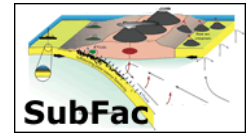


Light Elements and Li Isotopes Across the Northern Portion of the Central American Subduction Zone



Award: 04-05666 (June 2004)

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Light elements and Li isotopes exhibit no progressive across-arc changes traversing southeastern Guatemala and western El Salvador. Instead B and Li contents, as well as B/Nb and Li/Yb ratios, are generally higher in the volcanic rocks of the volcanic front and lower in those behind the front. Be concentrations show the opposite relationships, with generally higher values behind the front. In addition, many behind-the-front samples have lower $\delta^7\text{Li}$. Guatemalan volcanic rocks, in general, have recognizably lower $\delta^7\text{Li}$ than elsewhere along the Central American margin. The light element variations across southeastern Guatemala and western El Salvador clearly indicate that the volcanic front receives a much more pronounced fluid contribution from dehydrating, subducting Cocos lithosphere than the behind-the-front region. Selective trace element enrichments in front volcanic rocks suggest this strong fluid pulse comes from dehydrating serpentinite. Dehydration related to volcanic front formation occurs at slab depths between 85-105 km. The enhanced fluid contributions at the front yield a higher degree of wedge melting, thus explaining the lower Be contents of front samples. Although much diminished, a fluid signal from slab dehydration continues behind the volcanic front. We suggest this signal comes from the dehydration of phengite-bearing oceanic crust. There are two possible explanations of the lower $\delta^7\text{Li}$ of many behind-the-front volcanic rocks: selective loss of ^7Li during progressive dehydration of subducting Cocos lithosphere; or diffusive fractionation accompanying late-stage, selective crustal contamination. Since the slightly lower $\delta^7\text{Li}$ of Guatemalan volcanic rocks in general is consistent with a minor crustal overprint, the second explanation is favored.

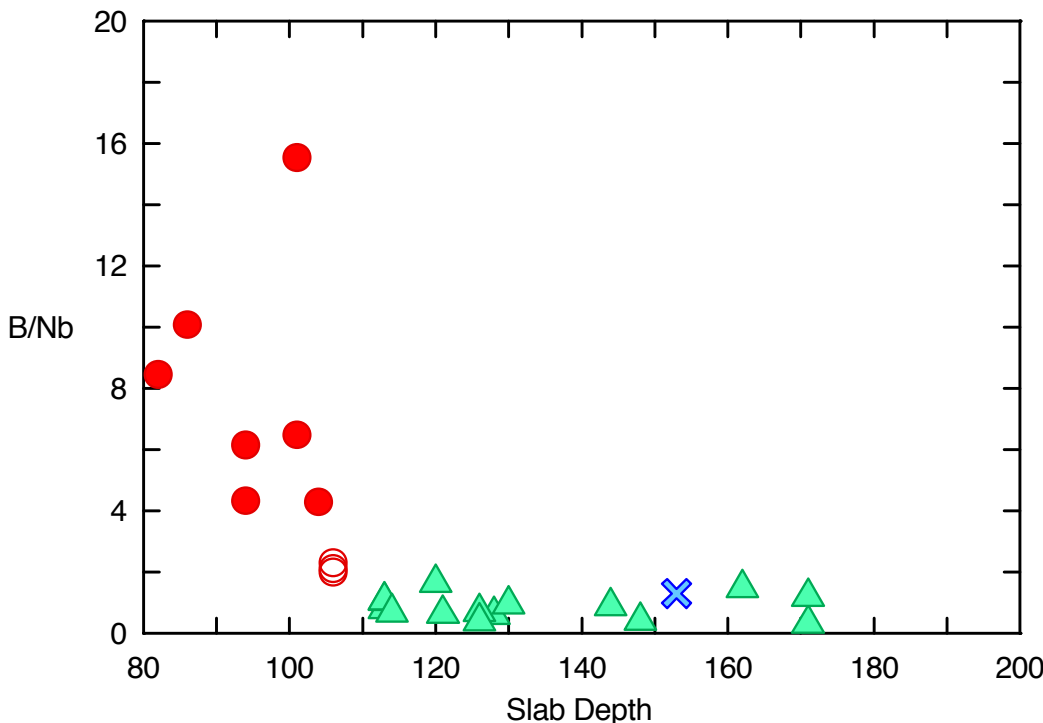


Figure: B/Nb for volcanic rocks erupted across southeastern Guatemala and western El Salvador versus slab depth (in kilometers). Volcanic front samples are shown in red (those from Pacaya volcano are open red circles). Behind-the-front samples are shown in green (except for unusual basaltic andesite from Las Viboras shield volcano in blue). Note abrupt decline in B/Nb immediately past the volcanic front and the lack of variation within the back-arc realm. Volcanic front samples also exhibit strong enrichment in Cs, but not in other incompatible trace elements.

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