



# Newsletter

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OAK RIDGE NATIONAL LABORATORY  
MANAGED BY UT-BATTELLE FOR THE U.S. DEPARTMENT OF ENERGY

## FROM THE DIRECTOR

Welcome to the first Climate Change Science Institute Newsletter! We will use the Newsletter to communicate recent happenings such as new researchers arriving throughout ORNL who are involved in climate change research, publications, proposal activities, job openings, and upcoming events. We will also highlight one project or researcher each month so that we can all learn about the varied research activities around ORNL. We need your input to keep all of this current, so please send us updates on these items at any time.

The Institute's objective is to help integrate and coordinate climate change research across ORNL. We have developed a mailing list to help everyone stay up-to-date; so, if you know of someone who might want to be added, please have him or her contact us at [climatenews@ornl.gov](mailto:climatenews@ornl.gov). The Institute will focus on the four Thrust Areas (summarized at the bottom of page 2) and seek opportunities for cross-lab publications, projects, and proposals. One recent success is ORNL being a partner with PNNL on a new project to link an integrated assessment model with an Earth system model; this project involves several divisions across ORNL and will be a great initial test of the Institute's integration and coordination role.

I want to take this opportunity to introduce the only full-time staff in the Institute. Mary Regan joined us in March as Project Manager, and Vickey McNalley joined us in January as Senior Administrative Assistant. They are located in Building 5600 Room B123; so, please stop by to introduce yourself and tell us about your research.

We at CCSI hope that you enjoy this first issue of our newsletter. We sincerely look forward to your feedback and newsletter submissions. Our vision of integration can only be achieved with your help.

## EARTH DAY—APRIL 22ND 40TH ANNIVERSARY

Once again, ORNL has numerous events planned for this year's Earth Day which will be officially celebrated at ORNL on April 19th from 11am to 1:30pm. Highlighted events include the Alternative Transportation Show on the Quad, Electric Vehicle Rides, and Tours of the East Campus Pond. New this year—1st Annual Earth Day Bike Ride on Wednesday, April 21st. You can find a complete listing of activities and contacts on the [Sustainable Campus Initiative](#).



This is the 40th Anniversary of Earth Day, and it has had a notable impact on many of us. Here is what some of your CCSI colleagues had to say about their first remembrances of Earth Day.

### Virginia Dale

Earth Day 1970 was preceded by a year of growing awareness of humans' role on the planet. In the summer of 1969, we first saw a photo of the whole Earth as a vision from space that filled many with a feeling of planetary community. On March 7, 1970, New England experienced a total eclipse (as was later made famous in Carly Simon's song about a vain man). I was in Boston and recall hearing "Here comes the Sun" sung by The Beatles blasting out from speakers placed in a dorm window as we stood in the dark of the day and watched light reappear. The Spring of 1970 was also marked by protests against the Vietnam War and feelings of helplessness as the war continued. But it was so much more positive to be engaged in an activity "for" something. The eclipse remains for me as a symbol of the awareness that emerged that Spring during the first "environmental teach in" on April 22. Earth Day is now touted as the beginning of the environmental movement, and it certainly was that for me. What I learned during the Spring of 1970 and, in particular, on April 22 was how human activity had degraded Earth's natural resources but that through collective action we could make

### Gary Jacobs

I was in high school, and Earth Day was around the same time as our annual week-long Maple Festival in St. Albans, Vermont. The weather at that time of year in Vermont is warm days and cold nights – perfect for getting the sap to flow. The festival celebrates all forms of maple products and is still going strong. My friends and I wandered around the Festival, and there were a few exhibits about Earth Day and the need to be good stewards of the Earth. I was hooked on Earth science as a freshman in high school due to an inspiring teacher. I knew even then that I wanted to do research in that area. Now, 40-years later, I am blessed to be part of our tremendous research programs at ORNL in ecology, geoscience, environmental stewardship, and climate change. I never thought in 1970 that our Maple Festival might be impacted by something like climate change, but that is now certainly a possibility in the future from the climate change impacts on northern forests that are projected.

