Cruise Report

Cruise No. SKQ202418S

JQZ Phoenix

12 December 2024 – 08 January 2025

Honolulu (United States) – Kolonia (Pohnpei, FSM)

Chief Scientist: Hannah Mark

Project Principal Investigators: Masako Tominaga, Maurice Tivey, William Sager

Cruise Report Coordinator & Chief Editor: Jonas Preine

Acknowledgments

We thank Captain Christoph Gabaldo and the crew of the RV Sikuliaq for their enthusiastic support during the entire cruise. The crew's professional commitment throughout our time at sea contributed significantly to the success of this expedition. Whether on the bridge, on deck, in the engine room, or the kitchen, we felt supported and welcomed, and appreciated the flexibility of all departments. Further, we would like to thank marine science technicians Jenny Grischuk and Ethan Roth for their fantastic support at all stages of the cruise.

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Summary

Expedition SKQ202418S was the first leg of the JQZ-Phoenix Expedition. The primary objective was to collect surface-towed magnetometer and multichannel seismic reflection data to study the Phoenix lineation set in the Western Pacific. This lineation set is one of three Jurassic magnetic anomaly sets in the region and is critical for understanding the Jurassic geomagnetic field history and the so-called Jurassic Quiet Zone (JQZ). The expedition departed Honolulu on December 13th. During the transit phase, which lasted until December 24th, underway geophysical data were collected using the ship's multibeam, Topas, and gravimeter systems, while we additionally deployed a surface-towed magnetometer system. Two tests of the seismic streamer were conducted en route. However, due to a communication failure with the magnetometer located at the end of the seismic streamer, the planned seismic acquisition strategy was revised. The team opted to deploy two airguns instead of four, along with the seismic streamer and a separate surface magnetometer. This configuration was deployed on December 24th.

Early in the survey, technical issues with the seismic streamer necessitated a full cable inspection, temporarily halting seismic data acquisition. Using this time, we collected magnetic data toward the anticipated location of the M42 anomaly. By December 27th, the streamer and airguns were redeployed, enabling the collection of four profiles around the M42 anomaly. Upon reaching the northernmost survey point, the magnetometer was deployed in parallel with the airguns and streamer for the southbound track. While technical difficulties with the airguns arose intermittently, these were promptly resolved. On January 3rd, all equipment was recovered, followed by a new deployment of four airguns and the streamer to compare the acoustic response with the previous lines surveyed using only two airguns. The final recovery of all equipment occurred on January 5th, marking the start of the transit to Pohnpei. We continued collecting underway geophysical data until arriving at port in Pohnpei on January 7th.

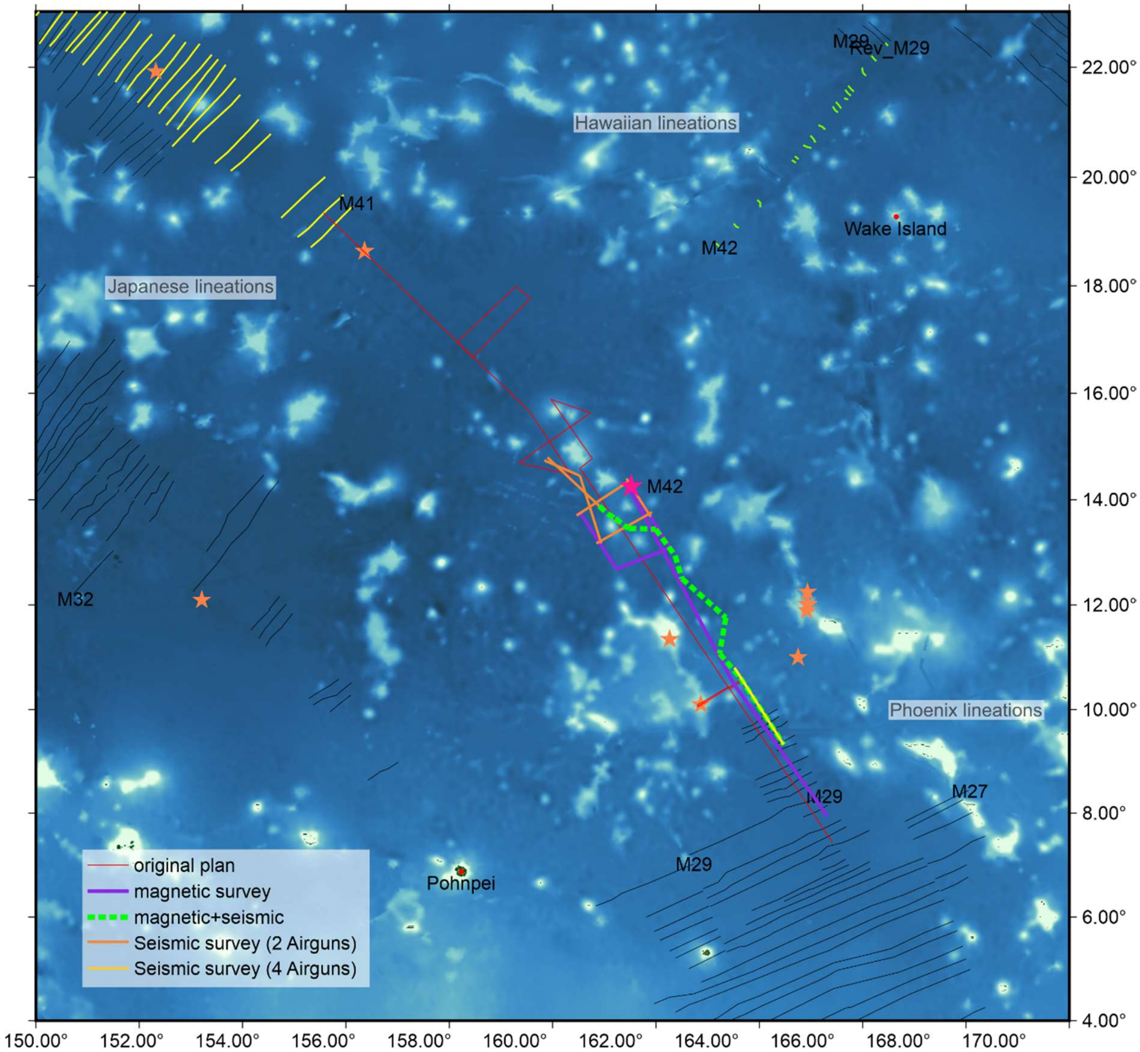

Figure 1.1: Map showing study area of Expedition SKQ202418S and the anticipated survey lines as well as the actually surveyed profiles in various configurations (see legend for details).

1. Roster

1.1 Principal Investigators

Name	Institution
Hannah Mark	Woods Hole Oceanographic Institution
Masako Tominaga	Woods Hole Oceanographic Institution
William Sager	University of Houston
Maurice Tivey	Woods Hole Oceanographic Institution
Jonas Preine	Woods Hole Oceanographic Institution

1.2 Geophysics

Name	Institution
Consuelo Antezana-Ray	Scripps Institution of Oceanography
Nicholas Benz	Scripps Institution of Oceanography
Brendon Mendenhall	Scripps Institution of Oceanography
Andrew Naslund	Scripps Institution of Oceanography
Douglas Penny	Scripps Institution of Oceanography
Leo Collier	University of Houston
Jameson Hampton	University of Houston
Bhupender Kumar	University of Houston
Edgar Moreno	University of Houston
Basil Nwafor	University of Houston
Jillian Raab	University of Houston

1.3 Marine Science Technicians

Name
Jenny Grischuk
Ethan Roth

1.4 Protected Species Observers

Name
Caitlin Clark-McClure
Morgan Dansby
Brenda Gomez Oritz
Miguel Lopez (team lead)
Hannah Shahmoradi

1.5 Ship's Crew

Name	Position	Name	Position
Christoph Gabaldo	Master	Xavier Sequeira	Oiler #12
Artie Levine	Ch. Mate	Eli Gould	Oiler #14
Ian Sherwood	2/M	Sam Paperman	Oiler #17
Val Koll	3/M	Kim Heine	Ch. Stew.
Simin Boroumand	Bosun	Evan Dunaway	Cook
Paul St. Onge	AB #11	Samuel Booker	Mess Att.
Sarah McManus	AB #13	Jordo Sattelmair	Electrician
Josh Beiningen	AB #15		
Liam Murray	AB #17		
Bob Cruise	Ch. Eng.		
Sam Olm	1st Eng		
David Young	2nd Eng		
Alex Wessel	3rd Eng		

2. Cruise Objectives

W. Sager & J. Preine

2.1 Introduction

Marine magnetic anomaly data are important for studies of plate tectonics and geomagnetism because the oceanic crust and uppermost mantle record the ambient geomagnetic field as new material is added at spreading ridges. As new lithosphere is emplaced within a narrow zone along the spreading axis and the geomagnetic field undergoes reversals in polarity, linear magnetic anomalies are formed at and parallel to the ridge axis and split into mirror image sequences by plate divergence (Vine and Matthews, 1963; Vine 1966). The pattern of linear magnetic anomalies is the basis for the geomagnetic polarity time scale (GPTS), which allows scientists to assess the age of the lithosphere (Gee and Kent, 2007). The pattern, direction, and timing of linear magnetic anomalies provides data for understanding seafloor spreading and plate kinematics (e.g., Seton et al., 2012).

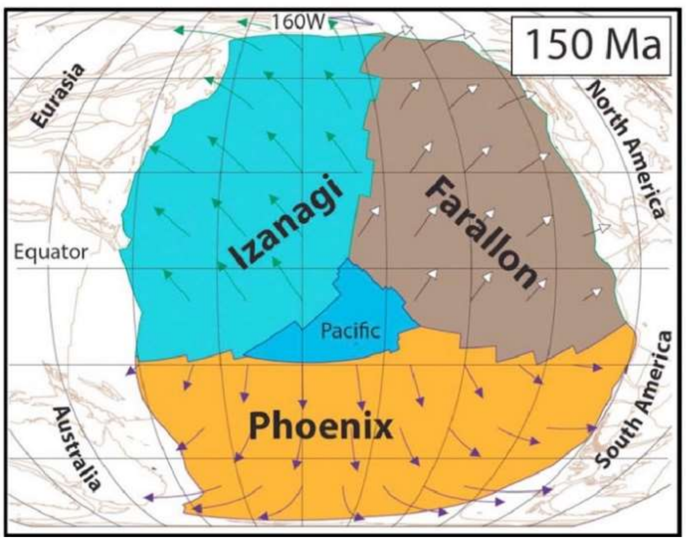

Figure 2.1: Origin of the Pacific plate. The Pacific plate began as a small microplate at the Izanagi-Farallon-Phoenix triple junction at ~180. This reconstruction shows the plate ~30 Myr later (Torsvik et al., 2019).

Linear magnetic anomalies also provide important information about the behavior and evolution of the geomagnetic field. The rate of reversals is variable, with some periods of time having few reversals and others many, presumably a reflection of the state of the core geodynamo (Gee and Kent, 2007). One manifestation of this behavior is constant polarity superchrons, which are long periods during which the magnetic field was stuck in one state and no reversals occurred. The most recent of these was the Cretaceous Normal Polarity Superchron, during which the geomagnetic field was in a constant normal state for ~37 Myr from 121.0 to 83.6 Ma (Ogg, 2020). It is widely-accepted that geomagnetic field strength was higher during the Cretaceous Normal Polarity Superchron than during mixed polarity periods before and after (Tarduno and Cottrell, 2005), although this conclusion is still debated. Prior to that, during the Permo-Carboniferous Reversed Polarity Superchron (aka, Kiaman), the magnetic polarity was consistently reversed for ~50 Ma from 312 to 362 Ma (Irving and Pulliah, 1976).

Because the oceanic crust is relatively uniform in composition, the amplitude of magnetic anomalies can be interpreted as a reflection of the geomagnetic field strength. Scientists have noted that Jurassic magnetic anomalies decrease in amplitude with increasing age and have interpreted this trend as an indication of weak field strength during that time (McElhinny and Larson, 2003). This trend in magnetic field strength may reflect the end of a period of low field intensity from ~180 to 135 Ma, which is also documented by paleomagnetic measurements and known as the Mesozoic Dipole Low (Prévot et al., 1990).

Initial surveys of the Early Cretaceous M-series magnetic anomalies noted this decrease in amplitude with age (e.g., Larson and Hilde, 1975). Because the magnetic anomalies seemed to disappear, the older lithosphere was known as the Jurassic Quiet Zone (JQZ) and thought to be analogous to the Cretaceous Normal Polarity Superchron (Larson and Pitman, 1972). Although the early GPTS had M25 as the earliest reversal chron, older anomalies are known based solely on data from the western Pacific (Cande et al., 1978; Handschumacher et al., 1988). This exclusivity is a result of the combination of the oldest documented seafloor being located in that region as well as the high spreading rates at which the lithosphere was formed (e.g., Hilde et al., 1977). It is also the impetus for this study, which aims to further understand the nature of the JQZ and its implications for geomagnetic field behavior and Pacific plate tectonics. Cruise SKQ202418S is the first part of a study of JQZ magnetic lineations, the fourth such study in a series funded by the National Science Foundation. This cruise (JQZ v.4.1) aims to collect seismic and sea surface magnetic data on a profile crossing pre-M29 magnetic lineations in Nauru Basin. As proposed, it will be followed by another cruise (as yet to be scheduled) to collect mid-water and near bottom magnetic data (JQZ v4.2).

2.2 Prior JQZ Studies

The Pacific plate formed at ~180 Ma as a small microplate at a triple junction between the Izanagi, Phoenix, and Farallon plates (Hilde et al., 1977; Boschman et al., 2016; Torsvik et al., 2019; **Figure 2.1**). Paleomagnetic studies indicate that it was near the equator at that time (Sager, 2006; Sager et al., 2015). The small plate continued to grow through the Jurassic and Cretaceous, with three sets of magnetic lineations forming at the three bounding ridges. The 'Japanese' lineations formed with a SW-NE strike at the Pacific-Izanagi ridge; the 'Hawaiian' lineations formed with a NW-SE strike at the Pacific-Farallon ridge; and the WSW-ENE trending 'Phoenix' lineations formed at the Pacific-Phoenix ridge (Larson and Chase, 1972). These anomalies bound the Jurassic portion of the Pacific plate, enclosing a small triangular area east of the Mariana Trench (**Figure 2.2**). This history is based on magnetic lineations recorded on the Pacific plate (**Figure 2.2**). The Izanagi and Phoenix plates have been subducted, so their records are lost (e.g., Seton et al., 2012). Older portions of the Farallon plate have been subducted and only younger remnants remain (Juan de Fuca, Cocos, and Nazca plates).

From studies of pre-M25 anomalies in the Pacific, it was clear that low amplitude, short-wavelength magnetic anomalies occurred over older seafloor (Handschumacher et al., 1988). Because of the small anomaly amplitudes measured at the sea surface, these anomalies are difficult to trace (which is why the area was called the JQZ in the first place). An obvious solution to obtain better anomaly records was to tow the magnetometer deep in the water column, near the crust which is the source of the magnetic signal. The first JQZ cruise (JQZ v1.0) occurred on the R/V *Thomas Washington* during 1992 (cruise TUNE08WT) and used a prototype deep tow magnetometer with a fluxgate sensor. It addressed the Japanese lineations because their associated spreading rate is fastest of the three anomaly sets (half rate 65 mma^{-1}; Sager et al., 1998). The survey consisted of two long profiles in Pigafetta Basin, separated by ~65 km and extending from anomaly M27 to the southeast by ~725 km (**Figure**

2.3; Sager et al., 1998; Tominaga et al., 2008). The magnetometer was towed at an average depth of ~4500-5000 m, >1500 m above the seafloor, at speeds of 2.1 – 2.5 kt (1.1 – 1.3 ms^{-1}). Survey data revealed a complex combination of small and large anomalies (**Figures 2.4, 2.5**). To facilitate correlation with sea surface anomalies (which define much of the GPTS), the anomalies were upward continued to a level mid-way between the deep-tow depth and the surface. The anomalies were interpreted as a series of longer wavelength chrons, of similar scale to surface anomalies, with the oldest being M38. Combined with the larger chrons were many short-wavelength polarity chrons, implying reversal rates as high as 6 (surface chrons) to 12 (deep-tow chrons) reversals per Myr (Sager et al., 1998).

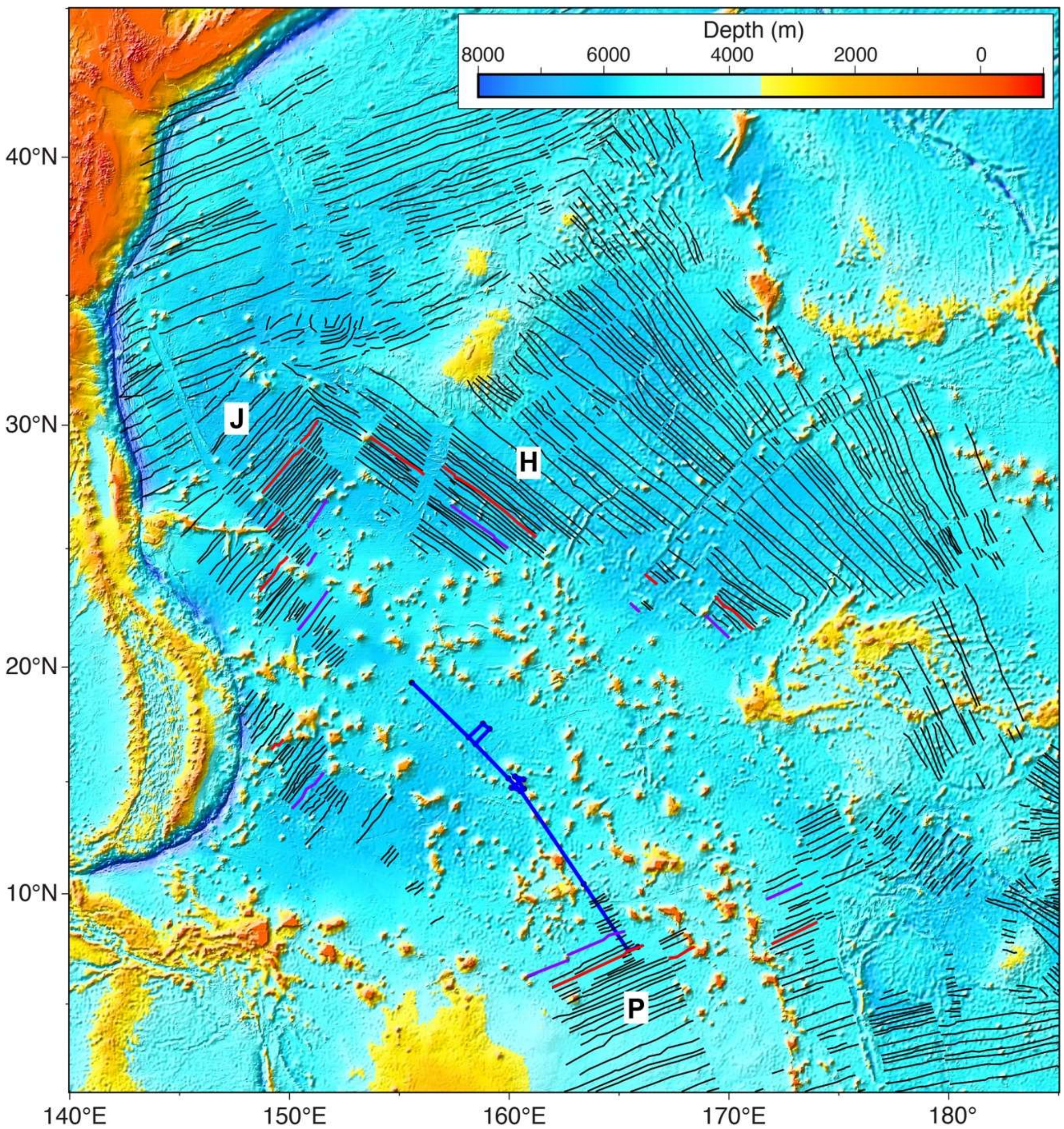

Figure 2.2: Western Pacific M-series magnetic lineations. Letter J indicates the Japanese lineations; letter H, the Hawaiian lineations, and letter P, the Phoenix lineations. Heavy red lines denote anomaly M25 and heavy purple lines, anomaly M29. Heavy blue line represents the proposed SKQ202418S seismic track line. Thin black lines represent magnetic lineations (Nakanishi et al., 1992).

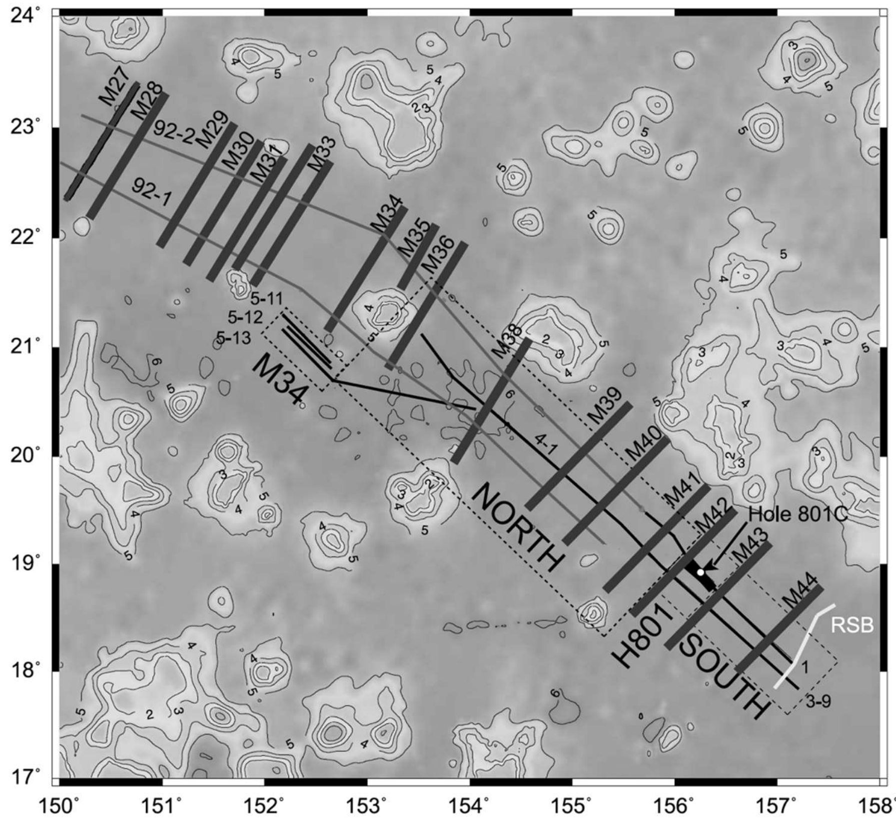

Figure 2.3: Deep-tow magnetic tracks over the Japanese lineations in Pigafetta Basin. Light gray lines (92-1, 92-2) were collected on cruise TUNE08WT. Dark lines were collected on cruise TN152. Dark bands show M-series anomaly lineations. Small white-filled circle shows location of Hole 801C. RSB = rough/smooth boundary (Tominaga et al., 2008).

A disappointment from JQZ v1.0 was that time limitations did not allow the profiles to extend to and past Ocean Drilling Program (ODP) Hole 801C, where Jurassic age crust (~167 Ma; Koppers et al., 2003) was drilled (**Figures 2.3-2.5**). The second JQZ cruise (JQZ v2.0) was designed to extend the Pigafetta Basin profiles past Hole 801 and beyond the "rough/smooth" boundary where anomaly character changed to longer wavelength characteristics (Tominaga et al., 2008). Data were collected in 2002/2003 on cruise TN152, onboard the R/V *Thomas G. Thompson*, using the deep-tow vehicle DSL120 with a three-axis fluxgate magnetometer. The DSL120 vehicle was towed at an average speed of 1.2 kt (0.56 ms^{-1}), which allowed it to be maintained at an altitude of ~100 m above the seafloor. The survey consisted of two long profiles to extend the previous survey from M34 (a well-defined anomaly) farther southeast by ~500 km. Three additional short profiles were acquired over M34 to examine anomaly repeatability. Five short profiles were run over Site 801 to examine anomaly repeatability and make a magnetic model of Hole 801C (Tivey et al., 2006; Tominaga et al., 2008). The JQZ v2.0 magnetic data continued the record of magnetic anomalies, interpreted as magnetic reversals back to ~170 Ma (anomaly M44). The anomaly amplitude decrease observed with older anomalies leveled out between anomalies M39 and M41 and older anomalies increased in amplitude (**Figure 2.5**). The zone of smallest anomalies was designated the low amplitude zone (LAZ; Tominaga et al., 2008).

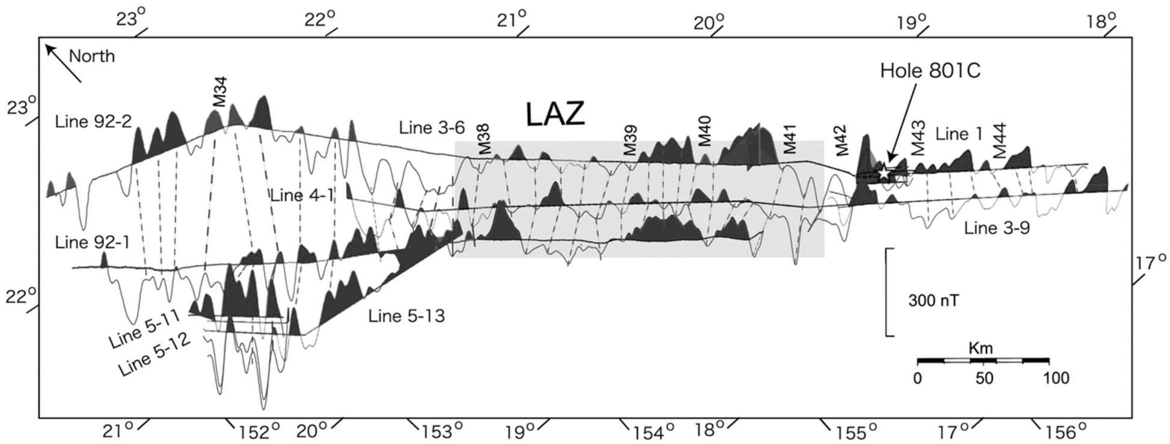

Figure 2.4: Wiggle plot of sea surface magnetic anomalies plotted along tracks in Pigafetta Basin. Dark shaded anomalies are positive. "M" numbers denote magnetic anomalies. LAZ is low amplitude zone. Star shows location of Hole 801C (Tominaga et al., 2008).

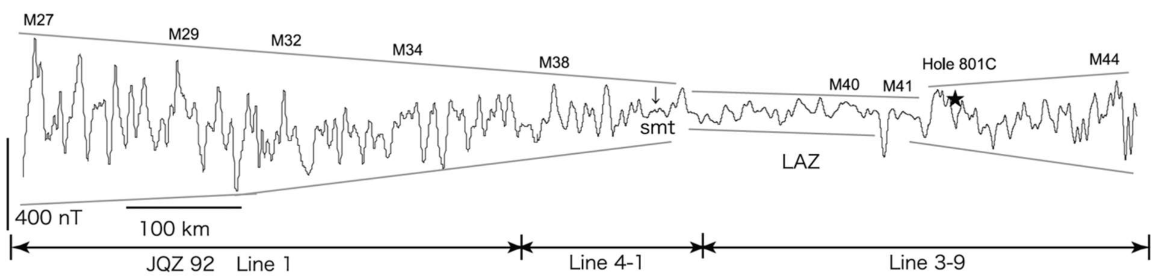

Figure 2.5: Composite magnetic anomaly plot for Pigafetta Basin. Outer lines highlight anomaly amplitude trends. LAZ: Low Amplitude Zone (Tominaga et al., 2008).

The third JQZ study targeted the Hawaiian magnetic lineations and was carried out during two cruises, TN272 on R/V Thomas G. Thompson during 2011/2012 (JQZ v3.1) and SKQ2014S2 on R/V Sikuliaq during 2014/2015 (JQZ v3.2). Data were collected on a ~900 km long SW-NE trending corridor between seamounts, centered near 20°N, 164°E (**Figure 2.6**). For this study, the autonomous underwater vehicle (AUV) Sentry was used to collect near seafloor data, the Tow-cam vehicle was used to collect mid-water data on SKQ2014S2, and Marine Magnetics SeaSpy Overhauser magnetometers were used to collect sea surface data. This produced a multi-level magnetic data set consisting of ~4600 m of sea surface data, ~700 km of mid-water data at a depth of ~4500 m, and ~700 km of Sentry magnetic data at an altitude of ~60 above the seafloor (Tominaga et al., 2021). These data were correlated across depths to derive a revised GPTS for M30 to M45 (**Figures 2.7, 2.8**). The correlation with the Japanese lineations is good and implies that the anomaly features indicate global geomagnetic chrons. The Hawaiian anomaly record also shows a zone of low amplitude, uncorrelatable magnetic anomalies that correlate with the LAZ in the Japanese lineations. It appears to have abrupt onset just after anomaly M42. Tominaga et al. (2021) speculate that this is the core of the Mesozoic Dipole Low and also the core of the ancient Pacific plate.

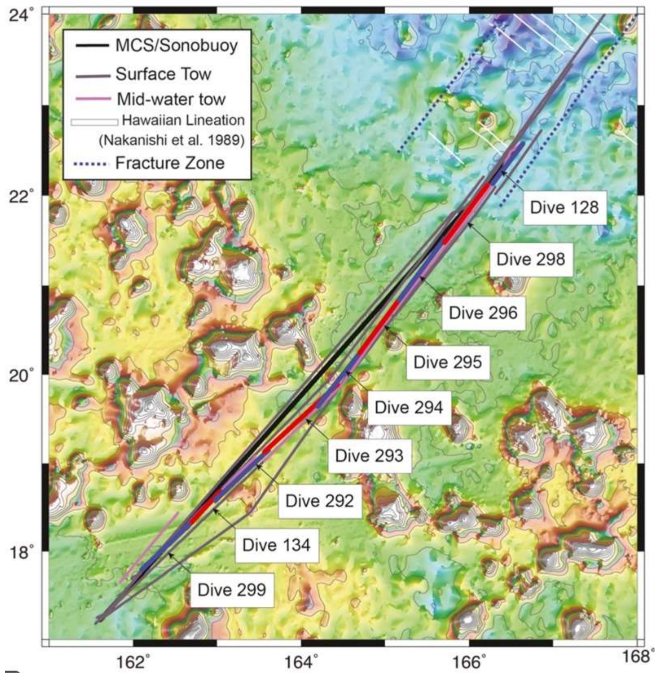

Figure 2.6: Magnetic data tracks collected during cruises TN272 and SKQ2014S2. Dive numbers denote dives for AUV Sentry. Colors denote different levels of data acquisition. (Tominaga et al., 2021).

Seismic data were also collected on cruise TN272. Multichannel seismic (MCS) data were collected with a 600-m long 48-channel streamer and two 110 cu-in GI-airguns along a profile ~800 km in length. The MCS data show sediment ranging from ~100 to 1100 m thickness, with an average of ~580 m along the profile (Tominaga et al., 2021). Various volcanic features were observed, such as sills and volcaniclastic sediments, which presumably originate from the volcanism that built nearby seamounts. Refraction seismic data were collected from 50 sonobouys launched along the seismic line. These data were used to build a 2D crustal model (Feng, 2016).

2.2 Expedition SKQ202418S

JQZ4 has the goal of studying the third set of Pacific-bounding magnetic anomalies, the Phoenix lineations. Originally, a single cruise was proposed to collect both magnetic and seismic data, but it was divided into two for practical and logistical reasons. The objective of cruise SKQ202418S is to collect sea surface magnetic data and seismic data. A subsequent cruise will collect deep magnetic data with AUV Sentry and mid-water data with the Towcam.

The Phoenix lineations are the most difficult set to study because they are close to Ontong Java Plateau and disturbed by many seamounts. That volcanism after crustal formation is likely to disturb the magnetic anomaly records. The proposed JQZ4 track begins over M25 and extends across the JQZ to link up with the Japanese anomaly deep-tow records near Hole 801C (**Figure 2.2**). It is positioned on a flowline that will intersect as few seamounts as possible.

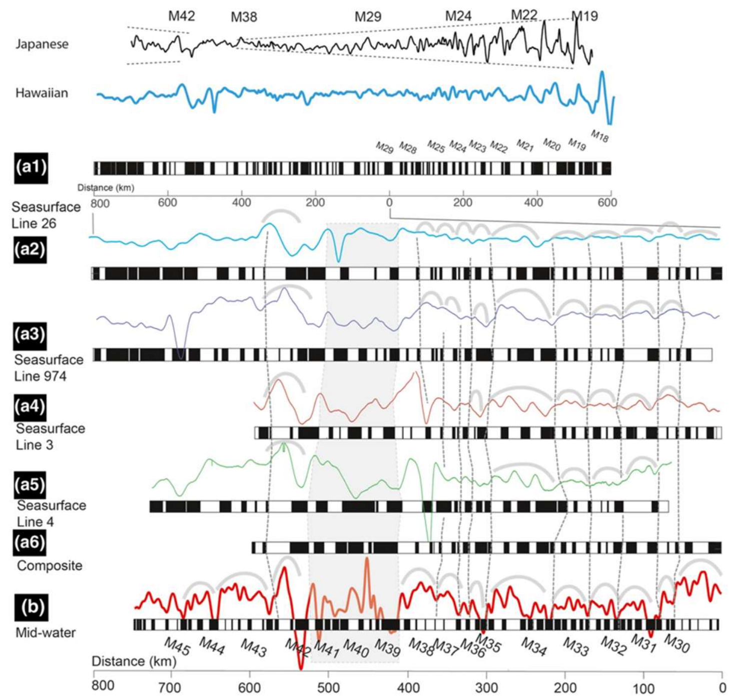

Figure 2.7: Comparison of sea surface and mid-water magnetic data and correlation of the Hawaiian and Japanese magnetic anomalies. Top diagram illustrates composite anomalies across the Japanese and Hawaiian lineations from M18 backwards in time past M42. Bottom profiles show sea surface (a1-a6) and mid-water (b) anomalies and reversal models. (Tominaga et al., 2021)

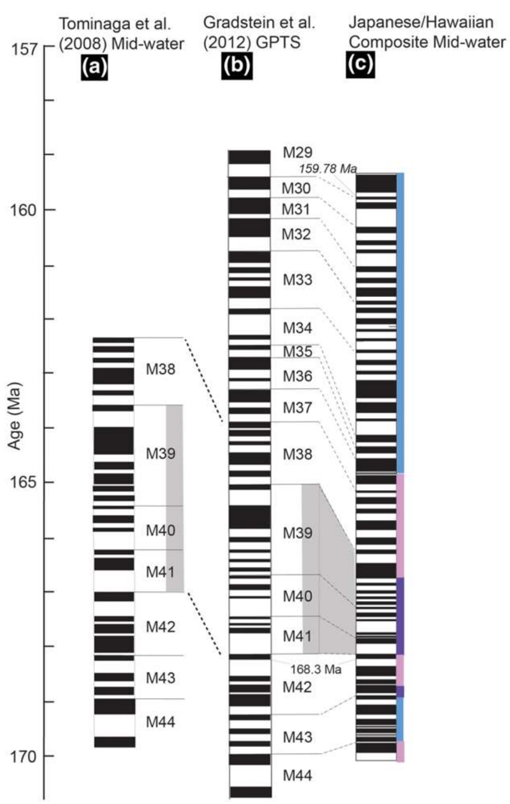

Figure 2.8: Composite JQZ geomagnetic polarity timescale. Blue, pink, and purple bars alongside the composite scale indicate a portion of the timescale derived from Hawaiian, combination of Hawaiian and Japanese, and Japanese anomalies only, respectively. (Tominaga et al., 2021)

3. Cruise Narrative

J. Preine

3.1 Narrative

Expedition SKQ202418S started in Honolulu with a science party consisting of the PI group from Woods Hole Oceanographic Institution, a group of students from the University of Houston led by William Sager, the seismic team from Scripps Institution of Oceanography, and a group of Protected Species Observers (PSOs). All members boarded RV Sikuliaq before the vessel departed Honolulu on December 13, 2024.

After initial preparations, including loading equipment, preparing the decks and the labs, and briefings, the vessel departed from Honolulu, setting sail on a 9-day transit toward the first waypoint. Onboard, the WHOI group and students, engaged in intensive training on geophysical data acquisition methods, while the Scripps team prepared for seismic operations and the PSOs stood daily vessel strike avoidance watches and madeobservations of passing animals on the transit.

During the transit, we carried out multibeam, Topas, gravity, and sea-surface magnetometer data collection, which started on December 13. The crew began with familiarization sessions covering onboard geophysical data collection protocols guided by the marine technicians. On the first few days of transit, we encountered a failure of the ship’s steering, which led to a temporary retrieval of the surface-towed magnetometer. These issues were quickly resolved after troubleshooting, allowing operations to continue. The watchstanders focused on adjusting the system parameters to capture optimal data while crossing diverse seafloor features, including previously uncharted seamounts. In addition to technical tasks, students received lectures and training sessions on the science behind the data collection process, including seismic data acquisition and processing. Preparations for the deployment of seismic gear and streamer testing were ongoing during this period, with the crew reviewing operational protocols and coordinating with bridge and seismic teams for smooth execution. As the days progressed, the focus shifted towards refining the deployment plans for the seismic gear. The scientific team continued to collect and analyze geophysical data, and the students became increasingly adept at their roles, managing watchkeeping duties, data logging, and underway data processing.

On December 19th, we reached the first waypoint at approximately 13.33°N, 178.70°W and initiated the first streamer test. After retrieving the sea surface magnetometer, the streamer was deployed with a second sea surface magnetometer attached to the tail buoy at the end of the streamer. While communications with the streamer and the birds were successful, communications with the tail buoy and the magnetometer were not. After retrieving the streamer, we redeployed the sea surface magnetometer and continued our transit with underway geophysics.

We reached our survey area on the 24th of December. Since communication with the magnetometer at the end of the streamer was unsuccessful, we needed to deploy the separate surface towed magnetometer in addition to the streamer, which implied that we could only use two GI guns instead of the anticipated four. Unfortunately, communication with the birds on the streamer was also unsuccessful, prompting us to use only two birds at the front and end of the streamer, providing little or no depth control on the streamer. After the start of the survey line, we encountered issues with the second airgun, which needed to be replaced, prompting us to perform several deployments and recoveries of the airgun array. After several hours of data acquisition (Lines 101-104), the streamer software started to show communication problems with several of the seismic sections, which crashed the computer running acquisition several times. In order to fix these problems, the science team decided to perform a full cable inspection, prompting us to retrieve the streamer and use the resulting downtime to collect magnetic data on the crucial north-bound profile along the Jurassic Quiet Zone at 10 kn acquisition speed.

The cable inspection took approximately 12 hours, during which we unspooled and tested each section of the streamer. We found that the first section of the streamer was damaged and that the last section had high leakage values, which prompted us to remove these sections. We completed our magnetic survey on December 27th and redeployed the streamer and airgun to collect four profiles along a box-shaped area close to magnetic anomaly M42. During that time, several recoveries of the airguns were necessary. We also encountered problems with the streamer again, during which we lost connection with several of the seismic sections. Onboard data processing showed that the seismic data are occasionally affected by strong noise bursts, which are probably related to mechanical stress on the streamer due to enhanced wave motion. By restarting the streamer software during quieter periods, we were able to establish connection with the lost sections. Since onboard data processing showed that the noise bursts can be suppressed by a despike filter, we decided to continue our measurements despite these problems.

On December 29th, we reached the northernmost point of our survey area. Since the rest of our planned survey lines were strictly south-bound without any major turns, we recovered the streamer and airgun, before deploying them together with the surface-towed magnetometer again. On our south-bound track, several recoveries of the airgun array were needed. Fortunately, the streamer and magnetometer continued collecting data without any problems.

We stopped our acquisition on January 4th, recovering all towed gear in order to deploy the initially anticipated configuration of four airguns, two each on the starboard and port sides, with the streamer deployed in the center. Beforehand we had to retrieve all equipment and prepare the deck for the operation of four airguns. In the meantime, we performed a CTD down to 980 m. Afterward, four airguns and the seismic streamer were successfully deployed, acquiring 182 km of the initially anticipated configuration on a north-bound track.

All gear was brought on deck on January 5th marking the end of seismic data acquisition. We deployed the magnetometer and started our transit toward Pohnpei, continuing to collect underway geophysical data. The magnetometer was brought on deck on the January 6th and all underway data collection ended during the evening of the same day. We arrived in Pohnpei early in the morning of the 7th, continuing clearing up decks and laboratories, before all members left the ship on the January 8th marking the end of Expedition SKQ202418S.

3.2 Daily Overview

- **December 11, 2024**: Majority of science party boarded RV Sikuliaq. Lab and deck preparations.
- **December 12, 2024**: Remaining members of science party boarded RV Sikuliaq. Lab and deck preparations. Safety meeting.
- **December 13, 2024**: Departure from Honolulu. Beginning of underway geophysical data collection. Deployment of seasurface magnetometer.
- **December 14, 2024**: Underway geophysical data collection.

- **December 15, 2024**: Underway geophysical data collection. Ship temporarily lost steering. We retrieved the seasurface magnetometer and re-deployed it after engine issues were resolved.
- **December 16, 2024**: Underway geophysical data collection.
- **December 17, 2024**: Underway geophysical data collection. Meeting to clarify mitigation procedures during seismic operations.
- **December 18, 2024**: Underway geophysical data collection. Meeting to prepare seismic operations.
- **December 19, 2024**: Underway geophysical data collection. Streamer Test I.
- **December 20, 2024**: Underway geophysical data collection. Repairs of the communication box with the tail buoy and magnetometer.
- **December 21, 2024**: Underway geophysical data collection. Start Streamer Test II
- **December 22, 2024**: Underway geophysical data collection. End Streamer Test II. Start of Compressor and Air pressure test.
- **December 23, 2024**: Underway geophysical data collection. End of Compressor and Air pressure test. Gun Test.
- **December 24, 2024**: Streamer deployment. Gun deployment. Start shooting. One gun down, troubleshooting, second deployment and recovery until successful deployment and stable functioning of the guns. Magnetometer deployed. Start of line. Recovery due to problems with the streamer. Turnaround and re-deployment of magnetometer while fixing streamer
- **December 25, 2024**: Geophysical data collection in the study area with a focus on the surface-towed magnetometer. Full cable inspection of the streamer.
- **December 26, 2024**: Geophysical data collection in the study area with a focus on the surface-towed magnetometer. Preparations for next deployment of seismic equipment.
- **December 27, 2024**: End of magnetic survey. Deployment of streamer and airguns; start of line.
- **December 28, 2024**: Seismic data acquisition. Interruption due to a failure of one of the airguns, which was quickly resolved. Several sections of the streamer showed errors but data acquisition continued.
- **December 29, 2024**: Seismic data acquisition. Testing of impact of ship speed on spike occurrence. Rebooting of streamer software enabled us to get communication with lost sections back.
- **December 30, 2024**: Seismic data acquisition. Recovery of streamer and airguns.
- **December 31, 2024**: Deployment of streamer, sea surface magnetometer, and airguns on a southerly course. Seismic data acquisition. Recovery of guns due to popped float and a compromised gun. Redeployment.
- **January 01, 2024:** Seismic data acquisition without major interruptions except for a short turtle shutdown.

- **January 02, 2024:** Seismic data acquisition without major interruptions except for a gun recovery due to a damaged float.
- **January 03, 2024:** Seismic data acquisition and preparation for deployment of four guns.
- **January 04, 2024:** Retrieval of all equipment and deployment of four guns with the seismic streamer. Seismic data acquisition with the originally anticipated airgun configuration.
- **January 05, 2024:** Retrieval of all equipment and end of seismic acquisition. Deployment of seasurface magnetometer. Underway geophysical data collection.
- **January 06, 2024:** Transit towards Pohnpei with underway geophysical data collection. Clearing up the decks and laboratories. Retrieval of magnetometer.
- **January 07, 2024:** Arrival in Pohnpei. Clearing up the decks and laboratories.
- **January 08, 2024:** All members of science party leave the vessel. End of Expedition SKQ202418S.

3.3 Cruise Statistics

Number of seismic profiles:	20
Total number of shots:	50436
Total profile length:	1563 km
Magnetic data length:	~6300 km
Multbeam/Topas/Gravity length:	~8000 km
CTDs:	1 (down to 680 m)
XBTs:	18

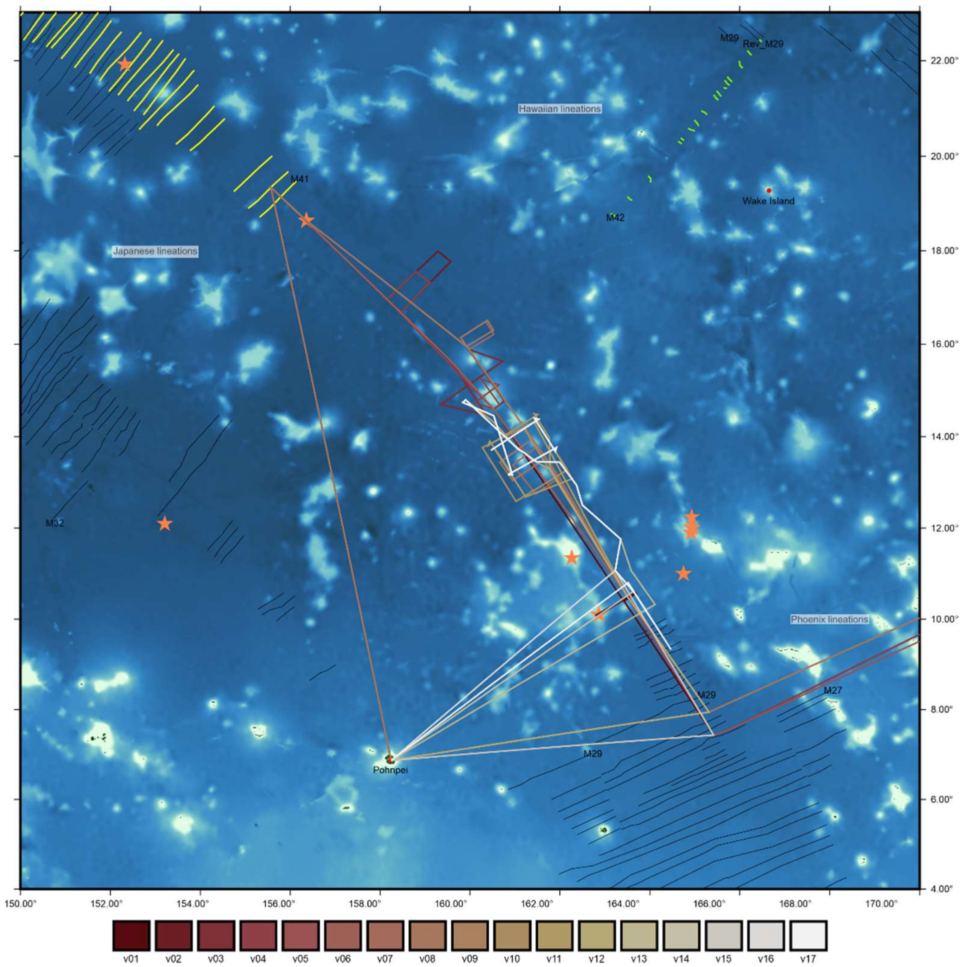

Figure 3.1: Illustration of the different waypoint configurations, which needed 17 iterations of modification as the cruise progressed.

4. Shipboard Systems

B. Nwafor & H. Mark & J. Preine

4.1 Positioning

Science operations aboard the R/V Sikuliaq relied on advanced positioning and motion-sensing technologies to ensure precision and reliability in data collection during this expedition. Among the three GPS receivers integrated into the vessel's data acquisition system (DAQ), the Kongsberg Seapath 380-R3 serves as the primary positioning source. Designed specifically for the scientific research needs of this and other studies, this system operates independently from the bridge's navigation system. The Kongsberg Seapath 380-R3 uses a dual-antenna differential GPS configuration (motion gyro compass (MGC) lower unit and MGC upper unit) that delivers exceptional positioning accuracy and reliable heading data (**Fig. 4.1**). By using two GNSS antennas mounted at the locations shown, the system provides precise latitude and longitude coordinates and achieves heading accuracy down to 0.01°. Differential GPS (DGPS) enhances positioning precision further by applying corrections from ground-based reference stations or satellite-based augmentation systems, ensuring sub-decimeter-level accuracy. This capability is critical for aligning and stabilizing the onboard scientific instruments (**Fig. 4.1**). In addition to its positioning functions, the Seapath 380-R3 includes integrated motion and attitude sensing, enabling precise measurement of roll, pitch, and heave with sub-degree accuracy (**Fig. 4.2**). This real-time data is ingested by the software controlling several instruments, including the multibeam echo sounder and sub-bottom profiler, enabling sonar acquisition parameters to adjust and compensate for the ship’s motion, even under challenging sea conditions.

The vessel’s primary navigation source, the Oceaneering C-NAV GPS receiver, complements the Seapath 380-R3 by refining its location data to an accuracy of half a meter. While Seapath assigns precise location and time stamps to key systems such as the Kongsberg EM304 multibeam echo sounder, TOPAS PS18 sub-bottom profiler, and ADCP OS75 and WH300 units, other instruments receive synchronized timestamps from the Network Time Protocol (NTP) time server as data is collected in real-time. This seamless integration of positioning and timing ensures consistent and accurate data for diverse scientific operations and measurements during the cruise.

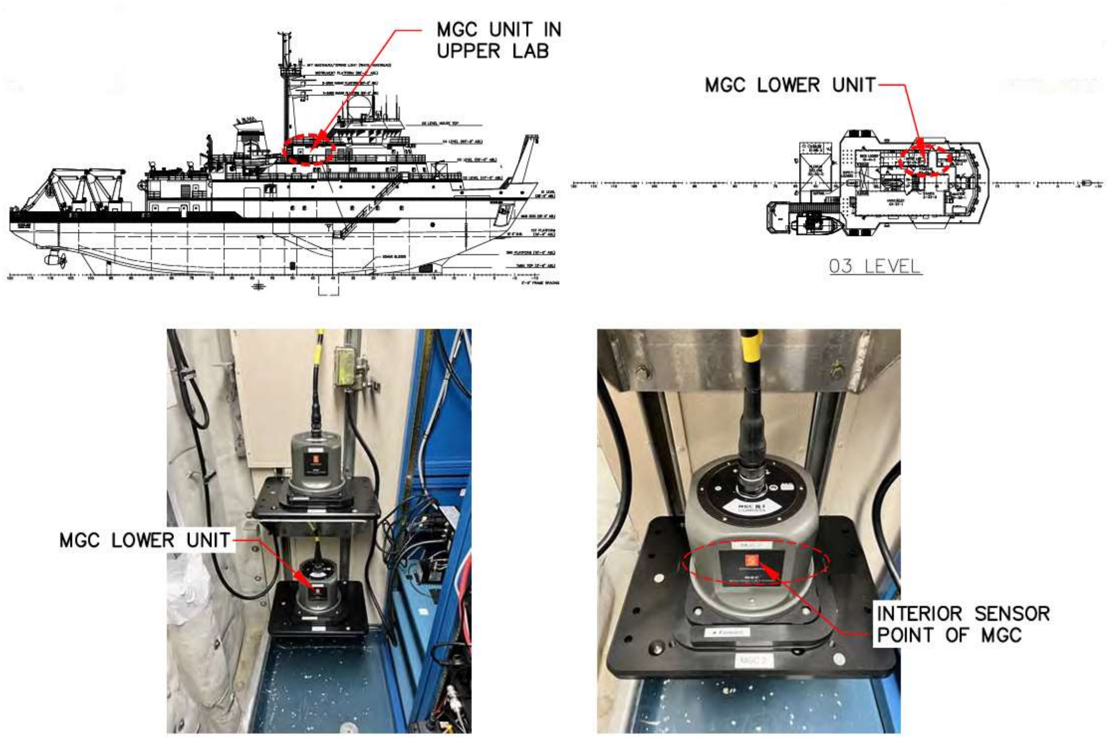

Figure 4.1: Location and photos of the motion gyro compass (MGC) onboard RV Sikuliaq.

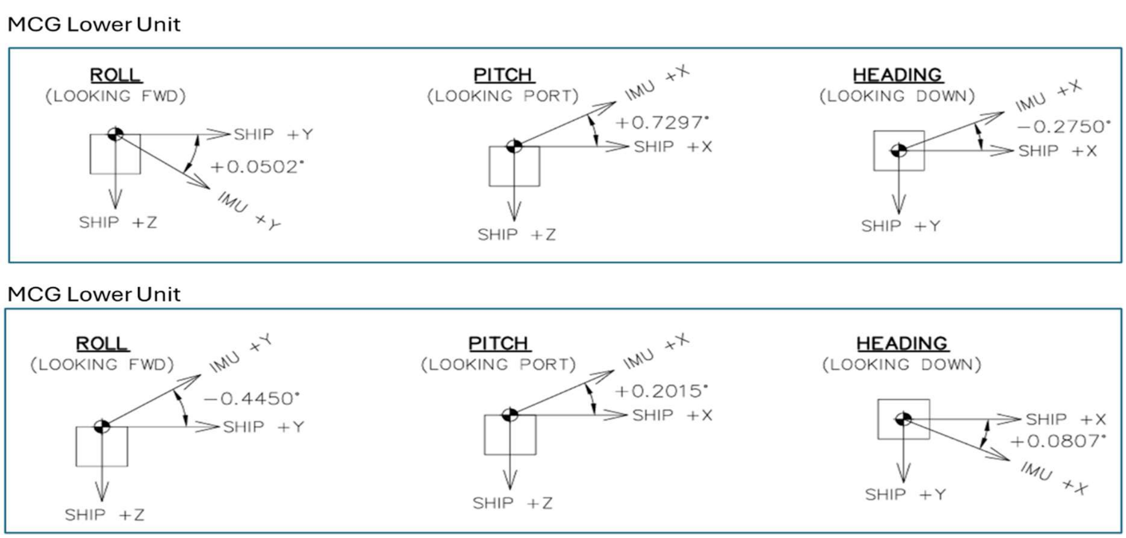

Figure 4.2: Schematic illustration of dual motion gyro compensation (MGC) principle.

4.2 Data Acquisition System (DAQ)

The DAQ (data acquisition system) refers to the system that collects, copies, and organizes raw data for science operations from local data acquisition systems and places files onto a networked science share drive (SSD). The SSD server is data.sikuliaq.alaska.edu/sci, and the raw and processed data are stored under the folder SKQ202418S. The table below shows the SKQ202418S index; notice that some folders are empty for this specific cruise. Each Kongsberg sonar system (EM304, TOPAS PS18, ADCP OS75, and WH300) has its own data acquisition system.

Table 4.1: Overview of the Data Acquisition System.

Folder name	Data content
adcp/	os75, wh300
ctd/	
docs/	
ek80/	
em304/	kongsberg multibeam echosounder data
em710/	
fastcast	
gnass	
knudsen/	
lds	lamont doherty logging system (lds) logs all ascii serial data generated by onboard sensors such as gps navigation, weather, and surface water properties. refer to following table for data content within this folder.
mocness	
picarro	
r2r	r2r event logger (elog) entries logged by watchstanders
rutter	
science	
soundguard	
topas	kongsberg topas ps18 parametric sub-bottom profiler data
xbt	expendable bathythermograph probe data
Subfolder name	Data content
adcp_speedlog	contains files and data related to measurements of water current velocities, vessel speeds, etc
ais_r4-navigator_bridge	contains files and logs related to the operation, configuration, and data storage of the AIS (Automatic Identification System) system
ctd_sea_bird	Not collected
ek80	contains Simrad EK80 echo sounder system data, related to acoustic surveys conducted with the EK80 system
em710ctr2udp	Not collected
events	Event logging for LDS sensors (i.e. start up); one file per sensor
flow_krohne_fwd	OPTIFLUX 5000 Electromagnetic flowmeter data

	measuring the flow and electrical conductivity of fresh seawater in the forward seachest in the bow thruster room.
flow_krohne_pco2	
fluoro_triplet_ctd	
fluoro_triplet_ctd_mrg	
fluoro_triplet_fwd	
gnss_cnav	Navigational data from the C-Na3050 Globally Corrected Global Positioning System located on the main mast.
gnss_mps865	
grav_dgs_33_proc	
grav_dgs_33_raw	
gyro_mgc_1	NAVIGAT 2100 Fiber-Optic Gyrocompass and Attitude Reference System data
gyro_mgc_2	NAVIGAT 2100 Fiber-Optic Gyrocompass and Attitude Reference System data
ins_seapath_10hz	
ins_seapath_position	
mb_em304_centerbeam	Nearest nadir centerbeam depth from multibeam EM302
mb_em710_centerbeam	
met_met4a_fwdmast	
nitrate_suna_fwd	
oxygen_optode4330	
oxygen_optode4330_cor	
pco2_ideo_merge	
rad_qsr2150a	
rad_sgr4	
rad_smp21	
sb_echosounder_1	
sb_echosounder_2	
speedlog	Bridge navigation Doppler speed log
ssv_aml_cb	
tdgp	
thermos_pyrometer_ct09	
thermos_pyrometer_ct15	Seasurface skin temperature data as measured by the Heitronics infrared radiation pyrometer just forward of the science control room.
thermos_sbe38_cb	
thermos_sbe38_fwd	
tsg_emssv	Log of the Kongsberg external datagrams providing real-time input for seasurface sound velocity needed for these sonars
tgs_sbe45_fwd	Surface seawater temperature and conductivity as measured by the Sea Bird SBE 45 MicroTSG Conductivity and Temperature Monitor located in the forward seachest.
tgs_sbe45_fwd_2	
wh300_xducer_depth	
winch_rapp	
wind_gill_fwdmast	Relative wind speed as measured by the WindObserver

	70/75 Ultrasonic Anemometer located on the forward mast.
wind_gill_fwdmast_true	True wind speed as measured by the WindObserver 70/75 Ultrasonic Anemometer on the foremast, using heading measurements from Seapath 380-R3.
wind_mast_port	
wind_mast_port_true	
wind_mast_stbd	
wind_mast_stbd_true	

5. Operations

H. Mark & J. Preine

5.1 Watch Standing Schedule

Principal Investigators:

04:00–16:00: Hannah Mark, Maurice Tivey

16:00–04:00: Masako Tominaga, Jonas Preine

Floating: William Sager

University of Houston Students:

00:00–04:00/12:00–16:00: Jillian Raab, Leo Collier

04:00–08:00/16:00–20:00: Jameson Hampton, Bhupender Kumar

08:00–12:00/20:00–24:00: Basil Nwafor, Edgar Moreno

5.2 Watch standing Duties

During transit:

- Log major events in e-log (e.g. sensors turning on/off, changing data acquisition parameters, notable activities onboard)
- Log navigation and sensor readings on paper every 15 minutes (in UTC time)
- Monitor quality of incoming bathymetry, subbottom, magnetic, and gravity data. Adjust acquisition parameters for EM304 and TOPAS. Alert marine technicians of any issues.
- Help with deck operations (magnetometer deployment /recovery) as needed
- Clean and process multibeam data
- Write assigned sections of the cruise report

During seismic survey:

- Continue all of the above transit watchstanding duties
- Assist SIO techs with monitoring the seismic system and incoming data
- Note shot numbers and line numbers in paper log book
- Log major seismic acquisition events in e-log (e.g. start/end of line; shutdowns for equipment, weather, or marine mammals; ramp-ups; any anomalies observed in real-time QC)
- Assist with seismic data processing

During the first few days of the initial transit, student watchstanders attended lectures on the tectonics of the study area, the marine magnetic record from the Jurassic, multibeam data acquisition, and MCS acquisition/processing. Marine technicians also provided training for watchstanders on how to monitor and adjust settings for the ship’s acoustic instrumentation (EM304 and TOPAS).

6. Multichannel Seismics

6.1 Overview

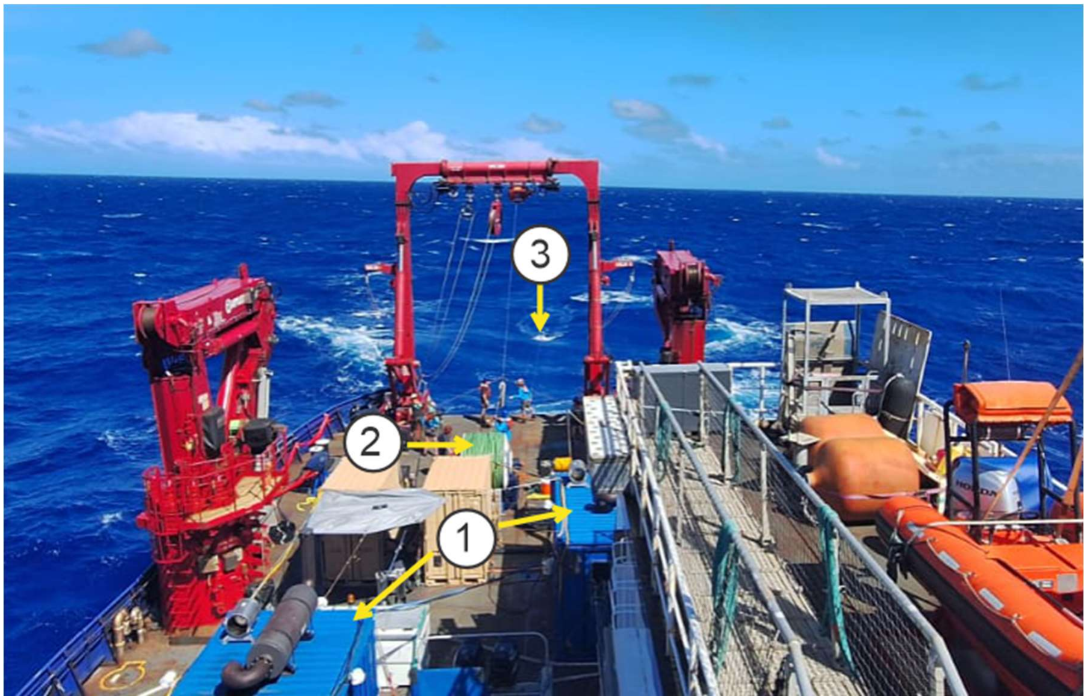

Figure 6.1: Overview of the main components of the seismic acquisition system during cruise SKQ202418S: (1) seismic air compressor containers, (2) streamer winch, and (3) airgun array in the water.

6.2 Shipboard Seismic Air Compressor System

J. Hampton & J. Preine

The seismic air compressors used during SKQ202418S were a critical component of the shipboard seismic acquisition system. Two LMF11s Seismic Air Compressors, each housed within a containerized unit, supplied the high-pressure air necessary for seismic source operations. These compressors were powered by a Volvo D13 engine, which drove both a TAM screw compressor and an LMF boxer piston compressor, ensuring robust and reliable air delivery throughout the survey.

The compressor units were installed and thoroughly tested at the start of the cruise. All connections were inspected and calibrated to meet operational specifications. Each compressor was equipped with a centralized operator station, enabling remote monitoring of performance metrics and system parameters. The interconnect capability of the compressors allowed for air storage sharing between units, enhancing overall efficiency and redundancy.

