Geodynamic controls at the southernmost Northern Andes magmatic arc: geochemical and geophysical evidence

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Understanding how magmatic arcs develop is crucial for the comprehension of subduction systems and the processes leading to continental growth and lithospheric recycling. Chronologic and provenance from U-Pb single grain dating by LA-ICP-MS of detrital zircons obtained from the forearc basin paired with Hf and O isotopic data and trace elements have provided indicators of the Late Cretaceous-Cenozoic evolution of the Ecuadorian magmatic arc. A major Late Cretaceous accretionary event (75-65 Ma) is marked by large isotopic variations (εHf>20 and δ^{18}O>8) attesting for intense magmatism resulting from melting of lower and upper crust materials. Highly fractionated signatures in trace elements and Eu/Eu* paired with δ^{18}O mantle-like and εHf juvenile values prevailed up to 45 Ma, suggesting that the arc was most likely emplaced in an over thickened crust. Subsequently, negative isotopic incursions from 45 to 30 Ma are defined by mantle sources as well as drops in the U/Yb, Eu/Eu* and Th/U ratios laying rough indicators of a broad extensional magmatic arc. From 30 to 10 Ma the arc evolved towards a bi-modal arc, with highly juvenile isotopical values in the North and slightly juvenile values in the south. Temporal trends from detrital analysis are further compared with: 1) in-situ zircon geochemical and isotopic data and 2) geophysical data sets, mostly gravimetric, magnetometric and seismic reflection records. The geophysical analysis provide a good template on the first-order segmentation of this part of the Andes, including deep anomalies related to ancient accreted arcs and/or serpentinized mantle and sub-surface extensional tectonics. These results give fresh perspectives on the long-term evolution of magmatic arcs in accreted oceanic terranes.

Mots-Clés : magmatic arc, subduction, Northern Andes, Ecuador

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