2018

Cruise Report for cruise Kilo Moana KM1811 in the U.S. Gulf of Alaska continental margin

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CRUISE REPORT

R/V Kilo Moana

U.S. Extended Continental Shelf Cruise to Map Gulf of Alaska, Eastern Pacific

Cruise KM1811

July 1 – August 3, 2018
Honolulu, HI to Seattle, WA

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1. **Cruise Outline**

KM1811 is the third cruise of bathymetric mapping of the continental shelf in the Gulf of Alaska (GOA) in the NE Pacific. The objective of the cruise was to collect all of the bathymetric, acoustic backscatter, and high resolution sub-bottom data that might be useful to support a potential submission by the U.S. under the U.N. Convention on the Law of the Sea, Article 76 (Mayer et al, 2002). The responsibility for conducting the mapping was given to the National Oceanic and Atmospheric Administration (NOAA) by the U.S. Congress, and has been implemented since 2003 through a cooperative agreement with the Center for Coastal and Ocean Mapping and NOAA-UNH Joint Hydrographic Center at the University of New Hampshire. The cruise DOI is doi:25999/

This cruise supplements data from two legs of a prior cruise (Gardner and Mayer, 2005) on the RV *Kilo Moana* (Fig. 1.1) in the Gulf of Alaska to identify the morphology of the base of the slope (BoS) zone (Fig. 1.2). The 2018 cruise consisted of primary bathymetric mapping in water depths of approximately 500 m to 4000 m using the R/V *Kilo Moana* operated by the University of Hawai'i. The primary mapping sonar was a Kongsberg EM122 multibeam echosounder (MBES), supplemented with a Knudsen Engineering 3260 chirp sub-bottom profiler, and a Bell Aerospace BGM-3 marine gravimeter. Motion measurement and positioning was provided by an Applanix POS/MV 320 (V5) GNSS-aided inertial motion unit (IMU), and sound-speed profile measurements used Lockheed Martin Co. Sippican expendable bathythermograph (XBT) calibrated to Lockheed Martin Co. expendable sound speed (XSV) casts. Details of the systems used can be found in Section 2. Scientific personnel for the cruise were provided by CCOM-JHC, NOAA, University of Hawai'i, The College of Charleston, the University of Southern Mississippi, Memorial University (Newfoundland) and the University of Hawai'i marine technician group. The personnel list can be found in Section 6.

Cruise mobilization started on June 29, 2018, with the RV *Kilo Moana* alongside the University of Hawai'i Marine Facility in Honolulu, HI. Mobilization and dock-side testing were conducted on June 29 and June 30. An opening gravity tie was conducted on June 30 at ~1500 hr and the ship departed Honolulu, HI on July 1 at 1800Z (0800 HST). The ship proceeded past the Aloha Tower and out to sea, making 10.5 kts. on the transit to the Gulf of Alaska. A Built-In-Self Test (BIST) was conducted for the EM122 as the ship moved into deeper water, which the system passed with no faults (see Appendix G). As the ship transited to deeper water, an XBT was launched for training purposes and to confirm the validity of the XBT system against an XSV measurement.

The *Kilo Moana* then proceeded toward the first waypoint to deploy the first of seven ARGO floats that were deployed for an independent NOAA project. Routine mapping with both the MBES and the Knudsen profiler commenced on July 2 at 0930L/1930Z. Sufficient XBTs were taken during the transit to assess any changes in sound speed in the local water mass, with routine XBT casts at 6-hr. or more frequent intervals as required. The XBT launcher failed on July 5 (JD 186) and the UNH Sound Velocity Manager was used to generate profiles on the transit. A new XBT launcher was received in Sitka, AK on July 11 (JD 192) and was immediately installed and tested. XSVs were cast twice to confirm the validity of XBT-generated sound-speed profiles. Sound speed at the transducer head was compared with the sound speed at the transducer depth on the XBT profile from the most recent sound-speed profile using the Kongsberg Seafloor Information System (SIS) software, and a new XBT launch was conducted when the difference between the two estimates was between 0.5 m/s-1.0 m/s for more than a few minutes. Details of the XBT launch frequency, location, and other metadata are provided in Appendix B.

A total of 7,640 km (4,141 nmi) of lines (excluding transits) were planned in the survey area (Fig. 1.2). The mapping effort was monitored by the science party and supervised by the Chief Scientist, with the assistance of the ship's crew and the University of Hawai'i marine technicians. Data quality was monitored in real time using the watch standers in the ship's survey lab, and data processing and quality control were conducted during ship-board operations as detailed in Section 2.6 and Section 3. Shipboard preliminary data products were created to ensure data quality (see Appendix C), but final data products were constructed at UNH after the cruise.

Seven ARGO floats were launched at pre-determined positions along the transit lines to the Gulf of Alaska as shown in Table 1.1. Pitch, roll, and heading patch tests were conducted in the Gulf of Alaska area as shown in Fig. 1.3.

Mapping continued until 1029Z (0229L) on July 31, 2018 (JD212) when the ship entered the Canadian Exclusive Economic Zone (EEZ) on the way to Seattle, WA. All sonars were secured and no data were collected during transit through the Canadian EEZ. A final successful BIST was conducted on the EM122 as the ship was leaving the survey area. The ship arrived at Pier 91 in Seattle, WA. on August 3, 2018 (JD 215) at 0800L/1600Z. A closing gravity tie was conducted at on August 7, 2018 (JD 220).

A total area of 98,777 km^2 (28,799 nmi^2) was mapped (excluding transits) during the cruise in 22 survey days (Fig. 1.4, 1.5, and 1.6). There were 14 days of transit. A survey calendar is shown in Table 1.2.

Figure 1.1**:** The R/*V Kilo Moana* in Apia, Western Samoa, in 2010. The *Kilo Moana* is a SWATH (Small Waterplane Area Twin Hull) vessel owned by the U.S. Navy and operated by the University of Hawai'i.

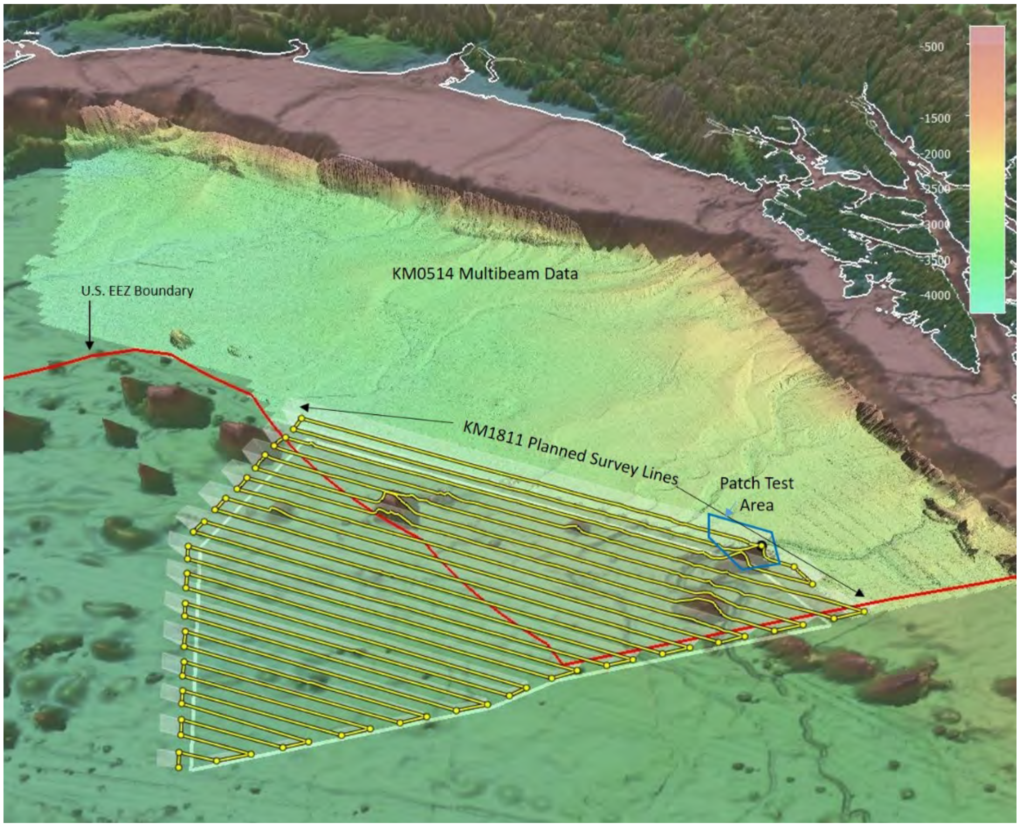


Figure 1.2: Overview of previously mapped area in the Gulf of Alaska from cruise KM0514-1 and KM0514-2 in 2005 with overlay of the pre-cruise planned waypoints and patch test area for KM1811.

Table 1.1: ARGO Float Deployments During Cruise 1811.

Serial Number	Julian Date	Time (GMT)	Latitude	Longitude
0942	184	2113	28°59.9’N	155°00.1’W
0939	185	1201	31°15.1’N	154°05.9’W
0938	186	0226	33°29.2’N	153°09.1’W
0941	186	1636	35°42.8’N	152°09.2’W
0940	187	0645	37°56.3’N	151°06.0’W
0937	188	1108	42°21.2’N	148°46.7’W
0943	189	0100	44°32.4’N	147°30.0’W

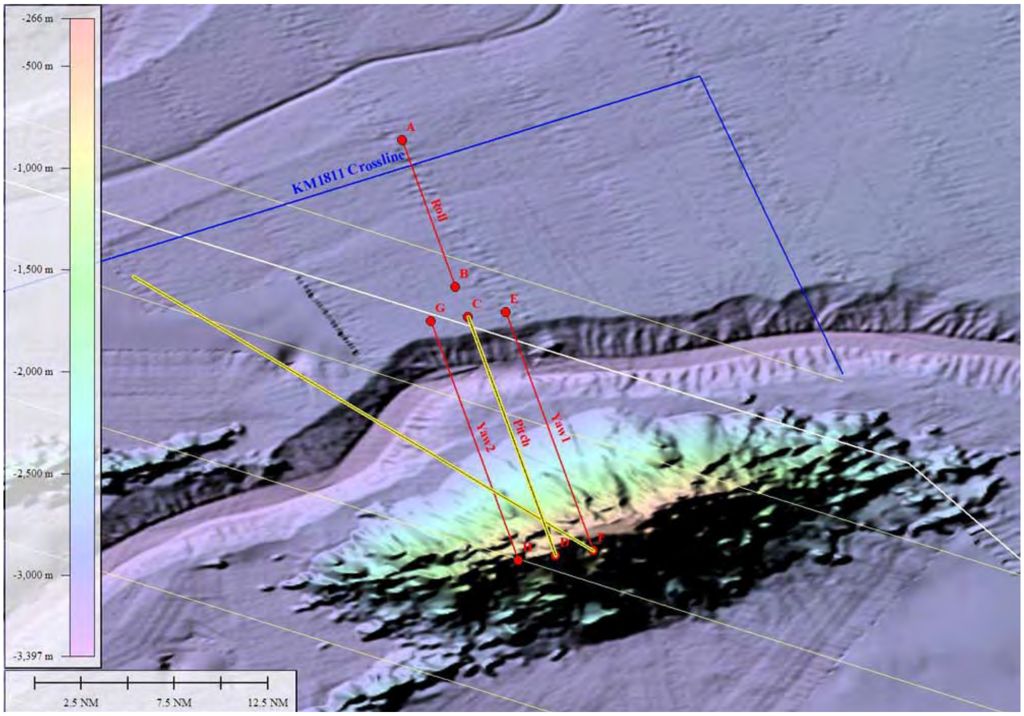


Figure 1.3: Patch Test Survey Pattern at NE Corner of KM1811 Gulf of Alaska survey, centered at 55° 44.32'N, 137° 7.63W.

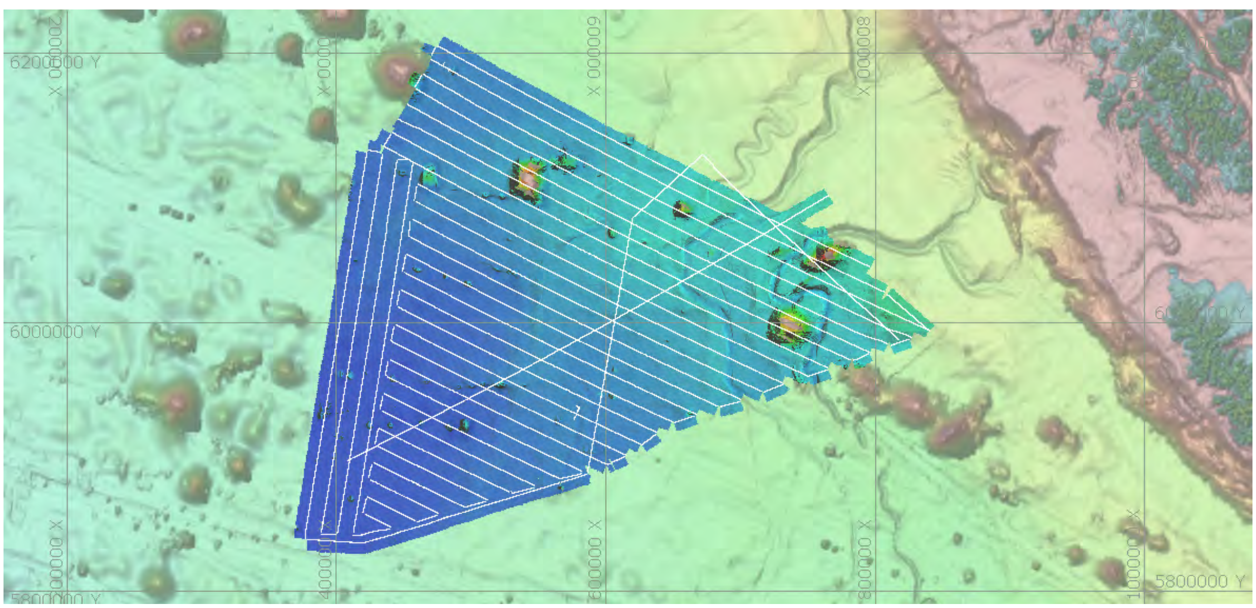


Figure 1.4: Overview of the lines as run during KM1811. A total of 8,680 km (4,687 nmi) of lines were completed in 22 survey days, for a total area mapped of 98,777 km^2 (28,799 nmi^2).

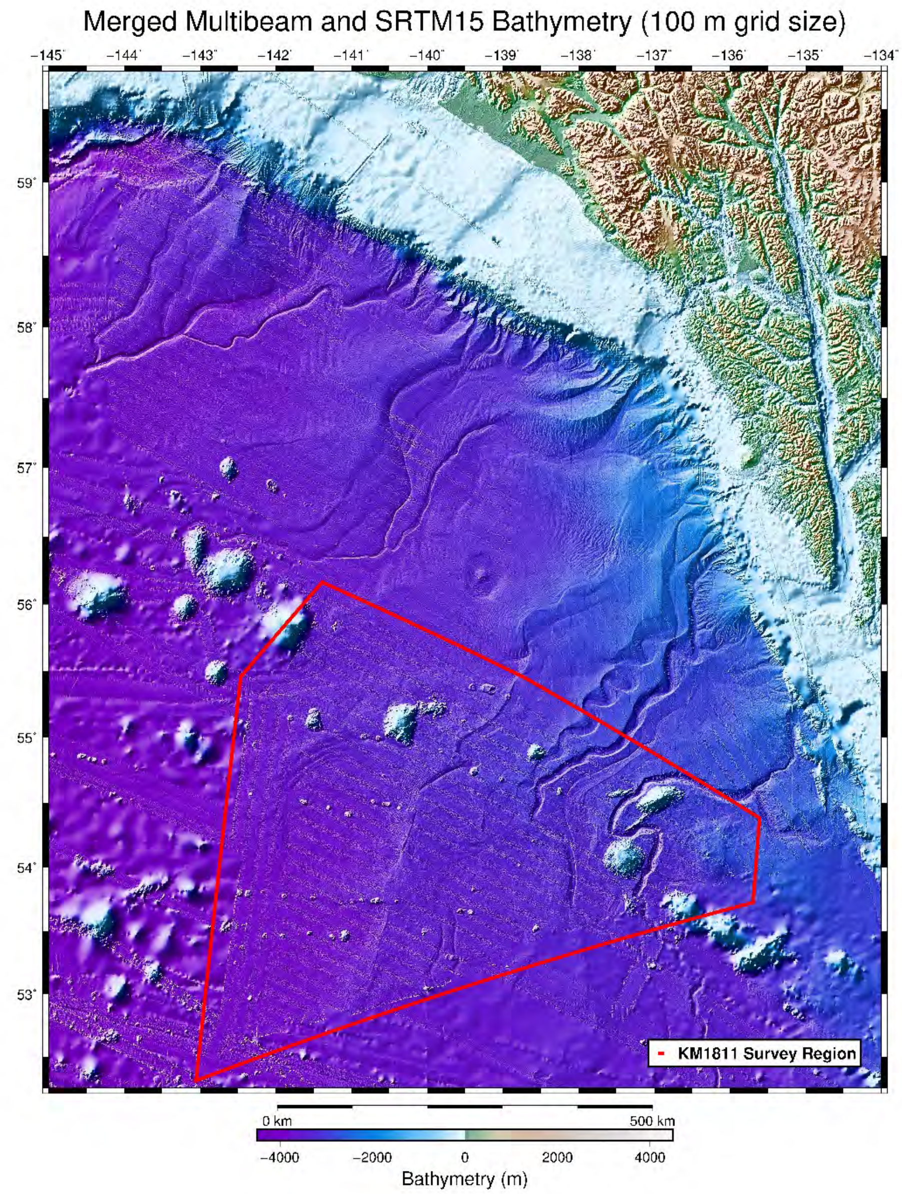


Figure 1.5: KM1811 survey data area shown on map of multibeam coverage in the area. Existing multibeam data has been merged with KM1811 coverage and SRTM15 (Shuttle Radar Topography Mission 15) satellite altimetry and plotted using *Generic Mapping Tools* 5.4.4.

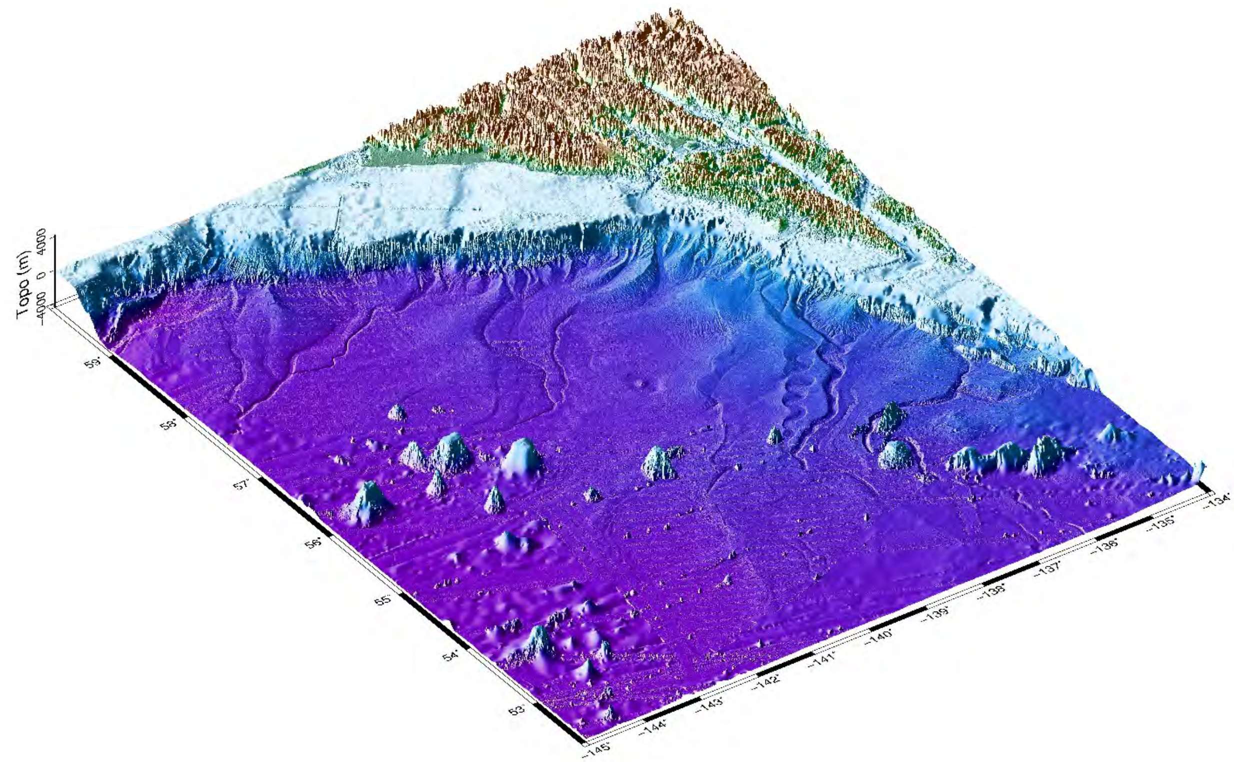


Figure 1.6: 3-D Image of Gulf of Alaska Multibeam Bathymetry Data combined SRTM15 satellite altimetry data. Produced using *Generic Mapping Tools* 5.4.4.

Table 1.2: KM1811 Survey Calendar

July/August 2018 (all times in UTC)						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 JD 182 1800 Depart Honolulu 2000 Safety Training	2 JD 183 1800 Training 1930 Start MB/SB Logging on KM1811-Transit1	3 JD 184 1500 Restart Knudsen 2145 ARGO #F942 deployed	4 JD 185 1200 ARGO #F938 deployed 1958 SIS restart I	5 JD 186 0226 ARGO F939 deployed 1500 Knudsen restart 1636 ARGO F941 deployed 1645 XBT launcher failed	6 JD 187 0645 ARGO F940 deployed	7 JD188 0330 Knudsen restart 0530 SIS restart 1108 ARGO F937 deployed
8 JD 189 0100 ARGO F943 deployed	9 JD 190 Transit continues	10 JD 191 0433 SOL GOA crossline	11 JD 192 0010 EOL crossline 0035 SIS restart 1400-1500 Arrive Sitka, XBT launcher install 1500 - Transit	12 JD 193 0600-1745 Patch test 1932 SOL HYPACK (HP) Line 2	13 JD 194 XBT launches at 1-2 hr intervals 1359 SOL HP 3	14 JD 195 1105 SOL HP 4 Note: Line spacing issues between Lines 3 and 4.
5 JD 196 0848 SOL HP 5. Line Spacing Issues cont.	16 JD 197 0604 SOL HP 6 1030: SIS gridding issues, stop/start survey	17 JD 198 0250: Turn, restart SIS & new project KM1811 0320: SOL HP 7 2303 SOL HP 8	18 JD 199 1907 SOL HP 9	19 JD 200 1400 SOL HP 10 2000: Changed line plan to exclude western triangle	20 JD 201 0646 SOL HP 11a 2227 SOL HP 12a	21 JD 202 1358 SOL HP 13a
22 JD 203 0406 SOL HP 14a 1740 SOL HP 15a	23 JD204 0625 SOL HP 16a 1805 SOL HP 17a	24 JD 205 0551 SOL HP 18a 0838-0851 Auto-pilot problems 1657 SOL HP 19a	25 JD 206 0326 SOL HP 20a Skip HP 21a 1300 SOL HP 22a 2135 SOL HP 23a	26 JD 207 0546 SOL HP 24a 1315 SOL HP 25a 1917 SOL HP 26a	27 JD 208 0049 SOL HP 27a 0518 SOL HP 28a 0905 SOL HP 29a 1145 SOL HP 30a 1305 SOL HP 31a 1410 SOL 32a 1430 SOL W1	28 JD 209 0437 SOL W2 1909 SOL W3
29 JD 210 0938 SOL HP W4	30 JD 211 0014 SOL South5 1112 SOL SBP6 2102 SOL SBP7	31 JD 212 0040 Start Transit 1040 Stop all logging	Aug 1 JD 213 Transit	2 JD 214 Transit	3 JD 215 1600Z (0800L) Arrive Seattle	

2 Survey Equipment

2.1 Multibeam Echosounder

RV *Kilo Moana* is equipped with a Kongsberg Maritime 12-kHz EM122 multibeam echosounder, model 309653, serial number 109[1]. The system generates a narrow sound pulse in the region of 12 kHz in a 150˚ swath ~1˚-wide along-track and the acoustic reflections from the seafloor are received on 2°-wide across-track receivers. A sequence of up to nine acoustic sectors at frequencies varying from 11.550-12.596 kHz can be generated on transmit to compensate for ship's yaw, at a source level of approximately 220 dB re. 1μPa at 1m. Optionally, the outer sectors of the transmit beam can be frequency modulated to improve overall signal-to-noise ratio. The system was operated in Deep FM high-density equidistant mode throughout the cruise, with a pulse length of approximately 15 ms. Pulse repetition rate varied with water depth, but has a period of approximately 15 s to 20 s for the majority of the cruise.

The departure draft at the beginning of the cruise of RV *Kilo Moana* was 7.57 m port forward; 7.65 m starboard forward; 7.72 m port aft; and 7.92 m starboard aft. The arrival draft at the conclusion of the cruise was 7.01 m fore, and 7.32 m aft . Although the draft varied slightly up and down during the cruise as a result of fuel consumption and ballast changes, the changes in draft were insignificant for this survey.

An AML Oceanographic Smart SV&T, serial number 20020, was used to measure sound speed at the transducer. Calibration was conducted by the manufacturer on 2016-02-25/27; the certificates of calibration are in Appendix D.2.

Kongsberg Seafloor Information System (SIS) version 4.3.2 build 31 (2016-02-24), marked as "For EM122 rev. 2.2.2_OCT_2016" was used to monitor and control the EM122 MBES.

2.2 Applanix POS/MV Motion Sensor

The EM122 was provided with position and motion information using an Applanix POS/MV inertial motion unit (IMU) version 5, PCS serial number 7995, IMU 64 serial number 3494 (antennae were AeroAntenna AT1675-540TS, port serial 10312, starboard serial 10299), which was provided with wide-area satellite-based differential positioning using the built-in Fugro Marinestar service on the BD982 receiver card (GNSS G2 service was used throughout). The POS/MV system provided motion estimates with uncertainty on the order of 0.02° (r.m.s.) for roll, pitch, and heading, heave accuracy of the maximum of 0.05 m (r.m.s.) or 5% of measured heave, and positioning accuracy of approximately 0.5 m (CEP). Applanix MVPOS-View software, version 9.82 (firmware 9.82), was used to monitor and control the performance of the POS/MV.

[1] There exists at least one other EM122 that also claims to be serial number 109 (specifically, on the RV *Marcus G. Langseth*). It is therefore unknown if this is an older serial number left over from the EM120 previously installed on RV *Kilo Moana*, or if all EM122 systems claim that this is their serial number, or if this is not actually a serial number in the conventional sense.

2.3 Knudsen 3260 Sub-bottom Profiler

The sub-bottom profiler (SBP) usedon KM1811 was a Knudsen Engineering 3.5-kHz 3260 rack-mounted echosounder, serial number K2K-07-0911, connected to two permanently hull-mounted transducer arrays (transmitter K2K-07-0884, firmware 2.64, 15 TR-75 Massa transducers) and 12-kHz (transmitted K2K-07-0890). The system was used at a nominal frequency of 3.5 kHz so as not to interfere with the EM122, and was synchronized to the firing rate of the EM122 so as to minimize interference between the two systems. The source level of the Knudsen 3260 is expected to be approximately 220 dB re. 1μPa at 1m, but may vary in practice. The system was configured for 64 ms linear frequency modulated (LFM) pulses, with 3.0-kHz bandwidth.

Knudsen EchoControlClient software version, 2.64, operating on a portable laptop computer, was used to monitor and control the system. The Knudsen EchoControlServer software used to interface to the echosounder was version 2.64. Although a replacement computer and an updated version of software and firmware were available, it was decided to conduct the survey with the existing configuration of hardware and software, which worked well throughout the cruise.

2.4 Gravity Meter

The *Kilo Moana* carries a Bell Aerospace BGM-3 marine gravimeter, with component part serial numbers 219 (sensor), 315 (CPS), and 322 (platform). The system is mounted in a secure space on the deck in the science office. The portable gravity meter used to provide tie-points was a Lacoste and Romberg Inc. model with no discernable model number, serial number 1. The gravimeter was operated throughout the cruise.

2.5 XBT Launch System

The XBT launch system was a Sippican (Lockheed-Martin) Mk21 LM3A launcher (serial number illegible). The control computer, located in the Wet Lab on the main deck aft, ran version 2.1.1 of Lockheed Martin Sippican's *WinMk21* software (MkCoeff 2.3.1, Mk21AL 2.3.1). The replacement XBT launcher was also a Lockheed Martin Sippican Mk21 LM3A, serial number 111601.

2.6 System Configuration

Fig. 2.1 shows the placement of the instrument displays in the main lab. A summary of serial numbers and software versions is provided in Table 2.1.

Figure 2.1: Instrument displays in the main lab of the RV *Kilo Moana* during KM1811. The large center screen is used for SIS, and the screen to the left displays the POS/MV real-time performance metrics, while the laptop to the right was used for Knudsen display. The laptop to the left was used for data processing and quality control. A separate real-time data mosaic service (far right) that was tested but not used for survey purposes was provided by University of Hawai'i.

Table 2.1: Summary of serial numbers and software versions for the various components of the mapping system, including data processing software, used during the mapping mission.

