NOAA *Okeanos Explorer* Program

MAPPING DATA ACQUISITION AND PROCESSING REPORT

CRUISE EX-13-01

Ship Shakedown & Patch Test & Exploration, Northeast Canyons (Mapping)

March 28 - April 5, 2013
N. Kingston, RI – N. Kingston, RI

Report Contributors:
Elizabeth "Meme" Lobecker,Mashkoor Malik,LT Laura Gallant, Lillian Stuart, Jacklyn James, Richard Nadeau, Wanda Vargas, Kolleen Mortimer, Erika Young

January 9, 2014

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1. Introduction

The *Okeanos Explorer* Program

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 to generate hypotheses and lead to further investigations by the wider scientific community.

Using a high-resolution multibeam sonar with water column capabilities, a deep water remotely operated vehicle, and telepresence technology, *Okeanos Explorer* provides NOAA the ability to foster scientific discoveries by identifying new targets in real time, diving on those targets shortly after initial detection, and then sending this information back to shore for immediate near-real-time collaboration with scientists and experts at Exploration Command Centers around the world. The subsequent transparent and rapid dissemination of information-rich products to the scientific community ensures that discoveries are immediately available to experts in relevant disciplines for research and analysis.

Through the *Okeanos Explorer* Program, 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. The program 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* Program combines the capabilities of the NOAA Ship *Okeanos Explorer* with shore-based high speed networks and infrastructure for systematic telepresence-enabled exploration of the world ocean. 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.

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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 Desciption 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-13-01, during which a ship shakedown and patch test were conducted, as well as mapping of several Atlantic Shelf Edge Canyons.

3. Cruise Objectives

The cruise objectives for EX-13-01 were defined in EX-13-01 Project Instructions and included the following. All objectives were achieved unless otherwise noted below.

Multibeam Patch Test

The primary focus of EX-13-01 was to conduct annual ship and system shakedown items, including a multibeam patch test over Veatch Canyon.

1. Conduct multibeam system testing.
    a. Conduct multibeam patch test over Veatch Canyon utilizing the 2012 patch test line plan.
    b. Conduct multibeam system noise testing at varying RPM intervals. STATUS: Delayed until EX1302.
2. Conduct sound velocity comparison cast between CTD and XBT. Near surface values were compared to values from the thermosalinograph (TSG) and Reson SVP-70 probe. CTD cable integrity was also confirmed.
3. Testing of new mission hardware:
    a. EM 302 data acquisition computer
    b. Multibeam processing computers (3)
4. Verify inventory of spares of all mapping sensors.

Ship Shakedown Objectives

1. Assess ship's essential operational equipment and procedures
    a. Annual review of watchstanding and underway operational procedures
    b. Annual review of ship's checklists (Getting Underway, Arrival, etc.)
    c. Fueling and ballasting procedures
    d. Functionality of water makers, marine sanitation devices, oil water separator, and all equipment typically not operational while alongside
    e. Annual review of small boat operational risk management and certification /practice for launch/recovery crews and coxswains.
    f. Swing ship's compass
2. Conduct emergency drills
    a. Fire/Damage Control

    b. Abandon Ship
    c. Man-Over-Board
    d. Steering Casualty
    e. Oil Spill/ Hazmat spill
3. Assess ship's equipment necessary to support operations
    a. Dynamic positioning system operator practice
    b. Deck equipment certification procedures and practice
4. Test ship's ROV Support Systems
    a. Deck equipment testing and training (Tuggers, A-frame and ROV lift Crane)
5. Telepresence Objectives: (VSAT 5 mb/sec ship to shore; T1 shore to ship)
    a. Test transmission of mapping daily products to tethys FTP
    b. Transfer and integrate streamed video capture stations to the Okeanos Explorer
    c. Develop any scripts / protocols to capture the video feeds using Video Lan Client (VLC) and rewrap / section the output video
    d. Write SOP for on ship video stream capture.
    e. Adapt cruise variable php script to include location for ST's or Expedition Coordinators to manipulate priority levels
    f. Test and refine ship-to-shore communications and operations procedures
    g. Test and refine operating procedures and products
    h. Underway testing of SCS processing automation
    i. Remote participation of IFREMER scientists / sonar experts while testing EM 302 and conducting patch test
    j. Software updates and testing of the dashboard system
    k. General documentation and SOP development and/or updating for using the automated backup system and dashboard
    l. Training the new ST on the automated backup system and dashboard system
    m. General waking up of the video/telepresence gear for the field season.

Atlantic Canyons Undersea Mapping Expeditions (ACUMEN) Mapping

Following the successful patch test at Veatch Canyon, the cruise focused on continuing the comprehensive mapping of Northeast canyons and adjacent continental shelf, previously carried out during*Okeanos Explorer* cruises EX-11-06, EX-12-01, EX-12-04, EX-12-05 Leg 2, EX-12-06 and during the 2011 and 2012 field seasons of the NOAA Ships *Nancy Foster, Henry B. Bigelow, Ronald H. Brown,* and *Ferdinand R. Hassler*. Collectively, these cruises comprise the ACUMEN project. It is expected these multibeam datasets will inform planning of telepresence enabled ROV expeditions to the continental shelf canyons scheduled for the summer of 2013 on the EX.

EX-13-01 focused on mapping all canyon and shelf priority areas not addressed in the previous cruises listed above. This work will include, but is not limited to, surveys of priority area margins and previous survey data holidays. Survey mapping during EX-13-01 complemented existing multibeam coverage of the seafloor between the 400 m contour and Extended Continental Shelf (ECS) survey between Cape Hatteras and the US-Canadian maritime territorial boundary.

The shelf break and slope off the northeastern US support a diversity of habitats including more than 70 canyons ranging from depths of ~100m to ~3500m. The canyons provide a refuge for a variety of fauna including species of deep water corals, fish and other animals. While some canyons have been studied previously, most are poorly known and are of high interest to federal and state agencies with research and

management responsibilities. NOAA OER's previous work on NE canyons includes “Deep Water Mid-Atlantic Canyon Exploration” in 2011 which focused on Norfolk, Washington, Accomac and Baltimore canyons. Other Atlantic canyons have also been identified as exploration targets during Atlantic Basin workshop. Other NOAA programs [e.g., National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center (NEFSC) and NMFS Deep Sea Coral Research and Technology Program (DSCRTP)] also have a stated interest in understanding the geomorphology and habitat complexity of these canyons. In 2012 OER initiated a program to explore these canyons in partnership with NOAA NMFS, NOAA National Ocean Service (NOS), NOAA Office of Marine and Aviation Operations (OMAO), Virginia Sea Grant, and the Mid Atlantic Regional Council on the Ocean (MARCO).

New England Seamounts Mapping

New England Seamounts mapping objectives were not completed due to unfavorable offshore weather conditions throughout the cruise. Water column mapping exploration was planned tooccur while transiting over the following seamounts with previous ECS data coverage: Bear, Mytilus, and Buell, Retriever, Picket, and Balanus Seamounts. Focused mapping exploration were planned to occur on Asterias, Kelvin, Kiwi, and Panulirus Seamounts, which lie just offshore from existing ECS mapping coverage. These objectives will be pursued as time allows throughout the 2013 and 2014 field seasons.

Overall Data Collection Objectives

During EX-13-01, multibeam and single beam data were generally collected 24 hours a day and expendable bathythermograph (XBT) casts were conducted at an interval defined by prevailing oceanographic conditions, generally every two to three hours. Additionally, subbottom profile data was collected daily between the hours of 1000 and 1800. All multibeam sonar data was fully processed according to established onboard procedures and was archived with the National Geophysical Data Center. Ancillary sonar datasets were archived at the National Oceanographic Data Center or the National Geophysical Data Center. The data collection objectives for the cruise are outlined in detail below.

1. XBT and CTD operations
    a. Test the ship’s 3 XBT hand-launchers.
    b. XBT casts will be collected at regular interval of no more than 6 hours and likely less in the vicinity of the Gulf Stream and associated eddies.
    c. Testing and verification of CTD sensors
2. Collect deep water multibeam sonar data (MBES)
    a. Conduct 24-hr/day mapping operations for the duration of the cruise.
    b. Collect bathymetric, sea floor backscatter, and water column backscatter data.
    c. Initial data collection focus on completion of canyons coverage.
    d. Secondary data collection focus on NE Seamounts including Asterias, Kiwi, Kelvin, and Panulirus.
3. Conduct training of new personnel in all mapping data collection and processing procedures (continuous throughout cruise).
    a. Training of new survey technician
    b. Training of interns/contractors/ physical scientists new to the ship.
    c. Conduct training of new personnel for XBT and CTD operations
4. The following new mission software will be installed and tested:

a. Operational software for the Kongsberg EK60 sonar was migrated to a new hardware and tested during EX-12-06. Testing of this new computer will continue. The prior computer was preserved as a backup in case there are any problems with the migration.
b. CARIS 7.1 and 8

5. Collect ancillary sonar data
    a. 24-hr/day EK60 single beam collection.
    b. Knudsen sub-bottom profiler data collection from 1000-1800.
6. Install and test new version of SVP Server, a software program created by Dr. Jonathan Beaudoin of the University of New Hampshire Center for Coastal and Ocean Mapping / Joint Hydrographic Center.

4. Participating Mapping Personnel

NAME	ROLE	AFFILIATION
CDR Ricardo Ramos	Commanding Officer	NOAA Corps
LT Laura Gallant	Field Operations Officer	NOAA Corps
Mashkoor Malik	Expedition Coordinator / Mapping Team Lead	NOAA OER (ERT Inc.)
Elizabeth “Meme” Lobecker	Expedition Coordinator / Mapping Team Lead	NOAA OER (ERT Inc.)
Lillian Stuart	Augmenting Senior Survey Technician	NOAA OMAO
Jacklyn James	Survey Technician	NOAA OMAO
Kolleen Mortimer	Physical Scientist	NOAA AHB (ERT Inc.)
Erika Young	Mapping Watchstander	NOAA OER / UCAR
Wanda Vargas	Mapping Watchstander	NOAA OER / UCAR

5. Summary of Major Findings

Cruise Map

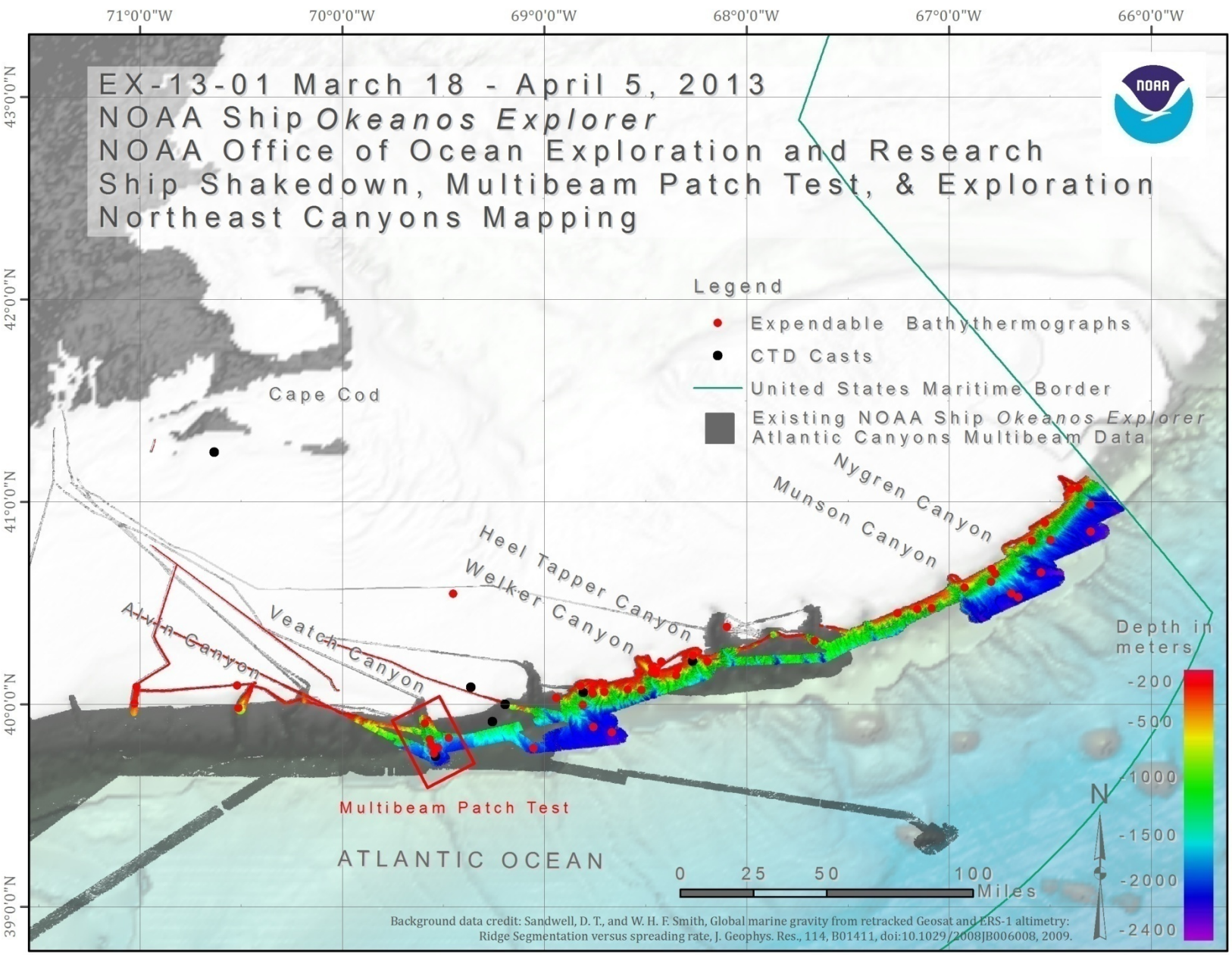


Figure 1.Cruise map made in ArcMap 10 showing overall cruise track and key operational areas.

Features of Interest

Veatch Canyon

For the second year in a row Veatch Canyon was used for the annual multibeam patch test. Overtime, 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.

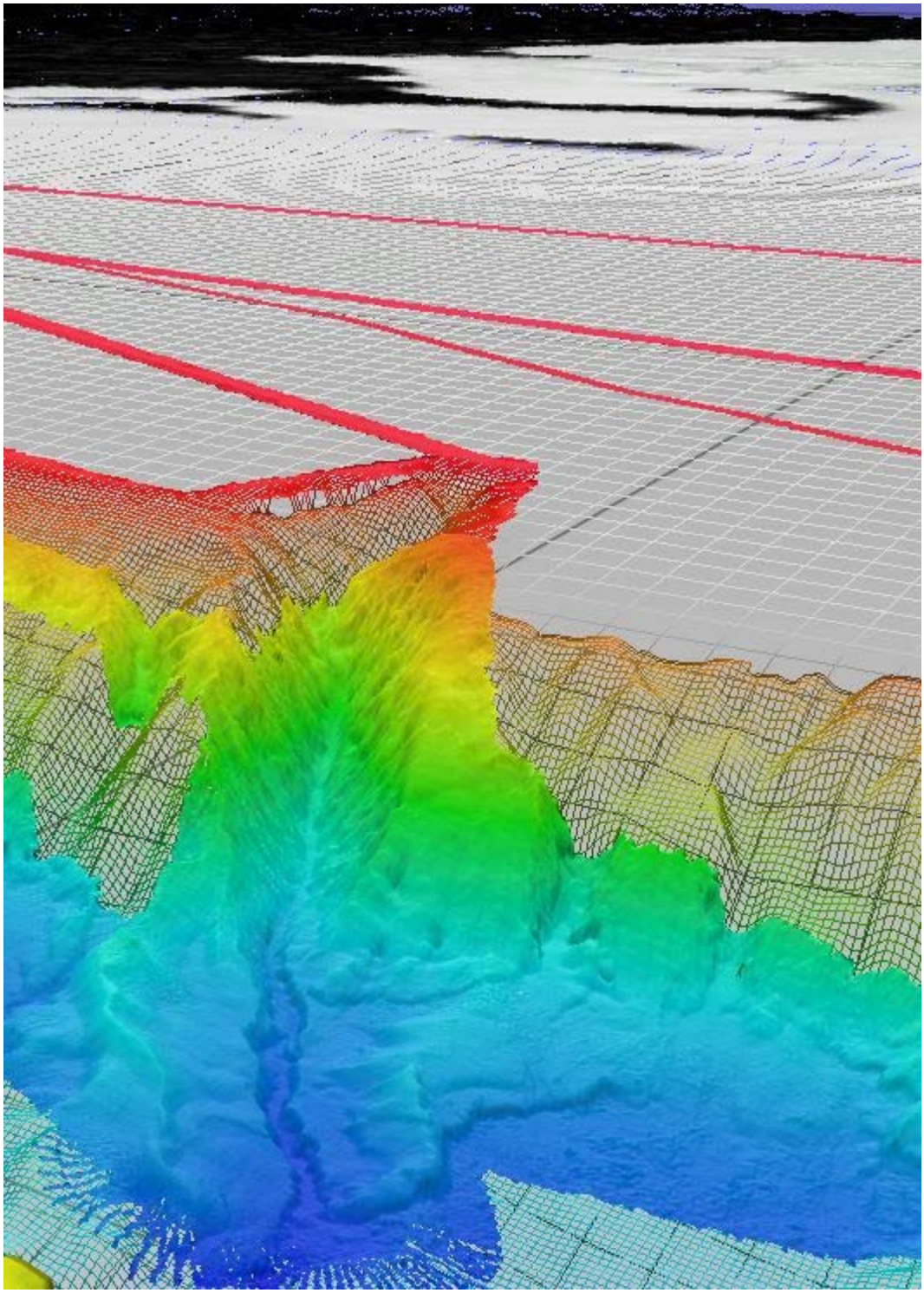


Figure 2. Veatch Canyon patch test site. EM 302 multibeam data gridded to 50 meters in Fledermaus v7. Background data: Sandwell and Smith, NOAA OER / UNH Law of the Sea Project, previous Okeanos Explorer data.

Alvin Canyon

Multibeam coverage at the head of Alvin Canyon was developed to better than the 400 meter isobath.

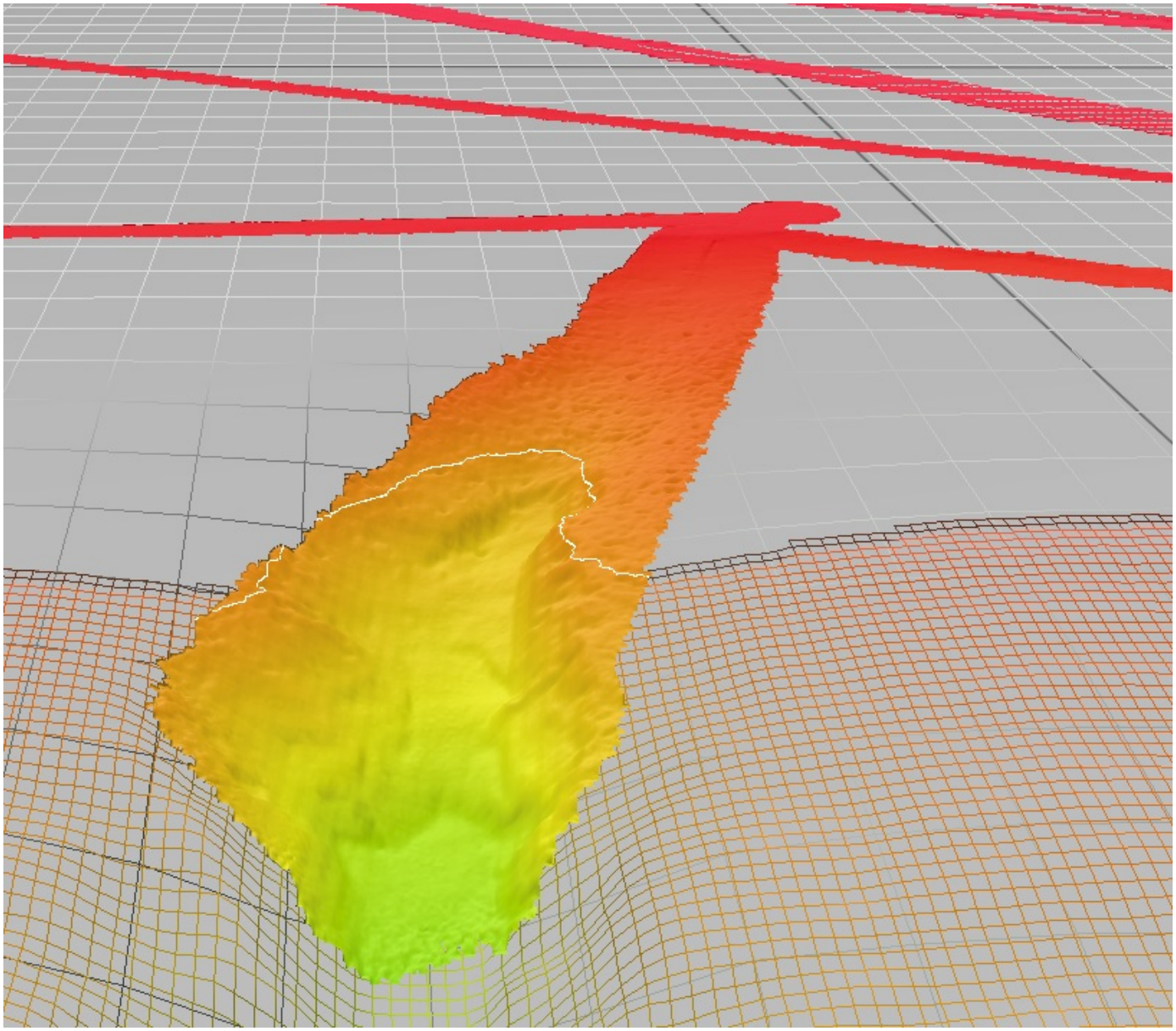


Figure 3. Alvin Canyon. EM 302 multibeam data gridded to 50 meters in Fledermaus v7. 400 meter isobath shown as white. Background data: Sandwell and Smith, NOAA OER / UNH Law of the Sea Project, previous Okeanos Explorer data.

Welker and Heel Tapper Canyons

Multibeam coverage at the heads of Welker and Heel Tapper Canyons was developed to the better than the 400 meter isobath.

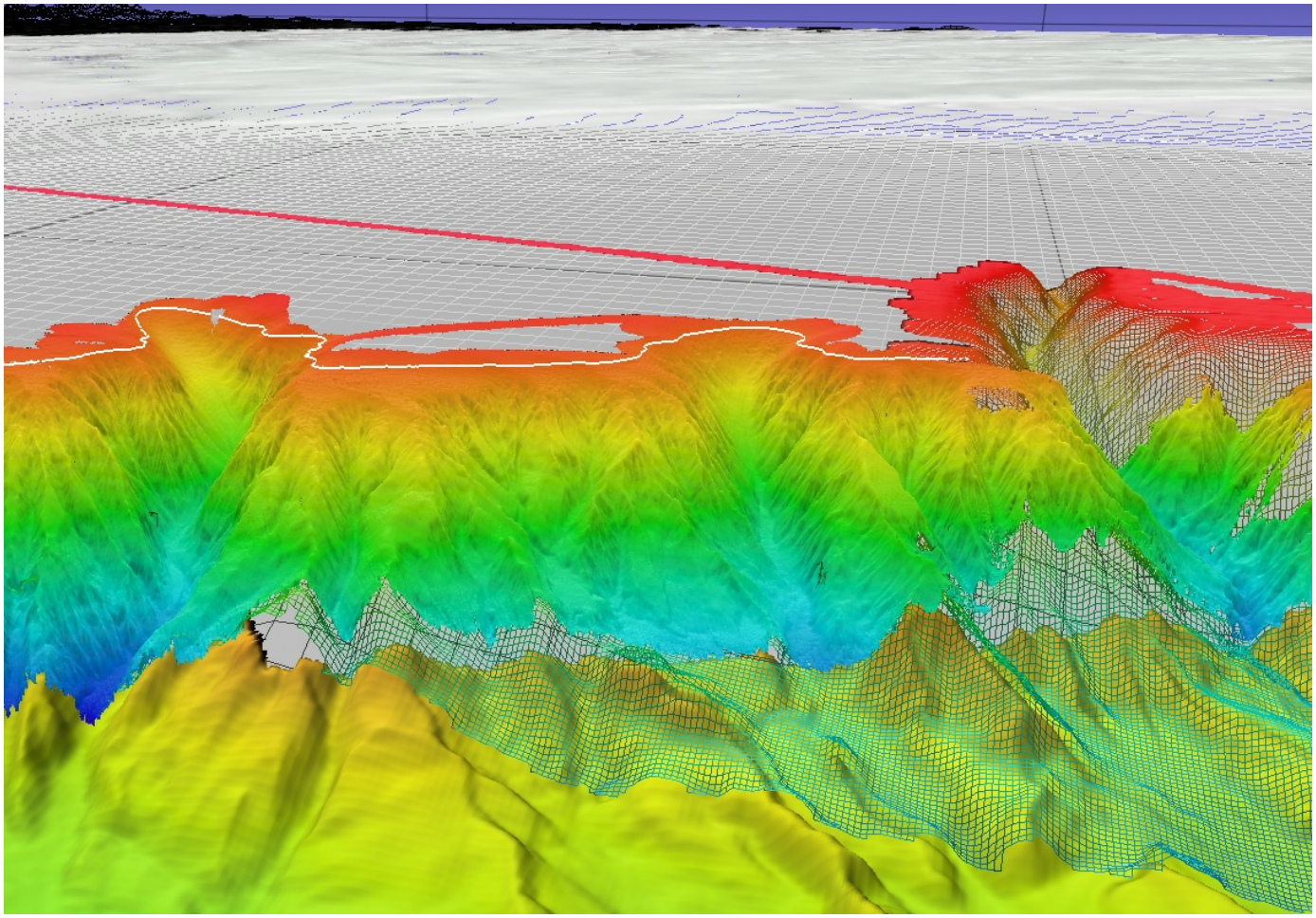


Figure 4. Welker (left) and Heel Tapper (right)Canyons. EM 302 multibeam data gridded to 50 meters in Fledermaus v7. 400 meter isobath shown as white. Background data: Sandwell and Smith, NOAA OER / UNH Law of the Sea Project, previous Okeanos Explorer data.

