



Conference on
Exploration and Exploitation
of Critical Raw Materials

MINEYE – Earth Observation Techniques for Mine Life Cycle Monitoring using ML Data Fusion Approach

Presented by Dr. Saman Tavakoli on behalf of the MINEYE project

 Tallinn, Estonia on 8th October 2024



EGT-TWINN
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MINEYE: Earth Observation techniques for MINE life cycle monitoring using ML data fusion approach

HORIZON Innovation Actions (IA)

Total cost EUR 5.77 M

13 partners, 9 countries

4-year project (start 01.2024)

TRL6 – TRL7



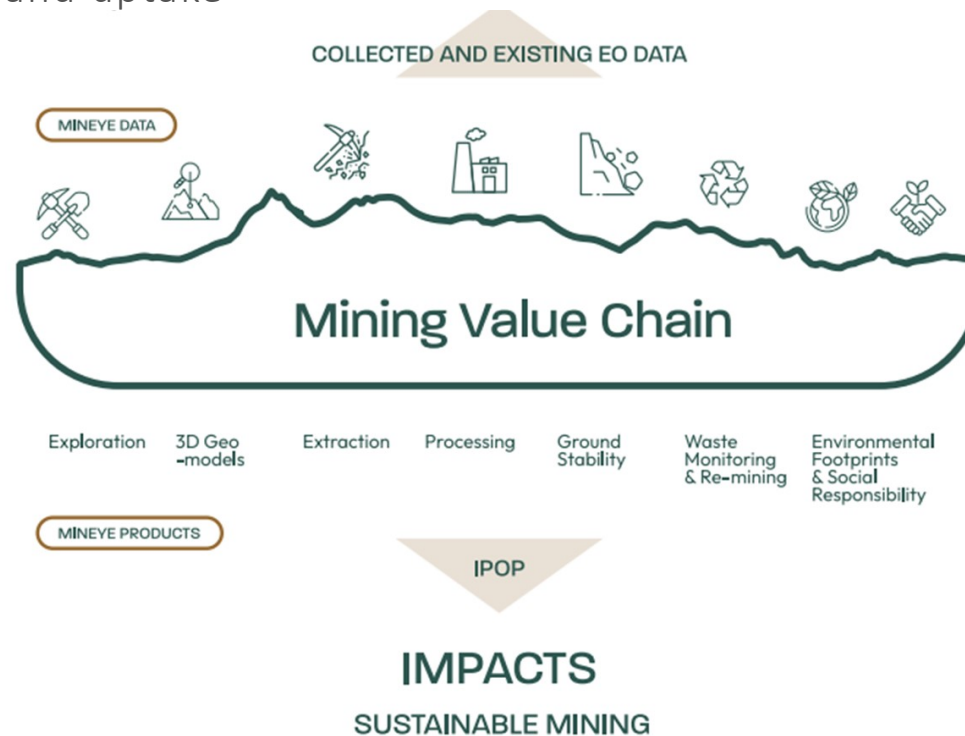
Expected overall outcome is to **increase access to primary and secondary raw materials**, in particular critical raw materials for EU industrial value chains and strategic sectors.

- MINEYE addresses the entire mine life cycle
- Demonstration at MINEYE pilot sites
- Project will develop commercial services and products for mine industry stakeholders



MINEYE's main objectives

- O1. Develop a web-based Interfacing, Programming and Optimization Platform (IPOP) and associated modules
- O2. Increase efficiency of mineral explorations by generating MPM
- O3. Mine waste valorisation and mine safety during mineral extraction
- O4. Technology demonstration at pilot (case study) sites with varying mining contexts
- O5. Knowledge sharing and uptake



The MINEYE Consortium



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Norwegian Geotechnical Institute

📍 Norway 🌐 WebSite

Role in Project	+
More Info	+

Luleå University of Technology

📍 Sweden 🌐 WebSite

Role in Project	+
More Info	+

University of Bologna

📍 Italy 🌐 WebSite

Role in Project	+
More Info	+

Terranigma

📍 Germany 🌐 WebSite

Role in Project	+
More Info	+



ETAM SA – Consulting Services

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Role in Project	+
More Info	+

Czech Geological Survey

📍 Czech Republic 🌐 WebSite

Role in Project	+
More Info	+

INNSIGHT

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Role in Project	+
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SPACEBEL

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Role in Project	+
More Info	+

SO.RI.CO.M.

