SEMINARIO DE ANÁLISIS NUMÉRICO DE ECUACIONES DIFERENCIALES PARCIALES.

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Título de la Charla:

A Priori and a Posteriori Error Analysis of a Residual Local Projection Finite Element Method for the Navier–Stokes equations

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Resumen

This work presents and analyzes a new Residual Local Projection stabilized finite element method (RELP) for the non-linear incompressible Navier–Stokes equations. Stokes problems defined element–wisely drive the construction of the residual-based terms which make the present method stable for the finite element pairs $\mathbb{P}_1/\mathbb{P}_l$, $l = 0, 1$. Numerical upwinding is incorporated through an extra control on the advective derivative and on the residual of the divergence equation. Existence of the discrete solution and uniqueness of a non–singular branch of solutions, as well as optimal error estimates in natural norms are proved under standard assumptions. Next, a divergence-free velocity field is provided by a simple post-processing of the computed velocity and pressure using the lowest order Raviart–Thomas basis functions. This updated velocity is proved to converge optimally to the exact solution. Also, an a posteriori error estimator is proposed, analyzed and the effectiveness of this is illustrated by several well–established benchmarks.