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Theme
Within the EU *Blue Transition* project (https://www.interregnorthsea.eu/blue-transition), which focuses on an integrated approach to water and soil management in the context of climate change, one of our research areas is the geophysical monitoring of an artificial recharge pond. The primary goal of this work is to monitor water saturation and transport dynamics beneath the infiltration pond to better understand the infiltration process and to optimize the operation of water works. An additional objective is to explore the potential for monitoring biofilm growth in the sand filter.
To achieve this, a Direct Current Induced Polarization (DCIP) system has been installed at a Managed Aquifer Recharge (MAR) plant in southern Sweden. The system is deployed in and around an infiltration pond and consists of 416 electrodes distributed across three lines. Each electrode is a 10 cm x 10 cm stainless steel plate, buried in trenches at a depth of 0.4 meters. These electrodes are connected alternately to two parallel cables, which are spaced 0.7 meters apart. The system is based on a Terrameter LS2, featuring a 16x32 relay switch with built-in lightning protection, controlled via PC over a network. In addition, sensors for water conductivity, water level, and temperature have been installed. Periodically, 3D-GPR measurements are conducted to monitor the groundwater level horizon and to assist in the structural interpretation of the subsurface.
DCIP data is collected using a 100% duty cycle with 4s pulses in roll-along. Multiple-gradient array are used for measurements, as well as a pseudo pole-dipole array in which the farthest electrode in each spread serves as the "remote" electrode. Reciprocal measurements are made for 10% of the data to allow for quantification of observation errors. In total, approximately 16,000 datapoints are measured daily. The data is transferred via SFTP to a server for processing and archiving.
Preliminary inversion of the apparent resistivity and integral chargeability data has yielded excellent fits, with mean residuals below 1%. The sandy sediments above the groundwater level show resistivities above 1 kΩm, which decrease to a few hundred Ωm in the saturated zone which reflects variations in sediment grain size. Where the line is near the neighbouring water-filled infiltration pond, a sharp increase in the resistivity interface is observed, corresponding to a rise in groundwater level. The chargeability in this area is relatively low.

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