GEWEX NEWS

GEWEX is a Core Project of WCRP on Global Energy and Water Exchanges

WCRP World Climate Research Programme | WMO | UNESCO | IOC | ICSU International Council for Science

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Abstracts Due 18 December 2017

www.gewexevents.org/events/2018conference

Contents

Call for Abstracts

The **2018 GEWEX Science Conference** is structured around the challenges confronting our ability to understand and predict changes in climate extremes and the availability of fresh water, considering the complex factors of natural variability, forced climate change due to human activities, and management practices such as dams, reservoirs, land cover changes and agricultural management. The Conference will reflect research activities that advance the main themes of the GEWEX Project and of the two World Climate Research Programme Grand Challenges on "Weather and Climate Extremes" and "Water for the Food Baskets of the World." Abstracts are welcomed on the following themes.

Conference Themes *(and Associated Sessions)*

1. Nexus of Water, Energy and Food

- Open session *(1)*
- Regional hydroclimate projects *(2)*
- Evapotranspiration determination *(3)*
- Advances in irrigation hydrology and its impact on the water cycle *(5)*
- Water cycle over breadbaskets: cities, agriculture and environment *(11)*
- Human-climate water nexus, climate change and water security *(13)*
- Droughts in present and future climate *(20)*
- Soils in water and climate models *(22)*
- High-resolution modeling and resolved/permitted convection *(25)*

2. Climate Extremes

- Open session *(1)*
- Regional hydroclimate projects *(2)*
- Understanding subdaily rainfall extremes and the diurnal cycle of precipitation *(4)*
- Modeling for extremes *(8)*
- Satellite observations for climate extremes, water cycle processes and land-climate interactions *(12)*
- Heatwaves in present and future climate *(16)*
- Addressing the challenge of compound events *(18)*
- Detection and attribution of climate extremes *(19)*
- Droughts in present and future climate *(20)*
- Climate extremes, ecosystems and society: impacts, feedbacks and emergent risks *(21)*
- High-resolution modeling and resolved/permitted convection *(25)*
- Documenting extremes *(26)*

3. Extreme Weather

- Open session *(1)*
- Understanding subdaily rainfall extremes and the diurnal cycle of precipitation *(4)*
- Changes in rainfall intensity and distribution in time and space and their effect on surface water partitioning *(6)*
- Modeling for extremes *(8)*
- Heatwaves in present and future climate *(16)*
- Storms and high-impact weather *(17)*
- Addressing the challenge of compound events *(18)*
- Land-atmosphere interactions and climate predictability, including subseasonal to seasonal *(23)*
- High-resolution modeling and resolved/permitted convection *(25)*
- Documenting extremes *(26)*

4. Atmospheric Modeling and Observations

- Open session *(1)*
- Regional hydroclimate projects *(2)*

4. Atmospheric Modeling and Observations *(continued)*

- Evapotranspiration determination *(3)*
- Understanding subdaily rainfall extremes and the diurnal cycle of precipitation *(4)*
- Changes in rainfall intensity and distribution in time and space and their effect on surface water partitioning *(6)*
- Global energy and water cycles, clouds and radiation *(10)*
- Storms and high-impact weather *(17)*
- Droughts in present and future climate *(20)*
- Land-atmosphere interactions and climate predictability, including subseasonal to seasonal *(23)*
- Benchmarking and metrics *(24)*
- High-resolution modeling and resolved/permitted convection *(25)*

5. Land Modeling and Observations

- Open session *(1)*
- Regional hydroclimate projects *(2)*
- Evapotranspiration determination *(3)*
- Advances in irrigation hydrology and its impact on the water cycle *(5)*
- Changes in rainfall intensity and distribution in time and space, and their effect on surface water partitioning *(6)*
- Water cycle over breadbaskets: cities, agriculture and environment *(11)*
- Satellite observations for climate extremes, water cycle processes, and land-climate interactions *(12)*
- Droughts in present and future climate *(20)*
- Climate extremes, ecosystems and society: impacts, feedbacks and emergent risks *(21)*
- Soils in water and climate models *(22)*
- Land-atmosphere interactions and climate predictability, including subseasonal to seasonal *(23)*
- Benchmarking and metrics *(24)*
- High-resolution modeling and resolved/permitted convection *(25)*

6. Mountain and High-Latitude Hydrology

- Open session *(1)*
- Regional hydroclimate projects *(2)*
- Understanding subdaily rainfall extremes and the diurnal cycle of precipitation *(4)*
- Changes in rainfall intensity and distribution in time and space and their effect on surface water partitioning *(6)*
- Cold regions Earth systems change, including precipitation occurring near 0°C *(7)*
- The mountain water cycle *(14)*
- Land-atmosphere interactions and water cycle over the third pole region *(15)*
- Benchmarking and metrics *(24)*
- High-resolution modeling and resolved/permitted convection *(25)*

7. Global Energy and Water Cycles

- Open session *(1)*
- Evapotranspiration determination *(3)*
- Advances in irrigation hydrology and irrigation impact on water cycle *(5)*
- Energy and water budget closure and advances in assessment techniques *(9)*
- Global energy and water cycles, clouds and radiation *(10)*
- Water cycle over breadbaskets: cities, agriculture and environment *(11)*
- Satellite observations for climate extremes, water cycle processes and land-climate interactions *(12)*
- Droughts in present and future climate *(20)*
- High-resolution modeling and resolved/permitted convection *(25)*

Conference Sessions

The following are the titles of the sessions. Detailed descriptions of each session are available on the Conference website.

