

VectOre – exploration criteria for polymetallic sulphide deposits and industrial carbonates

Project leader

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Partners

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Project duration

2017 - 2021



Goals of the project

Characterization of alteration zones around marble-/skarn-hosted Zn-Pb-Ag deposits.

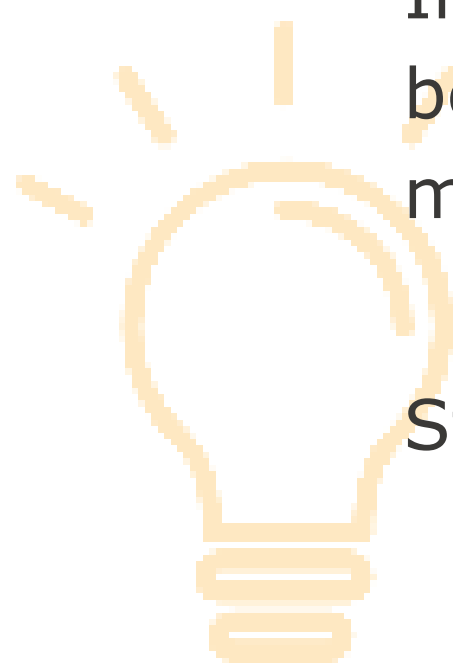
Improved exploration criteria for

- 1: Zn-Pb-Ag-rich sulphide deposits
- 2: Light-colored carbonate rock

Stimulate diversification at existing mines; carbonates as a bi-product rather than in mine waste.

Increased understanding of the geological relationship between light-colored carbonate rock and Zn-Pb-Ag mineralization.

