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The Expedition of the Research Vessel "Sonne" to the Manihiki Plateau in 2012 (So 224)

Edited by
Gabriele Uenzelmann-Neben
with contributions of the participants

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So 224

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1. ZUSAMMENFASSUNG/SUMMARY

Gabriele Uenzelmann-Neben[1] [1]Alfred-Wegener-Institut

Die Expedition So 224 mit FS *Sonne* vom 11.10.12 Suva, Fiji bis 17.11.12 Suva, Fiji bestand aus reflexions- und refraktionsseismischen Profilarbeiten im Gebiet des Manihiki Plateaus, einer Large Igneous Province (LIP) im südwestlichen Pazifik. Das Manihiki Plateau besteht aus drei geomorphologischen Einheiten, dem Western Plateau, dem North Plateau und dem High Plateau. Eine Untersuchung der Krustenstruktur ist notwendig, um die Hypothese der Bildung des Manihiki Plateaus als Teil einer ‚Super' LIP zusammen mit dem Ontong-Java und dem Hikurangi Plateau zu überprüfen. Zwei 270 nm lange seismische Refraktions- und Weitwinkelprofile, registriert über jeweils 33 Ozeanbodenseismometer, werden hier Details über die Krustenstruktur erbringen. Ein Gitter reflexionsseismischer Daten wird Auskunft über die weitere Entwicklung des Plateaus nach der initialen Bildungsphase sowie die Sedimentverteilung und Sedimentationsumgebung und geben. Zusätzlich werden basierend auf den reflexionsseismischen Daten Lokationen für drei Bohrsites für IODP proposal 630 identifiziert werden. Insgesamt wurden ~4200 km an hochauflösenden reflexionsseismischen Daten und ~1000 an refraktions/weitwinkelseismischen Daten gewonnen. Bathymetrische und Parasound Daten wurden parallel zu den seismischen Arbeiten gesammelt. Beide Datensätze dienen u. a. zur Auswahl geeigneter Lokationen für petrologische Beprobungen während der folgenden Expedition So 225.

Cruise Leg So 224 with RV *Sonne*, leaving Suva, Fiji on 11.10.12, returning to Suva, Fiji on 17.11.12, comprised seismic reflection and refraction studies of the Manihiki Plateau, a Large Igneous Province (LIP) in the south western Pacific Ocean. The Manihiki Plateau consists of three major geomorphological unit: Western Plateau, North Plateau, and High Plateau. A study of the crustal structure of Western and High Plateau was needed to understand the proposed evolution of the Manihiki Plateau as part of a 'super' LIP together with the Ontong-Java and Hikurangi Plateaus. Seismic refraction and wide-angle data collected with 33 ocean bottom seismometers along two 270 nm long profiles will provide details on the crustal development. Seismic reflection data were gathered to study the plateau's development following the initial phase of creation and the sedimentary distribution. Additionally, the data will be used to identify suitable drill locations for IODP proposal 630. In total ~4200 km of high resolution seismic reflection data, and ~1000 km of seismic refraction and wide-angle data were recorded. Bathymetric and Parasound data were recorded parallel to the seismic profiling. Both datasets have been used to pick significant locations for petrological sampling, which will be the focus of the following cruise So 225.

Fig. 1.1: Scientific crew of cruise So 224 (Photo: Torsten Bierstädt.)

2. OBJECTIVES

Gabriele Uenzelmann-Neben[1] [1]Alfred-Wegener-Institut

The Manihiki Plateau is a Large Igneous Province (LIP), which has been proposed to have formed as during a magmatic super event together with the Ontong-Java and the Hikurangi Plateaus. It is formed by three geomorphological units: High Plateau, North Plateau, and Western Plateau, which are separated by deep troughs (Winterer *et al.*, 1974). Little is known about the crustal structure of the plateau or its development following its formation. We will contribute to the following topics:

1. Structure of crust and mantle in the area of the Manihiki Plateau were studied in more detail using refraction and wide-angle seismic methods. Physical properties deduced this way, e.g. P- and S-wave velocities as well as refection coefficients, allow conclusions with respect to petrological composition (ultra mafic, mafic, serpentinised, etc.) of both crust and upper mantle. These parameters in combination with the volcanic-geochemical studies planed for cruise So 225 with RV *Sonne* form the base for the reconstruction of the petrological-magmatic structure of the Manihiki Plateau, the distribution both horizontally and vertically and hence an estimation on volume and chronological order of extrusive and intrusive processes.

2. The sedimentary distribution and the upper part of the basement were resolved using high resolution seismic reflection methods. Furthermore, the seismic reflection studies form part of the pre site survey for IODP proposal 630 'Cretaceous igneous and palaeoceanographic events recorded at Magellan, Manihiki and Hikurangi Plateaus, central Pacific Ocean'.

In order to derive at better understanding of formation and structure of the Manihiki Plateau, we have tackled the following questions:

1. How can are structure and upper mantle of the Manihiki Plateau? We have concentrated on the two major sub-plateaus (each ~300 nm across, see Figure 2.1). Can we identify differences in thickness and distribution of P-wave velocities between High and Western Plateau? In which way is the crust of the plateau embedded into the surrounding basins? Two seismic refraction profiles (Figure 2.1) across the sub-plateaus, which also cross into the neighbouring basins, provide information on origin of the Manihiki Plateau, the duration of its formation and its age.
2. What is the role of the Danger Island Trough? Does the Danger Island Trough represent a rift system, which starved before the formation of oceanic crust started? A NW-SE striking seismic refraction profile shows structure and shows the significance of the trough regarding the Manihiki Plateau.
3. What is the structure of the southern flank of the Manihiki Plateau? Does this flank document the separation of the Manihiki from the Hikurangi process? If so, do we observe a 'pure' break-up with block faulting or did the strong production of magma last and lead to the formation of e.g. Seaward Dipping Reflector Sequences (SDRS), as have been observed at the Kerguelen Plateau-Broken Ridge or Astrid Ridge-Mozambique Ridge? How thick are the sedimentary sequences? High resolution seismic reflection profiles crossing the southern flank provide detailed information on its structure and further allow the selection of dredge locations (cruise So 225) to compare the southern flank of the Manihiki Plateau with the Rapuhia Scarp at the northern Hikurangi Plateau.
4. Does the Manihiki Scarp represent rather a tectonic than a magmatic overprinted flank? Bathymetric data collected during cruise So 193 point towards a tectonic development, but the ages of volcanic rocks sampled there are not consistent with published models (e.g. (Larson *et al.*, 2002). High resolution seismic reflection profiles across the scarp show both structures of sediments and the structure of the flank. The data further allow to optimise the locations for a stratigraphic controlled samples with a ROV (cruise So 225). The combination of the seismic reflection data and volcanological-geochemical studies (cruise So 225) allow the reconstruction of the events (time, chronological order, style) leading to the formation of the Manihiki Scarp.

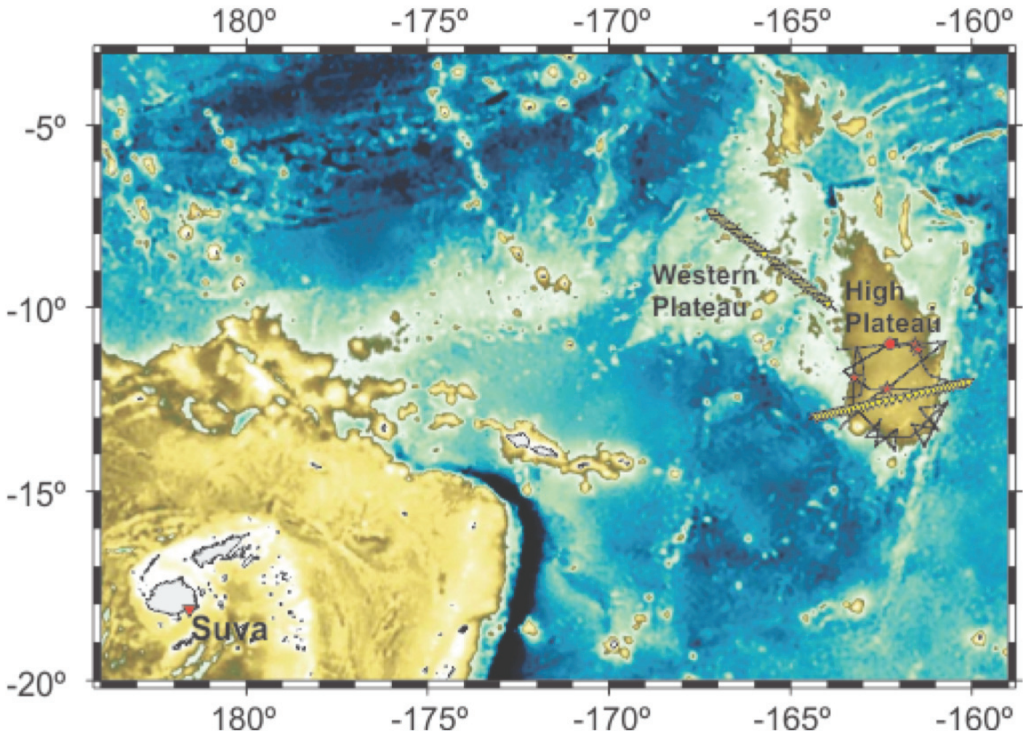

Fig. 2.1: Overview map of the area of interest. Black lines show the collected seismic lines, yellow triangle the locations of ocean bottom seismometers, the red dot the location of DSDP Leg 33 Site 317, and the red stars the location of sites proposed for IODP proposal 630.

5. Where can we identify undisturbed sedimentary sequences? Sites shall be chosen for IODP proposal 630, where Cretaceous sediments and the basement can be drilled and sampled. These drill location must not be impaired by thinning Cretaceous sequences, erosional unconformities, etc. High resolution seismic profiles image the complete sedimentary column and the upper part of the basement. Existing seismic data (Schlanger and Winterer, 1976, Beiersdorf *et al.*, 1995a, Beiersdorf *et al.*, 1995b) show strong variations in sedimentary thickness in relation to the basement topography. They also show erosional features. We have collected a small grid to select site locations as needed by IODP.

The project comprised geophysical operations in the area of the Manihiki Plateau (Figure 2.1). Streamer, airguns, ocean bottom seismometers as well as PARASOUND and multi-beam systems were used. Seismic reflection profiles were gathered in order to study the sedimentary distribution in relation to the tectonic and oceanographic evolution (black lines in Figure 2.1). Those profiles cover the mainly High Plateau, the central part of the Manihiki Plateau with the transition into the deep sea. Seismic refraction and wide-angle reflection profiles were gathered to study the crustal structure and evolution of the Manihiki Plateau. Furthermore, the profiles cover the location of DSDP Leg 33 Site 317 and the sites locations proposed for IODP proposal 630, Sites Man-1a, -2b, and -3a.

3. CRUISE ITINIRARY

Gabriele Uenzelmann-Neben[1] [1]Alfred-Wegener-Institut

date	Approx. Board time	Speed [kn]	Programme and event	weather
9.10.	9:00-19:00		On board, loading, set up of equipment	warm, humid, sunny
10.10.	9:00-19:00		loading, set up of equipment	Warm, humid, sunny
11.10. Transit ca 1069 nm, 4.5 days of transit	9:00	10	leave harbour, set up of equipment;	Warm, humid, sunny
12.10.		10	Transit to working area	5 Bft, warm, sunny
13.10.		10	Transit to working area	5 Bft, warm sunny
14.10.	8:00 12:30	10	Releaser test 1; Transit to working area	4 Bft, warm, sunny
15.10.	8:00 12:30 20:00	10	Releaser test 2; CTD; Transit to working area; Arrival in working area; deployment OBS profile AWI-20120100 (35h)	4 Bft, warm, sunny
16.10.	21:00	10	End deployment OBS profile AWI-20120100 (35h)	2 Bft, warm, rainy
17.10.	2:00 5:30	4 5	Deployment of Streamer and G-guns (3h); seismic profiling	5 Bft, warm, rainy
18.10.		5	Seismic profiling AWI-20120100	5 Bft, warm, rainy
19.10.	 15:00 18:00	5 4 10	Seismic profiling; Retrieval Streamer G-guns; Retrieval OBS	4 Bft, warm sunny
20.10.		10	Retrieval OBS	5 Bft, warm, rainy
21.10.		10	Retrieval OBS	2 Bft

22.10.	 4:41 11:00 13:36	10 5 5	Retrieval last OBS; Transit to 11° 2.45'S/163° 40.51'W; deployment streamer and GI-guns; Start AWI-201200001	5 Bft, warm, sunny
23.10.		5	Seismic profiling	4 Bft, warm, sun and rain; increasing winds, 5-6 Bft, 3m waves
24.10.		5	Seismic profiling	7-8Bft, warm, sunny, a bit rain
25.10.		5	Seismic profiling	3 Bft, warm, sunny
26.10.		5	Seismic profiling	3 Bft, warm, sunny
27.10.			Seismic profiling	4 Bft, sunny, warm
28.10.		5	Seismic profiling	4 Bft, warm, sunny, humid
29.10.		5	Seismic profiling	3 Bft, warm, sunny
30.10.	1:30 6:30	4 12	Retrieval streamer and GI-guns Deployment OBS	4 Bft, warm, sunny
31.10.	11:00 11:00 13:00	12 4 5	Deployment OBS Deployment streamer, G-guns Seismic profiling	3 Bft, warm sunny
1.11.		5	Seismic profiling	4 Bft, warm, sunny
2.11.	 19:00 21:00	5 4 12	Seismic profiling Retrieval of streamer and G-guns Retrieval of OBS	3 Bft, warm, sunny
3.11.		12	Retrieval of OBS	3 Bft, warm, sunny
4.11.	 16:30	12 12	Retrieval of OBS Transit	3 Bft, warm, sunny

	20:30 22:00	4 5	Deployment of streamer and GI-guns Seismic profiling	
5.11.		5	Seismic profiling	4 Bft, warm, sunny
6.11.		5	Seismic profiling	4 Bft, warm, sunny
7.11.		5	Seismic profiling	4 Bft, warm, sunny
8.11.		5	Seismic profiling	4 Bft, warm, sunny
9.11.		5	Seismic profiling	5 Bft, warm, rainy
10.11.		5	Seismic profiling	4 Bft, warm cloudy
11.11.		5	Seismic profiling	3 Bft, warm, sunny
12.11.	 21:00 24:00	5 4	Seismic profiling Retrieval streamer and GI-guns Transit to Suva	4 Bft, warm, cloudy
13.11.		12	Transit to Suva	4-5 Bft, cloudy, warm
14.11.		12	Transit to Suva	3-4Bft, cloudy,
15.11.		12	Transit to Suva	4-5 Bft, cloudy, warm
16.11.		12	Transit to Suva	4 Bft, cloudy, warm
17.11.	7:00	12	pilot, back in harbour , towing of containers	3 Bft, warm, sunny
18.11.	 14:00		Unloading; scientists off-board	3 Bft, warm sunny

4. GEOLOGICAL BACKGROUND

Gabriele Uenzelmann-Neben[1] [1]Alfred-Wegener-Institut

The south western Pacific is dominated by three big oceanic plateaus or Large Igneous Provinces (LIP): the Ontong-Java Plateau with a size > 1.5 10^6 km^2, the Manihiki Plateau with a size of probably 0.8 10^6 km^2, and the Hikurangi Plateau with ~0.35 10^6 km^2 (Figure 4.1). LIPs are the result of the most enormous volcanic events on Earth and have e.g. great importance with respect to short scale transfer of mass and energy from the mantle to the surface. Up to 100 km^3 of volcanic rocks are produced in a relatively short period of time during the formation of LIPs. The formation of LIPs in the south western Pacific is still under debate, e.g. it is being discussed whether these LIPs have their origin in one super plume (Greater Ontong Java Plateau Event; Coffin and Eldholm, 1993, Ingle and Coffin, 2004, Taylor, 2006). Other studies provided indications for a joint formation of the Hikurangi and Manihiki Plateaus (Billen and Stock, 2000, Hoernle *et al.*, 2004b, Downey *et al.*, 2007). If all three plateaus were created via a volcanic 'mega' event, the products would cover about 1 % of Earth's surface. This would have implications for our understanding of mantle processes and climate variability. During the eruption of such huge amounts of magma large quantities of CO_2 are emitted and passed into both atmosphere and hydrosphere. LIPs are thus considered to have been responsible for global modifications in the environment and several mass extinction events (Tarduno *et al.*, 1998, Courtillot *et al.*, 1999, Larson and Erba, 1999, Coffin *et al.*, 2006). Recent discussions have challenged the hypothesis that LIPs are formed via excessive volcanism within a few million years. New datings using Ar/Ar point towards three phases of volcanic activity with partly different sources for the Manihiki Plateau (Ingle *et al.*, 2007, Hauff *et al.*, 2008, Hoernle *et al.*, 2008a, Hoernle *et al.*, 2009, Timm *et al.*, 2009). So up to now it is unclear whether these LIPs are the product of one or more volcanic events or just represent part of the products of a much larger magmatic event (e.g. a Cretaceous 'mega'-event).

4.1 Large Igneous Provinces

Previous explanations for the formation of LIPs are closely related to the mantle plume theory. LIPs have been interpreted as the initial phase of a hotspot or mantle plume since they can often be observed at the start of hotspot tracks (White and McKenzie, 1995). In contrast to the well exposed continental flood basalts little has been known about the most often much larger oceanic LIPs. Open questions concern e.g. their internal structure, possible chemical heterogeneities, their relationship to local tectonics, the environment of formation (deep sea or submarine/subaerial), and especially the duration of formation. The plume head model has come under debate due to a lack of sufficient data (Fitton *et al.*, 2003, Anderson, 2003, Coffin, 2003, Hoernle *et al.*, 2004a, Korenaga, 2005, Roberge *et al.*, 2005). According to the plume head model LIPs needed to be formed under subaerial conditions, which at least for the Ontong Java Plateau appears not to be true. Other models for the formation of oceanic LIPs comprise the development of plateaus via plume-ridge interaction (Mahoney and Spencer, 1991), melt formation due to the impact of meteorites (e.g. Rogers, 1982, Ingle and Coffin, 2004), the accumulation of smaller areas of different age evolved via intraplate volcanism to a large plateau via subduction processes (e.g. Hoernle *et al.*, 2004a), and passive swelling of eclogites in the upper mantle connected to fast spreading during the Middle Cretaceous (Korenaga, 2005).

4.2 The Manihiki Plateau

Up to recently the knowledge on the Manihiki Plateau was based on expeditions and DSDP Leg 33 Site 317 from the 1960s and 1970s and a Japanese Project

carried out 2003 with RV *Hakuho Maru* (e.g. Ingle *et al.*, 2007). Winterer *et al.* (1974) divide the plateau into three geomorphological units (High Plateau, North Plateau, Western Plateau, Figure 4.2), which are separated by deep grabens (e.g. the Deep Islands Trough) possibly representing rift structures (Mahoney and Spencer, 1991). The crustal thickness of the Manihiki Plateau has been estimated between 15 km (Mahoney and Spencer, 1991, Hussong *et al.*, 1979) and 25 km (Viso *et al.*, 2005), its volume as 8.8-13.6 km^3. A systematic study using refraction seismic methods providing a much clearer picture is still lacking.
The few gathered rock samples show an age of 122 Ma for the basalt drilled at DSDP Leg 33 Site 317 (Neal *et al.*, 1997) and the debatable age of 81.6-49.5 Ma of a seamount (Beiersdorf *et al.*, 1995a, Beiersdorf *et al.*, 1995b). New lava samples from the eastern flank of the Danger Island Trough provide an age of 117.9±0.7 Ma and point towards two phases of activity (Ingle *et al.*, 2007). Winterer *et al.* (1974) suggest that the Manihiki Plateau evolved during rifting at the triple junction of the Pacific, the Antarctic, and the Farallon Plate during the Barremium (ca. 127-121 Ma). Other authors explain the formation of the plateau by a plume head and the interaction of rifting and a mantle plume (e.g. Mahoney and Spencer, 1991, Larson, 1997). Unfortunately, these hypotheses remain ambiguous due to a very limited data base.
New samples collected during cruise So 193 with RV *Sonne* in 2007 point towards a significantly more complex geodynamic evolution of the Manihiki Plateau (Werner and Hauff, 2007, Werner *et al.*, 2007, Hauff *et al.*, 2008, Hoernle *et al.*, 2008b, Coffin *et al.*, 2007). Age datings and geochemical analyses of about 80 rock samples produce evidence for a tholeiitic magma phase at 128-110 Ma ('plateau stage'), during which most of the plateau basalt was formed, and two alkaline phases (seamount stage at 110-83 Ma, and 'late stage volcanism' at 74-43 Ma). The tholeiitic rocks range from compositions similar to FOZO (or E-MORB, enriched mid-oceanic ridge basalt) to EM 1 (enriched mantle 1) compositions. In contrast to this compositions resembling FOZO to HIMU (high time integrated μ (U/Pb)) have been identified for the rocks formed during the later phases (Hauff *et al.*, 2008, Hoernle *et al.*, 2008b, Hoernle *et al.*, 2009, Timm *et al.*, 2009). Summarising these new samples show that the volcanism in the area of the Manihiki Plateau was chemically heterogeneous, involved at least different mantle sources, comprised three phases of magmatic activity, and had a duration of more than 80 My. Bathymetric data collected during cruise So 193 indicate intensive tectonic movements in the area of the Manihiki Plateau, which may have been characterised by several rift phases (Werner and Hauff, 2007, Coffin *et al.*, 2007). Additionally, the upper sedimentary sequences appear to be very consolidated and hardened indicating a secondary heating and/or tectonic movements (Werner and Hauff, 2007).
Winterer *et al*. (1974) and Ai *et al.* (2008) present the so far collected seismic reflection data. These comprise single channel data from the 1960s and 1970s and a cruise in 1998. Beiersdorf *et al.* (1995b) further present 3.5 KHz and 20 KHz data. Although the data are of minor quality they show sedimentary structures and can be used for an overview. The magmatic basement is covered by a 1000 m thick sedimentary column (Winterer *et al.*, 1974). Samples from DSDP Leg 33 Site 317 and cruise So 35 in combination with the old seismic reflection data indicate that volcano clastics form a continuous layer over large distances (Schlanger and Winterer, 1976, Beiersdorf and Erzinger, 1989), which are the result of volcanic activity during the early stages of subsidence of the

Manihiki Plateau (Jenkyns, 1976). Palaeontological and volcanological data point towards a formation of the plateau under shallow marine conditions (Kauffman, 1976, Jackson *et al.*, 1976, Mahoney and Spencer, 1991). Structure and texture of volcano clastics dredged during cruise So 193 support this and indicate explosive shallow marine or subaerial volcanism for the eastern part of High Plateau (Werner and Hauff, 2007).

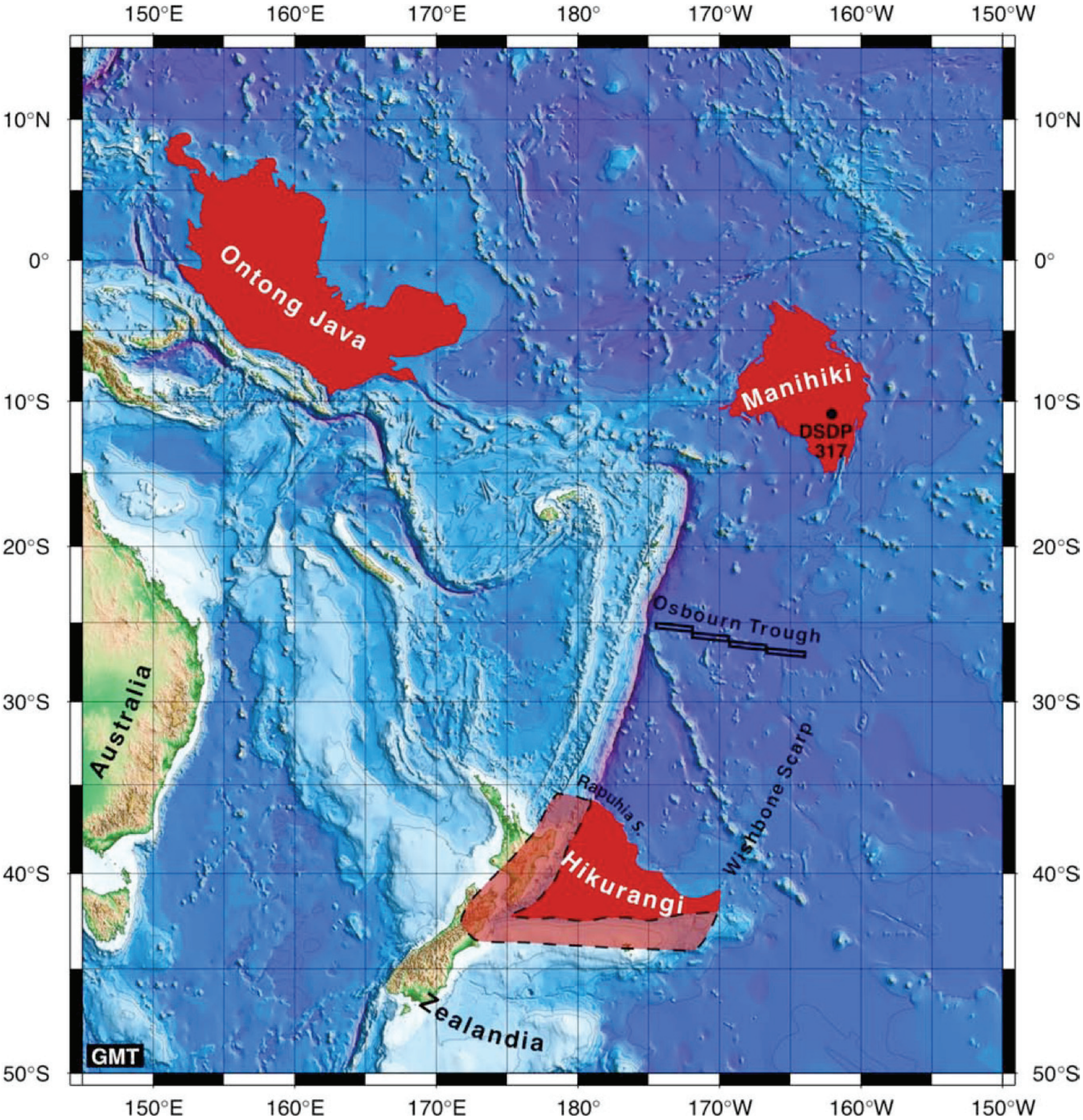

Fig. 4.1: Map showing the three large LIPs in the south western Pacific: the Ontong-Java Plateau, the Manihiki Plateau and the Hikurangi Plateau.

