UNDERCOVER
Redefining deep-earth exploration

GTK

HE UNDERCOVER

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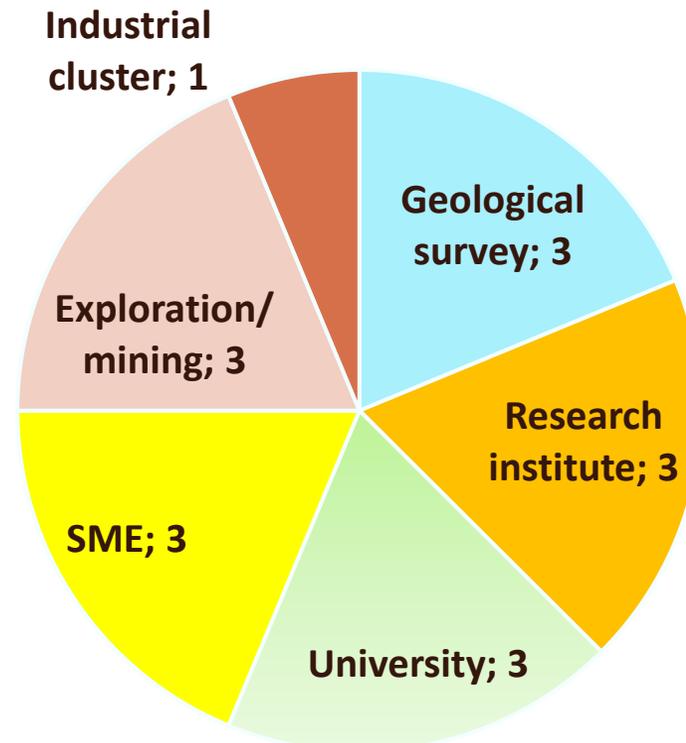4 LGI Sustainable Innovation, France
5 University of Münster, Germany

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

Pie chart: Industrial cluster; 1 — Geological survey; 3 — Research institute; 3 — University; 3 — SME; 3 — Exploration/mining; 3

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

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

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.

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
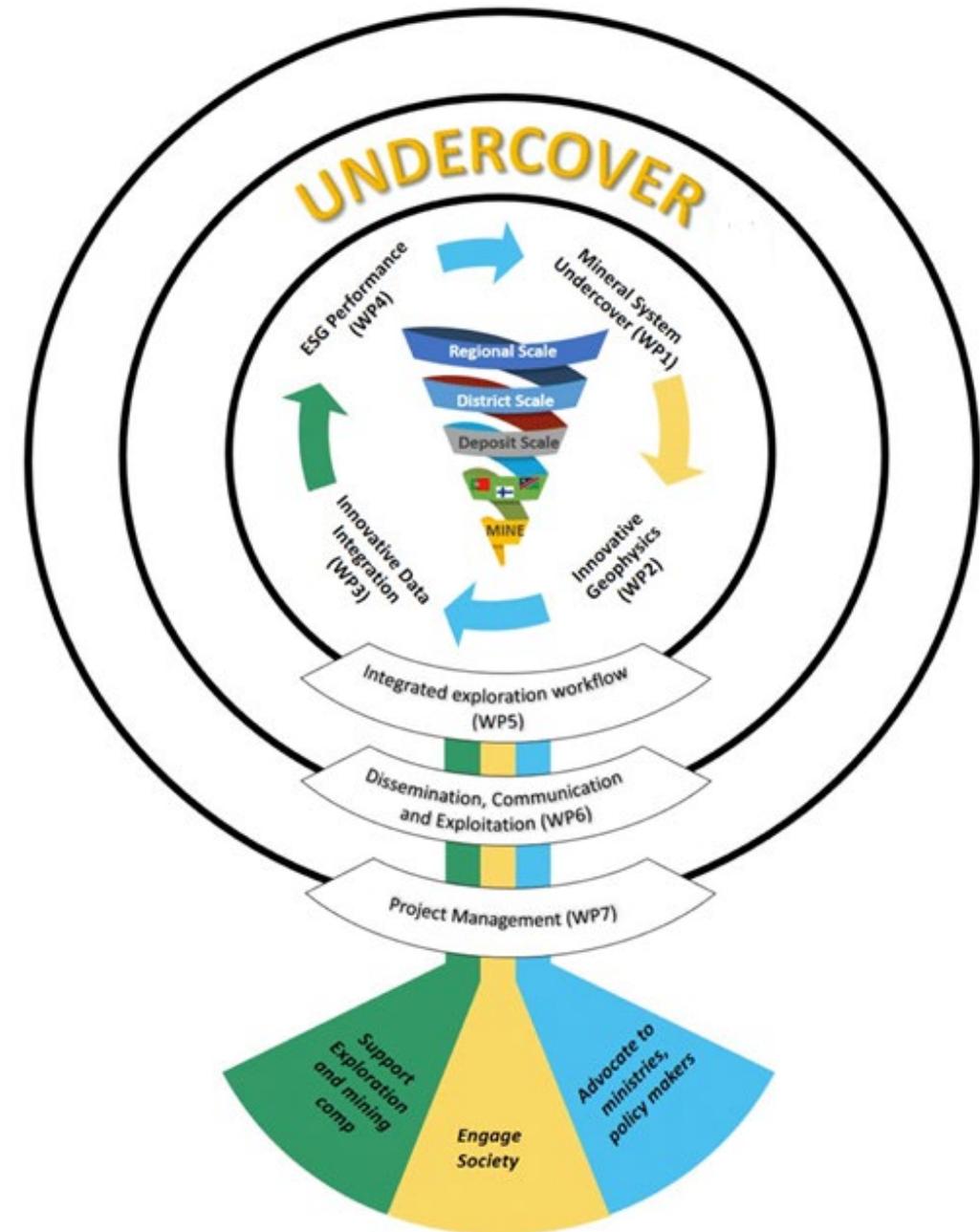
Case study areas