1. **Open Session on Water and Extremes Research**
   Conveners: Graeme Stephens, Sonia Seneviratne and Peter van Oevelen

2. **Regional Hydroclimate Projects**
   Conveners: Philippe Drobinsky, Jason Evans, Brian Golding, Branka Ivancan-Picek and Howard Wheater

3. **Evapotranspiration Determination**
   Conveners: Helen Cleugh, Joan Cuxart, Pierre Gentine and Jan Polcher

4. **Understanding Subdaily Rainfall Extremes and the Diurnal Cycle of Precipitation**
   Conveners: Andrea Flossmann, Hayley Fowler, Elizabeth Lewis and Nathalie Schaller

5. **Advances in Irrigation Hydrology and Water Management: Measurements, Modeling and Multi-Scale Impacts**
   Conveners: Hyungjun Kim, Patricia M. Lawston, Joseph Santanello and Wim Thiery

6. **Changes in Rainfall Intensity and Distribution in Time and Space and Their Effect on Surface Water Partitioning**
   Conveners: Gianpaolo Balsamo, Eleanor Blyth, Aaron Boone and Remko Uijlenhoet

7. **Cold Regions Earth Systems Change, Including Precipitation Occurring Near 0°C**
   Conveners: Pavel Groisman, Gerhard Krinner, Ronald Stewart and Howard Wheater

8. **Modeling for Extremes**
   Conveners: Gabi Hegeri, Andrew Pitman and Robert Vautard

9. **Energy and Water Budget Closure and Advances in Assessment Techniques**
   Conveners: Tristan L'Ecuyer, Karina von Schuckmann and Kevin Trenberth

10. **Global Energy and Water Cycles, Clouds and Radiation**
    Conveners: Rémy Roca, Graeme Stephens and Claudia Stubenrauch

11. **Water Cycle over the Breadbaskets: Cities, Agriculture and Environment**
    Conveners: Richard Harding, Taikan Oki and Yoshihide Wada

12. **Satellite Observations for Climate Extremes, Water Cycle Processes and Land-Climate Interactions**
    Conveners: Nick Rayner, Matthew Rodell and Christopher Taylor

13. **The Human-Climate Water Nexus, Climate Change and Water Security**
    Conveners: Katja Frieler, Carole Dalin, Anil Mishra and Jan Polcher

14. **The Mountain Water Cycle**
    Conveners: Chris DeBeer, John Pomeroy and Roy Rasmussen

15. **Land-Atmosphere Interactions and Water Cycle over the Third Pole Region**
    Conveners: Aili Ailikun, Xin Li, Bob Su, Yongkang Xue and Tandong Yao

16. **Heatwaves in Present and Future Climate**
    Conveners: Frédérique Cheruy, Erich Fischer and Francis Zwiers

17. **Storms and High-Impact Weather**
    Conveners: Michael Kunz, Olivia Romppainen-Martius and Paolo Ruti

18. **Addressing the Challenge of Compound Events**
    Conveners: Amir AghaKouchak, Bart van den Hurk, Seth Westra and Jakob Zscheischler

19. **Detection and Attribution of Climate Extremes**
    Conveners: Friederike Otto, Michael Wehner and Xuebin Zhang

20. **Droughts in Present and Future Climate**
    Conveners: Christel Prudhomme, Sonia Seneviratne, Jacob Schewe and Justin Sheffield

21. **Climate Extremes, Ecosystems and Society: Impacts, Feedbacks and Emergent Risks**
    Conveners: Markus Reichstein, Jana Sillmann and Dáithí Stone

22. **Soils in Water and Climate Models**
    Conveners: Dani Or, Harry Vereecken and Anne Verhoef

23. **Land-Atmosphere Interactions and Climate Predictability, Including Subseasonal to Seasonal (S2S)**
    Conveners: Paul Dirmeyer, Michael Ek and Xubin Zeng

24. **Benchmarking and Metrics**
    Conveners: Gab Abramovitz, David Lawrence and James Randerson

25. **High-Resolution Modeling and Resolved/Permitted Convection**
    Conveners: Elizabeth Kendon, Daniel Klocke, Nicole van Lipzig and Andreas Prein

26. **Documenting Extremes**
    Conveners: Lisa Alexander, Ali Behrangi, Lukas Gudmundsson and Albert Klein Tank

Submission of Abstracts

Submitted abstracts will be used to select presentations for poster and oral sessions. Poster sessions will be the main form of presentation during the Conference and a limited number of oral presentations will be given.

Only one abstract may be submitted per registrant. An abstract should contain a minimum of 500 words, up to a maximum of 1000 words.

There is a nonrefundable fee of 80 Canadian dollars ($80 CAD) to submit an abstract. This is separate from the Conference registration fee. Abstract fees are refundable only if your abstract is rejected. There is no refund for abstracts withdrawn after acceptance. To register for the Conference or submit an abstract, please see the conference website.

Important Dates

15 October 2017:	**Registration and abstract submission opens**
18 December 2017:	**Abstracts due**
15 January 2018:	**Abstract acceptance notification**
22 January 2018:	**Travel support notification**
1 February 2018:	**Early bird registration closes**

All participants, including invited speakers and conveners, must register.

Conference Website

www.gewexevents.org/events/2018conference

AGU Hydrology Section Student Subcommittee (H3S) Plans for Fall Meeting

With less than four months to go until the American Geophysical Union (AGU) Fall Meeting on 11–15 December 2017 in New Orleans, H3S is shifting into a higher gear to prepare several activities for the meeting.

For now, we have three workshops in the pipeline and one Town Hall in collaboration with the *Water Resources Research (WRR) Journal*. Our workshops will focus on cultural differences, career track options after graduation and the connections between science, private industry and policy-making. The Town Hall in collaboration with the *WRR Journal* will address the question of quality in reviewing and publishing and how to get the word out about your own research. Throughout the conference we will be organizing a scavenger hunt with new questions or challenges every day and exciting prizes. This year, we will have four pop-up sessions as alternative format lightning–style talks:

- 5th Annual Water Sciences Pop-Up
- Productive Stupidity: Movement Towards a Growth Mindset in Graduate Research
- Cultural Responses to Global Change
- A Scientist's Place: Redefining the Role of Science in a Dynamic World

Due to some regulations, not all of these pop-ups will be listed as official sessions in the meeting program. Some of them will be held as a brown-bag or lunch meeting. Keep an eye on our twitter account (@AGU_H3S) for updates and news!

Kevin Trenberth to Receive AGU Roger Revelle Medal

Kevin E. Trenberth, former co-chair of the GEWEX Scientific Steering Group from 2010–2013, an honorary Fellow of the Royal Society of New Zealand and a distinguished Senior Scientist at the National Center for Atmospheric Research, will receive the American Geophysical Union's Roger Revelle Medal at the AGU Fall meeting in New Orleans on 13 December 2017. This medal is given in recognition for outstanding contributions in atmospheric sciences, atmosphere-ocean coupling, atmosphere-land coupling, biogeochemical cycles, climate, or related aspects of the Earth system. Dr. Trenberth was nominated for the award for his outstanding research breakthroughs in several areas and his leadership in the World Climate Research Program, the Intergovernmental Panel on Climate Change and U.S. national research programs. Of particular note is his research in climate event attribution, his leadership in understanding the Earth's energy imbalance and the planet's energy and water cycles. He has served continuously on many World Climate Research Programme committees since the initiation of WCRP to the present, and we are grateful for his tireless efforts and commitment to climate science.