Instrument	Part	Make	Model/Release	Serial #/Date
Multibeam Kongsberg EM 122				
	Transceiver Unit	Kongsberg Maritime AS	309653	109
	SIS Workstation	Kongsberg Maritime AS	HWS-C3	47467B09
	SIS (software)	Kongsberg Maritime AS	4.3.2	2016-02-24
	TX36 (firmware)	Kongsberg Maritime AS	1.11	2013-05-07
	RX32 (firmware)	Kongsberg Maritime AS	1.11	2010-02-18
	BSP67B (firmware)	Kongsberg Maritime AS	2.2.3	2009-07-02
	CPU (firmware)	Kongsberg Maritime AS	1.3.8	2016-10-01
	DSV (firmware)	Kongsberg Maritime AS	3.1.8	2014-11-25
	DDS (firmware)	Kongsberg Maritime AS	3.5.10	2014-01-06
Applanix POS/MV 320				
	MV-320 (hardware)	Applanix Corporation	MV-320 V5	1.4-12
	MV-320 PCS (hardware)	Applanix Corporation	MV-320 V5	7995
	MV-320 IMU (hardware)	Applanix Corporation	IMU-64	3494/July 2016
	MV-320 (software)	Applanix Corporation	9.82	10005101
	Primary GPS Receiver	Furuno	GP 150	6416-8482
	Primary Antenna	AeroAntenna Technology	RG-45-NM-R	10312
	Secondary GPS Receiver	As Primary	As Primary	As Primary
	Secondary Antenna	AeroAntenna Technology	RG-45-NM-R	10299
	MS-POSView (software)	Applanix Corporation	9.82	
Marinestar GNSS				
	Build in (POS/MV)	Fugro MarineStar	//	1010117134
Transducer Sound Speed Sensor				
	Probe	AML Oceanographic	SV&T	20020/2-27-2016
XBT System Sippican MK21/USB				
	MK21 OI Board	Sippican	MK21/USB	0320
		Sippican	MK21-LM3A	111601
	WinMK21	Sea-Air Systems	2.1.1	2003
SBP Knudsen Chirp 3260				
	Topside Processor	Knudsen Eng. Ltd	D229-04331	K2K-07-0911
	Ch#1 3.5 kHz (hardware)	Knudsen Eng. Ltd	//	K2K-07-0884
	Ch#1 3.5 kHz (software)	Knudsen Eng. Ltd	D409-04195	2.64
	Ch#2 12 kHz (hardware)	Knudsen Eng. Ltd	//	K2K-07-0890
	Ch#2 12 kHz (software)	Knudsen Eng. Ltd	D409-04195	2.64
	Software EchoControlClient	Knudsen Eng. Ltd	D409-04184	2.64
Marine Gravity Meter System Bell BGM-3				
	Sensor	Bell Aerospace Textron	//	219
	CPS	Bell Aerospace Textron	//	315
	Platform	Bell Aerospace Textron	6109-307001-3	322
Land Gravity Meter System Bell BGM-3				
	Geodetic Gravity Meter	Lacoste & Romberg Inc	//	1
Processing Software				
	HIPS/SIPS	CARIS	10.3.3	2017-09-08
	Fledermaus	QPS	7.8.4	2018-05-23
	FMGT	QPS	7.8.4	2018-05-23
	SonarWeb	Chesapeake Technologies	3.16.0096	2009-10-13
	SonarWiz	Chesapeake Technologies	7.00.0011	2017-09-28
	HyPack MAX	Xylem	18.0.15.0	//
	Sound Speed Manager	HydrOffice	2018.1.40	2018
	Qimera	QPS	1.6.3	2018-05-24

3. Data Protocols

3.1 Collections

Data collection was conducted using standard hydrographic protocols for deep-water mapping. Static offsets for the positions of the components of the survey system were provided to RV *Kilo Moana* based on the latest survey report for the ship (dated 2015-03, Appendix D.1). Static angular offsets were assessed through the patch-test procedure described in Section 4 and were applied in the SIS software and thence to the real-time processing module in the EM122. The offsets determined on 2017-07-26 during a system test cruise (KM1711) were found to be correct, and no changes to the existing values were applied.

The SIS software was configured to automatically start new lines every eight hours, but lines were incremented manually every six hours. Line changes on the Knudsen 3260 were synchronized with the EM122 so that corresponding lines were always captured on each system. Turns were recorded separately for both systems, and each turn file was labeled as such to distinguish those files from the main data.

Speed of sound at the transducer was determined by an AML Oceanographic SV&T sensor that feds directly into the EM122 processing station in order to correct for refraction in the beam-steering computations. Sound-speed profiles (SSP) in the upper part of the water column were derived from XBT launches and occasional XSV launches (as required) and extended to deep water depths using almanac data from the World Ocean Atlas 2009 (WOA09) using the *HydrOffice* Sound Speed Manager software, version 2018.1.14, installed on the SIS workstation. (Note: There were a few problems with communications in the version 2018.1.14 *HydrOffice* Sound Speed Manager software, which required manual query to obtain draft and surface sound velocity. However, even with these issues, the program provided the functionality needed for transmission of the sound speed data to SIS. Therefore, it was decided that installation of a new version of the *HydrOffice* Sound Speed Manager software that was downloaded during the cruise was not necessary. After manual inspection and editing, these extended and simplified profiles were then sent to the EM122 over the network in order to avoid any dropped pings or stop/start update cycles. The profiles (raw, extended, and simplified) were also stored in a local database for further analysis. Routine XBT launches were conducted as needed or at 6-hr intervals. In many cases temporal variability in the water column necessitated XBT casts much more frequently (1-1.5 hours) than at 6 hr intervals. During the transit to the survey area, the XBT launcher failed and the SSP was derived from the *HydrOffice* Sound Speed Manager database until the replacement launcher was installed. The replacement launcher was used successfully for the entire survey map area. The sound speed at transducer depth from the SSP was compared in the SIS console with the current real-time sound speed at the transducer and if a difference of more than 0.5 m/s-1.0 m/s was observed for more than a few minutes, a new XBT cast was made. The XBT launch system is described in Section 2.5, and the metadata for the launches and probes is given in Appendix B.

The Knudsen Engineering 3260 SBP was operated throughout the cruise, except during the patch-test, typically with a nominal depth gate (range setting) of 500 m about the expected depth. A priority sub-bottom line with a range setting of 200 m and internal triggering was run at the end of the survey in an area requested by ECS experts. All sub-bottom data were recorded with an assumed sound speed of 1500 m/s. Full digital records were recorded in SEG-Y format and the Knudsen proprietary KEB format.

The gravity meter calibration ties and gravity data analysis were conducted by Jonathan Tree, one of the science crew who has extensive experience with gravimetry surveys, and/or the UH marine science technicians. The gravity tie data is provided in Appendix D and the gravity results are presented in Appendix E.

Although not formally part of the cruise, Acoustic Doppler Current Profiler (ADCP) data at 300 kHz and 38 kHz were collected continuously while underway. Data reduction and archive submission for this data were handled separately by University of Hawai'i.

3.2 Processing

Data from both the EM122 and the Knudsen 3260 were made available on the *Kilo Moana's* internal network using a network share from the ship's primary Network Attached Storage (NAS) device. Files from the EM122 were synchronized automatically to the NAS shortly after being completed; files from the Knudsen 3260 were copied to the NAS manually. Files were copied from the NAS to local storage for archive and processing at the completion of each line. For purposes of efficiency in data processing, the data were separated into sub-projects. The transits from Honolulu and to Seattle and the patch test data were kept as two separate projects in post-processing.

Data processing for the MBES bathymetry was conducted using QPS *Qimera* 1.6.3 (05-24-18) with visualization products created with QPS *Fledermaus* 7.8.4 (05-23-18). A separate flow-path between *Qimera* and *HYPACK* was established for intermediate gridded products created in *Qimera*, so that current data could be placed in the same geographic context with prior data. Generic Sensor Format (GSF) files, which contain both edited bathymetric data and backscatter imagery, were exported from *Qimera*. GSF files and GeoTIFF images were used for transfer. Preliminary onboard data processing for the Knudsen 3260 data was conducted in Chesapeake *SonarWiz* 7.00.0011 and *HYPACK* 18.0.15.0.

The MBES bathymetry data were processed using the *CUBE* algorithm, implemented in *Qimera*. A grid resolution of 100 m was used for all depths of water encountered. The *CUBE* calibration parameters used are given in Appendix D.4. Quality control of the MBES data during the cruise was carried out by the watch standers, to ensure that any anomalous depth measurements were either appropriately handled by the *CUBE* algorithms within QPS *Qimera*, or were edited by hand if necessary. Post-cruise cross-swath analyses were conducted by Dr. James V. Gardner, UNH/CCOM-JHC to determine the bathymetry uncertainty of the EM122 aboard the RV *Kilo Moana*. Results of the cross-swath analyses are given in Appendix F.

After the bathymetry grid was finalized in QPS *Qimera*, surface filtering was applied to the raw data so that legacy point-cloud files of surface-consistent sounding observations could be generated for archival purposes. Processed QPD files were exported in the Generic Sensor Format (GSF) in order to archive processed multibeam data files and for import into QPS *Fledermaus* and QPS *FMGT*. The files were also exported in ASCII longitude-latitude-depth format for use in future products. Grids were exported in BAG and GeoTIFF formats from QPS *Qimera*, and separate grids in geographic coordinates were constructed in QPS *Fledermaus* from the exported ASCII data. Preliminary data products were constructed onboard, and are illustrated in Appendix C, but final adjustment, cross comparisons, and product creation were conducted ashore by Dr. Gardner, UNH/CCOM-JHC.

The MBES backscatter data were processed using the QPS *FMGT* 7.8.4 (2018-05-23). A grid resolution of 100 m was used for the backscatter mosaics. The calibration parameters used are given in Appendix D.5. Mosaics of backscatter were exported in GeoTIFF and QPS *Fledermaus* SD format for review and for combination with bathymetric data in the visualization environment. Mosaics of bathymetry, backscatter and gravity were also created using the open source *MBSystem* software and plotted using the open source *Generic Mapping Tools* (*GMT)* 5.4.4 software.

Sub-bottom profiler data was processed using *SonarWiz* and *HYPACK* to convert the data into imagery and for export it in forms suitable for review and correlation with the MBES data. No further quality control was conducted.

For compatibility with previous legs of the cruise, the filenames used by the SIS software were translated into sequential filenames, starting with line number 200. Translation tables for MBES and Knudsen data are provided in Appendix A. FGDC-compliant metadata were constructed post-cruise by Dr. Gardner for each line of MBES and Knudsen data, as well as constructed overview grids of bathymetry and backscatter.

Data from the cruise in native Kongsberg Maritime .all format were archived for ingestion through the R2R program, and were made available after the cruise on a portable hard drive. Separately, CCOM-JHC provided processed data with metadata to the National Centers for Environmental Information (NCEI). The shipboard archive also contains raw data from all instruments, including meteorological observation, ship bridge logs, navigation information, and other underway sensor information.

Raw Gravity data collection and file format:

Marine gravity was continuously collected during the KM1811 cruise using the Bell BGM3 marine gravimeter on board the RV *Kilo Moana*. Raw gravity data files are produced daily, and are labeled km1811_raw_grav_[JDAY].rg. The data structure of these files is summarized below.

Year	Jday	Hr	Min	Sec	Unix Time	Lat.	Lon	Hdg	SOG	COG	Sensor	Raw counts	(01)	Raw Gravity (mgal)

Raw Gravity Processing:

Raw gravity data were processed daily using *GMT* program filter1d, and *awk* scripts to calculate east component of velocity vectors to calculate the Eötvös correction, and determine the value of gravity for positions using the 1984 International Gravity Formula (IGRF). Free-air gravity anomaly (FAA) was calculated by subtracting the IGRF value and adding the Eötvös correction. The results of these calculations are present in the final processed data files; named km1811_raw_grav_[JDAY].rg.faa. Processed gravity files are decimated to 15-s intervals. The format of these files are summarized below.

Year	JDay	Unix Time	Longitude	Latitude	Raw Gravity (mgal)	Eötvös Correction (mgal)	IGRF Value (mgal)	Free-air Anomoly (mgal)

Daily free-air gravity anomaly files were combined and gridded using the *GMT* programs blockmedian and nearneighbor. A discussion of the gravity results is in Appendix E. The final map of the free-air gravity anomaly within the survey area is shown in Figures 3.1 and E.1 and intermediate products are shown in Fig. E.2.

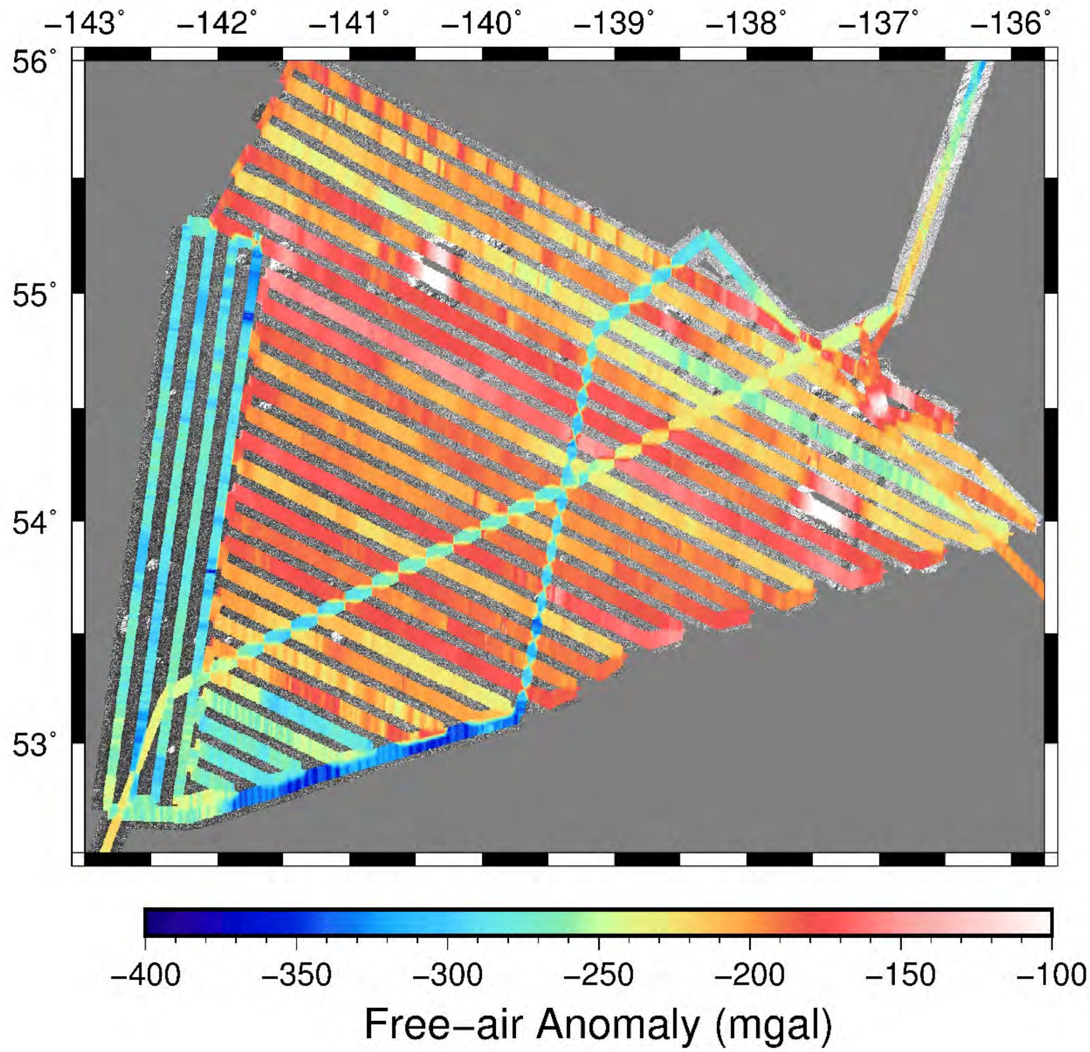


Figure 3.1: Map of the free-air gravity anomaly plotted on top of the multibeam backscatter. Note the inconsistency between cross-lines through the survey and western margin north-south survey lines. Strong variations within the NW-SE survey lines, which are suspected to be inaccurate, were observed. The largest variation was observed at the western margin.

4. Patch-Test Results

The most recent patch test of the EM122 on the RV *Kilo Moana* was performed during cruise KM1718 in November 2017. The patch test confirmed a patch test performed on July 24-26, 2017 conducted by Paul Johnson of UNH/CCOM-JHC on behalf of the NSF Multibeam Advisory Committee. However, regardless, a separate patch test was conducted prior to commencement of mapping in the survey area of KM1811 in order to re-confirm the values present in the system. Data from this patch test were named separately from the main survey and transit lines and held in a separate data directory. The patch tests were run with the initial offsets entered into the SIS software. A total of 6 patch-test lines were run prior to commencing the KM1811 survey (Fig. 4.1).

1. Pitch Test: Two sets of reciprocal lines on slope and top of ridge 10 kts (C-D-C and E-F-E)
2. Roll Test: Reciprocal lines on flat region at 10 kts (B-A-B)
3. Heading Test: Parallel lines in same direction on slope and top of ridge (E-F & G-H)

No timing (latency) test lines were run, because detection of latency offsets is not feasible in deep water.

The data were ingested into Qimera in a project separate from that where the main-scheme lines were processed ("KM1811_PatchTest"), and conventional processing was applied to allow the data to be used in the calibration tool within Qimera and the raw data was processed in the Kongsberg SIS software for comparison. Examination of the data showed, over the various pairs of lines that can be used to solve for roll, pitch, latency, and yaw, that there was no distinctive pattern of offset-derived artifacts from the data.

It was therefore concluded that the initial offsets (Fig. 4.2) of

Pitch: -0.35°
Roll: -0.07°
Yaw: +0.05°
Timing: 0 ms

would remain operational for the duration of the survey.

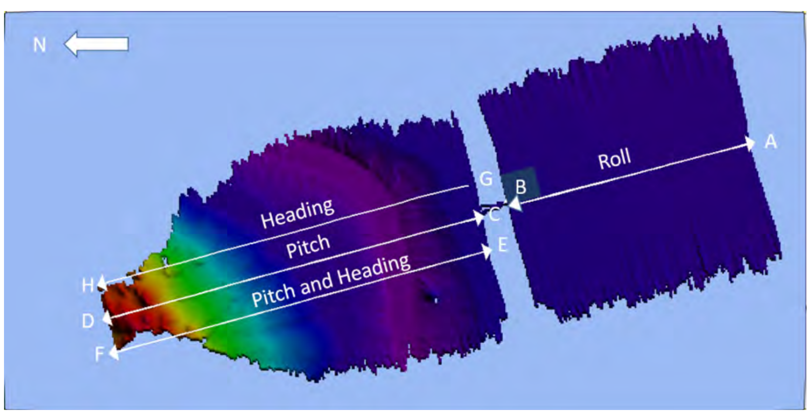
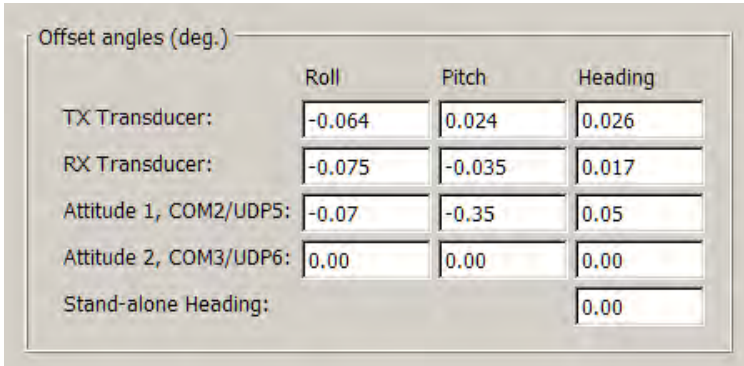


Figure 4.1: Patch-test lines run immediately prior to the KM1811 survey; the center of the area is at approximately 55° 44.12' N, 137° 04.91'W. All lines were run at 10-11 kts. The lines were run from C-D-C (pitch), then B-A-B (roll); E-F-E (repeat pitch) and E-F and G-H (heading).



Offset angles (deg.)

	Roll	Pitch	Heading
TX Transducer:	-0.064	0.024	0.026
RX Transducer:	-0.075	-0.035	0.017
Attitude 1, COM2/UDP5:	-0.07	-0.35	0.05
Attitude 2, COM3/UDP6:	0.00	0.00	0.00
Stand-alone Heading:			0.00

Figure 4.2: Angular offsets in effect during KM1811.

5. Daily Narrative

All times in UTC unless noted otherwise.

Friday, June 29, 2018 & Saturday, June 30, 2018 JD 180-182.

- Andy Armstrong and Paul Johnston arrive aboard RV *Kilo Moana* to set up and configure data processing equipment for cruise. Confirmed that the XBT and XSV supplies were loaded and stowed.
- Chief scientist and watch standers arrive on RV *Kilo Moana* for familiarization and training
- Seven ARGO floats loaded on board
- Gravity tie performed at University of Hawaii marine center

JD 182 -- July 1, 2018

- Depart Honolulu, 1800, safety meeting, drills

JD 183 -- July 2, 2018

- 1800: Training
- 1930: Start logging multibeam and sub-bottom data at ~25 deg. N.

JD 184 – July 3, 2018

- 1550-1555 Knudsen lost GPS feed, regained signal after restart
    - Ended raw line 11 (.sgy) before restart
    - Started raw line 12 (.sgy) after restart
- 2145: ARGO float #942 deployed

JD 185 -- July 4, 2018

- 1200: ARGO float #F0938 deployed
- 1200: Time zone changed to -9 UTC
- 1958: Kongsberg EM122 froze and restarted SIS – maintained logging in line 208.

JD 186 -- July 5, 2018

- 0226: ARGO float #F0939 launched
- 0530: Pyrotechnics training on aft deck
- 1500: Knudsen software updated; machine restarted, GPS feed problem.
- 1636: ARGO float #F0941 deployed
- 1645: XBT launcher failed to collect data, repairs pending

JD 187 -- July 6, 2018

- ~0600: Ascending steep rise, Knudsen SBP is having difficulty tracking bottom
- 0645: ARGO float #F0940 deployed
- ~0730: Descending rise, Knudsen SBP seemingly settling down and tracking better
- 0945: Still chasing bathymetry with Knudsen
-

JD 188 -- July 7, 2018

- 0230: Knudsen's SEG-Y Carrier Type was switched to filtered
- 0334: Knudsen machine was shut down in an attempt to reconnect it to the server
- 0340: Knudsen back up and running
- 0530: Reboot SIS, computer, TRU. Loss of sectors on port side persisted beyond initial SIS only restart.
- ~0550: SIS back online and logging. Two files for this recording period, 217 & 218. Lost some Knudsen SBP data during SIS reboot before switching to internal sync (same file, not advanced).
- 1108: ARGO float #F0937 deployed

JD 189 – July 8, 2018

- 0100: ARGO float #F0943 deployed
- 0540: Changed Penetration Filter setting from Weak to Medium to reduce nadir artifacts. 👍
- 0750: Entering area of more bathymetric relief, switched Penetration Filter back to Weak.
- 1002: Changed Penetration Filter setting from Weak to Medium, intermittent artifacts again.
- 1010: Now seeing a continuous 'feature', changed Penetration Filter setting from Medium to Strong.
- 1014: Changed Penetration Filter setting back to Medium after determining that continuous low relief features were real with orientations oblique to track. Fear the waterfall display

JD 190 – July 9, 2018

- 0700 – Time change to Zone -8 UTC.
- XBT launcher repair tested, not successful.

JD 191 – July 10, 2018

- 0433: Begin official survey, SOL 'Crossline' toward inshore start of main survey lines: GOA_Line_230
- 1033: First file change of the official survey
- ~1100: Odd "C C"-shaped seamount
- ~1230: SV red majority of the time; sometimes up to 3 m/s difference than sensor
    - Frequent changes in magnitudes >1m/s common in short durations of time
- Consistent side lobes on inner and outer beams (GOA Lines 232 & 233) easily removed by *Qimera*
- Sub-bottom data revealed weak to nonexistent stratification/massive bedding structure
- Auto-tilt runtime setting changed from 3° to 4° in attempt to fix side lobe issues (1730; GOA Line 233)
    - Adjustment seemed to have little effect

JD 192 – July 11, 2018

- ~0010: EOL 'Crossline', turn toward Sitka for resupply of XBT launchers

- ~0035: SIS crashed and restarted. Switched to line 236 after restart
- 0515: Water-column data was not being logged (after SIS crash?). Began logging WCL.
- ~0815: SV has gone red, *Sound Speed Manager* not working
- 0915: Switched to AUTO ping mode, now inshore of previous survey data at 1145 m water depth, but SIS is still choosing to operate in DEEP mode.
- 0921: Reboot SIS to bring it back up with Data Distribution tool (it was inadvertently shut down) and hopefully fix other woes. Knudsen stopped pinging since it was on external sync.
- 0928: Stopped logging on Knudsen after changing to internal sync. Still pinging. Data Distribution settings were set to pre-KM1811 departure values.
- 0932: Started logging again on both SIS (file #238) and Knudsen (file #067). Knudsen .kea and .keb files are missing for files #065, 066 – was changing Range setting.
- 0945: Knudsen switched back to external sync. *Sound Speed Manager* active again and new SVP applied, clear.
- 1015: EM 122 in MEDIUM ping mode, 600+ m w.d.
- 1037: EM 122 in SHALLOW ping mode, ~250 m w.d.
- 1044: Stopped logging and pinging Knudsen. Stopped logging EM 122, <250 m w.d.
- 1400-1500: Arrive Sitka and pick up new XBT launcher
- 1500-2400: Transit from Sitka to patch test; XBT launcher installed and tested. Testing *Sound Speed Manager* because of intermittent problems with SIS/SVP Manager communication. This issue is bothersome but not critical to use of SVP manager, because information can be loaded into SVP manager manually.

JD 193 – July 12, 2018

- 0000-0600: Continue transit to Patch Test.
- 0600: Take XSV and XBT. Apply XSV to data
- Preexisting bias values in the MRU: Roll=-0.07°, Pitch=-0.35°, Hdg=+0.05°, Time=0.00s
- 0624-0738: First pitch test line (C to D), #239
- 0749-0908: Reciprocal pitch test line (D to C), #240
- 1010: Compared results using SIS, *Qimera*, and *HYPACK* patch test tools with varied results. Moving on to roll test lines without changing pitch values (yet).
- 1025-1113: First roll test line (B to A), #241
- 1122-1208: Reciprocal roll test line (A to B), #242. Did not resume *HYPACK* logging until 1200.
  Determined that no change in roll value is necessary.
- 1307- 1423: First yaw test line (E to F), #243
- 1434: Reciprocal line (F to E) (for pitch comparison), #243
- 1615: 2nd yaw test line (G to H)
- 1745: Patch test complete. No changes made to system biases.

- 1745: Transit to plan line 2 (Line 1 deleted): Data logging SIS Line
- 1923: Start main scheme survey – *HYPACK* Line 2 (GOA_Line_246)

JD 194 – July 13, 2018

- 0512 short gap in Knudsen SBP record on raw line #073, shifted to wrong scale range
- Having to launch XBTs every 1—2 hr. because of distinct surface layer.
- 1359: Start *HYPACK* Line 03 (GOA_Line_251)

JD 195 – July 14, 2018

- 0843: EOL *HYPACK* Line 03
- 0851: SOL turn line 03 to 04, hdg 135°
- 1059: EOL turn line 03 to 04
- 1105: SOL *HYPACK* Line 04, hdg 299° (GOA_Line_255)

JD 196 – July 15, 2018

- 0546: Diverted 2° stbd to avoid data gap w/~20 nm to go, new hdg 301°, projected to be 1.1 nm to stbd at EOL. Overlap was <10%.
- 0645: Came back over 1° to port, new hdg 300°. Overlap now ~20%.
- 0802: EOL *HYPACK* Line 04. Finished ~0.5 nm to north of line with good overlap.
- 0810: SOL turn line 04 to 05, hdg 210°.
- 0841: EOL turn line 04 to 05. Coming in ~0.5 nm north of *HYPACK* Line 05
- 0848: SOL *HYPACK* Line 05, hdg 120°, ~20% overlap near SOL (GOA_Line_260)
- *HydrOffice Sound Speed Manager* software.
- At ~1230, overlap was only 5%, asked bridge to adjust course 1km to port on SIS_line_262, *HYPACK* Line 5
- ~01:30: Loud electrical pop from EM 122 TRU area, will run BIST test on next turn

JD 197– July 16, 2018

- 04:10: Gap has been forming, moving 100 m to port near EOL *HYPACK* Line 05 w/~7 km to go
- 04:14: Moving another 300 m to port. And then some…
- 05:02: EOL *HYPACK* Line 05. ~2.2 nm (~4 km) offset north of line 05 at EOL.
- 05:12: EM 122 passed BIST test. SOL turn line 05 to 06, hdg 255°
- 05:55: EOL turn line 05 to 06. Coming in 1.5 nm short on oblique turn line to compensate for EOL offset of line 05.
- 06:04: SOL *HYPACK* Line 06, course 299° (GOA_Line_265)
- 06:16: Maintaining ~20% overlap at SOL. Slowly heading back to line, targeting 6 nm downline, approximately where diversion on line 05 occurred. Requires gradual course change of 6°.
- 07:12: Have been back online with ~10% overlap
- 09:10: Gap forming on stbd side, but on edge of seamount so continuing online over channels to either side of edifice

- 10:33: SIS grid disappeared awhile back. Stopped logging, pulled off line, restarted SIS
- 10:58: Back online and restarted logging. Last portions of previous line, line change file, and first file of current line are not displayed in SIS grid. These problems likely stem from not beginning a new SIS survey project after arriving on site in the Gulf of Alaska after long transit from Hawai'i.
- 11:04: At turn off point when restarted SIS

JD 198 – July 17, 2018

- 0250: Turn from Line *HYPACK* Line 6 to Line 7. Stop logging on KM1811-Transit 1 and Start new project KM1811 in order to minimize load of data volume on SIS
- 0315: Load gridded background data from Lines 2-6 and crossline
- 0320: Start Line 7 (GOA_Line_275). Gap between previous line and current line. Line coverage is only 12-13.5 km. Came over 1.5 km to port.
- 0400: Change file to look at overlap between new data and previous lines. No gaps seen, so problem was caused by offset between background grid and real-time data.
- ~0845: EM 122 port side array gone wacky, system locked on to false topography or overcompensating while traversing flank of high relief seamount
- 0901: EM 122 cleared itself, back on track
- 1125: Checked last line file in *Qimera*, overlapping >10%. Close to middle of line now. Have been seeing wider gap with background image in SIS than at SOL.
- 2303: Start *HYPACK* Line 8 (GOA_Line_280)

JD 199 – July 18, 2018

- 0730: Maintaining ~20% overlap in middle of line 08
- 1130: Overlap ~10% beginning final third of line 08
- 19:07: Start *HYPACK* Line 9 (GOA_Line_284)

JD200 – July 19, 2018

- 0608: XBT #0676 failed. Not transferred to SIS/SSM/NAS.
- 1400: Start *HYPACK* Line 10 (GOA_Line_288).
- Change survey plan to exclude western triangle, due to consistent 13.5 km swath coverage and time constraints
- 17:40: Moved line 550 m to port because of excessive overlap.

