

Abstract

Different kinds of receivers and disposal sites, including deep radioactive waste repositories, are now projected into fissured hard rocks. Mathematical models of groundwater flow are a necessary tool of risk analysis of these projects. The models must be based on good knowledge of hydraulic properties of fractured rocks.

The main aim of this thesis was to establish a mathematical model of groundwater flow in the Melechov massif to the depth of 1 km, to investigate groundwater flow within this block and to estimate the uprise time of water from supposed depths of repository to the surface. The Melechov massif was chosen for this task because it was selected by the Radioactive Waste Repository Authority (RAWRA) as a test site. The model uses fracture network obtained by means of remote sensing from aerial photographs of Melechov surroundings.

The numerical model was created and performed using FEFLOW 5.2, a groundwater flow modelling software developed by the German company WASY. A six-layer stationary model was developed and calibrated using known values of hydraulic heads. The outputs of the simulation are maps of hydraulic head in the area of interest, maps of vertical components of flux density, estimates of vertical groundwater flow rates in each layer and uprise times of groundwater from supposed repository depths to the drainage levels of groundwater table.