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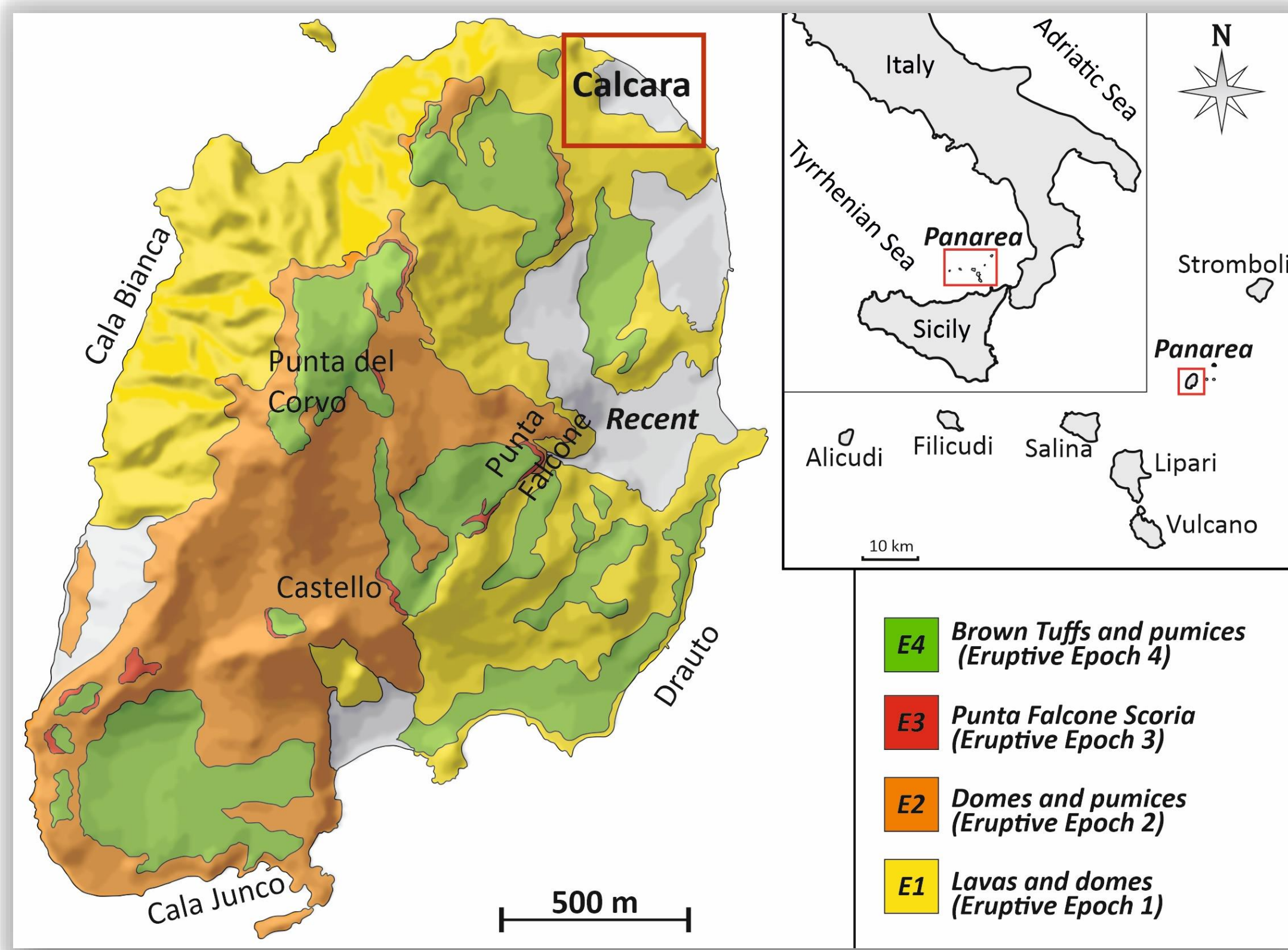
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Geochemistry of acid-sulfate alteration in Panarea (Aeolian Islands, Italy)

Théo Bouvart, Julien Poot, Augustin Dekoninck, Flore Schmit, Maxime Keutgen De Greef, Alain Bernard & Johan Yans