Study area: Sala



Key commodities addressed

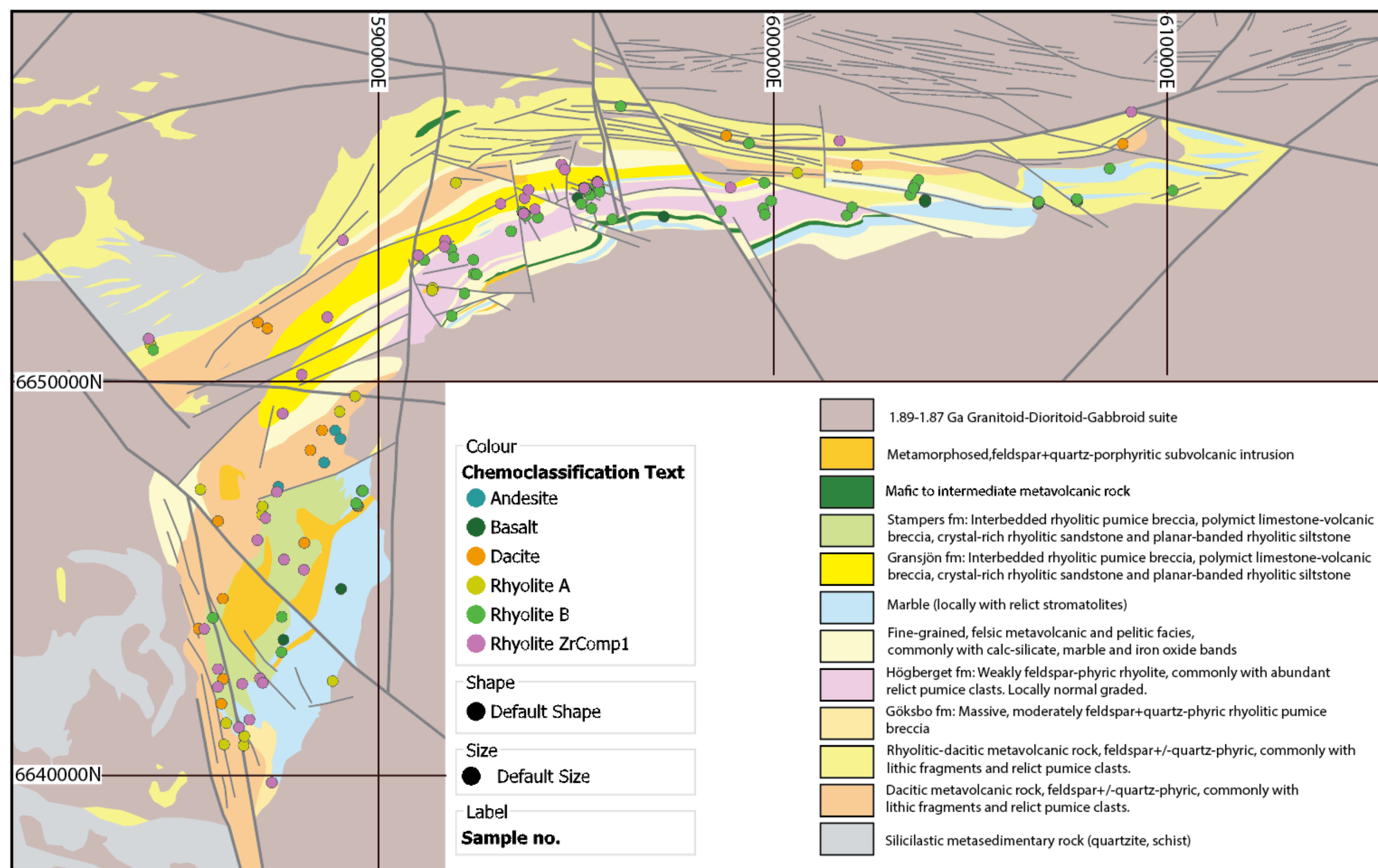


First-rate dolomite
Tistbrottet, Sala

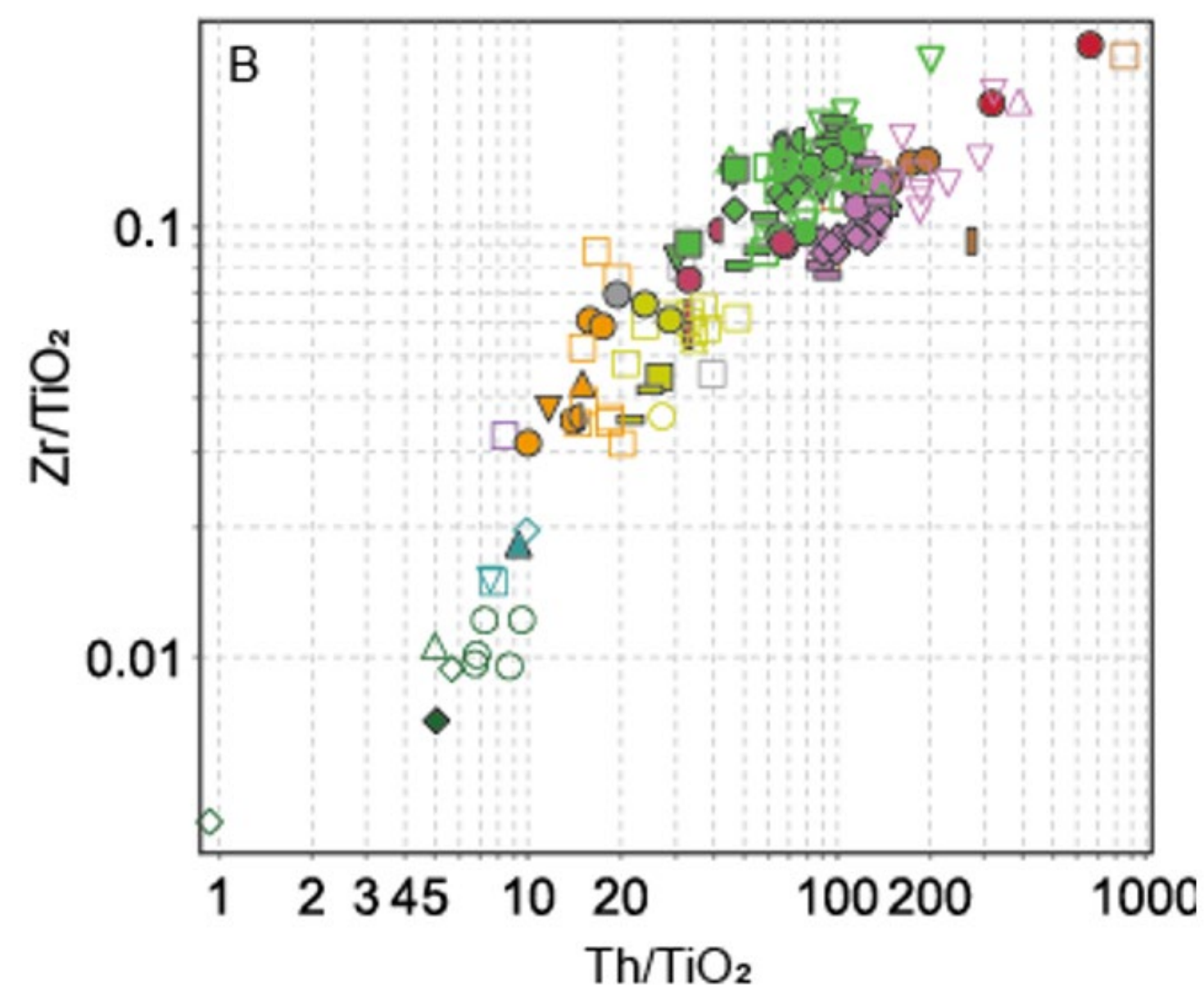