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## OAK RIDGE CLIMATE CHANGE SCIENCE INSTITUTE NEWSLETTER

### ABOUT THE INSTITUTE

ORNL has formed the Oak Ridge Climate Change Science Institute (CCSI) that will develop and execute programs for the multi-agency, multi-disciplinary climate change research partnerships at ORNL. The Institute will integrate scientific projects in modeling, observations, and experimentation with ORNL's powerful computational and informatics capabilities to answer some of the most pressing global change science questions. The Institute will produce quantitative, transparent and accessible scientific knowledge to address climate change consequences, mitigation actions, and the needs for future societal adaptation.

The Institute will foster and enhance the collaborations among scientists conducting research in Earth System Modeling, atmospheric and climate dynamics, algorithm and numerical methods research, bio-

geochemical cycles and ecosystem modeling, ecosystem dynamics, and data science. The fusion of modeling, data, and observations will allow the Institute to explore complex questions such as the analysis of vulnerability and adaptability to climate change impacts and the effectiveness of options to mitigate future climate change.

At the core of the Institute is an Earth System Modeling (ESM) enterprise that will utilize the scientific capabilities of the staff as well as the leadership-class computational facilities to project future climates and provide the basis for assessing likely impacts, how we will adapt to changes in the environment, and help assess the effectiveness of various mitigation options. ORNL data capabilities are a key enabling technology to enhance the ESM efforts. ORNL's carbon cycle and ecosystem science will combine the

development and improvement of terrestrial land surface models with the deployment of new measurements and experiments to focus on the critical scientific gaps and uncertainties needed to improve the quality of global climate projections by using the most complete formulations for the terrestrial carbon cycle.

The broad scope of knowledge and expertise required to address the Earth system analysis challenge dictates that the Institute establish collaborations with other National Laboratories, agencies and universities that together address the full scope of this complex multi-disciplinary scientific effort.

Dr. James J. Hack will lead the Institute with the support of Dr. David C. Bader as Deputy Director and Dr. Gary K. Jacobs as Operations and Business Development Manager.

### Why Virtual?

The primary goal in establishing the Institute is to enhance the integration of ORNL climate research. This integration will leverage the synergy of individuals leading to greater levels of collaboration, cooperation and trust. Individual organizations retain their independence and continue to develop their research. The Institute provides the structure for organizations to develop and maintain scientific efforts that are consistent with a unified ORNL climate strategy.



# Highlighted Research

The Spruce and Peatland Responses Under Climatic and Environmental Change or **SPRUCE** experiment is a key experimental component of the CCSI. It focuses on terrestrial ecosystems and the mechanisms that underlie their responses to climatic change.



The experimental work will be conducted in a *Picea mariana* [black spruce] – *Sphagnum* spp. bog forest in northern Minnesota in the USDA Forest Service's **Marcell Experimental Forest (MEF)**. The site is located at the southern margin of the boreal peatland forest. At that location, it is an ecosystem who's functions are considered especially vulnerable to projected climate change. Furthermore, the organisms it contains are expected to be near their tipping points for survival under projected future climates. "Responses to warming

and interactions with increased atmospheric CO<sub>2</sub> concentrations must be resolved in an experimental context to understand landscape feedbacks on the atmosphere for such important and spatially extensive high-latitude ecosystems" said Paul Hanson, Project Coordinator. "These important landscape-atmosphere interactions can't be adequately addressed through direct observations of existing ecosystems and gradients. Current climate variability and atmospheric composition just does not overlap with projected future conditions that climate change science is being asked to address."

Experimental work in the **8.1-ha S1 bog** will be a climate change manipulation focusing on the combined responses to multiple levels of warming at ambient or elevated CO<sub>2</sub> (eCO<sub>2</sub>) levels. The experiment will provide a platform for testing mechanisms controlling the vulnerability of organisms, biogeochemical processes and ecosystems to climatic change (e.g., thresholds for organism decline or mortality, limitations to regeneration, biogeochemical limitations to productivity, the cycling and release of CO<sub>2</sub> and CH<sub>4</sub> to the atmosphere).

