CENTER FOR MARINE RESOURCES AND ENVIRONMENTAL TECHNOLOGY

ACTIVITIES REPORT FOR THE CRUISE GOM1-06-MC118 ABOARD THE *R/V PELICAN*

MISSISSIPPI CANYON FEDERAL LEASE BLOCK 118
NORTHERN GULF OF MEXICO

March 1-7, 2006

OPERATIONS REPORT AND EVENT LOG OF CRUISE GOM1-06-MC118 WHICH ATTEMPTED TO ACQUIRE SEISMIC REFLECTION PROFILES ACROSS THE MOUND IN MC118 USING THE SURFACE-SOURCE-DEEP-RECEIVER (SSDR) TECHNIQUE

By

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INTRODUCTION

Prior to the cruise, two new deep-tow hydrophone arrays, each consisting of a ultra-low noise preamplifier and six hydrophone elements, were constructed and a new triple-armored fiber-optic/electrical-conductor cable was purchased. The cable is intended to deep-tow the SSDR receiver as well as to provide eventual operations capability for the station service device (SSD) and the shear sled. It has a 12,000 pound working load, a coaxial electrical pair and one central single-mode fiber-optic conductor. Its heavy-lift capability will facilitate deployment of battery packs and other components associated with the sea-floor observatory.

The cable was tension wound on a removable winch spool on the R/V Pelican. Installing the 3,000-meter cable on the winch spool presented a challenge because the winch manufacturer was unavailable to tension-load the cable and standard cable tension winders were inadequate for the job. MMRI personnel constructed a tensioning device and wound the cable on the R/V Pelican winch spool. The last 460 meters of the cable were faired for use in the deep-tow geophysical operations.

The wet end of the cable was terminated onboard ship at dockside. The two-part termination included a custom mechanical termination and pressure-compensated electrical termination. Since the underwater fiber-optic termination was not yet ready, the fiber-optic element was prepared but not connected inside the pressure-compensated termination housing.

The dry end of the cable was terminated at sea while underway to the survey site. After arrival at MC118, the ultra-short baseline (USBL) system was installed and calibrated by deploying a bottom-moored USBL pinger. Following the calibration of the USBL system and recovery of the USBL pinger, the pinger was installed on one of the deep-tow hydrophone arrays.

SSDR profiling commenced after USBL calibration. The source for the SSDR system is an 80 in^3 water-gun that requires a shipboard air-compressor to expel the water from the chamber. Fewer days were available for profiling due to the time required at the start of the cruise to terminate the cable and air-compressor failure at the end of the cruise.

SCIENTIFIC STAFF

Tom McGee – Chief Scientist, CMRET
Leonardo Macelloni – Scientist, CMRET
Brad Battista – Ph.D. Student, University of South Carolina
Max Woolsey – Master's Student in electrical engineering, University of Mississippi
Lorenzo Bennett – Master's Student in electrical engineering, University of Mississippi
Brian Noakes – Chief Technician, CMRET
Matt Lowe – Mechanical Technician, CMRET
Andy Gossett – Data Acquisition Technician, CMRET
Paul Higley – Chief Contractor, Specialty Devices, Inc.
Scott Sharpe – Contractor, Specialty Devices, Inc.

EVENT LOG

1 Mar 10:30 – Leo, Max, Lorenzo leave Oxford in van with Andy's gear.
10:50 – Pickup Tom at Crossroads.
16:15 – Pickup Brad at New Orleans airport.
18:50 – Arrive Cocodrie and meet Brian, Matt, Andy onboard *Pelican*.
22:00 – Paul and Scott arrive.

2 Mar 08:00 – Begin setting up onboard and terminating wet end of cable.
20:30 – Ship ready and wet end terminated.
20:50 – RV *Pelican* leaves dock.

3 Mar 08:00 – Begin terminating dry end of cable.
13:15 – Arrive MC118.
14:00 – Deploy USBL shipboard unit.
14:15 – No way to align USBL head with vessel centerline (mark painted over).
14:30 – Deploy USBL calibration buoy. E352738, N3193196.

15:15 – Communication established between buoy and shipboard unit.
17:00 – Calibration complete. Results poor. Relative errors: 25m in x, 12m in y.
17:15 – Learn ship's heading is being supplied by compass rather than gyro.
17:30 – Decide to leave buoy in overnight to try to improve calibration.
19:00 – Check heave compensation measurements and find errors.
19:30 – Correct errors and begin new calibration run.
21:00 – Complete new calibration run with only minor improvement.
21:30 – Run line to compare GPS heading with compass heading.
22:00 – Found 14^{o} difference, perhaps compass needs to be swung.
22:30 – Enter difference in USBL software and begin another calibration run.
24:00 – Calibration run complete, little improvement in error.