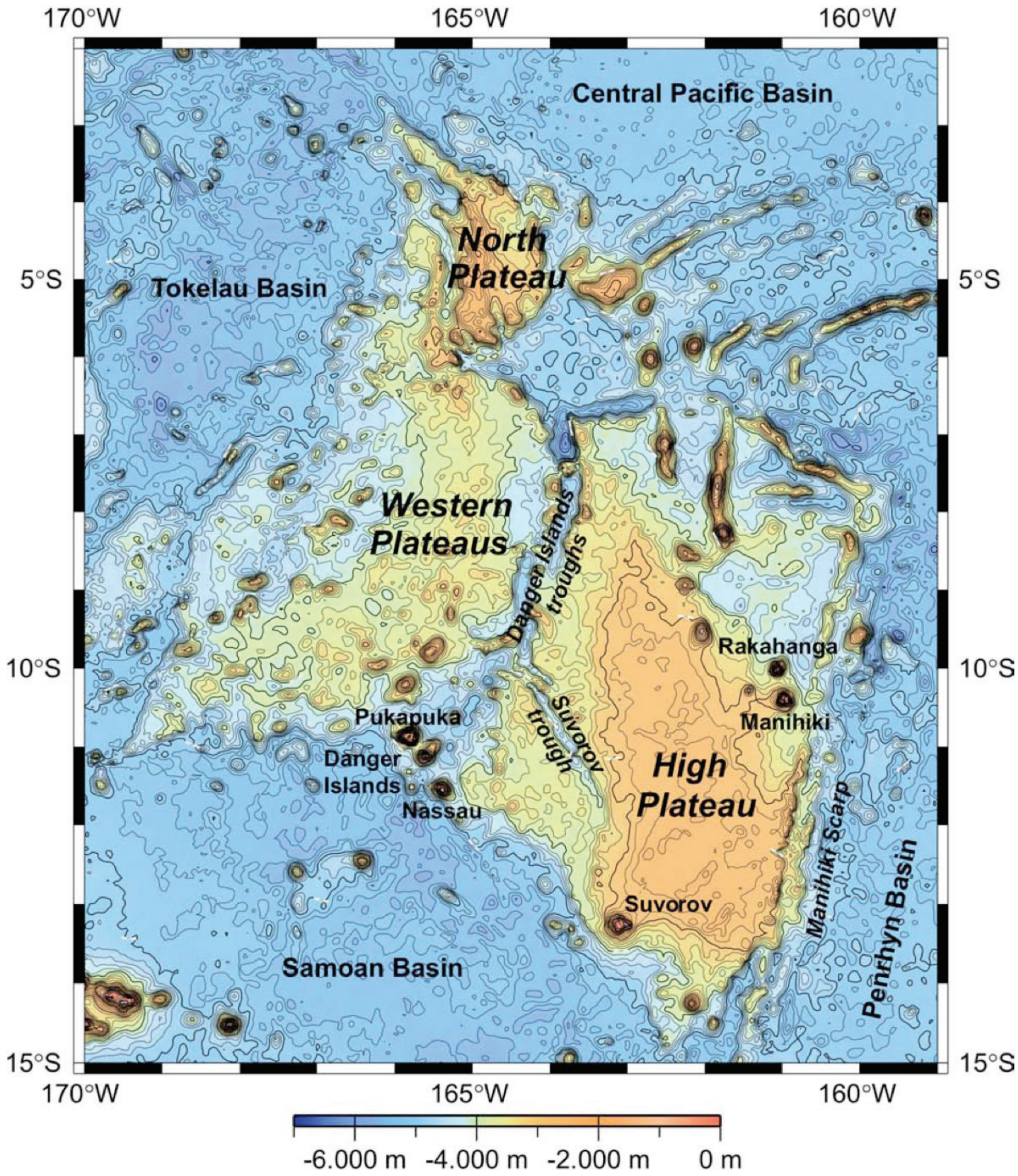

Fig. 4.2: Bathymetric map (Smith and Sandwell, 1997) showing the three morphological units of the Manihiki Plateau: Western Plateau, North Plateau, and High Plateau.

4.3 The southern and eastern flanks of the Manihiki Plateau

Following the hypothesis that the Manihiki Plateau was formed together with the Hikurangi Plateau the southern flank of the Manihiki Plateau has been proposed to represent location of the separation. The Osbourn Trough, a palaeo-spreading centre today located roughly in the middle between both plateaus, is supposed to have initiated the separation process. Accordingly the northern flank of the Hikurangi Plateau, Rapuhia Scarp, is very steep and characterised by a system of flank parallel faults and is referred to as a rifted margin (Hoernle *et al.*, 2008b). The bathymetry of the Manihiki Plateau's southern flank rather points towards a gentle inclined slope. Here, consolidated sedimentary and hard rocks crop out (Werner and Hauff, 2007). This flank hence is quite different from the Rapuhia Scrap and its nature remains unclear.

In contrast to the southern flank the eastern flank of the Manihiki Plateau, the Manihiki Scarp, steeply dips from 2500-3800 m to 5500 m. Its morphology is quite complex with steep steps, troughs, tectonically rotated blocks, volcanic ridges and occasional seamount. These morphological features are interpreted as sings for a rifted margin (Werner and Hauff, 2007, Werner *et al.*, 2007, Coffin *et al.*, 2007). This is consistent with Larson *et al.*'s (2002) model, which postulates the original Manihiki Plateau to have been twice the present size and to have broken up via rifting along its present northern and eastern flanks at 119 Ma (also see Viso *et al.*, 2005). Above the Manihiki Scarp a more than 400 km long volcanic ridge extends along the plateau's break, which may have formed in conjunction with the Manihiki Scarp. This ridge towers above High Plateau by about 600 m and is suspected to have been formed under subaerial conditions (Werner and Hauff, 2007), which is in contrast to the upper units of High Plateau. Rock samples from this ridge show a young Paleogene age. All other samples from the Manihiki Scarp are of Paleogene or Late Cretaceous age (Hauff *et al.*, 2008). This raises the question whether the event forming the Manihiki Scarp may have been overprinted by the Late Stage Volcanism or happened much later than Larson *et al.* (2002) and Viso *et al.* (2005) suggested. This would postdate the separation of Manihiki and Hikurangi Plateaus at the Osbourne spreading centre during the Middle Cretaceous. In general, the database is too limited to resolve the nature and creation of the Manihiki Scarp.

5. SCIENTIFIC PROGRAMMES – PRELIMINARY RESULTS

5.1 Seismic reflection profiling

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5.1.1 Methods

The application of seismic methods was the one of the primary operational objective of So 224 in order to obtain information on the sedimentary distribution in the area of the Manihiki Plateau. We used a standard multi-channel seismic reflection technique to image the outline and reflectivity characteristics of the sedimentary layers and the structure of the sub-sedimentary basement and lower crust by recording the returning near-vertical wave field. Figure 5.1 illustrates the principles of this technique.

5.1.2 Seismic equipment

5.1.2.1 Seismic sources, triggering and timing

We used a cluster of 4 GI-guns to resolve the sedimentary layers. A single GI-Gun™ is made of two independent airguns within the same body. The first airgun ("Generator") produces the primary pulse, while the second airgun ("Injector") is used to control the oscillation of the bubble produced by the "Generator". We

used the "Generator" with a volume of 0.72 litres (45 in^3) and fired the "Injector" (1.68 litres = 105 in^3) with a delay of 33 ms. This leads to an almost bubble-free signal. The guns were towed 40 m behind the vessel in 2 m depth and fired every 10 s (~25 m shot interval). To image the crustal structure we used two clusters with 4 G-guns™. The G-guns have a volume of 8.32 l each leading to a total volume of 66.56 l for the combined clusters.
Seismic data acquisition requires a very precise timing system, because seismic sources and recordings systems must by synchronised. A combined electric trigger-clock system was in operation in order (1) to provide the firing signal for the electric airgun valves, and (2) to provide the time-control of the seismic data recording. Due to the variable time difference in the NMEA format of the ship-provided clock and the DVS system, a separate Meinberg GPS clock was used with an antenna mounted on the upper deck. The clock provides UTC date and time (minute and second) pulses. Due to problems with the Meinberg GPS clock we used the more precise pulse provided by the GPS on board for seismic refraction profiling. Airguns were fired with gradually increasing working pressure (ramping up) at the beginning of a profile and after shot interruptions.

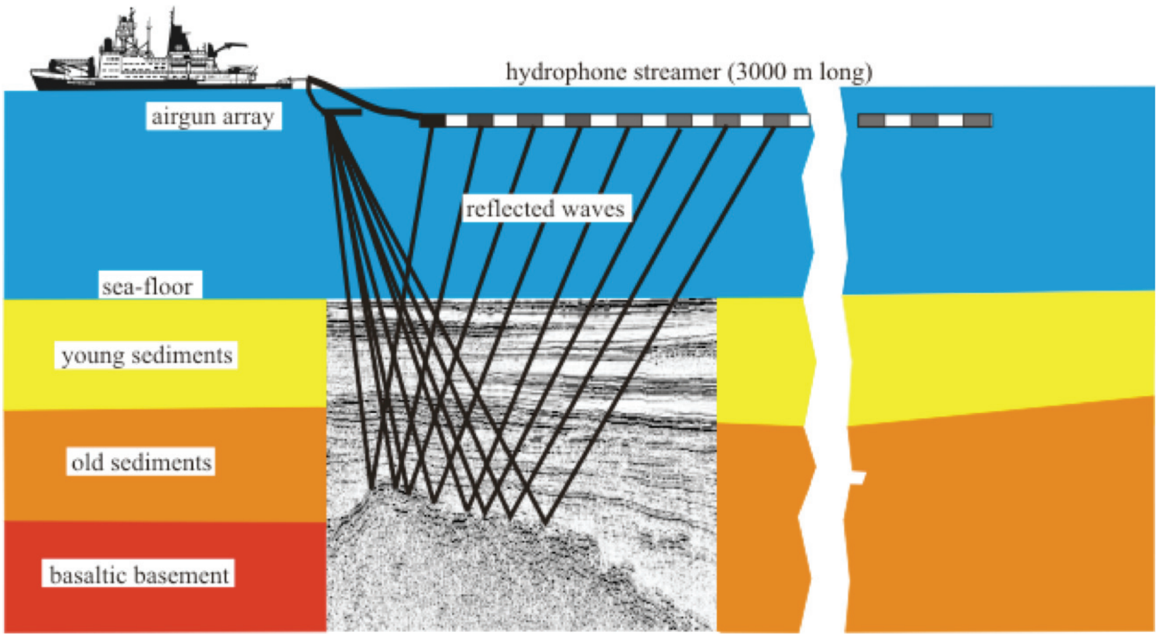

Fig. 5.1: Principle of marine seismic reflection surveying.

5.1.2.2 Multi-channel reflection recording system

For multi-channel reflection data acquisition, a complete digital seismic streamer and recording system was used. The system consists of a large capacity, fully integrated, high resolution marine seismic data acquisition system (SERCEL SEAL™) which is composed of both onboard and in-sea equipment (Fig. 5.2). The streamer is a 240-channel hydrophone array which is coupled to the onboard recorder via a fibre-optic tow leader and a deck lead. The data collected by the hydrophone array is firstly converted from an analogue signal to digital via an A/D converter and then converted to a 24-bit complement format at 0.25 ms sample rate by a DSP. The data is routed to a Line Acquisition Unit Marine (LAUM) at this point, one of these being located every five Acquisition Line

Sections or 750 m. The LAUM decimates, filters and compresses the data before routing them through the tow leader and deck lead to the on-board equipment.
The coupling of the streamer with the Control Module (CMXL) is made via the Deck Cable Crossing Unit (DCXU) which also acts as a LAUM for the first 60 channels of the streamer. The CMXL decompresses, demultiplexes and then performs IEEE 32-bit conversion to the data. The data are collected via a network switch and converted to SEGD by the PRM, the PRM being a processor software module used for formatting data to and from the cartridge drives, the plotters and Seapro QC™.

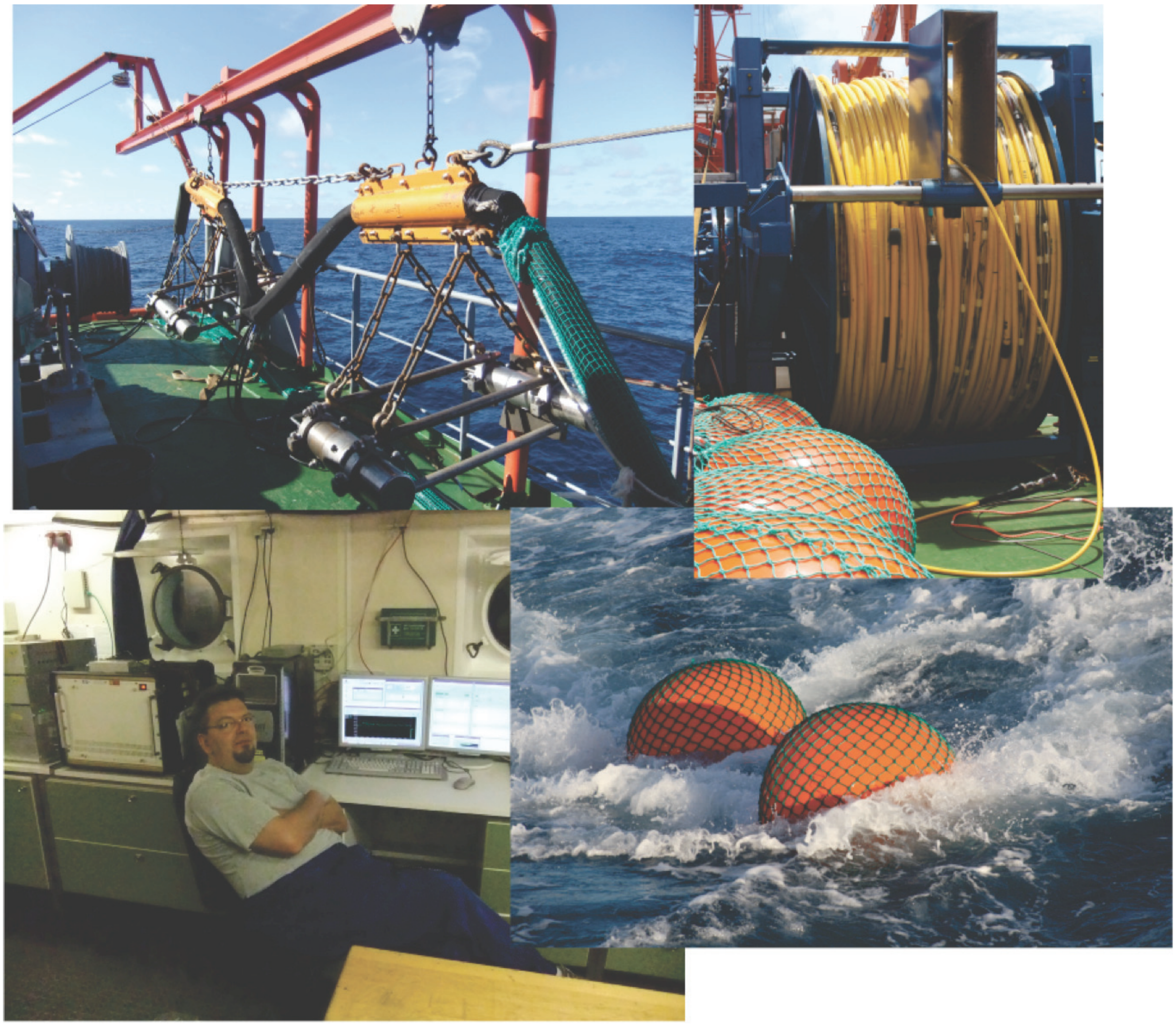

Fig. 5.2: SERCEL SEAL™ digital multichannel seismic system and the recordings units.

All system parameters can be set through the Human Computer Interface (HCI) which displays the systems activity such as print parameters, log files, high resolution graphic display and test results.
Cable depth keeping was monitored on Digicourse™ software, and adjustment to depths was made with Digibirds™, Model 5010. The Digicourse™ software gives a

continuously updated graphical display of depths and wing angles via the Digibirds™ which are situated at 300 m intervals along the streamer.

Tab. 5.1: Specification of SEAL system

Acquisition Line Section Spec.	
Length	150 m
Channels	12
Phones/group	16
1. Group length	12.5 m
2. Sensitivity	20 V/Bar open ended
3. Capacity	256 μf

The data were recorded with the following parameters (also Appendix A.5):

Tab. 5.2: Brief description of seismic recording parameters.

Profile Name	*Active Length*	*Lead-in*	*Record Length*	*Sample Rate*
AWI-20120101	3000 m	191 m	15 s	1 ms
AWI-20120201	3000 m	191 m	15 s	1 ms
AWI-20120001	3000 m	191 m	9 s	1 ms
AWI-20120002	3000 m	191 m	9 s	1 ms
AWI-20120003	3000 m	191 m	9 s	1 ms
AWI-20120004	3000 m	191 m	9 s	1 ms
AWI-20120005	3000 m	191 m	9 s	1 ms
AWI-20120006	3000 m	191 m	9 s	1 ms
AWI-20120007	3000 m	191 m	9 s	1 ms
AWI-20120008	3000 m	191 m	9 s	1 ms
AWI-20120009	3000 m	191 m	9 s	1 ms
AWI-20120010	3000 m	191 m	9 s	1 ms
AWI-20120011	3000 m	191 m	9 s	1 ms
AWI-20120012	3000 m	191 m	9 s	1 ms
AWI-20120013	3000 m	191 m	9 s	1 ms
AWI-20120014	3000 m	191 m	9 s	1 ms
AWI-20120015	3000 m	191 m	9 s	1 ms
AWI-20120016	3000 m	191 m	9 s	1 ms
AWI-20120017	3000 m	191 m	9 s	1 ms
AWI-20120018	3000 m	191 m	9 s	1 ms
AWI-20120019	3000 m	191 m	9 s	1 ms
AWI-20120020	3000 m	191 m	9 s	1 ms
AWI-20120021	3000 m	191 m	9 s	1 ms

AWI-20120022	3000 m	191 m	9 s	1 ms
AWI-20120023	3000 m	191 m	9 s	1 ms
AWI-20120024	3000 m	191 m	9 s	1 ms
AWI-20120025	3000 m	191 m	9 s	1 ms
AWI-20120026	3000 m	191 m	9 s	1 ms
AWI-20120027	3000 m	191 m	9 s	1 ms
AWI-20120028	3000 m	191 m	9 s	1 ms

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5.1.3 Preliminary results

We have collected one seismic reflection line crossing the Western Plateau and 28 seismic reflection lines across the High Plateau (Figure 5.3). The Western Plateau is characterised by a rugged basement topography, which strongly influences the sedimentary deposits. The sedimentary column is up to 300 ms thick. Basement high rise up to 1500 ms over the seafloor and prevent a continuous sedimentary layer. Instead, smaller depressions filled with sediments are formed. Towards the southeast the Danger Island Trough forms the boundary towards the High Plateau. It is a deep trough filled with at least 600 ms thick sediments.

We have crossed DSDP Leg 33 Site 317, located on the central High Plateau, twice (Figure 5.3). This enables a good correlation of the seismic reflection data with lithological information and the age-depth model developed for Site 317 (Shipboard Scientific Party, 1976) (Figure 5.4). Four units were drilled at Site 317 ranging in age from older than Aptian-Barremian to Quaternary (Shipboard Scientific Party, 1976). The units comprise basalt (unit 4, > 120 Ma), limestone and volcaniclastics (unit 3, Maestrichtian to Aptian), cherts and chalks (unit 2, early Eocene to middle Miocene), and calcareous ooze (unit 1, Quaternary). Six horizons subdividing the sedimentary column can be identified (Shipboard Scientific Party, 1976, Ai *et al.*, 2008): R7- top basalt at 870 ms, R6- top of megasequence 3 (limestone) at 600 ms, R5- top of megasequence 2 (cherty chalk) at 395 ms, R4- early Miocene at 225 ms, R3- middle Miocene at 170 ms, R2- late Miocene at 70 ms, and R1 forming the seafloor. All horizons can be identified clearly in our data (Figure 5.4). Horizon R6 appears as a strong unconformity with the top layers resting unconformably on it. Horizon R5 shows onlap terminations onto horizon R6.

The sedimentary sequences are very parallel on High Plateau, which allows a good correlation of the reflections. Towards the plateau's flanks they show strong erosion with some of the layers almost completely removed (Figure 5.5). In a few places we observe large scale intrusions, which disturb the Cretaceous sequences. These point towards a reactivation of magmatism in Late Cretaceous-Early Tertiary times. We also identify a number of graben structures affecting the Cretaceous layers indicating extensional tectonic processes. These may document the separation process of the Manihiki Plateau from the Hikurangi and Ontong-Java Plateaus. Faults cut through the sedimentary layers in a number of places hinting on strong tectonic movements (Figure 5.5).

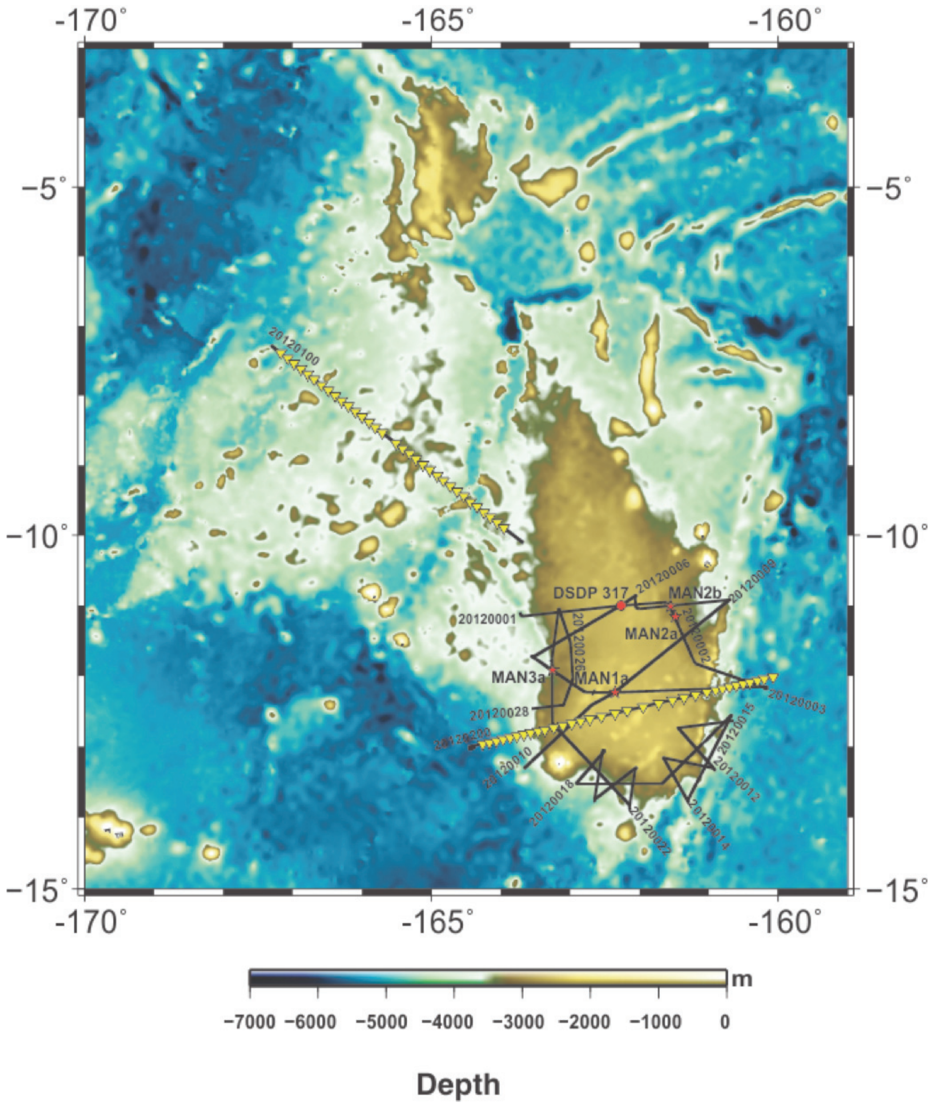

Fig. 5.3: Bathymetric map of the Manihiki Plateau with locations of the collected seismic lines in black. Yellow triangles show the locations of ocean bottom seismometers. Red dot shows the locations of DSDP Leg 33 Site 317 and red stars of sites proposed for IODP proposal 630.

At the eastern flank we observe a basement ridge rising up to 1000 ms above High Plateau's surface. This basement ridge appears to disturb the older, i.e. Cretaceous sequences, while the Tertiary sequences show onlap structures (Figure 5.6). This indicates a formation in Late Cretaceous-Early Tertiary times. This basement ridge forms the Manihiki Scarp. Towards the deep sea more basement highs covered by only very thin sediments can be observed.

The southern and central western flanks are also dominated by a basement ridge. Between this ridge and High Plateau a small basin filled with sediments up to 800 ms thick can be observed. In contrast to this the west-south western flank of High Plateau is not as steep and shows a dip of the Tertiary sedimentary sequences (lines AWI-20120005 and -20120006).

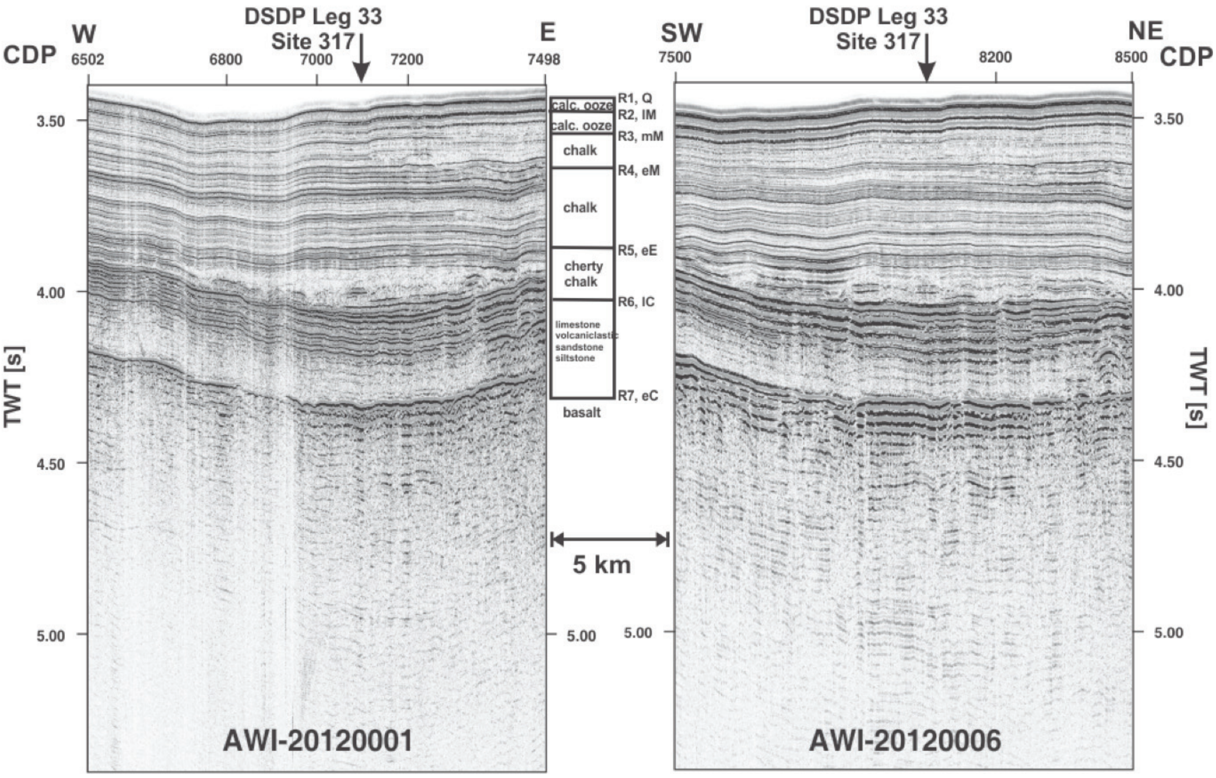

Fig. 5.4: Seismic lines AWI-20120001 and -20120006 showing the location of and lithology drilled at DSDP Leg 33 Site 317. Note the good correlation of seismic horizons and lithological unit boundaries. Q= Quaternary, lM= late Miocene, eM= early Miocene, eE= early Eocene, lC= late Cretaceous, eC= early Cretaceaous.

The very well defined seismic horizons allow a perfect identification of site locations for IODP proposal 630. Three locations had been picked by the proponents on High Plateau in order to sample the Cretaceous and Tertiary sediments as well as the basement (Erba *et al.*, 2005). The formation history and the later development of the Manihiki Plateau shall be resolved. In order to achieve these goals sites with a complete sedimentary column are needed. All site location were crossed twice with the collected seismic lines. Due to bad weather and problems with the equipment the location of Site Man-2a had to be relocated to Site Man-2b (Figure 5.3). Additionally, several crosslines were gathered to allow for further relocations of the sites.

Site Man-1a is located on seismic lines AWI-2012004 and -20120009 (Figure 5.3). All reflectors defines by Ai *et al.* (2008) can be identified easily with the unconformity of reflector R6 (top of volcaniclastics, late Cretaceous) being very prominent (Figure 5.7). At this location a complete section ranging from Quaternary sediments to Cretaceaous volcaniclastics covering the basement can be drilled. The basement itself shows several interal reflectors indicating an interlayering of basaltic flow sequences with sedimentary layers. The location of Site Man-2b (lines AWI-20120002 and -2012008) does not cover the complete sedimentary column (Figure 5.7). The upper layers ranging from calcareous ooze of Quaternary age to chalk of early Miocene age are missing. Strong erosion removed these sequences. If a complete sedimentary column is essential a further relocation of the site will be needed.

