Arctic Region Supercomputing Center

Pioneers in the Land of the Midnight Sun

The Arctic Region Supercomputing Center at the University of Alaska Fairbanks is an allocated distributed center under DoD's High Performance Computing Modernization Program. Located on the campus of America's Arctic University, ARSC is a leader in supporting scientific analysis, research and discovery of Polar Regions with state-of-the-technology, high performance computational resources. Best practices from HPCMP are implemented at ARSC in a unique, pioneering, open research environment.

CAP Testing

As part of the HPCMP's Capability Applications Project (CAP), a few competitively chosen users were the first to access *Midnight*. CAP allows users with mature code to tackle very large computational campaigns using significantly more processors than they would be able to normally. This allows scalability testing at the same time as the computational campaign.

Hypersonic Turbulence

Capacity testing gave users like Dr. Maria Pino Martin with Princeton University's Mechanical and Aerospace Engineering Department access for a large-scale capability computational workload on *Midnight*.

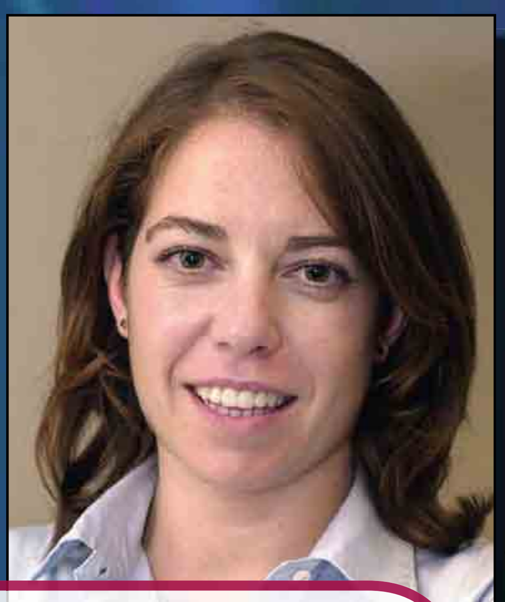
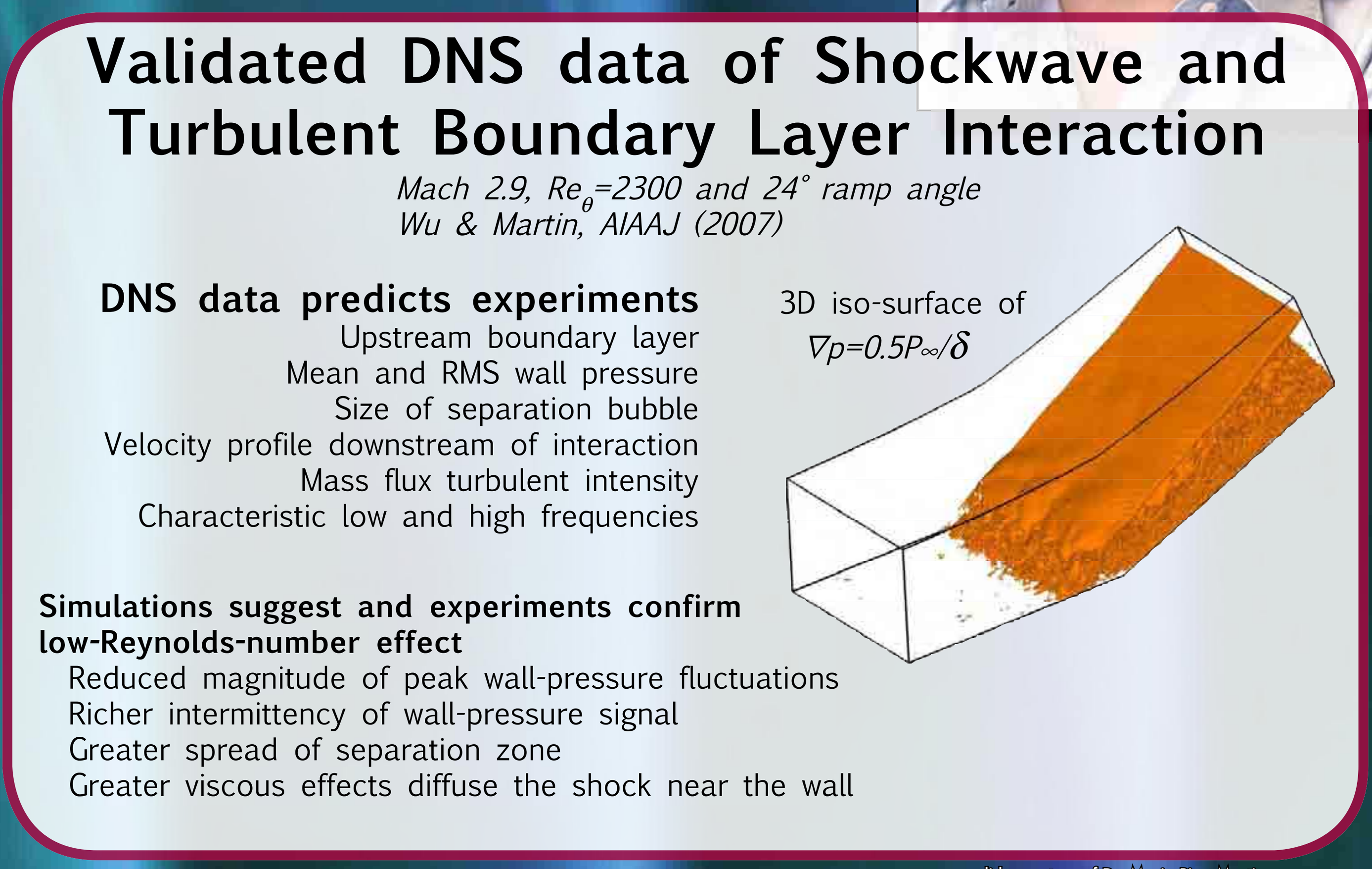