6.2.1 Compressor Specifications

Each LMF11s unit has dimensions of 13 ft × 8 ft × 8.5 ft and a weight of 28,000 lbs. The system operates in two pressure modes: 2,000 psi (low-pressure) and 3,000 psi (high-pressure). For Expedition SKQ202418S, the compressors were set to the 2,000 psi mode, aligning with the specific requirements of the seismic source configuration. With a volume output of 385 CFM per unit, the compressors provided an adequate and consistent air supply to support continuous seismic operations.

6.2.2 Operational Configuration

The compressors were integrated with high-pressure manifolds, each featuring five high-pressure air outlets. During Expedition SKQ202418S, the combined operation of both units sustained a seismic source configuration comprising eight 105/105 GI guns, operating at a 12-second shot interval with an operational pressure of 1,800 psi. The integration of the compressors facilitated seamless air supply management across the seismic system. The central operator station provided real-time diagnostics, ensuring that system pressure, temperature, and output remained within designated parameters. The interconnection capability played a crucial role in balancing air storage and delivery, particularly during periods of high demand.

6.3 Seismic Source

E. Moreno & J. Preine

6.3.1 Overview of Seismic Source

During this cruise, four GI sources were utilized as the primary seismic source to conduct seismic measurements. The GI-Source can operate in two principal modes: GI Mode and Harmonic Mode. In GI Mode, the injection is tuned to suppress the bubble oscillation entirely; in Harmonic Mode, the injection is de-tuned to reshape and adjust the bubble's oscillations. The harmonic setting was selected to produce a maximum energy, low-frequency pulse suited for deeper penetration. Below, we describe the GI-Source in detail, including its operating principles, configurations, and typical applications.

6.3.2 Description of Seismic Sources

The GI-Source was the primary seismic source utilized during the cruise. As an advanced airgun system comprising two independent air guns in a single body, referred to as the generator and the injector, it addresses the limitations of traditional airguns—particularly the unwanted bubble signal that can obscure primary measurements. The GI-Source initiates a high-energy acoustic pulse with the first of its two guns (generator) and suppresses or reshapes the bubble to minimize oscillations with the second (injector) (**Figure 6.1**). All figures referenced in this chapter are courtesy of the Scripps Institution of Oceanography.

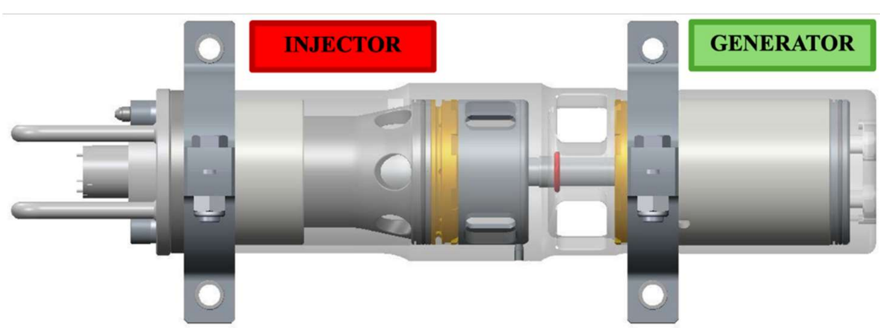

Figure 6.2: The GI-Source with injector and generator annotated.

6.3.3 Operating Principles

The GI-Source operates through a series of precise, synchronized processes involving solenoid valves, shuttle displacements, and pressurized chambers.

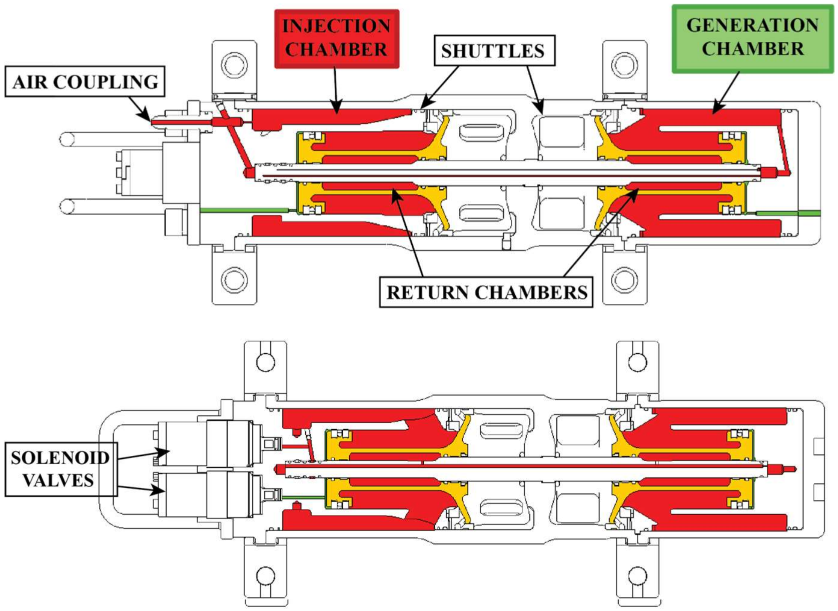

Figure 6.3: Cross-sections of GI-Source Airgun annotating components essential to airgun filling functionality.

A. Filling

The operation begins with compressed air filling the return chambers of the shuttles (**Figure 6.3**). This initial filling step closes and seals the two chambers. Simultaneously, the firing chambers of both the injector and generator, located between the casing and the shuttle, start to be pressurized. This pressurization prepares the system for the subsequent triggering and firing stages.

B. Generator Triggering

When the solenoid valve of the generator is energized, the generator triggering chamber is pressurized. This pressure causes the shuttle within the generator to unseal and move, allowing the larger area of the shuttle to be pressurized. The displacement of the shuttle prepares the generator for the release of high-pressure air (**Figure 6.4**).

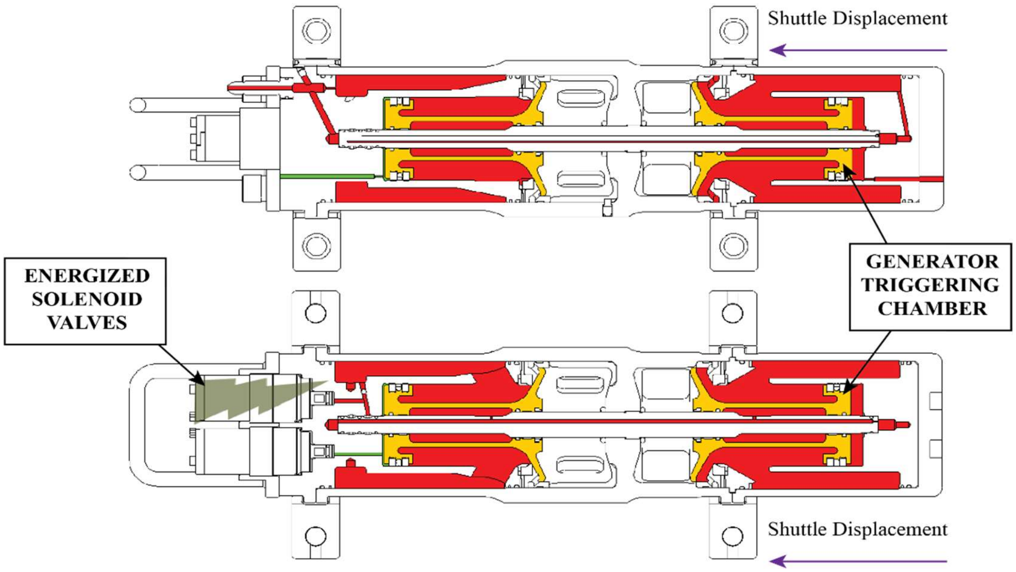

Figure 6.4: Cross-sections of GI-Source Airgun annotating components essential to generator triggering functionality.

C. Generator Shooting

The shuttle rapidly gains velocity before uncovering the exhaust port. At this moment, high-pressure air is explosively released into the surrounding water, generating the primary acoustic pulse (**Figure 6.5**). This release also initiates the formation of a bubble, which begins to expand.

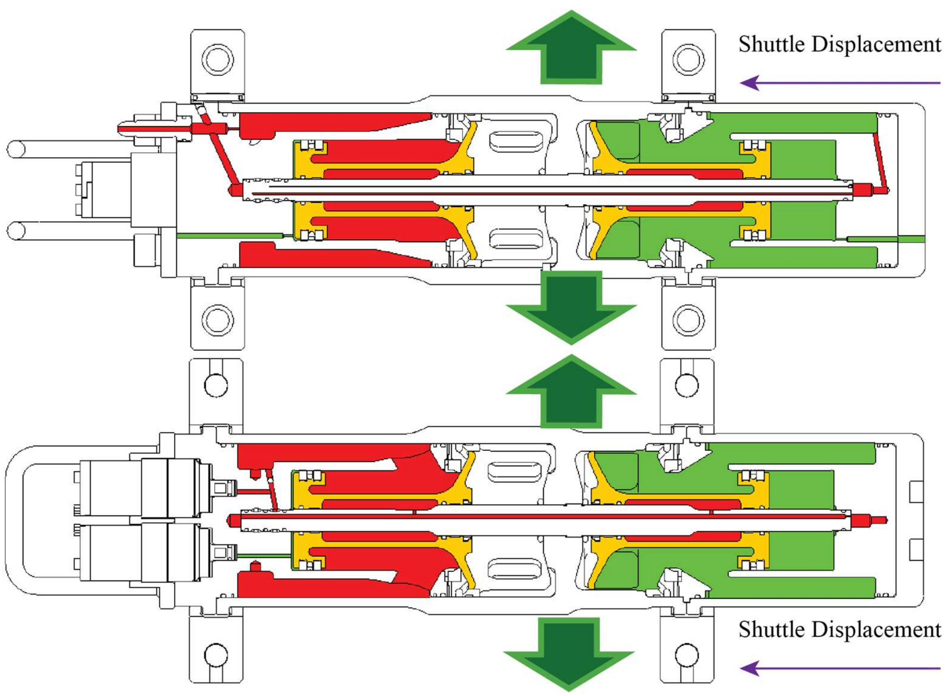

Figure 6.5: Cross-sections of GI-Source Airgun annotating components essential to generator shooting functionality and air bubble generation of primary pulse (green arrows).

D. Injector Triggering

The solenoid valve of the injector is then energized, pressurizing the injector triggering chamber. This action allows the injector shuttle to unseal and pressurizes the larger area of the shuttle, enabling its movement (**Figure 6.6**).

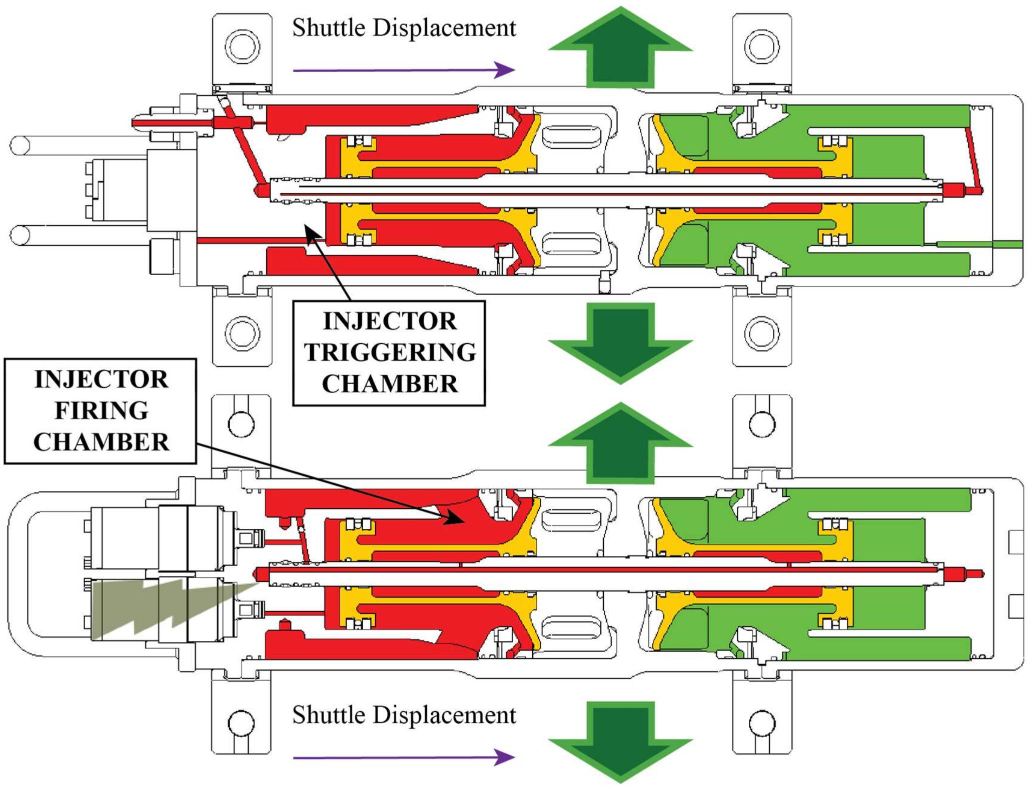

Figure 6.6: Cross-sections of GI-Source Airgun annotating components essential to injector triggering functionality.

E. Injector Shooting and Generator Closing

As the bubble generated by the primary pulse expands, the pressure within the generator firing chamber decreases. This drop in pressure allows the return chambers, which remain at full pressure, to return the generator shuttle to its pre-fired position, effectively closing the generator chamber. Simultaneously, the injector shuttle acquires high velocity and uncovers the exhaust port. As the bubble approaches its maximum size, the injector releases an additional volume of air into the generator bubble. This action stabilizes the internal pressure, preventing the bubble from collapsing violently and further reducing unwanted oscillations.

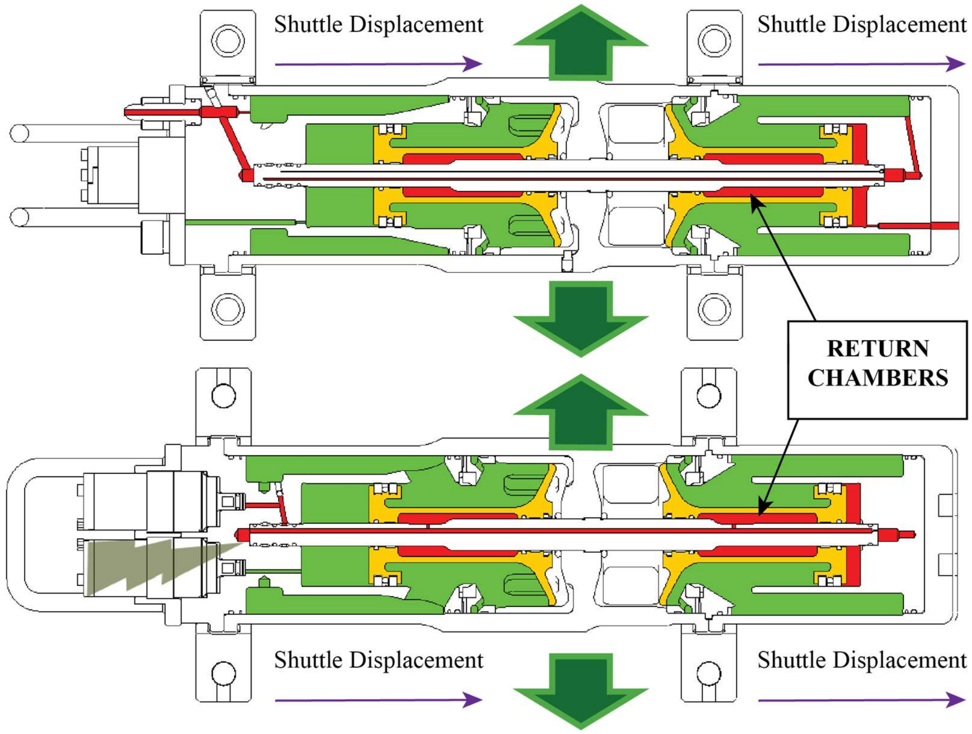

Figure 6.7: Cross-sections of GI-Source Airgun annotating components essential to injector shooting and generator closing functionality and air release to mitigate violent collapse of primary bubble.

F. Injector Closing

When the pressure within the injector firing chamber drops, the return chamber forces the injector shuttle back to its pre-fired position. This resets the system, preparing it for the next cycle.

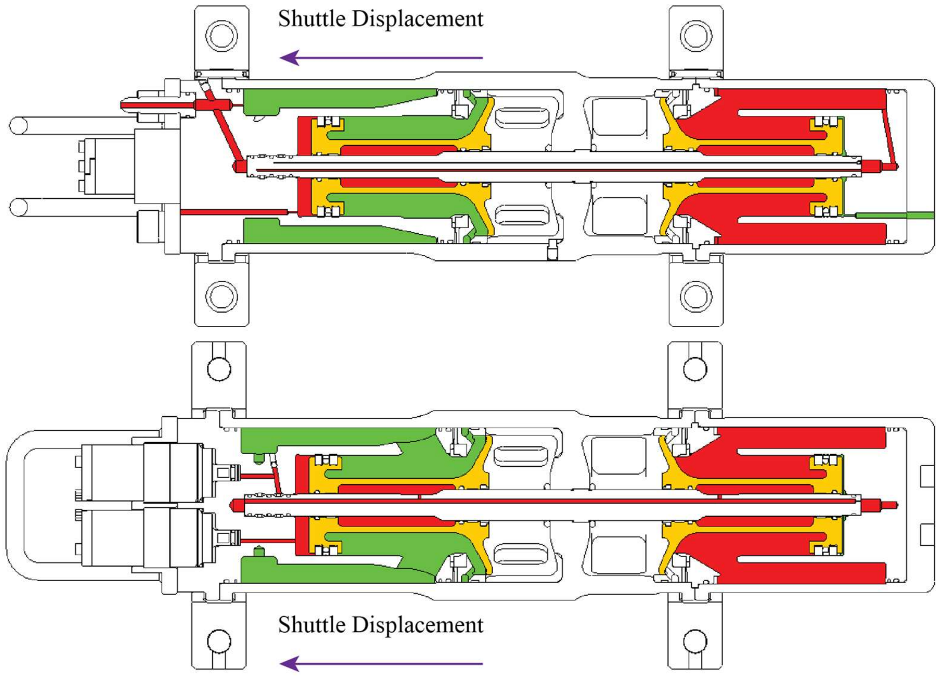

Figure 6.8: Cross-sections of GI-Source Airgun annotating components essential to injector closing functionality.

6.3.4 Advantages of the GI-Source

The precise coordination of the generator and injector processes provides several advantages:

- **Bubble Suppression (if desired)**: The injector stabilizes the generator bubble, preventing violent collapse and minimizing interference from bubble oscillations.
- **Adjustable-Frequency Components**: The controlled operation of the GI-Source ensures consistent and reproducible acoustic signals, ideal for both high-resolution, shallower imaging and lower-resolution, deeper imaging.
- **Operational Efficiency**: The rapid resetting of the generator and injector chambers allows for high firing rates during seismic surveys.

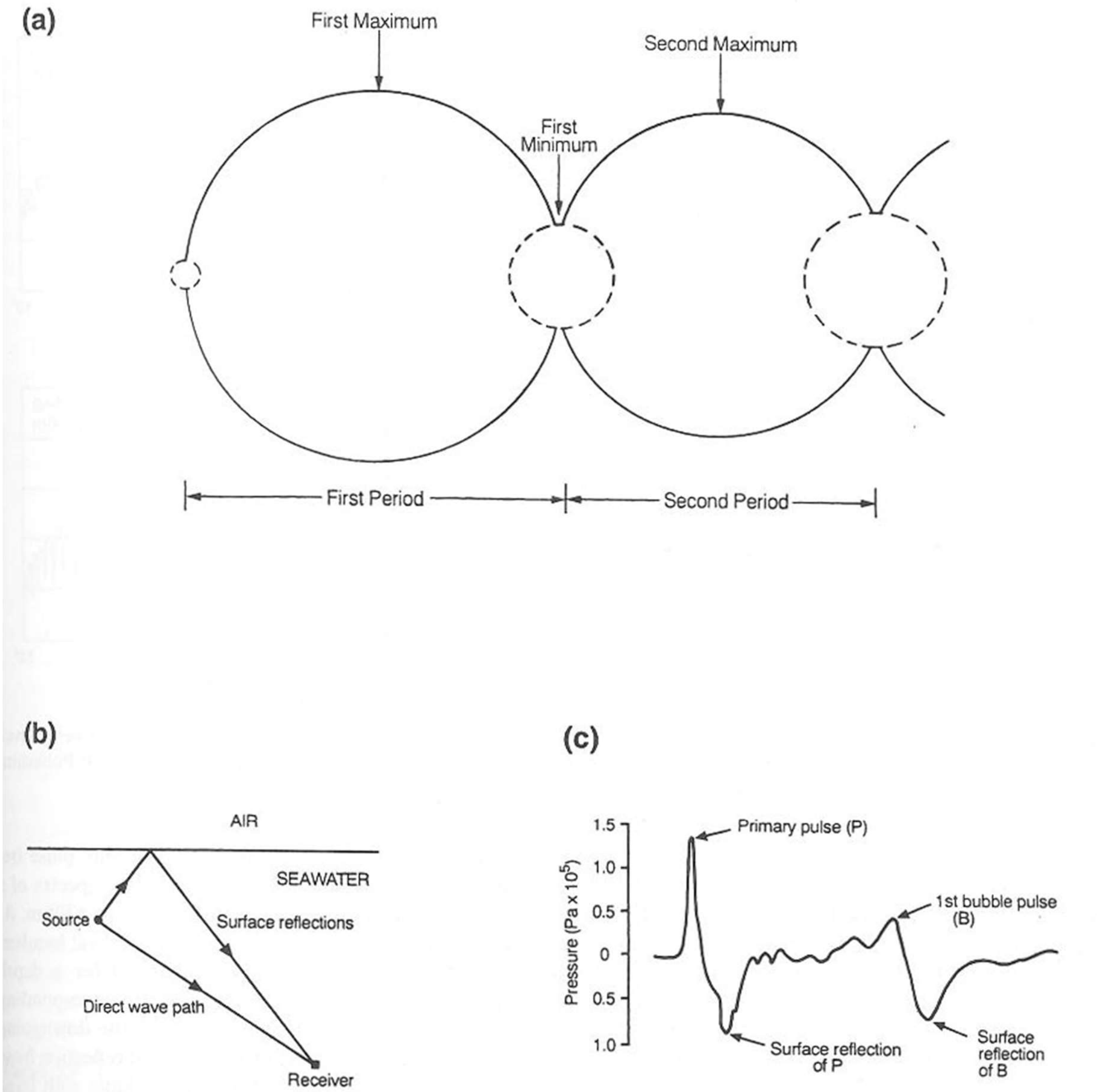

Figure 6.9: Illustration highlighting the signals of primary bubble generation and the subsequent pulses formed via the air bubbles collapse after expansion.

6.3.5 Operation Mode During Expedition SKQ202418S

For this cruise, the GI-Source operated in Harmonic 210 Mode, with a generator reservoir of 105 in³ and no injector volume reducer (**Fig. 6.10**). By tuning the system this way, we prioritized strong, low-frequency pulses to achieve deeper seismic penetration which is an essential requirement for imaging the basement. Although this mode does not fully suppress the bubble signal, even the smaller generator volume significantly reduces the effects of bubble oscillations compared to larger-volume setups.

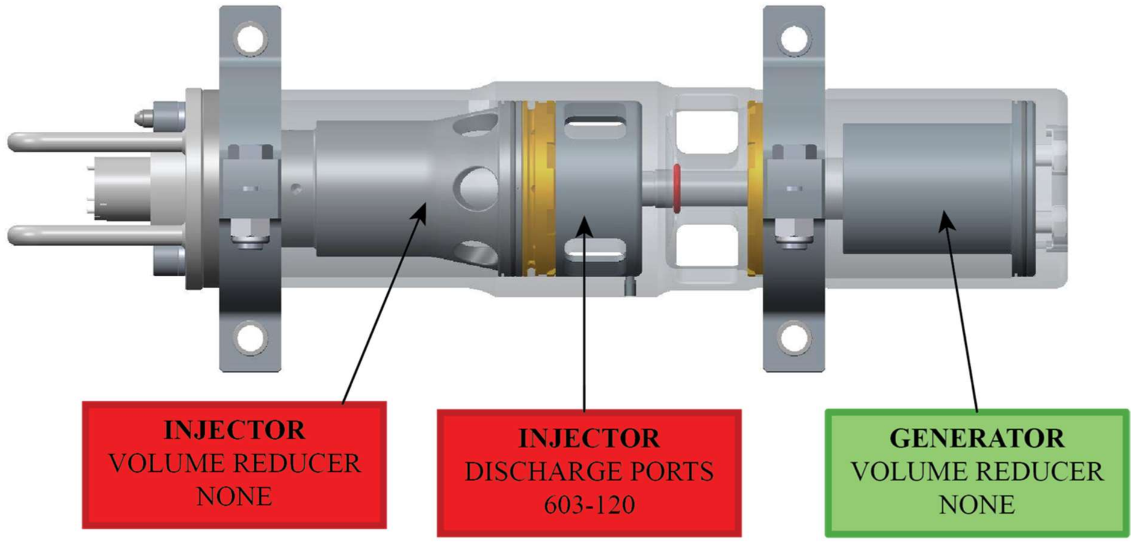

Figure 6.10: Diagram annotating and describing the technical settings of each GI-Source component.

6.3.6 Injector Delay

The delay in timing between the initiation of the primary bubble from the generator chamber and the subsequent initiation of the injector air is referred to as the injector delay (**Fig. 6.11**). The exact injector delay time varies depending on configuration (True GI or harmonic; pressure and depth). For Harmonic 210 mode, the injector delay times for various pressures and depths are listed in **Table 6.1**. For this cruise, an injector delay of ~20 ms was used.

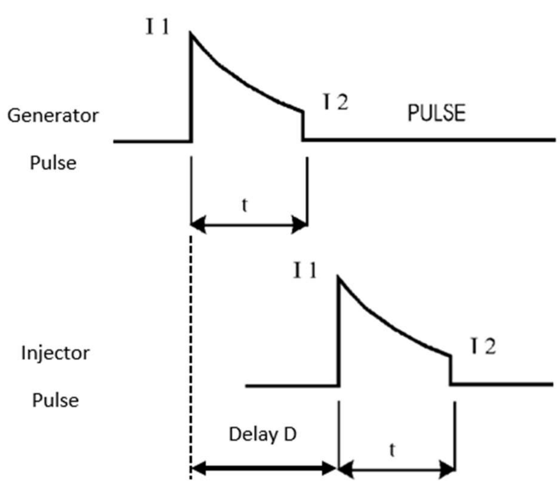

Figure 6.11: Graph showing the injector delay (Delay D) between rise times of generator pulse and injector pulse

Table 6.1: Delay times for the injector as a function of PSI and depth.

2000 PSI																
Depth (m)	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
Delay (msec)	58	56	54	52	51	49	48	47	45	44	43	42	41	40	39	38
3000 PSI																
Depth (m)	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9
Delay (msec)	66	63	61	59	57	56	54	53	51	50	49	47	46	45	44	43

6.3.7 Hotshot Software

The HotShot software is a seismic source control system designed for managing and synchronizing airgun arrays during marine geophysical surveys. It provides precise timing and firing control for up to 16 guns, ensuring coherent wavefronts for high-quality subsurface imaging. The software features a user-friendly graphical interface for real-time monitoring and configuration of gun parameters, including firing delays, sensor gain, and manifold pressure. With advanced error detection, detailed reporting, and integration capabilities for navigation systems, HotShot is a robust solution for efficient and accurate seismic acquisition in demanding marine environments.

In the Hotshot software, the aiming point refers to the specific time at which all guns in the seismic array are synchronized to fire. This ensures that the energy from all guns is synchronized and produces a coherent signal for accurate subbottom profiling. The default aiming point, and the one used on the cruise, is 50 milliseconds after the trigger signal (**Fig. 6.12**).

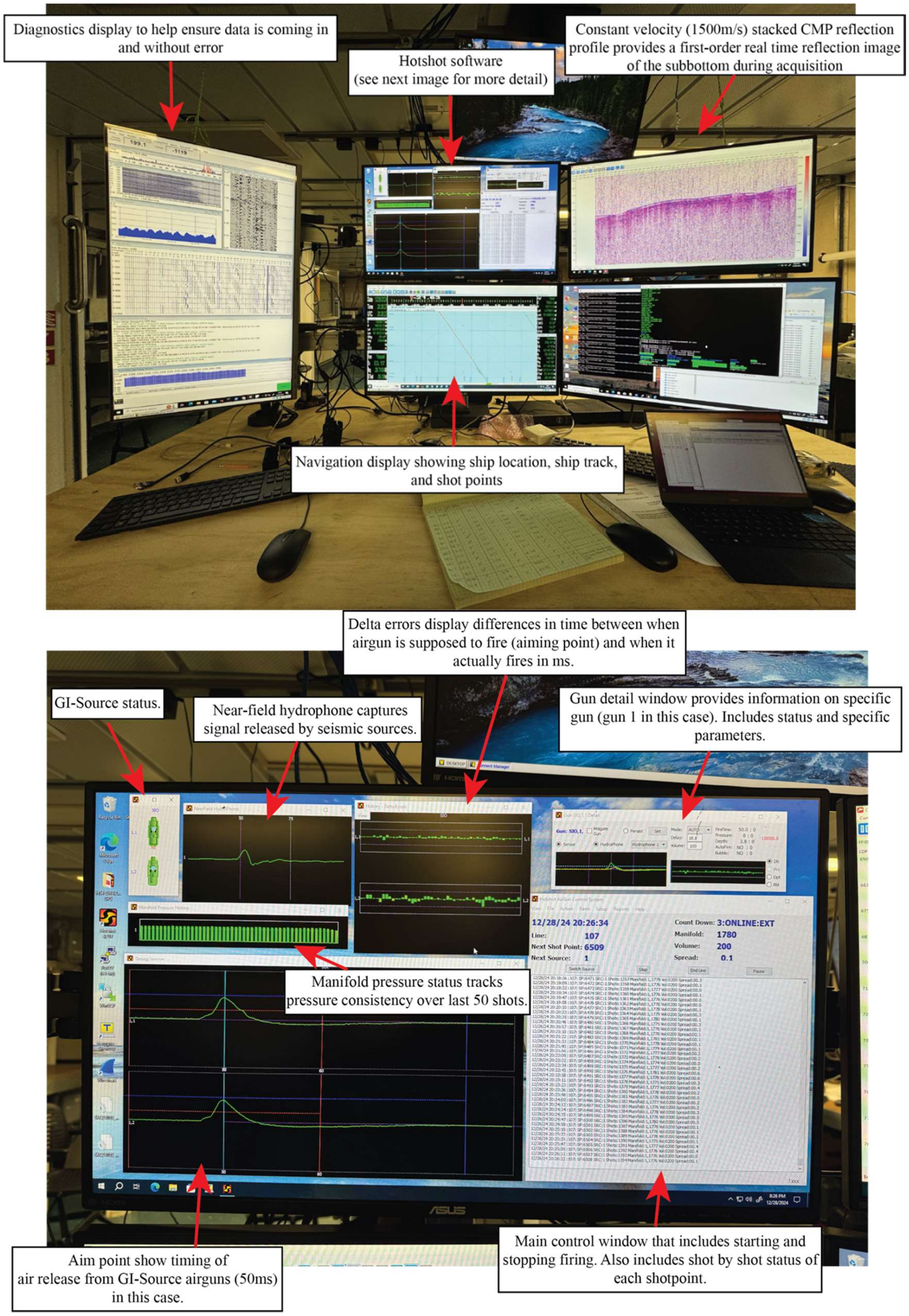

Figure 6.12: Monitor setup for watchkeeping during seismic acquisition (upper panel). HotShot software for monitoring of airgun operations (lower panel).

6.4 Seismic Streamer

B. Kumar & J. Preine

A marine seismic streamer is a long, buoyant cable towed behind a vessel during a marine seismic survey. It contains multiple hydrophones spaced along its length that detect and record sound waves reflected from subsurface geological formations. The streamer essentially acts as an underwater microphone array to create an image of the seabed geology beneath the survey area.

In our seismic survey, we used streamers manufactured by Geometrics. The GeoEel^{TM} is a highly flexible, modular marine Streamer system consisting of various components, analog and digital, dry and wet. We intended on using fifteen segments 6.25 m hydrophone spacing and each section is 50 m long (8 channels per section total 120 channels) but due to technical problems we were limited between 64 and 104 channels during most of the acquisition. **Figure 6.13** shows a schematic of the principle components of seismic streamer.

6.4.1 Top-Side Basic Components

- PC with CNT-2 Marine Controller – Windows-based, multi-threaded user interface, data storage.
- Streamer Power Supply Unit – Main hardware control unit, also called the "Deck Unit". The Deck Unit provides power to the in-water components, accepts inputs from a shot controller and supplies a gun control output signal, and all the necessary signals for the Streamer. It also contains eight auxiliary channels. The PC is connected via a standard CAT-5 RJ-45 Ethernet cable. The Deck Unit receives data from in-water components and passes them through to the CNT-2 Controller.
- Deck Cable – Connects Deck Unit to Tow Cable.
- Repeater – Receives and re-transmits Ethernet packets. Required every 100m.

6.4.2 Wet-end Basic Components

- Tow Cable – Connects Deck Cable to Stretch or Vibration Isolation Section.
- Vibration Isolation Section – Fluid-filled or solid section, generally placed at the inboard and outboard ends of the active portion of the Streamer.
- Stretch Section – Fluid- or gel-filled section, generally placed at the inboard end of the active portion of Streamer. Stretches to 110% of total length.
- Digitizer – Titanium module; contains 8-channel A/D circuitry.
- Active Streamer Section – Fluid-filled or solid section containing hydrophones.
- Tail Swivel – Attaches to the end of the last section in Streamer; provides tie-point for tail buoy.

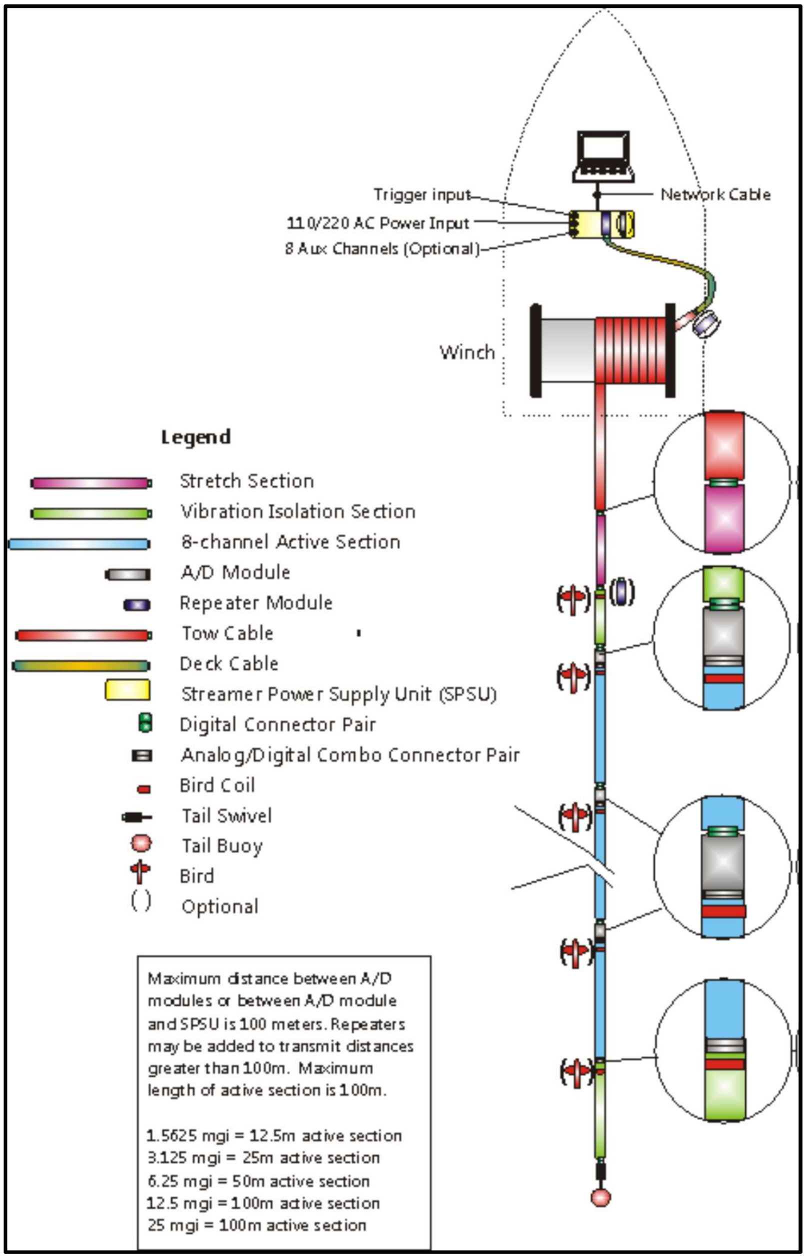

Figure 6.13: Schematic illustrating the main components of the used GeoEel Seismic Streamer System.

6.4.3 Deck Unit (SPSU)

The Deck Unit, or Streamer Power Supply Unit, serves as the main panel for connections to the GeoEel and typically runs on 60 VDC (**Figs. 6.14-6.17**). Portable and rack-mount versions of the Deck Unit are available.

The Deck Unit serves several functions, including:

- Providing power to and communication with Digitizers, Junction Boxes, and other in-water electronics.
- Accepting trigger signal from an external source (usually a source controller).
- Optionally providing a trigger output to fire a source.
- Providing interface between a bird control system and birds.
- Providing auxiliary recording channels.
- Providing system leakage, voltage, and current measurements.

It contains the following features:

- Power Switch – Controls power to Deck Unit.
- Power LED – Will be lit when power is on.
- Fuse – Check this 10A fuse if the Deck Unit will not power up; replace if necessary.
- 60V input – Connector for supplied DC power supply.
- Streamer – Connector for GeoEel Deck Cable. Provides power to and digital communications with the GeoEel or P-Cable System.
- Bird Coil – Provides communication with the bird coils in the GeoEel hydrophone sections.
- Streamer AUX – The GeoEel has an extra pair of wires that runs the length of the Streamer, generally used to provide power to the tail buoy.
- Fault – Clears the Over Current and/or Leakage LED.
- Streamer Voltage, VDC – Numeric output showing the DC voltage supplied from the external power supply. Typical is 60V. Deck Units for larger systems may include a voltage regulator to supply output voltage as high as 90V.
- Over Current LED – Illuminates if there is a short in the cable that causes current flow in excess of preset limits. Typically accompanied by a higher-than-normal leakage reading.
- Streamer Current, ADC – Numeric output showing current draw of GeoEel or P-Cable system. Useful in determining whether all sections are connected and powered up, and for assessing the severity of a leakage indication.
- Leakage LED – Illuminates when Leakage exceeds a preset value. Sensitive to short spikes in leakage that may not show up on LCD display. Readings above 500 will cause the red LED to be lit. Pressing the Fault button will reset the indicator.
- Streamer Leakage Indicator – Indicates current leakage to an unused wire in the GeoEel wire harness. Since no current is expected on this wire, the presence of a reading on this meter indicates the presence of electrical leakage somewhere in the system. See the section on leakage in the Troubleshooting section for conversion from the LCD reading to resistance.
- Trigger LED – Will blink briefly each time a trigger signal is received.
- Trigger Input – The GeoEel will trigger on a TTL+, TTL–, or contact closure. If you are using a closure, you should use the TTL– connector.
- Source Trigger Out – The Deck Unit is capable of providing a trigger to fire the source. It can be time-based, caused by an internal trigger in the Deck Unit, or the Deck Unit can receive a trigger signal from an external source and output a trigger. The Deck

Unit will output a TTL+, TTL–, or isolated contact closure, all 1 ms in duration. If triggering is provided by the Deck Unit, the trigger timing is set in the CNT-2 Controller.

- Ethernet – Connects to Ethernet input on Controller PC; provides digital communications between a Deck Unit and CNT-2 Controller.
- AUX ADC Inputs – This is an analog input for recording auxiliary signals such as confirmation time break, source hydrophone, etc. The system was delivered with an Auxiliary Channel Input Cable terminated with BNC connectors.
- Earth Binding Post – Connect to a good ground, either the hull or the sea itself.

Figure 6.14: Photo showing the Portable Deck Unit front panel.

Figure 6.15: Photo showing the rack mount Deck Unit.

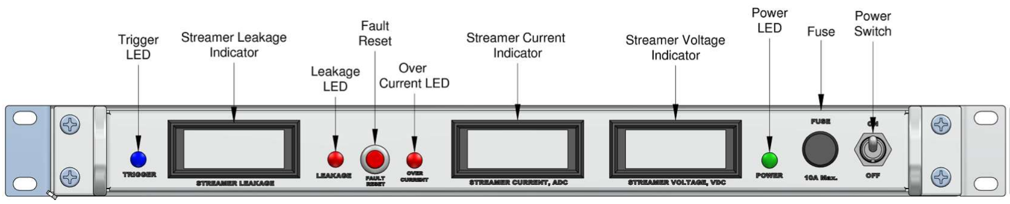

Figure 6.16: Illustration of the ports of the rack mount Deck Unit front.

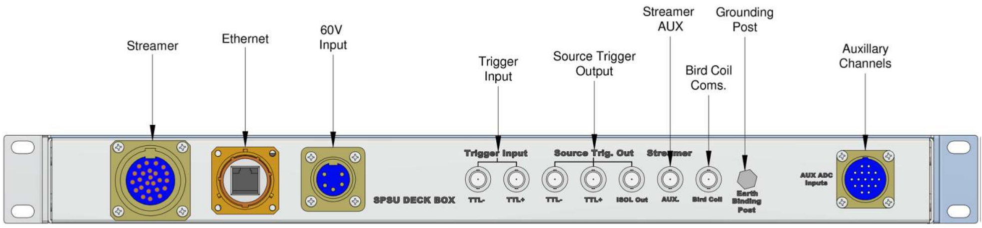

Figure 6.17: Rack mount Deck Unit rear

6.4.4 Auxiliary channel input cable

The Auxiliary Channel Input Cable is terminated with up to eight BNC connectors and allows to plug up to eight analog input signals into the 8-channel AUX board on the Deck Unit (**Fig. 6.18**).

6.4.5 Deck cable

The Deck Cable connects the Deck Unit to the Tow Cable or the P-Cable Signal Cable (**Fig. 6.18**). It can be up to 100m in length, and generally runs from the recording lab to the winch, where it connects either directly to the Tow/Signal Cable or via a slip-ring and/or Repeater. As such, it is not designed for immersion. Deck Cables exceeding 100m can be constructed using multiple Deck Cables with Repeaters.

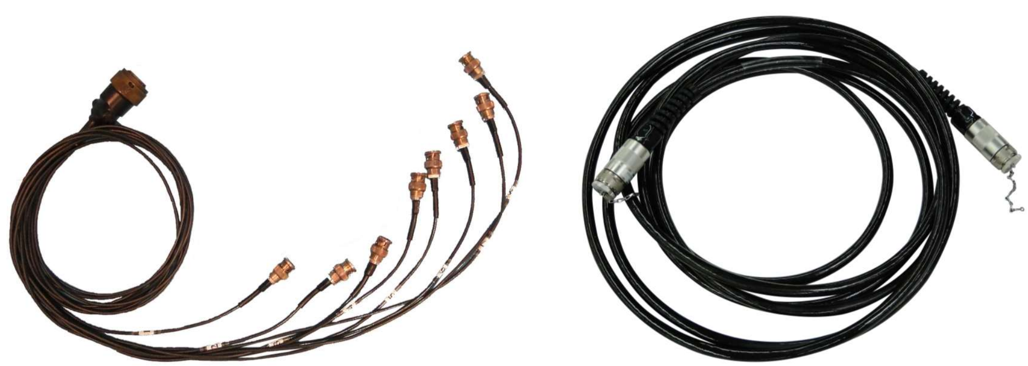

Figure 6.18: Eight-channel AUX input cable (left). Deck cable (right).

6.4.6 Repeater Module

Repeaters amplify and re-transmit Ethernet packets and are required every 100m. Digitizers and the Deck Units each function as Repeaters (**Fig. 6.19**). Also, the Tension Gauge and the In-line Depth/Compass modules both include Repeater circuitry. Generally, one Repeater is required between the Deck Cable and the Tow Cable, as their combined length, along with the length of the inboard Stretch or Vibration Isolation Section, is usually greater than 100m. In normal deployments, Repeaters are not needed after the first Digitizer.

Figure 6.19: In-line Repeater module (left). Tow cable (right).

6.4.7 Tow cable

The Tow Cable connects the Deck Cable to the first in-water component (**Fig.6.19**). At least one end, and optionally both, is submersible. Some earlier tow cables had a "Flex-tow" design which included 10m of fluid-filled section with a bird coil installed. This allows a lead bird, which must work the hardest to hold the Streamer at depth, to be placed well ahead of the first hydrophone, significantly reducing bird noise. This is accomplished in the current design with a separate Vibration Isolation Section. The maximum length of the Flex-tow design is 100m. The maximum length of the current design is 90m; 100m offset is achieved with the addition of a 10m Vibration Isolation Section. Longer offsets can be achieved by using multiple Tow Cables with Repeaters

6.4.8 Digitizer module

The 8-channel Digitizer is made of titanium and contains the A/D circuitry (**Fig. 6.20**). One Digitizer is mounted at the ship end of every Active Section. It takes eight analog inputs and delivers digital data via TCP/IP on an Ethernet cable. It also re-transmits Ethernet packets, and as such, functions as a Repeater. There are two versions of the Digitizer; the 2D version (below) and the lead Digitizer in a P-Cable system. The latter uses a wet-mate Subconn or Titan Jumper Cable to connect to the Junction Box.

Figure 6.20: 2D/3D Digitizer (left). Tail Depth/ Compass module (right).

6.4.9 Tail Depth/ Compass Module

The Tail Depth/Compass modules are installed at the aft ends of Streamers in either 2D or 3D configurations (**Fig. 6.20**). Standard units include an Ethernet switch and a depth sensor; a Digital Compass Heading Sensor can be included for positioning purposes. The compass and depth sensors communicate with the GeoEel Controller over the Ethernet lines.

6.5 Seismic Processing

B. Nwafor & J. Preine

6.5.1 Overview

This chapter outlines the key workflows and parameters used for the preliminary onboard processing of seismic data. During the research cruise, a total of fifteen2D seismic lines (L101–L120), depicted in **Figure 6.21**, were acquired, along with several minor turning and test lines listed in **Table 6.2**.

The fifteen seismic lines were loaded into the *Shearwater Reveal Processing* software for preliminary processing while onboard the vessel. This initial processing phase aimed to obtain time-migrated seismic images, access the data quality and first onboard interpretations.

Table 6.2 provides a comprehensive overview of the seismic data and acquisition details for the survey. It includes information such as the acquisition start date, start and end times, start and end FFID, and the shot numbers for each line. The table also specifies the number of guns used during acquisition, the total length of each survey line in kilometers, and the number of channels recorded for each line.

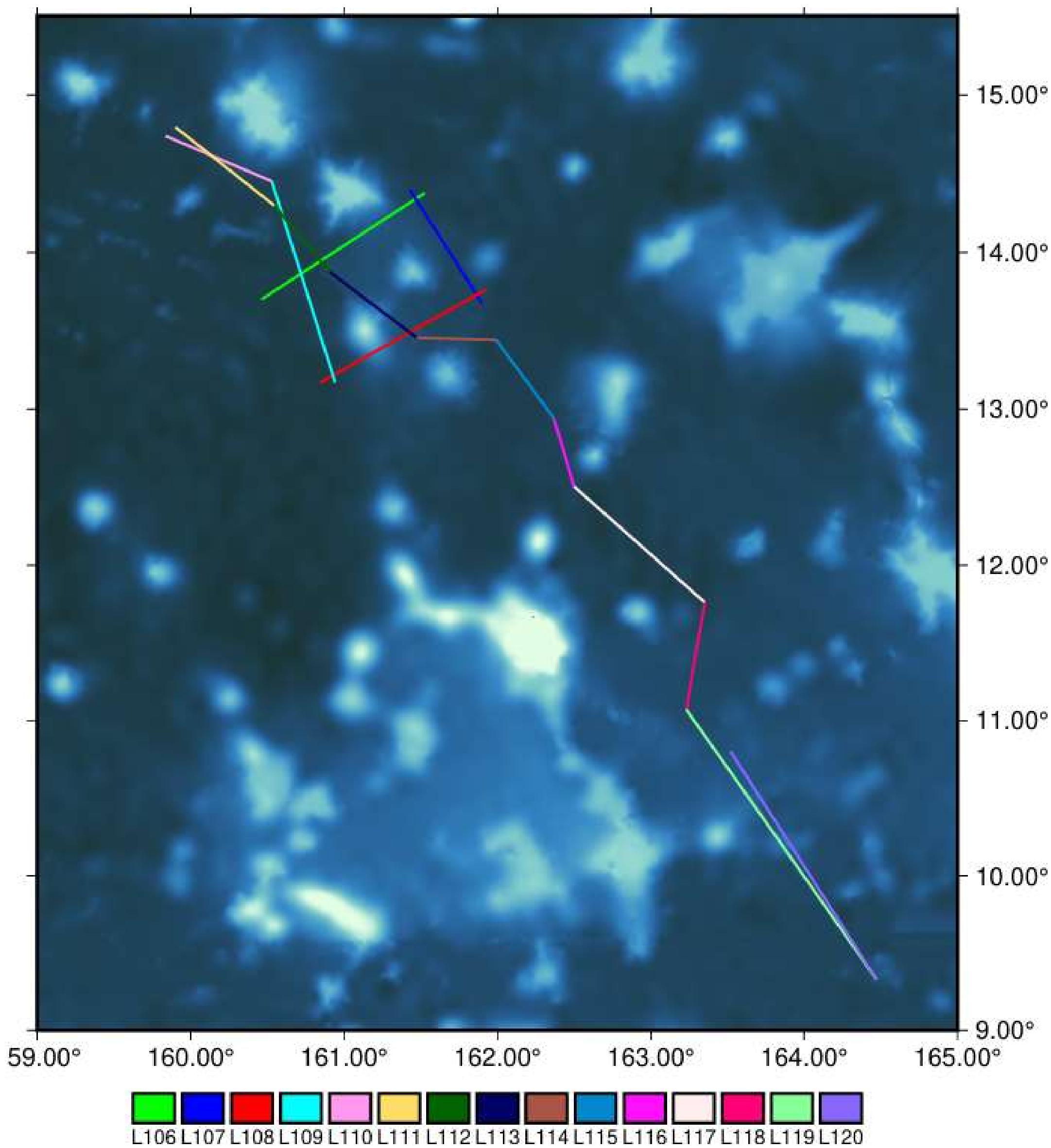

Figure 6.21: shows the spatial distribution of the fifteen major 2D seismic lines (L101–L120) acquired during the research cruise. The figure provides a visual overview of the survey layout, including the orientation and coverage of the seismic lines across the study area.

Table 6.2: Overview of seismic acquisition details, including survey parameters, line lengths, and recording specifications.

Line	Start Day	Start Time	End Day	End Time	Start FFID	End FFID	Total Shots	Guns	Length (km)	Channels
101	24.12.2024							2	N/A	120
102	24.12.2024							2	N/A	120
103	24.12.2024	16:28	24.12.2024	19:57	1001	1962	961	2	29,791	112
104	24.12.2024	20:02	24.12.2024	22:35	1001	1845	844	2	26,164	112 (FFID 1001-1823) 96 (FFID 1824-1844)
105	24.12.2024	22:50	24.12.2024	23:26	1001	1159	158	2	4,898	90
106	27.12.2024	23:35	28.12.2024	14:45	1001	5659	4658	2	144,398	104
106b	28.12.2024				5660	5925	265	2	8,215	?
107	28.12.2024	15:52	28.12.2024	23:55	1001	3431	2430	2	75,33	96
107b	29.12.2024	00:58	29.12.2024	02:25	1001	1409	408	2	12,648	?
108	29.12.2024	03:49	29.12.2024	18:35	1001	5291	4290	2	132,99	72 (FFID 1001-1975) 64 (FFID 1976 - 2196) 72 (FFID 2197 - 2202) 104 (FFID 2203 - 2295) 96 (FFID 2296 - 5291)
108_turn	29.12.2024	19:10	29.12.2024	20:06	5292	5572	280	2	8,68	
109	29.12.2024	20:21	30.12.2024	12:04	1001	5884	4883	2	151,373	96
110	30.12.2024	12:05	30.12.2024	20:26	1001	3635	2634	2	81,654	96
111	31.12.2024	04:00	31.12.2024	12:41	1001	3627	2626	2	81,406	72 (FFID 1001-1945) 64 (FFID 1946-3627)
112a	31.12.2024	12:54	31.12.2024	15:59	1001	1969	968	2	30,008	104
112b					1970	3166	1196	2	37,076	104
113a	31.12.2024	21:32	01.01.2025	00:15	1001	1857	856	2	26,536	104
113b	*only 4 shots*				*1001*	*1004*	*3*	*2*	0,093	*104*
114	01.01.2025	02:17	01.01.2025	09:34	1001	3202	2201	2	68,231	104
115	01.01.2025	09:35	01.01.2025	16:47	1001	3265	2264	2	70,184	104
116	01.01.2025	16:52	01.01.2025	22:01	1001	2598	1597	2	49,507	104
117	02.02.2025	22:05	02.02.2025	11:05	1001	4974	3973	2	123,163	104
118	02.02.2025	11:08	02.02.2025	16:29	1001	2684	1683	2	52,173	104
119a	02.02.2025	16:36	02.02.2025	20:32	1001	2252	1251	2	38,781	104
199b	02.02.2025	21:46	03.02.2025	11:33	2253	6366	4113	2	127,503	104
120	03.02.2025	06:09	04.02.2025	01:52	1001	6895	5894	4	182,714	104

6.5.2 Data Formats

The acquired seismic data were recorded in SEGD (an individual file for each shot) and SEGY (a joint file for all shots within one line) format, as well as SEG-Y. **Table 6.3** below provides a detailed breakdown of each seismic line, including their respective file formats and sizes. This summary facilitates efficient data organization and processing.

Table 6.3: Summary of the SEG-D files for each seismic line.

S/N	Line	Size (GB)
1	101	
2	102	
3	103	4.27
4	104	3.75
5	105	0.71
6	106	18
7	106_turn	1.42
8	107	8.79
9	107b	1.2
10	108	14.1
11	108_turn	0.99
12	109	17.2
13	110	9.33
14	111	6.63
15	112a	3.69
16	112b	4.55
17	113a	3.25
18	*113b*	15.5
19	114	8.37
20	115	8.61
21	116	6.07
22	117	15.1
23	118	6.41
24	119a	4.75
25	199b	25
26	120	22.4

6.5.3 Navigation data

The GPS navigation data is formatted as NMEA strings, which includes the Shot FFID, the UTC time recorded in hours, minutes, and seconds, as well as the longitude and latitude expressed in decimal degrees. Additionally, the quality of the GPS data is indicated by quality factor indicators, which help assess the reliability of the recorded coordinates. The navigation text file was imported into Reveal software using the **AsciiTableImport** tool. During the import process, the required column headers were carefully defined to ensure proper alignment and usability of the data.

Table 6.4: Navigation data Set-up and column information.

S/N	*Column Name*	*Column Begin*	*Column End*
1	SHOT	7	10
2	LAT_DEG	30	31
3	LAT_MIN	32	40
4	LON_DEG	44	46
5	LON_MIN	47	55

6.5.4 Coordinate conversion

The coordinates, initially recorded in degrees and minutes, were converted into decimal degrees for consistency and ease of use in further analysis. This conversion was performed using the DBMath tool in the Reveal software.

The formula for the conversion is as follows:

Latitude: **LAT = LAT_DEG + LAT_MIN/60**

Longitude: **LON = LON_DEG + LON_MIN/60**

Here, **LAT_DEG** and **LON_DEG** represent the whole degrees, while **LAT_MIN** and **LON_MIN** are the minutes portion of the coordinates. The division by 60 converts the minutes into a decimal fraction of a degree, which is then added to the whole degree. This ensures the coordinates are accurately expressed in decimal degree format, a standard required for most geospatial analyses and tools.

6.5.5 SEG-Y data Import

The 2D seismic lines, stored in SEG-Y format, were imported into the Reveal software using the Input Tool. During the import process, the SEG-Y headers were carefully mapped to align with the software's requirements. This involved ensuring that the SEG-Y Byte and SEG-Y Format settings corresponded accurately with the Reveal Header and Format. To maintain data integrity, the source and receiver coordinates were assigned to the correct Byte locations within the SEG-Y headers. The specific Byte locations for these coordinates are detailed in **Table 6.5**.

Table 6.5: Shows Byte location, SEG-Y Format and Header.

S/N	*SEG-Y Byte*	*SEG-Y Format*	*Header*
1	9	32-bit integer	FFID
2	13	32-bit integer	CHANNEL
3	73	Coordinate	SRC_X
4	77	Coordinate	SRC_Y
5	81	Coordinate	REC_X
6	85	Coordinate	REC_Y

6.5.6 SEG-D data import

The SEG-D data was imported using the **SegDRead** tool in the Reveal software. This tool reads SEG-D data directly from the disks and generates a gather for each SEG-D file. Unlike SEG-Y files, which typically contain multiple shots per file, SEG-D files generally store only one shot per file. As a result, all the FFIDs (Field File Identification Numbers) for the seismic lines were simultaneously loaded and output as a gather.

6.5.7 Navigation Merge

The navigation information was integrated with the seismic data using the **DBMerge** tool in the Reveal software. The **DBMerge** tool identified traces based on their **FFID** (Field File Identification Number) and matched them with the corresponding rows in the navigation database. Once a match was established, the tool transferred the relevant navigation values, such as coordinates and other metadata, into the trace headers. The UTM of the latitude and longitude of the acquisition location is as follows:

Table 6.6 Coordinate reference system

DATUM	**WGS 84**
ZONE	57
ZONE CENTRAL LONGITUDE	159E

These parameters indicate that the coordinates are referenced to the WGS 84 geodetic datum, which is the global standard for mapping and navigation. The data falls within UTM Zone 57, with a central meridian located at 159°E longitude.

6.5.8 2D Geometry Definition

The seismic acquisition parameters were defined to ensure correct binning geometry. The shot spacing was set at 31.0 meters, providing a consistent interval between consecutive shot points along the survey line. A total of 96 receiver channels were active during the acquisition, spaced at intervals of 6.25 m. The first offset, defined as the distance from the seismic source to the nearest receiver, was measured at 185.5 meters. Additionally, the desired CMP (Common Midpoint) spacing output was maintained at 6.25 meters (see **Table 6.7**).

Table 6.7: Seismic array and acquisition parameters

S/N	Acquisition Parameters	
1	Shot spacing	31.0
2	Channel Spacing	6.25
3	Number of Channels	96
4	First offset	185.5
5	Desired output CMP spacing	6.25
6	Desired First CMP number	1

6.5.9 Bandpass Filter

An initial Bandpass Filter was applied to the seismic data to attenuate low-frequency surface waves and enhance the signal quality. The filter was designed in the frequency domain with a frequency range of 10-40-300-500 Hertz. This range effectively removes unwanted low-frequency noise while preserving the critical signal components.

The filter length was set to 500 milliseconds, providing a balanced approach to suppressing noise while maintaining the integrity of the seismic signal. The application of this filter significantly improved the clarity of the seismic gathers (**Fig. 6.22, 6.23**).

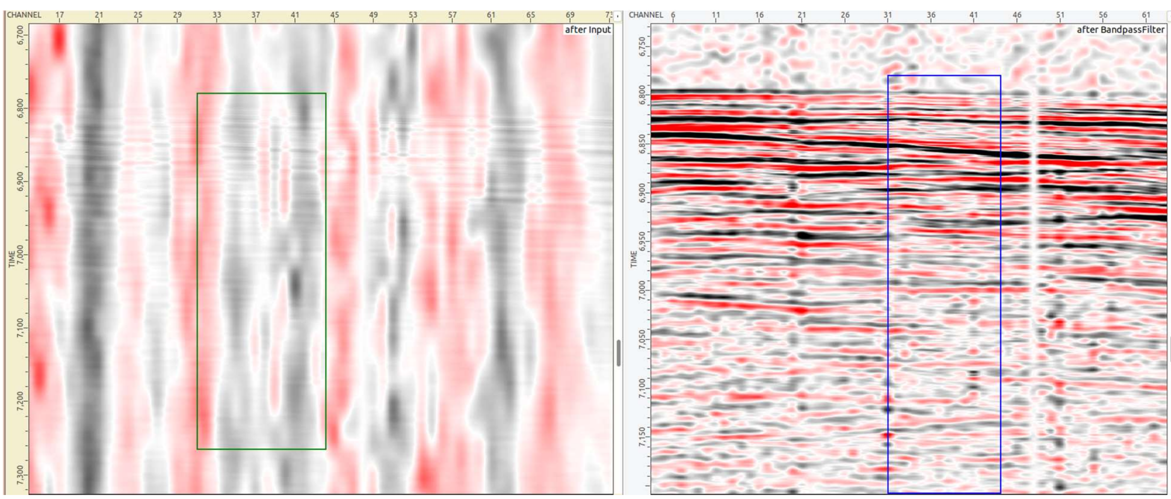

Figure 6.22: Comparison between an unfiltered and a bandpass-filtered shot gather. Rectangles shows area used to plot the frequency spectra in **Fig. 6.23**.