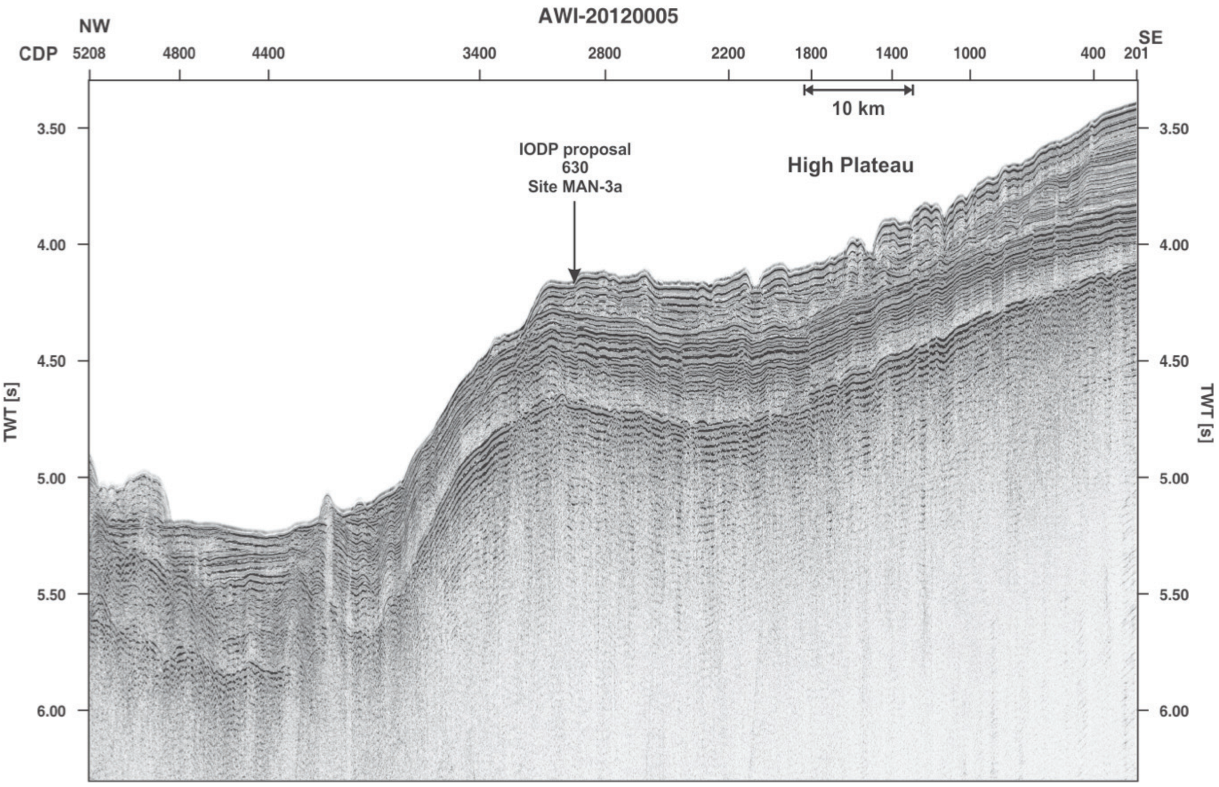

Fig. 5.5: Seismic profile AWI-20120005 across the western flank of High Plateau. Note the removal of the uppermost sedimentary sequences.

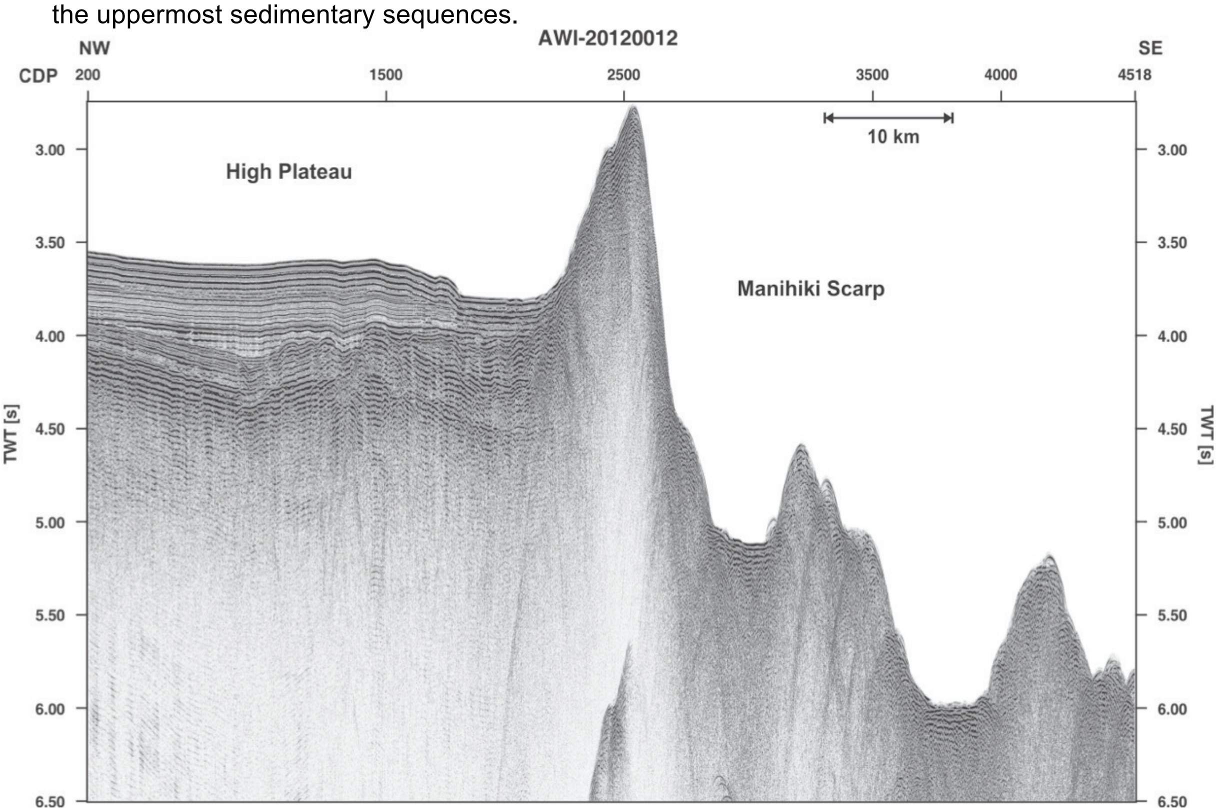

Fig. 5.6: Seismic profile AWI-20120012 across the eastern flank of the Manihiki Plateau, the Manihiki Scarp. Note the basement ridge at the flank deforming the sedimentary sequences.

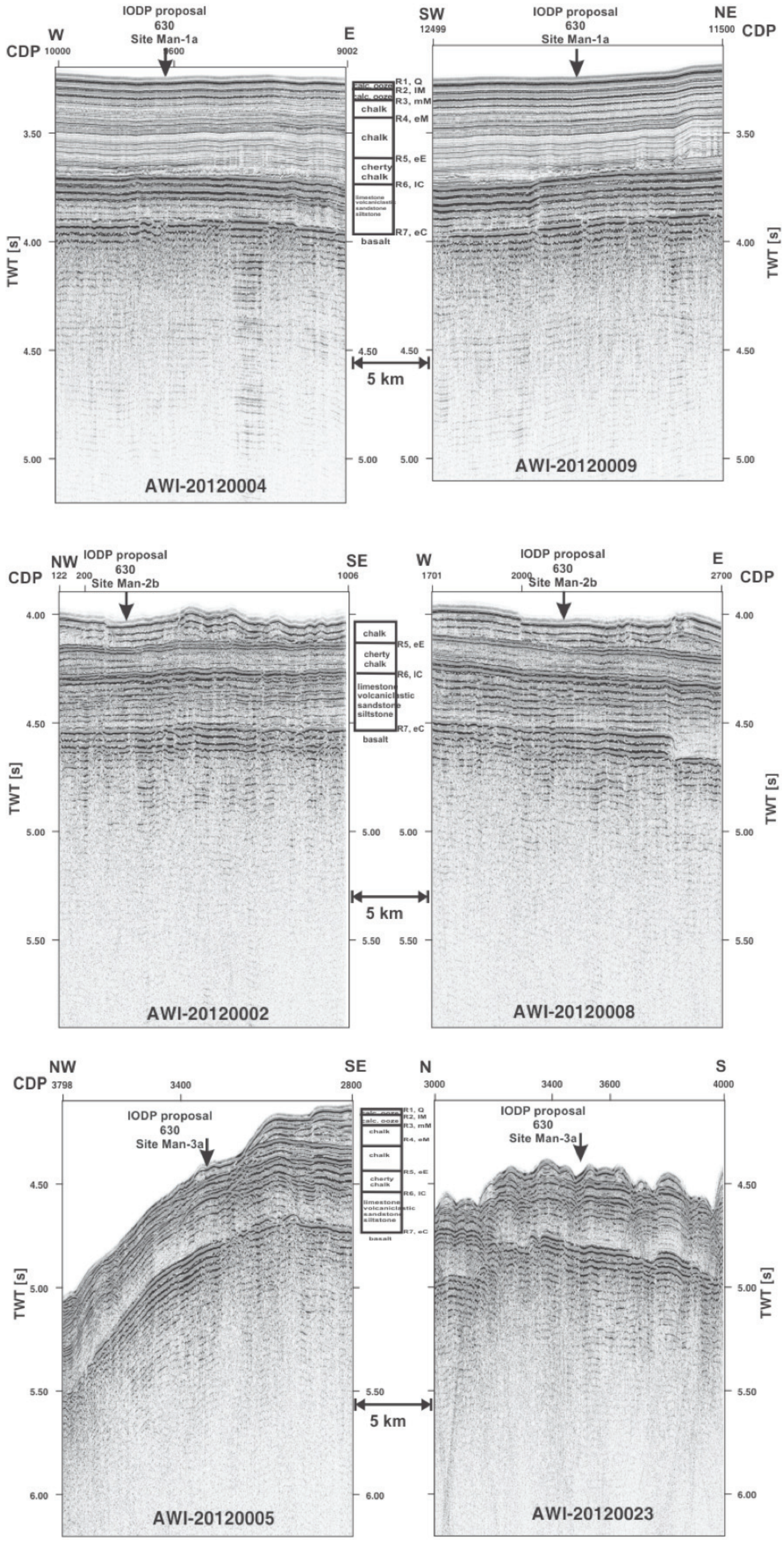

Fig. 5.7: Seismic lines crossing the proposed sites for IODP proposal 630. Q= Quaternary, lM= late Miocene, eM= early Miocene, eE= early Eocene, lC= late Cretaceous, eC= early Cretaceaous.

The location of site Man-3a was covered by seismic lines AWI-2012005 and -20120023. The sedimentary section is not complete at the location. A relocation of the site about 5 km to the east will ensure the recovery of a complete section of Quaternary to Cretaceous sediments (Figure 5.7).

5.2 Seismic refraction and wide-angle reflection surveying

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5.2.1 Objectives

The deep-crustal seismic profiling program of cruise SO224 was designed to reveal – for the first time – the structure and composition of the upper and lower crustal units, the crust-mantle boundary (Moho discontinuity) and the uppermost mantle beneath the Manihiki Plateau and its plateau margins. We planned the first profile AWI-20120100 such that it covers the Western Plateau from its western margin, which is conjugate to the eastern Ontong Java Plateau margin, to the Danger Islands Trough, which is suspected to be an internal failed rift, and across to the northwestern margin of the High Plateau. Profile AWI-20120200 extends from the southwestern margin of the High Plateau, which is conjugate to that of the northern Hikurangi Plateau, across the presumed thickest part of the central High Plateau and across its eastern margin into the Manihiki Scarp, which was presumably formed by a crustal shear process. In order to obtain records of higher resolution from the plateau margins, we increased the station intervals in these parts of the profile.

5.2.2 Method and equipment

The application of deep crustal seismic methods was one of the primary operational objectives of SO224 in order to reveal the deep structure and seismic velocity distribution of the crust and the crust-mantle boundary and the uppermost mantle of the Manihiki Plateau. We used seismic refraction and wide-angle reflection techniques to obtain the distribution of seismic P- and S-wave velocity fields from recordings of large-offset and deeply penetrating refracted and reflected waves at wide angles using ocean-bottom seismographs or hydrophones (OBS or OBH). In addition, we used the standard multi-channel seismic reflection (MCS) technique to image the outline and reflectivity characteristics of the sedimentary layers and the structure of the sub-sedimentary basement and lower crust by recording the returning near-vertical wavefield. Figure 5.1 illustrates the principles of both techniques.
The GEOMAR-type OBS and OBH systems consist of syntactic foam floats mounted on a steel frame together with the data logger and batteries in a pressure cylinder, an acoustic release, a seismometer (for OBS), a hydrophone, a radio beacon, a xenon flash light and a flag (Figure 5.8). The OBS systems are tightly connected to an anchor frame via the acoustic releaser. The OBH systems are anchored with a heavy steel bar connected to the release unit by a steel rope. The pressure cylinder contains the seismic data logger (MBS, MLS or MTS-type), manufactured by SEND GmbH, and a pack of 48 alkali batteries. The acoustic/time release units of type KUMQuat or IXSEA (formerly MORS/Oceano)

are attached to the frame with the corresponding clamp and to the anchor frame hook through a hook and the releaser latch of the OBS systems. The 3-component (4.5 s natural period) seismometer is mounted to the frame. A clamp bolt is screwed tightly against the seismometer to achieve a good coupling to the anchor frame. The hydrophones are of type HighTech (HTI) or E-2PD by OAS and are attached to the steel frame. The acoustic releaser types KUMQuat communicate via the K/MT 8011M deck unit, the IXSEA units communicate with the deck unit Oceano TT300. However, for recovering the systems from the seafloor, we used the ship-owned acoustic deck unit ORE Offshore 8011M, which communicates with both releaser types and which is connected to the hull-mounted hydrophone from the bridge. The advantage of this system is that it can be operated while the ship is in motion.

Fig. 5.8: Photos of the deployed OBS and OBH systems.

The recording parameters are set via the Java program *sendcom2* which also controls the time synchronisation of the internal recorder clock with an external GPS clock. For both deep crustal profiles, the sampling frequency on all channels was set to 250 Hz for the MBS and to 200 Hz for the MLS/MTS recorders. The gain was set to 5 for the hydrophone channel and to 9 for the three seismometer channels, respectively. The data were stored on 1 or 2 GB MicroDrive PCMCIA cards or flash cards of the MBS or MLS/MTS recorders. For detailed description of the components of the OBS systems, refer to the manuals by SEND GmbH. OBS/OBH deployments and recoveries of both profiles were conducted without major problems.
The seismic source for the OBS/OBH recordings consisted of an array of 8 G-Guns with 8.5 liters (520 in^3) volume each (total of 68 l = 4160 in^3), towed in

4 x 2 clusters at 10 m water-depth and fired at 210 bar every full minute. Trigger time was given by a Meinberg GPS clock for the first profile, and by the ship GPS clock for the second profile due to timing problems of the Meinberg clock. The shots were also recorded by the multichannel seismic (MCS) equipment (see chapter 5.1.2.1). The varying airgun configurations of this cruise are described in chapter 5.2.1.2.

5.2.3 Processing of seismic refraction/wide-angle data

The refraction seismic data were processed during the cruise to detect possible problems with the OBS/OBH and to allow for an initial assessment of the geological structures encountered along the two profiles. The main processing steps carried out include:

1. Download of navigation data and time adjustment of triggered shots
2. Download of the seismic raw data
3. Conversion of the raw data to SEGY format and quality control
4. Relocalization of the OBS/OBH positions
5. Adjustment of trace windows to correct GPS time (necessary for one record)
6. Data archiving

Download of navigation data and time adjustment of triggered shots
Navigation data were downloaded from the onboard Davis Ship (D-Ship) data acquisition system and transferred to a table according to format requirements by the *send2x* program of SEND GmbH (see *send2x* manual). These tables contain the GPS time, position (longitude and latitude) and water depth (center-beam of EM-120 multibeam system or Parasound depth).
As we encountered accuracy problems with the Meinberg clock used to time the trigger pulse of the airguns of profile AWI-20120100, we chose to generate the shot table for both profiles according to the accurate shot time recorded by an MBS recorder connected to the airgun trigger unit.

Download of the seismic raw data
After recovery of the OBS/OBH systems, the cylinders were opened and the drift (skew) of the recorder clock was measured by comparison with the time signal of the GPS clock, using the *sendcom2* program. A linear clock drift is assumed. The flash cards in the recorder were retrieved and transferred to a LINUX desktop computer (own by GEOMAR). Here the data on the cards (in native SEND format) were copied to disk together with the recorder parameter files.

Conversion to SEGY format and quality control
Initial SEGY files were created on the LINUX computer using the software *send2x* (SEND GmbH). The software demultiplexes the raw data and corrects for the drift of the OBS clock. Four SEGY files are obtained for each OBS and one for each OBH (only hydrophone). The four OBS files correspond to the four channels on the instrument:

Channel 1 - hydrophone
Channel 2 - horizontal geophone
Channel 3 - horizontal geophone
Channel 4 - vertical geophone

The output file names are generic names created by the software and contain information on the instrument, channel and recording time. Shot and station

positions are recorded in the SEGY headers in arc seconds. The record length is nominally 60 seconds with start-of-shot time given by a shot list with the recorded correct trigger-time.
For further processing, we used shell scripts as well as the software packages Seismic Unix (SU), Generic Mapping Tool (GMT) and ZP installed on the LINUX computer. The conversion to SEGY format, readable by SU, was done via the *send2x* program SEG-YWRITE. Initial shot-receiver offsets were added to the SEGY headers by a shell script using GMT routine *mapproject* and ZP program *segymodt*.

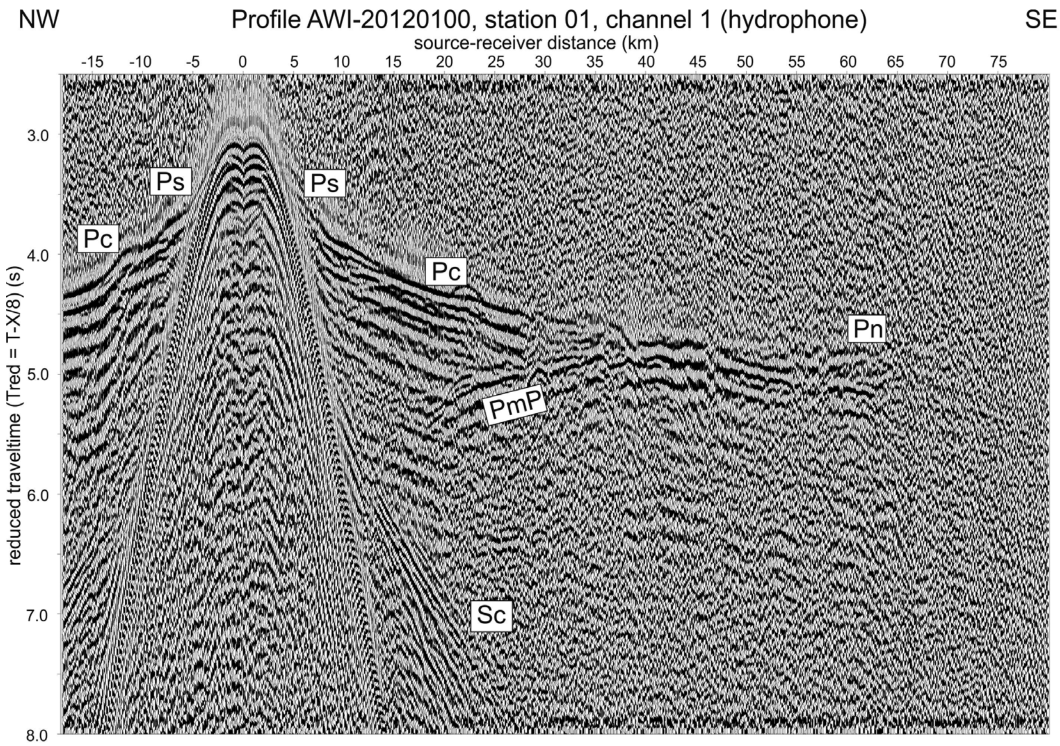

Fig. 5.9: Example of OBS record (hydrophone channel) from line AWI-20120100 of the Western Plateau. Dominant P-wave travel-time phases include refractions from the sedimentary cover (P_s), crustal refractions (P_c), Moho reflections (P_mP) and uppermost mantle refractions (P_n). The record also shows crustal S-wave refractions (S_c).

Relocalization of OBS/OBH positions

The OBS position at the seafloor differs from the deployment position of the instrument, which is related to currents while the OBS is sinking to the seafloor. Hence, the initial offsets calculated from the deployment position of the OBS have to be re-calculated. To obtain the minimum offset instrument position with respect to the recorded shot traces, the arrival times of the direct water wave in both directions were displayed at large scale, and a Δx (offset difference) was picked. This Δx was then added to or subtracted from the previous offset. These new offsets were written to the SEGY headers.

Adjustment of trace windows to correct GPS time (necessary for one record)

The records of OBS station 02 of profile AWI-20120100 were time-shifted by about 53 seconds. The reason for this shift is unknown. Later tests of the recorder showed an irregular skew implying that the internal clock is malfunctioning. We corrected the trace-onsets of all channel recordings according to the water-depth at this station and the average water velocity from CTD measurements. A time-shift of -54 s (only full seconds allowed) was applied with SEG-YWRITE. The remaining time-shift was done by applying a constant static correction in SU.*Data archiving*

For each folder for an OBS/OBH station, a number of data sets were archived:

1. The raw data retrieved from the flash cards (in native SEND format).
2. The initial SEGY files obtained from the *send2x software.*
3. One set of initial SEGY files that can be read by Seismic Unix on PC/Linux machines (little endian) and one set that can be read by SUN Unix machines (big endian) (*filename*.segy). This data set for PC/Linux has the offsets added to the headers that were calculated from the OBS/OBH deployment position (*filename*.segy.offsets).
4. One set of SEGY files with the re-calculated OBS/OBH positions and offsets in the headers (*filename*.segy.offsets.reloc).

The data are stored on an external USB hard disk with the file system mirrored on a second disk as backup. In addition to the seismic data, there are directories with the navigation files and plotted record sections for each OBS/OBH channel.

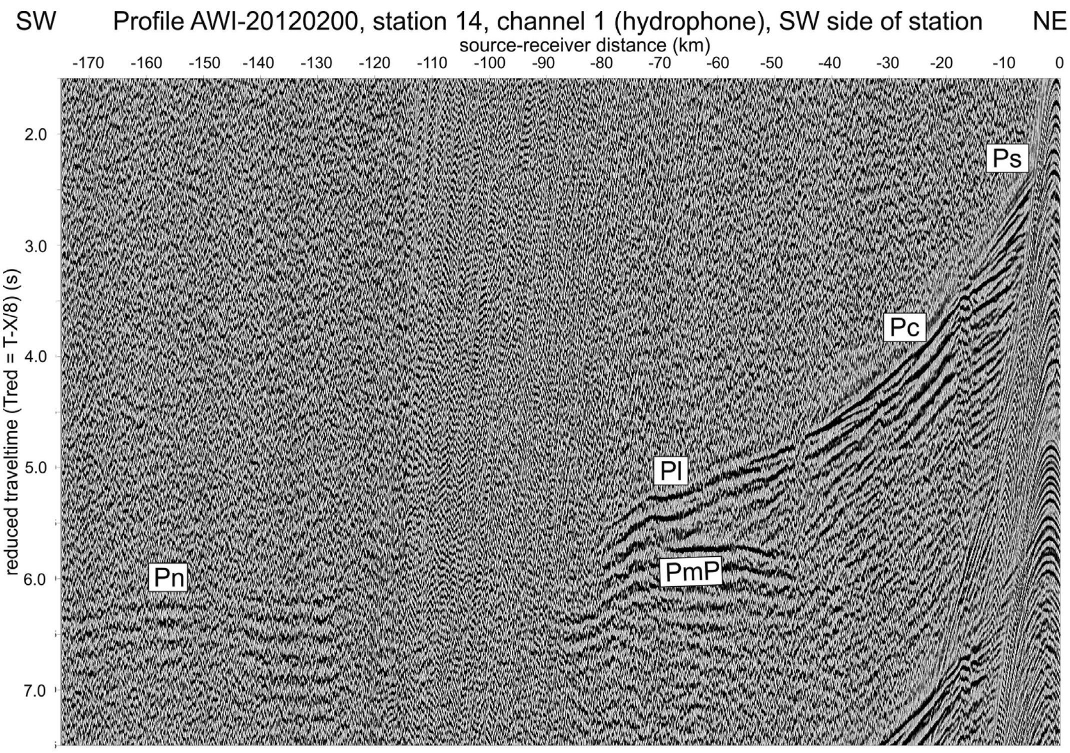

Fig. 5.10: Example of OBS record (hydrophone channel) from line AWI-20120200 across the High Plateau. Dominant P-wave travel-time phases include refractions from the sedimentary cover (P_s), upper crustal refractions (P_c), lower crustal refractions (P_l), Moho reflections (P_mP) and uppermost mantle refractions (P_n).

5.2.4 Preliminary results of refraction/wide-angle OBS data

The OBS/OBH data were displayed and plotted during the cruise mainly for data quality control. Any modelling for crustal structure and composition will be performed at AWI after the cruise as part of a doctoral project. In the following, we only show some data examples and preliminary travel-time phase identification.

5.2.4.1 Profile AWI-20120100

We deployed 33 OBS/OBH systems across the Western Plateau with a nominal station interval of 14.1 km. Of the deployed systems, two (stations 13 and 20) did not record on any channels due to malfunction of the recorder in one case and a human operator error in the second case. The data quality of the other systems ranges from very good to satisfying in the recording of P-wave phases, which can be observed at up to 135 km source-receiver offsets in the best records. In most cases, the hydrophone channel has the best signal-to-noise ratio even for S-wave phases (converted on seafloor to P-waves). Many of the seismometer recordings have a profound ringing in their data after the first-arrivals. The record example in Figure 5.9 clearly shows refracted first-arrival phases from the sediments (P_s) to the crust (P_c) and uppermost mantle (P_n) as well as high-amplitude reflections from the crust-mantle boundary (P_mP). Similar observations can be made from many of the other station records. A qualitative overview of the data quality of this profile is summarized in Table A.6.1.

5.2.4.2 Profile AWI-20120200

We deployed 33 OBS/OBH systems across the High Plateau with a variable station interval from 10.9 km across the plateau margins to 24.1 km over the central part of the plateau. Of the deployed systems, four (stations 12, 13, 16 and 24) did not record on any channels due to malfunction of the recorder in one case and wire connector problems in the other cases. One other station recorder (station 05) stopped recording prematurely so that seismic phases cannot be observed. The data quality of the other systems ranges from excellent to good in the recording of P-wave phases, which can be observed at up to 175 km source-receiver offsets in the best records. Very good S-wave phases (converted on seafloor to P-waves) were recorded by a large number of systems. Some of the seismometer recordings – but less than at profile AWI-20120100 – have a profound ringing in their data after the first-arrivals. The record example in Figure 5.10 clearly shows refracted first-arrival phases from the sediments (P_s) to the upper and lower crust (P_c and P_l) and uppermost mantle (P_n) as well as high-amplitude reflections from the crust-mantle boundary (P_mP). Similar observations can be made from many of the other station records. Some records show high-amplitude mid-crustal wide-angle reflections. S-wave records – primarily from the horizontal components of channels 2 and 3 – contain phases from the sedimentary cover (S_s), upper and lower crustal refractions (S_c and S_l), internal crustal reflections (S_iS), Moho reflections (S_mS) and uppermost mantle refractions (S_n) (example in Figure 5.11). A qualitative overview of the data quality of this profile is summarized in Table A.6.2.

