Office of Science
Notice DE-FG01-04ER04-10

Atmospheric
Radiation Measurement Program

Department of Energy

Office of Science Financial Assistance Program Notice DE-FG01-04ER04-10; Atmospheric Radiation Measurement 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 experimental and theoretical studies of the effects of clouds on the atmospheric radiation balance in conjunction with the Atmospheric Radiation Measurement (ARM) Program as part of the U.S. Global Climate Change Science Program (USCCSP). This notice requests new applications and renewal applications of grants currently funded by DOE under previous ARM Program notices that are relevant to the terms of reference for this announcement and responsive to the particular needs defined below.

DATES: Applicants are encouraged (but not required) to submit a brief preapplication for programmatic review. The deadline for submission of preapplications is March 15, 2004. Early submission of preapplications is encouraged to allow time for meaningful responses.

Formal applications submitted in response to this notice must be received by 4:30 p.m., E.D.T., April 9, 2004, to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2005. Awards are expected to begin on or about November 1, 2004.

ADDRESSES:

Preapplications referencing Program Notice DE-FG01-04ER04-10, may be sent to the program contact, Dr. Wanda Ferrell, via electronic mail at: wanda.ferrell@science.doe.gov or by U. S. Postal Service Mail at: Dr. Wanda Ferrell, Office of Biological and Environmental Research, Climate Change Research Division, SC-74/Germantown Building, U.S. Department of Energy, 1000 Independence Ave., SW, Washington, DC 20585-1290. Electronic mail is recommended to speed up response to preapplications.

Formal applications referencing Program Notice DE-FG01-04ER04-10, 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. Wanda Ferrell, Office of Biological and Environmental Research, Climate Change Research Division, SC-74, Germantown Building, U.S. Department of Energy, 1000 Independence Ave., SW, Washington, DC 20585-1290, telephone (301) 903-0043, fax (301) 903-8519, Internet e-mail address: wanda.ferrell@science.doe.gov. Program information is available on: http://www.science.doe.gov/ober/CCRD/arm.html.

SUPPLEMENTARY INFORMATION:

Background: Atmospheric Radiation Measurement (ARM) Program. Two major scientific objectives of the Climate Change Research Division (CCRD) are: (1) to improve the performance of predictive models of the Earth's climate, and (2) to thereby make more accurate predictions of the response of the climate system to increasing concentrations of greenhouse gases. The purpose of the ARM Program is to improve the treatment of radiation and clouds in the General Circulation Models (GCMs) used to predict future climate. This program is one component of the U.S. Climate Change Science Program that has the goal to improve the capability to accurately simulate and predict climate and climate change. The major component of the ARM Program involves gathering data for the development and testing of models of the atmospheric radiation transfer, properties of clouds, and the full life cycle of clouds with the ultimate goal of developing cloud system resolving models (CSRM) that directly and accurately simulate cloud-scale physical processes and that can be incorporated into the Multi-Scale Modeling Framework (MMF), also referred to as super parameterization. The ARM program has established sites in three climatic regimes where cloud and radiation data are collected. The first site, Southern Great Plains (SGP), began operation in calendar year 1992, with instruments spread over an area of approximately 60,000 sq. km., centered on Lamont, Oklahoma. The SGP was chosen as a field measurement site for several reasons including its relatively homogenous geography, wide variability of climate, cloud type, and surface flux properties, and large

seasonal variation in temperature and specific humidity. The Tropical Western Pacific (TWP) site is the area roughly between 10 degrees N to 10 degrees S of the equator from Indonesia to near Christmas Island. The TWP site consists of stations at Darwin, Australia, and on the islands of Manus, Papua, New Guinea and the Republic of Nauru respectively. This region was selected as an ARM site because it plays a large role in the interannual variability observed in the global climate system. The third site, the North Slope of Alaska (NSA), is located at Barrow, Alaska, with a secondary, inland site near Atqasuk. The NSA site was selected as an ARM site because it provides data about cloud and radiative processes at high latitudes, and by extension, about cold and dry regions of the atmosphere in general. Construction of an ARM Mobile Facility (AMF) was begun in late 2003 with the first deployment expected in late 2004. The AMF has been designed to address science questions beyond those investigated at the current fixed sites. The AMF will deploy instrumentation and data systems similar to those at the fixed ARM sites in NSA and TWP. The AMF will be deployed to sites around the world in various climatic regimes and sites of opportunity for durations of 6 to 18 months to study the effects of clouds and other atmospheric conditions and properties on radiation. The ARM sites, both mobile and fixed, have been designated as a user facility, the ARM Climate Research Facility (ACRF). Thus, AMF deployments and campaigns at the fixed ARM sites will be determined by a review by the ACRF Science Review Board.

