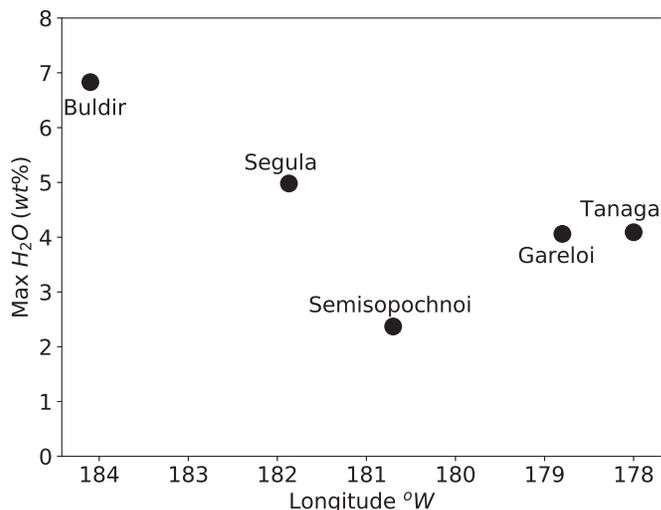


Water and oxygen fugacity controls on continental signatures in western Aleutian arc magmas

Janine Andrys, Katherine A. Kelley, Laura Waters, Elizabeth Cottrell, Michelle Coombs, and Matthew Jackson

Lavas of varying calc-alkaline affinity, from strongly calc-alkaline to mildly tholeiitic, erupt along the western Aleutian arc, making it an ideal natural laboratory for constraining the petrogenesis of these magma types. Our team collected tephra and lava samples from Buldir (184.1°W), Segula (181.8°W), Semisopochnoi (180.7°W), Gareloi (178.8°W) and Tanaga (178°W) Islands during the 2015 field season on leg 3 of NSF GeoPRISMS shared platform for Aleutians research. We measured dissolved volatiles, $\text{Fe}^{3+}/\Sigma\text{Fe}$ ratios, and major and trace elements of melt inclusions from these volcanoes in tandem with petrological experiments at controlled H_2O and $f\text{O}_2$. Our work provides critical

new constraints on the $f\text{O}_2$ and H_2O contents of variably calc-alkaline magmas in the Aleutian arc, and tests the links between $f\text{O}_2$, magmatic H_2O , magmatic differentiation, contributions from the subducted plate, and the slab and wedge thermal structure, with the goal of resolving the key factors that trigger calc-alkaline magmatic trends and the production of continental crust at subduction zones. Our findings indicate a gradient of increasing magmatic H_2O contents towards the western end of the Aleutian arc, which we link to changes in the slab thermal structure, and further resolve a key role for $f\text{O}_2$ in controlling the differentiation trends of arc magmas. ■



Plot of maximum dissolved H_2O content measured in olivine-hosted melt inclusions from tephra collected at five western Aleutian volcanoes, as a function of distance along strike. Results show a westward increase in magmatic H_2O content.

Photo below. Liz Cottrell and Katherine Sheppard collecting exposed tephra on Buldir Island during the 2015 NSF GeoPRISMS Aleutians field campaign. Photo credit: M. Coombs

