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Short Cruise Report RV SONNE, cruise SO288



Guayaquil (Ecuador) - Valparaiso (Ecuador) 15.01.2022 - 15.02.2022

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Figure 1: Overview map of the track (orange line) covered during the cruise SO288. The general time scope of the cruise is indicated by the dates marked along the track.

Objectives

Cruise SO288-COMBO focuses on the de-installation and recovery of the GeoSEA array off northern Chile. The seafloor geodetic station array was installed at three locations on the Chilean continental slope and the oceanic plate seaward of the deep-sea trench in 2015 during cruise SO244. All three arrays in principle measure the change in the position of a set of points as a function of time (e.g. interseismic creep or the displacement due to an earthquake), thus identifying ,deformation hotspots' on the seafloor, which then need to be linked to defined geological features. High-frequency seismic profiling is required to complement the punctual observations of the mm- to cm-scale displacement achieved through the geodetic surveying. This approach is instrumental to interpret the results of the seafloor geodetic survey, and allow inferences regarding the active tectonics of a larger area than the point locations covered by the geodesy. At the end of the active monitoring phase, the instruments including the data loggers are to be recovered. This work will be flanked by seismic surveys.

While the seafloor morphology in the area of the three networks is sufficiently known from high-resolution AUV mapping carried out during SO244 Leg I, information on subsurface structures, significantly also on possibly active tectonic faults, is still missing. These are to be detected by means of high-resolution multichannel profiling using GI-guns and a 175 m long streamer. Information on the seismic velocity structure and thus on the structure of the bedrock will be obtained from wide-angle seismic surveying employing ocean bottom seismometers (OBS). This work will be complemented by visual seafloor surveys (ROV camera). The overall goal of the project is to be able to evaluate the geodetic signals recorded over a period of several years differentiated by their origin, depending on the degree of coupling or creep of interseismic type, as well as the distribution of deformation at the plate boundary and within the upper plate. The mechanisms of seafloor deformation are a fundamental unresolved issue in seismology, as it has a direct influence on seismogenesis and thus on the hazard potential of plate boundaries. The seafloor geodetic measurements focus on the three array locations (Fig. 3.1) which were chosen with the aim to address the following specific scientific targets:

- In AREA1, the targeted baselines across a set of westward dipping normal faults aim to yield information on trench perpendicular motion as well as any possible strike-slip component resulting from slip partitioning. This information is important to validate the tectonic source of possible geodetic signals.
- The main target in AREA2 is to measure the extension across bending-related trench-parallel normal faults in water depths between 4030-4100 m. We aim to quantify the rate of fault motion by measuring the extent across a plate-bending related normal fault using the geodetic array in AREA2. In addition, ground-truthing by a ROV dive targets possible relics of recent fault movement.
- The principal aim in the tectonically complex AREA3 is to measure diffuse strain over long baselines (Fig. 3.3). In order to separate motion on upper plate faults from elastic strain build-up originating from the plate interface thrust, a 'spider web' layout of the array was chosen to cover a maximum area. Detailed 2D seismic profiling above the geodetic array aims to image possible upper plate faults.



Figure 2: Overview map showing the three main study areas (white squares) and the extent of the bathymetric survey (grey lines) carried out during SO288.

Narrative

On Saturday, 15 January 2022 at 13:00 local time (UTC-5) RV SONNE departed from the port of Guayaquil (Ecuador). The previous days in port were used for final preparations in the laboratories and the mobilization of the remotely operated vehicle (ROV) Kiel 6000 and the seismic equipment, as well as for a COVID-19 PCR screening of the cruise participants (32 crewmembers and 26 scientists). After the 3.5h passage through the Rio Guayas we reached the Pacific Ocean in calm conditions and started the transit south towards our working area in the EEZ of Chile. The scientists used the transit time to finish lab preparations and set up equipment.

Between January 17 - 19 five cruise participants were tested positive for COVID-19 and were isolated in their single cabins in accordance with the cruise specific 'COVID-19 Outbreak Management Plan'. All individuals except for one person showed no symptoms. In order to gain control over the further infection and to prevent all unnecessary movements on board, the planned research work was interrupted for 7 days, combined with daily antigen tests. In addition, strict hygiene and containment measures took effect. Official meetings were conducted via video conference, for which a SONNE-internal video client was installed. This 'ship's own quarantine' was essential in order to prevent an interruption of the voyage as well as to continue to enable the implementation of the research program. There is a consensual desire among both the crew and the scientific team to continue the cruise and to carry out the planned research work.

