

MAPP FY13 Information Sheet

Program Overview and Goal

The mission of the Modeling, Analysis, Predictions, and Projections (MAPP) Program is to enhance the Nation's capability to predict variability and changes 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.

In FY2013, the MAPP program will accept proposals targeting one of the following two priority research areas:

- 1) Research to Advance Climate Reanalysis
- 2) Research to Advance Climate and Earth System Models

Priority Area 1

Research to Advance Climate Reanalysis

Reanalysis integrates the instrumental record with model forecasts, produces a coherent set of climate variables for monitoring and analysis of climate variability, and supports climate prediction and climate model development. Reanalysis datasets have been identified as an important component of the WMO Global Framework for Climate Services.

Major reanalysis datasets have recently been developed in the US (CFSR, MERRA, 20CR) and internationally (*e.g.*, ERA-Interim, JRA-25). Evaluation of these datasets has demonstrated many advances (*e.g.*, improvements in the representation of intraseasonal variability, and the capability to represent climate anomalies back to the early 1900s) but has also highlighted issues that limit the use of these datasets for climate studies. These include spurious trends and jumps associated with the changing observing system, shortcomings in the representation of the hydrological cycle and surface fluxes, and issues with the quality of reanalyses in the stratosphere and in polar regions. (For a technical report on this topic, see <https://reanalyses.org/reports/progress-and-prospects>). Newly available remotely-sensed data, the development of Earth System models, and the benefits that would derive from more consistent states across analysis components, all point to a considerable interest in integrated Earth System reanalysis systems, including

some level of coupling among the various analysis components (*e.g.*, atmosphere and ocean).

Given the demonstrated importance of atmospheric reanalysis datasets and the potential benefits of developing integrated Earth System reanalysis, in FY13 the MAPP Program is soliciting proposals for research to advance NOAA's climate reanalysis capability.

Research proposals are sought that address one or both of the following research foci:

1) *Outstanding issues in atmospheric reanalysis*

Research should focus on improving our capability to a) overcome the impact of data inhomogeneities due to changes in the observing system and data biases, b) overcome the impact of model bias, c) better quantify uncertainties in reanalysis data including the impacts of data and model error, or d) exploit new or previously unexploited data (*e.g.*, data from early satellites).

2) *Integration among Earth System reanalysis components*

Research should focus on experimental methodologies to achieve a greater degree of integration among major components of an Earth data reanalysis system (atmosphere, ocean, and land) to allow for feedbacks, as an intermediate step to fuller integration.

Proposed research should build upon state-of-the-art NOAA reanalysis and data assimilation systems and aim at significant improvements beyond current capabilities in preparation for the next generation of NOAA's climate reanalysis running from the 20th century to present, and potentially extending back to the late 19th century as feasible. Proposals should draw upon excellence in reanalysis expertise across NOAA centers, NOAA research laboratories, and the broad external research community; should build on synergies between reanalysis efforts at NOAA and other national modeling centers; and should demonstrate awareness and coordination with ongoing national and international reanalysis efforts (*e.g.*, adoption of common metrics, identification of joint experiments, and sharing of results are highly encouraged).

Two different types of proposals may be submitted in response to this solicitation:

- Type I: Proposals by a core team led by NOAA investigators that will define a holistic approach to address the research objectives of this solicitation and deliver specific information, methodologies and research prototypes that will serve as the basis for the development of next generation of NOAA reanalysis covering the 20th century to present (potentially extending back to the late 19th century, as feasible). The team should leverage intramural NOAA resources and use this funding opportunity to extend NOAA's research capability. This should be achieved through partnerships across NOAA and with the external community, building on synergies between reanalysis efforts at NOAA and other

national modeling centers and on coordination with major international efforts. Proposals should include a strong management plan describing how data and systems would be shared among core team participants. Proposers are encouraged to include training opportunities for junior scientists at NOAA centers and laboratories as an integral part of the research project.

- Type II: Proposals that aim at addressing select research objectives of this solicitation (typically from one or two individual investigators), bringing specific innovative approaches to the development of the next generation of NOAA's reanalysis.

It is envisioned that only one Type I proposal will be funded as a result of this solicitation (in the range of \$500K-\$700K per year); multiple Type II awards may be made (typical size is \$75K to \$200k per year). For all awards, the duration is 3 years. Type I and Type II awards resulting from this solicitation are expected to constitute elements of a MAPP Reanalysis Task Force, which will aim to facilitate coordination and synergies among the various funded projects. The Type I award may be administered as a cooperative agreement to facilitate work as part of the planned Reanalysis Task Force, including coordination with Type II projects.

