IODP Proposal Cover Sheet

Mediterranean-Atlantic Gateway Exchange

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Received for:

Title	Investigating Miocene Mediterranean-Atlantic Gateway Exchange (IMMAGE)		
Proponents	Rachel Flecker, Abdella Ait Salem, Alvaro Arnaiz, Nadia Bahoun, Asmae Benarchid, Guillermo Booth Rea, Domenico Chiarella, Damien Do Couto, Hajar el Talibi, Gemma Ercilla, Ferran Estrada, Marcus Gutjahr, Tim Herbert, Javier Hernandez-Molina, Frits Hilgen, Francisco Jose Jiménez-Espejo, Wout Krijgsman, Santiago Ledesma-Mateo, Sonya Legg, Estefania Llave, Amine Manar, Pilar Mata, Hugo Matias, Paul Meijer, Cesar Rodriguez Ranero, Maria Isabel Reguera, Francisco J Rodríguez-Tovar, Michael Rogerson, Cristina Roque, Francisco Sierro, Duncan Wallace, Zakaria Yousfi		
Keywords	Paleoclimate, gateway, salt giant, contourites	Area	Either side of Gibraltar Strait

Proponent Information

Proponent	Rachel Flecker
Affiliation	School of Geographical Sciences, Bristol University
Country	United Kingdom

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Abstract

Marine gateways play a critical role in the exchange of water, heat, salt and nutrients between oceans and seas. The advection of dense waters helps drive global thermohaline circulation and, since the ocean is the largest of the rapidly exchanging CO2 reservoirs, this advection also affects atmospheric carbon concentration. Changes in gateway geometry can therefore significantly alter both the pattern of global ocean circulation and associated heat transport and climate, as well as having a profound local impact.

Today, the volume of dense water supplied by Atlantic-Mediterranean exchange through the Gibraltar Strait is amongst the largest in the global ocean. For the past five million years this overflow has generated a saline plume at intermediate depths in the Atlantic that deposits distinctive contouritic sediments in the Gulf of Cadiz and contributes to the formation of North Atlantic Deep Water. This single gateway configuration only developed in the early Pliocene, however. During the Miocene, a wide, open seaway linking the Mediterranean and Atlantic evolved into two narrow corridors: one in northern Morocco; the other in southern Spain. Formation of these corridors permitted Mediterranean salinity to rise and a new, distinct, dense water mass to form and overspill into the Atlantic for the first time. Further restriction and closure of these connections resulted in extreme salinity fluctuations in the Mediterranean, leading to the formation of the Messinian Salinity Crisis salt giant.

IMMAGE is an amphibious drilling proposal designed to recover a complete record of Atlantic-Mediterranean exchange from its Late Miocene inception to its current configuration. This will be achieved by targeting Miocene offshore sediments on either side of the Gibraltar Strait with IODP and recovering Miocene core from the two precursor connections now exposed on land with ICDP. The scientific aims of IMMAGE are to constrain quantitatively the consequences for ocean circulation and global climate of the inception of Atlantic-Mediterranean exchange; to explore the mechanisms for high amplitude environmental change in marginal marine systems and to test physical oceanographic hypotheses for extreme high-density overflow dynamics that do not exist in the world today on this scale.

Scientific Objectives

The objectives of the IMMAGE research program are:

Objective 1: To document the time at which the Atlantic first started to receive a distinct overflow from the Mediterranean and to evaluate quantitatively its role in Late Miocene global climate and regional environmental change.

Objective 2: To recover a complete record of Atlantic-Mediterranean exchange before, during and after the Messinian Salinity Crisis and to evaluate the causes and consequences of this extreme oceanographic event, locally, regionally and globally.

Objective 3: To test our quantitative understanding of the behavior of ocean plumes during the most extreme exchange in Earth's history.

These objectives require sediments that can only be recovered by undertaking both onshore drilling in Morocco and Spain and offshore drilling in the Alborán Sea and on the Moroccan and Iberian Atlantic margin. The drilling strategy for IMMAGE is therefore amphibious.

IMMAGE's scientific objectives 1 and 2 fall under IODP's science plan for Climate and Ocean Change: Reading the Past, Informing the Future, addressing Challenges 1, 2, 3 and 4 specifically and ICDP's focus on Global Cycles and Environmental Change. Objective 3, however, goes beyond the remit of the science plans of both ICDP and IODP by providing an unparalleled opportunity to test physical oceanographic representations of extreme high-density overflow dynamics. This objective will provide key insights into the role and behavior of all marine gateways and their impact on global climate.

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

Have you contacted the appropriate IODP Science Operator about this proposal to discuss drilling platform capabilities, the feasibility of your proposed drilling plan and strategies, and the required overall timetable for transiting, drilling, coring, logging, and other downhole measurements?

yes

Science Communications Plain Language Summary

Using simple terms, describe in 500 words or less your proposed research and its broader impacts in a way that can be understood by a general audience.

Marine gateways play a critical role in the exchange of water, heat, salt and nutrients between oceans and seas. Cold or salty water produced in marginal marine basins like the Mediterranean, flows out through the gateway as a dense plume that helps drive ocean circulation patterns. It also provides a mechanism for transporting atmospheric CO2 from the atmosphere, via the sea surface, to deeper parts of the ocean. Changes in gateway geometry can therefore significantly alter both the pattern of global ocean circulation and associated climate, as well as having a profound local impact on the marginal marine basin.

Today, the volume of dense water supplied by Atlantic-Mediterranean exchange through the Gibraltar Strait is amongst the largest in the global ocean. For the past five million years this overflow has generated a saline plume at intermediate depths in the Atlantic that deposits distinctive sediments in the Gulf of Cadiz and contributes to the formation of North Atlantic Deep Water. This single Gibraltar gateway configuration only developed around five million years ago, however. Before that, the Mediterranean was really an embayment of the Atlantic, connected by a wide, open seaway. Over time, this evolved into two narrow corridors: one in northern Morocco; the other in southern Spain. Formation of these corridors restricted exchange between the Mediterranean and Atlantic, permitting Mediterranean salinity to rise and producing a new, distinct, dense water mass that spilled into the Atlantic for the first time. Further restriction and closure of the connecting corridors resulted in extreme salinity fluctuations in the Mediterranean, leading to the precipitation of a huge volume of salt on the Mediterranean sea floor around six million years ago. This layer of salt around 1.5 km thick, equates to about 6% of the salt dissolved in the ocean today.

IMMAGE is an amphibious drilling proposal designed to recover a complete record of Atlantic-Mediterranean exchange from the initial development of a distinctively dense water mass, to its current Gibraltar configuration. This will be achieved by targeting Miocene offshore sediments on either side of the Gibraltar Strait with IODP and recovering Miocene core from the two precursor connections now exposed on land with International Continental Drilling Programme. The scientific aims of IMMAGE are to identify and quantify the impact of the onset of Atlantic-Mediterranean exchange on global ocean circulation and climate; to explore the mechanisms driving high amplitude environmental change in marginal marine systems including salt precipitation; and to test physical oceanographic hypotheses for how extremely dense overflow water from marginal basins behaves and mixes with ambient ocean water, something we do not know, because overflow water this dense does not currently exist in the world today.

Proposal History

Submission Type: Resubmission from previously submitted proposal

Review Response

In line with the EPSP comments and minutes the following changes have been made:
1. ALM-03A shifted slightly to avoid bright reflector. ALM-03B now positioned at 1740-5210. Depth remains 930 m;
2. GUB-02A - depth of penetration reduced above the unconformity to 1750 ms which is 920 m;
3. GUB-03A - depth of penetration reduced above the unconformity to 1750 ms which is 930 m;

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Proposed Sites (Total proposed sites: 8; pri: 3; alt: 5; N/S: 0)

Site Name	Position (Lat, Lon)	Water Depth (m)	Penetration (m)			Brief Site-specific Objectives
			Sed	Bsm	Total	
ALM-01A (Primary)	37.4317 -9.5767	1567	990	0	990	To recover a thick, shallow Late Miocene succession which contains distal Mediterranean overflow deposits. The main contribution of this site is that it captures the evolution of the equilibrium depth of the plume and hence tests quantitative constraints on the behavior of dense overflows (Objective 3). In addition, the high resolution (precessional) record we will recover at this site is a key component of the complete record of Mediterranean-Atlantic exchange during the Late Miocene-Pliocene (Objectives 1 and 2).
ALM-02A (Alternate)	36.8359 -9.7481	2265	1630	10	1640	To recover a thick, shallow Late Miocene succession which contains distal Mediterranean overflow deposits. The main contribution of this site is that it captures the evolution of the equilibrium depth of the plume and hence tests quantitative constraints on the behavior of dense overflows (Objective 3). In addition, the high resolution (precessional) record we will recover at this site is a key component of the complete record of Mediterranean-Atlantic exchange during the Late Miocene-Pliocene (Objectives 1 and 2).
ALM-03B (Alternate)	37.37711 -9.59853	1634	930	0	930	To recover a thick, shallow Late Miocene succession which contains distal Mediterranean overflow deposits. The main contribution of this site is that it captures the evolution of the equilibrium depth of the plume and hence tests quantitative constraints on the behavior of dense overflows (Objective 3). In addition, the high resolution (precessional) record we will recover at this site is a key component of the complete record of Mediterranean-Atlantic exchange during the Late Miocene-Pliocene (Objectives 1 and 2).
GUB-02A (Primary)	36.699683 -7.431424	547	1464	0	1464	This site targets a complete late Miocene succession in the pathway of Mediterranean overflow. The aim is to obtain a high-resolution (precessional) record of Miocene Mediterranean overflow at an intermediate site between the onshore records (RIF-01A and BET-01A) and the distal record (ALM-01A). This record makes a critical contribution to all three objectives
GUB-03A (Alternate)	36.700975 -7.411174	540	1650	0	1650	This site targets a complete late Miocene succession in the pathway of Mediterranean overflow. The aim is to obtain a high-resolution (precessional) record of Miocene Mediterranean overflow at an intermediate site between the onshore records (RIF-01A and BET-01A) and the distal record (ALM-01A). This record makes a critical contribution to all three objectives
WAB-03A (Primary)	36.312544 -4.571213	800	1700	0	1700	This site targets one of the few thick late Messinian sedimentary successions in the Alboran Basin. The record recovered from this location will provide key constraints on the chemistry and physical properties of Mediterranean overflow during the Late Miocene. This is critical for all three objectives.
EAB-02A (Alternate)	35.75518251 -2.43956525	845	1277	0	1277	This site targets one of the few thick late Messinian sedimentary successions in the Alboran Basin. The record recovered from this location will provide key constraints on the chemistry and physical properties of Mediterranean overflow during the Late Miocene. This is critical for all three objectives. The site is located on the Spanish side of the Moroccan-Spanish territorial boundary, very close to the other alternate site EAB-03A.
EAB-03A (Alternate)	35.750427 -2.431305	838	1277	0	1277	This site targets one of the few thick late Messinian sedimentary successions in the Alboran Basin. The record recovered from this location will provide key constraints on the chemistry and physical properties of Mediterranean overflow during the Late Miocene. This is critical for all three objectives. The site is located on the Moroccan side of the Moroccan-Spanish territorial boundary, very close to the other alternate site EAB-02A.

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Contact Information

Contact Person:	Rachel Flecker
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Proponent List

First Name	Last Name	Affiliation	Country	Role	Expertise
Rachel	Flecker	School of Geographical Sciences, Bristol University	United Kingdom	Principal Lead and Data Lead	Geochemistry, gateway exchange
Nadia	Bahoun	University of Hassan II Casablanca	Morocco	Other Proponent	Biostratigraphy
Domenico	Chiarella	Dept Earth Sciences, Royal Holloway, University of London	United Kingdom	Other Lead	Wireline logs, straits, tidal sediments
Damien	Do Couto	Universite de Pierre et Marie Cure, Paris	France	Other Proponent	Seismic interpretation
Gemma	Ercilla	Institute of Marine Sciences, Barcelona	Spain	Other Proponent	Seismic and sequence stratigraphy
Marcus	Gutjahr	GEOMAR, Kiel	Germany	Other Proponent	isotope geochemistry, overturning dynamics
Tim	Herbert	Dept. Earth, Environmental and Planetary Sciences, Brown University	United States	Other Proponent	Paleoceanography, orbital-climatic interactions
Javier	Hernandez-Molina	Royal Holloway, University of London	United Kingdom	Other Lead	Contourites
Sonya	Legg	Princeton University	United States	Other Proponent	Physical oceanography
Paul	Meijer	Utrecht University	Netherlands	Other Proponent	physical paleoceanography, numerical modelling
Michael	Rogerson	University of Hull	United Kingdom	Other Lead	Geochemistry and palaeoceanography
Cristina	Roque	Instituto Português do Mar e da Atmosfera Lisbon	Portugal	Other Proponent	Seismic interpretation
Francisco	Sierro	University of Salamanca	Spain	Other Lead	Planktic foraminfera and palaeoclimate
Zakaria	Yousfi	Office National des Hydrocarbures et des Mines, Rabat	Morocco	Other Proponent	Micropaleontology
Cesar	Rodriguez Ranero	Marine Sciences Institute, Barcelona	Spain	Other Proponent	Tectonics, basin analysis, geophysical imaging
Francisco Jose	Jiménez-Espejo	Granda University	Spain	Other Proponent	Geochemistry and palaeoclimate
Hugo	Matias	Centro de Recursos Naturais e Ambiente, Instituto Superior Tecnico (University of Lisbon)	Portugal	Other Proponent	Seismic interpretation
Asmae	Benarchid	Office Natioinal des Hydrocarbures et des Mines, Rabat	Morocco	Other Proponent	Petroleum Geology, seismic interpretation
Estefania	Llave	IGME, Instituto Geologico y Minero de España	Spain	Other Proponent	Seismic interpretation

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Proponent List (Continued)

First Name	Last Name	Affiliation	Country	Role	Expertise
Alvaro	Arnaiz	Repsol	Spain	Other Proponent	Seismic data