A New Vision for GEWEX Global Atmospheric System Studies (GASS) Panel

Xubin Zeng[1] and Daniel Klocke[2], Co-Chairs of GASS
[1]Department of Hydrology and Atmospheric Sciences, University of Arizona, USA; [2]Hans Ertel Center for Weather Research, Deutscher Wetterdienst, Germany

The GASS Panel was formed in 2010 when the GEWEX Cloud System Studies Project, the Atmospheric Boundary Layer Study and other related GEWEX projects were merged into the Panel. Since its formation, GASS and its projects have identified weaknesses in the representation of physical processes in atmospheric models for climate and weather (e.g., based on idealized test cases with single column modeling and large-eddy simulations), thus improving the understanding and subsequently the representation of these processes in global models. This now commonly accepted and used model development strategy can largely be credited to the initiatives of GASS and the related GEWEX activities that preceded it.

GASS and the Global Land/Atmosphere System Study (GLASS) Panel, which is responsible for studies related to the land surface and its interaction with the atmosphere, oversee all GEWEX modeling and prediction activities. These include the development and improvement of parameterization schemes to ensure their successful integration into weather and climate models.

The co-chairs of the GASS and GLASS Panels are members of the Working Group on Numerical Experimentation (WGNE), which is jointly sponsored by the World Climate Research Programme and the World Meteorological Organization Commission for Atmospheric Sciences. WGNE fosters the development of atmospheric circulation models for use in weather, climate, water and environmental prediction on all time scales, and the diagnosis and resolution of their shortcomings. It also promotes coordinated numerical experimentation for validating model results, observed atmospheric properties, and exploration of the natural and forced variability and predictability of the atmosphere, as well as studies aimed at refining numerical techniques and the formulation of atmospheric physics processes.

In past years, GASS has organized projects related to the atmospheric boundary layer, Madden-Julian Oscillation, clouds, microphysics, boundary layer clouds, large-eddy simulation and single-column model intercomparisons, polar clouds, cirrus, the grey zone (cloud and convection parameterization with a grid size of 1–10 km) and atmospheric radiation (*see: http://www.gewex.org/panels/global-atmospheric-system-studies-panel/gass-projects/*).

The role of the GASS was recently assessed by GEWEX, and recognizing the paramount importance of this Panel in achieving GEWEX goals, the GEWEX Scientific Steering Group recently appointed new co-chairs to continue the important work of GASS.

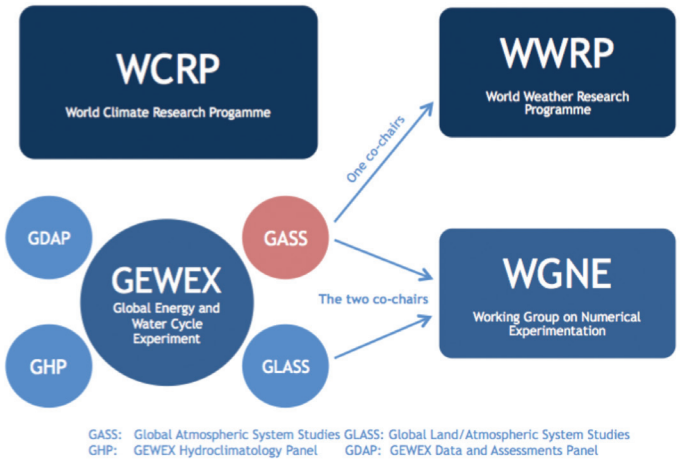
Strategy for GASS

The goal of GASS, to understand the physical processes and the coupling of those processes to atmospheric dynamics, particularly those that define the atmospheric branch of the hydrological cycle, remains the same. GASS will continue to facilitate and support the international community that carries out and uses observations, process studies, and numerical model experiments with the goal of developing and improving the representation of the atmosphere in weather and climate models. Primarily, GASS will continue coordinating scientific projects around process-oriented science questions that bring together experts to contribute to the development of atmospheric models.

The connection between GASS and World Weather Research Programme (WWRP) activities is a natural fit as both initatives have similar challenges in terms of model development and experience on short and long time-scale predictions (e.g., using intraseasonal prediction to bridge weather and climate). In addition, the relationship to the weather prediction community will be further strengthened in the future via the WWRP connection.

GASS projects will have crosscutting activities with other GEWEX Panels and also connect to global initiatives, such as the Aerosols, Clouds, Precipitation and Climate (ACPC) Initiative, the Global Atmospheric Watch (GAW) and the GEWEX Aerosol Precipitation (GAP) Project. GASS will also attempt to address the relevant WCRP Grand Challenges, particularly Clouds, Circulation and Climate Sensitivity; Weather and Climate Extremes; and Water for the Food Baskets of the World. The figure below shows these connections.

As idealized configuration modeling has now matured, GASS will focus more on the role of process interactions, which becomes especially relevant when integrating improved processes in existing models. Through either joint projects or the entrainment of expertise within GASS, the Panel will focus on several research priorities in weather and climate models:



Connections between GASS, GEWEX Panels and other global initiatives.

- Coupling dynamics with physics (e.g., surface-boundary layer-convection coupling, Madden-Julian Oscillation)
- Mechanisms for the diurnal cycle of precipitation over different regions
- Precipitation coupling with aerosols, clouds and environmental conditions
- Radiative transfer in the atmosphere and its interaction with clouds and circulation
- Representation of convection in models with a horizontal grid size of 1–10 km and its role in high impact weather
- Role of land processes in sub-seasonal to seasonal (S2S) prediction (e.g., supporting the S2S WCRP and WWRP joint project)
- Stable boundary layers and the impact of surface conditions on momentum transport and the energy and water cycle

GASS Panel Membership

The GASS Panel consists of two co-chairs and Panel members. Each member is expected to be an expert in a field relevant to GASS and be involved in one or more GASS projects as leader, participant or stakeholder.

The new co-chairs have opened a dialogue with their GASS colleagues about continuing existing projects and organizing future GASS projects. The GEWEX community is encouraged to email their ideas for potential GASS projects to the co-chairs. Learning from prior experiences, the co-chairs believe it is preferable that the proposed projects align with the interests of the proposers and his/her group or institution. This would not only increase the chance of success of the projects' success as GASS activities but also ensure the institutional support for the proposers' travel for attending GASS meetings.

