Geophysical Research Abstracts
Vol. 12, EGU2010-6890-1, 2010
EGU General Assembly 2010

Exploratory and structural data analysis of a sandy aquifer at Mol/Dessel, Belgium

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In the framework of the disposal of short-lived low- and intermediate-level radioactive waste in a near-surface disposal facility in Dessel, Belgium, additional extensive site characterization has been performed in 2008. The gathered data now enclose 388 hydraulic conductivity measurements on samples of 8 cored boreholes. Additionally, secondary information as grain size analysis, resistivity, porosity, etc. was gathered. With this dataset, a small-scale probabilistic approach can be used 1) to validate the current existing deterministic groundwater models based on large-scale average hydraulic conductivity values, and 2) to support design for a monitoring network. In preparation for stochastic realizations of the subsurface, an exploratory and structural data analysis was performed and is presented here.

The exploratory data analysis allows definition of hydrogeological units, independent from the existing lithostratigraphy. It also shows the presence of three conductivity classes within a strongly heterogeneous unit. Currently, only vertical structural data analysis is performed based on vertical data profiles. Semi-variograms and cross-variograms are calculated to characterize the spatial variance of the different hydrogeological units. Additional sampling and measurements will be performed in the future to provide information of the horizontal spatial variance. Together with the current results, these will serve as the basis for conditional stochastic simulation of groundwater flow and contaminant transport.