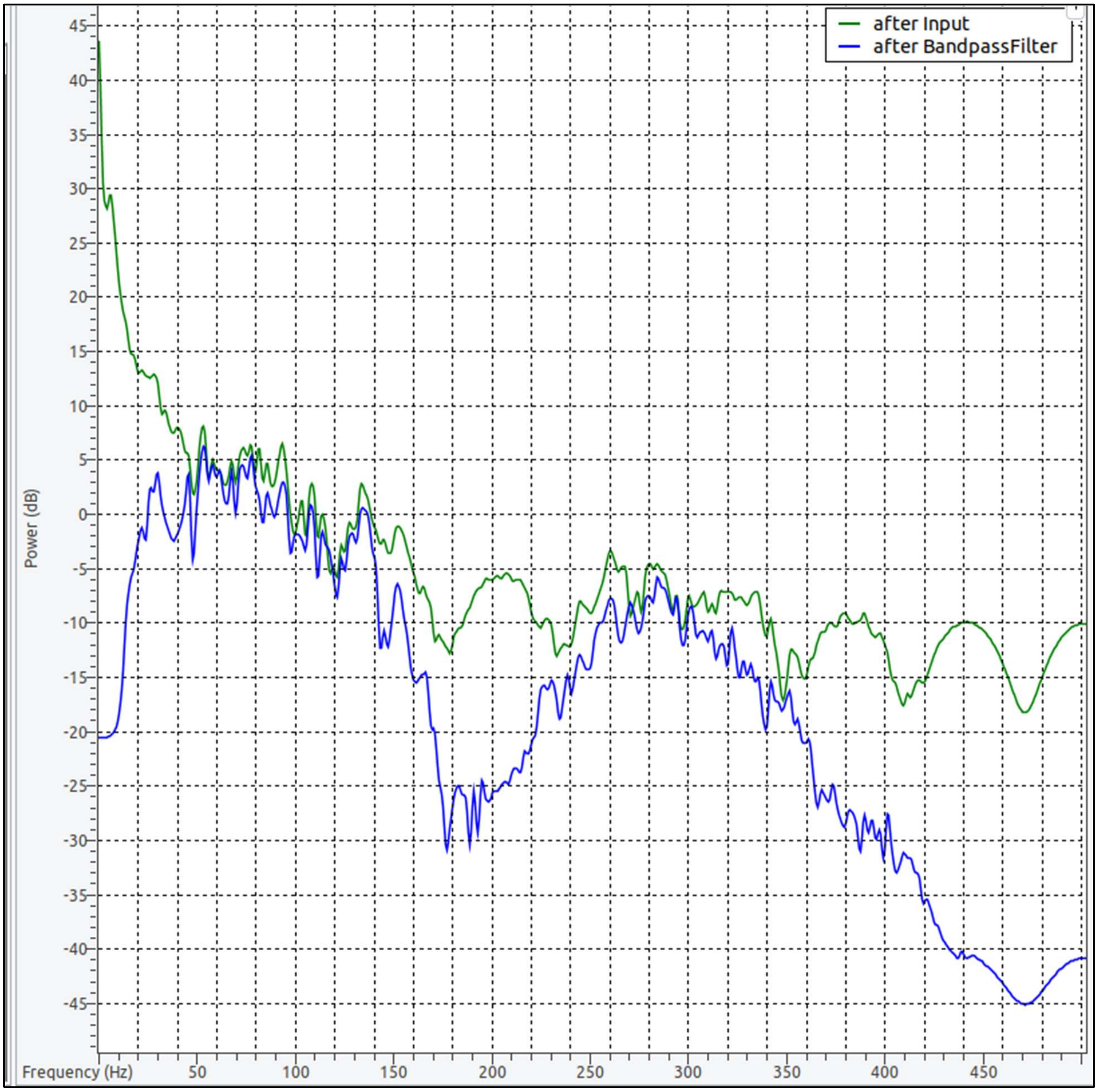

Figure 6.23: Amplitude spectrums of the gathers shown in **Figure 6.22**, illustrating the reduction in low-frequency energy and the enhancement of the desired signal bandwidth.

6.5.10 CMP Sorting

The filtered shot traces were organized into Common Midpoint (CMP) gathers using the CMP, OFFSET sort key. This sorting was performed using the WindowSort tool in the Reveal software. Each CMP gather was limited to a maximum of **1000 traces**, optimizing data manageability and processing efficiency. Additionally, **4 Bytes** were allocated to each sample, providing sufficient storage capacity to preserve both the amplitude fidelity and resolution of the seismic signals.

6.5.11 Despike

The Despike tool was applied to the seismic data to attenuate anomalous high-amplitude noise, such as those caused by cable strikes and connection problems within the seismic streamer. To calculate reference amplitudes, a window size of 600 milliseconds was defined across each input CMP gather, with 21 traces included in each estimation window. Within each window, the RMS amplitude of each trace segment was computed, and the median of these amplitudes was stored as the reference amplitude for the trace and time location corresponding to the window center.

A threshold multiplier of 10 times the median RMS amplitude was set to identify and attenuate noise. For points not located at a window center, reference amplitudes were calculated using nearest-neighbor interpolation. To complete the process, a replacement amplitude scalar of 2 was applied to ensure appropriate scaling of despiked data.

6.5.12 RMS Velocity Analysis

To calculate the semblance for velocity picking, an initial velocity range of 1000 to 3450 m/s was specified, with a velocity increment of 50 m/s, resulting in a total of 50 velocity values. Since the data was acquired in an ultra-deepwater environment, where minimal moveout and surface waves are present, no mute calculation was applied.

The semblance analysis was performed using a time window of 50 milliseconds, and moveout velocities were picked roughly at every 500 CMP increment, but this increment varied between seismic lines depending on the complexity of the subusrface.

The semblance analysis produced a velocity spectrum across the gather, allowing for the selection of RMS velocities suitable for application in Normal Moveout (NMO) correction. At each time sample, the coherence of the data in the gather was measured along hyperbolic trajectories, providing a quantitative assessment of the fit between the data and the assumed moveout velocities (**Fig. 6.24**).

The semblance value was computed as a sum over the traces in a gather, with the expression for semblance defined as:

$$s_{(T,v)} = \frac{[\sum tr[f(T,v,o)]^2]}{([\sum tr[f(T,v,o)]])^2}$$

Where

$$tr[t] = Sample(s) of\ the\ input\ trace\ tr\ interpolated\ to\ time\ t$$

$$f(T,v,o) = \sqrt{T^2 + \frac{0^2}{v^2}}$$

$$T = time\ at\ zero\ offset$$

$$v = RMS\ Velocity$$

$$o = offset$$

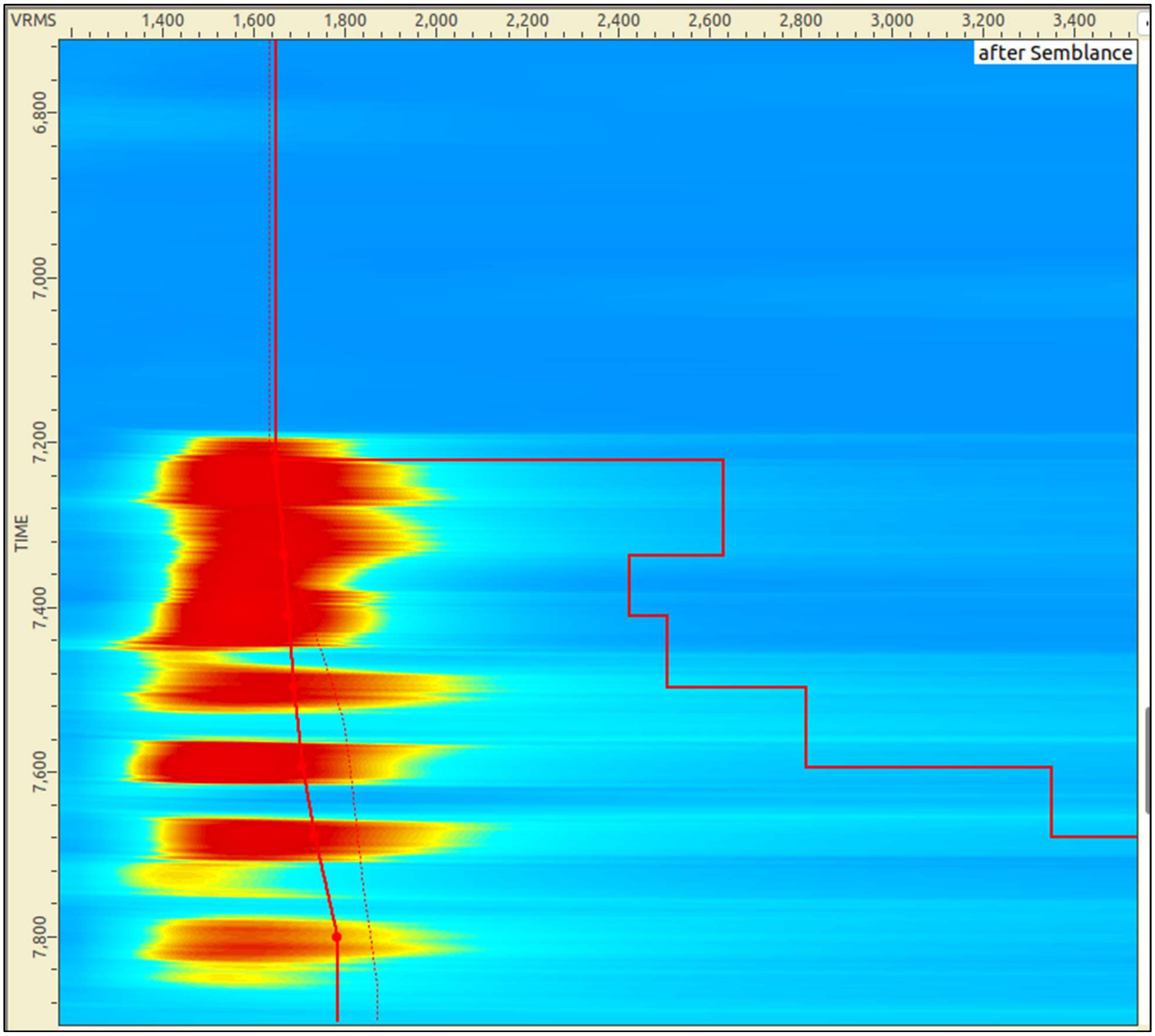

Figure 6.24: The semblance plot displays the velocity spectrum, highlighting areas of high coherence where seismic events align well with hyperbolic trajectories. These zones of high semblance provide the basis for selecting optimal RMS velocities, ensuring accurate NMO corrections and improved data quality for subsequent processing and interpretation.

The semblance was calculated at each time sample to evaluate the coherence of seismic data across hyperbolic trajectories. Simultaneously, a constant velocity stack was applied as the NMO (Normal Moveout) velocity was determined. This dual process ensured that the calculated velocities were immediately tested for their effectiveness in flattening seismic events.

The constant velocity stack was performed in a dedicated mode, starting with an initial velocity of 1200 m/s. Velocities were then incremented by 100 m/s, generating a series of stacked sections for comparison. This approach allowed for the direct assessment of velocity accuracy by observing the coherence and alignment of seismic reflections within each stacked section.

By combining semblance analysis with constant velocity stacking, the process provided a robust framework for selecting optimal RMS velocities, critical for accurate NMO correction and subsequent seismic interpretation. **Figure 6.25** shows a exemplary seismic section overlain by velocity picks.

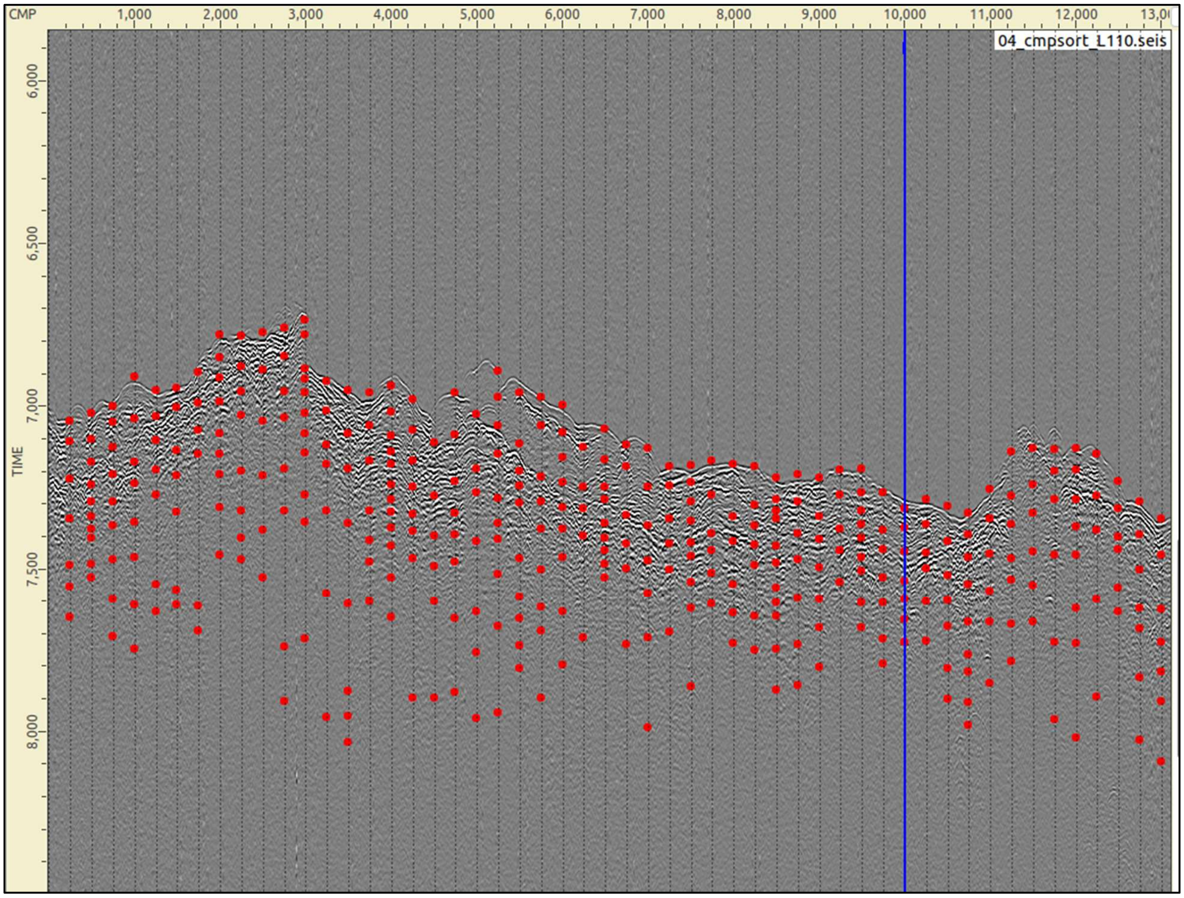

Figure 6.25: Velocity picks along CMP gathers at 250 crossline intervals for Line L110.

6.5.13 NMO Stack

The sorted CMP gathers were stacked to enhance the signal-to-noise ratio by further suppressing incoherent noise. Before stacking, Normal Moveout (NMO) correction was applied to the gathers using the velocities derived from the semblance analysis (**Fig. 6.26**). This step aligned the reflection events, ensuring accurate stacking of coherent signals. To address distortions caused by NMO stretching, a stretch mute was applied with a mute percentage of 60%, effectively removing regions where excessive stretching occurred. Additionally, a stretch mute taper of 30 milliseconds was used to smooth the transition between muted and unmuted data, preserving the continuity of the reflections.

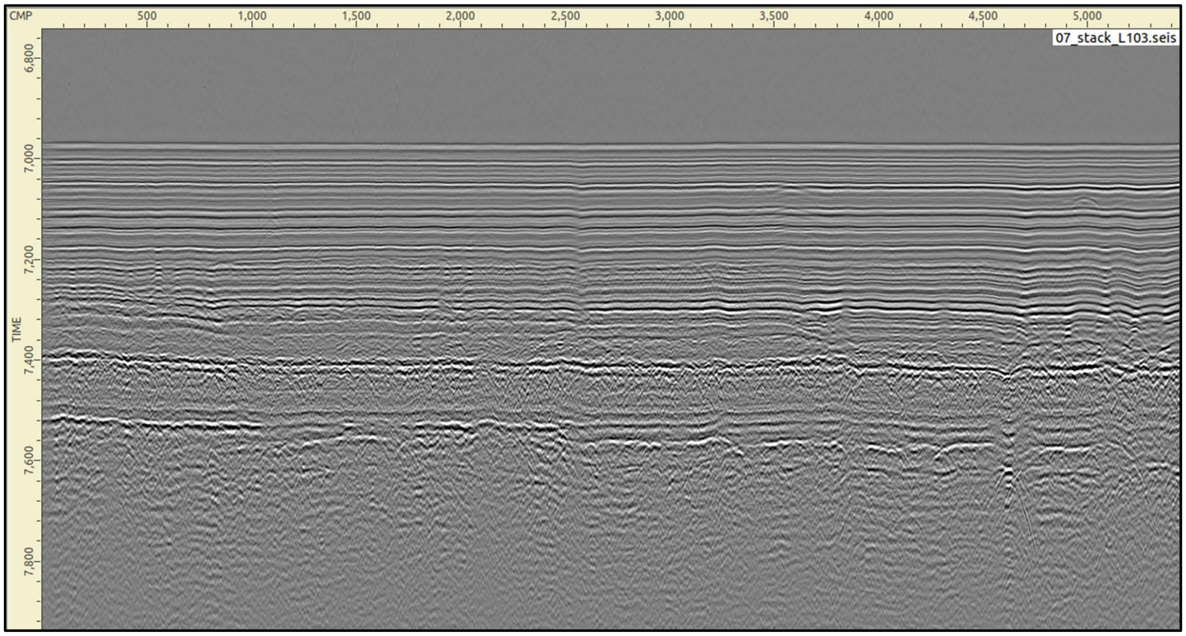

Figure 6.26: Stacked seismic traces for Line L103. This figure displays the final stacked section, highlighting coherent reflection events and subsurface features, which provide valuable insights into the geological structure and stratigraphy along the line.

6.5.14 Spherical Divergence Correction

The spherical divergence correction was applied to the seismic data to account for amplitude attenuation caused by wavefront spreading, also known as geometric spreading. This correction ensures that the amplitudes more accurately represent subsurface reflectivity by compensating for energy loss due to the expanding wavefront as seismic waves travel through the subsurface.

An offset-dependent correction was implemented, where the trace amplitudes were scaled by a factor specific to their offsets. This approach accounted for the varying degree of spreading with increasing source-receiver distance. A reference time of 1000 milliseconds was used as the baseline for applying the correction, ensuring consistent scaling across all traces.

6.5.15 Bottom mute

Before the migration process, a bottom mute was applied to the seismic data. This step involved removing the portions of the data below a specified time for each line where coherent signals were no longer present, typically dominated by noise. This noise leads to the occurrence of strong migration artifacts, so-called migration smiles, which were avoided by the bottom mute.

6.5.16 Post-stack migration

A post-stack time migration was performed on the seismic data using the semblance-derived or NMO velocity to correct for lateral variations in seismic wave travel times. This migration process adjusted the reflection positions, improving the accuracy of the subsurface image by compensating for distortions caused by changes in velocity and geometry.

A velocity percentage of 100% was applied, ensuring that the full velocity model was used to adjust the seismic data. The maximum frequency was set to 300 Hz, providing high-frequency detail for better resolution in the migrated image. Additionally, the CMP spacing of 6.25 meters was retained, preserving the original sampling interval for optimal data continuity. Exemplary migrated 2D lines are shown in **Figures 6.26** and **6.27.**

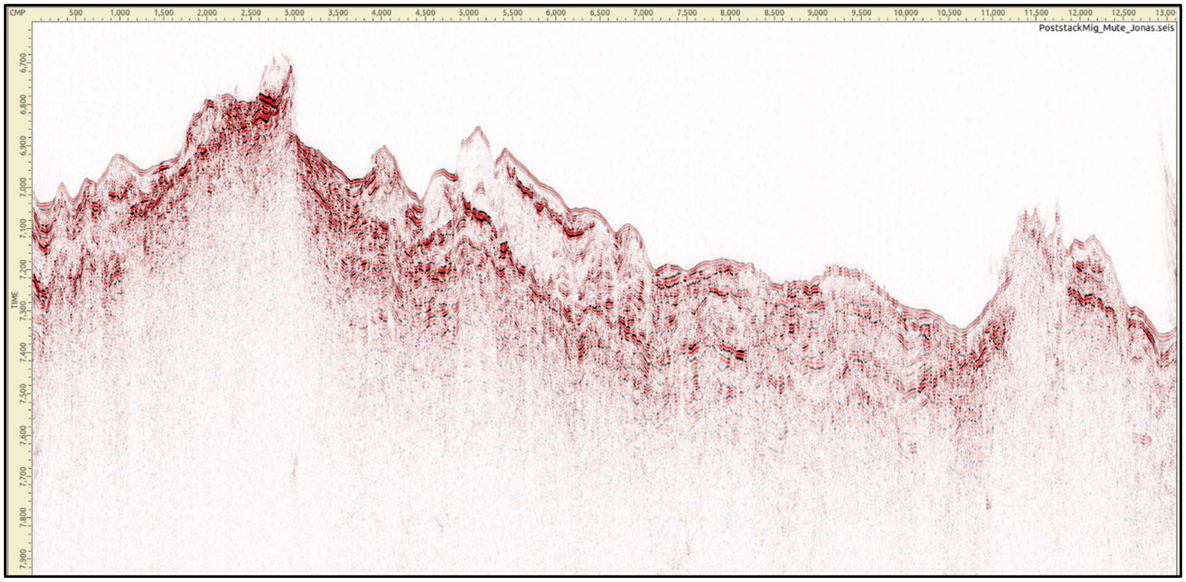

Figure 6.27: Post-stack time-migrated seismic section of L110.

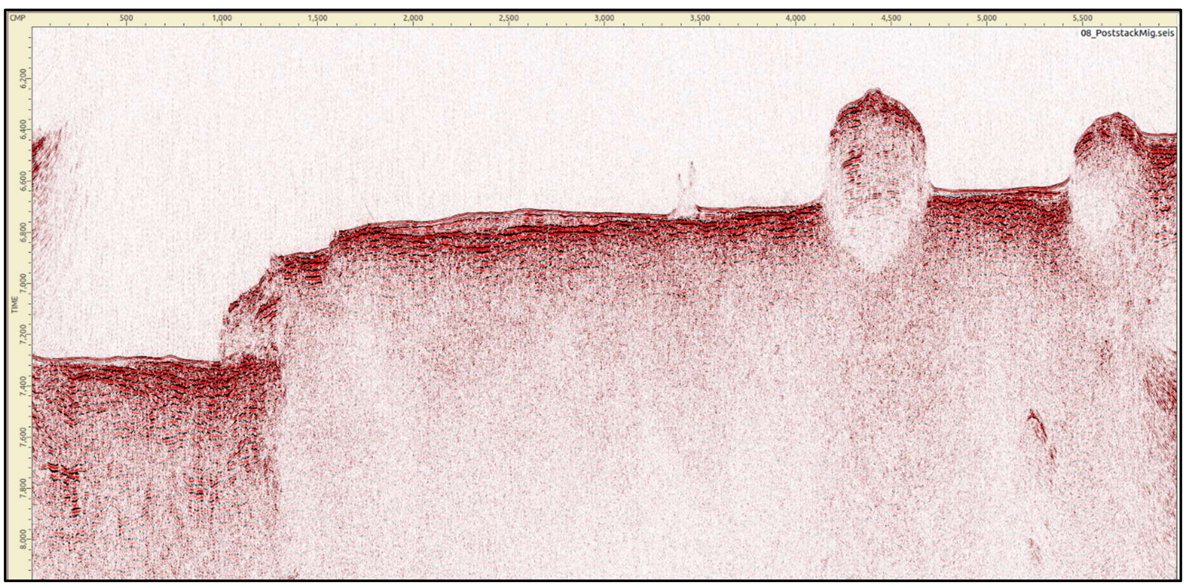

Figure 6.28: Post-stack time-migrated seismic section of L112.

6.6 Geometry

N. Benz

There were three towing configurations for this survey, referred to here as A, B, C. Offsets for each point, streamer tow point (Streamer TP), gun tow point (Gun TP), center of source (COS), and first record group (FRG), are referenced to survey points, numbers 301 and 302 from the ship's survey document, pages 60-61. The reference plane, a granite block, is the zero referenced point for the primary GPS, Seapath 380. Please note that the granite block is not centerline, hence unequal lateral offsets (x, navipac convention, and y, ship survey).

The primary tow points for PORT and STBD are on two 20-foot slings routed through the aft outboard chocks to bits, and the centerline (CENT) tow point is from the aftmost center deck socket, see the survey document. While towing four guns, shorter slings were used to account for the aftwards position of the port chock relative to the starboard chock, effectively keeping the fore-aft position of the gun hangers equal (y-values in Navipac convention). The distance from the Gun TP and COS is 26.5 m.

Due to a malfunctioning deck unit, there are two configurations for depth control birds (e.g. CB01). The first is a bird at the head of the forward vibration isolation section, and another at the head of the aft vibration isolation section after section #15. These two birds were set to maintain maximum fin angle of -15 degrees. This diving attitude is balanced by the forward tow point and the tail buoy and we estimate the streamer depth is around 2m below the surface. The second configuration involves five birds set to maintain a depth of 3m. In this configuration the birds could not be monitored in real time. These birds were located at the head of the forward vibration isolation section, head of second, sixth, and tenth active sections, and the head of the aft vibration isolation section.

Coordinate conventions:

NaviPac Axes: +X STBD, +Y FWD, +Z UP

Survey Axes: +X FWD, +Y STBD, +Z DOWN

Towing Configurations

A- Streamer STBD, Gun CENT, Mag PORT

B- Streamer STBD, Gun PORT, no Mag

C- Streamer CENT, Four Guns, no Mag

Table 6.8: Offsets. All values in meters, NaviPac convention. Referenced to Seapath (0,0,0) at the granite block.

Point	A	B	C
First Record Group	(9.61, -183.90, -3)	(9.61, -183.90, -3)	(2.12, -180.48, -3)
Center of Source	(2.12, -53.85, -4)	(-5.39, -57.33, -4)	(2.12, -57.33, -4)
Streamer Tow Point	(9.61, -30.83, -1)	(9.61, -30.83, -1)	(2.12, -27.35, 2.3)
Gun Tow Point	(2.12, -27.35, 2.3)	(-5.39, -30.83, -2)	(9.61, -30.83, -1)
Gun Tow Point (PORT)	—	(-5.39, -30.83, -1)	—

Table 6.9: Survey Benchmarks. Survey coordinate convention, values reproduced from vessel survey document

Page	Benchmark #	X (m)	Y (m)	Z (m)
60	301	-24.0293	8.6507	-2.3673
61	302	-24.0293	-4.4249	-2.3568

Streamer Configuration

- 25 m – Streamer tow point to faired tow cable
- 75 m – Two faired tow cables (75 m and 63 m)
- 25 m – Forward vibration isolation section
- 50 m – Active sections (15 sections = 120 channels; 13 sections = 104 channels)
- 25 m – Aft vibration isolation section
- 50 m – Tail buoy tow cable

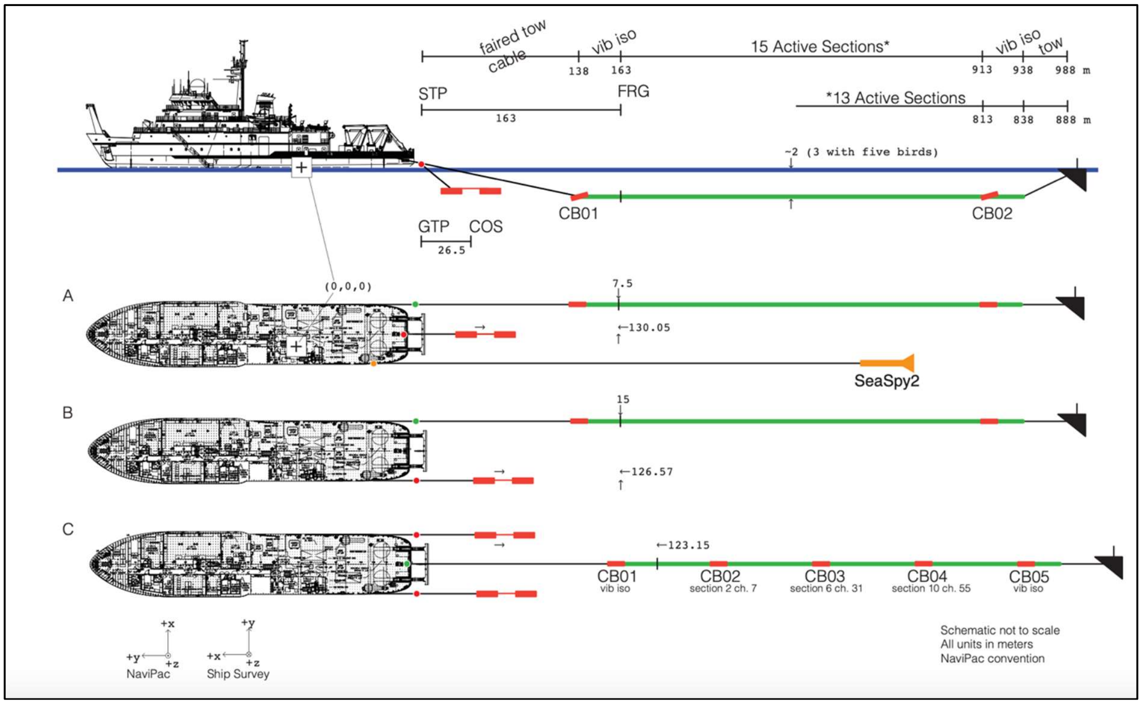

Figure 6.29: Overview of the streamer geometry during Expedition SKQ202418S.

7. Sea Surface Magnetometer

J. Raab & M. Tivey & W. Sager & J. Preine

7.1 Overview

Magnetic field data were collected during the cruise using a Marine Magnetics SeaSpy2 magnetometer supplied by the Multidisciplinary Instrumentation in Support of the Oceanography (MISO) facility (**Fig. 7.1**). SeaSpy2 is an Overhauser system that operates on a nuclear spin resonance principle which enables a total field measurement to be made with 0.01 nT precision. The sensor was towed astern with its tow cable connected to a cleat secured to the deck through a "Yale" grip, with the tie-off being 25 meters from the 0000 origin of the GPS antenna. The 300 meter tow cable was deployed and recovered by a portable winch supplied by MISO, mounted on the aft deck. The winch was powered by a ship-supplied 3-phase 208 V source.

Data were collected on a X140E Lenovo Thinkpad running Windows V7 using Marine Magnetics "BOB" software. Readings were sampled at a rate of 1 per second with a precision of 0.01 nT. GPS navigation was also recorded at the same rate, with the "BOB" software using a layback of 325 meters. All times were set to Universal Coordinated Time (UTC). Processing of the data involved parsing the daily raw mag files and merging with the ship's Seapath navigation data. The merged data were corrected for the 325 m layback behind the ship and then the regional field (International Geomagnetic Reference Field, 2024-2025) was removed to obtain magnetic anomaly. Files were saved in MATLAB format and as asciii files.

A deeptowed magnetometer sled was also prepared on board in case of catastrophic failure of the seismic system. This system, again provided by MISO, consisted of a deeptow marine magnetics sensor, a DSL datalink, and a Valeport depth and altitude sensor (**Fig. 7.2**). This was tested by hooking up to the ship's CTD 0.380 wire, which worked as desired. Fortunately, we did not need to deploy the system for this leg.

7.2 Acquisition Configurations

During the initial transit, the magnetometer was towed from the center of the aft deck at a speed of ~10 kts. Data quality was excellent. During the Nauru Basin survey transect the magnetometer was also towed from this central position (JD 359-362).

The SIO portable seismic system also included a Marine Magnetics SeaSpy-2 magnetometer connected to its tailbuoy. After several failed attempts at communication with both the tailbuoy and the SIO magnetometer, we settled on trying to tow the MISO magnetometer from the port side of the ship while towing the seismic streamer on the starboard side and the gun array in the center. The magnetometer winch was moved to the port side of the aft deck to accommodate this towing configuration. The magnetometer was towed in this configuration from JD366 to JD002 at a nominal survey speed of 5 kts.

Figure 7.1: The MISO winch that aided in the deployment and retrieval of the magnetometer (left). The Marine Magnetics Seaspy2 Sensor on deck of RV Sikuliaq before deployment (right). Photos: J. Preine

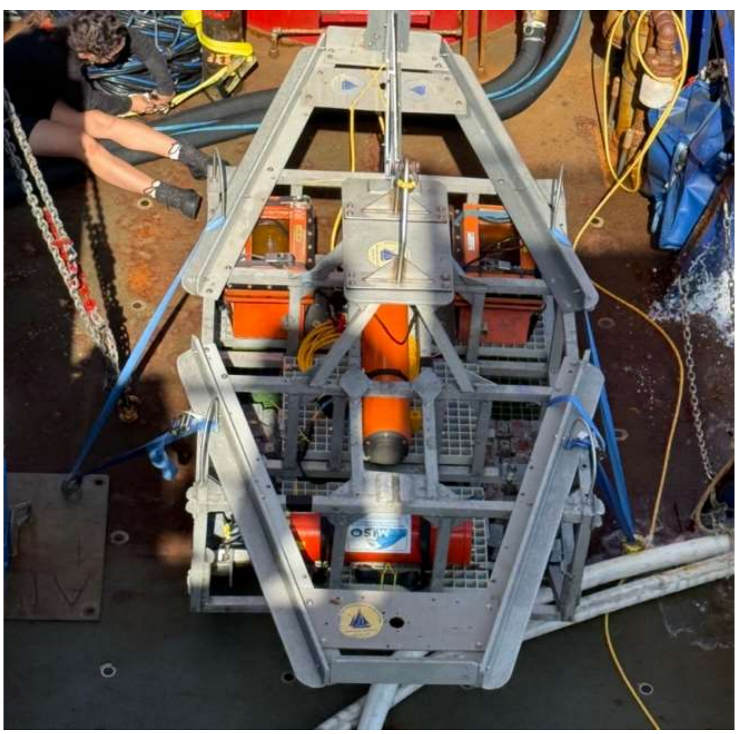

Figure 7.2: MISO Deeptow magnetometer. Feet of Consuelo (5’4” seismic technician) included for scale. Photo: M. Tivey

7.3 Data Examples

Figure 7.3 shows the measured anomalies during our transit from Honolulu to the survey area. These magnetic measurements were mostly unaffected by the solar-magnetic weather, which occurred mainly as small-wavelength variations in our measured magnetic anomalies (**Fig. 7.4**). Despite being near solar maximum, when magnetic storms are common, the cruise had generally good luck avoiding magnetic storms. The Kp index, which is a measure of magnetic field disturbance, was often low. Kp > 5 is considered an indicator of magnetic disturbance, but only two periods of magnetic data were affected by such conditions: 17 December 2024 from 3-6 hours UT and 1 January 2025 from 9-21 hours (UT) (**Fig. 7.4**). In the latter period, a minor geomagnetic storm (class G1) occurred and Kp rose to a maximum of 8. Magnetic data collected during that time show many small wiggles (amplitudes up to ~10-20 nT with wavelengths of minutes (**Fig. 7.4**), probably caused by micopulsations. Anomalies during this storm will be compared with those recorded on a base station in Pohnpei to assess whether they resulted from storm variations. Daily plots of magnetic anomalies and Kp index are in **Appendix A.2**.

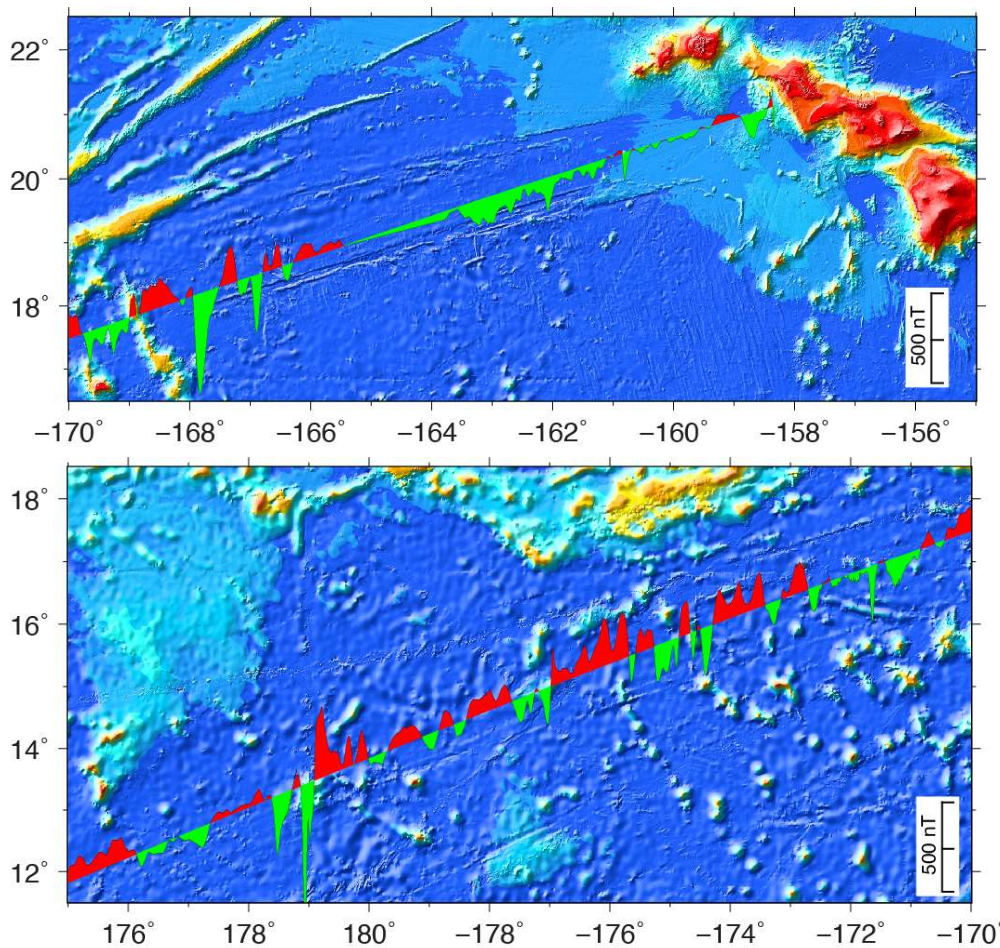

Figure 7.3: Data examples of measured magnetic anomalies projected on our transit line from Hawai'i towards the survey area.

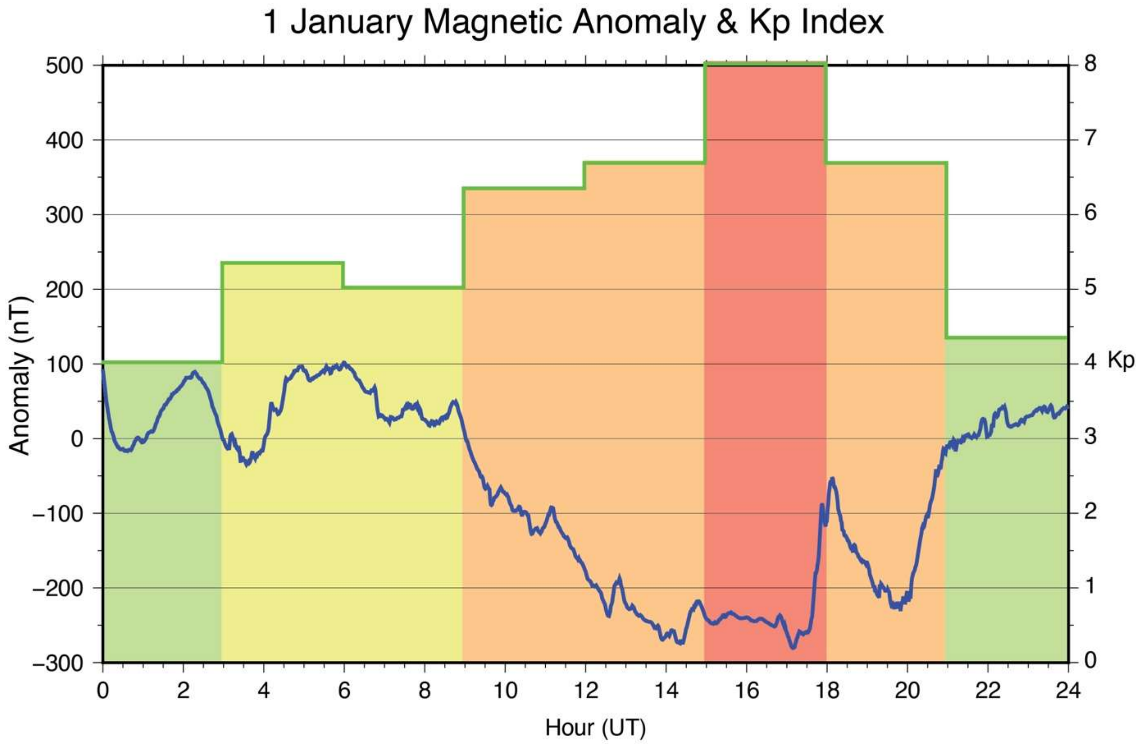

Figure 7.4: Magnetic anomaly and Kp Index plot for 1 January 2025, during a minor magnetic storm. The blue line shows recorded magnetic anomalies from the SeaSpy2 magnetometer. The green line denotes the Kp index, which is published for 3 hour intervals. Shading indicates Kp magnitude, with green denoting relatively undisturbed conditions and yellow, orange, and red representing disturbed times. The magnetic anomalies display many small (low amplitude and short time) anomalies caused by the unstable geomagnetic field.

8. Shipboard Gravity

J. Hampton & H. Mark & M. Tominaga & J. Preine

8.1 Data Collection

Shipboard gravity measurements were collected continuously during SK202418S. These data were collected utilizing a Dynamic Gravity Systems (DGS) AT1M marine gravimeter (**Fig. 8.1**). The gravimeter was mounted as close as possible to the center of the ship, on the 00 deck in the marine tech workshop, to minimize the range of motion experienced by the instrument due to the ship's roll. The meter was installed on 11/27/2023 in port of Seward, Alaska. A land tie was conducted at the dock in Honolulu, HI before the start of the cruise and another land tie was conducted in Pohnpei at the end of the cruise.

Data were collected at a sampling rate of 1 Hz and locations were logged via GPS. The gravimeter converts the local acceleration into an electrical signal, outputting the raw data as voltage measurements. The gravimeter's accompanying software from DGS produces a raw data file every 24 hours as well as a lightly processed file with the raw measurements calibrated.

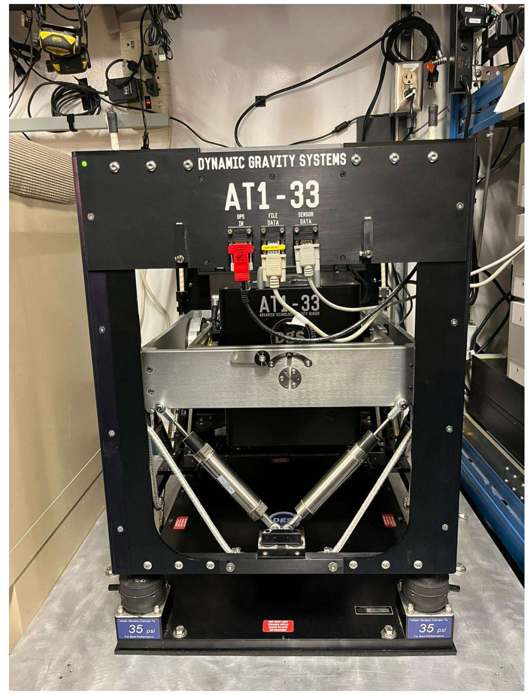

Figure 8.1: Dynamic Gravity Systems marine gravimeter model AT1-33 in the marine tech workshop onboard RV Sikuliaq.

8.2 Data Processing

Local variations in Earth's gravitational field, relative to predicted values, provide insights into the densities and distribution of mass in the shallow subsurface. To properly interpret these variations, it is essential to account for and correct various factors that influence gravity measurements. These corrections enhance the accuracy and reliability of the final data interpretation, enabling a clearer understanding of subsurface structures. Data processing involves analyzing the time series of gravity measurements collected during the survey. Pre-processing begins with an initial examination of the raw data to identify and remove any obvious errors. In addition, pre-processing includes gathering and reviewing all necessary information required for data processing: the ship's speed, heading, and geographic coordinates at all points in the time series. After completing these pre-processing steps, a series of conventional corrections are applied to the measured gravity. The following sections detail the individual steps involved in these corrections and provide a rationale for each.

8.2.1 Scale corrections

The DGS system's attached laptop automatically applies scale corrections to the raw gravity measurements, converting voltage readings into milligals. Combined with a subsequent adjustment for instrument bias, this process generates a time series of 'calibrated gravity':

$$G_{obs}(\text{mGal}) = \left(G_{filt} \times f\right) + \text{bias}$$

The scale factor *f* for the DGS AT1M has a value of 8388607. The *bias* was measured using a gravity tie at the pier before the start of the cruise and had a value of 969538.8152. The Gaussian raw gravity counts is denoted by *G*; *Gobs* are the observed gravity measurements in mGals.

8.2.2 Latitude correction

The second correction addresses variations in the measured gravity due to latitude. The strength of an observed gravitational field varies with the distance from the center of mass. Since Earth's gravitational field is centered at its core, its strength fluctuates as the Earth's radius changes with latitude. This radius change occurs as you go from the poles to the equator (~ 21 km), and results in a variation of about 5,000 mGals. In surveys that traverse different latitudes, a latitude correction (*LATC*) must be applied to correct for these changes. We use the international standard WGS84 ellipsoid values for the latitude correction.

$$LATC(\text{mGal}) = x[1 + A \times sin2(\theta) – B \times sin2(2\theta)]$$

Ge is the value of gravity at the equator on the reference ellipsoid (geoid) and is approximately 978.03253359 gal. *A* and *B* are functions of the flattening of the earth and are constants, while θ is the latitude at a given observation location.

8.2.3 Eotvos correction

The third correction compensates for the movement of the survey platform. We apply the Eötvös Correction (EC) to account for accelerations caused by the ship's motion, which can affect the gravimeter's readings. This step ensures that only true gravitational accelerations are measured, eliminating distortions from the ship's velocity and heading.

$$EC(\text{mGal}) = 7.487 \times Vxcos(\theta) \times cos(\alpha) + 0.004 \times V2$$

Where V is ship’s velocity in knots, θ is latitude, and α is the ship’s heading.

8.2.4 Free-Air correction

The next correction addresses the distance between the gravimeter and the geoid (nominally sea level). This adjustment accounts for the gravimeter's height (h) above or below sea level. Onboard RV Sikuliaq, the gravimeter is positioned approximately 3 meters above sea level. This straightforward scalar correction, known as the Free-Air Correction (FAC), remained consistent throughout the expedition.

$$FAC(mGal) = 0.3086 \times h$$

The free air correction assumes that all mass between the observation height and geoid have zero density, therefore it is assumed the measurement was taken in free air.

Applying the above corrections to the measured gravity time series produces what is known as the Free Air Anomaly, or FAA. We often make our first order interpretations from the FAA. At this stage, the anomaly was filtered using a 240 sec Blackman window.

8.2.5 Cross-coupling correction

This correction accounts for cross-coupling, a challenge specific to beam gravimeters. While gravimeters are designed to measure only the vertical component of gravity, horizontal accelerations from ship motion can cause errors. A gimbaled platform can tilt off-vertical due to these accelerations, introducing additional forces into the gravimeter reading. Although gyro-stabilized platforms reduce this effect, some acceleration remains. Cross-coupling depends on the off-level angle of the beam (θ), which is influenced by ship motion and platform stabilization. By modeling and correcting for cross-coupling, we mitigate these errors and improve the reliability of the gravity measurements.

8.2.6 Bouguer correction

The Bouguer correction addresses the gravitational effect of material between the observation station and the sea level datum. This effect arises because the additional mass contributes to the observed gravity. To account for this, we apply the Bouguer correction, which assumes a homogeneous layer of material with a thickness equal to the elevation above (or below) sea level.

$$BC(\mathrm{mGal}) = 2\pi G \Delta\rho h$$

The gravitational effect of this layer is calculated using the formula above, where is the height, G is the gravitational constant, and Δρ is the density difference. By subtracting this correction, we isolate the gravitational anomalies of interest, effectively removing the first-order gravity effects caused by surface material. This method is most effective when terrain slopes are gentle, as it simplifies topographic effects.

For marine gravimetry, Bouguer corrections are used to reduce FAA measurements to gravity anomalies attributable to crustal or mantle sources. This involves calculating corrections the water column (based on bathymetry), sediments (based on measured or estimated sediment thickness) and sometimes oceanic crust. The Mantle Bouguer Anomaly (MBA) refers to marine gravity that has been corrected for the density differences across those layers.

A further Bouguer-type correction can be applied in an attempt to isolate the gravity signal attributable to mantle density and/or crustal thickness variations. This correction is calculated in the same way as the previous Bouguer corrections, but the homogeneous layers in this case are mantle layers bounded by calculated isotherms assuming a standard model for oceanic plate cooling through time. Subtracting the gravity contributions due to the changes in density with mantle temperature leaves the Residual Mantle Bouguer Anomaly (RMBA).

8.3 Data Examples

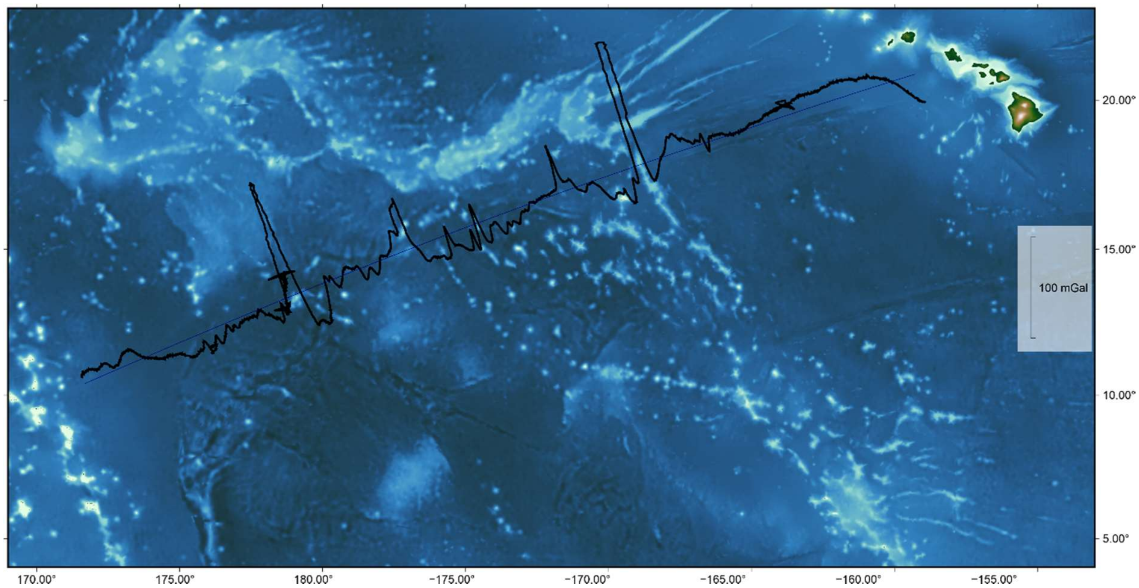

Figure 8.2: Measured Bouguer-corrected gravity projected on our transit from Hawaii toward the study area.

9. Multibeam Bathymetry

L. Collier & J. Preine

9.1 Equipment Specifications

The R/V Sikuliaq is equipped with a Kongsberg Simrad EM304 multibeam bathymetry echo sounder (**Fig. 9.1**). It can operate in the 26-34 kHz range, but the nominal sonar frequency is 30 kHz with an angular coverage sector of up to 150 degrees and 1600 beams per ping. In ideal conditions, the swath width is typically up to 5.5 times the water depth, though this can vary with slope returns and other seafloor conditions. The beam can also be aimed manually or set to vary automatically to optimize coverage.

Figure 9.1: Installation of the EM304 Transducer array, ice shield is removed for installation. Array runs for 20ft (6m) in line with the bulge (left). Transducer array mounted in the bulge of the R/V Sikuliaq after application of anti-fouling paint (right). Photos: E. Roth.

The software used to visualize and acquire EM304 data was the Kongsberg Seafloor Information System (SIS) version 5.14.0 (**Fig. 9.2**). This software allowed watch-standers to visualize changes in return coverage, alongside other diagnostic data, and to adjust depth settings to maintain optimal data logging. The main adjustments performed by the watch-standers during data collection were to the Depth Settings in the Runtime Parameters window. The minimum and maximum depths were manually adjusted by watch-standers to maintain the seafloor within the data collection window (**Fig. 9.3**). Force Depth was set according to the expected charted depth and assists the echo sounder in reacquiring the seafloor if there is interference or the seafloor is lost.

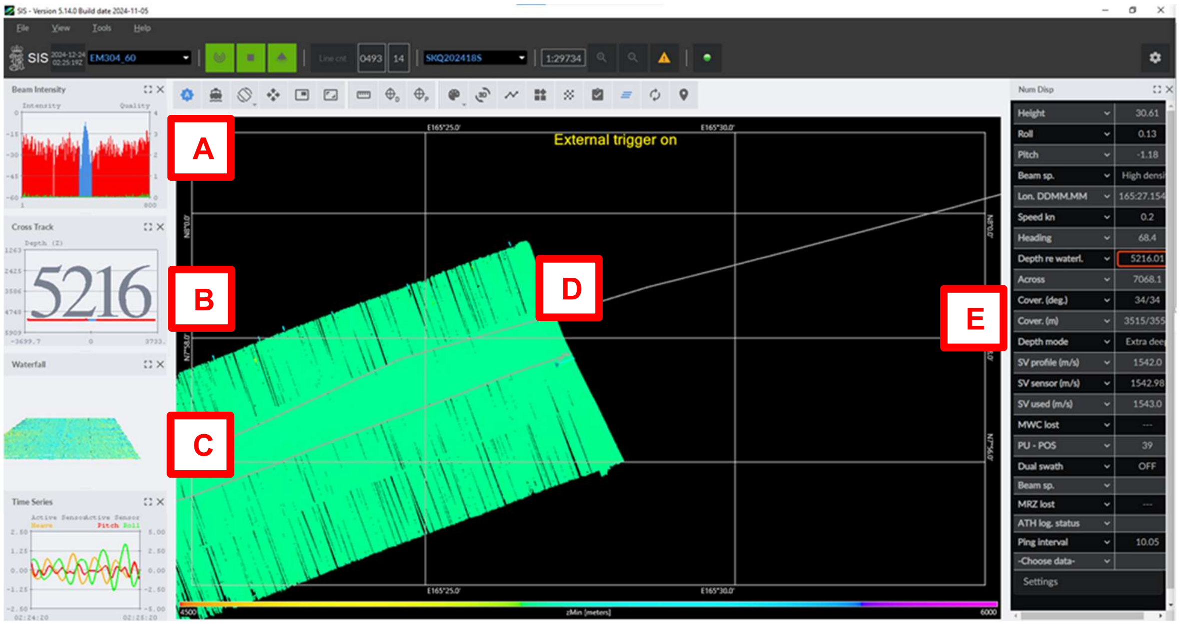

Figure 9.2: SIS Data Visualisation window showing underway EM304 bathymetry. A. Beam Intensity window shows center beam width and intensity of lateral returns. B. Cross Track Depth shows current depth under beam and a cross section of the seafloor across beam. C. Waterfall Data Display shows isometric display of seafloor. D. 2D SONAR data visualisation with ship track. E. Numerical Display for relevant system settings.

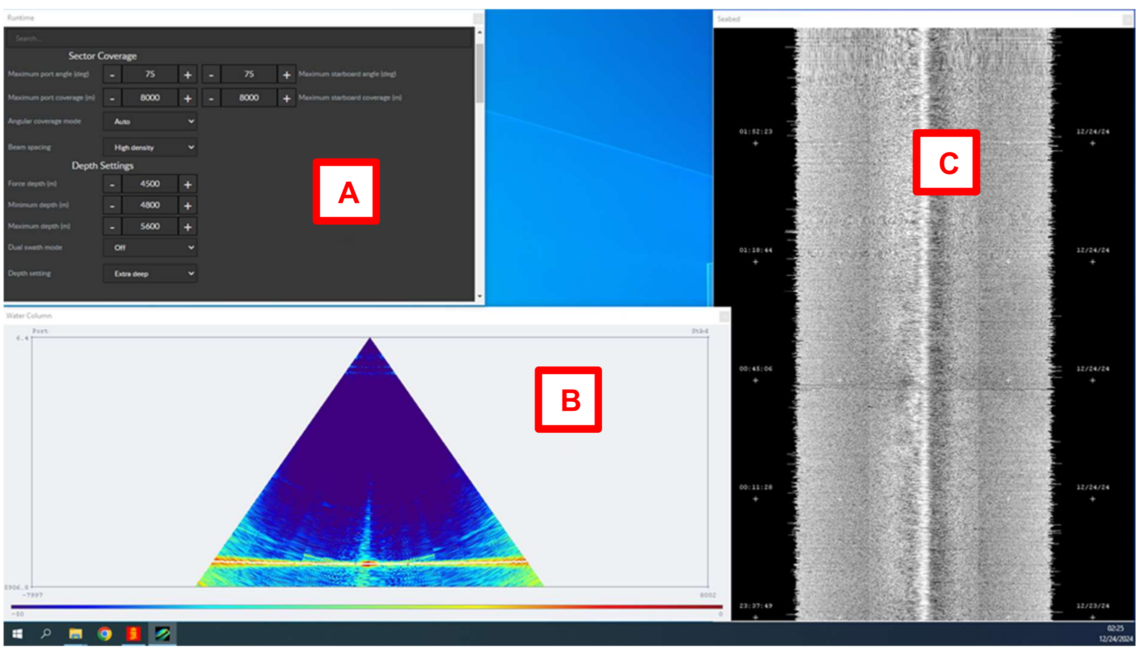

Figure 9.3: Secondary Data Displays. A. Runtime window for adjusting beam width, coverage mode, force depth, min/max depth, and depth setting. B. Water column sonograph, displays seafloor cross-sectional topography and picked seafloor. C. Seabed swath reflection amplitude data, for inferring seafloor surface characteristics.

9.2 Data Processing

1. Create a daily MB processing folder in SKQ20418SMB folder on a desktop (naming convention: MBProc20241214_JD349, change the date after Proc and JD accordingly)
2. Access the data drive (read-only), copy that day's .kmall files from the em304/raw folder into the folder you've created. Check the .kmall file sizes, most should be around 46mb
3. In the terminal, you should change your directory to the daily folder created as above.

   Create bulk data list:

   ls *kmall > datalist.preprocess.mb-1

   Create all the auxiliary parameter files:

   mbpreprocess --input=datalist.preprocess.mb-1 –verbose

   Create bulk beam-data list:

   format=`ls *.mb* | grep inf | head -n 1 | awk -F. '{print $2}' | awk -Fb '{print $2}'`

   ls *.mb$format | awk -v format=$format '{print $1, format}' > datalist.process_bathy.mb-1

4. In terminal, type mbeditviz and wait for the XQuartz to start the GUI.
5. In mbeditviz window, select "File/datalist.process_bathy.mb-1" (**Fig. 9.4**).

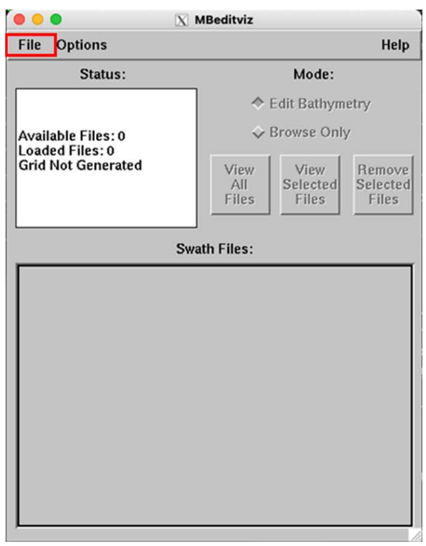

Figure 9.4: Screenshot of Step 4 of Multibeam Processing.

6. Click View All Files or Selected Files (**Fig. 9.5**).

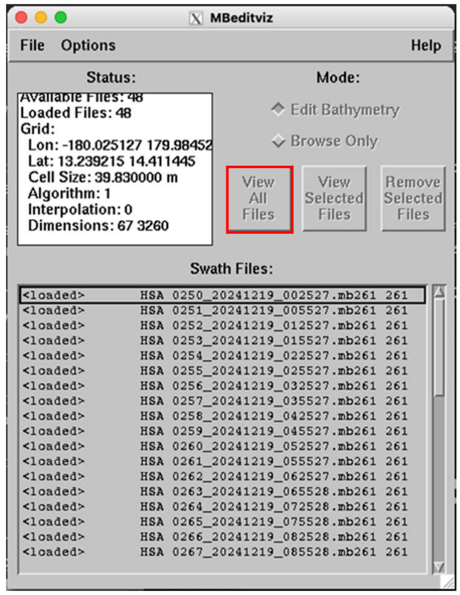

Figure 9.5: Screenshot of Step 6 of Multibeam Processing.

7. Select a grid size as close to 40 m as possible.
8. Select Area

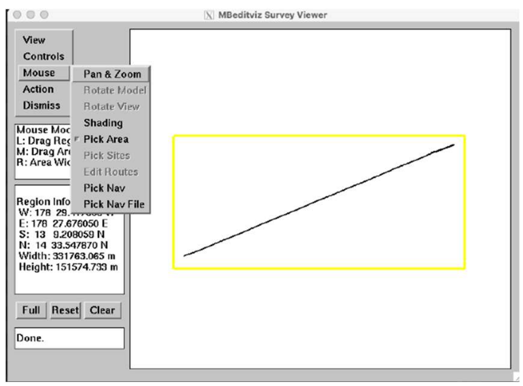

Figure 9.6: Screenshot of Step 8 of Multibeam Processing.

9. Edit pings in 3D mode with Erase and Restore, make good use of the pan and rotate features to identify all outlying data, you can also change the view mode to depth or return amplitude in the view drop-down menu (**Fig. 9.7**).

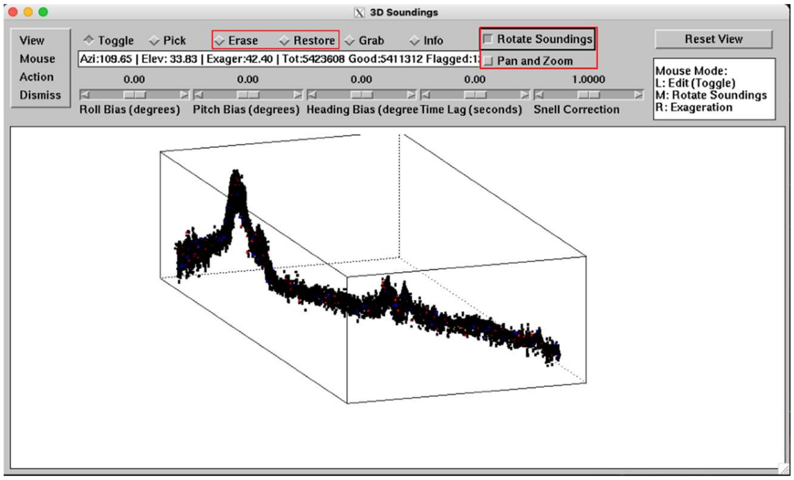

Figure 9.7: Screenshot of Step 9 of Multibeam Processing.

10. Once done, select the "Dismiss" button to exit the editing mode and check to confirm the .esf files have been created in the folder.

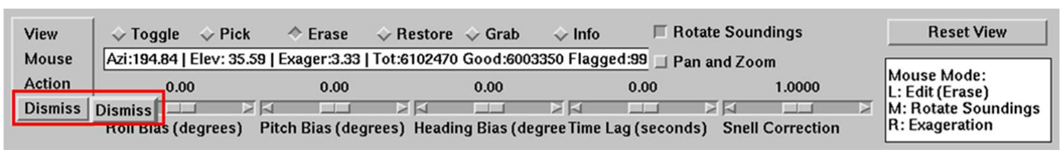

Figure 9.8: Screenshot of Step 10 of Multibeam Processing.

11. Close mbeditviz, taking care to close it with the file option and not the X button, then in command line:

    mbprocess -I datalist.process_bathy.mb-1 -C60

    ls -1 | grep p.mb261$ > datalist.process_grd.mb-1

12. Preparing the .grd files for QA in QGIS

    mbgrid -Idatalist.process_grd.mb-1 -A2 -F5 -N -C2 -E100 -OMBgrd20241214 -Gcd

    mbgrid -Idatalist.process_bathy.mb-1 -A2 -F5 -N -C2 -E100 -O MBgrd20241214raw -Gcd

10. PS18 Topas Sub-Bottom Profiler

L. Collier & J. Preine

The Kongsberg Topas PS18 Parametric Sub-Bottom Profiler is a high-resolution, narrow-beam instrument designed for full ocean-depth sediment imaging. By employing a narrower beam width and a high-bandwidth signal, it achieves enhanced resolution and minimizes reverberation compared to conventional sub-bottom profilers. Its low signal-to-reverberation ratio enables deeper penetration into sediment layers, making it useful in sub-surface exploration.

