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Kirsten J. Boyd* (boydk@apsu.edu), Department of Mathematics, Box 4626, Austin Peay State University, 601 College St, Clarksville, TN 37044, and **Todd Arbogast**. *Subgrid Upscaling and Error Estimates for Mixed Multiscale Finite Element Methods*.

For an elliptic partial differential equation with coefficients that vary on a very fine scale relative to the domain size, standard finite element methods are not practical due to the largeness of the resulting problem. The type of equation arises, for example, in the study of fluid flow in a heterogeneous porous medium. Tom Hou et al. defined particular “multiscale” basis functions for use in the numerical solution of such equations; independently, Todd Arbogast et al. developed an abstract “subgrid upscaling” framework for the study of the interaction of scales in these problems. We will explain how to combine these results to obtain error estimates and extend the multiscale finite element method. (Received February 05, 2008)