Geoelectrical monitoring for following changes due to in-situ bioremediation of chlorinated solvents contamination

Aristeidis Nivorlis[1], Torleif Dahlin[1], Matteo Rossi[1]

(1) Engineering Geology, Lund University, Lund, Sweden

keywords: long-term monitoring, geoelectrical, remediation

Soil contamination is a widespread problem and actions need to be taken to prevent damage to the groundwater and the life around the contaminated sites. In Sweden more than 80,000 sites are potentially contaminated, therefore there is a demand for accurate and efficient methods for site characterization and soil remediation. In-situ bioremediation has the potential to offer a safer, more sustainable, and cost-efficient alternative for soil remediation as opposed to other remediation techniques which usually require excavation of the contaminated mass. However, monitoring the progress of in-situ treatments requires soil/water sampling and laboratory analysis, which, if done frequently, can increase the cost dramatically. For this reason, there is a demand for new methodologies that can be used to follow the progress of in-situ bioremediation. We are investigating the applicability of geoelectrical monitoring in a former dry-cleaning facility located in Alingsås (Sweden). The site is contaminated with chlorinated solvents and a pilot in-situ bioremediation plan was launched in November 2017 testing the efficiency of two different stimulants. We developed an autonomous and fully automated system for geophysical monitoring with the Direct Current resistivity and time-domain Induced Polarization (DCIP) method that aims to follow the changes in the subsurface. We present a complete workflow that includes data acquisition, pre-processing, inversion and visualization of the daily DCIP monitoring data. The proposed scheme is robust and shows that DCIP monitoring has good potential to record the changes due to the bioremediation; however, it needs to be paired with more information (temperature, geochemistry, contaminant concentrations) to better understand the changes that take place in the subsurface.

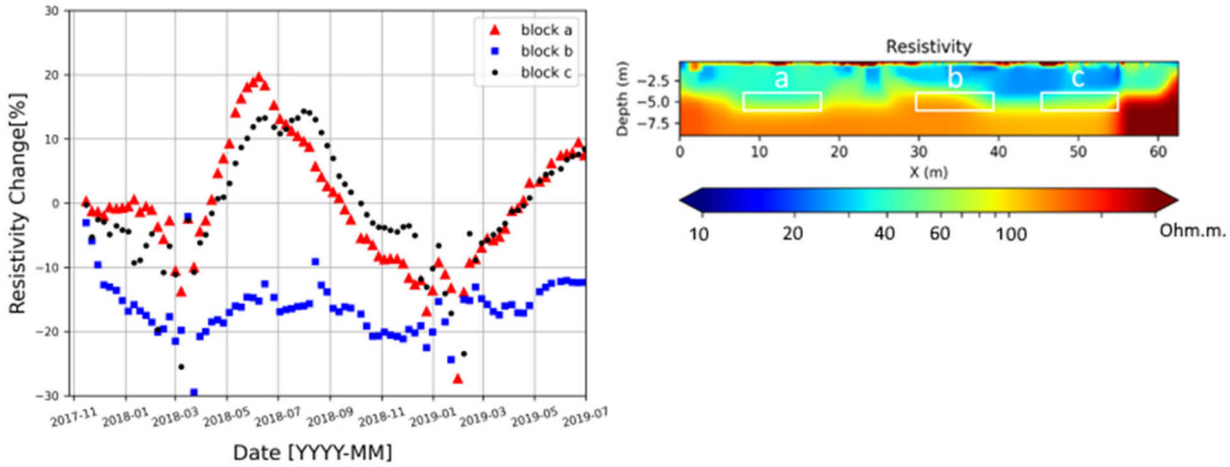

Figure caption: Time-lapse inversion of weekly averages for a period of 20-months after the initiated remediation experiement (left). Each point represents the average value of the change in resistivity (%) for the blocks a (red), b (blue) and c (black) highlighted in the reference resistivity model (right). The areas (a) and (b) represent areas treated with different fluids were area (c) represents the untreated reference area.The treated area (a) shows a similar behavior with the untreated area (c) in contrast with the treated area (b) which shows a different behavior consistently over the entire period of 20 months.