ABOUT WATER, ENERGY, & CLIMATE



The Global Energy and Water EXchanges project of the World Climate Research Programme

International GEWEX Project Office Report – GHP/GLASS 2016





What We Do

- The Global Energy and Water EXchanges (GEWEX) project of the World Climate Research Programme (WCRP) facilitates, enables, coordinates international climate and related research activities with an emphasis on land – atmosphere processes and interactions.
- From sub-surface processes related to hydrology to atmospheric processes including interactions between the troposhere and the stratosphere



Outline

IGPO Update

- Personnel and Budget
- Website and Activity Tracking
- Meetings and Travel Support
- Newsletter
- Leadership
- North American Activity and US GEWEX PO



IGPO Update

Personnel and Budget

- ► IGPO Funding in good shape (... Might change ☺)
- At roughly 800 K USD per year
- US GEWEX Initiative moving forward s I o w I y



Website Mock Up

GEWEX.ORG and GEWEXEVENTS.ORG !!

ABOUT PANELS ACTIVITIES EVENTS
ABOUT
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GEW/EX

WHAT IS GEWEX7

SCIENCE

GHP

GOVERNANCE

SPONSORS AND PARTNERS

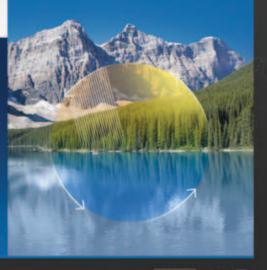
RELATED PAGE ITEMS

3.15.2015 SAMPLE EVENT TITLE IMFORMATION HERE

4.10.2015 SAMPLE EVENT TITLE IMFORMATION HERE

CHILD PAGE SUPPORT STATEMENT

Child pages will feature a side-image featuring beautiful landscape photos that correlated with the main message - keeping that the environment is important.



LOGIN



Add ons

- Podio: An online collaborative tool
- Balanced Score Cards (new)
- Online travel support requests
- Online meeting requests (next slide)
- Member profiles
- Online nomination submission (SSG primarily)
- Online member information (all panel members)



Website Functionality

- "Static part" that can be updated by Panel Chairs and designated persons
- Interactive part for Meetings* (incl. travel support requests), reports, address and mailing preference updates etc.
- Implement metrics to measure impact (not easy!), report tracking including accomplishments
- Realization that this is not an engineering project but a collaborative project hence the collaborators need to define in particular what the impact is and metrics to be used!



Meetings and Travel Support

- Yearly support from WCRP down from ~100 K USD to 60K USD (for 2017 maybe even less!)
- There is a strong need to get a better grip on the required support with a much longer lead time.
- Process to grant support and to make decisions on who and what will be more formalized (IGPO, SSG Chairs and Panel Chairs)
- Flexibility is necessary and desirable but is going to be sacrificed under limited availability of funding!



Meeting Registration

New system in place for meetings organized by IGPO

- Register at meeting site hosted on gewexevents.org
- Link to meeting site provided in email invitation
- For meetings where travel support is available, option to apply for funding included in the registration form
- Most meetings require that the form be completed in one sitting (cannot be saved and returned to later)
- No more RSVPs or travel support requests by email

	Kang and Angel a
GEWEX Data and A	ssessments Panel Meeting
ALL DESCRIPTION OF THE PARTY OF	29 November -1 December 2016 Washington, D.C., U.S.A.
	/Logistics / Registration / Documents
Fyou pain on atlanding the SDAP Meeting from 28 Novem Repetition form below. Repetition and meeting atlandars	ter-2 December 2016 in Washington, D.C., please 16 in the or is free.
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Meeting Registration

Redesign of gewexevents.org in the works

- New homepage with latest meetings listed
- Meetings index with current and past meetings
- Log-in access to personal account

When Directory for gewex.org is launched, most meetings hosted on gewexevents.org will require you to sign into your Directory account to register

- From the meeting site registration page you'll be directed to log in
- After logging in, you'll be able to fill in the registration form





Keep Note!!

Deadline 2017 meetings (October 2016) for WCRP travel support



Newsletter

- 1700 Hardcopies (2200 total incl. soft copies)
- Mailing list roughly 2200 scientist (growing)
- Cost about 50K 80 K USD per year



Leadership

- Fluctuating success in getting activities of the ground
- Hard to engage younger scientists
- How to sell the effort?!
- Volunteering does not mean no commitment
- Continuity very important, be timely in succession!



