

**PROGRAM ANNOUNCEMENT
TO DOE NATIONAL LABORATORIES**



**U. S. Department of Energy
Office of Science
Office of Biological and Environmental Research**

**Climate Model Development and Validation
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Announcement Type: Initial**

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REGISTRATIONS

A. DOE Office of Science Portfolio Analysis and Management System (PAMS)

The DOE Office of Science performs many functions for DOE national laboratory proposals in the Portfolio Analysis and Management System (PAMS), which is available at <https://pamspublic.science.energy.gov>.

There are many activities that you can perform in PAMS, and more functionality will be added throughout the near future. DOE national laboratories will submit pre-proposals, letters of intent, and proposals directly into PAMS.

You must register in PAMS to submit a pre-proposal, letter of intent, or DOE national laboratory proposal.

To access PAMS, you may use the Internet Explorer, Firefox, Google Chrome, or Safari browsers.

Notifications sent from the PAMS system will come from the PAMS email address <PAMS.Autoreply@science.doe.gov>. Please make sure your email server/software allows delivery of emails from the PAMS email address to yours.

Registering to PAMS is a two-step process; once you create an individual account, you must associate yourself with (“register to”) your institution. Detailed steps are listed below.

1. CREATE PAMS ACCOUNT:

To register, click the “Create New PAMS Account” link on the website <https://pamspublic.science.energy.gov/>.

- Click the “No, I have never had an account” link and then the “Create Account” button.
- You will be prompted to enter your name and email address, create a username and password, and select a security question and answer. Once you have done this, click the “Save and Continue” button.
- On the next page, enter the required information (at least one phone number and your mailing address) and any optional information you wish to provide (e.g., FAX number, website, mailstop code, additional email addresses or phone numbers, Division/Department). Click the “Create Account” button.
- Read the user agreement and click the “Accept” button to indicate that you understand your responsibilities and agree to comply with the rules of behavior for PAMS.
- PAMS will take you the “Having Trouble Logging In?” page. (Note: If you reviewed for or were listed as PI on a prior submission to the Office of Science but have not previously created an account, you may already be linked to an institution in PAMS. If this is the case, PAMS will take you to the PAMS home page.)

2. REGISTER TO YOUR INSTITUTION:

- Click the link labeled “Option 2: I know my institution and I am here to register to the institution.” (Note: If you previously created a PAMS account but did not register to an institution at that time, you must click the Institutions tab and click the “Register to Institution” link.)
- PAMS will take you to the “Register to Institution” page.
- Type a word or phrase from your institution name in the field labeled, “Institution Name like,” choose the radio button next to the item that best describes your role in the system, and click the “Search” button. A “like” search in PAMS returns results that contain the word or phrase you enter; you need not enter the exact name of the institution, but you should enter a word or phrase contained within the institution name. (Hint: If your institution has an acronym, such as ANL for Argonne National Laboratory or UCLA for the Regents of the University of California, Los Angeles, you may search for the acronym under “Institution Name like.” Many institutions with acronyms are listed in PAMS with their acronyms in parentheses after their names.)
- Find your institution in the list that is returned by the search and click the “Actions” link in the Options column next to the institution name to obtain a dropdown list. Select “Add me to this institution” from the dropdown. PAMS will take you to the “Institutions – List” page.
- If you do not see your institution in the initial search results, you can search again by clicking the “Cancel” button, clicking the Option 2 link, and repeating the search.
- All DOE National Laboratories have established profiles in PAMS, so please keep searching until you find your laboratory.

For help with PAMS, click the “External User Guide” link on the PAMS website, <https://pamspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this DOE National Laboratory Announcement should reference **LAB 16-1530**.

RECOMMENDATION

The Office of Science encourages you to register in all systems as soon as possible. You are also encouraged to submit letters of intent, pre-proposals, and proposals before the deadline.

Section I – DOE NATIONAL LABORATORY OPPORTUNITY DESCRIPTION

GENERAL INQUIRIES ABOUT THIS ANNOUNCEMENT SHOULD BE DIRECTED TO:

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SUMMARY

The Climate Model Development and Validation (CMDV) Activity in the Climate and Environmental Sciences Division (CESD), Office of Biological and Environmental Research (BER) of the Office of Science (SC), U.S. Department of Energy (DOE), is a new effort to improve climate model architecture, software, and computational design to prepare for exascale computing, to develop scale-aware physics for climate systems, and to enhance methods for model validation. This solicitation focuses mainly on the development and validation of scale-aware physics parameterizations for the atmosphere, with the goal of including these in either the current or next generation version of DOE's Accelerated Climate Model for Energy (ACME). A recent workshop report (<http://www.arm.gov/publications/programdocs/acme-arm-asr-draft-report.pdf>) describes a new strategy to better align DOE capabilities across scales and disciplines in order to much more rapidly advance ACME development. In line with this strategy, this Announcement solicits multi-institutional team projects led by DOE National Laboratories (and including non-DOE Laboratory collaborators, as appropriate), that will work in an end-to-end manner between measurements and modeling, and across scales from local and/or regional to global, in order to improve the fidelity of global climate model simulations, with a view to enhanced predictability, and address critical climate science challenges.

The model representation of clouds and aerosols, and their changes in response to energy and climate drivers, remain the most uncertain elements in model predictions of the climate system. Therefore, improved predictability requires greater understanding and representation of the behaviors of clouds and chemistry within global climate models.

SUPPLEMENTARY INFORMATION

Program Objective

This CMDV activity will draw upon and integrate capabilities that span atmospheric research within BER, with the ultimate goal of providing a substantial and measurable improvement to atmospheric process representation and coupled climate fidelity in DOE's ACME model, and to address significant atmospheric science research challenges. BER's atmospheric research includes the [ARM](#) Facility (which is the premier ground-based observations facility with a mission to advance climate change research), the Atmospheric System Research ([ASR](#)) activity (which focuses on quantifying the interactions among aerosols, clouds, precipitation, radiation, dynamics, and thermodynamics to improve fundamental process-level understanding) and the Earth System Modeling ([ESM](#)) activity (which develops all aspects of global Earth System Models toward a goal of a predictive understanding of climate). CMDV offers an opportunity to leverage and combine these capabilities to ensure that DOE atmospheric measurements, process understanding and modeling, and parameterization development can be effectively utilized in an Earth System Model, as demonstrated by a careful evaluation plan. The processes to be targeted as part of the CMDV activity must be observed, modeled, and validated over a range of scales, from field to the ESM grid-scale.

Atmospheric System Research (ASR)

The goal of the ASR activity is to improve the scientific understanding and treatment in atmospheric models of clouds, aerosols, and radiative transfer processes that are important drivers of climate change. ASR conducts research to: determine the properties of, and interactions among, aerosols, clouds, precipitation, and radiation that are most critical to understand in order to improve their representation in climate models; ascertain the roles of atmospheric dynamics, thermodynamic structure, radiation, surface properties, and chemical and microphysical processes in the life cycles of aerosols and clouds, and develop and evaluate models of these processes; and identify and quantify processes along the aerosol-cloud-precipitation continuum that affect the radiative fluxes at the surface and throughout the atmosphere and the radiative and latent heating rate profiles, and improve the ability to accurately model these processes.

Earth System Modeling (ESM)

Earth System Modeling supports the development of a much more sophisticated climate predictive capability in order to underpin the Nation's societal and energy planning. These developments include complex representations of climate systems, coupling these with "human" systems and drivers as needed to improve climate simulation fidelity, and the application of next-

generation computational methods to facilitate and to accelerate model computational performance on DOE's current and next-generation NERSC and Leadership Class Facility (LCF) computers. In 2014, DOE launched a Laboratory-led multi-institutional project to develop the Accelerated Climate Model for Energy (ACME). **The ACME project** is developing and applying a computationally advanced climate and Earth system model to investigate the challenges posed by the interactions of climate change with energy and related sectors. The ACME model simulates the fully coupled climate system at high-resolution (15-25 km) and is incorporating coupling with energy, water, and related technologies and infrastructures, and with a focus on near-term hindcasts (1970-2015) for model validation and a near-term projection (2015-2050) for societal planning. The model further employs regional-refinement using adaptive mesh methodologies in order to provide ultra-high-resolution to resolve critical physical and dynamical phenomena.

