

## 45th Session of the WCRP Joint Scientific Committee (JSC)

27-30 May 2024

### DEADLINE: 1 May

#### Instructions

**Overarching content/goal:** To provide an update on progress made during the last year, as well as your future plans, and highlight any aspects that you want to bring to the attention of the JSC.

- The length of the report should be kept to around 4 pages if possible (appendices and links can of course be used).
- Include the topics indicated below.
- Work with the WCRP secretariat responsible for your activity, in the preparation of the report and/or presentation.
- Discuss any points you would like to raise with the JSC with your JSC liaison(s), keeping the WCRP Secretariat focal point informed.

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### Report to the WCRP Joint Scientific Committee



#### **1. Highlights for Joint Scientific Committee (including high-level publications, new achievements/products, and capacity building activities – in particular anything you feel should go into a WCRP annual achievement report or brochure)**

##### General Achievements:

- Through its four panels, GEWEX organizes more than 30 active international projects, most focusing on actual research activities (process understanding, data development, field campaigns, comprehensive data evaluation), while some focusing on synthesis. Capacity development has been built into some of these activities.
- Excellent progress in new efforts beyond GEWEX: launched new activities related to human-natural coupled earth system, further development of the WCRP Cycles initiative (led by SSG co-chair Jan Polcher), and the WCRP launch of GPEX in October 2023 as a new lighthouse activity (led by SSG co-chair Xubin Zeng).
- Renewed collaboration with WWRP and the hydrology department. GEWEX provides the climate change perspective to flood forecasting in the InPRHA project. GEWEX contributes to the annual state of the Water Resources being developed by WMO.
- GEWEX Open Science Conference Organization – great success
  - current registrations over 860 with fully paid over 720;
  - besides science, there will be substantial applications sessions with and for stakeholders in collaboration with four ministries of Japan;

- *organize a special Space Agency Day on the day before the conference, including traditional and new space agencies*

## Panel Specific Achievements

### GASS

- **Legacy of the WCRP Grand Challenge on Clouds, Circulation and Climate Sensitivity**
  - *role of cloud processes in extreme events, large scale circulation, climate sensitivity?*
  - *convective organization/aggregation: physical mechanisms and role in climate?*
- **New observations**
  - *exploit past and future field campaigns, e.g. COMBLES, EUREC4A, MOSAIC, ORCESTR*
  - *exploit past and new satellite dataset, e.g. long time series of precipitation, radiation, and clouds, high-res GEO data, EarthCARE data*
- **New models**
  - *LES and CRMs running over increasingly large domains, in idealized or realistic configurations.*
  - *new, emerging generation of climate models (e.g. DYNAMO together with Digital Earth)*
- *10 On-going GASS Projects all in healthy state*
- *GASS-CFMIP collaboration on cloud feedback processes re-activated – Successful July 2023 Meeting in Paris (220 participants)*

### GDAP

- *All project activities making good progress (EEI/ISCCP-NG/Convective Tracking/BSRN/G-VAP)*
- **Earth Energy Imbalance Assessment**
  - *EEI from the geodetic technique: Trend in EEI of  $0.4 \pm 0.3 \text{ W.m}^{-2}$  per decade (90%CL)*
  - *EEI from the in situ observations: Trend in EEI of  $0.4 \pm 0.2 \text{ W.m}^{-2}$  per decade (66%CL)*
- **ISCCP-NG**
  - *GEO-Ring and ISCCP-NG Workshop in Darmstadt, Germany from 29 February - 1 March 2024*
  - *Available: L1g demo data for 2021 with  $0.05^\circ$  spatial resolution, 30-minute temporal resolution and no spectral thinning.*
  - *More Level-2 products to follow (clouds, aerosol, radiative flux and precipitation)*
- **BSRN**
  - *Strong continuation thanks to leadership.*
  - *Continuity for support of the individual stations constant concern!*
- **G-VAP II: A comprehensive and consistent assessment of long-term satellite-based water vapor data records**
  - *G-VAP archive v2.0 covers the period from 1979-2019.*
- **Convective System Tracking (emerging activity linking AOS/EarthCare, GASS with GDAP): Investigate the **development of convective cores, anvils, precipitation**, and their relationships to environments**
- *New precipitation products have emerged the and a new assessment is in preparation.*

