



Newsletter

LETTER FROM CCSI LEADERSHIP

Well, the MOVE is "done." OK – I recognize that we are still working through various issues. We appreciate your support and patience. The best quote that I heard was that the move "could have been a little better, but could have been a lot worse!" I want to say, "Thanks!" to Mary again. Her efforts were what made the moves as smooth as they were. And, her willingness to bring issues to others helped some of the glitches be addressed as timely as the system allowed. Well done, Mary!

Our Science Advisory Board (SAB) meeting is Sep 28-30. We look forward to seeing many of you at the plenary and poster sessions. One of the objectives for the SAB is to review our draft strategic plan. Jim, Dave, Ben, Peter, Danny, and

others are working to wrap up a draft. We will probably not have time to send it to all of the CCSI for review prior to the SAB. What we discuss with the SAB will be very much draft ideas, and we will be refining our plans over the next few months with feedback we receive from the SAB and you. So, stay tuned and please participate in the break out groups as you are asked.

A new activity that is just starting is the planning of a workshop to be held at ORNL jointly with NOAA during 2011. Chet Koblinsky (NOAA) has asked us to develop a draft set of topics that focus on Earth system modeling and delivery of information on impacts and adaptation. In addition, it will address the challenges of data systems for delivery of relevant and useful information. We are in the early stages of developing objectives; so if you have ideas, please forward

them to Gary.

We have seen great success from the integration efforts of the Institute this first year. Many of our successful proposals and cross-directorate publications were a result of collaboration by staff who had never really worked together until the Institute provided the avenue for integration. Next year will offer even more opportunities to leverage our collective expertise and research in making the CCSI a valued contributor to the science of climate change while applying new knowledge to developing solutions to the challenges that climate change will bring to our world. We look forward to working with you as we continue to define and grow each of the Research Themes and hope that our newly established proximity will further assist in and expedite this process.



CCSI COLLOCATES STAFF IN BUILDING 2040

During the week of August 30th, CCSI relocated almost 100 staff, previously located in seven different facilities, to Building 2040 at the intersection of 1st Street and Bethel Valley Road. UT-Battelle has leased the first and second floors from Pro2Serve. This new space will allow CCSI to continue to grow over the coming years. Since this is leased space, the standard ORNL prox card does not work on the card readers. Please contact the 2040 CCSI resident whom you are trying to reach so that they can let you in. There is a courtesy phone in the lobby near the CCSI entrance. All Foreign Nationals must have a 2040 keycard to enter the CCSI space and must key in upon each entry. Please contact your 2040 host prior to your arrival to ensure your timely access.



RECENTLY LAUNCHED OR UPDATED WEBSITES

SPRUCE: <http://mnspruce.ornl.gov>

NGEE: <http://ngee.ornl.gov>

WENDI (Wind Energy Data & Information) Gateway: <http://windenergy.ornl.gov/>

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OAK RIDGE CLIMATE CHANGE SCIENCE INSTITUTE NEWSLETTER

Highlighted Researcher



Growing up in Albuquerque, New Mexico, Galen was raised in a veritable epicenter of scientific research in scalable systems. With Sandia National Laboratory's primary campus located on Kirtland Air Force Base in Albuquerque, Los Alamos National Laboratory (LANL) less than 100 miles away, and the University of New Mexico's Scalable Systems Lab located in Albuquerque, it's no surprise that Galen ultimately found himself affiliated with each of these institutions, and eventually with ORNL's National Center for Computational Sciences (NCCS) and the Climate Change Science Institute. Galen is married to NCCS computational scientist Hai Ah Nam, and has a step-daughter named Maxine. When he's not busy developing infrastructures to support the world's fastest supercomputer (the Cray XT known as Jaguar, located at NCCS) and the climate science community, Galen enjoys hitting the gym and piloting his homebuilt Van's RV-7A airplane.

Galen Shipman already knew that he enjoyed computers and computer science when he began his undergraduate degree program at the University of New Mexico (UNM) when an introductory course in finance with Dr. Guantam Vora peaked his interest in computational finance. After obtaining his BBA in finance, Shipman spent time in the private sector, working for a number of for-profit and not-for-profit organizations. Though he got the opportunity to work on some interesting projects ranging from distributed computing infrastructures to analytics, he chose to pursue an MS degree in Computer Science under the advisement of Dr. Barney Maccabe (currently the director of the Computer Science and Mathematics Division at ORNL). Galen then joined the Scalable Systems Laboratory at UNM (led by Dr. Maccabe) affording him the opportunity to conduct research in scalable communication mechanisms for large-scale computational platforms.

