GUIDELINEGEO

Developed by
AGS Aarhus GeoSoftware

Inversion Software

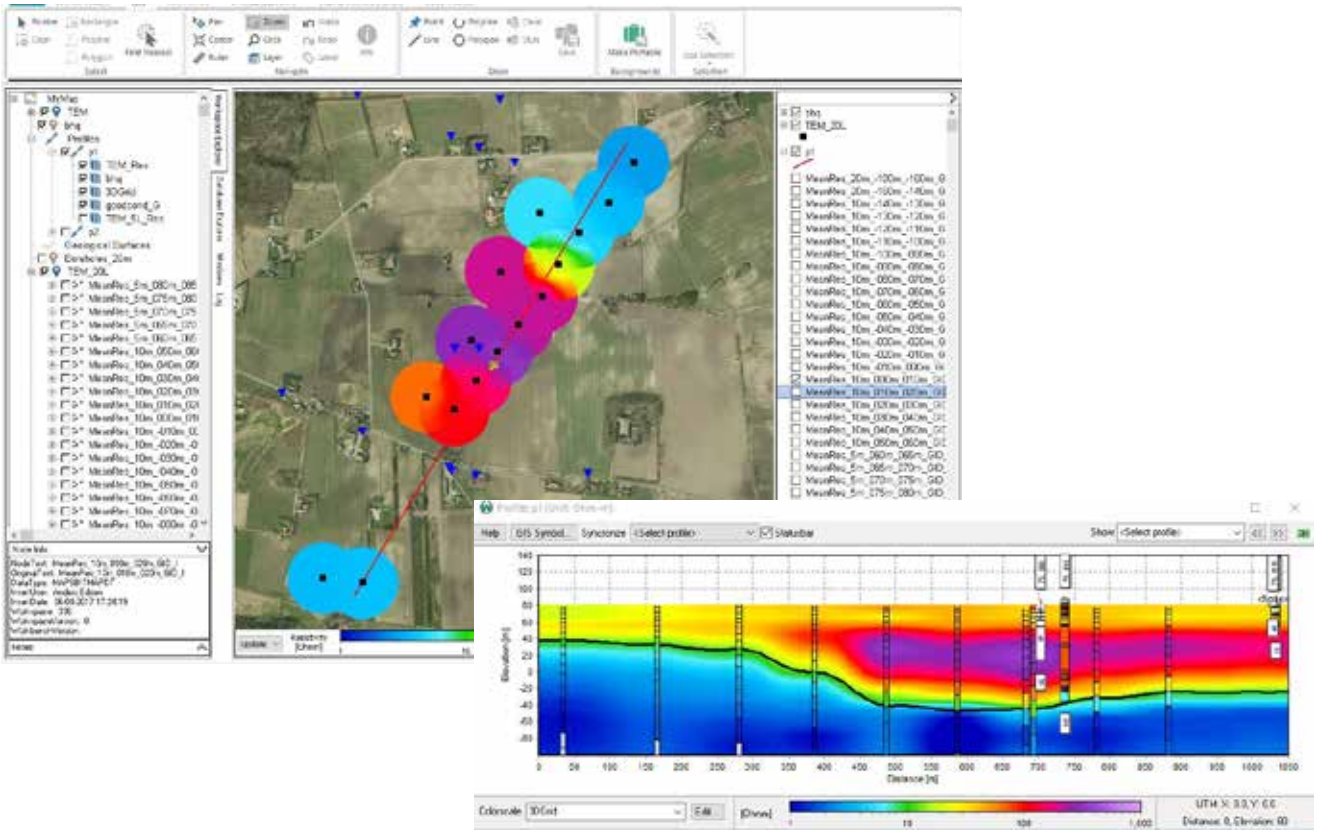
Processing, Inversion and Visualization

Aarhus Workbench

The geophysical world's pursuit to analyze the underground has generated a number of interpretation methods over the years. As different techniques are used to explore, investigate and understand the subsurface structure, the methods are becoming more advanced with every evolving iteration.

