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TRADITIO ET EXCELLENTIA

Applications in modern geochemical exploration by using surface and drill hole multielement and spectral datasets

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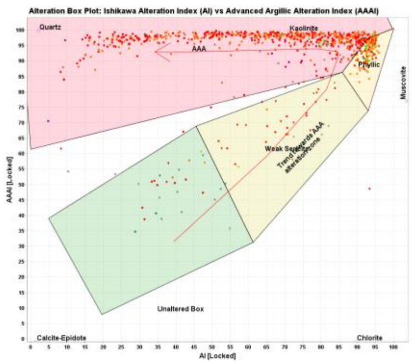
Lecture D2U2

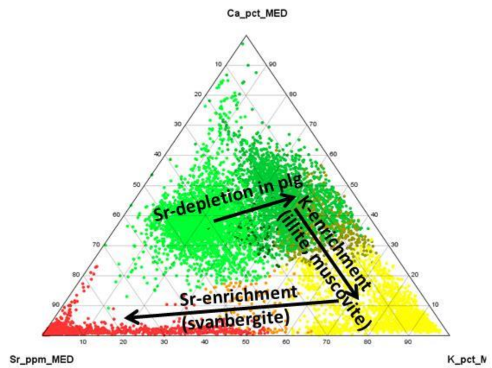
DIM ESEE

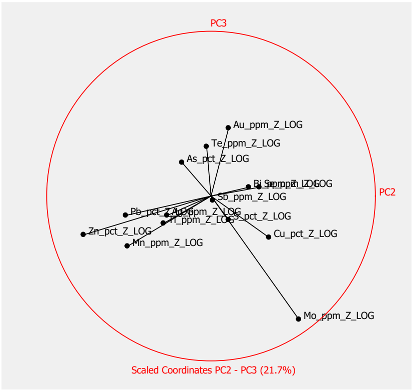
DIM ESEE 2: IMPLEMENTING INNOVATIONS

Innovation in Exploration

Dubrovnik, Croatia / hybrid mode - October 20th – 22nd, 2021





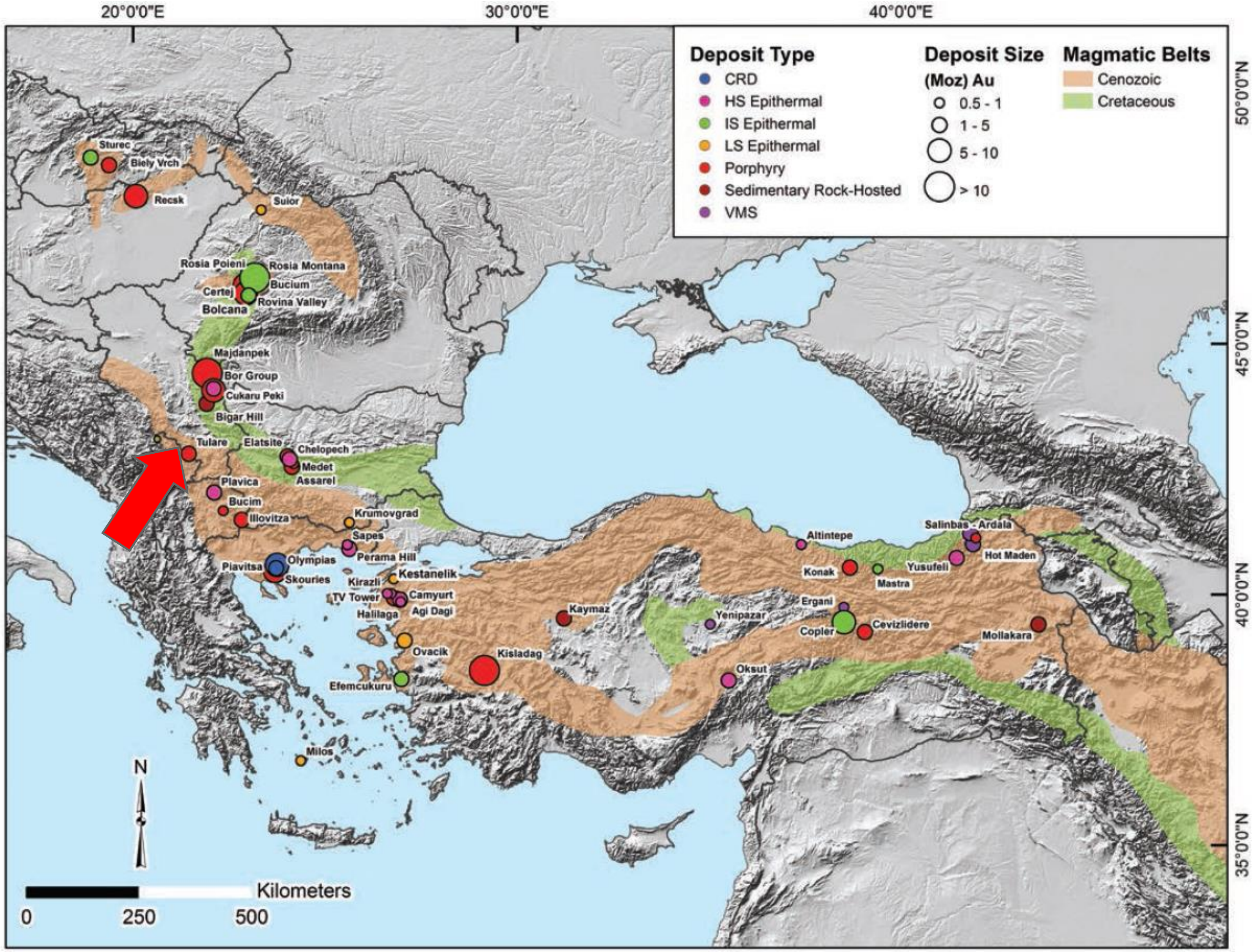


Content

The lesson aims to provide practical applications of modern geochemical exploration datasets thorough the review of real case studies focused on target generation and mineralization vectoring at various scales.
The application of widely used and accepted software tools for data analysis and interpretation (i.e., ioGAS by Reflex) and 3D integration and modelling (i.e., Leapfrog Geo by Seequent) will be demonstrated during the workflows.

1. The first case study will present a workflow on 3D data integration and modelling of prospect-scale surface and drill hole multielement and spectral datasets and vectoring for high-grade ore zones in a porphyry Cu-Au-Mo system from the Tertiary belt of the Balkans.

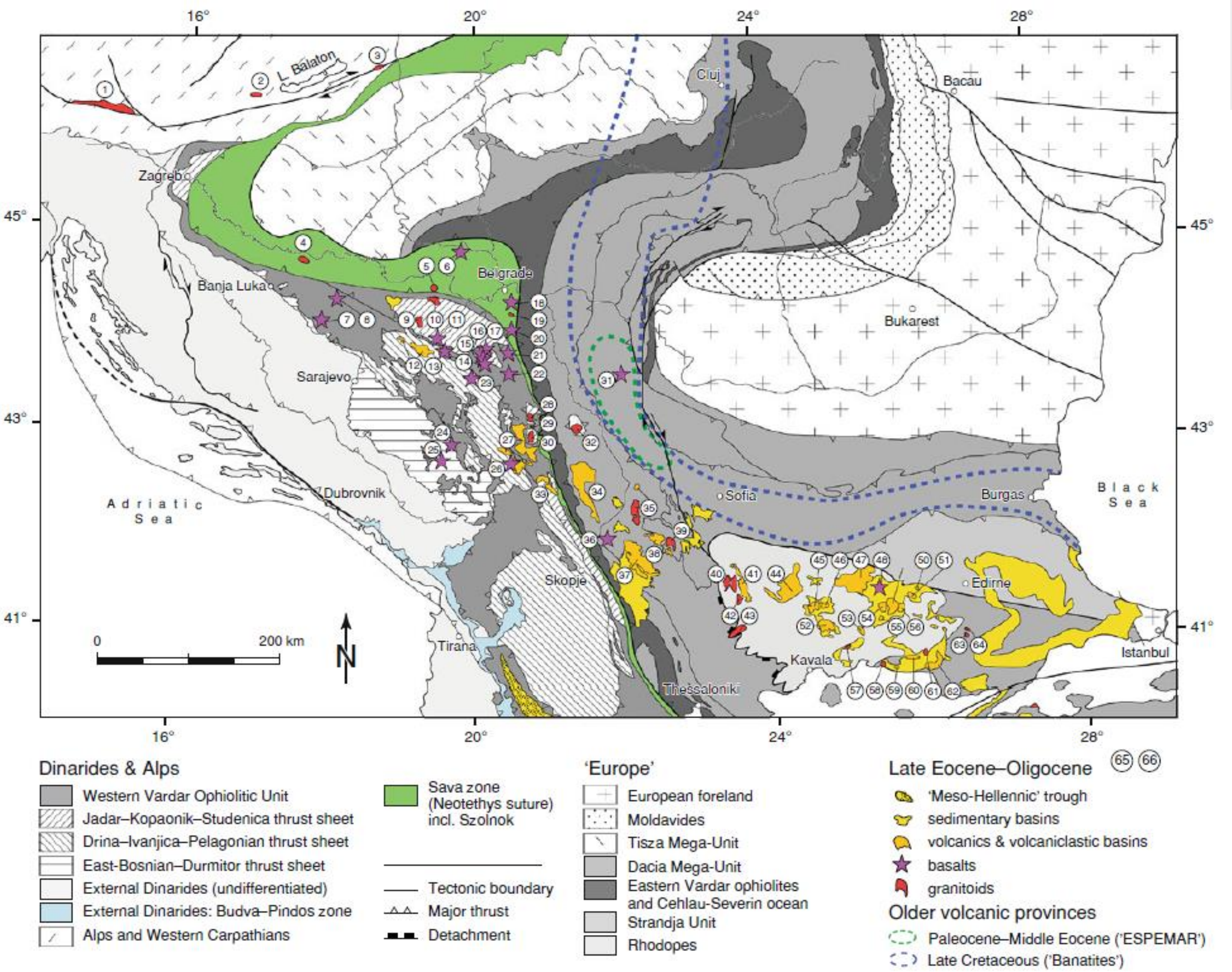
Case study I: porphyry Cu-Au mineralization in Lece magmatic complex, Serbia



Baker (2019):
Location and styles of Au deposits (>0.5 Moz Au) related to Cretaceous and Cenozoic magmatism in the Western Tethyan magmatic belt.

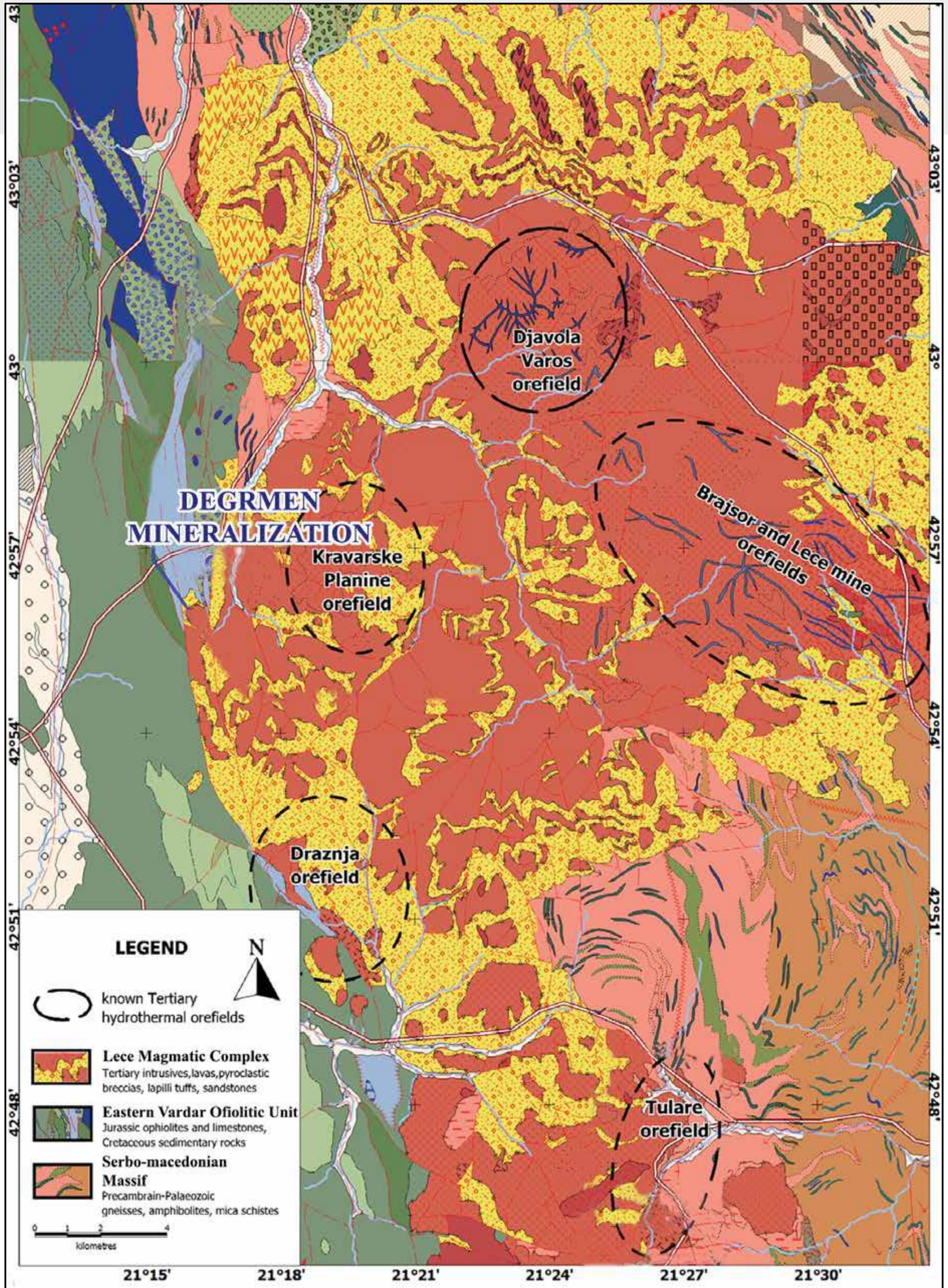
Abbreviations: CRD = carbonate replacement deposit, HS = high sulfidation, IS = intermediate sulfidation, LS = low sulfidation, VMS = volcanogenic massive sulphide.

Schefer et al, 2011: Distribution of Paleogene magmatism on the Balkan Peninsula.



Lece Magmatic Complex (LMC)

- Located in Southern Serbia.
- The LMC forms part of the Serbo-Macedonian-Rhodope province of the Tethyan Metallogenic Belt. In the Early Cretaceous period, the western part of the Eurasian plate had been a convergent margin.
- The region suffered a series of Late Cretaceous to Miocene subduction and collision events interspersed with syn- and post-orogenic extension. The basement to the Eocene-Oligocene magmatic rocks in southern Serbia is formed by the Serbo-Macedonian Massif, which is a NW-SE-oriented tectonic block situated between the Carpatho-Balkanides in the east and the Sava Suture in the west.
- The LMC is intruded into the Serbo- Macedonian Massif's metamorphic basement and the ophiolites of the East Vardar zone along the Sava Suture. The complex is characterized by lavas, breccias and lapilli tus with dacitic to andesitic composition pierced by shallow level dioritic intrusions. (Schmid et al., 2008; Ustaszewski et al., 2009; Schefer et al., 2011).

