WORLD CLIMATE RESEARCH PROGRAMME

42nd Session of the WCRP Joint Scientific Committee (JSC42)

GEWEX Core Program

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GEWEX

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1. Highlights for JSC

- GEWEX Science Plan: Strong focus on process studies at all spatiotemporal scales. We believe it to be a good foundation to work with most if not all LHAs!
- Restructuring/Renewal of GEWEX activities is on-going
  - GASS panel expanding and continues to work successfully with WWRP and WGNE
  - New GEWEX wide cross cutting activities on Irrigation, ET initiated. On Carbon (processes) and Groundwater & Surface Water (incl. floods) being set up. Prepares the integration of the GC Water for the Food Baskets of the World.
  - GHP working on 3 new RHPs Central Asia, US and Mountainous Africa (together with START)
  - Stronger collaboration between panels by adding liaison members (early-mid career)
- 2021 Pan-GASS meeting => July 24-28, 2022 in Monterey, CA, USA
- Improved communication strategy (a.o. ~bi-monthly SSG conf calls incl. panel co-chairs)
- Continued strong direct collaboration with START in Central Asia and Africa is in the planning

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2b. Primary Science Issues

GLASS: Land-atmosphere interactions

- Urban land surfaces
- Enhancing process studies, modelling and benchmarking through improved physically meaningful diagnostic tools and metrics
- GEWEX Land -Atmosphere Feedback Observatories: from bedrock to boundary layer

GHP: Hydroclimate

- Regional focused activities to support bridging between observational & modelling communities and the stakeholders (and other sci. communities)
- Further develop new RHPs with focus on trans-disciplinary Capacity Development
- Connect GASS and GLASS process studies with regional high-resolution (field scale!) - focus on mountain processes (TeamX, InARCH)

GASS: Atmosphere System Studies

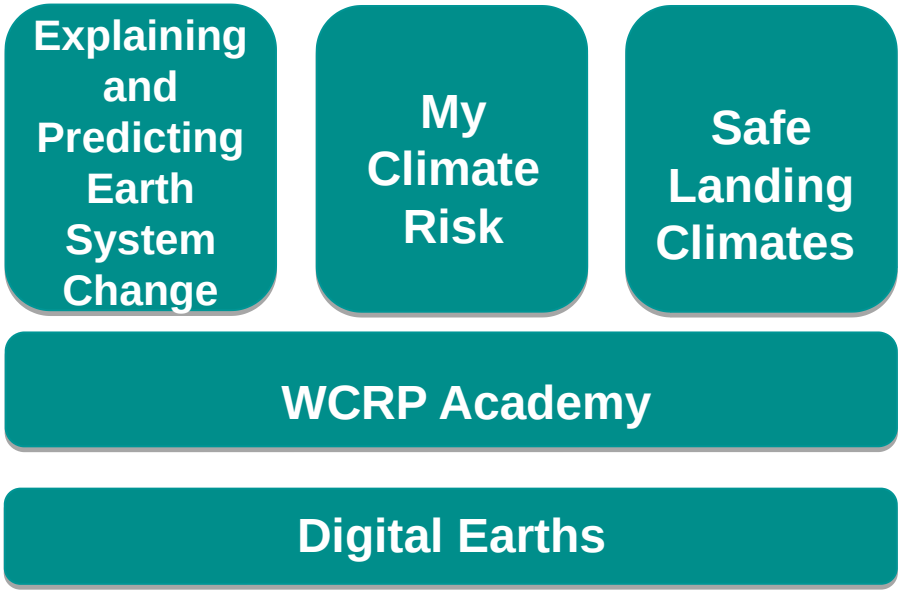
- Precipitation grand challenge (e.g., diurnal cycle, seasonal prediction), process understanding and parameterization for weather and climate models (e.g., surface momentum drag due to topography; cloud microphysics)
- Development of new projects (e.g., shallow and deep convection, dynamics-physics coupling, process studies motivated by WCRP grand challenge projects)
- Higher resolution observations and modelling that link with GLASS and GHP efforts

GDAP: data analysis and assessments

- Support integrated satellite data development and instrument simulators (ISCCP-NG, ACCP)
- Earth Energy Imbalance Assessment
- Development of new projects (e.g., Regional and global water cycle imbalance assessment)

