NOAA Ocean Exploration Program

MAPPING DATA ACQUISITION AND PROCESSING REPORT

CRUISE EX-14-04 Leg 1

Ship Shakedown & Patch Test & Exploration, New England Seamounts (Mapping)

August 9 – August 29, 2014
N. Kingstown, RI – N. Kingstown, RI

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1. Introduction

NOAA Ship *Okeanos Explorer*

Commissioned in August 2008, the NOAA Ship *Okeanos Explorer* is the nation's only federal vessel dedicated to ocean exploration. With 95% of the world's oceans left unexplored, the ship's combination of scientific and technological tools uniquely positions it to systematically explore new areas of our largely unknown ocean. These exploration cruises are explicitly designed in collaboration with the broad science community to provide a foundation of publicly accessible baseline data and information to support science and management needs. This baseline information often leads to further more detailed investigations by other parties.

The unique combination of mission capabilities including a high-resolution multibeam sonar deep water remotely operated vehicles, telepresence technology, and integrated data management system quicken the scientific discovery and dissemination process. These systems enable us to identify new targets in real time, dive on those targets shortly after initial detection, and then send this information back to shore for immediate near-real-time collaboration with scientists and experts at Exploration Command Centers around the world. The integrated data management system provide for the quick dissemination of information-rich products to the scientific community. This ensures that discoveries are immediately available to experts in relevant disciplines for research and analysis.

Through the operation and maintenance of the mission capabilities, NOAA's Office of Ocean Exploration and Research (OER) provides the nation with unparalleled capacity to discover and investigate new oceanic regions and phenomena, conduct the basic research required to document discoveries, and seamlessly disseminate data and information-rich products to a multitude of users. OER strives to develop technological solutions and innovative applications to critical problems in undersea exploration and to provide resources for developing, testing, and transitioning solutions to meet these needs.

Okeanos Explorer Management – a unique partnership within NOAA

The *Okeanos Explorer* mode of operations systematic telepresence-enabled exploration, requires a robust with shore-based high speed network and infrastructure. The ship is operated, managed and maintained by NOAA's Office of Marine and Aviation Operations, which includes commissioned officers of the NOAA Corps and civilian wage mariners. OER owns and is responsible for operating and managing the cutting-edge ocean exploration systems on the vessel (ROV, mapping and telepresence) and ashore including Exploration Command Centers and terrestrial high speed networks. The ship and shore-based infrastructure combine to be the only federal program dedicated to systematic telepresence-enabled exploration of the planet's largely unknown ocean.

2. Report Purpose

The purpose of this report is to briefly describe the mapping data collection and processing methods, and to report the results of the cruise. For a detailed description of *Okeanos Explorer* mapping capabilities, see the appendices section 'Kongsberg EM 302 Multibeam Sonar Description and Operational Specifications' and the ship's readiness report, which can be obtained by contacting the ships operations officer (ops.explorer@noaa.gov).

This report focuses on exploration expedition EX-14-04 Leg 1, during which a ship shakedown and patch test were conducted, as well as mapping of seamounts within the New England Seamounts Chain in the North Atlantic Ocean.

3. Cruise Objectives and Outcomes

The first several days of the expedition were dedicated to testing and calibrating mission-critical mapping and communication systems that were upgraded during the summer 2014 in-port maintenance period. The rest of the expedition focused on exploring and mapping seamounts within the New England Seamount chain that extends for approximately 1,100 kilometers off the continental shelf into the deep waters of the North Atlantic.

Over the past decade much of the U.S. Atlantic continental shelf margin has been mapped with modern multibeam sonar systems by the University of New Hampshire's Center for Coastal and Ocean Mapping as part of the U.S. Extended Continental Shelf Project. This effort comprehensively mapped the western portion of the New England Seamounts chain, out to the vicinity of Balanus Seamount. In 2013, the *Okeanos Explorer* completed an exploration expedition (EX-13-03) to comprehensively map additional seamounts eastward along the chain, including Asterias, Kiwi, Kelvin, and Atlantis II Seamounts. This expedition also discovered and mapped a previously unknown seamount now referred to informally as Discovery Seamount.

The EX-14-04 Leg 1 mapping work built directly on these previously completed mapping efforts by mapping and exploring the seamounts located east of the portion of the chain that is already well mapped. During transit mapping operations the *Okeanos Explorer* collected additional high resolution data over Bear, Physalia, Retriever, Picket, Balanus, Panulirus, and Atlantis II seamounts. This work filled minor data gaps and improved resolution in areas with previously completed multibeam sonar mapping work. Gosnold, Sheldrake, Gregg, San Pablo, and Manning Seamounts were the primary focus of survey mapping operations during the current expedition. All of Panulirus, Gosnold, Sheldrake, Gregg, and San Pablo Seamounts were mapped during 14-04 Leg 1. About half of Manning Seamount was mapped during the expedition prior to an early departure from working grounds in order to escape rough seas forecasted in association with Hurricane Cristobal.

The cruise objectives for EX-14-04 Leg 1 were defined in EX-14-04 Leg 1 Project Instructions and included the following. The "outcome" statement following each objective notes if the objective was achieved or not.

1. Conduct additional VSAT testing with MTN, Inc. technician as needed. The re-built VSAT system is planned to be tested at sea prior to this cruise. However, additional at sea testing may need to be done during the first few days of the cruise. If so, assistance from the ship's ETs may be needed. The ship will perform several aggressive steering maneuvers during

GAMS calibration for the POS MV (Objective 3), which should serve as a useful test of the VSAT's tracking capability under strenuous conditions.

Outcome: Not applicable. The ship ended up conducting a dedicated two day sea trial of the repaired VSAT system with good results, so additional testing during this cruise was not needed.

2. Kongsberg technician(s) to conduct alongside work on sonar equipment 8/7/14 and/or 8/8/14. This work primarily involves updating the Seafloor Information System (SIS) multibeam data acquisition software that is used to operate the EM302.

   Outcome: Completed. This work was done underway during the first day of the cruise.

3. Conduct POS MV GAMS calibration prior to the multibeam patch test.
   a. Create SOP. The GAMS calibration should be performed when there is good GPS satellite geometry and the vessel is underway where unrestricted maneuvering is possible. During the calibration the vessel performs a series of 'Figure 8' or 'S-turn' maneuvers. Applanix GAMS calibration instructions are provided in Appendix E.

   Outcome: Not completed. The secondary POS MV antenna failed during the cruise and a GAMS calibration was therefore not possible. A loose termination connection on the antenna was later determined to be the cause of the problem. Heading accuracy was between 0.5-1 degrees for most of the cruise, considerably less than the 0.1 degree accuracy typically obtained.

4. Conduct multibeam patch test at Veatch Canyon.

   Outcome: Completed. It was determined that no additional angular offsets were needed.

5. Conduct EK 60 calibration between Narragansett Bay and Veatch Canyon, exact location TBD dependent on water depth, traffic, and prevailing current conditions.

   Outcome: Completed. The calibration was completed in the vicinity of Veatch Canyon following the completion of the patch test. There were problems with interference from a large fish that was attracted to the calibration sphere, so the ship moved several miles to complete the process.

6. Shakedown items to test:
   a. Changes to POS MV hardware and update SOP.
   b. New XBT rack unit and update SOP.
   c. POS MV firmware update and update SOP.
   d. New version of Hypack installed on "PLANNING" computer and update relevant SOPs.

   Outcome: Completed. The POS MV firmware update had not been done by the ship so objectives a. and c. were not applicable.

7. Telepresence Objectives

   a. Evaluate functionality of recording and communication equipment relevant to Telepresence.
   b. Work with NOC to ensure ship routers are properly configured to support Telepresence.
   c. Work with MTN to evaluate repairs to VSAT and follow up on any VSAT issues identified doing the 2-day VSAT shakedown that will occur prior to EX-14-04 L1.
   d. Further refine workflow in partnership with Data Management team.

   Outcome: Completed. Testing of the RTS and EVS systems returned satisfactory results. Ships routers functioned properly in moving data and communication streams to their intended destinations. VSAT functionality was back to 2013 levels, and worked reasonably well given weather and sea-state. The new SAN was integrated and disk burn-in was initiated.

8. Data Management Objectives
   a. Continue acquisition and shore-side push of mapping data and products.
   b. Confirm data consolidation procedures / automation is still functional following dockside maintenance / updates.
   c. Continue development of automated full cruise data backup processes.
   d. Field test / integration of Mac Warehouse systems.

   Outcome: Completed.

9. Assess SVP Server status. This software program improves EX capability for water column sound speed characterization needed for the EM302 multibeam sonar.

   Outcome: The SVP Server was not used during this cruise, as there was not enough time to work on it given other operational challenges.

10. Collect deep water multibeam sonar data (MBES)
   a. Conduct 24-hr mapping operations for the duration of the cruise.
   b. Collect bathymetric, seafloor backscatter, and water column backscatter data.

   Outcome: Completed.

11. Collect ancillary sonar data
   a. EK60 split-beam sonar (24 hours/day).
   b. Knudson sub-bottom profiler (up to 24 hours/day, at a minimum from 0800-2000).The final decision to operate and collect sub-bottom profiler data will be at the discretion of the Commanding Officer.

   Outcome: Completed.

12. Perform baseline characterization mapping (multibeam, split-beam, sub-bottom) of New England Seamount chain in preparation for EX-14-04-Leg 3.

   Outcome: Completed. Mapping work was completed over five and half seamounts that lacked full coverage high resolution multibeam data.

13. During transit to and from seamounts working grounds, conduct exploration mapping, possibly to include:
    a. focused mapping at certain seamounts with existing ECS data
    b. transit mapping over poor data quality areas in existing ECS data or gaps in data from EX-13-03.

    Outcome: Completed.

14. XBT and CTD operations
    a. XBT casts will be collected at regular intervals of no more than 3-4 hours to ensure accurate sound velocity profiles for operating the MBES. These casts will be conducted by the mapping watches.
    b. A deep water CTD cast is planned to be done during the EM302 patch test for comparison of sound speed profile results with XBT casts. The CTD should be conducted prior to surveying the patch test lines in order to get as accurate a sound velocity profile of the water column as possible. Additional CTD casts are not planned for this cruise, but the equipment should be ready depending on science input.

    Outcome: Completed.

15. Conduct training of seven (7) mapping interns in all mapping data collection operations, including sonars and sound velocity profiling sensors and processing procedures (continuous throughout cruise).

    Outcome: Completed.

16. Collect standard full suite of SCS data. All SCS data will be sent to NCDDC and will be used in real-time by NCDDC throughout the cruise.

    Outcome: Completed.

17. Collect sun photometer measurements as part of ongoing survey-of-opportunity. Details of this objective provided in Appendix D.

    Outcome: Completed.

4. Participating Personnel

NAME	ROLE	AFFILIATION
CDR Ricardo Ramos	Commanding Officer	NOAA Corps
LT Emily Rose	Field Operations Officer	NOAA Corps
Derek Sowers	Expedition Coordinator / Mapping Team Lead	NOAA OER / ERT Inc.
Elizabeth Lobecker*	Mapping Team Lead	NOAA OER / ERT Inc.
Erin Weller	Mapping Watch Leader	NOAA AHB

Kalina Grabb	Mapping Watch Leader	NOAA OER/UCAR
Jacklyn James	Mapping Watch Leader	NOAA OMAO
Andrew Augustyn	Mapping Watch Stander	NOAA OER / UCAR
Timothy Hodson	Mapping Watch Stander	NOAA OER / UCAR
Lydia Auner	Mapping Watch Stander	NOAA Hollings Scholar
Meghan Rose Jones	Mapping Watch Stander	NOAA OER / UCAR
David Barbee*	Kongsberg Engineer	Kongsberg
Jared Harris*	Kongsberg Engineer	Kongsberg
Rachel Husted	Mapping Watch Stander	MD Sea Grant
Jared Drewniak*	Telepresence	NOAA OER (ERT, Inc)
Brendan Reser*	Data Management	NOAA OER (General Dynamics, Info Tech.)
Rebekah Rodriguez	Mapping Watch Stander	NOAA OER/UCAR

*Science personnel Lobecker, Barbee, Harris, Drewniak, and Reser participated only in the first several days of the expedition (the shakedown) and were transferred to shore via small boat in Jamestown, RI.

5. Summary of Major Findings

The first several days of the cruise were spent in the vicinity of Veatch Canyon conducting the EM 302 multibeam sonar patch test and EK 60 sonar calibration. After dropping off five members of the science party back in RI, the rest of the expedition days at sea were spent in transit and survey operations in the New England Seamount Chain in international waters. The cruise track line is shown in Figure 1.

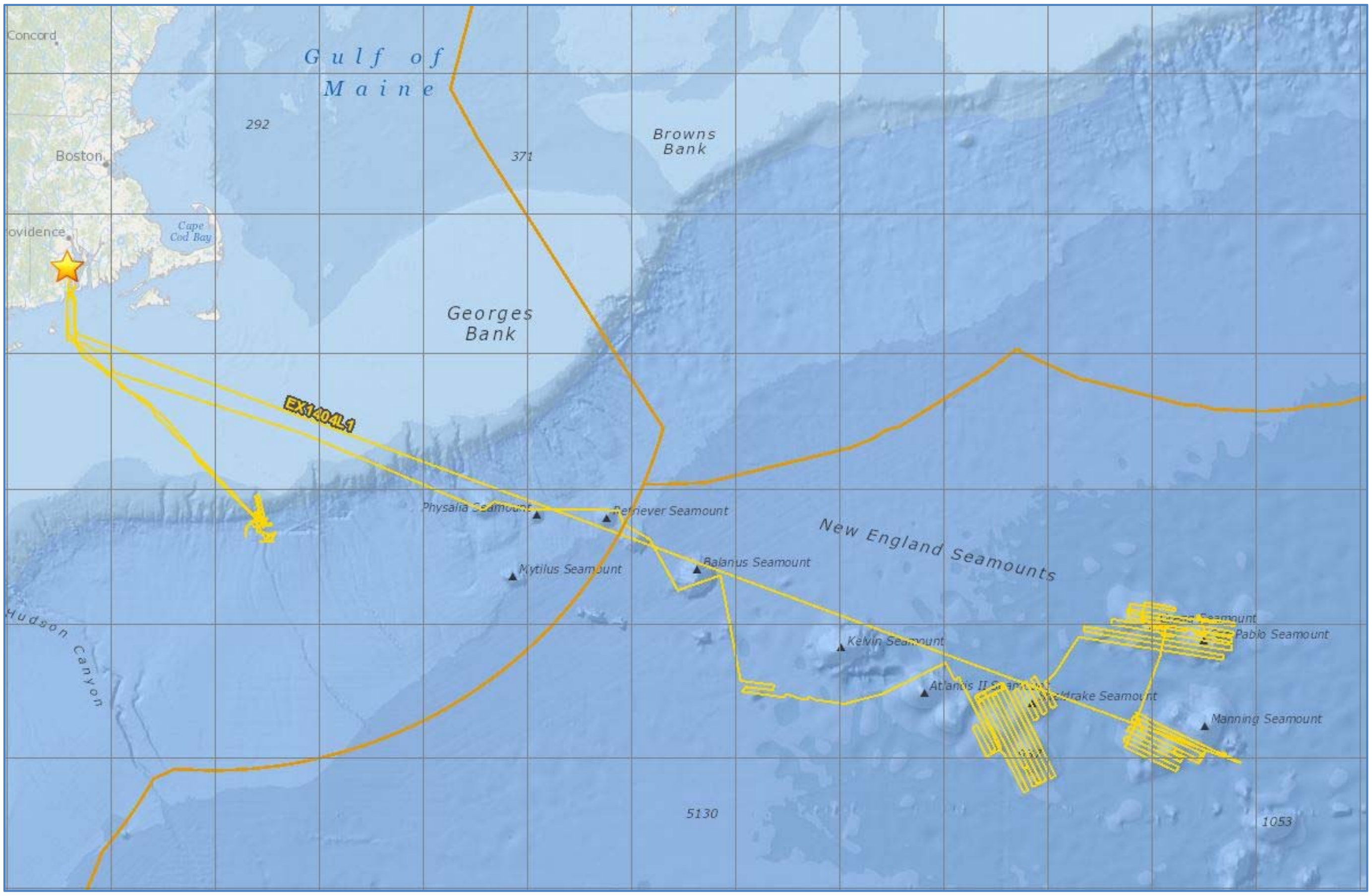


Figure 1. Cruise track for EX-14-04 Leg 1 shown in yellow. Orange lines represent world EEZ boundaries. Map created using NOAA *Okeanos Explorer* Atlas.

The summary cruise map for the expedition is shown in Figure 2. Locations of expendable bathythermograph deployments to obtain water column sound velocity profiles are shown with red boxes. Previous multibeam coverage of the seafloor obtained by the Okeanos Explorer is shown in grey, while multibeam coverage obtained during EX-14-04-L1 is shown with a color-coded bathymetry color ramp.

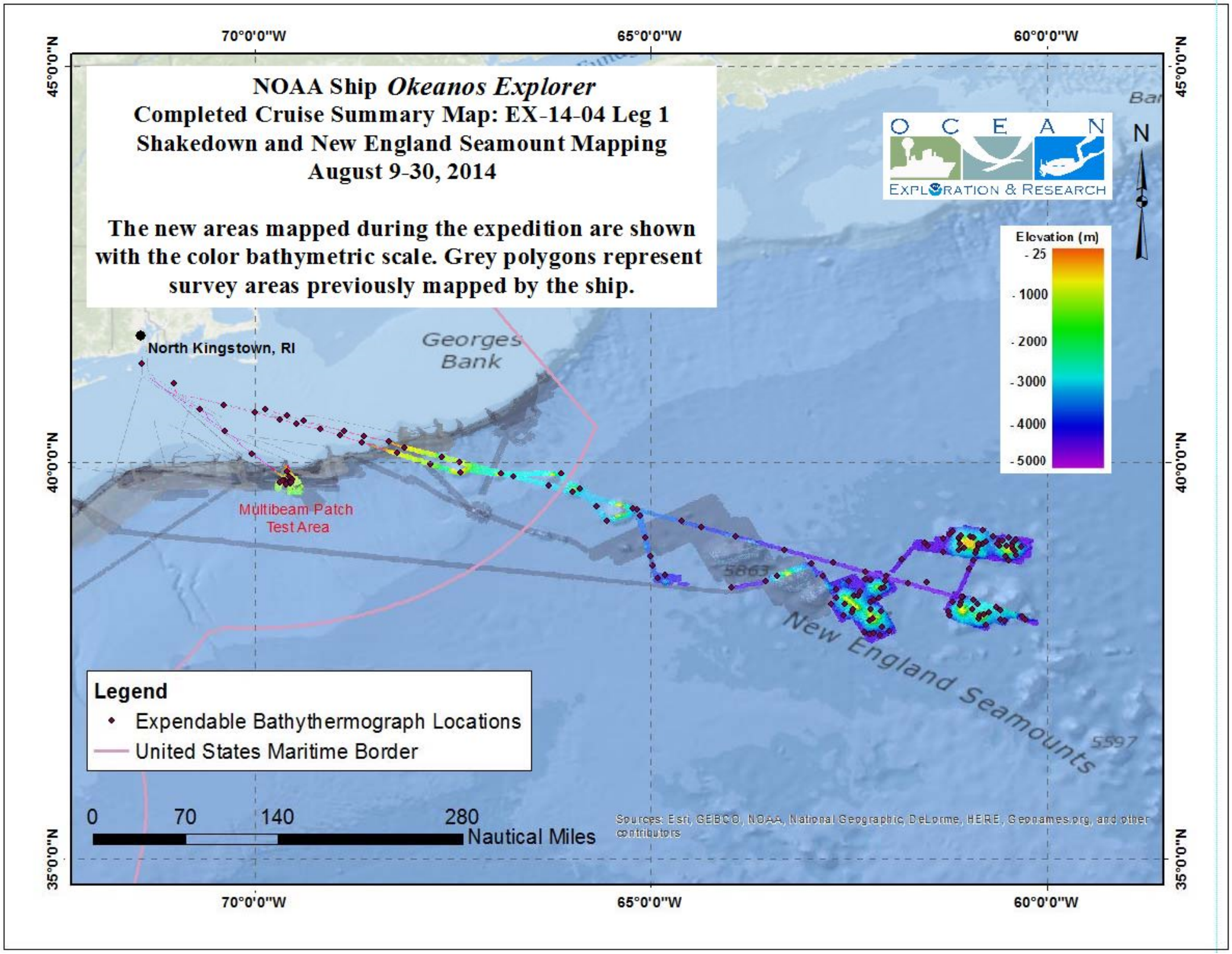


Figure 2.Cruise map made in ArcMap 10.1 showing overall cruise track and key operational areas.

While supplementary transit mapping data were collected over Bear, Physalia, Retriever, Picket, Balanus, Panulirus, and Atlantis II seamounts, the primary survey grounds for this expedition focused on Gosnold, Sheldrake, Gregg, San Pablo, and Manning Seamounts. A sampling of seafloor bathymetry data from these seamounts are highlighted in the figures below. As the focus area for the multibeam path test, Veatch Canyon is also highlighted.

Features of Interest

Veatch Canyon has been used for several years by the *Okeanos Explorer* as multibeam patch test site (Figure 3). Over time, conducting the annual patch test here will collect time series data over the smaller, potentially geologically significant channel that runs down the canyon's thalweg.

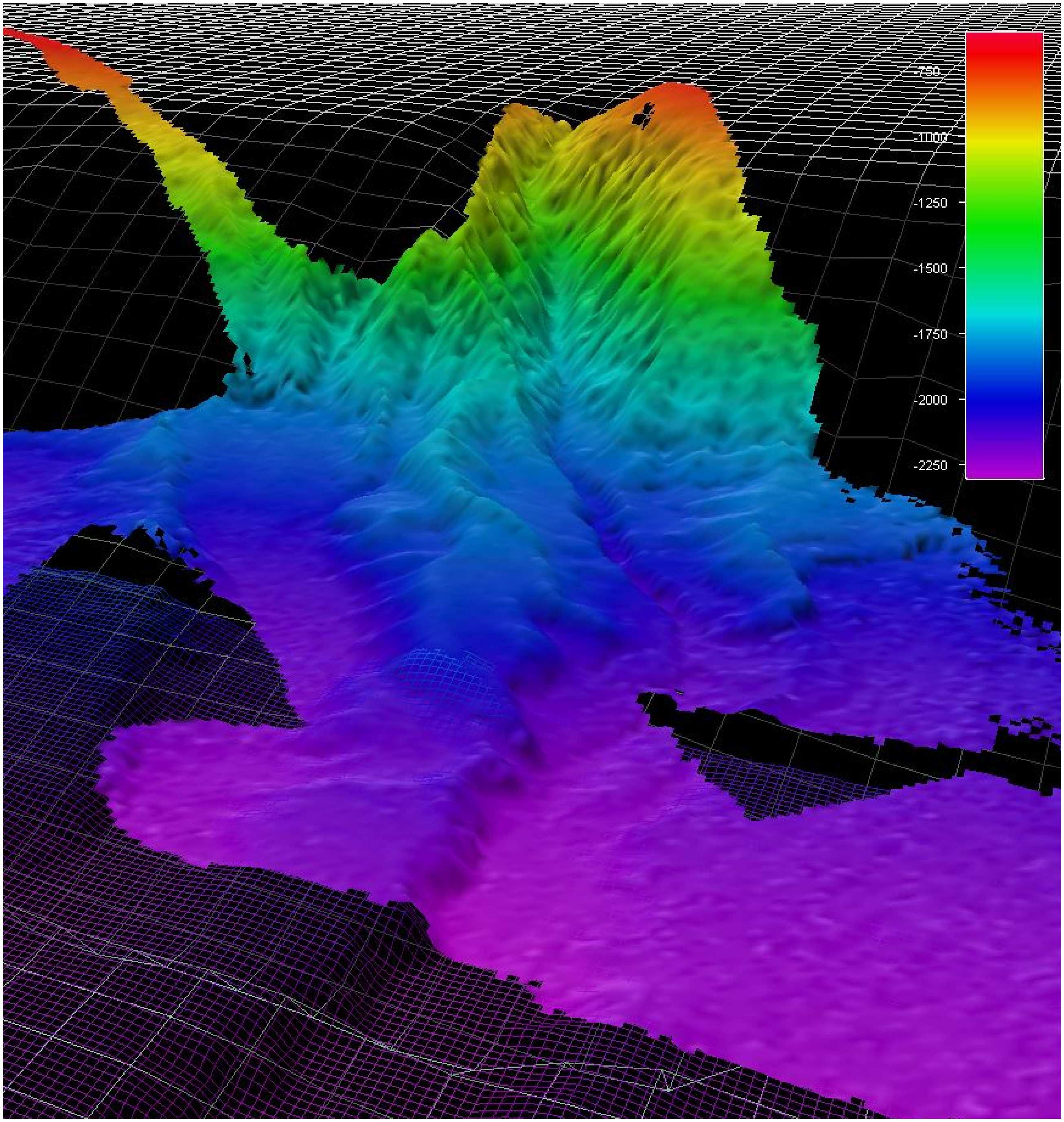


Figure 3. Veatch Canyon patch test site. EM 302 multibeam data gridded to 50 meters in Fledermaus v7.3.6a. Background data: Sandwell and Smith, NOAA OER / UNH Law of the Sea Project. Wireframe data is older data, color coded bathymetry was collected on this cruise.

Seamounts in Primary Survey Area

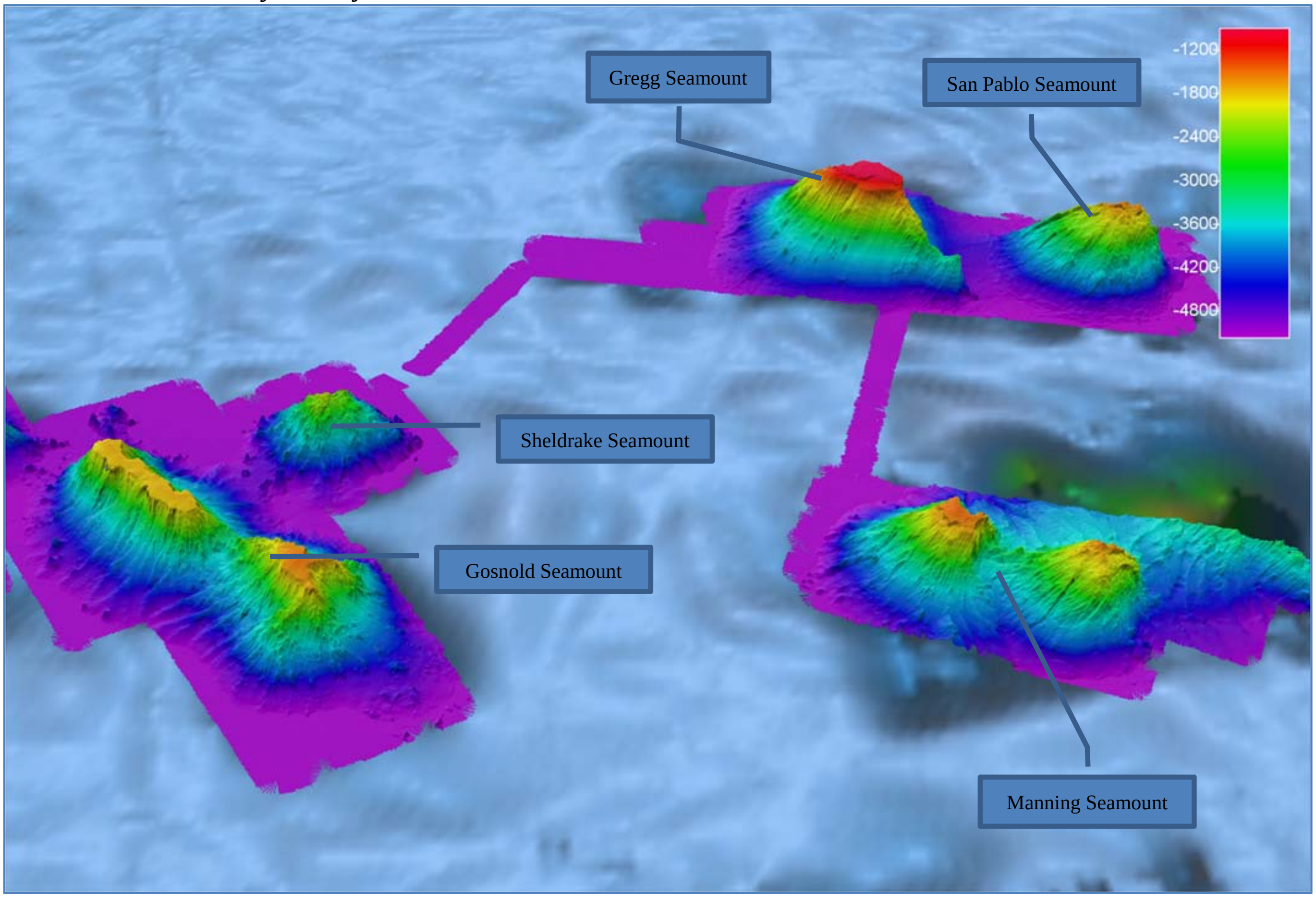


Figure 4. Primary survey area of EX-14-04 L1, showing Gosnold, Sheldrake, Gregg, San Pablo, and Manning Seamount color-coded bathymetry. EM 302 multibeam data gridded to 50 meters in Fledermaus v7.3.6a. Vertical exaggeration 6x, depth in meters. Background bathymetry data (offset to highlight new data): Sandwell and Smith.

Table 1. Summary characterization of the seamount features within the primary survey area.

Seamount Name	Approximate Least Depth Below Sea Level (meters)	Flat Topped? (Guyot Feature)	Height of Seamount (vertical relief from seafloor using 5000 m as surrounding seafloor reference depth)	
			Meters	Feet
Gosnold	1,640	Yes	3,360	11,024
Sheldrake	2,141	No	2,859	9,380
Gregg	901	Yes	4,099	13,448
San Pablo	1,360	No	3,640	11,942
Manning (partially mapped)	1,366	Yes and No	3,634	11,923

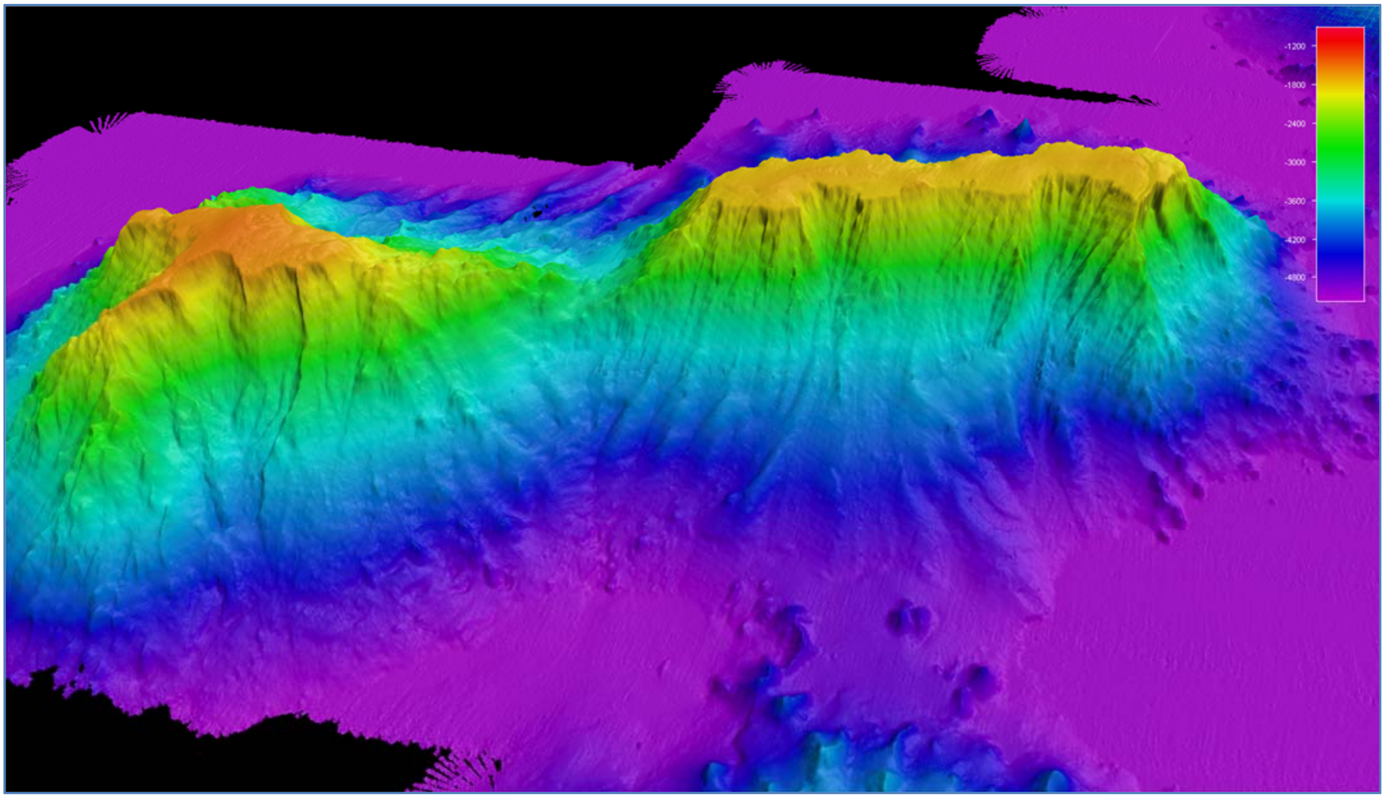


Figure 5. Oblique view of Gosnold Seamount showing color-coded bathymetry. EM 302 multibeam data gridded to 50 meters in Fledermaus v7.3.6a. Vertical exaggeration 3x, depth in meters.

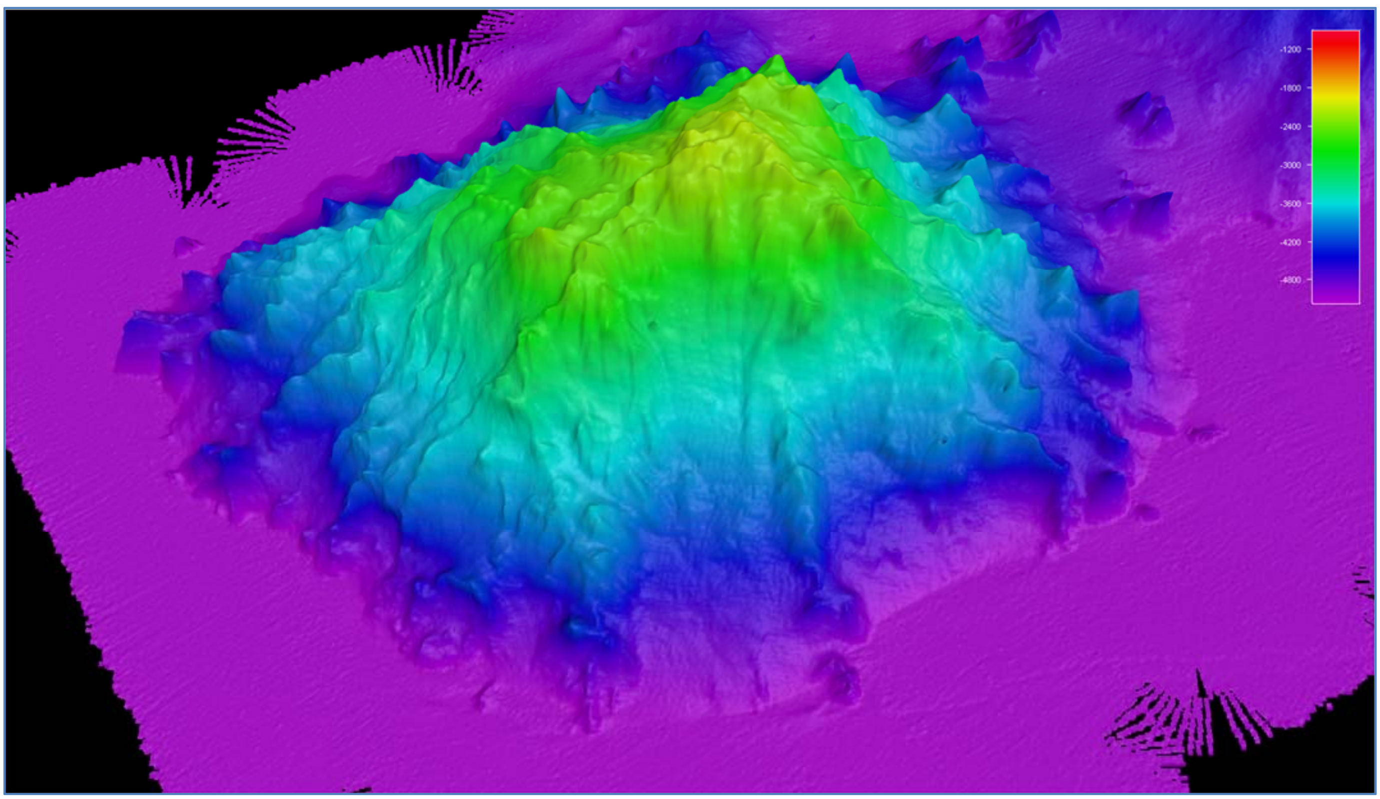


Figure 6. Oblique view of Sheldrake Seamount showing color-coded bathymetry. EM 302 multibeam data gridded to 50 meters in Fledermaus v7.3.6a. Vertical exaggeration 5x, depth in meters.

