**Environmental Monitoring Solutions**

G.Re.T.A. CLOUD
(SWCLA1022)

Web-based cloud platform that allows access to G.Re.T.A. system data from any Internet location.
The platform not only allows the visualization of the acquired data, but also the configuration of the system, the setting of alarm thresholds and the data analysis.
This service is offered by subscription by LSI LASTEM.
The website is multi-user and allows access by introducing personal credentials.
The cloud platform is available in Italian, English, French and Spanish.
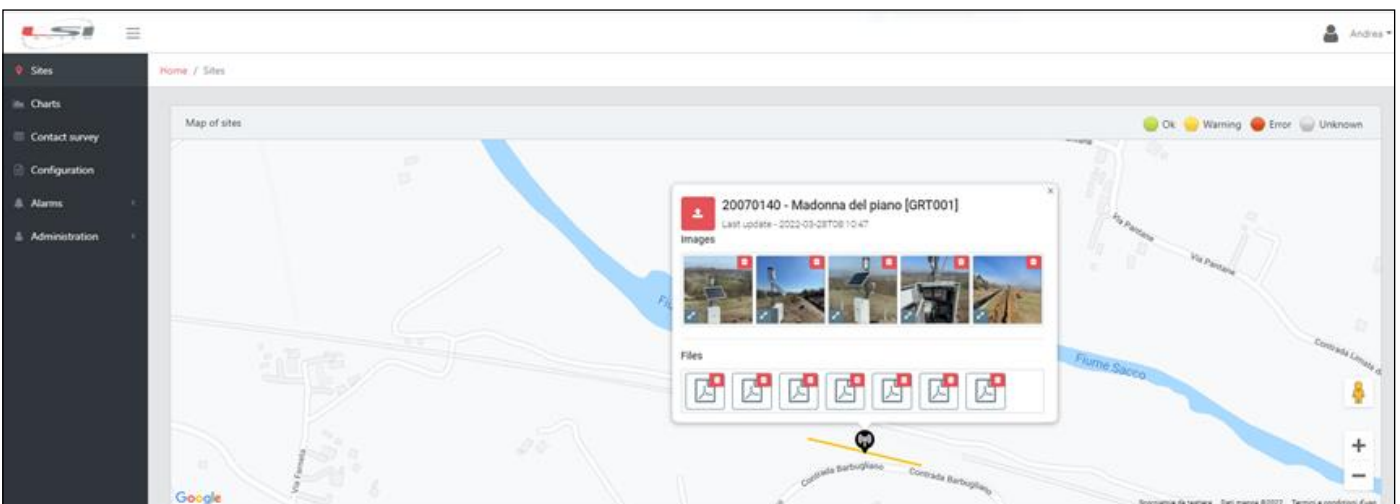
- Visualization of resistivity data
- Visualization of acquisition parameters
- Data export in text or jSON format: manual or automatic (through API)
- Comparison between data of different days
- Measurement of contact resistance of electrodes
- Inversion algorithm included in the cloud software with possibility of changing parameters of sites
- Possibility of integrating environmental and piezometric measurements inside the platform
- Calibration function to convert resistivity into soil water content
- Setting of alarm thresholds on percentage variation or absolute values
- Statistical analyses and time charts
- Acquisition configuration section

