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

Modeling Climate Impacts on Predictability of Fisheries and Other Living Marine Resources

[Note, there are additional coordinated solicitations through the Climate Variability and Predictability (CVP) Program and the Coastal and Ocean Climate Applications (COCA) Program. Please see these Programs' Information Sheets for 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 anticipates working with the National Marine Fisheries Service Office of Science and Technology to fund projects from this competition.

Competition Information

Title: Modeling Climate Impacts on the Predictability of Fisheries and Other Living Marine Resources

Changing climate and oceans are affecting the nation's valuable living marine resources (LMRs) and the people, businesses and communities that depend on them[1]. From warming oceans and rising seas to droughts and ocean acidification, these impacts are expected to increase with continued changes in the planet's climate system. There is much at risk. In the U.S., ocean-related commercial fishing and recreational fishing and the seafood industry annually contribute approximately $212 billion in sales impacts, $100 billion to the gross domestic product (GDP), and support over 1.7 million full- and part-time jobs across the broader economy[2]. Coastal habitats help defend coastal communities from storms and inundation and provide the foundation for tourism and recreation-based economies in many coastal communities. Climate-related information is needed to fulfill NOAA Fisheries mandates, and provide decision-makers with the information they need to reduce impacts and increase resilience with changing climate and ocean conditions[3]. Strengthen climate-related science capacity regionally and nationally to fulfill NOAA Fisheries information requirements in a changing climate.

To meet these needs NOAA needs to strengthen climate-related science as it relates to marine ecosystems regionally and nationally. Climate process-oriented research is needed to better understand how climate impacts LMRs, how to reduce impacts and how to increase resilience of LMRs and LMR-dependent communities.

The Office of Oceanic and Atmospheric Research (OAR) Climate Program Office programs are uniquely positioned to advance climate science needs in support of fisheries and living marine resources, extending and complementing research at OAR Research Laboratories and NMFS Fisheries Science Centers via the engagement of the broader research community. In FY2020, the Climate Variability and Predictability (CVP) program, the Modeling Analysis Predictions and Projections (MAPP) program and the Coastal and Ocean Climate Applications (COCA) program coordinate for a research initiative to address climate-marine ecosystem/fishery needs with the following three foci: process understanding (CVP), modeling and predictability (MAPP), and applied research to inform fishery management decisions (COCA).

The MAPP program previously supported research to explore the feasibility of using climate predictions to inform future conditions of our marine environments[4]. Initial results have shown promise of predictability but also exposed the need to further understand and more adequately model key processes that determine how climate impacts marine ecosystems across timescales to reduce overall uncertainties. For example, the occurrence of prolonged marine heat waves and their impacts on fisheries has highlighted the need to better understand and model their predictability, persistence, and effects on the ocean's physics, biogeochemistry and ecosystems. Similarly, on-going and projected climate change in the Arctic, associated with long-term decrease in Arctic sea-ice, warming and decreasing permafrost, among many other impacts, prompt us to better understand the set of processes that link to changes in ocean marine ecosystems.

Areas of needed improvement include the understanding and modeling of climate-related physical pathways that drive biogeochemical variability in U.S. marine ecosystems[5] and using models in combination with observations to assess processes, model fidelity and predictability across timescales. Processes of interest, among others, include those that modulate biogeochemical conditions in the Bering

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[1] Fourth National Climate Assessment, Oceans and Marine Resources chapter
https://nca2018.globalchange.gov/chapter/9/
[2] National Marine Fisheries Service. 2018. Fisheries Economics of the United States, 2016. U.S. Dept. of Commerce, NOAA Tech. Memo. NMFS-F/SPO-187, 243.
http://www.fisheries.noaa.gov/resource/document/fisheries-economics-united-states-report-2016
[3] NOAA Fisheries Climate Science Strategy
https://www.st.nmfs.noaa.gov/ecosystems/climate/national-climate-strategy
[4] http://bit.do/NOAA-Marine-Prediction-Task-Force
[5] https://www.fisheries.noaa.gov/topic/ecosystems#u.s.-regional-ecosystems

Sea and Gulf of Maine cold pools, the California Current System, the Atlantic Bight/Gulf Stream/Gulf of Mexico water mass, and the Pacific Islands. Processes in these regions are linked to global ones; processes on seasonal timescales are modulated by long term variability and change. Biogeochemical conditions in areas of interest result from a balance of processes at play across spatial and temporal scales (i.e. changes in upwelling can result from a balance of climate driven large-scale subsurface ocean dynamics and long-term warming effects on stratification). Across all these areas, there is the need to better represent how ocean biogeochemistry is affected by key physical climate parameters such as ocean temperature, ocean currents, upwelling and mixing. In particular, to advance predictions and projections, there is the need to focus on improved modeling of lead-lag relationships among processes that can provide the basis for predictability across timescales. There is also the need to understand the benefits of increased resolution for improved process representation, balancing this with the benefits of probabilistic information and improved representation of signal to noise ratio via larger ensembles.