ACME's scientific goals address three areas:

1. **Water Cycle**: "How do the hydrological cycle and water resources interact with the climate system on local to global scales?"
2. **Biogeochemistry**: "How do biogeochemical cycles interact with global climate change?"
3. **Cryosphere-Ocean System**: "How do rapid changes in cryosphere-ocean systems interact with the climate system?"

A major motivation for the ACME project is the paradigm shift in computing architectures and their related programming models as computational capabilities move towards the exascale era. ACME is therefore optimizing climate code performance for current and next-generation DOE Computer Facilities, by exposing increased concurrency throughout the model and increasing the on-core performance of key computational kernels. Redesigning code for better concurrency through the use of modularized kernels for accelerators will be beneficial for most envisioned exascale architectures.

An important aspect of adaptation to new architectures is a substantial effort to improve software design and practice. Early priorities for ACME software engineering include maintaining build, test, and performance tools for the relevant computer platforms, and providing rapid development and debugging capabilities to the team. In the longer-term, ACME will expand use of regression testing, tools for code coverage, correctness analysis, debugging at scale, and traceability of code back to scientific requirements. Productivity will be enhanced by greater use of libraries, frameworks, and tools.

ACME also has a substantial workflow effort, to enable and automate model simulation, post-processing, analysis and validation. Building from the Ultrascale Visualization Climate Data Analysis Tools (UV-CDAT) software, ACME output will be processed on a single workflow platform. Importantly, the workflow software can accommodate the very large data sets from the ACME high-resolution simulations and will enable "server-side" analysis of output rather than requiring porting of output to local machines. Model evaluation is initially based on well-established metrics developed by leading climate modeling centers. Availability of new observations, a focus on the ACME driving questions, and emphasis on high-resolution require

development of new diagnostics and metrics. Metrics are being established that will track model improvement and realism of the coupled system.

For more details on ACME, see the [ACME project web page](#), and particularly [Information for collaborators](#).

The ACME project has completed its first coupled model system (version 1 or “v1”), with the expectation that debugging, tuning and initial simulations will be completed in 2017, followed by v1 code and output release. Version 2 (v2) developments are now actively underway; proposals to this Announcement would be well-suited to contribute to the v2 phase of development. The ACME project expects that v2 will be frozen in 2018, followed by a testing-simulation phase and release during 2019-2020. For more advanced developments that are not complete before the v2 freeze, contribution to v3 would be possible.

For more information on v1 and v2, see [v1 developments and simulation plan](#), and [preliminary v2 development plans](#).

The CMDV projects that will be supported in response to this solicitation must be capable of significantly enhancing atmospheric process development and validation, with a particular focus on ACME. ACME’s variable resolution atmosphere, which can span the range of 100km to 15km, provides a particularly challenging opportunity for developing “scale-aware” physics. A SciDAC project which is nearing completion, “[Multiscale Methods for Accurate, Efficient and Scale-Aware Models of the Earth System](#)” has been developing scale-aware representations of atmospheric convection as well as cloud microphysics. The proposed project science as part of this solicitation, including development and testing goals, should extend, enhance and complement those of the Multiscale and ACME projects, but not duplicate them.

ARM Climate Research Facility

The ARM Climate Research Facility is a DOE Office of Science User Facility that provides the climate research community with strategically located in situ and remote sensing observatories designed to improve the understanding and representation, in climate and earth system models, of clouds, aerosols, and radiation as well as their interactions and coupling with the Earth’s surface. ARM currently operates three fixed site facilities, each representing uniquely different climate regimes (<http://www.arm.gov/sites>) -- the Southern Great Plains (SGP), the North Slope of Alaska (NSA), and the Eastern North Atlantic (ENA) in the Azores. ARM also operates its three ARM Mobile Facility (AMF) units on deployments to a variety of climatic regimes for shorter durations (<http://www.arm.gov/sites/amf>). The third mobile facility (AMF3) is currently in an extended term deployment at Oliktok Point, Alaska. Each ARM fixed and mobile facility has a suite of ground-based remote sensing and in situ instruments providing measurements of surface and boundary layer meteorology, atmospheric radiation, aerosol properties, and cloud and precipitation properties. ARM also has an aerial facility component which provides in situ measurements of aerosol and cloud properties.

The ARM Facility has recently released an updated [Decadal Vision](#) report and is undergoing a reconfiguration that is designed to accelerate the application of ARM observations and data processing for the understanding of key atmospheric processes and improving the representation of those processes in global climate models. As part of this reconfiguration, ARM has begun to develop a framework for routine large eddy simulation (LES) model runs over the ARM sites.

In the first phase of this development, a pilot project, the LES ARM Symbiotic Simulation and Observation (LASSO) project, was funded to develop the initial modeling workflow, with a focus on shallow convection at the ARM Southern Great Plains (SGP) site. **The LASSO project** (<http://www.arm.gov/science/themes/lasso>) will make available to the community a series of LES simulations and accompanying diagnostic datasets. It will also develop an ensemble of model forcing data methodologies, metrics to evaluate and intercompare the simulations, and software to simplify reproduction of the simulations. It is anticipated that preliminary LES model configurations with bulk microphysics for the SAM and WRF models and initial simulations of 6-10 cases of shallow convection, including an ensemble of forcing data, model output, and associated ARM data diagnostics will be available by June 2016. Simulations of additional shallow convection cases that include input data from the new ARM Boundary Facilities and simulations that include spectral bin microphysics are expected to be available by January 2017. Transition of the pilot project to ongoing, routine ARM simulations for shallow convection events is expected by summer 2017.

Requirements for projects

It is expected that one or two comprehensive cross-disciplinary atmospheric projects will be selected in response to this Announcement. Specifically, each project will bring together a team of observational and data scientists from the ARM community, process analysis and modeling scientists from the ASR community, and climate modeling and computational scientists from the ESM community to develop new computationally efficient, scale-aware physics capabilities for ACME (versions 2-3) and validate these capabilities against ARM observations and LES output. Proposed efforts should draw from topics and strategies described in a recent DOE draft workshop report (<http://www.arm.gov/publications/programdocs/acme-arm-asr-draft-report.pdf>). Projects should clearly address each of the following expectations, which will be assessed under the “Scientific and Technical Merit” and “Appropriateness of the Proposed Method or Approach” merit review criteria (See Section V.A.2 for merit review criteria).

1. Identify a targeted and well-defined set of aerosol and/or cloud processes that currently limit ACME’s predictive capability, so that improvement of these in ACME will be likely to improve its coupled climate simulation and lead to significant advancement of one or more “grand-challenge” science goals.
2. Include a plan to improve the representations of the targeted processes at multiple resolutions, spanning coarse (100km) to ultra-high (10km) resolutions of ACME to those attained by LES-CRM models, making use of high-resolution models and observations to develop representations appropriate for ACME.
3. Systematically construct an end-to-end plan to simulate and validate (with observations) each process in a manner appropriate to each scale and model configuration. This methodology should first be implemented on the key aerosol/cloud processes being

improved within this project, but should also have broader applicability to other atmospheric processes. The validation methodology may build on existing BER capabilities such as the Cloud-Associated Parameterizations Testbed ([CAPT](#)), LASSO, the Aerosol Modeling Testbed ([AMT](#)), or other testbed projects, if appropriate for the processes being studied.

4. Global model development and testing should be done using the ACME model and, if appropriate to the project goals, higher-resolution modeling should use the ARM LASSO project capabilities.
5. Use existing/upcoming observations from ARM as well as other appropriate and available sources, to develop *virtual field campaign datasets* that include a well-organized and documented collection of ARM observations (including multiple-parameter relationships), model-forcing data sets, and needed external datasets (e.g., satellite, weather radar) to develop and validate the process parameterizations at a range of scales.
6. All software developed under the project should be of high-quality and follow modern software practices (see, e.g., [ACME software practice](#) and [ARM coding guidelines](#)). Note that it is expected that any software developed under this project will be shared with the ACME and broader BER communities. Any new diagnostics for ACME should be designed to contribute to the ACME diagnostics packages.
7. Include a Data Management Plan (DMP) that is consistent with the [ACME DMP](#) and with the [ARM data policy](#). Virtual field campaign datasets developed under this project should be preserved and shared with the community as PI Data Products in the ARM archive.