On January 21 we reached our work area off the coast of northern Chile. The nearest ports in Arica and Iquique can be reached at short notice. We began a program of high-resolution mapping of the previously unmapped northern flank of the Iquique Ridge. This work is easily accomplished under the strict hygiene constraints, as only one person is required to be in the hydroacoustics lab at a time, and watch handovers are not direct, but are staggered by 15 minutes so that watchstanders do not encounter each other.

Between January 20 - 23 no new infections were confirmed, which was corroborated by a ship-wide PCR screening on January 25 so that instrument deployment could commence in the afternoon of January 25. The mapping survey was terminated and three CTD stations were conducted in working AREA1, of which the first was also used for a deep-sea test of the ocean bottom seismometer releasers. At 08:00 on January 26 the ROV was deployed for its first dive, which lasted until 20:00 on that day. During the dive, three GeoSEA stations (A107, A108 and A106, in that order) were recovered using a dedicated recovery frame. Afterwards, five CTD stations were accomplished. The morning of January 27 saw the next ROV dive and during the day, we recovered two additional GeoSEA stations (A103, A104) before starting the seismic program. After initiation of the mammal mitigation procedures, two GI guns (3.44 I) and a 175 m long streamer were deployed. Unfortunately, data transmission from the streamer failed shortly thereafter, so that the gear was recovered. Instead, three CTD stations were achieved to collect water samples.

On January 28 at 08:00, the third ROV dive commenced and by the end of the day, the last three GeoSEA stations from working AREA1 (A101, A102, A105) were safely recovered on deck. During the night, we completed an additional seven CTD stations to collect water samples. Some of the samples were immediately filtered on board and stored frozen or refrigerated for analysis of chemical and biological composition at home in the laboratory. Most of the water was obtained from the deep sea (1500 m) to conduct incubation experiments on the degradation of organic material by heterotrophic microorganisms at in-situ temperature (2°C) and in the dark in the ship's climate

laboratories. During the night of January 28 the Marine Snow Catcher, a large-volume water scoop that collects intact particles and associated microbial communities, and an in situ microbial incubator, which allows determination of microbial activity under hydrostatic in situ pressure conditions, were also deployed.

On January 29 the last person was released from isolation after a PCR test, so that all five infected persons resumed their regular duties. At the same time and after a 55 nm transit to working AREA2, we recovered the five GeoSEA transponders (A201-A205) on the oceanic Nazca plate seaward of the deep-sea trench, installed in water depths up to 4100 m. The transponders were extracted from the tripods (except A204) by the ROV so that the frames could remain in place and new transponders be re-installed at a later time to record long time series. In the evening, the GI air guns and streamer were launched to image the subsurface structures beneath the tripods. Seismic recording proceeded overnight and without interruption during January 30 until the early morning of January 31. During the day, four CTD stations were completed to retrieve water samples from the surface to the deep sea (4000 m) for the study of the vertical distribution of organic matter and microbial activity. A general PCR screening on January 31 yielded negative results for everyone on board and brought about the lifting of some of the strict hygiene measures.

After a 45 nm transit in the evening, a total of six ocean bottom seismometers were deployed in working AREA3 until the morning of February 1 when the ROV was deployed at 08:00h for its fifth dive. Unfortunately, at a water depth of 5100 m, we suddenly and unexpectedly lost all communication and control to the ROV. Rescue operations under these difficult conditions lasted until the late afternoon. The following 36 hrs were dedicated to the seismic program with acquisition of a refraction seismic profile using the G-gun array (portside only, 37.6 l) as a source and a survey of reflection lines shot with the GI-guns. Subsequently, the ocean bottom seismometers were recovered and additional CTD stations and an in-situ incubator experiment were run during the night of February 4. During this entire time, the repair work on the ROV was running in parallel. Three fibres in the fibre-optic cable turned out to be malfunctioning, so that the cable had to be truncated.

