

$^{40}\text{Ar}/^{39}\text{Ar}$ and U-Pb zircon ages provide new constraints on the history and magmatic evolution of the central Aleutian arc

Brian R Jicha¹, Suzanne M Kay², Robert W Kay², Brad S Singer¹

¹Department of Geoscience, University of Wisconsin-Madison, USA, ²Department of Earth and Atmospheric Sciences, Cornell University, USA

E-mail: bjicha@geology.wisc.edu

New $^{40}\text{Ar}/^{39}\text{Ar}$ and U/Pb zircon ages from Adak, Kanaga, and Great Sitkin Islands supplement existing geochronologic data and provide new information on the history and evolution of the central Aleutian arc. A clast from a volcanic sequence in southeastern Adak in the Finger Bay Volcanic Formation, interpreted to be the oldest unit on central Aleutian islands, yields an age of 38.19 ± 0.53 Ma. This age is similar to previous ages from this unit. However, all of the ages from the Finger Bay Volcanics are indistinguishable from the from $^{40}\text{Ar}/^{39}\text{Ar}$ and U/Pb zircon ages of ca. 38 Ma from the tholeiitic Finger Bay pluton, which intrudes the Finger Bay Volcanics. So, either the volcanism and plutonism were contemporaneous or the ages of the volcanics have been reset due to low grade metamorphism during emplacement of the pluton. The latter scenario is likely because the metamorphic imprint of the pluton is similar to the observed overprint in the volcanics. It is also important to note that the Finger Bay Volcanics on Adak are not related to the initiation of the central Aleutian arc as these rocks have meteoric not sea water alteration and thus the arc must have been built above sea level when these lavas erupted. Lavas from the Finger Bay Volcanics on west-central Kanaga and southern Great Sitkin islands are much younger, ranging from 10.2 to 3.2 Ma, suggesting that previous geologic interpretations on these islands need to be re-evaluated. A new $^{40}\text{Ar}/^{39}\text{Ar}$ age of 34.35 ± 0.05 Ma for a granodiorite in the calc-alkaline Hidden Bay pluton on Adak is in accord with new U/Pb zircon ages in this sample, which also importantly shows no evidence of older zircons. Two mafic dikes cutting the Hidden Bay pluton give ages of 33.36 ± 0.27 Ma and 32.80 ± 0.42 Ma. The central Adak Gannett Lake pluton, which was assumed to have an age like the 14 Ma Kagalaska Island pluton to the east, yields an age of 31.68 ± 0.06 Ma. Thus, the new age determinations indicate that calc-alkaline plutonism lasted for more than 3 Ma on Adak. The similarity of the trace element and isotopic signatures of the volcanic and plutonic rocks on Adak and Kanaga suggests that central Aleutian primitive arc magmas have changed little since at least 50 Ma except for increases in Ba/La and Th/La ratios after 2 Ma, which are attributed to subduction of glacial sediments that flooded the trench after 3 Ma. The near constancy of the mafic magma chemistry, the presence of calc-alkaline plutons dominated by granodiorite after 35 Ma and a lack of low-K island arc tholeiites and boninites paints a very different picture for the evolution of the central Aleutian arc than for western Pacific arcs.