### GHP

- **Regional Hydroclimate Projects**
  - *6 Active in 2024 (GWF, ANDEX, Baltic Earth, TPE-WS, AsiaPEX)*
  - *In 2025 GWF becomes GWFO (Global Water Futures Observatories)*
  - *Prospective one: Central Asia*
  - *Potential New Ones in Africa and New Zealand*
- **Cross-Cut Projects**
  - *4 Active (Teamx-CC, INARCH II, dET, Floods),*

- 2 New (Ground Water, Surface Water),
- 1 prospective (Mounterrain/Precipitation in Complex Topography)
- **Global Data Centers**
  - GRDC and GPCC,
  - Hydrolare is considered no longer active (and in part replaced by Surface Water Cross-Cut and Hydroweb 2.0)
- **GHP Networks**
  - PANNEX is the only current active network and very successful in bringing together the Pan-nonian Basin research community in Eastern Europe

## GLASS

- **PLUMBER2**: Refinements and improvements compared to the original PLUMBER experiment revealed that when LSMs are worse than the empirical model suite, they are often much worse, which causes a poor comparison overall against empirical benchmarks. No LSM can outperform an out-of-sample linear regression prediction of fluxes, with instantaneous SWdown as the **only** predictor
  - First **PLUMBER2** paper is submitted and is in review.
- **CLASP**:
  - A model sensitivity analysis using the HydroBlocks model illustrates the role turbulence parameterizations can have on the **temporal persistence of simulated land surface temperature (LST)**;
  - **Secondary circulations** that are seen to develop in the LES experiments due to surface thermal heterogeneity over the SGP site can be qualitatively reproduced in a two-column model that interact via a parameterized circulation;
  - To provide more conclusive evidence regarding the role of surface thermal heterogeneity on the macroscale atmospheric response, a series of **3 km WRF experiments** were run over the Contiguous United States over the summers of 2021-2023
  - With **CLASP** evolving towards numerical weather prediction spatial scales, there is a growing recognition that future focuses of CLASP should revolve around how surface heterogeneity impacts turbulence and mean advection at the surface and thus its impacts on surface fluxes
- **SIF-MIP**:
  - Model output submitted from **3 modeling groups and 3 tower sites**, based on reanalysis forcing.
  - Tower observed SIF output has been formatted and **made publicly available with DOIs**.
  - Initial results show **significant spread in estimated carbon and water exchange**. Much work is needed to ensure modelling teams are following protocol, as is always an issue with MIPs
- **Irrigation CC** convened a special issue focused on the use of Earth Observations for understanding irrigation and its impact on the climate system
- **LoCo** continues to influence local coupling components and aspects of field campaigns (LAFE/LAFO/GLAFO, GRAINEX, LIAISE, AMF3).
- Steady progress on soil parameterizations via **SoilWat** project and relating review and science papers, e.g. on combining root and soil hydraulics in macroscopic representations of root water uptake
- **GLAFO** is pioneering new approaches to measure atmospheric surface layer profiles using a synergy of scanning remote sensing in combination with tower measurements; GLAFO is also developing new methods for the evaluation of these observations using similarity-theory and machine-learning approaches to improve the parameterization of surface fluxes
  - DWD MOL in Lindenberg, Germany, and Ruisdael Observatory in the Netherlands became **GLAFOs**;
  - New GLAFOs are under discussion/in preparation in Brazil and Ghana
- **NEW PROJECTS**:

- GEWEX Ground Water Activity together with GHP – kick off in Sapporo
- GLAFO-GABLS-LoCo: verification of simulations with land-atmosphere model systems such as the UK Met Office Unified Model, ICON-JSBACH, WRF-NOAHMP-Gecros, WRF-NOAHMP-Hydro-Iso, and PALM
- LAFI: A new project Land-Atmosphere Feedback Initiative (**LAFI**), the Collaborative Research Unit (RU) 5639 of the German Research Foundation (DFG) was funded with participants of more than 10 research institutes in Germany. This project will be strongly interwoven with **GLAFO** & **GLASS** activities.
- **Prospective Projects:**
  - **ML4LM:** Machine learning for Land Models
  - The AFESP (Advancing the Frontiers of Earth System Prediction <https://research.reading.ac.uk/earth-system-prediction/>) **VaaSS** (“**Vegetation as a soil sensor**”)

#### Monsoon (together with CLIVAR)

- Will be covered in the CLIVAR Report

### 2. Planned science initiatives and major events (over next 1- 5 years)

- Various large conferences:
  - 2024 9<sup>th</sup> GEWEX Open Science Conference, Sapporo, Japan
  - 2025/26 PAN – GEWEX / RHP Conference
  - 2026/27 PAN GASS/GLASS Conference
  - 2028 10<sup>th</sup> GEWEX Open Science Conference (South America?)
- Field campaigns to be organized in Aug-Sep 2024 over the tropical Atlantic to study the organisation of tropical convection (ORCESTRA campaign = sum of EC-TOOC + BOWTIE + MAESTRO + PICCOLO initiatives), 50 years after GATE.
- Various new Regional Hydroclimate Projects in various stages of development/planning (Central Asia, Africa, New Zealand, Mediterranean)

### 3. Planned Products, high-level assessments or other key outputs/publications

- Preparing for a 3<sup>rd</sup> Precipitation Assessment
- Science Review Article on GEWEX Regional Hydroclimate Projects
- Other key publications of existing activities (e.g., global high temporal and spatial cloud data for km-scale model evaluations)

### 4. Linkages with other Core Projects, Lighthouse Activities, Academy etc.

- Together with Digital Earth we work on evaluating the capabilities of current land surface models to run a km-scale resolutions.
- CLIVAR and GEWEX continue to work together on Monsoons Panel, with additional interest from APARC.
- Close collaborations with GPEX (e.g., in interaction with WMO Hydrology)
- Representatives from ESMO and CLIC attended the in-person GEWEX SSG meeting in April 2024. GEWEX SSG Co-Chair also attended the in-person ESMO SSG meeting in 2024.

### 5. Partnerships with entities outside of WCRP

- Continued WWRP collaboration through primarily GASS and GLASS (along with WGNE) but also plans to extend close collaboration between climate sciences and weather to climate and hydrological forecasting (with WMO-Hydrology)

- *Restrengthening START collab: supports GEWEX RHPs on capacity development (Central Asia and Africa)*
- *Continued IAI collaboration on GHP/ANDEX*
- *WMO Hydrology should be further strengthened as mentioned under WWRP to extend close collaboration between climate sciences and weather to climate and hydrological forecasting*
- *GCOS collaboration on BSRN as well as 'Cycles' Initiative, GTN-H*
- *UNESCO- IHP regional support mostly in context of RHPs*
- *Local partners through our regional activities*

**6. Suggestions, issues or challenges, for example:**

- *Suggestions for new topics/activities:*
  - *Maybe more focus on progress of existing activities than on adding more on an already stretched community*
- *Recommendations or proposals, including any proposed changes to the science directions or structure of the Core Project*
  - *No*
- *Potentially a suggestion for a Global Fellowship focus for a 2025 call to be considered by the JSC: could be a broad topic of interest where science should be reinforced, or a region to be targeted for the fellowship:*
  - *We feel that a WCRP-sponsored fellowship might not be the most effective way of using the available resources. Searching partnerships with funders to do these fellowships might be a better alternative at much lower /minimal investment*
- *Advice you require from, or questions/comments that you have for, the JSC*
  - *It would be mutually beneficial if JSC treats Core Projects as partners in all major decision-making (including WCRP's decision to offer Global Fellowship).*