

**Theme 4: Comparisons of the
1999-2005 Canadian Prairie
Drought with Droughts at Other
Times & in Other Regions**

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“Cereal Killers”

Outline

- Original Theme 4 objectives
- Examples of comparison work done to date
- Work we still plan to complete and future projects

Original Objectives

(before funding was announced)

1. How do the physical features, processes, and feedbacks of the recent Canadian Prairie drought compare with a) previous Canadian Prairie droughts, b) Canada-wide droughts, c) US Great Plains droughts, and d) droughts across the world?
2. How does the prediction of the recent drought compare with predictions of other droughts?
3. How does the recent drought compare with past climate variability and projected climate change?

Original Proposed Research Plan

(before funding was announced)

1a. Physical Features Comparison – Other Prairie Droughts: (Good progress)

- Individual studies (from Themes 1 & 2) to compare similarities/differences of specific physical features
- Will involve direct comparisons with identified droughts as well as, determination of trends and variability during period of record
- Other severe droughts will be identified using various meteorological, agricultural, and hydrological indices

Proposed Research Plan

1b. Physical Features Comparison – Droughts in Other Regions: (Limited results)

- Will focus on larger-scale aspects such as teleconnections, soil moisture anomalies, moisture sources, and drought indices
- Canada-wide, US Great Plains, and other regions of the world through global focus on water cycle

Proposed Research Plan

2. Prediction Comparisons: (Still plan to complete)

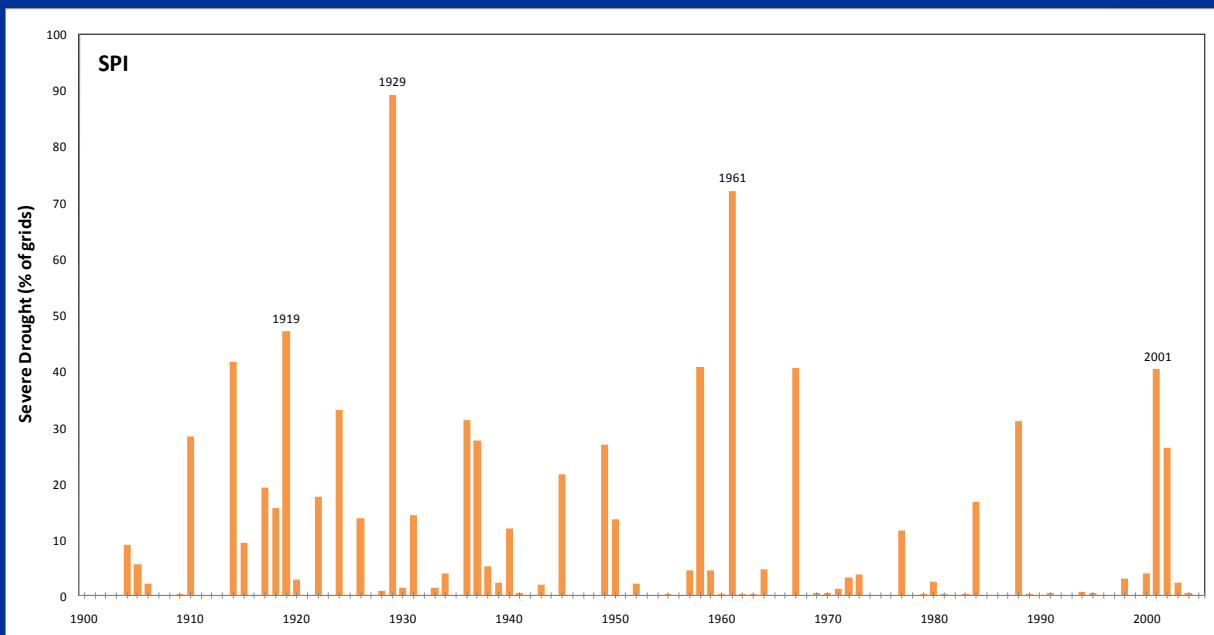
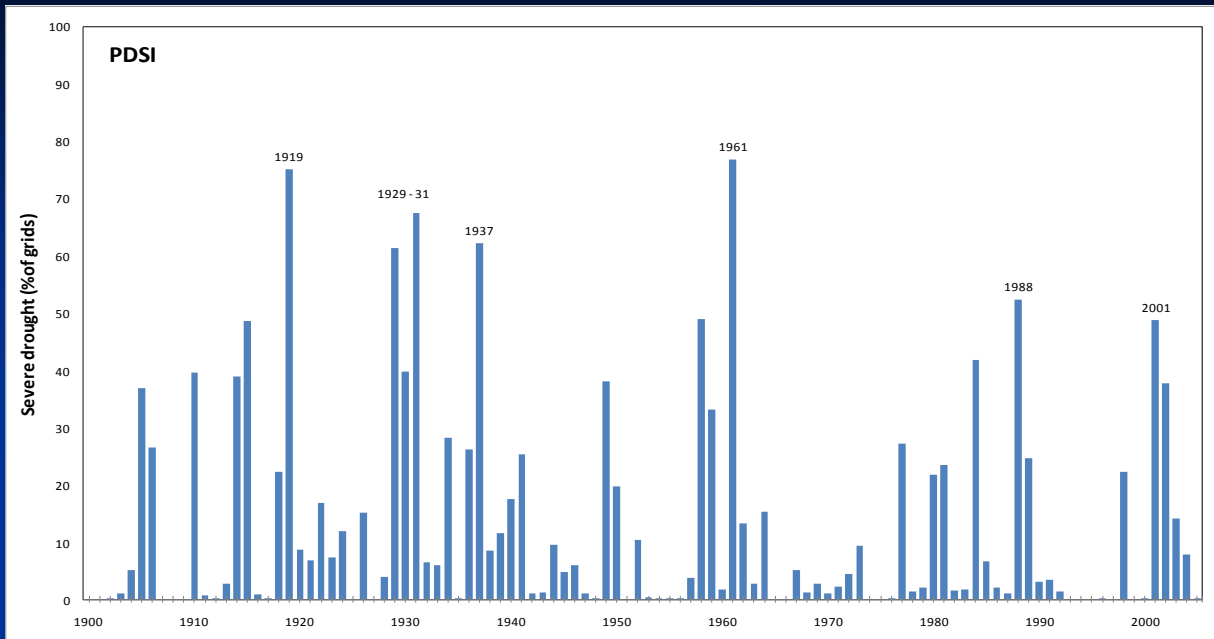
- Several multi-decadal model data sets including the current drought period resulting from Theme 3 studies
- Analyze these data sets to compare the prediction of recent Prairie drought with other droughts

