Office of Science
Financial Assistance
Summary of
Funding Opportunity Announcement

DE-FOA-0000536
Terrestrial Ecosystem Science

Office of Biological and Environmental Research (BER)

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 terrestrial ecosystem science that will improve the understanding of the role of terrestrial ecosystems in climate forcing related to a changing climate.

BER's Terrestrial Ecosystem Science (TES) program is the result of the consolidation of its former Terrestrial Carbon Processes (TCP) program and Program in Ecological Research (PER). The TES program will consider applications on measurements, experiments, modeling and synthesis that provide improved quantitative and predictive understanding of the terrestrial ecosystem that can affect atmospheric greenhouse gas concentration changes and thereby affect the anthropogenic gas forcing of climate. The emphasis of this FOA is to understand the impacts of, and feedbacks from a changing climate on non-managed terrestrial ecosystems. Authors should pose their research applications in the context of representing terrestrial ecosystem processes in earth system models.

Both single investigator projects and multi-investigator projects are encouraged. Multi-investigator projects are expected to integrate the efforts of a multi-disciplinary team to tackle problems that cannot be effectively addressed by a single investigator. All projects should clearly delineate an integrative, hypothesis-driven research approach or synthesis activity and describe how the results of the research would ultimately improve our ability to understand and predict the role of the terrestrial ecosystems in a changing climate.

Proposed research is intended to fill critical knowledge gaps, including the exploration of high-risk approaches. BER also encourages the submission of innovative exploratory applications with potential for future high impact on terrestrial ecosystem science. The probability of success and the risk-reward balance will be considered when making funding decisions.

PREAPPLICATIONS:

Preapplications are required.

Potential applicants are required to submit a brief preapplication, referencing Funding Opportunity Announcement DE-FOA-0000536 for receipt by DOE by 4:30 p.m., Eastern Time, June 14, 2011.

Preapplications are limited to three pages total, including a prescribed cover page. The cover page should include: the project title, the Lead PI's name and complete contact information, whether a New/Revised and Full/Exploratory application is anticipated, and a table listing the Lead PI and institution and all Co-PIs requesting funds, their institutions and the approximate amounts of funding requested for each institution for each year for the project. A sample cover page can be downloaded from http://science.energy.gov/ber/research/cesd/preapp_cover_page_templ.

Preapplications should be sent individually as a single PDF file attachment via email to: Daniel.Stover@science.doe.gov. The subject line of the email must state: "Preapplication DE-FOA-0000536- [Full or Exploratory]". Preapplications must be received by DOE by 4:30 p.m., Eastern Time, June 14, 2011. No FAX or mail submission of preapplications will be accepted.

Preapplications will be reviewed for conformance with the guidelines presented in this FOA and suitability in the technical areas specified in this FOA. A response to the preapplications encouraging or discouraging formal applications will be communicated to the applicants by July 5, 2011. Applicants who have not received a response regarding the status of their preapplication by this date are responsible for contacting the program office to confirm the status of their preapplications.

Preapplications should describe the research objectives, the technical approach(es), and the proposed team members, their expertise and their roles in the proposed project. The intent in requesting a preapplication is to save the time and effort of applicants in preparing and submitting a formal project application that may be inappropriate for the program.

Preapplications will be reviewed relative to the scope and research needs as outlined in this FOA and outlined in the Climate Research Roadmap workshop report (at http://science.energy.gov/~/media/ber/pdf/Climate_roadmap_workshop_2010.pdf). Biographical data are not required for preapplications, nor is an institutional endorsement necessary.

APPLICATION DUE DATE: September 12, 2011, 11:59 PM Eastern Time

Formal applications submitted in response to this FOA must be received by September 12, 2011, 11:59 PM Eastern Time, to permit timely consideration of awards in Fiscal Year 2012. **You are encouraged to transmit your application well before the deadline. APPLICATIONS RECEIVED AFTER THE DEADLINE WILL NOT BE REVIEWED OR CONSIDERED FOR AWARD.**

IMPORTANT SUBMISSION INFORMATION:
The full text of the Funding Opportunity Announcement (FOA) is located on FedConnect. Instructions for completing the Grant Application Package are contained in the full text of the FOA which can be obtained at: https://www.fedconnect.net/FedConnect/?doc=DE-FOA-0000536&agency=DOE. To search for the FOA in FedConnect click on "Search Public Opportunities". Under "Search Criteria", select "Advanced Options", enter a portion of the title "Terrestrial Ecosystem Science", then click on "Search". Once the screen comes up, locate the appropriate Announcement.

In order to be considered for award, Applicants must follow the instructions contained in the Funding Opportunity Announcement.