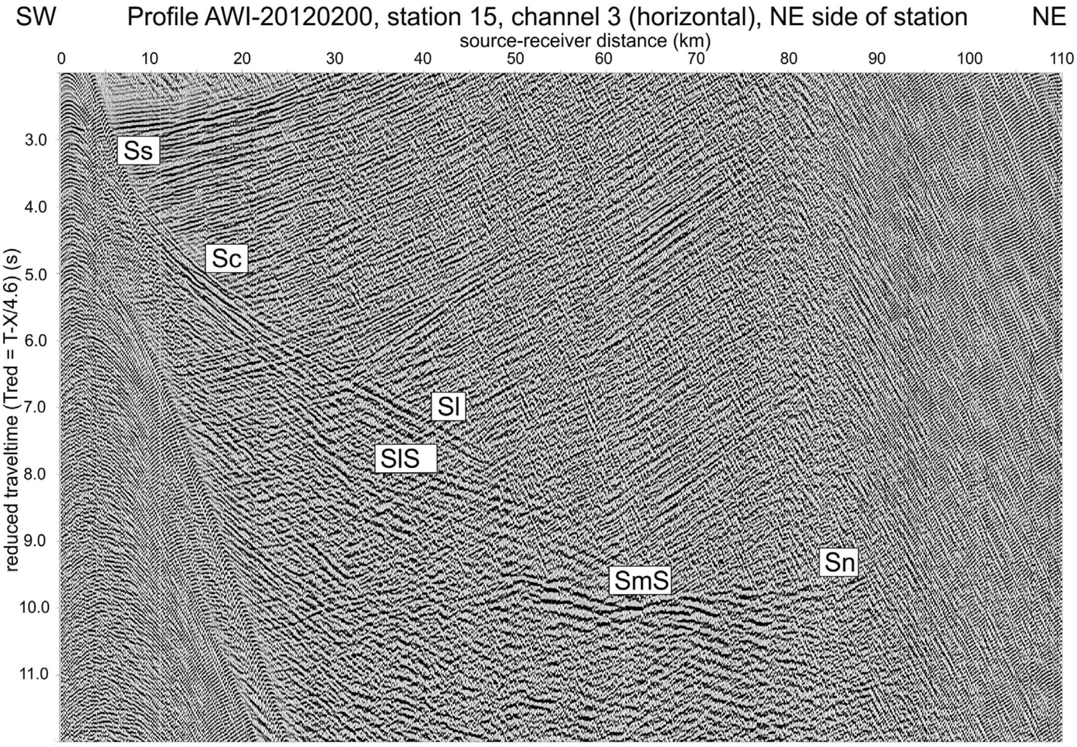

Fig. 5.11: Example of OBS record (horizontal seismometer channel) from line AWI-20120200 across the High Plateau. Dominant S-wave travel-time phases include refractions from the sedimentary cover (S_s), upper and lower crustal refractions (S_c and S_i), internal crustal reflections (S_iS), Moho reflections (S_mS) and uppermost mantle refractions (S_n).

5.3 Marine sediment echosounding using PARASOUND

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5.3.1 Scientific Objectives

Bottom and sub-bottom reflection patterns obtained by PARASOUND characterize the uppermost sediments of the ocean in terms of their acoustic behaviour down to about 200 m below the sea floor. This can be used to study depositional environments and their variation in space and time. The objectives of sediment echosounding during SO224 were:

- to provide a high-resolution counterpart for the uppermost sections of seismic profiles recorded during the cruise,
- to provide information about the sediment cover on top of Manihiki Plateau and seamount peaks

5.3.2 Technical aspects and modes of operation

RV *Sonne* is equipped with a Deep Sea Sediment Echo Sounder PARASOUND (ATLAS HYDROGRAPHIC, Bremen, Germany) DS III-P70. An overview about the system set up and operation of "PARASOUND DS III-P70" is given by Niessen *et al.* (in Klages and Thiede, 2011 and Niessen *et al.* (in Schiel, 2009).

The hull-mounted PARASOUND system generates two primary frequencies selectable between 18 and 23.5 kHz transmitting in a narrow beam of 4° at high power. As a result of the non-linear acoustic behaviour of water, the so-called "Parametric Effect", two secondary harmonic frequencies are generated of which one is the difference (e.g. 40 kHz) of the two primary frequencies, respectively. As a result of the longer wave length, the lower parametric frequency allows sub-bottom penetration up to 200 m (depending on sediment conditions) with a vertical resolution of about 0.30 m. The primary advantage of parametric echosounders is based on the fact that the sediment-penetrating pulse is generated within the narrow beam of the primary frequencies thereby providing a very high lateral resolution compared to conventional 4 kHz-systems.
On RV *Sonne*, PARASOUND DS III-P70 is controlled by two operator software packages plus server software running in the background. These processes are running simultaneously on a PC under "Windows XP". (i) ATLAS HYDROMAP CONTROL (Version 2.2.5) is used to run the system by an operator. The selected modes of operation, sounding options and ranges used during the cruise are summarized in Table 5.3. A list of abbreviations is given at the end of this chapter. (ii) ATLAS PARASTORE (Version 3.3.7) is used by the operator for on-line visualization (processing) of received data on PC screen, for data storage and printing. It can also be used for replaying of recorded data, post-processing and further data storage in different output formats (PS3 and/or SEG-Y). For any further details the reader is referred to the operator manuals of ATLAS HYDROMAP CONTROL, of ATLAS PARASTORE and some basic descriptions given by Niessen *et al.* (in Schiel, 2009).

Tab. 5.3: Settings of PARASOUND operation used on SO224

Used Settings	Selected Options	Selected Ranges
Mode of Operation	P-SBP/SBES	PHF, SLF
Frequency	PHF SLF	18.750 kHz 4.166 kHz
Pulse length	No. of periods Length	2 (normal operation) 0.5 ms at 2 periods
Transmission Source Level	Transmission Power Transmission Voltage	100% 158 V
Beam Steering	None	
Mode of Transmission	Pulse Train Quasi-Equidistant	300 ms Interval 400-700 ms
Pulse Type	Continuous Wave	
Pulse Shape	Rectangular	
Receiver Band Width	Output Sample Rate (OSR) Band Width (% of OSR)	6.1 kHz (manual mode) 66% (manual mode)
Reception Shading	None	
System Depth Source	Fix Min/Max Depth Limit	Other (EM-120) Manual ATLAS PARASTORE Controlled Atlas Parasound PHF
Water Velocity	C-Mean C-Keel	Manual 1500 m/s Manual 1500 m/s
Data Recording	PHF SLF	Full Profile Full Profile

5.3.3 Data acquisition, management, system failure and data quality

During SO224 digital data acquisition and storage were switched on with full data acquisition, when the 200 nm EEZ of Samoa was left on October 15 at 03:07 UTC. Acquisition and storage of data were finished on November 12 at 19:58 UTC after the working area was left and entering the 200 nm EEZ of Samoa. PARASOUND was continuously operating during the period stated above unless acquisition was interrupted by system crashes / necessary restarts and during OBS collection (Table 5.4). Acquisition included PHF and SLF data and traces were visualized as online profiles on screen. SLF profiles (200 m depth windows) were printed on A4 pages.
For the periods defined above eight different types of on-line data files were stored on hard discs:

(1-3) PHF data in ASD, PS3 and SEG-Y formats,
(4-6) SLF data in ASD, PS3 and SEG-Y formats,
(7) Navigation data and general PARASOUND settings (60 s intervals) in ASCII format,
(8) Auxiliary data about ATLAS PARASTORE settings in ASCII format.

Tab. 5.4: Summary of time windows when PARASOUND data acquisition was not possible due to system failure and repair, and when the system was on standby during OBS collection

Date 2012	From UTC	Until UTC	Duration (h)	reason
16.10.	01:45	01:58	0.22	RAM of Operator PC: adjustments and PC restart
19.10.	06:00		57.83	OBS collection
21.10.		15:50		
22.10.	00:50	00:58	0.13	RAM of Operator PC: PC restart
	04:15	04:50	0.03	2x CM-Recovery
23.10.	16:03	22:00	0.03	2x CM-Recovery
24.10.	00:18	09:09	4.50	Multiple CM-Recoveries; 4x PC restart; ('data not sent properly to sounder' message)
27.10.	13:20	13:30	0.16	RAM of Operator PC: PC restart
02.11.	08:32		43.41	OBS collection
04.11.		03:57		
07.11.	08:27	09:45	1.00	Water turbidity caused by ship: 2x PC restart, 'timeout while waiting for data'
10.11.	02:30	05:51	3.35	CM-Recovery, 'data not sent properly to sounder', 'SPM in Error state', HVPM communication error (hardware problem)
	06:49	22:49	0.16	10x CM-Recovery
11.11.	00:15	23:48	0.45	17x CM-Recovery; 1x PC restart
12.11.	00:33	16:26	0.25	15x CM-Recovery
Sum of time without data (h)			10.30	Due to system crashes and CM recoveries, without OBS collection time
Sum of time without data (h)			4.35	System crashes only
Sum of OBS collection time (h)			101.25	System on standby
Sum of operation time (h)			611.85	Incl. operation time without OBS collection time

All ASD data files stored are automatically packed into "cabinet files" by Atlas software. The files are named according to date and time of recording (containing about 5 minutes of acquired data per ASD file, about 10 minutes of data per PS3 or SEG-Y file). The data have been sorted by the operator into

folders according to data type and recording dates (0 to 24 hours UTC), copied to one external hard disk via fast USB-board and backed up on a second hard disc. In total 44,933 files in 156 folders of data with a total volume of 161 GB were stored on external discs. These data will be transferred to the AWI data base for being available through PANGAEA (www.pangaea.de) after publication. We will use the ship's database (full record of GPS-positions in one-minute intervals) for geo-referencing the PARASOUND data of the cruise.
During the entire period of acquisition the system was operator controlled (watch keeping). Book keeping was carried out including basic PARASOUND system settings, some navigation information, various kinds of remarks as well as a low-resolution bathymetry plot with hand-drawn sub-bottom sediment structures.
Data quality was good to very good throughout data acquisition and not affected by ship motion.
In total a number of 2 Operator PC or system crashes were observed during the cruise. One crash was caused by water turbidity caused by the ship, the other one was caused by hardware failure; several time an Operator PC restart was necessary due to RAM problems; CM-Recoveries were observed several times throughout the cruise; the data loss is summarized in Table 5.4. In total a period of 10.30 hours of data acquisition was lost, which is equivalent to 1.68% of the total time of PARASOUND operation, where profiling in the area under investigation was carried out (OBS collection time not included, Table 5.4). In addition we have noted several CM-recoveries, after which the system returned to normal operation automatically. CM recoveries caused small losses of data as each time acquisition interrupted for periods between 30 and 60 seconds (Table 5.4 – calculated for data loss of 60 seconds per CM-recovery).

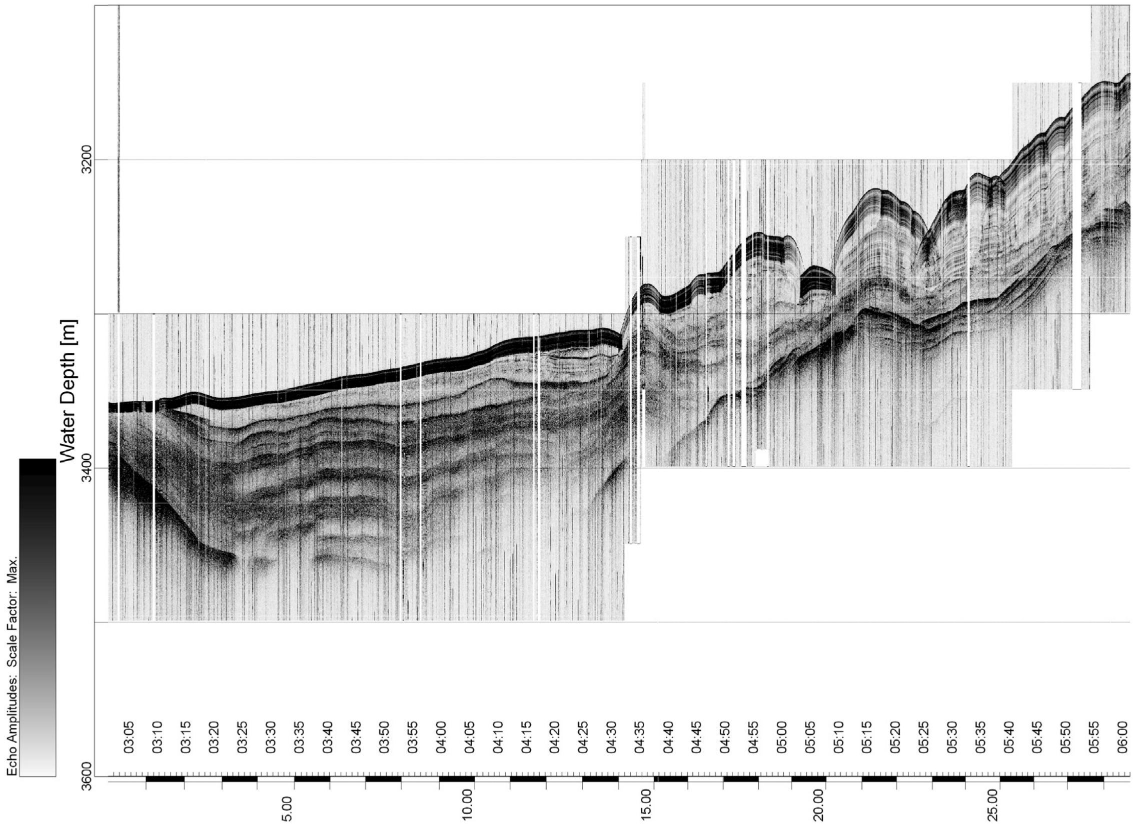

Fig. 5.12: PARASOUND profile recorded on seismic line AWI-20120001 (22.10.2012, 03:00-06:00 UTC). Plot produced using SeNT software (Hanno Keil, MARUM, University of Bremen).

5.3.4 List of abbreviations

ASCII	American Standard Code for Information Interchange
ASD	Atlas Sounding Data
C	Water sound velocity
CM	Control Module
EEZ	Exclusive Economic Zone
EM-120	Multi-Beam System (SIMRAD Echosounder)
mbsf	Meters below sea floor
OBS	Ocean bottom seismometer
PHF	Primary High Frequency
P-SBP	Parametric Sub-bottom Profiling
PS3	Export format of PARASOUND data
P70	Product version of PARASOUND with 70 kW pulse transmission power
RV	Research Vessel
SBES	Single-Beam Echo-Sounder
SEG-Y	Society of Exploration Physicists-Standard Format for Seismic Data
SLF	Secondary Low Frequency
SPM	Signal Processing Module
USB	Universal Serial Board

5.4 Bathymetry (Simrad EM120)

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5.4.1 Objectives

Precise depth information and bathymetric charts of the Manihiki Plateau are fundamental for geophysical and geological interpretation. Monitoring data acquisition and careful data processing during the cruise ensures to obtain the best data quality. The seafloor topography of the Manihiki Plateau during SO224 is largely unknown. Predicted bathymetry based on satellite radar altimetry data published by Smith and Sandwell (1997) and sparse generalized bathymetric data measured by several ships equipped with swath echo sounders reveal the entire bathymetry of the research area. This data is included in the *General Bathymetric Chart of the Oceans (GEBCO)* data set *GEBCO_08 (URL: www.gebco.net)*, however the precision of the dataset is not sufficient for geoscientific work. Multibeam echosounder (MBES) measurements during SO193 in 2007, several other minor expeditions (Werner and Hauff, 2007) and data acquired during SO224 improves the bathymetric knowledge in this region. Detailed maps of the seafloor topography can be used for track planning for the next expedition (SO225) investigating the same area. Bathymetric data are required for geophysical/geological pre-site surveys in preparation of site-proposals to the Integrated Ocean Drilling Program (IODP). Furthermore the acquired and processed bathymetry will be added to the GEBCO dataset. Bathymetric data on board *Sonne* were acquired with the echo sounder system *Kongsberg Simrad EM120* and mainly processed with the software *CARIS HIPS AND SIPS 6.1*.

5.4.2 Work at sea

Technical settings

The MBES *Kongsberg Simrad EM120* transmits 191 beams per ping and can operate from 20m to 11,000m 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 nearly 6 times swath coverage of the current water depth can be measured. The single beams have a footprint size (beamwidth) 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.

Data acquisition

Data acquisition started outside of the adjacent *exclusive economic zones* (EEZ) on the 15th of October 2012 at 03.07h UTC and the multibeam device was permanently switched off on the 12th of November 2012 at 20.00h UTC. The MBES *Kongsberg Simrad EM120* was running and recording data throughout the cruise with only 8 minutes total data loss due to system failure and 14 minutes due to bad weather conditions. During OBS-Recovery the MBES was switched of to avoid interferences with the release code frequency's (both systems operate with a frequency of 12kHzThe data were acquired by the Kongsberg acquisition software *Seafloor Information* System (SIS) V3.8.3 and stored in 30 min blocks in the SIMRAD raw data *.all-format. The ping mode was set to *deep and t*he beam spacing was set always to *equidistant* due to in general good weather conditions throughout the cruise. During data acquisition the aperture angle was always constantly adjusted by the surveyor. The aperture angle were mostly set between 150° and 130°, however in depth about 4km the aperture angle during moderate till bad sea conditions were reduced to 110° and in depth about 3km to 90° due to signal loss to the slant beams.

Sound velocity correction

An adequate sound velocity profile (SVP) during a bathymetric survey is crucial to avoid depth and positioning error due to refraction. In order to apply the sound velocity correction on the bathymetric data, physical properties of seawater (conductivity, temperature, pressure) in the water column have to be determined via a CTD-cast. A CTD-cast (Figure 5.13) was performed simultaneously during the second releaser test of the OBS at the beginning of the cruise. The data were acquired with the *Sea-Bird SBE Model 11 plus CTD DECK UNIT* using the software *Sea-Bird Seasave 7.20S* and processed with the software *Sea-Bird SBE Data Processing V.7.20b*. The CTD-cast was performed on the 13th of October 2012 (20:02h UTC) at 08°22,58'S / 168°23,58'W down to 3,980m (Figure 5.13). The sound velocity is calculated after *Del Grosso* equation (Del Grosso, 1974). However, in addition to SVP, a sound velocity sensor installed close to the transducer arrays measures the sound speed at the upper surface layer of the seawater. The sound speed is also transmitted to the SIS and used for sound velocity correction. The SVP was imported into SIS and applied on the bathymetric data during data acquisition and processing.

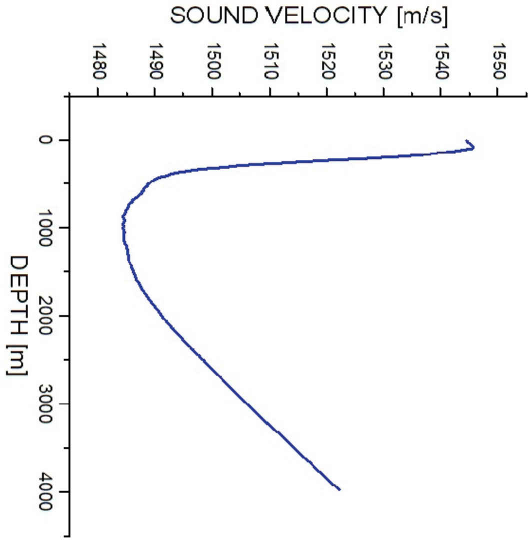

Fig. 5.13: SVP used for sound velocity correction during SO224

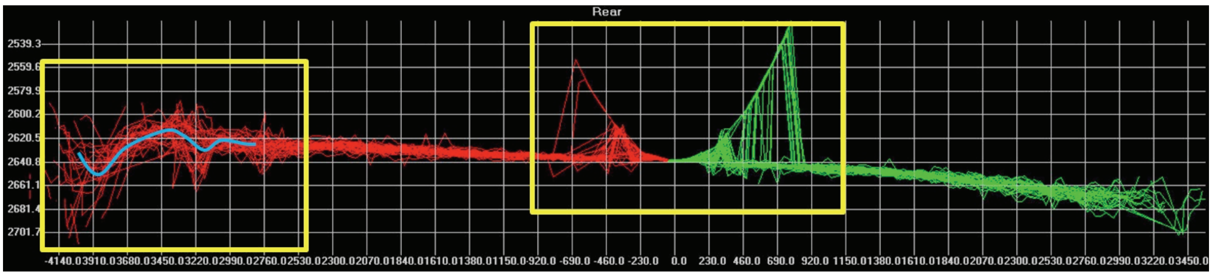

Fig. 5.14: Systematical error in depth acquisition (rear view with *Swath Editor*) In the centre of the swath (right yellow box) the beams are crooked upward with a parabolic form. At port side (left yellow box) the slant beams are crooked downwards, however the same problem occurred also sometimes on starboard side.

Data processing

The data were processed with the software *CARIS HIPS AND SIPS 6.1.* The raw data acquired by the SIS software were converted into the *HDCS*-format with the *conversion wizard* tool. Navigation errors were checked with the *Navigation Editor* and measured errors in depth values were erased manually with the *Swath Editor* and *Subset Editor* (Figure 5.14). To ensure to have true depth information's of the seafloor, bathymetric maps (grids) were calculated using the *BASE Surfaces* function and used for quality checks (Figure 5.15). Finally the data were exported to an ASCII-format to create maps with the open source software package *Generic Mapping Tool* (GMT) (Wessel and Smith, 1995). Systematical errors in depth acquisition were observed, especially in flat areas on the *Western Plateau* and *High Plateau* during calm sea conditions (Figure 5.14 and Figure 5.15). Once the bathymetry were getting more diverse the systematical error disappeared.

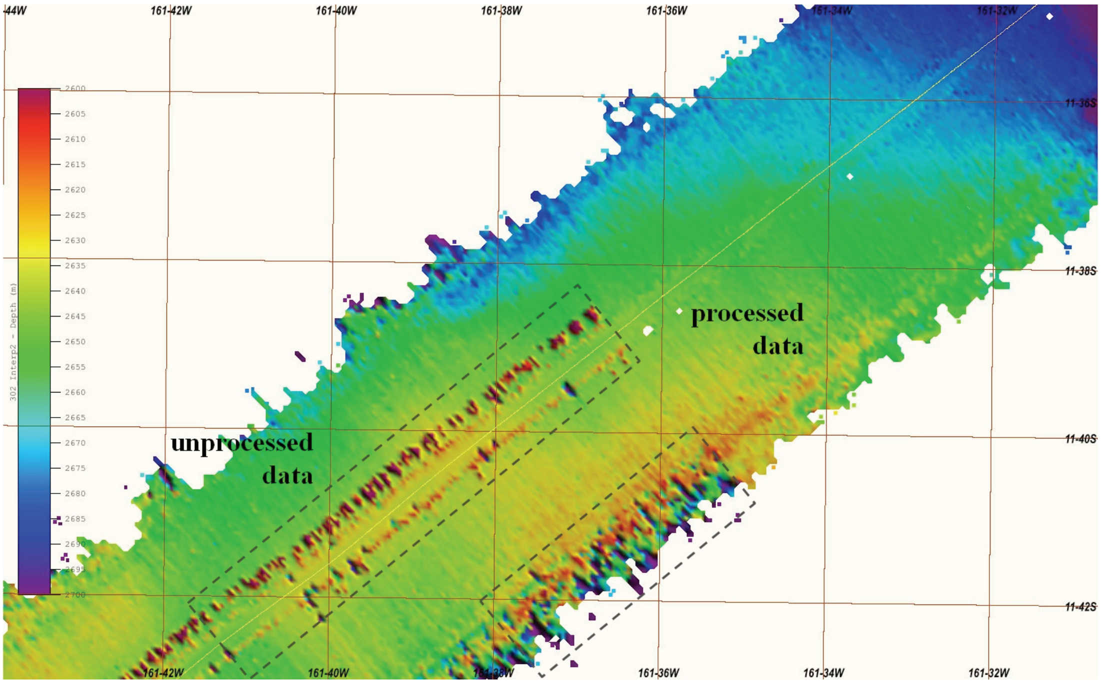

Fig. 5.15: Comparison of unprocessed and proceed data (the grid is calculated with the *base surface* function) The consequence of the systematical error (dotted grey boxes) in the depth acquisition can clearly be seen causing "railway-tracks" in the bathymetry.

Delivery of navigation and depth information to assist seismic analysis

For geophysical analyses of the seismic data (see chapter 5.1), navigation files with depth information of the nadir beams from the MBES were delivered on request to the scientists during the cruise. The data were obtained from the *Simrad EM120* raw data files (*.all) and processed with the *Bathy Conversion Wizard V.3.2* from Ralf Krocker (AWI) to the *.nak-format. The data were quality checked by the editor and data with errors in depth information were deleted. The quality check were performed without applying any statistical method, however apparently false measurements and systematical errors could clearly be seen in the data and erased manually (Figure 5.16). It is not known whether the frequently repeating systematical error originates from the data acquisition or data processing. During data cleaning about 1-5% of the measured nadir depth values were deleted during good weather conditions and up to 25% had to be deleted during bad weather conditions.

4	16-10-12	14:48:10	0	-10.08200	-163.69748	-10.08200	-163.69748	3565	0
5	16-10-12	14:48:21	0	-10.08214	-163.69731	-10.08214	-163.69731	4567	1002
6	16-10-12	14:48:32	0	-10.08226	-163.69713	-10.08226	-163.69713	4567	0
7	16-10-12	14:48:44	0	-10.08238	-163.69696	-10.08238	-163.69696	3562	-1005

Fig. 5.16: Example of a systematical error in depth acquisition of the nadir beam. It can be seen clearly that no sudden jump of 1002 meters in the topographic height in 11 seconds (with a cruising of 5 knots) is very likely. Furthermore it is unlikely to measure the same depth again at the next beam (a systematical error is assumed) followed by a sudden drop in height of 1005 meters after 12 seconds of cruising.

5.4.3 Preliminary results

Survey statistics

During SO224 27398161 soundings (pings) were recorded and 4,009,451 (17%) soundings were erased during data processing. Data were acquired on 27 separate days (data are stored in 1,175 raw-data files) and the bathymetry of 44,801km² were mapped (Figure 5.17).

Southern Manihiki Scarp

The bathymetry of the southern Manihiki Scarp (eastern boundary of High Plateau) shows elongated structures heading from north-north-east to south-south-west (Figure 5.18).

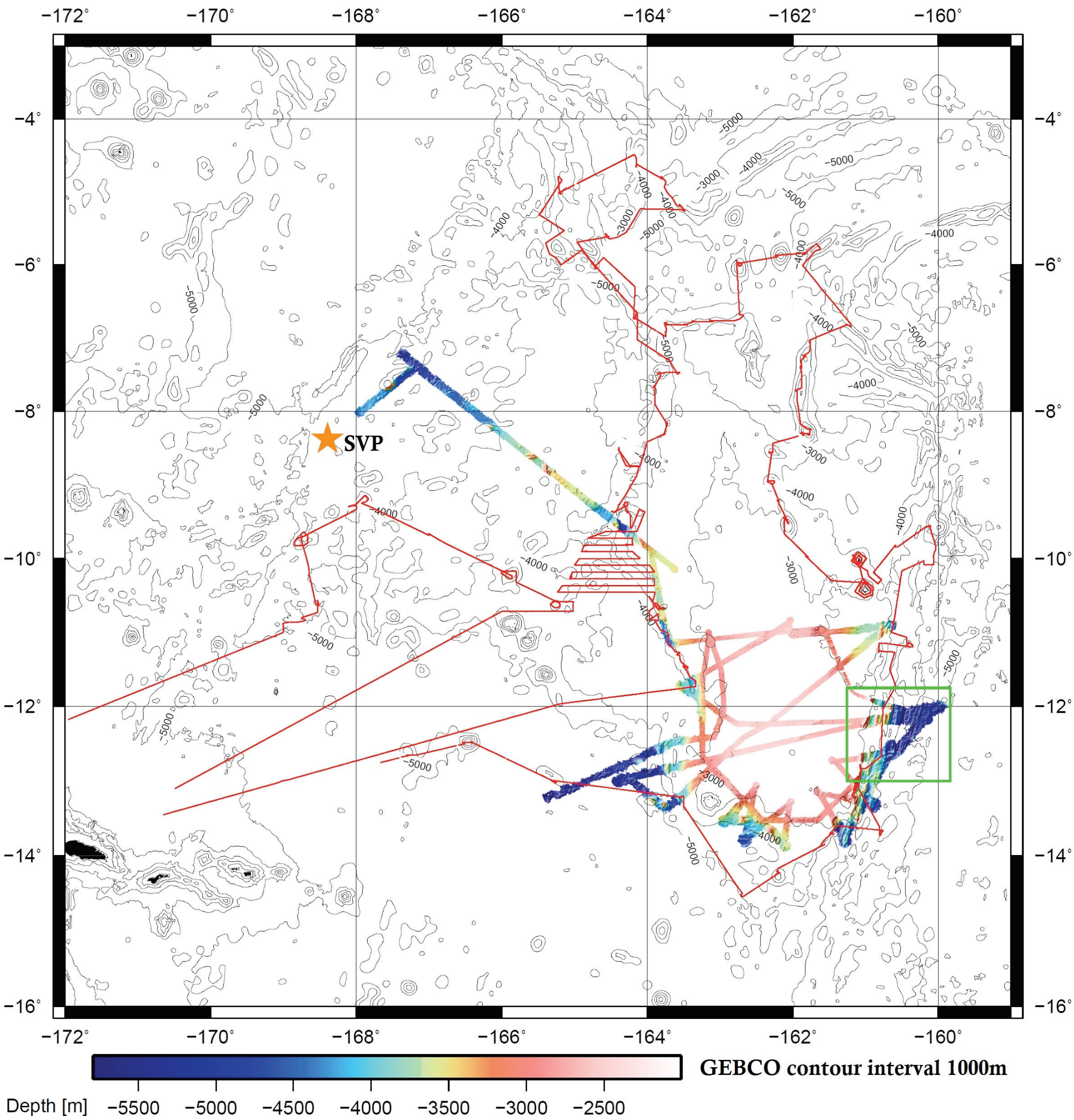

Fig. 5.17: MBES bathymetry of SO224, ship-track with measured bathymetry of SO193 and position of SVP. The 1000m contour lines (grey lines) are derived from the GEBCO_08 grid. Ship-tracks with measured bathymetry of SO193 is highlighted with a red line. The SVP position is marked with a orange star. Figure 5.18 in green box.

