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CRUISE REPORT

TO: Dr. Arthur E. Maxwell

FROM: Bill O'Brien, Chief Scientist *OB*

CRUISE: OBS/TUNED ARRAY EXPERIMENT - MISSISSIPPI CANYON
9-12 October, 1984

The UTIG OBS group recently completed a seismic experiment in the Mississippi Canyon area of the Gulf of Mexico using a tuned array as the energy source. All OBS operations were conducted from the M/V ROBIN, an offshore survey and supply vessel, and the tuned airgun array (6 strings of guns with 6 guns per string for a total volume of 5754 cubic inches all operating at 2000 psi at a nominal depth of 9.1 m) was towed by the GEKO Longeva.

Seven OBS were deployed all within 1.5 km of the midpoint of a 40 km line that ran approximately N-S (see map) with 5 OBS located on the line and 2 OBS located 1.5 km on either side of the line at the midpoint; the water depth along the line was about 1.5 km, and the line was shot from north to south. Coordinates of the OBS deployment and recovery points and the endpoints of the line are given in Table 1. Four OBS were configured with 3-component geophones (2 units with fixed 10 Hz geophones and 2 units with new self-leveling 4-1/2 Hz geophones), one OBS recorded data from a hydrophone as well as from a 4.5 Hz vertical geophone and the 2 off-line OBS each had a single 4.5 Hz vertical geophone. All 7 OBS were programmed to sample data at about 250 sample/sec (4.032 ms sample interval); these and other instrument details are summarized in Table 2.

Navigation was provided by a contract navigator (Offshore Navigation Inc.) using a Microphase system that we calibrated at three offshore platforms (see Table 3).

The seven OBS deployments and recoveries proceeded smoothly on schedule, but we found that the four 3-component OBS all

malfunctioned while on the bottom and failed to record useful data even though they all functioned perfectly in the lab both before and after the deployments. This type of inexplicable failure has occurred on the three previous cruises but never with these particular four units. OBS 1 recorded only the first shot, OBS 2 and OBS 4 recorded no shots and OBS 3 recorded 63 traces of information at incorrect times. The 2-component unit, OBS 6, operated perfectly for the first half of the line and provided us with our first high-quality hydrophone data recorded on the ocean bottom; these records along with geophone data from the same OBS will yield valuable information about OBS-seafloor coupling, geological structure and the nature of the waves arriving at the OBS. The unit then malfunctioned, however, and did not record any data for the second half of the line. The two single-component units, OBS 5 and OBS 7, operated perfectly, recording all the shots as well as a total of 78 records of ambient background noise. Each unit that malfunctioned returned with its main internal clock running but with its external time signal disabled; we noted similar symptoms on earlier cruises for malfunctioning units. It was impossible to reshoot the line because of the very tight schedule of the GEKO Longeva.

The scientific party included Bill O'Brien, Phil Roper, Paul McPherson and Mike Butterfield of UTIG, Yann Hello from ORSTOM in Noumea, New Caledonia, and also included Gary Boucher and Dave Stewart, sponsor personnel.

All ship-related operations proceeded smoothly, and the captain was extremely adept at positioning the boat for OBS deployments and recoveries. The OBS team operated with its usual efficiency, and we were very pleased to have Yann Hello ably assisting in all phases of the OBS operation. About 6 hours before the first OBS deployment, problems developed in the Microphase navigation equipment with a resulting loss of lane count, but the positioning ambiguity was removed by steaming behind the GEKO Longeva and calibrating the Microphase system using information radioed to us by their navigator.

SUMMARY OF ACTIVITIES

7 Oct McPherson and Butterfield flew to New Orleans, picked up the truckload of OBS gear left at the airport by the sponsor's driver and drove to Lockport, La.; they checked out the ship M/V Robin at Bollinger Offshore Boats and began setting up equipment in the lab after repairs were completed on one of the ship's main generators.

8 Oct O'Brien, Roper and Hello flew to New Orleans, met Boucher and Stewart (sponsor personnel) and drove to Lockport, arriving at the M/V Robin around 1600. We started rigging the stern boom for OBS deployments and continued checking out the OBS equipment.

9 Oct Finished modifications of the boom and left the dock at 1320 for the transit down Bayou Lafourche to the Gulf of Mexico. We arrived at the fuel dock in Fourchon at 2315 and tied up for the night after taking on fuel and water.

10 Oct Departed Fourchon about 0940 and were soon in the Gulf with the ship uncomfortably responsive to the choppy seas. Calibration of the Microphase navigation system began at 1015 at platform SH ST 26A, continued at 1505 at platform SHSP 42-1 and ended at 1710 at platform SH MC 194 (see Table 3); we then headed toward the experiment site with seas running 3 to 4 ft off the starboard beam. By 2100 all seven OBS had been turned on and were operating perfectly. About this time the navigator reported trouble with his equipment, and we discussed optional navigation strategies, including using the ship's Loran-C system for finding the deployment sites.

11 Oct Recalibrated the Microphase system with assistance from the GEKO Longeva around 0200 and began OBS deployments at 0336, finishing at 0602. The shooting began precisely at 0800:00 at the north end of the line with shot 1 as planned and proceeded southward, ending at 1233:20 with shot 411. All 7 OBS were recovered on schedule between 1342 and 1839, and we departed the experiment area about 1845 with good weather and seas.