Where to Submit: Applications must be submitted through Grants.gov to be considered for award. You cannot submit an application through Grants.gov unless you are registered. Please read the registration requirements carefully and start the process immediately. Remember you have to update your CCR registration annually. If you have any questions about your registration, you should contact the Grants.gov Helpdesk at 1-800-518-4726 to verify that you are still registered in Grants.gov.

Registration Requirements: There are several one-time actions you must complete in order to submit an application through Grants.gov (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the Central Contract Registry (CCR), register with the credential provider, and register with Grants.gov). Use the Grants.gov Organization Registration Checklist at http://www.grants.gov/assets/OrganizationRegCheck.pdf to guide you through the process. Designating an E-Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in the CCR registration process. Applicants, who are not registered with CCR and Grants.gov, should allow **at least 21 days** to complete these requirements. It is suggested that the process be started as soon as possible.

IMPORTANT NOTICE TO POTENTIAL APPLICANTS: When you have completed the process, you should call the Grants.gov Helpdesk at 1-800-518-4726 to verify that you have completed the final step (i.e. Grants.gov registration).

Questions: Questions relating to the registration process, system requirements, how an application form works, or the submittal process must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov.

Application Receipt Notices

After an application is submitted, the Authorized Organization Representative (AOR) will receive a series of four E-mails. It is extremely important that the AOR watch for and save each of the emails. It may take up to two (2) business days from application submission to receipt of email Number 2. The titles of the four E-mails are:

Number 1 - Grants.gov Submission Receipt Number
Number 2 - Grants.gov Submission Validation Receipt for Application Number
Number 3 - Grants.gov Grantor Agency Retrieval Receipt for Application Number
Number 4 - Grants.gov Agency Tracking Number Assignment for Application Number

Questions regarding the content of the Funding Opportunity Announcement (FOA) must be submitted through the FedConnect portal. You must register with FedConnect to respond as an interested party to submit questions, and to view responses to questions. It is recommended that you register as soon after release of the FOA as possible to have the benefit of all responses. More information is available at https://www.fedconnect.net/FedConnect/PublicPages/FedConnect_Ready_Set_Go.pdf. DOE will try to respond to a question within 3 business days, unless a similar question and answer have already been posted on the website.

Modifications: Notices of any modifications to this Funding Opportunity Announcement will be posted on Grants.gov and the FedConnect portal. You can receive an email when a modification or an announcement message is posted by registering with FedConnect as an interested party for this FOA. It is recommended that you register as soon after release of the FOA as possible to ensure you receive timely notice of any modifications or other announcements. More information is available at http://www.fedconnect.net.

All applications should be in a single PDF file.

GENERAL INQUIRIES ABOUT THIS FOA SHOULD BE DIRECTED TO:

Technical/Scientific Program Contacts:

Program Manager: Dr. Daniel Stover
Phone: (301) 903-0289
E-mail: Daniel.Stover@science.doe.gov

Merit Review Criteria

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

a) Scientific and/or Technical Merit of the Project
b) Appropriateness of the Proposed Method or Approach
c) Competency of Applicant's Personnel and Adequacy of Proposed Resources; and
d) 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 FOA and the agencies' programmatic needs. Note that 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 may be used, and submission of an application constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

Funding

It is anticipated that up to $3,000,000 will be available for approximately 10 to 15 awards to be made in Fiscal Year 2012, contingent on the availability of appropriated funds. For a Full Application, applicants may request project support for up to three years with annual budgets not to exceed $350,000/year total costs. The proposed research project should be designed to be completed within the three year period. For an Exploratory Application, applicants may request project support for up to two years with a total budget of up to $150,000. Applicants should specify whether they are submitting a Full Application or an Exploratory Application. DOE is under no obligation to pay for any costs associated with preparation or submission of preapplications or applications. DOE reserves the right to fund, in whole or in part, any, all, or none of the applications submitted in response to this FOA.

SUPPLEMENTARY INFORMATION: The TES program will consider applications on measurements, experiments, modeling and synthesis that provide improved quantitative and predictive understanding of the terrestrial ecosystem that can affect atmospheric greenhouse gas concentration changes and thereby affect the greenhouse gas forcing of climate. The emphasis of this FOA is to understand the impacts of, and feedbacks from a changing climate on non-managed terrestrial ecosystems. Authors should pose their research applications in the context of representing terrestrial ecosystem processes in earth system models.