The ROV could be launched again on February 4 and recovered three GeoSEA stations (A301, A303, A310) from water depths of more than 5200 m until the evening. An extensive reflection seismic program covering 640 km began in the evening and continued over the next three nights, followed by ROV dives during the day. On February 5 stations A302 and A305 were recovered by the ROV, following some maintenance work on the vehicle's POSIDONIA system. The ROV dive on the following day recovered stations A306 and A304.

On February 7 the last three GeoSEA transponders (A309, A308, A307) were recovered, ending the ROV program of SO288. Three CTD casts were accomplished until midnight, followed by the 40 nm transit back to working AREA2, where six OBS were deployed until the morning of February 8. At 07:00h mammal mitigation procedures were started prior to the deployment of the G-gun array. Shooting continued until 18:00h that day, after which we recovered the OBS and started the transit back to working AREA1, where a 20 hr MCS-survey was initiated.

On February 10 at 11:00h we left our study sites offshore northern Chile to head south. PARASOUND and multibeam bathymetry were collected during the transit. On February 11 at 05:00h we entered an uncharted segment of the marine forearc and commenced a dedicated multibeam survey to gain full coverage of the seafloor map reaching from the outer rise seaward of the deep-sea trench to the upper continental shelf. RV SONNE safely arrived at the anchorage of Valparaiso on February 15, 2022 at 07:00h, terminating cruise SO288. Throughout the cruise weather conditions were optimal, always calm seas and no rain.

Acknowledgements

SO288 is the first cruise of RV SONNE to start from a South American port to the Pacific during the COVID-19 pandemic. The ambitious planning and preparation related to the transportation of infrastructure and the safe travel of the scientific and nautical crews would not have been possible without the excellent shore-based administrative and logistical support of the German Research Fleet Coordination Centre, Universität Hamburg, the shipping company Briese Research and the Project Management Jülich (PtJ). We gratefully acknowledge the help of the Foreign Office in Berlin and the German Embassy in Santiago de Chile. We would also like to thank the Government of Chile for granting opportunity to work within their territorial waters. S.H.O.A. and SUBPESCA in Chile are thanked for the efficient permitting process. In particular, we would like to extend our special thanks to Prof. Sergio Barrientos (National Seismological Center and Universidad de Chile) and Prof. Eduardo Contreras-Reyes (Universidad de Chile) for their continued support. We especially thank Captain Tilo Birnbaum and his crew for managing the complicated logistics of the two scientific groups as well as of the large deployment of equipment and for their skillful execution of the complex scientific program. They contributed exceptionally to the pleasant and professional atmosphere on RV SONNE and their strict discipline in adhering to the safety and hygiene measures after the COVID-19 infections on board were confirmed made a decisive contribution to breaking the chains of infection. Thank you also to the participants of the Round Table for their intensive support from shore. The cruise and scientific work is financed by the Federal Ministry of Education and Research (BMBF) under grants 03F0658I (GeoSEA), 03G0288NA (COMBO) and 03G0288NB (HOMER) with additional funding and use of large-scale equipment from GEOMAR.

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Station Lists

| Station Number | Dive No. | Date | Time Start | At Bottom | Off Bottom | Time End | Location | Depth | ROV Bottom Time | |
|-------------------|-------------|-----------|-----------------|----------------------------------|---------------|--------------|---------------|-------|-----------------------|--|
| SO288 | | 2022[UTC] | [UTC] | [UTC] | [UTC] | [UTC] | | [m] | [h] | |
| Test | 310 | 15.01 | | Harbour Test Guayaquil., Ecuador | | | | | | |
| 003ROV01 | 311 | 26.01 | 12:30 | 14:06 | 22:22 | 23:55 | GeoSEA AREA 1 | 2850 | 08:16 | |
| 005ROV02 | 312 | 27.01 | 12:35 | 13:52 | 19:41 | 21:09 | GeoSEA AREA 1 | 2850 | 05:49 | |
| 008ROV03 | 313 | 28.01 | 12:05 | 13:20 | 20:05 | 21:23 | GeoSEA AREA 1 | 2850 | 06:45 | |
| 010ROV04 | 314 | 29.01 | 12:03 | 13:45 | 18:49 | 21:00 | GeoSEA AREA 2 | 4100 | 05:04 | |
| 019ROV05 | 315 | 01.02 | 12:00 | | | 21:00 | GeoSEA AREA 3 | 5100 | | |
| 029ROV06 | 316 | 04.02 | 12:06 | 14:27 | 20:24 | 23:00 | GeoSEA AREA 3 | 5300 | 05:57 | |
| 031ROV07 | 317 | 05.02 | 16:34 | 18:58 | 23:04 | 01:49 | GeoSEA AREA 3 | 5400 | 04:06 | |
| 033ROV08 | 318 | 06.02 | 14:45 | 17:09 | 19:21 | 21:47 | GeoSEA AREA 3 | 5400 | 02:12 | |
| 035ROV09 | 319 | 07.02 | 12:25 | 14:35 | 17:29 | 19:50 | GeoSEA AREA 3 | 5300 | 02:54 | |
| | | Tota | d: 8 scientific | / recovery | dives + 1 a | abandoned di | ve | | 41:03 | |

