

GEO and its Water Cycle Societal Benefit Area (SBA)

Rick Lawford
CEOP Meeting

Melbourne, Australia
August, 2009

G8 HOKKAIDO TOYAKO SUMMIT



ecō

The volume of the image files is controlled
to reduce electricity consumption.

th Observation System of Systems (GEOSS), ... in
priority areas, inter alia, climate change and
water resources management, by strengthening
observation, prediction and data sharing. ...
capacity building for developing countries ...
interoperability and linkage ...

To establish GEOSS, the Global Earth Observation System of Systems...

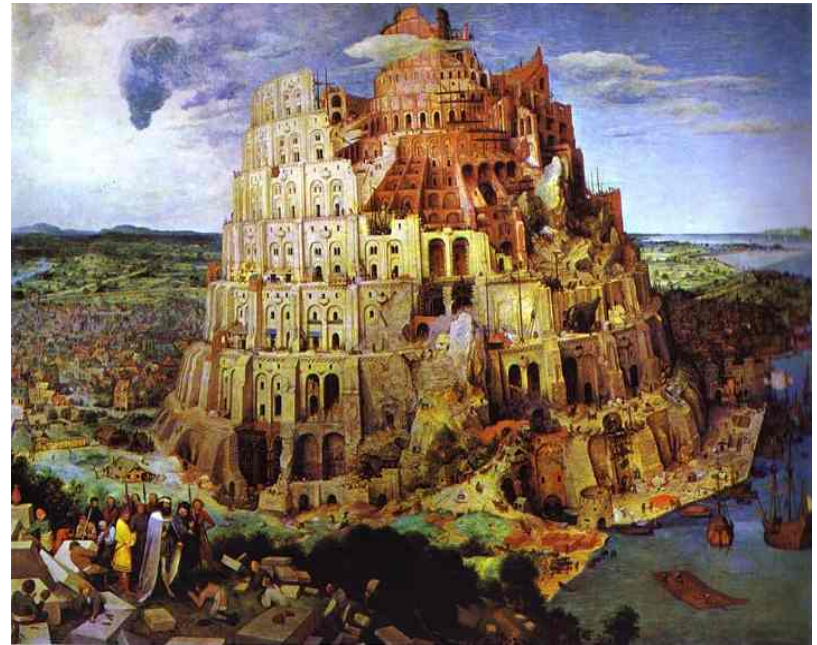
- **Coordinate and Sustain Observation Systems**
- **Provide Easier & More Open Data Access**
- **Foster Use through Science, Applications and Capacity Building**

... to answer Society's need for informed decision making

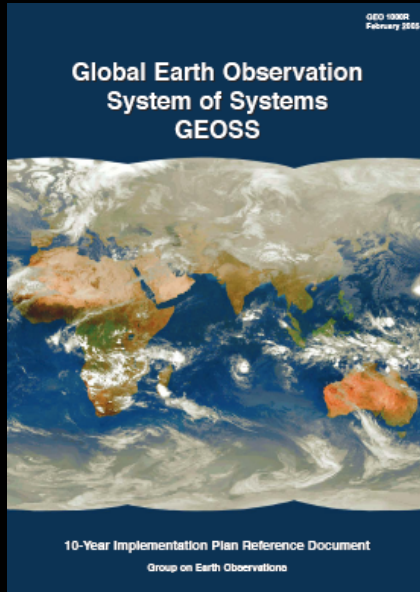
GEO Data Sharing Principles

GOAL: Full and Open Exchange of Data Recognizing Relevant International Instruments and National Policies and Legislation

- Data and Products at Minimum Time delay and Minimum Cost
- Free of Charge or Cost of Reproduction for Research and Education



The Primary Framework: GEOSS: A Global, Coordinated, Comprehensive and Sustained System of Observing Systems



Relevant Facts:

- Involves ~80 nations and ~50 international organizations who have agreed to work together to build the GEOSS.
- Coordinated by the Group on Earth Observations (GEO) which implements the GEOSS work plan through the best efforts of its community.

Targets



Tasks



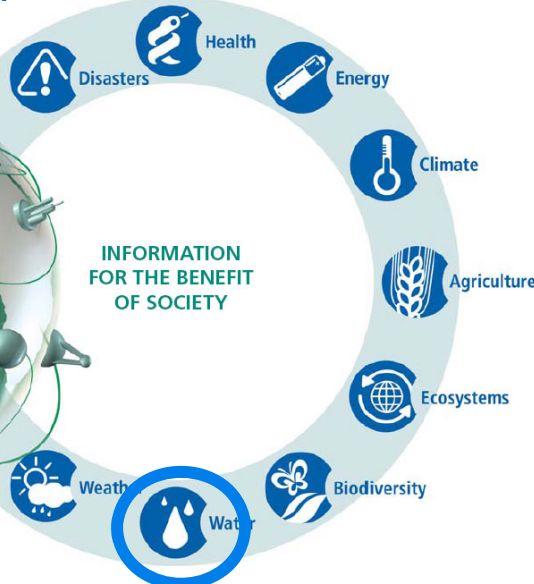
Sub Tasks

The Water Target

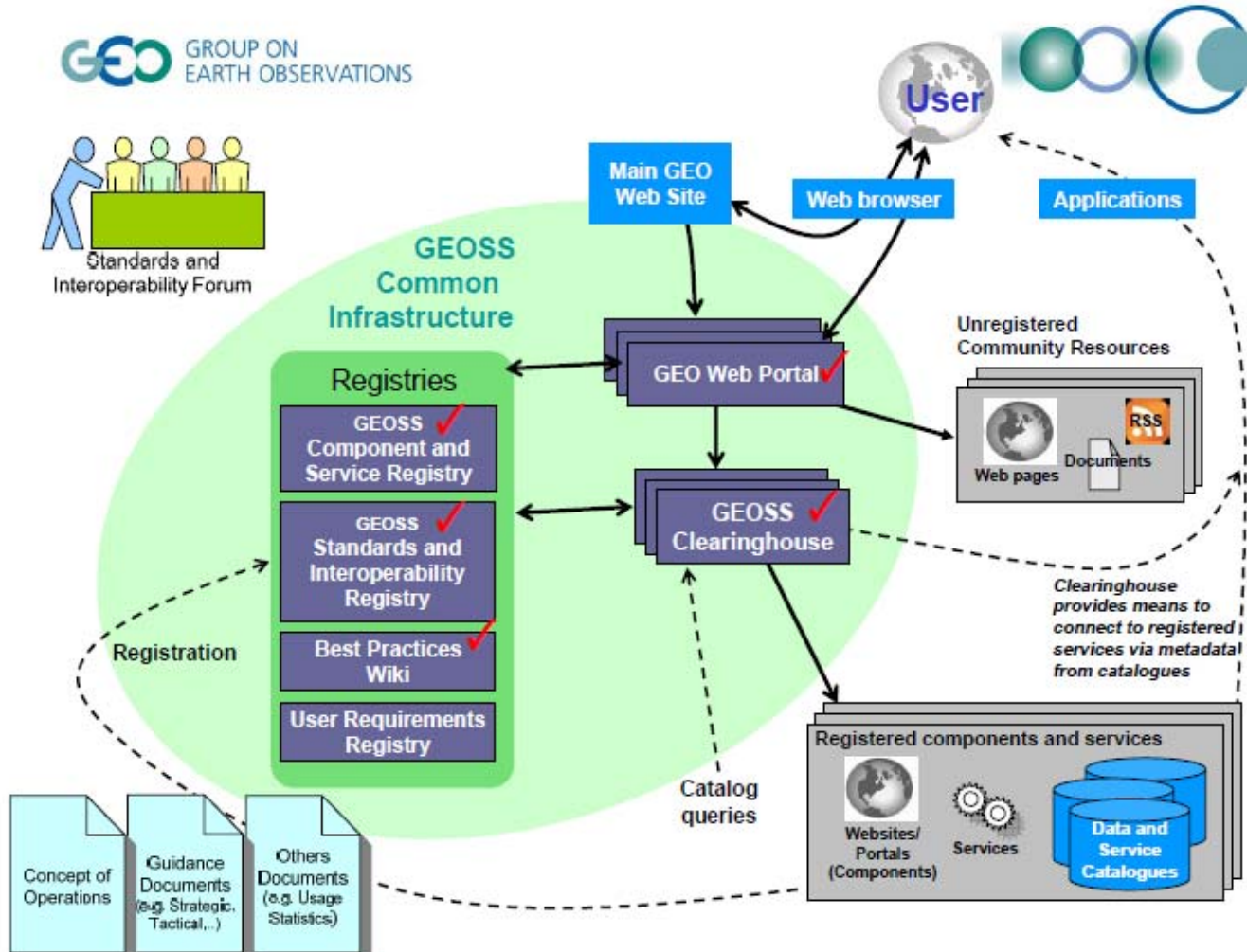
By 2015, produce comprehensive sets of data, information products and services to support decision-making for efficient management of the world's water resources, based on coordinated, sustained observations of the water cycle on multiple scales.

THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS

INFORMATION FOR THE BENEFIT OF SOCIETY



GEO is seeking groups to register data sets and data systems in its registries and portal.





Provide Feedback to GEO

BROWSE RESOURCES BY SOCIAL BENEFIT AREAS

- DISASTERS
- HEALTH
- ENERGY
- CLIMATE
- WATER
- WEATHER
- ECOSYSTEMS
- AGRICULTURE
- BIODIVERSITY

GEOS CLEARINGHOUSE

Europe Asia

South America Africa Africa

The planet's 2nd largest continent, includes (53) individual countries. It contains the Nile River, the world's longest, and the massive Sahara Desert, the world's largest. The continent's (highest point) is Mt. Kilimanjaro, in Tanzania, 19,341ft (5,895m), while the (lowest point) is Lac' Assal in the small country of Djibouti, 512 ft (156m) below sea level.

BREAKING NEWS

HURRICANES IN HAITI, EXTENSION OF CALL

On 11 September charter activation 220 was extended for a third time to cover the area hit successively by Hurricane Gustav, Hurricane Hanna, and Hurricane Ike, as the city of Gonaives remained under water and media reported about 500 dead.



More...

WELCOME TO GEOPORTAL

The GEOportal provides an entry point to access remote sensing, geospatial static and in-city data.

Primary Water Cycle Sub-Tasks under WA-08-01.

WA-08-01: Integrated Products for Water Resource Management and Research
Improvements and expansion of in-situ networks, combined with new and existing satellite missions and emerging assimilation and prediction capabilities, are opening the door to a new era in global water-cycle management.

a) Soil Moisture

b) Runoff

c) Groundwater

d) Precipitation

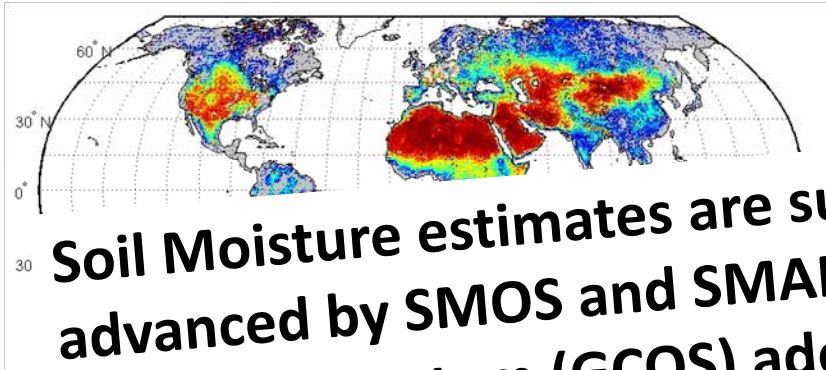
e) Water Cycle Data Integration

f) Pilot Projects for Improved Water Discovery and Quality Assessments

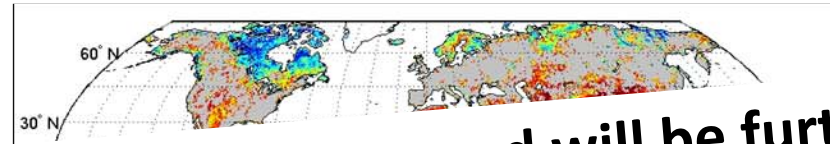
g) Global Water Quality Monitoring

BACKGROUND: SOIL MOISTURE PRODUCTS

SMMR, July 1980 (C-band)
(1978-1987)

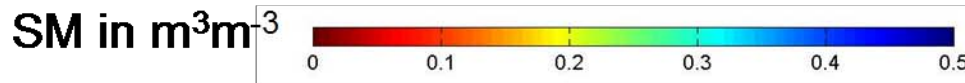
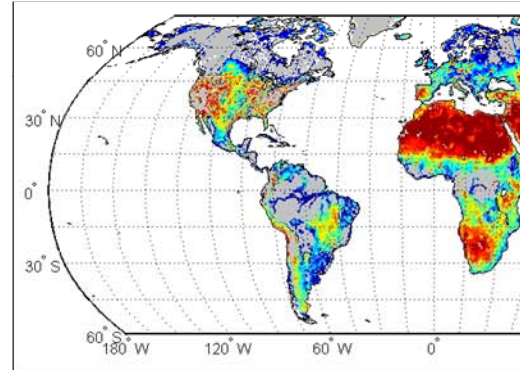
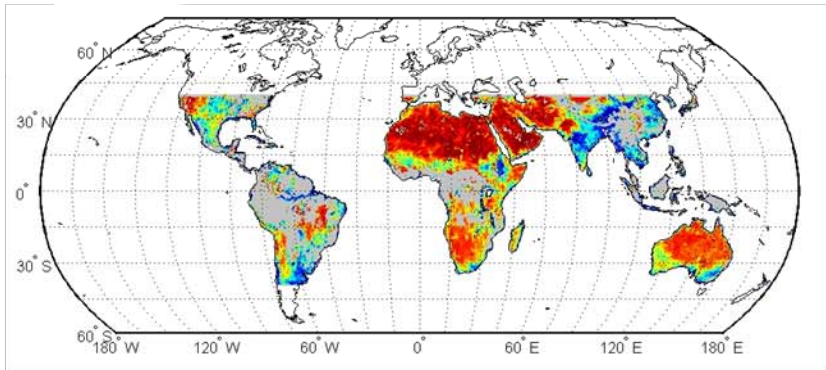


SSM/I, July 2004 (Ku-band)
(1987-Now)

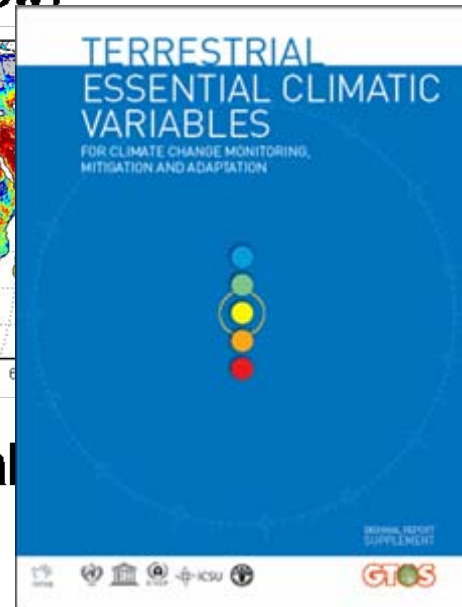


Soil Moisture estimates are surprisingly mature and will be further advanced by SMOS and SMAP. Recently the Global Climate Observing System (GCOS) adopted soil moisture as an Essential Climate Variable.