In the second year of his graduate program, Shipman began working at Los Alamos National Laboratory (LANL) as a student intern furthering his research in scalable communication mechanisms and working on transport protocols within the Open MPI implementation of the Message Passing Interface (MPI). His work primarily focused on developing scalable communication protocols over the InfiniBand (IB) high-performance interconnect, now common in many high-performance computing (HPC) architectures. Shipman's student internship progressed into a full time position with LANL at the Advanced Computing Laboratory (ACL) following his graduation where he continued to work on advanced development and directed research projects in support of a number of high-performance computing platforms

at LANL and SNL. Shipman came to ORNL in 2007 to continue his work in advanced development and directed research in support of the Oak Ridge Leadership Computing Facility (OLCF).

Galen's current work and that of his team includes several collaborative, cross-disciplinary projects.

Site PI for Earth Systems Grid (ESG) Project (FY06-11)

Led by co-PIs Dean Williams, Don Middleton, and Phil Jones (Lawrence Livermore National Laboratory [LLNL], National Center for Atmospheric Research [NCAR], and Los Alamos National Laboratory [LANL], respectively), this project was Shipman's first entry into supporting the needs of the climate modeling community. The ESG-CET (Center for Enabling Technologies) SciDAC project has developed technologies to securely access, monitor, catalog, transport, and distribute climate model data generated at modeling centers around the world. With over 20,000 registered users in over 120 countries, ESG proved to be a critical technology for the dissemination of climate modeling results for the Intergovernmental Panel on Climate Change (IPCC) Forth Assessment Report (AR4).

Current efforts are focused on extending these technologies in support of the CMIP-5 Project (Coupled Model Intercomparison Project) for the next IPCC Fifth Assessment Report (AR5). ESG now provides a federated data infrastructure in which data can be searched and discovered via any one of many data-portals known as gateways while the data searched and delivered via this infrastructure remains geographically distributed. According to Shipman, "Prior to ESG-CET, there was a large gap in the tools available to climate scientists and the data-volumes projected for CMIP-5 activities. It's very exciting to work on this project as it

GALEN SHIPMAN

draws upon our core competencies in systems software, simulation platforms and storage systems."

Ultra-Scale Visualization Climate Data Analysis Tools Project (UV-CDAT) (FY10-13)

UV-CDAT will provide an integrated framework for end-to-end data analysis and visualization of climate model and observational datasets providing provenance, workflow, and tools for inter-comparison of climate model datasets in support of IPCC efforts. Shipman is leading many of the technical aspects of this project for which Dave Bader is the PI. A primary goal of this project is to improve data analysis tools for climate that are currently lagging behind advancements in climate models. Climate models are continuing to advance in a number of dimensions including higher-resolution (both spatially and temporally). These advances have left many of the existing data analysis tools obsolete as datasets increase in both size and complexity.

As the climate community begins analysis for AR5 and beyond, ensemble analysis and model inter-comparison of increasingly complex model output will require advances in these analysis tools via full parallelization of the current CDAT system. Visualization of these datasets will require tighter integration of CDAT with visualization tools such as ParaView. Maintaining provenance of datasets and derived data-products will require advances in the state-of-art in provenance tracking using Viz-Trails as an integrating technology within UV-CDAT. This system will provide climate scientists with advanced tools to conduct their research while providing a mechanism of determining the provenance of both the data and derived data products using these tools.

In addition to his work with CCSI, Shipman is leading the parallel I/O

infrastructure development and testbed development for the OLCF3 project which is the next major system being deployed in ORNL's computing center.

What role does your research play in climate change research?

My research and that of my team involves architecture, design and development of next-generation data management and analysis tools for climate change research. Climate change research is both interdisciplinary and geographically distributed with numerous climate modeling centers around the world participating in activities such as IPCC. Climate change researchers increasingly rely on timely access to climate model datasets generated by these facilities and a diverse set of Earth system observations from remote sensing platforms. As part of the ESG project, our team is developing an infrastructure and related tools to provide seamless access to these datasets via a distributed archive, spanning numerous sites around the world such as ORNL, LLNL, the National Center for Atmospheric Research, the National Aeronau-

tics and Space Administration (NASA), the British Atmospheric Data Center, and the Japanese Center for Global Environmental Research, to name just a few. In addition to providing access to this data, We are collaborating with other researchers from ORNL, LLNL, LANL and the University of Utah to develop scalable analysis and visualization tools required for model inter-comparison and model validation/verification.

