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Short Cruise Report Expedition M149 with R/V Meteor

Las Palmas (Canary Island, Spain) – Cadiz (Spain)
24.07.2018 – 24.08.2018

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Captain: Detlef Korte

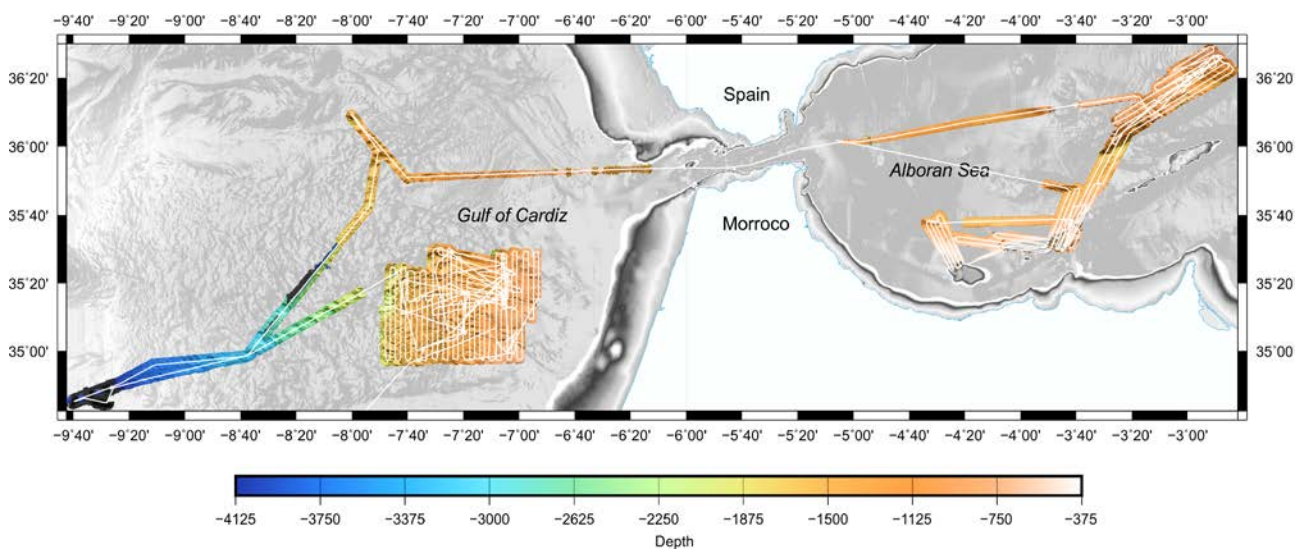


Fig.1: Shiptrack of R/V Meteor during Expedition M149 (white line) with acquired multibeam bathymetry data

Objectives

Earthquakes pose an enormous societal threat as demonstrated by events such as the 11 March 2011 Tohoku earthquake off NE Honshu, Japan, and the 26 December 2004 Sumatra earthquake off W Indonesia. Both earthquakes attained uncommonly high moment magnitudes and resultant tsunami destruction, showing that the factors governing earthquake nucleation, rupture propagation and the seismic cycle remain incompletely understood scientific phenomena. Some of the largest earthquakes in the last decades occurred along the circum-Pacific ring of fire, where the oceanic Pacific sea plate subducts beneath an adjacent continental plate (e.g., 2011 Tohoku earthquake off NE Japan, 2010 Maule earthquake off Chile or the 1964 Alaska earthquake). However, from historical records evidence exists that the collision zone between Eurasia and Africa hosted earthquakes and tsunamis with similar magnitude in the past.

The largest documented historical earthquake in W Europe, the Lisbon 1755 event occurred in the Gulf of Cadiz and had an estimated magnitude of M8.5-9. The resulting tsunami was highly destructive and reached the local coasts (Iberia, NW Africa), Azores and Cape Verdes, and crossed the Atlantic. The exact location of the 1755 Lisbon event remains a subject of debate. One reason is the not well known present day location of the plate boundary between Eurasia and Africa in the Gulf of Cadiz where deformation is distributed over a 200 km wide zone. Recently, a swath bathymetric study of the Gulf of Cadiz identified a 600 km wide WNW-ESE trending band of dextral strike-slip faults that connects two segments of the plate boundary between Eurasia and Africa: the Gloria fault to the west and the Riff-Tell fault zone to the east. This newly discovered band has important implications on the understanding of the plate tectonic framework and the generation of earthquakes and tsunamis in this region.

In the eastern Alboran Sea (western end of the Mediterranean Sea) a complex distribution of sinistral SW-NE and dextral SE-NW trending strike-slip faults exists between the Moroccan and Spanish margin. Similar to the Gulf of Cadiz this region has suffered large earthquakes in the past, which destroyed coastal communities repeatedly between the 15th and 19th century such as the cities of Vera and Almeria. Some of these faults extend up to 100 km in the Alboran Sea and continue on land such as the Carboneras fault in southern Spain, which has been identified as a potential candidate of large up to M7.2 earthquakes. The fault system in the Alboran Sea therefore constitutes a significant earthquake and tsunami threat to coastal communities neighboring the western Mediterranean Sea.

This is why Expedition M149 set out to study tectonic activity and fluid flow associated with the plate boundary between Eurasia and Africa in the Gulf of Cadiz and Alboran Sea and to answer three crucial scientific questions:

- What do sedimentary records reveal about the past tectonic and thus seismic activity?
- What are the zones of most active deep-seated fluid flow as a result of deformation in the Atlantic and Alboran sectors of the study area?
- What do deep-seated fluids tell us about the geological processes at depth in the Atlantic and Alboran study areas?

To achieve these expedition goals an integrated program of seafloor mapping, (long-term) in situ measurements and short and long core sampling of mud volcanoes and fault zones has been envisioned in which mud volcanoes may serve as a window to depth given their hydraulic connection to deeper (potentially seismogenic) levels of fault zones.

Narrative

After extensive operations in the port of Las Palmas (Gran Canaria), well into the evening of July 24, research vessel Meteor left the port of Cadiz, Canary Island, on July 25. The vessel steamed directly to the Gulf of Cadiz and arrived in the study area offshore Morocco in the evening of July 27. During that same night the seafloor was mapped using the ship's multibeam and parasound systems, which was continued the following nights and provided the basis for the seafloor sampling and measurements (Fig. 1). On the following day two mud volcanoes (MVs), known as Ginsburg MV and Yuma MV, and the surrounding seafloor were sampled down to a maximum of ~5.3 mbsf (meter below seafloor) using a gravity corer (Figs. 2 and 3). These mud volcanoes have been sampled in several expeditions before but no extensive coring has been previously done. For post-cruise gas and fluid analysis the scientists collected numerous sediment and fluid samples immediately after the gravity corer was retrieved onboard. In addition, detailed sedimentological descriptions and biostratigraphic and physical properties analyses were performed onboard and samples collected for post-cruise analyses.

Several attempts using the seafloor drill rig MeBo resulted in a ~18 m long borehole into the summit of the Ginsburg MV, which was eventually completed with setting a long-term observatory on August 3. The observatory will record the fluid pressure and temperature in the borehole over the next few years and document the activity of the mud volcano. Afterwards, both gravity coring and heat flow measurements were conducted to detect areas of active fluid flow. The sampling and heat flow profile extends in a north-south direction from the Yuma MV to Meknes MV and intersects two prominent strike-slip faults – namely the Lineament Center and Lineament South (Figs. 4-6). The two faults belong to the WNW-ESE trending band of dextral strike-slip faults that connects two segments of the plate boundary between Eurasia and Africa.

The MeBo was then deployed at the foot of the Ginsburg MV to sample possible mud flow events, as spotted on seismic images acquired on previous expeditions. During the first dive on August 5 the prototype of a CPT (cone penetration testing) device was successfully used with the sea floor drill rig. The CPT probe was pushed 30 m into the seafloor and recorded the force acting on the tip and sleeve of the probe as well as the pore water pressure. Dissipation tests were conducted at 6 and 30 m below seafloor, respectively, to determine the in situ pore water pressure in the sediment layers. The CPT was then exchanged with a downhole logging tool, which measured the natural gamma radiation of the sediment during the recovery of the drill pipes. The planned drilling at the site was postponed due to technical issues. During the repair works sampling of Lineament Center and Lineament South continued. In a second dive two days later the MeBo drilled 40 m into the foot of the Ginsburg mud volcano with a core recovery of 92%. During the retrieval of the drill pipe the electrical conductivity of the sediment was measured with a downhole logging probe. Preliminary assessment of the borehole logging data revealed a cyclicity, which corresponds to anoxic horizons in the sediment. These layers could be interpreted as anoxic and organic rich, possibly linked to the seepage of deeply sourced hydrocarbon-rich fluids. Fluid-induced structures oriented in direction to the sediment surface have been spotted at various depths in the whole core. Furthermore, pore fluids at the foot of the MV are characterized by salinities higher than seawater indicating leaching of deeply buried Triassic evaporites and a fluid seepage structure different from common mud volcanoes. In addition, maximum biostratigraphic ages of clasts in the mud volcano sediments (mud breccias) sampled at the summit are of younger Cretaceous age suggesting a different source depth compared to the fluids.

Subsequent seafloor drilling in the Gulf of Cadiz focused on the strike slip faults. The sea floor drill rig was deployed at the Lineament Center directly south of Ginsburg MV, where pilot heat flow measurements gave evidence for fluid flow activity. The borehole reached

the target depth of 20 m below seafloor and was successfully closed with a long-term observatory in the early morning of August 10. This second observatory is located 13 km south of the Ginsburg MV and will provide important information on the interplay of mud volcano and fault zone activities in this region.

