Exploring Earth. Empowering Europe.

S3 4!

UNDERCOVER

FINAL CONFERENCE

EU Projects session

Project: UNDERCOVER

Entity: CLUSTER PORTUGAL MINERAL RESOURCES

Speaker: LUÍS MARTINS

Title: REDIFINING DEEP MINERAL EXPLORATION

Funded by
the European Union

#FromSkyToSoil

JUNE 2025, VIGO SPAIN

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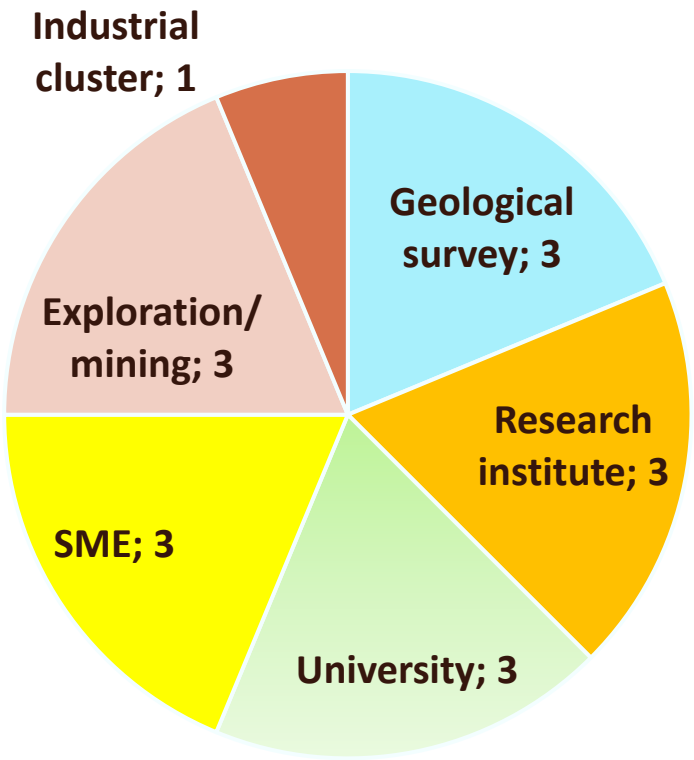
Redefining deep-earth exploration

UNDERCOVER – basics

- **Funding programme:** Horizon Europe
- **Call & topic:** HORIZON-CL4-2024-RESILIENCE-01: Resilient Value Chains 2024; HORIZON-CL4-2024-RESILIENCE-01-01: **Exploration of critical raw materials in deep land deposits**
- **Type of action:** HORIZON-RIA, Research & Innovation Action
- **Duration:** 1.1.2025 - 31.12.2027
- **Total budget:** 4 999 987.50 €
- **Total person-months:** 452
- **Consortium:** Sixteen partners from 7 countries
- **Project Manager:** Juha Kaija, GTK
- **Scientific Coordinators:** Jochen Kamm & Tero Niiranen, GTK



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UNDERCOVER – Consortium

INDUSTRY & SME´s (7 partners, 26% of the budget)

- ASSOCIACAO CLUSTER PORTUGAL MINERAL RESOURCES (ACPMR), PT
- SUPRACON AG (SUPRA), DE
- LGI SUSTAINABLE INNOVATION (LGI), FR
- ONGWE MINERALS (PTY) LTD (ONGWE), NA
- LATITUDE 66 COBALT OY (LAT66), FI
- SMART SEISMIC SOLUTIONS (S3), FR
- REDCORP, LDA (REDCORP), PT

RESEARCH (6 partners, 58%)

- GEOLOGIAN TUTKIMUSKESKUS (GTK), FI
- BUREAU DE RECHERCHES GEOLOGIQUES ET MINIERES (BRGM), FR
- GEOFYZIKALNI USTAV AV CR, V.V.I. (IG CAS), CZ
- LEIBNIZ-INSTITUT FUER PHOTONISCHE TECHNOLOGIEN E.V. (IPHT), DE
- LABORATORIO NACIONAL DE ENERGIA E GEOLOGIA I.P., (LNEG), PT
- INSTITUT NATIONAL DE LA RECHERCHE SCIENTIFIQUE (INRS), CA

