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# Himalayan erosion over the Plio-Pleistocene, as told by in-situ 10Be measured in Bengal fan detrital sediments

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It has been conjectured that the late Cenozoic climate cooling has increased the erosion rates at the Earth surface after the Plio-Pleistocene transition (Zhang et al. 2001, Herman et al. 2013). However, the reality of this late Cenozoic increase of erosion remains disputed at the global scale (e.g. Willenbring & von Blanckenburg 2010). Tackling further this issue at a large scale requires, among others, to use distinct methods (which will not be affected by the same potential bias than previously developed methods) and to focus on major contributors to terrestrial erosion. Here we present a record of Himalayan erosion from IODP drilled cores in the Bengal fan.

The Bengal fan has accumulated a large part of the Himalayan erosive products for at least 20 Ma. The fan mainly consists of turbidites that originate from sediments eroded in the Himalaya and transported by the Ganga and the Brahmaputra. IODP Expeditions 353 and 354 (Clemens et al. 2016, France-Lanord et al. 2016) recently drilled 1 site at 14˚N and a transect of sites at 8˚N in the fan. These cores, dated by magnetostratigraphy and biostratigraphy, are particularly rich in sands from the late Cenozoic and therefore they are prime records to investigate the erosion response to climate over this period. We trace the source of these sediments using $^{87}Sr/^{86}Sr$ and $\varepsilon Nd$ ratios on bulk silicates. The Himalayan formations and Transhimalaya are characterized by contrasted isotopic signatures resulting in distinct compositions for sediments of the modern Ganga and Brahmaputra. We trace erosion using in-situ cosmogenic $^{10}Be$ paleo-concentrations in the quartz of the sandy fraction (e.g. Charreau et al., 2011): in the Bengal fan sediments, $^{10}Be$ derived erosion rates integrate erosion over timescales of $\sim$1 kyr.

$^{87}Sr/^{86}Sr$ and $\varepsilon Nd$ ratios are distributed along the mixing curve of modern Ganga and Brahmaputra poles over the last 6 Ma. This shows that sources remained roughly stable from 6 to 0.2 Ma and reach pure Brahmaputra signatures for the last 0.2 Ma. $^{10}Be$ paleo-concentrations fluctuate in a range similar to the modern concentrations from Ganga and Brahmaputra (Lupker et al. 2012, 2017). Although the paleo-concentrations display a variable dispersion for the last 4 Ma (rather dispersed before 2 Ma and steadier afterwards), the time-averaged signal is relatively constant over the period, highlighting a striking steadiness of the Himalayan erosion rates. Despite the observed variations in the dominant sediment sources, from western to eastern parts of the Ganga-Brahmaputra watershed, our data suggest that the Himalayan erosion as a whole may not have been highly sensitive to climate change at the Plio-Pleistocene transition, and that its erosion patterns might be mainly controlled by regional tectonic forcing.

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