SEMINARIO DE ANÁLISIS NUMÉRICO Y MODELACIÓN MATEMÁTICA

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Título de la Charla:

An augmented mixed-primal finite element method for a coupled flow-transport problem

Fecha y Hora:

Martes 14 de Octubre de 2014, 15:30 Horas.

Lugar:

Auditorio Escuela de Arquitectura

Hall Ingeniería en Construcción

Universidad del Bío-Bío.

Resumen

In this talk we analyze the coupling of a scalar nonlinear convection-diffusion problem with the Stokes equations where the viscosity depends on the distribution of the solution to the tranport problem. An augmented variational approach for the fluid flow coupled with a primal formulation for the transport model is proposed. The resulting Galerkin scheme yields an augmented mixed–primal finite element method employing Raviart-Thomas spaces of order k for the Cauchy stress, and continuous piecewise polynomials of degree $\leq k+1$ for the velocity and also for the scalar field. The classical Schauder and Brouwer fixed point theorems are utilized to establish existence of solution of the continuous and discrete formulations, respectively. Then, sufficiently small data allow us to prove uniqueness and to derive optimal a priori error estimates. Finally, we report a few numerical tests confirming the predicted rates of convergence, and illustrating the performance of a linearized method based on Newton-Raphson iterations; and we apply the proposed framework in the simulation of thermal convection and sedimentation-consolidation processes.