Geophysical Research Abstracts
Vol. 18, EGU2016-2569, 2016
EGU General Assembly 2016

On Goal-Oriented, Hydrogeological Site Investigation: A Holistic Approach (Henry Darcy Medal Lecture)

Yoram Rubin
University of California, Berkeley, United States (rubin@ce.berkeley.edu)

UQ (for Uncertainty Quantification) is a critical element of groundwater management and by extension, of hydrological site investigation. While it is clear that UQ is an important goal, there is ambiguity as to what the target of the UQ should be, and how to make UQ relevant in the context of public policy. Planning for UQ (meaning what measurements to take, where, how many, what frequency, etc.), one could consider environmental performance parameters (EPMs, such as concentrations or travel time) as the targets of site investigation. But there is a need to go beyond EPMs, and to consider the uncertainty related to impacts such as enhanced cancer-risk due to groundwater contamination or, more generally, to decisions facing regulators. In any case, UQ requires site investigation, and decision-makers, who end up paying for it, are not really interested in EPMs: they care about making operational decisions that are defensible legally and justified from the perspective of public good.

The key to UQ, whether considering EPMS or operational decisions concerning the public good, is defining a suitable strategy for site investigation. There is a body of published works on relating site investigations with EPMs, but much less is known on how to support operational decisions with strategies for site characterization. In this lecture, I will address this issue and I will outline a comprehensive approach for addressing it using a statistical formalism that couples hypothesis testing with Bayesian statistics. I refer to this approach as goal-oriented site investigation. I will show how site investigation strategies, with specifics such as which measurements to take and where, could be related to goals lined with operational decisions. This includes (1) defining the relevant goals; (2) formulating hypotheses; (3) defining alternative strategies for site investigation and (4) evaluating them in terms of probabilities for making errors in accepting or rejecting the hypotheses.