Combined IODP and ICDP proponents

First Name	Last Name	Affiliation	Country	Role	Expertise
Rachel	Flecker	School of Geographical Sciences, Bristol University	United Kingdom	Principal Lead and Data Lead	Geochemistry, sedimentology, gateway exchange
Abdella	Ait Salem	Office National des Hydrocarbures et des Mines, Rabat	Morocco	Other Proponent	Seismic interpretation, basin analysis, wellsite geology
Alvaro	Arnaiz	Repsol	Spain	Other Proponent	Seismic interpretation
Nadia	Bahoun	University of Hassan II Casablanca	Morocco	Other Proponent	Micropalaeontology (foraminifera)
Asmae	Benarchid	Office National des Hydrocarbures et des Mines, Rabat	Morocco	Other Proponent	Seismic interpretation, petroleum Geology
Guillermo	Booth Rea	Instituto Andaluz de Ciencias de la Tierra, CSIC-University of Granada	Spain	Other Proponent	Structural geology, tectonics, geomorphology, geodynamics
Domenico	Chiarella	Dept Earth Sciences, Royal Holloway, University of London	United Kingdom	Other Lead	Wireline logs, tidal sedimentology
Damien	Do Couto	Universite de Pierre et Marie Cure, Paris	France	Other Proponent	Seismic interpretation
Hajar	el Talibi	Faculty of Sciences and Techniques of Al-Hoceima - FSTH, University of Mohammed Premier	Morocco	Other Proponent	Geochemistry, sedimentology, basin analysis, sedimentary petrology
Gemma	Ercilla	Institute of Marine Sciences, Barcelona	Spain	Other Proponent	Seismic and sequence stratigraphy
Ferran	Estrada	Institute of Marine Sciences, Barcelona	Spain	Other Proponent	Seismic and sequence stratigraphy
Marcus	Gutjahr	GEOMAR, Kiel	Germany	Other Proponent	Isotope geochemistry, overturning dynamics
Tim	Herbert	Dept. Earth, Environmental and Planetary Sciences, Brown University	United States	Other Proponent	Paleoceanography, orbital-climatic interactions
Javier	Hernandez-Molina	Royal Holloway, University of London	United Kingdom	Other Lead	Contourite sedimentology, seismic interpretation
Frits	Hilgen	Department of Earth Sciences, Faculty of Geosciences, Utrecht University	Netherlands	Other Proponent	Stratigraphy, micropalaeontology, astronomical dating
Francisco Jose	Jiménez-Espejo	Granda University	Spain	Other Proponent	Geochemistry, physical properties, sedimentology
Wout	Krijgsman	Paleomagnetic laboratory “Fort Hoofddijk”, Utrecht University	Netherlands	Other Proponent	Paleomagnetism, stratigraphy
Santiago	Ledesma-Mateo	Gas Natural Fenosa	Spain	Other Proponent	Seismic interpretation, petrophysics, stratigraphy
Sonya	Legg	Princeton University	United States	Other Proponent	Physical oceanography
Estefania	Llave	IGME, Instituto Geologico y Minero de España	Spain	Other Proponent	Seismic interpretation, contourites
Amine	Manar	Office National des Hydrocarbures et des Mines, Rabat	Morocco	Other Proponent	Seismic interpretation
Pilar	Mata	Instituto Geológico y Minero de España	Spain	Other Proponent	Physical properties, sedimentary geochemistry, diagenesis
Hugo	Matias	Centro de Recursos Naturais e Ambiente, Instituto Superior Tecnico (University of Lisbon)	Portugal	Other Proponent	Seismic interpretation
Paul	Meijer	Utrecht University	Netherlands	Other Proponent	Physical paleoceanography, numerical modelling
Cesar	Rodriguez Ranero	Marine Sciences Institute, Barcelona	Spain	Other Proponent	Tectonics, basin analysis, geophysical imaging
Maria Isabel	Reguera	Instituto Geológico y Minero de España	Spain	Other Proponent	Micropaleontology, paleoclimatology, paleoceanography
Francisco J	Rodríguez-Tovar	Department of Stratigraphy and Palaeontology, University of Granada	Spain	Other Proponent	Ichnology, palaeoecology, sequence stratigraphy, sedimentary basin analysis
Michael	Rogerson	University of Northumbria	United Kingdom	Other Lead	Geochemistry and palaeoceanography
Cristina	Roque	Instituto Português do Mar e da Atmosfera Lisbon	Portugal	Other Proponent	Seismic interpretation
Francisco	Sierro	University of Salamanca	Spain	Other Lead	Planktic foraminfera and palaeoclimate
Duncan	Wallace	Chariot Oil and Gas	United Kingdom	Other Proponent	Seismic interpretation
Zakaria	Yousfi	Office National des Hydrocarbures et des Mines, Rabat	Morocco	Other Proponent	Micropaleontology (foraminifera)

Addendum following the EPSP meeting held in February 2022 for IMMAGE 895-ADP

Investigating Miocene Mediterranean-Atlantic Gateway Exchange

Rachel Flecker, Javier Hernández Molina, Hugo Matias

Tabulated minutes of the EPSP meeting held in February 2022 for P895 (IMMAGE)

Site Name	Position (Lat, Lon)	Water Depth (m)	Requested Drilling Depth (m)	Approved Depth (m)	EPSP Decision	Remarks
ALM-01A (Primary)	37.4317 -9.5767	1567	990	990	Approved	Approved at 2021 EPSP meeting
ALM-02A (Alternate)	36.8359 -9.7481	2265	1640	1640	Approved	Approved at 2021 EPSP meeting
ALM-03A (Alternate)	37.38375 -9.593805	1627	930		Declined	Relocate at the crossing of inline 1740 and xline 5210.
EAB-02A (Alternate)	35.75518251 -2.43956525	845	1277	1277	Approved	Approved at 2021 EPSP meeting
EAB-03A (Alternate)	35.750427 -2.431305	838	1277	1277	Approved	Approved at 2021 EPSP meeting
GUB-02A (Primary)	36.699683 -7.431424	547	1464	920	Approved (to revised depth)	Depth reduced to 1750ms two-way travel time. Depth provided post-meeting.
GUB-03A (Alternate)	36.700975 -7.411174	540	1650	930	Approved (to revised depth)	Depth reduced to 1750ms two-way travel time. Depth approved post-meeting.
WAB-03A (Primary)	36.312544 -4.571213	800	1700	1700	Approved	Approved at 2021 EPSP meeting

New Sites

Site Name	Position (Lat, Lon)	Water Depth (m)	Requested Drilling Depth (m)	Approved Depth (m)	EPSP Decision	Remarks
ALM-03B-new (Alternate)	37.37711 -9.59853	1627	930	930	Approved	Substitution for ALM-03A - relocate at the crossing of inline 1740 and xline 5210.

Inline with these suggestions, the following changes have been made to the sites:

- **ALM-03A** has been shifted slightly to avoid a bright reflector. ALM-03B is now positioned at 1740 on the inline seismic line and 5210 on the crossing line. Depth remains 930 m. The site summary forms and metadata have been updated for ALM-03B accordingly (Fig. 1).

- The penetration depth for site **GUB-02A** has been reduced to 1750 ms (TWTT) so that it lies above the unconformity. This results in a revised drilling depth of 920 m. The site summary form and associated metadata have been updated for GUB-02A accordingly.

- The penetration depth for site **GUB-03A** has been reduced to 1750 ms (TWTT) so that it lies above the unconformity. This results in a revised drilling depth of 930 m. The site summary form and associated metadata have been updated for GUB-03A accordingly.

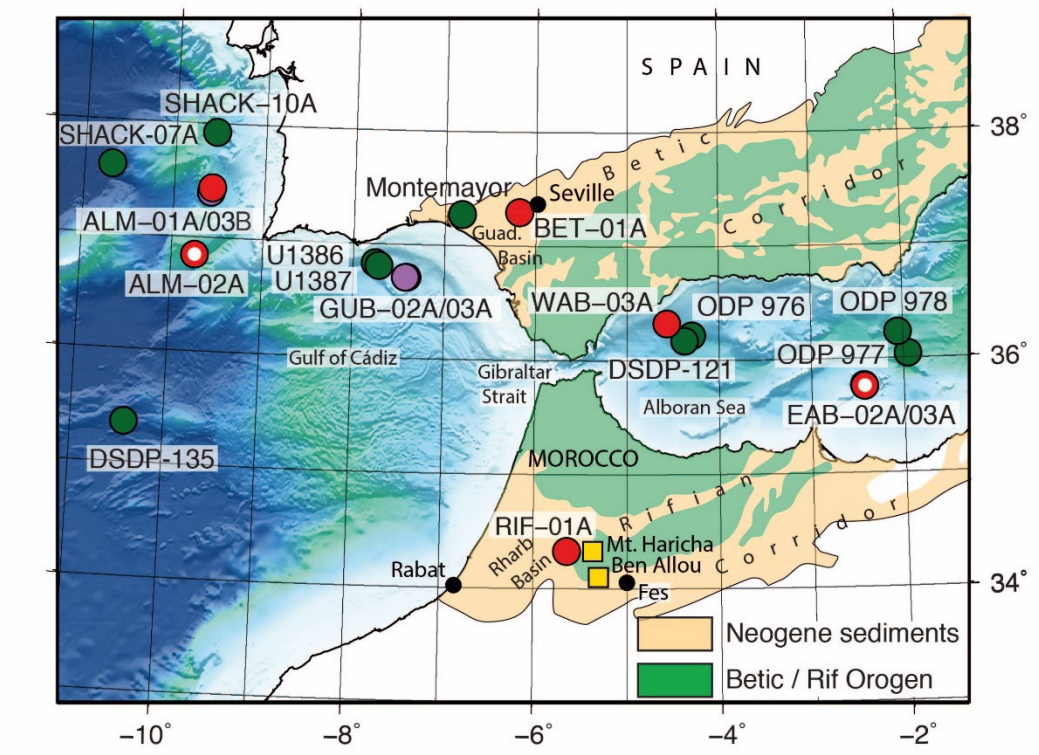

Figure 1. Updated map of the Mediterranean-Atlantic gateway at Gibraltar and the two Miocene connections, the Betic and Rifian corridors that are now exposed on land in Spain and Morocco respectively (brown shading). Filled dots indicate IMMAGE IODP and ICDP primary drilling targets. Dots with white centers are the IODP alternate sites. Purple dots indicate the location of the new primary (GUB-02A) and alternate sites (GUB-03A and ALM-03B) which at this scale sit behind the adjacent primary sites. Yellow squares are the location Miocene contourite exposures in Morocco (Capella et al., 2017). Green dots indicate proposed (SHACK-10A, SHACK-07A IODP Iberian Margin proposal) and existing (U1386, U1387, IODP Expedition 339; Montemayor borehole) holes that recovered or target upper Miocene sediments.

IODP Site Forms

Form 1 – General Site Information

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Section A: Proposal Information

Proposal Title	Investigating Miocene Mediterranean-Atlantic Gateway Exchange (IMMAGE)
Date Form Submitted	2022-04-07 17:38:10
Site-Specific Objectives with Priority (Must include general objectives in proposal)	To recover a thick, shallow Late Miocene succession which contains distal Mediterranean overflow deposits. The main contribution of this site is that it captures the evolution of the equilibrium depth of the plume and hence tests quantitative constraints on the behavior of dense overflows (Objective 3). In addition, the high resolution (precessional) record we will recover at this site is a key component of the complete record of Mediterranean-Atlantic exchange during the Late Miocene-Pliocene (Objectives 1 and 2).
List Previous Drilling in Area	IODP site U1391

Section B: General Site Information

Site Name:	ALM-01A	Area or Location:	Alentejo Margin, Iberian Margin
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 37.4317	Jurisdiction:	Portugal
Longitude:	Deg: -9.5767	Distance to Land: (km)	50
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	1567

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	990	0
Total Sediment Thickness (m)	990	
Total Penetration (m):	990	

General Lithologies:	mud, muddy sands, marls	Sedimentary

Coring Plan: (Specify or check)

Hole A: APC to refusal; XCB to refusal and define casing point; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing

APC ☑ XCB ☑ RCB ☑ Re-entry ☑ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☑	Magnetic Susceptibility	☑	Other tools:
Porosity	☑	Borehole Temperature	☑	
Density	☑	Formation Image (Acoustic)	☑	
Gamma Ray	☑	VSP (walkaway)	☐	
Resistivity	☑	LWD	☐	
Sonic (Δt)	☑			
Formation Image (Res)	☑			
VSP (zero offset)	☑			
Formation Temperature & Pressure	☑			

Other Measurements: PEF, Neutron and Dipmeter

Estimated Days:

Drilling/Coring:	Logging:	Total On-site:
9.4	3.4	12.8

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan

3-4 temperature measurements to establish a geothermal gradient

Potential Hazards/ Weather:

Shallow Gas	☐	Complicated Seabed Condition	☐	Hydrothermal Activity	☐	Preferred weather window: April-September
Hydrocarbon	☑	Soft Seabed	☐	Landslide and Turbidity Current	☐	
Shallow Water Flow	☐	Currents	☐	Gas Hydrate	☐	
Abnormal Pressure	☐	Fracture Zone	☐	Diapir and Mud Volcano	☐	
Man-made Objects (e.g., sea-floor cables, dump sites)	☑	Fault	☐	High Temperature	☐	
H_2S	☐	High Dip Angle	☐	Ice Conditions	☐	
CO_2	☐					

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 895 - Add 2	Site #: ALM-01A	Date Form Submitted: 2022-04-07 17:38:10

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	no	
1b High resolution seismic seismic reflection (crossing)	no	
2a Deep penetration seismic reflection (primary)	yes	Line: PD00522_ALM-1A_W PORTUGAL Position: SHOT POINT 4340
2b Deep penetration seismic reflection (crossing)	yes	Line: PD00610_ALM-1A_W PORTUGAL
3 Seismic Velocity	yes	Velocity conversion information provided: velocity_conversion_IMMAGE_Atlantic.docx
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	no	
7 Swath bathymetry	yes	Regional_bathymetry_Atlantic
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Nav_PD00-610.dat Nav_PD00-522.dat
17 Other		

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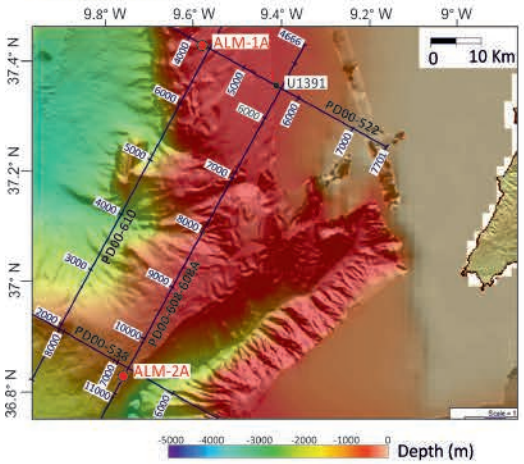
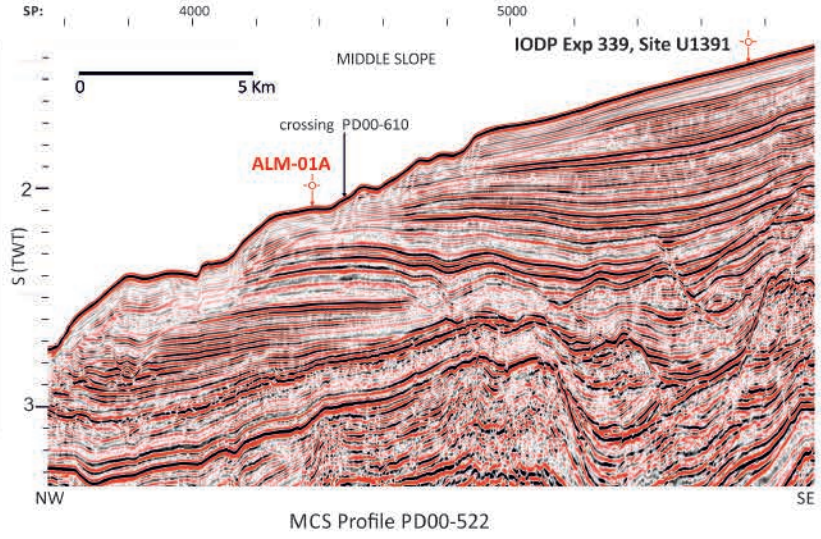
Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to refusal; XCB to refusal and define casing point; log hole A; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing; log below casing in Hole B
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	No significant hydrocarbon occurrences in U1391 at this stratigraphic depth
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	Hydrocarbon occurrences are at deeper stratigraphic levels
4. Indications of gas hydrates at this location	No
5. Are there reasons to expect hydrocarbon accumulations at this site?	Hydrocarbon accumulations are at deeper stratigraphic levels
6. What "special" precautions will be taken during drilling?	None
7. What abandonment procedures need to be followed?	None
8. Natural or manmade hazards which may affect ship's operations	cables - locations checked. Closest one is 1.3 nm distant
9. Summary: What do you consider the major risks in drilling at this site?	None

