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The Expedition of the Research Vessel "Sonne" to the Mozambique Basin in 2014 (SO230)

Edited by
Wilfried Jokat
with contributions of the participants

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RV "Sonne" Cruise SO230
29 December 2013 - 18 February 2014
Durban - Durban

Asymmetrisches Aufbrechen von Gondwana im Mosambik Becken (MOCOM)

und

Der passive und der gescherte Kontinentrand vor Mosambik: Früher Zerfall Gondwanas und der rezente Einfluss des ostafrikanischen Riftsystems (Page_Four)

Asymmetric Breakup of Gondwana in the Mozambique Basin (MOCOM)

and

The passive and rifted continental margin off Mozambique: Early dispersal of Gondwana and the recent influence of the East African rift system (PAGE_Four)

Fahrtleiter/Chief Scientist
Wilfried Jokat

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1. ZUSAMMENFASSUNG UND FAHRTVERLAUF

Wilfried Jokat AWI

Das Zielgebiet für den Fahrtabschnitt SO230 war der Kontinentrand von Zentral- und Nordmosambik. Das Forschungsvorhaben hatte zum Ziel die geologische Entwicklung dieser Region zur Zeit des späten Juras zu untersuchen. Diese Untersuchungen vor der Sambesi-Küste werden es uns ermöglichen, diese Erkenntnisse mit ähnlichen Resultaten entlang des konjugierenden Kontinentrandes vor der Ostantarktis zu vergleichen. Sowohl die Struktur des Kontinentrandes sowie die Geometrie des Kontinent-Ozean Überganges entlang beider Kontinenträndern sind wichtige Eingabeparameter für geodynamische Modelle, um den Aufbruch von Gondwana zu erklären.

Im ersten Teil der Reise SO230 haben wir die tiefere Struktur des Kontinentrandes vor Zentralmosambik untersucht, hier insbesondere das Beira Hoch, um dessen Struktur und geologische Entwicklung einzugrenzen. Am 5. Januar wurden die ersten von insgesamt 37 Ozeanbodenseismometern (OBS) entlang des 373 km langen Profils ausgelegt. Nachdem dieses Experiment am 10. Januar erfolgreich abgeschlossen war, wurde das vorhandene magnetische Netzwerk vor dem Sambesi Delta verdichtet. Dabei wurde die Lage alter Profile, die in 2005 mit FS *Sonne* und 2007 mit FS *Marion Dufresne* erhoben wurden, berücksichtigt. Zu unserer Überraschung hat das Beira Hoch eine magnetische Signatur, die nicht für den restlichen Kontinentrand typisch ist.

Im zweiten Teil dieses Fahrtabschnittes untersuchten wir ab dem 20. Januar den Übergang vom passiven Kontinentrand vor Zentralmosambik zum gescherten Kontinentrand (Davie Rücken) von Nordmosambik mit insgesamt vier tiefenseismischen Profilen. Die Profile wurden zwischen dem 20. Januar und 4. Februar 2014 vermessen. Der Profilabstand in Nord-Süd Richtung variiert zwischen 160 und 230 km. Hier kamen 20 - 25 OBS je Profil mit einem Abstand von jeweils 9 – 14 km zum Einsatz. Die Länge der Profile variiert zwischen 180 und 360 km. Da der Kontinentrand vor Nordmosambik sowie der Davie Rücken sehr schmal sind, waren die drei nördlichsten Linien relativ kurz. Damit wurde der gescherte Kontinentrand vor Nordmosambik auf einer Länge von 580 km untersucht, um die Krustenvariationen des Davie Rückens zu erfassen. Insgesamt wurden im Messgebiet tiefenseismische Profile mit einer Gesamtlänge von 1.360 km erhoben. Hierfür wurden 127 OBS/OBH entlang der fünf Profile eingesetzt und erfolgreich geborgen. Die landwärtige Verlängerung der tiefenseismischen Profile war leider nicht möglich, da wir keine entsprechende Forschungsgenehmigung der mosambikanischen Behörden erhielten. Die Datenqualität ist sehr gut bis befriedigend, so dass die wissenschaftlichen Ziele des Projektes erreicht werden können. Magnetische und gravimetrische Daten wurden fast entlang der gesamten Fahrtroute erhoben. Insgesamt wurden 12.181 km magnetische und 17.942 km gravimetrische Daten auf diesem Fahrtabschnitt gesammelt.

Nachdem wir die seismischen und magnetischen Projekte im Norden von Mosambik beendet hatten, führten wir eine detaillierte, flächige Fächersonarvermessung des Kerimbas Grabens durch. Ziel war es, am Meeresboden Strukturen zu identifizieren, die Hinweise auf neotektonische Aktivitäten in dieser Region erlauben. Die Vermessung fand zwischen dem 5. und 9. Februar 2014 statt. Eine erste Durchsicht der Fächersonar- und Parasounddaten liefert leider keine Hinweise auf große, neotektonische Versätze des Meeresbodens. Diese Daten sollen erneut begutachtet werden, wenn die reflektionsseismischen Daten des Fahrtabschnittes SO231 zur Verfügung stehen. Insgesamt wurden Fächsonar- (82.282 km²) und Parasounddaten während fast der gesamten Expedition erhoben. Zusammen mit den alten und der kommenden Expedition repräsentiert dies die umfangreichste Datenbasis, um junge Sedimentationsprozesse in dieser Region zu interpretieren und verstehen zu können. Um alle Experimente durchzuführen, legte FS *Sonne* auf dieser Expedition insgesamt 17.942 km (96.88 SM) zurück.

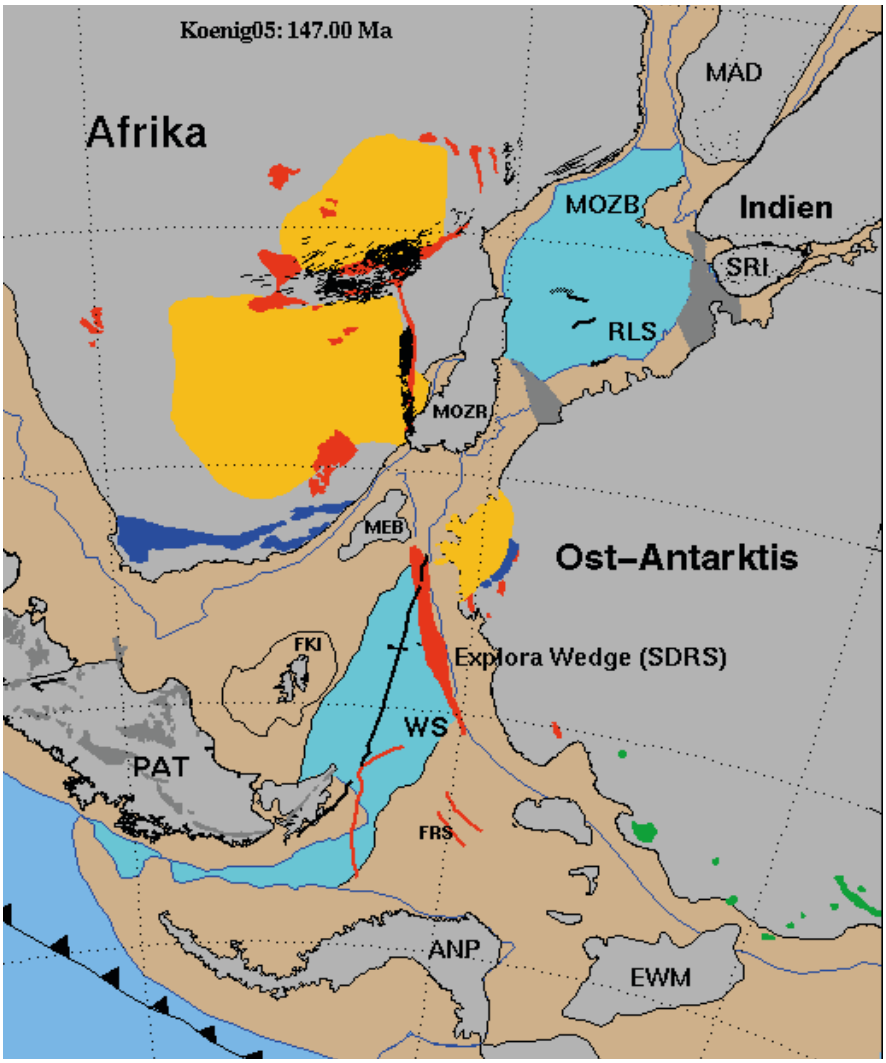

Fig. 1.1: Position of southern continents some 147 Ma ago (König and Jokat, 2006). The geophysical experiment was conducted in the northern basin (light blue). Red labelled areas: Regions, which are covered by basalts. Abbreviations: ANP: Antarctic Peninsula, ELW: Ellsworth Whitmore Mountains, FKI: Falkland Islands, FRS: Filchner-Ronne Shelf, IND: India; MAD: Madagascar, MEB: Maurice Ewing Bank, MOZR: Mozambique Ridge, PAT: Patagonia, SRI: Sri Lanka, WS: Weddell Sea.

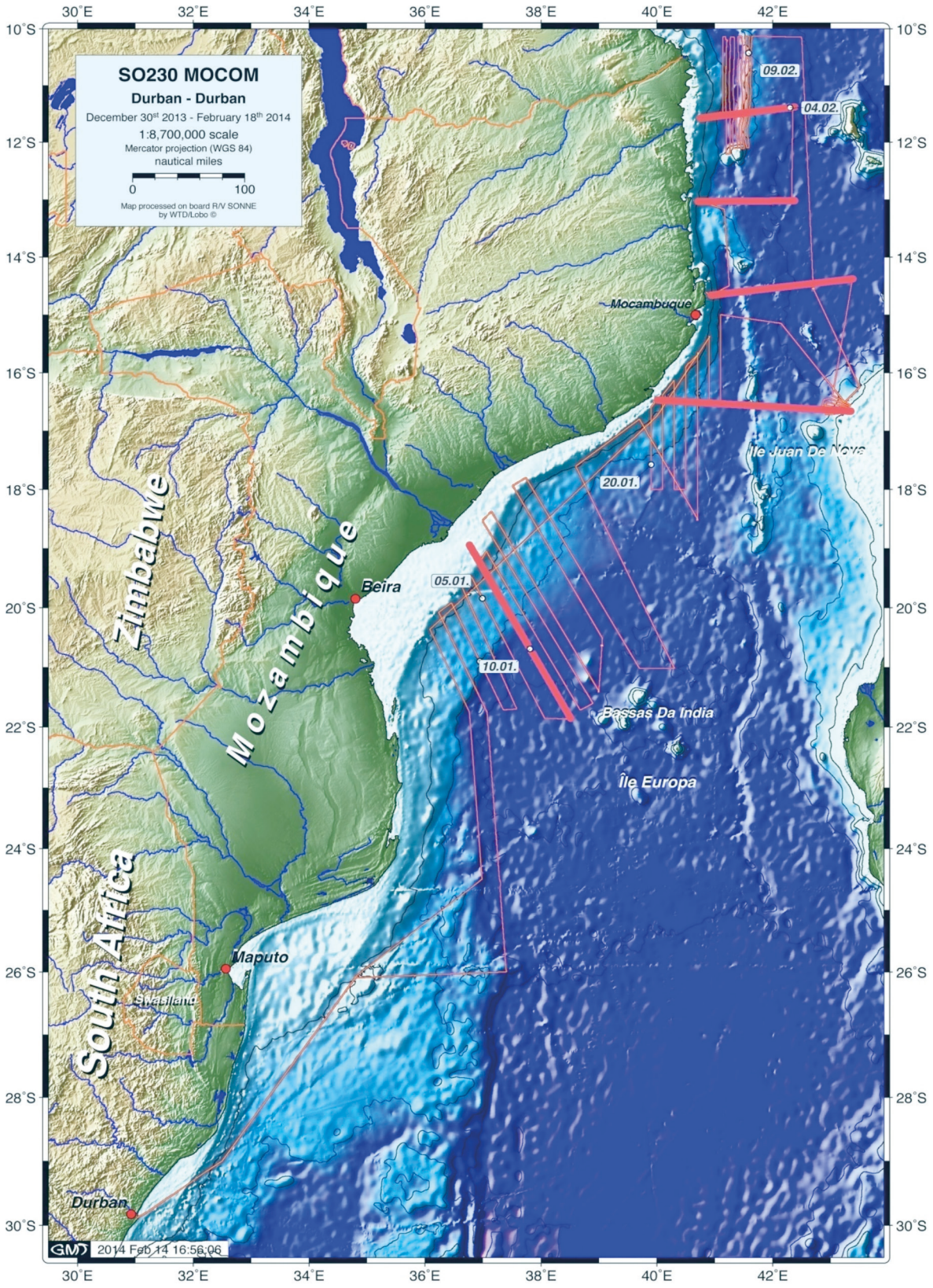

Fig. 1.2: General cruise track of SO230. The bold red lines indicate the position of the deep seismic sounding lines.

ITINERARY AND SUMMARY

The target area for the geophysical experiments on leg SO230 was focussed on the continental margins of central and northern Mozambique. The project aims to investigate its evolution in the Late Jurassic. The classification of the rifted margin along the Zambezi coast will enable comparison with the conjugate margin off East Antarctica. Both the structure of the margins and the geometry of the continent-ocean transition are critical input parameters for geodynamic models to better understand Gondwana break-up.

In the first part of the cruise SO230 we investigated the deeper structure of the continental margin off central Mozambique, namely the Beira High, to better constrain the fabric and evolution of this structure. On January, 5th, we started to deploy 37 oceanbottom seismometers along a 373 km long profile. After this experiment was finished on January 10th we conducted an extensive magnetic programme to densify the existing magnetic data from expeditions in 2005 (RV *Sonne*) and 2007 (RV *Marion Dufresne*) offshore of the Zambezi Delta. Much to our surprise there seems to exist a distinct magnetic pattern across the Beira High which is not typical at all for the remaining margin.

In the second part from January 20th onwards, we investigated the transition from the rifted continental margin off central Mozambique to the sheared margin (Davie Ridge) of northern Mozambique with four seismic refraction lines. These lines were acquired between January 20th and February 4th. Their south-north spacing varied between 160 to 230 km. The number of OBS ranged between 20 to 25 with a spacing of 9-14 km. Their length varied between 180 and 360 km. Since the continental margin and the Davie Ridge are quite narrow structures, the last three northern seismic lines were rather short. The northern margin was investigated in a N-S direction along 580 km to decipher the variations in the crustal fabric of this sheared margin. Along both segments of the Mozambican margin the total length of the seismic profiles is 1,360 km, and 127 OBS/OBH were deployed/retrieved along the five deep seismic sounding lines. Unfortunately, the planned landward extension of our deep seismic sound profiles could not be achieved since no research permit was received from the Mozambican authorities. The OBS data quality is moderate to excellent, and will allow achievement of the scientific goals of the project. Magnetic and gravity data were along most of the tracks. In total 12,181 km magnetic and 17,942 km gravity data were gathered.

After the termination of the main deep seismic and magnetic projects at the northern end of our seismic network, we conducted a detailed swath bathymetric survey to investigate neotectonic structures in the Kerimbas Graben. The survey lasted from February 5th to 9th. However, no large scale structures were found neither in the swath bathymetric nor in the sediment parasound data. They will be investigated/interpreted in greater detail, if the seismic reflection data from leg SO231 will be available. In total, swath bathymetric (82,282 km²) and parasound data were collected for most of the cruise. Together with the previous and upcoming cruises this is the most extensive scientific data base off eastern Africa allowing interpretation and understanding of recent sedimentary processes. Finally, *Sonne* sailed in total 17,942 km (9,688 nm) during our experiments.

2. MARINE GEOPHYSICS

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[1]AWI
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Objectives

Geophysical investigations along the continental margins of South-East Africa were carried out until the end of the 1980s. Industrial seismic data were measured predominantly on the continental shelf. They do not allow any interpretation with regard to the regional geology and their relevance for the break-up processes that occurred approximately 160 years million ago because they do not cover the continent-ocean boundary or the adjacent deep sea areas. French experiments revealed for the first time information on the sediment distribution in the Natal Basin, Mozambique Ridge and in the Mozambique Channel. A preliminary dating of horizons was carried out with the help of the existing scientific and industrial drilling (Raillard, 1990).

The knowledge of the entire continental margin off East Africa (from South Africa to Kenya) is very poor with regard to its crustal structure. Old deep seismic surveys were limited to the use of sonobuoys, which provided only sparse information on the crustal structure. The fragmentary wide-angle data are difficult to interpret and completely unsuitable for a modern interpretation. Thus, we are missing concrete information on the geometry and position the continent-ocean boundary (COB) especially off Mozambique (Raillard, 1990; Watts, 2001). The modelling of this geological border with the help of gravity data (Watts, 2001) is a first attempt to understand the deeper structure of the region around the port of Beira. A hypothesis of this modelling is that the COB is marked by volcanic rocks, which are located about 300 km west of the present coast. Southern Mozambique would be, according to this hypothesis, underlain mostly by Mesozoic oceanic crust. A confirmation or refutation of this hypothesis would have significant impact on early Gondwana reconstruction.

Unfortunately, there are no deep seismic reflection data, nor wide angle data, which may contribute to the clarification of this question. The old, existing industrial data have been recorded only up to 6 s which is too short for imaging the structure of the lower crust. The same limitation is true for the seismic data that have been collected by French institutions.

AWI/BGR have tried since 2005 to close those gaps with BMBF and BMWi funds. In the years 2000 to 2005 detailed magnetic measurements both in Antarctica (Jokat et al., 2003) as well as in the Mozambique Channel (SO183, 2005) were carried out. The goal was to acquire systematic marine magnetic data for a kinematic

modelling rather than having random tracks available. The measurements in Antarctica were acquired with a spacing of about 10 km, while the spacing in the Mozambique Channel (Jokat, 2006) was 30 km maximum. In the northern Mozambique Channel the magnetic measurements terminated in 2005, where at the time of the experiment the COB was suggested. Additional magnetic measurements with the *Marion Dufresne* in 2007 proved that the COB location was close to the Mozambican coast. However, as a result of both magnetic data sets (Antarctica, south-east Africa) a significantly improved geodynamic model for the relative movements between Africa and Antarctica for the period of approximately 155-120 million years ago could be calculated (König and Jokat, 2010). However the location of COB remained unknown, and consequently the initial fit of Africa and Antarctica in the early rift stages was still speculative.

In the summer of 2007 the first modern deep seismic profiles were acquired across the entire continental margin of cental Mozambique under a German French cooperation (BGR/AWI/IFREMER) (Leinweber et al., 2013). The seismic data as well as the magnetic gradiometer data acquired parallel to the seismic lines showed that the oceanic crust is around 300 km closer to the coast than previously accepted (Raillard, 1990). In addition to seismic studies, two deep seismic profiles as well as continuous magnetic and gravity were acquired. The results (Leinweber and Jokat, 2012; Leinweber et al., 2013 for details)can be summarized as follows:

The seismic data show very weak seaward sloping volcanic layers (seaward-dipping reflectors, SDR) on two profiles. These structures are, however, much closer to the modern continental margin than previously assumed.

The continent-ocean transition along the two refraction profiles is located very close to the coast. Furthermore, the transition area seems very sharp.

South of these two refraction profiles, the Beira High obviously represents a different segment of the continental margin. The seismic data as well as the potential field data show clear structural changes. It is unclear whether this covered structure is a basement high or a drift body. This could not be verified in the existing time frame of the expedition in 2007 with a deep seismic line. The Beira High stretches over almost half of the continental margin between Beira and the Davis Fracture Zone. Thus, it is questionable as to how typical these two northern lines are for the entire continental margin.

The four magnetic lines acquired in a NW-SE direction show surprising results. The northern end of the profile shows a prominent negative magnetic anomaly just above the area where SDRs were found. On the two eastern lines amplitudes south of the negative anomaly are extremely small, which would be compatible with oceanic crust of the so-called Jurassic quiet zone (older than M25). In contrast, the two western profiles via the Beira High show strong magnetic anomalies. This could mean that the structures formed at different times and that the break-up was more complex than indicated by the magnetic data from Antarctic. Here, a continuously positive anomaly with up to 600 nT has been mapped.

A recent publication about the position of the COB along the conjugate Antarctic margin (Leitchenkov et al., 2008) shows crustal variations which, as yet, has not been found off Mozambique. A comparison is not possible since crustal data are lacking south of the Zambezi river mouth. Although the Russian crustal data are based on sonobuoys, they indicate that the breakup might be strongly asymmetric, as also indicated by the magnetics and gravimetry off Mozambique.

The two BMBF projects MOCOM and PAGE_Four aim to gather details on sedimentary and crustal structures of the entire margin especially the transition from a rifted to a sheared margin. For conducting the experiments the *Sonne* has been used on two legs (SO230 and SO231). Here, we report on the activities during the first cruise.

Preliminary (expected) results

- The deep seismic data across the Beira High (20140010) indicates that there is thick oceanic crust present. Thus most of the present-day Zambezi delta is underlain by oceanic or transitional crust. The magnetic data clearly show the presence of magnetic spreading anomalies, the age of which is to be determined.
- The seismic profiles (4) across the northern margin, especially the Davie Ridge, indicate strong crustal variations. From a first analysis there are indications that small areas of oceanic crust exist between the Davie Ridge and the Mozambique continental margin. Currently no interpretation for the crustal composition of the Davie Ridge and its variations can be provided.
- The northernmost rift basin offshore of northern Mozambique (Rovuma Basin, Kerimbas Graben) were swath mapped to investigate the presence of young faults penetrating the sea floor. Only few indications for faults cutting the sea floor were found based on Parasound data. These data will be interpreted together with the seismic reflection data gathered during the expedition SO231.

2.1 Deployment of ocean bottom seismometers

Jürgen Gossler[2], Maren Bätzel[1], Jude Castelino[1], Tobias Gerach[1], Jürgen Gossler[2], Bastian Kimmel[1], Claudia Klemt[1], Christian Müller[1], Dietmar Penshorn[1], Antje Schlömer[1], Bernhard Schmitz[1], Matthias Schneider[1]

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Objectives

Existing modern geophysical data sets off Mozambique/Astrid Ridge show that the breakup of Africa/Antarctica was obviously asymmetrical. To what extent the geophysical observations along the conjugate margins are compatible with each other is unclear due to lack of data. The latest model including all available information can be found in Leinweber and Jokat (2012).

The new deep seismic profiles data collected were planned to provide constraints on the Beira High and the northern Mozambican margin. The two northern profiles gathered in 2007 (Leinweber et al., 2013) show very similar crustal structures. We expect a much different crustal fabric across the Beira High. The planned new profile will first clarify whether the Beira Hoch a) consists of continental crust or has a continental core has or whether it is a pure magmatic structure ("outer high"), b) a lower crustal high velocity body exists (Watts, 2001), and if so c) how far the thickened oceanic crust to the south continues. This profile was extended up to the magnetic anomaly M21/22 with several ocean bottom seismometer stations (OBS). There is a very pronounced lower crustal high velocity body along the two

profiles acquired in 2007. As the Beira High covers almost 50 % of the continental margin of central Mozambique, a sound tectonic understanding of this structure is absolutely necessary to better understand the breakup processes in this area.

The northern four lines (Fig. 2.1.1) aim to investigate the crustal variations of the northern sheared Mozambique margin. Furthermore, they should provide constraints on the crustal fabric and evolution of the Davie Ridge. The later data analysis should show whether the ridge might be a continental fragment or consist of igneous oceanic crust.

The seismic profile across the Beira High as well as the profiles across the Davie Ridge should have been extended with up to 10 land stations up to 100 km into the continent. If the assumption is true that parts of southern Mozambique are underlain by oceanic crust, this would be the most northerly position to find evidence for this. However, as there was no research permission received from the Mozambican government, this part of the experiment could not be achieved.

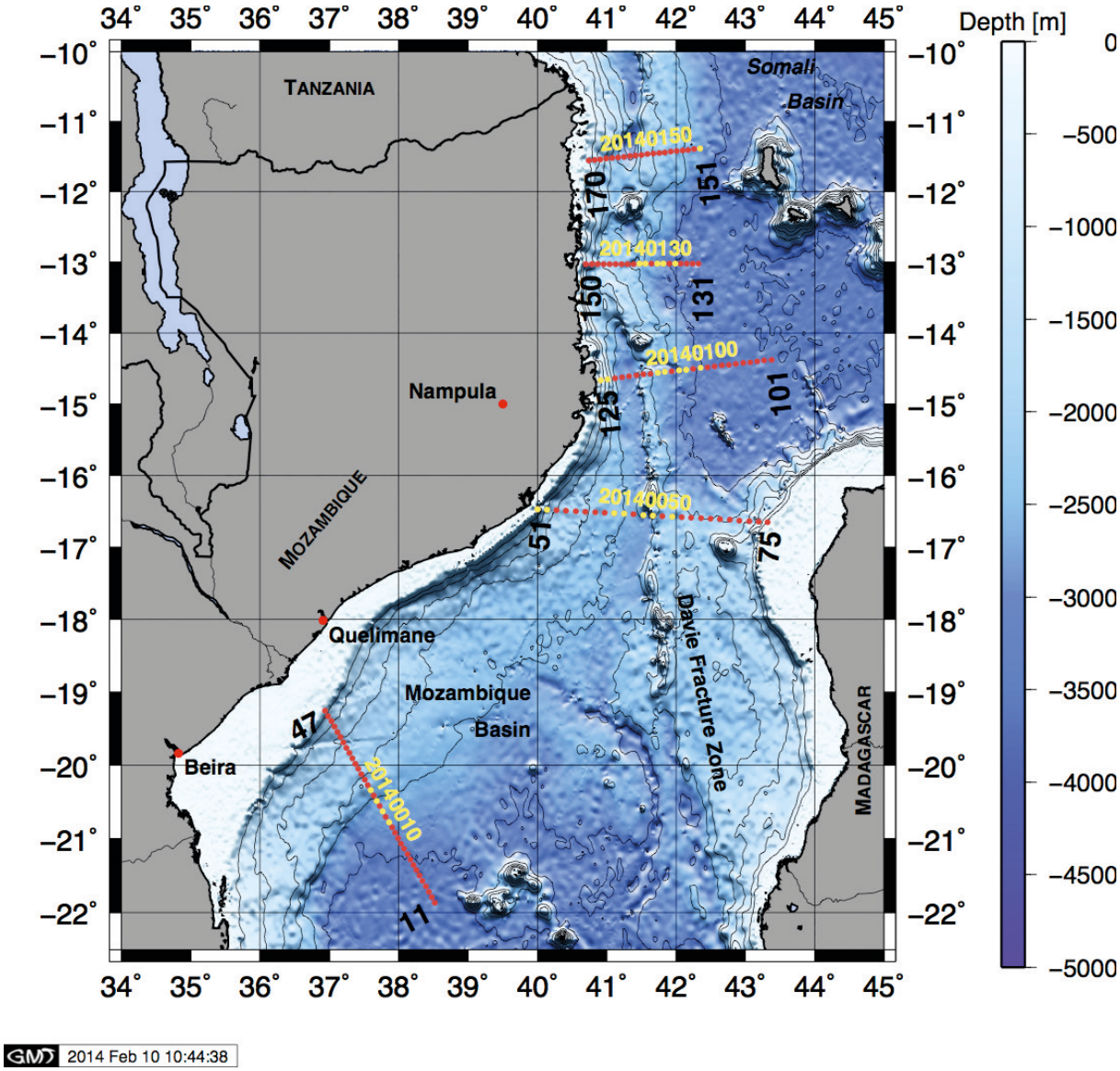


Fig. 2.1.1: Map of survey area with OBS (red dots) and OBH (yellow dots) locations

Work at sea

Method and equipment

The application of deep crustal seismic methods was one of the primary operational objectives of SO230 in order to reveal the deep structure and velocity distribution of the crust and crust-mantle boundary. We applied seismic refraction techniques deploying Ocean Bottom Seismometers (OBS) and Ocean Bottom Hydrophones (OBH). In total 33 OBS of different types (4 LOBSTERS, 9 cube designed, 20 2002-designed) and 7 OBH were used. Every OBS system (Fig. 2.1.2) consists of a frame with 4 flotation units, one titanium pressure cylinder, a 3-component seismometer, a hydrophone, an acoustic release unit, a flash light, a flag, a radio beacon, a swimming line with a small flotation ball and an anchor weight. The pressure cylinder contains the data logger and a power supply. Different types of acoustic release units (KUMQuat and IXSea) were used, both communicating via the K/MT 8011M deck unit. The data loggers (Marine Longtime Recorder (MLS), Marine Tsunameter Seismocoder (MTS) and Marine Broadband Seismic Recorder (MBS)) were programmed by SENDCOM software using a connected laptop.

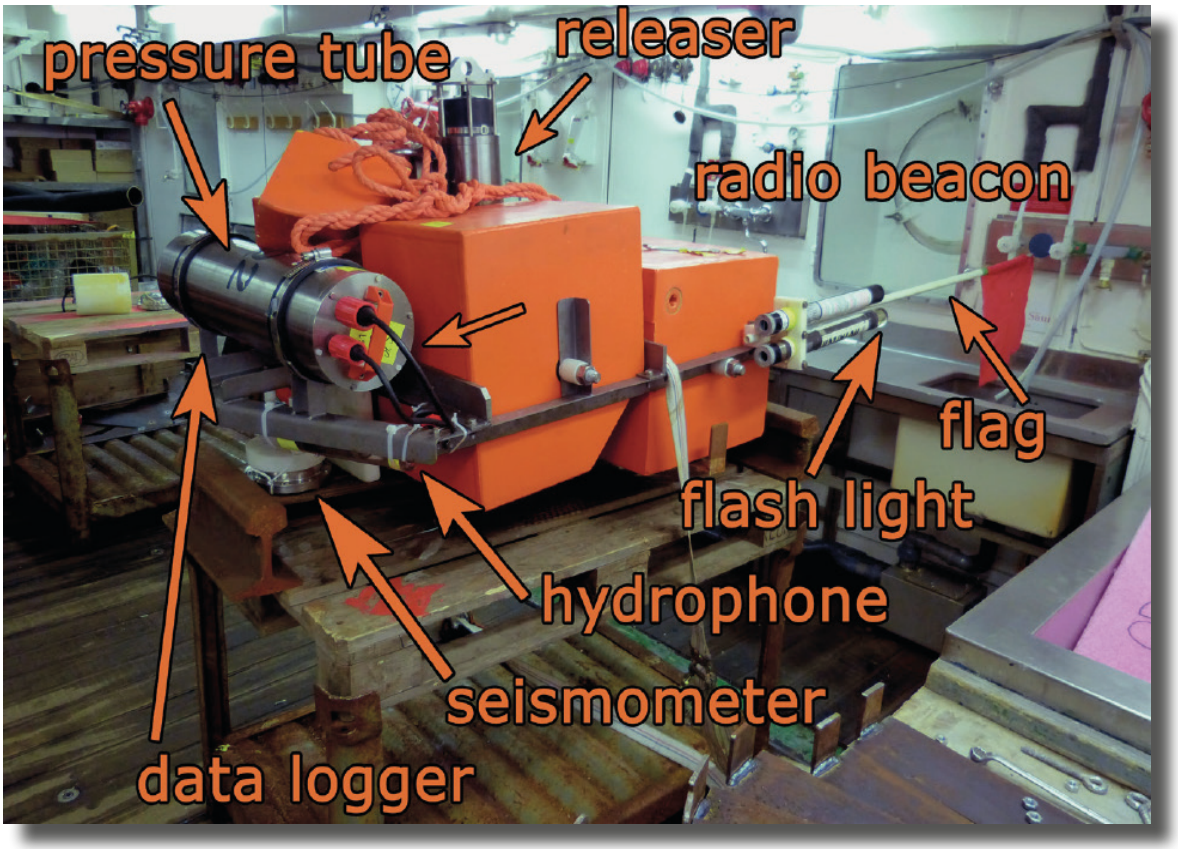


Fig. 2.1.2: Ocean Bottom Seismometer (OBS) with main components indicated

The OBH (Figs. 2.1.3, 2.1.4) is a steel tube with a buoyancy body on the top. A flash light, radio beacon and a flag are attached to the buoyant body. The titanium pressure cylinder, the acoustic release unit and the hydrophone are fixed below the buoyant body.

For both, OBS and OBH, anchors were built of sections of railway tracks and fixed with the hook of the release unit.

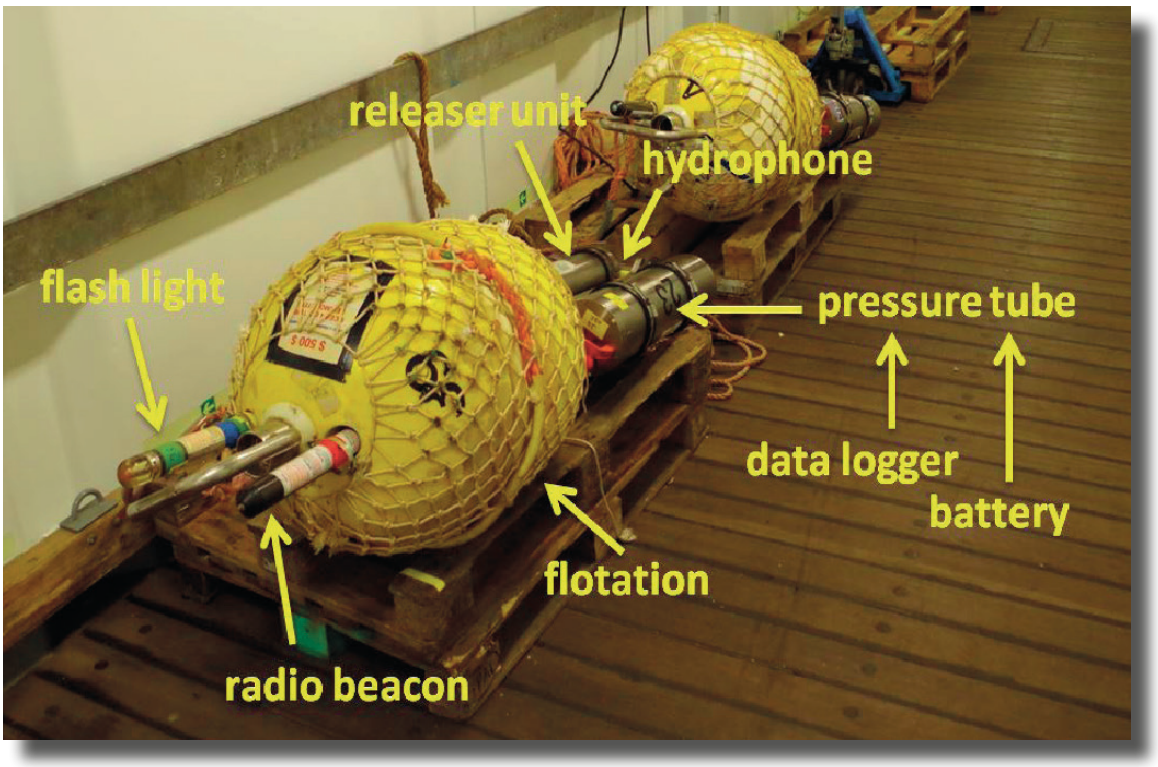


Fig. 2.1.3: Ocean Bottom Hydrophone (OBH) with main components indicated.

The seismic source for the OBS/OBH recordings consisted of an array of 8 G-Guns with 8.5 litres (520 in³) volume each (total of 68 l = 4,160 in³), towed in 4 x 2 clusters at 10 m water-depth and fired at 210 bar every full minute. The seismic trigger was provided by a Meinberg GPS clock.

Fig. 2.1.4: Floating OBS

Before deploying, the release units need to be programmed with an auto release time. Afterwards the hook of the releaser is closed to hold the anchor. The data loggers had to be programmed and were equipped with 1 or 2 flashcards and synchronized by GPS time (DCF-77 format). The sampling frequency was set to 250 Hz for MBS and 200 Hz for MLS/MTS recorders. The gain was set to 5 for the hydrophone channel and 9 for the 3 seismometer channels. Hydrophone and seismometer were tested, attached to the frame and connected to the pressure tube. The seismometer had to be installed between the frame and the anchor and is screwed tightly with a clamp bolt to achieve good sea floor coupling. The radio beacon and the flash light were checked and attached to the frame.

For recovery a hydro-acoustic signal is send by the KUM acoustic release unit to the OBS/OBH stations. Ideally the release hook opens after receiving the signal and responds with a signal indicating whether the unit is in vertical or horizontal position (showing if the OBS is still on the sea floor or ascending). The radio beacon and the flash light were reactivated by the decreased pressure at the surface. After recovering the OBS on deck, the data loggers were connected to a GPS system for time synchronization and to a laptop to read off the data.

Fig. 2.1.5: Deployment of an OBS

Itinerary of deployment and recovery (Figs. 2.1.4, 2.1.5)

The southernmost profile 20140010 (Fig. 2.1.1) was dedicated to investigate the rifted margin of the Mozambique coast, while the other 4 profiles (20140050, 20140100, 20140130, 20140150) should reveal information about the sheared margin of the northern Mozambique coast and reactivated fault zones.

The first OBS (20140011) along line 20140010 was deployed on 5th January 2014

at 21°51,950' S / 038°31,412' E. The OBS along the profile were deployed with a spacing of 5 nm. The last OBS (20140047) of the line was located at 19°15,295' S /036°56,378' E and was deployed on 7th January 2014. In total 37 OBS/OBH (33 OBS, 4 OBH) were used. Since there was no permission to extend the line onshore, parts of the shallow Zambezi delta were not investigated by our survey. After 2 days of air gun shooting the recovery started on 9th January and lasted till 10th January 2014. All OBS were recovered without problems.

Deployment of profile 20140050 started on 20th January 2014 at 16°28,036' S / 039°59,998' E with OBS 20140051. The distance of the OBS was 8 nm. The last OBS (20140075) was situated at 16°38,904' S / 043°19,190' E, and was deployed on 21st January 2014. In total the profile consisted of 25 OBS/OBH (18 OBS, 7 OBH). Air gun shooting lasted for 2 days. All instruments were successfully recovered between 23rd January and 25th January 2014.

For profile 20140100 deployment started on 26th January 2014 at 14°22,56' S /043°22,56' E. The last OBS (20140125) was positioned at 14°39,68' S /040°54,85' E, and was deployed on 27th January 2014. The OBS spacing was 6 nm. After 1.5 days of air gun shooting the recovery started on 29th January and lasted till 30th January 2014. All 25 instruments(18 OBS, 7 OBH) were recovered.

The instruments for line 20140130 were deployed on 30th January 2014 at 13°01,57' S /040°42,09' E. The last OBS (20140131) was situated at 13°01,15' S /042°19,59' E, and was deployed on 31st January 2014. In total 20 instruments (15 OBS, 5 OBH) with a spacing of 5 nm were deployed. Air gun shooting was completed within one day. The recovery started on 1st February and was completed on 2nd February 2014 without problems.

Deployment along the last profile 20140150 started with OBH 20140151 on 2nd February 2014 at 11°23,11' S /042°20,83 E. Deployment was completed on 3rd February 2014 at 11°33,26' S /040°44,39 E with OBS 20140170. The spacing of the 20 stations (19 OBS, 1 OBH) was 5 nm. Airgun shooting was conducted on 3rd February 2014. Due to another research vessel in the seismic survey area, shooting had to be terminated for 30 minutes. The recovery of the instruments was accomplished without problems on 4th February 2014.

Quality control

Of the 37 deployed OBS/OBH systems of profile 20140010 two did not record any signal on any channel. Data from another OBS could not be downloaded. The data quality of the remaining instruments is reasonably good in general. In the best records p-wave phases can be observed up to a source-receiver offset of 140 km. In general, the hydrophone channel has the best signal-to-noise ratio. As an example the record of OBS 20140019 is given in Fig. 2.1.6. Prominent phases are marked: Ps for the sedimentary phase, Pc for crustal phase and Pn for the Moho refraction. In the displayed record there is a data gap at an offset of -94 km. Air gun shooting had to be terminated because of dolphins crossing the vessel within the security radius.

Preliminary results

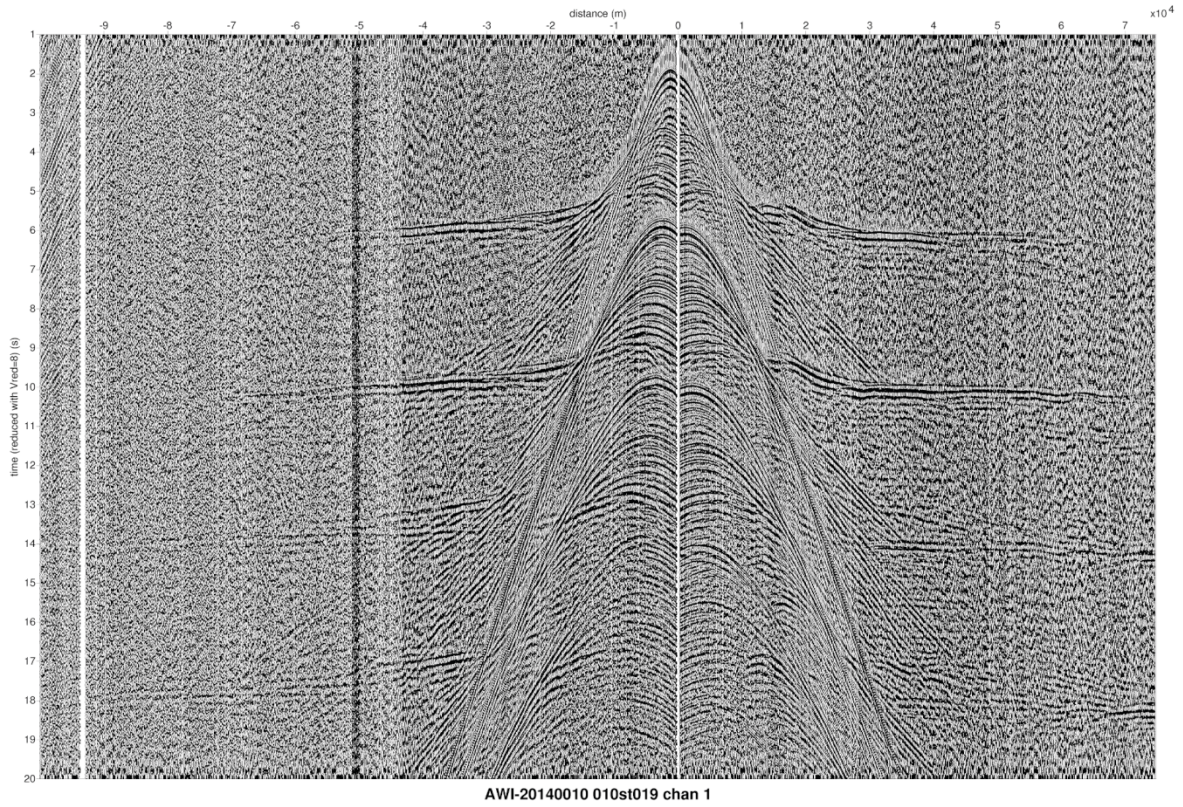


Fig. 2.1.6: Seismic record of OBS 20140019 (hydrophone channel)

Line 20140050 is the southernmost line across the Davie Ridge. In total, 25 OBS/OBH systems were deployed. One OBS did not record any signals at all due to flashcard problems. Data from two other OBS could not be downloaded. The flash cards will be sent to KUM, Kiel in order to retrieve the data with more sophisticated software. The data quality of the other instruments is moderate. The instruments positioned on the Davie Ridge show to usable signals. Here we speculate that the current induced noise is too high. In the best records p-wave phases can be observed at a source-receiver offset of 100 km. In Fig. 2.1.7 the record of OBS 20140071 is displayed and prominent phases are marked. The Moho refraction Pn can be seen more clearly in the multiple. The data gap at -22 km is due to an interruption of the data acquisition for airgun repair.

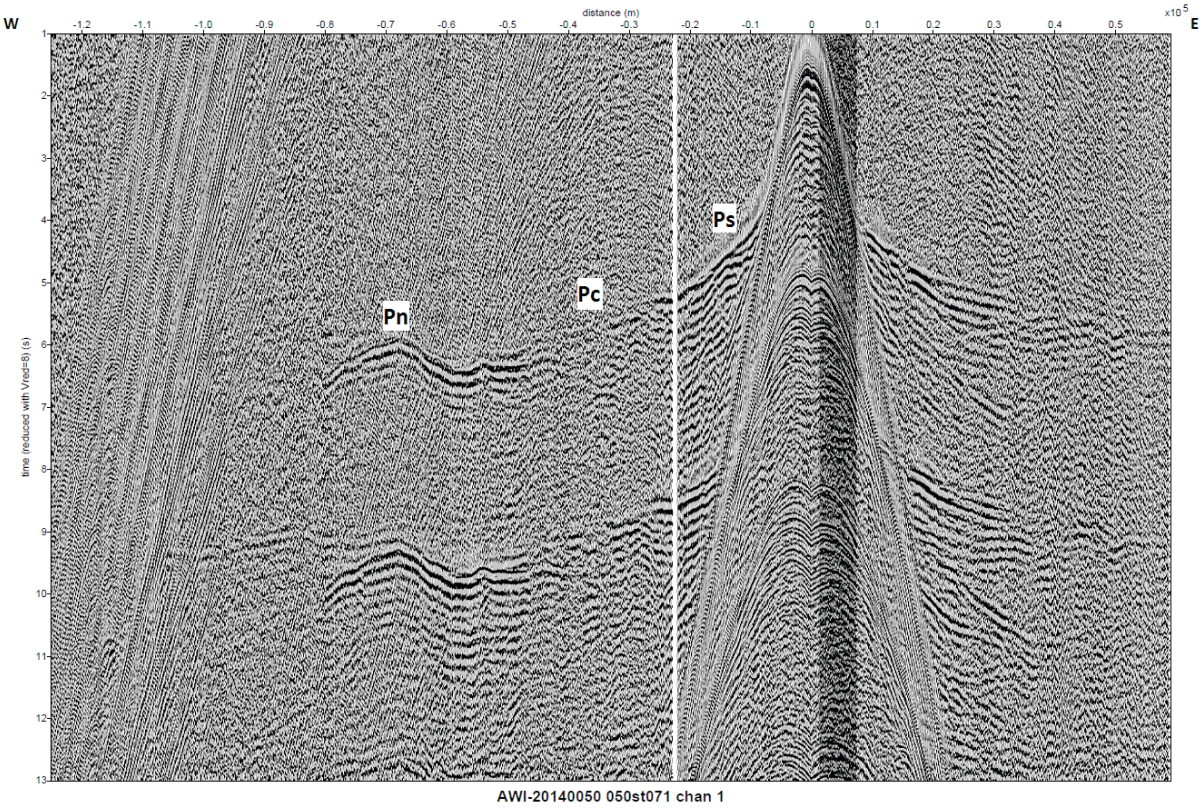


Fig. 2.1.7: Seismic record of OBS 20140118 (hydrophone channel)

The profile 20140100 crosses the ridge approximately 230 km km north of the previous line, where the ridge still has a pronounced topography. On profile 20140100 over the Davie Ridge 25 OBS/OBH systems were used. One flashcard did not contain data. The data quality of the other stations is good. P-wave phases can be observed up to a source-receiver offset of 90 km at maximum. The record of OBS 20140118 is given in Fig. 2.1.8 with prominent phases indicated: Ps for the sedimentary phase, Pc for crustal phase and Pn for the Moho refraction. The gap of traces at an offset of 46 km was caused by technical problems.