High-grade Zn-Pb-Ag ore
Sala silvermine

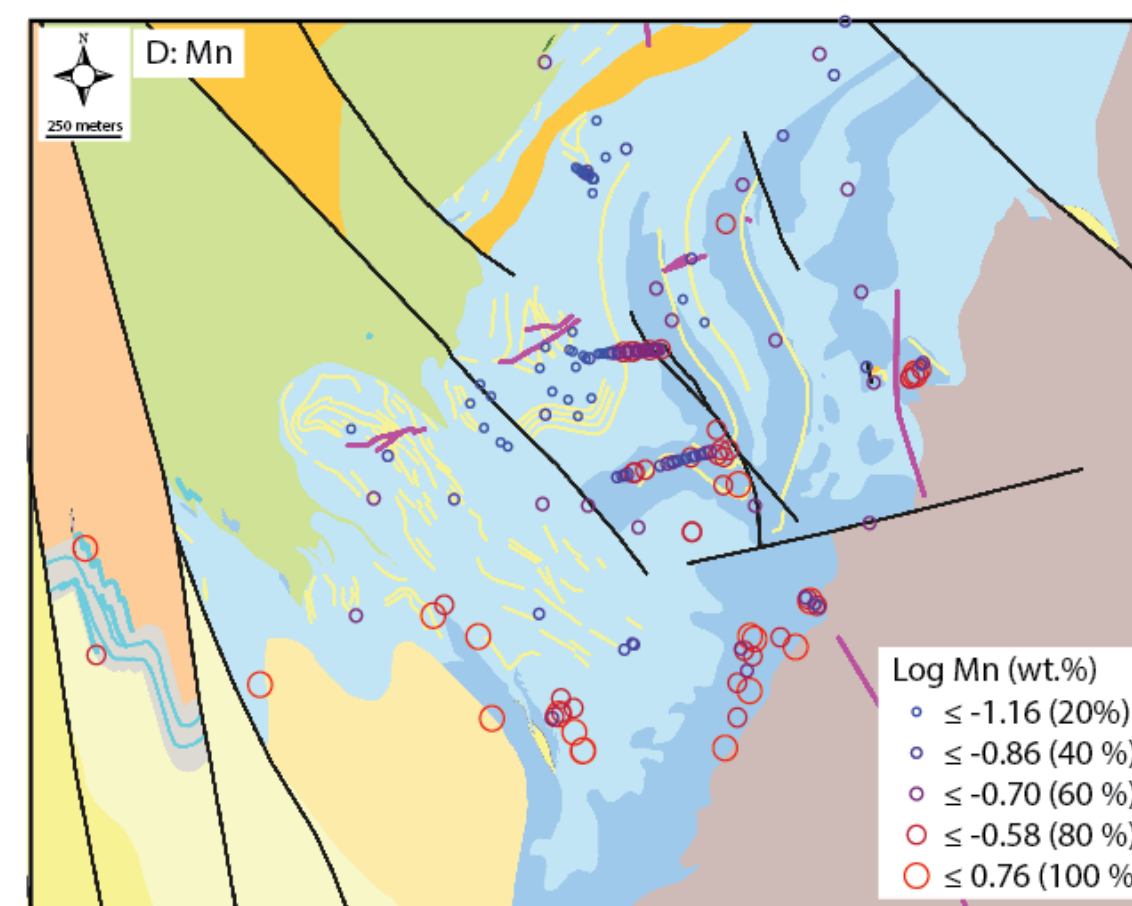
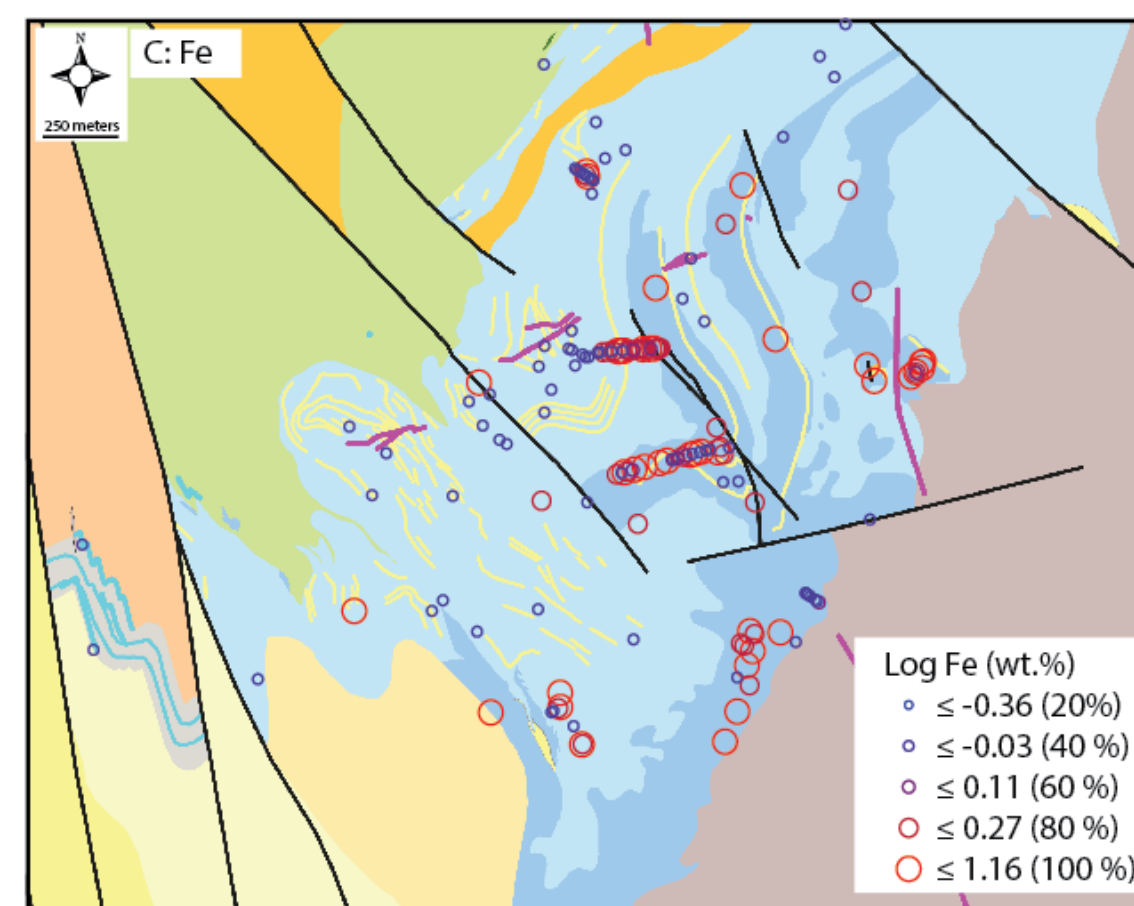