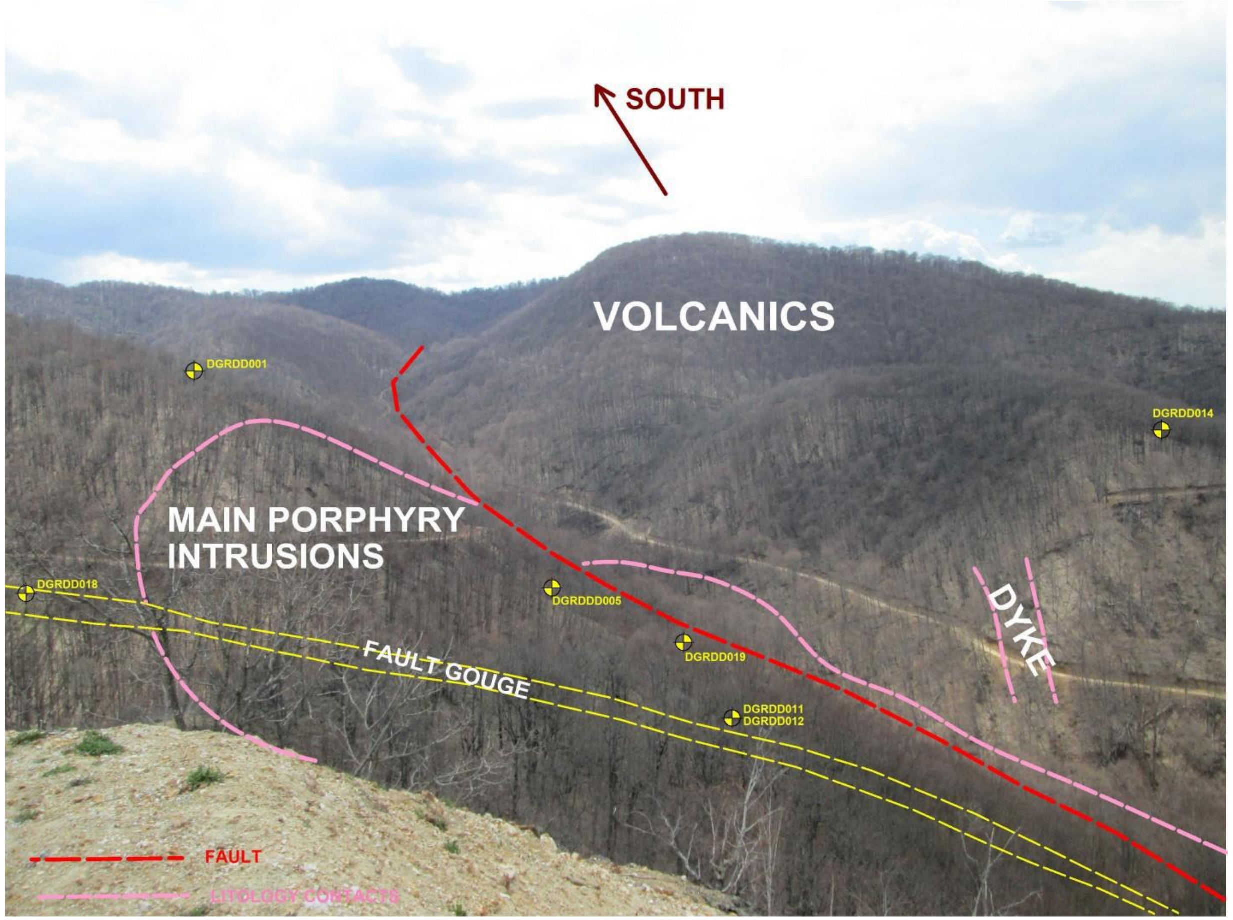


Map from Orban et al 2016

Case study I: exercise

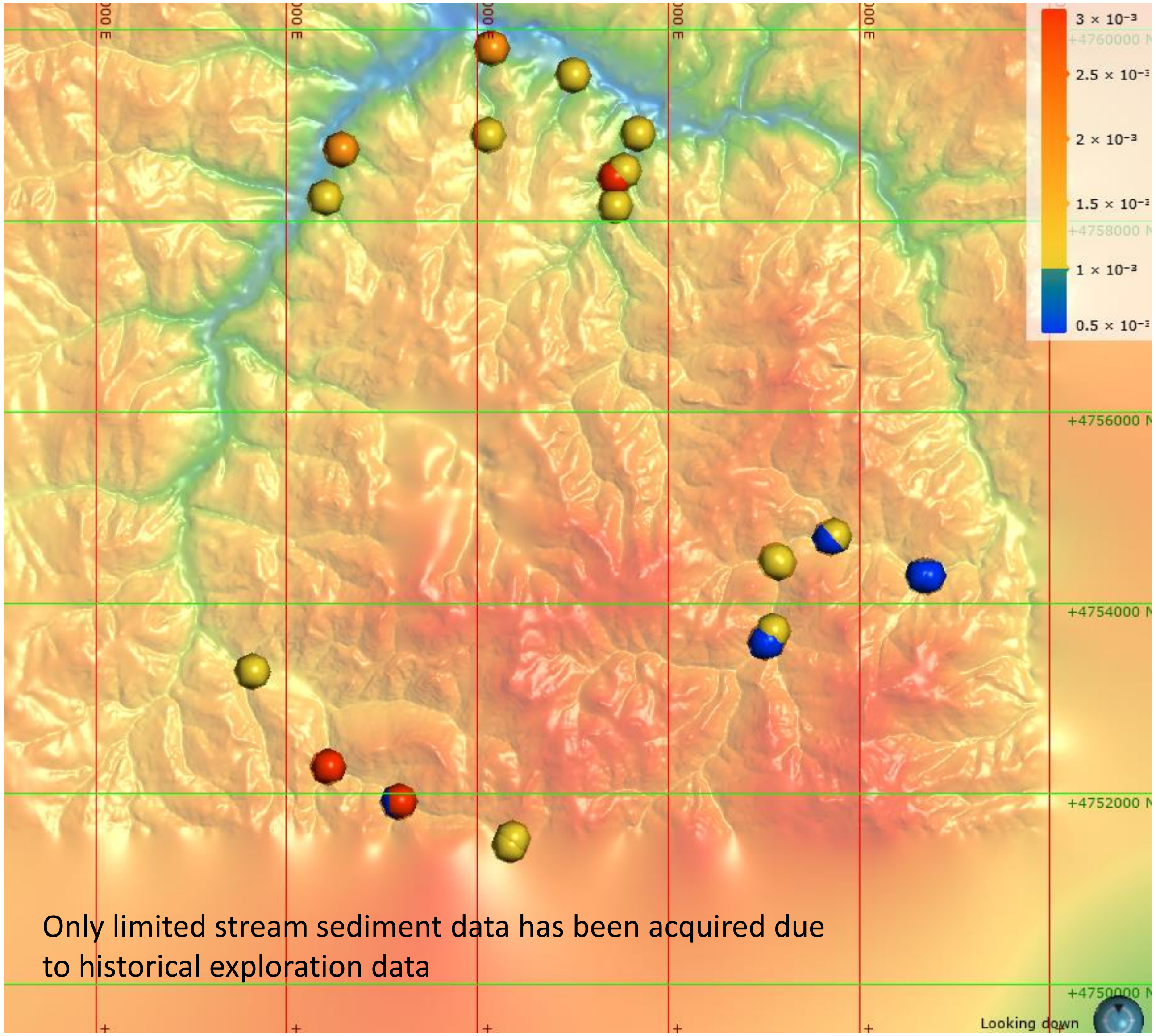
Green field exploration geochemistry work flow:

- Aim to integrate early stage surface exploration data (soil and rock sampling) in order to delineate Cu-Au porphyry mineralization and epithermal Au-Ag-Pb-Zn zones.
- Obtain alteration vectors (chalcophile zonation, lithophile zonation).
- Define drill targets in 3D
- Follow-up geochemical characterization of the drill holes, identify various paragenesis and provide exploration vectors and brief geometallurgical assessment for the area.



Case study 1: Kravarske Pl - stream sediment data

- Generally, the secondary streams were sampled. In the secondary streams the sample sites were carefully chosen, and these were not influenced by the main stream.
- The site selection criteria for representative sampling were the trap sites and each sample comprises a composite from at least four trap sites. The covered distance in the stream bed varies from 20 to 100 m especially in the small creeks where was difficult to find suitable trap sites for sampling and sometimes the sample comprises the composite from up to 10 trap sites.



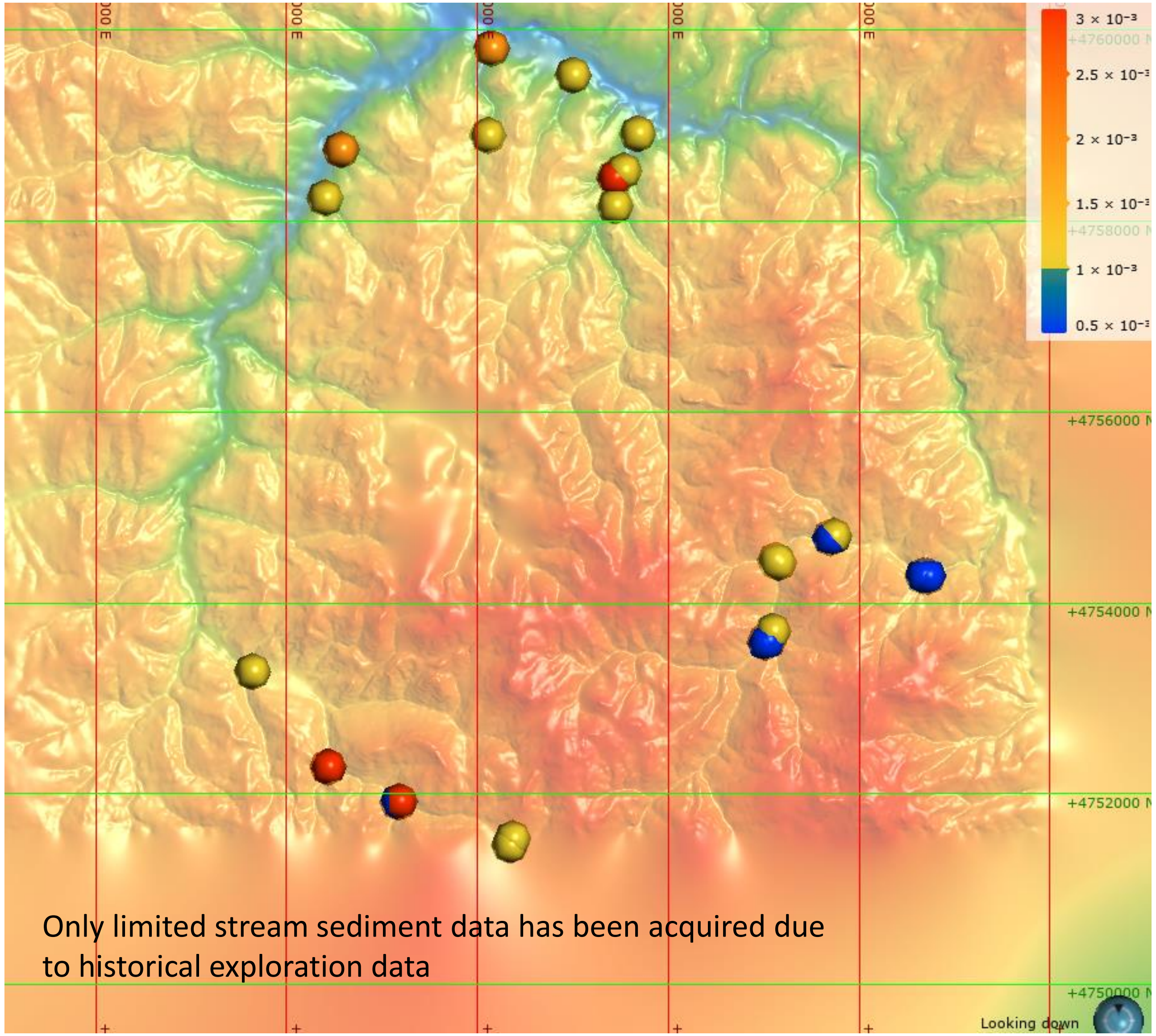
Only limited stream sediment data has been acquired due to historical exploration data

Case study 1: Kravarske Pl - stream sediment data

- The sampling procedure involved the following steps:

1, Selection of at least four trap sites suitable for sampling;
2, Pictures were taken about the trap sites and the general environment;
3, The trap sites were sampled collecting up to 20 kg bulk sample;
4, Using the 35 mesh (0.5 mm) sieve the coarse grained fraction was removed;
5, With the 80 mesh (0.177 mm) sieve the fine grained fraction was removed;
6, The sample was left to settle for 10-15 minutes to be able to recover the very fine grained material;
7, The samples were collected which passed through the 80 mesh sieve. The bulk weight of each collected sample has at least 400 g. The volume percentage of these three different fractions was estimated on the field.

- To test the variability in the field and the sampling precision, two field duplicates were taken in the central area. The samples were collected from one point upstream and the duplicate downstream in the same area. This procedure is considered to give better response to verify the variability in the field and the precision of the sampling procedure.



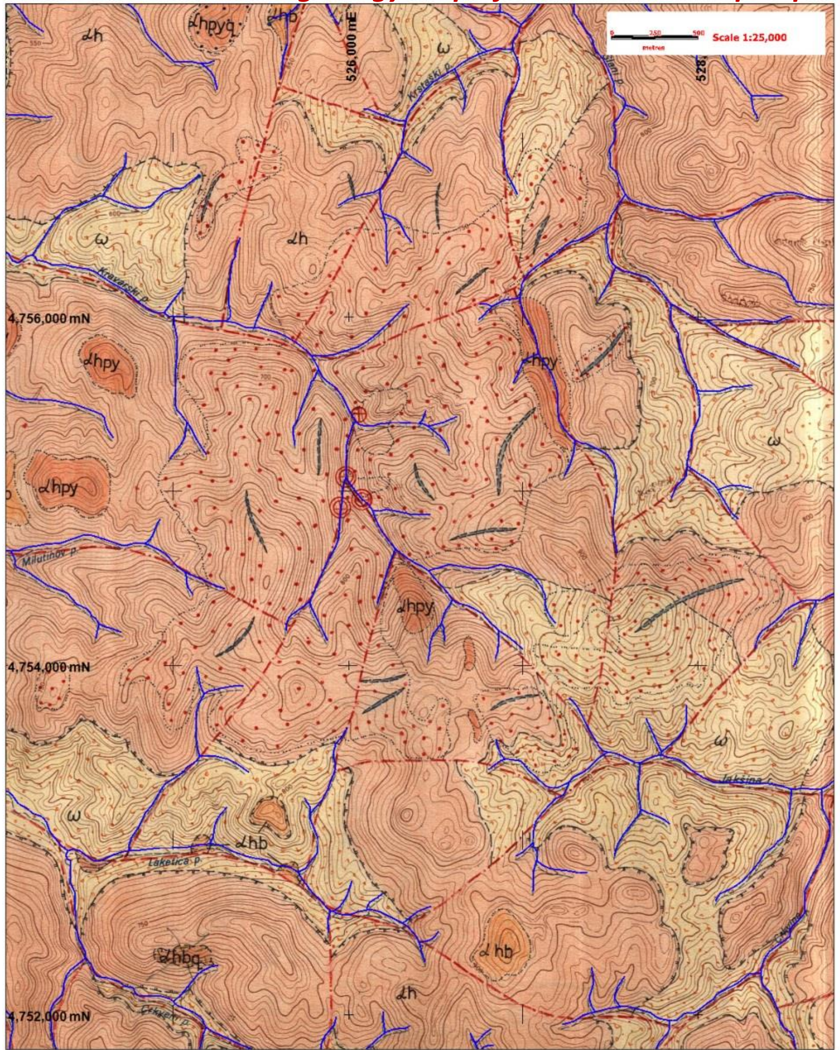
Only limited stream sediment data has been acquired due to historical exploration data

Case study 1: Kravarske Pl – soil data

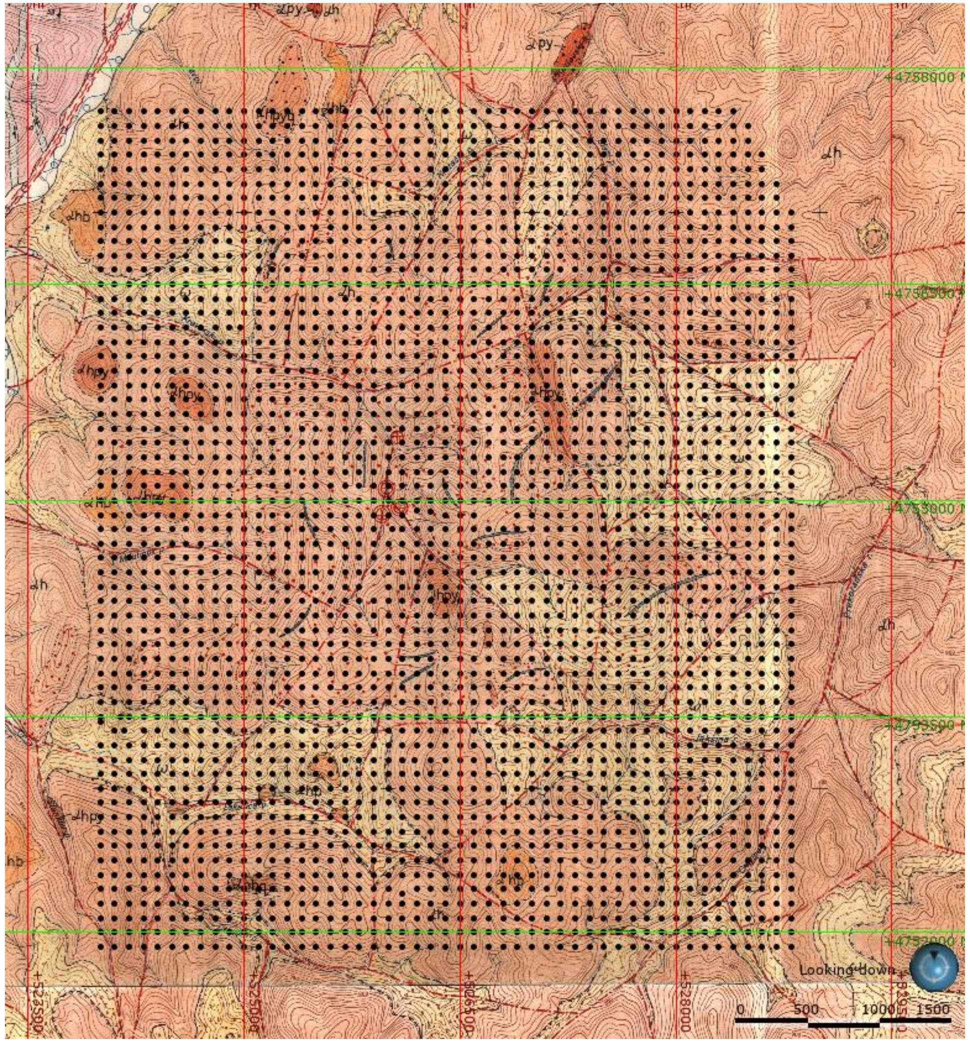
Tracing geochemical indicators to differentiate magmatic units

- Could we find geochemical indicators to help to differentiate on map the intrusive and volcanic units?
- Note that historical state mapping contoured only hydrothermal alteration zone over volcanic rocks, where we differentiated a complex suit of porphyry intrusive rocks – which is the proper interpretation?

1:25000 state based geology map of the Kravarske Pl prospect



50 meter spacing soil grid over state geology (4 acid digestion, ICP-MS finish)



Case study 1: Kravarske Pl – soil data

Tracing geochemical indicators to differentiate magmatic units

	Eigenvectors	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11	PC12
HFSE	Zr_ppm	0.258	**-0.391**	-0.158	-0.138	**0.430**	-0.144	0.083	-0.112	**-0.487**	**0.518**	-0.071	0.014
	Hf_ppm	0.257	**-0.390**	-0.112	-0.140	**0.444**	-0.216	0.198	0.133	**0.464**	**-0.481**	0.055	0.007
	Nb_ppm	0.114	**-0.371**	-0.001	**0.799**	0.067	0.284	-0.303	0.174	-0.031	-0.044	-0.005	-0.003
	Th_ppm	0.275	-0.066	**-0.501**	**-0.383**	-0.180	0.271	**-0.630**	-0.004	0.136	0.011	-0.001	-0.012
	U_ppm	0.236	-0.245	**-0.365**	0.181	**-0.677**	**-0.374**	0.344	-0.033	0.006	0.038	0.006	-0.017
	Sc_ppm	0.336	-0.090	0.136	-0.157	-0.132	**0.745**	**0.485**	-0.038	-0.069	-0.052	0.139	0.006
LREE	Ce_ppm	0.156	**0.425**	**-0.389**	0.326	0.268	0.081	0.158	**-0.576**	0.285	0.121	-0.055	0.060
	La_ppm	0.170	**0.456**	**-0.386**	0.090	0.159	-0.039	0.106	**0.477**	**-0.471**	-0.315	0.135	-0.035
HREE	Tb_ppm	**0.362**	0.237	0.160	0.017	-0.002	-0.018	0.064	**0.468**	0.322	**0.367**	**-0.562**	-0.097
	Y_ppm	**0.369**	0.168	0.261	0.048	-0.008	-0.192	-0.135	0.110	0.181	0.301	**0.734**	0.192
	Yb_ppm	**0.380**	0.082	0.292	0.021	-0.032	-0.147	-0.164	-0.304	-0.162	-0.222	-0.014	**-0.739**
	Lu_ppm	**0.382**	0.070	0.285	-0.005	-0.085	-0.130	-0.162	-0.234	-0.239	-0.326	-0.312	**0.634**
	Eigenvalues	**5.82**	**2.83**	**1.18**	0.74	0.53	0.39	0.24	0.11	0.06	0.05	0.04	0.02
	Percent	**48.46**	**23.60**	**9.86**	6.19	4.43	3.22	1.98	0.93	0.46	0.40	0.32	0.15
	Cumulative %	**48.46**	**72.06**	**81.91**	88.10	92.54	95.75	97.73	98.67	99.13	99.53	99.85	100.00

**** HFSE and REE are considered to be generally immobile at most hydrothermal conditions.***

The essential variability of immobile* incompatible elements (HFSE+REE) was determined using principal component analysis (PCA).

