EGU24-19206, updated on 18 May 2024
https://doi.org/10.5194/egusphere-egu24-19206
EGU General Assembly 2024
© Author(s) 2024. This work is distributed under
the Creative Commons Attribution 4.0 License.

The Neogene record of Himalayan erosion in the Bengal Fan

Christian France-Lanord[1], Albert Galy[1], Valier Galy[2], Pascale Huyghe[3], Jérôme Lavé[1], Sébastien Lenard[4], Mara Limonta[1], Thomas Rigaudier[1], Volkhard Spiess[5], and Aswin Tachambalath[1]

[1]CRPG-CNRS Université de Lorraine, Vandoeuvre-les-Nancy, France
[2]Woods Hole Oceanographic Institution, MA, USA
[3]ISTERRE, Université de Grenoble Alpes-CNRS, France
[4]University of Colorado Boulder, CIRES, USA
[5]GEOB, Bremen Universität

Over the Tertiary, the uplift of the Himalaya combined to the development of the monsoon generated the largest erosion basins of the planet. More than 80% of the erosion is exported to the Bay of Bengal by the Ganga-Brahmaputra river system and generates turbidity currents which convey detrital sediment building the Bengal Fan. In the modern Himalaya, the monsoon rainfall and tectonic processes shape the erosion pattern. The monsoon seasonal precipitation ensures efficient transport of sand-rich sediments in the basin despite long distances through a very flat floodplain and delta. Rapid transport also acts as a limiting factor for weathering as it reduces residence time in the floodplain but favors efficient carbon burial.

The IODP Expedition 354 drilled the Bengal Fan with seven sites over a 320 km E-W transect at 8°N. This construcs a composite sedimentary record of Himalayan erosion over the Neogene and Quaternary. Sediments are predominantly composed of turbidites generated from the Ganga-Brahmaputra delta. Turbiditic sediments show mineralogical, geochemical and isotopic characteristics which reveal a close analogy with those of the modern Ganga-Brahmaputra river. Sand deposition is dominant and is present in several meters thick sand lobe as well as in levee turbidite (Bergmann et al. 2020). Sand was used to determine average erosion rates of the Himalaya using quartz in situ concentrations of cosmogenic 10Be. Those show stable rate in spite of the onset of a more unstable climate from the Pliocene to the Pleistocene (Lenard et al. 2020).

Major element concentrations and Sr-Nd isotopic compositions of turbidite samples reflect combined effects of geological sources exposed to erosion, weathering and mineral sorting during transport. Deciphering these controls, based on the comparison between turbidite samples and modern river sediments of the Ganga and Brahmaputra basin reveals evolution from Miocene to present. Changes appear in the abundance of detrital carbonates likely reflecting decreasing exposition of the Tethys Himalaya to erosion since Miocene. Clear increase in the silicate Na and Ca concentrations from Miocene to Pleistocene indicates major change in the weathering conditions in the basin which can be related to longer residence time of the sediment in the floodplain and lower erosion ratesin the Miocene.

Bergmann et al. 2020, G. cube 10.1029/2019gc008702
Lenard et al. Nat Geosc. 2020, doi:10.1038/s41561-020-0585-2