Meeting/Workshop Reports

# 2022 GEWEX Hydroclimatology Panel (GHP) Meeting

**Monterey, California, USA**
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After two years of online meetings, the 2022 GHP Panel gathered to meet during the Pan-GEWEX meeting in Monterey, California. Facilitated by face-to-face interactions, the annual GHP meeting had lively peer-to-peer discussions during and after the sessions. Although some Panel members and project leads were unfortunately not able to travel, some attended the meeting virtually through Zoom. As the meeting occurred during the 2022 Pan-GEWEX Meeting, Panel members attended the cross-panel discussions and Pan-GEWEX Plenary that included reports on individual Panels by SSG rapporteurs and responses from Panel co-chairs. SSG members and invited speakers also attended the Panel meetings and contributed to the discussion. This provided an opportunity for positioning GHP activities within the broader GEWEX context. Some lessons learned during Covid-19 restrictions were still applied during the in-person meeting. For example, different projects submitted their presentations and reports in advance and Panel members reviewed each activity prior to the meeting. During the meeting, presentations were limited to a few slides and most of the time was given to discussions. This boosted the effectiveness of the meeting.

GHP is comprised of four different types of projects: (1) Regional Hydroclimate Projects (RHPs), aiming at understanding and predicting hydroclimatology in a specific region; (2) Crosscutting Projects (CCs), encouraging knowledge mobilization and global synthesis around a specific problem; (3) Global Data Centers, collecting and distributing hydrologically-relevant data; and (4) Networks, maintaining collaboration and building capacity for activities relevant to GEWEX science. During the GHP meeting, the group reviewed and discussed the progress of ongoing and prospective projects in these four categories.

### Ongoing and Prospective Regional Hydroclimate Projects (RHPs) and Networks

RHPs are generally large, multidisciplinary projects, developed for improved understanding of the physical processes that affect water and energy exchanges within a region. There are currently three ongoing RHPs, including Global Water Futures (GWF), Baltic Earth, and the Regional Hydrology Program for the Andes (ANDEX). GWF and Baltic Earth are mature RHPs with large groups of active researchers and established ties with local communities and end-users. While their approach toward pursuing an RHP is quite different, they demonstrate continuous progress and cutting-edge science. ANDEX is an initiating RHP, and its integrated science and implementation plans were approved by the Panel in late 2021. Since then, ANDEX has elected a new leadership, Jhan Carlo Espinoza and Mariano Masiokas, although the founding co-chairs, Germán Poveda and René Garreaud, are active within the program. GHP was pleased to see how ANDEX is taking off.

GHP also includes five prospective RHPs that are at different levels of development. Three prospective RHPs are quite advanced and are almost ready to launch and become initiating RHPs. These include Third Pole Environment-Water Sustainability (TPE-WS), the Asian Precipitation Experiments (AsiaPEX), and the United States RHP (U.S. RHP). TPE-WS showed good progress in its program and has submitted its science and implementation plan, which is currently under Panel review. AsiaPEX also had a fruitful year, with new findings regarding precipitation in Japan, the Philippines, and the Tibetan plateau. The Panel expects AisaPEX's science and implementation plan by late 2022 or early 2023. The U.S. RHP continues to grow through its Affinity Group, which has now reached a critical mass, allowing for the establishment of working groups and moving towards drafting science and implementation plans in 2023.

Two prospective RHPs, Central Asia and the second phase of the Hydrological cycle in the Mediterranean eXperiment (HyMeX), are still at their early stages. The Central Asia group is now trying to deepen its local network. The Panel expects that these efforts will flourish some years from now. In addition, in a data poor region like Central Asia, establishing an RHP can be challenging and will require support from a broader community. It was suggested that linking with GWF and the second phase of the International Network for Alpine Catchment Hydrology (INARCH-II) could be helpful. After the official sunset of the first phase of HyMeX in 2020, a new group of young researchers from the region has been trying to come up with an agenda for the second phase of HyMeX. The Panel sees that the new phase of HyMeX is evolving toward an umbrella for understanding the regional response to climate change and the associated impacts on stakeholders. Although the new team has been active and secured new funding sources, the efforts made have not yet converged toward an RHP. Informed by the successful experience of the Pannonian Experiment (PannEx), the Panel suggested that HyMeX could consider becoming a GHP network, allowing more flexibility in the research and outreach agendas.

PannEx, a GHP network that aims to provide a better understanding of Earth system processes over the Pannonian Basin, is currently the only active GHP network. PannEx started as an initiating RHP, and later evolved into a vibrant network of scientists from different disciplines interested in hydroclimatic processes of the region. The network runs several activities, such as new projects and organizing special issues and workshops. Prior to the 2022 GHP Meeting in Monterey, the PannEx team met in Budapest. After 7 years of service, Monika Lakatos stepped down as PannEx chair and Rita Pongrácz was elected as the new chair. The Panel wishes all the best for Monika and looks forward to working with the new leadership team.