Main features

Geolocation of the stations
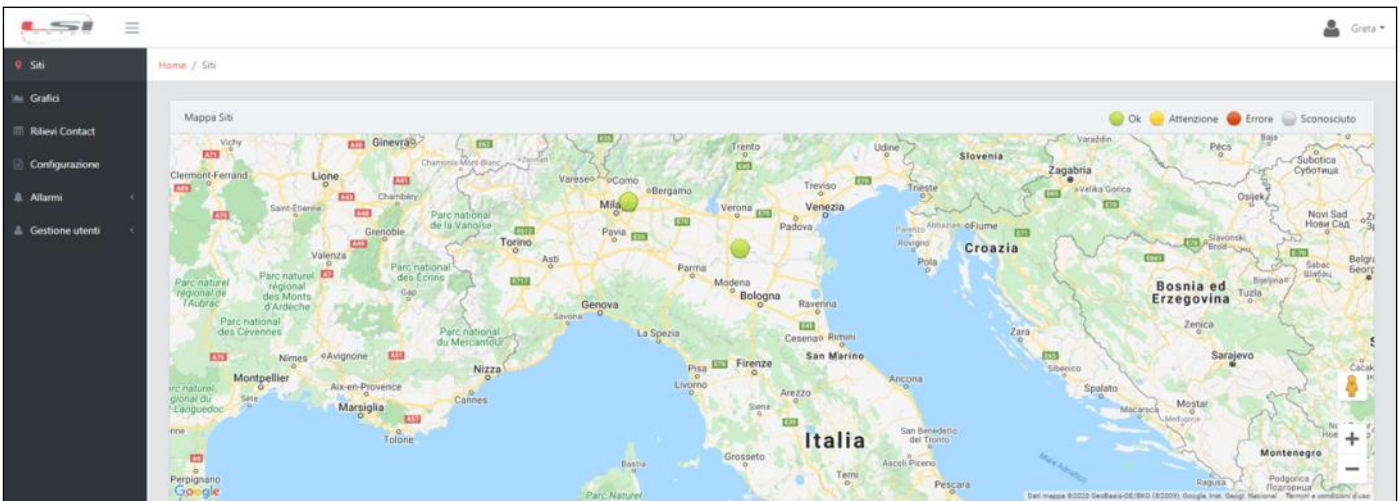
Display on a cartographic basis of the position of the G.Re.T.A. stations with name and first level of diagnostics on operation. G.Re.T.A. system communication to the LSI LASTEM server via Modem / Router. Geolocation of stations on the map: the colored dot indicates a first diagnostic on the correct functioning of the system.


Visualization of the profiles on Google map and possibility to upload, download and view images, documents and other metadata.

Visualization of resistivity data and acquisition parameters
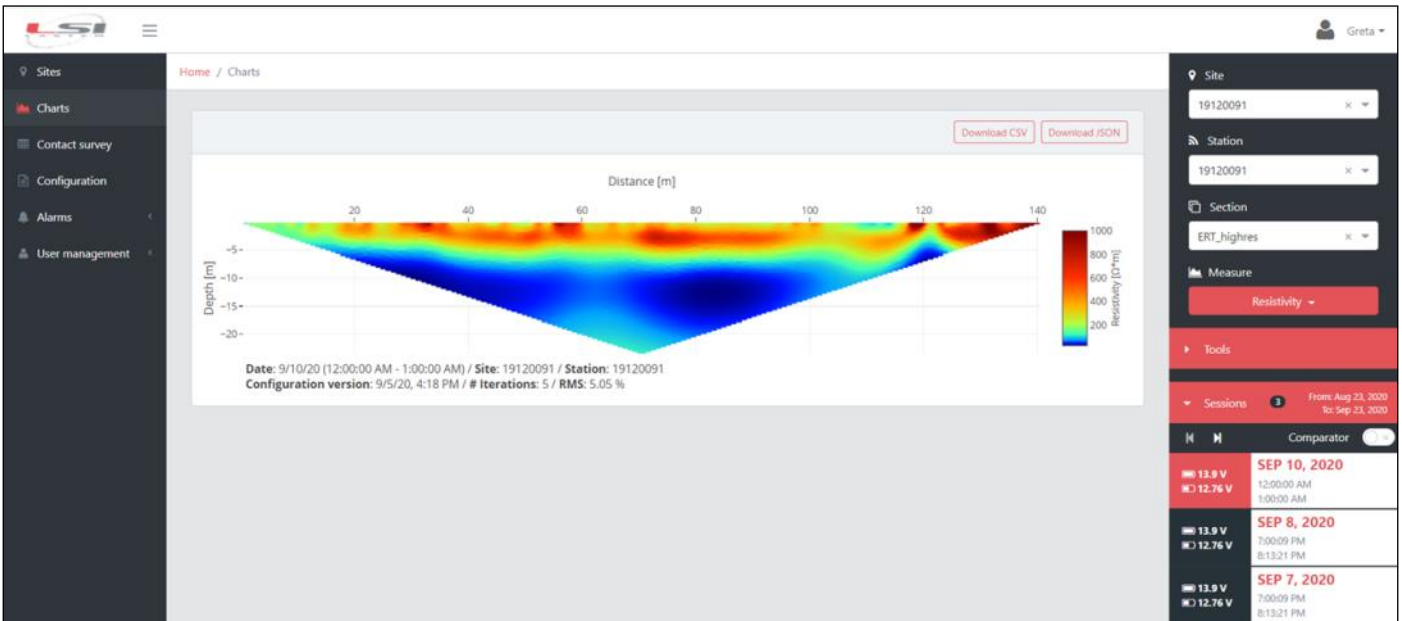
● *Display of apparent and inverted resistivity data. Display of the acquisition parameters, such as injected current, measured voltage, standard deviation of the measurements and estimation of soil water content (after system calibration). Possibility to exclude specific measurement sessions (e.g. performed for diagnostic tests) from display, automatic or manual comparisons and alarms.*