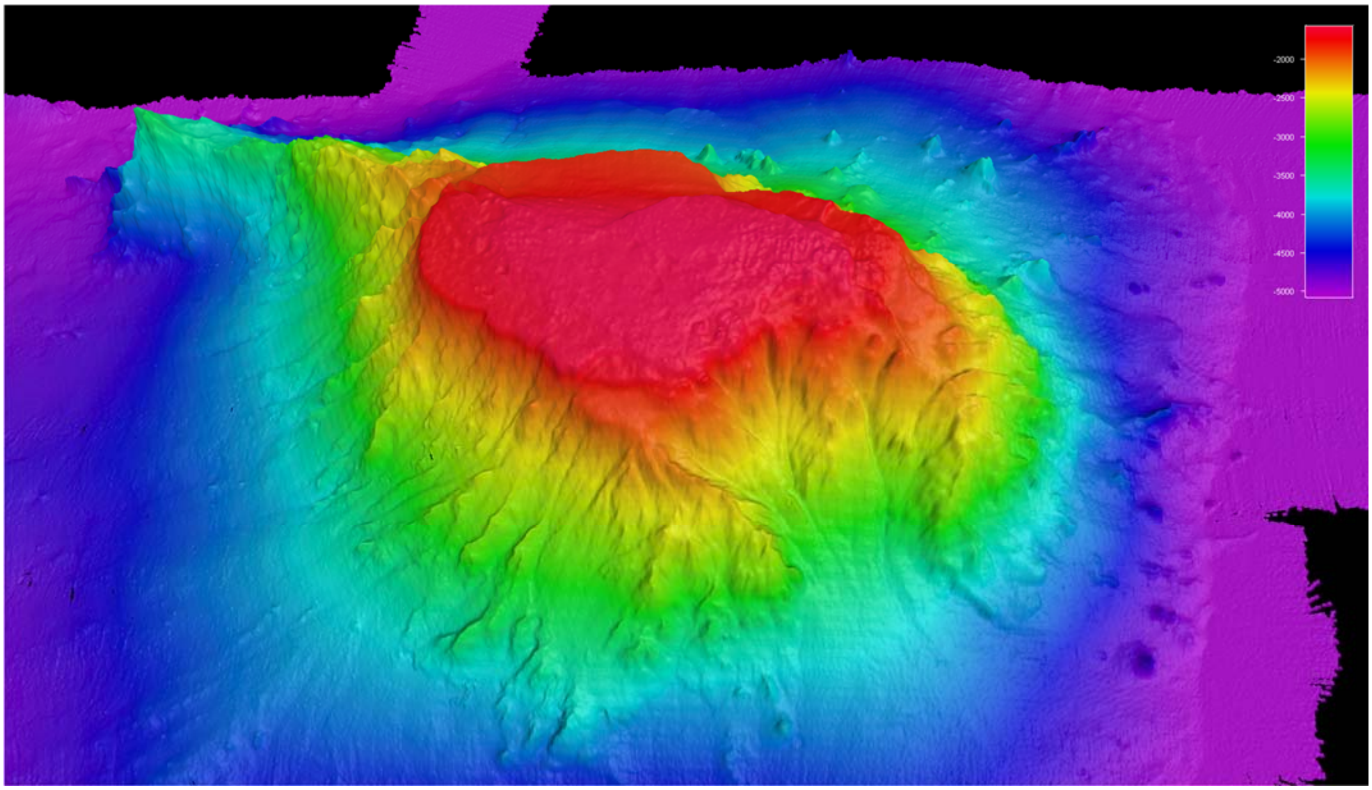


Figure 7. Oblique view of Gregg Seamount showing color-coded bathymetry. EM 302 multibeam data gridded to 50 meters in Fledermaus v7.3.6a. Vertical exaggeration 5x, depth in meters. This seamount rises approximately 4,099 meters (13,448 ft) from the seafloor to its summit, and was the tallest seamount mapped during the expedition. It also had the shallowest summit, 901 m below sea level.

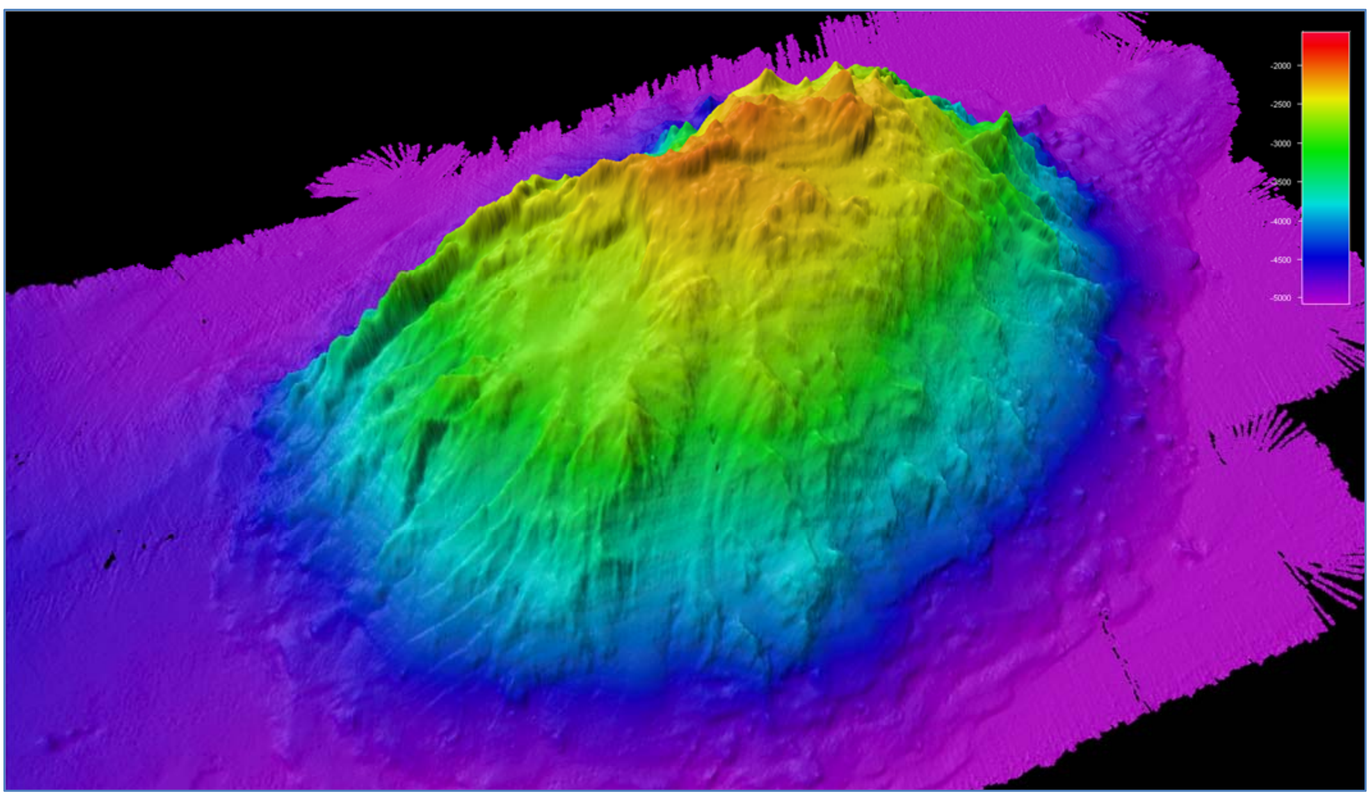


Figure 8. Oblique view of San Pablo Seamount showing color-coded bathymetry. EM 302 multibeam data gridded to 50 meters in Fledermaus v7.3.6a. Vertical exaggeration 5x, depth in meters.

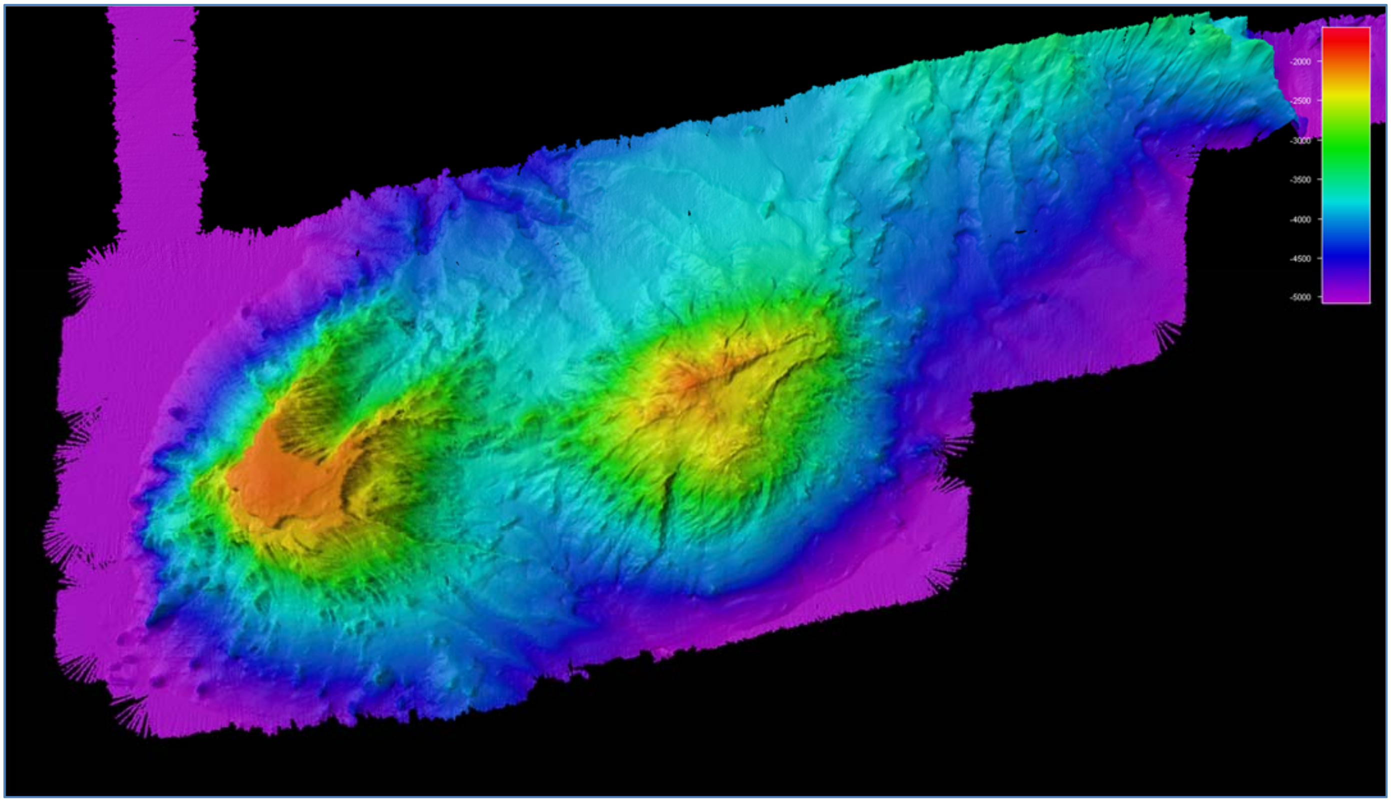


Figure 9. Oblique View of Manning Seamount showing color-coded bathymetry. EM 302 multibeam data gridded to 50 meters in Fledermaus v7.3.6a. Vertical exaggeration 5x, depth in meters.

Potential Discovery Feature

A feature was potentially discovered during exploratory surveying of Gosnold Seamount within the New England Seamount Chain. The feature is located approximately 390 nautical miles offshore from Cape Cod and lies just to the north of Gosnold Seamount. The feature has many small pinnacles instead of one distinct peak. The feature's maximum height above the surrounding seafloor is approximately 815 meters, so it does not meet the typical definition of a seamount (>1,000 meters relief from the seafloor). The depth at the top of the seamount is 4,240 meters below the sea surface. The feature has complex topography with highly variable slopes. The steepest slopes on the feature are 43 degrees. The feature is not found at all on Sandwell and Smith satellite-derived bathymetry, however there is a small apparently un-named bump shown at this location in Google Earth's ocean bathymetry layer.

The potential discovery was mapped during systematic surveying of Gosnold Seamount. The survey lines on the north end of Gosnold hinted at the foothills of a separate feature, so survey lines were extended northward to see what was there. The potential discovery was found using the Kongsberg EM 302 multibeam sonar. The data were processed in CARIS HIPS 7.1.2 and brought into Fledermaus 7.4.1 for visualization and measurements.

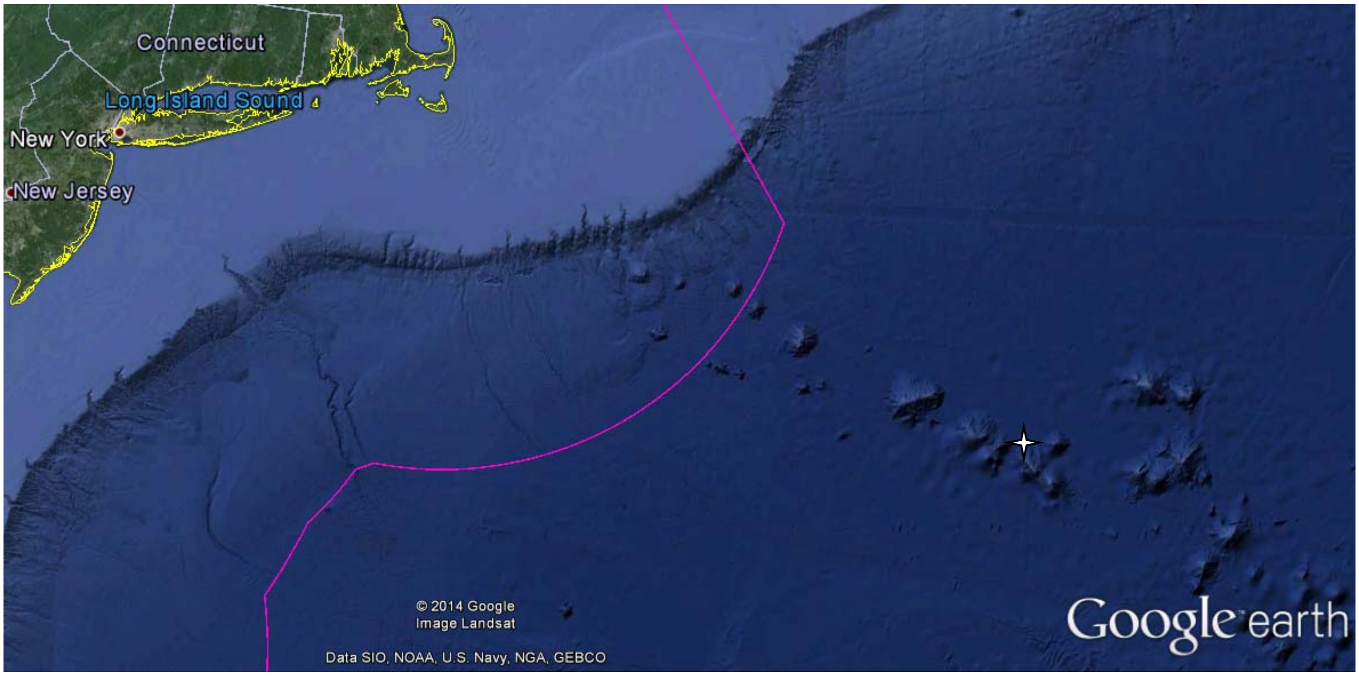


Figure 10. Location map of the feature, as indicated by star symbol. United States EEZ boundary shown by pink line. Image created in Google Earth.

Existing data available onboard for potential discovery investigation was limited to Sandwell and Smith global bathymetry. The Sandwell and Smith data provides no indication of the feature (See Figure 11). It is possible that previous research cruises may have mapped at least part of this feature.

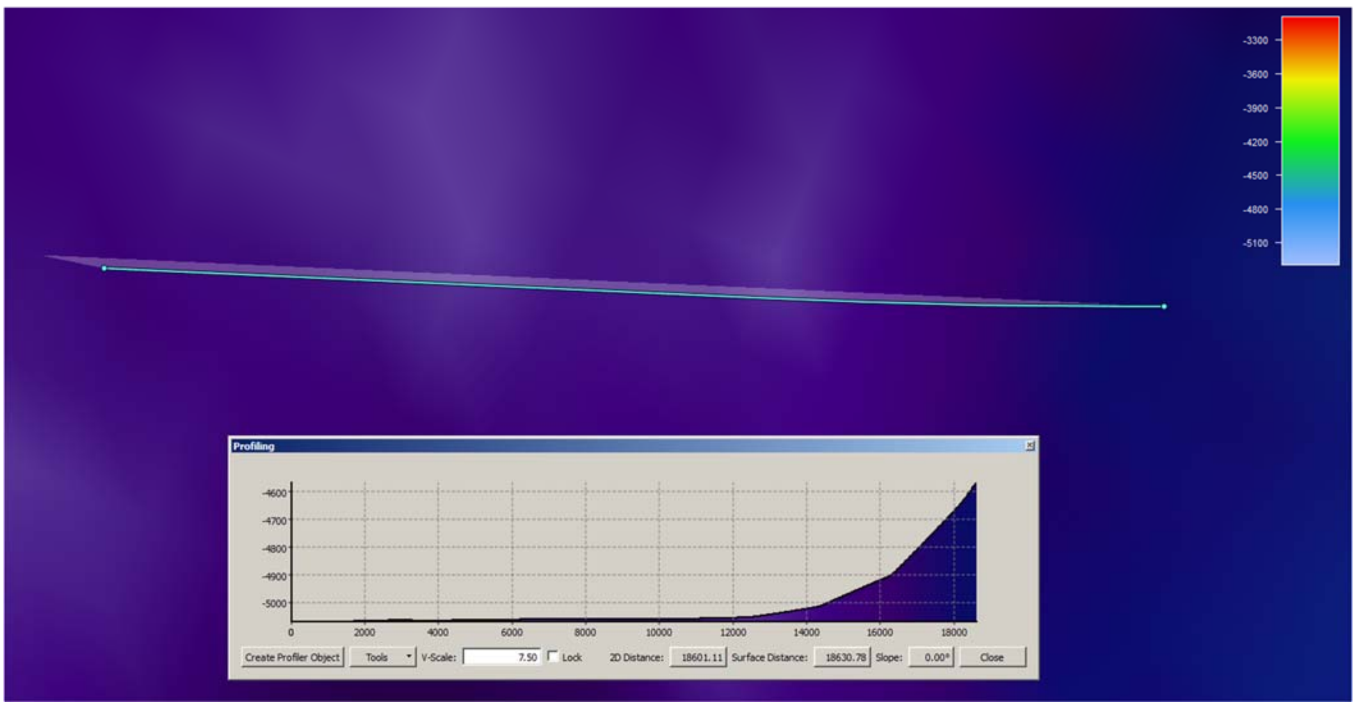


Figure 11. Plan view looking north of Sandwell and Smith satellite-derived data indicating a flat seafloor until the sharp rise of Gosnold Seamount on the right. Profile drawn west to east (left to right) with depths shown in meters. Image created in Fledermaus v7.4.1 Image credit: NOAA.

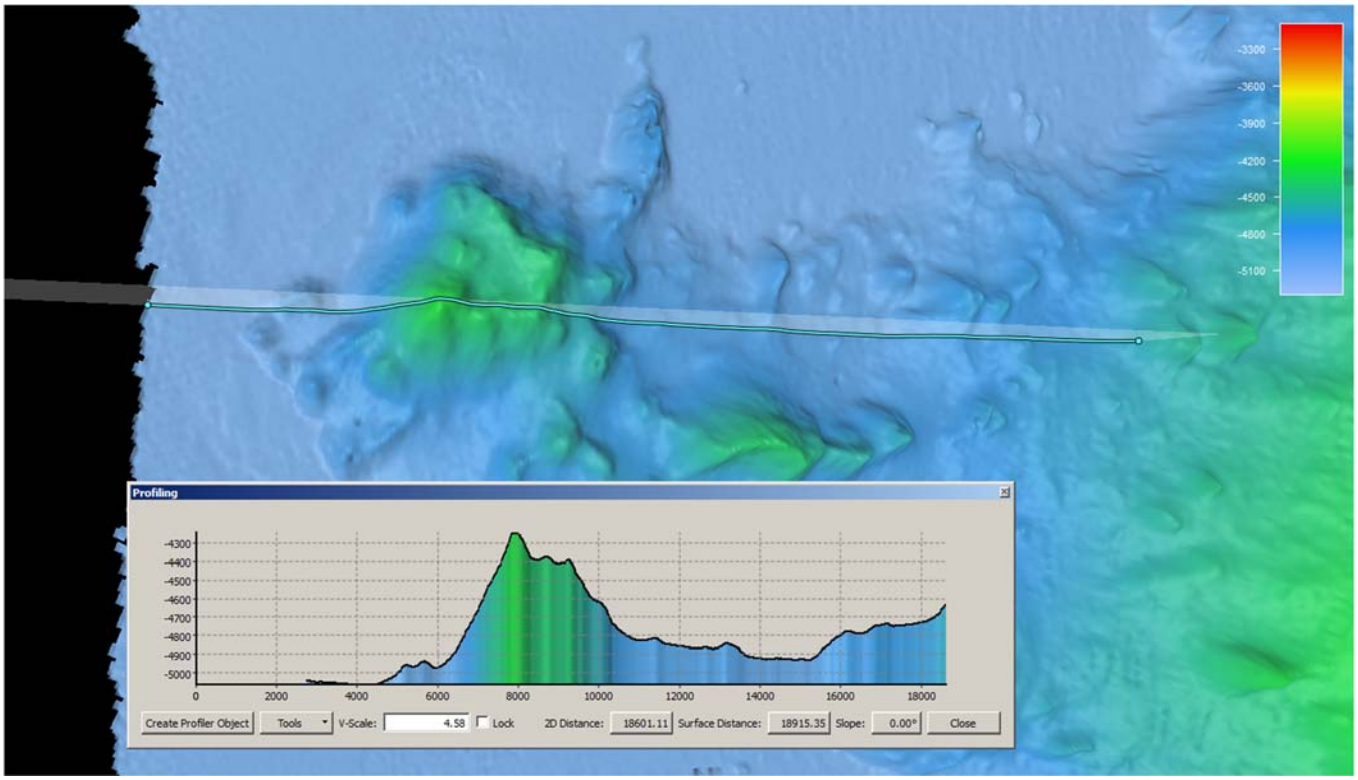


Figure 12. Plan view looking north of color coded bathymetry data collected by the EM 302 multibeam sonar on EX1404 Leg 1 showing a significant seamount feature. Profile shown is the same as in Figure 11, but shows a seamount with 815 m vertical relief from the surrounding seafloor. Image created in Fledermaus v7.4.1 Image credit: NOAA.

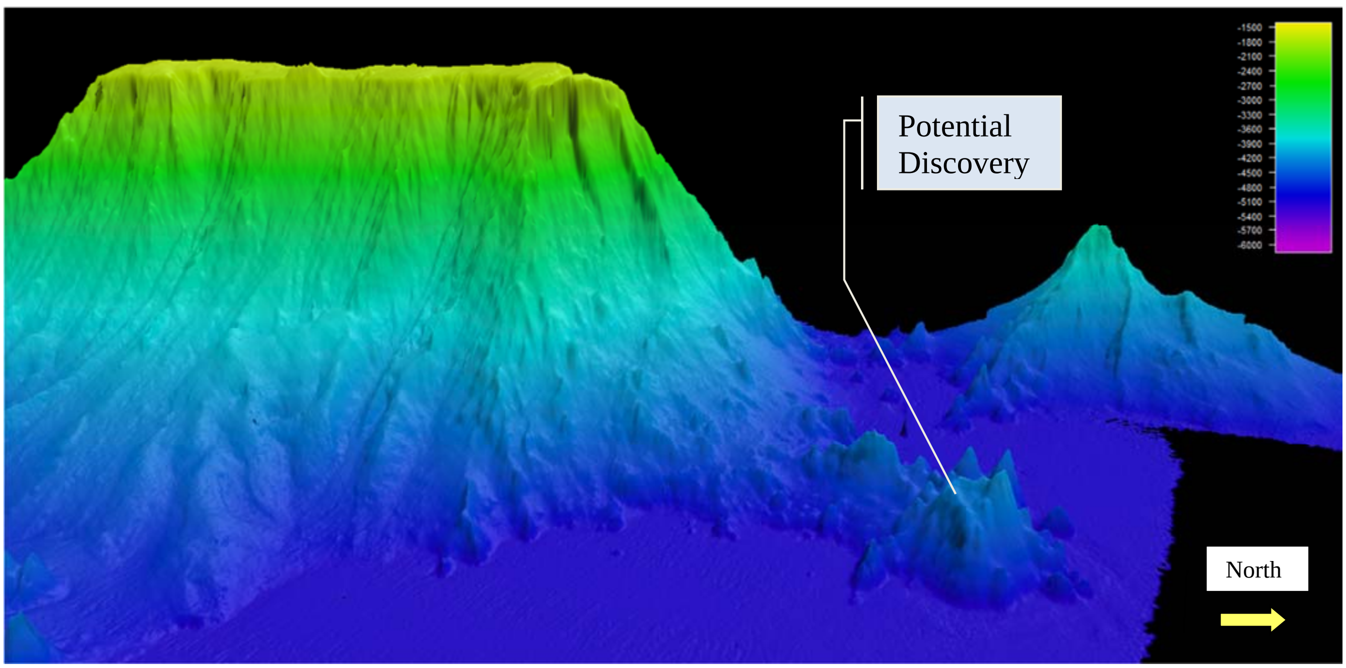


Figure 13. Three-dimensional oblique view of EM302 data showing the feature to the north of the looming Gosnold Seamount. Depths shown in meters, vertical exaggeration 5x. Image created in Fledermaus v7. Image credit: NOAA.

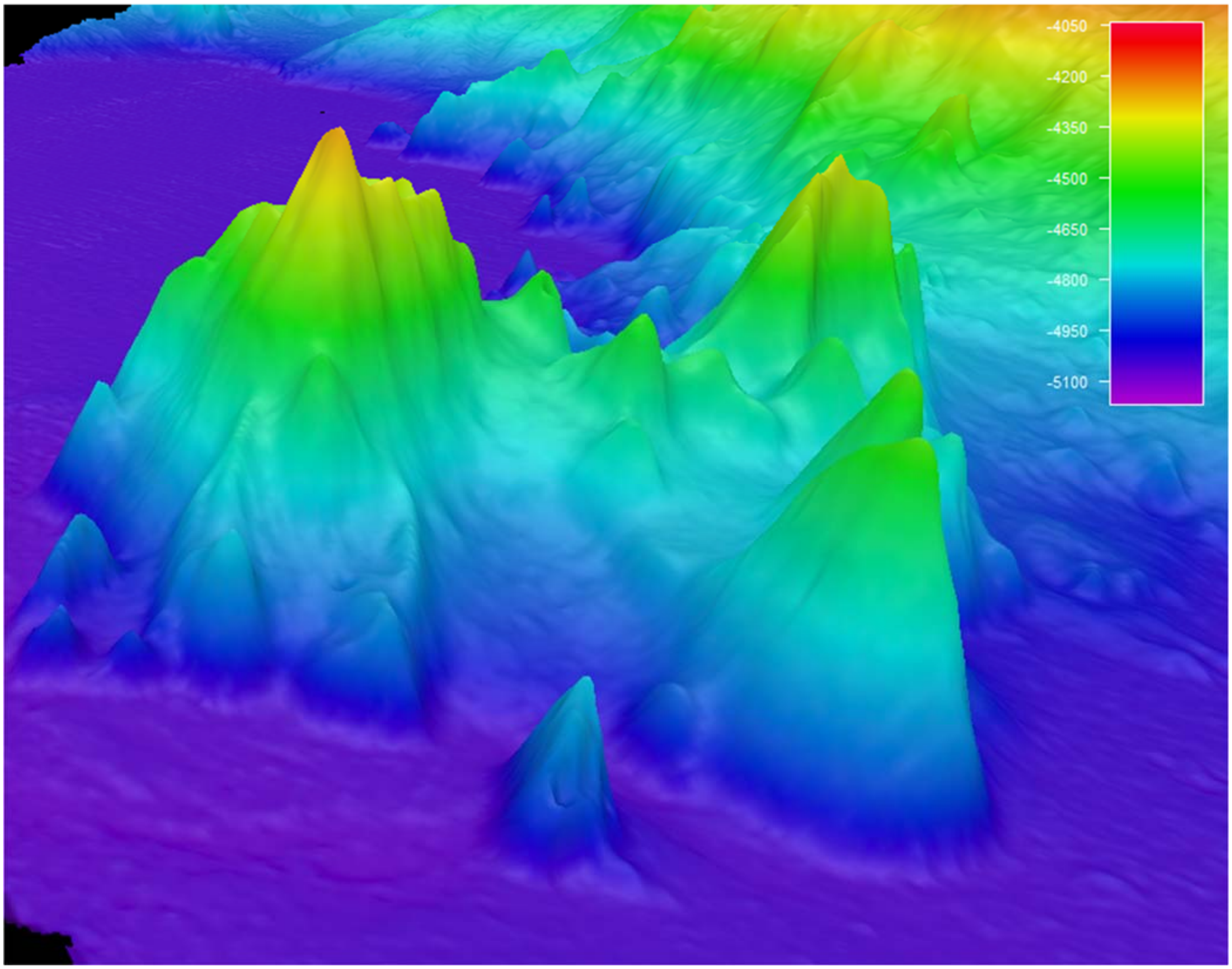


Figure 14. Close up oblique view of EM302 data showing the feature's numerous pinnacles and steep slopes. Depths shown in meters, vertical exaggeration 5x. Image created in Fledermaus v7. Image credit: NOAA.

Based on multibeam survey ship track lines publicly available on the National Geophysical Data Center's online multibeam data viewer, it appears that a 2003 expedition of the Atlantis may have previously collected Seabeam 2112 data over this feature.

6. Mapping Statistics

Dates	Aug 9-Aug 30th, 2014
Days lost to weather	4.5 days
Total mapping days	17.5 days
Total non-mapping days	4.5 days
Line kilometers of survey	5,564 km
Square kilometers mapped	21,283 km^2
Number / Data Volume of EM 302 raw bathymetric / bottom backscatter multibeam files	352 files / 35.4 GB
Number / Data Volume of EM 302 water column multibeam files	352 files / 109 GB

Number / Data Volume of EK 60 water column singlebeam files	894 files / 13.3 GB
Number / Data Volume of subbottom sonar files	911 files / 4.39 GB
Number of XBT casts	157
Number of CTD casts (including test casts)	2
Beginning draft	Forward: 15' 6"; Aft: 13'11”
Ending draft	Forward: 15' 4"; Aft: 13'2"
Average ship speed for survey	7.9 kts

7. Mapping Sonar Setup

The NOAA Ship *Okeanos Explorer* is equipped with a 30 kHz Kongsberg EM 302 multibeam sonar capable of mapping the seafloor in 0 to 8000 meters of water. The system generates a 150° beam fan containing up to 432 soundings per ping in waters deeper than 3000 meters. In waters less than 3000 meters, the system is operated in dual swath mode, and obtains up to 864 soundings per ping, by generating two swaths per ping cycle. Appendix D contains a detailed description of sonar system functionality and technical specifications, including acrosstrack and alongtrack data resolutions.

The ship is also equipped with a Kongsberg EK 60 singlebeam fisheries sonar. The transducer operates at 18 kHz and transmits a 7° beam fan.

Additionally the ship is equipped with a Knudsen 3260 subbottom profiler. The transducers produce a 3.5 kHz chirp signal.

8. Data Acquisition Summary

EX-14-04 Leg 1 operations included EM 302 multibeam, EK 60 singlebeam, and Knudsen subbottom profile data collection. The schedule of operations during transits and seamount survey operations included continuous 24 hour per day multibeam, singlebeam, and subbottom data collection.

Multibeam data was collected using Kongsberg’s Seafloor Information System (SIS) software to run the EM 302. SIS accounts for all the static offsets and biases during real time acquisition. The motion data from the POS MV 320 (Ver. 4.0.2.0) was directly fed into SIS during data acquisition to account for ship motion (i.e. yaw, heave, roll, pitch). Heading data was provided by the POS MV antennas. After failure of the secondary POS MV antenna heading accuracy was reduced. Vessel position data was obtained using a C-NAV GPS system. Real-time sound speed at the sonar head was determined using a Reson SVP-70 probe located near the multibeam transducer and fed into SIS to aid in beam steering. Expendable bathythermographs (XBTs) were used to collect water column sound velocity profiles every two to three hours to correct multibeam data for changes in sound speed in the water column, and were applied in real time using SIS. Water column backscatter data were collected at all times while the multibeam was logging, and data files were recorded separately by SIS as *.wcd files. CARIS HIPS/SIPS v. 7.1.2 SP 2 was used to edit and quality control the bathymetric data from the EM 302 multibeam. Edited data were exported to ASCII text files and then imported to QPS Fledermaus Ver. 7.3.4c for further processing, visualization, and product generation.

The QPS Fledermaus FMGT (7.4.1a) software package was used for processing EM 302 bottom backscatter data. QPS Fledermaus FMMidwater (7.4.1a) software was used to process watercolumn backscatter data. ‘Fan view’ and ‘Stacked view’ were used in the QPS water column tool to search for water column anomalies with strong acoustic returns. Apart from re-mapping previously discovered seeps in the vicinity of Veatch Canyon, no new seeps were discovered during the cruise.

Background data used for exploration mapping included multibeam data collected by the Extended Continental Shelf project, the Sandwell and Smith satellite altimetry bathymetric data, and bathymetry data from EX-13-03.

Tables listing all sonar files collected and products created during the cruise are provided in the appendices of this report. Tables listing all sound velocity files collected during the cruise are also provided.

9. Sonar Data Quality Assessment and Data Processing

EM 302 Multibeam Bathymetry Data

As part of routine maintenance for the multibeam system, Kongsberg's SIS software was upgraded at the beginning of this expedition (SIS version 3.9.2), and TRU firmware was updated to the latest compatible version. The SIS software upgrade proceeded as planned with support from Kongsberg Field Engineer Jared Harris. A new TRU fan unit was also installed to replace the existing unit with a burned out motor. Upon first initiating the TRU unit for the multibeam there were errors received in connecting with the echosounder. Kongsberg engineers tested TRU boards to troubleshoot problems, with one spare board being swapped for a failed board. Following troubleshooting, all BIST tests passed and data collection on the multibeam proceeded normally.