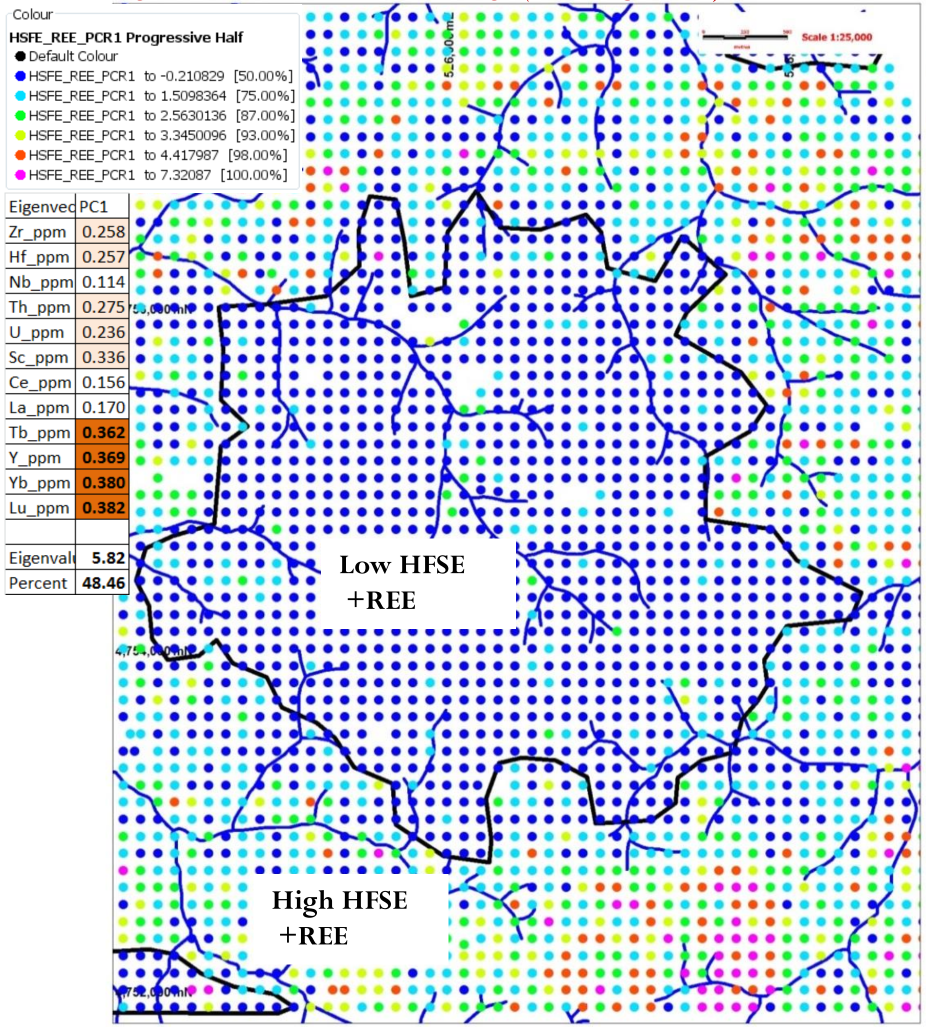
- PCA answers the question: Are there a few linear functions of the many original variables that in some way capture the essential variability in the original data set (Aitchison, 1984). PCA allows the investigator to gain a lower dimensional insight into the nature of the data. The linear transformations are termed principal components and are named PC1, PC2, etc. The transformation is such that the first few components almost always account for a large proportion of the variance in the original data set, and so contain the essential information of the larger data set of observed variables.
- We used the following PCA calculation settings:
  - We choose the following variables available from ME assay results: HFSE (Ta, Zr, Hf, Nb, Th, U) and REE (La, Ce, Tb, Sc, Y, Yb, Lu). All Ta assays were under detection limit.
  - We applied Robust Principal Component Analysis method and the algorithm with low outlier rejection as described by *Campbell, N.A. (1980). Robust procedures in multivariate analysis. I: Robust covariance estimation. Appl. Statist., 29, 231-237.*
  - PCA was performed on the correlation matrix.
  - Log transformation was applied to the data prior to analysis due to strong skewed distribution (checked on probability plots) of most elements.

Case study 1: Kravarske Pl – soil data

Tracing geochemical indicators to differentiate magmatic units

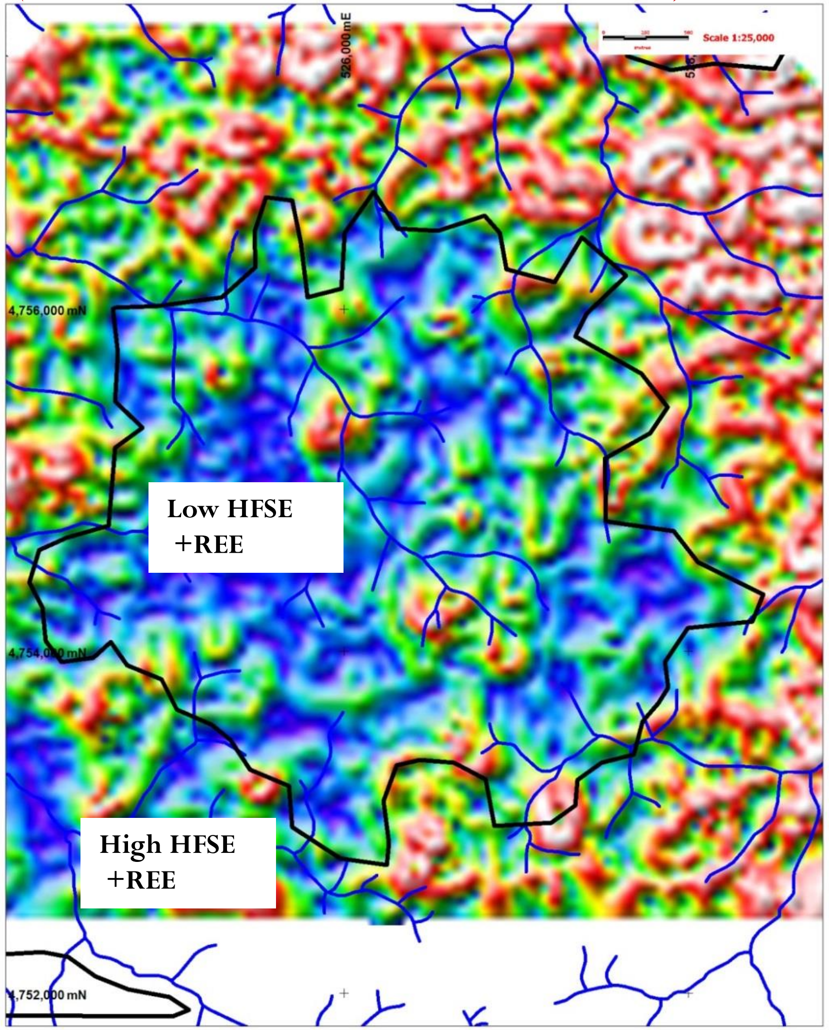
The distribution of PC1 (48.5% of the variance of the Degrmen HFSE-REE data set) component shows a circular geological feature separating lithology units with high and low HFSE+REE loadings (zoning of stratovolcano with bimodal compositional stages and/or caldera effect?).

Map distribution of HFSE-REE PC1 component contours zones with high and low HFSE+REE loadings (circular feature).



Eigenvec	PC1
Zr_ppm	0.258
Hf_ppm	0.257
Nb_ppm	0.114
Th_ppm	0.275
U_ppm	0.236
Sc_ppm	0.336
Ce_ppm	0.156
La_ppm	0.170
Tb_ppm	0.362
Y_ppm	0.369
Yb_ppm	0.380
Lu_ppm	0.382
Eigenvalu	5.82
Percent	48.46

HFSE+REE variation contour (PC1, black line) overlap with geophysics (Magnetic Horizontal Gradient; Enerson 2012 Survey Report).

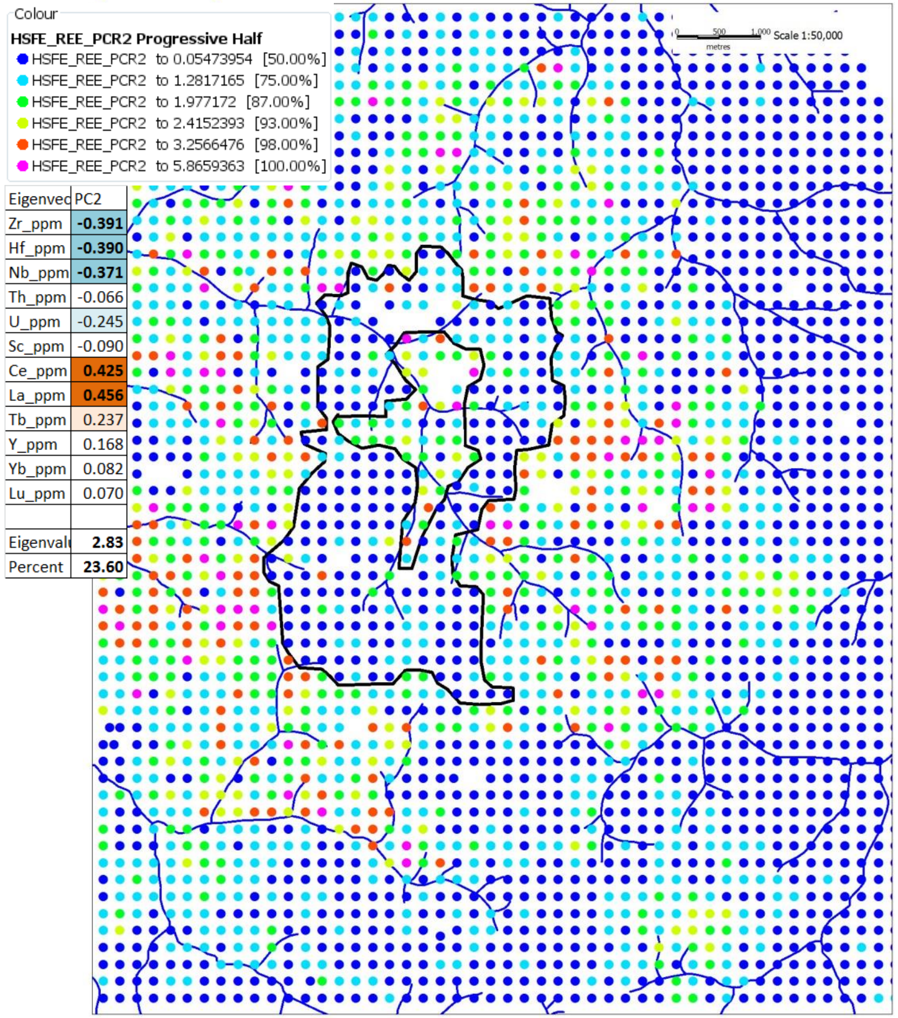


Case study 1: Kravarske PI – soil data

Tracing geochemical indicators to differentiate magmatic units

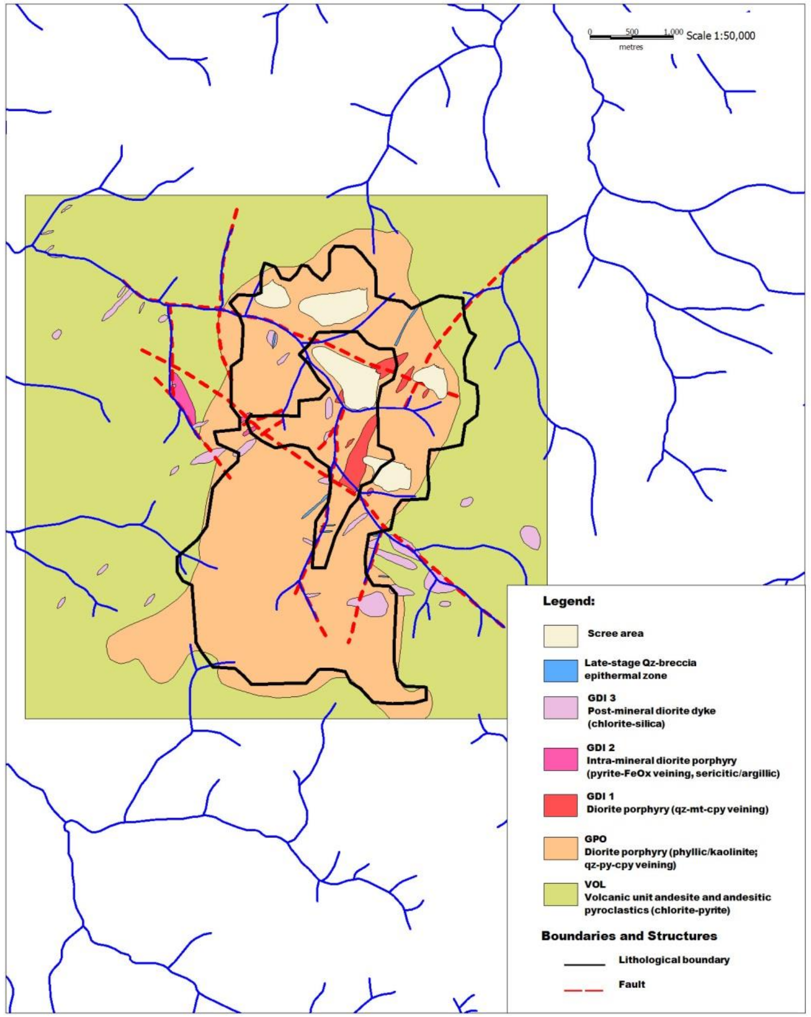
The distribution of PC2 (23.6% of the variance of the Degrmen HFSE-REE data set) component contours well the central intrusion-area, separating low LREE/HREE (GPO area) and high LREE/HREE (GDI1?) zones.

Map distribution of HFSE-REE PC2 component contours LREE/HREE variations in the central part of the license area.



Eigenvec	PC2
Zr_ppm	-0.391
Hf_ppm	-0.390
Nb_ppm	-0.371
Th_ppm	-0.066
U_ppm	-0.245
Sc_ppm	-0.090
Ce_ppm	0.425
La_ppm	0.456
Tb_ppm	0.237
Y_ppm	0.168
Yb_ppm	0.082
Lu_ppm	0.070
Eigenval	2.83
Percent	23.60

LREE/HREE variation contours (PC2, black lines) overlap well with company lithology borders (GPO and GDI1 zones, respectively).

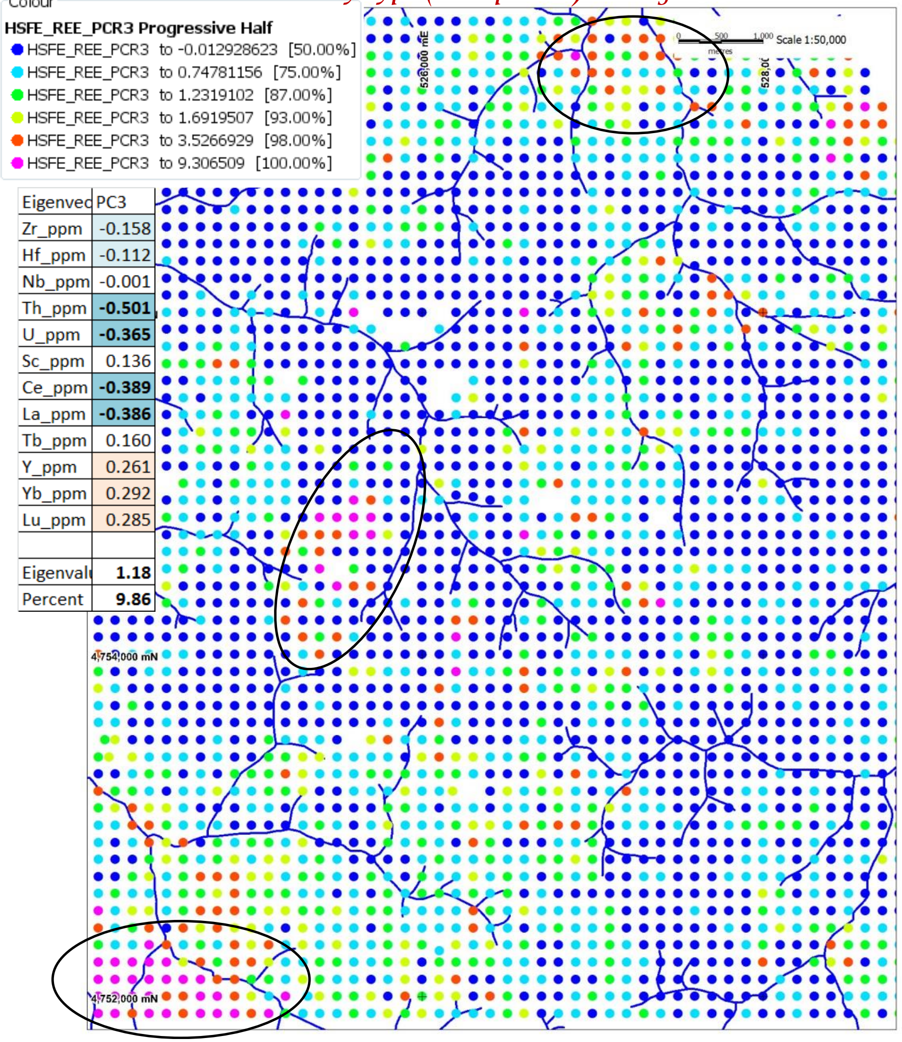


Case study 1: Kravarske Pl – soil data

Tracing geochemical indicators to differentiate magmatic units

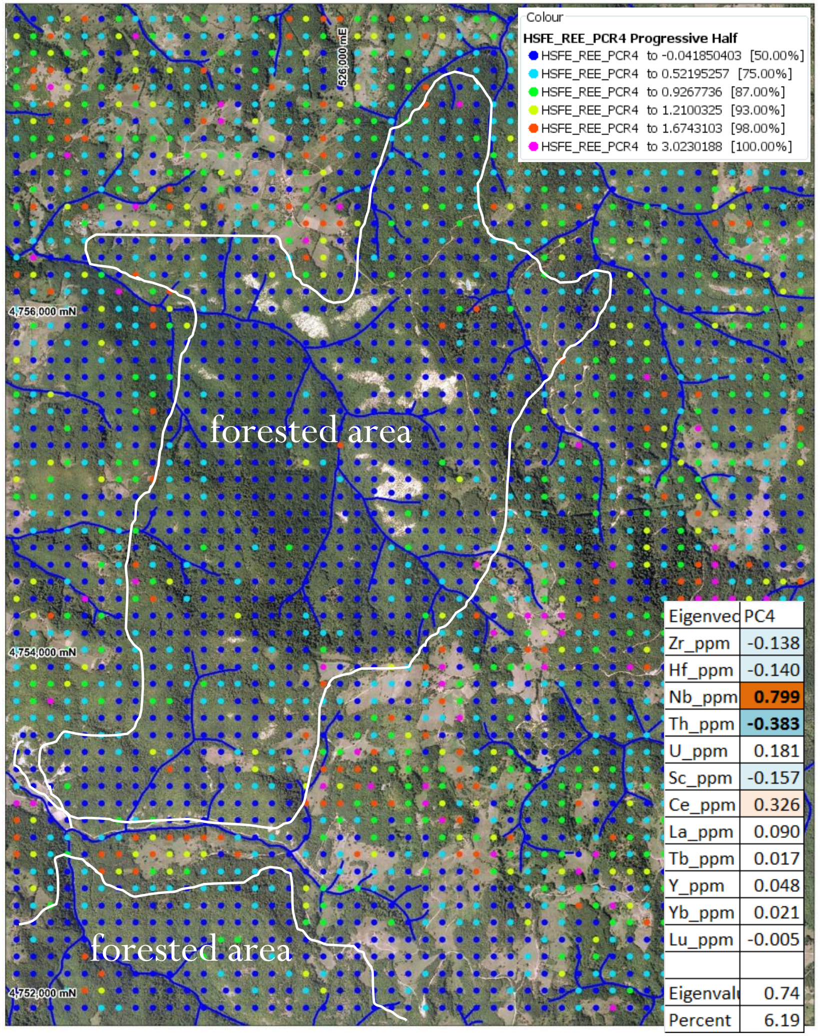
The distribution of PC3 (9.9% of the variance of the Degrmen HFSE-REE data set) and PC4 (6.2%) components are not correlating with known lithology variations, but might be set by processes related to soil formation.

Map distribution of HFSE-REE PC3 component might highlight soils enriched in a clay-type (amorphous?) which fix the HREE.



Eigenvec	PC3
Zr_ppm	-0.158
Hf_ppm	-0.112
Nb_ppm	-0.001
Th_ppm	**-0.501**
U_ppm	**-0.365**
Sc_ppm	0.136
Ce_ppm	**-0.389**
La_ppm	**-0.386**
Tb_ppm	0.160
Y_ppm	0.261
Yb_ppm	0.292
Lu_ppm	0.285
Eigenval	**1.18**
Percent	**9.86**

Map distribution of HFSE-REE PC4 component over orthophoto shows effect of forest vegetation on pH, which control the Th/Nb.

