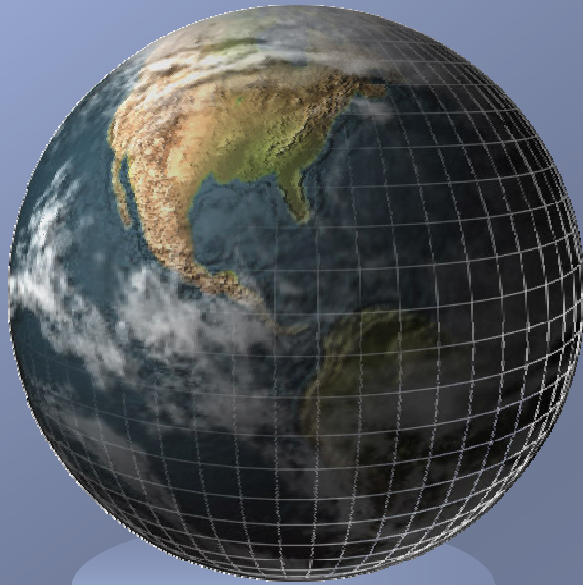


Drought Research Initiative (DRI) Theme 1



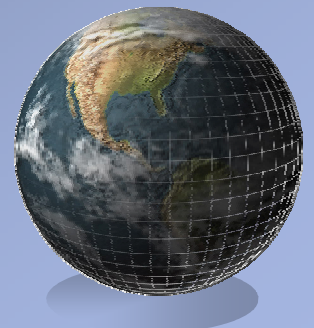
John Hanesiak
Centre for Earth Observation Science
(CEOS)

University of Manitoba

2nd DRI Network Meeting
Winnipeg, MB Jan. 11-13, 2007

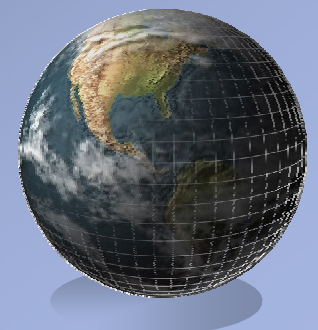
Outline

- Review of Theme 1 objectives
- Progress in each objective
- Data Management
- Where to from here in the next year



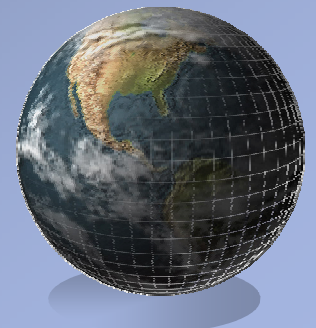
Research Questions of Theme 1

- Q1: What variables are required to quantify the characteristics of the recent drought?
- Q2: What data sources and model outputs are available for quantifying these parameters?
- Q3: How do we characterize and “close the budgets” of water and energy over the Prairies?



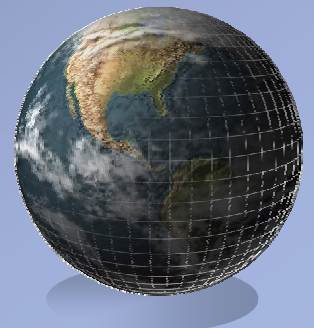
Q1: Variables Needed / Gathered

- 3-D assessment of the atmosphere
 - Temperature, humidity, wind, clouds, geopotential height, precipitation amount
- Surface exchange with atmosphere
 - Latent and sensible heat fluxes
- State of the surface
 - Vegetative state of crop & boreal zones in terms of moisture stress
 - Soil moisture at various levels
 - Snow cover (SWE)
 - Stream network, river flows, lake levels, wetlands, and depressions storage
 - Sea surface temperatures
- Ground water
 - Individual aquifers
 - Water table and well logs of other areas



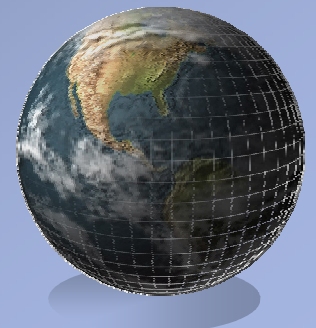
Q2: Data Sources

- Surface meteorological observations
- Upper air
- Model analyses
- Model forecasts
- Satellite datasets
- Lightning data
- Radar data
- Drought indices
- Forest conditions
- Crop conditions
- Flux & special tower observations