Munson Canyon

Multibeam coverage achieved at the heads of Munson (left) and Nygren (center) Canyons requires further development to defined the 400 meter isobath. The unnamed canyon to the far east directly adjacent to the U.S.-Canadian border was defined to better than the 400 meter isobath.

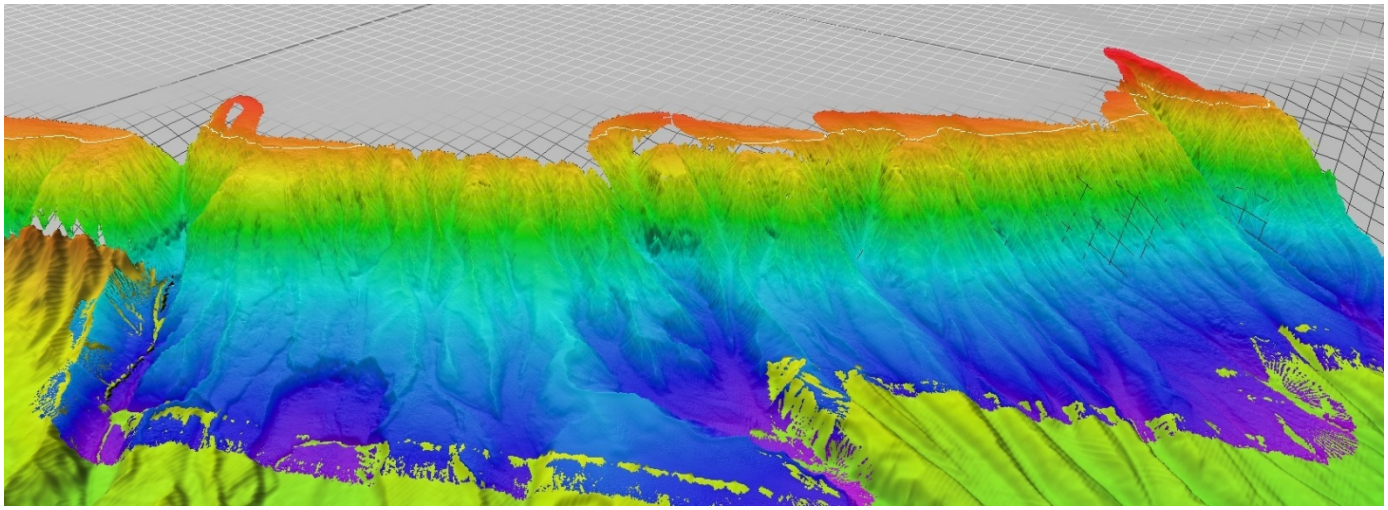


Figure 5. Canyons Munson (left),Nygren (center), and unnamed. EM 302 multibeam data gridded to 50 meters in Fledermaus v7. 400 meter isobath shown as white. Background data: Sandwell and Smith, NOAA OER / UNH Law of the Sea Project, previous Okeanos Explorer data.

6. Mapping Statistics

Dates	March 18 - April 5, 2013
Days lost to weather	9.1 days
Total mapping days	8.6 days
Total non-mapping days	9.1 days
Line kilometers of survey	2875.8 km
Square kilometers mapped	10,955.8 km^2
Number / Data Volume of EM 302 raw bathymetric / bottom backscatter multibeam files	208 files / 25 GB
Number / Data Volume of EM 302 water column multibeam files	206 files / 79 GB
Number / Data Volume of EK 60 water column singlebeam files	38 files / 1.4 GB
Number / Data Volume of subbottom sonar files	63 files / 1.4 GB
Number of XBT casts	49
Number of CTD casts (including test casts)	7
Beginning draft	Forward: 15' 2"; Aft: 14'
Ending draft	Forward: 14' 8"; Aft: 13'10"
Average ship speed for survey	8.1 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 multiping, or 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 crosstrack and alongtrack data resolutions.

The ship is also equipped with aKongsberg 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-13-01operations included EM 302 multibeam, EK 60 singlebeam, and Knudsen subbottom profile data collection. The schedule of operations during transits included continuous 24 hour per day multibeam and singlebeam data collection, and subbottom data collection from 1000 – 1800 (local).

Expendable bathythermographs were collected every two to four hours to correct multibeam data for changes in sound speed in the water column, and were applied in real time using Seafloor Information Software (SIS). Sound speed at the sonar head was determined using a Reson SVP-70 probe and the thermosalinograph. Data from these two systems was monitored for consistency throughout the cruise, and whichever was performing better was applied in realtime using SIS.

Background data used for exploration mapping included multibeam data collected by the Extended Continental Shelf project and Sandwell and Smith satellite altimetry bathymetric data.

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

Okeanos Explorer's annual multibeam patch test was conducted during this cruise and the results are discussed below.

A patch test was run on March 22 over Veatch Canyon. The results were analyzed by three experienced mapping scientists and the results varied. All agreed no timing offset is present in the system. However, heading offset analysis results ranged from 0 to -0.2° to +0.3°, and pitch offset analysis results ranged from 0° to -0.2°, and roll from 0° to -0.03°. A second set of heading, pitch, and roll patch test lines were planned to be run, but weather and operational conditions did not ultimately allow for this. Another full patch test will be run in May 2013, directly after the ship is in dry dock.

Offset Test	Line Numbers	Speed	Heading	Offset
Timing	0015_20130321_152036_EX1301_MB.all 0020_20130321_194424_EX1301_MB.all	5 knots 8 knots	350° 350°	0 seconds
Pitch	0018_20130321_180140_EX1301_MB.all 0020_20130321_194424_EX1301_MB.all	8 knots 8 knots	170° 350°	-.725°
Heading	0018_20130321_180140_EX1301_MB.all 0022_20130321_212804_EX1301_MB.all	8 knots	170°	0°

Roll	Roll calibration lines not run due to inclement weather

Table 1. EM 302 transducer offset values determined during EX-13-01.

Throughout the cruise, multibeam data quality was monitored in realtime by acquisition watchstanders. XBTs were conducted every two to four hours as necessary to maintain data quality. Ship speed was adjusted to maintain data quality as necessary.Line spacing was planned to ensure ¼ to ½ overlap between lines at all times. Cutoff angles in SIS were generally set to 75° on both the port and starboard sides.

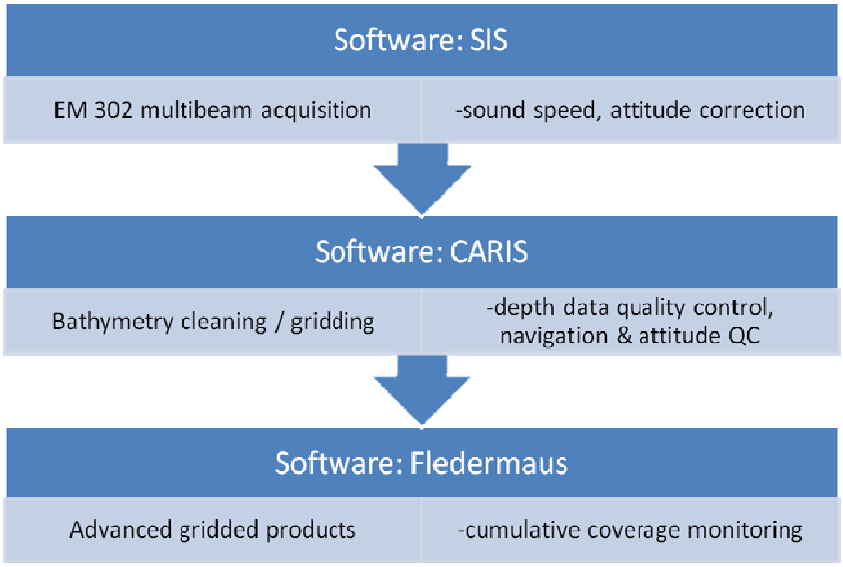


Figure 6. Shipboard multibeam data flow.

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, which were copied to the shoreside FTP on a daily basis for shoreside scientist participation.

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 seeps using Fledermaus Midwater. Detected seeps were converted to point SD files and viewed in Fledermaus along with other datasets, including bathymetry, bottom backscatter, and oxidation reduction potential data.A table detailing all water column data processing is provided in the appendices section of this report.

EM 302 Multibeam Bottom Backscatter Data Processing

On an as needed basis, multibeam bottom backscatter data were imported into Fledermaus FMGT, and mosaics were generated. These mosaics aided determining AUV dive target location based on relative acoustic backscatter reflective strength of the seabed.

EM 302 Built In System Tests(BISTs)

Initial BISTs run while transiting out of Narragansett Bay show several failures. The EM 302 TRU power was cycled several times and the cable for TX board #19 was found loose and reinserted. Later BISTs showed all systems working properly throughout the cruise. Receive noise levels were generally high, most likely due to inclement weather conditions experienced throughout the cruise.

Twelve built in system tests (BIST) were run during the cruise to monitor the system health of the EM 302 sonar electronics. In all cases, the sonar appeared to be performing well. A summary table of BIST results and a sample full BIST result is provided in the appendices of this report.

EM 302 Multibeam Crossline Analysis

Gridded mainscheme lines were imported into Fledermaus Crosscheck and converted to an SD surface. The Crosscheck analysis routine was utilized to compare gridded mainscheme data to the raw crossline file, and the results for each comparison are shown below.

The crosslinewas:
0155_20130330_042442_EX1301_MB.all (147°).

The mainscheme lines were:
0157_20130330_062607_EX1301_MB.all (58°)
0160_20130330_085839_EX1301_MB.all (238°)
0161_20130330_105840_EX1301_MB.all (238°)
0163_20130330_115527_EX1301_MB.all (58°)

292193 # Number of Points of Comparison
-1853.459647 # Data Mean
-1853.018121 # Reference Mean
-0.441530 # Mean
-0.134280 # Median
4.526300 # Std. Deviation
-2422.57 -1507.28 # Data Z - Range
-2323.88 -1514.60 # Ref. Z - Range
-214.32 139.53 # Diff Z - Range
9.494155 # Mean + 2*stddev
9.186913 # Median + 2*stddev
19.696148 # Ord 1 Error Limit
34.850151 # Ord 2 Error Limit
11.362251 # Special Order Error Limit
0.000000 # Custom Error Limit
0.000407 # Ord 1 P-Statistic
0.000123 # Ord 2 P-Statistic
0.005517 # Special Order P-Statistic
1.000000 # Custom P-Statistic
119 # Ord 1 - # Rejected
36 # Ord 2 - # Rejected
1612 # Special Order - # Rejected

292193 # Custom - # Rejected
1 # Order 1 Survey ACCEPTED
1 # Order 2 Survey ACCEPTED
1 # Special Order Survey ACCEPTED
0 # Custom Survey REJECTED

EK 60 Singlebeam Sonar Data

EK 60 data was collected at all times during mapping operations and was valuable in confirming the location of seeps. Data were monitored in realtime for the presence of seeps but were not processed. All instances of seeps observed in EK 60 data were also observed in EM 302 water column data.

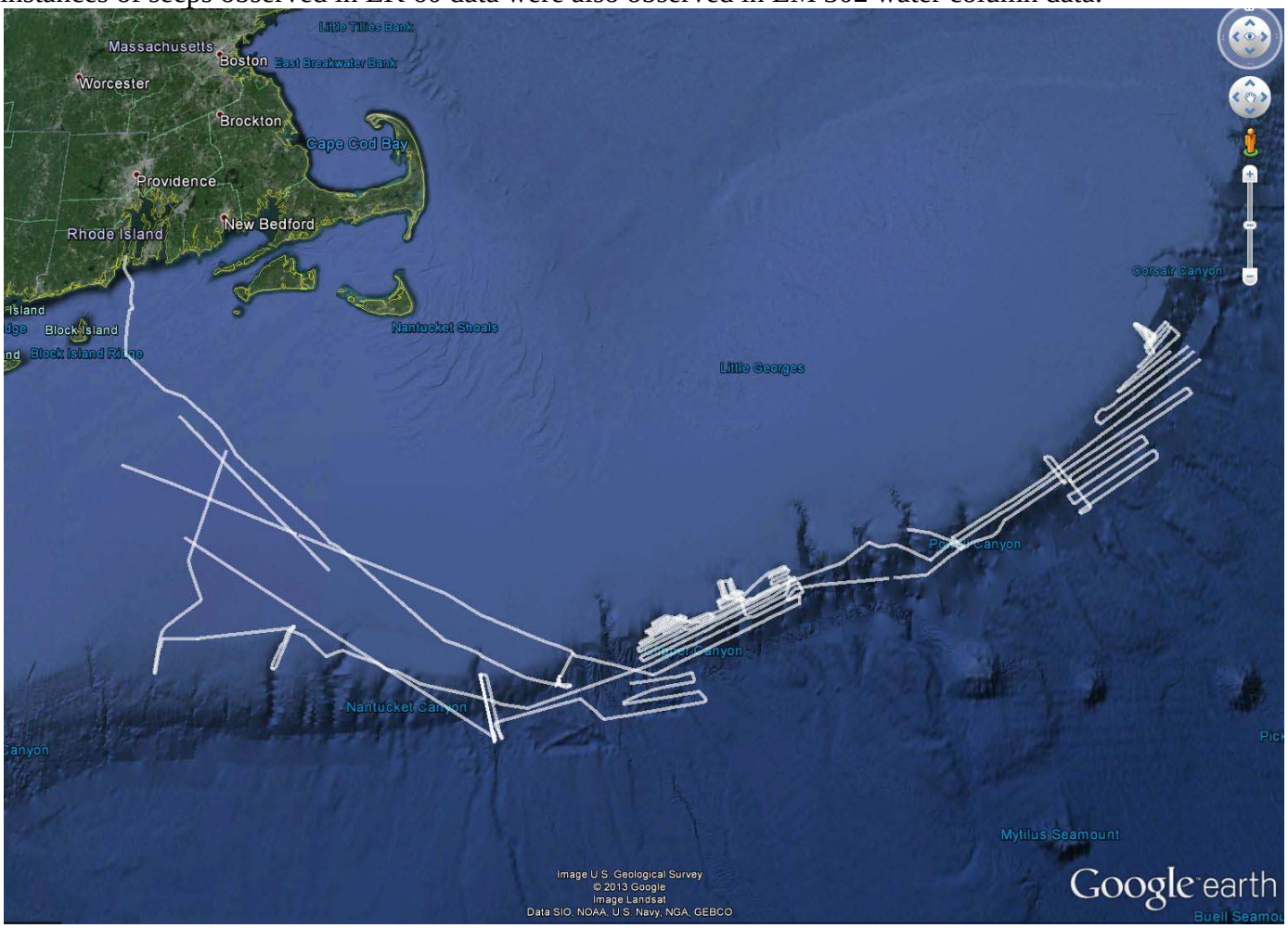


Figure 7. Tracklines of EK 60 singlebeam sonar data collected during EX-13-01, shown in Google Earth.

Knudsen 3260 Subbottom Profiler Data

Knudsen 3260 subbottom profiler data were monitored in realtime for data quality and for the presence of gas pockets and intrusions under the seabed.The subbottom profiler was run from 1000 - 1800during all survey operations except the multibeam patch test.

Subbottom profiler processing was using Chesapeake Technology Inc.'s Sonar Wiz. The dataset was not processed as a whole.

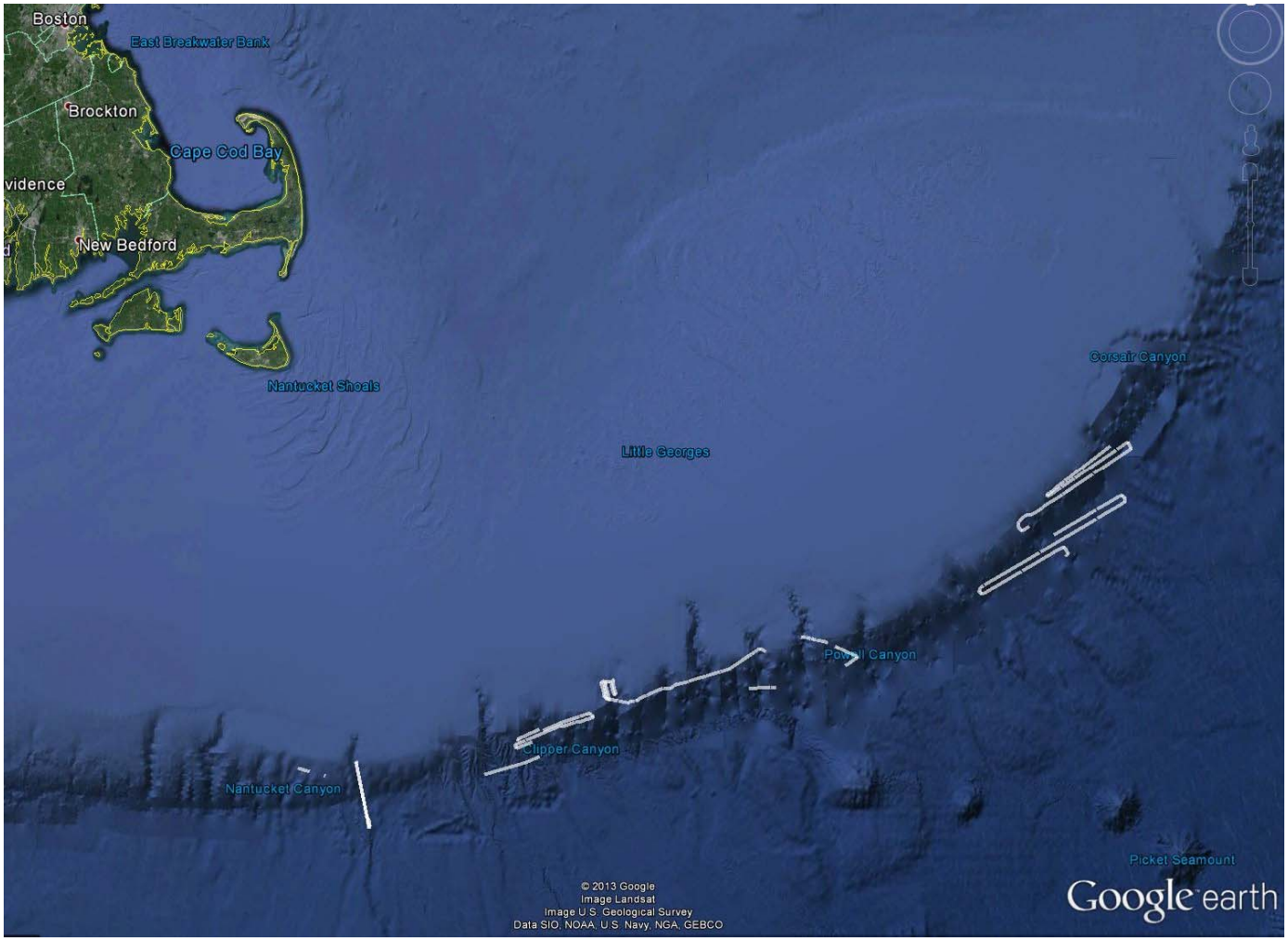
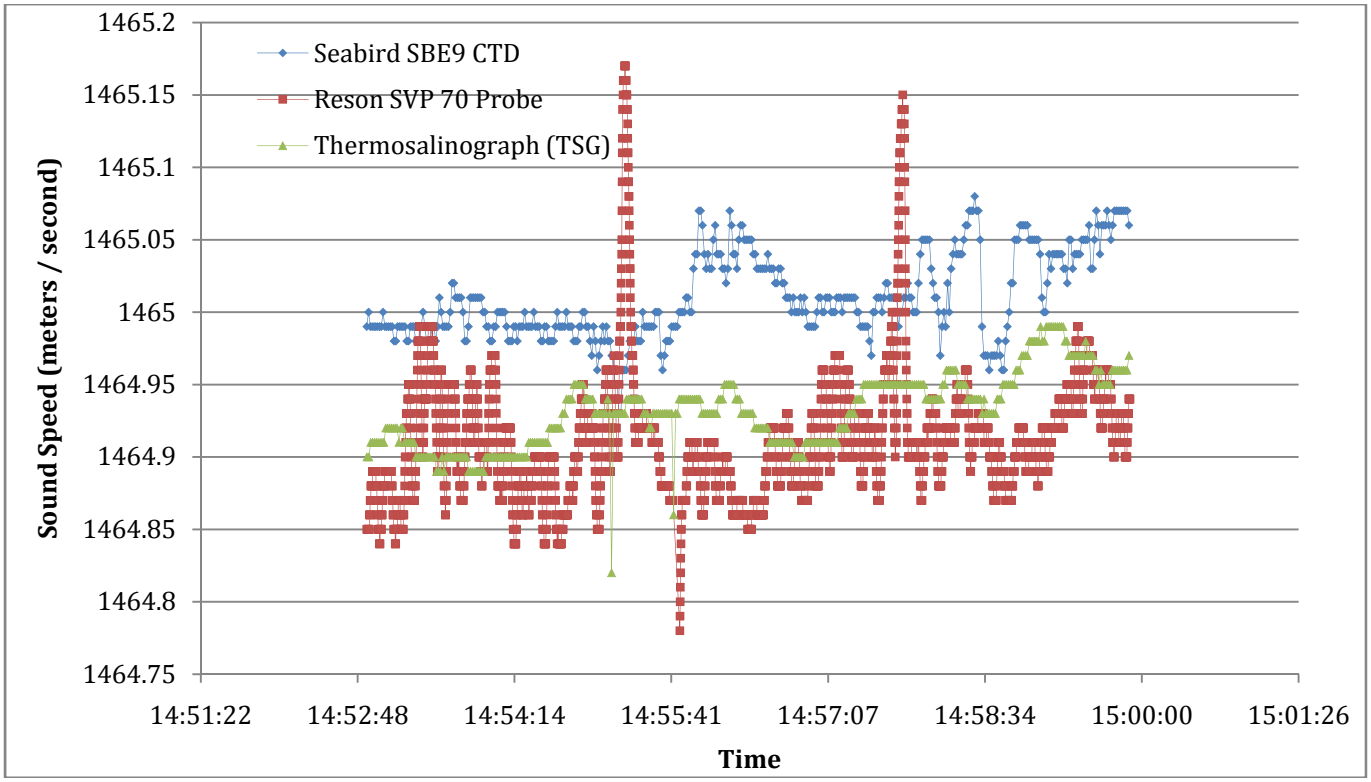


Figure 8. Tracklines of Knudsen subbottom profiler data collected during EX-13-01, shown in Google Earth.

Sound Velocity Profile Comparison

On March 26, a sound velocity profile comparison was conducted between the Seabird SBE 9 CTD, the hull mounted Reson SVP 70 Probe, and the thermosalinograph (TSG). All three sensors showed values within .15 meters / second. The results are shown in the graph below.



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.

Oliver Soubigou (IFREMER) and Mashkoor Malik (OER) organized a telepresence demonstration between the ship and 6 IFREMER scientists. Organized by The scientists were briefed about the current cruise, the telepresence setup, the normal operating procedures during telepresence enabled cruises, and data management onboard. IFREMER asked several questions at the end and seemed very interested in the concept.

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-13-01*Okeanos Explorer* data management plan is provided in the appendices of this report.

