

# Precision climate modeling forecast

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Climate modeling of tomorrow will feature precision and scale only imagined just a few years ago, say researchers David Erickson and John Drake of Oak Ridge National Laboratory's Computer Science and Mathematics Division.

Tremendous computational capabilities at ORNL's Leadership Computing Facility combined with other software tools now make it possible for researchers to create models that take into account the complete carbon cycle, terrestrial biology, El Ninos and hundreds of other factors. The goal is to provide what scientists call a fully integrated Earth system model that can be simulated every 15 minutes for centuries.

"Before, we had to make compromises that ultimately limited the resolution and scope of our models and subsequent predictions," said Drake, who noted that climate modeling is an enormous multi-agency effort. "Now, using what we have learned and with computing power exceeding 50 teraflops, we can make our models far more sophisticated."

Drake, Erickson and other researchers from ORNL are working with colleagues at the National Center for Atmospheric Research, NASA, Duke University, Georgia Tech and national labs across the country to develop a climate end station. The primary objective of the station will be to upgrade and maintain the Community Climate Systems Model, which has already been used to generate almost 12,000 climate simulations. This information is aimed at helping scientists assess the

risk of human-induced climate change.

"The upgraded model will incorporate the most recent atmospheric, oceanic and glacial ice data as well as improved chemistry, biology and physics," Drake said. "The new model will have the resolution capacity necessary to make conjectures about regional climate change, a capability that until now has been limited primarily by inadequate computational resources."

ORNL scientists are especially excited about a five-year \$1.2 million project with NASA's Goddard Space Flight Center involving a satellite that will allow them to track carbon dioxide emissions down to 75-kilometer grids around the world.

"Our new model will incorporate satellite data on regionally produced industrial emissions so scientists can directly simulate their distributions in Earth's atmosphere," said Erickson, ORNL principal investigator of the NASA project. "New tools that help us calculate how carbon is cycled through the ecosystem will be added to complement the new data and help us assess whether human activities are upsetting the delicate cycles that regulate atmospheric greenhouse gases."

Source: Oak Ridge National Laboratory

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