ACMS Applied Math Seminar

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Thursday, September 20, 2018
154 Hurley Hall
3:30 – 4:40 PM

Investigating and Improving Finite Element Simulations of Incompressible Flows

The numerical simulation of incompressible flows presents a number of challenges. For example, in practical settings, the disparity between large scales of motion and small impose substantial Nyquist conditions on spatial discretizations. In recent years, several novel techniques have been developed to circumvent this issue. I present one such technique called the Temporally-regularized Navier-Stokes Equations, and demonstrate both its efficacy in complicated flow regimes, as well as its sensitivity to perturbations of model tuning parameters.

A second difficulty in the simulation of incompressible flows is a complete understanding of their long-time behavior. It is commonplace to simulate extremely long time-scales in geophysical flows, e.g. weather prediction or climate models. I present long-time stability analysis (in both the L^2 energy and H^1 dissipation norms) of a finite element approximation of the Navier-Stokes equations discretized in time using a general class of semi-implicit time-stepping schemes.

The Department of Applied and Computational Mathematics and Statistics

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