

**Office of Science
Notice 03-09**

***Environmental Meteorology
Component of the Atmospheric Science Program (ASP), with
focus on Vertical Transport and Mixing***

Department of Energy

Office of Science Financial Assistance Program Notice 03-09; Environmental Meteorology Component of the Atmospheric Science Program (ASP), with focus on Vertical Transport and Mixing

AGENCY: U.S. Department of Energy

ACTION: Notice inviting grant applications.

SUMMARY: The Office of Biological and Environmental Research (OBER) of the Office of Science (SC), U.S. Department of Energy (DOE), hereby announces its interest in receiving applications for the Environmental Meteorology Component of the Atmospheric Science Program (ASP), for the Vertical Transport and Mixing (VTMX) Science Team. The research program supports the Department's Climate Change Research Program, the U.S. Global Change Research Program, and the Administration's goals to understand the meteorological processes associated with air quality and climate change.

DATES: Applicants are strongly encouraged to submit a brief preapplication for programmatic review. The deadline for submission of preapplications is April 28, 2003. Early submission of preapplications is encouraged.

Formal applications submitted in response to this notice must be received by 4:30 p.m., E.D.T., June 3, 2003, to be accepted for merit review and to permit timely consideration for award in Fiscal Year 2004. The applicants are also asked to submit an electronic copy of the abstract in ASCII format by 4:30 p.m., E.D.T., June 3, 2003, to: Rick.petty@science.doe.gov. The abstract should include the following information: PI and co-PIs, their institutions, and a brief summary of research.

Applicants are urged to review abstracts of proposals from DOE Laboratory scientists that have been tentatively selected for funding. Those selected proposals will be located at: <http://www.science.doe.gov/ober/GC/atsi.html> by March 26, 2003. Additionally, The VTMX Science Plan can be viewed at: <http://www.pnl.gov/VTMX>. Applications that are collaborative with or complementary to DOE Laboratory proposals are strongly encouraged.

ADDRESSES: Preapplications referencing Program Notice 03-09 may be sent to the program contact, Rickey Petty, via electronic mail at: Rick.petty@science.doe.gov or by U.S. Postal

Service Mail at Climate Change Research Division, Office of Biological and Environmental Research, Office of Science, SC-74/Germantown Building, U.S. Department of Energy, 1000 Independence Avenue, S.W., Washington, DC 20585-1290. Electronic mail is recommended to speed up response to preapplications.

Formal applications in response to this solicitation are to be electronically submitted 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. 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 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 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: Rickey Petty, Climate Change Research Division, Office of Biological and Environmental Research, Office of Science, SC-74/Germantown Building, U.S. Department of Energy, 1000 Independence Avenue, S.W., Washington, D.C. 20585-1290, telephone: (301) 903-5548, E-mail: Rick.petty@science.doe.gov, fax: (301) 903-8519. The full text of Program Notice 03-09 is available via the Internet using the following web site address: <http://www.sc.doe.gov/production/grants/grants.html>.

SUPPLEMENTARY INFORMATION: The scope of the research to be supported under this notice is the investigation of atmospheric vertical transport and mixing processes. The geographic focus for this research will be on urban areas affected by nearby elevated terrain, with an emphasis on studies of stably stratified conditions, periods with weak or intermittent turbulence, and morning and evening transition periods.

Background

The measurement and modeling of vertical transport and mixing processes in the lower atmosphere are of fundamental importance to modeling air quality, climate and weather. The upward and downward movements of air parcels in stable and residual layers of the atmosphere and the interactions between adjacent layers are particularly difficult processes to measure and characterize, and significant difficulties also exist in describing the behavior of the atmosphere during morning and evening transition periods. Limited understanding of the effects of heterogeneous land surfaces and complex terrain further limits our ability to understand and simulate vertical transport and mixing processes.

To address these issues a VTMX science team carried out field campaign in the Salt Lake City region in October 2000. These observations provide a data base for use in modeling and analytical studies, including mesoscale modeling, large eddy simulations (LES), direct numerical simulations (DNS), and conceptual modeling. Additional information on VTMX activities up to the present time may be found at: <http://www.pnl.gov/VTMX/>.

