

**Office of Science  
Financial Assistance  
Funding Opportunity Announcement  
DE-FOA-0000287**

***Terrestrial Carbon Cycle Research***

**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 carbon cycle research that will improve the understanding of the role of terrestrial biomes in the global carbon cycle and aid carbon cycle predictions related to climate change.

BER's carbon cycle science program will consider applications on measurements, experiments, and modeling that provide improved quantitative and predictive understanding of the terrestrial carbon cycle processes that can affect atmospheric CO<sub>2</sub> concentration changes and thereby affect the CO<sub>2</sub> forcing of climate. The emphasis of this Funding Opportunity Announcement (FOA) is to understand the impacts of, and feed backs from a changing climate on non-managed terrestrial ecosystems. Authors should pose their research applications in the context of representing terrestrial carbon cycle 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 and describe how the results of the research would ultimately improve our ability to understand and predict the role of the terrestrial biosphere in the global carbon cycle.

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

BER's strategy for basic research in climate science, including carbon cycle science is described in a recent strategic plan (<http://www.sc.doe.gov/ober/Climate%20Strategic%20Plan.pdf>). BER encourages potential researchers to review this plan to familiarize themselves with the program's strategic goals.

Applications must identify whether the application is a **Full Application** or an **Exploratory Application**. The intent of the Exploratory research component is to catalyze the study of new concepts, tools and approaches that could lead to breakthroughs in terrestrial carbon cycle science and to develop novel ideas for later, more substantial funding opportunities within the program (i.e., Full applications). Exploratory projects will have shorter duration and less funding

than Full projects. Exploratory applications should address topics that could lead to breakthroughs in one or more of the science areas in the program.

## **PREAPPLICATIONS**

Potential applicants are **strongly encouraged** to submit a brief preapplication, referencing DE-FOA-0000287, but no formal deadline is established for submission and review.

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 Full or Exploratory application is anticipated, and a table listing the Lead PI and institution and all Co-PIs requesting funds, their institutions and the amount of funding requested for each year for the project. The template for the required cover page should be downloaded from [http://www.science.doe.gov/ober/CESD/preapp\\_cover\\_page\\_tmpl.html](http://www.science.doe.gov/ober/CESD/preapp_cover_page_tmpl.html).

Preapplications should be sent individually as a single PDF file attachment via email to: Michael.Kuperberg@science.doe.gov. The subject line of the email must state: "Preapplication DE-FOA-0000287 - [Full or Exploratory]".

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 within five days of receipt. Applicants who have not received a response regarding the status of their preapplication in a timely manner should contact the program office to confirm the status of their preapplication.

Preapplications should describe the research objectives, the technical approach(s), and the proposed team members and their expertise. 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 Strategic Plan (<http://www.sc.doe.gov/ober/Climate%20Strategic%20Plan.pdf>). Biographical data are not required for preapplications, nor is an institutional endorsement necessary.

**APPLICATION DUE DATE: May 3, 2010, 11:59 p.m. Eastern Time**

Formal applications submitted in response to this FOA must be received by May 3, 2010, 11:59 p.m. Eastern time, to permit timely consideration of awards. **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->

[0000287&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 Carbon Cycle Research", 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). See <http://www.grants.gov/GetStarted>. 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. Part VII of the FOA explains how to submit other questions to the Department of Energy (DOE).

**GENERAL INQUIRIES ABOUT THIS FOA SHOULD BE DIRECTED TO:**

**Technical/Scientific Program Contact:**

**Program Manager:** Dr. J. Michael Kuperberg  
Office of Biological and Environmental Research  
U. S. Department of Energy  
**Phone:** 301-903-3281  
**E-Mail:** Michael.kuperberg@science.doe.gov

## **SUPPLEMENTARY INFORMATION:**

The Terrestrial Ecosystem Science research activity includes a strong component of terrestrial carbon cycle science. BER's strategy for basic research in climate science, including carbon cycle science, is described in a recent strategic plan (<http://www.sc.doe.gov/ober/Climate%20Strategic%20Plan.pdf>). The goal of the carbon cycle science program is to provide scientific knowledge of terrestrial carbon cycle to (i) provide accurate predictions of atmospheric CO<sub>2</sub> change; (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. 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 \(NACP\)](#), for example. The carbon cycle science program within DOE's Climate Science Program will consider applications on measurements, experiments and modeling that provide improved quantitative and predictive understanding of the terrestrial carbon cycle processes that can affect atmospheric CO<sub>2</sub> concentration changes and thereby affect the CO<sub>2</sub> forcing of climate.

