Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.13033

Identifying the source of alkaline volcanism across the northern Antarctic Peninsula

DANNY W. ANDERSON AND ALBERTO E. SAAL

Brown University

Presenting Author: danny_anderson@brown.edu

New work on the seemingly ubiquitous occurrence of Cenozoic alkali basalts across the northern Antarctic Peninsula suggests the presence of a long-lived, distinct, enriched source in this region's upper mantle. We collectively refer to these lavas as the Antarctic Peninsula Alkaline Volcanic group (APAV). We used new and published geochemical data for these alkali basalts (major and trace element contents and Sr, Nd, Pb, and Hf isotopes) to discern the geochemical characteristics of their unique, enriched source. Unexpectedly, we have identified this enriched source on both sides of the South Shetland Islands subduction zone trench, within the Bransfield Strait and James Ross Island back-arc regions as well as in the Phoenix mid-ocean ridge. Relative to Phoenix Ridge E-MORB, APAV samples generally range from similar to higher concentrations of Na_2O, TiO_2, K_2O, and P_2O_5, and lower SiO_2 and CaO at a similar MgO content, reminiscent of a pyroxenitic component in the upper mantle. Their primitive mantle normalized trace element patterns are similar to E-MORB. Remarkably, many of them have no clear trace element signals indicative of a subduction component (high LILE/HFSE) despite having erupted in the back-arc region. The most distinctive geochemical characteristics of the APAV basalts are their radiogenic isotopic compositions. These alkali basalts define trends in isotope plots that extend between a typical E-MORB source and a mantle that has been affected by subduction processes, as defined by arc-like lavas from the Bransfield Strait. Thus, the source of the APAV basalts appears to have been generated through interaction between E-MORB mantle and a subduction component. The presence of these lavas on both sides of the trench suggests that either their source formed before the trench reached its current-day position, or that subduction-modified mantle is somehow making its way across the trench, possibly through the slab window beneath the northern Antarctic Peninsula.