SMOS (C-band)
(2002-Now)



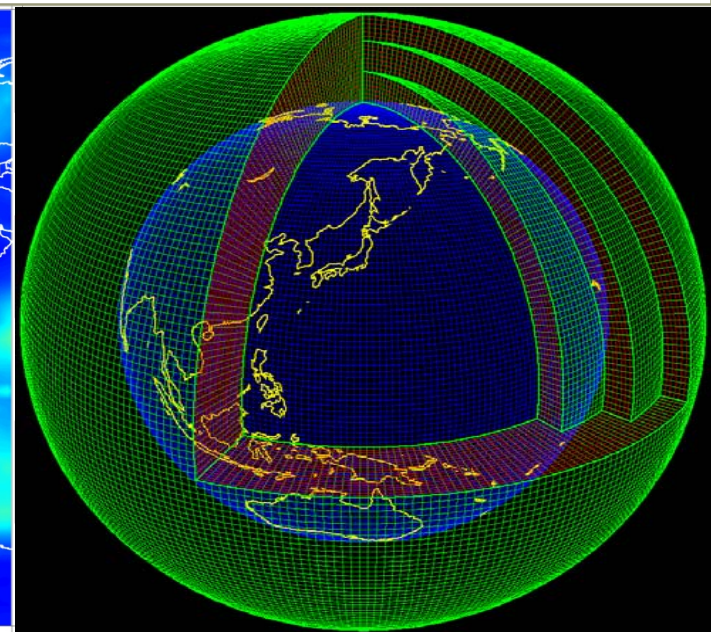
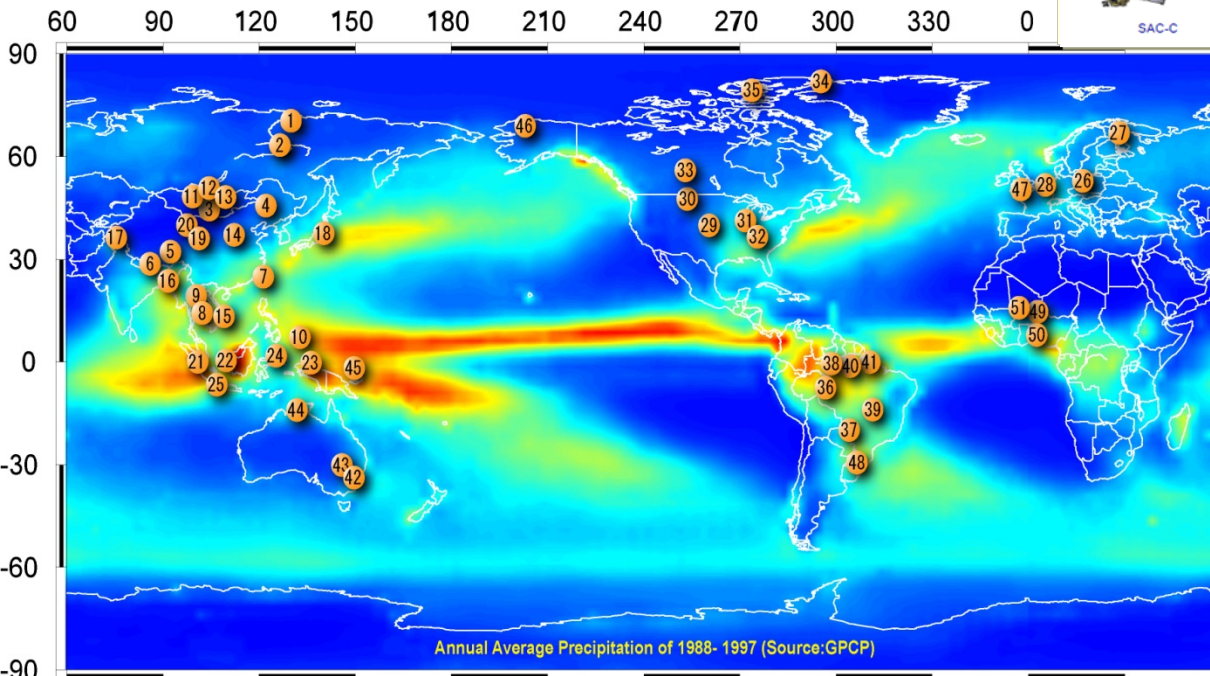
Owe et al





Coordinated Energy and Water Cycle Observations Project

Convergence of Observations *A Prototype of the Global Water Cycle Observation System of Systems*



WA-o6-02: Droughts, Floods and Water Resource Management

Address decision-making challenges related to the management of hydrometeorological extremes and the sustainable use of water.

a) Forecasting and Early Warning Systems for Droughts and Floods

b) Impacts from Drought

c) ACQWA (Assessing Climatic change and impacts on the Quantity and quality of WAter)

d) Drought Monitoring



Dr UGHT.

Everyone is Affected

Early Warning Systems for Droughts and Floods

Improve forecasting methods for extreme events (floods, droughts) for use by hydrological services throughout the world, to help bridge the gap between research and user communities. Expand upon regional initiatives such as the North American Drought Monitor (NADM) to establish a Global Drought Early Warning Systems(s) (GDEWS).

cecon.edu/~justin/research/project_global_monitor/

North American Drought Monitor

January 2006

Released: Thursday, February 16, 2006

<http://www.ncdc.noaa.gov/nadm.html>

Analysts:

- Canada - Ted O'Brien*
Dwayne Chobanik**
Kieran Findlater
- Mexico - Miguel Cortez
- U.S.A. - Rich Tinker
Richard Heim