Start of interactions with LHAs

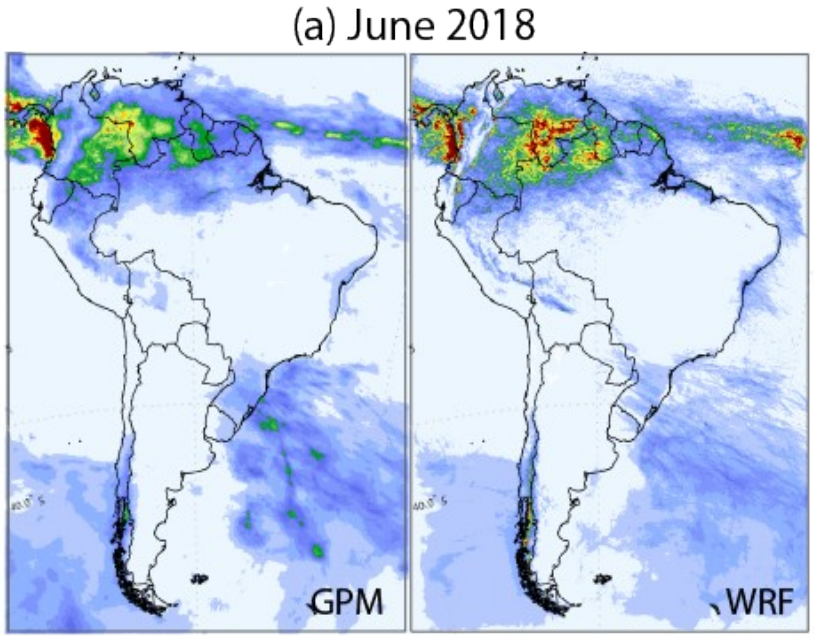
Interactions with the various LHAs have started :
Digital Earth, Safe Landing Climate and Explaining Earth System Changes.
Possible contributions of GEWEX were identified in each case.



The next groups to contact will be with “My Climate Risk” and “Regional Information for Society”.

Regional Digital Earths : The South American water cycle

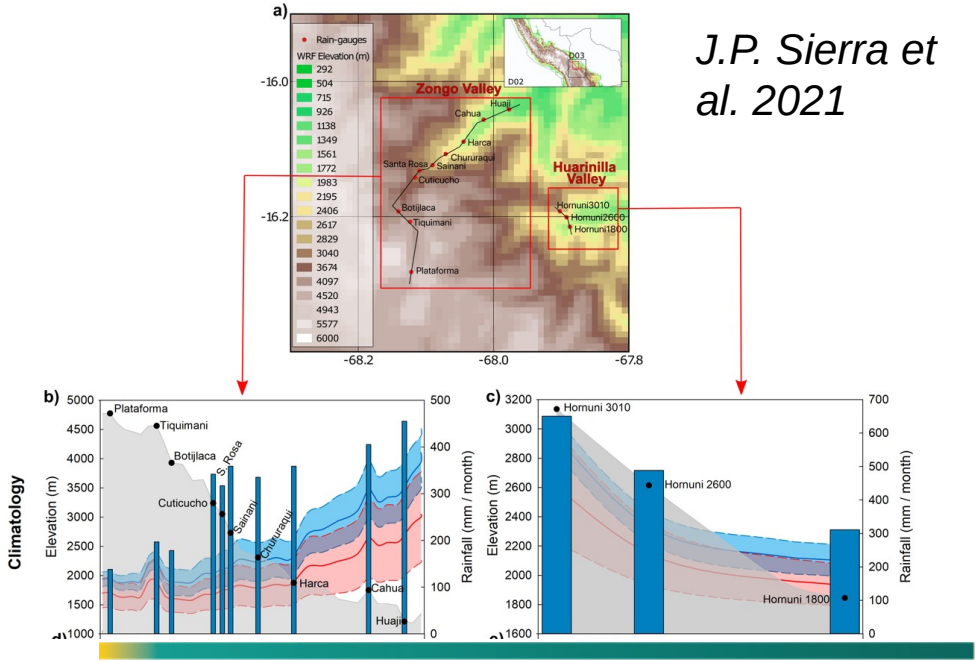
NCAR is currently performing 4km over South America and 1km simulations over Colombia.



