Visual Data Exploration and Analysis of Ultra-Large Climate Data

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SPONSOR: US DOE, Office of Science, Office of Biological and Environmental Research (BER)

PARTNERS: Lawrence Livermore National Laboratory (LLNL), Lawrence Berkeley National Laboratory (LBNL), University of California at Berkeley (UC-Berkeley), and Los Alamos National Laboratory (LANL)

PROJECT DESCRIPTION

The ORNL project team, consisting of climate, computational, and computer scientists, aims to develop, deploy, and apply parallel-capable visual data exploration and analysis software infrastructure to meet specific needs central to the DOE-BER climate science mission. The team's approach focuses on using a set of science drivers, which reflect challenges in understanding regional-scale climate-change phenomena, as the basis for a coordinated effort that includes visualization of ultra-large data, statistical analysis, and feature detection/tracking techniques. The aim is to deliver new capabilities needed by the climate science community to tackle problems of the scale required by Intergovernmental Panel on Climate Change (IPCC) Assessment Report 5 (AR5) objectives. The collective team will focus their efforts on the comprehensive collection of near-term simulations that ORNL team members will conduct using the DOE/National Science Foundation (NSF) Community Climate System Model (CCSM) in support of DOE's contributions to the AR5. Software will be delivered to the climate community via CDAT, a well-established software framework for climate data access and analysis. This approach ensures that the proposed technology advances meet specific DOE mission-critical climate science needs, and that the resulting technology will reach a large audience in the climate science community via deployment in a well established and widely used software framework.

SIGNIFICANCE

This project focuses on advancing an integrated visualization and analysis framework for scientific discovery from ultra-high-resolution simulations of near-term climate change. Initial milestones of the project will center on the comprehensive collection of near-term simulations using the DOE/NSF CCSM in support of DOE's contributions to AR5. The project is designed to align directly with the BER long-term measure in climate-change research, namely to:

> "Deliver improved scientific data and models about the potential response of the Earth's climate and terrestrial biosphere to increased greenhouse gas levels for policy makers to determine safe levels of greenhouse gases in the atmosphere."

Our objective is to transform our ability to visualize and analyze the ultra-high-resolution simulations that will increasingly underpin national and international assessments of climate change.