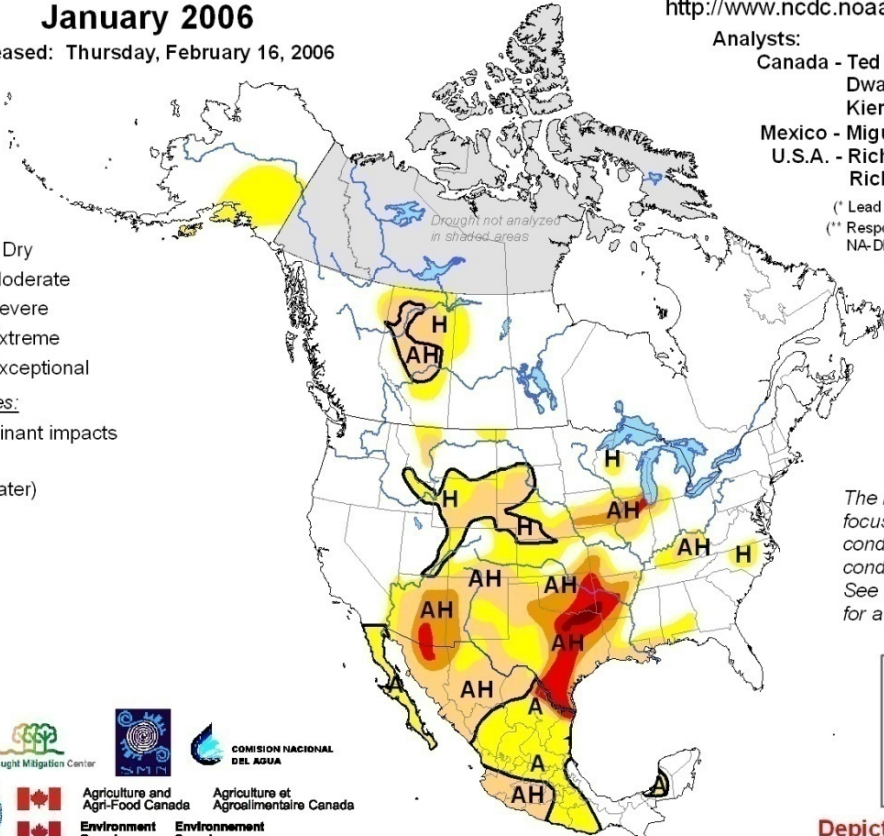
(* Lead author)
(** Responsible for assembling the NA-DM map)

Intensity:

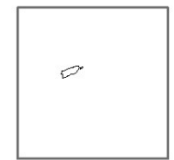
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

- ~ Delineates dominant impacts
- A = Agriculture
- H = Hydrological (Water)

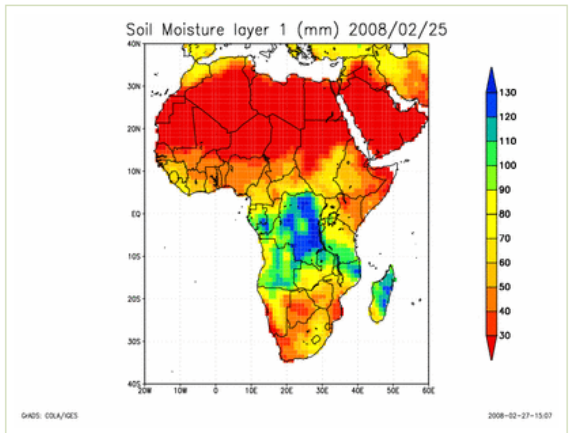


The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text for a general summary.

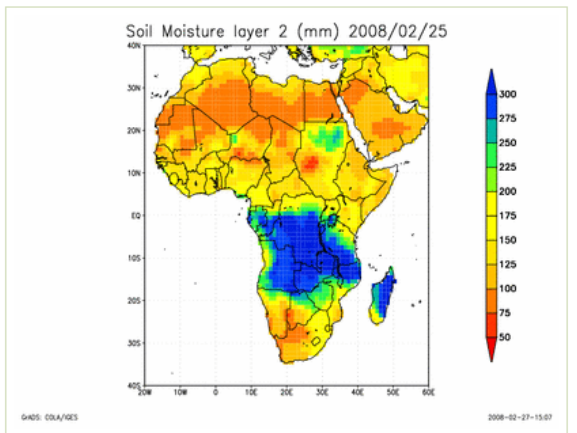


Depiction for Canada is Experimental

SOIL MOISTURE LAYER 1



SOIL MOISTURE LAYER 2



SOIL MOISTURE LAYER 3



WA-06-07: Capacity Building for Water Resource Management

Initiate capacity building programs in support of water management, to show the value of, and develop tools for, Earth observation data.

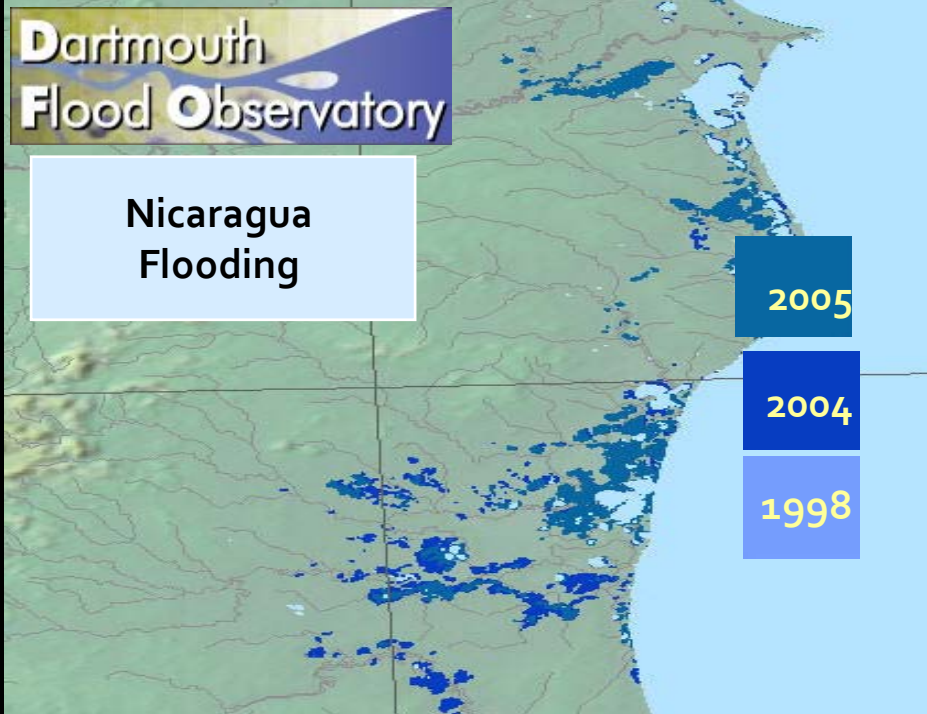
a) Latin America

b) Africa

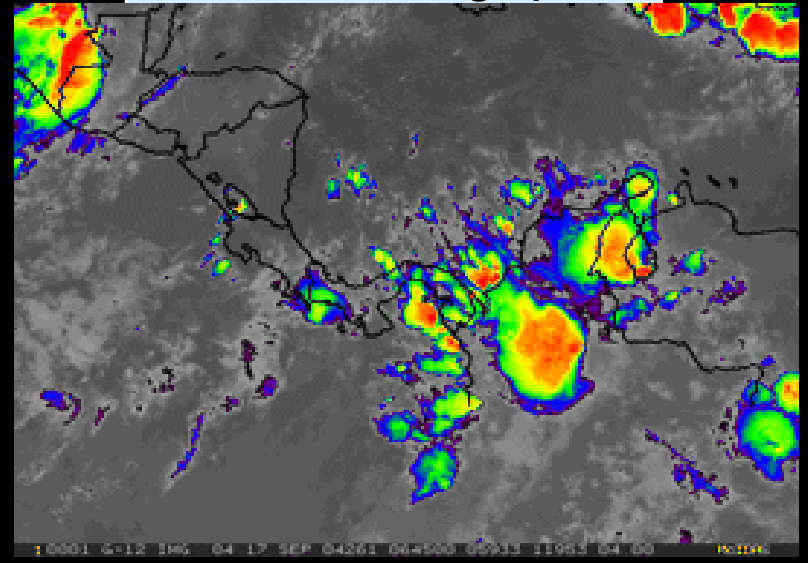
c) Asia

There are many opportunities for CEOP connections with these activities and they are strongly linked in functional ways

