Abstract Submitted
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Pressure drop for inertial flows in elastic porous media[1] MARTIN PAUTHENET, Institut de Mécanique des Fluides de Toulouse, ALESSANDRO BOTTARO, University of Genoa, YOHAN DAVIT, MICHEL QUINTARD, Institut de Mécanique des Fluides de Toulouse, POROUS MEDIA TEAM — The effect of the porosity and of the elastic properties of anisotropic solid skeletons saturated by a fluid is studied for flows displaying unsteady inertial effects. Insight is achieved by direct numerical simulations of the Navier-Stokes equations for model porous media, with inclusions which can oscillate with respect to their reference positions because of the presence of a restoring elastic force modeled by a spring. The numerical technique is based on the immersed boundary method, to easily allow for the displacement of pores of arbitrary shapes and dimensions. Solid contacts are anelastic. The parameters examined include the local Reynolds number, Re_d, based on the mean velocity through the reference unit cell and the characteristic size of the inclusions, the direction of the macroscopic forcing pressure gradient, the reduced frequency, f^*, ratio of the flow frequency to the natural frequency of the spring-mass system, and the reduced mass, m^*, ratio of the solid to the fluid density. Results demonstrate the effect of these parameters, and permit to determine the filtration laws useful for the subsequent macroscopic modeling of these flows through the volume averaged Navier-Stokes equations.

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