The previous hassle of puzzling the data together, analyzing and visualizing the results by using different programs is now history thanks to Aarhus Workbench – an advanced software package for processing, inversion and visualization.

Aarhus GeoSoftware (AGS) has developed a software package that brings most geophysical mapping methods together to a common arena – the GIS surface (Geographical Information System). The essence of the software is a variety of processing, modelling and inversion capabilities that together builds a toolbox that instantly displays the final result on the map.



Multiple soundings measured in Aarhus, Denmark using an ABEM WalkTEM. Data was collected for geological mapping of a buried valley where groundwater is located.

The picture is showing an interpolated 2D profile with marked layer boundaries, and a depth section visualized on the GIS interface.

FLEXIBLE MODULE PACKAGE

The Workbench package holds several flexible modules from the Essentials to the ERT and IP modules, that integrate all steps in the workflow from handling of raw data, inversion to visualization.

This will provide the basis for the decision-making regardless the subject of interest – such as water, environment or infrastructure mapping.

ESSENTIALS MODULE

Aarhus Workbench Essentials makes up the core in this modular suite and integrates all steps in the workflow.

Essentials module includes a robust GIS platform, which can handle processing, inversion and visualization of multiple geophysical data types. Essentials is not a stand-alone module; for complete data processing and inversion, additional modules such as ERT, IP or GCM are required. Sounding data, TEM or DC, which has been processed and inverted in Aarhus SPIA is easily imported and displayed.

The GIS surface is integrated with the processing tools, and cross sections can be made by simply drawing directly on the map.

Essentials report tool creates PDF reports with results from maps and profiles, which is a valuable addition for presentation purposes.

KEY FEATURES ESSENTIALS MODULE

- ▷ Integrated GIS interface
- ▷ Visualization of data in themes and profiles
- ▷ Import of borehole data
- ▷ Import DEM (Digital Elevation Model) maps and use elevation for inversion
- ▷ QC (Quality Control) visualization tool
- ▷ Tool for easy PDF report creation

ADDITIONAL MODULES

- ▷ Resistivity (ERT) or IP (Induced Polarization)
- ▷ Groundbased towed TEM
- ▷ GCM (Ground Conductivity Meter)
- ▷ Airborne EM (Electro-Magnetics)

The ERT and IP modules

The ERT and IP modules are designed for processing and inversion of imaging/ERT (Electrical Resistivity Tomography) and IP (Induced Polarization) data. The modules are fully integrated with the GIS interface and have automatic filters that will visualize data quality and increase the processing speed.

Inversion for both resistivity and IP can be done in 1D or 2D using smooth, sharp or layered models.

The IP module is equipped with a stand out groundbreaking feature – the ability to invert the full decay of the IP signal and not only the integral IP, which makes this software superior to other inversion solutions.

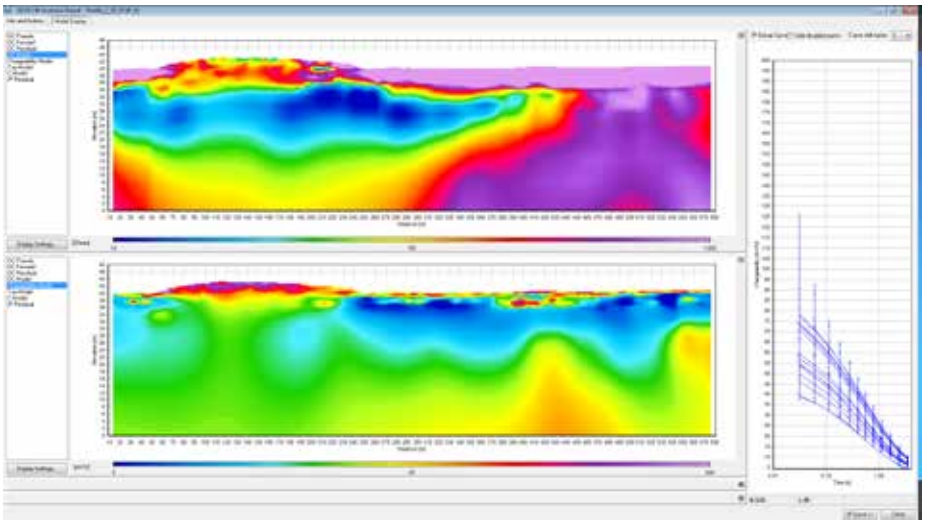
The time constant Tau and the frequency exponent C, are parameters, which describe the shape of the decay curve. They can e.g. be used for evaluating the grain size and grain size distribution of a mineralization. The Aarhus Workbench IP module is the only inversion tool able to provide these parameters based on full IP decay inversion.

