



9th The Global Energy and Water Exchanges Open Scientific Conference



Water
•
Climate

水
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気候



7–12 July 2024
Sapporo, Japan
Keio Plaza Hotel



Join us in beautiful Sapporo, Japan, to address the challenges facing humanity in terms of freshwater availability and associated disaster risk reduction and the sustainable development in the context of climate change and human activities.

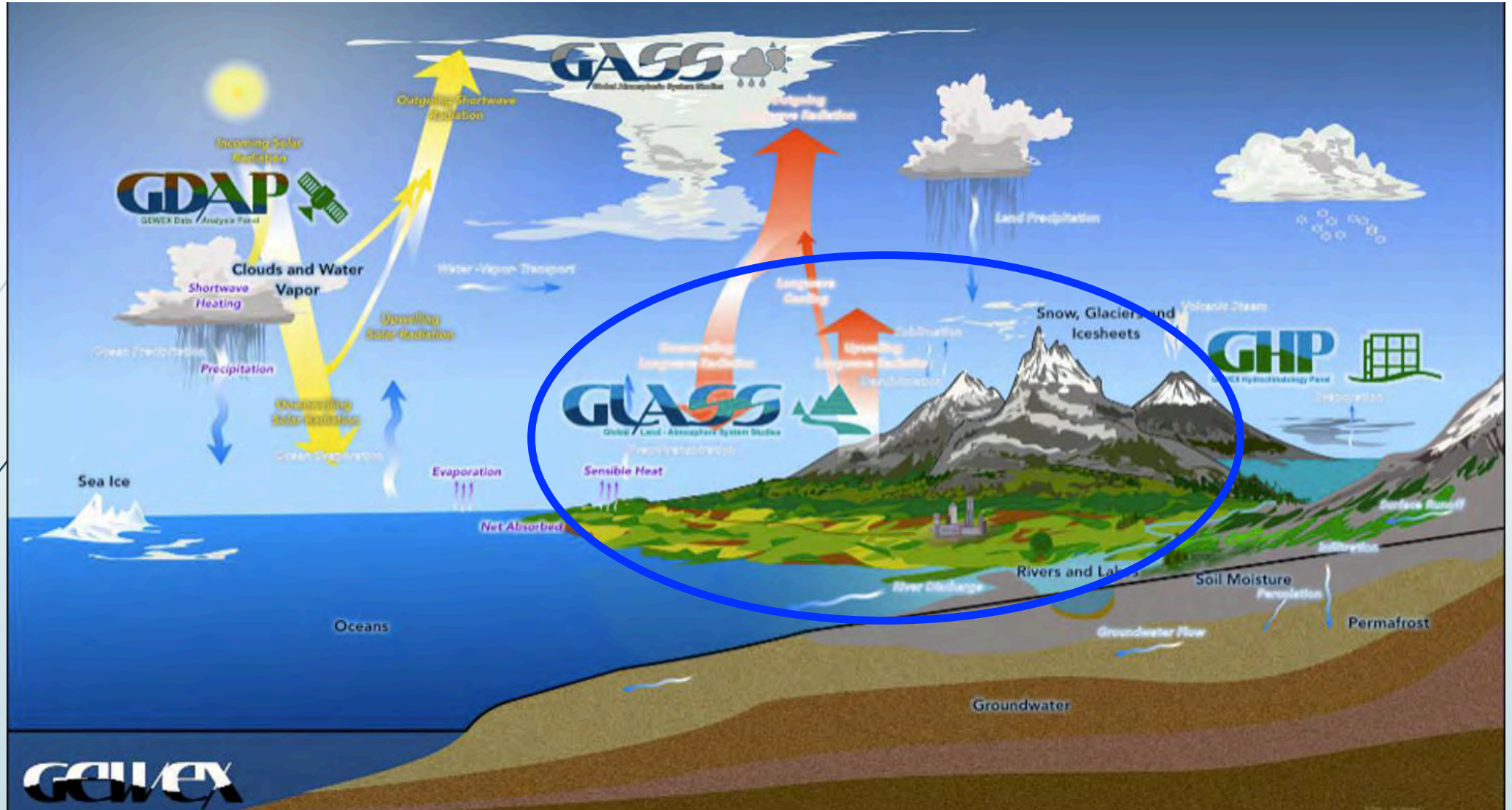


GEWEX
The Global Energy and
