

FY 2020 Competition Information Sheet

Program Name

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

Program Mission

The mission of the Modeling, Analysis, Predictions, and Projections (MAPP) Program is to enhance the Nation's capability to predict variability and change in Earth's climate system. The MAPP Program focuses on the coupling, integration, and application of Earth System models and analyses across NOAA, among partner agencies, and with the external research community. Primary objectives include: 1) improving Earth System models; 2) supporting an integrated Earth System analysis capability; 3) improving methodologies for global to regional scale analysis, predictions, and projections; and 4) developing integrated assessment and prediction capabilities relevant to decision makers based on climate analyses, predictions, and projections. The MAPP Program sits within the Earth System Science and Modeling (ESSM) Division of the NOAA Office of Oceanic and Atmospheric Research (OAR) Climate Program Office (CPO).

Focus for FY20

MAPP: Characterizing and Anticipating U.S. Droughts' Complex Interactions

[Note, there is a related competition through the National Integrated Drought Information System (NIDIS) called "Coping with Drought". Please see the relevant Information Sheet for additional details.]

Proposals may target only one of the FY 2020 MAPP competitions, which must be clearly identified in the proposal summary.

Funding for FY20

Pending the availability of funds in FY 2020, the MAPP program anticipates a funding allocation of \$1,800,000 for this competition. Total funding for this competition may exceed this amount, depending on partners' contributions.

Proposals may be for up to three years, up to \$170,000/year per Type I projects and up to \$500,000/year for the Type II project (only one Type II project may be funded). A total of 7-10 projects may be funded; this number may be exceeded depending on partners contributions. The MAPP program envisions partnering with the National Integrated Drought Information System (NIDIS) program and other agency programs, as appropriate, to fund the new awards.

Competition Information

Title: Characterizing and Anticipating U.S. Droughts' Complex Interactions

The National Integrated Drought Information System (NIDIS)¹, first authorized in 2006 and reauthorized in 2018, is a multi-agency partnership that coordinates drought monitoring, forecasting, and planning and information at national, state, and local levels across the country. The mission of NIDIS is to help the nation move to an increasingly proactive approach to understand and manage drought risks and impacts, and to improve long-term drought resilience. Since its inception NIDIS has been working with various federal, state, local and tribal agencies as well as a network of researchers, academics, resource managers, policymakers and its stakeholders. The work is the basis for the regional Drought Early Warning Systems (DEWS). Besides providing forecasts, the DEWS encourage innovation by integrating new, locally relevant drought information and supporting the introduction of new technologies that detect and communicate drought risks and warnings.

Since 2011, NOAA's Drought Task Force (DTF)², organized by the Modeling, Analysis, Predictions and Projections (MAPP) Program in partnership with NIDIS, has catalyzed community research aimed at improving national and regional drought capabilities. The DTF has focused on supporting NIDIS and its DEWS via advances in the understanding, monitoring and prediction of drought. DTF research has optimized NIDIS science investments by working in synergy with community activities as part of the US Global Change Research Program (USGCRP), the World Climate Research Program's Climate Variability and Predictability (CLIVAR) and Global Energy and Water Cycle Exchanges (GEWEX) programs. DTF research has had numerous practical applications for NIDIS³.

In FY 2020, the MAPP program will continue to support NIDIS development via a new set of DTF activities that focus on emerging priorities. As climate and human systems evolve, the face of U.S. drought changes in ways that we don't fully understand and anticipate. Droughts are triggering chains of complex interactions that involve natural and human systems. Some of these interactions may also affect the way drought itself evolves. For example, drought conditions can favor wildfire occurrence⁴; in turn fire occurrence can affect snowpack and hydrology, and also air quality which in turn can affect clouds and precipitation. Long term surface temperature increases also importantly influences such processes⁵. Drier land surface and decreased snowpacks can exacerbate droughts by triggering an array of Earth system processes.