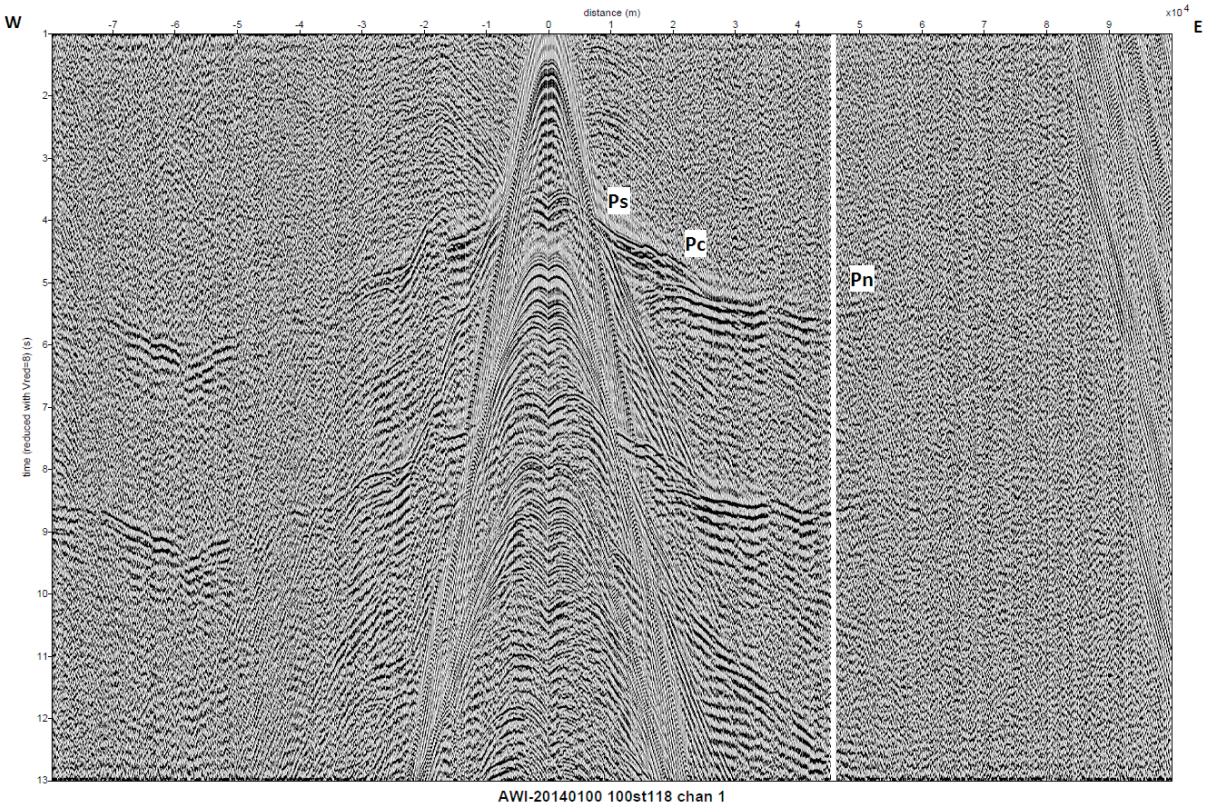


Fig. 2.1.8: Seismic record of OBS 20140118 (hydrophone channel)

Profile 20140130 is located 180 km north of the previous line. The profile is situated in a region, where the ridge topography vanishes. In total, 20 OBS/OBH systems were used on profile 20140130 over the Davie Ridge. Most of the instruments recorded data with a very good quality. In the best records p-wave phases can be observed at a source-receiver offset of 130 km. In Fig. 2.1.9 the record of OBS 20140140 is displayed. Prominent phases are marked: Ps for the sedimentary phase, Pc for crustal phase and Pn for the Moho refraction.

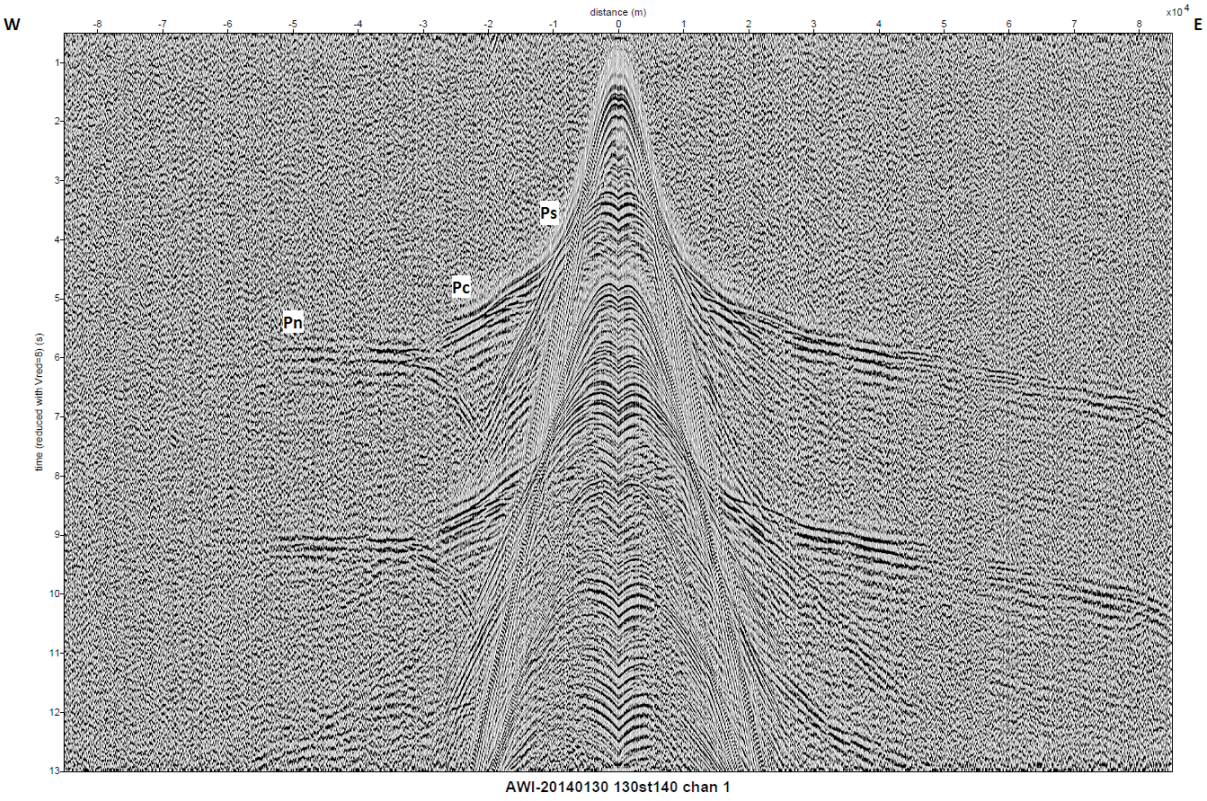


Fig. 2.1.9: Seismic record of OBS 20140140 (hydrophone channel)

The last deep seismic sounding line, profile 20140150, crosses the Kerimbas Graben, an area where seismic reflection data and earthquake data indicate recent tectonic activity. The line is located 170 km north of line 20140130. All of the 20 OBS/OBH systems recorded data, which have moderate to good quality. P-wave phases can be seen at a source-receiver offset of 90 km in best records. In Fig. 2.1.10 the record of OBS 20140159 is displayed. The sedimentary phase Ps and the crustal phase Pc as well as the Moho refraction Pn can be seen.

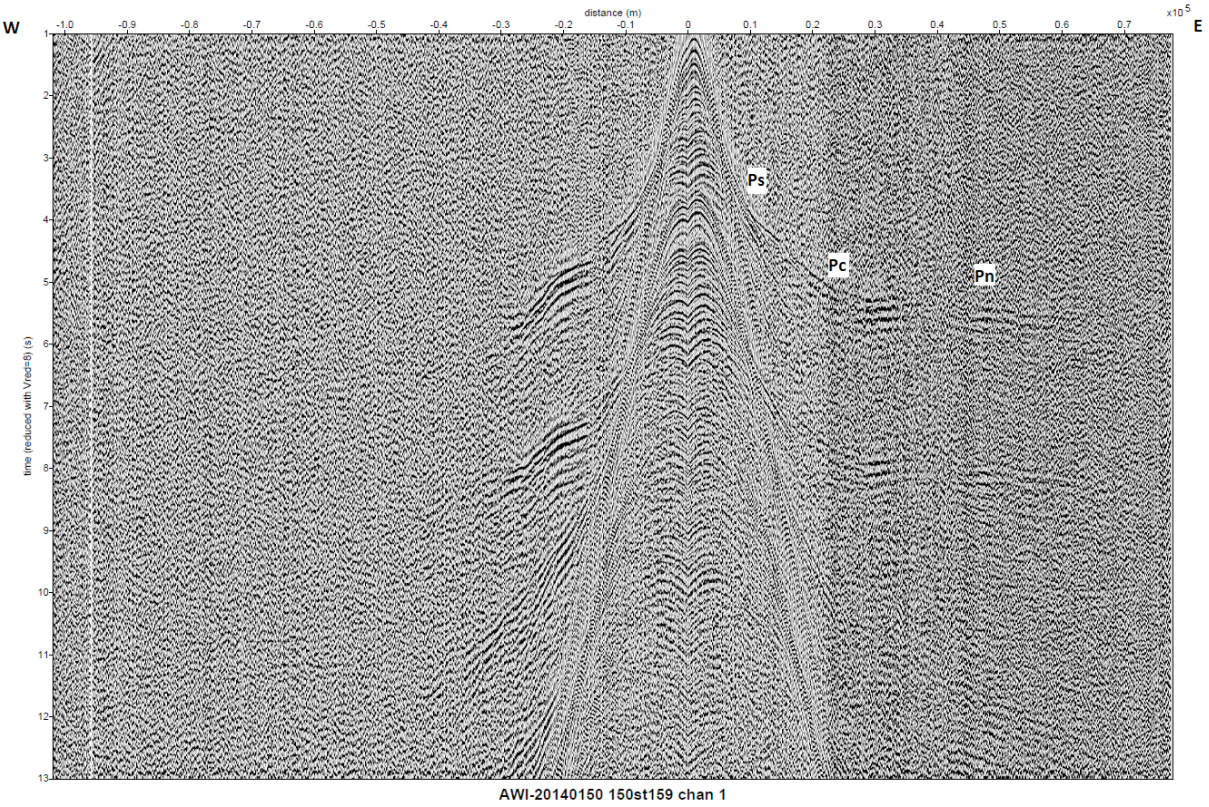


Fig. 2.1.10: Seismic record of OBS 20140159 (hydrophone channel)

In summary the Davie Ridge was investigated by four seismic reflection profiles over a distance of almost 600 km providing information on the different crustal domains.

The following tables (2.1.1 – 2.1.5) provide details on the OBS/OBH locations, their time lags as well their data quality.

Tab. 2.1.1: Deployment/Recovery/Data quality details for line 20140010

SO230 MOCOM OBS/OBH Deployment & Recovery Profile 20140010

	Deployment					Recovery									Quality Rating*			
Stat. No.	Latitude	Longitude	Depth (m)	Date	Time UTC	Latitude	Longitude	Depth (m)	Date	Time UTC	Type	Sensors	Rec. Type	Skew (ms)	C1 h	C2 x	C3 y	C4 z
11	21° 51,94' S	38° 31,41' E	3214,8	05.01.14	18:56	21° 51,39' S	38° 30,84' E	n/a	09.01.14	06:12	OBS	h,x,y,z	MLS	-6	1	2	3	4
12	21° 47,55' S	38° 28,74' E	3186,5	05.01.14	19:49	21° 46,65' S	38° 27,89' E	n/a	09.01.14	07:22	OBS	h,x,y,z	MLS	+11	1	2	2	2
13	21° 43,21' S	38° 26,07' E	3164,6	05.01.14	20:40	21° 42,13' S	38° 24,98' E	n/a	09.01.14	08:32	OBS	h,x,y,z	MLS	-4	2	3	4	4
14	21° 38,83' S	38° 23,38' E	3149,9	05.01.14	21:24	21° 37,81' S	38° 22,53' E	n/a	09.01.14	09:36	OBS	h,x,y,z	MLS	-33	2	3	3	3
15	21° 34,41' S	38° 20,69' E	3125,7	05.01.14	22:11	21° 33,40' S	38° 19,96' E	n/a	09.01.14	10:54	OBS	h,x,y,z	MLS	-6	2	2-3	2-3	2
16	21° 29,96' S	38° 18,00' E	3101,0	05.01.14	23:10	21° 28,80' S	38° 17,19' E	n/a	09.01.14	12:07	OBS	h,x,y,z	MLS	+13	1-2	2-3	2-3	2-3
17	21° 25,62' S	38° 15,33' E	3074,4	05.01.14	23:54	21° 24,85' S	38° 14,88' E	n/a	09.01.14	13:09	OBS	h,x,y,z	MBS	+9	1	2	3	3
18	21° 21,25' S	38° 12,73' E	3037,3	06.01.14	00:39	21° 20,20' S	38° 12,17' E	n/a	09.01.14	14:24	OBS	h,x,y,z	MBS	+16	1	3	3	1
19	21° 16,97' S	38° 10,21' E	3010,2	06.01.14	01:25	21° 16,01' S	38° 09,65' E	n/a	09.01.14	15:34	OBS	h,x,y,z	MBS	+16	1	3	3	1
20	21° 12,56' S	38° 07,39' E	2973,1	06.01.14	02:03	21° 11,87' S	38° 06,99' E	n/a	09.01.14	16:29	OBS	h,x,y,z	MBS	-35	1	2-3	2-3	1-2
21	21° 08,27' S	38° 04,72' E	2945,4	06.01.14	02:38	21° 06,86' S	38° 03,49' E	n/a	09.01.14	17:40	OBS	h,x,y,z	MLS	+33	1-2	3	3-4	2
22	21° 03,89' S	38° 02,08' E	2900,4	06.01.14	03:14	21° 03,00' S	38° 01,18' E	n/a	09.01.14	18:37	OBS	h,x,y,z	MLS	+3	1-2	3	3	1-2
23	20° 59,54' S	37° 59,52' E	2862,2	06.01.14	03:48	20° 58,67' S	37° 58,63' E	n/a	09.01.14	19:41	OBS	h,x,y,z	MLS	+18	1-2	3	3	2
24	20° 55,20' S	37° 56,87' E	2819,4	06.01.14	04:23	20° 54,54' S	37° 56,37' E	n/a	09.01.14	20:38	OBS	h,x,y,z	MLS	-18	2	3-4	3	2-3
25	20° 50,83' S	37° 54,27' E	2748,6	06.01.14	04:58	20° 49,90' S	37° 53,76' E	n/a	09.01.14	21:49	OBS	h,x,y,z	MLS	+5	3	3-4	3	3
26	20° 46,55' S	37° 51,52' E	2710,8	06.01.14	05:42	20° 45,96' S	37° 51,21' E	n/a	09.01.14	23:02	OB**H**	h	MLS	-8	1	-	-	-
27	20° 42,19' S	37° 48,88' E	2704,0	06.01.14	06:48	20° 41,32' S	37° 48,56' E	n/a	10.01.14	00:06	OBS	h,x,y,z	MLS	+1	4	4	4	4

	Deployment					Recovery									Quality Rating*			
Stat. No.	Latitude	Longitude	Depth (m)	Date	Time UTC	Latitude	Longitude	Depth (m)	Date	Time UTC	Type	Sensors	Rec. Type	Skew (ms)	C1 h	C2 x	C3 y	C4 z
28	20° 37,87' S	37° 46,26' E	2690,0	06.01.14	07:59	20° 37,27' S	37° 46,15' E	n/a	10.01.14	01:03	OB**H**	h	MLS	+8	1	-	-	-
29	20° 33,50' S	37° 43,59' E	2687,1	06.01.14	09:12	20° 32,56' S	37° 43,16' E	n/a	10.01.14	02:19	OBS	h,x,y,z	MLS	-3784	4	4	4	4
30	20° 29,18' S	37° 40,99' E	2520,4	06.01.14	10:26	20° 28,75' S	37° 40,97' E	n/a	10.01.14	03:16	OB**H**	h	MLS	-3	1	-	-	-
31	20° 24,86' S	37° 38,32' E	2284,8	06.01.14	11:38	20° 24,28' S	37° 37,90' E	n/a	10.01.14	03:59	OBS	h,x,y,z	MBS	-3	1	3	3	3-4
32	20° 20,49' S	37° 35,72' E	2125,2	06.01.14	12:45	20° 20,08' S	37° 35,38' E	n/a	10.01.14	04:39	OB**H**	h	MLS	+4	2	-	-	-
33	20° 16,15' S	37° 33,09' E	2139,3	06.01.14	13:52	20° 15,56' S	37° 32,52' E	n/a	10.01.14	05:23	OBS	h,x,y,z	MBS	+3	1	1-2	3	1-2
34	20° 11,80' S	37° 30,45' E	2102,6	06.01.14	14:59	20° 11,38' S	37° 29,94' E	n/a	10.01.14	06:07	OBS	h,x,y,z	MLS	+20	1	3	2	1
35	20° 07,47' S	37° 27,79' E	1929,3	06.01.14	16:08	20° 07,23' S	37° 27,32' E	n/a	10.01.14	06:56	OBS	h,x,y,z	MLS	n/a	1	2	2	2
36	20° 03,09' S	37° 25,21' E	1949,4	06.01.14	17:15	20° 03,07' S	37° 24,89' E	n/a	10.01.14	07:51	OBS	h,x,y,z	MLS	0	1	2-3	1	1-2
37	19° 58,76' S	37° 22,57' E	1884,5	06.01.14	18:20	19° 58,70' S	37° 22,23' E	n/a	10.01.14	08:37	OBS	h,x,y,z	MBS	+13	1	4	4	4
38	19° 54,42' S	37° 19,94' E	1813,2	06.01.14	19:24	19° 54,25' S	37° 19,61' E	n/a	10.01.14	09:57	OBS	h,x,y,z	MBS	+16	4	1-2	3-4	1
39	19° 50,10' S	37° 17,33' E	1729,9	06.01.14	20:23	19° 49,88' S	37° 17,06' E	n/a	10.01.14	10:55	OBS	h,x,y,z	MBS	+21	1-2	1-2	3-4	1
40	19° 45,75' S	37° 14,70' E	1641,1	06.01.14	21:26	19° 45,67' S	37° 14,64' E	n/a	10.01.14	11:38	OBS	h,x,y,z	MLS	+11	1	1-2	2	1
41	19° 41,40' S	37° 12,09' E	1531,4	06.01.14	22:26	19° 41,26' S	37° 12,18' E	n/a	10.01.14	12:25	OBS	h,x,y,z	MLS	+42	1	2	2-3	1-2
42	19° 37,06' S	37° 09,44' E	1437,9	06.01.14	23:25	19° 36,97' S	37° 09,74' E	n/a	10.01.14	13:21	OBS	h,x,y,z	MBS	-12				
43	19° 32,72' S	37° 06,84' E	1315,5	07.01.14	00:21	19° 32,58' S	37° 07,21' E	n/a	10.01.14	14:25	OBS	h,x,y,z	MTS	+26	1	3-4	3	2
44	19° 28,36' S	37° 04,24' E	1162,1	07.01.14	01:16	19° 28,13' S	37° 04,29' E	n/a	10.01.14	15:05	OBS	h,x,y,z	MLS	-40	1-2	3-4	2	1
45	19° 24,04' S	37° 01,63' E	935,9	07.01.14	02:11	19° 23,84' S	37° 01,93' E	n/a	10.01.14	15:51	OBS	h,x,y,z	MLS	-3	1	2	2-3	1-2
46	19° 19,67' S	36° 59,01' E	651,7	07.01.14	03:05	19° 19,54' S	36° 59,18' E	n/a	10.01.14	16:37	OBS	h,x,y,z	MLS	-7	1	3-4	3-4	3-4
47	19° 15,30' S	36° 56,38' E	203,3	07.01.14	03:53	19° 14,92' S	36° 56,48' E	n/a	10.01.14	17:22	OBS	h,x,y,z	MLS	+17	1	3	3	3

Average Station Interval:

Total Profile Length:

*Data Quality: 1 = good, 2 = medium, 3 = low, 4 = no data

Tab. 2.1.2: Deployment/Recovery/Data quality details for line 20140050

SO230 MOCOM OBS/OBH Deployment & Recovery Profile 20140050

	Deployment					Revovery									Quality Rating*			
Stat. No.	Latitude	Longitude	Depth (m)	Date	Time UTC	Latitude	Longitude	Depth (m)	Date	Time UTC	Type	Sensors	Rec. Type	Skew (ms)	C1 h	C2 x	C3 y	C4 z
51	16° 28,02' S	40° 0,00' E	417,5	20.01.14	07:24	16° 29,44' S	39° 58,56' E	n/a	23.01.14	18:23	OBH	h	MLS	-5	2-3	-	-	-
52	16° 28,51' S	40° 8,30' E	1229,8	20.01.14	08:33	16° 29,19' S	40° 7,77' E	n/a	23.01.14	20:15	OBH	h	MLS	+7	1-2	-	-	-
53	16° 28,97' S	40° 16,64' E	1509,1	20.01.14	09:47	16° 29,66' S	40° 16,12' E	n/a	23.01.14	21:37	OBS	h,x,y,z	MBS	+16	1	2	2-3	1-2
54	16° 29,45' S	40° 24,92' E	1696,4	20.01.14	11:03	16° 29,79' S	40° 24,64' E	n/a	23.01.14	22:51	OBS	h,x,y,z	MBS	-41	1-2	2-3	2-3	2
55	16° 29,86' S	40° 33,27' E	1865,3	20.01.14	12:21	16° 29,97' S	40° 33,08' E	n/a	24.01.14	00:05	OBS	h,x,y,z	MBS	+10	2	2	3	3
56	16° 30,25' S	40° 41,62' E	2018,2	20.01.14	13:43	16° 30,33' S	40° 41,45' E	n/a	24.01.14	01:24	OBS	h,x,y,z	MBS	+14	2	3	3	1-2
57	16° 30,73' S	40° 49,93' E	2141,0	20.01.14	15:01	16° 30,79' S	40° 49,84' E	n/a	24.01.14	02:26	OBS	h,x,y,z	MBS	-2	1	3	3	3
58	16° 31,18' S	40° 58,22' E	2239,3	20.01.14	16:18	16° 31,24' S	40° 58,14' E	n/a	24.01.14	03:35	OBS	h,x,y,z	MLS	+17				
59	16° 31,64' S	41° 6,56' E	2367,5	20.01.14	17:39	16° 31,67' S	41° 6,50' E	n/a	24.01.14	04:40	OBH	h	MLS	+15	2-3	-	-	-
60	16° 32,01' S	41° 14,91' E	2536,6	20.01.14	19:09	16° 32,08' S	41° 14,80' E	n/a	24.01.14	06:02	OBH	h	MLS	+14		-	-	-
61	16° 32,56' S	41° 23,21' E	2630,0	20.01.14	20:32	16° 32,59' S	41° 23,06' E	n/a	24.01.14	07:17	OBS	h,x,y,z	MLS	+23	3	3	3	3
62	16° 33,01' S	41° 31,56' E	2768,9	21.01.14	00:25	16° 33,19' S	41° 31,44' E	n/a	24.01.14	08:30	OBH	h	MLS	+17	3	-	-	-
63	16° 33,41' S	41° 39,88' E	1899,6	21.01.14	01:52	16° 33,53' S	41° 39,88' E	n/a	24.01.14	09:49	OBH	h	MLS	-11	3	-	-	-

	Deployment					Revovery									Quality Rating*			
Stat. No.	Latitude	Longitude	Depth (m)	Date	Time UTC	Latitude	Longitude	Depth (m)	Date	Time UTC	Type	Sensors	Rec. Type	Skew (ms)	C1 h	C2 x	C3 y	C4 z
64	16° 33,93' S	41° 48,18' E	2277,3	21.01.14	03:10	16° 34,00' S	41° 47,96' E	n/a	24.01.14	12:12	OBS	h,x,y,z	MLS	-42	3	3	3	3
65	16° 34,36' S	41° 56,55' E	2410,2	21.01.14	04:31	16° 34,52' S	41° 56,45' E	n/a	24.01.14	13:19	OBH	h	MLS	-11	2			
66	16° 34,84' S	42° 4,88' E	2255,8	21.01.14	05:51	16° 34,91' S	42° 4,83' E	n/a	24.01.14	14:20	OBS	h,x,y,z	MLS	-43175	4	3	3	2-3
67	16° 35,28' S	42° 13,21' E	2386,2	21.01.14	07:16	16° 35,32' S	42° 13,14' E	n/a	24.01.14	15:18	OBS	h,x,y,z	MLS	-5	1-2	2-3	3	2-3
68	16° 35,71' S	42° 21,53' E	2458,8	21.01.14	09:43	16° 35,64' S	42° 21,41' E	n/a	24.01.14	16:26	OBS	h,x,y,z	MLS	-21	2	2-3	3	3
69	16° 36,19' S	42° 29,84' E	2560,5	21.01.14	11:09	16° 36,09' S	42° 29,87' E	n/a	24.01.14	17:30	OBS	h,x,y,z	MBS	+30				
70	16° 36,68' S	42° 38,17' E	2440,9	21.01.14	12:32	16° 36,71' S	42° 38,07' E	n/a	24.01.14	18:43	OBS	h,x,y,z	MLS	+6	2	2-3	3	2
71	16° 37,08' S	42° 46,51' E	2552,1	21.01.14	13:57	16° 37,17' S	42° 46,53' E	n/a	24.01.14	19:42	OBS	h,x,y,z	MLS	+53	1-2	3	2-3	2
72	16° 37,54' S	42° 54,86' E	2272,9	21.01.14	15:21	16° 37,91' S	42° 54,72' E	n/a	24.01.14	20:50	OBS	h,x,y,z	MBS	+9	2-3	2-3	3	2-3
73	16° 38,02' S	43° 3,19' E	1946,8	21.01.14	17:37	16° 38,37' S	43° 3,10' E	n/a	24.01.14	22:08	OBS	h,x,y,z	MLS	-4	1-2	3	2-3	2-3
74	16° 38,46' S	43° 11,52' E	1280,8	21.01.14	18:56	16° 38,73' S	43° 11,33' E	n/a	24.01.14	23:16	OBS	h,x,y,z	MLS	+23	2	3	2-3	2
75	16° 38,91' S	43° 19,17' E	524,5	21.01.14	19:58	16° 39,08' S	43° 18,99' E	n/a	25.01.14	00:19	OBS	h,x,y,z	MLS	+14	3	3	3	3

Average Station Interval: 8nm

Total Profile Length: 192nm

*Data Quality: 1 = good, 2 = medium, 3 = low, 4 = no data

Tab. 2.1.3: Deployment/Recovery/Data quality details for line 20140100

SO230 MOCOM OBS/OBH Deployment & Recovery Profile 20140100

	Deployment					Recovery									Quality Rating*			
Stat. No.	Latitude	Longitude	Depth (m)	Date	Time UTC	Latitude	Longitude	Depth (m)	Date	Time UTC	Type	Sensors	Rec. Type	Skew (ms)	C1 h	C2 x	C3 y	C4 z
101	14° 22,56' S	43° 22,56' E	3419,2	26.01.14	07:19	14° 22,77' S	43° 22,46' E	n/a	29.01.14	00:22	OBS	h,x,y,z	MLS	+12	2-3	2-3	2	2
102	14° 23,24' S	43° 16,43' E	3400,7	26.01.14	08:44	14° 23,29' S	43° 16,29' E	n/a	29.01.14	01:24	OBS	h,x,y,z	MLS	+20	2-3	2-3	3	1-2
103	14° 23,98' S	43° 10,28' E	3384,7	26.01.14	10:10	14° 23,87' S	43° 10,06' E	n/a	29.01.14	02:39	OBS	h,x,y,z	MLS	-4	3	2	2	2
104	14° 24,69' S	43° 4,13' E	3379,2	26.01.14	11:23	14° 24,51' S	43° 3,95' E	n/a	29.01.14	03:37	OBS	h,x,y,z	MBS	+5	1-2	1-2	1-2	1
105	14° 25,35' S	42° 57,97' E	3365,5	26.01.14	12:37	14° 25,15' S	42° 57,98' E	n/a	29.01.14	04:29	OBS	h,x,y,z	MLS	+44	2	2-3	2-3	2
106	14° 26,07' S	42° 51,82' E	3345,1	26.01.14	13:51	14° 25,80' S	42° 51,85' E	n/a	29.01.14	05:22	OBS	h,x,y,z	MLS	+5	1-2	2-3	2-3	2
107	14° 26,71' S	42° 45,65' E	3333,0	26.01.14	15:07	14° 26,32' S	42° 45,87' E	n/a	29.01.14	06:41	OBS	h,x,y,z	MBS	+27	2	3	3	3
108	14° 27,33' S	42° 39,54' E	3285,8	26.01.14	16:19	14° 27,05' S	42° 39,71' E	n/a	29.01.14	07:40	OBS	h,x,y,z	MLS	-20	2	2-3	2-3	3
109	14° 28,09' S	42° 33,35' E	3215,0	26.01.14	17:34	14° 27,78' S	42° 33,55' E	n/a	29.01.14	08:40	OBS	h,x,y,z	MLS	-6	-	-	-	-
110	14° 28,83' S	42° 27,20' E	3137,4	26.01.14	18:46	14° 28,38' S	42° 27,73' E	n/a	29.01.14	09:40	OBS	h,x,y,z	MLS	+14643	2	2-3	2-3	1-2
111	14° 29,55' S	42° 21,04' E	3064,2	26.01.14	19:55	14° 29,27' S	42° 21,34' E	n/a	29.01.14	10:55	OBH	h	MLS	-12	1-2	-	-	-
112	14° 30,22' S	42° 14,89' E	2934,1	26.01.14	21:06	14° 29,90' S	42° 15,47' E	n/a	29.01.14	12:00	OBS	h,x,y,z	MLS	-43	2	1-2	1-2	2
113	14° 30,89' S	42° 8,74' E	2756,1	26.01.14	22:18	14° 30,80' S	42° 9,04' E	n/a	29.01.14	13:06	OBH	h	MLS	-15	1-2	-	-	-
114	14° 31,56' S	42° 2,58' E	2902,8	26.01.14	23:32	14° 31,59' S	42° 2,91' E	n/a	29.01.14	14:02	OBH	h	MLS	+16	1-2	-	-	-
115	14° 32,31' S	41° 56,40' E	2903,5	27.01.14	00:48	14° 32,41' S	41° 56,84' E	n/a	29.01.14	15:00	OBS	h,x,y,z	MLS	+24	1-2	2	2	2-3
116	14° 32,95' S	41° 50,23' E	2666,1	27.01.14	02:08	14° 33,16' S	41° 50,54' E	n/a	29.01.14	16:40	OBH	h	MLS	+15	1-2	-	-	-
117	14° 33,69' S	41° 44,14' E	2643,3	27.01.14	03:24	14° 33,93' S	41° 44,40' E	n/a	29.01.14	18:16	OBH	h	MLS	+14	1	-	-	-
118	14° 34,35' S	41° 37,92' E	2434,6	27.01.14	04:39	14° 34,74' S	41° 38,08' E	n/a	29.01.14	19:35	OBS	h,x,y,z	MLS	+106	1	2-3	3	2
119	14° 35,04' S	41° 31,79' E	2354,0	27.01.14	05:59	14° 35,90' S	41° 32,05' E	n/a	29.01.14	20:30	OBS	h,x,y,z	MBS	-1	1-2	1-2	1	2
120	14° 35,74' S	41° 25,61' E	2801,4	27.01.14	07:14	14° 36,59' S	41° 25,86' E	n/a	29.01.14	21:36	OBS	h,x,y,z	MLS	-59	1-2	2-3	2-3	3
121	14° 36,44' S	41° 19,46' E	2805,2	27.01.14	08:30	14° 37,76' S	41° 19,72' E	n/a	29.01.14	22:41	OBS	h,x,y,z	MBS	+4	1-2	2	2-3	2-3
122	14° 37,24' S	41° 13,33' E	2806,8	27.01.14	09:51	14° 38,34' S	41° 13,40' E	n/a	29.01.14	23:47	OBS	h,x,y,z	MBS	-47	2	2-3	3	3
123	14° 38,04' S	41° 7,18' E	2601,1	27.01.14	11:07	14° 38,91' S	41° 7,44' E	n/a	30.01.14	00:40	OBS	h,x,y,z	MBS	+22	2	2-3	2-3	2
124	14° 38,89' S	41° 1,03' E	1342,1	27.01.14	12:24	14° 39,53' S	41° 1,31' E	n/a	30.01.14	01:54	OBH	h	MLS	+6	1	-	-	-
125	14° 39,68' S	40° 54,85' E	607,5	27.01.14	13:27	14° 39,86' S	40° 55,14' E	n/a	30.01.14	02:56	OBH	h	MLS	-7	1-2	-	-	-

Average Station Interval: 6nm

Total Profile Length: 144nm

*Data Quality: 1 = good, 2 = medium, 3 = low, 4 = no data

Tab.2.1.4: Deployment/Recovery/Data quality details for line 20140130

SO230 MOCOM OBS/OBH Deployment & Recovery Profile 20140130

	Deployment					Recovery									Quality Rating*			
Stat. No.	Latitude	Longitude	Depth (m)	Date	Time UTC	Latitude	Longitude	Depth (m)	Date	Time UTC	Type	Sensors	Rec. Type	Skew (ms)	C1 h	C2 x	C3 y	C4 z
131	13° 1,15' S	42° 19,59' E	3251,3	31.01.14	11:11	13° 1,33' S	42° 19,67' E	n/a	02.02.14	01:12	OBS	h,x,y,z	MLS	-7	2-3	2-3	3	2-3
132	13° 1,17' S	42° 14,45' E	3205,3	31.01.14	10:31	13° 1,30' S	42° 14,47' E	n/a	02.02.14	00:25	OBS	h,x,y,z	MLS	+19	1	3	1-2	1
133	13° 1,20' S	42° 9,31' E	3142,0	31.01.14	09:52	13° 1,34' S	42° 9,33' E	n/a	01.02.14	23:41	OBS	h,x,y,z	MLS	-3	1-2	2	2-3	1-2
134	13° 1,23' S	42° 4,18' E	3083,9	31.01.14	09:15	13° 1,45' S	42° 4,19' E	n/a	01.02.14	22:57	OBS	h,x,y,z	MLS	+3	1-2	2	2	1-2
135	13° 1,25' S	41° 59,07' E	3016,8	31.01.14	08:40	13° 1,36' S	41° 59,05' E	n/a	01.02.14	22:07	OBH	h	MLS	-8	2	-	-	-
136	13° 1,27' S	41° 53,95' E	2965,3	31.01.14	08:05	13° 1,45' S	41° 53,95' E	n/a	01.02.14	21:15	OBS	h,x,y,z	MLS	-30	2	2	3	1-2
137	13° 1,30' S	41° 48,88' E	2876,6	31.01.14	07:30	13° 1,43' S	41° 48,93' E	n/a	01.02.14	20:18	OBH	h	MLS	-8	1-2	-	-	-
138	13° 1,33' S	41° 43,69' E	2762,7	31.01.14	06:54	13° 1,65' S	41° 43,80' E	n/a	01.02.14	19:00	OBH	h	MLS	+11	1	-	-	-
139	13° 1,35' S	41° 38,56' E	2635,8	31.01.14	06:18	13° 1,73' S	41° 38,68' E	n/a	01.02.14	18:14	OBS	h,x,y,z	MLS	+14	1-2	2-3	1-2	1-2
140	13° 1,34' S	41° 33,40' E	2519,4	31.01.14	03:19	13° 1,65' S	41° 33,46' E	n/a	01.02.14	17:29	OBH	h	MLS	+8	1	-	-	-
141	13° 1,36' S	41° 28,30' E	2646,9	31.01.14	02:07	13° 1,71' S	41° 28,38' E	n/a	01.02.14	16:42	OBH	h	MLS	+7	1	-	-	-
142	13° 1,44' S	41° 23,18' E	2399,0	31.01.14	00:54	13° 1,99' S	41° 23,25' E	n/a	01.02.14	15:38	OBS	h,x,y,z	MLS	+79	1	2-3	2-3	1-2
143	13° 1,48' S	41° 18,02' E	2252,2	30.01.14	23:47	13° 2,18' S	41° 18,10' E	n/a	01.02.14	14:53	OBS	h,x,y,z	MLS	+3	1	3	1-2	1
144	13° 1,48' S	41° 12,90' E	2218,0	30.01.14	22:43	13° 2,29' S	41° 12,91' E	n/a	01.02.14	14:03	OBS	h,x,y,z	MLS	-1	2	2	2-3	1
145	13° 1,52' S	41° 7,79' E	2165,4	30.01.14	21:33	13° 2,36' S	41° 7,85' E	n/a	01.02.14	13:18	OBS	h,x,y,z	MLS	-14	1-2	2-3	2	2
146	13° 1,52' S	41° 2,66' E	2235,7	30.01.14	20:31	13° 2,73' S	41° 2,69' E	n/a	01.02.14	12:34	OBS	h,x,y,z	MLS	-4	4	2	2-3	2
147	13° 1,55' S	40° 57,51' E	2103,3	30.01.14	19:30	13° 2,70' S	40° 57,63' E	n/a	01.02.14	11:44	OBS	h,x,y,z	MLS	+5346	1-2	3	3	1-2
148	13° 1,58' S	40° 52,38' E	1651,6	30.01.14	18:28	13° 2,47' S	40° 52,50' E	n/a	01.02.14	10:50	OBS	h,x,y,z	MLS	-27	2	2-3	3	2
149	13° 1,59' S	40° 47,25' E	1323,8	30.01.14	17:31	13° 2,32' S	40° 47,28' E	n/a	01.02.14	10:02	OBS	h,x,y,z	MLS	+19	2	3	3	3
150	13° 1,57' S	40° 42,09' E	806,9	30.01.14	16:34	13° 2,29' S	40° 42,10' E	n/a	01.02.14	09:13	OBS	h,x,y,z	MBS	-20	2-3	2-3	3	2-3

Average Station Interval: 5nm

Total Profile Length: 100nm

*Data Quality: 1 = good, 2 = medium, 3 = low, 4 = no data

Tab. 2.1.5: Deployment/Recovery/Data quality details for line 20140150

SO230 MOCOM OBS/OBH Deployment & Recovery Profile 20140130

	Deployment					Recovery									Quality Rating*			
Stat. No.	Latitude	Longitude	Depth (m)	Date	Time UTC	Latitude	Longitude	Depth (m)	Date	Time UTC	Type	Sensors	Rec. Type	Skew (ms)	C1 h	C2 x	C3 y	C4 z
131	13° 1,15' S	42° 19,59' E	3251,3	31.01.14	11:11	13° 1,33' S	42° 19,67' E	n/a	02.02.14	01:12	OBS	h,x,y,z	MLS	-7	2-3	2-3	3	2-3
132	13° 1,17' S	42° 14,45' E	3205,3	31.01.14	10:31	13° 1,30' S	42° 14,47' E	n/a	02.02.14	00:25	OBS	h,x,y,z	MLS	+19	1	3	1-2	1
133	13° 1,20' S	42° 9,31' E	3142,0	31.01.14	09:52	13° 1,34' S	42° 9,33' E	n/a	01.02.14	23:41	OBS	h,x,y,z	MLS	-3	1-2	2	2-3	1-2
134	13° 1,23' S	42° 4,18' E	3083,9	31.01.14	09:15	13° 1,45' S	42° 4,19' E	n/a	01.02.14	22:57	OBS	h,x,y,z	MLS	+3	1-2	2	2	1-2
135	13° 1,25' S	41° 59,07' E	3016,8	31.01.14	08:40	13° 1,36' S	41° 59,05' E	n/a	01.02.14	22:07	OBH	h	MLS	-8	2	-	-	-
136	13° 1,27' S	41° 53,95' E	2965,3	31.01.14	08:05	13° 1,45' S	41° 53,95' E	n/a	01.02.14	21:15	OBS	h,x,y,z	MLS	-30	2	2	3	1-2
137	13° 1,30' S	41° 48,88' E	2876,6	31.01.14	07:30	13° 1,43' S	41° 48,93' E	n/a	01.02.14	20:18	OBH	h	MLS	-8	1-2	-	-	-
138	13° 1,33' S	41° 43,69' E	2762,7	31.01.14	06:54	13° 1,65' S	41° 43,80' E	n/a	01.02.14	19:00	OBH	h	MLS	+11	1	-	-	-
139	13° 1,35' S	41° 38,56' E	2635,8	31.01.14	06:18	13° 1,73' S	41° 38,68' E	n/a	01.02.14	18:14	OBS	h,x,y,z	MLS	+14	1-2	2-3	1-2	1-2
140	13° 1,34' S	41° 33,40' E	2519,4	31.01.14	03:19	13° 1,65' S	41° 33,46' E	n/a	01.02.14	17:29	OBH	h	MLS	+8	1	-	-	-
141	13° 1,36' S	41° 28,30' E	2646,9	31.01.14	02:07	13° 1,71' S	41° 28,38' E	n/a	01.02.14	16:42	OBH	h	MLS	+7	1	-	-	-
142	13° 1,44' S	41° 23,18' E	2399,0	31.01.14	00:54	13° 1,99' S	41° 23,25' E	n/a	01.02.14	15:38	OBS	h,x,y,z	MLS	+79	1	2-3	2-3	1-2
143	13° 1,48' S	41° 18,02' E	2252,2	30.01.14	23:47	13° 2,18' S	41° 18,10' E	n/a	01.02.14	14:53	OBS	h,x,y,z	MLS	+3	1	3	1-2	1
144	13° 1,48' S	41° 12,90' E	2218,0	30.01.14	22:43	13° 2,29' S	41° 12,91' E	n/a	01.02.14	14:03	OBS	h,x,y,z	MLS	-1	2	2	2-3	1
145	13° 1,52' S	41° 7,79' E	2165,4	30.01.14	21:33	13° 2,36' S	41° 7,85' E	n/a	01.02.14	13:18	OBS	h,x,y,z	MLS	-14	1-2	2-3	2	2
146	13° 1,52' S	41° 2,66' E	2235,7	30.01.14	20:31	13° 2,73' S	41° 2,69' E	n/a	01.02.14	12:34	OBS	h,x,y,z	MLS	-4	4	2	2-3	2
147	13° 1,55' S	40° 57,51' E	2103,3	30.01.14	19:30	13° 2,70' S	40° 57,63' E	n/a	01.02.14	11:44	OBS	h,x,y,z	MLS	+5346	1-2	3	3	1-2
148	13° 1,58' S	40° 52,38' E	1651,6	30.01.14	18:28	13° 2,47' S	40° 52,50' E	n/a	01.02.14	10:50	OBS	h,x,y,z	MLS	-27	2	2-3	3	2
149	13° 1,59' S	40° 47,25' E	1323,8	30.01.14	17:31	13° 2,32' S	40° 47,28' E	n/a	01.02.14	10:02	OBS	h,x,y,z	MLS	+19	2	3	3	3
150	13° 1,57' S	40° 42,09' E	806,9	30.01.14	16:34	13° 2,29' S	40° 42,10' E	n/a	01.02.14	09:13	OBS	h,x,y,z	MBS	-20	2-3	2-3	3	2-3

Average Station Interval: 5nm

Total Profile Length: 100nm

*Data Quality: 1 = good, 2 = medium, 3 = low, 4 = no data

3. GRAVITY MEASUREMENTS

Ingo Heyde, Bernd Schreckenberger BGR

Objectives

Gravity field measurements allow the shape of the Geoid to be determined. The precise knowledge of the Geoid over the oceans has benefits for geodesy in the first place. For marine geosciences, the gravity field provides a wealth of information related to tectonics regionally and globally. For example the large structures of the mid-ocean ridges became visible in the gravity maps thus confirming the concept of plate tectonics. Where both gravity and independently measured bathymetry data exist, gravity anomalies not directly related to the sea floor topography indicate density contrasts within the Earth's crust. These can be modelled in order to obtain insight into geological structures at plate boundaries and other places where the geology is complex. Areas which are out of isostatic equilibrium due to uplift or depression also become apparent in the gravity field. Typically, a combination of gravity, magnetic, seismic and bathymetric data is used for integrated studies in marine geosciences.

Work on land and at sea

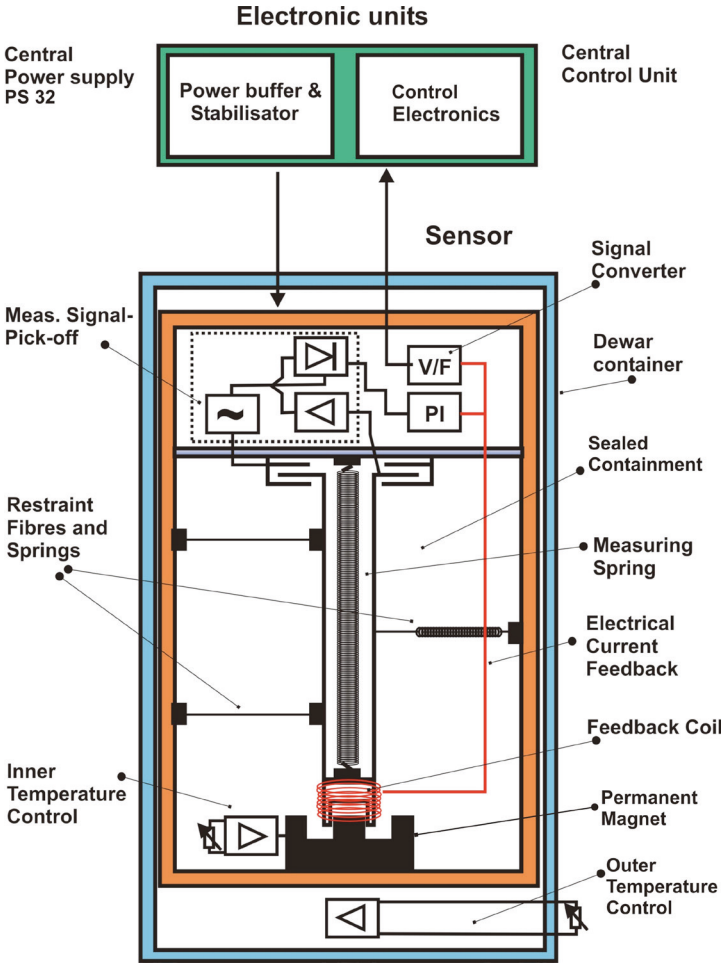
The sea gravimeter system KSS32M

During cruise SO230 the BGR-owned sea gravimeter system KSS32M (S/N 22) was installed in the gravimeter room one level below the main deck (Fig. 3.1). The gravimeter sensor was located approximately at the vessel's nominal water line, 1.5 m to port side from the centre line, and 47 m forward of the stern. Additionally the KSS32M (S/N 25) of the AWI was installed in the same room about 1 m towards the stern with regard to the BGR instrument. The AWI system was repaired just before the cruise by the manufacturer and should be tested. While the BGR system was powered and heated continuously since October 2013, the AWI instrument was installed just about 30 hours before leaving Durban.

Fig. 3.1: KSS32M gravimeter systems of AWI (red) and BGR (light grey) in the gravimeter room on RV Sonne

The gravimeter system KSS32M is a high performance instrument for marine gravity measurements, manufactured by the Bodenseewerk Geosystem GmbH. While the sensor is based on the Askania type GSS3 sea gravimeter designed by Prof. Graf in the 1960s, the development of the horizontal platform and the corresponding electronic devices took place at Bodenseewerk Geosystem in the beginning of the 1980s. The system was completely upgraded in 2011 by the successor company BGGS (Bodensee Gravitymeter Geosystem GmbH, Meersburg). Prior to this the system consisted of two main assemblies: the gyro-stabilized platform with the gravity sensor and a rack containing the control electronics, the data handling subsystem and the power supply. After the modernization the system electronics and the power supply are integrated in the platform.

The system is controlled by a notebook (HP ProBook 6550B). The main software operating the KSS32M is DAQS developed by BGGS. It allows the control of a number of settings (for example: parameters of the Bessel Filter applied to the measured data) and provides detailed information about the status of the system. The data acquisition is also managed by DACQS, whereby a wide range of values not only the gravity but also for example the attitude and horizontal accelerations of the platform are recorded.



