

Title: Transient heat transfer model for characterizing permafrost dynamics in Nadym region

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Abstract:

Permafrost plays an important role in the global environmental change, with its impact on the dynamics of ecosystems and hydrological cycles. As climate in Northern hemisphere is warming faster than anywhere else and permafrost is sensitive to the change in temperature regime, understanding on the processes characterizing permafrost dynamics is urgent. Here we focus on the important factors of the on-going thawing of permafrost using numerical modelling and field observations.

Our study reports the results from the transient heat transfer numerical model (Simulator for HEat and MAss Transport, SHEMAT), characterizing the complex relationship between the annual cycle of air temperatures and the permafrost thermal regime. The model is calibrated to several measurement sites. We use data of the permafrost temperatures along with the soil properties information. The data originates from Nadym region, situated in the north of the northern taiga subzone (Russia).

The model is used in predicting of important characteristics of changing permafrost: active layer thickness, temperature and depth. The effects of local energy balance conditions are taken into account by calculating the freezing and thawing indices with monthly averages of soil and air temperature data.