Elemental and isotopic characteristics of zircon from mafic amphibolite and granulite facies rocks, Kapuskasing uplift, Ontario, Canada

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Zircon is widely regarded as a robust archive of crustal processes, especially of felsic crust, and several studies utilising zircon geochemistry (U-Pb–Hf–O isotopes and trace elements) have provided important information on the generation and evolution of continental crust. What has been less studied is how mafic rocks contribute to the zircon archive and the effect that metamorphism and crustal differentiation have on the information recorded in already existing zircon and zircon formed during crustal anatexis.

We present results of *in situ* analyses of the isotopic and trace elemental composition of zircons from an Archaean crustal profile exposed in the Kapuskasing uplift of the Wawa-Abitibi Belt in the Superior craton. Zircons from amphibolite facies mafic gneiss have remarkably uniform $\delta^{18}O$ of 5.5–6.3 ‰ in both cores and rims and $^{207}Pb/^{206}Pb$ ages of about 2730 Ma. This is in agreement with values reported for volcanic activity in the lower grade rocks of the Abitibi [1] as well as inherited igneous cores from a local high-grade paragneiss [2]. They are therefore likely to represent a primary, magmatic signal. Zircons from leucosome-bearing mafic granulite have slightly higher, but still uniform $\delta^{18}O$ (6.7–8.0 ‰) and younger and more variable ages (2580–2690 Ma), which are consistent with age estimates for the peak of metamorphism [3] and later, cross-cutting tonalite [4]. An older core gave ages of 2730 and 3017 Ma (at similar $\delta^{18}O$), and could represent igneous crystallisation of the mafic protolith and/or inheritance. Locally derived leucosome contains larger (> 150 μm) zircons, indistinguishable in $\delta^{18}O$ and age variability from the mafic host, and smaller grains that show more variability in $\delta^{18}O$ (6–9 ‰). The differences between amphibolites and granulites appear to be protolith features and not solely a result of widespread resetting during high-grade metamorphism.

[1] King *et al.* (1998), *Precamb Res* **92**, 365–387. [2] Moser *et al.* (2008), *Geology* **36**, 239–242. [3] Krogh & Moser (1994), *Can. J. Earth Sci.* **31**, 1096–1103. [4] Krogh (1993), *EPSL 119*, 1–18.