Although advances have been and continue to be made in understanding and modeling vertical transport and mixing, the basic VTMX goals remain the same: to increase understanding of the mechanisms responsible for vertical transport and mixing; to improve our ability to measure and quantify the processes that account for VTMX; and to capture the improved understanding in vertical transport and mixing models.

Our particular interest in realizing these objectives is to improve the ability to accurately simulate and predict the effects of energy-related emissions on air quality in urban regions affected by adjacent elevated terrain (e.g., urban basins or valleys). The emphasis in this program area of the Atmospheric Science Program is on vertical transport and mixing processes in stably stratified conditions, in conditions of weak or intermittent turbulence, and during morning and evening transition periods.

A significant component of this program revolves around observations and data analyses from cooperative field measurement campaigns in urban basins or valleys. Depending on the availability of funds, the next major field experiment will most likely occur during the fall of 2004, with the Salt Lake City region again being the most likely study area.

Horizontal scales of interest are on the order of two hundred kilometers or less. Vertical scales will depend on the height of the daytime mixed layer and the elevation of any nearby terrain and will generally be on the order of a few kilometers or less. It is realized, of course, that processes involving larger scales may have to be taken into account for a full understanding of smaller-scale ones.

Categories

Applications are solicited in one or more of three principal categories: (1) Analysis of Existing Data Sets; (2) Field Experiments; and (3) Improvement of VTMX Models and Modeling Approaches. Prospective investigators should explicitly specify what category or categories are addressed by their proposed research. Individuals or groups intending to participate in field experiments should describe what measurements they intend to make and what instruments will be used to make them. Those intending to analyze data from one or more instruments or who will use data in numerical or conceptual modeling should specify what data are required for their purposes.

Category 1. Analysis of Existing Data Sets.

In addition to the data available from the October 2000 Salt Lake City VTMX field experiment, there are a large number of data sets collected in other field campaigns that may be useful in the study of vertical transport and mixing processes. Analyses or other use of these data may directly

contribute to the realization of the program's goals, and they may also help to identify processes to be studied in future field experiments and in the design of those experiments. Such analyses are particularly useful if comparisons or contrasts with findings from the next VTMX field experiments can then be made.

Category 2. Field Experiments.

One or more experiments designed explicitly to investigate selected vertical transport or exchange mechanisms will be conducted during the course of the new funding cycle for this program. Measurements will include observations of surface meteorological conditions; vertical profiles of wind velocity, temperature, and humidity; turbulence; surface energy balance, and other quantities that may be relevant to the study of vertical transport or exchange.

Measurements and subsequent analysis of the data, in one or more of these areas is encouraged. Novel approaches for obtaining and interpreting remote sensing data, combining results from a variety of instrument platforms, and relating these data to quantities that can be calculated using numerical models are also areas of research that are encouraged.

Instrument development is not anticipated to be an area of research supported by this program. To the extent that the novel use of an instrument might provide crucial measurements for field experiments, or that such experiments might provide an opportunity to apply new instrument technologies developed under other programs, however, support for such activities will be considered.

Category 3. Improvement of VTMX Models and Modeling Approaches.

Parameterizations of vertical transport or exchange are often based on assumptions about turbulence that are not applicable in all circumstances or on results of simulations that have been "tuned" to match a particular data set. In many cases the choice of parameter values is left to the individual investigator. Numerical models are particularly prone to failure as the atmosphere becomes more stable and in areas where topographic and thermal forcing are significant. New conceptual or numerical approaches may then be required to effect significant improvements in model performance. There is a need not only for further developments in numerical and conceptual modeling but also for more systematic testing and evaluation of the parameterizations and assumptions in these models. Whenever possible, such testing should be based on field data and not simply on model vs. model comparisons.

Science Issues

Relevant science issues that are of interest for this solicitation include:

- Identification of the fundamental processes that control vertical transport for stable and transition boundary layers.
- Measurements to identify and quantify these processes.
- Simulation and prediction of momentum, heat, and moisture surface fluxes in a stratified atmosphere with multiple layers.