Proposal #: 895 - Add 2	Site #: ALM-01A	Date Form Submitted: 2022-04-07 17:38:10

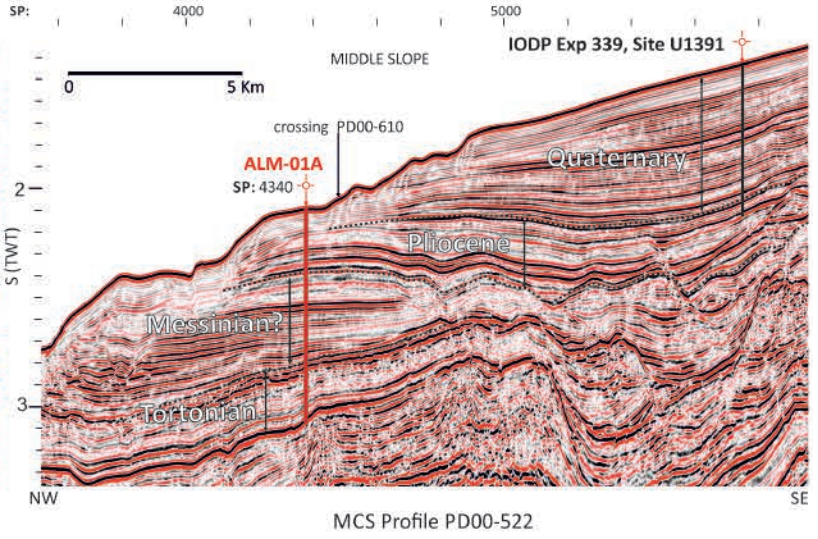
Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
0 - 258	Plio-Quaternary	0-5.33	1.775	Mud, silt and silty sand	Hemipelagic and muddy contourites	48	
258 - 410	Messinian transparent unit	5.33-5.6	1.9	Nannofossil marl	Hemipelagic	562	
410 - 704	Messinian contourites	5.6-7.2	2.1	Nannofossil marls and silty sands	Hemipelagic and silty contourites	183	
704 - 990	Tortonian	7.2-11.6	2.2	Nannofossil marls and silty sands	Hemipelagic, contourites and turbidites	65	

Coordinates: 37.4317; -9.5767
Water depth: 1567 m
Penetration: 990 m

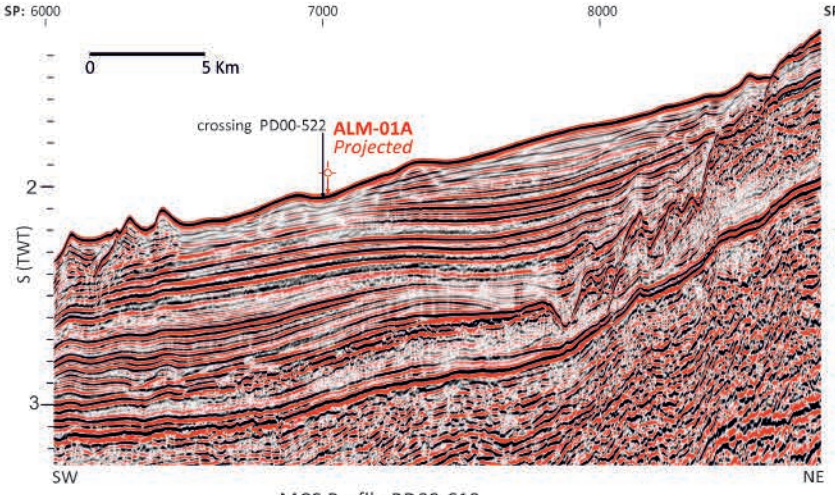




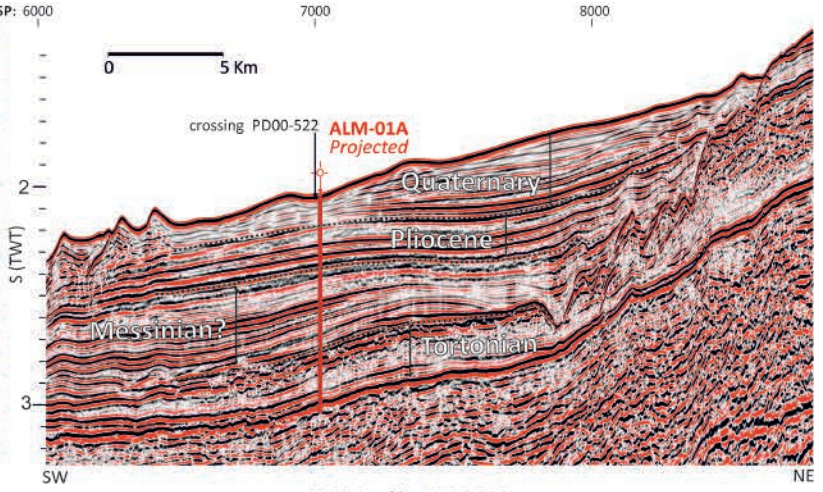
MCS Profile PD00-522



MCS Profile PD00-522



MCS Profile PD00-610



MCS Profile PD00-610

Remarks:
.- Seismic images are time migrated stacks
.- Seismic data in SP order

Data files in SSDB:
.- PD00522_ALM-1A_WPORTUGAL
(Time migrated stacks, TMS)
.- *Crossing profile*:
PD00610_ALM-1A_WPORTUGAL (TMS)

Additional data available:
.- multibeam, wells, velocity information

IODP Site Forms

Form 1 – General Site Information

895 - Add 2

Section A: Proposal Information

Proposal Title	Investigating Miocene Mediterranean-Atlantic Gateway Exchange (IMMAGE)
Date Form Submitted	2022-04-07 17:38:10
Site-Specific Objectives with Priority (Must include general objectives in proposal)	To recover a thick, shallow Late Miocene succession which contains distal Mediterranean overflow deposits. The main contribution of this site is that it captures the evolution of the equilibrium depth of the plume and hence tests quantitative constraints on the behavior of dense overflows (Objective 3). In addition, the high resolution (precessional) record we will recover at this site is a key component of the complete record of Mediterranean-Atlantic exchange during the Late Miocene-Pliocene (Objectives 1 and 2).
List Previous Drilling in Area	IODP site U1391

Section B: General Site Information

Site Name:	ALM-02A	Area or Location:	Alentejo Margin, Iberian Margin
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 36.8359	Jurisdiction:	Portugal
Longitude:	Deg: -9.7481	Distance to Land: (km)	70
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	2265

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	1630	10
Total Sediment Thickness (m)	1640	
Total Penetration (m):	1640	

General Lithologies:	mud, muddy sands, marls	sedimentary

Coring Plan: (Specify or check)

Hole A: APC to refusal; XCB to refusal and define casing point; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing

APC ☑ XCB ☑ RCB ☑ Re-entry ☑ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☑	Magnetic Susceptibility	☑	Other tools:
Porosity	☑	Borehole Temperature	☑	
Density	☑	Formation Image (Acoustic)	☑	
Gamma Ray	☑	VSP (walkaway)	☐	
Resistivity	☑	LWD	☐	
Sonic (Δt)	☑			
Formation Image (Res)	☑			
VSP (zero offset)	☑			
Formation Temperature & Pressure	☑			

Other Measurements: PEF, Neutron and Dipmeter

Estimated Days:

Drilling/Coring:	Logging:	Total On-site:
18.5	3.6	22.1

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan

3-4 temperature measurements to establish a geothermal gradient

Potential Hazards/ Weather:

Shallow Gas	☐	Complicated Seabed Condition	☐	Hydrothermal Activity	☐	Preferred weather window	
Hydrocarbon	☑	Soft Seabed	☐	Landslide and Turbidity Current	☐	April - September	
Shallow Water Flow	☐	Currents	☐	Gas Hydrate	☐		
Abnormal Pressure	☐	Fracture Zone	☐	Diapir and Mud Volcano	☐		
Man-made Objects (e.g., sea-floor cables, dump sites)	☑	Fault	☐	High Temperature	☐		
H_2S	☐	High Dip Angle	☐	Ice Conditions	☐		
CO_2	☐						

Sensitive marine habitat (e.g., reefs, vents)

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 895 - Add 2	Site #: ALM-02A	Date Form Submitted: 2022-04-07 17:38:10

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	no	
1b High resolution seismic seismic reflection (crossing)	no	
2a Deep penetration seismic reflection (primary)	yes	Line: PD00608-608A_ALM-1B_W PORTUGAL Position: SP 10685
2b Deep penetration seismic reflection (crossing)		Line: PD00538_ALM-2A_WPORTUGAL
3 Seismic Velocity	yes	Velocity conversion information provided: velocity_conversion_IMMAGE_Atlantic.docx
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	no	
7 Swath bathymetry	yes	Region_bathymetry_Atlantic
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores		
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	Nav_PD00538_ALM-02A.dat Nav_PD00608_608A_ALM-02A.dat
17 Other	no	

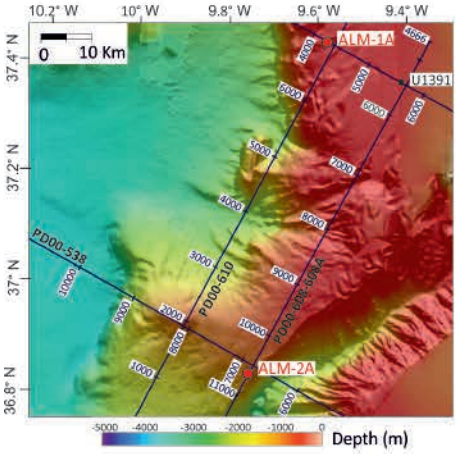
Proposal #: 895 - Add 2	Site #: ALM-02A	Date Form Submitted: 2022-04-07 17:38:10

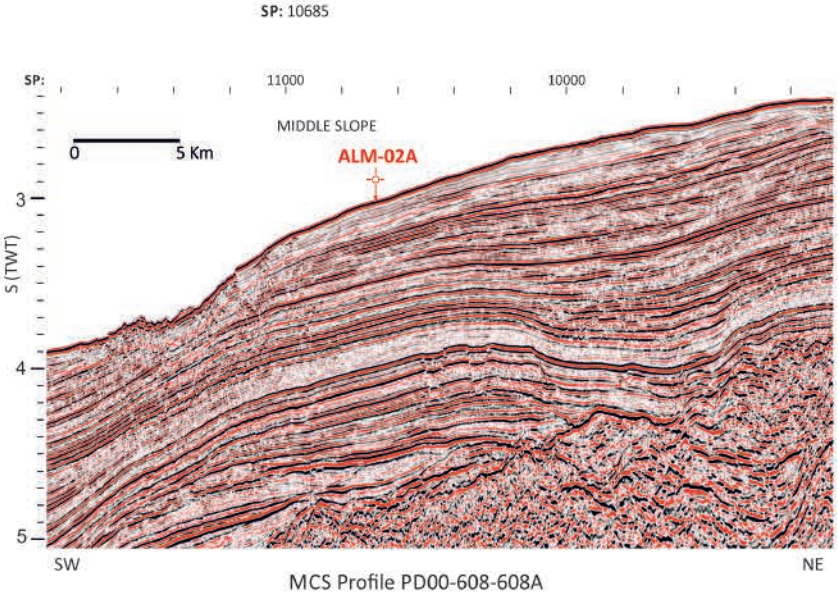
Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to refusal; XCB to refusal and define casing point; log hole A; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing; log below casing in Hole B
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	No significant hydrocarbon occurrences in U1391 at this stratigraphic depth
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	Hydrocarbon occurrences are at deeper stratigraphic levels
4. Indications of gas hydrates at this location	No
5. Are there reasons to expect hydrocarbon accumulations at this site?	Hydrocarbon accumulations are at deeper stratigraphic levels
6. What "special" precautions will be taken during drilling?	None
7. What abandonment procedures need to be followed?	None
8. Natural or manmade hazards which may affect ship's operations	cables - locations checked. Nearest cable is 7.5 nm distant. There is also a traffic control navigation channel 2.7 nm distant
9. Summary: What do you consider the major risks in drilling at this site?	None

Proposal #: 895 - Add 2	Site #: ALM-02A	Date Form Submitted: 2022-04-07 17:38:10

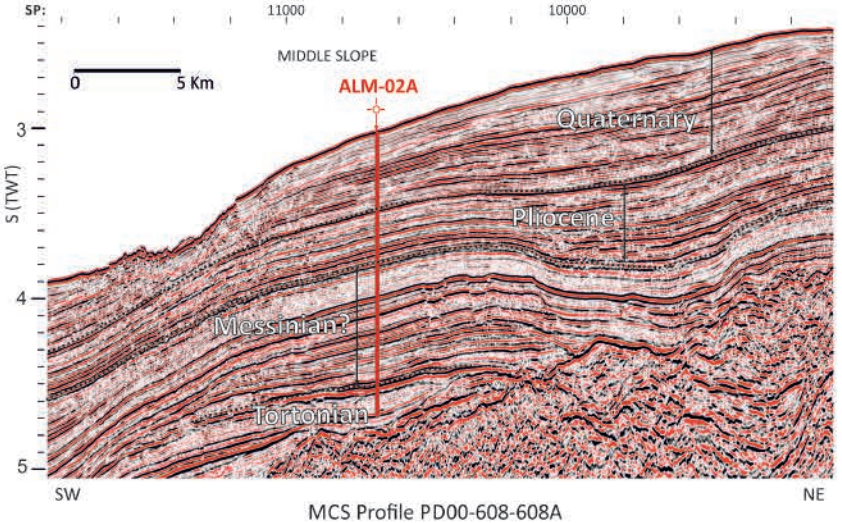
Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
0 - 693	Plio-Quaternary	0-5.33	1.775	Mud, silt and silty sand	Hemipelagic and muddy contourites	130	
693 - 874	Messinian transparent unit	5.33-5.6	1.9	Nannofossil marl	Hemipelagic	670	
874 - 1209	Messinian contourites	5.6-7.2	2.1	Nannofossil marls and silty sands	Hemipelagic and silty contourites	334	
1209 - 1629	Tortonian	7.2-11.6	2.2	Nannofossil marls and silty sands	Hemipelagic, contourites and turbidites	50	