JD201 – July 20, 2018

- 0603: EOL *HYPACK* Line 10
- 0610: SOL turn line 10 to 11a.
- 0641: EOL turn line 10 to 11a
- 0646: SOL *HYPACK* Line 11a, Hdg 120°
- 2124: SIS crashed at EOL turn
- 2227: SOL *HYPACK* Line 12a, (GOA_Line_292), Bridge's ECDIS Line 11

JD202 – July 21, 2018

- 0900: Passed over two narrow, steep spires or pinnacles with ~300 m relief
- 1358: Started *HYPACK* line 13a; ECDIS line 12 / SIS Line 300 (GOA_Lines_296)

JD 203 – July 22, 2018

- 0401: EOL turn line 13a to 14a
- 0406: Started *HYPACK* line 14a / ECDIS line 13 / SIS Line 304 (GOA_line_300), Hdg 297°
- 0715: Getting almost 25% overlap at 65 km downline, 3450 m w.d., 13—14 km swath width
- 1740 Start *HYPACK* line 15a / ECDIS line 14 / SIS line 0308 (GOA_line_304); Hdg 115°

JD 204 – July 23, 2018

- 0525: EOL *HYPACK* Line 15a
- 0531: SOL turn line 15a to 16a
- 0619: EOL turn line 15a to 16a
- 0625: SOL *HYPACK* Line 16a / SIS line 0308 (GOA_line_307); Hdg 295° [12.5, 12.5 km spacing]
- 1000: >20% overlap at SOL now reduced to minimal near middle of line, ~65 km downline, 3545 m w.d., 12.5—13+ km swath width
- 1030: Overlap has increased back to previous levels at 80 km downline, 3500 m w.d., ~13.5 km swath width
- 1805: SOL *HYPACK* Line 17a / SIS line 0315 (GOA_line_310)

JD 205 – July 24, 2018

- 0502: EOL *HYPACK* Line 17a
- 0509: SOL turn line 17a to 18a
- 0548: EOL turn line 17a to 18a
- 0551: SOL *HYPACK* Line 18a / ECDIS line 17 / SIS line 0318 (GOA_line_313), Hdg 297° [12.5, 12.5 km spacing]
- 0654: XBT #708 failed, #709 good
- 0838: Auto-pilot went wacky when switched hydraulic pumps ~60 km downline. Spinning around to redo coverage.
- 0851: Resume line 18a
- 1657: SOL *HYPACK* Line 19a / ECDIS line 18 / SIS line 0322 (GOA_line_317)

JD 206 – July 25, 2018

- 0326: SOL *HYPACK* Line 20a / ECDIS line 19 / SIS line 0326 (GOA_line_320), Hdg 297° [12.25, 12.25 km spacing]
- 1130: Achieving ~20% overlap for the entire line
- 1300: SOL SIS Line 329 / *HYPACK* Line 21a (switched to 22a because of closer proximity) (GOA_Line_323)

- 2155: SOL SIS Line 332 / *HYPACK* Line 23a

JD 207 – July 26, 2018

- 0500: EOL *HYPACK* Line 23a
- 0507: SOL turn line 23a to 24a
- 0538: EOL turn line 23a to 24a
- 0546: SOL *HYPACK* Line 24a / SIS Line 0334 (GOA_line_328), Hdg 115°
- 1315: SOL *HYPACK* Line 25a / SIS Line 0336 (GOA_Line_330), Hdg 298°
- 1917: SOL *HYPACK* Line 26a / SIS Line 0338 (GOA_Line_332), Hdg 115°

JD 208 – July 27, 2018

- 0049: SOL *HYPACK* Line 27a / SIS Line 0340 (GOA_Line_334), Hdg. 294°
- 0431: EOL *HYPACK* Line 27a
- 0439: SOL turn line 27a to 28a
- 0510: EOL turn line 27a to 28a
- 0518: SOL *HYPACK* Line 28a / SIS Line 0342 (GOA_Line_336), Hdg. 115°
- 0804: EOL *HYPACK* Line 28a
- 0811: SOL turn line 28a to 29a
- 0858: EOL turn line 28a to 29a
- 0905: SOL *HYPACK* Line 29a / SIS Line 0344 (GOA_Line_338), Hdg. 297°
- 1059: EOL *HYPACK* Line 29a
- 1105: SOL turn line 29a to 30a
- 1139: EOL turn line 29a to 30a
- 1145: SOL *HYPACK* Line 30a / SIS Line 0346 (GOA_Line_340), Hdg. 115°
- 1248: EOL SOL *HYPACK* Line 30a / SIS Line 0346 (GOA_Line_340), Hdg. 115°
- 1305: SOL *HYPACK* Line 31a / SIS Line 0347 (GOA_Line_341), Hdg. 115°
- ~1410-1424: Short segment lines after finishing point *HYPACK* 31a; SIS lines 0348 and 0349 (GOA_line_342).
- 1430: SOL *HYPACK* Line W1 / SIS Line 0350 (GOA_Line_343) Hdg. 9°. Western edge of survey.
- 1831: Did both ASV and XBT – almost identical results

JD 209 – July 28, 2018

- 0355: EOL *HYPACK* Line W1 (W=west)
- 0402: SOL turn line W1 to W2
- 0431: EOL turn line W1 to W2
- 0437: SOL *HYPACK* Line W2 / SIS Line 0353 (GOA_Line_346), Hdg 188°
- 0703: Moving 500 m to port to increase overlap
- 1825: EOL *HYPACK* Line W2
- 1834: SOL turn W2 to W3
- 1903: EOL turn W2 to W3

- 1909: SOL *HYPACK* Line W3 / SIS Line 0358 (GOA_Line_350), Hdg 10°

JD 210 – July 29, 2018

- 0853: EOL *HYPACK* Line W3
- 0901: SOL turn line W3 to W4
- 0927: EOL turn line W3 to W4
- 0938: SOL *HYPACK* Line W4 / SIS Line 0362 (GOA_Line_354), Hdg 188°

JD 211 – July 30, 2018

- 0004: EOL W4
- 0014: SOL *HYPACK* Line S5 / SIS Line 0365 (GOA_Line_357), Hdg. 91°
- 0440: Moving another 500 m to port to avoid gapping the corner pocket. Hdg 069°.
- 0505: Moving another 200 m port. Total will be 1200 m offset to port.
- 0510: Moving another 100 m to port
- 0522: Kept moving over to 1470 m off, now coming back to 1400 m off for future pockets
- 0616: Moving 100 m to port for a total of 1500 m off
- 0640: Incrementally increasing offset, now ~1850 m off to port
- 0715: Gap filled
- 0800: Next gap filled
- 0900: Left small gap to avoid distorted survey geometry
- 0941: SIS crashed for no apparent reason on SIS line 366. Stopped SBP logging.
- 0945: SIS back up and logging on same line 366, different timestamp. Resumed SBP logging.
- 1001: Stopped logging and spun around to reboot computer, SIS, and Data Distrib Mgr
- 1017: Restart survey, SIS Line 367. Determined it was not worth it to go all the way back to gap.
- 1108: EOL *HYPACK* Line S5
- 1112: SOL *HYPACK* Line SBP6 / SIS Line 0368 (GOA_Line_361), Hdg. 13°. Knudsen SBP on 200 m scale, internal sync. EM 122 pinging and logging, seeing intermittent 3.5-kHz interference.
- 2102: SOL *HYPACK* Line SBP7 / SIS Line 0370 (GOA_Line_363), Hdg 50°, Continue priority sub-bottom survey.

JD 212 – July 31, 2018

- 0038: EOL SBP7
- 0040: Start transit to Seattle; continue logging sub-bottom and multibeam until reaching Canadian EEZ. SIS Line 371 (GOA_Line_364), Hdg 135°
- 1029: EOL transit to Canadian EEZ, end of KM1811 sonar data acquisition. Also turned off ADCP.
- Transit to Seattle through Canadian EEZ.

JD 213 – JD 214 Aug 1 -2, 2018

- Transit to Seattle through Canadian EEZ

JD 216 – August 3, 2018

- 1600Z (0800L) Arrive at Pier 91 Seattle

6. Personnel List

The RV *Kilo Moana* provided deck officers, crew, and support personnel as appropriate for the safe operation of the ship. Two resident technicians were provided by University of Hawai'i to provide assistance in operating the computer and survey equipment on the ship, and to train the science party in their correct usage. The ship and scientific party are listed in Table 6.1.

Table 6.1: Ship and science party personnel during KM1811.

Name	Organization	Role
Joyce Miller	CCOM-JHC/ UH	Chief Scientist
Capt. David Martin	University of Hawai'i	Ship's Master
Brian Wehmeyer	University of Hawai'i	Chief Mate
Luke Barker	University of Hawai'i	Second Mate
Drew Steiger	University of Hawai'i	Third Mate
Ted Kane	University of Hawai'i	Chief Engineer
Jonathan Tree	University of Hawai'i	Gravity
Dr. John R. Smith	University of Hawai'i	Watch Lead/Scientist
Tiziana Munene	CCOM-JHC	Watch Lead//Graduate Student
Emmanuel Omayajowo	Univ. of Southern Mississippi	Watchstander/Graduate Student
Treyson Gillespie	College of Charleston	Watchstander/Student
Victoria Gitto	College of Charleston	Watchstander/ Student
Michaela Barnes	Memorial University	Watchstander/ Student
Rob Palomares	University of Hawaii	Lead Marine Technician
Juliana Diehl	University of Hawaii	Marine Technician

7. References

Mayer, L.A., Jakobsson, M., and Armstrong, A.A., 2002. The compilation and analysis of data relevant to a U.S. claim under the United Nations Law of the Sea Article 76. Technical report, Center for Coastal and Ocean Mapping and NOAA-UNH Joint Hydrographic Center, 75p.

Gardner , J.V. and Mayer, L.A., 2005 US Law of the Sea Cruise to Map the Foot of the Slope and the 2500-m Isobath of the Gulf of Alaska Continental Margin. Cruises 0514-1 and 0514-2. June 24-Sept. 1, 2005. Technical Report, Center for Coastal and Ocean Mapping and NOAA-UNH Joint Hydrographic Center, 110p.

Appendix A: File Name Translations

In order to maintain compatibility with previous UNH/CCOM-JHC Gulf of Alaska cruises, lines numbers from the SIS and Knudsen Engineering data were renamed to provide a sequential line numbering scheme. The SIS renaming is detailed in Table A.1 and that for the Knudsen is detailed in Table A.2.

Table A.1: Conversion table of Kongsberg SIS .all file names to UNH .all file names by Julian Day

JD	Data Folder	Kongsberg .all file name Line_yyyymmdd_time_Ship.all	UNH file name .all	Notes
183	**180702**	**0200_20180702_193430_KM_EM122**	**GOA_Line_200tran**	
184	180703	0201_20180703_000049_KM_EM122	GOA_Line_201tran	
184	180703	0202_20180703_060027_KM_EM122	GOA_Line_202tran	
184	180703	0203_20180703_120008_KM_EM122	GOA_Line_203tran	
184	180703	0204_20180703_180018_KM_EM122	GOA_Line_204tran	
185	**180704**	**0205_20180704_000036_KM_EM122**	**GOA_Line_205tran**	
185	180704	0206_20180704_060054_KM_EM122	GOA_Line_206tran	
185	180704	0207_20180704_120021_KM_EM122	GOA_Line_207tran	
185	180704	0208_20180704_195934_KM_EM122	GOA_Line_208tran	SIS crash
186	**180705**	**0209_20180705_000033_KM_EM122**	**GOA_Line_209tran**	
186	180705	0210_20180705_060017_KM_EM122	GOA_Line_210tran	
186	180705	0211_20180705_120021_KM_EM122	GOA_Line_211tran	
186	180705	0212_20180705_180015_KM_EM122	GOA_Line_212tran	
187	**180706**	**0213_20180706_000810_KM_EM122**	**GOA_Line_213tran**	
187	180706	0214_20180706_060021_KM_EM122	GOA_Line_214tran	
187	180706	0215_20180706_120028_KM_EM122	GOA_Line_215tran	
187	180706	0216_20180706_181910_KM_EM122	GOA_Line_216tran	
188	**180707**	**0217_20180707_000014_KM_EM122**	**GOA_Line_217atran**	**0530 Port side beam blanked out. SIS restarted**
188	180707	0218_20180707_054759_KM_EM122	GOA_Line_217btran	Appended logging to GOA_Line_217tran
188	180707	0219_20180707_060039_KM_EM122	GOA_Line_218tran	
188	180707	0220_20180707_120013_KM_EM122	GOA_Line_219tran	
188	180707	0221_20180707_180010_KM_EM122	GOA_Line_220tran	
188	180707	0222_20180707_000034_KM_EM122	GOA_Line_221tran	
189	**180708**	**0223_20180708_060022_KM_EM122**	**GOA_Line_222tran**	
189	180708	0224_20180708_120013_KM_EM122	GOA_Line_223tran	
189	180708	0225_20180708_180019_KM_EM122	GOA_Line_224tran	
190	**180709**	**0226_20180709_000018_KM_EM122**	**GOA_Line_225tran**	
190	180709	0227_20180709_060100_KM_EM122	GOA_Line_226tran	
190	180709	0228_20180709_120017_KM_EM122	GOA_Line_227tran	
190	180709	0229_20180709_180011_KM_EM122	GOA_Line_228tran	
190	180709	0230_20180709_000024_KM_EM122	GOA_Line_229tran	
191	**180710**	**0231_20180710_043339_KM_EM122**	**GOA_Line_230**	**Crossline**
191	180710	0232_20180710_103335_KM_EM122	GOA_Line_231	Crossline
191	180710	0233_20180710_163527_KM_EM122	GOA_Line_232	Crossline
191	180710	0234_20180710_223540_KM_EM122	GOA_Line_233	Crossline

192	**180711**	**0235_20180711_000840_KM_EM122**	**GOA_Line_234atran**	**SIS crashed, Transit to Sitka**
192	180711	0236_20180711_003602_KM_EM122	GOA_Line_234btran	SIS restarted, Transit to Sitka
192	180711	0237_20180711_061036_KM_EM122	GOA_Line_235tran	SIS crashed, Transit to Sitka
192	180711	0238_20180711_093308_KM_EM122	GOA_Line_236tran	SIS restarted, Transit to Sitka
193	**180712**	**0239_20180712_062406_KM_EM122**	**GOA_Line_237patchtest**	**Pitch**
193	180712	0240_20180712_074949_KM_EM122	GOA_Line_238patchtest	Pitch
193	180712	0241_20180712_102236_KM_EM122	GOA_Line_239patchtest	Roll
193	180712	0242_20180712_112230_KM_EM122	GOA_Line_240patchtest	Roll
193	180712	0243_20180712_130746_KM_EM122	GOA_Line_241patchtest	Yaw / Pitch
193	180712	0244_20180712_143301_KM_EM122	GOA_Line_242patchtest	Pitch
193	180712	0245_20180712_161444_KM_EM122	GOA_Line_243patchtest	Yaw
193	180712	0246_20180712_174831_KM_EM122	GOA_Line_244atran	SIS crash, transit to survey area
193	180712	0246_20180712_175911_KM_EM122	GOA_Line_244btran	SIS crash, transit to survey area
193	180712	0247_20180712_185013_KM_EM122	GOA_Line_245tran	
193	180712	0248_20180712_192313_KM_EM122	GOA_Line_246	
193	180712	0249_20180712_230041_KM_EM122	GOA_Line_247	
194	**180713**	**0250_20180713_050107_KM_EM122**	**GOA_Line_248**	
194	180713	0251_20180713_110013_KM_EM122	GOA_Line_249	
194	180713	0252_20180713_132808_KM_EM122	GOA_Line_250turn	
194	180713	0253_20180713_135834_KM_EM122	GOA_Line_251	
194	180713	0254_20180713_200058_KM_EM122	GOA_Line_252	
195	**180714**	**0255_20180714_020031_KM_EM122**	**GOA_Line_253**	
195	180714	0256_20180714_085138_KM_EM122	GOA_Line_254turn	
195	180714	0257_20180714_110550_KM_EM122	GOA_Line_255	
195	180714	0258_20180714_170012_KM_EM122	GOA_Line_256	
195	180714	0259_20180714_232708_KM_EM122	GOA_Line_257	
196	**180715**	**0260_20180715_052806_KM_EM122**	**GOA_Line_258**	
196	180715	0261_20180715_081038_KM_EM122	GOA_Line_259turn	
196	180715	0262_20180715_084835_KM_EM122	GOA_Line_260	
196	180715	0263_20180715_144903_KM_EM122	GOA_Line_261	
196	180715	0264_20180715_204812_KM_EM122	GOA_Line_262	
197	**180716**	**0265_20180716_024806_KM_EM122**	**GOA_Line_263**	
197	180716	0266_20180716_051202_KM_EM122	GOA_Line_264turn	
197	180716	0267_20180716_060410_KM_EM122	GOA_Line_265	SIS restarted
197	180716	0268_20180716_105813_KM_EM122	GOA_Line_266	
197	180716	0269_20180716_165819_KM_EM122	GOA_Line_267	
197	180716	0270_20180716_231209_KM_EM122	GOA_Line_268	
198	**180717**	**0271_20180717_031301_KM_EM122**	**GOA_Line_269**	
198	180717	0272_20180717_035943_KM_EM122	GOA_Line_270	
198	180717	0273_20180717_095909_KM_EM122	GOA_Line_271	
198	180717	0274_20180717_155918_KM_EM122	GOA_Line_272	
198	180717	0275_20180717_222007_KM_EM122	GOA_Line_273turn	
198	180717	0276_20180717_225216_KM_EM122	GOA_Line_274turn	
198	180717	0277_20180717_230328_KM_EM122	GOA_Line_275	
199	**180718**	**0278_20180718_050325_KM_EM122**	**GOA_Line_276**	
199	180718	0279_20180718_110325_KM_EM122	GOA_Line_277	
199	180718	0280_20180718_170335_KM_EM122	GOA_Line_278a	

199	180718	0281_20180718_174709_KM_EM122	GOA_Line_278b	
199	180718	0282_20180718_183310_KM_EM122	GOA_Line_279turn	
199	180718	0283_20180718_190753_KM_EM122	GOA_Line_280	
199	180718	0284_20180718_183310_KM_EM122	GOA_Line_281	
200	**180719**	**0285_20180719_071519_KM_EM122**	**GOA_Line_282**	
200	180719	0287_20180719_130741_KM_EM122	GOA_Line_283turn	
200	180719	0288_20180719_140029_KM_EM122	GOA_Line_284	
200	180719	0289_20180719_200013_KM_EM122	GOA_Line_285	
201	**180720**	**0290_20180720_020326_KM_EM122**	**GOA_Line_286**	
201	180720	0291_20180720_061101_KM_EM122	GOA_Line_287turn	
201	180720	0292_20180720_064617_KM_EM122	GOA_Line_288	
201	180720	0293_20180720_124724_KM_EM122	GOA_Line_289	
201	180720	0294_20180720_184642_KM_EM122	GOA_Line_290	
201	180720	0295_20180720_213024_KM_EM122	GOA_Line_291turn	
201	180720	0296_20180720_222338_KM_EM122	GOA_Line_292	
202	**180721**	**0297_20180721_042802_KM_EM122**	**GOA_Line_293**	
202	180721	0298_20180721_102755_KM_EM122	GOA_Line_294	
202	180721	0299_20180721_132142_KM_EM122	GOA_Line_295turn	
202	180721	0300_20180721_135841_KM_EM122	GOA_Line_296	
202	180721	0301_20180721_195437_KM_EM122	GOA_Line_297	
203	**180722**	**0302_20180722_015723_KM_EM122**	**GOA_Line_298**	
203	180722	0303_20180722_031611_KM_EM122	GOA_Line_299turn	
203	180722	0304_20180722_040617_KM_EM122	GOA_Line_300	
203	180722	0305_20180722_100612_KM_EM122	GOA_Line_301	
203	180722	0306_20180722_160701_KM_EM122	GOA_Line_302	
203	180722	0307_20180722_165426_KM_EM122	GOA_Line_303turn	
203	180722	0308_20180722_173536_KM_EM122	GOA_Line_304	
203	180722	0309_20180722_234026_KM_EM122	GOA_Line_305	
204	**180723**	**0310_20180723_053133_KM_EM122**	**GOA_Line_306turn**	
204	180723	0311_20180723_062445_KM_EM122	GOA_Line_307	
204	180723	0312_20180723_122514_KM_EM122	GOA_Line_308a	
204	180723	0313_20180723_125723_KM_EM122	GOA_Line_308b	
204	180723	0314_20180723_172714_KM_EM122	GOA_Line_309turn	
204	180723	0315_20180723_180534_KM_EM122	GOA_Line_310	
205	**180724**	**0316_20180724_000539_KM_EM122**	**GOA_Line_311**	
205	180724	0317_20180724_051008_KM_EM122	GOA_Line_312turn	
205	180724	0318_20180724_055203_KM_EM122	GOA_Line_313	
205	180724	0319_20180724_085116_KM_EM122	GOA_Line_314	
205	180724	0320_20180724_145107_KM_EM122	GOA_Line_315	
205	180724	0321_20180724_162243_KM_EM122	GOA_Line_316turn	
205	180724	0322_20180724_165726_KM_EM122	GOA_Line_317	
205	180724	0323_20180724_224509_KM_EM122	GOA_Line_318	
206	**180725**	**0324_20180725_024121_KM_EM122**	**GOA_Line_319aturn**	
206	180725	0325_20180725_031657_KM_EM122	GOA_Line_319bturn	
206	180725	0326_20180725_032626_KM_EM122	GOA_Line_320	
206	180725	0327_20180725_092411_KM_EM122	GOA_Line_321	
206	180725	0328_20180725_122138_KM_EM122	GOA_Line_322turn	
206	180725	0329_20180725_130056_KM_EM122	GOA_Line_323	
206	180725	0330_20180725_190003_KM_EM122	GOA_Line_324	
206	180725	0331_20180725_210134_KM_EM122	GOA_Line_325turn	
206	180725	0332_20180725_215533_KM_EM122	GOA_Line_326	
207	**180726**	**0333_20180726_050726_KM_EM122**	**GOA_Line_327turn**	
207	180726	0334_20180726_054631_KM_EM122	GOA_Line_328	

207	180726	0335_20180726_121518_KM_EM122	GOA_Line_329turn	
207	180726	0336_20180726_131311_KM_EM122	GOA_Line_330	
207	180726	0337_20180726_183753_KM_EM122	GOA_Line_331turn	
207	180726	0338_20180726_191720_KM_EM122	GOA_Line_332	
207	180726	0339_20180726_235906_KM_EM122	GOA_Line_333turn	
208	**180727**	**0340_20180727_004912_KM_EM122**	**GOA_Line_334**	
208	180727	0341_20180727_043952_KM_EM122	GOA_Line_335turn	
208	180727	0342_20180727_051819_KM_EM122	GOA_Line_336	
208	180727	0343_20180727_081133_KM_EM122	GOA_Line_337turn	
208	180727	0344_20180727_090304_KM_EM122	GOA_Line_338	
208	180727	0345_20180727_110539_KM_EM122	GOA_Line_339turn	
208	180727	0346_20180727_114436_KM_EM122	GOA_Line_340	
208	180727	0347_20180727_125815_KM_EM122	GOA_Line_341	
208	180727	0348_20180727_140431_KM_EM122	GOA_Line_342a	
208	180727	0349_20180727_141355_KM_EM122	GOA_Line_342b	
208	180727	0350_20180727_143017_KM_EM122	GOA_Line_343	
208	180727	0351_20180727_203651_KM_EM122	GOA_Line_344	
209	**180728**	**0352_20180728_043718_KM_EM122**	**GOA_Line_345turn**	
209	180728	0353_20180728_043718_KM_EM122	GOA_Line_346	
209	180728	0354_20180728_103705_KM_EM122	GOA_Line_347a	
209	180728	0355_20180728_121237_KM_EM122	GOA_Line_347b	
209	180728	0356_20180728_173343_KM_EM122	GOA_Line_348	
209	180728	0357_20180728_183122_KM_EM122	GOA_Line_349turn	
209	180728	0358_20180728_190842_KM_EM122	GOA_Line_350	
210	**180729**	**0359_20180729_011006_KM_EM122**	**GOA_Line_351**	
210	180729	0360_20180729_071016_KM_EM122	GOA_Line_352	
210	180729	0361_20180729_090141_KM_EM122	GOA_Line_353turn	
210	180729	0362_20180729_093610_KM_EM122	GOA_Line_354	
210	180729	0363_20180729_153811_KM_EM122	GOA_Line_355	
210	180729	0364_20180729_213910_KM_EM122	GOA_Line_356	
211	**180730**	**0365_20180730_001449_KM_EM122**	**GOA_Line_357**	
211	180730	0366_20180730_061618_KM_EM122	GOA_Line_358	SIS crash
211	180730	0366_20180730_094515_KM_EM122	GOA_Line_359	
211	180730	0367_20180730_101723_KM_EM122	GOA_Line_360	
211	180730	0368_20180730_111253_KM_EM122	GOA_Line_361	Subbottom Preferred Line
211	180730	0369_20180730_171824_KM_EM122	GOA_Line_362	Subbottom Preferred Line
211	180730	0370_20180730_210206_KM_EM122	GOA_Line_363	Subbottom Preferred Line
212	**180731**	**0371_20180731_004137_KM_EM122**	**GOA_Line_364**	**Subbottom Preferred Line**
212	180731	0372_20180731_064042_KM_EM122	GOA_Line_365	Subbottom Preferred Line

Table A.2: Conversion table of Knudsen-assigned .sgy file names to UNH file names by Julian Day.

JD	Data Folder	Knudsen file name .sgy	UNH file name .sgy	Notes
183	**180702**	**km1811_70884_CHP3.5_RAW_007**	**GOA_Line_200tran**	
184	**180703**	**km1811_70884_CHP3.5_RAW_008**	**GOA_Line_201atran**	
184	180703	km1811_70884_CHP3.5_RAW_009	GOA_Line_201btran	
184	180703	km1811_70884_CHP3.5_RAW_010	GOA_Line_202atran	
184	180703	km1811_70884_CHP3.5_RAW_011	GOA_Line_202btran	
184	180703	km1811_70884_CHP3.5_RAW_012	GOA_Line_203atran	
184	180703	km1811_70884_CHP3.5_RAW_013	GOA_Line_203btran	
184	180703	km1811_70884_CHP3.5_RAW_014	GOA_Line_203ctran	
184	180703	km1811_70884_CHP3.5_RAW_015	GOA_Line_203dtran	
184	180703	km1811_70884_CHP3.5_RAW_016	GOA_Line_204atran	
184	180703	km1811_70884_CHP3.5_RAW_017	GOA_Line_204btran	
185	**180704**	**km1811_70884_CHP3.5_RAW_018**	**GOA_Line_205tran**	
185	180704	km1811_70884_CHP3.5_RAW_019	GOA_Line_206tran	
185	180704	km1811_70884_CHP3.5_RAW_020	GOA_Line_207tran	
185	180704	km1811_70884_CHP3.5_RAW_021	GOA_Line_208tran	
186	**180705**	**km1811_70884_CHP3.5_RAW_022**	**GOA_Line_209tran**	
186	180705	km1811_70884_CHP3.5_RAW_023	GOA_Line_210tran	
186	180705	km1811_70884_CHP3.5_RAW_024	GOA_Line_211atran	
186	180705	km1811_70884_CHP3.5_RAW_025	GOA_Line_211btran	
186	180705	km1811_70884_CHP3.5_RAW_026	GOA_Line_211ctran	
186	180705	km1811_70884_CHP3.5_RAW_027	GOA_Line_212tran	
187	**180706**	**km1811_70884_CHP3.5_RAW_028**	**GOA_Line_213tran**	
187	180706	km1811_70884_CHP3.5_RAW_029	GOA_Line_214atran	
187	180706	km1811_70884_CHP3.5_RAW_030	GOA_Line_214btran	
187	180706	km1811_70884_CHP3.5_RAW_031	GOA_Line_215tran	
187	180706	km1811_70884_CHP3.5_RAW_032	GOA_Line_216tran	
188	**180707**	**km1811_70884_CHP3.5_RAW_033**	**GOA_Line_217atran**	
188	180707	km1811_70884_CHP3.5_FLT_033	GOA_Line_217btran	SEG-Y Carrier Type was changed to filtered
188	180707	km1811_70884_CHP3.5_FLT_034	GOA_Line_217ctran	Knudsen workstation had to be restarted
188	180707	km1811_70884_CHP3.5_FLT_035	GOA_Line_217dtran	
188	180707	km1811_70884_CHP3.5_FLT_036	GOA_Line_218tran	
188	180707	km1811_70884_CHP3.5_FLT_037	GOA_Line_219tran	
188	180707	km1811_70884_CHP3.5_FLT_038	GOA_Line_220atran	
188	180707	km1811_70884_CHP3.5_FLT_039	GOA_Line_220btran	
188	180707	km1811_70884_CHP3.5_FLT_040	GOA_Line_220ctran	
188	180707	km1811_70884_CHP3.5_FLT_041	GOA_Line_220dtran	
188	180707	km1811_70884_CHP3.5_FLT_042	GOA_Line_220etran	
188	180707	km1811_70884_CHP3.5_FLT_043	GOA_Line_220ftran	
188	180707	km1811_70884_CHP3.5_FLT_044	GOA_Line_221tran	
189	**180708**	**km1811_70884_CHP3.5_FLT_045**	**GOA_Line_222tran**	
189	180708	km1811_70884_CHP3.5_FLT_046	GOA_Line_223atran	
189	180708	km1811_70884_CHP3.5_FLT_047	GOA_Line_223btran	

189	180708	km1811_70884_CHP3.5_FLT_048	GOA_Line_224atran	
189	180708	km1811_70884_CHP3.5_FLT_049	GOA_Line_224btran	
189	180708	km1811_70884_CHP3.5_FLT_050	GOA_Line_224ctran	
189	180708	km1811_70884_CHP3.5_FLT_051	GOA_Line_224dtran	
190	**180709**	**km1811_70884_CHP3.5_FLT_052**	**GOA_Line_225tran**	
190	180709	km1811_70884_CHP3.5_FLT_053	GOA_Line_226tran	
190	180709	km1811_70884_CHP3.5_FLT_054	GOA_Line_227tran	
190	180709	km1811_70884_CHP3.5_FLT_055	GOA_Line_228atran	
190	180709	km1811_70884_CHP3.5_FLT_056	GOA_Line_228btran	
190	180709	km1811_70884_CHP3.5_FLT_057	GOA_Line_229tran	
191	**180710**	**km1811_70884_CHP3.5_FLT_058**	**GOA_Line_230**	
191	180710	km1811_70884_CHP3.5_FLT_059	GOA_Line_231	
191	180710	km1811_70884_CHP3.5_FLT_060	GOA_Line_232	
191	180710	km1811_70884_CHP3.5_FLT_061	GOA_Line_233	
192	**180711**	**km1811_70884_CHP3.5_FLT_062**	**GOA_Line_234tran**	
192	180711	km1811_70884_CHP3.5_FLT_064	GOA_Line_235atran	
192	180711	km1811_70884_CHP3.5_FLT_065	GOA_Line_235btran	
192	180711	km1811_70884_CHP3.5_FLT_066	GOA_Line_235ctran	
192	180711	km1811_70884_CHP3.5_FLT_067	GOA_Line_235dtran	
192	180711	km1811_70884_CHP3.5_FLT_068	GOA_Line_236tran	
193	**180712**	**km1811_70884_CHP3.5_FLT_069**	**GOA_Line_244btran**	***Patch test lines were not logged, transit to survey area**
193	180712	km1811_70884_CHP3.5_FLT_070	GOA_Line_245tran	
193	180712	km1811_70884_CHP3.5_FLT_071	GOA_Line_246	
193	180712	km1811_70884_CHP3.5_FLT_072	GOA_Line_247	
194	**180713**	**km1811_70884_CHP3.5_FLT_073**	**GOA_Line_248**	
194	180713	km1811_70884_CHP3.5_FLT_074	GOA_Line_249	
194	180713	km1811_70884_CHP3.5_FLT_075	GOA_Line_250turn	
194	180713	km1811_70884_CHP3.5_FLT_076	GOA_Line_251	
194	180713	km1811_70884_CHP3.5_FLT_077	GOA_Line_252	
195	**180714**	**km1811_70884_CHP3.5_FLT_078**	**GOA_Line_253**	
195	180714	km1811_70884_CHP3.5_FLT_079	GOA_Line_254turn	
195	180714	km1811_70884_CHP3.5_FLT_080	GOA_Line_255	
195	180714	km1811_70884_CHP3.5_FLT_081	GOA_Line_256	
195	180714	km1811_70884_CHP3.5_FLT_082	GOA_Line_257	
196	**180715**	**km1811_70884_CHP3.5_FLT_083**	**GOA_Line_258**	
196	180715	km1811_70884_CHP3.5_FLT_084	GOA_Line_259turn	
196	180715	km1811_70884_CHP3.5_FLT_085	GOA_Line_260	
196	180715	km1811_70884_CHP3.5_FLT_086	GOA_Line_261	
196	180715	km1811_70884_CHP3.5_FLT_087	GOA_Line_262	
197	**180716**	**km1811_70884_CHP3.5_FLT_088**	**GOA_Line_263**	
197	180716	km1811_70884_CHP3.5_FLT_089	GOA_Line_264turn	
197	180716	km1811_70884_CHP3.5_FLT_090	GOA_Line_265	
197	180716	km1811_70884_CHP3.5_FLT_091	GOA_Line_266	
197	180716	km1811_70884_CHP3.5_FLT_092	GOA_Line_267	
197	180716	km1811_70884_CHP3.5_FLT_093	GOA_Line_268	
198	**180717**	**km1811_70884_CHP3.5_FLT_094**	**GOA_Line_269**	
198	180717	km1811_70884_CHP3.5_FLT_095	GOA_Line_270	
198	180717	km1811_70884_CHP3.5_FLT_096	GOA_Line_271	
198	180717	km1811_70884_CHP3.5_FLT_097	GOA_Line_272	