Proposed Research Plan

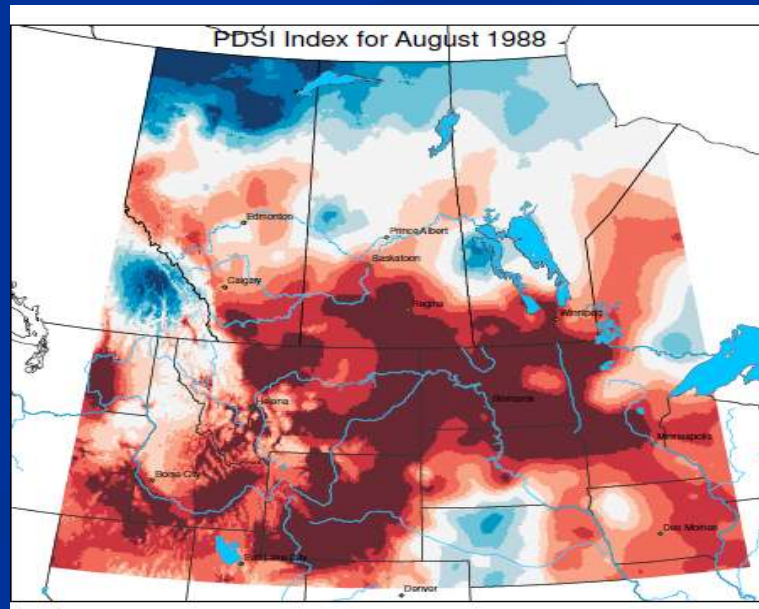
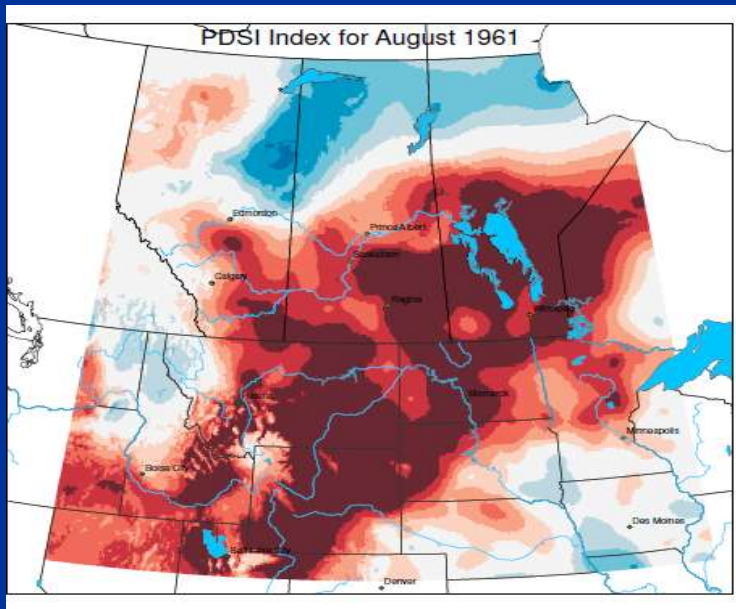
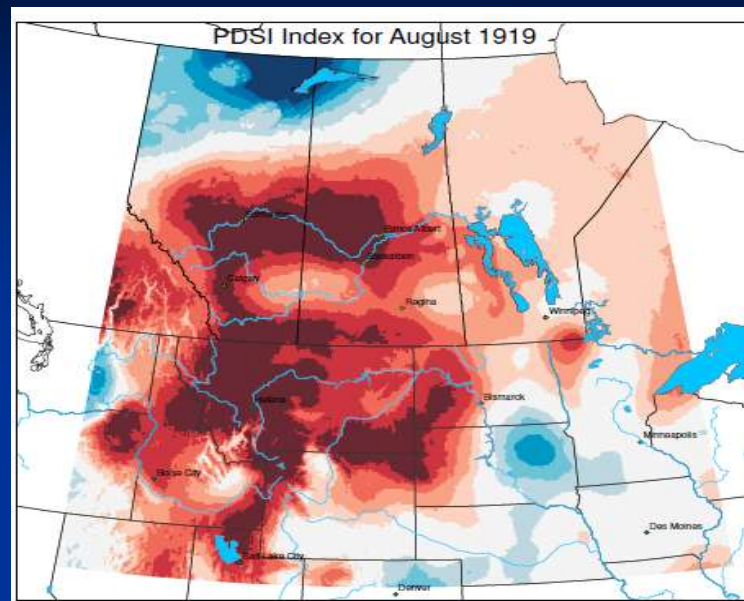
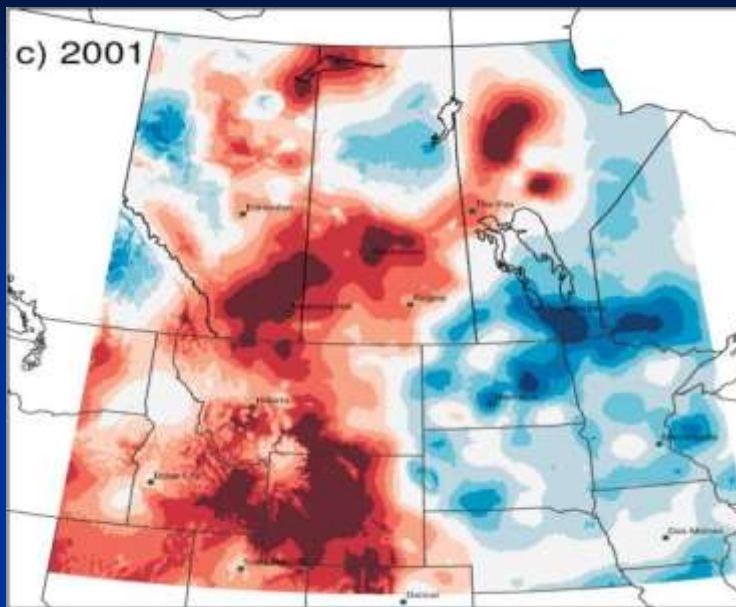
3. Comparisons with Past Climate Variability and Projected Future Climate Change: (Some results and still plan to complete)

- Identified similarities and differences as well as, analysis of past trends and variability in physical features will place this recent drought in the context of past climate variability during instrumental and paleo-climatic period of record.
- Using climate output from GCMs/RCMs, place the recent drought in the context of projected future climate change (e.g., how often can we expect this type of drought in the future?)