Who is the customer for your research?

Our work benefits a number of different communities of researchers and stakeholders in climate change research. Our team provides expertise in large-scale parallel I/O environments, communication libraries, and system architecture to the climate modeling community through the "Ultra-Scale Visualization and Climate Data Analysis Tools" (UV-CDAT) project funded by DOE's Office of Science Biological and Environmental Research. Through the ESG project, our work benefits the climate modeling community as well as other stakeholders from policy-makers to decision support specialists. The ESG team here at ORNL has taken a leadership role in the integration

of high-value observational datasets and ESG, providing the climate modeling community with easy access to these datasets for model development, tuning, and validation. This work has benefited not only the climate modeling community but also the broader climate change research community and has been embraced by other federal agencies beyond DOE, such as the NOAA and NASA.

Why is it important to you, personally, to become involved in climate change research?

Climate change science is of growing importance to our nation and our world as we struggle to understand and contend with our impact on the Earth's climate. Understanding the magnitude of our influence on the Earth system is of critical importance in making informed policy decisions that may lessen our impact and seek to adapt to or mitigate against longer-term effects of climate change. Contributing to this enterprise is quite exciting, affording me the opportunity to lend my expertise in computer science, particularly in data management and system architecture, to a problem of international importance.

In what direction do you see the future of climate change research going?

In order to make informed decisions, the climate science community will need to provide impact assessments at both regional and planetary scales under a variety of scenarios. These regional and planetary scale assessments will require increased spatial resolution resulting in dramatic increases in dataset sizes and increasingly complex data-analysis. Never before has scientific simulation been utilized as a primary tool to make informed policy decisions that have such potential to dramatically impact the lives of current and future generations. The potential economic and social costs of mitigation strategies will necessitate quantification of model and observational dataset uncertainties, in effect bounding the error of simulated impacts. To successfully deliver upon these requirements, the climate science community will need to draw upon the expertise of a wide range of researchers such as atmospheric- and biogeochemists, computational scientists, and computer scientists. I believe the climate science community is well positioned to undertake this integrated research.

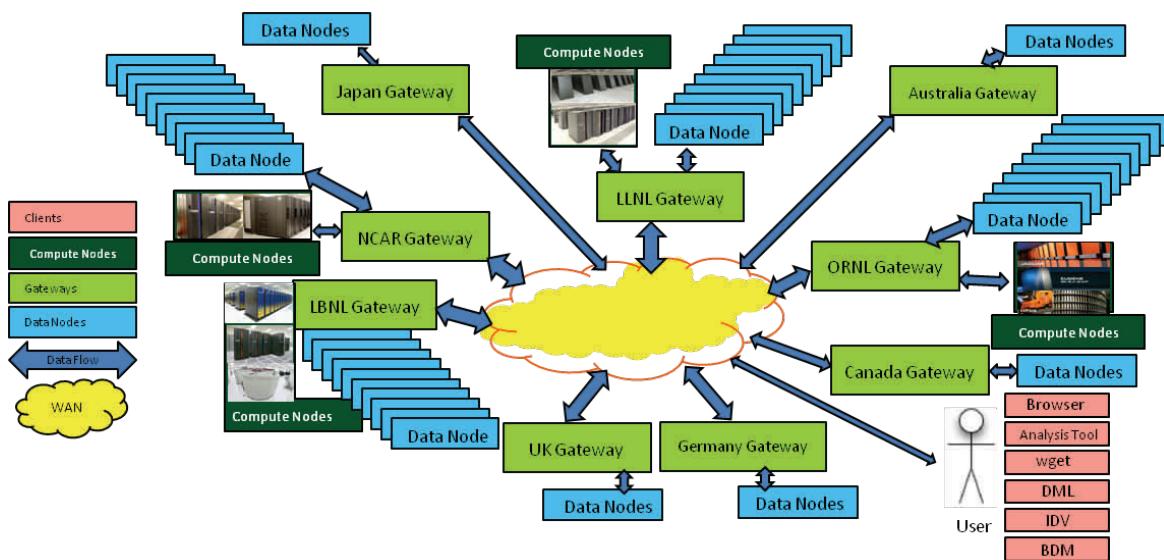


Figure 1. ESG provides a federated data architecture for accessing and analyzing datasets from numerous sites around the world.

