

Science Support Plan

R/V Marcus G. Langseth



Crisp 3D Seismic
April 10th 2011 – May 12th 2011
Cruise no. MGL1106
For
Nathan L. Bangs/Kirk McIntosh

Date: Latest Version #8	March 16 2011
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1. CRUISE OVERVIEW

MGL1106 seismic survey acquisition.

Principle Investigator: Nathan L. Bangs
Location: Costa Rica
Project no: MGL1106
Survey size: Approx. 37 days
Water depth: 100 – 3000 meters
Number of sail lines: 59

Other work conducted:

In addition to seismic work, gravity and magnetic data are collected 24/7. Thermosalinograph and sound velocity data is also collected. A pCO₂ system is logging data whenever the *Langseth* is at sea. Kongsberg EM122 Multibeam sonar and Knudsen 3260 sub-bottom profiler are in continuous operation during seismic acquisition. A RDI ADCP will also be in operation.

1.1. CRUISE OBJECTIVES

This project will acquire a 11 x 55 km volume of 3D seismic reflection data to examine the 3D structure of the Costa Rica convergent margin near Osa peninsula. The goal is to examine the structures and rock properties associated with the downdip transition into the seismogenic zone along the plate interface. This project is in support of the IODP CRISP deep riser drilling program and the MARGINS-SEIZE initiative.

1.2. CRUISE SCHEDULE

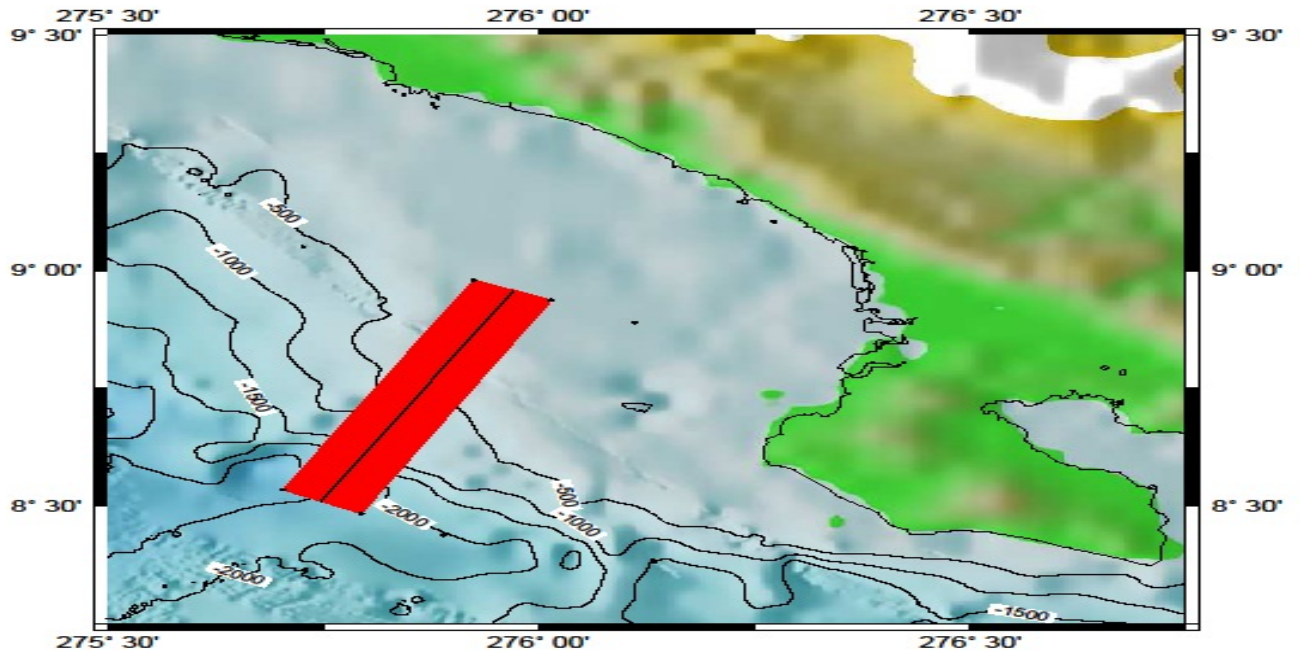
The cruise will consist of 1 leg(s). It is expected that Crew Change and resupply of the vessel will occur during these port calls. The schedule is as follows:

Date	Activity	Port
04/07/2011	Mobilization	Puerto Caldera, Costa Rica
04/10/2011	Depart port. Begin MGL1106.	Puerto Caldera, Costa Rica
05/12/2011	End MGL1106. Arrive in port.	Puerto Caldera, Costa Rica
05/13/2011	Demobilization	Puerto Caldera, Costa Rica

The science party will have access to the ship starting **04/07/2011**. They will be permitted to eat meals onboard starting on 04/07/2011 and will be permitted to move onboard on 04/07/2011.

At the end of the cruise, the scientists may stay onboard for 1 night after the ship arrives in port. Network services will be available until their departure.