KEY FEATURES ERT MODULE

- ▷ Automatic filters for improved processing speed
- ▷ Extensive QC (Quality Control) tools
- ▷ Integration with the GIS interface
- ▷ Smooth, sharp or layered inversion models

KEY FEATURES IP MODULE

- ▷ Cole-Cole or Constant Phase Angle parametrization for inversion of IP data
- ▷ More parameters (C and Tau) compared to traditional inversion software
- ▷ Full current waveform and filters incorporated into forward response for IP data modelling



The picture is showing the resistivity and IP models for a 2D profile, and IP decay curves.

ERT and IP profiles measured in Grindsted, Denmark using an ABEM Terrameter LS. The survey was performed to map a pollution plume at an old landfill.

Aarhus SPIA DC and SPIA TEM

Aarhus SPIA is a processing and inversion software for groundbased TEM soundings and resistivity VES data.

Aarhus SPIA has a user-friendly graphical interface that simplifies the processing and inversion process with the possibility to edit data and models directly in the plots.

There is also a built-in model report tool, which makes it quick and easy to generate a PDF report.

In Aarhus SPIA the user has the ability to:

- ▷ Change the standard deviation for each data point
- ▷ Add a priori information to the starting model
- ▷ Modify models during the inversion process
- ▷ Do 1D inversions using the AarhusInv inversion code

The processed data and inversion models are all saved in the same database and can be exported directly into Aarhus Workbench for further visualization of the results.

In the essential module within Aarhus Workbench it is also possible to create vertical sections and 2D visualizations for increased benefit when multiple TEM or VES soundings have been made.

Aarhus SPIA TEM

In Aarhus SPIA TEM, data obtained as Transient Electro-Magnetic (TEM) soundings can be plotted in different ways, e.g raw dB/dt, stacked dB/dt or apparent resistivity, which improves the processing overview. An automatic filtering procedure minimizes the influence from spikes and cultural noise.

The software is also preinstalled on the ABEM WalkTEM instruments. Data can easily be inverted into a qualitative 1D model, instantly after completing a measurement and while still out on the field.