As noted in Section IV.C of this Announcement, a Data Management Plan is a required element for all proposals. Data Management **plans should be no longer than 3 pages, and must be included as an appendix (i.e., not counted in the page limitation)** as described in Section IV.

Each team project will be led by a DOE laboratory, but should include university and/or non-DOE-Laboratory scientists as co-investigators and collaborators. The latter investigators are encouraged to contact the appropriate Divisions within the DOE National Laboratories to discuss potential teaming arrangements. More information on the DOE National Laboratories is available at <http://www.energy.gov/about-national-labs>. DOE National Laboratories may apply as both team leads and as collaborators to another Laboratory's team. Non DOE-Laboratory institutions may apply as members of multiple teams. However, an individual researcher may participate in at most two full applications as a Principal Investigator, Co-Principal Investigator, or Senior Personnel; and a National Laboratory can submit at most one application as a team lead. It is expected that all team members will have clear roles that are integrated with the broader project and contribute directly to project goals/deliverables.

Each of the following guidelines regarding project management and team integration should be addressed in the proposal. Note that "Team Integration and Project Management" is one of the merit review criteria for the proposed projects (See Section V.A.2 for merit review criteria).

1. The integrated team should consist of observational scientists, process analysis and/or modeling scientists, climate modelers, and computational scientists. While there will be a lead PI for the project, each of these elements should be clearly represented on the leadership/management team.
2. The project should work directly with (develop and use) the ACME model and may use outputs from the LASSO project (if appropriate to the project goals). The proposed project should clearly identify liaisons or integrators between the proposed project and ACME and/or LASSO. These individuals will be responsible for establishing integration of project tasks, timelines and software of the new project with the ACME/LASSO projects, and will facilitate communication across projects. If significant additional activities for the ACME or LASSO projects (e.g., additional simulations, software development, etc.) are required for integration with the proposed project, they should be planned and budgeted for in this proposal.
3. The project management structure and timelines should be clear and include demonstrable integration of institutions, scales of study, and disciplines (e.g. modeling and observations). There should be at least a 35% time commitment from all team members unless there is clear justification for smaller commitment for particular individuals and roles.

If selected, projects will engage in the [ACME collaboration](#) arrangement, enabling access of project developers to ACME code and software. While each project should propose, and will be evaluated on the quality of, a specific plan for validation of the proposed model element and its resulting ACME implementation, projects must share software as specified in the ACME collaboration arrangement and will ideally develop common validation elements available to all projects during the project funding period.

Investigators currently funded by ARM, ASR, or ESM (including ARM infrastructure members and investigators engaged in the ACME or LASSO projects) may apply to this Announcement. However, they should clearly describe how the efforts proposed under this Announcement differ from their currently funded projects.

Participation in BER meetings:

Due to the integrated nature of this project, and the need to connect to both the ARM/ASR and ACME communities, the project should be represented by attendance at one or both ACME face-to-face Team meetings and the ARM/ASR Joint User Facility/PI Meeting; key project personnel are also encouraged to participate in ACME task telephone calls and ASR working groups, as appropriate to the mutual goals of the teams. **Appropriate** costs for participation in these meetings by key personnel should be included in the budget. **Cost estimates should assume that each meeting is for a one-week period in the Washington, DC area.**

Collaboration

DOE anticipates supporting multi-institutional projects under this Announcement. Multi-institutional teams must be led by a DOE National Laboratory and are expected to be strongly coordinated. Multi-institutional proposals must include a project management plan in the project narrative that clearly indicates the role of each institution.

Collaborative proposals submitted from different institutions must clearly indicate that they are part of a collaborative project/group. Every partner institution must submit a proposal through its own sponsored research office. Each collaborative group can have only one lead institution. Each proposal within the collaborative group, including the narrative and all required appendices and attachments, must be identical with the following exceptions:

- Each proposal must contain a correct cover page for the submitting institution only.
- Each proposal must contain a unique budget corresponding to the expenditures for that proposal's submitting institution only.
- Each proposal must contain a unique budget justification corresponding to the expenditures for that proposal's submitting institution only.

Our intent is to create from the various proposals associated with a collaborative group one document for merit review that consists of the common, identical proposal materials combined with a set of detailed budgets from the partner institutions. Thus, it is very important that every proposal in the collaborative group be identical (including the title) with the exception of the budget and budget justification pages.

DOE National Laboratories participating in proposals by a multi-institutional team, either as the lead organization or as a collaborator with another Laboratory, should apply to this Announcement, following the above rules.

Collaborators from institutions other than DOE National Laboratories must submit applications following the above rules in response to the companion announcement, DE-FOA-0001530.

Section II – AWARD INFORMATION

A. TYPE OF AWARD INSTRUMENT

DOE anticipates awarding laboratory work authorizations under this DOE National Laboratory Program Announcement.

DOE will consider funding multi-institution collaborations under this Announcement.

B. ESTIMATED FUNDING

It is anticipated that approximately \$4,400,000 per year will be available under LAB 16-1530 and approximately \$1,000,000 per year under the companion DE-FOA-0001530, subject to appropriations of funds by the Congress. Applicants should request project support for three years. Following the first year award, out-year support will be contingent on the availability of appropriated funds, progress of the research, and programmatic needs. Awards are expected to begin in fiscal year 2016.

DOE is under no obligation to pay for any costs associated with the preparation or submission of a proposal. DOE reserves the right to fund, in whole or in part, any, all, or none of the proposals submitted in response to this DOE National Laboratory Announcement.

In addition to the individual award ceiling in Section C, the total annual budget for all DOE National Laboratory members of a multi-institutional collaboration may not exceed \$2,500,000 per year under LAB 16-1530.

C. MAXIMUM AND MINIMUM AWARD SIZE

The award size will depend on the availability of appropriated funds.

Ceiling

\$2,500,000 per year per DOE Laboratory institution

Floor

\$300,000 per year per DOE Laboratory institution

D. EXPECTED NUMBER OF AWARDS

Approximately 2 multi-institutional awards are expected.

The exact number of awards will depend on the number of meritorious proposals and the availability of appropriated funds.

E. ANTICIPATED AWARD SIZE

It is anticipated that award sizes for individual DOE National Laboratory institutions will range from \$300,000 per year to \$2,500,000 per year, with the total DOE National Laboratory award size to be \$2,500,000 per year per project.

The award size will depend on the number of meritorious proposals and the availability of appropriated funds.

F. PERIOD OF PERFORMANCE

DOE anticipates making awards with a project period of three years.

Continuation funding (funding for the second and subsequent budget periods) is contingent on: (1) availability of funds appropriated by Congress and future year budget authority; (2) progress towards meeting the objectives of the approved proposal; (3) submission of required reports; and (4) compliance with the terms and conditions of the award.

G. TYPE OF PROPOSAL

DOE will accept new DOE National Laboratory Proposals under this DOE National Laboratory Announcement. Please only submit a PAMS lab technical proposal in response to this Announcement; do not submit a DOE Field Work Proposal (FWP) at this time. The Office of Science will request FWPs later from those selected for funding consideration under this Announcement.

Section III – ELIGIBILITY INFORMATION

A. ELIGIBLE APPLICANTS AND TOPICS

This is a DOE National Laboratory-only Announcement. FFRDCs from other Federal agencies are not eligible to submit in response to this Program Announcement.

Investigators from institutions other than DOE National Laboratories may be collaborators on multi-institutional teams and must apply to the companion funding opportunity announcement DE-FOA-0001530.

B. COST SHARING

Cost sharing is not required.

C. ELIGIBLE INDIVIDUALS

Eligible individuals with the skills, knowledge, and resources necessary to carry out the proposed research as a Lead Principal Investigator/Principal Investigator are invited to work with their organizations to develop a proposal. Individuals from underrepresented groups as well as individuals with disabilities are always encouraged to apply.

Section IV – PROPOSAL AND SUBMISSION INFORMATION

A. ADDRESS TO REQUEST PROPOSAL PACKAGE

Proposal submission instructions are available in this Announcement on the DOE Office of Science Portfolio Analysis and Management System (PAMS). Screenshots showing the steps in DOE National Laboratory proposal submission are available in the PAMS External User Guide, accessible by navigating to <https://pamspublic.science.energy.gov> and clicking on the “PAMS External User Guide” link.

Proposals submitted outside of PAMS will not be accepted.

