CCRS data and models in support of drought studies

Shusen Wang,
Yi Luo,
Yan Yang,
Alexander Trishchenko

Canada Centre for Remote Sensing

CANADA'S **NATURAL RESOURCES**
NOW AND FOR THE **FUTURE**
nrcan.gc.ca

Natural Resources
Canada

Ressources naturelles
Canada

Canada

Satellite Climate Data Records (SCDR)

Goal: to produce long-term consistent satellite based time series of terrestrial variables for climate change and natural resources related studies.

- Surface Albedo/BRDF

- Land cover/vegetation type: moderate resolution, high resolution

- Leaf Area Index

- fAPAR - Fraction of Absorbed Photosynthetically Active Radiation

- Snow/cover fraction

- Glaciers/Ice Caps: area/elevation change- limited coverage

- Satellite-based Essential Climate Variables (ECVs) identified by GCOS /UNFCCC;

- Data and information for impact analyses of Climate (e.g., drought);

- Input for climate and ecosystem modelling (e.g., land surface scheme; carbon and water budget).

Satellite Climate Data Records (SCDR)

This goal is achieved by combining time series of observations from multi-satellite sensors including AVHRR, MODIS, VGT, MERIS, etc., using consistent technology.

CCRS MODIS data:

- generated from L1B swath data (no ISIN proj.);
- cover entire country;
- available since 03/2000 @ 10-day intervals;
- 7 spectral bands (B1-B7);
- 250m spatial resolution (downscaled B3-B7);
- better cloud screening;
- improved atmospheric correction;
- New BRDF model (separate snow & snow-free pixels);
- Improved retrievals of snow fraction and snow grain size;
- Improved parameterization of hot-spot (POLDER-based);
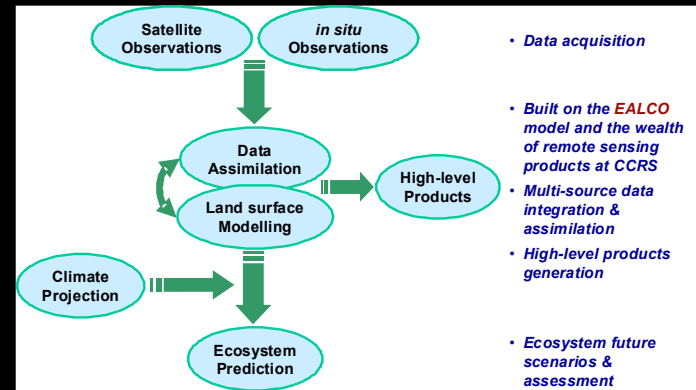- Include deep water and sea-ice.

CCRS AVHRR data:

- cover entire country;
- 5 or 6 channel radiometer (optical and thermal);
- 1km spatial resolution (B1,B2,B3A);
- available since 1979 (complete record since 1985);
- reprocessed to address consistency issue among different sensors;
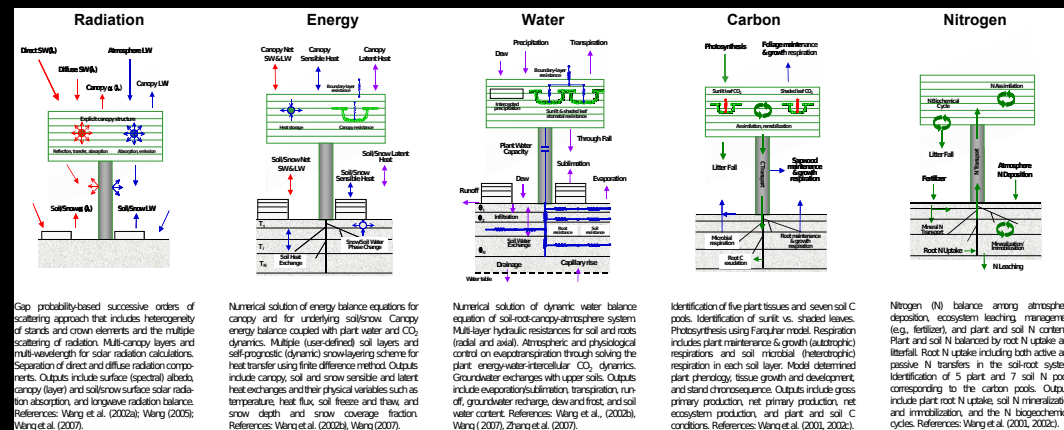- improved geo-reference accuracy.

