

Mantle heterogeneity and slab inputs in the Cascade Arc investigated with new high precision isotopic data

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Debate continues over the roles of mantle heterogeneity and variable slab inputs in generating diverse primitive lavas in the Cascade Arc, which include calc-alkaline basalt (CAB), high-alumina olivine tholeiite (HAOT) and intraplate basalt [1]. New high precision isotope and trace element data from the High Cascades (Shasta, Lassen, Adams, Crater & Medicine Lake) and Garibaldi Volcanic Belt (GVB) show that the GVB is isotopically distinct with lower $^{206}\text{Pb}/^{204}\text{Pb}$ (18.66-18.87) and $^{208}\text{Pb}^*/^{206}\text{Pb}^*$ (0.914-0.939) and higher ϵ_{Nd} (8.5-5.9) than the High Cascades ($^{206}\text{Pb}/^{204}\text{Pb}$: 18.82-19.08, $^{208}\text{Pb}^*/^{206}\text{Pb}^*$: 0.937-0.953, ϵ_{Nd} : 6.5-3.4). The difference reflects less subducting sediment input to the GVB and another depleted mantle component [2] that is not present in the High Cascades. Glacier Peak HAOT, located at the geographical intersection of the GVB and High Cascades, has the lowest $^{206}\text{Pb}/^{204}\text{Pb}$ and highest ϵ_{Nd} and ϵ_{Hf} , and is an anchor from which three arrays of Cascade data emanate in all isotopic systems. The first array includes Glacier Peak and the High Cascades (except Adams HAOT) and intersects the composition of bulk Northern Cascade subducting sediment [3]. HAOT and CAB display no systematic isotopic difference. A second array, with a shallower slope in Pb-Pb plots, is defined by Adams HAOT alone, and a third, with an even shallower slope, by Mt. Baker basalts. All Cascade arrays intersect at the composition of the deep Pacific mantle ("C") despite major differences in terrane boundaries and trace elements. This indicates that the deep Pacific mantle is a major constituent of the sub-arc mantle in North America.

[1] Bacon *et al* (1997) *Can. Min.* **35**, 397-423 [2] Mullen & Weis (2013) *G Cubed* **14**, 3126-3155 [3] Carpentier, Weis & Chauvel, *in prep.* [4] Nobre Silva *et al* (2013) *G Cubed* **14**, 659-676