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Coupling between tectonics and surface processes in the Congo Basin: Cretaceous-Cenozoic sedimentation and erosion triggered by climatic and tectonic factors

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Cretaceous to Recent evolution of the Congo Basin in Central Africa is still poorly documented although its history over the last 75 Myr has potentially recorded global and major regional events, including the Paleocene-Eocene Thermal Maximum at ∼56 Ma and the Miocene aperture of the Western branch of the East African Rift System along its eastern border at ∼25 Ma. Available data for associated off-shore deposits show that in parallel, the Congo River delta experienced a starvation period during the Mid- to Late Cretaceous and Paleogene, with endorheic lacustrine to desert environments in the upstream basin, followed by a period marked by high rates of drainage and sediment supply in the Neogene.

Here, we combine new observations on the recent tectonic evolution with newly obtained 39Ar-40Ar ages for cryptomelane from Katanga (Kasekelesa) and Kasaï (Mt Mwatshimwa) and the preliminary results of the Landana condensed section (∼45 m) Paleogene-Neogene sequence. The maximum burial in the Congo Basin is estimated at 80 Ma and was followed by the removal of at least 900-1500 m of sediments (Sachse et al., 2012). Soon after the 39Ar-40Ar ages reveal that a major (Campanian or older) surface formed in the Kasai and Katanga before ∼76 Ma, followed by at least two younger Eocene denudation episodes, during the Lutetian (∼45 Ma) and the Priabonian (∼35 Ma) and more Mio-Pliocene denudation surfaces during the Mio-Pliocene (De Putter et al., 2016). The older surface likely belongs to the subcontinental ‘African Surface’ that had previously not been identified for Central Africa.

During this long-lasting erosional history of the central part of the Congo Basin, the Landana section along the Atlantic coast recorded a condensed (∼45 m) sequence of Paleogene-Neogene sediments. The first 25m are shallow marine carbonates with little detrital input, recording slightly increasing weathering from the Danian to the Lutetian (Bayon et al., 2016). Whether this section had a physical connection with the inland basin at the time is not known. Simultaneously, a ∼150 m thick eolian sand accumulation (Kalahari Group s.l.) is assumed to have been deposited in the south-western margin of the Congo Basin. The strong silicification at the top of the Lutetian beds of the Landana section indicates a major discontinuity, which would correspond to the Lutetian denudation surface in Katanga. After this hiatus, sedimentation recorded by the Landana section changes sharply to coarse-grained siliciclastics, through a likely (re-established?) connection with the inland basin. A major change in sediment source is confirmed by εNd, whereas isotopic proxies of weathering (εHf, [U+F064]30Si) document a major decrease in weathering intensity. The sharp increase in sediment discharge is attributed to uplift along the southern and eastern margins of the Congo Basin, preceding the opening of the East African Rift in the Oligocene.

Bayon et al., 2016. Goldschmidt Conf. 2016, abstract book, 181
De Putter et al., 2015. Ore Geol. Rev. 71, 350-362
Sachse, V.F, Delvaux, D. and Littke, R., 2012. AAPG bulletin, 96(2), 277-300.