EO-Based model and high-level products

- **Surface/canopy radiation budget (fAPAR, net radiation, etc.);**

- **Surface/ecosystem carbon cycle (GPP, NPP, NEP, etc.);**

- **Surface water cycle (ET, runoff, groundwater recharge, soil moisture, SWE, plant water content, etc.);**

- **Surface energy balance (sensible & latent heat fluxes, soil/snow temperatures, freeze/thaw, etc.);**

- **Nitrogen cycles (mineralization, immobilization, plant N uptake, leaching, etc.);**

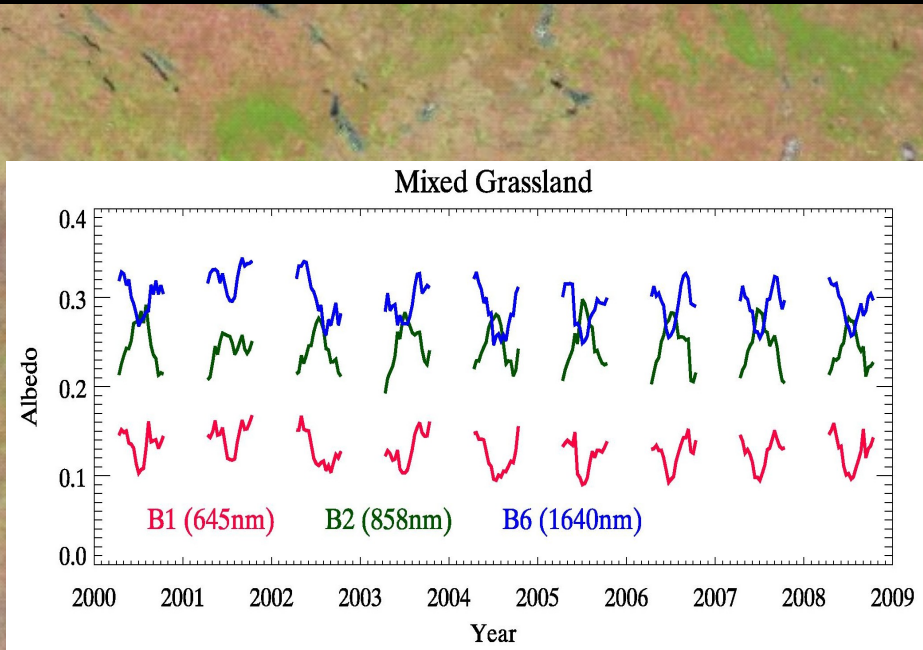- **Plant growth & development (phenology, biomass change, etc.).**

