Geophysical Research Abstracts
Vol. 17, EGU2015-1633, 2015
EGU General Assembly 2015

3D modeling of soil structure in urban groundwater areas: case studies in Kolpene, Rovaniemi, Finland

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3D modeling of groundwater areas is an important research method in groundwater surveys. Model of geological soil structure improves the knowledge of linkage between land use planning and groundwater protection. Results can be used as base information when developing the water supply services and anticipating and performing the measures needed in case of environmental accidents. Also, collected information is utilized when creating the groundwater flow model. In Finland, structure studies have been conducted in cooperation (among others) with the municipalities and local water suppliers and with the authorities from the Centre for Economic Development, Transport and the Environment.

Geological Survey of Finland carries out project "Structure studies in Kolpene groundwater area" in Rovaniemi, Finnish Lapland. Study site is located in northern Finland, in the vicinity of the city center of Rovaniemi. Extent of the area is about 13 square kilometers and there are lots of urban residential areas and other human activities. The objective of this project is to determine the geological structure of the Kolpene groundwater area so that the results can be used to estimate the validity of the present exclusion area and possible risks to the groundwater caused by the land use. Soil layers of the groundwater area are studied by means of collecting information by heavy drilling, geophysical surveying (ground penetrating radar and gravimeter measurements) and water sampling from the installed observation pipes. Also the general geological and hydrological mappings are carried out. Main results which will be produced are: 1) the model of the bedrock surface, 2) the model of the surface of the ground water and flow directions, 3) the thickness of ground water saturated soil layers and 4) location and main characteristics of the soil layers which are significant to the ground water conditions. The preparing studies have been started at the end of 2013 and the results will be reported at the end of June 2015. Project is funded by European Regional Development Fund and by the city of Rovaniemi.