Geophysical Research Abstracts
Vol. 21, EGU2019-14205, 2019
EGU General Assembly 2019

Uncertainty quantification in modeling water flow and transport of hydrocarbons: a case study in Sardinia (Italy)

Anna Botto (1), Matteo Camporese (1), Giorgio Cassiani (2), Alex Furman (3), Pauline Kessouri (3), and Mario Putti (4)

(1) Department of Civil, Environmental and Architectural Engineering, University of Padova, Padova, Italy (matteo.camporese@unipd.it, anna.botto@unipd.it), (2) Department of Geosciences, University of Padova, Padova, Italy (giorgio.cassiani@unipd.it), (3) Department of Civil and Environmental Engineering, Technion Israel Institute of Technology, Haifa, Israel (afurman@technion.ac.il, pauline.kessouri@gmail.com), (4) Department of Mathematics "Tullio Levi-Civita", University of Padova, Padova, Italy (putti@math.unipd.it)

Detailed modelling of water flow and contaminant transport in the subsurface is a non-trivial, time-consuming and cost-intensive procedure. While precise laboratory experimental analyses on a reliable number of water and soil samples are important to estimate the main parameters and to model the processes, in-situ geophysical measurements are essential to improve the parameter estimates obtained in the laboratory and both techniques allow a reliable comparison between the in-situ observations and the model results. Moreover, groundwater numerical models can be quite complex to handle and must be accurately calibrated to reproduce the in-situ evolution of water flow and transport of contaminants.

Although many efforts have been recently devoted to improve the aforementioned laboratory and field techniques and to obtain more effective models based on reliable parameters and forcing data, the uncertainty associated to these models, and hence to the results, can never be eliminated and must be properly quantified.

Within this context, a field case study, located in Sardinia (Italy), is presented where three jet fuel spills occurred in 2007, 2009 and 2010. Monthly data of water table levels and BTEX (Benzene, Toluene, Ethylbenzene and Xylene) concentrations, together with Iron, Manganese and total petroleum hydrocarbons are available. In addition, laboratory measurements of soil hydraulic properties have been conducted. The uncertainty of the main hydraulic parameters has been assessed through a Monte Carlo sampling procedure integrated with the PEST optimization algorithm implemented in a finite element model of the study site. The combined uncertainty of the hydraulic parameters and recharge rate- another significant source of uncertainty in the study area- is then evaluated, the final goal being to analyze the propagation of these different sources of uncertainty from the flow model to the simulation of hydrocarbon contaminants.