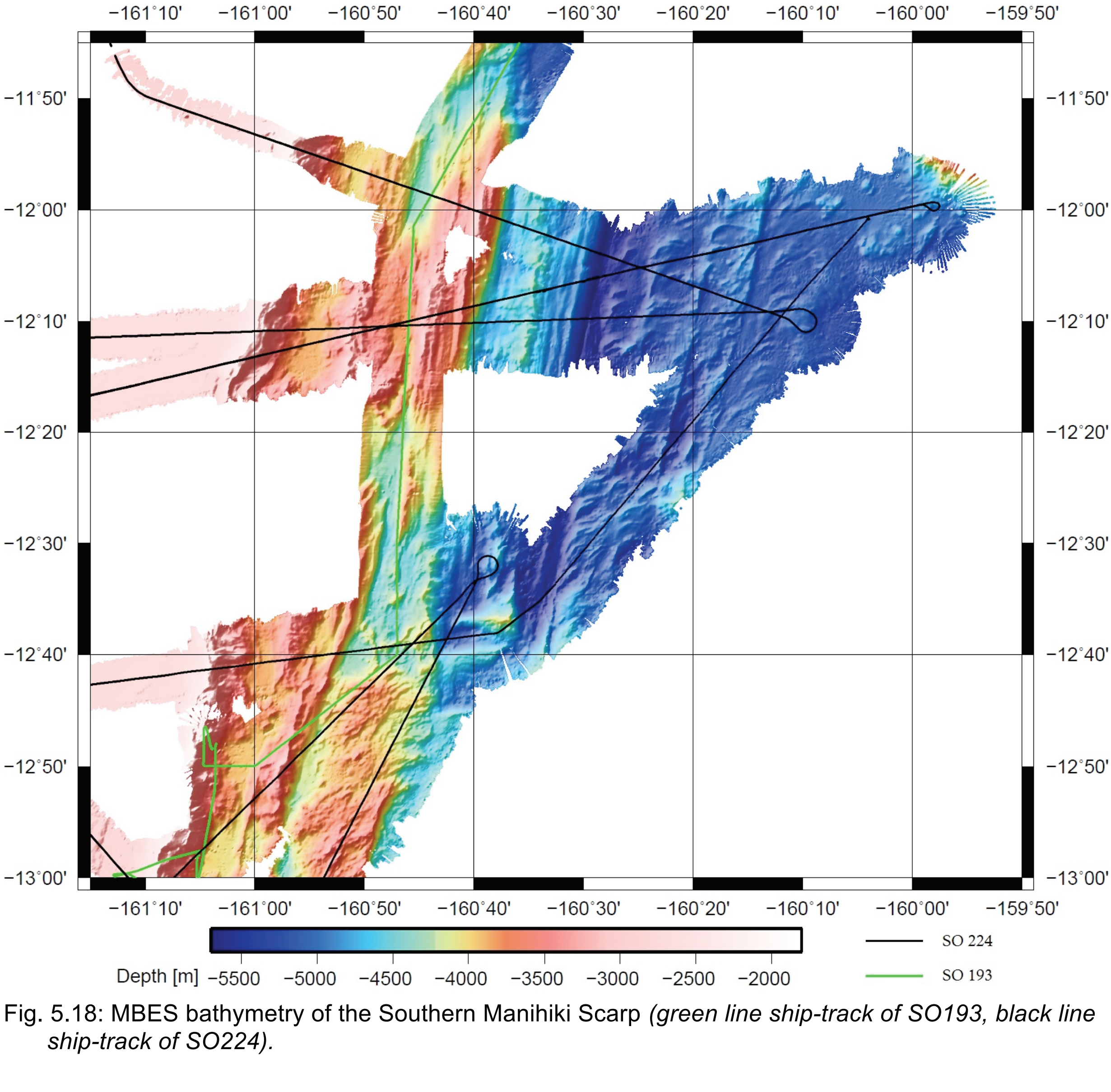

Fig. 5.18: MBES bathymetry of the Southern Manihiki Scarp *(green line ship-track of SO193, black line ship-track of SO224).*

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7. ACKNOWLEDGMENTS

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APPENDIX

A.1 TEILNEHMENDE INSTITUTE/PARTICIPATING INSTITUTIONS

A.2 FAHRTTEILNEHMER/CRUISE PARTICIPANTS

A.3 SCHIFFSBESATZUNG/SHIP'S CREW

A.4 STATIONSLISTE/STATION LIST

A.5 REGISTRIERPARAMETER DER REFLEXIONSSEISMIK/SEISMIC REFLECTION RECORDING PARAMETERS

A.6 OBS/OBH STATIONSLISTEN/STATION LISTS

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
Optimare	OPTIMARE Sensorsysteme AG Am Loners 15a 27572 Bremerhaven Germany

A.2 FAHRTTEILNEHMER / CRUISE PARTICIPANTS

Name/ Last name	Vorname/ First name	Institut/ Institute	Beruf/ Profession
Dr. Uenzelmann-Neben	Gabriele	AWI	Chief Scientist, reflection seismics
Castelino	Jude	AWI	Student, refraction seismics
Damaske	Daniel	AWI	Student, Simrad
Eggers	Thorsten	Optimare	Technician, Electronics
Freund	Madeleine	AWI	Student, Parasound
Dr. Gohl	Karsten	AWI	Senior Scientist, Refraction seismics
Gossler	Jürgen	AWI	Technician, Refraction seismics
Dr. Grützner	Jens	AWI	Post Doc, reflection seismics
Herman	Tobias	AWI	PhD student, refraction seismics
Hochmuth	Katharina	AWI	PhD student, seismic refraction
Horn	Michael	AWI	PhD student, seismic reflection
Huang	Xiaoxia	AWI	PhD student, seismic reflection
Kalberg	Thomas	AWI	PhD student, seismic refraction
Koch	Tobias	AWI	Student, Parasound
Müller-Michaelis	Antje	AWI	PhD student, seismic reflection
Penshorn	Dietmar	AWI	Technician, seismic reflection
Pietsch	Ricarda	AWI	PhD student, seismic reflection
Slaby	Beate	AWI	Student, Parasound
Suckro	Sonja	AWI	PhD student, seismic reflection

A.3 SCHIFFSBESATZUNG / SHIP'S CREW

No.	Name	Rank
1	Lutz Mallon	Master
2	Niels Aden	1. Offc.
3	Andreas Rex	Ch. Eng.
4	Ulrich Büchele	2. Offc.
5	Lars Hoffsommer	2. Offc.
6	Sabine Heuser	Doctor
7	Klaus Klinder	2. Eng.
8	Carsten Pieper	2. Eng.
9	Jörg Leppin	ELO
10	Wolfgang Borchert	System Manager
11	Torsten Bierstedt	Boatsw.
12	Denis Altendorf	A.B.
13	Oliver Eidam	A.B.
14	Arnold Ernst	A.B.
15	Frank Heibeck	A.B.
16	Finn Mohrdiek	A.B.
17	Robert Schernick	Apprentice
18	Michael Barkow	A.B.
19	Geert Hainke	Nautical student
20	Torsten Bolik	Motorman
21	Steven Ide	Motorman
22	Andreas Schröder	Apprentice
23	Rainer Rosemeyer	Fitter
24	Thomas Beyer	Electrician
25	Frank Tiemann	Cook
26	Andre Garnitz	Cooksmate
27	Andreas Pohl	1. Steward
28	Luis Royo	2. Steward

A.4 STATIONSLISTE / STATION LIST

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/001-1	13/10/12	20:00	10° 45,40' S	171° 23,55' W	4960	CTD	Beginn Station	
SO224/001-1	13/10/12	20:07	10° 45,34' S	171° 23,44' W	4964	CTD	zu Wasser	W: 5
SO224/001-1	13/10/12	21:31	10° 45,38' S	171° 23,56' W	4961	CTD	auf Tiefe	SLmax: 4000m
SO224/001-1	13/10/12	22:02	10° 45,38' S	171° 23,53' W	4960	CTD	Hieven	
SO224/001-1	14/10/12	0:24	10° 45,35' S	171° 23,48' W	4962	CTD	an Deck	
SO224/001-1	14/10/12	0:28	10° 45,35' S	171° 23,48' W	4965	CTD	Ende Station	rwK:046°/051°, d:4 nm/318 nm
SO224/002-1	14/10/12	20:00	8° 22,27' S	168° 23,63' W	4284	CTD	Beginn Station	
SO224/002-1	14/10/12	20:04	8° 22,27' S	168° 23,55' W	4282	CTD	zu Wasser	W:5
SO224/002-1	14/10/12	21:34	8° 22,21' S	168° 23,55' W	4280	CTD	auf Tiefe	SLmax: 4000m
SO224/002-1	14/10/12	22:10	8° 22,26' S	168° 23,54' W	4280	CTD	Hieven	SZmax: 19,7 kN
SO224/002-1	15/10/12	0:20	8° 22,18' S	168° 23,50' W	4279	CTD	an Deck	
SO224/002-1	15/10/12	0:24	8° 22,20' S	168° 23,50' W	4279	CTD	Ende Station	rwK: 051°, d: 94 nm
SO224/003-1	15/10/12	8:52	7° 23,20' S	167° 10,26' W	4882	OBS/OBH	Beginn Station	
SO224/003-1	15/10/12	8:53	7° 23,19' S	167° 10,24' W	4843	OBS/OBH	OBS zu Wasser	OBS # 01
SO224/003-1	15/10/12	9:46	7° 27,62' S	167° 4,40' W	4885	OBS/OBH	OBS zu Wasser	OBS # 02
SO224/003-1	15/10/12	10:37	7° 32,25' S	166° 58,84' W	4866	OBS/OBH	OBS zu Wasser	OBS # 03
SO224/003-1	15/10/12	11:28	7° 36,78' S	166° 52,91' W	4579	OBS/OBH	OBS zu Wasser	OBS # 04
SO224/003-1	15/10/12	12:22	7° 41,33' S	166° 46,98' W	4478	OBS/OBH	OBS zu Wasser	OBS # 05, rwK: 130°, d: 7 nm
SO224/003-1	15/10/12	13:09	7° 45,89' S	166° 41,49' W	4457	OBS/OBH	OBS zu Wasser	OBS # 06, rwK: 128°, d: 8 nm
SO224/003-1	15/10/12	14:00	7° 50,84' S	166° 35,16' W	4510	OBS/OBH	OBS zu Wasser	OBS # 07, rwK: 128°, d: 7 nm
SO224/003-1	15/10/12	14:51	7° 55,46' S	166° 29,17' W	4246	OBS/OBH	OBS zu Wasser	OBS # 08, rwK: 128°, d: 7 nm
SO224/003-1	15/10/12	15:40	8° 0,04' S	166° 23,20' W	4307	OBS/OBH	OBS zu Wasser	OBS # 09, rwK: 130°, d: 7 nm
SO224/003-1	15/10/12	16:27	8° 4,56' S	166° 17,76' W	4364	OBS/OBH	OBS zu Wasser	OBS # 10, rwK: 125°, d: 7sm
SO224/003-1	15/10/12	17:12	8° 8,65' S	166° 11,84' W	4370	OBS/OBH	OBS zu Wasser	OBS # 11, rwk: 131°, d: 8sm
SO224/003-1	15/10/12	17:57	8° 13,64' S	166° 5,90' W	3954	OBS/OBH	OBS zu Wasser	OBS # 12, rwk: 128°, d: 7sm
SO224/003-1	15/10/12	18:42	8° 18,18' S	165° 59,95' W	3937	OBS/OBH	OBS zu Wasser	OBS # 13, rwk: 128°, d: 7sm
SO224/003-1	15/10/12	19:31	8° 22,72' S	165° 54,01' W	3772	OBS/OBH	OBS zu Wasser	OBS # 14, rwk: 130°, d: 7sm
SO224/003-1	15/10/12	20:20	8° 27,27' S	165° 48,56' W	3770	OBS/OBH	OBS zu Wasser	OBS # 15, rwK: 128°, d: 7nm

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/003-1	15/10/12	21:13	8° 31,80' S	165° 42,64' W	3721	OBS/OBH	OBS zu Wasser	OBS # 16, rwK: 128°, d: 15nm
SO224/003-1	15/10/12	22:48	8° 40,86' S	165° 30,74' W	3754	OBS/OBH	OBS zu Wasser	OBS # 18, rwK: 128°, d: 7nm
SO224/003-1	15/10/12	23:41	8° 45,38' S	165° 24,84' W	3266	OBS/OBH	OBS zu Wasser	OBS # 19, rwK: 128°, d: 7nm
SO224/003-1	16/10/12	0:33	8° 49,98' S	165° 18,86' W	3572	OBS/OBH	OBS zu Wasser	OBS # 20, rwK: 130°, d: 7 nm
SO224/003-1	16/10/12	1:21	8° 54,52' S	165° 13,36' W	3432	OBS/OBH	OBS zu Wasser	OBS # 21, rwK: 128°, d: 7 nm
SO224/003-1	16/10/12	2:08	8° 59,05' S	165° 7,44' W	3519	OBS/OBH	OBS zu Wasser	OBS # 22, rwK: 128°, d: 7 nm
SO224/003-1	16/10/12	3:09	9° 3,59' S	165° 1,51' W	3588	OBS/OBH	OBS zu Wasser	OBS # 23, rwK: 128°, d: 7 nm
SO224/003-1	16/10/12	4:00	9° 8,52' S	164° 55,17' W	3636	OBS/OBH	OBS zu Wasser	OBS # 24, rwK: 128°, d: 8 nm
SO224/003-1	16/10/12	4:46	9° 13,07' S	164° 49,66' W	3686	OBS/OBH	OBS zu Wasser	OBS # 25, rwk: 130°, d: 7sm
SO224/003-1	16/10/12	5:37	9° 17,63' S	164° 43,71' W	3704	OBS/OBH	OBS zu Wasser	OBS # 26, rwk: 128°, d: 8sm
SO224/003-1	16/10/12	6:25	9° 22,14' S	164° 37,82' W	4297	OBS/OBH	OBS zu Wasser	OBS # 27, rwk: 125°, d: 7sm
SO224/003-1	16/10/12	7:11	9° 26,21' S	164° 31,88' W	4181	OBS/OBH	OBS zu Wasser	OBS # 28, rwk: 133°, d: 7sm
SO224/003-1	16/10/12	7:57	9° 31,21' S	164° 26,39' W	3613	OBS/OBH	OBS zu Wasser	OBS # 29, rwk: 125°, d: 7sm
SO224/003-1	16/10/12	8:44	9° 35,30' S	164° 20,45' W	4856	OBS/OBH	OBS zu Wasser	OBS # 30, rwK: 130° , d: 8nm
SO224/003-1	16/10/12	9:35	9° 40,24' S	164° 14,54' W	3964	OBS/OBH	Beginn Station	OBS # 31, rwK: 127° , d: 7nm
SO224/003-1	16/10/12	10:19	9° 44,26' S	164° 9,15' W	3806	OBS/OBH	OBS zu Wasser	OBS # 32, rwK: 128° , d: 7nm
SO224/003-1	16/10/12	11:07	9° 48,82' S	164° 3,18' W	3274	OBS/OBH	OBS zu Wasser	OBS # 33, rwK: 128° , d: 7nm
SO224/003-1	16/10/12	11:54	9° 53,33' S	163° 57,26' W	3457	OBS/OBH	OBS zu Wasser	OBS # 34. rwK: 128° , d: 8nm
SO224/003-1	16/10/12	12:52	9° 58,34' S	163° 51,22' W	3588	OBS/OBH	Kursänderung	rwK: 125°, d: 10 nm
SO224/003-1	16/10/12	13:47	10° 2,50' S	163° 45,32' W	3587	OBS/OBH	Ende Station	
Refraktionsseismisches Profil AWI 20120100								
SO224/004-1	16/10/12	13:54	10° 2,78' S	163° 44,94' E	0	Profil	Stationsbeginn	
SO224/004-1	16/10/12	13:55	10° 2,82' S	163° 44,86' E	0	Profil	Streamerendboje z.W.	(Typ "Gummi-Blubb")
SO224/004-1	16/10/12	13:56	10° 2,87' S	163° 44,80' W	3583	Profil	Bird z. W.	Bird # 01
SO224/004-1	16/10/12	14:00	10° 3,03' S	163° 44,56' W	3583	Profil	Bird z. W.	Bird # 02
SO224/004-1	16/10/12	14:05	10° 3,23' S	163° 44,24' W	3581	Profil	Bird z. W.	Bird # 03
SO224/004-1	16/10/12	14:16	10° 3,64' S	163° 43,65' W	3580	Profil	Bird z. W.	Bird # 04
SO224/004-1	16/10/12	14:21	10° 3,83' S	163° 43,37' W	3574	Profil	Bird z. W.	Bird # 05
SO224/004-1	16/10/12	14:31	10° 4,22' S	163° 42,82' W	3577	Profil	Bird z. W.	Bird # 06

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/004-1	16/10/12	14:42	10° 4,66' S	163° 42,19' W	3572	Profil	Bird z. W.	Bird # 07
SO224/004-1	16/10/12	14:54	10° 5,13' S	163° 41,52' W	3567	Profil	Bird z. W.	Bird # 08
SO224/004-1	16/10/12	15:05	10° 5,58' S	163° 40,88' W	3563	Profil	Bird z. W.	Bird # 09
SO224/004-1	16/10/12	15:23	10° 6,31' S	163° 39,85' W	3552	Profil	Bird z. W.	Bird # 10
SO224/004-1	16/10/12	15:42	10° 7,04' S	163° 38,78' W	3532	Profil	Bird z. W.	Bird # 11
SO224/004-1	16/10/12	16:00	10° 7,75' S	163° 37,78' W	3526	Profil	Bird z. W.	Bird # 12
SO224/004-1	16/10/12	16:06	10° 7,97' S	163° 37,46' W	3520	Profil	Streamer zu Wasser	SLmax.: 3000 nm
SO224/004-1	16/10/12	17:10	10° 7,63' S	163° 39,39' W	3545	Profil	Bb-Airgunarray zu Wasser	
SO224/004-1	16/10/12	17:26	10° 6,76' S	163° 39,93' W	3551	Profil	Stb-Airgunarray zu Wasser	
SO224/004-1	16/10/12	17:31	10° 6,48' S	163° 40,13' W	3555	Profil	Airgun eingeschaltet	
SO224/004-1	16/10/12	18:15	10° 4,28' S	163° 42,75' W	3576	Profil	Beginn Profil	rwk: 308°, d: 271sm
SO224/004-1	17/10/12	0:49	9° 44,36' S	164° 9,00' W	3805	Profil	Kursänderung	rwK: 307°, d: 7 nm
SO224/004-1	17/10/12	2:08	9° 40,32' S	164° 14,44' W	3955	Profil	Kursänderung	rwK: 307°, d: 7 nm
SO224/004-1	17/10/12	3:37	9° 35,35' S	164° 20,38' W	4859	Profil	Kursänderung	rwK: 305°, d: 7 nm
SO224/004-1	17/10/12	5:00	9° 31,32' S	164° 26,21' W	3626	Profil	Kursänderung	rwk: 313°, d: 7sm
SO224/004-1	17/10/12	6:29	9° 26,26' S	164° 31,83' W	4180	Profil	Kursänderung	rwk: 305°, d: 7sm
SO224/004-1	17/10/12	7:53	9° 22,16' S	164° 37,74' W	4223	Profil	Kursänderung	rwk: 308°, d: 7sm
SO224/004-1	17/10/12	9:20	9° 17,66' S	164° 43,65' W	3705	Profil	Kursänderung	rwK: 308°, d: 7nm
SO224/004-1	17/10/12	10:51	9° 13,09' S	164° 49,64' W	3666	Profil	Kursänderung	rwK: 310°, d: 7nm
SO224/004-1	17/10/12	12:20	9° 8,62' S	164° 55,05' W	3634	Profil	Kursänderung	rwK: 308°, d: 8 nm
SO224/004-1	17/10/12	14:04	9° 3,60' S	165° 1,49' W	3270	Profil	Kursänderung	rwK: 308°, d: 7 nm
SO224/004-1	17/10/12	15:39	8° 59,07' S	165° 7,42' W	3518	Profil	Kursänderung	rwK: 308°, d: 7 nm
SO224/004-1	17/10/12	17:15	8° 54,54' S	165° 13,37' W	3431	Profil	Kursänderung	rwk: 310°, d: 7sm
SO224/004-1	17/10/12	18:43	8° 50,00' S	165° 18,80' W	3595	Profil	Kursänderung	rwk: 308°, d: 8sm
SO224/004-1	17/10/12	20:21	8° 45,47' S	165° 24,76' W	3024	Profil	Kursänderung	rwK: 308°, d: 7nm
SO224/004-1	17/10/12	22:00	8° 40,90' S	165° 30,72' W	3761	Profil	Kursänderung	rwK: 310°, d: 8nm
SO224/004-1	17/10/12	23:38	8° 35,95' S	165° 36,59' W	3166	Profil	Kursänderung	rwK: 305°, d: 7nm
SO224/004-1	18/10/12	1:11	8° 31,85' S	165° 42,54' W	3724	Profil	Kursänderung	rwK: 308°, d: 7 nm
SO224/004-1	18/10/12	2:50	8° 27,30' S	165° 48,50' W	3752	Profil	Kursänderung	rwK: 310°, d: 7 nm
SO224/004-1	18/10/12	4:24	8° 22,78' S	165° 53,95' W	3769	Profil	Kursänderung	rwk: 308°, d: 7sm
SO224/004-1	18/10/12	6:00	8° 18,18' S	165° 59,97' W	3938	Profil	Kursänderung	rwk: 308°, d: 8sm
SO224/004-1	18/10/12	7:37	8° 13,64' S	166° 5,87' W	3894	Profil	Kursänderung	rwk: 311°, d: 8sm
SO224/004-1	18/10/12	9:19	8° 8,68' S	166° 11,78' W	4348	Profil	Kursänderung	rwK: 305°, d: 7nm
SO224/004-1	18/10/12	10:53	8° 4,58' S	166° 17,70' W	4370	Profil	Kursänderung	rwK: 310°, d: 7nm

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/004-1	18/10/12	12:27	8° 0,06' S	166° 23,16' W	4285	Profil	Kursänderung	rwK: 308°, d: 7 nm
SO224/004-1	18/10/12	14:00	7° 55,44' S	166° 29,17' W	4247	Profil	Kursänderung	rwK: 308°, d: 7 nm
SO224/004-1	18/10/12	15:34	7° 50,92' S	166° 35,07' W	4528	Profil	Kursänderung	rwK: 308°, d: 8 nm
SO224/004-1	18/10/12	17:16	7° 45,95' S	166° 41,43' W	4427	Profil	Kursänderung	rwk: 310°, d: 7sm
SO224/004-1	18/10/12	18:49	7° 41,36' S	166° 46,94' W	4476	Profil	Kursänderung	rwk: 308°, d: 7sm
SO224/004-1	18/10/12	20:25	7° 36,83' S	166° 52,84' W	4577	Profil	Kursänderung	rwK: 308°, d: 7nm
SO224/004-1	18/10/12	22:00	7° 32,36' S	166° 58,69' W	4686	Profil	Kursänderung	rwK: 310°, d: 7nm
SO224/004-1	18/10/12	23:38	7° 27,70' S	167° 4,28' W	4863	Profil	Kursänderung	rwK: 308°, d: 7nm
SO224/004-1	19/10/12	1:14	7° 23,18' S	167° 10,19' W	4879	Profil	Kursänderung	rwK: 310°, d: 10 nm
SO224/004-1	19/10/12	3:22	7° 16,94' S	167° 17,79' W	5038	Profil	Ende Profil	
SO224/004-1	19/10/12	3:42	7° 16,14' S	167° 18,76' W	5053	Profil	Bb-Airgunarray an Deck	
SO224/004-1	19/10/12	4:00	7° 15,43' S	167° 19,62' W	5021	Profil	Stb-Airgunarray an Deck	
SO224/004-1	19/10/12	4:03	7° 15,31' S	167° 19,77' W	5048	Profil	Beginn hieven Streamer	
SO224/004-1	19/10/12	5:17	7° 12,72' S	167° 23,27' W	5058	Profil	Streamer an Deck	
SO224/004-1	19/10/12	5:19	7° 12,65' S	167° 23,37' W	5057	Profil	Stationsende	
SO224/005-1	19/10/12	6:16	7° 18,74' S	167° 15,69' W	4926	OBS/OBH	Beginn Station	
SO224/005-1	19/10/12	6:17	7° 18,82' S	167° 15,60' W	4919	OBS/OBH	OBS ausgelöst	OBS # 01
SO224/005-1	19/10/12	7:34	7° 23,28' S	167° 10,19' W	0	OBS/OBH	OBS gesichtet	OBS # 01
SO224/005-1	19/10/12	7:44	7° 23,32' S	167° 10,08' W	4849	OBS/OBH	OBS an Deck	OBS # 01
SO224/005-2	19/10/12	7:50	7° 23,68' S	167° 9,66' W	4842	OBS/OBH	OBS ausgelöst	OBS # 02
SO224/005-2	19/10/12	8:55	7° 27,90' S	167° 4,32' W	4852	OBS/OBH	OBS gesichtet	OBS # 02
SO224/005-2	19/10/12	9:13	7° 27,85' S	167° 4,29' W	4855	OBS/OBH	OBS an Deck	OBS # 02
SO224/005-3	19/10/12	9:41	7° 30,40' S	167° 1,34' W	4862	OBS/OBH	OBS ausgelöst	OBS # 03
SO224/005-3	19/10/12	12:59	7° 32,50' S	166° 58,77' W	4804	OBS/OBH	OBS gesichtet	OBS # 03
SO224/005-3	19/10/12	13:36	7° 32,79' S	166° 58,60' W	4814	OBS/OBH	OBS an Deck	OBS # 03
SO224/005-4	19/10/12	14:22	7° 35,11' S	166° 55,37' W	4426	OBS/OBH	OBS ausgelöst	OBS # 04
SO224/005-4	19/10/12	14:51	7° 36,95' S	166° 53,08' W	4573	OBS/OBH	OBS gesichtet	OBS # 04
SO224/005-4	19/10/12	15:14	7° 37,09' S	166° 52,77' W	4603	OBS/OBH	OBS an Deck	OBS # 04
SO224/005-5	19/10/12	15:26	7° 37,70' S	166° 51,98' W	4568	OBS/OBH	OBS ausgelöst	OBS # 05
SO224/005-5	19/10/12	16:40	7° 41,64' S	166° 46,92' W	1003	OBS/OBH	OBS gesichtet	OBS # 05
SO224/005-5	19/10/12	16:49	7° 41,44' S	166° 47,08' W	4463	OBS/OBH	OBS an Deck	OBS # 05
SO224/005-6	19/10/12	17:04	7° 42,69' S	166° 45,47' W	4493	OBS/OBH	OBS ausgelöst	OBS # 06
SO224/005-6	19/10/12	18:22	7° 46,15' S	166° 41,56' W	4406	OBS/OBH	OBS gesichtet	OBS # 06
SO224/005-7	19/10/12	18:23	7° 46,15' S	166° 41,57' W	4406	OBS/OBH	OBS ausgelöst	OBS # 07

