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Yu, Peng; **Lee, Thong-See**; **Zeng, Yan**; **Low, Hong-Tong**

A numerical method for flows in porous and homogeneous fluid domains coupled at the interface by stress jump. (English) Zbl 1370.76110

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Summary: A numerical method was developed for flows involving an interface between a homogeneous fluid and a porous medium. The numerical method is based on the finite volume method with body-fitted and multi-block grids. A generalized model, which includes Brinkman term, Forcheimer term and nonlinear convective term, was used to govern the flow in the porous medium region. At its interface, a shear stress jump that includes the inertial effect was imposed, together with a continuity of normal stress. Furthermore, the effect of the jump condition on the diffusive flux was considered, additional to that on the convective part which has been usually considered. Numerical results of three flow configurations are presented. The method is suitable for coupled problems with regions of homogeneous fluid and porous medium, which have complex geometries.

MSC:

76M20 Finite difference methods applied to problems in fluid mechanics
76S05 Flows in porous media; filtration; seepage
65N06 Finite difference methods for boundary value problems involving PDEs

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Keywords:

interfacial condition; stress jump; porous medium; block-structured grids

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