Characterization to Date

- Atmosphere:
 - Surface Precipitation (PFRA / stations / CanGrid) (several people)
 - Hemispheric/synoptic links to drought via dynamics (Gyakum) and teleconnections (Bonsal/Shabbar)
 - T and RH trends and spatial variations (Strong)
 - Vertical estimates of condensate, moisture across various regions / features / events (Stewart)
 - Spatial / temporal variations of ET in ag zone (Hanesiak, Bullock)
 - Occurrence of convection in relation to wet/dry areas (Hanesiak)
 - Source regions of local vs transported moisture (Gyakum)

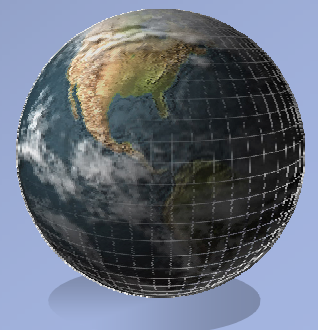


Characterization to Date

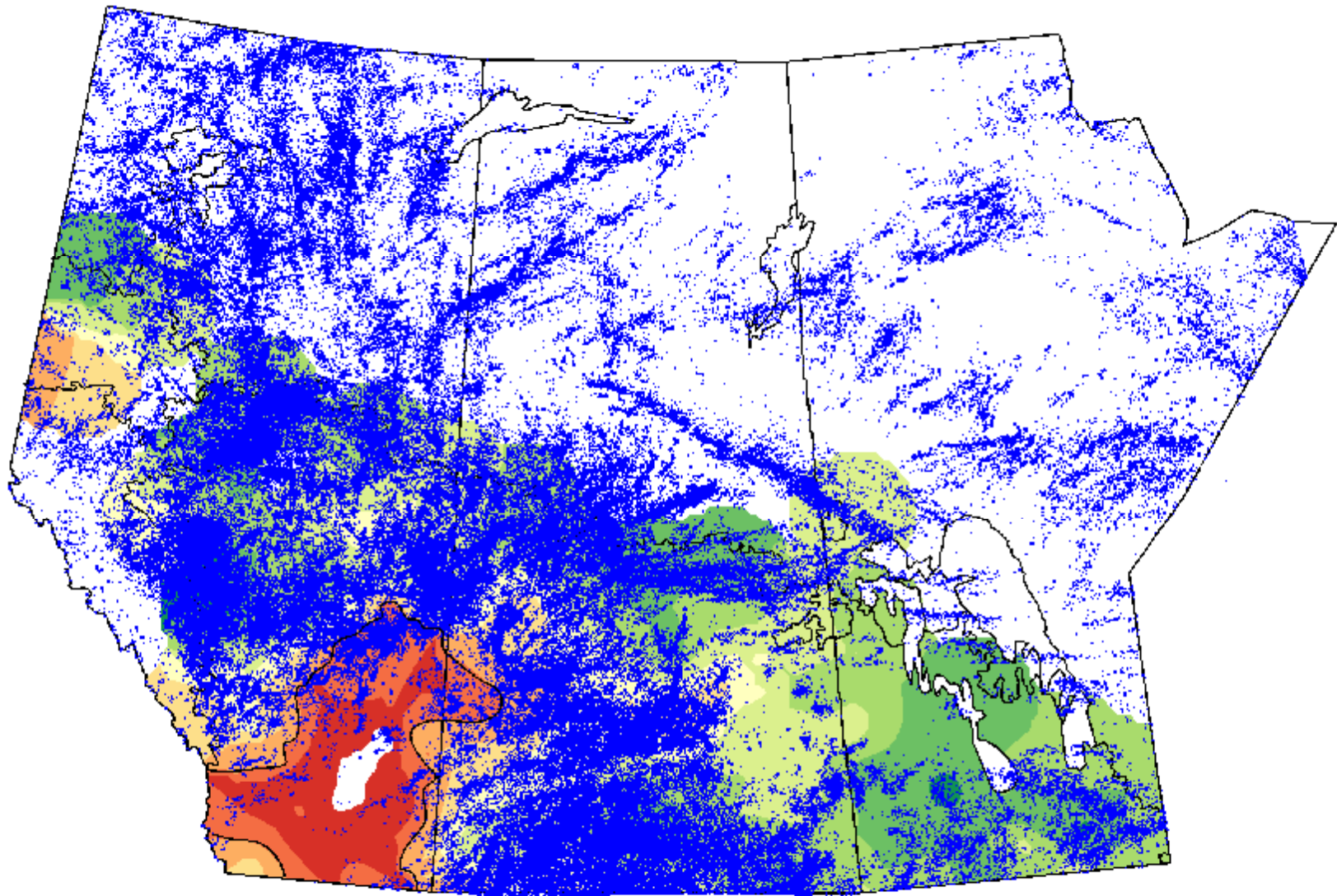
- Surface:
 - Quantifying spatial / temporal soil moisture, ET, compiling PFRA data (in ag zone only!) (Hanesiak)
 - Spatial / temporal soil moisture and drought indices (CRCM and observations) (Lin)
 - Mapping of ag drought intensity and crop conditions with meteorological data (Bullock)
 - Examination of several drought indices, temporal/spatial extent of drought (Wheaton)
 - Snow cover analysis (model and observations) (Hanesiak)
 - Wetland & lake monitoring & water storage (Van der Kamp)
 - SRB hydrology and ET (Pomeroy, Pietroniro)
- Sub-surface:
 - Alberta ground water temporal measurements in association with surface met data (Hayashi)
 - ADA ground water and surface flow observation / modeling (Woodbury, Snelgrove)



