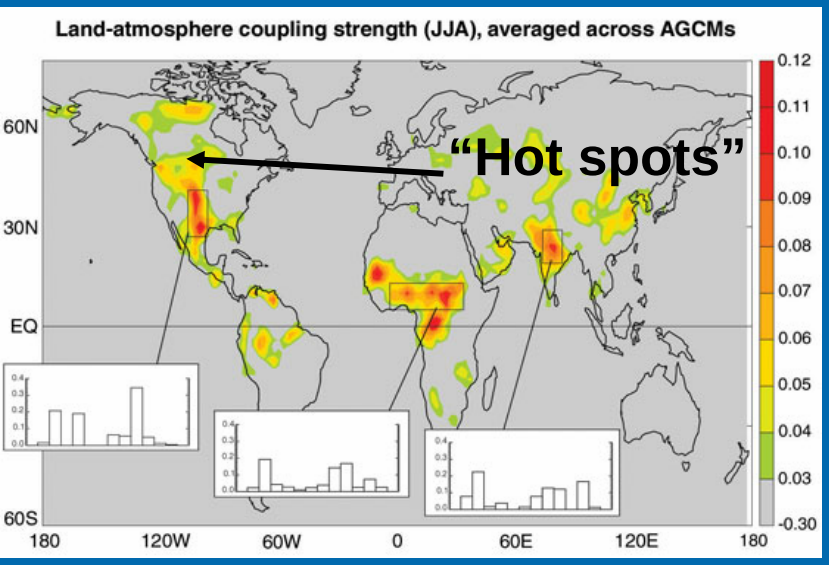


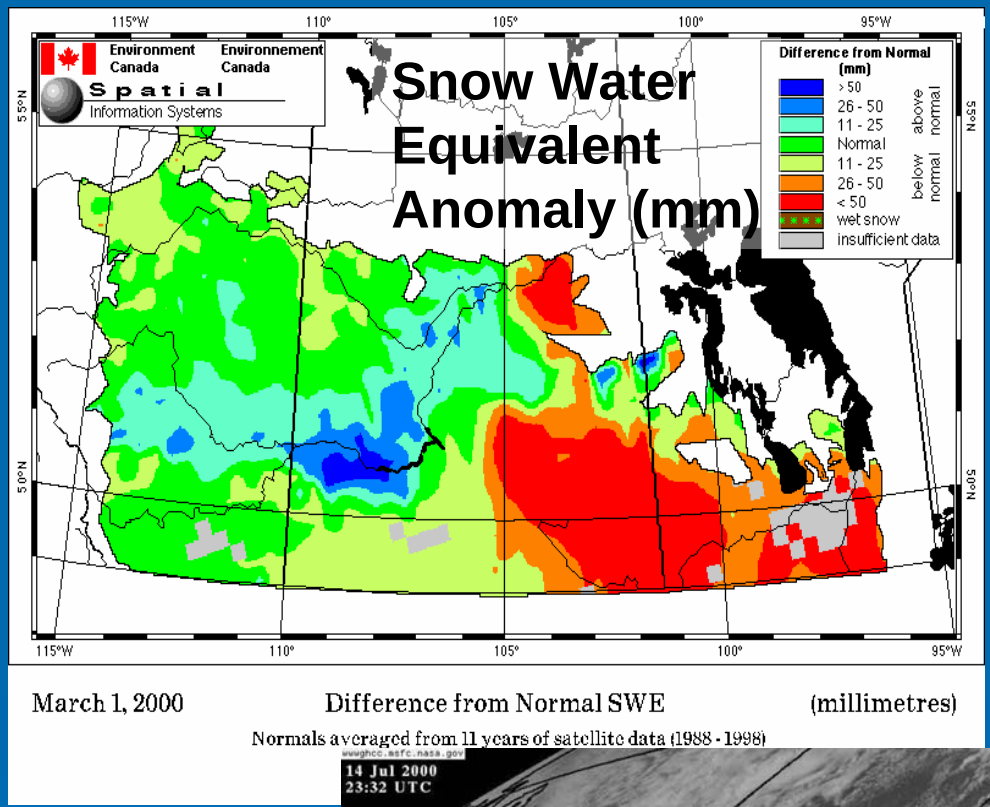
