## SANTIAGO NUMÉRICO III

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## A nonlinear Biot-Stokes model for the interaction of a non-Newtonian fluid with a poroelastic medium

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## Abstract

We develop and analyze a nonlinear model for the interaction of a quasi-Newtonian free fluid with a poroelastic medium. The flow in the fluid region is described by the Stokes equations and in the poroelastic medium by the quasi-static Biot model. We establish existence and uniqueness of a weak solution. A mixed finite element method is developed and analyzed for the approximation of the model, using a Lagrange multiplier to enforce weakly the continuity of flux on the interface. We establish stability and optimal order a priori error estimates. Computational experiments confirming the theoretical convergence rates, as well as applications to flows in filters and hydraulic fracturing are presented.

**Key words**: nonlinear Biot-Stokes equations, non-Newtonial fluid, fluid-structure interaction

Mathematics subject classifications (2010): 35M13, 65M12, 65M60, 76D07, 76S05

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