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# Acceleration and grain-size inversion of riverbed sedimentation driven by anthropogenic landscape reorganization (SE Brazil)

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Fluvial systems act as integrative components of landscapes, recording both long-term geomorphic conditions and rapid anthropogenic reorganization of land surfaces in their sedimentary archives. In tropical river basins, land-use intensification, urban expansion, and agricultural reconfiguration modify sediment sources, connectivity patterns, and energy regimes, producing measurable changes in sedimentation rates and grain-size composition. This study evaluates how recent anthropogenic landscape reorganization is recorded in fluvial sediments by quantifying changes in sedimentation rates and grain size over the last century in an anthropogenically modified tributary basin in southeastern Brazil.

The dataset integrates sediment core analysis, grain-size measurements, and multi-temporal land-use analysis. A sediment core with a total depth of 74 cm, collected from the fluvial bed, was dated using excess lead-210, with radionuclide activities measured by high-purity germanium (HPGe) gamma spectrometry. Sediment grain size was characterized by laser diffraction. Land-use and land-cover (LULC) changes were evaluated using multi-temporal MapBiomas classifications derived from Landsat satellite imagery (30 m spatial resolution), providing consistent annual land-use information since 1985 and complemented by transition matrices to assess land-use conversions through time.

The $^{210}$Pb age–depth relationship reveals a segmented depositional history, in which linear trends define three successive phases of quasi-constant sedimentation rates, consistent with a Constant Flux (CF) model appropriate for sustained $^{210}$Pb supply under variable sedimentation conditions. These phases indicate a progressive acceleration of sedimentation, from 5.0 mm yr□¹ between 1946 and 1968, to 7.4 mm yr□¹ during 1968–2004, and reaching 9.6 mm yr□¹ after 2004. Grain-size results show a pronounced temporal shift, representing a clear inversion from fine-grained (clay + silt-dominated) deposits in the older sections to predominantly sand-rich sediments in the most recent decades, occurring in parallel with the progressive increase in sedimentation rates. LULC analysis indicates a monotonic expansion of urban areas, intensification of agricultural land uses—particularly sugarcane cultivation—and a strong spatial reorganization of pasture and mosaic-of-uses classes. Transition matrices indicate that mosaic-of-use areas are a primary source of land-use conversions toward urban and agricultural classes.

Distinct depositional phases identified from the $^{210}$Pb age–depth model, together with grain-size variability and coherent land-use transitions, indicate that shifts in sedimentation regimes coincide with major phases of urban expansion and agricultural reconfiguration. These findings demonstrate that land-use change exerts first-order control on recent fluvial sedimentary records, allowing depositional regimes to be interpreted as stratigraphic expressions of anthropogenic landscape reorganization.