

# Late Quaternary variation in erosion rates and landscape changes in the Amazon River basin

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## Project Summary

This research aims to estimate paleo-erosion rates in the Amazon fluvial system during the late Quaternary. The reconstruction of the erosion rates through time was performed using high-resolution measurements of <sup>10</sup>Be cosmogenic nuclide concentration in well-dated (from optically stimulated luminescence - OSL) sedimentary deposits from the Solimões River in western Brazilian Amazonia. OSL and cosmogenic nuclide samples from terrace outcrops, fluvial bars, and modern sediments from the Solimões River were supported by BSG grant and analysed at the University of São Paulo (Brazil) and Imperial College London, respectively. Preliminary results will allow us to compare past erosion rates to the modern erosion rates measured in the detrital sand collected from the Amazon River mainstream and its main tributaries.

## Rationale

The Amazon River basin is the largest and one of the most complex fluvial systems on Earth. Its continent-wide watershed is under the South America summer monsoon and drains areas with varied relief and land cover. In the western region of the basin, prominent fill terraces record an imbalance between sediment supply and transport capacity, presumably due to climate changes during the late Quaternary. Studies focused on determining changes in erosion rates through time using quantitative approaches are necessary to understand the landscape's response to climate changes. Cosmogenic nuclides (such as <sup>10</sup>Be) contained in river sediments provide information about the erosion rate of its source area, while measurements of <sup>10</sup>Be concentration in sedimentary deposits can be used to infer paleo-erosion rates and how erosion rates have varied through time. In addition, the pattern in erosion rates through time can be compared with other proxy data that record regional hydroclimate oscillations. Comparing our dataset to such proxy records will allow us to address the fundamental question: Have well-known periods of past climate change resulted in significant shifts in erosion rates of Amazonian rivers in the past, and were they insensitive to such changes?



**Figure 1:** Fluvial terrace outcrop in western Amazon (Tefé city) sampled for OSL and cosmogenic nuclide analysis.

## Outputs and future research

The OSL dating obtained with the BSG grant was integrated into Pupim et al. (2019 - <https://doi.org/10.1016/j.quascirev.2019.03.008>). Cosmogenic nuclides data provide proof of concept to pump-prime an international research grant from FAPESP (São Paulo Research Foundation; Brazil) and MinCiencia (Colombia) approved in 2020, which aim to investigate changes in erosion rates across a larger area of the northern Andes-Amazon sedimentary system.