Concerns

- Even when we poll ahead of time for meeting availability, less people show up (for all panels and even SSG/Executive)
- Better include ECS in our activities
- Promotion of GEWEX activities and accomplishements is important not just for GEWEX sake but for all those involved
- Decrease in sponsor involvement (incl. Space agencies) (that said funding support is continued)



JSC-37 Outcome

- Two new Grand Challenges:
 - Near Term Climate Prediction and
 - Carbon Feedbacks in the Climate System
- Dropped the Regional Climate Information GC
- Monsoon Panel seems to be revived....(since 2 weeks ago)



WCRP Structure





WCRP Structure

Joint	Scientific Committee		Joint Planning Staff			
Mode	ling Advisory Council		Data Advisory Council			
	Working Groups on: Numerical Experimentation (WGNE), Seasonal to Interannual Prediction (WGSIP), Coupled Modeling (WGCM), Regional Climate (WGRC)					
CliC	CLIVAR	GEWEX	SPARC	CORDEX		
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2018 GEWEX Open Science Conference Lake Louise, Banff, Canada Late(r) in May 2018

Two Grand Challenges main focus:
Water for the Food Baskets of the World



Extremes









GEWEX Focus

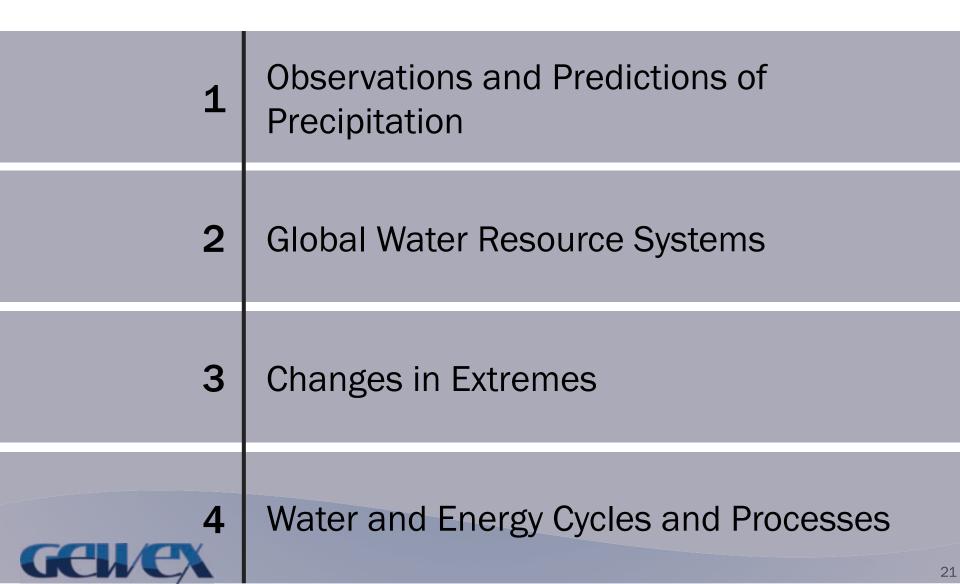
Water and Energy – People & Environment

- Water is a local 'challenge' driven by global processes
- GEWEX focuses on improved understanding of the relevant geophysical processes of water and energy and the human interaction therein to better model and predict changes
- Water and Energy Security are intrinsically related to Food Security – The Water-Energy-Food Nexus -> PEOPLE