- Improving numerical simulations and forecasts of vertical transport and mixing during stable and transition periods.
- Develop formulations for describing vertical diffusion in stable air.
- Improving understanding of how pollutants move through residual layers above stable or convective boundary layers.
- Quantifying the sensitivity of current local dispersion model predictions to variations in the treatment of vertical diffusivity and turbulence, and identify what limits our ability to forecast vertical transport in current numerical models.
- Quantify the effects of the thermal and roughness properties of urban areas on the vertical structure of the boundary layer.
- Determine the nature of (and where possible, quantify) the interaction of synoptic or terrain-induced flows with cold air pools in basins, and assess how such flows affect the formation and erosion of those pools and the dispersion of pollutants in them.
- Improve estimates of surface flux energy budgets.

Programmatic Issues

Collaboration among funded investigators is strongly encouraged for VTMX. Scientists from non-DOE laboratories and universities are encouraged to explore potential areas of collaboration with scientists from one or more of the DOE laboratories by reviewing the abstracts of proposals from the DOE laboratory scientists that have been identified as eligible for funding. The abstracts will be posted at: <http://www.science.doe.gov/aber/GC/atsi.html> approximately March 26, 2003, two months after the closing date of the Lab announcement. It is for this reason that the submission dates for DOE and non-DOE scientists are staggered. Alternatively, non-DOE participants may identify gaps in the research that are not covered by DOE laboratory approved proposals. Note that while independent investigations are anticipated in this program, it is important to keep the programmatic scope (vertical transport and mixing), geographic focus (urban basins or valleys), and areas of emphasis (stable conditions, conditions of weak or intermittent turbulence, and morning and evening transition periods) in mind when proposing and pursuing a course of investigation. Many of the principal research activities of this program will be associated with one or more cooperative major field measurement campaigns conducted by the VTMX community and with the subsequent analysis of the data collected in them. In addition, efforts will be made to encourage scientists funded by other agencies to participate in field experiments and to share data and results with researchers in this program. An annual meeting of program participants and other interested parties is anticipated, and investigators funded under VTMX should plan to attend.

Additionally, favorable consideration will be provided to those preapplications that show synergism with other research components of the Atmospheric Science Program, i.e., Atmospheric Chemistry and Tropospheric Aerosols.

Educational Opportunities

Opportunities exist for the financial support of undergraduate and graduate students wishing to participate in this program through the Department of Energy's Global Change Education Program. Information can be obtained at: <http://www.atmos.anl.gov/GCEP/> on the Internet.

Collaboration

Proposers are strongly encouraged to collaborate with researchers in other institutions, 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>.

Program Funding

It is anticipated that approximately \$1 million in first-year funding will be available for multiple awards to be made early in Fiscal Year 2004 in the categories described above, contingent upon availability of appropriated funds. Applicants may request project support up to four years, with out-year support contingent on availability of appropriated funds, progress of the research, and programmatic needs. The number of awards and range of funding will depend on the number of applications received and selected for award. Annual budgets are expected to range from \$60,000 to \$200,000 in total costs.

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 EMP 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 a formal application generally will be communicated within 15 days of receipt. Use of electronic mail for this communication will decrease the possibility of delay in responses to the preapplication.

The deadline for the submission of preapplications is April 28, 2003. 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>.

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.

Submission Information

Information about development and submission of applications, eligibility, limitations, evaluation, 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 the Guide and required forms is made available via the World Wide Web at: <http://www.sc.doe.gov/production/grants/grants.html>. DOE is under no obligation to pay for any costs associated with the preparation or submission of applications if an award is not made.

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. Awards are expected to begin on or about November 1, 2004. On the grant face page, form DOE F 4650.2, in block 15, also provide the PI's phone number, fax number and e-mail address. Attachments include 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 applicants are asked to submit an electronic copy of the abstract in ASCII format to: Rick.petty@science.doe.gov. The abstract should include the following information: PI and co-PIs, their institutions, and a brief summary of research.

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

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for Resource Management

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