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Geochemical evidence for melting of a complete section of the subducted slab at Nevado de Toluca Volcano, Central Mexico

A. Gómez-Tuena (1), L. Capra (2), Y. Cai (3), S.L. Goldstein (3), C.H. Langmuir (4)

(1) Centro de Geociencias, Universidad Nacional Autónoma de México, Querétaro 76230, México (tuena@geociencias.unam.mx / Phone: (442) 238-1104 ext. 120), (2) Instituto de Geografía, Universidad Nacional Autónoma de México, México City 04510, México, (3) Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY 10964, USA, (4) Department of Earth and Planetary Sciences, Harvard University, Cambridge, MA 02138, USA

Nevado de Toluca Stratovolcano in the central Transmexican Volcanic Belt (TMVB) has been erupting a monotonous set of calc-alkaline andesites and dacites (SiO_2=58-68%, Mg#=70-40) for the past $\sim$2.6 Ma. More primitive rocks are restricted to peripheral cinder cones and fissure lavas that belong to the Chichinautzin and Tenango volcanic fields. Adakite geochemical features occur in many samples of the Toluca suite, and these have been recently interpreted as being formed by a process of slab melting (Martínez-Serrano et al., 2004, *J Volcanol Geotherm Res* 138, 77-110). High density sampling and new ICP-MS trace element data of the Toluca rocks confirm the existence of a modest adakite signature (Sr/Y$<$60), but also reveals an as yet unrecognized set of lavas with very strong negative Ce anomalies (Ce/Ce*$>$0.25). These anomalies are prototypical features that distinguish the pelagic sedimentary horizon of the subducted oceanic crust sampled at DSDP site 487, and their presence in the Toluca rocks provide the first compelling evidence for slab-derived sedimentary contributions in the petrogenesis of the central TMVB. Negative Ce/Ce* anomalies in the Toluca rocks are coupled with low Sr/Y ($\sim$12), Zr/Sm ($\sim$12.6) and Th/La ($\sim$0.06) ratios, with values that are almost identical to those observed in the pelagic sediments, but they also have higher Gd/Yb ($\sim$4.2) ratios than those of the sediments. These features strongly indicate that sediment melting occurred in the presence of garnet, and confirm that very little fractionation occurs in Th/La, Zr/Sm and Sr/Y ratios during sediment partial fusion. In contrast, the Toluca rocks with the highest Sr/Y ratios have

positive Eu anomalies, trend towards MORB-like Sr and Nd isotopic compositions, but also have relatively lower Gd/Yb ($\sim$2.2), and higher Th/La ($\sim$0.35) and Zr/Sm ($\sim$47) ratios than the rocks with negative Ce anomalies. Taken together these features rule out assimilation of continental rocks, or subducted terrigenous sediments, because they have enriched isotopic compositions. Consequently, the new results confirm that the Toluca adakites can be better explained by melts from the metamorphosed subducted basalt. Yet their relatively lower Gd/Yb and higher Zr/Sm ratios further suggest that very little garnet was present in the residual assembly, and that basalt partial fusion probably occurred under amphibolite facies conditions.