

Program Announcement LAB 98-05

Climate Change Prediction Program

The Office of Biological and Environmental Research (OBER) of the Office of Energy Research, U.S. Department of Energy (DOE), hereby announces its interest in receiving research proposals from national laboratories to support the development of decadal to multi-century climate prediction in conjunction with the Climate Change Prediction Program, a part of the U.S. Global Change Research Program (USGCRP).

Brief preproposals that consist of two to three pages of narrative describing the research objectives and method of accomplishment are encouraged, but not required. There is no deadline for the preproposals, but early submission is encouraged. Allowance should be made for a two-week response time after submission of a preproposal. Preproposals will be reviewed relative to the scope and research needs of the Climate Change Prediction Program, as outlined in this Program Announcement. Principal investigator address, telephone number, FAX number, and E-mail address should be identified on the cover sheet of the preproposal.

It is anticipated that approximately \$1,500,000 will be available annually, contingent upon the availability of appropriated funds. Multiple year funding of projects is expected, also contingent upon the availability of appropriated funds. Approved projects are expected to be funded beginning approximately April 1, 1998. The allocation of funds within the research areas described in this announcement will depend upon the number and quality of proposals received. It is anticipated that a substantial portion of the funds will support the computational research projects identified in item (1) below. Typical projects are funded at a level of approximately \$200,000 per year, but could range from \$50,000 to \$600,000. Collaborative proposals are encouraged.

SUPPLEMENTARY INFORMATION: Groups and individuals at national laboratories already participating in projects and activities that are part of the Climate Change Prediction Program and that have tentative funding commitments that extend beyond FY 1998 should not respond to this announcement. This notice requests proposals to support research in the following five efforts:

(1) Modifications and improvements required to port state-of-the-science coupled atmosphere-ocean general circulation models (GCMs) or model components to advance, next generation massively-parallel scientific supercomputers.

(2) Theoretical limits to climate prediction over decade to multi-century time frames with subcontinental and smaller scale spatial accuracy.

(3) The development of improved mathematical techniques, model formulations and computer algorithms for atmosphere, ocean and coupled atmosphere-ocean general circulation models (GCM) that more accurately and efficiently describe and predict global climate system behavior on the time and space scales mentioned above using advanced, parallel-processing scientific supercomputers.

(4) The development of improved representations of key climate processes (surface processes, convective transport, etc.) that accurately simulate these processes on the appropriate scales used in GCM-based climate models that simulate decade-to-century climate change.

(5) The development and analysis of long-term, observation based climate data sets that can be used to test the ability of GCM-based climate models to realistically simulate and predict climate system behavior on the above-mentioned time and space scales. The data sets should be developed from existing observational data bases and not require the collection of further measurements.

Accurate prediction of climate change on decadal and longer time scales is a major scientific objective of the Environmental Sciences Division (ESD). The DOE Climate Change Prediction Program is the next phase in the evolution of DOE's long-standing climate modeling and simulation research agenda. It was developed from the integration of the Computer Hardware, Advanced Mathematics and Model Physics (CHAMMP) climate model development program with the CO₂ Research Program climate research program element. The program is focused on developing, testing and applying climate simulation and prediction models that stay at the leading edge of scientific knowledge and computational technology. A unique feature of the program is the establishment of a distributed modeling center involving DOE National Laboratories, the National Center for Atmospheric Research and the non-Federal research community. The program will develop models based on more definitive theoretical foundations and improved computational methods that will run efficiently on future generations of high-performance scientific supercomputers. The intent is to increase dramatically both the accuracy and throughput of computer model-based predictions of future climate system response to the increased atmospheric concentrations of greenhouse gases.

To ensure that the program meets the broadest needs of the research community and the specific objectives of ESD, the successful proposers will participate as members of the Climate Change Prediction Program Science Team along with selected scientists from related ESD programs. Costs for the participation in Science Team meetings and workshops should be included in the respondent's proposal. 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.