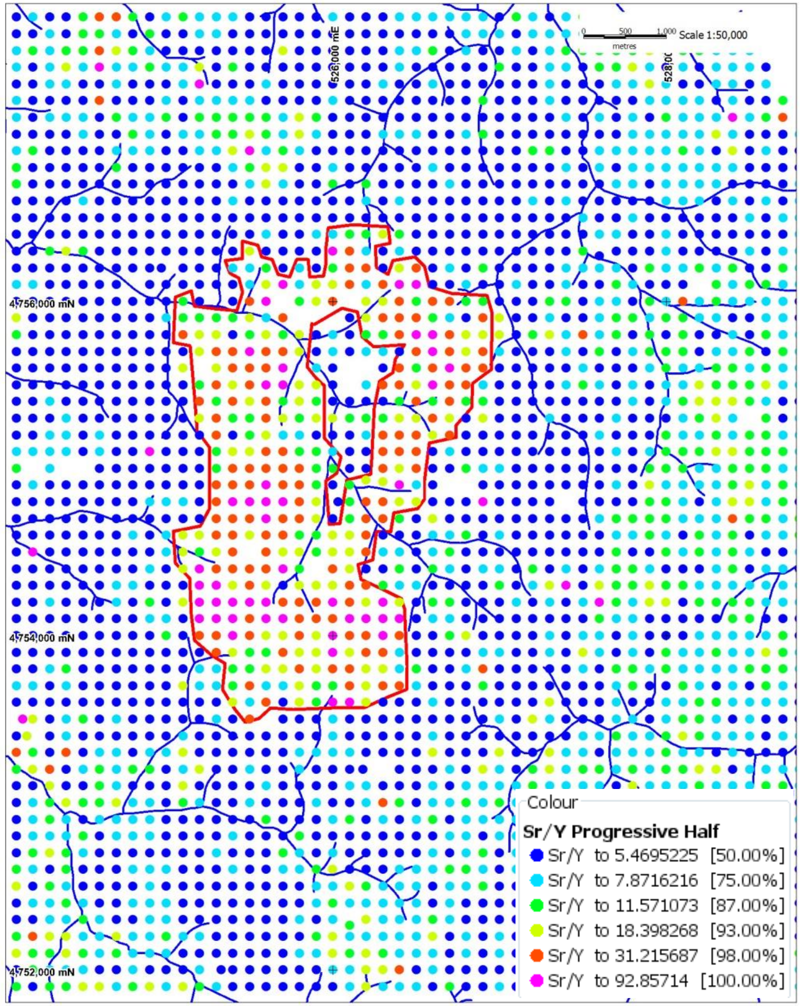


Eigenvec	PC4
Zr_ppm	-0.138
Hf_ppm	-0.140
Nb_ppm	**0.799**
Th_ppm	**-0.383**
U_ppm	0.181
Sc_ppm	-0.157
Ce_ppm	0.326
La_ppm	0.090
Tb_ppm	0.017
Y_ppm	0.048
Yb_ppm	0.021
Lu_ppm	-0.005
Eigenval	0.74
Percent	6.19

Case study 1: Kravarske PI – soil data

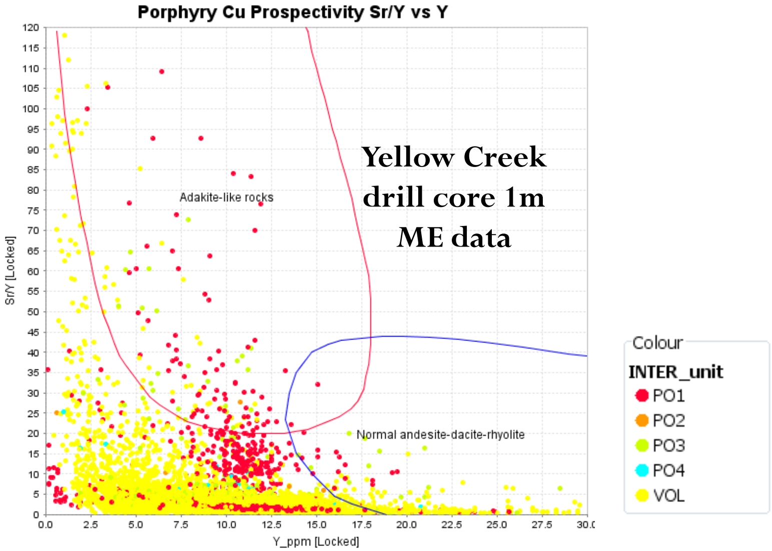
Tracing geochemical indicators to differentiate magmatic units – Sr/Y distribution

The distribution of Sr/Y ratio contours well the central intrusion-area, separating relative high Sr/Y (corresponding to GPO area on company map) and low Sr/Y (volcanics on company map) zones. The low Sr/Y values on the central part might (GDI1 area on company map) represent a separate magmatic source or amphibole+feldspar destruction related to potassic alteration.



NOTES:

Magmas with relative high Sr/Y and La/Yb ratios (referred also as adakitic signature) are generally thought to be formed by fractional crystallization of hydrous magmas and are commonly associated with high porphyry Cu prospectivity.



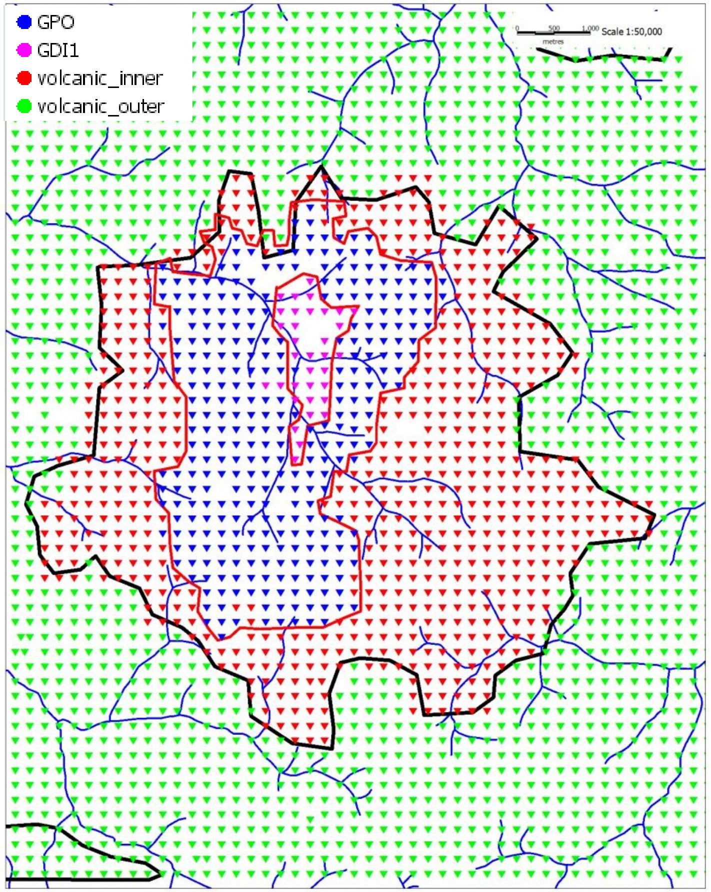
Recommended references:

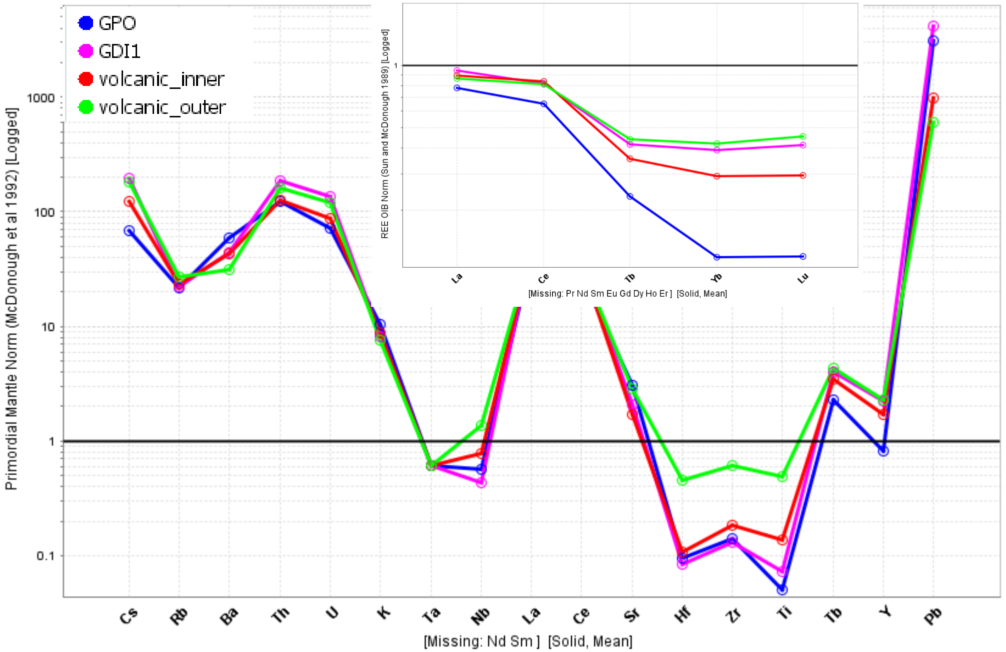
Richards et al. (2012): *High Sr/Y Magmas Reflect Arc Maturity, High Magmatic Water Content, and Porphyry Cu ± Mo ± Au Potential: Examples from the Tethyan Arcs of Central and Eastern Iran and Western Pakistan*. Econ Geol. v. 107, pp. 295–332

Chiaradia et al. (2012): *Why large porphyry Cu deposits like high Sr/Y magmas?* Sci. Rep. 2, 685; DOI:10.1038/srep00685.

Case study 1: Kravarske Pl – soil data

Tracing geochemical indicators to differentiate magmatic units – SUMMARY





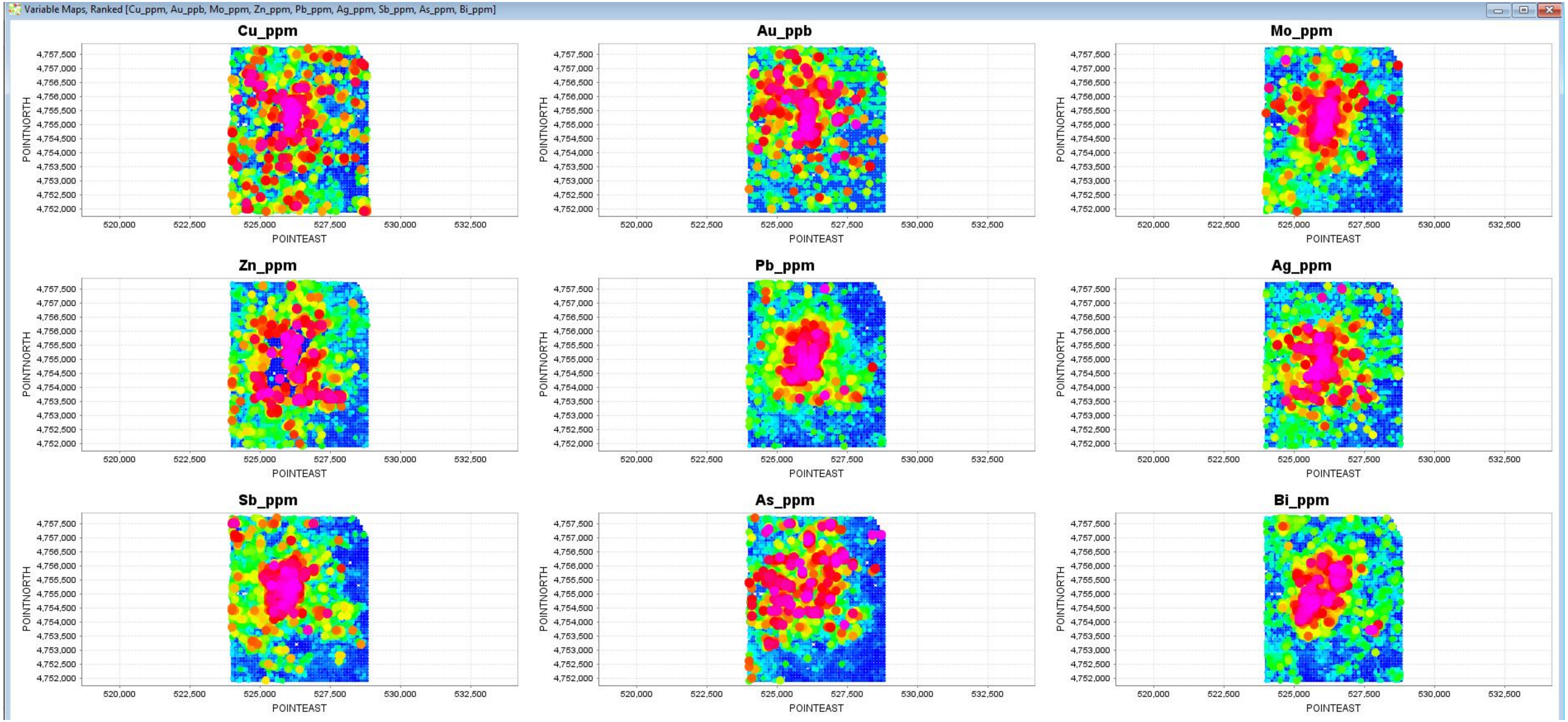
We were able to distinguish 4 units, which are characterized with specific HFSE - REE distribution and might represent different lithologies identified during mapping:

- Outer volcanic unit with relative elevated HFSE (Nb, Hf, Zr) content, low Sr/Y and low LREE (La, Ce)/HREE (Yb, Lu) ratios;
- Inner volcanic unite with relative low HFSE (Nb, Hf, Zr) content, low Sr/Y and low LREE (La, Ce)/HREE (Yb, Lu) ratios;
- Central porphyry unit (GPO) with relative low HFSE (Nb, HF, Zr) content, high Sr/Y and high LREE (La, Ce)/HREE (Yb, Lu) ratios;
- Central intrusion (GDI1) with relative low HFSE (Nb, HF, Zr) content, low Sr/Y and high LREE (La, Ce)/HREE (Yb, Lu) ratios.

It should be noted that even if the above presented geochemical units contour well on map plots and match well to the existing mapping results, we still cannot exclude that these units represent REE/HFSE mobilization related to hydrothermal zonation around a porphyry associated with feldspar and amphibole destruction (e.g. from core to rim: potassic altered – phyllic altered – propylitic altered – non altered rock).

Case study 1: Kravarske Pl – soil data

Tracing trace elements footprints related to hydrothermal alteration – Chalcophile distribution



Case study 1: Kravarske Pl – soil data

Tracing trace elements footprints related to hydrothermal alteration – Chalcophile PCA

- **The essential variability of selected chalcophile elements was determined using principal component analysis (PCA).**
- **We used the same PCA calculation settings as in case of HFSE+REE PCA**

Eigenvectors	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8	PC9	PC10	PC11
Au_ppb	0.236	-0.202	**0.586**	0.246	**-0.336**	**0.506**	**-0.302**	-0.182	-0.069	0.028	0.029
Cu_ppm	0.178	**-0.605**	0.171	**-0.541**	0.132	**-0.367**	-0.276	-0.137	0.059	-0.173	-0.002
Bi_ppm	0.321	0.334	-0.084	**-0.390**	-0.188	-0.049	-0.239	0.102	**-0.585**	**0.361**	-0.220
Cd_ppm	0.285	-0.175	**-0.498**	**0.370**	-0.198	-0.204	-0.195	**-0.475**	0.205	0.295	-0.173
Pb_ppm	**0.363**	0.254	-0.185	0.144	-0.061	-0.059	-0.158	-0.057	-0.171	**-0.826**	0.041
Zn_ppm	0.261	**-0.540**	-0.292	0.221	-0.081	0.112	0.170	**0.601**	-0.257	0.039	0.171
Mo_ppm	0.321	-0.050	-0.047	-0.296	-0.073	0.236	**0.723**	**-0.436**	-0.081	-0.010	0.154
As_ppm	**0.379**	0.031	0.160	0.029	0.238	0.087	0.194	0.244	0.323	-0.037	**-0.750**
Sb_ppm	0.287	0.073	0.314	**0.382**	**0.614**	**-0.315**	0.065	-0.125	-0.290	0.189	0.230
Te_ppm	0.321	0.179	-0.234	-0.234	**0.363**	**0.421**	**-0.316**	0.105	**0.402**	0.140	**0.393**
Tl_ppm	0.310	0.236	0.268	-0.007	**-0.462**	**-0.458**	0.137	0.267	**0.395**	0.103	0.311
Eigenvalues	**5.35**	**1.15**	**0.95**	**0.82**	0.63	0.58	0.50	0.35	0.28	0.21	0.17
Percent	**48.59**	**10.49**	**8.65**	**7.41**	5.71	5.29	4.58	3.22	2.56	1.94	1.56
Cumulative %	48.59	59.08	67.73	75.14	80.85	86.14	90.72	93.94	96.50	98.44	100.00

We interpret that the PC1-PC4 components match with the following ore environments (see also next pages with map plots)

PC1 – enrichment of all chalcophile elements related to a porphyry centered source.

PC2 – weakly mineralized (low Au?) phyllic alteration assemblage within the GPO with positive loadings from Bi, Pb, Te and Tl, and strong negative loadings from Cu, and Zn.

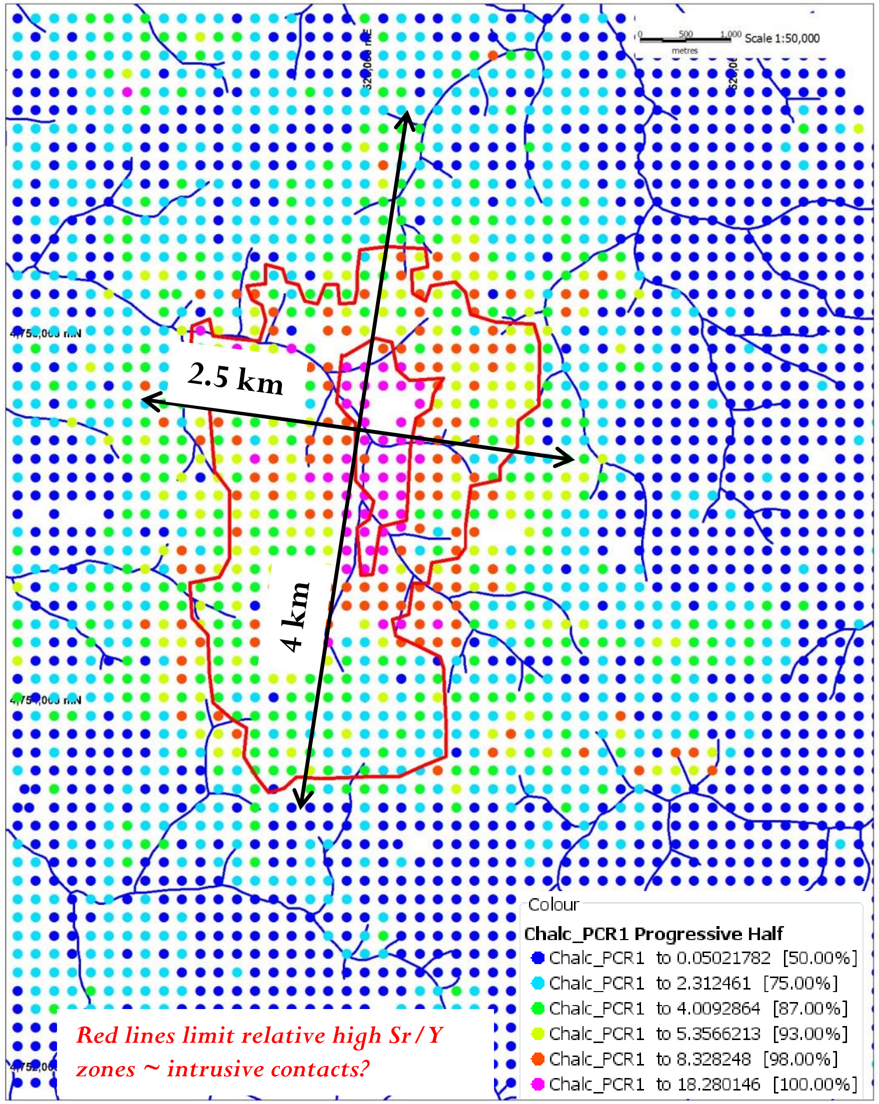
PC3 – epithermal-Au mineralization (sulfosalt rich, veins and breccia zones) with positive loadings of Au, Cu, As, Sb, and Tl, and negative loadings of Cd, Zn, Pb and Te.