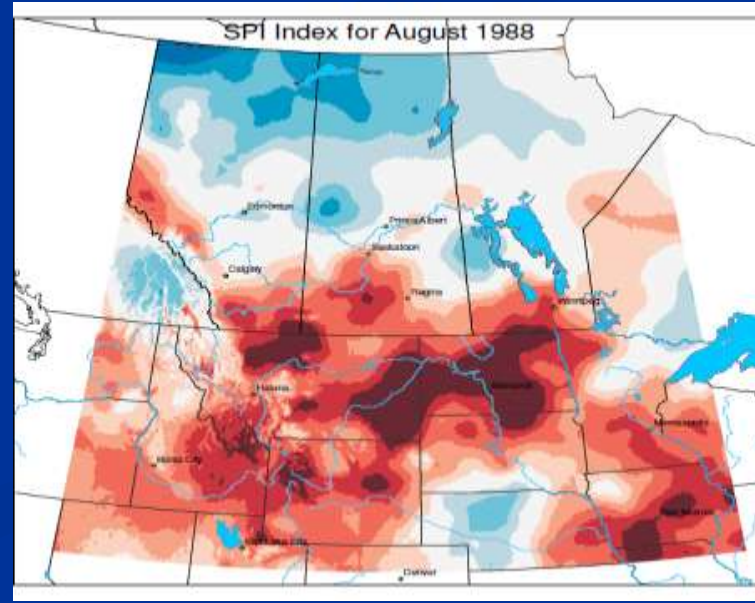
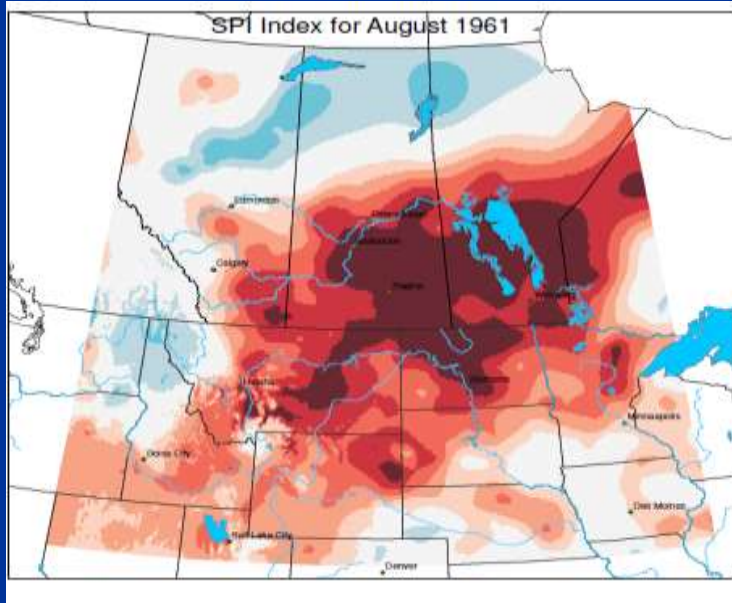
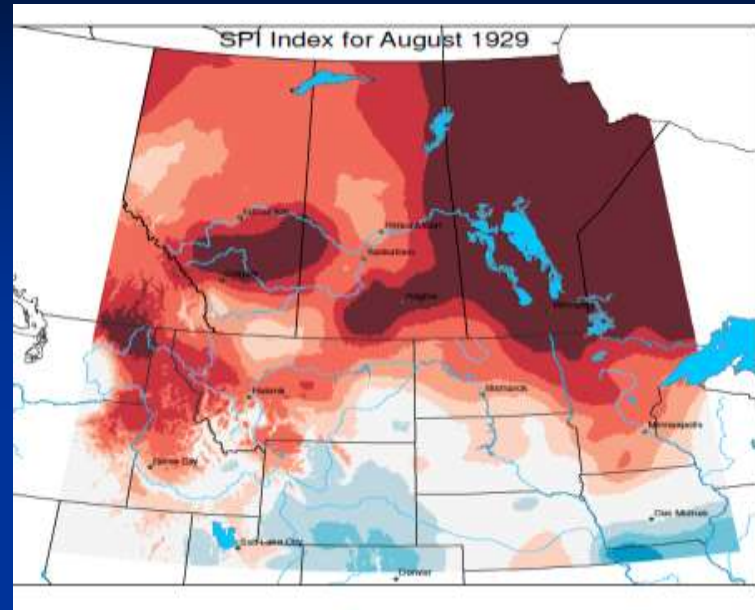
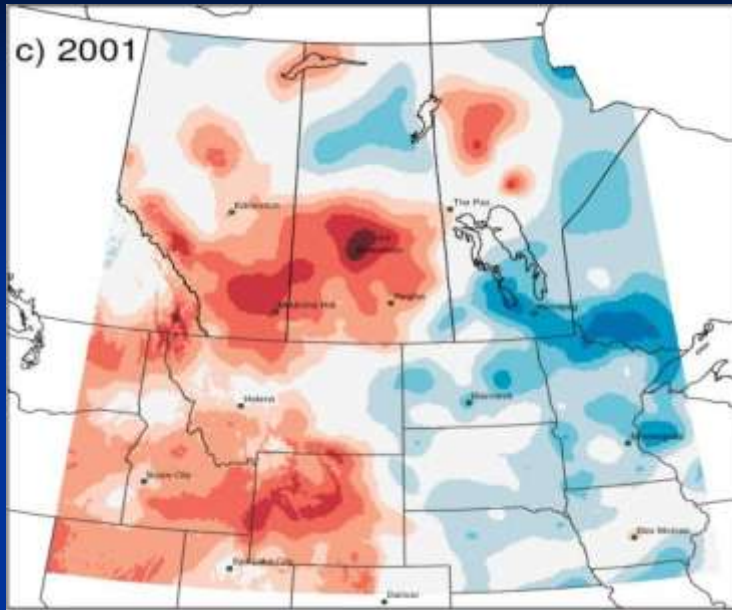
Results - Drought Indices