A day later, the seafloor drill rig MeBo also drilled 50 m into a pull-apart basin along the Hermes fault (Fig. 4), an east-west trending strike-slip fault branching from the Lineament Center. Several turbidites in the recovered sediment succession probably represent seafloor gravitational movements (Mass Transport Deposits, MTDs) due to faults slip activity in the past. The cores also show sharp contacts and tectonically displaced layers at different depths. Elevated heat flow and salinity values corroborate the notion of an active fault system. In combination with another 40 m long sediment core from a pull-apart basin along the Lineament South (Fig. 5) and further gravity cores from the two fault zones the lithostratigraphic record of the recovered sediment sequences will provide an unprecedented insight into the tectonic history of the Gulf of Cadiz region.

Between the MeBo deployments further mud volcanoes (Rabat, Almanzor and El Cid) were sampled using the gravity corer – including two newly discovered mud volcanoes, which the participants named „R2“ and „D2“. The last gravity cores in the main study area (Fig. 2) were taken on August 14 after which R/V Meteor moved first west to deeper waters (Fig. 3), where salt diapirs in the Seine abyssal plain were sampled and then steamed to the Alboran sea. During the transit across the Gulf of Cadiz additional gravity cores from potential mud volcanoes and salt diapirs in Portuguese and Moroccan waters were taken. At least one new mud volcano was discovered during the two days of transit and has been named „Funky Monkey“.

R/V Meteor entered the Alboran Sea on August 17 to study the hydrogeological and tectonic activity of faults off Spain and Morocco. The first study object was the Carboneras fault - a NE-SW trending strike-slip fault, which continues from the Spanish mainland into the Mediterranean Sea. After a pre-survey by seafloor mapping, gravity coring and heat flow measurements, the seafloor drill rig MeBo was deployed for the last time during Expedition M149 and sampled the sediment down to 20 m below seafloor. The recovered core shows multiple high angle faults, evidence for the deformation of the sediment through strike-slip faulting. The borehole was closed with a long-term observatory to measure water pressure and temperature variations in response to the sediment deformation in the next few years. Furthermore, the Al-Idrissi fault, a strike-slip fault offshore Morocco, was investigated by gravity coring and heat flow measurements. High salinities of pore waters sampled from gravity cores indicate a hydrogeological activity. Also the Marrakesh MV to the west of the Al-Idrissi fault was sampled via gravity corer. However, all gravity cores taken in the Alboran Sea were not opened for sedimentological descriptions and physical properties analyses due to a shortage in packing and processing material. Those analyses will be done post-cruise in Bremen and the data added to the final report.

Final multibeam and parasound surveys were conducted until midday of August 23 and revealed a buried mass transport deposit offshore Morocco. Post-expedition analysis will show if the mass wasting caused a tsunami in the Mediterranean Sea. The R/V Meteor arrived in the morning of August 24 in the port of Cadiz. The Expedition M149 equipment was unloaded on the same day and the scientist left the vessel on August 25.

Station maps

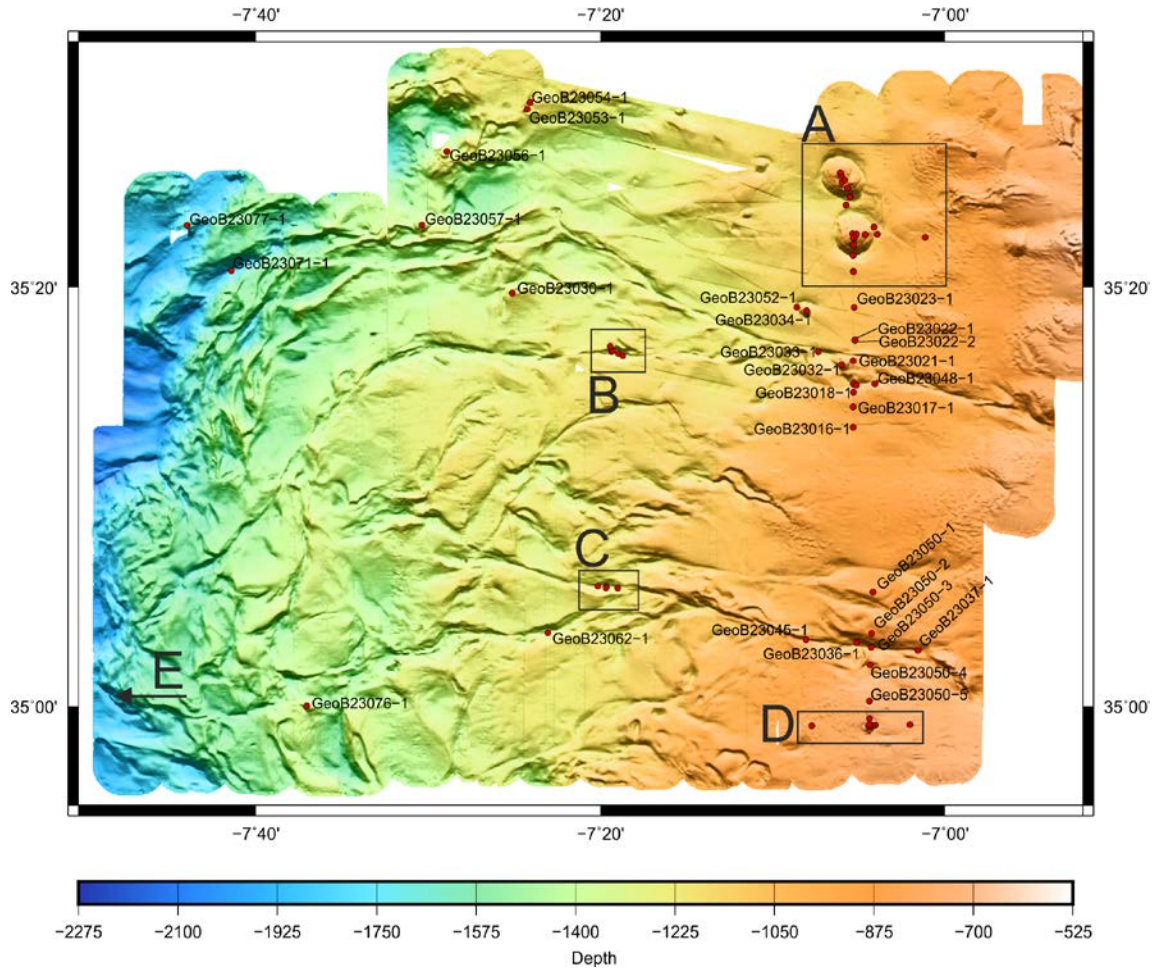


Figure 2: Overview of stations in the main study area offshore Morocco.

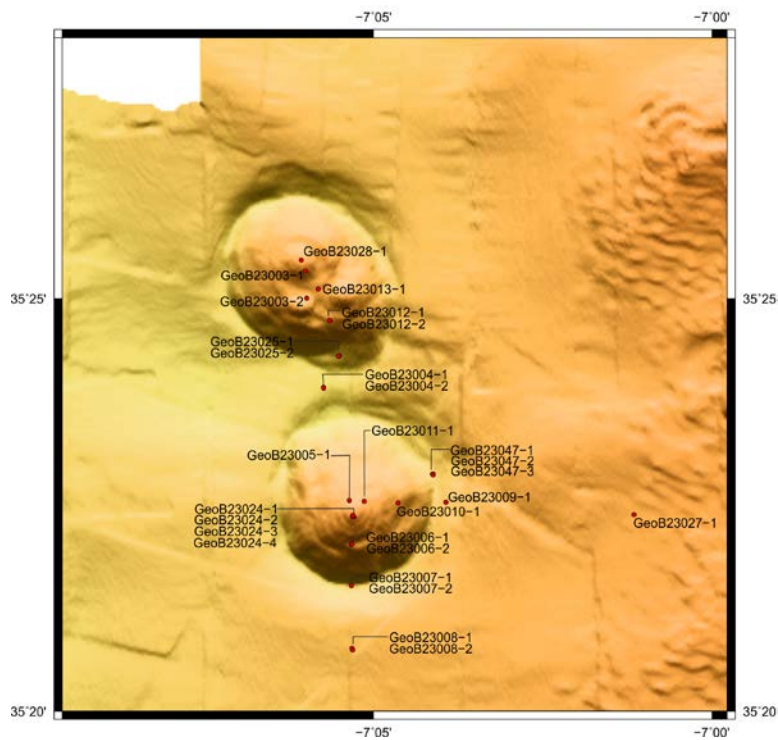


Figure 3: Detailed map of stations across Yuma and Ginsburg MVS (area A in Fig. 2).