UNIVERSITIES (3 partners, 16%)

- UNIVERSITAT MUNSTER (UM), DE
- UNIVERSIDADE DE EVORA (UDE) (Affiliated Entity), PT
- TECHNISCHE UNIVERSITAT BERLIN (TUB), DE

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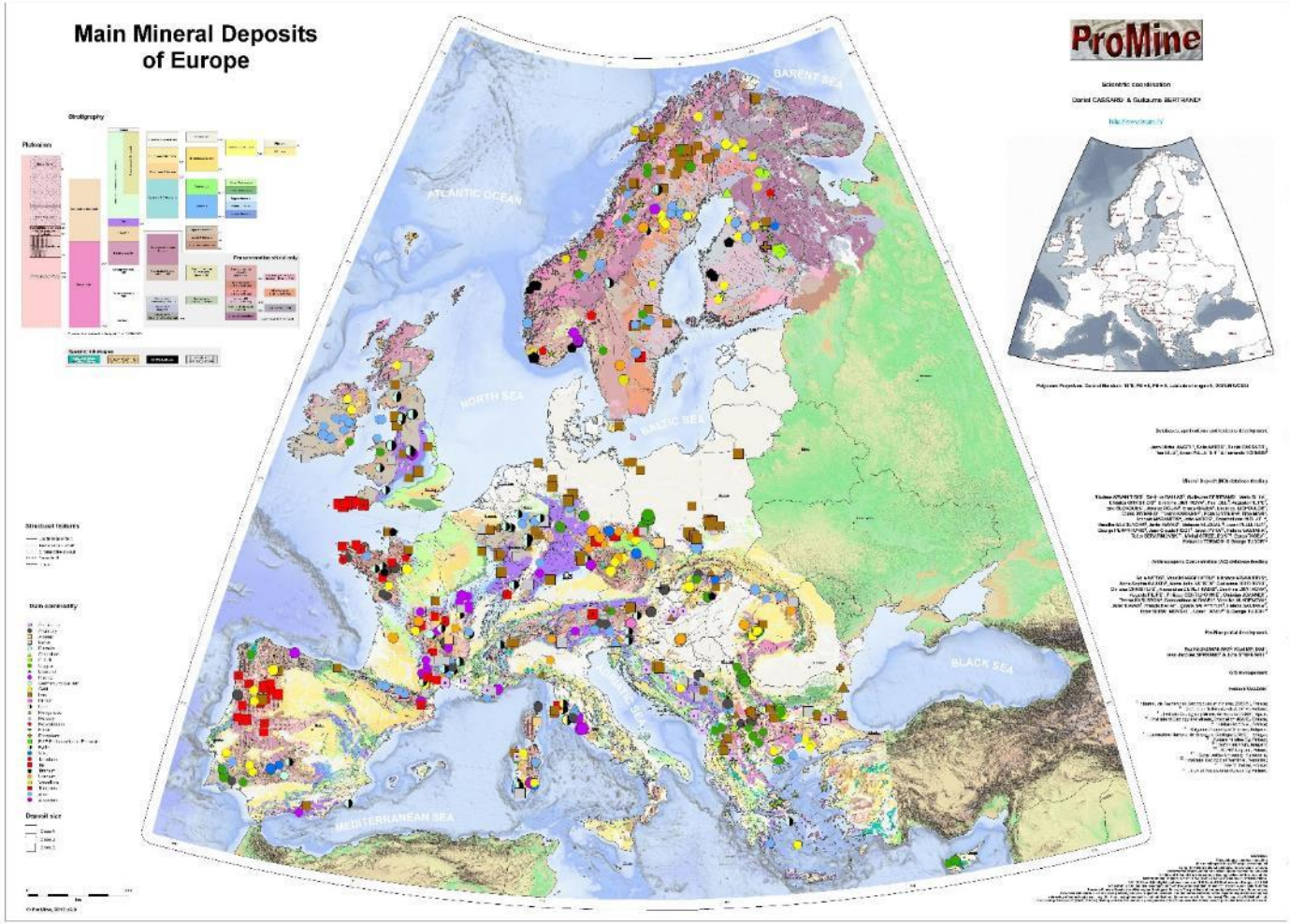
Motivation behind UNDERCOVER