- **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

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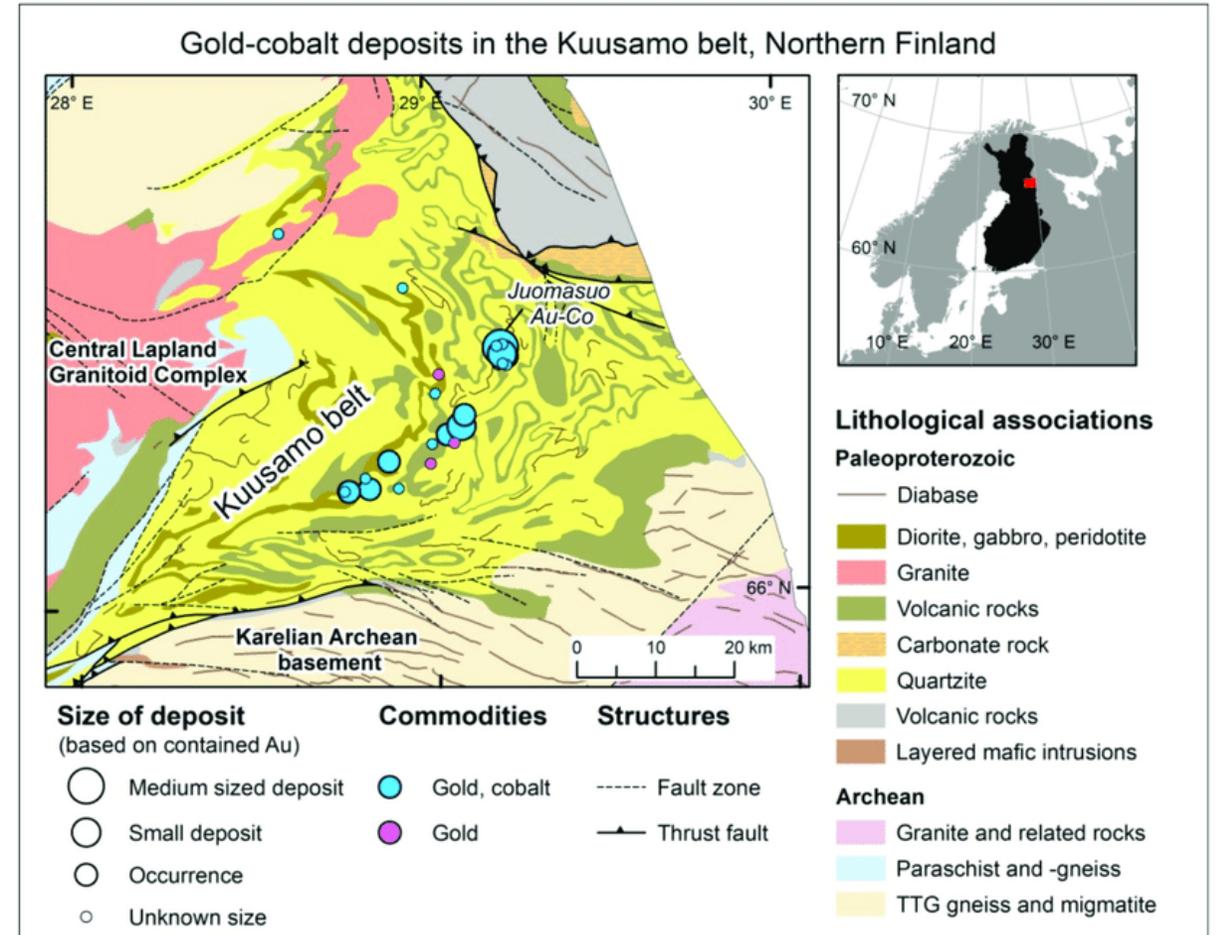
The Kuusamo Schist Belt and its gold-cobalt deposits, including the Juomasuo deposit. Guzik et al. 2021 modified after © Geological Survey of Finland 2020.