EO Data Assimilation System

- *Data acquisition*
- *Built on the EALCO model and the wealth of remote sensing products at CCRS*
- *Multi-source data integration & assimilation*
- *High-level products generation*
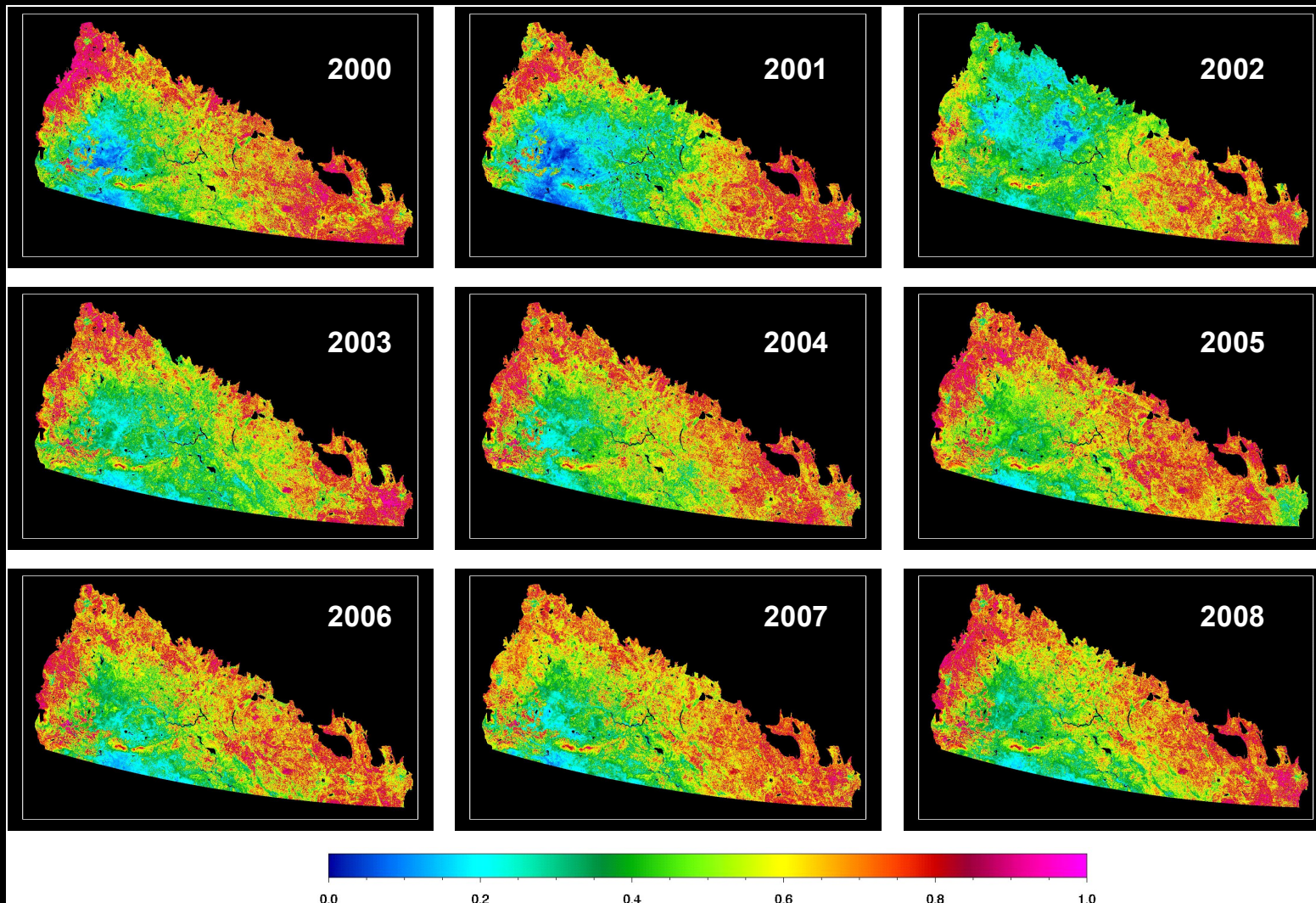- *Ecosystem future scenarios & assessment*

