Fiscal Year 2023 COM Competition Information Sheet:
Precipitation-related Dataset Development and Analysis

Program Name

COM - Climate Observations and Monitoring

Program Mission

The Climate Observation and Monitoring (COM) Program focuses on supporting work that leverages existing in-situ and remote sensing-based observations to develop value-added datasets, products, and analyses. Primary objectives are to support work that 1) provides usable and useful datasets that enable further monitoring and modeling efforts by research and operational communities; and 2) provides authoritative, long-term datasets and analyses for assessment activities.

COM sits within the Earth System Science and Modeling Division (ESSM) of NOAA's Oceanic and Atmospheric Research (OAR) Climate Program Office (CPO).

Focus for FY22

Precipitation-related Dataset Development and Analysis: Advancing Understanding of Precipitation Processes for NOAA Monitoring and Modeling Applications

Funding for FY22

Pending availability of funds in FY2022, COM anticipates a funding allocation of up to $3 - $4M for this competition.

Competition Information

Background

The recent [NOAA Precipitation Prediction Grand Challenge Strategy](#)[1] and the [NOAA ESSM - Department of Energy (DOE) workshop](#)[2] highlight the need to fully synthesize and exploit existing observations to *improve our understanding of and ability to accurately capture the multi-scale nature of precipitation, including associated large-scale atmospheric variability that modulates or forces regional precipitation, and the feedbacks and processes that ultimately determine the interplay between regional rainfall and large-scale atmospheric variability.* The IPCC Sixth Assessment Report (AR6) Working Group II (WGII)[3] report further highlights the urgency of addressing gaps in knowledge for improved understanding of an intensifying water cycle.

To tackle this, many observation-based precipitation, and related surface and atmospheric precipitation-related datasets exist; however, obstacles prevent their use and availability: they have biases, no single dataset can address all observing needs on space and time scales or certainty window, and these datasets are spread across many archives. These act as barriers for uptake by

multiple communities and impede the use of observations in advancing understanding of processes and precipitation prediction.

- The NOAA Precipitation Prediction Grand Challenge Strategy[1] (PPGC) calls for improvements to U.S. precipitation forecasts in order to reduce the devastating and sometimes billion-dollar weather and climate disasters associated with a warming climate and intensifying water cycle. In order to realize the eventual end goal of an accurate forecast, research is required to **fully exploit existing observations** and ensure that these are high quality, fully available (PPGC Objective 4), and synthesized (PPGC Objective 5) so that they are utilized by the research and operational communities.
- The co-sponsored NOAA and DOE workshop[2], which focused on precipitation processes and predictability, further highlighted opportunities to **advance the use of existing observations** for precipitation predictability research, and collaborative opportunities for observation and modeling communities.
- The IPCC Sixth Assessment Report (AR6) Working Group II (WGII)[3] highlights the impacts on ecosystems, biodiversity, and human communities from anthropogenic climate change detailed in AR6 Working Group I[4]: *anthropogenic climate change has increased atmospheric moisture and precipitation intensity (very likely by 2-3% per 1°C) (high confidence), increased terrestrial evapotranspiration (medium confidence) and contributed to drying in dry summer climates including in …western North America (medium to high confidence), and has caused earlier onset of snowmelt and increased melting of glaciers (high confidence) since the mid-20th century. The report also stated with high confidence that the water cycle variability and extremes are projected to intensify, regardless of the mitigation policy.*

Together, these reports highlight the **urgent need for research investments that will exploit existing observations to further understanding of precipitation, and enable future improvements to NOAA monitoring and modeling capabilities**. NOAA capabilities play an important role in providing timely and accurate precipitation predictions to protect lives and property.

Details for Proposals

In Fiscal Year 2023, the COM program solicits proposals that will exploit NOAA's (and other Federal or publicly available) existing surface (ocean, land, ice), atmosphere, precipitation and related observation-based data (inclusive of in situ, remote sensing, and paleoclimate data) to advance NOAA's PPGC strategy, fill knowledge gaps (e.g., highlighted in the reports listed above), and ultimately reduce societal impacts from an intensifying water cycle.