During operation on Expedition SKQ202418S, the Topas PS18 was paired with the EM-304 multibeam echosounder, integrating slope and depth data from the multibeam system to optimize beam control and bottom tracking. The transmitted beam is electronically stabilized in roll, pitch, and heave using input from a vertical reference unit, ensuring precise positioning of the beam area on the seafloor.

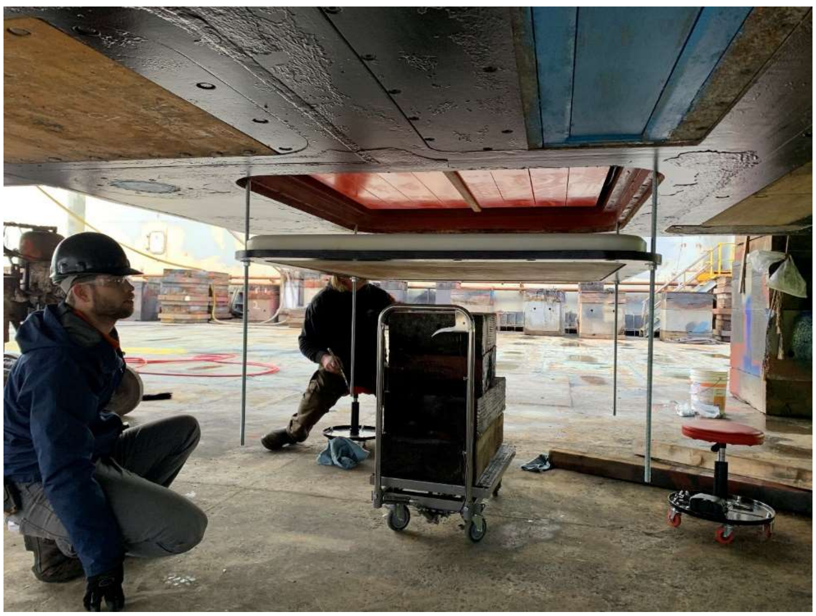

Figure 10.1: Installation of the PS-18 TOPAS array. Photo: E. Roth.

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Appendix

A.1 Daily Reports

SKQ202418S – Daily Report 01

11 December 2024

The majority of the science party arrived at RV Sikuliaq around 11:00 am. Following their arrival, initial introductions to the ship were conducted, familiarizing everyone with the vessel's layout, general safety protocols, and operational facilities.

Throughout the day, the science party started to set up the laboratories and deck equipment. Simultaneously, preparatory tasks were carried out, including organizing workspaces, reviewing operational plans, and holding team meetings to finalize the schedule for the upcoming days. This collaborative effort set the stage for a productive start to the expedition.

Figure A.1.1: RV Sikuliaq at sunset in the harbor of Honolulu. Photos: J. Preine.

SKQ202418S – Daily Report 02

12 December 2024

The last members of the science party joined the ship today, completing the team for the expedition. At 14:00, a security presentation was held to ensure that all participants were familiar with the safety protocols onboard. Following this, the students were introduced to the watch schedule, outlining their responsibilities during the cruise.

Throughout the day, efforts continued to finalize the setup of laboratories and deck equipment, while additional meetings and discussions focused on refining cruise preparations. With everyone now onboard, the team is fully prepared to begin operations. All participants spent the night on the ship, marking the transition to life at sea.

Figure A.1.1: Preparation of the SeaSpy magnetometer on the deck of RV Sikuliaq (left). Safety introduction (right). Photos: M. Tominaga & J. Preine.

SKQ202418S – Daily Report 03

13 December 2024

After successful mustering, R/V Sikuliaq departed Honolulu at 18:42 UTC from 21.315798°N, -157.877072°W to transit to the first waypoint. Shortly after departure, the Center Board was deployed at 19:39 UTC near 21.271438°N, -157.898382°W, and the Kongsberg EM304 multibeam system was activated at 19:49 UTC at 21.265631°N, -157.913420°W. UHDAS logging began at 19:52 UTC from 21.261881°N, -157.924467°W, followed by underway seawater science measurements at 21:20 UTC from 21.173378°N, -158.170317°W. At 22:11 UTC, the SeaSPY magnetometer was successfully deployed at 21.142504°N, -158.296387°W from the ship's stern and began operation at 22:36 UTC near 21.135180°N, -158.346423°W.

In parallel with technical operations, a comprehensive security drill and additional safety briefings were conducted to ensure everyone was fully prepared for potential emergencies at sea. In addition, PIs received training and introductions to monitor the hydroacoustic instruments and began watchkeeping duties, while the students were settling into life at sea, adjusting to the intense rolling of the ship. In the afternoon, the first lectures for the students started, providing an overview of the geological framework of the West Pacific and outlining the cruise's scientific objectives.

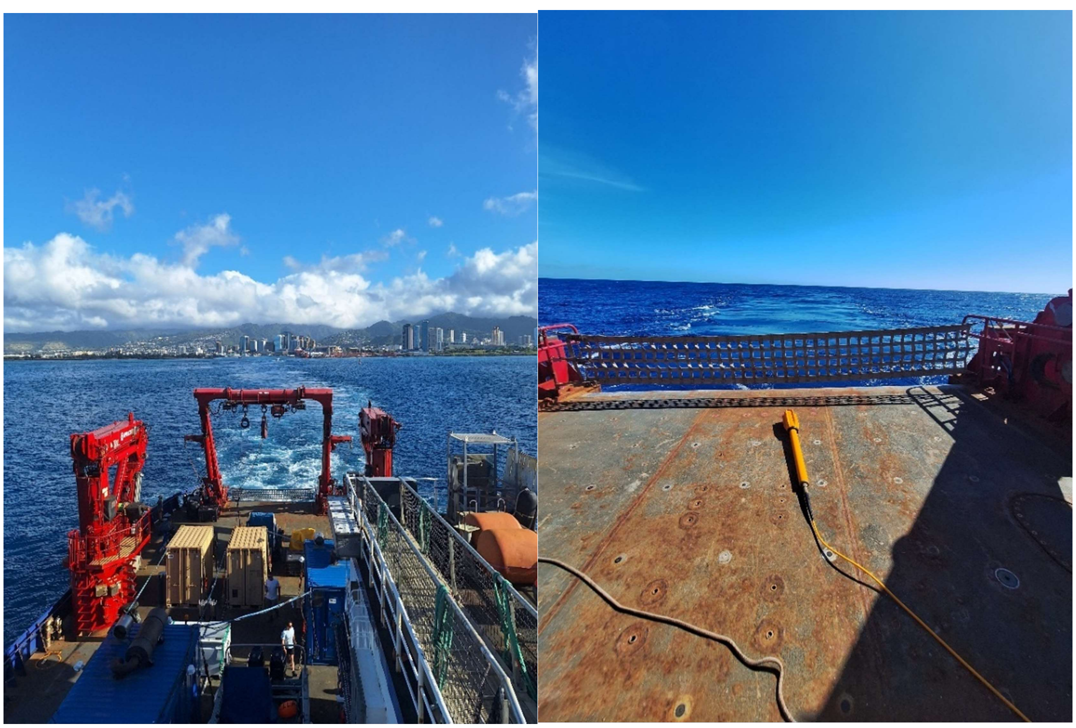


Figure A.1.2: RV Sikuliaq leaving Honolulu (left). SeaSpy magnetometer on deck before deployment (right). Photos: J. Preine.

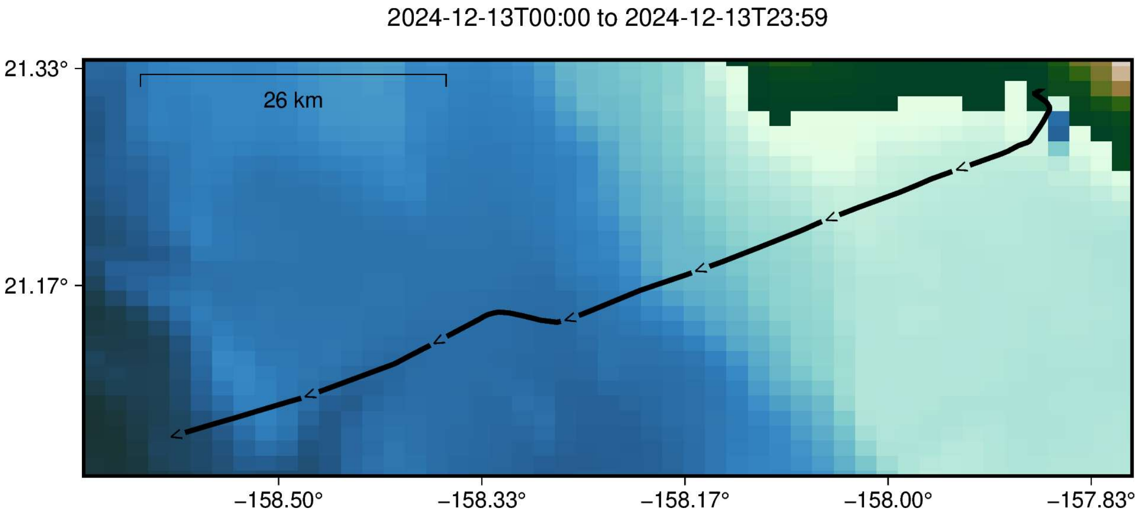


Figure A.1.4: Cruise map of Day 01 of Expedition SKQ202418S.

SKQ202418S – Daily Report 04

14 December 2024

On December 14, we continued with our transit to waypoint 1 onboard R/V Sikuliaq while collecting transit geophysical data. We travelled a total of 222.4 nm. The UTC day began with troubleshooting the Kongsberg EM304 multibeam system, which required temporary stops and starts between 01:01 UTC and 01:46 UTC near 20.995896°N, -158.772225°W. Logging resumed successfully at 01:46 UTC. Later, adjustments to multibeam parameters were made while crossing a high topographic feature at 12:44 UTC near 20.403539°N, -160.814817°W. By 19:50 UTC, the depth settings were updated to accommodate deeper water operations near 20.039273°N, -162.019597°W.

The Kongsberg TOPAS PS18 system began logging at 02:00 UTC near 20.950091°N, -158.944016°W. Throughout the day, adjustments to the master trigger delay were made to optimize data acquisition, including a reduction to 5400 ms at 12:41 UTC over a topographic high near 20.405791°N, -160.808340°W, and an increase to 6200 ms at 19:52 UTC in deeper waters near 20.037560°N, -162.025304°W.

PCO2 logging commenced at 04:07 UTC near 20.842837°N, -159.309187°W. Additionally, underway seawater science measurements were serviced at 21:42 UTC near 19.943689°N, -162.330934°W. We continued towing the surface magnetometer without any major problems.

In the scientific program, students participated in lectures on multibeam data acquisition and editing, as well as seismic data acquisition and processing. Intensive training sessions prepared them for watchkeeping duties, which they will begin tomorrow. The team continued to adjust to the rolling seas, with everyone managing to attend meals, meetings, and training sessions despite the conditions. The day concluded on a positive note with a beautiful sunset, offering a well-earned moment of calm and reward for the team's efforts.

Figure A.1.5: Training of the student group in the hydroacoustic lab (left). Sunset view toward the bow of RV Sikuliaq (right). Photos: J. Preine.

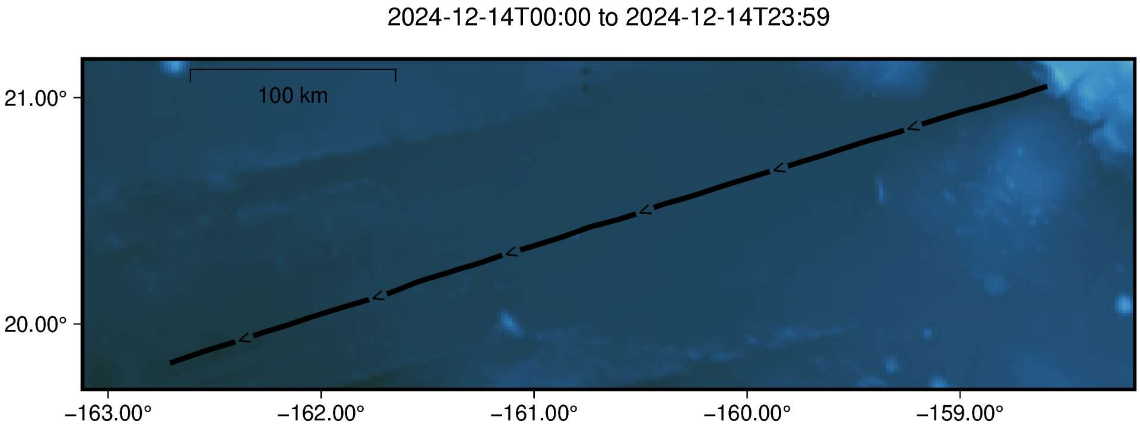


Figure A.1.6: Cruise map of Day 02 of Expedition SKQ202418S.

SKQ202418S – Daily Report 05

15 December 2024

The second day at sea during Expedition SKQ202418S was another transit day to our first waypoint, where we traveled a distance of 227.8 nm. At 00:25 UTC, the SeaSPY magnetometer software crashed, but it was quickly restarted by 00:30 UTC, resuming data collection near coordinates 19.8007°N, 162.7915°W. Adjustments were also made to the Kongsberg EM304 multibeam and TOPAS PS18 systems to optimize performance for deeper waters.

At 06:46 UTC, the ship temporarily lost steering, reducing speed to 3-4 knots and requiring the magnetometer to be recovered at 07:04 UTC near coordinates 19.4856°N, 163.8161°W. The ship's crew worked hard to fix the problem, and at 10:45 UTC, the steering was recovered. We continued the transit at 10 kn speed but waited until 18:46 to redeploy the magnetometer. For the redeployment, the ship slowed down to 3 kn, and after logging of magnetic data resumed by 19:01 UTC near coordinates 18.9489°N, 165.4622°W, the ship speed was increased again to 10 kn.

Throughout the day, several adjustments were made to the settings of the Kongsberg TOPAS PS18 (mainly changes of the master trigger delay) and to the depth range of the Kongsberg EM304 to accommodate changing operational depths, ensuring the collection of high-quality data.

Meanwhile, the student team began their shift system, gaining hands-on experience in watchkeeping, data logging, and onboard protocols.

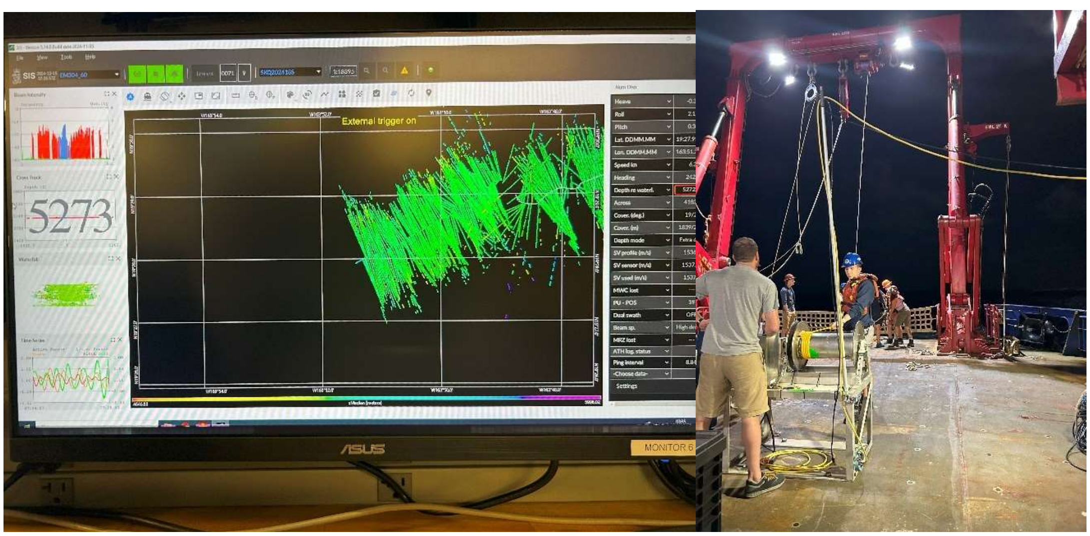


Figure A.1.7: Kongsberg EM304 screen after the ship lost steering (left). Retrieval of the magnetometer at night (right). Photos: M. Tominaga.

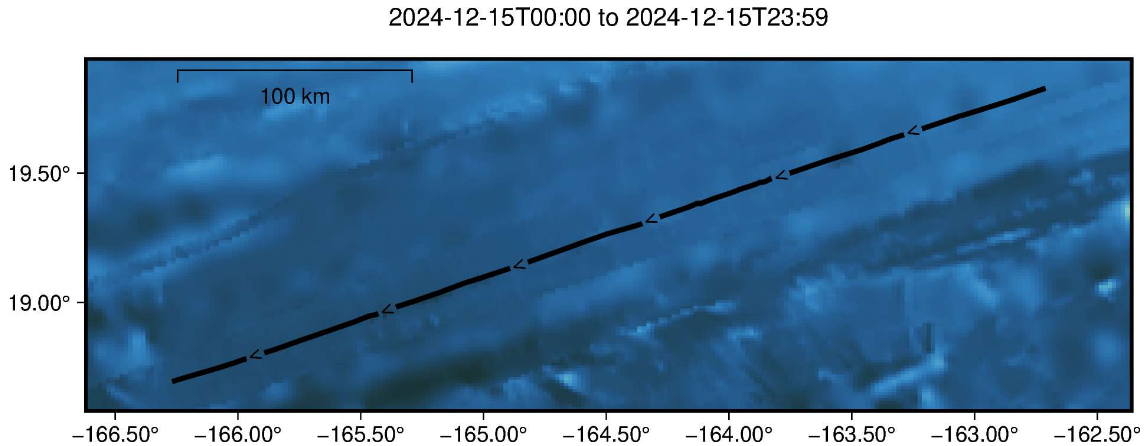


Figure A.1.8: Cruise map of Day 03 of Expedition SKQ202418S.

SKQ202418S – Daily Report 06

16 December 2024

The fourth day of transit toward the first waypoint of SKQ202418S saw smooth operations of the underway geophysics and further preparations for the anticipated deployment of the reflection seismic gear in our study area. We traveled a total of 252.8 nm. The student team continued to gain hands-on experience, becoming increasingly accustomed to and confident in watchkeeping, data logging, and onboard protocols. They also received training in multibeam data processing, contributing to their growing expertise in geophysical methods.

Throughout the day, the vessel maintained steady progress toward waypoint 1, with favorable weather conditions supporting the uninterrupted collection of geophysical data. The team efficiently monitored systems and made minor adjustments as needed to ensure optimal data quality, while also finalizing checklists and configurations for the seismic gear deployment.

Figure A.1.9: University of Houston students during watchkeeping of underway geophysical data acquisition (left). Photo of the Pacific Ocean during transit: no land and no other vessel in sight for miles and miles (right). Photos: M. Tominaga, H. Mark.

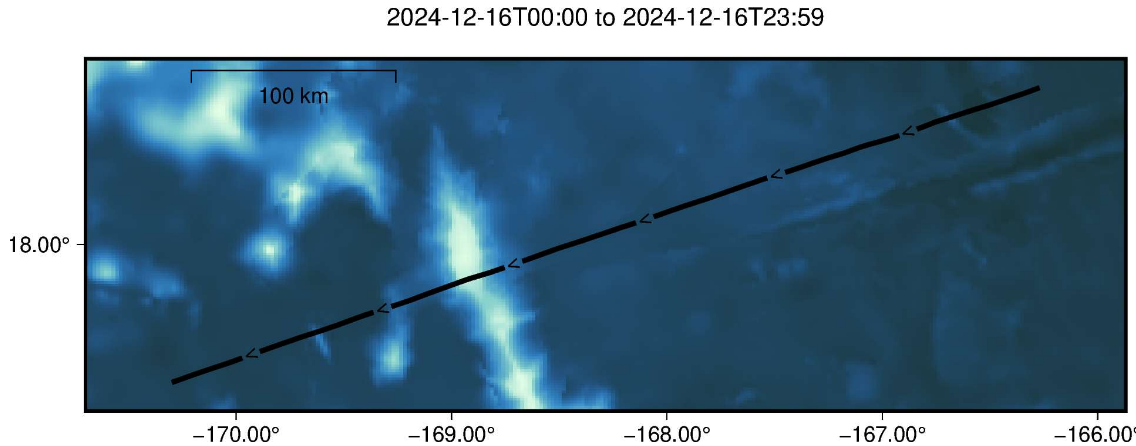


Figure A.1.10: Cruise map of Day 04 of Expedition SKQ202418S.

SKQ202418S – Daily Report 07

17 December 2024

Today marked the fifth day of our transit toward the first waypoint of SKQ202418S, and we made smooth progress in collecting underway geophysical data. We crossed several uncharted seamounts, which kept the watchstanders busy as they adjusted the recording length for the Topas system and optimized the depth settings for the EM304 multibeam system to ensure accurate measurements over the varied seafloor topography. The weather conditions were favorable, and everyone onboard reported feeling good overall.

A notable challenge for the watchstanders has been the stark temperature difference between the warm, humid air outside the ship and the very cool conditions inside the computer lab. While the low temperatures are essential for maintaining the performance of the computer systems, the constant transition can be particularly strenuous during night shifts. Despite this, the team is managing well and understands the importance of keeping the equipment properly cooled.

Additionally, the PIs held a meeting today with the bridge, the PSO team and the seismic team from Scripps to review marine mammal protection procedures, clarifying lines of communications and procedures. Overall, it was a productive and efficient day, with the team demonstrating adaptability and teamwork as we continue toward our first waypoint.

Figure A.1.11: Watchkeeping Setup in the computer lab of RV Sikuliaq (left). Topas echogram of a major seamount (right). Photos: E. Moreno; M. Tominaga.

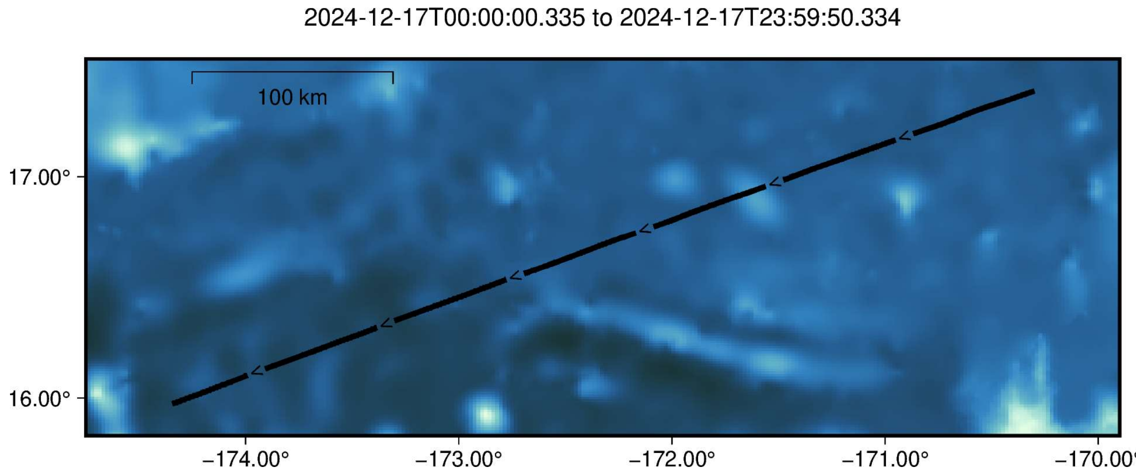


Figure A.1.12: Cruise Track of Day 05 of Expedition SKQ202418S.

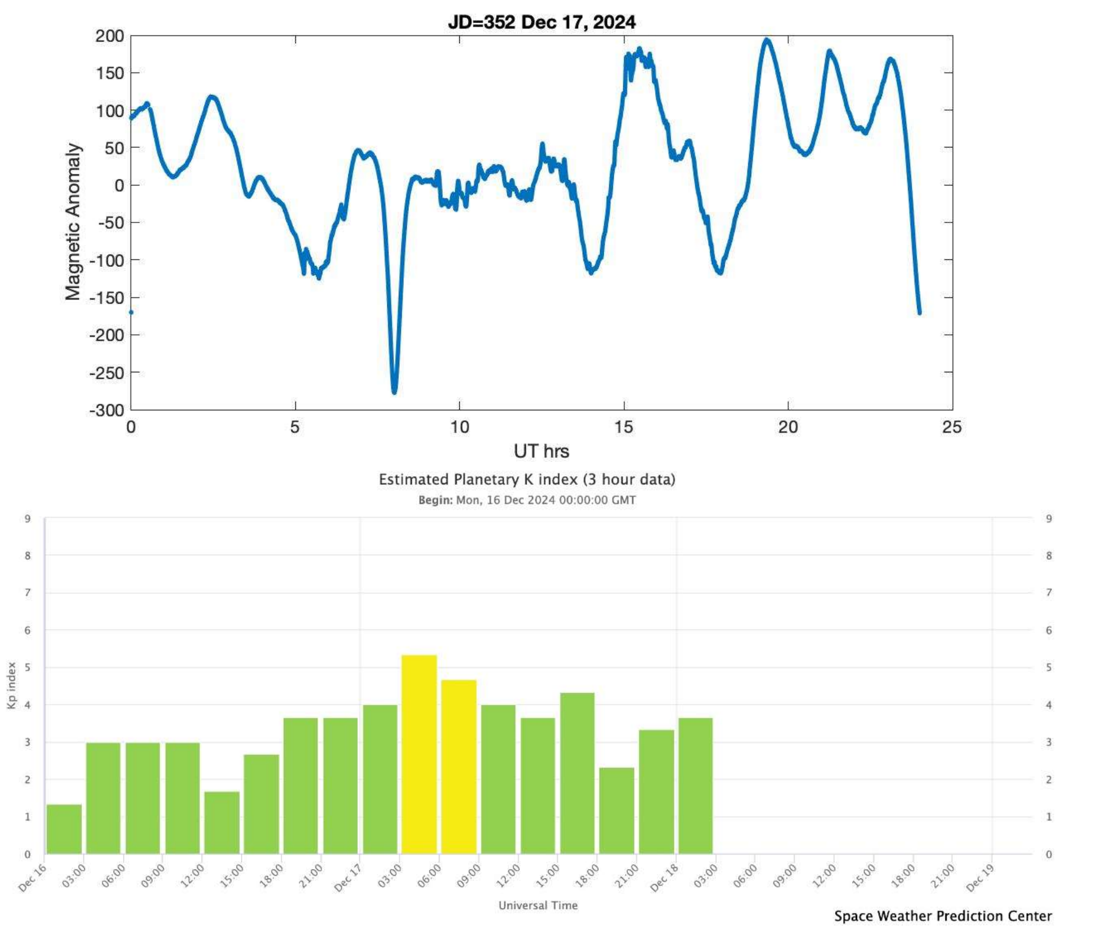


Figure A.1.13: Measured magnetic anomaly of day 06 of Expedition SKQ202418S from our surface towed magnetometer. (upper panel). KP index from NOAA of the same day (lower panel). We note that high KP values (>4) correspond to small-wavelength magnetic signals overprinting the long-wavelength magnetic anomaly measured between 5 am and 4 pm.

SKQ202418S – Daily Report 08

18 December 2024

Day six of our transit toward the first waypoint of SKQ202418S featured smooth operations and favorable weather conditions, allowing for steady progress in collecting underway geophysical data.

The geophysical data collection was uneventful yet engaging, as we crossed several seamounts. Watchstanders were kept busy adjusting recording depths to ensure data quality over these features.

A meeting between the PIs, bridge crew, and seismic team was held to coordinate and finalize details of the upcoming seismic operations. Discussions focused on ensuring alignment in protocols, timelines, and safety measures as we prepare for the upcoming streamer test and deployment in the study area.

Figure A.1.14: Some impressions of RV Sikuliaq on transit in the middle of the Pacific Ocean (Photos: J. Preine).

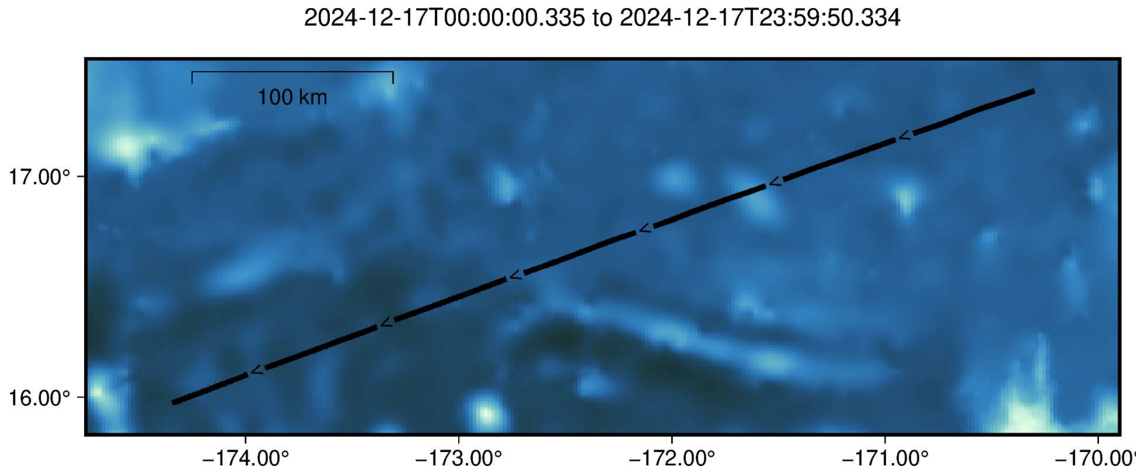


Figure 3: Cruise Track of Day 06 of Expedition SKQ202418S.

SKQ202418S – Daily Report 09

19 December 2024

On the seventh day aboard RV Sikuliaq, Expedition SKQ202418S saw two highlights: (i) we reached our first waypoint for an initial streamer test, and (ii) we crossed the dateline.

After another day of smooth operations of underway geophysical data, we crossed the dateline at 08:54 UTC. Several members of the science party gathered in the computer lab to watch the coordinates on the screen change from 179°W to 179°E. While some systems, e.g. the multibeam, encountered some software issues, the dateline crossing was otherwise without any problems.

The day commenced with slightly deteriorating weather conditions, inducing a heavy roll onboard RV Sikuliaq, sending a few people from the science party to bed. We retrieved the surface-towed magnetometer at 17:39 and held a GAR (green/amber/red risk assessment) meeting on the bridge. For the deployment of the streamer, tail buoy, and magnetometer, the ship slowed down to ~2 kn. While communication with the magnetometer and the tail buoy was unsuccessful, the streamer communication test, including the birds, succeeded. Operations continued until the next day UTC.

Figure A.1.16: Scientists of Expedition SKQ202418S gathering in the computer lab as we crossed the dateline. Shown are screenshots of the exact moment of the crossing. Note the multibeam display on the upper left corner shortly disappearing. Photos: M. Tominaga.

Figure A.1.17: Operations on deck for the streamer test. Photos: J. Preine.

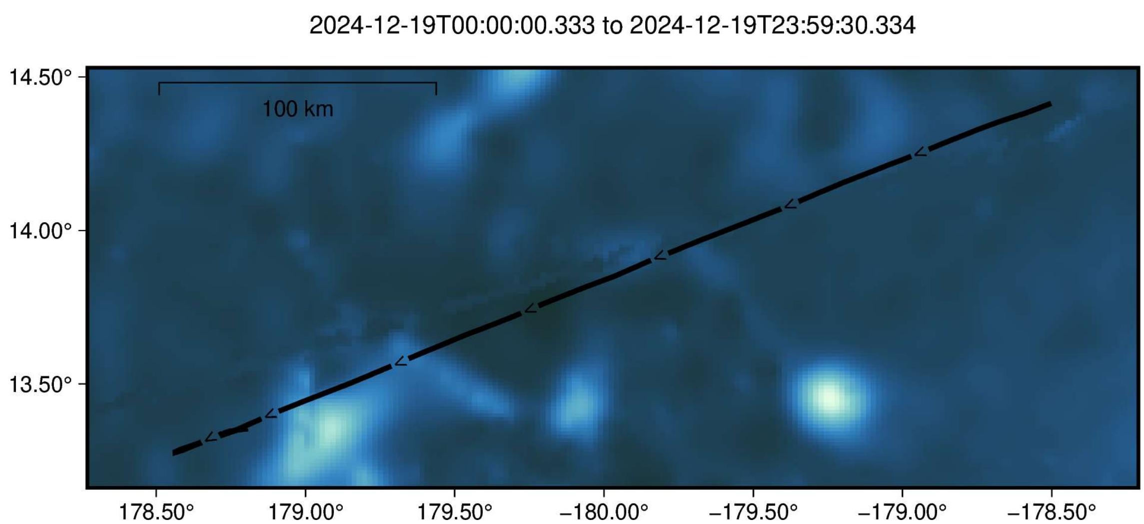


Figure A.1.18: Cruise Track of Day 07 of Expedition SKQ202418S.

SKQ202418S – Daily Report 10

20 December 2024

Day eight of Expedition SKQ202418S aboard RV Sikuliaq started with continuing deck operations to test the streamer. While communications with the streamer and the birds were successful, communications with the tail buoy and the magnetometer were not.

After retrieving the streamer, we deployed the SeaSPY magnetometer at 01:11 UTC near 13.356891°N, 178.800285°W. Following the deployment, we resumed underway geophysical data collection at a steady pace of 10 knots. The watchkeeping team remained busy as the vessel traversed further uncharted areas of the Pacific.

A delightful highlight of the day came when PSOs spotted a pod of Minke whales. The whales followed the ship for approximately 30 minutes, offering the crew and scientists a brief but memorable connection with the region's rare marine life.

Figure A.1.19: A minke whale approx. 200 m behind the ship's stern (Photos: J. Preine).

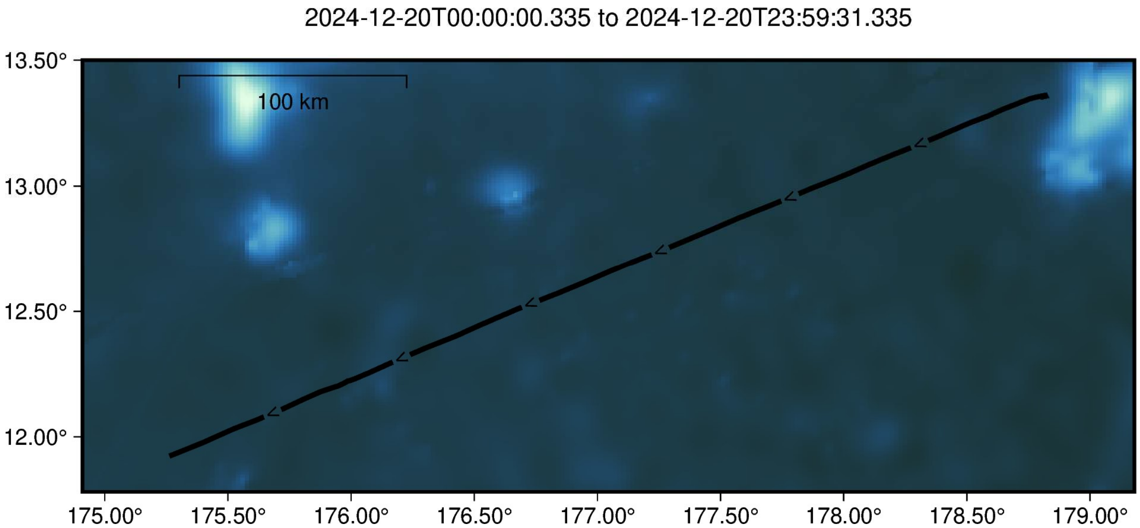


Figure A.1.20: Cruise Track of Day 08 of Expedition SKQ202418S.

SKQ202418S – Daily Report 111

21 December 2024

On day nine of Expedition SKQ202418S aboard RV Sikuliaq, geophysical data collection continued as we continued our transit toward the study area. We encountered some minor problems with the EM304 software, which were fixed immediately by the SSSGs. A downside of the day was that there was a blockage in the vacuum system on board, which briefly meant that the toilets could not be used. However, thanks to the fantastic efforts of the crew, this problem was solved immediately. At 22:53 UTC, the vessel reduced speed to 3 knots at coordinates 10.48°N, 171.79°E to recover the magnetometer before another deck test of the streamer, which continued during the next day.

Meanwhile, it began to look a lot like Christmas in the mess room thanks to the spectacular collaboration by the kitchen and deck crew.

Figure A.1.21: Its beginning to look a lot like Christmas aboard RV Sikuliaq (Photos: J. Preine).

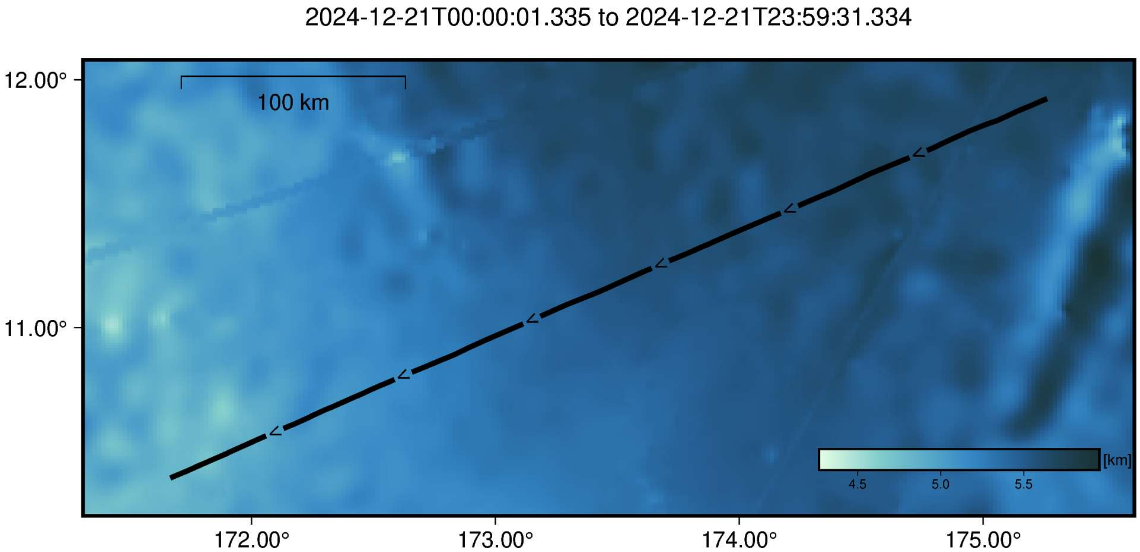


Figure A.1.22: Cruise Track of Day 09 of Expedition SKQ202418S.

SKQ202418S – Daily Report 12

22 December 2024

The day featured smooth onboard geophysical data collection. At 00:47 UTC, the vessel slowed to 2 knots (10.35°N, 171.57°E) to initiate a streamer test to check communication with the magnetometer at the end of the tail buoy. The streamer was recovered at 02:04 UTC (10.32°N, 171.42°E), but the communication with the magnetometer was not successful. This necessitated discussions among the PIs and implied significant adjustments to the science plan. At 02:12 UTC, the SeaSPY magnetometer was deployed (10.31°N, 171.49°E), and the vessel resumed to 10 kn speed by 02:25 UTC (10.31°N, 171.48°E).

Adding a special highlight, a curious minke whale followed the ship for several hours, delighting the team.

Figure A.1.23: Photos of a Minke Whale that followed the ship for a few hours in the afternoon (Photos: J. Preine).

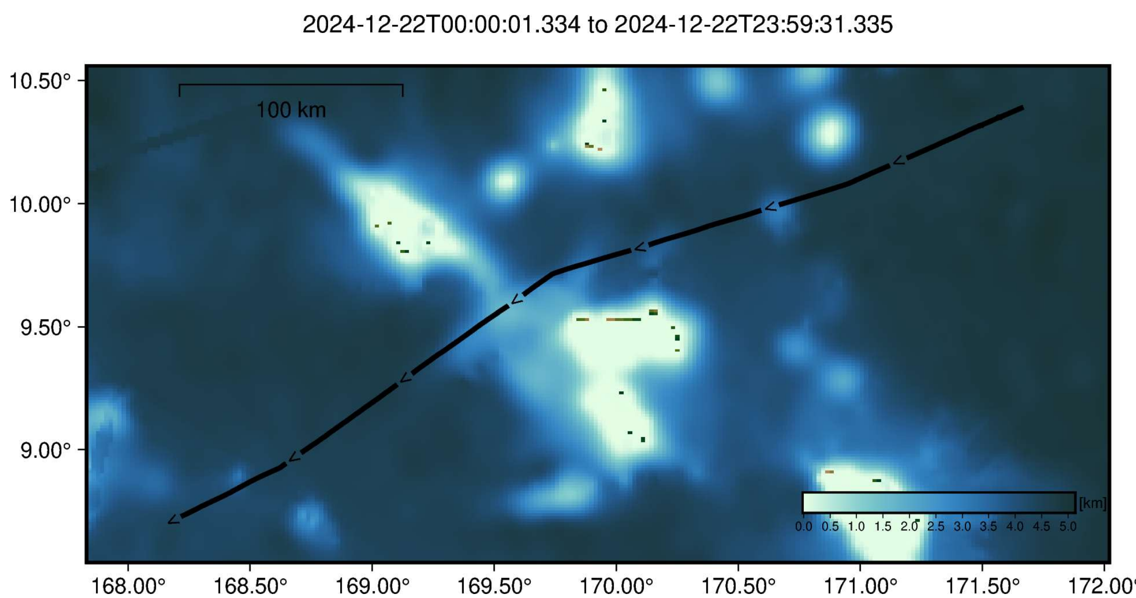


Figure A.1.24: Cruise Track of Day 10 of Expedition SKQ202418S.

SKQ202418S – Daily Report 13

23 December 2024

The day began with routine geophysical data collection as the vessel continued its transit. At 17:57 UTC, the ship slowed to 3 knots to recover the SeaSPY magnetometer, which was secured onboard by 18:13 UTC at coordinates 7.98°N, 165.48°E. Later, at 20:24 UTC, the ship changed course to a 70° heading to initiate airgun testing. By 20:57 UTC, the vessel reduced speed to 2 knots, and at 21:21 UTC, the airgun array was deployed into the water for testing. The compressors were pressurized and began sending pressure to the array by 22:16 UTC, with the first successful test shot completed at 22:26 UTC at 7.91°N, 165.31°E.

Testing concluded with the airguns taken offline at 23:27 UTC, and the compressor pressure ramped down shortly after. Throughout the day, smooth progress was made in the preparations and execution of the testing operations, with all activities running efficiently. Deployment activities are set to continue into the next day as the vessel progresses toward its objectives.

Figure A.1.25: Airguns before deployment. Photo: J. Preine.

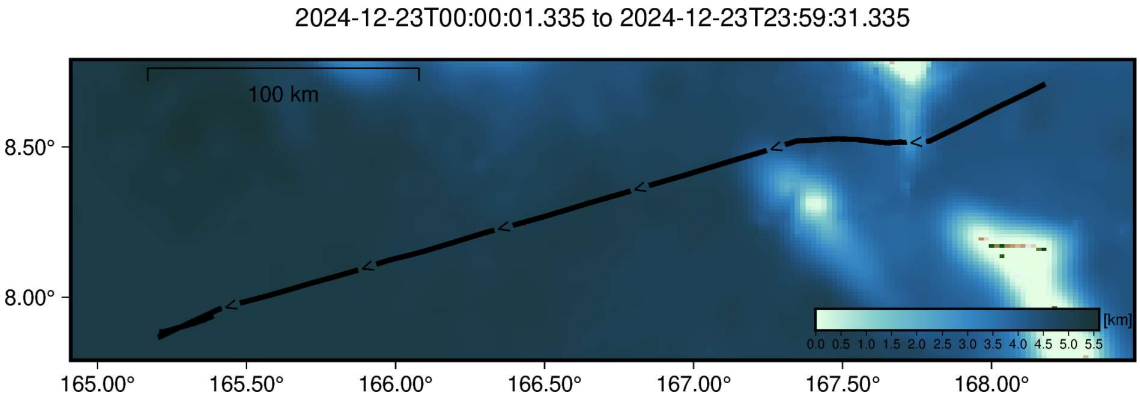


Figure A.1.26: Cruise Track of Day 11 of Expedition SKQ202418S.

SKQ202418S – Daily Report 14

24 December 2024

All the science party wanted for Christmas was some seismic data, and December 24th started with the first returns coming in from the seismic system over the beginning of the survey line!

The day started with multiple deployments of the airgun array. The first deployment was cut short when one gun stopped firing, prompting a swap and redeployment. However, the second attempt revealed an unstable wavelet, necessitating another recovery. After additional thorough testing, the guns were redeployed and performed stably. With the magnetometer deployed, the team transitioned into full acquisition mode, starting at the M28 anomaly and progressing northwestward.

Unfortunately, the streamer was not in the Christmas spirit. Around 18:00 UTC, connection errors began to interfere with data collection. As a result, around 23:45 the science party and SGG decided to recover equipment for a complete cable inspection. PIs also began to re-work the cruise plan in order to meet as many of the science objectives as possible within the remaining time. A cable party was scheduled to begin after dinner.

Figure A.1.27: Gun deployment and retrieval operations on deck of RV Sikuliaq. After three iterations, we finally achieved a synchronization and stable operation of both guns (lower right). Photos: J. Preine.

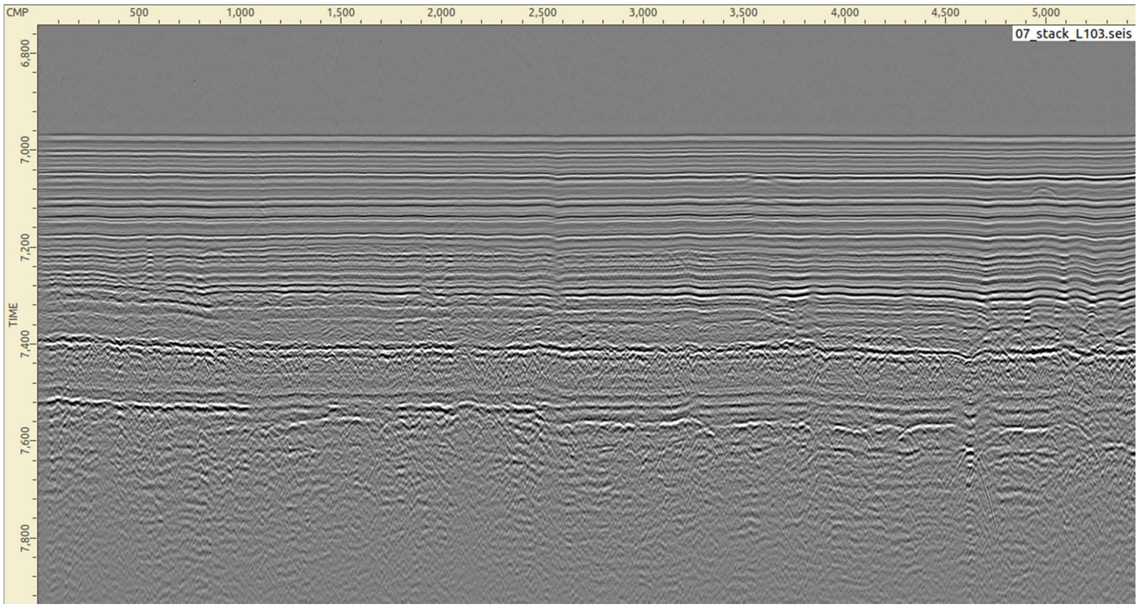


Figure A.1.28: A preliminary stack of data from the start of the survey line.

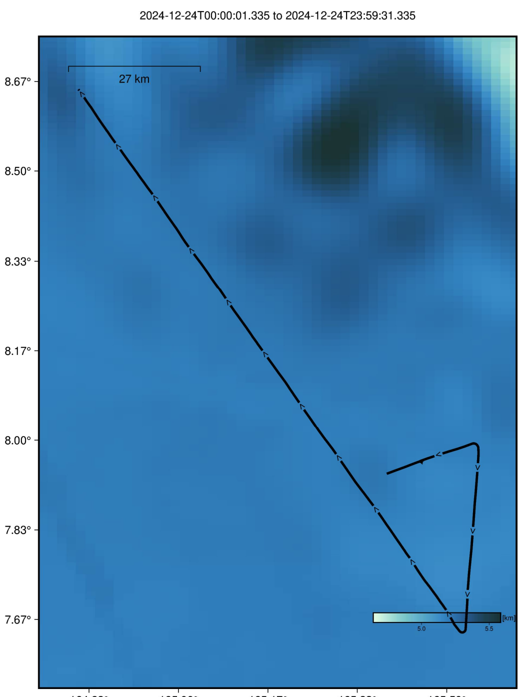


Figure A.1.29: Cruise Track of Day 12 of Expedition SKQ202418S.

SKQ202418S – Daily Report 15

25 December 2024

While steaming northwestward and collecting crucial magnetic data toward the M42 anomaly, the team focused on a comprehensive inspection of the 1.1 km seismic streamer. Section by section, the streamer was carefully off-spooled to evaluate each digitizer module and streamer section separately. The inspection revealed significant issues: a major malfunction in the first section, damage in the last section, and leakage caused by the tow cable to the buoy and the additional surface-towed magnetometer.

After identifying the damaged components, the team re-spooled the streamer without the compromised sections. Following approximately 12 hours of dedicated work on deck, the inspection was successfully completed, and the streamer was fully prepared for redeployment and continued seismic acquisition.

Despite the intense workload, Christmas celebrations brought joy to the vessel. The entire crew exchanged presents, enjoyed phenomenal cooking by the kitchen staff, and participated in festive games in the galley, all set to the soundtrack of cheerful Christmas music. The holiday spirit provided a much-needed respite, fostering camaraderie and lifting spirits after demanding days on deck.

Figure A.1.30: A full- cable inspection onboard RV Sikuliaq. Photos: J. Preine.

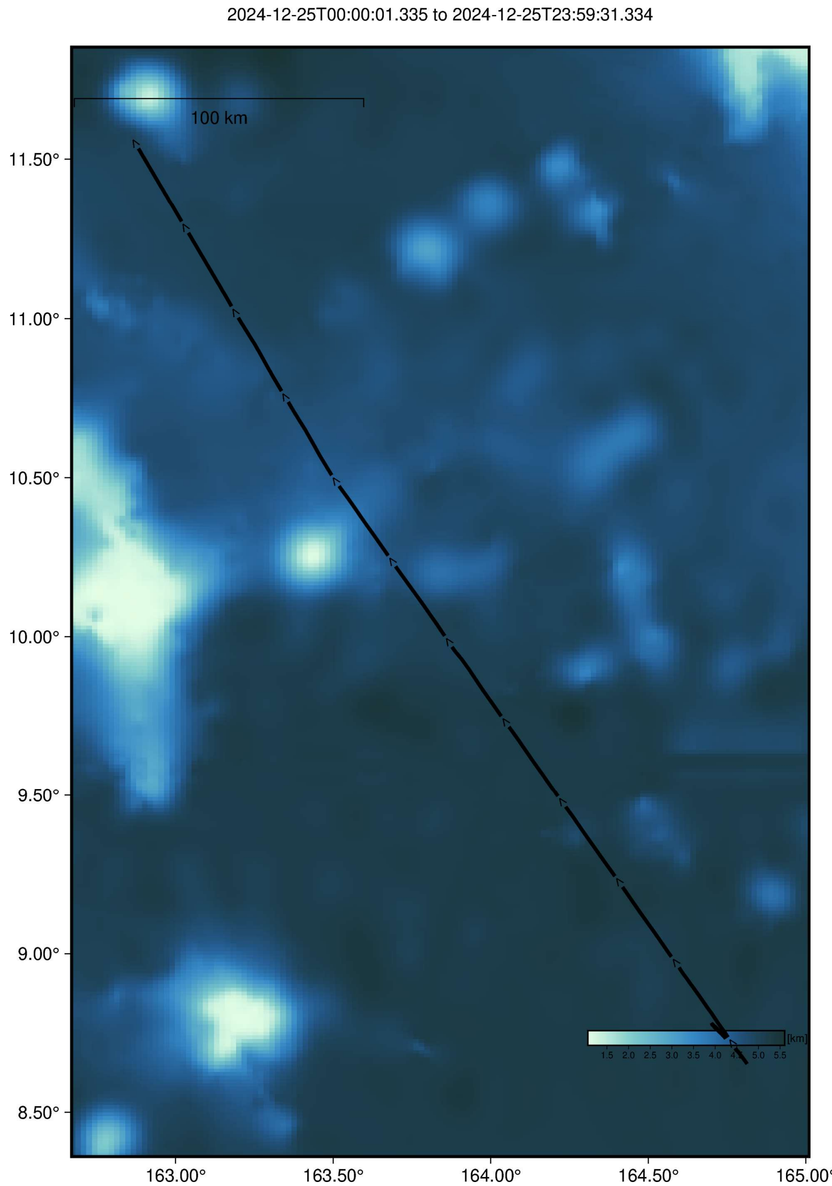


Figure A.1.31: Cruise Track of Day 13 of Expedition SKQ202418S.

SKQ202418S – Daily Report 16

26 December 2024

Today was an extraordinary milestone for the science party. While continuing measurements with the surface-towed magnetometer, we crossed the suspected M42 anomaly. After a preliminary assessment of the recorded magnetic anomalies, excitement rippled through the team—we are confident that we have found it! This discovery provides evidence that the Jurassic Quiet Zone was formed by three mid-ocean ridge systems, which have shaped the Pacific Plate since the onset of the current Wilson cycle.

Simultaneously, the seismic team remained hard at work, focusing on maintaining and repairing components of the streamer system, including trying to re-establish communication with the birds, as well as maintaining and testing the airguns. At 19:21 UTC, we launched an XBT.

In addition to these tasks, we held productive meetings with the seismic team and the bridge to refine communication principles and protocols onboard, aiming to enhance the efficiency and clarity of future operations.

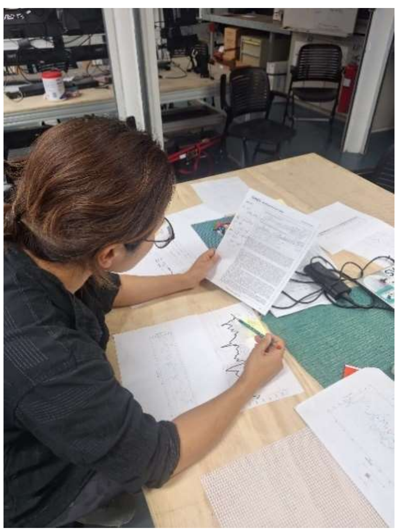


Figure A.1.32: M. Tominaga studying measured magnetic anomalies, confirming the presence of anomaly M42 on the Phoenix Plate! Photo: J. Preine.

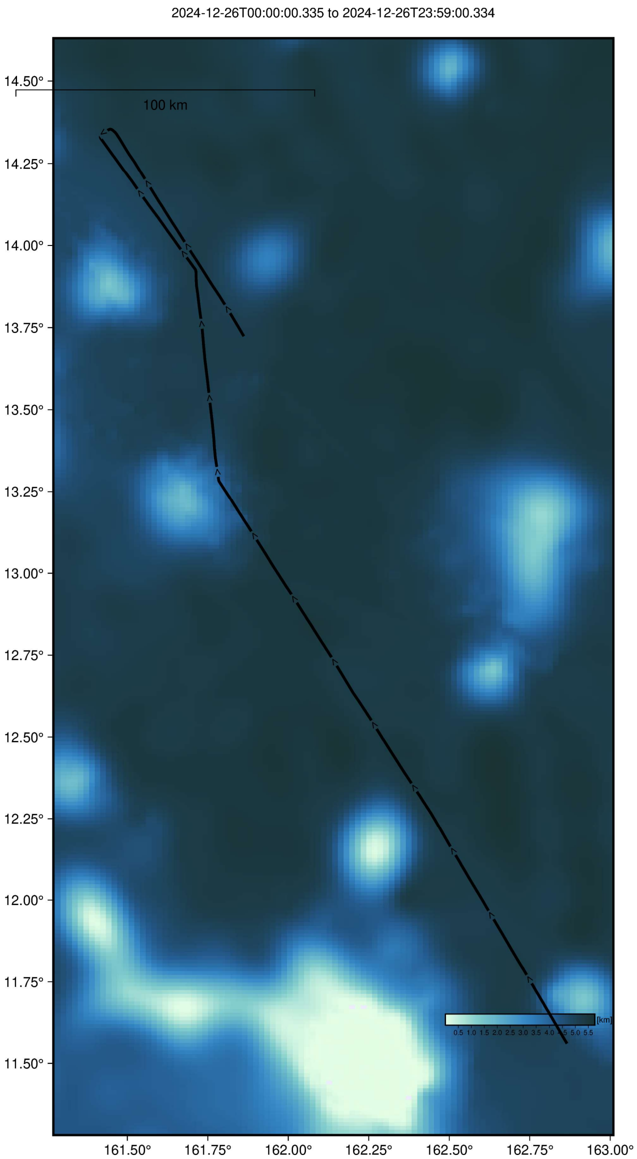


Figure A.1.33: Cruise Track of Day 14 of Expedition SKQ202418S.

SKQ202418S – Daily Report 17

27 December 2024

On day 15 onboard RV Sikuliaq, the team successfully completed the magnetic survey, having identified the M42 anomaly as a key result of the cruise. At 19:08 UTC, the magnetometer was recovered after having delivered the valuable data. Preparations for seismic acquisition followed, with the streamer deployed by 21:52 UTC and airguns in the water at 22:05 UTC. Full seismic acquisition commenced at 22:15 UTC, with the survey line beginning at 23:06 UTC.

Figure A.1.34: Deployment of the seismic streamer on the deck of RV Sikuliaq. Photos: J. Preine.

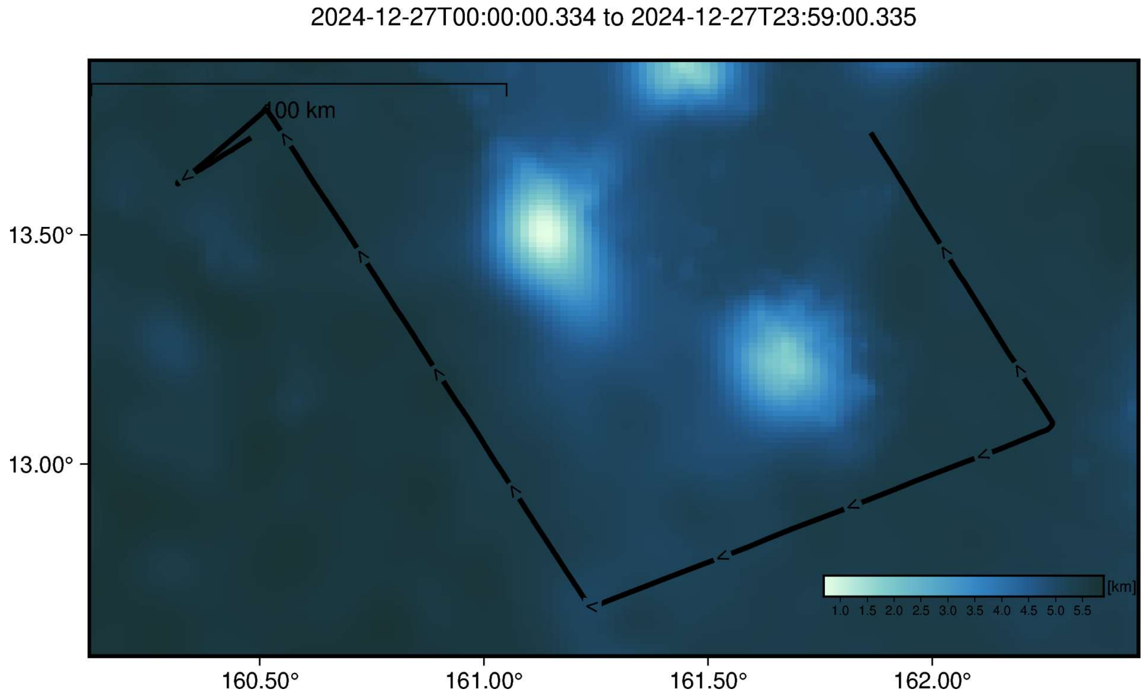


Figure A.1.35: Cruise Track of Day 15 of Expedition SKQ202418S.

SKQ202418S – Daily Report 18

28 December 2024

Day 16 onboard RV Sikuliaq focused on seismic acquisition. Students were actively engaged, being introduced to watchkeeping at the seismic station and participating in the onboard processing of incoming seismic data. These activities provided valuable hands-on experience while contributing to the progress of the survey.

However, technical challenges arose during the day. The last section of the streamer began showing errors, and a couple of hours later three additional sections displayed the same errors. These complications led to a reduction in active channels, limiting acquisition to 72 channels instead of the expected 104. At around 23:00 UTC, the airguns had to be retrieved due to problems on the umbilical. The gun issue was quickly resolved, allowing operations to resume without significant delay. Despite the setbacks, seismic acquisition continued effectively, with efforts underway to mitigate further disruptions.

Figure A.1.36: Instruction to the seismic station and watchkeeping procedures by the Scripps Seismic Team. Photo: J. Preine.

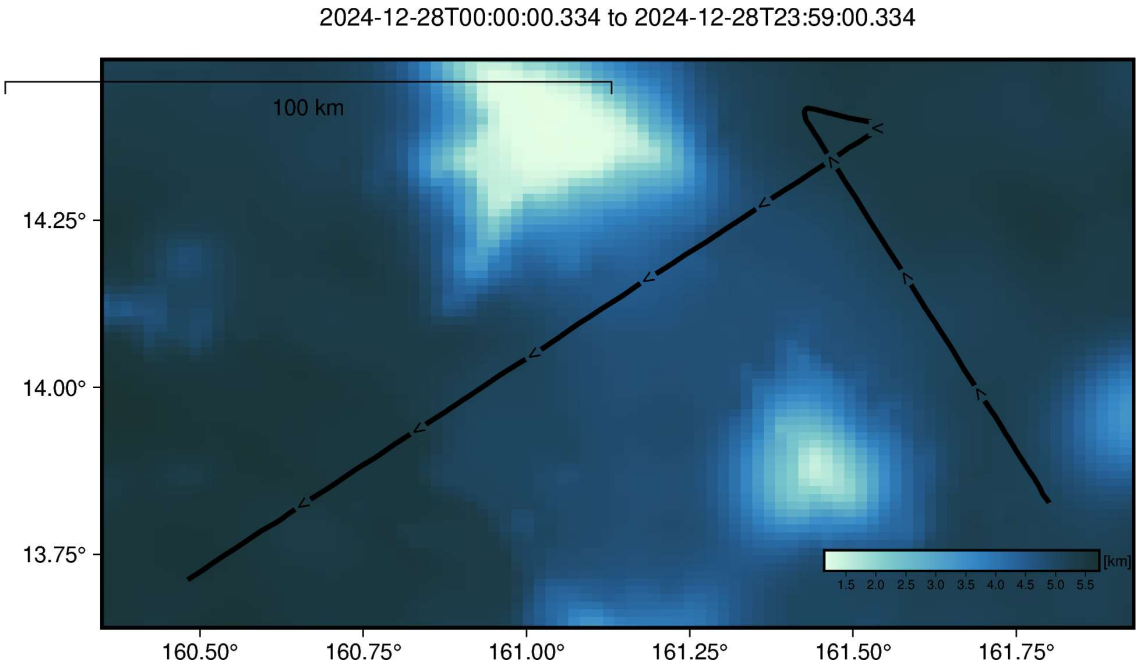


Figure A.1.37: Cruise Track of Day 16 of Expedition SKQ202418S.

