3D hydrogeological modeling of Deep Geological Disposal in the Nizhnekansky Rock massif

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Russian Federation has a selected site for Deep Geological Disposal in the Nizhnekansky massif (Krasnoyarsk territory). The current work is devoted to justification of its suitability. One of the main parts of the safety case of is the prediction of radionuclides migration in the environment which requires development and application of groundwater flow and transport models. This work presents the evolution of the hydrogeological model.

The granitoid rock of Nizhnekansky massif is complicated by presence of such geological structural elements as dykes, faults and crushing zones which influence significantly permeability features. Currently all available geological data are consolidated with the use of the MICROMINE program into a structural geological model. The three-dimensional model of the distribution of the main structural elements in the area of the DGD site is more detailed. The corresponding dykes appear to have a north trend and a steep fall (about 70 ° east).

Using the geometry of structural elements one can assess their role in the structure of groundwater flow on the basis of profile model. Verification of the model was carried out on the basis of measured hydraulic heads.

The preliminary calculations showed that including into the model additional structural elements (to a greater extent dykes and crushing zones) leads to a better matching between observed and model heads. This implies the need to take into account the structural elements more accurately. The migration of a conservative tracer was calculated as well using the developed flow model.

Moreover, the heterogeneity near the Deep Geological Disposal is three-dimensional in nature and it is impossible to implement it accurately in a two-dimensional setting without approximations. This requires three-dimensional modeling, such 3D numerical flow and transport models are developed using the GeRa code.
