IODP Proposal Cover Sheet

933 - Full

NW African Continental Margin Climate

Received for: 2018-10-01

Title	Neogene climate, productivity, and sedimentation at the NW African continental margin
Proponents	Torsten Bickert, Ilham Bouimetarhan, Peter deMenocal, Lydie Dupont, Aggeliki Georgiopoulou, Timothy D. Herbert, Sebastian Krastel, Anna Nele Meckler, Stefan Mulitza, Julia Reece, Oscar Romero, Enno Schefuß, Tilmann Schwenk, Peter J. Talling, Morelia Urlaub, Thomas Westerhold, Anya J. Crocker, Paul A. Wilson
Keywords	NW-African-continental-margin, Ceonozoic-climate, Sahara, eastern-boundary-upwelling, mass-wasting
Area	NW African continental margin

Proponent Information

Proponent	Torsten Bickert
Affiliation	MARUM, University of Bremen, 28359 Bremen, Germany
Country	Germany

☑ Permission is granted to post the coversheet/site table on www.iodp.org

Abstract

We propose an IODP expedition to investigate the Neogene climate, sedimentation and ocean productivity along the continental margin of NW Africa. We intend to drill a latitudinal transect of sites from Cap Bojador (~28°N) southeast of the Canary Islands to Sierra Leone Rise (~5°N). One primary objective, targeted at up to four primary sites, is to study the North African hydroclimate and vegetation to reconstruct the timing and cause of Miocene to Pleistocene aridification steps and their linkages to ocean circulation. A second primary objective is to obtain long records of millennial- to centennial-scale climate change in the subtropics and related sediment transport regimes from sites with exceptionally high- to very high sediment accumulation rates. These archives will complement those recently recovered from Southern Africa by IODP Exp. 361 and Continental Drilling Program coring of East African lakes, and help to build an in-depth understanding of past natural climate variability under future-relevant conditions across Africa. Sediments from the proposed expedition will also provide records to study (i) ocean productivity and ecosystem response to climate perturbations in the eastern boundary upwelling system off NW Africa, and, by deepening one hole, (ii) sediment transport on the continental margin of NW Africa, its effect on slope stability and the future hazard potential associated with submarine landslides. Our drilling strategy is based on an extensive array of high quality multichannel seismic data combined with information from GeoB sediment cores, and by the results of DSDP/ODP Legs 41 and 108. Drill cores from these two early legs provide helpful stratigraphic control and background information on past climate and ocean productivity. Our plans include three sites positioned close to classic sites (366, 658 and 659) where drilling will recover the more complete sections that are needed, and a further eight sites (including 4 alternates) where new coring will provide unprecedented high-quality information on lithologic and climate variability during the Neogene. One additional site in combination with a deep site off Western Sahara aims at unravelling the landslide history and mechanics along the margin. Our scientific objectives are closely aligned with those of the IODP 2013-2023 Science Plan and the proposed expedition will help meet the information priorities for human adaption to climate change in NW Africa identified by IPCC 2013 working group 2.

933 - Full

Scientific Objectives

Objective 1 - NW African climate in a warmer world, with emphasis on wind systems, dust supply, precipitation and vegetation
- How did African climate respond to global warmth during the late Cenozoic? What are the lessons from these records of natural climate variability for the Anthropocene?
- What is the relationship between NW African hydroclimate, global warming and Atlantic overturning ocean circulation?
- How is the origin and evolution of the Sahara - the world's largest hot desert - connected to global climatic and oceanic changes?

Objective 2 - High productivity, ecosystem and sediment transport response to climate perturbations
- What is the upwelling response to climate conditions warmer than today?
- What is the role of dust in fertilizing marine bioproduction and ballasting particle fluxes?
- What are the consequences of future climate change for high productivity marine ecosystems off NW Africa?
- How does ocean productivity and sediment deposition affect the timing and occurrence of giant submarine landslides?

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

933 - Full

Proposed Sites (Total proposed sites: 12; pri: 8; alt: 4; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
NWAFR-01A (Primary)	27.5374 -13.8459	1430	500	0	500	Cape Bojador high-resolution climate, Plio/Pleistocene millenial scale African hydroclimate, 0-3,5 Ma
NWAFR-02B (Primary)	24.2663 -17.1061	1590	1100	0	1100	Early Miocene climate, Sahara summer dust input, Sahara slide upslope headwall, slide preconditioning factors, 0 to 9-12 Ma
NWAFR-03A (Primary)	24.3876 -17.2680	2152	250	0	250	Sahara slide downslope, landslide frequency, dating seismic reflectors, 0 to 6-8 Ma
NWAFR-04A (Primary)	20.85154 -18.41739	2140	500	0	500	Cape Blanc high-resolution climate and productivity, Plio/Pleistocene millenial scale African hydroclimate, 0 to 3 Ma
NWAFR-05A (Primary)	15.4288 -17.8687	1970	500	0	500	North Senegal high-resolution climate, Plio/Pleistocene millenial scale African hydroclimate, 0-3,0 Ma
NWAFR-06B (Primary)	13.5269 -18.4441	3540	500	0	500	Early Miocene African climate, South Senegal high-resolution hydroclimate, 0-16 Ma
NWAFR-07A (Primary)	18.0772 -21.0262	3069	400	0	400	Sahara dust summer plume, early Miocene African climate, 0-24 Ma
NWAFR-08A (Primary)	5.6783 -19.8517	2853	300	0	300	Sahara dust winter plume, Early Miocene African climate, 0-35 Ma
NWAFR-09B (Alternate)	27.5376 -13.7022	900	650	0	650	Cape Bojador high-resolution climate, Plio/Pleistocene millenial scale African hydroclimate, 0-3,5 Ma
NWAFR-10B (Alternate)	20.5454 -18.0512	900	550	0	550	Cape Blanc high-resolution climate and productivity, Plio/Pleistocene millenial scale African hydroclimate, 0 to 3 Ma
NWAFR-11B (Alternate)	12.4293 -18.0054	3001	300	0	300	Casamanche high-resolution climate, Plio/Pleistocene millenial scale African hydroclimate, 0-4,0 Ma
NWAFR-12B (Alternate)	18.7500 -21.0000	3160	400	0	400	Sahara dust summer plume, early Miocene African climate, 0-24 Ma