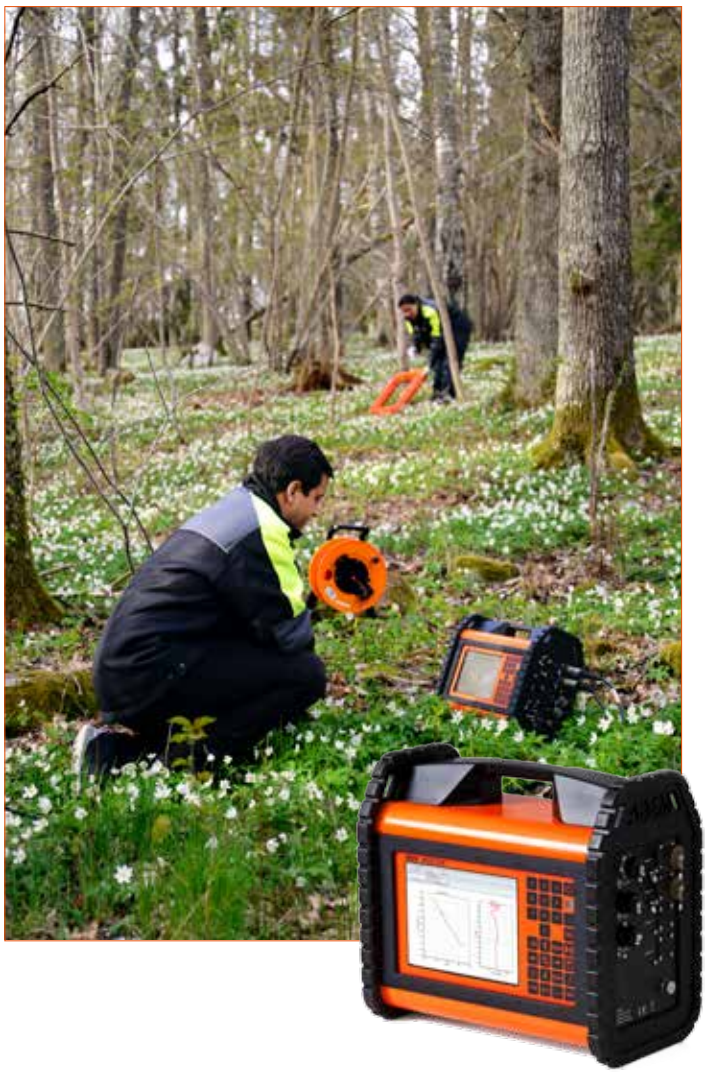
For more advanced editing, the same data can be further optimized at the office using the PC version of the software.

KEY FEATURES AARHUS SPIA DC AND SPIA TEM

- ▷ Fast and easy-to-use processing and inversion tools
- ▷ Simple to add a priori data
- ▷ Model report function
- ▷ Easy export to AGS Workbench for visualization
- ▷ Easy edit of field data
- ▷ View sounding positions with Google Maps

KEY FEATURES AARHUS SPIA TEM

- ▷ Plotting of Electro-Magnetic data, e.g raw dB/dt, stacked dB/dt or apparent resistivity, which improves the processing overview
- ▷ Instant inversion of data after field measurement in ABEM WalkTEM
- ▷ Automatic filtering procedure to minimize spike and noise



Aarhus SPIA DC

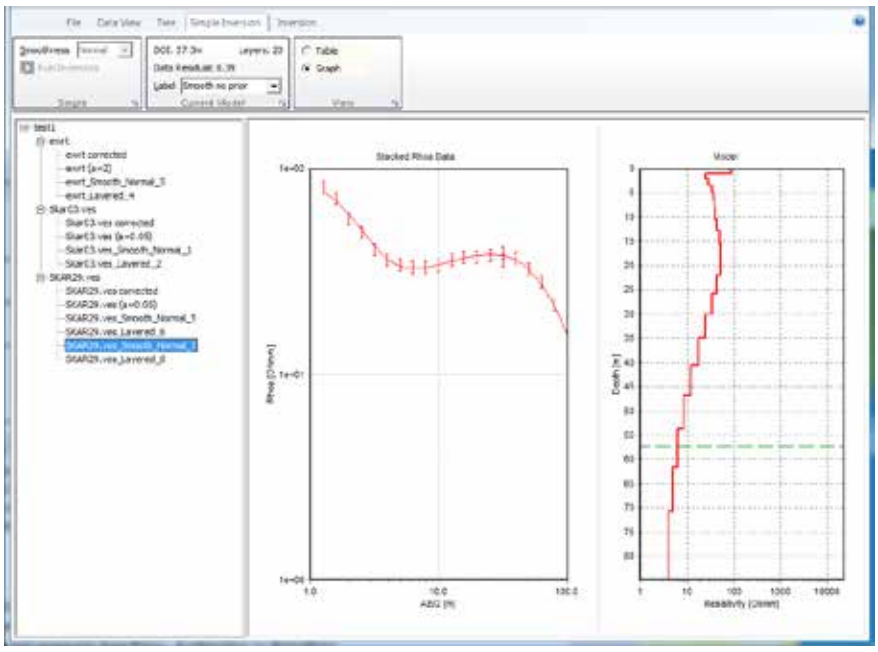
Resistivity VES data is processed and modelled by the Aarhus SPIA DC software. The graphical user-interface and the flexibility of data handling, makes this a comprehensive solution for VES data interpretation.

