



## **B and $\delta^{11}\text{B}$ behaviour in the Northern Volcanic Zone of the Andes. Insights on the devolatilization of the slab and related magma genesis processes.**

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The Northern Volcanic Zone (NVZ) in Ecuador is a large volcanic arc set over a continental crust showing strong lateral variation in nature and composition. Despite some controversy about this hypothesis, slab melts originating from direct partial melting of the downgoing plate seem to play an important role in the genesis of the Ecuadorian lavas as a widespread adakitic signature can be observed in most of the VZ.

We present new light element and the first B isotope data on the NVZ that shed light both on devolatilization processes in the downgoing slab and the magma genesis processes related to the latter.

B concentrations and  $\delta^{11}\text{B}$  in quaternary magmas both show a marked decrease from the front arc to the back-arc (ca. 18 ppm to 5 ppm and +3%, to -5%, respectively).  $\delta^{11}\text{B}$  value variation within the arc lavas is included in a range between typical values encountered in altered oceanic crust (AOC) and those usually found in depleted mantle.

Our data show that B concentration and isotope composition are insensitive to the limited crustal contamination recorded by the radiogenic isotopes (Sr, Nd and Pb).

High boron concentrations in the frontal arc seem to discard the hypothesis of adakite generation by lower continental crust melting since the latter is known to be depleted in this element. Boron isotopes variations between the magnesian and adakitic lavas of Pichincha volcano also rule out simple fractional crystallization as a viable process

to explain adakite production.

Pichincha lavas must be produced by different degrees of mixing/interaction between a low  $\delta^{11}\text{B}$  low B/Nb low-La/Yb Mg-rich end-member (the peridotitic depleted mantle) and a high  $\delta^{11}\text{B}$  high B/Nb high-La/Yb Mg-poor end-member (the Subduction Zone Component, SZC).

Low B concentrations in back-arc Sumaco volcano (5 ppm) indicate that the initial melting mantle was extremely depleted in this element ( $<0.2$  ppm) leaving little room for any kind of B addition from the subducting plate. This suggests that subduction input (at least for B) below the back-arc is negligible. We argue that the mantle-like  $\delta^{11}\text{B}$  (-5‰) of these lavas is not SZC-inherited but a characteristic of the pre-enriched mantle wedge, similar to signature of the nearby Galapagos mantle.

These results suggest that as far as B is concerned, most of the devolatilization of the slab seems to occur under the frontal arc. Slab melting probably represents a more efficient process to strip the downgoing slab from its water and fluid-mobile elements, than multiple mineral breakdown dehydration reactions characterizing subduction-induced prograde metamorphism. Such a dehydrated residual slab would be unable to provide fluid-mobile elements to enrich the mantle wedge in the back-arc.