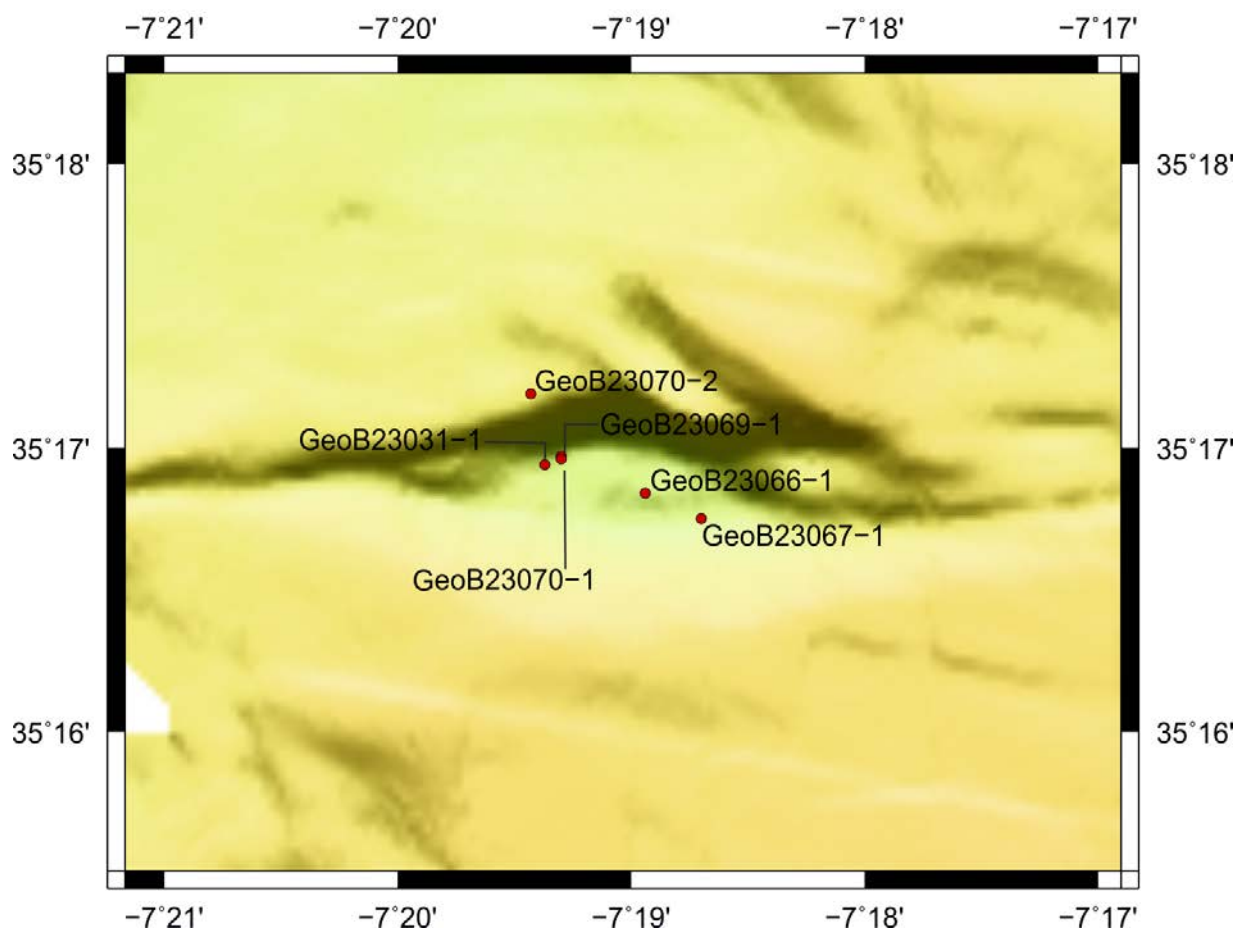


Figure 4: Detailed map of stations in the pull-apart basin of the Hermes fault (area B in figure 2).

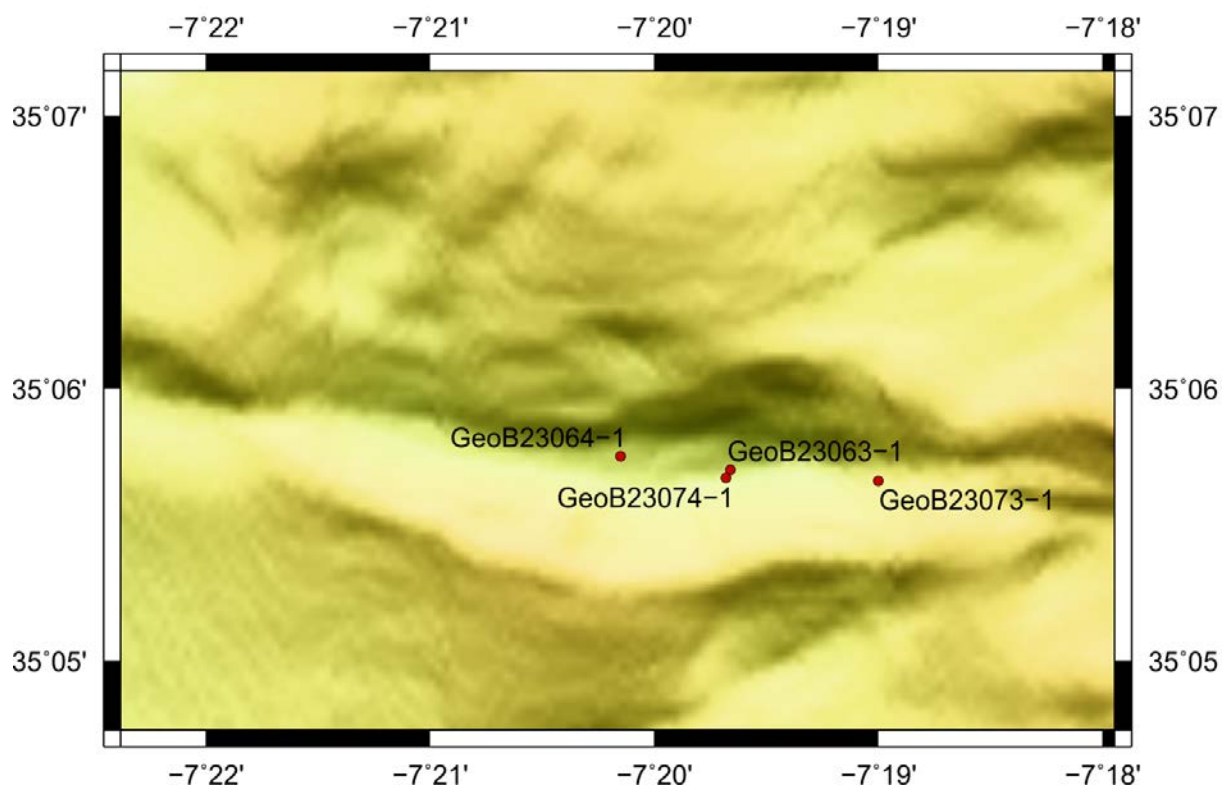


Figure 5: Detailed map of stations in the pull-apart basin of Lineament South (area C in Fig. 2).

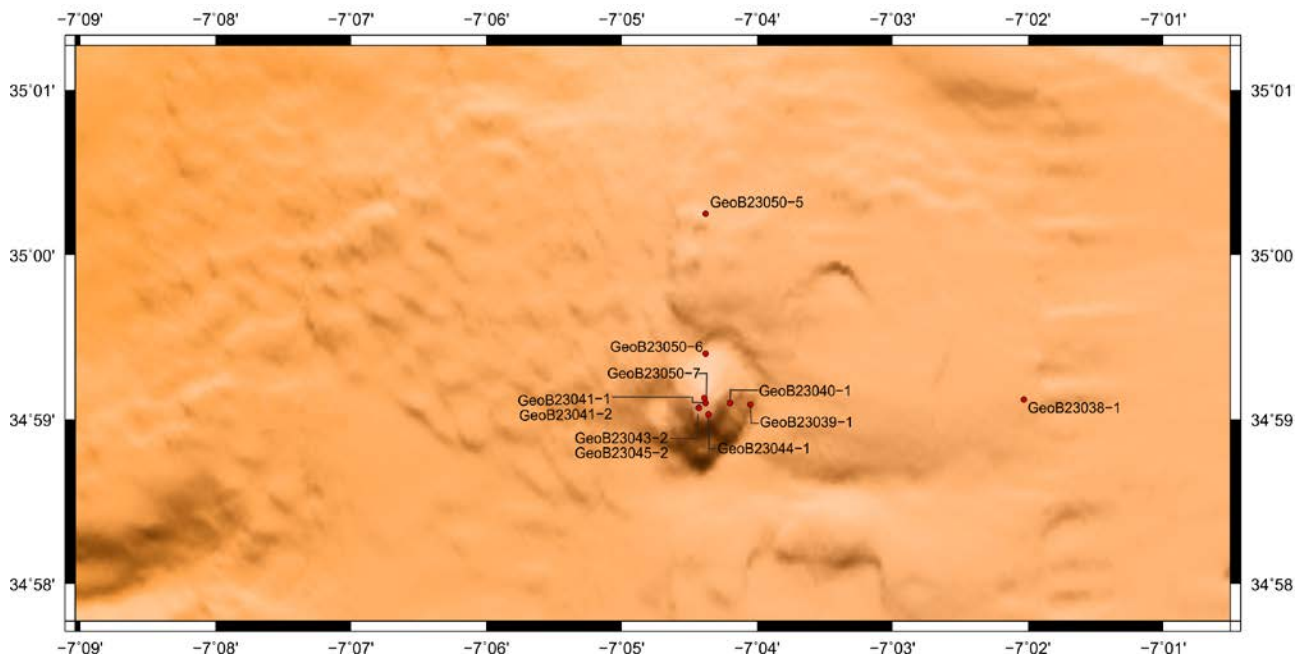


Figure 6: Detailed map of stations across Meknes MV (area D in Fig. 2).

