Detrital, biogenic, and diagenetic carbonates in turbidites of the Bengal Fan

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Since the Oligocene, the Himalayan erosion drives one of the most important detrital flux to the oceans. More than 500 Mt of sediments are transferred annually from the Bangladesh delta to the shelf and submarine canyon, the Swatch of No Ground. From the canyon, turbidity current drive sediments along channel levees and disperse sediment over 3000 km south of the delta. On land, the Ganga river and its main tributaries export particulate carbonate resulting from the physical erosion of limestone, marls and marble present mainly in the Tethys Himalaya and lesser Himalaya. In spite of high runoff, these rivers reach carbonate saturation and export particulate carbonate to the ocean. The modern river system exports ≈ 3 wt% of calcite and dolomite, and comparable concentrations are observed in Holocene sediments from the Northern Bay of Bengal. Detrital carbonates are easily sorted from marine carbonates thanks to their low $\delta^{18}O$ and high $^{87}Sr/^{86}Sr$ acquired during metamorphic stage. Their proportion increase in LGM sediments, likely reflecting weaker conditions of weathering during this period [1-2].

Recent IODP Exp. 354 on the Bengal Fan documented Himalayan derived turbiditic sedimentation at 8°N/≈3600 mbsl over the whole Neogene. There, large variations of detrital carbonate proportion are observed with maxima around 10 wt% reached during the upper Miocene. Analyses of the carbonate load also reveal the minor presence of biogenic carbonates, and the significant presence of diagenetic carbonates. They are characterized by high $\delta^{18}O$ around -2‰ PDB, low $\delta^{13}C$ ≈ -8‰ and $^{87}Sr/^{86}Sr$ near seawater composition. Their occurrence and proportion are closely associated with the fine clay fraction of the sediments. The average concentration of this diagenetic component is 1.2 wt% and it can reach 4 wt% in clay-rich samples. Pore-water compositions suggest that they were not produced in situ. Rather they may be produced up-fan and incorporated in the tubiditic mixing.

1 Lupker, M. et al. 2013 doi.org/10.1016/j.epsl.2013.01.038
2 Hein, C. J.et al. 2017 doi.org/10.1016/j.epsl.2017.08.013