Advanced proxies for provenance, mechanisms of modern stream sediments – An application of SEM-based quantitative mineralogical analysis

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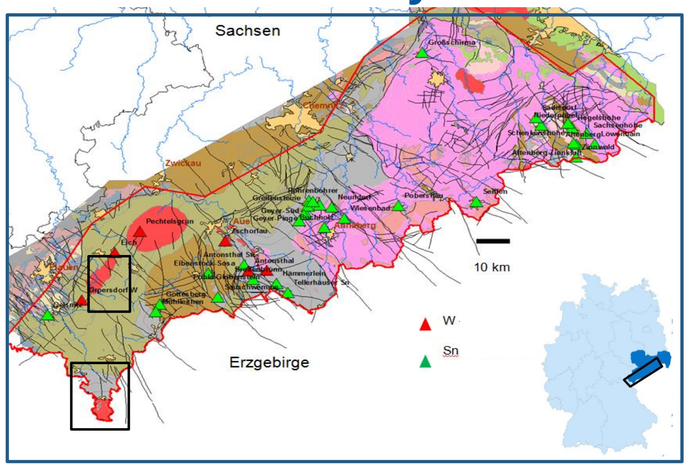
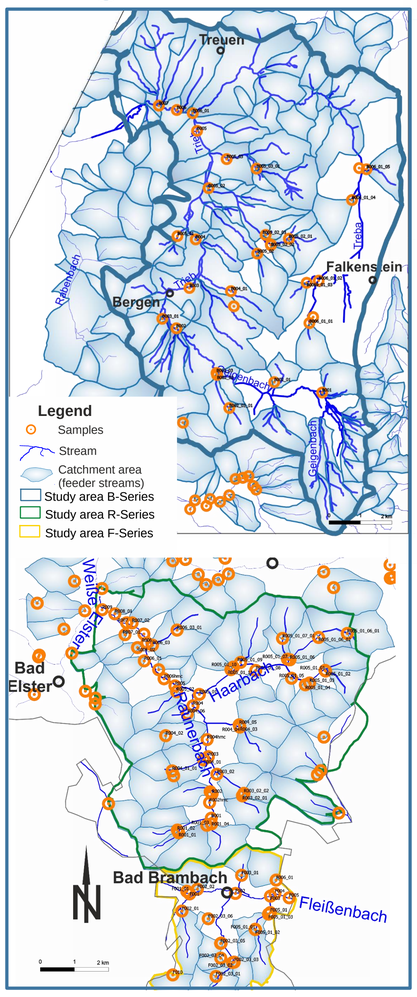
Stream Sediment Analytics

The aim of this study is to integrate the parameters provided by the Mineral Liberation Analyzer (MLA) with bulk geochemistry and XRD data into one holistic and quality assured model for stream sedimentary analytics. All data are subjected to robust statistical analysis and the results critically assessed.

