Trace element composition of amphibole and petrogenesis of hornblendites and plutonic suites of Cretaceous magmatic arcs developed in the Fuegian Andes, southernmost South America

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Abstract

The evolution of continental crust in convergent margins can be explored in southernmost South America (54-56 degrees S). Plutonic rocks of the Fuegian Batholith and the rear-arc satellite Ushuaia Pluton were emplaced within the magmatic arc and the Fuegian fold-and-thrust belt, respectively. They record subduction zone processes in two distinct tectonic settings during the evolution of the Rocas Verdes Basin. We report new U-Pb zircon geochronology, bulk rock chemistry, Sr-Nd isotope data, and EPMA and in-situ LA-ICP-MS analyses of amphibole from 'hornblendites' and gabbroic-granitoid suites in order to evaluate the origin and evolution of the magmatic plumbing systems in the upper plate of the subduction zone. Textural relationships and amphibole compositions in hornblendite indicate crystallization at lower crustal depths with pressures of 7-8 kbar in the Fuegian Batholith and of 5-6 kbar in the Ushuaia Pluton. Lower Cretaceous suites of hornblendite and talc-alkaline homblendegabbro, diorite and tonalite in the Fuegian Batholith have eNdt values ranging between +2 and +4. They were emplaced within an island arc coeval with mid-oceanic type spreading in the Rocas Verdes back-arc basin. Isotope ratios and amphibole compositions in hornblendite indicate crystallization from primitive and hydrous sub-alkaline basaltic melts with relatively low LREE/HREE and low alkali contents. The Late Cretaceous plutons in the fold-and-thrust belt were emplaced after the tectonic juxtaposition of Rocas Verdes ophiolitic complexes. The Ushuaia Pluton, consisting of clinopyroxene-hornblende cumulates, hornblende-gabbro, diorite and monzodiorite, was emplaced during the waning stage of Late Cretaceous magmatism. In this case hornblendite amphiboles show high contents of alkalis, LREE and incompatible elements with a strong crustal affinity (Th, Ba, Rb). The enriched incompatible trace element patterns indicate their derivation from K-rich transitional magmas formed in supra-subduction settings. Chemical variations in amphibole from homblendites and spatially related plutonic rocks are evaluated in terms of fluid flux from the subducted slab and partial melting of the subarc mantle,

ultimately controlled by the thermal state of the subducted slab and convergence rates. (C) 2020 Elsevier B.V. All rights reserved.

Palabras clave

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