1159-35-9 **Michael P Presho*** (mpresho@semo.edu), Michael Presho, and **Michael Hill**. *An Accurate Multiscale Method for Modeling Two-Phase Flow with Capillary Pressure.*

In this presentation we investigate a numerical method used for solving a two-phase flow model within the context of a physics-based two-level operator splitting scheme. The governing equations involve an elliptic pressure equation coupled with a convection-dominated parabolic equation. The underlying permeability of the porous medium is assumed to exhibit high variation over many length scales which leads to poor approximation properties in standard multiscale finite element spaces. In order to effectively solve the system we construct an approach that combines a mass-conservative generalized multiscale finite element method with an operator splitting scheme. In particular, we split the coupled system into three subsystems: the elliptic, the hyperbolic, and the parabolic pieces. To solve the elliptic equation we propose the use of a mass-conservative generalized multiscale finite element method (GMsFEM-FV), for the parabolic equation we use a mass-conservative multiscale finite element method (MsFEM-FV), and for the hyperbolic equation we use a standard non-oscillatory finite-volume scheme. The performance of the methodology is validated through a variety of numerical experiments. (Received May 21, 2020)