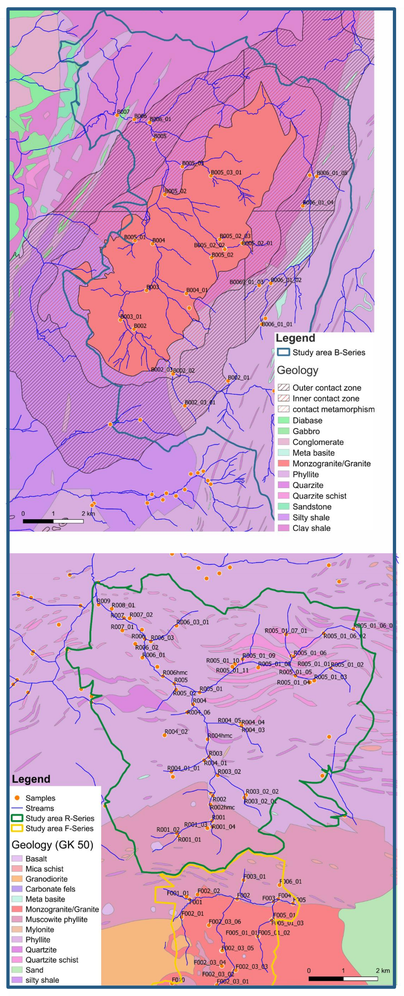
Study Area & Sampling



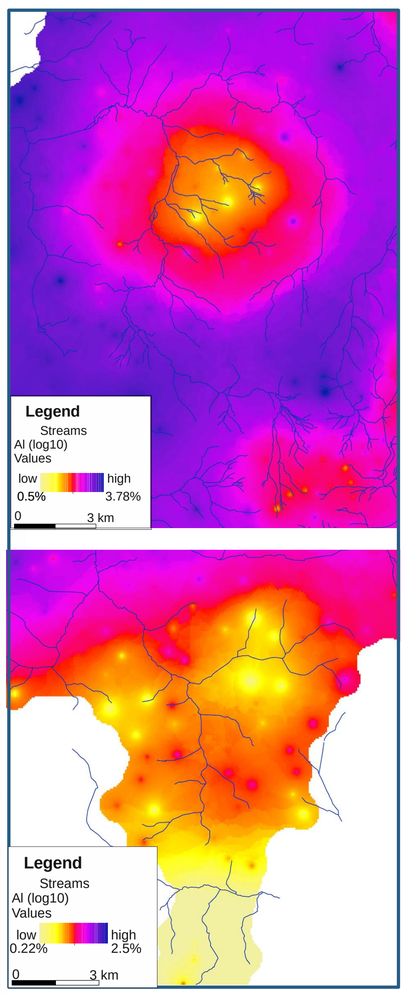


- Study area located in the Vogtland region of Germany.
- Bedrock comprises well studied plutonic and metamorphic units of the Variscan Orogeny.
- The population density in the study area is moderate; limited anthropogenic contamination is expected.

Geology



Geochemical distributions



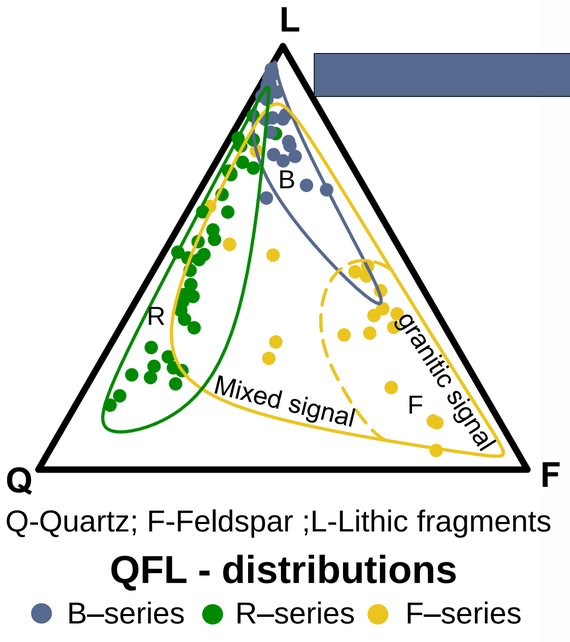
→integrated map of the logarithmic distribution of the Al content within the Stream sediment

- Al-content relatable to the lithological information of the study area
- Negative anomaly connected to the granitic rocks
- Potential differentiation of different Meta-sedimentary units
- Mixed-signals along the steam path

Methodical Approach

Statistical analyses

- Each sample comprises up to 40.000 grains
- Clear distinction between the steam systems
- indices lithological mixing