Drought Indices - PDSI

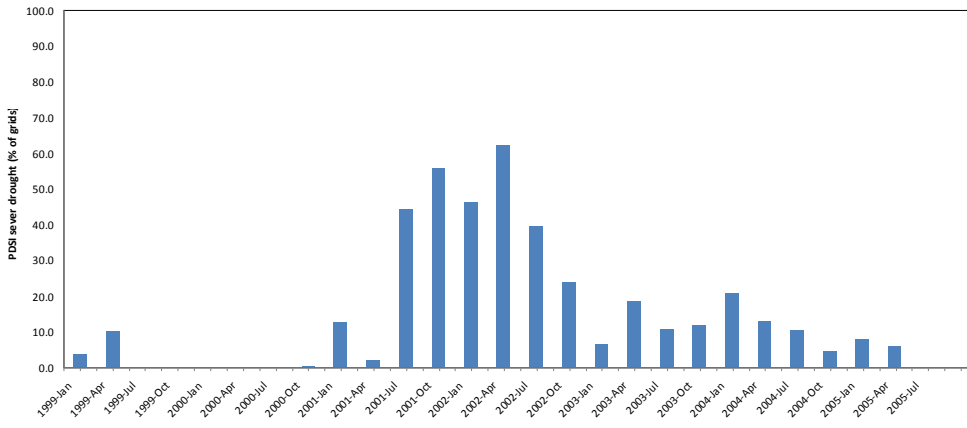


Drought Indices - SPI

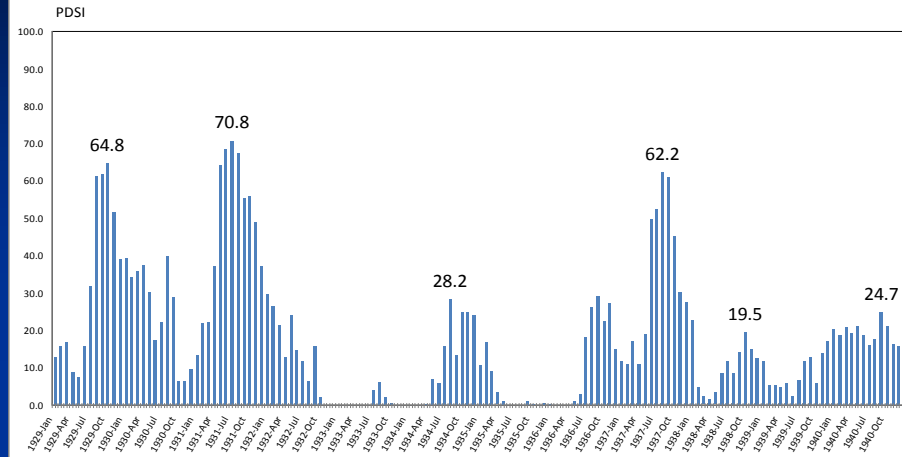


Drought Indices

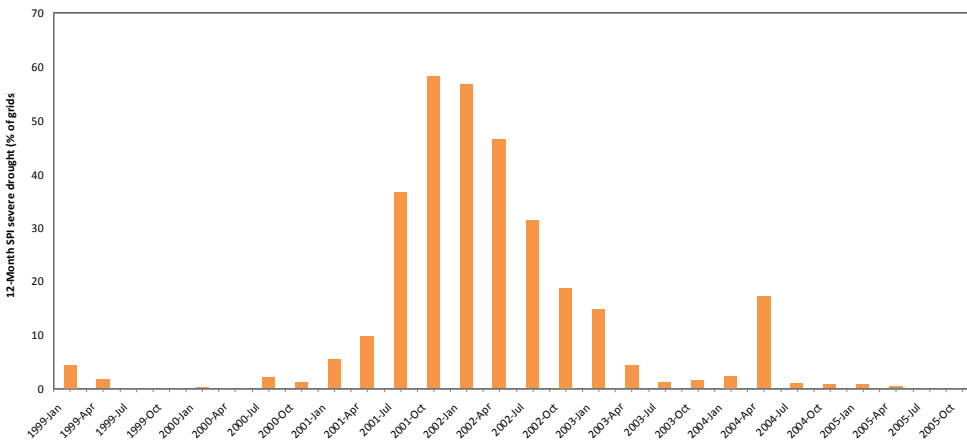
PDSI: 1999-2005