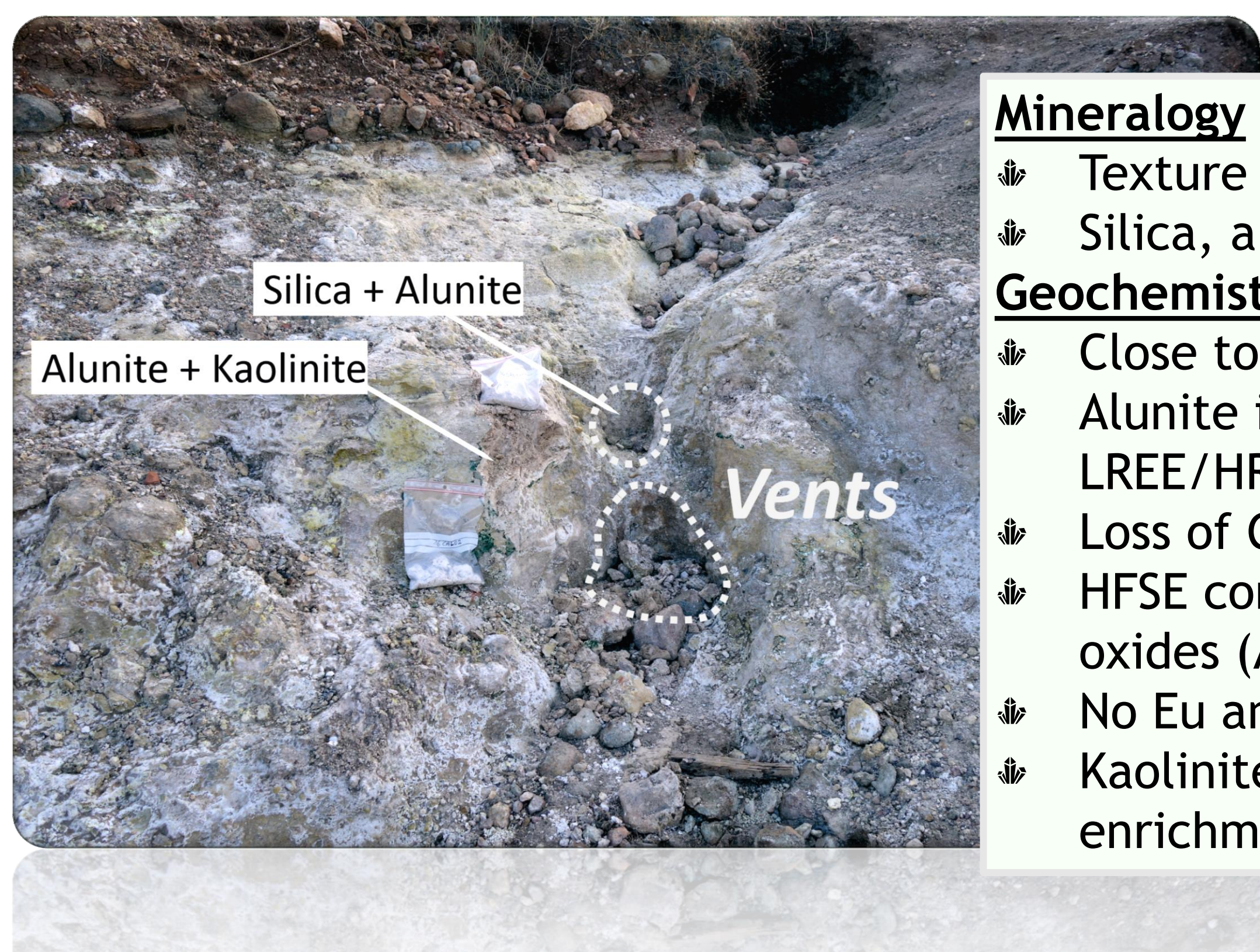
- Panarea is a partially emerged caldera.
- Protolith is calc-alkaline to high-K calc-alkaline andesite & dacite.
- **La Calcara** is an active steam-heated environment.
- Fluids typically originate from seawater, modified by complex interactions between boiling volcanic gases and meteoric water¹.
- Chemical composition and ³He/⁴He of Calcara suggest a magmatic system centered on Bottaro islet at relatively shallow depth². Both sites show synchronous variations suggesting a same deep feeding magmatic gas system^{2,3}.
- Ongoing Acid-sulfate alteration



