

1173-65-44

**Thinh Kieu\***, 2669 Rocky Knoll Ct, Dacula, GA 30019. *A MIXED FINITE ELEMENT APPROXIMATION FOR FLUID FLOWS OF MIXED REGIMES IN POROUS MEDIA.*

We consider the complex flows when all three regimes pre-Darcy, Darcy and post-Darcy may be present in different portions of a same domain. We unify all three flow regimes under mathematics formulation. We describe the flow of a single-phase fluid in  $\mathbb{R}^d, d \geq 2$ , by a nonlinear degenerate system of density and momentum. A mixed finite element method is proposed for the approximation of the solution of the above system. The stability of the approximations are proved; the error estimates are derived for the numerical approximations for both continuous and discrete time procedures. The continuous dependence of numerical solutions on physical parameters are demonstrated. Experimental studies are presented regarding convergence rates and showing the dependence of the solution on the physical parameters. (Received September 11, 2021)