1.3. WORK AREA / SURVEY PROGRAM



2. OPERATION AND SYSTEM STATUS

At the date of writing, the following pertaining to this cruise remain outstanding:

- The IHA (mammal permit) is awaiting final authorization. See 3.1 Permits below.
- The finalized shooting plan must be developed. See 3.5 Shooting Plan below.
- L-DEO is currently waiting on information regarding the gravity tie point nearest to Puerto Caldera. See 6.45 Gravity Tie Point below.
- A Chase Boat has been selected. The chartering procedure is in progress, See 10 Chase Boat below.
- The following cruise objectives are from the 3d shake-down recently completed (10-13 March):
 - Source:
 - All 4 arrays deployed.
 - All 4 acoustic & GPS units tested.
 - All 4 tow points modified to attain desired geometry.
 - IT/Comms/Processing:
 - Seisnet 1 & 2 tested and operational.
 - Recording tested.
 - Brute stack functionality tested.
 - Hi-Sea net operational.
 - Fleet Broadband operational.
 - ADCP tested and operational. (See 8.1.1 below.)
 - EM-122 operational. Noise files recorded with all seismic gear in tow and sent to Tim Gates for analysis/archiving.
 - Knudsen 3.5 tested and operational.
 - Navigation/Processing:
 - All Spectra interfaces tested and operational.
 - Syntrak MCS/Acquisition:
 - All 4 streamers and tail buoys deployed.
 - Streamers 3 & 4 full 6km length.
 - Both paravanes deployed.
 - Streamers and gun arrays successfully attached to paravanes for geometry set-up.
 - All streamers fully powered up and tested.
 - All compass birds tested and operational.
 - General Operations:
 - Wide tow handling system fully tested and operational.
 - New streamer reel remote system fully tested and operational.
 - All technical crew will sail on this mission, along with an additional industry qualified Navigator, giving qualified personnel available 24/7 during the mission.
- The following issues were noted during the 3d shake-down and are currently outstanding:
 - Source:
 - Comm problems with the GCM's on two strings. All GCMs have been fully tested, with 6 units failing. Array #4 is short 2 GCMs. 10 repaired GCMs enroute back to vessel from ION and are expected in San Diego next week. Failed units being shipped off this week for repair/return.
 - Lost GPS comms on string #4 due to incorrect plugging procedure – being addressed with corrected plugging this week.
 - Gun Umbilical #1 has a slow air leak at the bell housing. Re-termination scheduled to start 18th March – completion is 2 to 3 days.
 - Have 2 spare umbilicals on board,
 - Port Barovane has a vertical crack in one wing. Welding rod ordered and repairs scheduled to be completed prior to arrival in Costa Rica.

- IT/Comms/Sonars/Processing:
 - Echos: 5 seats, license expires in April. License renewal in progress.
 - Promax: 3 seats(?), license expires in June. License renewal in progress.
 - Seisnet: QC flow in progress. Required card for completing assembly of Seisnet3 on order.
 - Seisnet3 will be back-up unit to back-up unit (spare #2).
 - Brute stack: Could only test with stored data, no live test.
 - Knudsen: Only tested in unsynchronized operation. Synchronization wire needs to be run to EM-122 for synch firing and tested.
- Navigation/Positioning:
 - Spectra 3D configuration nearly complete, online binning configuration needs testing.
 - System timing remains to be tested (Spectra/Digishot/Digicourse/Syntrak)
 - Testing and evaluation of Sonardyne acoustic transponders in progress.
 - Acoustic network configuration in progress.
 - Posnet radio communications to tail buoy GPS inoperative. New antennas on order.
- Syntrak MCS/Acquisition:
 - Testing of pre-line and post-line noise files not done.
 - Streamer 1 is 3 sections short of 6km
 - Streamer 2 is 4 sections short of 6km
 - Eight (8) sections identified in the 4-cable spread that need to be changed out due to hydrophone leakage and crosstalk.
 - Before the vessel leaves San Diego, 31 newly acquired streamer sections will be loaded on the vessel which will allow the crew to completely re-build steamers 1 & 2 to 6km and have adequate spares for the rest of the mission.
 - During the 3D shake-down, the geometry of the towed equipment was evaluated and only minor changes will need to be made to tow points during the initial deployment

3. ENVIRONMENTAL ISSUES / PERMITS

3.1. PERMITS

This mission is completely within Costa Rican waters & therefore requires Costa Rican permission to conduct research within their sovereign territory. The Costa Rican foreign clearance application was filed with US State Department in September 2010. Costa Rican clearance was received by L-DEO on 8 March 2011 (see Appendix '6').

Because this is a seismic mission, L-DEO must comply with the National Environmental Protection Act, the Endangered Species Act and Marine Mammal Protection Act of 1972. The Incidental Harassment Authorization (IHA) was filed and is currently going through the review process at National Marine Fisheries Service (NMFS). The latest report indicates that there are no red flags. Be advised that NMFS typically does not issue the IHA until 24hrs in advance of sailing. The Protected Species Observers (PSO) Handbook and the IHA will be reviewed via phone with vessel personnel (Captain, Lead Tech, Lead PSO) and OMO (Mammal permit coordinator, Tech manager, Ops manager).

3.2. SHIPPING, FISHING AND DIVING ACTIVITY

No shipping activity of any significance is expected. Fishing activity is expected although to what level is difficult to ascertain as fishing operations will be small independent operators that follow the fish and may only be a temporary or sporadic interference. Shipping traffic can cause the vessel to divert from the shooting plan to avoid fishing vessels deploying or retrieving long line gear, shipping vessels anchored on a survey line and unawares of our approach. Fishing gear can also become entangled in the towed seismic equipment necessitating retrieval of some or all of the gear to effect repairs. Every attempt is made to identify fishing vessel or fishing gear hazards and avoid them.

3.3. OBSTRUCTION AND SHALLOWS

There are numerous obstructions and shallows throughout the entire survey area. There is no reliable bathymetry data available for the entire survey area, so the EM122 will be a very useful tool for determining if an area is safe to enter. The vessel should not enter into water 50m or less while towing equipment without the express written permission of the Marine Operation Manager.

3.4. WEATHER

Weather will be continually monitored while at sea. Weather forecasts will be available from the following systems:

www.buoyweather.com

<http://www.weatheronline.co.uk>

<https://oceanography.navy.mil/legacy/web/ops.htm>

<https://metocph.nmci.navy.mil/jtwc.php>

(Select Sailing weather)

(Select Public access)

(Joint Typhoon Warning Center)

3.5. SHOOTING PLAN

A shooting plan will be developed and approved by the Chief Scientist and the Chief Science Officer during the cruise mobilization. The shooting plan should not be deviated from without written authorization from both. The plan must take into consideration known issues such as shallows, obstructions, fishing or other activity, protected marine areas, prevailing strong currents, and weather. In some cases the Captain and/or Marine Operation Manager may also have to provide approval if safe operation or safe navigation of the vessel is in question. A copy of each approved version of the shooting plan is kept with the documentation for the science cruise.

