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Collapse of the African Surface across the Congo Basin surges the strontium isotope budget of the Cenozoic Ocean

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Rapid increase of $^{87}Sr/^{86}Sr$ in seawater over the last 40 million years is mostly attributed to exhumation of the Himalayas following collision and orogeny between India and Eurasia. These processes eroded abundant rocks with elevated radiogenic Sr isotope ratios ($^{87}Sr/^{86}Sr$= 0,72-0,76), the detritus of which shed into the Indian Ocean to form the Bengal Fan (~12 million km^3). Here we present an alternative interpretation from studying the large Congo Basin of central Africa (ca. 3,67 million km^2) and its associated submarine fan along the Atlantic margin (~1 million km^3).

Erosion of extensive 550-650 million year old Pan African mountains systems, of Alpine-Himalayan proportions, provided abundant sediment detritus from widely outcropping metamorphic terrains to the Congo Basin, as indicated by sediment dispersal directions and U/Pb dated detrital zircons from its 4-6 km thick Phanerozoic sequences. The upper part of the basin comprises 500 to 1000 m thick Jurassic-Cretaceous, poorly to un-consolidated red sandstones landscaped into a badlands topography that outcrop over 1,7 million km^2, but capped by a carapace of silcretes, calcretes and ferricretes that preserve the "African Surface" along the margins of the basin and beyond as far as southern Africa (Fig. 1). Across the entire interior of the Congo Basin large residual blocks of "Polymorph Sandstone" represent remnants of the African Surface that suddenly collapsed during rapid preferential erosion of the red sandstones, forming a regional 'sinkhole' centred around the present-day Congo River. This regional collapse can be matched to the onset of accelerated offshore sedimentation of the Congo Fan during the Eocene-Oligocene transition, at ca. 34 Ma. We measured Sr composition from both the red sandstones and the duricrusts ($^{87}Sr/^{86}Sr$=0,73-0,75), and then modelled the relative contributions of $^{87}Sr/^{86}Sr$ to seawater by dissolved loads from the Congo and the Himalayas using Sr paleo-fluxes for the Congo that are higher than the modern values to account first for, the total volume of 700,000 km^3 of Oligocene to Quaternary sediments accumulated offshore, and secondly the elevated $^{87}Sr/^{86}Sr$ values of the red sandstones that must have completely dominated the river load. First results suggest that the Congo Basin was a major contributor to the global Sr Oceanic budget during the period between 32 and 23 Ma.

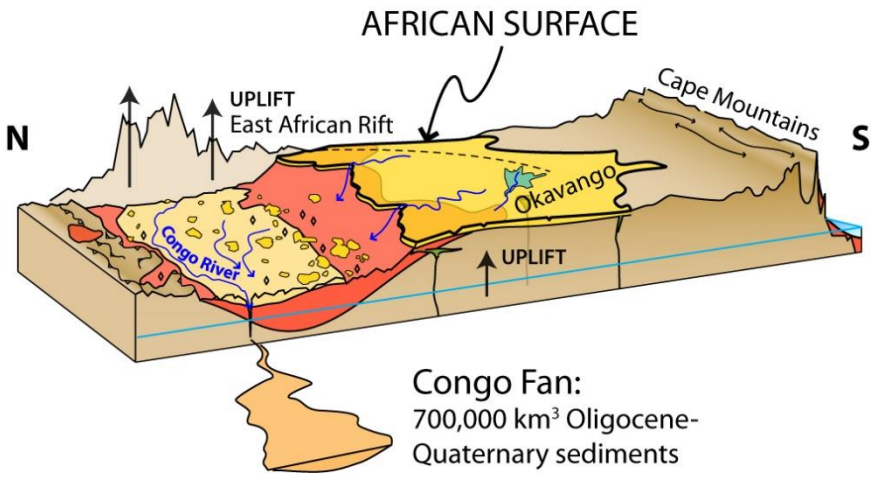

Figure 1: North-South model of sub-Saharan Africa, showing Cenozoic erosion of the Congo Basin and re-deposition of Mesozoic red bed sediments offshore onto the Congo Fan.