Satellite Data for Regional Climate Studies

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Goals

A. In order to understand the processes that resulted in the recent prairie drought it is useful to characterize the atmospheric conditions associated with the drought and to compare them with conditions in non-drought years. We will concentrate on cloud properties.

B. To develop data sets from satellite observations that can be used to evaluate the planned CCCma and CCRM simulations.

Why look at cloud properties?

- Clouds obviously are directly implicated in drought through their relationship with precipitation.
- Clouds have an important impact on the local energy budget, on evaporation, and indirectly impact on precipitation.

Why assemble satellite data sets to evaluate the models?

- We are going to be using these models to advance our understanding of the prairie drought and so we must have confidence in the models.
- Even if a model simulates certain aspects of the drought well, we have to be comfortable that it is doing so for the right reason.
- Even though a model may have been carefully evaluated for a particular region or globally does not mean that it will equally valid in another specific region.

Cloud Properties

- Parameters
  - Cloud cover
  - Cloud Optical Thickness
  - Cloud Height

? Data Source
  - International Satellite Cloud Climatology Project

Model Evaluation

- Parameters

  Cloud Cover

  Distribution of Outgoing Solar Radiation

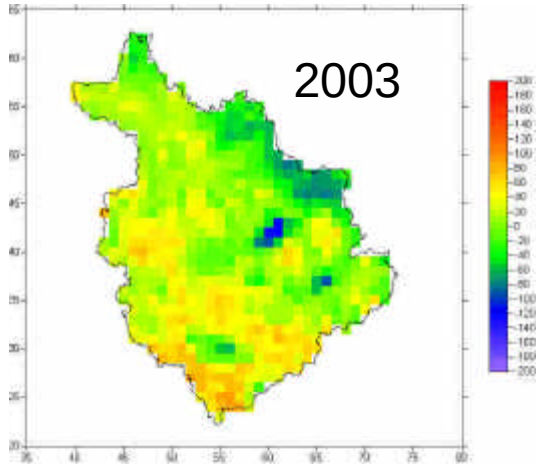
  Distribution of Solar Flux Absorbed at the Surface

