IODP Proposal Cover Sheet

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NW Africa Neogene Climate

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Title	Neogene climate of NW Africa
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Area	NW African continental margin

Proponent Information

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Abstract

We propose an IODP expedition to investigate the Miocene to Quaternary climate, targeted in a latitudinal transect of drill sites along the continental margin of NW Africa from Cap Bojador (~28°N) southeast of the Canary Islands to Sierra Leone Rise (~5°N). A major objective at all primary sites is to study North African hydroclimate and vegetation, to understand the response to past intervals of global and North Atlantic warmth, and to reconstruct the timing and cause of Neogene aridification and their linkages to global climate state and ocean circulation. These archives will complement those recently recovered from Southern Africa by IODP Exp. 361, and from Continental Drilling Program coring of East African lakes, to build an in-depth understanding of past natural climate variability under future-relevant conditions across Africa. A related secondary objective is to study ocean productivity and ecosystem coupling to African hydroclimate warmth both globally and in the North Atlantic. 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 highlight the potential of these sediments as valuable archives of past climate and ocean productivity. Our plans include two sites positioned close to classic sites (366 on Sierra Leone Rise and 659 on Cape Verde Plateau) where drilling will recover the more complete sections needed, and a further three primary and eight alternate sites where new coring will provide unprecedented high-quality information on African rainfall climate variability and vegetation response as well as oceanic production 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.

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Scientific Objectives

Objective 1 (primary priority) - NW African climate in a warmer world, with emphasis on wind systems, dust supply, precipitation and vegetation
• How did African climate and vegetation 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 warmth 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 (secondary priority) - Ocean productivity and ecosystem response to climate perturbations
• What is the marine productivity 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 marine ecosystems off NW Africa?

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

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Proposed Sites (Total proposed sites: 13; pri: 5; alt: 8; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
NWAFR-01A (Alternate)	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, Neogene northern limit of Mauritania upwelling, 0 to 17-20 Ma
NWAFR-03B (Alternate)	24.2694 -17.1585	1690	1060	0	1060	Early Miocene climate, Sahara summer dust input, Neogene northern limit of Mauritania upwelling, 0 to 17-20 Ma
NWAFR-04A (Alternate)	20.85154 -18.41738	2140	500	0	500	Cape Blanc high-resolution climate and productivity, Plio/Pleistocene millenial scale African hydroclimate, 0 to 3.5 Ma
NWAFR-05B (Primary)	15.4865 -17.9131	2280	250	0	250	North Senegal high-resolution climate, Pleistocene millenial scale African hydroclimate, 0-1,5 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, 0-20 Ma
NWAFR-08B (Primary)	5.7587 -20.0084	2880	250	0	250	Sahara dust winter plume, Early Miocene African climate, 0-19 Ma
NWAFR-09B (Alternate)	27.5376 -13.7022	900	650	0	650	Cape Bojador high-resolution climate, Plio/Pleistocene millenial scale African hydroclimate, 0-3,0 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 4.5 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, 0-20 Ma
NWAFR-13A (Alternate)	5.6742 -19.8437	2865	250	0	250	Sahara dust winter plume, Early Miocene African climate, 0-19 Ma