2024 GEWEX Hydroclimatology Panel (GHP) Meeting

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Thanks to the hospitality of Hokkaido University and our host, Professor Tomonori Sato, the 2024 GHP Meeting was held in wonderful Sapporo, Japan, during the first week of July, prior to the 9th GEWEX Open Science Conference (OSC). Once again, we had a very fruitful meeting with over 25 in-person attendees, including the majority of Panel members and activity leads. We also had participants that attended the meeting virtually. The 2024 GHP Meeting marked the busiest GHP assembly since the beginning of the COVID lockdown.

GHP hosts four different types of projects: (1) Regional Hydroclimate Projects (RHPs), aiming to understand and predict hydroclimatology in a specific region; (2) Cross Cutting Projects (CCs), encouraging knowledge mobilization and global synthesis of knowledge around a specific topic; (3) Networks, maintaining collaboration and building capacity for activities relevant to GEWEX science; and (4) Global Data Centers, collecting and distributing relevant hydroclimatic data. The 2024 GHP Meeting was an opportunity to demonstrate the important advances that these activities are providing to the regional and global scientific communities, GEWEX and its stakeholders, as well as the World Climate Research Programme (WCRP).

Besides evaluating the annual progress from our multiple activities, which is a typical meeting activity, the Panel had inspiring and thoughtful internal discussions on drafting guidance documentation regarding roles and responsibilities of Panel members as well as procedures for the different activities within GHP, including annual reporting procedures. These discussions led to delineating the next Panel activities moving forward. We also warmly welcomed new Panel members and activity leads.

Ongoing and Prospective Regional Hydroclimate Projects (RHPs)

RHPs are multidisciplinary projects to improve understanding of the physical and anthropogenic processes that affect water and energy exchanges within a specific region. There are currently six ongoing RHPs in the Panel. This includes two mature RHPs, i.e., Baltic Earth and Global Water Futures (GWF), along with four initiating RHPs, i.e., the Regional Hydrology Program for the Andes (ANDEX), Third Pole Environment-Water Sustainability (TPE-WS), the Humans and Hydroclimate in the United States (H_2US), and the Asian Precipitation Experiment (AsiaPEX). We also have a prospective RHP in the Panel, the Central Asia initiative.

Both mature RHPs include large groups of active researchers and established ties with local communities and end-users. As the Panel's oldest RHP, Baltic Earth is an example for a decentralized and bottom-up governing research program without any core funding, in which individual researchers join forces and share research interests and resources. On the other hand, GWF is an example of a centralized and top-down RHP, with a large amount of core funding. Despite their differences in pursuing the RHP concept, both Baltic Earth and GWF keep demonstrating solid and continuous progress and have been quite influential in the policy and decision-making spheres. Baltic Earth's assessment reports and fact sheets have become a knowledge base for decision makers in the Baltic Sea region. Currently, the leading team within Baltic Earth is working on updating their 2017 Science Plan to be submitted to the GHP, while a new Project Office is under exploration. After seven years of ambitious research, GWF sunsets now to GWF-Observatories, aiming at continuing the data observations and research sites going up to 2029. GWF also played a central role in the formation of the new Canada National Water Agency. The Panel expects that GWF will keep leading the understanding of the water cycle in Canada through the integration between western and Indigenous knowledge.

Initiating RHPs also had a productive year. ANDEX is advancing at a solid pace. The ANDEX Scientific Committee is currently working on its Scientific and Implementation Plan. Its recent annual meeting in Peru (May 2024) allowed interaction between a wider ANDEX community through a 3-day workshop devoted to transdisciplinary research, as well as activities focused on Early Career Researchers (ECRs) and the JovenANDEX network. Considering the international attention on the first set of ANDEX review papers, the ANDEX team submitted two more review papers on the state of atmospheric modeling in the region, and is preparing another review paper addressing hydrological modeling. Moreover, the current momentum in ANDEX is boosting its interaction with other GHP, GEWEX, and WCRP initiatives such as the International Network for Alpine Catchment Hydrology, Phase 2 (INARCH-II), the Climate and Ocean: Variability, Predictability and Change (CLIVAR)/GEWEX Monsoon Panel, the Climate and Cryosphere (CLiC) project, the Regional Information for Society (RIfS) project, and the My Climate Risk Lighthouse Activity. TPE-WS is an ambitious and world-class scientific program in the Tibetan Plateau, devoted to understanding water and energy cycles in Asia's high mountains. TPE-WS continues setting up and improving multiple measurement sites, including the development of a wind profile data platform, while continuing with modeling activities and analyses, publishing in top journals, and disseminating data to the broader research community. During only the last year, over 500 new data sets were published by TPE-WS. The Panel is extremely pleased with how TPE-WS is developing.

