

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



Objectives

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?



Proposed Research Plan

1a. Physical Features Comparison – Other Prairie Droughts:

- Individual studies (from Themes 1 & 2) to compare similarities/differences of specific physical features
- Extent of comparisons will depend on specific variables and data availability
- 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:

- 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:

- 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:

- 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?)



Contributions To Date

While conducting research directed to Themes 1 to 3, several DRI investigators have begun to characterize this recent drought in terms of historical variability. This has included:

- Comparing the 2001/2002 Canadian Prairie drought (in terms of extent and severity) to those that occurred during the instrumental period of record as measured by the PDSI and SPI. Also, some indication into future droughts as projected by GCMs.
- Relating seasonal teleconnection index values (SOI, PDO, PNA, AMO, AO, and NAO) global SSTs, and 500mb circulation patterns (including synoptic typing) with drought indices over the Canadian Prairies (SPI, PDSI, PDSI Z-value) at various lag and lead times for the entire instrumental period of record.
- Studying the details of secular changes in atmospheric circulation regimes, and other atmospheric circulation anomalies, during the past 60 years.



Contributions To Date

- 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