



Canadian Foundation for Climate  
and Atmospheric Sciences (CFCAS)  
Fondation canadienne pour les sciences  
du climat et de l'atmosphère (FCSCA)

## 2007 DRI Progress Report

**Project Title: Large-Scale Circulation Patterns and Teleconnections Associated with the 1999-2005 Canadian Prairie Drought**

**Investigators: Barrie Bonsal and Amir Shabbar**

### **1.0 Progress (beginning January 2007 to end December 2007)**

**1.1 Describe progress towards meeting the project objectives for those theme areas where you have received funding for 2006-2007. How are the original milestones being met (be specific)? List the key objectives and results achieved to date as well as any relevant application(s) of the results.**

#### **Theme 1:**

The main objective of this study as it pertains to Theme 1 is to describe and quantify the large-scale (hemispheric/synoptic) physical factors associated with the 1999-2005 Canadian Prairie drought. A detailed research plan has been formulated and the various data sets required for the analyses have been obtained. This includes:

1. Identification and acquisition of relevant data (1948 to 2005):
    - Monthly geopotential height data at the 1000mb, 850mb, 700mb, 500mb, and 200mb levels. Data have been acquired from the NCEP/NCAR and ERA40 reanalysis products.
    - Monthly gridded global sea-surface temperature (SST) data. Data have been acquired from the Reynolds and Hadley data sets.
    - Northern Hemisphere monthly soil moisture anomaly data: Data have been acquired from the Climate Prediction Center, LDAS, and NARR.
    - Relevant teleconnection indices: These include ENSO, PDO, PNA, AMO, AO, NAO, and QBO. Data have been acquired from the University of Washington.
    - Monthly gridded SPI and PDSI values for the Canadian Prairies.
  2. Quantification and analysis of data:
    - Monthly and seasonal anomalies of the various atmospheric, oceanic, and soil moisture data sets have been calculated based on the 1961-90 normal period.
    - Work has been initiated to compare the various aforementioned soil moisture data sets for consistency over the Prairie region.
- Future work will:
- Establish relationships between the various atmospheric, oceanic, and soil moisture parameters with observed surface conditions (i.e. SPI and PDSI values) over the Canadian Prairies during the period of record. Methods will include contemporaneous and lagged correlation and multiple regression analysis.

- Determine whether these relationships existed during the 1999-2005 drought. Exact statistical methods are to be determined.
- Assess the persistence of various atmospheric, oceanic, and land surface variables during the 1999-2005 drought.

**Theme 2:**

Following the quantification of the large-scale physical factors associated with the 1999-2005 Canadian Prairie drought, the main objective as it pertains to Theme 2 is to determine how these factors interacted with respect to the initiation, persistence, and termination of this drought. This will include collaboration with other researchers of the Network who are examining atmospheric physical processes and feedbacks at smaller spatial scales (e.g., John Gyakum, Kit Szeto, Ron Stewart, Geoff Strong). A better overall depiction of the physical features of this drought at a variety of scales will be provided thus, aiding in the better understanding of the processes and feedbacks acting on these scales.

**Theme 3:**

Not Applicable

**1.2 What contributions have you made, if any, to the unfunded themes of DRI through support in kind.**

*Theme 4: Compare the similarities and differences of the recent drought to previous droughts over this region and those in other regions, in the context of climate variability and change.*

Through in-kind research funds from Environment Canada, an analysis was carried out that compared the 2001/2002 Canadian Prairie drought to those that occurred during the instrumental period of record. Results were published in a journal manuscript: Bonsal, B.R. and M. Regier. 2007. Historical comparison of the 2001/2002 drought in the Canadian Prairies. *Climate Research*, **33**, 229-242.

*Theme 5: Apply our progress to address critical issues of importance to society.*  
None

**1.3 Describe your plans for research during the coming year and the following year and outline how the expected results will support the deliverables and goals of DRI.**

Future work will:

- Establish relationships between the various atmospheric, oceanic, and soil moisture parameters with observed surface conditions (i.e. SPI and PDSI values) over the Canadian Prairies during the period of record. Methods will include contemporaneous and lagged correlation and multiple regression analysis.
- Determine whether these relationships existed during the 1999-2005 drought. Exact statistical methods are to be determined.
- Assess the persistence of various atmospheric, oceanic, and land surface variables during the 1999-2005 drought.

This research supports Theme 1 (quantification of the physical features of the recent drought) in that it describes and quantifies the large-scale (hemispheric/synoptic) physical factors associated with the 1999-2005 Canadian Prairie drought.

It also supports Theme 2 (improving the understanding of the processes and feedbacks governing the formation, evolution, cessation and structure of the drought) by integrating the aforementioned Theme 1 results with other DRI researchers to provide a better overall

depiction of the physical features of this drought at a variety of scales and thus, aid in the better understanding of the processes and feedbacks acting on these scales.

## **2.0 Dissemination**

- 2.1. Provide information on dissemination of the research results (publications, including journal names and whether refereed), conference contributions, seminars, workshops or videos, websites or other methods of transferring the results.**

Bonsal, B.R. and M. Regier. 2007. Historical comparison of the 2001/2002 drought in the Canadian Prairies. *Climate Research*, **33**, 229-242.

Bonsal B.R., ***Droughts in Canada: An Overview***. Paper presentation at the Annual CMOS/CGU Meeting, May 28 – Jun 1, 2007, St. John's, NL.