Coordinates: 36.8358; -9.7480
Water depth: 2265 m
Penetration: 1629 m

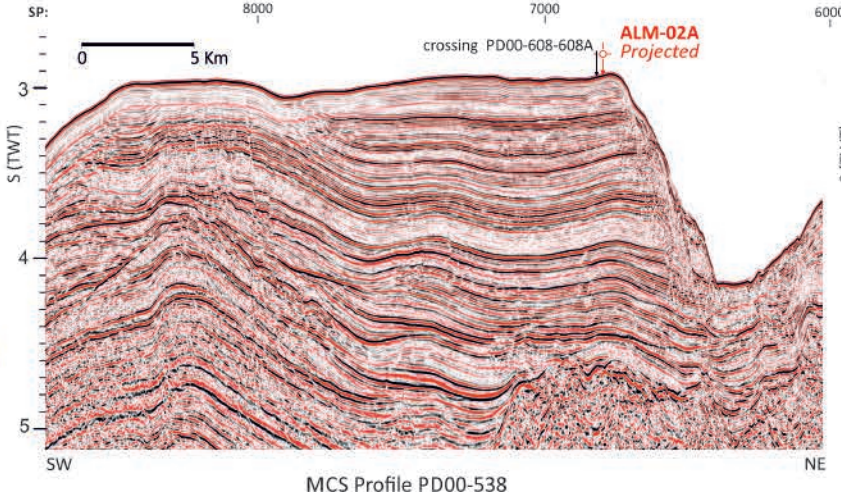




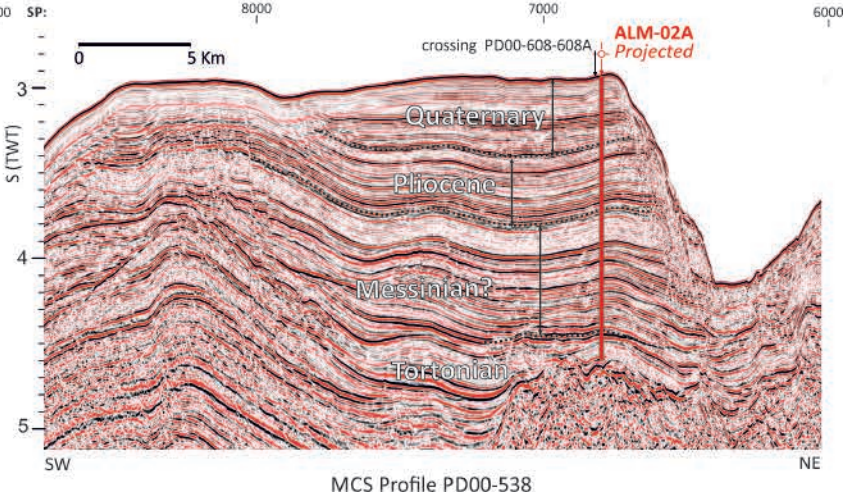
MCS Profile PD00-608-608A



MCS Profile PD00-608-608A



MCS Profile PD00-538



MCS Profile PD00-538

Remarks:
.- Seismic images are time migrated stacks
.- Seismic data in SP order

Data files in SSDB:
.- PD00608_608A_ALM-2A_WPORTUGAL
(Time migrated stacks, TMS)
.- *Crossing profile*:
PD00538_ALM-2A_WPORTUGAL (TMS)

Additional data available:
.- multibeam, wells, velocity information

IODP Site Forms

Form 1 – General Site Information

895 - Add 2

Section A: Proposal Information

Proposal Title	Investigating Miocene Mediterranean-Atlantic Gateway Exchange (IMMAGE)
Date Form Submitted	2022-04-07 17:38:10
Site-Specific Objectives with Priority (Must include general objectives in proposal)	To recover a thick, shallow Late Miocene succession which contains distal Mediterranean overflow deposits. The main contribution of this site is that it captures the evolution of the equilibrium depth of the plume and hence tests quantitative constraints on the behavior of dense overflows (Objective 3). In addition, the high resolution (precessional) record we will recover at this site is a key component of the complete record of Mediterranean-Atlantic exchange during the Late Miocene-Pliocene (Objectives 1 and 2).
List Previous Drilling in Area	IODP site U1391

Section B: General Site Information

Site Name:	ALM-03B	Area or Location:	Alentejo Margin, Iberian Margin
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 37.37711	Jurisdiction:	Portugal
Longitude:	Deg: -9.59853	Distance to Land: (km)	64
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	1634

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	930	0
Total Sediment Thickness (m)	930	
Total Penetration (m):	930	

General Lithologies:	mud, muddy sands, sands	sediment

Coring Plan: (Specify or check)

Hole A: APC to refusal; XCB to refusal and define casing point; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing

APC ☑ XCB ☑ RCB ☑ Re-entry ☑ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☑	Magnetic Susceptibility	☑	Other tools:
Porosity	☑	Borehole Temperature	☑	
Density	☑	Formation Image (Acoustic)	☑	
Gamma Ray	☑	VSP (walkaway)	☐	
Resistivity	☑	LWD	☐	
Sonic (Δt)	☑			
Formation Image (Res)	☑			
VSP (zero offset)	☑			
Formation Temperature & Pressure	☑			

Other Measurements: PEF, Neutron and Dipmeter

Estimated Days:

Drilling/Coring:	Logging:	Total On-site:
11.3	2.8	14.1

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas	☐	Complicated Seabed Condition	☐	Hydrothermal Activity	☐	Preferred weather window	
Hydrocarbon	☑	Soft Seabed	☐	Landslide and Turbidity Current	☐	April-September	
Shallow Water Flow	☐	Currents	☐	Gas Hydrate	☐		
Abnormal Pressure	☐	Fracture Zone	☐	Diapir and Mud Volcano	☐		
Man-made Objects (e.g., sea-floor cables, dump sites)	☑	Fault	☐	High Temperature	☐		
H_2S	☐	High Dip Angle	☐	Ice Conditions	☐		
CO_2	☐						

Sensitive marine habitat (e.g., reefs, vents)

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 895 - Add 2	Site #: ALM-03B	Date Form Submitted: 2022-04-07 17:38:10

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	no	
1b High resolution seismic seismic reflection (crossing)	no	
2a Deep penetration seismic reflection (primary)	yes	Line: WPortugal_IL1740_ALM03B.sgy Position: CDP CDP1740
2b Deep penetration seismic reflection (crossing)	yes	Line: WPortugal_XL5210_ALM03A.sgy Position: CDP CDP5210
3 Seismic Velocity	yes	Velocity conversion information provided: Velocity data for post-EPSP sties.docx
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	no	
7 Swath bathymetry	yes	Regional_bathymetry_Atlantic
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	WPortugal_LI1740_ALM03B_nav.dat WPortugal_XL5210_ALM03A_nav.dat
17 Other	no	

Proposal #: 895 - Add 2	Site #: ALM-03B	Date Form Submitted: 2022-04-07 17:38:10

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to refusal; XCB to refusal and define casing point; log hole A; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing; log below casing in Hole B
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	No significant hydrocarbon occurrences in U1391 at this stratigraphic depth
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	Hydrocarbon occurrences are at deeper stratigraphic levels
4. Indications of gas hydrates at this location	No
5. Are there reasons to expect hydrocarbon accumulations at this site?	Hydrocarbon occurrences are at deeper stratigraphic levels
6. What "special" precautions will be taken during drilling?	None
7. What abandonment procedures need to be followed?	None
8. Natural or manmade hazards which may affect ship's operations	this site is further from the cable than ALM-01A (e.g. >1.3 nm)
9. Summary: What do you consider the major risks in drilling at this site?	None

Proposal #: 895 - Add 2	Site #: ALM-03B	Date Form Submitted: 2022-04-07 17:38:10

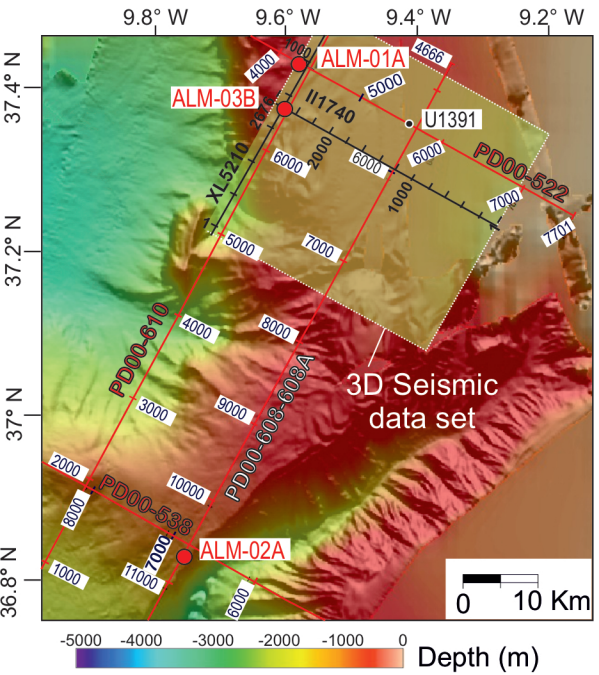
Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
0 - 328	Plio-Quaternary	0-5.33	1.775	Mud, silt and silty sand	Hemipelagic and muddy contourites	62	
328 - 414	Messinian Transparent Unit	5.33-6.4	1.9	Nannofossil marl	Hemipelagic	80	
414 - 593	Messinian contourites	6.4-7.2	2.1	Nannofossil marls and silty sands	Hemipelagic and silty contourites	223	
593 - 703	Upper Tortonian down to intraTortonian Unconformity	7.2-8	2.2	Nannofossil marls and silty sands	Hemipelagic and silty contourites	138	
703 - 930	Tortonian below Intra Tortonian Unconformity	8-11	2.2	Nannofossil marls and silty sands?	Hemipelagic and silty contourites	75	

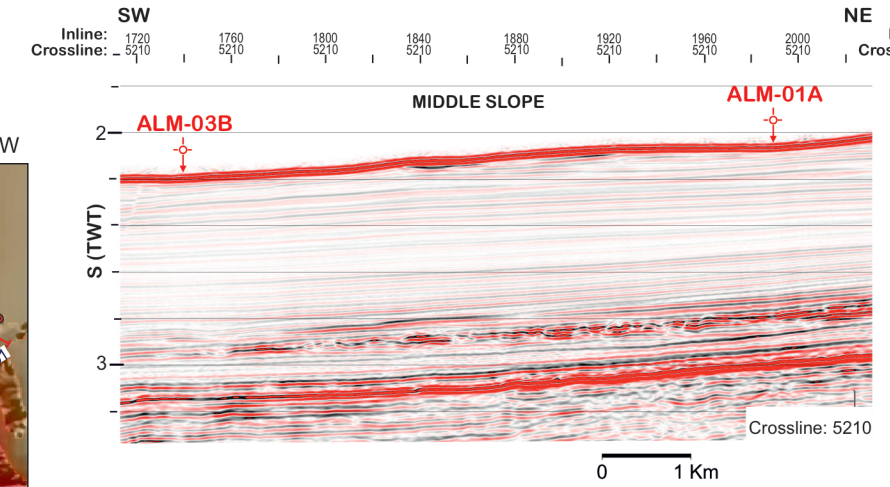
IODP proposal 895-Full

Site Summary Form 6

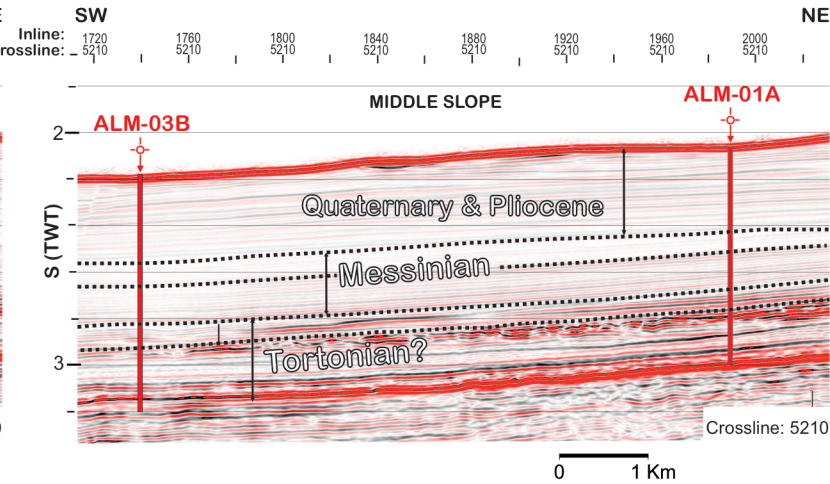
Site ALM-03B

Coordinates: 37.37711 / -9.59853
Water depth: 1634 m
Penetration: 930 m

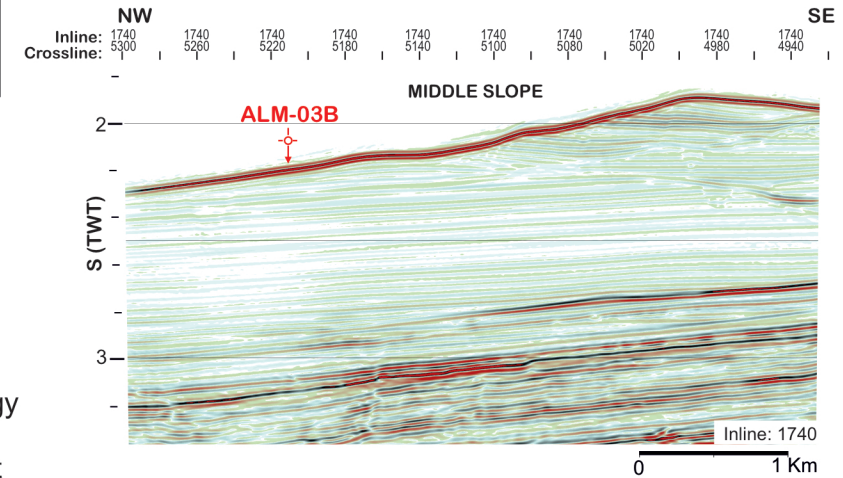




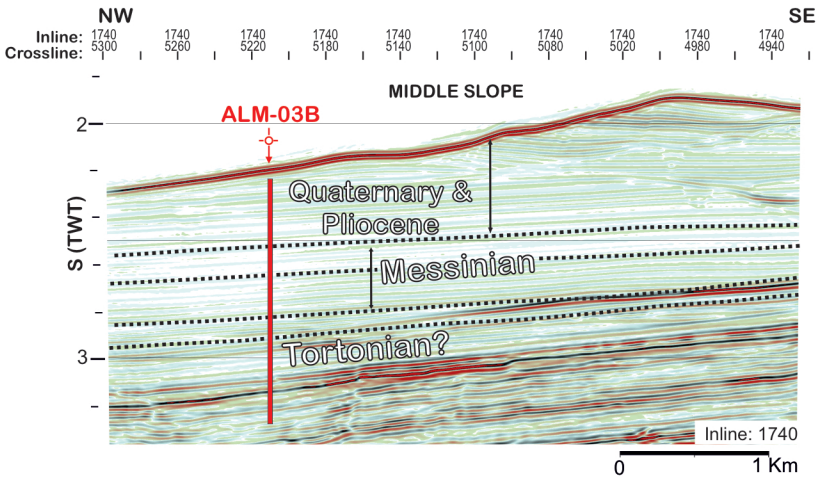
WPortugal_IL1740_ALM03B



WPortugal_IL1740_ALM03B



WPortugal_XL5210_ALM03B



WPortugal_XL5210_ALM03B

Remarks:
.- 3D seismic data are time migrated stacks

Data files in SSDB
.- *Inline:* WPortugal_IL1740_ALM03B.sgy
.- *Crossline:* WPortugal_XL5210_ALM03B.sgy