📍 Italy 🌐 WebSite

Role in Project	+
More Info	+

Tharsis Mining

📍 Spain 🌐 WebSite

Role in Project	+
More Info	+

Tre Altamira

📍 Italy 🌐 WebSite

Role in Project	+
More Info	+

Planet Labs Germany GmbH

📍 Germany 🌐 WebSite

Role in Project	+
More Info	+

Spectral Industries

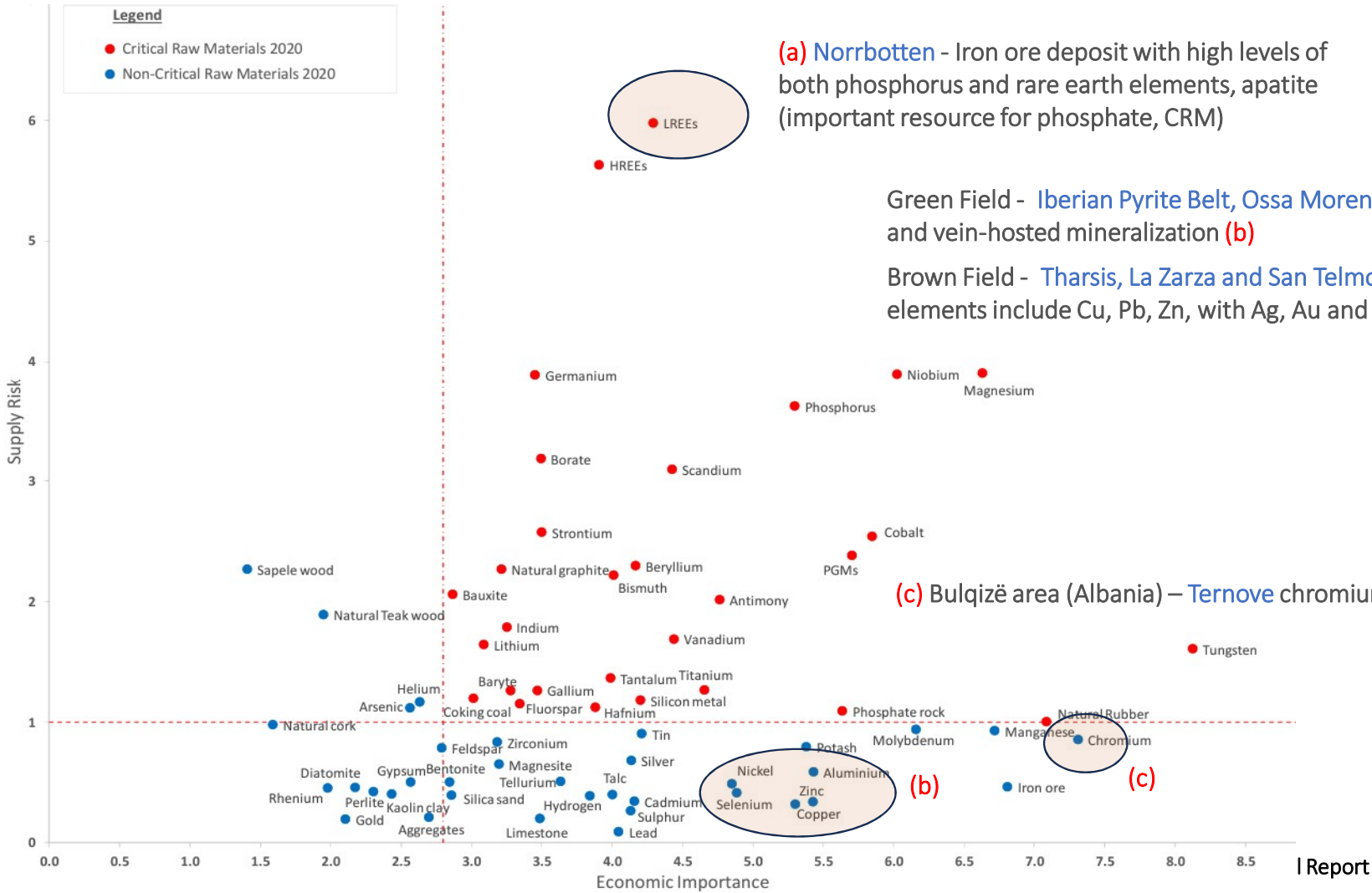
📍 The Netherlands 🌐 WebSite

Role in Project	+
More Info	+

- Partners and Pilot sites
