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Modeling sediment supply of the Congo watershed since the last 23 ka.

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The Congo River is the world's second river in term of drainage area (3.7 millions of km^2) and water discharge (42,000 m3.s-1). Located in equatorial Africa, the basin extends over the two hemispheres, leading to an annual homogeneous repartition of climatic parameters and modest variation in intra-annual discharge. Monitored for decades, a large dataset is available for both the hydrology and sediment load for the Congo system. Moreover, the Quaternary Congo turbidite system geometry has been widely studied and an abundance of paleo-environmental parameters have been inferred from chemical proxies analyzed from offshore cores. These numerous data, both onshore and offshore, allow for accurate calibration of numeric modeling and for efficient comparison between observed and simulated data.

This study aims (i) to quantify the evolution of sediment supply leaving the Congo watershed during the last 23 ka; (ii) to decipher the forcing parameters controlling the sediment supply over glacial/interglacial stages.

HydroTrend is a model that simulates water discharge and sediment load leaving a hydrologic system. It is based on morphologic, climatic, hydrologic, lithologic, land cover and anthropogenic factors. After calibrating the present-day discharge and sediment load, we simulated discharge and sediment supply over 23 ka, integrating the changes in environmental conditions during this period.

Results show that present-day simulations fit the observed data well if a significant part of sediments is being trapped by the catchment, in the floodplain. The long-term simulations show that the changes in climatic conditions (temperature and precipitations) between glacial and interglacial stages only account for a maximum variation of about 20 % of the sediment supply. The resulting land cover changes are most likely a more significant factor controlling the sediment supply; the loss of forest during colder and dryer stages can be responsible for up to 50 % of sediment supply increase.