12. Cruise Calendar.

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

March/April 2013						
Sun	Mon	Tues	Wed	Thur	Fri	Sat
						3/16 Mission personnel arrived to the ship in Davisville, RI.
3/17 Mission personnel arrived to the ship in Davisville, RI.	3/18 Departed dock at 1116. Commence mapping at Narragansett Bay sea buoy, transit to multibeam patch test site.	3/19 Headed back inshore to wait out heavy seas. Stood by offshore Block Island.	3/20 Conducted shallow test CTD. Commenced transit to patch test site.	3/21 Conducted 1500 meter CTD. Conducted multibeam patch test and canyon holiday fill lines.	3/22 Conducted holiday fill lines. Transited inshore to avoid heavy seas.	3/23 Stood by at Montauk. Headed back offshore to canyons mapping grounds in late morning.
3/24 Partial mapping day over canyons. Transit to Vineyard Sound.	3/25 Stood by in Vineyard Sound, waiting for latest low front to pass.	3/26 Stood by in Vineyard Sound. Practice surface CTD casts. Began transit to canyons working grounds.	3/27 Resume canyons mapping.	3/28 Continue canyons mapping. Practice 1000 meter CTD. Telepresence demo with IFREMER.	3/29 Continue canyons mapping.	3/30 Continue canyons mapping.
3/31 Continue canyons mapping.	4/1 Continue canyons mapping. Commence transit towards Veatch Canyon in heavier seas.	4/2 Veatch Canyon seep confirmation in sonars. 2 CTDs conducted. Transit to port in heavy seas.	4/3 Arrive port Davisville, RI, two days early. Mission personnel depart ship.	4/4 In port, Davisville, RI.	4/5 In port Davisville, RI.	

13. Daily Cruise Log

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

March 16, 2013
Mission personnel arrived to ship alongside in Davisville, Rhode Island: Brendan Reser.

March 17, 2013
Mission personnel arrived to ship: Mashkoor Malik, Wanda Vargas, Meme Lobecker, Rick Nadeau, Kolleen Mortimer.

March 18, 2013
Mission personnel arrive to the ship: Webb Pinner, Jared Drewniack, Erika Young. The ship departed the dock at 1116 to swing the compass. Compass personnel wastransferred to shore via the *EX2*fast rescue boat from the starboard davit at 1333 and the ship began transit out of Narragansett Bay at 1402 towards the Veatch Canyon multibeam patch test site. Veatch Canyon patch test plans were generated. Training of new personnel commenced including science plan introduction and control room introduction. Multibeam and

singlebeam shallow water transit data collection began after passing the Narragansett Bay sea buoy. Data quality was high until the early morning of 3/19. SVP Server (UNOLS Multibeam Advisory Committee-developed beta software) was utilized during transit, rather than conducting shallow XBTs. EM 302, EK 60, and Knudsen subbottom ping synchronization was confirmed.

Several EM 302 built in system tests (BIST) were run. Initial test results showed several inconsistent failures, including RX board connectivity, TX 36 power, and TRU power. The TRU power was cycled at the remote starter level and at the circuit breaker. TX board #19's ethernet cable was found loose, was reseated, and connectivity was re-established. Final BIST results run this day showed all tests passing and acceptable system integrity. The UPS alarm is still triggered as the ship passes through 165 RPMs.

Sonar room temperature has been a little running higher than normal (~85°F) and is being monitored.

March 19, 2013
At 0730 the ship began heading inshore to protected waters due to building weather conditions and extremely poor sonar data quality. Sonars were secured in the early morning due to extremely poor data quality in heavy seas. The thermosalinograph (TSG) was performing well in heavy seas but was secured as a precautionary measure. The patch test site was not reached before we headed inshore due to weather. The sea buoy was reached in the evening, and the ship stood by in the general vicinity overnight.The offshore weather conditions are being monitored and the plan is to attempt to head back out on Wednesday or Thursday as weather allows.

Safety drills were conducted, including fire and emergency, and abandon ship.

March 20, 2013
Transit back out to the patch test area commenced. SVP Server was utilized during transit over continental shelf to patch test site. The ship's electronic technicians were testing scientific computing system (SCS), so SVP Serverwas also used for sound speed at the sonar head during transit.

March 21, 2013
Overnight the ship continued transitoffshore to Veatch Canyon. A 1500 meter deep CTD cast was conducted. The CTD was conducted safely and various deck personnel practice operation of the winch and J-Frame. CTDs and XBTS are conducted using the old CTD Windows XP CPU until the new Windows 7 CPU is implemented. The Seabird software was used to collect the raw CTD data. Sensors today included: pressure, both temperature sensors, both conductivity sensors, dissolved oxygen (DO), oxidation reduction potential (ORP), turbidity, altimeter. Processing the raw CTD data has been delayed until Pydro/Velocipy is updated. Key installation files were missing from software's directory, and Pydro required reinstalling.

In the morning, the Reson 70 SVP probe began showing cyclical data fluctuations up to .2 m/s with occasional fluctuations up to .5 m/s. The TSG values were more consistent and the TSG was used for the patch test.

XBTs are processed with SVP Editor while Velocipy is being troubleshot for CTD data processing.

A multibeam patch test over Veatch Canyon commenced at 0945 and was completed at 1852. Holiday fill lines over previous canyon surveys were conducted in the evening as patch test lines were analyzed by three hydrographers. Initial patch test analysis showed the same offsets as previous years with the exception of heading. A second patch test will be run as conditions allow.

- timing 0°
- pitch -0.725°
- heading 0° (or -0.2°, or +0.2°)
- roll 0 °

The heading lines will be rerun as time allows to confirm the results.

Training of new personnel was ongoing. The sonar room is consistently 70 degrees Fahrenheit.

The weather picked up overnight, multibeam data quality degraded, and the ship began transit back inshore to avoid the heavier seas again.

March 22, 2013
Sonar data quality was high during canyon holiday fill lines in the early morning. The multibeam sonar was secured at 1049 in heavy seas. For the remainder of the day, the ship transited back inshore to wait out the heavy seas until a new weather window opens to return to the canyons exploration mapping areas off of Cape Cod.

Training of new personnel was ongoing. The sonar room is consistently 70 degrees Fahrenheit.

March 23, 2013
The ship stood by offshore Montauk in the morning before heading back offshore to the canyons area mapping working grounds at 1000. We are aiming to take advantage of a 24 offshore weather window before being forced back in Sunday night. Monday seas are building to 10-18 feet, Tuesday is predicted up to 24 ft. The seeps previously detected in Veatch Canyon were revisited and were verified (mb line 0041).

March 24, 2013
Overnight, the ship transited back out to the canyons exploration area and transit mapping data was collected. Canyons data collection commenced at 0130. At 1210, the ship turned back towards shore to begin the transit to Vineyard Sound to avoid the latest impending low pressure system. Storm force winds up to 50 kts are expected offshore.

Mapping data was collected over the canyons exploration areas from 0130 to 1210. The ship began heading inshore at 1210 and mapping data was collected until data quality degraded. Sonars were secured at 1408.

March 25, 2013
The ship stood by inVineyard Sound to avoid the latest impending low pressure system. Storm force winds up to 50 kts are expected offshore through Tuesday. A shallow CTD cast was attempted inside the Sound but winds were determined too high to deploy the CTD.

March 26, 2013
The ship continued to stand by south of Martha's Vineyard to avoid the low pressure systemmoving over the canyons working grounds. A shallow CTD cast was conducted and the deck department practiced several iterations of J-Frame and CTD winch operations. The bow thrusters were used during the CTD cast and performed well. Up to 30 breaching whales were sighted in two pods near Nantucket Island for a few hours in the morning, but were not close enough for species identification. Drills were held in the afternoon including abandon ship, and fire and emergency (medical). In the afternoon, the ship departed for the canyons working grounds as seas laid down.

CTD data is collected with the Windows XP machine and processed with the Windows 7 machine. Troubleshooting of CTD data processing has impacted XBT data processing. XBTs are collected with the new CTD computer and are processed manually in Microsoft Excel.

Side projects and training of new personnel were ongoing.

March 27, 2013
Overnight the ship transited to the canyons directly south of Martha's Vineyard including Alvin Canyon. In the early morning, shallow lines were run to complement existing data near the canyon head, then the ship transited east to resume mapping over main canyons survey areas. The seas have calmed significantly and multibeam data quality was generally high.

Troubleshooting of CTD / XBT computer upgrade to Windows 7 was ongoing. Data acquisition software for CTD and XBT were tested on Windows 7 machine and were found to communicate adequately with the respective hardware. SVP Server is as yet not fully operational due to the firewall on the Windows 7 machine. Testing of processing software for CTD and XBT continues with an opportunistic test CTD cast planned this week.

Side projects and training of new personnel were ongoing.

March 28, 2013
Data quality over canyons exploration mapping area was good early in the day and degraded in the evening in short period 4-6 foot seas. Operations focused on three canyons between Hydrographer and Oceanographer Canyons, including Welker Canyon. A 1000 meter CTD cast was conducted in the afternoon to continue training with new software and personnel.Side projects and training of new personnel were ongoing.

A telepresence demonstration was conducted between the ship and six scientists from the French Research Institute for Exploitation of the Sea(IFREMER). French scientist Oliver Soubigou organized the interaction from shore. The scientists were briefed about the current cruise, the telepresence setup, the normal operating procedures during telepresence enabled cruises, and data management onboard. IFREMER asked several questions at the end and seemed very interested in the concept.

March 29, 2013
Data quality over canyons exploration mapping area was excellent throughout the day. Operations focused on three canyons between Hydrographer and Oceanographer Canyons, including Welker Canyon. Holiday fill lines were run during transit to the eastern canyons survey area, which includes Powell, Munson, and Nygren Canyons, and abuts the U.S.-Canadian maritime border. An 800 meter CTD cast was conducted to test the altimeter and other sensors. A weather window is predicted until the seas pick up on Sunday evening.

March 30, 2013
A notable 6° C seawater temperature difference was noted at 0343 for approximately 1 hour. The anomaly was detected with both the TSG and Reson SVP sensor. Data quality over canyons exploration mapping area was excellent throughout the day. Operations focused on Powell, Munson, and Nygren Canyons. A pair of crosslines was run. The results are discussed in the multibeam data quality section.

Data quality over canyons exploration mapping area was excellent throughout the day. Operations focused on Powell, Munson, and Nygren Canyons near the U.S.-Canadian maritime border.

Subbottom profiler data is collected from 1400-2200 daily. EM 302 bathymetry and water column data, and EK 60 data, are collected at all times.

Side projects and training of new personnel were ongoing.

XBTs are collected with the Windows 7 machine and processed with SVP Editor on Windows 7 machine.

March 31, 2013
Data quality over canyons exploration mapping area was excellent throughout the day. Operations focused on Powell, Munson, and Nygren Canyons near the U.S.-Canadian maritime border.

Side projects and training of new personnel were ongoing.

XBTs are collected with the Windows 7 machine and processed with SVP Editor on Windows 7 machine.

April 1, 2013
Mapping quality degraded due to heavy seas and sonars were secured at 0330. The 15+ hour transit westward towards Veatch Canyon began. CTDs over seeps detected in the vicinity of Veatch Canyon during EX1206 were planned for April 2.

The weather forecast for the canyons working grounds is extremely unfavorable. The U.S. Navy issued weather warnings requiring official acknowledgement by ship's captains. Due to weather, plans were made to end the cruise two days early, on April 3.

April 2, 2013
Overnight the ship transited to Veatch Canyon. Two CTDs were conducted at the Veatch Canyon seeps. The seeps were clearly seen in the EK60 and EM 302 sonars, but were not detected with the CTD sensors according to initial field data processing. All sensors (temperature, pressure, light scattering (LSS), oxidation reduction potential (ORP), dissolved oxygen (DO)) were loaded on the CTD during today's casts. The altimeter provided accurate readings during the shallow 200m cast over the flat continental shelf.

The ship successfully exercised the dynamic position system. The azimuth bow thruster was lowered and retracted several times successfully. DP controls were exercised at both the main bridge controls and the aft control station.

In the evening, the ship began slow transit towards Narragansett Bay in heavy seas.

The TSG sensor remained secured in heavy seas.

April 3, 2013
The ship reached the Quonset pier in North Kingstown, RI at approximately 1400. Mission personnel departed the ship. Due to predicted weather conditions, the cruise ended two days early.

April 4, 2013
The ship was alongside in Davisville, Rhode Island.

April 5, 2013
The ship was alongside in Davisville, Rhode Island.

14. References

The 2013 Survey Readiness Report can be obtained by contacting NOAA Ship *Okeanos Explorer* at ops.explorer@noaa.gov.

EX-13-01ProjectInstructions 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-13-01 Data Management Plan

Document Purpose
This document is an addendum to the overarching Okeanos Explorer FY13 Data Management Plan (EX_FY13_DMP.pdf) and is specific to the EX-13-01 mission entitled "Ship Shakedown and Patch Test Exploration, NE Canyons and Seamounts" For more detailed information on the data management effort for the Okeanos Explorer in FY13, please refer to that document.

General Description of the Data to be Managed
EX-13-01 operations are expected to begin on March 18 from Davisville, RI and return April 5, 2013 to Davisville, RI. Multibeam and single beam mapping operations will be conducted 24 hours a day during the cruise. Sub bottom profile mapping will be conducted each day between 1000 and 1800. XBT casts will be conducted at an interval defined by prevailing oceanographic conditions, butnot to exceed 6 hours.Data management procedures are fully documented in the data management plan for the *Okeanos Explorer* for the FY13 field season (EX_FY13_DMP.pdf)

- Name of Dataset
    - : "EX1301: Ship Shakedown and Patch Test Exploration, NE Canyons and Seamounts"
- Mission Specific Keywords:
    - Place Specific:
        - Davisville
        - Rhode Island
        - Cape Hatteras
        - Western North Atlantic Ocean
        - US-Canadian territorial boundary
        - Veatch Canyon
        - Northeast Seamounts
        - Accomac Canyon
        - Baltimore Canyon
        - Washington Canyon
        - Bear Seamount
        - Mytilus Seamount
        - Buell Seamount
        - Physalia Seamount
        - Retriever Seamount
        - Picket Seamount
        - Balanus Seamount
        - Kiwi Seamount
        - Kelvin Seamount
        - Asterius Seamount
        - Panulirus Seamount
        - Dogbody Canyon

        - Welker Canyon
        - Sharpshooter Canyon
        - Clipper Canyon
        - Heel Tapper Canyon
        - Powell Canyon
        - Munson Canyon
        - Nygren Canyon

    - Theme Specific:
        - Multibeam
        - Multibeam sonar
        - Multi-beam sonar
        - Sub-bottom profile
        - Mapping survey
        - Multibeam backscatter
        - Water column backscatter
        - Singlebeam sonar
        - Singe beam sonar
        - Single-beam sonar
        - New England Seamounts
        - Continental shelf mapping
        - Extended continental shelf
        - ECS
        - Henry Bigelow
        - Henry B. Bigelow
        - Ferdinand Hassler
        - Ferdinand R. Hassler
        - Nancy Foster
        - Ronald H. Brown
        - Ron Brown
        - EX1201
        - EX1204
        - EX1106
        - EX1205L2
        - ACUMEN
        - Atlantic Canyons Undersea Mapping Expedition
        - Mid-Atlantic Canyons
        - Mid-Atlantic Regional Council on the Ocean
        - MARCO
- Summary description: EX-13-01 will be primarily focused on the annual ship and system shakedown and multibeam patch test operations. Following these operations, the EX will complete the comprehensive mapping of the Northeast canyons and the adjacent

continental shelf carried out by the cruises involved in the Atlantic Canyons Undersea Mapping Expeditions (ACUMEN) 2012 project.

- Temporal Bounds:
  - March 18 – April 5, 2013
- Spatial Bounds:
  - Northern:41.2
  - Southern:38.4
  - Western: -71.4
  - Eastern: -63.5
- Data Type Collections for Preservation/Stewardship:
  - Multibeam Bathymetry – continuous collection during the duration of the expedition.
  - Bottom Backscatter – continuous collection during the entire duration of the expedition
  - Water Column Backscatter – continuous collection during the entire duration of the expedition
  - Scientific Computing System (SCS) output – continuous collection of navigational, meteorological, integrated oceanographic sensor data
  - XBT – casts will be conducted at an interval defined by prevailing oceanographic conditions, but not to exceed 6 hours. Casts will collect water temperature at depth for sound velocity calculations to maintain multibeam data quality
  - Knudsen CHIRP 3260 –sub-bottom profiler data collected between 1000 and 1800 each day
  - EK60 – single beam sonar for water column features during the entire duration of the expedition
- Data Product/Product Collections for Preservation/Stewardship:
  - Gridded bathymetry (.txt)
  - Gridded bathymetric image (.tif)
  - Fledermaus gridded bathymetry imagery (.sd)
  - Fledermaus gridded backscatter imagery (.sd)
  - Google Earth gridded bathymetry (.kml)
  - ArcView gridded bathymetry (.asc)
  - SCS data output in NetCDF
  - Final Mapping Summary document
  - Final Cruise Summary document
- Volume of Data Expected
  - The volume of data expected from this cruise is approximately 120 GB.
- Personally Identifiable Information (PII) concerns
  - No PII will be included in these data.

Points of Contact

- Overall Point of Contact (POC) for the data:

    - Data Acquisition: EX Mapping Team: oar.oer.exmappingteam@noaa.gov
    - Data Management: Susan Gottfried (oer.info.mgmt@noaa.gov)
- Responsible for Data Quality:
    - Seafloor mapping and water column data:
      EX Mapping Team: oar.oer.exmappingteam@noaa.gov
    - SCS data: Office of Marine and Aviation Operations (OMAO): Lt. Laura Gallant, Okeanos Explorer Operations Officer (Ops.Explorer@noaa.gov)
- Responsible for data documentation and metadata activities:
    - National Coastal Data Development Center (NCDDC); Susan Gottfried, OER Data Management Coordinator (oer.info.mgmt@noaa.gov)
- Responsible for the data storage and data disaster recovery activities:
    - NOAA National Data Centers; National Oceanographic Data Center (NODC), National Geophysical Data Center (NGDC), NOAA Central Library (NCL)
- Responsible for ensuring adherence to this data management plan, including resources are made available to implement the DMP:
    - Data Acquisition: Meme Lobecker, Expedition Co-Coordinator, Mapping Team Lead
    - Data Acquisition: Mashkoor Malik, Expedition Co-Coordinator, Mapping Team Lead
    - Data Acquisition: Lt. Laura Gallant, OMAO, Okeanos Explorer Operations Officer
    - Data Management: Susan Gottfried, OER Data Management Coordinator

Data Stewardship

- 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 XBT firings are archived in their native format and are not quality controlled.
- What is the overall lifecycle of the data from collection or acquisition to making it available to customer?
    - All ship data from this mission is expected to be archived and accessible within 60-90 days post-mission.
    - METOC data from the SCS are converted in a post-mission model into archive-ready compressed NetCDF3 format and stored within the NCDDC THREDDS open-access server.
    - CTD data from casts are processed in a post-mission model and converted into archive-ready compressed NetCDF3 format and stored within the NCDDC THREDDS open-access server.

Data Documentation

- An ISO format metadata record to document the mission will be generated during pre-cruise planning and published in an OER catalog for public discovery and access. Documentation templates will be provided for post-mission products with references back to the overall mission metadata documents. Data collections and products will be documented with ISO or FGDC CSDGM metadata and published at the appropriate NOAA Data Center.
- ISO 19115-2 Geographic Information with Extensions for Imagery and Gridded Data will be the metadata standard employed.

Data Sharing

- All data recorded, observed, generated or otherwise produced on the *Okeanos Explorer* are considered non-proprietary and will be made available to the public as soon as possible after a period of due diligence in performing quality assurance and data documentation procedures.

Initial Data Storage and Protection

- 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 data volume.

Long-Term Archiving and Preservation

- Data from this mission will be preserved and stewarded through the NOAA National Data Centers. Refer to the *Okeanos Explorer* FY13 Data Management Plan (EX_FY13_DMP.pdf) for detailed descriptions of the processes, procedures, and partners involved in this collaborative process. Appendix A has an excerpt from EX_FY13_DMP.pdf) that illustrates the data and product pipelines that will be employed for this mission.

Data Management Objectives

The DMT's specific objectives for this mission are:

- Transfer and integrate streamed video capture stations to the *Okeanos Explorer*
- Develop scripts/protocols to capture the video feeds using Video LAN Client (VLC) and rewrap/section the output video
- Write SOP for on-ship video stream capture
- Adapt cruise variable php script (Rsync) to include section of code where survey techs can manipulate priority levels
- Update dashboard software and test
- Document SOP for automated backup system (Rsync) and the data dashboard
- Train the new survey tech on operation of the automated backup system (Rsync) and data dashboard

The DMT's common objectives for this mission are:

- Ensure the near real-time update of the *Okeanos Atlas* with
    - Ship track and hourly observations received via email.
    - Daily logs pulled from URI through RSS feeds and links to related images on oceanexplorer.noaa.gov website.
    - Daily cumulative bathymetric image overlays received via URI SRS.
- Execute multibeam and oceanographic data pipelines according to the FY13 DMP (EX_FY13_DMP.pdf).
- Develop ISO metadata for collection-level and dataset-level records collected from the ship(multibeam, singlebeam sonar, sub-bottom profiler, XBT, CTD, EX METOC,)

Expedition Principals for Data Management

Webb Pinner, OER Telepresence, EX Data and Information Lead, Webb.Pinner@noaa.gov
Sharon Mesick, NCDDC, Federal Program Manager, Data Management IPT Chair, Sharon.Mesick@noaa.gov
Susan Gottfried, NCDDC, OER Data Management Coordinator, Susan.Gottfried@noaa.gov
Brendan Reser, NCDDC, OER Cruise Data Manager, Brendan.Reser@noaa.gov
Andy Navard, NCDDC, Okeanos Atlas Developer, Andrew.Navard@noaa.gov
Dan Price, NGDC, Geophysical Data Officer, Daniel.Price@noaa.gov
Tom Ryan, NODC, Oceanographic Data Officer, Thomas.Ryan@noaa.gov
Anna Fiolek, NCL, Multimedia Librarian, Anna.Fiolek@noaa.gov

Data and Product Pipelines (excerpt from EX_FY13_DMP.pdf)

Oceanographic/Meteorological/Navigational Data Archive Pipeline

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.

Oceanographic/Meteorological/Navigational
Data/Products Pipeline

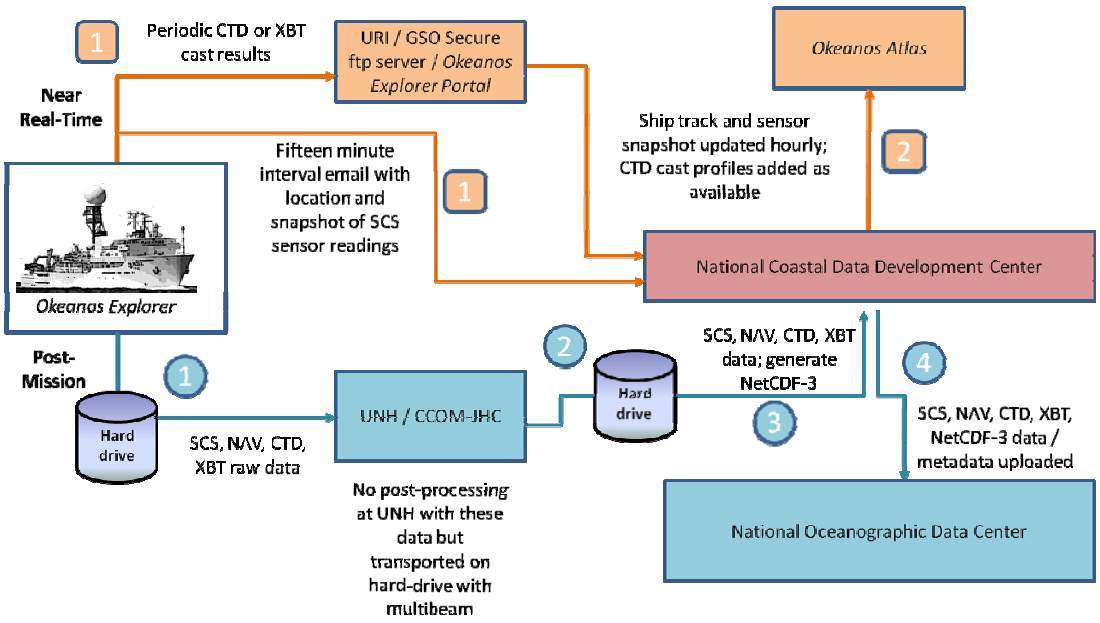


Fig 1: Oceanographic/Meteorological/Navigational Data Archive Pipeline

1 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

Multibeam Survey Data Archive Pipeline

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.