- Partners



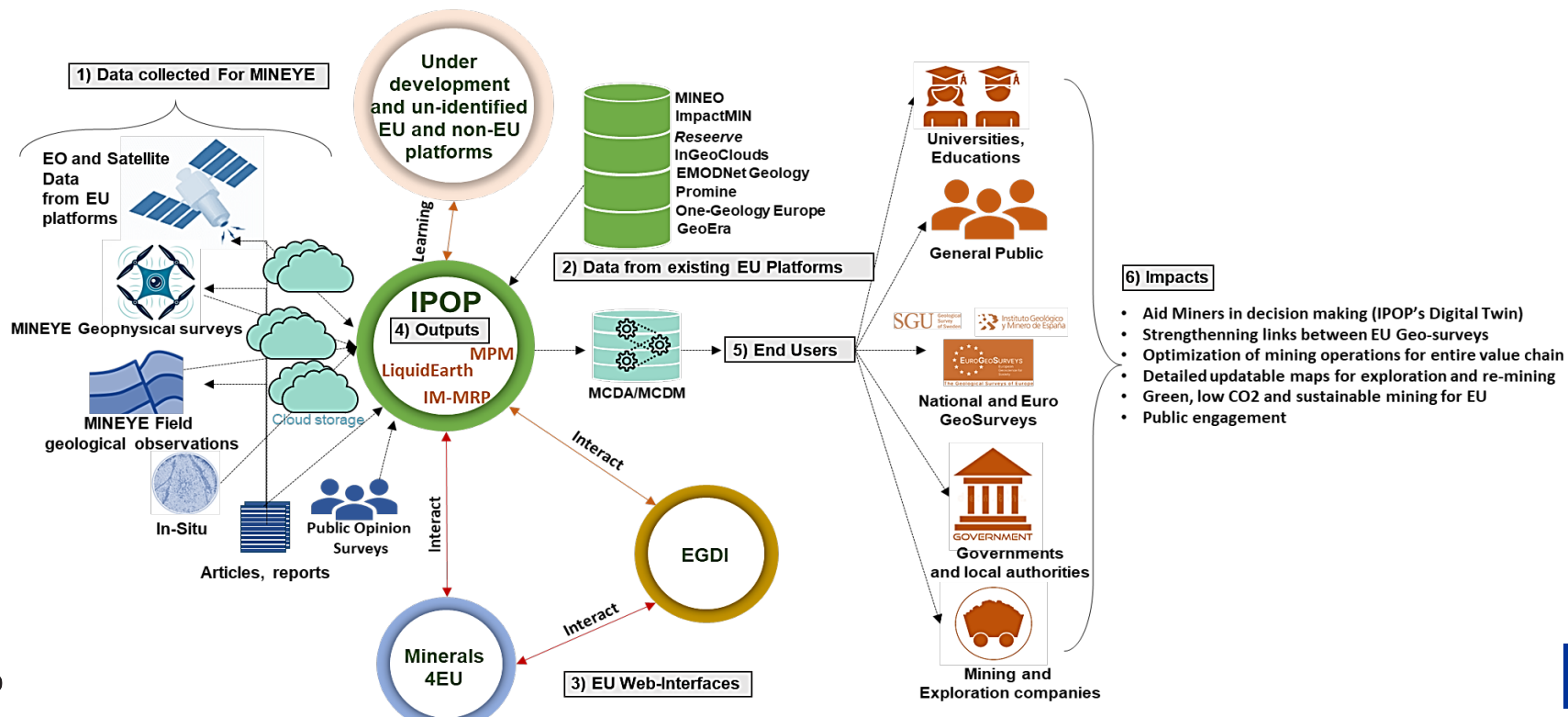
Demonstration at MINEYE pilot sites



The IPOP platform and modules

Interfacing, Programming and Optimization Platform (IPOP)

- Mineral Prospectivity Maps
- Direct targeting
- Liquid Earth EO Plugin (3D modelling)
- Inventory Map and Mining Residues Package for environmental analyses
- Global stability assessment



Main activities so far...