Four GEWEX Science Questions

For the next 5 to 10 years





Water for the Food Baskets of the World

The WCRP Grand Challenge on Water Availability

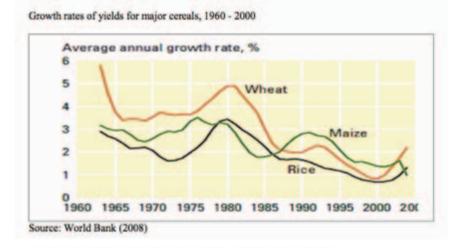
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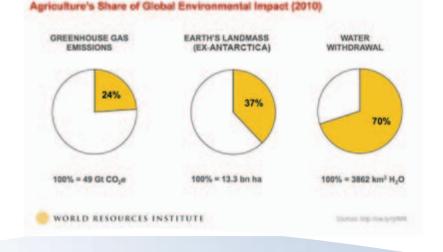
BASED UPON CONTRIBUTIONS FROM: JAN POLCHER, ROY RASMUSSEN, PETER VAN OEVELEN, YAHYA ABAWI, GRAEME STEPHENS, SONIA SENEVIRATNE, KEVIN TRENBERTH, YAOMING MA, **MICHAEL EK**, MATT RODELL, ERIC WOOD, JOERG SCHULZ, CHRIS KUMMEROW, ROBERT A. SCHIFFER, JUN MATSUMOTO, TOSHIO KOIKE, TAIKAN OKI, ANA BARROS, CRAIG FERGUSON, BEN ZAITCHEK AND MANY MORE...



Current State

Challenges for Food Production





• Population growth (Asia and Africa primarily)

- Globalization
- Urbanization
- Water scarcity
- Declining yield
- Climate variability and Climate Change
- Modernization of agriculture has lagged behind industrialization in developing countries
- Transfer of land from the production of food to production of fuel
- Transfer of land to livestock (high protein food)
- Biosecurity issues affecting Free Trade Agreements





Food Security

"Reliable access to sufficient quantities of affordable, nutritious food to maintain healthy, active lives." – 1996 World Food Summit

Four main dimensions of food security are;

- Availability Supply of food as determined by production, stock level and net trade
- Access affected by income, expenditure, markets and prices
- Utilisation nutritional status of what we produce
- Stability Inadequate access to food on periodic basis

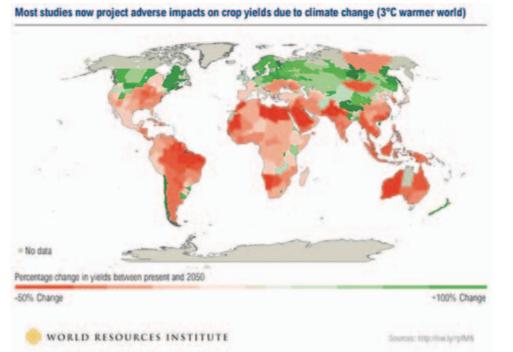
Availability and Stability are threatened by the impact of climate variability, climate extremes and climate change





Impact of Climate on Food Production

- Global demand for food is expected to rise faster than population increase
- Population is expected to increases by 30% by 2050 (9.3 Billion People)
- Average income will rise by 120% and change in diet from minimal calorie to high protein



- CO2 and Temperature
- Pest and Disease
- Flooding
- Water Availability (Scarcity and Variability)

- Unprecedented long-term climatic changes are likely to occur from greenhouse warming that will also affect seasonal to interannual variability
- Agriculture, particularly rain-fed is most vulnerable from droughts, extreme events, monsoonal change, heat stress, pest and diseases





The WCRP Grand Challenge on Water Availability

Water for the Food Baskets of the World



- Water Cycle Main Driver of Food Production
- A Warmer Climate Pushes the Water Cycle into Unknown Territory
- The Terrestrial Water Cycle is not Natural Anymore
- Urgency to Understand the New State of the Water Cycle in which Natural and Anthropogenic Processes Interact





The WCRP Grand Challenge on Water Availability

Water for the Food Baskets of the World



How will a warming world affect the available fresh water resources globally, the human interactions with these water resources, as well as their value to society and how does this translate specifically to the food basket regions of the world?

*Within the context of the World Climate Research Programme the focus will be on the geophysical processes and the anthropogenic influences on these processes





Products and Deliverables

How will a warming world affect the available fresh water resources globally and how does that translate specifically to the bread basket regions of the world?

- This grand challenge in particular expands on questions related to changes in water supply and storage both temporally and spatially with respect to reservoirs, ground water, snowpack depth etc. and in order to answer that we need to address both the water supply and demand side:
- Set of sub questions see next slide:
- Answers to these questions are the main outcome of this grand challenge. To enable the research needed we set up this grand challenge in tiers both in the regional sense as well as in research sense