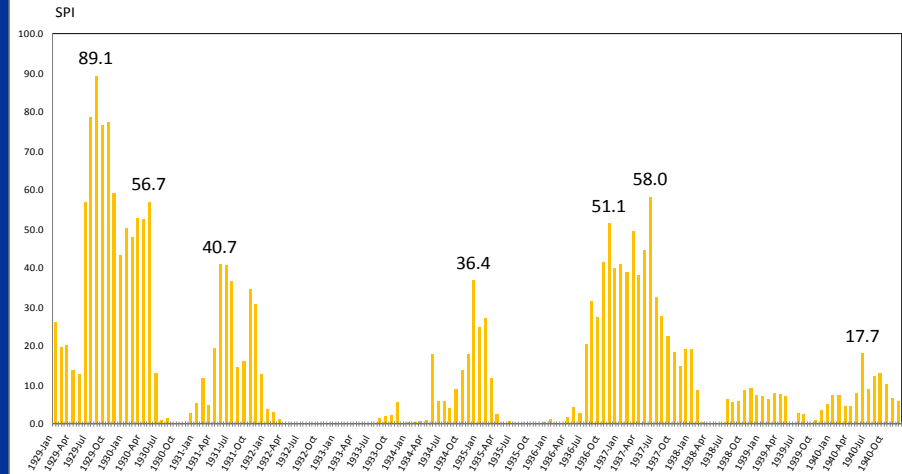
1929-40



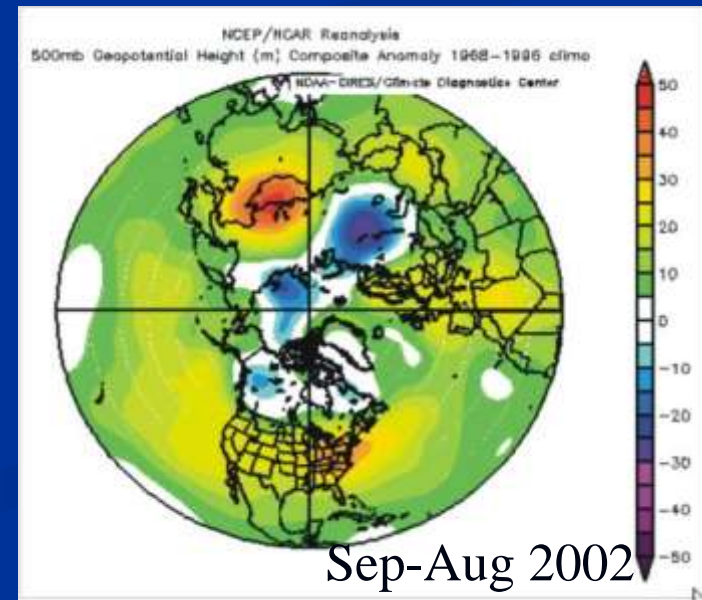
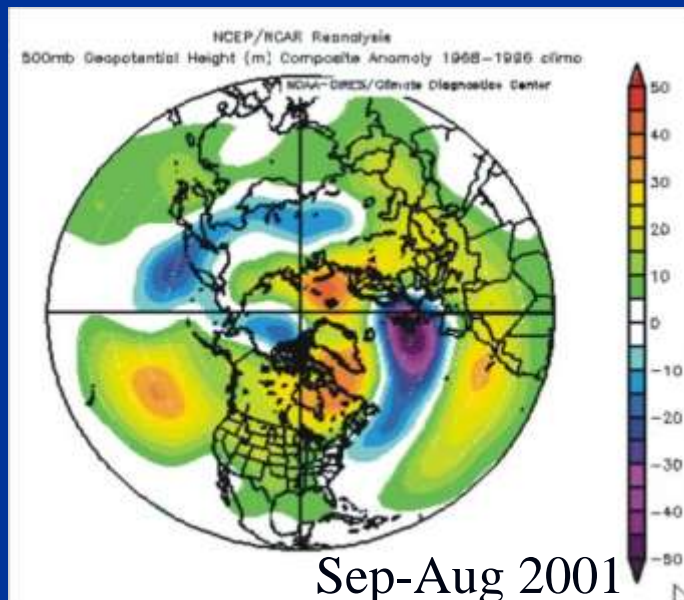
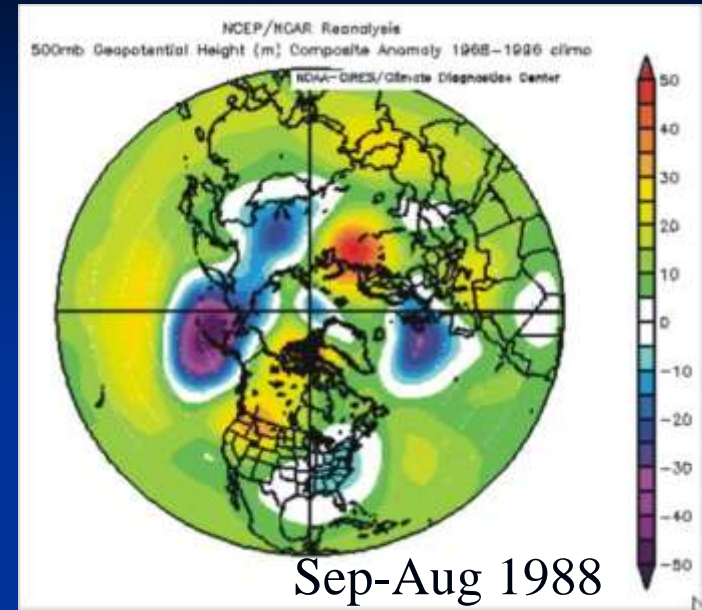
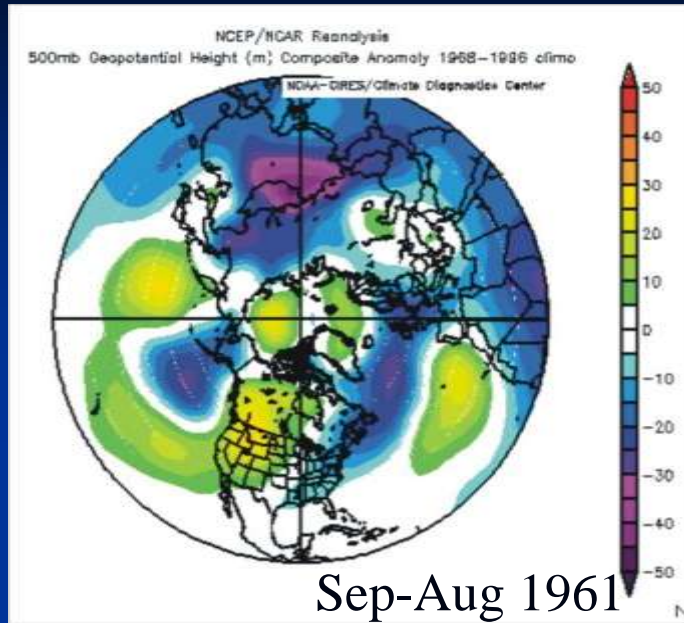
SPI: 1999-05