02.2024 - Visit to La Zarza and Tharsis mines and drill-core archive (Spain)



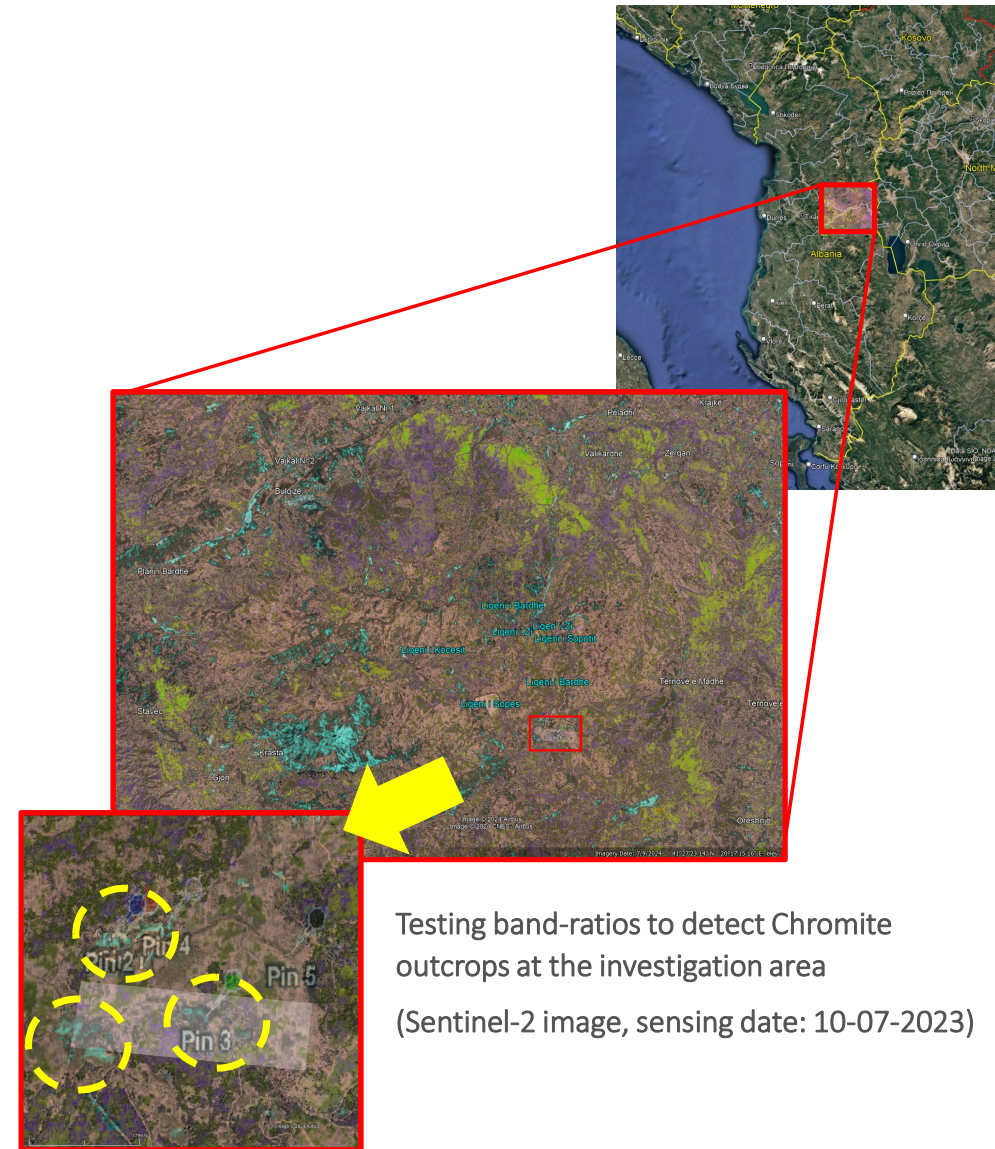
08.2024 - Visit to Ternove mine (Albania) to plan for exploration campaigns



08.2024 – Meeting with Albanian Geological survey to discuss access to data and knowledge sharing

Main activities so far....