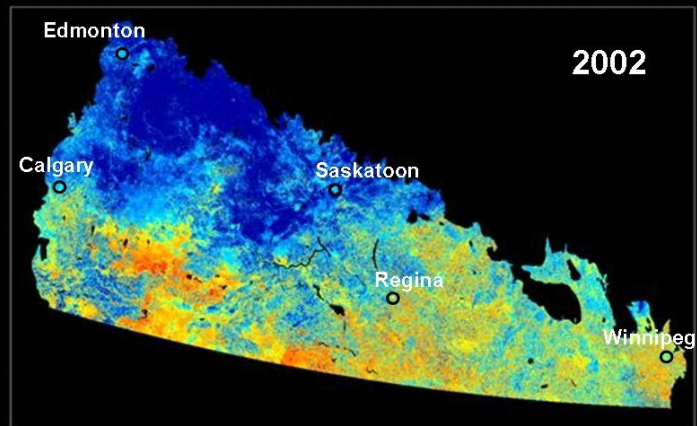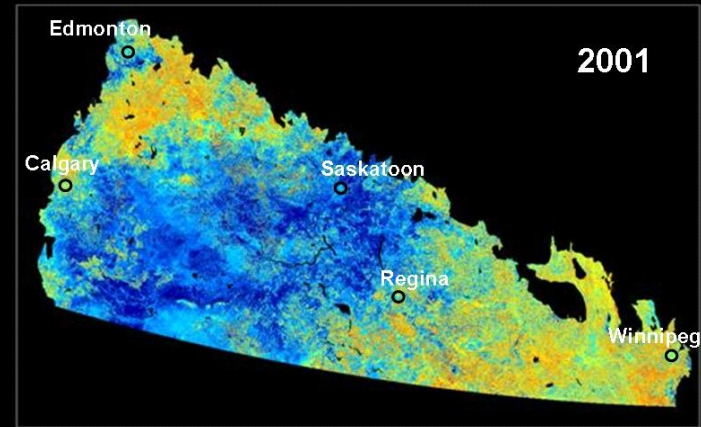## Ecological Assimilation of Land and Climate Observations – The EALCO model

albedo

Mixed Grassland

B1 (645nm) B2 (858nm) B6 (1640nm)

Aspen Parkland

B1 (645nm) B2 (858nm) B6 (1640nm)

