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Micropaleontological characterization of Cenozoic deep-sea fan deposits, Congo Fan, offshore Angola

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The Congo Fan is the second largest delta system in the world, spanning some 3.7 x 10^6 km^2 and draining most of central Africa through the Congo River and its associated tributaries. The Congo Fan is a terrigenous wedge largely built of Oligocene and Miocene sands and shales organised into thick sedimentary packages containing paleocanyons, paleochannels, and overbank deposits. The unique meandering paleochannels contain sands that have proved to be high quality traps for migrating hydrocarbons. In this study we analyse the foraminiferal microfauna from a well drilled in the distal section of the fan through Oligocene to middle Miocene deposits in an attempt to characterize the sedimentological subfacies and the evolution of the fan.

The West African margin has been an active depocentre since initial rifting took place in the mid-Cretaceous. The earliest marine deposits consist of Aptian evaporites (<1000 m thick) that overlie lacustrine deposits and form the complex of diapirs seen throughout the overlying strata. From the Late Cretaceous to early Oligocene, aggradational carbonate/siliciclastic ramp sediments formed ~200 m of deposits, which are the source rock for the overlying hydrocarbon-bearing sands. These are directly overlain by a significant Oligocene unconformity of several million years, followed by prograding terrigenous turbidite deposits that continue to the late Miocene forming up to 2000 m of deposits. These consist of shale and sand overbank and channel deposits, containing foraminifera in varying abundances. Sedimentation of the Congo Fan has continued throughout the late Miocene to Recent as a progradational wedge.

The well in this study largely spans the Oligocene to middle Miocene turbiditic fan. It has been sampled at 10 m intervals from about 2800 m to 4400 m depth, has a water depth of ~2000 m, and is located ~170 km offshore Angola (Block 31). The upper Oligocene section consists of predominantly black muds and silts with interbedded sandy horizons. This section continues

into the lower Miocene with little sedimentological change until reaching a large sand/silt body that is interpreted as a submarine paleochannel. The foraminifera are almost entirely agglutinated and are present in most samples at medium to low abundances. Typical cosmopolitan Paleogene forms can be identified (*Nothia robusta*, *Ammodiscus latus*, *Reticulophragmium amplectens*), along with several dominating high productivity forms (*e.g.*, *Portatrochammina alta* n.sp. and *Scherochorella congoensis* n. sp.). The diversity ranges from medium to low with significant faunal variation possibly related to medium to high productivity fluctuations.

The overlying sand horizon becomes barren after foraminiferal diversity and abundance drops away leaving only rare specimens of *Nothia* and *Ammodiscus*. Above this, the sand abruptly gives way to lower and middle Miocene silts and muds containing gradually more calcareous and planktonic foraminifera as well as persistent agglutinated forms. The diversity and abundance are high, showing significant variation that could be related to fluctuations in the CCD during the middle Miocene or due to secondary geochemical effects such as remobilised hydrocarbons. Faunas become more diverse with typical middle Miocene calcareous benthics (*Eponides crebbsi*) and Miocene agglutinated foraminifera (*Cyclammina acutidorsata*, *Haplophragmoides carinatus*) with some typical Paleogene forms persisting (*Glomospira irregularis*, *Haplophragmoides excavatus*). Planktonic foraminifera (*Globigerinoides – Praeorbulina – Orbulina* lineage and *Globorotalia peripheroronda*) have been used to assign the upper section of the well to the Langhian.

The fan underwent continuous progradation during the Oligocene to Miocene. Paleoenvironments changed from deep-sea (below the CCD) through the Oligocene and earliest Miocene, to progressively shallower environments (above the CCD) during the early and middle Miocene, showing a somewhat continuous rise to today's depth of around 2000 m.

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