



## **Non-invasive characterization of a crude-oil contaminated site: complex links between contamination and geophysical signals.**

G. Cassiani (1), A. Binley (2), A. Kemna (3), A. Flores Orozco (3), R. Deiana (4), P. Dietrich (5), U. Werban (5), L. Zschornack (5), C. Leven-Pfister (5,6), E. Rizzo (7), and G.P. Deidda (8)

(1) Università di Padova, Dipartimento di Geoscienze, Padova, Italy (giorgio.cassiani@unipd.it), (2) Lancaster Environment Centre, Lancaster University, UK, (3) Dept. of Geodynamics and Geophysics, University of Bonn, Germany, (4) Università di Padova, Dipartimento di Beni Culturali, Padova, Italy, (5) Department MET, UFZ Leipzig, Germany, (6) Institute for Geoscience, University of Tübingen, Germany, (7) IMAA CNR, Potenza, Italy, (8) Dipartimento di Ingegneria Civile e Ambientale e Architettura, Università di Cagliari, Cagliari, Italy

The characterization of contaminated sites requires that direct investigations be supplemented with a set of less-invasive, and more extensive, measurements. A combination of geophysical methods and direct push penetrometric techniques has been proposed within the EU FP7 project ModelPROBE. We present the results of the investigations conducted at the Trecate field site (NW Italy) which was affected in 1994 by crude oil contamination. The investigations include surface GPR, ERT, IP, SIP and SP surveys, together with direct push sampling and EC logs. Many of the geophysical measurements have been conducted in time-lapse mode in order to separate static and dynamic signals, the latter particularly linked to strong seasonal changes in water table elevations. The most interesting resulting aspects of this characterisation are (a) the geometrical link between the distribution of contamination and the site's heterogeneity, with particular regard to the presence of less permeable layers, as evidenced by the extensive surface geophysical measurements; and (b) the link between contamination and specific geophysical signals, such as DC resistivity, IP response and SP signal, particularly evident from cross-hole measurements.