



EX-09-05

Mapping Field Trial II

Volcanic fields on mid Mendocino ridge

CRUISE INSTRUCTIONS

NOAA Ship *Okeanos Explorer*
June 17 – June 27, 2009

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NOAA Office of Oceanic and Atmospheric Research

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Marine Operations Center Atlantic
NOAA Office of Marine and Aviation Operations

1 CRUISE INSTRUCTIONS

1.1 Cruise Title: Mapping Field Trial II

1.2 Cruise Number: EX-09-05

1.3 Cruise Dates

1.3.1 Departure: June 17, 2009, Depart Newport, OR

1.3.2 Arrival: June 27, 2009, Astoria, OR

1.4 Operating Area

During EX0903 cruise (May 05-26, 2009) two volcanic fields were discovered located on mid Mendocino ridge. However, due to time constraints these volcanic fields were not mapped fully to define their spatial extent. During this cruise the extent of these volcanic fields will be determined which may reveal more information about origin of these volcanic fields.

2 CRUISE OVERVIEW

2.1 Background

This cruise is a mapping field trial cruise in the area of Mendocino ridge, designed to test and refine operations for conducting mapping operations for exploration using NOAA Ship *Okeanos Explorer* (EX) mapping and related systems and sensors.

In August 2008, NOAA Commissioned the EX as “America’s Ship for Ocean Exploration”. The EX is America’s first ship dedicated solely to ocean exploration and discovery. The ship carries cutting-edge technology that will enable explorers at sea and at Exploration Command Centers ashore to investigate the unknown and poorly understood ocean and its phenomena. Exciting new discoveries will be shared live through the Internet with everyone from top government policymakers to students learning about the mysterious ocean. The EX is a partnership program of exploration with NOAA’s Office of Ocean Exploration and Research (OER) and NOAA’s Office of Marine and Aviation Operations (OMAO) to systematically explore the world ocean.

Following Commissioning, the EX began a period of shakedown and field trials cruises. Field trial cruises are designed to refine operations, standard operating procedures, training, and utilization of ship systems and personnel in different defined modes of exploration. This cruise is a continuation of the field trial period.

NOAA Okeanos Explorer (EX) is equipped (at present) with three deep water mapping sonars including Multibeam echo sounder (EM 302, 30 kHz), single beam echo sounder (EA 600, 12 kHz) and Knudsen sub-bottom profiler (SBP, 3.5 kHz).

2.2 Goals and Objectives

The goals of this field trial cruise are to test use of EX mapping sensors to characterize complex geological areas (i.e. volcanic field) and develop protocols to handle discoveries in terms of communication links, public information releases, websites etc. Also during EX0904 CIMS (Cruise Information Management System) was brought online, and integration of this system with mapping system will be tested during this cruise. Like other field trials, this cruise has primary and secondary goals and objectives. Completion of primary goals and objectives will make the cruise a success. The primary goal and objectives will be achieved in the context of mapping in the vicinity of Mendocino ridge. Following are the primary and secondary goals objectives of this cruise:

2.2.1 Primary Goal: Test, troubleshoot, refine and evaluate EX mapping systems, sensors, protocols and processes to support systematic exploration and small boat training

2.2.1.1 Small boat and other ship drills

The newly acquired fast rescue boat (EX-1) needs to be broken in for a minimum of twenty hours. During the first ten hours the small boat needs to run at three-fourth throttle or less and during the last ten hours the engine can run at full speed. This can be achieved anytime during the cruise as long as the weather allows it.

We also need to see that the crew becomes certified as coxswain and davit operators, and finish equipping both small boats with electronic equipment, radar reflectors and first aid kits to meet NOAA's small boat policy.

We anticipate this might take up to two days, depending on how much training is needed for the crew.

Other ship familiarization:

- Finish basic DP familiarization with LT VerPlanck and ENS Bloss so that they can attend the advance DP training course.
- The ship needs to work towards a qualification program for all deck equipment and the development of certifications.

2.2.1.2 Assess and evaluate performance of CIMS

CIMS has been built and implemented onboard EX by NCDDC. During June 1-12 (EX0904) cruise CIMS was installed onboard. Amongst other utilities, CIMS provides a robust system to provide metadata for the data collected by ship's mapping systems. There still remain some pending issues to be addressed to make CIMS fully operational. During this cruise personnel

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from NCCDC will not be available onboard but ship's mapping team will continue to incorporate CIMS in the mapping data management protocols.

