



Source to Sink study at continent-scale: Africa since 145 Ma

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A source to sink study was performed at the scale of Africa based on (1) the measurement of the compacted siliciclastic sediment volumes preserved in the African Basins (margins, rifts, intracratonic), for the sink (see for the method in Guillocheau et al., 2012, Basin Research) and (2) the measurement of the eroded volumes obtained by the difference of elevation between the modern topography and remarkable deformed planation surfaces (etchplains or pediplains), for the source (see for the method in Guillocheau et al., 2018, Gondwana Research). Two main planation surfaces of Upper Cretaceous and Middle Eocene age were mapped. They are weathering surfaces (etchplains) known as the African Surface(s).

(1) The sink analysis shows evidences of three periods of major denudation of Africa during Early Cretaceous (145-125 Ma, Berriasian-Barremian), Late Cretaceous (94-80 Ma) and uppermost Eocene to today (40-0 Ma). They record major Africa-scale uplifts related to mantle dynamics. The Cenozoic is a period of increase of the siliciclastic sediment volumes with a paroxysm during Plio-Pleistocene (5.5-0 Ma), here related to the dynamic of the Southern African superplume and not to climate changes.

(2) The range of the sedimentation rates is between 5 and 80 x 10³ km³/Ma, i.e. the rates of passive margin out of direct feeding by active mountain belts.

(2) The analysis of the denudation through time shows two different spatial patterns: from 94 to 80 Ma, denudation is located all over Africa and from 40 to 0 Ma, only along the “coastal” plain of Africa (with the noticeable exception of the Congo catchment). This is interpreted as different modes of plate deformation and relief growth.

(3) The source to sink budgets has been performed on the catchment of the Congo, Orange, Zambezi and East African rivers from 94-80 Ma to today. Surprisingly, they show equilibrated balances, suggesting low chemical erosion and/or neoformation of sedimentary particles (mainly clays: kaolinites to smectites) from the solutes along the sediment routing system.