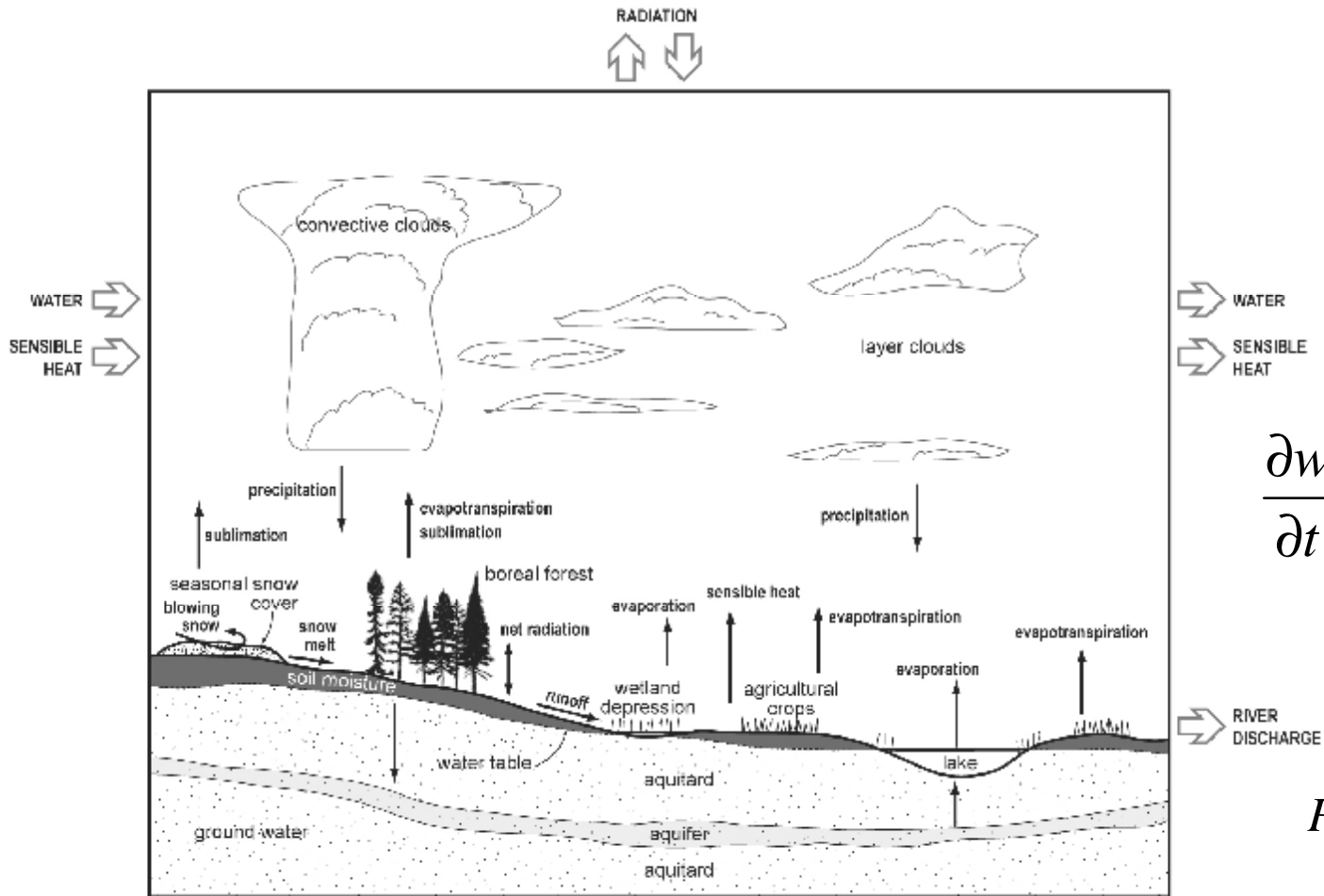
2000 RzSm animation



July 2000 Soil Moisture and Lightning

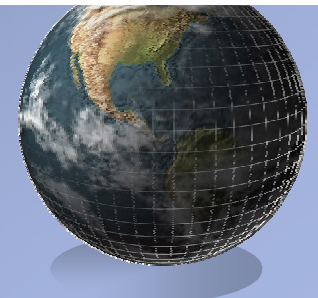


Q3: Water and Energy Budgets



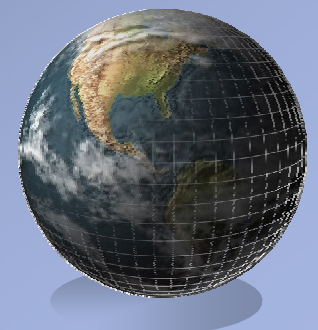
$$\frac{\partial w}{\partial t} + C = E - P$$