Patch Test

A multibeam sonar patch test was conducted on August 10 and 11 over Veatch Canyon. This was the second patch test of the 2014 field season, and was conducted because this cruise was the first time the ship had been back to sea after several months of intensive in-port maintenance work. Heading accuracy during the patch test occasionally exceeded the 0.1 degree threshold established within the POSVIEW. It was later determined that these heading issues were the result of interference (and potentially multipath) of a newly installed aft mast light shield occasionally blocking line of sight between the POSMV antennas and satellites near the horizon line. The Kongsberg engineer checked latency and pitch using the calibration tool in SIS, with no new offsets needed. Multibeam patch test data were also analyzed in CARIS software, and no additional offsets were needed for timing, pitch, or roll. A very minor offset adjustment for heading was considered, but given the problems with heading accuracy during the patch test no changes to the existing heading offset was applied to SIS.

Prior to collecting multibeam data for the patch test, sound velocity profiles were collected in the deep portion of the Veatch Canyon patch test area using both the ship's CTD rosette and an XBT in order to compare values. The results showed close agreement in sound velocity profiles (figure 15). This test demonstrates that the use of either instrument would provide sound velocity profiles suitable for applying to the multibeam sonar.

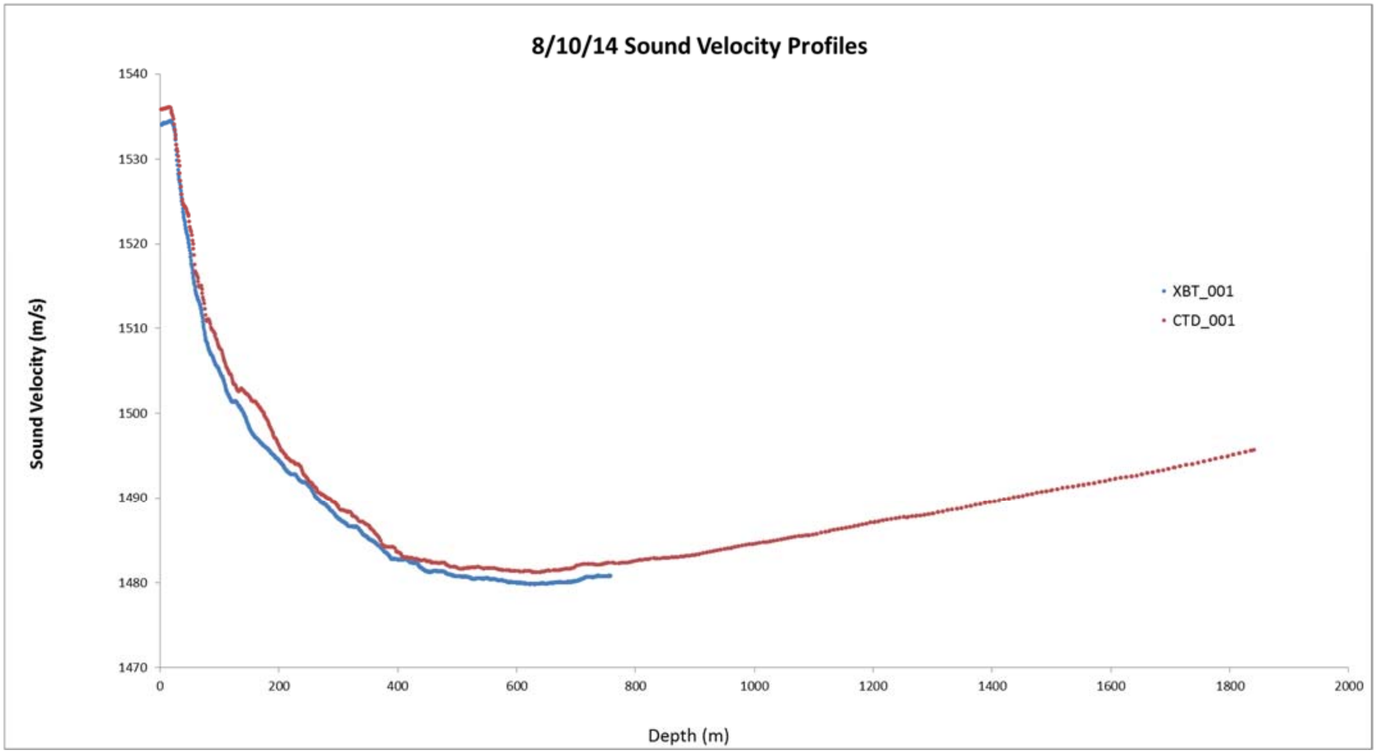


Figure 15. Comparison of sound velocity vs. depth profiles obtained using the ship's CTD rosette (red line) and an XBT (blue line).

Routine Multibeam Data Acquisition

Throughout the cruise, multibeam data quality was monitored in real-time by acquisition watch standers. XBTs were conducted every two to three hours as necessary to maintain data quality. On several occasions the time between XBT casts was longer due to lightning danger. Ship speed was adjusted to maintain data quality as necessary. Line spacing was planned to ensure a minimum of ¼ to ½ overlap between lines at all times. During rough weather, complete overlap of lines was sometimes necessary to compensate for extensive and frequent gaps in seafloor soundings. Cutoff angles in SIS were generally set to 70-75° on both the port and starboard sides.

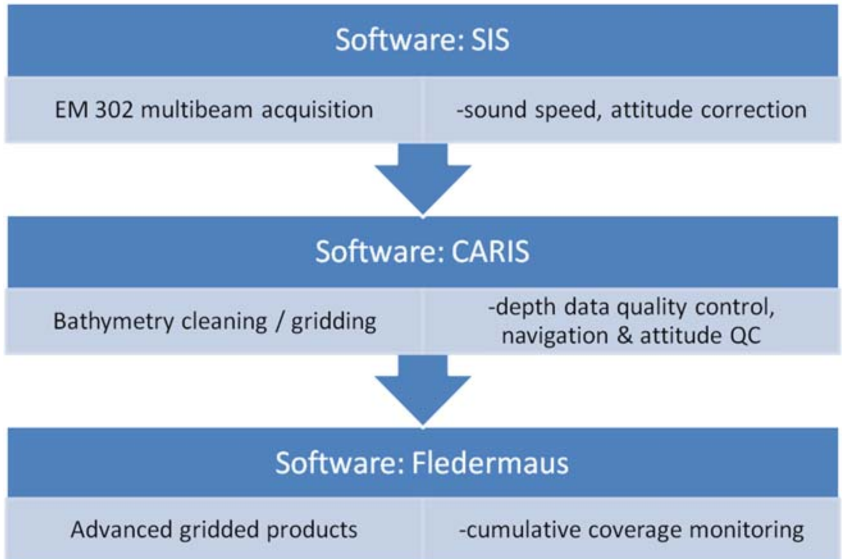


Figure 12. Shipboard multibeam data flow.

Raw multibeam bathymetry data files were acquired by SIS, and were imported into CARIS. In CARIS, attitude and navigation data stored in each file were checked, and erroneous soundings were removed using CARIS Swath Editor and Subset Editor. Once per day, cleaned, gridded bathymetric data were exported to ASCII text files (y,x,z) at 50 meter cell size in WGS84 datum. The ASCII files were then used to create Fledermaus SD objects. These SD objects were then exported to geotiff and Google Earth KMZ files, which were copied to the shoreside FTP on a daily basis for shoreside scientist.

EM 302 Multibeam Water Column Backscatter Data Processing

All water column backscatter data files collected by the EM 302 multibeam sonar were reviewed daily for the presence of water column anomalies (*e.g*. gas seeps) using Fledermaus Midwater. No new water column anomalies were discovered during this cruise.

EM 302 Multibeam Bottom Backscatter Data Processing

All multibeam bottom backscatter data were imported into Fledermaus FMGT, and mosaics were generated.

EM 302 Built In System Tests (BISTs)

Eighteen BIST tests were run during the course of the expedition to troubleshoot and monitor the health of the multibeam. BISTs were run prior to, and following, the SIS software upgrade and TRU board firmware updates. They were also run to troubleshoot individual transmit boards in the TRU in order to identify a failing TX board, test slots, and test the newly installed TX board. Later BISTs showed all systems working properly during survey operations within the primary working grounds in the New England Seamounts. BIST results are provided in the appendices of this report.

EM 302 Multibeam Crossline Analysis

Within CARIS software, fifty meter resolution grid surfaces were generated separately for a mainscheme area and for an orthogonally oriented crossline for comparison. Mainscheme and crossline surfaces were then compared using the “surface differencing” tool in CARIS. The results show a normally distributed result, with the mean difference between the two surfaces being 0.42 m. This result indicates that in survey water depths ranging from 1800-5100 meters, the mainscheme and crossline multibeam tracks surveyed in orthogonal directions at different times obtained seafloor depths that agreed with each other (on average) to within less than half a meter. Figure 17 displays summary statistics and a histogram plot of the differences between the mainscheme and crossline. The minimum/maximum value points were located in regions of the sonar swath that were affected by bubble sweepdown or outer beam detection errors typical for multibeam data collected in rough sea conditions such as those encountered during this expedition. These results provide strong validation of the quality of the multibeam bathymetry data.

<u>The crossline used:</u>
0279_20140824_032421_EX1404L1_MB (189°)

<u>The mainscheme lines used:</u>
0205_20140820_220742_EX1404L1_MB (98°)
0210_20140821_034808_EX1404L1_MB (278°)
0216_20140821_141238_EX1404L1_MB (98°)
0221_20140821_204125_EX1404L1_MB (277°)
0222_20140821_223223_EX1404L1_MB (95°)
0224_20140821_231640_EX1404L1_MB (278°)

	Points Compared	Max Value	Minimum Value	Average Difference	Standard Deviation
Crossline	51,105	123.26 meters	-141.21 meters	0.42 meters	10.04 m

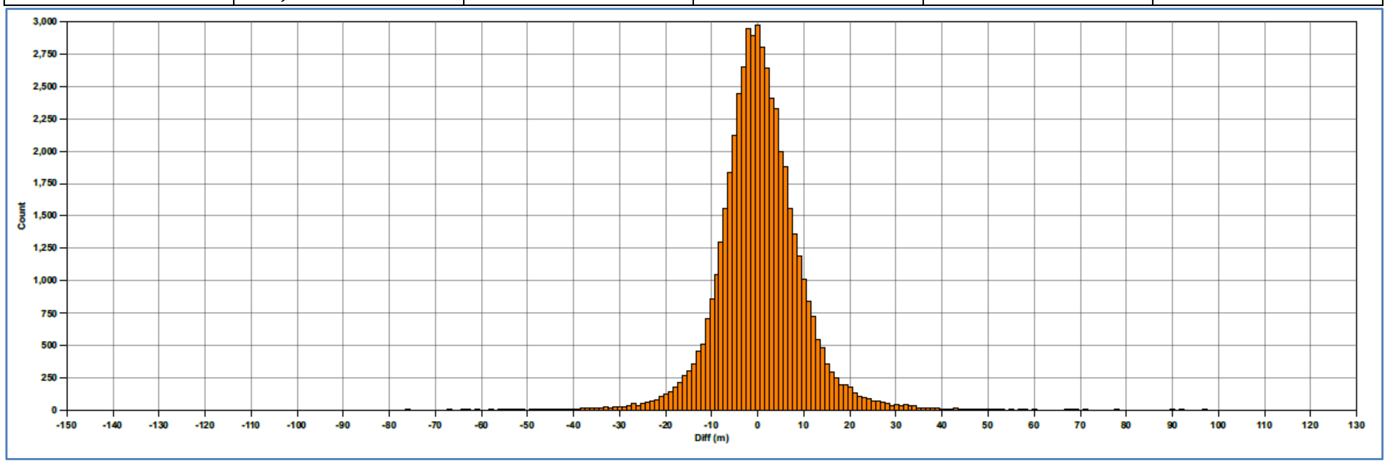


Figure 17. Summary statistics and a histogram plot of the differences between the mainscheme and crossline bathymetric surfaces.

EK 60 Singlebeam Sonar Data

EK 60 data were collected during the majority of the cruise (Figure 18). Data were monitored in real-time for the presence of seeps but were not processed further. The EK60 was off between Balanus Seamount and Sheldrake Seamount during troubleshooting of heading problems and attempted GAMS calibration. Data were collected continuously after that point until scientific sonars were secured for port entry.

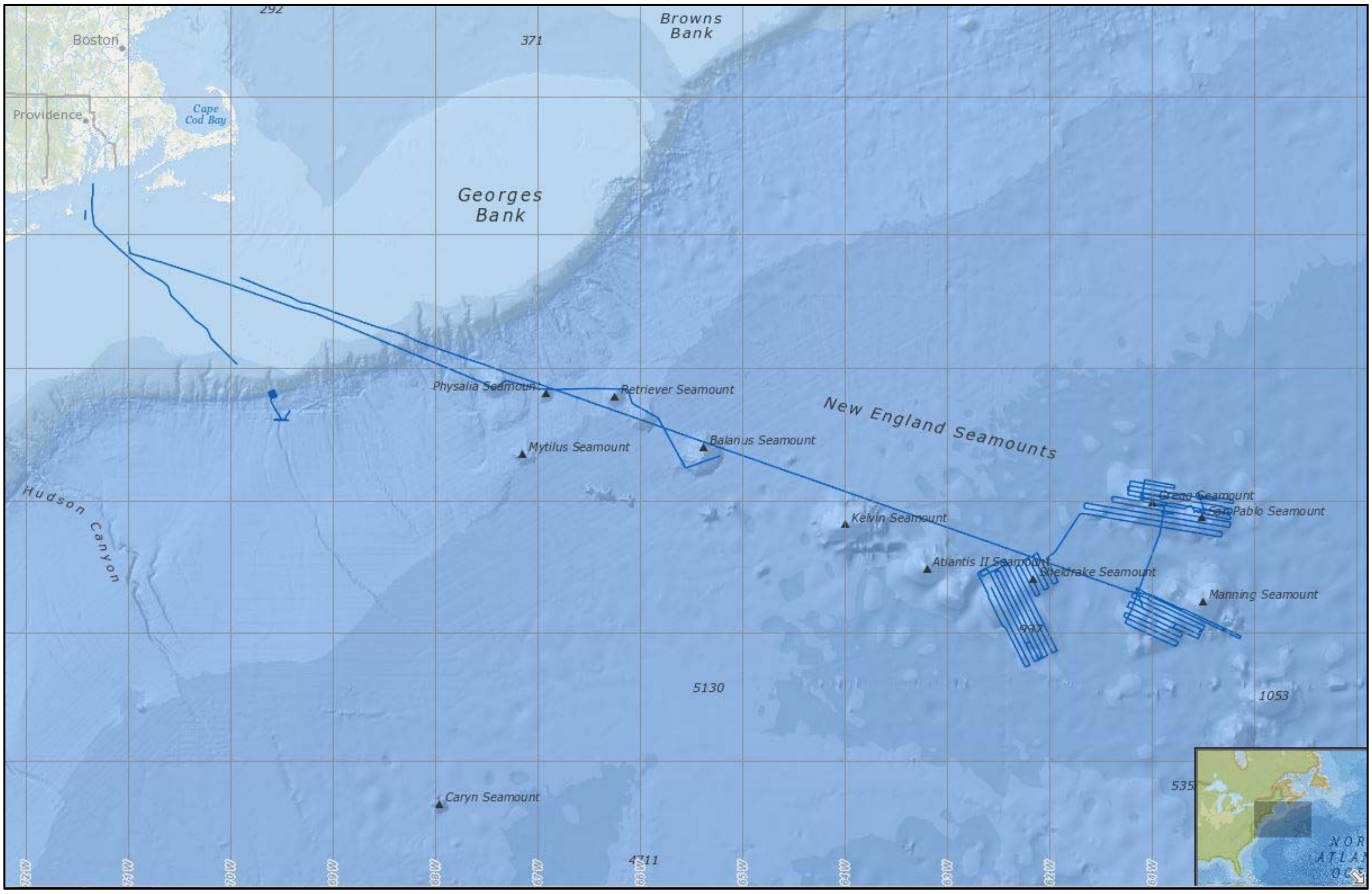


Figure 18. Tracklines of EK 60 singlebeam sonar data collected during EX-14-04 L1. Map Credit: National Geophysical Data Center (2014): Water Column Sonar Data Collection. National Geophysical Data Center, NOAA. doi: 10.7289/V5HT2M7C [accessed 10/22/2015].

Knudsen 3260 Subbottom Profiler Data

Knudsen 3260 subbottom profiler (SBP) data were monitored in real-time for data quality and were run during all survey operations except the multibeam patch test, EK60 calibration, and during heading problem troubleshooting. SBP data were collected 24 hours a day using Knudsen Chirp 3260 v.272 in SGY and KEB file formats. Data was not post-processed on the ship.

10. Telepresence

A 5 mb/s ship-to-shore connection was available throughout the cruise.

The 4-panel multicast feed was transmitted to shore throughout the cruise and was available at http://oceanexplorer.noaa.gov/okeanos/media/exstream/exstream.html.

The Expedition Coordinator did a live interaction with the COSEE Camp and Brian Kennedy on August 15, 2014 from the Control Room. The event was approximately 20 minutes of questions and answers with elementary and middle school students and went smoothly.

11. Data Archival Procedures

All mapping data collected by *Okeanos Explorer* are archived and publically available within 90 days of the end of each cruise via the National Geophysical Data Center's (NGDC) online archives. Data can be accessed via the following websites (last accessed 09/17/12):

- the NGDC Bathymetry Data Viewer at http://maps.ngdc.noaa.gov/viewers/bathymetry/

- the NGDC Multibeam Survey List at http://www.ngdc.noaa.gov/nndc/struts/results?op_0=l&v_0=&op_1=l&v_1=&t=101378&s=300&d=21&d=411&d=79

The complete EX-14-04 L1 *Okeanos Explorer* data management plan is provided in the appendices of this report.

12. Cruise Calendar.

All times listed are in EDT local time. Local ship time was -4 hours from UTC.

August 2014						
Sun	Mon	Tues	Wed	Thur	Fri	Sat
						8/9 Ship departed pier 1 at 0900.Transit to Veatch Canyon to begin patch test.
8/10 Veatch Canyon patch test. POSMV GAMS calibration. Drift test for EK60 Calibration.	8/11 EK60 calibration conducted. Began transit back to shore for personnel transfer.	8/12 Personnel transfer to shore. Weather Day in Jamestown Harbor to wait out the storm.	8/13 Weather day in Jamestown due to off shore 10-14' seas and strong winds. Anchor re-positioned.	8/14 Left Jamestown at 0830 to transit to sea mounts and collecting data when depths were adequate (deep enough).	8/15 Collecting multibeam, sub-bottom, and single beam data. Gap filling in New England Seamounts.	8/16 Full production mapping. Conducted emergency drills. Secondary POS MV ceased functioning.
8/17 Full production mapping day at Gosnold Seamount. POSMV antennas working normally.	8/18 Full production mapping day at Gosnold Seamount. Secondary POS antenna non-operational.	8/19 Work aloft done to inspect and measure the POS MV antennas separation(?). Survey work completed on Gosnold, began Sheldrake.	8/20 Full production mapping day. Completed Sheldrake, and began mapping Gregg Seamount.	8/21 Full production mapping day at Gregg and San Pablo Seamounts.	8/22 Full production mapping day at Gregg and San Pablo Seamounts.	8/23 Full production mapping day. Finished Gregg. Conducted dress out fire drill and watched fire and survival videos in lieu of drills this week.
8/24 Full production mapping day in transit and mapping Manning Seamount.	8/25 Full production mapping day at Manning Seamount.	8/26 Full production mapping day. Ended mapping operations at Manning Seamount at 1100 this morning to begin transit to RI.	8/27 Full production mapping day in transit to RI. Post cruise meeting completed.	8/28 Arrived in North Kingstown, RI at 1500. Returned from working grounds early due to Hurricane Cristobal's projected path to working grounds.	8/29 Weather day due to Hurricane Cristobal. Moored to Pier 1, North Kingstown, RI. EX 1 and 2 aboard, receiving all services from shore.	8/30 Weather day due to Hurricane Cristobal. Moored to Pier 1, North Kingstown, RI. Project staging day, ROVs loaded onboard.

13. Daily Cruise Log

All times listed are local ship time, which was -4 hours from UTC.

August 9, 2014

Today was the first sea day for EX-14-04 Leg 1. Weather was sunny and calm with very mild seas. Repair, software updates, and testing of the EM 302 multibeam sonar were the primary focus of mission operations. The multibeam is operational and the software upgrade was successful. There are concerns about the longevity of some of the transmit boards in the TRU of the EM 302. Hardware needed for the EK 60 sonar calibration was mounted to the deck in preparation for calibration work during the shakedown portion of the cruise. Initial orientation of new mapping interns was mostly completed on the previous day while in port, but ongoing orientation to watch-standing duties was done as time allowed. The multibeam patch test will continue as planned overnight, including conducting a GAMS calibration, and CTD deployment prior to patch testing.

August 10, 2014

A CTD and XBT cast were completed in the deep portion of the Veatch Canyon patch test area. The CTD sound velocity profile was applied to SIS for the beginning of the patch test. A GAMS calibration was successfully completed early in the morning, with heading accuracy in PosView now within acceptable bounds. PosView was opened on two computers and for some reason the heading accuracy turned red – heading returned to normal when only one PosView program was run.

Collection of patch testing lines over Veatch Canyon for calibration of the EM 302 multibeam sonar were completed today. Kongsberg checked latency and pitch using the calibration tool in SIS, with no new offsets needed. Results will also be confirmed (along with heading and roll) using the calibration tool in CARIS. Ops was able to get in touch with contacts on the *Ron Brown* just before they left port in Newport, OR today. The *Ron Brown* will loan a spare TX36 transmit board for the TRU to the EX – it is being shipped overnight mail tomorrow to be picked up with the small boat transfer on Tuesday. The board is for an EM122, so it will need firmware/software updates to make it run with the EM302, but procedures for this are onboard and within the skill set of the ship's ETs. This will provide the ship with a total of two spare TX36 boards for the seamounts mapping work. Ping modes deeper than required will be forced manually in SIS in order to put more power through the system, simulating a deeper water environment. This is being done to test the suspect TX36 boards prior to running them in deep water far from land during seamounts exploration.

Outriggers for the EK 60 were put in place today, with EK 60 calibration planned for all day tomorrow. A drift test will be done overnight at the proposed EK 60 calibration site to ensure the ship can drift freely long enough to complete the calibration tomorrow. The new SIS software will be tested tonight using settings that may enable enhanced seep detection capability in the water column. Several lines are being run over a known seep, using variable settings in SIS.

August 11, 2014

Multibeam patch test data were analyzed and no additional offsets were needed for timing, pitch, or roll. A minor offset for heading may be warranted and is being examined more closely prior to making changes to this angular offset in SIS.

During the night several line plans were run over known seeps in Veatch Canyon. New seep detection functionality available in the upgraded version of SIS for the EM 302 was tested over these seep locations.

A drift test was done with ship propulsion off to see how the ship was likely to drift during the EK60 calibration planned for the morning. The EM 302 was run in very deep and extra deep modes to make sure the TRU remained operational on power settings that will be needed while mapping in deeper water around the seamounts. No problems with the 302 were encountered, and the new SIS software version has been stable and bug-free so far.

Work on the EK60 calibration began shortly after daybreak. There was a lot of seaweed and fish activity in the water column which made it hard to get good target strength measurements on the calibration sphere. There appeared to be one large fish in particular that was attracted to the sphere and made measurements sporadically impossible for about one hour. After trying various tactics to scare away the fish, we brought the calibration equipment out of the water and transited several miles to an alternative calibration site and resumed drifting. This site worked much better. XBTs were used to calculate average sound speed at the start and end of the day. Full calibration was completed for pulse lengths of 512, 1029, 2048, 4096 microseconds. A gain calibration only was completed for pulse length of 8192 microseconds.

Training of interns in watch-standing duties, software, and XBTs continues with good progress and an excellent group of Mapping Interns.

August 12, 2014

The ship transited overnight to Narragansett Bay in order to drop off five mission personnel at the Jamestown Marina and pick up some important ship supplies including the EM 302 spare transmit board from the *Ron Brown*. After reviewing the updated 48-hour forecast for the expedition operating area, the decision was made to anchor in Jamestown Harbor in order to let the worst of the rough weather pass through on Wednesday prior to transiting to the seamounts.

The EM 302 logged data until the sea buoy and was kept pinging until anchoring. It was secured for the weather day. New calibration settings were entered into the EK60 operating software based on the results of yesterday’s calibration work. Science team members Meme Lobecker, Jared Drewniak, and Brendan Reser, along with Jared Harris and David Barbee from Kongsberg, departed the ship right after lunch on a small boat transfer to the Jamestown Marina.

The spare EM 302 transmit board from the *Ron Brown* was delivered, checked, and inventoried as a spare by the Survey Department.

The weather forecast for waters offshore of RI called for seas of 6-9' tonight and building up to 11' on Wednesday.

August 13, 2014

The ship took a weather day at anchor in Jamestown Harbor in order to let the worst of the rough weather pass through prior to transiting to the seamounts. Offshore waters within the transit area ended up being rougher than predicted, with swells of 10-14’, so the decision to wait out the storm in Narragansett Bay proved to be a good one. The ship plans to depart tomorrow morning.

August 14, 2014

The ship departed Narragansett Bay shortly after breakfast to begin the transit to the New England Seamounts chain. Mapping operations were conducted in transit on the shallow continental shelf. Multibeam, EK60, and subbottom sonars are all operational and collecting data.

August 15, 2014

The ship arrived at Bear Seamount, the first seamount in the chain, in the early morning. The day was spent doing transit mapping through seamounts previously mapped by the ECS effort during cruises led by UNH CCOM/JHC. The track line was chosen to fill small gaps in the ECS multibeam dataset while en route to the primary target seamounts of Gosnold, Sheldrake, Gregg, San Pablo, and Manning. The multibeam, EK60, and subbottom sonars are all operational and collecting good data with a mild sea state. Data collected during transit, along with the ECS data, will be useful for dive planning purposes for EX-14-04 Leg 3. The ship will map Panulirus Seamount overnight. This seamount was partially mapped during the EX1303 transit last year, so a few more lines will provide full mapping coverage of this small seamount. Following this, the ship will move to the primary survey area and begin mapping of Gosnold and Sheldrake seamounts.

August 16, 2014

The ship mapped the small seamount Panulirus. Heading accuracy problems increased until troubleshooting and GAMS calibration attempts with the POSMV were undertaken. The secondary antenna for the POSMV ceased working entirely, and the ship is currently surveying with only the primary POSMV antenna and lower than normally acceptable heading accuracy. EK 60 and subbottom sonars are functioning normally.

Heading accuracy became red periodically during the morning. We reset the POSMV and C-Nav GPS systems which seemed to help initially, but heading accuracy quickly went red. We tried GAMS calibrations on the POSMV several times without getting a successful result. Both GPS antenna feeds were working, at least partially, when we attempted the first calibration. Sometime during the second or third calibration effort all signal from the POS secondary antenna was lost. The ship's ETs tested the antenna cables and connectors for the primary and secondary GPS and diagnosed the problem to be full failure of the secondary GPS antenna device.

The ship does not currently have a spare POS antenna aboard. We were left with no option but to try to continue transit surveying on just the primary POS antenna and see how it went. We are able to survey, but the heading accuracy is hovering right around 1 degree, when our usual accuracy requirement is set at 0.1 degrees.

Multibeam data quality appears reasonable, but the full impact on data quality has not been assessed until we do some "mowing the lawn" survey lines to see how overlap in opposing headings works out. Further transit mapping is planned for the night, and opposing survey lines will be run in the morning.

Prior to the failure of the secondary GPS, we examined the antenna array on the flying bridge to see if we could identify causes of interference or multipath with the POS antennas. We noted a potentially significant issue. A large flat metal plate (navigation light shield) was installed during the summer in-port period underneath the aft mast headlight that is mounted at the top of the flying bridge. This plate is meant to block light from shining down on the bow of the ship and impairing the night vision of officers on the bridge. The size and position of this plate relative to the POS antennas are very likely causing some level of shading of the GPS signal from satellites at certain angles and multipath problems – both of which reduce heading accuracy. While the failure of the secondary antenna is our current main problem, a longer term fix is also strongly recommended with respect to the orientation of the POS antennas and light shield.

The ship plans to be mapping at Gosnold Seamount tomorrow (Sunday).

August 17, 2014

The problems with the POSMV heading that the ship experienced yesterday were absent today. Exploratory characterization mapping of Gosnold Seamount was conducted all day with high quality data. All three sonars functioned normally. Survey operations focused on Gosnold Seamount, with about 30% of it being completed by the end of the day. It is an impressive feature with a very flat mesa-like top so far. The ship plans to be mapping at Gosnold Seamount all day tomorrow (Monday).

August 18, 2014
Problems with the POSMV heading returned today, with the secondary GPS antenna providing no navigation data. The ship was still able to make good progress on mapping Gosnold Seamount and the multibeam data quality was reasonable, with overlapping swaths in opposing directions mapping seabed features in the same place with no visible offsets outside the norm. Sea state was moderate with swells of 2-4 feet, and currents around the seamounts often require crabbing angles to stay on survey lines. Mapping of Gosnold Seamount should be finished tomorrow, and we will then move to mapping nearby Sheldrake Seamount.

August 19, 2014
Seas remained favorable for surveying. Mapping of Gosnold Seamount was completed today. We seem to have discovered a small seamount just to the north of Gosnold. Mapping of Sheldrake Seamount began in the evening. At the request of the EC, Chief ET Conway went aloft to the flying bridge this morning and checked for any loose connections or damage to the POS antennas – nothing new was found to report. He also took measurements of the new light shield, the distance from the shield to the antenna, and the distance the antennas would have to be moved to be level in height with the shield to avoid interference. This information was turned into a schematic for documentation.

August 20, 2014
Mapping of Sheldrake Seamount was completed this morning. Seas remained favorable for surveying. Following a couple hours of transit, characterization survey operations began on the very large Gregg and San Pablo Seamounts. Overall data quality has been good on the three sonars. We have noticed one sporadic issue with the multibeam when we are surveying in very deep water on a flat seafloor. Occasionally there will be a series of pings with false (shallow) bottom detections occurring on some of the outer sector beams on the port side of the swath. We have sent documentation of this issue to Kongsberg's technical help asking for advice on what might be causing this and how we can fix it. This issue is intermittent, only occurs under certain conditions, and the bad data can be cleaned in processing so it is not a major problem. We ran a complete BIST test on the multibeam during the transit today and all tests passed without warnings.

August 21, 2014
Mapping of Gregg and San Pablo Seamounts continued all day today with good progress. Weather is picking up for tomorrow with forecasted confused seas of 4-6 feet. We were surprised today to find only flat seafloor in an area just off the SW corner of Gregg Seamount that clearly indicates a distinct peak in the Smith and Sandwell seafloor topography map. Mapping continued on the large impressive seamounts of Gregg and San Pablo.

August 22, 2014
Today was a challenging weather day, with rough conditions throughout the night and commensurately poor sonar data quality. Sea state reduced somewhat during the day, but still made for slow survey progress. Weather picking up again tonight, with a line of ongoing low pressure facing us for the next few days. Mapping of Gregg and San Pablo Seamounts continued all day today. Shortly after the overnight watch came on duty seas became rougher than predicted, with potentially up to 9' swells. Swells varied today from

roughly 4-8’. We experimented with several survey line orientations to try to improve data quality, but ultimately ended up sticking with our original planned lines since they are less subject to losing seafloor tracking. The multibeam worked better taking swells nearly on the beam, so it made for a rolling ride. Data quality is noticeably better on westward lines (with a slightly following sea) than the eastward lines. We have tightened up line spacing, slowed down, and tilted the sonar angle aft alongtrack to improve results. The currents around the seamounts are quite strong, and crab angles of up to 20 degrees are often necessary to maintain the ship’s position along the survey lines. Heading accuracy on the POSMV is holding at about 0.55 degrees. Conditions are expected to be rough again overnight, so progress on surveying will be slow.

August 23, 2014
Today was spent completing the mapping of Gregg Seamount. It was another challenging weather day with 5-7’ seas all day and few signs of relief in the forecast for the next few days. There is only one heading that enables good data collection, so the progress has been slow but steady. We have been filling gaps and areas of poor quality due to the sea state. We are on schedule to finish Gregg late tonight. The ship is monitoring the formation of a tropical storm system that is predicted to impact our operational area later in the week.

August 24, 2014
Gregg Seamount was completed and the ship did an overnight transit to Manning Seamount. The day was spent mapping Manning Seamount, with decent survey conditions and moderate sea state. The ship made a decision to return to port one day early in order to avoid being caught in dangerous seas later in the week when tropical storm Cristobal moves through our operating area. We will depart the seamounts working grounds Tuesday evening, with a planned arrival in North Kingstown Friday morning.

August 25, 2014
The day was spent continuing to map Manning Seamount. Survey conditions today were somewhat challenging given swells of 4-7’. It was rough overnight and some gap filling was needed today over the southern peaks within the seamount complex referred to as Manning. We plan to depart Manning Seamount mid-day Tuesday to begin the transit back to North Kingstown. We anticipate arriving in North Kingstown Friday morning at about 0900. The ROV loading is still slated to occur on Saturday.

August 26, 2014
Surveying conditions were very poor last night and line spacing was therefore very close together. Conditions improved somewhat during the day, and we completed mapping of the southern half of Manning Seamount, with the northern half still left to explore. The EC had planned a validation cross-line to cover Gosnold and Sheldrake Seamounts on the transit home, but due to the urgent need to put time and distance between us and the worst of the weather this survey line was not run. The cross-line should take 4-5 hours to run and would be an excellent use of overnight mapping time during the EX1404 Leg 3 ROV/Mapping cruise. We ended mapping operations at Manning Seamount at 1100 this morning. The ship required an earlier departure based on the updated forecast, which calls for 6-9’ seas in 24 hours and 9-12’ seas in 48 hours within the area of our transit back to port. This rough weather will be followed by substantially worse conditions as Hurricane Cristobal moves further up the East Coast. The ship is currently transiting as quickly and directly as possible back to North Kingstown.

August 27, 2014
The ship has been transiting rapidly and making good time back to home port in North Kingstown. The ride has been smooth, with fairly calm conditions and very long period gentle swell coming in from the south. Transit mapping with the normal 24 hour watch schedule is still being conducted. Swell size is picking up tonight. The post cruise meeting with the EC, senior officers, and ship Department Heads was

held from 1430-1530 today. The ship has passed over the canyons region and is now on the continental shelf in about 105 meters of water. We are expected to arrive in port Thursday afternoon.

August 28, 2014
All sonars were secured when the ship reached a water depth of 50 meters. This occurred at approximately 0500 EDT. All multibeam data has had initially data processing completed and will be quality checked at the UNH IOCM. All of the multibeam data has also been processed into backscatter mosaics and all water column data processed to look for water column anomalies. Apart from previously identified seeps in the vicinity of Veatch Canyon, no new seeps were discovered during this cruise and none were observed in the seamounts mapping area. A full suite of BIST tests were run on the EM 302 and all tests were successful (green). The sonar was pinged at the pier to make sure it was working fine. The multibeam sonar was then secured.

August 29, 2014
Weather day due to Hurricane Cristobal. Moored to Pier 1, North Kingstown, RI.

August 30, 2014
Weather day due to Hurricane Cristobal. Moored to Pier 1, North Kingstown, RI. Project staging day, ROVs loaded onboard.

14. References

The 2014 Survey Readiness Report can be obtained by contacting NOAA Ship *Okeanos Explorer* at ops.explorer@noaa.gov.

EX-14-04 L1 Project Instructions can be obtained by contacting NOAA Ship *Okeanos Explorer* at ops.explorer@noaa.gov.

The following data was used as background data throughout the cruise: Sandwell, D. T., and W. H. F. Smith, Global marine gravity from retracked Geosat and ERS-1 altimetry: Ridge Segmentation versus spreading rate, J. Geophys. Res., 114, B01411, doi:10.1029/2008JB006008, 2009.

