

NCCS Snapshot

The Week of June 25, 2007

NATIONAL CENTER
FOR COMPUTATIONAL SCIENCES



Oak Ridge National Laboratory
U.S. Department of Energy

ORNL Jaguar Supercomputer Advances to *Second in the World*



- Jaguar ranked Number 2 in the world by the Top500 List of the world's fastest computers
- Jaguar is Number 1 for open science, with major projects in climate science, astrophysics, fusion research, and many other critical areas
- Jaguar achieved 101.7 teraflops on High-Performance Linpack benchmark, more than 85 percent of its theoretical peak of 119 teraflops
- Jaguar also solved the largest Linpack problem ever (a matrix problem of order 2.2 million containing nearly 5 trillion elements)

*Jaguar
(Cray XT4)
supercomputer*

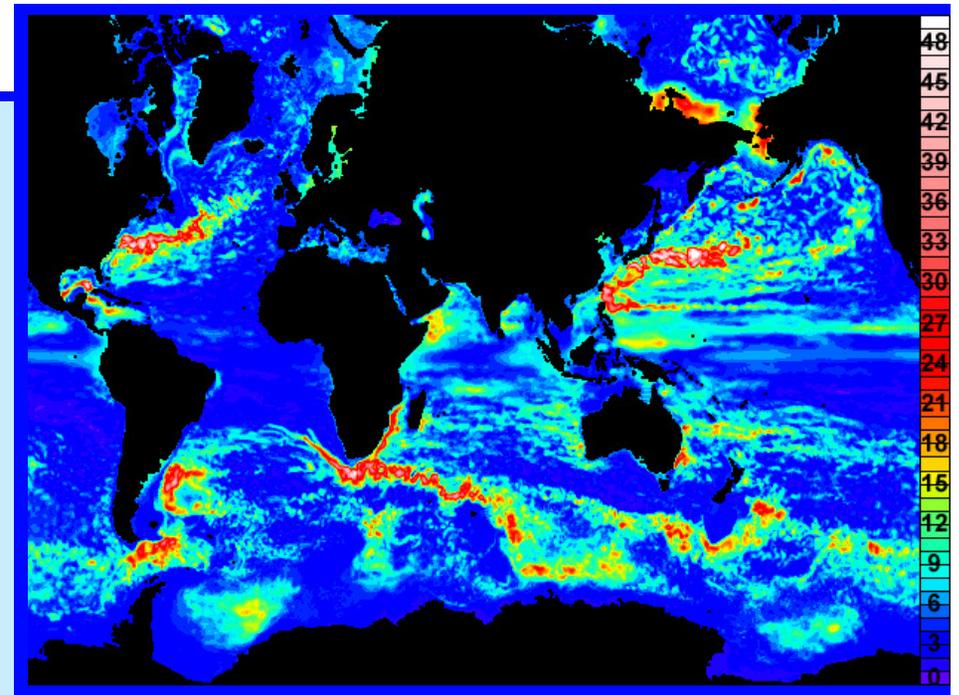
System is the world's most powerful for open science

Simulation Helps Unlock the Ocean's Secrets

"...half of the carbon dioxide that has been emitted over the last 100 years or so currently resides in the atmosphere. The rest is in the ocean..."

Synte Peacock, U. of Chicago, PI

- **Simulation promises to increase understanding of the ocean's role in regulating climate, as a repository for greenhouse gases**
- **The most fine-grained, global-scale simulations ever of how the oceans work**
 - **New knowledge of the currents and processes at work in the oceans**
 - **details about possible transport of gases and chemicals released into the ocean**



First-ever 100-year simulation of the ocean at a fine enough scale to include the relatively small, circular currents known as eddies. Until recently researchers lacked the computing power to simulate eddies directly on a global scale.

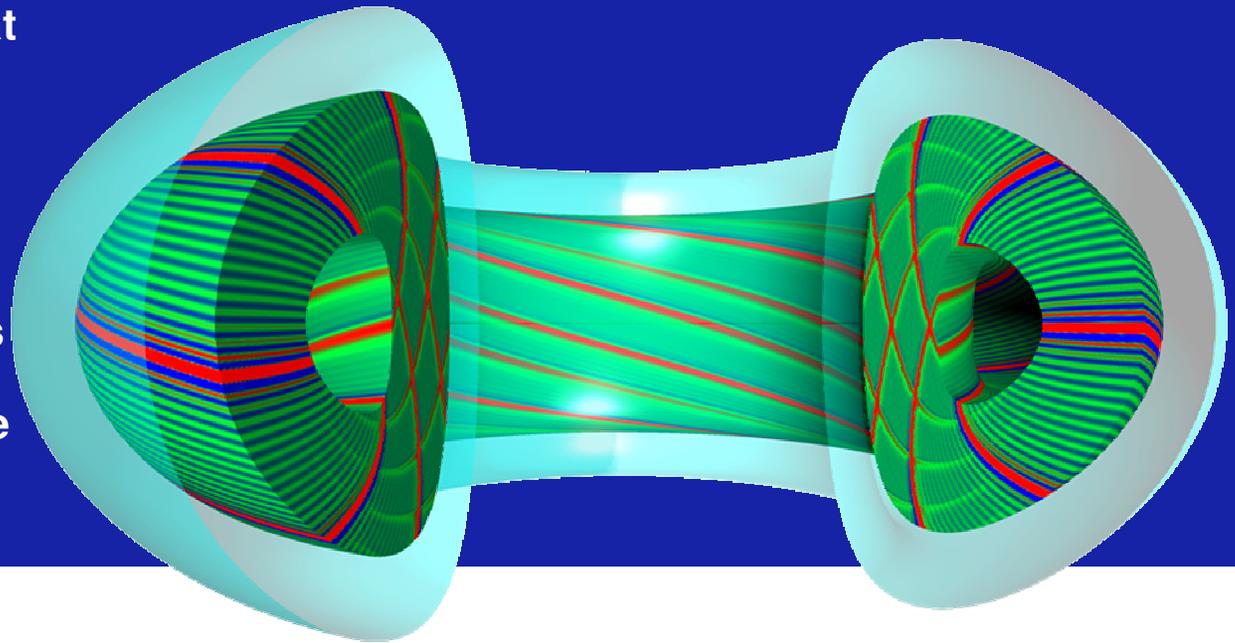
Project looks into the fate of trapped heat and greenhouse gases

