

IODP Proposal Cover Sheet

864 - Full

Equatorial Atlantic Gateway

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Title	The Origin, Evolution and Palaeoenvironment of the Equatorial Atlantic Gateway		
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Keywords	Cretaceous, Cenozoic, Paleoceanography, Tectonics, Evolution	Area	Pernambuco Plateau, NE Brazil

Proponent Information

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Abstract

This proposal seeks to answer first order questions about the tectonic, climatic and biotic evolution of the Equatorial Atlantic Gateway (EAG). We propose to target sequences of Late Cretaceous and Cenozoic sediments offshore NE Brazil, just south of the theorized final opening point of the EAG. These sequences are accessible to conventional non-riser drilling on the Pernambuco Plateau, part of the northeastern Brazilian continental shelf. This region was chosen to satisfy two key constraints that other regions in Equatorial Brazil could not meet: first, the Pernambuco Plateau records the Albian marine incursion into the South Atlantic at depths shallow enough to be recovered by non-riser drilling; second, Late Cretaceous and Paleogene sediments are close enough to the continental margin to provide both well-preserved organic biomarkers and calcareous microfossils for multi-proxy studies of greenhouse climate states. New records in this region will allow us to address major questions within five key themes: A) The early rift history of the Equatorial Atlantic; B) Biogeochemistry of the hydrographically restricted Equatorial Atlantic; C) Tracing the Late Cretaceous/Early Paleogene evolution of modern ocean circulation; D) Tropical climate-biosphere linkages; and E) The Cenozoic evolution of the modern tropical Atlantic. Tackling these major questions with new drilling in the EAG region will advance our understanding of the interactions between tectonics, large-scale climatic change, and the ecological responses of marine and terrestrial organisms to extreme environments.

Scientific Objectives

- i) Determine the dynamics and paleoenvironments of the Cretaceous Gondwana triple junction rift systems, including the localisation of rifting, passive margin formation, magmatism and depositional environments
- ii) Document the transition from breakup to mature spreading: ocean water chemistry, age of oceanic crust, gateway formation, contribution to the knowledge of rift diachronism
- iii) Determine the post rift evolution & deep earth Dynamics
- iv) Investigate how volcanism, ocean circulation, temperature, nutrient availability, and ecosystem compositions interact to both trigger and end Ocean Anoxic Events?
- v) Investigate the role of tropical young ocean basins within the global carbon cycle. How is this amplified during times of global temperature perturbations, such as OAEs?
- vi) What are the effects of extreme low oxygen concentrations and high temperatures on the ecological and biogeochemical processes operating within marine basins?
- vii) How did opening of the EAG contribute to the evolution of global ocean circulation?
- viii) Are there negative feedbacks that limit tropical temperatures in greenhouse climate states?

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

NA

Proposed Sites (Total proposed sites: 5; pri: 3; alt: 2; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
PER-4A (Primary)	-9.3159 -33.8728	4441	947	5	952	Oceanic crustal age; Early rift history; Cretaceous environmental change; long-term Cenozoic record of Atlantic deep-water
PER-5A (Alternate)	-7.5799 -33.5767	4413	964	5	969	Cretaceous environmental change; long-term Cenozoic record of Atlantic deep-water
PER-6A (Primary)	-8.4580 -33.9700	1857	900	5	905	Long-term Cretaceous to Modern Paleoceanographic records
PER-7A (Alternate)	-9.2317 -33.8136	4412	995	5	1000	Oceanic crustal age; Early rift history; Cretaceous environmental change; long-term Cenozoic record of Atlantic deep-water
PER-8A (Primary)	-8.5625 -33.9904	2003	400	0	400	Neogene Paleoceanographic records