- Europe has significant mineral potential remaining
- Only the top 0 – 100 m are systematically explored (if even)
- New large deposits are likely deep under cover
- There is little to no organised base data collection ongoing in Europe
- Europe is leading in many exploration-relevant technologies



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Main objectives

- Transform deep CRM exploration, introducing a paradigm shift by **extending the mineral systems concept**, currently underutilized in quantitative exploration, to deep exploration relevant spatial scales
- **Integrate** novel, cost-effective, and low-impact technologies and **methods for data collection and integration, including AI-based geological mapping and geophysical joint inversion.**
- Address and mitigate **environmental, social, and governance (ESG) aspects of mineral exploration at all stages**.
- **Map primary raw materials potential** in EU and non-EU countries across three major mineral belts
- Promote **the use of UNFC** for innovative and effective exploration strategies.
- **Advance deep mineral exploration technologies**, stimulate R&D, and ensure exploitation by EU stakeholders, inspiring confidence among policy makers and stakeholders.

The development of a comprehensive CRM exploration workflow suitable for exploration in both developed and remote areas.

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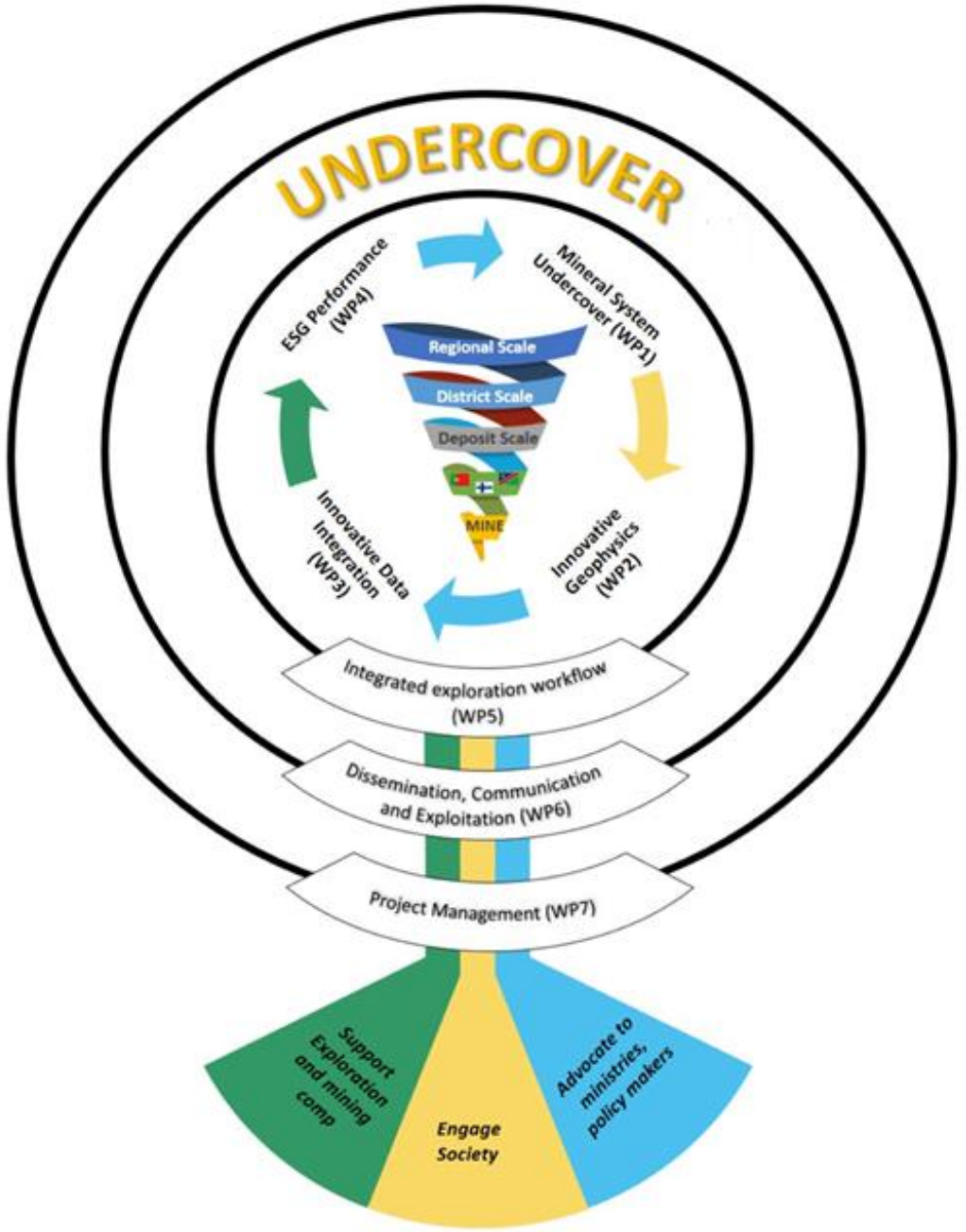
Work packages