15. Appendices

Appendix A: EX-14-04L1 Data Management Plan

Data Management Plan

Okeanos Explorer (EX1404L1): Shakedown and Mapping, NE Seamounts

Data Management Objectives

Test and re-certify established data pipelines. Test new Okeanos Atlas functions with operational data.
Test modified workflow for SCS (pulling from tethys instead of hard-drive) and also check on success of new SCS Submit Data functionality taken on by ship's crew. Confirm data consolidation procedures / automation is still functional following dockside maintenance / updates. At-sea data management training. Continue development of automated full cruise data backup processes. Field test / integration of Mac Warehouse systems.

1. General Description of Data to be Managed

1.1 Name of the Dataset of Data Collection Project

Okeanos Explorer (EX1404L1): Shakedown and Mapping, NE Seamounts

The first portion of the cruise will include various shakedown items that are necessary after the ship has been alongside for summer dockside repairs, including at-sea testing of VSAT and communications networks and systems, mapping software updates, hardware updates, and sonar calibration. The second portion of the cruise will focus on mapping previously unmapped seamounts in the New England Seamount chain.

1.2 If this mission is part of a series of missions, what is the series name?

OKEANOS EXPLORER

1.2 Keywords that could be used to characterize the data.

Davisville, mapping survey, multibeam, multibeam backscatter, multibeam sonar, multi-beam sonar, noaa fleet, okeanos, okeanos explorer, R337, Rhode Island, scientific computing system, SCS, single beam sonar, singlebeam sonar, single-beam sonar, sub-bottom profile, water column backscatter, expedition, exploration, explorer, marine education, noaa, ocean, ocean discovery, ocean education, ocean exploration, ocean exploration and research, ocean literacy, ocean research, OER, science, scientific mission, scientific research, sea, stewardship, systematic exploration, technology, transformational research, undersea, underwater, Veatch Canyon, Narragansett Bay, New England Seamounts, oceans

1.4 Summary description of the data to be generated.

Multibeam, single beam, and subbottom sonar data will be collected 24 hours a day and XBT casts will be conducted at an interval defined by prevailing oceanographic conditions, but not to exceed 3-4 hours. EX1404L1 will perform baseline characterization mapping (multibeam, splitbeam, subbottom) of New England Seamount chain in preparation for EX1404L3. During transiting to and from seamounts, exploration mapping will include areas of poor quality from existing ECS data and gaps in ECS data.

1.5 Anticipated temporal coverage of the data.

Cruise Dates: 8/9/2014 to 8/30/2014

1.6 Anticipated geographic coverage of the data.

Latitude Boundaries: 40 to 35.5

Longitude Boundaries: -72 to -57.5

1.7 What platforms will be employed during this mission?

NOAA Ship Okeanos Explorer

1.8 What data types will you be creating or capturing?

Cruise Plan, Cruise Summary, Data Management Plan, Highlight Images, Quick Look Report, Bottom Backscatter, EK60 Singlebeam Data, Multibeam (raw), Multibeam (processed), Multibeam (image), SCS Output (native), SCS Output (compressed), Sub-Bottom Profile data, Water Column Backscatter, XBT (raw), Mapping Summary, Multibeam (product)

1.8 What data types will you be submitting for archive?

Cruise Plan, Cruise Summary, Data Management Plan, Highlight Images, Quick Look Report, Bottom Backscatter, EK60 Singlebeam Data, Multibeam (raw), Multibeam (processed), Multibeam (image), SCS Output (native), SCS Output (compressed), Sub-Bottom Profile data, Water Column Backscatter, XBT (raw), Mapping Summary, Multibeam (product)

1.9 What volume of data is anticipated to be collected in the Project Time Frame?

160 GB

2. Points of Contact

2.1 Who is the overall point of contact for the data collection?

Derek Sowers, Physical Scientist, NOAA Office of Ocean Exploration and Research, Derek.Sowers@noaa.gov

2.2 Who is responsible for verifying the quality of the data?

Derek Sowers, Physical Scientist, NOAA Office of Ocean Exploration and Research, Derek.Sowers@noaa.gov

2.3 Who is responsible for data documentation and metadata activities?

Susan Gottfried, Data Management Coordinator, NOAA National Coastal Data Development Center, susan.gottfried@noaa.gov

2.4 Who is responsible for data storage and data disaster recovery activities?

NOAA National Data Centers (National Geophysical Data Center, National Oceanographic Data Center, NOAA Central Library)

3. Data Stewardship

3.1 What quality control procedures will be employed?

Quality control procedures for the data from the Kongsberg EM302 is handled at UNH CCOM/JHC. Raw (level-0) bathymetry files are cleaned/edited into new data files (level-1) and converted to a variety of products (level-2). Data from sensors monitored through the SCS are archived in their native format and are not quality controlled. Data from CTD casts and XBT firings are archived in their native format and are not quality controlled. CTDs are processed into profiles for display only on the Okeanos Atlas.

4. Data Documentation

4.1 Which metadata repository will be used to document this data collection?

An ISO format collection-level metadata record will be generated during pre-cruise planning and published in an OER catalog and Web Accessible Folder (WAF) hosted at NCDDC for public discovery and access. The record will be harvested by data.gov.

4.2 What additional metadata or other documentation is necessary to fully describe the data and ensure its long-term usefulness?

Additional metadata includes: Multibeam metadata to file level; Scientific Computing System (SCS) metadata; MAchine Readable Catalog (MARC) metadata for Library items.

4.3 What standards will be used to represent data and metadata elements in this data collection?

ISO 19115-2 Geographic Information with Extensions for Imagery and Gridded Data will be the metadata standard employed; a NetCDF-4 standard for oceanographic data will be employed for the SCS data; the Library of Congress standard, MAchine Readable Catalog (MARC), will be employed for NOAA Central Library records.

5. Data Sharing

5.1 What date will the data be made available to the public?

All data from this mission is expected to be documented, archived and accessible within 60-90 days post-mission through the NOAA National Data Centers and public access GIS map applications. Meteorological and Oceanographic (METOC) sensor data from the SCS, and CTD data are converted in a post-mission model into archive ready compressed NetCDF-4 format and stored within the NCDDC THREDDS open-access server.

5.2 If the data are not to be made publicly available, under what authority are the data restricted?

Not Applicable

5.2a Access Constraints Statement?

No data access constraints, unless data are protected under the National Historic Preservation Act of 1966.

5.2b Use Constraints Statement?

Data use shall be credited to NOAA Office of Ocean Exploration and Research.

6. Initial Data Storage and Protection

6.1 Where and how will the data be stored initially (prior to archive submission)?

Data are recorded and stored on NOAA shipboard systems compliant with NOAA IT procedures. Data are moved from ship to shore using a variety of standard, documented data custody transfer procedures. Data are transferred to NOAA Data Centers using digital and physical data transfer models depending upon the data volume.

6.2 Discuss data back-up, disaster recovery, contingency planning and off-site storage relevant to this data collection.

Data management standard operating procedures minimizing accidental or malicious modification or deletion are in place aboard the Okeanos Explorer and will be enforced.

6.3 Describe how the data will be protected from unauthorized access, how permissions will be managed and what process will be followed in the event of unauthorized access.

Account access to mission systems are maintained and controlled by the Program. Data access prior to public accessibility is documented through the use of Data Request forms and standard operating procedures.

7. Long-Term Archiving and Preservation

7.1 In what NOAA Data Center(s) will the data be archived and preserved?

Data from this mission will be preserved and stewarded through the NOAA National Data Centers. Refer to the Okeanos Explorer FY14 Data Management Plan at NOAA's EDMC DMP Repository (EX_FY14_DMP_Final.pdf) for detailed descriptions of the processes, procedures, and partners involved in this collaborative effort.

7.1 a If you do not plan to archive in the NOAA Data Centers, what is your long-term strategy for maintaining, curating, and archiving the data?

Not Applicable

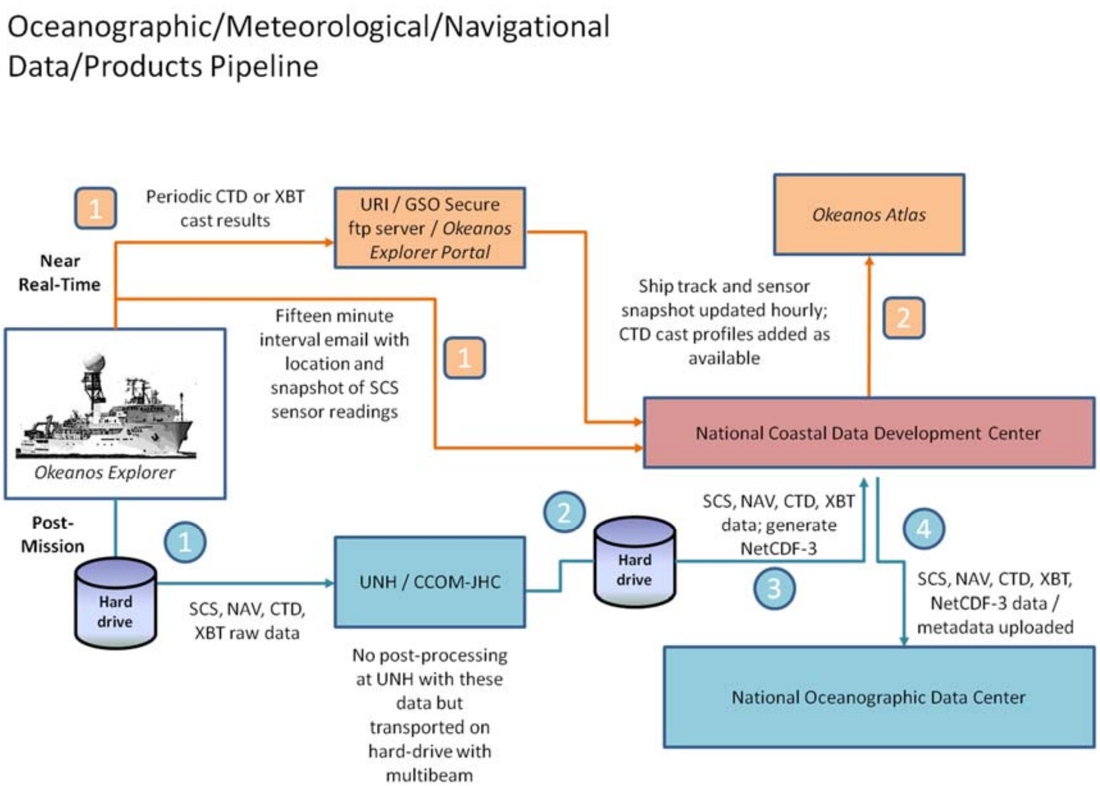
7.2 What transformations or procedures will be necessary to prepare data for preservation or sharing?

SCS data shall be delivered in its native format as well as an archive-ready, documented, and compressed NetCDF-4 format to NODC; multibeam data and metadata will be compressed and delivered in a bagit format to NGDC.

Data and Product Pipelines (excerpt from EX_FY13_DMP.pdf)

<u>Oceanographic/Meteorological/Navigational Data Archive Pipeline</u>

Data from hull-mounted and off-board oceanographic and meteorological (METOC) sensors; integrated oceanographic sensors from the submersibles; and navigational instrumentation on both the vessel and its submersibles are monitored through the ship's Scientific Computer System (SCS). Some of these data will be used in a near real-time mode to update the *Okeanos Atlas*. All of these data will be archived at the National Oceanographic Data Center (NODC) Marine Data Stewardship Division (MDSD) in Silver Spring, MD. A collection level metadata record describing the data inventory to be archived at the NODC/MDSD will be included with the data submission.



1 ***Fig 1: Oceanographic/Meteorological/Navigational Data Archive Pipeline***
At periodic (currently twenty minutes) intervals, an email from the ship to NCDDC is delivered with the ship's position and a snapshot of the SCS sensor suite.
As CTD or XBT casts are deployed, the results of the cast are included in the hourly synchronizations to the SRS.

2 The GIS team at NCDDC processes CTD cast data into thinned profiles for comparison to World Ocean Atlas historical profiles in the same region and month. The thinned profiles

are geo-located on the Okeanos Atlas. Ship track and sensor snapshot readings are geo-located on the Okeanos Atlas.

1 All SCS data, including navigation and CTD/XBT cast data are saved to a hard-drive. This hard-drive is the same that will hold the multibeam survey raw data and products generated on-board. This hard-drive will be either brought back or shipped to the University of New Hampshire Center for Coastal and Ocean Mapping (UNH CCOM) for post-processing, after which it will be shipped to NCDDC.

2 The Data Management team will post-process the SCS, NAV, CTD, and XBT raw data files, adding ASCII headers to each file and generating NetCDF-3 formatted files for the entire cruise for both SCS/NAV data and CTD/XBT data. FGDC CSDGM metadata will be generated for the navigational data and for the METOC sensor data.

3 The ASCII files, and the metadata will be uploaded to the National Oceanographic Data Center (NODC), where they will be accessioned and archived.

4 The NetCDF3 files will be stored within an NCDDC hosted Thematic Real-time Environmental Distributed Data Services (THREDDS) server for user discoverability and access.

Data Class	Instrument	Data Type	Format	Metadata Granularity	Archive Center
OCN/ MET	All SCS monitored sensors	Meteorological and Oceanographic data sensors	ASCII	1 meta rec	NODC/MDSD
NAV	DGPS, CNAV	EX, ROV, and sled navigation	ASCII	1 meta rec	NODC/MDSD
ALL	All	Archive Ready	NetCDF-3	1 meta rec	NODC/MDSD

Table 4: Oceanographic/Meteorological/Navigational Metadata Granularity and Target Archive

<u>Multibeam Survey Data Archive Pipeline</u>

The multibeam survey data collected by bottom-looking and complementary sensors, data from the calibration instruments, and the products generated after the data is returned to and post-processed at UNH will be archived at the NGDC. These data will be accompanied with a collection level metadata record for the NGDC as well as individual metadata records for each raw (level-0) file, each edited (level-1) file and each data product (level-2) and report (level-3) generated as a result. In addition, the submission to NGDC will include the following:

- raw (level-0) mapping survey and water column data files,
- CTD and/or XBT profile data used for calibration in multibeam survey,
- post-processed, quality assured, and edited (level-1) data files,
- specific data products (level-2) including cumulative GeoTIF images, gridded bathymetric files, KML files, Fledermaus output files, and an ArcGrid format, and
- comprehensive mapping survey data summary (level-3) report.

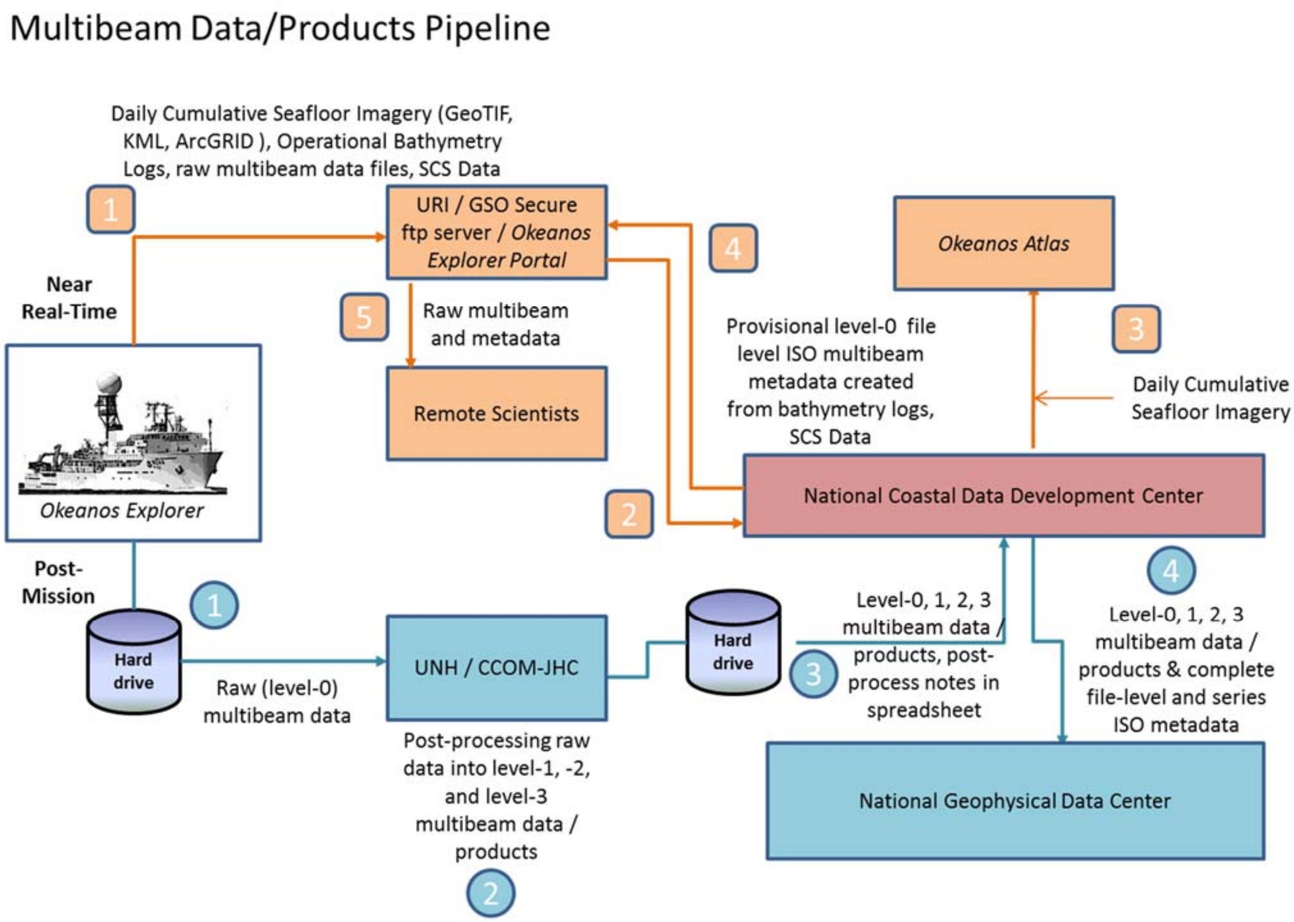


Figure 2: Multibeam Survey Data Archive Pipeline

Near Real-Time

1 The mapping survey team on the EX will include their operational processing spreadsheet in the folder that is targeted for synchronization to the SRS periodically throughout the day. As operational GeoTIFF images are created, these will also be saved to this folder.

2 The data management team at NCDDC pulls the GeoTIFF images, operational bathymetry processing spreadsheet and the SCS data streams for near real-time metadata generation and Okeanos Atlas update procedures.

3 Daily cumulative GeoTIFF images of the seafloor imagery are geo-located on the Okeanos Atlas by the GIS team at NCDDC.

4 Provisional metadata in an ISO format is generated for each raw (level-0) multibeam raw files using the SCS exported data, the operational processing spreadsheet and saved to the SRS.

5 Participating scientists wanting access to the raw multibeam in near real-time can pull the individual files with the metadata that provides operational and provisional processing steps and a disclaimer for non-QC status of the data.

Post-Mission

1 All bottom-looking sensor data and complementary data (water column and sound velocity) are saved to a hard-drive. This hard-drive will be either brought back or shipped to the University of New Hampshire Center for Coastal and Ocean Mapping (UNH CCOM) for post-processing.

2 A full complement of multibeam data from a 30-day EX cruise on which the Kongsberg EM302 multibeam system runs continuously will produce 200-300 Gigabytes of raw multibeam (37.5% of total volume) and water column data (62.5% of total volume). At UNH, the mapping team will post-process the multibeam data through the following steps:

- The raw (level-0) data will be saved to the CCOM file servers, where they will be quality checked and post-processed.
- The edited level-0 data is saved as level-1 data filesin a non-proprietary format – ASCII xyz files (cleaned not gridded).
- The post-processing steps used to produce the level-1 data will be documented.
- Level-2 products will be generated from the level-1 data files.
- The post-processing steps used to produce the level-2 data products will be documented.
- The level-1 data, level-2 products, post-processing steps, and working data processing spreadsheets will be copied to the hard drive in a new folder. A processing spreadsheet for FY12 will contain the temporal and spatial limits of each file and any supplemental information documenting problems or issues that affected the quality of the data in that file.

3 The hard-drive will be shipped to the NCDDC within approximately 3 weeks from cruise end date.

4 At NCDDC, all multibeam related files will be post-processed through metadata generation procedures. Metadata will be generated for each individual survey track file (level-0 and -1), for accompanying CTD/XBT profile data sets, for composite xyz files, KMLs, GeoTIFs, png images,

and Fledermaus output (level-2), and a set of data products and reports (level-3). The metadata will be added to the hard-drive and the hard-drive will be shipped to NGDC.

NOAA Ship Okeanos Explorer					
Data Class	**Instrument**	**Data Type**	**Format**	**Metadata Granularity**	**Archive Center**
GEO	Kongsberg EM302 (30 kHz)	Multibeam Bathymetry, Bottom Backscatter, Water Column Backscatter (proprietary format read into MBSystem)	.all, .wcd (proprietary)	1 meta rec per .all file in Multibeam Data folder and subfolders	NGDC
GEO	Simrad EK60	Singlebeam (time,depth)	.txt, (ASCII), .raw (proprietary)	Included in the SCS feed	TBD
GEO	Knudsen CHIRP 3260 (3.5 kHz)	Sub-bottom profile	.sgy, .kea, .keb (proprietary)	1 meta rec = Subbottom Profile Data folder	NGDC
OCN	SeaBird SBE-911plus	CTD Cast	.hex, .con (Proprietary); .cnv, .hdr, .bl, .jpg (processed)	1 meta rec = CTD folder	NGDC
OCN	Sippican MK-21 eXpendable BathyThermograph (XBT)	XBT	.edf (ASCII), .rdf (proprietary)	1 meta rec = XBT folder	NGDC
OCN	RESON	Sound Velocity (m/s)	TBD	1 meta rec = RESON folder	NGDC
OCN	Calculated	Sound Velocity (m/s)	.asvp (ASCII)	1 meta rec = Profile_Data/SVP or Profile_Data/ASVP	NGDC

Table 5: Multibeam Survey Metadata Granularity and Target Archive

Appendix B: Categorical Exclusion Letter

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
OCEANIC AND ATMOSPHERIC RESEARCH
Office of Ocean Exploration and Research
Silver Spring, MD 20910

MEMORANDUM FOR: The Record

FROM: John McDonough
Deputy Director, NOAA Office of Ocean Exploration and Research (OER)

SUBJECT: Categorical Exclusion for NOAA Ship *Okeanos Explorer* cruise EX-13-01

NAO 216-6, Environmental Review Procedures, requires all proposed projects to be reviewed with respect to environmental consequences on the human environment. This memorandum addresses the NOAA Ship *Okeanos Explorer's* scientific sensors possible effect on the human environment.

Description of Project
This project is part of the NOAA Office of Ocean Exploration and Research's "Science Program" and entails multi-disciplinary ocean mapping and exploration activities designed to increase knowledge of the marine environment. This project is entitled "EX-13-01 Leg Ship Shakedown and Patch Test, NE Canyons and Seamounts (Mapping)" and will be lead by Elizabeth Lobecker and Mashkoor Malik, physical scientists for the *Okeanos Explorer* program within OER. NOAA Ship *Okeanos Explorer* will depart Davisville, Rhode Island on March 18, 2013, return to Davisville, Rhode Island on April 5, 2013, and will conduct sonar mapping operations at all times during the cruise. Focused mapping and sonar testing operations will occur at offshore areas adjacent to the continental shelf break between Rhode Island and the US-Canadian maritime territorial boundary, and over several seamounts both within as well as just outside the U.S. Exclusive Economic Zone offshore from New England, including but not limited to Bear, Mytilus, Buell, Physalia, Retriever, Picket, and Balanus, Asterias, Kelvin, Kiwi, and Panulirus Seamounts. Acoustic instruments that will be operational during the project are a 30 kHz multibeam echosounder (Kongsberg EM 302), an 18 kHz singlebeam echosounder (Kongsberg EK 60), and a 3.5 kHz sub-bottom profiler (Knudsen Chirp 3260). Additionally, expendable bathythermographs (XBTs) will be deployed regular intervals in association with multibeam data collection.

Effect of Projects
As expected for ocean research with limited duration or presence in the marine environment, this project will not have the potential for significant impacts. Knowledgeable experts who are aware of the sensitivities of the marine environment will conduct the at-sea portions of this project.

Categorical Exclusion
This project would not result in any changes to the human environment. As defined in Sections 5.05 and 6.03.c.3 (a) of NAO 216-6, this is a research project of limited size or magnitude or with only short-term effects on the environment and for which any cumulative effects are negligible. As such, this project is categorically excluded from the need to prepare an environmental assessment.

Signed: [signature]
John McDonough, Deputy Director

Date: 2/28/2013

Printed on Recycled Paper

Appendix C. NASA Maritime Aerosols Network Survey of Opportunity

Survey or Project Name

Maritime Aerosol Network

Points of Contact (POC)

Lead POC or Principle Investigator (PI & Affiliation)	*Supporting Team Members ashore*
POC: Dr. Alexander Smirnov	*Supporting Team Members aboard (if required)*

Activities Description(s)*(Include goals, objectives and tasks)*

The Maritime Aerosol Network (MAN) component of AERONET provides ship-borne aerosol optical depth measurements from the Microtops II sun photometers. These data provide an alternative to observations from islands as well as establish validation points for satellite and aerosol transport models. Since 2004, these instruments have been deployed periodically on ships of opportunity and research vessels to monitor aerosol properties over the World Oceans.