The gravity sensor GSS30 (Fig. 3.2) was not affected by the modernization. It consists of a tube-shaped mass that is suspended on a metal spring and guided frictionless by 5 threads. It is non-astatized and particularly designed to be insensitive to horizontal acceleration. This is achieved by limiting the motion of the mass to the vertical direction. Thus, it is a straight line gravity meter avoiding cross coupling effects of beam type gravity meters. The main part of the total gravity acceleration is compensated by the mechanical spring, but gravity changes are compensated and detected by an electromagnetic system. The displacement of the spring-mass assembly with respect to the outer casing of the instrument is measured using a capacitance transducer.

Fig. 3.2: Principle sketch of the gravity sensor GSS30 of the gravimeter system KSS32M

The levelling subsystem consists of a platform stabilized in two axes by a vertical, electrically erected gyro. The stabilization during course changes can be improved by providing the system with online navigation data. The stabilized platform will keep the sensor in an upright position with an accuracy of levelling in the order of 0.5 arc-minutes. This is particularly important as the sensor is very sensitive to tilting and the corresponding effects of horizontal accelerations. Vertical acceleration, however, cannot be eliminated. Fortunately on a ship the vertical acceleration oscillates symmetrically with the ship's motion. The period of the oscillation is in the order of some seconds. This signal can be eliminated easily by means of low-pass filtering.

The data are transmitted via the notebook to the BGR data acquisition and processing system in the magnetic lab and online navigation data from this system are sent with a rate of 1 Hz to support the stabilizing platforms. The support is realized as follows: The horizontal position of the gyro-stabilized platform is controlled by two orthogonal horizontal accelerometers. The platform is levelled in such a manner that the horizontal accelerations are zero. If the ship describes a curve, the additional horizontal acceleration will cause the platform to be levelled according to the resulting apparent vertical axis. This axis may differ substantially from the true vertical axis and will result in reduced gravity values and additionally in an effect of horizontal accelerations on the measured gravity. This error, named the Harrison effect, is eliminated by supplying the KSS32M system with online navigation data. A microprocessor calculates the levelling errors from this input and enters them into the platform electronics which corrects the platform accordingly. However as there are still problems with the calculation of the platform correction which may result in severe levelling errors, this so-called turnmanoevre compensation was not activated on both instruments. Short activation tests during the two calibration circles for magnetics confirmed the levelling problems mentioned above.

Gravity ties to land stations

To compare the results of different gravity surveys the measured data have to be tied to a world-wide accepted reference system. This system is represented by the International Gravity Standardization Net IGSN71 (Morelli, 1974). The IGSN71 was established in 1971 by the International Union of Geodesy and Geophysics (IUGG) as a set of world-wide distributed locations with known absolute gravity values better than a few tenths of mGal. Therefore, gravity measurements on land have to be carried out to connect the gravity measurements at sea with the IGSN71. Furthermore, the instrumental drift of the KSS32M can be derived by the land ties at the beginning and the end of each cruise. The marine geophysical group of BGR uses a LaCoste&Romberg gravity meter, model G, no. 480 (LCR G480) for the gravity connections. Description and absolute gravity value for a reference stations in Durban was taken from the database of the Bureau de Gravimétrique International (BGI) in Toulouse. The reference station (**01**, DURM, 2931CC Durban) is located at Durban harbour in the DURMARINE building. During a former AWI cruise in 2009 an additional reference station was established outside the DURMARINE building in front of the statue "Durban's Lady in White" (Jokat et al., 2009). We undertook measurements there as well (**02**, Fig. 3.3) but, for the connection, the difference to **01** was considered as the readings inside the building were much more stable.

Fig. 3.3: Reference gravity station at the "Lady in White" statue in front of the DURMARINE building

RV *Sonne* moored at Pier 103 in Durban harbour (Fig. 3.4). On December 30, tie measurements to point **A** on the pier opposite the gravimeter room were made. Point **A** is located about 80 m from the northern end of the pier. The connection measurements resulted in an average absolute gravity value of 979352.84 mGal (with water level –1.7 m, IGSN71) for point **A** at the water level. The readings of the KSS32M systems at the same time (Dec. 30, 12:05 UTC) were -574.48 mGal (S/N 22) and -902.87 mGal (S/N 25).

Tab. 3.1: Observation report of the gravity tie measurements in Durban.

Station	Observer	Date	Time	Reading units	Gravity value [mGal]
UTC	Reading units	Gravity value [mGal]	10:05	2938.05	2983.66
A	M	30.12.13	10:07	2938.04	2983.65
A	K	30.12.13	10:11	2938.03	2983.64
A	B	30.12.13	10:14	2938.06	2983.67
01	B	30.12.13	11:01	2934.44	2979.98

Station	Observer	Date	Time	Reading units	Gravity value [mGal]
01	K	30.12.13	11:05	2934.43	2979.97
01	M	30.12.13	11:08	2934.41	2979.95
01	H	30.12.13	11:10	2934.45	2979.99
02	B	30.12.13	11:15	2934.53	2980.08
02	M	30.12.13	11:20	2934.54	2980.09
02	K	30.12.13	11:23	2934.45	2979.99
02	H	30.12.13	11:26	2934.53	2980.08
A	B	30.12.13	11:58	2938.18	2983.79
A	K	30.12.13	12:01	2938.13	2983.74
A	H	30.12.13	12:05	2938.10	2983.71
B	H	19.02.14	06:00	2938.42	2984.03
B	S	19.02.14	06:05	2938.43	2984.04
B	M	19.02.14	06:08	2938.43	2984.04
B	B	19.02.14	06:12	2938.42	2984.03
A	M	19.02.14	06:20	2938.19	2983.80
A	S	19.02.14	06:25	2938.21	2983.82
A	B	19.02.14	06:32	2938.21	2983.82
A	H	19.02.14	06:35	2938.21	2983.82
B	S	19.02.14	06:40	2938.35	2983.97
B	M	19.02.14	06:45	2938.36	2983.98
B	B	19.02.14	06:50	2938.37	2983.99
B	H	19.02.14	06:52	2938.36	2983.98
Observer: B=Bätzel, H=Heyde, K=Klemt, M=Müller, S=Schreckenberger, Gravity in mGal was calculated using LCR G 480 scaling table.					

Reference Stations:

01: Durban Harbour, DURMARINE Building, ground floor979348.66 mGal (DURM, 2931CC Durban, 29.8675°S, 31.0355°E, 5 m above MSL)
02: Durban Harbour, Statue "Durban's Lady in White" 979348.73 mGal (outside the DURMARINE building on the floor in front of the statue)

Gravity stations:

A: Durban Harbour, Pier 103, Bollard No. 33, 80 m from the northern end of the pier (29°52.613'S, 31°1.991'E)
B: Durban Harbour, Pier 103, Bollard No. 6, 80 m from the southern end of the pier (29°52.863'S, 31°1.876'E)

Table 3.1 provides the observation report for all gravity tie measurements.

Mean differences between reference and gravity stations:

01 – 02	= -0.11 mGal
01 – A	= -3.682 mGal / -3.774 mGal (mean -3.728 mGal)
02 – A	= -3.572 mGal / -3.664 mGal (mean -3.618 mGal)

Absolute gravity at **A** (from **01**): 979352.388 mGal
Absolute gravity at **A** (from **02**): 979352.348 mGal

Absolute gravity for **A** (reduced to water level –1.7 m) 979352.84 mGal (IGSN71) used for the gravity tie on 30.12.2013 (12:05 UTC).

Reading of sea gravimeter KSS32M, S/N 22, at that time: -574.48 mGal.
Reading of sea gravimeter KSS32M, S/N 25, at that time: -902.87 mGal.

A – B = -0.185 mGal

Absolute gravity at **B**: 979352.573 mGal

Absolute gravity for **B** (reduced to water level –2.3 m) 979353.185 mGal (IGSN71) used for the gravity tie on 19.02.2014 (06:45 UTC).

Reading of sea gravimeter KSS32M, S/N 22, at that time: -574.22 mGal.
Reading of sea gravimeter KSS32M, S/N 25, at that time: -902.20 mGal.

At the end of the cruise RV *Sonne* moored again at Pier 103 in Durban about 80 m from the southern end of the pier. On February 19, tie measurements to point **B** on the pier opposite the gravimeter room have been made. The distance between points **B** and **A** was about 470 m. The connection measurements resulted in an average absolute gravity value of 979353.185 mGal (reduced to water level –2.3 m, IGSN71) for point **B**. It has to be taken into account however that the draught of *RV Sonne* was 0.4 m less than at the leaving time of Durban (6.4 m vs. 6.8 m). So the absolute gravity value for point **B** at the height of the KSS32M sensor was 979353.078 mGal. The readings of the KSS32M systems at the same time (Feb. 19, 2014, 06:45 UTC) were -574.22 mGal (S/N 22) and -902.20 mGal (S/N 25). The instrumental drift for cruise SO230 can be derived from the readings in Durban to -0.43 mGal / 50.778 days or -0.008 mGal / day for S/N 25 and -0.02 mGal / 50.778 day for S/N 22. These drift rates are very small but nevertheless the corresponding drift correction will be applied to the observed data.

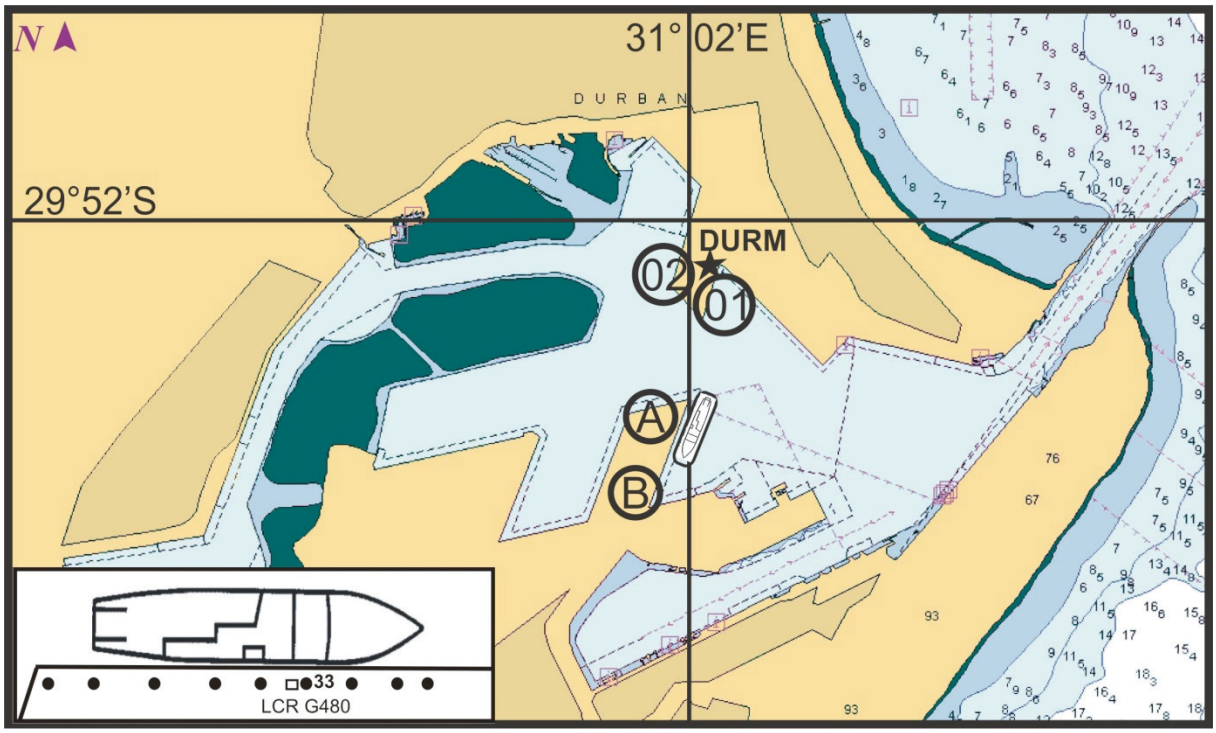


Fig. 3.4: Location of the mooring sites of RV Sonne at Pier 103 and of the reference gravity stations in Durban harbour

Preliminary results

Gravity data processing

Processing of the gravity data consists essentially of the following steps:

- a time shift of 76 seconds due to the overcritical damping of the sensor
- conversion of the output from measured voltage to mGal by applying a conversion factor of 4.7271 mGal/mV (KSS32M, No. 22) respectively 4.505 mGal/mV (No. 25). This was done directly during data acquisition in the DACQS software from BGGS.
- connection of the harbour gravity value to the world gravity net IGSN 71,
- correction for the Eötvös effect using the navigation data,
- subtraction of the normal gravity (GRS80),
- correction for the instrumental drift (not performed until completion of the cruise).

As a result, the so-called free-air gravity anomaly (FAA) is obtained, which in the case of marine gravity is simply the Eötvös-corrected, observed absolute gravity minus the normal gravity. Gravity values were recorded with a data rate of 1 Hz.

The KSS32M anomalies show short-wavelength oscillations in the order of 1-2 mGal especially during higher ship velocities and sea states (Fig. 3.5). Therefore, a median filter with a length of 300 s was applied to the data. Infrequent outliers were removed manually in advance. Additionally data recorded during sharp turns

and rapid speed changes of the vessel show disturbed values and were removed also manually.

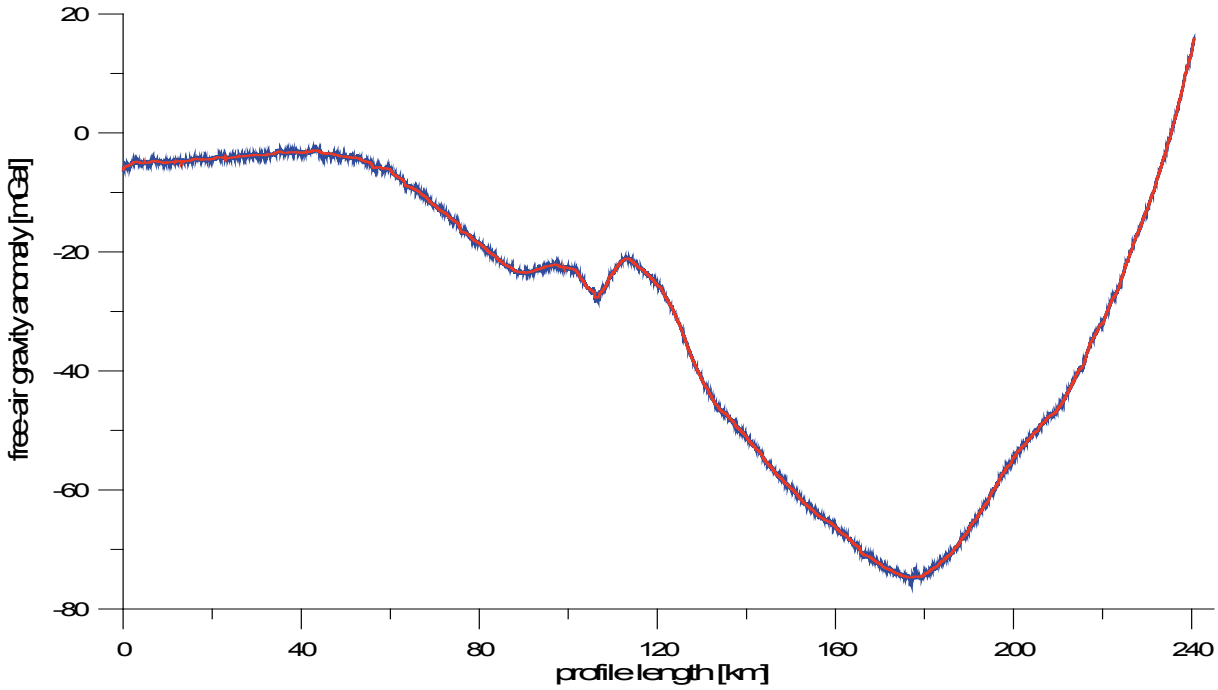


Fig. 3.5: Free-air gravity anomalies along profile BGR14-106 before (blue) and after applying a 300 s median filter (red)

Comparison of the marine gravimeter data and data quality

Fig. 3.6 shows a comparison of the measured gravity values of the two KSS32M systems along the first profile BGR14-101. The offset between both instruments observed before leaving Durban is considered. It is obvious that the shape of both curves coincide very well. During short term gravity variations caused mainly by changes of the ship's velocity the differences increase slightly.

However the mean differences between both gravity values increase nearly continuously with time from 0.82 mGal at the beginning of the profile to 2.64 mGal after 21.3 hours at the end. The differences may be explained by a different drift behaviour of the instruments. In particular it has to be taken into account that the AWI instrument did not arrive at a stable gravity value when leaving Durban due to insufficient heating time.

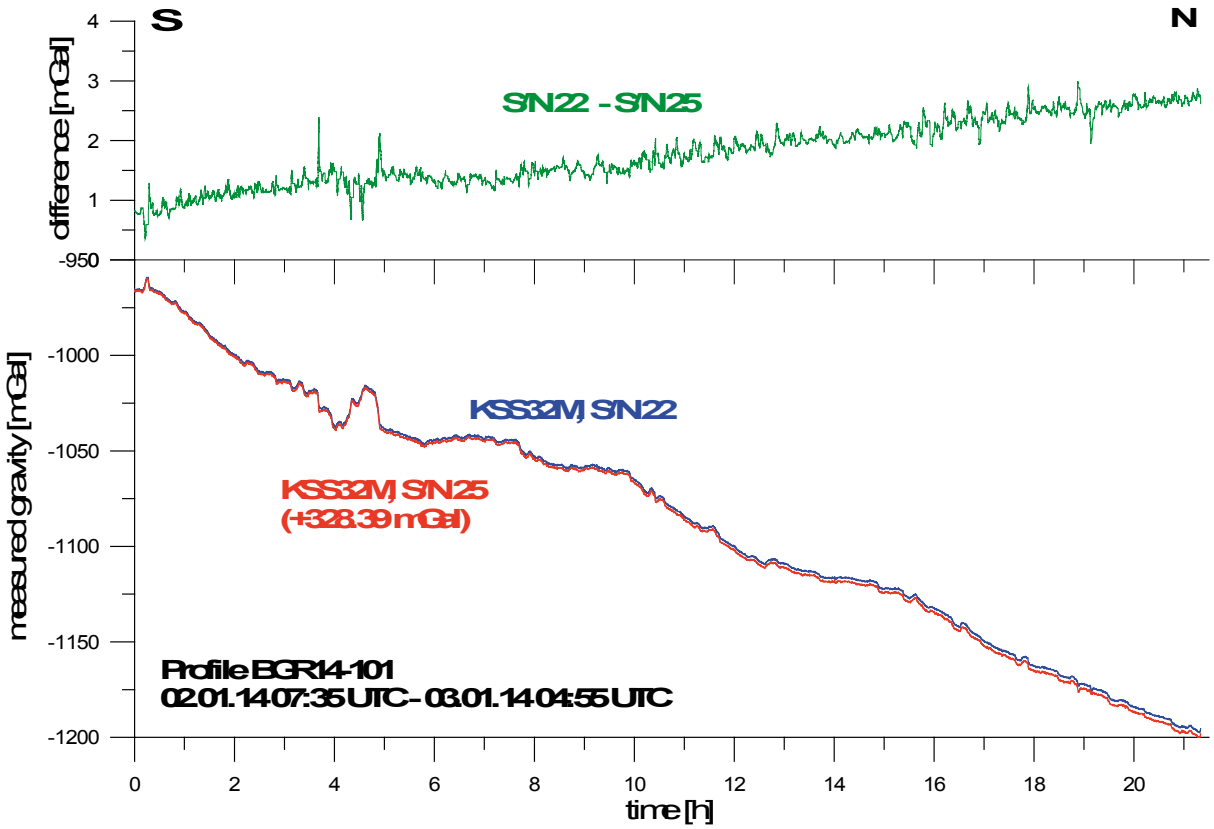


Fig. 3.6: Measured relative gravity values with the two sea gravimeter systems and the differences along profile BGR14-101

However the comparison of the gravity values on later profiles further north show that the differences between both instruments increase with time and gravity difference with respect to Durban. Fig. 3.7 shows the observed relative gravity values of both instruments along profile BGR14-139. The mean differences increased to 10.56 mGal and could probably not be explained by different instrumental drift rates alone. They may be explained also by non correct scale factors of the instruments. After determining the true instrumental drift after returning to Durban, it will be investigated whether a correction value to the scale factors should be applied.

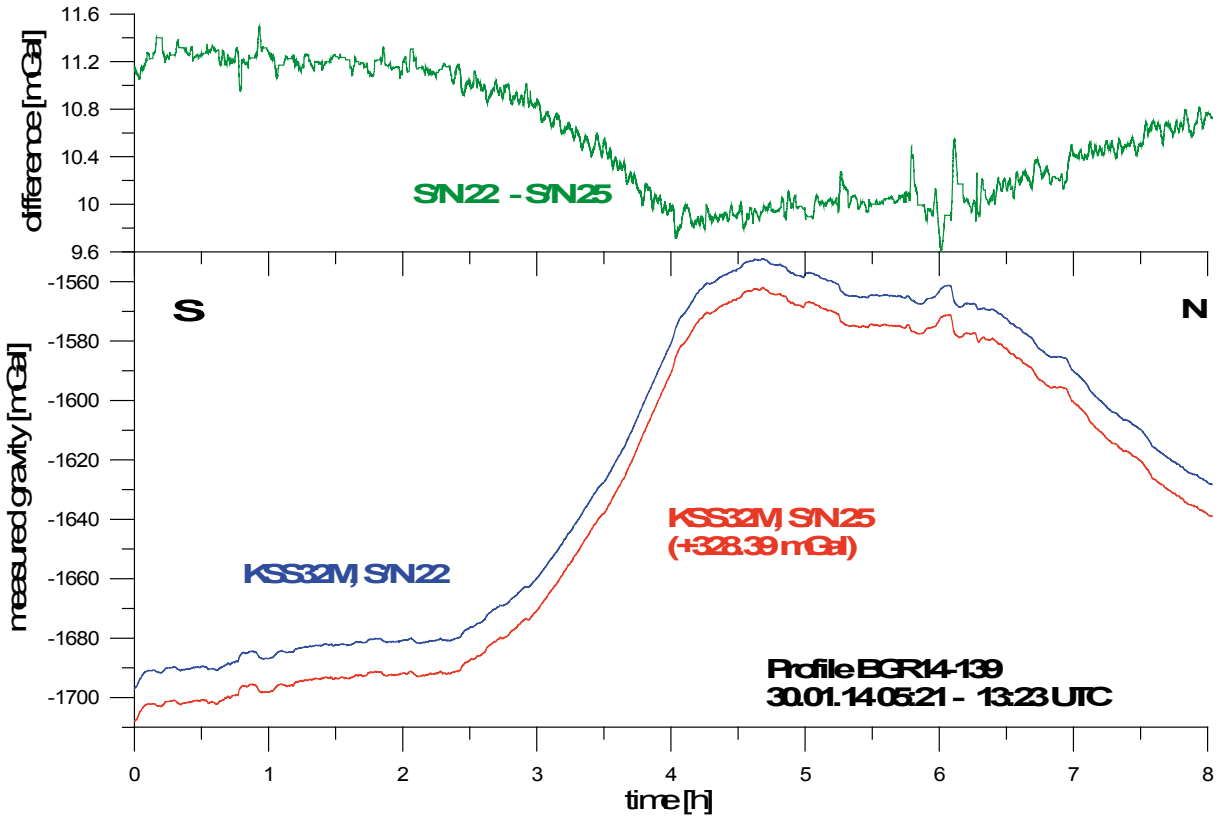


Fig. 3.7: Measured relative gravity values with the two sea gravimeter systems and the differences along profile BGR14-139

The gravity data observed during the cruise are of high quality and show larger noisy behaviour only entering sharp curves and rapid speed changes of the vessel. In order to check the accuracy of the data quantitatively, the free-air gravity values at crossovers of gravity profiles are compared. Figure 3.8 shows a map of the SO230 profiles together with the crossover errors (COE). The average COE in the KSS32M data for 36 crossovers is 1.35 mGal (1σ = 0.75 mGal). The biggest difference found was 2.48 mGal. The general accuracy, however, is better than 1.5 mGal. The COE will probably decrease after applying the instrumental drift correction as it is obvious that gravity values measured later in time are mostly lower than the respective values measured earlier.

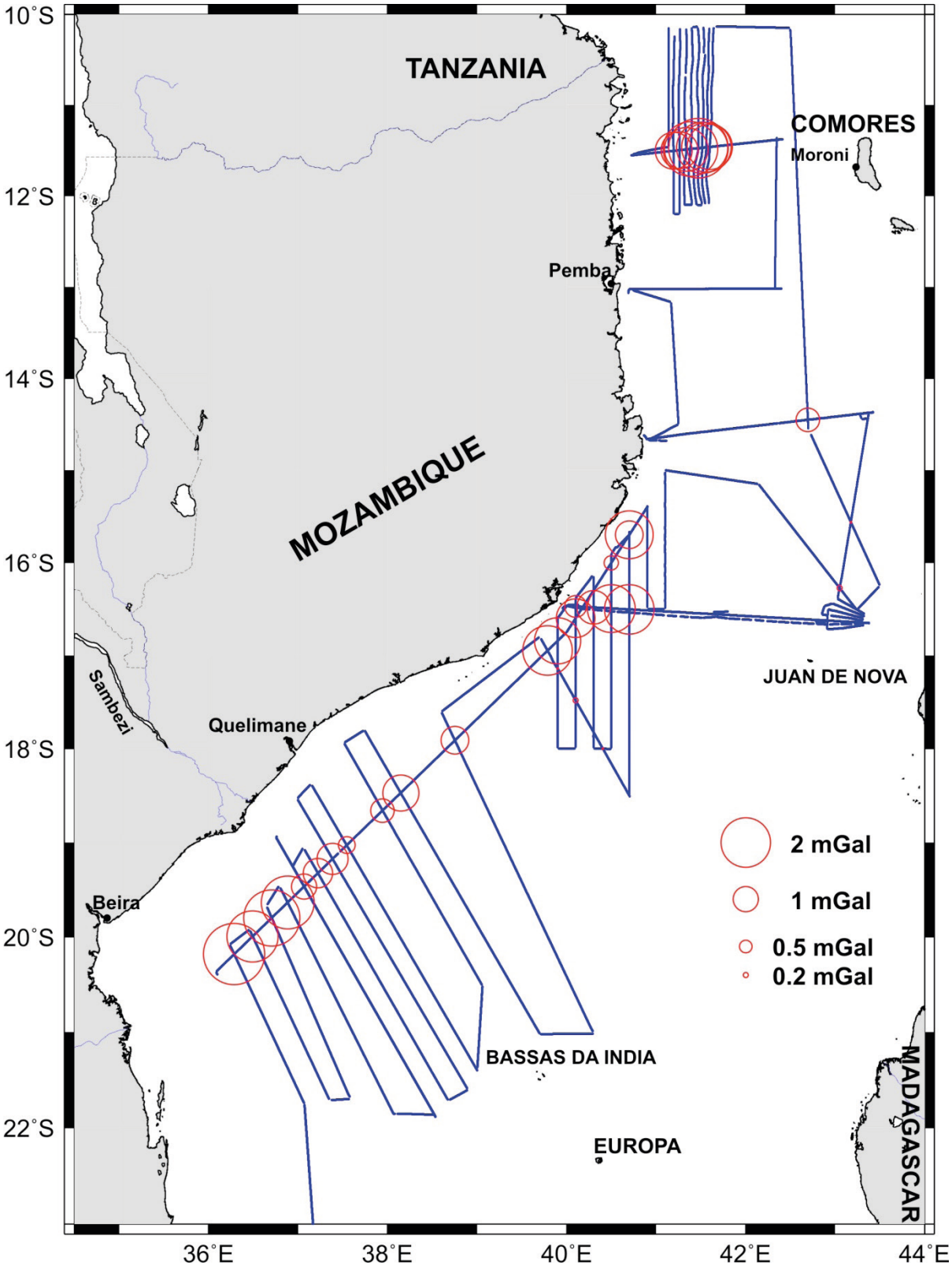


Fig. 3.8: Crossover errors (COE) of free-air gravity anomalies of SO230 profiles

During cruise BGR07 MOBAMASIS in 2007 gravity data were also measured with BGR's KSS31M, as the instrument was named before its upgrade in 2011. In total 16 profiles with a length of 3,720 km are located in the MOCOM survey area. Profile BGR14-109/109A followed the run of BGR07-208 in order to acquire refraction seismic data. Fig. 3.9 shows the free-air gravity anomalies and the bathymetry observed along both profiles. The correlation is almost perfect. Thus, the MOBAMASIS gravity data may be merged with the SO230 data for further map compilations.

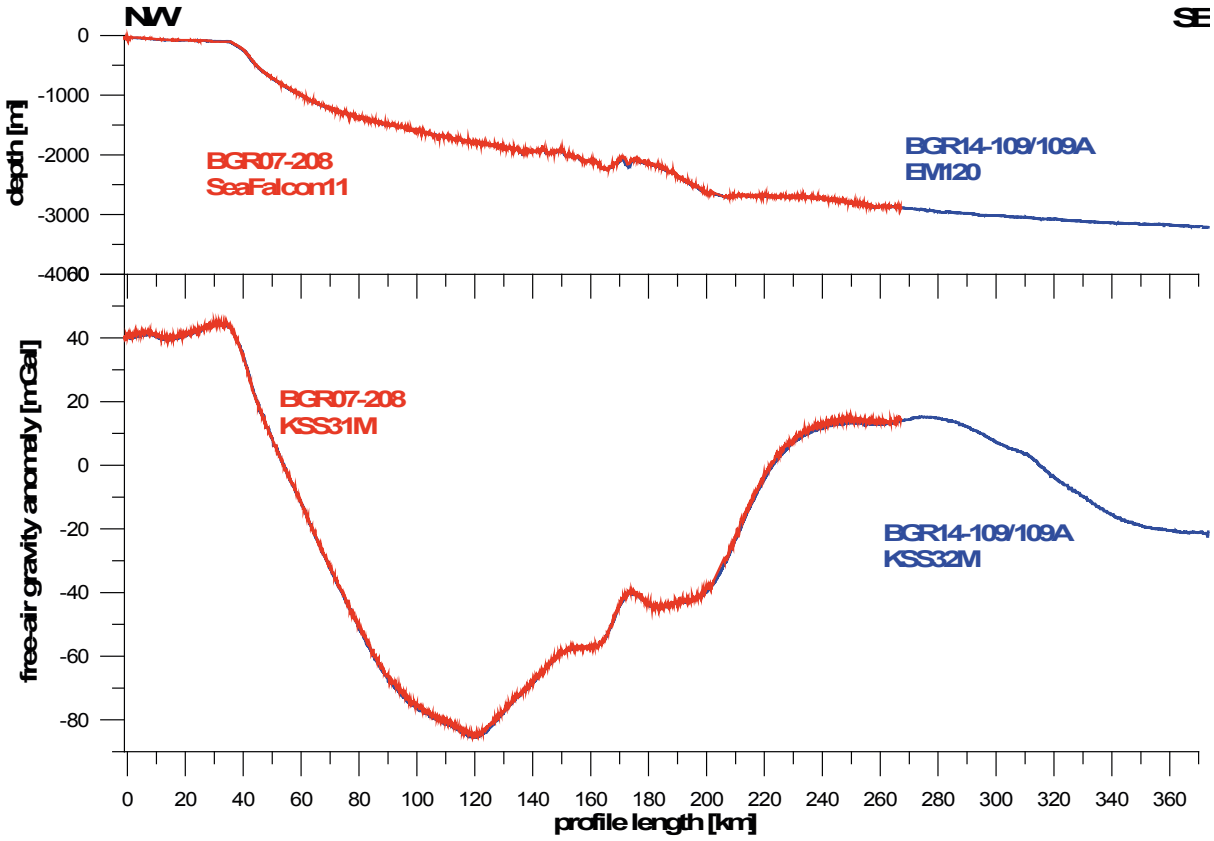


Fig. 3.9: Bathymetry (above) and free-air gravity anomalies (below) along profiles BGR07-208 (red) and BGR14-109/109A (blue)

Gravity database

Gravity measurements were carried out continuously during the entire cruise from leaving until returning to Durban harbour. Therefore gravity data along all 67 profiles with a total length of 12,185 km were measured (Fig. 3.10). The details of all profiles are summarized in the profile list (see appendix). In addition about 3,000 km of the acquired data along transits are useable.

Fig. 3.11 shows the free-air gravity anomaly map of the southern survey area with the prominent gravity minimum (-90 mGal) of the Beira High. The MOBAMASIS gravity data were included for the map compilation.

Fig. 3.12 shows the free-air gravity anomaly map of the northern survey area.

Prominent features are the positive gravity anomalies (+45 mGal) of the Davie Ridge and the negative anomalies (down to -120 mGal) of the adjacent graben in the west. The Kerimbas Graben is also characterized by low gravity anomaly values (down to -110 mGal).

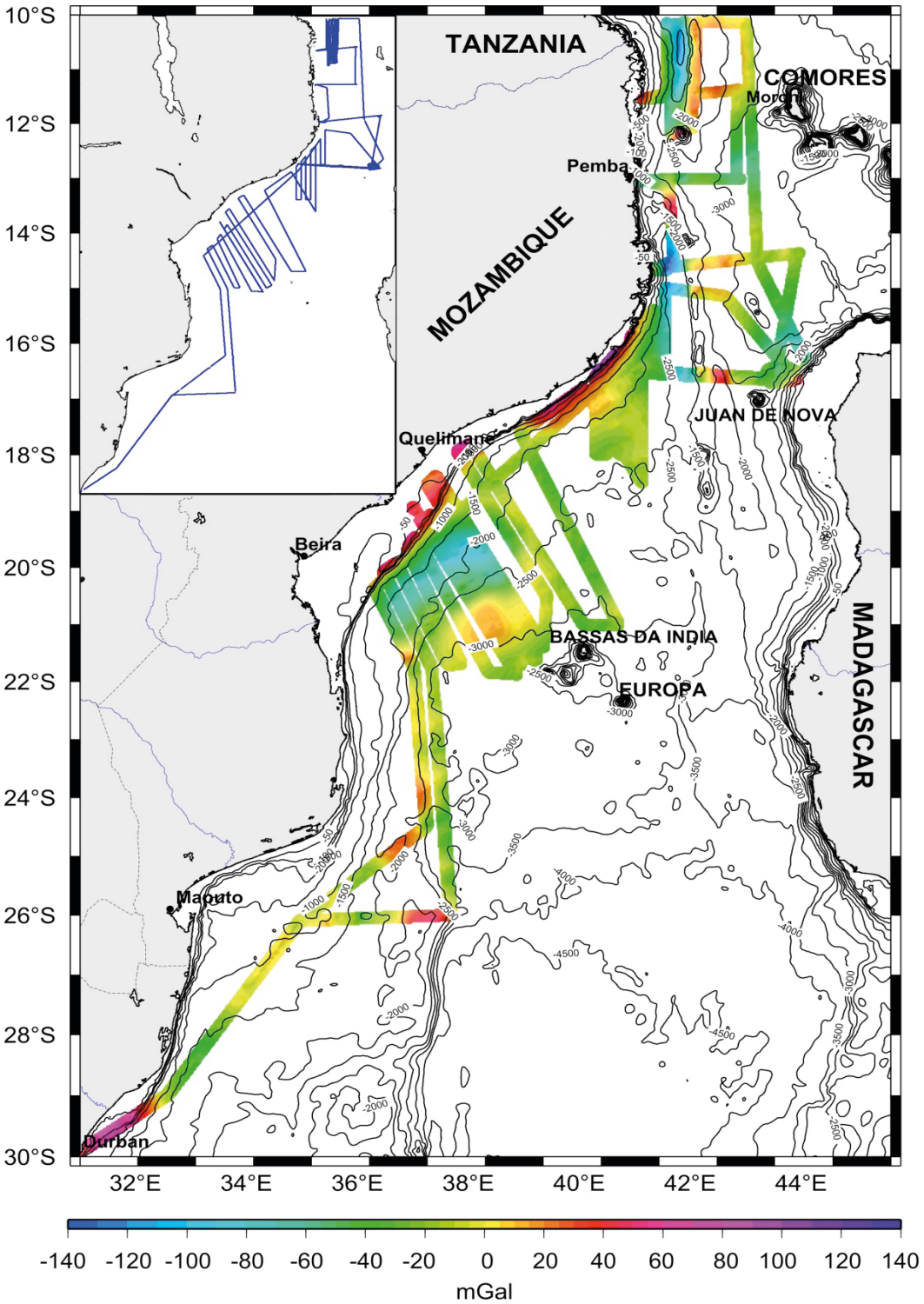


Fig. 3.10: Map of the free-air gravity anomalies acquired during cruise SO230. The map is drawn up to a distance of 12 kilometres from the tracks. The map is based on a 1 x 1 (arc-)minutes grid and it is underlain by the bathymetry of Andersen (2010).

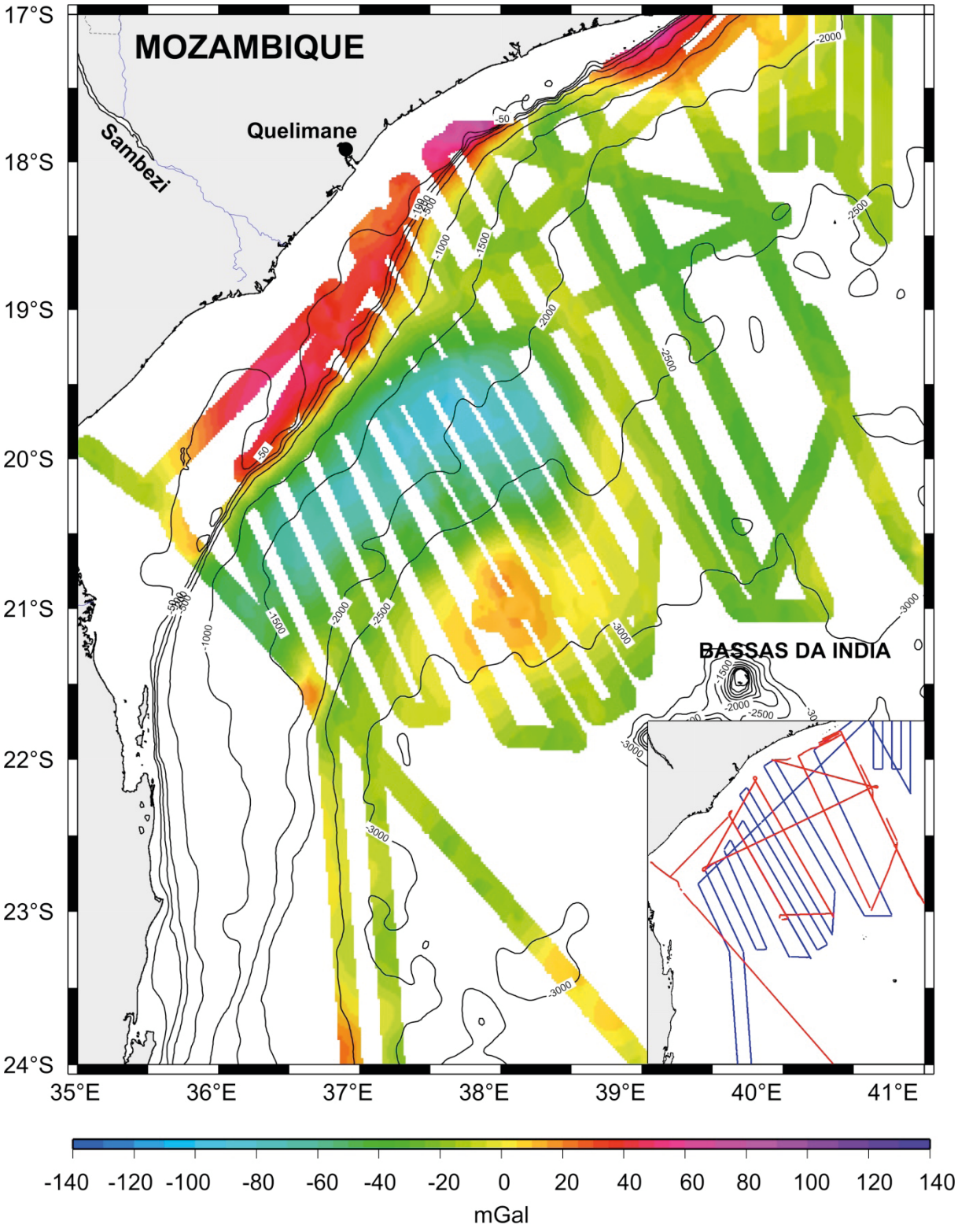


Fig. 3.11: Map of the free-air gravity anomalies in the southern survey area acquired during cruises MOBAMASIS (red profiles) and SO230 (blue profiles). The map is drawn up to a distance of 12 kilometres from the tracks. The map is based on a 1 x 1 (arc-) minutes grid and it is underlain by the bathymetry of Andersen (2010).

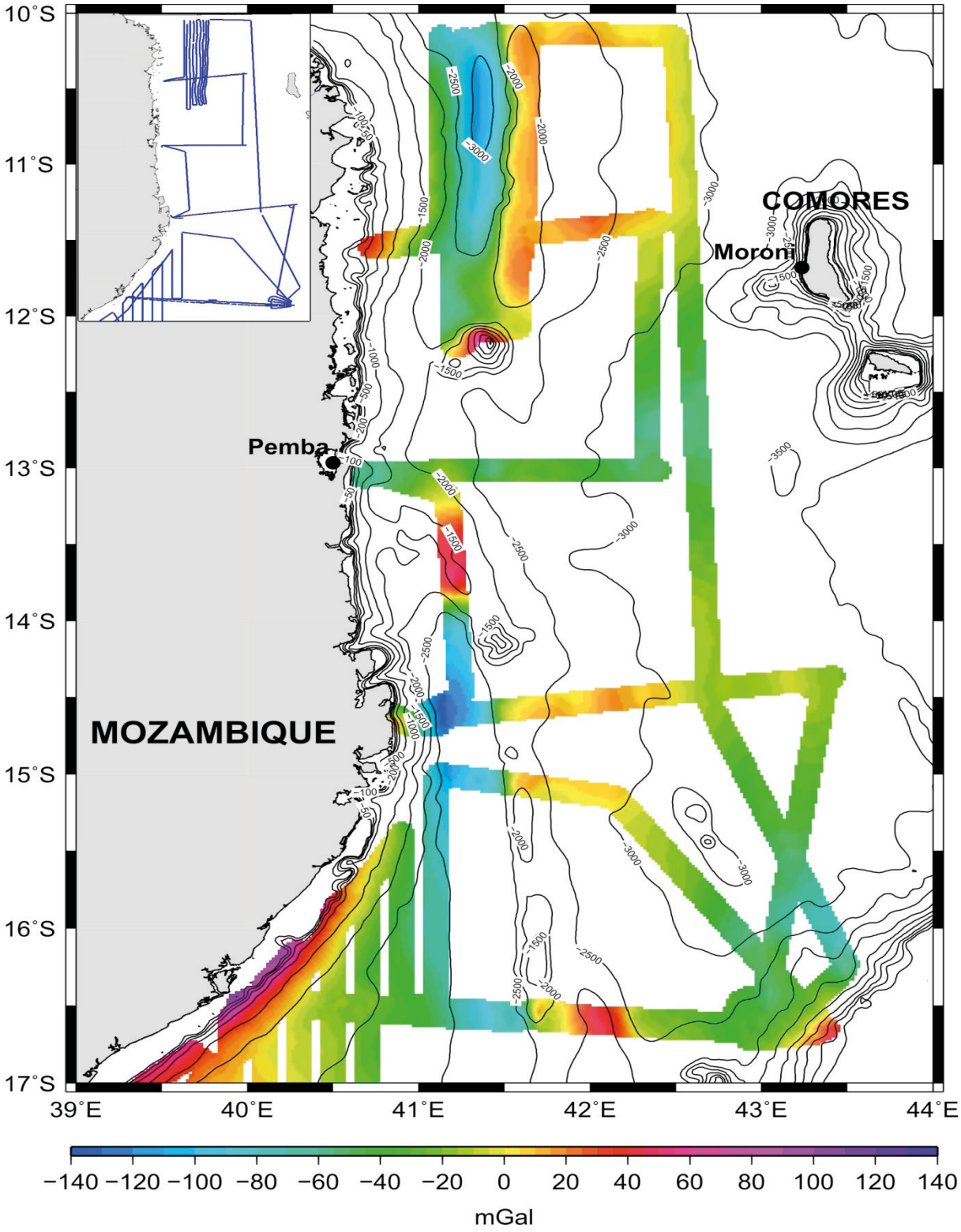


Fig. 3.12: Map of the free-air gravity anomalies acquired during cruise SO230 in the southern survey area. The map is drawn up to a distance of 8 kilometres from the tracks. The map is based on a 1 x 1 (arc-) minutes grid and it is underlain by the bathymetry of Andersen (2010).

Comparison with gravity anomalies derived from satellite altimetry

The analysis of crossover errors shows that our gravity measurements are far more precise than alternate methods of measuring the marine gravity field such as the calculation of free-air gravity anomalies from satellite altimeter measurements. A satellite altimeter uses a pulse-limited radar to measure the altitude of the satellite above the closest point to the sea surface. Global precise tracking coupled with dynamic orbit calculations provide an independent measurement of the height of the satellite above the ellipsoid. The difference between these two measurements is equal to the geoid height. In marine areas the free-air anomaly can be calculated from the slope of the geoid. Closely spaced satellite altimeter profiles collected during the GEOSAT Geodetic Mission (~ 6 km) and the ERS 1 Geodetic phase (~ 8 km) were used by different groups to calculate grids of the free-air gravity anomalies.

Our data set can serve as a reference for the comparison of two different satellite gravity data compilations. The first is the one from Sandwell and Smith (2009), version 20.1, referred to as SDW20.1 in the following. The second data set is from the DTU Space Center, Copenhagen (Andersen, 2010) referred to as DTU10 here. Subtracting the 1 x 1 minute grid of the DTU10 and SDW20.1 data from the 1 x 1 minute grid of the shipboard data one obtains the maps of the differences in the working area shown in Fig. 3.13. The maps are masked beyond a distance of 4 kilometres from the SO230 profiles. The differences of both datasets range between +20 and -10 mGal, whereby larger differences accumulate near the central Mozambique coast between 18°S and 16°S. In the northernmost survey area of the Kerimbas Graben and the south Somali Basin the shipboard gravity anomalies are almost constantly higher (≈ 4 to 8 mGal) than the anomalies derived from satellite altimetry.

Satellite gravity anomalies along the complete track were additionally calculated with bicubic interpolation out of the 1 x 1 minute grids and subtracted from the shipboard data (Fig. 3.14). The mean differences are nearly the same (DTU: 2.56 mGal; SDW20.1: 2.65 mGal). However, the standard deviation is lower for the SDW20.1 data (3.46 mGal vs. 4.07 mGal). However, these differences will change by applying the instrumental drift correction to the shipboard data after completion of the cruise in Durban.

To illustrate the differences between the data sets in detail, Fig. 3.15 shows exemplary a comparison along profiles BGR14-133/133a/133b and BGR14-141.

While the wavelength range of satellite and shipboard anomalies is mostly comparable, it becomes obvious that the satellite data could not resolve sharp bathymetric features like the western flank of the Davie Ridge on BGR14-133/133A/133B. On the other hand the satellite anomalies show frequent oscillations of several mGal with a wavelength of 15 to 20 km which are not real. These reflect the limited accuracy and resolution of the altimetry data. Approaching the coast the accuracy of the satellite data generally decreases and short wavelength on the shelf are not resolved. In the case of profile BGR14-141 the DTU10 gravity data should not be trusted within 20 km of the coast.

To conclude the free-air gravity anomalies derived from satellite altimetry are of great importance to obtain an overview of the gravity field in an oceanic area. For detailed investigations, however, shipboard gravity measurements are indispensable.