Request for Grant Applications

This notice requests applications for grants, both new and renewal that address the broad ARM goal of improving the representation of cloud and radiation processes in climate models. The research areas of interest include the development of algorithms for retrieving the required measurements, studies to improve the understanding of cloud and radiation physical processes, the translation of process study results into process models and parameterizations, and the incorporation of the submodels into climate models. ARM data consist of time series of vertical profiles of certain observables while parameterizations are geared to produce statistical cloud and radiation properties on the scale of several hundred kilometers. Since the format is not amenable to modelers, research is also needed to develop tools and methodologies for making ARM data more useful for the development and testing of submodels.

Specific areas of interest to the ARM program include, but are not limited to:

- Developing new techniques to retrieve the properties of ice clouds and mixed-phase clouds from ARM data.
- Conducting analyses for improving our understanding of cloud and radiation processes including of the 3D cloud-radiation process at scales from the local atmospheric column to the GCM grid square and the relationship between atmospheric radiation and the life-cycle of ice clouds and mixed-phase clouds.
- Developing and testing new cloud and radiation submodels for global climate models.
- Incorporating new cloud and radiation submodels into global climate models and demonstrating the improved performance of the models.
- Developing and applying methodologies to use ARM data more effectively in atmospheric models, both at the cloud resolving model scale and the global climate model scale.

- Quantifying the effects of aerosols on cloud properties and the resulting radiation field, using some combination of ARM observations and physical models.

Applications are especially encouraged that utilize ARM generated data in the above activities.

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. Submitted proposals that do not contain this information will be returned without review.

Applications for research to develop new techniques to retrieve the properties of ice clouds and mixed-phase clouds using ARM data should target their research on methods for deriving long-term records of cloud microphysical and macrophysical properties at multiple locations. The improved retrieval algorithms provide bulk microphysical estimates for clouds at all ARM fixed sites and are expected to include uncertainty estimates.

Applications for cloud and radiation process analyses should propose studies that elucidate radiative transfer in cloudy atmospheres, including the overlap problem of stratiform cloud layers. These studies may include, but are not limited to, 3-D radiative transfer, representations of cloud overlap, mixed phase clouds, cloud life cycles, feedback processes (especially in the Arctic), and other processes important for clouds, such as convection and turbulence and their effects on radiative transfer. The emphasis on the Arctic feedback is to test the hypothesis that links large climate feedbacks with surface and tropospheric temperatures, surface albedo, cloud cover, deep ocean water production (the global thermohaline ocean circulation pump), and the polar atmospheric heat sink.

Applications for research to develop and test new cloud and radiation process models should focus on investigating the validity of assumptions that are associated with such models and how well the ensemble of cloud and radiation sub models simulate clouds and their effect on radiation fields in the climate models.

Applications requesting funds to study incorporation of cloud and radiation parameterizations into global climate models and demonstrating the improved performance of the models are expected to provide a clear plan describing the method to be used to quantify the model improvement. Applicants are strongly encouraged to utilize the tools that have been developed for this purpose in the Climate Change Prediction Program - ARM Parameterization Testbed (CAPT) (http://www-pcmdi.llnl.gov/capt/) effort at DOE's Program for Climate Model Diagnosis and Intercomparison (PCMDI).

Applications for research to develop and apply methodologies to use ARM data more effectively in atmospheric models should focus on converting ARM data that usually consist of time series of vertical profiles of certain observables into a form that is of improved utility by climate modelers. This research area also includes techniques for converting model output to a form that

is equivalent ARM measurements, thus, enabling the direct comparison of model-produced cloud properties with ARM observations.

Applications for research to quantify the effect of aerosols on the radiation field should focus on both the indirect and direct role of aerosols on radiative transfer and cloud properties. Specifically the research should relate observations of radiative fluxes and radiances to the atmospheric composition and use these relations to develop and test parameterizations and/or process models to accurately predict the atmospheric radiative properties. Note, that the DOE Atmospheric Science Program (ASP) is being reconfigured in Fiscal Year 2004, to focus on aerosol radiative forcing with new research to be funded early in Fiscal Year 2005, and will support aerosol research on aerosol processes and resulting properties that influence radiation fields. A joint ARM-ASP working group will be formed to foster and facilitate collaborations between the two programs.