The 2nd Pan-GASS Conference: Understanding and Modeling Atmospheric Processes

Five years after the first Pan-GASS Conference was held in Boulder, Colorado, USA, the second Pan-GASS Conference is being planned for 26 February–2 March 2018 in Lorne (near Melbourne), Australia (*http://singh.sci.monash.edu/Pan-GASS/index.shtml*). The conference will bring together scientists working on various aspects of the representation of atmospheric physics in climate and weather forecasting models. The sessions will be organized around core GASS topics to reflect past and future projects in the area of process studies and atmospheric model development. One of the goals of the conference is to plan and discuss future GASS initiatives and the direction of research supporting atmospheric model development globally. The conference will also serve as a starting point for the new GASS Panel and its initiated projects.

A wide-ranging program of presentations and posters covering the key challenges of current and next generation atmospheric model development is planned, as well as working group meetings on specific topics and plenary discussions. Abstract submission will open on 1 September 2017.

Meeting/Workshop Reports

GLASS Panel Meeting

Tokyo, Japan
15–16 May 2017

Michael Ek[1] and Gab Abramowitz[2]
[1]NCEP Environmental Modeling Center, College Park, Maryland, USA; [2]UNSW Sydney and ARC Centre of Excellence for Climate Extremes, NSW, Australia

The Global Land/Atmosphere System Study (GLASS) Panel meeting was held at the University of Tokyo with 16 GLASS Panel members and guests attending, five remotely. The meeting occurred prior to the 4th Hydrology Delivers Earth System Science to Society (HESSS4) conference, which took place 17–19 May and included several GLASS-related presentations. At the GLASS meeting, community and associated crosscutting activities under the three panel elements were reviewed, including: (1) land model benchmarking to improve knowledge and representation of land-surface processes; (2) understanding land-atmosphere interaction and feedbacks; and (3) the role of the land surface in predictability.

Local Land-Atmosphere Coupling (LoCo) Project

Ahmed Tawfik presented the status of the LoCo Project—now in its second decade. The project is composed of 17 mostly young scientists from around the globe who have been very active in publishing and promoting LoCo-related work. This work includes the Coupling Metrics Toolkit (COMET), LoCo metric "cheat sheets," a book chapter on land-atmosphere interactions, and a core LoCo article for the *Bulletin of the American Meteorological Society* (in progress). Publications are available on the LoCo website at *http://www.gewex.org/loco/*. A great deal of energy in recent years has gone into supporting improved observations of land-atmosphere coupling, most notably in terms of the surface layer, soil moisture and the Atmospheric Boundary Layer (ABL). Numerous field campaigns were conducted or planned over the U.S. Southern Great Plains (SGP) and other regions. Many initiatives were proposed to promote improved ABL retrieval from space via the Decadal Survey, Global Climate Observing System/Essential Climate Variables (GCOS/ECVs) and the associated NASA-dedicated task group. There are plans to produce a LoCo-DICE [Diurnal Coupling Experiment, a joint GLASS and Global Atmospheric System Studies (GASS) Panel activity] analysis and paper, and focus on single-column model benchmarking (i.e., vertical benchmarking) to compliment the ongoing Protocol for the Analysis of Land Surface models (PALS)/PALS Land Surface Model Benchmarking Evaluation Project (PLUMBER) efforts.

PALS/PLUMBER

Gab Abramowitz provided an update on PALS (*http://www.modelevaluation.org*) and discussed the scope of a new PLUMBER activity. Changes to PALS include: (1) analyses are no longer restricted to a particular package or language; (2) a distributed architecture will allow analyses to be co-located with big data; (3) the potential for an Application Programming Interface (API) access to allow remote continuous integration testing of science in a model, not just code; and (4) a more generic design that can be used with any model type or component, not just land-surface models (LSMs). Under PALS, model intercomparison projects (MIPs) are transparent (analysis scripts are viewable, and experiments can be replicated) and MIPS are ongoing (new model additions will automatically be analyzed, and new analyses can be added retrospectively). This flexibility and greater capability means, for example, that MIPs such as the Global Soil Wetness Project (GSWP), PLUMBER and the legacy Project for Intercomparison of Land-Surface Parameterization Schemes (PILPS) experiments could be available and (re)analyzable quickly.

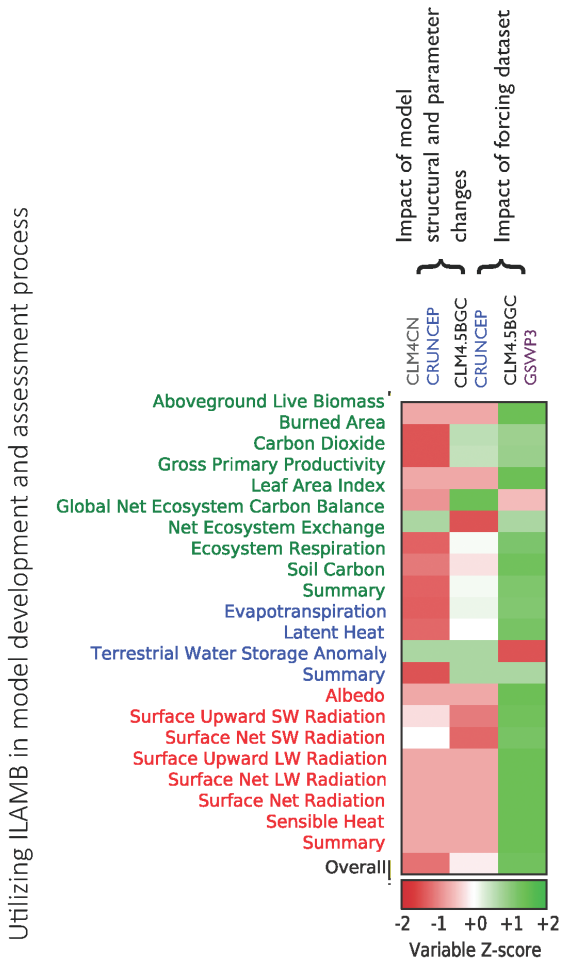
A future project, PLUMBER2, was discussed and a number of related issues were raised, including: (1) more sites are needed (versus the original 20 PLUMBER sites) and better quality-controlled and energy-balance-corrected FLUXNET site data, which could include urban regions; (2) improvement in the hierarchy of empirical models is needed to benchmark against (including energy and mass conservation by these empirical models); (3) more variables are necessary so that process-representation differences in models can be explored; (4) LSMs should be examined within a Budyko framework [i.e., investigating how the dryness index (potential evaporation/precipitation) affects a range of performance metrics]; (5) additional sites are needed that have boundary-layer data so land-atmosphere coupling effects can be investigated, e.g. for LoCo as described above, and for joint GLASS-GASS studies, including future phases of DICE. In this regard, Michael Ek expanded on the topic of future DICE efforts, including possible leverage efforts by the joint National Oceanic and Atmospheric Administration/National Center for Atmospheric Research "Global Model Testbed," which advocates a comprehensive simple-to-more-complex process-level model development hierarchy, including component-level (e.g., land, surface-layer) and single column model testing.