Data comparison
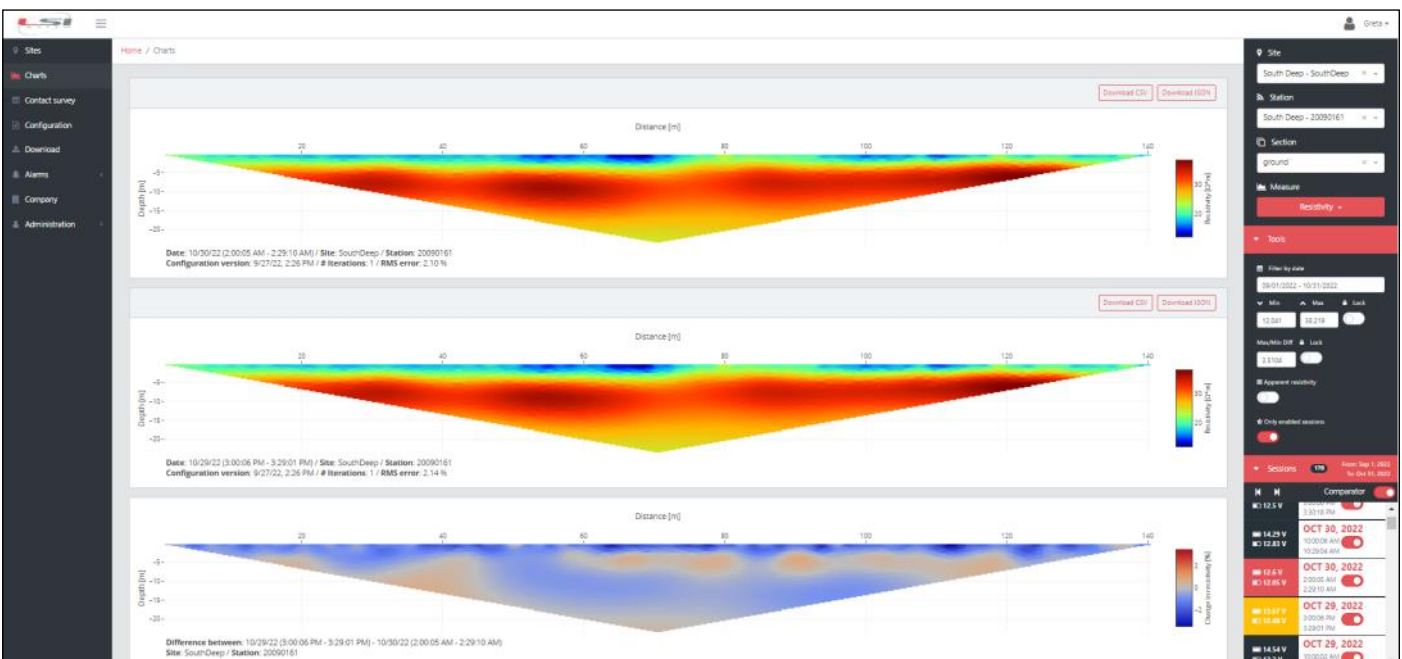
● *Possibility of manually comparing data acquired at different times, selectable from the list of measurements performed. Visualization of the section of percentage differences between the two measurements. By setting alarm thresholds, on the other hand, the platform makes automatic comparisons between each new data and the previous one at a selected time interval.*

