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**Numerical Analysis of Turbulent Flow in Porous Media** FATEMEH HASSANIPOUR, JAMES K. CATOE, JOSE LAGE, SMU — Modeling techniques and simulation of laminar flow through porous media have been applied for a number of years for designing particulate filters, catalytic reactors, thermal and sound insulators, combustors, and more recently fuel cells. Essential for further analysis, and in support of new synthesis, is the modeling necessary for simulating turbulent flows in porous media. This has been studied in the present work, in principle, through modeling that is an alternative to Direct Numerical Simulation. A natural approach to build a turbulence model for flow in porous media is to simply apply the time averaging (for handling turbulence) and the space averaging (for handling the morphology) to the microscopic equations valid at the pore level. When pursuing a combined time and space averaging approach, the averaging order (i.e. space-time or time-space) matters. The difference in pursuing a time-space or a space-time averaging order is now known to essentially impact the way in which the resulting model treats the interaction of a large flow structure. In the current study, these two different approaches have been investigated in parallel to the experiments for their validity range. The comparisons are based on flow structure visualization and on values of turbulence characteristics obtained from direct measurements of fluid velocity via digital particle image velocimetry.

Fatemeh Hassanipour
SMU

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