Since the last GHP meeting in Maynooth, Ireland, GHP approved two prospective regional initiatives to become new initiating RHPs. After the recommendations given by the Panel, the Humans and Hydroclimate in the United States (H_2US) initiative is advancing with the consolidation of its Science Plan, and is pursuing the identification of a Project Office. The frequent H_2US Affinity Group meetings continue and help in shaping a solid scientific dynamic among the group. The second RHP approved by late 2023 is AsiaPEX. The AsiaPEX team is advancing

in updating its Science Plan, the digitalization of historical precipitation records, the development of field campaigns, improving interactions with the CLIVAR/GEWEX Monsoon Panel, and identifying synergies with the TPE-WS RHP and the WCRP Global Precipitation Experiment (GPEX) Lighthouse Activity. They also hosted a number of sessions and workshops during the OSC.

Participants of the 2024 GHP Meeting outside the Frontier Research in Applied Sciences Building at Hokkaido University

Our only current prospective RHP, the Central Asia Initiative, has been converging in bringing together the regional scientific community. The team has significantly advanced in identifying common interests and potential research avenues for the region. During 2025, the Central Asia Initiative aims at developing activities such as workshops and summer schools focused on specific modeling skills. The Panel understands the challenges in forming a strong RHP in this region, yet fully recognizes the importance of this activity in an area that was not previously pursued by the GEWEX community.

Ongoing and Prospective Cross Cutting (CC) Activities

CCs are integral activities within GHP aiming at addressing the GEWEX Science Questions and creating collaboration between RHPs, other GEWEX Panels, and WCRP activities. GHP currently includes three active and four prospective CCs. The oldest CC in the Panel, 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. Since the last Panel meeting, TEAMx has put together an updated plan for the TEAMx Observational Campaign (TOC) and the first full version of the TEAMx Numerical Modeling Plan (NMP). These are two pivotal initiatives within this CC. In addition, TEAMx hosted its Third Workshop with more than 60 in-person and 30 online participants, who provided feedback to the TOC and NMP. Also, it hosted the TEAMx Online Community Event earlier this year, with more than 100 participants. Finally, this CC got 11 new funded projects during the last months (with national and/or international funding), demonstrating an outstanding momentum. Since 2023, TEAMx has had a Coordination Project Office led by Stephanie Westerhuis, which is now directed by Manuela Lehner with administrative support from Doris Fischer. The Panel thanks Stephanie for her great contributions, and warmly welcomes Manuela and Doris to the Panel.

Another mature CC is INARCH-II. This CC is advancing through its Common Observation Period Experiment (COPE), with data being collected and model runs in preparation. INARCH-II also established strong ties with RHPs and CCs, e.g., TPE-WS, ANDEX, H_2US, TEAMx, and other GEWEX and WCRP activities. INARCH-II co-chaired the WMO High Mountain Summit in 2023 and has now become a key contributor to the United Nations Educational, Scientific and Cultural Organization (UNESCO) Intergovernmental Hydrological Programme in Mountain Water Sustainability.

Determining Evapotranspiration (dET) has been another active CC with the goal of advancing the determination of evapotranspiration across scales. During 2023 and particularly 2024, dET has progressed at a calmer pace, and is currently undergoing a structural reshape under the new leadership of Li Jia, a former GHP Member and incoming GEWEX Science Steering Group (SSG) Member, and Bob Su, former GEWEX SSG Member and a new GHP Member. The meeting allocated a dedicated discussion to the future of dET and suggested different possible paths for this activity. The aim during the coming months is to define a suitable avenue for this CC in conjunction with the GEWEX Land-Atmosphere System Studies (GLASS) Panel and the previous dET leadership.

GHP also includes four prospective CCs at different levels of development. The most advanced prospective CC is the Flood CC, which looks at a wide spectrum of challenges around understanding flooding processes from observations to model development to socio-economic impact assessments. The core team hosted its first online workshop in September 2023, in which more than 80 experts from across the globe discussed the hydroclimatological and anthropogenic factors of flood generation, the spatiotemporal variability of flooding, and the interplay between climate and land use in causing floods. The Flood CC also developed a session in the 2023 American Geophysical Union (AGU) Fall Meeting, aiming to connect the activity with the broader research community. This CC had a further in-person informal meeting during the 9th GEWEX OSC, looking for convergence in the definition of research objectives that can be articulated in a Science Plan. The Precipitation over Mountainous Terrain (MOUNTerrain) aims at better process understanding, model development, and prediction of precipitation in mountainous terrains. Although this activity continues in hiatus, the Panel considers MOUNTerrain both an important and timely activity, particularly in the context of the GPEX Lighthouse Activity, yet it also recognizes the current challenges due to the lack of an active leadership team. The Panel decided to form a task force consisting of Panel co-chairs and members from current RHPs and CCs active in the moun-

tainous regions along with stakeholders from SSG and other GEWEX Panels to give momentum to this activity.

