PORE-CORE UPSCALING OF FLOW AND TRANSPORT WITH INERTIA AND ANISOTROPY

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We consider flow and transport models at porescale for a wide range of Reynolds numbers in realistic pore geometries in 2D and 3D. The geometries are either from i) experimental imaging, or are ii) synthetic disordered data honoring typical structure factors. The computational flow models at porescale are traditional discretizations of Navier-Stokes models. Transport is simulated with Godunov methods and uses conservative velocity data post-processed from the flow solver using a projection method.
The method we proposed in [Peszynska, Trykozko, IJMCE'11] for upscaling of flow from pore- to core-scale was originally tested on ensembles of ellipses and ellipsoids. For large flow rates it leads to anisotropic upscaled non-Darcy flow models. We revisit this method for realistic pore geometries and show the decrease of anisotropy effects with flow rates. Next, we show that the results of transport depend significantly on the inertia parameters; this raises an issue of how the upscaled transport properties should be derived.