

# High order homogenized Stokes models capture all three regimes

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We revisit the homogenization of the Stokes system modelling the physics of a laminar flow in a porous medium filled with many small solid obstacles.

In the context where the domain and the obstacles are periodic, the literature states that the physics converge to three possible models depending on the scaling ratio between the obstacles and the length of the unit cell, namely either to the Darcy equation, the Brinkmann equation, or the Stokes equation.

Motivated by applications in topology optimization, we will see in this presentation how well-posed homogenized models of arbitrary order can be derived by using non-standard two-scale expansions. Our recent results state that these higher order models converge coefficient wise to the Darcy, Brinkmann or Stokes equations for the associated appropriate scalings, unifying the three classical limit problems.