World Climate Research Programme Years of Precipitation (YoP, 2028–2030)
A coordinated international framework for advancing precipitation science

Background

Observing, modelling and predicting precipitation remain major scientific challenges in weather and climate research. Precipitation is central to freshwater availability, ecosystems, agriculture, energy production and disaster risk, yet significant knowledge gaps and uncertainties remain across spatial and temporal scales. These challenges are particularly evident for extreme precipitation associated with atmospheric rivers, monsoons, mesoscale convective systems, and tropical cyclones, which account for a large proportion of weather- and climate-related impacts worldwide. Some of these systems also affect high-latitude and polar regions, where precipitation plays an important role in the global climate system.

While advances in satellite observations, radar networks, numerical weather prediction and Earth system modelling have substantially improved our understanding of precipitation and our ability to observe and predict it, challenges remain in precipitation measurements, process understanding, model representation, and prediction. These are particularly acute in data-sparse and under-observed regions, areas with complex terrain, polar regions and over the ocean, and are compounded where resources for sustained observations and research are limited.

The Global Precipitation Experiment (GPEX) helps address these gaps through four linked priorities: reducing uncertainties in precipitation observations and datasets; improving process understanding; improving precipitation modelling, prediction and projection; and strengthening regional capacity for observations and climate services.

The Years of Precipitation (YoP) represent the **flagship activity** of GPEX. In addition to encouraging the development of new field campaigns, YoP provides a framework to coordinate existing and planned activities, connect observations with datasets and modelling, and maximize the scientific value of global investments in precipitation research. As highlighted in the GPEX Science Plan, the objective is to achieve better and greater scientific outcomes than could be achieved without coordinated international actions.

WCRP Years of Precipitation (YoP)

The Years of Precipitation (YoP, 2028–2030) initiative is a major implementation activity of the GPEX Science Plan. Envisaged from the development of the GPEX Science Plan, YoP will provide a framework for coordinating field campaigns and strengthening collaboration across observations, datasets, modelling and capacity development. Over the past year, the GPEX

community has compiled a global inventory of planned precipitation-related field campaigns associated with the four *High-Impact Precipitation Systems (HIPS)* and held extensive discussions with principal investigators, partner programmers and the wider precipitation science community. These discussions confirmed both the strong interest in a coordinated international framework and identified 2028–2030 as the period during which the greatest number of complementary field campaigns are expected to operate. The Kyoto discussions therefore confirmed the timeline and implementation pathway for YoP, rather than initiating the concept itself.

The primary objective of YoP is to maximize the scientific value and long-term legacy of existing and planned investments through international coordination, while encouraging the development of new field campaigns where important scientific or regional gaps are identified. By providing a common framework, YoP will facilitate stronger collaboration between field campaigns, improve connections between observations and modelling activities, and promote greater interaction between scientific, operational and regional communities. For example, common case studies could be developed around selected precipitation events or processes, providing a shared basis for cross-campaign comparison, model evaluation, and benchmarking across datasets.

Launch of YoP in 2026

Although field campaigns will take place during 2028–2030, the preparatory phase is equally important. Launching YoP now provides the GPEX community with sufficient time to build partnerships, align scientific priorities and coordinate activities before campaigns begin.

Several discussions with field campaign principal investigators highlighted the value of an internationally recognized framework under WCRP. Beyond strengthening scientific collaboration, such a framework provides participating projects with greater international visibility and a common platform that can be referenced in funding proposals and partnership discussions. Early engagement and coordination are essential to ensure that meaningful activities can be planned and implemented during YoP (2028–2030). YoP aims to engage funding agencies, national meteorological and hydrological services, research institutions, space agencies and operational partners early in the planning process to align field campaigns with complementary modelling and evaluation activities, encourage broad global participation, maximize scientific return and avoid duplication of effort. This early coordination is one of the principal strengths of the initiative and represents a realistic and achievable contribution from GPEX to the international precipitation community.

Role of YoP within GPEX

The Years of Precipitation represent one component of the broader GPEX Science Plan and is primarily implemented through Working Group 1, which focuses on coordinated field campaigns and observations. However, the scientific outcomes of YoP depend on strong interactions with the other three Working Groups.