B. LETTER OF INTENT AND PRE-PROPOSAL

1. Letter of Intent

LETTER OF INTENT DUE DATE

March 3, 2016

A Letter of Intent is highly recommended and must be submitted by March 3, 2016, 5:00 pm Eastern Time. **For multi-institutional collaborations, a single letter of intent should be submitted by the lead institution on behalf of the project team.**

The LOI is to help in planning the review and the selection of potential reviewers for the proposal. For this purpose, the LOI must include the following information:

- Anticipated title of proposed project
- Principal investigator name, email, and institution
- Name and institution of each co-investigator or senior personnel
- Anticipated budget (per year) for each institution
- Brief description of the key cloud or aerosol process that will be addressed in the proposal and how the cross-disciplinary nature of the team is suited to work in an end-to-end manner between measurements and modeling, and across scales from field to global, in order to improve global climate model simulations of this process.
- For each funded investigator or senior personnel, provide an alphabetical list of collaborative co-investigators including co-authors of the past 48 months, co-editors of the past 24 months, graduate and postdoctoral advisors/advisees, and close associations. For publications or collaborations with more than 10 authors, only list those individuals in the core group with whom the Principal Investigator interacted on a regular basis while the research was being done.

Not including the list of investigators and collaborators, the LOI may not exceed two pages.

The LOI must be submitted electronically through the DOE Office of Science Portfolio Analysis and Management System (PAMS) website <https://pamspublic.science.energy.gov/>. It is important that the LOI be a single file with extension .pdf, .docx, or .doc. The Principal

Investigator (PI) and anyone submitting on behalf of the PI must register for an account in PAMS before it will be possible to submit a letter of intent. **All PIs and those submitting LOIs on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to avoid submission delays.**

You may use the Internet Explorer, Firefox, Google Chrome, or Safari browsers to access PAMS.

Registering to PAMS is a two-step process; once you create an individual account, you must associate yourself with (“register to”) your institution. Detailed steps are listed below.

Create PAMS Account:

To register, click the “Create New PAMS Account” link on the website <https://pamspublic.science.energy.gov/>.

- Click the “No, I have never had an account” link and then the “Create Account” button.
- You will be prompted to enter your name and email address, create a username and password, and select a security question and answer. Once you have done this, click the “Save and Continue” button.
- On the next page, enter the required information (at least one phone number and your mailing address) and any optional information you wish to provide (e.g., FAX number, website, mailstop code, additional email addresses or phone numbers, Division/Department). Click the “Create Account” button.
- Read the user agreement and click the “Accept” button to indicate that you understand your responsibilities and agree to comply with the rules of behavior for PAMS.

PAMS will take you the “Having Trouble Logging In?” page. (If you have been an Office of Science merit reviewer or if you have previously submitted an proposal, you may already be linked to an institution in PAMS. If this happens, you will be taken to the PAMS home page.

Register to Your Institution:

- Click the link labeled “Option 2: I know my institution and I am here to register to the institution.” (Note: If you previously created a PAMS account but did not register to an institution at that time, you must click the Institutions tab and click the “Register to Institution” link.)
- PAMS will take you to the “Register to Institution” page.
- Type a word or phrase from your institution name in the field labeled, “Institution Name like,” choose the radio button next to the item that best describes your role in the system, and click the “Search” button. A “like” search in PAMS returns results that contain the word or phrase you enter; you do not need to enter the exact name of the institution, but you should enter a word or phrase contained within the institution name. (If your institution has a frequently used acronym, such as ANL for Argonne National Laboratory or UCLA for the Regents of the University of California, Los Angeles, you may find it easiest to search for the acronym under “Institution Name like.” Many institutions with acronyms are listed in PAMS with their acronyms in parentheses after their names.)
- Find your institution in the list that is returned by the search and click the “Actions” link in the Options column next to the institution name to obtain a dropdown list. Select “Add me to this institution” from the dropdown. PAMS will take you to the “Institutions – List” page.

- If you do not see your institution in the initial search results, you can search again by clicking the “Cancel” button, clicking the Option 2 link, and repeating the search.
- If, after searching, you think your institution is not currently in the database, click the “Cannot Find My Institution” button and enter the requested institution information into PAMS. Click the “Create Institution” button. PAMS will add the institution to the system, associate your profile with the new institution, and return you to the “Institutions – List” page when you are finished.

Submit Your Letter of Intent:

- Create your letter of intent outside the system and save it as a file with extension .docx, .doc, or .pdf. Make a note of the location of the file on your computer so you can browse for it later from within PAMS.
- Log into PAMS and click the Proposals tab. Click the “View / View / Respond to DOE National Laboratory Announcements” link and find the current announcement in the list. Click the “Actions/Views” link in the Options column next to this announcement to obtain a dropdown menu. Select “Submit Letter of Intent” from the dropdown.
- On the Submit Letter of Intent page, select the institution from which you are submitting this LOI from the Institution dropdown. If you are associated with only one institution in the system, there will only be one institution in the dropdown.
- Note that you must select one and only one Principal Investigator (PI) per LOI; to do so, click the “Select PI” button on the far right side of the screen. Find the appropriate PI from the list of all registered users from your institution returned by PAMS. (Hint: You may have to sort, filter, or search through the list if it has multiple pages.) Click the “Actions” link in the Options column next to the appropriate PI to obtain a dropdown menu. From the dropdown, choose “Select PI.”
- If the PI for whom you are submitting does not appear on the list, it means he or she has not yet registered in PAMS. For your convenience, you may have PAMS send an email invitation to the PI to register in PAMS. To do so, click the “Invite PI” link at the top left of the “Select PI” screen. You can enter an optional personal message to the PI in the “Comments” box, and it will be included in the email sent by PAMS to the PI. You must wait until the PI registers before you can submit the LOI. Save the LOI for later work by clicking the “Save” button at the bottom of the screen. It will be stored in “My Letters of Intent” for later editing.
- Enter a title for your letter of intent.
- Select the appropriate technical contact from the Program Manager dropdown.
- To upload the LOI file into PAMS, click the “Attach File” button at the far right side of the screen. Click the “Browse” (or “Choose File” depending on your browser) button to search for your file. You may enter an optional description of the file you are attaching. Click the “Upload” button to upload the file.
- At the bottom of the screen, click the “Submit to DOE” button to save and submit the LOI to DOE.
- Upon submission, the PI will receive an email from the PAMS system <PAMS.Autoreply@science.doe.gov> acknowledging receipt of the LOI.

You are encouraged to register for an account in PAMS at least a week in advance of the LOI submission deadline so that there will be no delays with your submission.

For help with PAMS, click the “External User Guide” link on the PAMS website, <https://pamspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this Laboratory Announcement should reference LAB 16-1530.

2. Pre-proposal

N/A

C. CONTENT AND PROPOSAL FORMS

PROPOSAL DUE DATE

March 25, 2016 at 11:59 PM Eastern Time

Files that are attached to the forms must be in Adobe Portable Document Format (PDF) unless otherwise specified in this announcement. Attached PDF files must be plain files consisting of text, numbers, and images without editable fields, signatures, passwords, redactions, or other advanced features available in some PDF-compatible software. Do not attach PDF portfolios.

LETTERS

Letters of collaboration from unfunded collaborators should also be included, if applicable, and should be placed in Appendix 7 (Other Attachments) after the Data Management Plan. These letters should state the intention to participate in the proposed research, with a brief description of the activities to be undertaken by the collaborator. Do not submit general letters of support as these are not used in making funding decisions and can interfere with the selection of peer reviewers.

1. Summary of Proposal Contents and Information about PAMS

Each DOE National Laboratory proposal will contain the following sections:

- Budget, entered into PAMS as structured data using the PAMS budget form
- Abstract (one page), entered into PAMS as a separate pdf
- Budget justification, entered into PAMS as a separate pdf
- Proposal, combined into a single pdf containing the following information:
 - Proposal Cover Page
 - Table of Contents
 - Project Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel – 10 page limit)

- Appendix 1: Biographical Sketch(es)
- Appendix 2: Current and Pending Support
- Appendix 3: Bibliography and References Cited
- Appendix 4: Facilities and Other Resources
- Appendix 5: Equipment
- Appendix 6: Data Management Plan
- Appendix 7: Other Attachments (optional)

SUBMISSION INSTRUCTIONS

Full proposals must be submitted into the DOE Office of Science Portfolio Analysis and Management System (PAMS). For help with PAMS, click the “External User Guide” link on the PAMS website, <https://pamspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9:00 AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free number) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submissions and inquiries about this Program Announcement should reference **LAB 16-1530**. Full proposals submitted in response to this Program Announcement must be submitted to PAMS no later than March 25, 2016, at 11:59 PM Eastern Time.

