Reconstructing the paleolandscapes of the Curitiba microplate, Southern Ribeira belt, Brazil: Provenance, geochemistry of protoliths and paleogeographic interpretations

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The reconstruction of ancient continental margins encompassed in continent-continent collision is a complex task. The continental blocks generally record a multiphase evolution with interaction of tectonic settings, plate polarities, basins, and their depositional architecture. In this context, the study of a paleolandscape through the integration of sedimentology, stratigraphy and geochemical analysis can contribute to the understanding of the paleogeography of a given territory.

The Ribeira belt (Southeast-Southern Brazil) resulted from the juxtaposition of several crustal blocks during the Brasiliano/Pan-African tectonic events (800 - 490 Ma), leading to the amalgamation of Western Gondwana. During orogenesis, a series of pre-Brasiliano blocks underwent variable rates of tectonic reworking – one of these blocks is referred to as the Curitiba microplate. Some of the metasedimentary strata on the Curitiba microplate are representative of Late Meso- to Neoproterozoic basins which bordered this pre-Brasiliano continental fragment: the Capiru Group.

The Capiru Group is a low-grade unit that records passive to active continental margin stages in which six formations were identified - termed from oldest to youngest as: Santana (proximal to distal marine shelf), Juruqui (proximal to distal deltaic), Rio Branco (carbonate platform), Morro Azul (lagoonal to shallow marine), Morro Grande (proximal to distal deltaic/ marine) and Bocaina formations (estuarine to shallow-marine). The paleoenvironmental interpretations indicate climate changes during the Capiru Group deposition, under a far-field or “Phantom Glacial” influence related to regional unconformities. Chemical and mineralogical Fe- and Al-rich protolith compositions suggest continental denudation during the passive continental margin stage, with low sediment input rates from a relatively low-gradient relief, highly weathered continental source, and stable since Mesoproterozoic times.

The recognition of unconformities in this stratigraphic record coupled with the presence of high-Al (meta-)pelites have brought discussions regarding the nature of the sedimentary precursors. One of the most reasonable explanations for the high-Al (meta-) pelites was the effects of leaching and consequent Al-enrichments promoted in weathered profiles that were later metamorphosed during the Brasiliano/Pan-African orogenies. Subsequently, during the deposition of the Bocaina Formation, the arkosic composition of sandstones and lithic conglomerate lags suggest source rejuvenation during the syn-orogenic stage.

The provenance data (U-Pb geochronology of detrital zircon) of the Capiru Group show Paleoproterozoic contributions (2000 – 2185 Ma) and slightly different Mesoproterozoic populations (1508 – 1100 Ma), suggesting mainly local sources (derived from the Curitiba microplate basement). These signatures were compared to the other chrono-correlative continental margin units of the region (Lajeado and lower Itaiacoca groups). Through the evolution of Capiru, Lajeado, and Itaiacoca groups, we suggest that the Capiru Group was deposited on the Northern margin of the Curitiba block, with Mesoproterozoic “exotic” contribution possibly derived from the Western Angola craton. On the other hand, the Lajeado and Itaiacoca groups were deposited on the East-Southeastern margin of the Paranapanema continental block, representative of a slightly different source-composite.

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