

Towards a real-time 4D Electrical Resistivity Tomography

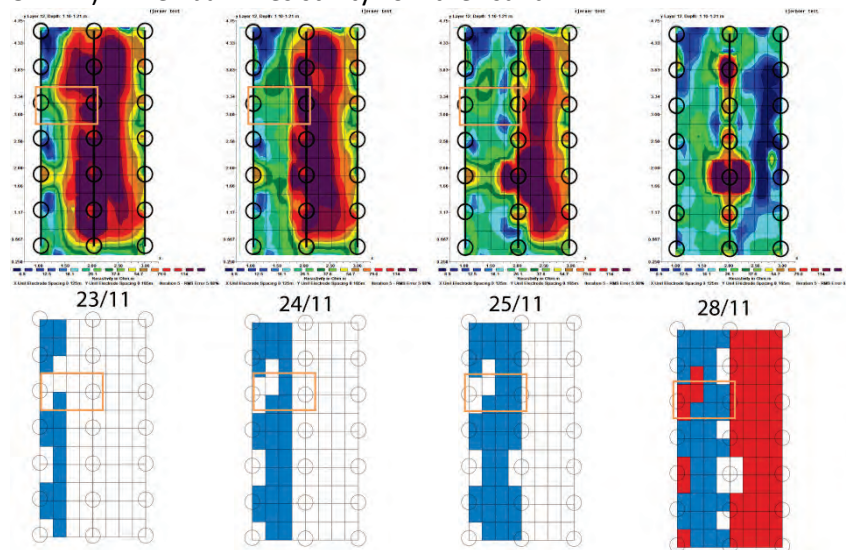
Marios Karaoulis¹, Marco de Kleine¹, Wim de Lange², Tsourlos Panagiotis³

- (1) *Applied Geology and Geophysics, Deltares, The Netherlands*
- (2) *Groundwater management, Deltares, The Netherlands*
- (3) *Department of geophysics, Aristotle University of Thessaloniki, Greece*

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In this work we present an optimized 3D array setup to image injection of iron fluid in a heterogeneous medium. During the injection phase, the water content of the pore space will be replaced with iron. We first measure the bulk resistivity of the sand sample saturated with tap water and we found that is about 80 Ohmm (fluid conductivity was 22 Ohmm). The bulk resistivity of the sand

were replaced with bags filled with iron fluid (blue blocks in figure) at various steps. For every simulation step, we measured a cycle of 63201 measurements of various arrays (pole-tripole, circular dipole-dipole, bipole-bipole and inhole) and different measuring planes (on x-x, x-y, z-z, x-z). Numerical analysis on the sensitivity combined with the actual physical measurements allowed us to reduce the number of measurements to 3479 and still be able to image accurately the fluid injection.



saturated with iron is about 3 Ohmm. We identify a contrast of about 30 times. Before the actual injection, we perform measurements in a tank filled with water and sand bags. For the tank experiment, 21 boreholes were installed in an electrical insulated tank of 7x5.2.5 m. We used 3 rows of 7 boreholes each row. Each row has distance of 1m from the subsequent row. Every borehole within the same row has distance of 0.66m. Each borehole has 11 electrodes, with 0.22m spacing. Total number of electrodes is 231. In order to simulate the injection, sand bags (white blocks in figure)

Figure: Inversion results of the corresponding tank simulation. White blocks indicate the location of sand bags (high resistivity) while blue and red blocs indicate sands filled with iron fluid.