Set of Sub Questions

WCRP Grand Challenge of Water Availability

- What are the effects of changes in the character of precipitation (snow vs. rain, snow water equivalent etc.)?
- How do the temporal changes in precipitation regimes affect water availability?
- How will changes in the mean and variability of precipitation affect human infrastructures ?
- Which regions will see an increase vs. decrease in precipitation?
- Which regions will see an increase vs. decrease in actual and potential evapotranspiration?
- Which regions will see an increase vs. decrease in the climatically available water (P-E)
- How is groundwater recharge and availability affected?
- In which regions can groundwater pumping be sustained in a warmer climate?
- How is snow cover, depth and water equivalent affected?
- In which regions is food productions endangered by the expected changes in the water cycle?
- Which actions need to be undertaken to improve our water management and maintain a viable agriculture?
- How will climate change modify competing interests for water?
- How are land water exchanges affected by climate change, or affecting themselves regional climate responses (e.g. temperature and precipitation means and extremes)
- How are changes in land-use/land cover affected by the water availability or affecting the water availability?





Methodology

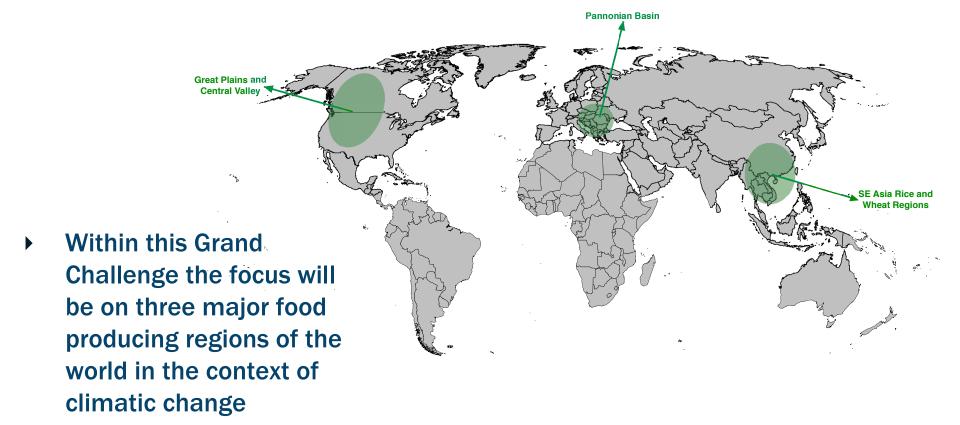
- A Regionally Tiered Approach
 - Focus on Three Main Regions
- A Research Topic Tiered Approach
 - NEW: Human Dimension
 - NEW: High Resolution Convection Permitting Modeling
 - Build upon Existing Efforts (Within and beyond WCRP)
 - UNESCO IHP, HYDROMET Services, iLEAPS, TPE etc.