In Aarhus SPIA DC, resistivity VES data can easily be imported. If an ABEM Terrameter SAS1000/4000 was used, the project data file can be directly imported without any need for data format conversion.

Data can be plotted as stacked apparent resistivity and the inversion models can be displayed as a smooth or layered model.

KEY FEATURES AARHUS SPIA DC

- ▷ Easy-to-use data import of VES data
- ▷ Advanced processing and inversion tools
- ▷ Simple model report function
- ▷ 1D inversion with AarhusInv



Resistivity sounding measured in Arusha, Tanzania using an ABEM Terrameter SAS1000. Data was collected in a groundwater survey as a pre-investigation for a well drilling.

Picture is showing the stacked apparent resistivity data, and the smooth inversed model.

Overview

KEY FEATURES processing and inversion software for TEM and VES data

	Aarhus SPIA TEM	Aarhus SPIA DC
▷ Advanced processing and inversion tools	☑	☑
▷ Simple to add priori data	☑	☑
▷ Easy export to AGS Workbench for visualization	☑	☑
▷ Easy edit of field data	☑	☑
▷ Instant inversion of data after field measurement	☑ Within the ABEM WalkTEM instrument	
▷ Automatic filtering procedure to minimize spike and noise	☑	
▷ Plotting of Electro-Magnetic data, (e.g raw dB/dt, stacked dB/dt and apparent resistivity)	☑	
▷ Easy-to-use data import of VES data		☑
▷ View sounding positions in Google Maps	☑	☑
▷ Simple model report function	☑	☑
▷ 1D inversion with AarhusInv	☑	☑

KEY FEATURES Aarhus Workbench

Essentials including ERT and IP modules

- ▷ GIS Interface
- ▷ QC visualization tool
- ▷ Visualization of data in themes and profiles
- ▷ Import of borehole data
- ▷ Fully developed processing tools and filters
- ▷ Import DEM maps and use elevation for inversion
- ▷ PDF generator
- ▷ Visualize data from other geophysical methods
- ▷ Additional modules can be added for complete data processing
- ▷ IP data processing
- ▷ 2D inversion with AarhusInv
- ▷ Interpolation of 1D to 2D, 2D to 3D