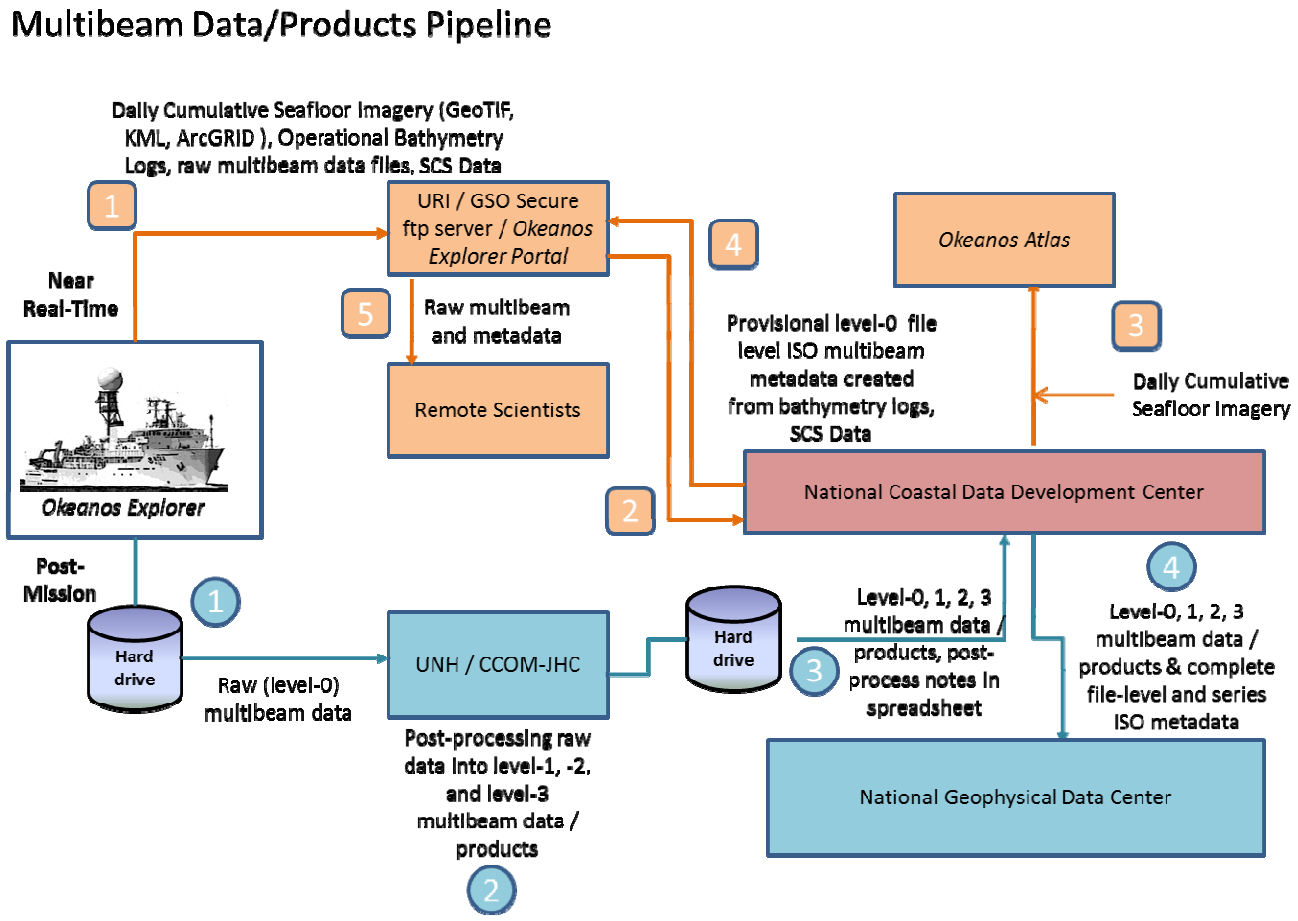


Figure 2: Multibeam Survey Data Archive Pipeline

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: _____ Date: 2/28/2013
John McDonough, Deputy Director

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.
         #* Attitude            [0] [0]
         #* 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]
         #* Ethernet AttVel     [0] [0]
      #} 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.
         #* None                [0] [1]
         #* 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.
         #* Baud rate:          [4800]
         #* Data bits           [8]
         #* Stop bits:          [1]
         #* Parity:             [NONE]
      #} 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           [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]
         #* Ethernet AttVel     [0] [0]
      #} Input Formats
```

```
#} COM3

#{ COM4 #// 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] [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          [0] [0]
    #* 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]
    #* Ethernet AttVel    [0] [0]
  #} Input Formats

#} COM4

#{ UDP2 #// 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          [0] [0]
    #* HDT Heading        [0] [0]
    #* SKR82 Heading      [0] [0]
    #* DBS Depth          [0] [0]
    #* DPT Depth          [0] [0]
    #* EA500 Depth        [1] [0]
    #* ROV. depth         [0] [0]
    #* Height, special purp [0] [0]
    #* Ethernet AttVel    [0] [0]
  #} Input Formats

#} UDP2

#{ UDP3 #// 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          [0] [0]
    #* HDT Heading        [1] [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]
    #* Ethernet AttVel    [0] [0]
  #} Input Formats

#} UDP3

#{ UDP4 #// 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           [1] [0]
    #* MK39 Mod2 Attitude,  [0] [0]
    #* ZDA Clock          [0] [0]
    #* HDT Heading        [1] [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]
    #* Ethernet AttVel    [0] [0]
  #} Input Formats

#} UDP4

#{ UDP5 #// Link settings.

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

  #{ Position #// Position input settings.
    #* None               [0] [0]
    #* 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           [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

  #{ MCAST1 #// Link settings.

