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Media Relations

UNH Space Plasma Physicist Selected For Prestigious Dept. Of Energy Award

May 25, 2011

DURHAM, N.H. – Kai Germaschewski, assistant professor of physics at the University of New Hampshire, has received a prestigious Early Career Research Program grant from the U.S. Department of Energy to support work in fusion plasmas that could one day lead to a cleaner source of energy. Germaschewski, who also works in the Space Science Center of UNH's Institute of Earth, Oceans and Space (EOS), is the first UNH faculty member to receive a grant through this program since its launch in 2009.

The grant, funded through the DOE's Office of Fusion Energy Sciences, will advance Germaschewski's work in harnessing supercomputing powers to better model the dynamics of fusion plasmas. His proposal for "Extended MHD Modeling of Nonlinear Instabilities in Fusion Plasmas" was one of just 67 chosen for funding by peer review from a field of more than 1,000 applications.

The project's principal objective is to computationally model global dynamics in fusion plasmas, which typically are modeled using magnetohydrodynamics (MHD). MHD modeling, says Germaschewski, treats plasma as an electrically conducting fluid interacting with a magnetic field. Germaschewski's research proposes to use a more sophisticated version of MHD, called "extended MHD", which enables the modeling of effects in high-temperature plasmas that are neglected in traditional MHD models.

Plasma is considered the fourth state of matter (after solid, liquid and gas); it consists of electrons and ions, or atoms that have lost electrons. Because of their size and complexity, description of the state of plasmas is done via models that treat the plasma as a single fluid or gas. Germaschewski's work builds on existing models with the ever-increasing power of computers to enhance understanding of the state of plasma.



"It's a step toward using more refined models toward explaining what might happen in these experiments," he says. For small plasma systems, he adds, computers can simulate the dynamics of individual particles. "For larger systems, we make further simplifications to fluid models, but still need to make sure to get the physics right."

The funding, which is \$750,000 over five years, will let Germaschewski hire a postdoctoral researcher to assist with his work. "The name 'early career' of this DOE program is very appropriate. It allows me to focus and build on my accomplishments in computational physics for further applications to fusion and other laboratory plasmas," he says.


Earlier this year, Germaschewski received another prestigious grant recognizing young scientists of promise, a National Science Foundation Early Career Development, or CAREER, grant. This grant, for nearly \$500,000 over five years, looks at interesting phenomena in the magnetosphere, the magnetic shield that protects the Earth from solar and cosmic radiation.


"As a joint member of the physics department and the newly established Integrated Applied Mathematics Program, Kai is ideally placed to use his exceptional talents in computational physics to a broad spectrum of problems in space science and plasma physics. The two career awards from NSF as well as DOE are apt recognition for his ability to address important and outstanding questions in both communities, and for the role he will continue to play in educating students in the area of high-performance computing," says Amitava Bhattacharjee, the Paul Professor of Space Science in EOS and one of Germaschewski's principal mentors for nearly a decade.


"Kai Germaschewski is an extraordinary member of our faculty and research community. He is leading the way as the first faculty member to receive this award from the Department of Energy and joins other

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distinguished researchers who have received NSF Career Grants," Jan Nisbet, senior vice provost for research at UNH, says. She adds that both grants will allow Germaschewski to make significant contributions to the fields of physics and space science.

"I am very interested in the computational side of things, which is beyond what's traditionally done in the physics department. This allows me to develop new tools which let me make progress on the science side of things," he says.

The University of New Hampshire, founded in 1866, is a world-class public research university with the feel of a New England liberal arts college. A land, sea, and space-grant university, UNH is the state's flagship public institution, enrolling 12,200 undergraduate and 2,300 graduate students.

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