

Whole-rock Nd-Sr and zircon Hf-O systematics on the inner units of the Eastern Paraguay Belt: Insights on the sedimentary provenance and orogenic-controlled sedimentation

Gabriella Frugis¹, Mario da Costa Campos Neto¹, Alice Westin Teixeira¹

(1) University of São Paulo, Institute of Geosciences, Rua do Lago, 562, São Paulo, Brazil

The Neoproterozoic Brasília and Paraguay orogenic belts are part of the Tocantins Province, a diachronic orogenic system developed during the Brasiliano-Pan African events as part of the Western Gondwana building process. The Brasília Orogen resulted from long-lasting subduction-collision events between São Francisco, Amazonian, and Paranapanema paleoplates. It comprises the volcano-sedimentary Bom Jardim de Goiás (BJG) sequence that makes contact with the Paraguay Belt. The Paraguay Belt is represented by metasedimentary units related to glacial-carbonate-like passive continental margin deposits, followed by the external and internal Glaciomarine (GU) and Foreland (FU) units, with granitic intrusions and volcano-sedimentary of the Nova Xavantina Sequence (NX), all at nonconformity above the Amazonas and Rio Apa cratons.

The BJG metasedimentary rocks have a detrital zircon age pattern restrict to the Paleoproterozoic, with an orthogneiss sample indicating a magmatic event around 0.68-0.67 Ga (U-Pb_{Zrc}). Zircons from both lithotypes point to more evolved crustal sources ($\delta^{18}\text{O}=6\text{-}11\text{‰}$; negative ϵHf_t). Tuffs of the NX have contribution of Paleoproterozoic, Mesoproterozoic and Neoproterozoic detritus, with the youngest age group setting the volcanic activity at 0.71 Ga. Hf-O data suggest a mantle-derived source for the Neoproterozoic and Mesoproterozoic zircons ($\delta^{18}\text{O}=4\text{-}6\text{‰}$; positive ϵHf_t). Metarenites of the same sequence confirms the maximum depositional age at around 0.69 Ga. The detrital zircons of the GU has mixed to more evolved isotopic signatures (high $\delta^{18}\text{O}$; negative ϵHf_t), with prevalence of Mesoproterozoic over Paleoproterozoic and Neoproterozoic detritus and maximum depositional age around 0.98-0.86 Ga. The FU has main contribution of Neoproterozoic detritus, with subordinate Mesoproterozoic and Paleoproterozoic detrital zircons and maximum depositional age around 0.59-0.53 Ga. Metasedimentary rocks suggest contribution varying from depleted mantle-derived to more evolved supracrustal sources ($\delta^{18}\text{O}=3\text{-}8\text{‰}$; negative to slightly negative ϵHf_t), with an orthogneiss presenting a wide range of ϵHf_t values (-15 to 3) with consistent low $\delta^{18}\text{O}$ values ($\delta^{18}\text{O}=3\text{-}6\text{‰}$).

Sr-Nd isotopic data of the BJG sequence suggests active margin and fore-arc environments of deposition (metavolcanic rocks: $\epsilon\text{Nd}_{0.75\text{ Ga}} = -4.7$ to 4.3 ; $\text{NdT}_{\text{DM}} = 1.8\text{-}1.0$ Ga; tuffs: $\epsilon\text{Nd}_{0.75\text{ Ga}} = 3.3$ to 5.6 ; $\text{NdT}_{\text{DM}} = 1.1\text{-}0.9$ Ga; $^{87}\text{Sr}/^{86}\text{Sr} < 0.71$), with prominent mafic components for the volcanic rocks ($\text{Th}/\text{Sc} < 0.1$) and more evolved features for the tuffs (Th/Sc around 1.0). NX sequence data suggests a back-arc environment of deposition, with mafic and upper crust components ($\epsilon\text{Nd}_{0.75\text{ Ga}} = -12.5$ to -10.2 ; $\text{NdT}_{\text{DM}} = 2.3\text{-}2.1$ Ga; $^{87}\text{Sr}/^{86}\text{Sr}_{\text{volcanic rocks}} < 0.71$; $^{87}\text{Sr}/^{86}\text{Sr}_{\text{tuff}}$ around 0.72). The GU presents a more scattered pattern, pointing to a passive margin environment ($\epsilon\text{Nd}_t = -9.3$ to -4.0 ; $\text{NdT}_{\text{DM}} = 2.1\text{-}1.6$ Ga), while the inner FU has a well-marked trend consistent with deposition in an active margin environment ($\epsilon\text{Nd}_t = -4.0$ to 7.8 ; $\text{NdT}_{\text{DM}} = 1.8\text{-}1.4$ Ga; $^{87}\text{Sr}/^{86}\text{Sr} = 0.71\text{-}0.73$).

The reported data suggest that the Brasília Orogen possibly controlled the volcanic activity and sedimentation of the NX sequence, with the rising of the Goiás Magmatic Arc. The volcanism likely resulted from the Paranapanema paleoplate thinning crust in a back-arc setting. The inherited and detrital zircon U-Pb data evinces the presence of a Rhyacian basement. As the rift in the back-arc became prominent, the GU deposition took place in the Amazonian and Rio Apa edges. It registers a main Mesoproterozoic source-area, which is found mainly in the Amazonian Craton, with the influence of Paleoproterozoic sources, possibly derivate from the Rio Apa Block. The inner FU, with maximum depositional age of 0.56 Ga, represents the syn-tectonic erosion of the uplifted Goiás Magmatic Arc and internal granites from Paraguay-Pampean Belt that advanced towards the Amazonian Craton during the passive margin inversion.

Financing: FAPESP nº 2017/18174-6