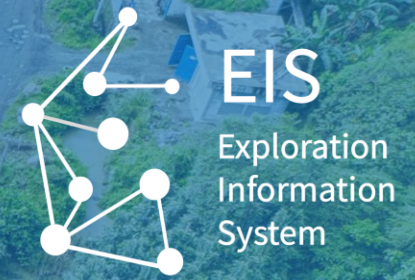


EIS Final Event:

Shaping the Future of Sustainable Mineral Exploration



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the European Union

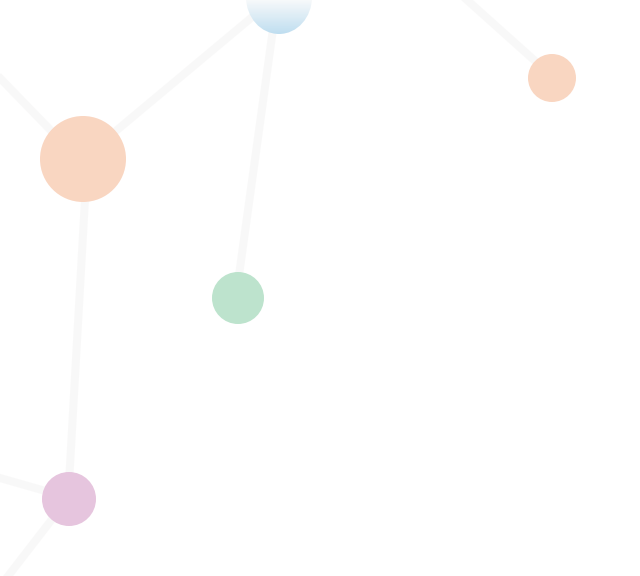


Vesa Nykänen (GTK)

EIS Overview

EIS Overview & Results

9:40 – 10:40



Exploration Information System – EIS Overview

Vesa Nykänen



October 7, 2025, EIS Final Event
Vesa Nykänen, GTK



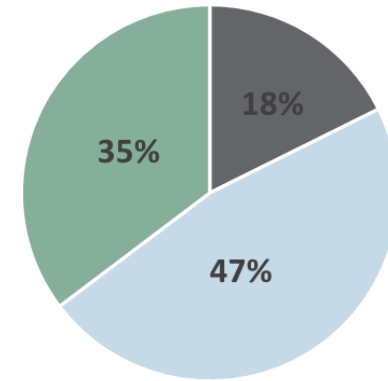
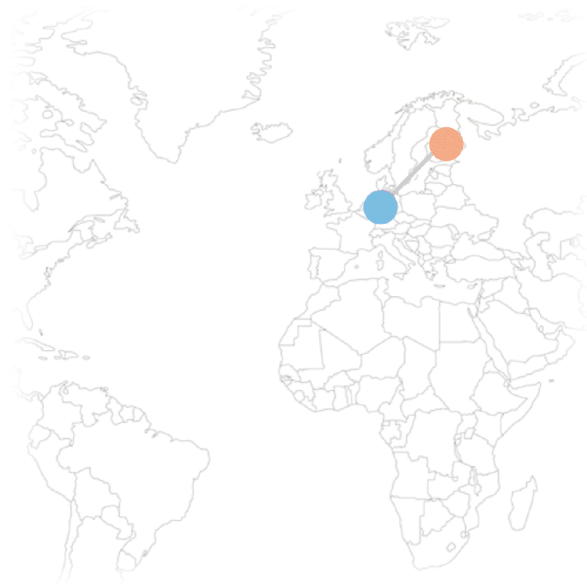
Funded by
the European Union

Exploration Information System (EIS)



Overview

- Exploration Information System (EIS) is a 36-month Horizon Europe project that will develop innovative exploration concepts and data analysis tools to enhance the probability of finding new sources of critical raw materials (CRM) for the EU's economy.



■ Research ■ Industry&SME ■ Academia



Funded by
the European Union

The EIS project in figures

42

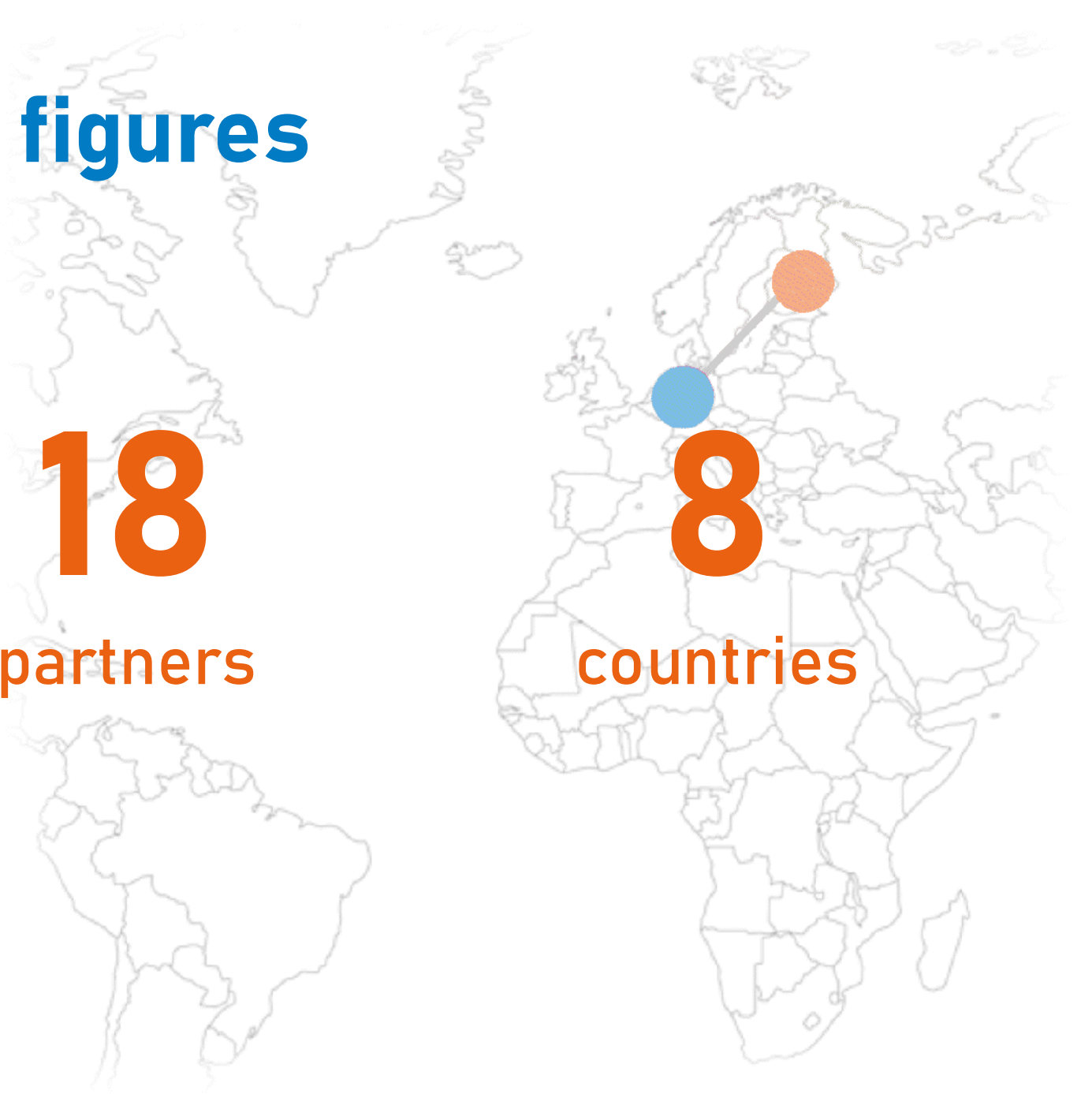
months

18

partners

8

countries



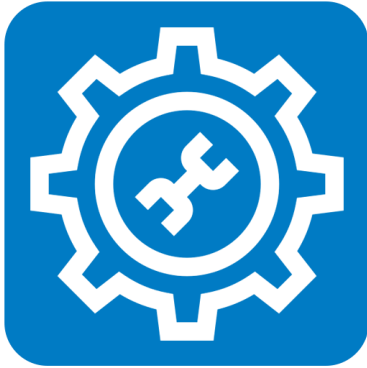
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EXPLORATION INFORMATION SYSTEM PARTNERS



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the European Union

Our objectives



**DEVELOP INNOVATIVE
EXPLORATION TOOLS**



**REDUCE EXPLORATION
AND MINING FOOTPRINTS**

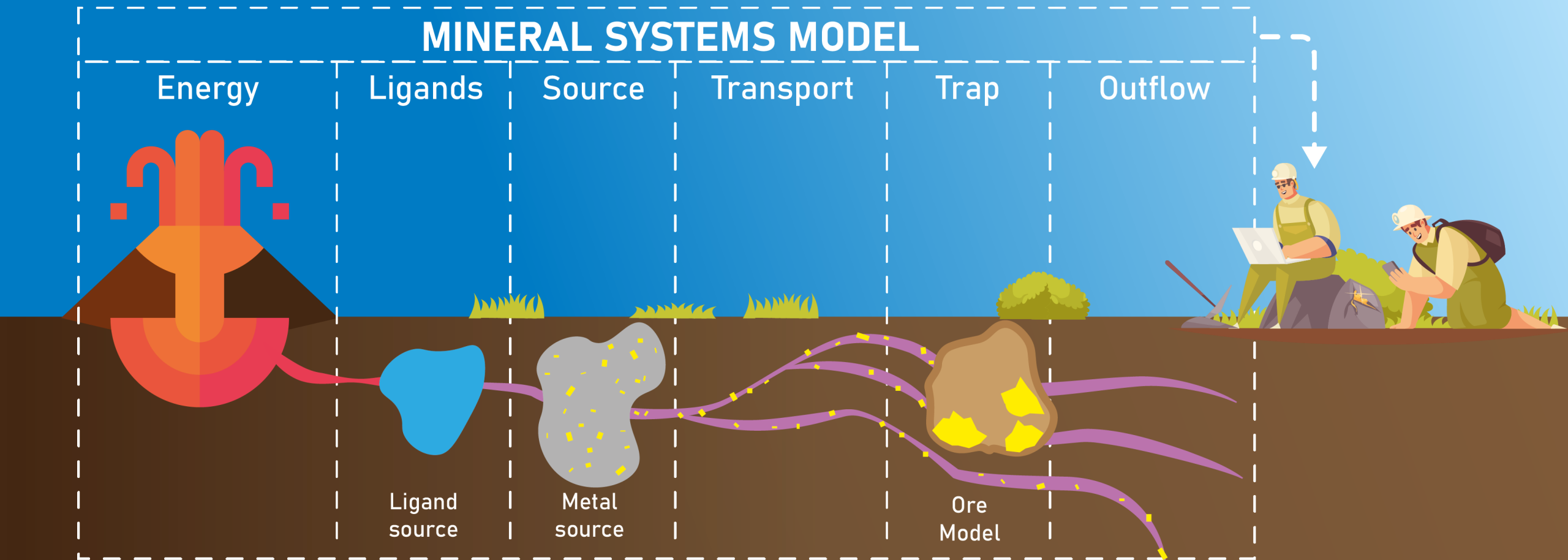


**RAISE AWARENESS
TO THE GENERAL PUBLIC**

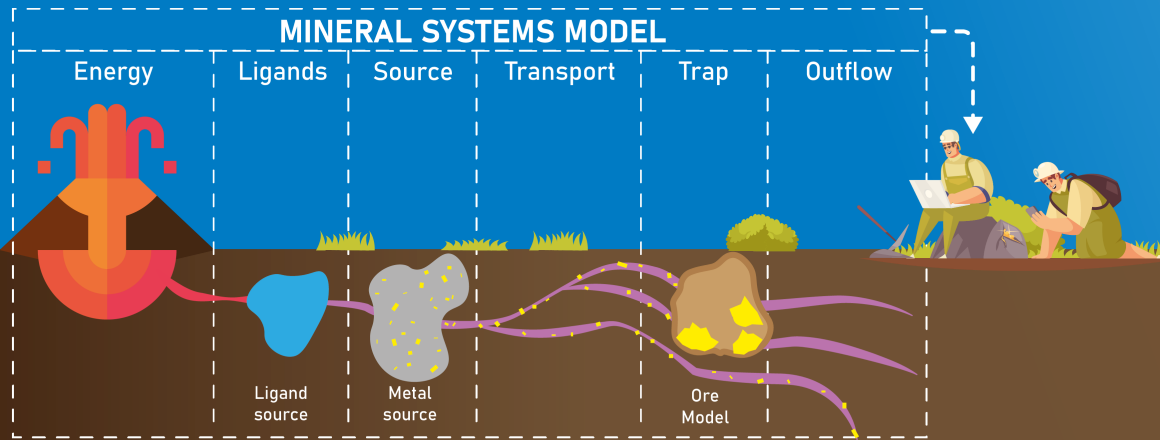


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the European Union

Our methodology



Our methodology

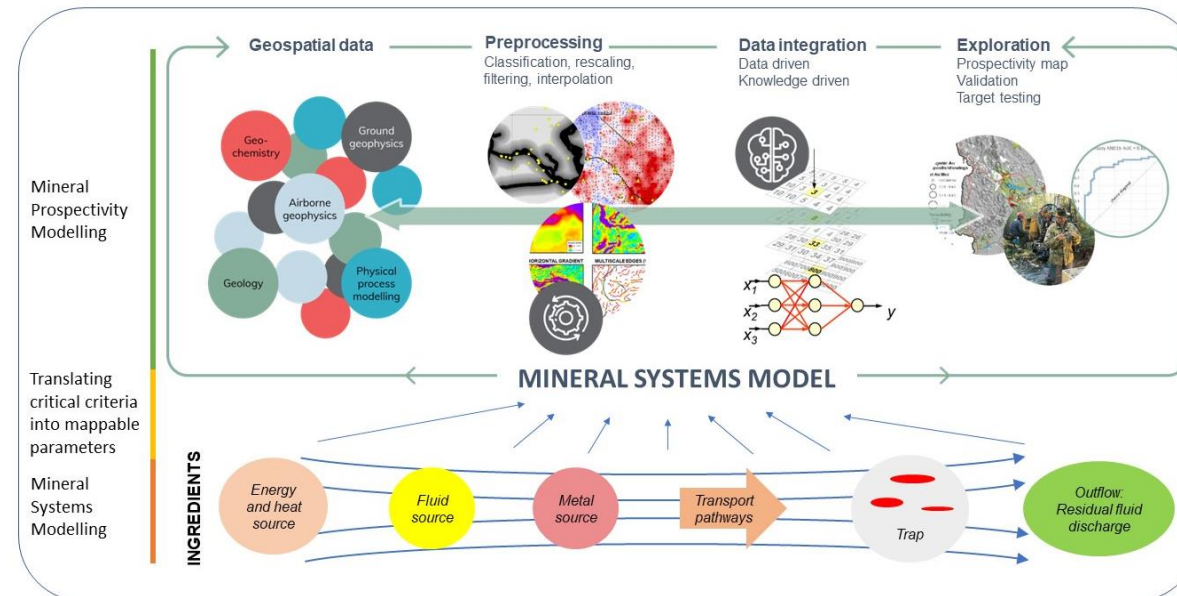


Exploration Information System (EIS)



Mineral Systems Approach

- EIS combines mineral systems models and MPM
 - Mineral system models aim at understanding all controlling factors that lead to the formation of ore deposits (Knox-Robinson et al. 1997).
 - EIS consists of components for different steps of mineral prospectivity analysis (Bonham-Carter 1994).

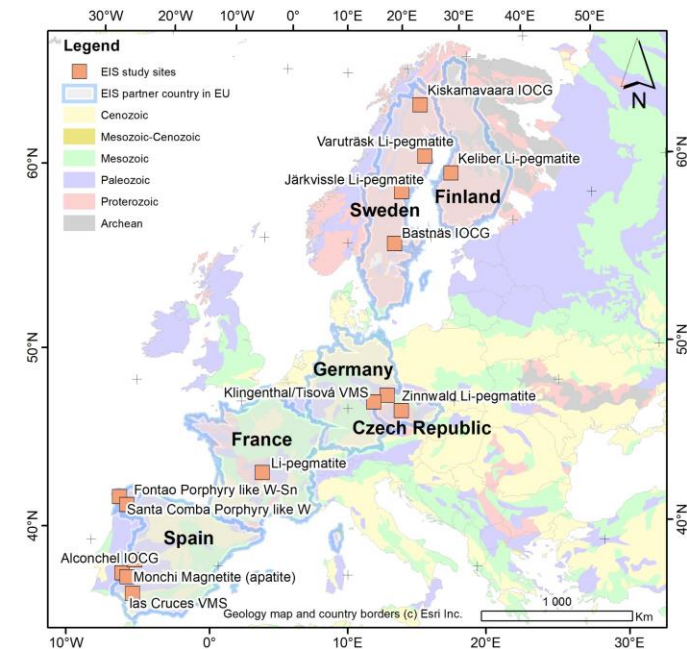
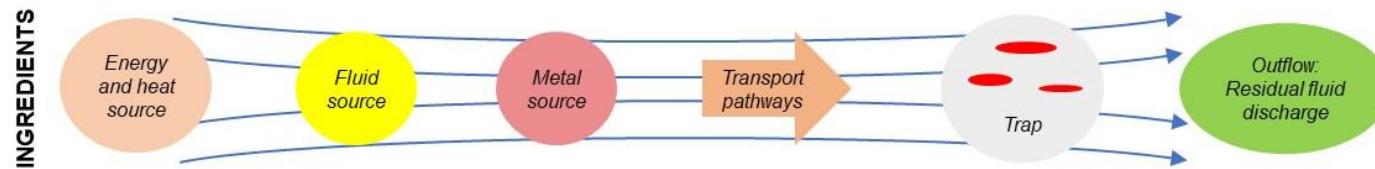


Exploration Information System (EIS)



Mineral Systems

- Three main mineral systems studied
 - Cobalt minerals potential in VMS systems
 - Lithium-tin-tantalum-tungsten minerals potential in granite/pegmatite-related systems
 - Rare earths-cobalt minerals potential in IOCG systems

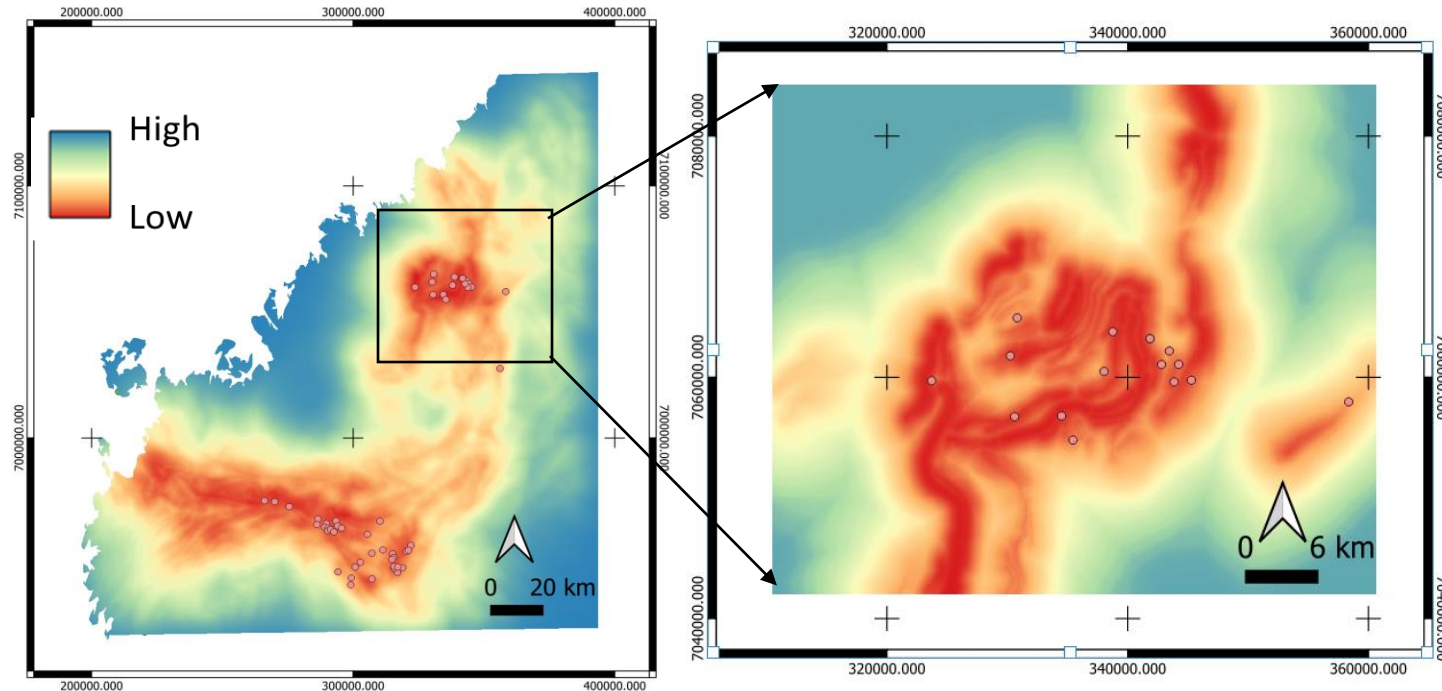


Exploration Information System (EIS)



Mineral Prospectivity Mapping (MPM)

- **Mineral prospectivity mapping** = mapping the likelihood of where mineral deposits may be found in a study area



Kaustinen
Pegmatite District
Scale Lignite
Mineral
Prospectivity
Modelling Results

Source:
Chudasama, GTK,
2025



Exploration Information System (EIS)



Software Development on QGIS platform

- Backbone of EIS is the “**EIS Toolkit**”, comprising a comprehensive set of software tools for performing specialized tasks involved in mineral prospectivity analysis.
- Tools in the “EIS Toolkit” were integrated into the “**EIS QGIS Plugin**”, a guided end-to-end implementation with a visual user interface for performing mineral prospectivity analysis.



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Thank you!