June 2002, MODIS

June 2006, MODIS
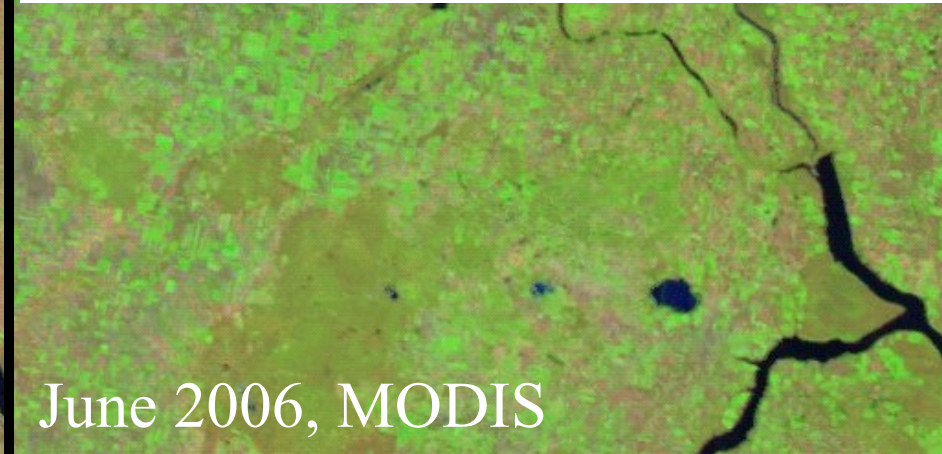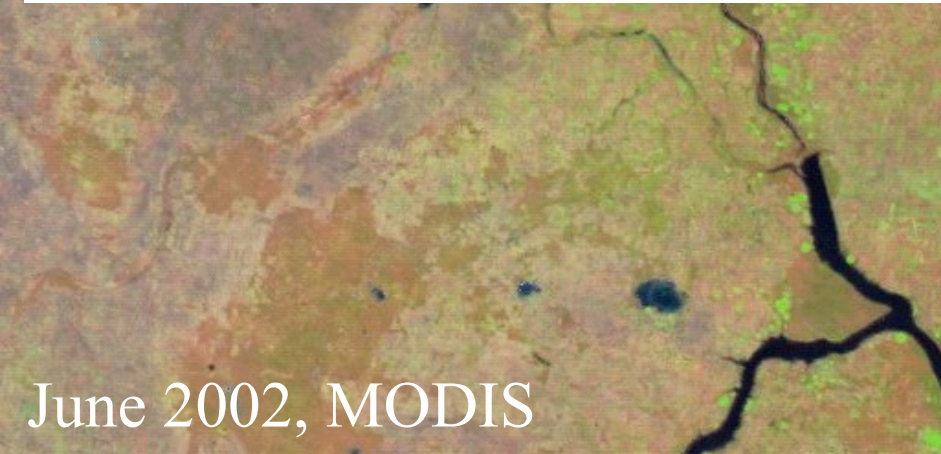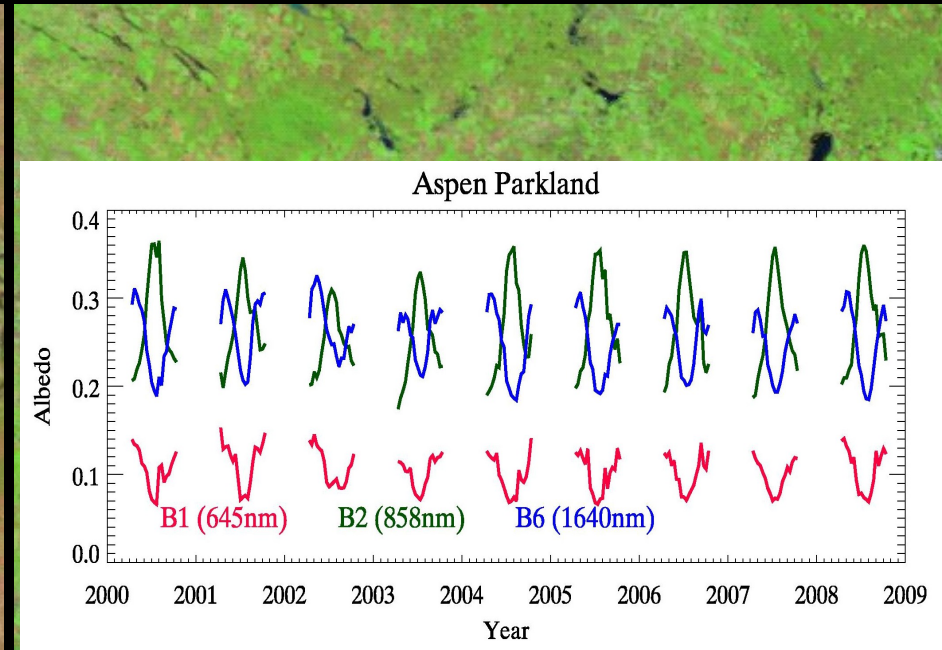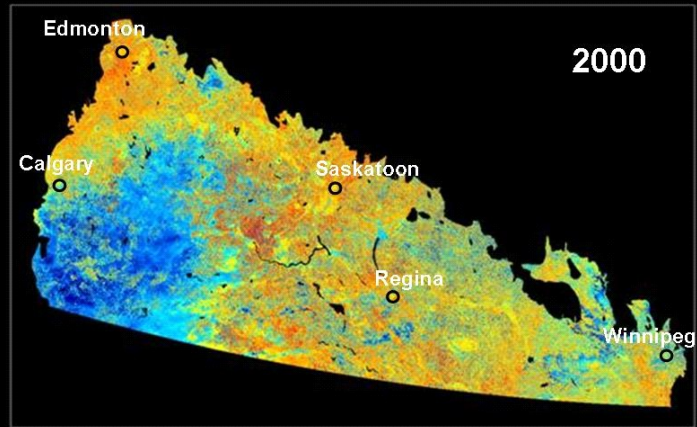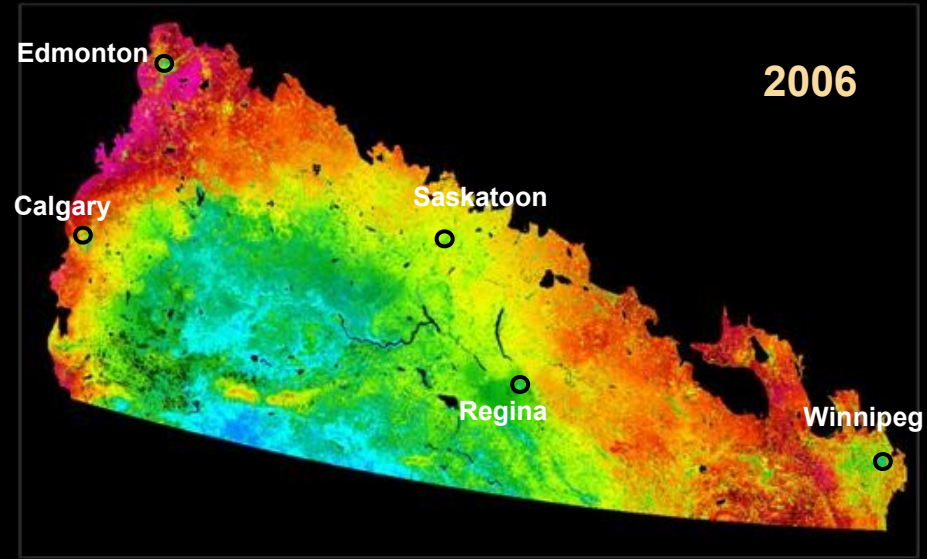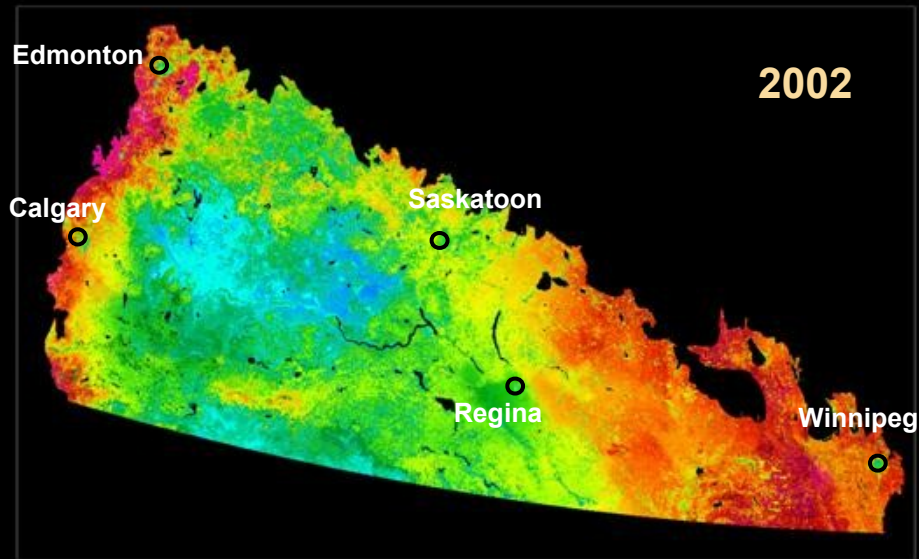
fAPAR in Canadian prairie 2000-2008