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/005-6	19/10/12	18:30	7° 46,03' S	166° 41,63' W	4405	OBS/OBH	OBS an Deck	OBS # 06
SO224/005-7	19/10/12	20:16	7° 51,12' S	166° 35,02' W	4497	OBS/OBH	OBS gesichtet	OBS # 07
SO224/005-8	19/10/12	20:17	7° 51,09' S	166° 35,06' W	4498	OBS/OBH	OBS ausgelöst	OBS # 08
SO224/005-7	19/10/12	20:30	7° 51,29' S	166° 35,13' W	4500	OBS/OBH	OBS an Deck	OBS # 07
SO224/005-8	19/10/12	21:37	7° 55,55' S	166° 29,29' W	4249	OBS/OBH	OBS gesichtet	OBS # 08
SO224/005-8	19/10/12	21:48	7° 55,69' S	166° 29,18' W	4245	OBS/OBH	OBMT gesichtet	OBS # 08
SO224/005-9	19/10/12	22:00	7° 56,46' S	166° 28,25' W	4161	OBS/OBH	OBS ausgelöst	OBS # 09
SO224/005-9	20/10/12	0:30	8° 0,31' S	166° 23,22' W	0	OBS/OBH	OBS gesichtet	OBS # 09
SO224/005-10	20/10/12	0:40	8° 0,19' S	166° 23,12' W	0	OBS/OBH	OBS ausgelöst	OBS # 10
SO224/005-9	20/10/12	0:44	8° 0,19' S	166° 23,04' W	0	OBS/OBH	OBS an Deck	OBS # 09
SO224/005-10	20/10/12	1:39	8° 4,86' S	166° 17,71' W	0	OBS/OBH	OBS gesichtet	OBS # 10
SO224/005-10	20/10/12	1:50	8° 4,69' S	166° 17,60' W	0	OBS/OBH	OBS an Deck	OBS # 10
SO224/005-11	20/10/12	1:52	8° 4,70' S	166° 17,57' W	0	OBS/OBH	OBS ausgelöst	OBS # 11
SO224/005-11	20/10/12	2:45	8° 8,96' S	166° 11,80' W	0	OBS/OBH	OBS gesichtet	OBS # 11
SO224/005-11	20/10/12	3:00	8° 8,81' S	166° 11,64' W	0	OBS/OBH	OBS an Deck	OBS # 11
SO224/005-12	20/10/12	3:04	8° 8,90' S	166° 11,50' W	0	OBS/OBH	OBS ausgelöst	OBS # 12
SO224/005-12	20/10/12	4:32	8° 13,88' S	166° 5,79' W	3949	OBS/OBH	OBS gesichtet	OBS # 12
SO224/005-12	20/10/12	4:39	8° 13,70' S	166° 5,87' W	3900	OBS/OBH	OBS an Deck	OBS # 12
SO224/005-13	20/10/12	4:45	8° 13,80' S	166° 5,55' W	4006	OBS/OBH	OBS ausgelöst	OBS # 13
SO224/005-13	20/10/12	5:51	8° 18,39' S	165° 59,80' W	3931	OBS/OBH	OBS gesichtet	OBS # 13
SO224/005-14	20/10/12	5:55	8° 18,31' S	165° 59,85' W	3931	OBS/OBH	OBS ausgelöst	OBS # 14
SO224/005-13	20/10/12	5:58	8° 18,26' S	165° 59,87' W	3934	OBS/OBH	OBS an Deck	OBS # 13
SO224/005-14	20/10/12	6:45	8° 22,60' S	165° 54,32' W	3778	OBS/OBH	OBS gesichtet	OBS # 14
SO224/005-15	20/10/12	6:48	8° 22,70' S	165° 54,15' W	3779	OBS/OBH	OBS ausgelöst	OBS # 15
SO224/005-14	20/10/12	6:56	8° 22,82' S	165° 53,83' W	3770	OBS/OBH	OBS an Deck	OBS # 14
SO224/005-15	20/10/12	7:40	8° 27,29' S	165° 48,67' W	2074	OBS/OBH	OBS gesichtet	OBS # 15
SO224/005-16	20/10/12	7:45	8° 27,33' S	165° 48,48' W	3760	OBS/OBH	OBS ausgelöst	OBS # 16
SO224/005-15	20/10/12	7:50	8° 27,32' S	165° 48,32' W	1051	OBS/OBH	OBS an Deck	OBS # 15
SO224/005-16	20/10/12	9:14	8° 31,71' S	165° 42,69' W	2729	OBS/OBH	OBS gesichtet	OBS # 16
SO224/005-16	20/10/12	9:24	8° 31,95' S	165° 42,42' W	2745	OBS/OBH	OBS an Deck	OBS # 16
SO224/005-17	20/10/12	10:13	8° 37,18' S	165° 35,57' W	3321	OBS/OBH	OBS ausgelöst	OBS # 18
SO224/005-17	20/10/12	11:27	8° 40,54' S	165° 30,76' W	3300	OBS/OBH	OBS gesichtet	OBS # 18
SO224/005-18	20/10/12	11:30	8° 40,59' S	165° 30,68' W	3700	OBS/OBH	OBS ausgelöst	OBS # 19
SO224/005-17	20/10/12	11:44	8° 40,83' S	165° 30,36' W	3300	OBS/OBH	OBS an Deck	OBS # 18
SO224/005-18	20/10/12	12:55	8° 45,19' S	165° 24,62' W	0	OBS/OBH	OBS gesichtet	OBS # 19

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/005-18	20/10/12	13:09	8° 45,29' S	165° 24,58' W	0	OBS/OBH	OBS an Deck	OBS # 19
SO224/005-19	20/10/12	13:16	8° 45,43' S	165° 24,51' W	0	OBS/OBH	OBS ausgelöst	OBS # 20
SO224/005-19	20/10/12	15:02	8° 49,82' S	165° 18,54' W	0	OBS/OBH	OBS gesichtet	OBS # 20
SO224/005-19	20/10/12	15:46	8° 49,75' S	165° 18,57' W	0	OBS/OBH	OBS an Deck	OBS # 20
SO224/005-20	20/10/12	15:53	8° 49,79' S	165° 18,64' W	0	OBS/OBH	OBS ausgelöst	OBS # 21
SO224/005-20	20/10/12	17:15	8° 54,39' S	165° 13,23' W	0	OBS/OBH	OBS gesichtet	OBS # 21
SO224/005-20	20/10/12	17:22	8° 54,43' S	165° 13,38' W	0	OBS/OBH	OBS an Deck	OBS # 21
SO224/005-21	20/10/12	17:28	8° 54,75' S	165° 13,05' W	0	OBS/OBH	OBS ausgelöst	OBS # 22
SO224/005-21	20/10/12	19:12	8° 58,89' S	165° 7,36' W	0	OBS/OBH	OBS gesichtet	OBS # 22
SO224/005-21	20/10/12	19:14	8° 58,92' S	165° 7,38' W	0	OBS/OBH	OBS ausgelöst	OBS # 23
SO224/005-21	20/10/12	19:19	8° 59,04' S	165° 7,45' W	0	OBS/OBH	OBS an Deck	OBS # 22
SO224/005-21	20/10/12	20:41	9° 3,47' S	165° 1,32' W	0	OBS/OBH	OBS gesichtet	OBS # 23
SO224/005-21	20/10/12	21:08	9° 3,45' S	165° 1,47' W	3590	OBS/OBH	OBS an Deck	OBS # 23
SO224/005-22	20/10/12	21:10	9° 3,39' S	165° 1,44' W	3590	OBS/OBH	OBS ausgelöst	OBS # 24
SO224/005-22	20/10/12	22:27	9° 8,44' S	164° 54,89' W	3636	OBS/OBH	OBS gesichtet	OBS # 24
SO224/005-22	20/10/12	22:37	9° 8,73' S	164° 55,20' W	3636	OBS/OBH	OBS an Deck	OBS # 24
SO224/005-23	20/10/12	22:40	9° 8,68' S	164° 55,26' W	3630	OBS/OBH	OBS ausgelöst	OBS # 25
SO224/005-23	20/10/12	23:50	9° 12,87' S	164° 49,58' W	0	OBS/OBH	OBS gesichtet	OBS # 25
SO224/005-23	21/10/12	0:08	9° 12,86' S	164° 49,67' W	0	OBS/OBH	OBS an Deck	OBS # 25
SO224/005-24	21/10/12	0:25	9° 13,70' S	164° 48,80' W	0	OBS/OBH	OBS ausgelöst	OBS # 26
SO224/005-24	21/10/12	1:35	9° 17,31' S	164° 43,79' W	0	OBS/OBH	OBS gesichtet	OBS # 26
SO224/005-25	21/10/12	1:55	9° 17,42' S	164° 43,66' W	0	OBS/OBH	OBS ausgelöst	OBS # 27
SO224/005-24	21/10/12	1:55	9° 17,42' S	164° 43,66' W	0	OBS/OBH	OBS an Deck	OBS # 26
SO224/005-25	21/10/12	3:34	9° 22,00' S	164° 37,82' W	0	OBS/OBH	OBS gesichtet	OBS # 27
SO224/005-25	21/10/12	4:02	9° 21,95' S	164° 37,64' W	0	OBS/OBH	OBS an Deck	OBS # 27
SO224/005-26	21/10/12	4:27	9° 23,77' S	164° 35,41' W	0	OBS/OBH	OBS ausgelöst	OBS # 28
SO224/005-26	21/10/12	5:31	9° 26,06' S	164° 31,84' W	0	OBS/OBH	OBS gesichtet	OBS # 28
SO224/005-26	21/10/12	5:49	9° 26,09' S	164° 31,93' W	0	OBS/OBH	OBS an Deck	OBS # 28
SO224/005-27	21/10/12	6:00	9° 26,75' S	164° 31,19' W	0	OBS/OBH	OBS ausgelöst	OBS # 29
SO224/005-27	21/10/12	7:48	9° 31,04' S	164° 26,42' W	0	OBS/OBH	OBS gesichtet	OBS # 29
SO224/005-27	21/10/12	8:00	9° 31,24' S	164° 26,45' W	0	OBS/OBH	OBS an Deck	OBS # 29
SO224/005-28	21/10/12	8:20	9° 32,98' S	164° 23,89' W	0	OBS/OBH	OBS ausgelöst	OBS # 30
SO224/005-28	21/10/12	9:32	9° 35,07' S	164° 20,30' W	0	OBS/OBH	OBS gesichtet	OBS # 30
SO224/005-28	21/10/12	9:48	9° 35,21' S	164° 20,51' W	0	OBS/OBH	OBS an Deck	OBS # 30
SO224/005-29	21/10/12	10:13	9° 37,00' S	164° 18,27' W	0	OBS/OBH	OBS ausgelöst	OBS # 31

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/005-29	21/10/12	11:17	9° 40,12' S	164° 14,40' W	0	OBS/OBH	OBS gesichtet	OBS # 31
SO224/005-29	21/10/12	11:32	9° 40,24' S	164° 14,67' W	0	OBS/OBH	OBS an Deck	OBS # 31
SO224/005-30	21/10/12	11:48	9° 41,34' S	164° 13,19' W	0	OBS/OBH	OBS ausgelöst	OBS # 32
SO224/005-30	21/10/12	12:55	9° 44,19' S	164° 9,19' W	0	OBS/OBH	OBS gesichtet	OBS # 32
SO224/005-31	21/10/12	12:55	9° 44,19' S	164° 9,19' W	0	OBS/OBH	OBS ausgelöst	OBS # 33
SO224/005-30	21/10/12	13:14	9° 44,11' S	164° 9,25' W	0	OBS/OBH	OBS an Deck	OBS # 32
SO224/005-31	21/10/12	14:40	9° 48,60' S	164° 3,58' W	0	OBS/OBH	OBS gesichtet	OBS # 33
SO224/005-31	21/10/12	14:57	9° 48,66' S	164° 3,22' W	0	OBS/OBH	OBS an Deck	OBS # 33
SO224/005-32	21/10/12	14:50	9° 48,65' S	164° 3,29' W	0	OBS/OBH	OBS ausgelöst	OBS # 34
SO224/005-32	21/10/12	16:31	9° 53,11' S	163° 57,58' W	3283	OBS/OBH	OBS gesichtet	OBS # 34
SO224/005-32	21/10/12	16:41	9° 53,12' S	163° 57,33' W	3277	OBS/OBH	OBS an Deck	OBS # 34
Reflexionsseismische Profile AWI 20120001 - 10								
SO224/006-1	21/10/12	22:59	10° 59,53' S	163° 45,10' W	4332	Profil	Stationsbeginn	
SO224/006-1	21/10/12	23:00	10° 59,59' S	163° 45,10' W	4232	Profil	Streamerendboje z.W.	Typ "Kenterprise" mit Dummy Horst
SO224/006-1	21/10/12	23:05	10° 59,90' S	163° 45,03' W	4304	Profil	Bird z. W.	No. 01
SO224/006-1	21/10/12	23:10	11° 0,22' S	163° 44,93' W	4287	Profil	Bird z. W.	No. 02
SO224/006-1	21/10/12	23:12	11° 0,34' S	163° 44,88' W	4233	Profil	Bird z. W.	No. 03
SO224/006-1	21/10/12	23:17	11° 0,63' S	163° 44,77' W	4191	Profil	Bird z. W.	No. 04
SO224/006-1	21/10/12	23:27	11° 1,22' S	163° 44,53' W	4361	Profil	Bird z. W.	No. 05
SO224/006-1	21/10/12	23:28	11° 1,28' S	163° 44,51' W	4383	Profil	Bird z. W.	No. 06
SO224/006-1	21/10/12	23:33	11° 1,57' S	163° 44,39' W	4421	Profil	Bird z. W.	No. 07
SO224/006-1	21/10/12	23:40	11° 2,02' S	163° 44,22' W	4430	Profil	Bird z. W.	No. 08
SO224/006-1	21/10/12	23:46	11° 2,40' S	163° 44,07' W	4441	Profil	Bird z. W.	No. 09
SO224/006-1	21/10/12	23:54	11° 2,90' S	163° 43,88' W	4426	Profil	Bird z. W.	No. 10
SO224/006-1	22/10/12	0:02	11° 3,42' S	163° 43,69' W	4429	Profil	Bird z. W.	No. 11
SO224/006-1	22/10/12	0:11	11° 4,01' S	163° 43,46' W	4439	Profil	Bird z. W.	No. 12
SO224/006-1	22/10/12	0:16	11° 4,32' S	163° 43,34' W	4438	Profil	Streamer zu Wasser	SL: 3000 m
SO224/006-1	22/10/12	0:33	11° 5,37' S	163° 42,92' W	4431	Profil	Bb-Airgunarray zu Wasser	
SO224/006-1	22/10/12	0:34	11° 5,43' S	163° 42,90' W	4430	Profil	Airgun eingeschaltet	(1. Schuß)
SO224/006-1	22/10/12	1:20	11° 8,64' S	163° 41,18' W	4424	Profil	Kursänderung	rwK: 084°, d: 85 nm
SO224/006-1	22/10/12	1:35	11° 8,96' S	163° 39,97' W	4430	Profil	Beginn Profil	rwK: 084°, d: 83 nm
SO224/006-1	22/10/12	18:13	11° 0,09' S	162° 15,81' W	2607	Profil	Kursänderung	rwk: 086°, d: 40sm
SO224/006-1	23/10/12	2:12	10° 57,15' S	161° 34,90' W	3012	Profil	Kursänderung	rwK: 156°, d: 14 nm
SO224/006-1	23/10/12	4:21	11° 6,71' S	161° 30,25' W	3029	Profil	Airgun abgeschaltet	

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/006-1	23/10/12	5:04	11° 9,52' S	161° 29,00' W	3080	Profil	Kursänderung	rwk: 156°, d: 43sm
SO224/006-1	23/10/12	5:20	11° 10,50' S	161° 28,56' W	3068	Profil	Airgun eingeschaltet	
SO224/006-1	23/10/12	7:20	11° 19,49' S	161° 24,55' W	4907	Profil	Airgun abgeschaltet	
SO224/006-1	23/10/12	9:05	11° 25,71' S	161° 21,81' W	2979	Profil	Airgun eingeschaltet	
SO224/006-1	23/10/12	14:28	11° 49,12' S	161° 10,92' W	3942	Profil	Kursänderung	rwK: 109°, d: 60 nm
SO224/006-1	23/10/12	17:51	11° 54,93' S	160° 54,94' W	2759	Profil	Airgun abgeschaltet	
SO224/006-1	23/10/12	18:08	11° 55,33' S	160° 53,78' W	3275	Profil	Airgun eingeschaltet	
SO224/006-1	24/10/12	3:07	12° 9,68' S	160° 11,72' W	15	Profil	Kursänderung	rwK: 268°, d: 5 + 125 nm
SO224/006-1	25/10/12	5:49	12° 14,00' S	162° 20,98' W	2455	Profil	Kursänderung	rwk: 270°, d: 25sm
SO224/006-1	25/10/12	10:45	12° 13,69' S	162° 46,12' W	2562	Profil	Kursänderung	rwK: 304° , d: 34 nm
SO224/006-1	25/10/12	17:28	11° 55,02' S	163° 14,97' W	3361	Profil	Kursänderung	rwk: 305°, d: 20sm
SO224/006-1	25/10/12	22:00	11° 43,00' S	163° 34,10' W	3606	Profil	Kursänderung	rwK: 059° , d: 86nm
SO224/006-1	26/10/12	16:11	11° 0,10' S	162° 15,81' W	2608	Profil	Kursänderung	rwK: 057°, d: 15 nm
SO224/006-1	26/10/12	19:26	10° 51,26' S	162° 1,99' W	2613	Profil	Airgun abgeschaltet	
SO224/006-1	26/10/12	19:27	10° 51,21' S	162° 1,92' W	2612	Profil	Kursänderung	rwk: 176°, d: 11sm
SO224/006-1	26/10/12	19:36	10° 50,78' S	162° 1,49' W	2617	Profil	Bb-Airgunarray an Deck	
SO224/006-1	26/10/12	20:16	10° 49,75' S	162° 3,18' W	2630	Profil	Bb-Airgunarray zu Wasser	
SO224/006-1	26/10/12	20:17	10° 49,80' S	162° 3,24' W	2628	Profil	Airgun eingeschaltet	
SO224/006-1	26/10/12	23:00	11° 1,94' S	162° 1,47' W	2511	Profil	Kursänderung	rwK: 084° , d: 29nm
SO224/006-1	27/10/12	4:39	11° 0,22' S	161° 33,23' W	3042	Profil	Kursänderung	rwk: 084°, d: 51sm
SO224/006-1	27/10/12	15:05	10° 54,93' S	160° 39,80' W	4032	Profil	Kursänderung	rwK: 231°, d: 5 + 126 nm
SO224/006-1	28/10/12	17:21	12° 13,94' S	162° 20,97' W	2454	Profil	Kursänderung	rwk: 241°, d: 22sm
SO224/006-1	28/10/12	21:44	12° 24,82' S	162° 40,88' W	2458	Profil	Kursänderung	rwK: 227° , d: 76nm
SO224/006-1	29/10/12	13:15	13° 18,27' S	163° 39,07' W	4867	Profil	Ende Profil	
SO224/006-1	29/10/12	13:16	13° 18,32' S	163° 39,13' W	4870	Profil	Airgun abgeschaltet	
SO224/006-1	29/10/12	13:30	13° 18,97' S	163° 39,82' W	4758	Profil	Bb-Airgunarray an Deck	
SO224/006-1	29/10/12	13:32	13° 19,06' S	163° 39,91' W	4911	Profil	Beginn hieven Streamer	
SO224/006-1	29/10/12	13:36	13° 19,23' S	163° 40,10' W	4747	Profil	Bird a. D.	Bird # 12
SO224/006-1	29/10/12	13:42	13° 19,49' S	163° 40,40' W	4732	Profil	Bird a. D.	Bird # 11
SO224/006-1	29/10/12	13:50	13° 19,83' S	163° 40,82' W	4816	Profil	Bird a. D.	Bird # 10
SO224/006-1	29/10/12	13:57	13° 20,14' S	163° 41,17' W	4656	Profil	Bird a. D.	Bird # 09
SO224/006-1	29/10/12	14:03	13° 20,43' S	163° 41,48' W	4510	Profil	Bird a. D.	Bird # 08
SO224/006-1	29/10/12	14:09	13° 20,72' S	163° 41,78' W	4679	Profil	Bird a. D.	Bird # 07
SO224/006-1	29/10/12	14:15	13° 21,01' S	163° 42,09' W	4443	Profil	Bird a. D.	Bird # 06
SO224/006-1	29/10/12	14:21	13° 21,30' S	163° 42,40' W	4359	Profil	Bird a. D.	Bird # 05

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/006-1	29/10/12	14:25	13° 21,50' S	163° 42,60' W	4338	Profil	Bird a. D.	Bird # 04
SO224/006-1	29/10/12	14:31	13° 21,81' S	163° 42,91' W	4351	Profil	Bird a. D.	Bird # 03
SO224/006-1	29/10/12	14:37	13° 22,09' S	163° 43,24' W	4304	Profil	Bird a. D.	Bird # 02
SO224/006-1	29/10/12	14:40	13° 22,24' S	163° 43,40' W	4420	Profil	Bird a. D.	Bird # 01
SO224/006-1	29/10/12	14:45	13° 22,48' S	163° 43,67' W	4411	Profil	Streamer an Deck	
SO224/006-1	29/10/12	14:49	13° 22,68' S	163° 43,89' W	4406	Profil	Streamerendboje a. D.	("Kenterprise")
SO224/006-1	29/10/12	14:50	13° 22,73' S	163° 43,95' W	4409	Profil	Stationsende	rwK: 310°, d: 40 nm
SO224/007-1	29/10/12	18:10	12° 57,56' S	164° 15,75' W	5098	OBS/OBH	Beginn Station	
SO224/007-1	29/10/12	18:39	12° 57,52' S	164° 15,67' W	5086	OBS/OBH	OBS zu Wasser	OBS # 01
SO224/007-1	29/10/12	19:16	12° 56,22' S	164° 9,73' W	5130	OBS/OBH	OBS zu Wasser	OBS # 02
SO224/007-1	29/10/12	19:54	12° 54,88' S	164° 3,82' W	5206	OBS/OBH	OBS zu Wasser	OBS # 03
SO224/007-1	29/10/12	20:40	12° 53,54' S	163° 57,89' W	4961	OBS/OBH	OBS zu Wasser	OBS # 04
SO224/007-1	29/10/12	21:22	12° 52,21' S	163° 51,96' W	5170	OBS/OBH	OBS zu Wasser	OBS # 05
SO224/007-1	29/10/12	22:07	12° 50,85' S	163° 46,01' W	4083	OBS/OBH	OBS zu Wasser	OBS # 06
SO224/007-1	29/10/12	22:51	12° 49,48' S	163° 40,09' W	3983	OBS/OBH	OBS zu Wasser	OBS # 07
SO224/007-1	29/10/12	23:37	12° 48,16' S	163° 34,17' W	3952	OBS/OBH	OBS zu Wasser	OBS # 08
SO224/007-1	30/10/12	0:27	12° 46,81' S	163° 27,75' W	3258	OBS/OBH	OBH zu Wasser	OBH # 09
SO224/007-1	30/10/12	1:14	12° 45,46' S	163° 21,82' W	3079	OBS/OBH	OBS zu Wasser	OBS # 10
SO224/007-1	30/10/12	2:10	12° 43,69' S	163° 14,13' W	2970	OBS/OBH	OBS zu Wasser	OBS # 11
SO224/007-1	30/10/12	3:34	12° 41,89' S	163° 6,33' W	2864	OBS/OBH	OBS zu Wasser	OBS # 12
SO224/007-1	30/10/12	4:29	12° 40,11' S	162° 58,61' W	2652	OBS/OBH	OBS zu Wasser	OBS # 13
SO224/007-1	30/10/12	5:18	12° 38,31' S	162° 50,83' W	2540	OBS/OBH	OBS zu Wasser	OBS # 14
SO224/007-1	30/10/12	6:07	12° 36,52' S	162° 43,06' W	2447	OBS/OBH	OBS zu Wasser	OBS # 15
SO224/007-1	30/10/12	7:08	12° 34,28' S	162° 33,04' W	2499	OBS/OBH	OBS zu Wasser	OBS # 16
SO224/007-1	30/10/12	8:21	12° 31,71' S	162° 21,26' W	2466	OBS/OBH	OBS zu Wasser	OBS # 18
SO224/007-1	30/10/12	9:28	12° 29,36' S	162° 10,69' W	2495	OBS/OBH	OBS zu Wasser	OBS # 19
SO224/007-1	30/10/12	10:51	12° 26,22' S	161° 56,98' W	2454	OBS/OBH	OBS zu Wasser	OBS # 20
SO224/007-1	30/10/12	12:12	12° 23,06' S	161° 43,30' W	2614	OBS/OBH	OBS zu Wasser	OBS # 21
SO224/007-1	30/10/12	13:28	12° 20,36' S	161° 31,39' W	2697	OBS/OBH	OBH zu Wasser	OBH # 22
SO224/007-1	30/10/12	14:33	12° 18,13' S	161° 21,39' W	2710	OBS/OBH	OBS zu Wasser	OBS # 23
SO224/007-1	30/10/12	15:40	12° 15,89' S	161° 11,34' W	2693	OBS/OBH	OBS zu Wasser	OBS # 24
SO224/007-1	30/10/12	16:40	12° 13,64' S	161° 1,76' W	2150	OBS/OBH	OBH zu Wasser	OBH # 25
SO224/007-1	30/10/12	17:25	12° 11,85' S	160° 54,02' W	3867	OBS/OBH	OBS zu Wasser	OBS # 26
SO224/007-1	30/10/12	18:01	12° 10,52' S	160° 48,12' W	3614	OBS/OBH	OBS zu Wasser	OBS # 27
SO224/007-1	30/10/12	18:38	12° 9,16' S	160° 42,18' W	3540	OBS/OBH	OBS zu Wasser	OBS # 28