OAK RIDGE CLIMATE CHANGE SCIENCE INSTITUTE NEWSLETTER

Highlighted Research

Using high-performance computers and a complex database of environmental observations, scientists from ORNL's Distributed Active Archive Center (DAAC) are collaborating with Cornell University's Lab of Ornithology through a project called DataONE (Observation Network for Earth) to investigate how climate change may affect bird migration.

The National Science Foundation (NSF)-sponsored DataONE project is developing a repository for ecological and environmental data sets as well as tools to explore, combine, visualize, and analyze these data. The bird migration study is an exemplar of the types of data-intensive science that researchers will be able to do with the DataONE project.

The DataONE team is combin-

ing fine-scale weather, land cover, human population distribution, elevation, along with observations collected by the National Aeronautic and Space Administration's MODIS satellite sensor on the greenness of the land for many different places in the conterminous U.S. Ornithologists from Cornell will use up to 80,000 processor hours on NSF's TeraGrid network of supercomputers (including Nautilus at the Joint Institute for Computational Sciences at ORNL) to combine DataONE environmental statistics with recorded bird sightings from eBird, an online database managed by Cornell and the National Audubon Society that allows bird enthusiasts across the globe to submit comprehensive reports on bird sightings. Linking bird sight-

DataONE

ings—species, numbers of individuals, location, and date—to environmental conditions could eventually help scientists see how the changing global climate is altering bird migration and distribution patterns.

"There are 100,000 locations across the U.S. where bird watchers have observed different species of birds," explains CCSI researcher and DataONE

co-principal investigator Bob Cook. "Our goal is to find the environmental data that we have at those points and analyze the relationship between those environmental datasets and the bird observations over time to understand the environmental factors that affect the timing of migration."

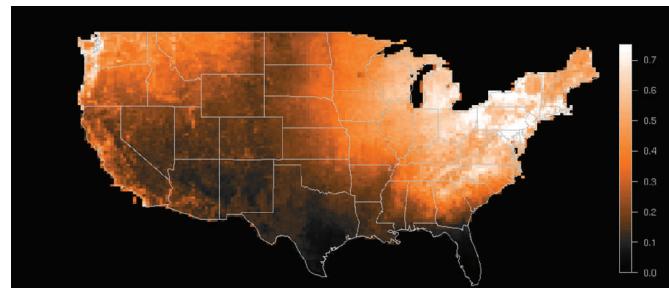


Figure 2. Predicted probability of occurrence of Song Sparrows (*Melospiza melodia*) in the continental U.S. for April 1, 2008. Brighter colors indicate higher probability.

CCSI WELCOMES NEW STAFF



Dr. Danny McKenna is the new Group Leader for the Computational Earth Sciences Group. He earned a 1st

Class Honours degree in Chemical Physics with Advanced Mathematics and a PhD in Theoretical Chemistry from the University of Glasgow, Scotland. McKenna worked for several years at the UK Met Office in the Atmospheric Chemistry Group of which he assumed leadership in 1990. During his time at the Met Office, McKenna participated in and assumed leadership roles in UK, European and US field campaigns including the first National Aeronautics and Space Administration (NASA) lead airborne polar campaigns to investigate the destruction of the ozone layer in 1987 and 1989 and the Met Office campaign to the Persian Gulf that made the first estimates of the environmental impacts caused by the oil well fire pollution at the end of the first Gulf War in 1991. In 1994, McKenna moved to the Forschungszentrum Juelich in Germany as the founding director of the Institute for Strato-

spheric Chemistry (ICG) and as Associate Professor in the Department of Physical Chemistry of the University of Bonn. As ICG director, McKenna developed an integrated program of instrument and model developments, field deployments and model analysis and as an associate professor taught courses in atmospheric physics and chemistry at the University of Bonn.

At the beginning of 2001, McKenna moved to the National Center for Atmospheric Research (NCAR) as Director of the Atmospheric Chemistry Division (ACD). During his tenure as ACD director, McKenna was instrumental in the development of the Megacity Impact on the Regional and Global Environment (MIRAGE) and in the Upper Troposphere and Lower Stratosphere (UTLS) programs. He also oversaw the creation of a new custom facility for the Atmospheric Chemistry Division where they moved in 2005. In 2006, McKenna stepped down as Division Director and assumed the role as an NCAR senior scientist and supported the MIRAGE and UTLS programs.