Appendix D: EM 302 Processing Parameters

```
#// Database Parameters

#// Seafloor Information System
#// Kongsberg Maritime AS
#// Saved:  2013.04.03 14:50:40

#// Build info:
#* SIS:          [Version: 3.8.3, Build: 89, DBVersion 19.0 CD
generated: Fri Mar 25 15:18:06 2011]
[Fox ver = 1.6.37]
[db ver = 19, proc = 19.0]
[OTL = 4.0.-95]
[ACE ver = 5.7.6]
[Coin ver = 2.5.0]
[Simage ver = 1.6.2a]
[Dime ver = DIME v0.9]
[STLPort ver = 8.0]
[FreeType ver = 2.3.7]
[TIFF ver = 3.9.2]
[GeoTIFF ver = 1250]
[GridEngine ver = 2.4.1]

#* Language       [3] #// Current language, 1-Norwegian, 2-
German,3-English, 4-Spanish

#* Type           [302]
#* Serial no.     [101]
#* Number of heads     [2]
#* System descriptor    [50331648] #// 03000000

#// ************************************************************************
#{ User comment #//


#} User comment

#// ************************************************************************

#// ************************************************************************
#// Installation parameters


#{ Input Setup #// All Input setup parameters

  #{ COM1 #// Link settings.

    #{ Com. settings #// Serial line parameter settings.
      #* Baud rate:      [9600]
      #* Data bits       [8]
      #* Stop bits:      [1]
      #* Parity:         [NONE]
    #} Com. settings

    #{ Position #// Position input settings.
      #* None            [1] [0]
      #* GGK             [1] [0]
      #* GGA             [1] [1]
      #* GGA_RTK         [1] [0]
      #* SIMRAD90        [1] [0]
    #} Position

    #{ Input Formats #// Format input settings.
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      #* MK39 Mod2 Attitude,  [0] [0]
      #* ZDA Clock       [1] [1]
      #* HDT Heading     [0] [0]
      #* SKR82 Heading   [0] [0]
      #* DBS Depth       [1] [0]
      #* DPT Depth       [1] [0]
      #* EA500 Depth     [0] [0]
      #* ROV. depth      [1] [0]
      #* Height, special purp [1] [0]
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    #} Input Formats

  #} COM1

  #{ COM2 #// Link settings.

    #{ Com. settings #// Serial line parameter settings.
      #* Baud rate:      [19200]
      #* Data bits       [8]
      #* Stop bits:      [1]
      #* Parity:         [NONE]
    #} Com. settings

    #{ Position #// Position input settings.
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      #* GGK             [0] [0]
      #* GGA             [0] [0]
      #* GGA_RTK         [0] [0]
      #* SIMRAD90        [0] [0]
    #} Position

    #{ Input Formats #// Format input settings.
      #* Attitude        [1] [1]
      #* MK39 Mod2 Attitude,  [0] [0]
      #* ZDA Clock       [0] [0]
      #* HDT Heading     [0] [0]
      #* SKR82 Heading   [0] [0]
      #* DBS Depth       [0] [0]
      #* DPT Depth       [0] [0]
      #* EA500 Depth     [0] [0]
      #* ROV. depth      [0] [0]
      #* Height, special purp [0] [0]
      #* Ethernet AttVel     [0] [0]
    #} Input Formats

  #} COM2

  #{ COM3 #// Link settings.

    #{ Com. settings #// Serial line parameter settings.
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      #* Data bits       [8]
      #* Stop bits:      [1]
      #* Parity:         [NONE]
    #} Com. settings

    #{ Position #// Position input settings.
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      #* GGK             [1] [0]
      #* GGA             [1] [0]
      #* GGA_RTK         [1] [0]
      #* SIMRAD90        [1] [0]
    #} Position

    #{ Input Formats #// Format input settings.
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      #* MK39 Mod2 Attitude,  [0] [0]
      #* ZDA Clock       [0] [0]
      #* HDT Heading     [1] [1]
      #* SKR82 Heading   [0] [0]
      #* DBS Depth       [1] [0]
      #* DPT Depth       [1] [0]
      #* EA500 Depth     [0] [0]
      #* ROV. depth      [1] [0]
      #* Height, special purp [1] [0]
```

```
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#} COM3

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      #* Data bits           [8]
      #* Stop bits:          [1]
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   #} Com. settings

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      #* GGK                 [1] [0]
      #* GGA                 [1] [0]
      #* GGA_RTK             [1] [0]
      #* SIMRAD90            [1] [0]
   #} Position

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      #* MK39 Mod2 Attitude,  [0] [0]
      #* ZDA Clock           [0] [0]
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      #* SKR82 Heading       [0] [0]
      #* DBS Depth           [1] [0]
      #* DPT Depth           [1] [0]
      #* EA500 Depth         [0] [0]
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#} COM4

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   #{ Com. settings #// Serial line parameter settings.
      #// N/A
   #} Com. settings

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      #* GGA                 [1] [0]
      #* GGA_RTK             [1] [0]
      #* SIMRAD90            [1] [0]
   #} Position

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      #* MK39 Mod2 Attitude,  [0] [0]
      #* ZDA Clock           [0] [0]
      #* HDT Heading         [0] [0]
      #* SKR82 Heading       [0] [0]
      #* DBS Depth           [0] [0]
      #* DPT Depth           [0] [0]
      #* EA500 Depth         [1] [0]
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#} UDP2

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   #} Com. settings

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      #* GGA                 [0] [0]
      #* GGA_RTK             [0] [0]
      #* SIMRAD90            [0] [0]
   #} Position

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      #* ZDA Clock           [0] [0]
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      #* SKR82 Heading       [0] [0]
      #* DBS Depth           [1] [0]
      #* DPT Depth           [1] [0]
      #* EA500 Depth         [0] [0]
      #* ROV. depth          [1] [0]
      #* Height, special purp [1] [0]
      #* Ethernet AttVel      [0] [0]
   #} Input Formats

#} UDP3

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      #// N/A
   #} Com. settings

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      #* GGK                 [0] [0]
      #* GGA                 [0] [0]
      #* GGA_RTK             [0] [0]
      #* SIMRAD90            [0] [0]
   #} Position

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      #* ZDA Clock           [0] [0]
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      #* SKR82 Heading       [0] [0]
      #* DBS Depth           [1] [0]
      #* DPT Depth           [1] [0]
      #* EA500 Depth         [0] [0]
      #* ROV. depth          [1] [0]
      #* Height, special purp [1] [0]
      #* Ethernet AttVel      [0] [0]
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#} UDP4

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      #// N/A
   #} Com. settings

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      #* GGA                 [0] [0]
```

```
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      #* SIMRAD90            [0] [0]
    #} Position

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      #* ZDA Clock           [0] [0]
      #* HDT Heading          [0] [0]
      #* SKR82 Heading        [0] [0]
      #* DBS Depth           [0] [0]
      #* DPT Depth           [0] [0]
      #* EA500 Depth          [0] [0]
      #* ROV. depth          [0] [0]
      #* Height, special purp [0] [0]
      #* Ethernet AttVel      [1] [1]
    #} Input Formats

    #{ Attitude Velocity settings #// Only relevant for UDP5 on
EM122, EM302, EM710, EM2040 currently
      #* Attitude 1          [1] [1]
      #* Attitude 2          [1] [0]
      #* Use Ethernet 2       [1] [1]
      #* Port:               [5602]
      #* IP addr.:           [192.168.2.20]
      #* Net mask:           [255.255.255.0]
    #} Attitude Velocity settings

  #} UDP5

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      #// N/A
    #} Com. settings

    #{ Position #// Position input settings.
      #* None                [1] [1]
      #* GGK                 [0] [0]
      #* GGA                 [0] [0]
      #* GGA_RTK             [0] [0]
      #* SIMRAD90            [0] [0]
    #} Position

    #{ Input Formats #// Format input settings.
      #* Attitude            [0] [0]
      #* MK39 Mod2 Attitude,  [0] [0]
      #* ZDA Clock           [1] [0]
      #* HDT Heading          [0] [0]
      #* SKR82 Heading        [0] [0]
      #* DBS Depth           [0] [0]
      #* DPT Depth           [0] [0]
      #* EA500 Depth          [0] [0]
      #* ROV. depth          [0] [0]
      #* Height, special purp [0] [0]
      #* Ethernet AttVel      [1] [0]
    #} Input Formats

  #} MCAST1

  #{ MCAST2 #// Link settings.

    #{ Com. settings #// Serial line parameter settings.
      #// N/A
    #} Com. settings

    #{ Position #// Position input settings.
      #* None                [1] [1]
      #* GGK                 [1] [0]
      #* GGA                 [1] [0]
      #* GGA_RTK             [1] [0]
      #* SIMRAD90            [1] [0]
    #} Position

    #{ Input Formats #// Format input settings.
      #* Attitude            [0] [0]
      #* MK39 Mod2 Attitude,  [0] [0]
      #* ZDA Clock           [1] [0]
      #* HDT Heading          [0] [0]
      #* SKR82 Heading        [0] [0]
      #* DBS Depth           [0] [0]
      #* DPT Depth           [0] [0]
      #* EA500 Depth          [0] [0]
      #* ROV. depth          [0] [0]
      #* Height, special purp [0] [0]
      #* Ethernet AttVel      [1] [0]
    #} Input Formats

  #} MCAST2

  #{ MCAST3 #// Link settings.

    #{ Com. settings #// Serial line parameter settings.
      #// N/A
    #} Com. settings

    #{ Position #// Position input settings.
      #* None                [1] [1]
      #* GGK                 [1] [0]
      #* GGA                 [1] [0]
      #* GGA_RTK             [1] [0]
      #* SIMRAD90            [1] [0]
    #} Position

    #{ Input Formats #// Format input settings.
      #* Attitude            [0] [0]
      #* MK39 Mod2 Attitude,  [0] [0]
      #* ZDA Clock           [1] [0]
      #* HDT Heading          [0] [0]
      #* SKR82 Heading        [0] [0]
      #* DBS Depth           [0] [0]
      #* DPT Depth           [0] [0]
      #* EA500 Depth          [0] [0]
      #* ROV. depth          [0] [0]
      #* Height, special purp [0] [0]
      #* Ethernet AttVel      [1] [0]
    #} Input Formats

  #} MCAST3

  #{ MCAST4 #// Link settings.

    #{ Com. settings #// Serial line parameter settings.
      #// N/A
    #} Com. settings

    #{ Position #// Position input settings.
      #* None                [0] [1]
      #* GGK                 [0] [0]
      #* GGA                 [0] [0]
      #* GGA_RTK             [0] [0]
      #* SIMRAD90            [0] [0]
    #} Position

    #{ Input Formats #// Format input settings.
      #* Attitude            [0] [0]
      #* MK39 Mod2 Attitude,  [0] [0]
      #* ZDA Clock           [1] [0]
```

```
      #* HDT Heading          [0] [0]
      #* SKR82 Heading        [0] [0]
      #* DBS Depth            [0] [0]
      #* DPT Depth            [0] [0]
      #* EA500 Depth          [0] [0]
      #* ROV. depth           [0] [0]
      #* Height, special purp [0] [0]
      #* Ethernet AttVel      [1] [0]
    #} Input Formats

  #} MCAST4


  #{ Misc. #// Misc. input settings.
    #* External Trigger     [1] [0]
  #} Misc.

#} Input Setup

#{ Output Setup #// All Output setup parameters

  #* PU broadcast enable  [1] [1]
  #* Log watercolumn to s [1] [1]

  #{ Host UDP1 #// Host UDP1 Port: 16100

    #{ Datagram subscription #//
      #* Depth                [0] [0]
      #* Raw range and beam a [0] [0]
      #* Seabed Image         [0] [0]
      #* Central Beams        [0] [0]
      #* Position             [0] [0]
      #* Attitude             [0] [0]
      #* Heading              [0] [0]
      #* Height               [0] [0]
      #* Clock                [0] [0]
      #* Single beam echosoun [0] [0]
      #* Sound Speed Profile  [0] [1]
      #* Runtime Parameters   [0] [1]
      #* Installation Paramet [0] [1]
      #* BIST Reply           [0] [1]
      #* Status parameters    [0] [1]
      #* PU Broadcast         [0] [0]
      #* Stave Display        [0] [0]
      #* Water Column         [0] [0]
      #* Internal, Range Data [0] [0]
      #* Internal, Scope Data [0] [0]
    #} Datagram subscription

  #} Host UDP1


  #{ Host UDP2 #// Host UDP2 Port: 16101

    #{ Datagram subscription #//
      #* Depth                [1] [1]
      #* Raw range and beam a [1] [1]
      #* Seabed Image         [1] [1]
      #* Central Beams        [1] [0]
      #* Position             [1] [1]
      #* Attitude             [1] [1]
      #* Heading              [1] [1]
      #* Height               [1] [1]
      #* Clock                [1] [1]
      #* Single beam echosoun [1] [1]
      #* Sound Speed Profile  [0] [1]
      #* Runtime Parameters   [0] [1]
      #* Installation Paramet [0] [1]
      #* BIST Reply           [1] [1]
      #* Status parameters    [0] [1]
      #* PU Broadcast         [1] [0]
      #* Stave Display        [0] [1]
      #* Water Column         [0] [1]
      #* Internal, Range Data [1] [0]
      #* Internal, Scope Data [1] [0]
    #} Datagram subscription

  #} Host UDP2


  #{ Host UDP3 #// Host UDP3 Port: 16102

    #{ Datagram subscription #//
      #* Depth                [0] [1]
      #* Raw range and beam a [0] [0]
      #* Seabed Image         [0] [0]
      #* Central Beams        [0] [0]
      #* Position             [0] [0]
      #* Attitude             [0] [1]
      #* Heading              [0] [0]
      #* Height               [0] [1]
      #* Clock                [0] [0]
      #* Single beam echosoun [0] [1]
      #* Sound Speed Profile  [0] [1]
      #* Runtime Parameters   [0] [0]
      #* Installation Paramet [0] [1]
      #* BIST Reply           [0] [0]
      #* Status parameters    [0] [0]
      #* PU Broadcast         [0] [0]
      #* Stave Display        [0] [0]
      #* Water Column         [0] [0]
      #* Internal, Range Data [0] [0]
      #* Internal, Scope Data [0] [1]
    #} Datagram subscription

  #} Host UDP3


  #{ Host UDP4 #// Host UDP4 Port 16103

    #{ Datagram subscription #//
      #* Depth                [1] [1]
      #* Raw range and beam a [1] [0]
      #* Seabed Image         [1] [0]
      #* Central Beams        [1] [0]
      #* Position             [1] [1]
      #* Attitude             [1] [0]
      #* Heading              [1] [0]
      #* Height               [1] [0]
      #* Clock                [1] [0]
      #* Single beam echosoun [1] [0]
      #* Sound Speed Profile  [1] [1]
      #* Runtime Parameters   [1] [1]
      #* Installation Paramet [1] [0]
      #* BIST Reply           [1] [0]
      #* Status parameters    [1] [0]
      #* PU Broadcast         [1] [0]
      #* Stave Display        [1] [0]
      #* Water Column         [1] [0]
      #* Internal, Range Data [1] [0]
      #* Internal, Scope Data [1] [0]
    #} Datagram subscription

  #} Host UDP4


  #{ Watercolumn #// Host UDP4 Port 16103
```

```
    #{ Datagram subscription #//
      #* Depth                [1] [0]
      #* Raw range and beam a [1] [0]
      #* Seabed Image         [1] [0]
      #* Central Beams        [1] [0]
      #* Position             [1] [1]
      #* Attitude             [1] [1]
      #* Heading              [1] [1]
      #* Height               [1] [0]
      #* Clock                [1] [0]
      #* Single beam echosoun [1] [0]
      #* Sound Speed Profile  [1] [1]
      #* Runtime Parameters   [1] [1]
      #* Installation Paramet [1] [1]
      #* BIST Reply           [1] [0]
      #* Status parameters    [1] [0]
      #* PU Broadcast         [1] [0]
      #* Stave Display        [1] [0]
      #* Water Column         [1] [1]
      #* Internal, Range Data [1] [0]
      #* Internal, Scope Data [1] [0]
    #} Datagram subscription

  #} Watercolumn

#} Output Setup

#{ Clock Setup #// All Clock setup parameters

  #{ Clock #// All clock settings.
    #* Source:              [1] #// External ZDA Clock
    #* 1PPS Clock Synch.    [1] [1]
    #* Offset (sec.):       [0]
  #} Clock

#} Clock Setup

#{ Settings #// Sensor setup parameters

  #{ Positioning System Settings #// Position related settings.

    #{ COM1 #// Positioning System Ports:
      #* P1S                 [1] #// Serial
      #* P1T                 [1] #// Datagram
      #* P1M                 [0] #// Enable position motion correction
      #* P1D                 [0.000] #// Position delay (sec.):
      #* P1G                 [WGS84] #// Datum:
      #* P1Q                 [1] #// Enable
      #* Pos. qual. indicator [] #//
    #} COM1

  #} Positioning System Settings

  #{ Motion Sensor Settings #// Motion related settings.

    #{ COM2 #// Motion Sensor Ports:
      #* MRP                 [RP] #// Rotation (POSMV/MRU)
      #* MSD                 [0] #// Motion Delay (msec.):
      #* MAS                 [1.00] #// Motion Sensor Roll Scaling:
    #} COM2

  #} Motion Sensor Settings

  #{ Active Sensors #//
    #* APS                 [0] [COM1] #// Position:
    #* ARO                 [2] [COM2] #// Motion:
    #* AHE                 [2] [COM2] #// Motion:
    #* AHS                 [3] [COM3] #// Heading:
  #} Active Sensors

#} Settings

#{ Locations #// All location parameters

  #{ Location offset (m) #//

    #{ Pos, COM1: #//
      #* P1X                 [0.00] #// Forward (X)
      #* P1Y                 [0.00] #// Starboard (Y)
      #* P1Z                 [0.00] #// Downward (Z)
    #} Pos, COM1:

    #{ Pos, COM3: #//
      #* P2X                 [0.00] #// Forward (X)
      #* P2Y                 [0.00] #// Starboard (Y)
      #* P2Z                 [0.00] #// Downward (Z)
    #} Pos, COM3:

    #{ Pos, COM4/UDP2: #//
      #* P3X                 [0.00] #// Forward (X)
      #* P3Y                 [0.00] #// Starboard (Y)
      #* P3Z                 [0.00] #// Downward (Z)
    #} Pos, COM4/UDP2:

    #{ TX Transducer: #//
      #* S1X                 [6.147] #// Forward (X)
      #* S1Y                 [1.822] #// Starboard (Y)
      #* S1Z                 [6.796] #// Downward (Z)
    #} TX Transducer:

    #{ RX Transducer: #//
      #* S2X                 [2.497] #// Forward (X)
      #* S2Y                 [2.481] #// Starboard (Y)
      #* S2Z                 [6.790] #// Downward (Z)
    #} RX Transducer:

    #{ Attitude 1, COM2: #//
      #* MSX                 [0.00] #// Forward (X)
      #* MSY                 [0.00] #// Starboard (Y)
      #* MSZ                 [0.00] #// Downward (Z)
    #} Attitude 1, COM2:

    #{ Attitude 2, COM3: #//
      #* NSX                 [0.00] #// Forward (X)
      #* NSY                 [0.00] #// Starboard (Y)
      #* NSZ                 [0.00] #// Downward (Z)
    #} Attitude 2, COM3:

    #{ Waterline: #//
      #* WLZ                 [1.838] #// Downward (Z)
    #} Waterline:

  #} Location offset (m)

#} Locations

#{ Angular Offsets #// All angular offset parameters

  #{ Offset angles (deg.) #//

    #{ TX Transducer: #//
      #* S1R                 [0.00] #// Roll
      #* S1P                 [0.00] #// Pitch
      #* S1H                 [359.98] #// Heading
    #} TX Transducer:

    #{ RX Transducer: #//
      #* S2R                 [0.00] #// Roll
```

```
    #* S2P            [0.00] #// Pitch
    #* S2H            [0.03] #// Heading
  #} RX Transducer:

  #{ Attitude 1, COM2: #//
    #* MSR            [0.00] #// Roll
    #* MSP            [-0.725] #// Pitch
    #* MSG            [0.00] #// Heading
  #} Attitude 1, COM2:

  #{ Attitude 2, COM3: #//
    #* NSR            [0.00] #// Roll
    #* NSP            [0.00] #// Pitch
    #* NSG            [0.00] #// Heading
  #} Attitude 2, COM3:

  #{ Stand-alone Heading: #//
    #* GCG            [0.00] #// Heading
  #} Stand-alone Heading:

 #} Offset angles (deg.)

#} Angular Offsets

#{ ROV. Specific #// All ROV specific parameters

 #{ Depth/Pressure Sensor #//
  #* DSF            [1.00] #// Scaling:
  #* DSO            [0.00] #// Offset:
  #* DSD            [0.00] #// Delay (msec.):
  #* DSH            [NI] #// Disable Heave Sensor
 #} Depth/Pressure Sensor

#} ROV. Specific

#{ System Parameters #// All system parameters

 #{ System Gain Offset #//
  #* GO1            [0.0] #// BS Offset (dB)
 #} System Gain Offset

 #{ Opening angles #//
  #* S1S            [0] #// TX Opening angle:
  #* S2S            [1] #// RX Opening angle:
 #} Opening angles

#} System Parameters

#// ***********************************************************************
#// Runtime parameters


#{ Sounder Main #//

 #{ Sector Coverage #//

  #{ Max. angle (deg.): #//
   #* MPA            [65] #// Port
   #* MSA            [65] #// Starboard
  #} Max. angle (deg.):

  #{ Max. Coverage (m): #//
   #* MPC            [5000] #// Port
   #* MSC            [5000] #// Starboard
  #} Max. Coverage (m):

  #* ACM            [1] #// Angular Coverage mode: AUTO
  #* BSP            [2] #// Beam Spacing: HIDENS EQDIST

 #} Sector Coverage

 #{ Depth Settings #//
  #* FDE            [1500] #// Force Depth (m):
  #* MID            [100] #// Min. Depth (m):
  #* MAD            [2500] #// Max. Depth (m):
  #* DSM            [2] #// Dual swath mode: DYNAMIC
  #* PMO            [3] #// Ping Mode: MEDIUM
  #* FME            [1] #// FM disable
 #} Depth Settings

 #{ Stabilization #//
#// For EM122, EM302, EM710, EM2040 this block is now called
Transmit Control in GUI.
  #* YPS            [1] #// Pitch stabilization
  #* TXA            [0] #// Along Direction (deg.):

  #{ Yaw Stabilization #//
   #* YSM            [2] #// Mode: REL. MEAN HEADING
   #* YMA            [300] #// Heading:
   #* HFI            [1] #// Heading filter: MEDIUM
  #} Yaw Stabilization

 #} Stabilization
#} Sounder Main

#{ Sound Speed #//

 #{ Sound Speed at Transducer #//
  #* SHS            [0] #// Source SENSOR
  #* SST            [14700] #// Sound Speed (dm/sec.):
  #* Sensor Offset (m/sec [0] #//
  #* Filter (sec.):     [4] #//
 #} Sound Speed at Transducer

#} Sound Speed

#{ Filter and Gains #//

 #{ Filtering #//
  #* SFS            [2] #// Spike Filter Strength: MEDIUM
  #* PEF            [0] #// Penetration Filter Strength: OFF
  #* RGS            [1] #// Range Gate: NORMAL
  #* PHR            [1] #// Phase ramp: NORMAL
  #* SLF            [0] #// Slope
  #* AEF            [1] #// Aeration
  #* STF            [1] #// Sector Tracking
  #* IFF            [1] #// Interference
 #} Filtering

 #{ Absorption Coefficient #//
  #* Source:        [0] #// Salinity. Note: This is not a PU
parameter.
  #* ABC            [6.879] #// 31.5 kHz
 #} Absorption Coefficient

 #{ Normal incidence sector #//
  #* TCA            [6] #// Angle from nadir (deg.):
 #} Normal incidence sector


 #{ Mammal protection #//
  #* TXP            [0] #// TX power level (dB): Max.
  #* SSR            [5] #// Soft startup ramp time (min.):
 #} Mammal protection
#} Filter and Gains

#{ Data Cleaning #//
 #* Active rule:      [AUTOMATIC1] #//
```

```
#{ AUTOMATIC1 #//
  #* PingProc.maxPingCountRadius            [10]
  #* PingProc.radiusFactor                  [0.050000]
  #* PingProc.medianFactor                  [1.500000]
  #* PingProc.beamNumberRadius              [3]
  #* PingProc.sufficientPointCount          [40]
  #* PingProc.neighborhoodType               [Elliptical]
  #* PingProc.timeRule.use                  [false]
  #* PingProc.overhangRule.use              [false]
  #* PingProc.medianRule.use                [false]
  #* PingProc.medianRule.depthFactor        [0.050000]
  #* PingProc.medianRule.minPointCount      [6]
  #* PingProc.quantileRule.use              [false]
  #* PingProc.quantileRule.quantile         [0.100000]
  #* PingProc.quantileRule.scaleFactor      [6.000000]
  #* PingProc.quantileRule.minPointCount    [40]
  #* GridProc.minPoints                     [8]
  #* GridProc.depthFactor                   [0.200000]
  #* GridProc.removeTooFewPoints            [false]
  #* GridProc.surfaceFitting.surfaceDegree  [1]
  #* GridProc.surfaceFitting.tukeyConstant  [6.000000]
  #* GridProc.surfaceFitting.maxIteration   [10]
  #* GridProc.surfaceFitting.convCriterion  [0.010000]
  #* GridProc.surfaceDistanceDepthRule.use  [false]
  #* GridProc.surfaceDistanceDepthRule.depthFactor
[0.050000]
  #* GridProc.surfaceDistancePointRule.use  [false]
  #* GridProc.surfaceDistancePointRule.scaleFactor
[1.000000]
  #* GridProc.surfaceDistanceUnitRule.use   [false]
  #* GridProc.surfaceDistanceUnitRule.scaleFactor
[1.000000]
  #* GridProc.surfaceDistanceStDevRule.use  [false]
  #* GridProc.surfaceDistanceStDevRule.scaleFactor
[2.000000]
  #* GridProc.surfaceAngleRule.use          [false]
  #* GridProc.surfaceAngleRule.minAngle
[20.000000]
  #* SonarProc.use                          [false]
  #* SonarProc.gridSizeFactor               [4]
  #* SonarProc.mergerType                   [Average]
  #* SonarProc.interpolatorType             [TopHat]
  #* SonarProc.interpolatorRadius           [1]
  #* SonarProc.fillInOnly                   [true]
 #} AUTOMATIC1

 #{ Seabed Image Processing #//
  #* Seabed Image Process [1] [0]
 #} Seabed Image Processing
#} Data Cleaning

#{ Advanced param. #//
#} Advanced param.
```

Appendix E: EM 302 Built In System Test (BIST) Results

Saved: 2013.03.22 14:11:33

Sounder Type: 302, Serial no.: 101

Date Time Ser. No. BIST Result

2013.03.22 13:56:45.691 101 0 OK

Number of BSP67B boards: 2
BSP 1 Master 2.3 090702 4.3 070913 4.3 070913
BSP 1 Slave 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 2.3 090702 4.3 070913 4.3 070913
BSP 2 Slave 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

2013.03.22 13:56:48.574 101 1 OK

High Voltage Br. 1

TX36 Spec: 90.0 - 145.0
0-1 120.5
0-2 120.5
0-3 119.7
0-4 120.1
0-5 120.1
0-6 119.3
0-7 120.1
0-8 118.8
0-9 120.1
0-10 120.5
0-11 120.5
0-12 118.8
0-13 120.5
0-14 120.1
0-15 120.9
0-16 120.5
0-17 119.7
0-18 120.5
0-19 119.7
0-20 119.7
0-21 119.7
0-22 120.5
0-23 119.3
0-24 120.1

High Voltage Br. 2

TX36 Spec: 90.0 - 145.0
0-1 120.1
0-2 120.1
0-3 119.7
0-4 119.3
0-5 119.3
0-6 119.7
0-7 119.3
0-8 119.3
0-9 120.1
0-10 120.1
0-11 119.7
0-12 120.9
0-13 118.9
0-14 120.5
0-15 120.5
0-16 120.5
0-17 119.7
0-18 120.1
0-19 119.7
0-20 120.1
0-21 120.5
0-22 120.5
0-23 119.7
0-24 119.7

Input voltage 12V

TX36 Spec: 11.0 - 13.0
0-1 11.9
0-2 11.9
0-3 11.9
0-4 11.9
0-5 11.9
0-6 11.9
0-7 11.9

0-8 11.9
0-9 11.9
0-10 11.9
0-11 11.9
0-12 11.9
0-13 12.0
0-14 11.9
0-15 11.9
0-16 12.0
0-17 11.9
0-18 11.9
0-19 11.9
0-20 11.9
0-21 11.9
0-22 11.9
0-23 11.8
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 26.0
0-2 26.0
0-3 26.8
0-4 26.4
0-5 26.4
0-6 26.8
0-7 27.2
0-8 27.6
0-9 27.2
0-10 24.8
0-11 24.8
0-12 24.8
0-13 26.0
0-14 28.0
0-15 26.4
0-16 26.4
0-17 26.8
0-18 27.2
0-19 26.4
0-20 26.4
0-21 26.4
0-22 26.0
0-23 26.4
0-24 26.0

Input Current 12V

TX36 Spec: 0.3 - 1.5
0-1 0.6
0-2 0.5
0-3 0.5
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 0.6
0-12 0.6
0-13 0.6
0-14 0.6
0-15 0.6
0-16 0.5
0-17 0.8
0-18 0.7
0-19 0.6
0-20 0.6
0-21 0.6
0-22 0.5
0-23 0.5
0-24 0.6

TX36 power test passed

IO TX MB Embedded PPC Embedded
PPC Download
2.11 One CPU1.13 Reduced Performance: 1
voice/Mar 5 2007/1.07 Jun 17 2008/1.11

TX36 unique firmware test OK

2013.03.22 13:56:48.757 101 2 OK

Input voltage 12V

RX32   Spec: 11.0 - 13.0
7-1   11.6
7-2   11.7
7-3   11.7
7-4   11.7

Input voltage 6V

RX32   Spec: 5.0 - 7.0
7-1   5.7
7-2   5.7
7-3   5.7
7-4   5.7

Digital 3.3V

RX32   Spec: 2.8 - 3.5
7-1   3.3
7-2   3.3
7-3   3.3
7-4   3.3

Digital 2.5V

RX32   Spec: 2.4 - 2.6
7-1   2.5
7-2   2.5
7-3   2.4
7-4   2.4

Digital 1.5V

RX32   Spec: 1.4 - 1.6
7-1   1.5
7-2   1.5
7-3   1.5
7-4   1.5

Temperature

RX32   Spec: 15.0 - 75.0
7-1   31.0
7-2   32.0
7-3   32.0
7-4   29.0

Input Current 12V

RX32   Spec: 0.4 - 1.5
7-1   0.8
7-2   0.7
7-3   0.7
7-4   0.7

Input Current 6V

RX32   Spec: 2.4 - 3.3
7-1   2.7
7-2   2.8
7-3   2.9
7-4   2.8

RX32   power test passed

IO   RX   MB Embedded   PPC Embedded
PPC Download
1.12 Generic1.14 GenericMay 5 2006/1.06
May 5 2006/1.07 Feb 18 2010/1.11

RX32 unique firmware test OK

2013.03.22 13:56:48.891 101   3   OK

High Voltage Br. 1

TX36   Spec: 90.0 - 145.0
0-1   120.5
0-2   120.5
0-3   120.1
0-4   120.1
0-5   120.1
0-6   119.3
0-7   120.1
0-8   118.8
0-9   119.7
0-10   120.5
0-11 120.5
0-12 119.3
0-13 120.5
0-14 120.1
0-15 120.9
0-16 120.5
0-17 119.7
0-18 120.5
0-19 119.7
0-20 120.1
0-21 119.7
0-22 120.5
0-23 119.3
0-24 120.1

High Voltage Br. 2

TX36   Spec: 90.0 - 145.0
0-1   120.1
0-2   120.1
0-3   119.7
0-4   119.3
0-5   119.7
0-6   119.7
0-7   119.3
0-8   119.3
0-9   120.1
0-10   120.1
0-11 119.7
0-12 120.9
0-13 118.9
0-14 120.5
0-15 120.5
0-16 120.5
0-17 119.7
0-18 120.1
0-19 119.7
0-20 120.1
0-21 120.5
0-22 120.5
0-23 119.7
0-24 120.1

Input voltage 12V

TX36   Spec: 11.0 - 13.0
0-1   11.9
0-2   11.9
0-3   11.9
0-4   11.9
0-5   11.9
0-6   11.9
0-7   11.9
0-8   11.9
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   12.0
0-17   11.9
0-18   11.9
0-19   11.9
0-20   11.9
0-21   11.9
0-22   11.9
0-23   11.8
0-24   11.9

RX32   Spec: 11.0 - 13.0
7-1   11.6
7-2   11.7
7-3   11.7
7-4   11.7

Input voltage 6V

RX32 Spec: 5.0 - 7.0
7-1 5.7
7-2 5.7
7-3 5.7
7-4 5.7

TRU power test passed

2013.03.22 13:56:49.074 101 4 OK

EM 302 High Voltage Ramp Test
Test Voltage:20.00 Measured Voltage: 19.00 PASSED
Test Voltage:40.00 Measured Voltage: 39.00 PASSED
Test Voltage:60.00 Measured Voltage: 59.00 PASSED
Test Voltage:80.00 Measured Voltage: 79.00 PASSED
Test Voltage:100.00 Measured Voltage: 100.00 PASSED
Test Voltage:120.00 Measured Voltage: 121.00 PASSED
Test Voltage:120.00 Measured Voltage: 120.00 PASSED
Test Voltage:100.00 Measured Voltage: 106.00 PASSED
Test Voltage:80.00 Measured Voltage: 85.00 PASSED
Test Voltage:60.00 Measured Voltage: 65.00 PASSED
Test Voltage:40.00 Measured Voltage: 45.00 PASSED

11 of 11 tests OK

2013.03.22 13:59:22.934 101 5 OK

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

2013.03.22 13:59:28.418 101 6 OK

Receiver impedance limits [600.0 1000.0] ohm

Board	1	2	3	4
1:	862.5	847.5	813.6	848.3
2:	836.7	849.9	820.0	853.9
3:	817.1	843.3	845.3	819.4
4:	850.3	829.9	837.0	842.7
5:	849.0	837.5	783.2	845.8
6:	859.8	850.6	829.7	826.5
7:	837.4	848.6	826.1	840.1
8:	845.2	836.4	847.9	733.6
9:	840.5	842.4	822.5	865.6
10:	824.2	855.9	784.1	833.9
11:	842.5	830.6	833.6	850.8
12:	850.4	817.6	835.1	853.2
13:	846.6	830.7	813.6	829.4
14:	827.8	833.8	853.5	841.7
15:	827.0	842.8	846.5	821.0
16:	853.7	822.9	846.0	877.4
17:	826.6	881.4	845.0	854.8
18:	850.2	827.5	851.7	823.9
19:	816.8	834.2	828.4	836.3
20:	831.2	870.1	842.9	849.1
21:	859.8	834.7	872.8	875.6
22:	877.1	845.3	826.7	822.3
23:	870.6	860.9	847.2	854.3
24:	881.3	883.1	865.7	850.0
25:	845.7	834.3	836.8	867.0
26:	845.9	821.9	845.3	849.0
27:	830.0	833.9	839.6	851.1
28:	818.6	833.3	812.0	835.1
29:	817.2	846.9	832.7	838.0
30:	856.3	822.3	843.3	0.0*
31:	830.8	820.4	844.9	854.6
32:	852.5	870.7	853.0	867.7

Transducer impedance limits [250.0 2000.0] ohm

Board	1	2	3	4
1:	337.6	358.1	359.1	360.5
2:	352.7	361.4	367.3	358.5
3:	340.9	339.5	390.2	374.6
4:	345.9	356.8	408.4	359.2
5:	332.0	358.6	391.3	355.8
6:	328.1	351.9	356.1	392.3
7:	345.4	347.1	389.2	372.6
8:	331.9	345.4	362.7	421.0
9:	366.8	363.0	370.9	358.2
10:	364.1	347.6	389.4	350.3
11:	333.5	360.7	364.5	359.0
12:	362.6	367.0	369.0	353.0
13:	340.1	354.0	386.9	368.3
14:	370.2	346.6	382.2	355.1
15:	337.2	339.3	368.3	351.0
16:	340.2	357.3	377.4	361.7
17:	334.5	365.5	345.5	365.4
18:	342.1	363.8	372.2	384.9
19:	354.3	367.5	369.7	385.9
20:	355.7	349.8	375.7	352.7
21:	356.6	368.5	363.4	363.8
22:	359.0	367.6	368.9	524.2
23:	363.6	346.3	362.3	599.6
24:	389.0	373.0	406.8	403.2
25:	416.0	463.5	439.9	449.8
26:	438.4	562.5	530.6	449.6
27:	399.7	461.2	529.5	378.5
28:	474.5	564.2	488.0	427.3
29:	391.7	410.4	499.0	459.7
30:	348.8	375.0	352.4	0.0*
31:	382.0	419.2	479.6	433.2
32:	350.6	371.7	467.5	383.2

Receiver Phase limits [-50.0 20.0] deg

Board	1	2	3	4
1:	-2.3	1.9	4.4	-2.5
2:	0.9	-2.7	3.2	-5.6
3:	3.9	-2.0	-0.9	1.7
4:	-1.7	2.0	0.8	-3.4
5:	-0.9	1.2	6.7	-1.0
6:	-3.8	-2.7	-0.1	1.7
7:	1.9	-0.7	3.5	-1.3
8:	-1.6	0.6	-3.5	14.0
9:	-0.5	1.8	3.0	-4.0
10:	2.8	-3.7	6.6	-2.5
11:	-2.5	2.2	-1.8	-1.5
12:	-1.1	2.6	-1.5	-3.5
13:	0.5	1.2	4.0	2.2
14:	2.6	0.0	-1.0	-1.8
15:	1.0	-3.9	-1.9	1.6
16:	-2.3	3.0	-1.9	-8.0
17:	0.9	-4.4	-2.0	-1.4
18:	-3.2	4.0	-2.9	1.9
19:	2.4	2.3	-1.4	0.8
20:	2.2	-4.0	-0.8	-0.5
21:	-0.2	3.2	-4.5	-4.3
22:	-1.6	-1.4	1.9	1.5
23:	0.2	-3.3	-0.1	-1.7
24:	-2.2	-4.3	-3.6	-2.9
25:	-0.8	2.0	1.0	-5.7
26:	-0.9	5.1	-3.3	-3.2
27:	1.7	-1.1	-0.5	-5.2
28:	5.4	-1.0	1.9	-0.4
29:	3.0	1.5	0.8	0.8
30:	-2.6	1.8	-1.9	40.5*
31:	1.4	2.8	-1.5	-0.2
32:	-2.6	-4.1	-2.8	-6.2

Transducer Phase limits [-100.0 0.0] deg

Board	1	2	3	4
1:	-37.5	-39.9	-37.9	-45.8
2:	-38.3	-40.3	-35.5	-49.9
3:	-34.4	-44.2	-37.6	-44.7
4:	-40.1	-37.5	-41.4	-40.9
5:	-40.5	-42.2	-41.6	-41.2
6:	-39.0	-37.4	-37.9	-38.8
7:	-37.5	-41.9	-37.7	-41.2

8: -39.3 -43.4 -45.4 -37.6
9: -41.0 -37.7 -39.3 -45.6
10: -43.5 -40.2 -31.7 -40.0
11: -40.6 -41.0 -44.9 -42.2
12: -37.6 -37.5 -47.9 -42.3
13: -38.7 -44.1 -34.9 -44.6
14: -38.7 -45.3 -38.8 -41.6
15: -33.2 -48.6 -40.8 -33.3
16: -41.3 -43.2 -39.7 -38.4
17: -31.2 -40.4 -45.1 -39.6
18: -36.1 -37.7 -42.6 -40.9
19: -38.6 -39.7 -40.2 -42.9
20: -35.6 -43.4 -45.9 -43.1
21: -36.6 -41.1 -38.8 -44.5
22: -38.2 -42.1 -33.2 -41.8
23: -38.4 -46.9 -38.5 -34.1
24: -41.7 -41.0 -48.3 -41.0
25: -36.0 -43.1 -48.3 -46.7
26: -49.5 -39.9 -38.5 -47.8
27: -37.4 -45.5 -40.4 -50.4
28: -42.2 -41.4 -47.0 -47.5
29: -41.6 -51.0 -44.4 -44.4
30: -40.2 -46.3 -42.9 157.7*
31: -45.1 -47.9 -40.6 -39.0
32: -46.2 -46.8 -46.9 -46.1
Rx Channels test passed

2013.03.22 13:59:56.619 101 7 OK

Tx Channels test passed

2013.03.22 14:02:37.763 101 8 OK

RX NOISE LEVEL

Board No:	1	2	3	4	
0:	53.8	49.4	53.2	55.1	dB
1:	51.5	48.3	53.4	53.1	dB
2:	52.3	48.9	53.9	54.8	dB
3:	51.4	48.3	52.3	53.9	dB
4:	52.9	49.6	53.7	56.1	dB
5:	52.8	50.1	53.1	57.2	dB
6:	53.8	50.1	53.2	58.1	dB
7:	52.0	49.8	53.3	61.0	dB
8:	51.0	50.0	52.7	62.6	dB
9:	51.0	49.2	52.7	66.9	dB
10:	50.5	49.8	52.6	68.0	dB
11:	49.7	48.9	51.4	64.4	dB
12:	50.0	50.3	52.9	67.2	dB
13:	49.3	49.9	53.0	63.4	dB
14:	48.9	49.8	53.0	57.6	dB
15:	49.1	50.7	53.2	57.2	dB
16:	47.3	49.6	51.9	55.5	dB
17:	49.0	49.1	51.4	53.8	dB
18:	47.9	50.8	51.9	55.8	dB
19:	47.8	49.8	51.3	54.4	dB
20:	48.6	52.5	52.6	55.7	dB
21:	49.1	53.0	53.4	55.5	dB
22:	50.1	53.5	52.9	55.0	dB
23:	49.4	54.4	54.1	54.8	dB
24:	48.3	52.1	55.7	54.9	dB
25:	49.1	54.4	57.5	54.5	dB
26:	49.0	53.7	56.3	54.9	dB
27:	48.3	52.2	54.4	53.9	dB
28:	49.3	53.9	55.5	54.9	dB
29:	48.7	53.8	54.7	61.7	dB
30:	48.7	54.1	54.2	54.7	dB
31:	49.0	54.9	54.2	55.1	dB

Maximum noise at Board 4 Channel 10 Level: 68.0 dB

Broadband noise test

Average noise at Board 1 50.4 dB OK
Average noise at Board 2 51.6 dB OK
Average noise at Board 3 53.7 dB OK
Average noise at Board 4 60.3 dB OK

2013.03.22 14:02:44.630 101 9 OK

RX NOISE SPECTRUM

Board No:	1	2	3	4	
26.1 kHz:	49.5	63.7	49.6	64.6	dB
26.3 kHz:	48.3	64.0	49.5	58.5	dB
26.5 kHz:	48.8	64.4	50.2	58.0	dB
26.7 kHz:	49.1	65.2	50.6	58.3	dB
26.9 kHz:	48.9	66.3	50.5	57.3	dB
27.1 kHz:	49.5	66.9	51.1	56.1	dB
27.3 kHz:	50.5	67.4	51.2	54.9	dB
27.5 kHz:	50.8	67.8	51.1	54.7	dB
27.7 kHz:	50.4	68.9	51.3	54.9	dB
27.9 kHz:	50.6	70.3	51.4	57.2	dB
28.1 kHz:	49.6	72.0	51.7	57.4	dB
28.3 kHz:	50.8	73.7	52.3	56.3	dB
28.5 kHz:	51.1	75.4	51.3	56.9	dB
28.7 kHz:	51.2	76.5	51.6	57.3	dB
28.9 kHz:	51.7	77.0	51.8	55.4	dB
29.1 kHz:	51.7	76.9	52.9	55.2	dB
29.3 kHz:	50.8	76.5	52.8	55.0	dB
29.5 kHz:	51.4	75.9	53.1	55.1	dB
29.7 kHz:	50.1	75.2	52.0	53.8	dB
29.9 kHz:	50.1	74.6	51.8	53.9	dB
30.1 kHz:	50.3	74.0	51.3	52.3	dB
30.3 kHz:	49.5	73.4	51.7	52.2	dB
30.5 kHz:	49.7	72.6	51.7	52.3	dB
30.7 kHz:	49.4	71.8	52.0	52.6	dB
30.9 kHz:	48.5	71.3	51.6	53.2	dB
31.1 kHz:	49.2	70.9	51.8	53.3	dB
31.4 kHz:	49.3	70.3	51.9	52.0	dB
31.6 kHz:	49.1	69.7	52.7	54.9	dB
31.8 kHz:	51.3	68.9	54.6	56.8	dB
32.0 kHz:	49.9	68.5	52.7	54.8	dB
32.2 kHz:	49.2	68.2	52.4	53.1	dB
32.4 kHz:	49.2	67.9	51.4	51.9	dB
32.6 kHz:	49.1	67.0	51.8	52.7	dB
32.8 kHz:	48.8	66.4	51.7	54.8	dB
33.0 kHz:	48.8	65.9	51.1	53.8	dB
33.2 kHz:	48.1	65.8	51.4	52.8	dB
33.4 kHz:	47.6	65.2	50.9	54.1	dB
33.6 kHz:	48.6	64.3	51.2	54.1	dB

33.8 kHz: 47.4 63.2 50.7 53.4
dB
34.0 kHz: 46.7 62.7 50.6 52.6
dB

Maximum noise at Board 2 Frequency 28.9
kHz Level: 77.0 dB

Spectral noise test

Average noise at Board 1 49.8 dB OK
Average noise at Board 2 71.7 dB OK
Average noise at Board 3 51.7 dB OK
Average noise at Board 4 55.9 dB OK

2013.03.22 14:02:51.497 101 10
OK

CPU: KOM CP6011
Clock 1795 MHz
Die 27 oC (peak: 44 oC @ 2013-03-21 -
17:25:36)
Board 27 oC (peak: 38 oC @ 2013-03-21 -
17:21:18)
Core 1.36 V
3V3 3.28 V
12V 12.05 V
-12V -12.04 V
BATT 0.00 V
Primary network: 157.237.14.60:0xffff0000
Secondary network: 192.168.2.20:0xffffff00

