

Zircon Ages and Compositions Constrain the Nature and Sources of Melting During and After Progressive Accretion of the Wrangellia Composite Terrane to the Southern Alaska Margin

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Most plutonic rocks in the western Alaska Range were emplaced during and after accretion of the (mostly) oceanic Wrangellia Composite Terrane (WCT) to the (mostly) Paleozoic continental southern Alaska margin (locally, Farewell terrane, FT). Plutons emplaced during progressive basin closure and terrane accretion (~95-76 Ma) were emplaced in WCT basement or proximal to the WCT-FT margin, are calcalkaline diorite to granite, and are products of a migrating arc associated with closure of the intervening basin. After 76 Ma, plutons are organized axially and cross into both sides of the suture zone, suggesting fault-controlled emplacement during crustal shortening and deformation. These Latest Cretaceous plutons are gabbro to granodiorite, have arc to collisional affinity, some with adakite-like compositions, possibly due to crustal thickening associated with WCT collision. In contrast, Paleocene plutons are fractionated granites with widespread, scattered distribution. Hf isotopes and U/Pb ages, measured in zircons from ~110 to ~30 Ma plutons by LA-ICPMS using the split-stream configuration, have maximum eHf that decreases gradually over time (+15 to +10) suggesting either more enriched mantle or an increasing role of crustal components in the melt source and/or during magma ascent and emplacement. However, most Late Cretaceous, and a subset of Paleocene, plutons have anomalously low eHf (+6 to -3). Paleocene granite eHf correlates with location and basement type; plutons in Paleozoic basement have lower eHf compared with those in Mesozoic basement. This pattern, most pronounced in the Paleocene plutons, is also seen in other age groups where similar-aged rocks were emplaced in both domains, suggesting strong basement control on Hf isotope compositions. The contrast in isotopes among same-aged plutons across terrane boundaries demonstrates a vital role for preexisting basement contributions in the formation of nascent continental crust.