Process level evaluation of models using the full suite of available observations provide an opportunity to better assess model fidelity. Newly available modeling experiments as part of multi-model intercomparison studies under the Coupled Model Intercomparison Project - Phase 6 (CMIP6)[6] and multi-model hindcast experiments, as well as mechanistic experimentation, can be applied to better understand processes, predictability, and improve models, predictions and projections.

In FY 2020, the OAR/Climate Program Office (CPO) MAPP Program in partnership with the NMFS Office of Science and Technology solicits proposals for research to improve the modeling of how climate impacts the predictability of fisheries and other living marine resources across timescales. [See the CVP and COCA programs solicitations Information Sheets for related research opportunities]. Proposals can focus on one or more of the Priority Areas A-C below:

A. Identify key climate/oceanic processes that affect ocean biogeochemistry of relevance to fisheries and other living marine resources in NMFS areas of interest across climate timescales. Proposals will use state-of-art models and observations to examine and identify dominant interactions that impact ocean dynamics and drive biogeochemical changes of key relevance to marine ecosystems, considering both local and remote factors.
B. Develop model metrics/diagnostics to evaluate models' ability to represent processes underpinning climate-ocean linkages of key importance for the predictability of fisheries and other living marine resources. Metrics/diagnostics will be to: 1) accelerate model development/improvement; to this end proposers are encouraged to leverage the process-level diagnostics approach and framework of the MAPP Model Diagnostic Task Force[7] and contribute new relevant metrics 2) inform uncertainty quantification and model suitability for the representation of processes as in Priority A and relevant NMFS applications (e.g. prediction, projection etc.).
C. Improve the modeling of climate-ocean predictability pathways and its representation in prediction/projection systems. This includes exploratory studies with improved/new predictions/projections methodologies e.g. assessing the advantages of higher resolution, more complex process representation and larger ensembles for specific applications; considering the impacts on the representation of predictability sources from using improved/new data for the initialization of the predictions/projections.

Across Priority Areas A-C above, proposals must:

[6] https://www.wcrp-climate.org/wgcm-cmip/wgcm-cmip6
[7] http://bit.do/NOAA-ESSM-MAPP-Model-Diagnostics-Task-Force

- Explicitly identify research relevance to NMFS, engaging NMFS Science Centers as appropriate.
- Intend to examine/apply/improve NOAA models intended for NMFS applications. In this regard, proposers should consider the full suite of Geophysical Fluid Dynamics Laboratory (GFDL) models, including the open source Modular Ocean Model (MOM) among others.
- Complement and extend research done within NOAA Research Laboratories, including key collaborations in the proposals, as appropriate.
- Ensure proposed modeling work adequately leverages useful observational data. This includes the use of historical in situ observations, process field campaign data, satellite data. Proposers should demonstrate the availability and suitability of the data for proposed research. Exploratory work demonstrating the use of emerging new data such as BGC Argo[8] deployed as part of TPOS 2020[9], is encouraged. Proposers will pay particular attention to the optimal use of data from NOAA Research Laboratories and other NOAA entities.
- Leverage existing relevant model datasets available from CMIP6 and/or hindcast experiments; may also propose mechanistic model experiments as justified by proposed research goals.

Across Priority Areas A-C above, proposals may consider:

- Research needs at a national or regional scale, considering NMFS regions of interest.
- 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).
● The 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; synthesis of new results and methodologies (e.g. special journal collections, topical reports, workshops); leading communication and engagement about Task Force activities with relevant external entities (e.g. a workshop involving NMFS to kickoff research activities); and demonstrating how research projects yield results that are of relevance to target marine ecosystem applications and regions.

Investigators of proposals selected via the CVP, MAPP, COCA Programs FY 2020 competitions on marine ecosystems research (as referenced above) will participate in a series of coordination and communication activities in order to share research methods and results, support collaboration and information exchange across proposals, and optimize the outcomes of this joint initiative.

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

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[8] http://biogeochemical-argo.org/
[9] http://tpos2020.org/

NMFS Point of Contact: Roger Griffis (Roger.griffis@noaa.gov)
MAPP Competition Manager: Daniel Barrie (Daniel.barrie@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[10]; investigators unable to submit via the form should email their LOI to oar.cpo.mapp@noaa.gov. Investigators will be notified by 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 website[11]; prior to when the webinar is held, potential applicants can also sign-up to receive an email notification[12].

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 resources[13].

Questions regarding the use of NOAA's high-performance computing platforms should be directed to Dan Barrie (mailto: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):

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[10] Note, a Google account is needed to submit via this LOI submission form:
https://forms.gle/EdxbhvohY8pnQY51A
[11] MAPP website: https://cpo.noaa.gov/MAPP
[12] MAPP Webinar sign up prior to when the webinar is held:
https://docs.google.com/forms/d/e/1FAIpQLScoswYBrwTxvjNseONZ5HD3MEP8gbg8yPN19gdEVp3WTYdbUA/viewform
[13] HPC Request Form

- Funding recipients are planning to submit data to NOAA National Centers for Environmental Information (NCEI), which will provide public access and archiving[14]. 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).
- 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.

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[14] 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).