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Wenbin Chen, Daozhi Han and Xiaoming Wang* (wxm@math.fsu.edu), Department of Mathematics, Florida State University, Tallahassee, FL 32306. *Uniquely solvable and energy stable decoupled schemes for Cahn-Hilliard-Stokes-Darcy system.*

We present two novel decoupled numerical schemes for solving the Cahn-Hilliard-Stokes-Darcy (CHSD) model for two-phase flows in karstic geometry. In the first numerical scheme, we explore a fractional step method (operator splitting) to decouple the phase-field (Cahn-Hilliard equation) from the velocity field (Stokes-Darcy uid equations). To further decouple the Stokes-Darcy system, we introduce a first order pressure stabilization term in the Darcy solver in the second numerical scheme so that the Stokes system is decoupled from the Darcy system and hence the CHSD system can be solved in a fully decoupled manner. We show that both decoupled numerical schemes are uniquely solvable and energy stable. Numerical results are presented to demonstrate the accuracy and efficiency of our schemes. (Received September 16, 2016)