Striking the Perfect Balance

Cutting-edge research explores tokamak plasmas

- Clean, abundant, inexpensive energy is the goal of the international ITER fusion reactor, fueled by plasma
- Plasma creates energy when hydrogen atoms collide. Resulting high-energy alpha particles heat the plasma, but can be ejected by turbulence of the gas
- Turbulence is necessary for a tokamak reactor. The GYRO code computes “optimal turbulence,” finding the perfect balance of heat and alpha-particle production and loss.

“The key is to know the rate at which the plasma is leaking heat and particles, because while some loss is necessary, too much can be detrimental.”
Jeff Candy, General Atomics, PI



Students Taste the Joys of Supercomputing



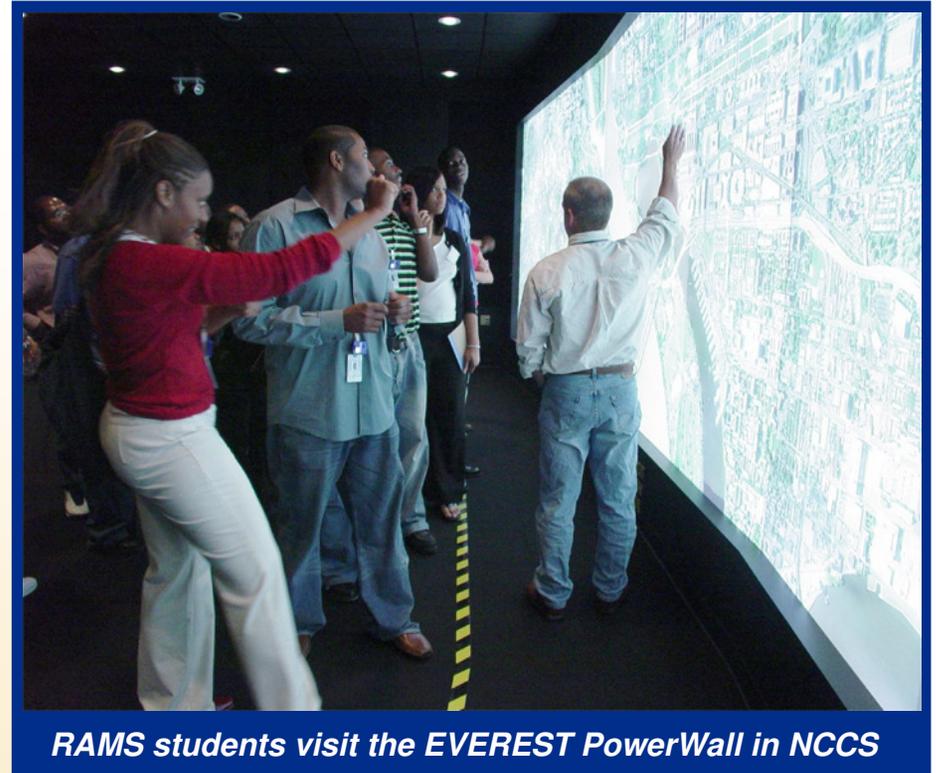
Rebecca Hartman-Baker

*Crash course gives them
the tools to get started*

- 40 students attend “A Crash Course in Supercomputing,” given by Rebecca Hartman-Baker of ORNL’s Computer Science and Mathematics Division
- Students get a taste of how to write the highly parallel programs required by modern high-performance computers
- The class is given accounts on the NCCS Cheetah supercomputer as well as a tour of the NCCS facilities

Fisk Junior Working to Make Jaguar Purr

- Fisk University junior Joylika Adams working at ORNL through the summer through the Research Alliance in Math and Science (RAMS)
- Working with Mark Fahey of the Scientific Computing Group
- Project involves identifying the most effective ways to perform input and output on the NCCS's premier Jaguar supercomputer



RAMS students visit the EVEREST PowerWall in NCCS

Computer science major spending summer at NCCS through RAMS program