2. UNDERSTAND THE DROUGHT





Atmosphere & Land Surface

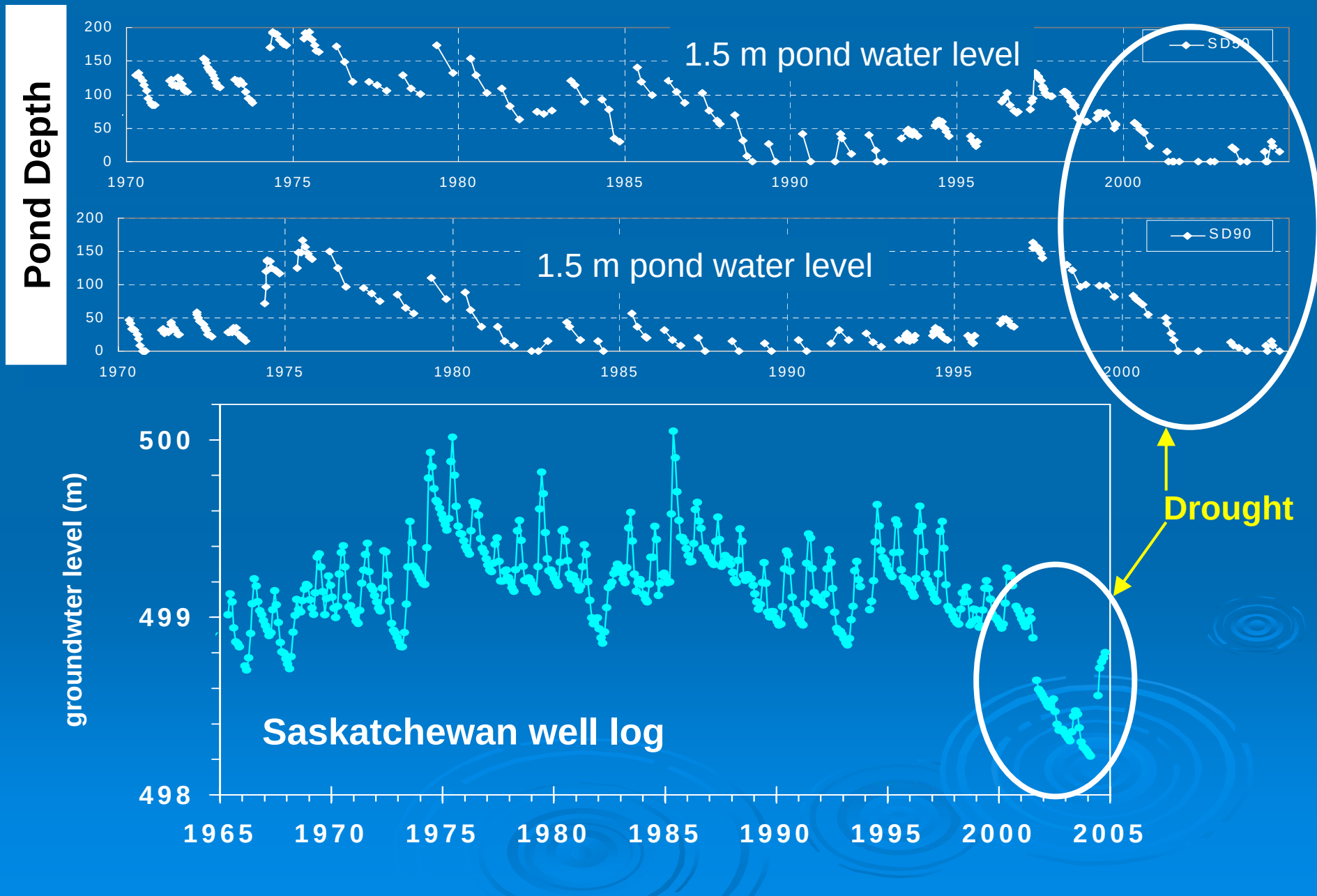