    #{ Com. settings #// Serial line parameter settings.
      #// 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-13-01 MB ACQUISITION / PROCESSING LOG												
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
0001_20130319_000824_EX1301_MB	SVP Server	3/19/2013	8.4	136	40-35-07.34N	40-47-04.38N	070-56-41.91W	070-40-40.38W	2013-03-19 00:08:24.595	2013-03-19 02:08:24.140		EX1301_Okeanos_March_2011_2013-078_0001_20130319_000824_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0002_20130319_020824_EX1301_MB	SVP Server	3/19/2013	8.3	135	40-23-25.84N	40-35-18.60N	070-40-52.65W	070-25-02.18W	2013-03-19 02:08:24.625	2013-03-19 04:08:23.656		EX1301_Okeanos_March_2011_2013-078_0002_20130319_020824_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0003_20130319_040824_EX1301_MB	SVP Server	3/19/2013	6.7	135	40-14-36.69N	40-23-40.74N	070-25-18.75W	070-13-09.98W	2013-03-19 04:08:24.156	2013-03-19 06:01:13.686		EX1301_Okeanos_March_2011_2013-078_0003_20130319_040824_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0004_20130319_060227_EX1301_MB	SVP Server	3/19/2013	4.5	135	40-07-36.32N	40-14-44.66N	070-13-19.76W	070-03-50.84W	2013-03-19 06:02:27.187	2013-03-19 08:02:04.221		EX1301_Okeanos_March_2011_2013-078_0004_20130319_060227_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0005_20130319_080204_EX1301_MB	SVP Server	3/19/2013	4.8	149	40-03-43.53N	40-07-47.94N	070-04-03.46W	070-00-45.23W	2013-03-19 08:02:04.721	2013-03-19 09:01:19.737		EX1301_Okeanos_March_2011_2013-078_0005_20130319_080204_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0006_20130321_000200_EX1301_MB	SVP Server	3/21/2013	7.8	123	40-24-58.67N	40-28-16.59N	071-04-28.79W	070-57-53.24W	2013-03-21 00:02:01.355	2013-03-21 00:45:59.365		EX1301_Okeanos_March_2011_2013-080_0006_20130321_000200_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0007_20130321_005105_EX1301_MB	SVP Server	3/21/2013	8.0	123	40-16-00.34N	40-24-47.31N	070-57-12.38W	070-39-15.40W	2013-03-21 00:51:05.866	2013-03-21 02:51:05.896		EX1301_Okeanos_March_2011_2013-080_0007_20130321_005105_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0008_20130321_025106_EX1301_MB	SVP Server	3/21/2013	8.1	123	40-07-23.08N	40-16-22.58N	070-39-33.93W	070-21-15.10W	2013-03-21 02:51:06.396	2013-03-21 04:51:05.419		EX1301_Okeanos_March_2011_2013-080_0008_20130321_025106_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0009_20130321_045105_EX1301_MB	SVP Server	3/21/2013	7.7	123	39-59-08.37N	40-07-43.42N	070-21-30.91W	070-04-15.07W	2013-03-21 04:51:05.919	2013-03-21 06:51:06.449		EX1301_Okeanos_March_2011_2013-080_0009_20130321_045105_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0010_20130321_065106_EX1301_MB	SVP Server	3/21/2013	7.2	123	39-50-56.45N	39-59-38.22N	070-04-36.53W	069-48-01.02W	2013-03-21 06:51:06.948	2013-03-21 08:51:06.977		EX1301_Okeanos_March_2011_2013-080_0010_20130321_065106_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0011_20130321_085107_EX1301_MB	SVP Server	3/21/2013	6.4	122	39-43-45.56N	39-52-28.79N	069-49-20.52W	069-33-25.67W	2013-03-21 08:51:07.478	2013-03-21 10:51:09.009		EX1301_Okeanos_March_2011_2013-080_0011_20130321_085107_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0012_20130321_105109_EX1301_MB	SVP Server	3/21/2013	5.7	123	39-43-07.59N	39-46-19.66N	069-35-50.06W	069-32-18.12W	2013-03-21 10:51:09.508	2013-03-21 11:02:34.512		EX1301_Okeanos_March_2011_2013-080_0012_20130321_105109_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0013_20130321_110317_EX1301_MB	SVP Server	3/21/2013	3.0	114	39-42-13.94N	39-45-47.02N	069-34-30.27W	069-30-32.87W	2013-03-21 11:03:18.014	2013-03-21 11:26:44.016		EX1301_Okeanos_March_2011_2013-080_0013_20130321_110317_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0014_20130321_145010_EX1301_MB	EX1301_XBT002_130321.asvp	3/21/2013	6.6	165	39-41-14.86N	39-46-34.17N	069-34-30.48W	069-29-50.26W	2013-03-21 14:50:10.571	2013-03-21 15:20:36.081		EX1301_Okeanos_March_2011_2013-080_0014_20130321_145010_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0015_20130321_152036_EX1301_MB	EX1301_XBT002_130321.asvp , EX1301_XBT003_130321.asvp	3/21/2013	5.2	347	39-43-02.01N	39-53-33.90N	069-36-55.98W	069-30-10.42W	2013-03-21 15:20:36.580	2013-03-21 17:20:33.142		EX1301_Okeanos_March_2011_2013-080_0015_20130321_152036_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0016_20130321_172033_EX1301_MB	EX1301_XBT003_130321.asvp , EX1301_XBT004_130321.EDF	3/21/2013	5.0	347	39-53-11.87N	39-55-49.03N	069-37-23.24W	069-33-47.47W	2013-03-21 17:20:33.611	2013-03-21 17:49:16.616		EX1301_Okeanos_March_2011_2013-080_0016_20130321_172033_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0017_20130321_174916_EX1301_MB	EX1301_XBT004_130321.EDF	3/21/2013	5.4	189	39-55-20.67N	39-56-51.32N	069-37-20.00W	069-35-01.82W	2013-03-21 17:49:17.142	2013-03-21 18:01:40.621		EX1301_Okeanos_March_2011_2013-080_0017_20130321_174916_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0018_20130321_180140_EX1301_MB	EX1301_XBT004_130321.EDF , EX1301_XBT005_130321.EDF	3/21/2013	8.2	167	39-43-20.49N	39-55-55.30N	069-37-03.89W	069-30-19.80W	2013-03-21 18:01:41.141	2013-03-21 19:31:58.644		EX1301_Okeanos_March_2011_2013-080_0018_20130321_180140_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 MB ACQUISITION / PROCESSING LOG													
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
0019_20130321_193158_EX1301_MB	EX1301_XBT005_130321.EDF	3/21/2013	8.2	328	39-41-43.20N	39-45-02.22N	069-34-26.06W	069-29-50.58W	2013-03-21 19:31:59.144	2013-03-21 19:44:24.151		EX1301_Okeanos_March_2011_2013-080_0019_20130321_193158_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0020_20130321_194424_EX1301_MB	EX1301_XBT005_130321.EDF , EX1301_XBT006_130321.EDF	3/21/2013	8.4	350	39-43-45.84N	39-56-50.86N	069-37-17.35W	069-30-20.48W	2013-03-21 19:44:24.648	2013-03-21 21:18:30.176		EX1301_Okeanos_March_2011_2013-080_0020_20130321_194424_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0021_20130321_211830_EX1301_MB	EX1301_XBT006_130321.EDF	3/21/2013	7.9	132	39-55-12.43N	39-56-37.96N	069-35-27.83W	069-33-40.50W	2013-03-21 21:18:30.673	2013-03-21 21:28:04.177		EX1301_Okeanos_March_2011_2013-080_0021_20130321_211830_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0022_20130321_212804_EX1301_MB	EX1301_XBT007_130321	3/21/2013	8.3	167	39-43-20.99N	39-55-29.93N	069-34-58.00W	069-28-41.32W	2013-03-21 21:28:04.677	2013-03-21 22:52:43.197		EX1301_Okeanos_March_2011_2013-080_0022_20130321_212804_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0023_20130321_225243_EX1301_MB	EX1301_XBT007_130321	3/21/2013	8.9	341	39-41-59.80N	39-47-49.07N	069-33-52.37W	069-28-01.80W	2013-03-21 22:52:43.699	2013-03-21 23:19:58.204		EX1301_Okeanos_March_2011_2013-080_0023_20130321_225243_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0024_20130321_231958_EX1301_MB	EX1301_XBT007_130321	3/21/2013	8.1	075	39-45-07.10N	39-49-37.43N	069-32-43.57W	069-24-41.85W	2013-03-21 23:19:58.704	2013-03-22 00:00:04.714		EX1301_Okeanos_March_2011_2013-080_0024_20130321_231958_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0025_20130322_000004_EX1301_MB	EX1301_XBT007_130321	3/22/2013	8.4	076	39-46-31.34N	39-52-24.47N	069-25-25.85W	069-09-36.46W	2013-03-22 00:00:05.215	2013-03-22 01:25:13.732		EX1301_Okeanos_March_2011_2013-081_0025_20130322_000004_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0026_20130322_012513_EX1301_MB	EX1301_XBT007_130321	3/22/2013	8.2	130	39-45-21.32N	39-52-25.09N	069-10-56.04W	069-02-47.92W	2013-03-22 01:25:14.232	2013-03-22 02:12:12.241		EX1301_Okeanos_March_2011_2013-081_0026_20130322_012513_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0027_20130322_021212_EX1301_MB	EX1301_XBT007_130321	3/22/2013	7.9	083	39-45-20.21N	39-48-39.76N	069-03-45.17W	069-02-07.83W	2013-03-22 02:12:12.741	2013-03-22 02:20:36.746		EX1301_Okeanos_March_2011_2013-081_0027_20130322_021212_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0028_20130322_022036_EX1301_MB	EX1301_XBT009_130322	3/22/2013	8.1	082	39-45-28.99N	39-50-57.86N	069-02-21.97W	068-41-12.57W	2013-03-22 02:20:37.246	2013-03-22 04:20:34.762		EX1301_Okeanos_March_2011_2013-081_0028_20130322_022036_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0029_20130322_042035_EX1301_MB	EX1301_XBT009_130322	3/22/2013	7.6	081	39-47-44.86N	39-51-21.45N	068-41-37.85W	068-37-52.00W	2013-03-22 04:20:35.263	2013-03-22 04:42:02.270		EX1301_Okeanos_March_2011_2013-081_0029_20130322_042035_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0030_20130322_044202_EX1301_MB	EX1301_XBT009_130322	3/22/2013	8.8	329	39-48-06.17N	39-53-28.60N	068-40-31.74W	068-35-19.72W	2013-03-22 04:42:02.768	2013-03-22 05:03:07.274		EX1301_Okeanos_March_2011_2013-081_0030_20130322_044202_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0031_20130322_050307_EX1301_MB	EX1301_XBT010_130322	3/22/2013	8.6	262	39-48-15.34N	39-53-25.27N	068-58-40.52W	068-39-13.98W	2013-03-22 05:03:07.772	2013-03-22 06:45:49.291		EX1301_Okeanos_March_2011_2013-081_0031_20130322_050307_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0032_20130322_064549_EX1301_MB	EX1301_XBT010_130322	3/22/2013	7.2	066	39-48-14.35N	39-54-06.46N	069-00-41.38W	068-49-37.18W	2013-03-22 06:45:49.791	2013-03-22 07:49:22.797		EX1301_Okeanos_March_2011_2013-081_0032_20130322_064549_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0033_20130322_074923_EX1301_MB	EX1301_XBT011_130322	3/22/2013	7.0	081	39-51-02.45N	39-55-16.30N	068-50-45.15W	068-40-52.49W	2013-03-22 07:49:23.299	2013-03-22 08:49:31.808		EX1301_Okeanos_March_2011_2013-081_0033_20130322_074923_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0034_20130322_084931_EX1301_MB	EX1301_XBT011_130322	3/22/2013	7.6	341	39-52-10.11N	39-57-15.79N	068-42-42.35W	068-38-13.71W	2013-03-22 08:49:32.311	2013-03-22 09:15:47.315		EX1301_Okeanos_March_2011_2013-081_0034_20130322_084931_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0035_20130322_091547_EX1301_MB	EX1301_XBT011_130322	3/22/2013	6.4	261	39-53-03.81N	39-56-57.89N	068-49-51.36W	068-41-23.42W	2013-03-22 09:15:47.817	2013-03-22 10:13:47.827		EX1301_Okeanos_March_2011_2013-081_0035_20130322_091547_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
NO 0036	NO 0036	NO 0036	NO 0036	NO 0036	NO 0036	NO 0036	NO 0036	NO 0036	NO 0036	NO 0036	NO 0036	NO 0036	NO 0036
0037_20130322_101347_EX1301_MB	EX1301_XBT011_130322	3/22/2013	6.2	263	39-52-48.08N	39-55-49.72N	068-53-08.57W	068-49-45.60W	2013-03-22 10:13:48.329	2013-03-22 10:39:10.833		EX1301_Okeanos_March_2011_2013-081_0037_20130322_101347_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0038_20130323_223201_EX1301_MB	SVP Server	3/23/2013	9.2	113	40-13-30.00N	40-18-57.02N	070-05-39.09W	069-48-58.85W	2013-03-23 22:32:01.197	2013-03-24 00:00:48.712		EX1301_Okeanos_March_2011_2013-082_0038_20130323_223201_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0039_20130324_000049_EX1301_MB	SVP Server	3/24/2013	9.0	118	40-05-19.96N	40-13-48.82N	069-49-09.32W	069-28-09.50W	2013-03-24 00:00:49.213	2013-03-24 02:00:48.732		EX1301_Okeanos_March_2011_2013-083_0039_20130324_000049_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 MB ACQUISITION / PROCESSING LOG													
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
0040_20130324_020049_EX1301_MB	SVP Server	3/24/2013	9.0	113	39-59-56.58N	40-05-36.32N	069-28-17.27W	069-11-37.14W	2013-03-24 02:00:49.229	2013-03-24 03:31:46.748		EX1301_Okeanos_March_2011_2013-083_0040_20130324_020049_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0041_20130324_033147_EX1301_MB	SVP Server	3/24/2013	8.8	128	39-58-43.32N	40-00-20.17N	069-12-19.48W	069-10-33.91W	2013-03-24 03:31:47.250	2013-03-24 03:40:34.245		EX1301_Okeanos_March_2011_2013-083_0041_20130324_033147_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0042_20130324_034034_EX1301_MB	SVP Server	3/24/2013	9.0	105	39-53-55.70N	40-00-00.71N	069-10-46.14W	068-50-09.40W	2013-03-24 03:40:34.744	2013-03-24 05:26:28.260		EX1301_Okeanos_March_2011_2013-083_0042_20130324_034034_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0043_20130324_052628_EX1301_MB	EX1301_XBT012_130324	3/24/2013	7.5	066	39-54-01.22N	40-02-38.64N	068-51-31.73W	068-32-09.42W	2013-03-24 05:26:28.760	2013-03-24 07:26:25.782		EX1301_Okeanos_March_2011_2013-083_0043_20130324_052628_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0044_20130324_072626_EX1301_MB	EX1301_XBT013_130324	3/24/2013	6.7	066	40-00-16.05N	40-08-08.53N	068-33-45.78W	068-16-15.72W	2013-03-24 07:26:26.282	2013-03-24 09:26:26.804		EX1301_Okeanos_March_2011_2013-083_0044_20130324_072626_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0045_20130324_092627_EX1301_MB	EX1301_XBT014_130324	3/24/2013	7.3	065	40-05-37.97N	40-09-57.29N	068-17-45.91W	068-09-55.61W	2013-03-24 09:26:27.302	2013-03-24 10:07:12.309		EX1301_Okeanos_March_2011_2013-083_0045_20130324_092627_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0046_20130324_100712_EX1301_MB	EX1301_XBT014_130324	3/24/2013	5.8	006	40-08-54.48N	40-09-32.96N	068-12-45.30W	068-09-39.90W	2013-03-24 10:07:12.808	2013-03-24 10:13:18.812		EX1301_Okeanos_March_2011_2013-083_0046_20130324_100712_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0047_20130324_101458_EX1301_MB	EX1301_XBT014_130324	3/24/2013	6.4	357	40-08-26.92N	40-12-58.51N	068-16-02.26W	068-09-15.60W	2013-03-24 10:14:58.814	2013-03-24 11:19:42.822		EX1301_Okeanos_March_2011_2013-083_0047_20130324_101458_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0048_20130324_111942_EX1301_MB	EX1301_XBT014_130324	3/24/2013	7.5	054	40-13-08.97N	40-20-25.42N	067-37-05.15W	067-24-49.79W	2013-03-24 14:48:57.855	2013-03-24 16:04:41.869		EX1301_Okeanos_March_2011_2013-083_0048_20130324_111942_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0049_20130324_131945_EX1301_MB	EX1301_XBT015_130324	3/24/2013	7.9	085	40-11-42.45N	40-15-16.94N	067-51-20.74W	067-34-55.52W	2013-03-24 13:19:45.339	2013-03-24 14:48:57.352		EX1301_Okeanos_March_2011_2013-083_0049_20130324_131945_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0050_20130324_144857_EX1301_MB	EX1301_XBT015_130324	3/24/2013	7.7	085	40-10-55.98N	40-14-45.69N	068-11-23.74W	067-51-08.81W	2013-03-24 11:19:43.322	2013-03-24 13:19:44.841		EX1301_Okeanos_March_2011_2013-083_0050_20130324_144857_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0051_20130324_160442_EX1301_MB	EX1301_XBT015_130324	3/24/2013	6.0	289	40-18-28.04N	40-23-38.57N	067-40-11.85W	067-24-08.47W	2013-03-24 16:04:42.369	2013-03-24 18:04:37.891		EX1301_Okeanos_March_2011_2013-083_0051_20130324_160442_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0052_20130324_180438_EX1301_MB	EX1301_XBT015_130324	3/24/2013	6.5	278	40-23-21.37N	40-23-34.56N	067-40-23.28W	067-40-12.60W	2013-03-24 18:04:38.389	2013-03-24 18:07:28.894		NO VALID DATA	NO VALID DATA
0053_20130325_185154_EX1301_MB	SVP Server	3/25/2013	5.7	192	41-14-40.32N	41-18-33.62N	070-56-34.03W	070-55-22.66W	2013-03-25 18:51:54.684	2013-03-25 19:33:59.192		EX1301_Okeanos_March_2011_2013-084_0053_20130325_185154_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0054_20130327_002955_EX1301_MB	SVP Server	3/27/2013	9.8	195	40-22-14.89N	40-41-24.10N	070-55-25.93W	070-48-56.19W	2013-03-27 00:29:55.993	2013-03-27 02:29:55.516		EX1301_Okeanos_March_2011_2013-086_0054_20130327_002955_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0055_20130327_022955_EX1301_MB	SVP Server	3/27/2013	9.9	195	40-06-13.22N	40-22-19.18N	071-00-18.45W	070-51-03.51W	2013-03-27 02:29:56.015	2013-03-27 04:29:56.032		EX1301_Okeanos_March_2011_2013-086_0055_20130327_022955_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0056_20130327_042956_EX1301_MB	SVP Server	3/27/2013	9.3	204	40-03-59.10N	40-06-35.30N	071-01-50.74W	070-59-52.44W	2013-03-27 04:29:56.533	2013-03-27 04:46:44.536		EX1301_Okeanos_March_2011_2013-086_0056_20130327_042956_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0057_20130327_044644_EX1301_MB	SVP Server	3/27/2013	8.4	185	39-57-46.87N	40-04-06.75N	071-02-49.13W	071-00-56.50W	2013-03-27 04:46:45.039	2013-03-27 05:31:30.044		EX1301_Okeanos_March_2011_2013-086_0057_20130327_044644_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0058_20130327_053130_EX1301_MB	SVP Server	3/27/2013	7.8	087	39-56-27.05N	39-57-52.77N	071-02-51.16W	071-00-47.84W	2013-03-27 05:31:30.543	2013-03-27 05:43:51.040		EX1301_Okeanos_March_2011_2013-086_0058_20130327_053130_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0059_20130327_054351_EX1301_MB	EX1301_XBT017_1303247	3/27/2013	8.0	007	39-57-50.85N	40-03-48.24N	071-02-27.79W	071-00-15.72W	2013-03-27 05:43:51.541	2013-03-27 06:29:22.047		EX1301_Okeanos_March_2011_2013-086_0059_20130327_054351_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0060_20130327_062922_EX1301_MB	EX1301_XBT017_130327	3/27/2013	9.2	087	40-03-32.61N	40-05-22.69N	071-01-18.28W	070-37-07.80W	2013-03-27 06:29:22.548	2013-03-27 08:29:21.578		EX1301_Okeanos_March_2011_2013-086_0060_20130327_062922_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0061_20130327_082922_EX1301_MB	EX1301_XBT018_130327	3/27/2013	8.7	087	40-04.94N	40-06.64N	070-37.18W	070-25.44W	2013-03-27 08:29:22.076	2013-03-27 09:35:54.588		EX1301_Okeanos_March_2011_2013-086_0061_20130327_082922_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 MB ACQUISITION / PROCESSING LOG													
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
0062_20130327_093555_EX1301_MB	EX1301_XBT018_130327	3/27/2013	9.0	200	39-58.14N	40-06.29N	070-30.76W	070-25.94W	2013-03-27 09:35:55.088	2013-03-27 10:31:05.600		EX1301_Okeanos_March_2011_2013-086_0062_20130327_093555_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0063_20130327_103106_EX1301_MB	EX1301_XBT018_130327	3/27/2013	8.7	262	39-56.90N	39-58.67N	070-31.85W	070-28.79W	2013-03-27 10:31:06.100	2013-03-27 10:41:30.596		EX1301_Okeanos_March_2011_2013-086_0063_20130327_103106_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0064_20130327_104130_EX1301_MB	EX1301_XBT018_130327, EX1301_XBT019_130327	3/27/2013	8.4	023	39-57.93N	40-05.46N	070-31.85W	070-26.93W	2013-03-27 10:41:31.096	2013-03-27 11:37:13.608		EX1301_Okeanos_March_2011_2013-086_0064_20130327_104130_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0065_20130327_113713_EX1301_MB	EX1301_XBT019_130327	3/27/2013	8.0	111	39-59.76N	40-05.79N	070-27.47W	070-10.45W	2013-03-27 11:37:14.138	2013-03-27 13:17:40.141		EX1301_Okeanos_March_2011_2013-086_0065_20130327_113713_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0066_20130327_131740_EX1301_MB	EX1301_XBT020_130327	3/27/2013	7.9	114	39-53.98N	40-01.30N	070-10.96W	069-51.59W	2013-03-27 13:17:40.631	2013-03-27 15:17:39.153		EX1301_Okeanos_March_2011_2013-086_0066_20130327_131740_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0067_20130327_151739_EX1301_MB	EX1301_XBT020_130327	3/27/2013	9.9	105	39-48.73N	39-55.11N	069-52.21W	069-29.33W	2013-03-27 15:17:39.653	2013-03-27 17:04:24.174		EX1301_Okeanos_March_2011_2013-086_0067_20130327_151739_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0068_20130327_170424_EX1301_MB	EX1301_XBT021_130327	3/27/2013	9.0	100	39-47.81N	39-51.49N	069-30.13W	069-23.42W	2013-03-27 17:04:24.674	2013-03-27 17:35:23.681		EX1301_Okeanos_March_2011_2013-086_0068_20130327_170424_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0069_20130327_173524_EX1301_MB	EX1301_XBT021_130327	3/27/2013	10.1	072	39-47.82N	39-54.74N	069-24.14W	069-06.40W	2013-03-27 17:35:24.181	2013-03-27 18:55:58.196		EX1301_Okeanos_March_2011_2013-086_0069_20130327_173524_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0070_20130327_191347_EX1301_MB	EX1301_XBT021_130327	3/27/2013	10.4	072	39-53.34N	39-58.62N	069-03.65W	068-51.41W	2013-03-27 19:13:47.701	2013-03-27 20:05:32.713		EX1301_Okeanos_March_2011_2013-086_0070_20130327_191347_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0071_20130327_200533_EX1301_MB	EX1301_XBT023_130327	3/27/2013	10.1	066	39-56.03N	40-06.62N	068-52.61W	068-27.16W	2013-03-27 20:05:33.211	2013-03-27 22:05:34.737		EX1301_Okeanos_March_2011_2013-086_0071_20130327_200533_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0072_20130327_220534_EX1301_MB	EX1301_XBT023_130327	3/27/2013	9.8	066	40-04.15N	40-12.20N	068-28.87W	068-08.91W	2013-03-27 22:05:35.237	2013-03-27 23:37:21.261		EX1301_Okeanos_March_2011_2013-086_0072_20130327_220534_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0073_20130327_233721_EX1301_MB	EX1301_XBT023_130327	3/27/2013	9.1	324	40-04.15N	40-13.89N	068-12.61W	068-09.26W	2013-03-27 23:37:21.760	2013-03-27 23:52:33.267		EX1301_Okeanos_March_2011_2013-086_0073_20130327_233721_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0074_20130327_235233_EX1301_MB	EX1301_XBT024_130327	3/27/2013	9.2	245	40-04.15N	40-13.68N	068-15.09W	068-11.37W	2013-03-27 23:52:33.767	2013-03-28 00:07:44.769		EX1301_Okeanos_March_2011_2013-086_0074_20130327_235233_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0075_20130328_000745_EX1301_MB	EX1301_XBT025_130327	03/28/2013	8.2	244	40-04.37N	40-13.03N	068-33.99W	068-13.95W	2013-03-28 00:07:45.271	2013-03-28 02:07:45.296		EX1301_Okeanos_March_2011_2013-087_0075_20130328_000745_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0076_20130328_020745_EX1301_MB	EX1301_XBT025_130328	03/28/2013	6.3	245	39-58.63N	40-05.66N	068-49.13W	068-33.54W	2013-03-28 02:07:45.796	2013-03-28 04:07:44.822		EX1301_Okeanos_March_2011_2013-087_0076_20130328_020745_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0077_20130328_040745_EX1301_MB	EX1301_XBT026_130328	03/28/2013	5.8	246	39-57.08N	40-01.01N	068-53.60W	068-48.36W	2013-03-28 04:07:45.322	2013-03-28 04:45:53.334		EX1301_Okeanos_March_2011_2013-087_0077_20130328_040745_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0078_20130328_044553_EX1301_MB	EX1301_XBT026_130328	03/28/2013	6.5	338	39-57.13N	40-00.10N	068-55.42W	068-52.30W	2013-03-28 04:45:53.835	2013-03-28 05:01:33.333		EX1301_Okeanos_March_2011_2013-087_0078_20130328_044553_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 MB ACQUISITION / PROCESSING LOG												
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
0079_20130328_050133_EX1301_MB	EX1301_XBT026_130328, EX1301_XBT027_130328	03/28/2013	8.1	066	39-58.11N	40-06.36N	068-54.59W	068-34.11W	2013-03-28 05:01:33.833	2013-03-28 07:01:29.857		EX1301_Okeanos_March_2011_2013-087_0079_20130328_050133_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0080_20130328_070130_EX1301_MB	EX1301_XBT028_130328	03/28/2013	7.3	065	40-05.34N	40-12.36N	068-34.72W	068-16.76W	2013-03-28 07:01:30.359	2013-03-28 09:01:29.386		EX1301_Okeanos_March_2011_2013-087_0080_20130328_070130_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0081_20130328_090129_EX1301_MB	EX1301_XBT028_130328	03/28/2013	7.0	063	40-11.12N	40-14.06N	068-17.62W	068-12.03W	2013-03-28 09:01:29.887	2013-03-28 09:36:40.391		EX1301_Okeanos_March_2011_2013-087_0081_20130328_090129_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0082_20130328_093640_EX1301_MB	EX1301_XBT028_130328	03/28/2013	6.7	308	40-13.25N	40-14.60N	068-13.13W	068-11.50W	2013-03-28 09:36:40.891	2013-03-28 09:48:08.396		EX1301_Okeanos_March_2011_2013-087_0082_20130328_093640_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0083_20130328_094808_EX1301_MB	EX1301_XBT028_130328, EX1301_XBT029_130328	03/28/2013	6.5848	244.974	068-12.44W	068-28.65W	40-07.54N	40-14.27N	2013-03-28 09:48:08.896	2013-03-28 11:48:06.923		EX1301_Okeanos_March_2011_2013-087_0083_20130328_094808_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0084_20130328_114807_EX1301_MB	EX1301_XBT029_130328, EX1301_XBT030_130328	03/28/2013	7.1047	247.566	068-28.29W	068-45.70W	40-02.24N	40-09.21N	2013-03-28 11:48:07.422	2013-03-28 13:48:06.448		EX1301_Okeanos_March_2011_2013-087_0084_20130328_114807_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0085_20130328_134807_EX1301_MB	EX1301_XBT030_130328	03/28/2013	7.2425	245.434	068-44.89W	068-54.50W	39-59.11N	40-03.57N	2013-03-28 13:48:06.948	2013-03-28 14:49:03.961		EX1301_Okeanos_March_2011_2013-087_0085_20130328_134807_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0086_20130328_144904_EX1301_MB	EX1301_XBT030_130328	03/28/2013	7.27	350.929	068-53.67W	068-55.53W	39-59.09N	40-01.40N	2013-03-28 14:49:04.465	2013-03-28 14:58:59.960		EX1301_Okeanos_March_2011_2013-087_0086_20130328_144904_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0087_20130328_145900_EX1301_MB	EX1301_XBT030_130328, EX1301_XBT031_130328	03/28/2013	8.3	069	40-00.20N	40-07.03N	068-54.69W	068-34.37W	2013-03-28 14:59:00.459	2013-03-28 16:57:43.484		EX1301_Okeanos_March_2011_2013-087_0087_20130328_145900_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0088_20130328_165743_EX1301_MB	EX1301_XBT031_130328	03/28/2013	7.4	305	40-06.24N	40-07.78N	068-35.94W	068-33.87W	2013-03-28 16:57:43.984	2013-03-28 17:10:41.491		EX1301_Okeanos_March_2011_2013-087_0088_20130328_165743_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0089_20130328_171041_EX1301_MB	EX1301_XBT031_130328	03/28/2013	8.3	248	40-02.92N	40-07.71N	068-48.41W	068-35.80W	2013-03-28 17:10:41.991	2013-03-28 18:23:11.007		EX1301_Okeanos_March_2011_2013-087_0089_20130328_171041_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0090_20130328_202233_EX1301_MB	EX1301_XBT031_130328	03/28/2013	6.6	064	40-02.88N	40-04.86N	068-50.18W	068-47.36W	2013-03-28 20:22:33.030	2013-03-28 20:33:22.530		EX1301_Okeanos_March_2011_2013-087_0090_20130328_202233_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0091_20130328_203322_EX1301_MB	EX1301_XBT031_130328	03/28/2013	8.3	219	40-02.70N	40-04.75N	068-48.65W	068-46.38W	2013-03-28 20:33:23.030	2013-03-28 20:41:15.536		EX1301_Okeanos_March_2011_2013-087_0091_20130328_203322_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0092_20130328_204116_EX1301_MB	EX1301_CTD005_130328	03/28/2013	9.3	246	40-01.16N	40-04.51N	068-53.45W	068-47.87W	2013-03-28 20:41:16.037	2013-03-28 21:08:29.543		EX1301_Okeanos_March_2011_2013-087_0092_20130328_204116_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0093_20130328_210830_EX1301_MB	EX1301_CTD005_130328	03/28/2013	6.9	348	40-00.86N	40-02.65N	068-54.89W	068-52.94W	2013-03-28 21:08:30.044	2013-03-28 21:22:00.541		EX1301_Okeanos_March_2011_2013-087_0093_20130328_210830_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0094_20130328_212201_EX1301_MB	EX1301_CTD005_130328	03/28/2013	7.1	064	40-01.62N	40-06.65N	068-41.68W	068-41.68W	2013-03-28 21:22:01.041	2013-03-28 22:44:40.059		EX1301_Okeanos_March_2011_2013-087_0094_20130328_212201_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0095_20130328_224440_EX1301_MB	EX1301_CTD005_130328	03/28/2013	7.6	274	40-06.26N	40-07.09N	068-42.99W	068-41.42W	2013-03-28 22:44:40.557	2013-03-28 22:54:30.064		EX1301_Okeanos_March_2011_2013-087_0095_20130328_224440_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 MB ACQUISITION / PROCESSING LOG													
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
0096_20130328_225430_EX1301_MB	SVP Server	03/28/2013	9.3	244	40-02.79N	40-06.68N	068-51.50W	068-42.73W	2013-03-28 22:54:30.563	2013-03-28 23:40:59.076		EX1301_Okeanos_March_2011_2013-087_0096_20130328_225430_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0097_20130328_234059_EX1301_MB	SVP Server	03/28/2013	7.0	018	40-02.92N	40-04.30N	068-52.26W	068-50.71W	2013-03-28 23:40:59.576	2013-03-28 23:48:50.571		EX1301_Okeanos_March_2011_2013-087_0097_20130328_234059_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0098_20130328_234850_EX1301_MB	SVP Server	03/28/2013	7.3	064	40-03.37N	40-05.06N	068-51.34W	068-49.13W	2013-03-28 23:48:51.071	2013-03-29 00:00:21.575		EX1301_Okeanos_March_2011_2013-087_0098_20130328_234850_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0099_20130329_000021_EX1301_MB	SVP Server	03/29/2013	7.1	064	40-03.92N	40-07.10N	068-49.74W	068-42.63W	2013-03-29 00:00:22.073	2013-03-29 00:47:27.084		EX1301_Okeanos_March_2011_2013-088_0099_20130329_000021_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0100_20130329_004727_EX1301_MB	SVP Server	03/2/2013	9.3	246	40-03.47N	40-07.38N	068-52.33W	068-42.58W	2013-03-29 00:47:27.583	2013-03-29 01:38:01.098		EX1301_Okeanos_March_2011_2013-088_0100_20130329_004727_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0101_20130329_013801_EX1301_MB	SVP Server	03/29/2013	7.7	360.0	40-03.41N	40-04.60N	068-52.95W	068-51.75W	2013-03-29 01:38:01.597	2013-03-29 01:44:24.097		EX1301_Okeanos_March_2011_2013-088_0101_20130329_013801_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0102_20130329_014424_EX1301_MB	EX1301_XBT032_130329	03/29/2013	7.5	063	40-03.87N	40-06.75N	068-52.27W	068-46.13W	2013-03-29 01:44:24.594	2013-03-29 02:23:44.139		EX1301_Okeanos_March_2011_2013-088_0102_20130329_014424_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0103_20130329_022344_EX1301_MB	EX1301_XBT032_130329	03/29/2013	8.2	297	40-06.25N	40-07.03N	068-46.89W	068-45.89W	2013-03-29 02:23:44.606	2013-03-29 02:28:22.608		EX1301_Okeanos_March_2011_2013-088_0103_20130329_022344_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0104_20130329_022822_EX1301_MB	EX1301_XBT032_130329	03/29/2013	9.5	246	40-04.96N	40-06.97N	068-50.64W	068-46.64W	2013-03-29 02:28:23.145	2013-03-29 02:47:49.141		EX1301_Okeanos_March_2011_2013-088_0104_20130329_022822_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0105_20130329_024749_EX1301_MB	EX1301_XBT032_130329	03/29/2013	8.1	354	40-04.96N	40-06.13N	068-51.20W	068-50.11W	2013-03-29 02:47:49.611	2013-03-29 02:52:26.139		EX1301_Okeanos_March_2011_2013-088_0105_20130329_024749_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0106_20130329_025226_EX1301_MB	EX1301_XBT032_130329	03/29/2013	7.9	063	40-05.36N	40-07.38N	068-50.71W	068-46.95W	2013-03-29 02:52:26.610	2013-03-29 03:14:09.615		EX1301_Okeanos_March_2011_2013-088_0106_20130329_025226_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0107_20130329_031410_EX1301_MB	EX1301_XBT032_130329	03/29/2013	8.3	104	40-05.01N	40-07.40N	068-47.26W	068-39.92W	2013-03-29 03:14:10.140	2013-03-29 03:54:34.144		EX1301_Okeanos_March_2011_2013-088_0107_20130329_031410_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0108_20130329_035434_EX1301_MB	EX1301_XBT032_130329	03/29/2013	8.4	069	40-05.20N	40-07.44N	068-40.23W	068-35.06W	2013-03-29 03:54:34.621	2013-03-29 04:22:24.628		EX1301_Okeanos_March_2011_2013-088_0108_20130329_035434_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0109_20130329_042225_EX1301_MB	EX1301_XBT032_130329	03/29/2013	8.6	069	40-06.74N	40-08.55N	068-35.49W	068-31.53W	2013-03-29 04:22:25.138	2013-03-29 04:42:49.630		EX1301_Okeanos_March_2011_2013-088_0109_20130329_042225_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0110_20130329_044250_EX1301_MB	EX1301_XBT032_130329, EX1301_XBT033_130329	03/29/2013	8.4	066	40-07.71N	40-10.60N	068-31.98W	068-26.00W	2013-03-29 04:42:50.141	2013-03-29 05:15:19.139		EX1301_Okeanos_March_2011_2013-088_0110_20130329_044250_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0111_20130329_051519_EX1301_MB	EX1301_XBT033_130329	03/29/2013	8.0	307	40-09.50N	40-10.95N	068-26.96W	068-25.72W	2013-03-29 05:15:19.638	2013-03-29 05:20:14.645		EX1301_Okeanos_March_2011_2013-088_0111_20130329_051519_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0112_20130329_052015_EX1301_MB	EX1301_XBT033_130329	03/29/2013	8.9	246	40-08.18N	40-10.97N	068-31.97W	068-26.75W	2013-03-29 05:20:15.144	2013-03-29 05:48:38.649		EX1301_Okeanos_March_2011_2013-088_0112_20130329_052015_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0113_20130329_054838_EX1301_MB	EX1301_XBT033_130329	03/29/2013	8.0	315	40-08.05N	40-09.55N	068-33.29W	068-31.63W	2013-03-29 05:48:39.149	2013-03-29 05:59:36.147		EX1301_Okeanos_March_2011_2013-088_0113_20130329_054838_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0114_20130329_055936_EX1301_MB	EX1301_XBT033_130329	03/29/2013	8.2	066	40-08.94N	40-11.72N	068-32.70W	068-26.31W	2013-03-29 05:59:36.647	2013-03-29 06:36:58.656		EX1301_Okeanos_March_2011_2013-088_0114_20130329_055936_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0115_20130329_063659_EX1301_MB	EX1301_XBT033_130329	03/29/2013	8.0	290	40-10.90N	40-12.00N	068-27.38W	068-25.92W	2013-03-29 06:36:59.156	2013-03-29 06:44:09.163		EX1301_Okeanos_March_2011_2013-088_0115_20130329_063659_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0116_20130329_064409_EX1301_MB	EX1301_XBT033_130329	03/29/2013	8.7	246	40-09.27N	40-11.93N	068-32.92W	068-27.10W	2013-03-29 06:44:09.661	2013-03-29 07:16:05.169		EX1301_Okeanos_March_2011_2013-088_0116_20130329_064409_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 MB ACQUISITION / PROCESSING LOG													
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
0117_20130329_071605_EX1301_MB	EX1301_XBT033_130329	03/29/2013	7.5	013	40-09.22N	40-10.31N	068-33.49W	068-32.45W	2013-03-29 07:16:05.669	2013-03-29 07:23:16.165		EX1301_Okeanos_March_2011_2013-088_0117_20130329_071605_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0118_20130329_072316_EX1301_MB	EX1301_XBT033_130329	03/29/2013	7.7	066	40-09.87N	40-12.16N	068-32.90W	068-27.38W	2013-03-29 07:23:16.665	2013-03-29 07:55:47.672		EX1301_Okeanos_March_2011_2013-088_0118_20130329_072316_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0119_20130329_075548_EX1301_MB	EX1301_XBT033_130329	03/29/2013	8.9	162	40-06.02N	40-12.21N	068-28.18W	068-24.97W	2013-03-29 07:55:48.173	2013-03-29 08:32:34.180		EX1301_Okeanos_March_2011_2013-088_0119_20130329_075548_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0120_20130329_083234_EX1301_MB	EX1301_XBT033_130329, EX1301_XBT034_130329	03/29/2013	8.0	064	40-06.22N	40-11.98N	068-26.03W	068-14.20W	2013-03-29 08:32:34.682	2013-03-29 09:39:49.693		EX1301_Okeanos_March_2011_2013-088_0120_20130329_083234_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0121_20130329_083234_EX1301_MB	EX1301_XBT034_130329	03/29/2013	7.8	013	40-09.57N	40-14.78N	068-16.20W	068-12.82W	2013-03-29 09:39:50.193	2013-03-29 10:12:14.204		EX1301_Okeanos_March_2011_2013-088_0121_20130329_093950_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0122_20130329_083234_EX1301_MB	EX1301_XBT034_130329	03/29/2013	8.6	246	40-12.42N	40-14.70N	068-18.40W	068-13.68W	2013-03-29 10:12:14.707	2013-03-29 10:37:02.710		EX1301_Okeanos_March_2011_2013-088_0122_20130329_101214_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0123_20130329_083234_EX1301_MB	EX1301_XBT034_130329	03/29/2013	7.9	022	40-12.36N	40-14.49N	068-19.21W	068-17.10W	2013-03-29 10:37:03.210	2013-03-29 10:51:21.211		EX1301_Okeanos_March_2011_2013-088_0123_20130329_103702_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0124_20130329_083234_EX1301_MB	EX1301_XBT035_130329	03/29/2013	7.7	067	40-13.36N	40-15.46N	068-17.83W	068-14.14W	2013-03-29 10:51:21.711	2013-03-29 11:11:51.713		EX1301_Okeanos_March_2011_2013-088_0124_20130329_105121_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0125_20130329_083234_EX1301_MB	EX1301_XBT035_130329	03/29/2013	7.8	005	40-14.76N	40-16.29N	068-14.57W	068-13.27W	2013-03-29 11:11:52.214	2013-03-29 11:23:21.219		EX1301_Okeanos_March_2011_2013-088_0125_20130329_111151_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0126_20130329_083234_EX1301_MB	EX1301_XBT035_130329	03/29/2013	9.5	248	40-14.29N	40-16.25N	068-18.37W	068-14.14W	2013-03-29 11:23:21.719	2013-03-29 11:44:01.224		EX1301_Okeanos_March_2011_2013-088_0126_20130329_112321_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0127_20130329_114401_EX1301_MB	EX1301_XBT035_130329	03/29/2013	7.3	358	40-14.07N	40-15.43N	068-19.42W	068-18.07W	2013-03-29 11:44:01.724	2013-03-29 11:58:00.224		EX1301_Okeanos_March_2011_2013-088_0127_20130329_114401_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0128_20130329_115800_EX1301_MB	EX1301_XBT035_130329	03/29/2013	7.7	068	40-14.77N	40-16.52N	068-18.40W	068-14.66W	2013-03-29 11:58:00.721	2013-03-29 12:20:25.727		EX1301_Okeanos_March_2011_2013-088_0128_20130329_115800_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0129_20130329_122025_EX1301_MB	EX1301_XBT035_130329	03/29/2013	8.3	304	40-15.73N	40-16.87N	068-15.41W	068-14.06W	2013-03-29 12:20:26.227	2013-03-29 12:28:29.233		EX1301_Okeanos_March_2011_2013-088_0129_20130329_122025_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0130_20130329_122829_EX1301_MB	EX1301_XBT035_130329	03/29/2013	9.8	248	40-15.03N	40-16.83N	068-19.26W	068-15.15W	2013-03-29 12:28:29.733	2013-03-29 12:47:55.237		EX1301_Okeanos_March_2011_2013-088_0130_20130329_122829_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0131_20130329_122829_EX1301_MB	EX1301_XBT035_130329	03/29/2013	9.3	230.0	40-10.27N	40-15.56N	068-26.98W	068-19.01W	2013-03-29 12:47:55.737	2013-03-29 13:35:24.246		EX1301_Okeanos_March_2011_2013-088_0131_20130329_124755_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0132_20130329_122829_EX1301_MB	EX1301_XBT035_130329	03/29/2013	7.8	276.0	40-08.91N	40-10.92N	068-29.38W	068-26.25W	2013-03-29 13:35:58.248	2013-03-29 13:49:24.747		EX1301_Okeanos_March_2011_2013-088_0132_20130329_133558_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0133_20130329_122829_EX1301_MB	EX1301_XBT035_130329 , EX1301_XBT036_130329	03/29/2013	7.3	345.0	40-10.55N	40-14.14N	068-29.55W	068-26.85W	2013-03-29 13:49:25.247	2013-03-29 14:18:37.256		EX1301_Okeanos_March_2011_2013-088_0133_20130329_134924_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0134_20130329_141837_EX1301_MB	EX1301_XBT036_130329	03/29/2013	7.5	174	40-11.54N	40-14.57N	068-30.00W	068-28.33W	2013-03-29 14:18:37.756	2013-03-29 14:42:34.261		EX1301_Okeanos_March_2011_2013-088_0134_20130329_141837_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0135_20130329_144234_EX1301_MB	EX1301_XBT036_130329	03/29/2013	7.2	246	40-10.51N	40-11.97N	068-30.29W	068-28.14W	2013-03-29 14:42:34.759	2013-03-29 14:52:04.760		EX1301_Okeanos_March_2011_2013-088_0135_20130329_144234_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0136_20130329_145205_EX1301_MB	EX1301_XBT036_130329	03/29/2013	7.3	342	40-11.44N	40-14.12N	068-30.63W	068-28.53W	2013-03-29 14:52:05.260	2013-03-29 15:11:29.763		EX1301_Okeanos_March_2011_2013-088_0136_20130329_145205_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 MB ACQUISITION / PROCESSING LOG													
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
0137_20130329_151130_EX1301_MB	EX1301_XBT036_130329	03/29/2013	7.6	242	40-13.28N	40-14.22N	068-32.21W	068-30.12W	2013-03-29 15:11:30.264	2013-03-29 15:21:56.769		EX1301_Okeanos_March_2011_2013-088_0137_20130329_151130_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0138_20130329_152157_EX1301_MB	EX1301_XBT036_130329	03/29/2013	7.0	166	40-09.85N	40-13.42N	068-32.28W	068-29.47W	2013-03-29 15:21:57.269	2013-03-29 15:49:30.274		EX1301_Okeanos_March_2011_2013-088_0138_20130329_152157_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0139_20130329_154930_EX1301_MB	EX1301_XBT036_130329	03/29/2013	6.5	313	40-09.67N	40-11.33N	068-32.36W	068-30.15W	2013-03-29 15:49:30.774	2013-03-29 16:03:50.774		EX1301_Okeanos_March_2011_2013-088_0139_20130329_154930_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0140_20130329_160351_EX1301_MB	EX1301_XBT036_130329	03/29/2013	7.4	347	40-11.21N	40-13.76N	068-33.20W	068-31.00W	2013-03-29 16:03:51.274	2013-03-29 16:23:55.779		EX1301_Okeanos_March_2011_2013-088_0140_20130329_160351_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0141_20130329_162356_EX1301_MB	EX1301_XBT036_130329	03/29/2013	8.8	112	40-08.84N	40-14.31N	068-33.08W	068-22.28W	2013-03-29 16:23:56.279	3/29/2013 5:40:08 PM		EX1301_Okeanos_March_2011_2013-088_0141_20130329_162356_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0142_20130329_174008_EX1301_MB	EX1301_XBT037_130329	03/29/2013	9.1	065	40-10.31N	40-13.68N	068-22.92W	068-15.89W	2013-03-29 17:40:08.793	2013-03-29 18:14:28.300		EX1301_Okeanos_March_2011_2013-088_0142_20130329_174008_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0143_20130329_185228_EX1301_MB	EX1301_XBT037_130329	03/29/2013	1.8	088	40-11.48N	40-13.91N	068-17.05W	068-14.37W	2013-03-29 18:52:28.308	2013-03-29 18:59:16.309		EX1301_Okeanos_March_2011_2013-088_0143_20130329_185228_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0144_20130329_193005_EX1301_MB	EX1301_CTD006_130329	03/29/2013	8.6	070	40-12.17N	40-16.93N	068-15.01W	068-02.89W	2013-03-29 19:30:05.315	2013-03-29 20:34:11.829		EX1301_Okeanos_March_2011_2013-088_0144_20130329_193005_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0145_20130329_203412_EX1301_MB	EX1301_CTD006_130329	03/29/2013	8.5	071	40-15.00N	40-17.40N	068-03.76W	067-58.76W	2013-03-29 20:34:12.329	2013-03-29 20:58:18.833		EX1301_Okeanos_March_2011_2013-088_0145_20130329_203412_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0146_20130329_205819_EX1301_MB	EX1301_CTD006_130329	03/29/2013	8.8	056	40-16.33N	40-21.88N	067-59.42W	067-50.86W	2013-03-29 20:58:19.333	2013-03-29 21:48:47.848		EX1301_Okeanos_March_2011_2013-088_0146_20130329_205819_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0147_20130329_214848_EX1301_MB	EX1301_CTD006_130329	03/29/2013	8.9	096	40-19.53N	40-21.48N	067-51.45W	067-43.94W	2013-03-29 21:48:48.349	2013-03-29 22:27:26.855		EX1301_Okeanos_March_2011_2013-088_0147_20130329_214848_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0148_20130329_222727_EX1301_MB	EX1301_XBT038_130329, EX1301_CTD006_130329	03/29/2013	9.6	114	40-15.44N	40-20.79N	067-44.03W	067-33.82W	2013-03-29 22:27:27.356	2013-03-29 23:17:10.363		EX1301_Okeanos_March_2011_2013-088_0148_20130329_222727_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0149_20130329_231710_EX1301_MB	EX1301_XBT038_130329	03/29/2013	9.0	063	40-16.05N	40-21.14N	067-35.64W	067-27.04W	2013-03-29 23:17:10.863	2013-03-30 00:00:43.374		EX1301_Okeanos_March_2011_2013-088_0149_20130329_231710_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0150_20130330_000043_EX1301_MB	EX1301_XBT038_130329	03/30/2013	9.4	062	40-17.56N	40-28.48N	067-28.64W	067-06.20W	2013-03-30 00:00:43.874	2013-03-30 02:00:43.898		EX1301_Okeanos_March_2011_2013-089_0150_20130330_000043_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0151_20130330_020044_EX1301_MB	EX1301_XBT038_130329, EX1301_XBT039_130330	03/30/2013	8.5	058	40-26.25N	40-33.89N	067-07.70W	066-54.86W	2013-03-30 02:00:44.398	2013-03-30 03:11:43.412		EX1301_Okeanos_March_2011_2013-089_0151_20130330_020044_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0152_20130330_031143_EX1301_MB	EX1301_XBT039_130330	03/30/2013	7.4	174	40-30.62N	40-34.09N	066-57.39W	066-53.11W	2013-03-30 03:11:43.912	2013-03-30 03:21:56.917		EX1301_Okeanos_March_2011_2013-089_0152_20130330_031143_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0153_20130330_032157_EX1301_MB	EX1301_XBT039_130330	03/30/2013	8.0	327	40-31.08N	40-37.55N	067-00.35W	066-54.39W	2013-03-30 03:21:57.417	2013-03-30 04:06:44.428		EX1301_Okeanos_March_2011_2013-089_0153_20130330_032157_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0154_20130330_040644_EX1301_MB	EX1301_XBT039_130330	03/30/2013	7.6	079	40-37.09N	40-38.46N	067-00.42W	066-57.34W	2013-03-30 04:06:44.927	2013-03-30 04:24:41.931		EX1301_Okeanos_March_2011_2013-089_0154_20130330_040644_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0155_20130330_042442_EX1301_MB	EX1301_XBT039_130330, EX1301_XBT040_130330	03/30/2013	8.1	147	40-26.55N	40-37.79N	066-58.29W	066-47.28W	2013-03-30 04:24:42.431	2013-03-30 05:54:49.950		EX1301_Okeanos_March_2011_2013-089_0155_20130330_042442_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 MB ACQUISITION / PROCESSING LOG													
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
0156_20130330_055450_EX1301_MB	EX1301_XBT040_130330	03/30/2013	7.4	241	40-24.01N	40-27.88N	066-54.27W	066-47.04W	2013-03-30 05:54:50.450	2013-03-30 06:26:07.453		EX1301_Okeanos_March_2011_2013-089_0156_20130330_055450_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0157_20130330_062607_EX1301_MB	EX1301_XBT040_130330, EX1301_XBT041_130330	03/30/2013	9.5	058	40-24.57N	40-36.97N	066-52.89W	066-29.21W	2013-03-30 06:26:07.953	2013-03-30 08:26:11.981		EX1301_Okeanos_March_2011_2013-089_0157_20130330_062607_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0158_20130330_082612_EX1301_MB	EX1301_XBT041_130330	03/30/2013	9.5	058	40-34.32N	40-37.85N	066-31.57W	066-26.99W	2013-03-30 08:26:12.482	2013-03-30 08:38:26.482		EX1301_Okeanos_March_2011_2013-089_0158_20130330_082612_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0159_20130330_083826_EX1301_MB	EX1301_XBT041_130330	03/30/2013	7.8	330	40-35.65N	40-40.48N	066-30.45W	066-25.73W	2013-03-30 08:38:26.982	2013-03-30 08:58:39.492		EX1301_Okeanos_March_2011_2013-089_0159_20130330_083826_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0160_20130330_085839_EX1301_MB	EX1301_XBT041_130330, EX1301_XBT042_130330	03/30/2013	7.8	238	40-29.15N	40-39.92N	066-48.09W	066-28.65W	2013-03-30 08:58:39.991	2013-03-30 10:58:40.515		EX1301_Okeanos_March_2011_2013-089_0160_20130330_085839_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0161_20130330_105840_EX1301_MB	EX1301_XBT042_130330	03/30/2013	8.6	238	40-26.46N	40-31.94N	066-54.29W	066-46.08W	2013-03-30 10:58:41.013	2013-03-30 11:37:18.522		EX1301_Okeanos_March_2011_2013-089_0161_20130330_105840_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0162_20130330_113718_EX1301_MB	EX1301_XBT042_130330	03/30/2013	9.1	338	40-26.20N	40-30.99N	066-56.73W	066-52.19W	2013-03-30 11:37:19.022	2013-03-30 11:55:27.524		EX1301_Okeanos_March_2011_2013-089_0162_20130330_113718_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0163_20130330_115527_EX1301_MB	EX1301_XBT042_130330	03/30/2013	9.8	059	40-28.23N	40-40.83N	066-55.13W	066-31.00W	2013-03-30 11:55:28.024	2013-03-30 13:55:27.550		EX1301_Okeanos_March_2011_2013-089_0163_20130330_115527_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0164_20130330_135527_EX1301_MB	EX1301_XBT043_130330	03/30/2013	9.7	057	40-37.90N	40-41.63N	066-32.88W	066-29.00W	2013-03-30 13:55:28.048	2013-03-30 14:05:13.550		EX1301_Okeanos_March_2011_2013-089_0164_20130330_135527_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0165_20130330_140513_EX1301_MB	EX1301_XBT043_130330	03/30/2013	9.1	321	40-39.19N	40-43.21N	066-32.89W	066-28.03W	2013-03-30 14:05:14.050	2013-03-30 14:19:18.557		EX1301_Okeanos_March_2011_2013-089_0165_20130330_140513_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0166_20130330_141918_EX1301_MB	EX1301_XBT043_130330	03/30/2013	9.1	238	40-31.30N	40-43.13N	066-53.16W	066-30.85W	2013-03-30 14:19:19.057	2013-03-30 16:19:20.079		EX1301_Okeanos_March_2011_2013-089_0166_20130330_141918_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0167_20130330_161920_EX1301_MB	EX1301_XBT043_130330	03/30/2013	9.0	239	40-31.13N	40-33.78N	066-53.65W	066-51.23W	2013-03-30 16:19:20.580	2013-03-30 16:22:11.583		EX1301_Okeanos_March_2011_2013-089_0167_20130330_161920_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0168_20130330_162211_EX1301_MB	EX1301_XBT043_130330	03/30/2013	9.5	350	40-30.94N	40-34.64N	066-55.31W	066-51.79W	2013-03-30 16:22:12.082	2013-03-30 16:36:35.582		EX1301_Okeanos_March_2011_2013-089_0168_20130330_162211_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0169_20130330_162211_EX1301_MB	EX1301_XBT044_130330	03/30/2013	9.5	058	40-32.64N	40-44.88N	066-53.78W	066-30.28W	2013-03-30 16:36:36.082	2013-03-30 18:36:33.606		EX1301_Okeanos_March_2011_2013-089_0169_20130330_163635_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0170_20130330_183633_EX1301_MB	EX1301_XBT044_130330	03/30/2013	8.9	058	40-41.95N	40-52.32N	066-32.63W	066-13.52W	2013-03-30 18:36:34.141	2013-03-30 20:14:33.627		EX1301_Okeanos_March_2011_2013-089_0170_20130330_183633_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0171_20130330_201433_EX1301_MB	EX1301_XBT044_130330	03/30/2013	9.1	294	40-49.43N	40-53.86N	066-18.18W	066-12.57W	2013-03-30 20:14:34.137	2013-03-30 20:32:43.146		EX1301_Okeanos_March_2011_2013-089_0171_20130330_201433_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0172_20130330_203243_EX1301_MB	EX1301_XBT045_130330, EX1301_XBT046_130330	03/30/2013	9.5	238	40-40.86N	40-53.27N	066-39.87W	066-15.93W	2013-03-30 20:32:43.636	2013-03-30 22:32:43.158		EX1301_Okeanos_March_2011_2013-089_0172_20130330_203243_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0173_20130330_223243_EX1301_MB	EX1301_XBT046_130330	03/30/2013	9.4	238	40-34.47N	40-43.56N	066-54.58W	066-37.44W	2013-03-30 22:32:43.658	2013-03-31 00:00:09.181		EX1301_Okeanos_March_2011_2013-089_0173_20130330_223243_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0174_20130331_000009_EX1301_MB	EX1301_XBT046_130330, EX1301_XBT047	03/31/2013	9.0	239	40-25.24N	40-36.05N	067-15.02W	066-53.49W	2013-03-31 00:00:09.680	2013-03-31 02:00:10.203		EX1301_Okeanos_March_2011_2013-090_0174_20130331_000009_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 MB ACQUISITION / PROCESSING LOG													
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
	_130331												
0175_20130331_020010_EX1301_MB	EX1301_XBT047_130331	03/31/2013	9.0	238	40-19.65N	40-27.05N	067-27.46W	067-14.18W	2013-03-31 02:00:10.705	2013-03-31 03:12:48.222		EX1301_Okeanos_March_2011_2013-090_0175_20130331_020010_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0176_20130331_031248_EX1301_MB	EX1301_XBT047_130331	03/31/2013	9.0	320	40-19.43N	40-22.46N	067-29.43W	067-26.34W	2013-03-31 03:12:48.723	2013-03-31 03:27:25.722		EX1301_Okeanos_March_2011_2013-090_0176_20130331_031248_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0177_20130331_032726_EX1301_MB	EX1301_XBT047_130331, EX1301_XBT048_130331	03/31/2013	9.6	060	40-20.72N	40-31.41N	067-28.36W	067-05.61W	2013-03-31 03:27:26.222	2013-03-31 05:27:23.747		EX1301_Okeanos_March_2011_2013-090_0177_20130331_032726_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0178_20130331_052723_EX1301_MB	EX1301_XBT048_130331, EX1301_XBT049_130331	03/31/2013	9.4	056	40-30.53N	40-41.87N	067-06.34W	066-44.57W	2013-03-31 05:27:24.246	2013-03-31 07:27:25.776		EX1301_Okeanos_March_2011_2013-090_0178_20130331_052723_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0179_20130331_072726_EX1301_MB	EX1301_XBT049_130331	03/31/2013	8.8	055	40-40.33N	40-52.17N	066-45.78W	066-24.60W	2013-03-31 07:27:26.276	2013-03-31 09:27:25.800		EX1301_Okeanos_March_2011_2013-090_0179_20130331_072726_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0180_20130331_092726_EX1301_MB	EX1301_XBT049_130331, EX1301_XBT050_130331	03/31/2013	9.0	055	40-49.49N	41-00.47N	066-27.26W	066-07.82W	2013-03-31 09:27:26.299	2013-03-31 11:07:14.321		EX1301_Okeanos_March_2011_2013-090_0180_20130331_092726_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0181_20130331_112410_EX1301_MB	EX1301_XBT050_130331	03/31/2013	10.0	234	40-48.37N	41-01.73N	066-33.68W	066-10.49W	2013-03-31 11:24:10.830	2013-03-31 13:23:19.352		EX1301_Okeanos_March_2011_2013-090_0181_20130331_112410_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0182_20130331_132319_EX1301_MB	EX1301_XBT051_130331	03/31/2013	10.0	235	40-44.20N	40-50.68N	066-42.96W	066-32.11W	2013-03-31 13:23:19.853	2013-03-31 14:14:15.863		EX1301_Okeanos_March_2011_2013-090_0182_20130331_132319_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0183_20130331_141416_EX1301_MB	EX1301_XBT051_130331	03/31/2013	7.8	030	40-43.80N	40-48.90N	066-44.36W	066-38.89W	2013-03-31 14:14:16.363	2013-03-31 15:01:06.870		EX1301_Okeanos_March_2011_2013-090_0183_20130331_141416_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0184_20130331_150107_EX1301_MB	EX1301_XBT051_130331	03/31/2013	7.8	055	40-47.86N	40-58.38N	066-39.65W	066-21.10W	2013-03-31 15:01:07.370	2013-03-31 17:01:07.395		EX1301_Okeanos_March_2011_2013-090_0184_20130331_150107_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0185_20130331_170107_EX1301_MB	EX1301_XBT051_130331, EX1301_XBT052_130331	03/31/2013	8.7	055	40-55.72N	41-03.32N	066-23.11W	066-11.64W	2013-03-31 17:01:07.895	2013-03-31 17:59:45.908		EX1301_Okeanos_March_2011_2013-090_0185_20130331_170107_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0186_20130331_181352_EX1301_MB	EX1301_XBT053_130331	03/31/2013	9.5	234	40-51.84N	41-04.16N	066-34.88W	066-13.18W	2013-03-31 18:13:52.413	2013-03-31 20:13:41.939		EX1301_Okeanos_March_2011_2013-090_0186_20130331_181352_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0187_20130331_201342_EX1301_MB	EX1301_XBT053_130331	03/31/2013	9.3	235	40-51.47N	40-52.86N	066-35.66W	066-34.02W	2013-03-31 20:13:42.439	2013-03-31 20:18:25.941		EX1301_Okeanos_March_2011_2013-090_0187_20130331_201342_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0188_20130331_201826_EX1301_MB	EX1301_XBT053_130331	03/31/2013	8.2	338	40-51.46N	40-52.70N	066-36.38W	066-34.97W	2013-03-31 20:18:26.440	2013-03-31 20:24:44.939		EX1301_Okeanos_March_2011_2013-090_0188_20130331_201826_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0189_20130331_202445_EX1301_MB	EX1301_XBT053_130331	03/31/2013	8.6	051	40-51.97N	41-04.01N	066-35.85W	066-16.45W	3/31/2013 8:24:45 PM	2013-03-31 22:24:44.469		EX1301_Okeanos_March_2011_2013-090_0189_20130331_202445_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0190_20130331_222444_EX1301_MB	EX1301_XBT053_130331	03/31/2013	8.7	044	41-01.60N	41-05.78N	066-18.73W	066-13.05W	3/31/2013 10:24:45 PM	2013-03-31 22:45:51.475		EX1301_Okeanos_March_2011_2013-090_0190_20130331_222444_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 MB ACQUISITION / PROCESSING LOG													
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
0192_20130331_230241_EX1301_MB	EX1301_XBT053_130331	03/31/2013	8.7994	222.416	066-24.93551W	066-16.42933W	40-59.84654N	41-06.29538N	2013-03-31 23:02:41.975	2013-03-31 23:57:10.987		EX1301_Okeanos_March_2011_2013-090_0192_20130331_230241_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0193_20130331_235711_EX1301_MB	EX1301_XBT053_130331	03/31/2013	8.3	321	40-59.78N	41-01.41N	066-25.90W	066-24.15W	2013-03-31 23:57:11.487	2013-04-01 00:04:51.987		EX1301_Okeanos_March_2011_2013-090_0193_20130331_235711_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0194_20130401_000452_EX1301_MB	EX1301_XBT053_130331, EX1301_XBT054_130401	04/01/2013	8.3	044	41-00.86N	41-06.93N	066-25.70W	066-17.32W	2013-04-01 00:04:52.487	2013-04-01 00:58:33.500		EX1301_Okeanos_March_2011_2013-091_0194_20130401_000452_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0195_20130401_011256_EX1301_MB	EX1301_XBT054_130401	04/01/2013	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NOTE: Line 0195 contains no data	NOTE: Line 0195 contains no data	N/A
0196_20130401_011418_EX1301_MB	EX1301_XBT054_130401	04/01/2013	10.6	224	41-02.23N	41-07.53N	066-25.45W	066-18.40W	2013-04-01 01:14:19.005	2013-04-01 01:52:10.513		EX1301_Okeanos_March_2011_2013-091_0196_20130401_011418_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0197_20130401_015210_EX1301_MB	EX1301_XBT054_130401	04/01/2013	8.0	048	41-01.33N	41-04.85N	066-26.09W	066-21.06W	2013-04-01 01:52:11.013	2013-04-01 02:26:16.520		EX1301_Okeanos_March_2011_2013-091_0197_20130401_015210_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0198_20130401_022616_EX1301_MB	EX1301_XBT054_130401	04/01/2013	8.6	314	41-03.45N	41-07.61N	066-26.80W	066-21.85W	2013-04-01 02:26:17.022	2013-04-01 02:58:04.028		EX1301_Okeanos_March_2011_2013-091_0198_20130401_022616_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0199_20130401_025804_EX1301_MB	EX1301_XBT054_130401	04/01/2013	8.0	205	41-06.90N	41-07.72N	066-27.33W	066-26.49W	2013-04-01 02:58:04.527	2013-04-01 03:04:32.030		EX1301_Okeanos_March_2011_2013-091_0199_20130401_025804_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0200_20130401_030432_EX1301_MB	EX1301_XBT055_130401	04/01/2013	8.0	143	41-02.51N	41-07.25N	066-27.07W	066-22.42W	2013-04-01 03:04:32.532	2013-04-01 03:40:06.537		EX1301_Okeanos_March_2011_2013-091_0200_20130401_030432_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0201_20130401_034006_EX1301_MB	EX1301_XBT055_130401	04/01/2013	7.0	027	41-02.12N	41-05.16N	066-23.91W	066-20.79W	2013-04-01 03:40:07.037	2013-04-01 03:59:12.041		EX1301_Okeanos_March_2011_2013-091_0201_20130401_034006_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0202_20130401_035912_EX1301_MB	EX1301_XBT055_130401	04/01/2013	9.2	305	41-04.63N	41-07.71N	066-27.09W	066-21.26W	2013-04-01 03:59:12.542	2013-04-01 04:29:09.048		EX1301_Okeanos_March_2011_2013-091_0202_20130401_035912_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0203_20130401_042909_EX1301_MB	EX1301_XBT055_130401	04/01/2013	8.0	219	41-07.12N	41-07.73N	066-27.71W	066-27.00W	2013-04-01 04:29:09.548	2013-04-01 04:33:59.549		EX1301_Okeanos_March_2011_2013-091_0203_20130401_042909_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0204_20130401_043359_EX1301_MB	EX1301_XBT055_130401	04/01/2013	7.1	150	41-02.89N	41-07.26N	066-27.67W	066-23.54W	2013-04-01 04:34:00.050	2013-04-01 05:12:30.559		EX1301_Okeanos_March_2011_2013-091_0204_20130401_043359_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 MB ACQUISITION / PROCESSING LOG													
MB Line Filename	SVP File Applied	Date (GMT) M/DD/YYYY	SOG (KTS)	Heading	Min Lon (dm)	Max Lon (dm)	Min Lat (dm)	Max Lat (dm)	Min Time	Max Time	Comments	Level 01 File Name	Level 02 Products (SD, KMZ, tiff, xyz)
0205_20130401_051230_EX1301_MB	EX1301_XBT055_130401	04/01/2013	6.9	041	41-02.31N	41-05.20N	066-25.14W	066-21.68W	2013-04-01 05:12:31.059	2013-04-01 05:35:29.563		EX1301_Okeanos_March_2011_2013-091_0205_20130401_051230_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0206_20130401_053529_EX1301_MB	EX1301_XBT055_130401	04/01/2013	9.6	309	41-04.28N	41-06.40N	066-24.84W	066-22.19W	2013-04-01 05:35:30.064	2013-04-01 05:48:20.067		EX1301_Okeanos_March_2011_2013-091_0206_20130401_053529_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0207_20130401_054820_EX1301_MB	EX1301_XBT055_130401	04/01/2013	5.9	172	40-59.94N	41-06.42N	066-25.71W	066-22.28W	2013-04-01 05:48:20.566	2013-04-01 06:53:10.084		EX1301_Okeanos_March_2011_2013-091_0207_20130401_054820_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84
0208_20130401_065310_EX1301_MB	EX1301_XBT055_130401	04/01/2013	5.0	VAR	40-58.73N	41-00.65N	066-26.66W	066-23.24W	2013-04-01 06:53:10.583	2013-04-01 07:16:12.586	DATA QUALITY VERY POOR	EX1301_Okeanos_March_2011_2013-091_0208_20130401_065310_EX1301_MB.txt	EX1301_MB_FNL_30m_WGS84