F. Dominguez et al. 2021

Water transport along the Eastern Valleys of the Andes :

- The strong diurnal cycle of rainfall is well reproduced.
- Amazon deforestation reduces rainfall in the lower parts of valleys



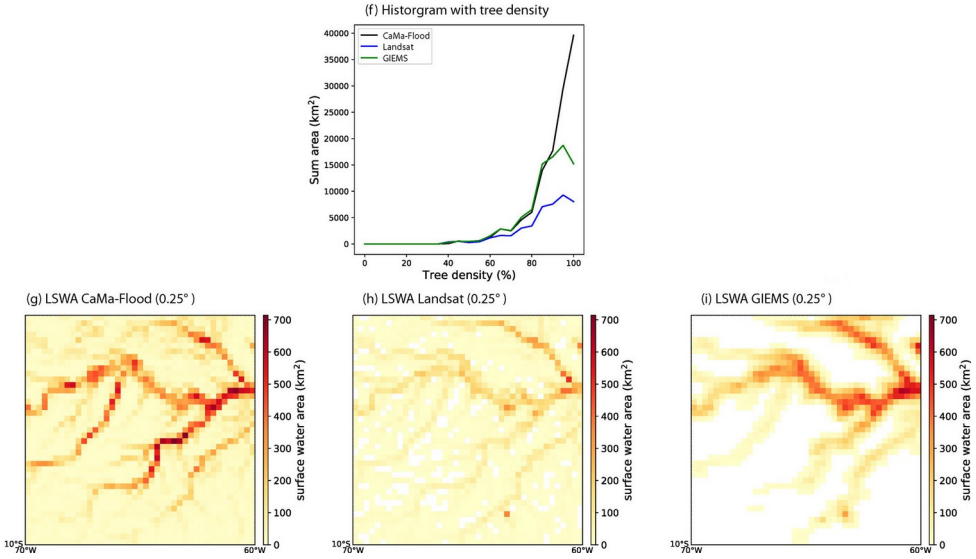
J.P. Sierra et al. 2021

South America the continent of rivers

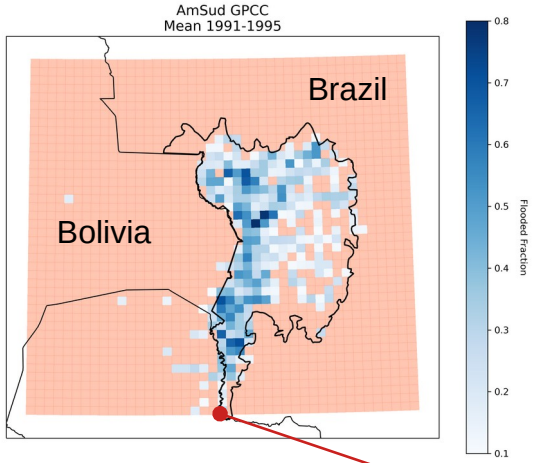
Rivers play an important role over the continent :

- Important riparian flooding
- Large inner deltas

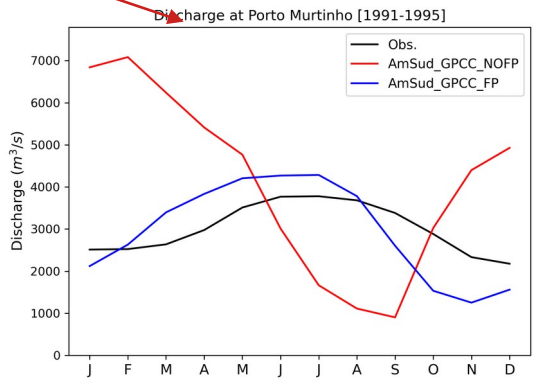
Lateral water transports are key for evaporation.



