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Tracing the Tectonic Evolution of Western Gondwana: New Sm-Nd T_{DM} Constraints from the Sergipano Belt (NE Brazil)

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The Sergipano Belt (NE Brazil) is a Neoproterozoic orogenic belt formed by the collision between the São Francisco Paleoplate and the Pernambuco-Alagoas Terrain (PEAL) during the Brasiliano Orogeny, a key event in the assembly of Western Gondwana. Although previous studies have provided insights into the tectonic evolution and sedimentary sources of this belt, available Sm-Nd T_{DM} data were limited, preventing a detailed understanding of provenance variations across different tectonic domains. This study presents new Sm-Nd T_{DM} ages from 38 metasedimentary rock samples collected from the Vaza Barris, Macururé, and Marancó domains, significantly expanding the dataset available for the region. The Marancó Domain exhibits exclusively Mesoproterozoic T_{DM} ages (1.32–1.49 Ga), confirming its derivation from PEAL plutonic rocks. The Macururé Domain displays a broad range of T_{DM} ages (1.07–1.95 Ga), including previously unrecognized Neoproterozoic ages (~1.07 Ga), suggesting the influence of Tonian mantle extraction sources. The Vaza Barris Domain shows the greatest variation in T_{DM} ages (0.55–2.36 Ga), including Cambrian (~550 Ma) ages, which had never been reported before. These results indicate that, unlike previous interpretations, the younger units in this domain have a distinct source area compared to Macururé, and that its sedimentation may have lasted longer than previously thought, possibly linked to the final stages of Gondwana assembly in the Phanerozoic. The presence of younger T_{DM} ages (Neoproterozoic and Cambrian) near major shear zones and the Itabaiana Dome suggests that local sedimentation was strongly influenced by tectonic uplift, erosion, and orogenic exhumation. Furthermore, the widespread Mesoproterozoic signatures across different domains may result from the mixing of Neoproterozoic and Paleoproterozoic sources, refining previous interpretations of sedimentary provenance in the region. These new findings significantly expand the recognized T_{DM} age spectrum and provide an unprecedented perspective on the evolution of the Sergipano Belt, revealing a more complex and dynamic sedimentary history than previously understood. By integrating this new dataset, a more detailed model for the tectonic and sedimentary evolution of the region can now be proposed, offering fresh insights into the processes that shaped this segment of Western Gondwana.