198	180717	km1811_70884_CHP3.5_FLT_098	GOA_Line_273turn	
198	180717	km1811_70884_CHP3.5_FLT_099	GOA_Line_274turn	
198	180717	km1811_70884_CHP3.5_FLT_100	GOA_Line_275	
199	**180718**	**km1811_70884_CHP3.5_FLT_101**	**GOA_Line_276**	
199	180718	km1811_70884_CHP3.5_FLT_102	GOA_Line_277	
199	180718	km1811_70884_CHP3.5_FLT_103	GOA_Line_278	
199	180718	km1811_70884_CHP3.5_FLT_104	GOA_Line_279turn	
199	180718	km1811_70884_CHP3.5_FLT_105	GOA_Line_280	
199	180718	km1811_70884_CHP3.5_FLT_106	GOA_Line_281	
200	**180719**	**km1811_70884_CHP3.5_FLT_107**	**GOA_Line_282**	
200	180719	km1811_70884_CHP3.5_FLT_108	GOA_Line_284	No Sub-bottom collected on turn
200	180719	km1811_70884_CHP3.5_FLT_109	GOA_Line_285	
201	**180720**	**km1811_70884_CHP3.5_FLT_110**	**GOA_Line_286**	
201	180720	km1811_70884_CHP3.5_FLT_111	GOA_Line_287turn	
201	180720	km1811_70884_CHP3.5_FLT_112	GOA_Line_288	
201	180720	km1811_70884_CHP3.5_FLT_113	GOA_Line_289	
201	180720	km1811_70884_CHP3.5_FLT_114	GOA_Line_290	
201	180720	km1811_70884_CHP3.5_FLT_115	GOA_Line_291turn	
201	180720	km1811_70884_CHP3.5_FLT_116	GOA_Line_292	
202	**180721**	**km1811_70884_CHP3.5_FLT_117**	**GOA_Line_293**	
202	180721	km1811_70884_CHP3.5_FLT_118	GOA_Line_294	
202	180721	km1811_70884_CHP3.5_FLT_119	GOA_Line_295turn	
202	180721	km1811_70884_CHP3.5_FLT_120	GOA_Line_296	
202	180721	km1811_70884_CHP3.5_FLT_121	GOA_Line_297	
203	**180722**	**km1811_70884_CHP3.5_FLT_122**	**GOA_Line_298**	
203	180722	km1811_70884_CHP3.5_FLT_123	GOA_Line_299turn	
203	180722	km1811_70884_CHP3.5_FLT_124	GOA_Line_300	
203	180722	km1811_70884_CHP3.5_FLT_125	GOA_Line_301	
203	180722	km1811_70884_CHP3.5_FLT_126	GOA_Line_302	
203	180722	km1811_70884_CHP3.5_FLT_127	GOA_Line_303turn	
203	180722	km1811_70884_CHP3.5_FLT_128	GOA_Line_304	
203	180722	km1811_70884_CHP3.5_FLT_129	GOA_Line_305	
204	**180723**	**km1811_70884_CHP3.5_FLT_130**	**GOA_Line_306turn**	
204	180723	km1811_70884_CHP3.5_FLT_131	GOA_Line_307	
204	180723	km1811_70884_CHP3.5_FLT_132	GOA_Line_308	
204	180723	km1811_70884_CHP3.5_FLT_133	GOA_Line_309turn	
204	180723	km1811_70884_CHP3.5_FLT_134	GOA_Line_310	
205	**180724**	**km1811_70884_CHP3.5_FLT_135**	**GOA_Line_311**	
205	180724	km1811_70884_CHP3.5_FLT_136	GOA_Line_312turn	
205	180724	km1811_70884_CHP3.5_FLT_137	GOA_Line_313	
205	180724	km1811_70884_CHP3.5_FLT_138	GOA_Line_314	
204	180724	km1811_70884_CHP3.5_FLT_139	GOA_Line_315	
205	180724	km1811_70884_CHP3.5_FLT_140	GOA_Line_316turn	
205	180724	km1811_70884_CHP3.5_FLT_141	GOA_Line_317	
205	180724	km1811_70884_CHP3.5_FLT_142	GOA_Line_318	
206	**180725**	**km1811_70884_CHP3.5_FLT_143**	**GOA_Line_319turn**	
206	180725	km1811_70884_CHP3.5_FLT_144	GOA_Line_320	
206	180725	km1811_70884_CHP3.5_FLT_145	GOA_Line_321	
206	180725	km1811_70884_CHP3.5_FLT_146	GOA_Line_322turn	
206	180725	km1811_70884_CHP3.5_FLT_147	GOA_Line_323	

206	180725	km1811_70884_CHP3.5_FLT_148	GOA_Line_324	
206	180725	km1811_70884_CHP3.5_FLT_149	GOA_Line_325turn	
206	180725	km1811_70884_CHP3.5_FLT_150	GOA_Line_326	
207	**180726**	**km1811_70884_CHP3.5_FLT_151**	**GOA_Line_327turn**	
207	180726	km1811_70884_CHP3.5_FLT_152	GOA_Line_328	
207	180726	km1811_70884_CHP3.5_FLT_153	GOA_Line_329turn	
207	180726	km1811_70884_CHP3.5_FLT_154	GOA_Line_330	
207	180726	km1811_70884_CHP3.5_FLT_155	GOA_Line_331turn	
207	180726	km1811_70884_CHP3.5_FLT_156	GOA_Line_332	
207	180726	km1811_70884_CHP3.5_FLT_157	GOA_Line_333turn	
208	**180727**	**km1811_70884_CHP3.5_FLT_158**	**GOA_Line_334**	
208	180727	km1811_70884_CHP3.5_FLT_159	GOA_Line_335turn	
208	180727	km1811_70884_CHP3.5_FLT_160	GOA_Line_336	
208	180727	km1811_70884_CHP3.5_FLT_161	GOA_Line_337turn	
208	180727	km1811_70884_CHP3.5_FLT_162	GOA_Line_338	
208	180727	km1811_70884_CHP3.5_FLT_163	GOA_Line_339turn	
208	180727	km1811_70884_CHP3.5_FLT_164	GOA_Line_340	
208	180727	km1811_70884_CHP3.5_FLT_165	GOA_Line_341	
208	180727	km1811_70884_CHP3.5_FLT_166	GOA_Line_342a	
208	180727	km1811_70884_CHP3.5_FLT_167	GOA_Line_342b	
208	180727	km1811_70884_CHP3.5_FLT_168	GOA_Line_343	
208	180727	km1811_70884_CHP3.5_FLT_169	GOA_Line_344	
209	**180728**	**km1811_70884_CHP3.5_FLT_170**	**GOA_Line_345turn**	
209	180728	km1811_70884_CHP3.5_FLT_171	GOA_Line_346	
209	180728	km1811_70884_CHP3.5_FLT_172	GOA_Line_347	
209	180728	km1811_70884_CHP3.5_FLT_173	GOA_Line_348	
209	180728	km1811_70884_CHP3.5_FLT_174	GOA_Line_349turn	
209	180728	km1811_70884_CHP3.5_FLT_175	GOA_Line_350	
210	**180729**	**km1811_70884_CHP3.5_FLT_176**	**GOA_Line_351**	
210	180729	km1811_70884_CHP3.5_FLT_177	GOA_Line_352	
210	180729	km1811_70884_CHP3.5_FLT_178	GOA_Line_353turn	
210	180729	km1811_70884_CHP3.5_FLT_179	GOA_Line_354	
210	180729	km1811_70884_CHP3.5_FLT_180	GOA_Line_355	
210	180729	km1811_70884_CHP3.5_FLT_181	GOA_Line_356	
211	**180730**	**km1811_70884_CHP3.5_FLT_182**	**GOA_Line_357**	
211	180730	km1811_70884_CHP3.5_FLT_183	GOA_Line_358	
211	180730	km1811_70884_CHP3.5_FLT_184	GOA_Line_359	
211	180730	km1811_70884_CHP3.5_FLT_185	GOA_Line_360	
211	180730	km1811_70884_CHP3.5_FLT_186	GOA_Line_361	Subbottom Preferred Line
211	180730	km1811_70884_CHP3.5_FLT_187	GOA_Line_362	Subbottom Preferred Line
211	180730	km1811_70884_CHP3.5_FLT_188	GOA_Line_363	Subbottom Preferred Line
212	**180731**	**km1811_70884_CHP3.5_FLT_186**	**GOA_Line_364**	**Subbottom Preferred Line**
212	180731	km1811_70884_CHP3.5_FLT_190	GOA_Line_365	Subbottom Preferred Line

Appendix B: XBT and XSV Casts Metadata

A total of 139 XBTs and two XSV-01s were cast in the main KM1811 survey area (Fig. B.1). During transit 11 XBTs were cast; the *Sound Speed Manager* database was used after the XBT launcher failed until a new launcher was available. Sixteen XBTs (12.3%) failed on or after launch, or were not used for processing. The composite spread of sound speed from all profiles is shown in Fig. B.2. The metadata associated with these launches are given in Table B..

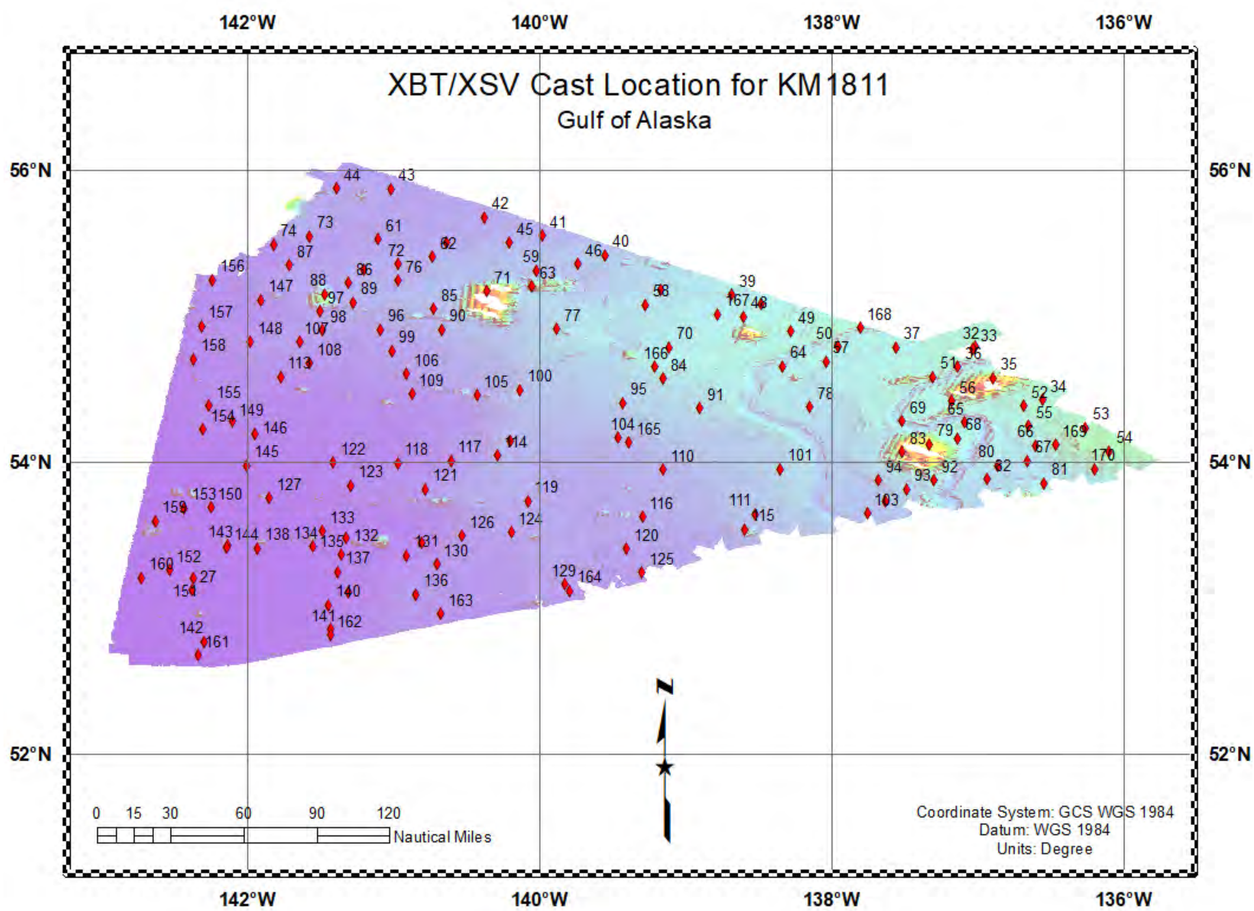


Fig. B.1: Locations of the XBTs launched during the course of the KM1811.

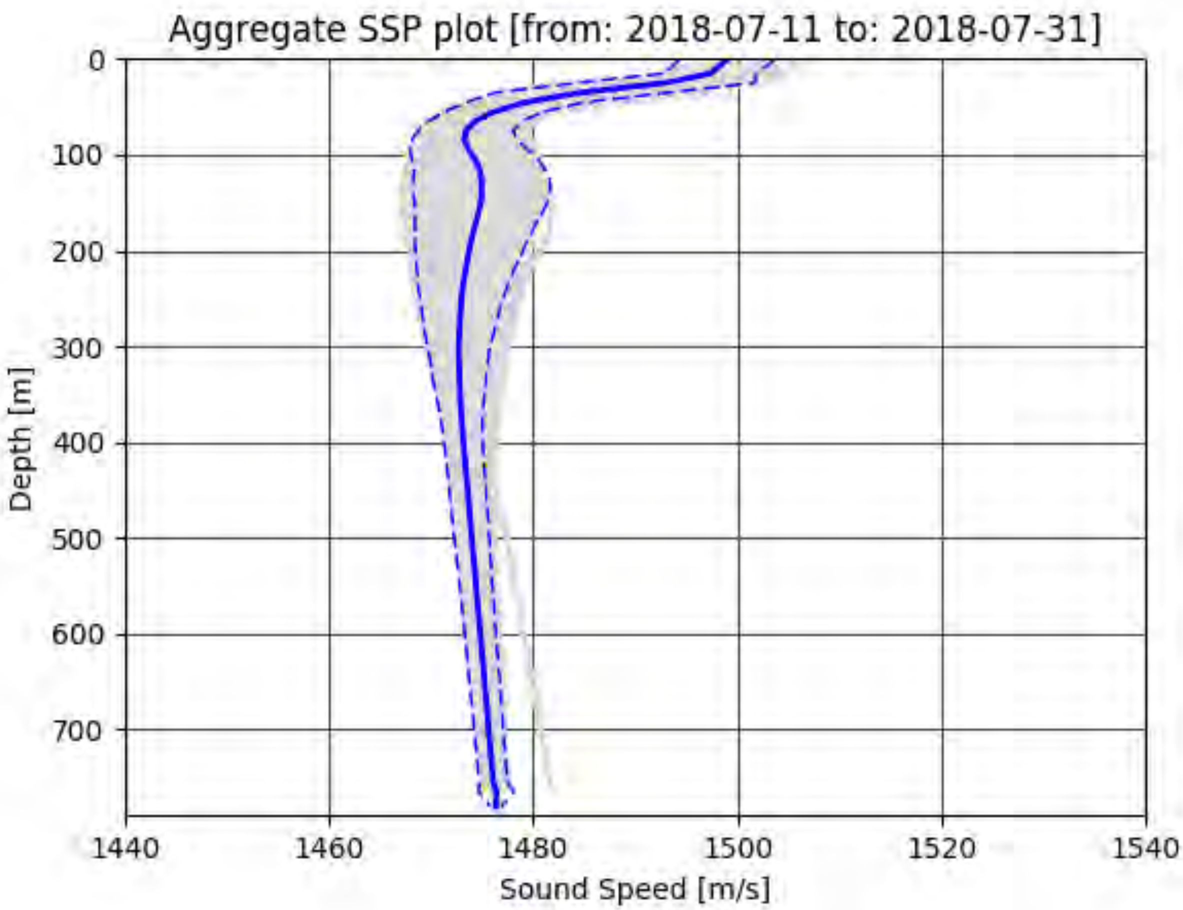


Fig. B.2: Aggregate of all XBT and XSV-derived sound speed profiles for KM1811, with mean value (solid blue) and 95% CI (dashed blue) lines.

Table B.1: Log of XBT and ASVP Launches during KM1811

Probe Number	Longitude	Latitude	Serial Number	Type
1	157° 12.02442' W	21° 51.23022' N	01301347	Deep Blue
2	156° 17.7588' W	24° 50.8086' N	01178890	Deep Blue
3	156° 8.92482' W	25° 19.53954' N	01301336	Deep Blue
4	156° 5.88186' W	25° 29.70582' N	01301340	Deep Blue
5	155° 55.25388' W	26° 4.0674' N	01178897	Deep Blue
6	155° 37.17288' W	27° 2.04492' N	01178893	Deep Blue
7	155° 26.19726' W	27° 37.23996' N	01178896	Deep Blue
8	155° 7.50198' W	28° 36.3528' N	01178892	Deep Blue
9	154° 46.48242' W	29° 34.197' N	01301337	Deep Blue
10	154° 32.418' W	30° 9.34812' N	01301338	Deep Blue
11	154° 16.11426' W	30° 49.88382' N	01301339	Deep Blue

12	153° 52.12206' W	31° 47.91528' N	01178891	Deep Blue
13	153° 29.4375' W	32° 41.6487' N	01301341	Deep Blue
14	153° 26.0127' W	32° 49.67652' N	01301342	Deep Blue
15	153° 16.07616' W	33° 12.90186' N	01301344	Deep Blue
16	153° 1.02834' W	33° 47.40846' N	01301345	Deep Blue
17	153° 53.31936' W	34° 4.68822' N	01301346	Deep Blue
18	152° 27.77538' W	35° 1.78956' N	01301343	Deep Blue
19	150° 22.5' W	39° 37.5' N		WOA13
20	150° 7.5' W	39° 37.5' N		WOA13
21	150° 7.5' W	39° 52.5' N		WOA13
22	149° 52.5' W	40° 7.5' N		WOA13
23	149° 52.5' W	40° 22.5' N		WOA13
24	149° 37.5' W	40° 37.5' N		WOA13
25	148° 22.5' W	42° 52.5' N		WOA13
26	148° 22.5' W	43° 7.5' N		WOA13
27	142° 22.5' W	53° 7.5' N		WOA13
28	-222° -30' W	54° 30' N		WOA09
29	-223° -30' W	55° 30' N		WOA09
30	135° 50.3379' W	56° 37.56006' N	01234532	Deep Blue
31	136° 39.72756' W	55° 16.96434' N	01234528	Deep Blue
32	137° 0.64746' W	54° 47.46192' N	032693	XSV-01
33	137° 1.49904' W	54° 46.62696' N	01234523	Deep Blue
34	136° 32.87304' W	54° 25.7925' N	01234524	Deep Blue
35	136° 53.10936' W	54° 34.74612' N	01179159	Deep Blue
36	137° 7.61526' W	54° 39.38916' N	01179163	Deep Blue
37	137° 32.95998' W	54° 47.4531' N	01179164	Deep Blue
38	138° 28.76076' W	55° 5.1582' N	01179160	Deep Blue
39	138° 40.66506' W	55° 8.87598' N	01179156	Deep Blue
40	139° 32.55174' W	55° 25.17432' N	01179165	Deep Blue
41	139° 58.3389' W	55° 33.23634' N	01179161	Deep Blue
42	140° 22.5039' W	55° 40.7544' N	01179157	Deep Blue
43	141° 0.52248' W	55° 52.55076' N	01160530	Deep Blue
44	141° 23.10648' W	55° 52.6533' N	01160531	Deep Blue
45	140° 12.02736' W	55° 30.4473' N	01160532	Deep Blue
46	139° 43.833' W	55° 21.57714' N	01160533	Deep Blue
47	139° 9.99024' W	55° 10.90722' N	01160537	Deep Blue
48	138° 35.62014' W	54° 59.97996' N	01160536	Deep Blue
49	138° 16.15626' W	54° 53.82762' N	01160535	Deep Blue
50	137° 56.84766' W	54° 47.6997' N	01160534	Deep Blue
51	137° 17.8242' W	54° 35.1714' N	01160541	Deep Blue
52	136° 40.54296' W	54° 23.16408' N	01160540	Deep Blue

53	136° 15.33984' W	54° 14.40186' N	01160539	Deep Blue
54	136° 5.38968' W	54° 4.47558' N	01160538	Deep Blue
55	136° 38.56836' W	54° 15.12792' N	01303964	Deep Blue
56	137° 10.29102' W	54° 25.1997' N	01303960	Deep Blue
57	138° 2.02344' W	54° 41.60886' N	01303956	Deep Blue
58	139° 16.13478' W	55° 4.91454' N	01303953	Deep Blue
59	140° 1.14846' W	55° 18.95994' N	01303955	Deep Blue
60	140° 37.70706' W	55° 30.29346' N	01303957	Deep Blue
61	141° 6.08202' W	55° 31.73928' N	01303959	Deep Blue
62	140° 43.60056' W	55° 24.49416' N	01303958	Deep Blue
63	140° 2.6592' W	55° 12.27882' N	01303963	Deep Blue
64	138° 19.58214' W	54° 39.67578' N	01303961	Deep Blue
65	137° 5.00388' W	54° 16.5' N	01303962	Deep Blue
66	136° 35.55564' W	54° 7.03614' N	01301312	Deep Blue
67	136° 39.26562' W	54° 0.70458' N	01301313	Deep Blue
68	137° 7.89648' W	54° 9.81396' N	01301315	Deep Blue
69	137° 30.78612' W	54° 17.07228' N	01301314	Deep Blue
70	139° 6.59082' W	54° 47.22462' N	01301319	Deep Blue
71	140° 21.48144' W	55° 10.53126' N	01301316	Deep Blue
72	140° 57.72168' W	55° 21.7197' N	01301318	Deep Blue
73	141° 34.36428' W	55° 32.96238' N	01301320	Deep Blue
74	141° 49.05762' W	55° 29.56248' N	01301321	Deep Blue
75	141° 11.91312' W	55° 19.15626' N	01301322	Deep Blue
76	140° 57.67968' W	55° 14.80908' N	01301323	Deep Blue
77	139° 52.57128' W	54° 54.92238' N	01301405	Deep Blue
78	138° 8.77734' W	54° 22.88526' N	01301406	Deep Blue
79	137° 19.53318' W	54° 7.51854' N	01301406	Deep Blue
80	136° 51.24024' W	53° 58.64304' N	01301296	Deep Blue
81	136° 32.1738' W	53° 51.45018' N	01301297	Deep Blue
82	136° 55.458' W	53° 53.20458' N	01301298	Deep Blue
83	137° 30.792' W	54° 4.22952' N	01301299	Deep Blue
84	139° 8.99124' W	54° 34.46532' N	01301403	Deep Blue
85	140° 43.30176' W	55° 3.15186' N	01301402	Deep Blue
86	141° 18.2373' W	55° 13.7388' N	01301401	Deep Blue
87	141° 42.59376' W	55° 21.07176' N	01301400	Deep Blue
88	141° 28.06152' W	55° 9.33252' N	01303917	Deep Blue
89	141° 16.0449' W	55° 5.71242' N	01303918	Deep Blue
90	140° 39.71388' W	54° 54.72948' N	01303919	Deep Blue
91	138° 53.82912' W	54° 22.38186' N	01303921	Deep Blue
92	137° 17.43456' W	53° 52.55076' N	01303924	Deep Blue
93	137° 28.82028' W	53° 48.9468' N	01303928	Deep Blue

94	137° 40.4121' W	53° 52.52736' N	01303927	Deep Blue
95	139° 25.50294' W	54° 24.50538' N	01303925	Deep Blue
96	141° 5.0166' W	54° 54.71238' N	01303926	Deep Blue
97	141° 29.83008' W	55° 2.18064' N	01301360	Deep Blue
98	141° 28.7217' W	54° 54.41406' N	01301361	Deep Blue
99	141° 0.44826' W	54° 45.91848' N	01301362	Deep Blue
100	140° 7.58886' W	54° 29.9409' N	01301363	Deep Blue
101	138° 20.83008' W	53° 57.3657' N	01301364	Deep Blue
102	137° 37.51854' W	53° 44.03076' N	01301365	Deep Blue
103	137° 44.99904' W	53° 38.96238' N	01301366	Deep Blue
104	139° 27.39258' W	54° 10.188' N	01301367	Deep Blue
105	140° 25.45218' W	54° 27.68556' N	01301368	Deep Blue
106	140° 54.19626' W	54° 36.34374' N	01301369	Deep Blue
107	141° 38.12988' W	54° 49.46292' N	01301370	Deep Blue
108	141° 34.27638' W	54° 40.7334' N	01301371	Deep Blue
109	140° 52.07322' W	54° 28.19238' N	01301383	Deep Blue
110	139° 8.66502' W	53° 57.11964' N	01301372	Deep Blue
111	138° 31.16112' W	53° 38.69382' N	01301373	Deep Blue
112	140° 11.49414' W	54° 8.70264' N	01301374	Deep Blue
113	141° 45.77538' W	54° 35.29494' N	01301382	Deep Blue
114	140° 16.92288' W	54° 2.7759' N	01301375	Deep Blue
115	138° 35.25588' W	53° 32.57178' N	01301376	Deep Blue
116	139° 17.25294' W	53° 37.49124' N	01301381	Deep Blue
117	140° 35.74218' W	54° 0.75096' N	01301380	Deep Blue
118	140° 57.76464' W	53° 59.73144' N	01301377	Deep Blue
119	140° 4.15332' W	53° 44.24904' N	01301378	Deep Blue
120	139° 23.77248' W	53° 24.39402' N	01303965	Deep Blue
121	140° 46.55274' W	53° 48.92382' N	01303969	Deep Blue
122	141° 24.37206' W	54° 0.05178' N	01303973	Deep Blue
123	141° 17.05764' W	53° 50.42772' N	01303974	Deep Blue
124	140° 11.28612' W	53° 31.19094' N	01303966	Deep Blue
125	139° 17.47752' W	53° 14.77344' N	01303967	Deep Blue
126	140° 31.51758' W	53° 29.71194' N	01303968	Deep Blue
127	141° 50.80956' W	53° 45.44238' N	01303970	Deep Blue
128	140° 48.12888' W	53° 27.17142' N	01303971	Deep Blue
129	139° 49.36428' W	53° 9.95946' N	01303972	Deep Blue
130	140° 41.97168' W	53° 18.05226' N	01303975	Deep Blue
131	140° 54.417' W	53° 21.69042' N	01303977	Deep Blue
132	141° 19.14258' W	53° 21.69042' N	01303978	Deep Blue
133	141° 28.93752' W	53° 31.67772' N	01303979	Deep Blue
134	141° 32.69922' W	53° 25.33884' N	01303980	Deep Blue

135	141° 21.00588' W	53° 21.94092' N	01303984	Deep Blue
136	140° 50.5449' W	53° 5.6655' N	01303983	Deep Blue
137	141° 22.37304' W	53° 14.95458' N	01303981	Deep Blue
138	141° 55.60644' W	53° 24.58398' N	01303988	Deep Blue
139	141° 18.33594' W	53° 6.41994' N	01303986	Deep Blue
140	141° 26.4912' W	53° 1.44924' N	01303987	Deep Blue
141	141° 25.46292' W	52° 51.32814' N	01301324	Deep Blue
142	142° 17.60058' W	52° 46.24074' N	01301325	Deep Blue
143	142° 7.93554' W	53° 25.96242' N	01301326	Deep Blue
144	142° 8.18652' W	53° 24.94044' N	032697	XSV-01
145	141° 59.8203' W	53° 58.80468' N	01301327	Deep Blue
146	141° 56.67282' W	54° 11.59422' N	01301328	Deep Blue
147	141° 54.1494' W	55° 6.77442' N	01301329	Deep Blue
148	141° 58.5117' W	54° 49.42188' N	01301330	Deep Blue
149	142° 6.04494' W	54° 17.08602' N	01301331	Deep Blue
150	142° 14.74314' W	53° 41.42286' N	01301335	Deep Blue
151	142° 21.81738' W	53° 12.28272' N	01301334	Deep Blue
152	142° 31.81248' W	53° 15.74514' N	01301332	Deep Blue
153	142° 25.76952' W	53° 41.19432' N	01301333	Deep Blue
154	142° 17.97948' W	54° 13.53906' N	01301348	Deep Blue
155	142° 15.62892' W	54° 23.1699' N	01301349	Deep Blue
156	142° 14.01858' W	55° 14.98782' N	01301350	Deep Blue
157	142° 18.62988' W	54° 56.11182' N	01301351	Deep Blue
158	142° 21.93264' W	54° 42.42576' N	01301355	Deep Blue
159	142° 37.68654' W	53° 35.93652' N	01301353	Deep Blue
160	142° 43.13478' W	53° 12.63624' N	01301352	Deep Blue
161	142° 20.07126' W	52° 40.61862' N	01301355	Deep Blue
162	141° 25.7412' W	52° 49.05666' N	01301357	Deep Blue
163	140° 40.10352' W	52° 57.7827' N	01301358	Deep Blue
164	139° 47.17578' W	53° 7.18308' N	01301359	Deep Blue
165	139° 22.90428' W	54° 8.1948' N	01303992	Deep Blue
166	139° 12.2676' W	54° 39.31692' N	01303989	Deep Blue
167	138° 46.35936' W	55° 0.97998' N	01303990	Deep Blue
168	137° 47.90916' W	54° 55.41504' N	01303991	Deep Blue
169	136° 27.6924' W	54° 7.18848' N	01303993	Deep Blue
170	136° 11.59962' W	53° 57.27102' N	01303994	Deep Blue

Appendix C: Shipboard Preliminary Products

Grids of data collected during the KM1811survey were generated for quality control. A resolution of 100 m was generally used. The final 100-m composite grid of the data collected in the survey area is shown in Fig. C.1, with vertical exaggeration of 5× for shading, and artificial sun-illumination from the northwest. Acoustic backscatter was also processed as part of the quality control process; the final composite, at a resolution of 50 m is shown in Fig. C.2.