2013.03.22 14:02:51.597 101 15
OK

EM 302

BSP67B Master: 2.2.3 090702
BSP67B Slave: 2.2.3 090702
CPU: 1.5.1 110322
DDS: 3.5.2 101013
RX32 version : Feb 18 2010 Rev 1.11
TX36 LC version : Jun 17 2008 Rev 1.11
VxWorks 5.5.1 Build 1.2/2-IX0100 May 16
2007, 11:31:17

Appendix F: Data Tables

EX-14-04 L1 Multibeam Data File Log										
MB LINE FILENAME	**DATE (UTC)**	**SVP FILE APPLIED**	**SOG (kt)**	**Heading**	**MIN LONG**	**MAX LONG**	**MIN LAT**	**MAX LAT**	**MIN TIME**	**MAX TIME**
0000_20140810_071646_EX1404L1_MB	8/10/2014	EX1404L1_CTD001_140810	6.03	045.005	069.589785W	069.499865W	39.692562N	39.752078N	2014-08-10 07:16:46.887	2014-08-10 07:28:39.889
0001_20140810_072830_EX1404L1_MB	8/10/2014	EX1404L1_CTD001_140810	8.62	346.85	069.594619W	069.499137W	39.726322N	39.806772N	2014-08-10 07:28:20.886	2014-08-10 07:58:39.894
0002_20140810_075830_EX1404L1_MB	8/10/2014	EX1404L1_XBT002_140810	8.82	347.067	069.608291W	069.522649W	39.795960N	39.875833N	2014-08-10 07:58:20.895	2014-08-10 08:28:41.401
0003_20140810_082831_EX1404L1_MB	8/10/2014	EX1404L1_XBT002_140810	9.02	347.059	069.622636W	069.558844W	39.869206N	39.939126N	2014-08-10 08:28:22.402	2014-08-10 08:55:09.908
0004_20140810_085500_EX1404L1_MB	8/10/2014	EX1404L1_XBT002_140810	8.39	358.336	069.624874W	069.588720W	39.929584N	39.958224N	2014-08-10 08:54:50.907	2014-08-10 09:05:30.416
0005_20140810_090520_EX1404L1_MB	8/10/2014	EX1404L1_XBT002_140810	8.90	166.792	069.621287W	069.556721W	39.861157N	39.944339N	2014-08-10 09:05:11.412	2014-08-10 09:35:33.918
0006_20140810_093524_EX1404L1_MB	8/10/2014	EX1404L1_XBT002_140810	9.08	167.769	069.607646W	069.521470W	39.785809N	39.873242N	2014-08-10 09:35:14.923	2014-08-10 10:05:34.926
0007_20140810_100525_EX1404L1_MB	8/10/2014	EX1404L1_XBT002_140810	8.86	166.754	069.594408W	069.500491W	39.722695N	39.803012N	2014-08-10 10:05:15.925	2014-08-10 10:31:33.434

0008_20140810_103124_EX1404L1_MB	8/10/2014	EX1404L1_XBT002_140810	6.81	164.251	069.578798W	069.495730W	39.691066N	39.748879N	2014-08-10 10:31:14.932	2014-08-10 10:45:22.936
0009_20140810_104513_EX1404L1_MB	8/10/2014	EX1404L1_XBT002_140810 and EX1404L1_XBT003_140810	4.46	346.446	069.588464W	069.498336W	39.726036N	39.766799N	2014-08-10 10:45:03.437	2014-08-10 11:15:23.444
0010_20140810_111514_EX1404L1_MB	8/10/2014	EX1404L1_XBT003_140810	4.76	347.454	069.595973W	069.507852W	39.764249N	39.805511N	2014-08-10 11:15:04.943	2014-08-10 11:45:25.450
0011_20140810_114515_EX1404L1_MB	8/10/2014	EX1404L1_XBT003_140810	4.90	346.899	069.605582W	069.521788W	39.802770N	39.845579N	2014-08-10 11:45:05.952	2014-08-10 12:15:21.459
0012_20140810_121512_EX1404L1_MB	8/10/2014	EX1404L1_XBT003_140810	5.01	347.02	069.613339W	069.539178W	39.841820N	39.886252N	2014-08-10 12:15:02.957	2014-08-10 12:45:21.965
0013_20140810_124512_EX1404L1_MB	8/10/2014	EX1404L1_XBT003_140810	5.07	347.312	069.621412W	069.563891W	39.881710N	39.926890N	2014-08-10 12:45:02.470	2014-08-10 13:15:23.472
0014_20140810_131513_EX1404L1_MB	8/10/2014	EX1404L1_XBT003_140810	5.08	346.381	069.622914W	069.585416W	39.922930N	39.941064N	2014-08-10 13:15:03.973	2014-08-10 13:25:19.975
0015_20140810_132510_EX1404L1_MB	8/10/2014	EX1404L1_XBT003_140810	6.03	166.246	069.630548W	069.585101W	39.918158N	39.957482N	2014-08-10 13:25:00.976	2014-08-10 13:55:20.982
0016_20140810_135511_EX1404L1_MB	8/10/2014	EX1404L1_XBT003_140810 and EX1404L1_XBT004_140810	8.72	167.204	069.619926W	069.515705W	39.764318N	39.926057N	2014-08-10 13:55:01.988	2014-08-10 14:59:19.000
0017_20140810_145909_EX1404L1_MB	8/10/2014	EX1404L1_XBT004_140810	9.05	173.38	069.588334W	069.498989W	39.696784N	39.782152N	2014-08-10 14:58:59.998	2014-08-10 15:22:08.007

0018_20140810_152158_EX1404L1_MB	8/10/2014	EX1404L1_XBT004_140810	9.15	315.912	069.594786W	069.514855W	39.689895N	39.748870N	2014-08-10 15:21:49.505	2014-08-10 15:29:32.007
0019_20140810_152923_EX1404L1_MB	8/10/2014	EX1404L1_XBT004_140810	9.03	347.867	069.617617W	069.518190W	39.722064N	39.814237N	2014-08-10 15:29:13.006	2014-08-10 16:02:12.516
0020_20140810_161309_EX1404L1_MB	8/10/2014	EX1404L1_XBT004_140810	8.58	347.369	069.632856W	069.553988W	39.828551N	39.942356N	2014-08-10 16:13:09.517	2014-08-10 16:58:39.530
0021_20140810_165830_EX1404L1_MB	8/10/2014	EX1404L1_XBT004_140810	8.37	348.28	069.634705W	069.602597W	39.937753N	39.954978N	2014-08-10 16:58:20.528	2014-08-10 17:04:24.029
0022_20140810_170424_EX1404L1_MB	8/10/2014	EX1404L1_XBT004_140810	8.07	102.886	069.634009W	069.569869W	39.941731N	39.970466N	2014-08-10 17:04:15.028	2014-08-10 17:24:26.535
0023_20140810_172416_EX1404L1_MB	8/10/2014	EX1404L1_XBT004_140810 & EX1404L1_XBT005_140810	8.71	167.148	069.584348W	069.472157W	39.726023N	39.947135N	2014-08-10 17:24:07.037	2014-08-10 18:55:05.060
0024_20140810_185505_EX1404L1_MB	8/10/2014	EX1404L1_XBT005_140810	9.05	020.868	069.549470W	069.411605W	39.697233N	39.782021N	2014-08-10 18:54:55.562	2014-08-10 19:34:52.071
0025_20140810_193443_EX1404L1_MB	8/10/2014	EX1404L1_XBT005_140810	8.98	256.73	069.637277W	069.494580W	39.690895N	39.775927N	2014-08-10 19:34:33.569	2014-08-10 20:14:40.082
0026_20140810_201430_EX1404L1_MB	8/10/2014	EX1404L1_XBT005_140810	8.29	354.592	069.685967W	069.598544W	39.692171N	39.789039N	2014-08-10 20:14:21.081	2014-08-10 20:37:20.583
0027_20140810_203710_EX1404L1_MB	8/10/2014	EX1404L1_XBT005_140810 and EX1404L1_XBT006_140810	8.76	076.193	069.644017W	069.487384W	39.729244N	39.815246N	2014-08-10 20:37:01.086	2014-08-10 21:22:27.095

0028_20140810_212217_EX1404L1_MB	8/10/2014	EX1404L1_XBT006_140810	8.40	256.868	069.521270W	069.450545W	39.756204N	39.818673N	2014-08-10 21:22:07.597	2014-08-10 21:33:14.598
0029_20140810_213305_EX1404L1_MB	8/10/2014	EX1404L1_XBT006_140810	8.96	255.776	069.647443W	069.491879W	39.729311N	39.816084N	2014-08-10 21:32:55.598	2014-08-10 22:16:35.609
0030_20140810_221625_EX1404L1_MB	8/10/2014	EX1404L1_XBT006_140810	8.92	239.497	069.719793W	069.622916W	39.702908N	39.789250N	2014-08-10 22:16:16.609	2014-08-10 22:39:13.140
0031_20140810_223903_EX1404L1_MB	8/10/2014	EX1404L1_XBT006_140810	8.94	194.261	069.746824W	069.663304W	39.703190N	39.757330N	2014-08-10 22:38:54.140	2014-08-10 22:45:20.142
0032_20140810_224520_EX1404L1_MB	8/10/2014	EX1404L1_XBT006_140810	9.14	182.307	069.750209W	069.663352W	39.659434N	39.716400N	2014-08-10 22:45:10.617	2014-08-10 23:07:39.145
0033_20140810_230730_EX1404L1_MB	8/10/2014	EX1404L1_XBT006_140810	7.95	247.215	069.754381W	069.666470W	39.619872N	39.684770N	2014-08-10 23:07:20.145	2014-08-10 23:19:16.621
0034_20140810_231907_EX1404L1_MB	8/10/2014	EX1404L1_XBT006_140810	7.90	003.194	069.752853W	069.664214W	39.656146N	39.699964N	2014-08-10 23:18:57.622	2014-08-10 23:37:13.627
0035_20140810_233714_EX1404L1_MB	8/11/2014	EX1404L1_XBT006_140810	2.09	326.066	069.752762W	069.663534W	39.675257N	39.744161N	2014-08-10 23:37:14.136	2014-08-11 00:19:27.637
0036_20140811_001927_EX1404L1_MB	8/11/2014	EX1404L1_XBT006_140810 & EX1404L1_XBT007_140811	7.99	048.29	069.755782W	069.603182W	39.692590N	39.807049N	2014-08-11 00:19:18.137	2014-08-11 01:07:55.152
0037_20140811_010755_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	7.66	072.418	069.627190W	069.531634W	39.749139N	39.820567N	2014-08-11 01:07:45.652	2014-08-11 01:31:56.657

0038_20140811_013147_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	7.72	334.855	069.592983W	069.512538W	39.773235N	39.835150N	2014-08-11 01:31:37.159	2014-08-11 01:38:43.164
0039_20140811_013834_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	7.86	250.541	069.624065W	069.534937W	39.761223N	39.832779N	2014-08-11 01:38:24.162	2014-08-11 01:59:12.171
0040_20140811_015903_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	7.06	340.222	069.658702W	069.582899W	39.760717N	39.827129N	2014-08-11 01:58:53.170	2014-08-11 02:07:35.166
0041_20140811_020725_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	7.62	073.67	069.633747W	069.551460W	39.776215N	39.844556N	2014-08-11 02:07:15.669	2014-08-11 02:29:28.171
0042_20140811_022918_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	7.88	322.731	069.595549W	069.525350W	39.792785N	39.860345N	2014-08-11 02:29:09.173	2014-08-11 02:38:24.178
0043_20140811_023815_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	7.73	249.074	069.591859W	069.562371W	39.799280N	39.854991N	2014-08-11 02:38:05.177	2014-08-11 02:40:40.179
0044_20140811_025649_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	6.39	339.004	069.663761W	069.592455W	39.788051N	39.849492N	2014-08-11 02:56:50.183	2014-08-11 03:05:31.684
0045_20140811_030522_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	7.48	072.135	069.642285W	069.547703W	39.800683N	39.869181N	2014-08-11 03:05:12.185	2014-08-11 03:30:48.189
0046_20140811_033039_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	7.41	170.803	069.596624W	069.530510W	39.818106N	39.870250N	2014-08-11 03:30:29.688	2014-08-11 03:37:43.192
0047_20140811_033743_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	8.10	252.432	069.640138W	069.552464W	39.800893N	39.869967N	2014-08-11 03:37:33.692	2014-08-11 04:01:26.699

0048_20140811_040117_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811	6.38	174.679	069.670849W	069.599694W	39.788379N	39.853000N	2014-08-11 04:01:07.698	2014-08-11 04:09:17.698
0049_20140811_040908_EX1404L1_MB	8/11/2014	EX1404L1_XBT007_140811 & EX1404L1_XBT008_140811	6.09	074.725	069.634771W	069.556152W	39.786844N	39.858557N	2014-08-11 04:08:58.198	2014-08-11 04:39:01.708
0050_20140811_043852_EX1404L1_MB	8/11/2014	EX1404L1_XBT008_140811	7.37	174.131	069.595693W	069.526941W	39.791562N	39.856914N	2014-08-11 04:38:42.208	2014-08-11 04:47:21.711
0051_20140811_044722_EX1404L1_MB	8/11/2014	EX1404L1_XBT008_140811	8.16	254.617	069.634426W	069.550124W	39.775688N	39.846302N	2014-08-11 04:47:12.212	2014-08-11 05:08:16.214
0052_20140811_050806_EX1404L1_MB	8/11/2014	EX1404L1_XBT008_140811	6.00	176.464	069.666894W	069.588949W	39.762709N	39.831274N	2014-08-11 05:07:56.715	2014-08-11 05:16:51.715
0053_20140811_051642_EX1404L1_MB	8/11/2014	EX1404L1_XBT008_140811	5.28	087.115	069.631233W	069.599577W	39.760045N	39.821441N	2014-08-11 05:16:32.714	2014-08-11 05:23:41.216
0054_20140811_052331_EX1404L1_MB	8/11/2014	EX1404L1_XBT008_140811	6.12	073.093	069.621312W	069.544292W	39.764316N	39.832738N	2014-08-11 05:23:22.217	2014-08-11 05:49:43.728
0055_20140811_054934_EX1404L1_MB	8/11/2014	EX1404L1_XBT008_140811	8.09	206.943	069.589837W	069.511125W	39.761342N	39.833436N	2014-08-11 05:49:24.725	2014-08-11 06:00:29.228
0056_20140811_060019_EX1404L1_MB	8/11/2014	EX1404L1_XBT008_140811	7.87	252.875	069.619163W	069.554408W	39.752389N	39.818556N	2014-08-11 06:00:09.731	2014-08-11 06:16:45.232
0057_20140811_061645_EX1404L1_MB	8/11/2014	EX1404L1_XBT008_140811 & EX1404L1_XBT009_140811	8.41	151.867	069.651142W	069.466163W	39.580744N	39.808724N	2014-08-11 06:16:36.231	2014-08-11 07:40:29.749

0058_20140811_074020_EX1404L1_MB	8/11/2014	EX1404L1_XBT009_140811	8.41	088.892	069.492837W	069.444158W	39.580379N	39.648608N	2014-08-11 07:40:10.750	2014-08-11 07:56:17.254
0059_20140811_075607_EX1404L1_MB	8/11/2014	EX1404L1_XBT009_140811	8.20	140.014	069.469672W	069.390070W	39.580367N	39.649298N	2014-08-11 07:55:57.754	2014-08-11 08:09:30.262
0060_20140811_080920_EX1404L1_MB	8/11/2014	EX1404L1_XBT009_140811	9.29	271.257	069.505101W	069.436746W	39.581874N	39.649326N	2014-08-11 08:09:10.762	2014-08-11 08:28:05.266
0061_20140811_082755_EX1404L1_MB	8/11/2014	EX1404L1_XBT009_140811	7.06	068.913	069.608068W	069.430468W	39.583503N	39.649168N	2014-08-11 08:27:46.265	2014-08-11 09:46:50.286
0062_20140811_094650_EX1404L1_MB	8/11/2014	EX1404L1_XBT009_140811	2.74	022.547	069.499849W	069.390047W	39.602396N	39.713922N	2014-08-11 09:46:41.285	2014-08-11 11:47:43.813
0063_20140812_004734_EX1404L1_MB	8/12/2014	EX1404L1_XBT0011_140812 & EX1404L1_XBT0012_140813	11.22	315.276	070.097382W	069.643715W	39.809127N	40.155873N	2014-08-12 00:47:34.513	2014-08-12 03:20:16.546
0064_20140812_033923_EX1404L1_MB	8/12/2014	EX1404L1_XBT0012_140812	10.95	324.41	070.210775W	070.147216W	40.193599N	40.256817N	2014-08-12 03:39:23.552	2014-08-12 04:04:32.558
0065_20140812_040433_EX1404L1_MB	8/12/2014	EX1404L1_XBT0012_140812	10.68	316.27	070.393038W	070.204688W	40.254703N	40.399427N	2014-08-12 04:04:23.063	2014-08-12 05:13:46.577
0066_20140812_051337_EX1404L1_MB	8/12/2014	EX1404L1_XBT0013_140812	10.71	316.381	070.568726W	070.389118W	40.396377N	40.535501N	2014-08-12 05:13:27.576	2014-08-12 06:18:23.091
0067_20140812_061823_EX1404L1_MB	8/12/2014	EX1404L1_XBT013_140812	10.84	313.857	070.867526W	070.565396W	40.533097N	40.745830N	2014-08-12 06:18:13.591	2014-08-12 08:06:21.619

0068_20140812_080611_EX1404L1_MB	8/12/2014	EX1404L1_XBT013_140812	11.37	312.175	071.067127W	070.864527W	40.743618N	40.877245N	2014-08-12 08:06:02.144	2014-08-12 09:10:11.634
0069_20140812_091002_EX1404L1_MB	8/12/2014	EX1404L1_XBT013_140812	11.52	312.572	071.068917W	071.064342W	40.874958N	40.878407N	2014-08-12 09:09:52.633	2014-08-12 09:10:36.140
0070_20140812_091036_EX1404L1_MB	8/12/2014	EX1404L1_XBT013_140812	11.45	314.206	071.289081W	071.066176W	40.876152N	41.032735N	2014-08-12 09:10:27.140	2014-08-12 10:22:37.653
0071_20140812_102325_EX1404L1_MB	8/12/2014	EX1404L1_XBT013_140812	11.39	319.869	071.334958W	071.289760W	41.033252N	41.070958N	2014-08-12 10:23:25.653	2014-08-12 10:39:14.159
0072_20140812_102325_EX1404L1_MB	8/12/2014	Line not processed								
0073_20140814_172134_EX1404L1_MB	8/14/2014	EX1404L1_XBT016_140814	11.18	119.743	071.004559W	070.615468W	40.776688N	40.938333N	2014-08-14 17:21:34.702	2014-08-14 19:21:44.227
0074_20140814_192134_EX1404L1_MB	8/14/2014	EX1404L1_XBT016_140814 & EX1404L1_XBT017_140814	11.14	108.864	070.616470W	070.153005W	40.663130N	40.779705N	2014-08-14 19:21:25.227	2014-08-14 21:21:43.760
0075_20140814_212134_EX1404L1_MB	8/14/2014	EX1404L1_XBT017_140814 and EX1404L1_XBT018_140814	10.64	109.786	070.153696W	069.714796W	40.546344N	40.665140N	2014-08-14 21:21:24.761	2014-08-14 23:21:34.787
0076_20140814_232135_EX1404L1_MB	8/14/2014	EX1404L1_XBT018_140814 and EX1404L1_XBT019_140814 and EX1404L1_XBT020_140815	10.29	109.061	069.715784W	069.290708W	40.436329N	40.549614N	2014-08-14 23:21:35.287	2014-08-15 01:21:44.813
0077_20140815_012135_EX1404L1_MB	8/15/2014	EX1404L1_XBT022_140815	10.11	110.195	069.291698W	068.878265W	40.320442N	40.439914N	2014-08-15 01:21:25.313	2014-08-15 03:21:44.842

0078_20140815_032135_EX1404L1_MB	8/15/2014	EX1404L1_XBT023_140815	10.38	112.265	068.880649W	068.459824W	40.181581N	40.324796N	2014-08-15 03:21:25.345	2014-08-15 05:21:45.377
0079_20140815_052136_EX1404L1_MB	8/15/2014	EX1404L1_XBT024_140815	9.93	111.963	068.467180W	068.050355W	40.036846N	40.197019N	2014-08-15 05:21:26.872	2014-08-15 07:21:40.402
0080_20140815_072140_EX1404L1_MB	8/15/2014	EX1404L1_XBT024_140815 & EX1404L1_XBT025_140815	10.65	111.749	068.080761W	067.622260W	39.901899N	40.092632N	2014-08-15 07:21:31.400	2014-08-15 09:21:45.435
0081_20140815_092135_EX1404L1_MB	8/15/2014	EX1404L1_XBT025_140815	10.74	094.834	067.659187W	067.218226W	39.822250N	39.953974N	2014-08-15 09:21:26.431	2014-08-15 11:21:52.458
0082_20140815_112142_EX1404L1_MB	8/15/2014	EX1404L1_XBT025_140815	8.61	103.536	067.239974W	067.172836W	39.853000N	39.929911N	2014-08-15 11:21:33.457	2014-08-15 11:37:30.464
0083_20140815_132143_EX1404L1_MB	8/15/2014	EX1404L1_XBT026_140815 & EX1404L1_XBT027_140815	8.45	087.497	066.865124W	066.499114W	39.808838N	39.889705N	2014-08-15 13:21:33.987	2014-08-15 15:21:48.516
0084_20140815_152139_EX1404L1_MB	8/15/2014	EX1404L1_XBT027_140815	8.15	088.979	066.498350W	066.139063W	39.812533N	39.893009N	2014-08-15 15:21:29.515	2014-08-15 17:21:53.045
0085_20140815_172143_EX1404L1_MB	8/15/2014	EX1404L1_XBT027_140815	5.37	093.118	066.166266W	066.080820W	39.812429N	39.886585N	2014-08-15 17:21:34.044	2014-08-15 17:33:24.551
0086_20140815_173315_EX1404L1_MB	8/15/2014	EX1404L1_XBT027_140815 & EX1404L1_XBT028_140815	6.77	158.943	066.171152W	066.066199W	39.813873N	39.860648N	2014-08-15 17:33:05.550	2014-08-15 17:47:41.558
0087_20140815_174732_EX1404L1_MB	8/15/2014	EX1404L1_XBT028_140815	7.15	159.572	066.159872W	066.032576W	39.724433N	39.831179N	2014-08-15 17:47:22.555	2014-08-15 18:30:16.063

0088_20140815_183006_EX1404L1_MB	8/15/2014	EX1404L1_XBT028_140815	5.29	117.861	066.116599W	066.032058W	39.705525N	39.771685N	2014-08-15 18:29:57.062	2014-08-15 18:37:10.570
0089_20140815_183701_EX1404L1_MB	8/15/2014	EX1404L1_XBT028_140815	7.87	117.346	066.092101W	065.806882W	39.601933N	39.769320N	2014-08-15 18:36:52.066	2014-08-15 20:14:10.090
0090_20140815_201400_EX1404L1_MB	8/15/2014	EX1404L1_XBT028_140815	6.51	147.465	065.867184W	065.771179W	39.598058N	39.660796N	2014-08-15 20:13:51.089	2014-08-15 20:26:51.095
0091_20140815_202641_EX1404L1_MB	8/15/2014	EX1404L1_XBT028_140815 & EX1404L1_XBT030_140815	7.93	149.292	065.853477W	065.614203W	39.367939N	39.629330N	2014-08-15 20:26:32.093	2014-08-15 22:26:55.624
0092_20140815_222646_EX1404L1_MB	8/15/2014	EX1404L1_XBT030_140815	7.45	148.848	065.685591W	065.517957W	39.229777N	39.394890N	2014-08-15 22:26:36.144	2014-08-15 23:37:08.639
0093_20140815_233659_EX1404L1_MB	8/15/2014	EX1404L1_XBT030_140815	3.83	024.632	065.599457W	065.520026W	39.222014N	39.287493N	2014-08-15 23:36:49.640	2014-08-15 23:46:11.143
0094_20140815_234601_EX1404L1_MB	8/15/2014	EX1404L1_XBT031_140815	8.07	068.633	065.569164W	065.219139W	39.226349N	39.386558N	2014-08-15 23:45:51.644	2014-08-16 01:46:06.671
0095_20140816_014606_EX1404L1_MB	Line not processed.									
0096_20140816_015400_EX1404L1_MB	8/16/2014	EX1404L1_XBT031_140816	7.43	068.606	065.220206W	065.189340W	39.316625N	39.391545N	2014-08-16 01:54:01.241	2014-08-16 01:56:32.742
0097_20140816_021506_EX1404L1_MB	8/16/2014	EX1404L1_XBT032_140816 & EX1404L1_XBT032_140816	7.22	165.823	065.201538W	065.056137W	39.137437N	39.399946N	2014-08-16 02:14:56.750	2014-08-16 04:15:12.277
0098_20140816_041502_EX1404L1_MB	8/16/2014	EX1404L1_XBT033_140816	7.51	166.019	065.131893W	064.998392W	38.888095N	39.146916N	2014-08-16	2014-08-16

									04:14:53.276	06:15:18.807
0099_20140816_061508_EX1404L1_MB	8/16/2014	EX1404L1_XBT034_140816 & EX1404L1_XBT035_140816	7.46	165.951	065.063431W	064.936137W	38.646330N	38.903456N	2014-08-16 06:14:59.310	2014-08-16 08:15:12.336
0100_20140816_081502_EX1404L1_MB	8/16/2014	EX1404L1_XBT035_140816	7.11	165.941	064.997999W	064.915734W	38.570599N	38.660024N	2014-08-16 08:14:53.335	2014-08-16 08:54:48.846
0101_20140816_085439_EX1404L1_MB	8/16/2014	EX1404L1_XBT035_140816	4.38	272.207	064.987518W	064.914165W	38.545107N	38.601991N	2014-08-16 08:54:29.844	2014-08-16 09:07:47.846
0102_20140816_090738_EX1404L1_MB	8/16/2014	EX1404L1_XBT036_140816	7.92	94	064.956473W	064.617928W	38.523010N	38.602548N	2014-08-16 09:07:28.847	2014-08-16 11:01:12.378
0103_20140816_110103_EX1404L1_MB	8/16/2014	EX1404L1_XBT036_140816	6.02	202	064.674404W	064.603199W	38.481302N	38.563936N	2014-08-16 11:00:53.377	2014-08-16 11:32:58.383
0104_20140816_113248_EX1404L1_MB	8/16/2014	EX1404L1_XBT036_140816	6.60	274	064.916618W	064.658991W	38.483019N	38.556509N	2014-08-16 11:32:39.383	2014-08-16 13:22:16.408
0105_20140816_133958_EX1404L1_MB	8/16/2014	EX1404L1_XBT036_140816 & EX1404L1_XBT037_140816	5.71	221	064.982045W	064.871096W	38.471179N	38.556713N	2014-08-16 13:39:58.909	2014-08-16 14:15:55.422
0106_20140816_141545_EX1404L1_MB	8/16/2014	EX1404L1_XBT037_140816	7.96	095.734	064.953188W	064.864436W	38.461004N	38.520409N	2014-08-16 14:15:36.423	2014-08-16 14:44:19.929
0107_20140816_155821_EX1404L1_MB	8/16/2014	EX1404L1_XBT037_140816	8.27	091.102	064.667655W	064.500747W	38.428363N	38.491054N	2014-08-16 15:58:21.546	2014-08-16 16:44:17.556
0108_20140816_164407_EX1404L1_MB	8/16/2014	EX1404L1_XBT037_140816	5.21	353.694	064.559294W	064.499940W	38.448182N	38.470881N	2014-08-16 16:43:58.057	2014-08-16 16:45:25.056

0109_20140816_203834_EX1404L1_MB	8/16/2014	EX1404L1_XBT037_140816 & EX1404L1_XBT038_140816	8.72	072.663	063.975511W	063.592359W	38.379457N	38.500357N	2014-08-16 20:38:34.091	2014-08-16 22:38:52.617
0110_20140816_223843_EX1404L1_MB	8/17/2014	EX1404L1_XBT038_140816 & EX1404L1_XBT039_140816 & EX1404L1_XBT040_140816	8.60	060.746	063.616703W	063.256229W	38.449831N	38.628771N	2014-08-16 22:38:43.145	2014-08-17 00:38:46.650
0111_20140817_003837_EX1404L1_MB	8/17/2014	EX1404L1_XBT040_140816	8.49	060.363	063.292179W	062.958853W	38.575486N	38.733105N	2014-08-17 00:38:28.147	2014-08-17 02:27:30.172
0112_20140817_022720_EX1404L1_MB	8/17/2014	EX1404L1_XBT041_140817	5.63	169.174	063.022825W	062.945857W	38.685727N	38.744188N	2014-08-17 02:27:11.175	2014-08-17 02:45:03.684
0113_20140817_024454_EX1404L1_MB	8/17/2014	EX1404L1_XBT041_140817	8.21	149.201	063.013345W	062.870125W	38.581431N	38.700132N	2014-08-17 02:44:44.683	2014-08-17 03:42:00.696
0114_20140817_034151_EX1404L1_MB	8/17/2014	EX1404L1_XBT041_140817	5.83							
0115_20140817_034210_EX1404L1_MB	8/17/2014	EX1404L1_XBT041_140817	7.20	067.12	062.938209W	062.865668W	38.551343N	38.609574N	2014-08-17 03:42:11.195	2014-08-17 03:48:10.198
0116_20140817_034800_EX1404L1_MB	8/17/2014	EX1404L1_XBT041_140817	7.99	061.903	062.920265W	062.816615W	38.569991N	38.632537N	2014-08-17 03:47:51.197	2014-08-17 04:07:58.703
0117_20140817_040749_EX1404L1_MB	8/17/2014	EX1404L1_XBT042_140817	8.19	150.765	062.884254W	062.666818W	38.345285N	38.606275N	2014-08-17 04:07:39.702	2014-08-17 06:07:57.734
0118_20140817_060748_EX1404L1_MB	8/17/2014	EX1404L1_XBT043_140817	8.28	148.978	062.735797W	062.504667W	38.098409N	38.365605N	2014-08-17 06:07:38.735	2014-08-17 08:08:00.765

0119_20140817_080751_EX1404L1_MB	8/17/2014	EX1404L1_XBT043_140817	8.36	151.186	062.581885W	062.465727W	38.048267N	38.117727N	2014-08-17 08:07:41.764	2014-08-17 08:33:00.271
0120_20140817_083250_EX1404L1_MB	8/17/2014	EX1404L1_XBT043_140817	7.23	249.613	062.583457W	062.470631W	38.013621N	38.083788N	2014-08-17 08:32:41.272	2014-08-17 08:55:03.277
0121_20140817_085453_EX1404L1_MB	8/17/2014	EX1404L1_XBT044_140817	8.05	327.382	062.719391W	062.528203W	38.029755N	38.282085N	2014-08-17 08:54:43.779	2014-08-17 10:38:20.307
0122_20140817_103810_EX1404L1_MB	8/17/2014	EX1404L1_XBT044_140817 & EX1404L1_XBT045_140817	7.10	220.27	062.720370W	062.664468W	38.217140N	38.265483N	2014-08-17 10:38:01.803	2014-08-17 10:38:42.804
0123_20140817_110153_EX1404L1_MB	8/17/2014	EX1404L1_XBT045_140817	8.22	149.57	062.754453W	062.553721W	37.988348N	38.220379N	2014-08-17 11:01:43.812	2014-08-17 12:47:11.838
0124_20140817_124712_EX1404L1_MB	8/17/2014	EX1404L1_XBT045_140817	8.21	032.244	062.634314W	062.549014W	37.966450N	38.038841N	2014-08-17 12:47:02.337	2014-08-17 13:09:29.342
0125_20140817_130919_EX1404L1_MB	8/17/2014	EX1404L1_XBT045_140817	8.75	058.576	062.582949W	062.429339W	37.994214N	38.096636N	2014-08-17 13:09:10.343	2014-08-17 13:52:43.853
0126_20140817_135234_EX1404L1_MB	8/17/2014	EX1404L1_XBT045_140817	6.97	284.723	062.490752W	062.409269W	38.032877N	38.097061N	2014-08-17 13:52:24.849	2014-08-17 14:02:42.355
0127_20140817_140233_EX1404L1_MB	8/17/2014	EX1404L1_XBT045_140817 & EX1404L1_XBT046_140817	8.37	329.913	062.651104W	062.421571W	38.050153N	38.335218N	2014-08-17 14:02:23.857	2014-08-17 16:02:48.384
0128_20140817_160238_EX1404L1_MB	8/17/2014	EX1404L1_XBT046_140817 & EX1404L1_XBT047_140817	8.50	329.87	062.703176W	062.568360W	38.296898N	38.425512N	2014-08-17 16:02:29.385	2014-08-17 16:48:41.397

0129_20140817_164832_EX1404L1_MB	8/17/2014	EX1404L1_XBT047_140817	8.77	057.777	062.710505W	062.604114W	38.396289N	38.460096N	2014-08-17 16:48:22.395	2014-08-17 17:05:41.901
0130_20140817_170532_EX1404L1_MB	8/17/2014	EX1404L1_XBT047_140817	8.12	149.374	062.662919W	062.437148W	38.184023N	38.448796N	2014-08-17 17:05:23.399	2014-08-17 19:05:46.934
0131_20140817_190537_EX1404L1_MB	8/17/2014	EX1404L1_XBT047_140817 & EX1404L1_XBT048_140817	8.31	149.149	062.509388W	062.272898W	37.930711N	38.196961N	2014-08-17 19:05:27.930	2014-08-17 21:05:44.963
132	8/17/2014									
0133_20140817_210535_EX1404L1_MB	8/17/2014	EX1404L1_XBT048_140817	8.89	149.147	062.352249W	062.163525W	37.739936N	37.955513N	2014-08-17 21:05:26.464	2014-08-17 22:33:07.484
0134_20140817_223258_EX1404L1_MB	8/17/2014	EX1404L1_XBT048_140817 & EX1404L1_XBT049_140817	7.37	217.377	062.226489W	062.161521W	37.718616N	37.769321N	2014-08-17 22:32:48.484	2014-08-17 22:37:01.983
0135_20140817_223652_EX1404L1_MB	8/17/2014	EX1404L1_XBT049_140817	7.30	249.034	062.243869W	062.192829W	37.708460N	37.769235N	2014-08-17 22:36:42.984	2014-08-17 22:51:55.991
0136_20140817_225146_EX1404L1_MB	8/17/2014	EX1404L1_XBT049_140817	6.64	316.28	062.268475W	062.211880W	37.708057N	37.759530N	2014-08-17 22:51:37.490	2014-08-17 22:55:22.488
0137_20140817_225522_EX1404L1_MB	8/18/2014	EX1404L1_XBT049_140817 & EX1404L1_XBT050_140817	7.83	329.049	062.420814W	062.214362W	37.726705N	37.987288N	2014-08-17 22:55:22.989	2014-08-18 00:55:30.019
0138_20140818_005520_EX1404L1_MB	8/18/2014	EX1404L1_XBT050_140817	7.94	329.076	062.456772W	062.361860W	37.958246N	38.045633N	2014-08-18 00:55:10.521	2014-08-18 01:25:33.027
0139_20140818_012523_EX1404L1_MB	8/18/2014	EX1404L1_XBT050_140817	7.56	309.403	062.497620W	062.402203W	38.006270N	38.076976N	2014-08-18 01:25:13.528	2014-08-18 01:46:42.034

