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Neogene erosion and weathering processes recorded in the Bay of Bengal

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A comprehensive Neogene clastic sedimentation sequence has been retrieved by IODP Expedition 354 in the middle Bengal fan. The last Ma turbiditic sediments have clear Himalayan origin based on the strong similitude in elemental and isotopic geochemistry with the upper pro delta sampled 900 km closer to the deltaic front and with the last 30yrs of riverine sediment of the Ganga and Brahmaputra. However, in the deep holes covering the last 20Myrs, the carbonate content and the geochemistry of both the silicate and the carbonate fractions display subtle variations consistent with changes in the sources of the sediments, albeit restricted to the Himalayas. Mineralogical sorting can introduce bias on isotopic fingerprint of deep-sea turbidites. In the Bay of Bengal, such effects generate Sr-Nd anti-correlated changes with a difference of ~1ε unit in εNd between coarsest and fine layers within the same turbidite, while the detrital carbonate content is not statistically different. Of course, source fingerprinting can also be blurred by changes in the weathering intensity modulated by the monsoon.

Considering coarse silt only across the transect at 8°N, Sr-Nd data of the silicate fraction define temporal changes insensitive to the sampling location. They are attributed to changes in the tectonic regime in the Himalayas. In particular, the activation of the MBT and associated exhumation of the Lesser Himalayan sequence (LHS) is marked by a drop in the εNd by 2ε units, starting around 7.6Ma. The rise in the proportion of LHS material is then stopped around 6.0Ma, and associated with a drop in detrital carbonate content. These coeval variations are likely related to the tectonic evolution of the range. However, after 6.0Ma, variations in the carbonate content, including at glacial-interglacial timescale (at 16°N) could be the witness of the modulation of the monsoon. For the older period, only cored at Site U1451, the middle Miocene is dominated by material derived from the high Himalayan crystalline series with significant contribution of the Trans-Himalaya batholith (until ~10Ma), both slightly more weathered than quaternary analogue and the significant erosion of the southern Tibet highlighted by high detrital carbonate content.