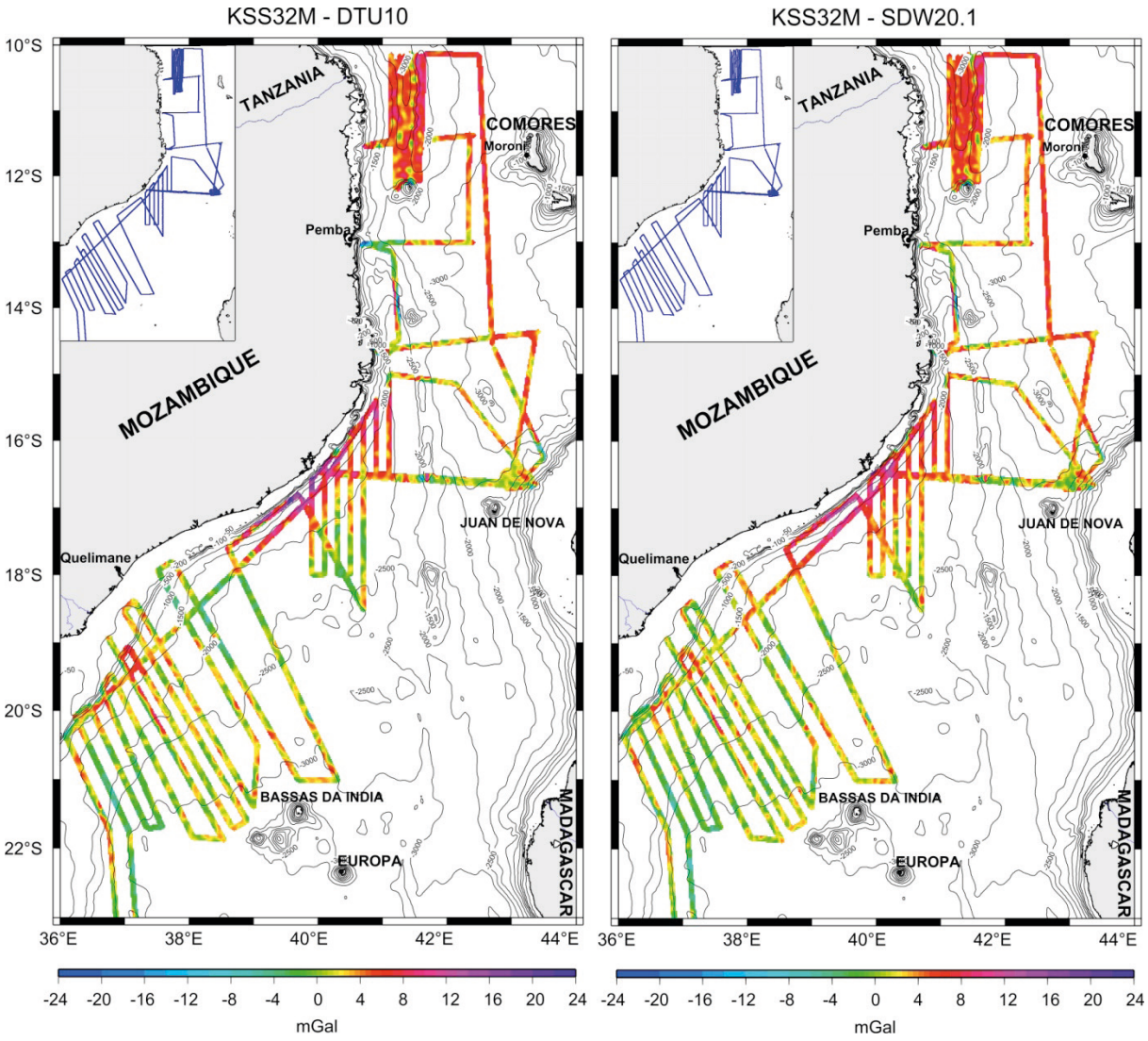


Fig. 3.13: Differences of the shipboard free-air gravity data and the gravity datasets derived from satellite altimetry (left: Andersen (2010), DTU10; right: Sandwell and Smith (2009), version 20.1)

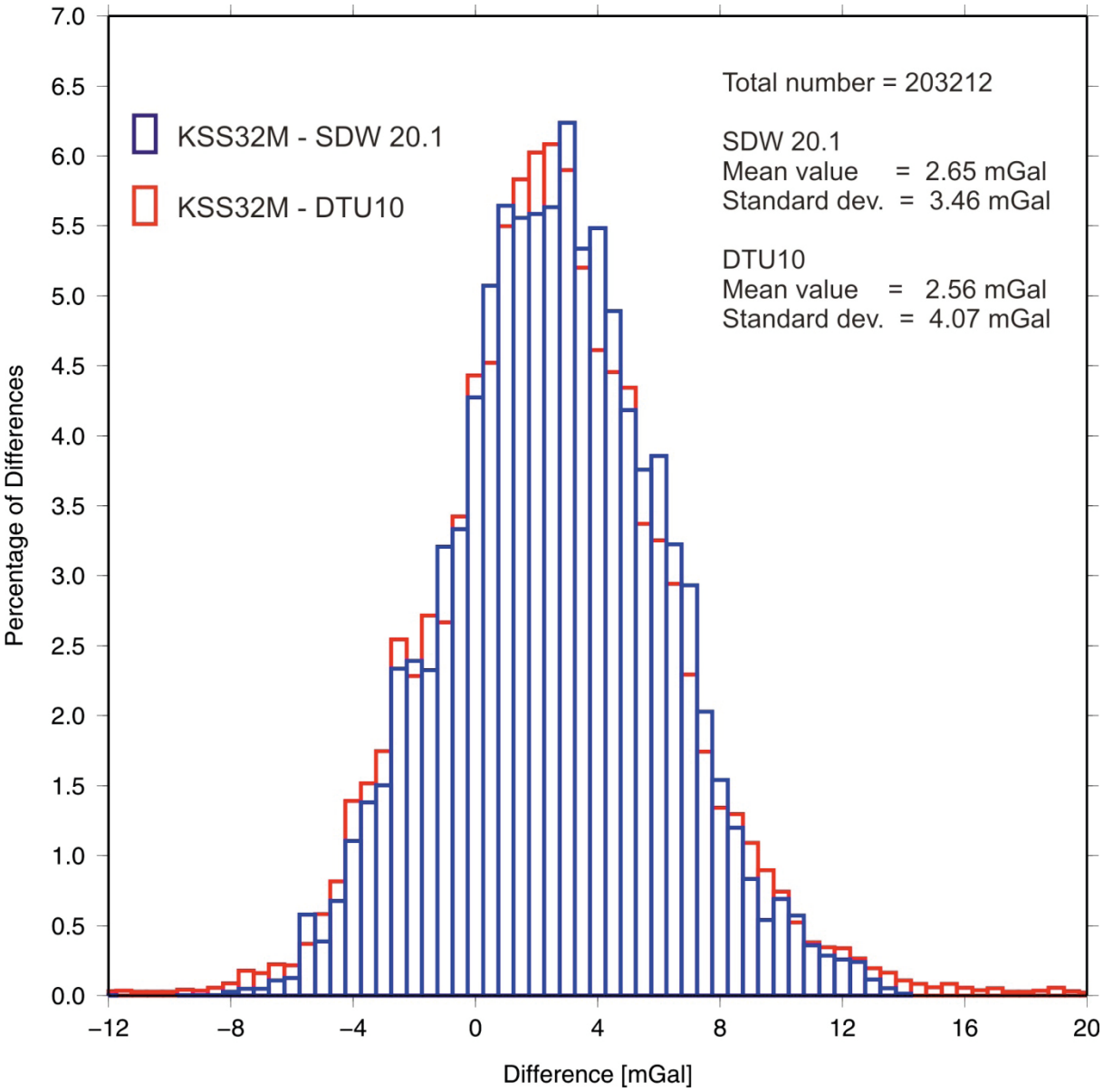


Fig. 3.14: Histogram of differences between shipboard KSS32M free-air gravity anomalies and the corresponding gravity datasets derived from satellite altimetry

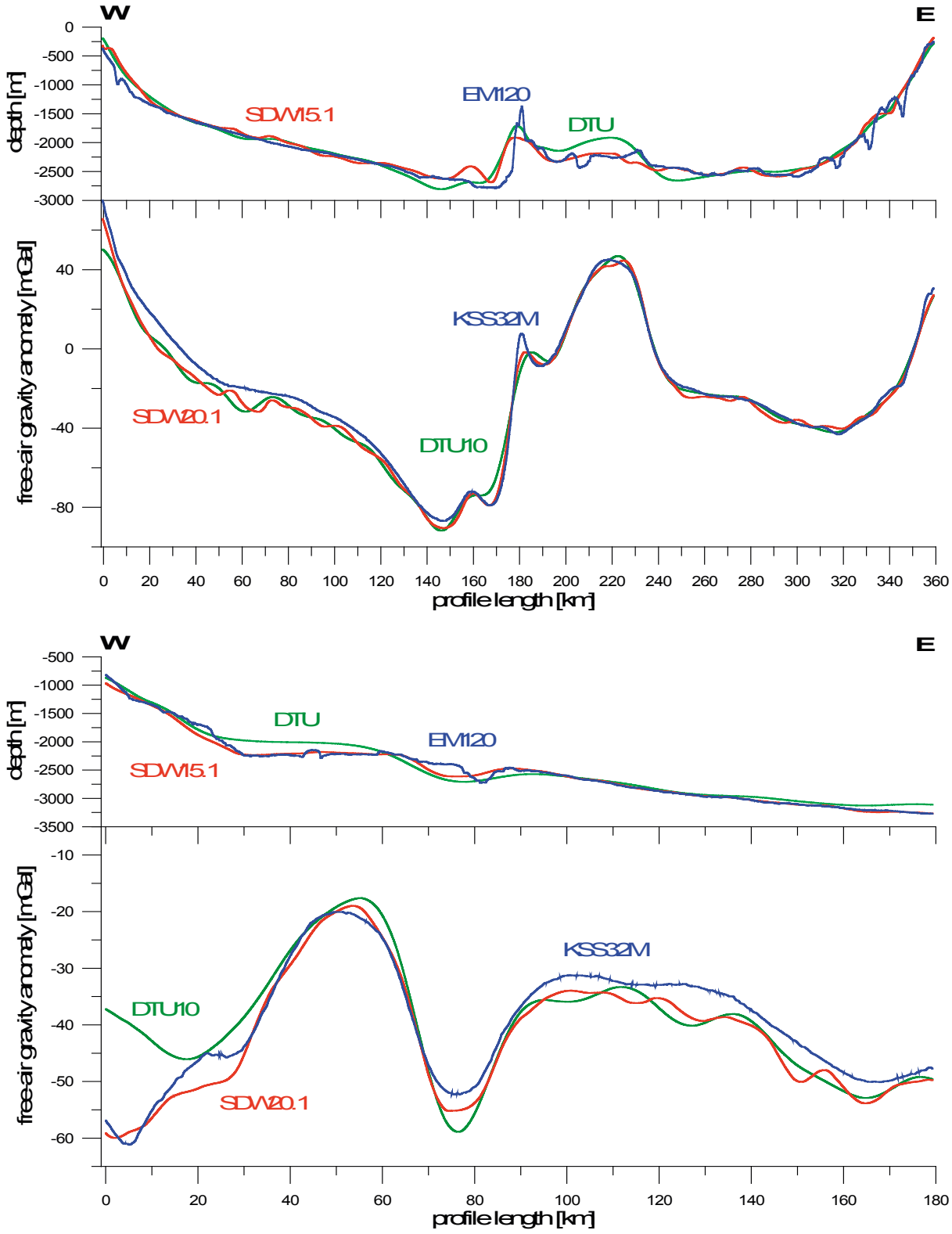


Fig. 3.15: Comparison of the ship-based KSS32M and satellite free-air gravity anomalies along profiles BGR14-133/133A/133B (above) and BGR14-141 (below) together with the corresponding bathymetry measured with the Simrad EM120 multibeam system and from the global bathymetry of Sandwell and Smith (2009) and Andersen et al. (2010)

4. MAGNETIC MEASUREMENTS

Bernd Schreckenberger, Ingo Heyde BGR

Objectives

Within the MOCOM (SO230) and PAGE_Four (SO231) projects the magnetic network gathered during previous cruises (SO183, MOBAMSIS) will consequently be extended towards the coast of Mozambique. The lines have a spacing of 20-40 km and will capture the different segment signatures of the continental margin. They should furthermore contribute to the interpretation of the geological formation of the Beira High in relation to the Gonwana break-up. North of Beira High, we found a mostly quiet magnetic field of the magnetic Jurassic quiet zone in this region. Here, future analysis will try to identify the magnetic anomaly of M33 in order to confirm/withdraw the continuity of the strong negative anomaly M41.

Three different magnetometer systems were used during cruise SO230 (MOCOM):

A towed arrangement consisting of (1) a SeaSPY gradient magnetometer array with two scalar Overhauser sensors and (2) a vector magnetometer sensor (Magson) (Fig. 4.1) and additionally (3) two vector magnetometer sensors mounted on the observation deck above the bridge (Fig. 4.2).

Towed gradient magnetometer system

The BGR **SeaSPY™** gradient magnetometer system (Marine Magnetics Corp.) consists of two proton precession magnetometers that utilize the quantum mechanical Overhauser effect. Two equivalent magnetometer sensors are towed 150 metres apart as a longitudinal array about 750 metres astern of the ship (Figs. 4.1, 4.2). Both sensors measure the total intensity of the magnetic field simultaneously. The difference between the two measurements is an approximation for the longitudinal gradient of the field in the direction of the profile line. Provided that the time variations of the Earth magnetic field are spatially homogeneous over the sensor spacing, the differences are free from temporal variations and their integration restores the variation-free total intensity or magnetic anomaly (apart from a constant value).

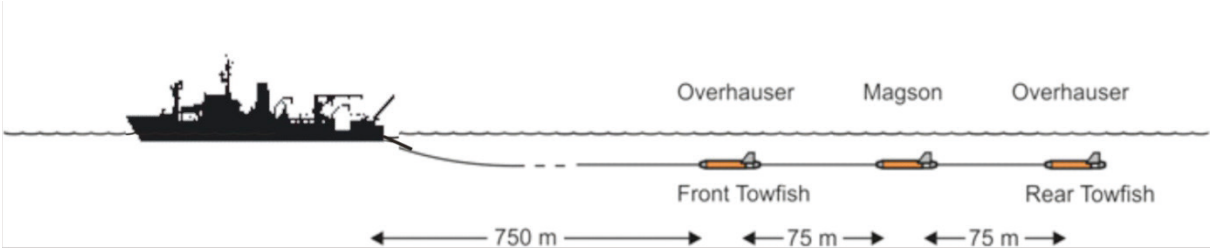


Fig. 4.1: Schematic sketch of the towed gradiometer system setup

A standard proton precession magnetometer uses a strong DC magnetic field to polarize itself before a reading can be taken. Overhauser sensors work similarly to proton magnetometers with the exception that the excitement of the proton spin (polarization) is through radio waves which excite the spin of the electrons in an organic fluid within the sensors. The electrons then transfer their spin to the protons in the fluid via a quantum mechanical process called Overhauser effect. Similar to every other proton magnetometer the relaxation frequency of the protons is a measure for the magnitude of the ambient magnetic field. The polarization power required is much smaller than that needed by normal proton magnetometer systems and the AC field may be left active while the sensor is producing a valid output signal. This allows the sensor to cycle much faster and to produce more precise results than a standard proton magnetometer. As configured for this survey, the Overhauser sensors had a cycle time of one second. The sensors are specified with a noise level of 0.01 nT/√Hz, a resolution of 0.001 nT, and an absolute accuracy of 0.2 nT.

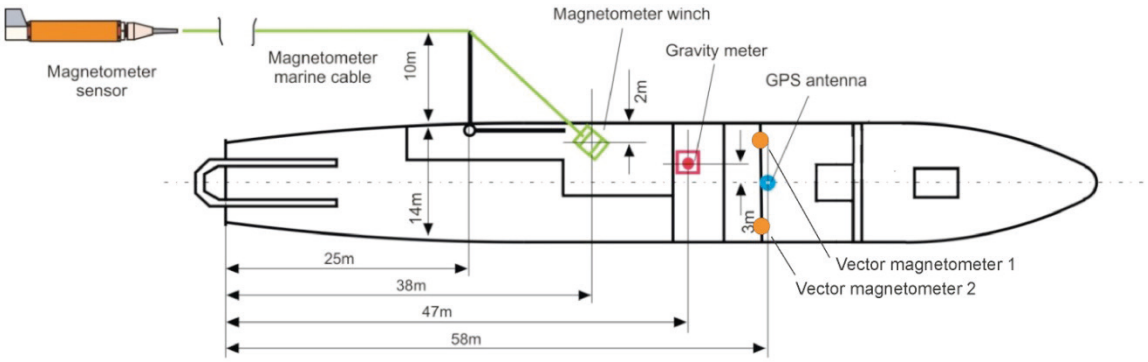


Fig. 4.2: Deployment configuration of the towed gradiometer array and installation locations of the ship-borne vector magnetometers.

Towed vector magnetometer

The fluxgate tow fishes were designed by BGR and built by Magson GmbH in Berlin. The first sensor was built in 2004 and modified in 2005; a second sensor was built in 2006 as a slightly modified copy of the first sensor.

The system consists of a digital 3-axis fluxgate magnetometer, two different two-axis tilt-meters, a single axis accelerometer and sensors for temperature, pressure, and humidity. Fluxgate and inclinometers are mounted on a common platform. All components together with the sensor electronics and the data recording unit are placed inside a pressurized glass-fibre tube of the same brand as the sensors of our SeaSpy™ gradiometer (Fig. 4.3). Data are stored internally with a sampling rate of 10 Hz on a compact flash card.

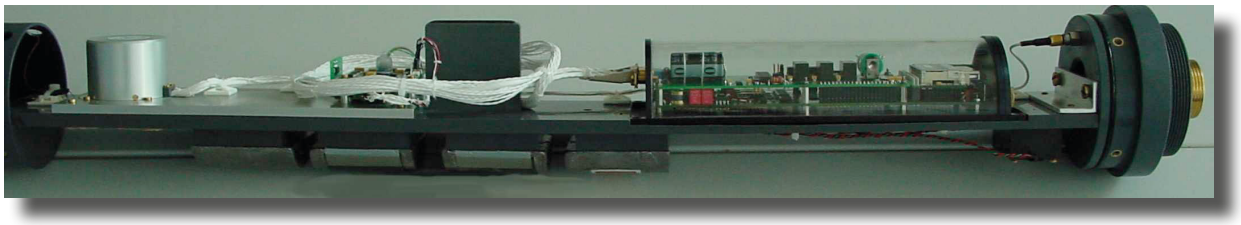


Fig. 4.3: Components inside the fluxgate magnetometer tow fish

The digital Magson fluxgate consists of two crossed ring-cores, three pick-up coils, and a tri-axial Helmholtz coil system for field feedback. The vector compensation reduces the cross field influence on the measurements. The internal feedback circuit, using digitally controlled DC-currents fed into the Helmholtz-coils maintains precise nulling of the field inside the ring-core. The second harmonic of the excitation frequency, which is digitized directly, is a measure of the absolute value of the magnetic vector component. Scale factor and non-orthogonality depend only on the stability of the feedback coil system and are estimated by a scalar fluxgate calibration. Fluxgate magnetometers with digitally compensated ring-core sensors maintain a considerably higher accuracy over non-compensated instruments and yield higher stability over time and temperature (24ppm/°C thermal expansion coefficient of feedback coil system). The Magson fluxgate sensor is specified with a noise level of < 0.02 nT/√Hz, a resolution of 0.008 nT and a long term stability < 10 nT/year.

The fluxgate and the tilt sensors are mounted on a common aluminium plate. The first tilt sensor by ABJ measures pitch and roll angles by 3D-MEMS technology (VTI sensor chip). The angular range covers a span of ± 30° with a resolution of 0.001°. The second tilt sensor is a dual axis accelerometer by Analog Devices (ADXL203), measuring pitch and roll angles over a range of ± 50°/± 20° (first/second Magson tow fish) resolving 0.05° of arc (noise level 0.095°). A third accelerometer for the vertical axis (ADXL103) allows detection of unintended tow fish positions beyond the inclinometer range. The accuracy of the ABJ sensor is significantly higher than that of the Analog Devices sensor, but the calibration function is non-linear and temperature dependent. The Analog Devices sensor has a calibration function which is linear and almost temperature independent, but it suffers resolution and a higher noise level by an order of magnitude. Both tilt meters measure not only the static acceleration, which would provide the needed true roll and pitch angles, but by principle they also measure dynamic accelerations of the continuously moving tow fishes. This source of error can be reduced by filtering.

High precision of the measured tilt angle is necessary to rotate the field components from the sensor's coordinate system of the moving fluxgate tow fish into the geomagnetic coordinate system. By rotation about the Euler angles, the vertical and horizontal vector components are obtained. The accuracy of the vector data is limited by the accuracy of the rotation angles. For example, a 0.01° tilt deviation may result in 5 nT component error in the survey area. Without any yaw angle estimation, the orientation of the horizontal field vector (i.e. the north and east component) remains unknown. A crude first approximation is given by the ship's course. Utilising magnetic heading from the fluxgates themselves (compass yaw) removes sea floor anomalies by default; however, a numerical yaw approximation

separating sea floor anomalies from tow fish movements in water by wavelength filtering has been introduced by Engels et al. (2008).

An embedded microprocessor with a flash disc is used to store all fluxgate and tilt-meter readings. The storage capacity of 1 GB is sufficient to allow 11 days of continuous operation at the selected sampling rate of 10 Hz.

Onboard vector magnetometer

Another vector magnetometer system was installed on the observation deck of the vessel (Fig. 4.2). It consists of two separate waterproof housings that contain orthogonal digital ring core fluxgate sensors and two-axis inclinometers, a data acquisition box and a GPS mouse. The system was built by MAGSON GmbH in Berlin for BGR as an onboard system for research vessels. The sensors have a dynamic range of +/- 100000 nT and a long-term stability of <10 nT/year and were fixed to the railing on the port and starboard sides of the observation deck (Fig. 4.2). The data are recorded internally on a CF memory card. Two different types of data files are stored separately for each hour. The first file type (file extension M60) contains the values of the three orthogonal vector components and the inclination values together with UTC time marks. The sampling rate can be chosen between 1 and 20 Hz. On this cruise we used 10 Hz. The second file type (file extension S60) contains time marks and latitude and longitude from the GPS receiver and temperature values for both sensors. The sensors are internally heated to a selectable temperature, on our cruise to 35°C. Additionally we also recorded the values from the ship's motion reference units (heave, roll, pitch, and azimuth). Experience shows that roll and pitch values from the vessel sensors are much more reliable than the inclinometer values from the fluxgate sensors that are less precise due to dynamic accelerations.

Work at sea

Magnetic survey operations

On the RV *Sonne* the magnetometer configuration is towed on the port side of the ship via an extendable boom about 10 m away from the ship (Fig. 4.2). The depth of the tow fishes is not precisely known due to unreliable depth indicators. It strongly depends on the speed of the vessel and we estimate that at 5 knots, such as during seismic profiles, the sensor depth might be around 60 m. For the magnetic/gravimetric/bathymetric profile lines which were mostly surveyed with 10 knots, the sensor depth will be considerably less and not more than 20 m. For some lines on the shallow shelf off Mozambique we pulled the magnetometers closer to the ship (rear sensor 200 m behind the stern) and set a limit of 30 m for the minimum water depth. The SeaSPY sensors s/n 13145 (front), s/n 13546 (rear) and the Magson fluxgate sensor s/n 13142 were operated during the whole cruise.

Four dedicated vector magnetometer calibration loops were performed. On 1st January a double loop from 19:18 UTC to 19:36 UTC without the towed magnetometers; on 13th January a double loop from 15:31 UTC to 16:39 UTC with the towed magnetometer array (Fig. 4.4), a single calibration loop without the towed instruments; on 4th February at around 7:47 UTC; and on 11th February a

double loop from 07:56 UTC to 09:01 UTC with the towed instrument. Using the data from the calibration loops it will be attempted later to compensate for the ship's magnetic field by estimating the compensation matrix in order to calculate total intensity values and magnetic anomalies from the vector components. Additionally it is intended to apply methods that were used by e.g. Seama et al. (1993), Korenaga (1995), Parker and O'Brian (1997) and Engels et al. (2008) to utilize the vector components for the determination of magnetic strike directions.

During cruise SO230 67 profiles were surveyed with the towed magnetometer system. They are named according to the BGR naming scheme beginning with BGR14-101. The profile list can be found in Appendix 4 and contains the start and end times, the geographical coordinates (WGS84) and direction and length for each line. The location of the lines can be seen in Fig. 4.5. For all profiles except of Line BGR14-137A (the eastern part of BGR14-137) magnetic data from the towed system are available.

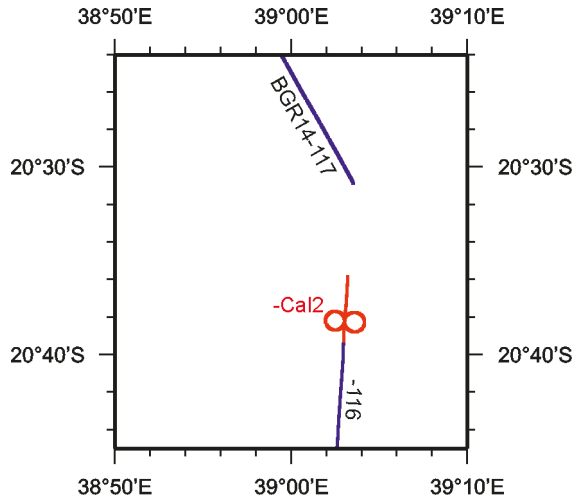


Fig.4.4: Track plot of the calibration/compensation figure between survey lines BGR14-116 and -117 on 13. January. The diameter of each circle is one nautical mile, the survey speed was 6 kn.

The total length of the lines is 12,110 km. Together with magnetic profiles obtained during cruise MD163 (MOBAMASIS, Reichert et al., 2007) and lines to be surveyed during the following SONNE cruise SO231 (PAGE-Four), a nearly complete coverage of the oceanic crust and the Beira High area between the Bassas da India islands and the Mozambique continental margin south of 16°S will be obtained.

Data processing

The data of the SeaSPY gradient magnetometers are recorded using the SeaLINK software by Marine Magnetics and additionally in the BGR data recording system that integrates the most relevant sensor data available on the ship into a propriety BGR database. Here, the navigation data of the ship, weather data, water depth values, the values of the BGR gravimeter and of the SeaSPY gradiometer are combined. Based on this data files (DE- files) a data processing procedure removes or interpolates erroneous values, calculates gravity free air anomaly values as well as magnetic anomalies by performing the IGRF reference field reduction. The data are then written to another data structure (DV-files). Additionally, in the DV-files the magnetometer values are shifted in time due to the cable length and the speed of the ship in order to represent the magnetic field at the position of the vessel.

Available programs that restore the magnetic anomaly from the gradient data either use the DV files (Eilers et al., 1994) or the original SeaSPY-files (Engels et

al., 2008). During the time of this cruise hardly any magnetic disturbances were observed. Only on 7th February at 17:00 UTC a storm sudden commencement (sc) with 20 nT amplitude was identified in the total intensity followed by minor magnetic unrest for some hours.

The data from the towed Magson fluxgate magnetometer can be processed using the programs by Engels et al. (2008) preferably utilizing the results of a calibration figure cruise like that one sailed on 1st January. Processing and interpretation of the towed vector magnetometer data suffer from the unknown azimuthal orientation of the tow fish that cannot be measured but may deviate severely from the course or heading of the vessel.

The vector magnetometer data from the two sensors installed on the observation deck of the ship do not suffer from the orientation problems of the towed vector magnetometers because the orientation sensors of the ship can be used. On the other side, the measured vector components are heavily influenced by the induced and remanent magnetization vectors of the ship which may also be time dependent. A first preliminary evaluation of the data indicates that the sensor on the port side (sensor 1) is obviously less disturbed than sensor 2 on the starboard side (Fig. 4.2).

The magnetic field vector $\mathbf{B}^{S}_{obs}$ measured by the fluxgate magnetometers in the reference frame of the ship is the sum of the magnetic field of the Earth ($\mathbf{B}^{S}$) at the location of the sensor and the induced ($\mathbf{B}^{S}_{ind}$) and remanent ($\mathbf{B}^{S}_{rem}$) field of the ship, all expressed in the reference frame of the ship and neglecting induced fields through the movement of the vessel in the earth magnetic field:

$$\mathbf{B}^{S}_{obs} = \mathbf{B}^{S} + \mathbf{B}^{S}_{ind} + \mathbf{B}^{S}_{rem} .$$

$\mathbf{B}^{S}_{obs}$ can then be expressed as

$$\mathbf{B}^{S}_{obs} = \underline{RPY}\mathbf{B} + \underline{ARPY}\mathbf{B} + \mathbf{B}^{S}_{rem}$$

with **B** as the Earth magnetic field at the sensor position in geographical coordinates and

$$\mathbf{B}^{S} = \underline{RPY}\mathbf{B} \quad \text{and} \quad \mathbf{B}^{S}_{ind} = \underline{ARPY}\mathbf{B}$$

as the rotated magnetic field vector of the Earth and the induced field of the ship. $\underline{R}$, $\underline{P}$ and $\underline{Y}$ are rotation matrices for the roll, pitch and yaw movements and $\underline{A}$ represents the unknown susceptibility tensor of the ship. The three components of the remanent magnetic field of the ship and the nine matrix elements of the susceptibility tensor $\underline{A}$ can be determined by a least squares fit of the measured magnetic field components against the values of a magnetic reference field during a calibration loop (Isezaki, 1986, König, 2006). After the determination of the 12

parameters that describe the magnetic field of the ship for all azimuthal directions measured vector components of the ship based magnetometers can be corrected for the field of the vessel.

Preliminary results

Fig. 4.6 shows the result of a first attempt to compensate the magnetic field of the ship for the onboard vector magnetometer (sensor 1) on the port side of the observation deck. The total intensity value of the frontal sensor of the towed gradient magnetometer serves as a reference value for comparison of the curves in the plots. The references for the calculation of the compensation matrix were the values of the vector components of the IGRF2010 reference field. It can be seen that the total intensity calculated from the uncompensated vector components shows a systematic variation between 18.000 nT and 23.500 nT as compared to the expected nearly constant value of approximately 31.500 nT (Fig. 4.6a) from the Overhauser sensor. Figures 4.6b and 4.6c show the same values after applying the vector compensation procedures. The difference between both instruments is now reduced to about +/- 300 nT (unfiltered values are shown). This preliminary result is considered to be of moderate quality. We suspect that the location of the sensors on the observation deck is not ideal and should probably be changed.

We thank Uta Engels (BGR) for the availability of her newly developed compensation code and her remote assistance during our first attempts to apply her programs and procedures to the data of this cruise.

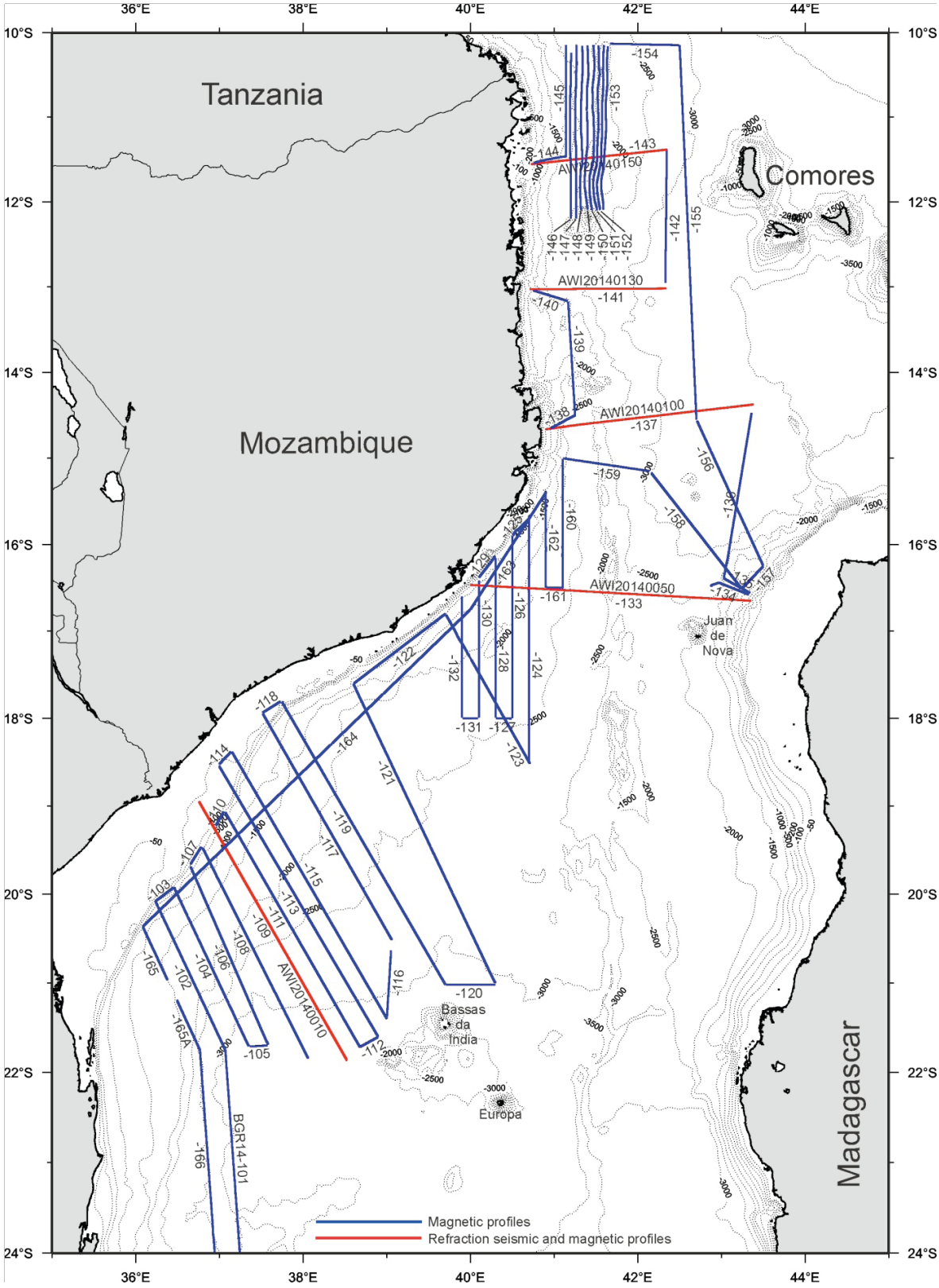


Fig. 4.5: Location of the geophysical profiles of cruise SO230 (MOCOM)

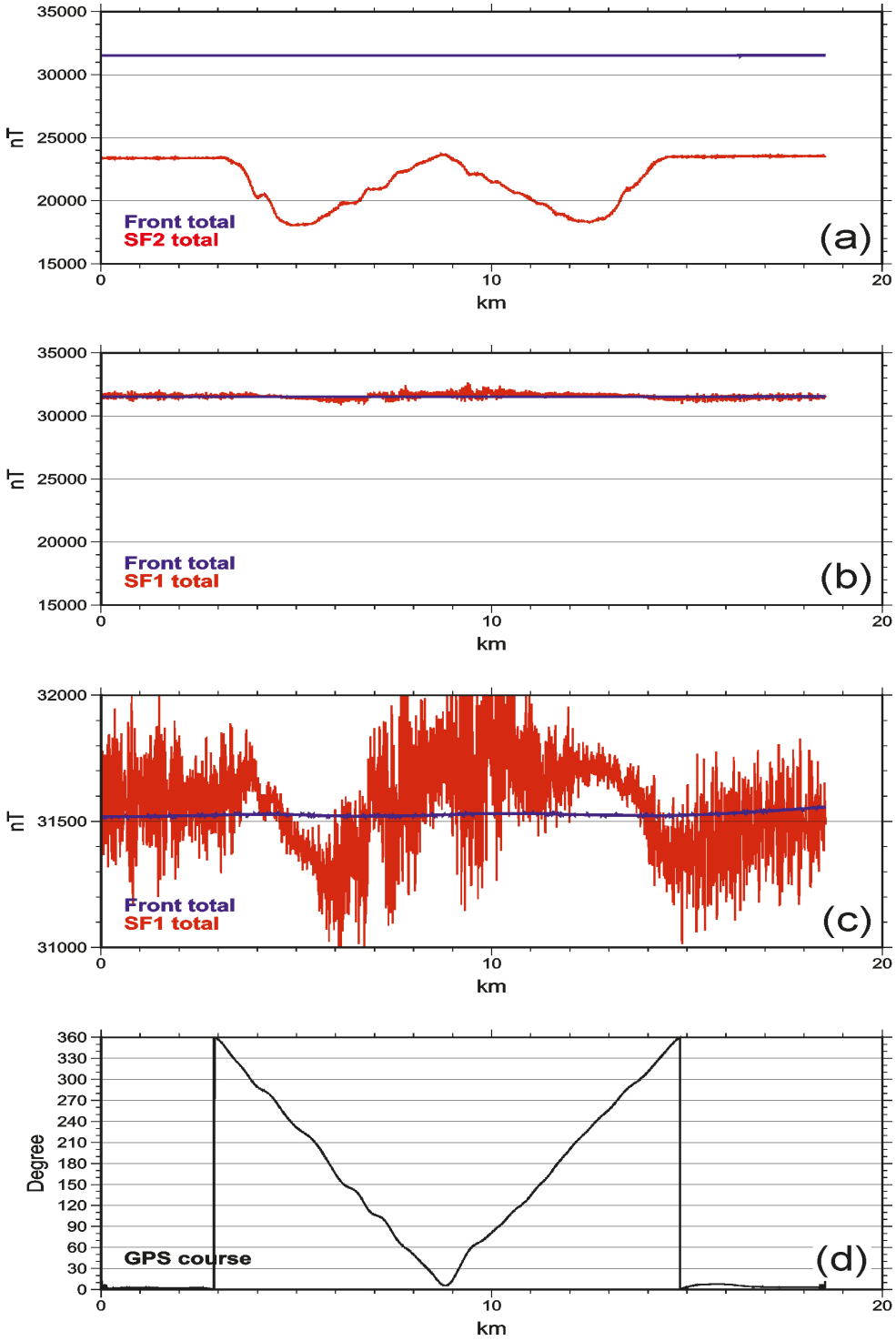


Fig. 4.6: Preliminary result of the compensation of the ship's magnetic field for fluxgate sensor 1 (SF1) on the observation deck in comparison to the total intensity measured with the towed frontal Overhauser sensor (blue line in (a)-(c)). (a) Total intensity (red) from the vector magnetometer before compensation and (b) after compensation. (c) Same as (b) at a larger scale. (d) Course plot for the calibration loop. See also Fig. 4.4.

4.1. Computer facilities/network and data acquisition system

In addition to the shipboard computers, BGR and AWI provided several desktop and laptop computers to carry out the acquisition and storage of all collected data (Fig. 4.1.1). Computers were installed in the magnetic laboratory (collection of magnetic and gravity data, shipboard database) and the gravimeter room (additional collection of gravity data). All PCs used operating system Windows 7 or Windows XP.

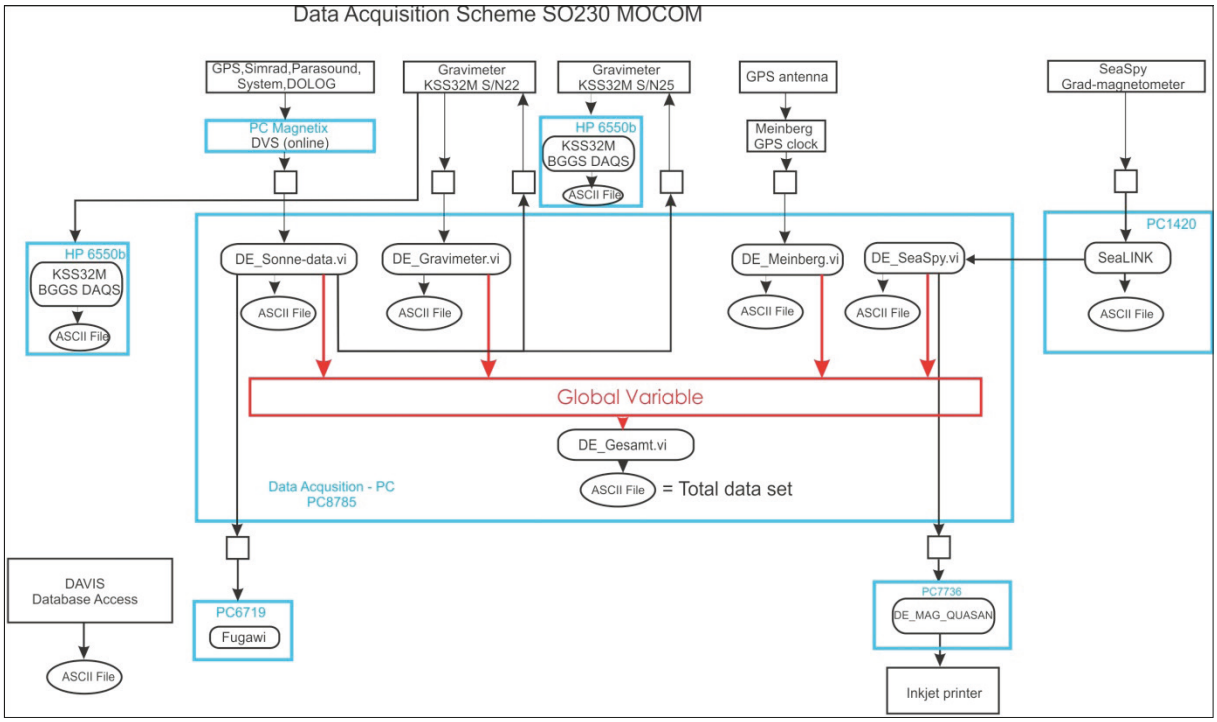


Fig. 4.1.1: Setup for data collection and storage installed during SO230

A shipboard computer (PC Magnetix) provided the following data from the ship's navigation system once per second:

- position, speed and course from GPS
- heading from the gyro compass
- speed from the Doppler-sonar (DO-Log)
- water depth values from the SIMRAD EM120 multibeam echosounder (centre beam only) and from Parasound
- Kongsberg MRU5: roll,pitch, yaw
- weather data

The HP 6550b notebooks in the gravimeter room control the functions of the KSS32-M marine gravimeter systems. Measured gravity values of the BGR system (S/N 22) are sent to the data acquisition PC (see below).

A notebook computer (PC6719) was installed in the magnetic laboratory to provide a visual display of the position of the ship in relation to the profile network by a navigation software package (Fugawi Global Navigator). This software permanently displayed the ship's position on a nautical map along with the positions of planned and measured profiles

PC1420 was used to control the operation of the SeaSpy marine gradiometer and to display the collected magnetic data. The Magson magnetometers have no real-time data transmission to the ship. Their data were stored on flash cards within the instrument.

The PC used for the acquisition of navigation data, gravity data, magnetic gradiometer data, time in UTC, depth, and weather data (PC8785) was equipped with a large number of serial and other ports. Each of the data strings was written into the memory of the data acquisition PC by real-time programs developed using LabView software. The PC was connected to a BGR-provided Meinberg GPS-clock that provided a uniform time reference to all collected data. Analogue recordings were produced for the total magnetic intensity and gradient.

The data were pre-processed on various computers. All data which are part of BGR's standard operations were transformed into a special data format on PC7736 within a procedure that checks, reformats, and collects the data items to one data set every second. The data could be extracted in many user defined formats from this database.

5. BATHYMETRY AND SEDIMENT ECHOSOUNDING

Kirsten Bußе[1], Jude Castelino[1], Annemarie Kunkel[1], Anke Sausen[1], Michael Watkeys[2], Errol Wiles[2]

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Objectives

Only sparse high resolution bathymetric map of the survey area currently exists. The objective of the bathymetric survey was to acquire new multibeam bathymetry data along the ship track for the duration of the SO230 MOCOM cruise. These data will be used in conjunction with gravity, magnetic, parasound and seismic refraction data to piece together the evolution of the study area. While the aforementioned techniques will be used investigate the deeper structure of the continental margin off central and northern Mozambique, the bathymetric map will allow descriptions and interpretations of recent sea floor processes to be made. This will enhance the limited understanding of ocean water / ocean floor interactions within the area. Such interactions range from gravity-driven processes to bottom water circulation, and may be related to various including glacial/interglacial cycles, regional tectonics, and *hinterland* uplift.

Work at sea

Technical set-up

The MBES *Kongsberg Simrad EM120* transmits 191 beams per ping and can operate from 20 m to 11,000 m water depth. The nominal frequency is 12kHz(sectors are frequency coded from 11.25 to 12.75 kHz) and it has a maximum ping rate of 5 Hz (5 pings per second). The aperture angle is variable and has a maximum coverage sector up to 150° (75° port, 75° starboard) which means a swath coverage nearly 6 times the width of the current water depth can be measured. The single beams have a footprint size (beam width) of 2° in, along and across direction. For movement compensation (roll, pitch, heave) of the ship the MBES system uses data of the *Kongsberg Seatex Motion Reference Unit (MRU) 5.* The heading and gyro information which is also a variable of the calculation for depth/positioning accuracy is acquired by the *Anschütz Standard 4 Kreiselanlage.* The GPS position is received by the *Seastar 9200*. All these different systems are connected to the MBES system.

Operation

In the study area, the *Simrad EM120* multibeam echosounder and parasound sub-bottom echosounder were operated fully supervised in 24h shift mode. An overlap of parallel multibeam tracks of at least 20 % was envisaged and almost always achieved.

Data acquisition started on the 31.12.2013 at 5:55h UTC.

During the cruise centre beam artefacts were observed in the middle of the swath of the Simrad EM120 multibeam echosounder. A contemporary Sound Velocity Profile (SVP) was unable to eliminate the centre beam artefacts. The artefacts were carefully removed in post-processing. Additionally there were problems in shallow water (<100 m). The System detected the sea floor at twice or thrice the water depth. These systematic errors were also cleaned in post-processing.

During transit, data recording continued until the 16.02.2014 at 21:10h UTC.

Tab. 5.1: Sound velocity profiles for multibeam data correction

Number	Date (UTC)	Time (UTC)	Latitude	Longitude	Depth [m]
1	01.01.2014	17:23	26°00.00' S	37°24.00' E	1800
2	05.01.2014	16:23	21°51.93' S	38°31.35' E	2400
3	20.01.2014	20:35	16°32.56' S	41°23.25' E	2600
4	28.01.2014	20:34	14°22.28' S	43°25.17' E	3000
5	31.01.2014	03:19	13°01.34' S	41°33.40' E	2500
6	02.02.2014	11:58	11°23.15' S	42°20.78' E	2750
7	07.02.2014	10:20	10°09.00'S	41°22.00'E	2800

Preliminary results

In the study area, approximately 82,282 km² of seabed were mapped (Fig. 5.1). The high resolution multibeam data provide detailed seabed information along the cruise track from Durban (South Africa) northwards to the Beira High, Davie Ridge, Kerimbas Graben and south Somali Basin in the north. In addition, multibeam and Parasound data were recorded during the transit back to Durban.

