Contribution ID: **666** Type: **Poster (+) Presentation**

A homogenised model for flow, transport andsorption in a heterogeneous porous medium

Monday, 31 May 2021 19:35 (1 hour)

A major challenge in flow through porous media is to better understand the link between pore-scale microstructure and macroscale flow and transport. For idealised microstructures, the mathematical framework of homogenisation theory can be used for this purpose. Here, we consider a two-dimensional microstructure comprising an array of circular obstacles, the size and spacing of which can vary along the length of the porous medium. We use homogenisation via the method of multiple scale to systematically upscale a novel problem that involves cells of varying area to obtain effective continuum equations for macroscale flow and transport. The equations are characterized by the local porosity, an effective local anisotropic flow permeability, and an effective local anisotropic solute diffusivity. These macroscale properties depend non-trivially on both degrees of microstructural geometric freedom (obstacle size and spacing). We take advantage of this dependence to compare scenarios where the same porosity field is constructed with different combinations of obstacle size and spacing. For example, we consider scenarios where the porosity is spatially uniform but the permeability and diffusivity are not. Our results may be useful in the design of filters, or for studying the impact of deformation on transport in soft porous media.

Time Block Preference

Time Block B (14:00-17:00 CET)

References

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