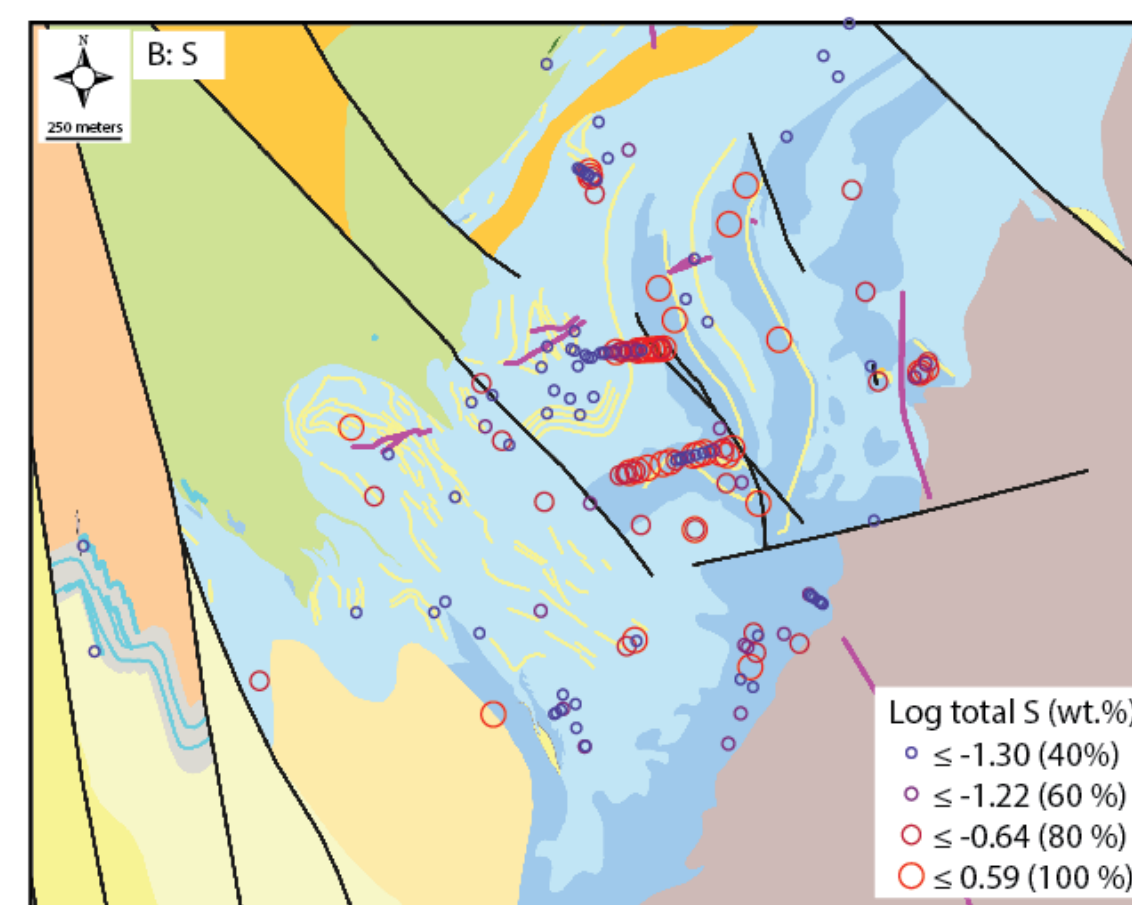
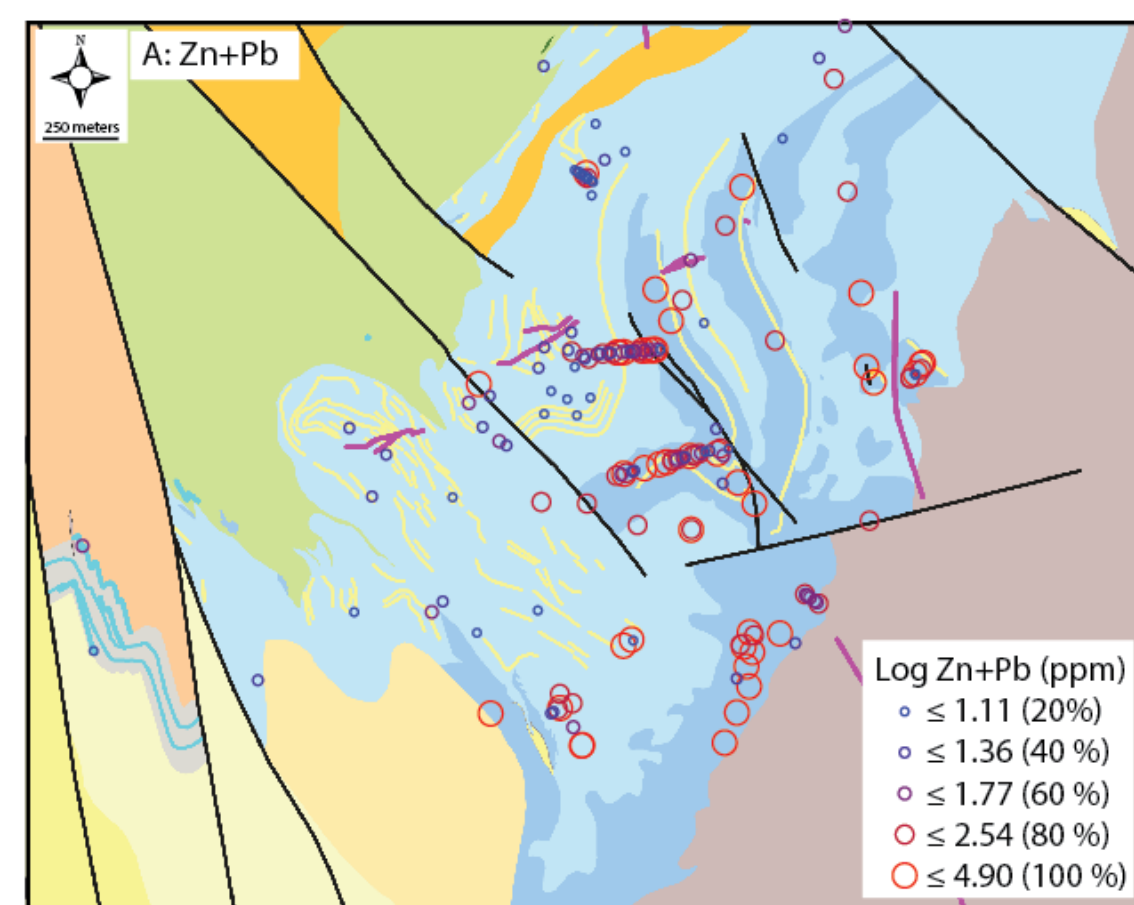
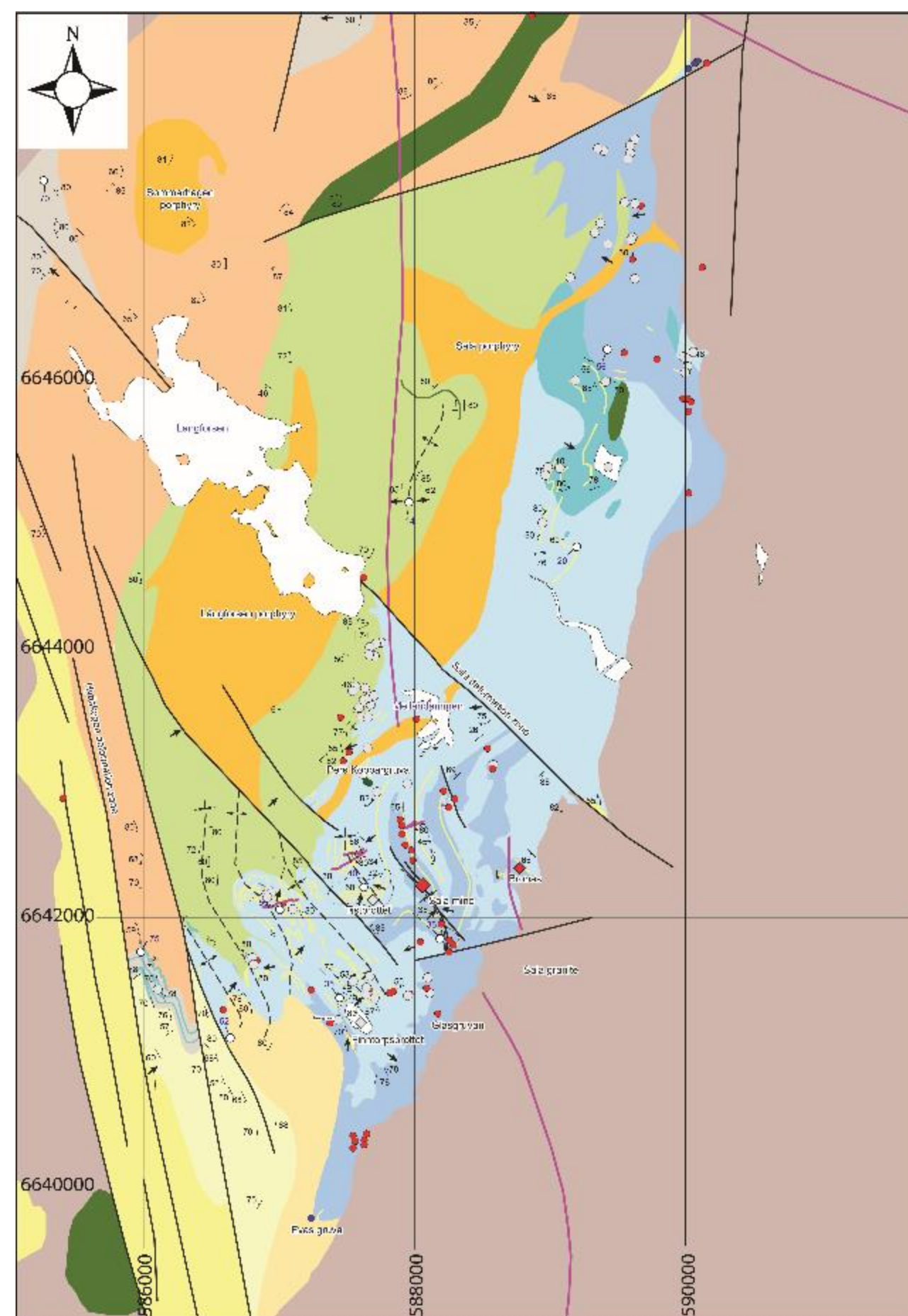
Revised geological map of the Sala area



