Geochemistry of the Cenozoic plateau lavas from the Pali Aike area (52°S), Southern Patagonia, South America.

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Abstract

Geochemical and isotopic analyses (Sr-Nd-Pb) of late Miocene to Quaternary plateau lavas from the Pali Aike area (52° S) was undertaken to constrain the melting processes and mantle sources that contributed to magma generation and the geodynamic evolution of southernmost Patagonia, South America.

The Pali Aike lavas is alkaline (Pali Aike, 45-49 wt.% SiO_2 ; 4.3-5.9 wt.% Na_2O+K_2O), relatively primitive (9.5-13.7 wt.% MgO) mafic volcanic rocks that have typical intraplate ocean island basalt-like signatures. Incompatible trace element ratios and isotopic ratios of the Pali Aike lavas differ from those of the majority of Neogene southern Patagonian slab window lavas in showing more enriched characteristics and are similar to HIMU-like basalts. The REE modeling to constrain mantle melting percentages suggests that these lavas were produced by low degrees of partial melting (1.0-2.0%) of a garnet lherzolite mantle source.

The major systematic variations of Sr-Nd-Pb isotopes in southern Patagonian lavas are related to geographic location. The Pali Aike lavas from the southernmost part of Patagonia have lower $^{87}Sr/^{86}Sr$ and higher $^{143}Nd/^{144}Nd$ and $^{206}Pb/^{204}Pb$ ratios, relative to most

of the southern Patagonian lavas erupted north of 49.5° S, pointing to a HIMU-like signature. An isotopically depleted and HIMU-like asthenospheric domain may have been the main source of magmas in the southernmost part of Patagonia (e.g., Pali Aike, Morro Chico, and Camus Aike volcanic field), suggesting the presence of a major discontinuity in the isotopic composition of the asthenosphere in southern Patagonia.

On the basis of geochemical and isotope data and the available geological and geotectonic reconstructions, a link between the HIMU asthenospheric mantle domain beneath southernmost Patagonia and the HIMU mega-province of the southwestern Pacific Ocean is proposed.

Keywords : Pali Aike, Patagonia, Sr-Nd-Pb isotope, Asthenosphere, HIMU-like ocean island basalt