Sources for intra-plate and arc basalts, high-Mg andesites, and adakites in the SW Japan arc

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High-Mg andesite and adakitic dacite volcanism occurred in the SW Japan arc at around 13 Ma and from ˜2 Ma respectively, in response to the subduction of the young Shikoku Basin of the Philippine Sea plate (PSP). These products are recognized as examples of melts from hot oceanic lithosphere. The Setouchi high-Mg andesite (HMA) has been investigated intensively, but comparatively little is known of the Quaternary adakitic dacites. We have examined the bulk rock geochemistry of the Daisen-Hiruzen and Aono adakites along with the nearby Quaternary alkali basalt lavas, because coexistence of alkali basalts and adakites characterizes the volcanic arc. We found that the mantle composition beneath the arc is variable, but is confined within a narrow binary mixing array represented by the compositions of the alkali basalts. In contrast, low-silica adakites from Daisen-Hiruzen and Aono have different sources, depleted in Aono and more enriched in Daisen-Hiruzen. Strontium, Neodymium, Hafnium, Lead, and Lithium isotope data suggest that (1) Daisen-Hiruzen and Aono adakites have depleted end-member components that were generated by mixing between subducted sediment (SED) and altered oceanic crust (AOC), with a greater AOC component at Aono; and (2) the adakites show almost no evidence of mixing with the ambient mantle wedge, but crustal assimilation in the high-silica adakites is significant. In contrast, the Setouchi HMA has a more enriched source than any of the alkali basalts and adakites, and appears to be the product of slab sediment melt which later interacted with mantle wedge peridotite. The chemical variation of slab melts in the SW Japan arc corresponds almost exactly to that observed in slab melts world-wide. Our results suggest the generation processes of slab melts vary significantly, probably due to the complex temperature structure during slab tearing.