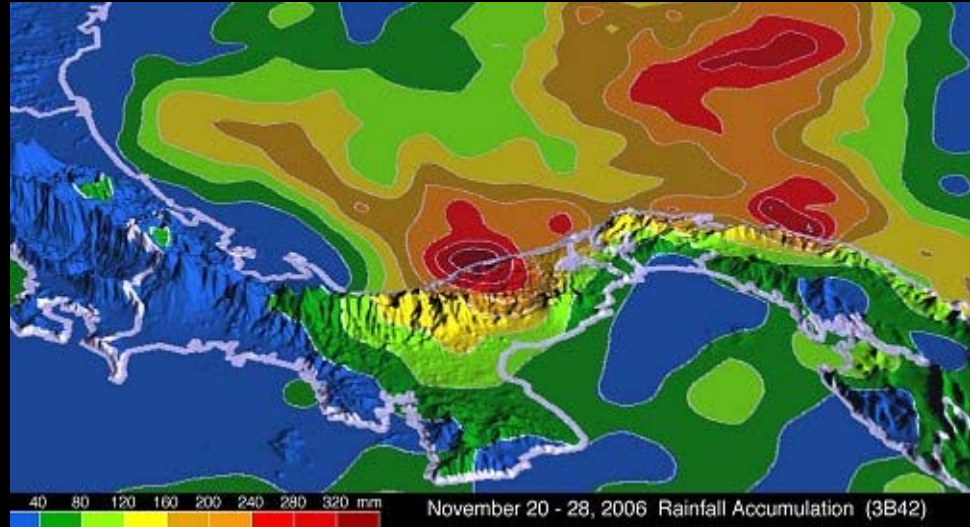
SERVIR: Floods



Panama City Floods of 17-18 September 2004
GOES IR imagery

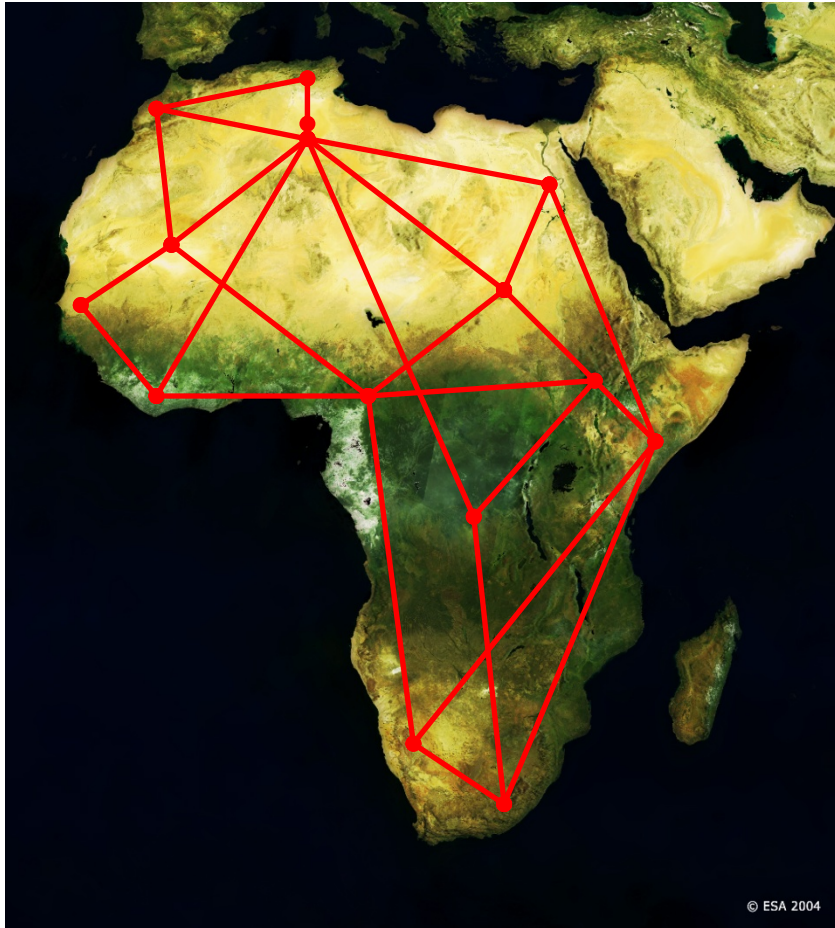


Through SERVIR the Panama National civil defense agency issued an advisory to two regions for evacuation. Accumulated rainfall during Panama floods as detected by the Tropical Rainfall Measuring Mission (TRMM) and included by SERVIR. *TRMM image courtesy Hal Pierce, Dr. Robert Adler/TRMM Project.*



TIGER Water Information & Knowledge Network

(After D. Fernandez)



TIGER involves more than 200 African experts (universities, technical centers, water authorities)

- Actions dedicated to:
 - Facilitate sharing of water knowledge, information and data;
 - Support the development of common water research programs;
 - Identify and promote best practices;

© ESA 2004

African Water Cycle Initiative Discussions (after T. Koike)

Maroc ●
•Data & information system for river management

Senegal ●
•GIS and urban flood management

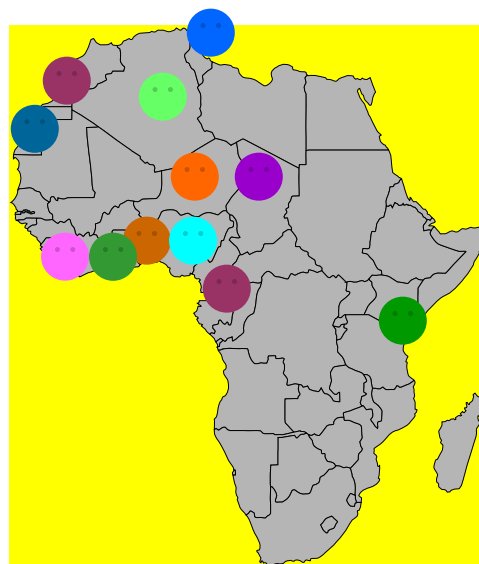
Cote d'Ivoire ●
•Lagoon environment

Ghana ●
•Volta-regional project

Benin ●
•PROJET OUEME2025
•Met service
•Realism of Water resources prediction

Nigeria ●
•Climate change & Moisture Availability

Algeria ●
• Data acquisition, planning, protection



Niger ●
•ACMAD, AGRHYMET

Tchad ●
•Lake Chad variability

Cameroun ●
•Climate Modification

Tunisia ●
•Water for agriculture
•Met service
•Data & Information system for water Res.
•Drought analysis
•Water pollution
•Sustainable water management
•Ground water & its salinization
•Water diversion management system
•Water balance

Kenya ●
•Downscaling of climate/Met info. for river management
•Flood management & mitigation

GEOSS Asian Water Cycle Initiative (AWCI)

19 Member Countries

18 River Basins for Initial Demonstration



A STRUCTURE TO IMPLEMENT THE WC COMMUNITY OF PRACTICE

(deployment)

- WaterNET
- Asian Water Cycle Init. (AWCI)
- TIGER

- Precipitation
- Soil moisture
- Runoff
- Water Quality
- Ground water
- CEOP
- E2E projects

Coordination
Coordination
international and national Bodies.
(e.g. IEEE Water Study)

(dissemination)

- Asian Capacity Building
- TIGER followon
- "Water" CB in the Americas

(deployment)

- WaterNET
- Asian Water Cycle Init. (AWCI)
- TIGER

- Precipitation
- Soil moisture
- Runoff
- Water Quality
- Ground water
- CEOP
- E2E projects

Coordination
by various international and national Bodies.
(e.g. IEEE Water Study)

(dissemination)

- Asian Capacity Building
- TIGER followon
- "Water" CB in the Americas

ADC

STC

UIC

CBC

GEO Task DA-09-02a will soon issue a Phase II survey form the will focus on Water cycle data centers.

