Semi-Airborne Electromagnetic Survey Design and Inversion for Large-Scale Mineral Exploration in the Harz Area, Germany

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Abstract

This study investigates the optimization of Semi-Airborne Electromagnetic (SAEM) surveys for enhanced subsurface imaging in mineral exploration. It highlights the utility of multi-transmitter systems and explores real data utilization and the challenges of large-scale surveys. With emphasis on Data obtained from DESMEX project surveys. The use of multiple transmitters is crucial. Single transmitters can distort results and mask subsequent bodies. Employing two transmitters on both sides of the target enhances resolution and depth accuracy. results are based on finite element forward operator custEM and pyGIMLi's inverse solver [1]. substantial advantages of combining single and multi-patch inversion data. This integration results in improved resolution, reduced artifacts, enhanced continuity of geological structures, superior anomaly detection, minimized edge effects, and improved depth penetration [2]. These findings open promising avenues for further exploration and research in geosciences, offering valuable insights into the Earth's subsurface and its intricate geological features. The next logical step involves expanding our methodology to large-scale inversion using more than three transmitters.

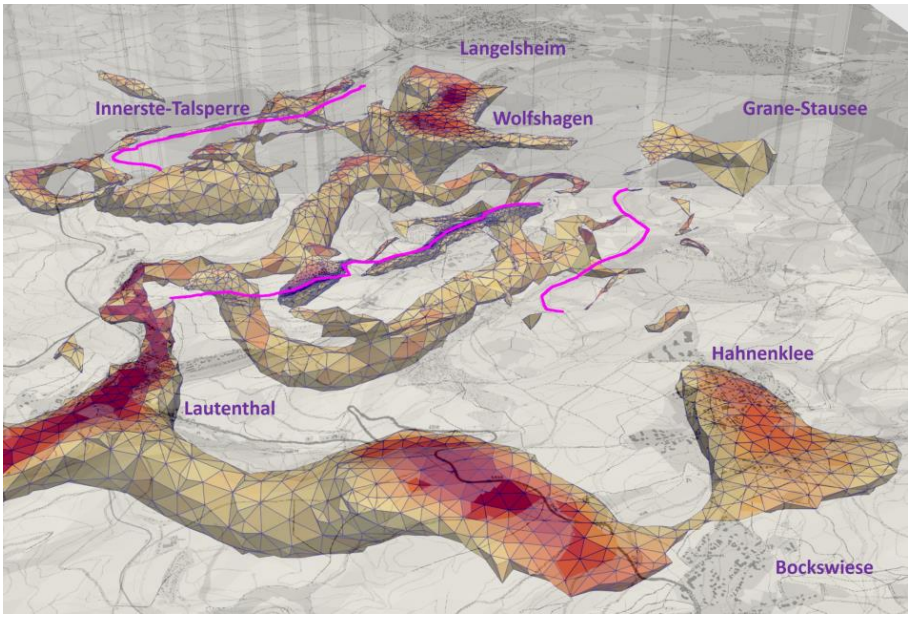

Figure 1: 3D Inversion result of Multi patch showing isosurfaces of conductive bodies below 50 ohm-m. Conductive areas at the surface are effect of villages, Hahnenkee, Bockswiese, Clausthal-Zellerfeld and roads/ infrastructure.

Reference / more information

1. Rochlitz, R.; Becken, M.; Günther, T. Three-dimensional inversion of semi-airborne electromagnetic data with a second-order finite-element forward solver. Geophysical. J. Int. 2023, 234, 528–545.
2. Nazari S, Rochlitz R, Günther T. Optimizing Semi-Airborne Electromagnetic Survey Design for Mineral Exploration. Minerals. 2023, 13(6):796.