1014-65-390 **Y. R. Efendiev*** (efendiev@math.tamu.edu), Department of Mathematics, TAMU 3368, College Station, TX 77843. *Multiscale finite element methods for flows in heterogeneous porous media.*

In this talk, I will describe the applications of multiscale finite element methods for flows in heterogeneous porous media. The main idea of multiscale finite element methods is based on the concept of generalized finite element methods. In particular, the small scale information is incorporated into the basis functions, which are coupled via global formulation of the problem. I will talk about our recent work on incorporating the global information into finite element basis functions in two-phase flow simulations. This method provides a significant improvement in two-phase flow simulations in porous media where the long-range effects are important. This is typical for some recent benchmark tests, such as the SPE comparative solution project, where porous media has a channelized structure. Generalization of multiscale finite element methods to nonlinear equations will be also presented. This is a joint work with Tom Hou (Caltech) and Victor Ginting (Texas A&M University). (Received September 14, 2005)