Integration of additional data

The system can be integrated with meteorological sensors connected to an additional data logger that can be installed in the same box of the system. It is also possible to connect piezometers.
All additional data are conveyed to the cloud platform to be displayed together with the acquired resistivity sections.
It is possible to view tables of environmental and piezometric data acquired at the same time of the geoelectrical measurement and view the piezometers' position and groundwater level directly on the resistivity section.
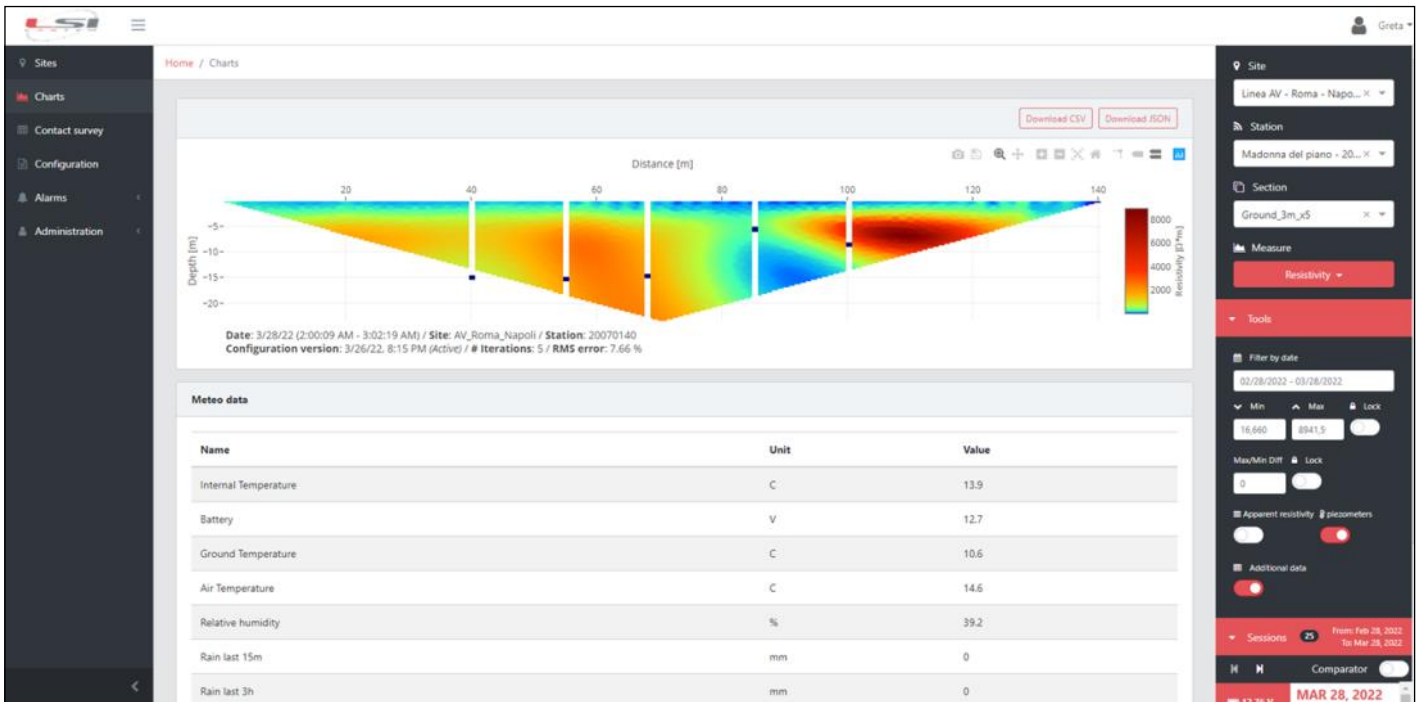
▶ *Display of additional data: environmental data (coming from meteorological sensors added to the system) and piezometric data from piezometers connected to an additional data logger installed alongwith the G.Re.T.A. system.*