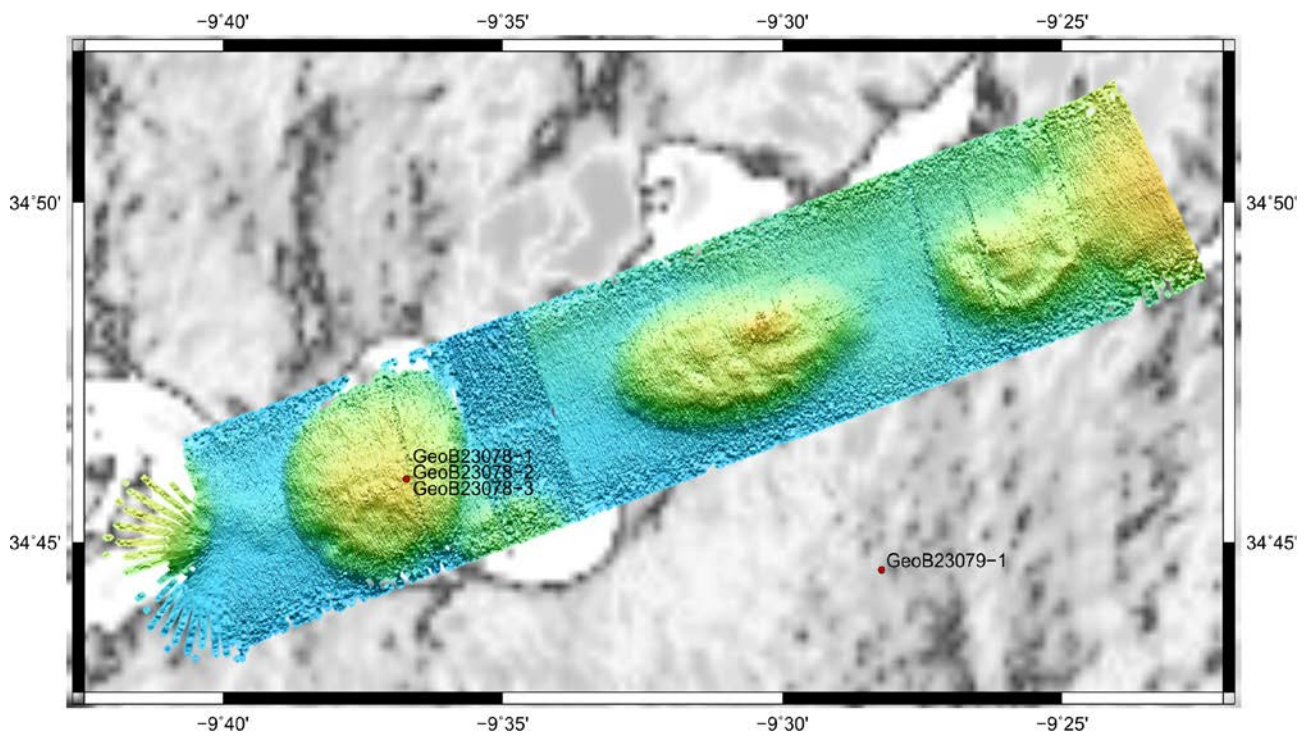


Figure 7: Detailed map of stations in the Seine abyssal plain (area E in Fig. 2).

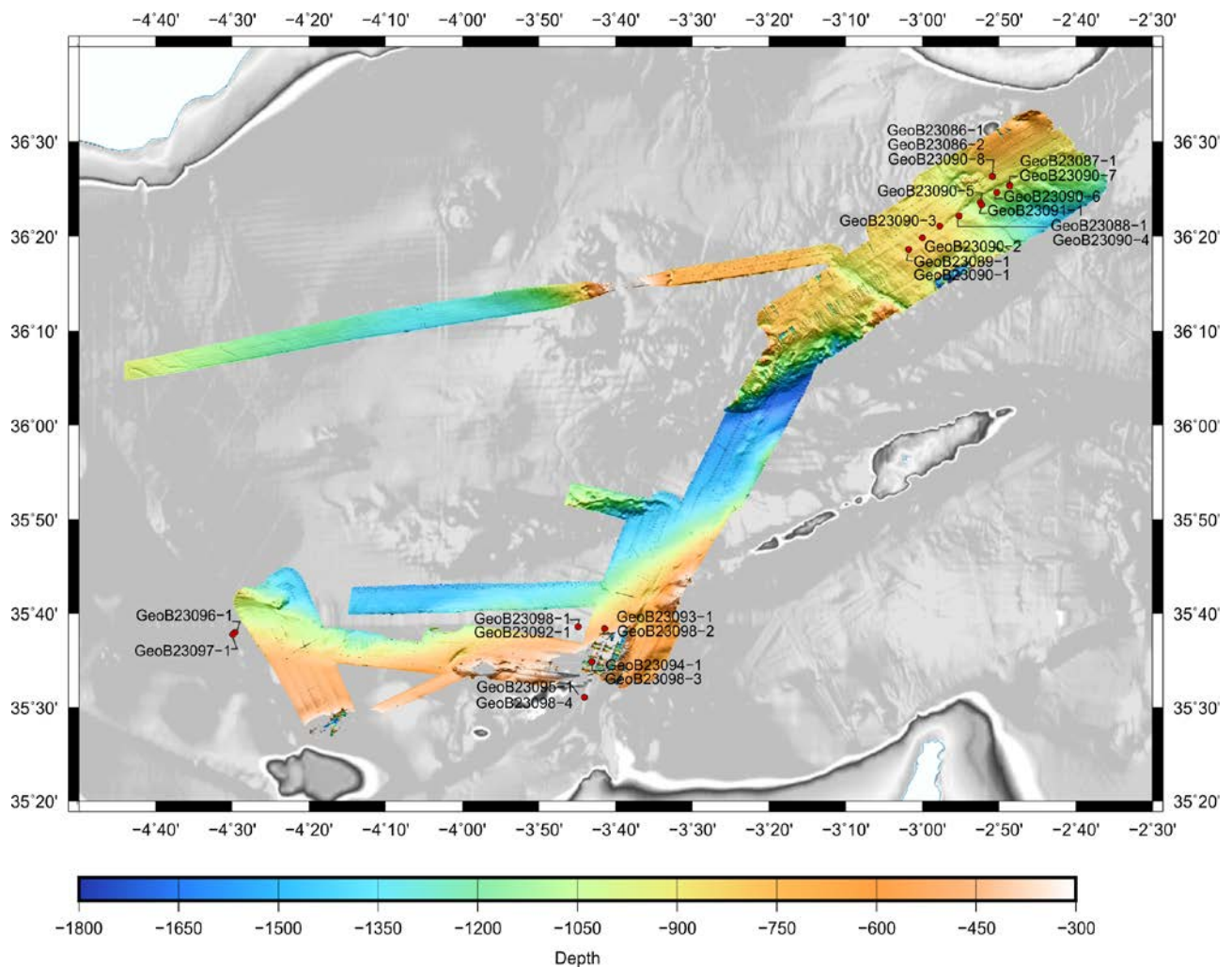


Figure 8: Detailed map of stations in the Alboran Sea.

Acknowledgements

All participants of Expedition M149 thank the countries of Morocco, Portugal and Spain for permission of research in their sovereign territories. The captain and the crew of R/V Meteor are thanked for their support, which immensely contributed to the success of the expedition.

Teilnehmerliste/Participants

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Stationliste/Stationlist

GeoB Number: Curation number of the core repository at the University of Bremen

Abbreviations: CTD+RO = Conductivity-Temperature-Depth with water sampler, GC=Gravity Corer, HF = Heat Flow Probe, MeBo = Seafloor drill rig MeBo

GeoB no.	Ship station	Location name	Gear	Date + Time	Latitude	Longitude	Water depth (m)	Sediment Recovery (cm)
GeoB 23001-1	M149-1	Plain between Lineament Center and South	CTD+RO	27.07.2018 18:43:00	35°06.821' N	7° 8.555'W	968	
GeoB 23003-1	M149-3	Yuma MV	GC	28.07.2018 06:18:00	35°25.332'N	7° 6.017'W	956	49
GeoB 23004-1	M149-4	Depression between Yuma and Ginsburg MV	GC	28.07.2018 07:45:00	35°23.923'N	7° 5.741'W	1661	474
GeoB 23005-1	M149-5	Crest of Ginsburg MV	GC	28.07.2018 09:17:00	35°22.550'N	7° 5.367'W	887	200
GeoB 23006-1	M149-6	Southern flank of Ginsburg	GC	28.07.2018 10:30:00	35°22.027'N	7° 5.338'W	965	300
GeoB 23007-1	M149-7	Southern rim of Ginsburg MV	GC	28.07.2018 12:00:00	35°21.525'N	7° 5.335'W	1121	532
GeoB 23008-1	M149-8	Southern backround sed. of Ginsburg MV	GC	28.07.2018 13:40:00	35°20.769'N	7° 5.327'W	1060	483
GeoB 23009-1	M149-9	Eastern rim of Ginsburg MV	GC	28.07.2018 15:06:00	35°22.538'N	7° 3.931'W	1072	357
GeoB 23010-1	M149-10	Eastern flank of Ginsburg MV	GC	28.07.2018 16:21:00	35°22.520'N	7° 4.644'W	977	245
GeoB 23012-1	M149-12	Southern flank of Yuma MV	GC	28.07.2018 19:00:00	35°24.734'N	7° 5.655'W	996	364
GeoB 23013-1	M149-13	Crest 2 of Yuma MV	GC	28.07.2018 20:13:00	35°25.110'N	7° 5.825'W	987	472
GeoB 23011-1	M149-11	Crest 2 of Ginsburg MV	GC	28.07.2018 17:40:00	35°22.546'N	7° 5.148'W	923	150
GeoB 23015-1	M149-15	Crest 2 of Ginsburg MV	MeBo	29.07.2018 07:30:00	35°22.859'N	7° 4.229'W		0
GeoB 23016-1	M149-16	Location 2 in plain south of Lineament Center	HF	29.07.2018 13:32:00	35°13.338'N	7° 5.334'W	944	
GeoB 23017-1	M149-17	Location 1 in plain south of Lineament Center	HF	29.07.2018 14:35:00	35°14.304'N	7° 5.334'W	941	
GeoB 23018-1	M149-18	Southern rim of Lineament Center	HF	29.07.2018 15:39:00	35°15.000'N	7° 5.316'W	965	
GeoB 23019-1	M149-19	Lineament Center to South	HF	29.07.2018 16:24:00	35°15.396'N	7° 5.310'W	1021	
GeoB 23003-2	M149-31	Yuma MV	HF	30.07.2018 19:47:00	35°25.327'N	7° 6.007'W	956	
GeoB 23004-2	M149-28	Depression between Yuma and Ginsburg MV	HF	30.07.2018 17:15:00	35°23.910'N	7° 5.742'W	1164	
GeoB 23006-2	M149-26	Southern flank of Ginsburg	HF	30.07.2018 15:13:00	35°22.026'N	7° 5.328'W	958	
GeoB 23007-2	M149-25	Southern rim of Ginsburg MV	HF	30.07.2018 14:06:00	35°21.521'N	7° 5.335'W	1141	
GeoB 23012-2	M149-30	Southern flank of Yuma MV	HF	30.07.2018 18:54:00	35°24.733'N	7° 5.659'W	1021	
GeoB 23021-1	M149-21	Lineament Center to South	HF	30.07.2018 07:32:00	35°16.500'N	7° 5.336'W	1017	