### Ongoing and Prospective Crosscutting (CC) Activities

CCs are integral activities within GHP aimed at addressing

GEWEX Science Questions and creating collaborations between RHPs, other GEWEX Panels, and WCRP activities. GHP currently includes three active and three prospective CCs. The Transport and Exchange Processes in the Atmosphere over Mountains Experiment (TEAMx) aims at improving the current understanding of exchange processes in the atmosphere over mountains and how these processes are parameterized in climate models. TEAMx now has a revised plan for its observational campaigns; it is moving towards numerical modeling experiments and new funding resources. INARCH-II is now officially launched as an active CC after its science plan was approved by the Panel in late 2021. The team is now working toward a Common Observation Period Experiment (COPE) that can be used for diagnosis and modeling. Determining Evapotranspiration (dET) is another active CC, with the goal to advance the understanding and determination of evapotranspiration across scales. dET has now completed the Land Surface Atmosphere Interactions over the Iberian Semi-Arid Environment campaign (LIAISE), a major observational field experiment that can support future process understanding and simulations. The dET team also submitted its science plan, which was reviewed by the Panel and is now being revised by the dET leadership. The Panel is pleased to see dET's continuous progress and how the effort is shaping toward a flagship international program.

GHP also includes three prospective CCs at different levels of development. After an active year in 2020 of focusing on intercomparison of irrigation algorithms in current Earth system models, activities in the Irrigation CC have slowed. GHP is very much interested in this CC, and together with the GEWEX Global Land-Atmosphere System Studies (GLASS) Panel, will investigate how activities related to understanding and representing irrigation can be boosted and shaped as an active CC. This is the same for the Precipitation over Mountainous Terrain project (MOUNTerrain), which aims at better process understanding, model development, and prediction of precipitation in mountainous terrain. In contrast, the prospective Flood CC, which looks at a wide spectrum of challenges around understanding flooding processes from observation to model development to socio-economic impact assessments, had a fruitful year. The current leadership has run a survey with the broader community to assess global interest in the topic. The Flood CC is now moving toward forming working groups and converging towards a defined set of research objectives.

### Data Centers

GHP currently includes two Global Data Centers, the Global Precipitation Climatology Centre (GPCC) and the Global Runoff Data Centre (GRDC). GPCC is well connected to the other GHP and GEWEX activities. Steady progress was reported related to precipitation data. After years of service, Udo Schneider has stepped down as GPCC director and Stephanie Hänsel, who was present in the meeting, is now GPCC director. GHP appreciates Udo's years of service and wishes Stephanie all the best in this important role. GRDC focuses on acquisition, harmonization, and storage of global historical river discharge data. The center progresses very well and new data are continuously added into the system. Also, the usage of GRDC has significantly increased since the launch of GRDC's online tool that made the GRDC data accessible to the broader research community.

Due to the importance of reliable information related to surface water storage for current and future GHP activities, GHP has started to investigate new sources of data that can compliment the data currently available through the International Data Centre on Hydrology of Lakes and Reservoirs (HYDROLARE). For this purpose, the Panel invited Cedric David from NASA's Jet Propulsion Laboratory (JPL) to discuss advances in using satellite remote sensing data for measuring areas and storages of surface waterbodies. The Panel recognizes this as a new avenue for continuous gathering of surface water data and considers future investments in this direction.

### Other Business

As the GHP meeting took place during the Pan-GEWEX event, GEWEX Scientific Steering Group members including the Panel rapporteurs attended the presentations and panel discussions. Several insightful comments were received from rapporteurs with regard to the need for continuous documentations and high-level overview of various activities within the Panel, particularly now that the Panel is growing in terms of number and size of activities. Panel leadership recognizes these needs and will invest in these directions. The Pan-GEWEX event also provided an exceptional opportunity for cross-panel interactions and discussing possibilities for collaborations. GHP and GLASS have had continuous collaborations through the years. The two Panels are currently working together on the dET and Irrigation CCs and consider extending their collaboration to other initiatives such as the Flood and TeamX CCs. GHP recognizes tremendous opportunities to work with the GEWEX Data and Analysis Panel (GDAP) over integrated data products, which can then support RHPs in benchmarking and model validation attempts. GDAP can also provide improved precipitation products that can support several activities in GHP and link the Flood CC to relevant satellite products for better flood inundation information. Although traditionally there have not been many interactions between GHP and the Global Atmospheric System Studies Panel (GASS), the two Panels identified several avenues for future collaborations, particularly in terms of kilometer-scale modeling, and improving the representation of hydrology in climate models that the GASS community uses. GHP continues working with the three GEWEX Panels to approach these initiatives.

GHP is continuously enriched through new Panel members. This year, GHP welcomed a new member, Dr. Santosh Pingale from the National Institute of Hydrology, Roorkee, India. Dr. Pingale's expertise is in surface and groundwater management and using modeling and observation techniques for irrigation management. He has previously worked in Africa and therefore can link the Panel activities to two currently underrepresented regions in the Panel. The Panel looks forward to working with Dr. Pingale and linking the Panel's activities to to the end-user communities most in need.