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Sources of the more weathered hemipelagic sediments in the Bengal Fan

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Chemistry and mineralogy of clastic sediments are detailed and powerful archives of the weathering in their source region through time. For the Bengal Fan, the routing of turbidity currents and the fluxes of riverine sediments point to a Himalayan origin of the clastic sedimentation, supported by geochemical and mineralogical data for turbiditic material [1]. However, more weathered compositions have been reported from pelagic sedimentation in the Bay of Bengal not directly fed by turbidity currents [2-3]. Here, we report detailed analysis of the hemipelagic levels retrieved by IODP Exp 354 corresponding to the sedimentation away from the channels where turbidity currents flow [1]. On average, the hemipelagics are enriched in carbonate (31 % versus 5.6% in turbidites), and depleted in alkali (Na/Al and K/Al (molar ratios) of 0.10 and 0.18 versus 0.17 and 0.24, respectively). The $\delta^{18}O$ of the carbonate (-1.9+/- 5,6‰ vs PDB) supports a significant contribution from pelagic carbonate. However, the clastic source of the hemipelagic is not entirely Himalayan since their mean $^{87}Sr/^{86}Sr$ ratio is 0.017 lower than in turbidites and the Eps Nd is 2.7 units higher, and closer to hemipelagic signatures [2-3]. In addition, the hemipelagic sediments are enriched in Cr (26% higher Cr/Al ratio), also in Ni and Co. So radiogenic isotopes and trace elements suggest a greater contribution of mantle-derived material. This could be an inherent component from the gangetic catchment (Deccan Traps) that could be more concentrated in the finer part of the turbiditic sedimentation. However, the fine fraction of the turbidites (<2μ) are more depleted in Na (Na/Al = 0.05), but less depleted in K (K/Al = 0.20), less enriched in Cr (11% higher) and their Eps Nd is only 1.2 units higher than their bulk composition. Therefore, the bottom nepheloid layer in the Bay of Bengal is likely recording a mixture of pelagic sedimentation, fines from turbidity currents but also mantle-derived material possibly from the Burma Arc.

[1] France-Lanord et al. (2016), Proceedings of the International Ocean Discovery Program 354

[2] Joussain et al. (2016), Quaternary Science Reviews, 148, 1-16

[3] Ali et al. (2021), Paleoceanography and Paleoclimatology, 36, e2020PA003909.