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GEWEX Co-chairs' report

S. Seneviratne, G. Stephens



1) SSG & panel memberships

- 2) GEWEX overview
- Main activities (separate reports on most of these):
- Advances in Water availability GC and Extremes GC
- Development of US GEWEX activities
- CMIP6 activities (LandMIPs: LS3MIP & LUMIP, HighResMIP)
- Interactions with other WCRP core projects (CLIVAR, CliC, and SPARC)
- Other GEWEX 2015 meetings and activities: ESA-GEWEX conference, Landatmosphere summer school
- 3) New activities
- Development of US RHP
- GEWEX PROES
- GEWEX Soils initiative
- 2016 Workshops (Hydro sensitvity, June; HiRes- Sept, PROES midlat storms, Nov)
- Cross panel (Cloud/aerosol/precipitation)
- GEWEX/CLIVAR activities
- 4)Update on US DS study
- 5) GEWEX/WCRP "state of the water cycle" Co-chairs' report









Prof. Sonia Seneviratne Co-Chair of the SSG



Prof. Lisa Alexander



Dr. Graeme Stephens Co-Chair of the SSG

Prof. Richard Anyah



Prof. Rene Garreaud



Dr. Xin Li



Dr. Nathalie de Noblet-Ducoudré



Dr. Paul Poli



Prof. German Poveda



Prof. Remko Uilenjhoet



Prof Peter Webster



Prof. Minghua Zhang

GEWEX SSG meeting, 2016 - Co-chairs' report

GEWEX Scientific Steering Group 2016





GEWEX within WCRP





GEWEX within WCRP









GEWEX vision

Water and energy are fundamental for life on Earth. Fresh water is a major pressure point for society owing to increasing demand and climate change.

Extremes of droughts, heat waves as well as floods, heavy rains and intense storms are substantially affected by climate change.

Better observations and analysis of these phenomena, and improving our ability to model and predict them (in particular related to the representation of land and atmospheric processes), will contribute to increasing information needed by society and decision makers for future planning.









Radiation Code Comparison **Mission:** To measure and predict global and regional energy and water variations, trends, and extremes (such as heat waves, floods and droughts), through improved observations and modeling of land, atmosphere and their interactions; thereby providing the scientific underpinnings of climate services.





Observations and Predictions of Precipitation

How can we better understand and predict precipitation variability and changes?

Global Water Resource Systems

How do changes in the land surface and hydrology influence past and future changes in water availability and security?

Changes in Extremes

How does a warming world affect climate extremes, and especially droughts, floods and heat waves, and how do land processes, in particular, contribute?

Water and Energy Cycles and Processes

How can understanding of the effects and uncertainties of water and energy exchanges in the current and changing climate be improved and conveyed?





SSG memberships

GEWEX overview

Main activities (separate reports on most of these):

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- Interactions with other WCRP core projects (CLIVAR, CliC, and SPARC)
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- GEWEX PROES
- GEWEX Soils initiative
- Idea: GEWEX/WCRP "state of the water cycle"





Actionable questions and activities organized into themes

Evaluate

Understand

- Precipitation observations?
- Model performance?
- Land-water processes models and observations?
- Hydrological sensitivity?
- Spatial pattern of precip change? ('wet wetter, dry drier'?)
- Regional changes to precipitation intensity (Convection?)
- Interactions between land water dynamics and atmospheric processes?

- Models improvements?
- Modeling human impacts

Predict

Cross cutting activities Monsoons, Energy balance closure, HiRes, PROES, data compilations

These activities also contribute directly to Extremes GC, climate sensitivity GC





AGU Earth's future Journal

Invited paper on GCs;

Examine the state of the planet and assess the challenges and opportunities associated with global and regional changes in the Earth System. Provide a scientific perspective on the research activities conducted within the international programs/projects.

Request;

Briefly describe the scientific objectives and rationale of GEWEX Water GC Highlight the milestones and the innovative outcome that are expected in the next few years. Focus on

- the scientific challenges the community is addressing, and
- the approach and methodology adopted to make substantial and
- measurable progress.

Provide some scientific background with a broad perspective rather than just a programmatic view.

10,000-word article (excluding title, acknowledgments, author and affiliation information, and references) with 3 figures and 2 tables would be ~25 publishing units.

