



Global Precipitation Experiment (GPEX)

44th Session of the WCRP Joint Scientific Committee

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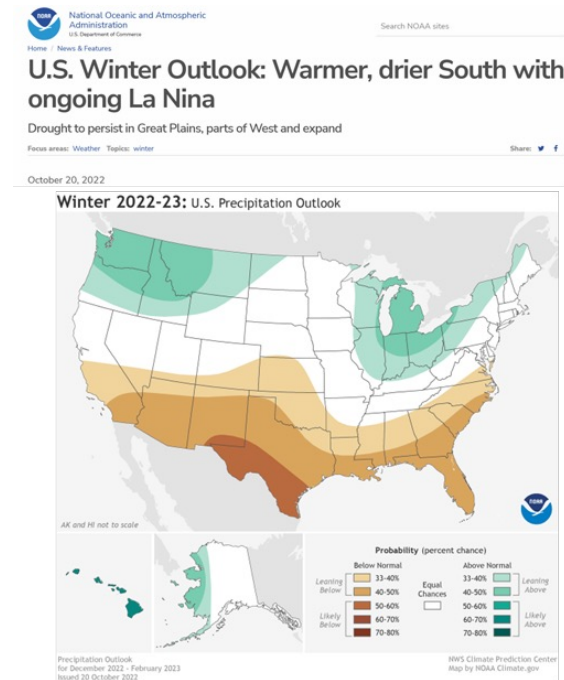


Motivation

Despite progress in the past few decades, the improvement of precipitation prediction and projection skill has been slow.

History

- 2020: USGCRP first explored the concept of GPEX.
- 2021: WCRP JSC decided to pursue this initiative
- 2022: GPEX Tiger Team was appointed; white paper was submitted.
- 2023: GPEX Science Team was appointed; Science Plan draft was submitted; GPEX to be launched as a LHA during the WCRP OSC in October 2023



NCEP and other organizations all failed in the seasonal prediction for **this winter (Dec-Feb)**



From my backyard in the morning of 3/2/2023

GPEX Science Team Membership

Represented:

GEWEX,
CLIVAR,
SPARC,
CliC,
RfS

Digital Earth,
EPESC,
SLC,
MCR,
WCRP Academy

Monsoon panel,
WWRP,
WMO Hydrology,
USGCRP,
WCRP Experts.

Name	Country	Core Project /LHA
Zeng, Xubin	USA	GEWEX & Chair of the GPEX Science Team
A.P., Dimri	India	CliC
Alves, Lincoln	Brazil	RfS
Boucher, Marie-Amélie	Canada	WMO Hydrology Expert
Cherchi, Annalisa	Italy	CLIVAR/GEWEX Monsoons Panel
DeMott, Charlotte	USA	CLIVAR
Gettelman, Andrew	USA	Digital Earth - LHA
Hanna, Edward	UK	CliC co-chair
Horinouchi, Takeshi	Japan	SPARC
Huang, Jin	USA	USGCRP
Lennard, Chris	South Africa	WCRP Academy and CORDEX Africa
Leung, Ruby	USA	WCRP Expert
Luo, Yali	China	WWRP- Southern China Monsoon Rainfall Exp.
Pryor, Sara	USA	RfS co-chair
Saint-Lu, Marion	France	SLC - LHA
Sobolowski, Stefan	Norway	RfS
Steiner, Jakob	Pakistan, Austria	MCR - LHA
Stevens, Bjorn	Germany	WCRP Expert
Teruggi, Giacomo	UN	WMO-Hydrology Division
Wehner, Michael	USA	EPESC - LHA

WCRP Charge to GPEX:

- What is new and visionary? What activities are exciting?
- What is the justification for GPEX to be a Pan-WCRP project?

GPEX Strategy

Plan the WCRP Years of Precipitation (YoP) and associated activities before and after.

Science Questions

Q1: What are the sources of uncertainties of quantitative precipitation estimates over global land & ocean, particularly over mountainous, high-latitude, & tropical regions, and how can we address them?

Q2: How is precipitation produced by complex moist processes and their interactions with atmospheric dynamics and other components of the Earth system?

Q3: What are the sources of precipitation biases in climate models and how can we reduce them to improve predictions and projections of precipitation at different temporal and spatial scales?