EX-13-01 EM 302 Water Column Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
0001_20130319_000824_EX1301_MB.wcd	1509280	031913	
0002_20130319_020824_EX1301_MB.wcd	1570056	031913	
0003_20130319_040824_EX1301_MB.wcd	1475244	031913	
0004_20130319_060227_EX1301_MB.wcd	1502472	031913	
0005_20130319_080204_EX1301_MB.wcd	843884	031913	
0006_20130321_000200_EX1301_MB.wcd	507660	032113	
0007_20130321_005105_EX1301_MB.wcd	1536292	032113	
0008_20130321_025106_EX1301_MB.wcd	1614332	032113	
0009_20130321_045105_EX1301_MB.wcd	1696444	032113	
0010_20130321_065106_EX1301_MB.wcd	1126724	032113	
0011_20130321_085107_EX1301_MB.wcd	603780	032113	
0012_20130321_105109_EX1301_MB.wcd	62200	032113	
0013_20130321_110317_EX1301_MB.wcd	135300	032113	
0014_20130321_145010_EX1301_MB.wcd	179704	032113	
0015_20130321_152036_EX1301_MB.wcd	705284	032113	
0016_20130321_172033_EX1301_MB.wcd	160480	032113	
0017_20130321_174916_EX1301_MB.wcd	123248	032113	
0018_20130321_180140_EX1301_MB.wcd	545664	032113	
0019_20130321_193158_EX1301_MB.wcd	72680	032113	
0020_20130321_194424_EX1301_MB.wcd	591372	032113	
0021_20130321_211830_EX1301_MB.wcd	90548	032113	
0022_20130321_212804_EX1301_MB.wcd	568908	032113	
0023_20130321_225243_EX1301_MB.wcd	160088	032113	
0024_20130321_231958_EX1301_MB.wcd	224344	032113	
0025_20130322_000004_EX1301_MB.wcd	450656	032213	
0026_20130322_012513_EX1301_MB.wcd	260936	032213	
0027_20130322_021212_EX1301_MB.wcd	47436	032213	