The emphasis of this FOA is to understand the impacts of, and feed backs from a changing climate on non-managed terrestrial ecosystems. Authors should pose their research applications in the context of representing terrestrial carbon cycle 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 carbon cycle models or by proposing direct improvements to such models (i.e., modeling applications). Authors are encouraged to consider utilization of or collaboration with sites that already support Free-Air Carbon Dioxide Enrichment (FACE) or AmeriFlux projects, thereby leveraging existing investments and long-term data sets.

While the program supports a broad spectrum of fundamental research in terrestrial carbon cycle science, this FOA encourages applications in the following areas:

- The role of disturbance in carbon cycling, particularly disturbance associated with changing climate (changes in atmospheric carbon, precipitation, ecosystem type).
- Changes in the rate and nature of soil carbon accretion associated with potential climate change.
- Controls of transformation of biomass into soil organic matter and stabilization mechanisms of the long-lived carbon components in soil.
- New and improved approaches to develop relationships between flux measurements and ecosystem function. For example:

(a) Effects of projected warming amount on net primary production (NPP), net ecosystem production (NEP), and changes in soil carbon storage in northeastern forests;

(b) Effects of projected precipitation changes on NPP, NEP, and changes in soil carbon storage in western semi-arid ecosystems; and

(c) Effects of elevated CO<sub>2</sub> in combination with warming (as projected for next 50-100 years) on photosynthesis as affected by plant community changes (C3/C4 and/or woody/herbaceous).

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*. This LTM expects carbon cycle research to determine the fate of CO<sub>2</sub> emitted from human activities, to understand carbon cycle mechanisms and controls that affect CO<sub>2</sub> as a climate change forcing agent, and to quantify interactions between the carbon cycle and climate. In addition to the merit review criteria mentioned below, it will be important for the proposed research to identify how anticipated research products will contribute to the LTM.

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 in form and content 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.

As a potential long-term terrestrial sink for carbon, the goals of soil carbon research are to quantify rates and magnitudes of soil carbon accretion, and to understand processes and properties that control transformation of biomass into soil organic matter, including studies of stabilization mechanisms of the long residence time components. Research is also 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 soil carbon processes (e.g., organic matter stabilization and dynamics, carbon turnover rates, root and microbial respiration, carbon/nitrogen/other relationships) should provide new insights on residence time and other carbon source or sink properties of ecosystem soil components. Priority will be placed on soil carbon research that is conducted at or closely linked to DOE's AmeriFlux sites or FACE experiments (see below). Applicants must certify that resident coordinators have agreed to plans for soil carbon research by offsite scientists at their sites or experiments.

Modeling and integration activities should include utilization of available AmeriFlux and FACE data products. Applications should identify large computational requirements, if any.

DOE's Climate Change research is an integral component of the [U.S. Global Change Research Program \(US GCRP\)](#), which is closely coordinated with other Federal carbon cycle research through the [Carbon Cycle Science Program](#). 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 [U.S. Carbon Cycle Science Plan \(Sarmiento and Wofsy, 1999\)](#), and the [State of the Carbon Cycle Report \(SOCCR\)](#) 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 should present a management structure for integrating collaborating investigators. Involvement of students and post doctoral scientists is encouraged. Refer to <http://www.science.doe.gov/grants/Colab.html> for details.

**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 change 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](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 carbon cycle science. Potential applicants are encouraged to consider use of these programs/facilities in developing their applications.

DOE currently supports four [FACE experiments](#) that are in various phases of completing long-term experiments. FACE sites represent potential opportunities to obtain samples or to conduct short-term experiments. Applicants interested in FACE experiments should contact the appropriate lead investigator.

The [Environmental Molecular Science Laboratory \(EMSL\)](#) at the Pacific Northwest National Laboratory (PNNL), a national scientific user facility at PNNL, 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.

The [Center for Accelerator Mass Spectrometry \(CAMS\)](#) 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 is providing 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 this link <http://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 \(JGI\)](#) 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.

## **Program Funding**

It is anticipated that up to \$4,000,000 will be available for approximately 12 to 15 awards to be made in late Fiscal Year 2010 and early Fiscal Year 2011, 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. 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 the preparation or submission of an application. DOE reserves the right to fund, in whole or in part, any, all, or none of the applications submitted in response to this FOA.

## **Merit Review**

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 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; and
4. 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 FOA and the agency's programmatic needs. It should be noted that external peer reviewers are selected on the basis of 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 review process is acceptable to the investigator(s) and the submitting institution.

The Catalog of Federal Domestic Assistance (CFDA) 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  
February 26, 2010.