The other two prospective CCs are the Groundwater and Surface Waters initiatives. The Groundwater initiative hosted a very successful workshop just after the GHP Meeting and before the 9th GEWEX OSC, with an engaged participation from attendees and a clearer convergence around the research objectives. Stefan Kollet from Jülich Research Institute and University of Bonn along with Laura Condon from the University of Arizona will lead the first version of the Groundwater Science Plan to be submitted to GHP. Having said that, the leadership teams and participants in the Groundwater initiative are tending toward forming a network at this stage, which is supported by the Panel co-chairs. Surface Waters is led by Cedric David of the National Aeronautics and Space Administration (NASA)'s Jet Propulsion Laboratory, who is actively pushing for a global river network observational and modeling initiative, given the new opportunities rising from the emergence of the Surface Water and Ocean Topography (SWOT) data. We will certainly see more positive developments of this prospective CC turning into an active GHP CC.

Ongoing Network

GHP Networks foster collaborations and capacity building activities relevant to GEWEX science. They may transition into an RHP or a CC upon successful initiation of research activities and sourcing of funds, or, alternatively, an RHP may develop into a Network upon completion. GHP currently hosts one active Network, the Pannonian Basin Experiment (PannEx). PannEx aims to provide a better understanding of Earth system processes over the Pannonian Basin. The activity started as an initiating RHP and later evolved into a vibrant group of scientists from different disciplines interested in the hydroclimatic processes of the region. During 2023, PannEx had multiple workshops, including hosting a training school on micrometeorological measurements with the participation of a considerable number of ECRs from the region. The PannEx team has also been active publishing in the second edition of a special Atmosphere issue on "Climatic Extremes in the Pannonian Basin".

Data Centers

GHP currently includes two Global Data Centers, the Global Precipitation Climatology Centre (GPCC) and the Global Runoff Data Centre (GRDC). Both Data Centers went through leadership changes after the retirement of Udo Schneider (the ex-director of GPCC) and Ulrich Looser (the ex-director of GRDC). The Panel recognizes years of active involvement from Udo and Ulrich and wishes them all the best during their retirements. The Panel warmly welcomed Markus Ziese and Simon Mischel, who are now leading GPCC and GRDC, respectively. GPCC is well-connected to other GHP and GEWEX activities and has shown steady progress on precipitation data acquisition and processing. GPCC foresees the complete production and release of the second version of homogenized data for Europe (HOMPRA-Europe2), as well as the release of next product versions in 2025. GRDC focuses on acquisition, harmonization, and storage of global historical river discharge data. The center is successfully progressing, continuously adding new data into the system. Most notably, GRDC has acquired the extended Baltic Sea Experiment (BALTEX, the former phase of Baltic Earth) data set, adding 768 new stations. The global usage of GRDC data has significantly increased since the launch of its online tool that made GRDC data accessible to the broader research community.

Other Business

GHP is closely linked with the GEWEX Panel on Global Land-Atmosphere System Studies (GLASS) through a number of joint activities. To facilitate the relationship between the two Panels, GHP Member Joshua Roundy of Kansas University serves as the GLASS-GHP liaison. During the 2024 GHP Meeting, Joshua presented a comprehensive summary of GLASS main activities, with a focus on Irrigation, a joint GLASS-GHP activity. During this discussion, the Panel raised the possibility of inviting Irrigation leaders to the next GHP Meeting, in order to strengthen links with GHP RHPs, such as H_2US.

Besides approving two new initiating RHPs (H_2US and AsiaPEX) and reviewing the updated Science Plan of the dET CC during 2023, GHP advanced in preparing an updated Terms of Reference on Roles and Responsibilities for Panel Members, seeking to provide more clarity to current and new Panel members. Moreover, the GHP Co-Chairs and the International GEWEX Project Office Director, Peter van Oevelen, prepared revised versions of the guidelines for prospective RHPs, CCs, and Networks. After fruitful dedicated discussions during the last day of the meeting, the Panel not only decided to have a review period for Panel members on the revised Terms of Reference and Activity Guidelines, but also to collect the feedback from current Activity Leaders on their corresponding guidelines before voting on the approval of these documents. The Panel members also decided to have regular seasonal meetings for a more engaged and participatory internal Panel activities.

GHP is continuously enriched through new Panel members. GHP acknowledges the insightful contributions from Dr. Li Jia, who will join the GEWEX SSG, and Dr. Xin Li, who leaves GHP. We wish both the best in their next challenges. We also welcomed four new Members: Dr. Michael Bosilovich, a NASA Scientist based in Greenbelt, MD, United States, and an ex-GEWEX SSG Member; Dr. Bob Su, Faculty of Geo-Information Science and Earth Observation (ITC) at the University of Twente in the Netherlands and an ex-GEWEX SSG Member; Dr. Quiaohong Sun, a shining ECR and Full Professor at the Nanjing University of Information Science & Technology in China; and Dr. Venkat Lakshmi, AGU's Hydrology Section President-Elect and professor at the University of Virginia, United States. During the 2024 GHP Meeting, refreshing and extremely insightful presentations were given by three of the new members.

As a final discussion, the Panel decided that the 2025 GHP Meeting will be held in Montreal, Canada, and hosted by GHP Co-Chair Ali Nazemi at Concordia University. We very much look forward to our next meeting in Montreal!