2.2.1.3 Develop protocols for mapping shore support

One of the major long term goal of EX is to establish protocols and ability to work with shore mapping support personnel. The ship has rectified telepresence issued highlighted during earlier field trial cruises and now has a high band width capability. However, due to NOAA security barriers, at present, EX can not use this high band width capacity to transfer mapping data to shore. Provided, these security issues are resolved, Dr. Gardner and Andy Armstrong at UNH will standby during the cruise to test transfer of mapping data to UNH and provide mapping products to the ship. The major emphasis will be to develop protocols to collaborate with shore mapping support.

2.2.1.4 Continue refining data products pipeline, documentation and sensor integration

A major focus of this cruise will be to continue to develop and improve methodologies to acquire, process, analyze and archive mapping data. Ancillary documentations in regards to standard operating procedures, system and wiring diagrams and operational reports will continue to be developed through out the cruise.

2.2.1.5 Establish and refine protocols to handle discoveries/anomalies/interesting finds

Exploration, being the main objective of EX, may result in new discoveries, anomalies and interesting features. During earlier field trials, it was noticed that there was some uncertainty as how ship should share the information with shore. Who should be contacted to provide an independent review of the data collected by the ship? Also a need of a website where ship can post daily products, images of interesting features observed etc. During this cruise, EX will work with OER / UNH to establish these protocols.

2.2.1.6 Mapping the extents of volcanic fields discovered during EX0903 cruise

During May 05-26, 2009 two volcanic fields were discovered. However, due to time constraints the full extent of these volcanic fields was not mapped then. During this cruise, mapping efforts will be concentrated on these areas to fully establish the extent of these volcanic fields. Additional CTD casts will be conducted in case interesting water column targets are observed in the EM 302 data.

2.2.2 Secondary Goal: Continue preparations, training, testing and evaluating of other EX systems and sensors.

2.2.2.1 Mapping team training

Mapping team (Stuart, Peters, Malik and Verplank) have worked together to identify the lapses in training required for each mapping team member. Special emphasis will be on cruise plan

3.2 Remotely Participating Personnel

The following personnel will participate or be available to participate from shore via limited communications at Exploration Command Centers.

Name	Affiliation	Role	Dates	M/F	Status	ECC
Russell, Craig	OER (ERT)	EX Program Planner	17-June to 27-June	M	US	PMEL
McDonough, John	OER	Deputy Director, Backup Expedition Coordinator	17-June to 27-June	M	US	SSMC
Dr. Jim Gardner	UNH	Mapping shore support	22 June to 27 June	M	US	UNH
Andy Armstrong	UNH	Mapping shore support	17 June to 27 June	M	US	UNH

Participating Organization Acronyms

OER – NOAA OAR Office of Ocean Exploration and Research

ERT – ERT, Inc, a NOAA Contractor

2020 – 2020 LLC, a NOAA Contractor

EO – Eastern Oceanics, a NOAA Contractor

UNH CCOM – University of New Hampshire Center for Coastal and Ocean Mapping

NMS – National Marine Sanctuary

3.4 Foreign Nationals – NOT APPLICABLE TO THIS CRUISE

4 ADMINISTRATION

4.1 Ship's Location

The ship will be docked at the OSU Pier, Newport, OR, starting June 12, 2009.

The ship will dock in Astoria, OR, starting July 27, 2009. Actual Pier TBD.

4.2 Key Points of Contact

4.2.1 Ship Operations

Marine Operations Center, Atlantic (MOA)
439 West York Street
Norfolk, VA 23510-1145
Telephone: (757) 441-6776
Fax: (757) 441-6495

Marine Operations Center, Pacific (MOP)
1801 Fairview Avenue East
Seattle, WA 98102-3767
Telephone: (206) 553-4548
Fax: (206) 553-1109

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Chief, Operations Division, Atlantic
(MOA1)
CDR Keith Roberts
Telephone: 757-441-6842
E-mail: ChiefOps.MOA@noaa.gov

Chief, Operations Division, Pacific
(MOP1)
CDR Mike Francisco
Telephone: 206-553-8705
Email: ChiefOps.MOP@noaa.gov

4.2.2 Mission Operations

Mashkooor Malik, Physical Scientist
NOAA Ocean Exploration & Research
(ERT, Inc.)
Phone: 603-862-4332 / 603-377-6319
E-mail: mamalik@cisunix.unh.edu