SKQ202418S – Daily Report 19

29 December 2024

Day 17 onboard RV *Sikuliaq* saw continued reflection seismic data acquisition. While processing the collected data, high-amplitude spikes appeared as vertical stripes in the seismic records. These anomalies, though removable with a despike filter, were suspected to stem from streamer issues compounded by the high ship speed of 5.5 knots and challenging sea conditions. An experiment was conducted to evaluate this hypothesis, with the ship's speed reduced incrementally from 2 knots to 5 knots. Results suggested a partial correlation between noise levels and speed but ultimately pointed to sea conditions as the primary source. Rebooting the streamer system confirmed that all sections remained functional, reducing concerns of a progressive loss of streamer sections. Since processing effectively removed noise, we decided to continue data collection 5.5 knots for optimal coverage.

Later, an AB observed that the steel cable used for recovery of the airguns had parted. Since the cable is used for recovery but not for towing, after assessing recovery options, it was decided to continue acquisition due to unfavorable weather conditions for retrieval. Operations experienced a brief pause when a Green Turtle entered the exclusion zone, prompting a shutdown of the guns. Once cleared, seismic data acquisition resumed smoothly.

Parts of the science party got excited when we noted crater structures on the seafloor at depths of approx. 5000 m. We are curious to see the processed seismic data of this line!

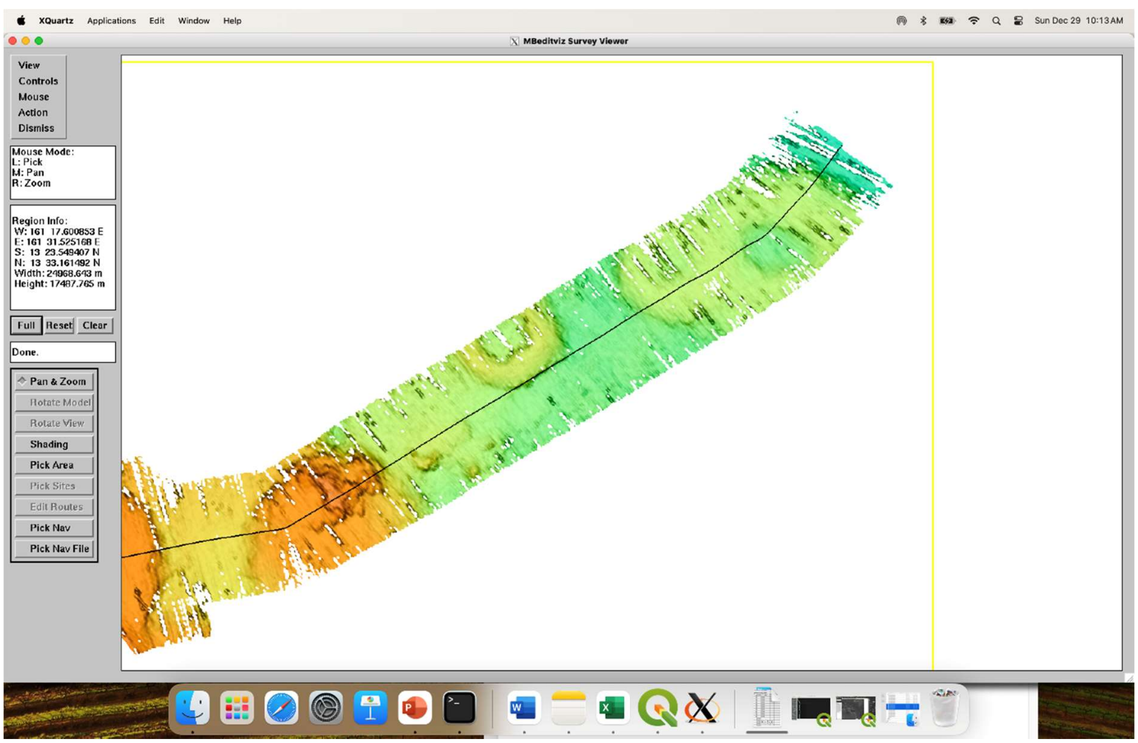


Figure A.1.38: Screenshot of a multibeam line crossing interesting, cratered volcanoes on the seafloor. Screenshot: L. Collier.

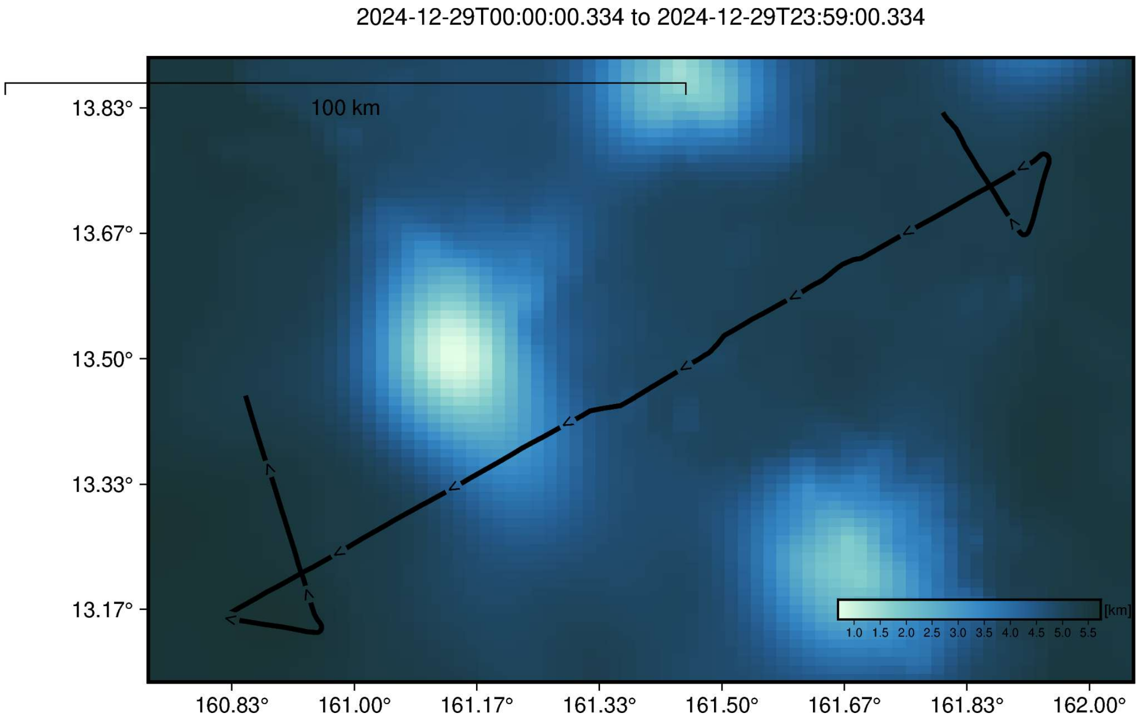


Figure A.1.39: Cruise Track of Day 17 of Expedition SKQ202418S.

SKQ202418S – Daily Report 20

30 December 2024

After a day of uninterrupted seismic data acquisition, we decided to recover the seismic gear due to the fact that the steel cable used for recovering the airguns had parted. During a turn at our northernmost survey point, we retrieved the equipment to repair the cable and subsequently redeployed the guns, streamer, and magnetometer on our southerly course. Recovery operations began at 20:27, with the airgun array and seismic streamer back on deck by 22:33.

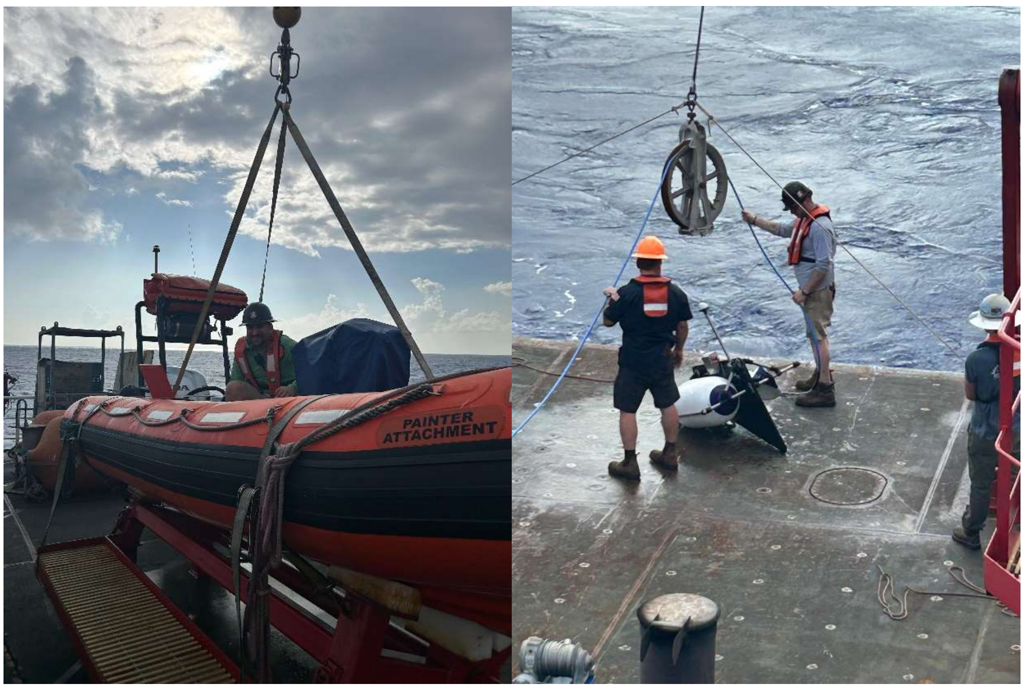


Figure A.1.40: Preparations for the gun recovery with a rescue boat (left). Retrieval of the buoy at the end of the streamer (right). Photos: M. Tominaga.

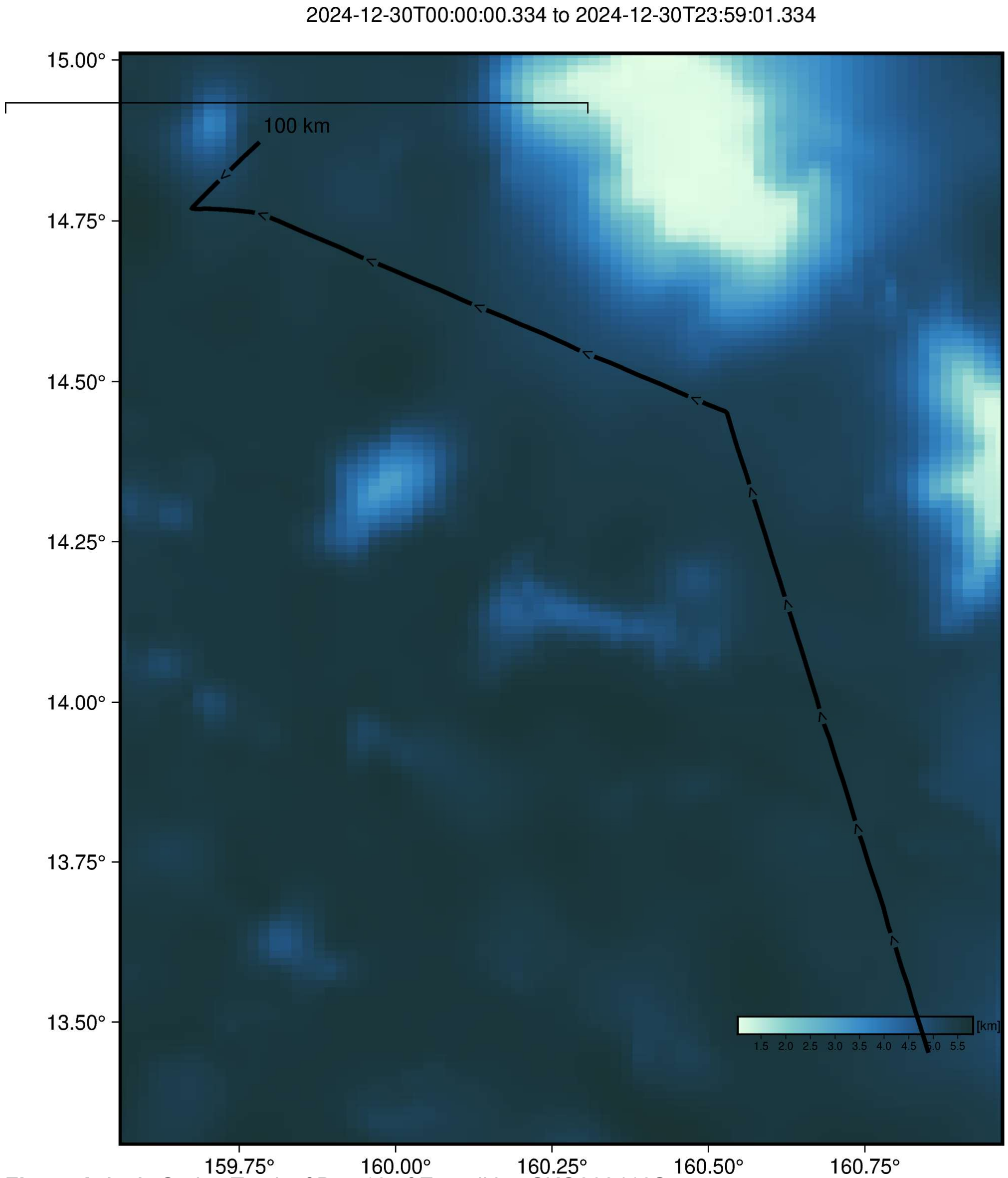


Figure A.1.41: Cruise Track of Day 18 of Expedition SKQ202418S.

SKQ202418S – Daily Report 21

31 December 2024

Day 19 onboard RV Sikuliaq was another day dedicated to seismic acquisition. We began our southern course with a series of (re)deployments following the small boat gun recovery: the seismic streamer deployment started at 01:03 and concluded by 01:43, followed by the SeaSPY magnetometer at 01:46. The airgun array was fully deployed by 02:40, and ramp-up commenced at 02:56. By 03:23, we were recording data along Line 111, maintaining speeds of approx. 5 knots for optimal acquisition.

The day saw a few interruptions. At 16:01, we recovered the airgun array to replace a popped float, completing the repairs and redeployment by 17:04, with ramp-up starting at 17:31. Later, at 22:41, a gun stopped shooting, marking another unexpected challenge in our operations.

Figure A.1.42: Acquisition setup on RV Sikuliaq. The seismic streamer is towed to starboard, the airguns in the center and the magnetometer on the port side. Photo: J. Preine

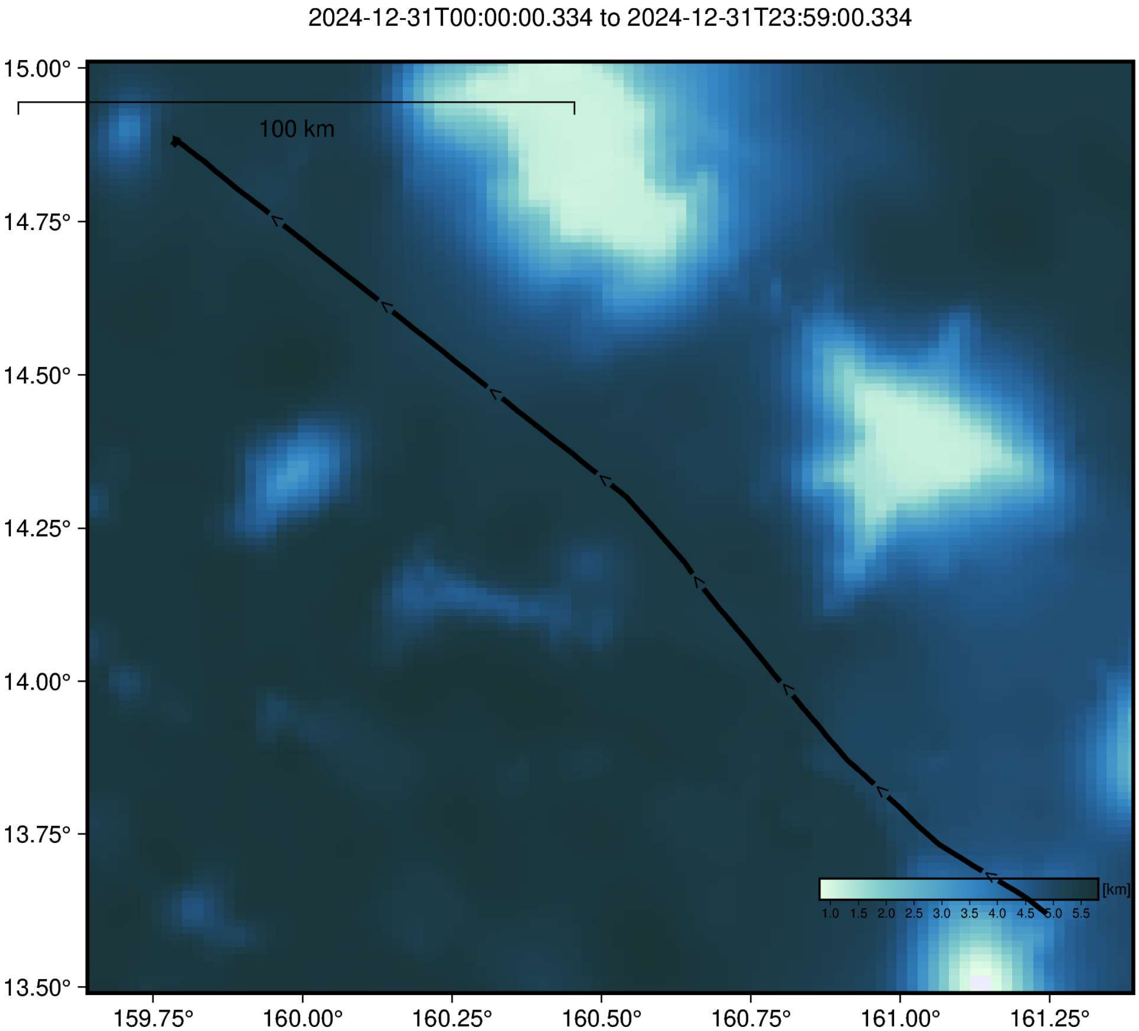


Figure A.1.43: Cruise Track of Day 19 of Expedition SKQ202418S.

SKQ202418S – Daily Report 22

01 January 2025

After welcoming the New Year, Day 20 onboard RV Sikuliaq was another day dedicated to geophysical data acquisition as we continued southward, collecting both reflection seismic and magnetic data. To obtain the most pristine magnetic signature of the ancient oceanic crust, our waypoints were carefully designed to avoid major seamounts while crossing intriguing small-scale seafloor features.

The day saw one brief interruption when the airguns were halted at 22:49 due to a passing turtle, resuming shortly after at 23:06 with minimal impact on data collection. Daily XBT measurements continued with enthusiastic student involvement, many of whom were surprised at the simplicity of launching the device despite the seemingly complex appearance of the XBT launcher.

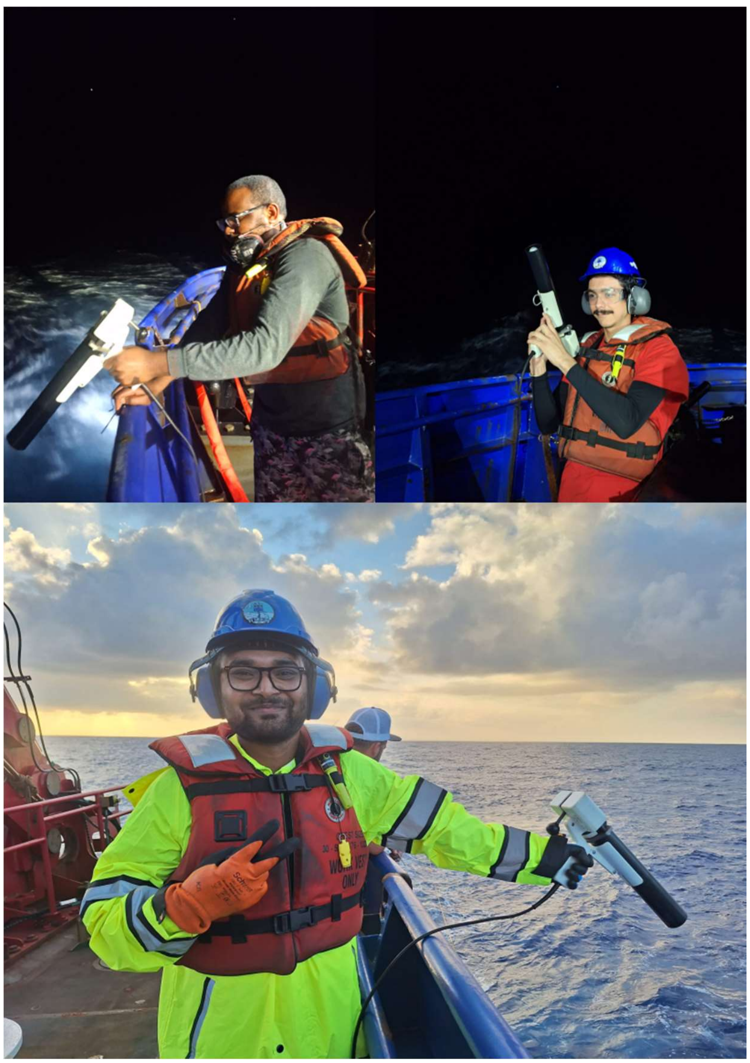


Figure A.1.44: XBT deployment by Basil, Edgar, and Bhupender (clockwise from top left). Photos: J. Preine.

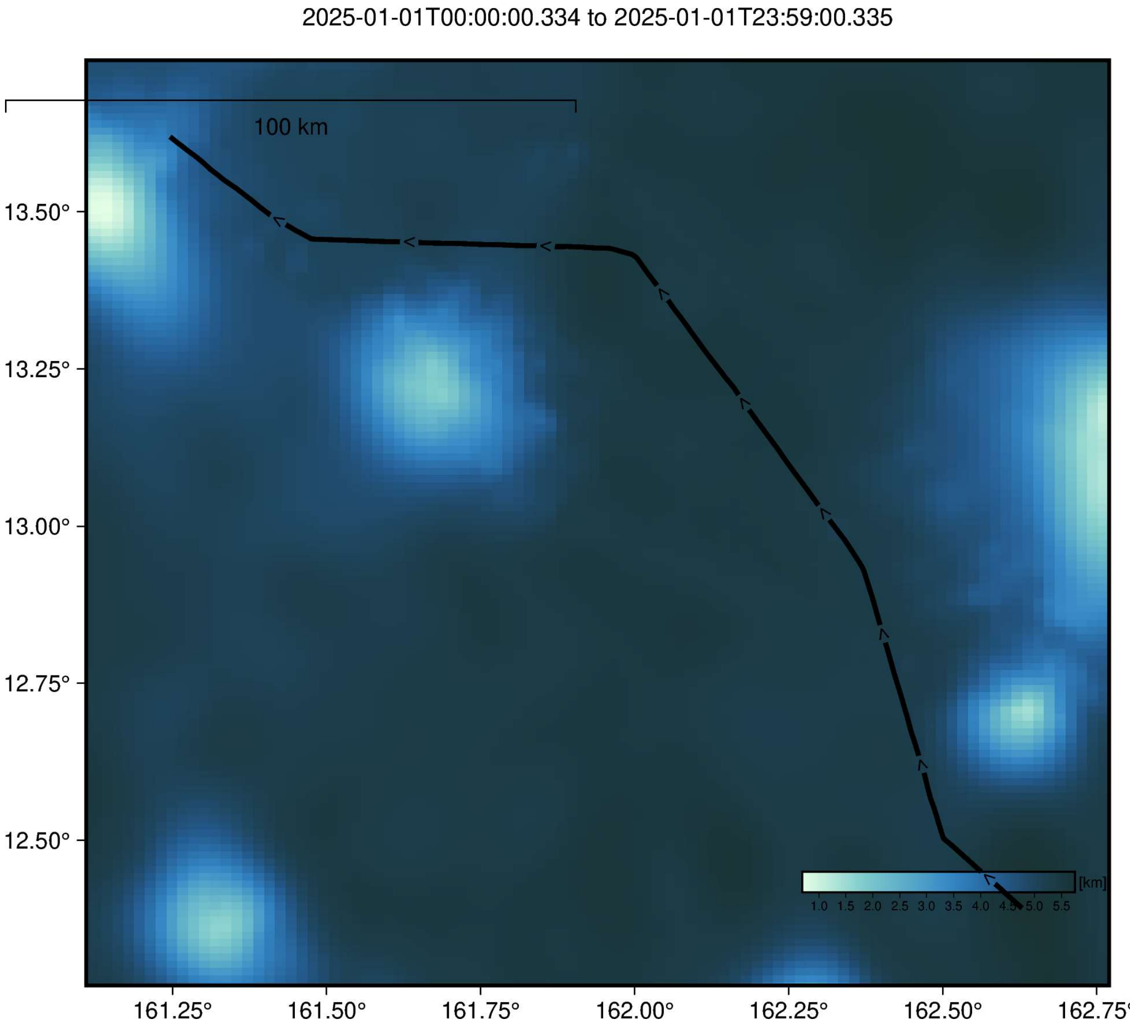


Figure A.1.45: Cruise Track of Day 20 of Expedition SKQ202418S.

SKQ202418S – Daily Report 24

03 January 2025

Day 21 of Expedition SKQ202418S focused on continued reflection seismic and magnetic data acquisition along our southern track. Operations were briefly interrupted at 20:34 when a float was lost, necessitating the recovery of the airgun array for repairs. By 21:39, the guns were back in the water, and a ramp-up sequence was initiated, with the array reaching full volume at 21:45.

Meanwhile, students processed seismic data throughout the day, ensuring that the backlog of incoming data was minimized and workflows remained efficient. Preparations for the conclusion of the cruise also began, including planning of data backups, lab cleaning, and packing equipment to streamline the final stages of the expedition.

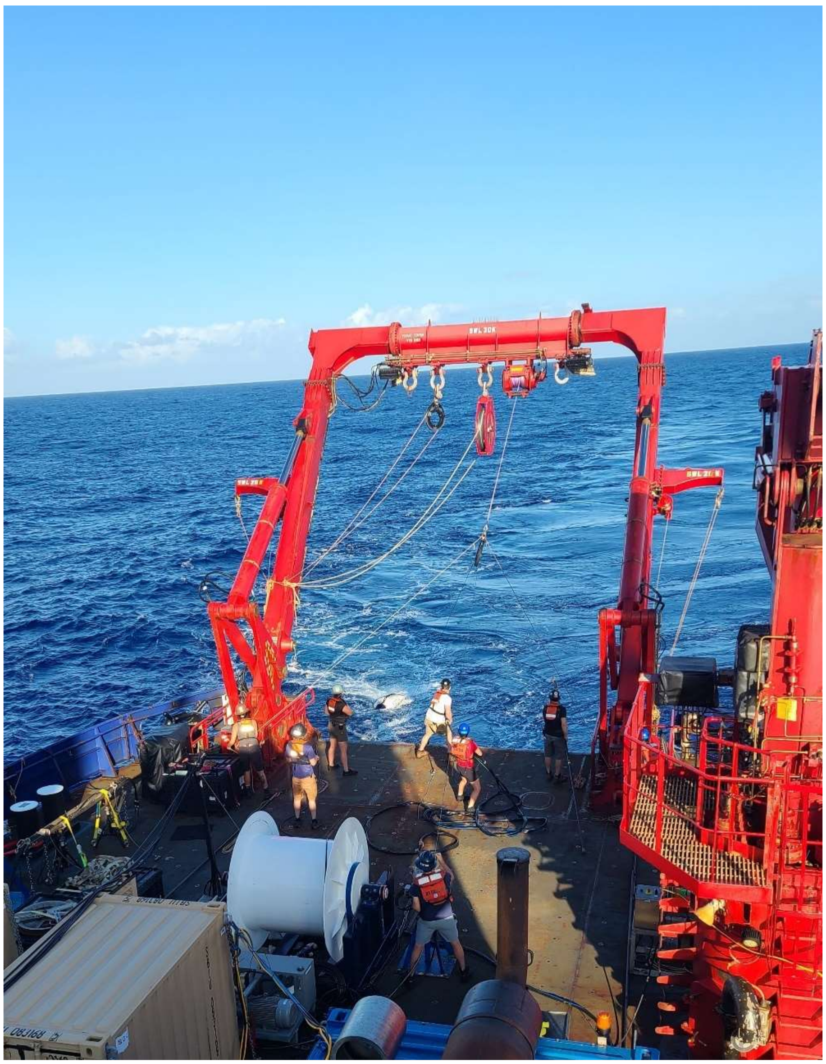


Figure A.1.46: Recovery of the airgun array, with water-filled float. Photo: H. Mark.

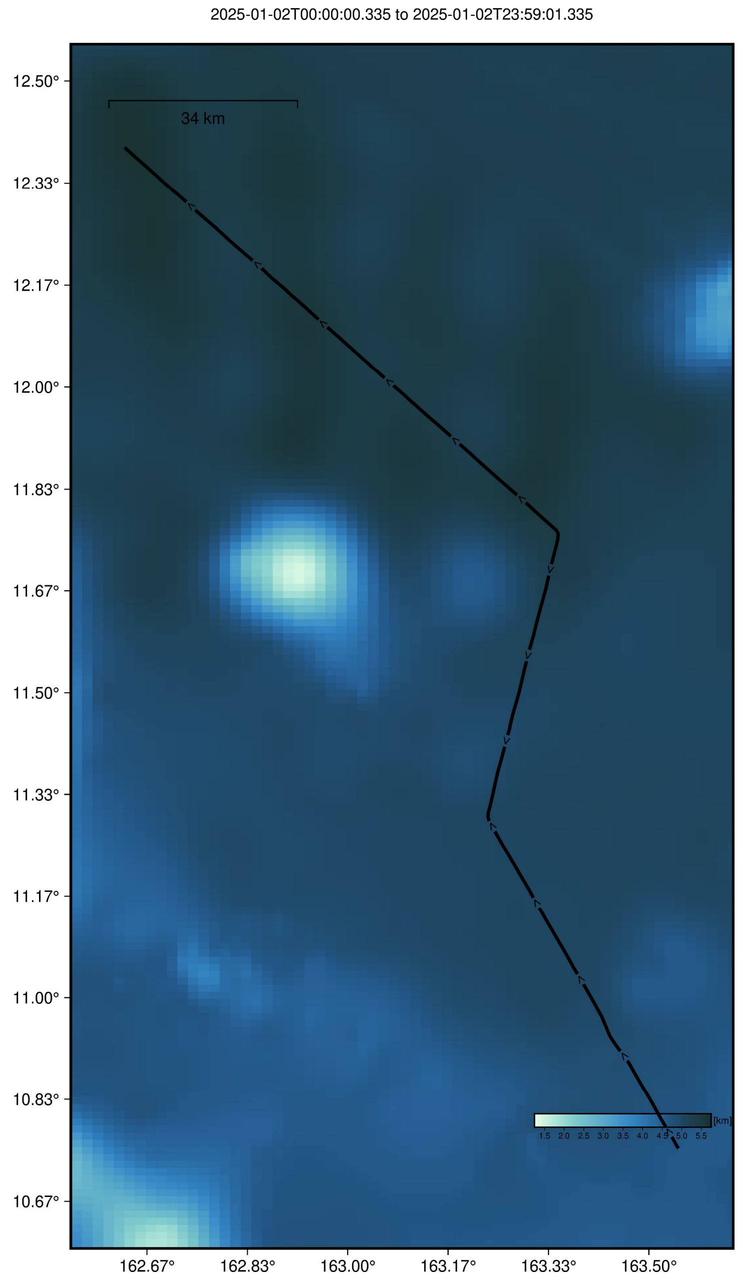


Figure A.1.47: Cruise Track of Day 21 of Expedition SKQ202418S.

SKQ202418S – Daily Report 26

04 January 2025

On January 4, 2025, the team initiated the last phase of seismic data acquisition with the deployment of the initially anticipated four airguns, two positioned on the portside and two on the starboard side, along with the seismic streamer centered on the vessel's midline.

The day commenced with the deployment of the airgun array at 04:09, positioning two guns on the portside and two on the starboard side. By 04:42, the seismic streamer was deployed, and the vessel began a turn to align with the planned survey track, completing it at 04:48 while increasing speed to 4 knots.

Following a minor starboard turn at 04:59, the ship adjusted its course and accelerated further, reaching 4.5 knots by 05:07. At 06:03, the airgun array ramp-up began with a single gun, gradually increasing to two guns at 06:09, and achieving full operational volume by 06:15.

At 06:16, the seismic acquisition officially began, following along a line that we previously surveyed with two guns to compare the differences between four and two guns.

Figure A.1.48: Deck operations onboard RV Sikuliaq after successful deployment of four airguns with the seismic streamer at center line.

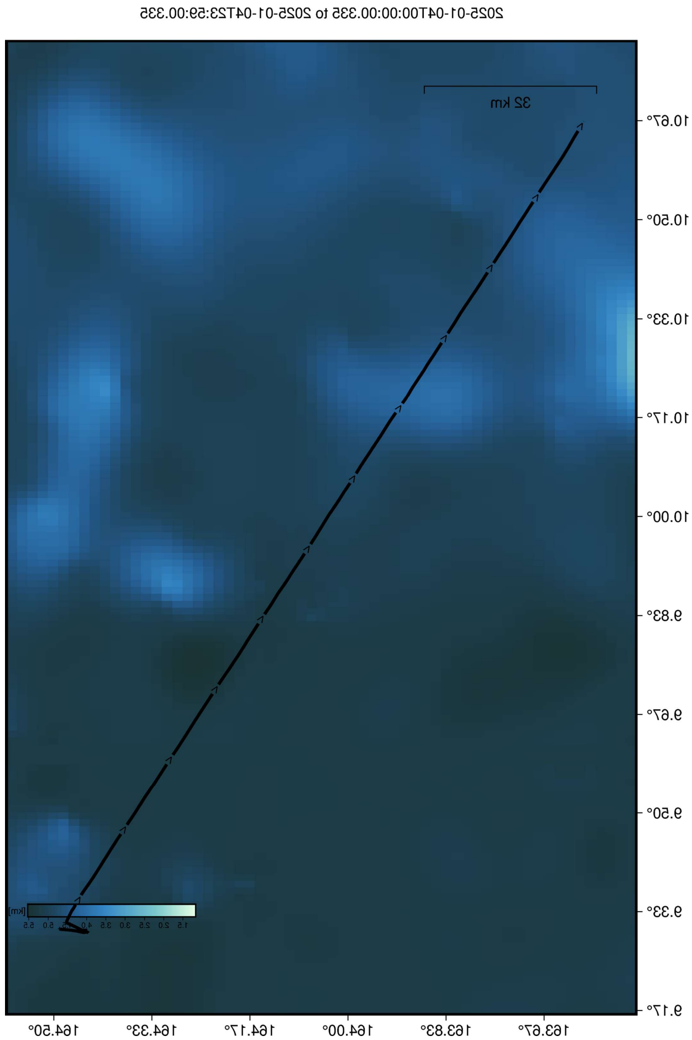


Figure A.1.49: Cruise Track of Day 22 of Expedition SKQ202418S.

SKQ202418S – Daily Report 27

05 January 2025

The seismic acquisition concluded at 02:00 with the completion of Line 120, utilizing four airguns. Following this, the retrieval including cleaning of the seismic streamer and both airgun arrays was carried out successfully.

At 03:50, the magnetometer was deployed to collect data along the transit toward Pohnpei. Throughout the remainder of the day, the vessel started to head towards Pohnpei at full speed, collecting geophysical data, including magnetometry, bathymetry, TOPAS sub-bottom profiling, and gravimetry.

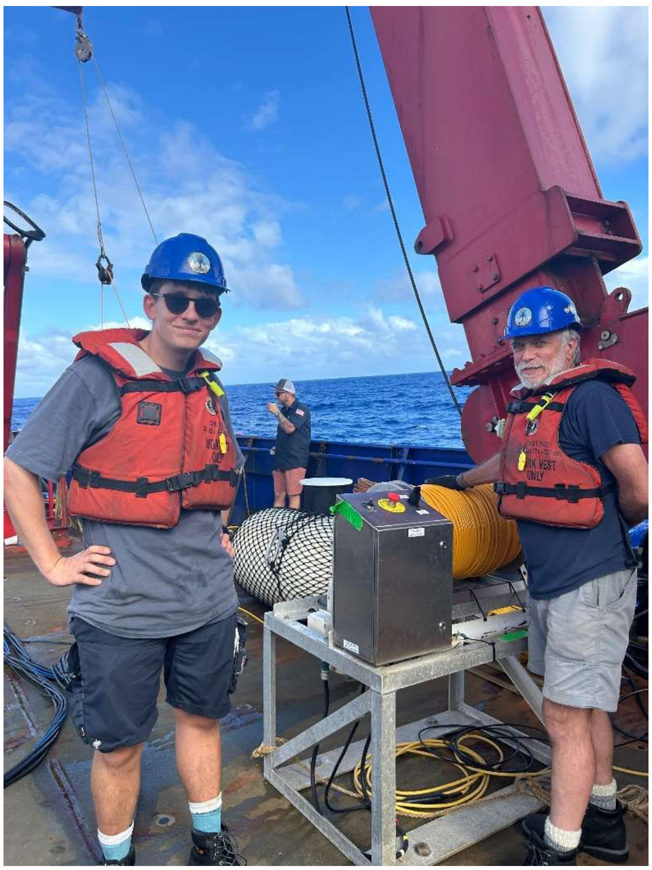


Figure A.1.50: Last deployment of the seasurface magnetometer. Photo: M. Tominaga.

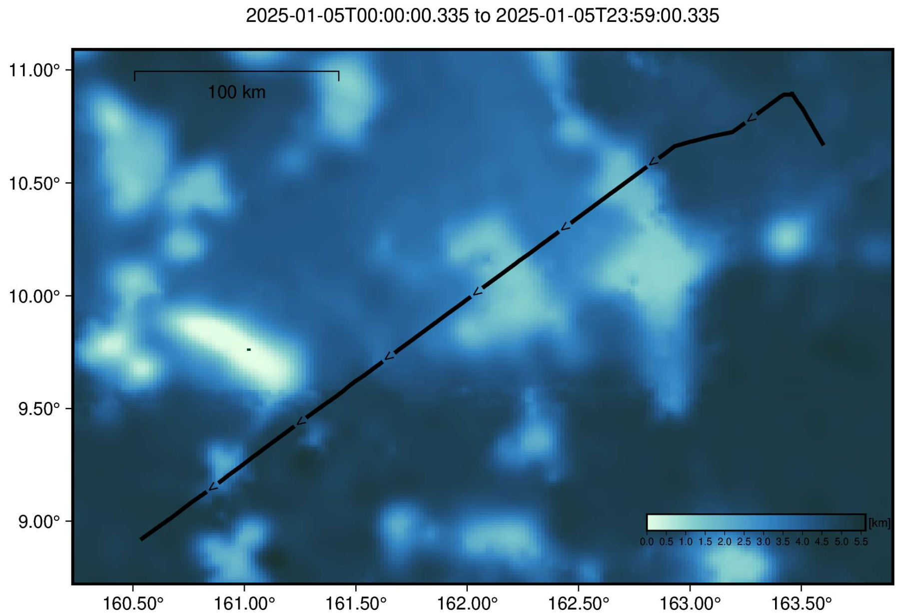


Figure A.1.51: Cruise Track of Day 23 of Expedition SKQ202418S.

SKQ202418S – Daily Report 28

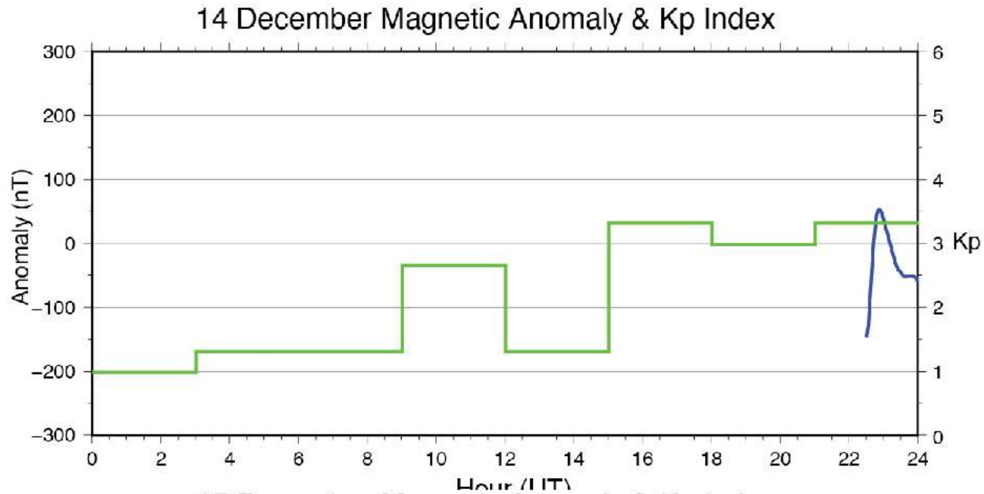
06 January 2025

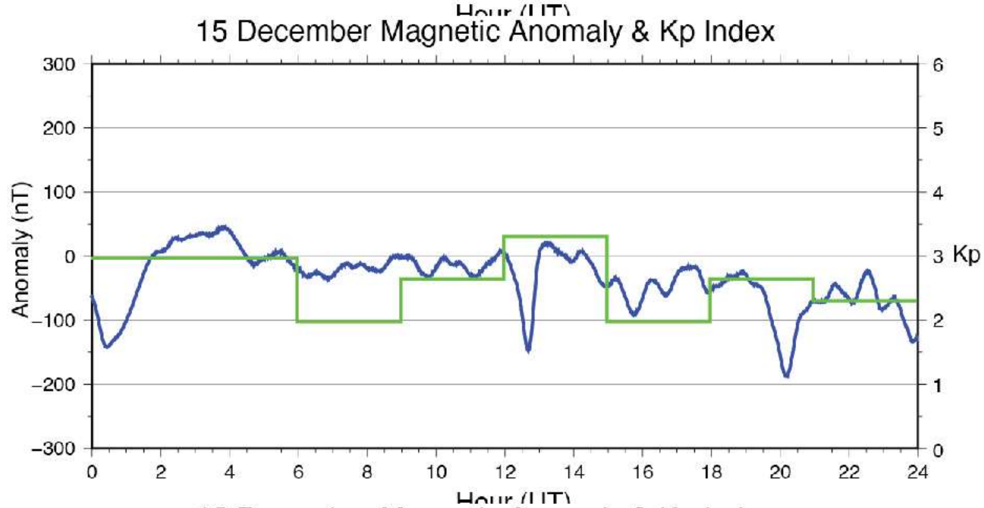
Geophysical data collection continued during the transit, with the magnetometer retrieved at 05:50. With seismic operations concluded, efforts shifted to cleaning the deck and laboratories. Watch-standing responsibilities for students officially ended, though Principal Investigators maintained oversight as the vessel approached and entered the Exclusive Economic Zone (EEZ) of Pohnpei. Upon arrival in Pohnpei, cleaning activities persisted as part of the final wrap-up procedures, marking the conclusion of this phase of the expedition.

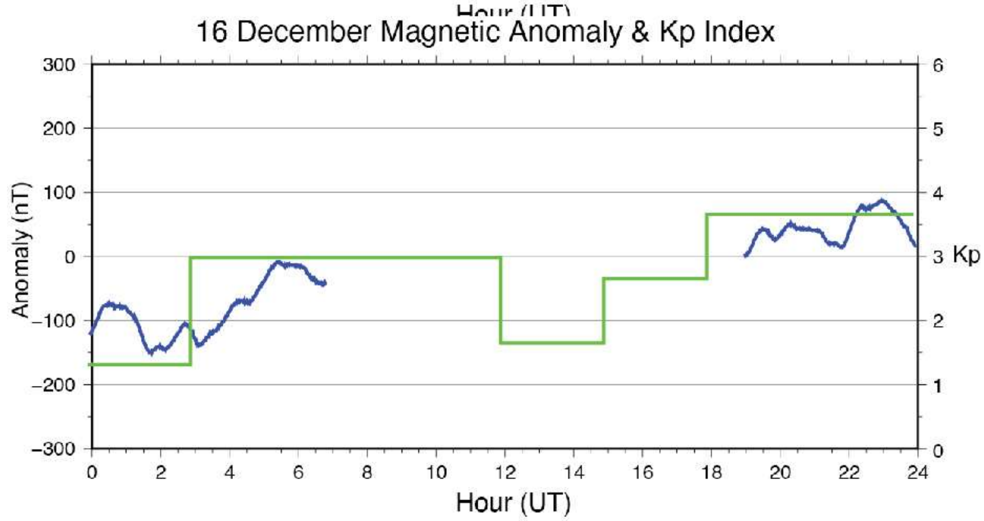
Figure A.1.52: Group picture of Expedition SKQ202418S. Photo: W. Sager.

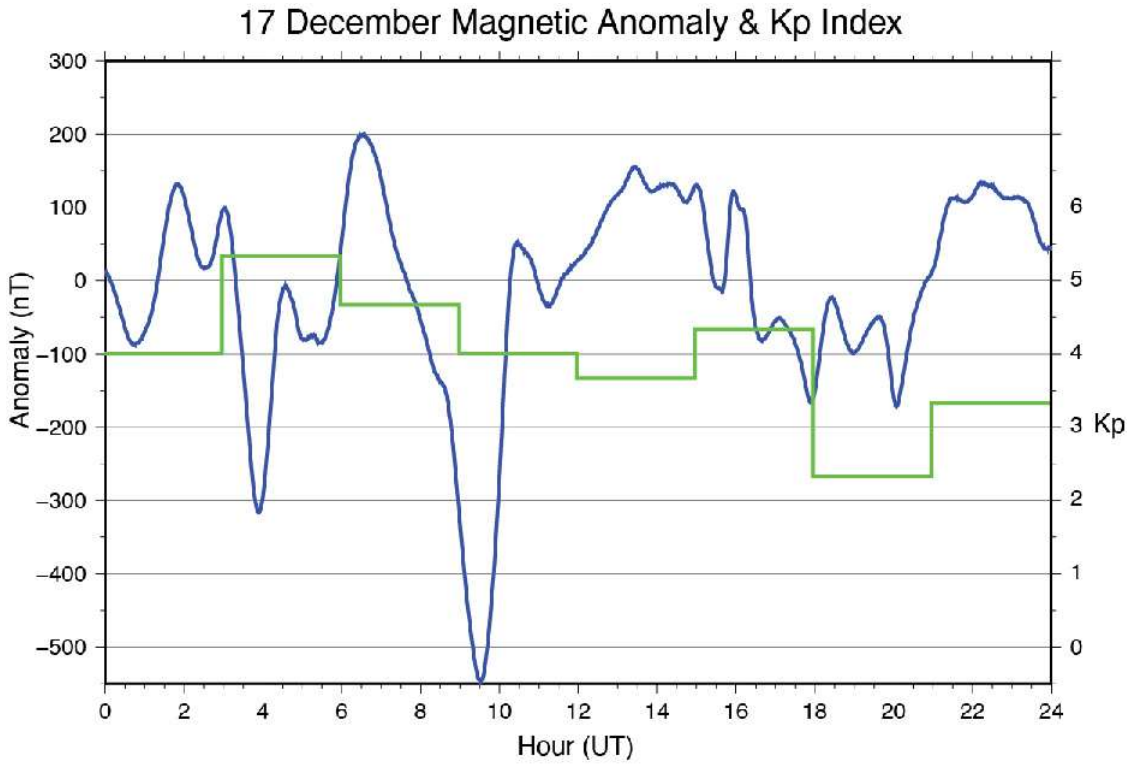
A.2 Daily magnetometer plots and KP index

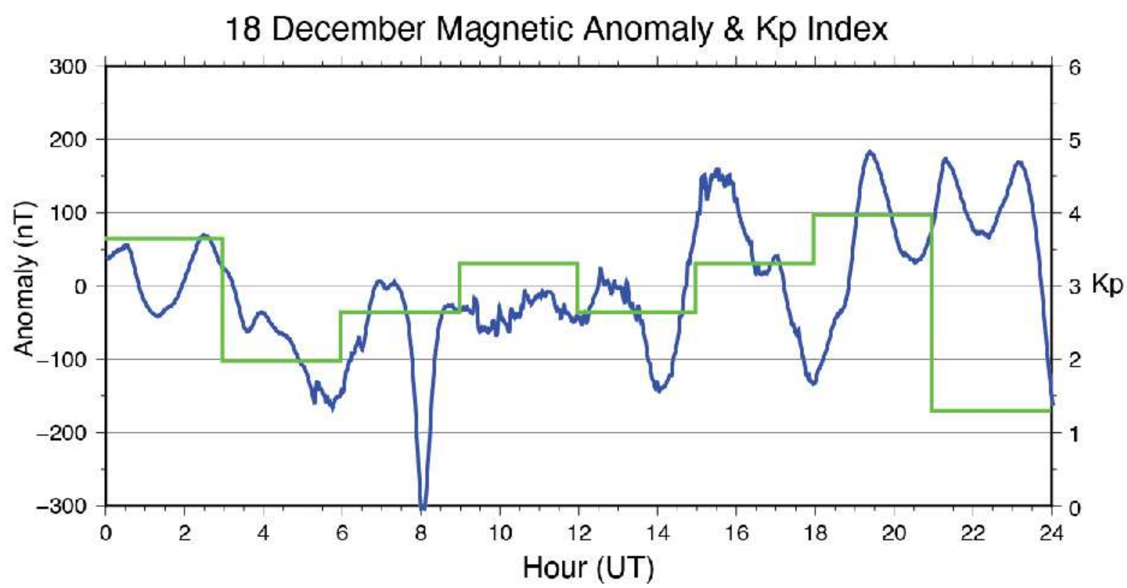
W. Sager

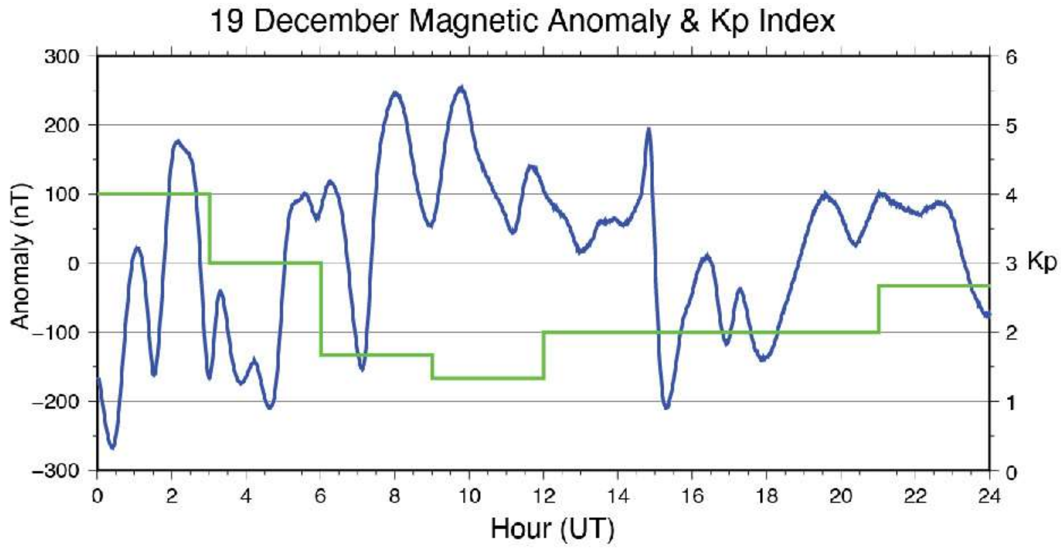


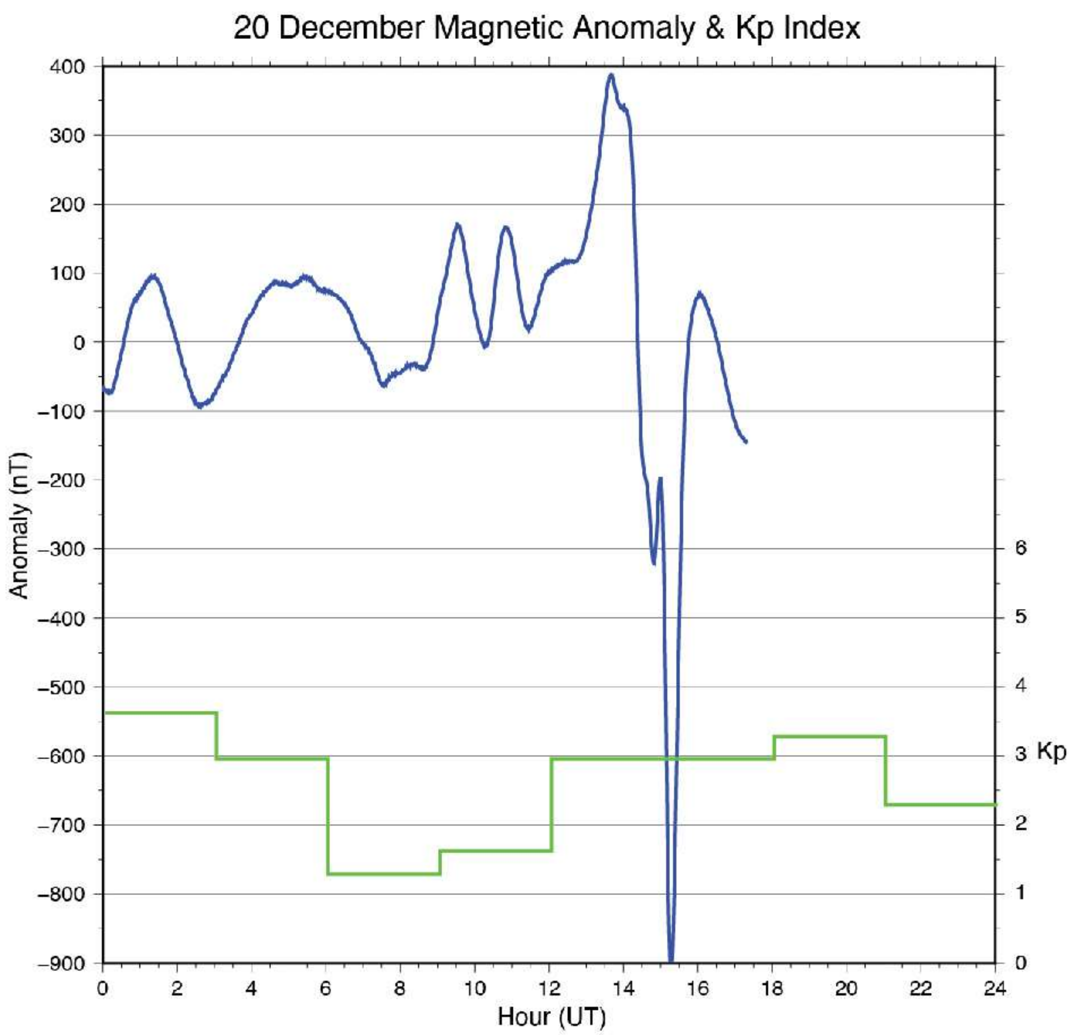


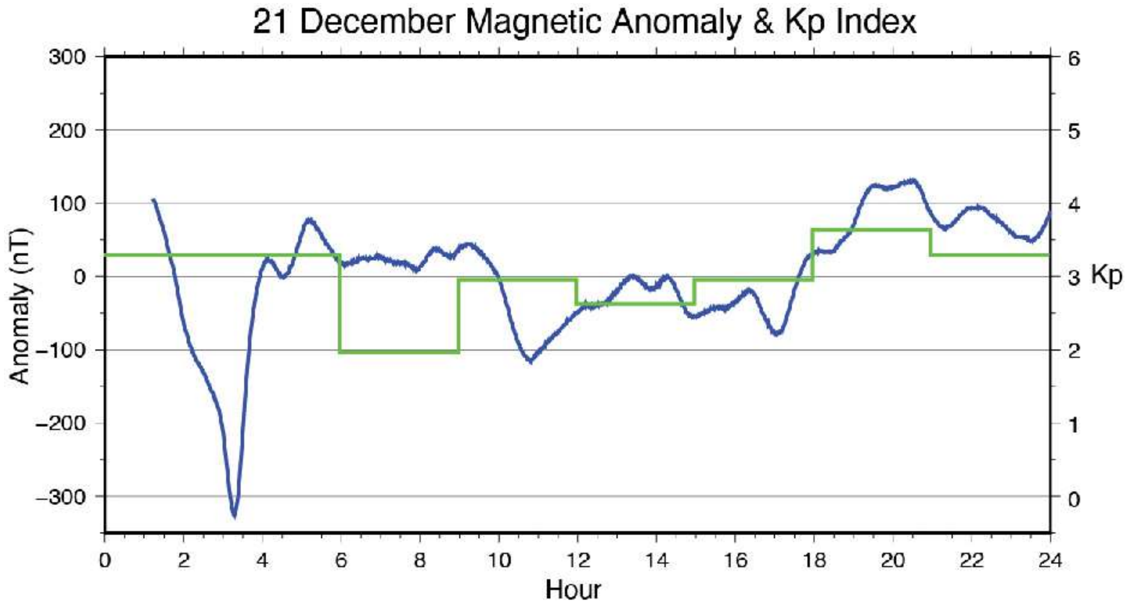


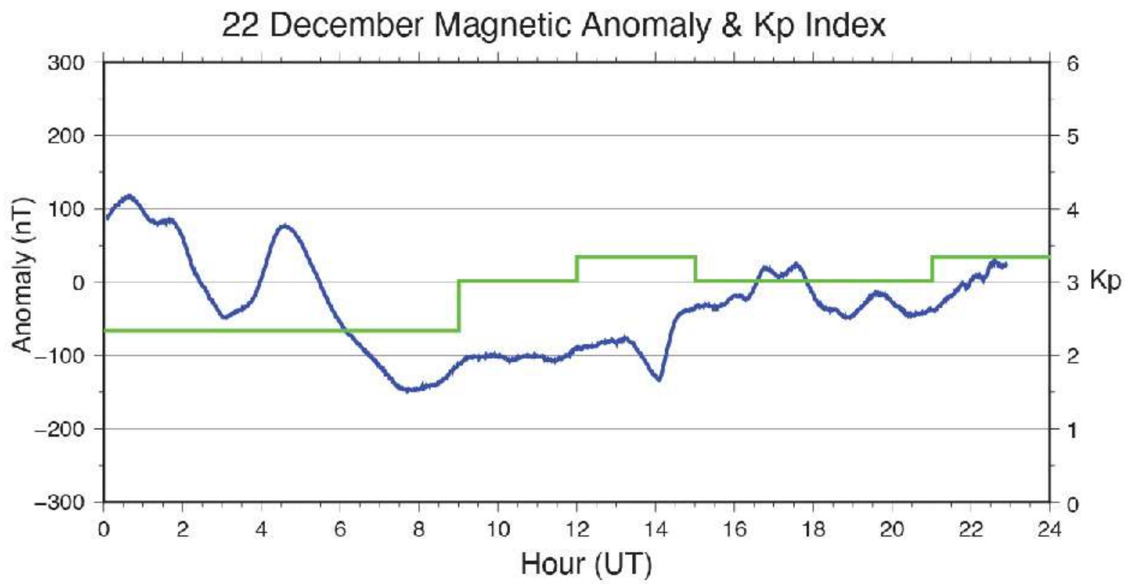

17 December Magnetic Anomaly & Kp Index
Anomaly (nT)
Hour (UT)
Kp
300
200
100
0
−100
−200
−300
−400
−500
0 2 4 6 8 10 12 14 16 18 20 22 24
6
5
4
3
2
1
0

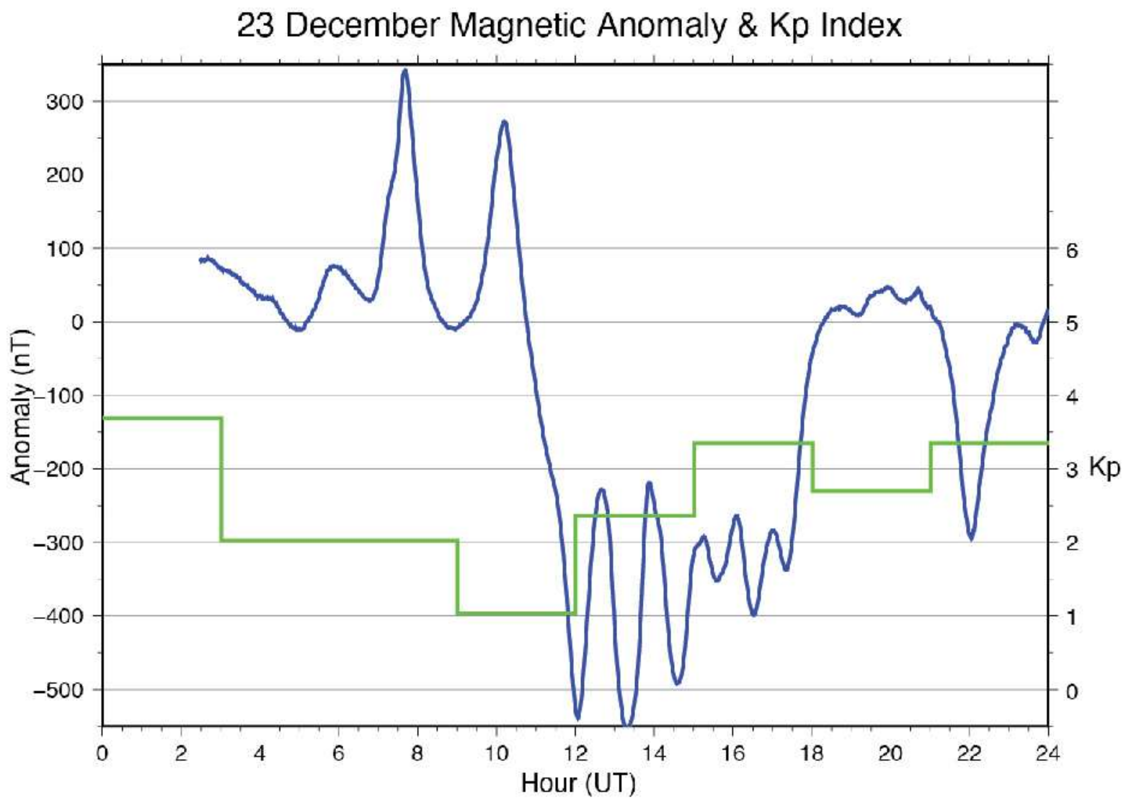

18 December Magnetic Anomaly & Kp Index
Anomaly (nT)
Hour (UT)
Kp
300
200
100
0
−100
−200
−300
0 2 4 6 8 10 12 14 16 18 20 22 24
6
5
4
3
2
1
0

