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Isooctane transport and remediation in soil using lysimeters

M. L. Colarieti, G. Toscano, and G. Greco
Università di Napoli Federico II, Ingegneria Chimica, Napoli, Italy (colariet@unina.it)

The AMRA lysimeter station (near Piana di Monte Verna, Caserta, Italy) consists of eight weighable monolithic groundwater lysimeters fully equipped with sensors to provide continuous monitoring of temperature, humidity, water tension and weight, as well as ports for soil, liquid and gas sampling. An air-injection system allows to perform venting or sparging actions into contaminated soils and groundwater. A meteo station provides the indispensable data to evaluate the interactions between lysimeters and the meteorological phenomena on site.
A preliminary experiment was performed last year to investigate the reactive transport of a NAPL-type contaminant under passive transport conditions and during an air-venting remediation action. 2,2,4-trimethylpentane (isooctane) was chosen as a representative contaminant from gasoline fuels.
Four lysimeters containing undisturbed soil extracted from a former industrial site were used. Surface vegetation was cut to avoid leaves interference during contamination phase. Two lysimeters were contaminated by distributing a fixed amount of isooctane onto the soil surface, while two more lysimeters were left uncontaminated for reference. Only for one of the two contaminated lysimeters air was vented through a port at 150 cm depth. Air injection started 30 min after the contamination, lasted all the experiment time, and was applied also to one of the reference lysimeters. Gas samples were drawn periodically at different depths of the two contaminated lysimeters and analysed for isooctane content.
Evolution of isooctane concentration profiles was different in the two contaminated lysimeters. In case of air-venting the contaminant maximum concentration was lower and the maximum depth reached by the contaminant was reduced. The time needed for a complete remediation action was compared with theoretical estimates computed according to normative procedures.