

GEWEX in North America

(past approach - early nineties)



The Mississippi River Basin provided a clear Geographical focus for research activities. This focus supported an accumulation of results and model development. (1994 – 2000)



(combined PACS plus GAPP)

The contiguous USA served as a platform for assimilation, modeling and prediction studies. Regional foci (e.g., Western Cordillera) did emerge but with less structure than in GCIP. (2000 – 2004)



The Americas served as a platform for modeling and observational studies over land and ocean in the Americas. CPPA contributed to both GEWEX and CLIVAR. (2005 – 2009)

GEWEX-Post 2013

Global and Regional Energy and Water project (GREW)?

MISSION: Develop improved observational, diagnostic and modeling capabilities *focusing on land-atmosphere interactions* to measure and predict global and regional energy and water variations, trends, and extremes such as heat waves, floods and droughts; and **provide the science underpinning climate services.**

Imperatives (selected):

- Data:** Climate data records and analysis of trends and extremes.
- Analysis:** Advanced diagnostic tools and pathways for model improvement.
- Modeling:** Attribute causes of trends and determine energy/water predictability.
- Applications:** Transition research to operations and promote capacity building.

CLIVAR (Climate Variability and Predictability)

Mission

To observe, simulate and predict changes in the earth's climate system with a **focus on ocean-atmosphere interactions**, enabling **better understanding of climate variability, predictability and change**, to the benefit of society and the environment in which we live.

1. **Anthropogenic Climate Change**
2. **Decadal Variability, Predictability and Prediction**
3. **Intraseasonal and Seasonal Predictability and Prediction**

7. **Capacity Building**

Terrestrial Regional North American Hydro-Climature Experiment (TRACE)

Prospectus

Initial Organizing Committee

Eric Wood, *Princeton University*

Peter van Oevelen, *International GEWEX Project Office*

Robert Schiffer, *University of Maryland Baltimore County*

Ruby Leung, *DoE Pacific Northwest National Laboratory*

Richard Lawford, *University of Manitoba*

Paul Houser, *George Mason University*

David Gochis, *NCAR Research Applications Laboratory*

Michael Ek, *NOAA/NWS, NCEP Environmental Modeling Center*

Michael Bosilovich, *NASA/Goddard Space Flight Center*

Ernesto Hugo Berbery, *University of Maryland, ESSIC*

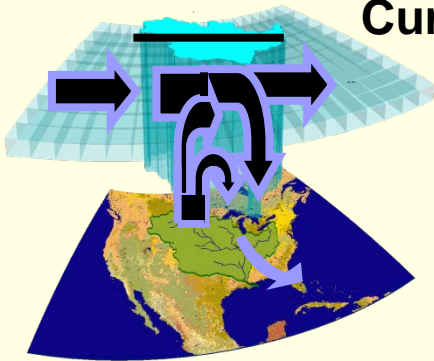
Deborah Belvedere, *University of Maryland Baltimore County*

Raymond Arritt, *Iowa State University*

Motivation for TRACE

- Reliable regional scale climate predictions are essential for assessing the availability and stresses on clean water supplies.
- Understanding and predicting water cycle extremes in a changing climate has direct application for preserving life, environment and economic assets.
- **CHALLENGE:** *provide skillful forecasts of extremes, weeks, seasons, years and even decades in advance that are useful for water resource management.*

Current Limitations:



- Translation of observational and simulated knowledge of regional and continental water budgets into better hydro-climate predictions
- Knowledge of the contribution of land surface processes to predictability
- Isolated in-situ and remote sensing observing systems
- Incomplete coupled atmosphere-hydrology models
- Understanding of human and earth system controls on the water cycle
- Disconnected disciplinary research and operational programs.

TRACE Vision and Scope

- **VISION:** coalesce an *interdisciplinary, international and interagency* effort to revolutionize North American hydro-climate science and solutions.
- **SCIENCE QUESTION:** *How does climate change affect the hydrological cycle on a regional to continental scale and to what extent is it predictable?*
- **OBJECTIVE:** entrain, integrate and coordinate the vast array of observation and prediction resources available to significantly advance skill in predicting and managing changes in North American water resources, as an integral part of the global climate system.
- **MISSION:** measure and predict North American **energy** and **water variations**, trends, and extremes through improved observation and prediction, thereby providing the scientific underpinnings of future climate services.
- **HERITAGE:** TRACE-RHP to build on previous contributions to the Global Energy and Water Cycle Experiment (GEWEX), but include the broader climate, carbon, ecology, and applications communities.
- **IMPLEMENTATION:** provide a integrating continental scale framework for both large scale studies, and basin and field scale projects.