Integrated stratigraphic and lithogeochemical analysis



Alteration model of the Sala marble



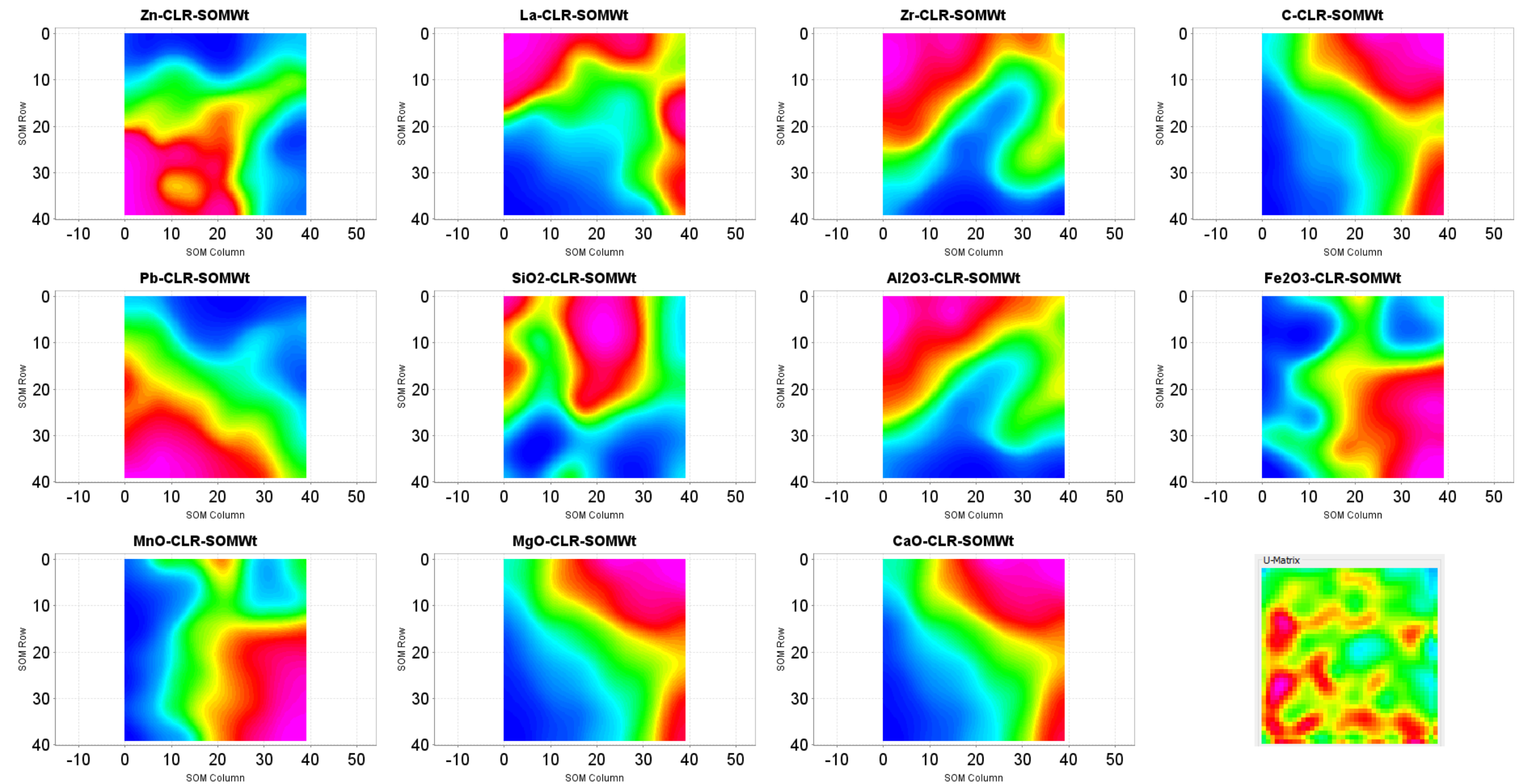
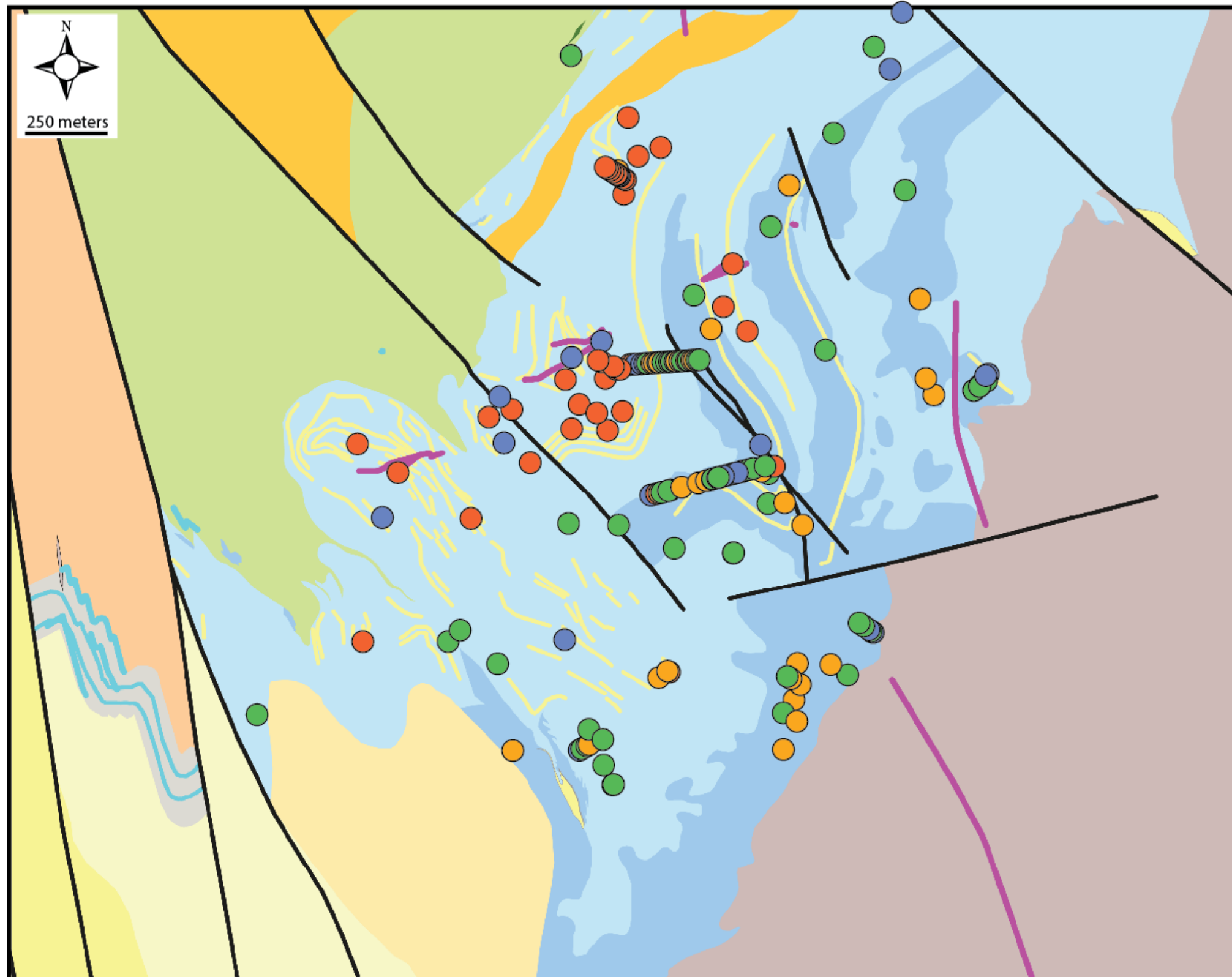
Exploration vectors for marble-hosted Zn-Pb-Ag deposits:

- Base metal anomalies
- Fe and Mn anomalies
- Volatile element anomalies (Hg, Sb)
- Geomagnetic corridors (elevated magnetite and pyrrhotite)
- Shear zones and lithological boundaries

First-rate dolomite deposits:

- c. 200 away from sulphide deposits
- Peripheral bleaching zones

Unsupervised detection of prospective samples

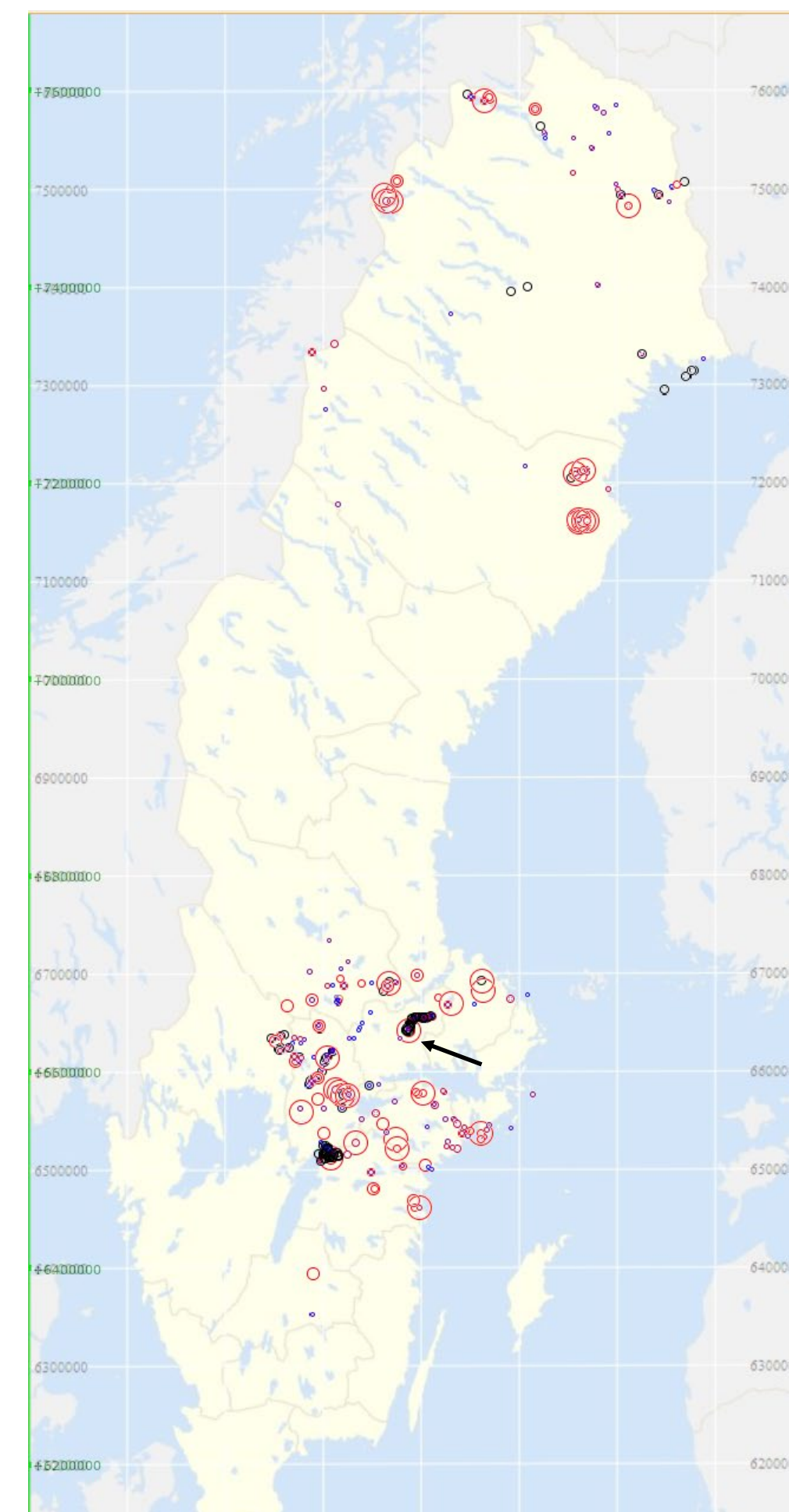
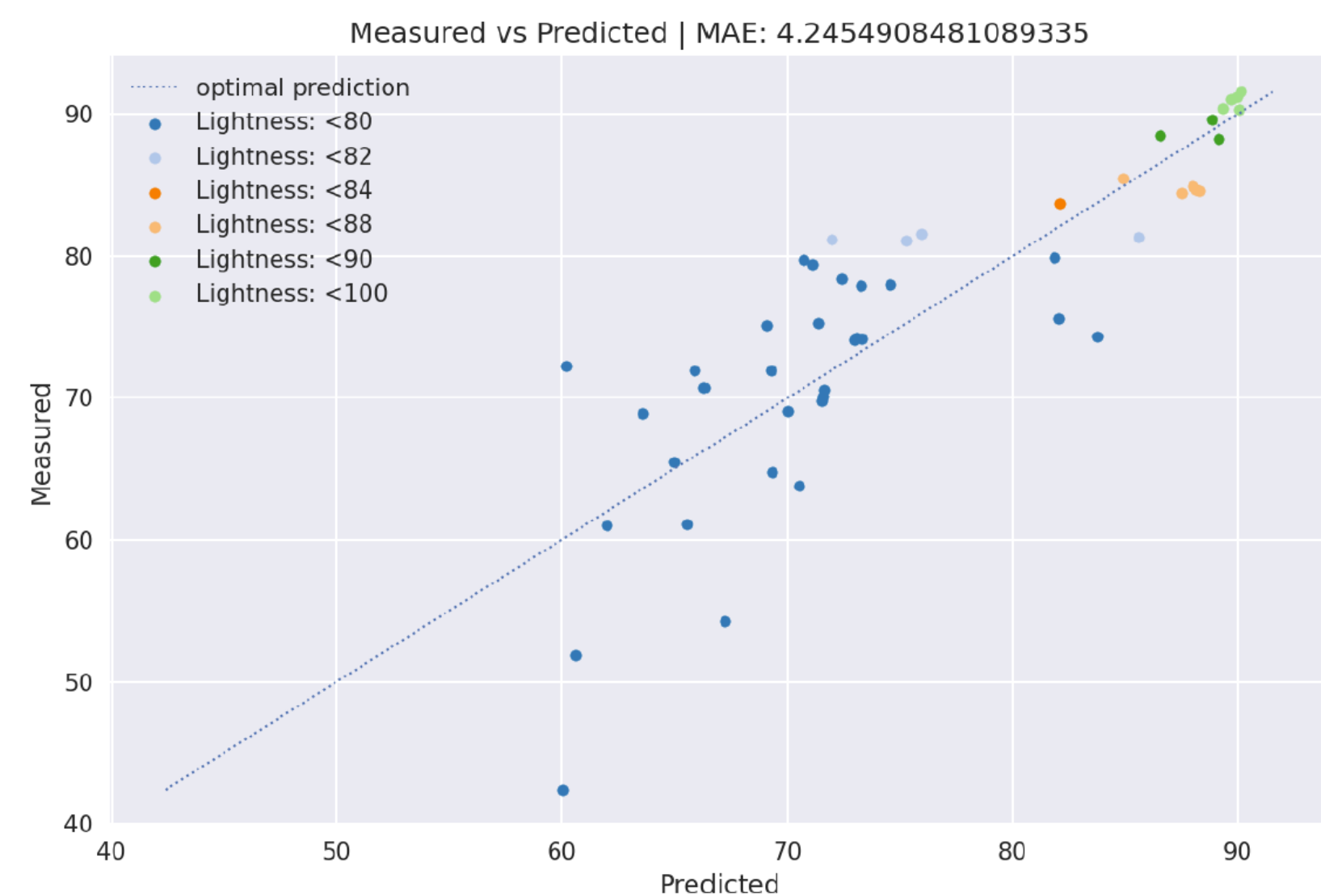