All PIs and those submitting on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to ensure timely submissions. To register, click “Create New PAMS Account” on the website <https://pamspublic.science.energy.gov/> and follow the instructions for creating an account.

The following information is provided to help with proposal submission. Detailed instructions and screen shots can be found in the user guide. To find the user guide, click the “External User Guide” link on the PAMS home page. Onscreen instructions are available within PAMS.

- Log into PAMS. From the proposals tab, click the “View DOE National Laboratory Announcements” link and find the current announcement in the list. Click the “Actions/Views” link in the Options column next to this Announcement to obtain a dropdown menu. Select “Submit Proposal” from the dropdown.
- Note that you must select one and only one Principal Investigator (PI) per proposal; to do so, click the “Select PI” button on the far right side of the screen. Find the appropriate PI from the list of all registered users from your institution returned by PAMS. (Hint: You may have to sort, filter, or search through the list if it has multiple pages.) Click the “Actions” link in the Options column next to the appropriate PI to obtain a dropdown menu. From the dropdown, choose “Select PI.”
- If the PI for whom you are submitting does not appear on the list, it means he or she has not yet registered in PAMS. For your convenience, you may have PAMS send an email invitation to the PI to register in PAMS. To do so, click the “Invite PI” link at the top left of the “Select PI” screen. You can enter an optional personal message to the PI in the “Comments” box, and it will be included in the email sent by PAMS to the PI. You must wait until the PI registers before you can submit the proposal. Save the proposal for later work by selecting “Save” from the dropdown at the bottom of the screen and then clicking the “Go”

button. It will be stored in “My Proposals” for later editing. As a minimum, you must complete all the required fields on the PAMS cover page before you can save the proposal for the first time.

- The cover page, budget, and attachments sections of the lab proposal are required by PAMS before it can be submitted to DOE.
- Complete the sections in PAMS one at a time, starting with the cover page and following the instructions for each section.
- Click the “+View More” link at the top of each section to expand the onscreen instructions. On the budget section, click the “Budget Tab Instructions” link to obtain detailed guidance on completing the budget form.
- Save each section by selecting either “Save” (to stay in the same section) or “Save... and Continue to the Next Section” (to move to the next section) from the dropdown menu at the bottom of the screen, followed by clicking the “Go” button.
- If you save the proposal and navigate away from it, you may return later to edit the proposal by clicking the “View My Existing Proposals” or “My Proposals” links within PAMS.
- You must enter a budget for each annual budget period.
- You must also enter a budget for each proposed sub-award. The sub-award section can be completed using the same steps used for the budget section.
- In the attachments section of the lab proposal, the abstract, the budget justification, and the proposal narrative are required and must be submitted as separate files.
- You must bundle everything other than the budget, abstract, and budget justification into one single PDF file to be attached under “Proposal Attachment.”
- Do not attach anything under “Other Attachments.”
- To upload a file into PAMS, click the “Attach File” button at the far right side of the screen. Click the “Browse” (or “Choose File” depending on your browser) button to search for your file. You may enter an optional description of the file you are attaching. Click the “Upload” button to upload the file.
- Once you have saved all of the sections, the “Submit to DOE” option will appear in the dropdown menu at the bottom of the screen.
- To submit the proposal, select “Submit to DOE” from the dropdown menu and then click the “Go” button.
- Upon submission, the PI will receive an email from the PAMS system <PAMS.Autoreply@science.doe.gov> acknowledging receipt of the proposal.
- The proposal will also appear under My Proposals with a Proposal Status of “Submitted to DOE.”

Please only submit a PAMS lab technical proposal in response to this Announcement; do not submit a DOE Field Work Proposal (FWP) at this time. The Office of Science will request FWPs later from those selected for funding consideration under this Announcement.

For help with PAMS, click the “External User Guide” link on the PAMS website, <https://pamspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9:00 AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free number) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submissions and inquiries about this Program Announcement should reference **LAB 16-1530**.

2. Detailed Contents of the Proposal

BUDGET AND BUDGET EXPLANATION

The budget must be submitted into PAMS using the PAMS budget form. Research proposed under this Announcement may only have one annual budget period.

PAMS will calculate the cumulative budget totals for you.

A written justification of each budget item is to follow the budget pages. The budget justification should be placed in a separate, single pdf document and attached on the appropriate screen in PAMS. Further instructions regarding the budget and justification are given below and in the PAMS software.

PROJECT SUMMARY/ABSTRACT (NO MORE THAN ONE PAGE)

The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the Principal Investigator (PI), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (i.e., benefits, outcomes). This document must not include any proprietary or sensitive business information as the Department may make it available to the public. The project summary must not exceed 1 page when printed using standard 8.5" by 11" paper with 1" margins (top, bottom, left and right) with font not smaller than 11 point. The one-page project summary/abstract should be placed in a separate, single pdf document and attached on the appropriate screen in PAMS.

The abstract may be used to prepare publicly accessible reports about DOE-supported research.

DOE COVER PAGE

(PART OF PROJECT NARRATIVE)

The following proposal cover page information may be placed on a plain page. No form is required. This cover page will not count in the project narrative page limitation.

- The project title:
- Applicant/Institution:
- Street Address/City/State/Zip:
- Postal Address:
- Administrative Point of Contact name, telephone number, email:
- Lead PI name, telephone number, email:
- DOE National Laboratory Announcement Number: **LAB 16-1530**
- DOE/Office of Science Program Office: **Office of Biological and Environmental Research**
- DOE/Office of Science Program Office Technical Contact: Dr. Dorothy Koch, Dr. Sally McFarlane, Dr. Shaima Nasiri, or Dr. Ashley Williamson
- PAMS Letter of Intent Tracking Number:

COVER PAGE SUPPLEMENT FOR COLLABORATIONS
(PART OF PROJECT NARRATIVE ATTACHED TO FIELD 8 ON THE FORM)

Collaborative proposals submitted from different institutions must clearly indicate they are part of a collaborative project/group. Every partner institution must submit a proposal through its own sponsored research office. Each collaborative group can have only one lead institution. Each proposal within the collaborative group, including the narrative and all required appendices and attachments, must be identical with one exception:

- Each proposal must contain the correct “cover-page” information for the submitting institution only.
- Each proposal must contain a unique budget corresponding to the expenditures for that proposal’s submitting institution only.
- Each proposal must contain a unique budget justification corresponding to the expenditures for that proposal’s submitting institution only.

The Office of Science will use the multiple proposals associated with a collaborative group to create one consolidated document for merit review that consists of the common, identical proposal materials combined with a set of detailed budgets from the partner institutions. It is very important that every proposal in the collaborative group be identical (including the title) with the exception of the budget and budget justification pages.

If the project is a collaboration, provide the following information on a separate page as a supplement to the cover page.

- List all collaborating institutions by name with each institution’s principal investigator on the same line.
- Indicate the lead PI who will be the point of contact and coordinator for the combined research activity.
- Provide a statement explaining the leadership structure of the collaboration.
- Include a description of each collaborating institution’s facilities, equipment, and resources that will be made available to the collaborative group.
- Include a table modeled on the following chart providing summary budget information from all collaborating institutions. Provide the total costs of the budget request in each year for each institution and totals for all rows and columns.

Collaborative Proposal Information								
	Names	Institution	Year 1 Budget	Year 2 Budget	Year 3 Budget	Year 4 Budget	Year 5 Budget	Total Budget
Lead PI								
Co-PI								
Co-PI								
Co-PI								

Example budget table (\$ in thousands)

* Note that collaborating proposals must be submitted separately.

PROJECT NARRATIVE (NO MORE THAN 40 PAGES LONG)

The project narrative **must not exceed 40 pages** of technical information, including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5” by 11” paper with 1 inch margins (top, bottom, left, and right). The font must not be smaller than 11 point. Merit reviewers will only consider the number of pages specified in the first sentence of this paragraph. This page limit does not apply to the Cover Page, Budget Page(s), Budget Justification, biographical material, publications and references, and appendices, each of which may have its own page limit.