4. CRUISE PARTICIPANTS

4.1. PARTICIPANT LIST

The following Technicians are expected:

Participant	Group/Affiliation	Position
Robert Steinhaus	L-DEO	Tech-in-Charge
Anthony Johnson	L-DEO	IT
David Martinson	L-DEO	NAV
Bern McKiernan	L-DEO	ET/ACQ (shift leader)
Brandi Murphy	UW (UNOLS)	ET/ACQ
Ryan Eaton	L-DEO	IT/ACQ/NAV
Dave Ng-Li	L-DEO	IT/NAV
Mike Martello	Geomotive (contractor)	NAV (shift leader)
Tom Spoto	L-DEO	Source, Towing & Handling (lead)
Carlos Gutierrez	L-DEO	Mechanic
Mike Tatro	L-DEO	Mechanic
Luis Barrentes	Costa Rican (sailed Holbrook mission)	Mechanic
TBN	Costa Rican (sailed Holbrook mission)	Mechanic

The following personnel will be required for mammal mitigation this cruise:

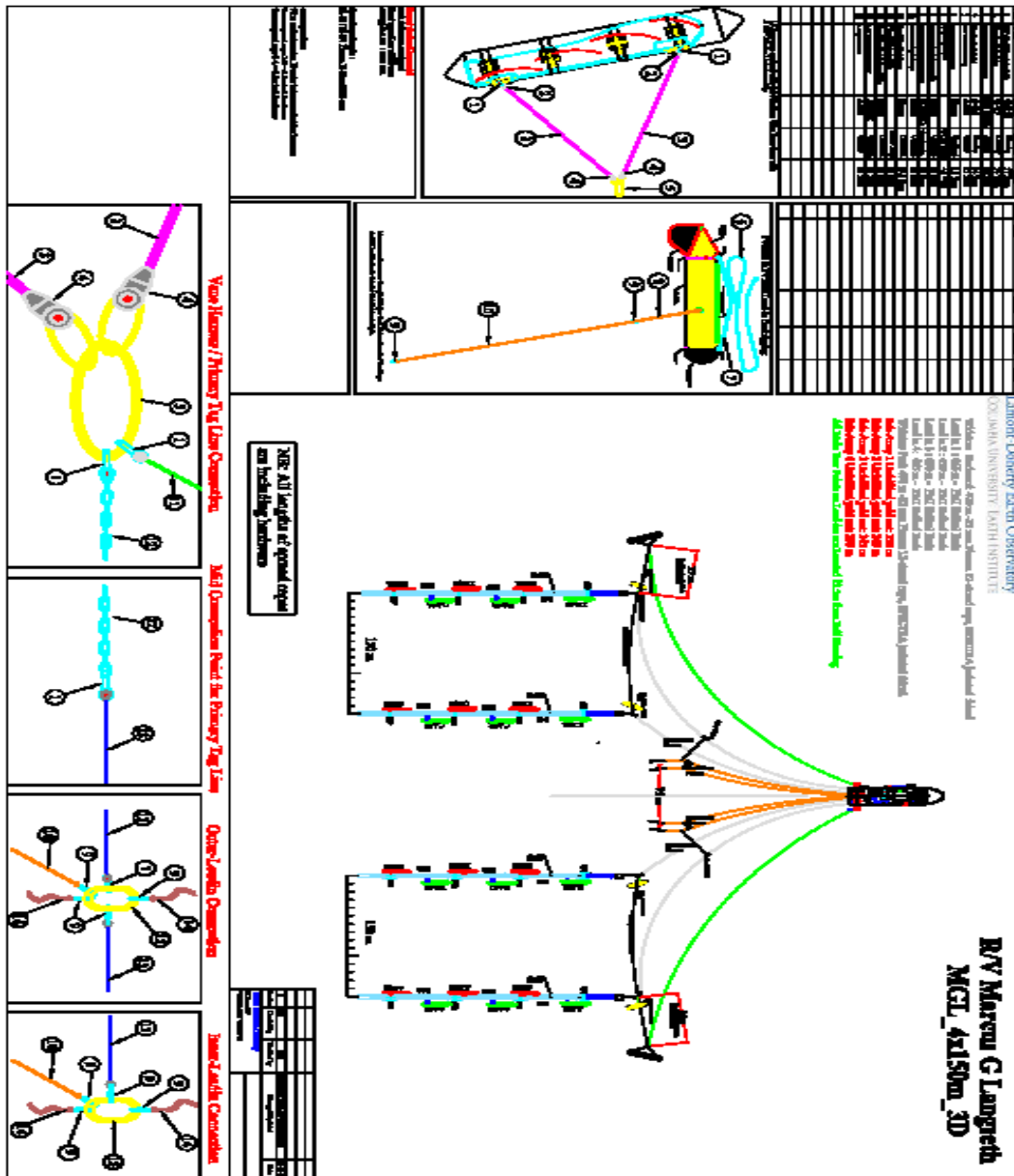
Participant	Group/Affiliation	Position
Diana Antichow-Alonzo	RPS-Geocet	Lead PSO
Stephanie Milne	RPS-Geocet	PAM operator
Meghan Piercy	RPS-Geocet	PSO
Jose David Palacios Alfaro	RPS-Geocet	PSO (local)
Meagan Cummings	L-DEO	PSO

