Geophysical Research Abstracts
Vol. 19, EGU2017-8008, 2017
EGU General Assembly 2017

Controls on Sediment Flux Via the Indus Canyon to the Deep Arabian Sea

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Conventional sequence stratigraphy models emphasize sealevel as the primary control on the sediment flux to deep continental margins. We assess the role of climatically modulated sediment supply in the Indus river/fan system in controlling the construction of the world's second largest submarine fan. Nd and Sr isotope analysis of post-glacial sediments from the Indus Canyon shows that these are identical to coeval sediments deposited at the river mouth over the same time period. In turn this implies that the degree of buffering does not exceed ~8 k.y., and likely much less. Cores at the canyon head seem to show annual monsoonal flood layers but slumping and reworking in the canyon probably causes some signal loss along the canyon axis. Nonetheless, coherent geochemical variations at selected sites implies a close link between the river discharge and the mid canyon, at least within the uncertainties of the 14C dating. Geochemical records become more scattered after 5 ka, which we attribute to reduced fluvial discharge linked to a weaker monsoon, contrasting with the strong monsoon in the Early Holocene. Although sedimentation continued in the canyon through the time of rising and maximum sealevel is unclear whether this sediment reached the upper fan. Limited coring has shown clay but no sandy deposits on upper fan lobes. Deep coring of Indus lobes and interlobes drapes in the Laxmi Basin by IODP Expedition 355 recovered a sequence spanning the last 11 Ma. Provenance studies based on bulk sediment Nd and Sr isotopes, as well as single grain zircon U-Pb dating shows a consistent shift in provenance during that time period, becoming progressively more Himalayan in character. All samples deposited since 2 Ma show close similarities with the modern interglacial river and not with the river's composition during the last glacial. This implies that sediment supply to the deep basin is biased by erosion during warm periods when the summer monsoon was strong and not during the colder, dry interglacials, despite the fact that lower sealevel would facilitate sediment flux to the deep basin floor. We infer than monsoon intensity trumps sealevel as a primary control over the generation of the deep-sea fan record.