Vesa Nykänen



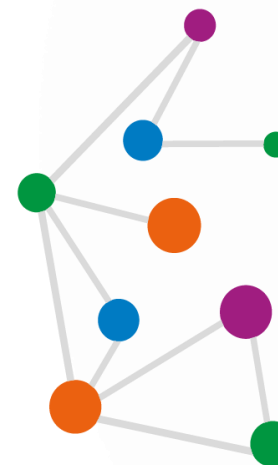
GTK



vesa.nykanen@gtk.fi



www.eis-he.eu



EIS

Exploration
Information
System



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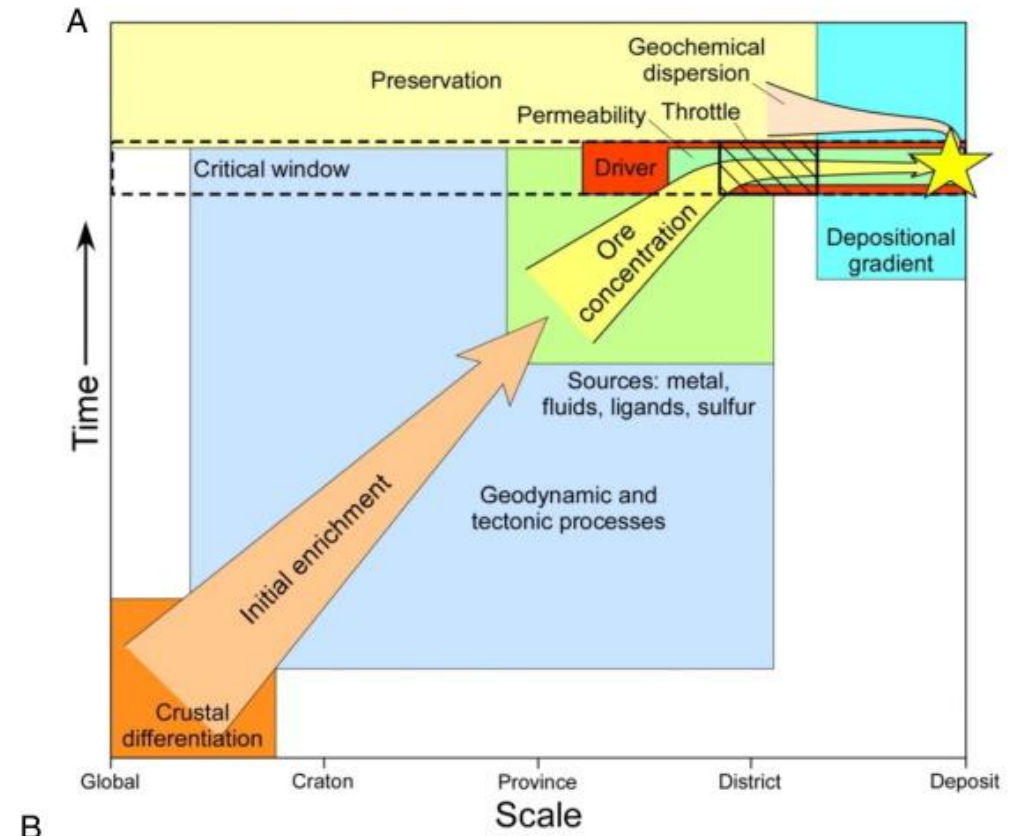
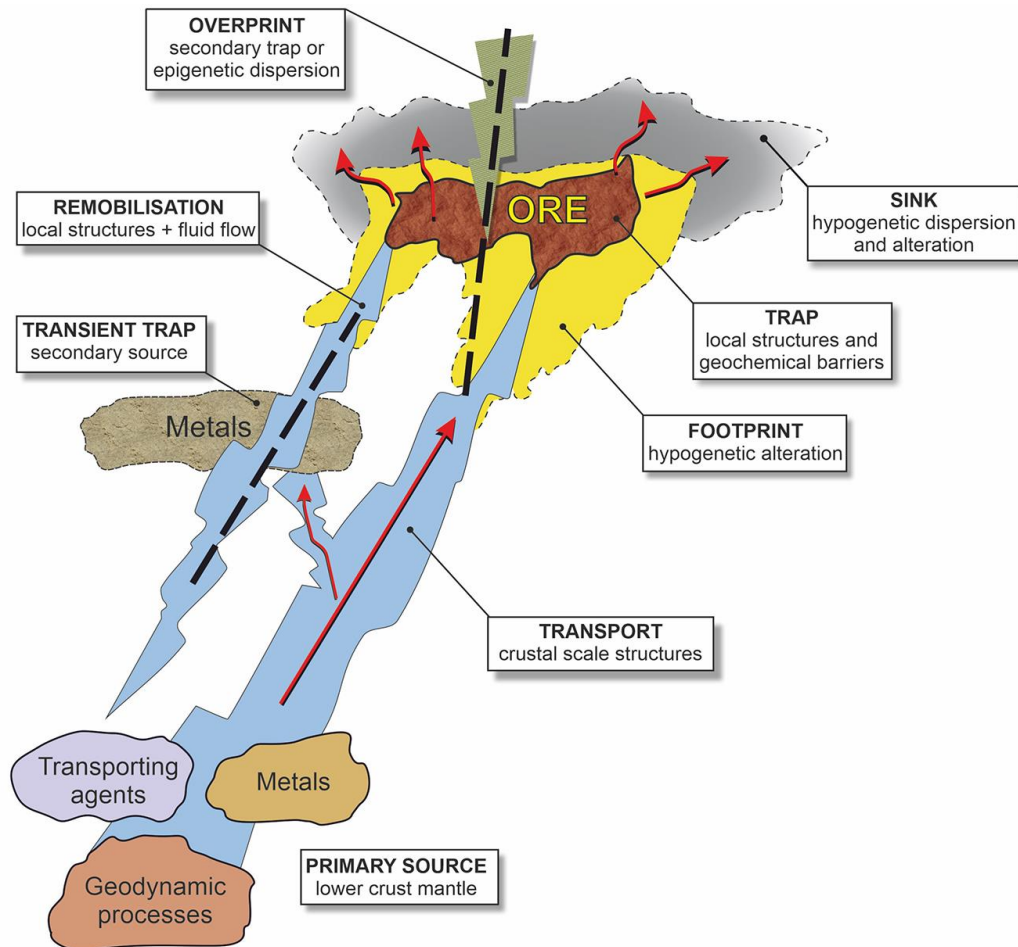
Tobias Bauer (LTU)

EIS Mineral Systems

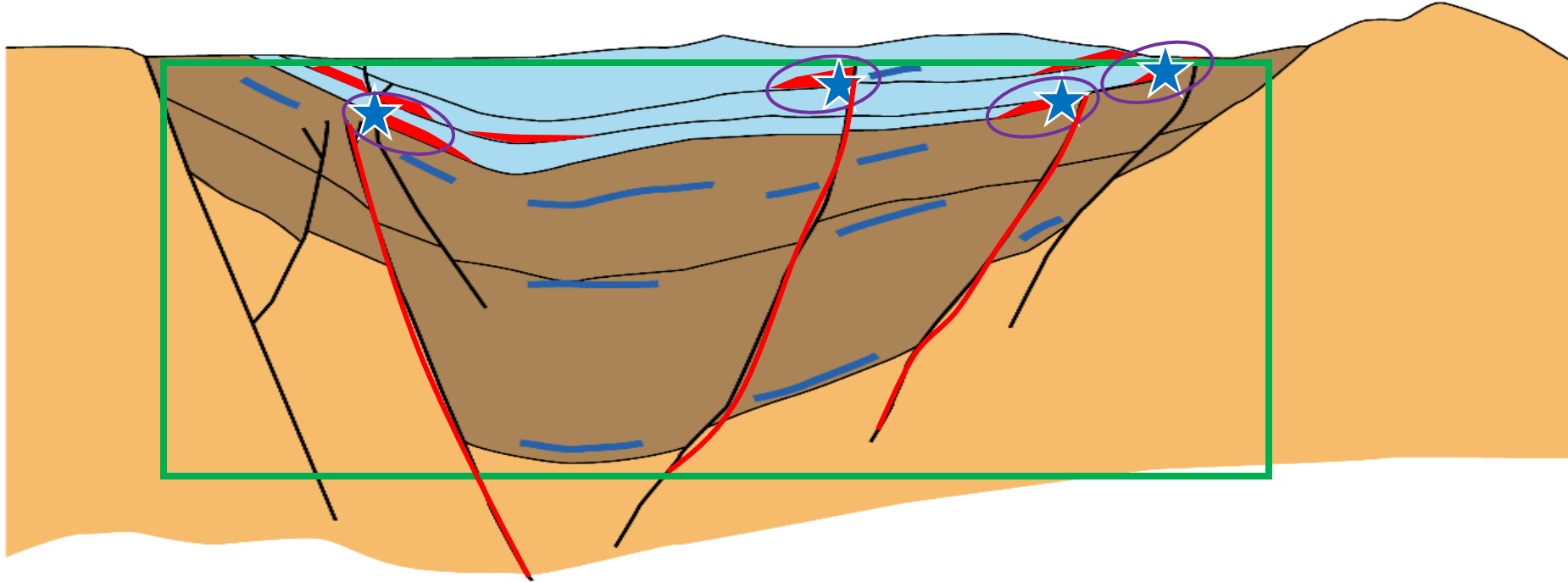
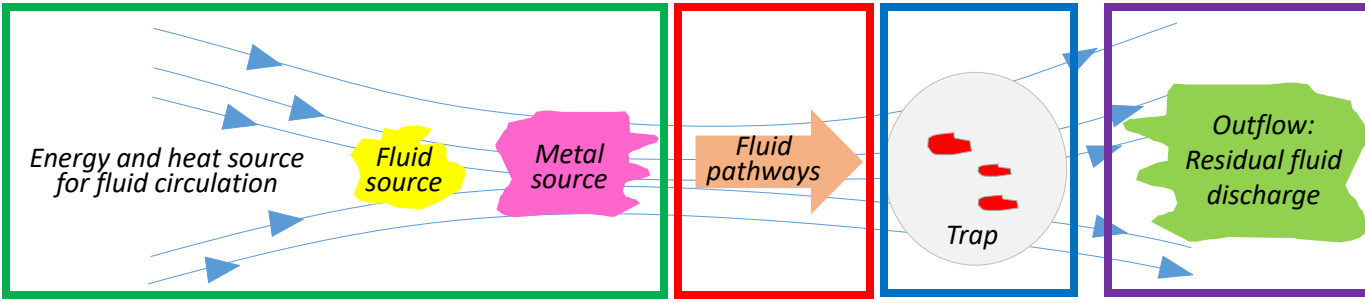
EIS Overview & Results

9:40 – 10:40

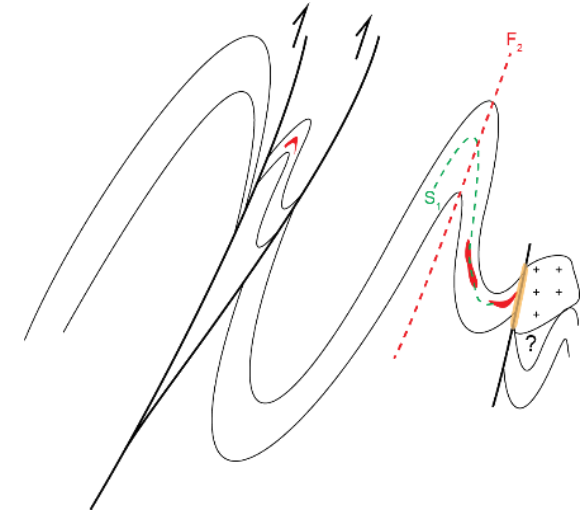
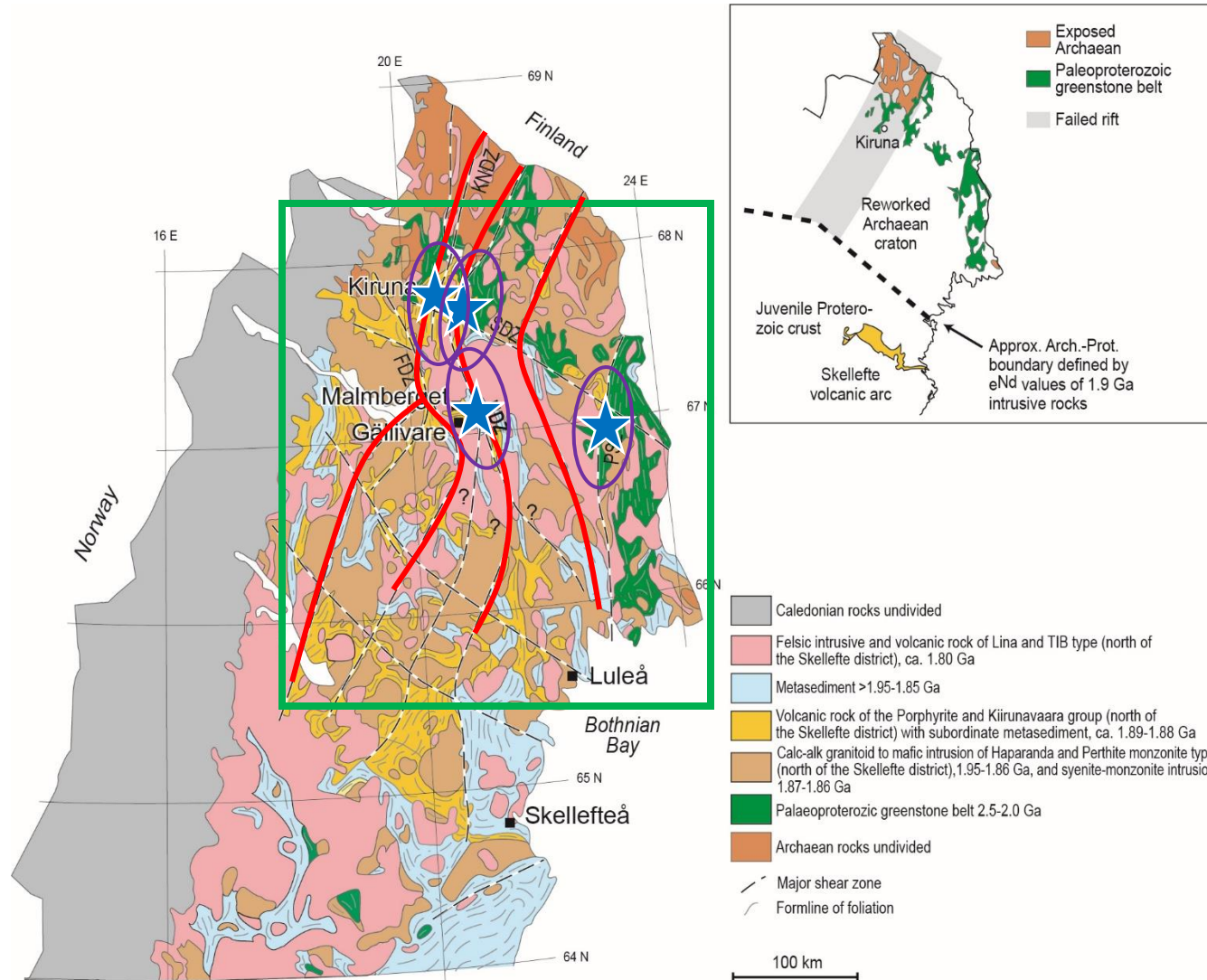
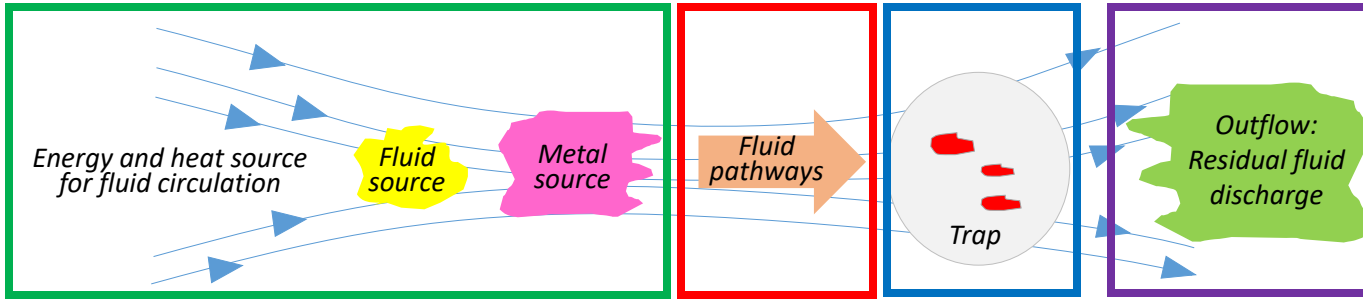
The mineral systems approach



INGREDIENTS



INGREDIENTS



Cobalt minerals potential VMS system



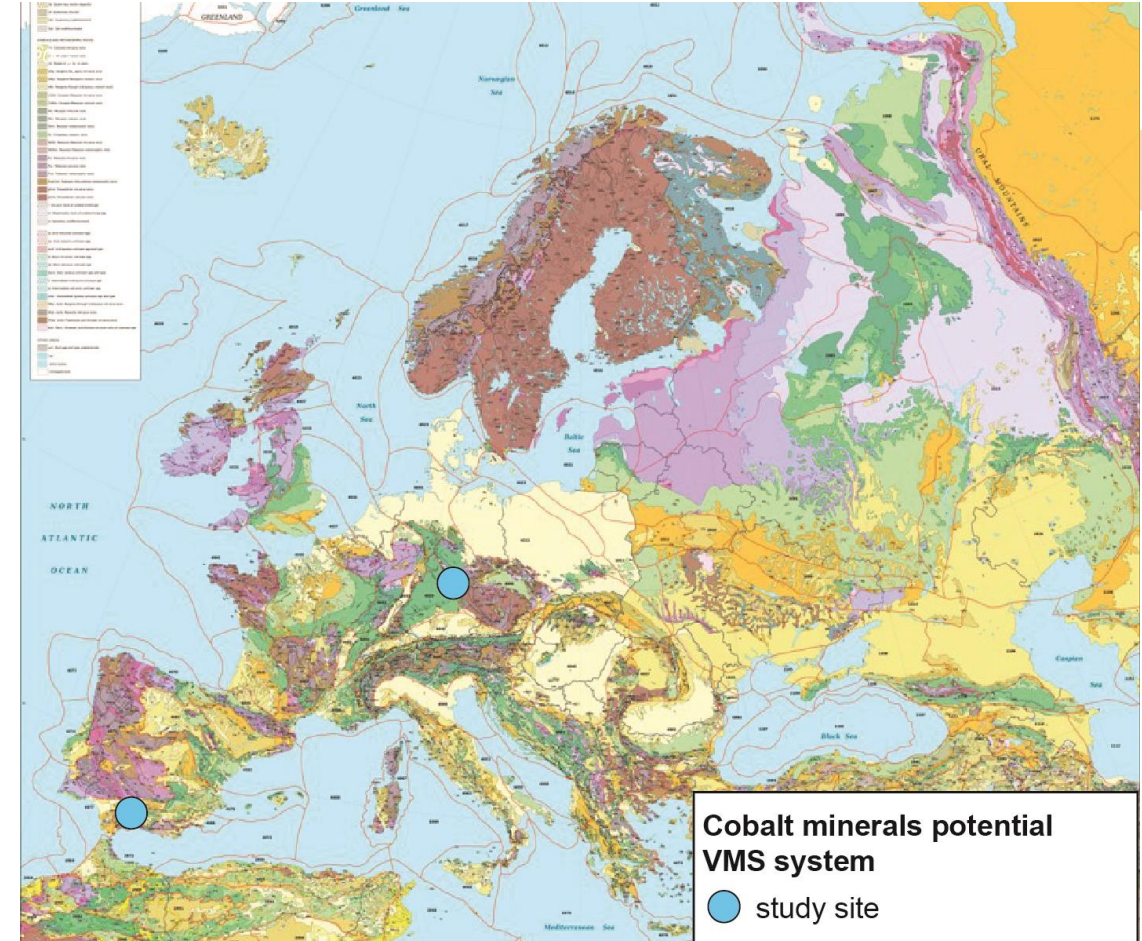
- Iberian Pyrite belt
- Tisova/Klingenthal