Water Exchanges
Program



GEWEX's Four Panels

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- **GDAP:** GEWEX Data Analysis Panel *Global Datasets Analysis and Assessments*
- **GASS:** Global Atmospheric System Studies *Atmospheric Processes - Dynamics*
- **GLASS:** Global Land-Atmosphere System Studies *Land Processes and Land-Atmosphere Interactions*
- **GHP:** GEWEX Hydroclimatology Panel *Regionally Focused Processes and Hydroclimate Projects*

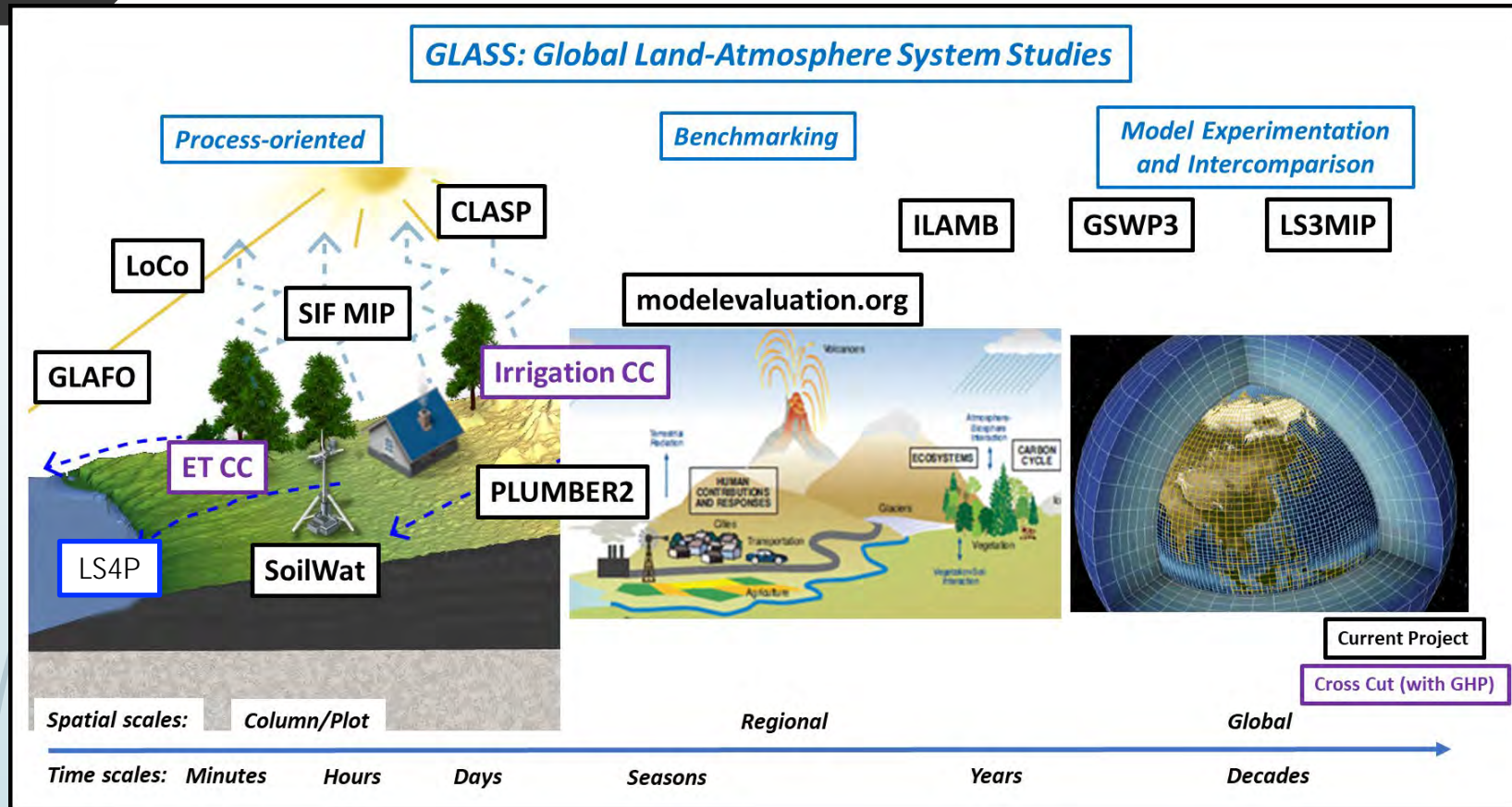
GLASS role in GEWEX:

- The **Global Energy and Water Cycle Exchanges Project** (GEWEX) is a core project in the **World Climate Research Programme** (WCRP), where GEWEX is dedicated to *understanding Earth's water cycle and energy fluxes at and below the surface and in the atmosphere.*
- The **Global Land-Atmosphere System Study** (GLASS) Panel in GEWEX coordinates the evaluation and intercomparison of the new generation of land models and land-atmosphere interactions in Earth system models, and their applications to scientific queries of broad interest. Thus, a key objective of GLASS is **model development and evaluation**, emphasizing **process-level understanding and comparisons to observational benchmarking datasets**. Projects:
 - Energy and water fluxes, partitioning at the surface, interactions with the boundary layer (relevant collaborations with GASS).
 - Linkage w/soil physics & hydraulics, groundwater, wetlands, cryosphere, flooding.
 - Linkage with the carbon cycle: vegetation phenology, vegetation dynamics, carbon allocation, plant hydraulics.
 - Anthropogenic influences on these cycles: irrigation; urbanization, human water management (dams & reservoirs, irrigation, water extraction); crop selection; fertilization, tillage and cultivation choices; mixed agroforest systems; etc.

Working on topics in green text.
Beginning to work on topics in blue.

GLASS Panel Projects: From column to global scale

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- **ILAMB:** International LAnd Model Benchmarking
- **Modevaluation.org:** web application for evaluating and benchmarking computational models.
- **GSWP3:** Global Soil Wetness Project, phase 3
- **LS3MIP:** Land Surface, Snow and Soil Moisture MIP

- **LoCo:** Local Coupling working group.
- **GLAFO:** GEWEX Land-Atmos. Feedback Observatories.
- **SIFMIP:** Solar-Induced Fluorescence MIP.
- **CLASP:** Coupling of Land and Atmospheric Sub-grid Parameterizations.
- **SoilWat:** Soils and Subsurface processes.
- **PLUMBER2:** The Protocol for the Analysis of Land Surface Models (PALS) Land Surface Model Benchmarking Evaluation Project, phase 2.
- **GASS-GLASS:** LS4P.
- **GHP Cross Cut (CC) projects:** Irrigation, Evapotranspiration.

GLASS Process-Oriented Projects

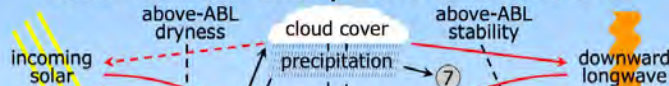
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LoCo (& GABLS)

Local Land-Atmosphere Coupling (LoCo) Project:

- Understand, quantify, model, and predict the role of local land-atmosphere coupling in the evolution of land-atmosphere fluxes and state variables and the respective water and energy cycles, including clouds.