Working Group 2 develops community approaches to precipitation data, analysis and integration, including reference observations, observational coverage, benchmarking and intercomparison. A survey with over 120 international responses highlighted the need for

higher resolution precipitation datasets, better representation of orographic precipitation, and improved solid precipitation measurements and data in high mountain and polar regions. These findings will guide WG2 activities during YoP, particularly in improving reference observations and validation datasets for precipitation datasets development and evaluation.

Working Group 3 focuses on process understanding, model evaluation, and prediction. Planned activities include a major review paper identifying current modelling gaps across the four HIPS, coordinated evaluation of kilometre-scale and convection permitting regional climate models, and stronger integration between observations and modelling through common case studies.

Working Group 4 complements these scientific activities through regional engagement and capacity development. Current activities include an Asia Pacific Network funded project bringing together Japan, Nepal, Bhutan, Bangladesh and India to strengthen high-resolution precipitation observations and technical capacity across South Asia. They also focus on broader efforts to improve community engagement, knowledge sharing, and access to precipitation observations in data-sparse regions.

Together, these four Working Groups establish an integrated scientific framework linking field observations, precipitation datasets, process understanding, model evaluation, prediction, and capacity development. The Years of Precipitation provides the coordination mechanism that enables these activities to work together rather than in isolation.

Expected Outcomes of YoP

The Years of Precipitation will help maximize the scientific value of precipitation activities by strengthening coordination across field campaigns, observations, datasets, and modelling.

Through this framework, GPEX will support:

- coordinated field campaigns across the four high-impact precipitation systems, with stronger links between observational and modelling teams;
- common case studies using agreed datasets and evaluation methods to investigate precipitation processes and assess model performance;
- assessments of uncertainties in precipitation datasets and gaps in model representation, including for extreme events;
- improved discovery, documentation and accessibility of participating campaign datasets, guided by Findable, Accessible, Interoperable and Reusable (FAIR) principles;
- scientific syntheses of findings across participating activities, identifying advances, remaining gaps and implications for precipitation prediction;
- regional capacity development and stronger collaboration among research, operational and funding partners, particularly in data-sparse and resource-constrained regions.

Partnerships and Engagement

During the preparatory phase (2026–2027), GPEX will work closely with relevant WCRP activities, WMO programmes, space agencies, NMHSs, research institutions, operational centers, and regional initiatives. A key aim will be to connect early with national agencies and funders so that field campaigns and regional activities can align with YoP, where appropriate. Engagement with the private sector is also being explored, particularly around data, tools and capacity development, but only in line with WMO/WCRP due diligence processes and principles of scientific independence.

Implementation Pathway (2026–2032)

The implementation of YoP will be undertaken in three phases.

Phase 1: Preparatory Phase (2026–2027)
The initial phase will focus on building the international framework required for coordinated implementation. Activities will include:

- engaging field campaign principal investigators and partner programmes;
- establishing partnerships with funding agencies and operational organisations;
- identifying and endorsing field campaigns contributing to YoP;
- developing community resources, including inventories of field campaigns and knowledge platforms;
- developing community-endorsed guidelines for data documentation, quality control, access conditions and archiving, working towards FAIR principles.
- supporting outreach, communication, and capacity-development activities.

Phase 2: Years of Precipitation (2028–2030)
During the implementation phase, GPEX will facilitate coordination across participating activities, promote exchange of knowledge and best practices, encourage cross-campaign collaboration, and strengthen interactions between observations, datasets, modelling and prediction activities across the four Working Groups.

Phase 3: Legacy/Post-Implementation Phase (2031–2032)
During the post-implementation phase, GPEX will facilitate coordination of data analysis activities, especially as they address the four HIPS. Importantly, GPEX will also help promote the data-sharing and long-term accessibility of the precipitation datasets, in line with the FAIR principles, encouraging precipitation datasets to be Findable, Accessible, Interoperable and Reusable wherever feasible. Specific tasks will include preparation and publication of synthesis scientific papers, exploration and documentation of transition datasets and methods into operational services, where possible, and documentation of impacts (i.e. document lessons learned, showcase success stories and demonstrate societal benefits). Overall, the post implementation phase will envisage community and partnership growth i.e., sustain and expand the global precipitation community; strengthen strategic partnerships with scientific, operational and funding organisations; foster new collaborations and mobilize resources for future initiatives.