For example, as the land becomes drier, drought can lead to heat waves and impacts on terrestrial and riverine ecosystems via natural and human induced pathways (e.g. river water levels and temperature can affect salmon health⁶); warmer temperatures can also lead to changes in snowpack with effects on hydrology. In turn, such processes can feedback into drought evolution. Such complex drought processes

¹ NIDIS was originally authorized in 2006, and reauthorized in 2014 and 2018. The overarching goals of the NIDIS program are defined by the public laws authorizing the program: P.L. 109-430, P.L. 113-86, and P.L. 115-423. For more information visit drought.gov.

² <http://bit.do/NOAA-ESSM-MAPP-Drought-Task-Force>

³ https://cpo.noaa.gov/sites/cpo/MAPP/pdf/rtc_report.pdf

⁴ https://drought.gov/drought/sites/drought.gov.drought/files/NIDIS_NDAWN_StrategicPlan_2018.pdf

⁵

https://cpo.noaa.gov/Portals/0/Docs/MAPP/Reports/2018/TemperatureDrought/Drought_TF_Temp_Drought_Final_Revised.pdf?ver=2018-07-31-104948-243

⁶ https://www.westcoast.fisheries.noaa.gov/stories/2015/06_01062015_california_drought.html

have regionally dependent characteristics, predictability and impacts. A diverse set of stakeholders and sectors are affected depending on the specific region/processes at play.

In order to fully characterize droughts and predict their general evolution and also specific stakeholder-relevant thresholds, it is increasingly important that we capture the array complex interactions which may intervene in U.S. droughts considering processes across timescales, spatial scales and disciplines, linking both natural and human induced effects. Research is needed to make progress on our understanding of how climate affects drought processes, what are the relevant processes and feedbacks, and linking this understanding into practical applications towards a more integrated characterization of droughts and improved probabilistic predictions from seasons to decades. Increasingly comprehensive Earth system models and new interdisciplinary observational data, both in situ and satellite, can be applied to address such research objectives and make progress.

In FY 2020, the OAR/Climate Program Office (CPO) MAPP Program, in partnership and coordination with the NIDIS program, solicits research proposals to advance our capability to more integrally characterize and anticipate US droughts in the context of hydroclimatic variability and change, linking this research to practical NIDIS applications [See the NIDIS “Coping with Drought” solicitation Information Sheet for a related research opportunity]. This includes examining the array of complex interactions that lead to drought and intervene during its evolution; identifying key parameters to more integrally characterize droughts; defining predictability and developing improved methodologies for prediction of key thresholds. Proposals can focus on one or more of the Priority Areas A-C below:

- A. Identify the array of complex interdisciplinary interactions that lead to US droughts and intervene during the evolution of drought, focusing on key processes and feedbacks. Research will aim to explain why extreme or prolonged droughts occur, how droughts are affected and effect the environment e.g. relations to land cover, soil health, fire occurrence, atmospheric composition, rivers and fisheries, snowpack, groundwater, etc;
- B. Identify key parameters and develop new/improved methodologies to more integrally characterize drought occurrence for an improved objective interdisciplinary characterization of US droughts and improved early warning; proposals will, consider uncertainties and probabilistic characterization. Proposals will include demonstration pilots (e.g. for specific drought cases or DEWS regions) illustrating new methodologies and pathways of potential future adoption as part of NIDIS routine monitoring activities.
- C. Examine the predictability U.S. droughts considering the interdisciplinarity of intervening processes and their multi-scale evolution; focus on identifying precursor mechanisms, signal to noise ratios and thresholds that can inform early warning; proposers will specify how research outcomes would inform applications such as new/improved modeling and/or methodologies for prediction/projection, with an overall reduction of uncertainties.

Across Priority areas A-C above, proposals will:

- Specify what is the value for the advancement of NIDIS, linking proposed research to outcomes that would advance specific NIDIS applications.
- Take advantage of state-of-art modeling systems in combination with observational data, demonstrating their availability and suitability for the proposed research goals. Research can make use of available model datasets, mechanistic model experiments (if duly justified), model-data fusion via data assimilation and machine learning, and model-data intercomparison.
- Consider the utility of interdisciplinary observational data in situ and remote sensed; sustained or field campaign based. Proposers will pay particular attention to the optimal use of data from

NOAA Research Laboratories (e.g. FIREX data as it becomes available) and other NOAA entities.