Applications that require a special field campaign, which has not already been planned and approved by the ARM Program Manager, will not be accepted for consideration.

To ensure that the program meets the broadest needs of the research community and the specific needs of the DOE CCRD, successful applicants are expected to participate as ARM Science Team members in the appropriate working group(s) relevant to their efforts. Costs for participation in ARM Science Team meetings and subcommittee meetings should be based on two trips of 1 week each to Washington, DC, and two trips of 3 days each to Chicago, Illinois.

Program Funding

It is anticipated that approximately $3 million will be available for awards in Fiscal Year 2005, contingent upon the availability of appropriated funds. Multiple-year funding of awards is expected, with out-year funding also contingent upon the availability of appropriated funds, progress of the research, and programmatic needs. The allocation of funds within the research areas will depend upon the number and quality of applications received. Awards are expected to begin on or about November 1, 2004. Equal consideration will be given to renewal and new 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.

Collaboration

Applicants are strongly encouraged to collaborate with researchers in other institutions, such as: universities, industry, non-profit organizations, federal laboratories and Federally Funded Research and Development Centers (FFRDCs), including the DOE National Laboratories, where appropriate, and to include cost sharing wherever feasible. Additional information on collaboration is available in the Application Guide for the Office of Science Financial Assistance Program that is available via the World Wide Web at: http://www.sc.doe.gov/production/grants/Colab.html.

Preapplications

Potential applicants are strongly encouraged to submit a brief preapplication that consists of two to three pages of narrative describing the research objectives and methods of accomplishment. These will be reviewed relative to the scope and research needs of the ARM Program. Principal Investigator (PI) address, telephone number, fax number and e-mail address are required parts of the preapplication. A response to each preapplication discussing the potential program relevance of research that would be proposed in a formal application generally will be communicated within 15 days of receipt. Use of e-mail for this communication will decrease the possibility of a delay in responses to the preapplication. The deadline for the submission of preapplications is March 15, 2004. Applicants should allow sufficient time so that the formal application deadline is met. SC's preapplication policy can be found on SC's Grants and Contracts Web Site at: http://www.sc.doe.gov/production/grants/preapp.html. Please contact Dr. Wanda Ferrell (wanda.ferrell@science.doe.gov).

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.

The evaluation process will include program policy factors such as the relevance of the proposed research to the terms of the announcement and the 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. Both federal and 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.

The Application

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

The technical portion of the application should not exceed twenty-five double-spaced pages and should include detailed budgets for each year of support requested. Applicants are asked to use the following ordered format:

- **Face Page** (DOE F 4650.2 (10-91))

  In block 15, also provide the PI's phone number, fax number and e-mail address.

- **Project Abstract Page**; single page only, should contain title, PI name, and abstract text
- **Budget pages** for each year and a budget summary of project period (using DOE F 4620.1)
- **Budget Explanation**
- **Project Description**
- **Long Term Measure: 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. Submitted proposals that do not contain this information will be returned without review.**
- **Literature Cited**
- **Collaborative Arrangements** (if applicable)
- **Facilities and Resources**
- **Biographical Sketches** should be submitted in a form similar to that of NIH or NSF (two to three pages).
- **Current and Pending Support**
- **Letters of Collaboration** (if applicable)
- **Renewal applications** should include a special section entitled "Accomplishments Under Previous Support." (See http://www.science.doe.gov/production/grants/App.html.) This section shall address the following:

    (a) continued relevance of their work to the goals of the ARM Program
    (b) the contribution of work conducted under previous support to the goals of the ARM Program, including a listing of publications and presentations

For researchers who do not have access to the World Wide Web (WWW), please contact Karen Carlson, Office of Biological and Environmental Research, Climate Change Research Division, SC-74/Germantown Building, U.S. Department of Energy, 1000 Independence Ave., SW, Washington, DC 20585-1290, phone: (301) 903-3338, fax: (301) 903- 8519, e-mail: karen.carlson@science.doe.gov; for hard copies of background material mentioned in this solicitation.

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 A. Alleva
Director
Grants and Contracts Division
Office of Science

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