- WP1. Mineral Systems under Cover: Kathryn Cutts, GTK
- WP2. Innovative Geophysics: Graham Hill, IG CAS
- WP3. Innovative Data Integration: Mathieu Darnet, BRGM
- WP4. Environmental, Social and Governance: Sam Whittlesey, LGI
- WP5. Integrated Exploration Strategy: Michael Becken, UM
- WP6. Communication, Dissemination & Exploitation: Capucine Pineau, LGI
- WP7. Project Management: Juha Kaija, GTK



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Case study areas

- **Kuusamo Schist Belt (Finland)** – Co, Au, REE and Cu
- **Iberian Pyrite Belt (Portugal**) – Cu, Pb, Zn, Sn, Ag, Au, In, Ga, Ge, V and Se
- **Kalahari Copper Belt (Namibia)** – Cu

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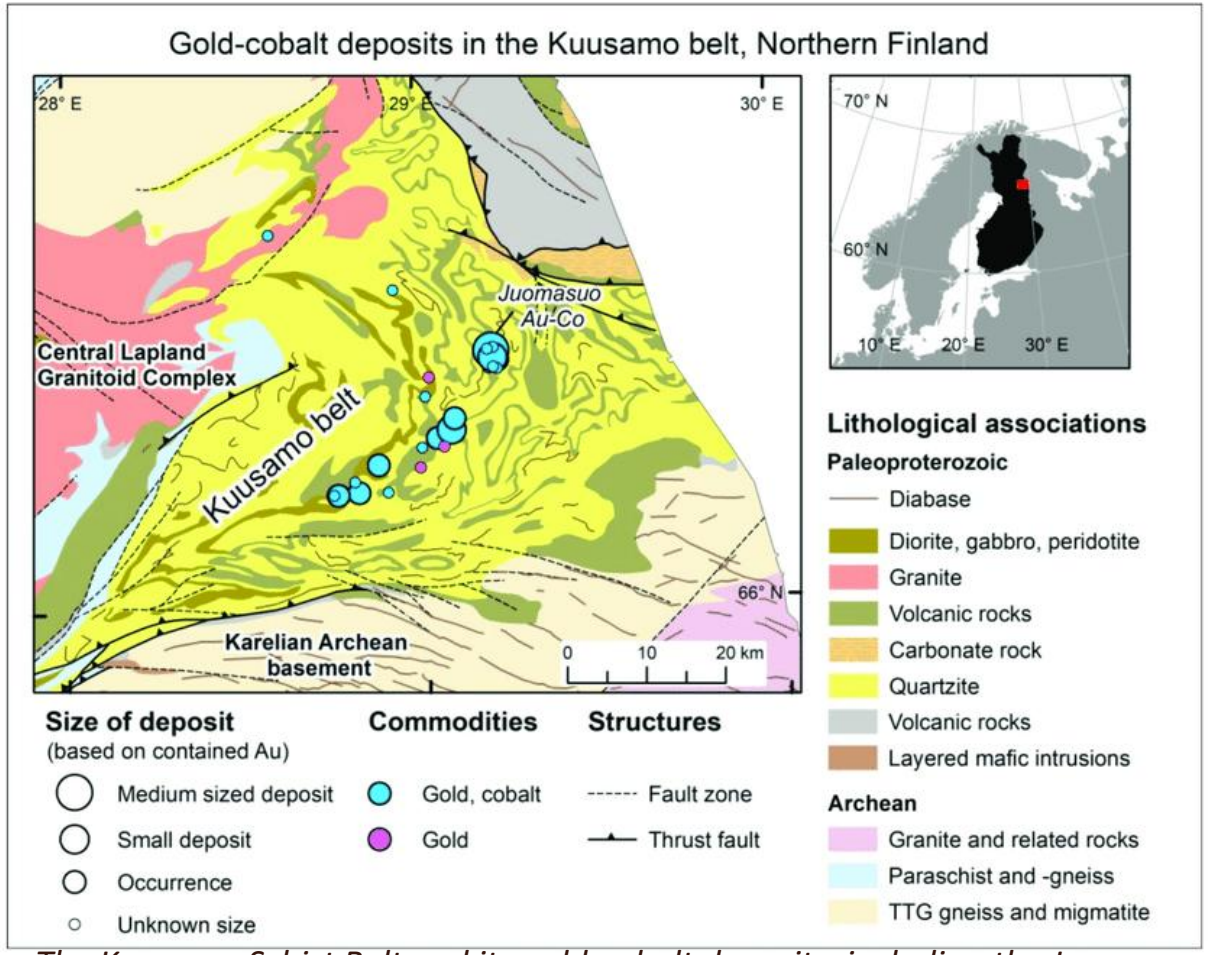
UNDERCOVER in Kuusamo Schist Belt

Brief outline of the tasks to be done

- **Geophysical measurements**
  - Belt-scale **MT**
  - **EM** in central part of the KB
  - **Passive seismic** in core area
- ESG-SLO work
- Compilation of relevant existing data sets
- Generation of initial & subsequently refined mineral system model (based on the results)
- Development of geochemical exploration methodology (MinExTarget BoT)
- Geochronology (Lu-Hf + conventional U-Pb)
- Data integration
- **3D modeling (Geophysics-Geology)**
- **GIS based prospectivity modeling** – application of AI based prediction algorithms in data preprocessing



The Kuusamo Schist Belt and its gold-cobalt deposits, including the Juomasuo deposit. Guzik et al. 2021 modified after © Geological Survey of Finland 2020.

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UNDERCOVER in Iberian Pyrite Belt

- Volcanogenic massive sulphide (VMS) deposit - an early-stage, potentially high-grade, polymetallic zinc-lead-copper exploration
- The exploration permit covering an area of approximately 10,700 hectares
- Zinc, Lead, Silver, Copper, Gold, Tin

UNDERCOVER:

- Multicopter semi-airborne **EM**
- **Passive-source seismics**
- **Active-source seismics**
- Geochronology
- Deposit and regional scale **3D modelling** integrating lithology and alteration models, structural data, structural interpretation of 3D seismic and airborne EM data. - A refined mineral system model
- Aquifer studies close to Lagoa Salgada
- ESG studies