Craig Russell, EX Program Planner
NOAA Ocean Exploration & Research
(ERT, Inc.)
Phone: 206-526-4803 / 206-518-1068
E-mail: craig.russell@noaa.gov

Nicola VerPlanck, Field Operations Officer
NOAA Ship *Okeanos Explorer*
Phone: 321-960-3726
E-mail: Nicola.Samuels@noaa.gov

4.2.3 Other Mission Contacts

Craig Russell, EX Program Planner
NOAA Ocean Exploration & Research
(ERT, Inc.)
Phone: 206-526-2803 / 206-518-1068
E-mail: Craig.Russell@noaa.gov

John McDonough, Deputy Director
NOAA Ocean Exploration & Research
Phone: 301-734-1023 / 240-676-5206
E-mail: John.McDonough@noaa.gov

Captain Andy Armstrong
JHC / UNH
Phone: 1-603-862-4559
Email: Andy.Armstrong@noaa.gov

Dr. James Gardner
CCOM/UNH
Phone: 1-603-862-3473
Email: jim.gardner@unh.edu

4.3 Shipments

Shipments to be received by the ship after June 1 and before June, 16, 2009 can be shipped to:

NOAA Ship *Okeanos Explorer*
OSU Ship Operations

2020 S.E. OSU Drive
Newport, OR 97365

4.4 Shipboard Meetings

Daily Operations Briefing meetings will be held at 1530 Local time in the forward lounge to review the current day, and define operations, associated requirements and staffing needs for the following day. A Plan of the Day (POD) will be posted each evening for the next day in specified locations through out the ship. Daily Situation Reports (SITREPS) will be posted as well and shared daily through the ship's visitor's site for onboard personnel and the EX PLONE site for shore side personnel (<http://terra.gso.uri.edu/NOAAShipOkeanosExplorer>)

4.5 Medical Clearance

All personnel will satisfy NOAA Health and Safety requirements, completing and providing NHSQ and PPD (Tuberculosis test) test results before boarding.

The revised NHSQ can be found at <http://www.oma.noaa.gov/medical.html>. Clearances are valid for 2 years for personnel under age 50 and 1 year for age 50 and over. All PPD's expire after one year from the date of administration.

Cruise participants will follow standard protocols described in the NHSQ, and will fax completed forms to CDR Pelkey as follows:

CDR Michelle Pelkey
Fax: 206-553-1112
Phone: 206-553-2298

5 OPERATIONS

Following is a description of the data to be collected, including: specific sensors or systems used; the operations implementation plan, including staging, conducting operations (on-station, underway) and de-staging; station or trackline geographic information, and any other operations requirements.

5.1 Data to be collected

As a field trial cruise, the primary data collected is evaluation and assessment information of operations, protocols, systems and processes. The secondary data collection objective is mapping data for NMS and ROV test dive targets. Following is a list of sensor measurements that will be required to accomplish the primary and secondary objectives:

5.1.1 Primary Systems and Sensors

- Kongsberg Simard EM302 Multibeam Echosounder (MBES)
- Kongsberg Simrad EA600 Deepwater Echosounder
- Knudsen 320BR Sub-bottom profiler (SBP)
- LHM Sippican XBT (various probes)
- Seabird SBE 911Plus CTD
- Seabird SBE 50 CTD Stand
- CNAV GPS
- POS/MV
- Seabird SBE-45 (Micro TSG)
- Kongsberg Dynamic Positioning-1 System
- NetApp mapping storage system
- CARIS HIPS Software
- SIS Software
- Hypack Software
- MapInfo Software
- Fledermaus Software
- ArcMap Software
- Scientific Computing System (SCS)
- ECDIS
- Met/Wx Sensor Package

5.1.2 Secondary Systems and Sensors

- Telepresence System
- VSAT High-Speed link (10 Mbps ship to shore)

5.1.3 Staging Plan

On June 16, 2009 the mission party will embark on the EX and begin preparations. All additional equipment to be brought aboard by the mission party will be shipped to the Newport, OR address provided by the ship. This equipment shall be loaded by the mission party onto EX no later than COB 16 June-2009 and placed in the wet lab or other appropriate destination location aboard the EX and ensure proper stowage, installation and securing of the material. The mission party is responsible for arranging all necessary transportation of material and personnel to and from the ship. Mission personnel will coordinate with the Ship Operations Officer for any ship services required to assist with loading mission materials. Crane service requests must be requested by the mission party 24 hours in advance of the required loading time.

