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Continental sediment sources, sinks, and the human factor in large tropical rivers: the case of South America

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Knowledge of river basins sediment yield at a continental scale, and accumulation in sedimentary basins (sinks) provides useful information for quantitative models of landscape evolution, geochemical and sediment mass balance studies for estimating continental and regional net erosion intensities, to quantify the fluxes of sediments exported to the Ocean. It also provides a crucial understanding of a variety of environmental and engineering applications. Although several estimations exist on the sediment fluxes of large rivers, the role of continental sedimentary basins and fluvial environments (large rivers and megafans) acting as major sedimentary sinks is still partially understood. The assessment is additionally complicated by the human activities that contribute to modifying the original rates of production, trapping, and transference of sediments at continental scales.

South America is an ideal place to discuss these aspects because it contains a) the longest mountain chain on the planet, the Andes; b) the longest and more extensive foreland systems, c) huge lowlands/plains, d) the largest rivers, e) the largest megafans, f) major intracratonic, sedimentary basins. Simultaneously, the rivers basins are being submitted to extreme environmental pressure by the construction of dams, land use/land cover changes (LULC), mining, etc.

Here, quantitative results on continental sources and fluxes are presented, with a focus on the role of the biggest source areas and the largest trapping systems at a continental scale such as megarivers and megafans. Particular attention is devoted to sediment budgets of large rivers that have been intensively modified by human activities in recent times (dams, deforestation, etc) or that are vulnerable to the potential construction of dams.