X. Zhou et al. 2021



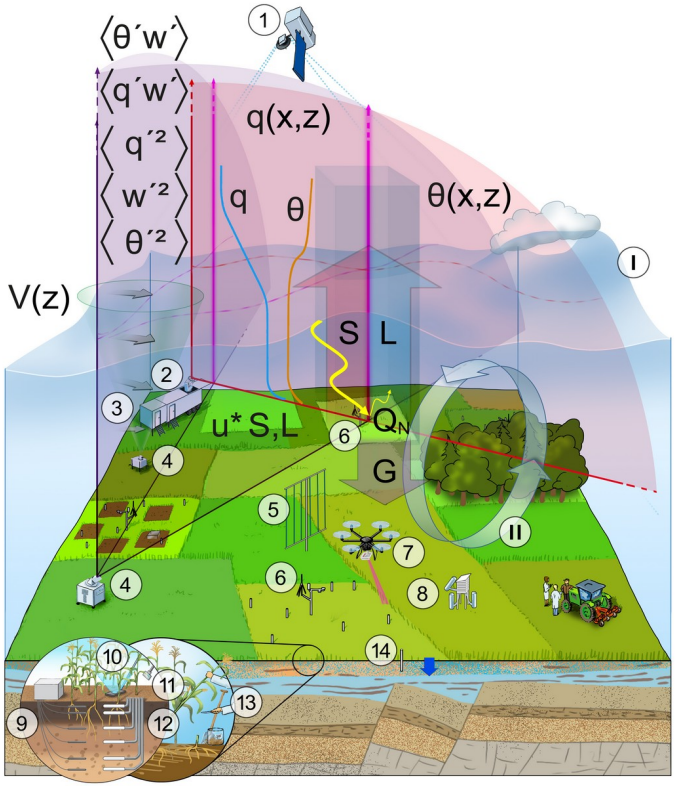
A. Schrapffer et al. 2021



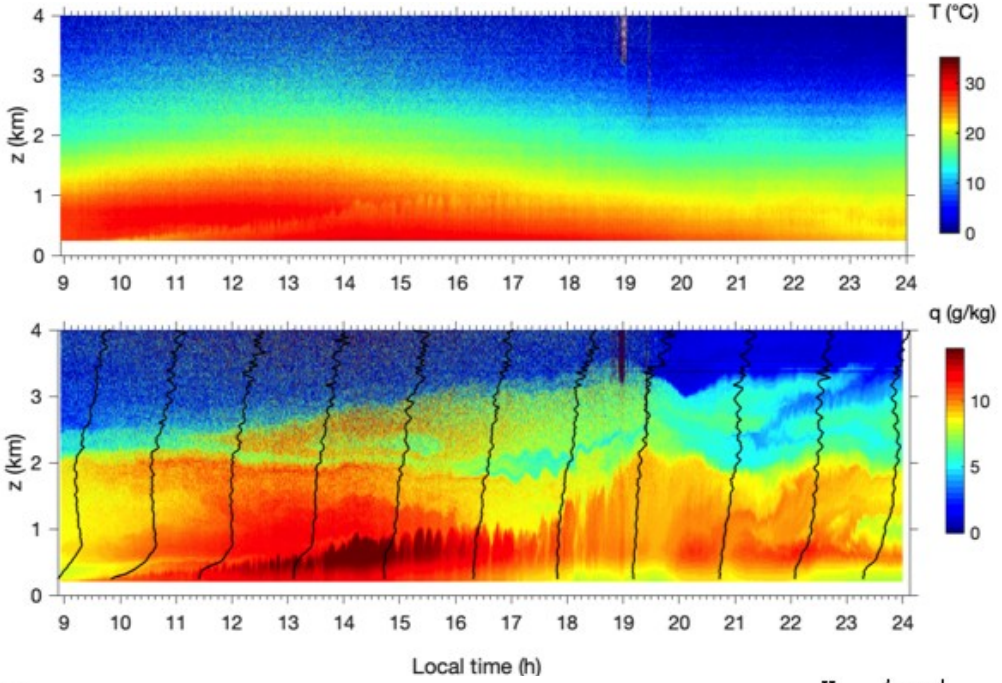
Without a detailed knowledge of these hydrological processes closing the water balance over the Amazon becomes challenging !