CHARLES
UNIVERSITY



CANADIAN
PALLADIUM



Co-bearing VMS Mineral System

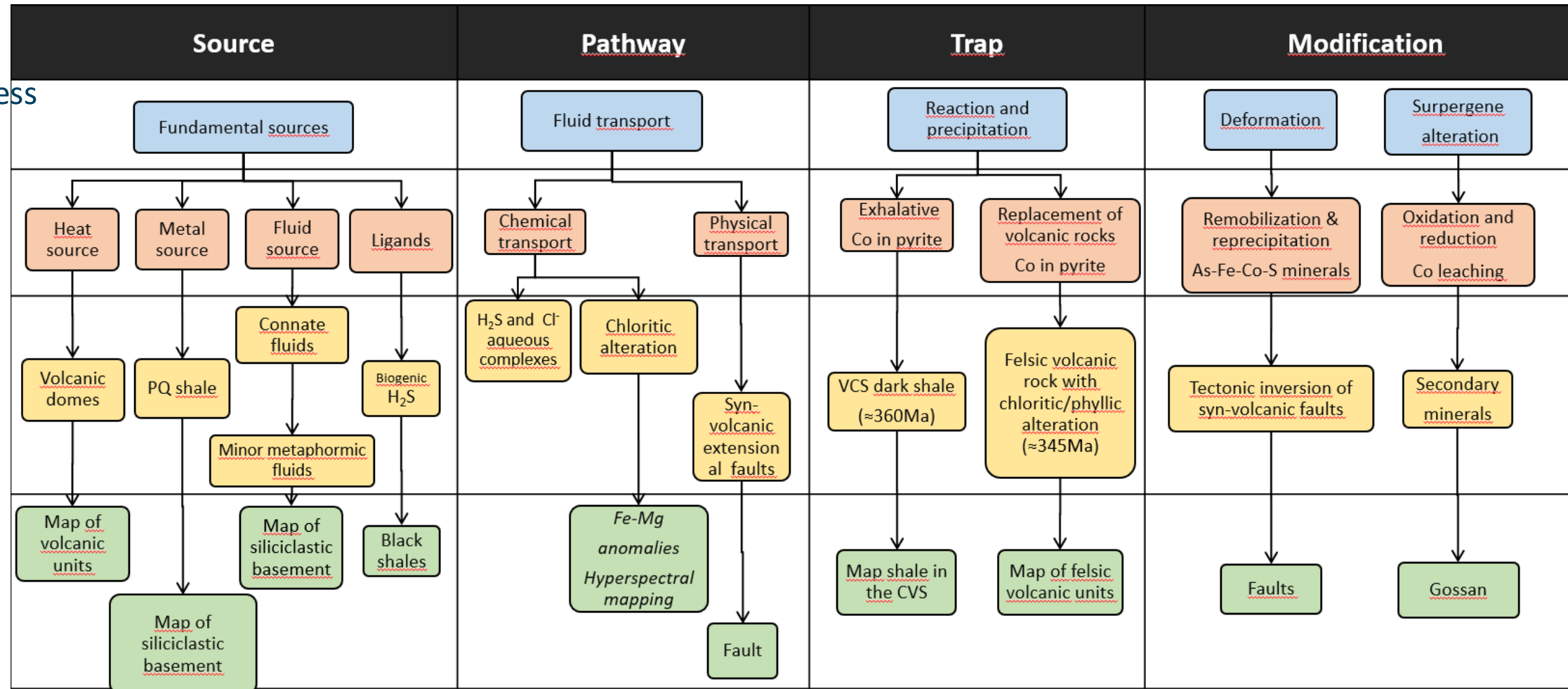


Critical Process

Constituent Process

Targeting Elements

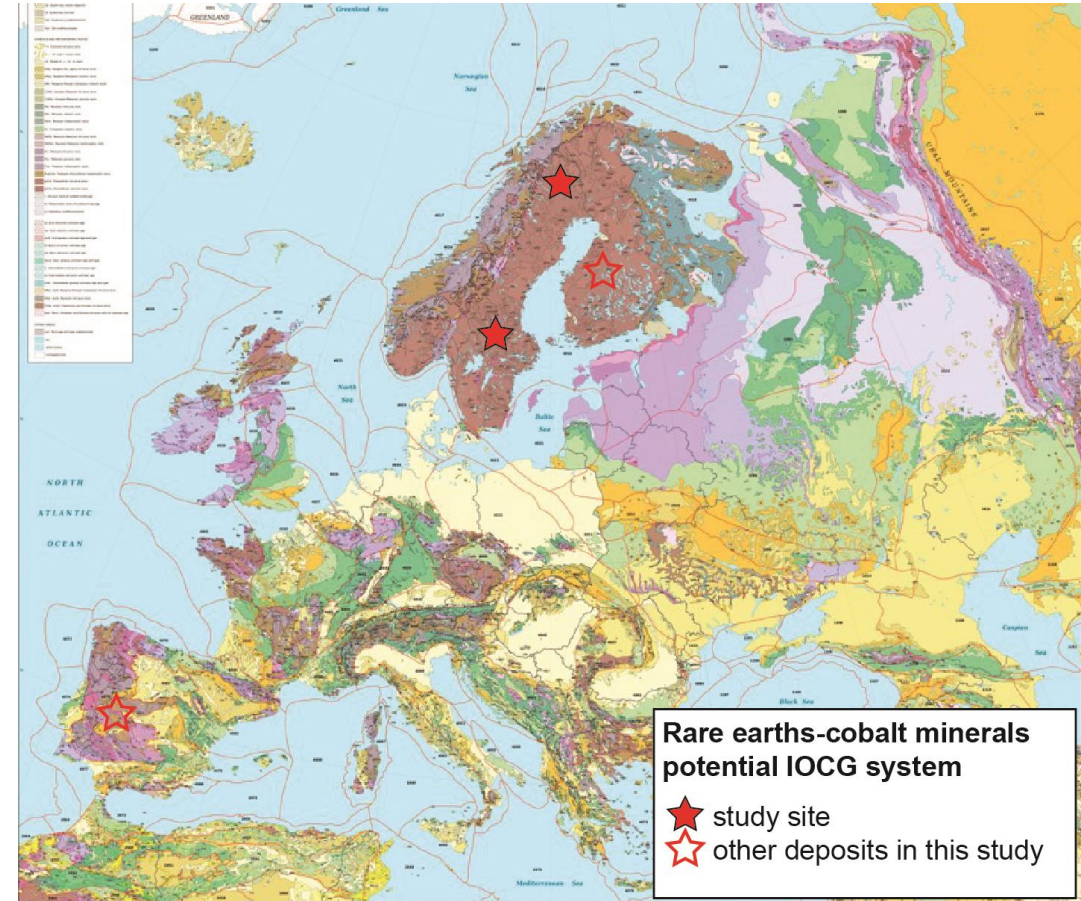
Mappable Proxies



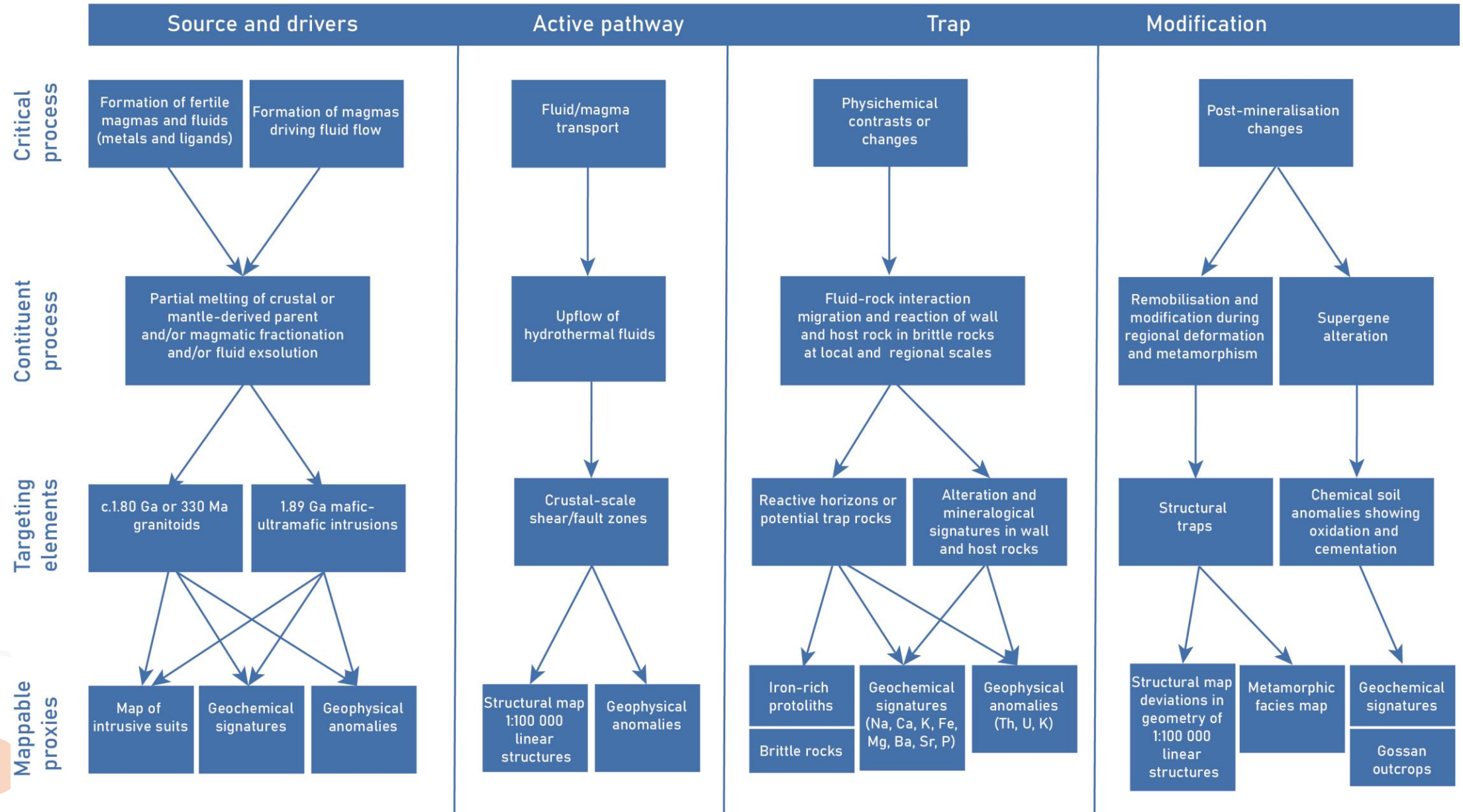
Rare earths-cobalt minerals potential IOCG system



- N & S Sweden
- Spain
- Finland



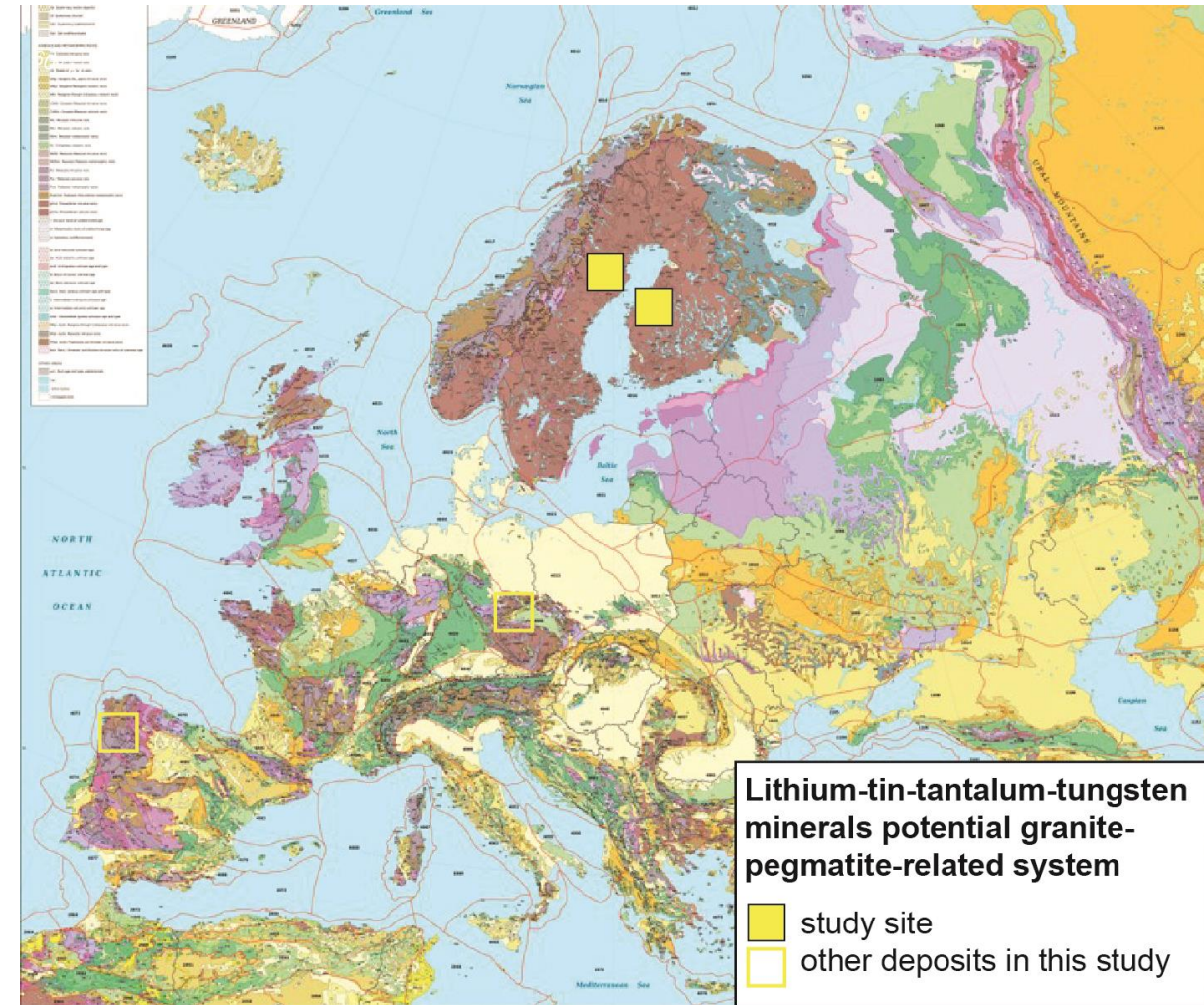
Rare earths-cobalt minerals potential IOCG system



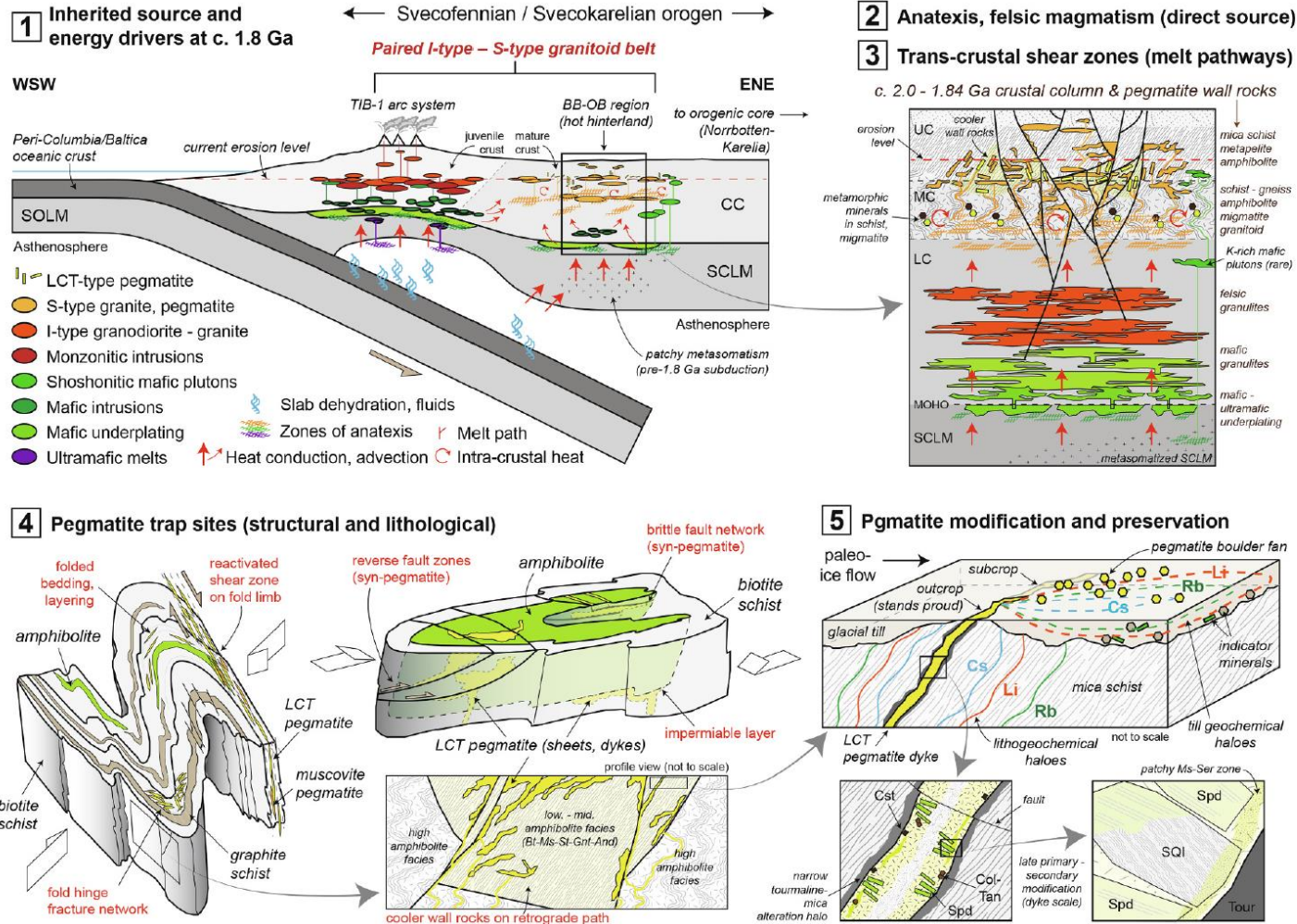
Lithium-tin-tantalum-tungsten minerals potential granite-pegmatite-related system



- Finland & Sweden
- Granite-related deposits W Iberia
- Zinnwald/Cinovec



Granite-pegmatite-related Mineral System



Source

- Sediments (Li–Cs–Ta enriched shales, wackes, argillites; felsic arc provenance).
- Mafic volcanics (S, P input; refractory for LCT).
- D2 metamorphism preserved Li-bearing micas, not Li-rich melts.
- Late-orogenic granites (c. 1.8 Ga) → Li-rich pegmatitic melts.

Pathways

- Trans-crustal shear zones, folds, reactivated faults.
- Long-lived conduits enabled melt ascent + fractionation.

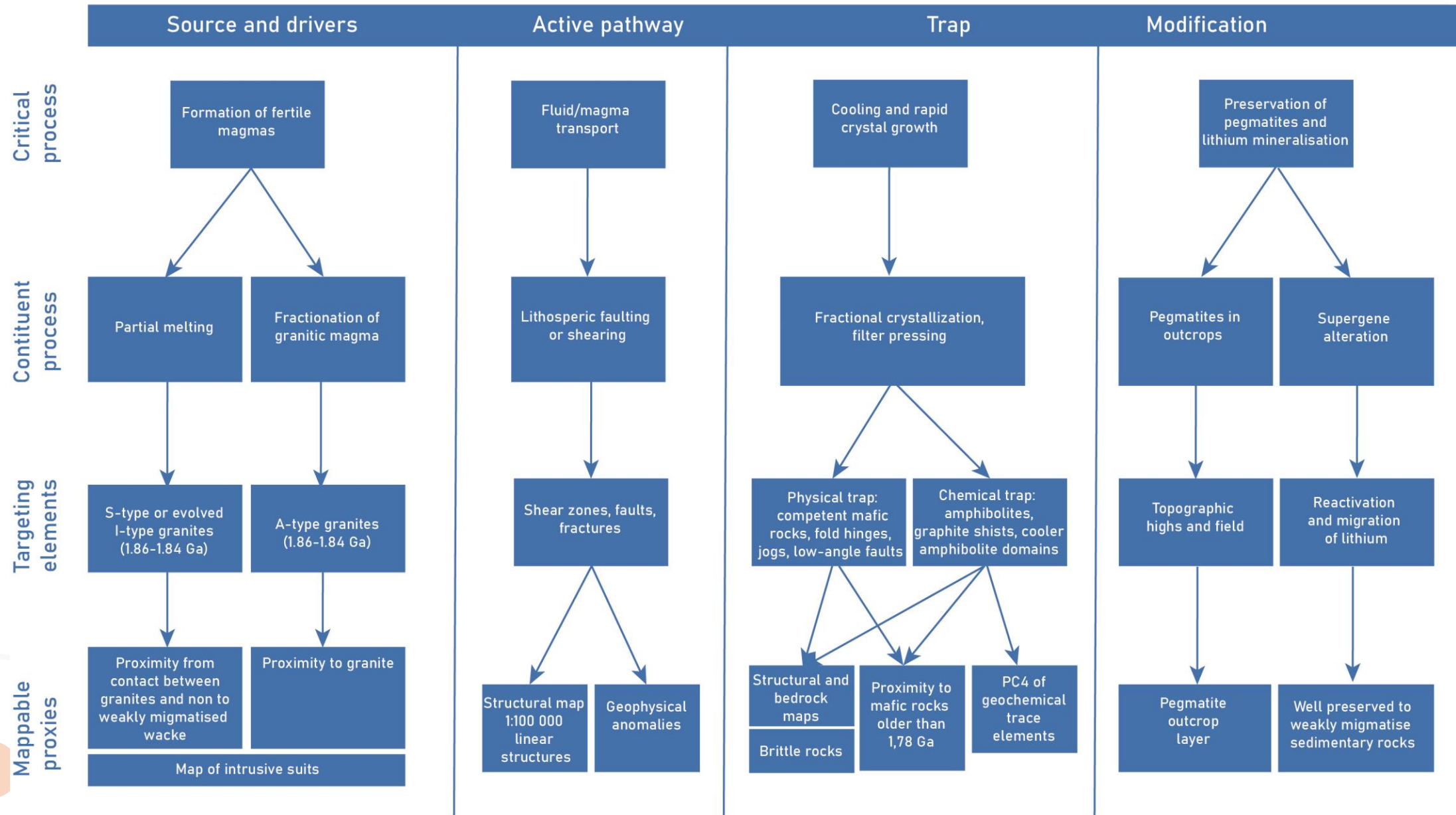
Traps

- Structural: jogs, fold hinges/limbs, low-angle faults.
- Lithological: amphibolites, graphite schists, cooler amphibolite domains.

Modification

- Greisenization, petalite → spodumene, cookeite, muscovite pseudomorphs.
- Tourmalinization/sericitization halos (Li–Rb–Cs).
- Faulting, brecciation, glacial dispersal trains.
- Weak geophysical contrasts; U–K radiometric anomalies.

Lithium-tin-tantalum-tungsten minerals potential granite-pegmatite-related system





Summary & Conclusions

- The mineral systems approach focusses on the process of how ore deposits form
- Translatable to mappable proxies applicable in exploration programs
- Integrated, multiscale exploration is the path to discovery of the next generation of deposits.



Thank you!



Tobias Bauer



**Luleå University of
Technology**



tobias.bauer@ltu.se



www.eis-he.eu



EIS

Exploration
Information
System



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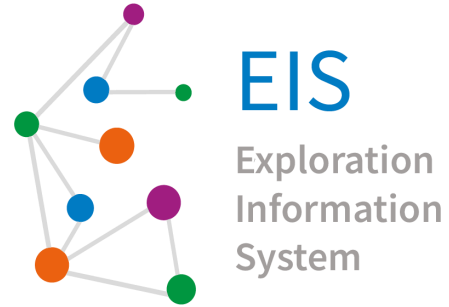
Andreas Knobloch (Beak)

EIS Wizard

EIS Overview & Results

9:40 – 10:40





EIS: Exploration Information System – EIS Toolkit & EIS Wizard

Andreas Knobloch, Beak Consultants GmbH

EIS Final Event
7 October 2025



**Funded by
the European Union**



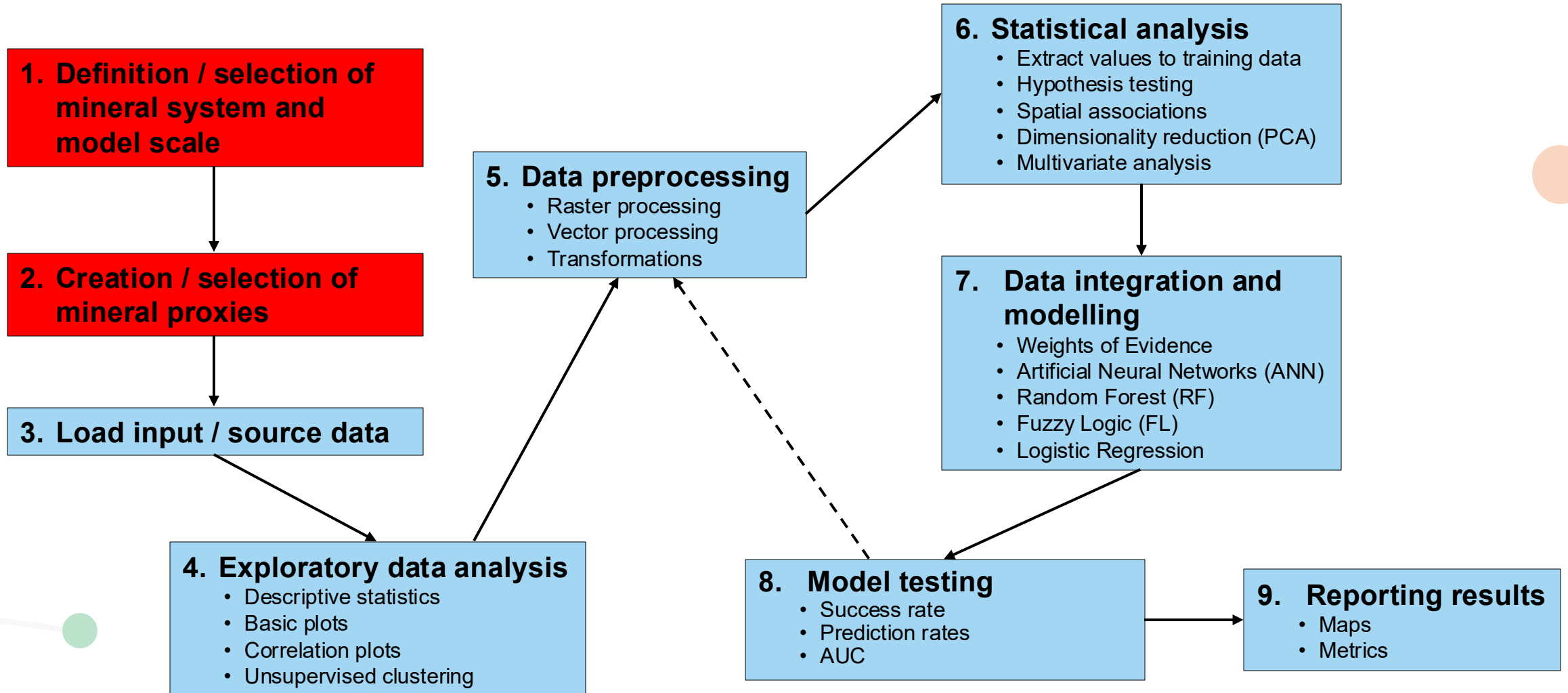
Exploration Information System (EIS)



Software Components

- Backbone of EIS is “**EIS Toolkit**”, comprising a comprehensive set of software tools for performing specialized tasks involved in mineral prospectivity analysis
- Tools from the “EIS Toolkit” are integrated into the “**EIS QGIS Plugin**”, a implementation for QGIS with a guided, graphical user interface, called “**EIS Wizard**” for QGIS for performing mineral system modelling and mineral prospectivity analysis

Exploration Information System (EIS)

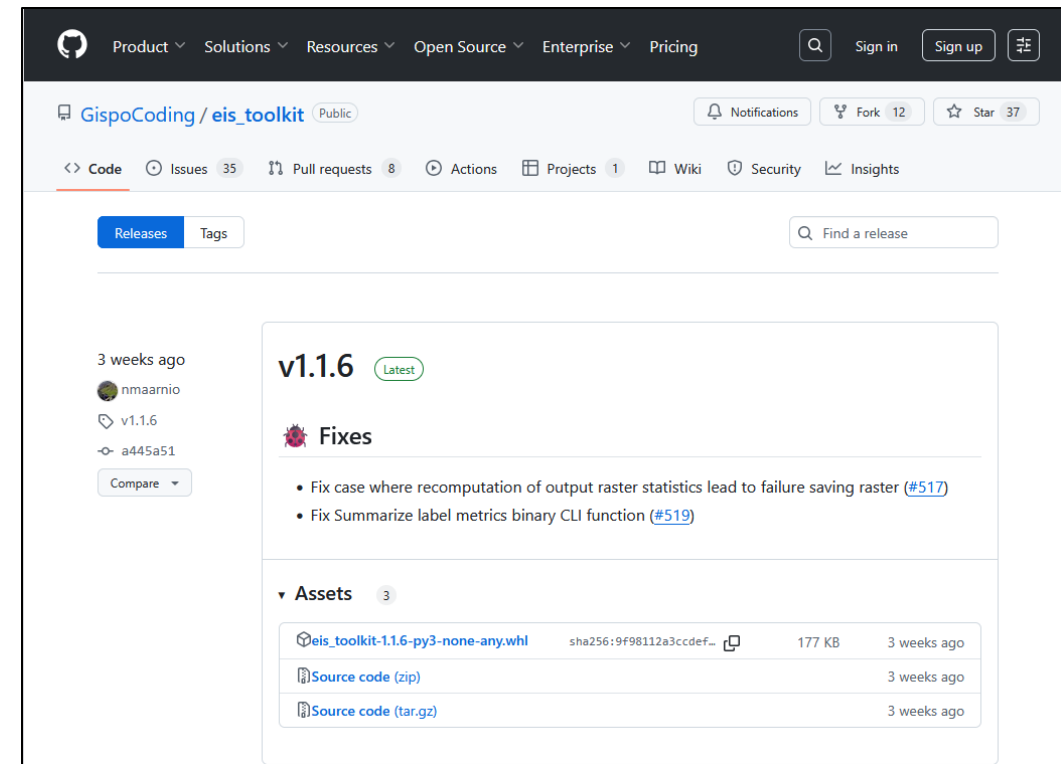


Exploration Information System (EIS)