The WCRP Grand Challenge on Water Availability

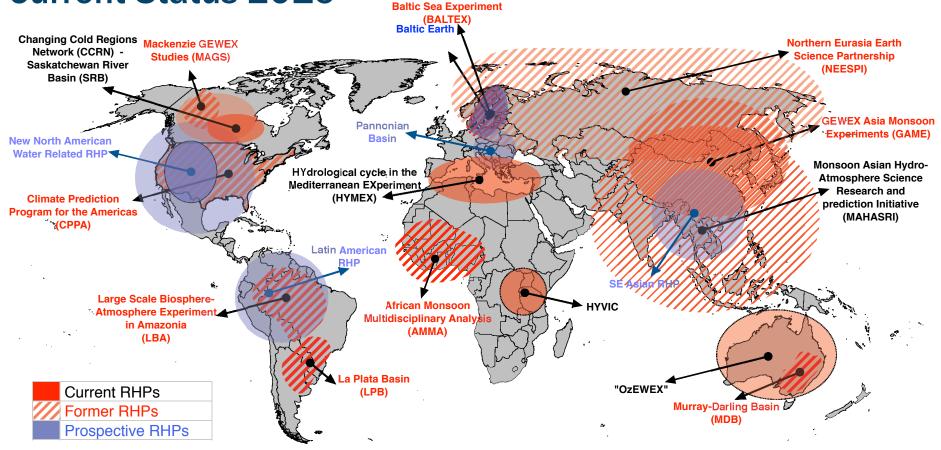
Water for the Food Baskets of the World







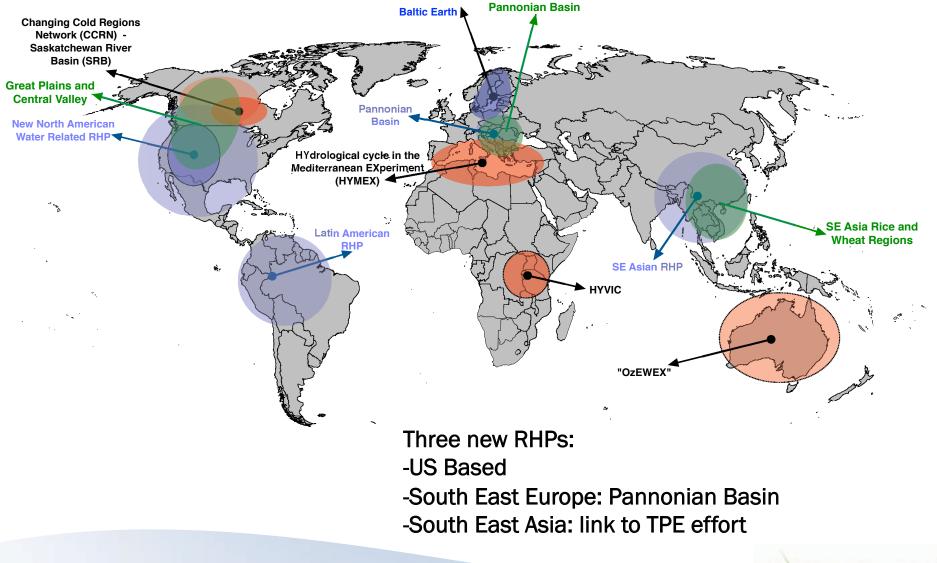
GEWEX Regional Hydroclimate Projects Current Status 2016







Food Basket Regions of the World







Regional Topical Leads

- CCRN and INARCH:
 - John Pomeroy , Howard Wheater
- US RHP:
 - Roy Rasmussen, Ana Barros, Craig Ferguson, Ben Zaitchek
- Pannonian Basin:
 - Monika Lakatos, Ivan Guettler
- Asian RHP:
 - Xin Li, Taikan Oki, Jan Polcher, James Renwick*





Research Topical Leads

- Anthropogenic Affects in Hydrology:
 - Richard Harding, Taikan Oki, Jan Polcher, Aaron Boone
- High Resolution Modeling:
 - Roy Rasmussen, Andreas Prein
- Land-climate interactions: (e.g. LS3MIP)
 - Sonia Seneviratne, Bart van den Hurk
- Land-atmosphere interactions (e.g. PLUMBER, DICE, GABLS):
 - Mike Ek, Aaron Boone, Eleanor Blythe
- Land use and land cover change:
 - Nathalie de Noblet, David Lawrence*
- Precipitation:
 - German Poveda, John Pomeroy, Ron Stewart*, James Renwick*
- Ground water and sub surface processes:
 - Mark Bierkens*, Ger de Rooij
- Large scale atmospheric circulation and processes:
 - Graeme Stephens,
- Water-Energy-Food NEXUS
 - Yahya Abawi, Richard Lawford, FAO representative





Examples of Research Topics

High Resolution Convection Permitting Model

- Running high resolution model over complex terrain is very important because:
- It can resolve vertical motions tied to complex terrain and thus able to produce "close to observed" precipitation pattern.
- Having accurate spatial distribution of precipitation is important for properly representing hydrologic balance.
- Better representation of surface processes such as ET LULC





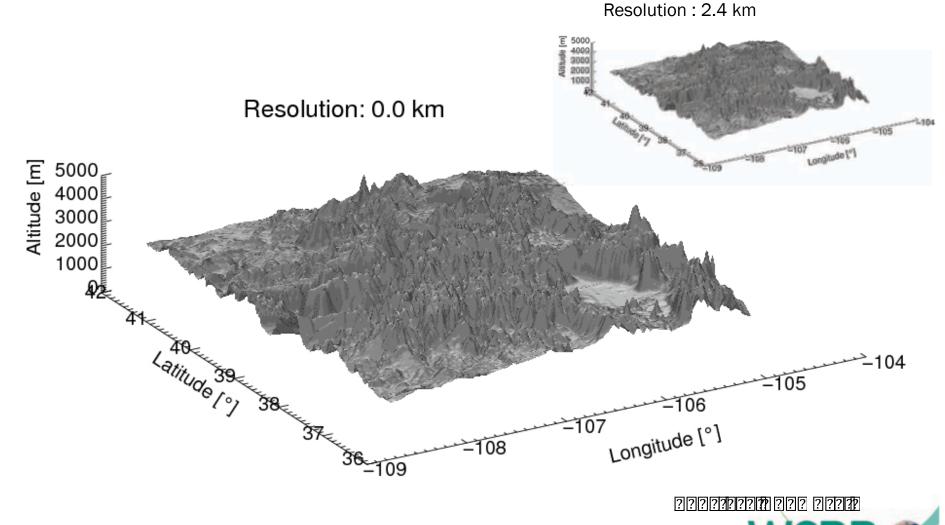
Transition to Convection Permitting Models

