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Daozhi Han* (dhan@math.fsu.edu), 1327 High RD, Apt. H1, Tallahassee, FL 32304, and
Xiaoming Wang, Dong Sun and **Hao Wu**. *A diffuse interface model for two phase flow in karst aquifers.*

Multiphase flow phenomena are ubiquitous in nature. Multiphase flows also play an important role in many engineering and environmental science applications. In some applications such as flows in karst aquifers, karst oil reservoir, proton membrane exchange fuel cell, multiphase flows in conduits and in porous media must be considered together. How free flows in conduit/channel interact with flow in porous media is a challenge.

In this talk we present a phase field model that couples two phase flow in conduit with two phase flow in porous media. The model together with the associated interface boundary conditions are derived utilizing Onsager's extremum principle, which enjoys a physically important energy law. We show the existence of global in time finite energy solution to the model in both 2D and 3D. Uniqueness of weak-strong solution can be established as well. Finally some numerical results will be provided using the proposed phase field model. (Received September 12, 2014)