

The trace element and U-Pb systematics of metamorphic apatite: Implications for provenance studies

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Apatite has strong potential as a provenance indicator in sedimentary rocks due to its widespread occurrence, its ability to accept a wide variety of trace elements into its crystal structure and its ability to provide reliable U-Pb and low-temperature thermochronological age information. However the lack of a comprehensive database on of apatite compositions in metamorphic rocks remains a stumbling block to the routine application of apatite geochemistry in provenance studies. This research aims to improve the metamorphic apatite compositional database.

Eleven whole rock samples (pelites and metabasites) from the Dalradian Supergroup of Ireland and Scotland were analysed by solution-ICPMS for trace elements and REE. Apatite grains from the same samples were dated by the U-Pb LA-ICPMS method combined with simultaneous acquisition of trace elements and the REE. Preliminary results demonstrate that Th and the LREE in metamorphic apatite are typically significantly depleted compared to magmatic apatite compositions from the literature, and this is attributed to metamorphic apatite growth in equilibrium with epidote or monazite. Pelitic apatites are typically more enriched in U, Th, the REE and Y, and As compared to apatite in metabasites.