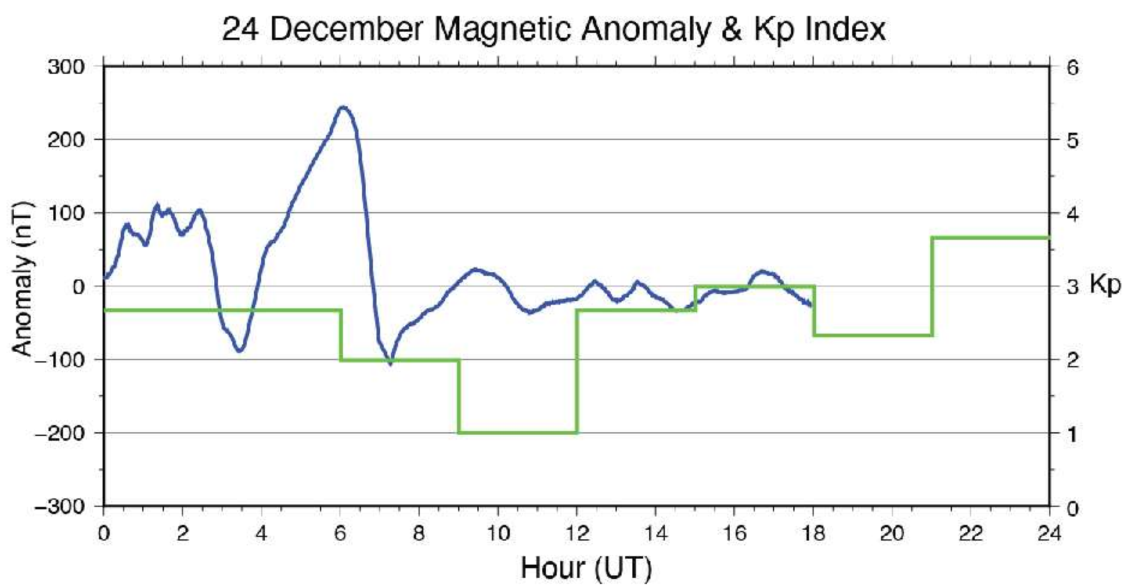

19 December Magnetic Anomaly & Kp Index
Anomaly (nT)
Kp
Hour (UT)
300
200
100
0
−100
−200
−300
6
5
4
3
2
1
0
0 2 4 6 8 10 12 14 16 18 20 22 24

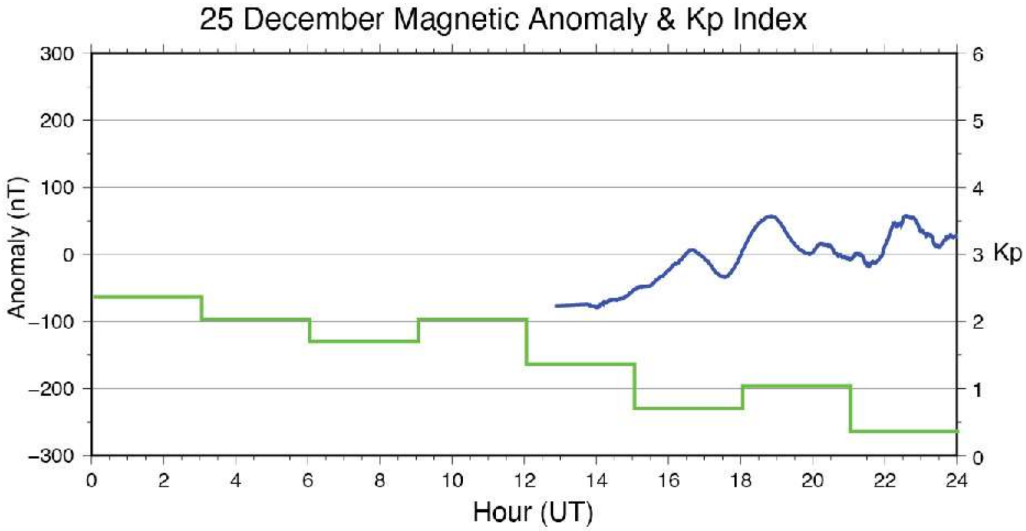

20 December Magnetic Anomaly & Kp Index
Anomaly (nT)
Kp
Hour (UT)
400
300
200
100
0
−100
−200
−300
−400
−500
−600
−700
−800
−900
6
5
4
3
2
1
0
0 2 4 6 8 10 12 14 16 18 20 22 24

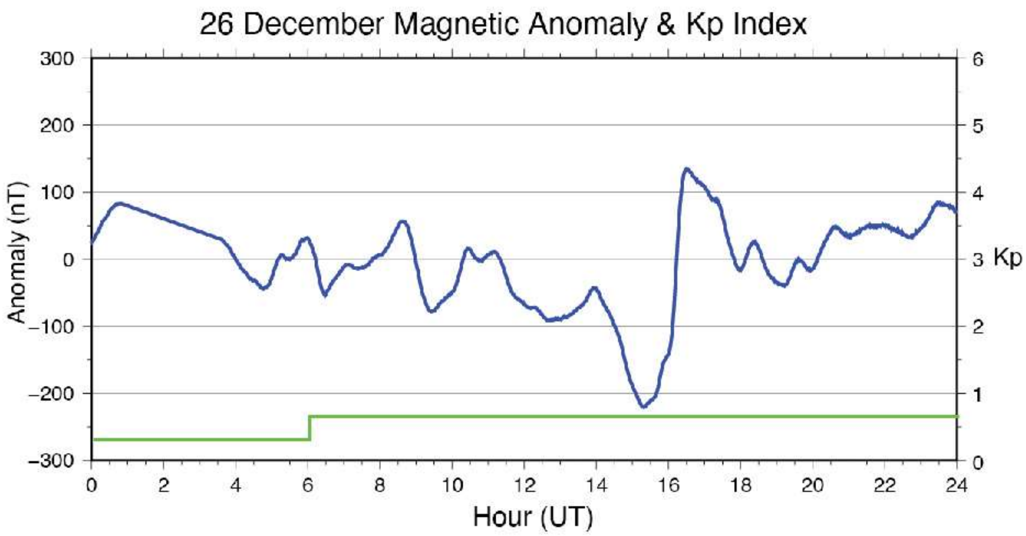

21 December Magnetic Anomaly & Kp Index
Anomaly (nT)
Kp
Hour
300
200
100
0
−100
−200
−300
6
5
4
3
2
1
0
0
2
4
6
8
10
12
14
16
18
20
22
24

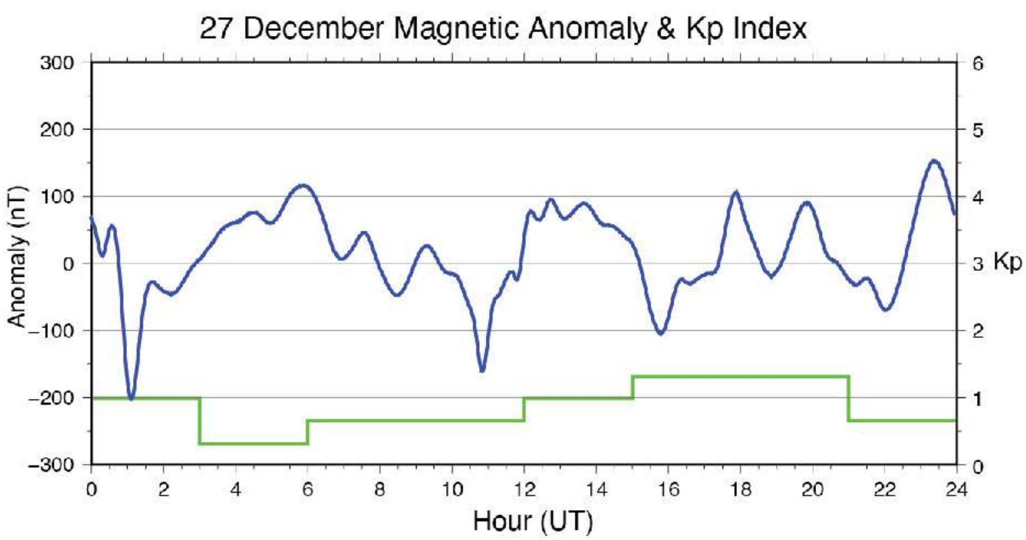

22 December Magnetic Anomaly & Kp Index
Anomaly (nT)
Kp
Hour (UT)
300
200
100
0
−100
−200
−300
6
5
4
3
2
1
0
0
2
4
6
8
10
12
14
16
18
20
22
24

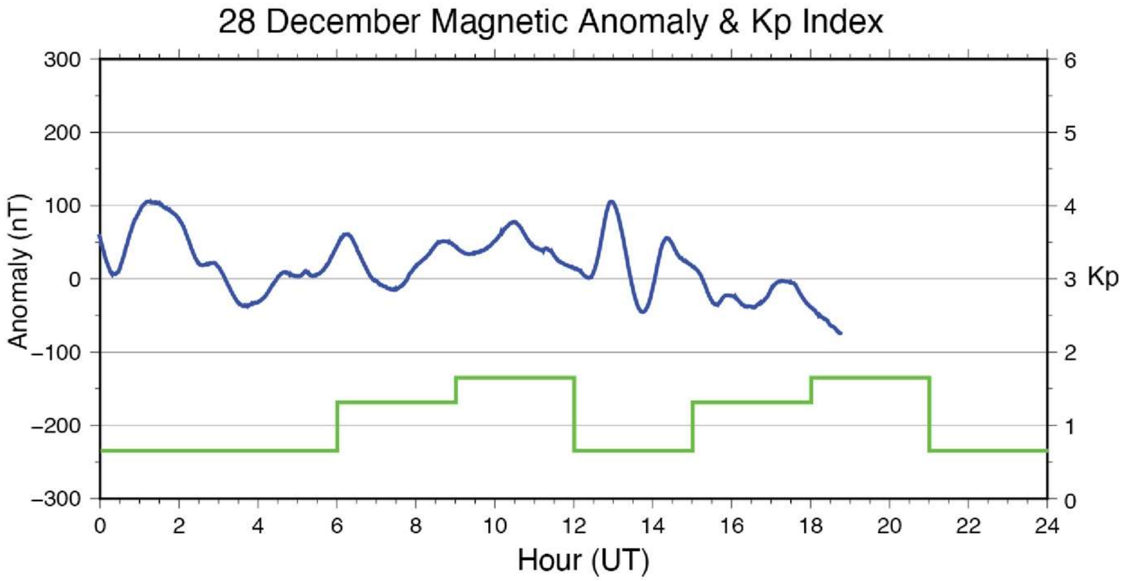

23 December Magnetic Anomaly & Kp Index
300
200
100
0
−100
−200
−300
−400
−500
Anomaly (nT)
6
5
4
3
2
1
0
Kp
0 2 4 6 8 10 12 14 16 18 20 22 24
Hour (UT)

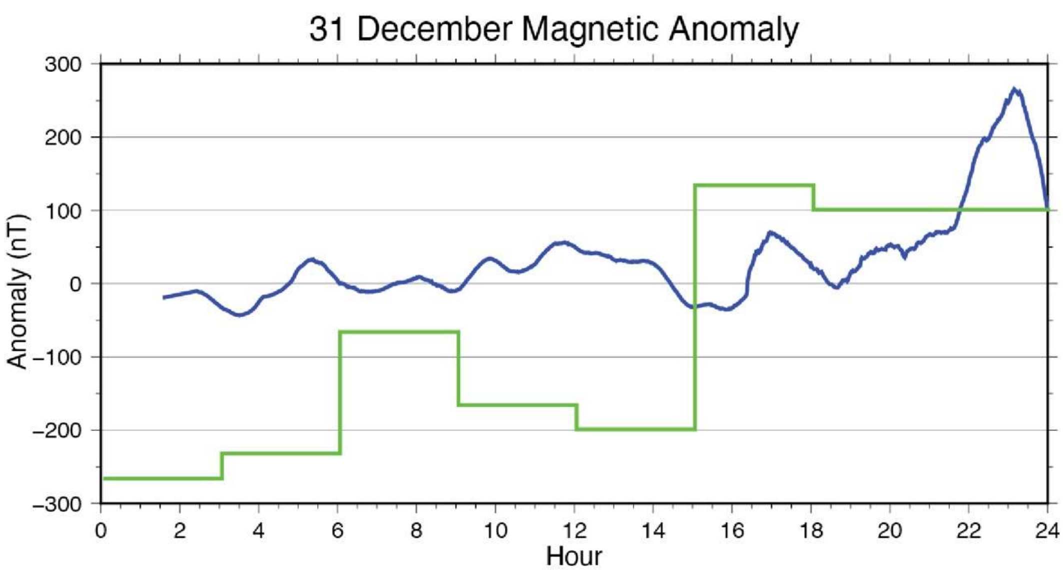

24 December Magnetic Anomaly & Kp Index
300
200
100
0
−100
−200
−300
Anomaly (nT)
6
5
4
3
2
1
0
Kp
0 2 4 6 8 10 12 14 16 18 20 22 24
Hour (UT)

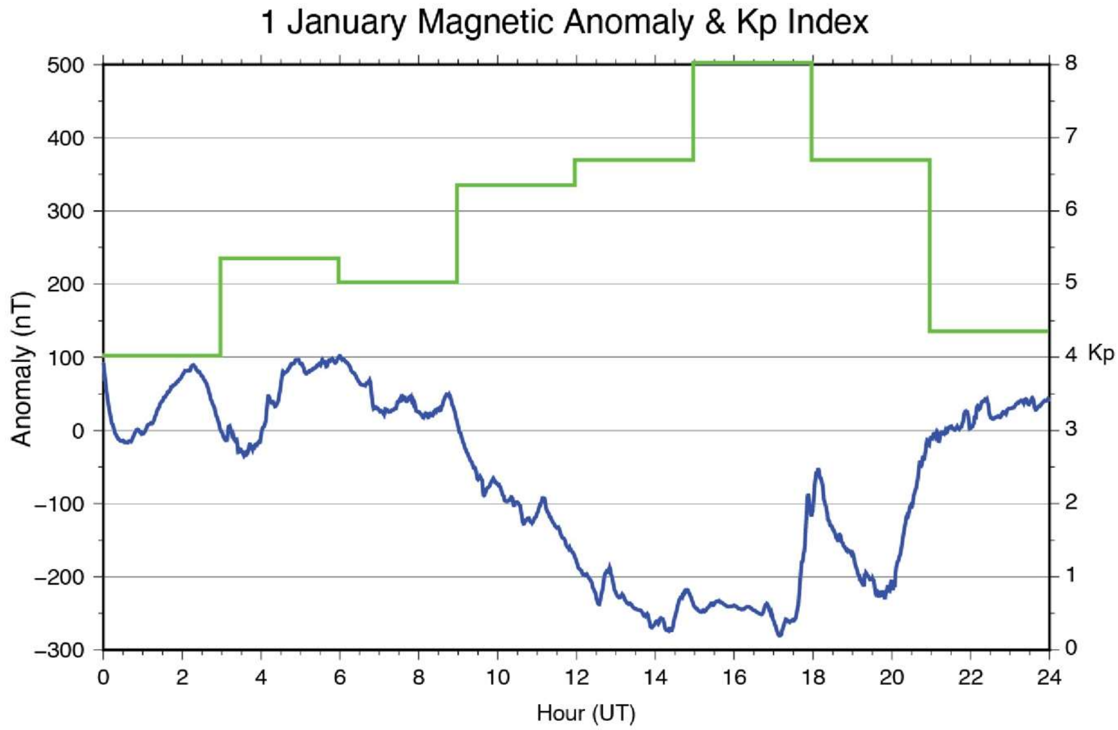

25 December Magnetic Anomaly & Kp Index
Anomaly (nT)
Kp
Hour (UT)

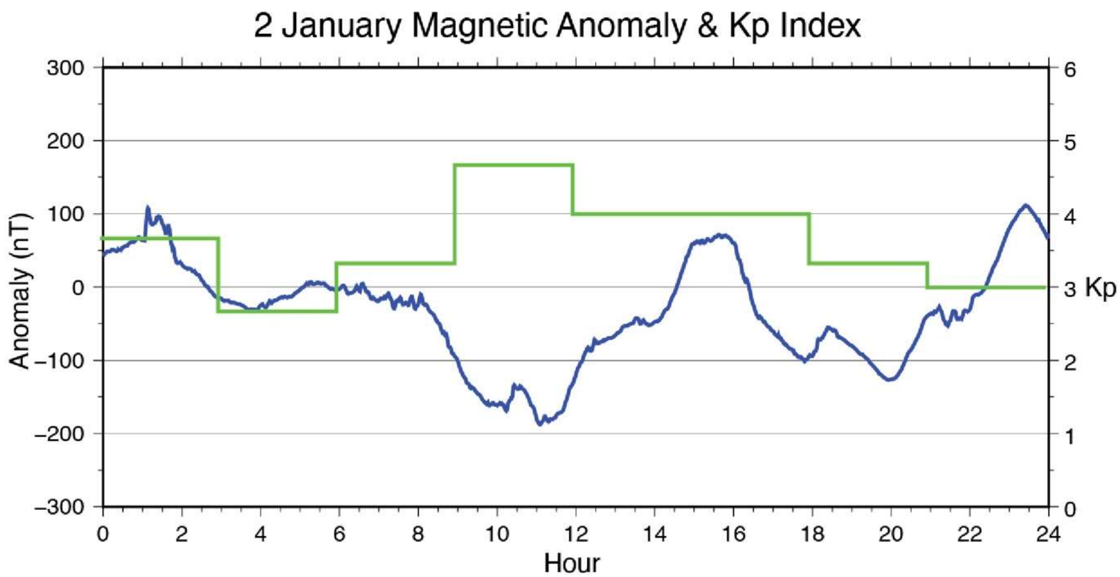

26 December Magnetic Anomaly & Kp Index
Anomaly (nT)
Kp
Hour (UT)

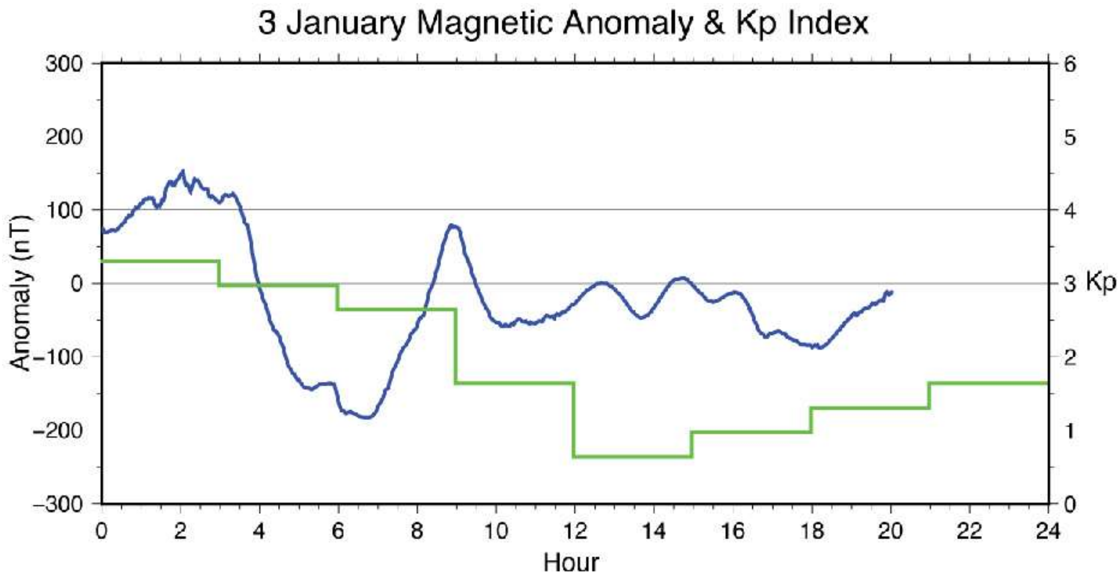

27 December Magnetic Anomaly & Kp Index
Anomaly (nT)
Kp
Hour (UT)

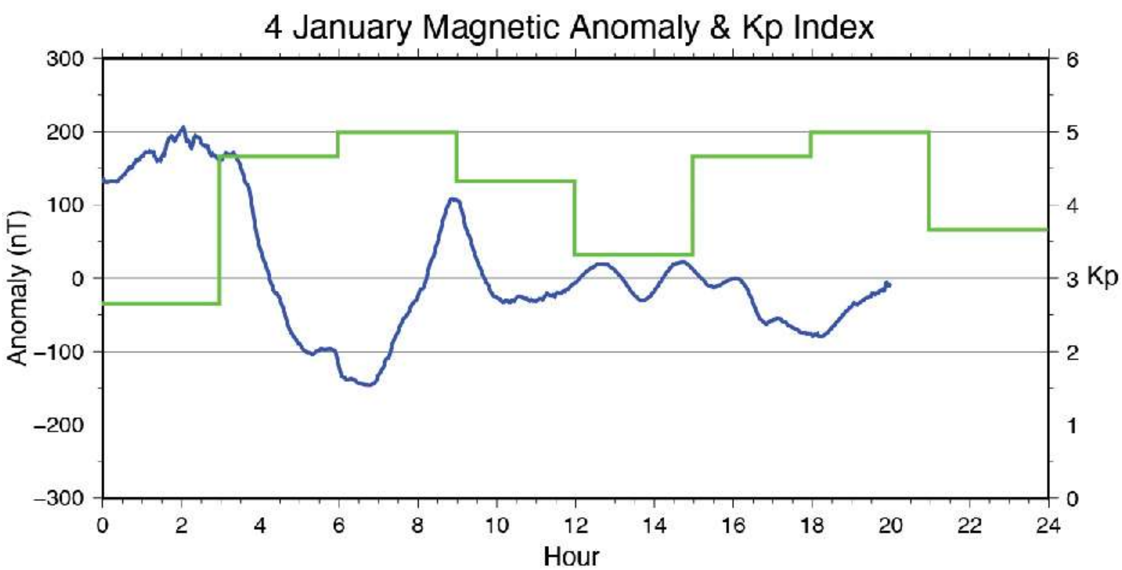

28 December Magnetic Anomaly & Kp Index
Anomaly (nT)
Kp
Hour (UT)

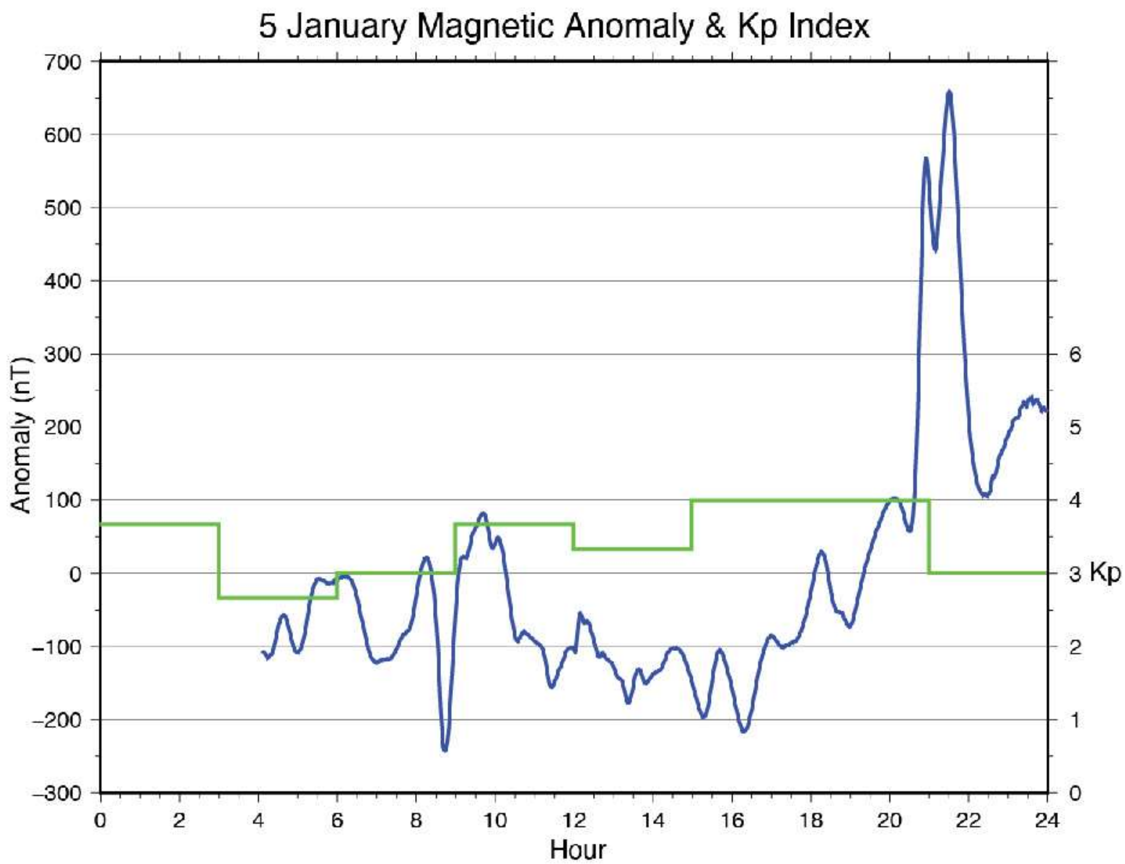

31 December Magnetic Anomaly
Anomaly (nT)
Hour

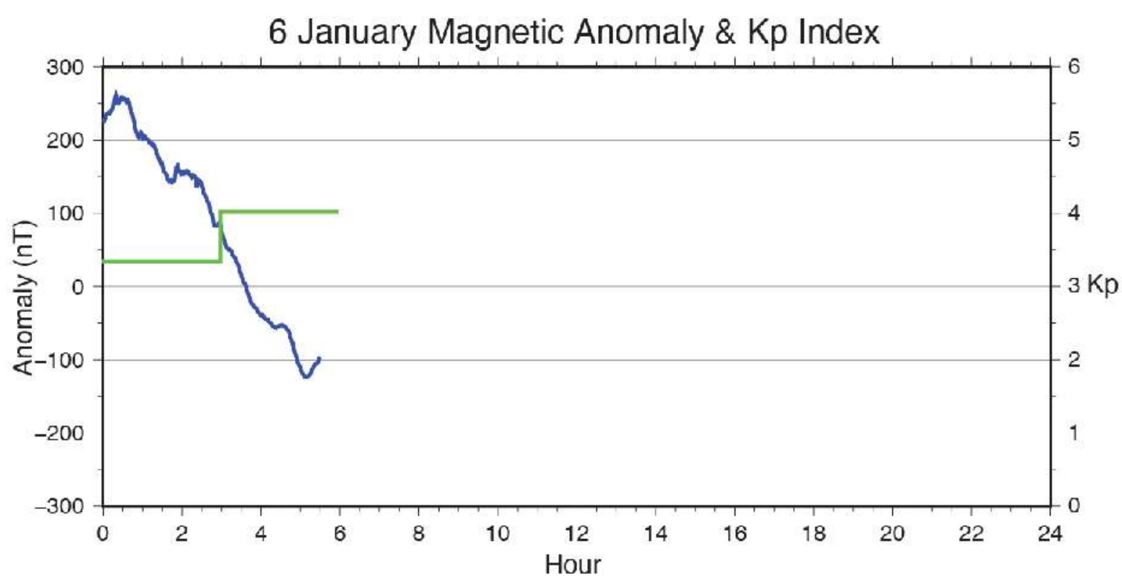

1 January Magnetic Anomaly & Kp Index
Anomaly (nT)
Kp
Hour (UT)
500
400
300
200
100
0
−100
−200
−300
8
7
6
5
4
3
2
1
0
0
2
4
6
8
10
12
14
16
18
20
22
24


2 January Magnetic Anomaly & Kp Index
Anomaly (nT)
Kp
Hour
300
200
100
0
−100
−200
−300
6
5
4
3
2
1
0
0
2
4
6
8
10
12
14
16
18
20
22
24


3 January Magnetic Anomaly & Kp Index
300
200
100
0
−100
−200
−300
Anomaly (nT)
6
5
4
3 Kp
2
1
0
0 2 4 6 8 10 12 14 16 18 20 22 24
Hour

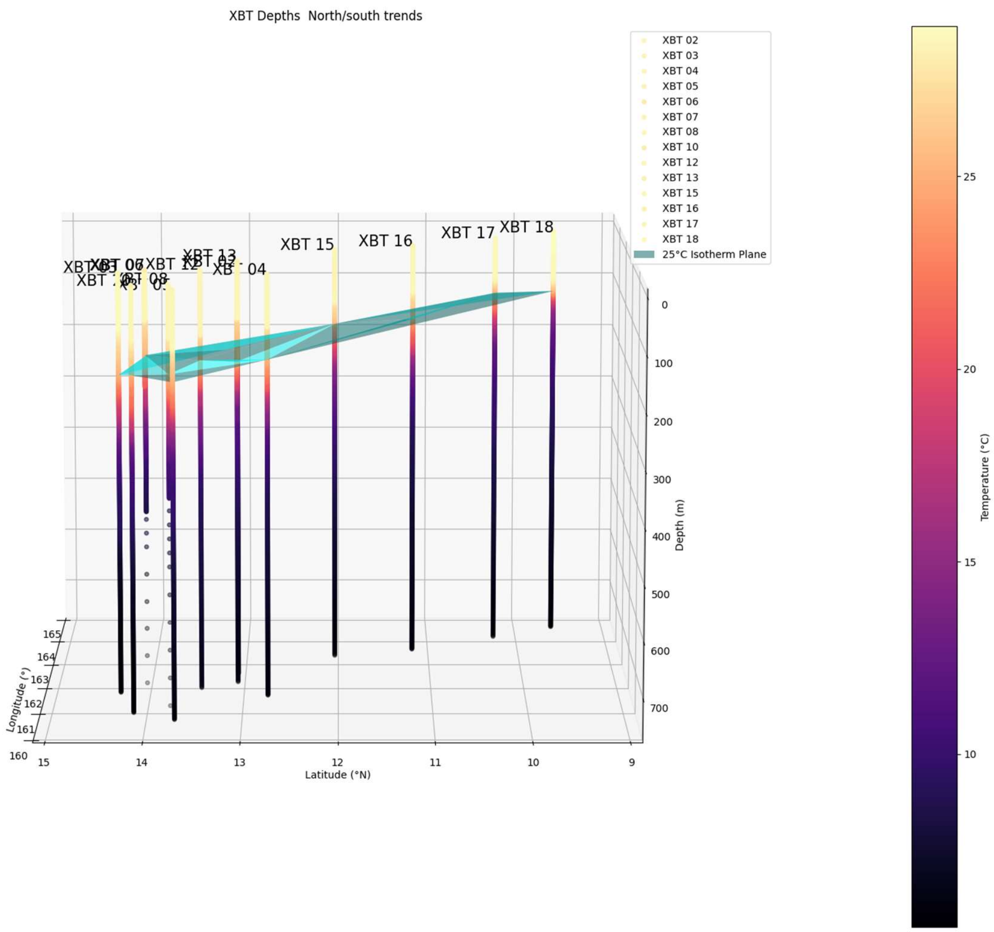

4 January Magnetic Anomaly & Kp Index
300
200
100
0
−100
−200
−300
Anomaly (nT)
6
5
4
3 Kp
2
1
0
0 2 4 6 8 10 12 14 16 18 20 22 24
Hour

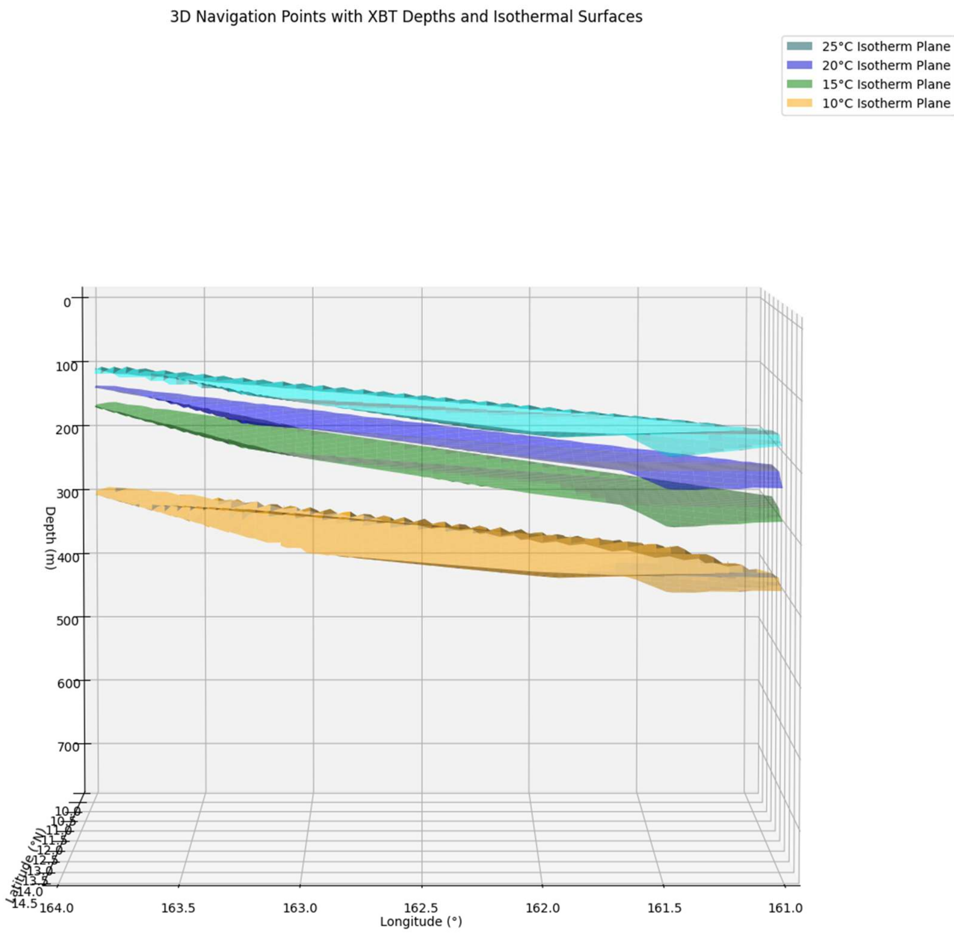

5 January Magnetic Anomaly & Kp Index
Anomaly (nT)
700
600
500
400
300
200
100
0
−100
−200
−300
Hour
0
2
4
6
8
10
12
14
16
18
20
22
24
Kp
6
5
4
3
2
1
0

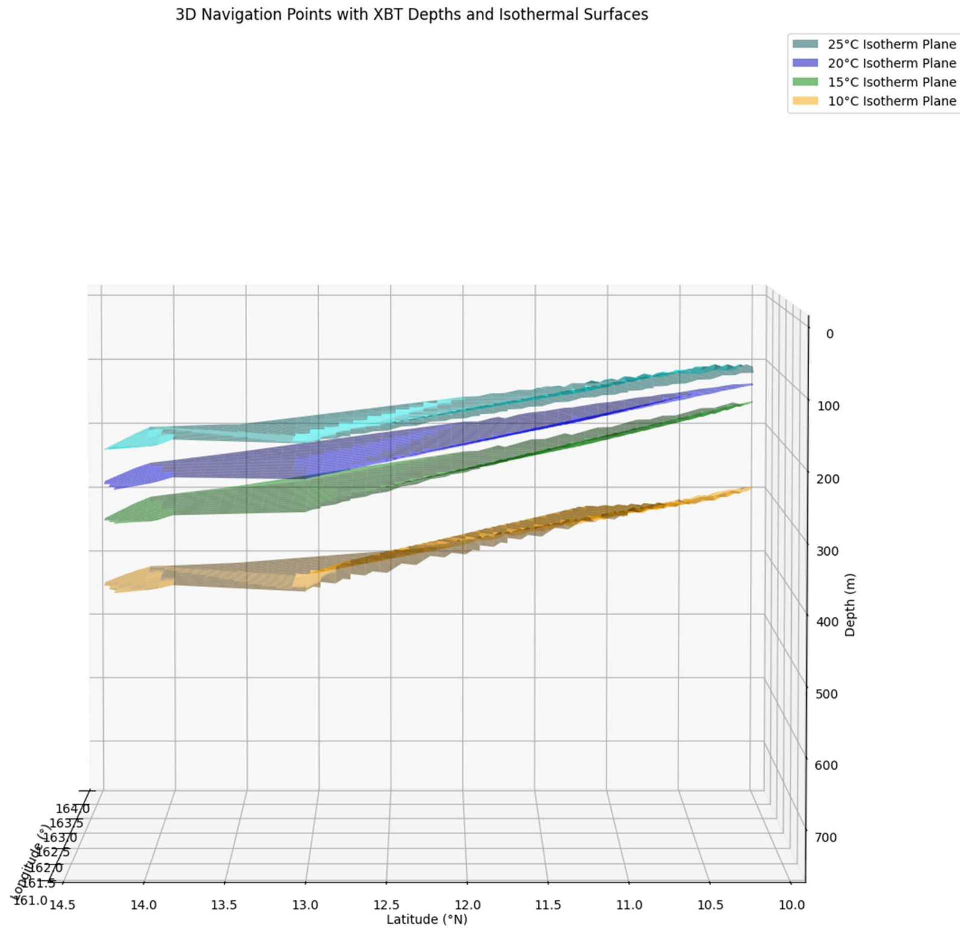

6 January Magnetic Anomaly & Kp Index
Anomaly (nT)
300
200
100
0
−100
−200
−300
Hour
0
2
4
6
8
10
12
14
16
18
20
22
24
Kp
6
5
4
3
2
1
0

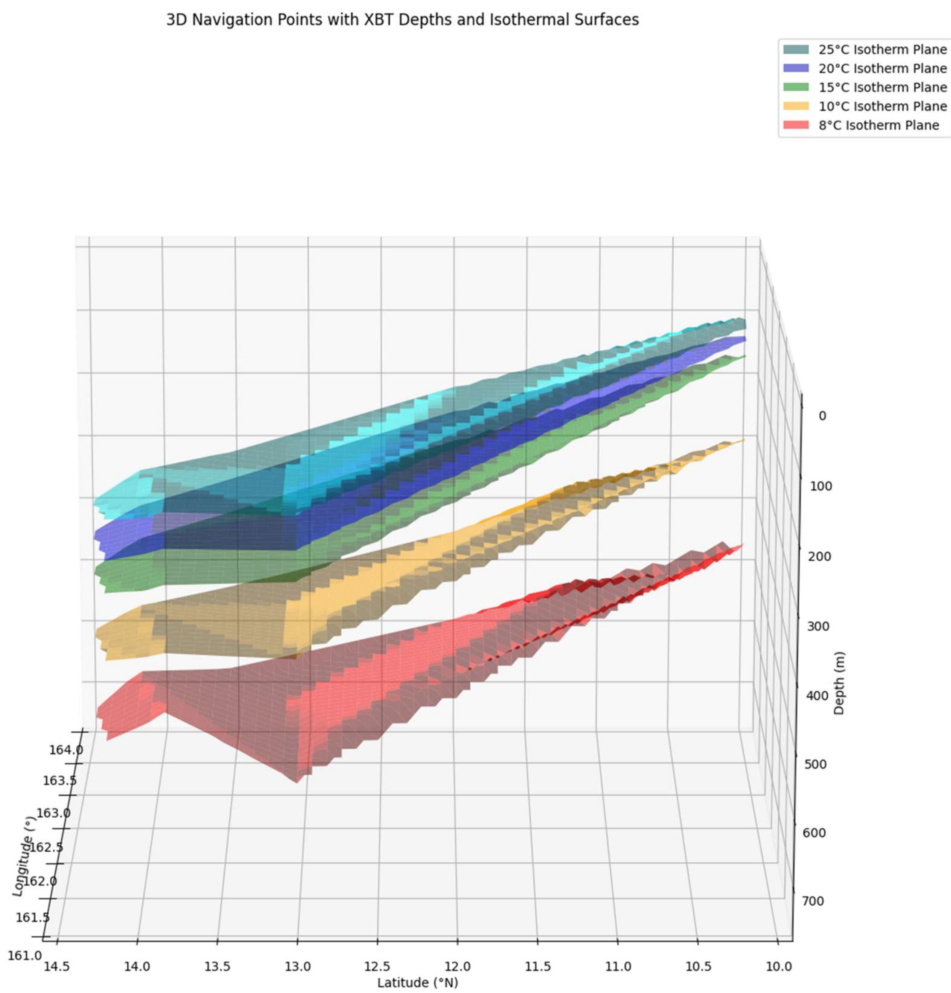
A.3 XBT Plots

J. Hampton




3D Navigation Points with XBT Depths and Isothermal Surfaces
25°C Isotherm Plane
20°C Isotherm Plane
15°C Isotherm Plane
10°C Isotherm Plane
Depth (m)
0
100
200
300
400
500
600
700
Latitude (°N)
10.0
14.0
14.5
164.0
163.5
163.0
162.5
162.0
161.5
161.0
Longitude (°)


3D Navigation Points with XBT Depths and Isothermal Surfaces
25°C Isotherm Plane
20°C Isotherm Plane
15°C Isotherm Plane
10°C Isotherm Plane
Depth (m)
0
100
200
300
400
500
600
700
Latitude (°N)
14.5
14.0
13.5
13.0
12.5
12.0
11.5
11.0
10.5
10.0
Longitude (°)
161.0
161.5
162.0
162.5
163.0
163.5
164.0



3D Navigation Points with XBT Depths and Isothermal Surfaces
25°C Isotherm Plane
20°C Isotherm Plane
15°C Isotherm Plane
10°C Isotherm Plane
8°C Isotherm Plane
Depth (m)
0
100
200
300
400
500
600
700
Longitude (°)
164.0
163.5
163.0
162.5
162.0
161.5
161.0
Latitude (°N)
14.5
14.0
13.5
13.0
12.5
12.0
11.5
11.0
10.5
10.0

A.4 Permissions

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

INCIDENTAL HARASSMENT AUTHORIZATION

The Scripps Institution of Oceanography (SIO) is hereby authorized under section 101(a)(5)(D) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1371(a)(5)(D)) to incidentally harass marine mammals, under the following conditions:

1. This incidental harassment authorization (IHA) is valid from December 11, 2024 through December 10, 2025.

2. This IHA is valid only for geophysical survey activity in the Nauru Basin of greater Micronesia in the NW Pacific Ocean, as specified in SIO's IHA application.

3. General Conditions

   (a) A copy of this IHA must be in the possession of SIO, the vessel operator, the lead protected species observer (PSO), and any other relevant designees of SIO operating under the authority of this IHA.

   (b) The species and/or stocks authorized for taking are listed in Table 1. Authorized take, by Level B harassment only, is limited to the species and/or stocks and numbers listed in Table 1.

   (c) The taking by Level A harassment, serious injury or death of any of the species listed in Table 1 or any taking of any other species of marine mammal is prohibited and may result in the modification, suspension, or revocation of this IHA. Any taking exceeding the authorized numbers listed in Table 1 is prohibited and may result in the modification, suspension, or revocation of this IHA.

   (d) SIO must ensure that relevant vessel personnel and the PSO team participate in a joint onboard briefing led by the vessel operator and lead PSO to ensure that responsibilities, communication procedures, marine mammal monitoring protocols, operational procedures, and IHA requirements are clearly understood.

4. Mitigation Requirements

   a. SIO must use independent, dedicated, trained visual PSOs, meaning that the PSOs must be employed by a third-party observer provider, must not have tasks other than to conduct observational effort, collect data, and communicate with and instruct relevant vessel crew with regard to the presence of marine mammals and mitigation requirements (including brief alerts regarding maritime hazards), and must have successfully completed an approved PSO training course.

1

b. At least one visual PSO must have a minimum of 90 days at-sea experience working in those roles, respectively, during a shallow penetration seismic survey, with no more than 18 months elapsed since the conclusion of the at-sea experience.

c. Visual Observation

i. During survey operations (e.g., any day on which use of the airgun array is planned to occur and whenever the airgun array is in the water, whether activated or not), a minimum of two PSOs must be on duty and conducting visual observations at all times during daylight hours (i.e., from 30 minutes prior to sunrise through 30 minutes following sunset) and 30 minutes prior to and during ramp-up of the airgun array. To the maximum extent practicable, two PSOs must be on duty at all times during daylight hours.

ii. Visual monitoring of the shutdown and buffer zones must begin no less than 30 minutes prior to ramp-up and must continue until one hour after use of the airgun array ceases or until 30 minutes past sunset.

iii. Visual PSOs must coordinate to ensure 360° visual coverage around the vessel from the most appropriate observation posts, and must conduct visual observations using binoculars and the naked eye while free from distractions and in a consistent, systematic, and diligent manner.

iv. During good conditions (e.g., daylight hours; Beaufort sea state (BSS) 3 or less), visual PSOs must conduct observations when the airgun array is not operating for comparison of sighting rates and behavior with and without use of the airgun array and between acquisition periods, to the maximum extent practicable.

v. Visual PSOs may be on watch for a maximum of four consecutive hours followed by a break of at least one hour between watches and may conduct a maximum of 12 hours of observation per 24-hour period.

d. Shutdown zones and buffer zones

i. Except as provided in 4(d)(ii), the PSOs must establish and monitor a 100-m shutdown zone and additional 100-m buffer zone (total 200 m). The 200-m zone must serve to focus observational effort but not limit such effort; observations of marine mammals beyond this distance shall also be recorded as described in 5(c) below and/or trigger shutdown as described in 4(f) (iii) below, as appropriate. The shutdown zone encompasses the area at and below the sea surface out to a radius of 100 m from the edges of the airgun array (rather than being based on the center of the array or around the vessel itself) (0–100 m). The buffer zone encompasses the area at and below the sea surface from the edge of the shutdown zone, out to a radius of 200 m from the edges of the airgun array (100–200 m). During use of the airgun array, occurrence of marine mammals within the buffer zone (but outside the shutdown zone) must be communicated to the operator to prepare for the potential shutdown of the airgun array. PSOs must monitor the shutdown zone and buffer zone for a minimum of 30 minutes prior to ramp-up (i.e., pre-start clearance).

ii. An extended 500 m shutdown zone must be established for all beaked whales, a large whale with a calf, and groups of six or more large whales. No buffer zone is required.

e. Pre-start clearance and Ramp-up

i. A ramp-up procedure must be followed at all times as part of the activation of the airgun array, except as described under 4(e)(viii).

ii. The operator must notify a designated PSO of the planned start of ramp-up as agreed upon with the lead PSO. The notification time should not be less than 60 minutes prior to the planned ramp-up in order to allow the PSOs time to monitor the shutdown and buffer zone for 30 minutes prior to the initiation of ramp-up.

iii. Ramp-ups shall be scheduled so as to minimize the time spent with the source activated prior to reaching the designated run-in.

iv. One of the PSOs conducting the pre-start clearance observations must be notified again immediately prior to initiating ramp-up procedures and the operator must receive confirmation from the PSOs to proceed.

v. Ramp-up must not be initiated if any marine mammal is within the shutdown or buffer zone. If a marine mammal is observed within the shutdown zone or the buffer zone during the 30 minute pre-start clearance period, ramp-up may not begin until the animal(s) has been observed exiting the zone or until an additional time period has elapsed with no further sightings (15 minutes for small odontocetes, and 30 minutes for mysticetes and all other odontocetes).

vi. Ramp-up must begin by activating one GI airgun and shall continue in stages, doubling the number of active elements at the commencement of each stage, with each stage lasting no less than 5 minutes. The operator must provide information to the PSO documenting that appropriate procedures were followed.

vii. PSOs must monitor the shutdown and buffer zones during ramp-up, and ramp-up must cease and the source must be shut down upon visual observation of a marine mammal within the shutdown zone. Once ramp-up has begun, observations of marine mammals within the buffer zone do not require shutdown, but such observation must be communicated to the operator to prepare for the potential shutdown.

viii. If the airgun array is shut down for brief periods (i.e., less than 30 minutes) for reasons other than that described for shutdown (e.g., mechanical difficulty), it may be activated again without ramp-up if PSOs have maintained constant observation and no detections of marine mammals have occurred within the applicable shutdown zone. For any longer shutdown, pre-start clearance observation and ramp-up are required. For any shutdown at night or in periods of poor visibility (e.g., BSS 4 or greater), ramp-up is required, but if the shutdown period was brief and constant observation was maintained, pre-start clearance watch is not required.

ix. Testing of the airgun array involving all elements requires ramp-up. Testing limited to individual source elements or strings does not require ramp-up but does require pre-start clearance watch.

f. Shutdown requirements

i. Any PSO on duty has the authority to delay the start of survey operations or to call for shutdown of the airgun array.

ii. The operator must establish and maintain clear lines of communication directly between PSOs on duty and crew controlling the airgun array to ensure that shutdown commands are conveyed swiftly while allowing PSOs to maintain watch.

iii. When the airgun array is active (i.e., anytime one or more airguns is active, including during ramp-up) and a marine mammal (excluding delphinids of the species described in 4(f)(iv)) appears within or enters the shutdown zone, the airgun array must be shut down. When shutdown is called for by a PSO, the airgun array must be immediately deactivated. Any dispute regarding a PSO shutdown must be resolved after deactivation.

iv. The shutdown requirement described in 4(f)(iii) shall be waived for small dolphins of the following genera: *Lagenodelphis, Stenella, Steno* and *Tursiops*.

1. If a dolphin of these genera is visually detected within the shutdown zone, no shutdown is required unless the PSO confirms the individual to be of a genus other than those listed above, in which case a shutdown is required.

2. If there is uncertainty regarding identification, visual PSOs may use best professional judgement in making the decision to call for a shutdown.

v. Upon implementation of shutdown, the source may be reactivated after the marine mammal(s) has been observed exiting the applicable shutdown zone (i.e., animal is not required to fully exit the buffer zone where applicable) or following a clearance period (15 minutes for small odontocetes, and 30 minutes for mysticetes and all other odontocetes) with no further observation of the marine mammal(s).

vi. Shutdown of the array is required upon observation of a species for which authorization has not been granted or a species for which authorization has been granted but the authorized number of takes has been met, approaching or observed within any harassment zone (Table 2).

g. Vessel strike avoidance

i. Vessel operators and crew must maintain a vigilant watch for all marine mammals and slow down, stop their vessel, or alter course, as appropriate and regardless of vessel size, to avoid striking any marine mammals. A visual observer aboard the vessel must monitor a vessel strike avoidance zone around the vessel (separation distances stated below). Visual observers monitoring the vessel strike avoidance zone may be third-party observers (i.e., PSOs) or crew members, but crew members responsible for these duties must be provided sufficient training to (1) distinguish marine mammals from other phenomena and (2) broadly to identify a marine mammal to taxonomic group (i.e., as a large whale, or other marine mammal).

ii. Vessel speeds must be reduced to 10 knots or less when mother/calf pairs, pods, or large assemblages of cetaceans are observed near a vessel.

iii. The vessel must maintain a minimum separation distance of 100 m from sperm whales and all baleen whales.

iv. The vessel must, to the maximum extent practicable, attempt to maintain a minimum separation distance of 50 m from all other marine mammals, with an understanding that at times this may not be possible (e.g., for animals that approach the vessel).

v. When marine mammals are sighted while a vessel is underway, the vessel must take action as necessary to avoid violating the relevant separation distance (e.g., attempt to remain parallel to the animal's course, avoid excessive speed or abrupt changes in direction until the animal has left the area). If marine mammals are sighted within the relevant separation distance, the vessel must reduce speed and shift the engine to neutral, not engaging the engines until animals are clear of the area. This does not apply to any vessel towing gear or any vessel that is navigationally constrained.

5. Monitoring Requirements

a. The operator must work with the selected third-party observer provider to ensure PSOs have all equipment (including backup equipment) needed to adequately perform necessary tasks, including accurate determination of distance and bearing to observed marine mammals. Such equipment, at a minimum, must include:

i. Reticle binoculars (e.g., 7 x 50) of appropriate quality (at least one per PSO, plus backups).

ii. Global Positioning Unit (GPS) (plus backup).

iii. Digital single-lens reflex cameras of appropriate quality that capture photographs and video (plus backup).

iv. Compass (plus backup).

v. Radios for communication among vessel crew and PSOs (at least one per PSO, plus backups).

vi. Any other tools necessary to adequately perform necessary PSO tasks.

b. Protected Species Observers Qualifications

i. PSOs must have successfully completed an acceptable PSO training course.

ii. NMFS must review and approve PSO resumes.

iii. One visual PSO with experience as shown in 4(b) shall be designated as the lead for the PSO team. The lead must coordinate duty schedules and roles for the PSO team and serve as primary point of contact for the vessel operator. (Note that the responsibility of coordinating duty schedules and roles may instead be assigned to a shore-based, third-party monitoring coordinator.) To the maximum extent practicable, the lead PSO must devise the duty schedule such that experienced PSOs are on duty with those PSOs with appropriate training but who have not yet gained relevant experience.

iv. PSOs must successfully complete relevant training, including completion of all required coursework and passing (80 percent or greater) a written and/or oral examination developed for the training program.

v. PSOs must have successfully attained a bachelor's degree from an accredited college or university with a major in one of the natural sciences, a minimum of 30 semester hours or equivalent in the biological sciences, and at least one undergraduate course in math or statistics.

vi. The educational requirements may be waived if the PSO has acquired the relevant skills through alternate experience. Requests for such a waiver must be submitted to NMFS and must include written justification. Requests must be granted or denied (with justification) by NMFS within one week of receipt of submitted information. Alternate experience that may be considered includes, but is not limited to (1) secondary education and/or experience comparable to PSO duties; (2) previous work experience conducting academic, commercial, or government-sponsored marine mammal surveys; or

(3) previous work experience as a PSO; the PSO should demonstrate good standing and consistently good performance of PSO duties.

c. Data Collection

i. PSOs must use standardized electronic data collection forms. PSOs must record detailed information about any implementation of mitigation requirements, including the distance of animals to the airgun array and description of specific actions that ensued, the behavior of the animal(s), any observed changes in behavior before and after implementation of mitigation, and if shutdown was implemented, the length of time before any subsequent ramp-up of the airgun array. If required mitigation was not implemented, PSOs should record a description of the circumstances.

ii. At a minimum, the following information must be recorded:

1. Vessel name, vessel size and type, maximum speed capability of vessel;
2. Dates (MM/DD/YYYY) of departures and returns to port with port name;
3. PSO names and affiliations, PSO ID (initials or other identifier);
4. Date (MM/DD/YYYY) and participants of PSO briefings (as discussed in General Requirement);
5. Visual monitoring equipment used (description);
6. PSO location on vessel and height (meters) of observation location above water surface;
7. Watch status (description);
8. Dates (MM/DD/YYYY) and times (Greenwich Mean Time (GMC)/Coordinated Universal Time (UTC)) of survey on/off effort and times (GMC/UTC) corresponding with PSO on/off effort;
9. Vessel location (decimal degrees) when survey effort began and ended and vessel location at beginning and end of visual PSO duty shifts;
10. Vessel location (decimal degrees) at 30-second intervals if obtainable from data collection software, otherwise at a practical regular interval;
11. Vessel heading (compass heading) and speed (knots) at beginning and end of visual PSO duty shifts and upon any change;
12. Water depths (meters) (if obtainable from data collection software);

13. Environmental conditions while on visual survey (at beginning and end of PSO shift and whenever conditions changed significantly), including BSS and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon;

14. Factors that may have contributed to impaired observations during each PSO shift change or as needed as environmental conditions changed (description) (e.g., vessel traffic, equipment malfunctions); and

15. Vessel/survey activity information (and changes thereof) (description), such as airgun array power output while in operation, number and volume of airguns operating in the array, tow depth of the array, and any other notes of significance (i.e., pre-start clearance, ramp-up, shutdown, testing, shooting, ramp-up completion, end of operations, streamers, etc.).

iii. Upon visual observation of any marine mammals, the following information must be recorded:

1. Sighting ID (numeric);

2. Watch status (sighting made by PSO on/off effort, opportunistic, crew, alternate vessel/platform);

3. Location of PSO/observer (description);

4. Vessel activity at the time of the sighting (e.g., deploying, recovering, testing, shooting, data acquisition, other);

5. PSO who sighted the animal/ID;

6. Time/date of sighting (GMT/UTC, MM/DD/YYYY);

7. Initial detection method (description);

8. Sighting cue (description);

9. Vessel location at time of sighting (decimal degrees);

10. Water depth (meters);

11. Direction of vessel's travel (compass direction);

12. Speed (knots) of the vessel from which the observation was made;

13. Direction of animal's travel relative to the vessel (description, compass heading);

14. Bearing to sighting (degrees);

15. Identification of the animal (e.g., genus/species, lowest possible taxonomic level, or unidentified) and the composition of the group if there is a mix of species;

16. Species reliability (an indicator of confidence in identification) (1=unsure/possible, 2=probable, 3=definite/sure, 9=unknown/not recorded);

17. Estimated distance to the animal (meters) and method of estimating distance;

18. Estimated number of animals (high/low/best) (numeric);

19. Estimated number of animals by cohort (adults, yearlings, juveniles, calves, group composition, etc.);

20. Description (as many distinguishing features as possible of each individual seen, including length, shape, color, pattern, scars or markings, shape and size of dorsal fin, shape of head, and blow characteristics);

21. Detailed behavior observations (e.g., number of blows/breaths, number of surfaces, breaching, spyhopping, diving, feeding, traveling; as explicit and detailed as possible; note any observed changes in behavior);

22. Animal's closest point of approach (CPA) (meters) and/or closest distance from any element of the airgun array;

23. Description of any actions implemented in response to the sighting (e.g., delays, shutdown, ramp-up) and time and location of the action.

24. Photos (Yes/No);

25. Photo Frame Numbers (list of numbers); and

26. Conditions at a time of sighting (e.g.. visibility, BSS).

6. Reporting

(a) SIO must submit a draft comprehensive report to NMFS on all activities and monitoring results within 90 days of the completion of the survey or expiration of the IHA, whichever comes sooner. A final report must be submitted within 30 days following resolution of any comments on the draft report. If no comments are received from NMFS within 30 calendar days of receipt of the draft report, the report shall be considered final. The draft report must include the following:

(i) Summary of all activities conducted and sightings of marine mammals near the activities;

(ii) Summary of all data required to be collected (see condition 5(c));

(iii) Full documentation of methods, results, and interpretation pertaining to all monitoring;

(iv) Summary of dates and locations of survey operations (including (1) the number of days on which the airgun array was active and (2) the percentage of time and total time the array was active during daylight vs. nighttime hours (including dawn and dusk)) and all marine mammal sightings (dates, times, locations, activities, associated survey activities);

(v) Geo-referenced time-stamped vessel tracklines for all time periods during which airguns were operating. Tracklines should include points recording any change in airgun status (e.g., when the airguns began operating, when they were turned off, or when they changed from full array to single gun or vice versa);

(vi) GIS files in ESRI shapefile format and UTC date and time, latitude in decimal degrees, and longitude in decimal degrees. All coordinates must be referenced to the WGS84 geographic coordinate system; and

(vii) Raw observational data.

(b) Reporting Injured or Dead Marine Mammals

(i) Discovery of Injured or Dead Marine Mammal – In the event that personnel involved in the survey activities covered by the authorization discover an injured or dead marine mammal, SIO must report the incident to the Office of Protected Resources (OPR) (PR.ITP.MonitoringReports@noaa.gov) as soon as feasible. The report must include the following information:

1. Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);

2. Species identification (if known) or description of the animal(s) involved;

3. Condition of the animal(s) (including carcass condition if the animal is dead);

4. Observed behaviors of the animal(s), if alive;

5. If available, photographs or video footage of the animal(s); and

6. General circumstances under which the animal was discovered.

(ii) Vessel Strike – In the event of a ship strike of a marine mammal by any vessel involved in the activities covered by the authorization, SIO must report the incident to OPR as soon as feasible. The report must include the following information:

1. Time, date, and location (latitude/longitude) of the incident;

2. Species identification (if known) or description of the animal(s) involved;

3. Vessel's speed during and leading up to the incident;

4. Vessel's course/heading and what operations were being conducted (if applicable);

5. Status of all sound sources in use;

6. Description of avoidance measures/requirements that were in place at the time of the strike and what additional measures were taken, if any, to avoid strike;

7. Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, visibility) immediately preceding the strike;

8. Estimated size and length of animal that was struck;

9. Description of the behavior of the marine mammal immediately preceding and following the strike;

10. If available, description of the presence and behavior of any other marine mammals immediately preceding the strike;

11. Estimated fate of the animal (e.g., dead, injured but alive, injured and moving, blood or tissue observed in the water, status unknown, disappeared); and

12. To the extent practicable, photographs or video footage of the animal(s).

7. This Authorization may be modified, suspended or revoked if the holder fails to abide by the conditions prescribed herein (including, but not limited to, failure to comply with monitoring or reporting requirements), or if NMFS determines: (1) the authorized taking is likely to have or is having more than a negligible impact on the species or stocks of affected marine mammals, or (2) the prescribed measures are likely not or are not effecting the least practicable adverse impact on the affected species or stocks and their habitat.

8. Renewals

On a case-by-case basis, NMFS may issue a one-time, one-year Renewal IHA following notice to the public providing an additional 15 days for public comments when (1) up to another year of identical, or nearly identical, activities are planned or (2) the specified activities would not be completed by the time this IHA expires and a Renewal would allow for completion of the activities, provided all of the following conditions are met:

(a) A request for renewal is received no later than 60 days prior to the needed Renewal IHA effective date (the Renewal IHA expiration date cannot extend beyond one year from expiration of this IHA).

(b) The request for renewal must include the following:

(i) An explanation that the activities to be conducted under the requested Renewal IHA are identical to the activities analyzed for this IHA, are a subset of the activities, or include changes so minor that the changes do not affect the previous analyses, mitigation and monitoring requirements, or take estimates (with the exception of reducing the type or amount of take).

(ii) A preliminary monitoring report showing the results of the required monitoring to date and an explanation showing that the monitoring results do not indicate impacts of a scale or nature not previously analyzed or authorized.

(c) Upon review of the request for Renewal, the status of the affected species or stocks, and any other pertinent information, NMFS determines that there are no more than minor changes in the activities, the mitigation and monitoring measures will remain the same and appropriate, and the findings made in support of this IHA remain valid.

DAMON RANDALL.KIMBERLY.BETH.1365821093 Digitally signed by DAMON RANDALL.KIMBERLY.BETH.1365821093 Date: 2024.12.11 08:49:59 -05'00'

Kimberly Damon-Randall,

Director, Office of Protected Resources,

National Marine Fisheries Service

Table 1. Authorized take numbers, by species

Species	Authorized Level B take
Humpback whale	10
Bryde's whale	3
Minke whale	2
Fin whale	1
Sei whale	2
Blue whale	1
Omura's whale	1
Sperm whale	25
Longman's beaked whale	3
Cuvier's beaked whale	41
Blainevelle's beaked whale	8
Beaked whales[1]	21
Risso's dolphin	27
Rough-toothed dolphin	20
Bottlenose dolphin	9
Pantropical spotted dolphin	125
Spinner dolphin	98
Striped dolphin	65
Frasier's dolphin	28
Short-finned pilot whale	23
Melon-headed whale	95
False killer whale	10
Pygmy killer whale	6
Killer whale	5
Pygmy sperm whale	19
Dwarf sperm whale	48

[1] Includes ginkgo-toothed beaked whale and Deraniyagala's beaked whale

Table 2. Modeled Radial Distances (m) to Isopleths Corresponding to Level A and Level B Harassment Thresholds.