PC4 – Au-base metal mineralization (veins) with positive loadings of Au, Cd, Pb, Zn and Sb, and negative loadings of Cu, Bi, Mo and Te.

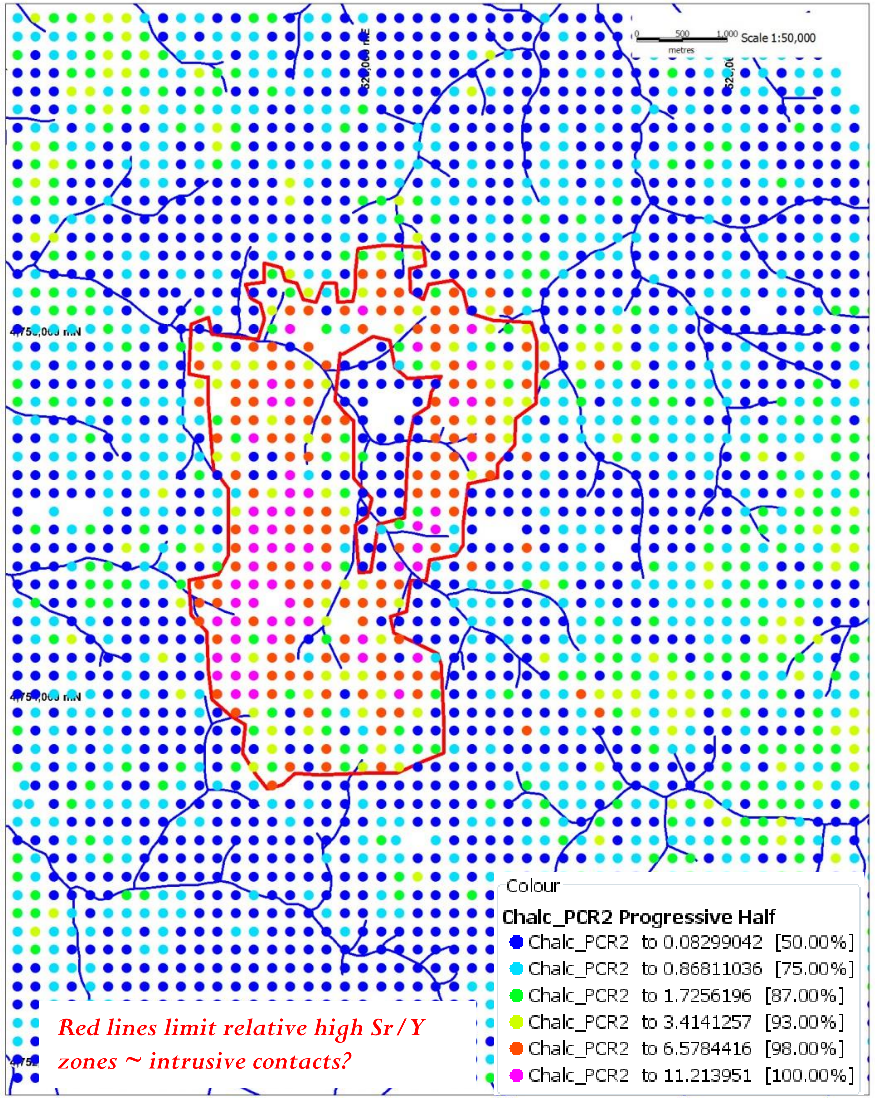
Case study 1: Kravarske Pl – soil data

Tracing trace elements footprints related to hydrothermal alteration – Chalcophile PC1 & PC2

PC1 –enrichment of all chalcophile elements related to a magmatic centered source



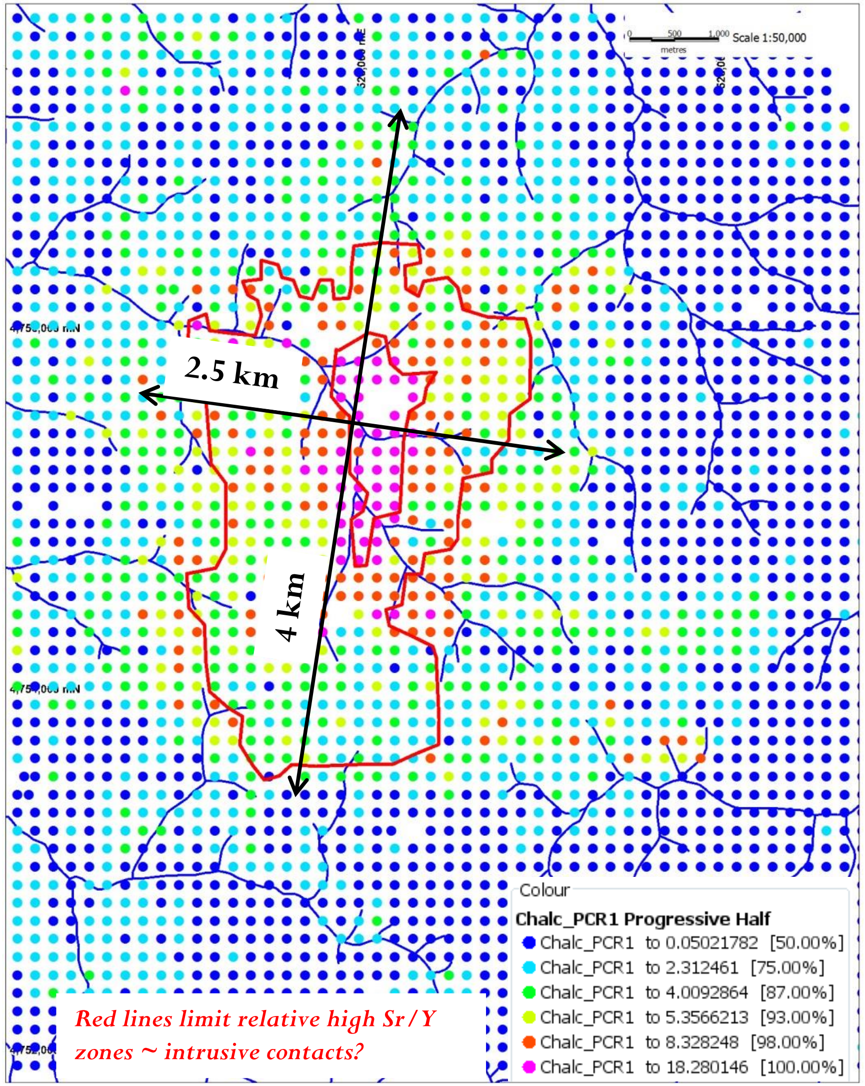
PC2 – weakly mineralized (low Au?) phyllic alteration assemblage within the GPO with positive loadings from Bi, Pb, Te and Tl, and strong negative loadings from Au, Cu, and Zn



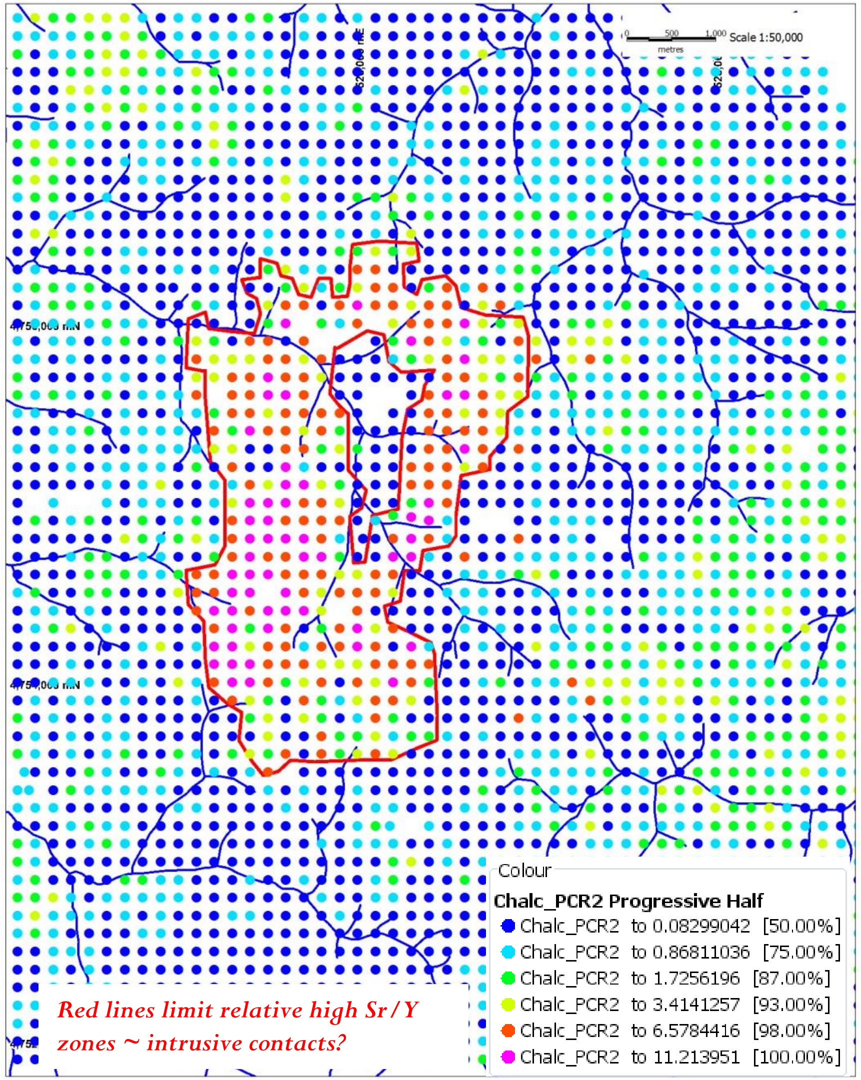
Case study 1: Kravarske Pl – soil data

Tracing trace elements footprints related to hydrothermal alteration – Chalcophile PC3 & PC4

PC1 –enrichment of all chalcophile elements related to a magmatic centered source



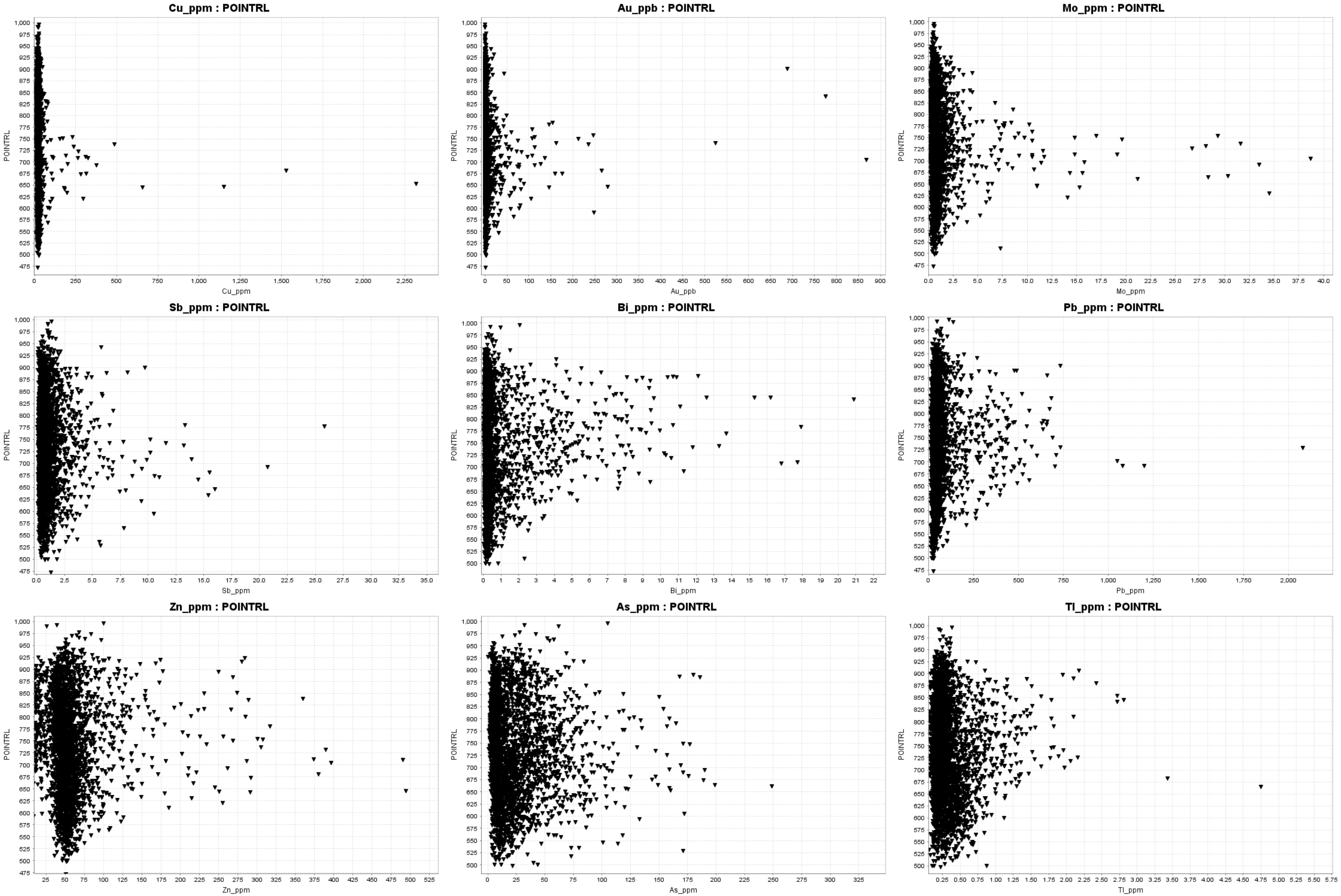
PC2 – weakly mineralized (low Au?) phyllic alteration assemblage within the GPO with positive loadings from Bi, Pb, Te and Tl, and strong negative loadings from Au, Cu, and Zn



Case study 1: Kravarske Pl – soil data

Tracing trace elements footprints related to hydrothermal alteration – porphyry zonation

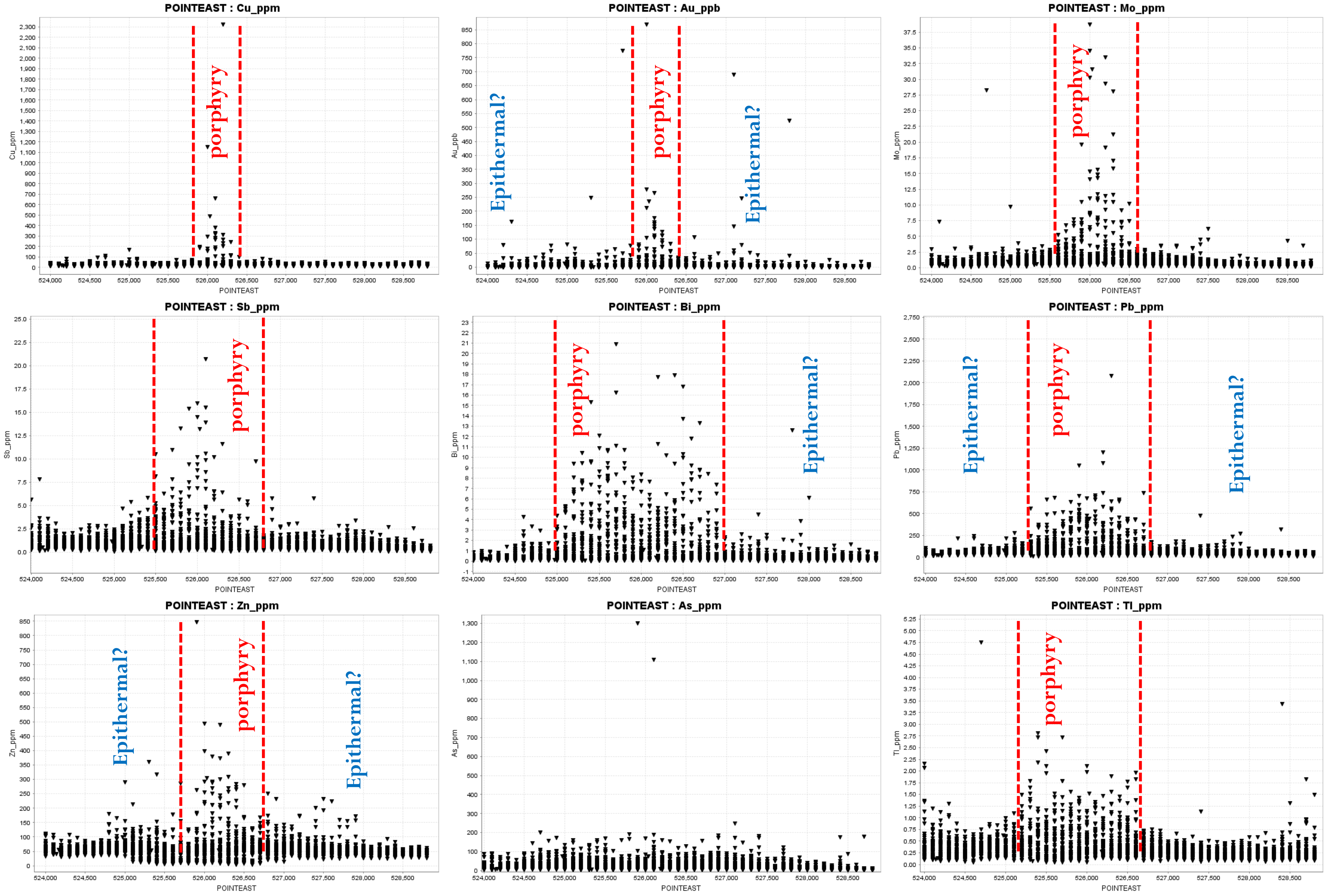
Plots of soil samples chalcophile content vs. elevation:



Case study 1: Kravarske Pl – soil data

Tracing trace elements footprints related to hydrothermal alteration – porphyry zonation