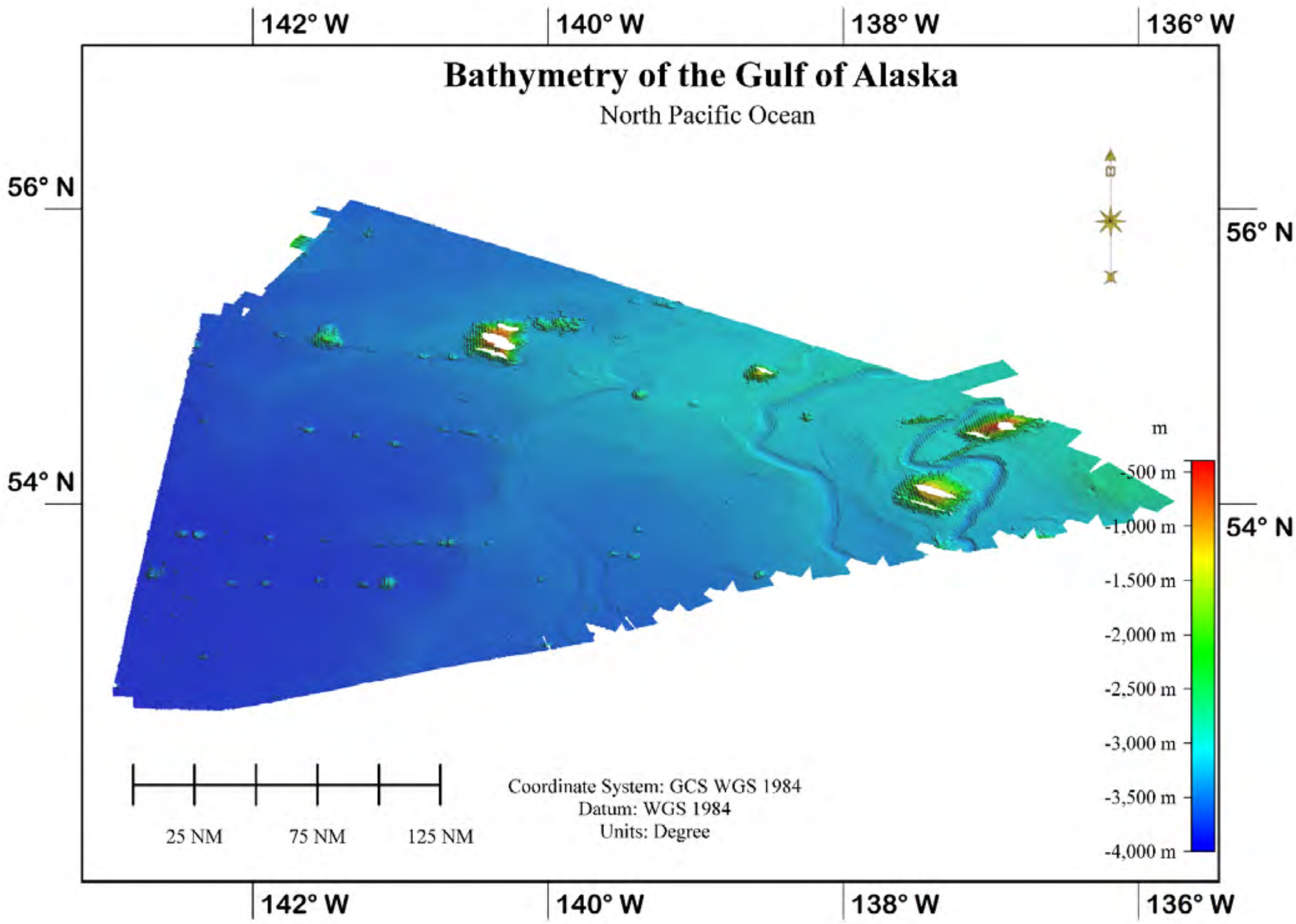


Figure C.1. Bathymetry of the KM1811 survey area in the Gulf of Alaska. Compare with Figure 1.2.

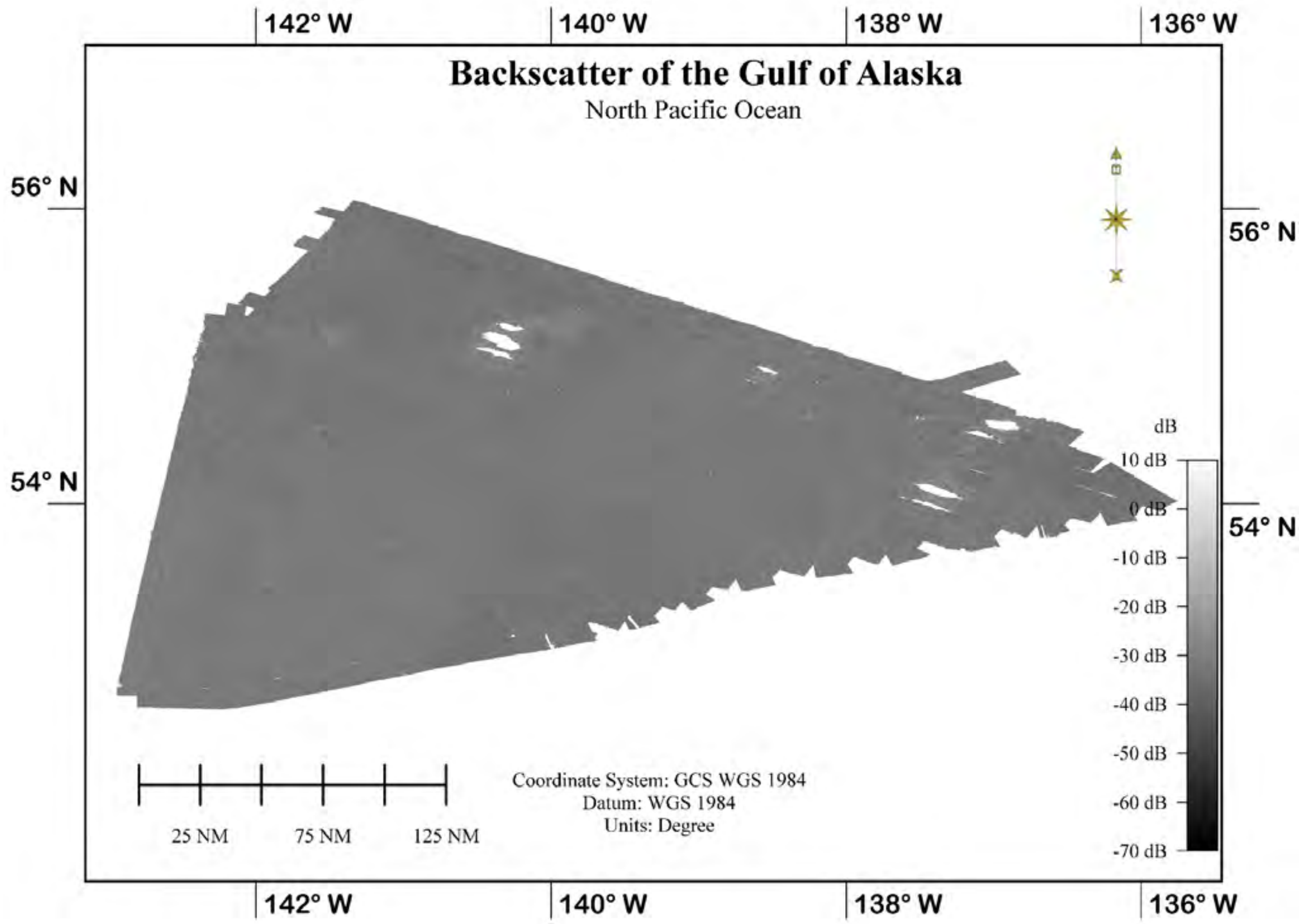


Figure C.2. Acoustic backscatter of the KM1811 survey area in the Gulf of Alaska co-registered to bathymetry in Figure C.1.

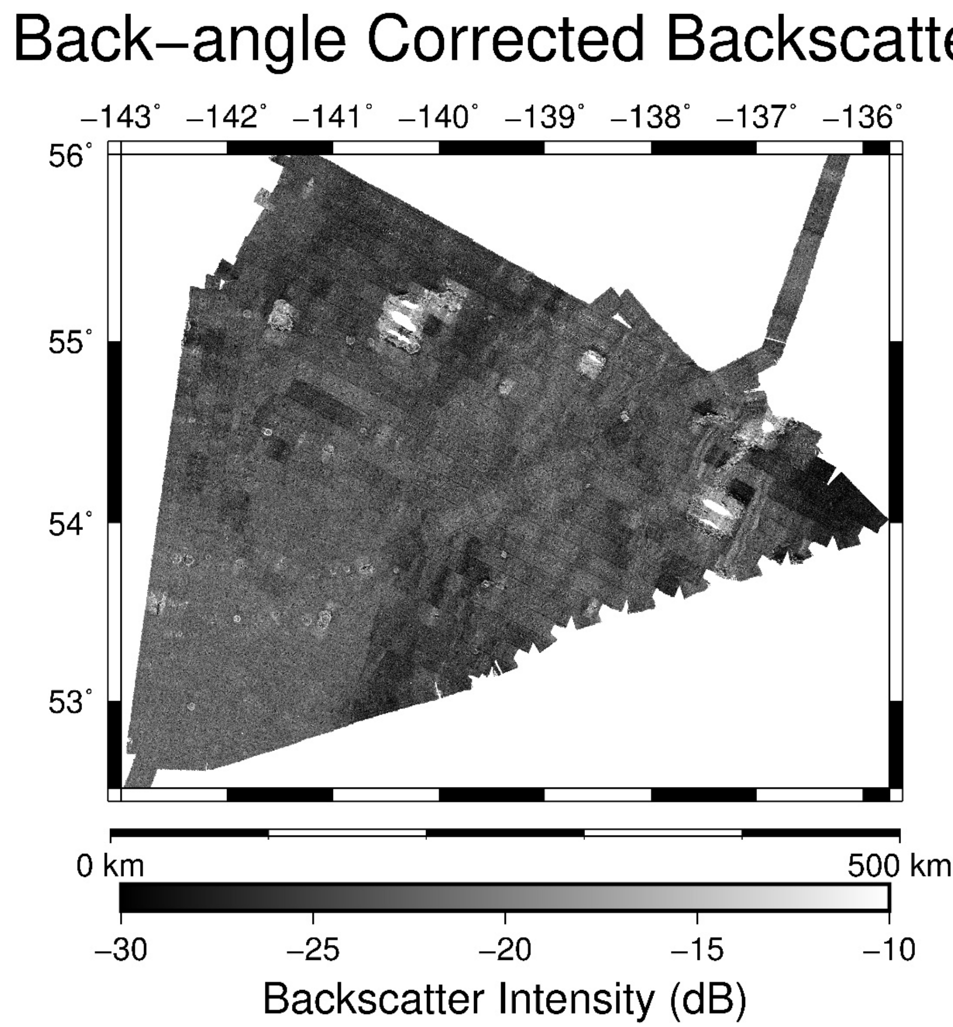
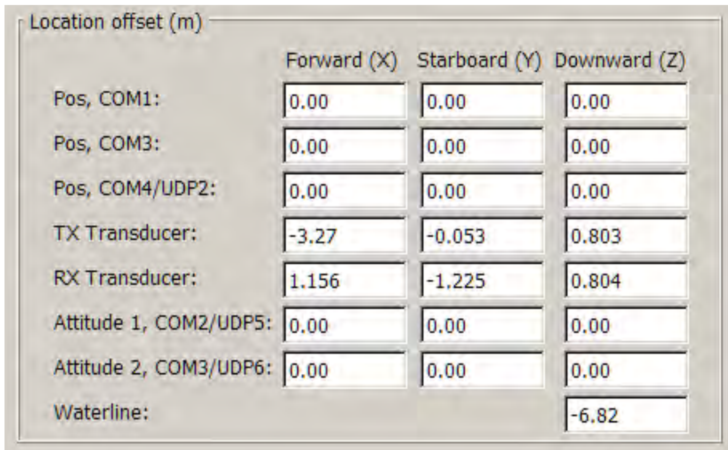


Figure C.3. Back-angle corrected backscatter of the KM1811 survey area iin the Gulf of Alaska processed using *MB Systems* software and plotted using *Generic Mapping Tools*.

Appendix D: Calibration Data

D.1. Installation Parameters

The positioning offsets for the EM122 are shown in Fig. D.1, as derived from SIS installation parameters. A graphical outline of the locations of the various sensors is given in Figure D.2.


Location offset (m)

	Forward (X)	Starboard (Y)	Downward (Z)
Pos, COM1:	0.00	0.00	0.00
Pos, COM3:	0.00	0.00	0.00
Pos, COM4/UDP2:	0.00	0.00	0.00
TX Transducer:	-3.27	-0.053	0.803
RX Transducer:	1.156	-1.225	0.804
Attitude 1, COM2/UDP5:	0.00	0.00	0.00
Attitude 2, COM3/UDP6:	0.00	0.00	0.00
Waterline:			-6.82

Figure D.1. Installation parameters for the EM122 on the Kilo Moana during KM17-18.

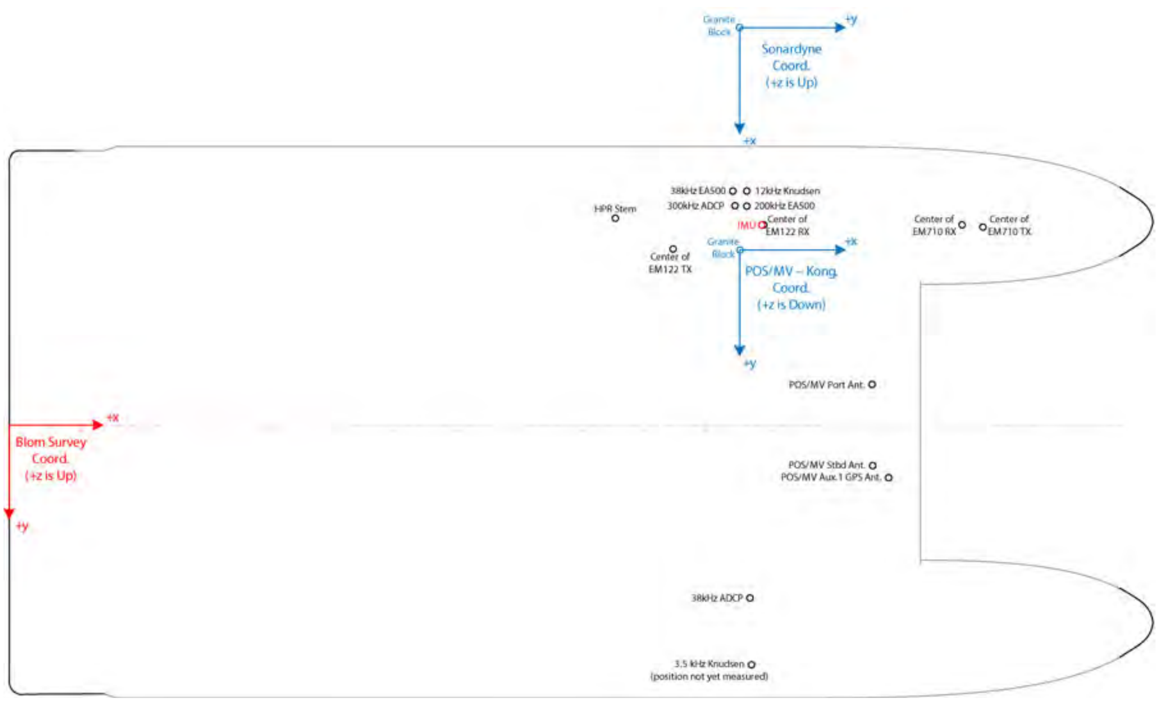


Figure D.2. Graphical layout of RV *Kilo Moana* instruments for KM17-18.

D.2 Sound Speed Sensors Certificates

The certificate of calibration for the AML Oceanographic sound speed (Fig. D.3) the calibration certificate for the temperature sensor is given in Fig. D.4.

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Certificate of Calibration

Customer:	Ocean Technology Group
Asset Serial Number:	020020
Asset Product Type:	Smart SV&T Instrument, 500m Housing
Calibration Type:	Sound Velocity
Calibration Range:	1400 to 1600 m/s
Calibration RMS Error:	.011
Calibration ID:	020020 003843 204181 270216 001546
Installed On:	020020

Coefficient A:	7.216886E-4	Coefficient H:	0.000000E+0
Coefficient B:	-7.436780E-5	Coefficient I:	0.000000E+0
Coefficient C:	1.139299E-6	Coefficient J:	0.000000E+0
Coefficient D:	-7.125645E-7	Coefficient K:	0.000000E+0
Coefficient E:	0.000000E+0	Coefficient L:	0.000000E+0
Coefficient F:	0.000000E+0	Coefficient M:	0.000000E+0
Coefficient G:	0.000000E+0	Coefficient N:	0.000000E+0

Calibration Date (dd/mm/yyyy): 27/2/2016

Certified By:

Robert Haydock
President, AML Oceanographic

AML Oceanographic certifies that the asset described above has been calibrated or recalibrated with equipment referenced to traceable standards. Please note that Xchange™ sensor-heads may be installed on assets other than the one listed above; this calibration certificate will still be valid when used on other such assets. If this instrument or sensor has been recalibrated, please be sure to update your records. Please also ensure that you update the instrument's coefficient values in any post-processing software that you use, if necessary. Older generation instruments may require configuration files, which are available for download at our Customer Centre at www.AMLoceanographic.com/support

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Figure D.3. Certificate of calibration for AML Oceanographic SV&T sound-velocity sensor.

AML OCEANOGRAPHIC
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Certificate of Calibration

Customer:	Ocean Technology Group
Asset Serial Number:	020020
Asset Product Type:	Smart SV&T Instrument, 500m Housing
Calibration Type:	Temperature
Calibration Range:	-2 to +32 Dec C
Calibration RMS Error:	.0012
Calibration ID:	020020 999999 020020 250216 193333
Installed On:	020020

Coefficient A:	-8.271178E+0	Coefficient H:	0.000000E+0
Coefficient B:	8.840404E-4	Coefficient I:	0.000000E+0
Coefficient C:	-9.215226E-9	Coefficient J:	0.000000E+0
Coefficient D:	1.849194E-13	Coefficient K:	0.000000E+0
Coefficient E:	-2.212972E-18	Coefficient L:	0.000000E+0
Coefficient F:	1.743399E-23	Coefficient M:	0.000000E+0
Coefficient G:	-4.450266E-29	Coefficient N:	0.000000E+0

Calibration Date (dd/mm/yyyy): 25/2/2016

Certified By:

AML Oceanographic

Robert Haydock
President, AML Oceanographic

AML Oceanographic certifies that the asset described above has been calibrated or recalibrated with equipment referenced to traceable standards. Please note that Xchange™ sensor-heads may be installed on assets other than the one listed above; this calibration certificate will still be valid when used on other such assets. If this instrument or sensor has been recalibrated, please be sure to update your records. Please also ensure that you update the instrument's coefficient values in any post-processing software that you use, if necessary. Older generation instruments may require configuration files, which are available for download at our Customer Centre at www.AMLoceanographic.com/support

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Figure D.4. Certificate of calibration for AML Oceanographic SV&T temperature sensor.

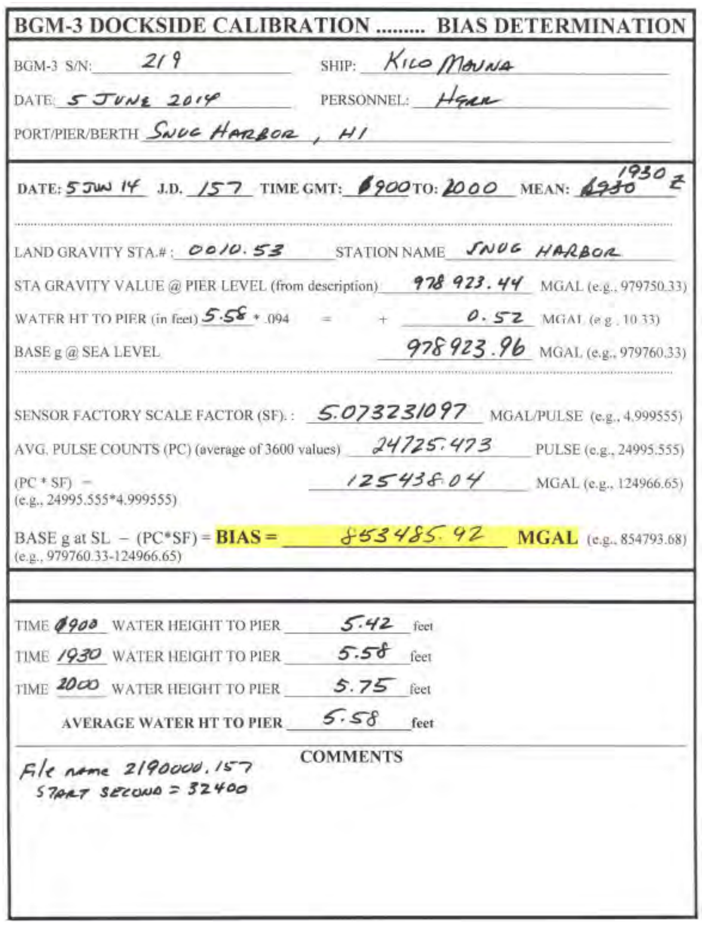
D.3 Gravity Ties

D.3.1 Calibration

The gravimeter is installed on the RV *Kilo Moana's* main deck, slightly to starboard of the centerline and aligned fore/aft approximately with aft-most port hole of Lab 2. The portable land gravimeter was in-line with the aft-most port hole of Lab 2, which is approximately where the gravimeter is installed A bias determination was conducted on the RV *Kilo Moana's* BGM-3 gravimeter on 2014-06-05, Fig. D.5, and was updated on 2017-03-13. No formal documentation of the re-determination is currently available, but e-mail documentation from Woods Hole Oceanographic Institute (WHOI: Tom Lanagan, tlanagan@whoi.edu) indicates that the scale factor was 5.073184939 mgal/pps, and the bias value was 853493.3941. The common reference station for all measurements is NGA Gravity Station 'Pier 35 Alpha' at the UH Marine Facility, Honolulu, HI, with description as shown in Fig. D.6; the gravity station monument is shown in Fig. D.7.

D.3.2 Observations

The opening and closing gravity tie information is provided in Figures D.8. and 9.



BGM-3 DOCKSIDE CALIBRATION .... BIAS DETERMINATION

BGM-3 S/N: 219 SHIP: Kilo Moana

DATE: 5 June 2014 PERSONNEL: Hgen

PORT/PIER/BERTH: Snug Harbor, HI

DATE: 5 Jun 14 **J.D.** 157 **TIME GMT:** 0900 **TO:** 2000 **MEAN:** ~~0930~~ 1930 Z

LAND GRAVITY STA.#: 0010.53 STATION NAME: Snug Harbor

STA GRAVITY VALUE @ PIER LEVEL (from description) 978 923.44 MGAL (e.g., 979750.33)

WATER HT TO PIER (in feet) 5.58 * .094 = + 0.52 MGAL (e.g. 10.33)

BASE g @ SEA LEVEL 978923.96 MGAL (e.g., 979760.33)

SENSOR FACTORY SCALE FACTOR (SF): 5.073231097 MGAL/PULSE (e.g., 4.999555)

AVG. PULSE COUNTS (PC) (average of 3600 values) 24725.473 PULSE (e.g., 24995.555)

(PC * SF) = 125438.04 MGAL (e.g., 124966.65)
(e.g., 24995.555*4.999555)

BASE g at SL – (PC*SF) = **BIAS =** 853485.92 **MGAL** (e.g., 854793.68)
(e.g., 979760.33-124966.65)

TIME 0900 WATER HEIGHT TO PIER 5.42 feet

TIME 1930 WATER HEIGHT TO PIER 5.58 feet

TIME 2000 WATER HEIGHT TO PIER 5.75 feet

AVERAGE WATER HT TO PIER 5.58 **feet**

COMMENTS

File name 2190000.157
Start second = 32400

Figure D.5. Dock-side bias determination for the RV *Kilo Moana's* Bell BCM-3 gravimeter.

DESCRIPTION OF GRAVITY STATION		
GRAVITY STATION Pier 35 Alpha	**WGS 84 POSTION** **Lat:**21°18'55.937"N **Long:**157°52'37.556"W **EH:**18.31m	
LOCATION University of Hawai'i, New Marine Center, Pier 35, Honolulu, Hawai'i		**DESCRIBED BY** Wheeler
ESTABLISHED BY NGA/SNSH		**DATE** March 2015

The station is located at the University of Hawai'i, Marine Center, Pier 35 at the 550 foot mark along the north-south Pier. The station is a 3" Brass NGA Gravity Station disk stamped "Pier 35 Alpha 2015".

Figure D.6. Description of the gravity reference station at Pier 35, Honolulu, HI used for gravity tie before KM1811.

Figure D.7. Gravity station monument at Pier 35, Honolulu, HI that corresponds to the station description in Fig. D.6.

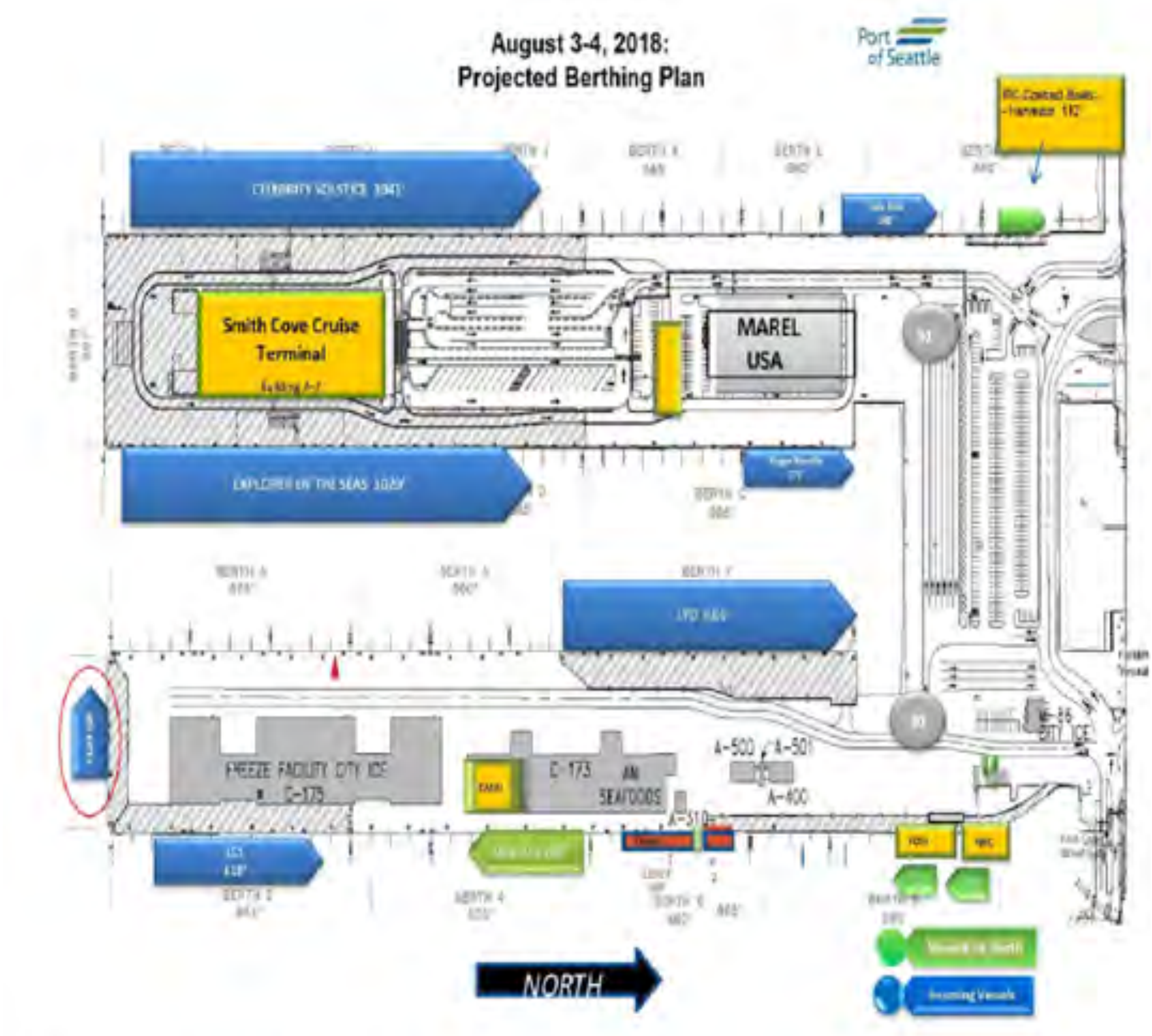


Illustration 2: KM Moored Pier 90 Smith Cove, Seattle WA

Figure D.8. Description of the gravity reference station at Pier 91, Seattle, WA. used for the gravity tie after KM1811.

D.3.2 Observations

KM18-11 Pre-Cruise Gravity Land-Tie Report

Date: June 29, 2018 HNL; Julian day 182
Gravity Station: Pier 35 Alpha
Port: Honolulu, Hawaii
Cruise: km1811
Gravity Station Location (lat/lon): 21° 18’55.937’ N / 157° 52’ 37.556’W
Gravity Station EH: 18.31m
Station Description: University of Hawaii Marine Center, Pier 35, Honolulu, Hawaii
Station Adjusted Gravity Value (mGal): 978927.887 ± 0.0024

Land Meter ID (Serial No.): LaCoste Romberg, s/n G-1
Ship's Meter ID (Serial Number): BGM-3, s/n 219

Benchmark Tie Details

Location	**Time (UTC)**	**Portable Meter Reading**	**Ships Meter Pulse Count**
Pre-Cruise Pier Measurement			
First pier measurement	JD 182 00:25:20	2197.20	24727
Second pier measurement	JD 182 00:29:23	2196.99	24692
Third pier measurement	JD 182 00:31:42	2196.99	24699
Average pier measurement		**2197**	**24706**

Main deck height above pier: **2.692m**
Pier‘s height above sea surface: **1.7907m**
Main deck above sea surface: **4.4831m**
Distance from port side of ship’s main deck: **1.6256m**
Ship’s draft mark:**Fwd= 7.5692m Aft= 7.7216m**

Ship’s GPS Location: 21.315062° N / -157.877463° W
Ship’s Heading: 206.9°T

Operator: Readings taken by T. Young (OTG) and J. Tree (UH).

KM1811 Post-Cruise Gravity Land-Tie Report

Date: 07 Aug. 2018 Seattle (Julian DAY 220)
Gravity Station: MSB-BB
Port: Smith Cove, Pier 90, Seattle WA

Cruise: KM1811
Gravity Station Location (lat/lon): 47 38.9804 N / 122 18.7866 W
Gravity Station EH: 88 in.
Station Description: University of Washington Marine Science Building Dock
Station Adjusted Gravity Value (mGal): 980729.450 ± 0.002
Land Meter ID (Serial No.): LaCoste Romberg, s/n G-1
Ship's Meter ID (Serial Number): BGM-3, s/n 219

Ship Tie Details

Ship Location	Time (UTC)	L&R Meter G-1 Reading	Conversion Table milligals	Ship's Meter Pulse Count	Ship's Meter Gravity
First pier measurement 47 37.5969 N 122 22.8164 W	JD 220 1640	3990.36 3990.33 3990.34			
		3990.34 (avg)	4148.8	25013.9	980382.0
Base Station measurement 47 38.9804 N 122 18.7866 W	JD 220 1752	3988.37 3988.37 3988.37			
		3988.37 (avg)	4146.7	25079.9	980716.6
Third pier measurement 47 37.5969 N 122 22.8164 W	JD 220 2036	3990.57 3990.55 3990.55			
		3990.56 (avg)	4149.0	25102.3	980830.3

Fig. D.8: KM1811 post-cruise gravity tie information

Figure 9a. Post-cruise gravity tie monument at the University of Washington Marine Sciences Bldg. dock, Seattle.

Figure 9b. Location of post-cruise gravity tie station at the University of Washington Marine Sciences Bldg. dock, Seattle.

D.4 CUBE Algorithm Parameters

The CUBE algorithm implementation in Qimera was configured with the algorithm deep water parameters and the CUBE hypothesis resolution algorithm was set to number of samples + neighborhood.