Table 1: Remotely operated vehicle (ROV) dives.

Table 2: GeoSea stations.

| Station No. | Latitude (°) ROV | Longitude (°) ROV | Depth | Depth | Recov. Date | Recov. Time | S/N |
|----------------|---------------------|----------------------|---------|------------------|----------------|----------------|------------|
| SO288 | [S] | [W] | ROV [m] | Multibeam [m] | 2022 | [UTC] | |
| Area 1 | | | | | | | |
| A107 | -70° 49.883' | -20° 47.919' | 2869.5 | 2867.1 | 26.01 | 15:35:13 | 284790-010 |
| A108 | -70° 50.052' | -20° 47.645' | 2861.6 | 2858.3 | 26.01 | 18:45:16 | 284790-001 |
| A106 | -70° 49.505' | -20° 47.826' | 2844.9 | 2843.4 | 26.01 | 22:17:06 | 284790-009 |
| A103 | -70° 49.059' | -20° 47.606' | 2750.1 | 2741.3 | 27.01 | 14:27:28 | 284790-004 |
| A104 | -70° 48.581' | -20° 47.399' | 2621.5 | 2617.7 | 27.01 | 19:31:45 | 284790-005 |
| A105 | -70° 49.434' | -20° 48.168' | 2871.0 | 2880.9 | 28.01 | 14:11:44 | 284792-008 |
| A101 | -70° 48.942' | -20° 47.964' | 2743.0 | 2731.9 | 28.01 | 17:38:21 | 284790-002 |
| A102 | -70° 48.507' | -20° 47.721' | 2609.8 | 2603.3 | 28.01 | 20:00:30 | 284790-003 |
| Area 2 | | | | | | | |
| A201 | -71° 43.927' | -21° 3.438' | 4130.1 | 4110.9 | 29.01 | 17:26:09 | 284791-006 |
| A202 | -71° 43.997' | -21° 3.154' | 4128.8 | 4104.8 | 29.01 | 16:24:05 | 284971-008 |
| A203 | -71° 44.217' | -21° 3.503' | 4084.3 | 4061.4 | 29.01 | 18:44:14 | 284791-009 |
| A204 | -71° 44.296' | -21° 3.16' | 4059.7 | 4048.5 | 29.01 | 14:53:27 | 284792-006 |
| A205 | -71° 44.226' | -21° 3.402' | 4083.5 | 4060.5 | 29.01 | 18:26:37 | 284791-005 |
| Area 3 | | | | | | | |
| A301 | -71° 4.158' | -20° 47.038' | 5292.5 | 5243 | 04.02 | 17:27:33 | 284790-006 |
| A302 | -71° 5.045' | -20° 47.571' | 5416.9 | 5367 | 05.02 | 19:45:17 | 284790-007 |
| A303 | -71° 3.654' | -20° 46.857' | 5243.6 | 5200 | 04.02 | 20:18:04 | 284790-008 |
| A304 | -71° 4.23' | -20° 46.424' | 5386.6 | 5336 | 06.02 | 19:19:41 | 284789-005 |
| A305 | -71° 4.659' | -20° 46.838' | 5406.6 | 5357 | 05.02 | 23:00:46 | 284790-010 |
| A306 | -71° 4.189' | -20° 46.659' | 5342.7 | 5295 | 06.02 | 17:57:33 | 284789-001 |
| A307 | -71° 4.232' | -20° 48.046' | 5278.4 | 5233 | 07.02 | 17:21:40 | 284789 |
| A308 | -71° 3.741' | -20° 47.903' | 5175.8 | 5133 | 07.02 | 16:07:01 | 284789-003 |
| A309 | -71° 2.779' | -20° 47.694' | 5142.5 | 5098 | 07.02 | 14:57:23 | 284789-004 |
| A310 | -71° 3.975' | -20° 47.245' | 5269.7 | 5223 | 04.02 | 16:03:20 | 284791-002 |