TRACE Activities

- **Data:** Develop climate data records of atmosphere, water, land, and energy-related quantities, including metadata and uncertainty estimates.
- **Analysis:** Describe and analyze variations, trends and extremes.
- **Processes:** Develop approaches to improve process-level understanding of energy and water cycles in support of improved models and predictions.
- **Prediction:** Determine factors controlling regional hydroclimate prediction; improve continental precipitation, cloud, and hydrology prediction, through accelerated development of coupled earth system models.
- **Solutions:** Attribute causes of variability, trends and extremes, determine the predictability of energy and water cycle changes and mitigative strategies
- **Technology transfer:** Develop and transition new observations, models, diagnostic tools and methods, data management to operational applications.
- **Capacity building:** Promote and foster training, outreach and the development of strategic collaborations both domestically and internationally.

TRACE

North-American Hydroclimate Experiment

Partnerships

Global Energy and Water Cycle Experiment
GEWEX
WCRP

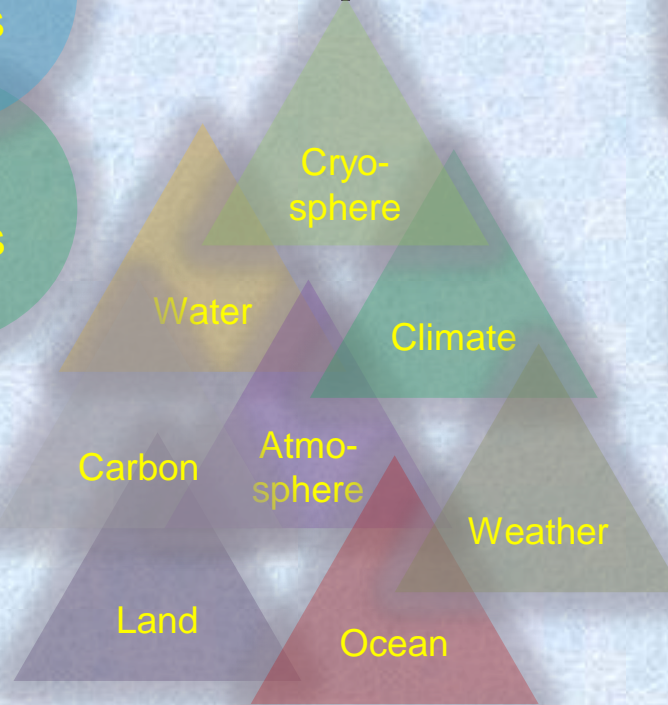
Research

Decision
Makers

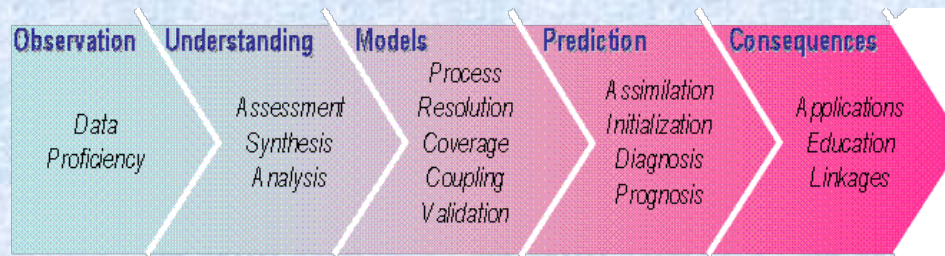
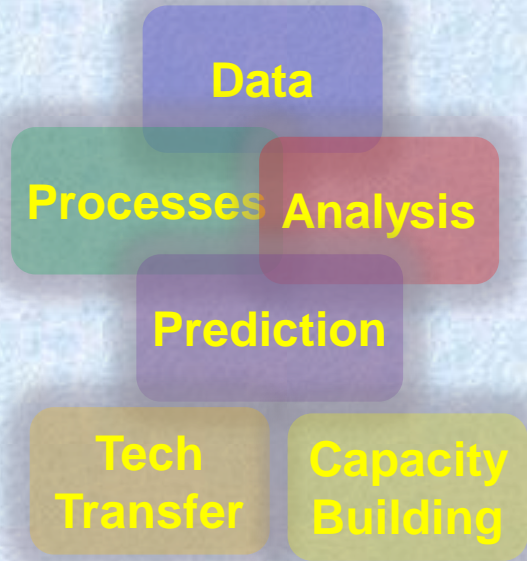
Services &
Operations