- Consider an integrated view of US droughts manifestations and causal relationships across the physical, biogeochemical and human spheres.
- Use/develop key metrics and apply observational data to demonstrate that proposed analyses are statistically robust, physically/biogeochemically defensible, objectively quantifiable;
- Actively involved in the research one or more NIDIS stakeholders, and/or one or more NOAA Service Line Office collaborators, as appropriate.
- Complement and extend research done within NOAA Research Laboratories, including key collaborations in the proposals, as appropriate.

Across Priority Areas A-C, proposals may consider:

- US drought at a national or regional scale, considering NIDIS DEWS regions.
- High profile-well documented case studies, either past or on-going, in a broader statistical context.
- Exploratory use of artificial intelligence methodologies to examine/synthesize/emulate observational/model behavior, ensuring approaches are supplemented by physical understanding.

Proposals may be for two types of projects:

- Type I Projects will address one or more of Priority Areas A-C and will contribute with their project to MAPP Task Force activities (below). Proposals should explicitly identify their intended contribution to the Task Force.
- Type II Project (only one will be funded) will have the same scientific objectives as Type I Projects, will address at least two Priority Areas A-C, and will also lead and coordinate the planned MAPP Task Force. Type II proposals should clearly separate scientific tasks and Task Force leadership/coordination activities, detailing plans and costs for each. The goal of the proposed leadership/coordination activities will be to integrate research from Type I proposals to optimize the outcomes of this research initiative. This will include facilitating the exchange of information/practices among Investigators with NIDIS stakeholders; synthesis of new results and methodologies (e.g. special journal collections, assessment reports and infographics); a set of common cases studies documenting collective advances in US droughts' understanding, methodologies, metrics; leading communication and engagement about Task Force activities with relevant external entities (e.g. workshops and webinars involving NIDIS stakeholders); and demonstration activities of how research projects yield results that are of relevance to NIDIS.

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MAPP Program Director: Annarita Mariotti (annarita.mariotti@noaa.gov)

NIDIS Program Director: Veva Deheza (veva.deheza@noaa.gov)

Additional General Guidelines for Applicants

- Principal Investigators submitting a proposal in response to this MAPP Announcement are required to follow the Letters of Intent (LOI) and Proposal preparation and submission guidelines described in the Climate Program Office FY 2020 Federal Funding Opportunity announcement.
- Investigators are strongly encouraged to submit an LOI prior to developing and submitting a full proposal using the [FY20 MAPP Letter of Intent submission form](#)⁷; investigators unable to submit via the form should email their LOI to oar.cpo.mapp@noaa.gov. Investigators will be notified by

⁷ Note, a Google account is needed to submit via this LOI submission form: <https://forms.gle/y7T8Zuev42BDh2zY8>

the MAPP Program Competition Manager as to whether a full proposal is encouraged based on the LOI within 30 days of the LOI due date.

- Proposals must clearly identify in their summary which MAPP competition is being targeted (only one competition may be targeted by a given proposal) and which sub-element of the competition is being targeted, if applicable.
- Administrative questions regarding the Federal Funding Opportunity (e.g. proposal formatting or submission guidelines) should be directed to Diane Brown (diane.brown@noaa.gov).

A webinar will be offered to potential applicants for background on the MAPP program and this solicitation soon after publication of this announcement. For information on webinar timing and registration procedures please check the MAPP website⁸; prior to when the webinar is held, potential applicants can also [sign-up](#) to receive an email notification⁹.

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 Form](#) with their proposal in order to apply for computational resources¹⁰.

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

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 archiving¹¹. Point of Contact for NCEI is Nancy Ritchey (Nancy.Ritchey@noaa.gov)
- Data are to be submitted to the 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).

⁸ MAPP website: <https://cpo.noaa.gov/MAPP>

⁹ MAPP Webinar sign up prior to when the webinar is held: <https://docs.google.com/forms/d/e/1FAIpQLScoswYBrwTxvjNseONZ5HD3MEP8gbg8yPN19gdEVp3WTYdbUA/viewform>

¹⁰ [HPC Request Form](#)

¹¹ 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 (www.ncdc.noaa.gov/atrac), for recurring and/or large volume data collections).

- 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.