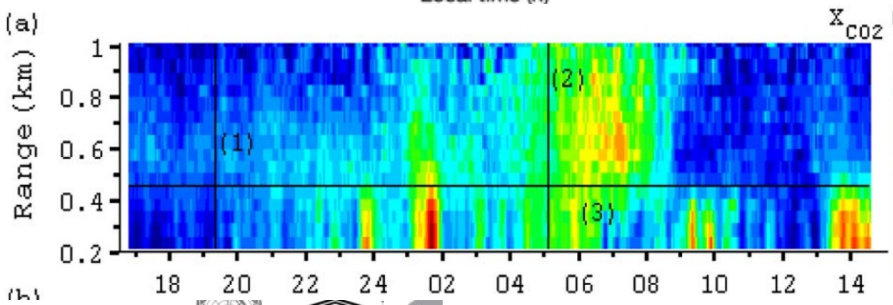
Safe Landing Climates : Water & Carbon processes

Highly instrumented sites allow to monitor surface/atmosphere interactions for energy, water and carbon.
GLAFOS are currently being deployed



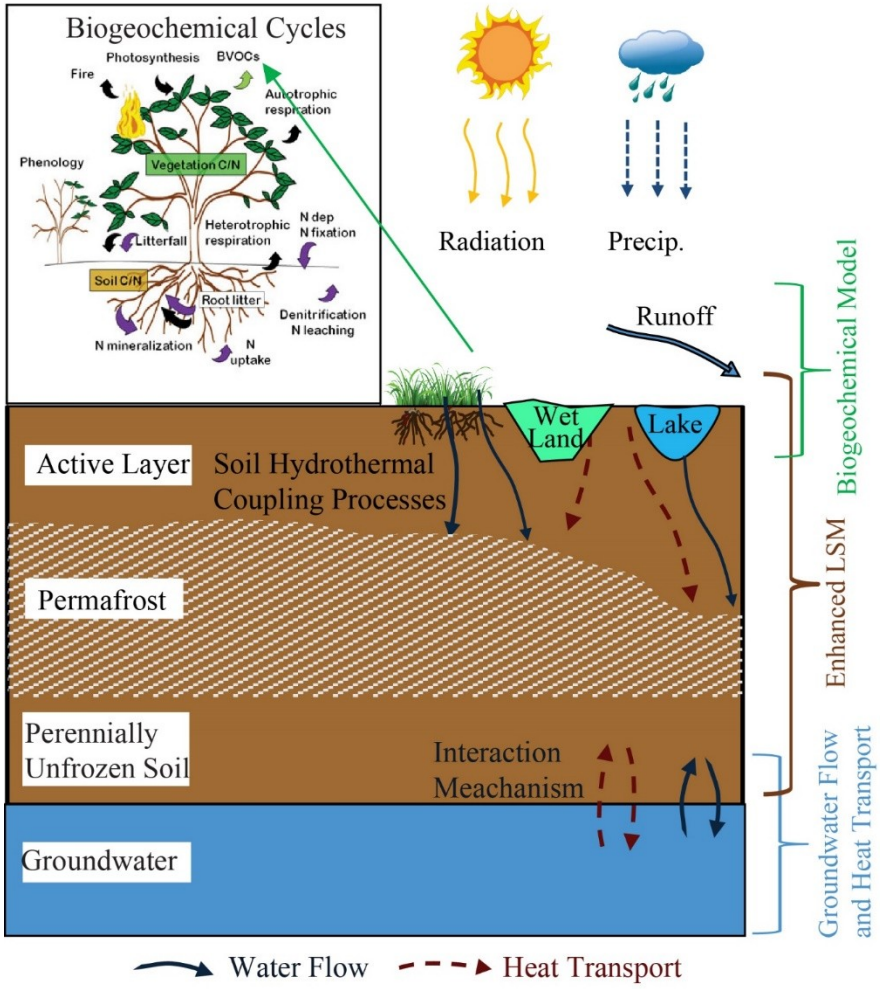
Lidar profiles for wind, temperature, moisture and CO_2. Observed in Palaiseau





F. *Gibert*, 2021

Soil : Water and Carbon Processes



a) Physical processes

GLASS leads the SoilWat project :

- Better understand soil types and their parameters.
- Reduce the uncertainty of soil hydraulic parameters.
- Improve modelling of water and heat transfers.
- Evaluate the impact of permafrost melt.
- Close interaction with organic matter decomposition and the CO_2 cycle

