1110-76-200 **Jiangguo Liu*** (liu@math.colostate.edu), Department of Mathematics, Colorado State University, Fort Collins, CO 80523. *Application of the Weak Galerkin Finite Element Method to Two-phase Flow Problems.*

Coupled flow and transport problems arise from modeling petroleum reservoir, magma movement in Earth crust, and drug delivery, among other real-world applications. Computer simulations of these problems require accurate and efficient numerical methods for the governing partial differential equations. In this talk, we present new numerical methods for two-phase flow problems that couple the Darcy equation for pressure and a transport equation for saturation in a nonlinear manner. The coupled problem is solved in the framework of operator decomposition. Specifically, the Darcy equation is solved by the weak Galerkin finite element method (WGFEM), whereas the saturation equation is solved by a finite volume method. The numerical velocity obtained from solving the Darcy equation by the WGFEM is locally conservative and has continuous normal components across element interfaces. This ensures accuracy and robustness of the finite volume solver for the saturation equation. Numerical experiments on benchmarks demonstrate that the combined methods can handle very well two-phase flow problems in high-contrast heterogeneous porous media. This is a joint work with Victor Ginting at University of Wyoming and Guang Lin at Purdue University. (Received February 20, 2015)