Priority Area 2

Research to Advance Climate and Earth System Models

Demand is growing for climate models to provide more accurate simulations of present climate and more credible and reliable predictions and projections of future climates at increasingly high resolution. Improving current modeling and prediction capabilities is crucial to NOAA's mission to respond to the societal need to better predict and project climate variability, particularly extremes and drought. Meeting this demand requires that progress in model development accelerate. As major modeling centers at NOAA and elsewhere consider post-CMIP5 (Coupled Model Intercomparison Project Phase 5) model development, coordinated sets of model experiments as part of CMIP5 (including those beyond the core set of CMIP5 experiments) represent an opportunity for research to guide future development of climate and Earth System models. Past efforts have demonstrated that the most persistent and vexing problems in how global models represent key processes are best tackled by bringing together field experimentalists and remote sensing experts, process modelers, and global-scale modelers together in research teams – the so-called Climate Process and Modeling Teams (CPTs for short; for more information visit <http://www.usclivar.org/resources/climate-model-evaluation>).

To advance climate and Earth System models, in FY13 the MAPP program is soliciting research proposals for CPTs focused on improving the representation of one of the following:

- 1) Cryospheric processes, with a focus on sea-ice and ice-sheet modeling
- 2) Cloud and cloud-radiative processes

CPTs solicited by this call should focus on the improvement of NOAA's climate and Earth System models (state-of-the-art models at GFDL and NCEP) by testing and evaluating the impact of improved process models when embedded in the global models. Considering the climate process research areas identified above, proposed CPTs should focus on those processes that have a mature observational and theoretical base, and scope proposed research so that significant progress can be made, over the duration of the project, in improving their representation in global climate and Earth System models. As appropriate, proposed projects should leverage existing modeling experiments, such as coordinated multi-model experiments performed as part of CMIP5 (*e.g.*, Cloud Feedback Model Intercomparison Project-2 experiments).

Each CPT should comprise a number of co-Is and institutions proposing as a collaborative group. Each team must involve co-Is from at least one, and preferably more, of NOAA's leading global modeling centers as collaborating institutions. Proposals that demonstrate collaborations and synergies across NOAA modeling centers and research laboratories and with modeling efforts at other leading U.S. modeling centers are strongly encouraged. A proposed CPT should bring together model developers, process modelers/theoreticians, and observational scientists to collaborate and systematically address the identified process and assess model fidelity. A strong management plan must be included in the Project Description. The plan should clearly delineate responsibilities among the collaborating institutions and set milestones for implementing and testing improved process representations in the target climate models.

Proposals should aim at the improvements of NOAA's GFDL and NCEP models in a multi-model framework. That is, proposals should lead to the improvement of NOAA's models based on testing and evaluating improved process models in multiple global models, considering processes that are of interest to more than one modeling center. This will help ensure model independence of results, because a multi-model approach reduces the likelihood of tuning results to a single model and renders the resulting gains more applicable to a wider array of models.

A CPT may be proposed as part of NCEP's Climate Test Bed (CTB; <http://www.cpc.ncep.noaa.gov/products/ctb/>) activities. The multi-model approach, as well as all other requirements above, still applies to these MAPP-CTB proposals. Proposers should also consider the specific terms and requirements that apply to MAPP-CTB proposals (these may be found at http://www.cpo.noaa.gov/cpo_pa/mapp/pdf/MAPP_CT_B_Proposals_Requirements.pdf)

and incorporate these in their proposals; proposals that do not comply with those requirements may be returned without review.

Project duration should be 3 years or less, depending on the activities that are being proposed. Project costs may be up to \$500k/year. Proposers should note that funding for this priority research area is conditional on a Congressional appropriation that supports a related element of the FY 2013 President's Budget.

General Guidelines for proposal submission

Principal Investigators submitting a proposal in response to this MAPP Announcement should clearly identify in their summary which of the above-listed MAPP competitions (one only per proposal) they are targeting.

Computational resources on NOAA's high-performance computing platforms are available for research in the priority areas above. Proposers who choose to request computational allocations on NOAA's platforms should 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 model to the NOAA platforms (the request form for computational resources can be found at

http://www.cpo.noaa.gov/cpo_pa/mapp/pdf/MAPP_FY13_HPC_Request_Form.docx).

Questions regarding the use of NOAA's high-performance computing platforms should be directed to the lead MAPP program manager, Don Anderson (see below).

PIs are strongly encouraged to submit Letters of Intent following the guidance in the Federal Funding Opportunity. Letters of Intent should be emailed to oar.cpo.mapp@noaa.gov.

Contact Information:

MAPP Program Managers: Don Anderson (don.anderson@noaa.gov), Annarita Mariotti (annarita.mariotti@noaa.gov), and Dan Barrie (daniel.barrie@noaa.gov).