NDVI anomaly, Canadian Prairie, 2000-2003
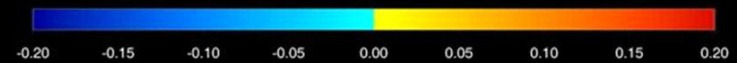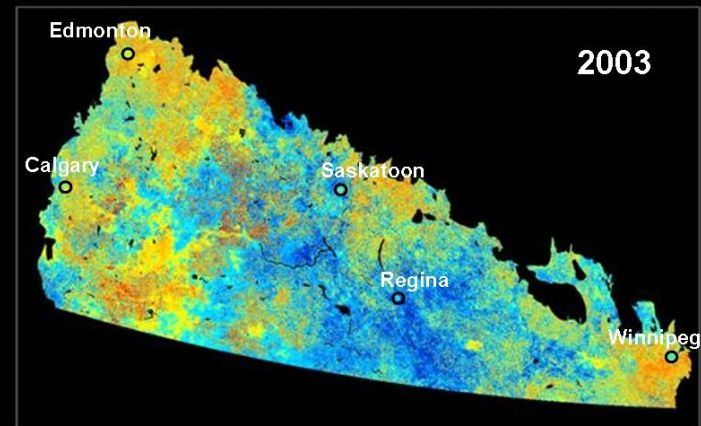
Plant productivity, 2002 vs. 2006

Drought and plant stomatal response

Ball et al., 1987   Leuning, 1995   Wang, S. et al., 2009