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

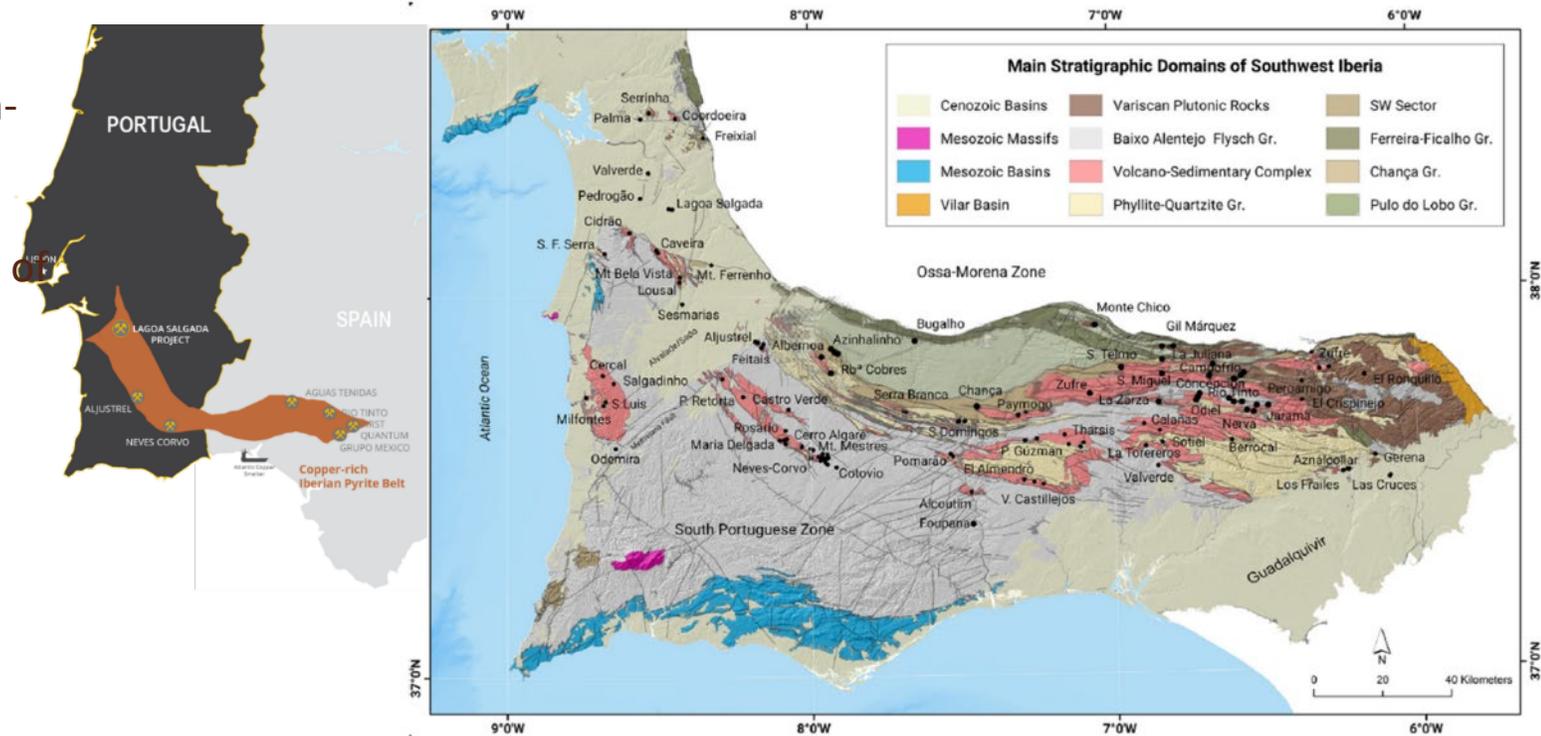