Geophysical Research Abstracts
Vol. 21, EGU2019-16882, 2019
EGU General Assembly 2019

Evolution of Irrawaddy megadelta sediment provenance since the Last Glacial Maximum

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The Irrawaddy (Ayeyawady) delta of Myanmar is one of the last unexplored megadeltas, delivering one of the highest fluxes of sediment in the world to the Andaman Sea. Two drill cores from Ta Loke Htaw and Kyonmangay provide new Sr and Nd isotope geochemistry ($<2\mu$m and >2 μm size fractions) and detrital zircon U-Pb geochronology that are used to constrain fluvial sediment provenance variability recorded within the Irrawaddy delta since the Last Glacial Maximum. These data are synthesized together with published bulk and single-grain sediment provenance datasets from the modern river, delta, and source bedrock, and integrated with geomorphic, neotectonic, and paleoenvironmental datasets to provide initial constraints on tectonic and surface process controls on Quaternary sediment delivery to the Andaman offshore.

Initial data show a limited range in $^{87}Sr/^{86}Sr$ isotope values between 0.714045 and 0.717467 ($\pm$0.000062, 2σ) and epsilon Nd values of -6.95 to -5.85 ($\pm$0.13, 2σ) for clay-sized material. Coarser material (>2 μm) show slightly less radiogenic$^{87}Sr/^{86}Sr$ signatures (0.711441–0.716361) and a $\sim$2 epsilon offset to less radiogenic values (-8.97 to -7.94) than finer fractions. Nd isotope signatures are overall more radiogenic than previously observed in the modern river (-11 to -8). The consistent $\sim$2 epsilon Nd value offset between grain-size fractions indicates hydrodynamic sorting has allocated different phases between the $<2\mu$m and >2 μm fractions and/or phase(s) sourced from bedrock terranes with differing histories.

Detrital zircon samples yield U-Pb ages ranging from early Miocene to late Archean, with 31–42% of ages between 20–75 Ma, 16–36% between 75–180 Ma, with smaller and variable peaks at $\sim$500–600 Ma, $\sim$850–1200 Ma, and 2300–2600 Ma. Delta samples indicate strong contributions from the Myittha-Chindwin tributaries and uppermost Irrawaddy since the Last Glacial Maximum and up to 10–9 ka. After 9 ka and until at least 5 ka, delta sediments at Kyonmangay show a shift to greater contributions from the southern Indo-Burman Range/Arakan Yoma and the Shan Plateau/Sibumasu terrane. By 1.5–1.0 ka, moderately more material is sourced again from the uppermost Irrawaddy and northeast Chindwin, with greater incorporation of southern Indo-Burman Range materials after 1.0 ka to present-day.