1067-65-2025 **Beatrice Riviere*** (`riviere@rice.edu`), CAAM department, 6100 Main Street, MS-134, Houston, TX 77005. *Weak and numerical solutions for coupled Navier-Stokes, Darcy and transport equations.*

The coupling of porous media flow with free flow arises in many applications including the industrial filtration problems and the environmental problems of contaminated aquifers through rivers. In this multiphysics couplings, the free flow is characterized by the Navier-Stokes equations whereas the porous media flow is described by the Darcy equations. Interface conditions such as the Beavers-Joseph-Saffman's law are prescribed at the interface between the two different physical flows. A transport equation satisfied by the contaminant concentration is coupled to the flow problem via the fluid viscosity and the velocity field.

In this work, we first study the well-posedness of weak solutions to the coupled problems. By varying the interface condition for the balance of forces, we construct two weak solutions using a Galerkin approach. Second we define and analyze several numerical schemes based on classical finite element methods and discontinuous Galerkin methods. Convergence of the schemes is also verified numerically. Numerical solutions for non homogeneous porous media are presented. (Received September 22, 2010)