Stake-
holders

Disciplines



Activities



TRACE Workshop

- Identify needs and opportunities for hydroclimate studies
- Develop scientific objectives for a new North American RHP
- Establish planning teams, structure, leadership, and milestones
- Identify opportunities to leverage agency programs and resources
- Establish opportunities for partnerships with agencies and programs



PARTICIPANTS:

- Interdisciplinary scientists and researchers
- National agency representatives
- Operational organizations and stakeholders

VENUE:

April 18-20, 2011

Crown Plaza Hotel in Silver Spring, Maryland

More Information: <http://www.trace-rhp.org>

Want to help us plan? Contact debbieb@umbc.edu

Discussion

- Do we need/want TRACE?
- Is the scope right? North America for a decade?
- Is TRACE helpful for us to advance science and services?
- Are the TRACE vision, mission, goals, objectives useful?
- How best to gather ideas, input, and partnership?
- What approach to garner community ownership, buy-in, involvement?
- How do we incorporate the new GEWEX imperatives?
- We must build on past work, wrap up some things, and go beyond.
- What enabling infrastructure is necessary and how do we get it?
- How should modeling be included?
- How do we deal with such an interdisciplinary project?

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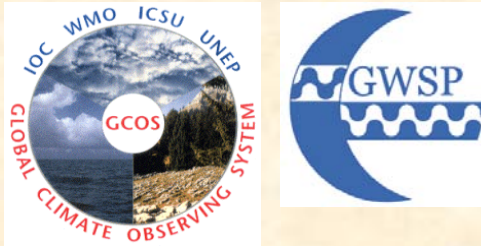
Resources and Partnerships



- Primarily envisioned as a North American contribution to the Global Energy and Water Cycle Experiment (GEWEX)
- explore links with other programs, i.e. the North American Carbon Program or the International Geosphere Biosphere Program (IGBP)

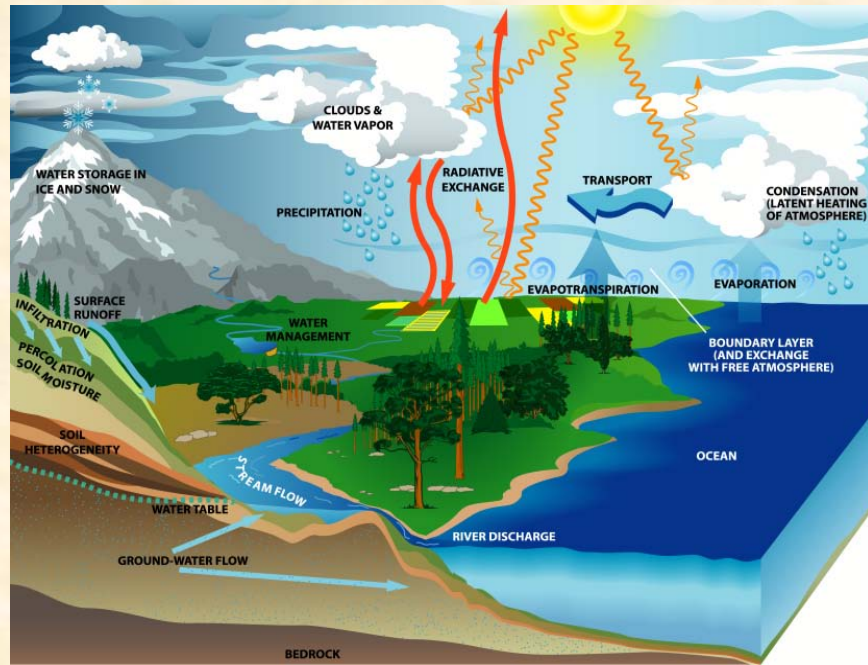


Canada



Why study the Water cycle?

1. Water exists in **all three phases** in the climate system and the **phase transitions** are a significant factor in the regulation of the global and regional energy balances
2. Water vapor in the atmosphere is the **principal greenhouse gas** and clouds at various levels and composition in the atmosphere represent both positive and negative feedback in climate system response
3. Water is the **ultimate solvent** and global biogeochemical and element cycles are mediated by the dynamics of the water cycle
4. Water is the element of the Earth system that most **directly impacts and constraint human society and its well-being.**



Water in the climate system functions on all time scales: From hours to centuries