GeoB 23022-1	M149- 22	Northern rim of Lineament Center	HF	30.07.2018 10:26:00	35°17.490'N	7° 5.231'W	1058	
GeoB 23023-1	M149- 23	Plain between Ginsburg MV & Lineament South	HF	30.07.2018 11:44:00	35°19.047'N	7° 5.278'W	1064	
GeoB 23024-1	M149- 27	Ginsburg MV Crest 3	HF	30.07.2018 15:52:00	35°22.356'N	7° 5.295'W	908	
GeoB 23025-1	M149- 29	Southern rim of Yuma MV	HF	30.07.2018 18:16:00	35°24.300'N	7° 5.510'W	1128	
GeoB 23008-2	M149- 24	Southern background sed. of Ginsburg MV	HF	30.07.2018 13:11:00	35°20.748'N	7° 5.310'W	1059	
GeoB 23024-2	M149- 33	Crest 3 of Ginsburg MV	MeBo	31.07.2018 07:00:00	35°22.356'N	7° 5.295'W		19
GeoB 23024-3	M149- 34	Crest 3 of Ginsburg MV	GC	31.07.2018 14:35:00	35°22.356'N	7° 5.319'W	908	255
GeoB 23025-2	M149- 36	Southern rim of Yuma MV	GC	31.07.2018 17:25:00	35°24.307'N	7° 5.520'W	1124	475
GeoB 23027-1	M149- 35	Background east of Ginsburg MV	GC	31.07.2018 15:54:00	35°22.383'N	7° 1.157'W	962	442
GeoB 23028-1	M149- 37	Crest 3 of Yuma MV	GC	31.07.2018 18:35:00	35°25.463'N	7° 6.070'W	959	289
GeoB 23030-1	M149- 39	S of Lineament Center	GC	01.08.2018 08:37:00	35°19.737'N	7°25.129'W	1206	471
GeoB 23031-1	M149- 40	Pull-apart basin Lineam. Center branch	GC	01.08.2018 10:29:00	35°16.945'N	7°19.377'W	1300	388
GeoB 23032-1	M149- 41	Lineament Center	GC	01.08.2018 12:43:00	35°16.329'N	7° 5.995'W	953	145
GeoB 23033-1	M149- 42	Depression in Lineament Center	GC	01.08.2018 13:59:00	35°16.938'N	7° 7.361'W	1176	291
GeoB 23022-2	M149- 43	Northern rim of Lineament Center	GC	01.08.2018 15:22:00	35°17.483'N	7° 5.233'W	1053	449
GeoB 23034-1	M149- 44	Crest of Rabat MV	GC	01.08.2018 16:49:00	35°18.896'N	7° 8.036'W	1039	294
GeoB 23036-1	M149- 46	Depression 1 in Lineament South	GC	02.08.2018 07:33:00	35° 3.059'N	7° 5.135'W	998	464
GeoB 23037-1	M149- 47	Depression 2 in Lineament South	GC	02.08.2018 08:56:00	35° 2.675'N	7° 1.571'W	901	413
GeoB 23038-1	M149- 48	Background east of Meknes MV	GC	02.08.2018 10:26:00	34°59.122'N	7° 2.037'W	744	376
GeoB 23039-1	M149- 49	Eastern rim of Meknes MV	GC	02.08.2018 11:49:00	34°59.095'N	7° 4.055'W	749	223
GeoB 23040-1	M149- 50	Eastern flank of Meknes MV	GC	02.08.2018 13:00:00	34°59.104'N	7° 4.200'W	735	169
GeoB 23041-1	M149- 51	Crest of Meknes MV	GC	02.08.2018 14:52:00	34°59.109'N	7° 4.388'W	687	0
GeoB 23041-2	M149- 51	Crest of Meknes MV	GC	02.08.2018 14:52:00	34°59.108'N	7° 4.387'W	687	75
GeoB 23024-4	M149- 53	Crest 3 of Ginsburg MV	MeBo	03.08.2018 08:00:00	35°22.372'N	7° 5.311'W	906	637
GeoB 23043-1	M149- 55	Crest 2 of Meknes MV / CC Test	GC	04.08.2018 12:39:00	34°59.074'N	7° 4.436'W	687	140
GeoB 23043-2	M149- 55	Crest 2 of Meknes MV / CC Test	GC	04.08.2018 13:36:00	34°59.072'N	7° 4.433'W	694	144
GeoB 23044-1	M149- 56	Crest 3 of Meknes MV	GC	04.08.2018 14:35:00	34°59.030'N	7° 4.369'W	695	77
GeoB 23045-1	M149- 57	Depression 3 in Lineament South	GC	04.08.2018 16:12:00	35° 3.194'N	7° 8.071'W	943	485

GeoB 23045-2	M149- 58	Depression 3 in Lineament South	CTD+ RO	04.08.2018 17:51:00	35° 3.194'N	7° 8.071'W		
GeoB 23047-1	M149- 59	Ginsburg eastern rim	MeBo	06.08.2018 07:00:00	35°22.871'N	7° 4.128'W	1116	325
GeoB 23047-2	M149- 60	Ginsburg eastern rim	MeBo	06.08.2018 07:00:00	35°22.877'N	7° 4.136'W	1115	492
GeoB 23048-1	M149- 61	Lineament Center	GC	06.08.2018 09:52:00	35°15.407'N	7° 4.073'W	961	0
GeoB 23049-1	M149- 62	Lineament Center	GC	06.08.2018 12:00:00	35°15.406'N	7° 5.311'W	1031	339
GeoB 23050-1	M149- 63	Lineament South / Meknes MV	HF	06.08.2018 13:45:00	35° 5.467'N	7° 4.189'W	867	
GeoB 23050-2	M149- 63	Lineament South / Meknes MV	HF	06.08.2018 15:36:00	35° 3.484'N	7° 4.264'W	862	
GeoB 23050-3	M149- 63	Lineament South / Meknes MV	HF	06.08.2018 16:30:00	35° 2.811'N	7° 4.287'W	1016	
GeoB 23050-4	M149- 63	Lineament South / Meknes MV	HF	06.08.2018 17:20:00	35° 1.983'N	7° 4.344'W	883	
GeoB 23050-5	M149- 63	Lineament South / Meknes MV	HF	06.08.2018 18:43:00	35° 0.259'N	7° 4.380'W	759	
GeoB 23050-6	M149- 63	Lineament South / Meknes MV	HF	06.08.2018 19:46:00	34°59.404'N	7° 4.380'W	786	
GeoB 23050-7	M149- 63	Lineament South / Meknes MV	HF	06.08.2018 20:10:00	34°59.139'N	7° 4.390'W	693	
GeoB 23047-3	M149- 65	Ginsburg eastern rim	MeBo	07.08.2018 08:00:00	35°22.863'N	7° 4.128'W	1126	3594
GeoB 23052-1	M149- 66	Eastern rim of Rabat MV	GC	08.08.2018 10:01:00	35°19.053'N	7° 8.602'W	1186	415
GeoB 23053-1	M149- 67	Crest of R2 MV	GC	08.08.2018 12:56:00	35°28.494'N	7°24.253'W	1163	200
GeoB 23054-1	M149- 68	Crest of D2 MV	GC	08.08.2018 14:24:00	35°28.817'N	7°24.091'W	1194	35
GeoB 23056-1	M149- 70	Crest of El Cid MV	GC	08.08.2018 17:34:00	35°26.462'N	7°28.922'W	1229	144
GeoB 23057-1	M149- 71	Crest of Amanzor	GC	08.08.2018 19:10:00	35°22.978'N	7°30.352'W	1230	178
GeoB 23060-1	M149- 75	Lineament center	MeBo	09.08.2018 14:00:00	35°15.347'N	7° 5.155'W	1013	1390
GeoB 23062-1	M149- 77	Pull-apart basin, Lineament South branch	GC	10.08.18 08:59:00	35° 3.519'N	7°23.055'W	1334	450
GeoB 23063-1	M149- 78	Pull-apart basin, Lineament South	GC	10.08.18 10:33:00	35° 5.705'N	7°19.664'W	1282	481
GeoB 23064-1	M149- 79	Pull-apart basin, Lineament South	GC	10.08.18 11:50:00	35° 5.756'N	7°20.153'W	1278	437
GeoB 23066-1	M149- 81	Pull-apart basin, Lineament Center branch	GC	10.08.18 15:35:00	35°16.847'N	7°18.941'W	1310	513
GeoB 23067-1	M149- 82	Pull-apart basin, Lineament Center branch	GC	10.08.18 16:46:00	35°16.759'N	7°18.708'W	1304	375
GeoB 23069-1	M149- 84	Pull-apart basin, Lineament Center branch	MeBo	11.08.2018 08:00:00	35°16.976'N	7°19.309'W	1280	4145
GeoB 23070-1	M149- 85	Pull-apart basin Lineament Center	HF	12.08.18 13:25:00	35°16.968'N	7°19.306'W	1309	
GeoB 23070-2	M149- 86	Pull-apart basin Lineament Center	HF	12.08.18 13:25:00	35°17.195'N	7°19.437'W	1309	
GeoB 23071-1	M149- 86	Lineament Center branch	GC	12.08.2018 17:51:00	35°20.794'N	7°41.429'W	1810	385
GeoB 23073-1	M149- 88	Pull-apart basin Lineament South	MeBo	13.08.2018 07:00:00	35° 5.661'N	7°19.000'W	1281	4223

