

Geophysical mapping

**For a higher knowledge about the subsurface geology
and improvement of groundwater models**

Intelligent mapping

At NIRAS we are specializes in applying electromagnetic (EM) and direct current (DC) electrical investigations, particularly for groundwater mapping and exploration. Geophysical investigations combined with geotechnical investigations can provide crucial information for large-scale infrastructure projects and raw material mapping.

Depending on the purpose and goal, various methods can be used in the field of electromagnetism, ranging from near-surface to in-depth investigations with airborne EM systems. These methods are sensitive to variations in electrical conductivity (resistivity). Since electrical resistivities are closely linked to soil lithology, these investigations can be used for indirect subsurface mapping.

The methods described here are part of the geophysical toolbox of NIRAS. Depending on our customers' preferences, we are also happy to use other methods.

SkyTEM groundwater investigations

The SkyTEM system is a dual-moment time-domain Airborne Electromagnetic (AEM) method, specifically designed for groundwater investigations in larger areas.

This system offers:

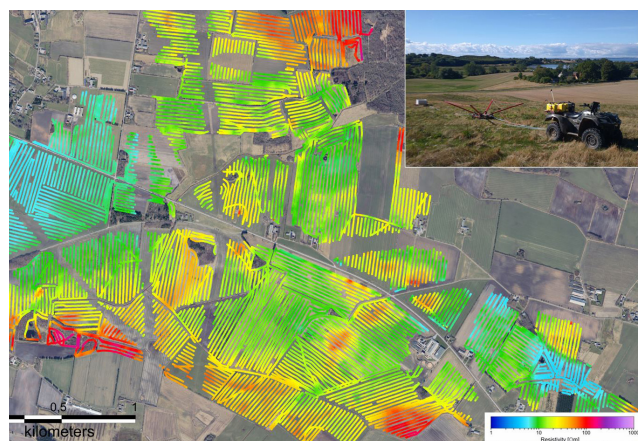
- Valuable insights into subsurface properties
- Can be designed to the actual purpose and area of interest
- Use survey line distances from 150 m to a few kilometers
- Depth of investigation varies from system set-up, but can extent 500 m.

SkyTEM has shown its ability to regional groundwater resource mapping, and aquifer delineation and was e.g. chosen by Department of Water Resource for mapping all high and medium priority basin in California.

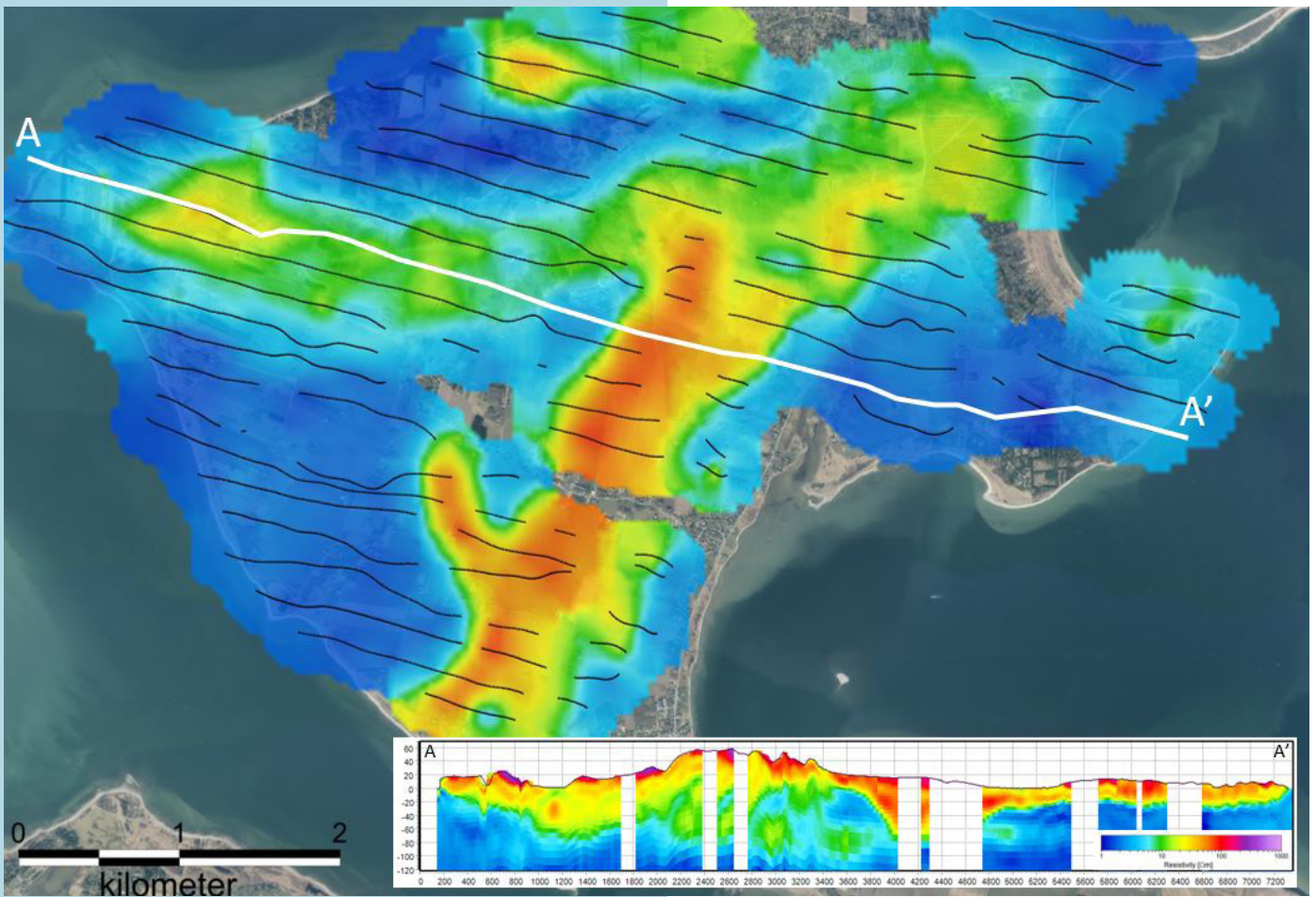
tTEM Ground-based system

The towed time domain electrical method (tTEM) is a ground-based electromagnetic system towed by a All-Terrain-Vehicle (ATV) and the resistivity is measured continuously in the time domain.

The system is design for detailed 3D geophysical



mapping in the subsurface in an efficient way. After geophysical processing and inversion the resistivity is interpreted to approximately 60-80 m depth depending on geological conditions. tTEM is particularly suitable for and often used for



mapping areas from a few hectares to several hundreds of hectares of size.

The figure above shows the resistivity in elevation -40 to -30 m a.s.l. High resistivities (red) indicates sandy sediments, whereas low resistivities (blue and green) indicates more clayey sediments. The model section shows the resistivity model from A to A'.

Other geophysical methods:

- The DualEM-421 is a detailed multi-configured Ground Conductivity Meter (GCM) applied for mapping of the ground conditions, where the resistivity is calculated
- For deeper Time-Domain Electromagnetic (TDEM) investigations, the sTEM system can be applied. The resistivity is measured to a depth of approximately 200 meters.
- Electrical Resistivity Tomography (ERT) is a widely used direct current (DC) method for groundwater mapping and geotechnical purposes. The resistivity can be measured to depths exceeding 100 meters.

NIRAS is a multiplanar consulting firm with offices in 30 countries, 3000 employees and 90 danish experts within geology and hydrogeology. Contact one of our specialist to learn more and get a concrete offer.



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