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Mineralogy of Nicobar Fan turbidites (IODP Leg 362): Himalayan provenance and diagenetic control.

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In this study we use quantitative petrographic and heavy-mineral data on silt-size and sand-size sediments from the Nicobar Fan turbiditic depositional system to unravel their provenance and to discriminate between pre-depositional and post-depositional processes controlling sediment mineralogy. Eighteen samples from the two drill sites U1480 and U1481, collected down to a depth of 1400 m during International Ocean Discovery Program (IODP) Expedition 362, were selected for analysis. A complete section of the sedimentary section overlying oceanic basaltic basement was recovered at the U1480 drill site, whereas the U1481 drill site, located 35 km to the southeast, focused on the deeper interval of the sedimentary section overlying oceanic basement. Here we illustrate compositional trends observed throughout the recovered succession, and compare heavy-mineral suites characterizing sediments drilled at the two U1480 and U1481 sites to check for potential differences in sediment provenance over a relatively short distance in trench settings. Diagenetic control with increasing burial depth was also specifically investigated.

In Pleistocene sediments at depths of a few tens of meters only, rich heavy-mineral assemblages include mainly hornblende, epidote, and garnet, associated with apatite, clinopyroxene, tourmaline, sillimanite, kyanite, zircon, titanite, and rare staurolite and rutile, testifying to long-distance provenance from the Himalayan range via the Ganga-Brahmaputra fluvio-deltaic-turbiditic system.

Heavy-mineral concentration shows a progressive decrease with burial depth, pointing to selective diagenetic dissolution of less durable detrital minerals. Clinopyroxene becomes rare below 400 m depth and was not recorded below 500 m depth, where amphibole decreases notably in relative abundance. More durable heavy minerals, including zircon, tourmaline, apatite, garnet, and epidote, consequently tend to be relatively enriched with increasing age and burial depth. Petrographic and heavy-mineral data, combined with biostratigraphic, paleomagnetic, and geochemical evidence, allow us to unravel the sedimentary history of the Nicobar Fan as related to Himalayan uplift, erosion, and monsoon development during the last 10 Ma.