Contribution ID: **1059** Type: **Poster Presentation**

A combined experimental and modeling study to evaluate the soil-gas monitoring for early detection of contaminants leakage into groundwater

Tuesday, 23 May 2023 16:10 (1h 30m)

Groundwater monitoring is the most widely used technique to detect non-aqueous phase liquid (NAPL) leakage from underground storage tanks. However, this method allows the detection of leakage as soon as the pollutants reach the groundwater table, dissolve, and move forward to the monitoring wells. In addition, this technique is often expensive and has to be accurate enough to allow rapid identification of the source in case of sudden detection of pollutants. Here, we present a new detection method for the leakage of volatile compounds in the soil before reaching the groundwater by monitoring the soil gas. A model has been developed to validate the proposed monitoring technique by the NAPL leakage from an underground reservoir tank. The model simulates the pollutant infiltration into the unsaturated porous media using the generalized Darcy' s equations and the soil gas extraction using the advection-diffusion equation, taking into account the gas adsorption onto grain surfaces. A decimetric-scale 2D tank experimental setup filled with different sand sizes was used to validate the developed model. The front part of the 2D tank was made of transparent glass to photograph the NAPL front propagation using the light-reflected method. We investigated the infiltration of two light NAPLs (diesel fuel and gasoline) from the middle top of the tank and different gas extraction flow rates. The gas extraction was performed from a port on the middle right side of the tank. The extracted gas was analyzed continuously using a portable gas chromatograph. The comparison of experimental and numerical results for LNAPL front propagation and gas concentration allowed the validation of the developed model. Therefore, the impact of the soil gas monitoring well distance from the leakage source, extraction flow rate, and soil and pollutant type on detection efficiency have been tested using the numerical model at a real scale. The results demonstrated that the proposed soil gas monitoring technique could detect pollution with a low soil-gas extraction flow rate in a radius of tens of meters around the soil gas monitoring well and after a few months for high and medium soil permeability.

Participation

In-Person

References

MDPI Energies Student Poster Award

No, do not submit my presenation for the student posters award.

Country

France

Acceptance of the Terms & Conditions

Click here to agree

Energy Transition Focused Abstracts

Primary authors: Dr DAVARZANI, Dorian (BRGM (French geological survey)); ALAMOOTI, Amir (BRGM (French geological survey)); Mr AUBERT, Nicolas (BRGM (French geological survey)); HUBÉ, Daniel (BRGM (French geological survey)); Dr GUÉRIN, Valérie (BRGM (French geological survey)); Dr CRAMPON , Marc (BRGM (French geological survey))

Presenter: Dr DAVARZANI, Dorian (BRGM (French geological survey))

Session Classification: Poster

Track Classification: (MS18) Innovative Methods for Characterization, Monitoring, and In-Situ Remediation of Contaminated Soils and Aquifers