1100-76-208   **Eugenio Aulisa**, **Lidia Bloshanskaya*** (`bloshanl@newpaltz.edu`), **Akif Ibragimov** and **Yalchin Efendiev**. *Upscaling of Forchheimer flows.*

We propose the upscaling method for the nonlinear Forchheimer flow in heterogeneous porous media. The generalized Forchheimer law is considered for incompressible and slightly-compressible single-phase flows. The resulting system is formulated in terms of a degenerate nonlinear flow equation for the pressure with the nonlinearity depending on the pressure gradient. The coarse scale parameters for the steady state problem are determined so that the volumetric average of velocity of the flow in the domain on fine scale and on coarse scale are close. A flow-based coarsening approach is used, where the equivalent permeability tensor is first evaluated following streamline methods for linear cases, and modified in order to take into account the nonlinear effects. The developed upscaling algorithm for nonlinear steady state problems is effectively used for variety of heterogeneities in the domain of computation. Direct numerical computations for average velocity and productivity index justify the usage of the coarse scale parameters obtained for the special steady state case in the fully transient problem. (Received February 08, 2014)

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