Crosscutting Group C

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- Ana Barros
- **Dan Cayan (day 2)**
- **Martyn Clark (day 1)**
- Dave Easterling
- Dave Gochis
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- Paul Houser
- Kathy Jacobs
- Jim Kinter
- **Steve Klein (day 1)**
- Ruby Leung
- Brian O'Neill
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- Christa Peters-Lidard
- Steve Regan
- Guido Salvucci
- Graeme Stephens
- **Vince Tidwell (day 2)**
- Kevin Trenberth
- Mike Wehner

DC1

An Integrative Modeling Challenge

- ***Can the water and energy supply over the contrasting landscapes and water use of western and eastern North America be sustained under projected changes in climate and human activity?***
  - *This overarching question will be investigated using a set of models and observations, describing multiple systems and involving different scales, that will consider the impact of changes that include variations and changes in the water cycle and energy supply and demand.*
  - *Supply and demand of water and energy will be accounted for, which will place emphasis upon describing, modeling and understanding human systems involved in managing, consuming and altering water and energy stocks and fluxes with their many influences, effects and feedbacks*

Slide 2

DC1 Daniel Cayan, 9/26/2012

MOTIVATION

- *Water and Energy supplies are already stressed in parts of North America; climate change and projected human footprints will likely intensify those stresses.*
- *Existing modeling tools do not contain fully integrated dynamic regional climate-water-energy components, especially r.e. managed/human affected water and energy systems.*
- *The vulnerability and adaptability of mountain and snow fed water cycle of western North America will be analyzed in comparison to the lower relief, less-seasonal precipitation regimes of eastern North America, each with their own profiles of human influence.*
- *North America domain needed to circumscribe droughts, heat waves, extreme precipitation which may occupy multiple watersheds and cross political boundaries.*
- *Addressing this issue will support the GEWEX stated goal to better understand and predict the water cycle and related phenomena, would support ideas set out for a NAWP, and also project onto several other existing or planned programs.*
- *Primary focus is water volume, but some water quality issues, e.g. water temperature may be included.*

INTERLINKED SET OF SCIENCE COMPONENTS

- Modeling experiments and predictability studies
- Multi-scale, multi-system tools for science and decision support
- Model development needs
- Data/observation needs
- Model intercomparison, testing and evaluation
- High volume computing resources, common software infrastructure for models & data
- Software infrastructure (e.g., tools for model/data integration and interoperability)
- Data management and visualization
- Strong interactions with the users

SUITE OF MODELS

*An **interconnected set of models** will be included to address the attendant systems and processes.*

- *GCMs (existing simulations) to include global scale influences on climate and in delivering precipitation.*
- *continental scale models of the North American climate and land surface*
- *sub-continental and regional models will be used, as appropriate, to address water, energy and humans.*
- *Resolution variable, but to include temporal and spatial detail required to capture event-scale processes will be supported by the modeling framework.*
- *Managed system, including human decisions would be incorporated*
- *Linking together models not discussed but obviously a challenge*

*A **complimentary set of observations** that capture the East to West variation in water supply and energy production characteristics*

OBSERVATIONS

- *Observations are a core element to drive and validate model simulations and in some cases to further develop models.*
- *The project would be informed by a wide range of observations and would incorporate models of the coupled climate system, the land surface, and human systems.*
- *North American domain would involve contributions from neighboring countries, which would reinforce international investment in the science and societal questions.*
- *This project could become an important consumer of observations, thus a justification for data and monitoring efforts. Model experiments would evaluate adequacy and quality of data and monitoring.*
- *Human elements bring together new forms of information on managed water and energy supply, demand, transfers/transmission, as well as social and economic data.*
- *By engaging stakeholder community, more complete information will be created to identify alternative futures for energy and water sector adaptive pathways.*

SOCIAL SCIENCE AND USER COMMUNITY INVOLVEMENT
(to be refined, expanded)

- Water management Partners
- Energy System Partners
- Social and Econ partners

DOE and OTHER AGENCY and INSTITUTION INVOLVEMENT

- This project is centered on DOE mission and goals

- *But*, there is ample opportunity and great need for substantial participation by *Other Agency* partners, also including academics and stakeholders with mandates and expertise on various elements of water, energy and climate

DELIVERABLES (a preliminary sketch not to be taken literally)

- 2-year
  - science teams formed
  - user community partners identified and involve
  - experimental design formulated
  - organized, managed observational and simulation datasets
  - tier of models assembled and configured
  - initial modeling results
- *5-year and beyond*
  - validated coupled model from control and historical climate & human systems.
  - ensemble projections and scenario runs accomplished and evaluated.
  - user feedback incorporated, partnership established

Crosscutting Group C (Day 1)

Integrative Modeling Challenge C.1

Key Features/Topic Relevance

A. Includes most DOE Wkshop elements
B. applies to extreme events as well as longer term phenomena
C. high resolution models will be developed/validated
D. observations are a core
E. integrating human system components is new emphasis
F. "pilot" that can be learned from for other regional investigations
G. crosses artificial boundaries (national, state, …)
H. requires scoping and planning

Approaches/Leveraging

A. multi or interdisciplinary
B. builds on prior studies & monitoring
C. calls upon existing and newly formed science groups
D. opportunity for multiple agencies to step up and collaborate

Scientific Impacts

A. new understanding, coupled systems on many levels
B. builds coordination and synergies across multiple science groups and cultures
C. requires considerable computer resource
D. requires active science management and steering

User Impacts

A. better insight and predictive skill.
B. opportunity for involvement of decision making partners
C. joins science and policy