| Station No. | Latitude (°) | Longitude (°) | Deploy. Date | Recov. Date | Depth | Recorder No. |
|-------------|--------------|---------------|--------------|-------------|-------|-----------------|
| SO288 | [°S] | [° W] | 2022 | 2022 | [m] | |
| OBS21 | 21°03,042 | 071°425,22 | 08.02 | 09.02 | 4270 | 011 |
| OBS22 | 21°03,087 | 071°43,047 | 08.02 | 09.02 | 4242 | 005 |
| OBS23 | 21°03,222 | 071°43,672 | 08.02 | 09.02 | 4104 | 007 |
| OBS24 | 21°03,261 | 071°44,265 | 08.02 | 09.02 | 4046 | 017 |
| OBS25 | 21°03,363 | 071°44,849 | 08.02 | 09.02 | 4037 | 013 |
| OBS26 | 21°03,437 | 071°45,400 | 08.02 | 09.02 | 4061 | 014 |
| OBS31 | 20°47,213 | 071°06,286 | 01.02 | 03.02 | 5610 | 011 |
| OBS32 | 20°49,942 | 071°06,030 | 01.02 | 03.02 | 5603 | 005 |
| OBS33 | 20°46,590 | 071°05,713 | 01.02 | 03.02 | 5474 | 007 |
| OBS34 | 20°46,244 | 071°05,409 | 01.02 | 03.02 | 5445 | 017 |
| OBS35 | 20°45,846 | 071°05,046 | 01.02 | 03.02 | 5499 | 013 |
| OBS36 | 20°45,508 | 071°04,742 | 01.02 | 03.02 | 5534 | 014 |

Table 3: Ocean-bottom seismometer (OBS) stations.

Table 4: Seismic profiles.

