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Subduction, collision and collapse record along the Neoproterozoic Ribeira belt, SE Brazil, in the context of Western Gondwana

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The Ribeira belt, SE Brazil, integrates the Neoproterozoic orogenic systems of Western Gondwana. Detailed geology, geochemistry and geochronology reveal a very complex and protracted evolution that started in the transition between the Mesoproterozoic and Neoproterozoic and extended until the Cambro-Ordovician. Tectonic evolution involved passive margin development around large paleocontinents, outboard subduction resulting in intra-oceanic and continental arc development, three collision episodes and a collapse stage until the transition to the stable Gondwana supercontinent.

In an example of deeply eroded belt, reworked basement rocks, high grade metasedimentary rocks and plutonic granitoids are the most common units cropping out within the four tectono-stratigraphic terranes that made up the belt. The Paraíba do Sul microcontinent, hosting a continental arc, tha outboard intra-oceanic arc and associated basins, and the Cabo Frio terranes (Angola) successively docked at ca. 620–605, 605–565, and 535–510 Ma against the reworked border of the São-Francisco paleocontinent.

Passive margin sequences developed since the Tonian to the Cryogenian, around the São Francisco and Paraíba do Sul paleocontinents, are marked by two contrasting sequences. The inner one is dominantly siliciclastic associated with tholeiitic basic magmatism, while the outer one is carbonate-rich, suggesting a different latitude and considerable distance between these two paleocontinents. At the same time a juvenile Tonian magmatic arc developed outboard, with both carbonatic rocks and tholeiitic volcanic rich layers deposited in the back-arc region. These associations suggest large oceanic spaces as pointed out by several authors in their paleogeographic reconstructions.

On the other hand, since late Cryogenian to Ediacaran, the closing of the oceanic spaces resulted in a compressive regime in all the involved tectonic blocks, generating continental arcs and related foreland basins in back-arc settings, associated to deformation and metamorphic overprint during the first two collision episodes. Thickening of continental crust generated abundant syn-collision magmatism, including S-, I and hybrid granitoid suites.

Later, in the Cambrian (ca. 535-520 Ma), the Cabo-Frio/Angola paleocontinent was accreted to the belt, resulting in renewed deformation and metamorphism, finally closing the remnant, restricted oceanic spaces and reworking the previously accreted terranes, generating large scale folding and dextral transpressional shear zones that reached the São Francisco paleocontinent margin.

Finally, a widespread bimodal magmatic event associated with transtensional deformation episodes characterized the orogenic collapse stage of the belt during Cambrian-Early Ordovician times, marking the transition to the stable, platform conditions in the interior of the Gondwana supercontinent.