Successful proposers for projects to port coupled atmosphere-ocean GCMs or model components to next generation scientific supercomputers will demonstrate concepts and capabilities needed to advance the computational aspects of climate model development. It is expected that proposing individuals and groups will have access to research and experimental massively-parallel scientific supercomputers of the type envisioned to be available for production scale computing in the 100 GigaFLOP to 1 TeraFLOP range within the next five years. The goal of these projects is not to produce production codes, but rather to point the direction for computational improvements that exploit new technologies. The starting point for these projects will be the climate models that are in use, or anticipated to be in use soon, for century-long climate predictions at major U.S. Climate modeling centers participating in the IPCC 2000 Scientific Assessment. Research may include, but is not limited to, modifications to model algorithms (but not formulation) to exploit new architectures and improvements to increase computational scaling and speed. Participating groups should plan to participate in periodic code benchmarking exercises and model diagnostic intercomparisons. Costs for computer access must be included explicitly in the cost proposal.

Successful proposers exploring the theoretical limits of climate prediction will conduct studies of the climate system to ascertain the capability for computer based climate simulation models to predict the aspects of the climate system that influence near-surface temperature, precipitation and winds, decades to centuries in the future. These studies may include, but are not limited to, analytical and modeling investigations of the coupled climate system, or components of the climate system, to identify climate dynamical mechanisms that influence long-term variability and predictability over continental and subcontinental spatial scales.

Successful proposers for developing new mathematical techniques and numerical algorithms will target their research toward methods that can be incorporated into models running on highly parallel scientific supercomputers capable of performing over 10¹¹ floating-point operations per second (100 giga-FLOPS) in climate modeling simulations. Proposers must demonstrate the role of their research in improving the accuracy and/or computational efficiency of GCM-based climate simulation models of the type envisioned for use in making forecasts of long-term climate change. These methods may be used in the simulation of any or all of the climate system processes modeled in a GCM, including, but not limited to, atmospheric and ocean dynamics and transport, surface energy and mass exchange, atmospheric radiative transfer, ocean convection, and sea-ice dynamics and thermodynamics. Proposers in this area must include a plan for the dissemination of

any developed model code, and necessary documentation, to the climate modeling community.

Successful proposers developing or improving representations of climate system processes for inclusion in GCM-based climate prediction models will conduct research to more accurately describe these processes and their interaction with other aspects of the simulated climate system. These studies will explore methods for incorporating the results of the U.S. Global Change Research Program's observational and experimental programs into model components that accurately describe climate system processes at the model resolution scales typically used for decade-to-multi-century climate prediction. Proposers in this area must include a plan for the dissemination of any developed model code, and necessary documentation, to the climate modeling community.

Successful proposers developing model diagnostic data sets will analyze existing observational data bases to develop time dependent records of climate variability and climate change that can be used as tests for climate change predictions. Analysis of the data should include consideration of the climate dynamical processes that led to the temporal and spatial variability in the record. Especially important is the development of diagnostic data sets that can be used to test model predictions of long-term changes in the near-surface temperature, precipitation and wind climatologies over continental and sub-continental spatial scales. Proposers in this area must include a plan to allow the inexpensive dissemination of the diagnostic data sets in a standard digital format.

Program information is available on the DOE/OBER www site using the URL <http://www.er.doe.gov/production/ober/GC/ch-fr.html>.

As a matter of reference, the Climate Change Prediction Program has already solicited grant applications from private sector organizations and academic institutions via Solicitation Notice 97-16 (published May 27, 1997). Grant applications will be selected for funding in FY 1998.

The instructions and format described below should be followed. Reference announcement LAB 98-05 on all submissions and inquiries about this program.

