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Cenozoic surface dynamics of West Africa: Drainage, hot spot swell growth, erosion budget and offshore sedimentary record

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Mapping of dated and regionally correlated lateritic paleolandscape remnants allowed reconstructing two Paleogene physiographic configurations of West Africa. Topographic reconstructions were corrected from flexural isostasy due to the erosion paleolandscapes have undergone since their abandonment. The reconstructions show that the drainage stabilized by 29 Ma and probably 34 Ma, allowing to link the inland geomorphic record to offshore sedimentation since that time. Mid-Eocene paleogeography further suggests that a marginal upwarp forming a continental divide preexisted Early Oligocene connection of the Niger and Volta catchments to the Equatorial Atlantic Ocean. Drainage rearrangement was primarily enhanced by the topographic growth of the Hoggar hot spot swell and must have caused a major stratigraphic turnover along the Equatorial margin of West Africa.

Differential elevations of reconstructed regional paleolandsurfaces geometries provide the spatial distribution of denudation for 3 time-increments (45-24, 24-11, 11-0 Ma). Volumetric erosional exports to the Equatorial Atlantic margin of Africa were then estimated for the drainage basins of constrained geometry for each time increment. Taking into account the continental bedrock lithologies and associated type regoliths, first-order mineralogical and granulometric composition of clastic yields are estimated for each drainage basin and for each erosion periods. Interpretation of offshore seismic lines allows for the evaluation of the stratigraphic expression of the continental erosion fluxes and documentation of the contrasted vertical mobility histories of margin's segments since 45 Ma. Confrontation of offshore clastic sediment volume estimates to continental erosion fluxes permits the source-to-sink investigation of a unique case study where both onshore erosion and offshore accumulations may be compared over geological time scales.