GSWP3 and LS3MIP

Hyungjun Kim gave an update on the status of the Global Soil Wetness Project Phase 3 (GSWP3) and the Land Surface, Soil Moisture and Snow Model Intercomparison Project (LS3MIP). GSWP3 is a global offline land MIP with a 0.5-degree forcing data set that will also be used for LS3MIP, the Land-Use Model Intercomparison Project (LUMIP) Coupled Model Intercomparison Project Phase 6 (CMIP6) and the GEWEX SoilWAT Project (described below). LS3MIP also includes an offline land component ("LMIP") endorsed by CMIP6, which will feature a long-term retrospective GSWP3 experiment starting in 1850 that uses prescribed land-use and land-cover changes derived from the Land Use Harmonization (LUH) data set. The 165-year data set has been frozen and is available for CMIP6 land-related studies.

LUMIP

Dave Lawrence provided an update on LUMIP, which is part of the CMIP6 suite of experiments whose experimental design has been published in Geoscientific Model Development (Lawrence et al., 2016). The historical LUH2 land use data set has been provided to the community and beta versions of the Shared Socioeconomic Pathway futures are also available with final versions expected in northern hemisphere (NH) summer 2017. Included in the LUMIP manuscript is a description of the sub-grid land use tile request (a subset of variables are requested on primary and secondary land, cropland, pastureland and urban land use tiles). For additional information on the LUMIP project, including links to access the LUH2 data, sign up for the LUMIP Google group and updates to the experimental design (available at *https://cmip.ucar.edu/lumip*). Simulations are expected to begin in NH summer 2017 as modeling centers start working on CMIP6.



Colors indicate which of the three simulations performs best for a particular variable. Red colors indicate that a particular simulation performed worst and green colors indicate that the simulation performed better. Each variable includes several metrics (e.g., RMSE, bias, interannual variability, spatial pattern correlation) and potentially several data sets (e.g., for LH Global Bio-Atmosphere Flux gridded data and FLUXNET sites). Variables labeled in red are "forcing" variables, which in these land-only simulations effectively represent an assessment of the forcing data sets.

International Land Model Benchmarking (ILAMB) Project

Dave Lawrence also gave an update on the ILAMB Project, where two versions of the ILAMB package have been released to the community. ILAMB Version 2 will be developed as open-source software, written primarily in Python. The current version assesses approximately 25 carbon, hydrology, energy and climate variables using 60 global, regional and site level data sets. Metrics for root-mean-square error (RMSE), absolute error, interannual variability, spatial patterns, variable-to-variable comparisons and more are included. An example is shown in the figure below, illustrating the impact of model structural improvements [Community Land Model 4 (CLM4) versus CLM4.5] compared against the impact of forcing data sets [Climatic Research Unit-National Centers for Environmental Prediction (CRUNCEPv4) versus GSWP3v0] using the ILAMB package. The package currently generates thousands of plots and is being utilized in model assessment and development, and to support analysis of MIPs. Example output from ILAMB, assessing output from simulations from several generations of the CLM [forced with GSWP3 and CRUNCEP data sets], is available at: *http://ilamb.ornl.gov/CLM/*. Note that results at this location are subject to change as both the ILAMB package and CLM are being finalized; figures from this example of the package should not be used for publication. Anyone interested in contributing data sets or metrics is encouraged to contact ILAMB project leads (Dave Lawrence, Forrest Hoffman, Jim Randerson, Bill Riley, Charlie Koven, Gretchen Keppel-Aleks or Nate Collier). The final workshop report of the May 2016 ILAMB workshop (Hoffman et al., 2017) is available at *https://www.ilamb.org/*. Finally, the ILAMB and PALS projects are exploring options to coordinate efforts for the mutual benefit of both projects.

Crosscuts and Joint Projects—GASS

John Edwards reported on the links between projects in the GLASS and GASS panels. Many of the projects within GASS are heavily focused on cloud processes, but two have a particularly strong relationship to the land surface. The GEWEX Atmospheric Boundary Layer Study (GABLS), led by Bert Holtslag and Gunilla Svensson, has conducted several intercomparisons of stable boundary layers involving both single-column studies using the physical schemes from numerical weather prediction and climate models, and also large-eddy simulation models. As the project has evolved, an increasing emphasis has been placed on more stable boundary layers and on coupling to the land surface (i.e., the GLASS-GASS joint project on DICE with an initial focus on the U.S. SGP). The current intercomparison, GABLS4, led by Eric Bazile, is concerned with simulation of the diurnal cycle of the boundary layer at a site on the Antarctic Plateau (the so called "DICE-over-ice" project). Recent progress was discussed at a workshop on stable boundary layers in March 2017 in Delft, The Netherlands. The Clouds Above the United States and Errors at the Surface (CAUSES) Project, led by Cyril Morcrette and Hsi-Yen Ma, is concerned with understanding the origin of continental warm biases in near-surface air temperature in the summer in both weather and climate models, making extensive use of data from the Atmospheric Radiation Mea-

surement site in the U.S. Great Plains in Oklahoma. Understanding the impact of clouds is a key part of this project, but current results indicate that surface processes also play a role.

SoilWat

Vincent Humphrey and Aaron Boone, and Anne Verhoef (remotely) gave updates on the status of the joint GEWEX and International Soil Modeling Consortium (ISMC) GEWEX Soil and Water (SoilWat) initiative. The goals of the project are to conduct an in-depth survey on how key soil physical processes (water and heat flow) are represented in climate and hydrological models, to make a systematic assessment of the utility of resolved soil maps, and sensitivity of climate models in improving the quality and resolution of soil maps and to survey how groundwater is implemented in climate models (and how this might lead to a global database of historical and current groundwater levels). The first two of these are under way with active surveys and a Soil Parameter MIP (SP-MIP) that closely follows LS3MIP protocols (van den Hurk et al., 2016).