## SPRUCE

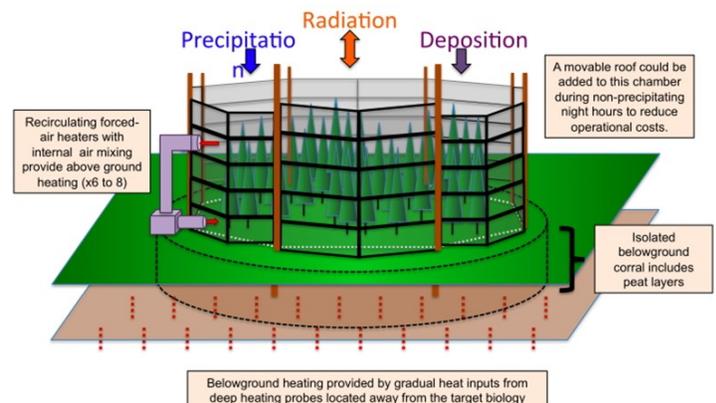
### Spruce and Peatland Responses Under Climatic & Environmental Change

The manipulations will evaluate the response of the existing biological communities to a range of warming levels from ambient to +9°C provided via large, modified open-top chambers. The ambient and +9°C warming treatments will also be conducted at eCO<sub>2</sub> (in the range of 800 to 900 ppm). Both direct and indirect effects of these experimental perturbations will be analyzed to develop and refine models needed for full Earth system analyses. SPRUCE was funded by the DOE Office of Science in October 2009. Site approvals, treatment and measurement optimization and infrastructure construction will occur between 2010 and 2012. The project is currently undergo-

ing NEPA evaluations including the preparation of an Environmental Assessment. The NEPA process is expected to be complete by the end of this summer. In the meantime, a full scale prototype of the above and below-ground warming enclosure is being constructed on the Oak Ridge Reservation to judge the energy requirements and technological details for the replicated systems to be installed in Minnesota. The team is also familiarizing themselves with the northern Minnesota ecosystem.

More at: [www.mnspruce.ornl.gov](http://www.mnspruce.ornl.gov)

### Response SFA Experimental Plot



## CCSI WELCOMES NEW STAFF



**Moetasim Ashfaq** comes to ORNL most recently from Stanford University where he was a post-doctoral research fellow in the Department of Environmental Earth System Science. He holds a B.S. in Mathematics and Physics, an M.S. in Physics, a Master of Philosophy in Computational Physics, and a Ph.D. in Atmospheric Sciences. He is a recognized expert in developing and maintaining RegCM3, a regional climate model originally developed at the National Center for Atmospheric Research (NCAR) and primarily applied to studies

of regional climate and seasonal predictability. Moet's research over the next two years will develop a high resolution regional climate modeling capability at ORNL as part of the Ultra High Resolution Global Climate Simulation project. This is a 4-year project funded by the DOE Office of Biological & Environmental Research at approximately \$1.6M per year. Developing this capability is critical to the advancement of Earth System Modeling which is a CCSI thrust area.



**Benjamin Preston** has joined ORNL from Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) where he was a Research Scientist with the Division of Marine & Atmospheric Research and the CSIRO's Climate Adaptation Flagship research initiative. Prior to his tenure with the CSIRO, he was a Senior Research Fellow with the Pew Center on Global Climate Change in Arlington, VA. He holds a BS in Biology from the College of William & Mary and a

PhD in Environmental Biology from the Georgia Institute of Technology. In recent years, Ben's research has focused on building understanding regarding the potential impacts of climate change on human settlements; the critique of existing frameworks, methods and tools for climate change impact and vulnerability assessment; and assisting stakeholders with regional and local adaptation planning. He intends to apply this experience to enhance the CCSI's research capabilities in Climate Impacts, Adaptation and Vulnerability Science and assist in linking ORNL's world class climate science to decision-making regarding climate change adaptation and mitigation.



**OAK RIDGE CLIMATE CHANGE SCIENCE INSTITUTE**

One Bethel Valley Road  
P.O. Box 2008, MS-6008  
Oak Ridge, TN 37831-6008

Phone: 865-574-5435  
Fax: 865-574-6476  
E-mail: [climatenews@ornl.gov](mailto:climatenews@ornl.gov)

We're on the Web!  
[www.climatechangescience.ornl.gov](http://www.climatechangescience.ornl.gov)

**RECENT DATA PRODUCTS**

Dale Kaiser and CDIAC updated two popular long-term global and hemispheric temperature anomaly records through 2009. Both the Jones et al. (<http://cdiac.ornl.gov/trends/temp/jonescru/jones.html>) and Hansen et al. (<http://cdiac.ornl.gov/trends/temp/hansen/hansen.html>) records show 2009 to be among the warmest on record.