.- *Inline:* WPortugal_IL1740_ALM03B_nav.txt
.- *Crossline:* WPortugal_XL5210_ALM03B_nav.txt

Additional data available:
.- *multibeam, wells, velocity information*

IODP Site Forms

Form 1 – General Site Information

895 - Add 2

Section A: Proposal Information

Proposal Title	Investigating Miocene Mediterranean-Atlantic Gateway Exchange (IMMAGE)
Date Form Submitted	2022-04-07 17:38:10
Site-Specific Objectives with Priority (Must include general objectives in proposal)	This site targets a complete late Miocene succession in the pathway of Mediterranean overflow. The aim is to obtain a high-resolution (precessional) record of Miocene Mediterranean overflow at an intermediate site between the onshore records (RIF-01A and BET-01A) and the distal record (ALM-01A). This record makes a critical contribution to all three objectives
List Previous Drilling in Area	IODP U1386, U1387, U1388, U1389, U1390

Section B: General Site Information

Site Name:	GUB-02A	Area or Location:	Algarve Basin, Gulf of Cadiz
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Spain
Latitude:	Deg: 36.699683	Distance to Land: (km)	48
Longitude:	Deg: -7.431424		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	547

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	1464	0
Total Sediment Thickness (m)	1464	
Total Penetration (m):	1464	

General Lithologies:	muds, muddy sands, marls, sands, turbidites	Sedimentary

Coring Plan: (Specify or check)

Hole A: APC to refusal; XCB to refusal and define casing point; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing

APC ☑ XCB ☑ RCB ☑ Re-entry ☑ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☑	Magnetic Susceptibility	☑	Other tools:
Porosity	☑	Borehole Temperature	☑	
Density	☑	Formation Image (Acoustic)	☑	
Gamma Ray	☑	VSP (walkaway)	☐	
Resistivity	☑	LWD	☐	
Sonic (Δt)	☑			
Formation Image (Res)	☑			
VSP (zero offset)	☑			
Formation Temperature & Pressure	☑			

Other Measurements: PEF, Neutron and Dipmeter

Estimated Days:

Drilling/Coring:	Logging:	Total On-site:
12.8	3.1	15.9

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas	☐	Complicated Seabed Condition	☐	Hydrothermal Activity	☐	Preferred weather window: April - September
Hydrocarbon	☑	Soft Seabed	☐	Landslide and Turbidity Current	☐	
Shallow Water Flow	☐	Currents	☐	Gas Hydrate	☐	
Abnormal Pressure	☐	Fracture Zone	☐	Diapir and Mud Volcano	☐	
Man-made Objects (e.g., sea-floor cables, dump sites)	☑	Fault	☐	High Temperature	☐	
H_2S	☐	High Dip Angle	☐	Ice Conditions	☐	
CO_2	☐					

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 895 - Add 2	Site #: GUB-02A	Date Form Submitted: 2022-04-07 17:38:10

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)		
1b High resolution seismic seismic reflection (crossing)		
2a Deep penetration seismic reflection (primary)	yes	Line: GulfofCadiz_IL3170_GUB02A.sgy Position: CDP CDP939
2b Deep penetration seismic reflection (crossing)	yes	Line: GulfofCadiz_XL2125_GUB02A.sgy Position: CDP CDP2189
3 Seismic Velocity	yes	Velocity conversion information provided: Velocity data for post-EPSP sties.docx
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	no	
7 Swath bathymetry	yes	Region_bathymetry_Atlantic
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	
13 Rock sampling	no	
14a Water current data		
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation		GulfofCadiz_IL3170_GUB02A_nav GulfofCadiz_XL2125_GUB02A_nav
17 Other	no	

Proposal #: 895 - Add 2	Site #: GUB-02A	Date Form Submitted: 2022-04-07 17:38:10

Pollution & Safety Hazard	Comment
1. Summary of operations at site	XCB to refusal and define casing point; log hole A if casing point is below Mio-Pliocene boundary; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing; log below casing in Hole B
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	No significant hydrocarbons in U1386 and U1387, but these sites do not penetrate as deeply as the proposed penetration depth here
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	Laterally and at deeper stratigraphic levels. We selected this site with the help of Repsol to avoid areas with hydrocarbon
4. Indications of gas hydrates at this location	Not on this site
5. Are there reasons to expect hydrocarbon accumulations at this site?	Laterally and at deeper stratigraphic levels
6. What "special" precautions will be taken during drilling?	None
7. What abandonment procedures need to be followed?	None
8. Natural or manmade hazards which may affect ship's operations	Cable locations need checking. Submarine exercises take place in this region - it would be necessary to inform authorities well in advance that JR is going to drill in this area
9. Summary: What do you consider the major risks in drilling at this site?	None

Proposal #: 895 - Add 2	Site #: GUB-02A	Date Form Submitted: 2022-04-07 17:38:10

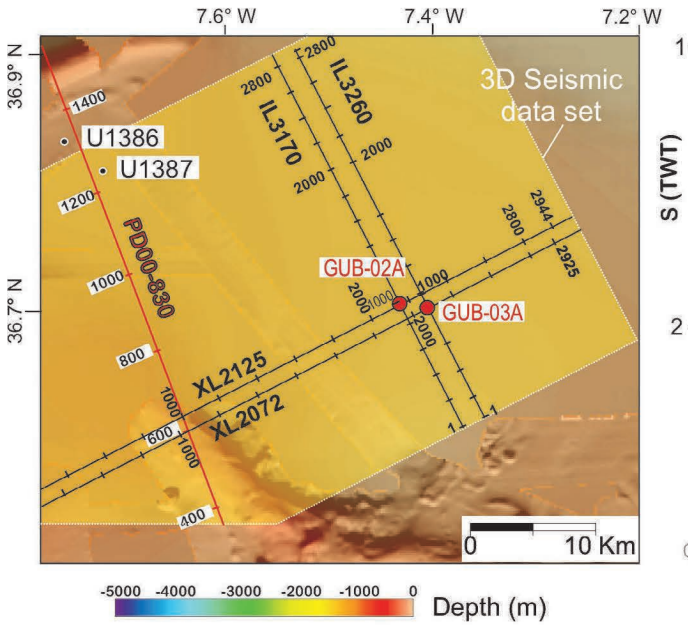
Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
0 - 754	Plio-Quaternary	0-5.33	1.775	muds and silty sands	Hemipelagic and contourites	141	
754 - 840	Messinian Transparent Unit	5.33-6.4	1.9	Nannofossil Marl	Hemipelagic	80	
840 - 920	Lower Messinian	6.4-7.2	2.1	sands, silty sands, muds	Hemipelagic, contourites and turbidites	327	

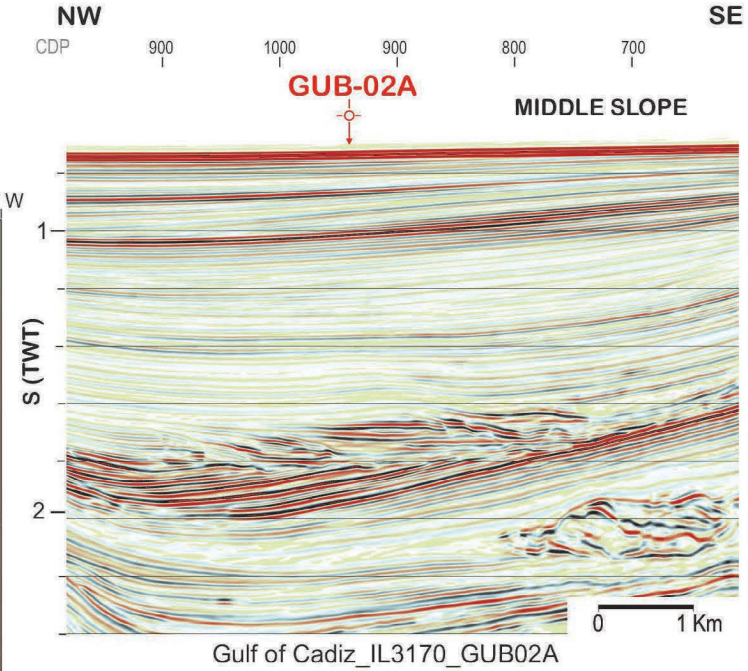
IODP proposal 895-Full

Site Summary Form 6

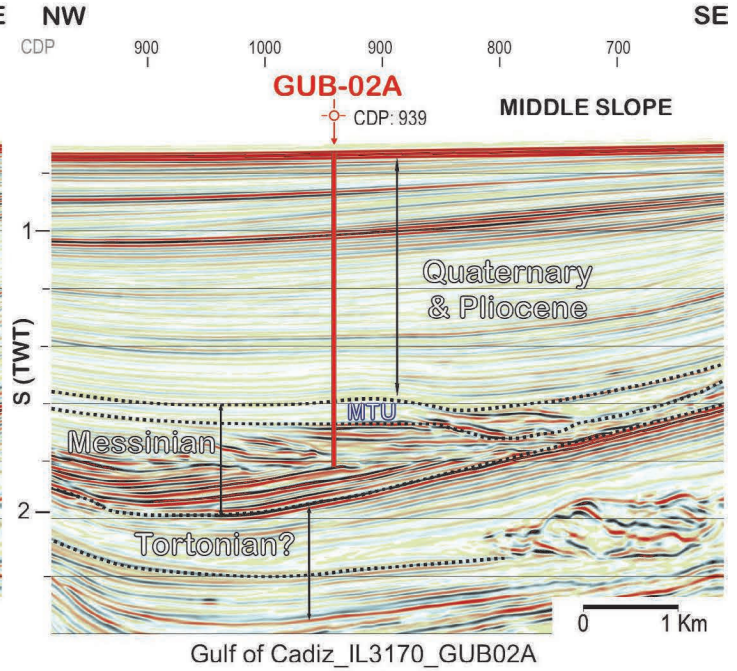
Site GUB-02A

Coordinates: 36.699683; -7.431424
Water depth: 547 m
Penetration: 920 m



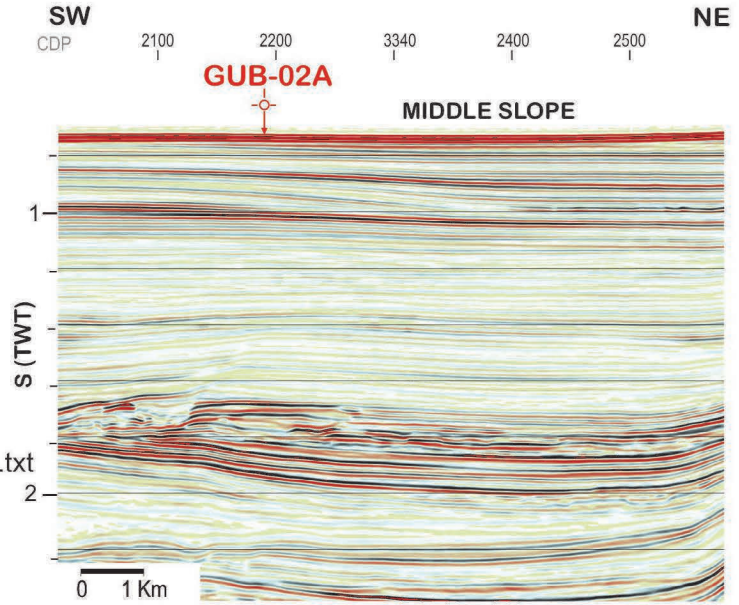


Gulf of Cadiz_IL3170_GUB02A

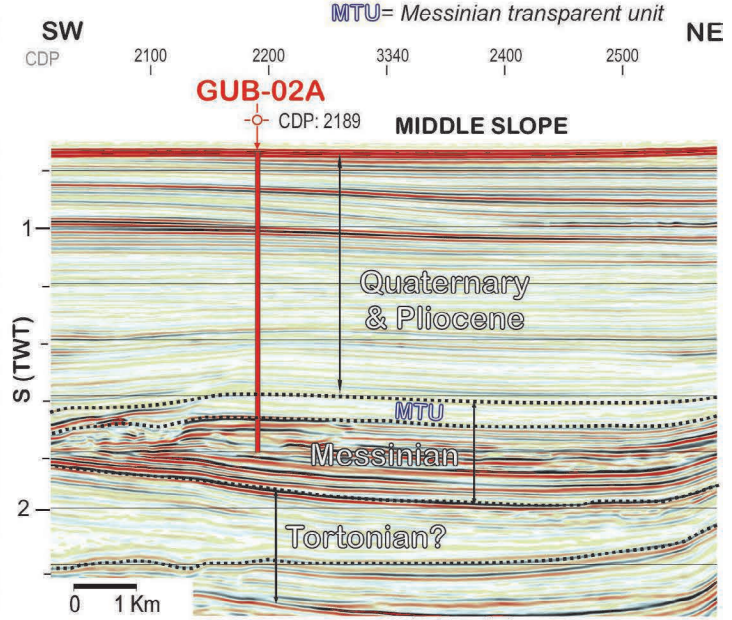


Gulf of Cadiz_IL3170_GUB02A

MTU= *Messinian transparent unit*



Gulf of Cadiz_XL2125_GUB02A



Gulf of Cadiz_XL2125_GUB02A

Remarks:
.- 3D seismic data are time migrated stacks

Data files in SSDB:
.- *Inline:* GulfofCadiz_IL3170_GUB02A.sgy
.- *Crossline:* GulfofCadiz_XL2125_GUB02A.sgy

.- *Inline:* GulfofCadiz_IL3170_GUB02A_nav.txt
.- *Crossline:* GulfofCadiz_XL2125_GUB02A_nav.txt