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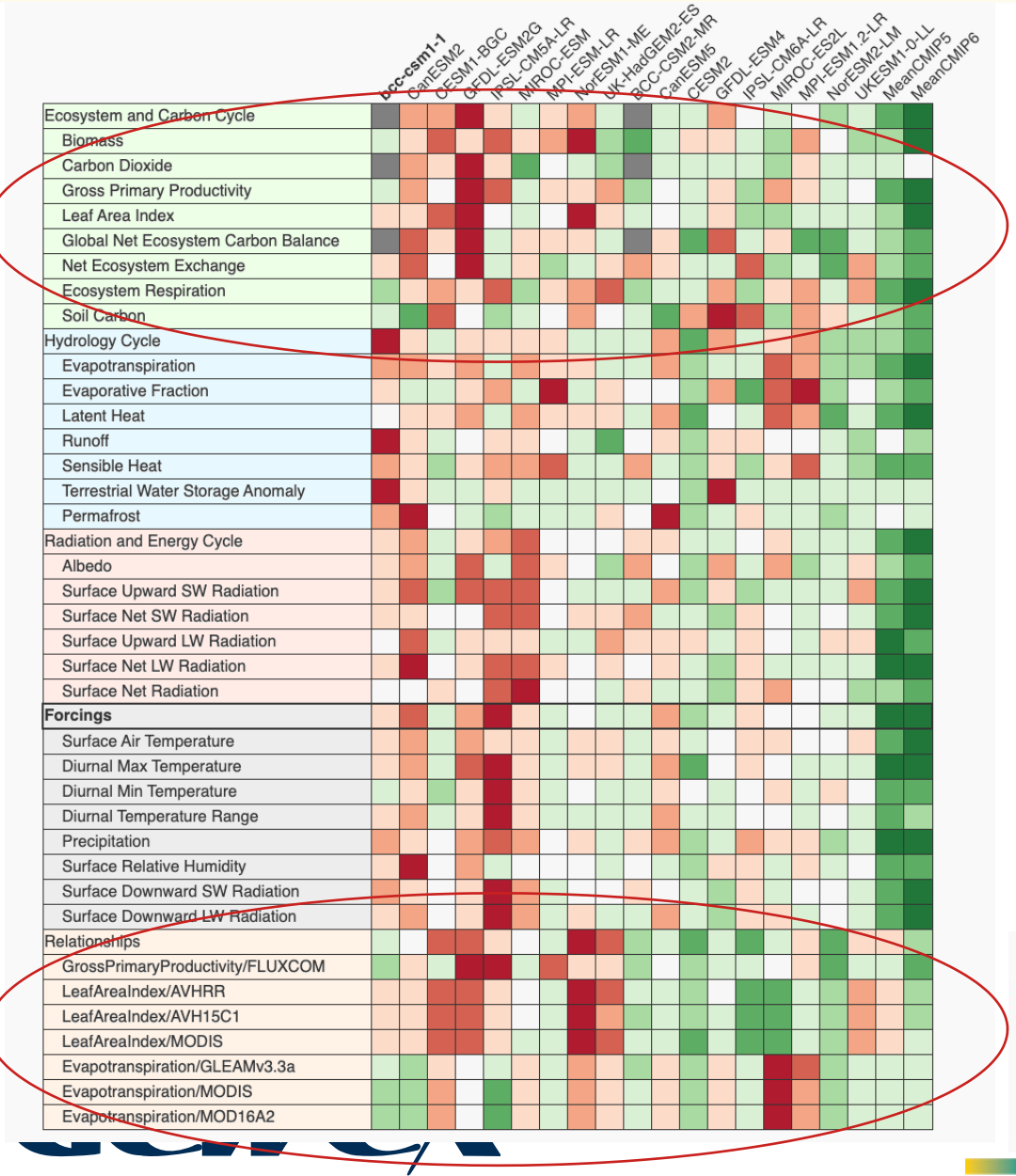
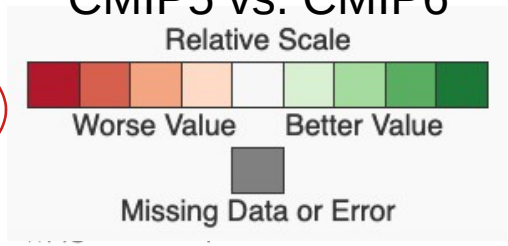
Water/Carbon coupling in land surface models



ILAMB evaluates the progression of coupled LSMs. The carbon cycle is key as it drives vegetation processes. Water & Carbon have always been central to LSMs.

Most have been validated over FluxNET sites.