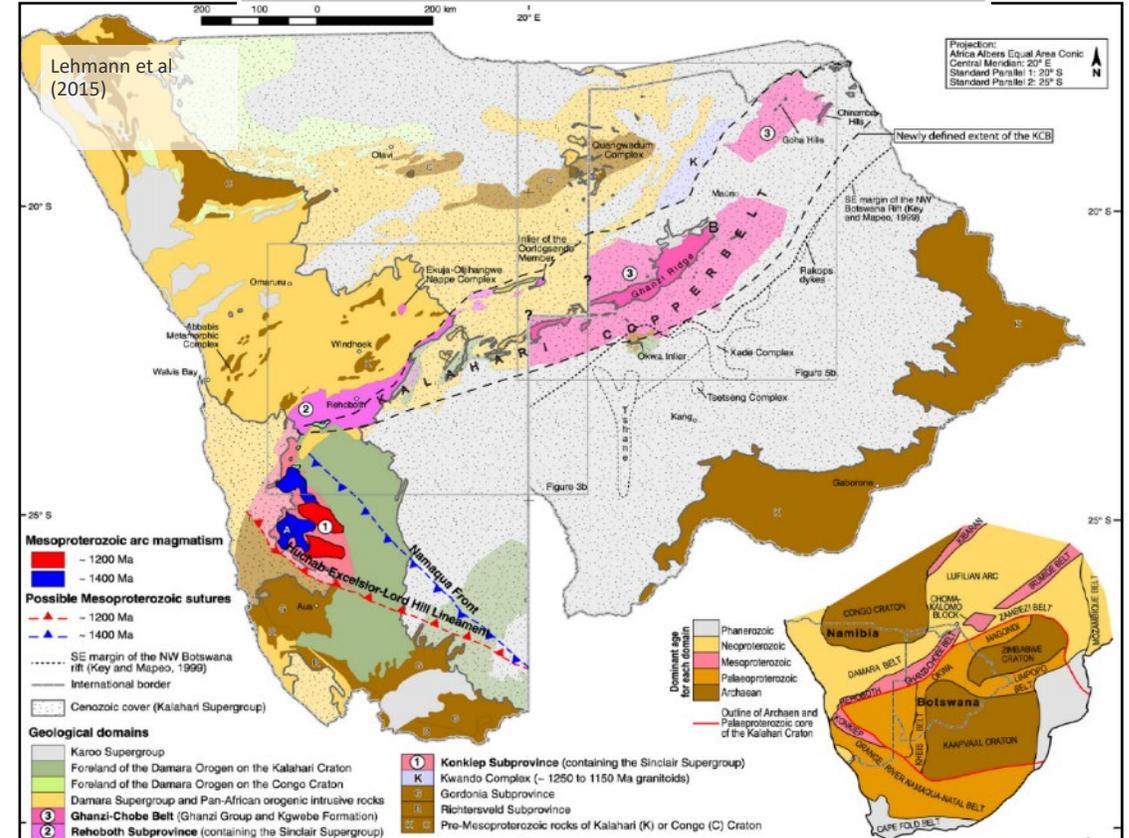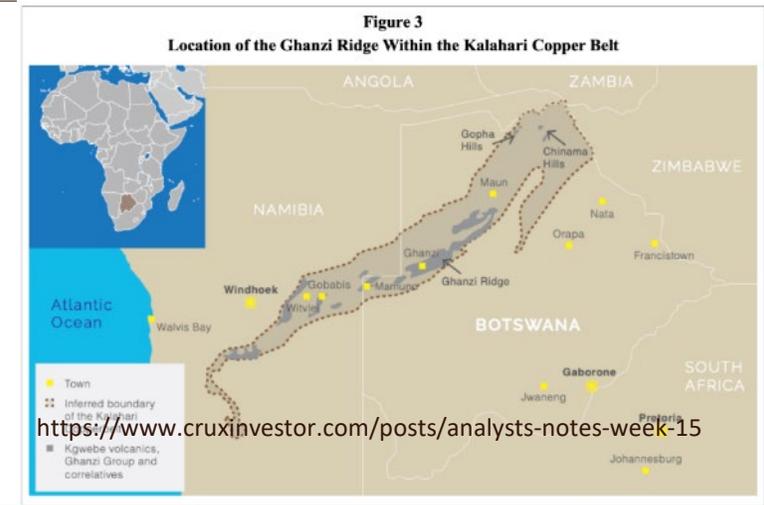L. Albardeiro, I. Morais, J. Pereira et al.