Software Release on GitHub

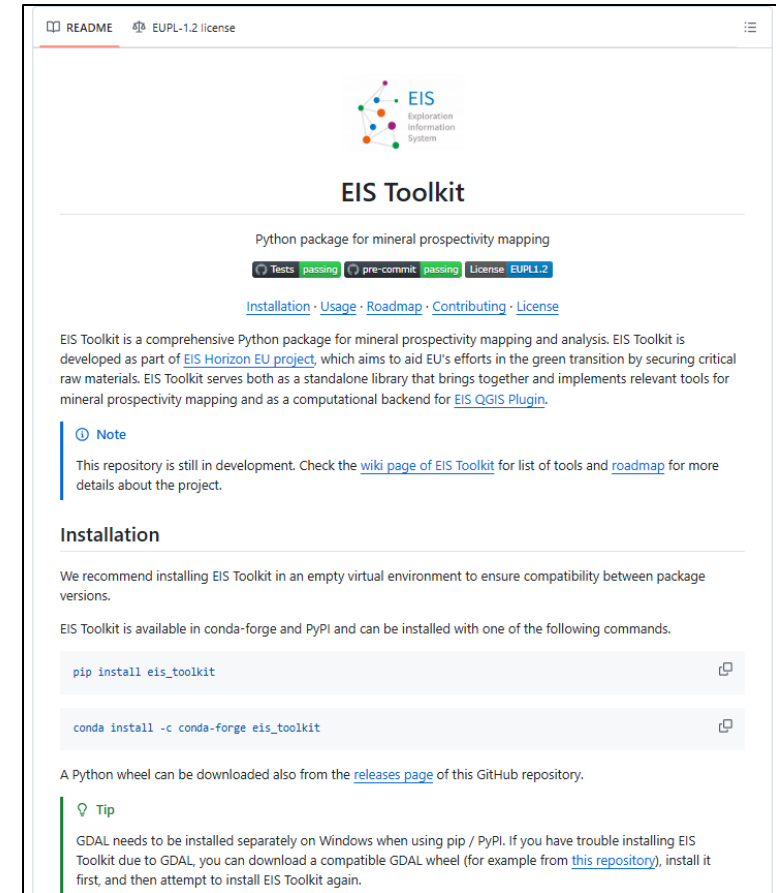
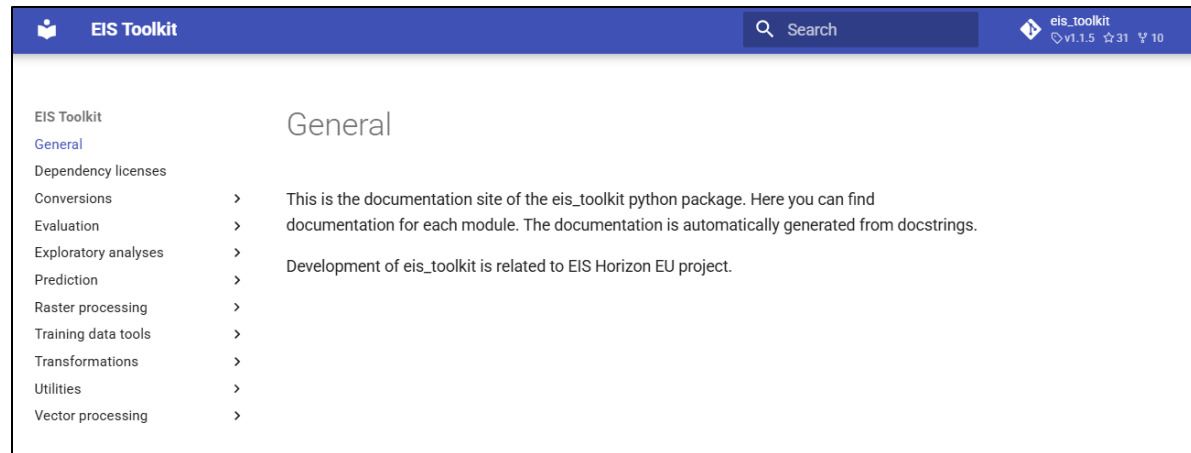
- EIS Toolkit
 - https://github.com/GispoCoding/eis_toolkit



Exploration Information System (EIS)



EIS Toolkit Documentation



Exploration Information System (EIS)



EIS Toolkit

Exploratory analyses

Tool	Status
PCA	■
K-means clustering	■
DBSCAN	■
Descriptive statistics	■
Statistical hypothesis tests	■
Basic plots (scatter, line, bar, hist, kde, ecdf, heatmap, pairplot, regplot)	■
Parallel coordinates plot	■
Feature importance	■
Local Moran's I	■

Data transformations

Tool	Status
Binarize	■
Winsorize	■
Logarithmic	■
Min-max	■
Z-score normalize	■
Clip transform	■
One-hot encode	■
CoDa transformations	■

Vector processing

Tool	Status
Reproject vector	■
Interpolation - IDW	■
Interpolation - kriging	■
Density computation	■
Distance computation	■
Calculate geometry	■
Extract shared lines	■
Cell-based association	■
Rasterize	■
Proximity computation	■

Status symbols:

- = Completed
- = In process / in review
- = Not yet started

Raster processing

Tool	Status
Reproject raster	■
Resample raster	■
Clip raster	■
Snap raster	■
Window raster	■
Unify rasters	■
Surface derivative tools	■
Extract values from raster	■
Reclassify	■
Create constant raster	■
Unique conditions grid	■
Smoothing/filter tools	■
Distance to anomaly	■
Proximity to anomaly	■

Exploration Information System (EIS)



EIS Toolkit

Training data tools

Tool	Status
Balance data (SMOTETomek)	■
Split data	■
Raster to points	■
Generate negatives	■
Data sampler	■

Prediction

Tool	Status
Fuzzy overlay	■
Weights of evidence	■
Logistic regression	■
Random forest (regr+cls)	■
Gradient boosting (regr+cls)	■
MLP (multilayer perceptron, regr+cls)	■
BNN	■

Status symbols:

- = Completed
- = In process / in review
- = Not yet started

Evaluation

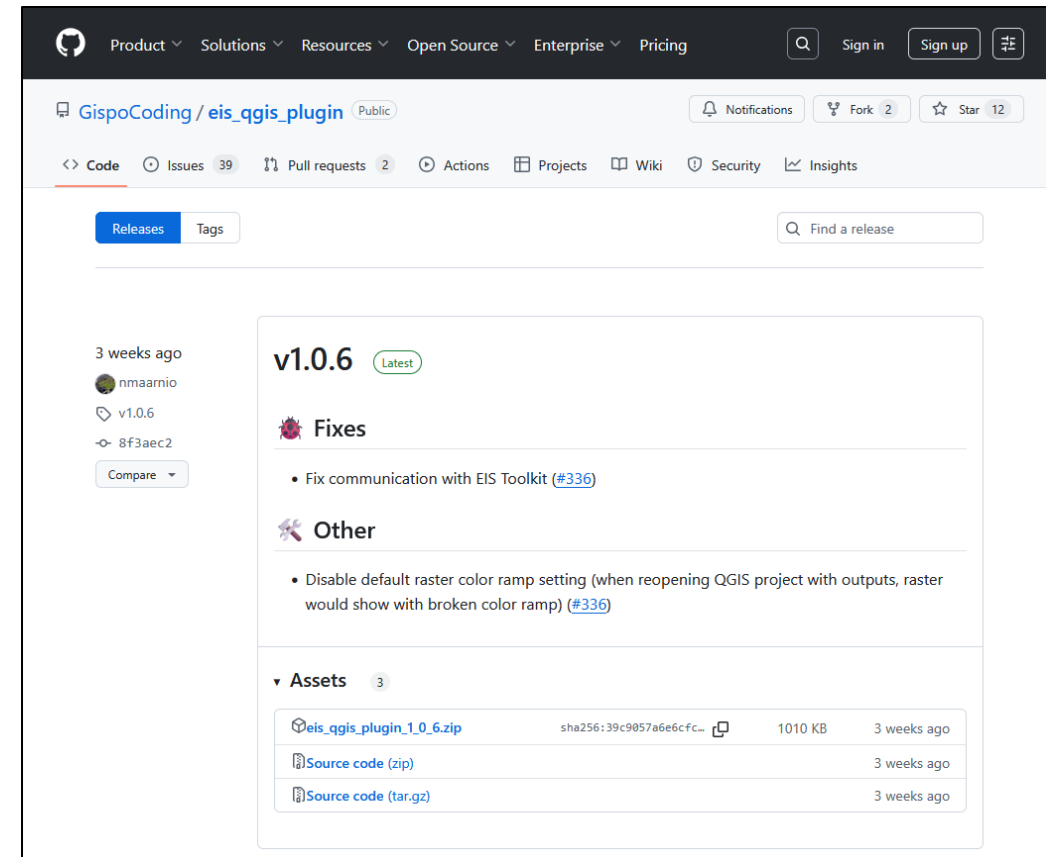
Tool	Status
Calculate base metrics	■
Summarize label metrics for binary classifier	■
Summarize probability metrics for binary classifier	■
Plot ROC curve	■
Plot DET curve	■
Plot precision-recall curve	■
Plot calibration curve	■
Plot distribution of predicted probabilities	■
Plot confusion matrix	■
Plot neural network training accuracy	■
Plot neural network training loss	■
Plot prediction area curves	■
Plot rate curve	■
Score model (accuracy, precision, recall, F1, MAE, MSE, RMSE, R2)	■

Exploration Information System (EIS)



Software Release on GitHub

- EIS QGIS Plugin and EIS Wizard
 - https://github.com/GispoCoding/eis_wizard



Exploration Information System (EIS)



EIS QGIS Plugin Documentation & Manual

Home

Mika Sorvoja edited this page 2 weeks ago · [9 revisions](#)

Welcome to the EIS QGIS Plugin wiki!

This wiki acts as a user guide and manual for EIS QGIS Plugin. The wiki is divided into pages, each corresponding to a part of the plugin. These pages are

- [Mineral system proxies](#)
- [EDA \(Exploratory Data Analysis\)](#)
- [Modeling](#)
- [History](#)
- [Settings](#)
- [Processing](#)

For installation instructions, [check the README of this repository](#).

Plugin structure

EIS QGIS Plugin has essentially two parts: EIS Processing and EIS Wizard. EIS Processing is a collection of processing algorithms that implement the individual tools of EIS Toolkit. EIS Wizard is a QGIS plugin application that seeks to facilitate MPM work in a guided and convenient way for users.

EIS Processing

EIS Processing algorithms are listed in the Processing Toolbox of QGIS under EIS provider. Tools are categorized similarly as in EIS Toolkit. For a full list of algorithms available, refer to the Processing page of this wiki.

Pages **7**

- [Home](#)
- [Mineral system proxies](#)
- [EDA](#)
- [Modeling](#)
- [History](#)
- [Settings](#)
- [Processing](#)

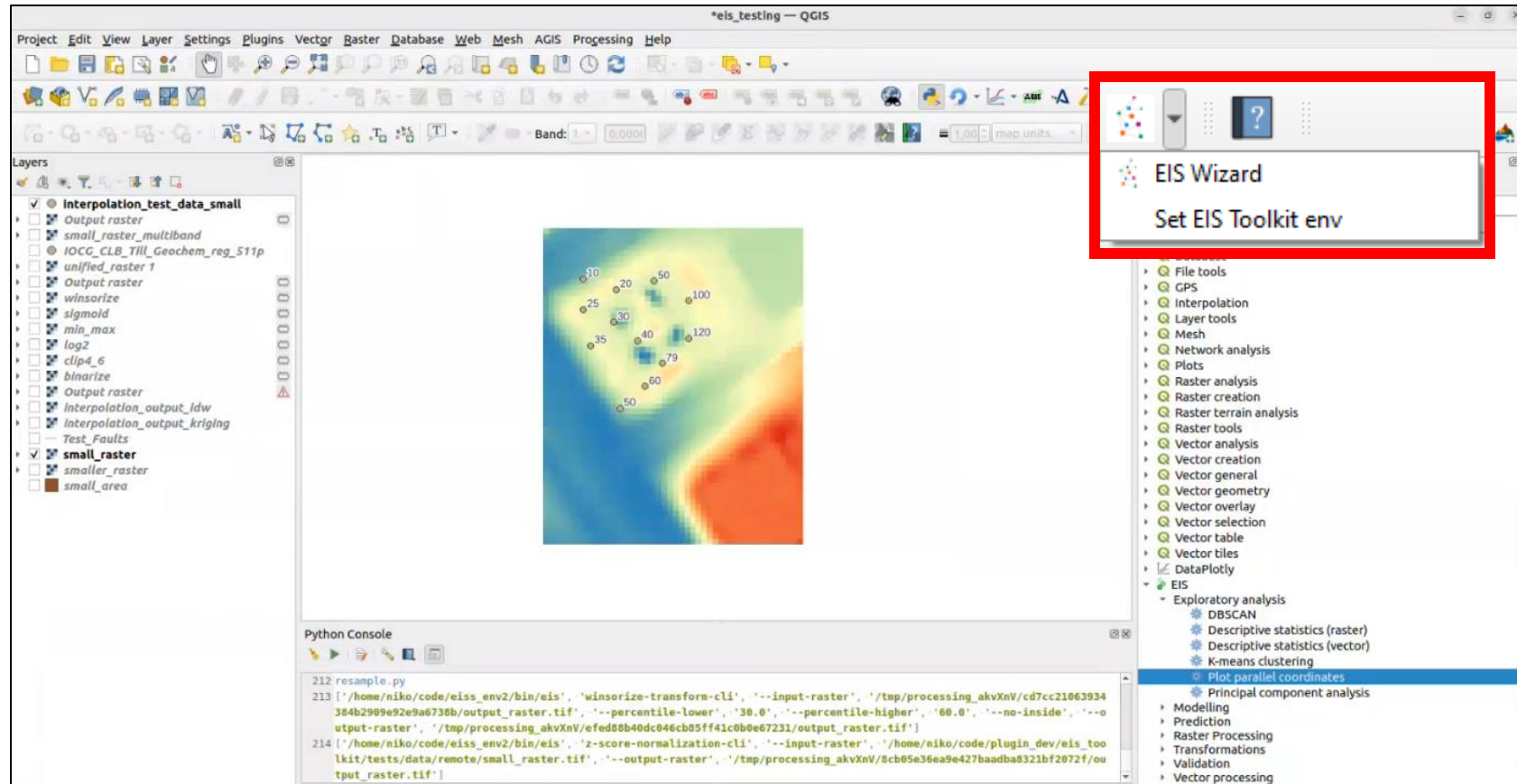
Clone this wiki locally

https://github.com/GispoCoding/eis_q

Exploration Information System (EIS)



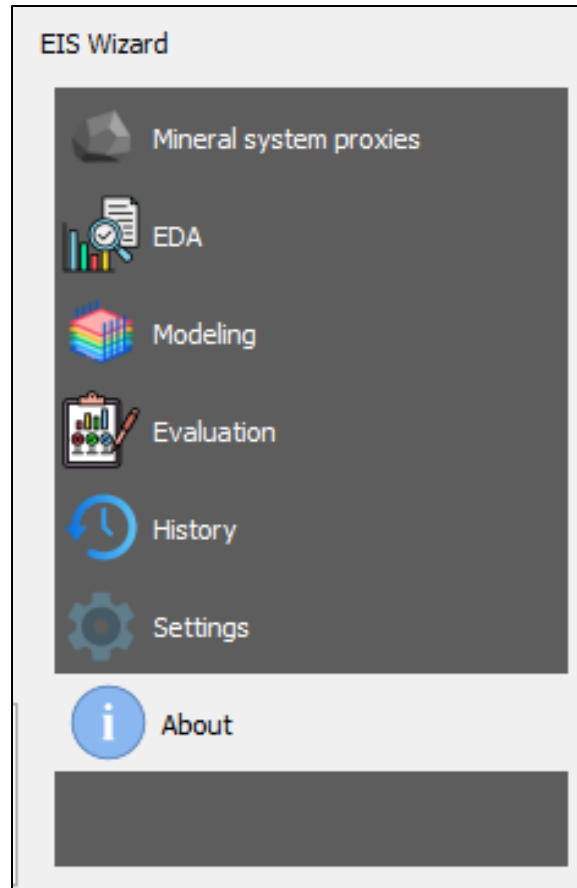
EIS Wizard Integration into QGIS



Exploration Information System (EIS)



EIS Wizard Main Menu



Exploration Information System (EIS)



EIS QGIS Wizard

Step 1: Create Mineral System

EIS Wizard

Mineral system proxies

EDA
Modeling
Evaluation
History
Settings
About

Mineral system 1

Mineral system IOCG 5
Study scale Regional 2
Mineral system proxies
Configure proxies 6

Source Pathways Depositional processes Mineralisation, remobilisation, modification 3

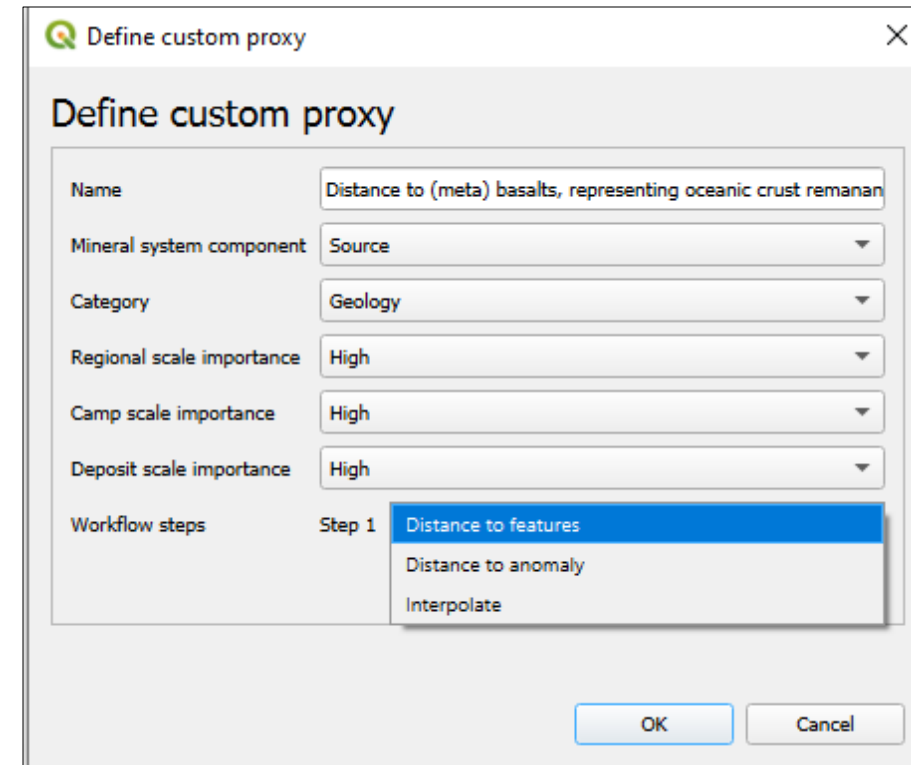
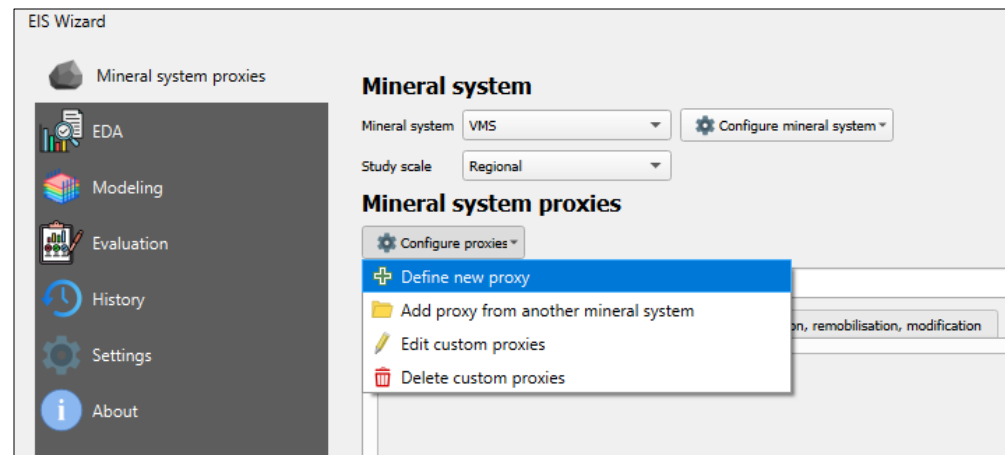
Proxy	Category	Process
* Distance to Fe-oxides (magnetite and hematite minerals; or any other Fe-oxides related minerals of interest)	geophysics	Process 4
* Distance to Fe-oxides mapped from high density anomalies	geophysics	Process
* Distance to felsic (meta)volcanic rocks and subvolcanic rocks	geology	Process
* Distance to high Fe concentrations	geochemistry	Process
* Distance to high Fe ₃ O ₄ concentration	geochemistry	Process
* Distance to high concentrations of Co-REEs	geochemistry	Process
* Distance to high conductivity anomalies	geophysics	Process
* Distance to magmatic intrusion of the relevant age (age from geology and radiometric data; distance from geophysical data)	geology	Process
* Distance to magmatism contemporary with mineralisation (within 5 km buffer)	geology	Process
* Distance to rock units displaying alkaline magma signature	geology	Process
* Syn- to late-orogenic back arc closure related intrusions	geology	Process
* Distance to albitized country rocks	geology	Process

Exploration Information System (EIS)



EIS QGIS Wizard

Step 2: Define and Add Mineral System Proxies



Exploration Information System (EIS)



EIS QGIS Wizard

Step 3: Export and Import Mineral System Proxies

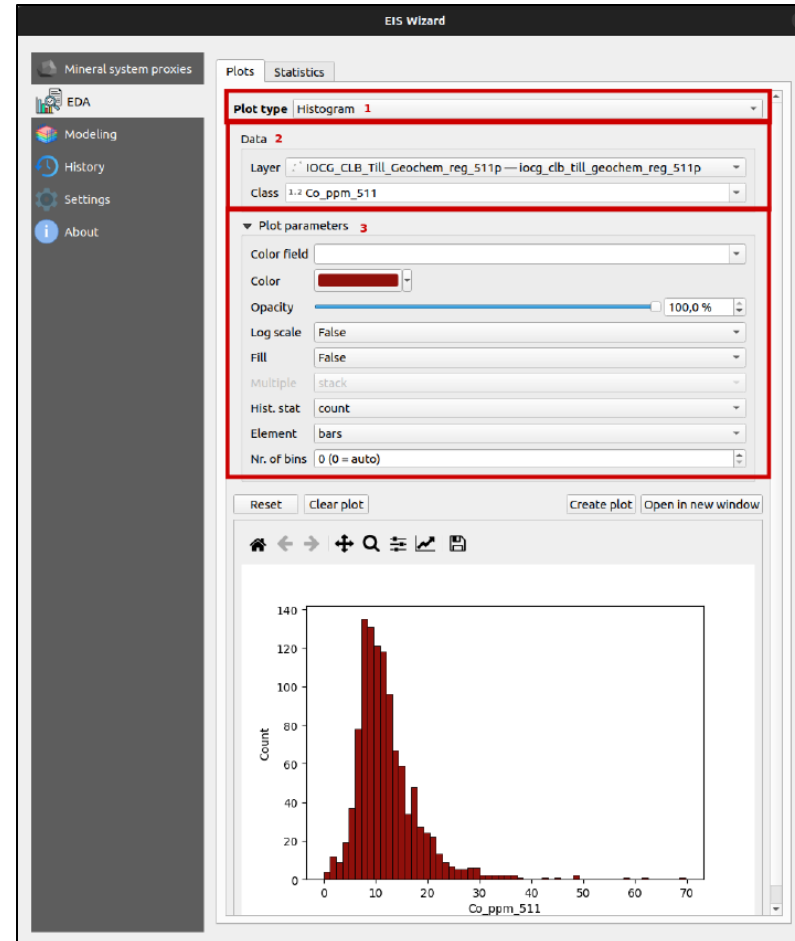
The screenshot shows the 'Mineral system' section of the EIS QGIS Wizard. It includes two dropdown menus: 'Mineral system' set to 'IOCG' and 'Study scale' set to 'Regional'. To the right of these is a 'Configure mineral system' button. Below these is the 'Mineral system proxies' section, which has a 'Configure proxies' button. A context menu is open over the 'Configure mineral system' button, showing options: 'New' (with a plus icon), 'Delete' (with a trash icon), 'Import' (with a folder icon), and 'Export' (with a document icon and a blue highlight).