Do not include any Internet addresses (URLs) that provide supplementary or additional information that constitutes a part of the proposal. Merit reviewers are not required to access Internet sites; however, Internet publications in a list of references will be treated identically to print publications. See Part VIII.D for instructions on how to mark proprietary proposal information. To attach a Project Narrative, click “Add Attachment.”

Background/Introduction: Explanation of the importance and relevance of the proposed work as well as a review of the relevant literature.

Proposed Research and Methods: Identify the hypotheses to be tested (if any) and details of the methods to be used including the integration of experiments with theoretical and computational research efforts.

Project Management Plan and Timetable of Activities: This section should describe project management structure, including responsibilities of each institution and plans for communication, coordination, and integration among collaborating institutions, across disciplines (models and observations), and across scales. Include a Timeline for all major activities including milestones and deliverables.

Project Objectives: This section should provide a clear, concise statement of the specific objectives/aims of the proposed project.

The Project Narrative comprises the research plan for the project. It should contain enough background material in the Introduction, including review of the relevant literature, to demonstrate sufficient knowledge of the state of the science. The major part of the narrative should be devoted to a description and justification of the proposed project, including details of the method to be used. It should also include a timeline for the major activities of the proposed project, and should indicate which project personnel will be responsible for which activities. There should be no ambiguity about which personnel will perform particular parts of the project, and the time at which these activities will take place.

Do not include any Internet addresses (URLs) that provide supplementary or additional information that constitutes a part of the proposal. Using Internet sites in an attempt to avoid page limits will fail: The content of those sites will not be reviewed. See Part VIII.D for instructions on how to mark proprietary proposal information.

APPENDIX 1: BIOGRAPHICAL SKETCH

Provide a biographical sketch for the project director/principal investigator (PD/PI) and each senior/key person as an appendix to your technical narrative. As part of the sketch, provide information that can be used by reviewers to evaluate the PI's potential for leadership within the scientific community. Examples of information of interest are invited and/or public lectures, awards received, scientific program committees, conference or workshop organization, professional society activities, special international or industrial partnerships, reviewing or editorship activities, or other scientific leadership experiences. The biographical information (curriculum vitae) must not exceed 3 pages when printed on 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right) with font not smaller than 11 point and must include the following:

Education and Training: Undergraduate, graduate and postdoctoral training; provide institution, major/area, degree and year.

Research and Professional Experience: Beginning with the current position list, in chronological order, professional/academic positions with a brief description.

Publications: Provide a list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights and software systems developed may be provided in addition to or substituted for publications. An abbreviated style such as the Physical Review Letters (PRL) convention for citations (list only the first author) may be used for publications with more than 10 authors.

Synergistic Activities: List no more than 5 professional and scholarly activities related to the effort proposed.

Identification of Potential Conflicts of Interest or Bias in Selection of Reviewers: Provide the following information in this section:

- **Collaborators and Co-editors:** List in alphabetical order all persons, including their current organizational affiliation, who are, or who have been, collaborators or co-authors with you on a research project, book or book article, report, abstract, or paper during the 48 months preceding the submission of this proposal. For publications or collaborations with more than 10 authors or participants, only list those individuals in the core group with whom the Principal Investigator interacted on a regular basis while the research was being done. Also, list any individuals who are currently, or have been, co-editors with you on a special issue of a journal, compendium, or conference proceedings during the 24 months preceding the submission of this proposal. If there are no collaborators or co-editors to report, state "None."
- **Graduate and Postdoctoral Advisors and Advisees:** List the names and current organizational affiliations of your graduate advisor(s) and principal postdoctoral sponsor(s). Also, list the names and current organizational affiliations of your graduate students and postdoctoral associates.

Personally Identifiable Information: Do not include sensitive personally identifiable information such as a Social Security Number, date of birth, or city of birth. Do not include information that a merit reviewer should not consider.

This appendix will not count in the project narrative page limitation.

APPENDIX 2: CURRENT AND PENDING SUPPORT

Provide a list of all current and pending support (both Federal and non-Federal) for the lead principal investigator and each principal investigator, including subawardees, for ongoing projects and pending proposals. For each organization providing support, show the total award amount for the entire award period (including indirect costs) and the number of person-months per year to be devoted to the project by the PI. Include the award number, title of the funded research project, and the name of the PI for the project. Briefly describe the research being performed and explicitly identify any overlaps with the proposed research.

Provide the Current and Pending Support as an appendix to your project narrative. Concurrent submission of an proposal to other organizations for simultaneous consideration will not prejudice its review.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 3: BIBLIOGRAPHY & REFERENCES CITED

Provide a bibliography of any references cited in the Project Narrative. Each reference must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. For research areas where there are routinely more than ten coauthors of archival publications, you may use an abbreviated style such as the Physical Review Letters (PRL) convention for citations (listing only the first author). For example, your paper may be listed as, “A Really Important New Result,” A. Aardvark et. al. (MONGO Collaboration), PRL 999. Include only bibliographic citations. Applicants should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the proposal. Provide the Bibliography and References Cited information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 4: FACILITIES & OTHER RESOURCES

This information is used to assess the capability of the organizational resources, including subawardee resources, available to perform the effort proposed. Identify the facilities to be used (Laboratory, Animal, Computer, Office, Clinical and Other). If appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Describe only those resources that are directly applicable to the proposed work. Describe other resources available to the project (e.g., machine shop, electronic shop) and the extent to which

they would be available to the project. For proposed investigations requiring access to experimental user facilities maintained by institutions other than the applicant, please provide a document from the facility manager confirming that the researchers will have access to the facility. Please provide the Facility and Other Resource information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 5: EQUIPMENT

List major items of equipment already available for this project and, if appropriate identify location and pertinent capabilities. Provide the Equipment information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 6: DATA MANAGEMENT PLAN

Provide a Data Management Plan (DMP) that addresses the following requirements:

1. DMPs should describe whether and how data generated in the course of the proposed research will be shared and preserved. If the plan is not to share and/or preserve certain data, then the plan must explain the basis of the decision (for example, cost/benefit considerations, other parameters of feasibility, scientific appropriateness, or limitations discussed in #4). At a minimum, DMPs must describe how data sharing and preservation will enable validation of results, or how results could be validated if data are not shared or preserved.
2. DMPs should provide a plan for making all research data displayed in publications resulting from the proposed research digitally accessible to the public at the time of publication. This includes data that are displayed in charts, figures, images, etc. In addition, the underlying digital research data used to generate the displayed data should be made as accessible as possible to the public in accordance with the principles stated in the Office of Science Statement on Digital Data Management (<http://science.energy.gov/funding-opportunities/digital-data-management/>). This requirement could be met by including the data as supplementary information to the published article, or through other means. The published article should indicate how these data can be accessed.
3. DMPs should consult and reference available information about data management resources to be used in the course of the proposed research. In particular, DMPs that explicitly or implicitly commit data management resources at a facility beyond what is conventionally made available to approved users should be accompanied by written approval from that facility. In determining the resources available for data management at Office of Science User Facilities, researchers should consult the published description of data management resources and practices at that facility and reference it in the DMP. Information about other Office of Science facilities can be found in the additional guidance from the sponsoring program.
4. DMPs must protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; avoid significant negative

impact on innovation, and U.S. competitiveness; and otherwise be consistent with all applicable laws, regulations, and DOE orders and policies. There is no requirement to share proprietary data.

5. The DMB should be consistent with the ACME DMP (available at http://science.energy.gov/~media/grants/pdf/foas/2015/SC_FOA_0001338.pdf) and with the ARM data policy (<http://www.arm.gov/data/docs/policy>). Virtual field campaign datasets developed under this project may be preserved and shared with the community as PI Data Products in the ARM archive.

DMPs will be reviewed as part of the overall Office of Science research proposal merit review process. Applicants are encouraged to consult the Office of Science website for further information and suggestions for how to structure a DMP: <http://science.energy.gov/funding-opportunities/digital-data-management/>

- This appendix should not exceed 3 pages including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5” by 11” paper with 1 inch margins (top, bottom, left, and right)
- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 7: OTHER ATTACHMENT

If you need to elaborate on your responses to questions 1-6 on the “Other Project Information” document, please provide the Other Attachment information as an appendix to your project narrative. Information not easily accessible to a reviewer may be included in this appendix, but do not use this appendix to circumvent the page limitations of the proposal. Reviewers are not required to consider information in this appendix.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

3. Detailed Instructions for the Budget

Budgets are required for the entire project period. A budget form should be completed for each budget period of the award, and a cumulative budget form for the entire project period will be populated by PAMS. A detailed budget justification narrative should be included after the budget pages. The justification should cover labor, domestic travel, equipment, materials and supplies, and anything else that will be covered with project funds.