Proposed projects should include a strong observation-based dataset/product development and/or observation-based analysis component. Examples of *dataset development and analysis* includes, but is not limited to: data synthesis, integration of multiple variables and/or platforms, data rescue, data curation or compilation, development of databases, and is inclusive of paleoclimate data and

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[1] NOAA Precipitation Prediction Grand Challenge Strategy, Weather Water Climate Board
[2] NOAA-DOE Precipitation Processes and Predictability Workshop Report 2021
[3] IPCC, 2022: *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.
[4] IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.

reconstructions. Global and regional studies (e.g. intermountain West) are both eligible under this funding announcement. Collection of new observations and instrumentation is not eligible under this funding announcement.

Project outcomes should improve the use of observations in precipitation monitoring, prediction, predictability research, and/or precipitation-related decision-support. For example, resulting datasets, analyses, tools, and/or products from this solicitation (including improvements to existing datasets) could enable the design and further development of advanced modeling capabilities (e.g. utilizing Machine Learning and Artificial Intelligence[5]); hypothesis testing in process studies; or enhance the use of data in future model initialization and evaluation.

Proposed projects are encouraged to consider one or more:

- Uncertainty quantification and assessment of errors or inconsistencies where observation-based datasets, or observations and models disagree
- Development of an integrated precipitation event database[2], and/or analysis of events, inclusive of their properties and precursors (e.g. global patterns leading up to high impact events, tropical-to-extratropical interactions)
- Extension of the observational record (from existing observations) through rescue of historical instrumental and/or paleoclimate proxy data to advance (i) constraining modes of climate variability and teleconnections in the hydrological cycle, (ii) estimates of the range of natural variability in extremes, (iii) knowledge of how water cycle responds to high CO_2 environment, OR (iv) future attribution studies
- Well-documented synthesis studies, accessible archives, and/or tools to better access existing archives that would optimize the usage of multiple data types (e.g. field campaigns, observational in situ networks, satellite data)
- User-inspired studies, such as analyses and methods development to detect trends and user-selected threshold exceedances from long-term observational records with national, U.S. coverage
- Improvements to existing datasets/products including improving on the data's findability, accessibility, interoperability, and reusability, and/or the dataset's "analysis-ready" or "AI ready" state
- Datasets, products, and analyses that would enable future NOAA OAR Modeling research in benchmarking and evaluation of (i) high frequency (fast) processes in NOAA models (such as the Geophysical Fluid Dynamics Lab's AM5, in development); (ii) snow in the West; (iii) high-resolution model simulations from high-resolution GCMs or downscaling techniques
- Advancement of the application of Artificial Intelligence and Machine Learning for earth system and climate science dataset development and analysis advancing NOAA's Artificial Intelligence Science and Technology Strategy[5] and relevant reports (e.g. National Academies report[6]), within the context of the competition

NOAA Engagement

Proposal stage: Applicants are not required to have a NOAA collaboration at the proposal stage. NOAA collaborations may be more relevant to some proposals than others. However, for projects that

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[5] NOAA Science and Technology Focus Area: Artificial Intelligence
[6] National Academies of Sciences, Engineering, and Medicine 2022. Machine Learning and Artificial Intelligence to Advance Earth System Science: Opportunities and Challenges: Proceedings of a Workshop. Washington, DC: The National Academies Press. https://doi.org/10.17226/26566.

propose to transition non-static products, datasets, and tools to NOAA during or after the duration of the project, collaborations are strongly encouraged at the proposal stage and these proposals should **include a statement (1 page or less) on the potential for the data product/set to be produced/maintained past the duration of the project (exclude from page count).** In these cases, *applicants should demonstrate that the NOAA or NOAA partner operational host is integrated (aware, supportive of, committed to planning for) into transition activities.*

Award stage: Funded PIs from this solicitation will be expected to work together in a working group (frequency: monthly meetings) focused on precipitation and related data, share results, and organize and coordinate activities the working group collectively decides on. Applicants should budget to dedicate time to PI meetings. Those interested in leading or co-leading the working group are encouraged to indicate their interest in the Project Narrative.