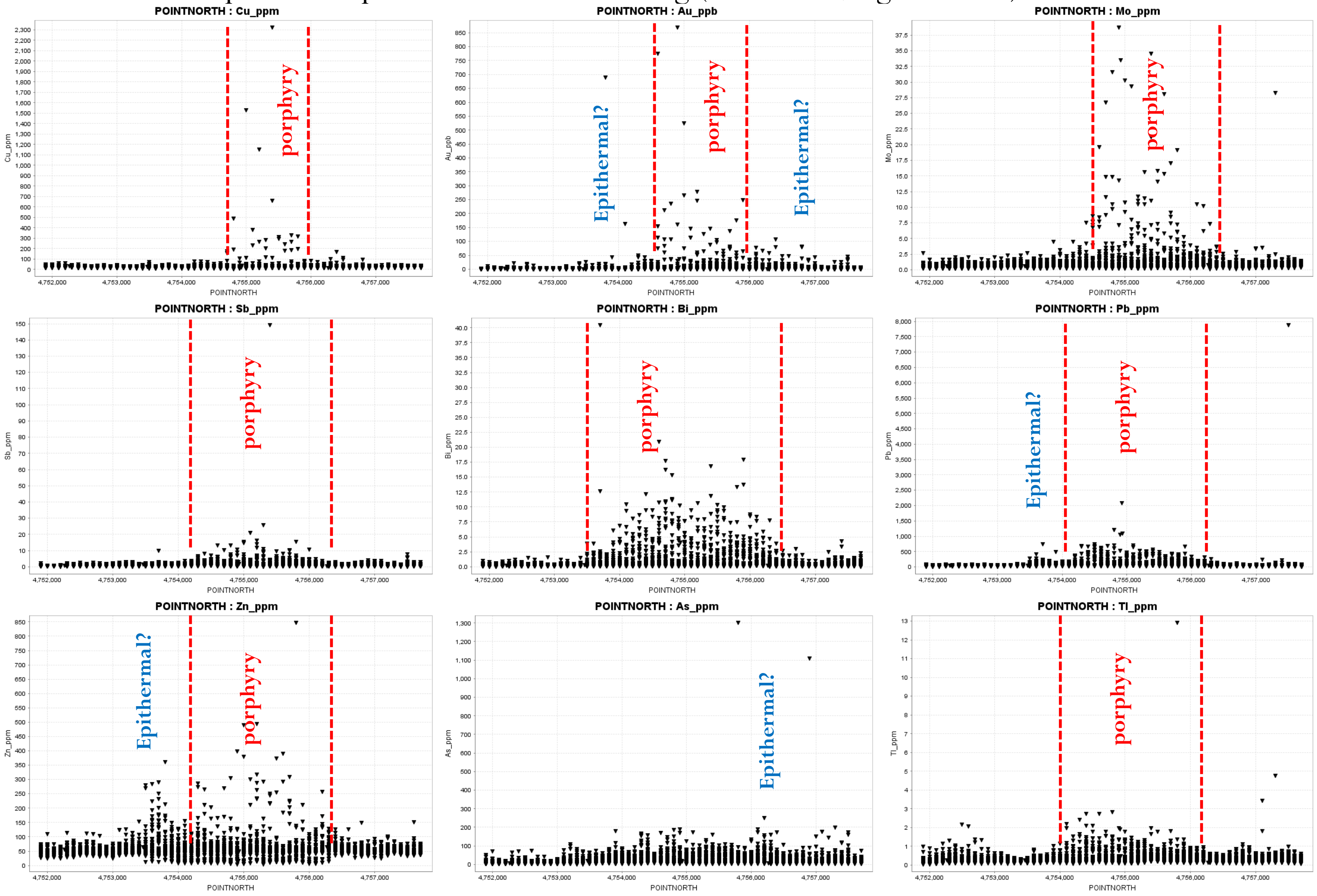
Plots of soil samples chalcophile content vs. Easting (left=west, right=east):



Case study 1: Kravarske Pl – soil data

Tracing trace elements footprints related to hydrothermal alteration – porphyry zonation

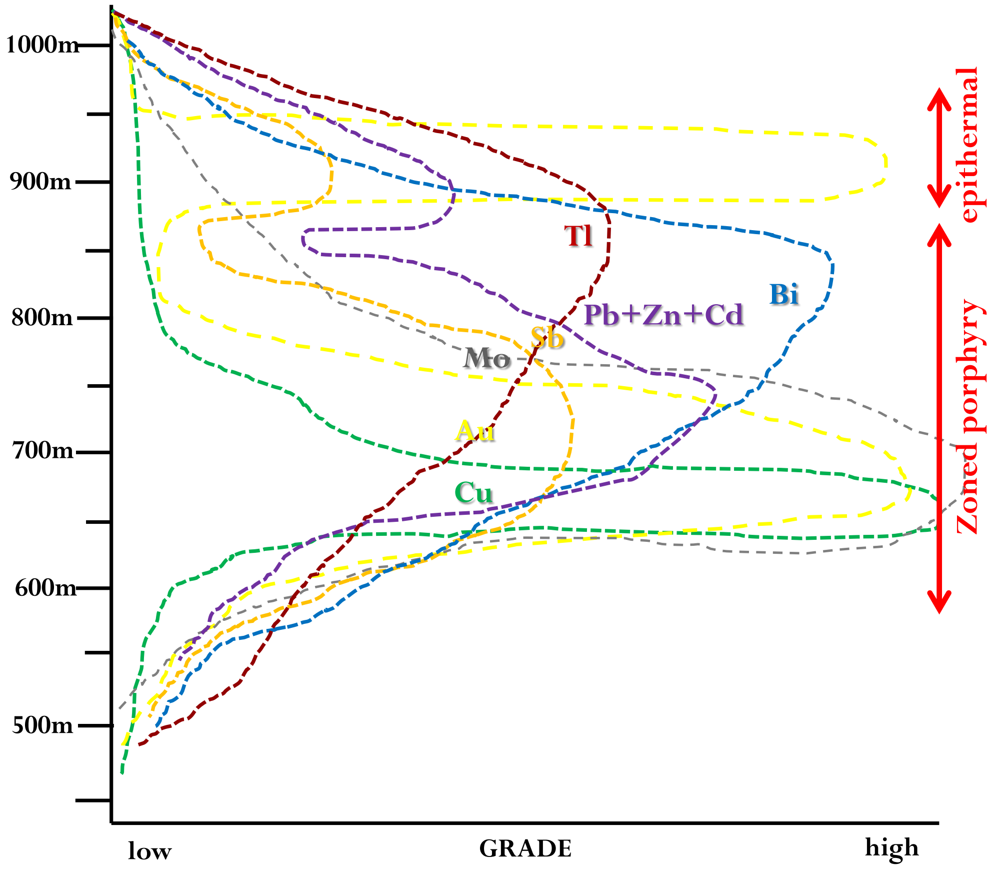
Plots of soil samples chalcophile content vs. Northing (left=south, right=north):



Case study 1: Kravarske Pl – soil data

Tracing trace elements footprints related to hydrothermal alteration – porphyry zonation

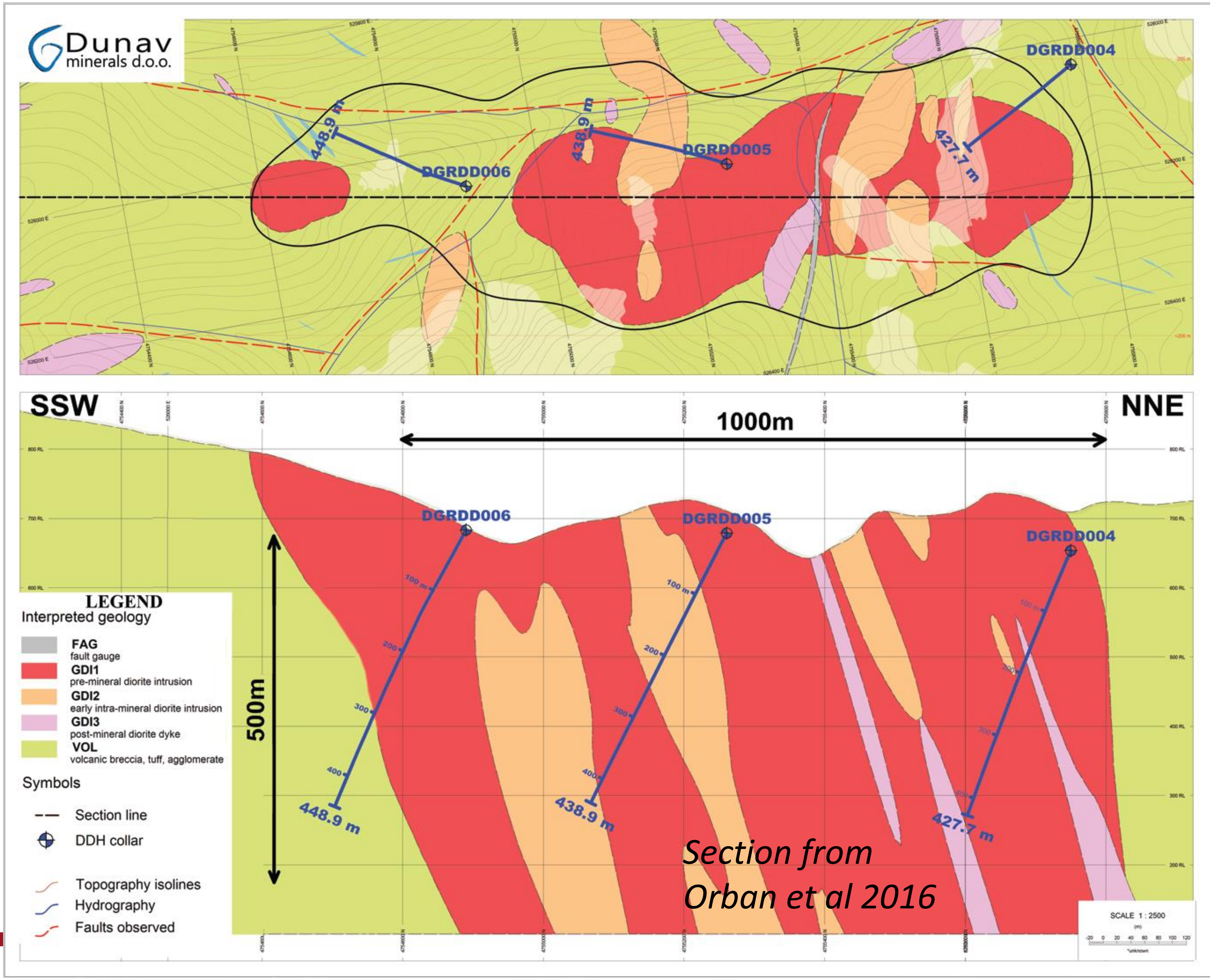
Plots of soil samples chalcophile content vs. elevation, summary:



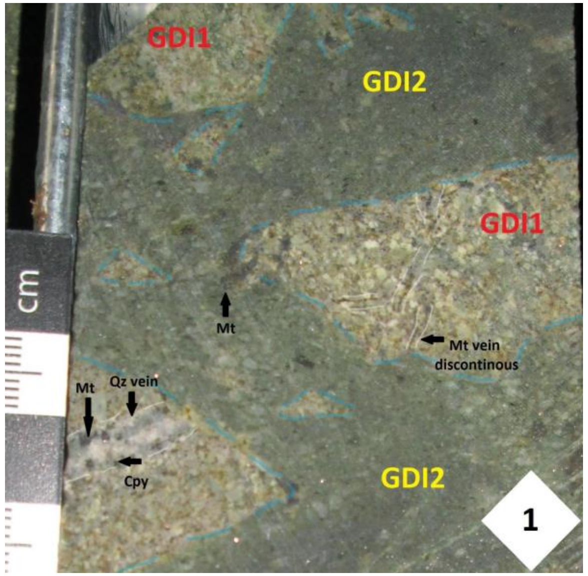
The distribution of the chalcophile elements grades support the presence of a well zoned (from 600m to 950m and from NE to SW: Cu-Au-Mo-Sb-Pb+Zn+Cd-Bi-Tl) porphyry mineralization and some overlying epithermal (Au-Sb-As-Tl-Bi and Zn-Pb-Sb-Au) mineralized zones.

Case study 1: Kravarske PI – drill hole data

Tracing trace elements footprints related to hydrothermal alteration – porphyry zonation

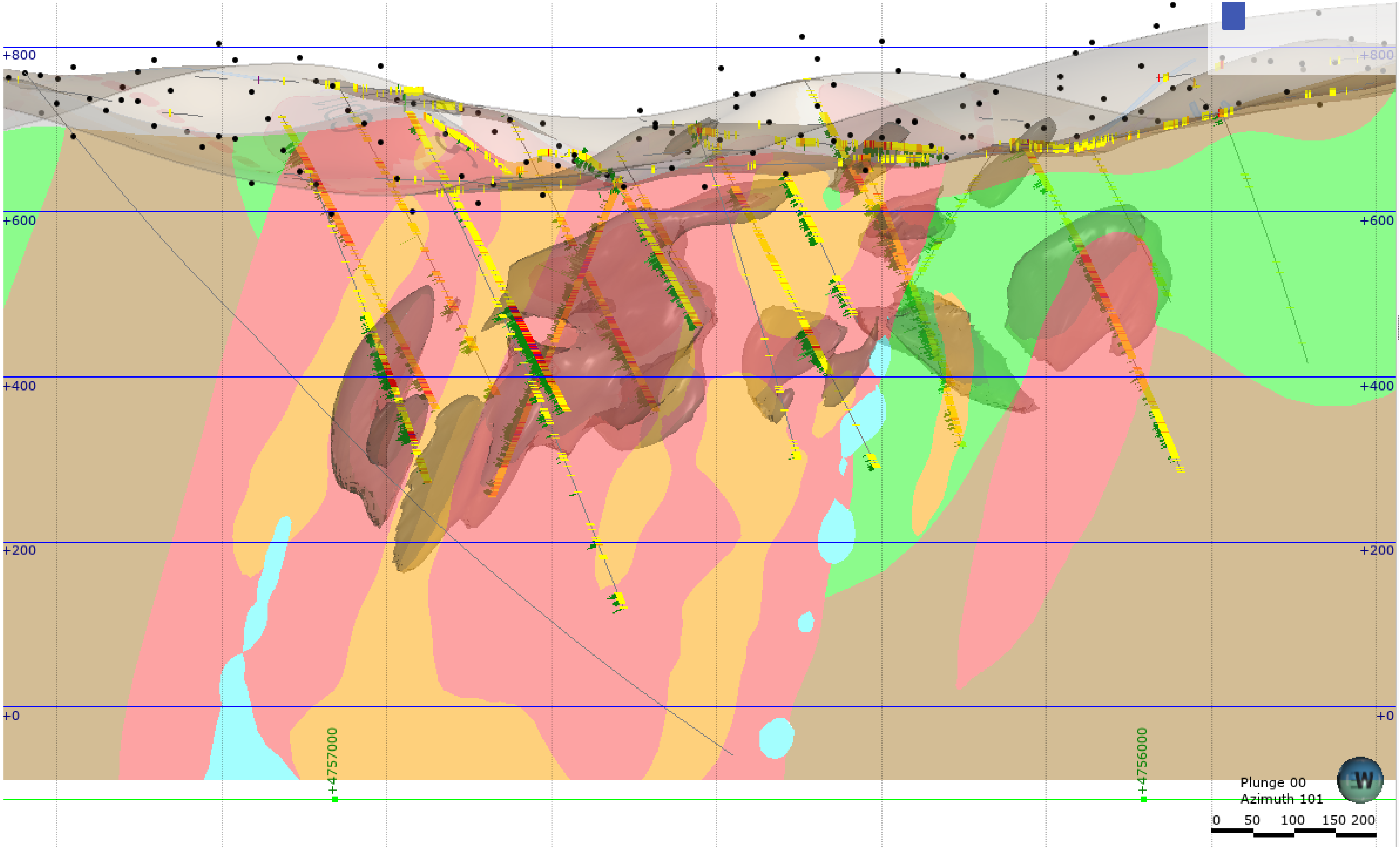


Section from Orban et al 2016



Case study 1: Kravarske Pl – drill hole data

Tracing trace elements footprints related to hydrothermal alteration – porphyry zonation

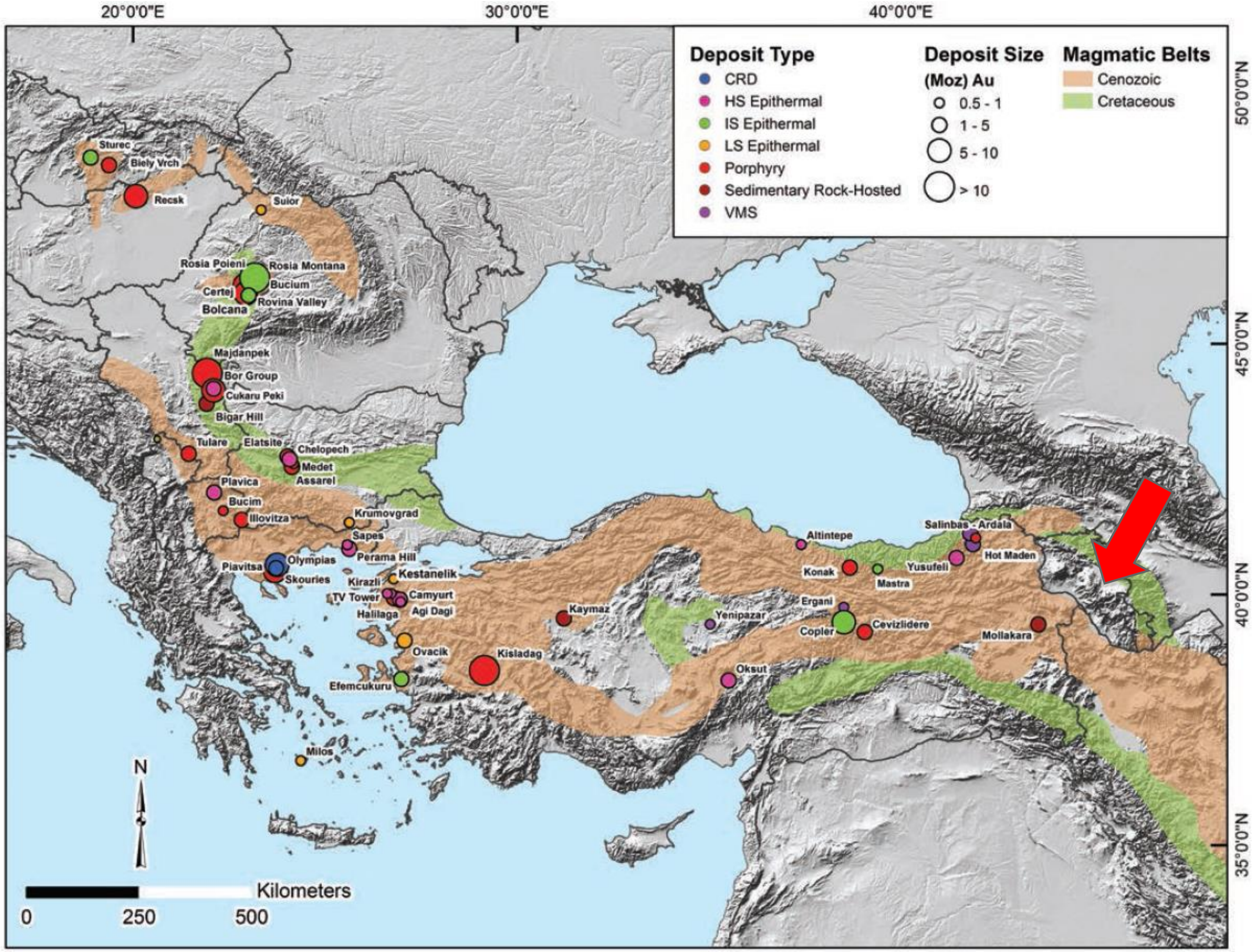


Content

The lesson aims to provide practical applications of modern geochemical exploration datasets thorough the review of real case studies focused on target generation and mineralization vectoring at various scales.
The application of widely used and accepted software tools for data analysis and interpretation (i.e., ioGAS by Reflex) and 3D integration and modelling (i.e., Leapfrog Geo by Seequent) will be demonstrated during the workflows.