A recent BER workshop outlined science needs for basic research in climate science, including terrestrial ecosystem science as described in the workshop report (http://www.sc.doe.gov/ober/ClimateRoadmapWorkshop_2010.pdf). BER encourages researchers to review this report with particular emphasis on the summary and chapters on "Terrestrial Science" and "Latitudinal Opportunities for Integrated Research Efforts" to familiarize themselves with the identified science needs. The goal of the TES program is to

provide scientific knowledge of terrestrial ecosystems to (i) provide accurate predictions of their roles in influencing the atmospheric concentration of greenhouse gases; (ii) quantify terrestrial carbon sources and sinks and how they are changing in relation to other atmospheric, climatologic and hydrologic influences; and (iii) assess terrestrial feedbacks on carbon cycle and climate change. Ecosystems are the fundamental unit of research for the TES program. Using modeling and other extrapolation methods, results are expected to extend to bioregion scales, and also contribute to continental scale analysis of carbon cycle problems that are analyzed by the North American Carbon Program (NACP) (http://www.nacarbon.org/nacp/), for example. The TES program will consider applications on measurements, experiments, modeling and synthesis that provide improved quantitative and predictive understanding of the terrestrial ecosystem processes that can affect atmospheric greenhouse gas concentration changes and thereby affect climate forcing.

The emphasis of this FOA is to understand the feedbacks to non-managed terrestrial ecosystems from a changing climate. Authors should pose their research applications in the context of representing terrestrial ecosystem processes in earth system models. This can be done through process research applications that specify mechanisms for the incorporation of results into state of the art ecosystem models, by proposing direct improvements to such models (i.e., modeling applications) or through synthesis activities that draw on existing data sets. Authors are encouraged to consider utilization of or collaboration with sites that have existing support (e.g., former FACE or existing AmeriFlux projects) thereby leveraging existing investments, archived samples and long-term data sets.

Relevance of proposed research to DOE's mission will be gauged by the extent that proposed carbon cycle research products contribute to the **long-term performance measure** (LTM) of DOE's climate change research, which is -- *Deliver improved scientific data and models about the potential response of the Earth's climate and terrestrial biosphere to increased greenhouse gas levels for policy makers to determine safe levels of greenhouse gases in the atmosphere*. In addition to the merit review criteria mentioned in Part V – Application Review Information, it will be important for the proposed research to identify how anticipated research products will contribute to the LTM.

While the program supports a broad spectrum of fundamental research in terrestrial ecosystem science and will consider research applications within this scope, this FOA encourages applications in the following Science Areas:

- The role of natural disturbances in carbon cycling, particularly disturbances associated with changing climate (e.g., changes in atmospheric carbon, precipitation, nutrients)
- The role of belowground processes and mechanisms across scales (e.g., soil carbon transformation, root dynamics, mycorrhizal interactions, and plant mediated (e.g. root exudates) biogeochemical transformations) associated with a changing climate.
- Factors controlling belowground processes associated with transformation of biomass into soil organic matter and stabilization mechanisms of the long-lived carbon components in soil as well as the results of those processes in the context of a changing climate.

- Responses and feedbacks of coupled biogeochemical cycles to climate change, including coupled trace element cycling (e.g. Mo, Fe).
- New and improved understanding of carbon pathways, fluxes and ecosystem function with particular emphasis on Arctic and tropical ecosystems

Belowground processes are a critical component to carbon cycling, yet our understanding of the specific processes have been over simplified or ignored. This "black box" approach to belowground systems will not lead to a mechanistic and predictive understanding of these systems as potential long-term terrestrial sinks for carbon. The goals of belowground ecosystem research are to quantify rates and magnitudes of carbon accretion, and to understand processes and properties that control transformation of biomass into organic matter, including studies of stabilization mechanisms of the long residence time components, their fate, and ecosystem feedbacks. Research is needed on these processes for different climate and vegetation conditions (e.g., as represented by AmeriFlux research sites) where results can be spatially scaled to estimate carbon changes across climate zones and bioregions. Products of research that focus on belowground carbon processes (e.g., organic matter stabilization and dynamics, carbon turnover rates, root and microbial respiration, carbon/nitrogen/other relationships) should provide new insights and model representation opportunities for coupled interactions, residence time and other carbon source or sink properties of belowground ecosystem components.

Applications that include the collection of carbon flux measurements must contribute to the AmeriFlux Network (http://public.ornl.gov/ameriflux/). The establishment of new carbon flux locations will be balanced carefully against the value of existing sites. Potential applicants are encouraged to review the existing AmeriFlux locations and to consider opportunities for collaboration as alternatives to the establishment of new sites. For applications that seek to sustain existing AmeriFlux locations, priority will be placed on hypothesis-based research that has a strong record of measurement performance and prompt delivery of data products to the AmeriFlux archive for use by the broader scientific community. Applicants are referred to the "AmeriFlux self-evaluation" report on the web site for information on expected operational and performance requirements. There is an established archive for reporting AmeriFlux data (see AmeriFlux web site for protocols), and supported projects will be expected to comply rigorously with reporting guidelines and standards.

