Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.13759

New lysimetric experiments to assess the effect of the intensity of groundwater table-level variations on the fate of petroleum hydrocarbon pollutants (LNAPL) in soils in the climate change context.

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In the last decades, the pressure exerted on soil and water resources rises due to human activities and climate change, threatening their long-term quality by contaminations and extreme events (IPCC, 2021). To improve contamination management in a climate change context, a better assessment of the effect of the climate-related factors (temperature, precipitation, and seasonal groundwater level variation patterns) on the fate of groundwater and soil pollutants must be better considered. For example, groundwater seasonal level variations and the temperature seems to influence the fate of light non-aqueous petroleum liquids (LNAPLs, ex: diesel fuel) in contaminated soils, affecting their volatilization, dissolution, and biodegradation patterns (Cavelan et al., 2022). Furthermore, a better coupling of *in-situ* and *ex-situ* monitoring methods is needed to better characterize these multi-component contaminations and their mobilization processes. To this end, we developed instrumented lysimetric columns, allowing the monitoring of contaminated soils under controlled climatic conditions. These instrumentations combine an *in-situ* physical-chemical and geophysical monitoring of the contaminated soil properties (water content, temperature, electrical conductivity and permittivity, pH, redox potential, weight), and the molecular characterization of contaminated water and surface gases (GC/MS, µGC). The effect on the fate and transport of diesel-contaminated soils of the groundwater level fluctuations intensity and precipitation regime was tested over 120 days. The results showed that: (1) 7% (lower intensity of water level variation) to 10% (high intensity of water level fluctuations) of the initial contamination was remobilized towards the dissolved phase and, in a less extant, to the gas phase; (2) Part of the dissolved contaminations was rapidly biodegraded; (3) An increase in the intensity of the water table level variations in the climate change context will accentuate the spreading and the trapping of the contaminants into the soil porosity, increasing LNAPL remobilization processes such as higher volatilization, gaseous surface emissions, and dissolution rates in the water table.

This work is partly funded by the LUE DEEPSURF (ANR-15-IDEX-04-LUE) and the BRGM, and is included in the GISFI scientific research consortium (http://www.gisfi.univ-lorraine.fr). The authors thank the GISFI for providing field site devices and the technical staff (Cyrielle Bonne and Fabien Domptail).