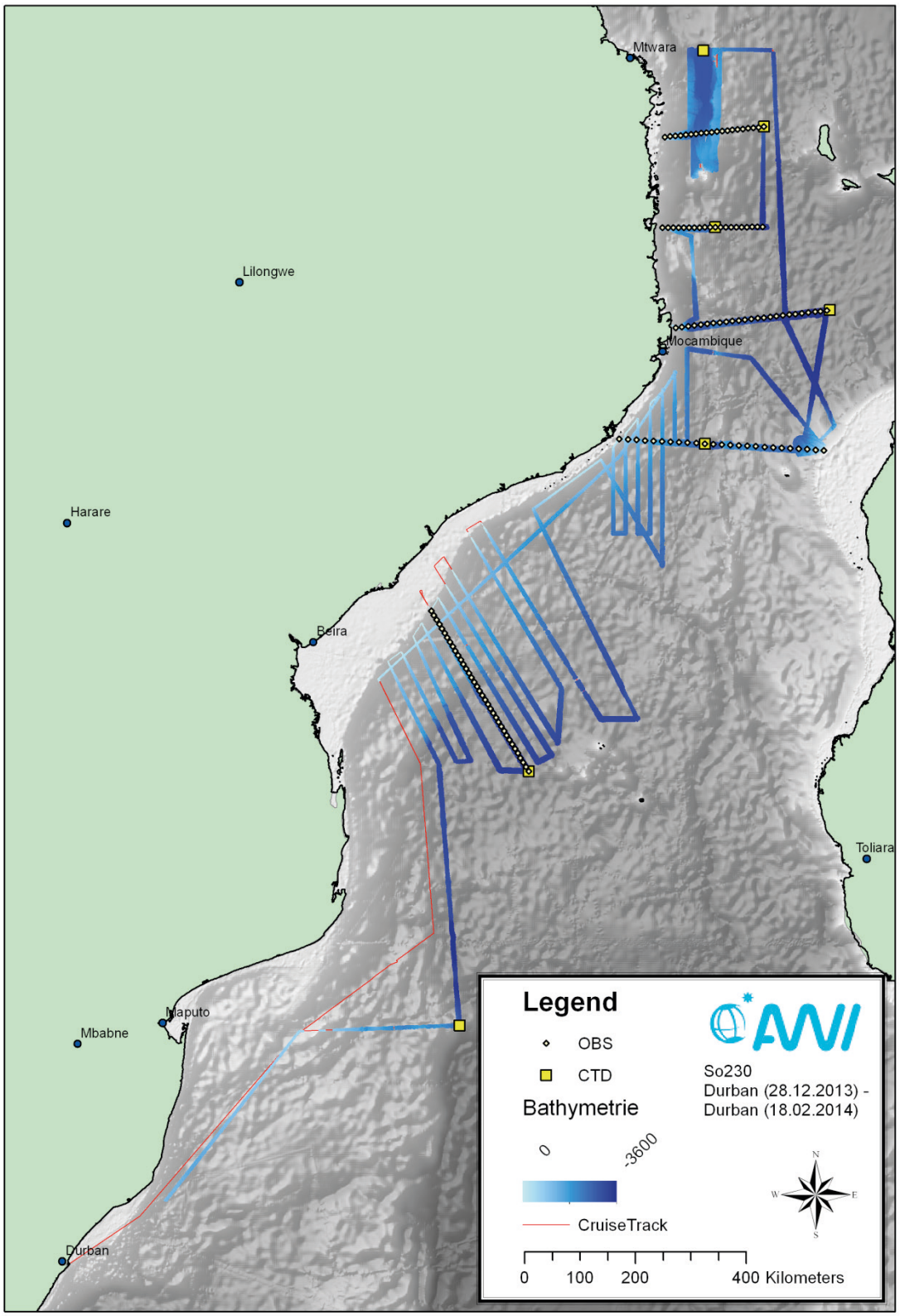

Fig. 5.1: Overview map of the study area showing the multibeam data coverage

Data management

All multibeam data recorded during this *Sonne* expedition will be stored by the AWI bathymetry group for post-processing. The processed data will be included in the PANGAEA data base. Data requests should be sent to the AWI bathymetry group. Bathymetry data recorded during SO230 will be provided to bathymetric compilation projects e.g. GEBCO (General Bathymetric Chart of the Ocean).

5.1 Parasound

Objectives

Sub-bottom sediment echo sounder systems provide high resolution images by transmitting high frequency beams. Depending on the sediment conditions, Parasound can penetrate up to 200 m below the seafloor providing a 0.3 m vertical resolution. This yields detailed information about the sedimentary processes that operated during deposition of the upper parts of sedimentary sequence as well as active processes sculpting the seafloor.

The objectives of Parasound acquisition on expedition SO230 were:

a. To obtain high frequency coverage of the upper sedimentary deposits in the Mozambique Channel.
b. To provide additional information, in conjunction with high resolution bathymetric maps, on recent depositional environments along the numerous submarine channels developed on the sea floor of the Mozambique Channel.

Work at sea

Technical aspects and modes of operation

Sub-bottom data were recorded with a Deep Sea Sediment Echo Sounder system, Parasound (ATLAS HYDROGRAGRAPHIC, Bremen, Germany) DS III-P70 which is installed permanently on the *RV Sonne*.

The Parasound system generates two primary frequencies selectable between 18 and 23.5 kHz transmitted in a narrow beam of 4° at high power. The two primary beams create a "Parametric effect" because of non-linear acoustic effect producing two secondary harmonic frequencies. This provides a higher lateral resolution in comparison to conventional 4 kHz sediment echo sounder systems because the sediment-penetrating pulse is generated within a narrow beam. The desired primary high frequency (PHF) was set at 20 kHz and the secondary low frequency (SLF) at 4 kHz SLF .

On the *RV Sonne*, the Parasound system is controlled by ATLAS Parasound software suite on a "Windows XP SP2" PC. The ATLAS Parasound CONTROL (ver. 2.2.X) package is used to set the operational environment of the sounding system. The basic settings used during the expedition are given in Table 5.1.1. ATLAS PARASTORE (ver. 3.3.16.0) provides options to visualize and process the acquired data real-time. In addition to storing the raw data files, processed data are stored in PS3 and SEG-Y formats. The output sample rate was set to 12.2 kHz and 66 % of the output sample rate.

Tab. 5.1.1: Parasound operation settings used during the SO230 expedition

Parameter setting	Selected mode	Additional options
Mode of operation	Parametric-SBP-SBES	
Frequency	PHF	20 kHz
	SLF	4 kHz
Trigger	Autonomous Operation	
Pulse settings	Pulse type	Continuous wave
	Pulse shape	Rectangular
	Pulse length	0.5 ms
	No. of Periods per Pulse	2
	No. of Pulses	4
	Time interval	400 ms
Receiver Band Width	Output sample rate	12.2 kHz
	Band Width	66 % of OSR
Water velocity	C-mean	1500 m/s
	C-keel	1500 m/s
System depth source	Fixed Min/Max. Depth limit	Other (EM-120)
		Manual
Data Recording	PHF	Full profile
	SLF	Full profile
Transmission	Source level	244.218 dB
	Voltage	159 V
	Duty Cycle	0.896
	Elements	8 x 16

Data acquisition commenced on 31st December 2013 at 06:07 hrs UTC and operated continuously until DD February 2014 at HH:MM hrs UTC, *outside the EEZ of South Africa,* with full profile data recording for PHF and SLF. Data acquisition was temporarily put on standby mode during the recovery of the OBS because the OBS releaser operates on similar frequencies. Table 5.1.2 summarises the events during data acquisition.

Tab. 5.1.2: Summary of events during Parasound data acquisition on the SO230 expedition.

Date	Time UTC	Event
31.12.2013	06:07	Start of data acquisition
01.01.2014	17:23 - 19:16	On Standby mode for releaser test
02.01.2014	05:20 – 07:00	On Standby mode for releaser test
05.01.2014	17:25 -18:32	On standby mode for releaser test
09.01.2014	05:18	On standby mode for OBS recovery (profile 1)
10.01.2014	17:24	Resume data acquisition
13.01.2014	15:31 – 16:29	Interrupted for magnetic calibration
20.01.2014	20:35	On standby mode for OBS recovery (profile 2)
20.01.2014	22:56	Resume data acquisition
21.01.2014	07:18	On standby mode for safety drill
21.01.2014	08:23	Resume data acquisition
21.01.2014	15:23	On standby mode for safety drill
21.01.2014	16:15	Resume data acquisition
23.01.2014	17:12	On standby mode for OBS recovery (profile 3)
23.01.2014	17:47	Resume data acquisition
23.01.2014	19:40	On standby mode for OBS recovery (profile 3)
23.01.2014	20:01	Resume data acquisition
23.01.2014	20:20	On standby mode for OBS recovery (profile 3)
24.01.2014	09:52	Resume data acquisition over Davie ridge
24.01.2014	11:23	On standby mode for OBS recovery (profile 3)
25.01.2014	00:25	Resume data acquisition
28.01.2014	20:34	On standby mode for CTD station
30.01.2014	02:59	Resume data acquisition
31.01.2014	03:21	On standby mode for CTD station
31.01.2014	05:40	Resume data acquisition
01.02.2014	08:52	On standby mode for OBS recovery (profile 4)
02.02.2014	01:26	Resume data acquisition
02.02.2014	11:58	On standby mode for CTD station
02.02.2014	14:37	Resume data acquisition
03.02.2014	12:23	On standby mode due to overlap
04.02.2014	20:15	Resume data acquisition
07.02.2014	10:20	On standby mode for CTD station
07.02.2014	12:42	Resume data acquisition
08.02.2014	06:34 – 06:47	System restart
10.02.2014	05:24	On standby mode

During the expedition the acquired data were stored in different formats at regular intervals as listed below

1. PHF data in ASD (complete profile) , PS3 and SEG-Y (200 m depth axis)
2. SLF data in ASD (complete profile) , PS3 and SEG-Y (200 m depth axis)
3. Navigation and survey settings summary (120 s interval) in ASCII
4. ATLAS PARASTORE settings in ASCII

Preliminary results

Overall, the data quality is good, with ca. 30 – 40 m of penetration into the sea floor sediments. Preliminary Parasound results show distinct sea floor reflections, with several continuous parallel sub-bottom reflections are common to a majority of the study area (Fig. 5.1.2). Such areas of sea floor are interspersed with areas which exhibit hyperbolic sea floor echoes, with indistinct sub-bottom reflections (Fig. 5.1.2). Sea floor channels have also been noted with in the study area; these features are typically confined to depths below the shelf break, and are seldom observed beyond ca. 3,000 m (Fig. 5.1.1).

Distinct sea floor reflections, with several continuous parallel sub-bottom reflections are associated with areas of smooth (with a gentle gradient) and undulating sea floor, while the hyperbolic echo character is observed in areas of steeper gradient, undulation sea floor, and proximal to sea floor channels.

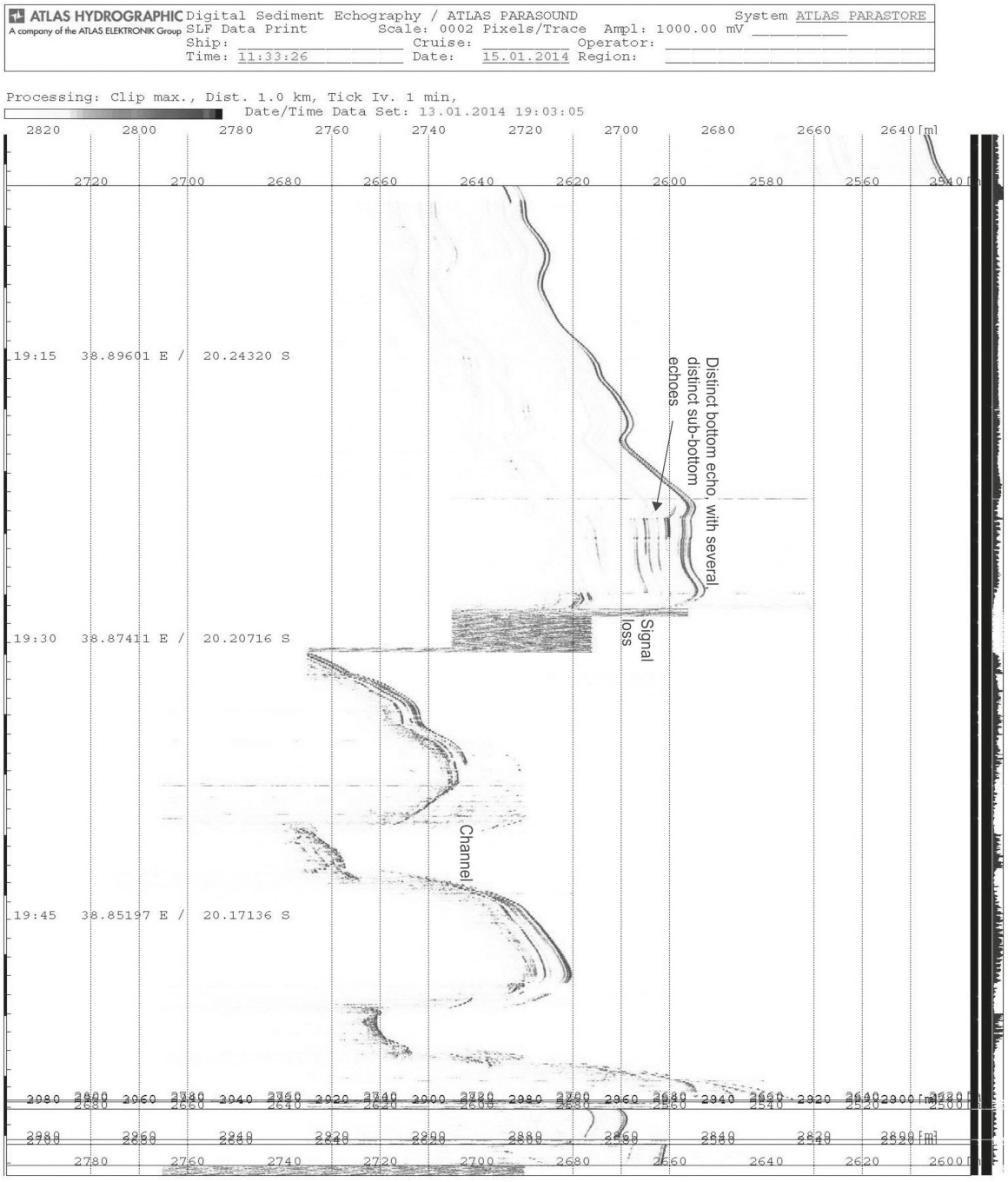

Fig. 5.1.1: An example of Parasound record from the Mozambique Channel. Distinct sea floor returns, with several continuous sub-bottom reflections are common to the study area. Several small scale channels are evident beyond the shelf break to a depth of ca. 3,000 m.

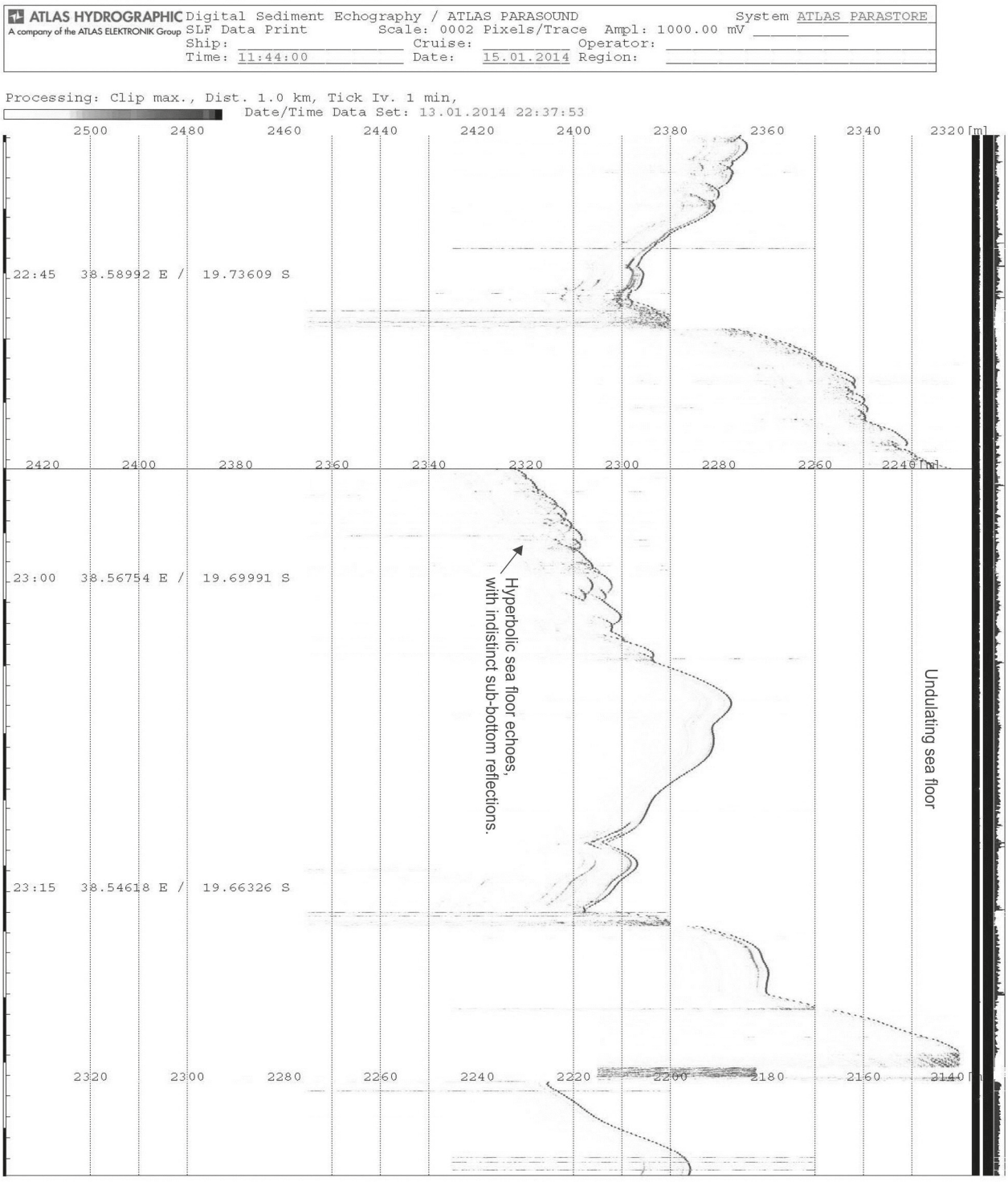

Fig. 5.1.2: Hyperbolic sea floor reflections are also evident in the area. This suggests uneven sea floor associated with depositional or erosional features.

5.2 Current processes

Errol Wiles and Michael Watkeys UKZN

Objectives

This section will describe some of the modern geological processes observed through swath bathymetry and Parasound during the SO230 cruise. For this purpose the area covered by the SO230 cruise may be subdivided into five geological regions:

1. the abyssal ocean floor between central Mozambique and northern Madagascar
2. the abyssal ocean floor and the Davie Ridge between northern Mozambique and the Comores
3. the continental margin of central Mozambique
4. the continental margin of northern Mozambique
5. the continental margin of NW Madagascar

Work at sea

Region 1 is underlain by Jurassic and Cretaceous oceanic crust formed during the drifting apart of Africa and Antarctica. It is deepest in the south, shallowing slowly northwards, with the monotony of the flat abyssal plain broken by some volcanic islands in the south and, most notably, by the Zambezi channel. This stretches diagonally across northeastern section of this region, flowing from northwest to southeast before turning to flow south in the eastern section.

Although the abyssal plain is generally flat, it contains sheeted drifts, superimposed with sediment waves. These features, along with north-eastward deflection of sea floor channels, suggest an anti-clockwise circulation of bottom currents in this region.

Region 2 developed during the Jurassic and Cretaceous during the extraction of Madagascar from East Africa by dextral strike-slip movement along the Davie fracture zone. Between the Davis Ridge and northern Mozambique coast there is a long narrow basin about 80 km wide. The ridge is aligned north-south, varying from approximately 6 km to 20 km wide and rises 1,400 m above the flanking abyssal plains. East of the ridge the ocean floor gradually descends to a flat abyssal plain on which the volcanic islands of the Comores have developed.

The northernmost part of the narrow basin has northward flowing bottom currents as indicated by sediment drift patterns and deflection of the channels emerging from the base of canyons. East of the Davie Ridge, the channels indicate a southeast flow towards the deepest parts of the basin between the Comores and north-western Madagascar.

Region 3 is an east-north-east trending rifted volcanic margin formed during the Jurassic when Africa and Antarctica separated. The Zambezi River flows into the Indian Ocean at the west-south-west end of this region while along the remaining length of this margin there are a number of much shorter rivers flowing south-south-east to the coast. The continental shelf offshore of the Zambezi delta is wide

(up to 130 km), having being built out by sediments from this river as well as from the Limpopo-Save delta. The shelf gradually narrows towards the east-north-east where it becomes about 10 km wide, and is dotted by a series of low islands. Here the shelf break is at about -100 to -120 m deep while the break in slope occurs at about -2,500 m to -2,800 m.

There appears to be no major upslope continuation of the Zambezi channel from Region 1 into Region 3. Rather, several smaller channels on the slope must act as tributaries which transport sediment to the Zambezi channel (Fig. 5.2.1). Instead of large individual canyons, the narrow shelf in the east-north-east contains numerous gullies and channels that have developed between the islands (Fig. 5.2.1, profile a – a'). Although some canyons here may be related to rivers, clearly a number are not.

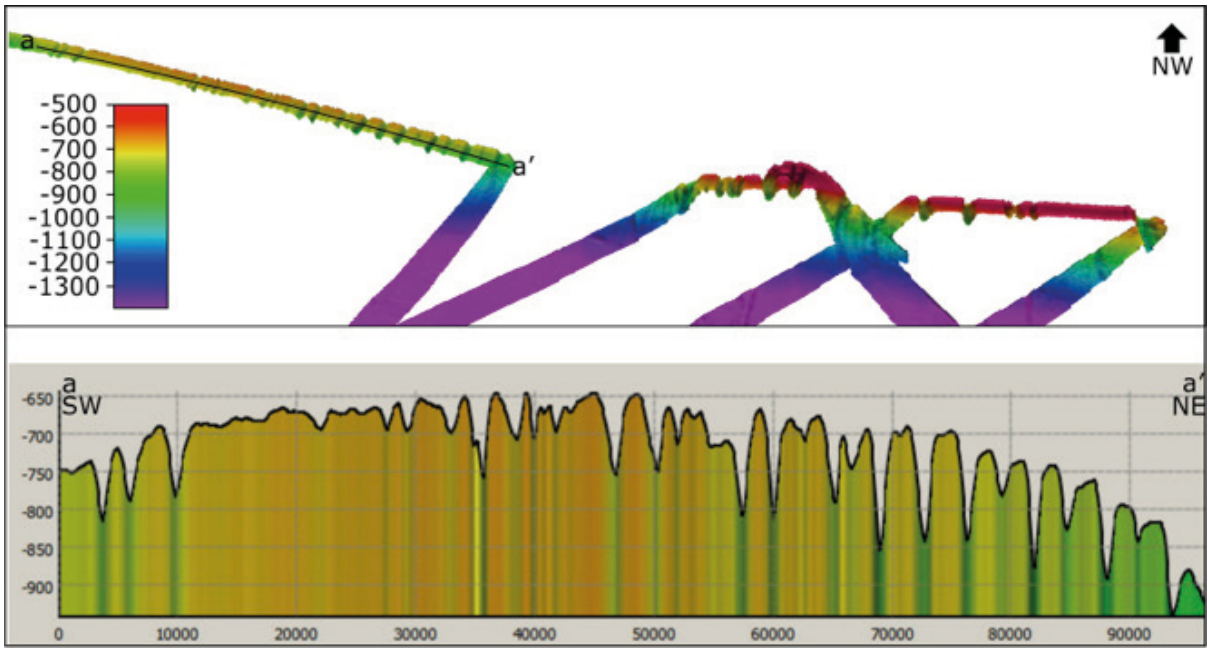

Fig. 5.2.1: Perspective view (toward the NW) of the Zambezi slope of Region 3(depth on figure is in metres). The numerous slope gullies are clearly evident, transporting sediment across the slope. Profile a – a' a series of slope gullies from the SE slope area.

Region 4 is a north-south trending strike-slip margin formed during the Jurassic and Cretaceous dextral movement between Africa and Madagascar. Three major rivers flow from west to east across northern Mozambique to this margin together with a number of shorter rivers. As with central Mozambique the continental shelf is narrow (ca. 14 km wide) and is peppered by a number of low-lying islands. However this region differs from Region 3 in the number of embayments along its length. The shelf break is at ca. -100 m to -120 m and the slope at ca. -2,700 m.

There are a significant number of canyons developed along the continental shelf and slope of this region, but few can be linked to rivers. In one case a knick point was noted along a canyon thalweg at a depth of -2,100 m (Fig. 5.2.1). Prior to this knick point the thalweg gradient is 3.3° while below the knick point it increases to an average of 12.3° reaching a maximum gradient of 19°. The location of this knick point, as well as the surrounding morphology suggests that normal faulting, with a down-throw to the east, may have played a role in its development.

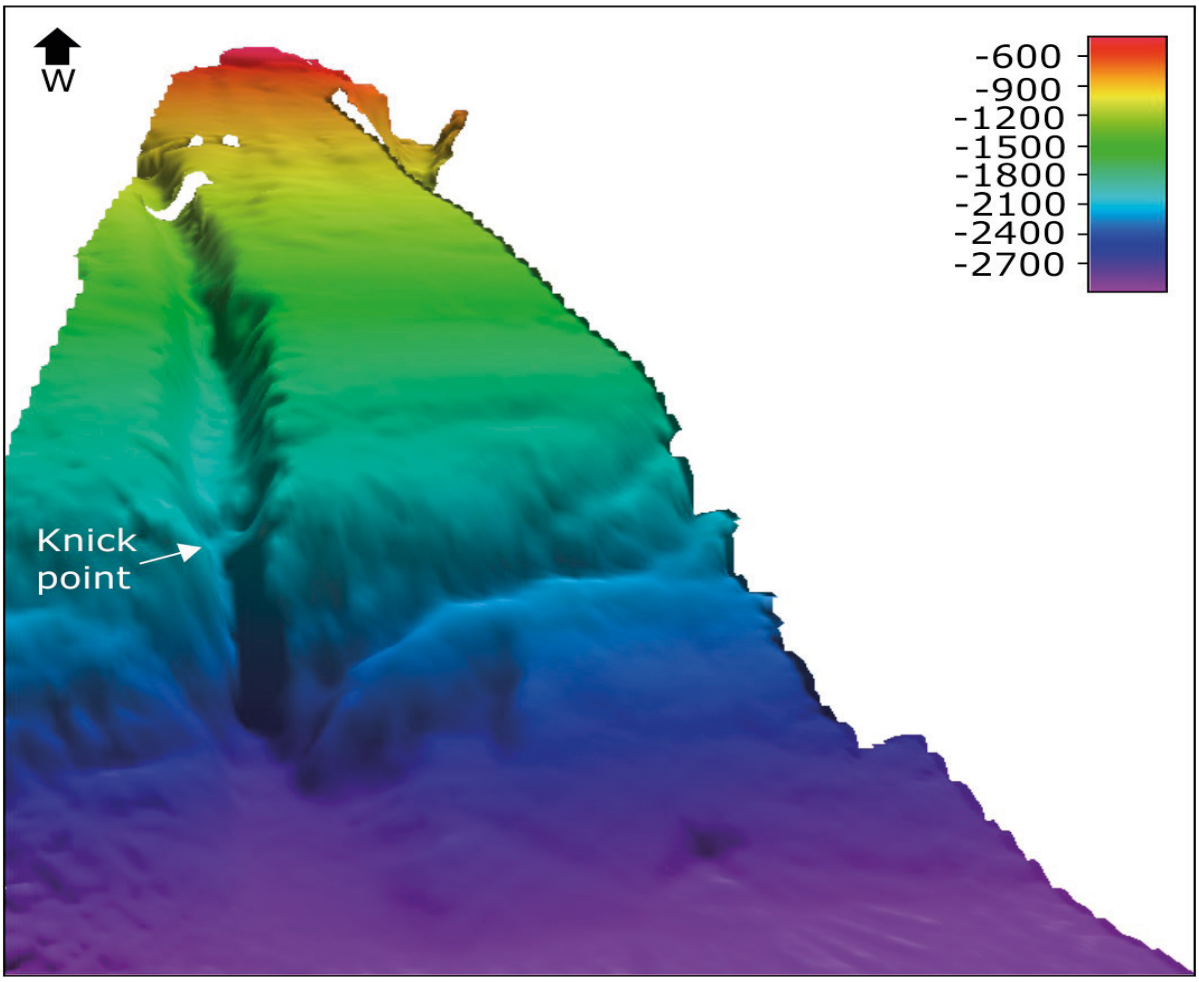

Fig. 5.2.1: Westward perspective view of a canyon from Region 4, which has a knick point at -2,100 m (depth on figure is in metres).

Region 5 is the NW margin of Madagascar which developed during the dextral strike-slip movement between Madagascar and Africa. The continental shelf is about 100 km wide and has the shallowest shelf break (-70 m to -80 m) and the steepest slope.

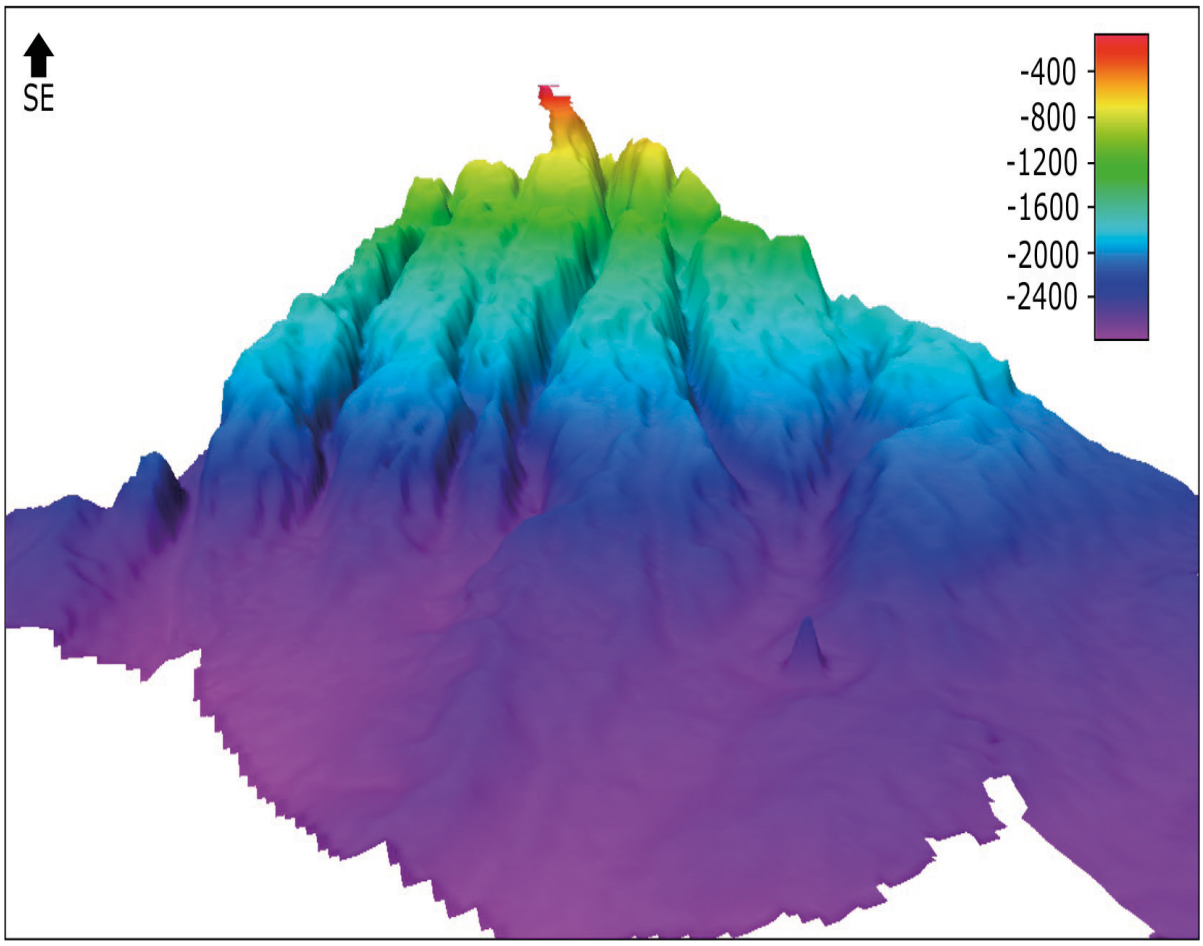

Fig. 5.2.3: The NW margin of Madagascar is significantly different from the Mozambique margin to the west(depth on figure is in metres). Numerous canyons, with few tributaries, have incised ca. 450 m into the slope in this region.

Preliminary results

An unexpected complex of six canyons was partially mapped out with multibeam swath bathymetry in this region (Fig. 5.2.3). The canyons are characterized by low sinuosity and have few tributaries. Canyon relief is relatively constant down slope (ca. 450 m) with relief decreasing upon reaching the base of the slope. It was not possible to establish whether the canyon heads breach the continental shelf because this would involve having to extend the mapping into Madagascar territorial waters.

6. DREDGE/TV GRAB REPORT

Mike Watkeys and Errol Wiles UKZN

Objectives

Dredging was undertaken using the video-grab installed on the RV *Sonne*. The video-grab system is capable of being deployed to a cable length of 10 km. The position of the grab head is monitored my means of an acoustic transducer which pings once every four seconds, allowing the research vessel to calculate the location of the video-grab, and adjust the course accordingly. The video feed, black and white as well as colour, is transferred via a fibre optic cable to the research vessel, and displayed in real-time. The visual data are recorded to a hard drive, and are later transferred to a DVD for archiving and playback. The grab jaws are operated by pistons, powered by battery packs, allowing multiple actuations of the jaws during a single deployment.

Work at sea

The first site selected for dredging (DL1) was a positive topographic feature on the ocean floor which is associated with a large magnetic anomaly that was identified on the *Pelagia* cruise Jokat et al., 2009). The hill is about 1.3 km in diameter and rises about 230 m above the surrounding ocean floor to a depth of –793 m below mean sea level (Fig. 6.1). The dredge line traversed a portion of this hill from south-west to north-east in an upslope direction.

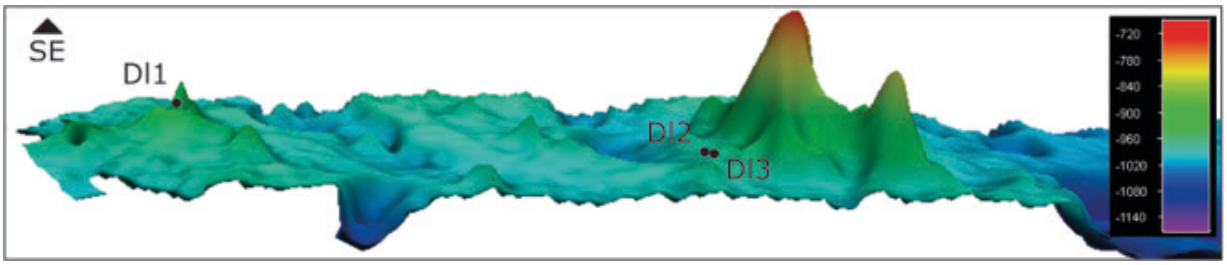

Fig. 6.1: Perspective view, looking SE, of grab sites DL1, DL2, and DL3

Preliminary results

Throughout the traverse the ocean floor was flat and devoid of any rock exposures. Instead the oceanic igneous crust was covered by a monotonous sequence of bioclastic sediment. As this type of sediment had not been expected, it was sampled (DL1).

In the main the bioclastic sediment of DL1 consisted of very fine- to medium grained shells, shelf fragments and foraminifera, with coarse coral fragments. Some complete gastropod shells up to 7 cm long were present. This sample did not have the characteristic calcareous ooze texture of the two other samples of bioclastic sediment dredged later during this cruise. It is not known whether that is an original feature or whether some of the very fine-grained sediment was winnowed out of the sample during the lifting of the dredge

The second site selected for dredging was another positive anomaly lying about 7 km south-west of DL1 but lacking any obvious magnetic anomaly. It forms an approximately spectacle shape with two hills joined by a saddle. Overall it is about 3 km east-west and 1.2 km in diameter (Fig. 6.1). A larger hill occurs in the east rising some 400 m above the surrounding ocean floor, reaching a depth of –711 m, while and a smaller hill to the west reaching -965 m below mean sea level.

Dredging commenced just north of the low saddle connecting these two hills and continued in a north-easterly direction to a small spur extending northwards from the larger hill. As with DL1, this section was underlain by a monotonous sequence of bioclastic sediments. However on the eastern flank of the spur a more undulating topography was encountered, sometimes with fairly steep slopes dropping down <5 m. In this area there were rock outcrops and these were sampled (DL2).

DL2 contained two cobbles of fine-grained basalt, both partially enclosed by a very fine-grained, laminated Mn-encrustation up to 6 cm thick. One cobble was dotted by very small spherical holes, some of which were lined by a pea green to yellowish brown coating. The other cobble had conical depressions up to 6 cm in diameter and 10 cm long that had been infilled by the Mn encrustation. Also collected was the bioclastic sediment that surrounded the rock outcrops. This consisted predominantly of a very fine-grained calcareous ooze containing foraminifera interspersed with coarse fragments of coral.

Dredging then continued in a north-easterly direction until the monotonous bioclastic sequence was encountered again. At the northern end of the dredge route, some small outcrops were observed but the dredge was unable to collect any samples (Fig. 6.1). The dredge route then returned towards the hills in a south-westerly direction. At the spur more outcrops were encountered and one was sampled (DL3).

DL3 consisted of a large rectangular boulder. It was composed of fine-grained basalt with some Mn encrustation. Attached to this boulder was coral while lying on top was bioclastic sediment. The largest coral attachment now comprises a main trunk 35 cm long with a top diameter off 4 cm, and two small branches near the base 6 cm long and 12 cm long, both with an end diameter of 2.5 cm. Two other smaller branches higher up the main trunk appear to have broken off before the sample was collected while a third large branch at the base broke off during the dredge operation. The main trunk and all the braches display growth rings. As with DL2, the bioclastic sediment comprised mainly of very fine-grained calcareous ooze with coarse coral fragments. Please find more details in table 6.1.

Tab. 6.1: Summary of dredge locations and samples

Station	Date	Dredge	Time (UTC)	Latitude	Longitude	Depth
DL1	1/1/2014	On bottom	4:48	034° 47.81'S	26° 05.56'E	952 m
		Off bottom	5:32	034° 47.97'S	26° 05.41'E	793 m
Sample	**Size**	**Description**				
1	55 x 40 x 25 cm	Bioclastic sediment consisting of coarse coral fragments, medium- to very fine-grained shell fragments and shells, with some complete gastropod shells up to 7 cm long, and foraminifera.				

Station	Date	Dredge	Time (UTC)	Latitude	Longitude	Depth
DL2	16/2/2014	On bottom	15:45	034° 45,23'	26° 8,12'	925 m
		Off bottom	17:21	034° 45,44'	26° 7,83'	959 m
Sample	**Size**	**Description**				
2	26 x 22 x 22 cm	Mn- encrusted fine-grained basalt. Mn-crust is up to 5 cm thick, very fined grained and laminated; in places it appears to infill conical depressions up to 6 cm diameter and up to 10 cm deep				
3	22 x 17 x 13 cm	Mn- encrusted fine-grained basalt. Basalt peppered by very small holes, sometimes lined with a pea green to yellowish brown coating. Mn-crust is up to 4 cm thick, very fine-grained and laminated.				
4	55 x 40 x 10 cm	Bioclastic sediment consisting of a mixture of coarse fragments of coral mixed with a very fine-grained calcareous ooze containing foraminifera.				

Station	Date	Dredge	Time (UTC)	Latitude	Longitude	Depth
DL3	16/2/2014	On bottom	18:28	034° 45,50'	26° 7,80'	943 m
		Off bottom	19:37	034° 45,45'	26° 7,84'	956.6
Sample	**Size**	**Description**				
5	90 x 80 x 35 cm	Vesicular fine-grained basalt, partially encrusted by Mn, with coral attached				
6	15 x 15 x 15 cm	Bioclastic sediment comprised mainly of very fine-grained calcareous ooze with foraminifera with coarse fragments of coral.				

7. MARINE MAMMAL OBSERVATION

Maren Baetzel[1], Jude Castelino[1], Tobias Gerach[1], Jürgen Gossler[2], Wilfried Jokat[1], Bastian Kimmel[1],Claudia Klemt[1], Christian Müller[1], Antje Schlömer[1], Bernhard Schmitz[1], Matthias Schneider[1], Mike Watkeys[3]

[1]AWI
[2]KUM
[3]UKZN

Objectives

Marine Mammal Observation was in place during the seismic shooting times. The aim of the observation was to protect marine mammals from underwater noise caused by seismic sources during the acquisition of seismic refraction data.

There were 5 periods of observations during the expedition:

1. 07.01.2014 - 09.01.2014 (profile 20140010)
2. 22.01.2014 - 23.01.2014 (profile 20140050)
3. 27.01.2014 – 28.01.2014 (profile 20140100)
4. 31.01.2014 – 01.02.2014 (profile 20140130)
5. 03.02.2014 (profile 20140150)

A short introduction about marine mammal observation and mitigation was given to the observers. The observations were made from the bridge or on the observation deck of RV *Sonne* during daylight (06:00 – 19.10 local time). The high bridge offers a good and clear view of the sea surface around the ship. Two observers used naked eye and binoculars (Fujinon 7-50 FTM/MT Field of view 7-300) to scan the sea surface. The scale of the binoculars was used for distance estimation of detected marine mammals. Details of sightings of marine mammals like ship position, time and species were written down in protocols.

Work at sea

Observation during airgun operation

In order to minimise the risk of disturbing marine mammals by seismic data acquisition, several actions were undertaken:

- The observers on bridge did a pre-shooting search for at least 30 minutes before starting the ramp up. The guns were ramped up by starting one gun at a time until all eight guns were shooting.
- The shooting was stopped immediately when a marine mammal was sighted within a zone of 500 m distance from the seismic source (mitigation zone). The guns were ramped up after the marine mammals were well outside of the mitigation zone.

Preliminary results

In summary, only once were marine mammals observed during the periods of airgun operation. In addition, on the 20.01.2014 we saw a small pod of unidentified species of whales (Fig. 7.1) when the airguns were not active. The tables 7.1-7.5 summarize our MM Observations.

Fig. 7.1: Pod of unidentified species of whales observed on 20.01.2014 (©Torsten Bierstedt)

Tab. 7.1: Marine mammal observations during profile 20140010

Date	Time (UTC)	Time (Local)	Notes	Whales	Number	Position
07.01.2014	05:30	08:30	start pre-shooting search	no		
07.01.2014	06:40	09:40	Testing air guns/ start ramp up	no		
07.01.2014	07:35	10:35	start refraction seismic profile 20140010	no		
08.01.2014	05:44	08:44	stop shooting	Hourglass dolphin	15-16	37° 43.43’ E 20° 33.19’ S
08.01.2014	05:50	08:50	start shooting	no		
08.01.2014	10:30	13:30	stop shooting, technical problems	no		
08.01.2014	12:08	15:08	start shooting,	no		
09.01.2014	04:25	07:25	stop shooting, end of profile 20140010	no		

During profile 20140010 the guns were switched off once because of hourglass dolphins were sighted within the mitigation zone. They moved across the ship track from starboard to port side within the mitigation zone. The guns were restarted after the dolphins were outside the mitigation zone and beyond visibility.