To edit a section on the budget, click the edit icon () for each section on the page. Remember to save all budget periods before moving on to the next section. You can save the budget periods by selecting “Save All Budget Periods” from the dropdown on the lower right corner of the PAMS budget entry screen and then clicking the “Go” button. You can also save any data entry page in PAMS using the blue diskette icon () in the floating toolbar on the bottom of the screen.

Section A. Senior/Key Person (Required)

For each Senior/Key Person, enter the appropriate information. List personnel, salary funds, and the number of months that person will be allocated to the project. Also include a written narrative in the budget justification that fully justifies the need for requested personnel.

Section B. Other Personnel

List personnel, salary funds, and the number of months that person will be allocated to the project. Also include a written narrative in the budget justification that fully justifies the need for requested personnel.

Section C. Equipment Description

For the purpose of this budget, equipment is designated as an item of property that has an acquisition cost of \$5,000 or more and an expected service life of more than one year. (Note that this designation applies for proposal budgeting only and differs from the DOE definition of capital equipment.) List each item of equipment separately and justify each in the budget justification section. Allowable items ordinarily will be limited to research equipment and apparatus not already available for the conduct of the work. General-purpose office equipment, such as a personal computer, is not eligible for support unless primarily or exclusively used in the actual conduct of scientific research.

Section D. Travel

In the budget justification, list each trip's destination, dates, estimated costs including transportation and subsistence, number of staff traveling, the purpose of the travel, and how it relates to the project. Indicate whether travel cost estimates are based upon quotes from travel agencies; upon past experience of similar number of trips to similar travel destinations; or something else (describe). To qualify for support, attendance at meetings or conferences must enhance the investigator's capability to perform the research, plan extensions of it, or disseminate its results.

Section E. Participant/Trainee Support Costs:

If applicable, submit training support costs. Educational projects that intend to support trainees (precollege, college, graduate and post graduate) must list each trainee cost that includes stipend levels and amounts, cost of tuition for each trainee, cost of any travel (provide the same information as needed under the regular travel category), and costs for any related training expenses. Participant costs are those costs associated with conferences, workshops, symposia or institutes and breakout items should indicate the number of participants, cost for each participant, purpose of the conference, dates and places of meetings and any related administrative expenses. In the budget justification, indicate whether trainee cost estimates are based upon past experience of support of similar number of trainees on similar projects; past experience of support of similar number of participants attending similar conferences/workshops/symposia; or something else (describe).

Section F. Other Direct Costs:

Enter Other Direct Costs information for each item listed.

- **Materials and Supplies:** Enter total funds requested for materials and supplies in the appropriate fields. In the budget justification, indicate general categories such as

glassware, and chemicals, including an amount for each category (items not identified under “Equipment”). Categories less than \$1,000 are not required to be itemized. In the budget justification, indicate whether cost estimates are based upon past experience of purchase of similar or like items; quotes/catalog prices of similar or like items; or something else (describe).

- **Publication Costs:** Enter the total publication funds requested. The proposal budget may request funds for the costs of documenting, preparing, publishing or otherwise making available to others the findings and products of the work conducted under the award. In the budget justification, include supporting information. In the budget justification, indicate whether cost estimates are based upon past experience of purchase of similar or like items; vendor quotes of similar publication services; or something else (describe).
- **Consultant Services:** Enter total funds requested for all consultant services. In the budget justification, identify each consultant, the services he/she will perform, total number of days, travel costs, and total estimated costs. In the budget justification, indicate whether consultant cost estimate is based upon previous experience/quotes for similar or like services; or something else (describe).
- **ADP/Computer Services:** Enter total funds requested for ADP/Computer Services. The cost of computer services, including computer-based retrieval of scientific, technical and education information may be requested. In the budget justification, include the established computer service rates at the proposing organization if applicable. In the budget justification, indicate whether cost estimates are based upon quotes/past experience of purchase of similar computer services; established computer service rates at the proposing institution; or something else (describe).
- **Subawards/Consortium/Contractual Costs:** Enter total costs for all subawards/consortium organizations and other contractual costs proposed for the project. In the budget justification, justify the details.
- **Equipment or Facility Rental/User Fees:** Enter total funds requested for Equipment or Facility Rental/User Fees. In the budget justification, identify each rental/user fee and justify. In the budget justification, indicate whether cost estimates are based upon past experience with similar or like items; vendor quotes of similar items; or something else (describe).
- **Alterations and Renovations:** Enter total funds requested for Alterations and Renovations.
- **In the budget justification,** itemize by category and justify the costs of alterations and renovations, including repairs, painting, removal or installation of partitions, shielding, or air conditioning. Where applicable, provide the square footage and costs.
- **Other:** Add text to describe any other Direct Costs not requested above. Enter costs associated with “Other” item(s). Use the budget justification to further itemize and justify.

Section G. Direct Costs

This represents Total Direct Costs (Sections A thru F) and will be calculated by PAMS.

Section H. Other Indirect Costs

Enter the Indirect Cost information for each field. Only four general categories of indirect costs are allowed/requested on this form, so please consolidate if needed.

Section I. Total Direct and Indirect Costs

This amount will be calculated by PAMS (Sections G + H)

D. SUBMISSIONS FROM SUCCESSFUL APPLICANTS

If selected for award, DOE reserves the right to request additional or clarifying information.

E. SUBMISSION DATES AND TIMES

1. Letter of Intent Due Date

March 3, 2016, 5:00 pm Eastern Time

You are encouraged to submit your Letter of Intent well before the deadline.

2. Pre-proposal Due Date

None

3. Proposal Due Date

March 18, 2016, 11:59 pm Eastern Time

You are encouraged to transmit your proposal well before the deadline.

4. Late Submissions

Delays in submitting letters of intent, pre-proposals, and proposals may be unavoidable. DOE has accepted late submissions when applicants have been unable to make timely submissions because of widespread technological disruptions or significant natural disasters. DOE has made accommodations for incapacitating or life-threatening illnesses and for deaths of immediate family members. Other circumstances may or may not justify late submissions. Unacceptable justifications include the following:

- Failure to begin submission process early enough.
- Failure to provide sufficient time to complete the process.
- Failure to understand the submission process.
- Failure to understand the deadlines for submissions.
- Failure to satisfy prerequisite registrations.
- Unavailability of administrative personnel.
- An upper respiratory infection (a “cold”) the week of the deadline.

You are responsible for beginning the submission process in sufficient time to accommodate reasonably foreseeable incidents, contingencies, and disruptions.

Applicants must contact the Program Office/Manager listed in this Funding Opportunity Announcement to discuss the option of a late submission. Contacting the Program Office/Manager after the deadline may reduce the likelihood that a request will be granted.

DOE notes that not all requests for late submission will be approved.

F. FUNDING RESTRICTIONS

Funding for all awards and future budget periods are contingent upon the availability of funds appropriated by Congress and the availability of future-year budget authority.

G. OTHER SUBMISSION AND REGISTRATION REQUIREMENTS

1. Where to Submit

Proposals must be submitted through PAMS to be considered for award.

Please only submit a PAMS lab technical proposal in response to this Announcement; do not submit a DOE Field Work Proposal (FWP) at this time. The Office of Science will request FWPs via the Searchable FWP system later from those selected for funding consideration under this Announcement.

2. Registration Process

ONE-TIME REGISTRATION PROCESS

You must complete the one-time registration process (all steps) before you can submit your first proposal through PAMS. Registration instructions appear in the front matter of this Announcement.

For help with PAMS, click the “External User Guide” link on the PAMS website, <https://pamspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this DOE National Laboratory Program Announcement should reference **LAB 16-1530**.

3. Proposal Receipt Notices

Upon submission, the PI will receive an email from the PAMS system <PAMS.Autoreply@science.doe.gov> acknowledging receipt of the proposal.