4.2. LDEO TECHNICAL STAFF

The LDEO technical support staff consists of a Technician in Charge, IT/Navigation Technicians, Data Acquisition Technicians and Sound Source technicians. Their responsibilities are as follows:

Position	Position Description
Technician in Charge	The Technician in charge is the senior LDEO technician onboard and is the liaison between the cruise participants, the LDEO staff, the Captain, the LDEO office and the port agent. He/she coordinates the support effort among the various parties onboard. The Technician in Charge is the first contact for issues related to on-board operations, cruise plans, etc. The TIC is responsible for deployment, recovery and trim of all towed seismic equipment,
IT/Navigation Technician	The IT/Navigation Technician is in charge of navigation system parameters and operations.
Data Acquisition Technician	The Data Acquisition Technician assists in deployment, recovery and trim of all towed seismic equipment, the seismic recording system parameters and operations as well as sound source controller operation.
Source, Towing & Handling Technician	The Sound Source Technician is in charge of deploying, retrieving and maintaining the sound source as well as other seismic towed equipment.

5. SYSTEM LAYOUT



6. ACQUISITION PARAMETERS

LDEO will ensure that the equipment in use meets the manufacturer's specifications, and also meets LDEO own quality requirements.

6.1. DEFINITION

Acquisition mode: Single vessel
 Configuration: Four streamer (6000m 468 ch.), dual source (3300 cu in3)
 Shot interval: 50 m

6.2. COVERAGE

Be aware the following:

- Use shot point 1001 for the start of each pre-plot, run-out shot-point is NOT included in pre-plots.
- A 3200 m run-out (64 shot-point) should be added to all lines.
- Run-in should be min. 8 km to ensure that the streamer is straight before SOL.

6.3. SEISMIC PARAMETERS

6.3.1. Seismic recording systems

Recording type	SERCEL Sytrak
Sample rate	2ms
Recording length	9.00 seconds w/ no Deep Sea Delay
Low Cut Filter	2.0 Hz / 12 dB/OCT
High Cut Filter	206 Hz Digital Filter / 276 dB/OCT w/ linear Phase
Data format	SEG-D 8058 rev. (demultiplexed) with External Header.
Media	3590E, SDLT320, or User Supplied.

6.3.2. Seismic streamer

Streamer

Streamer type	Thompson Marconi SENTRY
Streamer length	6000m
No of groups	468
Group Interval	12.50 m
Group length	12.50 m
Streamer depth	7 m +/- 1m
Near offset	375m
Spacing of birds	Every 300m + extra redundancy at head and tail of streamers

6.3.3. Energy source:

Source

Source type	BOLT
Shot interval	50m per source
Number Sources	2
Source depth	6m +/- 1m , may desire to use 6m or 9m for part of survey
Volume	6600 in3 (3300 in3 per source)
Air pressure	2000 psi
Source separation	6m Sub-Array to Sub-Array & 18m overall m
Max timing error	+/- 2ms

(Please see appendix 3 for source details)

6.3.4. Bathymetry

Bathymetry will be acquired (recorded) using a Kongsberg EM-122.

6.4. GEODECTIC PARAMETERS

6.4.1. Survey datum. Survey datum.

Spheroid	:	WGS84
Datum	:	WGS84
Semi Major Axis (a)	:	6378137.0m
Inverse Flattening (1/f)	:	298.257224
Projection System	:	UTM Zone 52 North
Scale Factor at CM	:	0.9996
Latitude at Origin	:	0° N
Longitude at Origin	:	129° E
False Easting	:	500000
False Nothing	:	0.0
Grid Units	:	Meters

6.4.2. World Geodetic System 84 (WGS-84)

Ellipsoid	:	WGS84
Semi Major Axis (a)	:	6378137.0m
Inverse Flattening (1/f)	:	298.257224

6.4.3. Datum shift WGS-84 to survey datum

X-shift	:	0m
Y-shift	:	0m
Z-shift	:	0m
X-axis rotation	:	0.sec
Y-axis rotation	:	0.sec
Z-axis rotation	:	0.sec
Scale correction	:	0.00ppm

6.4.4. Map Projection

Projection	:	Transverse Mercator
Projection System	:	Universal Transverse Mercator (UTM)
Projection Zone	:	UTM zone 52 North
Central Meridian	:	129° E
Scale Factor	:	0.9996
False Easting	:	50000 m
False Northing	:	0.0 m
Grid Units	:	Meters

6.4.5. Gravity Tie point

L-DEO is actively searching gravity tie point databases for a local tie point.

6.5. LINE NAME CONVENTION

6.5.1. Navigation and support data:

The line names can have a maximum of 12 characters Exp: MGL11041001P

```
Cruise Number:      MGL1104
Line Number:        -----1001
Line Type:          -----P/R/I
P = Prime, R= Reshot, I= Infill
```

CMP Line Numbers will start with 1001 for the Northern Most line and work their way south. The Pre-Plot (Track Lines) will increment by 8 because of the Number of CMP Lines acquired during each pass.

6.5.2. Recording and other system data

The format for line names of both of the RECORDS and HEADERS of all other data including the SEG-D and SEG-Y format should follow the full UKOOA 16 character standard to match the navigation data, as above.

6.6. POSITIONING SYSTEMS

Two independent standard multi-station DGPS systems are required for the survey.

Vessel Positioning

Primary Nav system	C-Nav dGPS
Secondary Nav system	Seapath dGPS
Tailbuoy navigation	PosNet rGPS
Source navigation	PosNet rGPS (1 unit per subarray)
Acoustics	Sonardyne SIPS1
Navigation processing	Concept Sprint 4.1.2 b2
Bird Controller	DigiCourse
Survey-Gyro (Primary)	Simrad GC-80
Ships-Gyro (secondary)	Sperry MK-27
Speed Log	Furuno DS-50
Multibeam	Kongsberg EM-122

6.7. IN SEA POSITIONING SYSTEMS

6.7.1. Tailbuoy

A Tailbuoy will be deployed at the tail of each streamer for positioning. Each Tailbuoy is to be fitted with a GPS unit, a radar reflector, a strobe light, and a Sonardyne SIPS 1 Acoustic transponder for ranging to the transponders on the tail of each streamer.

