Subduction erosion and slab diapirism in the western Mexican Volcanic Belt

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Subduction erosion, crustal exhumation and erosional unroofing have been affecting the western Mexican continental margin since at least the Early Miocene [1]. Evidence indicates that most of the eroded crust has been subducted, but it is currently unknown whether these materials are lost to the deep mantle or recycled in the form of arc magmas. The diverse nature of volcanism in western Mexico, and the relatively simple geology exposed along the forearc region, provides a unique opportunity to test these hypotheses.

Mafic volcanoes in western Mexico are arranged in two parallel volcanic chains with the unusual characteristic of being potassium-rich at the front and intraplate-like at the rear, with calc-alkaline andesitic volcanoes a common occurrence in both chains. Intraplate magmas have not been modified significantly by slab additions, and thus best reflect the composition of the background mantle wedge. Andesitic volcanoes and potassic rocks have strong subduction signatures, but differ significantly from each other in the relative abundance and fractionation of key incompatible trace elements, presumably as a result of interactions with chemically distinct subduction agents [2]. Interestingly, while the isotopic compositions of potassic and andesitic rocks unequivocally indicate contributions from a preexistent continental crust, rocks in both chains become gradually enriched westwards, indicating derivation from a common source that is independent from melt evolution or the thickness and composition of the underlying crustal basement. We thus interpret that crustal recycling must be occurring deep in the subduction zone, either by the re-melting of subducted oceanic sediments, or most likely, of plutonic/volcanic forearc rocks introduced into the mantle by subduction erosion. Furthermore, since the subducted slab lies ~150 km below the frontal potassic chain but >300 km below the rear arc, arc volcanoes could represent partial melts of discrete rising diapirs made by mixtures of hydrous mantle, sediments and eroded crustal blocks that detached buoyantly from the downgoing slab.

[1] Clift & Vannucchi (2004) *Rev. Geophys* **42**, RG2001; [2] Gómez-Tuena *et al.* (2011), *Geochim. Cosmochim. Acta* **75**, 213-241