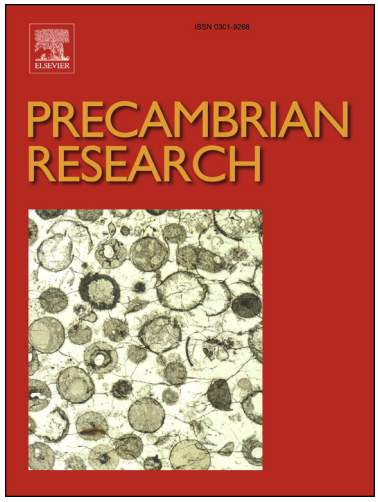

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Geochemistry and U–Pb–Hf zircon data for plutonic rocks of the Troia Massif, Borborema Province, NE Brazil: Evidence for reworking of Archean and juvenile Paleoproterozoic crust during Rhyacian accretionary and collisional tectonics

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Abstract

Rhyacian (c. 2.30 to 2.05 Ga) subduction–accretion and collisional processes are thought to represent an important event of crustal growth and reworking, often reported in the so–called Tranzamazonian/Eburnean granite–greenstone terranes of N/NE Brazil and West African craton. In this work, we present whole–rock geochemistry and U–Pb–Hf zircon ages for Rhyacian plutonic rocks that intrude Paleoproterozoic granite–greenstone terranes and Archean basement rocks of the Troia Massif, Borborema Province, NE Brazil. U–Pb SHRIMP zircon age of 2185 ± 4 Ma was obtained for a metatonalite sample (Mirador metatonalites). The metatonalites show geochemical affinity similar to those of adakites–like rocks, with all "classic" (slab–derived) adakitic signature (e.g. high Sr/Y, La/Yb and low HREE), but more akin to those evolved from partial melting of the metasomatized mantle wedge, followed by fractional crystallization. Zircon Hf crustal model ages of the metatonalite sample range between 2800 and 2660 Ma, evidencing that Archean crustal components contributed to its magma genesis, probably via subduction of continental–derived sediments to the mantle wedge. For potassic plutons of the Troia Massif (Bananeira suite) we obtained U–Pb SHRIMP zircon age of 2079 ± 4 Ma for a deformed quartz–monzonite with geochemical affinities similar to those derived from low–pressure partial melting of a K–rich mafic protolith. For less–deformed equigranular granites, we obtained a U–Pb LA–ICPMS zircon age of 2068 ± 5 Ma. They are high–K calc–alkaline and slightly peraluminous granites that probably derived from low–pressure partial melting of tonalitic crustal sources (metatonalites) and/or metagraywackes. Zircon Hf crustal model ages of a granite sample range from 2713 to 2535 Ma, evidencing Archean crustal contribution to magma genesis. However, two analyzed c. 2307 Ma inherited zircon grains show $\varepsilon_{Hf}(t)$ values of c. +4.87, indicating that crustal reworking of less–radiogenic Paleoproterozoic sources also participated in its genesis. Regional correlations of our results with the Paleoproterozoic record of the Troia Massif, Borborema Province and surrounding cratonic domains, suggest that the studied plutons are related to the c. 2.2 to 2.0 Ga Transamazonian/Eburnean orogenic cycle. The c. 2185 Ma metatonalites are associated to pre–collisional setting, while the c. 2079–2068 Ma quartz monzonites and granites evolved during collisional setting.

Keywords: Accretionary, Paleoproterozoic, Borborema Province, Troia Massif