

Numerical simulation of seepage processes in permafrost near a hydro unit

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Abstract In the territory of Western Yakutia, during the last 20 years, complex geophysical monitoring of hydraulic engineering units has been applied. Alongside field studies, numerical evaluation of permeable talik zone (thawing) origination and development in a broad zone around a dam was made. The non-steady problem of heat-mass transfer in fractured-porous saturated frozen media, interbedded in frozen impermeable strata is discussed. The model takes into consideration the main conditions causing initiation and development of talik near a reservoir: annual temperature and snow cover variation, seasonal water temperature distribution with depth in the storage basin adjacent to the dam, and evolution of permeability in rock due to thaw-freeze processes. The proposed model can be used to analyse more complex situations.

Key words permafrost; talik; hydro unit; geophysical monitoring; numerical modelling; Western Yakutia