GeoB 23074-1	M149- 89	Pull-apart basin Lineament South	HF	14.08.2018 09:18:00	35° 5.675'N	7°19.683'W	1274	
GeoB 23076-1	M149- 90	Lineament South Branch	GC	14.08.2018 12:39:00	35° 0.020'N	7°37.048'W	1302	336
GeoB 23077-1	M149- 91	Buried MV#1	GC	14.08.2018 16:25:00	35°22.953'N	7°43.990'W	1651	563
GeoB 23078-1	M149- 93	Salt dome west	CTD+ RO	15.08.2018 07:25:00	34°45.933'N	9°36.722'W	4054	
GeoB 23078-2	M149- 93	Salt dome west	HF	15.08.2018 08:58:00	34°45.935'N	9°36.723'W	4048	
GeoB 23078-3	M149- 93	Salt dome west	GC	15.08.2018 14:30:00	34°45.934'N	9°36.726'W	4052	464
GeoB 23079-1	M149- 94	Seine Abyssal Plain	GC	15.08.2018 18:30:00	34°44.592'N	9°28.230'W	4260	522
GeoB 23080-1	M149- 95	Salt dome east	GC	15.08.2018 21:44:00	35°49.342'N	9°25.771'W	4084	400
GeoB 23081-1	M149- 96	Crest of Funky Monkey MV	GC	16.08.2018 04:09:00	34°58.441'N	8°37.952'W	3143	274
GeoB 23082-1	M149- 97	Buried MV#2	GC	16.08.2018 11:00:00	35°41.784'N	7°54.424'W	1481	480
GeoB 23083-1	M149- 98	N Gulf of Cadiz background	GC	16.08.2018 14:50:00	35°58.646'N	7°50.728'W	1309	387
GeoB 23084-1	M149- 99	Lolita salt dome	GC	16.08.2018 17:12:00	36° 9.213'N	8° 0.362'W	1269	436
GeoB 23085-1	M149- 100	Buried MV#3	GC	16.08.2018 20:40:00	35°50.816'N	7°40.497'W	1288	433
GeoB 23086-1	M149- 102	Carboneras fault reference	CTD+ RO	18.08.2018 06:46:00	36°26.297'N	2°50.855'W	840	
GeoB 23086-2	M149- 102	Carboneras fault reference	GC	18.08.2018 07:43:00	36°26.298'N	2°50.854'W	835	233
GeoB 23087-1	M149- 103	Carboneras fault east	GC	18.08.2018 09:14:00	36°25.390'N	2°48.596'W	905	524
GeoB 23088-1	M149- 104	Carboneras fault center	GC	18.08.2018 10:53:00	36°22.148'N	2°55.192'W	967	129
GeoB 23089-1	M149- 105	Carboneras fault west	GC	18.08.2018 12:50:00	36°18.609'N	3° 1.786'W	917	377
GeoB 23090-1	M149- 107	Carboneras fault	HF	19.08.2018 08:09:00	36°18.604'N	3° 1.789'W	917	
GeoB 23090-2	M149- 107	Carboneras fault	HF	19.08.2018 09:33:00	36°19.834'N	3° 0.009'W	1023	
GeoB 23090-3	M149- 107	Carboneras fault	HF	19.08.2018 10:55:00	36°21.087'N	2°57.735'W	987	
GeoB 23090-4	M149- 107	Carboneras fault	HF	19.08.2018 12:15:00	36°22.149'N	2°55.193'W	968	
GeoB 23090-5	M149- 107	Carboneras fault	HF	19.08.2018 13:46:00	36°23.557'N	2°52.441'W	958	
GeoB 23090-6	M149- 107	Carboneras fault	HF	19.08.2018 14:59:00	36°24.614'N	2°50.282'W	935	
GeoB 23090-7	M149- 107	Carboneras fault	HF	19.08.2018 16:12:00	36°25.318'N	2°48.590'W	907	
GeoB 23090-8	M149- 107	Carboneras fault	HF	19.08.2018 18:02:00	36°26.307'N	2°50.895'W	842	
GeoB 23091-1	M149- 109	Carboneras fault	MeBo	20.08.2018 07:00:00	36°23.308'N	2°52.275'W	968	1717
GeoB 23092-1	M149- 111	Al-Idrissi fault zone reference	GC	21.08.2018 07:51:00	35°38.588'N	3°44.898'W	899	555
GeoB 23093-1	M149- 112	Al-Idrissi fault north	GC	21.08.2018 09:11:00	35°38.383'N	3°41.446'W	829	537
GeoB 23094-1	M149- 113	Al-Idrissi fault center	GC	21.08.2018 10:30:00	35°34.850'N	3°43.117'W	798	390
GeoB	M149-	Al-Idrissi fault	GC	21.08.2018	35°31.065'N	3°44.079'W	530	542

23095-1	114	south		11:51:00				
GeoB 23096-1	M149- 116	Marrakech MV	CTD+ RO	22.08.2018 06:29:00	35°37.975'N	4°29.656'W	1120	
GeoB 23097-1	M149- 117	Marrakech MV	GC	22.08.2018 07:52:00	35°37.766IN	4°29.939IW	1066	565
GeoB 23098-1	M149- 118	Al-Idrissi fault	HF	22.08.2018 12:52:00	35°38.593IN	3°44.893IW	910	
GeoB 23098-2	M149- 118	Al-Idrissi fault	HF	22.08.2018 15:18:00	35°38.373IN	3°41.433IW	838	
GeoB 23098-3	M149- 118	Al-Idrissi fault	HF	22.08.2018 17:02:00	35°34.868IN	3°43.131IW	797	
GeoB 23098-4	M149- 118	Al-Idrissi fault	HF	22.08.2018 18:45:00	35°31.064IN	3°44.071IW	529	

Waypoints of multibeam and parasound profiles

Ship station	Date + Time	Action	Latitude	Longitude	Water depth (m)
M149-2	27.07.2018 20:34	profile start	35° 07.049' N	007° 08.499' W	965
M149-2	28.07.2018 00:07	alter course	35° 28.161' N	007° 08.512' W	1062
M149-2	28.07.2018 00:35	alter course	35° 28.417' N	007° 04.970' W	1114
M149-2	28.07.2018 03:09	alter course	35° 12.998' N	007° 04.616' W	929
M149-2	28.07.2018 03:39	alter course	35° 12.666' N	007° 01.263' W	935
M149-2	28.07.2018 05:15	profile end	35° 21.911' N	007° 00.992' W	960
M149-14	28.07.2018 21:26	profile start	35° 28.358' N	007° 06.346' W	1105
M149-14	28.07.2018 23:57	alter course	35° 12.874' N	007° 06.359' W	947
M149-14	29.07.2018 00:29	alter course	35° 12.674' N	007° 02.803' W	916
M149-14	29.07.2018 01:17	alter course	35° 17.260' N	007° 02.395' W	958
M149-14	29.07.2018 03:33	alter course	35° 20.216' N	007° 18.523' W	1253
M149-14	29.07.2018 03:48	alter course	35° 18.840' N	007° 18.852' W	1251
M149-14	29.07.2018 05:12	alter course	35° 16.898' N	007° 08.907' W	1171
M149-14	29.07.2018 05:26	alter course	35° 15.532' N	007° 08.592' W	1101
M149-14	29.07.2018 05:47	profile end	35° 15.563' N	007° 10.881' W	1162
M149-20	29.07.2018 17:48	profile start	35° 19.907' N	007° 08.569' W	1138
M149-20	29.07.2018 19:17	alter course	35° 21.280' N	007° 18.786' W	1278
M149-20	29.07.2018 20:03	alter course	35° 15.656' N	007° 18.642' W	1174
M149-20	29.07.2018 21:26	alter course	35° 13.972' N	007° 08.617' W	1027
M149-20	29.07.2018 21:43	alter course	35° 15.493' N	007° 08.680' W	1100

M149-20	29.07.2018 23:21	alter course	35° 17.059' N	007° 20.548' W	1215
M149-20	30.07.2018 01:05	alter course	35° 27.353' N	007° 20.879' W	1338
M149-20	30.07.2018 01:18	alter course	35° 27.584' N	007° 22.400' W	1291
M149-20	30.07.2018 03:26	alter course	35° 14.907' N	007° 22.672' W	1214
M149-20	30.07.2018 03:41	alter course	35° 14.575' N	007° 24.196' W	1237
M149-20	30.07.2018 05:26	profile end	35° 25.308' N	007° 24.620' W	1407
M149-32	30.07.2018 21:53	profile start	35° 22.974' N	007° 24.494' W	1312
M149-32	30.07.2018 23:04	alter course	35° 30.104' N	007° 24.655' W	1202
M149-32	30.07.2018 23:13	alter course	35° 30.224' N	007° 25.700' W	1218
M149-32	31.07.2018 01:48	alter course	35° 14.808' N	007° 25.899' W	1245
M149-32	31.07.2018 02:02	alter course	35° 14.650' N	007° 27.441' W	1264
M149-32	31.07.2018 04:33	alter course	35° 30.043' N	007° 27.501' W	1202
M149-32	31.07.2018 04:46	alter course	35° 30.333' N	007° 28.926' W	1253
M149-32	31.07.2018 05:00	profile end	35° 29.097' N	007° 29.307' W	1238
M149-38	31.07.2018 21:02	profile start	35° 30.124' N	007° 30.763' W	1458
M149-38	31.07.2018 23:36	alter course	35° 14.972' N	007° 31.132' W	1273
M149-38	31.07.2018 23:57	alter course	35° 14.723' N	007° 33.421' W	1318
M149-38	01.08.2018 01:26	alter course	35° 23.399' N	007° 33.683' W	1836
M149-38	01.08.2018 01:43	alter course	35° 23.458' N	007° 35.452' W	1435
M149-38	01.08.2018 03:10	alter course	35° 14.841' N	007° 35.715' W	1383
M149-38	01.08.2018 03:25	alter course	35° 14.663' N	007° 37.355' W	1440
M149-38	01.08.2018 04:51	alter course	35° 23.200' N	007° 37.737' W	1636
M149-38	01.08.2018 05:07	alter course	35° 23.435' N	007° 39.720' W	1544
M149-38	01.08.2018 06:34	profile end	35° 14.779' N	007° 40.156' W	1401
M149-45	01.08.2018 18:58	profile start	35° 07.782' N	007° 08.454' W	958
M149-45	01.08.2018 20:44	alter course	34° 57.069' N	007° 08.224' W	811
M149-45	01.08.2018 20:57	alter course	34° 57.109' N	007° 06.757' W	797
M149-45	01.08.2018 23:22	alter course	35° 12.164' N	007° 06.541' W	937
M149-45	01.08.2018 23:38	alter course	35° 12.263' N	007° 04.878' W	927
M149-45	02.08.2018 02:06	alter course	34° 57.609' N	007° 04.540' W	760
M149-45	02.08.2018	alter course	34° 57.378' N	007° 02.884' W	751

