Contribution ID: **14** Type: **Poster Presentation**

Direct numerical simulation of two-phase fluid flow in two-dimensional porous media

The current research investigates the numerical simulation of incompressible two-phase flow of water and oil in a porous medium using the OpenFOAM software. The methodology for generating the porous geometry and grid study is explored. To facilitate a two-dimensional analysis, a single grid cell is constructed in the direction perpendicular to the planar domain. Subsequently, a water-oil mixture with an oil phase volume fraction of 0.5 is introduced from the left boundary of the computational domain. Owing to the imposed pressure gradient between the left and right boundaries, the multiphase fluid flow is driven towards the outlet, ultimately exiting through the right boundary. The numerical results demonstrate that a pressure differential of one pascal is maintained between the inlet and outlet flows. Additionally, due to the lower density of the oil phase relative to water, the oil phase exhibits a tendency to progressively stratify above the water phase within the porous medium.

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Track Classification: Geotechnique/Soil Mechanics