Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

AGE04-06 Room:301A Time:May 24 11:30-11:45

Significant Improvement to Imaging Hydraulic Heterogeneity in Heterogeneous Geologic Media via Hydraulic Tomography

ILLMAN, Walter[1*]

[1]University of Waterloo

Hydraulic parameters such as hydraulic conductivity (K) and specific storage (Ss) of geologic media are heterogeneous at multiple scales. A large number of techniques have been developed to deal with this heterogeneity, but little information is available on its performance in predicting groundwater flow and solute transport. In this presentation, I review the various heterogeneity mapping methods and introduce the concept of Hydraulic Tomography (HT). HT is a new approach to map the heterogeneity of the subsurface. It is analogous to geophysical tomography but different in a sense that the method relies on multiple pumping tests as sources of signals. These signals or drawdowns are detected in neighboring monitoring intervals. With a suitable inverse model, one can then estimate the three-dimensional spatial variability in K and Ss. One significant advantage of the approach is that it provides direct information on connectivity in hydraulic parameters, which is very important in contaminant transport problems. Research over the last decade has shown that this is a very robust technique and the estimated parameters are more reliable in predicting independently conducted pumping tests and tracer tests. I will introduce various synthetic, laboratory and field experimental results, compare HT against other heterogeneity mapping methods, and discuss future research directions.

Keywords: heterogeneity, contaminant transport, fractured rocks, stochastic hydrology, subsurface characterization, connectivity