

Office of Science
Notice DE-FG01-05ER05-14

Atmospheric Radiation Measurement Program

Department of Energy

**Office of Science Financial Assistance Program Notice
DE-FG01-05ER05-14; 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 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, 2005. Early submission of preapplications is encouraged to allow time for meaningful responses.

Formal applications submitted in response to this Notice must be received by 8:00 p.m., Eastern Time, April 12, 2005, to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2006. Awards are expected to begin on or about November 15, 2005.

ADDRESSES: Preapplications referencing Program Notice DE-FG01-05ER05-14 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 facilitate a faster response.

Formal applications

For this Solicitation, the Office of Science is using Grants.Gov for the electronic submission of applications. The Funding Opportunity Number is: DE-FG01-05ER05-14 and the CFDA Number for the Office of Science is: 81.049. Instructions and forms are available on the Grants.Gov website. Please refer to the "Funding Opportunity Announcement", Part IV -

Application and Submission Information; H. Other Submission and Registration Requirements for more specific guidance on "Where to Submit" and "Registration Requirements."

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>. Background material on ARM science is available through the ARM Science Plan <http://www.arm.gov/publications/programdocs/doe-er-arm-0402.pdf>.

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 and validating new parameterizations for climate models. Tools that are being used include, but are not limited to, cloud system resolving models (CSRMs) that directly and accurately simulate cloud-scale physical processes. Areas of interest include convection triggering conditions, closure assumptions, mechanisms and magnitudes of convective and mesoscale updrafts and downdrafts, convection- PBL interactions, and the importance of 3-D radiative transfer.

The ARM program has established three fixed facilities and has developed a mobile facility to collect cloud and radiation data in several climatic regimes. The Southern Great Plains (SGP) facility began operation in calendar year 1992, with instruments spread over an area of approximately 60,000 sq. km., centered on Lamont, Oklahoma. The SGP facility location 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) facility is located in the area roughly between 10°N to 10°S of the equator from Indonesia to near Christmas Island. It 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 a location for an ARM facility because it plays a large role in the interannual variability observed in the global climate system. The third facility, the North Slope of Alaska (NSA), is located at Barrow, Alaska, with a secondary, inland site near Atkasuk. The location of the NSA facility was selected 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. The development of the

ARM Mobile Facility (AMF) was completed in FY 2005, and its first deployment will begin in March 2005 at Pt. Reyes, California. In 2006 the AMF will be deployed at Niamey in Niger (13.5°N 2°E), during the field phases of the African Monsoon Multidisciplinary Analysis (AMMA) and related experiments. 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 facilities, both mobile and fixed, have been designated as a user facility, the ARM Climate Research Facility (ACRF). AMF deployments and campaigns at the fixed ARM sites will be determined by a review by the ACRF Science Review Board.

Request for Applications

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: "Deliver improved climate data & models for policy makers to determine safe levels of greenhouse gases for the Earth system. By 2013, substantially reduce differences between observed temperature and model simulations at subcontinental scales using several decades of recent data."

This Notice requests applications for grants, both new and renewal that address the ARM goal of improving the accuracy of climate model simulations by enhancing the representation of cloud and radiation processes in the models. The research areas of interest include the development of algorithms for retrieving the required measurements from ARM instruments, studies utilizing ARM data 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 ARM data format is not directly and readily amenable for use by climate modelers, research is also needed to develop tools and methodologies for making ARM data more useful for the development and testing of climate models.

Specific areas of interest to the ARM program follow:

- Developing new techniques to retrieve the properties all clouds, with a special focus on the properties of ice clouds and mixed-phase clouds.
- Conducting analyses to improve our understanding of cloud and radiation processes including 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.
- Developing and testing 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 limited to those that utilize ARM generated data in the proposed research. Applications for instrument development will not be considered. 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. For approved campaigns see (<http://www.db.arm.gov/cgi-bin/IOP/iops.pl>.)

Applications for research to develop new techniques to retrieve the properties of ice clouds and mixed-phase clouds using ARM data should be targeted on the development of methods for deriving long-term records of cloud microphysical and macrophysical properties at multiple locations. Proposed research to improve retrieval algorithms provide bulk microphysical estimates for clouds at all ARM fixed and mobile sites and must include uncertainty estimates.

Applications for cloud and radiation process analyses are requested that involve studies to elucidate radiative transfer in cloudy atmospheres, including the overlap problem of stratiform cloud layers. The proposed 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 based on the need 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. Areas of interest include convection triggering conditions, closure assumptions, mechanisms and magnitudes of convective and mesoscale updrafts and downdrafts, convection-PBL interactions, and the importance of 3-D radiative transfer.

Applications for research to develop and validate cloud and radiation parameterizations for global climate 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/projects/capt/>) effort at DOE's Program for Climate Model Diagnosis and Intercomparison (PCMDI).

Applications on research to develop and apply methodologies to use ARM data more effectively in atmospheric models should focus on either providing data to initialize and constrain limited area models, both SCMs and CRMs, or providing data to evaluate model performance. Research on forcing data sets should develop data to provide the required boundary conditions at model top and sides to run simulations for the NSA and TWP locations. Research to provide data to evaluate model performance should address either converting ARM measurements into the forms

that can be directly applied to model output or to developing techniques for converting model output to a form that is equivalent to ARM measurements.

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 especially the optical properties of aerosols and use these relations to develop and test parameterizations and/or process models to accurately predict the effect of aerosols on the atmospheric radiative properties. Note that the DOE Atmospheric Science Program (ASP) was reconfigured in FY 2004 to focus on aerosol radiative forcing with new research that began in early FY 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.

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 working group 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 \$3M will be available for awards in Fiscal Year 2006, 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 15, 2005. Equal consideration will be given to renewal and new applications.

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.science.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, 2005. 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.science.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. A separate panel will be convened to determine the programmatic relevance of the application.

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

Martin Rubinstein
Grants and Contracts Division
Office of Science

Posted on the Office of Science Grants and Contracts Web Site
February 16, 2005.