Exploration Information System (EIS)



EIS QGIS Wizard

Step 4: Exploratory Data Analysis

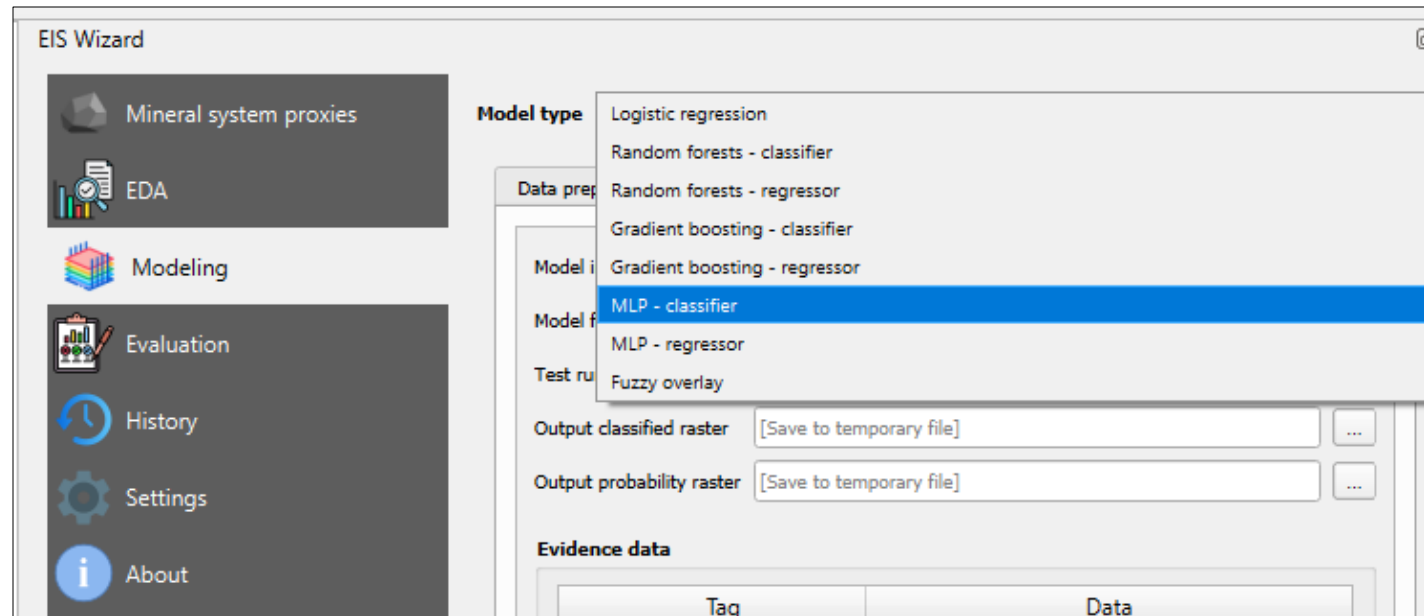


Exploration Information System (EIS)



EIS QGIS Wizard

Step 5: Modelling

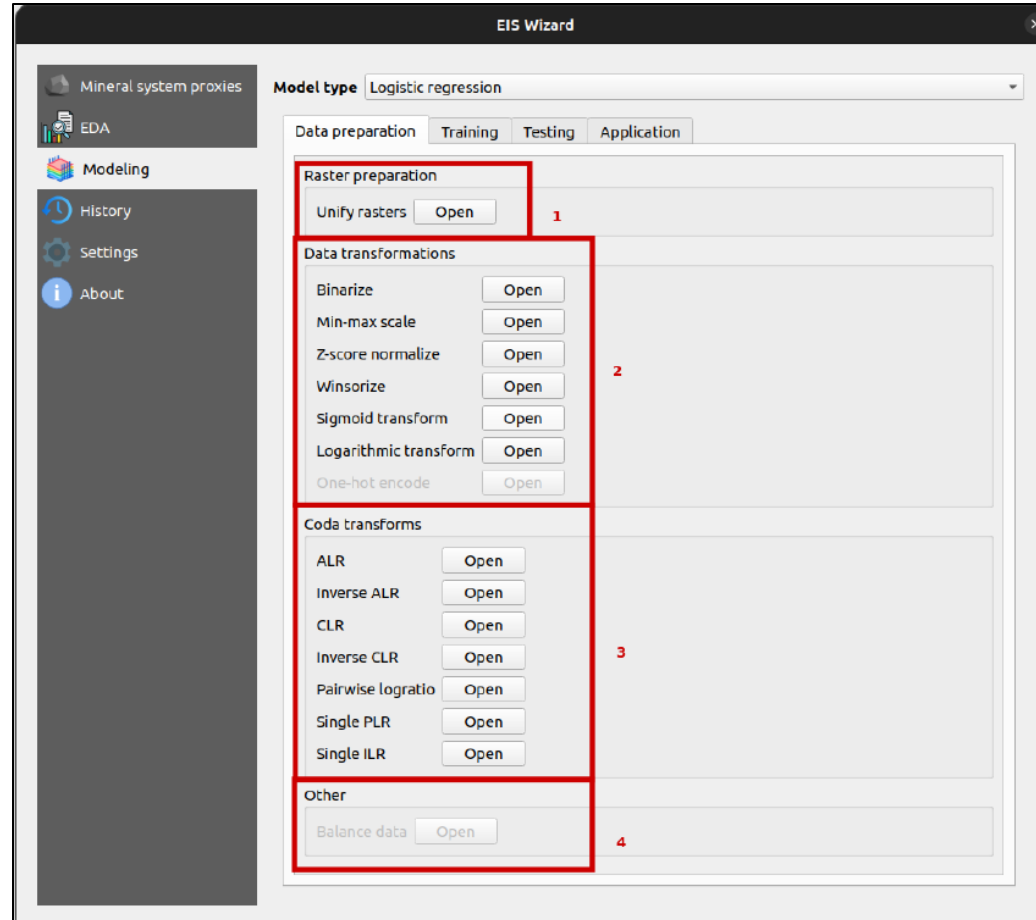


Exploration Information System (EIS)



EIS QGIS Wizard

Step 5: Modelling



Exploration Information System (EIS)



EIS QGIS Wizard

Step 5: Modelling

EIS Wizard

Mineral system proxies

EDA

Modeling

History

Settings

About

Model type: Logistic regression

Data preparation Training Testing Application

Model instance name: model_name

Model save path: 1 path/to/model/

Evidence data: 2

Tag	Data	Add	Delete
1	Distance to felsic (meta)volcanic rocks and subvolcanic rocks	+	-

Generate tags

Labels: 3

Distance to felsic (meta)volcanic rocks and subvolcanic rocks

Model parameters: 4

Verbose: 0

Random state: None (random)

Penalty: l2

Max iter: 100

Solver: lbfgs

Validation settings: 5

Validation method: Split

Split size (validation): 20%

Cross-validation folds: 5

Metrics: Accuracy

Reset Cancel Start training

Exploration Information System (EIS)



EIS QGIS Wizard

Step 5: Modelling

EIS Wizard

Mineral system proxies
EDA
Modeling
History
Settings
About

Model type Logistic regression

Data preparation Training Testing Application

Model instance name test_model

Model file 1 e/mika/Documents/Gispo/EIS/eis_qgis_plugin/test/test_model.joblib

Test run name

Output classified raster [Save to temporary file] ...

Output probability raster [Save to temporary file] ...

Evidence data 2

Tag	Data
1 small_raster	small_raster
2 small_raster_multiband	small_raster_multiband

Parameters 3

Classification threshold 0,500

Labels 4

small_area

Metrics 5

- ☐ Accuracy
- ☐ Precision
- ☐ Recall
- ☐ F1

Reset Cancel Run

Exploration Information System (EIS)



EIS QGIS Wizard

Step 5: Modelling

EIS Wizard

Model type: Logistic regression

Data preparation | Training | Testing | Application

Model instance name: test_model

Model file 1: e:/mika/Documents/Gispo/EIS/eis_qgis_plugin/test/test_model.joblib

Application run name:

Output classified raster: [Save to temporary file] ...

Output probability raster: [Save to temporary file] ...

Evidence data 2

Tag	Data
1 small_raster	☒ small_raster
2 small_raster_multiband	☒ small_raster_multiband

Parameters 3

Classification threshold: 0.500

Cancel Run

Progress: 0%

Exploration Information System (EIS)



EIS QGIS Wizard

Step 6: Model Result Evaluation

The screenshot shows the 'EIS Wizard' window with the 'Statistics' tab selected. The interface includes a sidebar with navigation options: Mineral system proxies, EDA, Modeling, Evaluation (selected), History, Settings, and About. The main panel displays the following data and metrics:

Data

Deposits	deposit_raster	1
Predictions (classifications/labels)	Output classified	2
Predictions (probabilities)	Output probabilities	3

Decimals: 2
[Compute]

Classification/label metrics

Accuracy	0.96
Precision	0.99
Recall	0.95
F1	0.97
True positives	1011
False positives	100
False negatives	12
True negatives	1817

Probability metrics

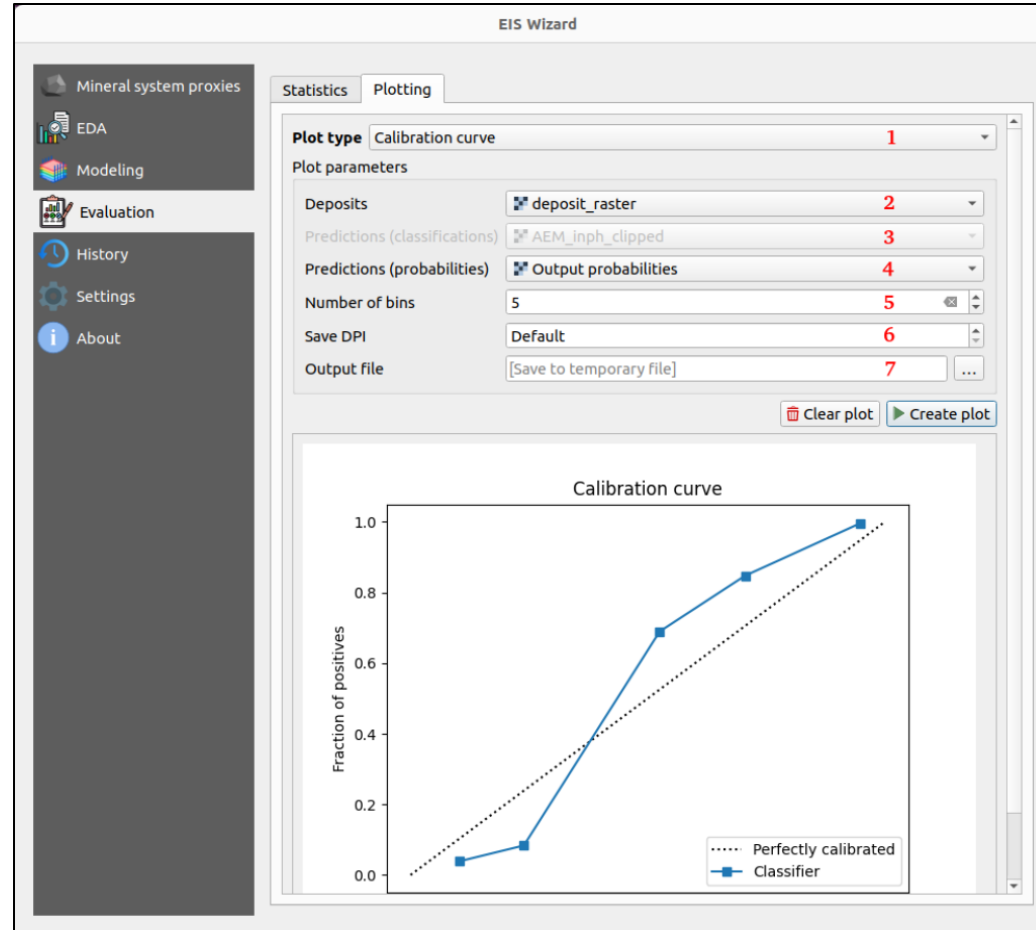
ROC AUC	0.99
Log loss	0.14
Average precision	1.0
Brier score loss	0.03

Exploration Information System (EIS)



EIS QGIS Wizard

Step 6: Model Result Evaluation



Exploration Information System (EIS)



Training

- Conducted User Trainings:
 - March 2024:
 - PDAC Conference 2024 Short Course



Exploration Information System (EIS)



Training

- Conducted User Trainings:
 - May 2024:
 - Internal Stakeholder User Training, Finland



Exploration Information System (EIS)



Training

- Conducted User Trainings:
 - August 2025:
 - SGA Conference 2025



Exploration Information System (EIS)



Training

- Conducted User Trainings:
 - October 2025:
 - Short Course Universite de Lorraine



07 October 2025

EIS Final Event

Andreas Knobloch, Beak

Exploration Information System (EIS)



Training

- MinProXT Webinar:
 - October 2024 & October 2025



	Geological Survey of Canada Christopher Lawley (Research Scientist) Steve Zhang (Research Scientist) Julie Bourdeau (Research Scientist) Mohammad Parsa (Research Scientist) natural-resources.canada.ca
	Geological Survey of Finland (GTK) Johanna Pesonen (Senior Scientist, Information Solutions Unit) Bijal Chudasama (Research Scientist, Information Solutions Unit) Maarit Middleton (Associate Professor, Information Solutions Unit) www.gtk.fi
	Beak Consultants GmbH Andreas Knobloch (Geologist, Managing Director) www.beak.de

Exploration Information System (EIS)



Future Outlook

- EIS Transition:
 - Open Source!
 - Further development of software
 - Bugfixes and updates
 - Improvements GUI and manual
 - Additional tools
 - Development of business strategy
 - Training
 - Maintenance
 - Consulting

- Targeted Users:



GSEU
GEOLOGICAL SERVICE FOR EUROPE



EuroGEO



Thank you!



Andreas Knobloch



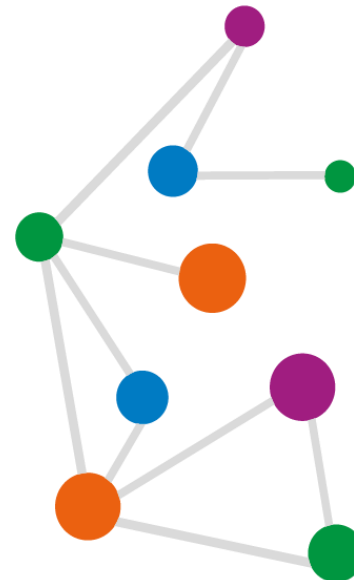
Beak Consultants GmbH



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www.eis-he.eu



EIS

Exploration
Information
System



**Funded by
the European Union**

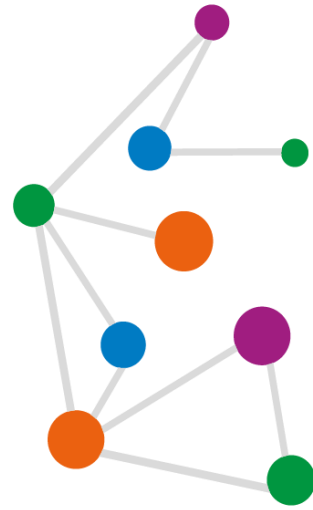


Guillaume Bertrand (BRGM)

EIS Selected Test Case Studies

EIS Overview & Results

9:40 – 10:40



EIS

Exploration
Information
System

« Real world » testing of the EIS tools

EIS Final Event

October 7th 2025, Brussels, Belgium



Funded by
the European Union

EIS test case studies

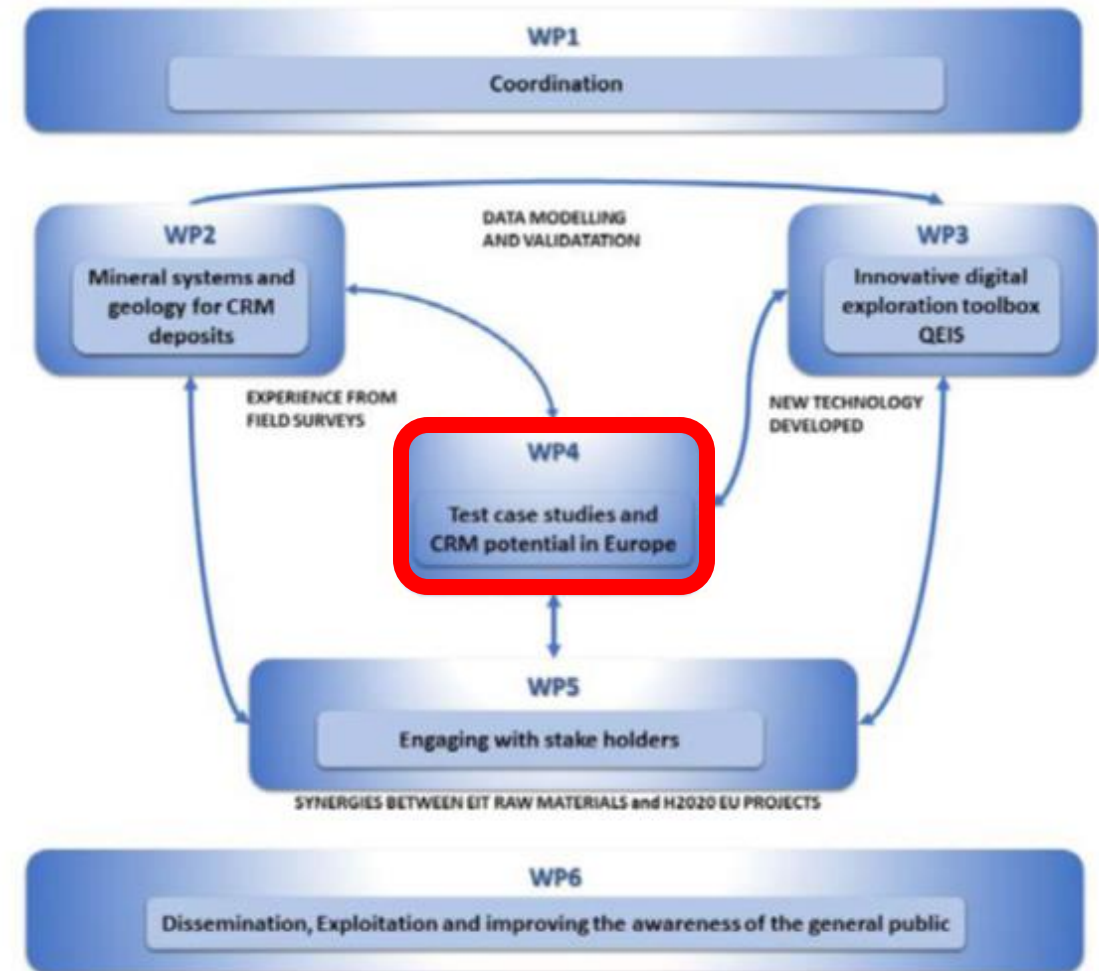


Operational testing and application of the EIS tools and the mineral systems models:

- Co-base metal in VMS systems
- Li-Sn-ta-W in granite/pegmatite-related systems
- REE-Co minerals in IOCG systems

The goals:

- Test the EIS tools and mineral systems to confirm their technical viability and scientific pertinence;
- Provide feedbacks to EIS developers to improve the tools;
- Refine mineral system models whenever needed;

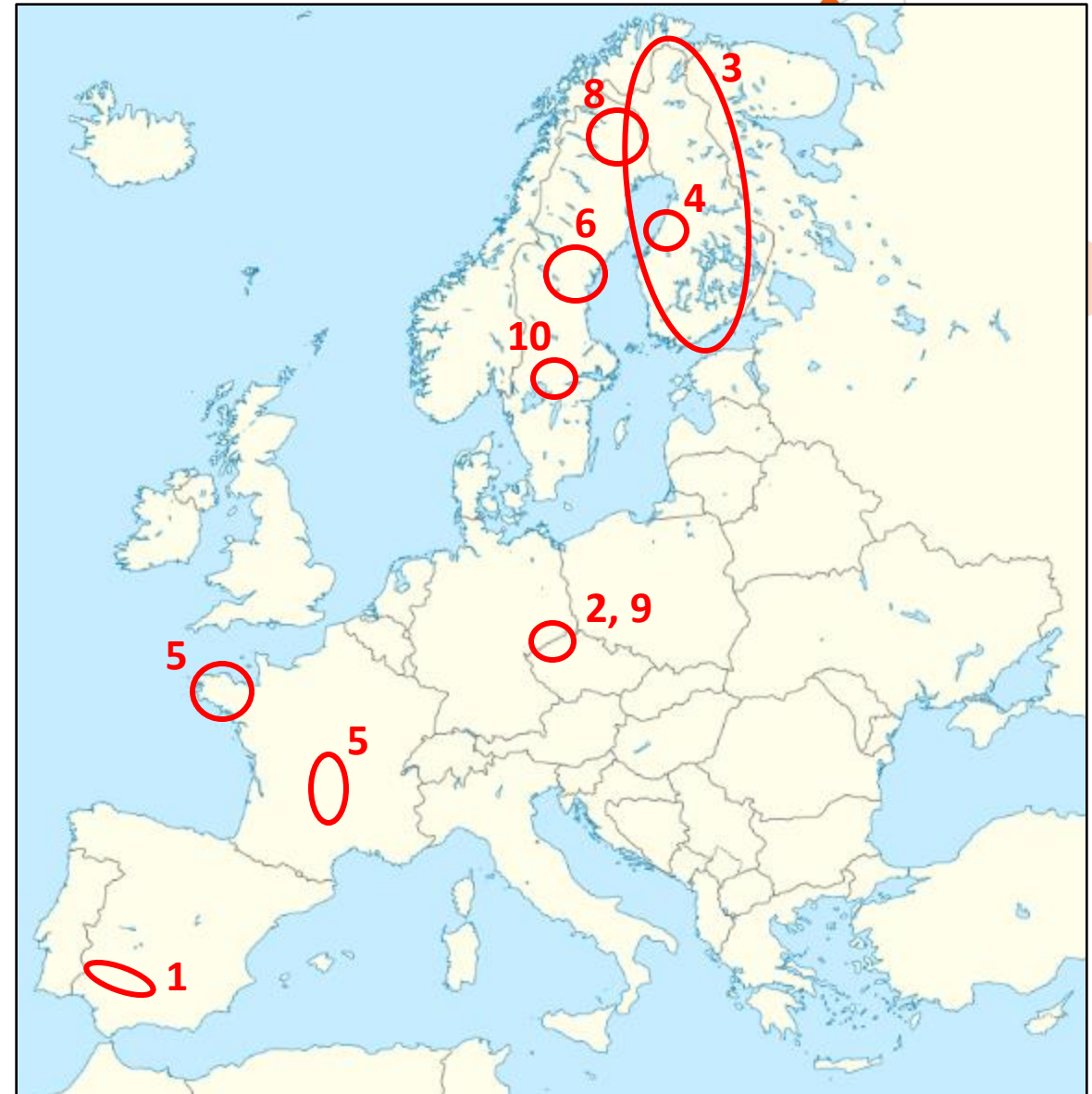


WP4 – test case studies



10+ test case studies:

- **Co-base metal in VMS systems :**
 1. Elvira & Las Cruces, Spain (CSIC);
 2. Tisova-Klingenthal, Czechia & Germany (GoldenPET);
 3. VMS in Finland (GTK);
- **Li-Sn-ta-W in granite/pegmatite-related systems :**
 4. Central Ostrobothnia, Finland (GTK);
 5. French Variscan Massifs, France (BRGM);
 6. Västernorrland, Sweden (SGU);
 7. Orange River, South Africa (UFS);
 8. Aero Li project, Norrbotten, Sweden (Talga);
 9. Erzgebirge, Czechia & Germany (Zinwald Lithium);
- **REE-Co minerals in IOCG systems :**
 10. Bergslagen, Sweden (SGU);



WP4 – test case studies



Overviews in the following slides

- **Co-base metal in VMS systems :**

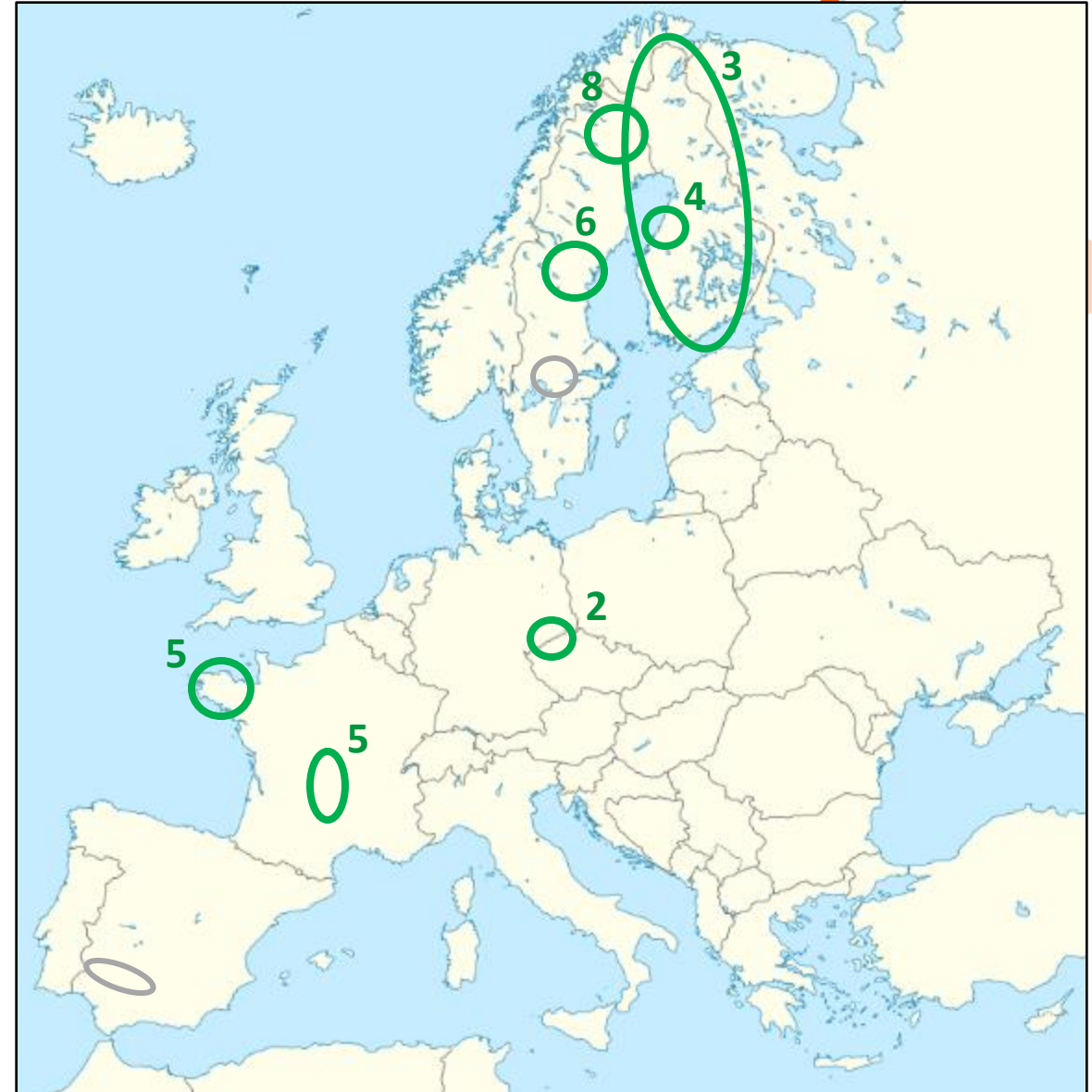
1. Elvira & Las Cruces, Spain (CSIC);
2. Tisova-Klingenthal, Czechia & Germany (GoldenPET);
3. VMS in Finland (GTK);

- **Li-Sn-ta-W in granite/pegmatite-related systems :**

4. Central Ostrobothnia, Finland (GTK);
5. French Variscan Massifs, France (BRGM);
6. Västernorrland, Sweden (SGU);
7. Orange River, South Africa (UFS);
8. Aero Li project, Norrbotten, Sweden (Talga);
9. Erzgebirge, Czechia & Germany (Zinwald Lithium);

- **REE-Co minerals in IOCG systems :**

10. Bergslagen, Sweden (SGU);



Tisová-Klingenthal (GoldenPET)

Overview

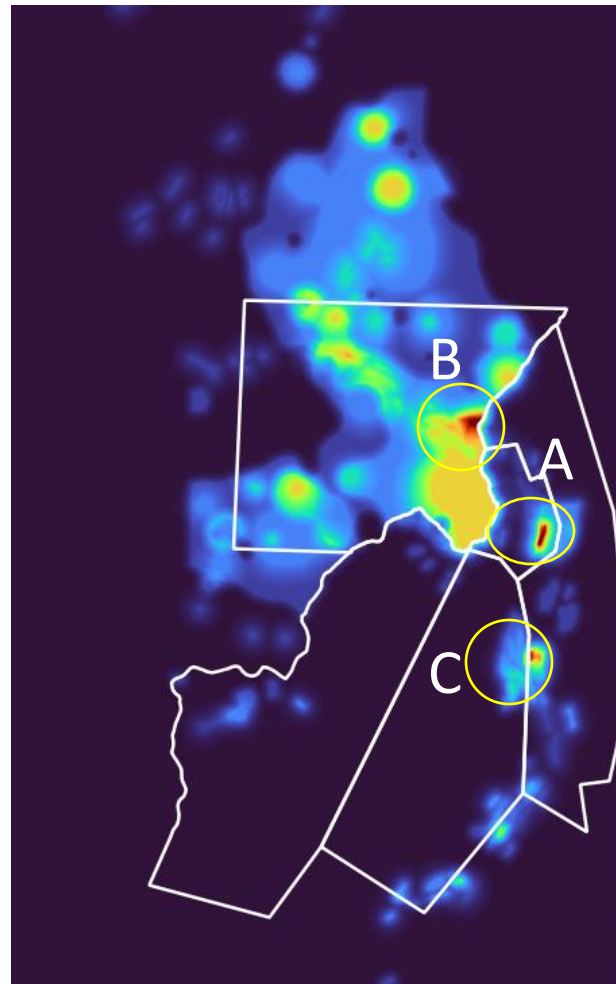
- Czechia-Germany border;
- Prospect-scale;
- VMS-related system (Besshi-type SEDEX);

Modelling

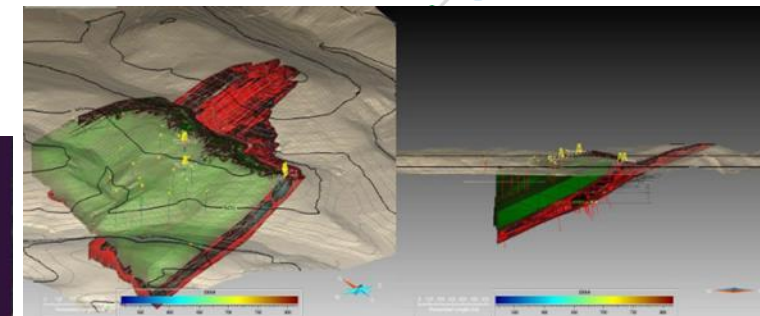
- Input data: Buffered Metabasalt Lithologies, Cu and Zn anomalies, no training data (FL);
- Fuzzy Logic: 3 high anomalies identified, either expected (A) or surprising (C);

Additional sampling on the 'B' anomaly

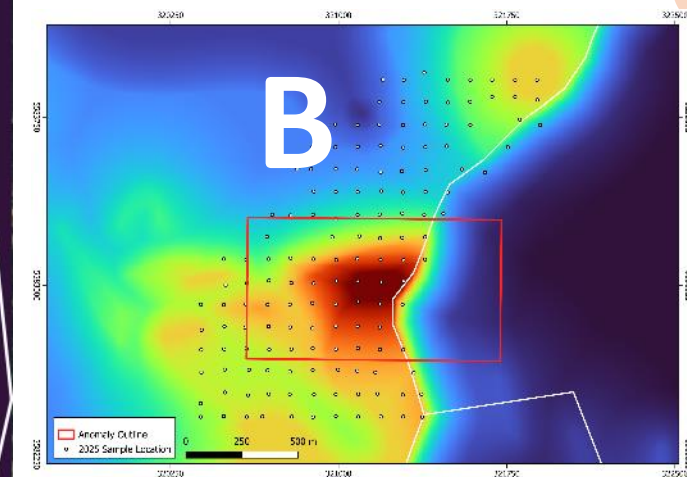
- 145 soil geochemistry samples were collected in March 2025;
- Analyses completed;



Fuzzy Logic model displayed with Tisova-Klingenthal License boundaries. Three anomalies circled (A, B, C)



Geologic model of the Tisova Deposit, metabasites in green, mineralized units in red



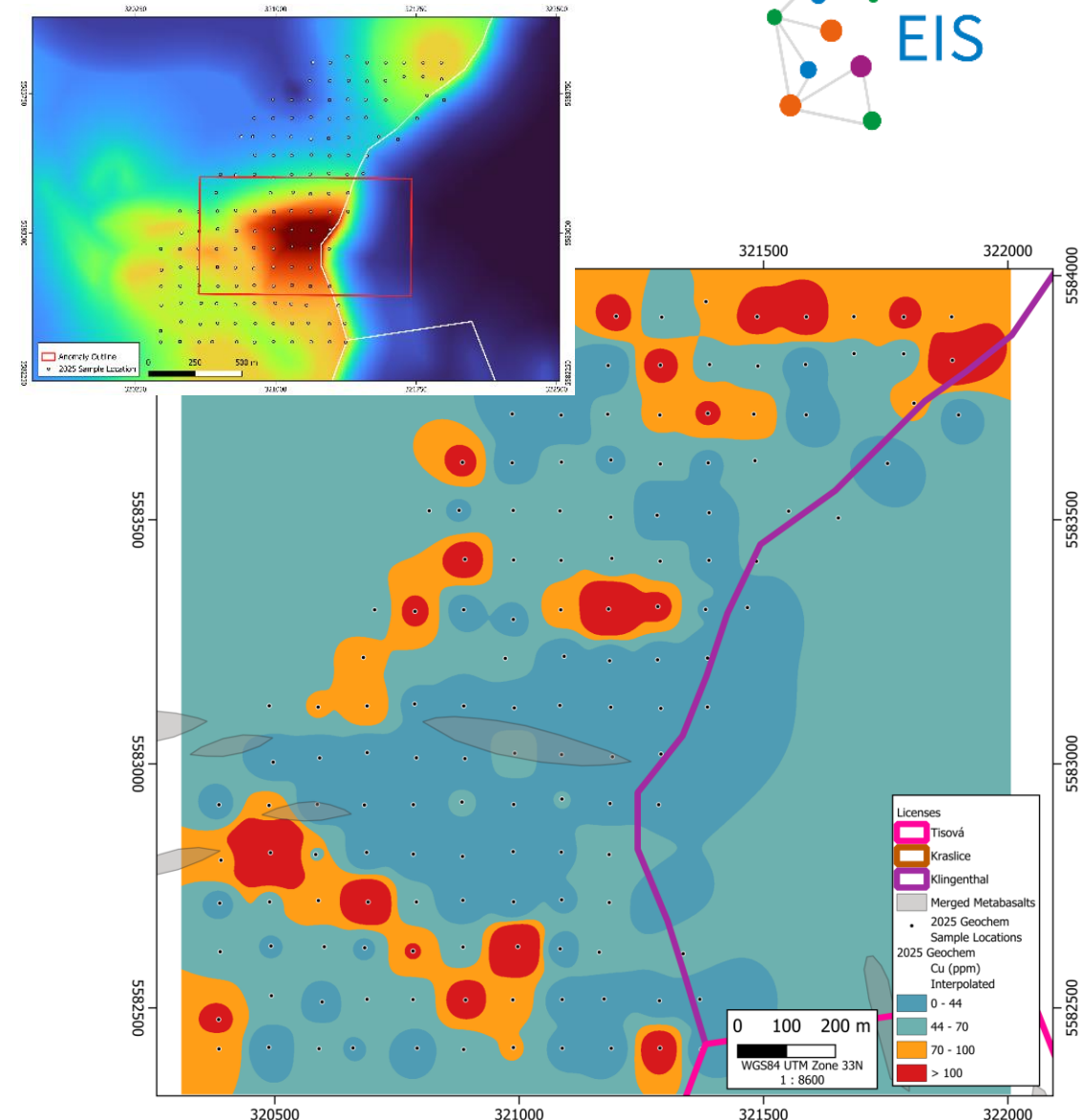
Tisová-Klingenthal (GoldenPET)

Additional Sampling – Significance

- Results from the 2025 geochemical survey did not confirm the 'B anomaly' area;
- ... but neighboring Cu values warrant further investigation to assess their significance.

Main highlights

- Successful test of EIS tools for VMS-type mineral system;
- **Prospect-scale testing in operational exploration project;**
- **Field control of FL models (geochem. sampling), which results help refine models (positive loop);**
- **Benchmarking with the Advangeo modelling software;**
- Peer-reviewed publication submitted;



Interpolated Cu values from 2025 soil sampling. Cu grade intervals consistent with what was used during the initial modelling process.

VMS in Finland (GTK)

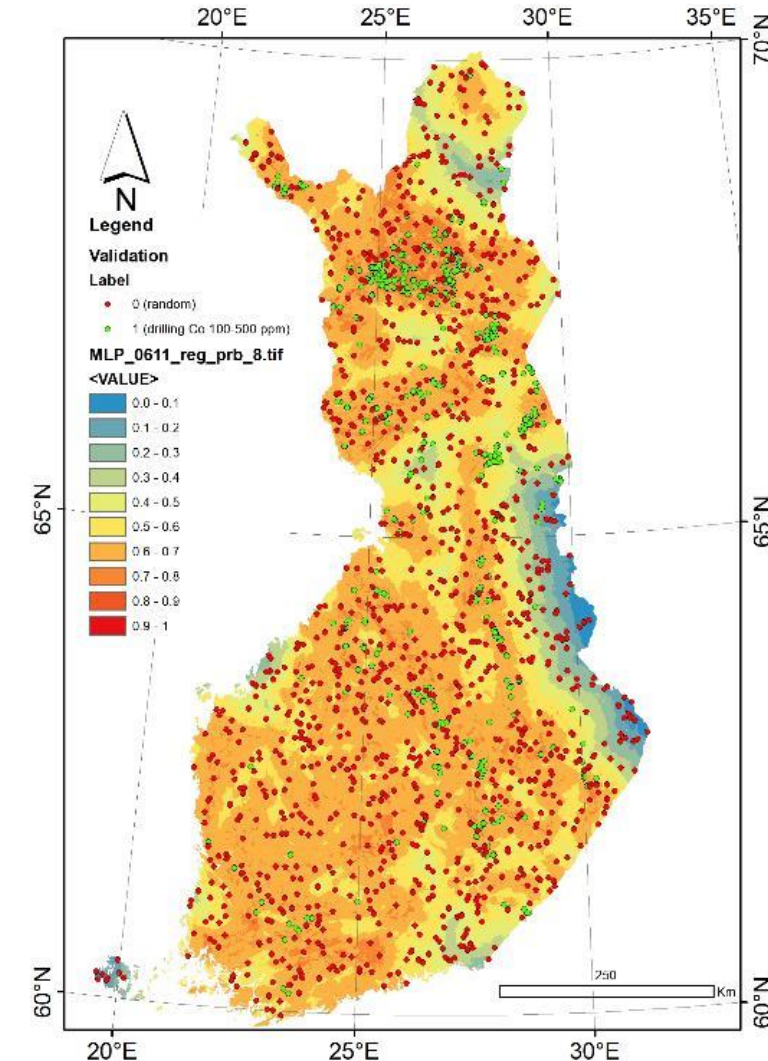
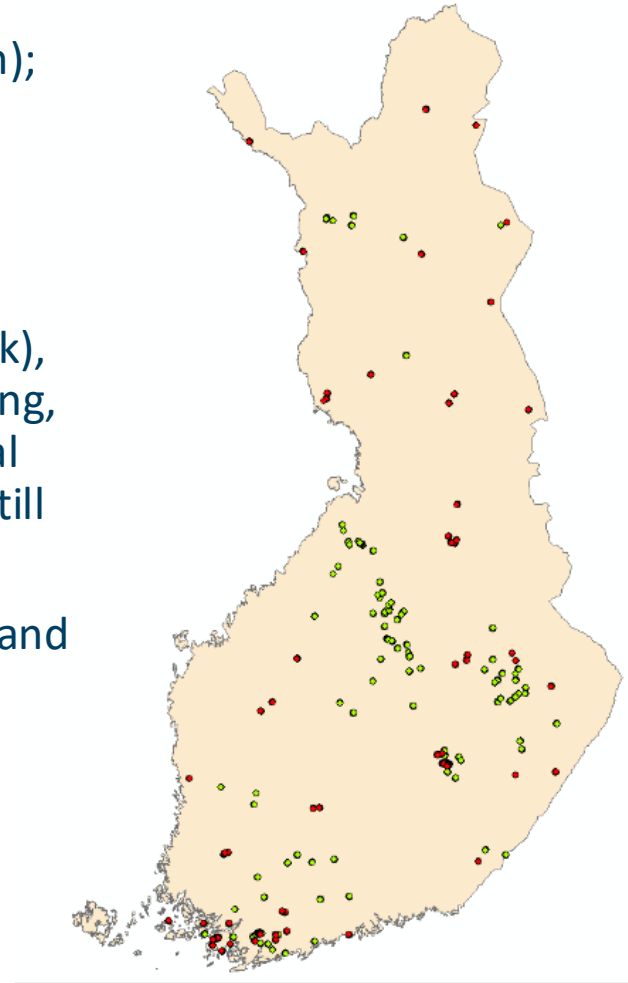


Overview

- Finland (entire land cover);
- Country scale , very high resolution (100x100 m);
- Precambrian VMS deposits in northeastern Fennoscandian Shield:

Modelling

- Large and diversified data: bedrock map (1:200k), high-res. airborne geophysics (200 m line-spacing, 40 m terrain clearance, multi-element), regional ground gravity survey/Gravity worms, regional till geochemistry survey (Co, Cu, Zn)
- FL, RF and GB prospectivity models completed and compared;

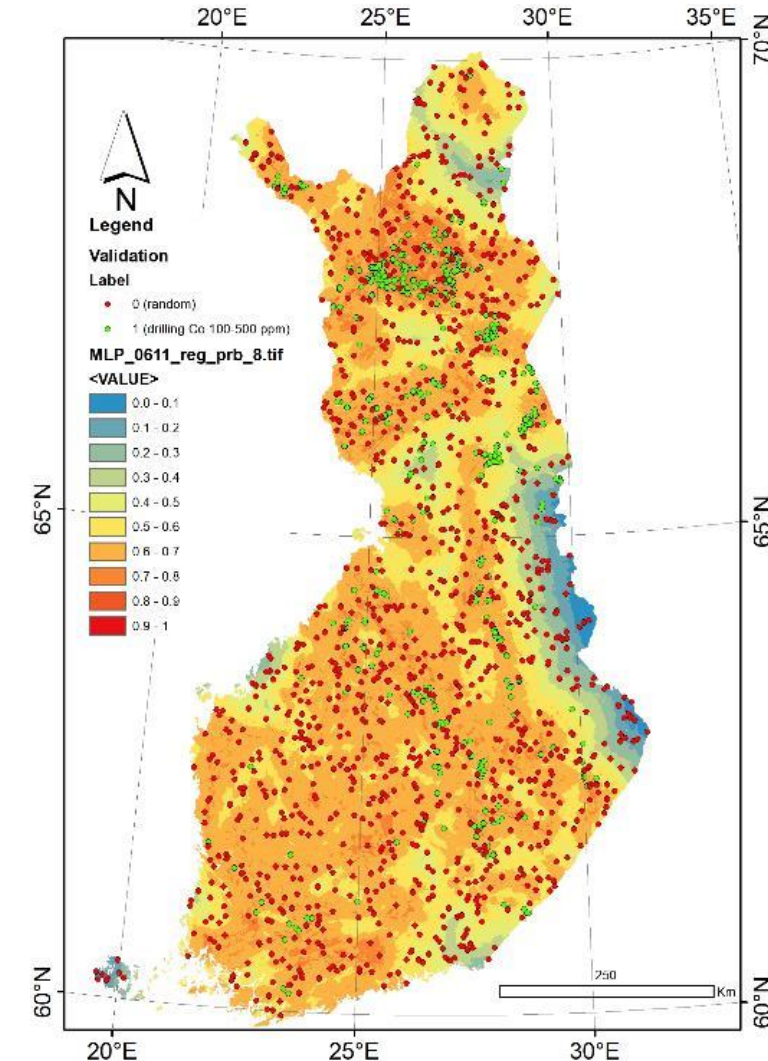
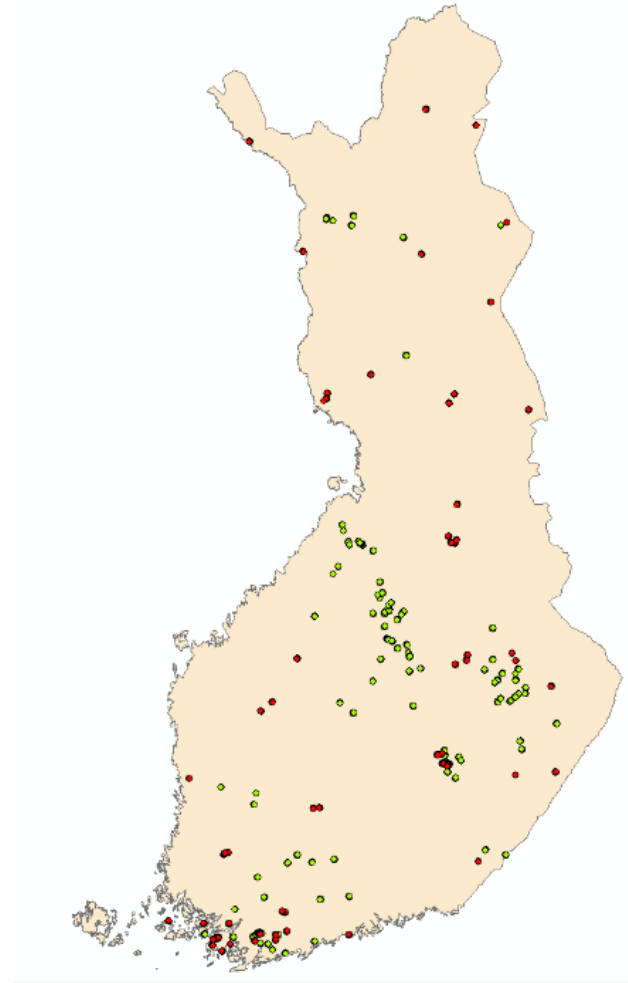


