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Stream Sediments as an Exploration Tool for Spodumene Pegmatites

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Stream sediment geochemistry has long been used in exploration for gold and other chemically resistant minerals, typically at district or larger scale. Spodumene pegmatites contain a variety of distinctive heavy minerals, and common minerals with distinctive chemistry and/or texture, many of them resistant to weathering. As part of the GREENPEG project, which is developing toolkits for buried pegmatite exploration, we have applied this technique on the prospect scale (25-50 km²) in two areas of known spodumene pegmatite subcrop beneath thin (<1 m) soil: the Moylisha prospect, southeast Ireland, and the Wolfsberg prospect on the Carinthia-Styria border, Austria. In Moylisha, ~400 Ma spodumene pegmatites were emplaced along the contact between ~410 Ma granites intruding Ordovician mica schists; in Wolfsberg, ~ 270 Ma spodumene pegmatites were emplaced into Variscan mica schists and amphibolites, and later metamorphosed up to eclogite facies at around 90 Ma.

Samples were collected mainly from first- and second-order streams, washed, and sieved onsite into three size fractions. Heavy mineral fractions were separated by shaking table from the 125/150- to 500- μ m sieved samples. An aliquot of each heavy fraction was resin mounted, polished, and analysed by QEMSCAN automated mineralogy.

In both Moylisha (Ireland) and Wolfsberg (Austria), we demonstrate relatively high abundances of spodumene, beryl, and kaolinite (amongst other minerals) in streams draining known subcropping spodumene pegmatite intrusions. Abundances of these minerals are markedly lower in samples draining other lithologies. Further, we show that certain normalised mineral associations (calculated by QEMSCAN as a percentage of what touches what in the sample), such as spodumene with beryl and spodumene with quartz, are highest in streams draining pegmatite intrusions. These findings highlight the potential of QEMSCAN of stream sediments as a vectoring tool at the district to prospect scale at early stages of spodumene pegmatite exploration campaigns.