- "Climatically Available Water (P-E)" as we want both P and E at higher spatial (and temporal) resolutions
- Agronomy and the FAO in particular, are limiting themselves to "reference evaporation" without taking into account small scale processes which change water availability.
- Soil moisture availability is strongly driven by things as rainfall intensity which has been below our (GEWEX) radar screen for decades
- Most (Pot.) ET formulations used by agronomy are not very useful in a changing climate scenario
- Plenty of evidence that (sub)surface/atmosphere interactions occur at small(er) scales and will not be credible until we reach convection permitting models.
- ==> High resolution modeling but we should not limit it to just the atmospheric processes! It is the entire terrestrial/atmospheric system which need to be treated at very high resolution.
- Many problems exist both terrestrial as well as atmospheric including: human dimension, LULC etc.





Value of high-res. regional model

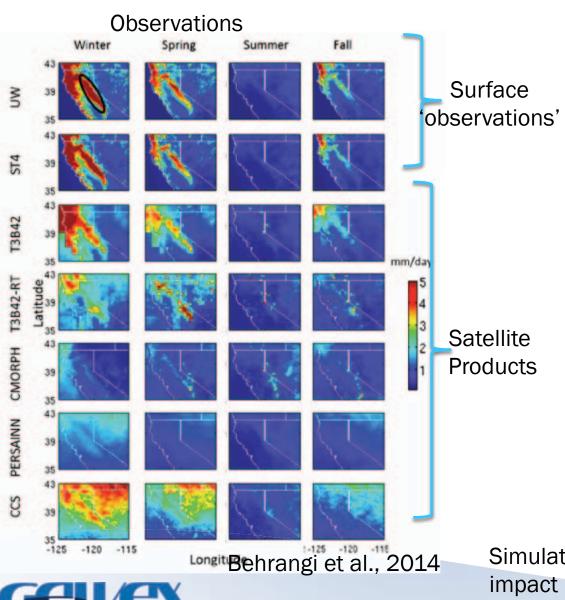


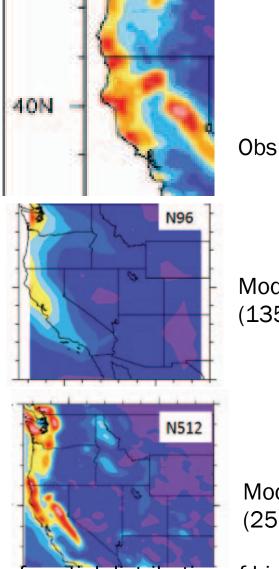
Id Climate Research Programme



Example of mountain hydrology







Model (135km)

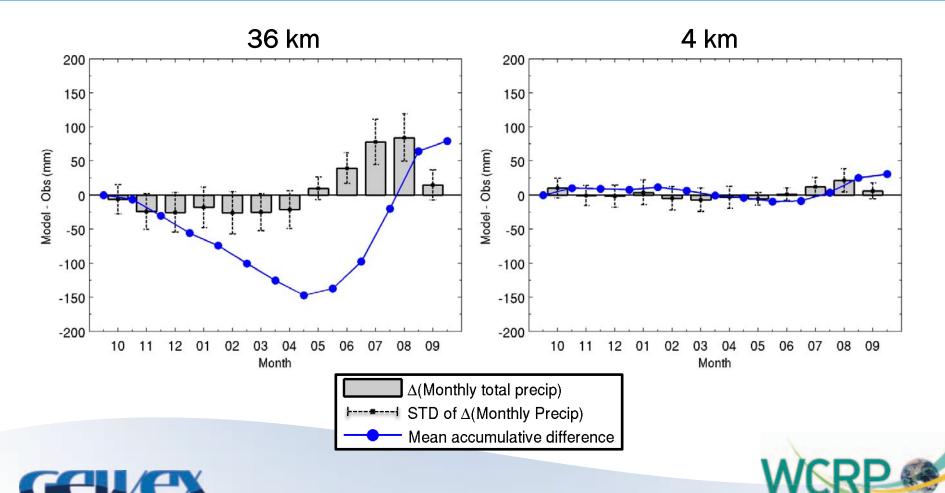
Model (25km)

