Role of crustal and slab components in the Northern Volcanic Zone of the Andes (Ecuador) constrained by Sr–Nd–O isotopes

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Abstract

A combined approach based on trace elements, radiogenic (Sr–Nd) and stable (O) isotopes allows us to discuss the role of crustal assimilation and mantle metasomatism in Quaternary Ecuadorian magmatism. Magmas emplaced in the Eastern Cordillera have high Sr isotopic ratios and relatively high $\delta^{18}O$ values, which reflect crustal assimilation (6–13 vol.%) of igneous and metamorphic Palaeozoic and Mesozoic rocks during ascent and storage in the continental crust. However, in the Volcanic Front, where the crust consists of accreted MORB-like basaltic lavas intruded by granodioritic bodies, the basement rocks have more or less the same radiogenic isotopic signatures as the mantle-derived magmas. This limits the visible imprint of crustal assimilation in the radiogenic isotopic ratios. Oxygen isotope ratios are more sensitive and trace better assimilation mechanisms. They record not only some influence of crustal assimilation (7–14 vol.%) in the Volcanic Front lavas, but also point out the role of mantle source metasomatism. In this paper we propose a model of mantle metasomatism below the Ecuadorian arc, in which the metasomatic agent requires the involvement of both low-degree partial melts of the altered oceanic crust and subducted sediments.

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