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Catchment sediment yield in Africa: a continent-wide analysis

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While several studies compiled and analyzed measured contemporary catchment sediment yield (SY, [t/km^2/y]) values for various regions of the world, Africa remains strongly underrepresented in these studies. We therefore conducted a review on published SY data for Africa, explored the spatial variability of these SY data and examined which environmental factors explain this variability. We collected SY measurements of at least one year for 682 African catchments across the continent (> 8340 catchment-years) from 84 publications and reports. Catchment areas range from 0.02 km^2 to > 3,800,000 km^2. Observed SY values range between 0.2 and 15,699 t/km^2/y (median: 160 t/km^2/y, average: 634 t/km^2/y).

Correlation and partial correlation analyses showed that spatial variation of SY in Africa is mainly explained by differences in seismic activity, topography, vegetation cover and annual runoff depth. Other factors such as lithology, catchment area or reservoir impacts showed less clear correlations. Based on these findings we propose a simple regression model that allows simulating the observed regional patterns of SY in Africa fairly well. This model predicts an average SY of 42 t/km^2/y for the entire African continent, a value that corresponds closely to earlier estimates of the sediment output of the African continent to the oceans.

The fact that SY shows the strongest correlation with seismic activity, while climatic variables explain little of the observed variation can be considered surprising as Africa is relatively inactive in terms of seismic activity and is characterized by a very large climatic variability. This suggests that processes such as tectonically related rock-fracturing and earthquake-triggered landslides may have a stronger influence on contemporary SY-values than previously assumed.