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/007-1	30/10/12	19:15	12° 7,82' S	160° 36,26' W	4567	OBS/OBH	OBS zu Wasser	OBS # 29
SO224/007-1	30/10/12	19:53	12° 6,47' S	160° 30,33' W	4845	OBS/OBH	OBS zu Wasser	OBS # 30
SO224/007-1	30/10/12	20:33	12° 5,13' S	160° 24,39' W	5592	OBS/OBH	OBS zu Wasser	OBS # 31
SO224/007-1	30/10/12	21:20	12° 3,78' S	160° 18,01' W	4931	OBS/OBH	OBS zu Wasser	OBS # 32
SO224/007-1	30/10/12	22:04	12° 2,42' S	160° 12,08' W	5095	OBS/OBH	OBS zu Wasser	OBS # 33
SO224/007-1	30/10/12	22:57	12° 0,63' S	160° 4,31' W	4975	OBS/OBH	OBS zu Wasser	OBS # 34
Refraktionsseismisches Profil AWI 20120200								
SO224/008-1	30/10/12	22:58	12° 0,63' S	160° 4,29' W	4992	Profil	Stationsbeginn	
SO224/008-1	30/10/12	23:01	12° 0,63' S	160° 4,23' W	4989	Profil	Streamerendboje z.W.	Typ "Kenterprise" mit Dummy Horst
SO224/008-1	30/10/12	23:04	12° 0,59' S	160° 4,06' W	4992	Profil	Bird z. W.	Bird # 01
SO224/008-1	30/10/12	23:08	12° 0,51' S	160° 3,77' W	4992	Profil	Bird z. W.	Bird # 02
SO224/008-1	30/10/12	23:12	12° 0,45' S	160° 3,50' W	4990	Profil	Bird z. W.	Bird # 03
SO224/008-1	30/10/12	23:18	12° 0,37' S	160° 3,11' W	4991	Profil	Bird z. W.	Bird # 04
SO224/008-1	30/10/12	23:23	12° 0,30' S	160° 2,78' W	4978	Profil	Bird z. W.	Bird # 05
SO224/008-1	30/10/12	23:29	12° 0,22' S	160° 2,38' W	4973	Profil	Bird z. W.	Bird # 06
SO224/008-1	30/10/12	23:35	12° 0,14' S	160° 1,98' W	4977	Profil	Bird z. W.	Bird # 07
SO224/008-1	30/10/12	23:41	12° 0,04' S	160° 1,59' W	4975	Profil	Bird z. W.	Bird # 08
SO224/008-1	30/10/12	23:48	11° 59,95' S	160° 1,12' W	4970	Profil	Bird z. W.	Bird # 09
SO224/008-1	30/10/12	23:54	11° 59,87' S	160° 0,72' W	4947	Profil	Bird z. W.	Bird # 10
SO224/008-1	31/10/12	0:02	11° 59,75' S	160° 0,18' W	4948	Profil	Bird z. W.	Bird # 11
SO224/008-1	31/10/12	0:07	11° 59,68' S	159° 59,84' W	4898	Profil	Bird z. W.	Bird # 12
SO224/008-1	31/10/12	0:12	11° 59,60' S	159° 59,51' W	4878	Profil	Streamer zu Wasser	SL: 3000 m
SO224/008-1	31/10/12	0:13	11° 59,59' S	159° 59,45' W	4861	Profil	Kursänderung	rwK: 257°, d: 270 nm
SO224/008-1	31/10/12	1:08	11° 59,54' S	159° 59,26' W	4856	Profil	Stb-Airgunarray zu Wasser	SL: 40 m
SO224/008-1	31/10/12	1:22	11° 59,76' S	160° 0,23' W	4939	Profil	Bb-Airgunarray zu Wasser	RL: 40 m
SO224/008-1	31/10/12	1:24	11° 59,79' S	160° 0,37' W	4939	Profil	Beginn Profil	(1. Schuß)
SO224/008-1	31/10/12	2:11	12° 0,65' S	160° 4,33' W	4990	Profil	Kursänderung	rwK: 257°, d: 8 nm, OBS # 34
SO224/008-1	31/10/12	3:41	12° 2,41' S	160° 12,02' W	5088	Profil	Kursänderung	rwK: 257°, d: 6 nm, OBS # 33
SO224/008-1	31/10/12	4:55	12° 3,80' S	160° 18,03' W	4947	Profil	Kursänderung	rwk: 258°, d: 6sm, OBS # 32
SO224/008-1	31/10/12	6:11	12° 5,13' S	160° 24,39' W	5351	Profil	Kursänderung	rwk: 257°, d: 6sm, OBS # 31
SO224/008-1	31/10/12	7:22	12° 6,47' S	160° 30,29' W	4860	Profil	Kursänderung	rwk: 257°, d: 6sm, OBS # 30
SO224/008-1	31/10/12	8:34	12° 7,81' S	160° 36,21' W	4572	Profil	Kursänderung	rwK: 257°, d: 6nm, OBS # 29
SO224/008-1	31/10/12	9:44	12° 9,16' S	160° 42,12' W	3535	Profil	Kursänderung	rwK: 257°, d: 6nm, OBS # 28

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/008-1	31/10/12	10:57	12° 10,50' S	160° 48,06' W	3605	Profil	Kursänderung	rwK: 257°, d: 6nm, OBS # 27
SO224/008-1	31/10/12	12:08	12° 11,86' S	160° 54,03' W	3874	Profil	Kursänderung	rwK: 257°, d: 8 nm, OBS # 26
SO224/008-1	31/10/12	13:40	12° 13,64' S	161° 1,76' W	2142	Profil	Kursänderung	rwK: 257°, d: 10 nm, OBS # 25
SO224/008-1	31/10/12	15:37	12° 15,89' S	161° 11,36' W	2693	Profil	Kursänderung	rwK: 257°, d: 10 nm, OBS # 24
SO224/008-1	31/10/12	17:37	12° 18,13' S	161° 21,39' W	2710	Profil	Kursänderung	rwK: 257°, d: 10 nm, OBS # 23
SO224/008-1	31/10/12	19:37	12° 20,37' S	161° 31,44' W	2697	Profil	Kursänderung	rwk: 257°, d: 12sm, OBS # 22
SO224/008-1	31/10/12	20:24	12° 21,29' S	161° 35,48' W	2679	Profil	Bb-Airgunarray an Deck	
SO224/008-1	31/10/12	21:08	12° 22,11' S	161° 39,08' W	2643	Profil	Bb-Airgunarray zu Wasser	
SO224/008-1	31/10/12	22:00	12° 23,06' S	161° 43,27' W	2614	Profil	Kursänderung	rwK: 257°, d: 14nm, OBS # 21
SO224/008-1	01/11/12	0:47	12° 26,21' S	161° 56,97' W	2454	Profil	Kursänderung	rwK: 257°, d: 14 nm, OBS # 20
SO224/008-1	01/11/12	3:32	12° 29,35' S	162° 10,66' W	2496	Profil	Kursänderung	rwK: 257°, d: 10 nm, OBS # 19
SO224/008-1	01/11/12	5:38	12° 31,69' S	162° 21,09' W	2467	Profil	Kursänderung	rwk: 258°, d: 12sm, OBS # 18
SO224/008-1	01/11/12	8:02	12° 34,27' S	162° 32,96' W	2500	Profil	Kursänderung	rwK: 257^, d: 10nm, OBS # 16
SO224/008-1	01/11/12	10:02	12° 36,50' S	162° 42,99' W	2448	Profil	Kursänderung	rwK: 257°, d: 8nm, OBS # 15
SO224/008-1	01/11/12	11:36	12° 38,28' S	162° 50,79' W	2543	Profil	Kursänderung	rwK: 257°, d: 8nm, OBS # 14
SO224/008-1	01/11/12	13:10	12° 40,07' S	162° 58,50' W	2659	Profil	Kursänderung	rwK: 257°, d: 8 nm, OBS # 13
SO224/008-1	01/11/12	14:44	12° 41,89' S	163° 6,31' W	2861	Profil	Kursänderung	rwK: 257°, d: 8 nm, OBS # 12
SO224/008-1	01/11/12	16:17	12° 43,67' S	163° 14,00' W	2960	Profil	Kursänderung	rwK: 257°, d: 8 nm, OBS # 11
SO224/008-1	01/11/12	17:50	12° 45,45' S	163° 21,75' W	3081	Profil	Kursänderung	rwk: 257°, d: 6sm, OBS # 10
SO224/008-1	01/11/12	19:00	12° 46,78' S	163° 27,66' W	3257	Profil	Kursänderung	rwk: 257°, d: 6sm, OBS # 09
SO224/008-1	01/11/12	20:17	12° 48,14' S	163° 34,10' W	3936	Profil	Kursänderung	rwK: 258°, d: 6nm, OBS # 08
SO224/008-1	01/11/12	21:29	12° 49,49' S	163° 40,07' W	3983	Profil	Kursänderung	rwK: 257°, d: 6nm, OBS # 06
SO224/008-1	01/11/12	22:40	12° 50,81' S	163° 45,92' W	4079	Profil	Kursänderung	rwK: 257°, d: 6nm, OBS # 06
SO224/008-1	01/11/12	23:52	12° 52,16' S	163° 51,86' W	5167	Profil	Kursänderung	rwK: 257°, d: 6nm, OBS # 05
SO224/008-1	02/11/12	1:06	12° 53,51' S	163° 57,78' W	4972	Profil	Kursänderung	rwK: 257°, d: 6 nm, OBS # 04
SO224/008-1	02/11/12	2:20	12° 54,87' S	164° 3,76' W	5207	Profil	Kursänderung	rwK: 257°, d: 6 nm, OBS # 03
SO224/008-1	02/11/12	3:31	12° 56,19' S	164° 9,70' W	5139	Profil	Kursänderung	rwK: 257°, d: 06 nm, OBS # 02

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/008-1	02/11/12	4:42	12° 57,55' S	164° 15,63' W	5076	Profil	Kursänderung	rwk: 257°, d: 10sm, OBS # 01
SO224/008-1	02/11/12	6:34	12° 59,67' S	164° 25,08' W	5401	Profil	Ende Profil	
SO224/008-1	02/11/12	6:34	12° 59,67' S	164° 25,08' W	5401	Profil	Airgun abgeschaltet	
SO224/008-1	02/11/12	6:48	12° 59,91' S	164° 26,10' W	5417	Profil	Bb-Airgunarray an Deck	
SO224/008-1	02/11/12	7:02	13° 0,45' S	164° 26,80' W	5428	Profil	Stb-Airgunarray an Deck	
SO224/008-1	02/11/12	7:03	13° 0,51' S	164° 26,81' W	5431	Profil	Beginn hieven Streamer	
SO224/008-1	02/11/12	8:01	13° 1,51' S	164° 23,97' W	5440	Profil	Bird a. D.	Bird # 07
SO224/008-1	02/11/12	8:06	13° 1,34' S	164° 23,67' W	5420	Profil	Bird a. D.	Bird # 08
SO224/008-1	02/11/12	8:12	13° 1,12' S	164° 23,30' W	5415	Profil	Bird a. D.	Bird # 09
SO224/008-1	02/11/12	8:17	13° 0,95' S	164° 22,99' W	5410	Profil	Bird a. D.	Bird # 10
SO224/008-1	02/11/12	8:22	13° 0,77' S	164° 22,68' W	5383	Profil	Bird a. D.	Bird # 11
SO224/008-1	02/11/12	8:25	13° 0,67' S	164° 22,49' W	5406	Profil	Bird a. D.	Bird # 12
SO224/008-1	02/11/12	8:31	13° 0,47' S	164° 22,13' W	5400	Profil	Streamerendb oje a. D.	
SO224/009-1	02/11/12	8:32	13° 0,43' S	164° 22,06' W	5402	OBS/OBH	Beginn Station	Anfahrt OBS # 01
SO224/009-1	02/11/12	8:38	13° 0,09' S	164° 21,39' W	0	OBS/OBH	OBS ausgelöst	OBS # 01
SO224/009-1	02/11/12	9:23	12° 57,23' S	164° 14,35' W	0	OBS/OBH	OBS ausgelöst	OBS # 02
SO224/009-1	02/11/12	9:57	12° 57,51' S	164° 15,42' W	0	OBS/OBH	OBS gesichtet	OBS # 01
SO224/009-1	02/11/12	10:05	12° 57,63' S	164° 15,69' W	0	OBS/OBH	OBS an Deck	OBS # 01
SO224/009-1	02/11/12	10:29	12° 56,76' S	164° 12,00' W	0	OBS/OBH	OBS gesichtet	OBS # 02
SO224/009-1	02/11/12	10:49	12° 56,26' S	164° 9,71' W	0	OBS/OBH	OBS an Deck	OBS # 0
SO224/009-1	02/11/12	11:09	12° 55,60' S	164° 6,79' W	0	OBS/OBH	OBS ausgelöst	OBS # 03
SO224/009-1	02/11/12	11:40	12° 54,26' S	164° 0,96' W	0	OBS/OBH	OBS ausgelöst	OBS # 04
SO224/009-1	02/11/12	12:37	12° 54,86' S	164° 3,84' W	0	OBS/OBH	OBS gesichtet	OBS # 03
SO224/009-1	02/11/12	12:46	12° 54,90' S	164° 3,77' W	0	OBS/OBH	OBS an Deck	OBS # 03
SO224/009-1	02/11/12	13:11	12° 54,07' S	164° 0,32' W	0	OBS/OBH	OBS gesichtet	OBS # 04
SO224/009-1	02/11/12	13:18	12° 53,76' S	163° 58,99' W	0	OBS/OBH	OBS ausgelöst	OBS # 05
SO224/009-1	02/11/12	13:43	12° 53,61' S	163° 58,03' W	0	OBS/OBH	OBS an Deck	OBS # 04
SO224/009-1	02/11/12	14:32	12° 51,81' S	163° 50,29' W	0	OBS/OBH	OBS ausgelöst	OBS # 06
SO224/009-1	02/11/12	14:49	12° 52,18' S	163° 51,77' W	0	OBS/OBH	OBS gesichtet	OBS # 05
SO224/009-1	02/11/12	15:05	12° 52,23' S	163° 52,13' W	0	OBS/OBH	OBS an Deck	OBS # 05
SO224/009-1	02/11/12	15:32	12° 51,29' S	163° 48,04' W	0	OBS/OBH	OBS gesichtet	OBS # 06
SO224/009-1	02/11/12	15:46	12° 50,76' S	163° 46,27' W	0	OBS/OBH	OBS ausgelöst	OBS # 07
SO224/009-1	02/11/12	15:52	12° 50,75' S	163° 46,13' W	0	OBS/OBH	OBS an Deck	OBS # 06
SO224/009-1	02/11/12	16:57	12° 49,49' S	163° 40,24' W	0	OBS/OBH	OBS gesichtet	OBS # 07

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/009-1	02/11/12	16:58	12° 49,49' S	163° 40,25' W	0	OBS/OBH	OBS ausgelöst	OBS # 08
SO224/009-1	02/11/12	17:06	12° 49,38' S	163° 40,33' W	0	OBS/OBH	OBS an Deck	OBS # 07
SO224/009-1	02/11/12	17:48	12° 48,18' S	163° 34,28' W	0	OBS/OBH	OBS gesichtet	OBS # 08
SO224/009-1	02/11/12	18:01	12° 48,19' S	163° 34,34' W	0	OBS/OBH	OBS an Deck	OBS # 08
SO224/009-1	02/11/12	18:18	12° 47,60' S	163° 31,83' W	0	OBS/OBH	OBS ausgelöst	OBS # 09
SO224/009-1	02/11/12	18:57	12° 46,75' S	163° 27,86' W	0	OBS/OBH	OBS gesichtet	OBS # 09
SO224/009-1	02/11/12	18:59	12° 46,77' S	163° 27,86' W	0	OBS/OBH	OBS ausgelöst	OBS # 10
SO224/009-1	02/11/12	19:08	12° 46,97' S	163° 27,95' W	0	OBS/OBH	OBS an Deck	OBS # 09
SO224/009-1	02/11/12	19:39	12° 45,68' S	163° 22,90' W	0	OBS/OBH	OBS gesichtet	OBS # 10
SO224/009-1	02/11/12	19:44	12° 45,62' S	163° 22,37' W	0	OBS/OBH	OBS ausgelöst	OBS # 11
SO224/009-1	02/11/12	19:49	12° 45,61' S	163° 22,08' W	0	OBS/OBH	OBS an Deck	OBS # 10
SO224/009-1	02/11/12	20:55	12° 43,82' S	163° 14,47' W	0	OBS/OBH	OBS gesichtet	OBS # 11
SO224/009-1	02/11/12	21:00	12° 43,84' S	163° 14,36' W	0	OBS/OBH	OBS an Deck	OBS # 11
SO224/009-1	02/11/12	21:16	12° 43,58' S	163° 12,82' W	0	OBS/OBH	OBS ausgelöst	OBS # 12
SO224/009-1	02/11/12	21:46	12° 42,17' S	163° 7,47' W	0	OBS/OBH	OBS gesichtet	OBS # 12
SO224/009-1	02/11/12	22:06	12° 42,37' S	163° 6,42' W	0	OBS/OBH	OBS an Deck	OBS # 12
SO224/009-1	02/11/12	22:07	12° 42,39' S	163° 6,40' W	0	OBS/OBH	OBS ausgelöst	OBS # 13
SO224/009-1	02/11/12	22:55	12° 40,33' S	162° 59,53' W	0	OBS/OBH	OBS gesichtet	OBS # 13
SO224/009-1	02/11/12	23:00	12° 40,32' S	162° 59,18' W	0	OBS/OBH	OBS ausgelöst	OBS # 14
SO224/009-1	02/11/12	23:18	12° 40,61' S	162° 58,69' W	0	OBS/OBH	OBS an Deck	OBS # 13
SO224/009-1	03/11/12	0:00	12° 38,77' S	162° 52,09' W	0	OBS/OBH	OBS gesichtet	OBS # 14
SO224/009-1	03/11/12	0:21	12° 38,89' S	162° 50,67' W	0	OBS/OBH	OBS ausgelöst	OBS # 15
SO224/009-1	03/11/12	0:24	12° 38,96' S	162° 50,63' W	0	OBS/OBH	OBS an Deck	OBS # 14
SO224/009-1	03/11/12	1:05	12° 36,83' S	162° 44,27' W	0	OBS/OBH	OBS gesichtet	OBS # 15
SO224/009-1	03/11/12	1:21	12° 36,76' S	162° 43,06' W	0	OBS/OBH	OBS an Deck	OBS # 15
SO224/009-1	03/11/12	1:45	12° 35,84' S	162° 39,99' W	0	OBS/OBH	OBS ausgelöst	OBS # 16
SO224/009-1	03/11/12	2:32	12° 34,52' S	162° 34,16' W	0	OBS/OBH	OBH gesichtet	OBH # 16
SO224/009-1	03/11/12	2:46	12° 34,40' S	162° 33,18' W	0	OBS/OBH	OBH an Deck	OBH # 16
SO224/009-1	03/11/12	3:15	12° 33,38' S	162° 29,01' W	0	OBS/OBH	OBS ausgelöst	OBS # 18
SO224/009-1	03/11/12	4:05	12° 32,02' S	162° 22,64' W	0	OBS/OBH	OBS gesichtet	OBS # 18
SO224/009-1	03/11/12	4:17	12° 31,66' S	162° 21,26' W	0	OBS/OBH	OBS an Deck	OBS # 18
SO224/009-1	03/11/12	4:34	12° 31,33' S	162° 19,46' W	0	OBS/OBH	OBS ausgelöst	OBS # 19
SO224/009-1	03/11/12	5:28	12° 29,41' S	162° 11,07' W	0	OBS/OBH	OBS gesichtet	OBS # 19
SO224/009-1	03/11/12	5:39	12° 29,31' S	162° 10,75' W	0	OBS/OBH	OBS an Deck	OBS # 19
SO224/009-1	03/11/12	6:16	12° 28,05' S	162° 5,01' W	0	OBS/OBH	OBS ausgelöst	OBS # 20

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/009-1	03/11/12	7:09	12° 26,14' S	161° 57,16' W	0	OBS/OBH	OBS gesichtet	OBS # 20
SO224/009-1	03/11/12	7:16	12° 26,16' S	161° 57,10' W	0	OBS/OBH	OBS an Deck	OBS # 20
SO224/009-1	03/11/12	7:51	12° 24,82' S	161° 51,12' W	0	OBS/OBH	OBS ausgelöst	OBS # 21
SO224/009-1	03/11/12	8:58	12° 23,19' S	161° 43,94' W	0	OBS/OBH	OBS gesichtet	OBS # 21
SO224/009-1	03/11/12	9:17	12° 23,01' S	161° 43,45' W	0	OBS/OBH	OBS an Deck	OBS # 21
SO224/009-1	03/11/12	9:43	12° 22,19' S	161° 39,54' W	0	OBS/OBH	OBS ausgelöst	OBS # 22
SO224/009-1	03/11/12	11:02	12° 20,52' S	161° 32,01' W	0	OBS/OBH	OBS gesichtet	OBS # 22
SO224/009-1	03/11/12	11:26	12° 20,39' S	161° 31,42' W	0	OBS/OBH	OBS an Deck	OBS # 22
SO224/009-1	03/11/12	11:45	12° 19,83' S	161° 28,94' W	0	OBS/OBH	OBS ausgelöst	OBS # 23
SO224/009-1	03/11/12	12:33	12° 18,20' S	161° 21,66' W	0	OBS/OBH	OBS gesichtet	OBS # 23
SO224/009-1	03/11/12	12:45	12° 18,13' S	161° 21,56' W	0	OBS/OBH	OBS an Deck	OBS # 23
SO224/009-1	03/11/12	13:03	12° 17,71' S	161° 19,47' W	0	OBS/OBH	OBS ausgelöst	OBS # 24
SO224/009-1	03/11/12	13:55	12° 15,99' S	161° 11,61' W	0	OBS/OBH	OBS gesichtet	OBS # 24
SO224/009-1	03/11/12	14:15	12° 16,07' S	161° 11,52' W	0	OBS/OBH	OBS an Deck	OBS # 24
SO224/009-1	03/11/12	14:27	12° 15,74' S	161° 10,73' W	0	OBS/OBH	OBS ausgelöst	OBS # 25
SO224/009-1	03/11/12	15:40	12° 13,75' S	161° 2,07' W	0	OBS/OBH	OBS gesichtet	OBS # 25
SO224/009-1	03/11/12	15:42	12° 13,70' S	161° 2,03' W	0	OBS/OBH	OBS ausgelöst	OBS # 26
SO224/009-1	03/11/12	16:03	12° 13,94' S	161° 1,87' W	0	OBS/OBH	OBS an Deck	OBS # 25
SO224/009-1	03/11/12	16:48	12° 12,03' S	160° 54,58' W	0	OBS/OBH	OBS gesichtet	OBS # 26
SO224/009-1	03/11/12	16:49	12° 12,01' S	160° 54,47' W	0	OBS/OBH	OBS ausgelöst	OBS # 27
SO224/009-1	03/11/12	17:00	12° 12,16' S	160° 54,39' W	0	OBS/OBH	OBS an Deck	OBS # 26
SO224/009-1	03/11/12	17:44	12° 10,64' S	160° 48,58' W	0	OBS/OBH	OBS gesichtet	OBS # 27
SO224/009-1	03/11/12	17:49	12° 10,60' S	160° 48,33' W	0	OBS/OBH	OBS ausgelöst	OBS # 28
SO224/009-1	03/11/12	17:52	12° 10,58' S	160° 48,24' W	0	OBS/OBH	OBS an Deck	OBS # 27
SO224/009-1	03/11/12	18:38	12° 9,27' S	160° 42,48' W	0	OBS/OBH	OBS gesichtet	OBS # 28
SO224/009-1	03/11/12	18:39	12° 9,27' S	160° 42,46' W	0	OBS/OBH	OBS ausgelöst	OBS # 29
SO224/009-1	03/11/12	18:43	12° 9,26' S	160° 42,28' W	0	OBS/OBH	OBS an Deck	OBS # 28
SO224/009-1	03/11/12	20:09	12° 7,95' S	160° 36,58' W	0	OBS/OBH	OBS ausgelöst	OBS # 30
SO224/009-1	03/11/12	20:33	12° 8,00' S	160° 36,65' W	0	OBS/OBH	OBS gesichtet	OBS # 29
SO224/009-1	03/11/12	20:46	12° 7,95' S	160° 36,41' W	0	OBS/OBH	OBS an Deck	OBS # 29
SO224/009-1	03/11/12	21:23	12° 6,68' S	160° 31,15' W	0	OBS/OBH	OBS gesichtet	OBS # 30
SO224/009-1	03/11/12	21:25	12° 6,66' S	160° 31,01' W	0	OBS/OBH	OBS ausgelöst	OBS # 31
SO224/009-1	03/11/12	21:41	12° 6,60' S	160° 30,25' W	0	OBS/OBH	OBS an Deck	OBS # 30
SO224/009-1	03/11/12	23:16	12° 5,38' S	160° 24,64' W	0	OBS/OBH	OBS ausgelöst	OBS # 32
SO224/009-1	03/11/12	23:29	12° 5,37' S	160° 24,64' W	0	OBS/OBH	OBS gesichtet	OBS # 31

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/009-1	03/11/12	23:49	12° 5,29' S	160° 24,31' W	0	OBS/OBH	OBS an Deck	OBS # 31
SO224/009-1	04/11/12	0:38	12° 3,34' S	160° 16,04' W	0	OBS/OBH	OBS ausgelöst	OBS # 33
SO224/009-1	04/11/12	1:16	12° 3,93' S	160° 18,20' W	0	OBS/OBH	OBS gesichtet	OBS # 32
SO224/009-1	04/11/12	1:27	12° 3,94' S	160° 17,98' W	0	OBS/OBH	OBS an Deck	OBS # 32
SO224/009-1	04/11/12	2:02	12° 2,55' S	160° 12,60' W	0	OBS/OBH	OBS gesichtet	OBS # 33
SO224/009-1	04/11/12	2:03	12° 2,54' S	160° 12,52' W	0	OBS/OBH	OBS ausgelöst	OBS # 34
SO224/009-1	04/11/12	2:15	12° 2,50' S	160° 12,03' W	0	OBS/OBH	OBS an Deck	OBS # 33
SO224/009-1	04/11/12	3:54	12° 0,79' S	160° 4,59' W	0	OBS/OBH	OBS gesichtet	OBS # 34
SO224/009-1	04/11/12	4:32	12° 0,83' S	160° 4,03' W	4987	OBS/OBH	OBS an Deck	OBS # 34
SO224/009-1	04/11/12	4:35	12° 0,87' S	160° 4,09' W	4983	OBS/OBH	Ende Station	rwK: 220°, d: 45 nm
Reflexionsseismische Profile AWI 20120011 - 28								
SO224/010-1	04/11/12	8:31	12° 34,45' S	160° 33,33' W	5562	Profil	Stationsbeginn	
SO224/010-1	04/11/12	8:32	12° 34,49' S	160° 33,37' W	5558	Profil	Streamerendb oje z.W.	
SO224/010-1	04/11/12	8:34	12° 34,59' S	160° 33,46' W	5555	Profil	Bird z. W.	Bird # 01
SO224/010-1	04/11/12	8:37	12° 34,75' S	160° 33,61' W	5514	Profil	Bird z. W.	Bird # 02
SO224/010-1	04/11/12	8:42	12° 35,01' S	160° 33,85' W	5522	Profil	Bird z. W.	Bird # 03
SO224/010-1	04/11/12	8:47	12° 35,24' S	160° 34,10' W	5593	Profil	Bird z. W.	Bird # 04
SO224/010-1	04/11/12	8:52	12° 35,45' S	160° 34,37' W	5545	Profil	Bird z. W.	Bird # 05
SO224/010-1	04/11/12	8:58	12° 35,70' S	160° 34,69' W	5540	Profil	Bird z. W.	Bird # 06
SO224/010-1	04/11/12	9:03	12° 35,92' S	160° 34,98' W	5536	Profil	Bird z. W.	Bird # 07
SO224/010-1	04/11/12	9:09	12° 36,16' S	160° 35,32' W	5472	Profil	Bird z. W.	Bird # 08
SO224/010-1	04/11/12	9:16	12° 36,44' S	160° 35,72' W	5038	Profil	Bird z. W.	Bird # 09
SO224/010-1	04/11/12	9:22	12° 36,69' S	160° 36,03' W	4821	Profil	Bird z. W.	Bird # 10
SO224/010-1	04/11/12	9:30	12° 37,02' S	160° 36,45' W	4250	Profil	Bird z. W.	Bird # 11
SO224/010-1	04/11/12	9:35	12° 37,22' S	160° 36,70' W	4184	Profil	Bird z. W.	Bird # 12
SO224/010-1	04/11/12	9:41	12° 37,47' S	160° 37,03' W	4315	Profil	Streamer zu Wasser	
SO224/010-1	04/11/12	9:52	12° 37,91' S	160° 37,64' W	4451	Profil	Bb-Airgunarray zu Wasser	20m ausgelegt
SO224/010-1	04/11/12	9:53	12° 37,95' S	160° 37,70' W	4368	Profil	Beginn Profil	rwK: 263° , d: 47nm
SO224/010-1	04/11/12	9:54	12° 37,98' S	160° 37,75' W	4463	Profil	Airgun eingeschaltet	
SO224/010-1	04/11/12	19:21	12° 44,03' S	161° 25,76' W	2679	Profil	Kursänderung	rwk: 139°, d: 45sm
SO224/010-1	05/11/12	6:00	13° 18,12' S	160° 55,28' W	4249	Profil	Kursänderung	rwk: 281°, d: 43sm
SO224/010-1	05/11/12	16:11	13° 9,53' S	161° 38,39' W	2715	Profil	Kursänderung	rwK: 151°, d: 41 nm (+ 7 nm)
SO224/010-1	05/11/12	23:00	13° 33,27' S	161° 24,79' W	3057	Profil	Depressor zu Wasser	
SO224/010-1	06/11/12	2:13	13° 47,28' S	161° 16,75' W	3876	Profil	Airgun abgeschaltet	

