NSF Award in Mathematical and Physical Sciences

Principal investigator: Mary Silber, engineering sciences and applied mathematics, McCormick School of Engineering and Applied Science

- Project: IGMS: Coupling and feedback in the climate system
- Start Date: September 15, 2009
- Total Award Amount: $99,953

How the results of this project will benefit society:
The PI will spend the academic year 2009-2010 in the Climate Group in the Geophysical Sciences Department at the University of Chicago. Expected outcomes of the immersion year include (1) developing sustainable interdisciplinary research collaborations with leading climate scientists, (2) identifying relevant projects for applied mathematics Ph.D. research, and (3) developing a seminar course on “Challenges of Modeling the Climate and Climate Change” aimed at Northwestern University advanced undergraduate and graduate students.

The problem the project is trying to solve:
To ensure a broad overview of key components of the climate system, the PI has identified three research project areas that interface with the research activities of faculty and their students in the Geophysical Sciences Department at the University of Chicago. These projects concern (1) mathematical modeling of the ice component of the climate system, which is important to understand for predicting sea level rise due to global warming, (2) mechanisms of abrupt climate change in the last glacial cycle that are related to thermohaline circulation in the deep Atlantic, which would be constrained by new paleoclimate proxy records of North Atlantic sea-surface temperature and salinity changes, and (3) investigations of system level climate models of extreme glaciation events in earth’s distant past including models of “Snowball Earth.”

How this project will work:
Primary goals of the immersion year include (1) gaining a scientific overview of key physical components of the climate system, including how they interact, their characteristic temporal and spatial scales, and how they are modeled; (2) gaining experience with paleoclimate proxy data, including how they are obtained, how they are interpreted quantitively, their uncertainties and their quality; (3) developing research collaborations with climate scientists at the University of Chicago aimed at understanding the role of coupling and feedback in climate change.

Additional activities include (1) expanding the PI’s participation in the Climate Group journal club, which she joined in January 2009, by leading some of the journal club discussions and proposing topics of investigation that relate to her mathematical expertise in dynamical systems and bifurcation theory, (2) attending weekly departmental seminars to gain a broad perspective on geophysical sciences research, (3) auditing graduate courses on “Climate Dynamics” and “Global Climate Models,” and (4) attending a number of professional meetings and workshops related to climate science.

This award is funded under the American Recovery and Reinvestment Act of 2009, NSF Award number: 0929419.