**RECENT PUBLICATIONS**

Garten C.T., J.L. Smith, J.E. Amonette, V.L. Bailey, D.J. Brice, H.F. Gonzalez, R.L. Graham, C.A. Gunderson, R.C. Izaurralde, P.M. Jardine, J.D. Jastrow, M.K. Kerley, R. Matamala, M.A. Mayes, F.B. Metting, R.M. Miller, K. Moran, W.M. Post, R.D. Sands, C.W. Schadt, J.R. Phillips, A.M. Thomson, D.D. Tyler Jr., T. Vugteveen, T.O. West, and S.D. Wullschleger. Intra-annual changes in biomass, carbon, and nitrogen dynamics at 4-year old switchgrass field trials in west Tennessee, USA. *Agriculture, Ecosystems & Environment* 136: 177-184.

Iversen CM (2010) Digging deeper: Fine root responses to rising atmospheric [CO<sub>2</sub>] in forested ecosystems. *New Phytologist* 186:346-357.

Iversen CM, Bridgman SD, Kellogg LE (2010) Scaling plant nitrogen use and uptake efficiencies in response to nutrient addition in peatlands. *Ecology* 91: 693-707.

Johnson, NC, GWT Wilson, MA Bowker, JA Wilson, and RM Miller. 2010. Resource limitation is a driver of local adaptation in mycorrhizal symbioses. *Proc. Nat. Acad. Sci. USA.* 107: 2093-2098.

Kardol P, Cregger MA, Company CE, Classen AT (2010) Soil ecosystem functioning under climate change: plant species and community effects. *Ecology* 91: 767-781.

Martin M.Z., N. Labbe, N. Andre, S.D. Wullschleger, R.D. Harris and M.H. Ebinger. 2010. Novel multivariate analysis for soil carbon measurements using laser-induced breakdown spectroscopy. *Soil Science Society of America Journal* 74: 87-93.

West, T.O., C.C. Brandt, L.M. Baskaran, C.M. Hellwinckel, R. Mueller, C.J. Bernacchi, V. Bandaru, B. Yang, B.S. Wilson, G. Marland, R.G. Nelson, D.G. De La Torre Ugarte, and W.M. Post. 2010. Crop-land carbon fluxes in the United States: Increasing geospatial resolution of inventory-based carbon accounting. *Ecological Applications* (in press).

*Coming in May*

CCSI Science Advisory Board  
ORNL Climate Highlight: New NOAA Collaboration  
Highlighted Researcher: Kate Evans  
CCSI Seminar Series

**CALENDAR**

The Climate Rally (National Mall) .....	15 April 2010
Earth Day .....	22 April 2010
NASA EOSDIS Data Center Manager's Meeting (Virginia Beach, VA) .....	4-6 May 2010
<a href="#">Improving Observing Network Coordination: A Cyberinformatics Forum</a> (Boulder, CO) .....	17-19 May 2010
<a href="#">Workshop on High-Resolution Global Modeling</a> (Fort Collins, CO) .....	15-17 June 2010
<a href="#">15th Annual CCSM Workshop*</a> (Breckenridge, CO) .....	28 June—1 July 2010
<a href="#">SciDAC 2010</a> (Chattanooga, TN) .....	11-15 July 2010
<a href="#">Federation of Earth Science Information Partners, Summer 2010 Meeting*</a> (Knoxville, TN) .....	20-23 July 2010
<a href="#">2010 TeraGrid Conference</a> (Pittsburgh, PA) .....	2-5 August 2010
<a href="#">95th Ecological Society of America Annual Mtg</a> (Pittsburgh, PA) .....	1-6 August 2010
<a href="#">PROMITHEAS, The Energy and Climate Change Policy Network</a> (Athens) .....	7-8 October 2010

\*Denotes full or partial ORNL sponsorship.



*Developing and executing programs for the multi-agency, multi-disciplinary climate change research partnerships at the*

**CURRENT CCSI JOB OPPORTUNITIES**

We seek motivated individuals across a range of educational and professional experience including M.S. through Ph.D. academic qualifications at junior, as well as senior levels of experience to address some of the most pressing global climate change science questions. You can view complete position descriptions and apply at [www.climatechangescience.ornl.gov/careers](http://www.climatechangescience.ornl.gov/careers).

- Deputy Division Director— Environmental Sciences
- Climate Computational Scientists
- Postdoctoral Research Associates
- Group Leader: Computational Earth Sciences—Climate & Earth Modeling
- Carbon—Climate Modeler