photo courtesy of Princeton University

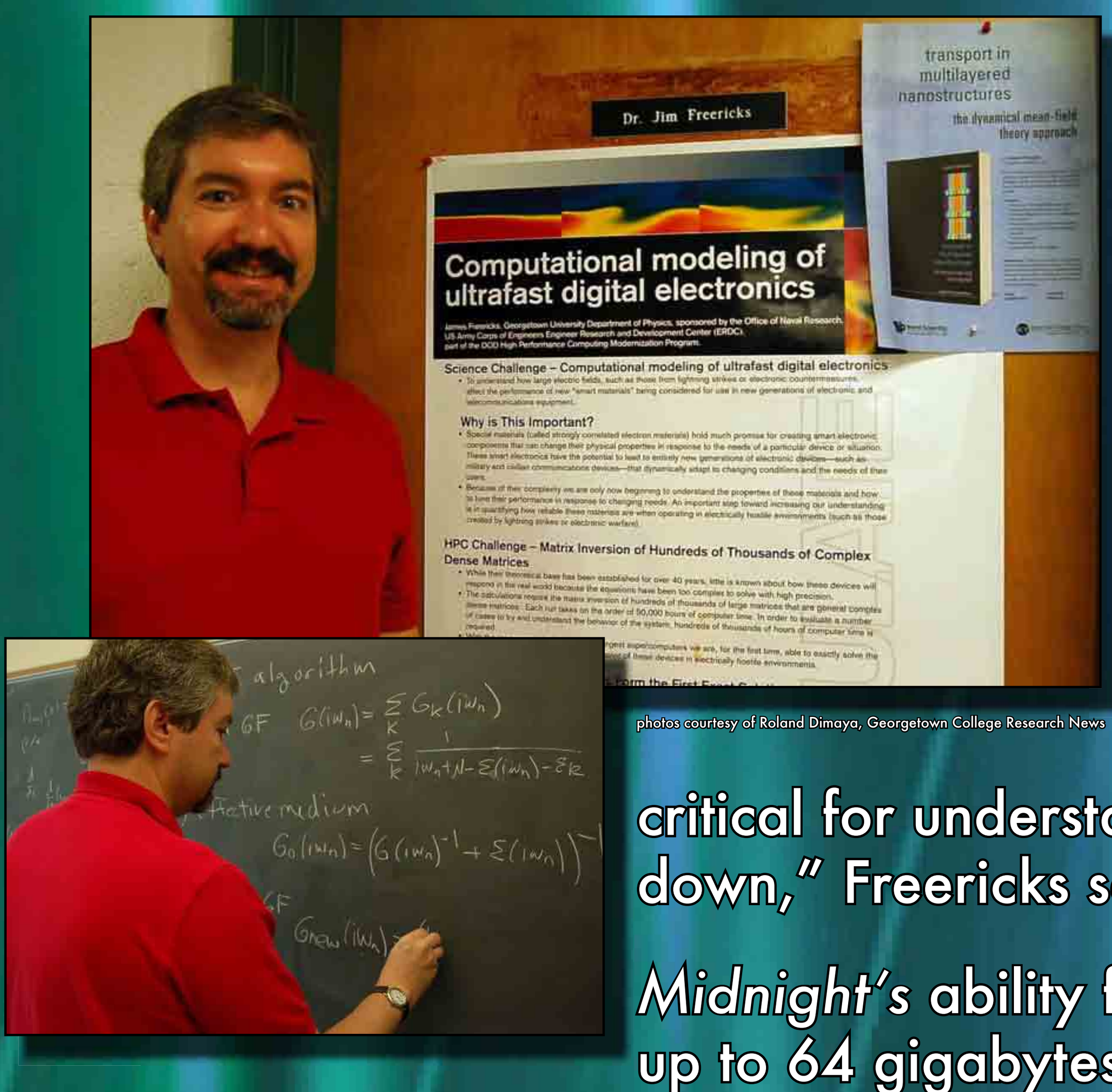
Dr. Martin's work focuses on developing large-scale calculations to simulate the movement of objects through air at supersonic and hypersonic speed, which creates turbulence and shock waves. For example, when the space shuttle re-enters orbit its speed is so swift that air molecules can't get out of the way fast enough. The swells and swirls of air flowing over the shuttle at high speed create friction, which creates intense heat.

"If we can't predict the flow conditions we cannot expect to control them," said Martin. She is seeking to understand turbulence for forthcoming high-speed vehicles, which will travel at MACH 10-15.



slide courtesy of Dr. Maria Pino Martin

Ultrafast Digital Electronics



photos courtesy of Roland Dimaya, Georgetown College Research News

Dr. James Freericks, Georgetown University Physics Department, is fine-tuning a mathematical calculation that would predict the performance limits of highly sophisticated electronic equipment in environments with extremely strong electromagnetic fields.

"Many military electronics are exposed to extreme operating conditions, so knowing their nonlinear response to large electric fields is critical for understanding under what circumstances they'd break down," Freericks said.

Midnight's ability for each Opteron processor to share memory up to 64 gigabytes within a node has provided a significant advantage over many other machines for large memory jobs. During the CAP phase, Freericks was able to bypass typical wall time limitations, avoiding the need for frequent checkpoints and restarts.

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