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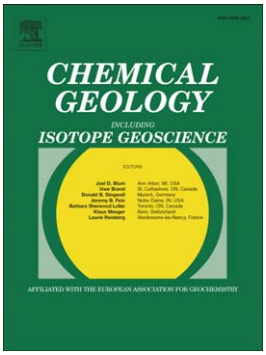

Insights into low- to moderate-temperature recrystallization of zircon: Unpolished crystal depth profile techniques and geochemical mapping

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Insights into low- to moderate-temperature recrystallization of zircon: unpolished crystal depth profile techniques and geochemical mapping

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Abstract

Depth profiling techniques for U-Pb geochronology and REE geochemistry were applied to unpolished, metasomatized Archean zircon from metasedimentary rock samples within the North Caribou greenstone belt, Western Superior Province, Canada. Samples were selected in order to investigate the isotopic and chemical effects of fluid interaction on zircon at temperatures between 300–700°C. Zircon rims are <5 μm thick and have $^{207}Pb/^{206}Pb$ ages between ca. 2788–2667 Ma, with two-thirds of rim ages ranging between 2754–2735 Ma, which is >100 Myr younger than primary crystallization (interior) ages. These dates correspond to regional tectonothermal episodes including potassic alteration, suggesting that metamorphism and regional hydrothermal fluid flow were synchronous. Similarly, REE geochemical analyses on the outer margins of the same unpolished zircon reveal that rims are characterized by variable LREE concentrations, high Hf, and low Th/U ratios, indicating that elements were mobile during fluid-zircon interaction. Unpolished zircon crystal faces were also mapped with a LA-ICP-MS technique to expose their 2-dimensional trace element variability. The patterns reveal a dendritic network or a patchy mosaic form, which is perhaps promoted by the presence of fractures, adjacent mineralogy or variations in the crystallinity of the zircon. The integration of these microanalytical techniques into the study of zircon can provide insight into the timing of low- to

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