D.5 *GeoCoder* Algorithm Parameters

The *GeoCoder* implementation in QPS *FMGT* was set to the standard configuration for FMGT 7.8.4. This configures the algorithm to carry out transmit and receive power/gain corrections, apply beam pattern corrections, accept all beams, use the absorption coefficients from file, and apply no backscatter bias. The algorithm uses a "flat" AVG correction with window size of 300 pings, computing statistics in logarithmic space. The mosaic used the "blend" method with a 50% inter-line blending, and dB mean estimation. Navigation was taken from the default source in the input file, with automatically determined sonar defaults. Dual-swath compensation was turned off. The default processing pipeline was used.

Appendix E: Gravity Data Consistency Analysis

Gravity data collected are suspected to be of low accuracy and not valid for further interpretation without RMS minimization and correction factors being applied to the data derived from a cross-over analysis. Suggested further work should use the Generic Mapping Tools 5.4.4 module, X2SYS to obtain correction factors. Scientist, Jonathan Tree, has investigated any sources that may have resulted in these variations such as processing errors or ship dynamic effects (see Fig. F.1 below). The ship's pitch and heave seem to have the least effect on the quality of the gravity data, while hard turns and higher roll magnitudes appear to roughly correlate with magnitude shifts within the data (Fig. F.1). The Eötvös correction is shown in Fig. F.2 for the purpose of highlighting that the correct magnitude of corrections were applied to the free-air gravity reduction. Fig. F.2 shows that the gravity vector calculations are accurate and that they have removed the directional bias present in the filtered raw gravity (Fig. F.1). The gravimeter is suspected to have been locked into a nonvertical gravity component measurement due to gyro stabilizaition failure following turns. This is most obvious in the southern region of the survey following frequent turns of shorter survey lines and the following western margin of chiefly north-south survey lines.

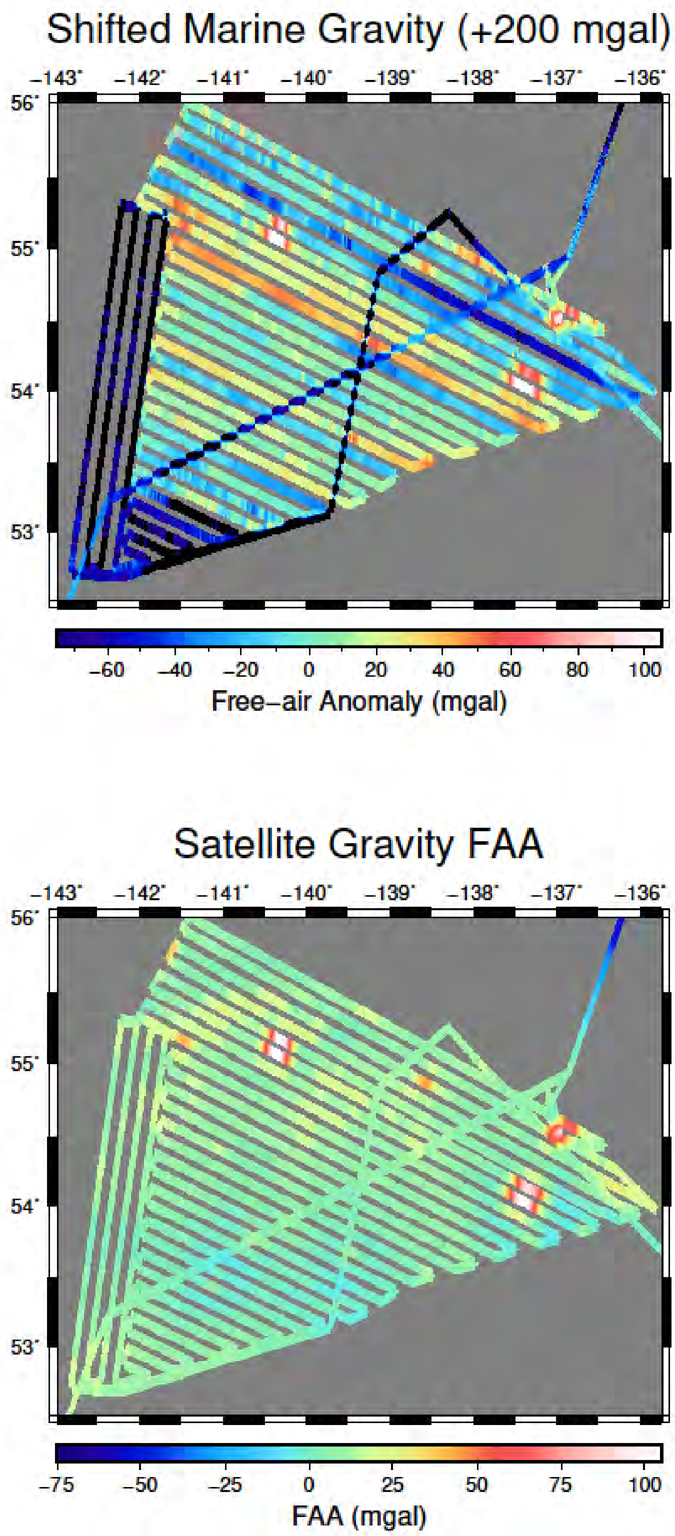


Figure E.1. Comparison of shifted marine gravity to satellite free-air anomoly. The shift of +200 mgal was an estimate to best match magnitudes of the two datasets for visual comparison only. Note the large discepency in most negative values during the last 4 days of the expedition along the southern survey area terminus and the north-northeast / south-southwest heading lines on the western edge, along with the cross-lines through the survey region.

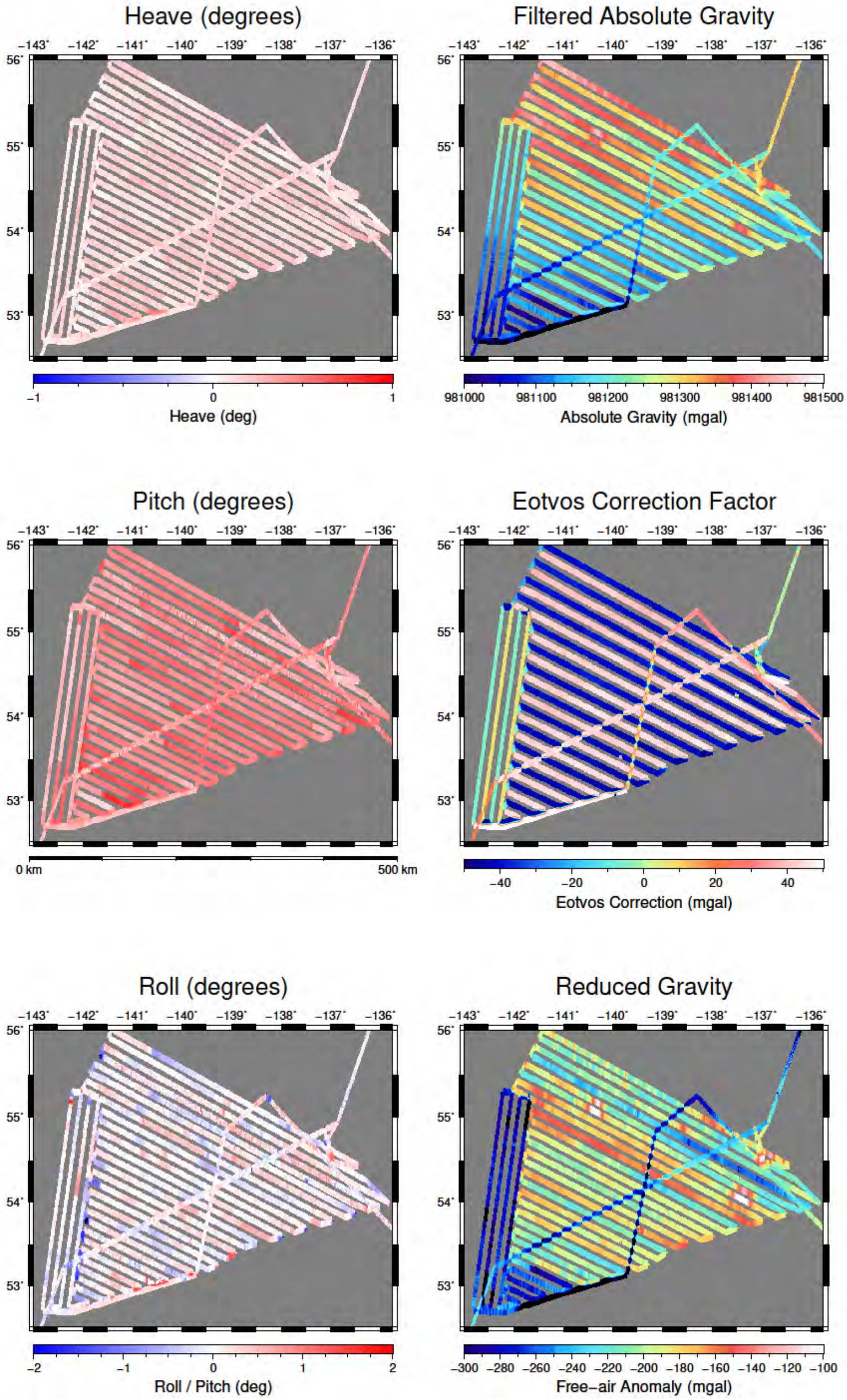
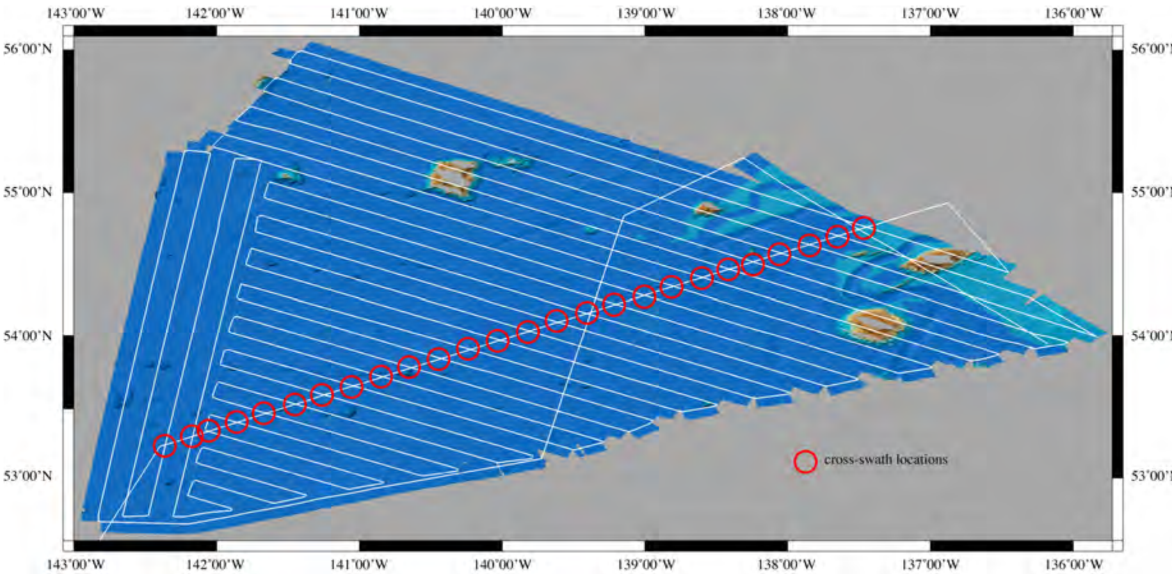
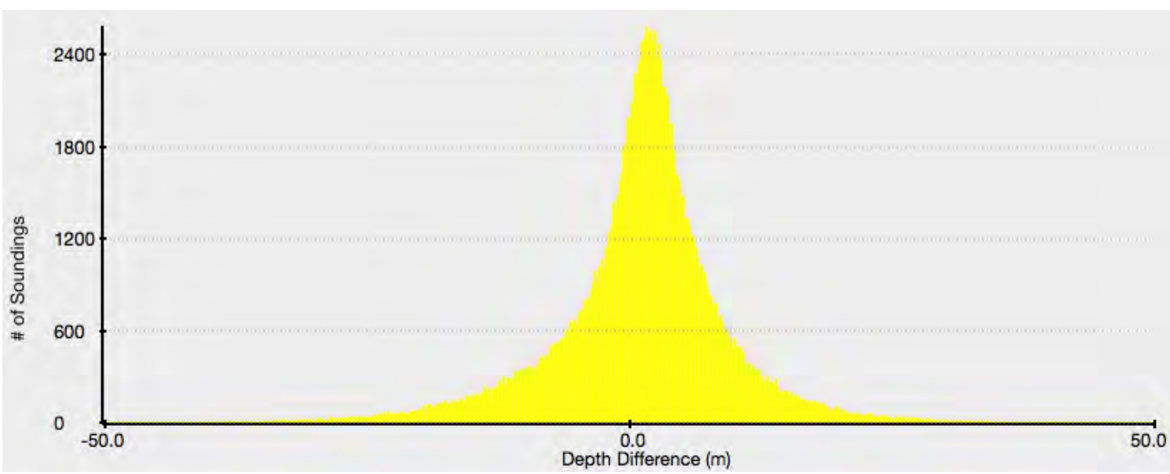


Figure E.2. Ship dynamics plotted on the left three-figure panel show no correlation to the quality of data collected plotted in the right side three-figure panel. The right hand plots show the filtered absolute gravity along with the Eötvös correction factor to illustrate that the erroneous FAA data were not an introduced artifact of data reduction.

Appendix F: Post-Cruise Cross-Swath Analyses (by Dr. James V. Gardner)



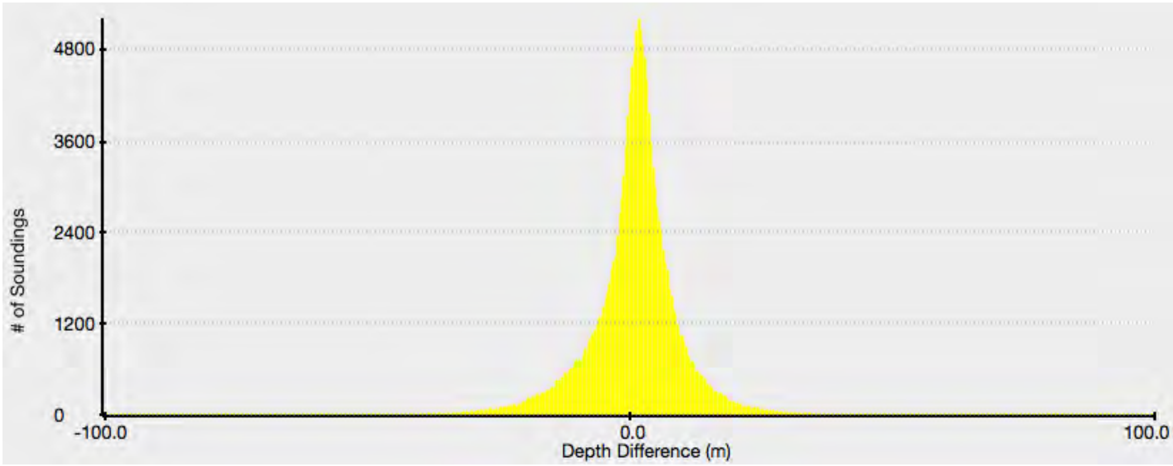
Locations of cross-swath analyses for the Gulf of Alaska area.



Histogram of sounding-depth differences from cross-line check of Line 343 and dipline 230 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

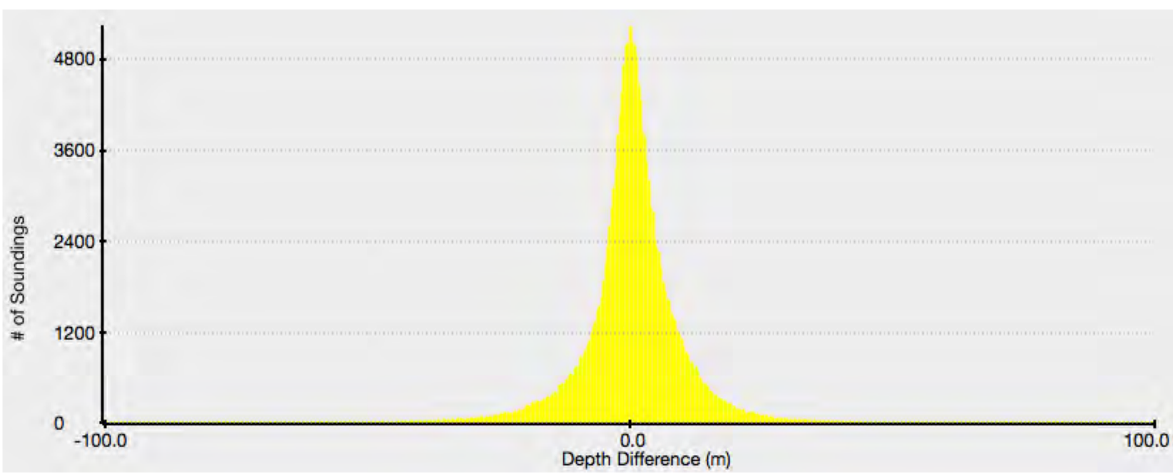
Line 343 vs dipline 230	Mean water depth	3845 m
	Mean Z difference	1.21 m
	Standard deviation	8.70 m
	Number of samples	150,628
	Percent of water depth	0.48% at 2σ



Histogram of sounding-depth differences from cross-line check of Line 328 and dipline 230 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

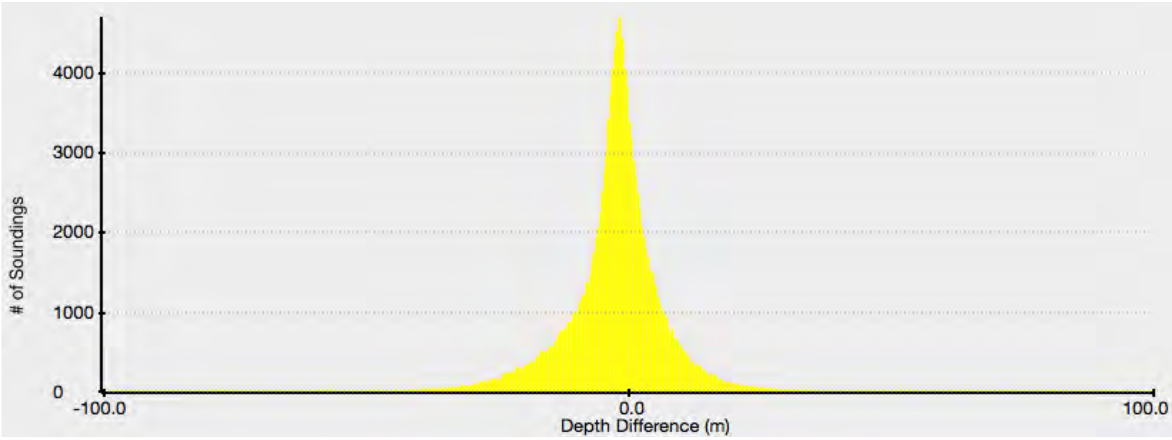
Line 328 vs dipline 230	Mean water depth	3805 m
	Mean Z difference	-0.54 m
	Standard deviation	11.97 m
	Number of samples	168,805
	Percent of water depth	0.61% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 330 and dipline 230 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

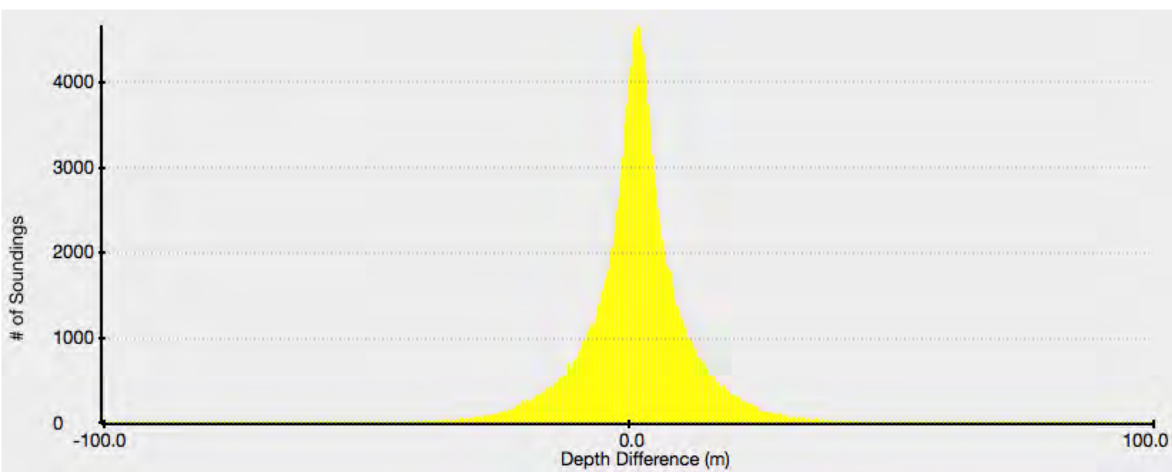
Line 330 vs dipline 230	Mean water depth	3824 m
	Mean Z difference	0.50 m
	Standard deviation	11.06 m
	Number of samples	165,926
	Percent of water depth	0.59% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 320 and dipline 230 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

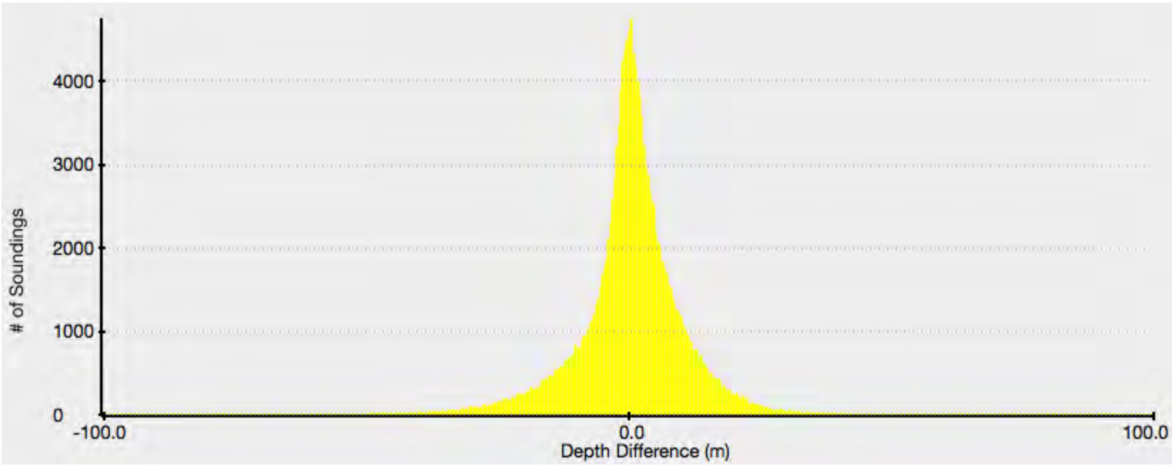
Line 320 vs dipline 230	Mean water depth	3760 m
	Mean Z difference	-2.38 m
	Standard deviation	9.60 m
	Number of samples	139,884
	Percent of water depth	0.45% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 323 and dipline 230 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

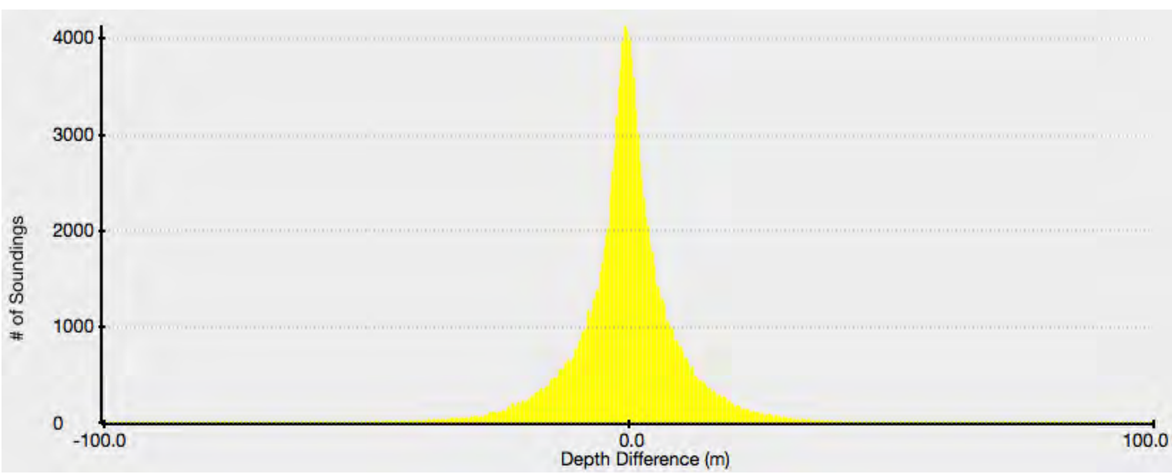
Line 323 vs dipline 230	Mean water depth	3795 m
	Mean Z difference	1.86 m
	Standard deviation	10.13 m
	Number of samples	160,300
	Percent of water depth	0.52% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 326 and dipline 230 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

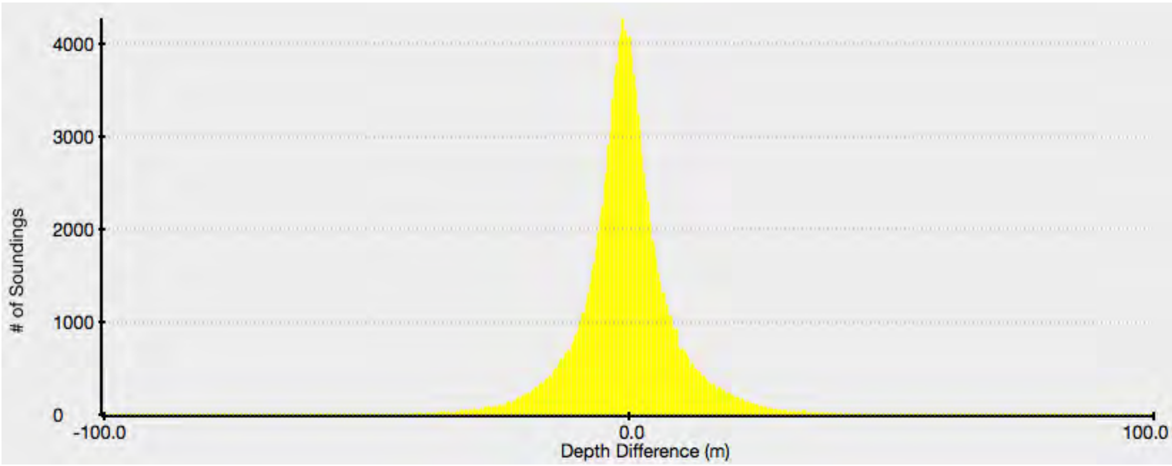
Line 326 vs dipline 230	Mean water depth	3809 m
	Mean Z difference	0.37 m
	Standard deviation	11.26 m
	Number of samples	158,172
	Percent of water depth	0.60% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 314 and dipline 231 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

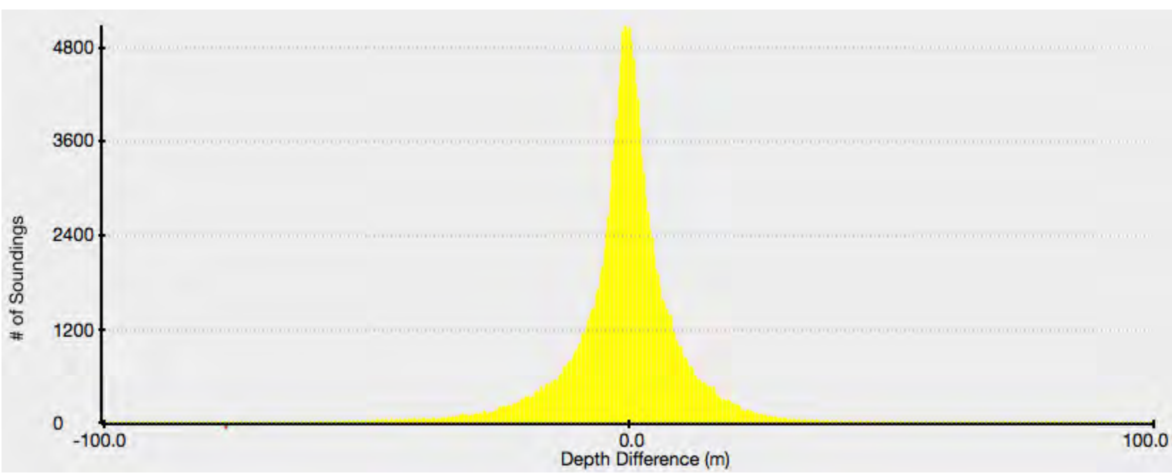
Line 314 vs dipline 231	Mean water depth	3718 m
	Mean Z difference	--0.53 m
	Standard deviation	11.84 m
	Number of samples	131,847
	Percent of water depth	0.62% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line X307 and dipline 231 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

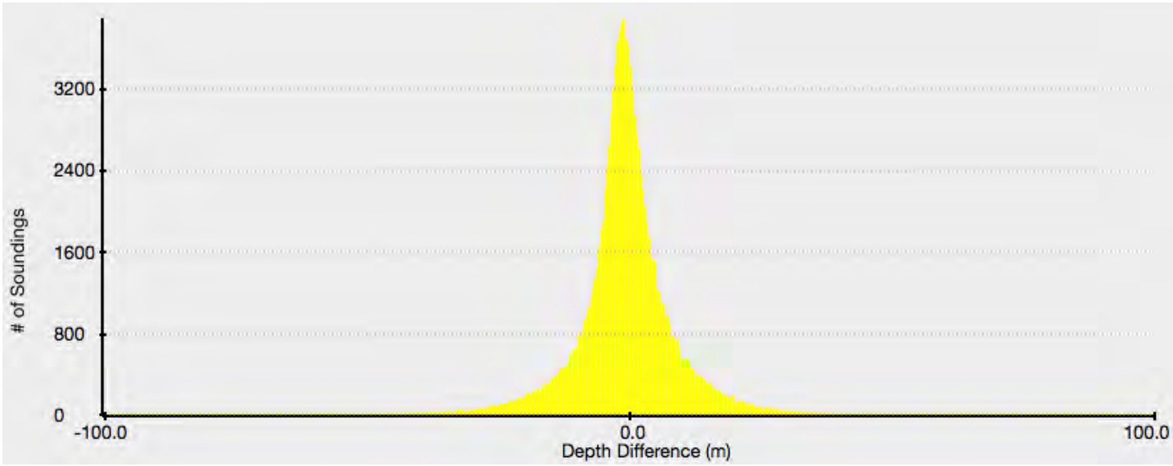
Line 307 vs dipline 231	Mean water depth	3884 m
	Mean Z difference	-0.23 m
	Standard deviation	10.0 m
	Number of samples	145,241
	Percent of water depth	0.51% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 310 and dipline 231 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