| Line no. | Date | Time Start | Time End | Latitude Longitude Start Start | | Latitude Longitude End End | | FFN Start | FFN End |
|-----------------|-------|------------|----------|-----------------------------------|------------------------------|-------------------------------|------------|--------------|------------|
| | | | | Sta | art | E | Ind | | |
| SO288 | 2022 | [UTC] | [UTC] | xx° xx.x' | XX[°] XX.X ' | XX[°] XX.X ' | xx° xx.x' | | |
| Survey P2000 | | | | | | | | | |
| P2001 | 29.01 | 23:09:00 | 01:33:57 | 21°06,885 | 071°46,714 | 21°02,114 | 071°38,298 | 180 | 1041 |
| P2002 | 30.01 | 02:06:38 | 04:11:40 | 21°00,860 | 071°39,455 | 21°04,910 | 071°46,947 | 1237 | 1988 |
| P2003 | 30.01 | 04:48:21 | 06:44:39 | 21°03,193 | 071°47,766 | 20°59,269 | 071°40,557 | 2208 | 2906 |
| P2004 | 30.01 | 07:30:06 | 09:28:00 | 20°57,513 | 071°41,664 | 21°01,171 | 071°48,439 | 3179 | 3883 |
| P2005 | 30.01 | 09:47:00 | 11:50:00 | 21°02,159 | 071°48,506 | 21°05,975 | 071°41,205 | 3994 | 4729 |
| P2006 | 30.01 | 12:28:18 | 14:09:16 | 21°04,407 | 071°40,212 | 21°01,093 | 071°46,795 | 4968 | 5574 |
| P2007 | 30.01 | 14:45:57 | 16:38:58 | 20°59,331 | 071°46,079 | 21°02,516 | 071°39,432 | 5794 | 6472 |
| P2008 | 30.01 | 17:28:49 | 19:13:43 | 21°04,985 | 071°40,612 | 21°01,766 | 071°47,184 | 6771 | 7401 |
| P2009 | 30.01 | 19:46:04 | 21:36:00 | 21°00,468 | 071°46,594 | 21°03,717 | 071°39,832 | 7594 | 8250 |
| P2010 | 30.01 | 22:15:00 | 23:54:00 | 21°05,457 | 071°40,651 | 21°02,383 | 071°45,775 | 8475 | 9085 |
| P2011 | 31.01 | 00:32:05 | 02:31:33 | 21°03,564 | 0,71°46,811 | 21°00,002 | 071°40,124 | 9311 | 10027 |
| P2012 | 31.01 | 03:12:01 | 05:07:50 | 21°01,695 | 071°38,923 | 21°05,815 | 071°46,315 | 10270 | 10965 |
| P2013 | 31.01 | 05:39:45 | 07:52:49 | 21°04,654 | 071°47,106 | 21°00,611 | 071°39,716 | 11157 | 11955 |
| P2014 | 31.01 | 08:29:00 | 10:54:00 | 21°02,086 | 071°38,806 | 21°07,058 | 071°47,792 | 12170 | 13037 |
| Survey P3000 | | | | | | | | | |
| P3001 | 01.02 | 23:05:00 | 00:44:19 | 20°50,052 | 071°05,192 | 20°45,793 | 071°01,337 | 14118 | 14617 |
| P3002 | 02.02 | 01:15:11 | 02:15:58 | 20°44,557 | 071°02,499 | 20°47,717 | 071°05,380 | 14771 | 15074 |
| P3003 | 02.02 | 02:46:10 | 03:55:46 | 20°47,004 | 071°06,889 | 20°43,780 | 071°04,114 | 15225 | 15574 |
| P3004 | 02.02 | 04:41:34 | 05:36:58 | 20°45,044 | 071°02,567 | 20°47,928 | 071°05,123 | 15803 | 16080 |
| P3005 | 02.02 | 06:04:36 | 07:16:37 | 20°47,197 | 071°06,422 | 20°43,898 | 071°03,456 | 16218 | 16578 |
| P3006 | 02.02 | 07:51:03 | 08:50:00 | 20°45,041 | 071°02,225 | 20°48,016 | 071°04,841 | 16750 | 17041 |
| P3007 | 02.02 | 09:17:00 | 10:26:00 | 20°47,426 | 071°06,230 | 20°44,253 | 071°03,463 | 17179 | 17521 |
| P3008 | 02.02 | 11:05:38 | 12:02:13 | 20°45,260 | 071°02,044 | 20°48,232 | 071°04,675 | 17723 | 18005 |
| P3009 | 02.02 | 12:27:34 | 13:31:30 | 20°47,643 | 071°06,004 | 20°44,432 | 071°03,193 | 18133 | 18452 |
| P3010 | 02.02 | 14:10:55 | 15:11:34 | 20°45,547 | 071°01,577 | 20°48,566 | 071°04,253 | 18650 | 18953 |
| P3011 | 02.02 | 16:03:53 | 17:05:12 | 20°46,901 | 071°06,500 | 20°43,726 | 071°03,772 | 19214 | 19521 |
| P3012 | 02.02 | 17:31:22 | 18:12:35 | 20°42,976 | 071°04,990 | 20°45,189 | 071°06,609 | 19652 | 19858 |