Introduction of the resistivity-water content calibration function
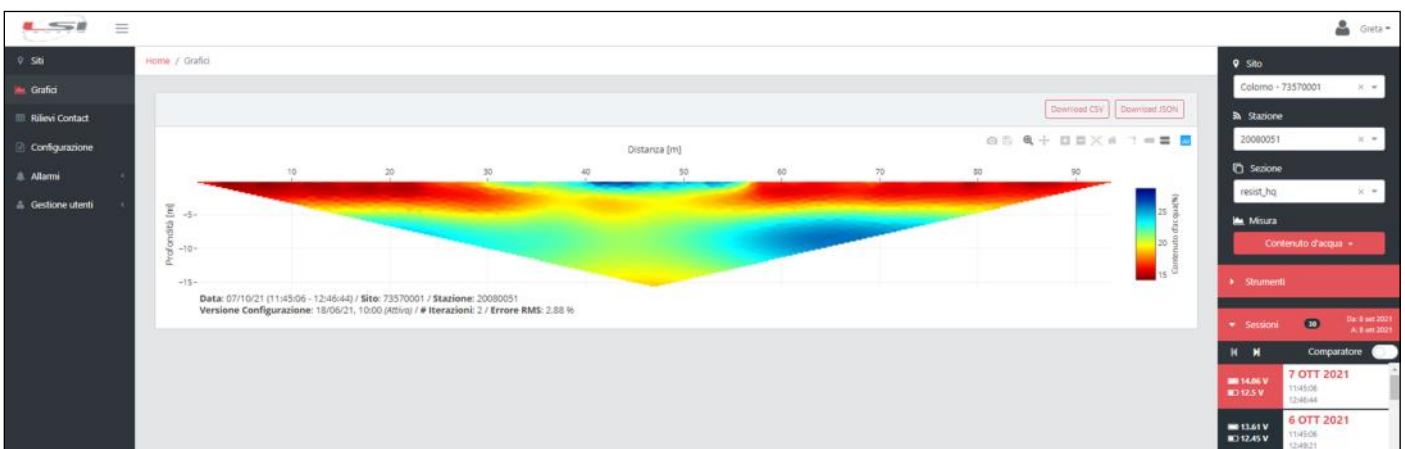
▶ *The user can enter the calibration parameters of a specific site-dependent function for the transformation of resistivity sections into sections of soil water content. To obtain parameters A and B of the function, it is necessary to perform a core drilling with extraction of samples at different depths in order to directly measure the water content of the soil.*

Measurement configuration

The user configures the performing of the G.Re.T.A. system measurements indicating the type of survey:

- apparent resistivity measurement
- measurement of contact resistances

choosing the time frequency of the measurements and the acquisition parameters. The system updates automatically, recognizing the presence of a new configuration file on the server.