Due end March 2016





WCRP Extremes GC

Co-Chairs: L. Alexander, G. Hegerl, S. Seneviratne, X. Zhang

First version of implementation plan (submitted to WCRP, available on web page) completed; Co-leads for activities identified; Several activities initiated







WCRP Extremes GC

- 4 extremes (Heavy precipitation, heatwaves, droughts, storms)
- 4 themes (Document, Understand, Attribute, Simulate)







4 themes

improved quality of ground-based and remote-sensing based datasets for extremes DOCUMENT

interactions between large-scale drivers and regional-scale processes

UNDERSTAND

role of external (e.g. anthropogenic) forcings vs internal variability for changes in intensity and frequency of extremes ATTRIBUTE

Evaluate and improve models for simulations of extremes SIMULATE/PREDICT





WCRP Extremes GC







WCRP Extremes GC: Main 2015 activities

- Jan 2015: IDAG meeting (X. Zhang, G. Hegerl)
- Feb. 2015: Workshop on GC extremes data requirements, Sydney, Australia (L. Alexander)
- Aug. 2015: Published special issue in Weather and Climate Extremes (7 students' led papers from WCRP 2014 summer school; Editorial of S.I. Seneviratne & F.W. Zwiers; Foreword of D. Carlson; Special Issue editor: L. Alexander)
- Aug. 2015: Swiss Climate Summer School (R. Knutti, S.I. Seneviratne)
- Oct. 2015: Workshop on Understanding, modeling and predicting weather and climate extremes (J. Sillmann, S.I. Seneviratne, G. Hegerl)





WCRP Extremes GC: Main 2016 activities

- 2016: Planned workshops:
 - Blocking, April 2016 (with SPARC)
 - High-impact weather, June 2016 (with WWRP)
 - 13th International Meeting on Statistical, June 2016 Climatology (Statistical methods for extremes)
 - ExtremeX workshop, December 2016 (Theme: Understand)
- IDAG 2016: Paper writing meeting (overview article planned in high-impact journal; contact taken with Nature Geoscience)

Further details see Extremes GC overview





doi:10.1038/nature16542

Allowable CO₂ emissions based on regional and impact-related climate targets

Sonia I. Seneviratne¹, Markus G. Donat^{2,3}, Andy J. Pitman^{2,3}, Reto Knutti¹ & Robert L. Wilby⁴



(Seneviratne et al. 2016, Nature, published online)





GEWEX CMIP6 activities

GEWEX involved in several CMIP6 projects:

- LS3MIP (land surface, snow and soil moisture MIP)
- LUMIP (land use MIP)
- HighResMIP

"LandMIPs"

- CFMIP
- CORDEX

Feedback on MIPs provided to WGCM, S. Seneviratne and G. Stephens

New H2020 projects providing European-based funding for LS3MIP, LUMIP and HighResMIP simulations (H2020 CRESCENDO, H2020 PRIMAVERA)





LS3MIP (Land Surface, Snow, and Soil Moisture MIP)

Co-chairs:

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Joint GEWEX and CLIC activity



Follow-up to ESM-SnowMIP, GLACE-CMIP, and GSWP3





LS3MIP (Land Surface, Snow, and Soil Moisture MIP)

- Offline reference land simulations: "LMIP"
- Coupled sensitivity experiments investigating the impacts of snow- and soil moisture-climate interactions (process understanding, constraints)







LUMIP (Land Use MIP)

Co-chairs: David Lawrence (NCAR) and George Hurtt (University of Maryland)

SSG: Almut Arneth, Victor Brovkin, Kate Calvin, Andrew Jones, Chris Jones, Peter Lawrence, Nathalie de Noblet-Ducoudré, Julia Pongratz, Sonia Seneviratne, Elena Shevliakova

With involvements of GEWEX (GLASS) and ILEAPS







What are the effects of land use and land-use change on climate and biogeochemical cycling (past-future)?

Are there regional land management strategies with promise to help mitigate and/or adapt to climate change?