$$P - E + R_{in} - R_{out} = \frac{\partial S}{\partial t}$$

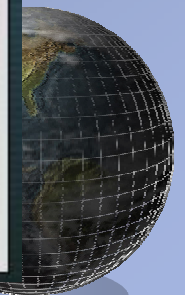
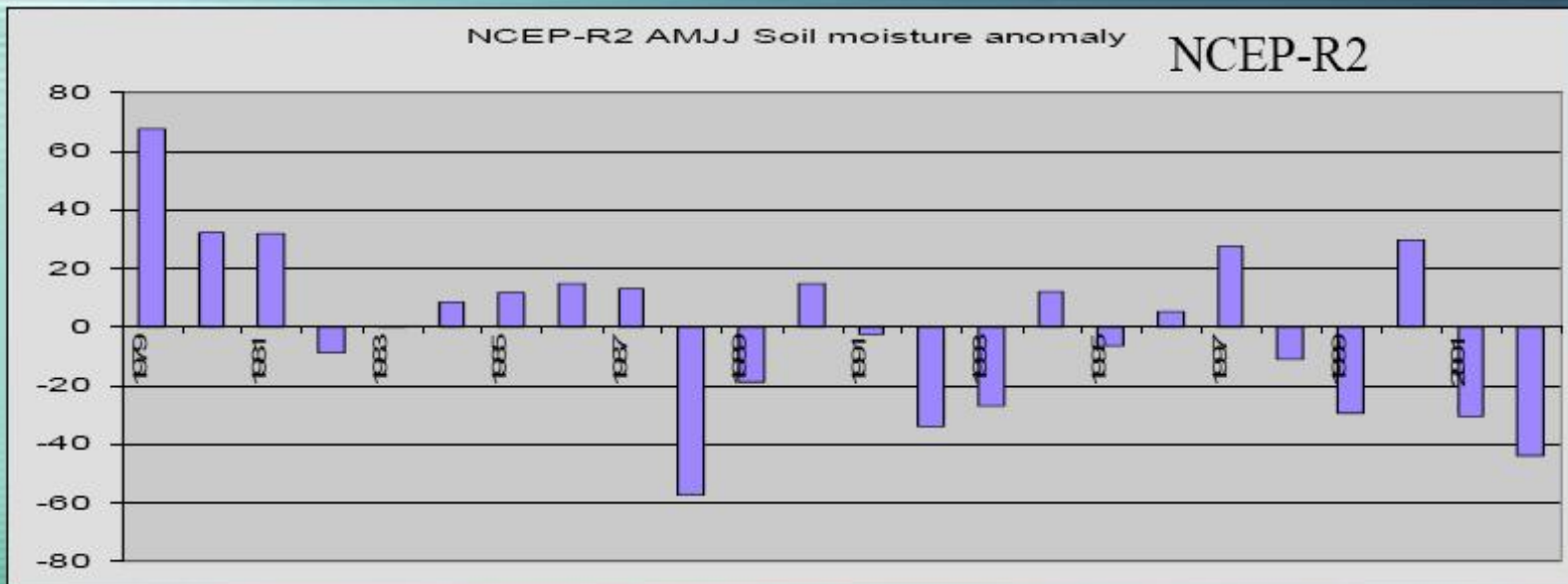
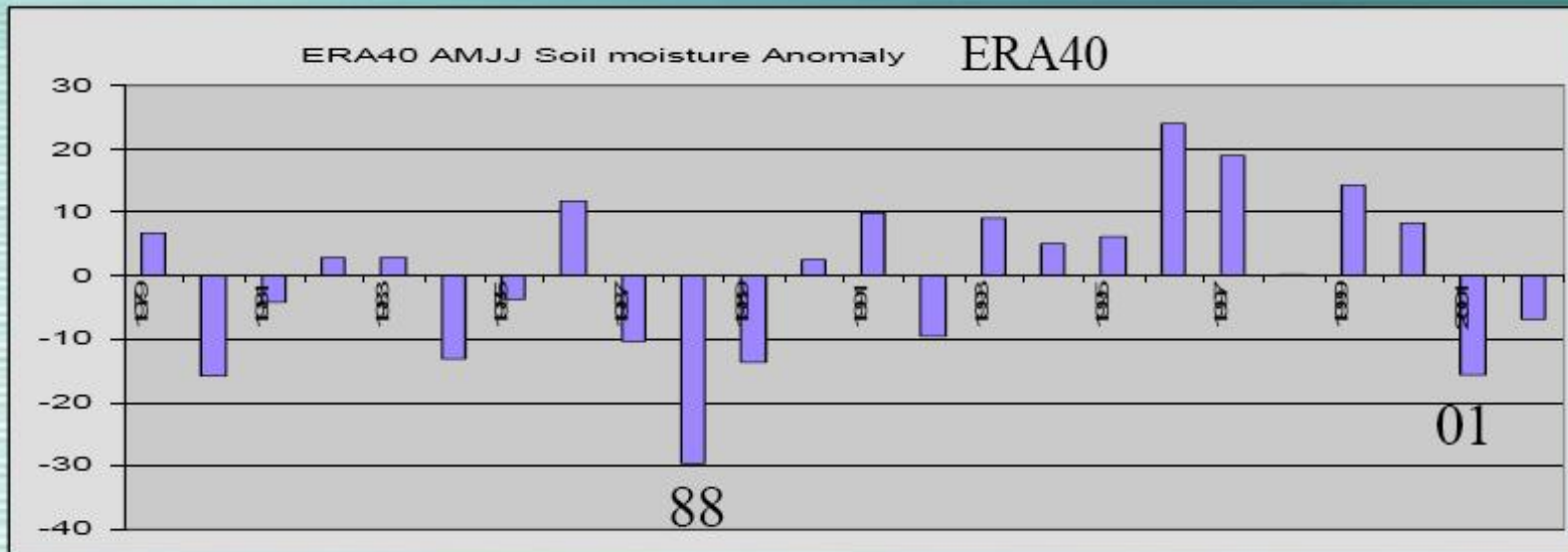


Progress to Date

- GPS S. Alberta network (2003-05) diurnal trends (Strong)
- SRB water and energy budgets (Szeto, Stewart, Pomeroy, Pietroniro)
- Source regions of water vapor (Gyakum, Stewart)
- Vertical flows of energy and water in Alberta using obs and modeling (Hayashi)

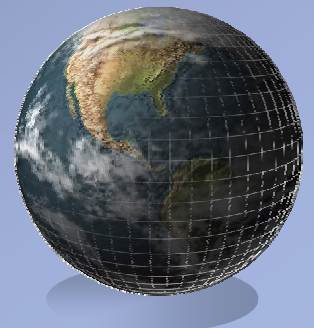


Variability among Budgets Estimatescont....AMJJ Soil Moisture anomalies (mm)



Theme 1 Deliverables

- Collective datasets archived on CDs characterizing the drought
- Outreach to user community and stakeholders through workshops and conferences
- Synthesis article on drought characterization and flow of water and energy



Future Theme 1 Work

- Transition to cross-cutting themes
- Characterization of Drought
 - compilation of drought spatial and temporal aspects (atmospheric, surface hydrology and ground water)
 - Google Earth applications on integration
- Water & Energy Budgets
 - summary of water budget for region
- Data Management
 - Matt / Patrice
- Gaps in Theme 1?