| P3013 | 02.02 | 18:27:51 | 19:25:08 | 20°45,933 | 071°05,873 | 20°48,246 | 071°02,658 | 19934 | 20220 |
|-----------------|-------|----------|----------|-----------|------------|-----------|------------|-------|-------|
| Survey P4000 | | | | | | | | | |
| P4001 | 02.02 | 22:30:00 | 03:23:19 | 20°40,436 | 070°00,220 | 20°55,512 | 071°13,708 | 21065 | 21654 |
| P4002 | 03.02 | 04:40:06 | 11:49:00 | 20°55,489 | 071°13,655 | 20°33,528 | 070°54,025 | 21807 | 22663 |
| Survey P5000 | | | | | | | | | |
| P5001 | 05.02 | 00:33:00 | 02:32:00 | 20°42,342 | 071°01,529 | 20°42,520 | 070°53,115 | 23124 | 23835 |
| P5002 | 05.02 | 03:02:00 | 04:26:03 | 20°44,059 | 070°53,490 | 20°43,944 | 070°59,502 | 24019 | 24527 |
| P5003 | 05.02 | 04:59:21 | 07:04:36 | 20°45,561 | 070°59,501 | 20°45,709 | 070°50,586 | 24727 | 25479 |
| P5004 | 05.02 | 07:49:57 | 09:50:08 | 20°47,875 | 070°50,676 | 20°47,549 | 070°59,249 | 25751 | 26472 |
| P5005 | 05.02 | 10:31:20 | 11:25:38 | 20°49,391 | 070°59,434 | 20°49,533 | 070°55,562 | 26719 | 27044 |
| P5006 | 06.02 | 03:23:00 | 05:28:53 | 20°49,490 | 070°57,012 | 20°49,780 | 070°47,987 | 27171 | 27928 |
| P5007 | 06.02 | 06:07:17 | 09:07:59 | 20°51,691 | 070°48,029 | 20°51,390 | 071°00,904 | 28159 | 29243 |
| P5008 | 06.02 | 09:47:01 | 12:30:00 | 20°53,231 | 071°00,939 | 20°53,552 | 070°49,904 | 29477 | 30404 |
| P5009 | 06.02 | 23:00:52 | 02:13:00 | 20°48,593 | 071°01,606 | 20°48,878 | 070°48,007 | 30533 | 31684 |
| P5010 | 07.02 | 02:58:00 | 05:52:36 | 20°47,807 | 070°47,807 | 20°46,512 | 071°00,273 | 31851 | 33003 |
| P5011 | 07.02 | 07:57:23 | 10:37:26 | 20°43,744 | 070°56,241 | 20°54,423 | 070°56,549 | 33752 | 34713 |
| Survey P6000 | | | | | | | | | |
| P6001 | 08.02 | 13:10:00 | 18:05:11 | 21°04,737 | 071°55,354 | 21°01,645 | 071°31,963 | 35075 | 35667 |
| P6002 | 08.02 | 19:05:00 | 22:49:24 | 21°01,666 | 071°32,362 | 21°04,061 | 071°50,251 | 35786 | 36235 |
| Survey P7000 | | | | | | | | | |
| P7001 | 09.02 | 14:44:00 | 15:05:00 | 20°48,192 | 070°46,951 | 20°48,164 | 070°45,501 | 37379 | 37538 |
| P7002 | 09.02 | 15:41:00 | 17:19:23 | 20°46,252 | 070°45,704 | 20°46,342 | 070°52,681 | 37814 | 38548 |
| P7003 | 09.02 | 17:53:56 | 19:20:50 | 20°47,909 | 070°52,701 | 20°47,839 | 070°46,530 | 38807 | 39455 |
| P7004 | 09.02 | 19:43:11 | 20:07:12 | 20°48,886 | 070°46,131 | 20°49,783 | 070°47,552 | 39589 | 39807 |
| P7005 | 09.02 | 20:25:38 | 21:05:33 | 20°49,389 | 070°48,537 | 20°46,712 | 070°48,719 | 39945 | 40245 |
| P7006 | 09.02 | 21:24:41 | 21:32:31 | 20°46,147 | 070°47,778 | 20°46,430 | 070°47,309 | 40389 | 40389 |
| P7007 | 09.02 | 21:55:00 | 23:10:57 | 20°47,509 | 070°47,582 | 20°47,574 | 070°52,963 | 40617 | 41186 |
| P7008 | 09.02 | 23:25:18 | 23:32:11 | 20°47,031 | 070°53,651 | 20°46,561 | 070°53,683 | 41293 | 41345 |
| P7009 | 09.02 | 23:49:44 | 00:32:00 | 20°45,932 | 070°52,848 | 20°46,085 | 070°49,898 | 41476 | 41793 |
| P7010 | 10.02 | 01:22:00 | 01:57:00 | 20°49,038 | 070°50,186 | 20°49,115 | 070°52,710 | 42163 | 42427 |
| P7011 | 10.02 | 02:40:00 | 04:04:49 | 20°47,231 | 070°52,362 | 20°47,148 | 070°46,268 | 42748 | 43387 |
| P7012 | 10.02 | 04:36:57 | 06:31:47 | 20°48,614 | 070°46,069 | 20°48,746 | 070°54,276 | 43628 | 44490 |
| P7013 | 10.02 | 07:10:25 | 09:16:18 | 20°46,902 | 070°54,298 | 20°46,732 | 070°45,333 | 44778 | 45721 |
| P7014 | 10.02 | 09:46:40 | 11:47:36 | 20°48,164 | 070°45,363 | 20°48,285 | 070°53,973 | 45947 | 46853 |
| P7015 | 10.02 | 12:27:00 | 13:27:00 | 20°50,072 | 070°54,071 | 20°49,990 | 070°49,822 | 47142 | 47500 |
| P7016 | 10.02 | 13:41:00 | 14:30:00 | 20°49,427 | 070°49,153 | 20°46,087 | 070°49,308 | 47695 | 48071 |

