

Fiscal Year 2025 Competition Information Sheet: Climate Change Projections to 2050: Information for Industrial Applications

Program Name

Modeling, Analysis, Predictions, and Projections (MAPP) Program

Program Mission

The Modeling, Analysis, Predictions, and Projections (MAPP) program supports advances in the development and application of Earth system models and analyses across NOAA for the purpose of building resilience to climate impacts, predicting and projecting change from years to decades in the future, and improving our understanding of and ability to simulate the Earth system. The MAPP Program is part of the Earth System Science and Modeling (ESSM) Division of the NOAA Office of Oceanic and Atmospheric Research (OAR) Climate Program Office. MAPP works with partner agencies in the U.S. Global Change Research Program, and focuses on engaging the non-NOAA research community to help advance NOAA's modeling capabilities and applications.

Focus for FY 2025

Climate Change Projections to 2050: Applied Information for Industrial Applications

Funding for FY 2025

Pending the availability of funds in FY 2025, it is anticipated that \$2,000,000 per year will be available to fund 10-13 proposals, which should target a funding level of up to \$170,000 per year for three years.

Competition Information

There is a long-identified need for reliable Earth system information that looks forward years to decades in the future¹. The need for high spatial resolution information and climate risk characterization is only growing as awareness of infrastructure vulnerability to climate and weather conditions grows, and as climate change impacts manifest. In the United States, the information need is currently met in a heterogeneous fashion depending on the forward-looking timescale -- through individual researcher-stakeholder interactions, bespoke data and information provision approaches that use a diverse array of methods (e.g., downscaling), and a ecosystem of tools targeting individual user communities with a diverse range of expertise, needs, and technical proficiency. A rich network of user-scientist relationships and an array of approaches has emerged to draw on, but an investment in the strengthening of these co-development collaborations is needed to ensure that our best climate modeling, data, and understanding is put into practice.

¹ <https://www.ametsoc.org/index.cfm/ams/about-ams/ams-statements/archive-statements-of-the-ams/climate-services1/>

As NOAA considers and develops its role in this information space, a number of motivating factors have converged. First, the agency is increasingly being asked by National-scale organizations such as the American Society of Civil Engineers to produce consistent, reliable, transparent mid-to-long-range forward-looking information. These requests are in addition to the myriad day-to-day requests for prognostic climate information that come into various NOAA offices, e.g., NWS forecast offices, Regional Climate Centers, or for particular climate risks e.g. through the NIDIS, NIHHIS programs. Second, NOAA has a number of unique and preeminent capabilities and organizational components that may be optimally assembled to meet this need. Third, NOAA has a mission requirement to serve as a provider of authoritative and transparent information services and products across a wide array of Earth system features and sectoral needs.

NOAA currently serves as the National lead in producing weather and seasonal forecasts and information products, a task that necessitates high-quality research, observations, and modeling to produce reliable, transparent, and equitable information for a diverse array of users. GFDL's distinguished climate models², Earth system models³, and cross-timescale prediction systems are available to tackle extended prediction and projection needs. These systems have been applied to weather forecast improvements at NOAA, but have not yet been connected to a routine product and service delivery effort for longer timescales outside of the Coupled Model Intercomparison Project (CMIP), which does not directly feed into products and services. The National Centers for Environmental Information (NCEI), and various laboratories and other operational centers routinely provide high information-quality climate products and services, but not for forward-looking multi-year to multi-decade timescales. A number of information, service delivery, and collaboration structures with deep experience in climate information and services currently exist at NOAA -- the Regional Integrated Services and Assessments program, Regional Climate Centers, Regional Climate Service Directors, for example. NOAA is currently experimenting with a prediction/projection-to-product pipeline through the Climate, Ecosystems, and Fisheries Initiative, although this effort is specifically focused on marine ecosystems and the National Marine Fisheries Service mission⁴. However, it serves a model for how focused product and service development on longer lead timescales could work for other impact areas.

To address the above context, and extract new value from NOAA's well-positioned organizations and capabilities, this research solicitation seeks to test and build the science and structure needed to support NOAA's nascent efforts to provide information on mid-to-long timescales, and to connect NOAA's research and modeling capabilities with its product development and services capabilities for industry applications.

Over the past few years, NOAA's Geophysical Fluid Dynamics Laboratory developed and released the Seamless System for Prediction and Earth System Research (SPEAR)⁵ to support R&D and forecast efforts in the seasonal to multi-decadal time frame. The SPEAR system uses many of the components of GFDL's flagship CM4, but is optimized to run large ensembles for prediction purposes over a wide variety of timescales, and in a computationally flexible manner generally favoring higher atmospheric resolution over ocean resolution⁶. Predictions from the system are currently contributed to the North American Multi-Model Ensemble⁷ project as well as the Lead Centre for Annual-to-Decadal Climate Prediction