Data Information/Sharing Plan Guidance

Dissemination plan

Projects that result in a dataset/product/tool should articulate how they will overcome potential communication and knowledge transfer gaps between different science communities and/or user groups relevant to the proposal. For instance, if the project proposes to develop a database - *What will be different or more useful about this for intended users (e.g. science community users, modelers, observationalists, etc.) than others? Will they be involved in its development? How will the project ensure the value-add of the resulting dataset, product, or tool?*

Analysis ready data

Applicants are strongly encouraged to follow F.A.I.R[7] guiding principles. Applicants are encouraged to use the Earth Science Information Partners multi-agency "AI analysis ready" data checklist and guidance[8] as a tool to self-assess the extent to which project data are intended to be analysis-ready for future use by the broader science community. *Note: that all checklist items may not be relevant to every project, and there is not a requirement or expectation that every dataset perfectly meet all checklist items.*

Applicants are encouraged to outline how they plan to address "analysis-ready" data needs, if relevant to the project, in the data information/sharing plan. As noted in the "AI Analysis Ready" Checklist, and where relevant, applicants should consider developing and documenting uncertainty estimates for their data, which will advance its use by other science communities. Additionally applicants are encouraged to consider creating interactive notebooks or tutorials using and accessing the resulting dataset or product. Applicants proposing to use AI techniques may be interested in joining the NOAA AI Community of Practice to share notebooks and other lessons learned.

Data Archival

All products and deliverables produced via solicitation will reside in the open access / open source domain, freely available to the public. Public access to grant/contract-produced data and code will be enabled in one of the following ways (select one):

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[7] Wilkinson et al. 2016. FAIR Guiding Principles…, Nature Scientific Data
[8] ESIP Data Readiness Cluster (2022): Checklist to Examine AI-readiness for Open Environmental Datasets. ESIP. Online resource. https://doi.org/10.6084/m9.figshare.19983722.v1

- Funding recipients are planning to submit data to NOAA National Centers for Environmental Information (NCEI), which will provide public access and archiving. Point of Contact for NCEI is ncei.info@noaa.gov. More information on NCEI archive services can be found here: https://www.ncei.noaa.gov/archive. Proposals anticipating archiving paleoclimate datasets are encouraged to contact the NOAA paleoclimate world data service: paleo@noaa.gov
- Data are to be submitted to an International Council for Science (ICSU) World Data System facility: https://www.icsu-wds.org/community/membership/regular-members)
- An existing publicly accessible online data server at the funded institution is to be used to host these data (describe in proposal).
- An existing publicly accessible online "cloud" service is to be used to host the data (described in the proposal). The Competition Manager is the responsible NOAA Official for questions regarding this guidance and for verifying accessibility of data produced by funding recipients.

The goal of the COM program funding is to produce valuable datasets for multiple communities, including the scientific community. Projects adhering to state of art data management principles are highly relevant.

Contact Information and Submission Information

For questions related to the competition, please contact the Competition Manager Virginia.Selz@Noaa.gov

Letters of Intent (LOIs)
- Please email your LOI submissions to virginia.selz@noaa.gov
- Principal investigators submitting a proposal in response to this COM competition announcement are required to follow the Letters of Intent (LOI) and Proposal preparation and submission guidelines described in the Climate Program Office FY 2023 Notice of Federal Funding Opportunity announcement.
- Investigators are strongly encouraged to submit an LOI prior to developing and submitting a full proposal. LOIs can be submitted to Virginia Selz (Virginia.Selz@noaa.gov). Investigators will be notified by the COM Program Competition Manager as to whether a full proposal is encouraged based on the LOI within four weeks of the LOI due date. LOIs are not required.

General Information
- Administrative questions regarding the Notice of Federal Funding Opportunity (e.g. proposal formatting or submission guidelines) should be directed to Diane Brown (diane.brown@noaa.gov), please cc: virginia.selz@noaa.gov
- **Federal investigators** *only* should submit proposals directly to the Competition manager (virginia.selz@noaa.gov). Federal investigators, please contact the program manager to discuss submission guidelines.
- Each PI and Co-I on the same project, but from separate institutions,should submit separate proposal applications through grants.gov. **SUBAWARDS ARE STRONGLY DISCOURAGED** except in rare cases. Please contact program manager if you anticipate the need for a subaward.