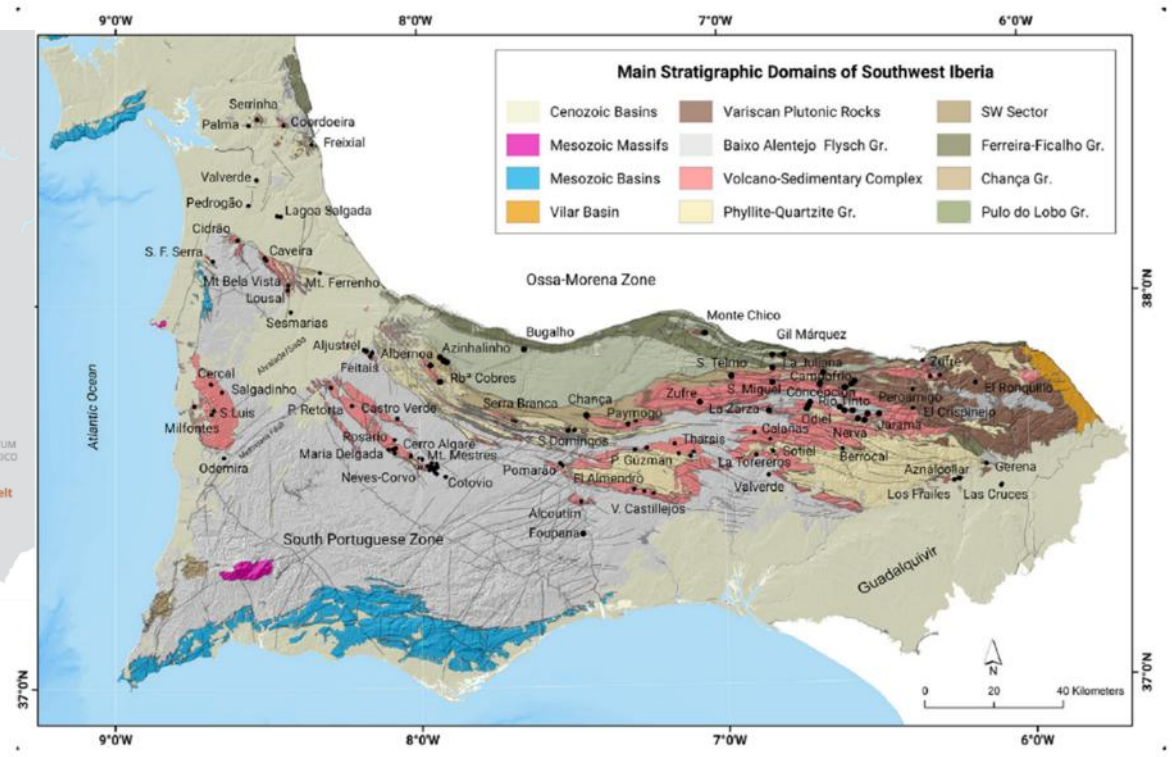

Fig. 1. Geological Map of South Portuguese Zone with emphasis on the Iberian Pyrite Belt (b). adapted from Díez-Montes et al., 2020a, 2020b

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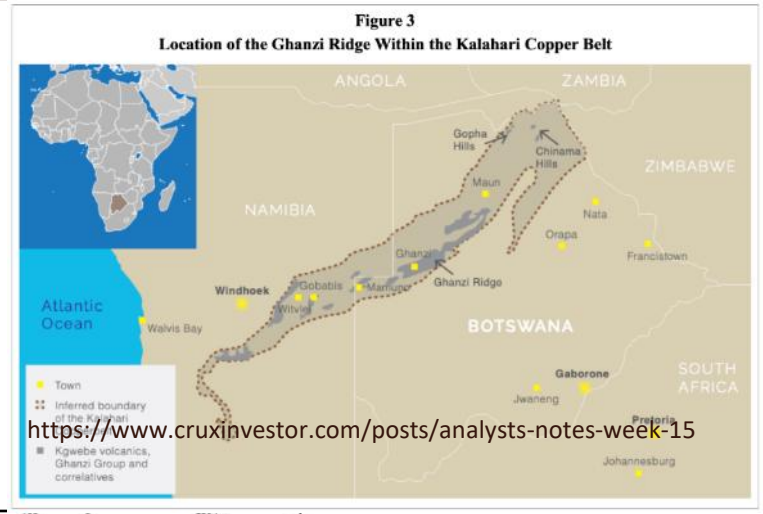
UNDERCOVER in Kalahari Copper Belt

