EEMstudio: a QGIS plugin for processing and modelling of electric and electromagnetic data with focus on induced polarization

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Workshop session: From field data acquisition and processing to inversion

Is the first and presenting author a student? No

In the workflow of electric and electromagnetic methods, processing is an essential step that have an influence on the outcome of the resulting models. IP effects in ground galvanic measurements are characterized by low signal-to-noise ratio, and effects generated by noise and interferences with anthropogenic infrastructures produce outliers on a significant fraction of the acquired IP data, which can be interpreted erroneously as geological features if not culled out during processing. Similarly, in inductive data, coupling results in artifacts in the models like spotted appearance and buried conductors (Viezzoli et al., 2013).

The preferred method for processing IP and inductive data is the visual inspection and manual culling of faulty data using ad hoc interfaces, possibly with the support of a georeferenced map, which helps in identifying man-made infrastructures like power lines, metal fences, guardrails and underground cables and pipes that generate coupling effects on both IP and inductive data.

EEMstudio is a QGIS plugin that gather visualization, processing and modelling tools within the QGIS environment (Fig. 1a). Processing is made in a designated tool configurated for both electric data (Fig. 1b) and electromagnetic data (not show in Fig. 1 for brevity). In this interface, various plots linked with the QGIS map allow a clear overview of the data, with a focus also on IP visualization. Here data can be inspected and removed where needed. In addition to data, it is possible also to upload, visualize and compare forward and model files to perform also quality control.

Regarding the modelling part, the inversions are handled using EEMverter, the inversion software developed by the EEM Team for Hydro & eXploration (Fiandaca et al., 2024), in 1D/2D/3D, also joint and timelapse. With EEMstudio is possible to gather and prepare all the files needed and launch directly the inversions (Fig. 1c).

One last app is the Model Builder (Fig. 1d), with the purpose of building 1D/2D/3D synthetic models to use as starting models or for forward computation.

EEMstudio was developed with the purpose of having all the necessary tools for processing and modelling of data in a unique environment, so that the workflow is optimized and convenient. Being it within QGIS, it is possible also to take advantage of all the functionalities of the most widespread open-source Geographic Information System software available.

It will be released open-source in a free version under the EUPL 1.2 software license, suitable for academic or professional use.

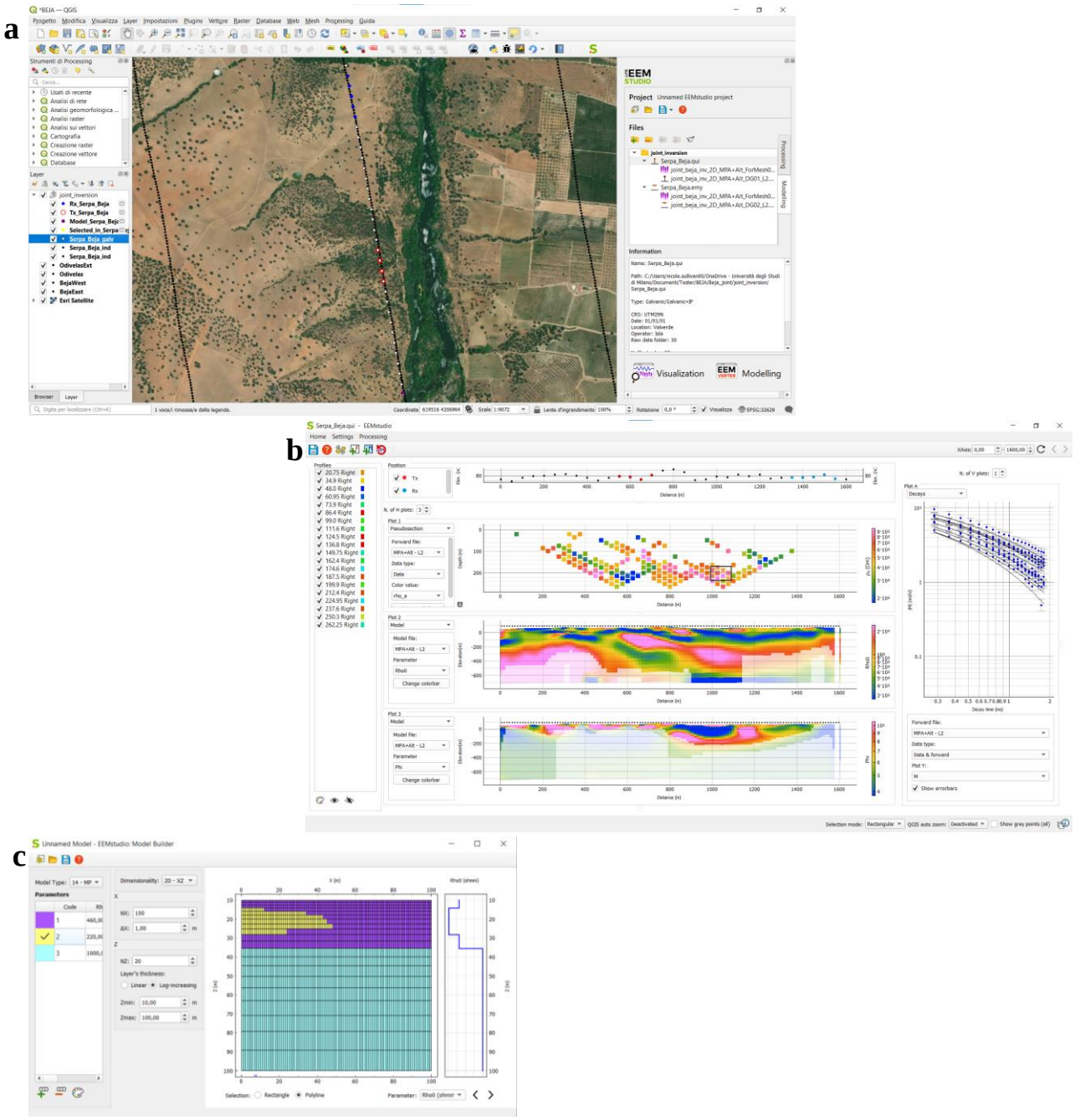

Figure 1: EEMstudio apps: a) QGIS main window with EEMstudio widget on the right and plotted layers from processing, b) processing and visualization app with galvanic data example, c) Model Builder to build synthetic models.

References

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