Airgun configuration	Level A harassment zone (m)			Level B harassment zone (m)
	LF cetaceans	MF cetaceans	HF cetaceans	
4 airgun array (420 in^3)	38.5	0	85.8	1,408

Republic of the Marshall Islands
MINISTRY OF FOREIGN AFFAIRS AND TRADE

P.O. Box 1349 | Majuro, MH 96960 | Phone: (692) 625-3181

US/66-24

The Ministry of Foreign Affairs and Trade of the Republic of the Marshall Islands presents its compliments to the Embassy of the United States of America and, with reference to the latter's ***Note No. 24-035***, has the honor to convey grant authorization from the Government of the Republic of the Marshall Islands concerning the JQZ-Phoeniz-MCS Research Vessel to conduct marine scientific study in the RMI.

The Ministry has the further honor to advise that the vessel is granted permission on the condition that a copy of the report and all data and other information from the vessel in RMI waters is forwarded to the Ministry and Marshall Islands Resources Authority (MIMRA). A copy of the report and necessary data will also need to be provided to the Applied Geoscience and Technology Division of the Secretariat of the Pacific Community (SPC) for input in the library database.

The Ministry of Foreign Affairs and Trade of the Republic of the Marshall Islands avails itself of this opportunity to renew to the Embassy of the United States of America the assurances of its highest consideration.

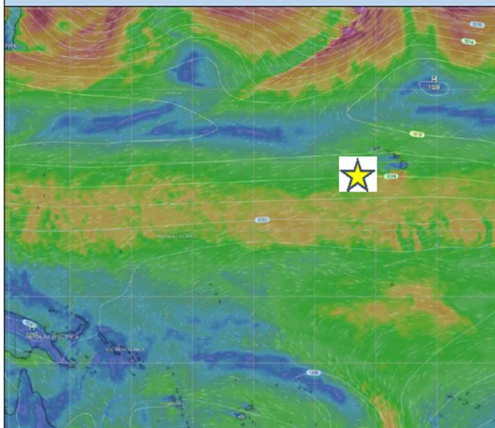
16 July 2024

Embassy of the United States of America
Majuro, REPUBLIC OF THE MARSHALL ISLANDS

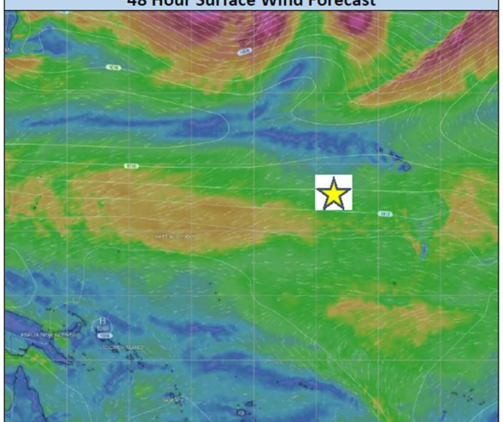
A.5 Weather Reports

Saturday December 14th 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 80°F Low: 75°F
Current Air Temp: 77.3°F (0600)
Current Sea Temp: 79.8°F
Est. Sunrise: 07:13 - Est. Sunset: 18:08

Synopsis: A cold front is expected to weaken, stall, and dissipate near Oahu tonight. A passing front far north of the islands will push a weak ridge across the area this weekend, maintaining light to gentle trade winds. High pressure building north-northeast of the area next week will tighten the pressure gradient across the islands, producing fresh to strong trade winds.

Transit to Survey Line

Today - Saturday – December 14th:
Day: ENE winds 16 to 22 kt. ESE swell 5 to 7 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the high 70's.
Evening: ENE shifting to E'ly winds 18 to 25 knots.
Sunday – December 15th:
Day: E'ly winds 14 to 19 kt. ESE swell 5 to 8 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the high 70's.
Evening: ENE winds 11 to 16 knots. Cloudy with a chance for rain.
Monday - December 16th:
Day: ENE winds 12 to 17 kt. ESE swell 5 to 8 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the high 70's.
Evening: ENE winds 12 to 17 knots.
Tuesday - December 17th:
Day: ENE winds 16 to 22 kt. ESE swell 5 to 8 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the high 70's.
Evening: ENE winds 18 to 25 knots.

Survey Start Location – ECMWF Model

Monday 16								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	80°	83°	81°	82°	83°	83°	83°
Rain in	0.04	0.16	0.05	0.06	0.05	0.02	0.04	0.09
Wind kt	18	16	18	17	15	18	18	19
Wind gusts kt	24	24	24	26	26	24	26	27
Waves ft	7	7	7	8	7	7	8	8
Swell ft	4	5	5	4	4	4	4	5
Swell period	8.7	8.9	11.3	10.3	8.4	8.8	9.9	11.4

Tuesday 17								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	81°	82°	82°	82°	83°	82°	82°
Rain in	0.03	0.05	0.07	0.09	0.15	0.04	0.09	0.18
Wind kt	19	20	22	20	21	22	23	22
Wind gusts kt	27	29	30	31	30	31	31	32
Waves ft	8	8	9	9	9	9	9	9
Swell ft	5	5	4	4	4	4	4	4
Swell period	11.3	11	10.8	7.2	10.6	10.5	10.4	10

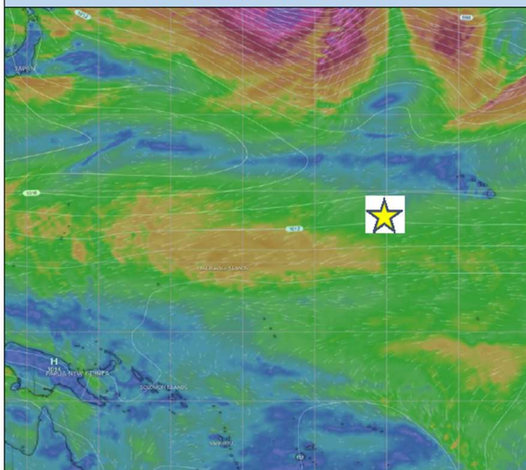
Wednesday 18								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	82°	82°	81°	81°	81°	81°	81°
Rain in	0.53	0.4	0.26	0.37	0.67	0.29	0.19	0.12
Wind kt	22	22	25	21	20	21	17	16
Wind gusts kt	32	32	34	34	31	30	27	28
Waves ft	10	10	10	10	10	10	10	10
Swell ft	4	4	3	4	5	7	7	6
Swell period	9.9	9.9	13.2	12.9	11.9	11.8	7.8	7.9

Thursday 19								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	81°	80°	80°	81°	82°	80°
Rain in	0.09	0.34	0.25	0.17	0.16	0.13	0.01	0.2
Wind kt	15	14	12	14	12	13	15	14
Wind gusts kt	25	23	22	22	23	23	20	21
Waves ft	9	9	9	9	8	8	8	8
Swell ft	6	6	6	5	6	6	4	5
Swell period	8.4	8.6	12.3	12.1	7.4	11.8	7	7.1

Friday 20							
Hours	2	5	8	11	14	17	23
	15Z	18Z	21Z	00Z	03Z	06Z	12Z
Temperature °F	81°	81°	82°	82°	82°	83°	82°
Rain in	0.04	0.07	0.03	0.09	0.01	0.06	0.13
Wind kt	14	15	15	16	14	14	17
Wind gusts kt	22	22	23	24	21	19	23
Waves ft	8	8	7	7	7	7	7
Swell ft	4	4	4	5	4	4	5
Swell period	7.1	7.2	9.3	9.1	7.9	9.9	7.6

Sunday December 15th 2024

24 Hour Surface Wind Forecast	Weather Forecast



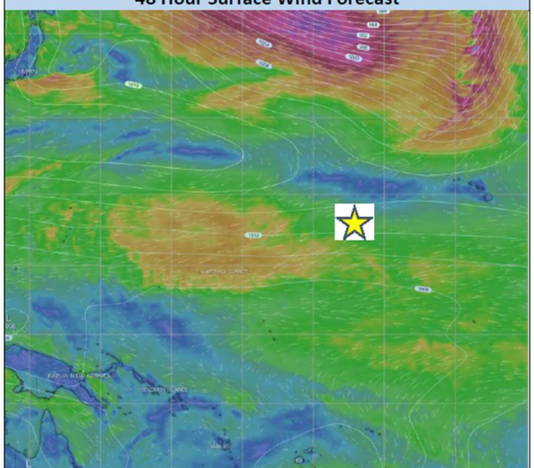
Air Temp: High 80°F Low: 75°F
Current Air Temp: 78.6°F (0600)
Current Sea Temp: 79.6°F
Est. Sunrise: 07:26 - Est. Sunset: 18:25

Synopsis & Notes: As continue our transit to the Southern end of our Op Area we'll be getting further along into the trade winds. Winds and seas are expected to build through the coming days, though should remain on our stern throughout the week.

Transit to Survey Line

Today - Sunday – December 15th:
Day: ENE winds 15 to 25 kt. ESE combined seas and swell 5 to 8 ft with occasional larger sets. Mostly cloudy through the morning. Temperatures in the high 70's.
Evening: ENE winds 18 to 25 knots.
Monday – December 16th:
Day: E'ly winds 14 to 19 kt. E'ly combined seas and swell 5 to 8 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the high 70's.
Evening: ENE winds 14 to 19 knots. Cloudy with a chance for rain.
Tuesday - December 17th:
Day: ENE winds 12 to 17 kt. ESE swell 5 to 8 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the high 70's.
Evening: ENE winds 12 to 17 knots. Winds and seas to build throughout the night.
Wednesday - December 18th:
Day: ENE winds 20 to 25 kt. ENE sea and swell 7 to 10 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the high 70's.
Evening: ENE winds 20 to 28 knots.

48 Hour Surface Wind Forecast



Survey Start Location – ECMWF Model

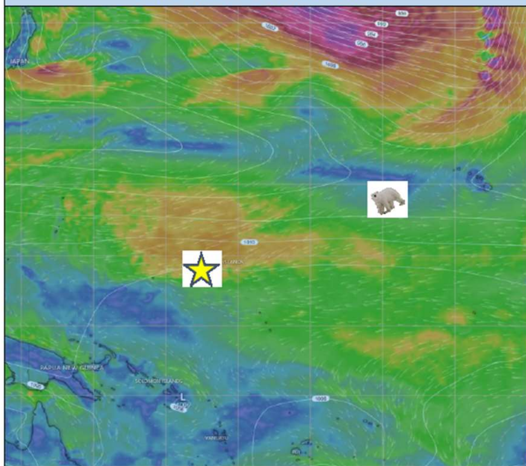
		Tuesday 17								Wednesday 18							
Hours		2	5	8	11	14	17	20	23	2	5	8	11	14	17	20	23
		15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature	°F	81°	80°	82°	83°	82°	82°	81°	81°	81°	81°	82°	81°	81°	81°	82°	81°
Rain	in	0.03	0.05	0.05	0.06	0.02	0.08	0.13	0.15	0.24	0.29	0.24	0.32	0.21	0.22	0.09	0.28
Wind	kt	18	18	21	22	20	22	20	24	22	24	21	23	20	21	21	21
Wind gusts	kt	27	26	30	31	29	31	31	32	32	32	31	33	32	32	28	30
Wind dir.																	
Waves	ft	8	8	8	9	9	9	9	9	10	10	10	10	10	10	10	10
Swell	ft	5	5	4	4	4	4	5	4	4	3	4	4	6	6	6	5
Swell period		11.2	11	10.8	10.6	7.4	10.3	10.2	10	9.8	9.9	13.6	13.5	12.6	12.6	12.7	7.9

		Thursday 19								Friday 20							
Hours		2	5	8	11	14	17	20	23	2	5	8	11	14	17	20	23
		15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature	°F	81°	80°	81°	80°	81°	81°	80°	79°	80°	79°	81°	81°	82°	83°	84°	82°
Rain	in	0.15	0.1	0.08	0.19	0.49	0.11	0.22	0.4	0.13	0.22	0.1	0.19			0.01	0.03
Wind	kt	20	20	18	16	17	16	16	12	13	15	15	13	13	15	16	15
Wind gusts	kt	30	27	26	27	24	24	23	22	20	24	25	24	17	20	21	22
Wind dir.																	
Waves	ft	10	9	9	9	8	8	8	8	8	8	8	8	7	7	7	8
Swell	ft	6	5	6	6	6	6	5	5	5	5	6	6	5	4	4	4
Swell period		12.6	11.9	12.4	8.2	7.9	11.9	7.7	7.2	7.2	7.2	7.6	7.3	7.6	8.2	8.3	11.8

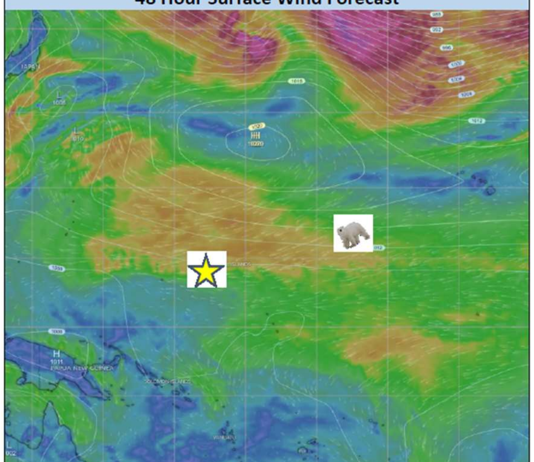
		Saturday 21						
Hours		2	5	8	11	14	17	23
		15Z	18Z	21Z	00Z	03Z	06Z	12Z
Temperature	°F	81°	81°	83°	83°	83°	84°	83°
Rain	in	0.13	0.07	0.01	0.01	0.01	0.02	0.09
Wind	kt	18	18	17	21	18	20	18
Wind gusts	kt	24	25	24	27	27	29	27
Wind dir.								
Waves	ft	8	8	8	8	8	9	9
Swell	ft	4	5	5	5	5	5	5
Swell period		11.9	7.8	11.5	11.4	11.2	6.9	10.8

Monday December 16th 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 80°F Low: 75°F
Current Air Temp: 78.3°F (0600)
Current Sea Temp: 80.4°F
Est. Sunrise: 06:41 - Est. Sunset: 17:45

Synopsis & Notes: As the polar bear to the left continue to the South West we're looking to get several weather changes in the coming days. Today into tomorrow should be relatively similar conditions. Tuesday evening and onward we're going to be expecting increased wind and waves coming out of the NE. Additionally the ESE swell looks like it will begin to get countered with 5-8 ft mixed WNW and ENE swells come Thursday, deteriorating conditions further.

Transit to Survey Line

Today - Monday – December 16th:
Day: East winds 12 to 17 kt. Seas 3 to 5 ft. ESE swell 5 to 7 ft with occasional larger sets. Partly cloudy through the morning. Temperatures in the high 70's.
Evening: East winds 18 to 25 knots. Seas 3 to 5 ft. ESE swell 5 to 7 ft with occasional larger sets.
Tuesday – December 17th:
Day: NE winds 14 to 19 kt. ENE seas 4 to 6 ft w/ mixed Northly swell 5 to 8 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the high 70's.
Evening: NE winds 17 to 22 knots. Winds and seas to build throughout the night.
Wednesday - December 18th:
Day: ENE winds 22 to 30 kt. Waves 8 to 10 feet. Mixed Northly swell 6 to 9 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the low 80's.
Evening: ENE winds 22 to 30 knots. Winds and seas to continue building throughout the night.
Thursday - December 19th:
Day: ENE winds 22 to 30 kt. ENE sea and swell 8 to 12 ft with possible larger sets. Mostly cloudy through the day. Temperatures in the high 70's.
Evening: ENE winds 20 to 28 knots. Seas 7 to 12 ft

Survey Start Location (Gold Star Above) – ECMWF Model

Wednesday 18								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	82°	82°	82°	83°	81°	82°	81°
Rain in	0.48	0.14	0.07	0.22	0.07	0.37	0.3	0.22
Wind kt	21	21	23	20	21	20	20	19
Wind gusts kt	31	32	31	33	31	30	29	29
Waves ft	9	9	9	10	10	10	10	10
Swell ft	4	4	3	4	5	5	6	7
Swell period	10	9.9	13.9	13.3	7.8	12.1	13.2	7.6

Thursday 19								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	80°	81°	81°	82°	82°	83°
Rain in	0.46	0.28	0.58	0.14	0.08	0.17	0.04	0.06
Wind kt	18	17	17	18	16	17	19	17
Wind gusts kt	27	28	27	26	26	23	25	25
Waves ft	10	10	9	9	9	9	9	9
Swell ft	7	6	7	7	5	6	4	6
Swell period	13	12.8	12.6	12.4	12.3	12.1	7.5	11.8

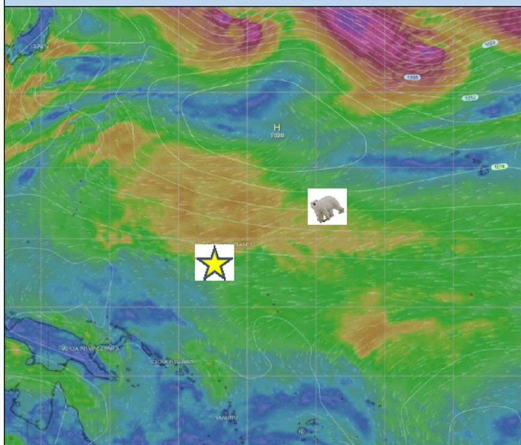
Friday 20								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	80°	82°	81°	81°	82°	82°	82°
Rain in	0.25	0.11	0.1	0.14	0.28	0.02	0.14	0.07
Wind kt	17	17	17	15	11	13	14	18
Wind gusts kt	25	25	26	26	24	19	22	24
Waves ft	9	8	8	8	8	8	8	8
Swell ft	6	6	5	6	5	5	4	4
Swell period	11.7	7.6	10.5	7.7	7.7	8	8.5	11.5

Saturday 21								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	82°	80°	82°	83°	83°	84°	82°
Rain in	0.02	0.1	0.2	0.07	0.02	0.04	0.04	0.09
Wind kt	19	20	21	19	18	19	21	17
Wind gusts kt	25	26	27	29	25	25	27	27
Waves ft	8	8	8	9	9	8	8	8
Swell ft	5	5	4	4	5	5	4	5
Swell period	8.9	8.8	7.3	7.2	11.4	11.3	10.7	11.2

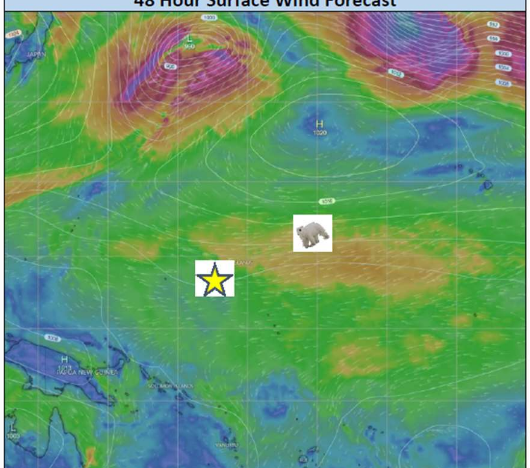
Sunday 22							
Hours	2	5	8	11	14	17	23
	15Z	18Z	21Z	00Z	03Z	06Z	12Z
Temperature °F	82°	83°	81°	84°	83°	83°	83°
Rain in	0.02	0.01	0.13	0.02	0.01	0.01	0.01
Wind kt	19	20	19	21	21	21	20
Wind gusts kt	26	26	27	27	27	28	28
Waves ft	8	8	8	8	9	9	9
Swell ft	6	5	4	4	3	3	3
Swell period	8.4	6.7	10.3	12	10.1	9.8	13.3

Tuesday December 17th 2024

24 Hour Surface Wind Forecast	Weather Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 80°F Low: 75°F
Current Air Temp: 78.8°F (0600)
Current Sea Temp: 80.9°F
Est. Sunrise: 06:54 - Est. Sunset: 18:03

Synopsis & Notes: As the polar bear to the left continues sailing to the South West we're still looking to see several weather changes in the coming days. Today should be relatively similar conditions as we've been seeing, though this evening and onward we're going to be expecting increased wind and waves coming out of the NE. Additionally the ESE swell looks like it will begin to get countered with 5-8 ft mixed WNW swells come Thursday, deteriorating conditions further. Conditions look to remain heightened until Saturday.

Transit to Survey Line

Today - Tuesday – December 17th:
Day: NE winds 14 to 19 kt. Seas 3 to 5 ft. ESE swell 5 to 7 ft with occasional larger sets. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: NE winds 17 to 22 knots. Seas 3 to 5 ft. ESE swell 5 to 8 ft with occasional larger sets. Winds and seas to build throughout the night.
Wednesday – December 18th: DRILLS
Day: NE winds 20 to 25 kt. ENE seas 7 to 10 ft w/ mixed Northly swell 5 to 8 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the high 70's.
Evening: NE winds 25 to 30 knots. ENE seas 8 to 10 ft. Winds and seas continuing to build.
Thursday - December 19th: STREAMER TESTING
Day: ENE winds 25 to 30+ kt. Waves 8 to 12 ft. Mixed Northly swell 6 to 9 ft with occasional larger sets. Mostly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 25 to 30 knots. Conditions expected to
Friday - December 20th: TIME SHIFT @ 0200LT, UTC -11 → -12
Day: ENE winds 22 to 30 kt. ENE sea and swell 7 to 11 ft with possible larger sets. Mostly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 20 to 28 knots. Seas 6 to 10 ft

Survey Start Location (Gold Star Above) – ECMWF Model

Thursday 19								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	80°	81°	80°	80°	80°	83°	83°	80°
Rain in	0.3	0.16	0.17	0.29	0.19	0.01	0.04	0.03
Wind kt	17	18	19	19	17	19	18	18
Wind gusts kt	25	25	27	28	26	26	25	24
Waves ft	9	9	9	9	9	9	9	8
Swell ft	5	5	6	6	5	5	5	5
Swell period	8.1	8.2	12.6	12.5	7.5	12.1	7.4	7.6

Friday 20								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	80°	80°	81°	81°	81°	82°	81°	82°
Rain in	0.02	0.04	0.08	0.18	0.13	0.03	0.09	0.04
Wind kt	20	15	17	16	12	17	16	19
Wind gusts kt	25	27	25	28	23	22	23	25
Waves ft	8	8	8	8	8	8	8	8
Swell ft	4	5	5	6	7	5	4	4
Swell period	7.5	7.2	7.9	7.9	7.3	8.3	8.6	12.6

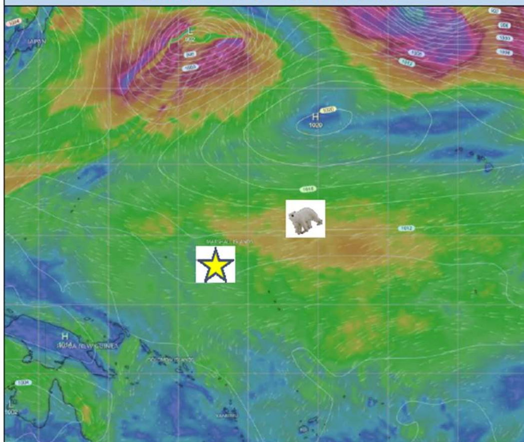
Saturday 21								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	82°	83°	83°	83°	83°	84°	83°
Rain in		0.01	0.01	0.02	0.01	0.02	0.01	0.03
Wind kt	20	19	22	21	20	19	20	20
Wind gusts kt	26	26	29	29	27	27	26	27
Waves ft	8	8	8	8	9	9	9	8
Swell ft	4	5	4	4	5	5	5	5
Swell period	7.6	9.1	11.7	11.6	11.5	11.4	11.4	11.3

Sunday 22								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	82°	82°	83°	83°	84°	84°	84°
Rain in	0.03	0.06	0.08	0.01	0.01	0.01		
Wind kt	19	19	19	22	21	21	21	20
Wind gusts kt	27	26	28	28	28	27	27	27
Waves ft	8	8	8	9	9	9	9	9
Swell ft	5	5	5	5	5	3	3	3
Swell period	11.3	11.3	11.3	11.4	11.5	13.1	13.2	13.2

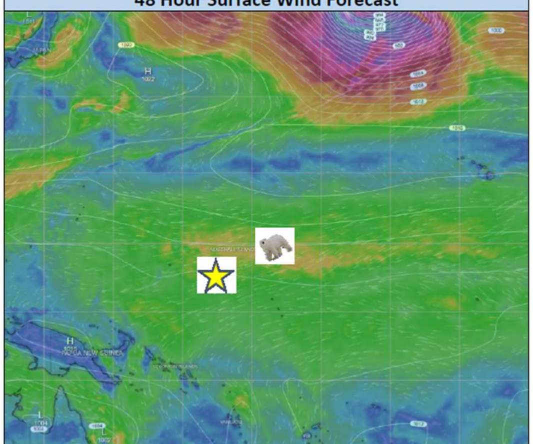
Monday 23							
Hours	2	5	8	11	14	17	23
	15Z	18Z	21Z	00Z	03Z	06Z	12Z
Temperature °F	84°	83°	84°	84°	82°	83°	82°
Rain in			0.02	0.03	0.03	0.06	0.09
Wind kt	21	22	21	20	19	19	19
Wind gusts kt	27	28	28	27	29	28	28
Waves ft	9	9	9	9	9	9	10
Swell ft	3	4	4	4	5	5	4
Swell period	13.3	11.9	12	12	13.2	13	11.9

Wednesday December 18th 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

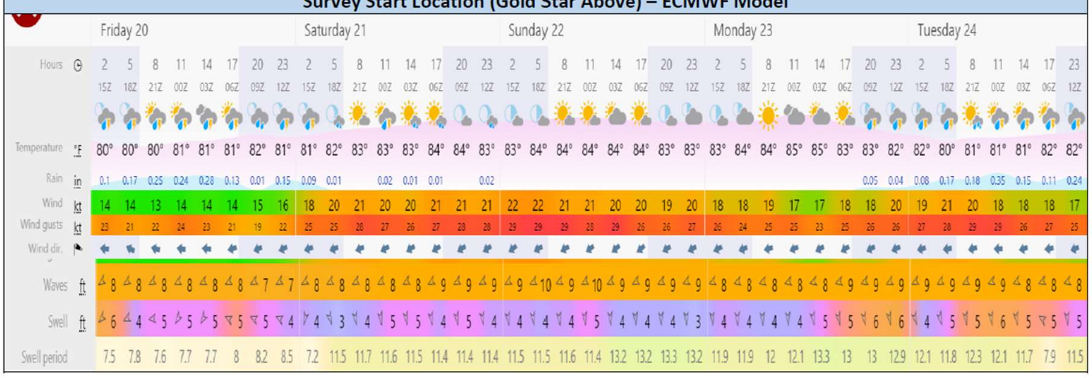
Air Temp: High 80°F Low: 75°F
Current Air Temp: 80.3°F (0600)
Current Sea Temp: 81.2°F
Current MMR Temp: 107.6°F
Est. Sunrise: 07:09 - Est. Sunset: 18:24

Synopsis & Notes: Today we're beginning to see the new swell coming out of the North. Conditions have remained steady longer than expected, though throughout today and this evening we're still expecting increased wind and waves coming out of the NE building on top of the existing ESE swell we've been dealing with. For now the weather looks to peak midday tomorrow and then slowly wain through to the weekend.

<u>Transit to Survey Line</u>

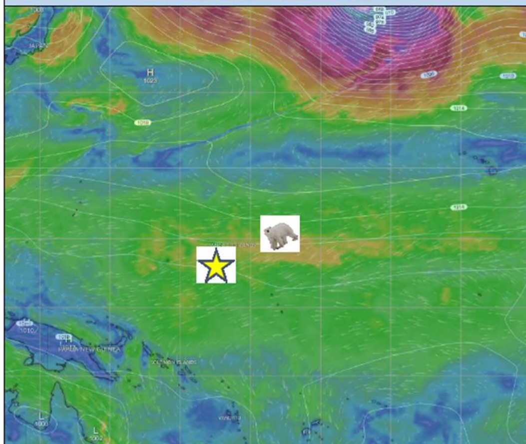
Today - Wednesday – December 18th: DRILLS
Day: NE winds 18-25 kt. Seas 5-7 ft. ESE swell 3-5 ft. N'y swell building to 5-7 ft with occasional larger sets. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: NE winds 25-30 knots. Seas 8-10 ft. NNW swell 5-8 ft with occasional larger sets. Winds and seas to build throughout the night.
Thursday – December 19th: STREAMER TESTING
Day: NE winds 25-30+ kt. ENE seas 8-12 ft w/ mixed Northly swell 5-8 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the high 70's.
Evening: NE winds 20-25 knots. ENE seas 8-11 ft. Winds and seas continuing to build.
Friday - December 20th: TIME SHIFT @ 0200LT, UTC -11 → -12
Day: ENE winds 20-25 kt. Waves 8-11 ft. Mixed Northly swell 5-8 ft with occasional larger sets. Mostly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 20-25 kt. Seas 8-10 ft with mixed Northly swell 5-8 ft
Saturday - December 21th:
Day: ENE winds 17-22 kt. ENE seas 7-9 ft with possible larger sets. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Start Location (Gold Star Above) – ECMWF Model

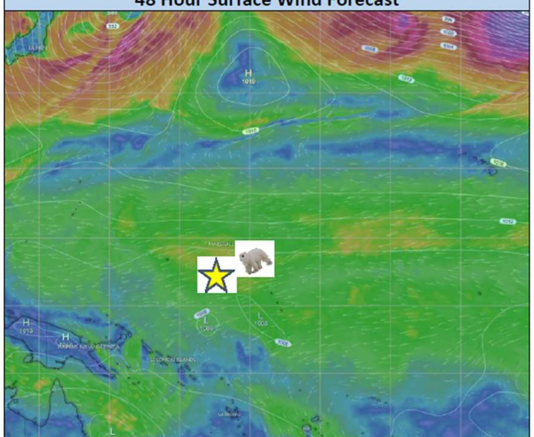


Thursday December 19th 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 80°F Low: 75°F
Current Air Temp: 80.1°F (0600)
Current Sea Temp: 81.6°F
Current MMR Temp: 108.0°F
Est. Sunrise: 07:22 - Est. Sunset: 18:43

Synopsis & Notes: With conditions having remained steady longer than expected it looks like the winds and seas finally caught up with us. We continue to have a long period swell coming out of the North. Winds have come up into the mid 20 kts and are expected with increased gusts throughout the day. This afternoon into the evening should be the worst of it, though conditions are expected to remain heighten and seas likely to become confused in the days to follow. Looking ahead to the beginning of our survey, similar conditions to what we'll see in the next couple days are to be expected.

Transit to Survey Line

Today - Thursday – December 19th: STREAMER TESTING
Day: NE winds 25-30 kt. Seas 8-12 ft. ESE swell 3-5 ft. Long period N'ly swell building to 5-8 ft with occasional larger sets. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: ENE winds 20-25 knots. Seas 8-11 ft. NxW swell 5-8 ft with occasional larger sets.
Friday– December 20th: TIME SHIFT @ 0200LT, UTC -11 → -12
Day: ENE winds 20-25 kt. ENE seas 8-10 ft w/ mixed but predominantly LP Northly swell 5-8 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the high 70's.
Evening: NE winds 20-25 knots. ENE seas 8-10 ft.
Saturday - December 21st:
Day: ENE winds 17-22 kt. Seas 8-10 ft. Mixed but predominantly LP Northly swell 5-8 ft with occasional larger sets. Partly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 18-23 kt. Seas 8-10 ft
Sunday - December 22nd:
Day: ENE winds 19-24 kt. ENE seas 7-9 ft. Mixed swell 5-8 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Start Location (Gold Star Above) – ECMWF Model

Saturday 21								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	80°	81°	82°	83°	84°	84°	84°
Rain in	0.02	0.35	0.17					
Wind kt	18	12	19	20	21	21	21	21
Wind gusts kt	23	25	25	25	27	28	28	28
Waves ft	7	7	7	7	8	8	9	9
Swell ft	5	6	5	5	4	4	4	5
Swell period	9.2	8.3	11.9	11.7	11.6	11.5	11.4	11.4

Sunday 22								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	83°	84°	83°	84°	84°	82°
Rain in					0.01			0.02
Wind kt	21	20	20	20	20	20	21	19
Wind gusts kt	27	27	26	26	27	27	27	27
Waves ft	9	9	9	9	9	9	9	9
Swell ft	4	5	5	5	4	4	4	4
Swell period	11.5	11.5	11.6	11.7	11	10	15.2	14.9

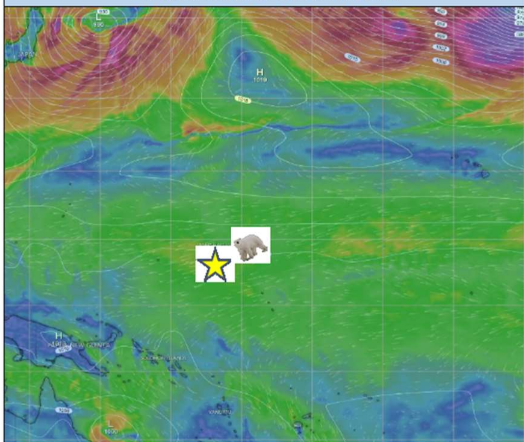
Monday 23								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	83°	84°	85°	84°	85°	82°
Rain in	0.01	0.01						0.05
Wind kt	19	20	21	20	19	17	19	19
Wind gusts kt	26	26	27	27	26	25	25	26
Waves ft	9	9	9	9	9	9	9	9
Swell ft	4	4	4	4	5	5	6	4
Swell period	14.5	14.2	13.8	13.2	13.2	13.1	13	12.3

Tuesday 24								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	82°	82°	82°	82°	82°	82°	81°
Rain in	0.07	0.17	0.43	0.13	0.11	0.28	0.24	0.21
Wind kt	20	18	19	21	20	19	18	16
Wind gusts kt	27	28	29	30	30	30	28	29
Waves ft	9	9	9	9	9	9	9	9
Swell ft	4	5	5	6	5	5	5	6
Swell period	12	12.4	12.2	12	11.8	11.7	11.5	11.6

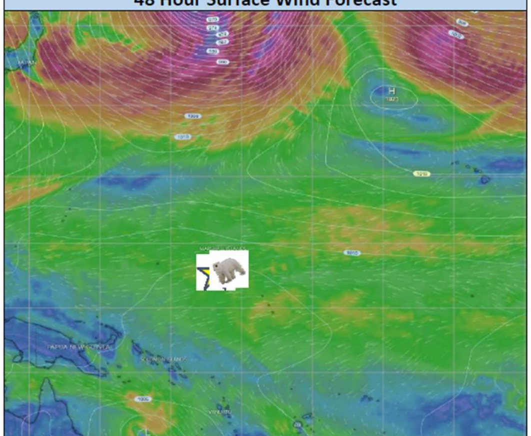
Wednesday 25							
Hours	2	5	8	11	14	17	23
	15Z	18Z	21Z	00Z	03Z	06Z	12Z
Temperature °F	81°	81°	81°	81°	81°	81°	82°
Rain in	0.21	0.19	0.18	0.17	0.13	0.12	0.24
Wind kt	15	18	16	18	17	15	16
Wind gusts kt	28	28	27	29	25	26	26
Waves ft	9	8	8	8	8	8	8
Swell ft	5	5	4	5	6	6	4
Swell period	11.6	10.6	11.5	11.4	8	8.2	14.9

Friday December 20th 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 80°F Low: 75°F
Current Air Temp: 80.7°F (0600)
Current Sea Temp: 82.4°F
Current MMR Temp: 108.5+°F
Est. Sunrise: 06:31 - Est. Sunset: 17:55

Synopsis & Notes: Looks like we've made it through of the worst weather expected for the next few days. Our time testing the seismic gear yesterday seemed to allowed for the area of stronger winds to shift and dissipate for us before we continued further to the southeast into it. Over the last few days of transit before we reach the survey line winds and seas are expected to remain relatively stable at the current state, with potential of easing. Additionally, Saturday on we may receive some protection from these NE'ly seas from the Marshal Islands.

Transit to Survey Line

Today - Friday – December 20th: TIME HAS SHIFTED - UTC -11 → -12
Day: ENE winds 17-24 kt. Seas 5-7 ft. ESE swell 5-8 ft. Long period N'ly swell 4-6 ft. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: ENE winds 17-23 knots. Seas 5-7 ft. ESE swell 5-8 ft with occasional larger sets.
Saturday – December 21st:
Day: ENE winds 15-20 kt. ENE seas 5-7 ft. ESE swell 5-8 ft. Northly swell 4-6 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the low 80's.
Evening: ENE winds 15-20 knots. ENE seas 5-7 ft. ESE swell 5-7 ft
Sunday - December 22nd:
Day: ENE winds 15-20 kt. ENE seas 4-6 ft. ESE swell 5-7 ft with occasional larger sets. Partly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 15-20 kt. Seas 4-6 ft.
Monday - December 23rd: AM Arrival to OP Area
Day: ENE winds 15-20 kt. ENE seas 5-7 ft. Mixed swell 5-7 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Start Location (Gold Star Above) – ECMWF Model

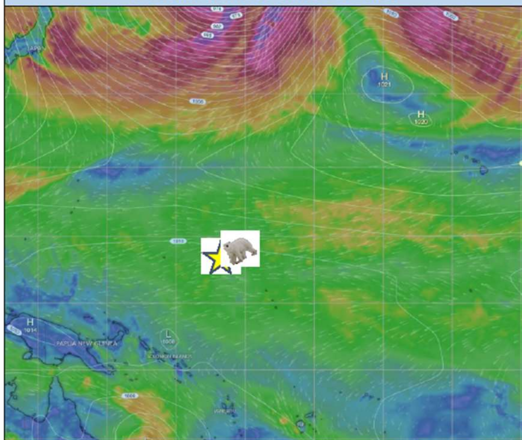
	Sunday 22								Monday 23							
Hours	2	5	8	11	14	17	20	23	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	84°	84°	83°	84°	84°	83°	83°	83°	83°	84°	84°	84°	85°	85°
Rain in									0.02							
Wind kt	20	20	19	19	19	18	18	18	17	17	18	18	18	18	19	19
Wind gusts kt	26	26	26	26	25	24	24	24	24	23	23	24	23	24	25	25
Waves ft	9	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Swell ft	5	4	4	5	5	5	5	5	5	5	5	5	4	4	5	5
Swell period	11.3	11.4	11.4	8.6	8.5	8.6	8.6	8.7	8.7	8.8	8.9	8.7	10.3	10.4	13	12.8

	Tuesday 24								Wednesday 25							
Hours	2	5	8	11	14	17	20	23	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	82°	81°	81°	82°	83°	83°	82°	81°	81°	81°	81°	80°	81°	81°	82°
Rain in	0.01	0.03	0.18	0.15	0.13	0.07	0.07	0.14	0.33	0.09	0.15	0.22	0.16	0.19	0.22	0.04
Wind kt	19	18	21	20	18	19	21	20	16	17	18	17	20	16	18	17
Wind gusts kt	25	26	29	29	28	29	29	29	28	27	28	28	27	27	25	25
Waves ft	9	9	9	9	9	9	9	9	9	9	9	9	9	8	8	8
Swell ft	5	5	5	6	6	5	5	4	4	4	4	6	4	5	5	6
Swell period	12.6	12.4	12.2	11.9	11.8	11.6	11.5	11.5	11.3	10.5	10.5	11.3	11.3	11.2	11.1	8.1

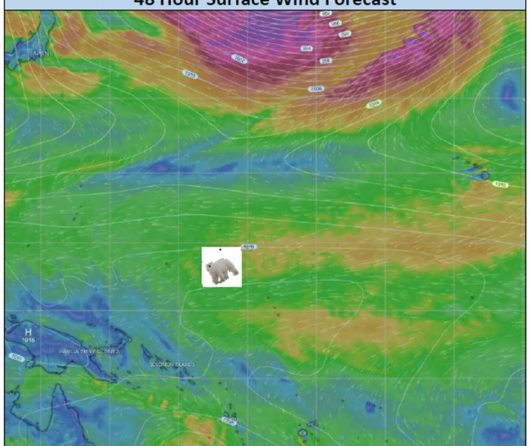
	Thursday 26						
Hours	2	5	8	11	14	17	23
	15Z	18Z	21Z	00Z	03Z	06Z	12Z
Temperature °F	82°	82°	81°	81°	81°	81°	82°
Rain in	0.14	0.16	0.22	0.13	0.08	0.19	0.4
Wind kt	18	15	19	19	17	19	16
Wind gusts kt	26	24	26	26	26	29	28
Waves ft	8	8	9	9	9	9	9
Swell ft	7	5	6	5	7	6	6
Swell period	7.9	8.5	8.2	8.1	13.3	11.8	12.8

Saturday December 21st 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 80°F Low: 75°F
Current Air Temp: 81.6°F (0600)
Current Sea Temp: 82.6°F
Current MMR Temp: 107.6+°F
Est. Sunrise: 06:42 - Est. Sunset: 18:13

Synopsis & Notes: As we come to the last few days of our transit to the Op Area conditions are remain relatively stable. Sustained winds 15 to 20 knots. We'll continue to see an ESE swell around 5 to 7 feet as well an underlying Northerly swell around 4 to 6 feet. As we begin our survey line, winds and seas are predicted to remain similar to the conditions we're currently seeing. A North/Northwesterly swell is expected to become more prominent as the week goes on.

Transit to Survey Line

Today - Saturday – December 21st:
Day: ENE winds 15-20 kt, gusts to 25 kt. ENE seas 5-7 ft. ESE swell 5-8 ft. Northerly swell 4-6 ft. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: ENE winds 15-20 kt. Seas 4-6 ft. ESE swell 5-8 ft with occasional larger sets.
Sunday – December 22nd:
Day: ENE winds 15-20 kt. ENE seas 4-6 ft. ESE swell 5-7 ft. Northly swell 4-6 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the low 80's.
Evening: ENE winds 15-20 knots. ENE seas 4-6 ft. ESE swell 5-7 ft
Monday - December 23rd: AM Arrival to OP Area
Day: NE winds 15-20 kt, gusts to 25. ENE seas 4-6 ft. ESE swell 5-7 ft with occasional larger sets. Partly cloudy through the day. Temperatures in the low 80's.
Evening: NE winds 15-20 kt. Seas 4-6 ft.
Tuesday - December 24th: Christmas Eve
Day: ENE winds 15-20 kt. ENE seas 4-6 ft. Mixed swell 5-7 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Start Location (Gold Star Above, Under the Bear) – ECMWF Model

Sunday 22

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	83°	83°	83°	83°	83°	83°
Rain in								
Wind kt	18	20	19	17	15	15	17	16
Wind gusts kt	26	26	26	25	23	20	22	22
Waves ft	9	9	9	8	8	7	7	7
Swell ft	5	4	4	6	6	5	5	5
Swell period	11.3	11.3	11.3	8.4	8.3	8.4	8.7	8.8

Monday 23

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	83°	83°	83°	84°	84°	82°
Rain in								0.02
Wind kt	14	14	16	15	14	15	16	16
Wind gusts kt	21	19	21	21	20	20	20	23
Waves ft	7	7	7	7	7	7	7	7
Swell ft	5	5	5	5	5	4	4	4
Swell period	8.6	8.8	9	8.6	8.1	8.7	8.6	13

Tuesday 24

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	80°	80°	81°	81°	84°	84°	84°
Rain in	0.02	0.03	0.17	0.15	0.09	0.04		
Wind kt	17	19	17	18	21	18	20	21
Wind gusts kt	24	25	28	27	28	28	26	27
Waves ft	8	8	8	8	8	8	9	9
Swell ft	5	5	5	5	4	5	5	5
Swell period	12.7	12.5	12.3	12.1	11.9	11.8	11.7	11.8

Wednesday 25

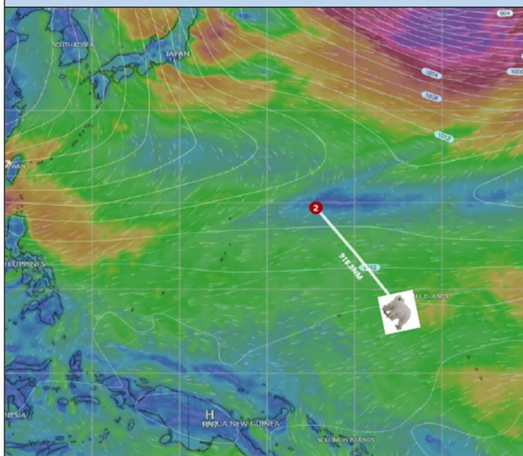
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	84°	82°	82°	81°	82°	82°
Rain in				0.03	0.04	0.04	0.04	0.08
Wind kt	19	19	18	19	17	18	17	15
Wind gusts kt	27	26	25	26	27	26	26	26
Waves ft	9	9	9	9	9	8	8	8
Swell ft	4	4	5	6	6	5	5	5
Swell period	10.6	10.6	11.7	8.2	8.2	8.1	11.2	11.1

Thursday 26

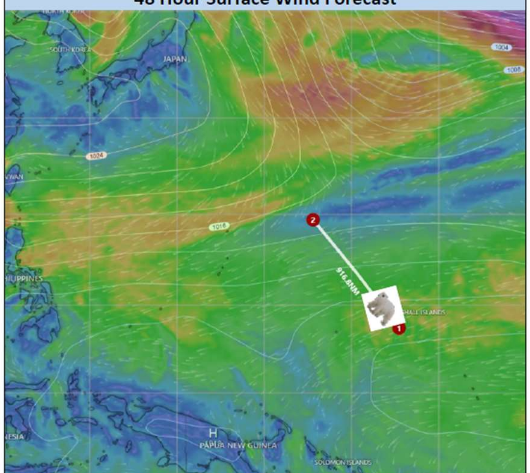
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	81°	80°	81°	81°	81°	81°
Rain in	0.32	0.16	0.3	0.11	0.21	0.17	0.05	0.19
Wind kt	17	15	18	16	20	15	19	15
Wind gusts kt	25	26	25	26	26	27	25	25
Waves ft	8	8	9	9	9	10	10	9
Swell ft	5	5	6	6	7	7	7	6
Swell period	8.3	8.2	8.3	13.9	13.6	13.4	13.2	8.5

Sunday December 22nd 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 80°F Low: 75°F
Current Air Temp: 83.2°F (0600)
Current Sea Temp: 84.3°F
Current MMR Temp: 108.6+°F
Est. Sunrise: 06:55 - Est. Sunset: 18:30

Synopsis & Notes: As we make our way through the Marshall Islands, conditions look to have improved from yesterday. Winds are down to 10 to 15 kt with mild seas. We're still experiencing an Easterly swell, though lesser than the last couple days. Expectation is that these calmer conditions will be sustained for today and tomorrow. Come Tuesday, winds and seas out of the East are predicted to increase to similar conditions we saw just a few days ago and remain throughout the rest of the week. A NNW swell is expected to become more prominent as the week goes on as well.

Transit to & Along the Survey Line

Today - Sunday – December 22nd:
Day: ENE winds 15-20 kt, gusts to 25 kt. ENE seas 4-6 ft. Easterly swell 5-8 ft. Northerly swell 4-6 ft. Mostly cloudy through the morning. Temperatures in the low 80's.
Evening: ENE winds 15-20 kt. Seas 4-6 ft. Easterly swell 4-6 ft with occasional larger sets.
Monday – December 23rd: AM Arrival to OP Area
Day: ENE winds 15-20 kt. ENE seas 4-6 ft. Easterly swell 4-6 ft. Northly swell 3-5 ft with occasional larger sets. Mostly sunny through the day. Temperatures in the low 80's.
Evening: ENE winds 15-20 knots. ENE seas 5-7 ft. Easterly swell 5-7 ft
Tuesday - December 24th: Christmas Eve
Day: NE winds 20-25 kt, gusts to 30. ENE seas 5-7 ft. Easterly swell 5-7 ft with occasional larger sets. Partly cloudy through the day. Temperatures in the low 80's.
Evening: NE winds 20-25 kt. Seas 5-7 ft.
Wednesday - December 25th: Christmas Day
Day: ENE winds 20-25 kt, gusts to 30. ENE seas 5-8 ft. Mixed swell 5-7 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Start Location – ECMWF Model

Monday 23								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	82°	83°	84°	84°	84°	84°	84°
Rain in		0.01						
Wind kt	13	15	16	15	13	13	13	15
Wind gusts kt	20	20	21	21	19	17	17	19
Waves ft	7	7	7	7	7	7	7	7
Swell ft	6	5	5	5	5	5	5	4
Swell period	8	9.2	9.4	9	8.2	7.9	8.1	8.6

Tuesday 24								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	84°	84°	84°	84°	83°	85°
Rain in							0.01	0.08
Wind kt	17	16	18	18	19	20	18	20
Wind gusts kt	22	22	23	24	24	26	26	26
Waves ft	7	8	8	8	8	8	9	9
Swell ft	4	4	5	5	4	5	5	5
Swell period	8.7	12.8	12.6	12.3	12.1	11.9	11.8	7.9

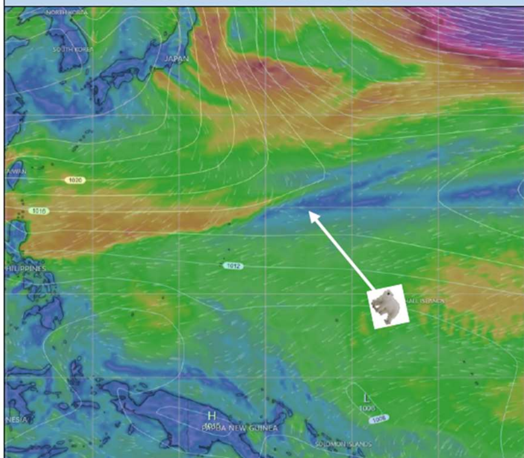
Wednesday 25								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	82°	82°	81°	82°	83°	84°	84°
Rain in	0.09	0.08	0.08	0.19	0.26	0.04		
Wind kt	19	18	19	16	16	18	20	20
Wind gusts kt	28	28	31	28	27	28	26	27
Waves ft	9	9	9	9	8	8	9	9
Swell ft	5	4	4	6	6	5	5	5
Swell period	11.9	10.6	11.8	11.6	8	11.3	11.3	11.1

Thursday 26								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	84°	84°	82°	82°	83°	83°
Rain in		0.02			0.03	0.13	0.15	0.01
Wind kt	21	22	19	21	19	18	17	19
Wind gusts kt	27	28	28	27	27	25	25	25
Waves ft	9	10	10	10	10	10	10	9
Swell ft	4	5	6	7	7	6	7	7
Swell period	15.8	8.3	8.3	14.1	13.7	8.4	13.2	13

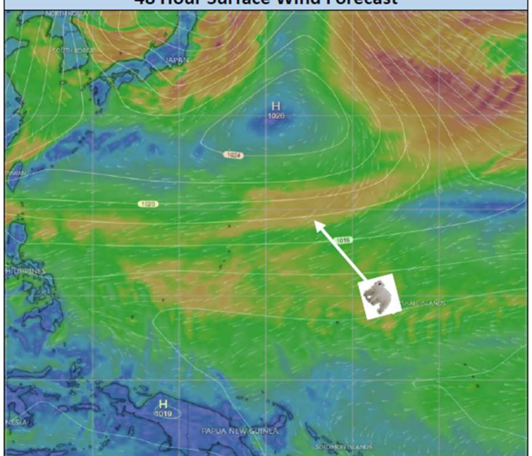
Friday 27								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	81°	81°	80°	81°	81°	81°
Rain in	0.01		0.09	0.08	0.12	0.14	0.08	0.27
Wind kt	20	18	19	17	17	15	18	16
Wind gusts kt	26	27	26	24	24	24	24	26
Waves ft	9	9	9	9	9	9	9	8
Swell ft	7	7	6	5	6	6	5	6
Swell period	12.9	12.8	12.7	12.1	7.8	12.3	12.2	12.1

Monday December 23rd 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

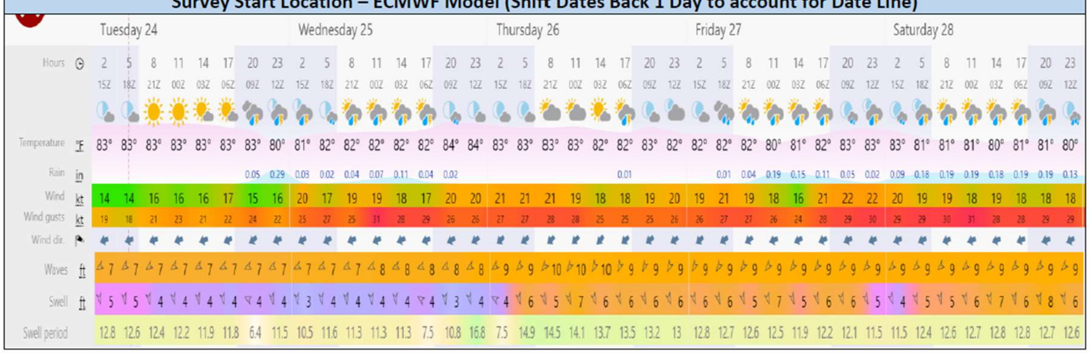
Air Temp: High 85°F Low: 75°F
Current Air Temp: 83.2°F (0600)
Current Sea Temp: 85.0°F
Current MMR Temp: 130+°F
Est. Sunrise: 07:08 - Est. Sunset: 18:49

Synopsis & Notes: After roughly 10 days of transit we've finally arrived at the beginning of our survey line this morning. Winds are around 15 to 20 kts with mild seas. We're still experiencing an Easterly swell, which is now predicted to increase as the week goes on peaking 8-10ft on Thursday. Tuesday into Wednesday, winds and seas out of the East/Northeast are predicted to increase and the NNW swell is expected to become more prominent Wednesday through the remained of the week.

Along the Survey Line

Today - Monday – December 23rd: Arrival to Op Area
Day: NE winds 15-20 kt, gusts to 25 kt. ENE seas 4-6 ft. Easterly swell 4-6 ft. Northerly swell 4-6 ft. Mostly cloudy through the morning. Temperatures in the low 80's.
Evening: NE winds 15-20 kt. Seas 4-6 ft. Easterly swell 4-6 ft with occasional larger sets. Northerly swell 4-6 ft.
Tuesday – December 24th: Christmas Eve
Day: NE winds 20-25 kt. ENE seas 4-6 ft. Easterly swell 4-6 ft. Northly swell 3-5 ft with occasional larger sets. Partly sunny through the day. Temperatures in the low 80's.
Evening: NE winds 20-25 knots. NE seas 5-7 ft. Easterly swell 5-7 ft. Northerly swell 4-6 ft.
Wednesday - December 25th: Christmas Day
Day: NE winds 20-25 kt, gusts to 30. NE seas 5-7 ft. Easterly swell 5-7 ft with occasional larger sets. Northerly swell 4-6 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: NE winds 20-25 kt, gusts to 30. NE seas 5-8 ft.
Thursday - December 26th:
Day: ENE winds 20-25 kt, gusts to 30. NE seas 5-8 ft. Northerly swell 5-7 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Start Location – ECMWF Model (Shift Dates Back 1 Day to account for Date Line)



Tuesday 24								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	83°	83°	83°	83°	83°	80°
Rain in							0.05	0.29
Wind kt	14	14	16	16	16	17	15	16
Wind gusts kt	19	18	21	23	21	22	24	22
Waves ft	7	7	7	7	7	7	7	7
Swell ft	5	5	4	4	4	4	4	4
Swell period	12.8	12.6	12.4	12.2	11.9	11.8	6.4	11.5

Wednesday 25								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	82°	82°	82°	82°	82°	84°	84°
Rain in	0.03	0.02	0.04	0.07	0.11	0.04	0.02	
Wind kt	20	17	19	19	18	17	20	20
Wind gusts kt	25	27	25	31	28	29	26	26
Waves ft	7	7	7	8	8	8	8	8
Swell ft	3	4	4	4	4	4	3	4
Swell period	10.5	11.6	11.3	11.3	11.3	7.5	10.8	16.8

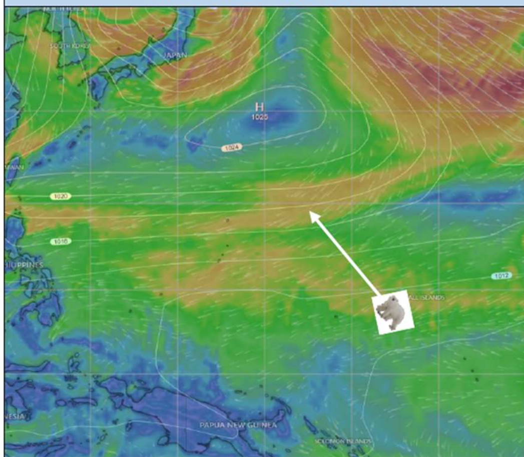
Thursday 26								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	83°	83°	82°	82°	83°	82°
Rain in						0.01		
Wind kt	21	21	21	19	18	18	19	20
Wind gusts kt	27	27	28	28	25	25	25	26
Waves ft	9	9	10	10	10	9	9	9
Swell ft	4	6	5	7	6	6	6	6
Swell period	7.5	14.9	14.5	14.1	13.7	13.5	13.2	13

Friday 27								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	82°	82°	80°	81°	82°	83°	83°
Rain in		0.01	0.04	0.19	0.15	0.11	0.05	0.02
Wind kt	19	21	19	18	16	21	22	22
Wind gusts kt	26	27	27	26	24	28	29	30
Waves ft	9	9	9	9	9	9	9	9
Swell ft	6	6	5	7	5	6	6	5
Swell period	12.8	12.7	12.6	12.5	11.9	12.2	12.1	11.5

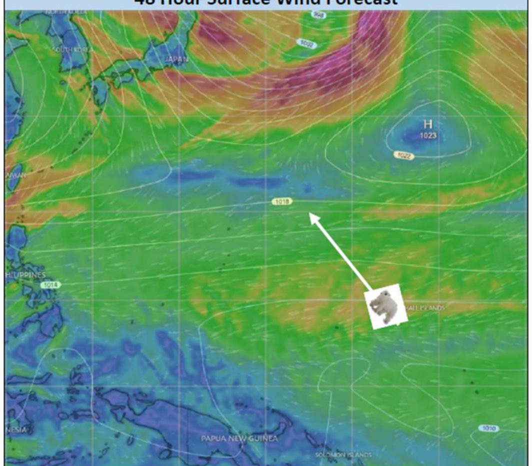
Saturday 28								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	81°	81°	81°	80°	81°	81°	80°
Rain in	0.09	0.18	0.19	0.19	0.18	0.19	0.19	0.13
Wind kt	20	19	19	18	19	18	18	18
Wind gusts kt	29	29	30	31	28	28	29	29
Waves ft	9	9	9	9	9	9	9	9
Swell ft	4	5	5	6	7	6	8	6
Swell period	11.5	12.4	12.6	12.7	12.8	12.8	12.7	12.6

Tuesday December 24th 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 85°F Low: 80°F
Current Air Temp: 83.0°F (0600)
Current Sea Temp: 85.0°F
Current MMR Temp: 130+°F
Est. Sunrise: 07:10 - Est. Sunset: 18:49

Synopsis & Notes: Merry Christmas Eve, we've begun our survey this morning! Weather conditions for the rest of the week appear to be relatively stable. Winds have increased to 20-25 kts, occasionally gusting 30+ when a squall rolls through. Sea state will likely increase slightly with these increased winds and we're to expect our Northerly to increase as well. We'll looking to experience this slightly heightened sea state for the remainder for the week. For now there doesn't appear to be any major shifts in weather for the foreseeable future. Winds out of the NE, predominant seas out of the East, secondary swell out of the NNW.

Along the Survey Line

Today - Tuesday – December 24th: Christmas Eve
Day: NE winds 20-25 kt, gusts to 30 kt. ENE seas 4-6 ft. Mixed easterly swell 5-7 ft. Northerly swell 4-6 ft. Mostly cloudy through the morning, occasional squals. Temperatures in the low 80's.
Evening: NE winds 20-25 kt. Seas 5-7 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 4-6 ft.

Wednesday – December 25th: Christmas Day
Day: NE winds 20-25 kt, gusts to 30 kt. ENE seas 5-8 ft. Mixed easterly swell 4-6 ft. Northly swell 4-7 ft with occasional larger sets. Partly sunny through the day. Temperatures in the low 80's.
Evening: NE winds 20-25 knots. NE seas 5-7 ft. Mixed easterly swell 5-7 ft. Northerly swell 4-6 ft.

Thursday - December 26th:
Day: NE winds 20-25 kt, gusts to 30. NE seas 5-8 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 4-7 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: NE winds 20-25 kt, gusts to 30. NE seas 5-8 ft.