5.1.4 De-Staging Plan

Upon return to port in Astoria, OR on 27-June-2009, the mission party shall dismantle any additional equipment brought aboard for removal no later than COB 28-June-2009. The mission party is responsible for arranging all necessary transportation of material and personnel to and

from the ship. Mission personnel will coordinate with the Ship Operations Officer for any ship services required to assist with unloading transient mission materials. Crane service requests must be requested by the mission party 24 hours in advance of the required loading time.

5.2 Cruise Implementation Plan

The shipboard EM 302 and EA 600 will be operated around the clock (24 hours per day) during this cruise. SBP will also be operated simultaneously provided interference issues between the EM 302 and EA 600 are resolved before the cruise. Multibeam data will be processed, and digital terrain maps will be developed to assist in day to day planning and operational decisions. XBT/CTD data will be collected in survey regions to improve the quality of the multibeam data acquisition. Time and location for small boat drills and other ship drills will be decided based on time availability and weather conditions at discretion of the ship's command. CIMS assessment, mapping team training, discovery handling, mapping shore support objectives will be achieved in context of mapping over volcanic fields.

5.2.1 Mapping the extents of volcanic fields discovered during EX0903 cruise

During May 05-26, 2009 two volcanic fields were discovered. However, due to time constraints the full extent of these volcanic fields was not mapped then. During this cruise, mapping efforts will be concentrated on these areas to fully establish the extent of these volcanic fields. Additional CTD casts will be conducted in case interesting water column targets are observed in the EM 302 data.

5.2.2 Continue working on data products pipeline, documentation and sensor integration

The EX and OER teams collaborated over the last year to develop, refine and document the mapping data products pipeline, documentation (SOPs) and sensor integration. All cruise activities will result in additional information to be captured in these ongoing documents and activities.

5.3 Detailed Operations Schedule

The following tables and figures provide a detailed representation of the planned schedule and cruise track. Any revised locations will be provided prior to the arrival of the mission party to the EX. Mapping operations presume a vessel speed of 8-9 knots. Transit operations presume a maximum vessel speed of 10 knots and average or likely speed of 8 knots. CTD operations will be conducted while holding station. XBT operations presume a vessel speed of 8 knots.

Table 1. List of projected major operations associated with performance evaluation of mapping sensors. Operating dates and locations are subject to change based on sequential satisfactory performance the mapping sensors. The CTD/XBT casts listed are in addition to the daily XBT/CTD casts.

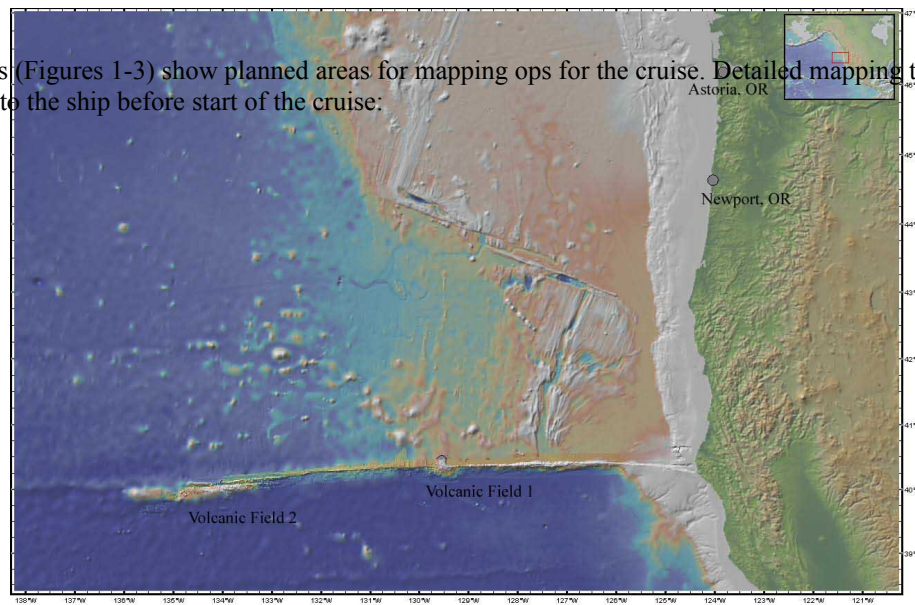
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Dates (mm/dd)	Location	Operations	Time (Days) Approximate	Distance (nm) Approximate
06/17	Newport, OR	Departure		
06/17-06/19	Newport, OR	Small boat / other drills	2	-
06/19-06/20	Newport, OR	Transit to volcano site # 1	1.75	350
06/20	Volcano Site # 1	Conduct CTD cast	0.5	
06/20-06/21	Volcano Site # 1	Mapping ops	1	300
06/22-06/23	Volcano Site # 1	Transit to Volcano Site # 2	1.5	300
06/24-06/25	Volcano Site # 2	Mapping ops	1.5	250
06/25-06/26	Volcano Site # 2	Transit to Astoria, OR	1.75	350
06/27	Astoria, OR	Arrival		
Total			10	1550