- Visit to brown site mining areas (Spain) and drill-core archive of Tharsis Mining group
- Meeting with Albanian Geological survey to discuss data and knowledge sharing
- Visit to Ternove mine to plan for exploration campaigns
- Preparation of first version of the project's EO database
- Satellite images collections for the case study area (Sentinel-2, Prisma, EnMap, EMIT, SkySat, PlanetScope)
- Data feature identification and extraction for mineral prospectivity mapping



Data Compilation



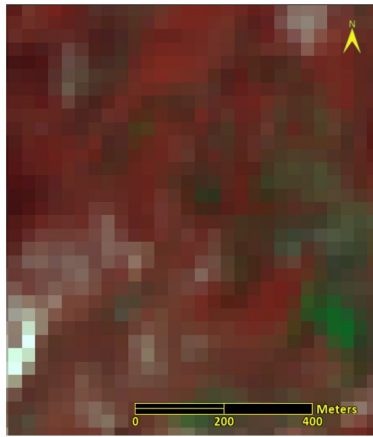
(a) SkySat 09/07/2023 (0.5m, RGB)



(b) PlanetScope 17/07/2023 (3m, RGB)



(c) Sentinel-2 10/07/2023 (10m)



(d) PRISMA VNIR 03/05/2020 (30m, NIRGB)

Visual examples of four different EO products for a subset of the area surrounding the Albanian pilot site.

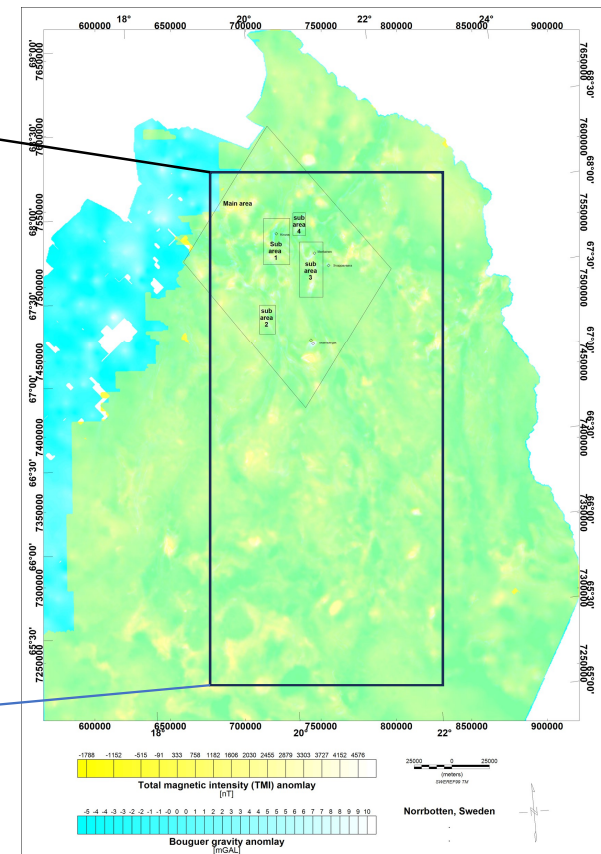
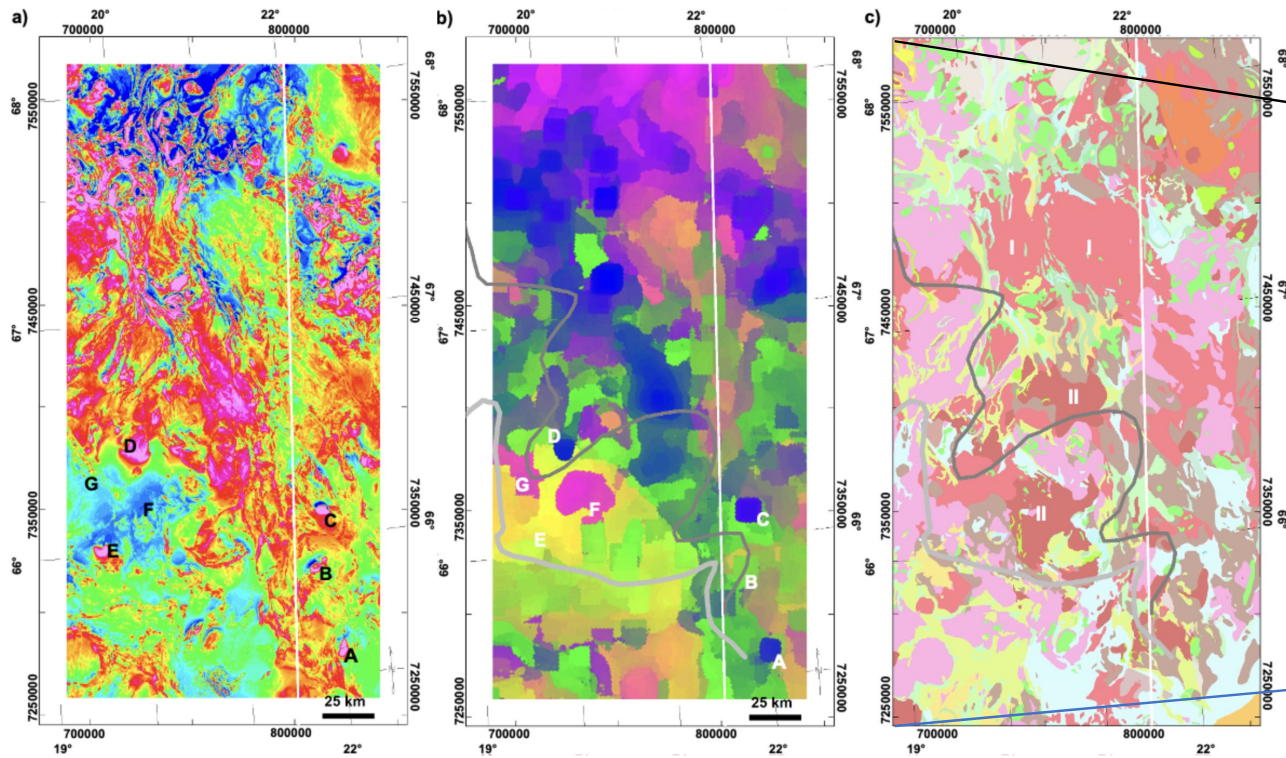
Decreasing spatial and increasing spectral resolution from (a) to (d).

