

**Office of Science**  
**Notice DE-FG01-04ER04-08**

*Scientific Discovery*  
*Through Advanced Computing:*  
*Climate Change Prediction Program*

**Department of Energy**

**Office of Science Financial Assistance Program Notice DE-FG01-04ER04-08; Scientific Discovery Through Advanced Computing: Climate Change Prediction Program**

**AGENCY:** U.S. Department of Energy

**ACTION:** Notice inviting grant applications.

**SUMMARY:** The Office of Biological and Environmental Research (BER) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving applications for research grants in the Climate Change Prediction Program (CCPP), which is a component of the U.S. Climate Change Science Program (CCSP). Applications should describe research projects supporting the development of simulation models (computer programs) for prediction of climate decades to centuries in the future, and should clearly describe how that research will contribute to a measurably improved ability to use terascale computing to predict climatic change. **All applications submitted in response to this Notice must explicitly state how the proposed research will support accomplishment of the BER Climate Change Research Division's (CCRD's) Long Term Measure of Scientific Advancement to deliver improved data and models for policy makers to determine acceptable levels of greenhouse gases in the atmosphere.**

**DATES:** Applicants are encouraged (but not required) to submit a 1-2 page preapplication for programmatic review. There is no deadline for the preapplication, but early submission of preapplications is encouraged to allow time for meaningful discussions.

Formal applications submitted in response to this Notice must be received by 4:30 p.m., E.S.T., March 15, 2004, to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2004.

**ADDRESSES:** Preapplications referencing Program Notice DE-FG01-04ER04-08 should be sent to Dr. Jeffrey S. Amthor, CCPP Program Manager, via E-mail to: [jeff.amthor@science.doe.gov](mailto:jeff.amthor@science.doe.gov). Please include "Preapplication Program Notice DE-FG01-04ER04-08" in the E-mail subject field.

Formal applications referencing Program Notice DE-FG01-04ER04-08, must be sent electronically by an authorized institutional business official through DOE's Industry Interactive

Procurement System (IIPS) at: <http://e-center.doe.gov/>. IIPS provides for the posting of solicitations and receipt of applications in a paperless environment via the Internet. In order to submit applications through IIPS, your business official will need to register at the IIPS website. **IIPS offers the option of using multiple files, please limit submissions to one volume and one file if possible, with a maximum of no more than four PDF files.** The Office of Science will include attachments as part of this notice that provide the appropriate forms in PDF fillable format that are to be submitted through IIPS. Color images should be submitted in IIPS as a separate file in PDF format and identified as such. These images should be kept to a minimum due to the limitations of reproducing them. They should be numbered and referred to in the body of the technical scientific grant application as Color image 1, Color image 2, etc. Questions regarding the operation of IIPS may be E-mailed to the IIPS Help Desk at: HelpDesk@pr.doe.gov, or you may call the help desk at: (800) 683-0751. Further information on the use of IIPS by the Office of Science is available at: <http://www.sc.doe.gov/production/grants/grants.html>.

If you are unable to submit an application through IIPS, please contact the Grants and Contracts Division, Office of Science at: (301) 903-5212 or (301) 903-3604, in order to gain assistance for submission through IIPS or to receive special approval and instructions on how to submit printed applications.

**FOR FURTHER INFORMATION CONTACT:** Dr. Jeffrey S. Amthor, phone: (301) 903-2507; E-mail: jeff.amthor@science.doe.gov.

#### **SUPPLEMENTARY INFORMATION:**

##### **Background: Scientific Discovery Through Advanced Computing Program and the Climate Change Prediction Program**

Accurate prediction of future climate on decadal to centennial time scales is a major scientific objective of the BER CCRD. The CCPP represents the current phase of BER's long-standing climate modeling and simulation research agenda. The CCPP is focused on developing, testing, and applying climate simulation and prediction models (computer programs) that stay at the leading edge of scientific knowledge and computational technology. The CCPP will continue to develop models based on more definitive theoretical foundations and improved computational methods that will run efficiently on current and future high-performance supercomputers. The intent is to increase dramatically both the accuracy and throughput of computer programs designed to predict effects of increased concentrations of greenhouse gases in the atmosphere on the climatic system. Specifically, the CCPP will measurably advance models used to predict climatic variability and change decades to centuries in the future under a variety of forcing scenarios. Such advancements will be associated with, but not limited to, improving component model performance and accuracy, implementing efficient strategies to couple model components, and maximizing throughput on computers capable of peak speeds of 10-50 trillion Operations Per Second (10-50 teraOPS).