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/010-1	06/11/12	2:24	13° 47,97' S	161° 16,38' W	3899	Profil	Bb-Airgunarray an Deck	
SO224/010-1	06/11/12	2:25	13° 48,03' S	161° 16,34' W	3933	Profil	Kursänderung	rwK: 027°, d: 81 nm (+ 7 nm)
SO224/010-1	06/11/12	3:06	13° 48,46' S	161° 18,29' W	4067	Profil	Bb-Airgunarray zu Wasser	SL: 20 m
SO224/010-1	06/11/12	3:07	13° 48,41' S	161° 18,34' W	4069	Profil	Airgun eingeschaltet	
SO224/010-1	06/11/12	20:00	12° 33,25' S	160° 39,71' W	0	Profil	Kursänderung	rwk: 225°, d: 82 nm (+ 7nm)
SO224/010-1	07/11/12	8:35	13° 12,73' S	161° 20,57' W	2869	Profil	Airgun abgeschaltet	
SO224/010-1	07/11/12	8:53	13° 13,55' S	161° 21,45' W	2830	Profil	Airgun eingeschaltet	
SO224/010-1	07/11/12	13:54	13° 31,10' S	161° 39,83' W	2914	Profil	Kursänderung	rwK: 270°, d: 72 nm
SO224/010-1	08/11/12	4:33	13° 31,43' S	162° 54,39' W	3810	Profil	Kursänderung	rwK: 041°, d: 34 nm (+ 7 nm)
SO224/010-1	08/11/12	4:53	13° 31,42' S	162° 56,12' W	3742	Profil	Airgun abgeschaltet	
SO224/010-1	08/11/12	5:09	13° 31,44' S	162° 57,28' W	3757	Profil	Bb-Airgunarray an Deck	
SO224/010-1	08/11/12	5:57	13° 32,89' S	162° 56,20' W	3893	Profil	Bb-Airgunarray zu Wasser	
SO224/010-1	08/11/12	5:58	13° 32,86' S	162° 56,14' W	3893	Profil	Airgun eingeschaltet	
SO224/010-1	08/11/12	13:26	13° 4,56' S	162° 30,44' W	2582	Profil	Kursänderung	rwK: 189°, d: 39 nm (+ 7 nm)
SO224/010-1	08/11/12	22:27	13° 44,39' S	162° 38,11' W	4615	Profil	Kursänderung	rwK: 052°, d: 43nm
SO224/010-1	09/11/12	9:39	13° 18,38' S	162° 3,01' W	2562	Profil	Kursänderung	rwK: 188°, d: 32nm
SO224/010-1	09/11/12	17:21	13° 49,43' S	162° 7,70' W	3668	Profil	Kursänderung	rwk: 317°, d: 95sm
SO224/010-1	10/11/12	14:16	12° 40,22' S	163° 14,65' W	2948	Profil	Kursänderung	rwK: 360°, d: 45 nm
SO224/010-1	10/11/12	23:15	11° 55,10' S	163° 14,99' W	3367	Profil	Kursänderung	rwK: 000°, d: 11nm
SO224/010-1	11/11/12	1:20	11° 44,44' S	163° 14,96' W	3231	Profil	Kursänderung	rwK: 008°, d: 42 nm
SO224/010-1	11/11/12	9:50	11° 2,58' S	163° 9,13' W	2958	Profil	Kursänderung	rwK: 161°, d: 30nm
SO224/010-1	11/11/12	17:03	11° 31,16' S	162° 59,07' W	2840	Profil	Kursänderung	rwk: 176°, d: 31sm
SO224/010-1	11/11/12	23:09	12° 2,25' S	162° 56,83' W	2901	Profil	Kursänderung	rwK: 200°, d: 24nm
SO224/010-1	12/11/12	3:45	12° 24,53' S	163° 4,92' W	2903	Profil	Kursänderung	rwK: 263°, d: 33 nm
SO224/010-1	12/11/12	9:00	12° 27,68' S	163° 31,80' W	3914	Profil	Ende Profil	
SO224/010-1	12/11/12	9:00	12° 27,68' S	163° 31,80' W	3914	Profil	Airgun abgeschaltet	
SO224/010-1	12/11/12	9:15	12° 27,90' S	163° 32,80' W	3783	Profil	Bb-Airgunarray an Deck	
SO224/010-1	12/11/12	9:18	12° 27,95' S	163° 33,01' W	3760	Profil	Beginn hieven Streamer	
SO224/010-1	12/11/12	9:25	12° 28,05' S	163° 33,49' W	3805	Profil	Bird a. D.	Bird # 01
SO224/010-1	12/11/12	9:31	12° 28,13' S	163° 33,89' W	3800	Profil	Bird a. D.	Bird # 02
SO224/010-1	12/11/12	9:40	12° 28,26' S	163° 34,51' W	3855	Profil	Bird a. D.	Bird # 03
SO224/010-1	12/11/12	9:47	12° 28,35' S	163° 34,98' W	3895	Profil	Bird a. D.	Bird # 04
SO224/010-1	12/11/12	9:53	12° 28,43' S	163° 35,35' W	3915	Profil	Bird a. D.	Bird # 05
SO224/010-1	12/11/12	9:59	12° 28,51' S	163° 35,74' W	3942	Profil	Bird a. D.	Bird # 06
SO224/010-1	12/11/12	10:05	12° 28,59' S	163° 36,15' W	3962	Profil	Bird a. D.	Bird # 07

Station	Date	UTC	Position Lat	Position Lon	Depth [m]	Equipment used	Action	Remarks
SO224/010-1	12/11/12	10:10	12° 28,65' S	163° 36,47' W	3963	Profil	Bird a. D.	Bird # 08
SO224/010-1	12/11/12	10:15	12° 28,71' S	163° 36,78' W	3949	Profil	Bird a. D.	Bird # 09
SO224/010-1	12/11/12	10:20	12° 28,76' S	163° 37,10' W	3942	Profil	Bird a. D.	Bird # 10
SO224/010-1	12/11/12	10:25	12° 28,81' S	163° 37,42' W	3942	Profil	Bird a. D.	Bird # 11
SO224/010-1	12/11/12	10:28	12° 28,84' S	163° 37,61' W	3942	Profil	Bird a. D.	Bird # 12
SO224/010-1	12/11/12	10:32	12° 28,88' S	163° 37,86' W	3943	Profil	Streamerend-boje a. D.	**Ende der Stations-arbeiten**

A.5 REGISTRIERPARAMETER DER REFLEXIONSSEISMIK/ SEISMIC REFLECTION RECORDING PARAMETERS

Line	start				end				length [nm]
	date	UTC	lat	lon	date	UTC	lat	lon	
AWI-20120101	16.10.12	17:31:53	-10.11	-163.67	19.10.12	3:22:00	-7.28	-167.29	273.6
AWI-20120201	31.10.12	1:25:04	-11.997	-160.007	2.11.12	6:34:06	-13.005	-164.364	270
AWI-20120001	22.10.12	00:36:47	-11.094	-163.74	23.10.12	2:06:31	-10.951	-161.588	124
AWI-20120002	23.10.12	2:22:11	-10.961	-161.574	23.10.12	14:28:13	-11.82	-161.18	57
AWI-20120003	23.10.12	14:28.13	-11.818	-161.18.3	24.10.12	3:08:36	-12.163	-160.191	60
AWI-20120004	24.10.12	4:48:56	-12.163	-160.192	25.10.12	10:45:28	-12.228	-162.77	150
AWI-20120005	25.10.12	10:45:28	-12.228	-162.769	25.10.12	21:43:05	-11.714	-163.55	54
AWI-20120006	25.10.12	22:48:55	-11.712	-163.525	26.10.12	19:26:32	-10.853	-162.03	100
AWI-20120007	26.10.12	20:49:03	-10.866	-162.056	26.10.12	23:27:55	-11.046	-161.99	11
AWI-20120008	26.10.12	23:27:55	-11.046	-161.993	27.10.12	15:06:05	-10.915	-160.659	80
AWI-20120009	27.10.12	16:19:25	-10.917	-160.689	28.10.12	21:44:28	-12.415	-162.683	147
AWI-20120010	28.10.12	21:44:28	-12.414	-162.682	29.10.12	13:14:20	-13.305	-163.652	76
AWI-20120011	4.11.12	9:53:08	-12.632	-160.628	4.11.12	19:29:29	-12.736	-161.443	47
AWI-20120012	4.11.12	20:55:29	-12.733	-161.431	4.11.12	19:29:29	-13.334	-160.886	45

Line	airgun configuration	total volume [l]	shot interval [s]	No of shots	field tapes
AWI-20120101	8 G-guns	66.7	60	3450	P00147
AWI-20120201	8 G-guns	66.7	60	3190	P00155
AWI-20120001	4 GI-guns	9.6	10	9169	P00148
AWI-20120002	4 GI-guns	9.6	10	3366	P00148
AWI-20120003	4 GI-guns	9.6	10	4465	P00148
AWI-20120004	4 GI-guns	9.6	10	10772	P00148/ P00150
AWI-20120005	4/3 GI-guns	9.6/7.2	10	3941	P00150
AWI-20120006	3 GI-guns	7.2	10	7415	P00150
AWI-20120007	4 GI-guns	9.6	10	952	P00150
AWI-20120008	4GI-guns	9.6	10	5622	P00150/ P00152
AWI-20120009	4 GI-guns	9.6	10	10583	P00152
AWI-20120010	4 GI-guns	9.6	10	5578	P00152/ P00154
AWI-20120011	4 GI-guns	9.6	10	3454	P00156
AWI-20120012	4 GI-guns	9.6	10	3258	P00156

Line	start				end				length [nm]
	date	UTC	lat	lon	date	UTC	lat	lon	
AWI-20120013	5.1112	7:34:59	-13.301	-160.919	5.11.12	16:10:30	-13.154	-161.666	42
AWI-20120014	5.11.12	17:34:59	-13.157	-161.641	6.11.12	2:12:30	-13.789	-161.279	42
AWI-20120015	6.1112	3:46:04	-13.761	-161.296	6.11.12	20:00:35	-12.533	-160.661	81
AWI-20120016	6.11.12	21:18:15	-12.554	-160.661	7.11.12	13:58:03	-13.518	-161.664	82
AWI-20120017	7.11.12	13:58:03	-13.518	-161.663	8.11.12	4:32:23	-13.524	-162.907	73
AWI-20120018	8.11.12	6:25:36	-13.524	-162.901	8.11.12	13:25:36	-13.076	-162.507	34
AWI-20120019	8.11.12	14:39:46	-13.067	-162.493	8.11.12	22:56:37	-13.783	-162.633	39
AWI-20120020	9.11.12	00:59:47	-13.744	-162.638	9.11.12	9:39:37	-13.291	-162.023	43
AWI-20120021	9.11.12	11:04:27	-13.304	-162.049	9.11.12	17:21:17	-13.882	-1612.116	32
AWI-20120022	9.11.12	19:14:17	-13.824	-162.129	10.11.12	14:16:07	-12.67	-163.245	95
AWI-20120023	10.11.12	14:16:07	-12.67	-163.245	11.11.12	1:19:57	-11.74	-163.249	55
AWI-20120024	11.11.12	1:19:57	-11.74	-163.249	11.11.12	10:15:23	-11.041	-163.152	42
AWI-20120025	11.11.12	11:07:42	-11.04	-163.152	11.11.12	17:03:52	-11.552	-162.984	30
AWI-200120026	11.11.12	17:03:52	-11.552	-162.984	11.11.12	23:10:02	-12.041	-162.947	32

Line	airgun configuration	total volume [l]	shot interval [s]	No of shots	field tapes
AWI-20120013	4 GI-guns	9.6	10	3098	P00156
AWI-20120014	4 GI-guns	9.6	10	3105	P00156
AWI-20120015	4 GI-guns	9.6	10	5847	P00156
AWI-20120016	4 GI-guns	9.6	10	5929	P00158
AWI-20120017	4 GI-guns	9.6	10	5246	P00158
AWI-20120018	4 GI-guns	9.6	10	2520	P00158
AWI-20120019	4 GI-guns	9.6	10	2809	P00158
AWI-20120020	4 GI-guns	9.6	10	3247	P00158/ P00030
AWI-20120021	4 GI-guns	9.6	10	2261	P00030
AWI-20120022	4GI-guns	9.6	10	6851	P00030
AWI-20120023	4 GI-guns	9.6	10	3983	P00030
AWI-20120024	4 GI-guns	9.6	10	3192	P00030
AWI-20120025	4 GI-guns	9.6	10	2137	P00030
AWI-200120026	4 GI-guns	9.6	10	2197	P00030/ P00032

Line	**start**				**end**				**length [nm]**
	date	UTC	lat	lon	date	UTC	lat	lon	
AWI-20120027	11.11.12	23:10:02	-12.039	-162.947	12.11.12	3:45:33	-12.411	-163.079	23
AWI-20120028	12.11.12	3:45:33	-12.409	-163.082	12.11.12	9:00:11	-12.464	-163.543	26

Line	airgun configuration	total volume [l]	shot interval [s]	No of shots	field tapes
AWI-20120027	4 GI-guns	9.6	10	1653	P00032
AWI-20120028	4 GI-guns	9.6	10	1887	P00032

A.6 OBS/OBH STATIONSLISTEN / STATION LISTS

Table A.6.1: Profile AWI-20120100

	Deployment				Recovery											
Stat. No.	Latitude South	Longitude West	Depth (m)	Date/Time UTC	Latitude South	Longitude West	Depth (m)	Date/Time UTC	Type	Sensors	Rec. Type	Skew (ms)	C 1 h	C 2 x	C 3 y	C 4 z
01	07°23.160'	167°10.210'	4881	15.10.12 / 08:49	07°23.353'	167°10.050'	n/a	19.10.12 / 07:45	OBS	h,x,y,z	MBS	+5	1	2	2	2
02	07°27.632'	167°04.367'	4884	15.10.12 / 09:47	07°27.757'	167°04.274'	4865	19.10.12 / 09:14	OBS	h,x,y,z	MBS	-206	2	3	3	3
03	07°32.285'	166°58.810'	4875	15.10.12 / 10:35	07°32.814'	166°58.598'	4816	19.10.12 / 13:37	OBS	h,x,y,z	MBS	-151	1	3	3	3
04	07°36.791'	166°52.892'	4584	15.10.12 / 11:28	07°37.090'	166°52.770'	n/a	19.10.12 / 13:41	OBS	h,x,y,z	MBS	-254	2	2	1-2	1-2
05	07°41.348'	166°46.955'	4480	15.10.12 / 12:20	07°41.511'	166°46.834'	4473	19.10.12 / 15:26	OBS	h,x,y,z	MBS	+20	1-2	2	1	1
06	07°45.907'	166°41.471'	4428	15.10.12 / 18:22	07°40.023'	166°41.579'	4417	19.10.12 / 18:22	OBS	h,x,y,z	MBS	n/a	1	2	2	3
07	07°50.889'	166°35.107'	4541	15.10.12 / 14.01	07°51.322'	166°35.101'	4493	19.10.12 / 20:31	OBS	h,x,y,z	MBS	-153	2	3	3	3
08	07°55.463'	166°29.167'	4264	15.10.12 / 14:51	07°55.705'	166°29.180'	4245	19.10.12 / 21:48	OBS	h,x,y,z	MBS	-35	2	3	3	1-2
09	08°00.049'	166°23.166'	4307	15.10.12 / 15:40	08°00.049'	166°23.054'	n/a	20.10.12 / 00:43	OBH	h	MLS	0	1	-	-	-
10	08°04.561'	166°17.752'	4371	15.10.12 / 16:27	08°04.690'	166°17.600'	n/a	20.10.12 / 01:50	OBS	h,x,y,z	MBS	-4	1	3	3-4	3
11	08°08.649'	166°11.735'	4356	15.10.12 / 17:12	08°08.040'	166°11.663'	n/a	20.10.12 / 02:59	OBS	h,x,y,z	MBS	-1	1-2	2-3	3-4	3
12	08°13.654'	166°05.654'	3993	15.10.12 / 17:57	08°13.698'	166°05.868'	3904	20.10.12 /04 :39	OBS	h,x,y,z	MBS	+20	1-2	3	2-3	2-3
13	08°18.198'	165°59.928'	3937	15.10.12 / 18:45	08°18.218'	165°59.857'	3928	20.10.12 / 05:58	OBS	h,x,y,z	MBS	n/a	-	-	-	-
14	08°22.720'	165°54.003'	3768	15.10.12 / 19:31	08°22.865'	165°53.673'	n/a	20.10.12 / 06:57	OBS	h,x,y,z	MBS	+16	2	3-4	3	3
15	08°27.277'	165°48.551'	3766	15.10.12 / 20:20	08°27.323'	165°48.300'	3780	20.10.12 / 07:49	OBS	h,x,y,z	MBS	-56	2	3	3-4	1-2
16	08°31.802'	165°42.641'	3718	15.10.12 / 21:13	08°32.090'	165°42.263'	n/a	20.10.12 / 09:25	OBH	h	MLS	+30	2	-	-	-
17	08°35.910'	165°36.640'	3730	-	-	-	-	-	-	-	-	-	-	-	-	-
18	08°40.864'	165°30.727'	3765	15.10.12 / 22:48	08°40.831'	165°30.336'	n/a	20.10.12 / 11:43	OBS	h,x,y,z	MBS	+6	1-2	2-3	2-3	3
19	08°45.395'	165°24.827'	3052	15.10.12 / 23:41	08°45.296'	165°24.579'	n/a	20.10.12 / 13:08	OBS	h,x,y,z	MBS	-6	4	3-4	3-4	3-4
20	08°49.982'	165°18.841'	3578	16.10.12 / 00:33	08°49.754'	165°18.727'	n/a	20.10.12 / 15:45	OBS	h,x,y,z	MBS	n/a	4	4	4	4
21	08°54.527'	165°13.350'	3431	16.10.12 / 01:26	08°54.430'	165°13.376'	n/a	20.10.12 / 17:21	OBS	h,x,y,z	MTS	+16	1	3	3	2
22	08°59.059'	165°07.421'	3522	16.10.12 / 02:08	08°59.087'	165°07.420'	n/a	20.10.12 / 19:20	OBH	h	MLS	+9	1	-	-	-
23	09°03.613'	165°01.487'	3586	16.10.12 / 03:09	09°03.430'	165°01.450'	n/a	20.10.12 / 21:09	OBS	h,x,y,z	MBS	-30	1-2	3	2-3	3
24	09°08.570'	164°55.096'	3636	16.10.12 / 04:02	09°08.726'	164°55.205'	n/a	20.10.12 / 22:37	OBS	h,x,y,z	MBS	+15	1-2	3	1-2	2
25	09°13.078'	164°49.658'	3652	16.10.12 / 04:46	09°12.847'	164°49.669'	n/a	21.10.12 / 00:09	OBS	h,x,y,z	MBS	+32	2	2-3	4	4
26	09°17.626'	164°43.714'	3706	16.10.12 / 05:38	09°17.423'	164°43.660'	n/a	21.10.12 / 01:55	OBH	h	MLS	+32	2-3	-	-	-
27	09°22.151'	164°37.801'	4233	16.10.12 / 06:25	09°21.980'	164°37.642'	n/a	21.10.12 / 04:00	OBS	h,x,y,z	MBS	+6	1	3	3	3
28	09°26.220'	164°31.871'	4181	16.10.12 / 07:11	09°26.094'	164°31.928'	n/a	21.10.12 / 05:49	OBS	h,x,y,z	MBS	-47	2	2-3	3	3-4
29	09°31.216'	164°26.375'	3611	16.10.12 / 07:57	09°31.233'	164°26.456'	n/a	21.10.12 / 07:58	OBH	h	MLS	-53	1-2	-	-	-
30	09°35.305'	164°20.447'	4855	16.10.12 / 08:44	09°35.200'	164°20.528'	n/a	21.10.12 / 09:48	OBS	h,x,y,z	MBS	+36	1-2	4	4	3
31	09°40.240'	164°14.536'	3961	16.10.12 / 09:34	09°40.240'	164°14.680'	n/a	21.10.12 / 11:32	OBS	h,x,y,z	MBS	-12	1-2	4	4	4
32	09°44.265'	164°09.144'	3807	16.10.12 / 10:21	09°44.144'	164°09.224'	n/a	21.10.12 / 13:13	OBS	h,x,y,z	MLS	-3	1	-	-	-
33	09°48.835'	164°03.163'	3274	16.10.12 / 11:07	09°48.660'	164°03.222'	n/a	21.10.12 / 14:47	OBS	h,x,y,z	MBS	+1	1	4	4	4
34	09°53.337'	163°57.255'	3457	16.10.12 / 11:54	09°53.337'	163°57.321'	3277	21.10.12 / 16:41	OBS	h,x,y,z	MBS	n/a	4	1-2	2	1-2

Table A.6.2: Profile AWI-20120200

	Deployment				Recovery											
Stat. No.	Latitude South	Longitude West	Depth (m)	Date/Time UTC	Latitude South	Longitude West	Depth (m)	Date/Time UTC	Type	Sensors	Rec. Type	Skew (ms)	C 1 h	C 2 x	C 3 y	C 4 z
01	12°57.518'	164°15.666'	5045	29.10.12 / 18:38	12°57.623'	164°15.690'	n/a	02.11.12 / 10:04	OBS	h,x,y,z	MBS	+6	1	1	1	1
02	12°56.218'	164°09.705'	5139	29.10.12 / 19:16	12°56.266'	164°09.704'	n/a	02.11.12 / 10:49	OBS	h,x,y,z	MBS	+8	2	2	1-2	1-2
03	12°54.884'	164°03.747'	5178	29.10.12 / 19:54	12°54.884'	164°03.874'	n/a	02.11.12 / 12:40	OBS	h,x,y,z	MBS	-9	1	3	2-3	2
04	12°53.540'	163°57.868'	4954	29.10.12 / 20:41	12°53.650'	163°58.010'	n/a	02.11.12 / 13:40	OBS	h,x,y,z	MBS	-67	1-2	3	3	3
05	12°52.205'	163°51.947'	5143	29.10.12 / 21:22	12°52.382'	163°52.110'	n/a	02.11.12 / 14:58	OBS	h,x,y,z	MBS	+25	4	4	4	4
06	12°50.850'	163°45.994'	4076	29.10.12 / 22:07	12°50.771'	163°46.121'	n/a	02.11.12 / 15:53	OBS	h,x,y,z	MBS	+41	1	1-2	2	3
07	12°49.474'	163°40.073'	3986	29.10.12 / 22:51	12°49.368'	163°40.332'	n/a	02.11.12 / 17:06	OBS	h,x,y,z	MBS	-153	1	3	2-3	2-3
08	12°48.125'	163°34.141'	3947	29.10.12 / 23:37	12°48.187'	163°34.339'	n/a	02.11.12 / 18:00	OBS	h,x,y,z	MBS	-33	1	2	2	2
09	12°46.806'	163°27.745'	3260	30.10.12 / 00:28	12°46.970'	163°27.950'	n/a	02.11.12 / 19:10	OBH	h	MBS	+10	1	-	-	-
10	12°45.460'	163°21.815'	3083	30.10.12 / 01:13	12°45.610'	163°22.080'	n/a	02.11.12 / 19:50	OBS	h,x,y,z	MBS	-145	1	2	1-2	2
11	12°43.681'	163°14.114'	2969	30.10.12 / 02:10	12°43,840'	163°14.360'	n/a	02.11.12 / 21:05	OBS	h,x,y,z	MLS	-22	1	2	1-2	1-2
12	12°41.889'	163°06.309'	2862	30.10.12 / 03:34	12°42.369'	163°06.414'	n/a	02.11.12 / 22:06	OBS	h,x,y,z	MBS	n/a	4	4	4	4
13	12°40.110'	162°58.596'	2653	30.10.12 / 04:29	12°40.665'	162°58.684'	n/a	02.11.12 / 23:19	OBS	h,x,y,z	MBS	n/a	4	4	4	4
14	12°38.308'	162°50.799'	2542	30.10.12 / 05:18	12°38.975'	162°50.672'	n/a	03.11.12 / 00:24	OBS	h,x,y,z	MLS	-1	1	2	1	1
15	12°36.515'	162°43.040'	2459	30.10.12 / 06:07	12°36.782'	162°43.050'	n/a	03.11.12 / 01:20	OBS	h,x,y,z	MBS	-53	1	1-2	1	1
16	12°34.276'	162°33.023'	2509	30.10.12 / 07:08	12°34.396'	162°33.181'	n/a	03.11.12 / 02:45	OBH	h	MBS	-147	4	-	-	-
17	-	-	-	-	-	-	-	-	none	-	-	-	-	-	-	-
18	12°31.704'	162°21.231'	2475	30.10.12 / 08:21	12°31.673'	162°21.238'	n/a	03.11.12 / 04:18	OBS	h,x,y,z	MBS	+7	1	2	1-2	1
19	12°29.359'	162°10.676'	2503	30.10.12 / 09:28	12°39.313'	162°10.771'	n/a	03.11.12 / 05:40	OBS	h,x,y,z	MBS	-6	1	2-3	1-2	2
20	12°26.221'	161°56.958'	2463	30.10.12 / 10:51	12°26.177'	161°57.042'	n/a	03.11.12 / 07:18	OBS	h,x,y,z	MTS	+13	1	2	1-2	1-2
21	12°23.059'	161°43.285'	2615	30.10.12 / 12:12	12°23.011'	161°43.456'	n/a	03.11.12 / 09:16	OBS	h,x,y,z	MBS	+37	3	1-2	2	3
22	12°20.356'	161°31.386'	2698	30.10.12 / 13:27	12°20.371'	161°31.419'	n/a	03.11.12 / 11:22	OBH	h	MBS	+54	1	-	-	-
23	12°18.127'	161°21.390'	2710	30.10.12 / 14:32	12°18.136'	161°21.564'	n/a	03.11.12 / 12:44	OBS	h,x,y,z	MBS	-29	1	2-3	3	1-2
24	12°15.885'	161°11.332'	2693	30.10.12 / 15:40	12°16.062'	161°11.516'	n/a	03.11.12 / 14:14	OBS	h,x,y,z	MBS	+13	4	4	4	4
25	12°13.641'	161°01.753'	2147	30.10.12 / 16:40	12°13.925'	161°07.871'	n/a	03.11.12 / 16:05	OBH	h	MTS	+28	1	-	-	-
26	12°11.850'	160°54.001'	3868	30.10.12 / 17:25	12°12.158'	160°54.415'	n/a	03.11.12 / 17:00	OBS	h,x,y,z	MBS	+34	1	2-3	2	2-3
27	12°10.519'	160°48.095'	3609	30.10.12 / 18:01	12°10.371'	160°48.223'	n/a	03.11.12 / 17:51	OBS	h,x,y,z	MBS	+4	1	3	3-4	3
28	12°09.165'	160°42.177'	3542	30.10.12 / 18:37	12°10.580'	160°48.240'	n/a	03.11.12 / 18:42	OBS	h,x,y,z	MBS	-49	1	1-2	1-2	1-2
29	12°07.817'	160°36.245'	4557	30.10.12 / 19:15	12°07.943'	160°36.414'	n/a	03.11.12 / 20:44	OBH	h	MBS	-150	1	-	-	-
30	12°06.465'	160°30.293'	4846	30.10.12 / 19:53	12°06.599'	160°30.254'	n/a	03.11.12 / 21:41	OBS	h,x,y,z	MLS	-58	1-2	2-3	2-3	2-3
31	12°05.128'	160°24.383'	5358	30.10.12 / 20:33	12°05.302'	160°24.315'	n/a	03.11.12 / 23:50	OBS	h,x,y,z	MBS	-146	4	1-2	1-2	1
32	12°03.778'	160°18.000'	4933	30.10.12 / 21:19	12°03.915'	160°10.008'	n/a	04.11.12 / 01:12	OBS	h,x,y,z	MLS	-5	1	3-4	3	2
33	12°02.240'	160°12.061'	5066	30.10.12 / 22:04	12°02.511'	160°12.026'	n/a	04.11.12 / 02:16	OBS	h,x,y,z	MBS	+7	1	3-4	2-3	2
34	12°00.633'	160°04.290'	4971	30.10.12 / 22:57	12°00.847'	160°03.987'	n/a	04.11.12 / 04:32	OBS	h,x,y,z	MBS	-151	1	3	1-2	1-2

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