GLASS Panel Interactions with other Projects—GHP

Additional crosscutting projects in GEWEX and other groups were discussed. In the GEWEX Hydroclimatology Panel (GHP), process level improvements in land are a shared interest with GLASS. Craig Ferguson, GLASS liaison with GHP, reviewed GHP projects, including Regional Hydroclimate Projects (RHPs) and crosscutting projects such as subdaily precipitation (Intelligent use of climate models for adaptation to non-Stationary hydrological Extremes, INTENSE), cold/shoulder season precipitation near 0°C and mountain hydrology (International Network for Alpine Catchment Hydrology, INARCH). In this regard, Gab Abramowitz summarized the issue of how water management and human influences (on both water and energy cycles) are treated in large-scale models, which is of interest to GLASS and GHP, and the subject of a 2016 joint workshop. Future activities are being planned. Aaron Boone updated the Panel on the status of "Land surface Interactions with the Atmosphere over the Iberian Semi-arid Environment" (LIAISE), a regional project with seasonally stressed vegetation and often a high degree of heterogeneity, and the need to better model the surface energy budget and properly represent the seasonal dry-down period. The likely timing for the measurement program in LIAISE is May 2019–May 2020, with linkages between GLASS, GHP and other projects.

Hydrological Cycle in the Mediterranean Experiment

As the liaison between GHP and GLASS, Pere Quintana Seguí gave an update on the work of the HyMeX Droughts and Water Resources science team towards the improvement, understanding and quantification of drought in the Mediterranean. This work is built around three themes: (1) defining drought, (2) understanding drought processes, and (3) predicting drought. Drought description work has been done at the regional/country level, such as examination of drought trends in Italy and Tunisia. As data sharing between countries is difficult, the aim is to use a common methodology to harmonize results. Interesting work has been performed using hydrological models forced by downscaled long-term reanalysis data in order to reconstruct past droughts for a period of 140 years in France. Remote sensing data (RSD) is also being used to describe drought (vegetation, precipitation, soil moisture), and to quantify the water levels behind smaller dams, since in many countries reservoir-level data are not available. Additionally, RSD are being assimilated in LSMs at different scales (single plot to an entire country). At the larger scales, LSMs are used to estimate river flow and fresh water inputs into the Mediterranean Sea. In terms of prediction, there is an effort to study the applicability of seasonal forecasts for water resource management in small Mediterranean basins, with interesting results. HyMeX research has been carried out under several projects, and in this regard, the future LIAISE campaign will examine the role of the land surface during the dry-down period in Iberia.

WCRP and Other Organizations

Michael Ek reported on liaison activities with the WCRP Modeling Advisory Council (WMAC) and the World Meteorological Organization Working Group on Numerical Experimentation (WGNE). The broad goal of WGNE and WMAC is to improve global weather and climate models and coordinate high-level aspects of modeling across WCRP. The GLASS presence in these groups is focused on land-modeling and land-atmosphere interaction. Paul Dirmeyer provided updates on the activities of the Sub-seasonal to Seasonal (S2S) Prediction Project activities and the joint GEWEX-Climate and Ocean: Variability, Predictability and Change (CLIVAR) Monsoon Panel efforts. Most relevant to GLASS is the increasing interest in land initialization, which includes soil moisture and snow, and the impact on S2S predictive skill, which is relevant for proper modeling of monsoon circulations. Rich Ellis reviewed the link between GEWEX and the Integrated Land Ecosystem Atmosphere Processes Study (iLEAPS), where the focus of iLEAPS is on ecosystems and land-use changes and their effects on biogeochemical cycles and land-atmosphere interaction, which involves a strong overlap on a number of topics with the GEWEX focus on energy and water. This includes a future iLEAPS-GEWEX collaborative project on the Arctic (ArcticMIP), where the importance of modeling high-latitude processes is being addressed, and will be discussed at the Arctic Terrestrial Modeling Workshop in Oxford in September 2017. Such a focus on the Arctic could also involve and improve GEWEX-wide participation, i.e., land-model benchmarking (GLASS), land-atmosphere interaction studies (GLASS and GASS), regional hydrology (GHP) and remotely sensed data sets working with the GDAP, thereby increasing GLASS-GDAP interaction.

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4th HESSS International Conference on Climate Extremes and Global Energy, Water and Carbon Cycles

Tokyo, Japan
16–19 May 2017

Hyungjun Kim[1], Jacob Schewe[2], Gab Abramowitz[3], Michael Ek[4], Aaron Boone[5], Sonia I. Seneviratne[6], Forrest M. Hoffman[7], James S. Famiglietti[8], Toshiyuki Nakaegawa[9], Yukihiko Onuma[1], Tomoko Nitta[1], Dai Yamazaki[1], Takao Yoshikane[1], Masashi Kiguchi[1], Kei Yoshimura[1], Yukiko Hirabayashi[1] and Taikan Oki[1]

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Over past centuries, the land-atmosphere energy and water cycles and the terrestrial biosphere have been substantially affected by human-induced alterations of water flows and storages through irrigation practices, damming rivers and groundwater extraction, in addition to the significant impacts on global warming by anthropogenic greenhouse gas emissions. Both climatic and land-surface changes are projected to continue into the future, and the interactions between the two necessitate consideration of all the human drivers when trying to understand changes in the global water and energy cycles and the implications of projected climate change and mitigation options. The global change research agenda is thus inherently cross-disciplinary, compeling scientific communities to engage with each other across traditional science boundaries.

Since 2007, the Hydrology delivers Earth System Sciences to Society (HESSS) conferences have provided forums for strengthening synergies between climate modeling and monitoring research communities. The "4th HESSS International Conference (HESSS4) on Climate Extremes and Global Energy, Water and Carbon Cycles: Improving and Integrating Knowledge Across Disciplines" was hosted at the Institute of Industrial Science at the University of Tokyo. Over 100 participants from 16 countries attended the conference, which featured 47 oral and 34 poster presentations. The scientific focus of HESSS4 was on climate extremes and their impacts, and the importance of these events in a changing climate and to society. Also discussed were recent model intercomparison projects (MIPs) spanning multiple disciplines.

HESSS4 had five sessions covering the following topics:

- Changes of Climate Forcing and Terrestrial Feedback
- Changing Climate and the Natural Human System
- Satellite Remote Sensing and Model Integration
- Uncertainties in Model Simulations and
- Delivering Science to Society.