Tab. 7.2: Marine mammal observation during profile 20140050

Date	Time (UTC)	Time (Local)	Notes	Whales	Number	Position
22.01.2014	03:00	06:00	start MMO	no		
22.01.2014	03:45	06:45	stop shooting, technical problems	no		
22.01.2014	05:00	08:00	start pre-shooting search	no		
22.01.2014	06:16	09:16	start ramp up	no		
22.01.2014	09:29	11:29	stop shooting, technical problems	no		
22.01.2014	09:39	12:39	start ramp up	no		
23.01.2014	07:16	10:16	stop shooting, technical problems	no		
23.01.2014	08:10	11:10	start pre-shooting search	no		
23.01.2014	08:41	11:41	start ramp up	no		
23.01.2014	15:00	18:00	stop shooting, end of profile 20140050	no		

Tab. 7.3: Marine mammal observation during profile 20140100

Date	Time (UTC)	Time (Local)	Notes	Whales	Number	Position
27.01.2014	13:16	16:16	start pre-shooting search	no		
27.01.2014	14:37	17:37	start ramp up	no		
27.01.2014	14:56	17:56	start refraction seismic profile 20140100	no		
27.01.2014	16:15	19:15	end of MMO	no		
28.01.2014	03:00	06:00	start MMO	no		
28.01.2014	04:18	07:18	stop shooting, technical problems	no		
28.01.2014	04:23	07:23	start shooting	no		
28.01.2014	16:16	19:15	end MMO	no		

Tab. 7.4: Marine mammal observation during profile 20140130

Date	Time (UTC)	Time (Local)	Notes	Whales	Number	Position
31.01.2014	11:35	14:35	start pre-shooting search	no		
31.01.2014	12:39	15:39	start ramp up	no		
31.01.2014	13:00	16:00	start refraction seismic profile 20140130	no		
31.01.2014	16:15	19:15	end MMO	no		
01.02.2014	03:00	06:00	start MMO	no		
01.02.2014	08:05	11:05	end MMO	no		

Tab. 7.5: Marine mammal observation during profile 20140150

Date	Time (UTC)	Time (Local)	Notes	Whales	Number	Position
03.02.2014	05:30	08:30	start pre-shooting search	no		
03.02.2014	06:30	09:30	start ramp up	no		
03.02.2014	07:02	10:02	start refraction seismic profile 20140150	no		
03.02.2014	07:35	10:35	stop shooting	no		
03.02.2014	08:24	11:24	start shooting	no		
03.02.2014	16:10	19:10	end MMO	no		

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APPENDIX

A.1 PARTICIPATING INSTITUTIONS

A.2 CRUISE PARTICIPANTS

A.3 SHIP'S CREW

A.4 MAGNETIC / GRAVIMETER PROFILE LIST

A.5 STATION LIST

A.1 TEILNEHMENDE INSTITUTE / PARTICIPATING INSTITUTIONS

	Address
AWI	Stiftung Alfred-Wegener-Institut für Polar- und Meeresforschung in der Helmholtz-Gemeinschaft Postfach 120161 27515 Bremerhaven Germany
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe Stilleweg 2 30655 Hannover Germany
KUM	KUM –Umwelt- und Meerestechnik Kiel GmbH Wischhofstr.1-3, 24148Kiel/Germany
UKZN	Geological Sciences School of Agricultural, Earth and Environmental Sciences University of KwaZulu-Natal Duban 4000 Republic of South Africa

A.2 FAHRTTEILNEHMER / CRUISE PARTICIPANTS

Name/ Last name	Vorname/ First name	Institut/ Institute	Beruf/ Profession
Bätzel	Maren	AWI	Geophysicist
Bußе	Kirsten	AWI	Student, geodesy
Castelino	Jude	AWI	Geophysicist
Gerach	Tobias	AWI	Student, geophys
Gossler	Jürgen	KUM	Geophysicist
Heyde	Ingo	BGR	Geophysicist
Jokat	Wilfried	AWI	Geophysicist
Kimmel	Bastian	AWI	Student, geophys
Klemt	Claudia	AWI	Geophysicist
Kunkel	Annemarie	AWI	Student, geodesy
Müller	Christian	AWI	Geophysicist
Penshorn	Dietmar	AWI	Technician
Sausen	Anke	AWI	Student, geodesy
Schlömer	Antje	AWI	Geophysicist
Schmitz	Bernhard	AWI	Student, geophys
Schneider	Matthias	AWI	Student, geophys
Schreckenberger	Bernd	BGR	Geophysicist
Watkeys	Michael	UKZN	Geologist
Wiles	Errol	UKZN	Geologist

A.3 SCHIFFSBESATZUNG / SHIP'S CREW

No.	Name	Rank
1	Korte, Detlef	Master
2	Aden, Nils	1. Offc.
3	Rex, Andreas	Ch. Eng.
4	Hoffsommer, Lars	2. Offc.
5	Henning, Tim	2. Offc.
6	Raabe, Dr. Konrad	Doctor
7	Klinder, Klaus	2. Eng.
8	Horschel, Roman	2. Eng.
9	Beyer, Thomas	Elec.
10	Borchert, Wolfgang	ELO
11	Meinecke, Stefan	ELO
12	Bierstedt, Torsten	Boatsw.
13	Eidam, Oli	A.B.
14	Ross, Reno	A.B.
15	Fischer, Sascha	A.B.
16	Barko, Michael	A.B.
17	Mohrdiek, Finn	A.B.
18	Mehlhase, Hans	A.B.
19	Rosemeyer, Rainer	Mot-man
20	Bolik, Torsten	Mot-man
21	Helbeck, Frank	Mot-man
22	Schernik, Robert	Mot-man
23	Wieden, Wilhelm	Cook
24	Bohne, Jörg	Cooksmate
25	Pohl, Andreas	1. Stwdess
26	Royo, Luis	2. Stwdess

A.4 MAGNETIC/GRAVIMETRY PROFILE LIST

Line number	Date	Time UTC	Latitude	Longitude	Course	S=seismics M=magnetics G=gravity B=bathymetry	Length (km)
BGR14-101	02.01.14	07:35:00	25° 15.262' S	37° 20.477'E		M,G,B	
	03.01.14	04:55:00	21° 45.028' S	37° 4.151' E	356°		390.27 km
BGR14-102	03.01.14	04:55:10	21° 45.002'S	37° 4.142'E		M,G,B	
	03.01.14	16:01:00	20° 4.555'S	36° 14.530' E	335°		204.83 km
BGR14-103	03.01.14	16:03:00	20° 4.331'S	36° 14.780'E		M,G,B	
	03.01.14	17:30:00	19° 55.512'S	36° 27.007'E	53°		26.82 km
BGR14-104	03.01.14	17:35:00	19° 55.745'S	36° 27.745'E		M,G,B	
	04.01.14	05:23:00	21° 42.436'S	37° 21.072'E	155°		218.05 km
BGR14-105	04.01.14	05:27:00	21° 42.679'S	37° 21.733'E		M,G,B	
	04.01.14	06:38:00	21° 41.963'S	37° 34.418'E	87°		21.86 km
BGR14-106	04.01.14	06:44:00	21° 41.137'S	37° 34.877'E		M,G,B	
	04.01.14	19:50:00	19° 41.144'S	36° 39.209'E	336°		242.21 km
BGR14-107	04.01.14	20:00:00	19° 39.539'S	36° 39.299'E		M,G,B	
	04.01.14	21:21:00	19° 28.021'S	36° 46.847'E	32°		25.07 km
BGR14-108	04.01.14	21:34:00	19° 28.883'S	36° 48.043'E		M,G,B	
	05.01.14	13:33:00	21° 50.999'S	38° 3.812'E	154°		294.07 km
BGR14-109	07.01.14	07:35:00	18° 57.023'S	36° 45.474'E		S,M,G,B	
	08.01.14	10:34:30	20° 53.815S	37° 55.974'E	151°		248.65 km
BGR14-109A	08.01.14	12:07:30	20° 53.003'S	37° 55.490'E		S,M,G,B	
	09.01.14	04:30:00	21° 52.114'S	38° 31.524'E	151°		125.86 km
BGR14-110	10.01.14	17:50:00	19° 13.136'S	36° 57.510'E		M,G,B	
	10.01.14	18:56:00	19° 3.893'S	37° 2.980'E	29°		19.61 km
BGR14-111	10.01.14	19:10:00	19° 4.327'S	37° 4.337'E		M,G,B	
	11.01.14	13:29:00	21° 42.916'S	38° 40.853'E	151°		338.06 km
BGR14-112	11.01.14	13:31:00	21° 42.824'S	38° 41.207'E		M,G,B	
	11.01.14	14:51:00	21° 36.263'S	38° 53.689'E	61°		24.68 km

Line number	Date	Time UTC	Latitude	Longitude	Course	S=seismics M=magnetics G=gravity B=bathymetry	Length (km)
BGR14-113	11.01.14	14:53:00	21° 35.952'S	38° 53.710'E		M,G,B	
	12.01.14	12:14:00	18° 32.761'S	36° 59.793'E	329°		392.81 km
BGR14-114	12.01.14	12:22:00	18° 31.495'S	36° 59.923'E		M,G,B	
	12.01.14	13:32:00	18° 22.989'S	37° 8.280'E	43°		21.53 km
BGR14-115	12.01.14	13:37:00	18° 23.176 'S	37° 9.058 'E		M,G,B	
	12.01.14	10:35:00	21° 24.073'S	39° 0.042'E	150°		386.69 km
BGR14-116	13.01.14	10:55:00	21° 23.769'S	38° 59.927'E		M,G,B	
	13.01.14	15:31:00	20° 38.213'S	39° 3.031'E	4°		84.52 km
BGR-14-CAL	13.01.14	15:31:01	20° 38.211'S	39° 3.031'E		M,G,B	
	13.01.14	16:41:00	20° 37.660'S	39° 3.095'E	various		13 km
BGR14-117	13.01.14	17:22:00	20° 30.935'S	39° 3.538'E		M,G,B	
	14.01.14	11:15:00	17° 56.823'S	37° 31.098'E	330°		327.94 km
BGR14-118	14.01.14	11:20:00	17° 56.089'S	37° 31.095'E		M,G,B	
	14.01.14	12:45:00	17° 48.490'S	37° 43.642'E	58°		26.21 km
BGR14-119	14.01.14	12:55:00	17° 48.890'S	37° 44.967'E		M,G,B	
	15.01.14	13:31:00	21° 1.052'S	39° 42.063'E	150°		410.38 km
BGR14-120	15.01.14	13:34:00	21° 1.161'S	39° 42.453'E		M,G,B	
	15.01.14	17:17:00	21° 1.033'S	40° 17.746'E	90°		61.00 km
BGR14-121	15.01.14	17:25:00	21° 0.042'S	40° 17.878'E		M,G,B	
	16.01.14	16:48:00	17° 36.403'S	38° 36.166'E	334°		416.85 km
BGR14-122	16.01.14	16:51:00	17° 35.987'S	38° 36.451'E		M,G,B	
	17.01.14	00:41:00	16° 48.182'S	39° 41.859'E	53°		145.67 km
BGR14-123	17.01.14	00:46:00	16° 48.677'S	39° 42.420'E		M,G,B	
	17.01.14	12:29:00	18° 31.045'S	40° 42.534'E	151°		217.21 km
BGR14-124	17.01.14	12:52:00	18° 29.242'S	40° 41.991'E		M,G,B	
	18.01.14	05:51:00	15° 39.971'S	40° 41.971'E	360°		313.43 km
BGR14-125	18.01.14	06:06:00	15° 40.832'S	40° 43.048'E		M,G,B	
	18.01.14	07:53:00	15° 53.531'S	40° 30.434'E	224°		32.53 km

Line number	Date	Time UTC	Latitude	Longitude	Course	S=seismics M=magnetics G=gravity B=bathymetry	Length (km)
BGR14-126	18.01.14	07:58:00	15° 54.321'S	40° 30.092'E		M,G,B	
	18.01.14	20:31:00	17° 59.698 S	40° 29.973 E	180°		232.16 km
BGR14-127	18.01.14	20:35:00	18° 0.136'S	40° 29.480'E		M,G,B	
	18.01.14	21:38:00	17° 59.982 S	40° 18.411'E	271°		19.49 km
BGR14-128	18.01.14	21:42:00	17° 59.560'S	40° 18.002'E		M,G,B	
	19.01.14	08:45:00	16° 9.676'S	40° 18.005'E	360°		203.47 km
BGR14-129	19.01.14	08:55:00	16° 8.332'S	40° 17.674'E		M,G,B	
	19.01.14	10:44:00	16° 22.874'S	40° 6.137'E	217°		33.85 km
BGR14-130	19.01.14	10:57:00	16° 24.962'S	40° 5.992'E		M,G,B	
	19.01.14	20:19:00	17° 59.428'S	40° 5.975'E	180°		174.92 km
BGR14-131	19.01.14	20:25:00	18° 0.031'S	40° 5.209'E		M,G,B	
	19.01.14	21:27:00	17° 59.992'S	39° 54.43' E	270°		18.98 km
BGR14-132	19.01.14	21:32:00	17° 59.469'S	39° 54.017'E		M,G,B	
	20.01.14	05:54:00	16° 36.044'S	39° 54.014'E	360°		154.48 km
BGR14-133	21.01.14	21:16:00	16° 39.024'S	43° 20.882'E		S,M,G,B	
	22.01.14	03:41:00	16° 37.130'S	42° 47.240'E	273°		59.79 km
BGR14-133A	22.01.14	06:12:00	16° 37.350'S	42° 51.41' E		S,M,G,B	
	23.01.14	07:14:00	16° 30.199 S	40° 39.841 E	273°		233.89 km
BGR14-133B	23.01.14	08:43:00	16° 30.305'S	40° 41.135'E		S,M,G,B	
	23.01.14	16:20:00	16° 28.020'S	39° 59.901'E	273°		73.33 km
BGR14-134	25.01.14	12:50:00	16° 29.011'S	42° 52.536'E		M,G,B	
	25.01.14	16:21:00	16° 34.648'S	43° 19.582'E	102°		49.13 km
BGR14-135	25.01.14	16:31:00	16° 33.635'S	43° 20.279'E		M,G,B	
	25.01.14	19:02:00	16° 23.543'S	43° 1.778'E	300°		37.79 km
BGR14-136	25.01.14	19:05:00	16° 23.169'S	43° 1.705'E		M,G,B	
	26.01.14	06:26:00	14° 28.188'S	43° 21.618'E	10°		215.85 km
BGR14-137	27.01.14	14:55:00	14° 39.693'S	40° 53.825'E		S,M,G,B	

Line number	Date	Time UTC	Latitude	Longitude	Course	S=seismics M=magnetics G=gravity B=bathymetry	Length (km)
	28.01.14	08:06:00	14° 29.286'S	42° 22.724'E	83°		160.48 km
BGR14-137A	28.01.14	08:06:01	14° 29.285'S	42° 22.726'E		S,G,B	
	28.01.14	19:40:00	14° 22.495'S	43° 22.937'E	83°		108.70 km
BGR14-138	30.01.14	03:20:00	14° 39.038'S	40° 57.334'E		M,G,B	
	30.01.14	05:20:00	14° 29.396'S	41° 14.956'E	61°		36.28 km
BGR14-139	30.01.14	05:21:00	14° 29.235'S	41° 14.956'E		M,G,B	
	30.01.14	13:23:00	13° 10.404'S	41° 10.009'E	357°		146.24 km
BGR14-140	30.01.14	13:27:00	13° 9.924'S	41° 9.590'E		M,G,B	
	30.01.14	16:00:00	13° 2.271'S	40° 44.508'E	287°		47.40 km
BGR14-141	31.01.14	13:00:00	13° 1.160'S	42° 20.388'E		S,M,G,B	
	01.02.14	08:04:00	13° 1.557'S	40° 42.062'E	270°		177.39 km
BGR14-142	02.02.14	01:52:00	12° 57.142'S	42° 19.666'E		M,G,B	
	02.02.14	11:21:00	11° 22.643'S	42° 20.783'E	1°		174.99 km
BGR14-143	03.02.14	06:50:00	11° 33.394'S	40° 43.394'E		S,M,G,B	
	03.02.14	07:37:00	11° 32.881'S	40° 47.893'E	83°		8.22 km
BGR14-143A	03.02.14	08:25:00	11° 32.911'S	40° 48.062'E		S,M,G,B	
	04.02.14	01:00:00	11° 22.915'S	42° 22.686'E	84°		172.71 km
BGR14-144	04.02.14	20:35:00	11° 32.536'S	40° 45.535'E		M,G,B	
	04.02.14	23:12:00	11° 27.775'S	41° 8.413'E	78°		42.44 km
BGR14-145	04.02.14	23:13:00	11° 27.665'S	41° 8.444'E		M,G,B	
	05.02.14	08:00:00	10° 8.915'S	41° 8.425'E	0°		145.82 km
BGR14-146	05.02.14	09:06:00	10° 14.462'S	41° 12.242'E		M,G,B	
	05.02.14	22:08:00	12° 11.830'S	41° 11.830'E	180°		217.33 km
BGR14-147	05.02.14	22:38:00	12° 11.680'S	41° 15.739'E		M,G,B	
	06.02.14	12:15:00	10° 9.223'S	41° 16.189'E	0°		226.75 km
BGR14-148	06.02.14	12:45:00	10° 9.723'S	41° 20.164'E		M,G,B	
	07.02.14	01:40:00	12° 5.916'S	41° 19.239'E	180°		215.16 km

Line number	Date	Time UTC	Latitude	Longitude	Course	S=seismics M=magnetics G=gravity B=bathymetry	Length (km)
BGR14-149	07.02.14	02:12:00	12° 5.647'S	41° 23.837'E		M,G,B	
	07.02.14	10:00:00	10° 55.775'S	41° 23.653'E	0°		129.38 km
BGR14-149A	07.02.14	12:49:00	10° 55.471'S	41° 23.255'E		M,G,B	
	07.02.14	18:05:00	10° 9.429'S	41° 23.892'E	0°		85.26 km
BGR14-150	07.02.14	18:40:00	10° 9.037'S	41° 28.063'E		M,G,B	
	08.02.14	08:00:00	12° 5.860'S	41° 27.115'E	180°		216.32 km
BGR14-151	08.02.14	08:25:00	12° 6.135'S	41° 30.624'E		M,G,B	
	08.02.14	21:32:00	10° 9.201'S	41° 31.788'E	1°		216.53 km
BGR14-152	08.02.14	22:11:00	10° 9.221'S	41° 35.706'E		M,G,B	
	09.02.14	11:05:00	12° 5.540'S	41° 33.226'E	181°		215.43 km
BGR14-153	09.02.14	11:20:00	12° 5.647'S	41° 35.289'E		M,G,B	
	10.02.14	00:29:00	10° 8.073'S	41° 39.508'E	2°		217.84 km
BGR14-154	10.02.14	00:34:00	10° 8.004'S	41° 40.277'E		M,G,B	
	10.02.14	05:30:00	10° 9.000'S	42° 29.447'E	91°		89.64 km
BGR14-155	10.02.14	05:33:00	10° 9.288'S	42° 29.805'E		M,G,B	
	11.02.14	07:55:00	14° 32.873'S	42° 41.979'E	177°		488.57 km
BGR14-CAL2	11.02.14	07:56:00	14° 32.973'S	42° 41.987'E		M,G,B	
	11.02.14	09:05:00	14° 33.517'S	42° 42.147'E	various		13 km
BGR14-156	11.02.14	09:09:00	14° 33.943'S	42° 42.404'E		M,G,B	
	11.02.14	20:10:00	16° 14.589'S	43° 29.799'E	156°		204.67 km
BGR14-157	11.02.14	20:15:00	16° 15.380'S	43° 29.653'E		M,G,B	
	11.02.14	22:20:00	16° 30.411'S	43° 14.715'E	224°		38.46 km
BGR14-158	11.02.14	22:24:00	16° 30.276'S	43° 14.123'E		M,G,B	
	12.02.14	08:40:00	15° 9.437'S	42° 8.931'E	322°		189.45 km
BGR14-159	12.02.14	08:45:00	15° 8.980'S	42° 8.258'E		M,G,B	
	12.02.14	14:48:00	15° 0.045'S	41° 6.270'E	278°		112.06 km
BGR14-160	12.02.14	14:53:00	15° 0.672'S	41° 6.008'E		M,G,B	
	12.02.14	23:47:00	16° 30.028'S	41° 5.675'E	180°		165.46 km

Line number	Date	Time UTC	Latitude	Longitude	Course	S=seismics M=magnetics G=gravity B=bathymetry	Length (km)
BGR14-161	12.02.14	23:52:00	16° 30.041'S	41° 4.876'E		M,G,B	
	13.02.14	00:50:00	16° 29.997'S	40° 54.763'E	270°		17.96 km
BGR14-162	13.02.14	00:53:00	16° 29.853'S	40° 54.283'E		M,G,B	
	13.02.14	07:34:00	15° 22.836'S	40° 53.860'E	360°		124.10 km
BGR14-163	13.02.14	07:50:00	15° 23.624'S	40° 54.283'E		M,G,B	
	13.02.14	17:30:00	16° 44.984'S	40° 0.000'E	213°		178.95 km
BGR14-164	13.02.14	17:32:00	16° 45.220'S	39° 59.751'E		M,G,B	
	15.02.14	00:27:00	20° 21.957'S	36° 5.109'E	225°		575.00 km
BGR14-165	15.02.14	00:30:00	20° 22.355'S	36° 5.143'E		M,G,B	
	15.02.14	04:25:00	20° 57.990'S	36° 22.740'E	155°		72.69 km
BGR14-165A	15.02.14	06:12:00	21° 11.809'S	36° 29.541'E		M,G,B	
	15.02.14	10:01:00	21° 45.042'S	36° 45.990'E	155°		67.75 km
BGR14-166	15.02.14	10:03:00	21° 45.387'S	36° 46.026'E		M,G,B	
	16.02.14	02:49:00	24° 29.811'S	36° 58.909'E	176°		305.25 km
BGR14-167	16.02.14	02:51:00	24° 30.124'S	36° 58.724'E		M,G,B	
	16.02.14	06:11:00	24° 56.848'S	36° 22.416'E	231°		78.60 km
							12181.54km

A4. STATION LIST SO230

Abkürzungen / Abbreviation			Eingesetzte Geräte / Equipment used		Einsätze / tasks
z.W	zu Wasser / into water				
o.D.	an Deck / on deck			CTD (Releasertest & SSP)	8
Slmax	(maximale) Seillänge / max. rope-length			TVG	3
LT	Lottiefe nach EM 120 / Depth of EM 120			OBS	127 deployed / 127 recovered
W ...	eingesetzte Winde / Winch used			Seismik	05 profiles
nm	Seemeilen / nautical miles			Magnetometer	04 profiles
EM/PS	SIMRAD Multibeam / Parasound			EM/PS	03 profile
rwk / COG:	Rechtweisender Kurs / true course				
d:	Distanz / distance				
v:	Geschwindigkeit in Knoten / SOG in knots				
SL:	Seillänge / rope-length				
SZ:	Seilzug / rope tension				

Winde	D/M	Type	RF-Nr	SO 230 Tasks	intotal tasks	SO 230 length	intotal length	Condit-ion	SO 230 max. length	max. rope length ever lowered
W 1	18,2	LWL	081200442	0 h	0 h	0 m	0 m	1	0 m	0 m
W 2	18,2	LWL	071000295	6 h	589 h	2834 m	275839 m	2	949 m	6386 m
W 4	11	Koax	071000299	19 h	112 h	20850 m	105369 m	2	3000 m	5960 m
W 5	11	Koax	031200186	0 h	0 h	0 m	0 m	1	0 m	0 m
W 6	18,2	Koax	021200118	0 h	384 h	0 m	302023 m	2	0 m	4206 m

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/001-1	01.01.14	04:24	26° 5,44' S	34° 47,77' E	949,2	SW 11	14,6	0,8	TV-Grab Typ A	TVG	Beginn Station	
SO230/001-1	01.01.14	04:26	26° 5,45' S	34° 47,79' E	951	SSW 10	15,1	0,5	TV-Grab Typ A	TVG	zu Wasser	W2
SO230/001-1	01.01.14	04:48	26° 5,56' S	34° 47,81' E	952,7	S 7	110,1	0,6	TV-Grab Typ A	TVG	Bodensicht	SLmax: 939 m
SO230/001-1	01.01.14	05:31	26° 5,42' S	34° 47,97' E	797	SSW 11	48,8	0,4	TV-Grab Typ A	TVG	Zugriff	SL: 790 m
SO230/001-1	01.01.14	05:40	26° 5,41' S	34° 47,96' E	809,9	S 8	166,8	0,9	TV-Grab Typ A	TVG	hieven	
SO230/001-1	01.01.14	06:06	26° 5,41' S	34° 47,99' E	1172,8	S 9	105,2	0,8	TV-Grab Typ A	TVG	an Deck	
SO230/001-1	01.01.14	06:15	26° 5,41' S	34° 47,97' E	1127	S 8	278,5	0,8	TV-Grab Typ A	TVG	Ende Station	
SO230/002-1	01.01.14	16:57	26° 1,64' S	36° 40,20' E	1989,4	SW 6	177,8	2,2	CTD	CTD	Beginn Station	Wasserschall und Releasertest
SO230/002-1	01.01.14	16:59	26° 1,69' S	36° 40,19' E	1990,1	SSW 5	165	1,3	CTD	CTD	zu Wasser	W4
SO230/002-1	01.01.14	17:43	26° 2,03' S	36° 40,26' E	0	SSW 4	145,6	1,1	CTD	CTD	auf Tiefe	SLmax: 1800 m
SO230/002-1	01.01.14	18:30	26° 2,30' S	36° 40,17' E	0	SSW 4	249,7	0,4	CTD	CTD	Hieven	
SO230/002-1	01.01.14	19:14	26° 2,52' S	36° 40,02' E	0	S 5	203,8	0,4	CTD	CTD	an Deck	
SO230/002-1	01.01.14	19:17	26° 2,54' S	36° 40,00' E	2004,2	SSE 4	286,2	0,6	CTD	CTD	Ende Station	
SO230/003-1	02.01.14	04:00	25° 17,95' S	37° 20,67' E	3327,3	W 3	304,2	1,5	CTD	CTD	Beginn Station	Releasertest
SO230/003-1	02.01.14	04:01	25° 17,93' S	37° 20,65' E	3326,8	W 2	330,6	1	CTD	CTD	zu Wasser	W4
SO230/003-1	02.01.14	05:18	25° 17,84' S	37° 20,57' E	3322	NW 3	319,6	0,2	CTD	CTD	auf Tiefe	SLmax: 3000 m
SO230/003-1	02.01.14	05:58	25° 17,84' S	37° 20,61' E	0	NW 2	183,1	0,3	CTD	CTD	Hieven	
SO230/003-1	02.01.14	06:58	25° 17,86' S	37° 20,59' E	0	NW 3	342,5	0,7	CTD	CTD	an Deck	
SO230/003-1	02.01.14	07:00	25° 17,86' S	37° 20,59' E	3320,5	NW 3	33,4	0,3	CTD	CTD	Ende Station	
SO230/004-1	02.01.14	07:09	25° 17,43' S	37° 20,59' E	3314,5	WNW 3	2,7	4,9	Magneto-meter	MAGN	Beginn Station	

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/004-1	02.01.14	07:41	25° 14,76' S	37° 20,44' E	3202,3	NNW 3	353,1	6,4	Magneto-meter	MAGN	Beginn Profil	rwk: 356°, d: 214 nm
SO230/004-1	03.01.14	04:55	21° 45,02' S	37° 4,15' E	3008,4	SSE 6	342,5	10	Magneto-meter	MAGN	Kursänderung	rwk: 335°, d: 111 nm
SO230/004-1	03.01.14	15:58	20° 4,96' S	36° 14,29' E	151,3	S 7	7,7	9,6	Magneto-meter	MAGN	Kursänderung	rwk: 053°, d: 16 nm
SO230/004-1	03.01.14	17:32	19° 55,44' S	36° 27,35' E	394,7	S 9	97,2	10,3	Magneto-meter	MAGN	Kursänderung	rwk: 155°, d: 119 nm
SO230/004-1	04.01.14	05:24	21° 42,54' S	37° 21,22' E	3060,3	SE 3	122,9	9,5	Magneto-meter	MAGN	Kursänderung	rwk: 087°, d: 13 nm
SO230/004-1	04.01.14	06:39	21° 41,90' S	37° 34,59' E	3167,2	ESE 5	64,1	10,2	Magneto-meter	MAGN	Kursänderung	rwk: 337°, d: 133 nm
SO230/004-1	04.01.14	19:55	19° 40,33' S	36° 39,05' E	220,8	S 5	8	9,9	Magneto-meter	MAGN	Kursänderung	rwk: 032°, d: 15 nm
SO230/004-1	04.01.14	21:22	19° 27,88' S	36° 46,95' E	169,6	SE 4	44,8	9,9	Magneto-meter	MAGN	Kursänderung	rwk: 154°, d: 99 nm
SO230/004-1	05.01.14	07:20	20° 56,03' S	37° 34,33' E	2848	SSE 2	153,4	9,5	Magneto-meter	MAGN	Kursänderung	rwk: 154°, d: 61 nm
SO230/004-1	05.01.14	13:33	21° 51,01' S	38° 3,82' E	3209,9	ESE 3	149,1	5,3	Magneto-meter	MAGN	Ende Profil	
SO230/004-1	05.01.14	13:55	21° 51,40' S	38° 4,86' E	3214,8	ESE 3	88,1	3,9	Magneto-meter	MAGN	Magnetometer an Deck	
SO230/004-1	05.01.14	13:56	21° 51,40' S	38° 4,93' E	3214,7	E 2	91,6	4,1	Magneto-meter	MAGN	Ende Station	
SO230/005-1	05.01.14	16:24	21° 51,92' S	38° 31,35' E	3213,6	SSE 7	336,5	0,9	CTD	CTD	Beginn Station	Releasertest
SO230/005-1	05.01.14	16:25	21° 51,91' S	38° 31,34' E	3214,4	SSE 6	302,8	1	CTD	CTD	zu Wasser	W4
SO230/005-1	05.01.14	17:40	21° 51,50' S	38° 30,92' E	0	ESE 5	6	0,6	CTD	CTD	Hieven	SLmax: 2400 m
SO230/005-1	05.01.14	18:31	21° 51,15' S	38° 30,71' E	0	E 4	334,4	1,6	CTD	CTD	an Deck	
SO230/005-1	05.01.14	18:33	21° 51,10' S	38° 30,68' E	3206,8	ENE 5	343,8	1,9	CTD	CTD	Ende Station	
SO230/006-1	05.01.14	18:54	21° 51,90' S	38° 31,39' E	3211,5	E 6	132,5	1,2	OBS/OBH	OBS/OBH	Beginn Station	
SO230/006-1	05.01.14	18:56	21° 51,94' S	38° 31,41' E	3214,8	E 5	162	1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 11, Frequenz: B
SO230/006-1	05.01.14	19:49	21° 47,55' S	38° 28,74' E	3186,5	E 4	58,3	0,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 12. Frequenz: C

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/006-1	05.01.14	20:40	21° 43,21' S	38° 26,07' E	3164,6	E 6	76,5	2,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 13, Frequenz: A
SO230/006-1	05.01.14	21:24	21° 38,83' S	38° 23,38' E	3149,9	ESE 4	66,3	1,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 14, Frequenz: C
SO230/006-1	05.01.14	22:11	21° 34,41' S	38° 20,69' E	3125,7	ENE 3	40,8	3,2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 15, Frequenz: B
SO230/006-1	05.01.14	23:10	21° 29,96' S	38° 18,00' E	3101	ENE 3	16,4	0,6	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 16, Frequenz: D
SO230/006-1	05.01.14	23:54	21° 25,62' S	38° 15,33' E	3074,4	N 3	15,9	4,2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 17, Frequenz: A
SO230/006-1	06.01.14	00:39	21° 21,25' S	38° 12,73' E	3037,3	NNW 3	353,4	4,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 18, Frequenz: C
SO230/006-1	06.01.14	01:25	21° 16,97' S	38° 10,21' E	3010,2	NNE 4	13,9	2,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 19, Frequenz: B
SO230/006-1	06.01.14	02:03	21° 12,56' S	38° 7,39' E	2973,1	N 5	349,7	3,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 20, Frequenz: A
SO230/006-1	06.01.14	02:38	21° 8,27' S	38° 4,72' E	2945,4	NNW 6	358,9	4,6	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 21, Frequenz: C
SO230/006-1	06.01.14	03:14	21° 3,89' S	38° 2,08' E	2900,4	NNW 6	350,9	3,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 22, Frequenz: D
SO230/006-1	06.01.14	03:48	20° 59,54' S	37° 59,52' E	2862,2	NNW 6	359,7	4,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 23, Frequenz: B
SO230/006-1	06.01.14	04:23	20° 55,20' S	37° 56,87' E	2819,4	NNW 6	354,6	3,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 24, Frequenz: A
SO230/006-1	06.01.14	04:58	20° 50,83' S	37° 54,27' E	2748,6	N 5	356,1	3,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 25, Frequenz: C
SO230/006-1	06.01.14	05:42	20° 46,55' S	37° 51,52' E	2710,8	N 6	55,2	1,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 26, Frequenz: B
SO230/006-1	06.01.14	06:48	20° 42,19' S	37° 48,88' E	2704	N 4	57,3	1,4	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 27, Frequenz: D
SO230/006-1	06.01.14	07:59	20° 37,87' S	37° 46,26' E	2690	N 5	62,2	2,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 28, Frequenz: A
SO230/006-1	06.01.14	09:12	20° 33,50' S	37° 43,59' E	2687,1	N 5	84,3	1,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 29, Frequenz: D
SO230/006-1	06.01.14	10:26	20° 29,18' S	37° 40,99' E	2520,4	NNE 4	30,7	1,4	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 30, Frequenz: A
SO230/006-1	06.01.14	11:38	20° 24,86' S	37° 38,32' E	2284,8	NE 6	57,8	0,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 31, Frequenz: C

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/006-1	06.01.14	12:45	20° 20,49' S	37° 35,72' E	2125,2	NNE 6	20,9	1,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 32, Frequenz: D
SO230/006-1	06.01.14	13:52	20° 16,15' S	37° 33,09' E	2139,3	NE 6	44,8	1,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 33, Frequenz: C
SO230/006-1	06.01.14	14:59	20° 11,80' S	37° 30,45' E	2102,6	ENE 6	57,7	1,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 34, Frequenz: D
SO230/006-1	06.01.14	16:08	20° 7,47' S	37° 27,79' E	1929,3	NE 7	60,5	2,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 35, Frequenz: A
SO230/006-1	06.01.14	17:15	20° 3,09' S	37° 25,21' E	1949,4	NE 8	59	3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 36, Frequenz: C
SO230/006-1	06.01.14	18:20	19° 58,76' S	37° 22,57' E	1884,5	NE 8	66,8	1,2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 37, Frequenz: A
SO230/006-1	06.01.14	19:24	19° 54,42' S	37° 19,94' E	1813,2	NE 8	41,3	1,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 38, Frequenz: B
SO230/006-1	06.01.14	20:23	19° 50,10' S	37° 17,33' E	1729,9	NNE 9	61,2	2,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 39, Frequenz: C
SO230/006-1	06.01.14	21:26	19° 45,75' S	37° 14,70' E	1641,1	NNE 8	67,1	0,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 40, Frequenz: A
SO230/006-1	06.01.14	22:26	19° 41,40' S	37° 12,09' E	1531,4	N 6	61,1	2,4	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 41, Frequenz: B
SO230/006-1	06.01.14	23:25	19° 37,06' S	37° 9,44' E	1437,9	NNE 7	57,9	1,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 42, Frequenz: D
SO230/006-1	07.01.14	00:21	19° 32,72' S	37° 6,84' E	1315,5	NNE 7	54	1,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 43, Frequenz: A
SO230/006-1	07.01.14	01:16	19° 28,36' S	37° 4,24' E	1162,1	NNE 8	57,2	1,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 44, Frequenz: B
SO230/006-1	07.01.14	02:11	19° 24,04' S	37° 1,63' E	935,9	NNE 9	57,6	2,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 45, Frequenz: D
SO230/006-1	07.01.14	03:05	19° 19,67' S	36° 59,01' E	651,7	N 9	42,2	0,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 46, Frequenz: D
SO230/006-1	07.01.14	03:53	19° 15,30' S	36° 56,38' E	203,3	N 9	67,4	1,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 47, Frequenz: B
SO230/006-1	07.01.14	03:54	19° 15,27' S	36° 56,39' E	204,1	N 9	71,4	1,3	OBS/OBH	OBS/OBH	Ende Station	
SO230/007-1	07.01.14	05:49	19° 0,20' S	36° 47,93' E	104,5	N 8	327,7	1,9	Profil	PR	Stations-beginn	
SO230/007-1	07.01.14	05:56	19° 0,06' S	36° 47,87' E	101,5	N 8	346,9	1,2	Profil	PR	Stb-Airgunarray zu Wasser	

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/007-1	07.01.14	06:12	18° 59,71' S	36° 47,79' E	96,1	NNW 8	334,1	0,7	Profil	PR	Bb-Airgunarray zu Wasser	
SO230/007-1	07.01.14	06:15	18° 59,65' S	36° 47,77' E	14,7	NNW 8	355,9	1,8	Profil	PR	Magnetometer zu Wasser	
SO230/007-1	07.01.14	06:25	18° 58,99' S	36° 47,73' E	47,3	NNW 7	357,5	5,7	Profil	PR	Bird z. W.	
SO230/007-1	07.01.14	06:37	18° 58,03' S	36° 47,68' E	43,6	NNW 7	356	4,6	Profil	PR	Airgun eingeschaltet	
SO230/007-1	07.01.14	06:38	18° 57,95' S	36° 47,68' E	43,1	NNW 7	359,9	4,4	Profil	PR	Airgun abgeschaltet	
SO230/007-1	07.01.14	06:40	18° 57,80' S	36° 47,67' E	42,3	NNW 6	346,2	4,4	Profil	PR	Airgun eingeschaltet	
SO230/007-1	07.01.14	07:35	18° 57,03' S	36° 45,47' E	36,9	NW 5	165,1	4,9	Profil	PR	Beginn Profil	rwk: 150°, d: 204 nm
SO230/007-1	08.01.14	05:44	20° 33,19' S	37° 43,43' E	2675,2	SSE 7	153,1	5	Profil	PR	Airgun abgeschaltet	MM < 500 m
SO230/007-1	08.01.14	05:48	20° 33,46' S	37° 43,58' E	2686,1	SSE 6	150,1	5,2	Profil	PR	Airgun eingeschaltet	MM > 500 m
SO230/007-1	08.01.14	10:30	20° 53,67' S	37° 55,88' E	2791,3	SSE 8	155,8	4,6	Profil	PR	Airgun abgeschaltet	
SO230/007-1	08.01.14	10:50	20° 53,76' S	37° 56,01' E	2797,1	SE 8	101,8	0,5	Profil	PR	Stb Airgun an Deck	
SO230/007-1	08.01.14	11:45	20° 53,82' S	37° 55,54' E	2793	SSE 6	22,1	3,3	Profil	PR	Stb Airgun zu Wasser	
SO230/007-1	08.01.14	11:56	20° 53,02' S	37° 55,97' E	2927	SE 4	349,4	7,1	Profil	PR	Airgun eingeschaltet	
SO230/007-1	09.01.14	04:30	21° 52,12' S	38° 31,53' E	3209,7	S 12	153	5,3	Profil	PR	Ende Profil	
SO230/007-1	09.01.14	04:45	21° 52,39' S	38° 31,68' E	3211,7	S 12	145,4	1	Profil	PR	Stb-Airgunarray an Deck	
SO230/007-1	09.01.14	04:58	21° 52,55' S	38° 31,77' E	3212,9	S 13	171,9	1,1	Profil	PR	Bb-Airgunarray an Deck	
SO230/007-1	09.01.14	05:13	21° 53,08' S	38° 32,01' E	3214	SSW 13	156,3	3,8	Profil	PR	Magnetometer an Deck	
SO230/007-1	09.01.14	05:13	21° 53,08' S	38° 32,01' E	3214	SSW 13	156,3	3,8	Profil	PR	Stationsende	

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/008-1	09.01.14	05:17	21° 53,26' S	38° 32,09' E	3215,7	SSW 12	151,4	2,6	OBS/OBH	OBS/OBH	Beginn Station	
SO230/008-1	09.01.14	05:20	21° 53,36' S	38° 31,95' E	3214,8	SW 11	274,8	5,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 11
SO230/008-1	09.01.14	06:02	21° 51,70' S	38° 31,10' E	0	SSW 12	47,8	0,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 11
SO230/008-1	09.01.14	06:12	21° 51,39' S	38° 30,84' E	0	S 10	330,8	2,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 11
SO230/008-1	09.01.14	06:22	21° 50,62' S	38° 30,33' E	0	S 12	326,5	8,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 12
SO230/008-1	09.01.14	07:06	21° 47,22' S	38° 28,38' E	0	SSW 11	19	1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 12
SO230/008-1	09.01.14	07:22	21° 46,65' S	38° 27,89' E	0	S 7	314,5	2,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 12
SO230/008-1	09.01.14	07:26	21° 46,48' S	38° 27,72' E	0	S 8	310,5	4,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 13
SO230/008-1	09.01.14	08:17	21° 43,09' S	38° 25,38' E	0	SSW 11	279,5	1,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 13
SO230/008-1	09.01.14	08:32	21° 42,13' S	38° 24,98' E	0	S 9	299,8	2,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 13
SO230/008-1	09.01.14	08:34	21° 42,05' S	38° 24,91' E	0	SSE 7	329	3,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 14
SO230/008-1	09.01.14	09:18	21° 38,22' S	38° 22,19' E	0	SSW 11	115,9	2,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 14
SO230/008-1	09.01.14	09:36	21° 37,81' S	38° 22,53' E	0	S 7	330,8	3,3	OBS/OBH	OBS/OBH	OBH an Deck	OBS # 14
SO230/008-1	09.01.14	09:42	21° 37,52' S	38° 22,19' E	0	S 10	299,2	7,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 15
SO230/008-1	09.01.14	10:38	21° 34,08' S	38° 20,74' E	0	SW 11	250,2	2,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 15
SO230/008-1	09.01.14	10:54	21° 33,40' S	38° 19,96' E	0	S 9	303,7	3,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 15
SO230/008-1	09.01.14	11:00	21° 33,11' S	38° 19,70' E	0	SSW 10	334,4	4,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 16
SO230/008-1	09.01.14	11:57	21° 29,23' S	38° 17,76' E	0	S 10	303,1	7,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 16
SO230/008-1	09.01.14	12:07	21° 28,80' S	38° 17,19' E	0	SSW 8	316,2	2,5	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 16
SO230/008-1	09.01.14	12:09	21° 28,74' S	38° 17,15' E	0	S 8	313,7	2,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 17
SO230/008-1	09.01.14	13:02	21° 25,04' S	38° 15,33' E	0	S 11	284,6	6,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 17
SO230/008-1	09.01.14	13:09	21° 24,85' S	38° 14,88' E	0	S 8	317,1	2,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 17
SO230/008-1	09.01.14	13:15	21° 24,58' S	38° 14,40' E	0	SSW 10	319,6	8,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 18

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/008-1	09.01.14	14:05	21° 20,91' S	38° 12,61' E	0	SSW 10	185,8	0,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 18
SO230/008-1	09.01.14	14:24	21° 20,20' S	38° 12,17' E	0	SSW 8	343,9	2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 18
SO230/008-1	09.01.14	14:27	21° 20,09' S	38° 12,06' E	0	S 9	313,5	5,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 19
SO230/008-1	09.01.14	15:25	21° 16,39' S	38° 9,73' E	0	S 8	67,4	1,2	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 19
SO230/008-1	09.01.14	15:33	21° 16,04' S	38° 9,69' E	0	SSE 8	308,8	3,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 20
SO230/008-1	09.01.14	15:34	21° 16,01' S	38° 9,65' E	0	SSE 7	278,5	1,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 19
SO230/008-1	09.01.14	16:22	21° 12,16' S	38° 7,07' E	0	SSW 7	108,8	2,2	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 20
SO230/008-1	09.01.14	16:29	21° 11,87' S	38° 6,99' E	0	SE 9	292,4	4,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 20
SO230/008-1	09.01.14	16:32	21° 11,81' S	38° 6,83' E	0	SSE 8	306	4,7	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 21
SO230/008-1	09.01.14	17:11	21° 7,61' S	38° 4,46' E	0	SSW 5	124,2	1,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 21
SO230/008-1	09.01.14	17:40	21° 6,86' S	38° 3,49' E	0	S 4	302,2	2,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 21
SO230/008-1	09.01.14	17:44	21° 6,74' S	38° 3,28' E	0	S 4	299,8	5,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 22
SO230/008-1	09.01.14	18:21	21° 2,91' S	38° 1,29' E	0	S 4	49,3	5,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 22
SO230/008-1	09.01.14	18:37	21° 3,00' S	38° 1,18' E	0	S 4	287,8	3,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 22
SO230/008-1	09.01.14	18:42	21° 2,74' S	38° 0,84' E	0	S 5	319,8	8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 23
SO230/008-1	09.01.14	19:21	20° 58,50' S	37° 58,65' E	0	SSW 4	214,3	1,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 23
SO230/008-1	09.01.14	19:41	20° 58,67' S	37° 58,63' E	0	S 3	297,7	3,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 23
SO230/008-1	09.01.14	19:45	20° 58,52' S	37° 58,41' E	0	SSW 4	327,9	5,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 24
SO230/008-1	09.01.14	20:24	20° 54,23' S	37° 56,38' E	0	SW 3	171,9	2,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 24
SO230/008-1	09.01.14	20:38	20° 54,54' S	37° 56,37' E	0	SSE 3	291,3	2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 24
SO230/008-1	09.01.14	20:42	20° 54,46' S	37° 56,21' E	0	SSE 2	304	3,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 25
SO230/008-1	09.01.14	21:22	20° 50,68' S	37° 53,77' E	0	SSW 3	3	3,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 25
SO230/008-1	09.01.14	21:49	20° 49,90' S	37° 53,76' E	0	S 1	277,9	2,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 25

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/008-1	09.01.14	21:55	20° 49,83' S	37° 53,61' E	0	WSW 1	278,6	1,2	OBS/OBH	OBS/OBH	OBH ausgelöst	OBH # 26
SO230/008-1	09.01.14	22:48	20° 46,57' S	37° 51,49' E	0	SW 2	344,8	3,2	OBS/OBH	OBS/OBH	OBH gesichtet	OBS # 26
SO230/008-1	09.01.14	23:02	20° 45,96' S	37° 51,21' E	0	SSW 2	321,5	1,9	OBS/OBH	OBS/OBH	OBH an Deck	OBH # 26
SO230/008-1	09.01.14	23:06	20° 45,87' S	37° 51,12' E	0	S 2	334,2	1,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 27
SO230/008-1	09.01.14	23:48	20° 42,73' S	37° 49,14' E	0	SSW 2	340,1	6,4	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 27
SO230/008-1	10.01.14	00:06	20° 41,32' S	37° 48,56' E	0	SSW 2	339,6	2,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 27
SO230/008-1	10.01.14	00:10	20° 41,19' S	37° 48,49' E	0	S 2	334,4	2,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 28
SO230/008-1	10.01.14	00:48	20° 37,87' S	37° 46,13' E	0	SW 1	335,5	3,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 28
SO230/008-1	10.01.14	01:03	20° 37,27' S	37° 46,15' E	0	SW 1	347,7	1,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 28
SO230/008-1	10.01.14	01:12	20° 36,82' S	37° 45,73' E	0	SSE 1	316,9	9,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 29
SO230/008-1	10.01.14	01:50	20° 33,02' S	37° 43,49' E	0	NW 1	109,2	0,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 29
SO230/008-1	10.01.14	02:19	20° 32,56' S	37° 43,16' E	0	W 3	277,7	0,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 29
SO230/008-1	10.01.14	02:21	20° 32,55' S	37° 43,12' E	0	W 3	270,8	2,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 30
SO230/008-1	10.01.14	03:09	20° 28,55' S	37° 40,79' E	0	W 2	204,1	0,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 30
SO230/008-1	10.01.14	03:14	20° 28,69' S	37° 40,93' E	0	W 2	143,4	3,4	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 31
SO230/008-1	10.01.14	03:16	20° 28,75' S	37° 40,97' E	0	W 2	166,3	1,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 30
SO230/008-1	10.01.14	03:50	20° 24,89' S	37° 38,32' E	0	W 3	332,7	5,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 31
SO230/008-1	10.01.14	03:52	20° 24,73' S	37° 38,23' E	0	W 2	328,2	5,7	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 32
SO230/008-1	10.01.14	03:59	20° 24,28' S	37° 37,90' E	0	W 3	313,4	1,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 31
SO230/008-1	10.01.14	04:29	20° 20,73' S	37° 35,71' E	0	WNW 2	333,3	6,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 32
SO230/008-1	10.01.14	04:39	20° 20,08' S	37° 35,38' E	0	WNW 3	340,9	1,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 32
SO230/008-1	10.01.14	04:41	20° 20,02' S	37° 35,36' E	0	W 3	337,4	2,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 33
SO230/008-1	10.01.14	05:10	20° 16,31' S	37° 33,09' E	0	NW 2	329	5,5	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 33
SO230/008-1	10.01.14	05:23	20° 15,56' S	37° 32,52' E	0	NNW 1	320,9	1,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 33

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/008-1	10.01.14	05:27	20° 15,31' S	37° 32,34' E	0	WNW 1	328,7	7,4	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 34
SO230/008-1	10.01.14	05:54	20° 12,31' S	37° 30,57' E	0	NNW 2	329	6,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 34
SO230/008-1	10.01.14	06:07	20° 11,38' S	37° 29,94' E	0	NNW 3	341	1,3	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 34
SO230/008-1	10.01.14	06:12	20° 11,18' S	37° 29,86' E	0	W 2	330,3	5,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 35
SO230/008-1	10.01.14	06:42	20° 7,83' S	37° 27,93' E	0	NW 3	331,1	5,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 35
SO230/008-1	10.01.14	06:56	20° 7,23' S	37° 27,32' E	0	NW 4	296,9	1,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 35
SO230/008-1	10.01.14	06:58	20° 7,17' S	37° 27,25' E	0	NNW 3	326,1	3,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 36
SO230/008-1	10.01.14	07:29	20° 3,79' S	37° 25,40' E	0	NW 3	334,2	6,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 36
SO230/008-1	10.01.14	07:51	20° 3,07' S	37° 24,89' E	0	NNW 4	150,1	0,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 36
SO230/008-1	10.01.14	07:57	20° 2,92' S	37° 24,91' E	0	WNW 2	333,3	6,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 37
SO230/008-1	10.01.14	08:23	19° 59,65' S	37° 23,07' E	0	NNW 3	331,8	8,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 37
SO230/008-1	10.01.14	08:37	19° 58,70' S	37° 22,23' E	0	NW 3	312,6	0,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 37
SO230/008-1	10.01.14	08:40	19° 58,64' S	37° 22,16' E	0	NNW 3	318,2	3,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 38
SO230/008-1	10.01.14	09:44	19° 54,13' S	37° 19,66' E	0	N 3	269,9	1,2	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 38
SO230/008-1	10.01.14	09:57	19° 54,25' S	37° 19,61' E	0	NW 3	205,9	1,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 38
SO230/008-1	10.01.14	10:03	19° 54,16' S	37° 19,41' E	0	NNW 2	339,3	5,7	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 39
SO230/008-1	10.01.14	10:33	19° 50,42' S	37° 17,22' E	0	NNW 3	306,5	6,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 39
SO230/008-1	10.01.14	10:55	19° 49,88' S	37° 17,06' E	0	NW 2	249,1	0,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 39
SO230/008-1	10.01.14	10:58	19° 49,91' S	37° 16,99' E	0	NNW 3	274,3	2,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 40
SO230/008-1	10.01.14	11:29	19° 45,68' S	37° 14,43' E	0	NW 2	329,3	4,4	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 40
SO230/008-1	10.01.14	11:38	19° 45,67' S	37° 14,64' E	0	NNW 2	106,4	1,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 40
SO230/008-1	10.01.14	11:40	19° 45,69' S	37° 14,69' E	0	N 2	141,5	1,4	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 41
SO230/008-1	10.01.14	12:16	19° 41,58' S	37° 11,88' E	0	NNE 2	328,9	6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 41
SO230/008-1	10.01.14	12:25	19° 41,26' S	37° 12,18' E	0	NW 3	49,8	1,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 41
SO230/008-1	10.01.14	12:34	19° 40,96' S	37° 12,24' E	0	NNE 2	327,6	5,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 42