Modeling, synthesis and integration activities should consider utilization of available AmeriFlux and FACE data products. Applications should identify large computational requirements and their proposed plan for acquiring access to appropriate computational resources.
DOE's Climate Change research is an integral component of the U.S. Global Change Research Program (USGCRP) (http://www.globalchange.gov/), which is closely coordinated with other Federal carbon cycle research through the Carbon Cycle Science Program (http://www.carboncyclescience.gov/). The website for the Carbon Cycle Science Program includes a "Relevant Documents" section that provides links to key documents outlining science needs for U.S. carbon science research programs. The carbon cycle science community recently began an effort to update and revise the 1999 U.S. Carbon Cycle Science Plan – written by a committee chaired by Jorge Sarmiento and Steve Wofsy. Applicants are encouraged to review *A U.S. Carbon Cycle Science Plan* (Sarmiento and Wofsy, 1999) (http://www.carboncyclescience.gov/documents/cc_sp_1999.pdf), and the State of the Carbon

Cycle Report (SOCCR) (http://www.carboncyclescience.gov/programs.php#SOCCR) as the latest descriptions of research needs for this area.

Collaboration and Training

Multi-disciplinary and inter-institutional collaborations are strongly encouraged to enhance and strengthen research capabilities as needed. Collaboration could include institutions such as universities, industry, non-profit organizations, federal laboratories and Federally Funded Research and Development Centers (FFRDCs), including the DOE National Laboratories. All collaborative applications should include letters of agreement from each collaborator who would receive funding. These letters should specify the contributions the collaborators intend to make if the application is accepted and funded. **Applications for multi-investigator projects must present a management structure** for integrating collaborating investigators. Involvement of students and post doctoral scientists is encouraged. Refer to http://www.sc.doe.gov/grants/colab.asp for details. Only the Lead Institution and PI need submit an application to this FOA at this time but the submission **must** include all budgetary information for all funded Co-PIs.

Data Sharing Policy: Research data obtained through public funding are a public trust. As such, these data must be publicly accessible. To be in compliance with the data policy of the U.S. Global Change Research Program of full and open access to global change research data, **applications submitted in response to this FOA must include a description of the researcher's data sharing plans if the proposed research involves the acquisition of data in the course of the research that would be of use to the climate research and assessment communities**. This includes data from extensive, long-term observations and experiments and from long-term model simulations of climate that would be costly to duplicate. The description must include plans for sharing the data that are to be acquired in the course of the proposed research, particularly how the acquired data will be preserved, documented, and quality assured, and where it will be archived for access by others. Data of potentially broad use in climate change research and assessments should be archived, when possible, in data repositories for subsequent dissemination. Examples of DOE-funded data repositories may be found at http://cdiac.ornl.gov/, http://www-pcmdi.llnl.gov/ipcc/about_ipcc.php. The repository where the researcher intends to archive the data should be notified in advance of the intention, contingent on a successful outcome of the application review. If data are to be archived at the researcher's home institution or in some other location, the application must describe how, where, and for how long the data will be documented and archived for access by others. Researchers are allowed an initial period of exclusive use of the acquired data to quality assure it and to publish papers based on the data, but they are strongly encouraged to make the data openly available as soon as possible after this period. DOE's Office of Biological and Environmental Research defines the exclusive use period to be one year after the end of the data acquisition period for the proposed performance period of the award but exceptions to extend this period may be justified for unique or extenuating circumstances.

Availability of User Facilities and Other Specialized Resources

The Department of Energy has responsibility for programs and facilities that offer unique and complementary resources that support research in terrestrial ecosystem science. Potential applicants are encouraged to consider use of these programs/facilities in developing their applications. The author must certify that site coordinators and/or advisory panels have agreed to plans for the proposed research. This certification should be in the form of a letter of support included with the application.

DOE has supported a number of FACE experiments (http://public.ornl.gov/face/index.shtml) that have recently undergone destructive harvest. Some of these sites have maintained archives of treatment and control plant material and soil which are available for use by the scientific community. DOE encourages the community to consider the use of these unique and valuable samples as part of applications to this FOA. For more information contact the appropriate FACE site coordinator (http://public.ornl.gov/face/global_face.shtml).