In addition, four sessions dealt with the following topics:

- Climate Extremes: Atmospheric Forcing, Land Feedback and Propagation;
- Interactions between Nature and Society: Modeling and Policies;
- Short-/Mid-Range Hydrologic Forecast and Data Assimilation; and
- Satellite Remote Sensing for Extreme Monitoring.

The GEWEX Global Land Atmosphere System Study (GLASS) Panel and the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP) each held an open science session, and two tutorial sessions related to the International Land Model Benchmarking (ILAMB) Project were also convened. The program and presentations are available at: *http://www.gewexevents.org/events/hesss4/*.

As proposed at the HESSS2 Conference in 2010, the GEWEX Global Soil Wetness Project Phase 3 (GSWP3) serves as liaison among the various projects and MIPs. The protocol and the atmospheric boundary conditions have been shared with the GEWEX Global Land Atmosphere System Study (GLASS) Panel and projects across disciplines, including ISIMIP, the Earth System Model-Snow Model Intercomparison Project (ESM-SnowMIP)—linking WCRP and its Climate and Cryosphere (CliC) Project—and the satellite MIPs of the 6th Phase of the Coupled Model Intercomparison Project Phase (CMIP6) such as Land Surface, Snow, Soil-moisture Model Intercomparison Project (LS3MIP) and the Land Use Model Intercomparison Project (LUMIP). During HESSS4, it was confirmed that these efforts efficiently reduced redundancy across the initiatives and built capacity among communities.

Discussions were held on facilitating better communication between science communities and society and it was suggested that HESSS reach out to social scientists. Reducing knowledge and information asymmetry would be one of the keys to linking hydrology and society and proposing solutions to bring the different disciplines together. It was recommended to maintain, mine and rescue data on socio-hydrology, which will be of key importance as satellite and other global data drive the development of macroscale land surface and hydrologic models. HESSS5 would be an opportune checkpoint to measure the changes in gaps and progress toward a better interdisciplinary structure.

A conference special issue will be published in *Water Resources Research* in the *American Geophysical Union Journal* (Organizers: H. Kim, J. Schewe, F. M. Hoffman and Y. Wada). During the submission window of 15 June–31 October 2017, papers from the HESSS4 conference and its associated communities are invited (contact Hyungjun Kim via e-mail at *hjkim@iis.u-tokyo.ac.jp)*.

10th HyMeX Workshop

Barcelona, Spain
3–7 July 2017

Philippe Drobinski[1], Véronique Ducrocq[2], Maria Carmen Llasat[3], Pere Quintana-Seguí[4], Joan Bech[3] and Javier Martin-Vide[3]

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The Hydrological Cycle in the Mediterranean Experiment (HyMeX) is a 10-year (2010–2020) GEWEX Hydroclimatology Panel Regional Hydroclimate Project to improve the understanding of the water cycle, with emphasis on extreme events by monitoring and modeling the Mediterranean atmosphere-land-ocean coupled system and its variability. Building upon the 5-year review of HyMeX achievements conducted in 2015 (see report on page 20 of the November 2015 issue of *GEWEX News*), more than 160 scientists from over 10 countries participated in the 10th HyMeX Workshop to present first results related to the new science plan developed at the last workshop. Emphases included more integrated transdisciplinary studies, including water resources, droughts and their impacts, the water cycle and renewable energy resources, flash floods and social vulnerabilities and an attempt to integrate forecasting of heavy precipitation, flash floods and their impacts. The workshop also aimed at preparing the second Mediterranean Coordinated Regional climate Downscaling Experiment (MED-CORDEX-2) and upcoming field campaigns.

Continuum Scale and Integrated Analysis

One hundred talks and 69 posters presented scientific results on the main HyMeX topics in plenary and parallel sessions. The session themes included heavy precipitation, ocean circulation processes, cyclones and strong winds, flash floods and vulnerability, flash-flood prediction, water budgets, drought and water resources and integrated prediction. Seventeen parallel working sessions of the different HyMeX science teams enabled transdisciplinary discussions and promoted dialogue on the three future field campaigns, and on the preparation of the second MED-CORDEX exercise. The workshop program, presentations and more information about HyMeX are available at: *http://www.hymex.org*.

Preparation of MED-CORDEX2

The workshop was also an opportunity to confer over the implementation of the MED-CORDEX flagship pilot studies, which can be seen as the follow-up of the first MED-CORDEX exercise (Ruti et al., 2016). This discussion was carried out in one full day, held before the official start of the HyMeX workshop, and in several parallel working sessions during the workshop. These sessions aimed to identify the participants of each MED-CORDEX flagship pilot study and the models, and to define the numerical protocol and the agenda. There are three MED-CORDEX flagship pilot studies.

One flagship pilot study is dedicated to convection and is shared between MED-CORDEX and EURO-CORDEX. Its objective is to investigate convective-scale events, their processes and their changes in a few key regions of Europe and the Mediterranean using convection-permitting regional climate models (RCMs), statistical models and available observations. It also strives to provide a collective assessment of modeling capacity at the convection-permitting scale and to shape a coherent and collective assessment of the consequences of climate change on convective event impacts at local to regional scales.

The second MED-CORDEX flagship pilot study focuses on air-sea interactions, with special emphasis on the role of small scale ocean processes and waves. The selected region is the area surrounding the Mediterranean Sea, which is often referred to as an ocean in miniature, due to the variety of processes occurring therein. These include strong air-sea interactions, active mesoscale and submesoscale dynamics and a permanent thermohaline overturning circulation. A detailed analysis of how air-sea coupling at high resolution can modify the regional climate, and consequently the global climate is still missing in the literature. There are some indications that it could provide an added value to RCMs in both the present climate and future scenarios, but the mechanisms underlying such impacts are not completely understood.

The third MED-CORDEX flagship pilot study is dedicated to the role of natural and anthropogenic aerosols in the Mediterranean region. Aerosols strongly affect the Mediterranean Basin, which is located at the crossroads of air masses carrying both natural and anthropogenic particles, making it an ideal testbed for aerosol effects on climate. They are currently not taken into account well in RCMs. The use of RCMs with explicit aerosol representation will help us understand the role of Mediterranean aerosols on past regional climate variability. It will also help to determine the role of regionally born aerosols in the future climate sensitivity of the Mediterranean region and to address the role of aerosols in shaping extreme events (continental heat waves, heavy precipitation events, ocean heat waves, strong regional winds, droughts) in the Mediterranean.

These flagship pilot studies will contribute to several WCRP Grand Challenges, especially on climate extremes and water availability. They also contribute to one of the identified CORDEX Challenges on coupled regional climate models.

