**Multiscale Mathematical Modeling of the Seepage into the Soil Under Cryolithozone Conditions**

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In this work, the numerical modelling of fluid seepage in the presence of permafrost in heterogeneous soils is considered. The multiphysics model consists of the coupled Richards’ equation and the Stefan problem. These problems often contain heterogeneities due to variations of soil properties. In the paper, we design a multiscale simulation method based on Generalized Multiscale Finite Element Method (GMsFEM). For this reason, we design coarse-grid spaces for this multiphysics problem and design algorithms for solving the overall problem. Numerical simulations are carried out on two-dimensional and three-dimensional model problems. For the case of a three-dimensional, somewhat realistic geometry with a complex surface structure is considered. We demonstrate the efficiency and accuracy of the proposed method using several representative numerical results.

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