A portion of the current CCPP is funded by the DOE SC Scientific Discovery Through Advanced Computing (SciDAC) program. It is anticipated that applications to this Notice that

are selected for support will be funded by the SciDAC portion of the CCPP. The goal of SciDAC is to develop the scientific computing software and hardware infrastructure needed to use terascale computers to advance research programs in Basic Energy Sciences, Biological and Environmental (including climatic) Research, Fusion Energy Sciences, and High Energy Physics, and Nuclear Physics. SciDAC creates a scientific computing software infrastructure that bridges the gap between the advanced computing technologies being developed by the computer industry and the scientific research programs sponsored by the DOE SC. All applications chosen for funding in response to this Notice will therefore explicitly state how the proposed research will contribute to a measurably improved ability to use terascale computing to address important climatic change prediction issues.

Through SciDAC, the CCPP is presently supporting the Community Climate System Model (CCSM) Consortium Project at six DOE National Laboratories (Argonne, Lawrence Berkeley, Lawrence Livermore, Los Alamos, Oak Ridge, and Pacific Northwest). The CCSM Consortium Project includes collaboration with the National Aeronautics and Space Administration's Data Assimilation Office and the National Center for Atmospheric Research. Software engineering is a key focus of the Project, and throughput has increased for the atmospheric, land surface, oceanic, and sea ice components of the CCSM as a result of Project activities. Other Project accomplishments include completion and release of a new version of the Parallel Ocean Program (POP), including improved performance on vector machines; development of the new hybrid vertical-coordinate version of POP, called HYPOP; and improvement of the dynamic core of the Community Sea Ice Model (CSIM). In addition, portability of the CCSM has been significantly enhanced by the Project. Where appropriate, applications to this Notice are encouraged to include collaboration with the ongoing DOE CCSM Consortium Project.

### **Request for Grant Applications**

This Notice requests applications for grants for one of the three following activities, all of which are to be directed at development of simulation models (computer programs) for prediction of climate decades to centuries in the future and contribute to an enhanced ability to use terascale computing to implement such models:

- (1) Renewal of projects presently funded by the CCPP. Applications for renewal funding should include clear descriptions of progress made with present CCPP support. Such descriptions should be part of the technical portion of the application (see below).
- (2) Development of improved representation of key climatic processes (surface processes, convective transport processes, etc.) that accurately simulate these processes in general circulation models (GCMs) used to study potential decadal-to-centennial climatic variability and change with subcontinental spatial accuracy, and which are executed on supercomputers.
- (3) Development of improved or new mathematical techniques, model formulations, and computer algorithms for atmosphere, ocean, and coupled atmosphere-ocean GCMs that more accurately and efficiently describe and predict global climatic system behavior on decadal to centennial time scales and on subcontinental space scales, and which are executed on supercomputers.

**All applications submitted in response to this Notice must explicitly state how the proposed research will support accomplishment of the BER CCRD's Long Term Measure of Scientific Advancement to deliver improved data and models for policy makers to determine acceptable levels of greenhouse gases in the atmosphere.** All applications should also state clearly how the proposed research would contribute to a measurably enhanced ability to use terascale computing to address critical climatic change prediction issues.

Applicants seeking renewal of present grants should demonstrate, in their application, (a) the continued relevance of their work to the goal of advancing the science of decade-to-multi-century climatic change prediction and the contribution their work makes to an improved ability to use terascale computing to address climatic change issues; (b) the quality and relevance of work conducted under previous support to these goals, including a listing of publications and presentations; and (c) relevant contributions to the development of DOE climate modeling programs, including participation in the organization of meetings and workshops and collaborations with other DOE-supported investigators. The technical portion of applications should include a section titled "Accomplishments under Previous Support" that addresses items (b) and (c) above. Applicants should be prepared to provide, on short notice, complete legible copies of all publications, reports, etc., listed in this section, should they be required for the review process.

Applicants seeking funds to develop improved representation of key climatic processes for inclusion in GCMs should focus their applications on efforts to more accurately describe and include such processes, and their interactions with other aspects of the simulated climatic system, in GCMs. These projects might explore opportunities, methods, and collaborations for incorporating the results of the CCSP's observational and experimental programs (such as the DOE Atmospheric Radiation Measurement [ARM] program) into model components that accurately describe climatic system processes at the temporal and spatial scales typically used for decade-to-multi-century climatic change prediction. Applications for such activities must include a clear plan for the dissemination of any developed model code, and necessary documentation, to the climate modeling community.

