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Momentum transfer at the interface between a porous medium and a pure fluid HOWARD HU, University of Pennsylvania, SONGPENG ZHANG, Tsinghua University — We examine the flow parallel to the interface between a porous medium and a liquid, focusing on the boundary conditions at the interface. When Darcys law is used to describe the momentum transport in the porous layer, the classic Beavers-Joseph condition relates the shear rate and the slip velocity at the interface with a slip parameter that depends on the structure of the porous surface. When the Brinkman equation is used, the averaged velocity is continuous at the interface, however the fluid shear stress across the interface commonly experiences a jump. This shear stress jump can be expressed in terms of the slip velocity at the interface divided by a length characterized by the square root of the permeability, and a dimensionless stress jump coefficient. In this work, we study the momentum transfer from the clear fluid onto the solid structure at the interface, and proposed a stress partition parameter that characterizes the stress transfer from the clear fluid to the fluid (and solid) phase of the porous medium. Simple models are developed to formulate this stress partition parameter for porous media that are brush-like, long fibers, and random, respectively. Our model predictions are compared with numerical and experimental results in the literature.

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