Dr. Dan Hayes came to ORNL by way of Alaska where he was serving as a postdoctoral research scientist on a National Science Foundation-supported project under the Arctic System Science Program. While in Alaska, Hayes was also involved in a US Department of Agriculture and NASA-supported collaborative project between the US and Canadian forestry scientists to understand the effects of disturbance (with a focus on insect defoliation) on carbon cycle dynamics in the context of climate change. Hayes received his PhD from Oregon State in 2006. While pursuing his degree, Hayes received a NASA Earth System Science Graduate Fellowship. In addition, Hayes also worked as a teaching assistant, instructing classes in photogrammetry and remote sensing, image processing for natural resource monitoring, forest ecosystem management, and summer field forestry. Hayes is a Carbon-Climate Modeler in the Ecosystem Science Group in the Environmental Sciences Division.



Pete Eby, a recent transplant from Tampa, joined the Computing and Computational Sciences Directorate, Infrastructure Server and Software Sup-

port as a UNIX/Linux Systems Engineer. In this role, Eby will be supporting the UNIX/Linux infrastructure, designing and implementing solutions as needed to meet computing, storage and other needs and assisting to administer and maintain servers providing DAAC, CDIAC and ARM Archive data functionality both to ORNL and the research community. Prior to joining ORNL, Eby was a UNIX/Linux administrator in large scale (Tier 1 / 2) data centers supporting various commercial operations. Eby's experience also includes being project engineer on several projects in remote Alaska (Sheninya, Kotzebue, etc.) and in Micronesia (Wake Island) on a variety of large scale heavy civil and mechanical construction projects for clients such as Red Dog Mine, the US Air Force and eth Alaska Railroad company.

UT-BATTELLE SIGNS IAV MOU WITH UNIVERSITY OF THE SUNSHINE COAST

In August, UT-Battelle signed a Memorandum of Understanding (MOU) with the University of the Sunshine Coast (USC) in Queensland Australia to recognize and build on the relationship that exists between the two institutions and establish a firm basis for continued cooperation to enhance their respective research objectives in the climate impacts, adaptation and vulnerability (IAV) domain.

Public and private sector interest regarding climate change IAV is increasing rapidly at a range of geopolitical scales, from global to local. Accordingly, opportunities and funding for IAV research are anticipated to expand. International collaboration represents a pathway to a) enhance knowl-

edge transfer regarding IAV among global regions, b) leverage research funding to maximize return on research investment, and c) compare and contrast IAV research and findings in different national contexts.

Some of the planned collaboration include:

- Pursuit of international research funding in support of joint research projects, workshops and conferences, and international researcher exchange;
- Joint authorship of research papers of mutual interest relevant to sustainability and climate change IAV research; and

- Joint mentorship of students and postdoctoral fellows.

Ben Preston (UT-Battelle's point -of-contact for this MOU) stated, "The University of the Sunshine Coast is home to some of Australia's leading researchers working on climate change adaptation and its connections to broader issues of sustainability. Over the past several years, I've enjoyed a productive collaboration with USC, and this MOU will hopefully enable the CCSI to take advantage of that relationship in the years ahead."

USC is located in the subtropical region of southeast Queensland, which is often considered to epitomize Australia's many challenges in adapting to

the potential impacts of climate change. The region boasts unique and valued ecological landscapes, but is currently undergoing intense development pressure, particularly along the coastal margins. This has led to significant debate regarding the growing vulnerability of the region to climate change and what management options are available to meet the rising demand for natural resources while increasing the resilience of human settlements and ecosystems. Such challenges are mirrored in many regions of the U.S., and therefore international collaboration such as the USC/ ORNL MOU help to maximize learning about research methods and findings as well as sustainability solutions.

HIGH-RESOLUTION CLIMATE COMPUTING HIGHLIGHTS

The following are some highlights of recent and ongoing work in high-resolution climate computing:

- Determining domain decompositions that optimize performance of the high resolution ocean component of the CCSM (with collaborator Sherri Mikelson at Argonne).
- Configuring the spectral dycore for high resolution climate simulation.
- Implementation of a new time stepping feature that allows much faster simulation of the coupled high resolution model
(Taylor M.A., K.J. Evans, J.J. Hack and P.H. Worley " Subcycled Dynamics in the Spectral Community Atmosphere Model, Version 4. J. Physics. Conf. Series, 127: to appear.)
- Development of a monthly varying, higher resolution aerosol dataset.

