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Impact of gravity processes on the initial post-rift stages of construction and evolution of a continental margin: Insights from the eastern Gulf of Aden

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The study of the post-rift sediment architecture and continental slope morphology leads to a reconstruction of the initial stages of formation and evolution of gravity-driven processes on the northern margin of the eastern Gulf of Aden. The slope-related features and associated deposits in the deep basin along this young passive margin are investigated through the analysis of a set of seismic-reflection and multibeam bathymetry data. This study demonstrates how preconditioning and triggering factors (tectonics, climate and eustatic variations) can interact and control the margin morphology and post-rift sediment architecture in a source-to-sink perspective. The combined geomorphological and stratigraphic study of this margin allows us to identify three morphological domains inherited from the structural segmentation. The monsoon climate combined with a major eustatic lowstand is proposed as the most likely set of factors preconditioning slope destabilisation on the whole margin. These factors also enhance the effect of the late post-rift uplift of the eastern morphological domain of the studied margin. The formation and distribution of the slope-related features are thus mainly controlled by active faults on the continental slope and the potential effect of bottom currents at the base of the continental slope. The oversteepening of the continental slope in the eastern domain of the studied margin is probably the main triggering factor controlling the generation of failure processes and subsequent canyon formation by upslope erosion. The analysis of canyon location and morphology along the uplifted part of the continental slope reveals the long-term influence of secondary slope-related features, contour currents and turbidite flows on the development of canyons. As a consequence of the late post-rift uplift that only affected the eastern part of the studied margin, huge volumes of sediment were accumulated in mass-transport complexes at the foot of numerous slope-related features and broad canyons on the oversteepened continental slope.