Applicants seeking funds to develop improved or new mathematical techniques and numerical algorithms should target their applications toward methods that can be incorporated into GCMs running on computers capable of performing over 10 teraOPS. Applicants must demonstrate the role of their proposed research in improving the accuracy and/or computational efficiency of GCMs envisioned for use in making forecasts of long-term climatic change. Foci of the applications might include, but need not be limited to, atmospheric and oceanic dynamics and transport, surface energy and mass exchanges, atmospheric radiative transfer, ocean convection, and sea-ice dynamics and thermodynamics. Applications for such activities must include a clear plan for the dissemination of any developed model code, and necessary documentation, to the climate modeling community.

To ensure that the CCPP meets both the broad needs of the climate modeling research community and the specific needs of the CCRD, successful applicants will participate as members of the CCPP Science Team along with scientists from related CCRD and SC programs. Costs for participation in Science Team meetings and workshops should be included in each

application. Yearly estimates for Science Team travel should be based on one trip of five days to Washington, DC, one trip of five days to San Francisco, CA, and one trip of five days to Denver, CO.

## **Program Funding**

It is anticipated that about \$4,000,000 will be available for awards in Fiscal Year 2004, contingent on the availability of appropriated funds. Project start dates of about September 15, 2004, are expected. Applications may request project support up to three years, with out-year support contingent on availability of appropriated funds, progress of the research, and programmatic needs. It is anticipated that a substantial fraction of available funds will be used to support renewal of existing research projects under (1) above. The allocation of funds within the other two research areas will depend on the quality of applications received. Typical awards are expected to be about \$200,000 per year, but individual awards may deviate from this amount based on variation in the scope of work proposed in the applications. DOE is under no obligation to pay for any costs associated with the preparation or submission of applications if an award is not made.

## **Preapplications**

Potential applicants are strongly encouraged to submit a brief (1-2 pages of narrative), concise, and clear preapplication describing the proposed research project objectives and methods. These will be reviewed relative to the terms of this Notice. Principal investigator name, organization, telephone number, and e-mail address are essential parts of the preapplication. A response to each preapplication, discussing the potential program relevance of a formal application, generally will be communicated within 30 days of receipt. There is no deadline for the submission of preapplications, but applicants should allow sufficient time to meet the application deadline of March 15, 2004. SC's preapplication policy is on its Grants and Contracts Web Site at: <http://www.sc.doe.gov/production/grants/preapp.html>.

## **Merit Review**

Applications will be subjected to formal merit review (peer review) and will be evaluated against the following evaluation criteria which are listed in descending order of importance codified at 10 CFR 605.10(d):

1. Scientific and/or Technical Merit of the Project;
2. Appropriateness of the Proposed Method or Approach;
3. Competency of Applicant's personnel and Adequacy of Proposed Resources;
4. Reasonableness and Appropriateness of the Proposed Budget.

For renewals, progress on previous funded research will be an important criterion for evaluation. The evaluation will include program policy factors such as the relevance of the proposed research to the terms of the announcement and an agency's programmatic needs. Note, external peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Non-federal reviewers will often be used, and submission of an

application constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

### **Submission Information**

Information about the development, submission of applications, eligibility, limitations, evaluation, the selection process, and other policies and procedures may be found in 10 CFR Part 605, and in the Application Guide for the Office of Science Financial Assistance Program. Electronic access to SC's Financial Assistance Application Guide is possible via the World Wide Web at: <http://www.sc.doe.gov/production/grants/grants.html>.

In addition, for this notice, the research description must be 20 pages or less, exclusive of attachments, and must contain an abstract or summary of the proposed research, on a separate page with the name of the applicant, mailing address, phone, Fax and email listed. **Applicants who have had prior support must include a Progress Section with a brief description of results and a list of publications derived from that funding.** Attachments should include short (2 pages) curriculum vitae, a listing of all current and pending federal support and letters of intent when collaborations are part of the proposed research. Curriculum vitae should be submitted in a form similar to that of the National Institutes of Health (NIH) or the National Science Foundation (NSF) (two to three pages).

The Catalog of Federal Domestic Assistance number for this program is 81.049, and the solicitation control number is ERFAP 10 CFR Part 605.

John Rodney Clark  
Associate Director of Science  
for Resource Management

Published in the Federal Register January 6, 2004, Volume 69, Number 3, Pages 635-638.