Electrical Resistivity Tomography (ERT) and Induced Polarization (IP)

The ERT/IP method allows detailed mapping of the subsurface electrical resistivity and chargeability that can be interpreted into geological variations

Variations of the subsurface conditions can be characterized by variations in the electrical resistivity. The ERT and IP – methods are optimized for mapping variations in electrical resistivity and chargeability.

ERT and IP can be applied for various objectives where information about subsurface structures and conditions is crucial.

The ERT/IP method

The ERT method is a non-intrusive galvanic geophysical method.

Variation in the subsurface can be mapped using various survey strategies, adapted to specific targets and purposes.

Commonly used is the 2D profiling setup. For more detailed purposes the arrays can be expanded to more complex 3D setup.

Resolution and maximum investigation depth is highly dependent on the field setup like length of cable layout and electrode distance. Typical investigation depth is approximately 70m.

Smaller electrode separation is applied for detailed mapping of the shallow subsurface, whereas longer separations are used for mapping the resistivity of the deeper subsurface.

Combining ERT with measurement of time domain Induced Polarization (IP) enables characterizing variation in electrical chargeability. Joint ERT/IP measurements are highly relevant for mineral prospecting and mapping of contaminated sites.

Instrumentation

Ramboll uses the most accurate and efficient instrumentation available.

Multi core cables with takeout distances for every 2, 5 or 10m and total length reaching 800m are typically used. The instrumentation is ABEM LS, ABEM SAS4000, or ES10-64 produced by ABEM /Guideline Geo.

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Stainless steel electrode connected to the multicore transmitter and receiver cable

Applications

The ERT and IP methods are applicable in several cases where subsurface conditions are crucially.

Examples are:

- Delineation of aquifers.
- Mapping protecting clay layers separating shallow aquifers from the deeper and better protected aquifers.
- Contaminating percolates studies and discrimination of former waste sites.
- Delineation of natural resources, for example clay, sand, gravel etc.
- Mineral prospecting. The IP method is especially valuable for mapping disseminated sulphide mineralization.
- Pre-geotechnical investigations e.g. at larges construction sites, road development and pipeline investigations.

Services

Ramboll has more than 20 years of experiences and will:

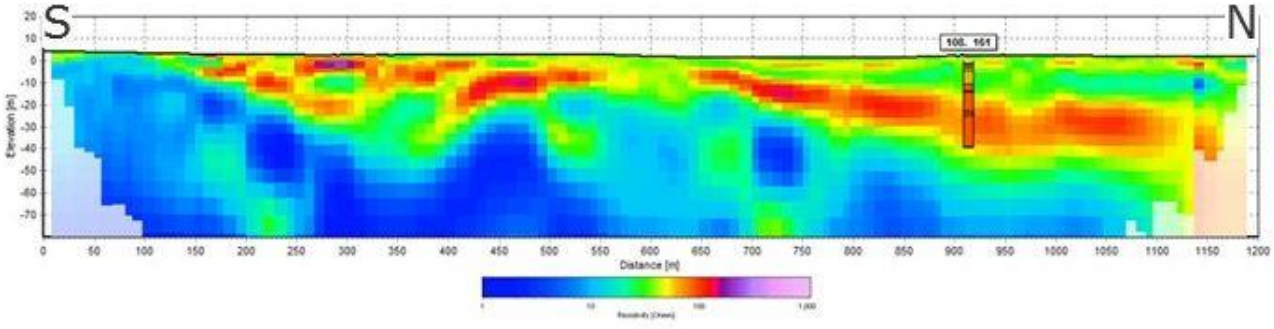
- Support clients and other stakeholders with relevant information and analysis that ensures optimized survey setup.
- Setup survey optimized for Scope of Work.
- Collect data using experienced geophysicists and Standard Operation Procedure.
- Processing and inversion of ERT/IP data using state of the art software packages Aarhus Workbench.
- Interpretation of the inverted ERT/IP data focused on the objective of the survey.

Examples

At the figure below a resistivity section for an ERT dataset is visualized with a borehole-log. Blue colors show low resistivity layers e.g. clay or saltwater intrusion. Red colors show high resistivity layers e.g. a possible aquifer consisting of sand and gravel.

A strong correlation between the resistivity section and the borehole-log description is seen. The extent of the sand layer correlating with high resistivity can be interpreted in both directions from the well-log site.

In the northern part (right side of the figure) the low resistivity layer above protects the underlying aquifer from pollution from the surface. Therefore, the aquifer in the northern part of the survey area, will be prioritized for possible future water supply boreholes.



Resistivity section based on ERT data.