Q4: How can we enhance regional and local capacity building for precipitation measurements, process understanding, prediction, and projection?

Activity #1: WCRP Years of Precipitation (YoP)

- Engage and coordinate with national and international funding agencies
- Coordinate global field campaigns with in situ, airborne, and satellite measurements of the atmosphere, land, and ocean, focusing on different storm types for different seasons
 - Winter: atmospheric rivers,
 - Spring: mesoscale convective systems,
 - Summer: monsoons,
 - Fall: tropical cyclones

Activities #2 - #4 will be included in the YoP Phase and the Pre- and Post-YoP Phases.

Activity #2: Precipitation Databases

GPEX should focus on activities that will add values to existing efforts, such as:

- Work with other projects (e.g., GEWEX) to set up a baseline surface precipitation network (BSPN) over land.
- Work with other projects (e.g., CLIVAR, GEWEX, SPARC) to organize a dialogue between oceanographers and atmospheric scientists to design gauges for buoys.
- Emphasize the development of low-cost, easy-to-maintain instruments for enhancing global precipitation measurement network.
- Work with other projects (e.g., GEWEX, hydrology/cryosphere community) to enhance existing ground-based observational networks

Activity #3: Precipitation Modeling, Prediction, and Process Understanding

Coordinate multi-scale analysis and precipitation forecasts, and support the establishment of multi-model databases, along with common evaluation metrics.

Leverage multi-storm resolving model ensembles developed globally or regionally (e.g., Digital Earth, CORDEX, GEWEX) and a hierarchy of models.

Leverage the outcomes of the CMIP6 framework (and future CMIP7), with a focus on models with simulations at various resolutions (e.g., km-scale, 0.25° , and 1°).

Activity #4: National/Regional Activities and Capacity Development

Support the capacity development by entraining scientists and graduate students into YoP, particularly from the Global South.

Make storm-resolving models (SRMs) available for resource-challenged scientists in the Global South where SRMs could bring much added value.

Support existing national/regional activities and/or the establishment of new activities, partly through capacity building.

WCRP Relevance

As precipitation is an essential climate variable, GPEX will directly contribute to all four objectives of the WCRP Strategic Plan 2019-2028. Precipitation is also central to the WMO's mission on water, weather, and climate.

Partnership

The strategy of GPEX is to focus on the YoP and associated coordinated global field campaigns, gridded data evaluation and analysis, km-scale modeling, process understanding, and prediction of extreme events.

Therefore, GPEX has to be a pan-WCRP initiative by drawing on the expertise across all the WCRP projects and from other partners (WWRP projects; WMO hydrological activities; START; space agencies; funding agencies and foundations).

Outcomes and Deliverables

To use precipitation as the unifying force for cross-WCRP activities, to attract more national and international funding and hence attract more scientists to WCRP activities, and to provide scientific deliverables:

- Plan and organize globally coordinated field experiments;
- Evaluate, improve, and develop gridded datasets of precipitation;
- Evaluate, improve, and develop precipitation modeling and prediction; and
- Increase capacity for precipitation related efforts.

Risks

- Lack of funding from national and international agencies.
- Lack of buy-in from the community.

Requirements and Budget:

- Agency support of 1-2 staff, collocated with a core WCRP project office.
- WCRP support of workshops and SSC meetings.

Communication and Capacity Exchange:

- Collocation of GPEX meetings with OSCs of WCRP projects.
- Publication of GPEX Science Plan in BAMS.

Implementation and Timeline:

- Pre-YoP Phase (e.g., Years 1-3): Seek anchor projects for the global field campaigns; pursue Activities #2 - #4
- YoP (e.g., Years 4-6): focus on all Activities #1 - #4.
- Post-YoP (e.g., Years 7-9): pursue Activities #2 - #4, focus on new measurements.

GPEX activity will be completed and fully integrated into WCRP Core Projects in 1-3 years after YoP. This would happen in 5-10 years.

What does GPEX need from you?

Provide your input; e.g.,

- What revisions are needed in the Science Plan?
- What GPEX activities could your Project lead or co-develop?
- What GPEX activities are you interested in leading? or do you want to nominate somebody else?

Share the GPEX Science Plan draft with your colleagues to generate excitement and seek their input.

Share the GPEX Science Plan draft with managers and leaders at funding agencies for possible inclusion in their planning of new major funding opportunities.

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