**OFFICE OF ENERGY RESEARCH GUIDE FOR PREPARATION OF
SCIENTIFIC/TECHNICAL PROPOSALS TO BE SUBMITTED BY
NATIONAL LABORATORIES**

Proposals from national laboratories submitted to the Office of Energy Research (ER) as a result of this program announcement, will undergo scientific/technical merit

review. The following guidelines for content and format are intended to facilitate an understanding of the requirements necessary for ER to conduct a merit review of a proposal. Please follow the guidelines carefully, as deviations could be cause for declination of a proposal without merit review.

1. Evaluation Criteria

Proposals will be subjected to formal merit review (peer review) and will be evaluated against the following criteria which are listed in descending order of importance:

- Scientific and/or technical merit of the project
- Appropriateness of the proposed method or approach
- Competency of the personnel and adequacy of the proposed resources
- Reasonableness and appropriateness of the proposed budget

The evaluation will include program policy factors such as the relevance of the proposed research to the terms of the announcement, the uniqueness of the proposer's capabilities, and demonstrated usefulness of the research for applications in other DOE Program Offices as evidenced by a history of programmatic support directly related to the proposed work.

2. Summary of Proposal Contents

- Field Work Proposal Cover Sheet (DOE ONLY)
- Face Page
- Table of Contents
- Abstract
- Narrative
- Literature Cited
- Budget and Budget Explanation
- Other support of investigators
- Biographical Sketches
- Description of facilities and resources
- Appendix

2.1 Number of Copies to Submit

An original and seven copies of the formal proposal/FWP must be submitted.

3. Detailed Contents of the Proposal

Proposals must be readily legible, when photocopied, and must conform to the following three requirements: the height of the letters must be no smaller than 10 point with at least 2 points of spacing between lines (leading); the type density must average no more than 17 characters per inch (the type in this paragraph meets the guidelines); the margins must be at least one-half inch on all sides. Figures, charts, tables, figure legends, etc., may include type smaller than these requirements so long as they are still fully legible.

3.1 *Field Work Proposal Cover Sheet* (DOE ONLY)

The Field Work Proposal (FWP) Cover Sheet is to be prepared and submitted consistent with policies of the investigator's laboratory and the local DOE Operations Office.

Laboratories may submit proposals directly to the ER Program office listed in the appendix of this guide. A copy should also be provided to the appropriate DOE operations office.

3.2 *Face Page*

The face page is to include the following information.

Title of proposed project
ER Program announcement title
Name of laboratory
Name of principal investigator (PI)
Position title of PI
Mailing address of PI
Telephone of PI
Fax number of PI
Electronic mail address of PI
Name of official signing for laboratory*
Title of official
Fax number of official
Telephone of official
Electronic mail address of official
Requested funding for each year; total request
Use of human subjects in proposed project:

If activities involving human subjects are not planned at any time during the proposed project period, state "No"; otherwise state "Yes", provide the IRB Approval date and

Assurance of Compliance Number and include all necessary information with the proposal should human subjects be involved.

Use of vertebrate animals in proposed project:

If activities involving vertebrate animals are not planned at any time during this project, state "No"; otherwise state "Yes" and provide the IACUC Approval date and Animal Welfare Assurance number from NIH and include all necessary information with the proposal.

Signature of PI, date of signature

Signature of official, date of signature*

*The signature certifies that personnel and facilities are available as stated in the proposal, if the project is funded.

3.3 Table of Contents

Provide the initial page number for each of the sections of the proposal. Number pages consecutively at the bottom of each page throughout the proposal. Start each major section at the top of a new page. Do not use unnumbered pages and do not use suffices, such as 5a, 5b.

3.4 Abstract

Provide an abstract of no more than 250 words. Give the broad, long-term objectives and what the specific research proposed is intended to accomplish. State the hypotheses to be tested. Indicate how the proposed research addresses the ER scientific/technical area specifically described in this announcement.