6.7.2. Source Positioning

Each Sub-Array float will have a Posnet rGPS Pod installed along with each sub-array having a Sonardyne SIPS 1 acoustic pod.

6.7.3. Streamer Positioning

Streamers are positioned using a combination of DigiCourse 5010/11 compass birds and Sonardyne acoustic transponders.

6.7.4. Magnetic Compasses and birds

The compasses and birds will be mounted at 300m intervals on the streamer.

The depth controllers / compasses will be DigiCourse model 5010 / 5011.

Extra compass birds will be mounted in the front and tail of the streamer for redundancy.

6.7.5. Acoustic Positioning

Four Sonardyne SIPS 1 Acoustic Pods will be mounted on the streamer cable. Two at the head of the Streamer which will range to the Source Acoustic Pods which are co-located with the rGPS units on the Sub-Array Floats. The other two units will be located on the tail of the Streamer that will range to the Tailbuoy, which is co-located with the rGPS unit for more accurate positioning of the Source and Streamer.

6.8. MAGNETIC DECLINATION

Source: www.USGS.gov

Model: IGRF-2005

Date: 07/03/09

Position: 20° 41'N, 118° 34'E

Magnetic Decl.: 3.167 E'W

Variation: 0°04'/yr

Map for reference purposes only. Magnetic declinations should be calculated for various points using the Mag dec calculator found on www.ngdc.noaa.gov

6.9. NAVIGATION PROCESSING

The navigation processing is to be performed onboard using the Concept Sprint Navigation Processing System.

Final data format: UKOOA P190

Final data medium: Electronic

6.10. SEISMIC QC PROCESSING

To be provided by the scientist

6.11. SOUND VELOCITY

Sound velocity will be collected for use in the multibeam data processing. XBT – T-5 and T-7 Probes will be launched once daily. Probes are supplied by LDEO. If additional profile data is desired, Science party should make arrangements to provide more probes.

7. COMPUTERS AND COMMUNICATIONS

7.1. SHIP'S NETWORK

Langseth's computer network consists of gigabit networking to all lab spaces, with wireless accessibility throughout the ship. Internet access is on a separate, wired network. Only certain spaces have ports to access the internet. Refer to the Internet Access and Usage policy for details.

7.2. EMAIL, DATA TRANSFERS AND INTERNET ACCESS

Langseth has a shipboard email server. All on board are given email accounts. Users can access the shipboard email server from the ship's network; internet access is not required. Email on the ship's mail server is batched and run periodically, normally every 20 minutes. Changes to the email batch schedule will be announced. The shipboard email server message limit is 1MB. Intra-ship email is limited to 10MB.

Access to email from home institutions is not blocked, and can be received on the internet-enabled network.

Large data transfers can be arranged. Transfers can be done at any time during the cruise but require coordination with the *Langseth* technical staff.

Internet access is a limited resource on ships. While HiSeasNet provides a 24-hour connection, bandwidth is less than that of a typical residential DSL service. Please refer to the internet access policy (on the internal *Langseth* web site) for information detailing how internet access is controlled. Any questions or assistance requirements, please contact the *Langseth* technical staff.

7.3. SCIENTIST OWNED COMPUTERS

Scientists may bring their own computers to the vessel. *Langseth* tech staff will provide support in setting up a network connection and access to email, file services, and printing. Windows XP/Vista/7, Mac OS X, and Linux Redhat/Ubuntu/Debian/Fedora are supported.

Scientists may bring workstation computers. Please discuss beforehand with technical staff during planning stages to ensure enough space is available for all equipment. *Langseth* tech staff will assist users in setting up workstations.

Langseth technical staff can provide desktop support limited to setting up network access and configuring devices to access network services. Windows XP/Vista/7, Mac OS X, and Linux Redhat/Ubuntu/Debian/Fedora are supported. Limited break/fix support is provided, on a best-effort basis.

Updated anti-virus software is required prior to departure. Failing to update on-coming computers' anti-virus software puts the entire vessel network in danger.

7.4. PUBLIC COMPUTERS

Langseth provides workstations and software for seismic processing and general-purpose computing. These are located in the Main Lab. For a list of software available on these systems, please refer to the internal *Langseth* web site. Any questions or assistance requirements, please contact the *Langseth* technical staff.

Internet terminals (at least one) are also provided for crew and science party use. These may be relocated depending on mission requirements. Tech staff will brief the science party on internet terminal access during orientation.

7.5. VOICE COMMUNICATIONS

Telephone calls for the PIs can be made from the bridge. On weekends, the internet may be secured for up to two hours at a time to allow morale calls for all on board. Morale phone calls are in 15-minute slots.

8. UNDERWAY DATA AND DATA DISTRIBUTION

8.1. DATA COLLECTION

8.1.1. Sonars

The sonars available on board the *Langseth*, the Kongsberg EM122 Multibeam, the Knudsen 3260 3.5 Khz Sub-bottom Profiler, and the RDI OS75 ADCP, are operated continuously throughout every cruise. Staff on board *Langseth* are proficient in basic operation of these systems, but are not sonar experts. PI's who require advanced expertise during their cruise will need to bring their own personnel.

Knudsen Sub-bottom Profiler

Langseth standard procedure is to enable external sync on the Knudsen, keeping it synchronized with the EM122. **This sometimes results in a reduction in the Knudsen sampling rate**, but minimizes interference with the EM122. PI's who wish to run the Knudsen without synchronizing to the EM122 must discuss this with the Technician in Charge.