Fumarole

Different alteration textures

Altered prism

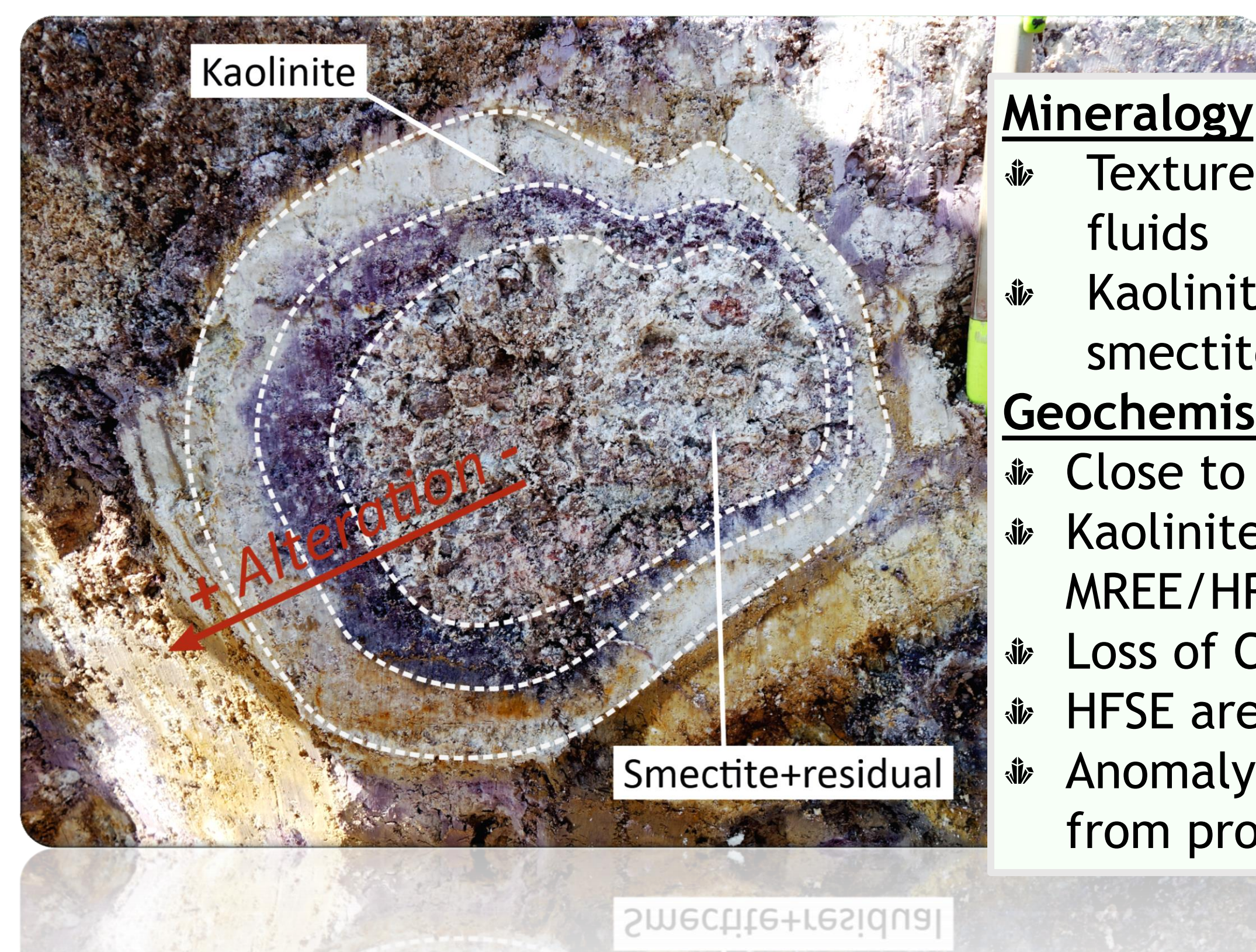


Mineralogy

- Texture loss
- Silica, alunite, kaolinite

Geochemistry

- Close to protolith values
- Alunite is fractionating LREE/HREE
- Loss of Cs, Rb
- HFSE content varies with Ti oxides (Anatase)
- No Eu anomaly inherited
- Kaolinite displays no major enrichment/depletion

