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West Central Gondwana correlations and paleo-reconstruction of its main Phanerozoic continental basins

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Pioneering stratigraphic correlations by Alex du Toit, in the 1930s, first highlighted significant similarities between the sedimentary rock sequences in south-central Africa and eastern South America, supporting the concept of a united West Central Gondwana Basin complex. Based on field investigations, sediment provenances, stratigraphic basin analysis and recent thermochronology we propose improved correlations and paleogeographic reconstructions of the Cape-Karoo (South Africa), Congo (DRC, Rep. of Congo, Gabon, Angola and the CAR), Paraná and Parnaíba (Brazil) basin sequences.

Following Pan African-Brasiliano orogens (800-500 Ma), continental red-bed sediments sourced from central Gondwana mountains were deposited southward across the interior. These earliest Paleozoic sequences (the Inkisi, Banalia, Bianco and Upper Nama Groups) subsequently provided a large part of sediment detritus to Ordovician-Carboniferous platforms (the Cape Supergroup, Dwyka, Rio Ivaí, Paraná, Itarare, Serra Grande and Canindé Groups), flanking the southern and northern passive margins, and which episodically recorded glaciations and marine transgressions, whilst significant erosion affected the Gondwana interior with up to 5 km overburden removed across the internal Tanzanian and South African Highlands between 350 and 220 Ma. Following Permian-Triassic basin inversion and/or erosion recorded across the entire interior of West Central Gondwana can be linked to large-scale intracontinental deformations in response to the Appalachian-Mauritanian-Variscan (330-270 Ma) and Cape-Sierra de la Ventana (280-240 Ma) orogens flanking the northwestern and southwestern margins of Gondwana, respectively (Fig. 1A). Arid Triassic-Jurassic sedimentation culminated in widespread deposition of aeolian dunes (the Clarens, Dekese, Etjo, Botucatu, Sergi, Sambaiba and Pastos Bons Formations) during northerly paleo-winds, episodically interrupted by eruptions from the Large Igneous Provinces at 200 Ma (CAMP), 182 Ma (Karoo) and 132 Ma (Paraná-Etendeka), during progressive Pangea/Gondwana break-up. Main periods of rifting and onset of spreading are recorded in the centres of the Congo, Paraná and Parnaíba Basins by an unconformity and/or a hiatus covered by Cretaceous marine and fluvial deposits (the Loia, Bokungu, Kwango, Bauru and Grajaú Groups; Fig. 1B). Along the basin margins, widely across southern Africa, prolonged weathering and exhumation removed a further 2-5 km of overburden during the Kalahari Epeirogeny (120-80 Ma). The resulting sediment detritus was shed offshore, significantly changing the chemistry of the Cenozoic oceans and atmosphere.

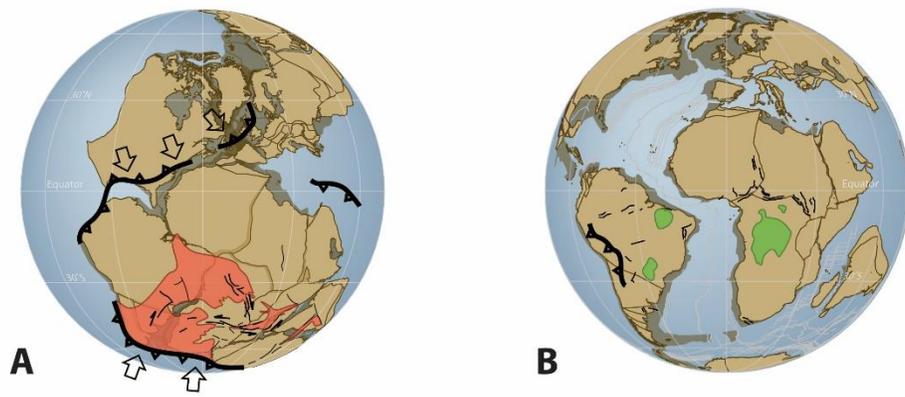


Figure 1: Plate reconstructions at 260 Ma (A) and 83 Ma (B), showing main continental basin sequences of West Central Gondwana.

