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Major reorganization in the transport pathway of Zambezi River sediments along and across the Mozambique Shelf during the last glacial-interglacial transition

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The sediment discharge of the Zambezi River that drains a considerable part of tropical southern Africa has build up an extensive fan system. Sedimentation along the Mozambique Margin is affected by large counter-clockwise eddies that propagate southward through the Mozambique Channel. Satellite images and salinity contours show that the modern plume of the Zambezi is transported northward over the shallow shelf. In order to determine the temporal and spatial changes in Zambezi-derived sediments, we collected piston and multi-cores along and across the Mozambique shelf (INATEX cruise, spring 2009). Here, we present grain-size data, XRF and magnetic susceptibility (MS) profiles from four sediment cores PE304-80,-83, -85 and -88, at respectively 1329m, 939m, 597m and 415m water depth along a S-N transect starting off the Zambezi River mouth.

The chronology of these cores is established by cross-correlating XRF and MS patterns with neighboring cores that have been dated by 14C AMS. Grain-size distributions of the lithogenic fraction were decomposed into different sub-populations using an end-member algorithm. The finest-grained end-member is interpreted as the suspended river material, whereas the coarsest end-member was probably derived by reworking of shelf sediments.

High proportions of the fine-grained end-member occur during glacial conditions in the southern cores PE304-83, -85, and -88, and during the Holocene in the northernmost core PE304-80. Likewise, relatively coarse-grained sedimentation shifted from the northern area in the glacial period to the southern area in the Holocene. This opposing grain-size trend between the southern and the northern sediment cores indicates a northward and onto the shelf migration of the Zambezi suspended load during the last deglaciation. Before, during the glacial period, large areas of the Mozambique Shelf were exposed, resulting in deposition of the Zambezi River suspended load more to the east and closer to the shelf break and continental slope. The Holocene shift of Zambezi sedimentation to the northern part of the shelf is confirmed by Nd-Sr isotope signatures of the finest end-member in core 64PE304-80.

We conclude that the flooding and, consequently, the initiation of shelf currents primarily controlled local sediment transport pathways along and across the continental shelf of Mozambique. The implication of these results is that the most dramatic shifts in sedimentation patterns, affecting climate proxy records along the Mozambique margin, reflect sea level change rather than climate change in the Zambezi drainage area over last glacial-deglacial transition.