EX-13-01 EM 302 Water Column Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
0028_20130322_022036_EX1301_MB.wcd	742720	032213	
0029_20130322_042035_EX1301_MB.wcd	140604	032213	
0030_20130322_044202_EX1301_MB.wcd	131740	032213	
0031_20130322_050307_EX1301_MB.wcd	614716	032213	
0032_20130322_064549_EX1301_MB.wcd	385352	032213	
0033_20130322_074923_EX1301_MB.wcd	368748	032213	
0034_20130322_084931_EX1301_MB.wcd	162096	032213	
0035_20130322_091547_EX1301_MB.wcd	363704	032213	
0037_20130322_101347_EX1301_MB.wcd	179120	032213	
0039_20130324_000049_EX1301_MB.wcd	376508	032413	
0040_20130324_020049_EX1301_MB.wcd	1017640	032413	
0041_20130324_033147_EX1301_MB.wcd	43564	032413	
0042_20130324_034034_EX1301_MB.wcd	339820	032413	
0043_20130324_052628_EX1301_MB.wcd	660684	032413	
0044_20130324_072626_EX1301_MB.wcd	712216	032413	
0045_20130324_092627_EX1301_MB.wcd	232180	032413	
0046_20130324_100712_EX1301_MB.wcd	41860	032413	
0047_20130324_101458_EX1301_MB.wcd	363240	032413	
0048_20130324_111942_EX1301_MB.wcd	642300	032413	
0049_20130324_131945_EX1301_MB.wcd	490800	032413	
0050_20130324_144857_EX1301_MB.wcd	411092	032413	
0051_20130324_160442_EX1301_MB.wcd	978244	032413	
0052_20130324_180438_EX1301_MB.wcd	71752	032413	
0053_20130325_185154_EX1301_MB.wcd	421908	032513	
0054_20130327_002955_EX1301_MB.wcd	1182752	032713	
0055_20130327_022955_EX1301_MB.wcd	1295324	032713	
0056_20130327_042956_EX1301_MB.wcd	190652	032713	

EX-13-01 EM 302 Water Column Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
0057_20130327_044644_EX1301_MB.wcd	281576	032713	
0058_20130327_053130_EX1301_MB.wcd	55008	032713	
0059_20130327_054351_EX1301_MB.wcd	336028	032713	
0060_20130327_062922_EX1301_MB.wcd	1778308	032713	
0061_20130327_082922_EX1301_MB.wcd	975840	032713	
0062_20130327_093555_EX1301_MB.wcd	584772	032713	
0063_20130327_103106_EX1301_MB.wcd	38816	032713	
0064_20130327_104130_EX1301_MB.wcd	581180	032713	
0065_20130327_113713_EX1301_MB.wcd	1291044	032713	
0066_20130327_131740_EX1301_MB.wcd	1561232	032713	
0067_20130327_151739_EX1301_MB.wcd	790884	032713	
0068_20130327_170424_EX1301_MB.wcd	168772	032713	
0069_20130327_173524_EX1301_MB.wcd	427916	032713	
0070_20130327_191347_EX1301_MB.wcd	289024	032713	
0071_20130327_200533_EX1301_MB.wcd	670124	032713	
0072_20130327_220534_EX1301_MB.wcd	477784	032713	
0073_20130327_233721_EX1301_MB.wcd	70384	032713	
0074_20130327_235233_EX1301_MB.wcd	68088	032713	
0075_20130328_000745_EX1301_MB.wcd	500716	032813	
0076_20130328_020745_EX1301_MB.wcd	613988	032813	
0077_20130328_040745_EX1301_MB.wcd	231188	032813	
0078_20130328_044553_EX1301_MB.wcd	87548	032813	
0079_20130328_050133_EX1301_MB.wcd	550396	032813	
0080_20130328_070130_EX1301_MB.wcd	519228	032813	
0081_20130328_090129_EX1301_MB.wcd	149208	032813	
0082_20130328_093640_EX1301_MB.wcd	25496	032813	
0083_20130328_094808_EX1301_MB.wcd	371588	032813	

EX-13-01 EM 302 Water Column Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
0084_20130328_114807_EX1301_MB.wcd	382948	032813	
0085_20130328_134807_EX1301_MB.wcd	311996	032813	
0086_20130328_144904_EX1301_MB.wcd	45996	032813	
0087_20130328_145900_EX1301_MB.wcd	566000	032813	
0088_20130328_165743_EX1301_MB.wcd	68816	032813	
0089_20130328_171041_EX1301_MB.wcd	395032	032813	
0090_20130328_202233_EX1301_MB.wcd	57604	032813	
0091_20130328_203322_EX1301_MB.wcd	35836	032813	
0092_20130328_204116_EX1301_MB.wcd	128148	032813	
0093_20130328_210830_EX1301_MB.wcd	42472	032813	
0094_20130328_212201_EX1301_MB.wcd	619112	032813	
0095_20130328_224440_EX1301_MB.wcd	171268	032813	
0096_20130328_225430_EX1301_MB.wcd	499556	032813	
0097_20130328_234059_EX1301_MB.wcd	83732	032813	
0098_20130328_234850_EX1301_MB.wcd	89616	032813	
0099_20130329_000021_EX1301_MB.wcd	606072	032913	
0100_20130329_004727_EX1301_MB.wcd	610544	032913	
0101_20130329_013801_EX1301_MB.wcd	57068	032913	
0102_20130329_014424_EX1301_MB.wcd	392708	032913	
0103_20130329_022344_EX1301_MB.wcd	76840	032913	
0104_20130329_022822_EX1301_MB.wcd	205316	032913	
0105_20130329_024749_EX1301_MB.wcd	40272	032913	
0106_20130329_025226_EX1301_MB.wcd	220692	032913	
0107_20130329_031410_EX1301_MB.wcd	593256	032913	
0108_20130329_035434_EX1301_MB.wcd	393652	032913	
0109_20130329_042225_EX1301_MB.wcd	269536	032913	
0110_20130329_044250_EX1301_MB.wcd	239444	032913	

EX-13-01 EM 302 Water Column Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
0111_20130329_051519_EX1301_MB.wcd	42484	032913	
0112_20130329_052015_EX1301_MB.wcd	188436	032913	
0113_20130329_054838_EX1301_MB.wcd	142964	032913	
0114_20130329_055936_EX1301_MB.wcd	366980	032913	
0115_20130329_063659_EX1301_MB.wcd	65104	032913	
0116_20130329_064409_EX1301_MB.wcd	290320	032913	
0117_20130329_071605_EX1301_MB.wcd	116812	032913	
0118_20130329_072316_EX1301_MB.wcd	311472	032913	
0119_20130329_075548_EX1301_MB.wcd	351812	032913	
0120_20130329_083234_EX1301_MB.wcd	427012	032913	
0121_20130329_093950_EX1301_MB.wcd	256960	032913	
0122_20130329_101214_EX1301_MB.wcd	179996	032913	
0123_20130329_103702_EX1301_MB.wcd	125536	032913	
0124_20130329_105121_EX1301_MB.wcd	196840	032913	
0125_20130329_111151_EX1301_MB.wcd	184024	032913	
0126_20130329_112321_EX1301_MB.wcd	191872	032913	
0127_20130329_114401_EX1301_MB.wcd	232888	032913	
0128_20130329_115800_EX1301_MB.wcd	217904	032913	
0129_20130329_122025_EX1301_MB.wcd	125924	032913	
0130_20130329_122829_EX1301_MB.wcd	228432	032913	
0131_20130329_124755_EX1301_MB.wcd	724192	032913	
0132_20130329_133558_EX1301_MB.wcd	85184	032913	
0133_20130329_134924_EX1301_MB.wcd	329128	032913	
0134_20130329_141837_EX1301_MB.wcd	333016	032913	
0135_20130329_144234_EX1301_MB.wcd	88164	032913	
0136_20130329_145205_EX1301_MB.wcd	220044	032913	
0137_20130329_151130_EX1301_MB.wcd	152944	032913	

EX-13-01 EM 302 Water Column Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
0138_20130329_152157_EX1301_MB.wcd	241788	032913	
0139_20130329_154930_EX1301_MB.wcd	124396	032913	
0140_20130329_160351_EX1301_MB.wcd	168308	032913	
0141_20130329_162356_EX1301_MB.wcd	656144	032913	
0142_20130329_174008_EX1301_MB.wcd	397020	032913	
0143_20130329_185228_EX1301_MB.wcd	25284	032913	
0144_20130329_193005_EX1301_MB.wcd	440500	032913	
0145_20130329_203412_EX1301_MB.wcd	213084	032913	
0146_20130329_205819_EX1301_MB.wcd	516896	032913	
0147_20130329_214848_EX1301_MB.wcd	544000	032913	
0148_20130329_222727_EX1301_MB.wcd	287080	032913	
0149_20130329_231710_EX1301_MB.wcd	202452	032913	
0150_20130330_000043_EX1301_MB.wcd	650408	033013	
0151_20130330_020044_EX1301_MB.wcd	360812	033013	
0152_20130330_031143_EX1301_MB.wcd	57216	033013	
0153_20130330_032157_EX1301_MB.wcd	202072	033013	
0154_20130330_040644_EX1301_MB.wcd	258672	033013	
0155_20130330_042442_EX1301_MB.wcd	541824	033013	
0156_20130330_055450_EX1301_MB.wcd	190040	033013	
0157_20130330_062607_EX1301_MB.wcd	683536	033013	
0158_20130330_082612_EX1301_MB.wcd	69548	033013	
0159_20130330_083826_EX1301_MB.wcd	120968	033013	
0160_20130330_085839_EX1301_MB.wcd	691716	033013	
0161_20130330_105840_EX1301_MB.wcd	224676	033013	
0162_20130330_113718_EX1301_MB.wcd	108652	033013	
0163_20130330_115527_EX1301_MB.wcd	684476	033013	
0164_20130330_135527_EX1301_MB.wcd	59188	033013	

EX-13-01 EM 302 Water Column Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
0165_20130330_140513_EX1301_MB.wcd	86136	033013	
0166_20130330_141918_EX1301_MB.wcd	690812	033013	
0167_20130330_161920_EX1301_MB.wcd	16232	033013	
0168_20130330_162211_EX1301_MB.wcd	79160	033013	
0169_20130330_163635_EX1301_MB.wcd	656340	033013	
0170_20130330_183633_EX1301_MB.wcd	529072	033013	
0171_20130330_201433_EX1301_MB.wcd	108496	033013	
0172_20130330_203243_EX1301_MB.wcd	674336	033013	
0173_20130330_223243_EX1301_MB.wcd	450024	033013	
0174_20130331_000009_EX1301_MB.wcd	656508	033113	
0175_20130331_020010_EX1301_MB.wcd	371320	033113	
0176_20130331_031248_EX1301_MB.wcd	60872	033113	
0177_20130331_032726_EX1301_MB.wcd	1030396	033113	
0178_20130331_052723_EX1301_MB.wcd	917540	033113	
0179_20130331_072726_EX1301_MB.wcd	653048	033113	
0180_20130331_092726_EX1301_MB.wcd	578056	033113	
0181_20130331_112410_EX1301_MB.wcd	668504	033113	
0182_20130331_132319_EX1301_MB.wcd	242668	033113	
0183_20130331_141416_EX1301_MB.wcd	259204	033113	
0184_20130331_150107_EX1301_MB.wcd	818776	033113	
0185_20130331_170107_EX1301_MB.wcd	330496	033113	
0186_20130331_181352_EX1301_MB.wcd	775008	033113	
0187_20130331_201342_EX1301_MB.wcd	41944	033113	
0188_20130331_201826_EX1301_MB.wcd	53664	033113	
0189_20130331_202445_EX1301_MB.wcd	897264	033113	
0191_20130331_224551_EX1301_MB.wcd	8176	033113	
0192_20130331_230241_EX1301_MB.wcd	318932	033113	

EX-13-01 EM 302 Water Column Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
0193_20130331_235711_EX1301_MB.wcd	65836	033113	
0194_20130401_000452_EX1301_MB.wcd	406044	040113	
0195_20130401_011256_EX1301_MB.wcd	6240	040113	
0196_20130401_011418_EX1301_MB.wcd	289088	040113	
0197_20130401_015210_EX1301_MB.wcd	230744	040113	
0198_20130401_022616_EX1301_MB.wcd	377868	040113	
0199_20130401_025804_EX1301_MB.wcd	100656	040113	
0200_20130401_030432_EX1301_MB.wcd	360164	040113	
0201_20130401_034006_EX1301_MB.wcd	100856	040113	
0202_20130401_035912_EX1301_MB.wcd	432116	040113	
0203_20130401_042909_EX1301_MB.wcd	74888	040113	
0204_20130401_043359_EX1301_MB.wcd	548204	040113	
0205_20130401_051230_EX1301_MB.wcd	141928	040113	
0206_20130401_053529_EX1301_MB.wcd	196880	040113	
0207_20130401_054820_EX1301_MB.wcd	604304	040113	
0208_20130401_065310_EX1301_MB.wcd	179888	040113	

EX-13-01 EK 60 Singlebeam Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
EX1301_EK60_-D20130318-T232332.bot	1,080	031813	
EX1301_EK60_-D20130318-T232332.idx	1,248	031813	
EX1301_EK60_-D20130318-T232332.raw	132,372	031813	
EX1301_EK60_-D20130318-T232424.bot	87,928	031913	
EX1301_EK60_-D20130318-T232424.idx	153,232	031913	
EX1301_EK60_-D20130318-T232424.raw	52,441,944	031913	
EX1301_EK60_-D20130319-T051935.bot	72,504	031913	

EX-13-01 EK 60 Singlebeam Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
EX1301_EK60_-D20130319-T051935.idx	126,240	031913	
EX1301_EK60_-D20130321-T004812.bot	87,832	032113	
EX1301_EK60_-D20130321-T004812.idx	153,064	032113	
EX1301_EK60_-D20130321-T004812.raw	52,447,720	032113	
EX1301_EK60_-D20130321-T064142.bot	77,752	032113	
EX1301_EK60_-D20130321-T064142.idx	135,424	032113	
EX1301_EK60_-D20130321-T064142.raw	52,436,968	032113	
EX1301_EK60_-D20130321-T144632.bot	80,536	032113	
EX1301_EK60_-D20130321-T144632.idx	140,296	032113	
EX1301_EK60_-D20130321-T144632.raw	52,435,116	032113	
EX1301_EK60_-D20130321-T221015.bot	75,704	032213	
EX1301_EK60_-D20130321-T221015.idx	131,840	032213	
EX1301_EK60_-D20130321-T221015.raw	52,429,260	032213	
EX1301_EK60_-D20130322-T063107.bot	41,976	032213	
EX1301_EK60_-D20130322-T063107.idx	72,816	032213	
EX1301_EK60_-D20130322-T063107.raw	28,996,864	032213	
EX1301_EK60_-D20130323-T160125.bot	27,256	032313	
EX1301_EK60_-D20130323-T160125.idx	47,056	032313	
EX1301_EK60_-D20130323-T160125.raw	22,632,188	032313	
EX1301_EK60_-D20130323-T204757.bot	88,184	032313	
EX1301_EK60_-D20130323-T204757.idx	153,680	032313	
EX1301_EK60_-D20130323-T204757.raw	52,436,544	032313	
EX1301_EK60_-D20130324-T023534.bot	82,040	032413	
EX1301_EK60_-D20130324-T023534.idx	142,928	032413	
EX1301_EK60_-D20130324-T023534.raw	52,438,436	032413	
EX1301_EK60_-D20130324-T094202.bot	47,000	032413	
EX1301_EK60_-D20130324-T094202.idx	81,608	032413	
EX1301_EK60_-D20130324-T094202.raw	29,847,676	032413	
EX1301_EK60_-D20130324-T135300.bot	1,336	032413	

EX-13-01 EK 60 Singlebeam Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
EX1301_EK60_-D20130324-T135300.idx	1,696	032413	
EX1301_EK60_-D20130324-T135300.raw	303,524	032413	
EX1301_EK60_-D20130324-T135551.bot	52,056	032413	
EX1301_EK60_-D20130324-T135551.idx	90,456	032413	
EX1301_EK60_-D20130324-T135551.raw	32,461,532	032413	
EX1301_EK60_-D20130327-T001512.bot	87,672	032713	
EX1301_EK60_-D20130327-T001512.idx	152,784	032713	
EX1301_EK60_-D20130327-T001512.raw	52,430,512	032713	
EX1301_EK60_-D20130327-T060809.bot	87,544	032713	
EX1301_EK60_-D20130327-T060809.idx	152,560	032713	
EX1301_EK60_-D20130327-T060809.raw	52,440,240	032713	
EX1301_EK60_-D20130327-T120720.bot	84,312	032713	
EX1301_EK60_-D20130327-T120720.idx	146,904	032713	
EX1301_EK60_-D20130327-T120720.raw	52,441,136	032713	
EX1301_EK60_-D20130327-T184313.bot	82,232	032713	
EX1301_EK60_-D20130327-T184313.idx	143,264	032713	
EX1301_EK60_-D20130327-T184313.raw	52,432,376	032713	
EX1301_EK60_-D20130328-T014346.bot	85,048	032813	
EX1301_EK60_-D20130328-T014346.idx	148,192	032813	
EX1301_EK60_-D20130328-T014346.raw	52,440,244	032813	
EX1301_EK60_-D20130328-T081336.bot	87,160	032813	
EX1301_EK60_-D20130328-T081336.idx	151,888	032813	
EX1301_EK60_-D20130328-T081336.raw	52,435,800	032813	
EX1301_EK60_-D20130328-T141627.bot	58,776	032813	
EX1301_EK60_-D20130328-T141627.idx	102,216	032813	
EX1301_EK60_-D20130328-T141627.raw	35,561,000	032813	
EX1301_EK60_-D20130328-T183110.bot	920	032813	
EX1301_EK60_-D20130328-T183110.idx	968	032813	
EX1301_EK60_-D20130328-T183110.raw	39,416	032813	

EX-13-01 EK 60 Singlebeam Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
EX1301_EK60_-D20130328-T205357.bot	86,904	032813	
EX1301_EK60_-D20130328-T205357.idx	151,440	032813	
EX1301_EK60_-D20130328-T205357.raw	52,435,016	032813	
EX1301_EK60_-D20130329-T030132.bot	86,744	032913	
EX1301_EK60_-D20130329-T030132.idx	151,160	032913	
EX1301_EK60_-D20130329-T030132.raw	52,429,512	032913	
EX1301_EK60_-D20130329-T091535.bot	86,968	032913	
EX1301_EK60_-D20130329-T091535.idx	151,552	032913	
EX1301_EK60_-D20130329-T091535.raw	52,434,256	032913	
EX1301_EK60_-D20130329-T152615.bot	40,408	032913	
EX1301_EK60_-D20130329-T152615.idx	70,072	032913	
EX1301_EK60_-D20130329-T152615.raw	24,118,668	032913	
EX1301_EK60_-D20130329-T181805.bot	888	032913	
EX1301_EK60_-D20130329-T181805.idx	912	032913	
EX1301_EK60_-D20130329-T181805.raw	15,876	032913	
EX1301_EK60_-D20130329-T192948.bot	84,056	032913	
EX1301_EK60_-D20130329-T192948.idx	146,456	032913	
EX1301_EK60_-D20130329-T192948.raw	52,436,748	032913	
EX1301_EK60_-D20130330-T021727.bot	79,800	033013	
EX1301_EK60_-D20130330-T021727.idx	139,008	033013	
EX1301_EK60_-D20130330-T021727.raw	52,428,908	033013	
EX1301_EK60_-D20130330-T095446.bot	76,280	033013	
EX1301_EK60_-D20130330-T095446.idx	132,848	033013	
EX1301_EK60_-D20130330-T095446.raw	52,435,276	033013	
EX1301_EK60_-D20130330-T181434.bot	80,600	033013	
EX1301_EK60_-D20130330-T181434.idx	140,408	033013	
EX1301_EK60_-D20130330-T181434.raw	52,447,468	033013	
EX1301_EK60_-D20130331-T013820.bot	85,528	033113	
EX1301_EK60_-D20130331-T013820.idx	149,032	033113	

EX-13-01 EK 60 Singlebeam Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (MMDDYY)**	**Comments**
EX1301_EK60_-D20130331-T013820.raw	52,434,372	033113	
EX1301_EK60_-D20130331-T080541.bot	27,960	033113	
EX1301_EK60_-D20130331-T080541.idx	48,288	033113	
EX1301_EK60_-D20130331-T080541.raw	18,774,496	033113	
EX1301_EK60_-D20130331-T112426.bot	73,592	033113	
EX1301_EK60_-D20130331-T112426.idx	128,144	033113	
EX1301_EK60_-D20130331-T112426.raw	47,275,984	033113	
EX1301_EK60_-D20130331-T183943.bot	83,000	033113	
EX1301_EK60_-D20130331-T183943.idx	144,608	033113	
EX1301_EK60_-D20130331-T183943.raw	52,443,892	033113	
EX1301_EK60_-D20130401-T014033.bot	82,552	040113	
EX1301_EK60_-D20130401-T014033.idx	143,824	040113	
EX1301_EK60_-D20130401-T014033.raw	49,977,136	040113	
EX1301_EK60_-D20130402-T125847.bot	85,272	040213	
EX1301_EK60_-D20130402-T125847.idx	148,584	040213	
EX1301_EK60_-D20130402-T125847.raw	52,451,632	040213	
EX1301_EK60_-D20130402-T193831.bot	59,448	040313	
EX1301_EK60_-D20130402-T193831.idx	103,392	040313	
EX1301_EK60_-D20130402-T193831.raw	52,440,060	040313	
EX1301_EK60_-D20130403-T072704.bot	43,096	040313	
EX1301_EK60_-D20130403-T072704.idx	74,776	040313	
EX1301_EK60_-D20130403-T072704.raw	39,353,596	040313	

EX-13-01 Knudsen Subbottom Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (M/DD/YY)**	**Comments**
EX1301_SBP_70870_3.5kHz_003.sgy	26,223,780	032113	
EX1301_SBP_70870_3.5kHz_004.sgy	26,223,780	032113	
EX1301_SBP_70870_3.5kHz_005.sgy	26,223,780	032113	
EX1301_SBP_70870_3.5kHz_006.sgy	26,223,780	032113	
EX1301_SBP_70870_3.5kHz_007.sgy	26,223,780	032113	
EX1301_SBP_70870_3.5kHz_008.sgy	2,707,770	032113	
EX1301_SBP_70870_3.5kHz_009.sgy	3,221,220	032213	
EX1301_SBP_70870_3.5kHz_010.sgy	26,223,780	032413	
EX1301_SBP_70870_3.5kHz_011.sgy	8,458,410	032413	
EX1301_SBP_70870_3.5kHz_012.sgy	26,223,780	032413	
EX1301_SBP_70870_3.5kHz_013.sgy	26,223,780	032413	
EX1301_SBP_70870_3.5kHz_014.sgy	26,223,780	032413	
EX1301_SBP_70870_3.5kHz_015.sgy	585,510	032713	
EX1301_SBP_70870_3.5kHz_016.sgy	26,223,780	032413	
EX1301_SBP_70870_3.5kHz_017.sgy	26,223,780	032413	
EX1301_SBP_70870_3.5kHz_018.sgy	26,223,780	032413	
EX1301_SBP_70870_3.5kHz_019.sgy	26,223,780	032413	
EX1301_SBP_70870_3.5kHz_020.sgy	26,223,780	032413	
EX1301_SBP_70870_3.5kHz_021.sgy	722,430	032413	
EX1301_SBP2_70870_3.5kHz_022.sgy	11,299,500	032713	
EX1301_SBP2_70870_3.5kHz_027.sgy	4,453,500	032713	
EX1301_SBP2_70870_3.5kHz_028.sgy	25,299,570	032813	
EX1301_SBP2_70870_3.5kHz_029.sgy	26,223,780	032813	
EX1301_SBP2_70870_3.5kHz_030.sgy	26,223,780	032813	
EX1301_SBP2_70870_3.5kHz_031.sgy	26,223,780	032813	
EX1301_SBP2_70870_3.5kHz_032.sgy	26,223,780	032813	
EX1301_SBP2_70870_3.5kHz_033.sgy	26,223,780	032813	

