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High resolution variability in the Quaternary Indian monsoon inferred from records of clastic input and paleo-production recovered during IODP Expedition 355

Annette Hahn (1), Mitchell Lyle (2), Denise Kulhanek (3), Sergio Ando (4), and Peter Clift (5)

(1) MARUM, University of Bremen, Bremen, Germany, (2) College of Earth, Ocean and Atmospheric Sciences, Oregon State University, Corvallis, OR, USA, (3) International Ocean Discovery Program, Texas A&M University, College Station, TX, USA, (4) Department of Earth and Environmental Sciences, University of Milano-Bicocca, Milano, Italy, (5) Louisiana State University, Baton Rouge, LA, USA

The sediment cores obtained from the Indus fan at Site U1457 during Expedition 355 of the International Ocean Discovery Program (IODP) contain a ca. 100m spliced section covering the past ca. 1Ma. We aim to make use of this unique long, mostly continuous climate archive to unravel the millennial scale atmospheric and oceanic processes linked to changes in the Indian monsoon climate over the Quaternary glacial-interglacial cycles. Our aim is to fill this gap using fast, cost-efficient methods (Fourier Transform Infrared Spectroscopy [FTIRS] and X-ray Fluorescence [XRF] scanning) which allow us to study this sequence at a millennial scale resolution (2-3cm sampling interval). An important methodological aspect of this study is developing FTIRS as a method for the simultaneous estimation of the sediment total inorganic carbon and organic carbon content by using the specific fingerprint absorption spectra of minerals (e.g. calcite) and organic sediment components. The resulting paleo-production proxies give indications of oceanic circulation patterns and serve as a direct comparison to the XRF scanning data. Initial results show that variability in paleo-production is accompanied by changes in the quantity and composition of clastic input to the site. Phases of increased deposition of terrigenous material are enriched in K, Al, Fe and Si. Both changes in the weathering and erosion focus areas affect the mineralogy and elemental composition of the clastic input as grain size and mineralogical changes are reflected in the ratios of lighter to heavier elements. Furthermore, trace element compositions (Zn, Cu, Mn) give indications of diagenetic processes and contribute to the understanding of the depositional environment. The resulting datasets will lead to a more comprehensive understanding of the interplay of the local atmospheric and oceanic circulation processes over glacial-interglacial cycles; an essential prerequisite for regional predictions of global climate change impacts.