Future Field Campaigns

Three campaigns are also planned in the frame of HyMeX to complement the completed field experiments from the Enhanced Observation Period (Braud et al., 2014) and Special Observation Periods (SOP1, Ducrocq et al., 2014; Ferretti et al., 2014; and SOP2, Estournel et al., 2016) (see Drobinski et al., 2014 for a full overview). The field experiments in preparation (shown in the figure on the next page) are:

- EXploiting new Atmospheric Electricity Data for Research and the Environment (EXAEDRE)—an experiment planned for September 2018 on atmospheric electricity, complementing activities from SOP1 (Defer et al., 2015)

Location of the future field campaigns planned within the frame of HyMeX.

- The Pelagic Ecosystem Response to dense water formation in the Levant Experiment (PERLE)—an oceanic experiment planned for October 2018, February 2019 and June–July 2020, supplementing SOP2 (Estournel et al., 2016), but in the Levantine region in the eastern Mediterranean.
- Land surface Interactions with the Atmosphere over the Iberian Semi-arid Environment (LIAISE)—an experiment planned from April 2020 to March 2021, focusing on land surface interactions over the Iberian semi-arid environment.

The workshop provided an opportunity for in-depth discussions on implementing the field campaigns, including funding issues, instrumental set-up, deployment strategies and more.

The EXAEDRE field campaign aims to improve knowledge by combining observation and modeling, not only for the various physical phenomena that accompany lightning, but also to study the contribution of "flash" information for applications to monitor extreme phenomena and to quantify the improvement of weather forecasts by introducing the "flash" data into an assimilation chain. This approach anticipates the use of powerful "all-weather" lightning detectors placed in geostationary orbit as part of the Meteosat Third Generation program. EXAEDRE revolves around the following observation components:

1. observations already collected in SOP1 (Defer et al., 2015) and permanent measurements of electrical activity by the three-dimensional light detection Suivi de l'Activité Electrique Tridimensionnelle Totale de l'Atmosphère (SAETTA) Network and the Météorage Operational Network,
2. the development of a new lightning detector based on the principle of very high frequency interferometry, and
3. a field campaign in Corsica, associating the SAETTA Network with the French Service of Instrumented Aircraft for Environmental Research (SAFIRE) Falcon20, carrying the RASTA radar, primary marine aerosol microphysics probes and the AMPERA platform for measuring the electric field along three axes.

All this is accompanied by ground instrumentation sensitive to the phenomenon of electrification of clouds and to the properties of natural electric discharges, and by ground and spatial remote sensing to monitor environmental conditions.

The PERLE action, shared between HyMeX and the Marine Ecosystems Response in the Mediterranean Experiment (MerMeX), aims at describing the formation and spread of Levantine Intermediate Water and determining its role on the distribution of nutrients and on the structuring of planktonic ecosystems in the eastern Mediterranean. It is a complement to the SOP2 experiments conducted in the northwestern Mediterranean with similar objectives. The Levantine Intermediate Water is one of the most crucial water masses of the Mediterranean—it contributes to most of the subsurface water and salt transport between the eastern and western basins of the Mediterranean, it plays a key role in the deep convection both in the northwestern Mediterranean and in the South Adriatic and it fills nearly all the intermediate layers of

the eastern basin, where it is prone to vertical exchanges with the surface layer that supplies nutrients to the photic layer and supports a significant fraction of the primary production. The PERLE strategy is based on intensive field work concentrating all of the observation methods (cruises, moorings, gliders, profilers and satellites) of key physical and biogeochemical parameters in an experiment lasting one full annual cycle, and on the use of longer-term observations from existing and future observation systems. It is complemented by a massive modeling effort, which includes the implementation, validation and improvement of physical-biogeochemical coupled models to simulate recent trends on the basis of observations and future scenarios.

Finally, the LIAISE field campaign will explore the surface/atmosphere interactions over the Iberian Peninsula. Specifically, it aims to create a better understanding of the dry-down of soils after the winter rainfall has ended, as this is a critical season for the Mediterranean climate. It determines the water resources that will be available for the crop growing period, the state of the natural vegetation and it probably holds predictive value for atmospheric conditions for the summer. In a changing climate, the period of an annual cycle will be critical for managing water resources and adapting our societies to a warmer world. Fundamental knowledge also needs to be built on the impact of water and environmental management on local climatic processes. Field campaigns are planned, combining ground-based in-situ and remote sensing measurements at different sites (among those the Ebro Basin) as well as airborne measurements.

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GEWEX/WCRP Calendar

For the complete Calendar, see: http://www.gewex.org/events/

18–20 September 2017—4th Satellite Soil Moisture Validation and Application Workshop and CCI Soil Moisture User Workshop—Vienna, Austria

18–22 September 2017—COSPAR 2017—Jeju, Republic of Korea

25–28 September 2017—CFMIP Meeting on Clouds, Precipitation, Circulation, and Climate Sensitivity—Tokyo, Japan

9–12 October 2017—Annual GEWEX Data and Assessment Panel (GDAP)Meeting—Boulder, Colorado, USA

9–13 October 2017—32th Session of WGNE and Pan-WCRP Modeling Groups Meeting—Exeter, United Kingdom

16–18 October 2017—25th SPARC Scientific Steering Group Meeting—Seoul, Republic of Korea

17–19 October 2017—GEWEX Hydrometeorology Panel (GHP) and Third Pole Experiment (TPE) Workshop—Kathmandu, Nepal

25–26 October 2017—7th GEWEX Global Water Vapor (GVAP) Assessment Workshop—Leicester, United Kingdom

13–17 November 2017—5th International Conference on Reanalysis (ICR5)—Rome, Italy

27–30 November 2017—23rd Session of CLIVAR SSG—Rome, Italy

7–11 January 2018—98th AMS Annual Meeting—Austin, Texas, USA

6–8 February 2018—HEPEX Workshop on Breaking the Barriers—Melbourne, Victoria, Australia

8–9 February 2018—3rd International Network for Alpine Research Catchment Hydrology (INARCH) Workshop—Zugspitze, Germany

26 February–2 March 2018—2nd Pan-GASS Conference—Lorne, VIC, Australia

6–11 May 2018—2018 GEWEX Science Conference—Canmore, Alberta, Canada

11–15 June 2018—2nd Baltic Earth Conference—Helsingoer, Denmark

11–15 July 2018—COSPAR 2018: 42nd Scientific Assembly of COSPAR—Pasadena, CA, USA

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