EX-13-01 Knudsen Subbottom Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (M/DD/YY)**	**Comments**
EX1301_SBP2_70870_3.5kHz_034.sgy	26,223,780	032813	
EX1301_SBP2_70870_3.5kHz_035.sgy	20,233,530	032813	
EX1301_SBP2_70870_3.5kHz_036.sgy	24,033,060	032913	
EX1301_SBP2_70870_3.5kHz_037.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_038.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_039.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_040.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_041.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_042.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_043.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_044.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_045.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_046.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_047.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_048.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_049.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_050.sgy	26,223,780	032913	
EX1301_SBP2_70870_3.5kHz_051.sgy	20,301,990	033013	
EX1301_SBP2_70870_3.5kHz_052.sgy	26,223,780	033013	
EX1301_SBP2_70870_3.5kHz_053.sgy	26,223,780	033013	
EX1301_SBP2_70870_3.5kHz_054.sgy	26,223,780	033013	
EX1301_SBP2_70870_3.5kHz_055.sgy	26,223,780	033013	
EX1301_SBP2_70870_3.5kHz_056.sgy	26,223,780	033013	
EX1301_SBP2_70870_3.5kHz_057.sgy	19,514,700	033113	
EX1301_SBP2_70870_3.5kHz_058.sgy	26,223,780	033113	
EX1301_SBP2_70870_3.5kHz_059.sgy	26,223,780	033113	
EX1301_SBP2_70870_3.5kHz_060.sgy	26,223,780	033113	

EX-13-01 Knudsen Subbottom Data Log			
File Name	**File Size (bytes)**	**Collection Date (GMT) (M/DD/YY)**	**Comments**
EX1301_SBP2_70870_3.5kHz_061.sgy	26,223,780	033113	
EX1301_SBP2_70870_3.5kHz_062.sgy	26,223,780	033113	
EX1301_SBP2_70870_3.5kHz_063.sgy	26,223,780	033113	
EX1301_SBP2_70870_3.5kHz_064.sgy	16,878,990	033113	
EX1301_SBP2_70870_3.5kHz_065.sgy	31,272	033113	
EX1301_SBP2_70870_3.5kHz_066.sgy	26,223,780	033113	
EX1301_SBP2_70870_3.5kHz_067.sgy	26,223,780	033113	
EX1301_SBP2_70870_3.5kHz_068.sgy	26,223,780	033113	
EX1301_SBP2_70870_3.5kHz_069.sgy	26,121,090	033113	
EX1301_SBP_010.kea	44,649	032413	
EX1301_SBP_010.keb	3,559,186	032413	
EX1301_SBP_013.kea	305,129	032413	
EX1301_SBP_013.keb	24,338,386	032413	

EX-13-01 CTD Data Log				
Raw File Name (.hex)	**Collection Date (GMT) (M/DD/YY)**	**Latitude**	**Longitude**	**Comments**
EX1301_CTD001_130320	3/20/2013	40 48.09N	71 46.03W	
EX1301_CTD002_130321	3/21/2013	39 44.46N	69 32.41W	
EX1301_CTD003_130326	3/26/2013	41 14.8N	70 38.06W	
EX1301_CTD004_130328	3/28/2013	40 3.46N	68 48.52W	
EX1301_CTD005_130328	3/28/2013	40 2.99N	68 49.16W	
EX1301_CTD006_130329	3/29/2013	40 12.79N	68 16.09W	
EX1301_CTD007_130402	4/2/2013	39 59.98N	69 11.7W	
EX1301_CTD008_130402	4/2/2013	39 54.84N	69 15.55W	

EX-13-01 SVP LOG						
DATE (GMT)	**TIME (GMT)**	**XBT/CTD FILE NAME**	**LAT (WGS84)**	**LONG (WGS84)**	**Probe Type**	**NOTES**
3/20/2013	1910	EX1301_CTD001_130320	40 48.09 N	071 46.03 W	CTD	
3/21/2013	1229	EX1301_CTD002_130321	39 44.46 N	069 32.41 W	CTD	
3/21/2013	1406	EX1301_XBT002_130321	39 45.41016N	069 32.93018W	DEEP BLUE XBT	
3/21/2013	1617	EX1301_XBT003_130321	39 48.09155N	069 33.62939W	DEEP BLUE XBT	
3/21/2013	1731	EX1301_XBT004_130321	39 54.37880N	069 35.53662W	DEEP BLUE XBT	
3/21/2013	1901	EX1301_XBT005_130321	39 47.75146N	069 33.53027W	DEEP BLUE XBT	
3/21/2013	2025	EX1301_XBT006_130321	39 49.60864N	069 34.09717W	DEEP BLUE XBT	
3/21/2013	2229	EX1301_XBT007_130321	39 47.13403N	069 31.57568W	DEEP BLUE XBT	
NO XBT 08	NO XBT 08	NO XBT 08	NO XBT 08	NO XBT 08	NO XBT 08	NO XBT 08
3/22/2013	0213	EX1301_XBT009_130322	39 46.97974N	069 03.41016W	DEEP BLUE XBT	
3/22/2013	0505	EX1301_XBT010_130322	39 51.73975N	068 40.04492W	DEEP BLUE XBT	
3/22/2013	0820	EX1301_XBT011_130322	39 53.22070N	068 45.60596W	DEEP BLUE XBT	
3/23/2013	0517	EX1301_XBT012_130323	39 92.81620N	068 87.18340W	DEEP BLUE XBT	
3/24/2013	0719	EX1301_XBT013_130324	40 01.91200N	068 56.50230W	DEEP BLUE XBT	
3/24/2013	0939	EX1301_XBT014_130324	40 12.59120N	068 25.37600W	DEEP BLUE XBT	
3/24/2013	1428	EX1301_XBT015_130324	40 22.89920N	067 65.88130W	DEEP BLUE XBT	
3/26/2013	1444	EX1301_CTD003_130326	41 14.80 N	070 38.06 W	CTD	
3/27/2013	0436	EX1301_XBT016_130327	40 05.14000N	071 01.10000W	DEEP BLUE XBT	NOT APPLIED TO MB DATA

EX-13-01 SVP LOG						
DATE (GMT)	**TIME (GMT)**	**XBT/CTD FILE NAME**	**LAT (WGS84)**	**LONG (WGS84)**	**Probe Type**	**NOTES**
3/27/2013	0513	EX1301_XBT017_130327	40 00.17000N	071 01.75000W	DEEP BLUE XBT	
3/27/2013	0858	EX1301_XBT018_130327	40 05.60978N	070 31.25800W	DEEP BLUE XBT	
3/27/2013	1046	EX1301_XBT019_130327	39 58.85074N	070 30.89198W	DEEP BLUE XBT	
3/27/2013	1409	EX1301_XBT020_130327	40 73.08710N	071 62.23150W	DEEP BLUE XBT	
3/27/2013	1709	EX1301_XBT021_130327	39 50.03715N	069 28.45674W	DEEP BLUE XBT	
NO XBT 22	NO XBT 22	NO XBT 22	NO XBT 22	NO XBT 22	DEEP BLUE XBT	NO XBT 22
3/27/2013	2153	EX1301_XBT023_130327	40 04.23000N	068 31.33100W	DEEP BLUE XBT	
3/27/2013	2352	EX1301_XBT024_130327	40 12.63702N	068 11.68115W	DEEP BLUE XBT	
3/28/2013	0219	EX1301_XBT025_130328	40 04.40234N	068 35.2998W	DEEP BLUE XBT	
3/28/2013	0407	EX1301_XBT026_130328	39 59.77637N	068 48.6665W	DEEP BLUE XBT	
3/28/2013	0612	EX1301_XBT027_130328	40 03.56664N	068 42.25000W	DEEP BLUE XBT	
3/28/2013	0836	EX1301_XBT028_130328	40 10.5752N	068 20.59766W	DEEP BLUE XBT	
3/28/2013	1137	EX1301_XBT029_130328	40 08.92480N	068 27.09473W	DEEP BLUE XBT	
3/28/2013	1349	EX1301_XBT030_130328	40 03.06177N	068 45.65674W	DEEP BLUE XBT	
3/28/2013	1549	EX1301_XBT031_130328	40 03.79419N	068 45.94189W	DEEP BLUE XBT	
3/28/2013	1844	EX1301_CTD004_130328	40 03.46 N	068 48.52 W	CTD	
3/28/2013	1922	EX1301_CTD005_130328	40 04.9833N	068 81.93300W	CTD	APPLED TO MB DATA
3/29/2013	0204	EX1301_XBT032_130329	40 05.45898N	068 49.4062W	DEEP BLUE XBT	
3/29/2013	0503	EX1301_XBT033_130329	40 09.34351N	068 28.33496W	DEEP BLUE XBT	

EX-13-01 SVP LOG						
DATE (GMT)	**TIME (GMT)**	**XBT/CTD FILE NAME**	**LAT (WGS84)**	**LONG (WGS84)**	**Probe Type**	**NOTES**
3/29/2013	0902	EX1301_XBT034_130329	40 08.5752N	068 20.99902W	DEEP BLUE XBT	
3/29/2013	1101	EX1301_XBT035_130329	40 14.51636N	068 15.9624W	DEEP BLUE XBT	
3/29/2013	1353	EX1301_XBT036_130329	40 11.13818N	068 28.10352W	DEEP BLUE XBT	
3/29/2013	1715	EX1301_XBT037_130329	40 09.95044N	068 27.13623W	DEEP BLUE XBT	
3/30/2013	1836	EX1301_CTD006_130329	40 12.79 N	068 16.09 W	CTD	
3/29/2013	2249	EX1301_XBT038_130329	40 18.82471N	067 39.90967W	DEEP BLUE XBT	
3/30/2013	0212	EX1301_XBT039_130330	40 28.41577N	067 05.22266W	DEEP BLUE XBT	
3/30/2013	0450	EX1301_XBT040_130330	40 34.54810N	066 55.37891W	DEEP BLUE XBT	
3/30/2013	0735	EX1301_XBT041_130330	40 31.69385N	066 39.49756W	DEEP BLUE XBT	
3/30/2013	1021	EX1301_XBT042_130330	40 32.95508N	066 41.59326W	DEEP BLUE XBT	
3/30/2013	1357	EX1301_XBT043_130330	40 39.02393N	066 32.80176W	DEEP BLUE XBT	
3/30/2013	1705	EX1301_XBT044_130330	40 36.30688N	066 47.55176W	DEEP BLUE XBT	
3/30/2013	2038	EX1301_XBT045_130330	40 51.22803N	066 18.02734W	DEEP BLUE XBT	
3/30/2013	2314	EX1301_XBT046_130330	40 38.68311N	066 46.28271W	DEEP BLUE XBT	
3/31/2013	0130	EX1301_XBT047_130331	40 28.2168N	067 09.44238W	DEEP BLUE XBT	
3/31/2013	0436	EX1301_XBT048_130331	40 27.01343N	067 15.30664W	DEEP BLUE XBT	
3/31/2013	0715	EX1301_XBT049_130331	40 40.11646N	066 47.31396W	DEEP BLUE XBT	
3/31/2013	0902	EX1301_XBT050_130331	40 48.77808N	066 29.93506W	DEEP BLUE XBT	
3/31/2013	1345	EX1301_XBT051_130331	40 48.46069N	066 35.47168W	DEEP BLUE XBT	

EX-13-01 SVP LOG						
DATE (GMT)	**TIME (GMT)**	**XBT/CTD FILE NAME**	**LAT (WGS84)**	**LONG (WGS84)**	**Probe Type**	**NOTES**
3/31/2013	1726	EX1301_XBT052_130331	40 59.14028N	066 18.19230W	DEEP BLUE XBT	
3/31/2013	1954	EX1301_XBT053_130331	40 53.85208N	066 31.54068W	DEEP BLUE XBT	
4/1/2013	0034	EX1301_XBT054_130401	41 04.02421N	066 21.50047W	DEEP BLUE XBT	
4/1/2013	0334	EX1301_XBT055_130401	41 03.78120N	066 23.79512W	DEEP BLUE XBT	
4/2/2013	1259	EX1301_CTD007_130402	39 59.98 N	069 11.70 W	CTD	
4/2/2013	1543	EX1301_CTD008_130402	39 54.84 N	069 15.55 W	CTD	

EX-13-01 BIST LOG									
BIST FILE NAME	**DATE (UTC) (MM/DD/YY)**	**TIME (GMT)**	**BIST TYPE**	**Broadband Max RX Noise (dB)/Board/Channel**	**Broadband Avg RX Noise Board 1 (dB)**	**Broadband Avg RX Noise Board 2 (dB)**	**Broadband Avg RX Noise Board 3 (dB)**	**Broadband Avg RX Noise Board 4 (dB)**	**NOTES**
EX1301_BIST_031813_1300.txt	03/18/13	1300	ALL	-	-	-	-	-	ALL TESTS FAILED. BOARDS NOT DETECTED.
EX1301_BIST_031813_1345.txt	03/18/13	1345	ALL	Board 4 Channel 3 Level: 67.0 dB	62.4 dB	61.7 dB	62.8 dB	62.9 dB	IMPEDANCE AND PHASE TEST FAILURES (EXPECTED): BOARD 4 CHANNEL 30
EX1301_BIST_031813_1839.txt	03/18/13	1839	ALL	-	-	-	-	-	ALL TESTS FAILED. ALL NOISE LEVELS > 80 dB.
EX1301_BIST_031813_1839_RXNoiseLevel.txt	03/18/13	1839	RX NOISE LEVEL	-	-	-	-	-	IMPEDANCE AND PHASE TEST FAILURES (EXPECTED): BOARD 4 CHANNEL 30; ALL TESTS FAILED. ALL NOISE LEVELS > 80 dB.
EX1301_BIST_031813_1839_RXNoiseSpectrum.txt	03/18/13	1839	RX NOISE SPECTRUM	-	-	-	-	-	IMPEDANCE AND PHASE TEST FAILURES (EXPECTED): BOARD 4 CHANNEL 30; ALL TESTS FAILED. ALL NOISE LEVELS > 80 dB.
EX1301_BIST_031913_0006.txt	03/19/13	0006	ALL	Board 3 Channel 6 Level: 75.5 dB	74.3 dB	74.4 dB	74.7 dB	74.4 dB	IMPEDANCE AND PHASE TEST FAILURES (EXPECTED): BOARD 4 CHANNEL 30
EX1301_BIST_031913_0905.txt	03/19/13	0905	ALL	Board 4 Channel 29 Level: 61.7 dB	55.6 dB	55.8 dB	55.7 dB	56.8 dB	IMPEDANCE AND PHASE TEST FAILURES (EXPECTED): BOARD 4 CHANNEL 30; ALL HIGH Z AND PHASE
EX1301_BIST_032013_2202.txt	03/20/13	2202	ALL	Board 4 Channel 19	68.7 dB	68.4 dB	69.4 dB	70.9 dB	IMPEDANCE AND PHASE TEST FAILURES (EXPECTED): BOARD 4 CHANNEL 30

EX-13-01 BIST LOG									
BIST FILE NAME	**DATE (UTC) (MM/DD/YY)**	**TIME (GMT)**	**BIST TYPE**	**Broadband Max RX Noise (dB)/Board/Channel**	**Broadband Avg RX Noise Board 1 (dB)**	**Broadband Avg RX Noise Board 2 (dB)**	**Broadband Avg RX Noise Board 3 (dB)**	**Broadband Avg RX Noise Board 4 (dB)**	**NOTES**
				Level: 76.0 dB					
EX1301_BIST_032213_1400.txt	03/22/13	1400	ALL	Board 4 Channel 10 Level: 68.0 dB	50.4 dB	51.6 dB	53.7 dB	60.3 dB	IMPEDANCE AND PHASE TEST FAILURES (EXPECTED): BOARD 4 CHANNEL 30
EX1301_BIST_032713_1912.txt	03/27/13	1912	ALL	Board 3 Channel 25 Level: 72.0 dB	54.2 dB	55.6 dB	63.4 dB	55.2 dB	IMPEDANCE AND PHASE TEST FAILURES (EXPECTED): BOARD 4 CHANNEL 30
EX1301_BIST_040113_1800.txt	04/01/13	1800	ALL	Board 2 Channel 16 Level: 71.1 dB	70.0 dB	70.1 dB	70.1 dB	70.0 dB	IMPEDANCE AND PHASE TEST FAILURES (EXPECTED): BOARD 4 CHANNEL 30
EX1301_BIST_040213_1800.txt	04/03/13	1800	ALL	-	-	-	-	-	ALL TESTS FAILED. BOARDS NOT DETECTED.

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 2. 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 3. 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 4. 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 5. 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
- 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
- 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
- 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.

EX-13-01 Weather Log								
Local Date	Local Time	UTC Time	UTC Date	Wind Direction (deg)	Wind Speed (kts)	Wave Height (ft)	Swell Direction (deg)	Swell Height (ft)
3/18/2013	1700	2100	3/18/2013	110	20	1		
3/18/2013	2000	0000	3/19/2013	100	19	1		
3/18/2013	2300	0300	3/19/2013	094	27			
3/19/2013	0200	0600	3/19/2013	110	34	5-7	110	5-7
3/19/2013	0500	0900	3/19/2013	110	41	8-10	110	8-10
3/19/2013	0800	1200	3/19/2013	137	31	7-9	120	10
3/19/2013	1100	1500	3/19/2013	144	14	8-10	135	8
3/19/2013	1400	1800	3/19/2013	220	15	5-7	120	8-10
3/19/2013	1700	2100	3/19/2013	336	20	5	140	7
3/19/2013	2000	0000	3/20/2013	318	27	3	130	5
3/19/2013	2300	0300	3/20/2013	291	16	3-5	110	5
3/20/2013	0200	0600	3/20/2013	305	21	2-3	120	3-5
3/20/2013	0500	0900	3/20/2013	300	22	2-3	120	4
3/20/2013	0800	1200	3/20/2013	291	25	3-6	280	4-6
3/20/2013	1100	1500	3/20/2013	294	24	2-3	270	4-6
3/20/2013	1400	1800	3/20/2013	260	15	3-4	250	45
3/20/2013	1700	2100	3/20/2013	254	18	2-3	240	5
3/20/2013	2000	0000	3/21/2013	250	20	2-3	250	5
3/20/2013	2300	0300	3/21/2013	260	14	2-3	250	4-5
3/21/2013	0200	0600	3/21/2013	225	4	2-3	230	4-5
3/21/2013	0500	0900	3/21/2013	LT	VAR	<2	200	3-5
3/21/2013	0800	1200	3/21/2013	126	10	1-2	240	3-4
3/21/2013	1100	1500	3/21/2013	309	23	2-3	100	3-4
3/21/2013	1400	1800	3/21/2013	100	20	3-4	190	3-4
3/21/2013	1700	2100	3/21/2013	100	18	2-3	120	4-5
3/21/2013	2000	0000	3/22/2013	105	12	2-3	120	4
3/21/2013	2300	0300	3/22/2013	109	13	2-3	100	4-5
3/22/2013	0200	0600	3/22/2013	070	11	2-3	090	4-5
3/22/2013	0500	0900	3/22/2013	060	10	3-5	090	4-6
3/22/2013	0800	1200	3/22/2013	320	31	5-7	320	6-8
3/22/2013	1100	1500	3/22/2013	280	28	5-7	300	8-10
3/22/2013	1400	1800	3/22/2013	280	28	5-7	300	8-10
3/22/2013	1700	2100	3/22/2013	290	26	5-7	280	8-10
3/22/2013	2000	0000	3/23/2013	275	25	5-7	290	8-10
3/22/2013	2300	0300	3/23/2013	290	28	5-7	290	8-10
3/23/2013	0200	0600	3/23/2013	300	26	5-6	290	8-9

EX-13-01 Weather Log								
Local Date	Local Time	UTC Time	UTC Date	Wind Direction (deg)	Wind Speed (kts)	Wave Height (ft)	Swell Direction (deg)	Swell Height (ft)
3/23/2013	0500	0900	3/23/2013	275	25	4-6	250	5
3/23/2013	0800	1200	3/23/2013	277	25	4-6	260	6-9
3/23/2013	1100	1500	3/23/2013	260	20	2-3	260	4-6
3/23/2013	1400	1800	3/23/2013	270	30	3-4	260	5-6
3/23/2013	1700	2100	3/23/2013	285	25	4-5	250	5-7
3/23/2013	2000	0000	3/24/2013	295	27	3-4	280	6-8
3/23/2013	2300	0300	3/24/2013	325	25	3-4	290	6-8
3/24/2013	0200	0600	3/24/2013	310	21	3-4	300	6-8
3/24/2013	0500	0900	3/24/2013	300	20	3-5	275	6-8
3/24/2013	0800	1200	3/24/2013	310	19	3-5	320	6-8
3/24/2013	1100	1500	3/24/2013	300	17	2-4	320	6-8
3/24/2013	1400	1800	3/24/2013	310	16	3-4	320	6-8
3/24/2013	1700	2100	3/24/2013	335	9	2-3	300	5-6
3/27/2013	0200	0600	3/27/2013	300	16	1-2	240	4-5
3/27/2013	0500	0900	3/27/2013	305	13	1-2	250	3-5
3/27/2013	0800	1200	3/27/2013	295	14	1-2	250	3-5
3/27/2013	1100	1500	3/27/2013	290	14	1-2	260	3-5
3/27/2013	1400	1800	3/27/2013	295	17	1-2	270	4-5
3/27/2013	1700	2100	3/27/2013	288	19	2-3	260	4-5
3/27/2013	2000	0000	3/28/2013	285	26	2-3	290	4-5
3/27/2013	2300	0300	3/28/2013	300	29	3-4	290	5-6
3/28/2013	0200	0600	3/28/2013	330	20	2-3	276	5-6
3/28/2013	0500	0900	3/28/2013	320	25	3-5	010/270	5-6
3/28/2013	0800	1200	3/28/2013	330	26	3-5	330	6-7
3/28/2013	1100	1500	3/28/2013	330	21	2-4	330	5-6
3/28/2013	1400	1800	3/28/2013	005	18	4-5	250/320	4-6
3/28/2013	1700	2100	3/28/2013	014	18	4-5	010	5-7
3/28/2013	2000	0000	3/29/2013	350	25	4-5	010	7-8
3/28/2013	2300	0300	3/29/2013	340	19	3-4	010	5-6
3/29/2013	0200	0600	3/29/2013	350	20	2-3	010	4-6
3/29/2013	0500	0900	3/29/2013	330	20	1-3	010	4-6
3/29/2013	0800	1200	3/29/2013	300	12	2-4	320	3-5
3/29/2013	1100	1500	3/29/2013	270	14	1-2	300	3-4
3/29/2013	1400	1800	3/29/2013	280	14	1-2	290	2-3
3/29/2013	1700	2100	3/29/2013	276	11	1-2	280	2-3
3/29/2013	2000	0000	3/30/2013	290	13	1-2	270	2-3
3/29/2013	2300	0003	3/30/2013	285	14	1-2	290	2-3
3/30/2013	0200	0600	3/30/2013	290	14	1-2	270	3-4

EX-13-01 Weather Log								
Local Date	Local Time	UTC Time	UTC Date	Wind Direction (deg)	Wind Speed (kts)	Wave Height (ft)	Swell Direction (deg)	Swell Height (ft)
3/30/2013	0500	0900	3/30/2013	315	15	3-4	080	2-4
3/30/2013	0800	1200	3/30/2013	305	8	2-4	270	2-4
3/30/2013	1100	1500	3/30/2013	315	7	1-2	270	2-3
3/30/2013	1400	1800	3/30/2013	315	8	1-2	270	2-3
3/30/2013	1700	2100	3/30/2013	330	11	1-2	220	2-3
3/30/2013	2000	0000	3/31/2013	330	18	1-2	290	2-3
3/30/2013	2300	0300	3/31/2013	320	18	1-2	290	2-3
3/31/2013	0200	0600	3/31/2013	300	12	1-2	240	3-4
3/31/2013	0500	0900	3/31/2013	280	10	3-4	250	3-4
3/31/2013	0800	1200	3/31/2013	290	14	2-3	250	3-4
3/31/2013	1100	1500	3/31/2013	210	7	1-2	250	1-2
3/31/2013	1400	1800	3/31/2013	252	9	1-2	220	3-4
3/31/2013	1700	2100	3/31/2013	185	7	1-2	220	2-3
3/31/2013	2000	0000	4/01/2013	195	10	1-2	250	1-2
3/31/2013	2300	0300	4/01/2013	165	12	1-2	250	1-2
4/1/2013	0200	0600	4/01/2013	140	30	4-5	130	4-6
4/1/2013	0500	0000	4/01/2013	140	35	6-8	140	6-10
4/1/2013	0800	1200	4/01/2013	225	23	6-8	140	8-10