- Fossil fuel vs. land use change
- Biogeochemical vs. biogeophysical impact of land use
- Land cover vs. land management impacts
- Modulation of land use impact on climate by land-atmosphere coupling strength (LS3MIP)
- Modulation of global CO₂ fertilization by land use

CMIP6 Questions:	How does Earth System respond to forcing?
WCRP Grand Challenge:	Biospheric forcings and feedbacks ,
	Water Availability, Climate Extremes





LS3MIP and LUMIP jointly constitute the "LandMIPs" of CMIP6: Comprehensively cover land-related analyses

GEWEX

that provide a deeper understanding of mountain precipitation processes, and to facilitate improvements in numerical weather prediction models, climate models, and hydrological models. The development of observational data sets will be a central activity. In particular, MOUNTerrain will focus on a collation of existing digitized observational data for highelevation precipitation, and data rescue of high-elevation precipitation records (including quality control), including undigitized meteorological station records and ski-field and alpine clubs records, global and regional reanalysis products, and climate model precipitation fields from CMIP5 and 6.

Some of the key questions to be addressed include:

- How useful are (and how best to use) remotely sensed and gridded data sets, such as TRMM, GPCP, and reanalyses for characterizing high-elevation precipitation?
- How well are we measuring solid precipitation in moun-

Land Processes, Forcings, and Feedbacks in Climate Change Simulations: The CMIP6 "LandMIPs"

Sonia I. Seneviratne¹, Bart van den Hurk², Dave Lawrence³, Gerhard Krinner⁴, George Hurtt⁵, Hyungjun Kim⁶, Chris Derksen⁷, Taikan Oki⁶, Aaron Boone⁸, Michael Ek⁹, Victor Brovkin¹⁰, Paul Dirmeyer¹¹, Hervé Douville⁸, Pierre Friedlingstein¹², Stefan Hagemann¹⁰, Randal Koster¹³, Nathalie de Noblet-Ducoudré¹⁴, and Andrew Pitman¹⁵

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LandMIP workshop, ETH, October 26-28





Interactions with other core projects (CLIVAR, CliC, SPARC)

CLIVAR:

Interactions in following areas: Monsoon panel, Surface energy and water balances, ETCCDI, Extremes GC, Salinity

CliC:

Join coordination of LS3MIP CMIP6 experiment PROES: Greenland surface nergy/mass balance Land surface and snow modeling; cold regions processes; observations of surface water budget

SPARC: Involvement in extreme GC Potential interactions with GASS PROES UTCC





Other GEWEX 2015 meetings

C C	eo for water cycle science 2015 European Space Ager	ncy
	List of even	nts
Home	•	
Objectives	Earth Observation for Water Cycle Science 2015	
Topics	,	
Organisation	20th-23rd October 2015 ESA-ESRIN, Italy	
Deadlines	۶ ۱	
Registration	Co-organized by ESA, GEWEX	
Abstracts	Final Presentations On line	
Abstract Book	,	
Programme		
Presentation Guidelines		
Committees		
Accommodation		
Flyer		e.,
Venue		
Social Event		
Contact		1

http://www.eo4water2015.info





Other GEWEX 2015 meetings

ALPINE SUMMER SCHOOL

Processi fondamentali della dinamica dei fluidi geofisici e del sistema climatico Processus fondamentaux de la dynamique des fluides géophysiques et du système climatique Fundamental processes in geophysical fluid dynamics and the climate system



Course XXIII

Land-Atmosphere Interactions

Valsavarenche, Valle d'Aosta (Italy), 22 June - 1 July, 2015

Directors of the Course: **Pierre Gentine** - Columbia University, NY, USA **Albert A. M. Holtslag** - Wageningen University, The Netherlands

Scientific Secretary: Silvia Terzago - CNR-ISAC, Italy





http://www.to.isac.cnr.it/aosta_old/aosta2015/index.htm





GEWEX soils initiative

See separate presentation (D. Or)

Bottom-up initiative, strong motivation of soil research community; also corresponds to previous request from JSC

Workshop planned in June 2016





Idea: GEWEX "State of the water cycle"

STATE OF THE CLIMATE IN 2014



Special Supplement to the Bulletin of the American Meteorological Society Vol. 96, No. 7, July 2015

Similar to BAMS "State of the climate" Focus on 3-5 year time frames Climatic scale (not only 1 year and not only single weather events) Water cycle focused

Feedbacks, inputs?





Summary:

Several new activities (GEWEX wide and providing interfaces to other research communities)

Panel activities: See individual reports

To be discussed: Integration between panels, contribution of panels to GCs, new activities