Friday - December 27th:
Day: ENE winds 20-25 kt, gusts to 30. NE seas 5-8 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-7 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Line Lower Portion – ECMWF Model (Shift Dates Back 1 Day to account for Date Line)

Wednesday 25								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	83°	82°	82°	83°	83°	83°
Rain in		0.01	0.02	0.02	0.16	0.01		
Wind kt	19	17	18	17	16	21	22	21
Wind gusts kt	25	24	23	26	25	27	28	28
Waves ft	7	7	7	8	8	8	9	9
Swell ft	4	4	4	5	5	4	4	5
Swell period	11.6	11.4	11.5	11.3	10.7	7.3	10.9	16.5

Thursday 26								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	84°	81°	82°	82°	83°	83°	83°	83°
Rain in			0.01					
Wind kt	20	21	21	21	19	19	20	20
Wind gusts kt	29	28	28	28	27	24	25	27
Waves ft	9	10	10	10	10	10	9	10
Swell ft	7	7	7	7	8	8	7	7
Swell period	15.1	14.8	14.4	14	13.7	13.4	13.2	13

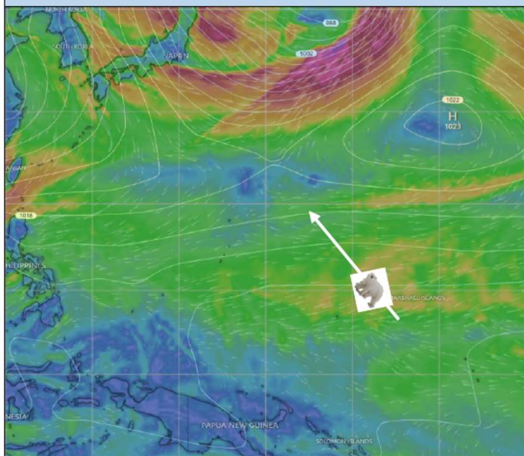
Friday 27								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	82°	83°	83°	83°	83°	82°	81°
Rain in								0.37
Wind kt	20	20	21	20	20	20	22	19
Wind gusts kt	27	27	27	28	28	26	27	29
Waves ft	10	9	9	9	9	9	9	9
Swell ft	7	7	6	5	7	7	6	7
Swell period	12.9	12.8	12.1	12	12.6	12.6	12.6	12.7

Saturday 28								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	81°	82°	83°	82°	84°	83°
Rain in	0.24	0.11	0.06	0.13	0.02	0.06	0.02	
Wind kt	18	18	18	19	22	20	20	21
Wind gusts kt	26	27	29	31	30	28	28	28
Waves ft	9	9	9	10	10	10	10	10
Swell ft	7	7	7	7	8	7	7	6
Swell period	12.9	13	13.2	13.3	13.3	13.2	12.1	12

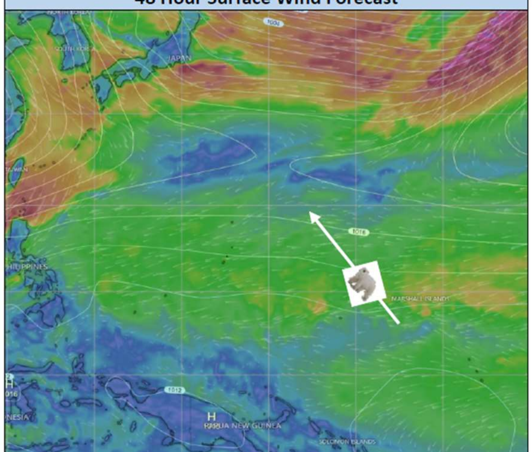
Sunday 29								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	83°	83°	83°	85°	82°	83°	82°
Rain in						0.01		
Wind kt	22	21	22	20	20	21	20	18
Wind gusts kt	28	29	29	29	28	28	27	26
Waves ft	10	10	10	10	10	10	10	10
Swell ft	7	8	7	7	8	7	7	7
Swell period	13.2	13.3	13.3	13.3	13.3	13.3	13.2	13.1

Wednesday December 25th 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

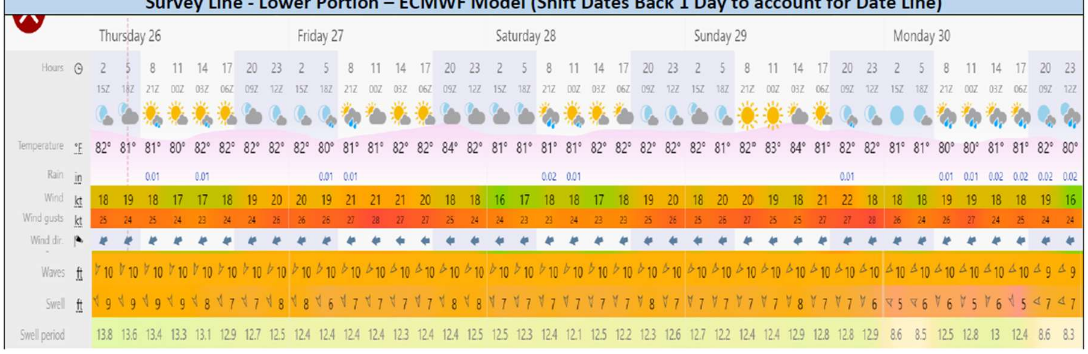
Air Temp: High 85°F Low: 80°F
Current Air Temp: 82.6°F (0600)
Current Sea Temp: 83.5°F
Est. Sunrise: 07:21 - Est. Sunset: 18:52

Synopsis & Notes: Merry Christmas everyone! Winds have increased to 20-25 kts. Sea state has risen slightly with these increased winds and as well as our Northerly swell. We'll likely to experience this heightened sea state for the remainder for the week into next week. For now, there still doesn't appear to be any major shifts in weather for the foreseeable future. Winds out of the NE, predominant seas out of the East, secondary swell out of the NNW.

Along the Survey Line

Today - Wednesday – December 25th: Christmas Day!
Day: NE winds 20-25 kt, gusts to 30 kt. ENE seas 4-6 ft. Mixed easterly swell 5-7 ft. Northerly swell 4-6 ft. Mostly cloudy through the morning, occasional squalls. Temperatures in the low 80's.
Evening: NE winds 20-25 kt. Seas 5-7 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 4-6 ft.
Thursday – December 26th:
Day: NE winds 20-25 kt, gusts to 30 kt. ENE seas 5-8 ft. Mixed easterly swell 5-7 ft. Northly swell 4-7 ft with occasional larger sets. Partly sunny through the day. Temperatures in the low 80's.
Evening: NE winds 20-25 knots. NE seas 5-8 ft. Mixed easterly swell 5-7 ft. Northerly swell 4-6 ft.
Friday - December 27th:
Day: NE winds 20-25 kt, gusts to 30. NE seas 5-8 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 4-7 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: NE winds 20-25 kt, gusts to 30. NE seas 5-8 ft.
Saturday - December 28th:
Day: ENE winds 20-25 kt, gusts to 30. NE seas 5-8 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-7 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Line - Lower Portion – ECMWF Model (Shift Dates Back 1 Day to account for Date Line)



Thursday 26

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	81°	81°	80°	82°	82°	82°	82°
Rain in			0.01		0.01			
Wind kt	18	19	18	17	17	18	19	20
Wind gusts kt	25	24	25	24	23	24	24	26
Waves ft	10	10	10	10	10	10	10	10
Swell ft	9	9	9	9	8	7	7	8
Swell period	13.8	13.6	13.4	13.3	13.1	12.9	12.7	12.5

Friday 27

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	80°	81°	81°	82°	82°	84°	82°
Rain in		0.01	0.01					
Wind kt	20	19	21	21	21	20	18	18
Wind gusts kt	26	26	27	28	27	27	25	24
Waves ft	10	10	10	10	10	10	10	10
Swell ft	8	6	7	7	7	7	8	8
Swell period	12.4	12.4	12.4	12.4	12.3	12.4	12.4	12.5

Saturday 28

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	81°	81°	82°	82°	82°	82°
Rain in			0.02	0.01				
Wind kt	16	17	18	18	17	18	19	20
Wind gusts kt	24	23	23	24	23	23	25	26
Waves ft	10	10	10	10	10	10	10	10
Swell ft	7	7	7	7	7	7	8	7
Swell period	12.5	12.3	12.4	12.1	12.5	12.2	12.3	12.6

Sunday 29

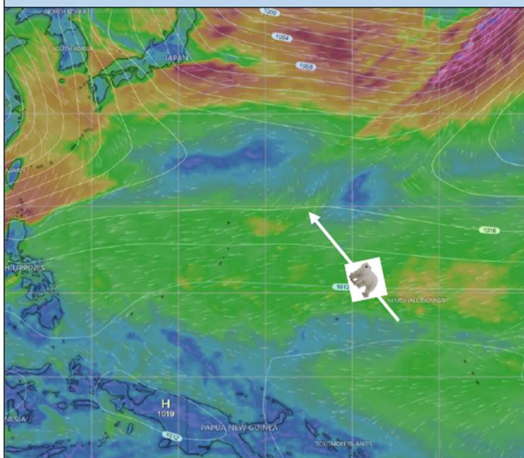
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	81°	82°	83°	84°	81°	82°	82°
Rain in							0.01	
Wind kt	18	20	20	19	18	21	22	18
Wind gusts kt	25	26	27	25	25	27	27	28
Waves ft	10	10	10	10	10	10	10	10
Swell ft	7	7	7	7	8	7	7	6
Swell period	12.7	12.2	12.4	12.4	12.9	12.8	12.8	12.9

Monday 30

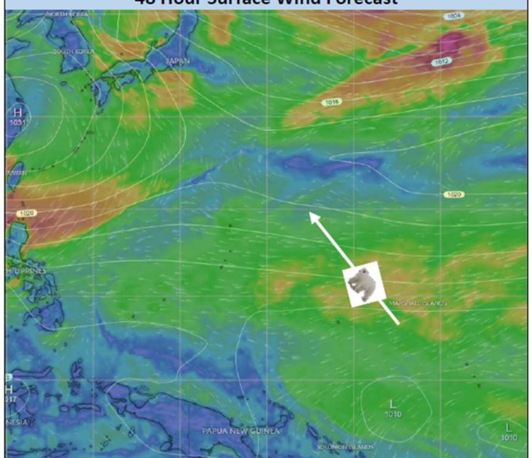
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	80°	80°	81°	81°	82°	80°
Rain in			0.01	0.01	0.02	0.02	0.02	0.02
Wind kt	18	18	19	19	18	18	19	16
Wind gusts kt	26	24	26	27	24	25	24	24
Waves ft	10	10	10	10	10	10	9	9
Swell ft	5	6	6	5	6	5	7	7
Swell period	8.6	8.5	12.5	12.8	13	12.4	8.6	8.3

Thursday December 26th 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 85°F Low: 80°F
Current Air Temp: 80.0°F (0600)
Current Sea Temp: 83.7°F
Est. Sunrise: 07:36 - Est. Sunset: 18:53

Synopsis & Notes: For the rest of the week into the weekend the predicted conditions look to be relatively stable. We'll likely to experience this heightened sea state for the into next week. For now, there still doesn't appear to be any major shifts in weather for the foreseeable future. Winds out of the ENE, predominant seas out of the East, secondary swell out of the NxW.

Along the Survey Line

Today - Thursday – December 26th:
Day: ExN winds 20-25 kt, gusts to 30 kt. ENE seas 5-7 ft. Mixed easterly swell 6-8 ft. Northerly swell 4-7 ft. Mostly cloudy through the morning, occasional squalls. Temperatures in the low 80's.
Evening: East winds 20-25 kt. Seas 5-7 ft. Mixed easterly swell 6-8 ft with occasional larger sets. Northerly swell 4-7 ft.
Friday – December 27th:
Day: East winds 20-25 kt, gusts to 30 kt. ENE seas 5-7 ft. Mixed easterly swell 5-8 ft. Northly swell 4-7 ft with occasional larger sets. Possible squalls overnight. Partly sunny through the day. Temperatures in the low 80's.
Evening: NE winds 20-25 knots. ENE seas 5-7 ft. Mixed easterly swell 6-8 ft. Northerly swell 4-6 ft.
Saturday - December 28th:
Day: East winds 20-25 kt, gusts to 30. NE seas 5-7 ft. Mixed easterly swell 6-8 ft with occasional larger sets. Northerly swell 4-7 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: NE winds 20-25 kt, gusts to 30. NE seas 5-8 ft.
Sunday - December 29th:
Day: East winds 20-25 kt, gusts to 30. NE seas 5-8 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-7 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Line - Lower Portion – ECMWF Model (Shift Dates Back 1 Day to account for Date Line)

Friday 27								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	82°	81°	82°	80°	82°	82°	82°
Rain in	0.01				0.02	0.01		
Wind kt	16	19	20	20	19	17	15	17
Wind gusts kt	23	26	27	27	26	25	21	22
Waves ft	10	10	10	10	10	10	10	10
Swell ft	7	7	7	7	8	6	8	8
Swell period	12.4	12.3	12.2	11.5	11.8	10.4	11.8	11.9

Saturday 28								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	79°	80°	81°	82°	82°	82°	81°
Rain in		0.01	0.01					
Wind kt	15	15	14	15	17	16	19	17
Wind gusts kt	22	20	20	20	21	23	24	24
Waves ft	10	10	10	9	9	9	9	9
Swell ft	8	8	7	7	7	7	8	7
Swell period	11.8	11.8	11.8	11.9	11.8	11.8	11.9	12

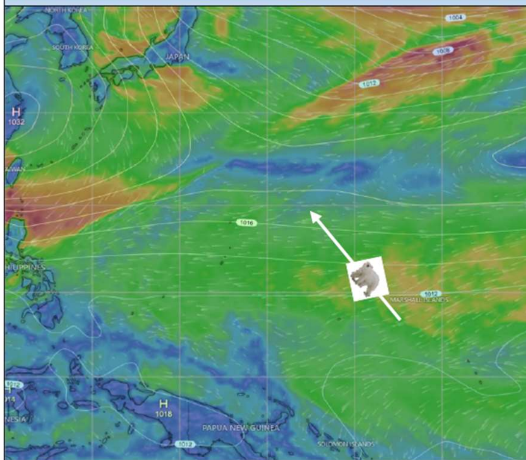
Sunday 29								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	82°	83°	83°	82°	83°	83°	82°
Rain in	0.01							
Wind kt	17	19	21	21	20	19	20	19
Wind gusts kt	23	24	28	28	27	26	26	26
Waves ft	9	10	10	10	10	10	10	9
Swell ft	8	7	7	7	7	7	7	7
Swell period	12	12.8	12.8	12.8	12.7	12.7	12.6	12.6

Monday 30								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	82°	82°	82°	82°	81°	80°	80°
Rain in						0.01	0.02	
Wind kt	19	17	16	17	16	17	17	16
Wind gusts kt	24	24	22	23	22	23	23	25
Waves ft	9	9	9	9	9	9	9	9
Swell ft	6	7	7	7	7	7	6	7
Swell period	12.5	8.4	8.4	8.6	8.4	8.5	8.7	8.6

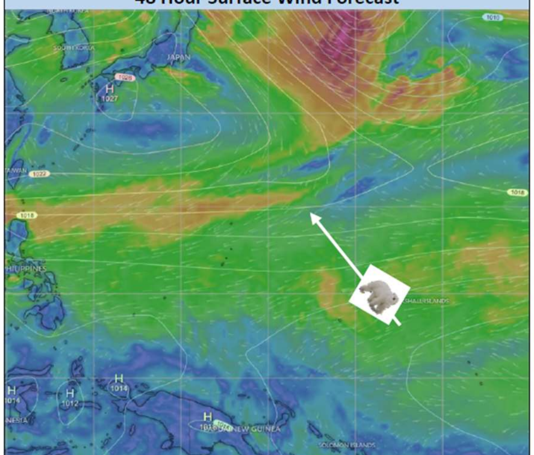
Tuesday 31								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	80°	81°	82°	81°	81°	80°	82°	82°
Rain in				0.01	0.01	0.02	0.01	
Wind kt	16	18	19	18	17	17	17	17
Wind gusts kt	22	24	24	24	24	23	22	22
Waves ft	9	9	9	9	9	9	9	9
Swell ft	6	6	4	6	6	6	6	7
Swell period	8.8	11.8	10.6	11.7	11.7	8.6	8.6	8.3

Friday December 27th 2024

24 Hour Surface Wind Forecast	Weather Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 85°F Low: 80°F
Current Air Temp: 81.8°F (0600)
Current Sea Temp: 83.3°F
Est. Sunrise: 07:39 - Est. Sunset: 18:59

Synopsis & Notes: For the rest of the week into the weekend the predicted conditions look to be relatively stable. We'll likely to experience this heightened sea state for the into next week. For now, there still doesn't appear to be any major shifts in weather for the foreseeable future. Winds out of the ENE, predominant seas out of the East, secondary swell out of the NxW.

Along the Survey Line

Today - Friday – December 27th:
Day: ExN winds 15-20 kt, gusts to 25 kt. ENE seas 5-7 ft. Mixed easterly swell 5-8 ft. Northerly swell 6-8 ft. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: East winds 20-25 kt. Seas 5-7 ft. Mixed easterly swell 5-8 ft with occasional larger sets. Northerly swell 6-8 ft.
Saturday – December 28th:
Day: East winds 20-25 kt. ENE seas 5-7 ft. Mixed easterly swell 5-8 ft. Northly swell 6-8 ft with occasional larger sets. Possible squalls overnight. Partly sunny through the day. Temperatures in the low 80's.
Evening: ENE winds 20-25 knots. ENE seas 5-7 ft. Mixed easterly swell 6-8 ft. Northerly swell 4-6 ft.
Sunday - December 29th:
Day: ENE winds 20-25 kt. ENE seas 5-7 ft. Mixed easterly swell 6-8 ft with occasional larger sets. Northerly swell 4-7 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 20-25 kt, gusts to 30. NE seas 5-8 ft.
Monday - December 30th:
Day: ENE winds 20-25 kt, gusts to 30. ENE seas 5-7 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-7 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Line - Lower Portion – ECMWF Model (Shift Dates Back 1 Day to account for Date Line)

Saturday 28								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	82°	82°	81°	82°	83°	83°	81°
Rain in				0.01				
Wind kt	16	17	16	18	16	16	17	16
Wind gusts kt	22	22	22	24	23	21	22	23
Waves ft	10	10	10	10	10	10	9	9
Swell ft	8	8	8	8	7	7	7	7
Swell period	11.9	12.1	12.1	12	12	12.1	12	12

Sunday 29								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	81°	81°	83°	83°	82°	82°	82°
Rain in								
Wind kt	17	17	19	18	18	19	19	20
Wind gusts kt	22	23	26	25	24	24	24	25
Waves ft	9	9	9	9	9	9	9	9
Swell ft	7	6	7	6	6	5	7	6
Swell period	12	12.7	12.7	12.6	12.5	12.4	12.4	12.3

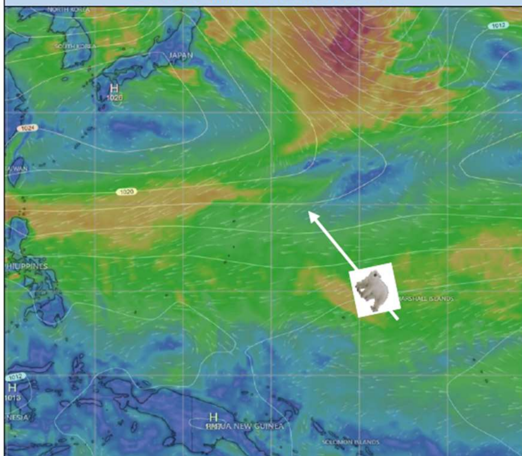
Monday 30								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	82°	83°	83°	83°	82°	82°
Rain in							0.01	0.01
Wind kt	20	19	16	17	15	16	17	19
Wind gusts kt	26	25	24	23	22	21	23	24
Waves ft	9	9	9	9	9	9	9	9
Swell ft	6	6	7	7	7	6	6	6
Swell period	12.3	12.3	8.3	8.4	8.3	8.5	8.8	8.9

Tuesday 31								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	82°	82°	82°	82°	80°	79°
Rain in	0.03					0.02	0.04	0.08
Wind kt	18	18	19	20	17	19	17	16
Wind gusts kt	24	24	24	25	25	24	25	24
Waves ft	9	9	9	9	9	9	9	9
Swell ft	6	6	5	5	6	6	6	6
Swell period	8.8	8.8	9.1	8.9	8.6	8.9	11.4	8.5

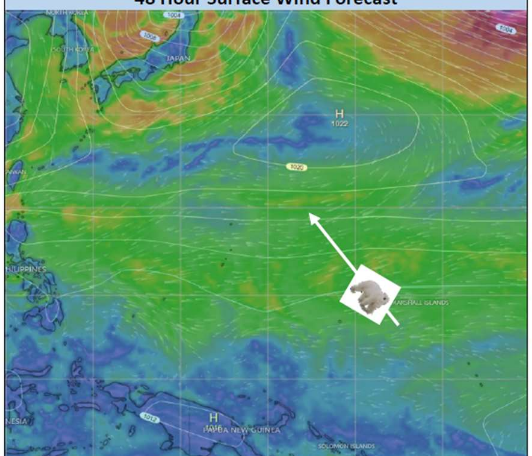
Wednesday 1								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	80°	82°	81°	82°	81°	82°	82°	83°
Rain in	0.04		0.01	0.04	0.01	0.01		
Wind kt	17	18	18	16	15	15	15	15
Wind gusts kt	24	24	24	23	21	20	19	20
Waves ft	9	8	8	8	8	8	7	7
Swell ft	7	7	6	6	6	6	6	6
Swell period	8.3	8.2	8.6	8.5	8.4	8.4	8.4	8.4

Saturday December 28th 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 85°F Low: 80°F
Current Air Temp: 82.6°F (0600)
Current Sea Temp: 83.3°F
Est. Sunrise: 07:37 - Est. Sunset: 18:54

Synopsis & Notes: For the rest of the weekend into the week the predicted conditions look to be relatively stable. We'll experience this heightened sea state into next week. Come Tuesday into Wednesday winds and seas are expected to come down a bit. For now, there still doesn't appear to be any major shifts in weather for the foreseeable future. Winds out of the ExN, predominant seas out of the East, secondary swell out of the NxW.

Along the Survey Line

Today - Saturday – December 28th:
Day: ExN winds 20-25 kt, gusts to 30 kt. ENE seas 5-7 ft. Mixed easterly swell 5-8 ft. Northerly swell 6-8 ft. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: East winds 20-25 kt. Seas 5-7 ft. Mixed easterly swell 5-8 ft with occasional larger sets. Northerly swell 6-8 ft.
Sunday – December 29th:
Day: East winds 20-25 kt. ENE seas 5-7 ft. Mixed easterly swell 5-8 ft. Northly swell 6-8 ft with occasional larger sets. Possible squalls overnight. Partly sunny through the day. Temperatures in the low 80's.
Evening: ENE winds 20-25 knots. ENE seas 5-7 ft. Mixed easterly swell 6-8 ft. Northerly swell 4-6 ft.
Monday - December 30th:
Day: ENE winds 20-25 kt. ENE seas 5-7 ft. Mixed easterly swell 6-8 ft with occasional larger sets. Northerly swell 4-7 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 20-25 kt, gusts to 30. NE seas 5-8 ft.
Tuesday - December 31st:
Day: ENE winds 15-20 kt, gusts to 25. ENE seas 5-7 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-7 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Line - Lower Portion – ECMWF Model (Shift Dates Back 1 Day to account for Date Line)

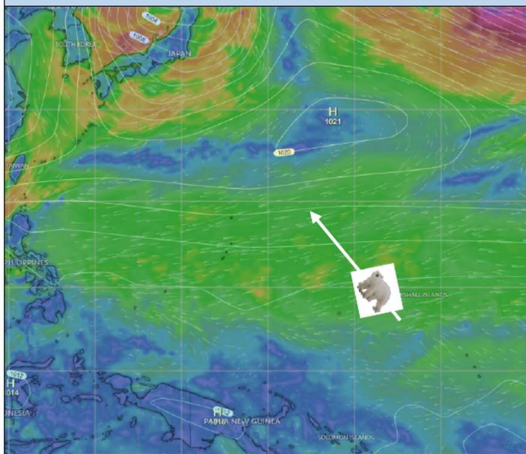
	Sunday 29								Monday 30							
Hours	2	5	8	11	14	17	20	23	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	82°	82°	83°	82°	82°	82°	83°	81°	79°	81°	82°	83°	83°	81°	80°
Rain in										0.01					0.01	0.01
Wind kt	18	19	18	18	19	20	20	18	17	19	20	17	17	16	17	17
Wind gusts kt	24	24	24	23	25	26	26	26	24	24	27	26	22	21	22	24
Waves ft	10	10	10	9	9	9	9	9	9	9	9	9	9	9	9	9
Swell ft	8	7	8	6	7	6	6	7	6	6	5	6	7	7	6	6
Swell period	12.1	13	12.9	8.5	12.5	12.6	12.2	12.1	8.6	12.4	12.3	8.6	8.5	8.4	8.6	8.7

	Tuesday 31								Wednesday 1							
Hours	2	5	8	11	14	17	20	23	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	80°	81°	81°	82°	80°	79°	80°	81°	81°	81°	82°	82°	80°	81°	82°	82°
Rain in	0.02			0.01	0.03	0.06	0.1	0.04		0.01			0.02	0.05		
Wind kt	17	18	18	19	18	18	18	20	16	18	17	16	12	15	16	16
Wind gusts kt	23	24	23	24	26	25	25	26	26	23	24	22	23	20	21	21
Waves ft	9	9	9	9	9	9	9	9	9	9	9	8	8	8	8	8
Swell ft	6	6	5	5	5	6	5	6	6	6	6	6	6	6	6	6
Swell period	8.7	8.9	9	9	8.9	8.7	9.1	11.5	8.4	8.6	8.6	8.1	8.1	8.1	8.3	8.2

	Thursday 2							
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	80°	80°	80°	80°	82°	82°	79°
Rain in		0.09	0.03	0.02	0.01			0.03
Wind kt	13	10	11	11	10	11	12	13
Wind gusts kt	20	17	15	15	15	14	15	18
Waves ft	8	8	8	8	7	7	7	7
Swell ft	6	6	6	6	6	6	5	[illegible]
Swell period	8.2	8.1	8.4	8.4	8.3	8.4	8.5	[illegible]

Sunday December 29th 2024

24 Hour Surface Wind Forecast	Weather Forecast



Weather Forecast

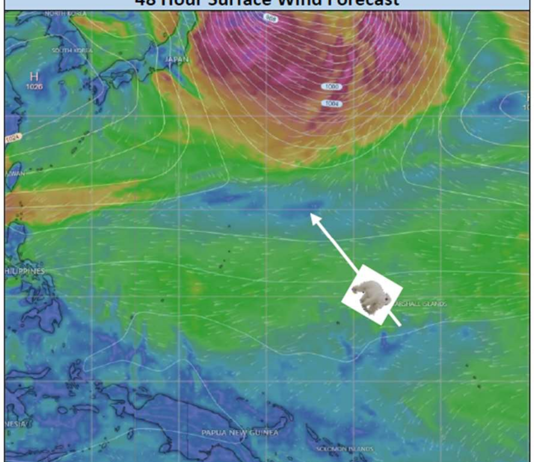
Air Temp: High 85°F Low: 80°F
Current Air Temp: 82.6°F (0600)
Current Sea Temp: 83.3°F
Est. Sunrise: 07:38 - Est. Sunset: 19:00

Synopsis & Notes: For the rest of the weekend into the week the predicted conditions look to be relatively stable and lessening. We'll experience this heightened sea state into next week. Come Tuesday into Wednesday winds and seas are expected to come down a bit. For now, there still doesn't appear to be any major shifts in weather for the foreseeable future. Winds out of the ExN, predominant seas out of the East, secondary swell out of the NxW.

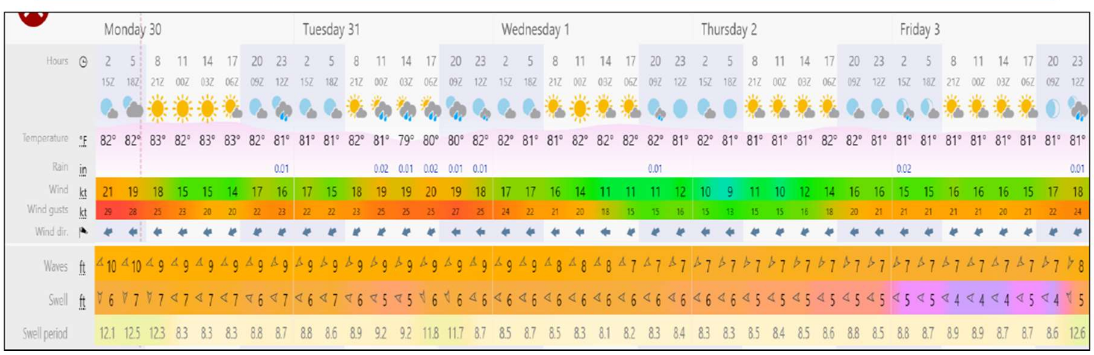
Along the Survey Line

Today - Sunday – December 29th:
Day: ExN winds 15-20 kt, gusts to 25 kt. ENE seas 4-6 ft. Mixed easterly swell 5-8 ft. Northerly swell 5-7 ft. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: East winds 15-20 kt. Seas 5-7 ft. Mixed easterly swell 5-8 ft with occasional larger sets. Northerly swell 4-6 ft.
Monday – December 30th:
Day: East winds 15-20 kt, gust to 25 kt. ENE seas 5-7 ft. Mixed easterly swell 5-8 ft. Northly swell 5-7 ft with occasional larger sets. Possible squalls overnight. Partly sunny through the day. Temperatures in the low 80's.
Evening: ENE winds 20-25 knots. ENE seas 5-7 ft. Mixed easterly swell 6-8 ft. Northerly swell 4-6 ft.
Tuesday - December 31st: NEW YEARS EVE
Day: ENE winds 15-20 kt. ENE seas 5-7 ft. Mixed easterly swell 6-8 ft with occasional larger sets. Northerly swell 4-7 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 15-20 kt, gusts to 25. ENE seas 5-7 ft.
Wednesday - January 1st: NEW YEARS DAY
Day: ENE winds 15-20 kt, gusts to 25. ENE seas 5-7 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-7 ft. Mostly cloudy through the day. Temperatures in the low 80's.

48 Hour Surface Wind Forecast



Survey Line - Lower Portion – ECMWF Model (Shift Dates Back 1 Day to account for Date Line)



Monday 30								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	82°	83°	82°	83°	83°	82°	81°
Rain in								0.01
Wind kt	21	19	18	15	15	14	17	16
Wind gusts kt	29	28	25	23	20	20	22	23
Waves ft	10	10	9	9	9	9	9	9
Swell ft	6	7	7	7	7	7	6	7
Swell period	12.1	12.5	12.3	8.3	8.3	8.3	8.8	8.7

Tuesday 31								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	82°	81°	79°	80°	80°	82°
Rain in				0.02	0.01	0.02	0.01	0.01
Wind kt	17	15	18	19	19	20	19	18
Wind gusts kt	22	22	23	25	25	25	27	25
Waves ft	9	9	9	9	9	9	9	9
Swell ft	6	7	6	5	5	6	6	6
Swell period	8.8	8.6	8.9	9.2	9.2	11.8	11.7	8.7

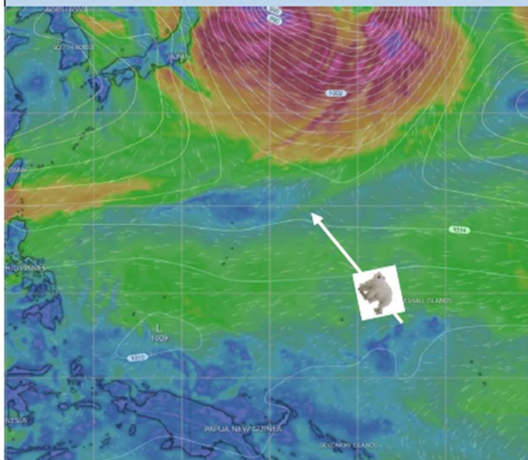
Wednesday 1								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	81°	81°	82°	82°	82°	82°	81°
Rain in							0.01	
Wind kt	17	17	16	14	11	11	11	12
Wind gusts kt	24	22	21	20	18	15	15	16
Waves ft	9	9	8	8	8	7	7	7
Swell ft	6	6	6	6	6	6	6	6
Swell period	8.5	8.7	8.5	8.3	8.1	8.2	8.3	8.4

Thursday 2								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	81°	81°	81°	81°	82°	82°	81°
Rain in								
Wind kt	10	9	11	10	12	14	16	16
Wind gusts kt	15	13	15	15	16	18	20	21
Waves ft	7	7	7	7	7	7	7	7
Swell ft	6	6	5	5	5	5	5	5
Swell period	8.3	8.3	8.5	8.4	8.5	8.6	8.8	8.5

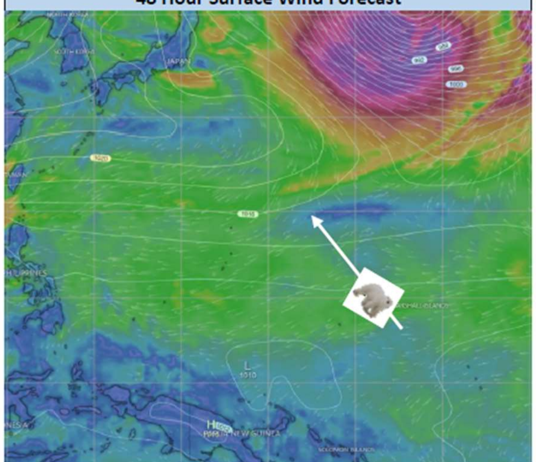
Friday 3								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	81°	81°	81°	81°	81°	81°
Rain in	0.02							0.01
Wind kt	15	15	16	16	16	15	17	18
Wind gusts kt	21	21	21	21	20	21	22	24
Waves ft	7	7	7	7	7	7	7	8
Swell ft	5	5	4	4	4	5	4	5
Swell period	8.8	8.7	8.9	8.9	8.7	8.7	8.6	12.6

Monday December 30th 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 85°F Low: 80°F
Current Air Temp: 81.3°F (0600)
Current Sea Temp: 83.5°F
Est. Sunrise: 07:44 - Est. Sunset: 19:01

Synopsis & Notes: Looking forward into the week, predictions are for conditions to improve. We could still see upwards of 20-25 knots today, but tonight into tomorrow winds should decrease down towards 10-15 knots. Wind waves should decrease along with the that, though our Easterly and Northerly swell sets aren't expected to be going anywhere. As you can see to the left, there's yet another intense system rolling across the Northern Pacific keeping the Northerly swell from dampening. Additionally, the Easterly trades stretch all the way across to Mexico, so we'll continue to see the Easterly swell set.

Along the Survey Line

Today - Monday – December 30th:
Day: Northeast winds 15-20 kt, gusts to 25 kt. ENE seas 4-6 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-8 ft. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: Eastly winds 15-20 kt. Seas 4-6 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 5-8 ft.

Tuesday – December 31st: NEW YEARS EVE
Day: Eastly winds 10-15 kt. ENE seas 3-5 ft. Mixed easterly swell 5-7 ft. Northly swell 6-8 ft with occasional larger sets. Possible squalls overnight. Partly sunny through the day. Temperatures in the low 80's.
Evening: Easterly winds 10-15 knots. ENE seas 5-7 ft. Mixed easterly swell 6-8 ft. Northerly swell 4-6 ft.

Wednesday - January 1st: NEW YEARS DAY
Day: ENE winds 10-15 kt. ENE seas 3-5 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 4-7 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 10-15 kt, gusts to 20. NE seas 5-8 ft.

Thursday – January 2nd:
Day: ENE winds 15-20 kt, gusts to 25. ENE seas 3-5 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-8 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Line - Lower Portion – ECMWF Model (Shift Dates Back 1 Day to account for Date Line)

Tuesday 31								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	81°	81°	80°	80°	80°	80°
Rain in				0.01	0.01	0.02	0.02	0.02
Wind kt	17	15	16	16	18	17	17	18
Wind gusts kt	22	22	21	25	24	24	24	24
Waves ft	9	9	9	9	9	9	9	9
Swell ft	6	6	6	6	5	5	6	5
Swell period	8.8	8.6	8.8	8.9	9.1	9	8.8	8.8

Wednesday 1								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	81°	81°	82°	82°	82°	82°
Rain in	0.01	0.1	0.01					
Wind kt	14	14	15	13	12	12	12	10
Wind gusts kt	24	20	20	19	17	16	16	15
Waves ft	8	8	8	8	8	7	7	7
Swell ft	6	6	6	6	6	6	6	6
Swell period	8.3	8.4	8.5	8.3	8.2	8.4	8.4	8.4

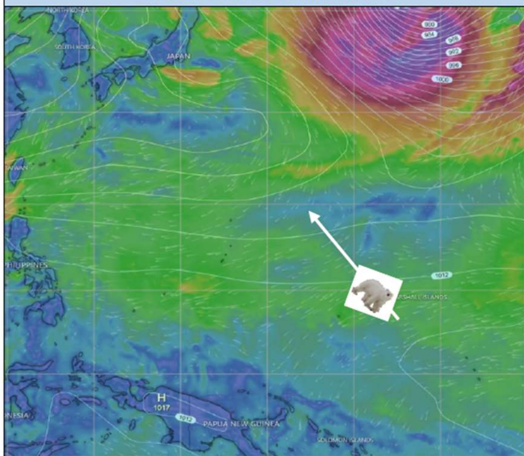
Thursday 2								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	81°	81°	81°	82°	81°	81°
Rain in							0.01	0.02
Wind kt	9	8	8	10	9	11	12	12
Wind gusts kt	13	12	11	13	13	14	16	17
Waves ft	7	7	7	7	7	7	7	7
Swell ft	6	5	5	5	5	5	5	5
Swell period	8.4	8.4	8.5	8.6	8.6	8.6	11.2	8.6

Friday 3								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	80°	82°	81°	82°	81°	81°	81°	81°
Rain in	0.01							
Wind kt	13	15	15	15	15	14	17	16
Wind gusts kt	17	18	20	20	20	19	21	21
Waves ft	7	7	7	7	7	7	7	8
Swell ft	5	4	4	4	5	4	5	5
Swell period	8.6	8.8	9	8.8	8.6	8.6	12	12.5

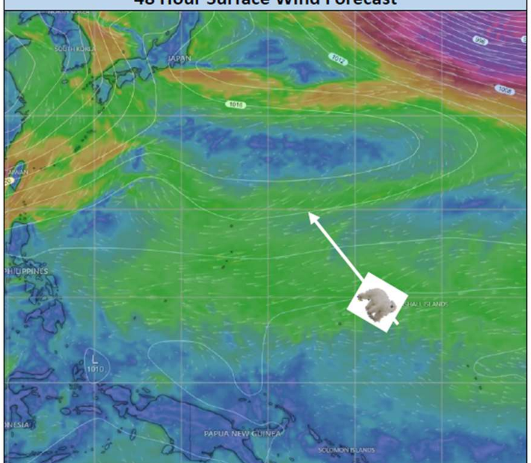
Saturday 4								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	80°	80°	81°	81°	81°	82°	82°	81°
Rain in		0.01	0.01					
Wind kt	15	14	14	11	11	10	12	12
Wind gusts kt	20	19	19	18	15	14	16	16
Waves ft	9	10	10	11	10	10	10	10
Swell ft	6	9	9	9	9	9	9	8
Swell period	12.5	15.4	15.4	15	14.5	14	13.6	13.3

Tuesday December 31st 2024

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 85°F Low: 80°F
Current Air Temp: 82.0°F (0600)
Current Sea Temp: 83.0°F
Est. Sunrise: 07:40 - Est. Sunset: 18:59

Synopsis & Notes: Happy New Years! Well, it appears that the forecast models yesterday were a bit off. The expected 10-15 knots of wind ended up being sustained 20-30 knots for a while there. We ended up seeing gusts up to 45 knots during a squall overnight. This certainly picked the seas up a bit in the middle of night. Conditions have gradually improved as the mornings gone on. We're back to seeing sustained winds around 15-20 knots and the seas have come slightly down with them. Looking at today's forecasts, we should stay around current conditions for the next couple days with winds to increase back to 20-25 with 30kt gusts come Thursday into Friday.

Along the Survey Line

Today - Tuesday – December 31st: NEW YEARS EVE
Day: SE winds shifting to ExN 15-20 kt, gusts to 30 kt. ExN seas 4-6 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-8 ft. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: ExN winds 15-20 kt. Seas 4-6 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 5-8 ft.
Wednesday – Janurary 1st: NEW YEARS DAY
Day: Easterly winds 15-20 kt. ENE seas 3-5 ft. Mixed easterly swell 5-7 ft. Northly swell 6-8 ft. Possible squalls overnight. Mostly sunny through the day. Temperatures in the low 80's.
Evening: Easterly winds 15-20 knots. ENE seas 4-6 ft. Mixed easterly swell 6-8 ft. Northerly swell 4-6 ft.
Thursday - January 2nd:
Day: ENE winds 15-20 kt. ENE seas 3-5 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 4-7 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 10-15 kt, gusts to 20. NE seas 5-8 ft.
Friday – January 3rd:
Day: ENE winds 15-20 kt, gusts to 25. ENE seas 4-6 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-8 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Line - Lower Portion – ECMWF Model (Shift Dates Back 1 Day to account for Date Line)

Wednesday 1

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	80°	82°	82°	82°	81°	80°
Rain in	0.01	0.02	0.02				0.01	0.01
Wind kt	16	13	14	12	11	11	11	11
Wind gusts kt	24	22	19	20	15	15	15	15
Waves ft	8	8	8	8	7	7	7	7
Swell ft	6	6	6	6	6	6	6	6
Swell period	8.2	7.9	8.2	7.9	8	8.1	8.1	8.2

Thursday 2

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	81°	81°	82°	82°	82°	82°
Rain in	0.01							
Wind kt	11	10	10	11	10	11	13	14
Wind gusts kt	15	15	14	14	14	15	17	18
Waves ft	7	7	7	7	7	7	7	7
Swell ft	5	5	5	5	5	5	5	5
Swell period	8.2	8.2	8.2	8.4	11.6	11.6	11.5	11.4

Friday 3

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	81°	81°	81°	81°	81°	81°	81°
Rain in		0.01						
Wind kt	13	14	15	16	15	14	16	17
Wind gusts kt	18	18	20	21	21	19	21	22
Waves ft	7	7	7	7	7	6	7	7
Swell ft	5	4	4	4	4	4	4	4
Swell period	11.2	11	10.7	10.8	10.6	8.6	8.6	9.7

Saturday 4

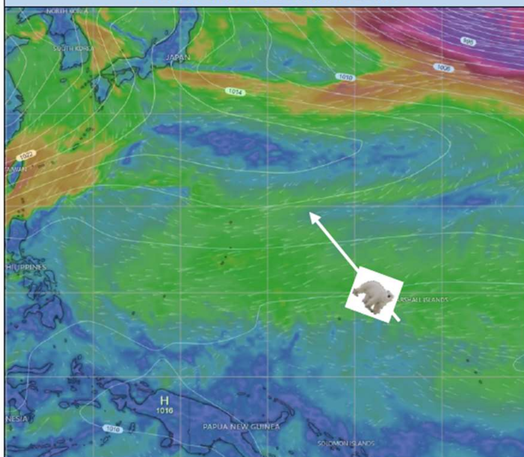
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	81°	81°	82°	82°	82°	81°
Rain in								
Wind kt	17	14	14	15	14	14	14	12
Wind gusts kt	22	21	19	21	19	18	19	18
Waves ft	7	8	9	10	10	10	10	9
Swell ft	5	5	7	8	8	8	8	8
Swell period	12	11.1	14.9	15.1	14.6	14.2	13.7	13.4

Sunday 5

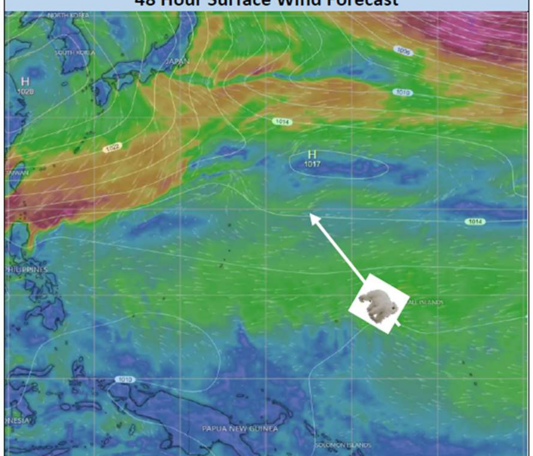
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	82°	82°	82°	82°	82°	82°	81°
Rain in		0.01	0.02					
Wind kt	13	13	16	16	16	17	17	16
Wind gusts kt	17	17	20	22	20	21	21	21
Waves ft	9	9	9	9	9	8	8	8
Swell ft	7	7	7	7	6	6	6	6
Swell period	13	12.8	12.7	12.6	11.8	12.4	12.2	12.1

Wednesday January 1st 2025

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 85°F Low: 80°F
Current Air Temp: 79.0°F (0600)
Current Sea Temp: 83.0°F
Est. Sunrise: 07:32 - Est. Sunset: 18:56

Synopsis & Notes: Happy New Year everyone! Conditions have improved since yesterday. Winds and seas are down, even our different swell sets have dropped a bit. We're currently seeing lighter winds around 10 knots, though they're expect to increase more to 10-15 with gusts to 20 throughout today. Tomorrow we should be back up towards 15-20 with gust in the low to mid 20 knot range. Seas are expected to raise slightly with the winds as well as see a larger Northerly swell again by the weekend. Conditions should stay relatively stable through to the weekend, though Saturday into Sunday looks like things are expected to pick up significantly out of the NE.

Along the Survey Line

Today - Wednesday – January 1st: NEW YEARS DAY
Day: Easterly winds shifting to ExN 10-15 kt, gusts to 20 kt. ExN seas 4-6 ft. Mixed easterly swell 5-7 ft. Northerly swell 4-6 ft. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: ExN winds 15-20 kt. Seas 4-6 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 4-6 ft.

Thursday – January 2nd:
Day: Easterly winds 15-20 kt. ENE seas 3-5 ft. Mixed easterly swell 5-7 ft. Northly swell 5-7 ft. Mostly sunny through the day. Temperatures in the low 80's.
Evening: Easterly winds 15-20 knots. ENE seas 4-6 ft. Mixed easterly swell 5-7 ft. Northerly swell 4-6 ft.

Friday - January 3rd:
Day: ENE winds 15-20 kt. ENE seas 3-5 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 4-7 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 10-15 kt, gusts to 20. NE seas 5-8 ft.

Saturday – January 4th:
Day: ENE winds 15-20 kt, gusts to 25. ENE seas 5-7 ft. Mixed easterly swell 5-8 ft. Northerly swell 5-8 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Survey Line - Lower Portion – ECMWF Model (Shift Dates Back 1 Day to account for Date Line)

Thursday 2								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	82°	82°	82°	82°	82°	82°
Rain in								
Wind kt	12	13	13	13	13	13	14	14
Wind gusts kt	17	17	17	17	17	17	18	19
Waves ft	6	6	6	7	7	7	7	7
Swell ft	4	4	4	4	4	5	5	5
Swell period	11.5	7.6	7.7	7.8	11.8	11.9	12	12

Friday 3								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	80°	82°	81°	81°	82°	82°
Rain in								
Wind kt	14	15	16	15	15	17	17	17
Wind gusts kt	19	19	21	21	20	22	23	23
Waves ft	7	7	7	7	6	6	6	7
Swell ft	5	5	5	4	4	4	4	4
Swell period	11.9	11.7	11.5	11.2	11.1	10.8	10.9	10.6

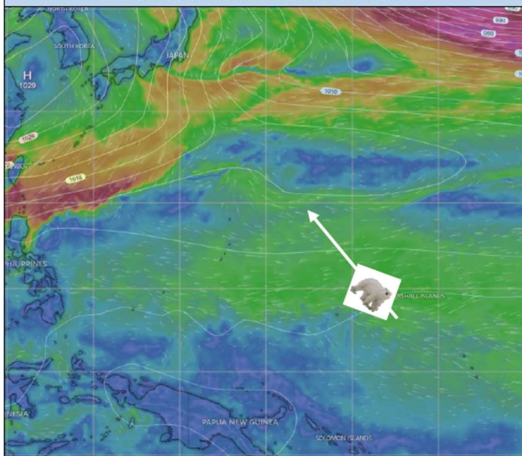
Saturday 4								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	82°	81°	81°	81°	79°	82°	82°
Rain in			0.02	0.02	0.02	0.04	0.02	
Wind kt	17	17	17	17	16	15	17	16
Wind gusts kt	23	22	22	23	22	21	22	23
Waves ft	7	7	8	9	10	10	10	10
Swell ft	4	4	6	7	8	8	8	8
Swell period	10.3	10.2	15.1	15.5	15.3	15	14.5	14.2

Sunday 5								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	82°	82°	82°	82°	82°	81°
Rain in		0.01					0.01	0.01
Wind kt	16	17	18	18	17	18	17	17
Wind gusts kt	21	23	23	23	23	24	24	23
Waves ft	10	10	9	9	9	9	9	8
Swell ft	8	8	7	8	7	7	7	7
Swell period	13.9	13.6	13.4	13.2	13	12.9	12.8	12.7

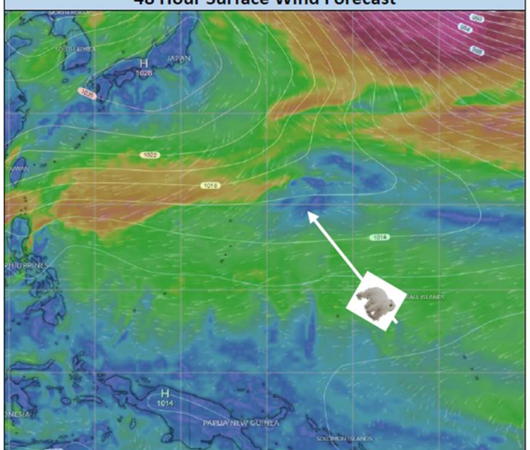
Monday 6								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	82°	81°	80°	81°	81°	81°	81°
Rain in				0.02	0.01	0.02	0.01	0.01
Wind kt	19	20	20	22	21	21	21	22
Wind gusts kt	25	26	27	30	29	27	27	28
Waves ft	8	8	8	8	8	8	8	8
Swell ft	6	7	6	6	6	5	5	5
Swell period	12.6	12.4	12.2	12.1	11.9	11.7	11.7	11.5

Tuesday January 2nd 2025

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 85°F Low: 80°F
Current Air Temp: 81.7°F (0600)
Current Sea Temp: 83.4°F
Est. Sunrise: 07:26 - Est. Sunset: 18:55

Synopsis & Notes: Winds and seas look like they should stabilize with our current conditions for the next couple of days. We're seeing 15-20 knot winds with gusts to 25. The winds are predicted to hold like this until Saturday when they'll increase 20-25 with gust 30+ knots. The seas and swell out of the East will come up with those NE'ly winds. As for the Northerly swell, it looks like by tomorrow it'll be increasing by 2-3 feet as the increase sea state to the N/NW is finally reaching us.

Along the Survey Line

Today - Thursday – January 2nd:
Day: ENE winds 15-20 kt, gusts to 25 kt. ExN seas 4-6 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-7 ft. Partly cloudy through the morning. Temperatures in the low 80's.
Evening: ExN winds 15-20 kt. Seas 4-6 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 4-6 ft.
Friday – January 3rd:
Day: Easterly winds 15-20 kt. ENE seas 3-5 ft. Mixed easterly swell 4-6 ft. Northly swell 5-7 ft. Mostly sunny through the day. Temperatures in the low 80's.
Evening: Easterly winds 15-20 knots. ENE seas 4-6 ft. Mixed easterly swell 4-6 ft. Northerly swell 5-8 ft.
Saturday - January 4th:
Day: ENE winds 15-20 kt. ENE seas 3-5 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 5-8 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 10-15 kt, gusts to 20. NE seas 5-8 ft.
Sunday – January 5th:
Day: ENE winds 15-20 kt, gusts to 25. ENE seas 5-7 ft. Mixed easterly swell 5-8 ft. Northerly swell 5-8 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Pohnpei 3NM – ECMWF Model

Friday 3

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	79°	79°	80°	80°	81°	79°	79°	79°
Rain in	0.12	0.17	0.26	0.17	0.06	0.13	0.08	0.17
Wind kt	11	12	12	13	12	12	12	11
Wind gusts kt	18	17	18	18	17	18	17	17
Wind dir.								
Waves ft	5	5	5	5	5	5	5	5
Swell ft	3	4	4	4	4	4	4	3
Swell period	9.8	11.9	11.9	11.8	11.6	11.4	11.2	10.8

Saturday 4

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	78°	78°	79°	81°	80°	79°	79°	79°
Rain in	0.19	0.13	0.29	0.08	0.2	0.24	0.21	0.04
Wind kt	11	11	6	6	6	10	5	7
Wind gusts kt	17	16	16	15	17	15	14	12
Wind dir.								
Waves ft	5	4	4	5	5	6	6	6
Swell ft	3	3	3	3	3	4	5	6
Swell period	9.3	8.8	6.2	6.2	14.2	16.7	15.3	15

Sunday 5

Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	80°	79°	78°	81°	82°	82°	79°	79°
Rain in	0.01	0.06	0.15	0.04	0.01		0.29	0.32
Wind kt	9	9	11	15	14	15	6	10
Wind gusts kt	12	15	16	19	20	20	19	18
Wind dir.								
Waves ft	6	7	7	7	7	7	6	6
Swell ft	6	6	6	6	6	6	5	5
Swell period	14.6	14.3	14	13.8	13.6	13.5	13.4	12.3

Monday 6

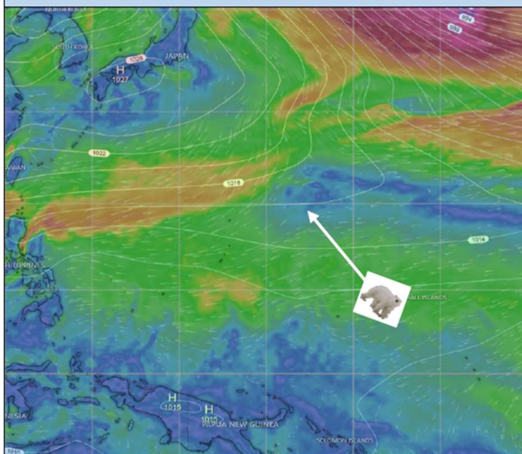
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	80°	81°	83°	83°	82°	81°	83°	83°
Rain in		0.02				0.01	0.02	
Wind kt	14	16	16	16	18	17	17	17
Wind gusts kt	18	21	22	22	24	24	23	22
Wind dir.								
Waves ft	6	6	6	6	6	6	6	6
Swell ft	5	5	5	5	5	5	5	5
Swell period	12.3	13.1	13	12.8	12.7	12.5	12.4	12.2

Tuesday 7

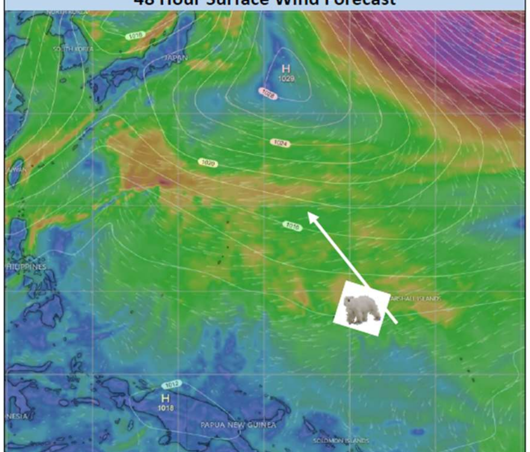
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	80°	83°	81°	83°	84°	83°	83°
Rain in	0.01	0.03	0.03	0.03	0.02			
Wind kt	15	13	17	17	18	17	17	18
Wind gusts kt	22	20	22	25	24	24	23	24
Wind dir.								
Waves ft	6	6	6	6	6	6	6	6
Swell ft	5	5	5	4	4	4	4	4
Swell period	12.1	11.9	11.8	9.3	7.4	12.1	12.4	12.7

Wednesday January 3rd 2025

24 Hour Surface Wind Forecast



48 Hour Surface Wind Forecast



Weather Forecast

Air Temp: High 85°F Low: 80°F
Current Air Temp: 82°F (0600)
Current Sea Temp: 83°F
Est. Sunrise: 07:19 - Est. Sunset: 18:55

Synopsis & Notes: Winds and seas look like they've increased sooner than expected pushing us past 15-20 to 20-25. We're currently seeing around 20 knot with gusts to 30. The winds are predicted to hold like this for the foreseeable future. The seas and swell out of the East will come up with these NE'ly winds. As for the Northerly swell, it looks like throughout today it'll be increasing by 2-3 feet as the increase sea state to the N/NW is finally reaching us.

Along the Survey Line

Today - Friday – January 3rd:
Day: ENE winds 15-20 kt, gusts to 30 kt. ExN seas 4-6 ft. Mixed easterly swell 5-7 ft. Northerly swell 5-7 ft. Partly cloudy through the morning, with chance or rain. Temperatures in the low 80's.
Evening: ENE winds 20-25 kt. Seas 4-6 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 4-8 ft.

Saturday – January 4th:
Day: ENE winds 20-25 kt, gusts to 30 kt. ENE seas 4-7 ft. Mixed easterly swell 5-7 ft. Northly swell 5-7 ft. Mostly sunny through the day. Temperatures in the low 80's.
Evening: ENE winds 20-25 knots. ENE seas 4-6 ft. Mixed easterly swell 4-6 ft. Northerly swell 5-8 ft.

Sunday - January 5th:
Day: ENE winds 20-25 kt, gust to 30 kt. ENE seas 4-7 ft. Mixed easterly swell 5-7 ft with occasional larger sets. Northerly swell 5-8 ft. Partly cloudy through the day. Temperatures in the low 80's.
Evening: ENE winds 10-15 kt, gusts to 20. NE seas 5-8 ft.

Monday – January 6th:
Day: ENE winds 20-25 kt, gusts to 30. ENE seas 5-7 ft. Mixed easterly swell 5-8 ft. Northerly swell 4-6 ft. Mostly cloudy through the day. Temperatures in the low 80's.

Pohnpei 3NM – ECMWF Model

Saturday 4								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	79°	80°	79°	79°	79°	79°	79°	80°
Rain in	0.11	0.2	0.13	0.29	0.28	0.17	0.13	0.01
Wind kt	16	14	15	12	9	8	5	7
Wind gusts kt	22	21	21	21	18	15	14	11
Waves ft	5	5	5	5	6	6	7	7
Swell ft	4	3	3	3	4	4	6	6
Swell period	11.1	8.6	10.7	6.5	10.7	17.5	16.1	15.6

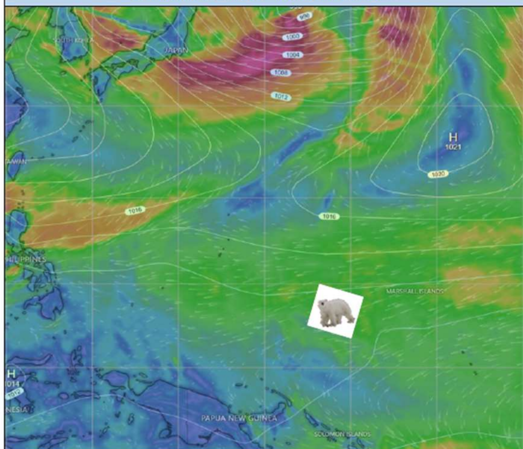
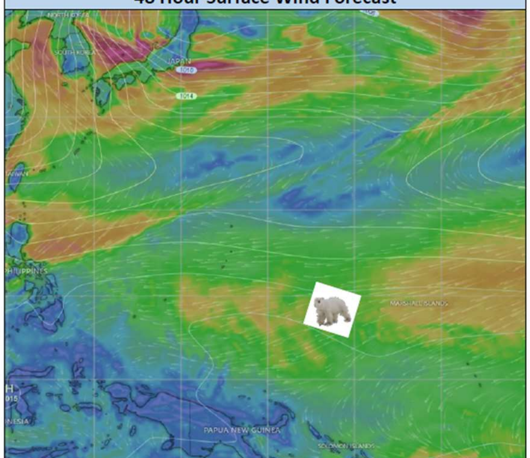
Sunday 5								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	79°	79°	80°	81°	81°	80°	79°	80°
Rain in	0.07	0.15	0.08	0.02	0.05	0.3	0.06	0.01
Wind kt	8	9	12	14	14	11	14	12
Wind gusts kt	11	14	16	20	20	19	20	19
Waves ft	7	7	7	7	7	7	7	7
Swell ft	6	6	6	6	6	6	6	6
Swell period	15.1	14.7	14.4	14.1	13.8	13.7	13.5	13.4

Monday 6								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	79°	80°	83°	84°	82°	82°	83°	83°
Rain in	0.06	0.01	0.01		0.01	0.02		
Wind kt	9	12	19	17	17	18	20	19
Wind gusts kt	18	16	24	24	24	25	27	26
Waves ft	6	6	7	7	6	7	7	7
Swell ft	5	6	5	5	5	5	5	5
Swell period	12.3	13	12.8	12.7	12.5	12.4	12.3	12.2

Tuesday 7								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	83°	83°	84°	84°	84°	84°	84°	84°
Rain in				0.01				
Wind kt	18	17	18	20	18	18	18	19
Wind gusts kt	26	23	24	26	25	24	24	25
Waves ft	7	7	7	7	7	7	7	7
Swell ft	5	5	5	4	5	5	5	4
Swell period	12.1	12	11.9	11.8	12	12.3	12.5	12.8

Wednesday 8								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	84°	82°	84°	84°	85°	85°	84°	83°
Rain in								
Wind kt	19	21	19	16	15	17	17	17
Wind gusts kt	25	28	28	24	21	21	24	23
Waves ft	7	7	7	7	7	7	7	7
Swell ft	4	4	5	4	4	4	4	5
Swell period	13.2	13.5	13.8	9.8	13.5	13.5	16.7	14.8

Tuesday January 7th 2025

24 Hour Surface Wind Forecast	Weather Forecast
	**Air Temp: High 85°F Low: 80°F** **Current Air Temp: 82.2°F (0600)** **Current Sea Temp: 83.5°F** **Est. Sunrise: 06:41 - Est. Sunset: 18:25** **<u>Pohnpei, Micronesia</u>** **Today – Tuesday – January 7th:** *Day:* East wind 20kt. Wind waves 4 to 5 ft. Northeast swell 5 to 7 ft and north 3 to 4 ft *Evening:* East wind 20 kt. Wind waves 4 to 5 ft. Northeast swell 5 to 7 ft and north 3 to 4 ft **Wednesday – January 8th** East wind 15 to 20 kt. Wind waves 3 to 5 ft. Northeast swell 5 to 7 ft and north 4 ft **Thursday/Friday - January 9th & 10th:** East wind 15 to 20 kt. Wind waves 4 to 5 ft. Northeast swell 5 to 7 ft and north 4 to 5 ft. **Saturday – January 11th:** East winds 15 to 20 kt. Wind waves 3 to 5 ft. Northeast swell 5 to 7 ft and north 3 to 4 ft.
48 Hour Surface Wind Forecast	
	

Pohnpei – ECMWF Model

Tuesday 7								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	80°	83°	84°	83°	82°	82°	82°
Rain in				0.03	0.06	0.05	0.01	
Wind kt	13	13	13	16	15	15	12	13
Wind gusts kt	22	21	22	25	26	26	24	21
Waves ft	6	6	6	6	6	6	6	6
Swell ft	4	5	4	4	5	4	4	4
Swell period	12.1	12	8.6	12.3	12	12.2	8.2	8.2

Wednesday 8								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	82°	84°	85°	84°	81°	80°
Rain in				0.01			0.01	0.02
Wind kt	13	13	15	16	14	13	11	11
Wind gusts kt	21	21	24	26	27	23	21	17
Waves ft	6	5	5	6	6	6	6	6
Swell ft	4	4	4	4	4	4	4	4
Swell period	12	11.7	13.3	12.8	11.3	8	7.4	12.4

Thursday 9								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	78°	79°	82°	84°	84°	82°	83°
Rain in	0.01	0.01	0.02	0.02	0.03	0.01		0.01
Wind kt	12	10	12	15	15	15	14	15
Wind gusts kt	18	18	20	26	26	26	24	24
Waves ft	6	6	6	6	7	7	7	7
Swell ft	4	4	5	5	5	5	5	5
Swell period	14.5	12.7	12.1	12.2	12.1	11.9	11.9	12.1

Friday 10								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	82°	82°	85°	85°	86°	84°	82°	82°
Rain in						0.01		
Wind kt	15	16	18	17	17	16	14	15
Wind gusts kt	24	25	28	29	28	27	25	23
Waves ft	7	7	7	7	7	7	6	6
Swell ft	5	5	5	5	5	5	5	5
Swell period	12.1	12.2	12	11.8	12.5	12.3	12.4	12

Saturday 11								
Hours	2	5	8	11	14	17	20	23
	15Z	18Z	21Z	00Z	03Z	06Z	09Z	12Z
Temperature °F	81°	81°	82°	85°	85°	81°	79°	78°
Rain in	0.01	0.02	0.01	0.02		0.05	0.01	0.03
Wind kt	14	14	15	16	15	14	11	12
Wind gusts kt	23	22	23	27	26	25	24	20
Waves ft	6	6	6	6	6	6	6	6
Swell ft	5	5	4	4	4	4	4	4
Swell period	11.7	12.2	12.2	12.2	12	7.7	12.2	12