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/008-1	10.01.14	13:05	19° 37,15' S	37° 9,09' E	0	NNE 2	36,5	4,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 42
SO230/008-1	10.01.14	13:11	19° 36,97' S	37° 9,48' E	0	NNW 0	70,3	4,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 43
SO230/008-1	10.01.14	13:21	19° 36,97' S	37° 9,74' E	0	ESE 1	121,4	0,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 42
SO230/008-1	10.01.14	14:04	19° 32,66' S	37° 6,95' E	0	ENE 1	347,6	1,2	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 43
SO230/008-1	10.01.14	14:25	19° 32,58' S	37° 7,21' E	0	E 3	118,5	0,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 43
SO230/008-1	10.01.14	14:28	19° 32,64' S	37° 7,23' E	0	E 2	215,7	2,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 44
SO230/008-1	10.01.14	14:57	19° 28,79' S	37° 4,37' E	0	ENE 4	335	6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 44
SO230/008-1	10.01.14	15:05	19° 28,13' S	37° 4,29' E	0	ENE 3	358,9	1,5	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 44
SO230/008-1	10.01.14	15:07	19° 28,06' S	37° 4,25' E	0	E 3	313,5	3,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 45
SO230/008-1	10.01.14	15:37	19° 24,24' S	37° 1,78' E	0	E 3	331	4,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 45
SO230/008-1	10.01.14	15:51	19° 23,84' S	37° 1,93' E	0	ENE 5	121,2	2,3	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 45
SO230/008-1	10.01.14	16:01	19° 23,18' S	37° 1,26' E	0	E 5	320,5	11,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 46
SO230/008-1	10.01.14	16:22	19° 20,04' S	36° 59,23' E	0	E 5	329,9	7,4	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 46
SO230/008-1	10.01.14	16:37	19° 19,54' S	36° 59,18' E	0	ENE 7	166,4	1,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 46
SO230/008-1	10.01.14	16:51	19° 17,98' S	36° 57,95' E	0	E 7	328,8	11,3	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 47
SO230/008-1	10.01.14	16:58	19° 16,89' S	36° 57,30' E	0	E 7	329	10,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 47
SO230/008-1	10.01.14	17:22	19° 14,92' S	36° 56,48' E	0	E 8	53,4	0,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 47
SO230/008-1	10.01.14	17:23	19° 14,91' S	36° 56,49' E	0	E 7	54,2	0,6	OBS/OBH	OBS/OBH	Ende Station	
SO230/009-1	10.01.14	17:31	19° 14,65' S	36° 56,69' E	201,3	E 7	33,1	6	Magneto-meter	MAGN	Beginn Station	
SO230/009-1	10.01.14	17:32	19° 14,57' S	36° 56,74' E	196	E 7	29	6,2	Magneto-meter	MAGN	Magnetometer zu Wasser	
SO230/009-1	10.01.14	19:00	19° 3,43' S	37° 3,43' E	172,4	ESE 8	70,5	9,5	Magneto-meter	MAGN	Beginn Profil	rwk: 150°, d: 184 nm
SO230/009-1	11.01.14	13:28	21° 42,90' S	38° 40,68' E	3154,4	SE 3	114,2	10,7	Magneto-meter	MAGN	Kursänderung	rwk: 061°, d: 14 nm
SO230/009-1	11.01.14	14:51	21° 36,27' S	38° 53,71' E	3216,4	SE 6	34,3	9,3	Magneto-meter	MAGN	Kursänderung	rwk: 330°, d: 213 nm

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/009-1	12.01.14	12:14	18° 32,76' S	36° 59,79' E	68,5	SE 6	330,5	9,8	Magneto-meter	MAGN	Kursänderung	rwk: 043°, d: 13 nm
SO230/009-1	12.01.14	13:33	18° 22,93' S	37° 8,44' E	36,5	S 9	81,8	9,6	Magneto-meter	MAGN	Kursänderung	rwk: 150°, d: 14 nm
SO230/009-1	12.01.14	15:00	18° 34,98' S	37° 16,29' E	198,6	SE 7	147,5	6,8	Magneto-meter	MAGN	Kursänderung	rwk: 150°, d: 197 nm
SO230/009-1	13.01.14	10:36	21° 24,21' S	39° 0,12' E	3105	S 6	155,8	9,5	Magneto-meter	MAGN	Kursänderung	rwk: 004°, d: 53 nm
SO230/009-1	13.01.14	15:31	20° 38,21' S	39° 3,03' E	2817,6	S 4	0,6	6,7	Magneto-meter	MAGN	Beginn Kalibrierungs-dreh-kreis	
SO230/009-1	13.01.14	16:36	20° 38,25' S	39° 3,03' E	2815,4	S 4	1	5,8	Magneto-meter	MAGN	Ende Kalibrierungs-dreh-kreis	d: 6 nm
SO230/009-1	13.01.14	17:22	20° 30,93' S	39° 3,55' E	2770,8	SSE 7	355	10,2	Magneto-meter	MAGN	Kursänderung	rwk: 331°, d: 178 nm
SO230/009-1	14.01.14	11:17	17° 56,52' S	37° 30,94' E	33,2	SW 4	348,3	9,9	Magneto-meter	MAGN	Kursänderung	rwk: 058°, d: 15 nm
SO230/009-1	14.01.14	12:47	17° 48,30' S	37° 43,94' E	35,4	SSW 5	63,1	10,2	Magneto-meter	MAGN	Kursänderung	rwk: 151°, d: 7 nm
SO230/009-1	14.01.14	13:30	17° 53,97' S	37° 47,97' E	429,1	SSW 8	148,8	10,2	Magneto-meter	MAGN	Kursänderung	rwk: 150°, d: 216 nm
SO230/009-1	15.01.14	13:31	21° 1,06' S	39° 42,06' E	3089,2	SSE 11	123,2	9,1	Magneto-meter	MAGN	Kursänderung	rwk: 090°, d: 34 nm
SO230/009-1	15.01.14	17:18	21° 1,00' S	40° 17,91' E	2990,3	SSE 15	60,2	10,3	Magneto-meter	MAGN	Kursänderung	rwk: 335°, d: 226 nm
SO230/009-1	16.01.14	16:48	17° 36,39' S	38° 36,16' E	1276,1	SW 8	7,9	10,3	Magneto-meter	MAGN	Kursänderung	rwk: 053°, d: 79 nm
SO230/009-1	17.01.14	00:38	16° 48,42' S	39° 41,42' E	947,2	W 8	51	10,3	Magneto-meter	MAGN	Kursänderung	rwk: 151°, d: 119 nm
SO230/009-1	17.01.14	12:27	18° 30,74' S	40° 42,46' E	2580,8	WNW 11	151,4	9,3	Magneto-meter	MAGN	Kursänderung	rwk: 360°, d: 170 nm
SO230/009-1	18.01.14	05:52	15° 39,82' S	40° 41,99' E	1036,8	N 5	19,1	8,9	Magneto-meter	MAGN	Kursänderung	rwk: 224°, d: 19 nm
SO230/009-1	18.01.14	07:56	15° 53,99' S	40° 30,16' E	629,1	N 5	192,8	11,4	Magneto-meter	MAGN	Kursänderung	rwk: 180°, d: 126 nm
SO230/009-1	18.01.14	20:32	17° 59,86' S	40° 29,90' E	2419,9	NW 1	215,5	9,9	Magneto-meter	MAGN	Kursänderung	rwk: 270°, d: 12 nm

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/009-1	18.01.14	21:37	18° 0,00' S	40° 18,57' E	2435	WSW 2	265,3	9,6	Magneto-meter	MAGN	Kursänderung	rwk: 360°, d: 112 nm
SO230/009-1	19.01.14	08:53	16° 8,44' S	40° 18,02' E	820,3	S 6	312,1	10,2	Magneto-meter	MAGN	Kursänderung	rwk: 218°, d: 19 nm
SO230/009-1	19.01.14	10:45	16° 23,01' S	40° 6,03' E	531,9	SSW 6	216,3	11	Magneto-meter	MAGN	Kursänderung	rwk: 180°, d: 97 nm
SO230/009-1	19.01.14	20:21	17° 59,75' S	40° 5,82' E	2429,6	NNW 1	219,6	9,9	Magneto-meter	MAGN	Kursänderung	rwk: 270°, d: 11 nm
SO230/009-1	19.01.14	21:26	18° 0,00' S	39° 54,60' E	2410,2	SSW 2	269,7	9,8	Magneto-meter	MAGN	Kursänderung	rwk: 360°, d: 84 nm
SO230/009-1	20.01.14	05:54	16° 36,03' S	39° 54,00' E	717,8	WNW 4	11,5	9,5	Magneto-meter	MAGN	Ende Profil	
SO230/009-1	20.01.14	06:15	16° 35,11' S	39° 54,66' E	618,2	W 3	21,8	2,4	Magneto-meter	MAGN	Magnetometer an Deck	
SO230/009-1	20.01.14	06:16	16° 35,08' S	39° 54,69' E	614,3	W 3	35,2	2,1	Magneto-meter	MAGN	Ende Station	
SO230/010-1	20.01.14	07:23	16° 28,05' S	39° 59,99' E	420,1	WSW 2	27,3	1,9	OBS/OBH	OBS/OBH	Beginn Station	
SO230/010-1	20.01.14	07:24	16° 28,02' S	40° 0,00' E	417,5	WSW 3	28,5	1,6	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 51, Frequenz: A
SO230/010-1	20.01.14	08:33	16° 28,51' S	40° 8,30' E	1229,8	W 1	82,7	1,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 52, Frequenz: D
SO230/010-1	20.01.14	09:47	16° 28,97' S	40° 16,64' E	1509,1	SSW 2	77,6	1,4	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 53, Frequenz: B
SO230/010-1	20.01.14	11:03	16° 29,45' S	40° 24,92' E	1696,4	S 2	31,5	3,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 54, Frequenz: A
SO230/010-1	20.01.14	12:21	16° 29,86' S	40° 33,27' E	1865,3	SSW 3	20,9	3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 55, Frequenz: C
SO230/010-1	20.01.14	13:43	16° 30,25' S	40° 41,62' E	2018,2	SSW 5	80,5	1,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 56, Frequenz: A
SO230/010-1	20.01.14	15:01	16° 30,73' S	40° 49,93' E	2141	S 5	37,5	2,4	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 57, Frequenz: D
SO230/010-1	20.01.14	16:18	16° 31,18' S	40° 58,22' E	2239,3	S 3	31,3	3,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 58, Frequenz: A
SO230/010-1	20.01.14	17:39	16° 31,64' S	41° 6,56' E	2367,5	SSE 3	15,3	2,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 59, Frequenz: B

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/010-1	20.01.14	19:09	16° 32,01' S	41° 14,91' E	2536,6	SE 4	36,3	2,4	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 60, Frequenz: A
SO230/010-1	20.01.14	20:32	16° 32,56' S	41° 23,21' E	2630	ESE 5	25,8	1,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 61, Frequenz: C
SO230/010-1	21.01.14	00:25	16° 33,01' S	41° 31,56' E	2768,9	E 4	23,1	2,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 62, Frequenz: B
SO230/010-1	21.01.14	01:52	16° 33,41' S	41° 39,88' E	1899,6	ESE 3	3,3	2,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 63, Frequenz: C
SO230/010-1	21.01.14	03:10	16° 33,93' S	41° 48,18' E	2277,3	NNW 0	16,2	2,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 64, Frequenz: D
SO230/010-1	21.01.14	04:31	16° 34,36' S	41° 56,55' E	2410,2	W 3	351,5	1,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 65, Frequenz: B
SO230/010-1	21.01.14	05:51	16° 34,84' S	42° 4,88' E	2255,8	SW 1	12,4	2,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 66, Frequenz: A
SO230/010-1	21.01.14	07:16	16° 35,28' S	42° 13,21' E	2386,2	ENE 1	6,8	0,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 67, Frequenz: C
SO230/010-1	21.01.14	09:43	16° 35,71' S	42° 21,53' E	2458,8	NW 3	16,4	4,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 68, Frequenz: B
SO230/010-1	21.01.14	11:09	16° 36,19' S	42° 29,84' E	2560,5	N 3	34,4	2,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 69, Frequenz: C
SO230/010-1	21.01.14	12:32	16° 36,68' S	42° 38,17' E	2440,9	WSW 4	32,2	4,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 70, Frequenz: B
SO230/010-1	21.01.14	13:57	16° 37,08' S	42° 46,51' E	2552,1	WSW 3	3,8	3,2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 71, Frequenz: D
SO230/010-1	21.01.14	15:21	16° 37,54' S	42° 54,86' E	2272,9	SW 4	9,4	1,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 72, Frequenz: C
SO230/010-1	21.01.14	17:37	16° 38,02' S	43° 3,19' E	1946,8	WSW 3	2,5	0,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 73, Frequenz: D
SO230/010-1	21.01.14	18:56	16° 38,46' S	43° 11,52' E	1280,8	WSW 2	21,6	1,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 74, Frequenz: D
SO230/010-1	21.01.14	19:58	16° 38,91' S	43° 19,17' E	524,5	SW 2	70,1	1,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 75, Frequenz: B
SO230/010-1	21.01.14	20:00	16° 38,90' S	43° 19,24' E	488,9	WSW 3	93,8	3,7	OBS/OBH	OBS/OBH	Ende Station	
SO230/011-1	20.01.14	20:33	16° 32,54' S	41° 23,23' E	2632,8	ESE 5	25,5	1	CTD	CTD	Beginn Station	
SO230/011-1	20.01.14	20:40	16° 32,56' S	41° 23,29' E	2627,9	ESE 3	163,3	0,2	CTD	CTD	zu Wasser	W4

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/011-1	20.01.14	21:45	16° 32,60' S	41° 23,31' E	2633,2	ESE 2	125,1	0,3	CTD	CTD	auf Tiefe	SLmax: 2600 m
SO230/011-1	20.01.14	21:45	16° 32,60' S	41° 23,31' E	2633,2	ESE 2	125,1	0,3	CTD	CTD	Hieven	
SO230/011-1	20.01.14	22:49	16° 32,56' S	41° 23,42' E	2626,2	SSE 1	90,4	0,3	CTD	CTD	an Deck	
SO230/011-1	20.01.14	22:55	16° 32,56' S	41° 23,42' E	2628,4	SSE 1	221,2	0,6	CTD	CTD	Ende Station	
SO230/012-1	21.01.14	20:36	16° 39,16' S	43° 22,96' E	56,8	WSW 2	273,8	4	Profil	PR	Stations-beginn	
SO230/012-1	21.01.14	20:52	16° 39,09' S	43° 22,24' E	202,8	SW 2	285,4	3	Profil	PR	Bb-Airgunarray zu Wasser	
SO230/012-1	21.01.14	21:01	16° 39,07' S	43° 21,78' E	258,4	SSW 2	254,3	2,9	Profil	PR	Stb-Airgunarray zu Wasser	
SO230/012-1	21.01.14	21:07	16° 39,06' S	43° 21,48' E	278,2	SW 2	267,2	2,8	Profil	PR	Magnetometer zu Wasser	
SO230/012-1	21.01.14	21:30	16° 38,93' S	43° 19,62' E	383,4	SSE 2	276,1	5,4	Profil	PR	Beginn Profil	rwk: 273°, d: 201 nm
SO230/012-1	22.01.14	03:45	16° 37,10' S	42° 46,88' E	2553,6	NE 5	270,8	4,9	Profil	PR	Airgun abgeschaltet	
SO230/012-1	22.01.14	04:10	16° 38,07' S	42° 47,23' E	2527	N 7	89,5	4,2	Profil	PR	Stb-Airgunarray an Deck	
SO230/012-1	22.01.14	06:11	16° 37,36' S	42° 51,48' E	2586,7	N 3	276	4,5	Profil	PR	Stb-Airgunarray zu Wasser	
SO230/012-1	22.01.14	06:16	16° 37,33' S	42° 51,06' E	2512,5	NNW 2	274,7	5,6	Profil	PR	Airgun eingeschaltet	
SO230/012-1	22.01.14	09:29	16° 36,42' S	42° 34,02' E	2251	NW 5	272	5,2	Profil	PR	Airgun abgeschaltet	
SO230/012-1	22.01.14	09:33	16° 36,40' S	42° 33,67' E	2475,5	NNW 6	272,1	5,2	Profil	PR	Airgun eingeschaltet	
SO230/012-1	23.01.14	07:16	16° 30,19' S	40° 39,67' E	1982,6	N 12	272	4,7	Profil	PR	Airgun abgeschaltet	
SO230/012-1	23.01.14	07:32	16° 30,69' S	40° 39,39' E	1974,2	NNW 9	111,9	3,1	Profil	PR	Stb-Airgunarray an Deck	

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/012-1	23.01.14	08:30	16° 30,48' S	40° 42,23' E	2022,8	N 10	270,1	4,2	Profil	PR	Stb-Airgunarray zu Wasser	
SO230/012-1	23.01.14	08:33	16° 30,45' S	40° 42,01' E	2016	N 9	287,5	5	Profil	PR	Airgun eingeschaltet	
SO230/012-1	23.01.14	16:19	16° 28,02' S	39° 59,99' E	414,3	ENE 3	271,7	5,2	Profil	PR	Airgun abgeschaltet	
SO230/012-1	23.01.14	16:19	16° 28,02' S	39° 59,99' E	414,3	ENE 3	271,7	5,2	Profil	PR	Ende Profil	
SO230/012-1	23.01.14	16:33	16° 28,31' S	39° 58,79' E	276	ENE 4	240,2	5,5	Profil	PR	Bb-Airgunarray an Deck	
SO230/012-1	23.01.14	16:44	16° 28,97' S	39° 57,94' E	367,1	NE 5	222,9	5,9	Profil	PR	Stb-Airgunarray an Deck	
SO230/012-1	23.01.14	16:55	16° 29,78' S	39° 57,16' E	337,8	NE 6	222	6,1	Profil	PR	Magnetometer an Deck	
SO230/012-1	23.01.14	16:55	16° 29,78' S	39° 57,16' E	337,8	NE 6	222	6,1	Profil	PR	Stationsende	
SO230/013-1	23.01.14	17:06	16° 30,46' S	39° 57,24' E	618,1	NNE 6	112,8	5,1	OBS/OBH	OBS/OBH	Beginn Station	
SO230/013-1	23.01.14	17:13	16° 30,65' S	39° 57,98' E	517,6	NE 6	102,8	6,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 51
SO230/013-1	23.01.14	17:41	16° 28,38' S	39° 59,83' E	0	NE 8	17,4	3,5	OBS/OBH	OBS/OBH	OBS gesichtet	
SO230/013-1	23.01.14	18:23	16° 29,44' S	39° 58,56' E	549,9	N 9	217,4	2,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 51
SO230/013-1	23.01.14	19:41	16° 27,54' S	40° 8,22' E	1148,3	E 11	185,1	8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 52
SO230/013-1	23.01.14	20:01	16° 28,75' S	40° 7,85' E	0	N 11	223,9	2,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 52
SO230/013-1	23.01.14	20:15	16° 29,19' S	40° 7,77' E	0	N 10	190,4	1,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 52
SO230/013-1	23.01.14	20:56	16° 29,02' S	40° 12,99' E	0	N 12	90,4	9,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 53
SO230/013-1	23.01.14	21:25	16° 29,27' S	40° 15,85' E	0	N 12	119,5	3,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 52
SO230/013-1	23.01.14	21:37	16° 29,66' S	40° 16,12' E	0	N 12	179,9	2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 53
SO230/013-1	23.01.14	22:15	16° 29,57' S	40° 21,31' E	0	N 12	86,3	8,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 54
SO230/013-1	23.01.14	22:40	16° 29,58' S	40° 24,19' E	0	ENE 11	96,4	2,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 54
SO230/013-1	23.01.14	22:51	16° 29,79' S	40° 24,64' E	0	N 10	188,9	2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 54

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/013-1	23.01.14	23:28	16° 29,71' S	40° 29,64' E	0	N 12	93,5	10	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 55
SO230/013-1	23.01.14	23:55	16° 29,83' S	40° 32,80' E	0	NE 11	34,8	0,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 55
SO230/013-1	24.01.14	00:05	16° 29,97' S	40° 33,08' E	0	N 11	194,1	1,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 55
SO230/013-1	24.01.14	00:32	16° 30,07' S	40° 36,34' E	0	N 13	88,4	9,7	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 56
SO230/013-1	24.01.14	01:06	16° 30,28' S	40° 41,26' E	0	N 11	91,4	6,2	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 56
SO230/013-1	24.01.14	01:24	16° 30,33' S	40° 41,45' E	0	N 11	180	0,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 56
SO230/013-1	24.01.14	01:41	16° 30,44' S	40° 43,74' E	0	N 13	96,8	10,3	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 57
SO230/013-1	24.01.14	02:14	16° 30,97' S	40° 49,26' E	0	N 12	96,1	6,2	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 57
SO230/013-1	24.01.14	02:26	16° 30,79' S	40° 49,84' E	0	NNE 9	61,7	1,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 57
SO230/013-1	24.01.14	02:45	16° 30,96' S	40° 52,64' E	0	N 12	95,3	9,4	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 58
SO230/013-1	24.01.14	03:20	16° 31,35' S	40° 57,80' E	0	N 12	116,7	3,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 58
SO230/013-1	24.01.14	03:35	16° 31,24' S	40° 58,14' E	0	N 10	196,4	0,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 58
SO230/013-1	24.01.14	03:58	16° 31,43' S	41° 1,64' E	0	N 10	97,2	10	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 59
SO230/013-1	24.01.14	04:34	16° 31,74' S	41° 6,35' E	0	N 9	103,7	3,4	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 59
SO230/013-1	24.01.14	04:40	16° 31,67' S	41° 6,50' E	0	NNE 8	45,1	0,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 59
SO230/013-1	24.01.14	05:04	16° 31,84' S	41° 10,30' E	0	N 10	93,6	10,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 60
SO230/013-1	24.01.14	05:53	16° 32,13' S	41° 14,68' E	0	NNE 9	12,7	1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 60
SO230/013-1	24.01.14	06:02	16° 32,08' S	41° 14,80' E	0	N 9	160,3	1,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 60
SO230/013-1	24.01.14	06:28	16° 32,26' S	41° 18,76' E	0	N 10	93,5	8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 61
SO230/013-1	24.01.14	07:09	16° 32,84' S	41° 22,73' E	0	N 9	63,6	3,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 61
SO230/013-1	24.01.14	07:17	16° 32,59' S	41° 23,06' E	0	NNW 9	244,6	0,3	OBS/OBH	OBS/OBH	OBMT gesichtet	OBS # 61
SO230/013-1	24.01.14	07:41	16° 32,92' S	41° 26,31' E	0	N 9	97,1	9,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 62
SO230/013-1	24.01.14	08:18	16° 33,28' S	41° 30,79' E	0	NNW 9	68,8	4,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 62

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/013-1	24.01.14	08:30	16° 33,19' S	41° 31,44' E	0	NNW 7	193	0,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 62
SO230/013-1	24.01.14	08:55	16° 33,43' S	41° 35,07' E	0	N 10	90,2	10,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 63
SO230/013-1	24.01.14	09:37	16° 33,28' S	41° 39,56' E	0	NNW 8	251,4	2,5	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 63
SO230/013-1	24.01.14	09:49	16° 33,53' S	41° 39,88' E	0	NNW 6	90,2	0,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 63
SO230/013-1	24.01.14	11:24	16° 32,05' S	41° 48,38' E	2300,7	NNE 7	188,9	7,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 64
SO230/013-1	24.01.14	11:57	16° 33,73' S	41° 47,50' E	0	N 8	105,1	3,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 64
SO230/013-1	24.01.14	12:12	16° 34,00' S	41° 47,96' E	0	N 7	156,4	1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 64
SO230/013-1	24.01.14	12:28	16° 34,08' S	41° 49,74' E	0	N 9	87,7	10,3	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 65
SO230/013-1	24.01.14	13:06	16° 34,40' S	41° 55,70' E	0	N 9	91,7	6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 65
SO230/013-1	24.01.14	13:19	16° 34,52' S	41° 56,45' E	0	N 6	340,3	0,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 65
SO230/013-1	24.01.14	13:42	16° 34,62' S	42° 0,05' E	0	N 7	90,7	10,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 66
SO230/013-1	24.01.14	14:15	16° 35,00' S	42° 4,73' E	0	NNW 7	100,3	3,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 66
SO230/013-1	24.01.14	14:20	16° 34,91' S	42° 4,83' E	0	N 6	13,2	0,5	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 66
SO230/013-1	24.01.14	14:38	16° 34,97' S	42° 7,40' E	0	N 5	94,4	9,7	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 67
SO230/013-1	24.01.14	15:13	16° 35,39' S	42° 12,89' E	0	N 5	92,4	5,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 67
SO230/013-1	24.01.14	15:18	16° 35,32' S	42° 13,14' E	0	N 4	120,5	0,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 67
SO230/013-1	24.01.14	15:39	16° 35,48' S	42° 16,38' E	0	N 5	95,9	9,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 68
SO230/013-1	24.01.14	16:16	16° 35,81' S	42° 21,49' E	0	NNW 4	15,3	0,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 68
SO230/013-1	24.01.14	16:26	16° 35,64' S	42° 21,41' E	0	NE 4	330,5	0,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 68
SO230/013-1	24.01.14	16:47	16° 35,87' S	42° 24,53' E	0	N 5	99,4	10,4	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 69
SO230/013-1	24.01.14	17:23	16° 36,20' S	42° 29,57' E	0	N 5	82,8	2,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 69
SO230/013-1	24.01.14	17:30	16° 36,09' S	42° 29,87' E	0	N 4	60,6	1,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 69
SO230/013-1	24.01.14	17:50	16° 36,40' S	42° 32,96' E	0	N 4	96,9	9,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 70
SO230/013-1	24.01.14	18:25	16° 36,69' S	42° 37,34' E	0	N 3	94	5	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 70

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/013-1	24.01.14	18:43	16° 36,71' S	42° 38,07' E	0	N 2	202,4	1,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 70
SO230/013-1	24.01.14	19:00	16° 37,01' S	42° 40,19' E	0	NNW 2	95,7	10	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 71
SO230/013-1	24.01.14	19:33	16° 37,20' S	42° 45,89' E	0	NNW 2	78,8	9,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 71
SO230/013-1	24.01.14	19:42	16° 37,17' S	42° 46,53' E	0	WNW 2	86,9	0,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 71
SO230/013-1	24.01.14	20:08	16° 37,39' S	42° 50,71' E	0	NW 2	94,8	10,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 72
SO230/013-1	24.01.14	20:40	16° 37,54' S	42° 55,05' E	0	WSW 1	13,3	1,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 72
SO230/013-1	24.01.14	20:50	16° 37,91' S	42° 54,72' E	0	WNW 1	205	2,3	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 72
SO230/013-1	24.01.14	21:10	16° 38,29' S	42° 57,19' E	0	WSW 1	94,5	9,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 73
SO230/013-1	24.01.14	21:49	16° 38,07' S	43° 2,40' E	0	SSW 2	114,6	4,2	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 73
SO230/013-1	24.01.14	22:08	16° 38,37' S	43° 3,10' E	0	SSW 3	141,4	1,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 73
SO230/013-1	24.01.14	22:42	16° 38,20' S	43° 7,29' E	0	SSE 4	93,9	10,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 74
SO230/013-1	24.01.14	23:01	16° 38,36' S	43° 10,53' E	0	SE 5	96,3	7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 74
SO230/013-1	24.01.14	23:16	16° 38,73' S	43° 11,33' E	0	SSE 3	175	1,5	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 74
SO230/013-1	24.01.14	23:54	16° 38,69' S	43° 16,82' E	0	SSE 4	93,4	10,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 75
SO230/013-1	25.01.14	00:04	16° 38,80' S	43° 18,45' E	0	ESE 4	88,4	6,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 75
SO230/013-1	25.01.14	00:19	16° 39,08' S	43° 18,99' E	0	SE 3	179,4	0,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 75
SO230/013-1	25.01.14	00:19	16° 39,08' S	43° 18,99' E	0	SE 3	179,4	0,9	OBS/OBH	OBS/OBH	Ende Station	
SO230/014-1	25.01.14	00:39	16° 39,43' S	43° 20,06' E	325,8	ESE 5	241,9	5	Ver-messung	EM / PS	Beginn Profil	rwk: 253°, d: 1 nm
SO230/014-1	25.01.14	00:44	16° 39,63' S	43° 19,45' E	497,1	E 4	256	8,4	Ver-messung	EM / PS	Kursänderung	rwk: 161°, d: 1 nm
SO230/014-1	25.01.14	00:50	16° 40,19' S	43° 19,39' E	622,3	ENE 3	159,9	7,2	Ver-messung	EM / PS	Kursänderung	rwk: 262°, d: 4 nm
SO230/014-1	25.01.14	01:22	16° 40,97' S	43° 15,35' E	713,1	NE 12	262,5	8,2	Ver-messung	EM / PS	Kursänderung	rwk: 261°, d: 9 nm
SO230/014-1	25.01.14	02:33	16° 42,40' S	43° 5,58' E	1789,8	NE 10	261,3	8	Ver-messung	EM / PS	Kursänderung	rwk: 267°, d: 11 nm
SO230/014-1	25.01.14	03:51	16° 43,19' S	42° 54,74' E	2291,4	E 4	279,8	7,8	Ver-messung	EM / PS	Kursänderung	rwk: 002°, d: 9 nm

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/014-1	25.01.14	05:00	16° 34,13' S	42° 54,96' E	2555,6	E 6	31,6	7,2	Ver-messung	EM / PS	Kursänderung	rwk: 098°, d: 16 nm
SO230/014-1	25.01.14	07:04	16° 36,21' S	43° 11,53' E	1468,1	E 4	108,5	8	Ver-messung	EM / PS	Kursänderung	rwk: 105°, d: 6 nm
SO230/014-1	25.01.14	07:52	16° 37,76' S	43° 17,89' E	784,8	ENE 5	72,6	7,1	Ver-messung	EM / PS	Kursänderung	rwk: 018°, d: 2 nm
SO230/014-1	25.01.14	08:08	16° 36,00' S	43° 18,58' E	925,6	NE 5	334,7	6,9	Ver-messung	EM / PS	Kursänderung	rwk: 285°, d: 23 nm
SO230/014-1	25.01.14	11:04	16° 30,34' S	42° 55,55' E	2520	ESE 3	282	7,8	Ver-messung	EM / PS	Kursänderung	rwk: 180°, d: 4 nm
SO230/014-1	25.01.14	11:34	16° 34,03' S	42° 55,19' E	2555,1	E 3	181,9	7,8	Ver-messung	EM / PS	Kursänderung	rwk: 279°, d: 4 nm
SO230/014-1	25.01.14	12:05	16° 33,64' S	42° 51,35' E	2524	ESE 1	276,4	7,7	Ver-messung	EM / PS	Kursänderung	rwk: 018°, d: 6 nm
SO230/014-1	25.01.14	12:29	16° 31,00' S	42° 51,87' E	2610,4	ENE 3	17,8	4,9	Ver-messung	EM / PS	Magnetometer z.W.	
SO230/014-1	25.01.14	12:54	16° 28,50' S	42° 52,70' E	2624,6	ENE 3	19,1	7,5	Ver-messung	EM / PS	Kursänderung	rwk: 072°, d: 5 nm
SO230/014-1	25.01.14	13:37	16° 26,54' S	42° 58,20' E	2620,4	NE 2	99,6	7,2	Ver-messung	EM / PS	Kursänderung	rwk: 112°, d: 22 nm
SO230/014-1	25.01.14	16:22	16° 34,62' S	43° 19,71' E	911,7	NW 2	66,9	7,9	Ver-messung	EM / PS	Kursänderung	rwk: 026°, d: 1 nm
SO230/014-1	25.01.14	16:31	16° 33,63' S	43° 20,29' E	1175,1	N 3	342,4	7,8	Ver-messung	EM / PS	Kursänderung	rwk: 299°, d: 20 nm
SO230/014-1	25.01.14	19:00	16° 23,70' S	43° 1,99' E	2545,3	E 3	300,4	8,4	Ver-messung	EM / PS	Kursänderung	rwk: 009°, d: 123 nm
SO230/014-1	26.01.14	06:45	14° 26,67' S	43° 21,90' E	3413	E 2	6,5	4,8	Ver-messung	EM / PS	Magnetometer a.D.	
SO230/014-1	26.01.14	07:12	14° 23,04' S	43° 22,47' E	3416,5	E 1	7,9	6,6	Ver-messung	EM / PS	Ende Profil	
SO230/015-1	26.01.14	07:19	14° 22,56' S	43° 22,56' E	3419,2	ESE 2	8,9	2,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 101, Frequenz: B
SO230/015-1	26.01.14	08:44	14° 23,24' S	43° 16,43' E	3400,7	E 3	327,1	3,6	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 102, Frequenz: D
SO230/015-1	26.01.14	10:10	14° 23,98' S	43° 10,28' E	3384,7	E 3	342,3	3,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 103, Frequenz: D
SO230/015-1	26.01.14	11:23	14° 24,69' S	43° 4,13' E	3379,2	E 2	337,8	3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 104, Frequenz: C

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/015-1	26.01.14	12:37	14° 25,35' S	42° 57,97' E	3365,5	NE 1	342,2	2,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 105, Frequenz: D
SO230/015-1	26.01.14	13:51	14° 26,07' S	42° 51,82' E	3345,1	NE 2	351,7	2,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 106, Frequenz: B
SO230/015-1	26.01.14	15:07	14° 26,71' S	42° 45,65' E	3333	NE 2	8,8	1,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 107, Frequenz: C
SO230/015-1	26.01.14	16:19	14° 27,33' S	42° 39,54' E	3285,8	NE 4	2,5	2,6	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 108, Frequenz: B
SO230/015-1	26.01.14	17:34	14° 28,09' S	42° 33,35' E	3215	NE 4	340,4	2,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 109, Frequenz: C
SO230/015-1	26.01.14	18:46	14° 28,83' S	42° 27,20' E	3137,4	NE 3	349,9	3,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 110, Frequenz: A
SO230/015-1	26.01.14	19:55	14° 29,55' S	42° 21,04' E	3064,2	ENE 3	354,6	4,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 111, Frequenz: B
SO230/015-1	26.01.14	21:06	14° 30,22' S	42° 14,89' E	2934,1	ENE 4	329,3	2,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 112, Frequenz: D
SO230/015-1	26.01.14	22:18	14° 30,89' S	42° 8,74' E	2756,1	E 2	331,3	3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 113, Frequenz: C
SO230/015-1	26.01.14	23:32	14° 31,56' S	42° 2,58' E	2902,8	ENE 4	328,1	2,4	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 114, Frequenz: B
SO230/015-1	27.01.14	00:48	14° 32,31' S	41° 56,40' E	2903,5	NE 2	355,1	3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 115, Frequenz: C
SO230/015-1	27.01.14	02:08	14° 32,95' S	41° 50,23' E	2666,1	NNE 2	355,6	2,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 116, Frequenz: A
SO230/015-1	27.01.14	03:24	14° 33,69' S	41° 44,14' E	2643,3	NE 3	349,2	2,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 117, Frequenz: B
SO230/015-1	27.01.14	04:39	14° 34,35' S	41° 37,92' E	2434,6	ENE 3	350,6	2,2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 118, Frequenz: A
SO230/015-1	27.01.14	05:59	14° 35,04' S	41° 31,79' E	2354	NNE 2	334,1	2,4	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 119, Frequenz: A
SO230/015-1	27.01.14	07:14	14° 35,74' S	41° 25,61' E	2801,4	NE 3	337	1,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 120, Frequenz: D
SO230/015-1	27.01.14	08:30	14° 36,44' S	41° 19,46' E	2805,2	NNE 2	350,8	1,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 121, Frequenz: C
SO230/015-1	27.01.14	09:51	14° 37,24' S	41° 13,33' E	2806,8	NE 3	336,5	1,2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 122, Frequenz: A
SO230/015-1	27.01.14	11:07	14° 38,04' S	41° 7,18' E	2601,1	NE 2	17	2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 123, Frequenz: B

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/015-1	27.01.14	12:24	14° 38,89' S	41° 1,03' E	1342,1	NE 4	0,6	1,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 124, Frequenz: D
SO230/015-1	27.01.14	13:27	14° 39,68' S	40° 54,85' E	607,5	ENE 7	42,2	2,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 125, Frequenz: D
SO230/015-1	27.01.14	13:29	14° 39,63' S	40° 54,91' E	638,7	ENE 6	71,3	1,9	OBS/OBH	OBS/OBH	Ende Station	
SO230/016-1	27.01.14	14:01	14° 37,02' S	40° 51,57' E	877,2	ESE 5	106,8	3,4	Profil	PR	Stations-beginn	
SO230/016-1	27.01.14	14:10	14° 37,43' S	40° 52,11' E	1855,7	NE 6	131,3	4,5	Profil	PR	Magnetometer zu Wasser	l: 150 m
SO230/016-1	27.01.14	14:23	14° 37,92' S	40° 52,61' E	768,4	NNE 5	136,4	2,3	Profil	PR	Bb-Airgunarray zu Wasser	
SO230/016-1	27.01.14	14:33	14° 38,24' S	40° 52,88' E	2737,7	NE 5	141,8	2,4	Profil	PR	Stb-Airgunarray zu Wasser	
SO230/016-1	27.01.14	14:45	14° 39,02' S	40° 53,37' E	1000,5	NNE 5	150,3	4,9	Profil	PR	Magnetometer zu Wasser	l: 950 m
SO230/016-1	27.01.14	14:55	14° 39,70' S	40° 53,83' E	439,9	NNE 5	126,5	4,7	Profil	PR	Beginn Profil	rwk: 083°, d: 145 nm
SO230/016-1	28.01.14	04:16	14° 31,48' S	42° 3,00' E	2712,7	WSW 8	88,1	5,1	Profil	PR	Airgun abgeschaltet	
SO230/016-1	28.01.14	04:23	14° 31,42' S	42° 3,60' E	2628,4	WSW 8	83,6	5	Profil	PR	Airgun eingeschaltet	
SO230/016-1	28.01.14	08:18	14° 29,20' S	42° 23,74' E	3102,4	NNW 18	89,9	5,1	Profil	PR	Magnetometer an Deck	
SO230/016-1	28.01.14	19:35	14° 22,52' S	43° 22,60' E	3426	NNE 8	90	4,8	Profil	PR	Ende Profil	
SO230/016-1	28.01.14	19:35	14° 22,52' S	43° 22,60' E	3426	NNE 8	90	4,8	Profil	PR	Airgun abgeschaltet	
SO230/016-1	28.01.14	20:13	14° 22,43' S	43° 24,37' E	3426	NNE 7	84,4	2,6	Profil	PR	Bb-Airgunarray an Deck	
SO230/016-1	28.01.14	20:25	14° 22,36' S	43° 24,94' E	3429,6	NNE 7	88,2	2,8	Profil	PR	Stb-Airgunarray an Deck	
SO230/016-1	28.01.14	20:26	14° 22,35' S	43° 24,99' E	3428,9	NNE 7	89,3	3,5	Profil	PR	Stationsende	
SO230/017-1	28.01.14	20:27	14° 22,34' S	43° 25,04' E	3427,5	NNE 7	67,5	2,6	CTD	CTD	Beginn Station	

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/017-1	28.01.14	20:36	14° 22,28' S	43° 25,17' E	3430,8	NE 8	87,1	0,5	CTD	CTD	zu Wasser	W4
SO230/017-1	28.01.14	21:53	14° 22,11' S	43° 25,33' E	3431,5	NE 5	258	0,2	CTD	CTD	auf Tiefe	SLmax: 3000 m
SO230/017-1	28.01.14	21:53	14° 22,11' S	43° 25,33' E	3431,5	NE 5	258	0,2	CTD	CTD	Hieven	
SO230/017-1	28.01.14	23:06	14° 22,01' S	43° 25,16' E	3434,4	NNE 9	89,1	0,2	CTD	CTD	an Deck	
SO230/017-1	28.01.14	23:08	14° 22,01' S	43° 25,16' E	3430,8	NNE 9	329	0,3	CTD	CTD	Ende Station	
SO230/018-1	28.01.14	23:09	14° 22,01' S	43° 25,15' E	3432	NNE 8	304,2	0,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 101
SO230/018-1	29.01.14	00:04	14° 22,55' S	43° 22,20' E	0	NE 11	274,9	0,2	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 101
SO230/018-1	29.01.14	00:22	14° 22,77' S	43° 22,46' E	0	NE 10	168	0,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 101
SO230/018-1	29.01.14	00:27	14° 22,85' S	43° 22,47' E	0	NE 9	149,4	1,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 102
SO230/018-1	29.01.14	01:13	14° 23,46' S	43° 16,34' E	0	NE 12	295,8	1,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 102
SO230/018-1	29.01.14	01:24	14° 23,29' S	43° 16,29' E	0	NE 8	149,4	1,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 102
SO230/018-1	29.01.14	01:28	14° 23,39' S	43° 16,38' E	0	E 7	175,5	3,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 103
SO230/018-1	29.01.14	02:27	14° 24,23' S	43° 10,02' E	0	NNE 7	37,1	0,5	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 103
SO230/018-1	29.01.14	02:33	14° 24,05' S	43° 9,98' E	0	NNE 7	352,6	2,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 104
SO230/018-1	29.01.14	02:39	14° 23,87' S	43° 10,06' E	0	NNE 7	75,9	0,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 103
SO230/018-1	29.01.14	03:24	14° 24,91' S	43° 4,00' E	0	NNE 8	258	3,5	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 104
SO230/018-1	29.01.14	03:29	14° 24,77' S	43° 3,85' E	0	NE 8	349,5	4,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 105
SO230/018-1	29.01.14	03:37	14° 24,51' S	43° 3,95' E	0	NE 6	124,5	1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 104
SO230/018-1	29.01.14	04:15	14° 25,28' S	42° 58,54' E	0	N 6	259,6	5,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 105
SO230/018-1	29.01.14	04:28	14° 25,15' S	42° 57,97' E	0	NNW 7	77,9	1,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 106
SO230/018-1	29.01.14	04:29	14° 25,15' S	42° 57,98' E	0	NNW 6	78,1	1,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 105
SO230/018-1	29.01.14	05:13	14° 26,03' S	42° 51,81' E	0	N 7	266,1	4,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 106
SO230/018-1	29.01.14	05:15	14° 26,00' S	42° 51,71' E	0	NNE 7	306,2	2,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 107
SO230/018-1	29.01.14	05:22	14° 25,80' S	42° 51,85' E	0	NNW 7	80	1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 106

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/018-1	29.01.14	06:22	14° 26,63' S	42° 45,74' E	0	N 6	287	0,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 107
SO230/018-1	29.01.14	06:41	14° 26,32' S	42° 45,87' E	0	N 5	35,2	2,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 107
SO230/018-1	29.01.14	06:44	14° 26,22' S	42° 46,02' E	0	ENE 6	104	3,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 108
SO230/018-1	29.01.14	07:33	14° 27,24' S	42° 39,92' E	0	N 4	272,6	3,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 108
SO230/018-1	29.01.14	07:35	14° 27,27' S	42° 39,77' E	0	NNW 11	251,1	4,3	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 109
SO230/018-1	29.01.14	07:40	14° 27,05' S	42° 39,71' E	0	NW 11	35,6	3,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 108
SO230/018-1	29.01.14	08:32	14° 28,10' S	42° 33,47' E	0	N 6	262,3	3,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 109
SO230/018-1	29.01.14	08:36	14° 27,96' S	42° 33,39' E	0	NE 5	41	3,7	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 110
SO230/018-1	29.01.14	08:40	14° 27,78' S	42° 33,55' E	0	NNW 5	31,4	2,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 109
SO230/018-1	29.01.14	09:25	14° 28,76' S	42° 27,75' E	0	NNW 8	246,3	6,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 110
SO230/018-1	29.01.14	09:40	14° 28,38' S	42° 27,73' E	0	N 6	61,3	2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 110
SO230/018-1	29.01.14	09:44	14° 28,32' S	42° 27,85' E	0	NNE 6	71,7	3,3	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 111
SO230/018-1	29.01.14	10:47	14° 29,40' S	42° 20,98' E	0	N 8	112,3	2,5	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 111
SO230/018-1	29.01.14	10:55	14° 29,27' S	42° 21,34' E	0	N 6	64,3	2,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 111
SO230/018-1	29.01.14	10:58	14° 29,22' S	42° 21,44' E	0	NE 4	71,8	2,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 112
SO230/018-1	29.01.14	11:47	14° 30,17' S	42° 15,69' E	0	NNW 8	254,1	8,4	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 112
SO230/018-1	29.01.14	12:00	14° 29,90' S	42° 15,47' E	0	NNW 6	125,1	0,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 112
SO230/018-1	29.01.14	12:05	14° 29,96' S	42° 15,56' E	0	NE 5	259,1	2,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 113
SO230/018-1	29.01.14	12:55	14° 30,82' S	42° 8,54' E	0	N 5	52,6	3,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 113
SO230/018-1	29.01.14	13:06	14° 30,80' S	42° 9,04' E	0	NNW 7	88,9	1,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 113
SO230/018-1	29.01.14	13:12	14° 30,73' S	42° 8,89' E	0	NNE 5	260,8	6,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 114
SO230/018-1	29.01.14	13:53	14° 31,63' S	42° 2,58' E	0	NNE 4	257	3,2	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 114
SO230/018-1	29.01.14	14:02	14° 31,59' S	42° 2,91' E	0	NNE 6	137,3	1,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 114

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/018-1	29.01.14	14:04	14° 31,66' S	42° 3,00' E	0	E 7	175,6	3,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 115
SO230/018-1	29.01.14	14:50	14° 32,45' S	41° 56,41' E	0	NE 7	329,9	2,4	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 115
SO230/018-1	29.01.14	15:00	14° 32,41' S	41° 56,84' E	0	N 8	127,6	1,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 115
SO230/018-1	29.01.14	15:05	14° 32,59' S	41° 56,86' E	0	NE 8	257,1	5,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 116
SO230/018-1	29.01.14	16:25	14° 33,09' S	41° 50,38' E	0	N 8	269	0,2	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 116
SO230/018-1	29.01.14	16:40	14° 33,16' S	41° 50,54' E	0	N 8	105,5	0,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 116
SO230/018-1	29.01.14	16:48	14° 33,26' S	41° 50,03' E	0	N 10	262	9,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 117
SO230/018-1	29.01.14	18:07	14° 33,94' S	41° 44,14' E	0	NNE 8	207,3	0,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 117
SO230/018-1	29.01.14	18:16	14° 33,93' S	41° 44,40' E	0	NNW 8	130	1,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 117
SO230/018-1	29.01.14	18:18	14° 33,94' S	41° 44,46' E	0	NE 7	103,9	3,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 118
SO230/018-1	29.01.14	19:22	14° 34,65' S	41° 38,25' E	0	NNE 9	290	2,4	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 118
SO230/018-1	29.01.14	19:35	14° 34,74' S	41° 38,08' E	0	NNW 9	114	2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 118
SO230/018-1	29.01.14	19:44	14° 34,88' S	41° 37,79' E	0	NNE 7	264,6	7,4	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 119
SO230/018-1	29.01.14	20:06	14° 35,27' S	41° 34,56' E	0	NNE 9	261,1	8,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 119
SO230/018-1	29.01.14	20:30	14° 35,90' S	41° 32,05' E	0	NNE 8	104,1	1,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 119
SO230/018-1	29.01.14	20:40	14° 36,02' S	41° 31,40' E	0	NNE 9	265,7	9,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 120
SO230/018-1	29.01.14	21:23	14° 36,00' S	41° 25,37' E	0	E 8	107,9	3,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 120
SO230/018-1	29.01.14	21:29	14° 36,34' S	41° 25,70' E	0	NNE 7	143,4	3,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 121
SO230/018-1	29.01.14	21:36	14° 36,59' S	41° 25,86' E	0	N 8	161,3	1,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 120
SO230/018-1	29.01.14	22:26	14° 37,50' S	41° 19,74' E	0	NNE 6	234,6	6,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 121
SO230/018-1	29.01.14	22:41	14° 37,76' S	41° 19,72' E	0	N 7	130,1	2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 121
SO230/018-1	29.01.14	22:42	14° 37,79' S	41° 19,74' E	0	N 6	142,1	2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 122
SO230/018-1	29.01.14	23:36	14° 37,52' S	41° 13,16' E	0	NE 9	159,8	4,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 122
SO230/018-1	29.01.14	23:47	14° 38,34' S	41° 13,40' E	0	NNW 8	168,4	2,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 122

