

UNDERCOVER

Redefining deep-earth exploration

UNDERSTANDING THE SCIENCE

TURNING MINERAL EXPLORATION DATA INTO KNOWLEDGE

Combining complex datasets to improve the understanding and assessment of deeply buried critical raw materials deposits.

OVERVIEW

Mineral exploration generates large amounts of geological, geophysical and geochemical information. UNDERCOVER investigates how these datasets can be integrated, analysed and interpreted to develop a unified understanding of the subsurface. By combining joint inversion, petrophysical modelling and artificial intelligence with geological expertise, the project aims to improve the identification and assessment of prospective areas for deeply buried critical raw material deposits.

Why does it matter?

- **Complex information** – Deep exploration generates various datasets that, individually, may not provide a complete geological understanding of the subsurface.
- **Connecting the evidence** – Linking geophysical models with measured rock properties helps interpret rock types, alteration, and mineralisation.
- **Exploration potential** – Improved geological interpretation supports identifying and assessing areas favourable to mineralisation.
- **Leveraging AI** – Trained AI models can identify complex patterns in enormous datasets that may be difficult to recognise through conventional interpretation.

UNDERCOVER INNOVATION

UNDERCOVER is investigating how joint inversion and artificial intelligence can support interpreting complex exploration data. The research combines geological knowledge with information from different exploration methods to build integrated representations of the subsurface. By analysing relationships across multiple datasets, including geological, geophysical and geochemical information, UNDERCOVER aims to improve mineral prospectivity modelling and identify geological settings that may host deeply buried critical raw materials. Rather than replacing expert interpretation, the project explores how AI-assisted approaches can work alongside geological expertise to transform large volumes of data into meaningful knowledge for future exploration.

OUR PARTNERS

GTK · LGI sustainable innovation · brgm · LNEG · Institute of Geophysics · Leibniz IPHT · INRS Institut national de la recherche scientifique · Universität Münster · Technische Universität Berlin · Universidade de Évora · Ongwe · Latitude66 · REDCORP · Cluster Portugal Mineral Resources · supracon · Smart Seismic Solutions

How does it work?

UNDERCOVER brings together different types of exploration information to improve understanding of subsurface geological systems. Joint inversion combines geophysical datasets to constrain subsurface physical properties. Petrophysical modelling links these properties to rock types, alteration, and mineralization. AI-assisted modelling uses trained neural networks to identify patterns, support geological interpretation, and improve analysis of complex datasets. By integrating all observations collected through different methods, the project develops mineral prospectivity models that highlight areas where geological conditions may be favourable for critical raw material deposits, providing a stronger basis for assessing exploration potential and associated uncertainties.

Key technologies

- Geological, geophysical and geochemical data integration
- Multi-physics joint inversion
- Petrophysical modelling
- Artificial intelligence
- 3D geological models
- Mineral prospectivity modelling

BENEFITS

For exploration

- Better interpretation of complex exploration datasets
- Stronger links between physical rock properties and geological features
- Informed identification of potential exploration areas
- Reduced uncertainty in exploration decisions

For society

- Advancing the use of data and AI in geological research
- Improving knowledge from complex exploration datasets
- Supporting new data-driven approaches to mineral exploration

Funded by the European Union

www.undercover-project.eu · contact@undercover-project.eu · @UNDERCOVER project