

IODP Proposal Cover Sheet

Niger Transform Margin

840 - Pre

Title	The Niger Transform Margin –Cretaceous Gateway opening and modern deep biosphere dynamics of an active petroleum system		
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Abstract

The tropical Cretaceous South Atlantic was a primary site of organic carbon production, biotransformation and burial, manifested by thick and widespread black shale deposits and prolific petroleum systems along the conjugate continental margins. The WAZOBIA ('Come Here' in three Nigerian languages) proposal targets the Nigeria Transform Margin (NTM) off tropical West Africa as a relevant region for scientific drilling.

WAZOBIA will address two primary goals linking paleo-environmental studies with cutting-edge research of an active petroleum system: (1) Develop new understanding of the timing of the opening of the Cretaceous Equatorial Atlantic Gateway and its consequences for global biogeochemical cycles, tropical precipitation/weathering, and the evolution of marine biota. (2) Constrain the petroleum system deep biosphere by drilling immature Cretaceous (source) and Tertiary (reservoir) successions as well as fluid migration routes from deeper buried source units. This innovative deep biosphere approach will enable geomicrobiological and biogeochemical studies encompassing major components of an active petroleum system. A secondary goal will target Miocene-to-Modern sections to contribute to the earth system context for equatorial upwelling and hominin evolution from a tropical W-African perspective.

With this cross-disciplinary scope, WAZOBIA will investigate key periods of earth-ocean history and climate, as well as pioneer comprehensive microbial studies exploring the biogeochemistry associated with entire petroleum systems. WAZOBIA will therefore address issues central to the IODP Future Science plan, including 'climate systems and elevated CO₂'; 'regional patterns of precipitation'; 'resilience of the ocean to chemical perturbations'; and 'the deep biosphere'.

These overarching goals will be achieved through drilling continuous Cretaceous and Miocene-to-Modern sediments across lateral and bathymetric transects to obtain high quality, high resolution records on a sub-regional scale.

We have identified corridors where thermally immature Cretaceous strata are located at relatively deep subsurface depths (>500m). We plan 2-3 drill sites with multiple holes to provide sufficient material for the planned multidisciplinary studies. Final drilling locations will be identified based on more detailed depth maps. These will be prepared using data from Shell, Nigeria and will be generated in preparation for a full proposal.

This pre-proposal has been developed in partnership with Shell Nigeria/Nigerian DPR who are likely to offer access to their data archives given strong endorsement by the IODP panel including the invitation for a full proposal. We emphasize that there is clear potential that this program could develop into a Complementary Project Proposal (CPP).

Scientific Objectives

WAZOBIA targets the Nigeria Transform Margin off tropical West Africa to address two primary goals linking comprehensive paleo-environmental studies of the Cretaceous with cutting-edge research of an active petroleum system:

(1) Develop critical new understanding of the timing of the opening of the Cretaceous Equatorial Atlantic Gateway (EAG) and its consequences for global biogeochemical cycles, tropical precipitation/weathering patterns, black shale formation, and the evolution of marine biota in a greenhouse ocean.

(2) Constrain the petroleum system deep biosphere by drilling immature Cretaceous (source) and Tertiary (reservoir) successions as well as fluid migration routes from deeper buried units.

Four main scientific objectives have been identified to address these goals:

(1) Recovery of expanded and continuous thermally immature sections to reconstruct the opening history of the EAG in a fully open tropical South Atlantic position, and its subsequent development into a persistent equatorial upwelling system.

(2) Provision of consistent high resolution sedimentary records of paleo-monsoonal forcing in a tropical setting along the gradually changing atmospheric pCO₂ levels in the Cretaceous greenhouse and its relationship to global climate events (OAEs, hyperthermals). The development of the equatorial upwelling system as context for African hominin evolution will be targeted as a secondary priority using new, expanded Miocene-to-Modern sediment sections.

(3) Investigation of active microbiological and geochemical processes, kinetics, microbial biogeography, and subsurface hydraulics of substrate transport and cell dispersal within and between different components of an active petroleum system.

(4) Evaluation of current biogas production and consumption in immature black shales.

Non-standard measurements technology needed to achieve the proposed scientific objectives.

n.a.

Proposed Sites

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
NTMS-01	6.092763, 2.834473	1200	1000	0	1000	Niger continental margin, exact site location NOT yet specified (see pre-proposal)