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Distribution of flow-induced stresses in the pore space of random porous media[1] DIMITRIOS PAPAVASSILIOU, NGOC PHAM, University of Oklahoma — The distributions of stresses in the pore space of packed-sphere beds when a fluid flows through the porous medium under Darcy flow conditions are numerically computed with Lattice Boltzmann simulations. Three different ideally-packed (i.e., face-centered cubic, body-centered cubic and simple cubic packing) and one randomly-packed configuration of the packed bed are considered. It is found that the probability density function of the stresses, when the stresses are normalized with the mean value and the standard deviation of the distribution, behaves in different modes when the packing type changes. In the Darcy regime, the normalized stress distribution of a particular packing type is independent of the pressure difference and presents a unique pattern. The most important finding is that a log-normal distribution can successfully fit the stress distributions in the simulated randomly packed beds with high statistical accuracy. The applicability of the log-normal distribution is also explored for other types of porous media, and it is found that it is likely applicable for porous media with random pore space configurations.

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