GEOCHEMISTRY AND GEOCHRONOLOGY OF THE CRAWFISH INLET PLUTON, BARANOF ISLAND, ALASKA

Wackett[1], A.A., Smith[1], D.R., Roig[2], C.I., Cavosie[2], A.J., Davidson[3], C.M., Garver[4], J.I., Valley, J.W.[5]

[1]Trinity University; TX; [2] University of Puerto Rico, PR; [3] Carleton College, MN; [4]Union College, NY [5] Univ. of Wisconsin, WI

The Sanak-Baranof plutonic belt (SBPB) includes a series of biotite tonalite, granodiorite, and granite near-trench plutons that sporadically intrude the Campanian to Eocene Chugach-Prince William terrane (CPW) over 2100 km along the curved southern Alaskan margin (Hudson et al., 1979; Hill et al., 1981; Bradley et al., 1998). SBPB intrusions have been interpreted to be the result of subduction of the Kula-Farallon or Kula-Resurrection spreading ridge at a trench-ridge-trench triple junction (Bradley et al., 2003; Haeussler et al., 2003; Cowan, 2003). Part of the SBPB, the Crawfish Inlet pluton intrudes the Maastrichtian-Paleocene Sitka Graywacke and is exposed on Southern Baranof Island in Southeast Alaska. It has been considered to mark the eastern boundary of the SBPB based on its anomalous forearc location and field relationships (Hudson et al., 1979; Haeussler et al., 2003; Bradley et al., 2003). However, Reifenstuhl (1986) concluded that the Crawfish Inlet pluton is not likely to be a part of the SBPB based on its petrography and major element chemistry. In this study we use petrographic, geochemical, and U/Pb geochronology of zircon to compare the Crawfish Inlet pluton and the Krestof pluton on Baranof Island to other intrusive bodies of the SBPB. Geochemical and oxygen isotope analyses are used in petrogenetic models to evaluate if mixing between accretionary wedge material of the CPW and MORB can explain the chemistry of the Crawfish Inlet and Krestof plutons.

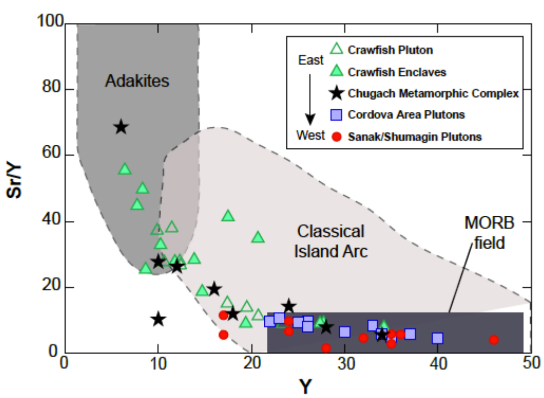

Figure 1: Sr/Y vs. Y for the Crawfish and other SBPB plutons. Cordova pluton: Barker et al. (1992); Sanak/ Shumagin area: Hill et al. (1981); Chugach metamorphic complex: Sisson et al,

Few studies have compared the geochemical signature of plutons across the SBPB. However, Farris and Paterson (2009) found that plutons in the western belt (Sanak/Shumagin Islands and Cordova) exhibit low Sr/Y ratios and LREE enrichment with well-developed Eu anomalies, while those in the eastern belt (Chugach Metamorphic Complex) display higher Sr/Y ratios and less LREE enrichment (Fig. 1). Compositions of granites and mafic enclave samples from the Crawfish Inlet pluton generally exhibit higher Sr/Y (>15) ratios and lower Y compared to plutons lying to the west. Some samples of eastern SBPB plutons plot within the adakite field (Fig. 1), leading workers to conclude that slab melting might be an important process for the formation of some SBPB plutons (Drummond and Defant, 1990; Harris et al., 1996; Farris and

Paterson, 2009). An alternative explanation involves melting of mafic, garnet and/or amphibole-bearing lower crust (e.g., Dawes, 1994; Garrison and Davidson, 2003).

Analyses of $\delta^{18}O$ on zircon, quartz, and magmatic garnet were made by laser fluorination from seven granite samples from the Crawfish Inlet pluton, one from the Krestof pluton, and one from the Aialik pluton of the SBPB collected near Seward, Alaska. Values of $\delta^{18}O$ (Zrc) from the Crawfish and Krestof plutons on Baranof Island in Southeast Alaska range from 6.18‰ to 7.48‰, and 9.62‰ from the Aialik pluton (Fig. 2). All nine zircon samples lie in the "supracrustal" field, as zircons with $\delta^{18}O$ > 6‰ are not known from uncontaminated mantle-derived magmas (Valley et al., 2005; Cavosie et al., 2005; Cavosie et al., 2011). A preliminary interpretation of the elevated $\delta^{18}O$ measured in these plutons indicates mixing and equilibration with a crustal component and are consistent with major and trace element geochemical data. Future work will focus on further analysis of $\delta^{18}O$ data with U/Pb ages of the Crawfish Inlet pluton, as well as petrogenetic modeling using the trace element and isotopic compositions of the mafic enclaves and graywacke as endmembers to evaluate their relative roles in the generation of magmas emplaced in the Crawfish Inlet pluton.

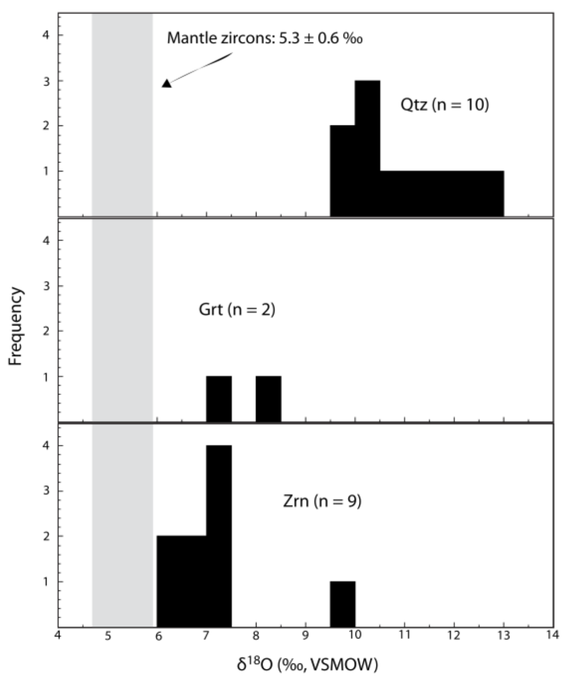

Figure 2: Histogram of oxygen isotope analyses of quartz, garnet and zircon by laser fluorination from Crawfish Inlet and Krestof plutons. The shaded vertical bar indicates range of mantle-equilibrated zircon, 5.3 ± 0.6‰ (2 SD), (Valley et al., 2005).

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