Additional data available:
.- multibeam, wells, velocity information

IODP Site Forms

Form 1 – General Site Information

895 - Add 2

Section A: Proposal Information

Proposal Title	Investigating Miocene Mediterranean-Atlantic Gateway Exchange (IMMAGE)
Date Form Submitted	2022-04-07 17:38:10
Site-Specific Objectives with Priority (Must include general objectives in proposal)	This site targets a complete late Miocene succession in the pathway of Mediterranean overflow. The aim is to obtain a high-resolution (precessional) record of Miocene Mediterranean overflow at an intermediate site between the onshore records (RIF-01A and BET-01A) and the distal record (ALM-01A). This record makes a critical contribution to all three objectives
List Previous Drilling in Area	IODP U1386, U1387, U1388, U1389, U1390

Section B: General Site Information

Site Name:	GUB-03A	Area or Location:	Algarve Basin, Gulf of Cadiz
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Spain
Latitude:	Deg: 36.700975	Distance to Land: (km)	48
Longitude:	Deg: -7.411174		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ✓	Water Depth (m):	540

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	1650	0
Total Sediment Thickness (m)	1650	
Total Penetration (m):	1650	

General Lithologies:	muds, muddy sands, marls, sands, turbidites	Sedimentary

Coring Plan: (Specify or check)

Hole A: APC to refusal; XCB to refusal and define casing point; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing

APC ☑ XCB ☑ RCB ☑ Re-entry ☑ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☑	Magnetic Susceptibility	☑	Other tools:
Porosity	☑	Borehole Temperature	☑	
Density	☑	Formation Image (Acoustic)	☐	
Gamma Ray	☑	VSP (walkaway)	☐	
Resistivity	☑	LWD	☐	
Sonic (Δt)	☑			
Formation Image (Res)	☑			
VSP (zero offset)	☑			
Formation Temperature & Pressure	☐			

Other Measurements: PEF, Neutron and Dipmeter

Estimated Days:

Drilling/Coring:	Logging:	Total On-site:
12.3	3.9	16.2

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

Potential Hazards/ Weather:

Shallow Gas	☐	Complicated Seabed Condition	☐	Hydrothermal Activity	☐	Preferred weather window	
Hydrocarbon	☑	Soft Seabed	☐	Landslide and Turbidity Current	☐	April - September	
Shallow Water Flow	☐	Currents	☐	Gas Hydrate	☐		
Abnormal Pressure	☐	Fracture Zone	☐	Diapir and Mud Volcano	☐		
Man-made Objects (e.g., sea-floor cables, dump sites)	☑	Fault	☐	High Temperature	☐		
H_2S	☐	High Dip Angle	☐	Ice Conditions	☐		
CO_2	☐						

Sensitive marine habitat (e.g., reefs, vents)

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 895 - Add 2	Site #: GUB-03A	Date Form Submitted: 2022-04-07 17:38:10

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	no	
1b High resolution seismic seismic reflection (crossing)	no	
2a Deep penetration seismic reflection (primary)	yes	Line: GulfofCadiz_IL3260_GUB03A.sgy Position: CDP CDP888
2b Deep penetration seismic reflection (crossing)	yes	Line: GulfofCadiz_XL2072_GUB03A.sgy Position: CDP CDP2279
3 Seismic Velocity	yes	Velocity conversion information provided: Velocity data for post-EPSP sties.docx
4 Seismic Grid	no	
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	no	
7 Swath bathymetry	yes	Region_bathymetry_Atlantic
8a Side looking sonar (surface)		
8b Side looking sonar (bottom)		
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	yes	GulfofCadiz_IL3260_GUB03A_nav GulfofCadiz_XL2072_GUB03A_nav
17 Other	no	

Proposal #: 895 - Add 2	Site #: GUB-03A	Date Form Submitted: 2022-04-07 17:38:10

Pollution & Safety Hazard	Comment
1. Summary of operations at site	XCB to refusal and define casing point; log hole A if casing point is below Mio-Pliocene boundary; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing; log below casing in Hole B
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	No significant hydrocarbons in U1386 and U1387, but these sites do not penetrate as deeply as the proposed penetration depth here
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	Laterally and at deeper stratigraphic levels. We selected this site with the help of Repsol to avoid areas with hydrocarbon
4. Indications of gas hydrates at this location	Not on this site
5. Are there reasons to expect hydrocarbon accumulations at this site?	Laterally and at deeper stratigraphic levels
6. What "special" precautions will be taken during drilling?	None
7. What abandonment procedures need to be followed?	None
8. Natural or manmade hazards which may affect ship's operations	Cable locations need checking. Submarine exercises take place in this region - it would be necessary to inform authorities well in advance that JR is going to drill in this area
9. Summary: What do you consider the major risks in drilling at this site?	None

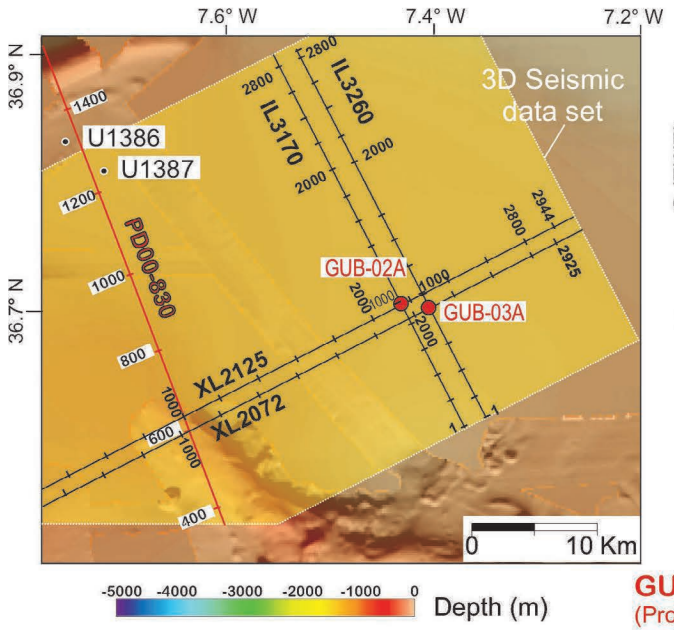
Proposal #: 895 - Add 2	Site #: GUB-03A	Date Form Submitted: 2022-04-07 17:38:10

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
0 - 736	Plio-Quaternary	0-5.33	1.775	muds, silts and silty sands	Hemipeligic and contourites	138	
736 - 869	Messinian Transparent Unit	5.33-6.4	1.9	Nannofossil Marl	Hemipelagic	124	
869 - 930	Lower Messinian	6.4-7.2	2.1	Sands, silty sands, muds	Hemipelagic, contourites and turbidites	433	

IODP proposal 895-Full

Site Summary Form 6

Coordinates: 36.700975; -7.41174
Water depth: 540 m
Penetration: 930 m



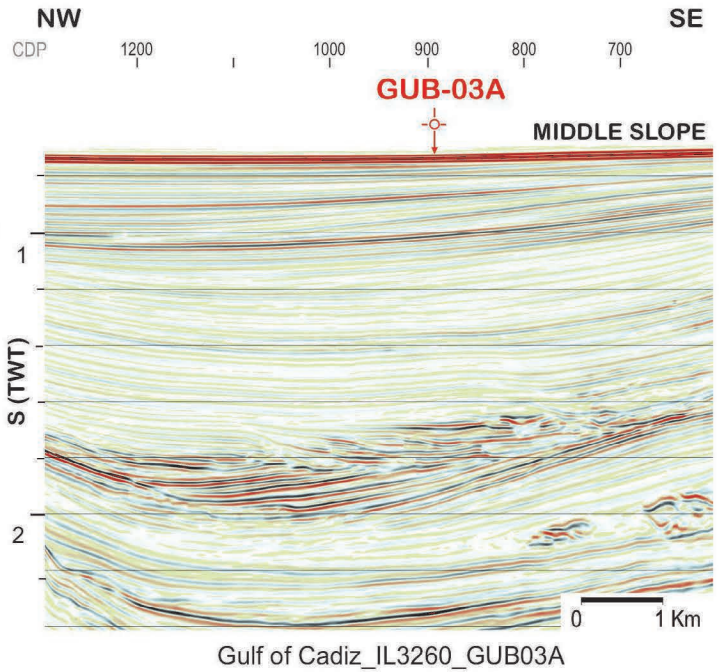
Remarks:
.- 3D seismic data are time migrated stacks

Data files in SSDB:
.- *Inline:* GulfofCadiz_IL3260_GUB03A.sgy
.- *Crossline:* GulfofCadiz_XL2072_GUB03A.sgy

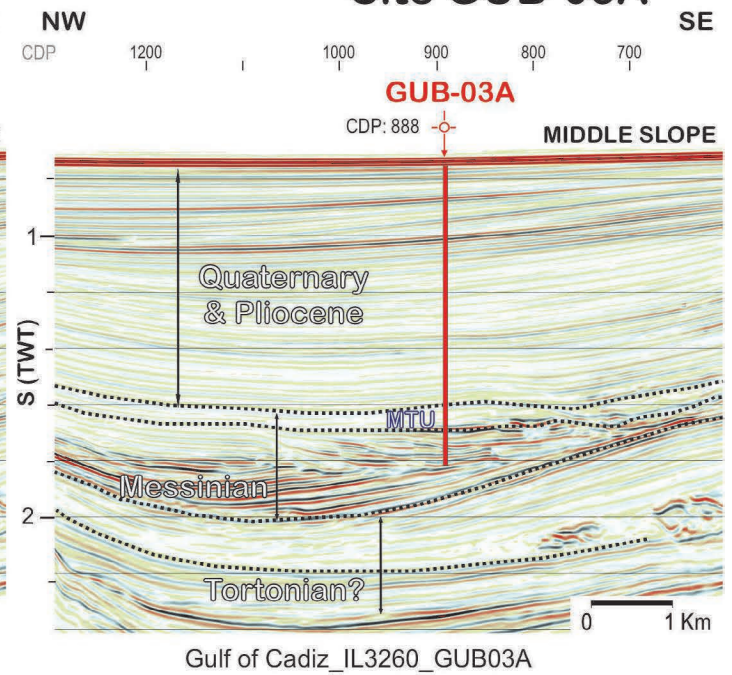
.- *Inline:* GulfofCadiz_IL3260_GUB03A_nav.txt
.- *Crossline:* GulfofCadiz_XL2072_GUB03A_nav.txt

Additional data available:
.- multibeam, wells, velocity information

Site GUB-03A

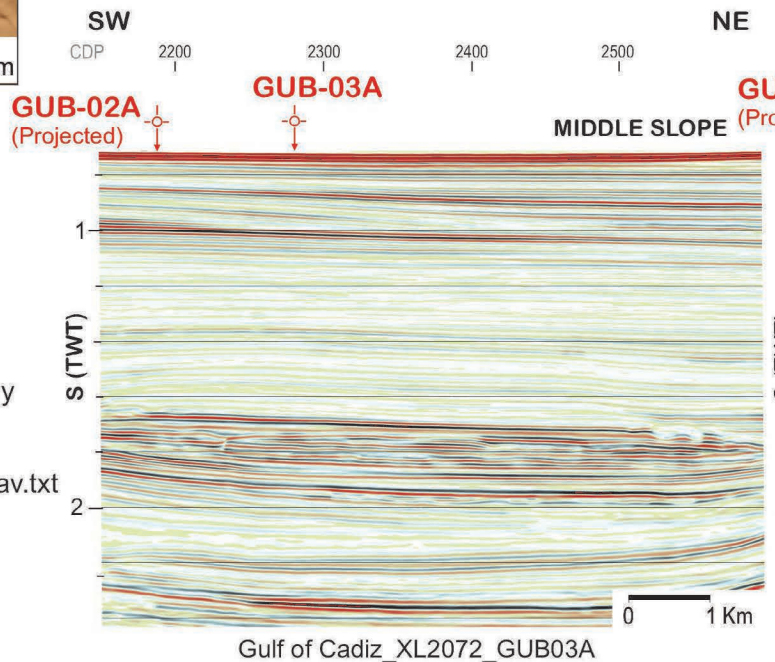


Gulf of Cadiz_IL3260_GUB03A

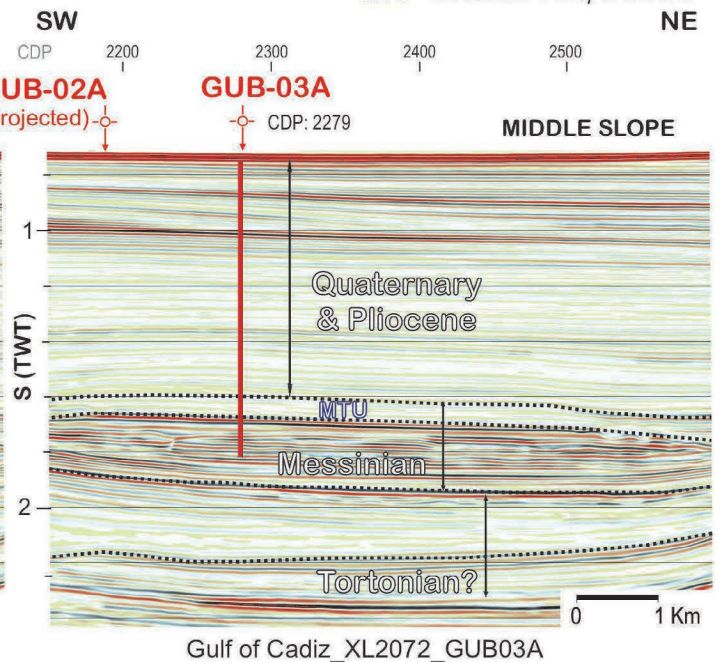


Gulf of Cadiz_IL3260_GUB03A

MTU= *Messinian transparent unit*



Gulf of Cadiz_XL2072_GUB03A



Gulf of Cadiz_XL2072_GUB03A

IODP Site Forms

Form 1 – General Site Information

895 - Add 2

Section A: Proposal Information

Proposal Title	Investigating Miocene Mediterranean-Atlantic Gateway Exchange (IMMAGE)
Date Form Submitted	2022-04-07 17:38:10
Site-Specific Objectives with Priority (Must include general objectives in proposal)	This site targets one of the few thick late Messinian sedimentary successions in the Alboran Basin. The record recovered from this location will provide key constraints on the chemistry and physical properties of Mediterranean overflow during the Late Miocene. This is critical for all three objectives.
List Previous Drilling in Area	DSDP121, ODP 976

Section B: General Site Information

Site Name:	WAB-03A	Area or Location:	Western Alboran Basin
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 36.312544	Jurisdiction:	Spain
Longitude:	Deg: -4.571213	Distance to Land: (km)	22
Coordinate System:	WGS 84		
Priority of Site:	Primary: ✓ Alternate: ☐	Water Depth (m):	800

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	1700	0
Total Sediment Thickness (m)	1700	
Total Penetration (m):	1700	