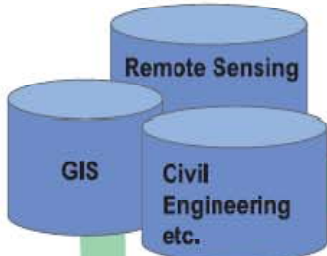
Phase I Results: Brief description of Data Storage Capabilities

	theme	storage	Data base
WDC Boulder	Glaciology	32TB(RAID)+ 40TB (MAID) 300TB(Tape Storage) +75 TB disk array	<ul style="list-style-type: none"> •Sybase Enterprise Server relational database •MySQL database server •Catalog metadata database
WDC Lanzhou	Glaciology & Geocryology	10TB (RAID)	
WDC Hamburg	Climate	Growth of DB system of 100 TB/year will increase to 1 PB/year after 2009	
GRDC: Germany	River Runoff	sufficient storage capabilities	commercial database
GOSIC NOAA/USA	Earth obs. data portal	No storage system but link function	
GIOVANI NASA/USA	Web-based application	20 TB	
GES-DISC NASA/USA	integration and analysis	500 TB Peak daily numbers:3.3 TB for processing 1.7 TB for archiving	
DIAS Japan	integration and analysis	700TB (disk)	
GENESI-DR ESA	e-science infrastructure		OGC Web <i>Services</i> , GridFTP, HTTPS, OPeNDAP, BitTorrent for file-based DRs.

Types of Data Users

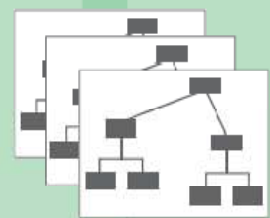
	Project Participants	Academic	Gvt Research	Gvt Operations	Commercial	Operators	Website Use	Data Base Downloads	Fully Open Access	App before access
NSIDC/ WDC Boulder	X	X	X	X	X		3.2M/y	7.2 million files/yr*	X	
WDC Lanzhou		X	X	X						X
WDC Hamburg		X	X							
GRDC Germany	X	X	X	X				120/y		X
GOSIC NOAA/NCDC/US	X	X	X	X	X			2500/d	X	
GIOVANI NASA/US		X	X	X	X		2000/m		X	
GES-DIS NASA/US		X	X	X	X		150K/m		X	
DIAS Japan	X	X								X
GENESI-DR ESA/EC	X	X	X	X		X		Restricted by policies		X

Technical Term Dictionary

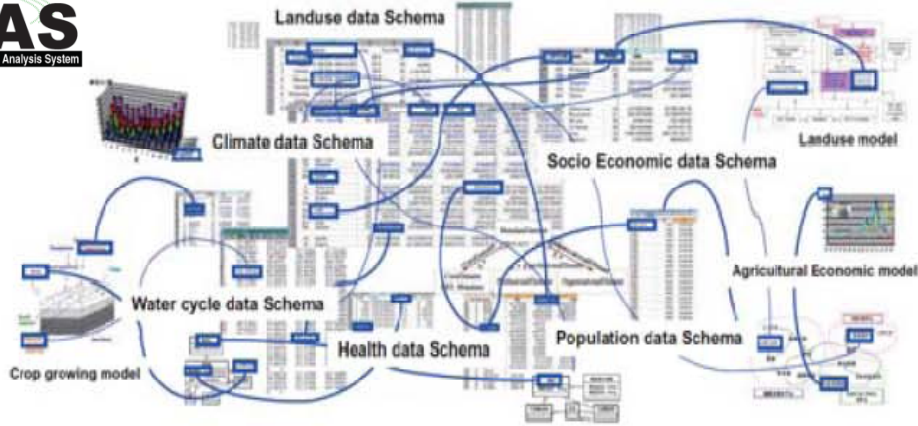


Reverse Dictionary

Data model Searching System

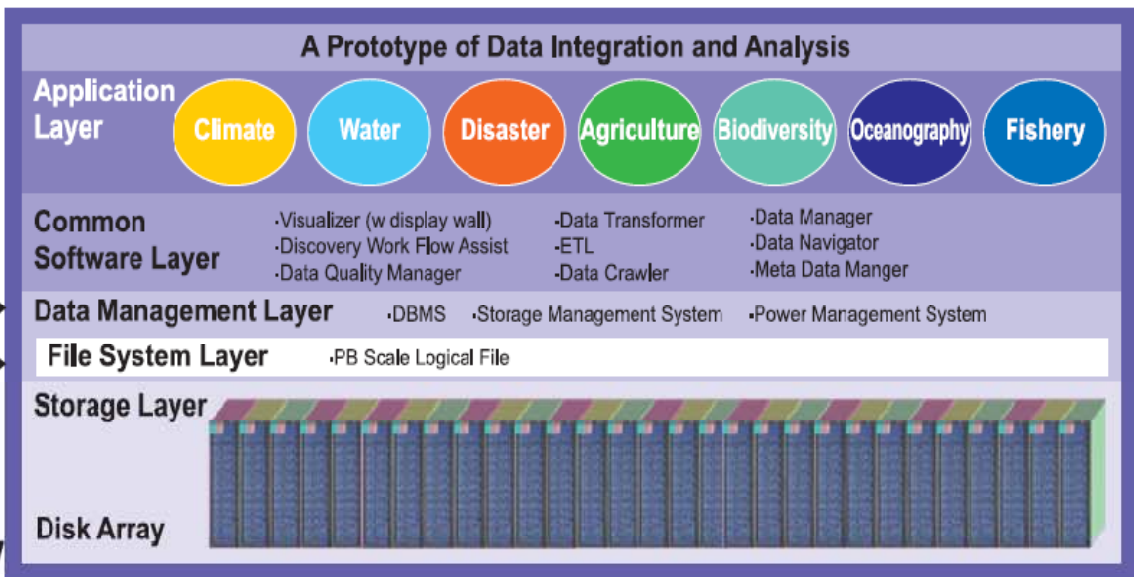


Hierarchical Diagram



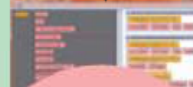
Geographical Dictionary

Extra Diversity and Complex Relativity of Data and Information



Data Related information Archive System

OWL Association/Link Knowledge



Database Across Searching System

Extra-Large Volume data from various data and information source



In-situ Observation



Citizen Observation



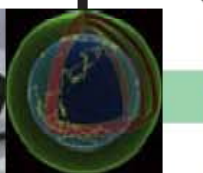
Oceanographic Observation



Satellite Observation



Weather and Climate Model



Operational Observation



Operational Information



Operational Information

Group on Earth Observations

Task US-06-01

Current & Future States of Critical Earth Observation Priorities

Critical Earth Observation Priorities		Currently Available	
		Yes	No
Available in Future	Planned	Good situation	In waiting
	No Plan	Possible crisis	Major gap

Group on Earth Observations

Task US-06-01

Sushel Unninayar has been leading a review on behalf of the Water Cycle Community of Practice.