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/018-1	29.01.14	23:52	14° 38,62' S	41° 13,45' E	0	ENE 7	216	4,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 123
SO230/018-1	30.01.14	00:33	14° 38,88' S	41° 7,39' E	0	NW 21	254,2	5,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 123
SO230/018-1	30.01.14	00:40	14° 38,91' S	41° 7,44' E	0	WSW 18	141	2,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 123
SO230/018-1	30.01.14	01:09	14° 38,95' S	41° 4,63' E	0	NNW 8	268,2	8,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 124
SO230/018-1	30.01.14	01:45	14° 39,27' S	41° 1,02' E	0	NNW 4	130,6	0,5	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 124
SO230/018-1	30.01.14	01:54	14° 39,53' S	41° 1,31' E	0	NW 2	156	3,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 124
SO230/018-1	30.01.14	02:24	14° 39,80' S	40° 57,68' E	0	NNW 1	270,9	9,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 125
SO230/018-1	30.01.14	02:39	14° 39,79' S	40° 55,42' E	0	WNW 3	267,2	5,5	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 125
SO230/018-1	30.01.14	02:56	14° 39,86' S	40° 55,14' E	0	NW 1	104,7	1,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 125
SO230/018-1	30.01.14	02:58	14° 39,88' S	40° 55,19' E	0	WNW 2	112,8	1,4	OBS/OBH	OBS/OBH	Ende Station	
SO230/019-1	30.01.14	03:00	14° 39,87' S	40° 55,28' E	4479,5	W 2	78,3	4,3	Magneto-meter	MAGN	Beginn Station	
SO230/019-1	30.01.14	03:12	14° 39,47' S	40° 56,31' E	815,6	W 1	75	5,5	Magneto-meter	MAGN	Magnetometer zu Wasser	SL: 900 m
SO230/019-1	30.01.14	03:13	14° 39,44' S	40° 56,41' E	827,7	WSW 1	70,3	6,1	Magneto-meter	MAGN	Beginn Profil	rwk: 063°, d: 21 nm
SO230/019-1	30.01.14	05:15	14° 30,11' S	41° 14,86' E	2793,2	NNE 3	38,5	9	Magneto-meter	MAGN	Kursänderung	rwk: 357°, d: 80 nm
SO230/019-1	30.01.14	13:25	13° 10,10' S	41° 9,88' E	2198	N 10	317,6	10	Magneto-meter	MAGN	Kursänderung	rwk: 287°, d: 28 nm
SO230/019-1	30.01.14	16:04	13° 2,16' S	40° 44,01' E	1043,2	NNE 11	277,3	5,8	Magneto-meter	MAGN	Ende Profil	
SO230/019-1	30.01.14	16:20	13° 2,03' S	40° 42,70' E	884,6	NNE 10	276,8	4,3	Magneto-meter	MAGN	Magnetometer an Deck	
SO230/019-1	30.01.14	16:21	13° 2,03' S	40° 42,70' E	884,6	NNE 10	276,8	4,3	Magneto-meter	MAGN	Ende Station	
SO230/020-1	30.01.14	16:22	13° 2,02' S	40° 42,62' E	878,6	NNE 10	279,5	4,8	OBS/OBH	OBS/OBH	Beginn Station	
SO230/020-1	30.01.14	16:34	13° 1,57' S	40° 42,09' E	806,9	NNE 9	7,9	1,4	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 150, Frequenz: B
SO230/020-1	30.01.14	17:31	13° 1,59' S	40° 47,25' E	1323,8	N 9	0,2	1,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 149, Frequenz: A

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/020-1	30.01.14	18:28	13° 1,58' S	40° 52,38' E	1651,6	N 9	15,8	1,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 148, Frequenz: C
SO230/020-1	30.01.14	19:30	13° 1,55' S	40° 57,51' E	2103,3	N 10	4,6	1,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 147, Frequenz: D
SO230/020-1	30.01.14	20:31	13° 1,52' S	41° 2,66' E	2235,7	NNE 10	10,8	1,6	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 146, Frequenz: C
SO230/020-1	30.01.14	21:33	13° 1,52' S	41° 7,79' E	2165,4	NNE 9	27,9	1,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 145, Frequenz: B
SO230/020-1	30.01.14	22:43	13° 1,48' S	41° 12,90' E	2218	NNE 7	39,4	1,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 144, Frequenz: A
SO230/020-1	30.01.14	23:47	13° 1,48' S	41° 18,02' E	2252,2	N 7	22,8	2,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 143, Frequenz: C
SO230/020-1	31.01.14	00:54	13° 1,44' S	41° 23,18' E	2399	N 6	18,9	2,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 142, Frequenz: D
SO230/020-1	31.01.14	02:07	13° 1,36' S	41° 28,30' E	2646,9	N 6	355,9	2,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 141, Frequenz: A
SO230/020-1	31.01.14	03:19	13° 1,34' S	41° 33,40' E	2519,4	NNE 6	265,2	0,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 140, Frequenz: B
SO230/020-1	31.01.14	06:18	13° 1,35' S	41° 38,56' E	2635,8	NNW 6	89,3	2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 139, Frequenz: A
SO230/020-1	31.01.14	06:54	13° 1,33' S	41° 43,69' E	2762,7	NNW 6	101,6	3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 138, Frequenz: B
SO230/020-1	31.01.14	07:30	13° 1,30' S	41° 48,88' E	2876,6	NW 6	84,5	2,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 137, Frequenz: D
SO230/020-1	31.01.14	08:05	13° 1,27' S	41° 53,95' E	2965,3	NNW 6	95,1	3,2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 136, Frequenz: B
SO230/020-1	31.01.14	08:40	13° 1,25' S	41° 59,07' E	3016,8	NNW 5	97,8	3,6	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 135, Frequenz: C
SO230/020-1	31.01.14	09:15	13° 1,23' S	42° 4,18' E	3083,9	NW 5	93,1	3,6	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 134, Frequenz: D
SO230/020-1	31.01.14	09:52	13° 1,20' S	42° 9,31' E	3142	NW 5	73,8	3,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 133, Frequenz: B
SO230/020-1	31.01.14	10:31	13° 1,17' S	42° 14,45' E	3205,3	NNW 6	86,7	2,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 132, Frequenz: C
SO230/020-1	31.01.14	11:11	13° 1,15' S	42° 19,59' E	3251,3	NNW 5	102,2	2,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 131, Frequenz: D
SO230/020-1	31.01.14	11:11	13° 1,15' S	42° 19,59' E	3251,3	NNW 5	102,2	2,8	OBS/OBH	OBS/OBH	Ende Station	

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/021-1	31.01.14	03:19	13° 1,34' S	41° 33,40' E	2519,4	NNE 6	265,2	0,5	CTD	CTD	Beginn Station	
SO230/021-1	31.01.14	03:24	13° 1,33' S	41° 33,40' E	2522,8	NNE 5	353,9	0,5	CTD	CTD	zu Wasser	W4
SO230/021-1	31.01.14	04:33	13° 1,33' S	41° 33,48' E	2516,4	N 6	130,7	0,2	CTD	CTD	auf Tiefe	SL: 2500 m
SO230/021-1	31.01.14	05:32	13° 1,34' S	41° 33,53' E	2515,6	NNW 6	15,8	0,2	CTD	CTD	an Deck	
SO230/021-1	31.01.14	05:38	13° 1,34' S	41° 33,54' E	2519	NNW 5	67,2	0,2	CTD	CTD	Ende Station	
SO230/022-1	31.01.14	11:46	13° 1,13' S	42° 24,33' E	3286,7	NW 6	90,3	7,6	Profil	PR	Stations-beginn	
SO230/022-1	31.01.14	11:56	13° 1,28' S	42° 24,79' E	3291,2	NNW 5	269,2	4,5	Profil	PR	Magnetometer zu Wasser	
SO230/022-1	31.01.14	12:10	13° 1,19' S	42° 23,64' E	3284	NNW 6	275,2	3,3	Profil	PR	Bb-Airgunarray zu Wasser	
SO230/022-1	31.01.14	12:37	13° 1,18' S	42° 22,33' E	3274	NNW 5	264,4	2,8	Profil	PR	Stb-Airgunarray zu Wasser	
SO230/022-1	31.01.14	13:00	13° 1,16' S	42° 20,38' E	3261,2	N 6	270,2	4,8	Profil	PR	Beginn Profil	rwk: 270°, d: 96 nm
SO230/022-1	01.02.14	08:05	13° 1,56' S	40° 41,97' E	795	N 7	270,7	5,1	Profil	PR	Ende Profil	
SO230/022-1	01.02.14	08:05	13° 1,56' S	40° 41,97' E	795	N 7	270,7	5,1	Profil	PR	Airgun abgeschaltet	
SO230/022-1	01.02.14	08:20	13° 2,66' S	40° 41,53' E	766,1	N 6	193,5	4,1	Profil	PR	Bb-Airgunarray an Deck	
SO230/022-1	01.02.14	08:33	13° 3,56' S	40° 41,40' E	772,8	N 6	185,9	4,3	Profil	PR	Stb-Airgunarray an Deck	
SO230/022-1	01.02.14	08:40	13° 4,05' S	40° 41,33' E	794,1	N 5	187,9	4,1	Profil	PR	Magnetometer an Deck	
SO230/022-1	01.02.14	08:40	13° 4,05' S	40° 41,33' E	794,1	N 5	187,9	4,1	Profil	PR	Stationsende	
SO230/023-1	01.02.14	08:41	13° 4,12' S	40° 41,31' E	815,7	N 6	187,4	4	OBS/OBH	OBS/OBH	Beginn Station	
SO230/023-1	01.02.14	08:48	13° 4,23' S	40° 40,78' E	749,2	NE 8	338,7	7,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 150
SO230/023-1	01.02.14	09:05	13° 2,10' S	40° 41,78' E	0	NNE 7	25,7	7,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 150

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/023-1	01.02.14	09:13	13° 2,29' S	40° 42,10' E	0	N 7	165,7	3,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 150
SO230/023-1	01.02.14	09:34	13° 2,19' S	40° 44,54' E	0	N 6	77,5	8,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 149
SO230/023-1	01.02.14	09:54	13° 1,82' S	40° 47,06' E	0	NNW 6	94,9	2,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 149
SO230/023-1	01.02.14	10:02	13° 2,32' S	40° 47,28' E	0	N 7	165,9	3,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 149
SO230/023-1	01.02.14	10:15	13° 2,21' S	40° 48,69' E	0	NNW 7	77	9,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 148
SO230/023-1	01.02.14	10:41	13° 1,97' S	40° 52,23' E	0	NNW 7	96,5	2,4	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 148
SO230/023-1	01.02.14	10:50	13° 2,47' S	40° 52,50' E	0	NNW 7	165,4	2,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 148
SO230/023-1	01.02.14	11:03	13° 2,62' S	40° 53,67' E	0	N 7	84,2	9,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 147
SO230/023-1	01.02.14	11:32	13° 2,35' S	40° 57,20' E	0	N 6	113,9	2,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 147
SO230/023-1	01.02.14	11:44	13° 2,70' S	40° 57,63' E	0	NNW 6	191,8	1,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 147
SO230/023-1	01.02.14	11:45	13° 2,72' S	40° 57,62' E	0	NNW 6	182,5	2,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 146
SO230/023-1	01.02.14	12:24	13° 2,41' S	41° 2,63' E	0	N 7	109,6	3,5	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 146
SO230/023-1	01.02.14	12:34	13° 2,73' S	41° 2,69' E	0	NNW 5	179,5	2,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 146
SO230/023-1	01.02.14	12:36	13° 2,80' S	41° 2,69' E	0	NNW 5	161,2	2,1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 145
SO230/023-1	01.02.14	13:09	13° 2,23' S	41° 7,40' E	0	N 7	90,1	5,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 145
SO230/023-1	01.02.14	13:18	13° 2,36' S	41° 7,85' E	0	NNW 6	152	1,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 145
SO230/023-1	01.02.14	13:20	13° 2,40' S	41° 7,92' E	0	NNW 7	103,8	4,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 144
SO230/023-1	01.02.14	13:49	13° 2,20' S	41° 12,27' E	0	N 6	91,7	5,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 144
SO230/023-1	01.02.14	14:02	13° 2,27' S	41° 12,90' E	0	NNW 7	172,3	1,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 143
SO230/023-1	01.02.14	14:03	13° 2,29' S	41° 12,91' E	0	NNW 7	168,1	1,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 144
SO230/023-1	01.02.14	14:34	13° 2,24' S	41° 17,32' E	0	N 7	97	5,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 143
SO230/023-1	01.02.14	14:53	13° 2,18' S	41° 18,10' E	0	NNW 5	179,6	1,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 143
SO230/023-1	01.02.14	14:55	13° 2,23' S	41° 18,16' E	0	NNW 6	107,9	3,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 142
SO230/023-1	01.02.14	15:29	13° 2,22' S	41° 23,06' E	0	NNW 6	68,3	3,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 142
SO230/023-1	01.02.14	15:38	13° 1,99' S	41° 23,25' E	0	NNE 6	148,1	1,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 142
SO230/023-1	01.02.14	15:40	13° 2,01' S	41° 23,33' E	0	N 6	94,8	4,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 141

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip- ment used	Abbrev.	Action	Remarks
SO230/023-1	01.02.14	16:35	13° 1,85' S	41° 28,31' E	0	NNE 5	187,3	0,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 141
SO230/023-1	01.02.14	16:42	13° 1,71' S	41° 28,38' E	0	NNE 5	86,7	1,5	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 141
SO230/023-1	01.02.14	16:48	13° 1,72' S	41° 29,02' E	0	N 5	92,1	8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 140
SO230/023-1	01.02.14	17:20	13° 1,82' S	41° 32,75' E	0	N 6	62,6	4,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 140
SO230/023-1	01.02.14	17:23	13° 1,73' S	41° 32,98' E	0	NE 5	79,2	6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 139
SO230/023-1	01.02.14	17:29	13° 1,65' S	41° 33,46' E	0	NNE 7	105,5	1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 140
SO230/023-1	01.02.14	18:03	13° 1,81' S	41° 37,96' E	0	NNW 7	66,9	4,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 139
SO230/023-1	01.02.14	18:05	13° 1,78' S	41° 38,09' E	0	NNE 6	81,4	4,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 138
SO230/023-1	01.02.14	18:14	13° 1,73' S	41° 38,68' E	0	NNE 6	151,7	0,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 139
SO230/023-1	01.02.14	18:45	13° 1,78' S	41° 43,12' E	0	NNE 7	88,4	7,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 138
SO230/023-1	01.02.14	18:47	13° 1,73' S	41° 43,35' E	0	NNE 7	65,9	6,4	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 137
SO230/023-1	01.02.14	19:00	13° 1,65' S	41° 43,80' E	0	N 7	141,4	0,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 138
SO230/023-1	01.02.14	20:08	13° 1,58' S	41° 48,65' E	0	NNE 6	311,2	0,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 137
SO230/023-1	01.02.14	20:11	13° 1,57' S	41° 48,68' E	0	NNE 5	63,4	2,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 136
SO230/023-1	01.02.14	20:18	13° 1,43' S	41° 48,93' E	0	NNE 6	58,5	0,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 137
SO230/023-1	01.02.14	21:05	13° 1,44' S	41° 53,97' E	0	NNE 6	239,1	1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 136
SO230/023-1	01.02.14	21:15	13° 1,45' S	41° 53,95' E	0	NNE 6	12,3	0,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 136
SO230/023-1	01.02.14	21:16	13° 1,45' S	41° 53,94' E	0	NNE 6	296,3	0,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 135
SO230/023-1	01.02.14	21:59	13° 1,35' S	41° 59,01' E	0	N 6	16,1	0,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 135
SO230/023-1	01.02.14	22:05	13° 1,35' S	41° 59,03' E	0	N 7	135,5	1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 134
SO230/023-1	01.02.14	22:07	13° 1,36' S	41° 59,05' E	0	N 6	120,8	0,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 135
SO230/023-1	01.02.14	22:48	13° 1,28' S	42° 4,10' E	0	NNE 5	236,2	0,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 134
SO230/023-1	01.02.14	22:50	13° 1,29' S	42° 4,09' E	0	NNE 5	76,7	0,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 133
SO230/023-1	01.02.14	22:57	13° 1,45' S	42° 4,19' E	0	N 7	175,8	1,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 134

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/023-1	01.02.14	23:34	13° 1,49' S	42° 9,10' E	0	NNW 7	70,7	3,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 133
SO230/023-1	01.02.14	23:35	13° 1,47' S	42° 9,15' E	0	NNW 6	67,7	3,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 132
SO230/023-1	01.02.14	23:41	13° 1,34' S	42° 9,33' E	0	N 6	261,6	0,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 133
SO230/023-1	02.02.14	00:17	13° 1,43' S	42° 14,21' E	0	N 6	40,9	3	OBS/OBH	OBS/OBH	OBS gesichtet	OBs # 132
SO230/023-1	02.02.14	00:21	13° 1,34' S	42° 14,36' E	0	NNW 7	67,7	2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 131
SO230/023-1	02.02.14	00:25	13° 1,30' S	42° 14,47' E	0	NNW 5	52	0,5	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 132
SO230/023-1	02.02.14	01:02	13° 1,35' S	42° 19,36' E	0	NW 5	71,2	3,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 131
SO230/023-1	02.02.14	01:12	13° 1,33' S	42° 19,67' E	0	NW 5	98,2	0,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 131
SO230/023-1	02.02.14	01:13	13° 1,33' S	42° 19,68' E	0	WNW 5	18,2	1,6	OBS/OBH	OBS/OBH	Ende Station	
SO230/024-1	02.02.14	01:13	13° 1,33' S	42° 19,68' E	0	WNW 5	18,2	1,6	Magneto-meter	MAGN	Beginn Station	
SO230/024-1	02.02.14	01:43	12° 58,16' S	42° 19,63' E	3253,1	NNW 5	1,2	5,9	Magneto-meter	MAGN	Magnetometer z.W.	
SO230/024-1	02.02.14	01:44	12° 58,06' S	42° 19,64' E	3263,4	NNW 5	2,2	6,3	Magneto-meter	MAGN	Beginn Profil	rwk: 001°, d: 95 nm
SO230/024-1	02.02.14	11:20	11° 21,00' S	42° 20,80' E	2690,6	NW 2	2,2	4,3	Magneto-meter	MAGN	Ende Profil	
SO230/024-1	02.02.14	11:35	11° 21,93' S	42° 20,84' E	2690,6	NW 2	15	1,8	Magneto-meter	MAGN	Magnetometer a.D.	
SO230/024-1	02.02.14	11:35	11° 21,93' S	42° 20,84' E	2690,6	NW 2	15	1,8	Magneto-meter	MAGN	Ende Profil	
SO230/025-1	02.02.14	11:56	11° 23,15' S	42° 20,82' E	2776,2	NW 4	178,5	2,1	CTD	CTD	Beginn Station	
SO230/025-1	02.02.14	12:00	11° 23,16' S	42° 20,77' E	2777,6	NW 3	243,8	0,6	CTD	CTD	zu Wasser	
SO230/025-1	02.02.14	13:05	11° 23,33' S	42° 20,66' E	2787,7	NW 3	187,7	0,4	CTD	CTD	auf Tiefe	SLmax: 2750 m
SO230/025-1	02.02.14	14:15	11° 23,37' S	42° 20,64' E	2788,3	NNW 3	38,5	0,2	CTD	CTD	an Deck	
SO230/025-1	02.02.14	14:16	11° 23,37' S	42° 20,64' E	2792,4	NNW 3	65,4	0,3	CTD	CTD	Ende Station	
SO230/026-1	02.02.14	14:17	11° 23,37' S	42° 20,64' E	2790,2	N 3	1,3	0,4	OBS/OBH	OBS/OBH	Beginn Station	
SO230/026-1	02.02.14	14:24	11° 23,14' S	42° 20,81' E	2781,7	NW 3	32,2	2,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 151, Frequenz B

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/026-1	02.02.14	15:04	11° 23,69' S	42° 15,74' E	2682	NNE 5	310,5	2,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 152, Frequenz D
SO230/026-1	02.02.14	15:41	11° 24,23' S	42° 10,62' E	2578,3	NNE 6	305,8	2,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 153, Frequenz C
SO230/026-1	02.02.14	16:16	11° 24,74' S	42° 5,60' E	2475,2	N 7	278,3	2,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 154, Frequenz B
SO230/026-1	02.02.14	16:51	11° 25,27' S	42° 0,46' E	2390,2	NNE 5	269,7	2,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 155, Frequenz D
SO230/026-1	02.02.14	17:29	11° 25,81' S	41° 55,47' E	2264,8	NNE 5	254,4	1,5	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 156, Frequenz: B
SO230/026-1	02.02.14	18:07	11° 26,32' S	41° 50,38' E	2147,7	NNE 7	292,7	1,9	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 157, Frequenz: A
SO230/026-1	02.02.14	18:47	11° 26,86' S	41° 45,31' E	2065,8	NNE 7	279,9	2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 158, Frequenz: D
SO230/026-1	02.02.14	19:25	11° 27,41' S	41° 40,24' E	1964,2	NNE 5	264,3	2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 159, Frequenz: B
SO230/026-1	02.02.14	20:02	11° 27,95' S	41° 35,17' E	1834,2	NNE 5	267	2,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 160, Frequenz: C
SO230/026-1	02.02.14	20:40	11° 28,48' S	41° 30,09' E	1737,5	NNE 7	269,8	2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 161, Frequenz: D
SO230/026-1	02.02.14	21:18	11° 29,01' S	41° 25,02' E	2318	N 6	266,9	3,2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 162, Frequenz: C
SO230/026-1	02.02.14	21:54	11° 29,55' S	41° 19,97' E	2610,9	NNE 7	257,9	3,1	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 163, Frequenz: A
SO230/026-1	02.02.14	22:29	11° 30,09' S	41° 14,92' E	2644,3	N 6	244,5	3,4	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 164, Frequenz: C
SO230/026-1	02.02.14	23:04	11° 30,62' S	41° 9,82' E	2414,6	N 7	246,6	3,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 165, Frequenz: A
SO230/026-1	03.02.14	00:10	11° 31,18' S	41° 4,72' E	2187,2	NNW 6	351,3	2,2	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 166, Frequenz: D
SO230/026-1	03.02.14	01:19	11° 31,68' S	40° 59,60' E	1945,4	N 7	357,7	0,8	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 167, Frequenz: C
SO230/026-1	03.02.14	02:24	11° 32,21' S	40° 54,53' E	1567,4	NW 6	328,5	0,7	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 168, Frequenz: A
SO230/026-1	03.02.14	03:26	11° 32,76' S	40° 49,47' E	1021,6	NW 5	319,6	1,4	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 169, Frequenz: D
SO230/026-1	03.02.14	04:26	11° 33,28' S	40° 44,39' E	441,4	NW 6	356,6	1,3	OBS/OBH	OBS/OBH	OBS zu Wasser	OBS # 170, Frequenz: B

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/026-1	03.02.14	04:27	11° 33,26' S	40° 44,39' E	441,5	NW 5	352,5	0,8	OBS/OBH	OBS/OBH	Ende Station	
SO230/027-1	03.02.14	05:32	11° 33,04' S	40° 41,39' E	385	N 5	64,7	2,2	Profil	PR	Stations-beginn	
SO230/027-1	03.02.14	05:42	11° 33,12' S	40° 42,14' E	533,1	NW 5	94,9	4,9	Profil	PR	Magnetometer zu Wasser	
SO230/027-1	03.02.14	05:56	11° 33,20' S	40° 42,94' E	324,5	NW 7	99,9	2,6	Profil	PR	Bb-Airgunarray zu Wasser	
SO230/027-1	03.02.14	06:08	11° 33,30' S	40° 43,38' E	349,7	NW 6	115,6	2,5	Profil	PR	Stb-Airgunarray zu Wasser	
SO230/027-1	03.02.14	07:00	11° 33,28' S	40° 44,36' E	436,4	WNW 5	84	5,7	Profil	PR	Airgun eingeschaltet	
SO230/027-1	03.02.14	07:00	11° 33,28' S	40° 44,36' E	436,4	WNW 5	84	5,7	Profil	PR	Beginn Profil	rwk: 084°, d: 96 nm
SO230/027-1	03.02.14	07:35	11° 32,91' S	40° 47,73' E	799,1	NNW 6	80,1	6,2	Profil	PR	Airgun abgeschaltet	
SO230/027-1	03.02.14	08:24	11° 32,94' S	40° 47,98' E	823	NNW 4	70,5	5,9	Profil	PR	Airgun eingeschaltet	
SO230/027-1	04.02.14	01:00	11° 22,91' S	42° 22,69' E	2739,2	N 8	85,5	4,7	Profil	PR	Ende Profil	
SO230/027-1	04.02.14	01:00	11° 22,91' S	42° 22,69' E	2739,2	N 8	85,5	4,7	Profil	PR	Airgun abgeschaltet	
SO230/027-1	04.02.14	01:18	11° 22,85' S	42° 23,65' E	0	NNW 7	80,1	2,7	Profil	PR	Bb-Airgunarray an Deck	
SO230/027-1	04.02.14	01:29	11° 22,82' S	42° 24,16' E	0	NNW 7	88,2	2,6	Profil	PR	Stb-Airgunarray an Deck	
SO230/027-1	04.02.14	01:39	11° 22,78' S	42° 24,66' E	0	N 8	81,4	3	Profil	PR	Magnetometer an Deck	
SO230/027-1	04.02.14	01:40	11° 22,78' S	42° 24,71' E	0	N 7	81,9	2,6	Profil	PR	Stationsende	
SO230/028-1	04.02.14	01:41	11° 22,78' S	42° 24,76' E	0	NNW 8	83,3	3,2	OBS/OBH	OBS/OBH	Beginn Station	
SO230/028-1	04.02.14	01:41	11° 22,78' S	42° 24,76' E	0	NNW 8	83,3	3,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 151
SO230/028-1	04.02.14	02:26	11° 23,26' S	42° 20,78' E	0	N 6	13	1,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 151
SO230/028-1	04.02.14	02:33	11° 23,04' S	42° 20,79' E	0	NNW 6	356,7	0,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 151

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/028-1	04.02.14	02:34	11° 23,02' S	42° 20,79' E	0	NNW 6	341,2	1,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 152
SO230/028-1	04.02.14	03:10	11° 23,84' S	42° 15,90' E	0	N 6	261,7	5,4	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 152
SO230/028-1	04.02.14	03:18	11° 23,67' S	42° 15,71' E	0	N 5	44,2	1,2	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 152
SO230/028-1	04.02.14	03:19	11° 23,65' S	42° 15,72' E	0	NW 5	359,1	1,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 153
SO230/028-1	04.02.14	03:52	11° 24,36' S	42° 10,90' E	0	NNW 8	263,2	5,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 153
SO230/028-1	04.02.14	03:59	11° 24,26' S	42° 10,65' E	0	NNW 7	74,5	0,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 153
SO230/028-1	04.02.14	04:00	11° 24,25' S	42° 10,66' E	0	NW 6	22,7	1,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 154
SO230/028-1	04.02.14	04:33	11° 24,88' S	42° 5,86' E	0	NNW 7	266,2	5,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 154
SO230/028-1	04.02.14	04:43	11° 24,89' S	42° 5,63' E	0	NNW 6	141,4	0,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 154
SO230/028-1	04.02.14	04:44	11° 24,90' S	42° 5,64' E	0	NW 6	109,7	1	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 155
SO230/028-1	04.02.14	05:16	11° 25,46' S	42° 1,09' E	0	NNW 8	259,7	6,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 155
SO230/028-1	04.02.14	05:19	11° 25,51' S	42° 0,77' E	0	NW 7	246,3	5,3	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 156
SO230/028-1	04.02.14	05:29	11° 25,55' S	42° 0,62' E	0	NW 8	122,6	0,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 155
SO230/028-1	04.02.14	06:01	11° 26,16' S	41° 56,31' E	0	NNW 8	269,3	9,9	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 156
SO230/028-1	04.02.14	06:09	11° 25,98' S	41° 55,65' E	0	NNW 7	337,1	1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 156
SO230/028-1	04.02.14	07:45	11° 27,27' S	41° 56,11' E	0	WSW 7	247,9	2,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 157
SO230/028-1	04.02.14	08:22	11° 26,57' S	41° 51,11' E	0	NNW 9	274,8	8,5	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 157
SO230/028-1	04.02.14	08:39	11° 26,64' S	41° 50,78' E	0	NW 8	123,8	1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 157
SO230/028-1	04.02.14	08:41	11° 26,64' S	41° 50,81' E	0	WNW 8	21,5	0,9	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 158
SO230/028-1	04.02.14	09:15	11° 27,31' S	41° 45,75' E	0	NNW 10	243,3	6,6	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 158
SO230/028-1	04.02.14	09:24	11° 27,28' S	41° 45,64' E	0	NW 8	103,6	1,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 158
SO230/028-1	04.02.14	09:30	11° 27,38' S	41° 45,78' E	0	NE 6	218,2	3,3	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 159
SO230/028-1	04.02.14	10:01	11° 27,91' S	41° 40,96' E	0	NNW 11	255,4	8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 159

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/028-1	04.02.14	10:10	11° 27,92' S	41° 40,65' E	0	NW 9	102,2	1,3	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 159
SO230/028-1	04.02.14	10:21	11° 28,00' S	41° 40,22' E	0	NNW 10	261,1	9,4	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 160
SO230/028-1	04.02.14	10:48	11° 28,55' S	41° 35,64' E	0	NNW 10	262,4	8,5	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 160
SO230/028-1	04.02.14	11:00	11° 28,63' S	41° 35,54' E	0	NW 10	149,9	1,3	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 160
SO230/028-1	04.02.14	11:13	11° 28,76' S	41° 34,89' E	0	NNW 10	263,6	8,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 161
SO230/028-1	04.02.14	11:42	11° 29,15' S	41° 30,19' E	0	NE 11	331,8	3,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 161
SO230/028-1	04.02.14	11:49	11° 29,30' S	41° 30,49' E	0	NNW 10	140,4	1,6	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 161
SO230/028-1	04.02.14	12:00	11° 29,59' S	41° 30,15' E	0	N 11	266,5	9,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 162
SO230/028-1	04.02.14	12:34	11° 29,78' S	41° 25,20' E	0	NNE 10	310,4	1,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 162
SO230/028-1	04.02.14	12:40	11° 29,87' S	41° 25,42' E	0	NNW 11	136,7	1,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 162
SO230/028-1	04.02.14	13:17	11° 29,74' S	41° 21,33' E	0	N 12	270,9	7,6	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 163
SO230/028-1	04.02.14	13:54	11° 30,41' S	41° 20,18' E	0	N 9	145,7	0,7	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 163
SO230/028-1	04.02.14	14:01	11° 30,35' S	41° 20,25' E	0	N 9	145,6	1,1	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 163
SO230/028-1	04.02.14	14:02	11° 30,37' S	41° 20,27' E	0	N 9	137,9	1,3	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 164
SO230/028-1	04.02.14	14:39	11° 31,08' S	41° 15,18' E	0	NE 10	309,6	3,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 164
SO230/028-1	04.02.14	14:48	11° 30,77' S	41° 15,16' E	0	NNW 9	160,3	1,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 164
SO230/028-1	04.02.14	14:50	11° 30,82' S	41° 15,19' E	0	N 9	144,1	1,7	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 165
SO230/028-1	04.02.14	15:24	11° 31,60' S	41° 10,50' E	0	N 12	269,5	9,3	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 165
SO230/028-1	04.02.14	15:33	11° 31,42' S	41° 10,09' E	0	N 9	137,9	1,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 165
SO230/028-1	04.02.14	15:34	11° 31,44' S	41° 10,12' E	0	NW 9	85,2	1,7	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 166
SO230/028-1	04.02.14	16:03	11° 32,11' S	41° 5,67' E	0	N 11	259,6	8,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 166
SO230/028-1	04.02.14	16:15	11° 31,86' S	41° 4,99' E	0	N 9	157,5	1,7	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 166
SO230/028-1	04.02.14	16:16	11° 31,87' S	41° 5,01' E	0	NNW 9	114,3	1,3	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 167
SO230/028-1	04.02.14	17:05	11° 32,52' S	40° 59,69' E	0	NNW 9	54,2	0,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 167

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/028-1	04.02.14	17:17	11° 32,15' S	40° 59,90' E	0	NW 8	106,1	0,5	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 167
SO230/028-1	04.02.14	17:21	11° 32,20' S	40° 59,88' E	0	NW 7	247,3	2,5	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 168
SO230/028-1	04.02.14	18:00	11° 33,11' S	40° 55,14' E	0	NNW 8	318,9	3,8	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 168
SO230/028-1	04.02.14	18:19	11° 32,82' S	40° 54,79' E	0	NNW 6	159,5	2,4	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 168
SO230/028-1	04.02.14	18:38	11° 33,06' S	40° 52,75' E	0	NNW 6	267,3	9,8	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 169
SO230/028-1	04.02.14	18:52	11° 33,23' S	40° 50,55' E	0	NNW 5	254,6	8,1	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 169
SO230/028-1	04.02.14	19:11	11° 33,48' S	40° 49,75' E	0	NW 4	140,3	2,9	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 169
SO230/028-1	04.02.14	19:36	11° 34,07' S	40° 46,61' E	712,4	NNW 7	264,8	10,2	OBS/OBH	OBS/OBH	OBS ausgelöst	OBS # 170
SO230/028-1	04.02.14	19:43	11° 34,17' S	40° 45,64' E	611,3	NNW 7	256,6	7,2	OBS/OBH	OBS/OBH	OBS gesichtet	OBS # 170
SO230/028-1	04.02.14	20:00	11° 33,75' S	40° 44,53' E	466,8	NNW 6	122,1	0,8	OBS/OBH	OBS/OBH	OBS an Deck	OBS # 170
SO230/028-1	04.02.14	20:01	11° 33,75' S	40° 44,54' E	467	NW 6	114,8	1,3	OBS/OBH	OBS/OBH	Ende Station	
SO230/029-1	04.02.14	20:01	11° 33,75' S	40° 44,54' E	467	NW 6	114,8	1,3	Ver-messung	EM / PS	Beginn Station	
SO230/029-1	04.02.14	20:22	11° 32,81' S	40° 44,37' E	428,4	N 5	79,5	4,8	Ver-messung	EM / PS	Beginn Profil	rwk: 079°, d: 24 nm
SO230/029-1	04.02.14	20:23	11° 32,80' S	40° 44,45' E	437,2	NW 6	78,6	4,8	Ver-messung	EM / PS	Magnetometer zu Wasser	
SO230/029-1	04.02.14	23:08	11° 28,03' S	41° 7,98' E	2347,5	NNW 10	83,7	9	Ver-messung	EM / PS	Kursänderung	rwk: 090°, d: 79 nm
SO230/029-1	05.02.14	08:00	10° 8,91' S	41° 8,41' E	2680	N 7	8,5	9,1	Ver-messung	EM / PS	Kursänderung	rwk: 090°, d: 3 nm
SO230/029-1	05.02.14	08:21	10° 8,93' S	41° 11,11' E	2712,4	N 6	182,8	8,4	Ver-messung	EM / PS	Kursänderung	rwk: 180°, d: 3 nm
SO230/029-1	05.02.14	08:38	10° 11,45' S	41° 11,60' E	2728	NNW 9	156,3	9,3	Ver-messung	EM / PS	Kursänderung	rwk: 090°, d: 1 nm
SO230/029-1	05.02.14	08:47	10° 11,85' S	41° 12,71' E	2741,2	N 10	111,5	8,4	Ver-messung	EM / PS	Kursänderung	rwk: 180°, d: 120 nm
SO230/029-1	05.02.14	22:09	12° 11,98' S	41° 11,84' E	1832,8	W 8	164,3	9	Ver-messung	EM / PS	Kursänderung	rwk: 090°, d: 4 nm
SO230/029-1	05.02.14	22:33	12° 12,04' S	41° 15,28' E	1609,7	W 8	87,3	9,2	Ver-messung	EM / PS	Kursänderung	rwk: 360°, d: 123 nm

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/029-1	06.02.14	12:13	10° 9,50' S	41° 16,10' E	2770,3	N 8	358	10,1	Ver-messung	EM / PS	Kursänderung	rwk: 090°, d: 4 nm
SO230/029-1	06.02.14	12:38	10° 9,00' S	41° 19,63' E	2704,6	NNW 10	90,2	9	Ver-messung	EM / PS	Kursänderung	rwk: 180°, d: 118 nm
SO230/029-1	07.02.14	01:40	12° 5,93' S	41° 19,24' E	1124,8	WNW 8	136,2	8,1	Ver-messung	EM / PS	Kursänderung	rwk: 090°, d: 4 nm
SO230/029-1	07.02.14	02:10	12° 5,87' S	41° 23,72' E	1251,1	W 10	44,6	8,1	Ver-messung	EM / PS	Kursänderung	rwk: 360°, d: 71 nm
SO230/029-1	07.02.14	10:15	10° 54,88' S	41° 23,38' E	2850,6	NW 11	336,3	2,3	Ver-messung	EM / PS	Magnetometer an Deck	Unterbrechung
SO230/030-1	07.02.14	10:19	10° 54,82' S	41° 23,36' E	2848,8	NW 10	179,7	0,3	CTD	CTD	Beginn Station	
SO230/030-1	07.02.14	10:20	10° 54,83' S	41° 23,36' E	2850	NW 9	139,9	0,3	CTD	CTD	zu Wasser	
SO230/030-1	07.02.14	11:29	10° 55,60' S	41° 23,36' E	2846,6	NW 9	108,6	0,8	CTD	CTD	auf Tiefe	SLmax: 2800 m
SO230/030-1	07.02.14	12:29	10° 56,08' S	41° 23,54' E	2847,6	NW 8	162,3	0,7	CTD	CTD	an Deck	
SO230/030-1	07.02.14	12:32	10° 56,11' S	41° 23,56' E	2846	NNW 8	134,2	1,6	CTD	CTD	Ende Station	
SO230/029-2	07.02.14	12:33	10° 56,12' S	41° 23,57' E	2849,2	NNW 8	184,7	0,3	Ver-messung	EM / PS	Beginn Profil	Fortsetzung, rwk: 360°, d: 47 nm
SO230/029-2	07.02.14	12:36	10° 56,08' S	41° 23,54' E	2847,2	NW 9	335,6	2,3	Ver-messung	EM / PS	Magnetometer z.W.	
SO230/029-2	07.02.14	18:07	10° 9,12' S	41° 23,87' E	2694,8	NNW 9	356,4	9,2	Ver-messung	EM / PS	Kursänderung	rwk: 090°, d: 4 nm
SO230/029-2	07.02.14	18:39	10° 8,90' S	41° 28,03' E	2713,5	N 11	154,4	8,6	Ver-messung	EM / PS	Kursänderung	rwk: 180°, d: 117 nm
SO230/029-2	08.02.14	08:00	12° 5,87' S	41° 27,11' E	1552,9	WNW 8	173,4	9,5	Ver-messung	EM / PS	Kursänderung	rwk: 090°, d: 4 nm
SO230/029-2	08.02.14	08:25	12° 6,14' S	41° 30,64' E	1998	W 8	39,2	8,3	Ver-messung	EM / PS	Kursänderung	rwk: 360°, d: 118 nm
SO230/029-2	08.02.14	21:35	10° 8,75' S	41° 31,77' E	1936,6	N 7	358	8,9	Ver-messung	EM / PS	Kursänderung	rwk: 090°, d: 4 nm
SO230/029-2	08.02.14	22:00	10° 7,98' S	41° 35,10' E	2038,8	NNW 10	85,8	8,5	Ver-messung	EM / PS	Kursänderung	rwk: 180°, d: 118 nm
SO230/029-2	09.02.14	11:00	12° 4,91' S	41° 32,91' E	2110,3	NNW 8	167,8	9,2	Ver-messung	EM / PS	Kursänderung	rwk: 090°, d: 2 nm
SO230/029-2	09.02.14	11:16	12° 5,85' S	41° 34,81' E	2210,6	NNW 11	107,3	9,7	Ver-messung	EM / PS	Kursänderung	rwk: 360°, d: 118 nm

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/029-2	10.02.14	00:22	10° 8,67' S	41° 38,66' E	2125	NNE 6	17,6	9,6	Ver-messung	EM / PS	Ende Profil	
SO230/031-1	10.02.14	00:22	10° 8,67' S	41° 38,66' E	2125	NNE 6	17,6	9,6	Ver-messung	EM / PS	Beginn Profil	rwk: 091°, d: 50 nm
SO230/031-1	10.02.14	05:32	10° 9,15' S	42° 29,74' E	0	N 14	139,3	10,1	Ver-messung	EM / PS	Kursänderung	rwk: 178°, d: 264 nm
SO230/031-1	11.02.14	07:55	14° 32,88' S	42° 41,98' E	3302,8	SW 2	176	5,9	Ver-messung	EM / PS	Kursänderung	Kalibrierung, d: 6 nm
SO230/031-1	11.02.14	09:00	14° 33,00' S	42° 42,00' E	3308,1	W 2	176,8	6,7	Ver-messung	EM / PS	Kursänderung	rwk: 156°, d: 112 nm
SO230/031-1	11.02.14	20:12	16° 14,93' S	43° 29,83' E	1926,3	SW 4	184,4	9,7	Ver-messung	EM / PS	Kursänderung	rwk: 223°, d: 22 nm
SO230/031-1	11.02.14	22:18	16° 30,20' S	43° 14,97' E	1585	SE 4	222,1	9,4	Ver-messung	EM / PS	Kursänderung	rwk: 322°, d: 103 nm
SO230/031-1	12.02.14	08:43	15° 9,08' S	42° 8,57' E	3006	ESE 5	306,2	9,7	Ver-messung	EM / PS	Kursänderung	rwk: 279°, d: 61 nm
SO230/031-1	12.02.14	14:49	15° 0,00' S	41° 6,00' E	2406,2	E 3	246,8	11	Ver-messung	EM / PS	Kursänderung	rwk: 180°, d: 90 nm
SO230/031-1	12.02.14	23:43	16° 29,53' S	41° 6,01' E	2356,9	NNE 1	180,2	9,7	Ver-messung	EM / PS	Kursänderung	rwk: 270°, d: 12 nm
SO230/031-1	13.02.14	00:50	16° 30,00' S	40° 54,76' E	2185,7	ENE 3	269,9	9,8	Ver-messung	EM / PS	Kursänderung	rwk: 360°, d: 69 nm
SO230/031-1	13.02.14	07:53	15° 24,04' S	40° 53,98' E	1353,4	WSW 5	212,2	9,3	Ver-messung	EM / PS	Kursänderung	rwk: 213°, d: 96 nm
SO230/031-1	13.02.14	17:30	16° 45,00' S	40° 0,00' E	1486,6	SSE 10	219,4	10	Ver-messung	EM / PS	Kursänderung	rwk: 226°, d: 311 nm
SO230/031-1	15.02.14	00:25	20° 21,71' S	36° 5,31' E	611,4	SE 11	223,7	10,4	Ver-messung	EM / PS	Kursänderung	rwk: 155°, d: 91 nm
SO230/031-1	15.02.14	05:11	21° 3,47' S	36° 25,44' E	1545,5	SSE 8	158,5	5,3	Ver-messung	EM / PS	Magnetometer a.D.	
SO230/031-1	15.02.14	06:06	21° 11,37' S	36° 29,33' E	1557,6	SE 11	155,2	5,8	Ver-messung	EM / PS	Magnetometer z.W.	
SO230/031-1	15.02.14	10:00	21° 44,89' S	36° 45,94' E	2596,6	SSE 10	152,7	10,8	Ver-messung	EM / PS	Kursänderung	rwk: 176°, d: 165 nm
SO230/031-1	16.02.14	02:50	24° 29,99' S	36° 58,85' E	3215,6	SE 11	204,2	10,5	Ver-messung	EM / PS	Magnetometer a.D.	
SO230/031-1	16.02.14	02:50	24° 29,99' S	36° 58,85' E	3215,6	SE 11	204,2	10,5	Ver-messung	EM / PS	Ende Profil	

Station	Date	UTC	PositionLat	PositionLon	Depth [m]	Wind [m/s]	COG [°]	v [kn]	Equip-ment used	Abbrev.	Action	Remarks
SO230/032-1	16.02.14	15:25	26° 8,16' S	34° 45,18' E	918,8	SE 6	46,3	0,6	TV-Grab Typ A	TVG	Beginn Station	
SO230/032-1	16.02.14	15:27	26° 8,16' S	34° 45,18' E	920,8	SE 7	26	0,1	TV-Grab Typ A	TVG	zu Wasser	W2
SO230/032-1	16.02.14	15:45	26° 8,12' S	34° 45,23' E	925,4	SE 7	181,2	0,8	TV-Grab Typ A	TVG	Bodensicht	SL: 903 m
SO230/032-1	16.02.14	17:14	26° 7,83' S	34° 45,45' E	958,2	SE 7	238,5	0,4	TV-Grab Typ A	TVG	Zugriff	SL: 943 m
SO230/032-1	16.02.14	17:16	26° 7,82' S	34° 45,45' E	1231,3	SE 7	7,3	0,3	TV-Grab Typ A	TVG	Zugriff	SL: 946 m
SO230/032-1	16.02.14	17:21	26° 7,83' S	34° 45,44' E	959,3	SE 7	183,6	0,3	TV-Grab Typ A	TVG	Zugriff	SL: 945 m
SO230/032-1	16.02.14	17:26	26° 7,83' S	34° 45,45' E	959	SE 8	135,2	0,4	TV-Grab Typ A	TVG	hieven	
SO230/032-1	16.02.14	17:48	26° 7,81' S	34° 45,48' E	956,1	SE 10	244	0,6	TV-Grab Typ A	TVG	an Deck	
SO230/032-1	16.02.14	18:06	26° 7,80' S	34° 45,50' E	939,6	ESE 11	223,8	0,3	TV-Grab Typ A	TVG	Ende Station	
SO230/033-1	16.02.14	18:07	26° 7,80' S	34° 45,50' E	952,8	SE 10	193,3	0,6	TV-Grab Typ A	TVG	Beginn Station	
SO230/033-1	16.02.14	18:08	26° 7,80' S	34° 45,50' E	948,6	SE 9	43,6	0,7	TV-Grab Typ A	TVG	zu Wasser	W2
SO230/033-1	16.02.14	18:28	26° 7,80' S	34° 45,50' E	943,9	SE 8	152,5	0,7	TV-Grab Typ A	TVG	Bodensicht	SL: 940 m
SO230/033-1	16.02.14	18:58	26° 7,74' S	34° 45,50' E	967,9	SE 10	236,8	0,3	TV-Grab Typ A	TVG	Zugriff	SLmax: 949 m
SO230/033-1	16.02.14	19:01	26° 7,75' S	34° 45,50' E	967	ESE 10	246,6	0,4	TV-Grab Typ A	TVG	Zugriff	SLmax: 949 m
SO230/033-1	16.02.14	19:37	26° 7,84' S	34° 45,45' E	956,6	SE 11	306,4	0,1	TV-Grab Typ A	TVG	Zugriff	SLmax: 915 m
SO230/033-1	16.02.14	19:40	26° 7,84' S	34° 45,44' E	955,8	ESE 12	351,2	0,3	TV-Grab Typ A	TVG	hieven	
SO230/033-1	16.02.14	20:11	26° 7,78' S	34° 45,47' E	948,7	ESE 10	96,4	0,7	TV-Grab Typ A	TVG	an Deck	
SO230/033-1	16.02.14	20:38	26° 8,07' S	34° 45,42' E	825,6	ESE 9	206,4	0,8	TV-Grab Typ A	TVG	Ende Station	

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