Joint Event

NUMERICAL METHODS FOR PDEs SEMINAR

and

PHYSICAL MATHEMATICS SEMINAR

Conservation Law Modeling of Mixing in Layered Hydrostatic Flows

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ABSTRACT:

This talk proposes a framework to quantify the large-scale effects of fluid mixing without resolving the associated small scale motion. The equations of motion for hydrostatic flows adopt the form of a hyperbolic system of nonlinear equations that yields breaking waves. To model the shock waves that ensue, one needs to involve integral conserved quantities, such as mass and momentum. Yet in a system composed of layers that may mix, first physical principles do not provide a set of conserved quantities large enough to completely determine the flow. Our proposal is to replace the conventional conservations laws of each layer's mass and momentum, invalid aftershocks form, by others, such as energy, in a way that provides a natural description of the mixing process.

On the numerical side, we develop a finite volume algorithm to simulate general systems of conservation laws with arbitrary conserved quantities. Applications range from the lock-exchange, through the mixing Rossby adjustment problem, to overturning circulations such as the atmospheric Hadley cells.

Jointly with Paul A. Milewski (Bath) and Robert E. Friel (Courant)**.**

Wednesday, October 16, 2013
4:00 PM - 5:00 PM
Building E17, Room 129

http://math.mit.edu/seminars/nmpde/

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