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Plio-Quaternary sedimentation in the Mozambique Channel and in the Zambezi Fan

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The classical stratigraphic framework stating minimum land-to-sea transfers during periods of high relative sea-level is challenged by marine sedimentary systems in regions where climate (low latitude, monsoon-type) is dominated by the 23-ky cyclicity. Known turbidite systems at the lowest latitudes, like the Nile and Bengal systems (Ducassou et al., 2009; Weber et al., 1997) show that the supply of sediments to the deep oceanic domain could persist during relative high sea-level periods. But turbidite systems at low-latitudes still remain poorly understood. In this work, we use the Zambezi turbidite system as a case study to develop our understanding of the reactivity of deep marine sedimentary systems and land-sea transfers to low-latitude climate variability. The Zambezi Plio-Quaternary turbidite system ($\sim$ 2000 km long x 500 km wide) is located within the Mozambique Channel (Indian Ocean; $\sim$11°-30°S), separating Madagascar from the African continent, in a context of high hydronamic conditions. An extensive dataset acquired strategically along the turbidite system was obtained within the scope of the PAMELA project (scientific project leaded by Ifremer and TOTAL in collaboration with Université de Bretagne Occidentale, Université Rennes 1, Université Pierre and Marie Curie, CNRS et IFPEN) and includes multibeam bathymetry, seismic reflection data and sediment cores.

Preliminary results of morphological, seismic and sedimentological study suggest that this turbidite system in the Mozambique Channel is particular: i) The Zambezi Valley currently appears to be dominated by erosional or vacuity process over its entire length, which is observed within the valley as well as on the flanks; ii) Only two restricted zones of tubiditic deposition are identified; iii) The sedimentary record of the last 375 ky shows few turbidites that occurs both during glacial and interglacial periods, with a rate of recurrence of several tens of thousands of years.

Additional sedimentological results demonstrate a high diversity in turbidite facies depending on the location in the Zambezi system and the pelagic sediments between these turbidites are carbon-rich and have a low sedimentation rate (average of 2.7 cm/ka).

These results imply that multiple controlling factors (sediment supplies, geomorphology, along slope bottom currents inducing possible selective transport of fine particles and impact of climatic and eustatic cycles) impacted the sedimentation and led to the atypical architecture of the Zambezi turbidity system.

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