If the multibeam is not in use, the Knudsen will be run in internal sync.

Knudsen data is recorded in SEG-Y, KEA, and KEB formats.

EM122 Multibeam Sonar

The EM122 multibeam sonar is normally run with standard options enabled and automatic parameter adjustments enabled where possible. This configuration should provide good coverage (swath width), but may not provide optimal coverage under all conditions. These settings will not provide the best data quality. Specifically, reducing swath width is often required to attain the best data quality and density. Consult with *Langseth* technical staff or other authorities if there are specific requirements for your cruise.

The EM122 sound velocity profile (SVP) will be processed from XBT or XCTD data and uploaded to the EM122 system by *Langseth* technical staff. The updates will occur at the discretion of shipboard technical staff or at Chief Scientist request, up to once per day, coincident with XBT deployment (see XBT below).

Should more frequent updates than once per day be required, the science party must supply the necessary probes (See XBT below). They must also supply approx. 30 mins of personnel time to perform the processing, per profile. Training in processing and uploading the profile to the multibeam will be provided by *Langseth* staff.

RDI OS75 Acoustic Doppler Current Profiler

The ADCP is newly installed on the *Langseth* and will be operated for the first time during the 2011 science mission season. The vendor (Teledyne RDI) ran both Harbor Acceptance (done in San Francisco) and Sea Acceptance (done offshore San Diego) tests, completing the commissioning of the system. Dr. Jules Hummon from University of Hawaii joined the *Langseth* for the JMS inspection cruise and fully installed their on-board system for logging, processing and QC of the data. The installation was completed and is fully functional, with daily email alerts coming in automatically to the technical staff.

8.1.2. XBT

Langseth carries Sippican T-5 and T-7 probes, suitable for general oceanography and support of the multibeam sonar. *Langseth* deploys one probe daily when possible. Science party assistance (one person, ~20 minutes daily) is required for routine probe launch. Multiple people can be trained on probe launch operations. If no science party members are available to assist with deployments, deployments may be reduced to twice weekly or as necessary.

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Due to space and cost considerations, *Langseth* does not routinely carry probes in excess of these requirements. PI's who require additional probes or probes of a different type must discuss their needs with OMO before the cruise. PI's who have a specific deployment plan should work with shipboard technical staff during the cruise.

Cut-off limit – The standard cut-off limit for XBT probes will be used unless a specific request is made by the PI. (T5-1850m, T7=700m)

Other Mk21 probes, e.g. XCTD's and XSV's, may be deployed using the *Langseth* Mk21 system. *Langseth* does not provide these probes. If required, they must be provided by the PI.

8.1.3. Magnetism and Gravity

Magnetism

Langseth policy is to deploy the magnetometer only in the work area. The magnetometer is not deployed during transits to and from the work area. The magnetometer must be recovered at less than 3 knots. The magnetometer will not be deployed during OBS recovery or deployment operations.

Gravity

The *Langseth* gravimeter is Bell Aerospace BGM-3. Gravity data is processed for QC purposes, and made available to users as a convenience. Please note that the processing process has not been vetted by any gravity experts. The processed data is not presented as a finished product and is not guaranteed free from defect. Users who are interested in processed gravity data are strongly encouraged to process the data independently.

8.1.4. CTD

Langseth carries a Sea-Bird Electronics SBE19 CTD. This instrument does not have a water sampling system. Users interested in water sampling, please alert the Technical Service Manager. This equipment will have to be sourced via RVTEC.

Note that the *Langseth* Dynacon CTD winch does not currently have a slip-ring installed.

8.1.5. Navigation

Langseth carries the following navigation equipment. These systems are provided to support Seismic operations and the multibeam system. There are no user-configurable options.

These systems are operated by the vessels crew and technical staff, and are turned on or secured as necessary. They are normally operated, unless equipment or permit requirements dictate otherwise.

Furuno FE700 echosounder
Furuno DS50 doppler speedlog
C-Nav 3050 DGPS
C-Nav 2000 DGPS
SiMrad GC80 gyrocompass
Sperry Mark 37 gyrocompass
POS/MV Integrated Nav System
Seapath Integrated Nav System
Spectrum Instruments TM-4 Event Logger

All of these instruments output serial data and are logged using the LDS data logging system (see below).

8.1.6. Meteorological

Langseth has an RM-Young Weather Station installed for wind speed/direction, air temp/humidity, and barometric pressure.

8.1.7. Surface Seawater

The following meteorological and hydrographical instruments are on board *Langseth* and are routinely operated:
LDEO PCO2
SBE-21 TSG
Applied Microsystems MicroSV
Sea-bird Electronics SBE38 Temperature Sensor

8.1.8. Client-provided Instrumentation

Set-up and operation of client-provided instrumentation is the responsibility of the Chief Scientist. *Langseth* tech staff can assist with serial data feeds and network access. *Langseth* technical staff will

8.1.9. Lamont Data System (LDS)

Serial data is logged on *Langseth* via the Lamont Data System (LDS). The LDS provides a highly configurable system for receiving, recording, manipulating, and transmitting serial data. Access to this system, either to log data from client-provided instrumentation or to have navigation or other data sent to client instruments or data logging equipment, is possible. Please discuss these needs with *Langseth* tech staff before the cruise.

LDS data is automatically copied (using rsync) to the cruise directory every six hours.

8.2. DATA DISTRIBUTION AND SHIPMENT

8.2.1. Collection

All data acquired from *Langseth* sensors flows to the central *Langseth* fileserver (fserve), where they are stored in a cruise-specific network share, called the ‘cruise directory’. All cruise documentation, log files, and records are also stored on the cruise directory. Shipboard researchers can access the cruise directory using as a CIFS network share (standard windows file sharing). *Langseth* technical staff will assist users in accessing the cruise directory. Access to the raw data is read-only, but writable areas are available for users to store documents and files. Users are encouraged to store any cruise-related materials (except seismic processing files) to the cruise directory. Users are also encouraged to load data from non-*Langseth* (i.e., client-provided) instruments on to the cruise directory.

