ORIGIN OF THE REGIONALLY DISTINCTIVE DACITIC TO RHYOLITIC MAGMA SERIES ERUPTED AT HAYES VOLCANO, THE EASTERNMOST VOLCANO OF THE ALEUTIAN-ALASKA ARC

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Key Takeaways

- Hayes volcano produced regionally distinctive magmas throughout its known eruptive history
 - Different groups have same parental magma, but variable differentiation depths
- Similar/same isotopic source(s) and parental magma(s) as nearest neighbor, Spurr volcanic complex
- Slab trajectory controls geochemistry beneath Hayes

An Introduction to Hayes Volcano



Waythomas & Miller (2002)

Regional Tectonic Setting



Modified after Eberhart-Phillips et al. (2006) & Fuis et al. (2008)

Compositional Groups at Hayes





Why is Hayes Distinctive?

Relative to Spurr and other neighboring volcanoes, Hayes is:

- Similar crustal thickness
- displaced further from the trench
- higher above the slab surface

Increased P and T releases additional water from the Pacific Plate beneath Hayes.

Water expands garnet stability to lower pressures and allows amphibole to be a stable crystallizing phase at 1.2 Gpa (30 - 40 km).



Modified after Eberhart-Phillips et al. (2006) & Fuis et al. (2008)

Hayes Isotopic Landscape



 Glass Whole Book
High-Sr Group (Tephras A, B, D-F, H)
High-Si Group
Other Volcanoes
Spurr Volcanic Complex
Augustine
Redoubt
Adakitic WVF

💭 Non-adakitic WVF

- Hayes preserves minimal evidence for sediment contamination OR slab melt components
- Each volcanic system defines its own isotopic field

Data fields from: Hegner & Tatsumoto (1989), Clift, et al. (2005), Nye & Turner (1990), Plank & Langmuir (1998), Yogodinski et al (2015, 2017)



Near neighbors, Spurr and Hayes, share the same source or mixture of sources.

Revisiting the Elevated Sr/Y Signature



- The primary distinction between Hayes and Spurr the role for amphibole and garnet.
- Lower crustal process fractional crystallization of an isotopically similar primary magma.

Hayes Petrogenetic Modeling – A Summary



Graphical Summary



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Thank you! Questions?