General Lithologies: Conglomerates, sandstones, marls, shales, volcanoclastics, clays, minor anhydrite/gypsum

Coring Plan: (Specify or check): Hole A: APC to refusal; XCB to refusal and define casing point; offset to Hole B: drilling and case off upper part of the

APC ☑ XCB ☑ RCB ☑ Re-entry ☑ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☑	Magnetic Susceptibility	☑	Other tools:
Porosity	☑	Borehole Temperature	☑	
Density	☑	Formation Image (Acoustic)	☑	
Gamma Ray	☑	VSP (walkaway)	☐	
Resistivity	☑	LWD	☐	
Sonic (Δt)	☑			
Formation Image (Res)	☑			
VSP (zero offset)	☑			
Formation Temperature & Pressure	☑			

Other Measurements: PEF, Neutron and Dipmeter

Estimated Days: Drilling/Coring: 9.4 | Logging: 3.4 | Total On-site: 12.8

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

3-4 temperature measurements to establish a geothermal gradient

Potential Hazards/ Weather:

Shallow Gas	☐	Complicated Seabed Condition	☐	Hydrothermal Activity	☐	Preferred weather window: April - September
Hydrocarbon	☐	Soft Seabed	☐	Landslide and Turbidity Current	☐	
Shallow Water Flow	☐	Currents	☐	Gas Hydrate	☐	
Abnormal Pressure	☐	Fracture Zone	☐	Diapir and Mud Volcano	☐	
Man-made Objects (e.g., sea-floor cables, dump sites)	☐	Fault	☐	High Temperature	☐	
H_2S	☐	High Dip Angle	☐	Ice Conditions	☐	
CO_2	☐					

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 895 - Add 2	Site #: WAB-03A	Date Form Submitted: 2022-04-07 17:38:10

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	no	
1b High resolution seismic seismic reflection (crossing)	no	
2a Deep penetration seismic reflection (primary)	yes	Line: CAB01-125 Position: SP: 590 High-resolution multichannel
2b Deep penetration seismic reflection (crossing)	yes	Line: CAB01-106 Position: 472 High-resolution multichannel; 1.2 km far
3 Seismic Velocity	no	
4 Seismic Grid	yes	1 to 2 km spaced grid of multi-channel seismics
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	Parametric profile; 200 m far from site
7 Swath bathymetry	yes	50x50m
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	no	
17 Other	no	

Proposal #: 895 - Add 2	Site #: WAB-03A	Date Form Submitted: 2022-04-07 17:38:10

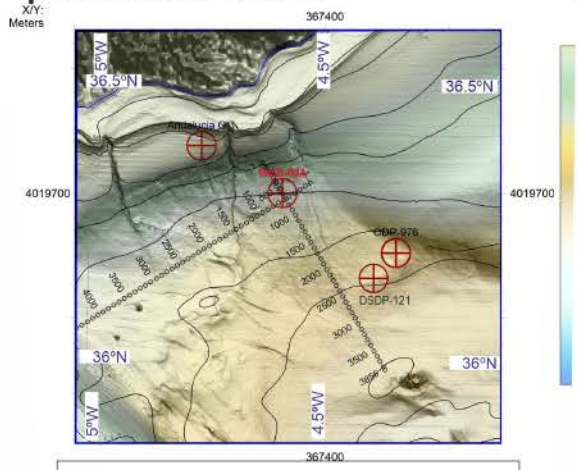
Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to refusal; XCB to refusal and define casing point; log hole A; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing; log below casing in Hole B
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	For Site 976, located in the Western Alboran Basin, the data quality of compressional-wave velocities was degraded in the sediment cores because of gas expansion (Comas et al., 1996).
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	Seismic research and exploratory drilling have been activities in the Alboran Sea for more than 30 years. During the 1980s three exploration wells were drilled. None of these surveys found evidence of a significant presence of oil in the basin. In 2005 the project Siroco was launched by the Spanish oil company Repsol, focusing on the search for natural gas. The project was abandoned in 2015 and exploratory drilling operations weren't carried out. Kuo et al. (2002), Mountfield et al. (2002), and Weinzapfel et al. (2003) recently reassessed and specified the hydrocarbon potential ofthe Alboran Sea arguing in favor of a Miocene petroleum system in this basin.
4. Indications of gas hydrates at this location	No
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Standard precautions
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	Presence of organic-rich layers in the Plio-Quaternary deposits.Presence of close fault, landslides and turbidites in the sedimentary register
9. Summary: What do you consider the major risks in drilling at this site?	Presence of organic-rich layers in the Plio-Quaternary deposits.Presence of close fault, landslides and turbidites in the sedimentary register

Proposal #: 895 - Add 2	Site #: WAB-03A	Date Form Submitted: 2022-04-07 17:38:10

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
0 - 428	BQD boundary at 428 m; bottom Quaternary	2.6	1.69	Quaternary deposits comprise coarse to fine deposits based on seismic facies	Contourite and turbidite sedimentation	150	Depths measured from seafloor. Sedimentation rate based on ODP 976 & 977
428 - 739	M boundary at 739. Mio-Pliocene boundary	M: 5.33 /5.46 (Bache et al., 2012)	1.94	Pliocene deposits comprise coarse to fine deposits based on seismic facies. Marls and shale on the commercial well Andalucia-G1	Contourite and turbidite sedimentation	Pliocene: 150	Depths measured from seafloor. Sedimentation rate based on ODP 976 & 977
739 - 956	Base of MSC	5.97	1.94	Clays, anhydrites and volcanoclastics on the commercial well Andalucia-G1	Subaereal/shallow waters during the MSC	176	Depths measured from seafloor
956 - 1108	Messinian-Tortonian boundary	7.2	2.9	Marls and Shales with intercalations of calcarenites on the commercial well Andalucia-G1	Deep-sea environment.		Depths measured from seafloor
1108 - 1666	Tortonian tectonic inversion	ca. 8	2.9	Conglomerates and sandstones in the commercial well Andalucia-G1	Deep-sea environment.	190	Depths measured from seafloor
1666 - 1700	Below the Tortonian tectonic inversion	>8	2.9	Marls, silts and sands	Hemipelagic marine deposition		

Site Summary

coordinates: 36.312544º/-4.571213º
water depth: 800 m
penetration: 1700 m



BQD: base Quaternary
M: Miocene-Pliocene boundary
Ms: base of MSC
M-T: Messinian-Tortonian boundary
intraT: IntraTotornian boundary
Tinv: Tortonian inversion

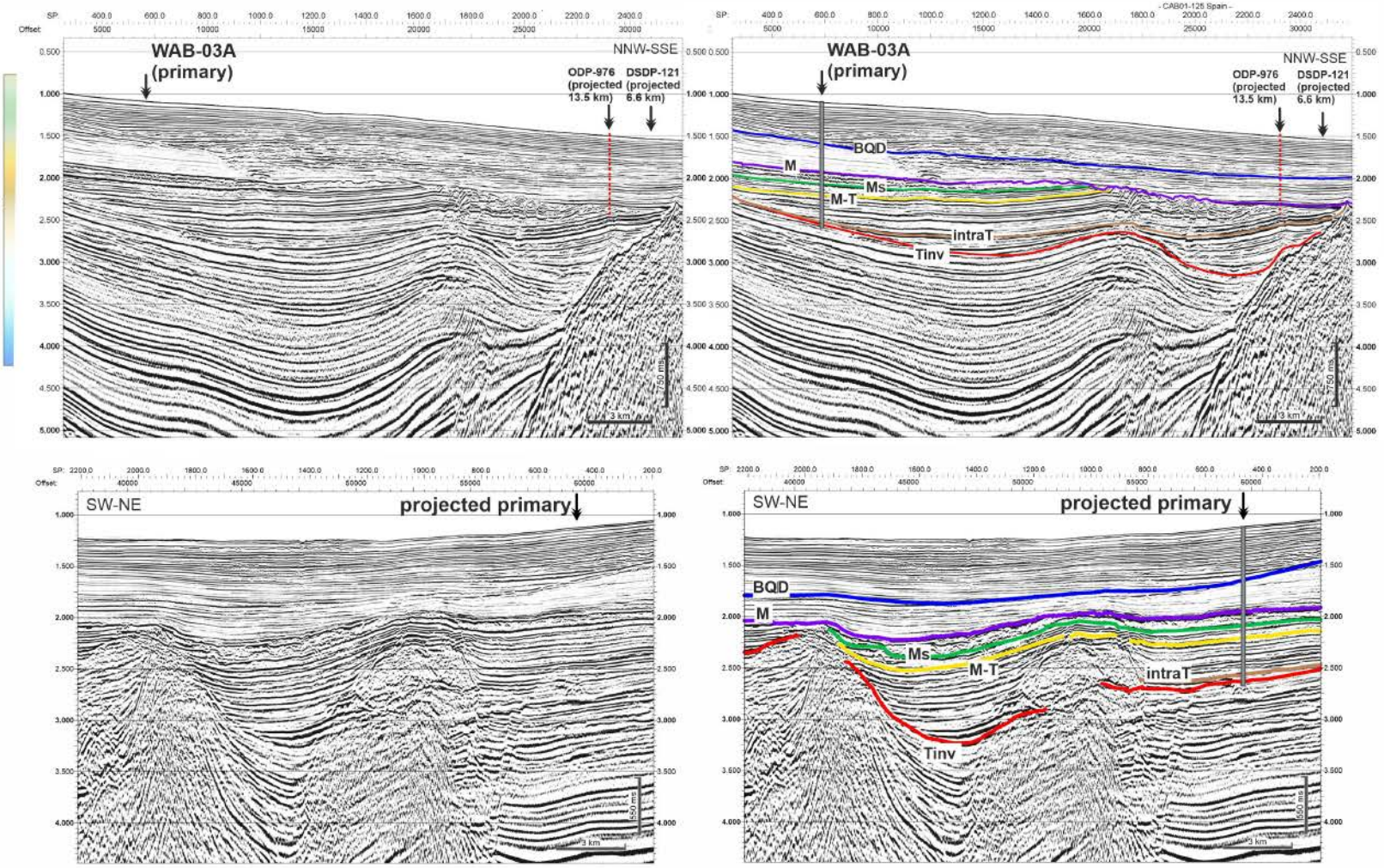
Remarks:
Seismic data in SP order
Navigation integrated in SGY

Data files:
Drill site on CAB01-125.segy; **SP:** 590
Crossing line: CAB01-106.segy; **SP:** 465

Additional information:
multibeam 50x50 m
parametric seismics 84 m far
Spanish waters

IMMAGE PROPOSAL

WAB-03A (primary)



IODP Site Forms

Form 1 – General Site Information

895 - Add 2

Section A: Proposal Information

Proposal Title	Investigating Miocene Mediterranean-Atlantic Gateway Exchange (IMMAGE)
Date Form Submitted	2022-04-07 17:38:10
Site-Specific Objectives with Priority (Must include general objectives in proposal)	This site targets one of the few thick late Messinian sedimentary successions in the Alboran Basin. The record recovered from this location will provide key constraints on the chemistry and physical properties of Mediterranean overflow during the Late Miocene. This is critical for all three objectives. The site is located on the Spanish side of the Moroccan-Spanish territorial boundary, very close to the other alternate site EAB-03A.
List Previous Drilling in Area	DSDP121, ODP 976, 977, 978, 979

Section B: General Site Information

Site Name:	EAB-02A	Area or Location:	Pytheas Basin, Alboran Sea
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#			
Latitude:	Deg: 35.75518251	Jurisdiction:	Spain
Longitude:	Deg: -2.43956525	Distance to Land: (km)	67
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	845

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	1277	0
Total Sediment Thickness (m)	1277	
Total Penetration (m):	1277	

General Lithologies: marls, silts, sands and clays

Coring Plan: (Specify or check): Hole A: APC to refusal; XCB to refusal and define casing point; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing

APC ☑ XCB ☑ RCB ☑ Re-entry ☑ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☑	Magnetic Susceptibility	☑	Other tools:
Porosity	☑	Borehole Temperature	☑	
Density	☑	Formation Image (Acoustic)	☑	
Gamma Ray	☑	VSP (walkaway)	☐	
Resistivity	☑	LWD	☐	
Sonic (Δt)	☑			
Formation Image (Res)	☑			
VSP (zero offset)	☑			
Formation Temperature & Pressure	☑			

Other Measurements: PEF, Neutron and Dipmeter

Estimated Days: Drilling/Coring: 11.7 | Logging: 3 | Total On-site: 14.7

Observatory Plan: *Longterm Borehole Observation Plan/Re-entry Plan*

3-4 temperature measurements to establish a geothermal gradient

Potential Hazards/ Weather:

Shallow Gas	☐	Complicated Seabed Condition	☐	Hydrothermal Activity	☐	Preferred weather window: April - September
Hydrocarbon	☐	Soft Seabed	☐	Landslide and Turbidity Current	☑	
Shallow Water Flow	☐	Currents	☐	Gas Hydrate	☐	
Abnormal Pressure	☐	Fracture Zone	☐	Diapir and Mud Volcano	☐	
Man-made Objects (e.g., sea-floor cables, dump sites)	☐	Fault	☑	High Temperature	☐	
H_2S	☐	High Dip Angle	☐	Ice Conditions	☐	
CO_2	☐					

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 895 - Add 2	Site #: EAB-02A	Date Form Submitted: 2022-04-07 17:38:10

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	no	
1b High resolution seismic seismic reflection (crossing)	no	
2a Deep penetration seismic reflection (primary)	yes	Line: GBT02 Position: SP 1955 High-resolution multichannel
2b Deep penetration seismic reflection (crossing)	yes	Line: MSB12 Position: SP 1457 It is 450 m far from site
3 Seismic Velocity	no	
4 Seismic Grid	yes	2 to 5.3 km spaced grid of multi-channel seismics
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz		Parametric profile; 430 m far from site
7 Swath bathymetry	yes	50x50m
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	no	
17 Other	no	

Proposal #: 895 - Add 2	Site #: EAB-02A	Date Form Submitted: 2022-04-07 17:38:10

Pollution & Safety Hazard	Comment
1. Summary of operations at site	Hole A: APC to refusal; XCB to refusal and define casing point; log hole A; offset to Hole B: drilling and case off upper part of the hole; re-enter and RCB coring below casing; log below casing in Hole B
2. All hydrocarbon occurrences based on previous DSDP/ODP/IODP drilling	For Site 976, located in the Western Alboran Basin, the data quality of compressional-wave velocities was degraded in the sediment cores because of gas expansion (Comas et al., 1996).
3. All commercial drilling in this area that produced or yielded significant hydrocarbon shows	Seismic research and exploratory drilling have been activities in the Alboran Sea for more than 30 years. During the 1980s three exploration wells were drilled. None of these surveys found evidence of a significant presence of oil in the basin. In 2005 the project Siroco was launched by the Spanish oil company Repsol, focusing on the search for natural gas. The project was abandoned in 2015 and exploratory drilling operations weren't carried out. Kuo et al. (2002), Mountfield et al. (2002), and Weinzapfel et al. (2003) recently reassessed and specified the hydrocarbon potential ofthe Alboran Sea arguing in favor of a Miocene petroleum system in this basin.
4. Indications of gas hydrates at this location	No
5. Are there reasons to expect hydrocarbon accumulations at this site?	No
6. What "special" precautions will be taken during drilling?	Standard precautions
7. What abandonment procedures need to be followed?	
8. Natural or manmade hazards which may affect ship's operations	Presence of organic-rich layers in the Plio-Quaternary deposits.Presence of close fault, landslides and turbidites in the sedimentary register
9. Summary: What do you consider the major risks in drilling at this site?	Presence of organic-rich layers in the Plio-Quaternary deposits.Presence of close fault, landslides and turbidites in the sedimentary register

