Subducted oceanic crust melt contributions to the Mexican Volcanic Belt and other young hot slab arcs

Y.M. CAI[1]*, S.L. GOLDSTEIN[1], S.M. STRAUB[1], A. GOMEZ-TUENA[2], C.H. LANGMUIR[3], L. CAPRA[2], A.B. LAGATTA[1] AND A.L. MARTIN-DEL POZZO[4]

[1]Lamont Doherty Earth Observatory, Palisades, NY, USA (cai@ldeo.columbia.edu)
[2]Centro de Geociencias, UNAM Juriquilla, Qro, Mexico
[3]EPS, Harvard University, Cambridge, MA, USA
[4]Instituto de Geoficisa, UNAM Mexico City, Mexico

Quaternary arc volcanoes of the Central Mexican Volcanic Belt (CMVB) are associated with the subduction of young Cocos plate (15-18 Ma). Despite thick overlying continental crust (>40 km), primitive basalts and high Mg# andesites showing minimal crustal assimilation are erupted. These include "high-Nb" basalts lacking substantial "subduction signatures" in their trace element patterns, and "normal" arc calcalkaline basalts and andesites showing prominent subduction contributions (high Ba/La, Th/Nd) and typical "adakitic" slab melt signatures, including high-Ni olivines, Mg# up to 73 at 60wt% SiO_2, high Sr/Y and Gd/Yb.

The "high-Nb" basalts show the smallest subduction component and thus best reflect the regional mantle wedge. In the calcalkaline lavas εHf correlates negatively with Lu/Hf. The low εHf-high Lu/Hf endmember is similar as the high-Nb basalts. The high εHf lavas have values approaching Pacific MORB, but with very low Lu/Hf (<0.04, compared with typical values of ~0.2 in Pacific MORB). The low Lu/Hf require low degree partial melting of a garnet-rich source, which togther with the high εHf indicate a substantial component derived from melting of eclogitic oceanic crust. A key feature of the data is that the lavas showing the largest slab melt signature also show the highest εHf and thus are more "depleted mantle-like" than the regional mantle wedge.

This low Lu/Hf garnet signature is absent in western Pacific arcs associated with old cold slabs such as Mariana and Kermedec. In some arcs (Sunda, Luzon, Lesser Antilles) low Lu/Hf correlate with low εHf, indicating a substantial sediment contribution. High Mg# andesites from other young slab arcs such as the Cascades, Setouchi (Japan) and Northern Kamchatka show negative correlations of high εNd with low Lu/Hf, consistant with an oceanic crust melt contribution. Thus, global data suggest that Hf–Nd isotopes and Lu/Hf are effecitive tracers for depleted eclogitic melt of the subducted oceanic crust. Furthermore, Hf isotopes are more sensitive tracers for the slab melt component than Nd isotopes.

Intra-volcanic layered intrusions in Sal island (Cape Verde Archipelago): Insights into an ocean island root zone

R. CALDEIRA[1,2,3] AND L.C. SILVA[2,3]

[1]INETI/LNEG - Dep.Geol., Portugal (rita.caldeira@ineti.pt)
[2]IICT - DES, Lisboa, Portugal
[3]CeGUL - Lisbon Univ., Lisbon, Portugal

In the island of Sal, a north-eastern and one of the most eroded islands of the Cape Verde archipelago (2000 km East of the mid ocean Central Atlantic ridge), various generations of silicate granular rocks that are part of the oldest sequence of alkaline magmatism (Old Eruptive Complex) are exposed. These rocks are evidenced by marginal facies and a variable density of crosscutting dykes. The latest (~16 Ma [1]) correspond to sub-circular, intra-volcanic layered intrusions, simple or composite, 40 to 650 m wide. This study is focused on 6 of these structures which provide an excellent opportunity to envisage the processes operating in shallow magma chambers associated with intra-plate ocean island volcanism. We present detailed field, petrographic, mineralogical and geochemical data and discuss the setting conditions of these structures. Composite intrusions exhibit horizontal layering that, on surface, results in concentric zonation with an outer/basal zone consisting in alternating bands (150 to 10 m) of alkali pyroxenites and gabbros and a core/upper zone (50 to 150 m) of essexites and/or syenites. Fine-scale, sub-vertical, rhythmic phase layering occurs within some of the gabbroic bands, with alignments of plagioclase laths alternating with mafic minerals like clinopyroxene, olivine and oxides. The pattern displayed by these bands strongly suggests the existence of convective flows operating in the magma body. In each intrusion, bulk-rock compositions show a general (in)upward decrease in Mg# (79 - 50) and enrichment in incompatible elements (e.g. Zr = 171 to 518 ppm), but incompatible element ratios show little variation (e.g. Nb/Zr = 0.19 - 0.27). Cryptic layering is evidenced by variations in the composition of plag (An_{69}-An_{24}), cpx (Mg# = 91 - 70) and oliv (Fo = 81 - 50). We suggest that these intra-volcanic intrusions were built up by injection of small magmatic batches of basanitic composition that, through the process of fractional crystallisation, in which gravitational crystal settling was an important mechanism (producing cumulate pyroxenites and gabbros), evolved in a sequence where essexites and syenites were the last differentiates.

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[1] Torres *et al*. (1998) *Garcia Orta, S Geol* **18**, 9-13.