Developing Soil Sampling Workflows for Lithium Exploration in SW England

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The Cornubian granite batholith of SW England hosts one of the largest undeveloped Li resources in Europe. Li has been historically overlooked by regional and local scale exploration programmes due to a lack of demand, with current exploration activity largely focussed on brownfield sites, leaving the greenfield Li exploration potential of SW England under-investigated.

Soil sampling, a well-established greenfield exploration tool, is typically applied without significant consideration of variability between deposit types or natural variations across a sampling area. This study focusses on two known and contrasting Li occurrences in SW England: the Tregonning Granite, a medium-grained and variably altered Li-mica rich granite pluton; the Meldon Aplite, an aphanitic Li-mica and petalite bearing aplite dyke. Trial orientation pits were dug at both sites to collect bulk soil samples from different soil horizons, with sufficient material to separate each into five size fractions for fully quantitative (ICP-MS) geochemistry. Additional material was prepared as resin-mounted blocks for advanced mineralogical analysis using SEM-EDS, QEMSCAN and RAMAN spectroscopy.

Li distribution in soil size fractions shows soils overlying the Tregonning Granite have elevated Li in the 500-2000 µm fraction, and those overlying the Meldon Aplite have Li in the 75-150 µm fraction. Multielement geochemical data analysis highlights the application of U/Th ratios, distinguishing granitic (U/Th > 0.43) from metasedimentary-derived material. SEM-EDS and QEMSCAN have identified mineralogical sources of the U and Th, as well as providing bulk mineralogical data about the sample material, with RAMAN spectroscopy being used for the rapid identification of Li mineral speciation.

Initial results from these samples reinforce the need to tailor soil sampling programmes for specific deposit types, with geochemistry and mineralogy showing a strong correlation to the source material properties.