ABSTRACT

The seepage of fluid through saturated porous media may lead to inner erosion, channelization, preferential flow and transport and deposition of particles. A novel mathematical model was created to describe some of the processes. The model describes a temporal and spatial development of porosity (volume fraction) and permeability (transmissivity) due to erosion and deposition in saturated porous and fractured media. The model calculates the change of permeability and porosity in a direction of different fracture joint sets. The model is based on multi-continua theory, where a region is divided into components (three or more components in this thesis). The components are described by separate differential equations. This approach was used recently by Mahadevan *et al.* (2012) and Fujisawa *et al.* (2009) for erosion of porous media.

This thesis describes the approaches, assumptions and the equations used in the model. In contrast to the published models, the thesis considers anisotropy. It is characterized by transmissivity tensor (also hydraulic conductivity tensor), which is composed of vectors in the joint sets directions. The model also uses a Dupuit approximation, which allows to approximate flow onto a horizontal plane. The model is also introduced by a numerical simulation using final element method. Model was coded in Python language with the use of FEniCS module.

Key words: inner erosion, fractures, porous and fractured media, mathematical modelling, numerical modelling, Dupuit