	02:22				
M149-45	02.08.2018 05:01	alter course	35° 12.056' N	007° 02.802' W	922
M149-45	02.08.2018 05:15	alter course	35° 12.298' N	007° 01.332' W	932
M149-45	02.08.2018 06:21	profile end	35° 05.780' N	007° 00.916' W	908
M149-52	02.08.2018 16:42	profile start	35° 05.318' N	007° 00.968' W	888
M149-52	02.08.2018 18:07	alter course	34° 57.585' N	007° 00.884' W	746
M149-52	02.08.2018 18:23	alter course	34° 57.294' N	006° 59.378' W	728
M149-52	02.08.2018 21:42	alter course	35° 17.765' N	006° 59.101' W	900
M149-52	02.08.2018 22:22	alter course	35° 19.579' N	007° 04.252' W	1047
M149-52	02.08.2018 23:38	alter course	35° 26.950' N	007° 06.673' W	1069
M149-52	03.08.2018 00:00	alter course	35° 26.890' N	007° 04.762' W	1078
M149-52	03.08.2018 00:45	alter course	35° 23.317' N	007° 07.701' W	1144
M149-52	03.08.2018 01:43	alter course	35° 23.144' N	007° 14.850' W	1233
M149-52	03.08.2018 02:47	alter course	35° 21.300' N	007° 08.086' W	1121
M149-52	03.08.2018 03:36	alter course	35° 23.485' N	007° 02.616' W	995
M149-52	03.08.2018 04:32	alter course	35° 28.927' N	007° 02.549' W	1048
M149-52	03.08.2018 04:50	alter course	35° 29.068' N	007° 00.935' W	1015
M149-52	03.08.2018 05:55	alter course	35° 22.616' N	007° 00.958' W	960
M149-52	03.08.2018 06:12	alter course	35° 22.343' N	007° 02.611' W	990
M149-52	03.08.2018 06:33	profile end	35° 20.253' N	007° 02.772' W	1002
M149-54	03.08.2018 23:25	profile start	35° 21.317' N	007° 02.744' W	1006
M149-54	03.08.2018 23:54	alter course	35° 17.496' N	007° 02.797' W	969
M149-54	04.08.2018 00:17	alter course	35° 17.109' N	006° 59.219' W	913
M149-54	04.08.2018 01:47	alter course	35° 28.994' N	006° 58.627' W	939
M149-54	04.08.2018 01:58	alter course	35° 29.197' N	006° 57.128' W	909
M149-54	04.08.2018 04:26	alter course	35° 09.647' N	006° 56.866' W	767
M149-54	04.08.2018 04:38	alter course	35° 09.219' N	006° 55.128' W	775
M149-54	04.08.2018 07:10	alter course	35° 29.006' N	006° 54.790' W	833
M149-54	04.08.2018 07:22	alter course	35° 28.767' N	006° 53.096' W	768
M149-54	04.08.2018 09:00	profile end	35° 15.840' N	006° 53.170' W	778
M149-59	04.08.2018 18:57	profile start	34° 57.085' N	007° 09.240' W	838

M149-59	04.08.2018 19:16	alter course	34° 57.482' N	007° 11.083' W	880
M149-59	04.08.2018 20:57	alter course	35° 14.013' N	007° 10.765' W	1083
M149-59	04.08.2018 21:07	alter course	35° 14.023' N	007° 12.566' W	1141
M149-59	04.08.2018 22:46	alter course	34° 57.242' N	007° 12.601' W	907
M149-59	04.08.2018 22:55	alter course	34° 57.286' N	007° 14.296' W	954
M149-59	05.08.2018 00:37	alter course	35° 14.542' N	007° 14.339' W	1177
M149-59	05.08.2018 00:46	alter course	35° 14.739' N	007° 15.928' W	1124
M149-59	05.08.2018 02:32	alter course	34° 57.262' N	007° 16.179' W	1052
M149-59	05.08.2018 02:40	alter course	34° 57.108' N	007° 17.741' W	1083
M149-59	05.08.2018 04:38	alter course	35° 17.059' N	007° 17.954' W	1183
M149-59	05.08.2018 04:46	alter course	35° 17.255' N	007° 19.371' W	1220
M149-59	05.08.2018 05:26	profile end	35° 10.778' N	007° 19.729' W	1142
M149-64	06.08.2018 21:54	profile start	34° 57.292' N	007° 18.378' W	1115
M149-64	06.08.2018 22:04	alter course	34° 57.378' N	007° 20.225' W	1192
M149-64	06.08.2018 23:47	alter course	35° 14.654' N	007° 20.337' W	1179
M149-64	06.08.2018 23:54	alter course	35° 14.822' N	007° 21.865' W	1195
M149-64	07.08.2018 01:39	alter course	34° 57.477' N	007° 22.085' W	1188
M149-64	07.08.2018 01:47	alter course	34° 57.292' N	007° 23.629' W	1293
M149-64	07.08.2018 03:27	alter course	35° 13.832' N	007° 23.676' W	1221
M149-64	07.08.2018 03:36	alter course	35° 14.061' N	007° 25.275' W	1227
M149-64	07.08.2018 04:30	profile end	35° 05.139' N	007° 25.549' W	1254
M149-69	08.08.2018 15:24	information	35° 29.122' N	007° 23.876' W	1224
M149-69	08.08.2018 16:11	alter course	35° 28.059' N	007° 24.480' W	1234
M149-69	08.08.2018 16:23	profile end	35° 29.178' N	007° 23.904' W	1221
M149-72	08.08.2018 21:40	profile start	35° 05.489' N	007° 25.576' W	1238
M149-72	08.08.2018 22:30	alter course	34° 57.278' N	007° 25.868' W	1296
M149-72	08.08.2018 22:40	alter course	34° 57.625' N	007° 27.460' W	1310
M149-72	09.08.2018 00:41	alter course	35° 15.769' N	007° 27.262' W	1253
M149-72	09.08.2018 00:54	alter course	35° 15.962' N	007° 28.834' W	1295
M149-72	09.08.2018 02:47	alter course	34° 57.419' N	007° 29.485' W	1359
M149-72	09.08.2018	alter course	34° 57.257' N	007° 31.087' W	1403

	02:56				
M149-72	09.08.2018 04:30	profile end	35° 12.075' N	007° 31.045' W	1269
M149-74	09.08.2018 11:46	profile start	35° 14.056' N	007° 05.167' W	941
M149-74	09.08.2018 12:22	profile end	35° 17.686' N	007° 05.163' W	1061
M149-76	10.08.2018 04:35	profile start	35° 11.625' N	007° 31.250' W	1280
M149-76	10.08.2018 04:58	alter course	35° 15.163' N	007° 31.278' W	1270
M149-76	10.08.2018 05:07	alter course	35° 15.201' N	007° 32.968' W	1294
M149-76	10.08.2018 06:56	alter course	34° 57.104' N	007° 33.390' W	1416
M149-76	10.08.2018 07:05	alter course	34° 56.795' N	007° 34.821' W	1557
M149-76	10.08.2018 07:24	profile end	34° 59.771' N	007° 34.871' W	1366
M149-80	10.08.2018 13:12	profile start	35° 06.136' N	007° 21.023' W	1238
M149-80	10.08.2018 13:32	alter course	35° 05.406' N	007° 18.867' W	1181
M149-80	10.08.2018 14:03	profile end	35° 07.119' N	007° 19.940' W	1193
M149-83	10.08.2018 18:44	profile start	35° 15.042' N	007° 34.928' W	1339
M149-83	10.08.2018 20:33	alter course	34° 56.795' N	007° 35.460' W	1530
M149-83	10.08.2018 20:42	alter course	34° 57.014' N	007° 37.056' W	1419
M149-83	10.08.2018 22:30	alter course	35° 14.938' N	007° 37.167' W	1437
M149-83	10.08.2018 22:38	alter course	35° 14.628' N	007° 38.760' W	1478
M149-83	11.08.2018 00:24	alter course	34° 57.039' N	007° 38.986' W	1478
M149-83	11.08.2018 00:33	alter course	34° 56.898' N	007° 40.712' W	1536
M149-83	11.08.2018 03:17	alter course	35° 24.252' N	007° 40.731' W	1507
M149-83	11.08.2018 03:26	alter course	35° 24.466' N	007° 42.333' W	1843
M149-83	11.08.2018 04:45	profile end	35° 11.103' N	007° 42.701' W	1564
M149-87	12.08.2018 19:25	profile start	35° 12.187' N	007° 42.673' W	1548
M149-87	12.08.2018 20:58	alter course	34° 56.946' N	007° 43.028' W	1691
M149-87	12.08.2018 21:06	alter course	34° 56.956' N	007° 44.385' W	1761
M149-87	12.08.2018 23:49	alter course	35° 24.208' N	007° 44.493' W	1749
M149-87	12.08.2018 23:58	alter course	35° 24.378' N	007° 46.088' W	1743
M149-87	13.08.2018 02:44	alter course	34° 56.987' N	007° 46.524' W	1738
M149-87	13.08.2018 02:51	alter course	34° 56.852' N	007° 47.821' W	1878
M149-87	13.08.2018 04:30	profile end	35° 12.964' N	007° 48.105' W	2054

