Geophysical Research Abstracts
Vol. 12, EGU2010-11657, 2010
EGU General Assembly 2010

Geophysical techniques in the study of Hydrocarbon contamination: lab experiments

Valeria Giampaolo (1), Enzo Rizzo (1), Salvatore Straface (2), Mario Votta (1), and Vincenzo Lapenna (1)

(1) CNR, IMAA-Hydrogeosite Laboratory, Tito Scalo (PZ), Italy (rizzo@imaa.cnr.it), (2) University of Calabria, Soil Conservation Department, 87036 Rende (CS), Italy

Remediation of sites contaminated by hydrocarbon, due to blow out, leakage from tank or pipe and oil spill, is an environmental problem because infiltrated oil can persist in the ground for a long time and the actual method are invasive and expansive . In the last years there was a growing interest in the use of geophysical methods for environmental monitoring (Greenhouse et al., 1993; Daily and Ramirez, 1995; Lendvay et al., 1998; Atekwana et al., 2000; Chambers et al., 2004; Song et al., 2005; French et al., 2009), and there have been several recent study that relate self-potential measurements to subsurface contaminants (Perry et al., 1996; Naudet et al., 2003; Naudet et al., 2004). Infact, this method is a valid tool for site characterization and monitoring because it is sensitive to contaminant chemistry and redox processes generated by bacteria during the biodegradation phase (Atekwana et al., 2004; Naudet and Revil, 2005).
Therefore the goal of this investigation is to characterize underground contaminant distributions using minimally invasive geophysical methods (electrical resistivity tomography and self-potential), in combination with hydrochemical measurements, and to develop fundamental constitutive relations between soil physical and degradation activity parameters and geophysically measurable parameters, in order to improve site remediation efficiency.
These tests have been realized at a PVC pool situated in the Hydrogeosite Laboratory of CNR-IMAA. The pool is completely filled with $\sim$ 0.80 m3 of an homogeneous medium (quartz-rich sand with a medium-high hydraulic conductivity in the order of 10-5 m/s), to simulate the space and time dynamics of an artificial aquifer; besides it has been endowed of a sensors network at surface and in borehole, to measure self-potential and electrical resistivity. The experiments consist in geophysical measurements to monitor a simulated oil spill into sand-box following by water rain. The experiment was able to obtain information about contaminant distribution and biodegradation in the subsurface. Besides combining measurements from multiple geophysical and/or hydrochemical measurements allow us to obtain more accurate characterization of spatial variability. The work is part of the research project ModelPROBE (Model-Driven soil probing, site assessment and evaluation, Grant No. 213161 in the framework of the EC-FP7 funded).