3.5 Narrative

The narrative comprises the research plan for the project and is limited to 15 pages. It should contain the following subsections:

Background and significance Briefly sketch the background leading to the present proposal, critically evaluate existing knowledge, and specifically identify the gaps which the project is intended to fill. State concisely the importance of the research described in the proposal. Explain the relevance of the project to the research needs identified by the Office of Energy Research. Include references to relevant published literature, both to work of the investigators and to work done by other researchers.

Preliminary Studies Use this section to provide an account of any preliminary studies that may be pertinent to the proposal. Include any other information that will help to establish the experience and competence of the investigators to pursue the proposed

project. References to appropriate publications and manuscripts submitted or accepted for publication may be included.

Research Design and Methods Describe the research design and the procedures to be used to accomplish the specific aims of the project. Describe new techniques and methodologies and explain the advantages over existing techniques and methodologies. As part of this section, provide a tentative sequence or timetable for the project.

Subcontract or Consortium Arrangements If any portion of the project described under "Research Design and Methods" is to be done in collaboration with another institution, provide information on the institution and why it is to do the specific component of the project. Further information on any such arrangements is to be given in the sections "Budget and Budget Explanation", "Biographical Sketches", and "Description of facilities and resources".

3.6 Literature Cited

List all references cited in the narrative. Limit citations to current literature relevant to the proposed research. Information about each reference should be sufficient for it to be located by a reviewer of the proposal.

3.7 Budget and Budget Explanation

A detailed budget is required for the entire project period, which normally will be three years, and for each fiscal year. It is preferred that DOE's budget page, Form 4620.1 be used for providing budget information*. Modifications of categories are permissible to comply with institutional practices, for example with regard to overhead costs.

A written justification of each budget item is to follow the budget pages. For personnel this should take the form of a one-sentence statement of the role of the person in the project. Provide a detailed justification of the need for each item of permanent equipment. Explain each of the other direct costs in sufficient detail for reviewers to be able to judge the appropriateness of the amount requested.

Further instructions regarding the budget are given in section 4 of this guide.

* Form 4620.1 is available at web site:
<http://www.er.doe.gov/production/grants/forms.html>

3.8 Other Support of Investigators

Other support is defined as all financial resources, whether Federal, non-Federal, commercial or institutional, available in direct support of an individual's research endeavors. Information on active and pending other support is required for all senior personnel, including investigators at collaborating institutions to be funded by a subcontract. For each item of other support give the organization or agency, inclusive dates of the project or proposed project, annual funding, and level of effort devoted to the project.

3.9 Biographical Sketches

This information is required for senior personnel at the laboratory submitting the proposal and at all subcontracting institutions. The biographical sketch is limited to a maximum of two pages for each investigator.

3.10 Description of Facilities and Resources

Describe briefly the facilities to be used for the conduct of the proposed research. Indicate the performance sites and describe pertinent capabilities, including support facilities (such as machine shops) that will be used during the project. List the most important equipment items already available for the project and their pertinent capabilities. Include this information for each subcontracting institution, if any.

3.11 Appendix

Include collated sets of all appendix materials with each copy of the proposal. Do not use the appendix to circumvent the page limitations of the proposal. Information should be included that may not be easily accessible to a reviewer.

Reviewers are not required to consider information in the Appendix, only that in the body of the proposal. Reviewers may not have time to read extensive appendix materials with the same care as they will read the proposal proper.

The appendix may contain the following items: up to five publications, manuscripts (accepted for publication), abstracts, patents, or other printed materials directly relevant to this project, but not generally available to the scientific community; and letters from investigators at other institutions stating their agreement to participate in the project (do not include letters of endorsement of the project).

4. Detailed Instructions for the Budget

(DOE Form 4620.1 "Budget Page" may be used)

4.1 Salaries and Wages

List the names of the principal investigator and other key personnel and the estimated number of person-months for which DOE funding is requested. Proposers should list the number of postdoctoral associates and other professional positions included in the proposal and indicate the number of full-time-equivalent (FTE) person-months and rate of pay (hourly, monthly or annually). For graduate and undergraduate students and all other personnel categories such as secretarial, clerical, technical, etc., show the total number of people needed in each job title and total salaries needed. Salaries requested must be consistent with the institution's regular practices. The budget explanation should define concisely the role of each position in the overall project.