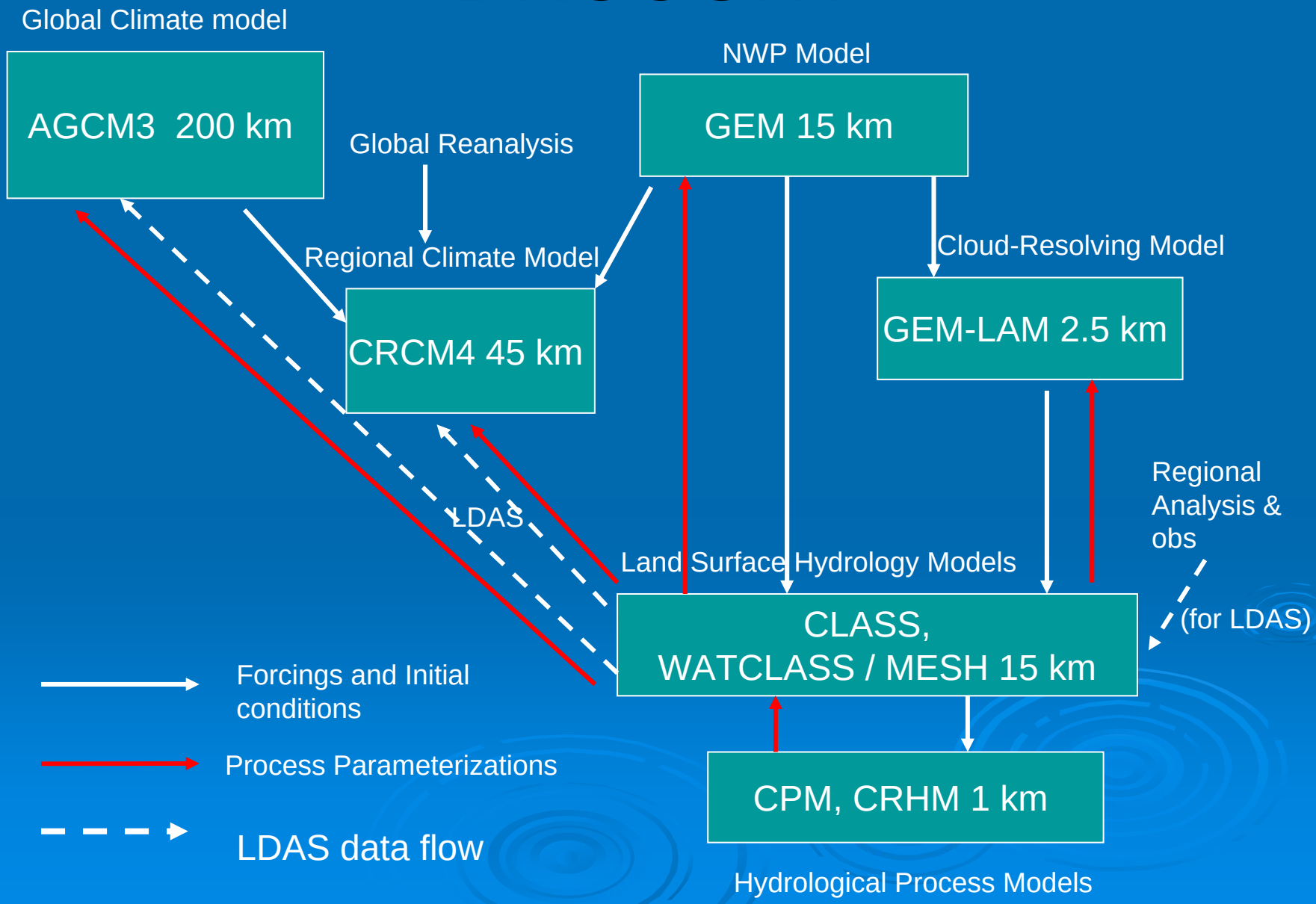
Varying vegetation between drought and non-drought

