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The Equatorial Atlantic Laboratory: sediment routing systems and lithosphere deformation

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We summarize the results of a 7 years study of the sediment routing systems of the West African Craton transporting its erosional products to the Central and Equatorial Atlantic passive margins at geological time scale. We used paleogeographic maps to define the geodynamics framework of this routing system with in particular the propagation of the Equatorial Atlantic oblique rift separating the West African and Amazonian Cratons. We used sub-surface data to evaluate the evolution of lithosphere necking distribution along the conjugated African and South American margins of the rift system. We estimated the long-term denudation pattern at continental scale from low temperature thermochronology measures of samples from 3 transects perpendicular to the Atlantic margin. We used the exceptional preservation of geomorphologic markers to reconstruct the drainage system of the craton since 45 Ma, and estimate the associated denudation and exports of terrigenous sediments to the Atlantic margin. Finally, we estimated the accumulation history in the passive margin basins and compare them with the estimated denudation histories from thermal histories and geomorphologic markers. We show that the modes of preservation of sedimentary export in the passive margin basins are highly variable in time (immediate post roft versus late post-rift) and space (transform/oblique versus divergent margin segments). We show that the present day drainage of the West African Craton as been stable since 30 Ma when it underwent a major reorganization driven by the growth of the relief associated with the Hoggar mantle plume. We show that accumulation in the passive margin basins fall within the same order of magnitude than denudation on the craton at the scale of the Meso-Cenozoic. This allows us to argue to the relevance of using the stratigraphic architecture of passive margin basins to estimate the denudation history of their continental domains.