4.2 Equipment

DOE defines equipment as "an item of tangible personal property that has a useful life of more than two years and an acquisition cost of \$5000 or more." Special purpose equipment means equipment which is used only for research, scientific or other technical activities. Items of needed equipment should be individually listed by description and estimated cost, including tax, and adequately justified. Allowable items ordinarily will be limited to scientific equipment that is not already available for the conduct of the work. General purpose office equipment normally will not be considered eligible for support.

4.3 Domestic Travel

The type and extent of travel and its relation to the research should be specified. Funds may be requested for attendance at meetings and conferences, other travel associated with the work and subsistence. In order to qualify for support, attendance at meetings or conferences must enhance the investigator's capability to perform the research, plan extensions of it, or disseminate its results. Consultant's travel costs also may be requested.

4.4 Foreign Travel

Foreign travel is any travel outside Canada and the United States and its territories and possessions. Foreign travel may be approved only if it is directly related to project objectives.

4.5 Other Direct Costs

The budget should itemize other anticipated direct costs not included under the headings above, including materials and supplies, publication costs, computer services, and consultant services (which are discussed below). Other examples are: aircraft rental, space rental at research establishments away from the institution, minor

building alterations, service charges, and fabrication of equipment or systems not available off-the-shelf. Reference books and periodicals may be charged to the project only if they are specifically related to the research.

a. Materials and Supplies

The budget should indicate in general terms the type of required expendable materials and supplies with their estimated costs. The breakdown should be more detailed when the cost is substantial.

b. Publication Costs/Page Charges

The budget may request funds for the costs of preparing and publishing the results of research, including costs of reports, reprints page charges, or other journal costs (except costs for prior or early publication), and necessary illustrations.

c. Consultant Services

Anticipated consultant services should be justified and information furnished on each individual's expertise, primary organizational affiliation, daily compensation rate and number of days expected service. Consultant's travel costs should be listed separately under travel in the budget.

d. Computer Services

The cost of computer services, including computer-based retrieval of scientific and technical information, may be requested. A justification based on the established computer service rates should be included.

e. Subcontracts

Subcontracts should be listed so that they can be properly evaluated. There should be an anticipated cost and an explanation of that cost for each subcontract. The total amount of each subcontract should also appear as a budget item.

4.6 Indirect Costs

Explain the basis for each overhead and indirect cost. Include the current rates.

5.0 Appendix:

5.1 Due Dates

Proposers are encouraged (but not required) to submit brief pre-proposals, there is no deadline for the pre-proposals, but early submission is encouraged.

Submission of formal proposals/FWPs must be received no later than 4:30 p.m. E.S.T., January 2, 1998.

5.2 Submission Site

Completed preproposals may be electronically mailed, which is preferred, or they may be sent to one of the program contacts.

Completed proposals/FWPs must be sent to Ms. Karen Carlson, U.S. Department of Energy, Office of Energy Research, Office of Biological and Environmental Research, ER-74, 19901 Germantown Road, Germantown, MD 20874-1290.

5.3 Energy Research Program Contacts

For further information contact: Dr. Patrick A. Crowley, Office of Biological and Environmental Research, Environmental Sciences Division, ER-74, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874-1290. Telephone: (301) 903-3069, FAX: (301) 903-8519, E-mail: p.crowley@oer.doe.gov. or Dr. Wanda R. Ferrell, Office of Biological and Environmental Research, Environmental Sciences Division, ER-74, U.S. Department of Energy, 19901 Germantown Road, Germantown, MD 20874-1290. Telephone: (301) 903-0043, FAX: (301) 903-8519, E-mail: wanda.ferrell@oer.doe.gov.