DOE also supports an experiment to assess the response of northern boreal and peatland ecosystems to increases in temperature and exposures to elevated atmospheric CO_2 concentrations. The Spruce and Peatland Responses Under Climatic and Environmental Change (SPRUCE) experiment is currently being established at the Marcell Experimental Forest in northern Minnesota. More information including opportunities for collaboration with this study can be found at: http://mnspruce.ornl.gov/.

The Environmental Molecular Science Laboratory (EMSL) (http://www.emsl.pnl.gov/emslweb/) at the Pacific Northwest National Laboratory (PNNL), a national scientific user facility, provides integrated experimental and computational resources for discovery and technological innovation in the environmental molecular sciences to support the needs of DOE and the nation. Advanced imaging, spectroscopy, high-resolution mass spectroscopy and transciptomics/proteomics are a few of the many capabilities at EMSL are available to users free of charge for understanding the complex biogeochemistry that occurs at mineral/water and microbe/mineral interfaces in the terrestrial biosphere.

The Center for Accelerator Mass Spectrometry (CAMS) (https://cams.llnl.gov/about.php) at Lawrence Livermore National Laboratory provides accelerator mass spectroscopy capabilities on a cost-recovery basis to the scientific community. In the context of carbon cycle studies, radiocarbon measurements can be used to determine the 'age' and rate of change of carbon stocks or as a biogeochemical tracer to elucidate processes and pathways. CAMS provides technical and analytical support to several existing research projects in the carbon cycle sciences. More information on the applicability of CAMS capability to carbon cycle science is available at https://cams.llnl.gov/naturalcarbon.php?id=8.

DOE supports high performance computing centers, which provide compute cycles to the scientific user community, including the National Energy Research Scientific Computing Center (NERSC) at the Lawrence Berkeley National Laboratory (http://www.nersc.gov), and the National Center for Computational Sciences (NCCS) at the Oak Ridge National Laboratory (http://nccs.gov).

The Joint Genome Institute (JGI) (http://www.jgi.doe.gov/) in Walnut Creek, California provides the scientific community access to state of the art genomic sequencing capabilities for microbial, plant, and other (non-pathogen) targets. In all cases, the aim of the JGI is to provide to the national and international scientific community the genome-derived "parts lists" that support further discovery.

DOE also provides users with access to synchrotron light sources that are capable of providing structural and chemical information often unavailable with conventional sources of x-rays. DOE laboratories with synchrotrons include: Argonne National Laboratory (http://www.aps.anl.gov/); Brookhaven National Laboratory (http://www.nsls.bnl.gov/); Lawrence Berkeley National Laboratory (http://www.als.lbl.gov/); and Stanford Synchrotron Radiation Laboratory (http://www-ssrl.slac.stanford.edu/index.html). Use of the synchrotron light sources requires a separate approval process.

Any Other Special Requirements:

Only the Lead Institution and PI need submit an application to this FOA, but the submission **must** include all budgetary information for all funded Co-PIs. The application narrative should begin with a cover page that includes: the project title, the Lead PI's name and complete contact information, whether the application is for a **Full** or **Exploratory** project, and a table listing the Lead PI and institution and all funded Co-PIs, their institutions and the amount of funding requested for each year for the project for each funded investigator. A sample cover page is available at http://science.energy.gov/ber/research/cesd/preapp_cover_page_templ.

In addition to the cover page mentioned in Part IV – Application and Submission Information, the submission package should include a one-page Executive Summary that identifies the name of the applicant, the project director/principal investigator(s), the project title, the objectives of the project, the hypotheses to be tested and/or the enabling capabilities to be developed, the proposed methodology, the names of **all investigators** and their affiliations, and the potential impact of the project to DOE (i.e., benefits, outcomes). **The Executive Summary must describe how the proposed research will support the accomplishment of the BER Long Term Measure to *"Deliver improved scientific data and models about the potential response of the Earth's climate and terrestrial biosphere to increased greenhouse gas levels for policy makers to determine safe levels of greenhouse gases in the atmosphere"***. Please include this behind the cover page. The Executive Summary does not count toward the narrative page limits.

Applications that previously have been submitted for review, but were declined, are required to address (within the Narrative Section) major issues and concerns raised from previous reviews and to describe how the application was improved and updated since the original submission. All applicants must check "NEW" on the SF-424 R&R when submitting. Do not select Revised or Resubmission.

All Lead PI's are required to attend TES PI meetings (generally a 2-day meeting) held in the Washington DC area or in conjunction with the North America Carbon Program (NACP). Travel funds should be budgeted to allow at least the lead PI to attend this meeting.

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

Posted on the Office of Science Grants and Contracts Web Site
May 10, 2011.