Self-organizing maps.

- Red group mainly reflect light marble
- Orange group mainly reflect mineralized marble

Supervised machine learning

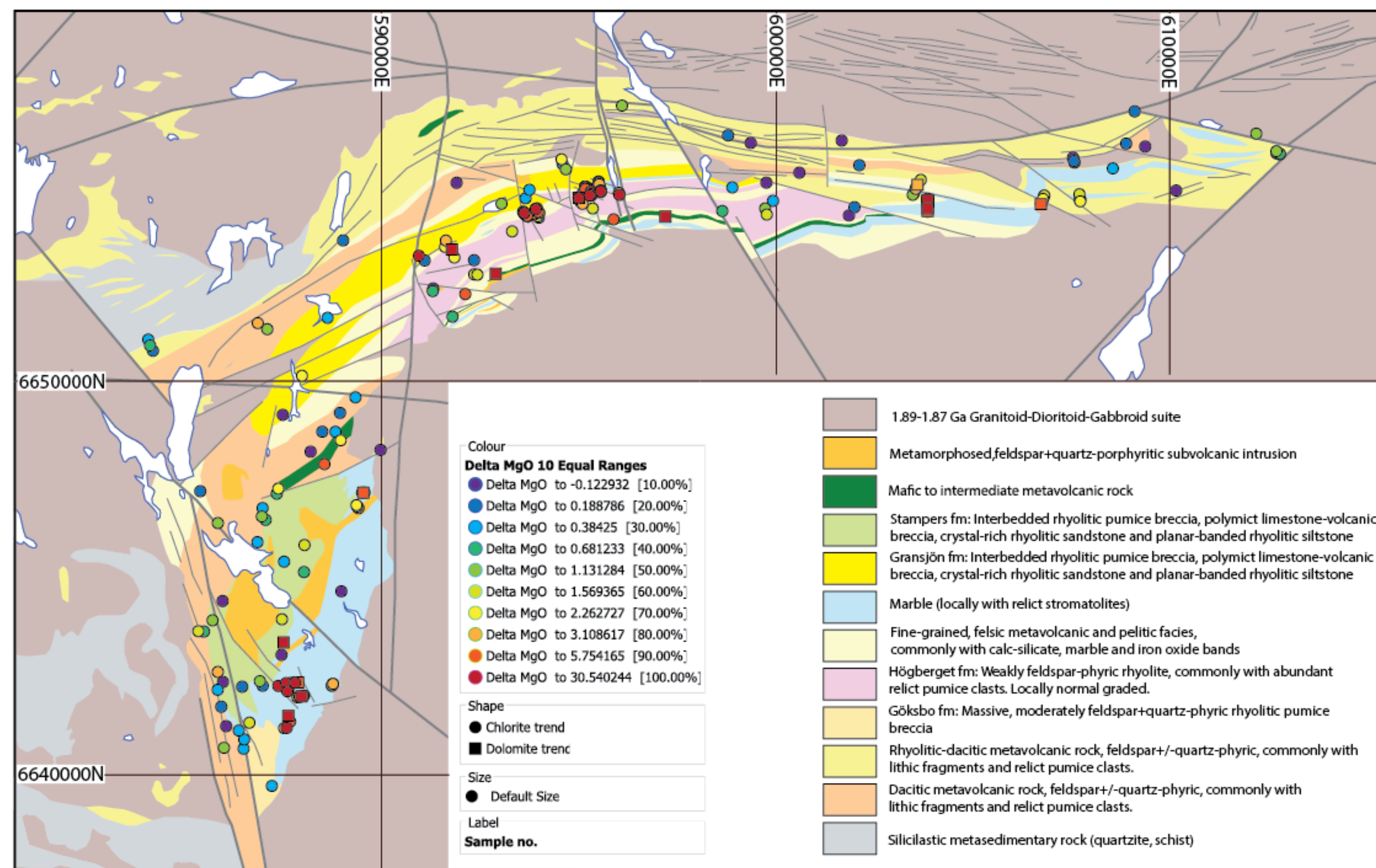
Random forest regression on whole-rock lithogeochemical data can successfully predict lightness.



Model applied to 934 regional samples in SGU database.