2. The second case study will follow applications in modern geochemical exploration by using systematic sampling protocols, portable sensor-based devices and remote sensing datasets – Targeting for Cu-Au epithermal system in remote areas

Case study II: Early greenfield exploration project located in Lower Caucasus, Central Armenia

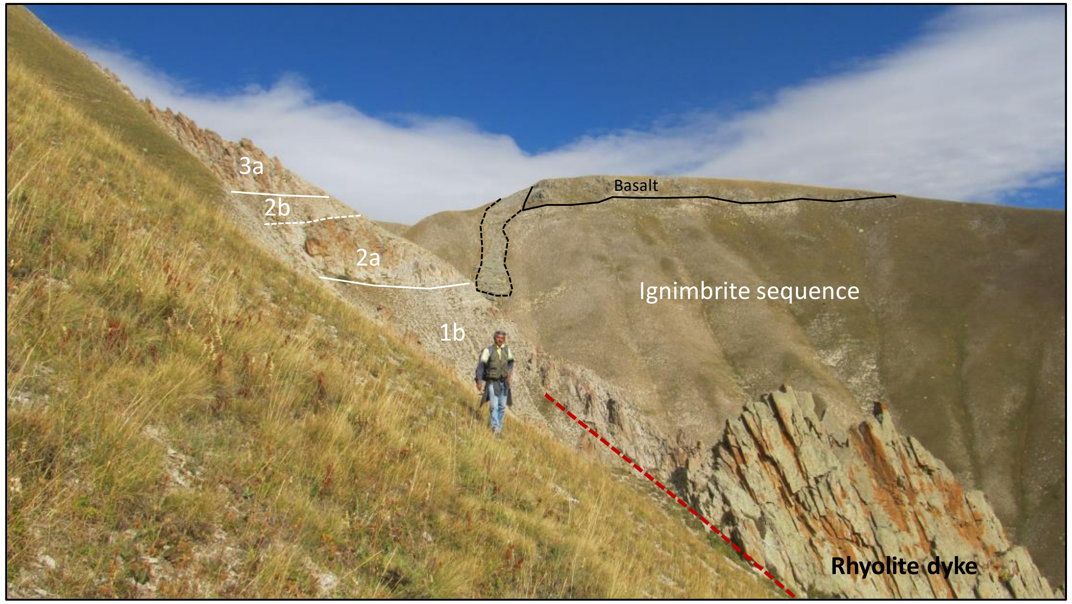


Baker (2019):
Location and styles of Au deposits (>0.5 Moz Au) related to Cretaceous and Cenozoic magmatism in the Western Tethyan magmatic belt.

Abbreviations: CRD = carbonate replacement deposit, HS = high sulfidation, IS = intermediate sulfidation, LS = low sulfidation, VMS = volcanogenic massive sulphide.

Au-Cu prospect, Lower Caucasus, Central Armenia

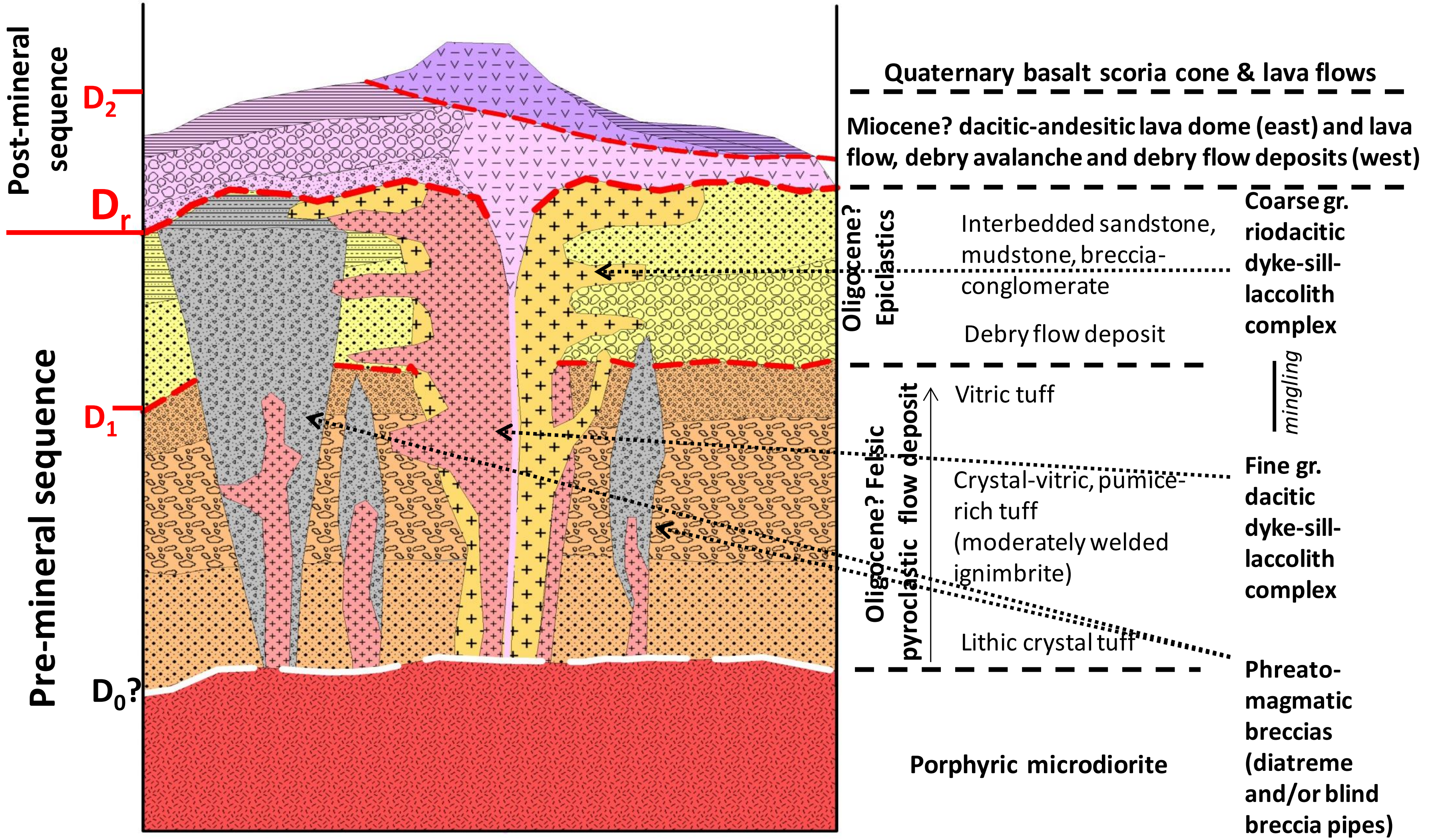
Early greenfield exploration project located in Lower Caucasus, Central Armenia



Au-Cu prospect, Lower Caucasus, Central Armenia

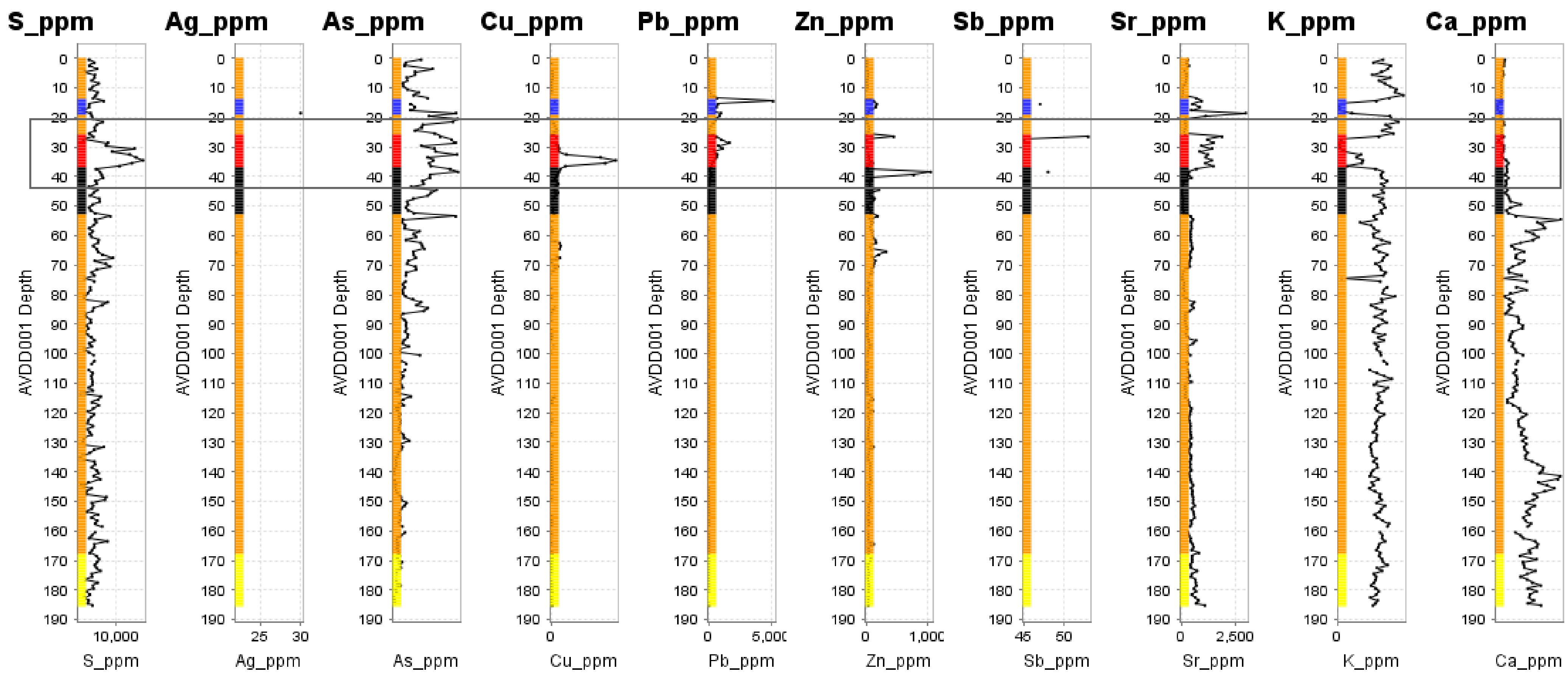
Complex geology represented by Oligocene to Quaternary volcano-sedimentary sequence and fertile intrusions

The non-welded part of the pyroclastic-flow-deposit, underlying the epiclastic deposits in the Artsiv zone, represents a high-permeability lithology; it is prospective, in particular, at locations where intersected by subvertical structures such as breccia pipes/diatremes or fracture zones.



Au-Cu prospect, Armenia

Early scout drilling (AVDD001): distribution of metals and lithophile elements (pXRF dataset)



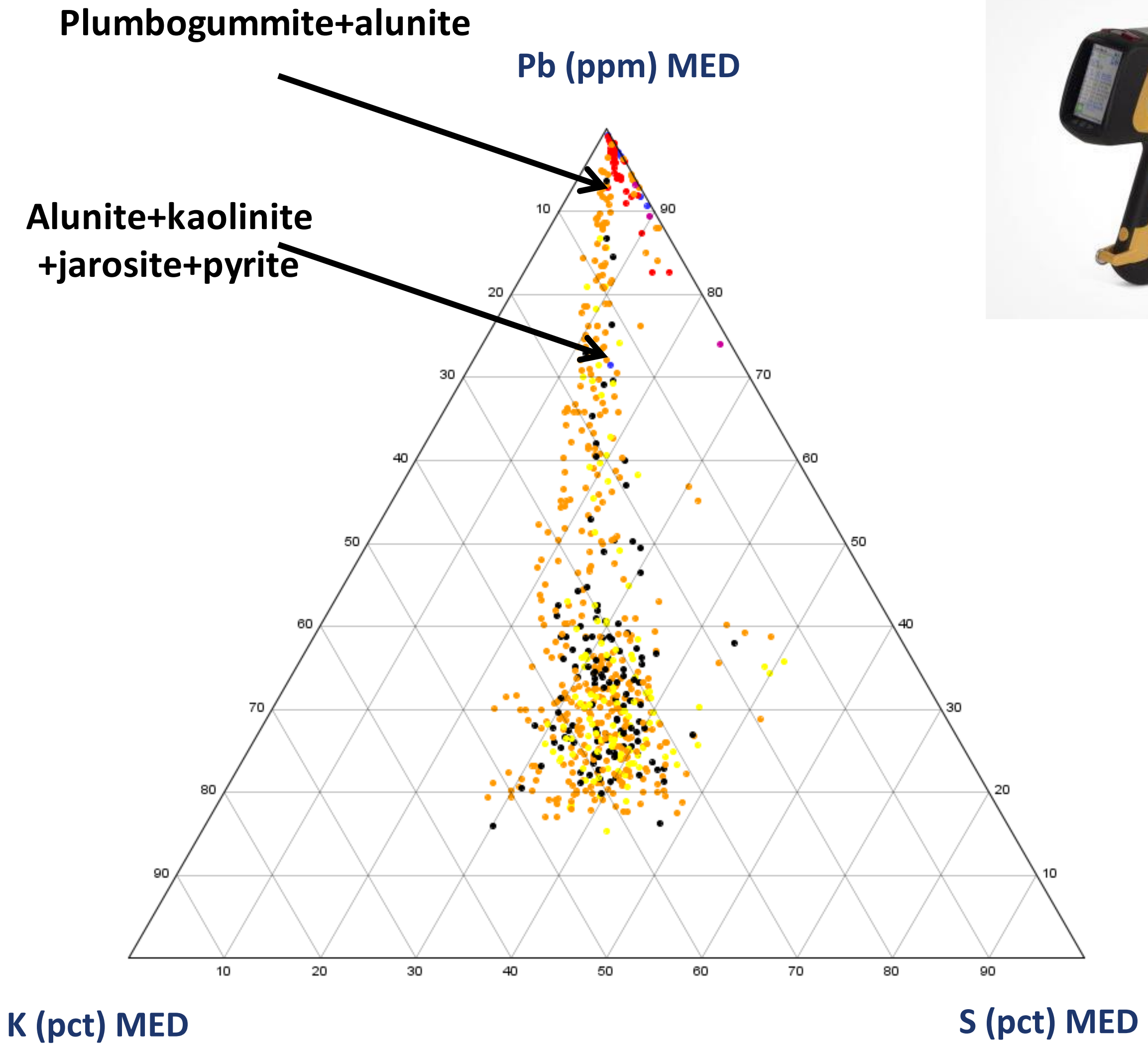
Logged Alteration

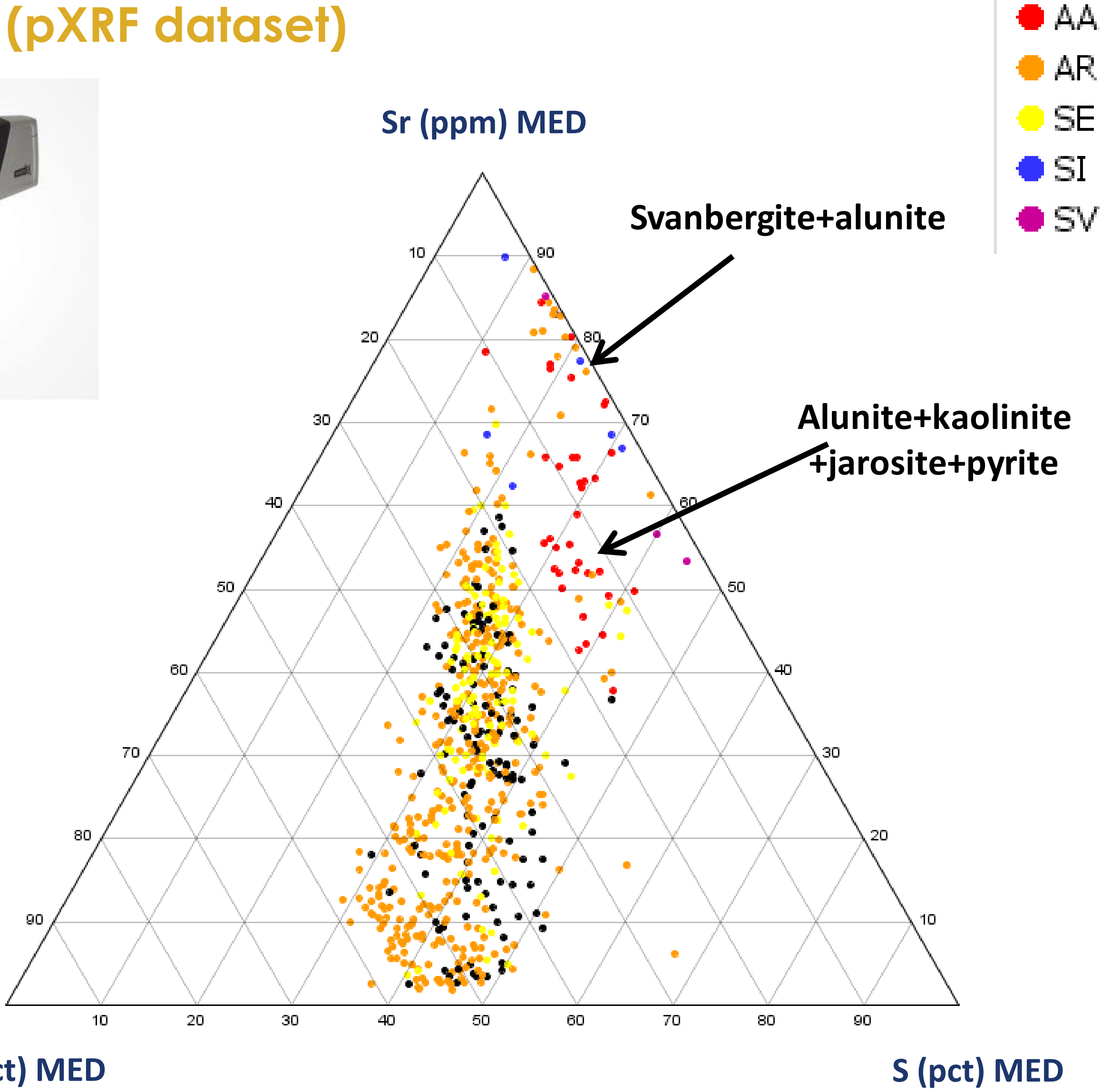
- AA
- AR
- SE
- SI
- SV

Observe that acid sulphate alteration zone within the central part of mineralized area is associated with elevated Sr (range of >1000 ppm), but low K, therefore most APS mineral is not alunite.