² <https://www.gfdl.noaa.gov/climate-models/>

³ <https://www.gfdl.noaa.gov/earth-system-models/>

⁴ <https://www.fisheries.noaa.gov/about-us>

⁵ <https://www.gfdl.noaa.gov/spear/>

⁶ <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2019MS001895>

⁷ <https://www.cpc.ncep.noaa.gov/products/NMME/>

organized by the UK Met Office⁸. The system is also designed to flexibly take advantage of future advances in GFDL's atmospheric, land, and ocean modeling; for example, the types of variable resolution grids being prototyped in GFDL's atmospheric modeling efforts which could enable high-resolution telescoping over regions of interest for weather and climate impacts. SPEAR offers the opportunity to leverage and apply GFDL's class-leading climate modeling capabilities toward new products and services on multi-annual to multi-decadal timescales as a key part of NOAA's emerging Climate-Ready Nation effort.^{9 10}

The MAPP program has a long history of supporting prediction and projection research and development, climate and Earth system model evaluation and analysis, applications of modeling and prediction systems to climate impact problems, investigations of multi-timescale predictability in the Earth system, the development of prediction and projection products, and R&D for the testing and transition of systems and products to real time or Operational use. Much of this work is focused on extending the strong internal efforts at NOAA's laboratories and operational centers, demonstrating new capabilities, and transitioning those capabilities into routine use.. Leveraging and building on this history, proposals are solicited through this competition that will evaluate and test NOAA prediction and projection systems on multi-annual to multi-decadal timescales for industry applications.

For FY25, the MAPP program invites proposals that develop multi-decadal projections of climate impacts related to various industry concerns. A number of industries including finance and reinsurance, retail, and architecture and engineering, have been engaged with NOAA in recent years¹¹ and are seeking integrated projections of climate risks to mitigate climate impacts on their operations. Projects submitted in response to this solicitation should focus on the application of climate data and model projections to characterizing the risks to these industries. Proposals should include the application of relevant datasets such as CMIP6, downscaled projection datasets, observations, and large ensemble simulations. Collaborations with industrial stakeholders or individuals who serve as boundary-spanners between the climate science and industrial stakeholder communities are essential to the effective co-development of reliable, useful and responsive projections for application in industrial planning. Proposals should result in tangible products, information, or techniques that can be delivered to stakeholders for application. Proposals may consider developing methods or outputs that can be transitioned to NCEI.

Proposals should include the use of data from NOAA's SPEAR system in combination with other large ensemble and projection datasets in R&D projects. Proposals should include thorough evaluation of the suitability of particular models for application and correspondingly consider evaluations of model uncertainty for particular applications as well as the delivery of that uncertainty information to stakeholders. In addition to SPEAR data, proposals should use data from other projection datasets (e.g., CMIP6), or other large ensemble datasets as part of the proposed work. Use of projection and large ensemble data from other U.S. modeling centers is encouraged. When possible, proposals are encouraged to link their evaluations back to recommendations for model and system improvements, for example, through published journal articles, collaborations with GFDL staff, or contributions to the Model Diagnostics Task Force package.¹² MAPP proposals are expected to have a strong grounding in physical

⁸ <https://hadleyserver.metoffice.gov.uk/wmolc/>

⁹ https://www.noaa.gov/sites/default/files/2022-06/NOAA_FY2226_Strategic_Plan_ExecutiveSummary.pdf

¹⁰ <https://www.noaa.gov/organization/administration/noaa-administrative-orders-chapter-216-program-management/nao-216-127-providing-for-climate-ready-nation>

¹¹ <https://www.noaa.gov/news-release/biden-harris-administration-invests-85m-for-industry-proving-grounds-program>

¹² <https://www.gfdl.noaa.gov/mdtf-diagnostics/>

process understanding and evaluation. Projects using AI or ML methodologies to assess climate risk from data should prioritize explainability of results and transparency of data and tools.

CPO has organized its programs to focus on high-priority climate risk areas¹³ including extreme heat, hydroclimate and water resources, marine ecosystems, and coastal inundation. The motivation behind these risk areas is to organize collective opportunities to focus research toward applications for the work CPO's individual programs fund. Proposers are encouraged to think about potential applicability of their work within the context of those climate risk areas. Proposals focused on marine ecosystems are **not encouraged** through this competition, as those topics are covered through other MAPP solicitations.

A limited set of variables is currently available from the SPEAR system¹⁴. Proposers are strongly advised to familiarize themselves with the available data as they scope their projects. For funded proposers, additional variables and data frequencies relevant for hydroclimate risks, and coastal impacts may be made available for funded investigators. Proposers should list variables and frequencies needed for proposed analyses in their Letters of Intent so that feasibility can be evaluated. Higher-resolution data (e.g., 25km atmospheric grid) also may become available during the course of the project.