MCS data is recorded directly to RAID (disk) via a tape emulator card and is also stored on the central fileserver under a different share, called the ‘SEGD directory’.

Note that all shipboard researchers are provided credentials to access the cruise directory and SEG D directory. After the cruise is completed, these directories are archived and are not available to subsequent users. During the cruise, however, all cruise participants have access to all data. If there are specific data security concerns, these MUST be identified before the cruise.

Toward the end of the cruise (usually the day of arrival), *Langseth* tech staff will close the cruise directory and no further additions will be possible. Sufficient notice will be made to users to allow completion of work.

8.2.2. Distribution and Transport

Data are logged up to arrival at the pier. The data distribution will be finalized the day of arrival and will be ready for packaging the morning after arrival.

Scientists must provide their own media for transporting MCS data off the vessel at cruise end. OMO staff can recommend appropriate hardware and/or media for this purpose. The MCS data is made available to scientists via network share, either NSF or CIFS. *Langseth* tech staff will assist scientists in ensuring the MCS data is properly copied to user media.

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The cruise directory, including underway digital data (all data other than MCS), will be packaged by *Langseth* technical staff at the end of the cruise. Two sets of the data will be provided to the Chief Scientist on portable media. These will be either SDLT tape or, for a fee, portable hard drives.

If a gravity tie can be completed before the cruise directory is closed out, the gravity tie records will be stored on the cruise directory, including gravimeter data up to and through the gravity tie. If a gravity tie cannot be completed, a gravity addendum will be compiled and made available to scientists at a later date.

8.2.3. Archival and Release

Per NSF policy, all data collected aboard *Langseth* must be made available to the public within two years of collection. NSF has funded several programs to archive and disseminate research data.

R2R – Rolling Deck to Repository

NSF has created the ‘Rolling Deck to Repository’ (R2R) program to remove the burden of data transmittal/submittal from the PI’s. The R2R program is a data clearinghouse based at L-DEO which receives data from UNOLS vessels and forwards the data to the appropriate long-term data storage facilities.

At completion of the cruise, Langseth technical staff will submit the contents of the cruise directory and SEG D directory (i.e., all the data) to R2R.

MGDS – Marine Geoscience Data System

The Marine Geoscience Data System (MGDS) provides access to data portals for the [NSF-supported Ridge 2000](#) and [MARGINS](#) programs, the [Antarctic and Southern Ocean Data Synthesis](#), and the [Seismic Reflection Field Data Portal](#). These portals were developed and are maintained as a single integrated data system, providing free public access to a wide variety of marine geoscience data collected throughout the global ocean.

Upon receiving the cruise data, R2R will archive the raw seismic and other data in the MGDS repository.

IRIS – Incorporated Research Institute for Seismology

Founded in 1984 with support from the National Science Foundation, IRIS is a consortium of over 100 US universities dedicated to the operation of science facilities for the acquisition, management, and distribution of seismological data.

8.2.4. Chief Scientist Responsibilities

Upon arrival on the vessel, the Chief Scientists shall meet with the Chief Technician and the Data Manager to discuss the NSF and *Langseth* data policies.

Before departing the vessel, the Chief Scientist will meet with the *Langseth* data manager and sign the data release authorization, which authorizes LDEO to transmit and submit the data on their behalf. At this time, certain data sets can be marked for early release.

Langseth does not routinely collect non-digital data (e.g. water samples, cores) during seismic operations. Should non-digital data be collected, they will be the responsibility of the Chief Scientist. He or she should arrange to have the samples removed from the vessel at the end of the cruise and ensure that NSF archival requirements are satisfied.

9. SHIPBOARD SAFETY & SECURITY

9.1. SHIPBOARD SAFETY

The ship's master has the final authority for all safety-related matters posing any danger to the ship and/or anyone aboard it. Additionally, if anyone onboard finds that unsafe conditions exist, he or she has the authority to stop any related shipboard science until the situation is corrected. This would include issues of industrial, marine or laboratory safety

Orientation will be conducted for on-coming science party. This will include a safety briefing and vessel walk-through. Each cabin has station bill postings and copies of the UNOLS RVOC Safety Training Manual, Chapter 1.

9.2. MEDICAL CARE

While in port, any non-emergency health or injury needs will be handled by the Captain. Arrangement can be made through either the Captain or the Technician in Charge, who will pass the request on to the Captain. ALL EMERGENCY MEDICAL SITUATIONS NEED TO BE COMMUNICATED TO THE CAPTAIN THROUGH THE QUICKEST MEANS AVAILABLE. Emergency protocol will be addressed during orientation. Medical Advisory Systems provides medical advice while at sea. The Captain is the primary person to contact for medical care while at sea. Be advised that the infirmary is small and medical supplies are limited. It is the responsibility of all cruise participants to advise the Captain of any medical conditions, and ensure an adequate supply of any and all prescription medication required by that participant.

9.3. SHIPBOARD SECURITY

The R/V *Marcus G Langseth* is a US flagged vessel, and can therefore be subject to MARSEC (marine security). All engineering spaces and vessel safe operation spaces are off limits to non-affiliated and/or non-escorted personnel. All persons intending to board the vessel must provide positive proof of identification. A Passport, US drivers license, or TWIC (transportation workers identification credential) are accepted. Non-crew cannot enter a US port facility or board the *Langseth* unescorted without a TWIC. A gangway watch is maintained and all non-crew are required to sign-in and sign-out.