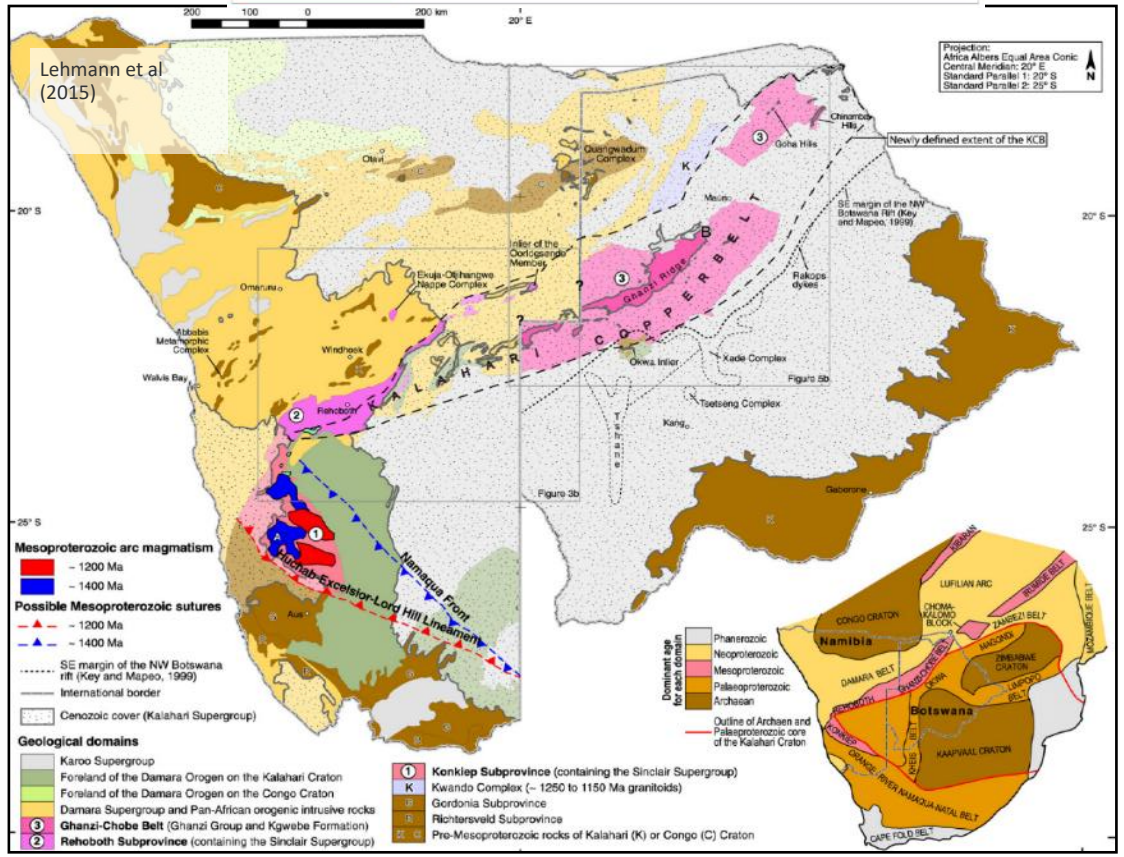
- Ongwe Minerals, holds ~963 000 ha of exploration licenses on the Kalahari Copper Belt
- Limited historical exploration proved the fertility of the Copper Belt in Namibia
- Ongwe has identified multiple targets that require follow-up geophysics & drill testing

UNDERCOVER:

- Initial mineral system model
- Multicopter semi-airborne **EM**
- **3D inversion** of semi-airborne EM data
- ESG studies



https://www.cruxinvestor.com/posts/analysts-notes-week-15



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Thank you.

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