

Department of Mathematics

University of Houston

Scientific Computing Seminar

Professor Jacques Rappaz

Chaire d'Analyse et Simulation Numérique

Ecole Polytechnique Fédérale de Lausanne

Switzerland

Convection-diffusion problems with Robin's boundary conditions. Application to a solidification problem

Thursday, February 2, 2012

3:00 PM- 4:00 PM

Room 646 PGH

Abstract: When a material occupying a cavity Ω is in a liquid state at time $t = 0$ submitted to some motions and which is gradually solidified when the time goes up, it is important to correctly satisfy an energy balance in order to proceed to a realistic numerical simulation. When the liquid state is incompressible, the convection velocity has to be exactly divergence free for not artificially losing energy. Unfortunately, in a lot of numerical schemes, the approximation of the velocity is not exactly divergence free and consequently the discretization of the heat equation with convection produces unwelcome numerical effects!

In this talk, we present a new numerical scheme for convection-diffusion problems with Robin's boundary conditions producing the conservation of energy and other properties even if the velocity field is not exactly with divergence free. We prove that this scheme is stable and convergent. When we apply this numerical scheme to a solidification problem, we verify that the total energy for cooling and solidification of the material together with the energy which is passing through the boundary is conserved.

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This seminar is easily accessible to persons with disabilities. For more information or for assistance, please contact the Mathematics Department at 743-3500.