0140_20140818_014632_EX1404L1_MB	8/18/2014	EX1404L1_XBT051_140818	8.04	330.043	062.643259W	062.433179W	38.046204N	38.291510N	2014-08-18 01:46:23.534	2014-08-18 03:33:09.061
0141_20140818_033259_EX1404L1_MB	8/18/2014	EX1404L1_XBT051_140818	8.21	343.632	062.652721W	062.555554W	38.267770N	38.322868N	2014-08-18 03:32:49.559	2014-08-18 03:46:23.064
0142_20140818_034613_EX1404L1_MB	8/18/2014	EX1404L1_XBT051_140818	7.46	329.253	062.739238W	062.570717W	38.283741N	38.468223N	2014-08-18 03:46:03.565	2014-08-18 05:07:29.084
0143_20140818_050719_EX1404L1_MB	8/18/2014	EX1404L1_XBT051_140818	8.43	064.047	062.742635W	062.582032W	38.435740N	38.515414N	2014-08-18 05:07:10.089	2014-08-18 05:42:24.597
0144_20140818_054215_EX1404L1_MB	8/18/2014	EX1404L1_XBT051_140818	7.78	147.519	062.645526W	062.425109W	38.246534N	38.494729N	2014-08-18 05:42:05.096	2014-08-18 07:42:29.626
0145_20140818_074220_EX1404L1_MB	8/18/2014	EX1404L1_XBT051_140818	7.74	149.061	062.498979W	062.271523W	38.016854N	38.264375N	2014-08-18 07:42:10.144	2014-08-18 09:42:24.658
0146_20140818_094215_EX1404L1_MB	8/18/2014	EX1404L1_XBT051_140818	7.95	149.025	062.347414W	062.197682W	37.907889N	38.036454N	2014-08-18 09:42:05.659	2014-08-18 10:36:00.670
0147_20140818_103551_EX1404L1_MB	8/18/2014	EX1404L1_XBT051_140818	7.96	067.303	062.287181W	062.159761W	37.879548N	37.952422N	2014-08-18 10:35:41.170	2014-08-18 10:56:29.674
0148_20140818_105620_EX1404L1_MB	8/18/2014	EX1404L1_XBT051_140818 & EX1404L1_XBT052_140818	7.11	329.114	062.370362W	062.162086W	37.912409N	38.159818N	2014-08-18 10:56:10.177	2014-08-18 12:56:36.704
0149_20140818_125626_EX1404L1_MB	8/18/2014	EX1404L1_XBT052_140818 & EX1404L1_XBT053_140818	7.27	329.176	062.516105W	062.306938W	38.121210N	38.375454N	2014-08-18 12:56:17.703	2014-08-18 14:56:39.234

0150_20140818_145629_EX1404L1_MB	8/18/2014	EX1404L1_XBT053_140818	7.28	329.277	062.562004W	062.431971W	38.341864N	38.472461N	2014-08-18 14:56:20.235	2014-08-18 15:49:52.748
0151_20140818_154943_EX1404L1_MB	8/18/2014	EX1404L1_XBT053_140818	8.63	073.203	062.573731W	062.453811W	38.439376N	38.503880N	2014-08-18 15:49:33.251	2014-08-18 16:12:22.260
0152_20140818_161212_EX1404L1_MB	8/18/2014	EX1404L1_XBT053_140818 & EX1404L1_XBT054_140818	7.86	149.285	062.518259W	062.292365W	38.221915N	38.475581N	2014-08-18 16:12:03.256	2014-08-18 18:12:16.784
0153_20140818_181206_EX1404L1_MB	8/18/2014	EX1404L1_XBT054_140818	7.65	149.169	062.380177W	062.157657W	38.007230N	38.243286N	2014-08-18 18:11:57.785	2014-08-18 20:06:15.316
0154_20140818_200605_EX1404L1_MB	8/18/2014	EX1404L1_XBT054_140818	6.45	043.523	062.228681W	062.157041W	37.988573N	38.038527N	2014-08-18 20:05:56.316	2014-08-18 20:13:26.818
0155_20140818_201317_EX1404L1_MB	8/18/2014	EX1404L1_XBT054_140818 & EX1404L1_XBT055_140818	6.20	332.85	062.239211W	062.165545W	38.006882N	38.065455N	2014-08-18 20:13:07.818	2014-08-18 20:34:30.324
0156_20140818_203420_EX1404L1_MB	8/18/2014	EX1404L1_XBT055_140818	5.37	185.266	062.255473W	062.172457W	38.028713N	38.075374N	2014-08-18 20:34:10.822	2014-08-18 20:40:06.826
0157_20140818_203957_EX1404L1_MB	8/18/2014	EX1404L1_XBT055_140818	6.82	155.886	062.247365W	062.163095W	38.014124N	38.048693N	2014-08-18 20:39:47.824	2014-08-18 20:54:43.829
0158_20140818_205434_EX1404L1_MB	8/18/2014	EX1404L1_XBT055_140818	7.89	149.464	062.233864W	062.039974W	37.808721N	38.030237N	2014-08-18 20:54:24.826	2014-08-18 22:38:25.356
0159_20140818_223815_EX1404L1_MB	8/18/2014	EX1404L1_XBT055_140818 & EX1404L1_XBT056_140818	5.80	244.05	062.143877W	062.044300W	37.773234N	37.838789N	2014-08-18 22:38:05.855	2014-08-18 23:02:54.860

0160_20140818_230245_EX1404L1_MB	8/18/2014	EX1404L1_XBT056_140818	6.49	328.999	062.237254W	062.087618W	37.790061N	37.953238N	2014-08-18 23:02:35.861	2014-08-19 00:22:27.879
0161_20140819_002228_EX1404L1_MB	8/19/2014	EX1404L1_XBT056_140818	6.97	232.29	062.283946W	062.177598W	37.880913N	37.963326N	2014-08-19 00:22:28.380	2014-08-19 00:43:09.887
0162_20140819_004300_EX1404L1_MB	8/19/2014	EX1404L1_XBT056_140818 & EX1404L1_XBT057_140819	8.10	149.242	062.283355W	062.119232W	37.758517N	37.923896N	2014-08-19 00:42:50.887	2014-08-19 01:50:55.906
0163_20140819_015046_EX1404L1_MB	8/19/2014	EX1404L1_XBT057_140819	5.06	072.384	062.168156W	062.126231W	37.747678N	37.803716N	2014-08-19 01:50:36.905	2014-08-19 01:54:45.402
0164_20140819_015436_EX1404L1_MB	8/19/2014	EX1404L1_XBT057_140819	7.19	059.177	062.164798W	062.004289W	37.754846N	37.849035N	2014-08-19 01:54:26.401	2014-08-19 02:47:59.416
0165_20140819_024749_EX1404L1_MB	8/19/2014	EX1404L1_XBT057_140819	4.29	341.477	062.057988W	061.989018W	37.807918N	37.843472N	2014-08-19 02:47:40.419	2014-08-19 02:54:47.421
0166_20140819_025438_EX1404L1_MB	8/19/2014	EX1404L1_XBT058_140819	6.88	328.992	062.188654W	061.989444W	37.821705N	38.050243N	2014-08-19 02:54:28.421	2014-08-19 04:54:48.452
0167_20140819_045439_EX1404L1_MB	8/19/2014	EX1404L1_XBT059_140819	7.15	329.114	062.330496W	062.117897W	38.020138N	38.259820N	2014-08-19 04:54:29.451	2014-08-19 06:54:51.481
0168_20140819_065442_EX1404L1_MB	8/19/2014	EX1404L1_XBT060_140819	6.74	329.085	062.446785W	062.249052W	38.237970N	38.464185N	2014-08-19 06:54:32.480	2014-08-19 08:54:50.015
0169_20140819_085440_EX1404L1_MB	8/19/2014	EX1404L1_XBT060_140819	6.38	329.116	062.484966W	062.390830W	38.435719N	38.524996N	2014-08-19 08:54:31.511	2014-08-19 09:32:00.521

0170_20140819_093151_EX1404L1_MB	8/19/2014	EX1404L1_XBT060_140819	4.54	042.165	062.496214W	062.419866W	38.487030N	38.542172N	2014-08-19 09:31:42.020	2014-08-19 09:41:52.028
0171_20140819_094142_EX1404L1_MB	8/19/2014	EX1404L1_XBT061_140819	6.87	239.629	062.670634W	062.443057W	38.406740N	38.537651N	2014-08-19 09:41:33.022	2014-08-19 11:16:06.548
0172_20140819_111556_EX1404L1_MB	8/19/2014	EX1404L1_XBT061_140819	7.31	332.852	062.719597W	062.632449W	38.402759N	38.494057N	2014-08-19 11:15:47.049	2014-08-19 11:40:21.050
0173_20140819_114011_EX1404L1_MB	8/19/2014	EX1404L1_XBT061_140819	8.64	060.099	062.697693W	062.420917W	38.449039N	38.588199N	2014-08-19 11:40:02.049	2014-08-19 13:09:10.075
0174_20140819_130901_EX1404L1_MB	8/19/2014	EX1404L1_XBT061_140819	7.34	121.467	062.465639W	062.398159W	38.538547N	38.591459N	2014-08-19 13:08:51.573	2014-08-19 13:12:46.574
0175_20140819_131236_EX1404L1_MB	8/19/2014	EX1404L1_XBT061_140819 & EX1404L1_XBT062_140819	7.88	174.584	062.466236W	062.388962W	38.481352N	38.563192N	2014-08-19 13:12:27.077	2014-08-19 13:38:20.585
0176_20140819_133811_EX1404L1_MB	8/19/2014	EX1404L1_XBT062_140819	6.92	324.279	062.489499W	062.407256W	38.483899N	38.551581N	2014-08-19 13:38:01.583	2014-08-19 13:57:04.586
0177_20140819_135655_EX1404L1_MB	8/19/2014	EX1404L1_XBT062_140819	9.37	078.486	062.484940W	062.394185W	38.517109N	38.571650N	2014-08-19 13:56:45.586	2014-08-19 14:08:04.088
0178_20140819_140754_EX1404L1_MB	8/19/2014	EX1404L1_XBT062_140819	8.33	149.184	062.449990W	062.226983W	38.277397N	38.554701N	2014-08-19 14:07:45.089	2014-08-19 16:07:57.619
0179_20140819_160748_EX1404L1_MB	8/19/2014	EX1404L1_XBT062_140819 & EX1404L1_XBT063_140819	8.39	149.041	062.308059W	062.066525W	38.031882N	38.307967N	2014-08-19 16:07:38.620	2014-08-19 18:08:04.650

0180_20140819_180755_EX1404L1_MB	8/19/2014	EX1404L1_XBT063_140819	8.34	148.835	062.149802W	061.943406W	37.818838N	38.053917N	2014-08-19 18:07:45.149	2014-08-19 19:44:47.670
0181_20140819_194438_EX1404L1_MB	8/19/2014	EX1404L1_XBT063_140819 & EX1404L1_XBT064_140819	6.87	059.15	061.991334W	061.913372W	37.817126N	37.884960N	2014-08-19 19:44:28.670	2014-08-19 20:05:13.179
0182_20140819_200503_EX1404L1_MB	8/19/2014	EX1404L1_XBT064_140819	3.79	348.557	061.967520W	061.897332W	37.841362N	37.880903N	2014-08-19 20:04:54.178	2014-08-19 20:08:04.178
0183_20140819_200754_EX1404L1_MB	8/19/2014	EX1404L1_XBT064_140819	8.30	328.968	062.123188W	061.902299W	37.848567N	38.126681N	2014-08-19 20:07:44.681	2014-08-19 22:08:05.708
0184_20140819_220756_EX1404L1_MB	8/19/2014	EX1404L1_XBT064_140819 & EX1404L1_XBT065_140819 & EX1404L1_XBT066_140819	8.40	329.025	062.149508W	062.047458W	38.094095N	38.151443N	2014-08-19 22:07:46.711	2014-08-19 22:19:49.713
0185_20140820_000757_EX1404L1_MB	8/20/2014	EX1404L1_XBT066_140819	8.26	334.44	062.369766W	062.206357W	38.344551N	38.521727N	2014-08-20 00:07:57.242	2014-08-20 01:17:54.257
0186_20140820_011744_EX1404L1_MB	8/20/2014	EX1404L1_XBT066_140819	8.45	058.556	062.355644W	062.276602W	38.483340N	38.546840N	2014-08-20 01:17:34.757	2014-08-20 01:33:04.261
0187_20140820_013254_EX1404L1_MB	8/20/2014	EX1404L1_XBT066_140819	8.23	143.852	062.320946W	062.251801W	38.497109N	38.548478N	2014-08-20 01:32:44.763	2014-08-20 01:40:17.263
0188_20140820_014007_EX1404L1_MB	8/20/2014	EX1404L1_XBT067_140819	8.12	152.777	062.315890W	062.105786W	38.256176N	38.515977N	2014-08-20 01:39:57.765	2014-08-20 03:34:33.794
0189_20140820_033424_EX1404L1_MB	8/20/2014	EX1404L1_XBT068_140819	7.87	052.479	062.151510W	062.063477W	38.251234N	38.320011N	2014-08-20 03:34:14.794	2014-08-20 03:54:09.798

0190_20140820_035400_EX1404L1_MB	8/20/2014	EX1404L1_XBT069_140819	7.73	332.952	062.269086W	062.067820W	38.292489N	38.549939N	2014-08-20 03:53:50.297	2014-08-20 05:54:13.829
0191_20140820_055404_EX1404L1_MB	8/20/2014	EX1404L1_XBT069_140819	8.51	045.718	062.289697W	062.171697W	38.517243N	38.607068N	2014-08-20 05:53:54.835	2014-08-20 06:34:33.338
0192_20140820_063423_EX1404L1_MB	8/20/2014	EX1404L1_XBT070_140819	8.26	152.816	062.236739W	062.026116W	38.316183N	38.569234N	2014-08-20 06:34:14.342	2014-08-20 08:29:09.368
0193_20140820_082900_EX1404L1_MB	8/20/2014	EX1404L1_XBT070_140819	8.08	049.479	062.085052W	061.975289W	38.299747N	38.369206N	2014-08-20 08:28:50.868	2014-08-20 08:51:45.376
0194_20140820_085135_EX1404L1_MB	8/20/2014	EX1404L1_XBT070_140819 & EX1404L1_XBT071_140819	8.19	332.764	062.187447W	061.982651W	38.341733N	38.601104N	2014-08-20 08:51:25.876	2014-08-20 10:45:14.404
0195_20140820_104504_EX1404L1_MB	8/20/2014	EX1404L1_XBT071_140820	8.90	073.955	062.195619W	062.077337W	38.568899N	38.639187N	2014-08-20 10:44:54.906	2014-08-20 11:12:02.910
0196_20140820_111153_EX1404L1_MB	8/20/2014	EX1404L1_XBT071_140820 & EX1404L1_XBT072_140820	8.04	152.623	062.143015W	061.937139W	38.349466N	38.598974N	2014-08-20 11:11:43.911	2014-08-20 13:05:33.937
0197_20140820_130524_EX1404L1_MB	8/20/2014	EX1404L1_XBT072_140820	7.24	057.568	061.981791W	061.886906W	38.346462N	38.410947N	2014-08-20 13:05:14.936	2014-08-20 13:27:13.944
0198_20140820_132704_EX1404L1_MB	8/20/2014	EX1404L1_XBT072_140820	7.34	332.435	062.057090W	061.891283W	38.379301N	38.580200N	2014-08-20 13:26:54.447	2014-08-20 15:01:56.968
0199_20140820_150147_EX1404L1_MB	8/20/2014	EX1404L1_XBT072_140820 & EX1404L1_XBT073_140820	9.89	047.015	062.065903W	061.974952W	38.548115N	38.603450N	2014-08-20 15:01:37.470	2014-08-20 15:14:52.971

0200_20140820_152716_EX1404L1_MB	8/20/2014	EX1404L1_XBT073_140820 & EX1404L1_XBT074_140820	8.94	033.997	061.987192W	061.720186W	38.597106N	38.857145N	2014-08-20 15:27:16.478	2014-08-20 17:27:20.505
0201_20140820_172711_EX1404L1_MB	8/20/2014	EX1404L1_XBT074_140820	8.72	031.132	061.787826W	061.678617W	38.846157N	38.914645N	2014-08-20 17:27:01.503	2014-08-20 17:53:35.014
0202_20140820_175325_EX1404L1_MB	8/20/2014	EX1404L1_XBT074_140820	9.29	082.967	061.736437W	061.655611W	38.884253N	38.937926N	2014-08-20 17:53:16.015	2014-08-20 18:07:47.517
0203_20140820_180738_EX1404L1_MB	8/20/2014	EX1404L1_XBT074_140820	8.32	098.693	061.672599W	061.287904W	38.842812N	38.935495N	2014-08-20 18:07:28.019	2014-08-20 20:07:46.550
0204_20140820_200737_EX1404L1_MB	8/20/2014	EX1404L1_XBT074_140820 & EX1404L1_XBT075_140820	8.99	098.513	061.335973W	060.922837W	38.779590N	38.885402N	2014-08-20 20:07:27.550	2014-08-20 22:07:52.078
0205_20140820_220742_EX1404L1_MB	8/20/2014	EX1404L1_XBT075_140820 & EX1404L1_XBT076_140820	8.70	098.111	060.948356W	060.562749W	38.739104N	38.848949N	2014-08-20 22:07:32.582	2014-08-21 00:07:41.609
0206_20140821_000741_EX1404L1_MB	8/21/2014	EX1404L1_XBT076_140820 & EX1404L1_XBT077_140821	8.59	097.984	060.578400W	060.326776W	38.704666N	38.792009N	2014-08-21 00:07:42.139	2014-08-21 01:27:52.630
207 - DNP	Line not processed.									
0208_20140821_012813_EX1404L1_MB	8/21/2014	EX1404L1_XBT077_140821	8.37	003.205	060.359582W	060.281752W	38.705040N	38.799919N	2014-08-21 01:28:03.630	2014-08-21 01:48:17.635
0209_20140821_014807_EX1404L1_MB	8/21/2014	EX1404L1_XBT078_140821	8.45	278.046	060.680144W	060.316379W	38.742431N	38.855508N	2014-08-21 01:47:58.634	2014-08-21 03:48:18.668
0210_20140821_034808_EX1404L1_MB	8/21/2014	EX1404L1_XBT079_140821	7.87	278.346	061.014423W	060.677458W	38.788870N	38.894516N	2014-08-21 03:47:59.668	2014-08-21 05:48:22.699

0211_20140821_054813_EX1404L1_MB	8/21/2014	EX1404L1_XBT080_140821	7.72	278.369	061.336698W	061.004994W	38.829387N	38.934167N	2014-08-21 05:48:03.698	2014-08-21 07:48:22.728
0212_20140821_074813_EX1404L1_MB	8/21/2014	EX1404L1_XBT081_140821	7.92	278.784	061.674068W	061.332250W	38.880626N	38.975001N	2014-08-21 07:48:03.229	2014-08-21 09:47:34.261
0213_20140821_094724_EX1404L1_MB	8/21/2014	EX1404L1_XBT081_140821	8.27	030.327	061.701114W	061.626081W	38.927233N	39.017755N	2014-08-21 09:47:15.261	2014-08-21 10:12:51.765
0214_20140821_101242_EX1404L1_MB	8/21/2014	EX1404L1_XBT081_140821 & EX1404L1_XBT082_140821	8.29	098.543	061.642516W	061.281004W	38.915330N	39.014860N	2014-08-21 10:12:32.764	2014-08-21 12:12:48.795
0215_20140821_121238_EX1404L1_MB	8/21/2014	EX1404L1_XBT082_140821 EX1404L1_XBT083_140821	8.30	098.499	061.296927W	060.921115W	38.871979N	38.970763N	2014-08-21 12:12:29.296	2014-08-21 14:12:38.326
0216_20140821_141238_EX1404L1_MB	8/21/2014	EX1404L1_XBT083_140821 & EX1404L1_XBT084_140821	8.13	098.143	060.962359W	060.582968W	38.818859N	38.918284N	2014-08-21 14:12:28.826	2014-08-21 16:12:48.861
0217_20140821_161239_EX1404L1_MB	8/21/2014	EX1404L1_XBT084_140821 & EX1404L1_XBT085_140821	8.09	098.033	060.611862W	060.249817W	38.779071N	38.881392N	2014-08-21 16:12:30.359	2014-08-21 18:12:51.889
0218_20140821_181242_EX1404L1_MB	8/21/2014	EX1404L1_XBT085_140821	7.77	090.517	060.263201W	060.235518W	38.777582N	38.833628N	2014-08-21 18:12:32.890	2014-08-21 18:17:39.389
0219_20140821_181730_EX1404L1_MB	8/21/2014	EX1404L1_XBT085_140821	7.98	347.538	060.277994W	060.201638W	38.784280N	38.871515N	2014-08-21 18:17:20.887	2014-08-21 18:41:30.896
0220_20140821_184121_EX1404L1_MB	8/21/2014	EX1404L1_XBT085_140821 & EX1404L1_XBT086_140821	8.56	277.973	060.614042W	060.252300W	38.816556N	38.933746N	2014-08-21 18:41:11.894	2014-08-21 20:41:35.425

0221_20140821_204125_EX1404L1_MB	8/21/2014	EX1404L1_XBT086_140821	8.39	277.939	060.878885W	060.613444W	38.862208N	38.960050N	2014-08-21 20:41:16.425	2014-08-21 22:14:46.452
0222_20140821_223223_EX1404L1_MB	8/21/2014	EX1404L1_XBT087_140821	8.84	095.506	060.929803W	060.785035W	38.873683N	38.944346N	2014-08-21 22:32:23.456	2014-08-21 23:04:48.465
0223_20140821_230438_EX1404L1_MB	8/21/2014	EX1404L1_XBT087_140821	8.32	359.458	060.835439W	060.749247W	38.877523N	38.948016N	2014-08-21 23:04:28.964	2014-08-21 23:16:50.466
0224_20140821_231640_EX1404L1_MB	8/22/2014	EX1404L1_XBT088_140821	9.00	277.917	061.183211W	060.791569W	38.891115N	39.006659N	2014-08-21 23:16:40.966	2014-08-22 01:16:48.998
0225_20140822_011639_EX1404L1_MB	8/22/2014	EX1404L1_XBT088_140821	8.90	278.777	061.405182W	061.176486W	38.935243N	39.023330N	2014-08-22 01:16:29.998	2014-08-22 02:26:12.516
0226_20140822_022602_EX1404L1_MB	8/22/2014	EX1404L1_XBT088_140821	8.50	012.296	061.428927W	061.359587W	38.979835N	39.066301N	2014-08-22 02:25:53.518	2014-08-22 02:45:33.017
0227_20140822_024523_EX1404L1_MB	8/22/2014	EX1404L1_XBT089_140821	8.40	094.322	061.385567W	061.378927W	39.014095N	39.065246N	2014-08-22 02:45:13.518	2014-08-22 02:47:14.021
0228_20140822_044519_EX1404L1_MB	8/22/2014	EX1404L1_XBT090_140821	7.90	098.329	061.037306W	060.692611W	38.928574N	39.013733N	2014-08-22 04:45:10.549	2014-08-22 06:45:28.586
0229_20140822_064519_EX1404L1_MB	8/22/2014	EX1404L1_XBT090_140822	7.23	096.907	060.717062W	060.673163W	38.923458N	38.974424N	2014-08-22 06:45:10.084	2014-08-22 06:51:34.585
0230_20140822_065125_EX1404L1_MB	8/22/2014	EX1404L1_XBT091_140822	7.18	099.828	060.684422W	060.567161W	38.909382N	39.002082N	2014-08-22 06:51:15.588	2014-08-22 07:48:48.598

0231_20140822_074838_EX1404L1_MB	8/22/2014	EX1404L1_XBT091_140822	6.46	100.694	060.588151W	060.478859W	38.906531N	38.951890N	2014-08-22 07:48:29.597	2014-08-22 08:26:47.144
0232_20140822_082637_EX1404L1_MB	8/22/2014	EX1404L1_XBT091_140822	8.39	351.713	060.519147W	060.457457W	38.894617N	38.950458N	2014-08-22 08:26:28.606	2014-08-22 08:41:04.610
0233_20140822_093528_EX1404L1_MB	8/22/2014	EX1404L1_XBT091_140822	5.28	231.528	060.604396W	060.523187W	39.036196N	39.089756N	2014-08-22 09:35:18.627	2014-08-22 09:59:51.144
0234_20140822_095941_EX1404L1_MB	8/22/2014	EX1404L1_XBT091_140822	7.04	128.874	060.607279W	060.532392W	39.017890N	39.061039N	2014-08-22 09:59:31.633	2014-08-22 10:09:20.144
0235_20140822_100911_EX1404L1_MB	8/22/2014	EX1404L1_XBT091_140822 & EX1404L1_XBT092_140822	8.33	093.7	060.573273W	060.202588W	38.993321N	39.068164N	2014-08-22 10:09:01.146	2014-08-22 12:06:28.665
0236_20140822_120619_EX1404L1_MB	8/22/2014	EX1404L1_XBT092_140822	6.90	169.379	060.240115W	060.172681W	38.990589N	39.023885N	2014-08-22 12:06:09.168	2014-08-22 12:18:41.669
0237_20140822_121831_EX1404L1_MB	8/22/2014	EX1404L1_XBT092_140822	7.72	266.79	060.232538W	060.174710W	38.960165N	39.017590N	2014-08-22 12:18:22.169	2014-08-22 12:30:12.671
0238_20140822_123003_EX1404L1_MB	8/22/2014	EX1404L1_XBT092_140822 & EX1404L1_XBT093_140822	7.85	277.963	060.564997W	060.229914W	38.961722N	39.060966N	2014-08-22 12:29:53.671	2014-08-22 14:30:09.201
0239_20140822_142959_EX1404L1_MB	8/22/2014	EX1404L1_XBT093_140822 & EX1404L1_XBT095_140822	7.68	278.271	060.887195W	060.555727W	39.006247N	39.111427N	2014-08-22 14:29:49.703	2014-08-22 16:30:05.232
0240_20140822_162955_EX1404L1_MB	8/22/2014	EX1404L1_XBT096_140822	8.30	278.344	061.221746W	060.880022W	39.044790N	39.151176N	2014-08-22 16:29:46.233	2014-08-22 18:24:06.759

0241_20140822_182357_EX1404L1_MB	8/22/2014	EX1404L1_XBT096_140823	8.16	187.252	061.274872W	061.200120W	39.058756N	39.147299N	2014-08-22 18:23:47.762	2014-08-22 18:47:46.767
0242_20140822_184737_EX1404L1_MB	8/22/2014	EX1404L1_XBT096_140824	8.25	098.599	061.236527W	061.001332W	39.026277N	39.114699N	2014-08-22 18:47:28.263	2014-08-22 20:04:30.785
0243_20140822_200421_EX1404L1_MB	8/22/2014	EX1404L1_XBT096_140825	7.44	222.354	061.048179W	060.966671W	39.021209N	39.082541N	2014-08-22 20:04:11.784	2014-08-22 20:09:01.785
0244- Do not process	Line not processed.									
0245_20140822_200909_EX1404L1_MB	8/22/2014	EX1404L1_XBT096_140826	8.10	275.17	061.047188W	061.005613W	39.017506N	39.085988N	2014-08-22 20:09:09.785	2014-08-22 20:21:24.291
0246_20140822_202115_EX1404L1_MB	8/22/2014	EX1404L1_XBT096_140826	7.70	041.443	061.102039W	061.013668W	39.022542N	39.087922N	2014-08-22 20:21:05.788	2014-08-22 20:26:25.790
0247_20140822_202616_EX1404L1_MB	8/22/2014	EX1404L1_XBT096_140826 & EX1404L1_XBT097_140822	8.31	097.8	061.047638W	060.677590W	38.991161N	39.091910N	2014-08-22 20:26:06.787	2014-08-22 22:26:25.820
0248_20140822_222616_EX1404L1_MB	8/22/2014	EX1404L1_XBT097_140822 & EX1404L1_XBT098_140822 & EX1404L1_XBT099_140822 & EX1404L1_XBT100_140822	7.50	098.514	060.710405W	060.364533W	38.942640N	39.038230N	2014-08-22 22:26:16.321	2014-08-23 00:26:20.854
0249_20140823_002611_EX1404L1_MB	8/23/2014	EX1404L1_XBT100_140823	7.48	100.501	060.394290W	060.214425W	38.920686N	39.001551N	2014-08-23 00:26:01.851	2014-08-23 01:24:43.865
0250_20140823_012434_EX1404L1_MB	8/23/2014	EX1404L1_XBT100_140823	7.14	200.102	060.259215W	060.183218W	38.885311N	38.972134N	2014-08-23 01:24:24.371	2014-08-23 01:47:59.372

0251_20140823_014749_EX1404L1_MB	8/23/2014	EX1404L1_XBT100_140823 & EX1404L1_XBT101_140823	7.67	277.749	060.477569W	060.230876W	38.884943N	38.974740N	2014-08-23 01:47:39.875	2014-08-23 03:15:54.895
0252_20140823_031545_EX1404L1_MB	8/23/2014	EX1404L1_XBT101_140823 & EX1404L1_XBT102_140823	6.73	254.215	060.592108W	060.462526W	38.897643N	38.973690N	2014-08-23 03:15:35.395	2014-08-23 03:59:05.409
0253_20140823_035856_EX1404L1_MB	8/23/2014	EX1404L1_XBT102_140823	8.01	091.911	060.625376W	060.533069W	38.888919N	38.964712N	2014-08-23 03:58:46.908	2014-08-23 04:20:37.911
0254_20140823_042528_EX1404L1_MB	8/23/2014	EX1404L1_XBT103_140823	7.88	101.162	060.566129W	060.235292W	38.840781N	38.944959N	2014-08-23 04:25:18.912	2014-08-23 06:18:15.440
0255_20140823_061806_EX1404L1_MB	8/23/2014	EX1404L1_XBT103_140823	8.83	348.434	060.277447W	060.204826W	38.843702N	38.933617N	2014-08-23 06:17:56.444	2014-08-23 06:36:38.948
0256_20140823_063629_EX1404L1_MB	8/23/2014	EX1404L1_XBT103_140823 & EX1404L1_XBT104_140823	7.81	279.45	060.575944W	060.241466W	38.873290N	38.981789N	2014-08-23 06:36:19.947	2014-08-23 08:36:42.478
0257_20140823_083633_EX1404L1_MB	8/23/2014	EX1404L1_XBT104_140823 & EX1404L1_XBT105_140823 & EX1404L1_XBT106_140823	7.48	277.607	060.899073W	060.570362W	38.919736N	39.024587N	2014-08-23 08:36:23.978	2014-08-23 10:36:41.009
0258_20140823_103631_EX1404L1_MB	8/23/2014	EX1404L1_XBT106_140823	7.92	281.484	061.230115W	060.877953W	38.961349N	39.085735N	2014-08-23 10:36:22.005	2014-08-23 12:36:42.040
0259_20140823_123632_EX1404L1_MB	8/23/2014	EX1404L1_XBT106_140823	7.50	282.127	061.260241W	061.201428W	39.014430N	39.085311N	2014-08-23 12:36:22.542	2014-08-23 12:44:01.541
0260_20140823_124351_EX1404L1_MB	8/23/2014	EX1404L1_XBT106_140823 & EX1404L1_XBT107_140823	7.79	025.891	061.272675W	061.178239W	39.043971N	39.182323N	2014-08-23 12:43:42.042	2014-08-23 13:46:41.053

0261_20140823_134631_EX1404L1_MB	8/23/2014	EX1404L1_XBT107_140823	7.93	098.491	061.181641W	060.835786W	39.078909N	39.179899N	2014-08-23 13:46:22.052	2014-08-23 15:46:46.086
0262_20140823_154637_EX1404L1_MB	8/23/2014	EX1404L1_XBT107_140823	7.89	098.15	060.848472W	060.782252W	39.070212N	39.136396N	2014-08-23 15:46:27.085	2014-08-23 16:06:53.088
0263_20140823_160643_EX1404L1_MB	8/23/2014	EX1404L1_XBT107_140823	8.32	339.074	060.822299W	060.739222W	39.069427N	39.159916N	2014-08-23 16:06:34.090	2014-08-23 16:22:41.596
0264_20140823_162232_EX1404L1_MB	8/23/2014	EX1404L1_XBT107_140823 & EX1404L1_XBT108_140823	7.93	278.692	061.094925W	060.788810W	39.095247N	39.199711N	2014-08-23 16:22:22.597	2014-08-23 18:03:07.143
0265_20140823_180257_EX1404L1_MB	8/23/2014	EX1404L1_XBT108_140823	8.64	178.089	061.113709W	061.034492W	39.158231N	39.170209N	2014-08-23 18:02:48.140	2014-08-23 18:05:33.142
0266_20140823_180523_EX1404L1_MB	8/23/2014	EX1404L1_XBT108_140823	9.03	188.176	061.143402W	061.031066W	39.048931N	39.159290N	2014-08-23 18:05:14.621	2014-08-23 18:46:00.141
0267_20140823_184550_EX1404L1_MB	8/23/2014	EX1404L1_XBT108_140823 & EX1404L1_XBT110_140823	8.90	072.766	061.161460W	061.046297W	38.966816N	39.093514N	2014-08-23 18:45:41.144	2014-08-23 19:48:02.644
0268_20140823_194753_EX1404L1_MB	8/23/2014	EX1404L1_XBT110_140823 & EX1404L1_XBT111_140823	7.49	098.921	061.092495W	060.853087W	38.993617N	39.094341N	2014-08-23 19:47:44.143	2014-08-23 21:17:53.669
0269_20140823_211744_EX1404L1_MB	8/23/2014	EX1404L1_XBT111_140823	6.25	262.836	060.888767W	060.804915W	38.992686N	39.060379N	2014-08-23 21:17:35.169	2014-08-23 21:30:04.175
0270_20140823_212954_EX1404L1_MB	8/24/2014	EX1404L1_XBT111_140823	6.57	282.752	060.878853W	060.839550W	38.993374N	39.060579N	2014-08-23 21:29:45.174	2014-08-23 21:35:20.174

0271_20140823_213510_EX1404L1_MB	8/24/2014	EX1404L1_XBT111_140823	7.66	278.581	061.109392W	060.852706W	38.998482N	39.096299N	2014-08-23 21:35:00.677	2014-08-23 23:03:20.696
0272_20140823_230311_EX1404L1_MB	8/24/2014	EX1404L1_XBT111_140823 & EX1404L1_XBT112_140823	7.40	140.983	061.146717W	061.056544W	39.005515N	39.095424N	2014-08-23 23:03:02.197	2014-08-23 23:24:58.205
0273_20140823_232449_EX1404L1_MB	8/24/2014	EX1404L1_XBT112_140823	6.42	099.564	061.075058W	060.867272W	38.977733N	39.057716N	2014-08-23 23:24:49.200	2014-08-24 00:56:29.728
0274_20140824_005619_EX1404L1_MB	8/24/2014	EX1404L1_XBT113_140823	9.57	189.921	060.900062W	060.818330W	38.936772N	39.026679N	2014-08-24 00:56:10.228	2014-08-24 01:13:32.231
0275_20140824_011322_EX1404L1_MB	8/24/2014	EX1404L1_XBT113_140823	6.52	270.932	061.006513W	060.866420W	38.932901N	39.002169N	2014-08-24 01:13:12.734	2014-08-24 02:07:14.743
0276_20140824_020705_EX1404L1_MB	8/24/2014	EX1404L1_XBT113_140823	5.77	269.302	061.044404W	060.996568W	38.948552N	38.989041N	2014-08-24 02:06:55.741	2014-08-24 02:26:57.750
0277_20140824_022648_EX1404L1_MB	8/24/2014	EX1404L1_XBT113_140823	7.89	091.209	061.007370W	060.929933W	38.945410N	38.993159N	2014-08-24 02:26:39.247	2014-08-24 02:52:28.252
0278_20140824_032124_EX1404L1_MB	8/24/2014	EX1404L1_XBT113_140823	7.27	+K269:M275+K276:M282	060.922531W	060.833833W	38.940373N	38.982147N	2014-08-24 03:21:14.263	2014-08-24 03:24:30.764
0279_20140824_032421_EX1404L1_MB	8/24/2014	EX1404L1_XBT113_140823	7.42	189.661	060.961363W	060.837197W	38.752799N	38.965085N	2014-08-24 03:24:11.266	2014-08-24 05:00:16.290
0280_20140824_050016_EX1404L1_MB	8/24/2014	EX1404L1_XBT114_140823 & EX1404L1_XBT115_140823	8.86	199.15	061.078623W	060.894060W	38.473003N	38.776856N	2014-08-24 05:00:07.288	2014-08-24 07:00:16.819

