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Vectoring lithium (Li) mineralizations: a first approach to pegmatite geochemical halo definition in the Fregeneda-Almendra area

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Background and study area

Previous studies have focused on the development of innovative exploration techniques [1] for critical metals like Li (key to the electrification of vehicles and energy storage). However, most of these techniques can only detect surface pegmatite-hosted deposits. In this study, a first attempt is made to define the geochemical halos associated with different types of pegmatites in the Fregeneda-Almendra (Spain-Portugal) pegmatite field. Excluding intra-granitic pegmatites, the remaining metasediment-hosted dykes range from simple, concordant, barren pegmatites to more evolved, Li, F, Sn, Rb, Nb>Ta, B, and P enriched dykes. The host-rocks correspond to a Neoproterozoic-Cambrian pelitic-sandy flysch series.

Approach and preliminary results

Samples were collected transverse to both mineralized and barren dykes. The process included both surface and drill core host-rock samples, besides control samples collected outside pegmatite influence. Major and trace elements were analyzed by ICP-OES/ICP-MS. Scatterplots and Pearson's coefficient analysis highlighted a strong correlation between Li and Tl and Rb, as well as a moderate correlation with Sn and Cs – Figure 1. A very strong correlation between Tl and Rb was observed. Both host-rocks of barren and Li-bearing dykes showed enrichment in Li, Cs and Rb when compared with the control group, but the degree of enrichment in Cs increases with the evolution degree of the pegmatites. Field observations point to B metasomatism in the host-rock of both barren and evolved dykes that can reach up to 30 m away from the contact of thickest pegmatites.

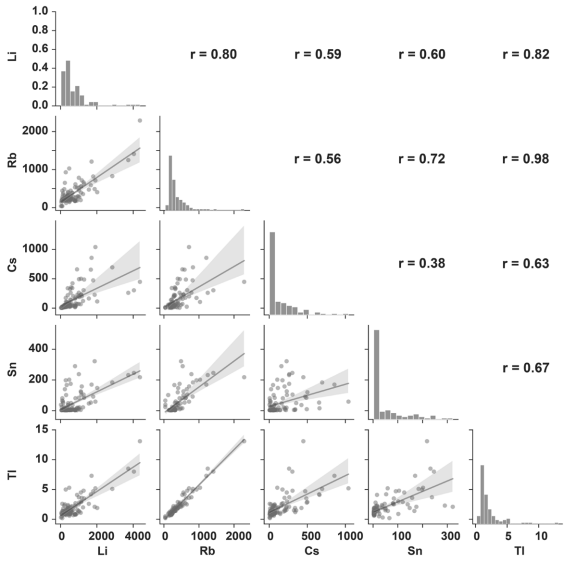

Figure 1: Scatterplots and Pearson coefficient (r) for selected elements.

Final remarks

The results showed that geochemical analysis of metasedimentary host-rocks can help to vector possible buried pegmatites. The Cs content might enable the discrimination between barren and Li-bearing dykes. Future work will include detailed lithological and mineral-chemistry studies.

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[1] Cardoso-Fernandes, J., et al., Detecting Lithium (Li) Mineralizations from Space: Current Research and Future Perspectives. Applied Sciences, 2020. 10(5): p. 1785.