The Alaska-Aleutian Arc: Revisiting the bulk rock geochemistry database to identify "gaps"

Alaska Volcano Observatory

V51E-0085 The Aleutian-Alaskan System: Revisiting the Correlations between Magma Geochemistry and Tectonic Parameters along the Northern Arc of the Ring of Fire

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Collaborative Project Goal

What causes the geochemical diversity along global volcanic arcs? To answer this question, we focus on the Aleutian-Alaska arc, which is one of the longest single arc-trench volcanic systems in the world. Following the NSF-sponsored Alaska-Aleutian Arc Workshop, we are currently reviewing the existing Alaska Volcano Observatory Geochemical Database reporting ~9,000 bulk rock major and trace element data. We aim to identify existing geochemical gaps and illuminate both source contributions driving primary Aleutian arc magma genesis and crustal differentiation processes along the arc.

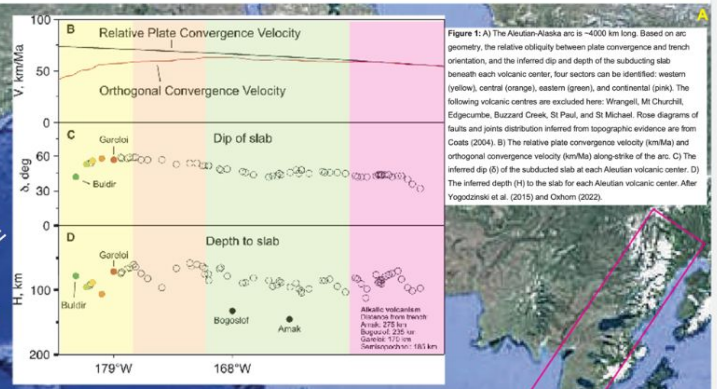
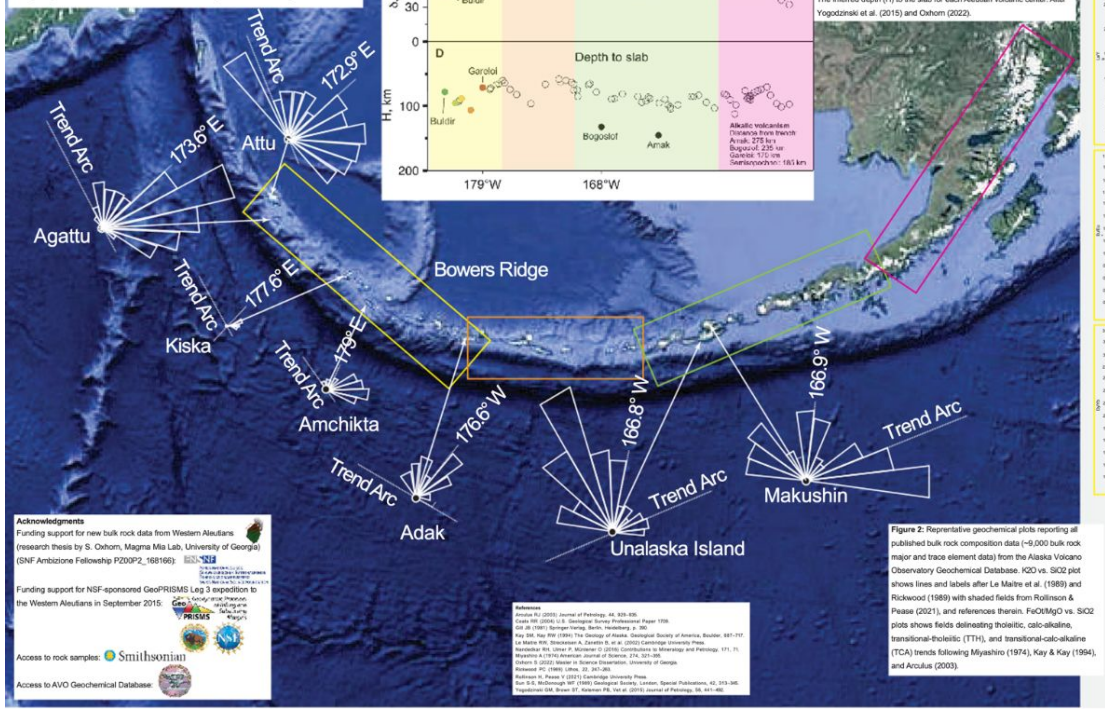