Table 2. Approximate mapping locations for this cruise.

Place	Latitude(N)	Longitude(W)
NewPort OR	44.64	-124.04
Astoria OR	46.18	-123.83
VolcanoSite#1	40.446	-129.549
VolcanoSite#2	40.087	-133.938

Following figures (Figures 1-3) show planned areas for mapping ops for the cruise. Detailed mapping track lines will be provided to the ship before start of the cruise:



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Figure 1: Map showing over view of the departure and arrival port and mapping ops areas labeled as Volcanic field 1 and 2.

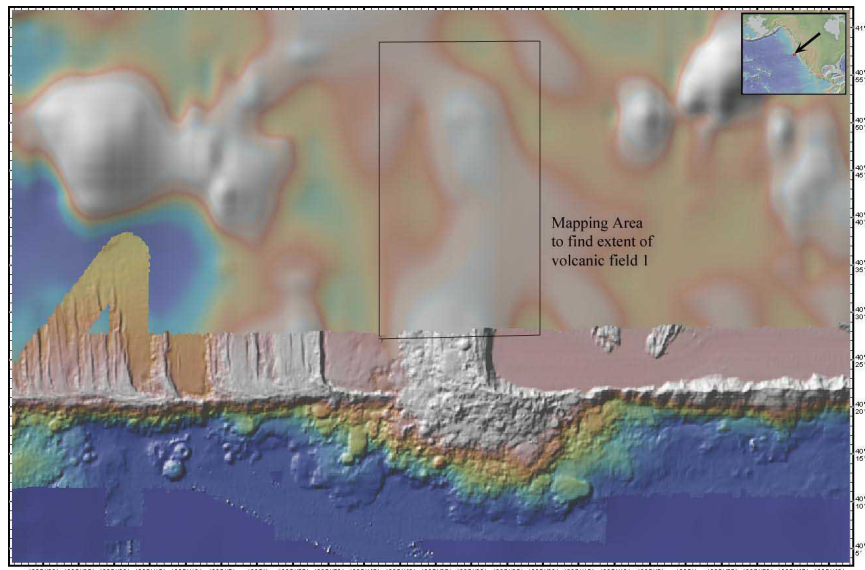


Figure 2: Planned mapping area north of volcanic field 1, to find the extent of volcanic field.

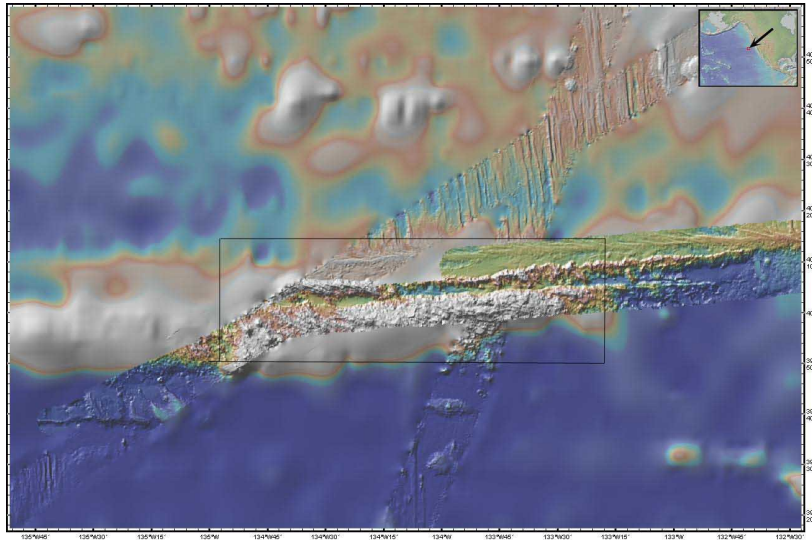


Figure 3: Planned mapping area around Volcanic Field 2.

