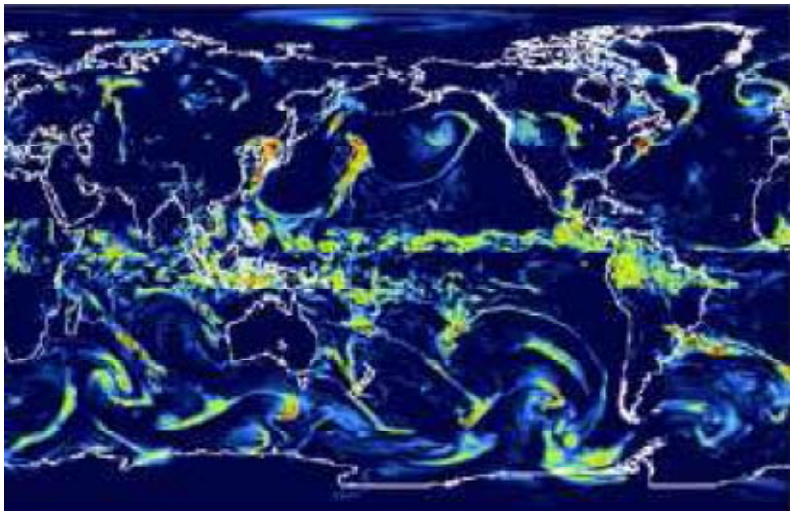
NOAA Calls on DOE Supercomputers to Simulate Climate and Severe Weather

Improved forecasts of climate and weather depend on complex models run on terascale supercomputers. The National Oceanic and Atmospheric Administration is making use of Department of Energy leadership computing facilities at Oak Ridge National Laboratory to increase its predictive power.



At 25-km resolution, we can study the statistics of tropical cyclones under climate change.

The National Oceanic and Atmospheric Administration (NOAA) aims to understand and predict changes in the global environment. A scientific agency of the Department of Commerce, it charts sea and sky, warns of dangerous weather (through its National Weather Service program), guides the use of coastal and marine resources, and conducts studies to better our stewardship of the environment. Increasingly, improved forecasts depend on complex models run on terascale supercomputers, which carry out trillions of operations each second. Now NOAA is making use of Department of Energy (DOE) leadership computing facilities at Oak Ridge National Laboratory (ORNL) to increase its predictive power with simulations that began in 2007 and will continue into 2008.

"We now have models that are highly scalable and are limited only by available hardware," says Venkatramani Balaji of NOAA's Geophysical Fluid Dynamics Laboratory at Princeton University. "DOE's proposal to make available the Leadership Computing Facility for this project provides an unprecedented match between capability computing resources and a state-of-the-art model."

The Intergovernmental Panel on Climate Change, corecipient with Al Gore of the 2007 Nobel Peace Prize, employed models that resolve oceanic and atmospheric events on 100-kilometer scales. Using new, higher-resolution models that reveal events at 25-kilometer or finer scales, NOAA researchers may learn if climate variability is predictable on the order of decades and if models can forecast regional phenomena, such as hurricanes. The researchers also expect future models to simulate full cloud physics—missing from current models.

Besides studying the averaged weather conditions that, over time, constitute climate, NOAA scientists are using state-of-the-art models to investigate more immediate severe-weather events. For example, high-resolution simulations of less than a kilometer may reveal how hurricanes are born and evolve. In 2007 NOAA ported existing models to DOE's high-performance computing (HPC) environment at the National Center for Computational Sciences (NCCS). Its goals for 2008 include optimizing computational performance and evaluating high-resolution forecasts. Knowledge gained from this work may guide national policy for weather-forecasting models in coming years. Simulations may bring real-world benefits.

OAK RIDGE National Laboratory

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Says NOAA's Stephen Lord, "Improved forecasts of severe weather, including hurricane track and intensity on 1- to 7-day time scales and basin-wide hurricane genesis on monthly time scales and other major rainfall and wind events on monthly time scales, result in the savings of life, mitigation of property damage, and an enhanced national economy."

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