CMIP5 vs. CMIP6



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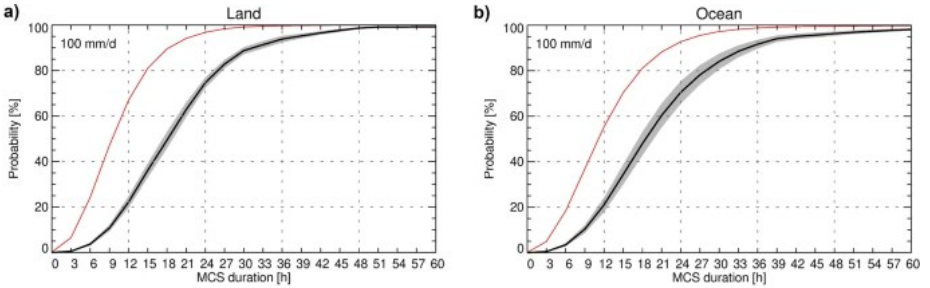
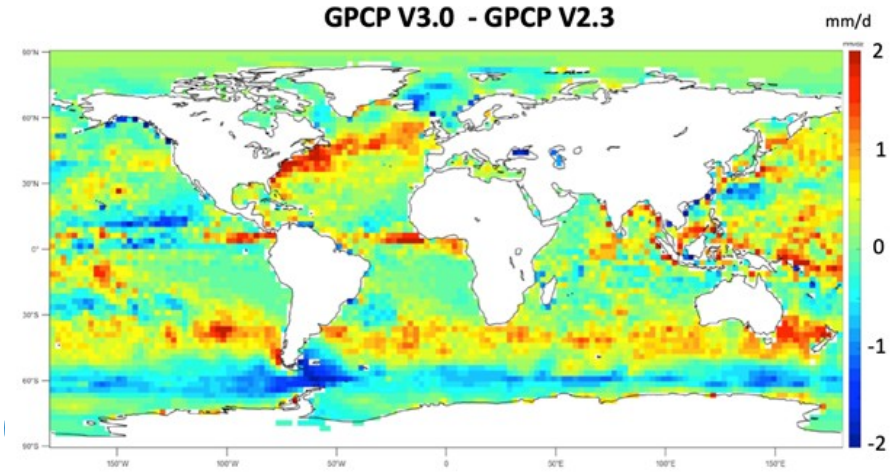
Explaining and Predicting Earth System

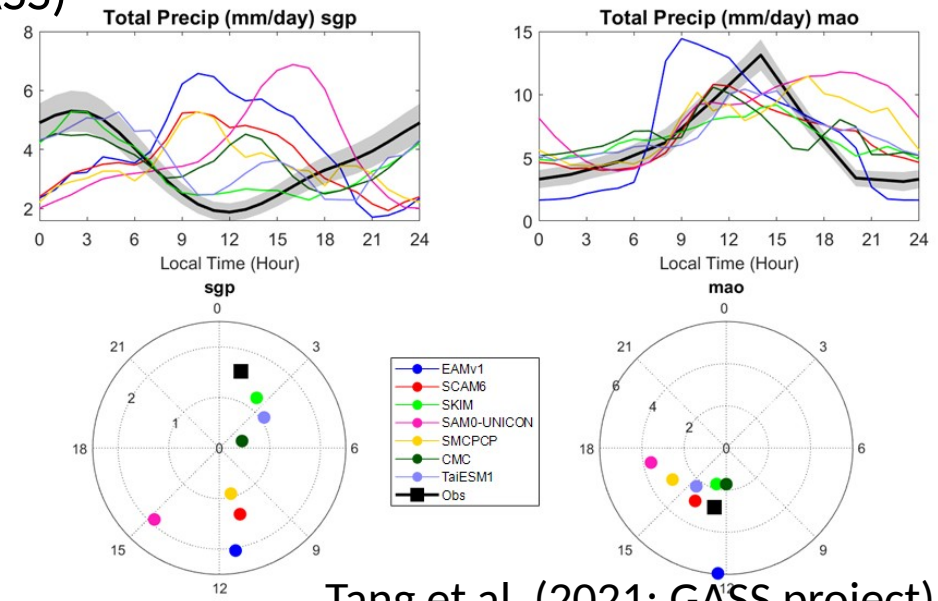
Precipitation initiatives/X cut activities