0281_20140824_070017_EX1404L1_MB	8/24/2014	EX1404L1_XBT115_140823	9.16	199.412	061.219803W	061.031236W	38.191782N	38.501911N	2014-08-24 07:00:07.818	2014-08-24 09:00:09.847
0282_20140824_090009_EX1404L1_MB	8/24/2014	EX1404L1_XBT115_140823	9.14	203.429	061.294817W	061.154724W	38.061365N	38.214060N	2014-08-24 09:00:00.350	2014-08-24 09:55:16.865
0283_20140824_095517_EX1404L1_MB	8/24/2014	EX1404L1_XBT115_140823	8.87	122.256	061.296195W	061.227439W	38.043860N	38.100225N	2014-08-24 09:55:07.859	2014-08-24 10:02:16.863
0284_20140824_100217_EX1404L1_MB	8/24/2014	EX1404L1_XBT115_140823 & EX1404L1_XBT116_140823	7.82	113.54	061.265216W	060.937490W	37.933337N	38.090785N	2014-08-24 10:02:07.863	2014-08-24 12:02:25.896
0285_20140824_120216_EX1404L1_MB	8/24/2014	EX1404L1_XBT116_140823	8.16	113.473	060.960815W	060.768433W	37.870792N	37.990029N	2014-08-24 12:02:06.894	2014-08-24 13:08:04.407
0286_20140824_130754_EX1404L1_MB	8/24/2014	EX1404L1_XBT116_140823	5.35	022.488	060.801305W	060.714207W	37.866290N	37.954800N	2014-08-24 13:07:44.909	2014-08-24 13:45:54.918
0287_20140824_134545_EX1404L1_MB	8/24/2014	EX1404L1_XBT116_140823 & EX1404L1_XBT117_140824	8.29	293.66	061.093143W	060.734308W	37.909668N	38.072333N	2014-08-24 13:45:35.920	2014-08-24 15:45:51.449
0288_20140824_154541_EX1404L1_MB	8/24/2014	EX1404L1_XBT117_140824 & EX1404L1_XBT118_140824	7.67	293.907	061.290532W	061.058073W	38.015278N	38.151532N	2014-08-24 15:45:31.953	2014-08-24 17:09:48.968
0289_20140824_170939_EX1404L1_MB	8/24/2014	EX1404L1_XBT118_140824	6.22	031.822	061.312692W	061.226473W	38.101880N	38.188155N	2014-08-24 17:09:29.470	2014-08-24 17:37:18.476
0290_20140824_173708_EX1404L1_MB	8/24/2014	EX1404L1_XBT118_140824	7.93	114.495	061.266919W	061.145705W	38.091103N	38.182812N	2014-08-24 17:36:58.980	2014-08-24 18:11:28.484

0291_20140824_193704_EX1404L1_MB	8/24/2014	EX1404L1_XBT118_140824 & EX1404L1_XBT119_140824	8.01	113.57	060.963068W	060.718089W	37.931918N	38.072796N	2014-08-24 19:37:04.512	2014-08-24 21:03:02.028
0292_20140824_210252_EX1404L1_MB	8/24/2014	EX1404L1_XBT119_140824	6.40	064.498	060.770635W	060.690353W	37.931449N	38.003187N	2014-08-24 21:02:42.528	2014-08-24 21:08:27.528
0293_20140824_210818_EX1404L1_MB	8/24/2014	EX1404L1_XBT119_140824	7.27	022.971	060.769709W	060.673640W	37.961007N	38.008279N	2014-08-24 21:08:08.529	2014-08-24 21:24:10.534
0294_20140824_212401_EX1404L1_MB	8/24/2014	EX1404L1_XBT119_140824	7.79	303.397	060.747690W	060.672235W	37.969614N	38.039148N	2014-08-24 21:23:51.531	2014-08-24 21:31:27.035
0295_20140824_213117_EX1404L1_MB	8/24/2014	EX1404L1_XBT119_140824 & EX1404L1_XBT120_140824	7.67	293.79	061.026164W	060.700036W	37.975766N	38.142614N	2014-08-24 21:31:08.037	2014-08-24 23:31:15.569
0296_20140824_233116_EX1404L1_MB	8/24/2014	EX1404L1_XBT120_140824	8.09	293.864	061.259342W	060.995702W	38.087428N	38.223607N	2014-08-24 23:31:06.072	2014-08-25 01:02:15.594
0297_20140825_010216_EX1404L1_MB	8/25/2014	EX1404L1_XBT120_140824	7.83	076.833	061.287496W	061.208873W	38.167565N	38.226949N	2014-08-25 01:02:16.094	2014-08-25 01:13:23.092
0298_20140825_011313_EX1404L1_MB	8/25/2014	EX1404L1_XBT120_140824	7.73	025.475	061.272399W	061.183352W	38.187253N	38.244532N	2014-08-25 01:13:03.596	2014-08-25 01:31:52.595
0299_20140825_013143_EX1404L1_MB	8/25/2014	EX1404L1_XBT120_140824	8.06	132.785	061.257237W	061.177748W	38.207497N	38.269313N	2014-08-25 01:31:33.100	2014-08-25 01:42:44.602
0300_20140825_014245_EX1404L1_MB	8/25/2014	EX1404L1_XBT121_140824 & EX1404L1_XBT122_140824	7.59	113.791	061.225222W	060.910143W	38.098694N	38.259292N	2014-08-25 01:42:35.104	2014-08-25 03:42:43.142

0301_20140825_034243_EX1404L1_MB	8/25/2014	EX1404L1_XBT123_140824	7.71	113.73	060.939835W	37.991656N	060.619688W	38.151840N	2014-08-25 03:42:33.632	2014-08-25 05:42:43.666
0302_20140825_054244_EX1404L1_MB	8/25/2014	EX1404L1_XBT122_140824 & EX1404L1_XBT123_140824	7.51	113.454	060.642469W	37.966322N	060.545852W	38.048699N	2014-08-25 05:42:34.662	2014-08-25 06:15:41.170
0303_20140825_061541_EX1404L1_MB	8/25/2014	EX1404L1_XBT123_140824	6.50	021.837	060.584230W	37.955510N	060.490168W	38.053297N	2014-08-25 06:15:31.673	2014-08-25 07:00:22.686
0304_20140825_070022_EX1404L1_MB	8/25/2014	EX1404L1_XBT124_140824	7.58	293.761	060.833184W	38.001217N	060.511454W	38.157954N	2014-08-25 07:00:13.686	2014-08-25 09:00:23.714
0305_20140825_090023_EX1404L1_MB	8/25/2014	EX1404L1_XBT125_140824	7.60	293.723	061.128923W	38.101906N	060.802115W	38.266949N	2014-08-25 09:00:14.715	2014-08-25 11:00:23.745
0306_20140825_110024_EX1404L1_MB	8/25/2014	EX1404L1_XBT125_140824	7.44	294.633	061.223517W	061.089491W	38.205399N	38.295088N	2014-08-25 11:00:14.244	2014-08-25 11:40:11.256
0307_20140825_114001_EX1404L1_MB	8/25/2014	EX1404L1_XBT125_140824	6.78	049.962	061.236614W	061.148344W	38.261753N	38.335058N	2014-08-25 11:39:51.756	2014-08-25 12:10:53.765
0308_20140825_121054_EX1404L1_MB	8/25/2014	EX1404L1_XBT125_140824 & EX1404L1_XBT126_140825	8.24	114.26	061.175387W	060.840787W	38.158799N	38.328572N	2014-08-25 12:10:44.761	2014-08-25 14:11:01.792
0309_20140825_141102_EX1404L1_MB	8/25/2014	EX1404L1_XBT126_140825	8.17	113.688	060.859797W	060.521812W	38.046261N	38.211769N	2014-08-25 14:10:52.293	2014-08-25 16:11:02.324
0310_20140825_161102_EX1404L1_MB	8/25/2014	EX1404L1_XBT126_140825	8.06	114.076	060.554341W	060.489227W	38.030670N	38.096876N	2014-08-25 16:10:53.322	2014-08-25 16:26:32.330

0311_20140825_162632_EX1404L1_MB	8/25/2014	EX1404L1_XBT126_140825 & EX1404L1_XBT127_140825	6.95	206.225	060.571022W	060.451544W	37.930534N	38.089365N	2014-08-25 16:26:23.327	2014-08-25 17:29:44.346
0312_20140825_172944_EX1404L1_MB	8/25/2014	EX1404L1_XBT127_140825	7.99	292.404	060.813177W	060.540598W	37.933932N	38.070401N	2014-08-25 17:29:35.343	2014-08-25 19:02:32.868
0313_20140825_190233_EX1404L1_MB	8/25/2014	EX1404L1_XBT128_140825	6.65	040.793	060.835908W	060.721414W	38.004973N	38.097541N	2014-08-25 19:02:23.369	2014-08-25 19:33:29.878
0314_20140825_193330_EX1404L1_MB	8/25/2014	EX1404L1_XBT128_140825	7.64	293.82	061.073826W	060.747441W	38.033226N	38.203388N	2014-08-25 19:33:20.380	2014-08-25 21:33:36.408
0315_20140825_213326_EX1404L1_MB	8/25/2014	EX1404L1_XBT128_140825	7.64	294.197	061.118168W	061.042214W	38.145822N	38.214641N	2014-08-25 21:33:16.912	2014-08-25 21:48:46.414
0316_20140825_214836_EX1404L1_MB	8/25/2014	EX1404L1_XBT128_140825 &EX1404L1_XBT129_140825	6.36	113.179	061.139657W	061.043865W	38.151743N	38.218826N	2014-08-25 21:48:27.417	2014-08-25 21:57:12.415
0317_20140825_215712_EX1404L1_MB	8/25/2014	EX1404L1_XBT128_140825 & EX1404L1_XBT129_140825	7.42	339.469	061.186618W	061.047373W	38.172702N	38.347208N	2014-08-25 21:57:02.917	2014-08-25 23:17:35.940
0318_20140825_231726_EX1404L1_MB	8/25/2014	EX1404L1_XBT129_140825	6.61	080.575	061.191817W	061.128374W	38.315878N	38.373447N	2014-08-25 23:17:16.939	2014-08-25 23:27:31.440
0319_20140825_232731_EX1404L1_MB	8/26/2014	EX1404L1_XBT129_140825 & EX1404L1_XBT130_140826	8.00	115.855	061.160122W	060.863063W	38.202714N	38.366116N	2014-08-25 23:27:31.940	2014-08-26 01:27:35.473
0320_20140826_012736_EX1404L1_MB	8/26/2014	EX1404L1_XBT131_140825	7.88	113.897	060.863712W	060.547661W	38.089098N	38.241558N	2014-08-26 01:27:25.975	2014-08-26 03:27:43.009

0321_20140826_032733_EX1404L1_MB	8/26/2014	EX1404L1_XBT131_140825	7.87	113.739	060.570515W	060.307225W	37.997509N	38.127798N	2014-08-26 03:27:24.007	2014-08-26 05:02:47.533
0322_20140826_050238_EX1404L1_MB	8/26/2014	EX1404L1_XBT131_140825	6.72	042.151	060.335133W	060.254720W	37.988884N	38.056034N	2014-08-26 05:02:28.531	2014-08-26 05:21:57.537
0323_20140826_052147_EX1404L1_MB	8/26/2014	EX1404L1_XBT131_140825	6.32	300.448	060.320067W	060.275926W	38.009333N	38.058511N	2014-08-26 05:21:38.043	2014-08-26 05:26:48.541
0324_20140826_052638_EX1404L1_MB	8/26/2014	EX1404L1_XBT131_140825	7.52	179.234	060.356759W	060.276623W	37.996273N	38.068707N	2014-08-26 05:26:29.040	2014-08-26 05:41:40.048
0325_20140826_054140_EX1404L1_MB	8/26/2014	EX1404L1_XBT131_140825 & EX1404L1_XBT132_140826	7.62	113.971	060.327205W	060.143138W	37.932080N	38.044601N	2014-08-26 05:41:30.545	2014-08-26 06:48:26.062
0326_20140826_064817_EX1404L1_MB	8/26/2014	EX1404L1_XBT132_140826	6.05	011.459	060.173809W	060.100319W	37.931123N	37.995436N	2014-08-26 06:48:07.064	2014-08-26 07:08:43.568
0327_20140826_070843_EX1404L1_MB	8/26/2014	EX1404L1_XBT132_140826 & EX1404L1_XBT133_140827	7.77	293.483	060.447271W	060.123414W	37.952279N	38.104958N	2014-08-26 07:08:34.567	2014-08-26 09:08:44.098
0328_20140826_090844_EX1404L1_MB	8/26/2014	EX1404L1_XBT133_140825 & EX1404L1_XBT134_140827	6.77	293.39	060.699251W	060.424155W	38.061203N	38.201637N	2014-08-26 09:08:34.600	2014-08-26 11:08:49.149
0329_20140826_110849_EX1404L1_MB	8/26/2014	EX1404L1_XBT134_140827	6.85	292.666	060.971335W	060.684106W	38.157047N	38.292031N	2014-08-26 11:08:40.146	2014-08-26 13:08:53.663
0330_20140826_130844_EX1404L1_MB	8/26/2014	EX1404L1_XBT134_140827	6.87	293.102	061.001917W	060.936035W	38.238760N	38.302894N	2014-08-26 13:08:35.162	2014-08-26 13:22:37.663

0331_20140826_132228_EX1404L1_MB	8/26/2014	EX1404L1_XBT134_140827 & EX1404L1_XBT136_140827	8.10	279.347	061.226257W	060.962558W	38.252979N	38.337385N	2014-08-26 13:22:18.665	2014-08-26 14:45:36.185
0332_20140826_144536_EX1404L1_MB	8/26/2014	EX1404L1_XBT136_140827	8.93	288.131	061.589865W	061.204163W	38.291508N	38.435613N	2014-08-26 14:45:27.185	2014-08-26 16:45:29.721
0333_20140826_164530_EX1404L1_MB	8/26/2014	EX1404L1_XBT136_140827 & EX1404L1_XBT137_140827	10.02	288.579	061.987318W	061.561758W	38.389437N	38.547417N	2014-08-26 16:45:20.719	2014-08-26 18:45:32.249
0334_20140826_184532_EX1404L1_MB	8/26/2014	EX1404L1_XBT137_140827 & EX1404L1_XBT138_140827	10.57	288.772	062.412311W	061.966389W	38.501412N	38.661720N	2014-08-26 18:45:22.750	2014-08-26 20:45:32.780
0335_20140826_204533_EX1404L1_MB	8/26/2014	EX1404L1_XBT138_140827	11.12	289.083	062.855697W	062.392122W	38.615670N	38.786367N	2014-08-26 20:45:23.780	2014-08-26 22:45:43.815
0336_20140826_224533_EX1404L1_MB	8/26/2014	EX1404L1_XBT138_140827 & EX1404L1_XBT139_140827	10.61	289.237	063.284597W	062.841371W	38.740572N	38.902746N	2014-08-26 22:45:24.811	2014-08-27 00:45:30.844
0337_20140827_004531_EX1404L1_MB	8/27/2014	EX1404L1_XBT139_140827 & EX1404L1_XBT140_140827	9.65	289.606	063.667939W	063.268936W	38.855901N	39.011923N	2014-08-27 00:45:31.344	2014-08-27 02:45:30.376
0338_20140827_024530_EX1404L1_MB	8/27/2014	EX1404L1_XBT140_140827 & EX1404L1_XBT141_140827	9.04	289.788	064.030252W	063.662159W	38.960483N	39.109695N	2014-08-27 02:45:20.877	2014-08-27 04:45:29.404
0339_20140827_044529_EX1404L1_MB	8/27/2014	EX1404L1_XBT141_140827 & EX1404L1_XBT142_140827	9.54	289.987	064.417799W	064.029027W	39.058473N	39.214949N	2014-08-27 04:45:20.405	2014-08-27 06:45:33.437
0340_20140827_064533_EX1404L1_MB	8/27/2014	EX1404L1_XBT142_140827 & EX1404L1_XBT143_140827	10.86	290.306	064.866044W	064.412918W	39.167755N	39.332464N	2014-08-27 06:45:23.937	2014-08-27 08:45:37.969

0341_20140827_084538_EX1404L1_MB	8/27/2014	EX1404L1_XBT143_140827 & EX1404L1_XBT144_140827 & EX1404L1_XBT145_140827	11.37	290.546	065.333663W	064.844709W	39.287258N	39.463886N	2014-08-27 08:45:28.972	2014-08-27 10:45:31.502
0342_20140827_104531_EX1404L1_MB	8/27/2014	EX1404L1_XBT145_140827	11.42	290.899	065.797640W	065.299758W	39.405376N	39.590594N	2014-08-27 10:45:22.499	2014-08-27 12:45:34.531
0343_20140827_124534_EX1404L1_MB	8/27/2014	EX1404L1_XBT145_140827 & EX1404L1_XBT146_140827	11.42	291.179	066.258217W	065.764191W	39.528046N	39.719800N	2014-08-27 12:45:25.032	2014-08-27 14:45:31.065
0344_20140827_144531_EX1404L1_MB	8/27/2014	EX1404L1_XBT146_140827 & EX1404L1_XBT147_140827	10.50	291.48	066.688259W	066.230255W	39.654594N	39.833653N	2014-08-27 14:45:22.060	2014-08-27 16:45:34.596
0345_20140827_164534_EX1404L1_MB	8/27/2014	EX1404L1_XBT147_140827 & EX1404L1_XBT148_140827	9.42	291.746	067.071367W	066.657012W	39.770146N	39.933785N	2014-08-27 16:45:25.098	2014-08-27 18:45:29.627
0346_20140827_184529_EX1404L1_MB	8/27/2014	EX1404L1_XBT148_140827	8.99	291.984	067.433155W	067.042776W	39.873204N	40.034940N	2014-08-27 18:45:20.626	2014-08-27 20:45:39.656
0347_20140827_204529_EX1404L1_MB	8/27/2014	EX1404L1_XBT149_140827 &EX1404L1_XBT150_140827	9.51	292.224	067.821007W	067.413852W	39.972882N	40.138155N	2014-08-27 20:45:20.659	2014-08-27 22:45:41.187
0348_20140827_224531_EX1404L1_MB	8/27/2014	EX1404L1_XBT150_140827&EX1404L1_XBT151_140827	10.36	293.577	068.239088W	067.803664W	40.078813N	40.233433N	2014-08-27 22:45:21.691	2014-08-28 00:45:31.722
0349_20140828_004532_EX1404L1_MB	8/28/2014	EX1404L1_XBT152_140827&EX1404L1_XBT153_140827	11.01	291.78	068.687397W	068.230658W	40.219076N	40.343978N	2014-08-28 00:45:32.222	2014-08-28 02:45:40.252
0350_20140828_024530_EX1404L1_MB	8/28/2014	EX1404L1_XBT153_140827&EX1404L1_XBT154_140827	9.51	293.064	069.076930W	068.685789W	40.339972N	40.447607N	2014-08-28 02:45:20.755	2014-08-28 04:45:30.286

0351_20140828_044530_EX1404L1_MB	8/28/2014	EX1404L1_XBT154_140827	10.27	293.363	069.495662W	069.075663W	40.444322N	40.558874N	2014-08-28 04:45:21.285	2014-08-28 06:45:30.315
0352_20140828_064530_EX1404L1_MB	8/28/2014	EX1404L1_XBT155_140827	10.40	295.412	069.903867W	069.494565W	40.556613N	40.678304N	2014-08-28 06:45:20.818	2014-08-28 08:41:29.348

Appendix G: Kongsberg EM 302 Multibeam Sonar Description and Operational Specifications

Several features of the *Okeanos Explorer's* 30 kHz multibeam make it an excellent tool for ocean exploration. The following is a brief description of these features.

Depth Range

The system is designed to map the seafloor in water depths of 10 to 7000 meters. This leaves only the deepest parts of the deeper ocean trenches out of the EM 302's reach. In fact, when the ship transited over the Mariana Trench going to and from Indonesia in 2010, the system was able to detect the bottom at depths of up to 8000 meters.

High Density Data

In multibeam data, the denser the data, the finer resolution maps can be produced. In water deptsh 3000 meters and shallower, the system can operate in dual swath, or multiping mode, which results in increased along track data density. This is achieved by detecting two swaths per ping cycle, resulting in up to 864 beams per ping.

The *Okeanos Explorer* mapping team typically operates the multibeam in high density equidistant ping mode, which results in up to 864 evenly spaced soundings on the seafloor per ping.

Multiple Data Types Collected

The system collects seafloor backscatter data, which provides information about the character of the seafloor in terms of bottom type.

The system also collects water column backscatter data, which has the ability to detect gaseous plumes in the water column. The full value of this feature is still being realized.

FM chirp mode is utilized in water depths greater than 1000 meters, and allows for the detection of the bottom further out from nadir than with previous 30 kHz systems. This results in wider swath widths, giving a higher likelihood of new discoveries as well as efficiency of survey operations.

Multibeam Primer

The area of the seafloor covered, or ensonified, by a single beam within a pulse of sound, or ping, is called the beam footprint. This beam footprint is defined in terms of the across track and along track values. Both of these values are dependent on water depth and the beam width at which the sound pulse is transmitted and received. The across track beam width value is also dependent on the receive angle, or "listening" angle, of the system, and the angle from nadir which it is received. The transmit angle for the transmit transducer is 0.5°, which is the smallest possible angle currently available for the EM302 system. The further out from nadir a sounding occurs, the larger the footprint will be. The receive angle for the receive transducer is 1°. As an example, as seen in Table 1 below, in 2000 meters of water, a beam footprint will have a radius of 18 meters at nadir but 25 meters by the time it hits the seafloor at an angle 140 degrees out from nadir.

Calculated acrosstrack acoustic beam footprint in meters for EM 302 (high density ping mode, 432 soundings/profile)				
Water depth (m)	Angle from nadir			
50	1 deg RX center	90 deg	120 deg	140 deg
100	1	0.5	1	1
200	2	1	2	3
400	4	2	3	5
1000	7	4	6	10
2000	18	9	16	25
4000	35	19	32	-
6000	70	37	-	-
7000	105	56	-	-

Table 1. Calculated across track EM302 beam footprint. Reference: Kongsberg Product description, Kongsberg document 302675 Rev B, Date 14/06/06, p. 17.

Calculated acrosstrack sounding density for EM 302 (high density ping mode, 432 soundings/profile)			
Water depth (m)	Swath Width		
50	90 deg	120 deg	140 deg
100	0.2	0.4	0.9
200	0.5	0.8	1.7
400	0.9	1.6	3.5
1000	1.9	3.2	6.9
2000	4.6	8.1	17.4
4000	9.3	16.2	-

Table 2. Calculated across track EM302 sounding density. Reference: Kongsberg Product description, Kongsberg document 302675 Rev B, Date 14/06/06, p. 17.

Acrosstrack sounding density describes the spacing between individual soundings on the seafloor in the acrosstrack direction. The maximum swath of the EM 302 is 150 degrees. At this swath, the sounding density will be the least dense, since the beams will be spread out over a larger horizontal distance over the seafloor. As the swath angle (width) is decreased, the sounding density will increase, as the same number of beams are now spread out over a smaller horizontal distance over the seafloor.

Calculated ping rate and alongtrack resolution for EM 302					
140 deg swath, one profile per ping					
			Alongtrack distance between profiles (m)		
Water depth (m)	Swath Width (m)	Ping Rate (pings/second)	@4 kts	@8 kts	@12 kts
50	275	3.2	0.7	1.2	1.9
100	550	1.8	1.1	2.2	3.3
200	1100	1	2.1	4.2	6.3
400	2200	0.5	4.1	8.2	12.2
1000	5500	0.2	10	20	30
2000	8000	0.1	15.2	30.5	45.7
4000	8000	0.06	19.2	38.5	57.7
6000	8000	0.04	24.5	49	73.4

Table 3. Calculated ping rate and along track EM302 sounding density, one profile per ping. Reference: Kongsberg Product description, Kongsberg document 302675 Rev B, Date 14/06/06, p. 15.

Calculated ping rate and alongtrack resolution for EM 302					
140 deg swath, two profiles per ping					
			Alongtrack distance between profiles (m)		
Water depth (m)	Swath Width (m)	Ping Rate	@4 kts	@8 kts	@12 kts
50	275	3.2	0.3	0.6	0.9
100	550	1.8	0.6	1.1	1.7
200	1100	1	1.1	2.1	3.2
400	2200	0.5	2	4.1	6.1
1000	5500	0.2	5	10	15
2000	8000	0.1	7.6	15.2	22.8

Table 4. Calculated ping rate and along track EM302 sounding density, two profiles per ping. Reference: Kongsberg Product description, Kongsberg document 302675 Rev B, Date 14/06/06, p. 15.

Reference: Kongsberg Product Description: EM 302 multibeam echosounder

Appendix H: Acronyms

- ACUMEN - Atlantic Canyons Undersea Mapping Expeditions
- ASCII – American Standard Code for Information Interchange
- AUV – autonomous underwater vehicle
- BIST – built in system test
- CDR – Commander
- CO – Commanding Officer
- CTD – conductivity, temperature, depth
- dB - decibel
- CW – continuous wave
- DNP – do not process
- DO - dissolved oxygen
- DP - dynamic position(ing)
- ECS – Extended Continental Shelf
- EVS – Manufacturer of video broadcast and media production systems
- ERT – Earth Resources Technology Inc.
- ET – Electronics Technician
- EX – NOAA Ship *Okeanos Explorer*
- FM – frequency modulated / modulation
- FTP – file transfer protocol
- IFREMER - Institut français de recherche pour l'explotation de la mer
- GB - gigabytes(s)
- KB - kilobytes(s)
- kHz – kilohertz
- km – kilometer
- kts – knots
- LT – Lieutenant
- LSS - light scattering sensor
- m - meters
- MB – multibeam sonar
- MB – megabytes(s)
- NCDDC – National Coastal Data Development Center
- NGDC – National Geophysical Data Center
- NMEA – National Marine Electronics Association
- NOAA – National Oceanic and Atmospheric Administration
- NODC – National Oceanographic Data Center
- NOPP – National Ocean Partnership Program
- OER – NOAA Office of Ocean Exploration and Research
- OMAO – NOAA Office of Marine and Aviation Operations
- OPS – Operations Officer
- ORP - oxygen reduction potential
- ROV – remotely operated vehicle
- RTS – manufacturer of intercom communication systems
- SAN – storage area network
- SBP – subbottom profiler

- SCS – scientific computer system
- SIS – Seafloor Information System
- SVP – sound velocity profile
- TRU – transceiver unit
- TSG - thermosalinograph
- UCAR – University Corporation for Atmospheric Research
- UPS – uninterruptable power supply
- USBL – ultrashort baseline
- USGS – United States Geological Survey
- XBT – expendable bathythermograph
- XO – Executive Officer
- VSAT – very small aperture satellite
- WD – water depth
- WHOI – Woods Hole Oceanographic Institution

Appendix I: Weather Log

This weather log is provided to give environmental conditions related to multibeam data quality.

EX1404L1 WEATHER LOG								
LOCAL DATE	**LOCAL TIME**	**UTC TIME**	**UTC DATE**	**WIND DIRECTION (deg)**	**WIND SPEED (kt)**	**WAVE HEIGHT (ft)**	**SWELL DIRECTION (deg)**	**SWELL HEIGHT (ft)**
8/10/2014	0000	0400	8/10/2014	15°	7	0-1	310°	0-1
8/10/2014	0400	0800	8/10/2014	350°	10	0-1	310°	0-1
8/10/2014	0800	1200	8/10/2014	LT	VAR	0-1	280°	0-1
8/10/2014	1200	1600	8/10/2014	260°	7	0-1	250°	0-1
8/10/2014	1600	2000	8/10/2014	280°	7	0-1	260°	0-1
8/10/2014	2000	0000	8/11/2014	330°	<5	<1	265°	<1
8/11/2014	0000	0400	8/11/2014	60°	7	0-1	20°	0-1
8/11/2014	0400	0800	8/11/2014	16°	11	0-1	20°	0-1
8/11/2014	0800	1200	8/11/2014	40	10	0-1	40	1-2
8/11/2014	1200	1600	8/11/2014	60	10	0-1	40	1-3
8/11/2014	1600	2000	8/11/2014	70	8	0-1	45	0-1
8/11/2014	2000	0000	8/12/2014	100	10	<1	50	<1
8/12/2014	0000	0400	8/12/2014	145	11	1-2	150	1-2
8/12/2014	0400	0800	8/12/2014	155	9	0-1	170	0-1
8/12/2014	0800	1200	8/12/2014	120	11	0-1	120	1-2
8/12/2014	1200	1600	8/12/2014	120	10	1	120	1-2
8/12/2014	1600	2000	8/12/2014	130	13	0-1	-	-
8/12/2014	2000	0000	8/13/2014	140	15	-	-	-
8/13/2014	0000	0400	8/13/2014	135	17	0-1	-	-
8/13/2014	0400	0800	8/13/2014	110	18	1-2	-	-
8/13/2014	0800	1200	8/13/2014	120	23	1-2	-	-
8/13/2014	1200	1600	8/13/2014	125	21	1-2	-	-
8/13/2014	1600	2000	8/13/2014	150	19	1-2	-	-
8/13/2014	2000	0000	8/14/2014	230	5	1-2	-	-
8/14/2014	0000	0400	8/14/2014	310	6	0-1	-	-
8/14/2014	0400	0800	8/14/2014	290	9	0-1	-	-
8/14/2014	0800	1200	8/14/2014	LT	VAR	0-1	-	-
8/14/2014	1200	1600	8/14/2014	275	11	1-2	280/220	2-3/1-2
8/14/2014	1600	2000	8/14/2014	270	13	1-2	140	2-3
8/14/2014	2000	0000	8/15/2014	287	10	1-2	130/220	2-3
8/15/2014	0000	0400	8/15/2014	295	11	2-3	225	3-4
8/15/2014	0400	0800	8/15/2014	290	12	1-2	240	3-4
8/15/2014	0800	1200	8/15/2014	340	10	1-2	290/330	2-4
8/15/2014	1200	1600	8/15/2014	300	8	1-2	250/335	2-4
8/15/2014	1600	2000	8/15/2014	225	6	0-1	270/230	2-3
8/15/2014	2000	0000	8/15/2014	230	8	1	20/280	2-3

8/16/2014	0000	0400	8/16/2014	220	16	1-3	300	2-3
8/16/2014	0400	0800	8/16/2014	230	18	1-2	310	2-4
8/16/2014	0800	1200	8/16/2014	200	18	1-2	210	2-4
8/16/2014	1200	1600	8/16/2014	220	18	1-2	200	2-3
8/16/2014	1600	2000	8/16/2014	240	18	1-2	225	2-3
8/16/2014	2000	0000	8/17/2014	235	15	0-2	180/270	2-3
8/17/2014	0000	0400	8/17/2014	290	17	1-2	180/270	2-3
8/17/2014	0400	0800	8/17/2014	290	8	1-2	300	1-2
8/17/2014	0800	1200	8/17/2014	215	3	0-1	1-2	
8/17/2014	1200	1600	8/17/2014	225	10	0-1	1-2	
8/17/2014	1600	2000	8/17/2014	230	15	0-1	1-2	
8/17/2014	2000	0000	8/18/2014	200	15	0-2	2-3	
8/18/2014	0000	0400	8/18/2014	205	22	1-2	245	1-3
8/18/2014	0400	0800	8/18/2014	280	18	1-2	310	2-4
8/18/2014	0800	1200	8/18/2014	161	9	1-2	270	2-4
8/18/2014	1200	1600	8/18/2014	250	20	1-2	050	2-4
8/18/2014	1600	2000	8/18/2014	270	19	1-2	250	2-4
8/18/2014	2000	0000	8/19/2014	300	15	2-4	240	2-4
8/19/2014	0000	0400	8/19/2014	275	16	1-3	240/330	2-4
8/19/2014	0400	0800	8/19/2014	290	12	1-3	300	2-4
8/19/2014	0800	1200	8/19/2014	270	8	1-2	350	2-4
8/19/2014	1200	1600	8/19/2014	265	12	1-2	230	23
8/19/2014	1600	2000	8/19/2014	245	15	0-1	300	1-3
8/19/2014	2000	0000	8/20/2014	010	6	1-2	290	1-3
8/20/2014	0000	0400	8/20/2014	145	9	0-1	280	1-2
8/20/2014	0400	0800	8/20/2014	140	12	0-1	280	1-2
8/20/2014	0800	1200	8/20/2014	40	7	0-1	180	1-2
8/20/2014	1200	1600	8/20/2014	65	9	0-1	220	1-2
8/20/2014	1600	2000	8/20/2014	085	3	0-1	100	1-2
8/20/2014	2000	0000	8/21/2014	162	10	0-2	154	1-3
8/21/2014	0000	0400	8/21/2014	185	10	1-2	200	2-3
8/21/2014	0400	0800	8/21/2014	025	9	1-2	200	2-3
8/21/2014	0800	1200	8/21/2014	030	9	1-2	170	1-3
8/21/2014	1200	1600	8/21/2014	135	5	1-2	120/060	1-3
8/21/2014	1600	2000	8/21/2014	170	10	1-2	050	2-3
8/21/2014	2000	0000	8/22/2014	090	13	2-3	080	2-3
8/22/2014	0000	0400	8/22/2014	025	23	2-4	080/030	3-5
8/22/2014	0400	0800	8/22/2014	030	20	3-4	030	4-6
8/22/2014	0800	1200	8/22/2014	040	16	3-5	070	5-7
8/22/2014	1200	1600	8/22/2014	037	15	3-5	000/040	3-5
8/22/2014	1600	2000	8/22/2014	065	10	2-4	60/120	3-5
8/22/2014	2000	0000	8/23/2014	040	16	3-5	070	5-7
8/23/2014	0000	0400	8/23/2014	075	13	2-4	060	4-6

8/23/2014	0400	0800	8/23/2014	080	16	2-4	060	4-6
8/23/2014	0800	1200	8/23/2014	035	20	3-4	350	4-6
8/23/2014	1200	1600	8/23/2014	045	19	3-4	035	4-6
8/23/2014	1600	2000	8/23/2014	041	13	2-4	060	4-6
8/23/2014	2000	0000	8/24/2014	055	14	2-4	060	4-6
8/24/2014	0000	0400	8/24/2014	060	12	2-4	060	4-6
8/24/2014	0400	800	8/24/2014	060	12	2-4	060	4-6
8/24/2014	0800	1200	8/24/2014	190	14	2-4	090	3-5
8/24/2014	1200	1600	8/24/2014	100	12	2-3	100	3-5
8/24/2014	1600	2000	8/24/2014	035	8	2-4	80	3-5
8/24/2014	2000	2400	8/25/2014	055	16	2-4	000/070	3-5
8/25/2014	0000	0400	8/25/2014	050	17	2-4	000/070	3-4
8/25/2014	0400	0800	8/25/2014	080	7	2-4	070	3-4
8/25/2014	0800	1200	8/25/2014	050	16	1-3	010/060	2-5
8/25/2014	1200	1600	8/25/2014	050	19	2-3	070	3-5
8/25/2014	1600	2000	8/25/2014	070	13	1-2	060	3-5
8/25/2014	2000	0000	8/26/2014	045	16	1-2	050	3-5
8/26/2014	0000	0400	8/26/2014	175	13	1-2	150	3-5
8/26/2014	0400	0800	8/26/2014	115	13	1-2	150	3-5
8/26/2014	0800	1200	8/26/2014	080	17	1-2	085	3-5
8/26/2014	1200	1600	8/26/2014	075	13	1-2	065/140	3-2
8/26/2014	1600	2000	8/26/2014	095	17	2-3	065/140	3-5
8/26/2014	2000	0000	8/27/2014	060	8	1-3	110/055	2-4
8/27/2014	0000	0400	8/27/2014	080	5	1-2	060	2-3
8/27/2014	0400	0800	8/27/2014	150	4	1-2	060	2-3
8/27/2014	0800	1200	8/27/2014	080	10	0-1	060	1-3
8/27/2014	1200	1600	8/27/2014	145	11	1-2	100/185	2-3
8/27/2014	1600	2000	8/27/2014	160	12	1-2	160	2-4