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Wenbin Chen, Daozhi Han and Xiaoming Wang* (wxm@math.fsu.edu), Department of Mathematics, Florida State University, Tallahassee, FL 32306. *An energy stable and fully decoupled scheme for the Cahn-Hilliard-Stokes-Darcy system for two-phase flows in karstic geometry.*

We present an accurate, efficient, and stable scheme for the Cahn-Hilliard-Stokes-Darcy system for two-phase flows in karstic geometry. The scheme is first order accurate in time and satisfies a modified energy law at the discrete level. The most salient feature of the scheme is that it is completely decoupled in the sense that only a Cahn-Hilliard solver, a Stokes solver, and a Darcy solver are required at each time step. Our numerical experiments support our theoretical results. (Received January 11, 2017)