عنوان مقاله:

Numerical Analysis of Fluid Flow in a Deformable Porous Medium Using Finite Element Method

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خلاصه مقاله:

In this paper, a coupled fluid flow-geomechanical simulation using finite element numerical method is presented. This model includes solving conservation of mass and momentum balance equations for solid framework and fluid phases. These equations are based on the Biot consolidation theory. Fluid pore pressure and solid phase displacement have been selected as the primary variables in these equations. The governing equations are discretized using finite element method. The resulting equation system is then solved in a fully coupled process in which convergence and stability of results are guaranteed. Then, the Mendel's problem is solved using the proposed model and the results are compared with analytical and accurate answers to the problem. The proposed model shows a very good agreement with analytical solutions, which indicates the accuracy of the model designed in this article. Finally, this model is used to simulate the discharge of water from a sand column with a two phase saturation approach. This paper presents a coupled model using the finite element method, which the governing equations of fluid flow in a deformable porous medium are solved simultaneously.

کلمات کلیدی:

Finite Element, Poroelasticity, Consolidation, Coupled fluid flow-geomechanical model

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