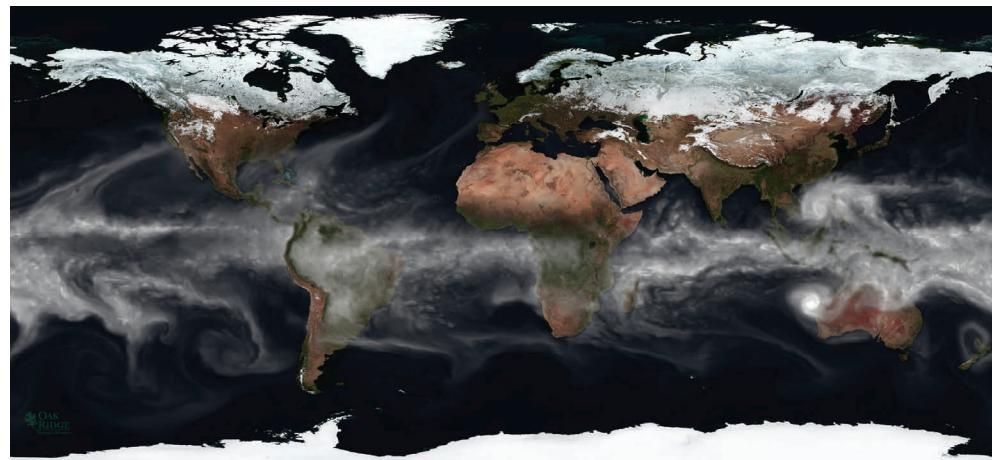


Figure 3. Total precipitable water within a test simulation of the T34I resolution of the community Atmosphere model version 4, with subcycled dynamics. Picture rendering created by Jamison Daniel.

CDIAC UWG TO MEET AT ORNL



The Carbon Dioxide Information Analysis Center (CDIAC) will

be hosting the next meeting of their User Working Group (UWG) at ORNL building 2040 (the new home for CCSI) on September 27-28, 2010. CDIAC serves as the U.S. Department of Energy's primary climate-change data repository and information clearinghouse and has been housed at ORNL since 1982. The CDIAC UWG meets every two years to evaluate and advise CDIAC on data priorities, information technologies, research focus, and future work plans. The seven-person CDIAC UWG is chaired by Dr. Robert Key (Princeton University).



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RECENT DATA PRODUCTS

Three Data Sets from the ISLSCP Initiative II Snow, Sea Ice, and Oceans Data Collection released

Three New LBA-ECO data sets released

Coming in September

Data Archives—strategic vision for the future Highlighted Researcher: Ben Preston SAB1st Annual Meeting Highlights

CALENDAR

- [17th AMS Conference on Air-Sea Interaction](#) (Annapolis, MD) 27 Sept-1 Oct 2010
[PROMITHEAS, The Energy and Climate Change Policy Network](#) (Athens) 7-8 October 2010
World Climate Research Programme—Open Science Conf. (Denver, CO).....24-28 October 2010
[Climate Adaptation in the Nordic Countries: Science, Practice, Policy](#) (Stockholm) ...8 -10 Nov 2010
[Special Symposium on Climate Change & Impact Assessment sponsored by the International Association for Impact Assessment](#) (Washington, DC).....15-16 November 2010
[Strategic Environmental R&D Program Annual Symposium](#) (Washington, DC)...30 Nov—2 Dec 2010
[American Geophysical Union Fall Meeting](#) (San Francisco, CA)13-17 December 2010
[91st Annual Amer. Meteorological Society Meeting](#) (Seattle, WA)..... 23-27 January 2011
[AmeriFlux Science Meeting & 3rd NACP All-Investigators Mtg](#) (New Orleans).... 31 Jan—4 Feb 2011
[Amer. Assoc. for the Advancement of Science Annual Meeting](#) (Washington, DC).....17-21 Feb 2011
[Colorado Conference on Earth System Governance](#) (CSU, Fort Collins, CO).....17-20 May 2011
[Fifth Intl. Conf on Flood Management](#) (Tsukuba, Japan).....27-29 September 2011



*Developing and executing
programs for the multi-agency,
multi-disciplinary climate change
research partnerships at
Oak Ridge National Laboratory.*

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 questions in global climate change science. You can view complete position descriptions and apply at <http://jobs.ornl.gov>.

- Deputy Division Director—Environmental Sciences
 - Climate Computational Scientists
 - Postdoctoral Research Associates
 - Technical Project Leads—Environmental Sciences