SEPIM

# Seminario de Estudiantes de Postgrado en Ingeniería Matemática

Sesión 6 - 2026

Martes 10 de noviembre, 12:30 horas, auditorio Hermann Alder Weller, CI²MA



## *An HDG method for a convection-diffusion equation with directional do-nothing boundary conditions.*


Reverse osmosis is one of the most commonly used techniques in water desalination processes. The mathematical model involves the Navier-Stokes equations coupled to an advection-diffusion equation. This model is usually solved by fixed-point arguments to decouple both equations. In this work, we focus on the advection-diffusion equation with directional do-nothing boundary conditions. We derive a proper variational formulation and prove its well-posedness using the theory of perturbed saddle-point problems in Banach spaces. In addition, we propose a hybridizable discontinuous Galerkin (HDG) scheme to approximate the solution and show its well-posedness, where the main difficulty is the treatment of the Neumann-type boundary condition. The numerical analysis is complemented by a reliable and efficient a posteriori error estimator, whose performance and adaptive refinement capabilities are illustrated through a set of computational examples.



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