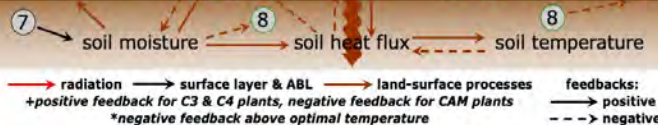
Local Land-Atmosphere Interactions



Process-based verif.:

PBL profiles, land-atmosphere coupling metrics.

e.g. FLUXNET, GLAFOs.



GLAFO

GEWEX Land/Atmosphere Feedback Observatory:

- Understand land-atmosphere feedbacks over different large-scale forcing regimes and characterize coupling strength with observation of surface, PBL and entrainment fluxes.

$$\langle \theta'w' \rangle$$

Process-based verif.:

Superior observations of subsurface states and processes, surface fluxes, PBL profiles (T, q, U & fluxes), PBL-top **entrainment fluxes**, land-atmosphere coupling metrics.



CLASP

Coupling of Land and Atmospheric Subgrid Parameterizations:

- Enable interaction between "tiling" approach over land and existing atmospheric sub-grid schemes. Moves beyond the uniform land and atmosphere assumptions. Modeling & obs.

Uniform atmosphere to heterogeneous land

Uniform land to heterogeneous atmosphere

Process-based verif.:

Grid-averaged and subgrid atmospheric variables (T, q, U), PBL and surface fluxes, and corresponding land-atmosphere coupling metrics.

e.g. FLUXNET, GLAFOs.



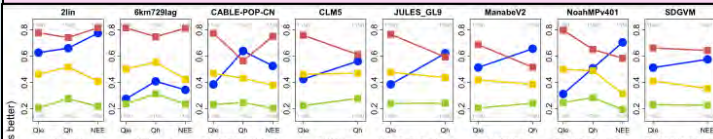
GLASS Process-Oriented Projects (cont.)

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PLUMBER2

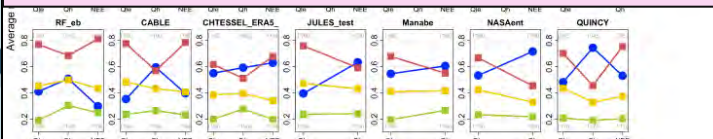
Protocol for the Analysis of Land Surface models (PALS) Land Surface Model Benchmarking Evaluation Project, Phase 2:

- Comparison of multiple land models with 170 Fluxnet sites. Focus on surface fluxes and net ecosystem exchange compared with empirical models--which still win the "beauty" contest!



Process-based verif.:

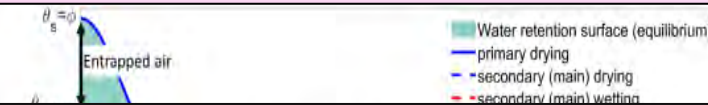
Surface fluxes.
BGC-relevant information.
e.g. FLUXNET, GLAFOs.



SoilWAT

Soil-Water in Earth System Models:

- Understand and improve soil hydraulic and thermodynamic processes, and soil-plant representation in Earth system models. "Soil-Cloud Cascade" connections with LoCo, CLASP. Improve soils data sets. A joint project between with GEWEX & Int'l Soil Modeling Consortium.



Process-based verif.:

Soil moisture, temperature, ice. Soil hydraulics and thermodynamics.
e.g. FLUXNET, ISMN



dET CC

Determining Evapotranspiration (dET):

- Key term in Earth's water and energy budgets. Evaluate ET schemes and observations.

Process-based verif.:

ET & ET-components
e.g. FLUXNET.

Irrigation CC

Irrigation representation in Earth system models:

- Global irrigation withdrawals.



Process-based verif.:

Locations & timing of water application, extraction.
Regional/global data sets?

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GLASS-related topics with WGNE relevance:

Water cycle and precipitation extremes.

Water and climate research for sustainable society.

Coupled water, energy, and carbon cycles.

Anthropogenic effect on water cycles.

Disaster risk reduction and water solutions.

<https://www.gewexevents.org/meetings/gewex-osc2024/>



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