Zircon O and biotite Mg isotopes of granitoids from the Gyeongsang Arc System in southeastern Korea indicate crustal self-cannibalization

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Zircon oxygen-hafnium and biotite magnesium isotopic compositions of Late Cretaceous to Oligocene (88–27 Ma) granitoids from the Gyeongsang continental arc, southeastern Korea, collectively provide a new insight into the magma source and evolution. Zircon crystals extracted from eight calc-alkaline or alkaline plutons often contain xenocrystic cores, and typically show magmatic cathodoluminescence zonings and sharp Raman spectra. Most zircons have positive εHf values plotting below the MORB evolution path, indicating that the arc magmatism was dominated by the recycling of juvenile crustal materials. Zircon $\delta^{18}O$ values shifted upward or downward from the mantle range (5.3 ± 0.3 ‰; [1]) attest to the oxygen isotopic exchange of crustal protoliths with surface waters at various temperature conditions. One xenocrystic zircon core from the youngest pluton shows a dramatic rimward decrease in $\delta^{18}O$ from +4.4‰ to negative values (–0.7 to –0.1‰). The smaller but discernable core-to-rim decreases of $\delta^{18}O$ values are recognized selectively in magmatic zircons from four plutons possessing biotite $\delta^{26}Mg$ values (–0.07 to +2.06‰) distinctly higher than the mantle range (–0.25 ± 0.07‰; [2]). Such a concomitant oxygen-magnesium isotopic variation provides compelling evidence for a series of self-induced hydrothermal alteration and assimilation processes (*i.e.*, "crustal self-cannibalization"; [3]). This study shows that the supracrustal input to magmas in a young and juvenile orogen can be traced effectively by the combination of stable isotope records from the plutonic root.

[1] Valley *et al*. (1998) *CMP* **133,** 1-11. [2] Teng *et al*. (2010) *GCA* **74,** 4150-4166. [3] Bindeman (2008) *Rev. Mineral. Geochem.* **69,** 445-478.