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**Daozhi Han\*** (djhan@iu.edu), 831 E 3rd, Bloomington, IN 47405, **Wenbin Chen**, Shanghai, and **Xiaoming Wang**, Tallahassee, FL 32308. *On two-phase flows in karstic geometry.*

Multiphase flow phenomena are ubiquitous. In some applications such as flows in unconfined karst aquifers, karst oil reservoir, proton membrane exchange fuel cell, multiphase flows in conduits, and in porous media must be considered together. Geometric configurations that contain both conduit and porous media are termed karstic geometry. In this talk, we derive a diffuse interface model for two-phase flow in karstic geometry utilizing Onsager's extremum principle. The model together with the interface boundary conditions satisfies a physically important energy law. Then, we present a novel decoupled unconditionally energy-stable numerical scheme for solving this diffuse interface model. (Received February 03, 2017)