

Meeting: 1002, Pittsburgh, Pennsylvania, SS 5A, Special Session on Multiscale Algorithms in Computational Fluid Dynamics

1002-65-157 **Ivan Yotov*** (yotov@math.pitt.edu), Department of Mathematics, 301 Thackeray Hall,
University of Pittsburgh, Pittsburgh, PA 15260. *Adaptive mortar upscaling for flow in porous media.*

The use of mortar finite elements in flow simulations allows for coupling multiple subdomains with independently constructed numerical grids and possibly different physical models and discretization methods. The mortar spaces are used to impose physically meaningful interface conditions in a numerically stable and accurate way. We formulate the mortar method with coarse mortars as a subgrid upscaling method, where the coarse subdomain decomposition and fine subdomain grids provide two-scale approximations. The effective flow is computed in subdomains on the fine scale while fluxes are matched on the coarse scale. However, the mortar method provides the additional flexibility to vary adaptively the number of interface and subdomain degrees of freedom which leads to more accurate multiscale approximations. We describe several efficient and reliable *a posteriori* error estimators for mortar mixed finite element discretizations, which can be used to drive the adaptive process. The algorithms are illustrated in flow in porous media computations. (Received September 13, 2004)