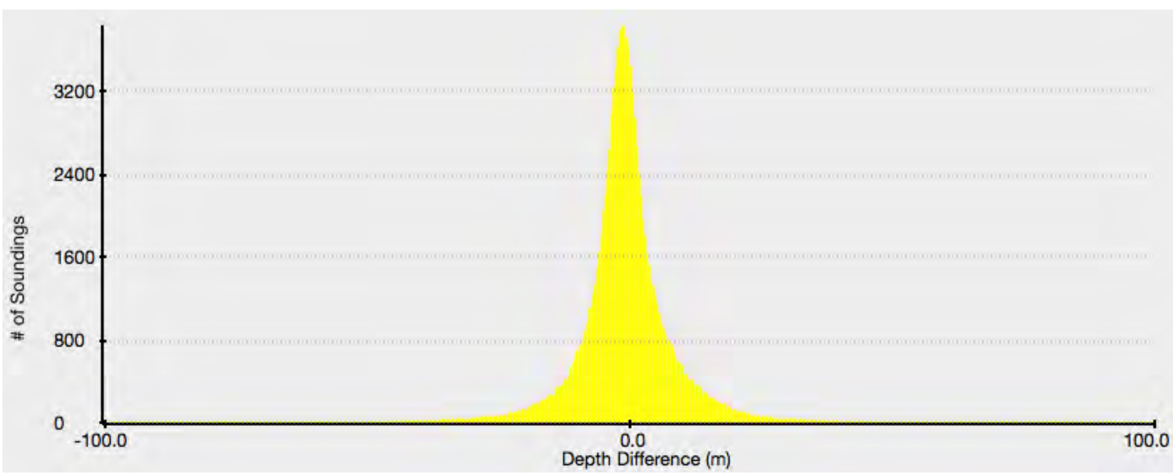
Line 310 vs dipline 231	Mean water depth	3519 m
	Mean Z difference	-1.31 m
	Standard deviation	9.60 m
	Number of samples	153,927
	Percent of water depth	0.51% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 300 and dipline 231 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

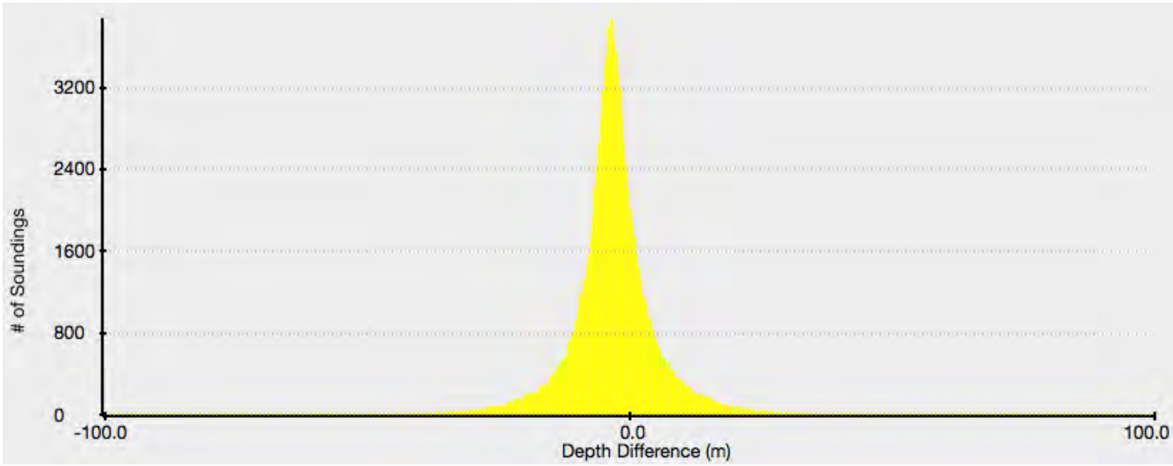
Line 300 vs dipline 231	Mean water depth	3493 m
	Mean Z difference	-0.60 m
	Standard deviation	9.88 m
	Number of samples	121,782
	Percent of water depth	0.55% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 305 and dipline 231 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

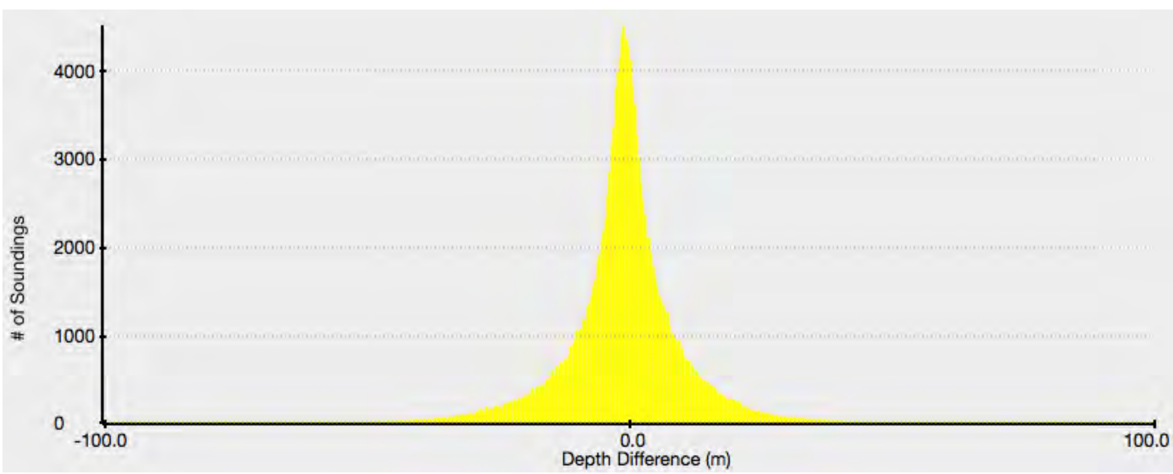
Line 305 vs dipline 231	Mean water depth	3504 m
	Mean Z difference	-0.64 m
	Standard deviation	9.90 m
	Number of samples	115,000
	Percent of water depth	0.55% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 293 and dipline 231 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

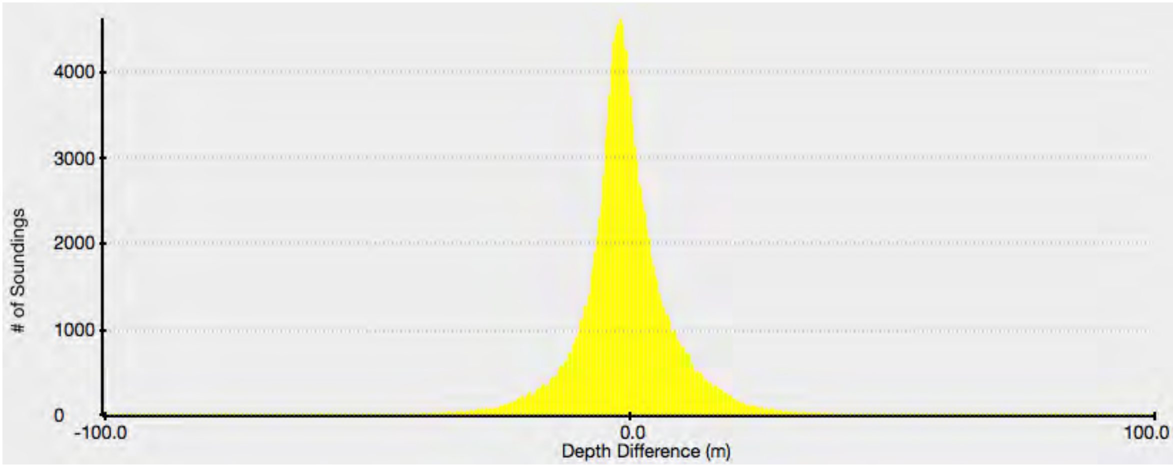
Line 293 vs dipline 231	Mean water depth	3406 m
	Mean Z difference	-2.86 m
	Standard deviation	9.11 m
	Number of samples	107,347
	Percent of water depth	0.45% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 297 and dipline 231 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

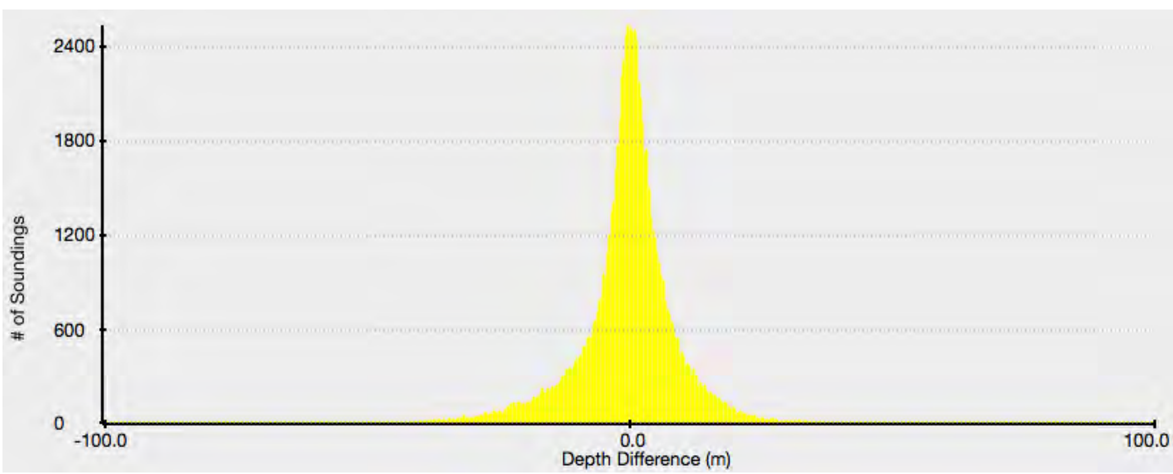
Line 297 vs dipline 231	Mean water depth	3466 m
	Mean Z difference	-0.91 m
	Standard deviation	11.22 m
	Number of samples	153,647
	Percent of water depth	0.62% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 289 and dipline 231 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

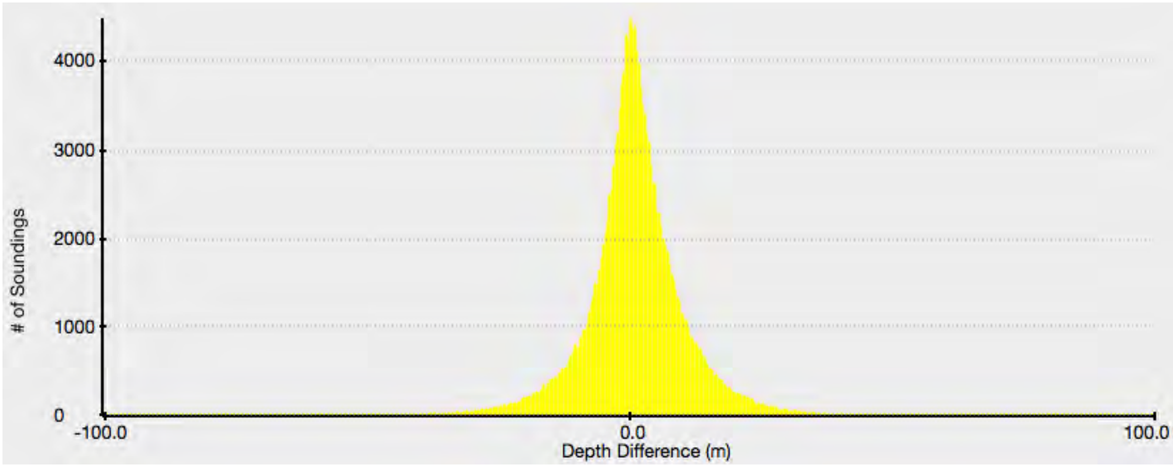
Line 289 vs dipline 231	Mean water depth	3317 m
	Mean Z difference	-0.57 m
	Standard deviation	9.54 m
	Number of samples	149,782
	Percent of water depth	0.56% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 285 and dipline 232 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

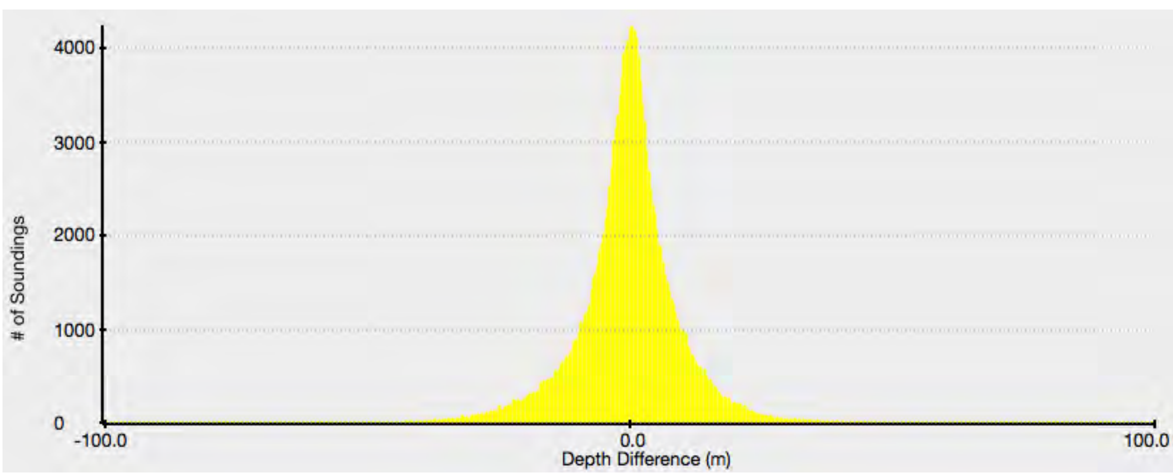
Line 285 vs dipline 232	Mean water depth	3250 m
	Mean Z difference	-0.24 m
	Standard deviation	9.55 m
	Number of samples	79,461
	Percent of water depth	0.58% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 276 and dipline 232 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

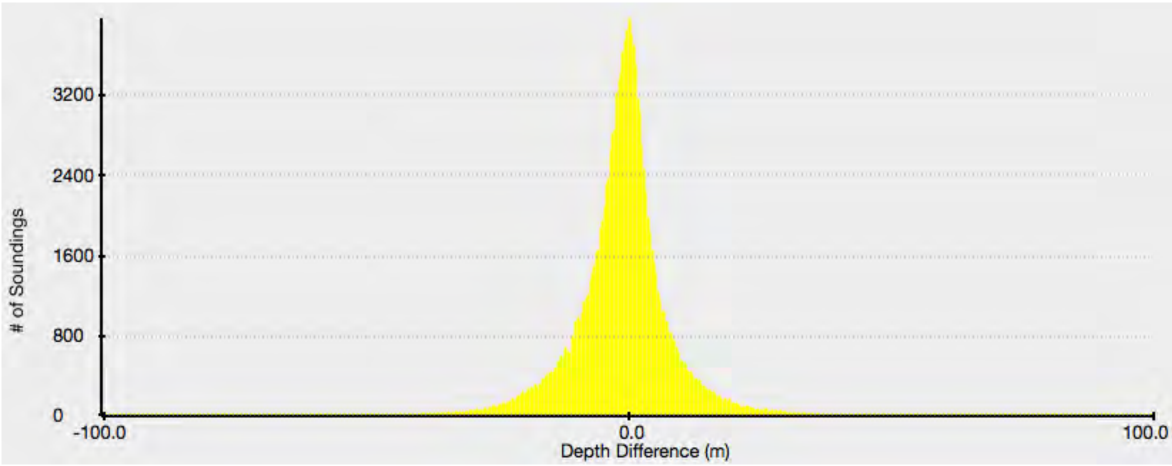
Line 276 vs dipline 232	Mean water depth	3164 m
	Mean Z difference	1.28m
	Standard deviation	9.54 m
	Number of samples	158,489
	Percent of water depth	0.64% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 281 and dipline 232 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

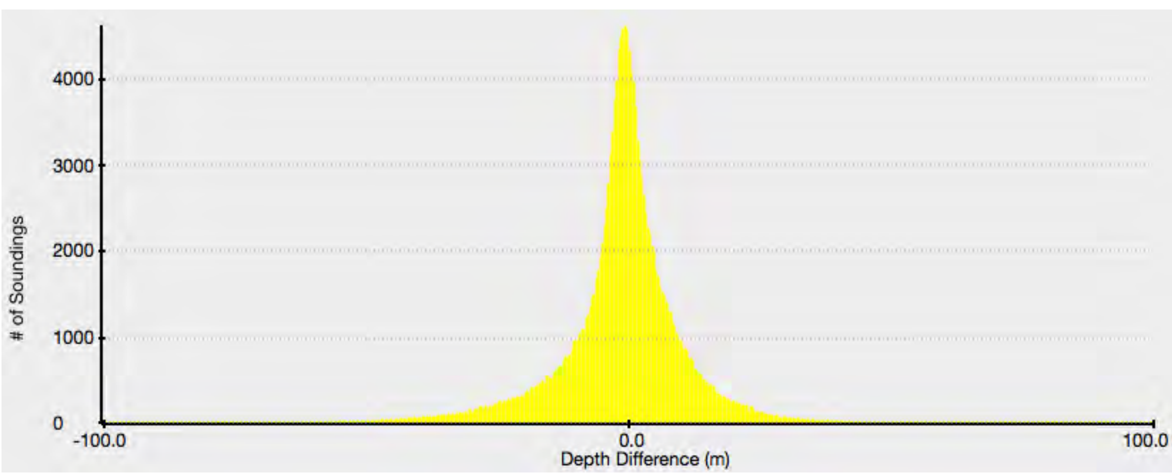
Line 281 vs dipline 232	Mean water depth	3183 m
	Mean Z difference	-0.05 m
	Standard deviation	10.20 m
	Number of samples	156,530
	Percent of water depth	0.64% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 271 and dipline 232 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

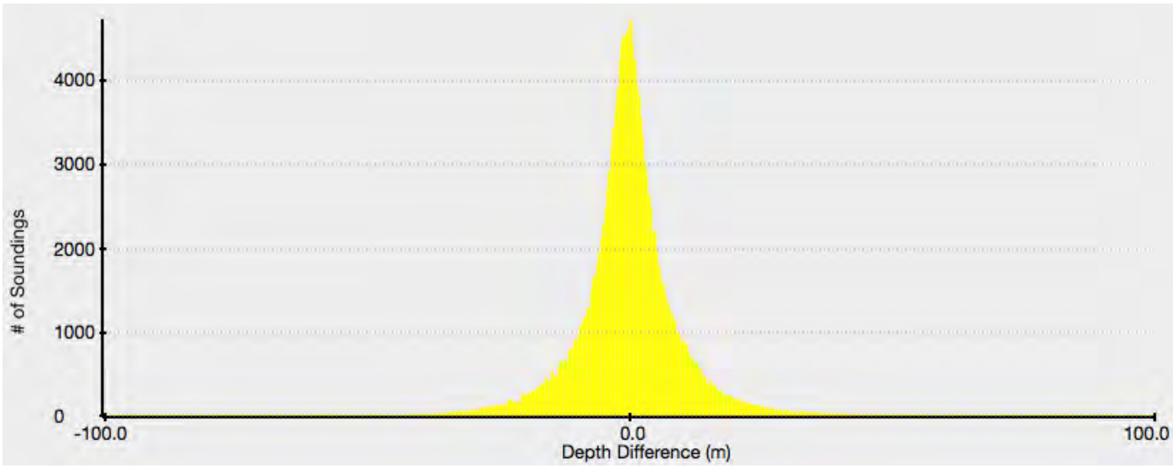
Line 271 vs dipline 232	Mean water depth	3152 m
	Mean Z difference	-0.96 m
	Standard deviation	9.15 m
	Number of samples	127,056
	Percent of water depth	0.55% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 266 and dipline 232 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

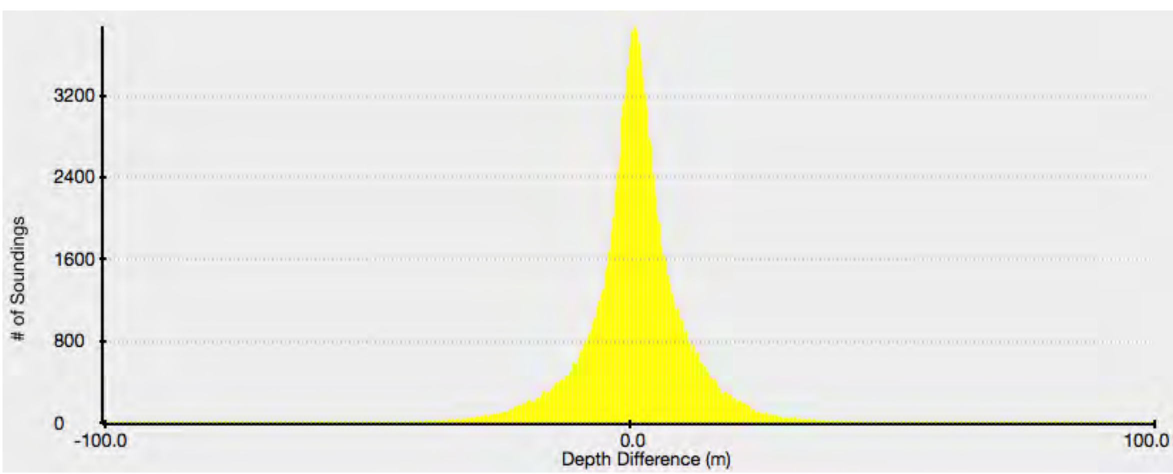
Line 266 vs dipline 232	Mean water depth	3136 m
	Mean Z difference	-1.10 m
	Standard deviation	11.89 m
	Number of samples	162,634
	Percent of water depth	0.72% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 262 and dipline 232 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

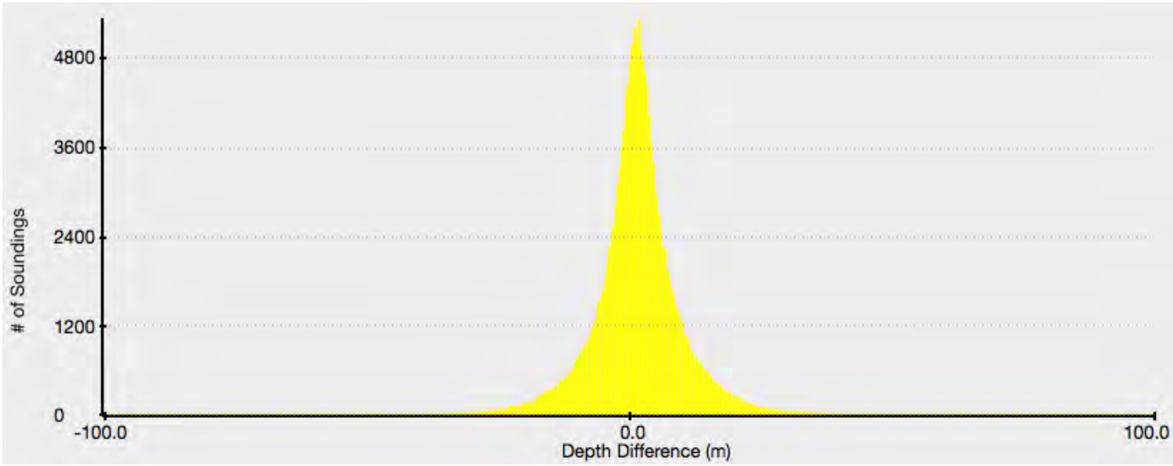
Line 262 vs dipline 232	Mean water depth	3116 m
	Mean Z difference	0.08 m
	Standard deviation	10.40 m
	Number of samples	160,411
	Percent of water depth	0.67% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 253 and dipline 232 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

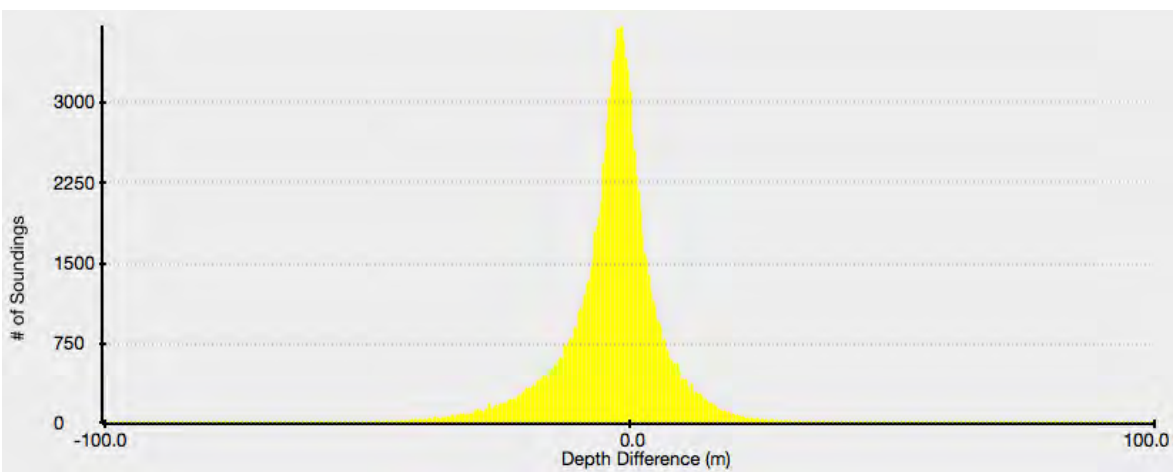
Line 253 vs dipline 232	Mean water depth	3048 m
	Mean Z difference	1.39 m
	Standard deviation	10.02 m
	Number of samples	132,377
	Percent of water depth	0.70% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 256 and dipline 232 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

Line 256 vs dipline 232	Mean water depth	3082 m
	Mean Z difference	1.73 m
	Standard deviation	8.96 m
	Number of samples	167,754
	Percent of water depth	0.63% at 2 σ



Histogram of sounding-depth differences from cross-line check of Line 247 and dipline 232 (smooth bathymetry). Kongsberg Maritime EM122.

Cross check statistics for the above lines.

Line 247 vs dipline 232	Mean water depth	3026 m
	Mean Z difference	-2.95 m
	Standard deviation	10.07 m
	Number of samples	121,005
	Percent of water depth	0.57% at 2σ

Appendix G: Built-In Self Tests (BIST) of EM122

G-1. Built-in Self Test (BIST) of KM1811 EM122 conducted at the pier in Honolulu prior to departure.

Saved: 2018.07.02 01:06:54
Sounder Type: 122, Serial no.: 109
Date Time Ser. No. BIST Result

2018.07.02 01:00:13.777 109 0 OK
Number of BSP67B boards: 2
BSP 1 Master 2.2.3 090702 4.3 070913 4.3 070913
BSP 1 Slave 2.2.3 090702 6.0 080902
BSP 1 RXI FPGA 3.6 080821
BSP 1 DSP FPGA A 4.0 070531
BSP 1 DSP FPGA B 4.0 070531
BSP 1 DSP FPGA C 4.0 070531
BSP 1 DSP FPGA D 4.0 070531
BSP 1 PCI TO SLAVE A1 FIFO: ok
BSP 1 PCI TO SLAVE A2 FIFO: ok
BSP 1 PCI TO SLAVE A3 FIFO: ok
BSP 1 PCI TO SLAVE B1 FIFO: ok
BSP 1 PCI TO SLAVE B2 FIFO: ok
BSP 1 PCI TO SLAVE B3 FIFO: ok
BSP 1 PCI TO SLAVE C1 FIFO: ok
BSP 1 PCI TO SLAVE C2 FIFO: ok
BSP 1 PCI TO SLAVE C3 FIFO: ok
BSP 1 PCI TO SLAVE D1 FIFO: ok
BSP 1 PCI TO SLAVE D2 FIFO: ok
BSP 1 PCI TO SLAVE D3 FIFO: ok
BSP 1 PCI TO MASTER A HPI: ok
BSP 1 PCI TO MASTER B HPI: ok
BSP 1 PCI TO MASTER C HPI: ok
BSP 1 PCI TO MASTER D HPI: ok
BSP 1 PCI TO SLAVE A1 HPI: ok
BSP 1 PCI TO SLAVE A2 HPI: ok
BSP 1 PCI TO SLAVE A3 HPI: ok
BSP 1 PCI TO SLAVE B1 HPI: ok
BSP 1 PCI TO SLAVE B2 HPI: ok
BSP 1 PCI TO SLAVE B3 HPI: ok
BSP 1 PCI TO SLAVE C1 HPI: ok
BSP 1 PCI TO SLAVE C2 HPI: ok
BSP 1 PCI TO SLAVE C3 HPI: ok
BSP 1 PCI TO SLAVE D1 HPI: ok
BSP 1 PCI TO SLAVE D2 HPI: ok
BSP 1 PCI TO SLAVE D3 HPI: ok

BSP 2 Master 2.2.3 090702 4.3 070913 4.3 070913
BSP 2 Slave 2.2.3 090702 6.0 080902
BSP 2 RXI FPGA 3.6 080821
BSP 2 DSP FPGA A 4.0 070531
BSP 2 DSP FPGA B 4.0 070531
BSP 2 DSP FPGA C 4.0 070531
BSP 2 DSP FPGA D 4.0 070531
BSP 2 PCI TO SLAVE A1 FIFO: ok
BSP 2 PCI TO SLAVE A2 FIFO: ok
BSP 2 PCI TO SLAVE A3 FIFO: ok
BSP 2 PCI TO SLAVE B1 FIFO: ok
BSP 2 PCI TO SLAVE B2 FIFO: ok
BSP 2 PCI TO SLAVE B3 FIFO: ok
BSP 2 PCI TO SLAVE C1 FIFO: ok
BSP 2 PCI TO SLAVE C2 FIFO: ok
BSP 2 PCI TO SLAVE C3 FIFO: ok
BSP 2 PCI TO SLAVE D1 FIFO: ok
BSP 2 PCI TO SLAVE D2 FIFO: ok
BSP 2 PCI TO SLAVE D3 FIFO: ok
BSP 2 PCI TO MASTER A HPI: ok
BSP 2 PCI TO MASTER B HPI: ok
BSP 2 PCI TO MASTER C HPI: ok
BSP 2 PCI TO MASTER D HPI: ok
BSP 2 PCI TO SLAVE A1 HPI: ok
BSP 2 PCI TO SLAVE A2 HPI: ok
BSP 2 PCI TO SLAVE A3 HPI: ok
BSP 2 PCI TO SLAVE B1 HPI: ok
BSP 2 PCI TO SLAVE B2 HPI: ok
BSP 2 PCI TO SLAVE B3 HPI: ok
BSP 2 PCI TO SLAVE C1 HPI: ok
BSP 2 PCI TO SLAVE C2 HPI: ok
BSP 2 PCI TO SLAVE C3 HPI: ok
BSP 2 PCI TO SLAVE D1 HPI: ok
BSP 2 PCI TO SLAVE D2 HPI: ok
BSP 2 PCI TO SLAVE D3 HPI: ok

Summary:
BSP 1: OK
BSP 2: OK

2018.07.02 01:00:15.260 109 1 OK
High Voltage Br. 1

TX36 Spec: 99.0 - 121.0
0-1 111.4
0-2 111.0

0-3   111.8
0-4   111.4
0-5   111.8
0-6   112.3
0-7   112.3
0-8   112.3
0-9   111.8
0-10   111.8
0-11 112.3
0-12 111.8
0-13 111.8
0-14 112.3
0-15 111.8
0-16 111.8
0-17 111.8
0-18 111.4
0-19 111.4
0-20 112.3
0-21 111.8
0-22 111.8
0-23 111.4
0-24 111.8

High Voltage Br. 2

TX36   Spec: 99.0 - 121.0
0-1   111.4
0-2   111.4
0-3   111.4
0-4   111.9
0-5   112.3
0-6   112.3
0-7   111.9
0-8   112.3
0-9   111.4
0-10   112.3
0-11 112.7
0-12 111.9
0-13 111.4
0-14 112.3
0-15 111.9
0-16 111.4
0-17 111.9
0-18 112.7
0-19 111.9
0-20 112.7

0-21 111.9
0-22 111.9
0-23 111.9
0-24 111.4

Input voltage 12V

TX36   Spec: 11.0 - 13.0
0-1   11.9
0-2   11.9
0-3   12.0
0-4   11.9
0-5   11.9
0-6   12.0
0-7   12.0
0-8   12.0
0-9   11.9
0-10   11.9
0-11   11.9
0-12   11.9
0-13   11.9
0-14   11.9
0-15   11.9
0-16   11.8
0-17   11.9
0-18   12.0
0-19   11.9
0-20   12.0
0-21   11.9
0-22   11.9
0-23   11.9
0-24   11.9