VMS in Finland (GTK)



Main highlights

- Successful test of EIS tools for VMS-type mineral system;
- **Technical capability of EIS tools to process very high-resolution models at country scale;**
- Comparison of FL, RF and GB models results and performance;
- Peer-reviewed publication submitted;



Central Ostrobothnia, Finland (GTK)



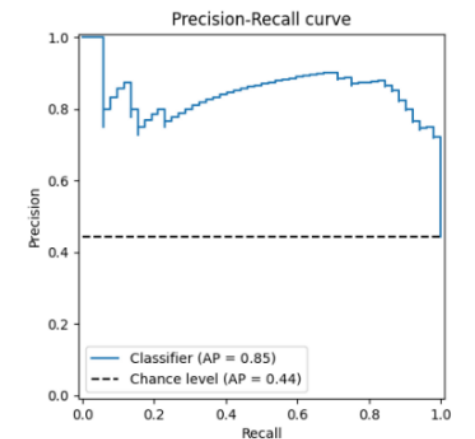
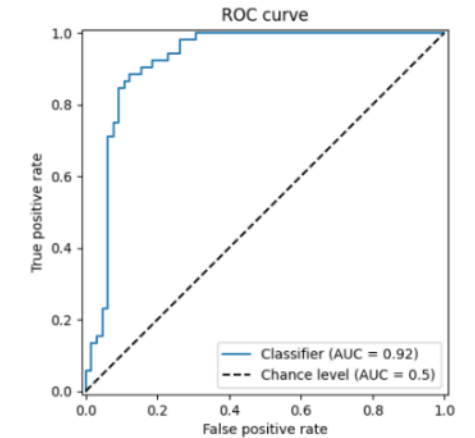
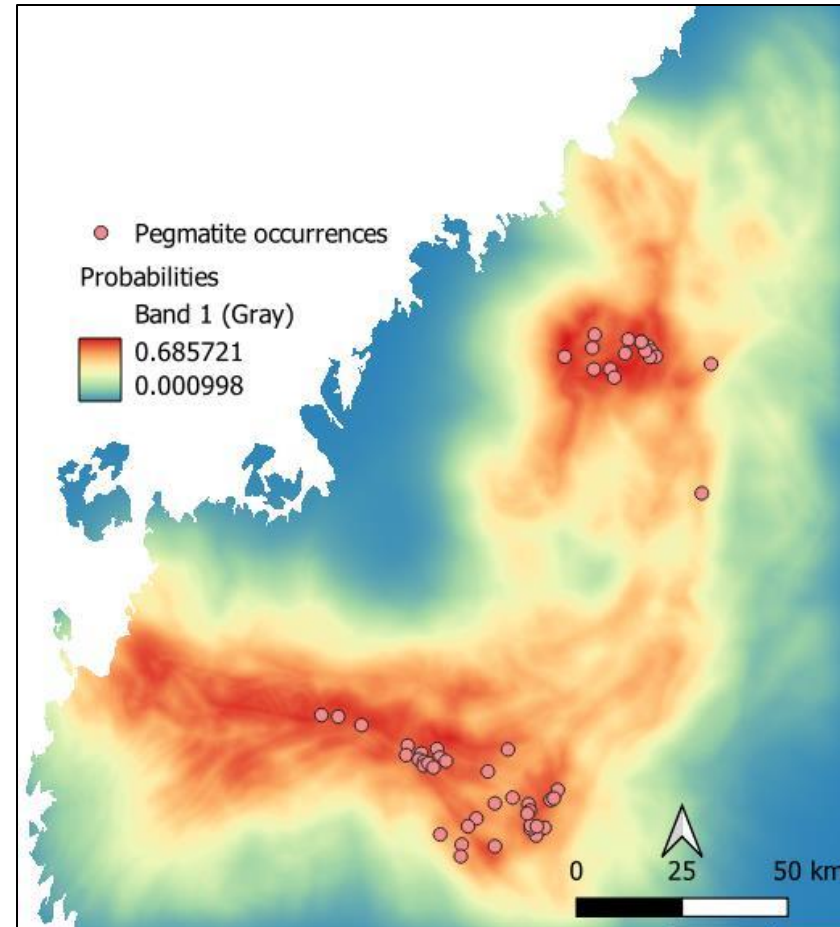
Overview

- Central Ostrobothnia Belt, Finland;
- Regional and Camp scales;
- LCT Pegmatite mineralisation type;

Modelling

- Main data: geology, lithogeochemistry, bedrock observation, tectonic structures, metamorphism, ...
- Mineral system defined and complete (proxies derived and features ranked using Feature Importance Tool);
- MPM modelling with RF, MLP and GB, although LR models were outperforming;

Regional scale Logistic Regression modelling

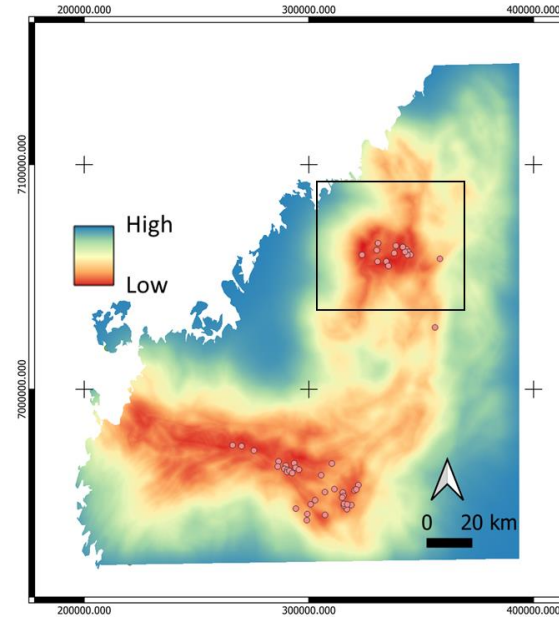


Central Ostrobothnia, Finland (GTK)

Main highlights

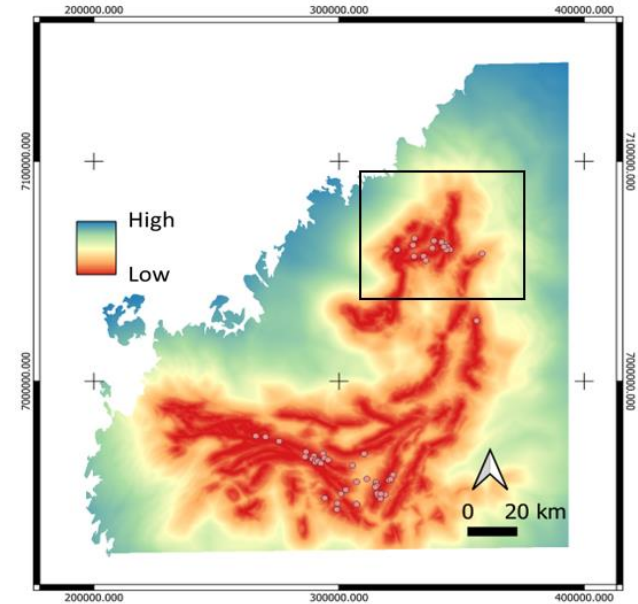
- Successful test of EIS tools for LCT-pegmatite; mineral system in EIS Wizard;
- **Multi-scale testing: camp to regional;**
- Testing and benchmarking of 4 modeling methods (LR, RF, MLP, GB)
- **Positive feedback loop: Identification and ranking of the important components helped refine the LCT-Pegmatites mineral system**
- SGA 2025 Proceeding publication; Peer-reviewed publication submitted;

Logistic Regression modelling



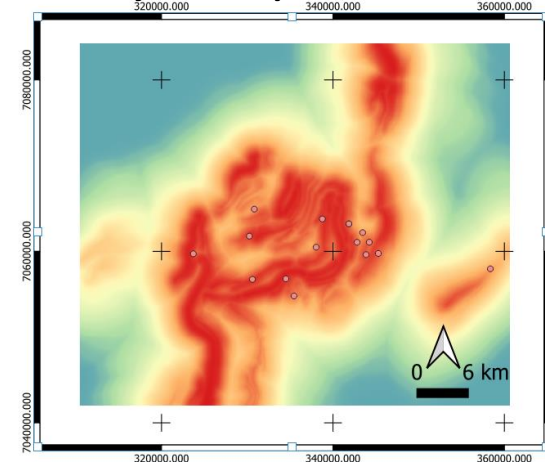
Regional scale

Multilayer Perceptron

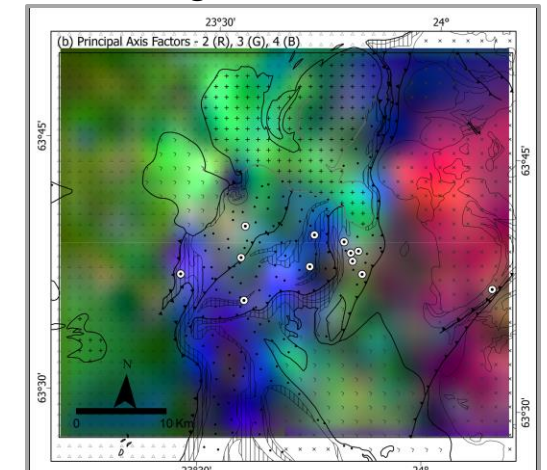


Camp scale - Kaustinen

Multilayer Perceptron



PCA-based lithogeochemical characterizations



French Variscan massifs (BRGM)

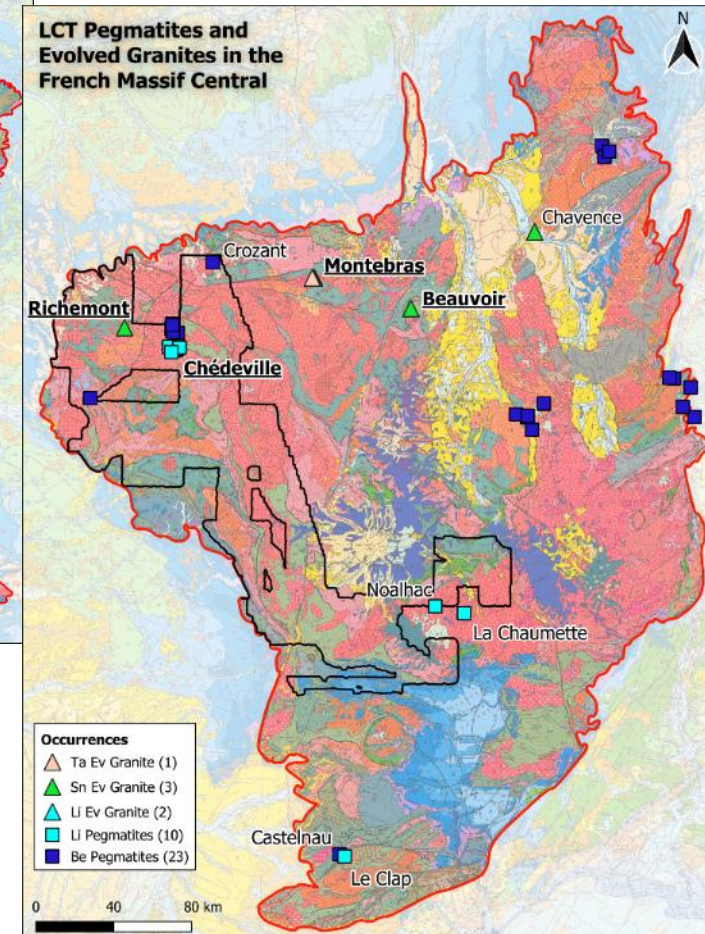
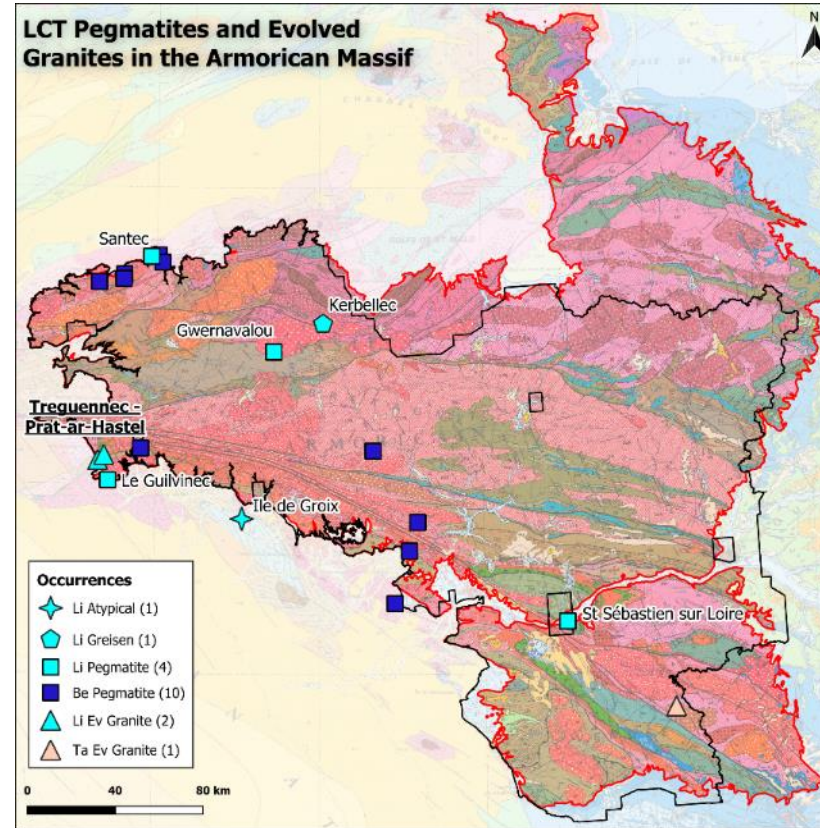


Overview

- Armorican Massif and W Central Massif (France);
- Regional scale (2 regions);
- Segments of the W Europe Variscan Belt, Li-Sn-W-Ta bearing pegmatites and granites;

Modelling

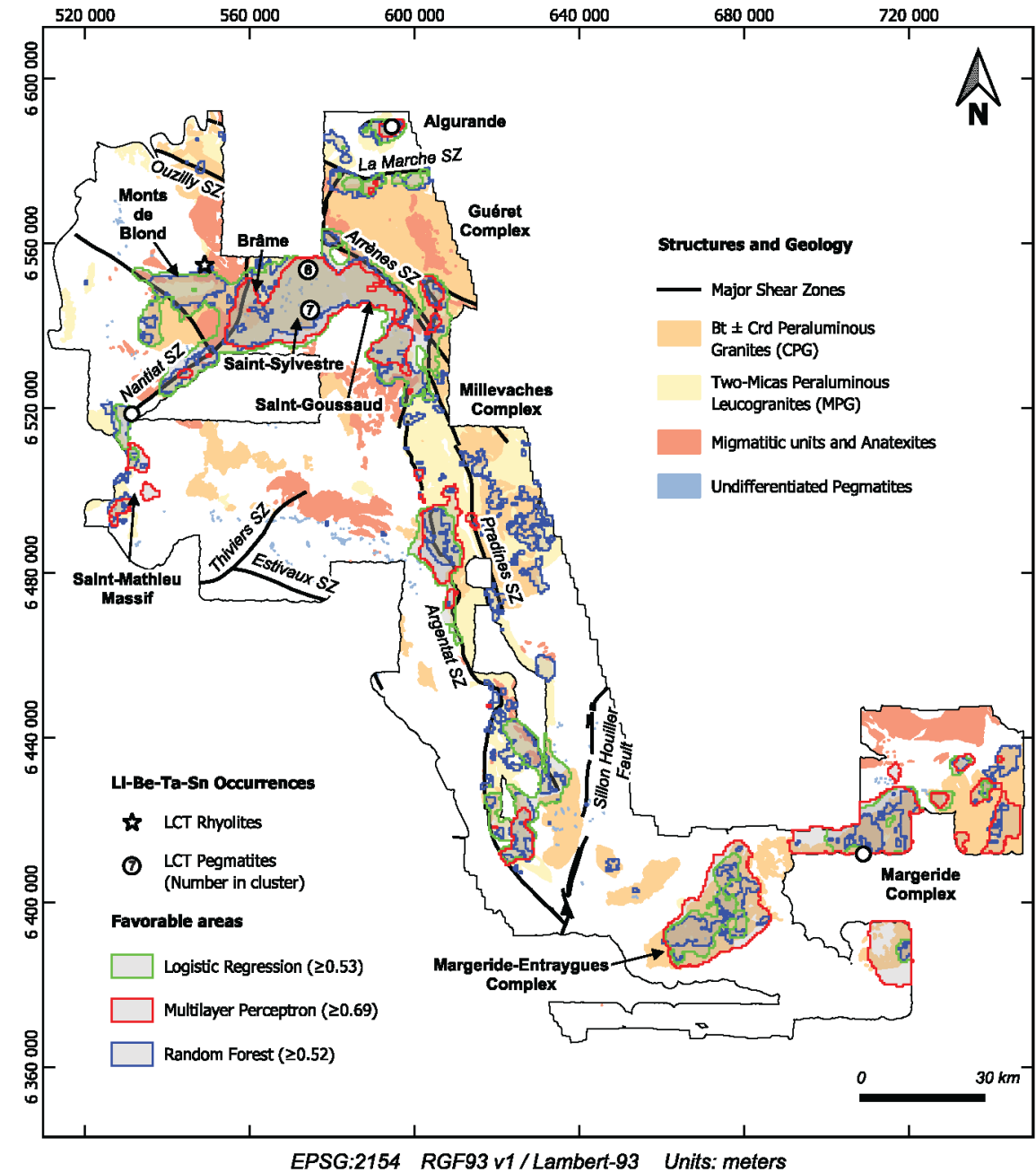
- Main data: known occurrences and deposits, 50k geological maps, radiometric data (250 m, U/Th/K), magnetic data (250 m, RTP), stream sediment analyses, gravimetry (500 m, Bouguer);
- RF, LR and MLP models completed for both areas;



French Variscan massifs (BRGM)

Main highlights

- Successful test of EIS tools for Li-Sn-W-Ta bearing pegmatites and granites at regional scale;
- **Benchmarking of modelling methods in two distinct regions with consistent datasets and EIS evaluation tools;**
- New prospective areas highlighted;
Perspective of using EIS tools to support valorizing data of the newly started French NEP (Art. 19 of CRMA);
- Peer-reviewed publication submitted;



Comparison of predictive maps produced using EIS plugin for the FMC

Orange River, South Africa (UFS)

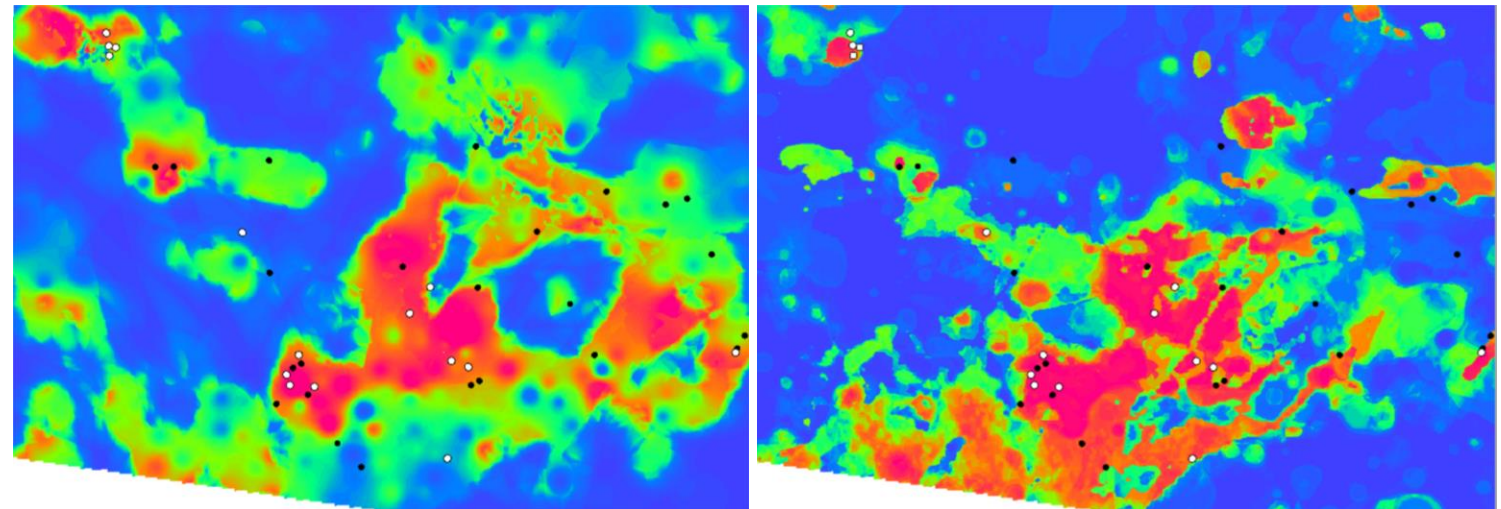
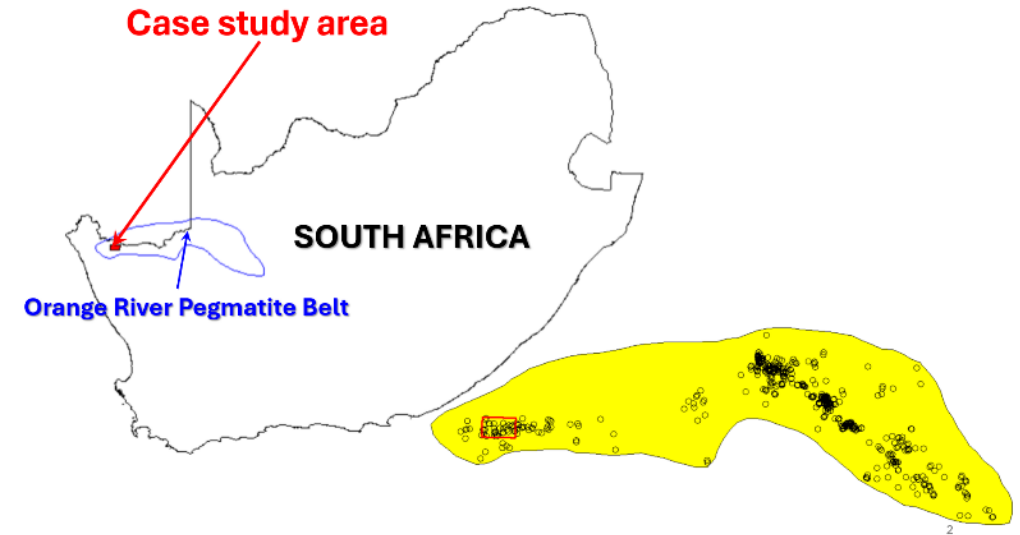


Overview

- Western South Africa;
- District-scale;
- Pegmatite-related Li mineralization in the W Orange River pegmatite belt.