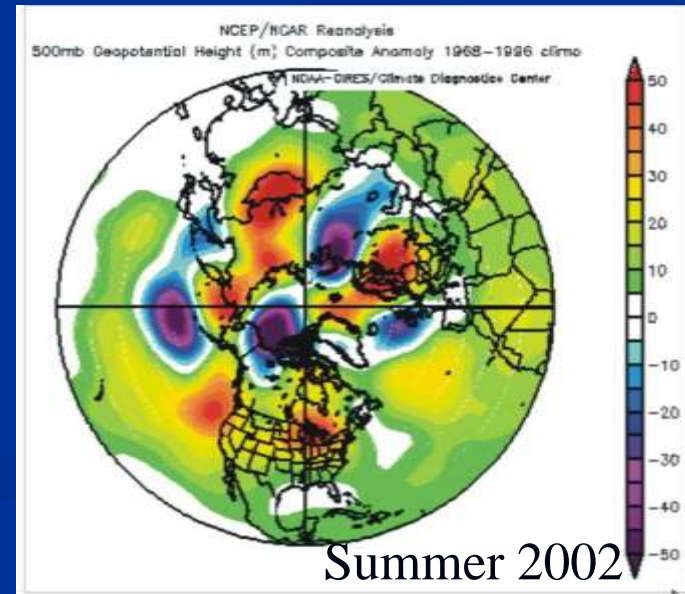
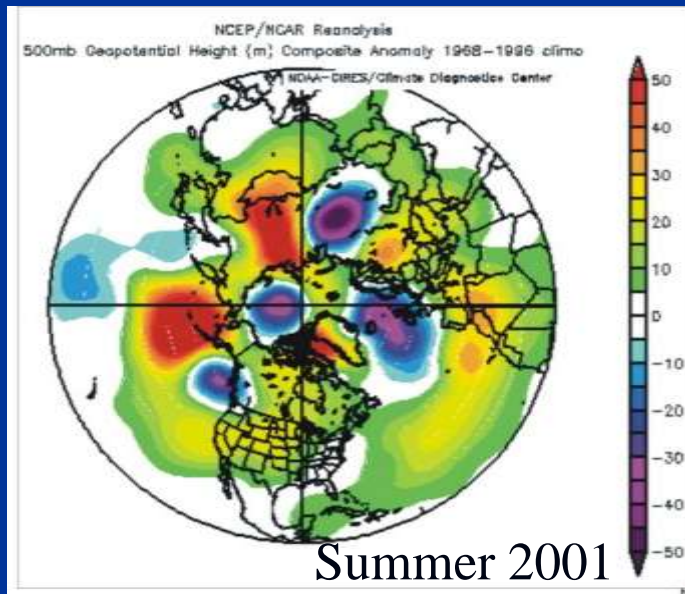
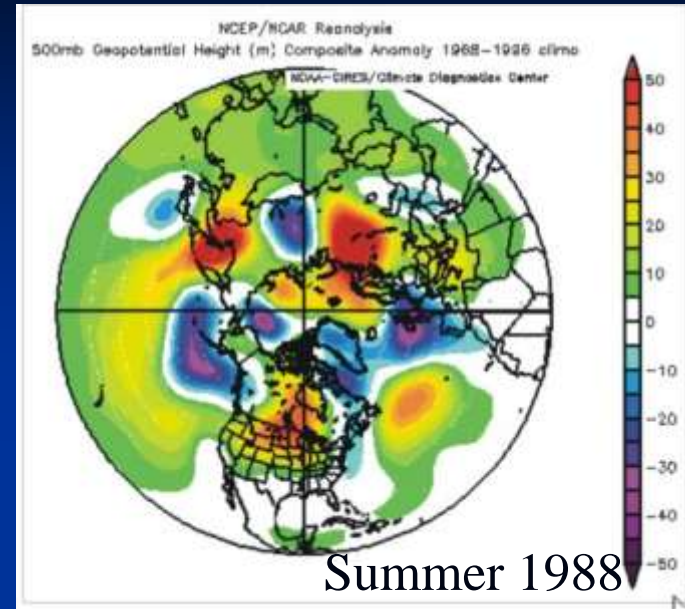
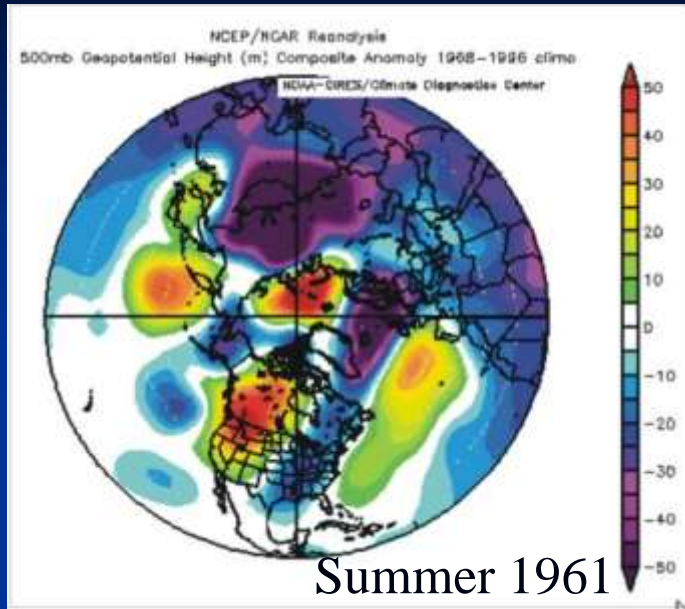