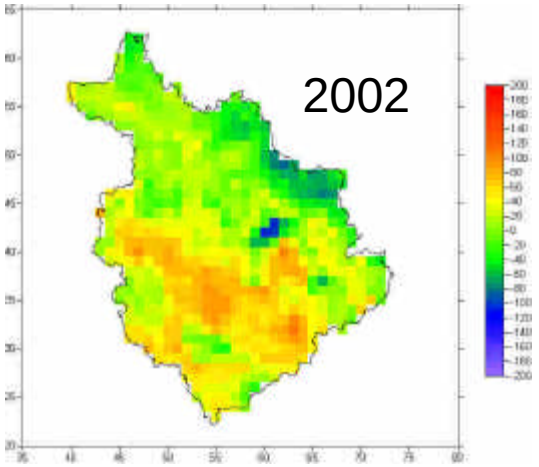
  Outgoing Longwave Radiation

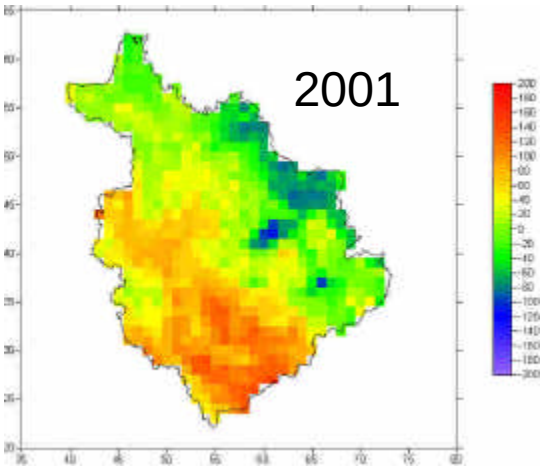
? Data sources

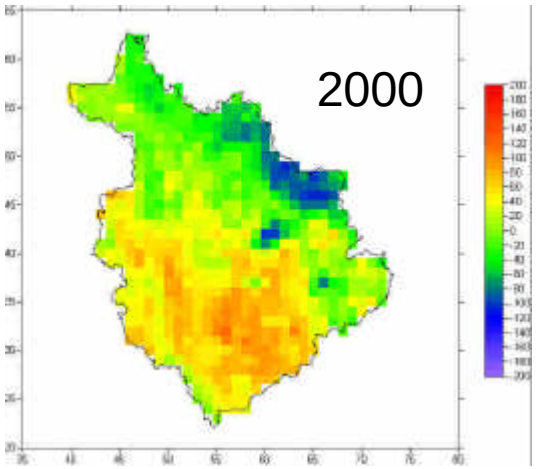
  CERES, AVHRR, GOES, MODIS,

TOA Solar Flux Differences (CCRM – $CERES_{terra}$) March at 1900 UTC

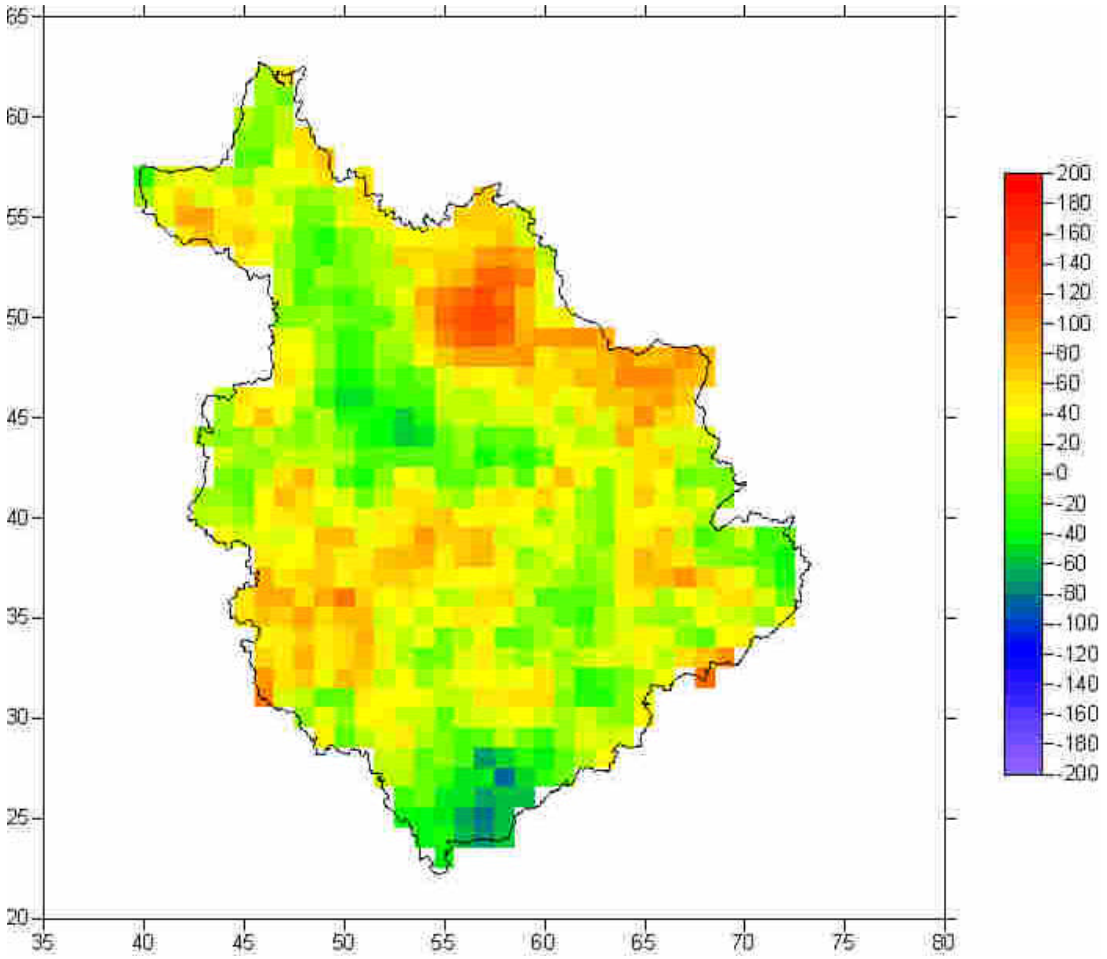




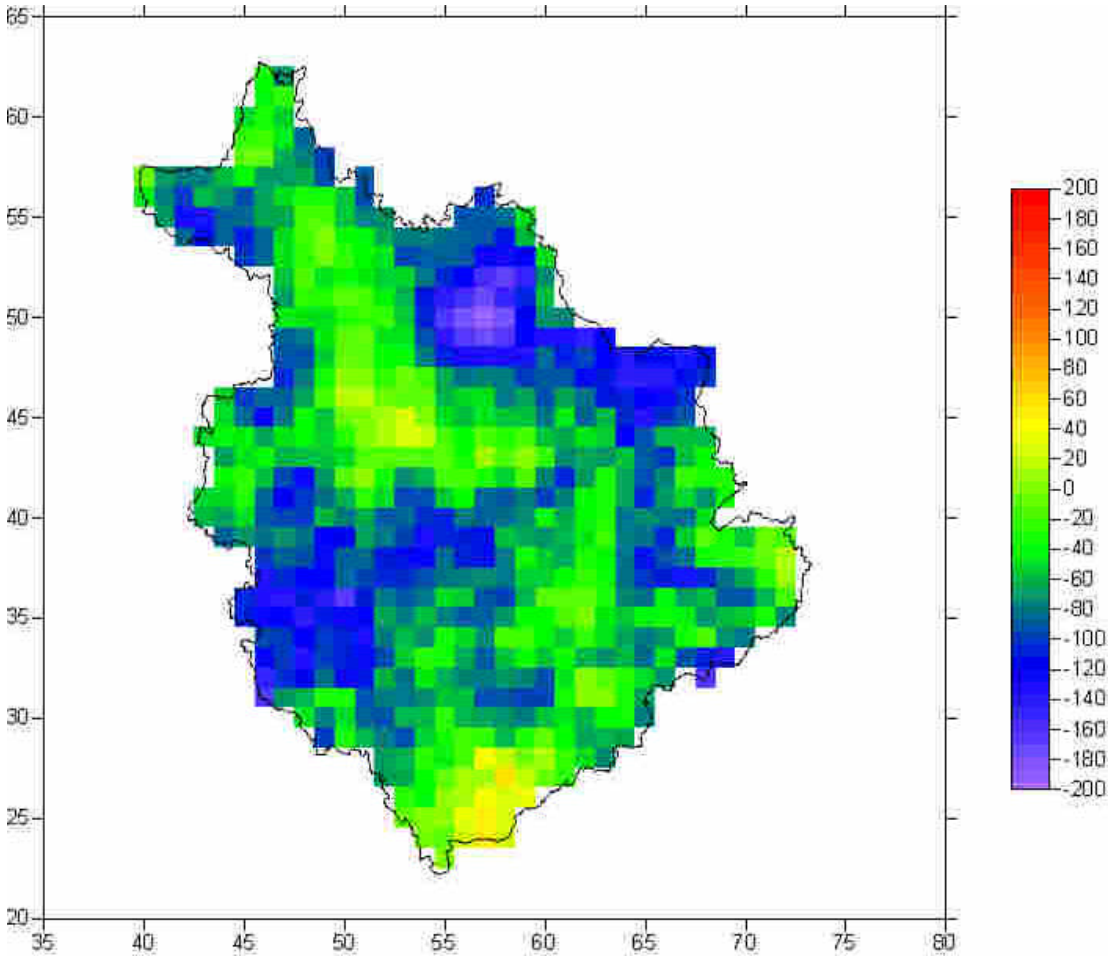




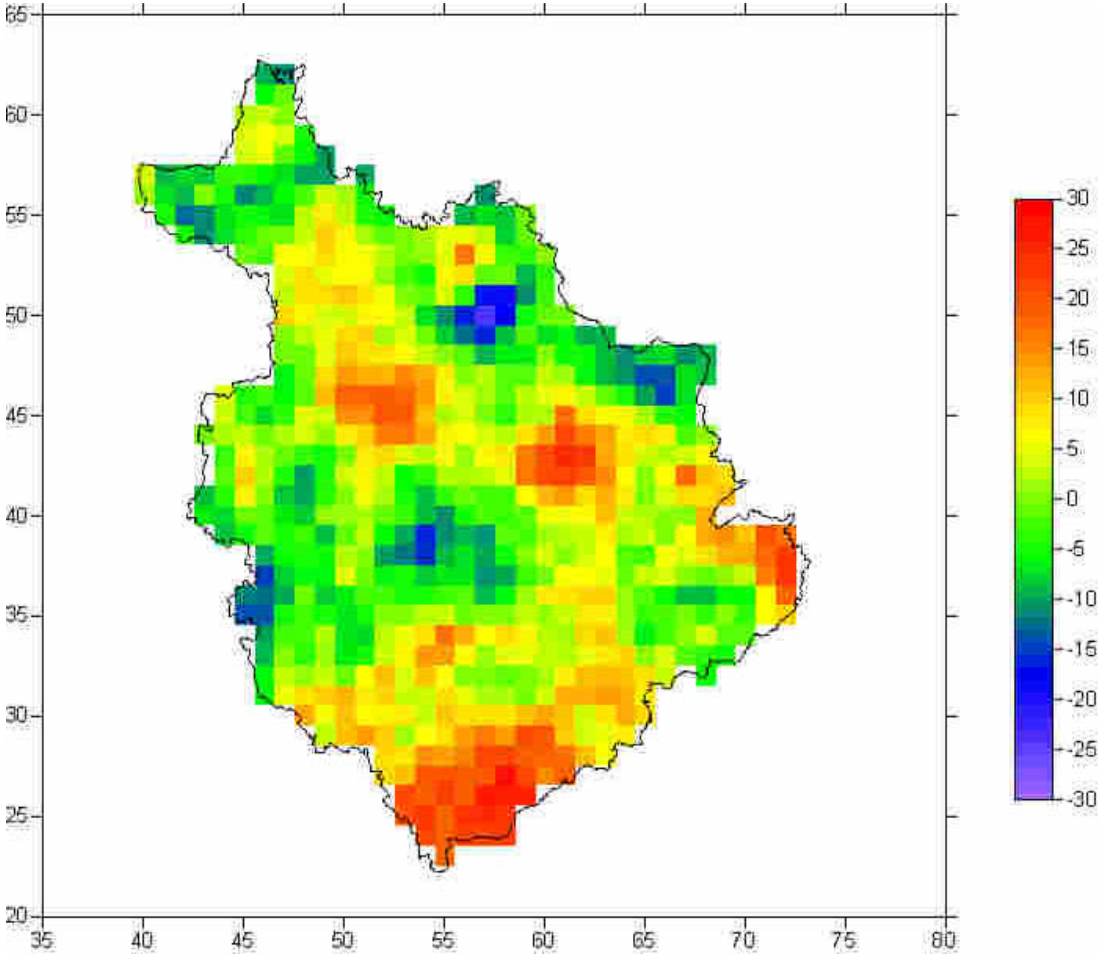
Model – Satellite Differences in TOA Solar Flux July 2001



Model – Satellite Differences in Solar Flux Absorbed at Surface, July 2001



Model – Satellite Differences in OLR, July 2001



Impact of Aerosols

- Were aerosol optical depths unusually large during the drought?
- If so, what was their impact on the radiation budget?
- What can we include about the impact of higher aerosol optical depths on precipitation formation (modelling and/or observational studies?)

Contributions to Themes

- Cloud characterization clearly contributes to Theme 1: “Quantification of the physical features of the recent Prairie drought”.
- The retrievals of solar radiation fluxes absorbed at the surface will contribute to the study of the energy fluxes at the surface, another aspect of Theme 1.
- The aerosol studies will contribute to Theme 1 in terms of quantification and Theme 2 when applied to particular convective and regional-scale cases.

Contributions to Themes (cont)

- The satellite flux studies will contribute to Theme 3 by helping to evaluate the models that are being used to simulate the droughts.