UIC's Refined Process: Nine Steps

- The process lists the steps serially, yet some of them can be done in parallel.
- With some concurrent activities, this process spans approx. 10-12 months.
- Analyst and Advisory Group for each SBA will develop a detailed schedule

Step 1: UIC Members identify Advisory Groups and Analysts for each SBA

Step 2: Determine scope of topics for the current priority-setting activity

Step 3: Identify existing documents regarding observation priorities for the SBA

Step 4: Develop analytic methods and priority-setting criteria

Step 5: Review and analyze documents for priority Earth observations needs

Step 6: Combine the information and develop a preliminary report on the priorities

Step 7: Gather feedback on the preliminary report

Step 8: Perform any additional analysis

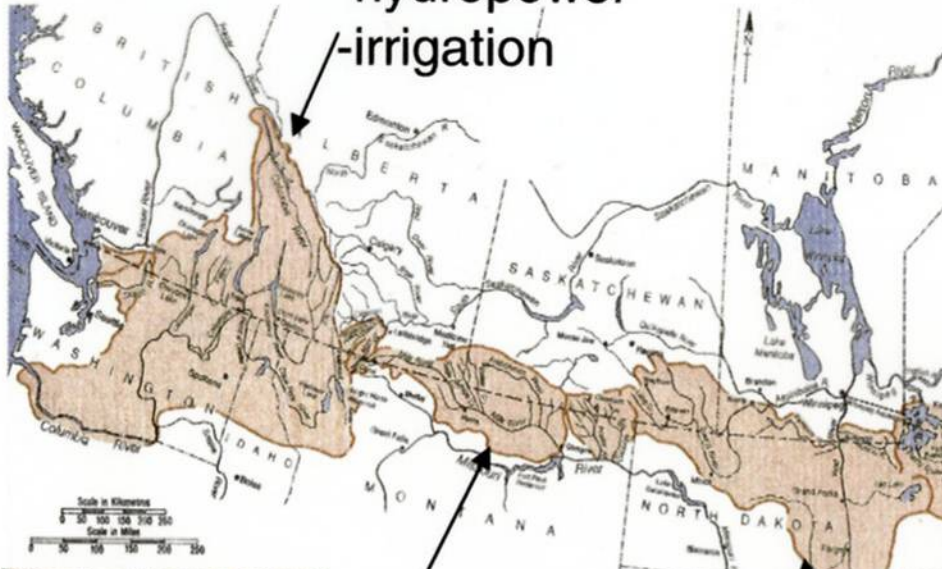
Step 9: Complete the report on Earth observations for the SBA

When all SBA analyses complete, UIC will compare across them.

US/CANADA GEO PLANS AND ACTIVITIES

THE IMPORTANCE OF WATER IN SHARED CANADA/US BASINS

Columbia
-hydropower
-irrigation

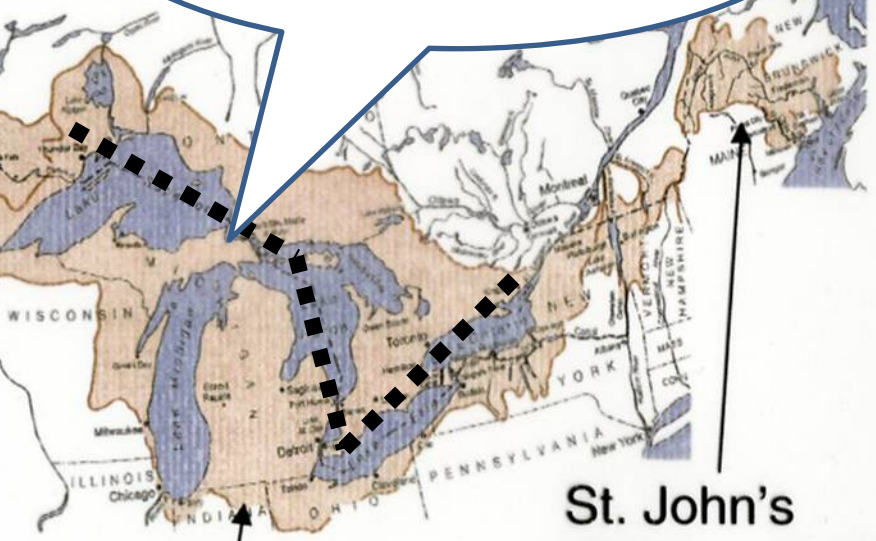


The IJC and EPA have recently completed studies that are the basis of continued monitoring activities in this area.

Milk River
-irrigation

Red River of the North
-diversions
-flood control

Yukon
-hydropower



Great Lakes
-hydropower
-lake levels for shipping
and recreation
-commercial fisheries

St. John's
-flood control

THE IMPORTANCE OF WATER IN SHARED CANADA/US BASINS

Columbia
-hydropower
-irrigation

REDE plans to look at Extremes including droughts and floods on the prairies.