Governance

The Years of Precipitation (YoP) will be implemented under the scientific leadership of the GPEX Scientific Steering Group (SSG), with coordination and support provided by the WCRP Secretariat.

Delivery of the indicative outputs will be coordinated through the four GPEX Working Groups. Working Group 1 will lead coordination of field campaigns and observations; Working Group 2 will facilitate the analysis, intercomparison, and integration of precipitation observations and datasets, including the assessment of their uncertainties, in collaboration with participating projects. Working Group 3 will lead activities on process understanding, model evaluation and prediction; and Working Group 4 will coordinate regional engagement and capacity development. The Working Groups will collaborate on shared activities, including common case studies, links between observations and modelling, and cross-campaign scientific syntheses.

Each Working Group will refine its priorities, intended outputs, and delivery schedules with participating teams. The SSG will review progress regularly, address gaps and dependencies across the Working Groups, and guide adjustments to the implementation pathway. Participating activities will be encouraged to share updates, scientific findings, and lessons learnt to maximise benefits across the wider community.

Participation in YoP is open to existing and planned activities that align with the objectives of GPEX. Following the existing written criteria on endorsing GPEX anchor projects, a transparent endorsement process will be established to recognize contributing initiatives (with different considerations for existing activities and proposals under development) while promoting collaboration, visibility, and exchange across the international precipitation community.

Indicative Outputs and Coordination

The following indicative outputs will guide implementation. Priorities, responsibilities and delivery schedules will be refined by the GPEX Working Groups with participating teams, under SSG oversight and with WCRP Secretariat support.

Phase	Priority outputs	Coordination
Preparation 2026–2027	Updated campaign inventory; participation and endorsement criteria; identification of observational and regional gaps.	WG1, with input from WG2–4 and SSG agreement on endorsement arrangements.
Preparation 2026–2027	Initial common case studies and evaluation methods; expectations for data documentation, sharing and archiving; regional capacity-development priorities.	WG2 and WG3, working with WG1 on campaign links and WG4 on regional needs.

Years of Precipitation 2028–2030	Coordinated observations and exchange across participating campaigns; documented datasets made available as appropriate; joint analysis of selected case studies and model performance.	WG1 for campaign coordination, WG2 for datasets and benchmarking, and WG3 for process studies and model evaluation.
Years of Precipitation 2028–2030	Training and knowledge exchange responding to identified regional needs, including observation quality management and use of precipitation datasets.	WG4, with contributions from WG1–3 and regional partners.
Legacy 2031–2032	Cross-campaign scientific syntheses; assessments of remaining observational and modelling gaps; continued dataset accessibility; documentation of potential applications to operational services.	WG2 and WG3, with WG1 and participating teams supporting campaign-data access, and WG4 supporting regional uptake and knowledge exchange.

Implementation will build primarily on resources secured by participating projects and institutions, with GPEX providing scientific coordination and WCRP Secretariat support within available capacity; additional resources will be sought for shared activities and priority gaps.

Conclusion

The Years of Precipitation represent a major implementation milestone of the WCRP Global Precipitation EXperiment. They provide a practical and achievable framework for bringing together the international precipitation community around a common scientific objective while strengthening collaboration across observations, datasets, modelling and capacity development.

By coordinating activities before they begin, rather than after they have already been implemented, YoP seeks to maximize the scientific return of ongoing investments, strengthen international partnerships, and create a legacy for precipitation science. In doing so, the initiative will contribute to advancing our understanding and prediction of high-impact precipitation systems and support the broader objectives of GPEX in addressing one of the most challenging problems in weather and climate research. Such an initiative will not only advance precipitation science but will also help demonstrate how coordinated international research can create tangible value for people and communities around the world.