5.4 Station Operations

The following station operations will be conducted during this cruise. The procedures for these operations can be found in Standard Operating Procedures aboard the EX.

- CTD casts
- XBT casts (various probes)

5.5 Underway Operations

The following underway operations will be conducted during this cruise. The procedures for these operations can be found in Standing Operation Procedures aboard the EX.

- Mapping operations using EM302, EA600 and Knudsen 320BR
- XBT casts (various probes)
- TSG Monitoring
- SCS Data Acquisition
- Meteorological Data Acquisition
- ROV mission space cleaning and preparations (who is doing this?)
- Telepresence system tuning and testing (who is doing this?)

5.6 Applicable Restrictions

None.

5.7 Small Boat Operations

Nil

6 FACILITIES

6.1 Equipment and Capabilities Provided by the EX

- EM302 Mapping System
- EA600 Echosounder System
- Knudsen 320 BR Subbottom profiler system
- POS/MV
- CNAV DGPS
- SCS System
- Dynacon Hydrographic Winch with .32" 8000m electromechanical conductor cable terminated for CTD operations, positioned for use with the starboard J-Frame.
- Starboard J-Frame rigged to Dynacon Hydrographic Winch.
- Manual Wire Angle indicator for CTD casts
- SeaBird Electronics 9/11 plus CTD and deck unit with dual temperature and conductivity sensors and auxiliary ports for additional sensors.
- Teledyne Benthos BFP-312HP pinger
- Conductivity and temperature sensor package to provide dual sensors on the CTD (primary)
- LHM Sippican XBT system and probes
- Telepresence System
- NetApp network storage devices
- Color copier and printer
- Mission party computer and network access
- Desk and workspace in the dry and wet-labs
- Adequate deck lighting for night-time operations
- Navigational equipment including GPS and radar
- Safety harnesses for working on quarterdeck and fantail
- Ship's crane(s) used for loading and/or deploying
- Limited rain gear for inclement weather
- Hard hats for deck operations
- Berthing and meals for embarked personnel

6.2 Equipment and Capabilities Provided by the Mission Party

- Ancillary mission laptop computers
- Ancillary mapping processing workstation

7 OPERATIONAL RISK MANAGEMENT

For every operation to be conducted aboard the ship (NOAA-wide initiative), risk management procedures will be followed. For each operation, risks will be identified and assessed for probability and severity. Risk mitigation strategies / measures will be investigated and implemented where possible. After mitigation, the residual risk will have to be assessed to make Go-No Go decisions for the operations. Particularly with new operations, risk assessment will be ongoing and updated as necessary. This does not only apply to over-the-side operations, but to everyday tasks aboard the vessel that pose risk to personnel and property.

- CTD (and other pertinent) ORM documents will be followed by all personnel working on board the EX
- All personnel on board are in the position of calling a halt to operations/activities in the event of a safety concern.

8 MISCELLENEOUS

8.1 Communications

Specific information on how to contact the NOAA Ship *Okeanos Explorer* and all other fleet vessels can be found at:

<http://www.moc.noaa.gov/phone.htm>

8.1.1 Important Telephone and Facsimile Numbers and E-mail Addresses

8.1.1.1 *Ocean Exploration and Research (OER):*

OER Program Administration:
Phone: (301) 734-1010
Fax: (301) 713-4252
E-mail: Firstname.Lastname@noaa.gov

8.1.1.2 *University of New Hampshire, Center for Coastal and Ocean Mapping*

Phone: (603) 862-3438
Fax: (603) 862-0839

8.1.1.3 *NOAA Ship Okeanos Explorer - Telephone methods listed in order of increasing expense:*

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United States Coast Guard – San Francisco, California:

Primary Phone: (415) 399-3547
Emergency Phone: (415) 556-2103
Fax Number: (415) 399-3521

EX Cellular:
OOD (401) 378-7414

EX Iridium:
808-659-9179

EX INMARSAT B
Line 1: 011-872-764-852-328
Line 2: 011-872-764-852-329

Mission personnel may obtain access to these systems with permission from the Commanding Officer on a cost-reimbursable basis.