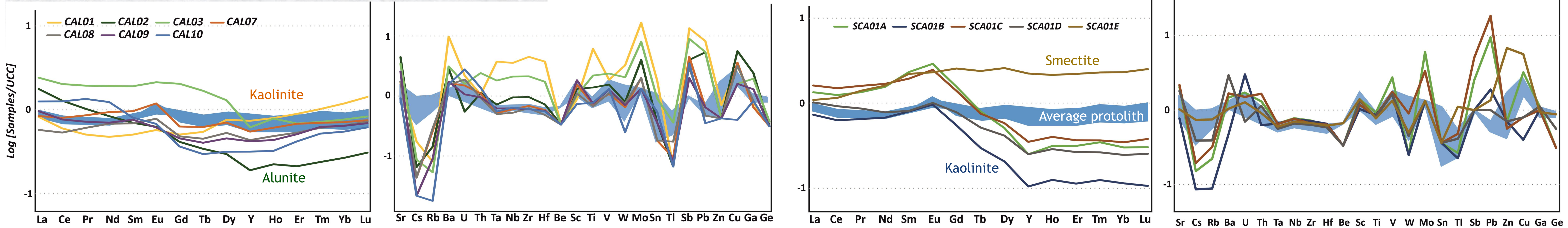


Mineralogy

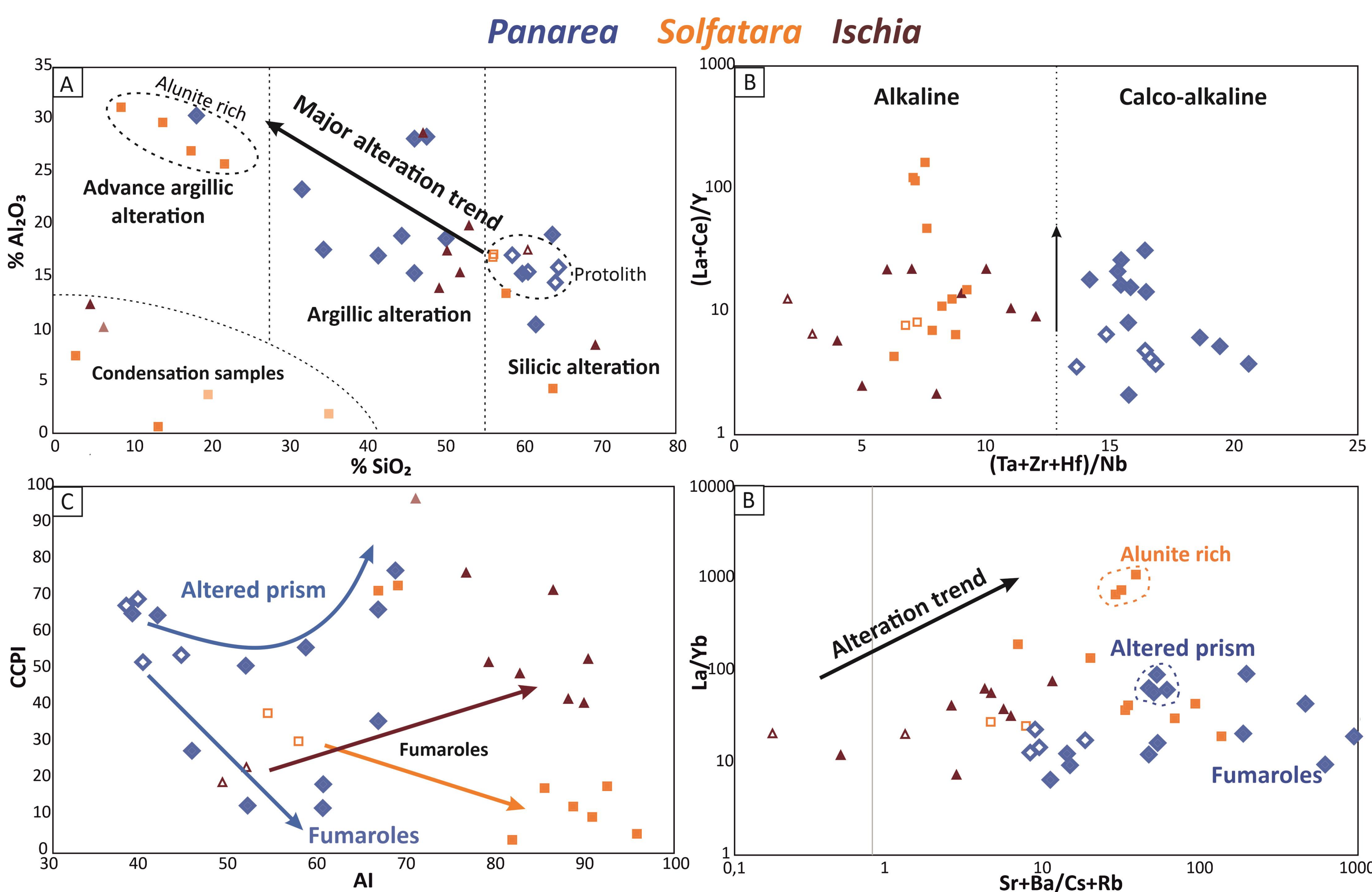
- Texture preserved, pervasive fluids
- Kaolinite (± alunite), smectite, residual plagioclase

Geochemistry

- Close to protolith values
- Kaolinite is fractionating MREE/HREE
- Loss of Cs, Rb
- HFSE are immobile
- Anomaly + in Eu, inherited from protolith



Comparison with other Italian hydrothermal systems Global vs local



Conclusions

- Alteration indices and elements ratios distinguish protolith from alterites and some major alteration trends⁴.
- **Protolith heritage** in altered samples → ongoing process of exchange of chemical elements & replacement of primary rock. Alteration products retain Nb and Ta calco-alkaline or alkaline heritage.
- Alkali elements loss during hydrothermal alteration.
- Alunite is fractionating LREE/HREE. Kaolinite plays various roles in the REE fractionation.
- Acid fluids significantly mobilize REE during the primary rock dissolution. REE concentration is governed by the protolith initial composition.
- The fractionation between LREE, MREE and HREE is induced by mineralogy, alteration intensity, pH, ionic strength and possibly crystallinity of alteration minerals.

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