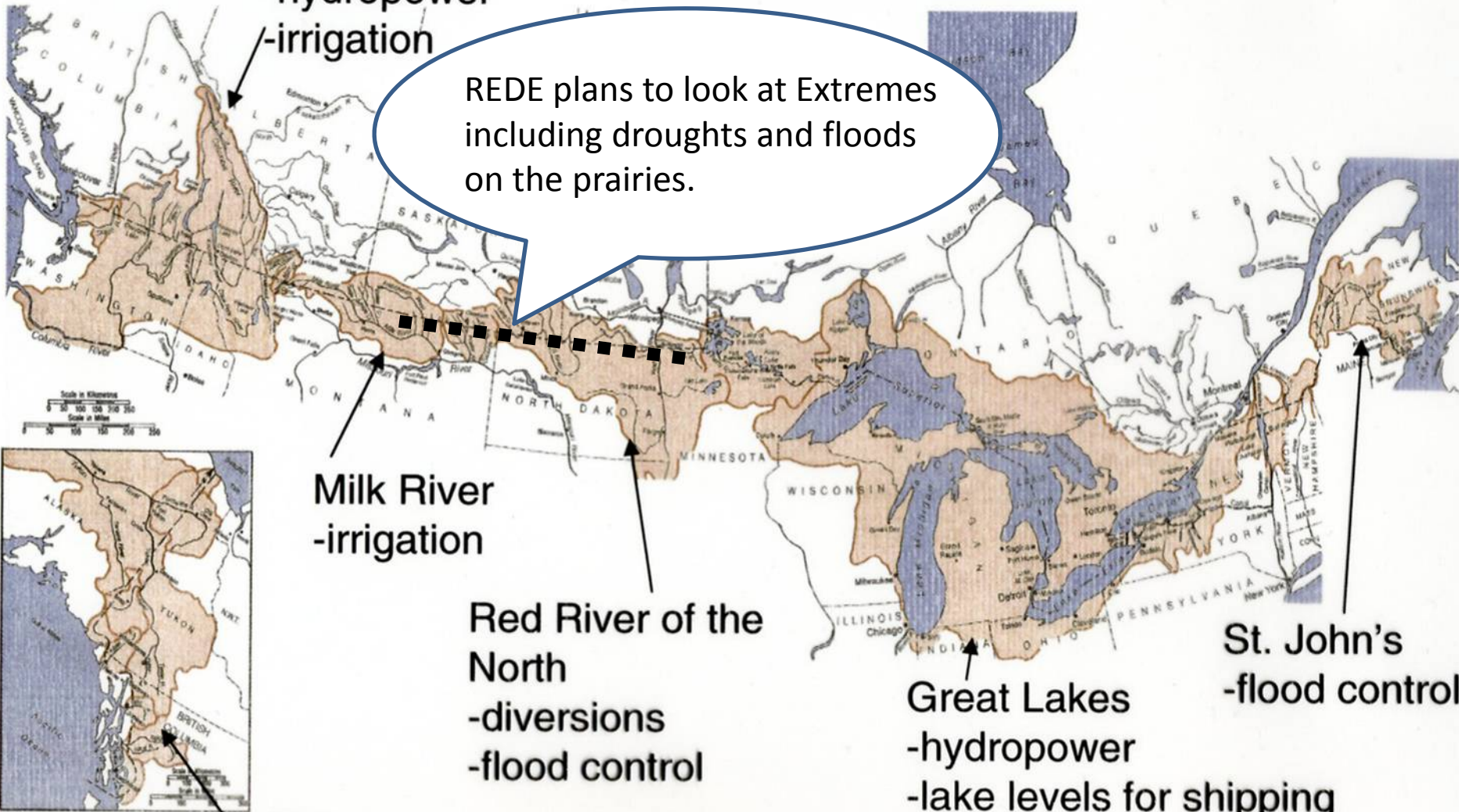
Milk River
-irrigation

Red River of the North
-diversions
-flood control

Great Lakes
-hydropower
-lake levels for shipping and recreation
-commercial fisheries

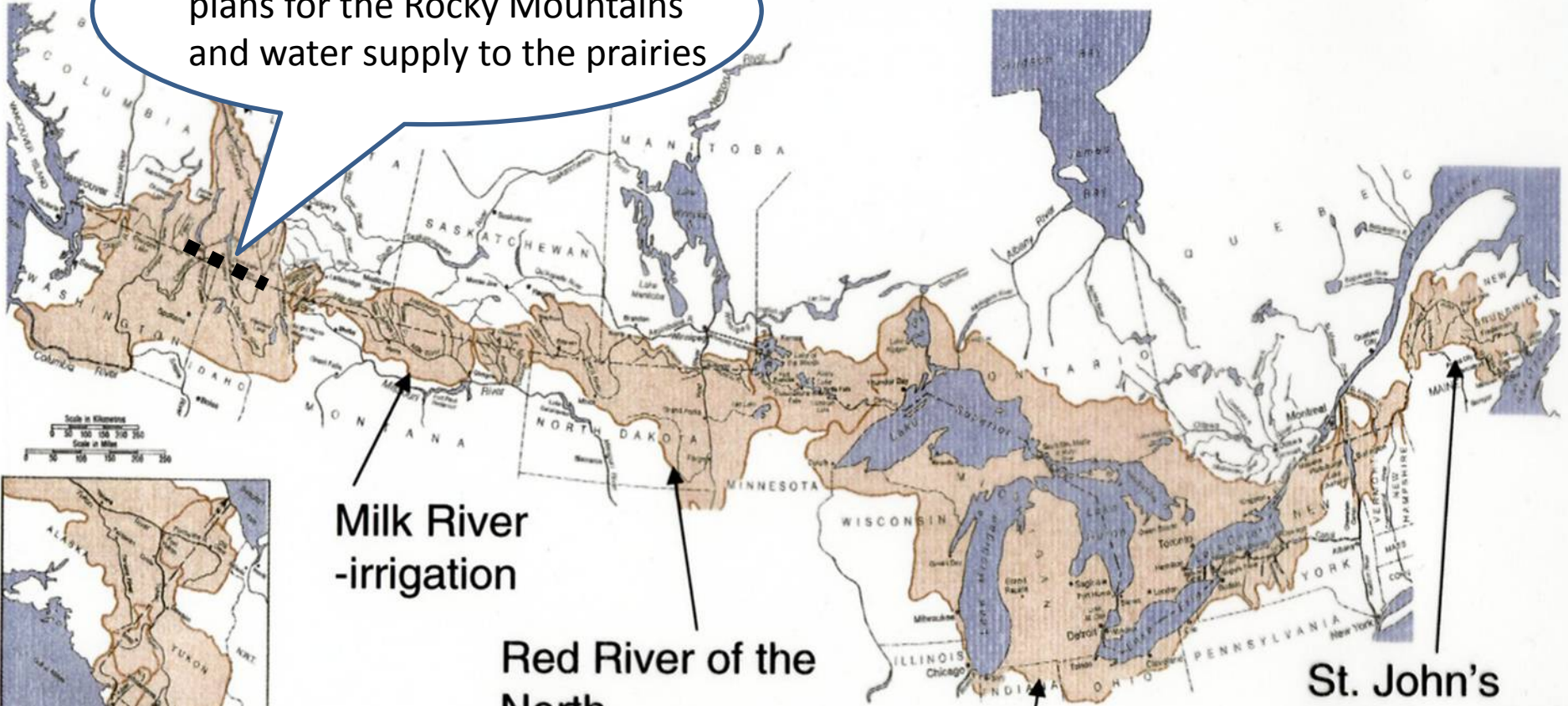
St. John's
-flood control

Yukon
-hydropower



THE IMPORTANCE OF WATER IN SHARED CANADA/US BASINS

The Western Watershed has plans for the Rocky Mountains and water supply to the prairies



Milk River
-irrigation

Red River of the North
-diversions
-flood control

Great Lakes
-hydropower
-lake levels for shipping
and recreation
-commercial fisheries

St. John's
-flood control

Yukon
-hydropower

Activities that are on-going or planned

1. Completion of the user survey of water cycle data needs.
2. Launch of the water cycle forum. Check out watercycleforum.com.
3. Organization of a possible IEEE/WC COP workshop and Town Hall meeting at the fall AGU.
4. Organization of the 2010 IGWCO Planning Meeting.
5. Workshop on Data Centre Alliances/ Harmonization in November 2009
6. Water Cycle Capacity Building activities in Africa and Latin America.
7. Completion of the Water Cycle Data User Needs Survey.
8. Completion of the Blueprint for "Water for the World"
9. Continued efforts to launch workshops with GEOBon and HELP.

Needed: More Convergence and Harmonization of individual Water Cycle Communities of Practice

SUMMARY

1. Is the way CEOP (and GEWEX) are represented in GEO documentation adequate or are improvements needed?
2. What are the links between AMY, MAHASRI and the AWCI?
3. How should CEOP be involved in the development of an African Water Cycle Initiative?

For GEWEX:

How could/should LANDFLUX be integrated into the GEO framework?