10. CHASE BOAT

L-DEO is currently in charter process with the owners of *La Rata Bastarda* for chase boat function. Vessel details as follows:

- Can stay out for full Bangs mission
- \$6,400/day (all inclusive, based on the current \$4.10 Costa Rica fuel costs ... if that changes, then rate changes)
- ~86' LOA
- US captains & mates, 2 Costa Rican fishermen/deck hands, 1 Panamanian fisherman/deck hand.

11. CONTACTS AND ADDRESSES

11.1. R/V *MARCUS G LANGSETH*

Call Up List
OMO Fax 845-359-6817

Name	Position/	Office	Home	Cell
OMO Primary Contact Paul Ljunggren pwl@ldeo.columbia.edu	Ops Manager	845-365-8845	203-234-1543	914-806-5095
OMO Alternate Jeff Rupert	Manager Tech Services	845-365-8367	845-544-2445	845-558-4239
OMO Alternate Sean Higgins, sean@ldeo.columbia.edu	Director OMO	845-365-8528	914-831-5575	914-260-6759
Klein, Martin porteng@ldeo.columbia.edu	Port Engineer			845-608-1188
Meyer, Megan megan@ldeo.columbia.edu	Tech Services	845-365-8377		914-589-4861

Marine Mammal Issue Points of Contact

Cummings, Meagan cummings@ldeo.columbia.edu	Safety/Env Coordinator	845-365-8456		609-706-2508
Rupert, Jeff, Rupert@ldeo.columbia.edu	Manager Tech. Services	845-365-8367	845-544-2445	845-558-4239
Ljunggren, Paul pwl@ldeo.columbia.edu	Operations Manager	845-365-8845	203-234-1543	914-806-5095

NMFS (Injured or Dead Marine Mammal)

Chief Permits, Conservation and Education Division			301-713-2289	
Stranding		301-713-2322	301-713-0376 Ext.178	
Marine Mammal Commission General Number		301-504-0087		

Supplemental Call Up Lists

COLUMBIA	OFFICE	FAX	HOME	CELL
<u>Employee Relations-</u> Garvey, Sheila Sg776@columbia.edu	212-870-3325	212-870-2810		
<u>Office of the General Counsel-</u> Michael Feiler mf@gc.columbia.edu	212-854-5795	212-222-8505		
<u>Risk Management-</u> Frank Koerner fk2102@columbia.edu	212-845-9704	212-854-9709		
<u>External Relations-</u> Erin Trowbridge etrowbridge@ei.columbia.edu	212-854-9485			917-291-7974
Kevin Krajick- Science Writer kkrajick@ei.columbia.edu	845-365-8607	845-365-8164		212-666-4824 917-361-7766

NSF

Goad, Linda-Ship Operations lgoad@nsf.gov	703-292-7706	703-292-9085	703-222-7878	703-901-5178
Holik, James- Instrumentation jholik@nsf.gov	703-292-7711	703-292-9085		

NAVY(ONR)

TBN	703-696-6999	703-696-2007		
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STATE DEPARTMENT

State Department State situation and they can patch to local embassy or ask for Elizabeth Tirpak	Operations Center	202-647-1512		
Elizabeth Tirpak (OES) (tirpakej@state.gov)	202-647-0238	202-647-1106		703-980-8890
MMP (DECK OFFICERS) Werse, Steve swerse@bridgedeck.org	201-963-1900	201-963-5403		
MEBA(LICENSED ENGINEERS) Bill McHugh	201-433-7100	201-433-7959		

R/V *MARCUS G LANGSETH*

IMO		9010137
Ship Cell Phones	Captain	914-275-3918
	Chief Engineer	845-558-6188
	Tech-in-charge	845-652-0509
Registration		NY3360FG
Call Sign		WDC6698
MMSI		
High Seas Net:		
Bridge Extension		1000
Lab Extension		1401
Iridium Voice		011 8816 3183 0511 * Only rings on bridge.
Via Inmarsat C (C-Link email)		436980010@inmc.eik.com
Fleet Broadband		870 773 153 692

Ocean Codes- 871 Atlantic East; 872 Pacific; 873 Indian; and 874 Atlantic West

Email: Chief Science Officer: Roberts@ldeo.columbia.edu / ajohnson@ldeo.columbia.edu
Captain: captain@ldeo.columbia.edu
Bridge: Bridge@ldeo.columbia.edu

11.2. AGENTS

Tudoran Transport
Vasile Tudoran
vtudoran@aol.com
+1 562 882 5590

12. EXPERIENCE AND FEEDBACK

12.1. EXPERIENCE AND FEEDBACK VIA UNOLS POST CRUISE ASSESMENT FORM

The Post Cruise Assessment of the research cruise is part of a program to evaluate how well vessels and personnel of the academic research fleet are supporting the scientific objectives of the research community, and to identify areas that may need better support or guidance to improve the success of future projects. This Assessment should be filled out by the Captain, Tech in Charge and PI/Co PI for each Cruise. Any other crew member or science party member is welcome to fill out an assessment form as they see fit.

Information provided in this form will be used by:

- Operating Institutions, Ship's Crew, and Technical Support Personnel
 - To make improvements to equipment and procedures on their vessels.
- UNOLS Office
 - To track the overall performance of the academic research fleet.
- Funding Agencies
 - To assess areas that requires more attention.
- Yourself
 - To make constructive suggestions for improvement that will benefit future research projects for yourself and your colleagues and to let ship operators know what they are doing well.

The Technical Service Manager and Marine Operations Manger will evaluate all feedback. Personnel and/or personnel involved in operations affected by the feedback might be contacted to ensure that the feedback is understood correctly.

Based on the feedback given and evaluation and control performed conclusions for improvements are made. Details of improvements found necessary will be passed back to involved personnel and/or Client. The Technical Service Manager or Marine Operations is responsible for activation of the improvements.