- Understanding and predicting extremes
- Evaluating (global) models
- Process understanding – warm rain PROES
- Updated climatologies (e.g. GPCP)
- Diurnal cycle of convection (GASS)
- Aerosol-precipitation process (GAP)
- Mountain Precipitation (GHP, GLASS, GASS)
- Precipitation assessment (GDAP)



Joint analysis of MCS (red) and P >100m/d (black) distributions over the tropics (Roca and Fiolleau 2020)





Tang et al. (2021; GASS project)

A new GEWEX initiative with broader applications

ISCCP–NG A MAJOR DATA INITIATIVE FOR THE DECADE

Input: Ingesting the Raw L1b from the Advanced Geo Imagers and generating a global gridded (L1g) of the common channels on a specified grid with certain temporal resolution.

Output: Developing L2g and L3 products based on the L1g and other data to make information to feed applications.

Applications: Use our current knowledge to inform the ISCCP-NG L1g and L2g efforts to optimize their efforts to generate a data-set that has utility for the coming decades.

***Governance:** The specification of roles and support by space and research agencies and how to implement them in international framework..

INPUT: L1 Common spectral channels (O~10) , 10minute, 2km global

OUTPUT: Cloud properties

APPLICATIONS : Many

Darmstadt, Oct 2019

Interaction with operational services

- GEWEX has built bridges between operational weather services and the climate community throughout its 30 years. The collaboration has been extremely productive :
  - Weather services supported GEWEX field campaigns.
  - Operational issues have triggered research questions.
  - GEWEX has contributed major model developments to NWP
- The same should be achieved with hydrologic and Hydrometeorological services. In 2021 WMO proposed a new vision for NHS. Our SSG reviewed that proposal and provided feedback :
  - Climate change is not taken into account in the vision of hydrological forecasting.
  - Lack of an Earth system vision in the hydrology community.
  - No vision on the collaboration with WCRP.

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2a. Primary Science Issues

- Expanding activities on carbon process in their interactions with the water cycle to the GEWEX.
- Support better integration of -water related- climate science with hydrological applications and services (at WMO but also for GEWEX with other communities e.g. GEO / IAHS / UNESCO-IHP.
- Develop global to regional consistent water and energy budgets : Not all observations observe all processes !
- Bring back evaporation into the focus of the scientific community to enhance our understanding and increase our confidence in the predicted changes.

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3a. Organizational Issues and Challenges

Interactions with other WCRP Activities (CPs, LHAs, IPOs etc.)

- Expansion of the GEWEX SSG with 2 extra members to support the interaction with the new CPs and LHAs :
  - RIfS : direct representation is preferred to provide an efficient connection/channel to support regional information development and uptake. GHP's RHPs are one important element to be considered.
  - ESMOC : GEWEX already has close interactions with the modelling (via GASS and GLASS) and observational (via GDAP and GHP) projects. Direct representation is preferred for efficient coordination.
- GEWEX would prefer to pro-actively manage with LHAs the contributions we can make to these transversal goals of WCRP. This will require regular and continuous interactions with the LHAs. Past meetings allowed to identify key activities but now interaction processes are needed to maintain the interaction over time.

Proposed additional elements in the new WCRP

- With the addition of new project offices, communications among all core projects and LHAs becomes more challenging. There is a need for expanded WCRP Secretariat support for more coordination and facilitation.
- *With the increased importance of water resources in a changing climate within the whole of WMO, WCRP should take the lead* and better coordinate efforts between WCRP (e.g., GEWEX, My Climate Risk, Safe Landing Climates), WMO Hydrology Department, and UNESCO Intergovernmental Hydrological Programme.

GEWEX community and evolution of activities

- For each GEWEX panel, we do see the natural evolution of activities, with some projects ending and new projects developing. The overall structure of GEWEX seems to be adaptive enough to accommodate the needs of the evolving community.

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3b. Issues and Challenges

- Many activities, in particular new ones have suffered from the pandemic through lack of support (many proposal grants are still on hold or delayed) and lack of in person meetings (including international field experiments).
- Some geopolitical issues might hamper direct engagement with certain countries in particular if perceived as bilateral.
- Clarity needed on, in particular WMO Departments of Research and Infrastructure and their mandates.
- WCRP Reorganization should not be rushed and clarity on terms of references is needed.