4. Viewing Submitted Proposals

Upon submission, the proposal will appear under My Proposals for the PI and the Submitter with a Proposal Status of “Submitted to DOE.”

Section V - PROPOSAL REVIEW INFORMATION

A. CRITERIA

1. Initial Review Criteria

Prior to a comprehensive merit evaluation, DOE will perform an initial review to determine that (1) the applicant is eligible for the award; (2) the information required by the Program Announcement has been submitted; (3) all mandatory requirements are satisfied; (4) the proposed project is responsive to the objectives of the Program Announcement, and (5) the proposed project is not duplicative of programmatic work. Proposals that fail to pass the initial review will not be forwarded for merit review and will be eliminated from further consideration.

2. Merit Review Criteria

Proposals will be subjected to scientific merit review (peer review) and will be evaluated against the following criteria, listed in descending order of importance.

- Scientific and/or Technical Merit of the Project;
- Appropriateness of the Proposed Method or Approach;
- Team Integration and Project Management;
- Competency of Applicant's Personnel and Adequacy of Proposed Resources; and
- Reasonableness and Appropriateness of the Proposed Budget.

The evaluation process will also include program policy factors such as the relevance of the proposed research to the terms of the DOE National Laboratory Announcement and the agency's programmatic needs, the balance of activities within the program, and the utility of the proposed activities to the broader scientific community. 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 proposal constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

The questions below are provided to the merit reviewers to elaborate the criteria:

SCIENTIFIC AND/OR TECHNICAL MERIT OF THE PROPOSED RESEARCH

- What is the scientific innovation of proposed research?
- What is the likelihood of achieving valuable results?
- How might the results of the proposed work impact the direction, progress, and thinking in relevant scientific fields of research?
- How does the proposed work compare with other efforts in its field, both in terms of scientific and/or technical merit and originality?
- Does the proposal articulate a well-defined set of aerosol and/or cloud processes that currently limit ACME's predictive capability, as well as "grand challenge" research goals that could be achieved as a result of this project or these model improvements?

APPROPRIATENESS OF THE PROPOSED METHOD OR APPROACH

- Does the proposed project present an end-to-end approach, with respect to a) process scales, b) model-observational approaches, and c) a careful “scale-dependent” validation plan, that is suitable for making progress on the process of interest?
- How logical and feasible are the research approaches? Are the conceptual framework, methods, and analyses well justified, adequately developed, and likely to lead to scientifically valid conclusions?
- Does the proposed plan effectively utilize appropriate DOE modeling and measurement capabilities, including the ACME model, ARM measurements, and LASSO models?
- Does the proposal recognize significant potential problems and consider alternative strategies?

TEAM INTEGRATION AND PROJECT MANAGEMENT

- Is there a sound management strategy for coordinating the research within the project?
- Is the proposed research plan a cohesive and integrated effort that is greater than the sum of its individual parts?
- Is the role of each partnering institution clearly articulated in the proposal? Does the management plan adequately engage all institutions and investigators?
- Does the management plan include a plan and approach to integrate with ACME, LASSO and ARM dataset, development, scientific and software elements? Is the role of the project liaisons appropriate and adequate for successful project integration?
- Does the proposal include a task timeline and team structure appropriate to the project scope?
- Is the Data Management Plan suitable for the proposed research and to what extent does it support the validation of research results?

COMPETENCY OF APPLICANT’S PERSONNEL AND ADEQUACY OF PROPOSED RESOURCES

- What is the past performance and potential of the Principal Investigator (PI) and other key team leaders?
- How well qualified is the research team, including key project leaders and liaisons, to carry out the proposed research?
- Is the role and merit of each partnering institution clearly indicated in the proposal?
- Is each team member committed at 35%; are any exceptions to this adequately justified?
- Are the research environment and facilities adequate for performing the research?

REASONABLENESS AND APPROPRIATENESS OF THE PROPOSED BUDGET

- Are the proposed budget and staffing levels adequate to carry out the proposed research?
- Is the budget reasonable and appropriate for the scope?

B. REVIEW AND SELECTION PROCESS

1. Merit Review

Proposals that pass the initial review will be subjected to a formal merit review and will be evaluated based on the criteria above.

2. Selection

The Selection Officials will consider the following items, listed in no order of significance:

- Scientific and technical merit of the proposed activity as determined by merit review
- Availability of funds
- Relevance of the proposed activity to Office of Science priorities
- Ensuring an appropriate balance of activities within Office of Science programs
- Previous performance

3. Discussions and Award

The Government may enter into discussions with a selected applicant for any reason deemed necessary. Failure to resolve satisfactorily the issues identified by the Government will preclude award to the applicant.

C. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES

It is anticipated that the award selection will be completed by July, 2016. It is expected that awards will be made in Fiscal Year 2016.

Section VI - AWARD ADMINISTRATION INFORMATION

A. AWARD NOTICES

1. Notice of Selection

Selected Applicants Notification: DOE will notify applicants selected for award. This notice of selection is not an authorization to begin performance.

Non-selected Notification: Organizations whose proposals have not been selected will be advised as promptly as possible. This notice will explain why the proposal was not selected.

2. Notice of Award

A work authorization/contract modification issued by the contracting officer is the authorizing award document.

B. REPORTING

Annual progress reports from the award investigator will be required and will be due 90 days before the end of each budget year.

Section VII - QUESTIONS/AGENCY CONTACTS

A. QUESTIONS

For help with PAMS, click the “External User Guide” link on the PAMS website, <https://pamspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this DOE National Laboratory Program Announcement should reference **LAB 16-1530**.

Please contact the PAMS help desk for technological issues with the PAMS system.

Questions regarding the specific program areas and technical requirements may be directed to the technical contacts listed for each program within the DOE National Laboratory Program Announcement or below.

Please contact the program staff with all questions not directly related to the PAMS system.

B. AGENCY CONTACTS

PAMS Customer Support	855-818-1846 (toll-free) 301-903-9610 sc.pams-helpdesk@science.doe.gov
Program Manager Scientific Contact	Dr. Dorothy Koch 301-903-0105 dorothy.koch@science.doe.gov Dr. Sally McFarlane 301-903-0943 sally.mcfarlane@science.doe.gov Dr. Shaima Nasiri 301-903-0207 shaima.nasiri@science.doe.gov Dr. Ashley Williamson 301-903-3120 ashley.williamson@science.doe.gov

Section VIII - OTHER INFORMATION

A. MODIFICATIONS

Notices of any modifications to this DOE National Laboratory Announcement will be posted on the Grants and Contracts website (<http://science.energy.gov/grants/>).

B. GOVERNMENT RIGHT TO REJECT OR NEGOTIATE

DOE reserves the right, without qualification, to reject any or all proposals received in response to this DOE National Laboratory Announcement and to select any proposal, in whole or in part, as a basis for negotiation and/or award.

C. COMMITMENT OF PUBLIC FUNDS

The Contracting Officer is the only individual who can make awards or commit the Government to the expenditure of public funds. A commitment by other than the Contracting Officer, either explicit or implied, is invalid.

D. PROPRIETARY PROPOSAL INFORMATION

Patentable ideas, trade secrets, proprietary or confidential commercial or financial information, disclosure of which may harm the applicant, should be included in a proposal only when such information is necessary to convey an understanding of the proposed project. The use and disclosure of such data may be restricted, provided the applicant includes the following legend on the first page of the project narrative and specifies the pages of the proposal which are to be restricted:

“The data contained in pages _____ of this proposal have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes.”

To protect such data, each line or paragraph on the pages containing such data must be specifically identified and marked with a legend similar to the following:

“The following contains proprietary information that (name of applicant) requests not be released to persons outside the Government, except for purposes of review and evaluation.”

E. EVALUATION AND ADMINISTRATION BY NON-FEDERAL PERSONNEL

In conducting the merit review evaluation, the Government may seek the advice of qualified non-Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The applicant, by submitting its proposal, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign conflict of interest and non-disclosure agreements prior to reviewing a proposal. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

F. AVAILABILITY OF FUNDS

Funds are not presently available for this award. The Government's obligation under this award is contingent upon the availability of appropriated funds from which payment for award purposes can be made. No legal liability on the part of the Government for any payment may arise until funds are made available to the Contracting Officer for this award and until the awardee receives notice of such availability, to be confirmed in writing by the Contracting Officer.