M149-92	14.08.2018 22:05	profile start	34° 58.679' N	008° 37.317' W	3197
M149-92	14.08.2018 22:17	alter course	34° 58.281' N	008° 38.668' W	3204
M149-92	15.08.2018 01:33	alter course	34° 55.869' N	009° 08.711' W	3744
M149-92	15.08.2018 01:51	alter course	34° 55.804' N	009° 10.838' W	3951
M149-92	15.08.2018 03:23	alter course	34° 50.068' N	009° 23.863' W	4065
M149-92	15.08.2018 05:35	profile end	34° 45.087' N	009° 39.881' W	4250
M149-101	17.08.2018 14:47	profile start	36° 09.647' N	003° 11.874' W	889
M149-101	17.08.2018 15:00	alter course	36° 10.757' N	003° 09.640' W	917
M149-101	17.08.2018 17:24	alter course	36° 23.052' N	002° 44.938' W	1104
M149-101	17.08.2018 17:34	alter course	36° 24.372' N	002° 45.851' W	1011
M149-101	17.08.2018 19:58	alter course	36° 12.670' N	003° 10.820' W	931
M149-101	17.08.2018 20:07	alter course	36° 13.799' N	003° 10.968' W	890
M149-1011	17.08.2018 22:39	alter course	36° 25.952' N	002° 47.617' W	886
M149-101	17.08.2018 22:46	alter course	36° 26.744' N	002° 48.692' W	851
M149-101	18.08.2018 00:54	alter course	36° 15.870' N	003° 10.988' W	858
M149-101	18.08.2018 03:23	alter course	36° 27.855' N	002° 50.330' W	753
M149-101	18.08.2018 03:33	alter course	36° 29.172' N	002° 51.410' W	622
M149-101	18.08.2018 04:52	profile end	36° 22.064' N	003° 05.791' W	931
M149-106	18.08.2018 14:03	profile start	36° 16.273' N	003° 02.992' W	849
M149-106	18.08.2018 14:33	alter course	36° 18.883' N	003° 04.574' W	918
M149-106	18.08.2018 14:58	alter course	36° 19.877' N	003° 03.068' W	972
M149-106	18.08.2018 15:30	alter course	36° 17.564' N	003° 01.135' W	933
M149-106	18.08.2018 15:50	alter course	36° 18.239' N	002° 59.206' W	967
M149-106	18.08.2018 16:18	alter course	36° 20.685' N	003° 00.548' W	954
M149-106	18.08.2018 16:42	alter course	36° 21.912' N	002° 58.630' W	917
M149-106	18.08.2018 17:09	alter course	36° 19.771' N	002° 56.970' W	1072
M149-106	18.08.2018 17:31	alter course	36° 20.601' N	002° 54.640' W	1074
M149-106	18.08.2018 18:03	alter course	36° 23.479' N	002° 55.842' W	879
M149-106	18.08.2018 18:30	alter course	36° 24.706' N	002° 53.432' W	853
M149-106	18.08.2018 19:07	alter course	36° 22.566' N	002° 51.403' W	1042
M149-106	18.08.2018	alter course	36° 23.662' N	002° 49.690' W	1011

	19:25				
M149-106	18.08.2018 19:49	alter course	36° 25.861' N	002° 50.860' W	861
M149-106	18.08.2018 20:01	alter course	36° 26.490' N	002° 49.670' W	849
M149-106	18.08.2018 20:31	alter course	36° 24.312' N	002° 47.667' W	665
M149-106	18.08.2018 20:50	alter course	36° 23.892' N	002° 45.277' W	1055
M149-106	18.08.2018 21:14	alter course	36° 21.891' N	002° 43.605' W	1187
M149-106	19.08.2018 00:49	alter course	36° 03.771' N	003° 21.130' W	1154
M149-106	19.08.2018 02:31	alter course	35° 48.596' N	003° 30.903' W	1261
M149-106	19.08.2018 02:42	alter course	35° 49.166' N	003° 32.463' W	1410
M149-106	19.08.2018 04:31	alter course	36° 04.389' N	003° 23.118' W	989
M149-106	19.08.2018 05:46	profile end	36° 12.096' N	003° 11.685' W	916
M149-108	19.08.2018 21:13	profile start	36° 09.431' N	003° 12.648' W	905
M149-108	19.08.2018 22:13	alter course	36° 04.144' N	003° 23.511' W	1020
M149-108	19.08.2018 22:39	alter course	36° 00.485' N	003° 25.919' W	1173
M149-108	19.08.2018 22:49	alter course	36° 00.886' N	003° 27.404' W	1062
M149-108	19.08.2018 23:22	in the water	36° 05.216' N	003° 24.859' W	915
M149-108	20.08.2018 00:44	alter course	36° 12.375' N	003° 10.715' W	898
M149-108	20.08.2018 00:53	alter course	36° 13.598' N	003° 11.294' W	942
M149-108	20.08.2018 02:16	alter course	36° 06.712' N	003° 25.768' W	844
M149-108	20.08.2018 02:24	alter course	36° 07.726' N	003° 26.455' W	827
M149-108	20.08.2018 03:58	profile end	36° 16.321' N	003° 10.255' W	870
M149-110	20.08.2018 21:31	profile start	36° 00.921' N	003° 27.691' W	1054
M149-110	21.08.2018 00:57	alter course	35° 30.028' N	003° 47.082' W	1395
M149-110	21.08.2018 01:11	alter course	35° 29.855' N	003° 45.396' W	994
M149-110	21.08.2018 03:34	alter course	35° 49.381' N	003° 33.335' W	1443
M149-110	21.08.2018 03:42	alter course	35° 48.782' N	003° 31.665' W	1367
M149-110	21.08.2018 05:44	alter course	35° 30.426' N	003° 43.084' W	536
M149-110	21.08.2018 05:55	alter course	35° 30.117' N	003° 41.492' W	718
M149-110	21.08.2018 06:28	alter course	35° 35.096' N	003° 38.732' W	643
M149-110	21.08.2018 07:07	profile end	35° 38.566' N	003° 45.041' W	910
M149-115	21.08.2018 12:50	profile start	35° 29.866' N	003° 44.383' W	510

M149-115	21.08.2018 14:16	alter course	35° 42.346' N	003° 36.401' W	678
M149-115	21.08.2018 14:40	alter course	35° 42.358' N	003° 40.986' W	1078
M149-115	21.08.2018 15:17	alter course	35° 36.782' N	003° 44.341' W	723
M149-115	21.08.2018 15:27	alter course	35° 35.375' N	003° 43.698' W	596
M149-115	21.08.2018 16:02	alter course	35° 29.890' N	003° 46.221' W	434
M149-115	21.08.2018 16:07	alter course	35° 29.864' N	003° 47.234' W	324
M149-115	21.08.2018 16:54	alter course	35° 36.207' N	003° 44.576' W	731
M149-115	21.08.2018 16:58	alter course	35° 36.708' N	003° 45.448' W	768
M149-115	21.08.2018 17:46	alter course	35° 29.356' N	003° 49.672' W	152
M149-115	21.08.2018 18:22	alter course	35° 30.027' N	003° 56.736' W	363
M149-115	21.08.2018 19:00	alter course	35° 30.749' N	004° 04.297' W	324
M149-115	21.08.2018 20:27	alter course	35° 25.082' N	004° 19.988' W	105
M149-115	21.08.2018 22:04	alter course	35° 39.878' N	004° 28.682' W	1377
M149-115	21.08.2018 22:16	alter course	35° 39.436' N	004° 30.128' W	1329
M149-115	21.08.2018 23:59	alter course	35° 24.709' N	004° 21.591' W	105
M149-115	22.08.2018 00:07	alter course	35° 23.969' N	004° 22.600' W	104
M149-115	22.08.2018 01:45	alter course	35° 38.191' N	004° 31.418' W	1116
M149-115	22.08.2018 01:52	alter course	35° 38.003' N	004° 32.434' W	1021
M149-115	22.08.2018 03:30	alter course	35° 23.821' N	004° 24.226' W	98
M149-115	22.08.2018 03:37	alter course	35° 23.305' N	004° 24.958' W	97
M149-115	22.08.2018 05:14	station end	35° 37.406' N	004° 34.181' W	1007
M149-119	22.08.2018 20:31	profile start	35° 41.970' N	003° 41.672' W	1065
M149-119	22.08.2018 21:07	alter course	35° 47.418' N	003° 38.656' W	1399
M149-119	22.08.2018 21:16	alter course	35° 48.097' N	003° 40.049' W	1412
M149-119	22.08.2018 23:24	alter course	35° 28.813' N	003° 49.978' W	217
M149-119	23.08.2018 02:13	alter course	35° 32.252' N	004° 23.483' W	802
M149-119	23.08.2018 02:21	alter course	35° 33.409' N	004° 23.933' W	991
M149-119	23.08.2018 05:04	alter course	35° 30.049' N	003° 51.118' W	116
M149-119	23.08.2018 05:11	alter course	35° 30.862' N	003° 50.444' W	112
M149-119	23.08.2018 06:46	alter course	35° 33.344' N	004° 09.744' W	965
M149-119	23.08.2018	alter course	35° 32.579' N	003° 49.784' W	166

	08:29				
M149-119	23.08.2018 10:00	profile end	35° 46.872' N	003° 42.497' W	1429