PRISMA shown as false colour image picturing a near-infrared band (806 nm) instead of a red band.

Main characteristics of EO Products collected at the case study areas

EO Product	Spatial Resolution (m)	Spectral Range (nm)	Number of Bands
EnMap	30	420-2450 (VNIR, SWIR)	228
EMIT	60	381-2493 (VNIR, SWIR)	285
Planet Scope	3	465-885 (VNIR)	4
PRISMA	VNIR+SWIR 30, Pan 5	400-2505 (VNIR, SWIR, Pan)	240
Sentinel-2	Depending on band 10, 20 or 60	443-2190 (VNIR + SWIR)	13
SkySat	0.5	450-900 (VNIR + Pan)	4

Data feature definition, extraction and analyses



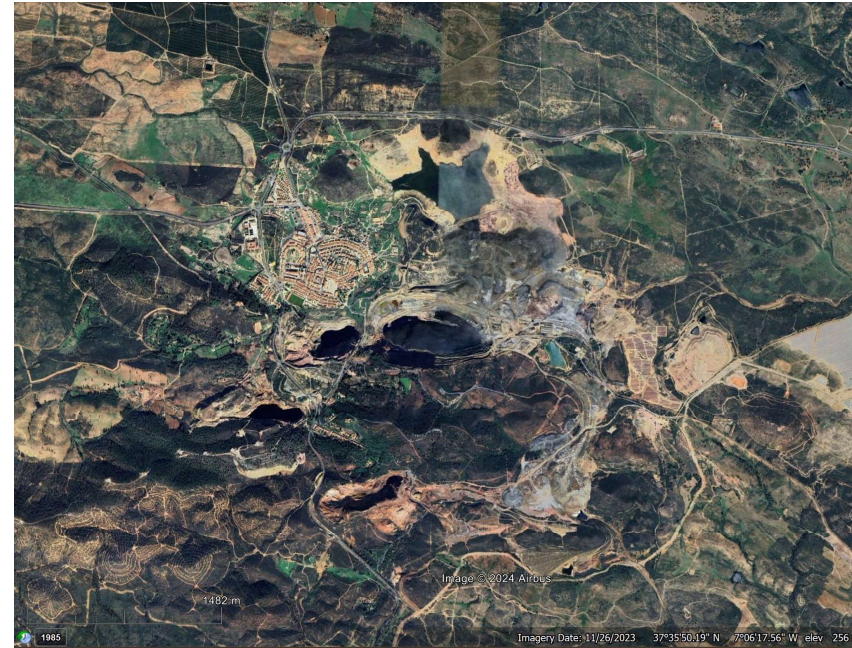
mineyo

Self-organising map clustering of Norrbotten ore province (subset) – features extracted from magnetic and gravity data provided by Swedish Geological Survey (from Vadoodi & Rasmussen, manuscript in preparation)



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Upcoming activities



Combined geophysical measurements at pilot sites and petrophysical measurements on core samples

- Continuous and periodical environmental monitoring and grade-tonnage modelling of the potential secondary raw materials within mining residues
- Ground stability monitoring to identify the size and growth of the area influenced by mining

Don't miss MINEYE updates on social media!



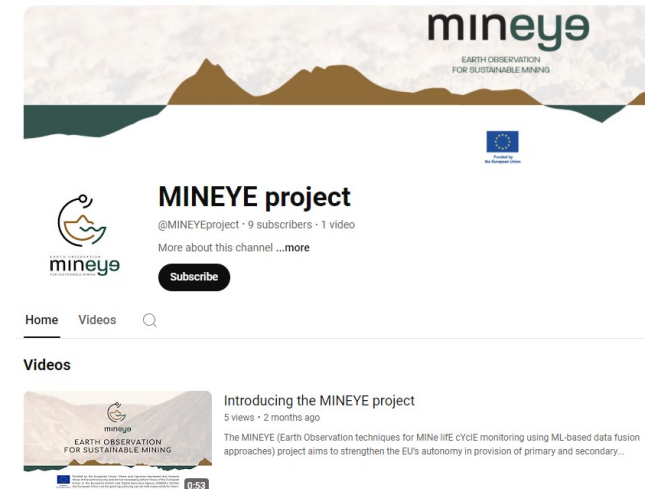
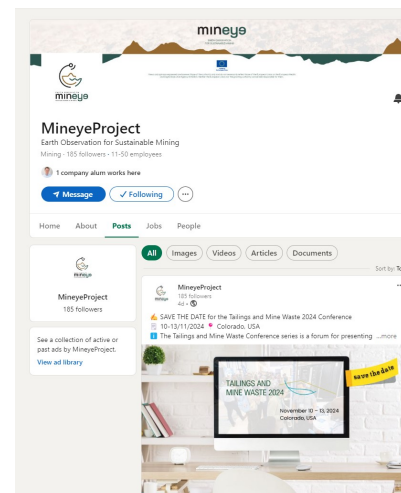
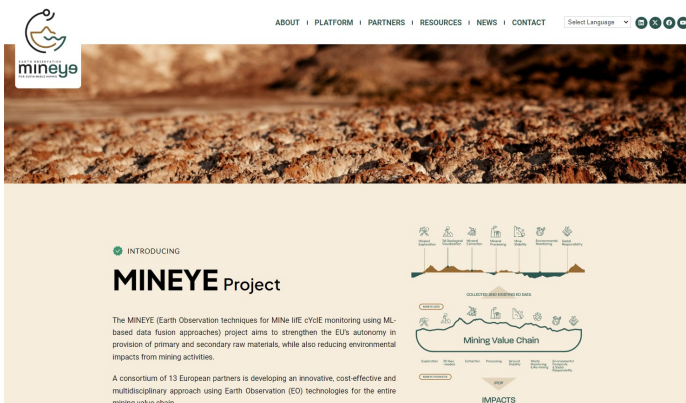
mineye-project.eu



[MineyeProject](https://www.linkedin.com/company/mineye-project)



[@MINEYEproject](https://www.youtube.com/channel/UCMINEYEproject)



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Thank you for your attention!



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