Gondwana Research 121 (2023)

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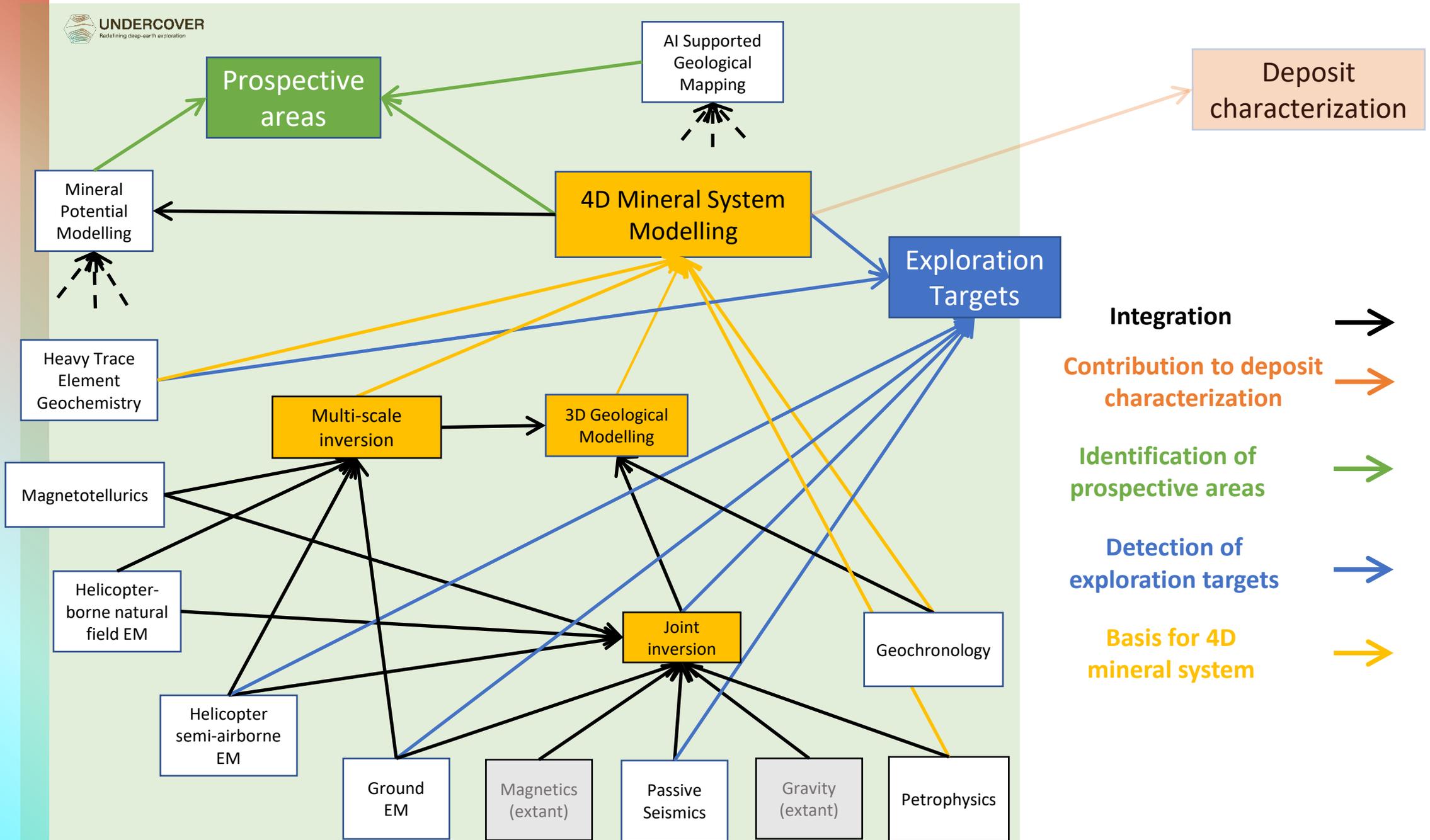
UNDERCOVER in Kalahari Copper Belt

- 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

Figure 3
Location of the Ghanzi Ridge Within the Kalahari Copper Belt

Lehmann et al (2015)

Thank you.

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