| Station No. | | Date | Gear | Time | Profile/ Sampli ng depth | Latitude (°) | Longitude (°) | Water depth |
|-------------|-----------------|-------|-------|-------|-----------------------------------|---------------|----------------|----------------|
| SONNE | Working area | 2022 | [UTC] | [UTC] | [m] | [° S] | [° W] | [m] |
| SO288_2-2 | 1 | 26.01 | CTD | 01:40 | 2500 | 20° 47.887' S | 070° 49.824' W | 2870 |
| SO288_2-3 | 1 | 26.01 | CTD | 06:52 | 1000 | 20° 47.883' S | 070° 49.827' W | 2860 |
| SO288_4-1 | 1 | 27.01 | CTD | 00.10 | 2500 | 20° 47.887' S | 070° 49.440' W | 2846 |
| SO288_4-2 | 1 | 27.01 | CTD | 02:06 | 1500 | 20° 47.843' S | 070° 49.442' W | 2846 |
| SO288_4-3 | 1 | 27.01 | CTD | 05:25 | 1500 | 20° 47.836' S | 070° 49.444' W | 2841 |
| SO288_4-4 | 1 | 27.01 | CTD | 07:22 | 1500 | 20° 47.839' S | 070° 49.443' W | 2844 |
| SO288_7-1 | 1 | 28.01 | CTD | 01:17 | 1500 | 20° 47.651' S | 070° 50.075' W | 2862 |
| SO288_7-2 | 1 | 28.01 | CTD | 02:31 | 1500 | 20° 47.650' S | 070° 50.059' W | 2857 |
| SO288_7-3 | 1 | 28.01 | CTD | 05:41 | 1500 | 20° 47.652' S | 070° 50.060' W | 2863 |
| SO288_9-1 | 1 | 28.01 | MSC | 22:44 | 50 | 20° 47.571' S | 070° 50.104' W | 2860 |
| SO288_9-2 | 1 | 28.01 | MSC | 23:17 | 1500 | 20° 47.648' S | 070° 50.055' W | 2858 |
| SO288_9-3 | 1 | 29.01 | ISMI | 00:40 | 1500 | 20° 47.645' S | 070° 50.051' W | 2857 |
| SO288_12-1 | 2 | 31.01 | CTD | 12:20 | 3800 | 21° 03.609' S | 071° 44.149' W | 4060 |
| SO288_12-2 | 2 | 31.01 | CTD | 16:10 | 3000 | 21° 03.442' S | 071° 44.130' W | 4070 |
| SO288_12-3 | 2 | 31.01 | CTD | 19:32 | 1500 | 21° 03.435' S | 071° 44.126' W | 4069 |
| SO288_12-4 | 2 | 31.01 | CTD | 21:34 | 1000 | 21° 03.442' S | 071° 44.132' W | 4074 |
| SO288_28-1 | 3 | 03.02 | CTD | 23:03 | 1500 | 20° 46.586' S | 071° 04.617' W | 5327 |
| SO288_28-2 | 3 | 04.02 | CTD | 01:19 | 1500 | 20° 46.566' S | 071° 04.631' W | 5345 |
| SO288_28-3 | 3 | 04.02 | ISMI | 03:03 | 1500 | 20° 46.563' S | 071° 04.642' W | 5342 |
| SO288_36-1 | 3 | 07.02 | CTD | 20:40 | 5000 | 20° 46.565' S | 071° 04.631' W | 5340 |
| SO288_36-2 | 3 | 08.02 | CTD | 00:40 | 1000 | 20° 46.566' S | 071° 04.633' W | 5338 |
| SO288_36-3 | 3 | 08.02 | CTD | 02:33 | 1000 | 20° 46.565' S | 071° 04.640' W | 5337 |

Table 4: CTD (including UVP5), Marine Snow Catcher (MSC) and In-Situ Microbial Incubator (ISMI) stations