

# CLIMATE CHANGE SCIENCE INSTITUTE

The Climate Change Science Institute (CCSI) was formed in 2009 to integrate climate science activities across Oak Ridge National Laboratory. Approximately, 130 scientists in the areas of (i) earth system modeling, (ii) data integration, dissemination, and informatics, (iii) integrative ecosystem science, and (iv) climate impacts, adaptation, and vulnerability science are co-located in a single modern, open office space environment.

CCSI's priorities are to create the science, experiments, data, and community capacity to:

- Strengthen the predictive capabilities and effectiveness of climate and biogeochemical models.
- Identify and understand how climate change impacts the resiliency of human and natural land-energy-water systems, including extreme events and tipping points.
- Participate in national and international climate assessments and response option analysis.
- Develop useful climate adaptation and mitigation tools and information in collaboration with land-energy-water system stakeholders.

## WHY CCSI?

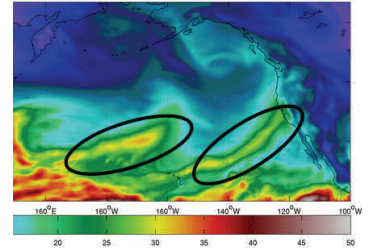
CCSI is a unique institution within the national laboratory system and across the country. CCSI attributes include:

- **Collocation.** Multidisciplinary staff collocated within a diverse science laboratory with world-class supercomputers, measurement and analysis tools, and scientific expertise.
- **Model-Data-Experiment Integration.** Improving multi-scale climate and biogeochemical models and their uncertainty characterization by integrating models, long-term large-scale field experiments, and data analytical services.
- **Mission-Inspired Science.** Science driven by the need to better understand the impacts and consequences of climate change on human and natural land-energy-water systems.

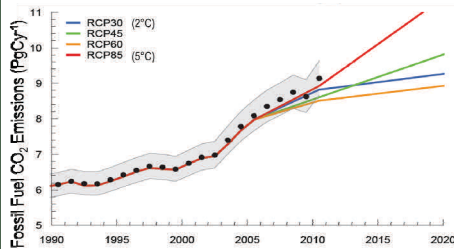


# RESEARCH THEMES

The **Earth System Modeling group** uses high-performance computing resources including America's fastest supercomputer, Titan, to retool global Earth modeling techniques to operate at higher resolutions. The ongoing development of ultra-high-resolution models has led to models many times more detailed than standard models, which improves regional modeling in high demand by public and private decision makers. *Image caption: Planetary-scale pressure waves that can generate extreme weather events.*

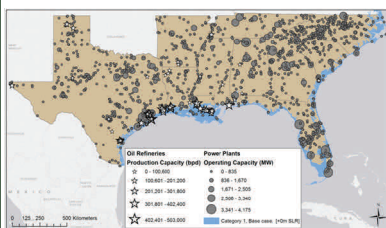
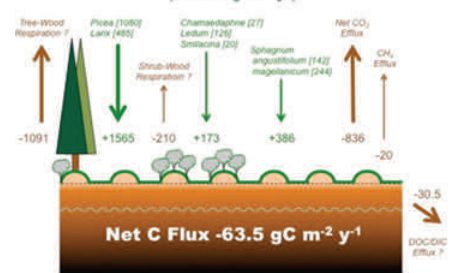


The **Data Integration, Dissemination, and Informatics group** hosts a range of important climate-related archives and creates tools to merge data from separate archives into single portals geared toward a broad range of scientists and stakeholders interested in climate change information, including Earth science datasets that inform the building of complex climate models. The group also creates data-management tools so researchers can provide direct links to their data and users can easily adopt datasets to their own scientific needs. *Image: Historical and projected fossil fuel CO<sub>2</sub> emissions according to the 2010 Representative Carbon Pathway models.*



The **Integrative Ecosystem Science group** studies carbon cycle processes and feedbacks, such as the influence of rising carbon dioxide concentrations on land ecosystems. Researchers estimate that 50% of the world's carbon is stored in soil and vegetation, which humans have a unique ability to manipulate through such land use as agriculture and deforestation. The group conducts large-scale field experiments on the peatlands of northern Minnesota, the Arctic, the tropics and other climate sensitive ecosystems. *Image caption: Flux of carbon through a peatland ecosystem.*

## 2012 C-Cycle Interpolations for the S1 Bog (C Flux in gC m<sup>-2</sup> y<sup>-1</sup>)



Spatial distribution of energy facilities in the U.S. Southeast as well as the coastal area potentially susceptible to inundation from a category 1 hurricane.

The **Impacts, Adaptation, and Vulnerability Science group** develops analysis tools and methods for assessing adaptation strategies and advising stakeholders who must prepare people and infrastructure for risks associated with climate change. Many of these analysis methods span multiple scales, from local to global, and rely on advanced computer models and diverse datasets that include social, political, and economic, as well as environmental, assessments.

## Career and Educational Opportunities

Multiple opportunities are available periodically from field technicians to high performance computing modelers, from undergraduate interns to Ph.D. scientists. To find opportunities, please visit the following sites:

- **CCSI post-doctoral and job opportunities** are posted to the ORNL jobs board (<http://www.ornl.gov/ornl/careers>).
- **Doctoral Fellowships** are available through the **Bredesen Center for Interdisciplinary Research and Graduate Education** (<http://bredesencenter.utk.edu/>).
- **Students** interested in internships can apply to various interdisciplinary and discipline based programs including the Higher Education Research Experience, Nuclear Engineering Science Laboratory Synthesis, Research Alliance for Math and Science, Science Undergraduate Laboratory Internship, Volkswagen Scholars, and the Oak Ridge Science Semester, through ORAU and the Oak Ridge Institute for Science and Education. For more information or to apply please visit <http://orau.org/ornl>.