Individual storm events

Local Surface and Groundwater Depletion

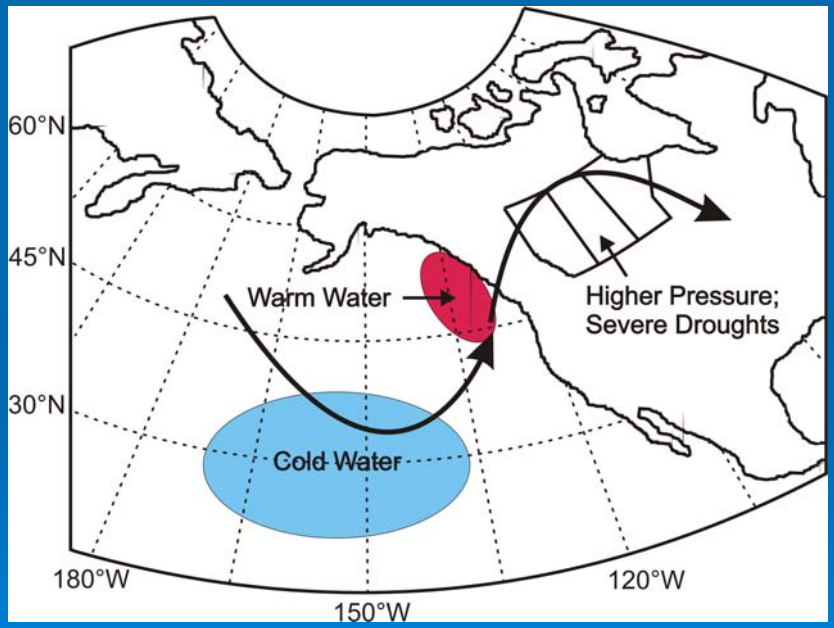


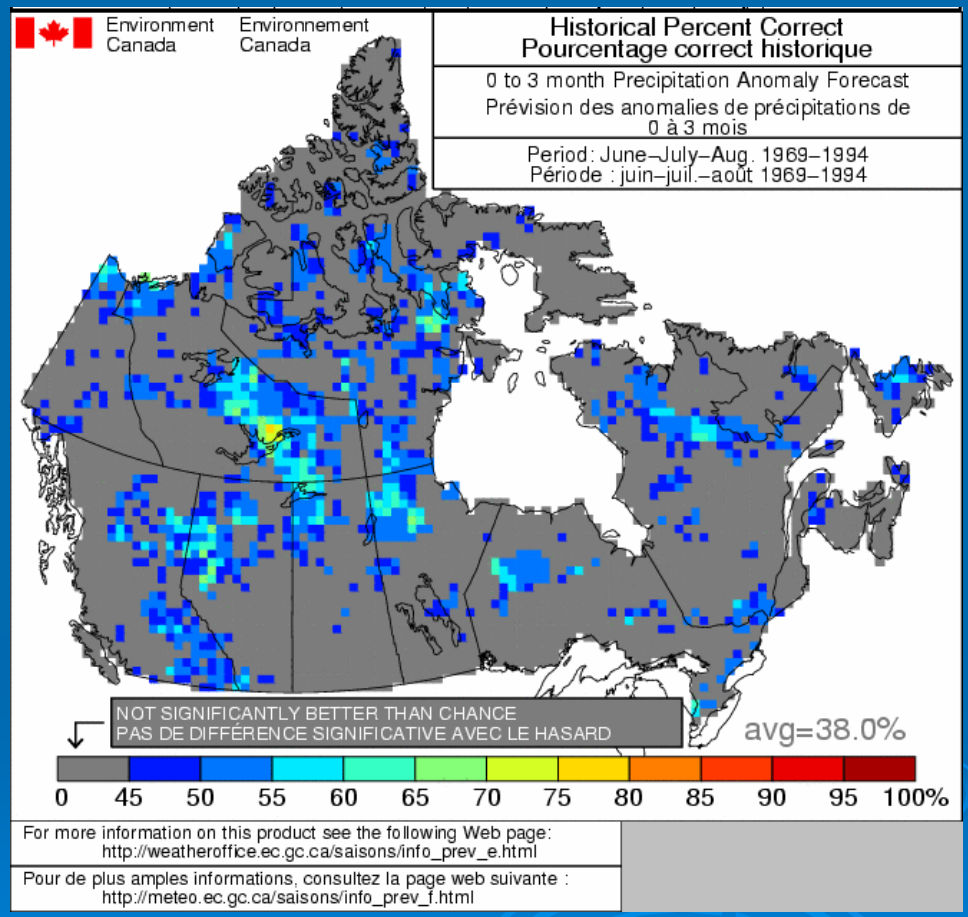
3. SIMULATE AND PREDICT THE DROUGHT



DROUGHT PREDICTION

Seasonal prediction of precipitation generally has low skill

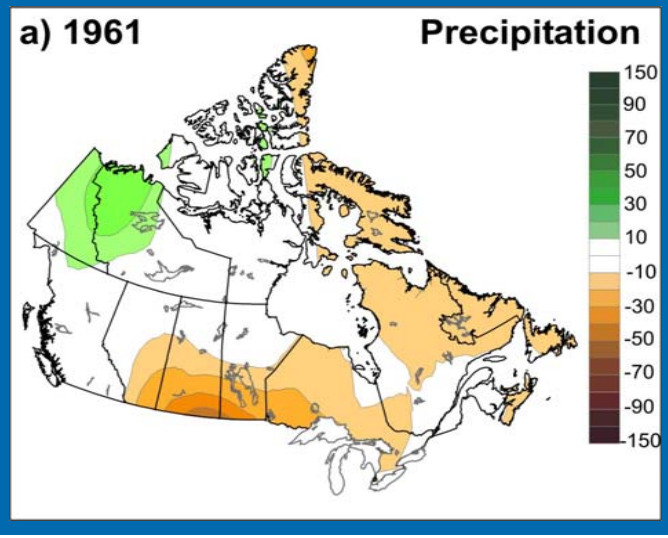




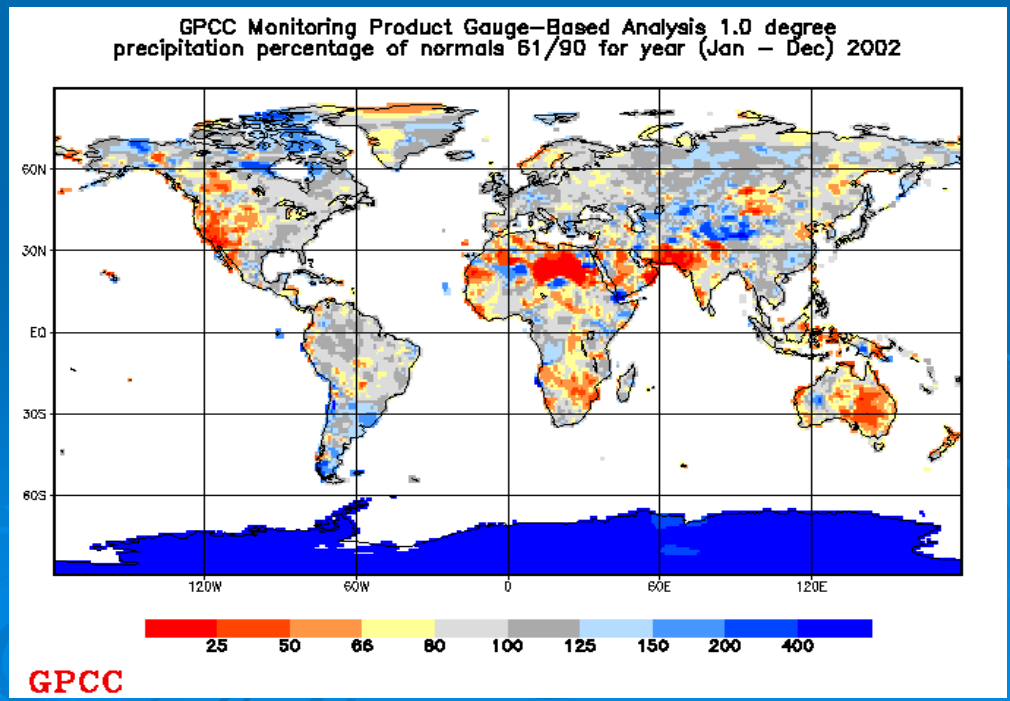
North Pacific SST affect some droughts, but not the recent Prairie drought

4. COMPARE THE DROUGHT

- Previous Canadian Prairie Droughts
- Others in North America
- Around the world



1961 Precipitation Anomaly



2002 Global Precipitation Anomaly

5. INTERACT WITH THOSE AFFECTED BY DROUGHT

An initial list of our partners includes:

- **Agriculture and Agri-Food Canada**
- **Alberta Agriculture, Food and Rural Development**
- **Alberta Environment**
- **Canadian Forestry Service**
- **Environment Canada (several components)**
- **Manitoba Hydro**
- **Manitoba Water Stewardship**
- **Saskatchewan Research Council**
- **SaskWater**
- **Saskatchewan Watershed Authority**
- **… and many others!!**

UNIQUE CONTRIBUTIONS

Some of the unique scientific issues include:

- Drought multi-year ‘memory’ induced by snowmelt runoff, frozen soil infiltration, pond storage
- Complete quantification of the hydrological cycle on the Canadian Prairies
- Atmospheric flow controls on precipitation
- Water vapour - precipitation recycling ‘hot spot’ with Prairie vegetation, soil moisture, ponds
- Effect of drought on convective storm genesis
- Variations in the non-contributing area for streamflow
- Groundwater model explicitly linked to the atmosphere via a land surface scheme
- …

And, to a large extent:

- Our approach and its strong collaborative atmosphere-hydrology foundation

1st DRI Science Meeting

- January 11-12 2006, Saskatoon
- Investigators, collaborators, partners
- Reaching out to international community of drought scientists
- Developing details of science plan implementation
- Reviewing current state of understanding, information and predictive tools