1131-65-333 **Eric Chung**, **Yalchin Efendiev**, **Wing Tat Leung**, **Maria Vasilyeva** and **Yating Wang*** (wytgloria@math.tamu.edu), Department of Mathematics, Mailstop 3368, Texas A&M University, College Station, TX 77840. *Multiscale model reduction for transport and flow problems in perforated domains.*

Convection-dominated transport phenomena have broadly applications. In these physical processes, the transport velocity is often a solution of a heterogeneous flow problem. In this work, we consider coupled flow (Stokes problem) and transport (unsteady convection-diffusion problem) in perforated domains. We construct a coarse-scale solver based on Generalized Multiscale Finite Element Method (GMsFEM). The main idea of the GMsFEM is to develop a systematic approach for computing multiscale basis functions. We use a mixed formulation and appropriate multiscale basis for both flow and transport to guarantee mass conservation. Petrov-Galerkin mixed formulations are used for the transport problem, which guarantee stability. We consider two different approaches. As a first approach, we use the multiscale flow solution in constructing basis functions for the transport equation. In the second approach, the multiscale basis functions for flow and transport are constructed jointly. The novelty of this approach is to construct a coupled multiscale basis functions. An algorithm for adaptively adding online multiscale basis functions is presented to speed up convergence. In summary, our results indicate that only a few of the proposed basis functions are able to give accurate solutions. (Received July 18, 2017)