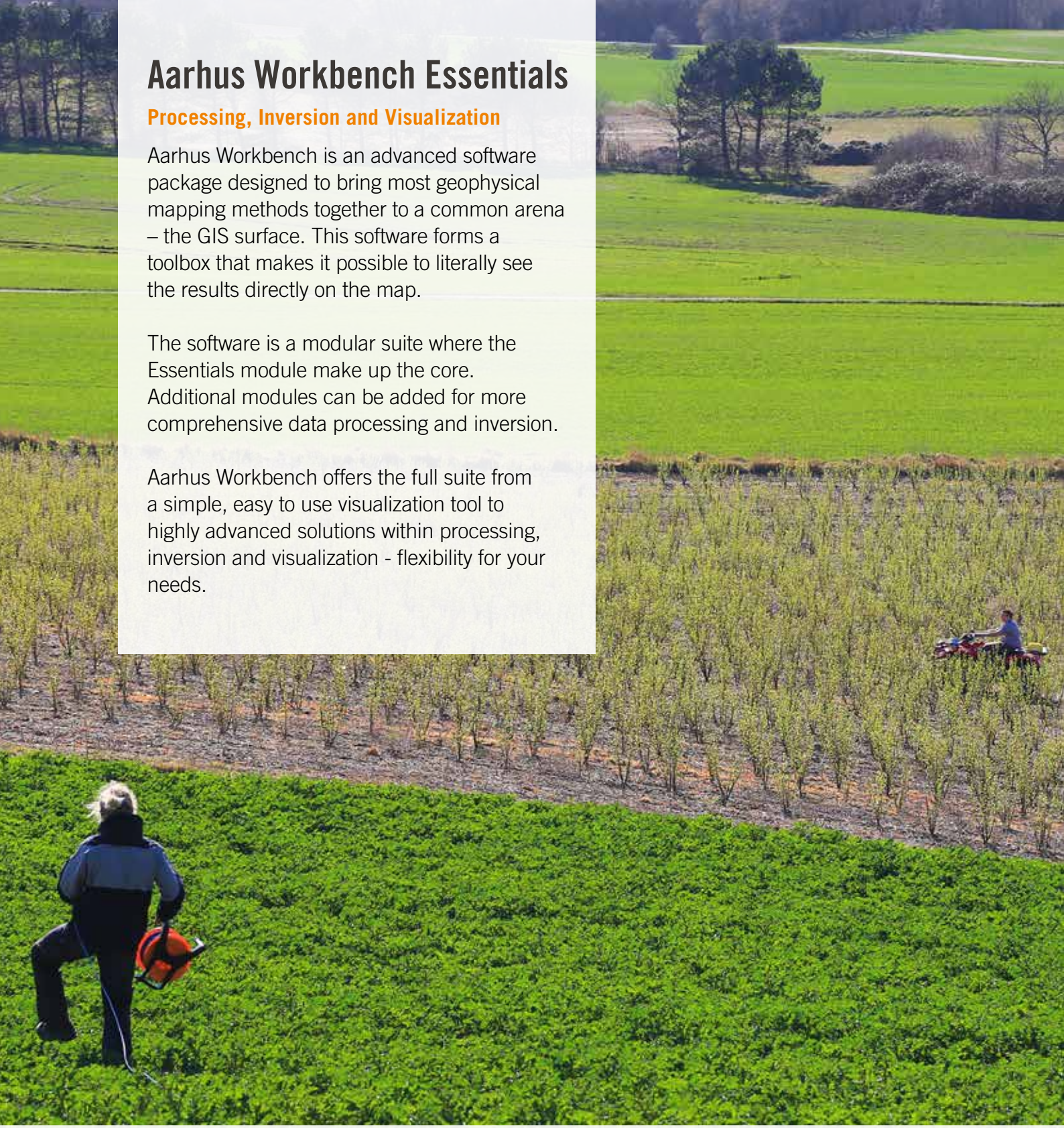
Aarhus Workbench Essentials

Processing, Inversion and Visualization

Aarhus Workbench is an advanced software package designed to bring most geophysical mapping methods together to a common arena – the GIS surface. This software forms a toolbox that makes it possible to literally see the results directly on the map.

The software is a modular suite where the Essentials module make up the core. Additional modules can be added for more comprehensive data processing and inversion.

Aarhus Workbench offers the full suite from a simple, easy to use visualization tool to highly advanced solutions within processing, inversion and visualization - flexibility for your needs.



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***Guideline Geo** is a world-leader in geophysics and geo-technology offering sensors, software, services and support necessary to map and visualize the subsurface. Guideline Geo operates in four international market areas: Infrastructure – examination at start-up and maintenance of infrastructure, Environment – survey of environmental risks and geological hazards, Water – mapping and survey of water supplies and Minerals – efficient exploration. Our offices and regional partners serve clients in 121 countries. The Guideline Geo AB share (GGEO) is listed on NGM Equity.*

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