EA19

A Multiproxy Approach to the Paleoenvironmental Reconstruction of the Paleogene Succession in the Rovuma Basin, Offshore Mozambique: Signatures of Eustatism, Climate Change and 'African Superswell'

G. Knezaurek (Eni spa), E. Menichetti (Eni spa), A. Piva (Eni spa), S. Torricelli* (Eni spa)

Summary

The reconstruction of the depositional history of the Paleogene succession from wells drilled in Area 4, offshore Mozambique, was carried out by interpreting paleoecological signals from integrated paleontological and non-paleontological datasets.

A high-resolution integrated biostratigraphic framework was realized. Empirical indices based on palynomorphs, foraminifera and calcareous nannofossils were derived from this study and integrated with the lithological log curves and the mineralogical dataset. Inferences were made in terms of paleo-temperature, bathymetry, distance from the coastline, intensity of surface runoff and fluvial discharge into the sea. Connections among global climatic trends, tectonic uplift of the hinterland, eustatic cycles, sediment accumulation and turbidite deposition in deep marine settings have been extensively investigated.

A reconstruction of the depositional history of the Paleogene succession drilled by wells located in Area 4, offshore Mozambique, has been carried out by interpreting paleoecological signals from integrated paleontological datasets.

Starting from empirical indexes based on palynomorphs, foraminifera and calcareous nannofossils, inferences have been made in terms of paleo- temperature, climate, bathymetry, distance from the coastline, intensity of surface runoff and fluvial discharge into the sea. Connections among global climatic trends, tectonic uplift of the Eastern African hinterland, eustatic cycles, sediment accumulation on the shelf and turbidite deposition in deep marine settings have been extensively investigated.

A 'Priabonian turnover', evidenced by different fossil records, is supposed to reflect two driving forces that started to operate in conjunction about 37-38 Ma ago: a) the inception of global climate cooling, leading to the onset of the late Eocene-Oligocene Antarctic glaciation; b) the tectonic uplift of the South-Eastern African hinterland, affecting continental drainage patterns and specifically the catchment of the paleo-Rovuma River.

In Area 4, the Priabonian-Oligocene climatic and tectonic conditions resulted in higher intensity of surface runoff and fluvial discharge to the sea. They account for about 60% of bulk reservoir volumes in Mamba and Coral gas fields (sand and conglomerate), deposited in deep sea settings by turbidity fluxes during a 15 Myr time span and containing about 66% of GIIP. In contrast, only 40% of bulk reservoir rock volumes, containing 33% of GIIP, were delivered to the basin from the Danian to Lutetian during a 25 Myr span, when climate was much warmer and drier, and topographic relief in the hinterland was lower. In conclusion, the post-Bartonian scenario was much more favorable than pre-Priabonian scenario to the accumulation and delivery of sand to the 'sink'.

If compared to average sedimentation rates documented for turbidite deposits worldwide, sedimentation rates calculated here on the basis of a high resolution biostratigraphy, are very low in the Lower-Middle Eocene and low in the Oligocene. This evidence can be explained by the following reasons: a) depositional settings on the basin floor were unconfined and subject to fluxes bypass; b) bottom currents continuously reworked sand rich gravity flows perpendicularly, removing finer fractions and stacking them into drift mounds to the North; b) even in the more favorable Oligocene scenario (higher topographic relief, enhanced surface runoff and river discharge) the Rovuma river catchment was relatively small if compared to big rivers.

These results improve substantially the stratigraphic detail in the Paleogene succession offshore Northern Mozambique, shedding light on the geological evolution of the Rovuma Basin and especially on mechanisms controlling sediment delivery from 'source to sink'. The proposed model provide new insights into reservoir facies distribution along this portion of the East African margin.