



**SGA 2023**

## Mineral Resources in a Changing World

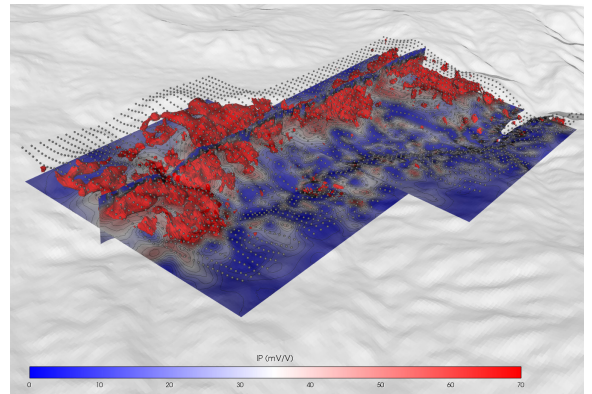


### SC10: From geothermal systems to ore deposits: Deep Electrical Resistivity Tomography for the investigation of Earth Resources

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Federico Fischanger (GEG Experts) & Matteo Lupi (UNIGE)*

*Post-conference short course 02-03 September 2023, ETH Zürich*

The growing demand for mineral resources calls for the development of innovative, highly-sensitive, deeply-penetrating, and fully 3D geophysical methods. The IRIS Fullwaver fills this technological gap and addresses the need for large and yet high-quality electrical datasets. This quasi-wireless technology allows the acquisition of flexible 3D full-waveform resistivity and induced polarization data with a large penetration depth (i.e. up to 1500 m depth). The method has been successfully applied across various disciplines, both in the academic and industrial sectors and its growing traction makes it today one of the most appealing prospecting method for the mining sector. Multi-disciplinary datasets investigating geothermal systems, mine pits, and sedimentary basins have shown the flexibility and the sensitivity of the hardware. Data are inverted with ERTLAB, a robust and advanced inversion software developed to process various electrical resistivity and induced polarization tomography data. ERTLab has a user-friendly interface for processing 2D, 3D or 4D electrical resistivity tomography (ERT) geophysical data.



This hands-on workshop will highlight how 3D geoelectrical data can be processed and used to investigate various geological settings, including but not limited to geothermal systems, ore deposits, sedimentary basins across various tectonic settings. More specifically, the workshop will provide datasets from high-enthalpy geyser-hosting hydrothermal systems, a distal Fe-skarn, sedimentary basin and an a sediment-hosted hydrothermal system. Participants will have the opportunity to acquire data and process datasets to learn and test the potential of DERT.



Gianfranco Morelli is a geophysical engineer with a 30 years experience in geophysical exploration for the mining, geological and the archaeological sector. Associate and Technical Manager of Geostudi Astier srl, he is specialised in the development of hardware and software for geophysical prospecting, with focus on 3D mapping methods for Resistivity, Electromagnetic, Ground Penetrating Radar and Seismic surveying, and long- term down-hole monitoring systems. Gianfranco Morelli was the first developer of ERTLAB that is now widely used for the forward modelling and the inversion of electromagnetic data.



Federico Fischanger is an expert in 3D deep electrical resistivity/chargeability surveys (DERT methods), providing support in both survey design and data processing. He works with universities, research groups, engineering and geophysics companies, taking care of the logistics and training of the teams involved in DERT measurements for civil and environmental engineering, geotechnics, geology, hydrogeology and mining projects.



Matteo Lupi is an Associate Professor at the University of Geneva and uses geophysical methods to investigate active and paleo geothermal systems and fluid flow in the upper crust. His research tracks fluids at depth and covers the interaction between fluid flow and geological structures. Matteo uses passive seismic and electromagnetic methods to capture full 3D images of active and paleo geothermal systems that are ideal natural laboratories to investigate fluid-transport processes. The fast upwelling of deep fluids is accompanied by short-lived permeability enhancements associated with intense seismic and micro-seismic activity and (on the long term) with the formation of ore deposits.