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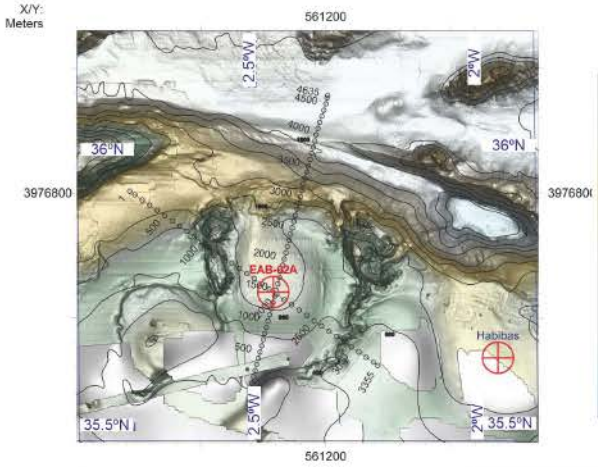
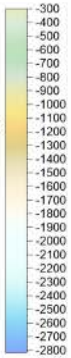
Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
0 - 465	BQD boundary at 204 m; bottom Quaternary	2.6	1.65	Quaternary deposits comprise silty clay to clay	Deep-sea environment. Contourite sedimentation	150	Depths measured from seafloor. Sedimentation rate based on ODP 976 & 977
465 - 715	M boundary at 715m. Mio-Pliocene boundary	M: 5.33/5.46 (Bache et al., 2012)	1.81	Pliocene: silty clay to clay;	Deep-sea environment. Contourite sedimentation	Pliocene: 150	Depths measured from seafloor. Sedimentation rate based on ODP 976 & 977
715 - 1277	section: upper Miocene.	5.33/5.46 - < 7.2	2.9	Miocene sediments including marls, silts, sands and clays	Open marine		Depths measured from seafloor

Site Summary

coordinates: 35.75518251º/-2.43956525º
water depth: 845 m
penetration: 1277 m





BQD: base Quaternary
M: Miocene-Pliocene boundary
BPM: Base post-rift Miocene

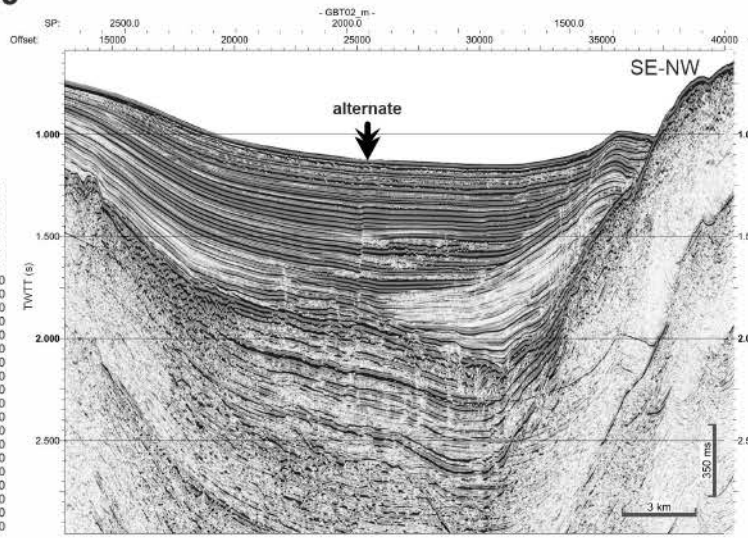
Remarks:
Seismic data in SP order
Navigation integrated in SGY

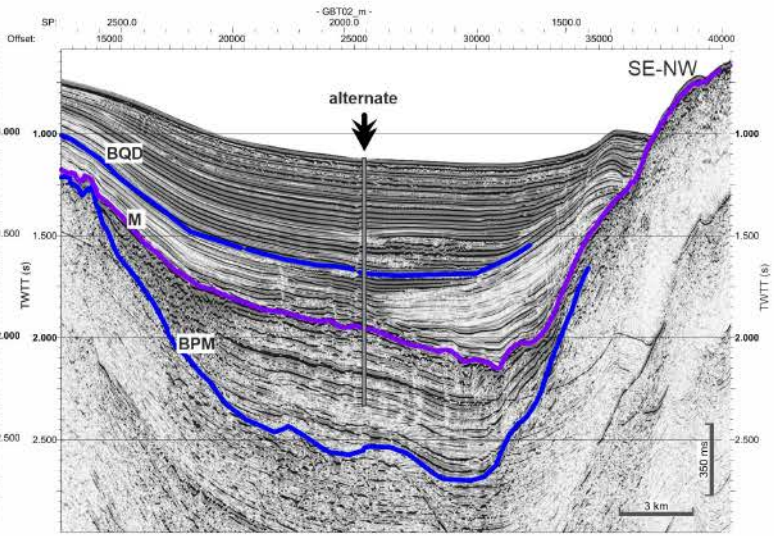
Data files:
Drill site on GBT02.segy; **SP:** 1955
Crossing line: MSB12.segy; **SP:** 1460

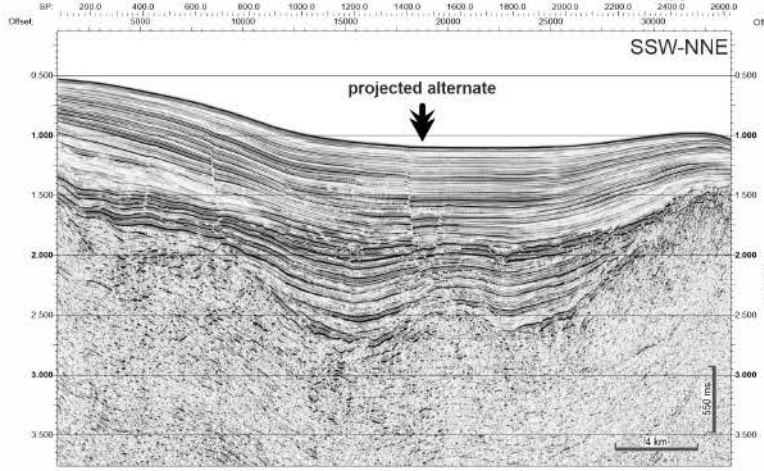
additional information:
multibeam 50x50 m
Spanish waters

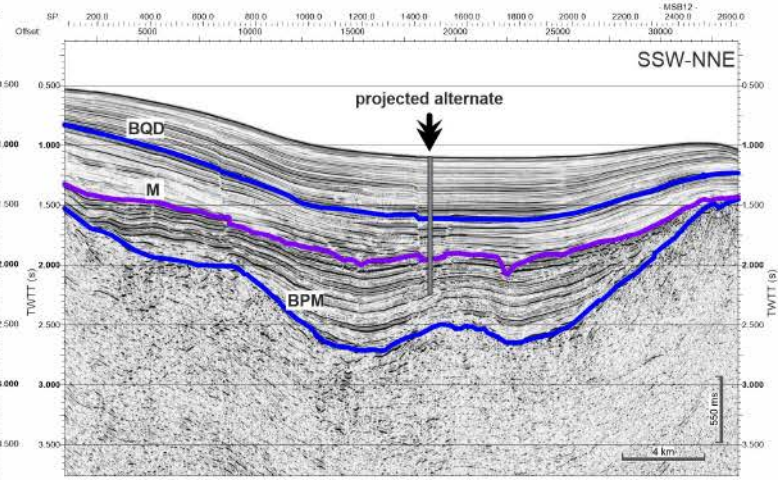
IODP IMMAGE PROPOSAL

SITE EAB-02A (alternate)









IODP Site Forms

Form 1 – General Site Information

895 - Add 2

Section A: Proposal Information

Proposal Title	Investigating Miocene Mediterranean-Atlantic Gateway Exchange (IMMAGE)
Date Form Submitted	2022-04-07 17:38:10
Site-Specific Objectives with Priority (Must include general objectives in proposal)	This site targets one of the few thick late Messinian sedimentary successions in the Alboran Basin. The record recovered from this location will provide key constraints on the chemistry and physical properties of Mediterranean overflow during the Late Miocene. This is critical for all three objectives. The site is located on the Moroccan side of the Moroccan-Spanish territorial boundary, very close to the other alternate site EAB-02A.
List Previous Drilling in Area	ODP 977, 978, 979

Section B: General Site Information

Site Name:	EAB-03A	Area or Location:	Pytheas Basin, Alboran Sea
If site is a reoccupation of an old DSDP/ODP Site, Please include former Site#		Jurisdiction:	Morocco
Latitude:	Deg: 35.750427	Distance to Land: (km)	67
Longitude:	Deg: -2.431305		
Coordinate System:	WGS 84		
Priority of Site:	Primary: ☐ Alternate: ☑	Water Depth (m):	838

Section C: Operational Information

	Sediments	Basement
Proposed Penetration (m):	1277	0
Total Sediment Thickness (m)	1277	
Total Penetration (m):	1277	

General Lithologies: marls, silts, sands and clays

Coring Plan: (Specify or check)

APC ☑ XCB ☑ RCB ☑ Re-entry ☑ PCS ☐

Wireline Logging Plan:

Standard Measurements		Special Tools		
WL	☑	Magnetic Susceptibility	☑	Other tools:
Porosity	☑	Borehole Temperature	☑	
Density	☑	Formation Image (Acoustic)	☑	
Gamma Ray	☑	VSP (walkaway)	☐	
Resistivity	☑	LWD	☐	
Sonic (Δt)	☑			
Formation Image (Res)	☑			
VSP (zero offset)	☐			
Formation Temperature & Pressure	☑			

Other Measurements: PEF, Neutron and Dipmeter

Estimated Days: Drilling/Coring: 11.7 | Logging: 3 | Total On-site: 14.7

Observatory Plan:

Longterm Borehole Observation Plan/Re-entry Plan

3-4 temperature measurements to establish a geothermal gradient

Potential Hazards/ Weather:

Shallow Gas	☐	Complicated Seabed Condition	☐	Hydrothermal Activity	☐	Preferred weather window: April - September
Hydrocarbon	☐	Soft Seabed	☐	Landslide and Turbidity Current	☑	
Shallow Water Flow	☐	Currents	☐	Gas Hydrate	☐	
Abnormal Pressure	☐	Fracture Zone	☐	Diapir and Mud Volcano	☐	
Man-made Objects (e.g., sea-floor cables, dump sites)	☐	Fault	☑	High Temperature	☐	
H_2S	☐	High Dip Angle	☐	Ice Conditions	☐	
CO_2	☐					

Sensitive marine habitat (e.g., reefs, vents):

Other:

IODP Site Forms

Form 2 - Site Survey Detail

Proposal #: 895 - Add 2	Site #: EAB-03A	Date Form Submitted: 2022-04-07 17:38:10

Data Type	In SSDB	Details of available data and data that are still to be collected
1a High resolution seismic reflection (primary)	no	
1b High resolution seismic seismic reflection (crossing)	no	
2a Deep penetration seismic reflection (primary)	yes	Line: Line: GBT02 Position: SP: 2004 High-resolution multichannel
2b Deep penetration seismic reflection (crossing)	yes	Line: Line: MSB12 Position: SP: 1432 It is 405 m far from site
3 Seismic Velocity	no	
4 Seismic Grid	yes	2 to 5.3 km spaced grid of multi-channel seismics
5a Refraction (surface)	no	
5b Refraction (bottom)	no	
6 3.5 kHz	yes	Parametric profile; 430 m far from site
7 Swath bathymetry	yes	50x50m
8a Side looking sonar (surface)	no	
8b Side looking sonar (bottom)	no	
9 Photography or video	no	
10 Heat Flow	no	
11a Magnetics	no	
11b Gravity	no	
12 Sediment cores	no	
13 Rock sampling	no	
14a Water current data	no	
14b Ice Conditions	no	
15 OBS microseismicity	no	
16 Navigation	no	
17 Other	no	

Proposal #: 895 - Add 2	Site #: EAB-03A	Date Form Submitted: 2022-04-07 17:38:10

Pollution & Safety Hazard	Comment
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Proposal #: 895 - Add 2	Site #: EAB-03A	Date Form Submitted: 2022-04-07 17:38:10

Subbottom depth (m)	Key reflectors, unconformities, faults, etc	Age (My)	Assumed velocity (km/s)	Lithology	Paleo-environment	Avg. accum. rate (m/My)	Comments
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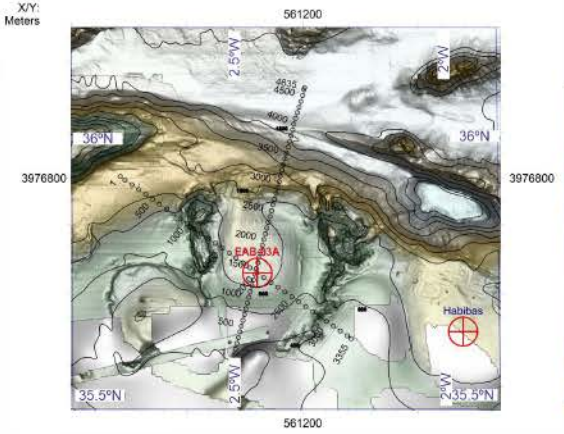
444 - 711	M boundary at 715m. Mio-Pliocene boundary	M: 5.33/5.46 (Bache et al., 2012)	1.81	Pliocene: silty clay to clay;	Deep-sea environment. Contourite sedimentation	Pliocene: 150	Depths measured from seafloor. Sedimentation rate based on ODP 976 & 977
711 - 1277	section: upper Miocene.	5.33/5.46 - < 7.2	2.9	Miocene sediments including marls, silts, sands and clays	Subaereal/shallow waters duirng the MSC; Open marine during the rest of the Miocene		Depths measured from seafloor

Site Summary

coordinates: 35.750427º/-2.431305º
water depth: 838 m
penetration: 1277 m



BQD: base Quaternary
M: Miocene-Pliocene boundary
BPM: Base post-rift Miocene

Remarks:
Seismic data in SP order
Navigation integrated in SGY

Data files:
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Crossing line: MSB12.segy; **SP:** 1460

Additional information:
multibeam 50x50 m
Moroccon waters

IODP IMMAGE PROPOSAL

SITE EAB-03A (alternate)