

# IODP Proposal Cover Sheet

864 - Full 2

Equatorial Atlantic Gateway

Received for: 2017-04-03

Title	The Origin, Evolution and Paleoenvironment 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 in the vicinity of 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, Aptian-Albian aged sediments, that record the main phases of the South Atlantic marine incursion, are present at depths shallow enough to be recovered by non-riser drilling; second, Late Cretaceous and Paleogene sediments preserved on the Pernambuco Plateau, are close enough to the continental margin, and at shallow enough paleo water depths (<2000 m) to provide 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 four key themes: A) The early rift history of the Equatorial Atlantic; B) Biogeochemistry of the restricted Equatorial Atlantic; C) The long-term paleoceanography of the Equatorial Atlantic Gateway; and, D) the limits of tropical climates and ecosystems under conditions of extreme warmth. Tackling these major questions with new drilling in the EAG region will advance our understanding of the long-term interactions between tectonics, oceanography, ocean biogeochemistry and climate, and the functioning of tropical ecosystems and climate during intervals of extreme warmth.

## 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 and how this is amplified during times of global temperature perturbations, such as OAEs
- vi) Test the effects of extreme low oxygen concentrations and high temperatures on the ecological and biogeochemical processes operating within marine basins
- vii) Determine the impact of EAG opening on the evolution of global ocean circulation
- viii) Determine if there are 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: 9; pri: 4; alt: 5; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
PER-04A (Alternate)	-9.3160 -33.8728	4441	947	20	967	Oceanic crustal age; Early rift history; Cretaceous environmental change; long-term Cenozoic record of Atlantic deep-water
PER-05A (Alternate)	-7.5799 -33.5767	4413	964	20	984	Cretaceous environmental change; long-term Cenozoic record of Atlantic deep-water
PER-06A (Alternate)	-8.4580 -33.9700	1857	900	20	920	Long-term Cretaceous to Modern Paleooceanographic records
PER-07A (Alternate)	-9.2317 -33.8136	4412	995	20	1015	Oceanic crustal age; Early rift history; Cretaceous environmental change; long-term Cenozoic record of Atlantic deep-water
PER-08A (Alternate)	-8.5625 -33.9904	2003	400	0	400	Neogene Paleooceanographic records
PER-09A (Primary)	-8.5660 -33.9233	2237	600	0	600	Late Cretaceous - early Paleogene paleoclimate records
PER-10A (Primary)	-8.4664 -33.4818	4580	1000	0	1000	Syn- to post-rift transition; Aptian to Recent pelagic sediments
PER-11A (Primary)	-9.5413 -33.3834	4704	1400	20	1420	Oceanic crustal age; Early rift history; Cretaceous environmental change; long-term Cenozoic record of Atlantic deep-water
PER-12A (Primary)	-8.5634 -33.9750	2049	600	0	600	Late Paleogene paleoclimate records from hemi-pelagic clays