MAPP Competition Manager: Daniel Barrie (daniel.barrie@noaa.gov)

Additional General Guidelines for Applicants

- Principal Investigators submitting a proposal in response to this Announcement are required to follow the Letters of Intent (LOI) and Proposal preparation and submission guidelines described in the Climate Program Office FY 2025 Federal Funding Opportunity announcement.
- Investigators are strongly encouraged to submit an LOI prior to developing and submitting a full proposal. LOIs should be submitted through the [FY25 Letter of Intent submission form](#)¹⁵; investigators unable to submit via the Google form should email their LOI to daniel.barrie@noaa.gov. Investigators will be notified by the Competition Manager as to whether a full proposal is encouraged based on the LOI within 60 days of the LOI due date.
- Administrative questions regarding the Federal Funding Opportunity (e.g. proposal formatting or submission guidelines) should be directed to Diane Brown (diane.brown@noaa.gov).

Collaboration discovery

Successful proposals will need to demonstrate capability in both climate science and applied realms. Given that many climate scientists and industrial practitioners/applied scientists do not have pre-existing collaborations, we are offering some facilities to support collaboration discovery. These facilities, a Slack Channel, and Industrial Liaisons, are described below.

The MAPP FY25 Climate Change Projections to 2050 Slack Channel

A slack channel has been established to connect climate scientists who may be interested in this solicitation and industry-oriented researchers seeking to apply climate data. Because these communities in many cases do not have knowledge of each other, but are interested in the connection of climate research and industrial

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<https://cpo.noaa.gov/News/ArtMID/7875/ArticleID/1945/NOAA%E2%80%99s-Climates-Program-Office-launches-Climates-Risk-Areas-Initiative>

¹⁴ https://www.gfdl.noaa.gov/spear_large_ensembles/

¹⁵ Note, a Google account is needed to submit via this LOI submission form: <https://forms.gle/6j34Eztza5QbLbDV7>

applications, the MAPP program is interested in deploying Slack as a tool to encourage discoverability between the communities. You may review the Terms of Reference and register for the Slack Channel [here](#).

Industry Proving Grounds Coordinators

Under the Inflation Reduction Act, NOAA has put significant resources into supporting collaborations between its product and service delivery capabilities, and the private sector¹⁶. Three focus industries are supported by designated NOAA liaisons. If you are interested in potential collaborations on projects relevant to these sectors, you may want to contact these liaisons for support in identifying potential collaborations:

Reinsurance and finance - Adam Smith (adam.smith@noaa.gov)

Retail - Jenny Dissen (jenny.dissen@noaa.gov)

Architecture and Engineering - Russ Vose (russell.vose@noaa.gov)

Diversity and Inclusion

MAPP recognizes that it has an opportunity to support NOAA's and the community's commitment to diversity and inclusion by taking an intentional step that encourages program applicants to consider diversity and inclusion as part of their scientific projects. MAPP supports the goal of increasing the inclusion of underrepresented groups in NOAA-relevant modeling science. This action has the potential to make an impact on not only the diversity and inclusion in science at NOAA, but also beyond the agency. In your proposal, we encourage you to think about how your project can broaden the participation of underrepresented groups (e.g., gender, race, ethnicity, disability, geographic, etc.). Examples could include, but are not limited to, full participation of women, persons with disabilities, and other underrepresented minorities in science, technology, engineering, and mathematics (STEM). Opportunities that may engage students or early career scientists from underrepresented groups at different or earlier ages (e.g., even secondary) in the context of your proposed research are encouraged.

For further information on NOAA Indigenous Knowledge Guidance, please see [here](#).

Data Archiving and Computational Resources

Computational Resources

Computational resources on NOAA's high-performance computing platforms may be requested for research sponsored as a result of this solicitation. Proposals should indicate the availability of alternative computing resources should NOAA resources not be available for the project. Proposers who choose to request computational allocations on NOAA's platforms must include in their proposal a request describing the computational resources and data storage required, as well as a description of how they will port their methodology to the NOAA platforms. Proposers must submit an HPC Request Form¹⁷ with their proposal in order to apply for computational resources.

Questions regarding the use of NOAA's high-performance computing platforms should be directed to Dan Barrie (daniel.barrie@noaa.gov).

¹⁶ <https://www.noaa.gov/inflation-reduction-act/inflation-reduction-act-climate-data-and-services/industry-proving-grounds>

¹⁷ https://cpo.noaa.gov/wp-content/uploads/2024/06/MAPP_FY25_HPC_Request_Form.docx

Data Management Guidance

The MAPP Program requires that 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 will be enabled in one of the following ways (select one):

- Funding recipients are planning to submit data to NOAA National Centers for Environmental Information (NCEI), which will provide public access and archiving¹⁸. Point of Contact for NCEI is Nancy Ritchey (Nancy.Ritchey@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 (above) is the responsible NOAA Official for questions regarding this guidance and for verifying accessibility of data produced by funding recipients.

¹⁸ NCEI supports the creation of adequate metadata and data ingest into long term repository holdings using tools such as Send2NCEI (www.nodc.noaa.gov/s2n), for small volume, one-time only data collections) and Advanced Tracking and Resource tool for Archive Collections or ATRAC (<https://www.ncdc.noaa.gov/atrac/index.html>), for recurring and/or large volume data collections).