Digital 3.3V

TX36   Spec: 2.8 - 3.5
0-1   3.3
0-2   3.3
0-3   3.3
0-4   3.3
0-5   3.3
0-6   3.3
0-7   3.3
0-8   3.3
0-9   3.3
0-10   3.3

0-11 3.3
0-12 3.3
0-13 3.3
0-14 3.3
0-15 3.3
0-16 3.3
0-17 3.3
0-18 3.3
0-19 3.3
0-20 3.3
0-21 3.3
0-22 3.3
0-23 3.3
0-24 3.3

Digital 2.5V

TX36 Spec: 2.4 - 2.6
0-1 2.5
0-2 2.5
0-3 2.5
0-4 2.5
0-5 2.5
0-6 2.5
0-7 2.5
0-8 2.5
0-9 2.5
0-10 2.5
0-11 2.5
0-12 2.5
0-13 2.5
0-14 2.5
0-15 2.5
0-16 2.5
0-17 2.5
0-18 2.5
0-19 2.5
0-20 2.5
0-21 2.5
0-22 2.5
0-23 2.5
0-24 2.5

Digital 1.5V

TX36 Spec: 1.4 - 1.6

0-1 1.5
0-2 1.5
0-3 1.5
0-4 1.5
0-5 1.5
0-6 1.5
0-7 1.5
0-8 1.5
0-9 1.5
0-10 1.5
0-11 1.5
0-12 1.5
0-13 1.5
0-14 1.5
0-15 1.5
0-16 1.5
0-17 1.5
0-18 1.5
0-19 1.5
0-20 1.5
0-21 1.5
0-22 1.5
0-23 1.5
0-24 1.5

Temperature

TX36 Spec: 15.0 - 75.0
0-1 37.2
0-2 37.6
0-3 36.4
0-4 35.2
0-5 36.0
0-6 36.4
0-7 36.4
0-8 34.4
0-9 36.4
0-10 35.6
0-11 34.8
0-12 34.4
0-13 35.2
0-14 35.6
0-15 36.0
0-16 35.6
0-17 38.4
0-18 38.0

0-19 37.6
0-20 38.0
0-21 38.0
0-22 36.4
0-23 37.2
0-24 36.4

Input Current 12V

TX36 Spec: 0.3 - 1.5
0-1 0.6
0-2 0.6
0-3 0.6
0-4 0.5
0-5 0.5
0-6 0.5
0-7 0.6
0-8 0.5
0-9 0.5
0-10 0.5
0-11 0.5
0-12 0.5
0-13 0.5
0-14 0.5
0-15 0.6
0-16 0.5
0-17 0.5
0-18 0.5
0-19 0.5
0-20 0.5
0-21 0.5
0-22 0.5
0-23 0.6
0-24 0.6

TX36 power test passed

IO TX PPC Embedded PPC Download
2.11 1.14 Mar 5 2007/1.07 May 7 2013/1.11

TX36 unique firmware test OK

2018.07.02 01:00:25.761 109 2 OK
Input voltage 12V

RX32   Spec: 11.0 - 13.0
7-1   11.7
7-2   11.8

Input voltage 6V

RX32   Spec: 5.0 - 7.0
7-1   5.7
7-2   5.7

Digital 3.3V

RX32   Spec: 2.8 - 3.5
7-1   3.3
7-2   3.3

Digital 2.5V

RX32   Spec: 2.4 - 2.6
7-1   2.5
7-2   2.5

Digital 1.5V

RX32   Spec: 1.4 - 1.6
7-1   1.5
7-2   1.5

Temperature

RX32   Spec: 15.0 - 75.0
7-1   37.0
7-2   38.0

Input Current 12V

RX32   Spec: 0.4 - 1.5
7-1   0.6
7-2   0.6

Input Current 6V

RX32   Spec: 2.4 - 3.3
7-1   2.7
7-2   2.9

RX32   power test passed

IO   RX   MB Embedded   PPC Embedded   PPC Download
1.12 1.14 May 5 2006/1.06 May 5 2006/1.07 Feb 18 2010/1.11

RX32 unique firmware test OK

2018.07.02 01:00:25.827 109   3   OK
High Voltage Br. 1

TX36   Spec: 99.0 - 121.0
0-1   111.4
0-2   111.0
0-3   111.8
0-4   111.4
0-5   112.3
0-6   112.3
0-7   112.3
0-8   111.8
0-9   111.8
0-10   111.8
0-11 112.3
0-12 112.3
0-13 111.8
0-14 112.3
0-15 111.8
0-16 111.8
0-17 111.8
0-18 111.4
0-19 111.4
0-20 112.3
0-21 111.8
0-22 111.8
0-23 111.4
0-24 111.8

High Voltage Br. 2

TX36   Spec: 99.0 - 121.0
0-1   111.4
0-2   111.0
0-3   111.4
0-4   111.9
0-5   112.3
0-6   112.3

0-7   111.9
0-8   111.9
0-9   111.4
0-10   112.3
0-11 112.7
0-12 111.9
0-13 111.4
0-14 112.3
0-15 111.9
0-16 111.4
0-17 111.9
0-18 112.3
0-19 111.9
0-20 112.7
0-21 111.9
0-22 111.9
0-23 111.4
0-24 111.0

Input voltage 12V

TX36   Spec: 11.0 - 13.0
0-1   11.9
0-2   11.9
0-3   12.0
0-4   11.9
0-5   11.9
0-6   12.0
0-7   12.0
0-8   12.0
0-9   11.9
0-10   11.9
0-11   11.9
0-12   11.9
0-13   11.9
0-14   11.9
0-15   11.9
0-16   11.8
0-17   11.9
0-18   11.9
0-19   11.9
0-20   12.0
0-21   11.9
0-22   11.9
0-23   11.9
0-24   11.9

RX32   Spec: 11.0 - 13.0
7-1   11.7
7-2   11.8

Input voltage 6V

RX32   Spec: 5.0 - 7.0
7-1   5.7
7-2   5.7

TRU power test passed

2018.07.02 01:00:25.944 109   4   OK
EM 122 High Voltage Ramp Test
Test Voltage:20.00 Measured Voltage: 18.00 PASSED
Test Voltage:60.00 Measured Voltage: 59.00 PASSED
Test Voltage:100.00 Measured Voltage: 100.00 PASSED
Test Voltage:110.00 Measured Voltage: 110.00 PASSED
Test Voltage:70.00 Measured Voltage: 75.00 PASSED
Test Voltage:30.00 Measured Voltage: 35.00 PASSED

6 of 6 tests OK

2018.07.02 01:02:43.100 109   5   OK

BSP 1 RXI TO RAW FIFO: ok
BSP 2 RXI TO RAW FIFO: ok

2018.07.02 01:02:47.567 109   6   OK
Receiver impedance limits [350.0 700.0] ohm
Board 1   2   3   4
 1: 497.9 553.1
 2: 536.5 554.6
 3: 545.2 551.9
 4: 552.9 555.8
 5: 556.6 559.6
 6: 564.3 538.5
 7: 571.2 547.8
 8: 562.4 560.2
 9: 488.1 521.3
10: 543.6 531.4

11:	529.1	558.3
12:	542.8	546.8
13:	574.0	526.0
14:	527.6	572.7
15:	562.2	519.0
16:	563.5	548.5
17:	551.5	508.3
18:	557.0	511.1
19:	562.3	563.5
20:	570.8	565.8
21:	517.6	562.4
22:	573.6	526.1
23:	572.9	559.6
24:	544.1	561.4
25:	560.7	537.3
26:	577.9	572.2
27:	495.1	565.5
28:	544.3	545.0
29:	507.4	553.3
30:	556.3	509.9
31:	592.7	546.9
32:	539.0	553.1

Receiver Phase limits [-20.0 20.0] deg

Board	1	2	3	4
1:	4.0	-0.5		
2:	0.4	-1.0		
3:	0.0	-0.9		
4:	-0.4	-1.0		
5:	-1.2	-0.5		
6:	-0.9	0.1		
7:	-1.4	-0.3		
8:	-1.7	-1.1		
9:	4.3	2.0		
10:	0.0	0.7		
11:	1.2	-0.7		
12:	-0.4	0.3		
13:	-1.6	2.0		
14:	1.7	-1.8		
15:	-0.9	2.7		
16:	-1.2	-0.5		
17:	0.0	3.9		
18:	-1.1	3.2		
19:	-1.1	-1.4		
20:	-2.4	-1.8		
21:	2.8	-1.5		

22: -2.2 1.8
23: -1.8 -1.0
24: 0.8 -1.6
25: -1.4 1.0
26: -2.0 -2.0
27: 4.1 -0.9
28: 0.1 -0.1
29: 4.1 -0.7
30: 0.0 2.6
31: -3.0 0.2
32: 1.5 -1.2
Rx Channels test passed

2018.07.02 01:03:19.069 109 7 OK
Tx Channels test passed

2018.07.02 01:05:59.026 109 8 OK
RX NOISE LEVEL

Board No: 1 2

0:	60.3	47.6	dB
1:	55.7	47.4	dB
2:	54.1	46.6	dB
3:	51.7	45.6	dB
4:	51.2	46.8	dB
5:	50.4	47.0	dB
6:	51.0	48.5	dB
7:	49.7	48.2	dB
8:	49.0	48.7	dB
9:	48.4	47.9	dB
10:	49.7	48.3	dB
11:	48.7	48.1	dB
12:	48.8	47.8	dB
13:	48.1	47.5	dB
14:	49.3	48.6	dB
15:	48.7	48.7	dB
16:	48.3	48.7	dB
17:	47.5	48.7	dB
18:	48.0	48.6	dB
19:	47.6	49.5	dB
20:	47.3	48.9	dB
21:	47.0	50.9	dB
22:	47.4	51.0	dB

23:	48.1	49.3	dB
24:	49.8	51.1	dB
25:	49.0	51.0	dB
26:	49.6	51.7	dB
27:	49.1	51.1	dB
28:	48.9	53.8	dB
29:	48.4	55.2	dB
30:	48.2	57.3	dB
31:	47.9	62.4	dB

Maximum noise at Board 2 Channel 31 Level: 62.4 dB

Broadband noise test

Average noise at Board 1 51.0 dB OK
Average noise at Board 2 52.0 dB OK

2018.07.02 01:06:04.976 109 9 OK
RX NOISE SPECTRUM

Board No:	1	2	
10.0 kHz:	45.9	47.1	dB
10.2 kHz:	47.0	48.1	dB
10.3 kHz:	48.5	49.0	dB
10.4 kHz:	48.5	49.3	dB
10.6 kHz:	49.1	52.0	dB
10.7 kHz:	50.6	50.0	dB
10.9 kHz:	49.4	51.2	dB
11.0 kHz:	49.7	50.8	dB
11.2 kHz:	50.0	51.5	dB
11.3 kHz:	49.1	50.2	dB
11.4 kHz:	49.2	50.5	dB
11.6 kHz:	49.2	48.6	dB
11.7 kHz:	48.4	49.1	dB
11.9 kHz:	48.2	48.0	dB
12.0 kHz:	48.1	49.6	dB
12.1 kHz:	48.3	49.1	dB
12.3 kHz:	47.5	48.1	dB
12.4 kHz:	47.2	48.0	dB
12.6 kHz:	46.8	47.3	dB
12.7 kHz:	45.9	48.4	dB
12.9 kHz:	46.3	50.4	dB
13.0 kHz:	45.3	48.4	dB

Maximum noise at Board 2 Frequency 10.6 kHz Level: 52.0 dB

Spectral noise test

Average noise at Board 1   48.3 dB   OK
Average noise at Board 2   49.5 dB   OK

2018.07.02 01:06:10.927 109   10   OK
CPU: KOM CP6011
Clock 1795 MHz
Die   46 oC (peak: 62 oC @ 2018-07-02 - 00:58:41)
Board 49 oC (peak: 51 oC @ 2018-07-02 - 00:58:35)
Core 1.33 V
3V3   3.28 V
12V   11.91 V
-12V -12.13 V
BATT 3.14 V
Primary network: 157.237.14.60:0xffff0000
Secondary network: 192.168.1.1:0xffffff00

2018.07.02 01:06:10.993 109   15   OK
EM 122
BSP67B Master: 2.2.3 090702
BSP67B Slave: 2.2.3 090702
CPU: 1.3.8 161001
DDS: 3.5.10 140106
DSV: 3.1.8 141125
RX32 version : Feb 18 2010 Rev 1.11
TX36 LC version : May 7 2013 Rev 1.11
VxWorks 5.5.1 Build 1.2/2-IX0100 May 16 2007, 11:31:17

G-2. Built-in Self Test (BIST) of KM1811 EM122 conducted in deep water during transit from Honolulu to the Gulf of Alaska.

Saved: 2018.07.16 05:08:56

Sounder Type: 122, Serial no.: 109

Date Time Ser. No. BIST Result

2018.07.16 05:02:46.068 109 0 OK

Number of BSP67B boards: 2

BSP 1 Master 2.2.3 090702 4.3 070913 4.3 070913

BSP 1 Slave 2.2.3 090702 6.0 080902

BSP 1 RXI FPGA 3.6 080821

BSP 1 DSP FPGA A 4.0 070531

BSP 1 DSP FPGA B 4.0 070531

BSP 1 DSP FPGA C 4.0 070531

BSP 1 DSP FPGA D 4.0 070531

BSP 1 PCI TO SLAVE A1 FIFO: ok

BSP 1 PCI TO SLAVE A2 FIFO: ok

BSP 1 PCI TO SLAVE A3 FIFO: ok

BSP 1 PCI TO SLAVE B1 FIFO: ok

BSP 1 PCI TO SLAVE B2 FIFO: ok

BSP 1 PCI TO SLAVE B3 FIFO: ok

BSP 1 PCI TO SLAVE C1 FIFO: ok

BSP 1 PCI TO SLAVE C2 FIFO: ok

BSP 1 PCI TO SLAVE C3 FIFO: ok

BSP 1 PCI TO SLAVE D1 FIFO: ok

BSP 1 PCI TO SLAVE D2 FIFO: ok

BSP 1 PCI TO SLAVE D3 FIFO: ok

BSP 1 PCI TO MASTER A HPI: ok

BSP 1 PCI TO MASTER B HPI: ok

BSP 1 PCI TO MASTER C HPI: ok

BSP 1 PCI TO MASTER D HPI: ok

BSP 1 PCI TO SLAVE A1 HPI: ok

BSP 1 PCI TO SLAVE A2 HPI: ok

BSP 1 PCI TO SLAVE A3 HPI: ok

BSP 1 PCI TO SLAVE B1 HPI: ok

BSP 1 PCI TO SLAVE B2 HPI: ok

BSP 1 PCI TO SLAVE B3 HPI: ok

BSP 1 PCI TO SLAVE C1 HPI: ok

BSP 1 PCI TO SLAVE C2 HPI: ok

BSP 1 PCI TO SLAVE C3 HPI: ok

BSP 1 PCI TO SLAVE D1 HPI: ok

BSP 1 PCI TO SLAVE D2 HPI: ok

BSP 1 PCI TO SLAVE D3 HPI: ok

BSP 2 Master 2.2.3 090702 4.3 070913 4.3 070913

BSP 2 Slave 2.2.3 090702 6.0 080902

BSP 2 RXI FPGA 3.6 080821

BSP 2 DSP FPGA A 4.0 070531
BSP 2 DSP FPGA B 4.0 070531
BSP 2 DSP FPGA C 4.0 070531
BSP 2 DSP FPGA D 4.0 070531
BSP 2 PCI TO SLAVE A1 FIFO: ok
BSP 2 PCI TO SLAVE A2 FIFO: ok
BSP 2 PCI TO SLAVE A3 FIFO: ok
BSP 2 PCI TO SLAVE B1 FIFO: ok
BSP 2 PCI TO SLAVE B2 FIFO: ok
BSP 2 PCI TO SLAVE B3 FIFO: ok
BSP 2 PCI TO SLAVE C1 FIFO: ok
BSP 2 PCI TO SLAVE C2 FIFO: ok
BSP 2 PCI TO SLAVE C3 FIFO: ok
BSP 2 PCI TO SLAVE D1 FIFO: ok
BSP 2 PCI TO SLAVE D2 FIFO: ok
BSP 2 PCI TO SLAVE D3 FIFO: ok
BSP 2 PCI TO MASTER A HPI: ok
BSP 2 PCI TO MASTER B HPI: ok
BSP 2 PCI TO MASTER C HPI: ok
BSP 2 PCI TO MASTER D HPI: ok
BSP 2 PCI TO SLAVE A1 HPI: ok
BSP 2 PCI TO SLAVE A2 HPI: ok
BSP 2 PCI TO SLAVE A3 HPI: ok
BSP 2 PCI TO SLAVE B1 HPI: ok
BSP 2 PCI TO SLAVE B2 HPI: ok
BSP 2 PCI TO SLAVE B3 HPI: ok
BSP 2 PCI TO SLAVE C1 HPI: ok
BSP 2 PCI TO SLAVE C2 HPI: ok
BSP 2 PCI TO SLAVE C3 HPI: ok
BSP 2 PCI TO SLAVE D1 HPI: ok
BSP 2 PCI TO SLAVE D2 HPI: ok
BSP 2 PCI TO SLAVE D3 HPI: ok

Summary:
BSP 1: OK
BSP 2: OK

2018.07.16 05:02:47.551 109 1 OK
High Voltage Br. 1

TX36 Spec: 99.0 - 121.0
0-1 111.0
0-2 111.0
0-3 111.4
0-4 111.0
0-5 111.8

0-6   111.8
0-7   112.3
0-8   111.8
0-9   111.4
0-10   111.8
0-11 111.8
0-12 111.8
0-13 111.4
0-14 111.8
0-15 111.8
0-16 111.8
0-17 111.4
0-18 111.4
0-19 111.4
0-20 111.8
0-21 111.4
0-22 111.4
0-23 111.4
0-24 111.8

High Voltage Br. 2

TX36   Spec: 99.0 - 121.0
0-1   111.0
0-2   111.0
0-3   111.0
0-4   111.4
0-5   111.9
0-6   112.3
0-7   111.9
0-8   111.9
0-9   111.0
0-10   111.9
0-11 112.3
0-12 111.9
0-13 111.0
0-14 111.9
0-15 111.9
0-16 111.0
0-17 111.9
0-18 112.3
0-19 111.9
0-20 112.7
0-21 111.4
0-22 111.4
0-23 111.4

0-24 111.0

Input voltage 12V

TX36   Spec: 11.0 - 13.0
0-1   11.9
0-2   11.9
0-3   12.0
0-4   11.9
0-5   11.9
0-6   11.9
0-7   12.0
0-8   12.0
0-9   11.9
0-10   11.9
0-11   11.9
0-12   11.9
0-13   11.9
0-14   11.9
0-15   11.9
0-16   11.8
0-17   11.9
0-18   11.9
0-19   11.9
0-20   12.0
0-21   11.9
0-22   11.9
0-23   11.9
0-24   11.9

Digital 3.3V

TX36   Spec: 2.8 - 3.5
0-1   3.3
0-2   3.3
0-3   3.3
0-4   3.3
0-5   3.3
0-6   3.3
0-7   3.3
0-8   3.3
0-9   3.3
0-10   3.3
0-11   3.3
0-12   3.3
0-13   3.3

0-14 3.3
0-15 3.3
0-16 3.3
0-17 3.3
0-18 3.3
0-19 3.3
0-20 3.3
0-21 3.3
0-22 3.3
0-23 3.3
0-24 3.3

Digital 2.5V

TX36 Spec: 2.4 - 2.6
0-1 2.5
0-2 2.5
0-3 2.5
0-4 2.5
0-5 2.5
0-6 2.5
0-7 2.5
0-8 2.5
0-9 2.5
0-10 2.5
0-11 2.5
0-12 2.5
0-13 2.5
0-14 2.5
0-15 2.5
0-16 2.5
0-17 2.5
0-18 2.5
0-19 2.5
0-20 2.5
0-21 2.5
0-22 2.5
0-23 2.5
0-24 2.5

Digital 1.5V

TX36 Spec: 1.4 - 1.6
0-1 1.5
0-2 1.5
0-3 1.5

0-4 1.5
0-5 1.5
0-6 1.5
0-7 1.5
0-8 1.5
0-9 1.5
0-10 1.5
0-11 1.5
0-12 1.5
0-13 1.5
0-14 1.5
0-15 1.5
0-16 1.5
0-17 1.5
0-18 1.5
0-19 1.5
0-20 1.5
0-21 1.5
0-22 1.5
0-23 1.5
0-24 1.5

Temperature
\-----------
TX36 Spec: 15.0 - 75.0
0-1 38.8
0-2 39.2
0-3 38.0
0-4 36.4
0-5 38.0
0-6 38.0
0-7 38.0
0-8 35.6
0-9 37.6
0-10 36.8
0-11 36.0
0-12 35.6
0-13 36.4
0-14 36.8
0-15 37.6
0-16 37.2
0-17 39.6
0-18 39.6
0-19 39.2
0-20 39.2
0-21 39.2

0-22   38.0
0-23   38.8
0-24   38.4

Input Current 12V

TX36   Spec: 0.3 - 1.5
0-1   0.6
0-2   0.6
0-3   0.6
0-4   0.5
0-5   0.5
0-6   0.5
0-7   0.6
0-8   0.5
0-9   0.5
0-10   0.5
0-11   0.5
0-12   0.5
0-13   0.5
0-14   0.5
0-15   0.5
0-16   0.5
0-17   0.5
0-18   0.5
0-19   0.5
0-20   0.5
0-21   0.5
0-22   0.5
0-23   0.6
0-24   0.6

TX36   power test passed

IO   TX   PPC Embedded   PPC Download
2.11 1.14 Mar 5 2007/1.07 May 7 2013/1.11

TX36 unique firmware test OK

2018.07.16 05:02:47.668 109   2   OK
Input voltage 12V

RX32   Spec: 11.0 - 13.0
7-1   11.7
7-2   11.8

Input voltage 6V

RX32 Spec: 5.0 - 7.0
7-1 5.7
7-2 5.7

Digital 3.3V

RX32 Spec: 2.8 - 3.5
7-1 3.3
7-2 3.3

Digital 2.5V

RX32 Spec: 2.4 - 2.6
7-1 2.5
7-2 2.5

Digital 1.5V

RX32 Spec: 1.4 - 1.6
7-1 1.5
7-2 1.5

Temperature

RX32 Spec: 15.0 - 75.0
7-1 39.0
7-2 39.0

Input Current 12V

RX32 Spec: 0.4 - 1.5
7-1 0.6
7-2 0.6

Input Current 6V

RX32 Spec: 2.4 - 3.3
7-1 2.7
7-2 2.9

RX32 power test passed

IO RX MB Embedded PPC Embedded PPC Download

1.12 1.14 May 5 2006/1.06 May 5 2006/1.07 Feb 18 2010/1.11

RX32 unique firmware test OK

2018.07.16 05:02:47.735 109 3 OK
High Voltage Br. 1

TX36   Spec: 99.0 - 121.0
0-1   111.0
0-2   110.6
0-3   111.4
0-4   111.0
0-5   111.8
0-6   112.3
0-7   112.3
0-8   111.8
0-9   111.4
0-10   111.8
0-11 111.8
0-12 111.8
0-13 111.4
0-14 111.8
0-15 111.8
0-16 111.8
0-17 111.4
0-18 111.4
0-19 111.4
0-20 111.8
0-21 111.4
0-22 111.4
0-23 111.4
0-24 111.8

High Voltage Br. 2

TX36   Spec: 99.0 - 121.0
0-1   111.0
0-2   111.0
0-3   111.0
0-4   111.4
0-5   111.9
0-6   112.3
0-7   111.9
0-8   111.9
0-9   111.0

0-10 111.9
0-11 112.3
0-12 111.9
0-13 111.0
0-14 112.3
0-15 111.9
0-16 111.0
0-17 111.9
0-18 111.9
0-19 111.9
0-20 112.7
0-21 111.4
0-22 111.4
0-23 111.4
0-24 111.0

Input voltage 12V

TX36 Spec: 11.0 - 13.0
0-1 11.9
0-2 11.9
0-3 12.0
0-4 11.9
0-5 11.9
0-6 12.0
0-7 12.0
0-8 12.0
0-9 11.9
0-10 11.9
0-11 11.9
0-12 11.9
0-13 11.9
0-14 11.9
0-15 11.9
0-16 11.8
0-17 11.9
0-18 12.0
0-19 11.9
0-20 12.0
0-21 11.9
0-22 11.9
0-23 11.9
0-24 11.9

RX32 Spec: 11.0 - 13.0
7-1 11.7

7-2   11.8

Input voltage 6V

RX32   Spec: 5.0 - 7.0
7-1   5.7
7-2   5.7

TRU power test passed

2018.07.16 05:02:47.851 109   4   OK
EM 122 High Voltage Ramp Test
Test Voltage:20.00 Measured Voltage: 17.00 PASSED
Test Voltage:60.00 Measured Voltage: 59.00 PASSED
Test Voltage:100.00 Measured Voltage: 100.00 PASSED
Test Voltage:110.00 Measured Voltage: 110.00 PASSED
Test Voltage:70.00 Measured Voltage: 75.00 PASSED
Test Voltage:30.00 Measured Voltage: 35.00 PASSED

6 of 6 tests OK

2018.07.16 05:05:05.008 109   5   OK

BSP 1 RXI TO RAW FIFO: ok
BSP 2 RXI TO RAW FIFO: ok

2018.07.16 05:05:09.475 109   6   OK
Receiver impedance limits [350.0 700.0] ohm
Board 1   2   3   4
 1: 502.1 552.2
 2: 536.8 553.8
 3: 546.5 549.6
 4: 550.7 555.2
 5: 555.7 558.8
 6: 561.3 537.9
 7: 570.4 546.5
 8: 561.0 558.7
 9: 488.4 522.2
10: 542.5 532.7
11: 527.2 557.4
12: 541.2 548.7
13: 570.5 527.8
14: 525.8 572.8

15: 558.6 520.6
16: 561.8 549.5
17: 547.9 509.1
18: 555.5 512.1
19: 559.9 562.8
20: 566.8 565.8
21: 515.2 562.0
22: 569.9 527.3
23: 569.3 558.6
24: 540.8 560.0
25: 558.4 538.6
26: 575.7 571.2
27: 496.0 565.8
28: 545.2 545.6
29: 506.6 553.5
30: 554.9 511.5
31: 589.3 547.2
32: 538.2 551.9

Receiver Phase limits [-20.0 20.0] deg

Board	1	2	3	4
1:	3.5	-0.4		
2:	0.2	-0.9		
3:	-0.3	-0.7		
4:	-0.4	-0.9		
5:	-1.3	-0.4		
6:	-0.8	0.1		
7:	-1.5	-0.2		
8:	-1.8	-1.0		
9:	4.1	1.9		
10:	-0.1	0.6		
11:	1.2	-0.6		
12:	-0.4	0.2		
13:	-1.5	1.8		
14:	1.8	-1.9		
15:	-0.7	2.6		
16:	-1.1	-0.6		
17:	0.2	3.8		
18:	-1.1	3.1		
19:	-1.1	-1.4		
20:	-2.2	-1.8		
21:	2.9	-1.5		
22:	-2.1	1.7		
23:	-1.6	-0.9		
24:	0.9	-1.5		
25:	-1.3	0.9		

26:	-2.0	-1.9
27:	3.9	-1.0
28:	-0.1	-0.1
29:	4.0	-0.6
30:	0.0	2.5
31:	-2.8	0.2
32:	1.5	-1.1

Rx Channels test passed

2018.07.16 05:05:41.026 109 7 OK

Tx Channels test passed

2018.07.16 05:08:21.000 109 8 OK

RX NOISE LEVEL

Board No: 1 2

0:	69.5	52.5	dB
1:	65.2	51.7	dB
2:	63.9	50.8	dB
3:	61.8	50.2	dB
4:	61.1	51.3	dB
5:	60.0	51.2	dB
6:	58.8	54.1	dB
7:	57.4	53.3	dB
8:	55.8	53.5	dB
9:	56.0	53.1	dB
10:	55.9	52.6	dB
11:	53.9	51.8	dB
12:	55.1	51.6	dB
13:	53.5	51.7	dB
14:	53.6	52.4	dB
15:	53.9	52.6	dB
16:	54.2	52.5	dB
17:	52.7	51.9	dB
18:	52.0	52.5	dB
19:	51.7	52.9	dB
20:	51.9	52.8	dB
21:	51.6	53.9	dB
22:	51.4	54.3	dB
23:	51.9	54.1	dB
24:	54.4	55.3	dB
25:	52.4	55.0	dB
26:	52.6	56.3	dB

27:	52.1	55.6	dB
28:	51.5	57.5	dB
29:	51.4	58.9	dB
30:	51.6	61.1	dB
31:	52.9	67.6	dB

Maximum noise at Board 1 Channel 0 Level: 69.5 dB

Broadband noise test

Average noise at Board 1 58.9 dB OK
Average noise at Board 2 56.5 dB OK

2018.07.16 05:08:26.950 109 9 OK
RX NOISE SPECTRUM

Board No:	1	2	
10.0 kHz:	55.0	54.2	dB
10.2 kHz:	56.4	55.5	dB
10.3 kHz:	59.6	55.3	dB
10.4 kHz:	60.0	57.1	dB
10.6 kHz:	57.0	56.4	dB
10.7 kHz:	61.5	58.1	dB
10.9 kHz:	59.4	58.0	dB
11.0 kHz:	58.0	56.3	dB
11.2 kHz:	60.8	56.9	dB
11.3 kHz:	59.1	56.1	dB
11.4 kHz:	57.9	56.5	dB
11.6 kHz:	60.9	56.1	dB
11.7 kHz:	58.5	55.7	dB
11.9 kHz:	58.0	54.8	dB
12.0 kHz:	59.9	56.2	dB
12.1 kHz:	57.0	54.9	dB
12.3 kHz:	57.1	53.7	dB
12.4 kHz:	55.7	53.1	dB
12.6 kHz:	56.1	54.2	dB
12.7 kHz:	58.0	54.3	dB
12.9 kHz:	55.7	52.7	dB
13.0 kHz:	57.7	51.9	dB

Maximum noise at Board 1 Frequency 10.7 kHz Level: 61.5 dB

Spectral noise test

Average noise at Board 1   58.5 dB   OK
Average noise at Board 2   55.6 dB   OK

2018.07.16 05:08:32.917 109   10   OK
CPU: KOM CP6011
Clock 1795 MHz
Die   49 oC (peak: 60 oC @ 2018-07-12 - 05:06:16)
Board 51 oC (peak: 55 oC @ 2018-07-12 - 05:31:52)
Core 1.33 V
3V3   3.28 V
12V   11.91 V
-12V -12.13 V
BATT 3.18 V
Primary network: 157.237.14.60:0xffff0000
Secondary network: 192.168.1.1:0xffffff00

2018.07.16 05:08:32.984 109   15   OK
EM 122
BSP67B Master: 2.2.3 090702
BSP67B Slave: 2.2.3 090702
CPU: 1.3.8 161001
DDS: 3.5.10 140106
DSV: 3.1.8 141125
RX32 version : Feb 18 2010 Rev 1.11
TX36 LC version : May 7 2013 Rev 1.11
VxWorks 5.5.1 Build 1.2/2-IX0100 May 16 2007, 11:31:17
