# TUDIECENTRUM VOOR KERNENERG CENTRE D'ÉTUDE DE L'ÉNERGIE NUCLÉAIR KATHOLIEKE UNIVERSITEIT EUVEN

Exploratory and structural data analysis of a sandy aquifer at Mol/Dessel, Belgium Bart Rogiers<sup>1,2</sup>, Dirk Mallants<sup>1</sup>, Okke Batelaan<sup>2,3</sup>, Matej Gedeon<sup>1</sup>, Marijke Huysmans<sup>2</sup> & Alain Dassargues<sup>2,4</sup> mailto:bart.rogiers@sckcen.be http://www.sckcen.be

## Background

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 (Figs.1,2). Additionally, secondary information as grain size analysis, electrical resistivity, porosity, etc. was gathered.



Also, a set of about 180 CPTs is available, uniformly spread over the entire study area (Fig. 1). In preparation for generating stochastic equiprobable realizations of the subsurface, an exploratory and structural data analysis was performed. Figure 1: Map of study area.



#### Figure 2: Log K cored boreholes.











Figure 5: Stationarity analysis.



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## **Objectives**

- In depth analysis of hydraulic conductivity
- Suggest secondary variables
- Essay the existing lithostratigraphy
- Propose further site characterization efforts

## Approach

- Descriptive statistics Statistical testing
- Regression
- Stationarity analysis
- Geostatistics

### Results

- Presence of 3 conductivity classes within the local aguitard (Fig.3)
- No anisotropy at sample scale except for the lower aquifer (Fig. 4)
- Delineation statistically homogeneous units (Fig. 5)
- Grain size can be used for predicting K deterministically (Fig. 6)
- Vertical correlation lengths of 15, 2, and 20 meter (Fig. 7)
- CPT point resistance seems promising as secondary variable (Figs. 8 & 9)

### Conclusion

The exploratory data analysis allowed to define statistically consistent zones, which can be used for a stratified geostatistical approach. The local aquitard proves to be far more heterogeneous than the other units. The importance of characterising this unit is again emphasized. Grain size can be used to predict K deterministically. This is especially interesting because 2 geotechnical boreholes are available on the site with ~190 grain size measurements. The point resistance might be useful as secondary variable, but additional CPTs are required to optimize the observed relationship, and to estimate horizontal correlation distances. Together with the current results, these will serve as the basis for conditional stochastic simulation of groundwater flow and contaminant transport.













FGU 2010 European Geosciences Union – General Assembly 2010 – Vienna, Austria, 02 – 07 May 2010

Diapositive 1

A3 which porosity ? effective or total ? measured by well logging direct or indirect trhough neutron log ? measured in lab on samples ? calculated by granulometric data ? Dassargues; 21-04-10