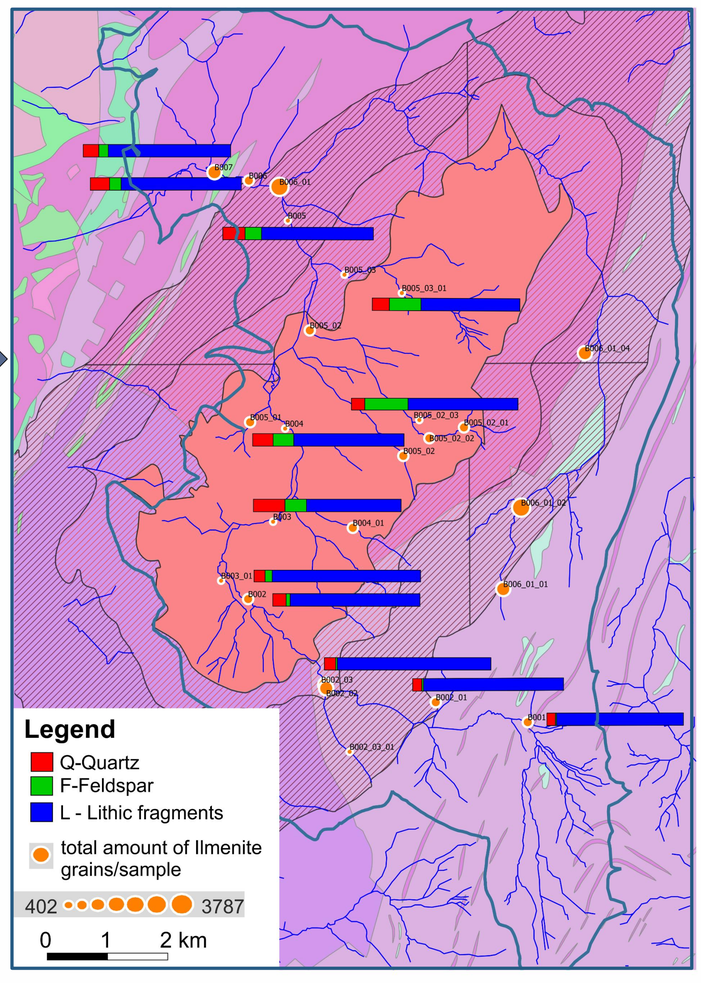


Q-Quartz; F-Feldspar ;L-Lithic fragments

QFL - distributions

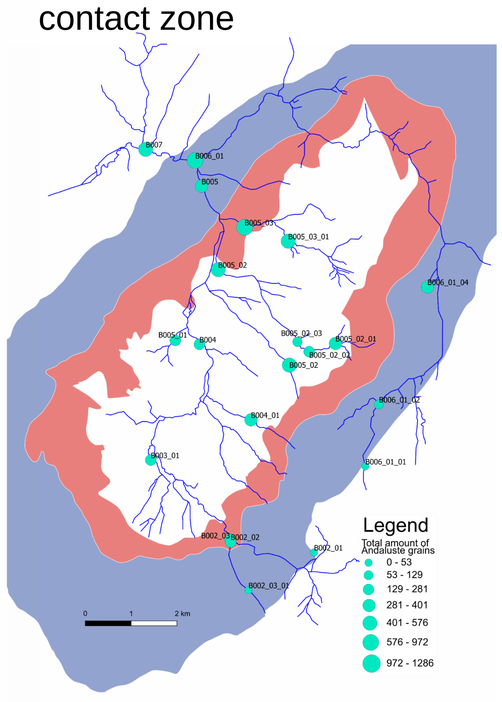
B–series R–series F–series

Lithological/Mineralogical signals



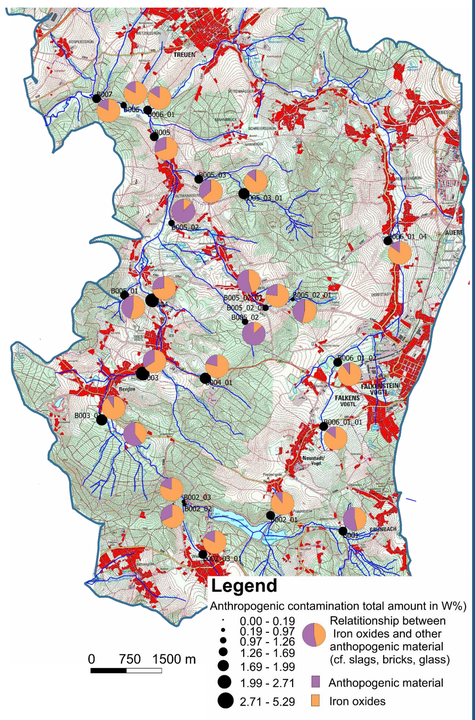
Andalusite related to the contact zone

- Andalusite amount rises over the stream path
- Increasing enrichment in association with the inner contact zone



Anthropogenic contamination

- Anthropogenic contamination can be related to villages
- Iron Oxides mainly anthropogenic, occasional mixed with Magnetite



First results based on mineralogical Data

First results of this study suggest a clear improvement to the detection of lithological changes of the source rock composition (cf. QFL, Ilmenite and Andalusite distribution) and transport features of the unconsolidated sediments by including MLA data – as compared to the consideration of whole rock geochemical data only. Anthropogenic contamination is well recognized and can be used to balance its impact on the chemical composition.

This study is a part of the WISTAMERZ project, a collaborative research project focused on the Exploration potential of critical raw materials based on stream-sediment analyses. The study is carried out in the Erzgebirge and the southern Vogtland (c. 5000 km²). The geological maps (GK50) and the topographic map are provided by the national survey of Saxony (© LfULG).

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