Simulation of spatial distribution of highimpact precipitation events improves with high resolution

Example of impact of resolution (resolved topography) on snow pack

30% too little precip in the winter and 65% too much in the summer using 36 km model compared to 4 km model (compensating errors)

Evapotranspiration in the 36 km model 38% higher than the 4 km model



World Climate Research Programme

Examples of Research Topics

Representation of effects of land use and land cover changes (LULCC)

- Correctly representing the effects of LULCC on climate is essential for projections
- Changes in LULCC strongly affect mean climate and climate extremes (Pitman et al. 2009, GRL; De Noblet et al. 2012, J. Climate; Davin et al. 2014, PNAS)
- Irrigation represents a major intervention in the water cycle, in particular affecting regional temperature and precipitation (Lobell et al. 2006, GRL; Cook et al. 2011, Clim. Dyn; Wei et al. 2013, JHM)
- Low emissions scenarios keeping Tglob below 2° (e.g. RCP 2.6, van Vuuren et al. 2011, Clim. Ch.) heavily rely on changes in land use (aforestation, bioenergy production)





Institutional and Other Partners

Regionally Focused

- Academic Institutions/Universities
- Federal/National Agencies
- Regional/State/Local Agencies
- International Research Organizations
- HydroMet Services
- Stakeholders
- Young Hydrologic Society/YESS/APECS etc.





International Workshop on Land Surface Multi-spheres Processes of Tibetan Plateau and their Environmental and Climate Effects Assessment August 8-11, 2016, Xining, China

GEWEX/GLASS Plans for Representing Land-Atmosphere processes for TPE/Tibet/Himalayas

In Context of:

- 1) World Climate Research Programme (WCRP) Grand Challenges:
- 2) WCRP/GEWEX Science Questions:

MANY GRAND CHALLENGES AND SCIENCE QUESTIONS INVOLVE WATER. GLASS focus is on model development and evaluation, concentrating on land processes in the new generation of landsurface models, and representing land-atmosphere interactions. The Tibetan region represents a unique climate: Cold, Dry, High Elevation with Semi-Arid Grassland Ecosystems.





International Workshop on Land Surface Multi-spheres Processes of Tibetan Plateau and their Environmental and Climate Effects Assessment August 8-11, 2016, Xining, China

GEWEX/GLASS Project: Land Model Benchmarking

- Evaluate performance of land-surface models in the context of defined metrics for a number of flux sites worldwide.
- Land models should out-perform empirical models, persistence (for NWP models), climatology (for climate models).
- Extend to sites on the Tibetan Plateau.

The PALS Land sUrface Model Benchmarking Evaluation pRoject (PLUMBER)

- E Evergreen Needleleaf
- B Evergreen Broadleaf
- D Deciduous Broadleaf
- M Mixed Forest
- G Grassland
- C Cropland
- W Woody Savanna
- S Savanna
- P Permanent Wetlands



Martin Best (UKMO), Gab Abramowitz (UNSW) et al.

Global Energy and Water cycle Exchanges project Global Land/Atmosphere System Study





International Workshop on Land Surface Multi-spheres Processes of Tibetan Plateau and their Environmental and Climate Effects Assessment August 8-11, 2016, Xining, China

GEWEX/GLASS-GASS (Global Atmospheric System Studies) Project: Diurnal land-atmosphere coupling experiment (DICE)

- DICE-1: Study the interactions between the land-surface & atmospheric boundary layer and assess feedbacks.
- DICE-Over-Ice: Study the interactions between the ice/snowsurface and atmospheric boundary layer under conditions of strong stability and assess feedbacks.
- Extend to sites on the Tibetan Plateau.



Southern Great Plains, USA (CASES-99 Experiment)

Dome C - Antarctica

Qinghai Province



Global Energy and Water cycle Exchanges project Global Land/Atmosphere System Study