Au-Cu prospect, Lower Caucasus, Central Armenia

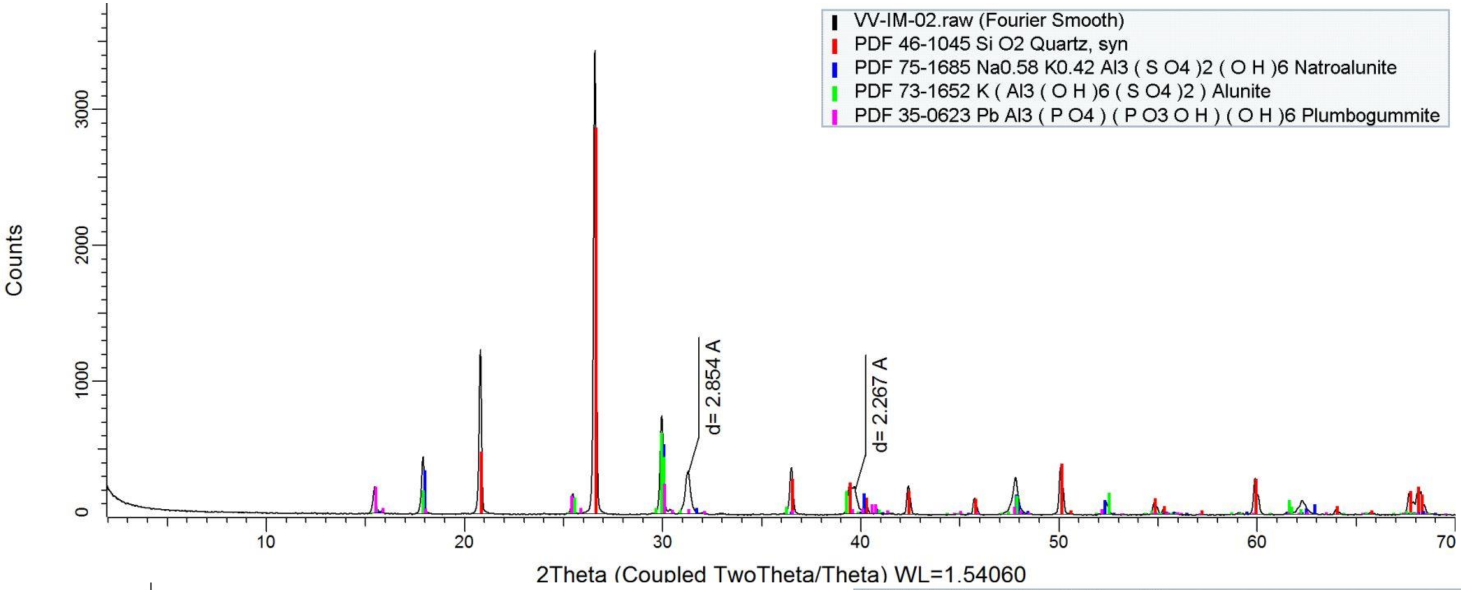
Early scout drilling: distribution of S-K-Sr-Pb (pXRF dataset)

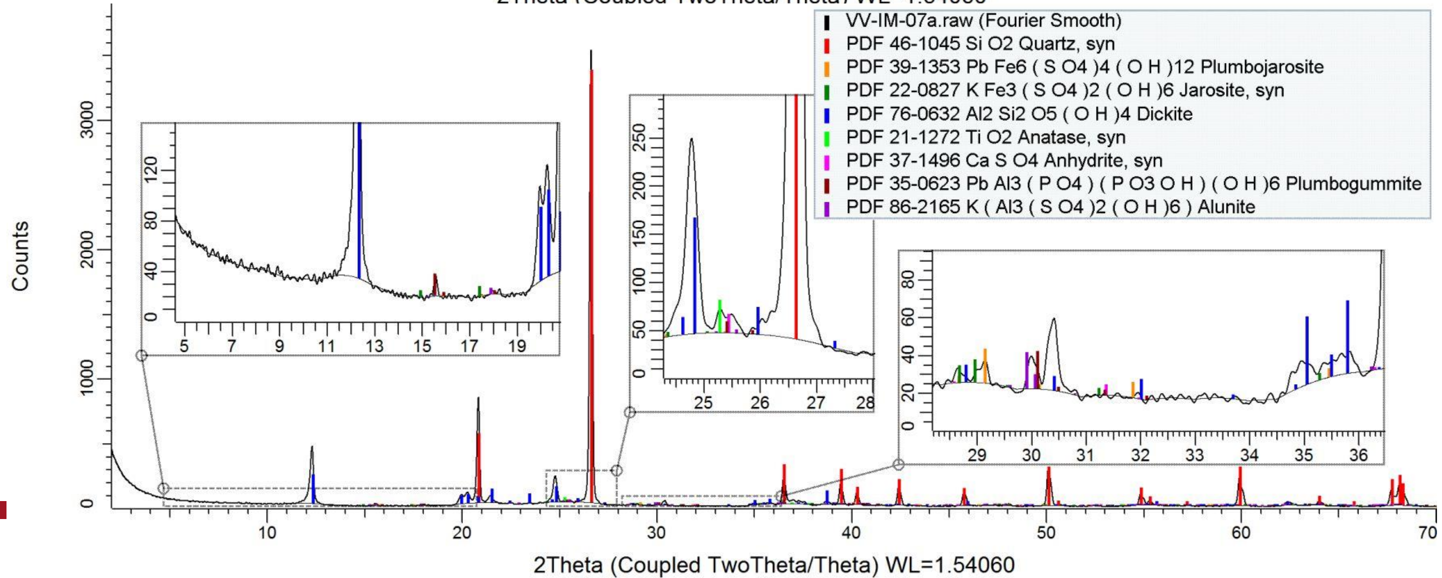


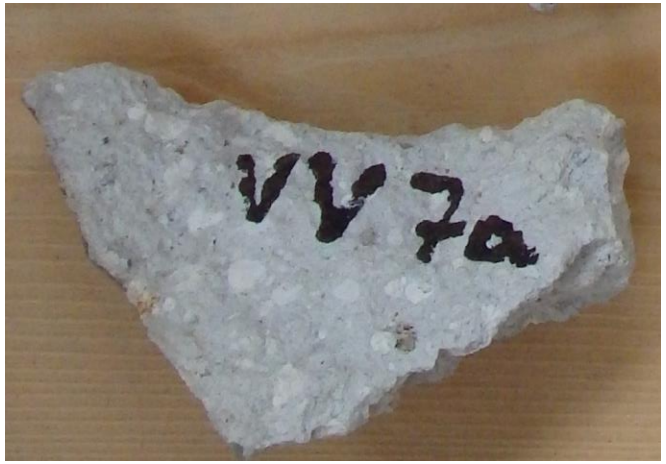


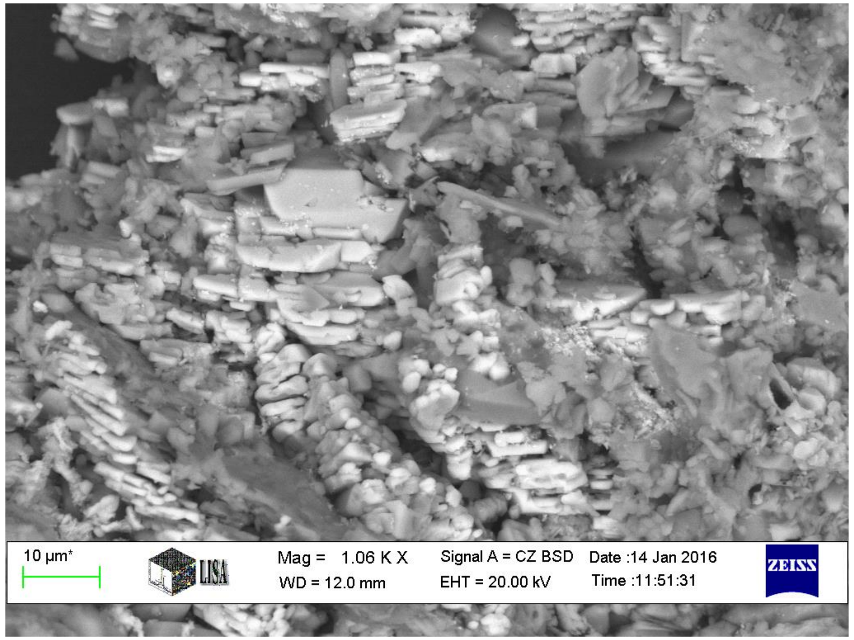
Artsiv Au-Cu prospect, Lower Caucasus, Central Armenia

Early scout drilling: APS minerals by XRD and SEM EDS





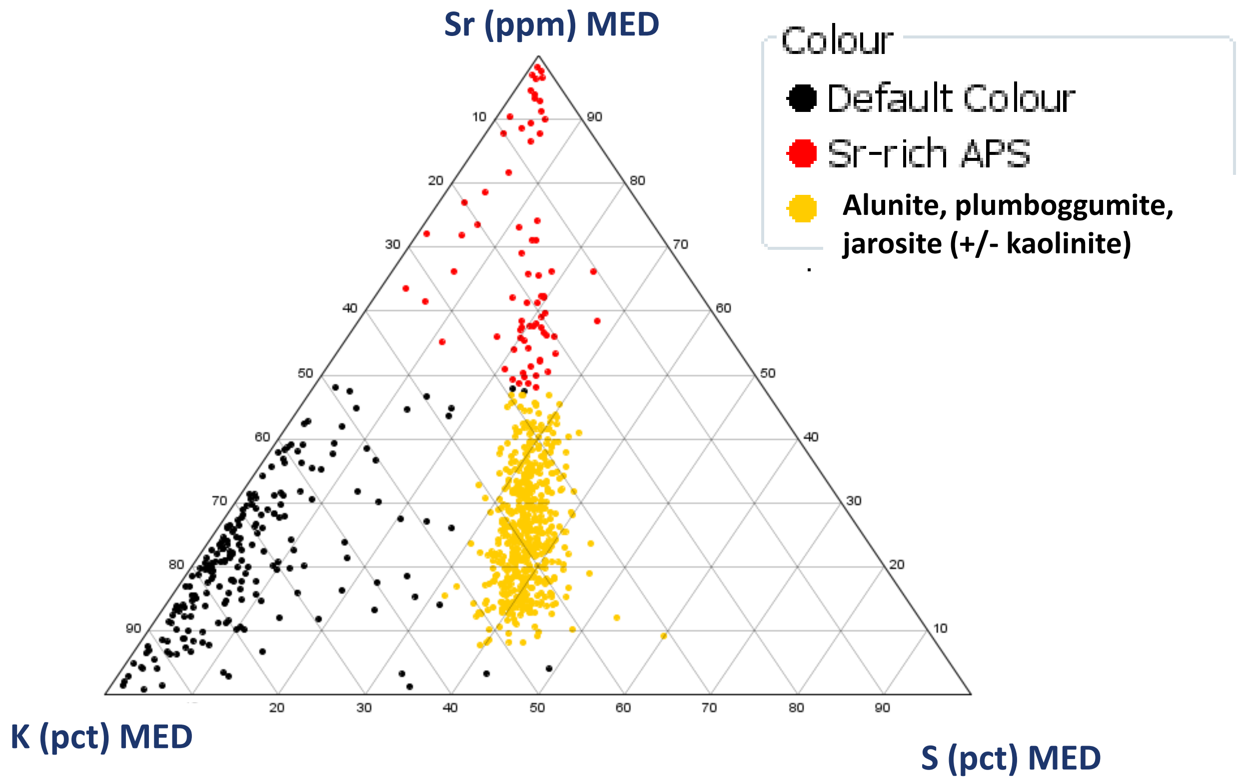


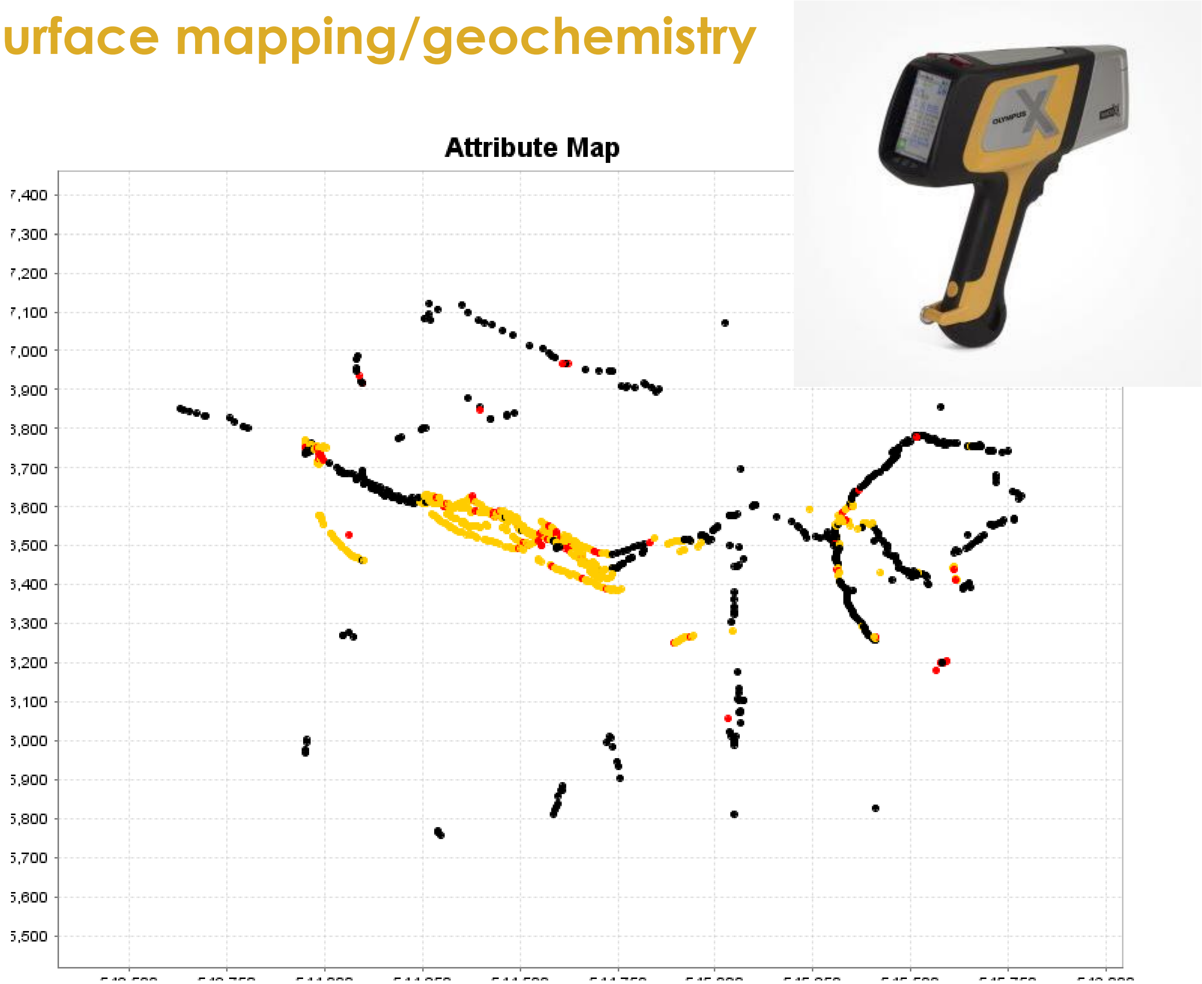


XRD&SEM EDS completed at Miskolc Univ.

Artsiv Au-Cu prospect, Lower Caucasus, Central Armenia

Applying the observations from drilling to surface mapping/geochemistry

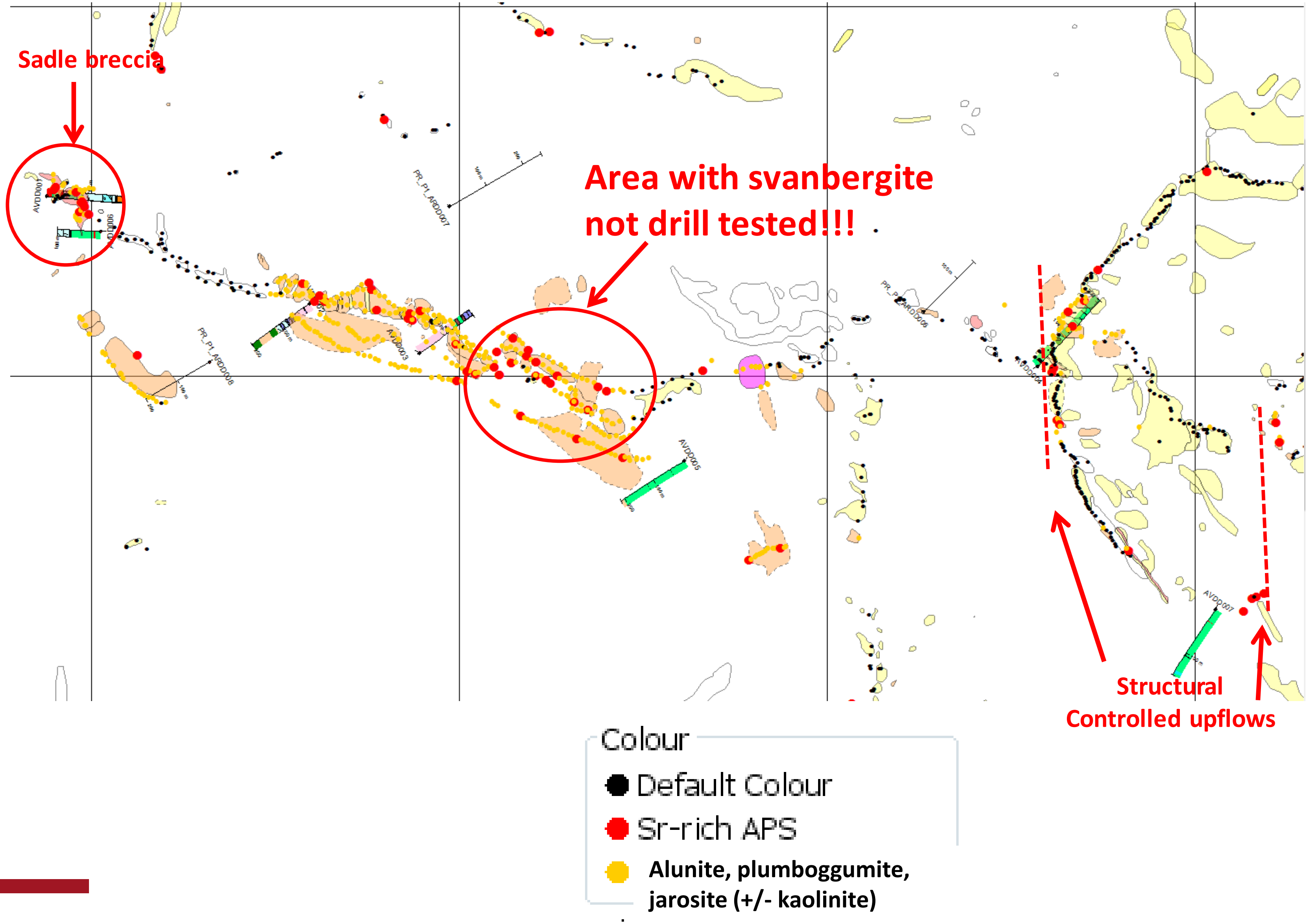




pXRF data collected at surface in Artsiv area

Artsiv Au-Cu prospect, Lower Caucasus, Central Armenia

Applying the observations from drilling to surface mapping/geochemistry



- µXRF data collected from drill core pulp samples (Ca-K-S-Sr-Pb) is very usefull to define main alteration zonations within the advanced argillic alteration environment (fresh rock -> smectite+illite -> sericite -> kaolinite -> vuggy silica + alunite -> vuggy silica + APS (svanbergite + plumbogummite + alunite)).
- The central parts of the mineralized acid-sulphate alteration system are marked by svanbergite enrichment (similar to Chelopech HS system).
- Revisiting the µXRF data collected from the surface it can be observed that high-Sr values (svanbergite enrichment) highlight a large (circular) upflow zone between existing scout drill holes. The last-mentioned area represent a direct drill target for HS mineralization.

Long-term and creative professional collaboration environment and teamwork with Dundee Precious Metals and agreement to share exploration geochemical information for academic purposes is greatly appreciated.

Thank you for your attention!

DIM ESEE 2: IMPLEMENTING INNOVATIONS

Innovation in Exploration

Dubrovnik, Croatia / hybrid mode -
October 20th – 22nd, 2021