Contribution ID: **777** Type: **Poster (+) Presentation**

Resolving flow path resistance in heterogeneous porous media as a graph-theory problem

Tuesday, 1 June 2021 19:00 (1 hour)

This work aims to understand the relationship between the spatial flow distribution and its underlying pore structure in heterogeneous porous media. Thousands of two-dimensional samples of polydispersed granular media are used to 1) obtain the velocity field via direct numerical simulations, and 2) conceptualize the pore-network as a graph in each sample. Analysis of the flow field allows us to first identify the primary flow paths. Then, the graph edges are weighted by structural attributes of the individual pores to find the shortest path through the sample. Overlap between the primary flow paths and the predicted shortest path determines the accuracy of the weighting scheme tested. A differential evolution genetic algorithm is employed to determine the "fittest"weighting scheme that maximizes accuracy while minimizing overparameterization. Our results demonstrate that the path of least resistance is accurately predicted in all samples for single phase flow and is independent of the flow distribution (uniform to preferential). The results of this work could be used for fast –relative to computationally expensive direct numerical simulations —characterization of porous media heterogeneity, which in turn can be used to predict the time of first arrival and location based on structural information alone.

Time Block Preference

Time Block C (18:00-21:00 CET)

References

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Primary authors: KANAVAS, Zoe (University of California, Davis); Prof. MORALES, Veronica (University of California, Davis); PEREZ-RECHE, Francisco (University of Aberdeen)

Presenter: KANAVAS, Zoe (University of California, Davis)

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