Alarm module

The user can set alarms to be activated when absolute value thresholds or percentage change thresholds of resistivity data are exceeded. Alarms can be classified as: Observation, Warning, Alert.
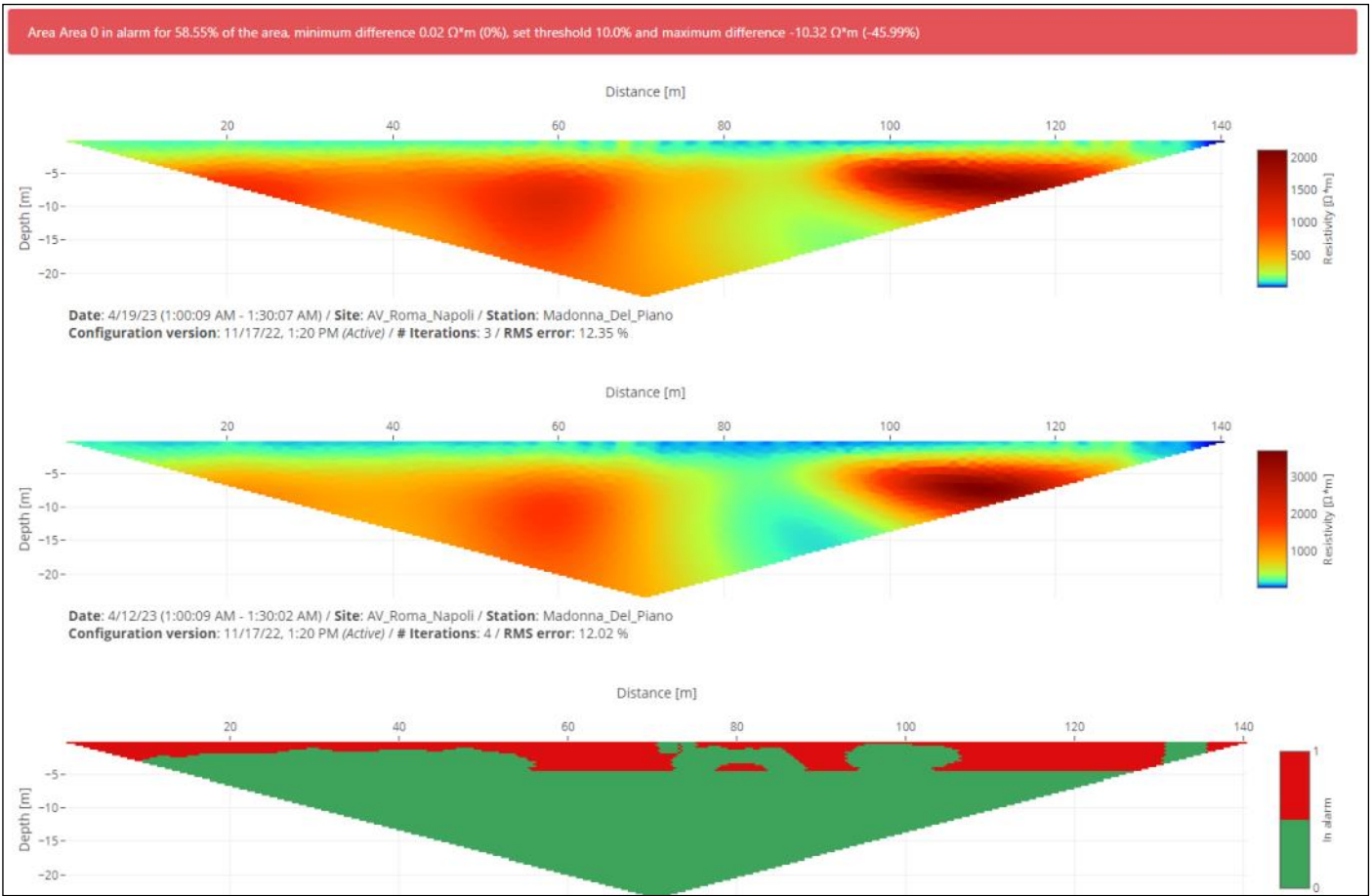
It is possible to choose the section area on which to apply the alarm, the temporal distance over which to evaluate the command and the % variation or absolute value of resistivity to be reached. For each system it is possible to set multiple alarms with threshold operation, applied to different zones of the section or acting on different time periods. The alarm can be simulated on past data to evaluate the effectiveness of the selected thresholds.
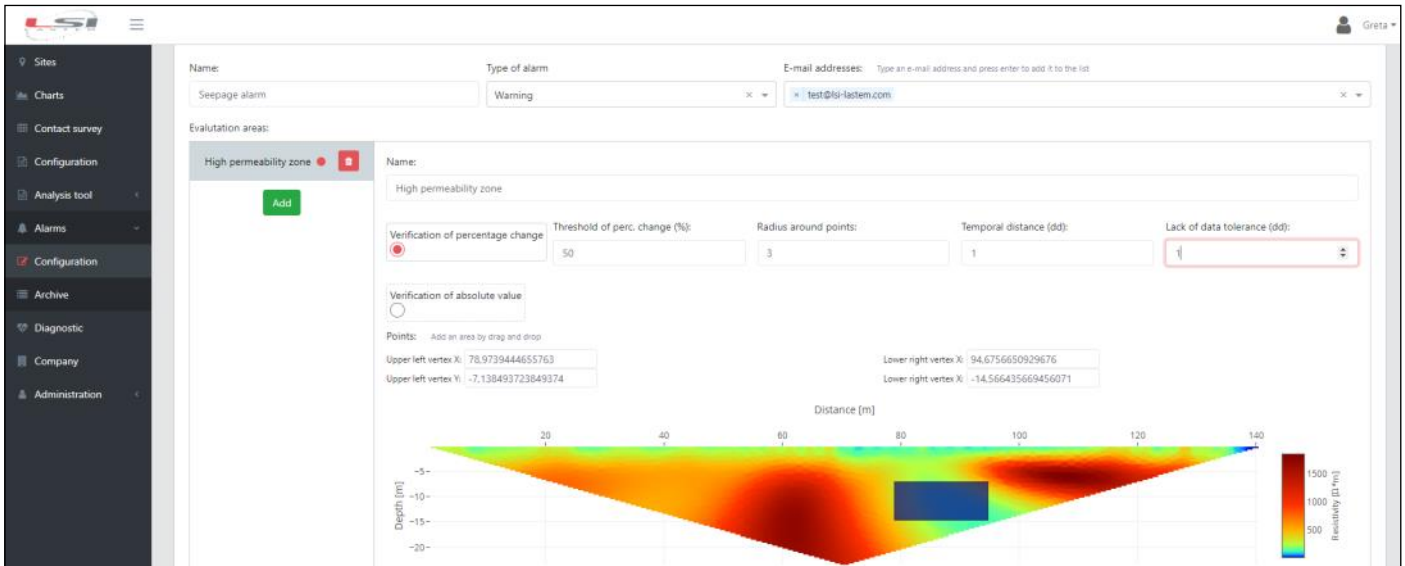
○ *Setting an alarm on the percentage change in a specific zone of the section.*
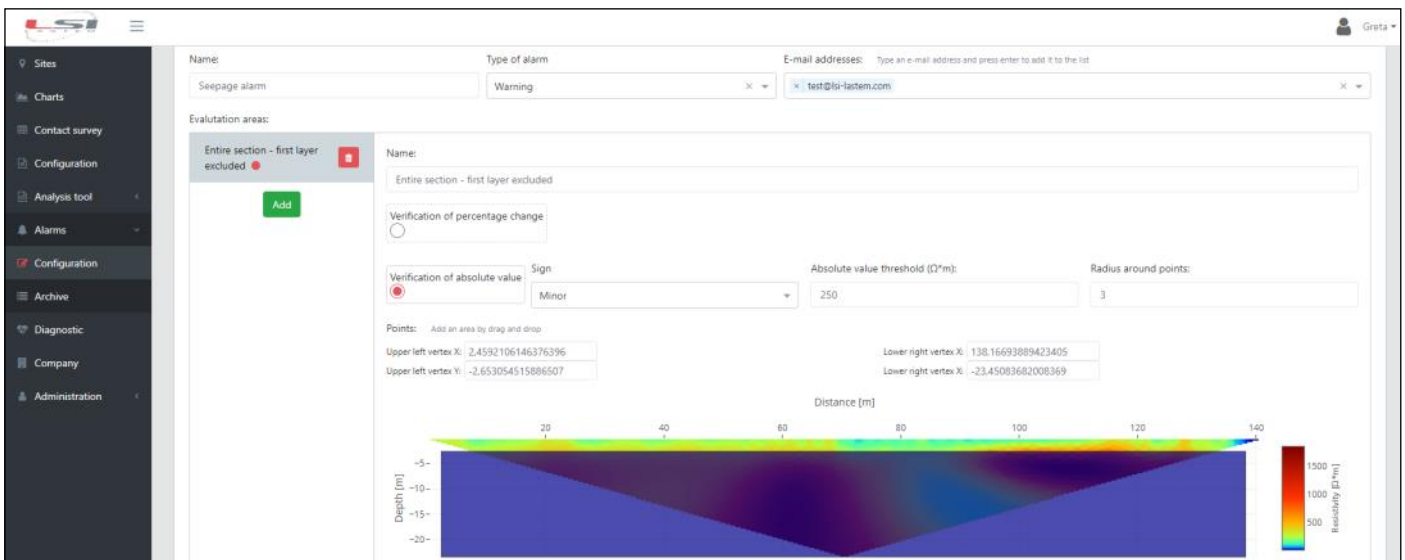
○ *Setting an alarm on the absolute value over the entire section excluding the uppermost layer.*

Area Area 0 in alarm for 58.55% of the area, minimum difference 0.02 Ω*m (0%), set threshold 10.0% and maximum difference -10.32 Ω*m (-45.99%)

Date: 4/19/23 (1:00:09 AM - 1:30:07 AM) / **Site:** AV_Roma_Napoli / **Station:** Madonna_Del_Piano
Configuration version: 11/17/22, 1:20 PM *(Active)* / **# Iterations:** 3 / **RMS error:** 12.35 %

Date: 4/12/23 (1:00:09 AM - 1:30:02 AM) / **Site:** AV_Roma_Napoli / **Station:** Madonna_Del_Piano
Configuration version: 11/17/22, 1:20 PM *(Active)* / **# Iterations:** 4 / **RMS error:** 12.02 %

The user is notified of the threshold crossing via an e-mail, from which he can access the display of the data that triggered the alarm.

Data analysis module

Statistical analyses can be performed on standard deviation data to assess the quality of measurements, or on resistivity data, water content or acquisition parameters (injected current, measured voltage).
Analyses can be made by averaging the entire section or a single zone.
The tool allows a CSV file to be downloaded or a time graph of the analysed variables to be produced.