4 Mar 02:00 – Decide the main problem lies with compass error in ship's heading.
08:00 – Trying to change from compass to gyro.
09:30 – Found bad ground connection but gyro output still not good.
10:00 – Run circle to swing compass and reduce deviation. No improvement.
10:30 – Manually swing compass without improvement.
11:00 – Satellite compass onboard but format wrong for direct use with USBL.
11:30 – Writing software to modify satellite compass output for USBL input.
12:00 – Casting for speed of sound profile near mound.
13:00 – Cast complete.
15:00 – Working on format software.
21:00 – Software complete.
21:30 – Begin calibration run.
23:00 – Run complete. Calibration good: 0.8m in x, 0.7m in y.

5 Mar 07:00 – Preparing to release calibration buoy.
07:40 – Buoy on way up.
08:10 – Calibration buoy onboard.
08:20 – Preparing SSDR system for deployment.
09:30 – Start firing on first practice line w/o deep-tow deployed (shots@20m).
11:00 – Complete 400m test of deep-tow termination w/o hydrophone.
12:45 – Hydrophone array in the water.
14:00 – Begin line 26, FFID 1, E-to-W, 20m/shot.
14:30 – End line 26, FFID 177, with no good recordings and a lot of noise.
14:55 – Begin line 44, FFID 178, W –to-E, 30m/shot.
15:00 – Compressor down 7 shots into line 44. One bottle of air left.
15:05 – Suspend shooting to save air until analysis of last 7 shots.
15:30 – Compressor apart. Main shaft damaged but able to continue carefully.
15:45 – Bottles charged and compressor off.
15:30 – Called Vaughn. May need to use analog trigger and shoot on time.
16:30 – Noise is 60Hz, 32kHz (USBL) and 600Hz (computer power supplies?).
17:00 – Begin line 42, FFID 234, W-E, 30m/shot.
17:15 – TTL pulse too noisy to shoot on distance, change to analogue shot phone.
17:30 – Stop shooting and pull up array to increase preamp gain from 14 to 28db.
17:40 – Much noise on signals from both array and shot phone.
18:30 – Array noise traced to faulty BNC connector onboard.
19:00 – Array redeployed.

19:40 – Still no clear signal on shot phone. Source brought onboard.
21:45 – Shot phone good but cable has low resistance (6 meg-ohms) when open.
22:00 – Replacing shot phone key with signal generator triggered by key pulse.
22:15 – Signal generator cannot be triggered.
22:45 – Can shoot on time but cannot log GPS for each shot.
22:50 – Source back in water.
23:00 – Shooting line segments with GPS at beginning and end to get some data.

6 Mar 00:40 – Begin line 32, FFID 471, W-E, 9sec/shot.
00:50 – West end of line 32 clipped.
00:55 – (approx time) slow down. LGC FFID641=HyPac FFID646.
01:00 – End line 32. LGC FFID693=HyPac FFID701.
01:22 – Begin line 38, FFID701, E-W, 9sec/shot.
02:00 – End line 38, LGC FFID969=HyPac FFID975.
03:00 – Rerun clipped portion of line 32, FFID977, W-E, 9sec/shot.
03:25 – End rerun line 32, FFID1202.
04:10 – Begin central part of line 27, FFID1203, S-N, 9sec/shot.
04:30 – End central part of line 27, LGC FFID1337=HyPac FFID1337.
04:15 – Begin retrieving equipment.
05:35 – Secure USBL unit.
05:45 – Depart MC118.
20:00 – Arrive Cocodrie.

7 Mar 07:30 – Load van.
08:30 – Depart Cocodrie.
10:30 – Drop off Brad at New Orleans airport.
16:10 – Drop off Tom at crossroads.
16:45 – Arrive Oxford.

CONCLUSIONS

Due to the many problems encountered (see event log), seismic data collection was disappointing. In fact, no seismic profile was completed satisfactorily. Therefore it was concluded that several items required attention before further SSDR profiling could be attempted. These were:

Repair gyro onboard *Pelican.*
Align USBL with hull centerline and mark clearly.
Increase update rate on tail buoy GPS.
Rebuild compressor.
Replace shot phone line.
Install speaker in signal line for noise identification.
Contact National Instruments about shooting on distance.
Lookout software should log GPS time and coordinates (ship, source, receiver).
Lookout screen should display a clipping indicator.
Lookout software should log clipped FFIDs in a file.