Figure 1: A) The Aleutian-Alaska arc is ~4000 km long. Based on arc geometry, the relative obliquity between plate convergence and trench orientation, and the inferred dip and depth of the subducting slab beneath each volcanic center, four sectors can be identified: western (yellow), central (orange), eastern (green), and continental (pink). The following volcanic centres are excluded here: Wrangell, Mt Churchill, Edgecumbe, Buzzard Creek, St Paul, and St Michael. Rose diagrams of faults and joints distribution inferred from topographic evidence are from Coats (2004). B) The relative plate convergence velocity (km/Ma) and orthogonal convergence velocity (km/Ma) along-strike of the arc. C) The inferred dip (δ) of the subducted slab at each Aleutian volcanic center. D) The inferred depth (H) to the slab for each Aleutian volcanic center. After Yogodzinski et al. (2015) and Oxhorn (2022).



Acknowledgments

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Funding support for NSF-sponsored GeoPRISMS Leg 3 expedition to the Western Aleutians in September 2015:

Access to rock samples: Smithsonian

Access to AVO Geochemical Database:

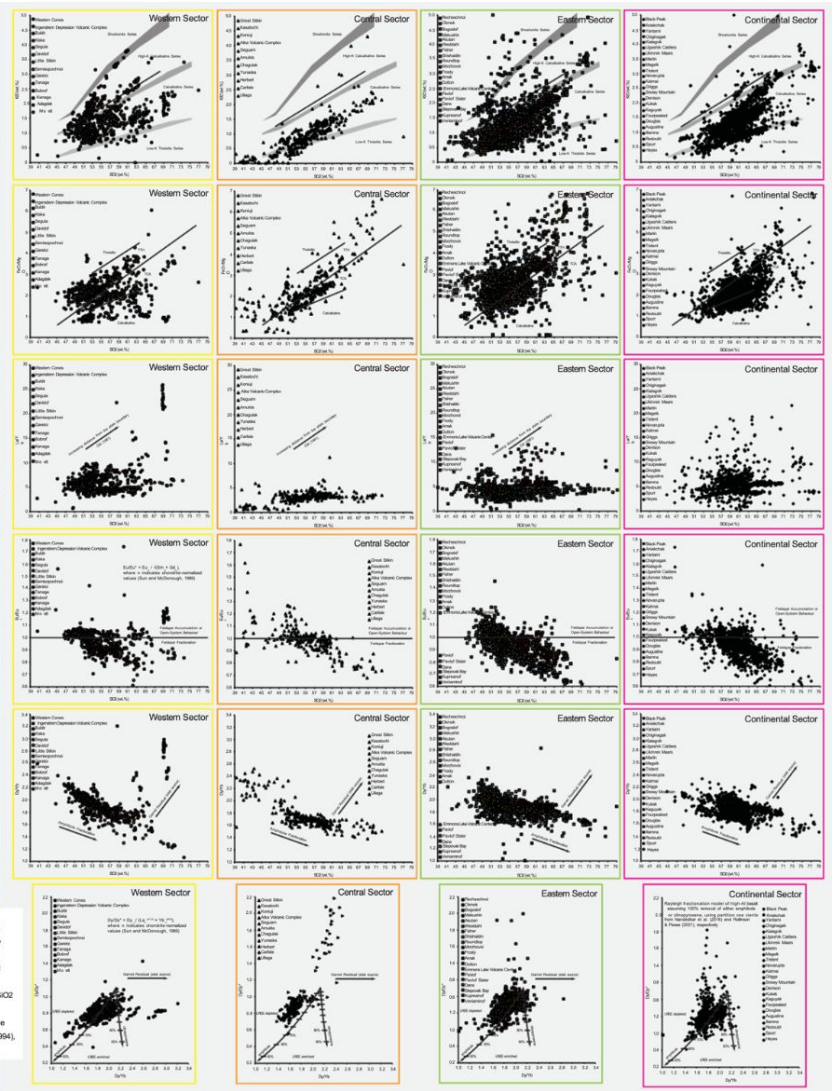

Figure 2: Representative geochemical plots reporting all published bulk rock composition data (~9,000 bulk rock major and trace element data) from the Alaska Volcano Observatory Geochemical Database. K2O vs. SiO2 plot shows lines and labels after Le Maitre et al. (1989) and Rickwood (1989) with shaded fields from Rollinson & Pease (2021), and references therein. FeOt/MgO vs. SiO2 plots shows fields delineating tholeiitic, calc-alkaline, transitional-tholeiitic (TTH), and transitional-calc-alkaline (TCA) trends following Miyashiro (1974), Kay & Kay (1994), and Arculus (2003).

References

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Come to see our poster at State-of-the-Arc session on on Friday morning!