Tectonic Development, Sedimentation and Paleoceanography of the Mozambique Channel

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ABSTRACT

The Mozambique Channel is located in the northernmost part of the deep Mozambique basin. It evidences the complex geodynamic evolution linked with the break-up of Gondwanaland. The basin hosts a record of sediments since the Jurassic separation of East Gondwana (Madagascar, India, Australia and Antarctica) and West Gondwana (Africa and South America). The present-day basin is characterized by a superimposition of water masses originating from the South: the Antarctic Bottom Waters (AABW), the Circumpolar Deep Waters (CDW) and the Antarctic Intermediate Waters (AAIW); but also from the North with the North Atlantic Deep Waters (NADW). By mean of seismic reflection profiles, we reveal the main structure and sediment distribution of the basin, allowing the reconstruction of its evolution associated with the main bottom water flows that influenced the depositional development. Since the Cretaceous, sediment distribution in the western part of the Channel was mainly influenced by gravity driven processes from the East African continental margin, and then modified by bottom currents. Based on the recent age model proposed by Ponte et al., (in revision), we identify up to nine units in the basin which took place: (1) Before the Neocomian, (2) between the Neocomian and the top Cenomanian, (3) between the top Cenomanian and the base Tertiary, (4) during the Paleocene-Eocene, (5) during the Oligocene, (6) from the top Oligocene to the Middle Miocene, (7) during the Upper Miocene, (8) in the Pliocene and (9) in the Pleistocene. During the Cretaceous, analysis of seismic profiles in the Mozambique basin reveals that structural components such as the Davie Fracture Zone are primary factors influencing contourites development by creating narrow deep gateways. In the Tertiary, the main phase of giant contourites drift development occurs during the Oligocene, influenced by the onset of the AABW and the CDW, coeval with the opening of the Drake and Tasmanian Passages. During the Early Miocene, the onset of the NADW might have forced the deepening of the AABW and became progressively dominant in the Mozambique Channel. It might be inferred that this change has caused the end of the giant drifts growth and their passive burial from the Middle Miocene times.