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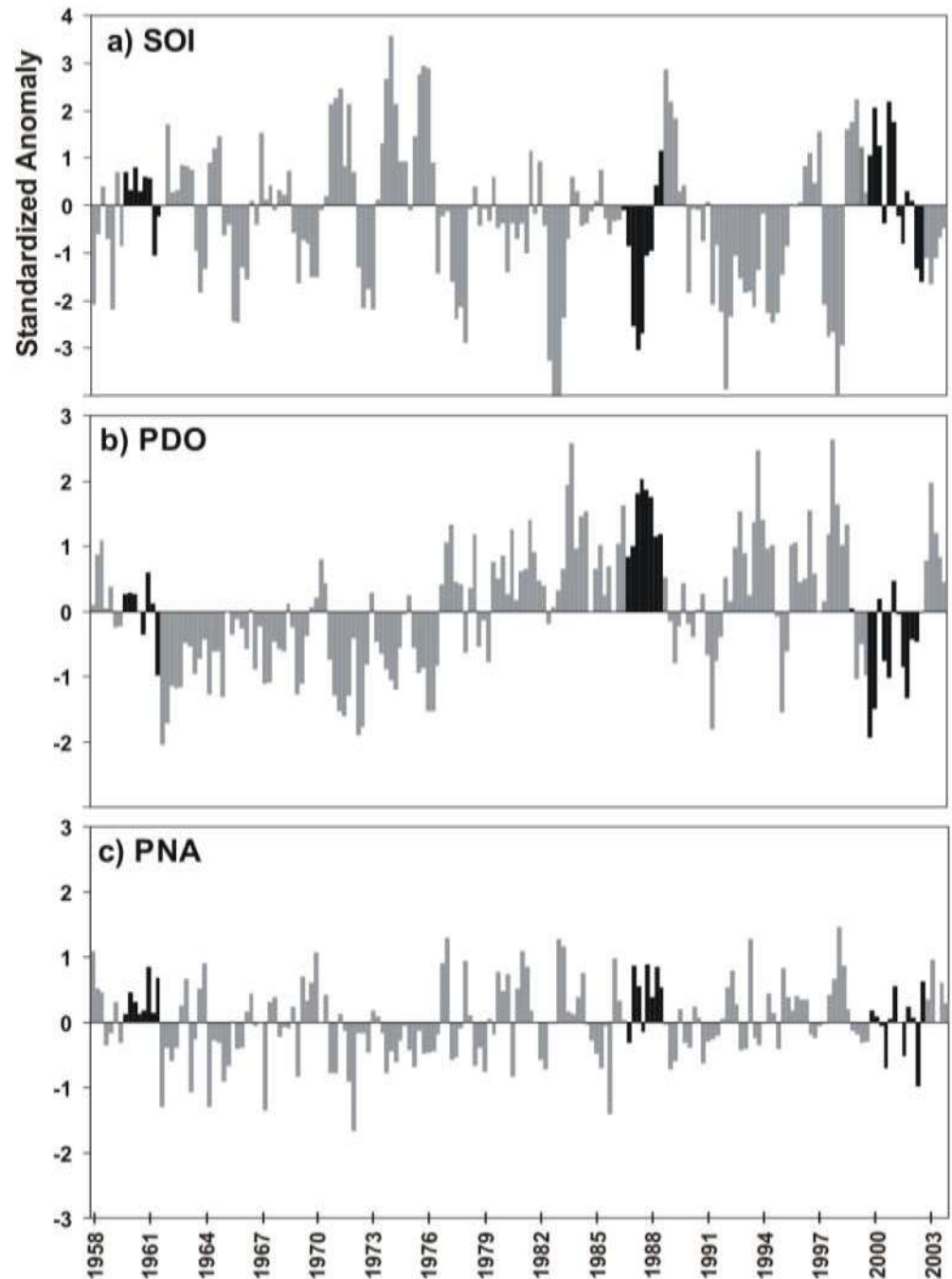
Atmospheric Circulation Comparisons