E-Mail: Ops.Explorer@noaa.gov (mention the person's name in SUBJECT field)

8.1.1.4 Marine Operations Center, Pacific (MOP):

Operations Division (MOP1)

Phone: (206) 553-4548
Fax: (206) 553-1109

E-Mail: FirstName.LastName@noaa.gov
E-Mail to Radio Room: Radio.Room@noaa.gov

8.1.1.5 Marine Operations Center, Atlantic (MOA):

Operations Division (MOA1)

Phone: (757) 441-6206
Fax: (757) 441-6495

9 DISPOSITION OF DATA

9.1 Responsibilities

9.1.1 Shipboard

9.1.1.1 Responsibilities

9.1.1.1.1 Ship

The Commanding Officer is responsible for all data collected for missions until those data have been transferred to mission party designees. Data transfers will be documented on NOAA Form 61-29. Reporting and sending copies of project data to NESDIS (ROSCOP form) is the responsibility of OER.

9.1.1.1.2 NOAA OE

(Develop boilerplate wording over time to include NOAA OE data policies.)

9.1.1.2 Deliverables

- a. At sea
 - Daily plans of the Day (POD)
 - Daily situation reports (SITREPS)
- b. Post cruise
 - Refined documentation on ROVs, ROV control room and telepresence system.
 - Refined SOPs for use of control room and telepresence system.
 - Strategy for preparing for FY 09 operations.
 - Assessments of all activities.

9.1.1.3 Archive

- The Program and ship will work together to ensure proper archive of metadata and acquired data sets, and that all metadata and data formats meet FGDC compliance. Details TBD.

9.1.2 Deliverables

9.1.2.1 *At sea*

9.1.2.1.1 Daily plans of the Day (POD)

9.1.2.1.2 Daily situation reports (SITREPS)

9.1.2.2 *Post Cruise*

9.1.2.2.1 Refined SOPs for water column mode of exploration

9.1.2.2.2 Data sets from CTD profiles

9.1.2.2.3 Mapping data from multi-beam operations

9.1.2.2.4 Assessment of all activities

9.1.2.3 *Archive*

- The Program and ship will work together to ensure proper archive of metadata and acquired data sets, and that all meta data formats meet FGDC compliance.

10 ADDITIONAL PROJECTS

10.1 Definition - Ancillary and piggyback projects are secondary to the objectives of the cruise and should be treated as additional investigations. The difference between the two types of secondary projects is that an ancillary project does not have representation aboard and is accomplished by the ship's force.

1.1 Ancillary Projects - Any ancillary work done during this project will be accomplished with the concurrence of the Chief Scientist and on a not-to-interfere basis with the programs described in these instructions and in accordance with the *NOAA Fleet Standing Ancillary Instructions*.

1.2 Piggyback Projects - (list projects or state "None")

11 HAZARDOUS MATERIALS

The field party chief shall be responsible for complying with MOCDOC 15, Fleet Environmental Compliance #07, Hazardous Material and Hazardous Waste Management Requirements of Visiting Scientists. July 2002 (Edit sections 7.1 and 7.2. If no HAZMATs

are being brought aboard then delete sub-sections 7.1 through 7.2 and state that no HAZMATS will be brought aboard.)

1.3 Inventory

If the inventory is for 20 or fewer hazardous materials, include the list here. Otherwise, attach it as part of the section 9 Appendix. Include quantity, neutralizing agent(s) brought aboard and their quantity. Also, document existence of spill kits, and identify the individual on board the vessel to be should be notified should a spill occur.

1.4 Material Safety Data Sheet (MSDS)

(Provide an electronic MSDS for each hazardous material that will be brought aboard the ship. These may be included as part of the Appendix of these instructions. If so, refer here to that section of the Appendix. Otherwise, state that MSDSs will be forwarded separately.)

12 APPENDICES

12.1 Equipment Inventory (List all program supplied equipment, including quantity, weight, and dimensions.)

12.2 HAZMAT Inventory (If the inventory is for more than 20 hazardous materials, include the list here. Otherwise, attach it as part of section 7. List all HAZMATS and quantities, MSDSs, spill kits, and buffering agents.)

12.3 Figures (Include any figures, schematics, and/or chartlets.)

12.4 Tables (Include any tables of station locations.)