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Petrogenesis of late Paleozoic high-Ba–Sr intrusions in the southern Chiapas Massif, Mexico

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Late Paleozoic plutonic complexes in southern Mexico and northern South America are discerned to be the result of eastward subduction along the newly formed western margin of Pangaea[1,2]. The Chiapas Massif Complex provides a critical record of the major crustal-scale episode of magmatism in Mexico during this period[1,3]. This work is based on a series of plutonic rocks from the southern Chiapas Massif. LA-ICP-MS zircon U-Pb dating reveals that they were emplaced between 278±0.6 and 250±1.9 Ma. Their chemical compositions indicate that they belong to high-K calc-alkaline to shoshonitic series (SiO2=48.60-63.56 wt.%; K2O=1.12-4.94 wt.%). Moreover, according to their geochemical characteristics, the rocks exhibit signatures similar to the High Ba-Sr granites[4,5]. They have high Ba (849–9236 ppm), and Sr (360–932 ppm) concentrations relative to typical A-, I- and S-type granites and strongly fractionated REE patterns ([La/Yb]N=7.0-26.0). They are enriched in LILEs (e.g., K, Ba, Sr) and depleted in HFSEs (e.g., Nb, Ta, Ti) in the multielement diagram, with high K/Rb (101-272) and Sr/Y (10.9-45.5). As shown by whole-rock isotopic data ($\varepsilon Nd_{(270Ma)}$ from -0.80 to -6.94; $\varepsilon Hf_{(270Ma)}$ from -1.20 to -7.47) and zircon/monazite saturation thermometry, partial melting of an enriched source probably produced the suite at a temperature below 800ºC. This corresponding source is a lithospheric mantle metasomatized by subduction-related fluids with residual garnet. Fractional crystallization and minor crustal assimilation of these magmas resulted in variable but coherent geochemical and isotopic characteristics of the suite. The presence of inherited ~1.0 Ga zircon grains and Hf isotope data of zircon suggest that the assimilated crust has Rodinia-type components. We concluded that a post-collisional intracontinental regime in the southern Maya Block as accounting for generating the plutonic rocks under research.

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