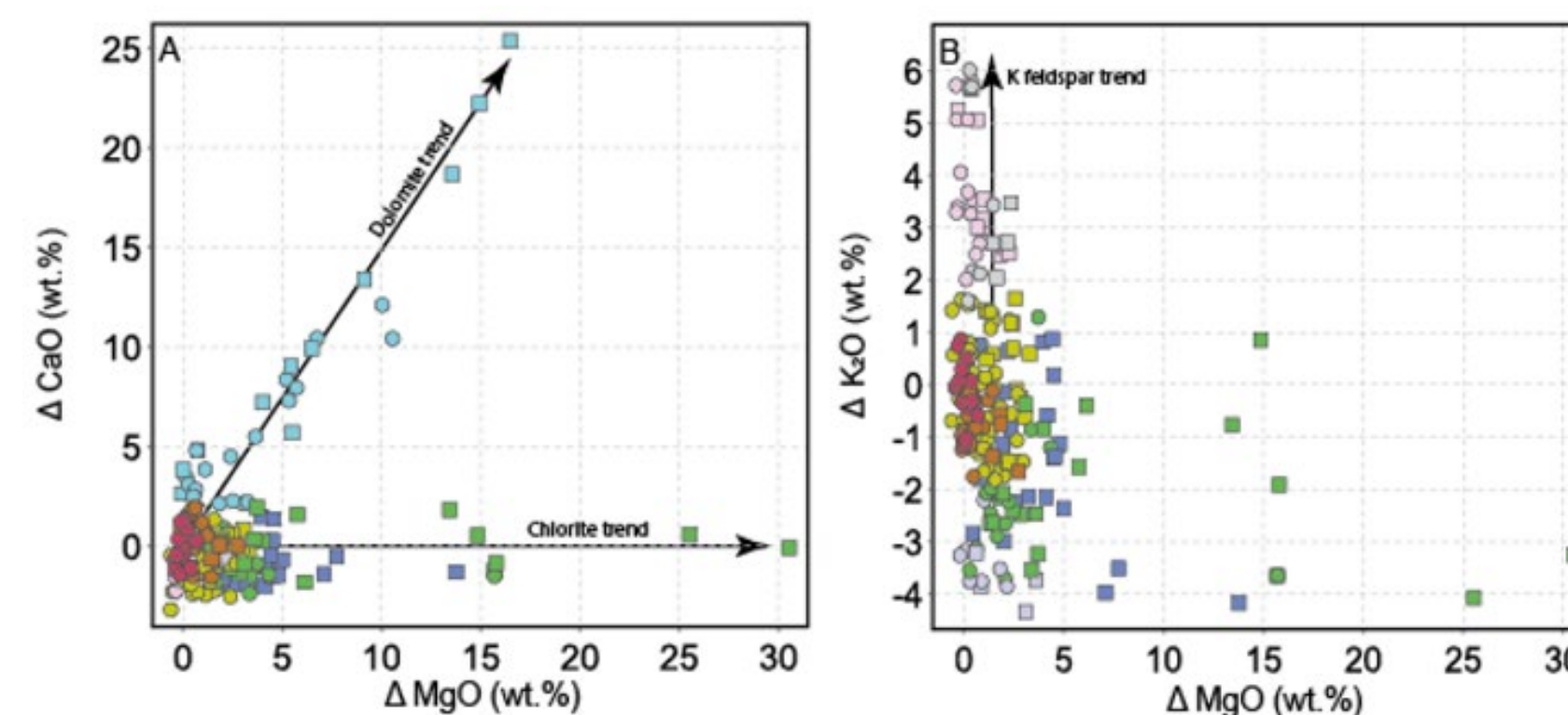
Large red circles are prospective areas for First-rate marble.

Regional alteration map of metavolcanic succession

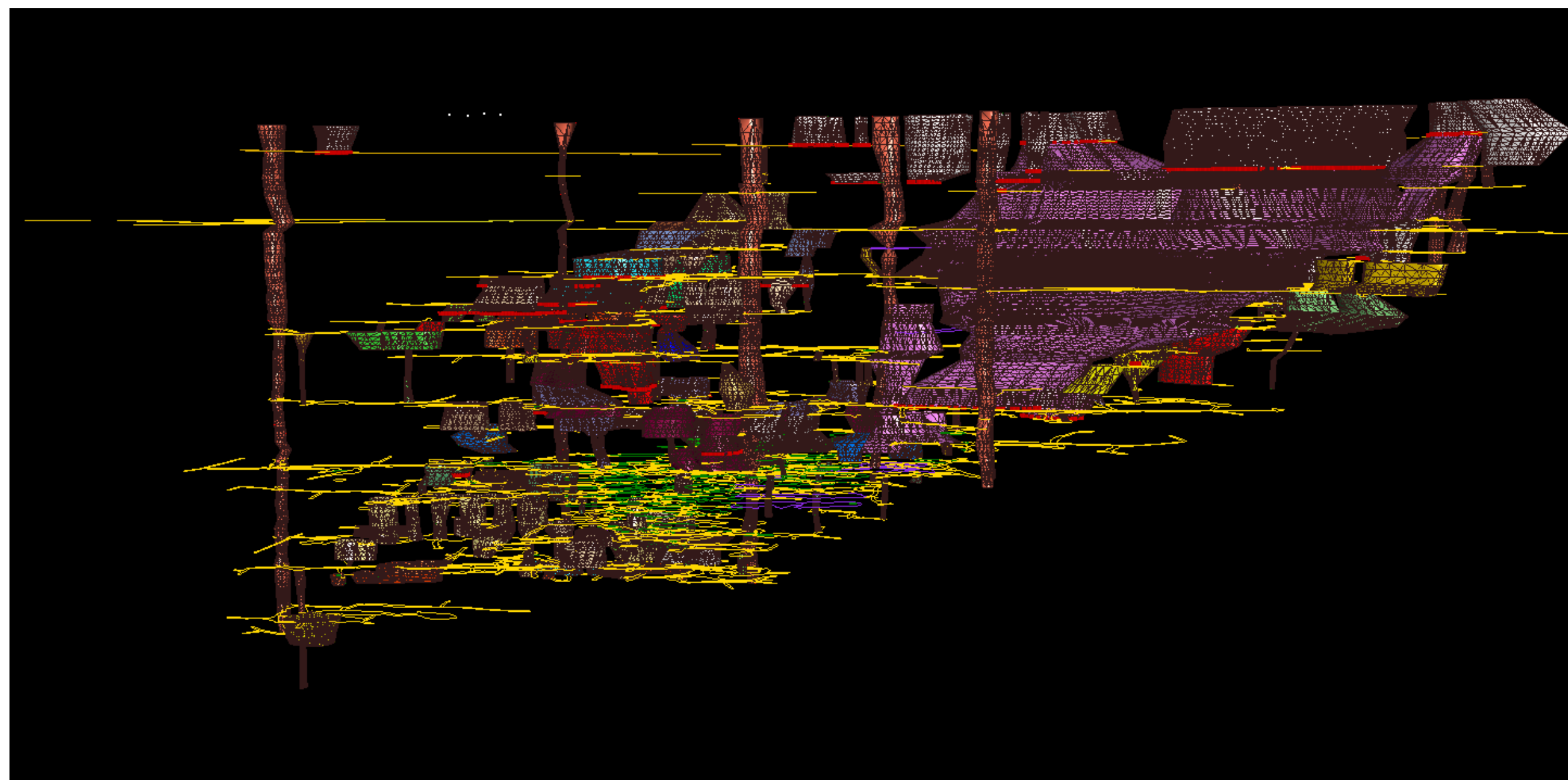


Chemical changes due to hydrothermal alteration.

Outlines alteration zones associated with Zn-Pb-Ag deposits.



Upcoming activities and next step



- Finish the exploration targeting models.
- Finish all layers in the new surface map.
- 3D model of the Sala Zn-Pb-Ag deposit.
- Publication of results in peer-reviewed scientific journals.



Mining innovation for a sustainable future