• Status of the GEWEX science plan
• Highlights of Cross cut activities
• A new ‘global’ data initiative
• GEWEX-CLIVAR collaborations

Report to CLIVAR SSG, 2021
The GEWEX organization

Scientific Steering Group: 10 Members plus 2 co-chairs and ex-officio members of NASA, ESA, JAXA and EUMETSAT

Activities:

4 Panels

- These are the GEWEX core - each consists of several working groups, most are process centric in focus

Several cross-cutting activities:

- Process Evaluation Studies (X GEWEX)
- Precipitation process initiatives (X GEWEX & beyond )
- WCRP GC on Water for the Food Baskets of the World (X GEWEX & beyond)
- RHPs (X GEWEX & beyond)
- Joint Monsoon Panel (w/ CLIVAR)
- EEI assessment (w/ CLIVAR, SPARC)
- WCRP GC on Extremes (w/ CLIVAR)

GEWEX science plan (SATM)

New initiatives

- highlighted next

Other Notable developments/events

- ESA-GEWEX-pan GEWEX conference, Earth Observation for Water Cycle Science, Versailles; Nov 2020
- GEWEX-OSC, 2022 (TBD)
A GEWEX ‘science and applications traceability matrix’

Provides traceability from WCRP strategies, to core science, to defined metrics to applications and to programs

The GEWEX Mission:
Quantitative understanding and prediction of the coupling of energy and water in the changing Earth system

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GEWEX SATM summarizes the science plan & meant to convey WCRP connectivity – currently finalizing with panel inputs

SSG

SSG

WCRP strategy

Panels: Bedrock science

WCRP implementation
GEWEX Goals

Goal #1: Determine the extent to which Earth’s water cycle can be predicted. This Goal is framed around making quantitative progress on three related areas: reservoirs, flux exchanges, and precipitation extremes.

Goal #2: Quantify the inter-relationships between Earth’s energy and water cycles to advance our understanding of the system and our ability to predict it across spatiotemporal scales: forcing-feedback understanding, ABL process representation, understanding circulation controls, and land-atmosphere interactions.

Goal #3: Quantify anthropogenic influences on the water cycle and our ability to understand and predict changes to Earth’s water cycle: anthropogenic forcing of continental scale water availability, water management influences, and variability of water availability

Water cycle is always linked to energy cycle
Cross GEWEX-CLIVAR EEI activity (and GCOS?)

Basic questions:

- Is this ERB trend real?
- How does it relate to, for example, the SLR ‘acceleration’ and related ocean heat uptake?
Precipitation initiatives/X cut activities

- Understanding and predicting extremes
- Evaluating (global) models – a broad initiative funded by US DOE, led by Prof Christian Jakob
- Process understanding – warm rain PROES
- Updated climatologies (e.g. GPCP)
- Diurnal cycle of convection (GASS)
- Aerosol-precipitation process (GAP)
- Mountain Precipitation
- Precipitation assessment (GDAP)

Joint analysis of P and MCS distributions over the tropics (Roca and Fiolleau 2020)

Tang et al. (2021; GASS project)
A new GEWEX initiative with applications beyond GEWEX

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
The GEWEX Regional Hydroclimate Projects, The Food Basket Foci Regions of the World and the CORDEX Domains

- Current Regional Hydroclimate Projects & Networks
- Planned or Envisioned Regional Hydroclimate Projects & Networks
- Global Water Futures
- AndEX
- Baltic Earth
- PannEX
- HyMEX
- AsiaPEX
- OzeWEX
- East African Mountain Range
- New Zealand
- SE Asia Rice and Wheat Regions
- TPE – Water Sustainability
- US RHP
- Central Asian High Mountains
- Pannonian Basin
- CORDEX Domain (not all domains are represented)
- Incan and Modern Agricultural Food Producing Regions in the Andes
GLASS Projects Schematic

- Process-oriented
- Benchmarking
- Model Intercomparisons

Projects:
- GLASS
- SoilWat
- PLUMBER
- DICE/GABLS
- LoCo
- PALS
- LUMIP
- GSWP3
- LS3MIP
- ILAMB

Image: GFDL HIRAM forecast model
Perspectives on GEWEX-CLIVAR Collaborations

- WCRP LHA
- EEI (Earth Energy Imbalance)
- Monsoons of the world for process understanding, seasonal prediction, and climate change. It is crucial to synthesize what have worked and what have not in the past decades (in terms of contributions to the broad climate sciences of WCRP).
- WCRP GC on Extremes

Xie et al. (2020) GEWEX Quarterly Monsoon Special Issue
Perspectives on GEWEX-CLIVAR Collaborations

- Regional water cycle and ocean salinity (or even more broadly, Earth Water imbalance, also including sea level rise) – link to SWOT and GRACE-FO missions

- S2S predictability (GLASS GLACE; GASS LS4P)

- Unified turbulence of the ABL (over land, ocean, ice) and ocean mixed layer

Reeves Eyre and Zeng (2021): Atmospheric and terrestrial measurements along with ocean salinity are needed to close the Amazon water cycle

Liu et al. (2019)

GASS LS4P simulated effects of Tibetan Plateau May 2003 land temperature anomaly on June 2003 global precipitation anomaly (Xue et al. 2021)