Modelling

- Main data: geological map, airborne magnetic and radiometric data, ASTER images, multi-element soil geochemistry;
- FL and RF modeling completed;



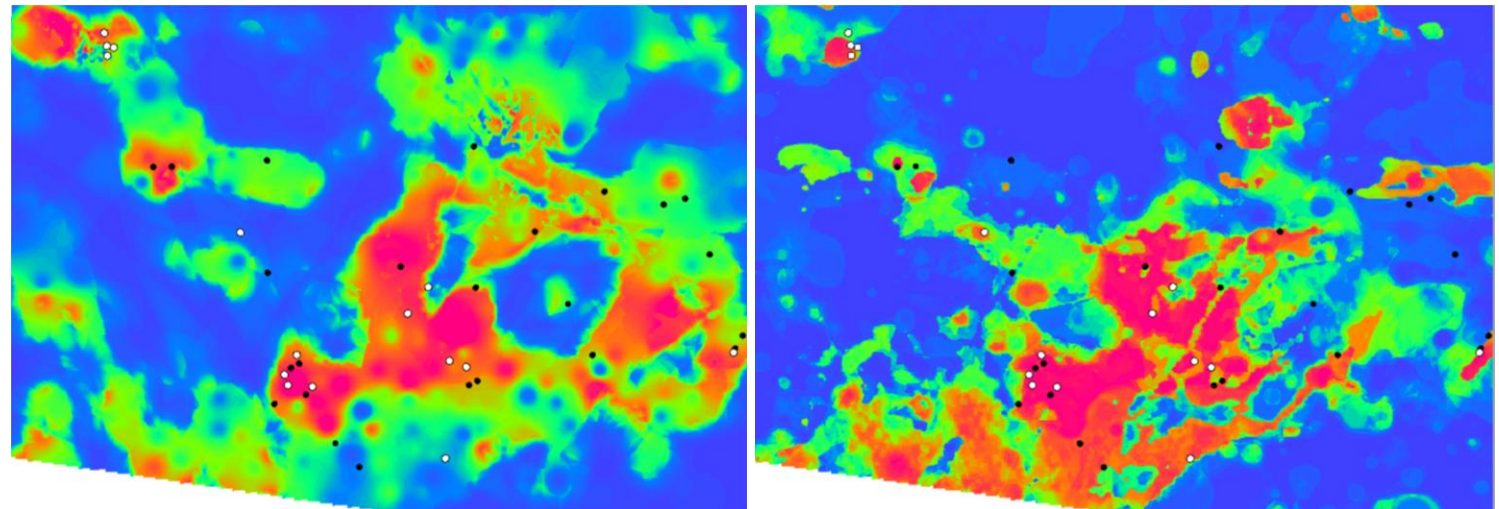
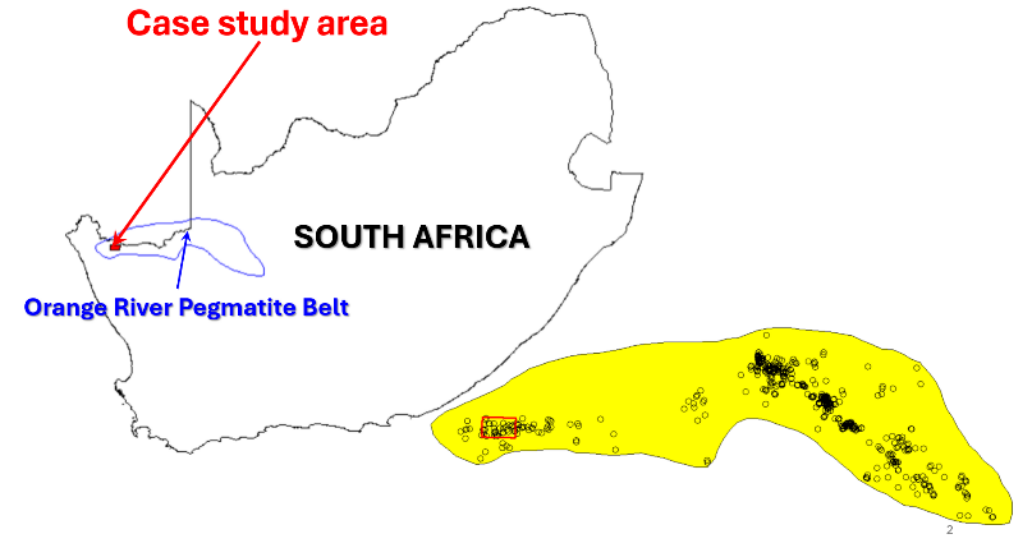
Prospectivity for Li-bearing pegmatites: fuzzy logic model (left), random forest model (right). White dots = pegmatite quarries. Black dots = pegmatite occurrences

Orange River, South Africa (UFS)



Main highlights

- Successful test of EIS tools on pegmatite-related Li system in extra-European geological context;
- Testing focused mainly only defining targeting criteria in the EIS, and the application of 2 machine learning tools (FL and RF);
- Results indicate usefulness of the EIS toolkit in modeling of prospectivity for LCT pegmatites in the ORPB → **New targets for exploration of LCT pegmatites in the ORPB delineated;**
- Peer-reviewed publication submitted;



Prospectivity for Li-bearing pegmatites: fuzzy logic model (left), random forest model (right). White dots = pegmatite quarries. Black dots = pegmatite occurrences

Aero Li-pegmatite project (TALGA)

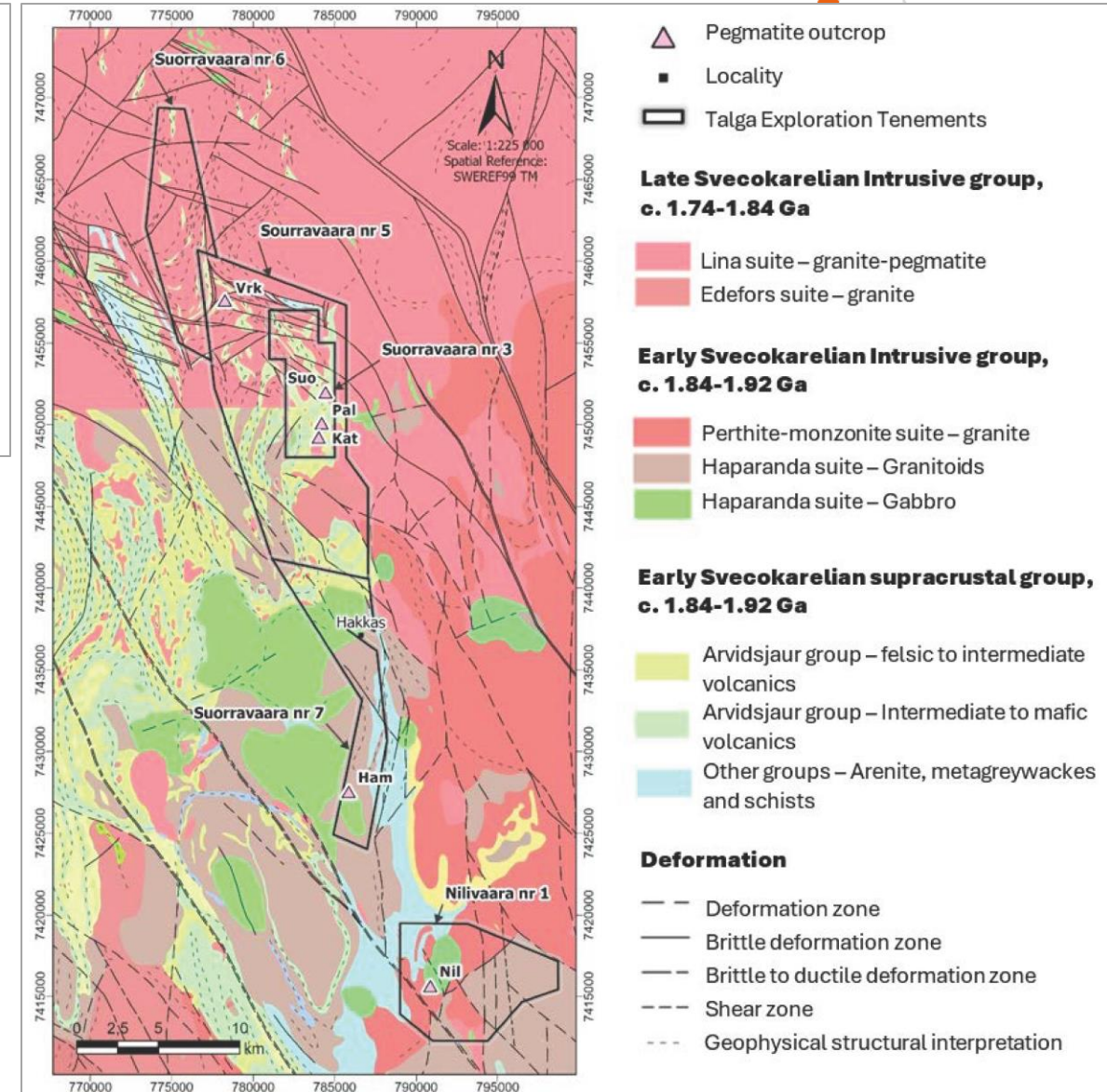


Overview

- Norrbotten (Northern Sweden), Gällivare municipality;
- Prospect scale (37x65km), 500m resolution (refining to 100m);
- LCT-pegmatite type, Svecofennian orogeny;

Modelling

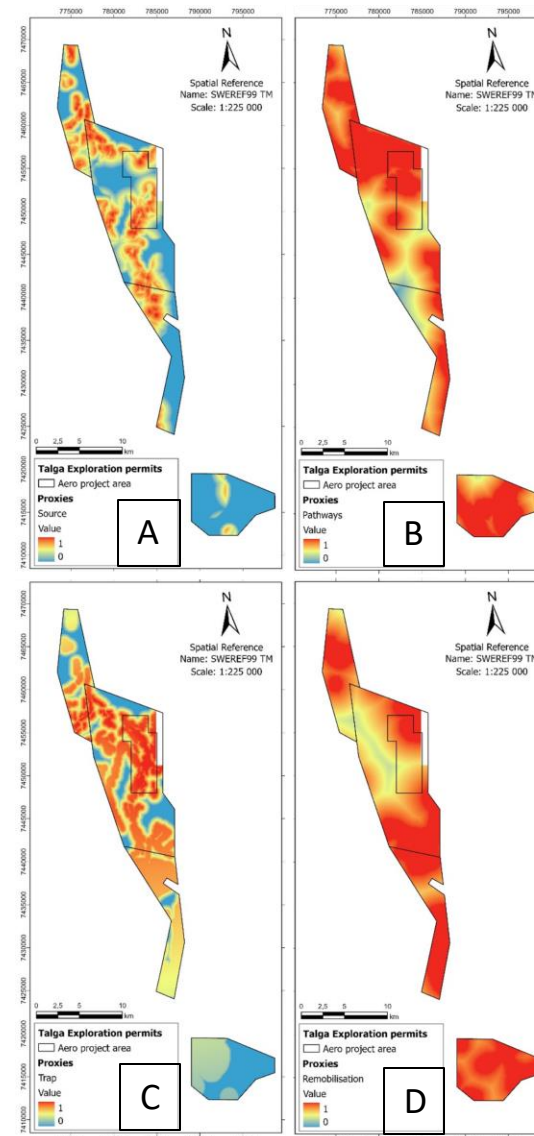
- Main data: radiometrics, structural, lithologies, gravity, magnetics, geochem (SGU); field mapping and sampling (Talga);
- Some assumptions on mineral system (early-stage exploration phase);
- FL modeling (no training data at that scale)



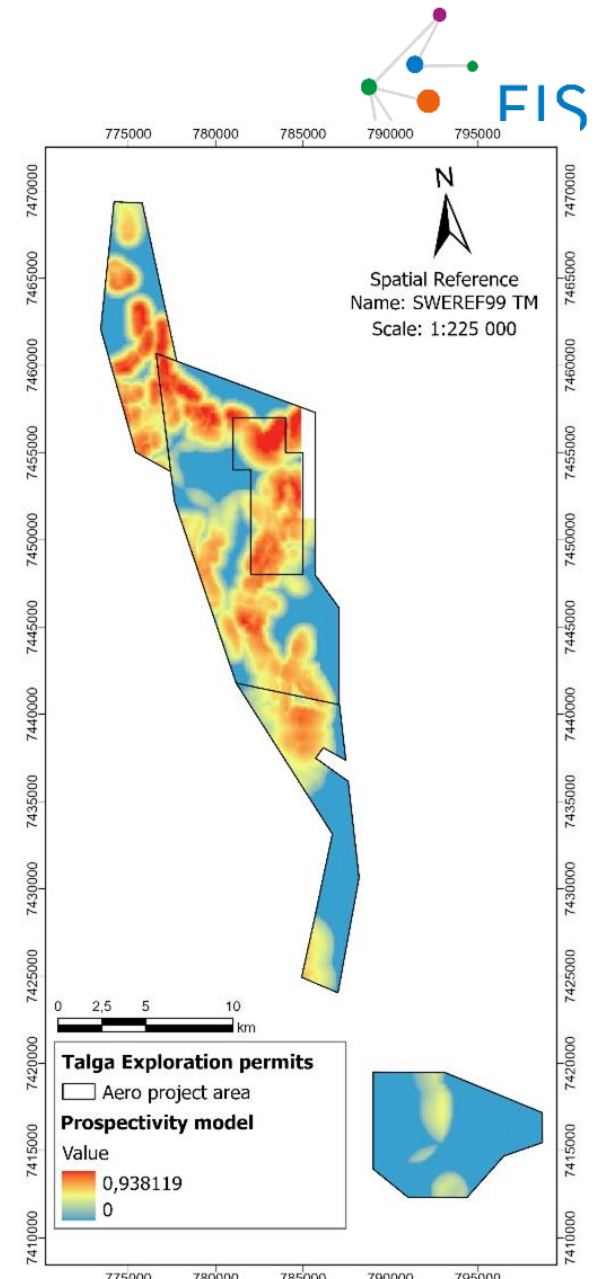
Aero Li-pegmatite project (TALGA)

Main highlights

- Successful test of EIS tools for LCT pegmatite-type mineral system;
- **Prospect-scale testing in operational exploration project;**
- **Several prospectivity anomalies were identified and will be investigated in future exploration activities;**
- Peer-reviewed publication submitted;



Proxies: A: Source, B: Pathways, C: Trap, D: Remobilisation



Fuzzy Logic Prospectivity model of Aero

REE line-Bergslagen (SGU)

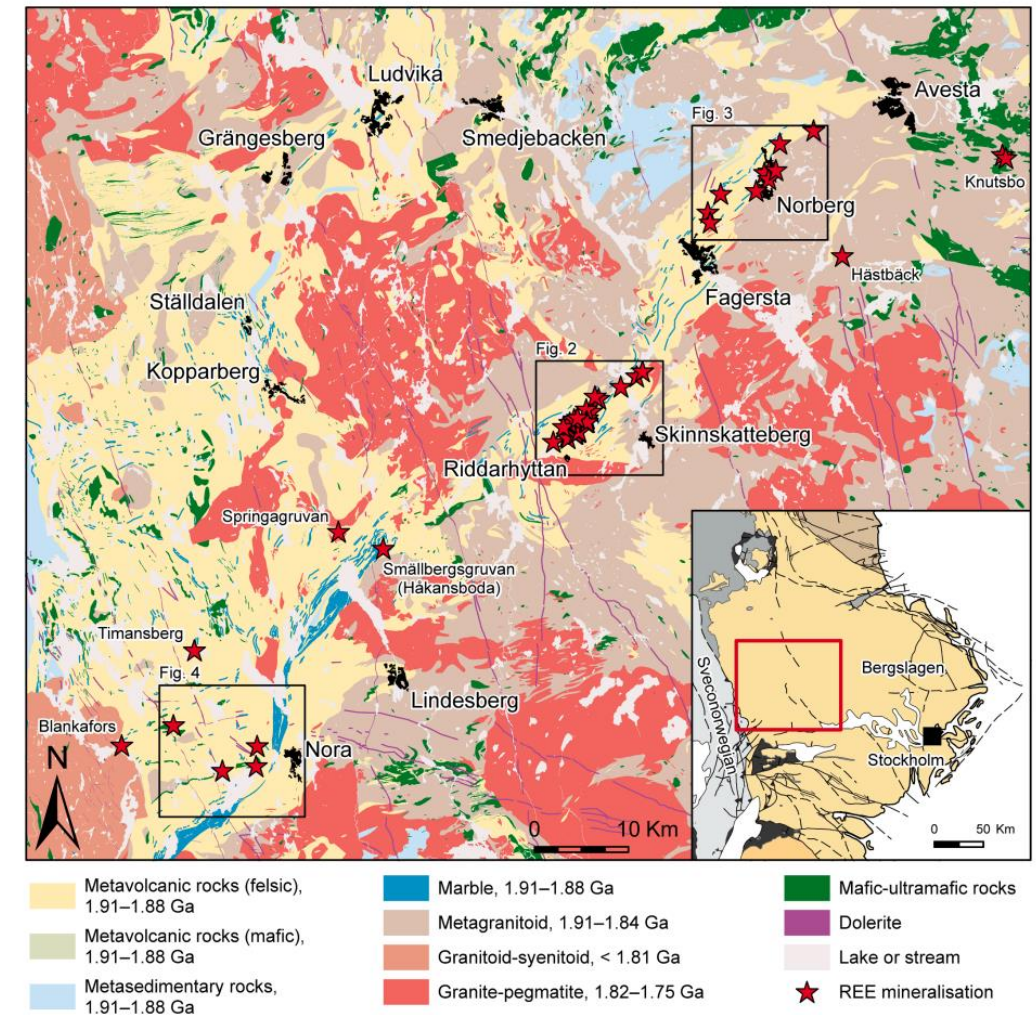


Overview

- Bergslagen region, southern Sweden;
- Regional scale;
- REE-mineralization in IOCG-related polymetallic skarn-type deposits (Fe-Cu±Co,Bi,Au).

Modelling

- Main data: granite age layer, mafic to ultramafic layer (source); 1:100 000 linear structures, geophysical magnetic anomalies (Active pathway), K-Mg-Ca-Fe-Na alteration, carbonate and volcanic rocks (Trap)
- FL, LR, RF and WofE models completed and compared;



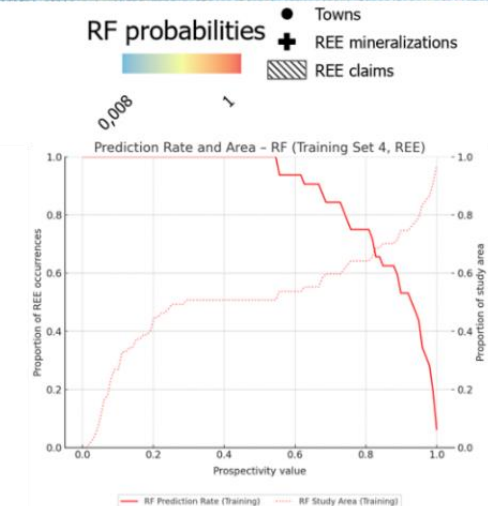
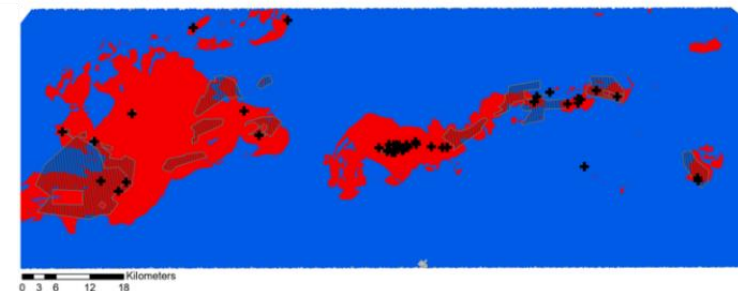
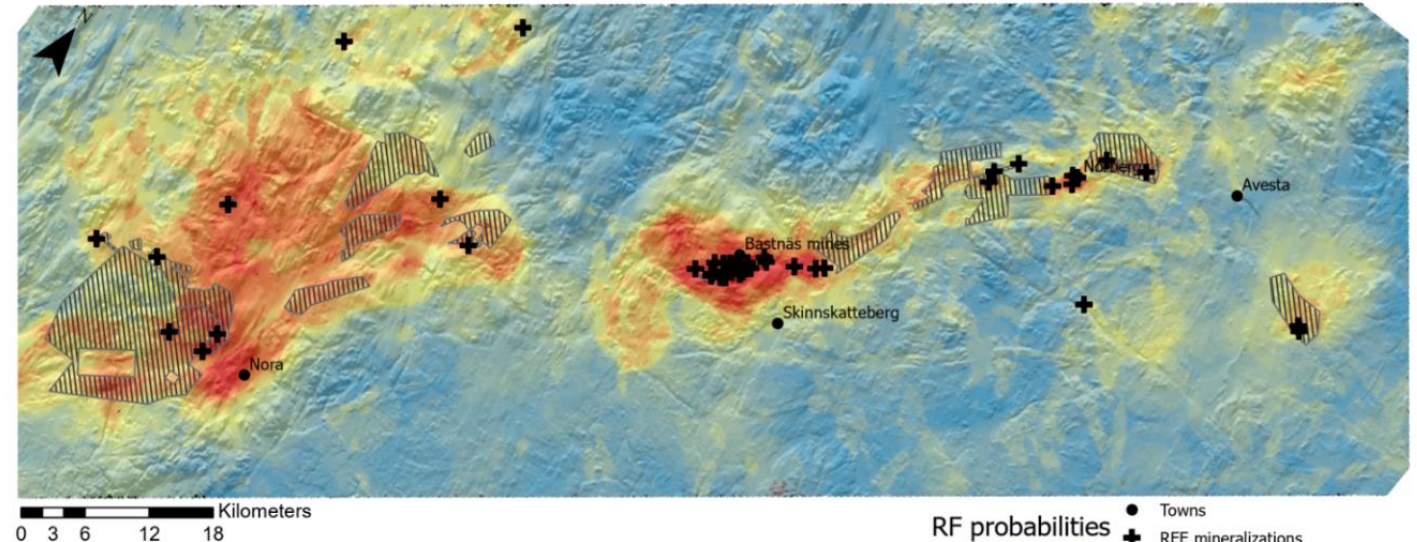
Map of Bergslagen focusing on the region surrounding the REE-line, with key REE mineralized areas within the squares. From Andersson et al. (2024)

REE line-Bergslagen (SGU)



Main highlights

- Successful test of EIS tools for IOCG-related systems at regional scale;
- Mineral system published in peer-reviewed journals (Sadeghi et al., 2023, Andersson et al. 2024, Casey et al., 2024);
- Testing and benchmarking of several modelling methods;
- **New prospective areas defined, possibly in support to NEP;**
- Peer-reviewed publication submitted;



Conclusion



- 10+ case studies have been completed, with various types and formats of data, in various geological contexts;
- They cover all 3 types of deposits, all scales (camp to country), all available modelling methods and various end-users needs (private exploration, NGSos);
- Important work to compile datasets, define mineral systems, produce models, provide feedbacks and recommendations;
- Details of test case studies have been or are being published in peer-reviewed journals (high scientific footprint), syntheses in project deliverables;;
- Very positive conclusions from these test case studies :
 - EIS tools are usable for a wide range of geological contexts, scales, mineral systems and types of data;
 - The use of EIS plugin is a net positive when performing MPM: faster modelling and evaluation of models, as well as defining your own minerals system proxies and workflow → strong support to mineral exploration, in Europe and beyond;



Thank you!



Guillaume Bertrand and the WP4 team



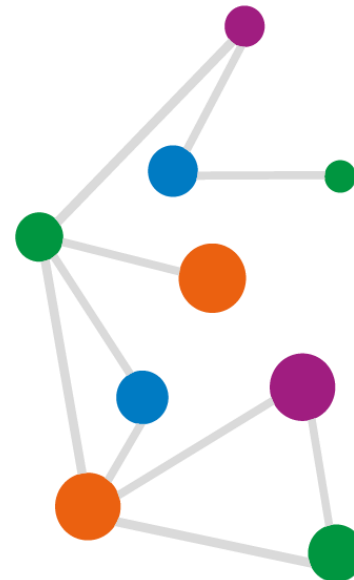
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EIS

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Q&A

EIS Overview & Results

9:40 – 10:40



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(GTK)



Tobias Bauer
(LTU)



Andreas Knobloch
(Beak)



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(BRGM)