Atmospheric Circulation Comparisons

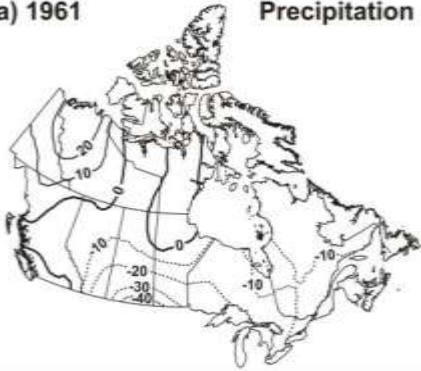


Teleconnection Comparisons

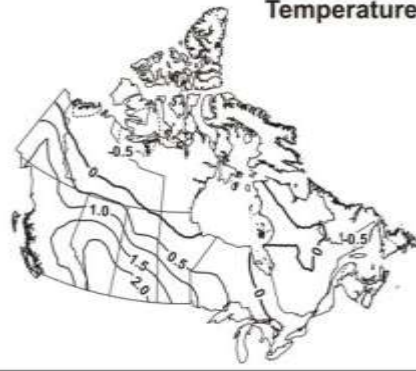


Cold vs Warm Droughts?

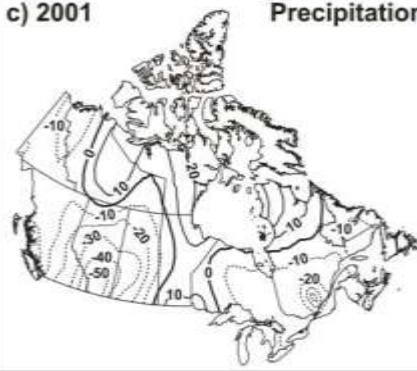
a) 1961 Precipitation



Temperature



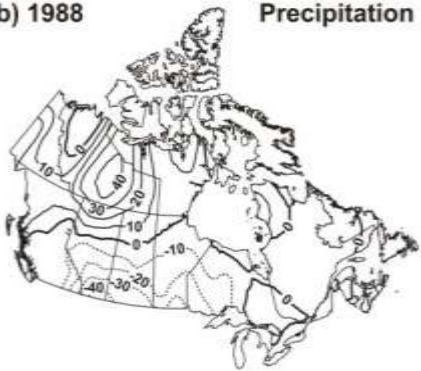
c) 2001 Precipitation



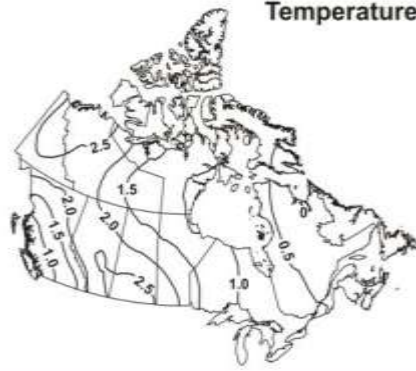
Temperature



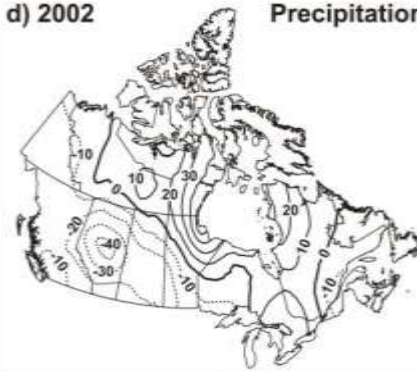
b) 1988 Precipitation



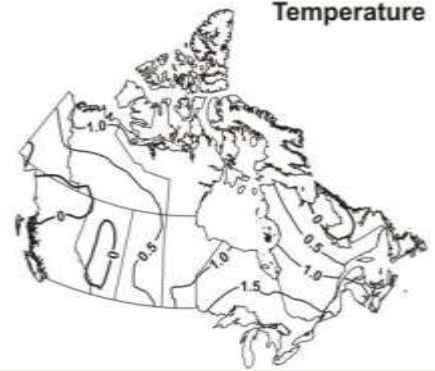
Temperature



d) 2002 Precipitation



Temperature

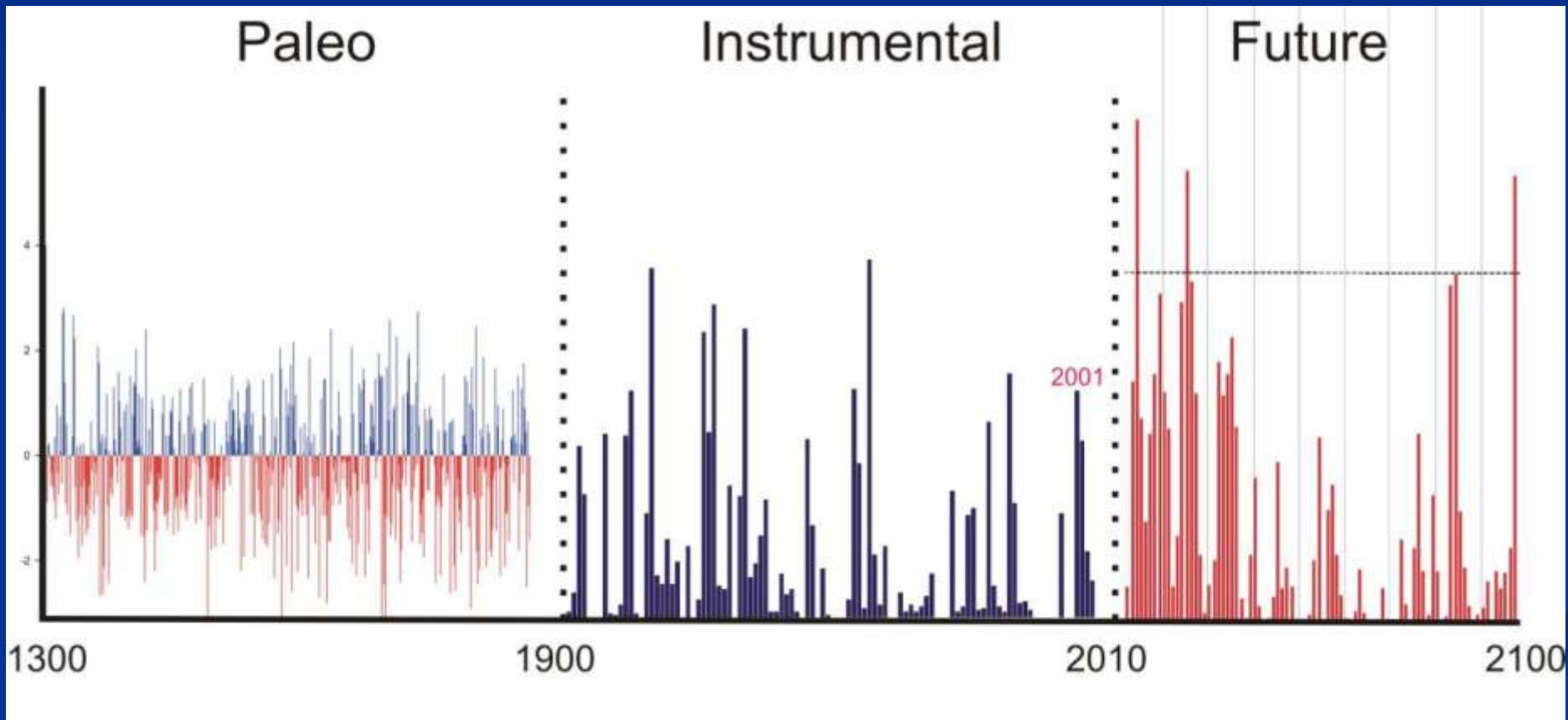


Other Contributions

- Assessing and comparing water and energy budget anomalies for different drought periods over the Prairies.
- Comparing boundary layer moisture cycling and the diurnal cycle of moisture from varying land cover during the 1999-2004 drought to the drought that occurred in 1988.
- Examining the relationship between precipitation and clouds over the Prairies for the 20-year period 1984 to 2004 using data from the ISCCP SRB datasets.
- Examining hydro-meteorological extremes from historical time series of temperature and precipitation from +100 year old high quality datasets.
- Compiling region-wide well data observations over the period 1965-2005 and lake level data from 1910-2007 to establish a basis to compare the effects of the recent drought with previous droughts.
- Beginning to address drought in other regions of the world through international GEWEX and in particular, examining whether major precipitation events mark the end of meteorological drought

Work to Complete

Context of the 1999-2005 Canadian Prairie Drought in Terms of Historical Events and Projected Future Occurrences



Work to Complete/Future Projects

- **Prediction Comparisons:** Predictions of 1999-2005 drought with that of 1988 (Cold vs Warm drought concept?)
- Comparisons of droughts in other regions of the world through global focus on water cycle

Thank You