12 Oct Arrived at the dock in Lockport about 1630, loaded the equipment in the truck and departed for New Orleans.

copy: Scientific Party
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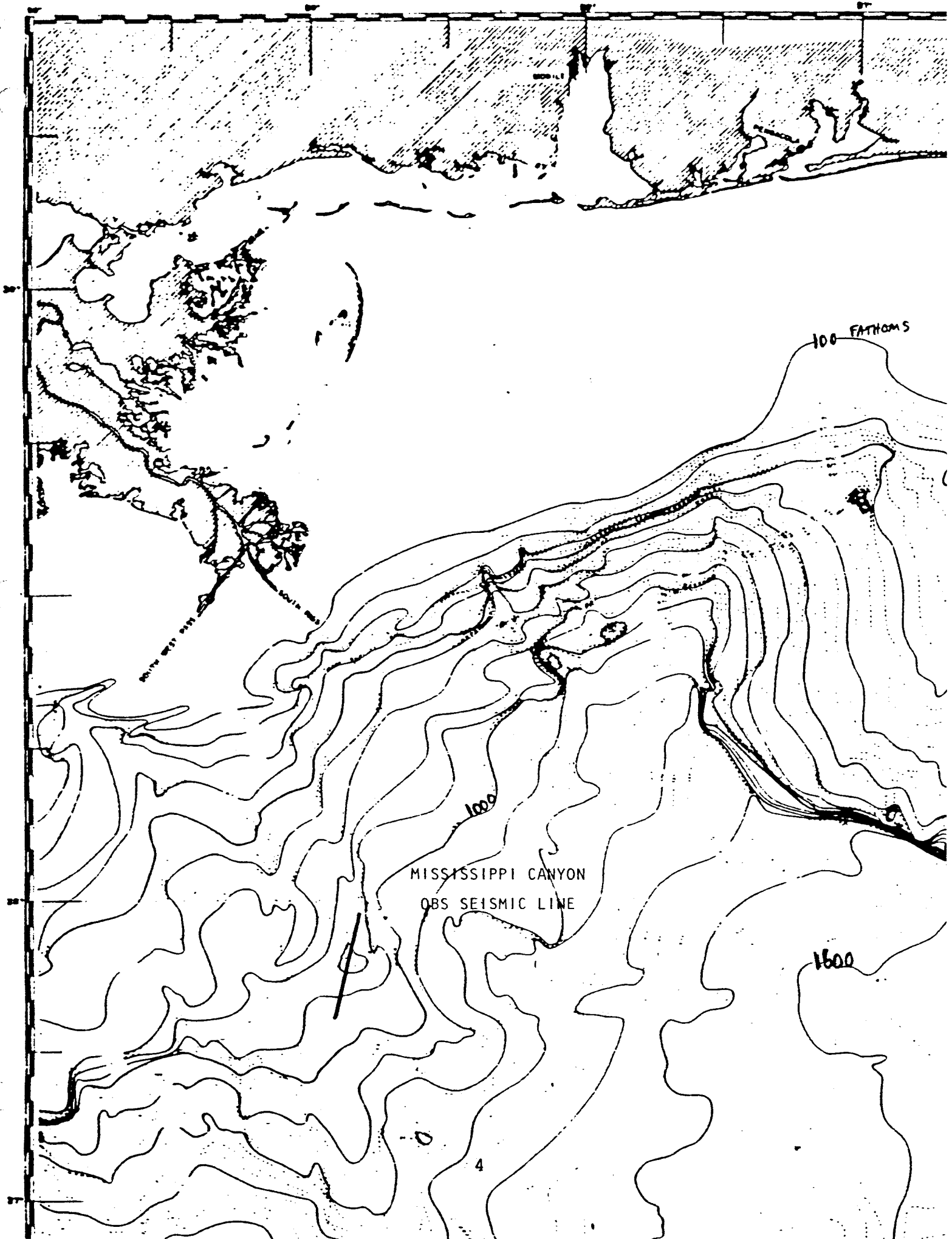


TABLE 1. OBS deployment and recovery coordinates (deg, min, sec) and times (all on 11 Oct) and Loran-C TD's. The coordinates of the endpoints of the seismic line are also shown.

OBS#	DEPLOYMENT	TIME	RECOVERY	TIME
1	27 46 02.40 88 52 34.20 W = 12380.7 X = 28747.9	0336:06	27 45 48.43 88 52 42.38 W = 12380.7 X = 28746.6	1342:07
2	27 46 34.20 88 52 26.40 W = 12381.1 X = 28752.0	0354:35	27 46 20.59 88 52 31.36 W = 12380.9 X = 28750.3	1443:20
3	27 47 06.00 88 52 18.60 W = 12381.8 X = 28756.0	0407:09	27 46 54.83 88 52 18.79 W = 12381.7 X = 28755.2	1535:28
4	27 47 37.80 88 52 10.80 W = 12381.8 X = 28759.9	0414:44	27 47 26.44 88 52 10.16 W = 12382.2 X = 28759.2	1624:23
5	27 46 39.60 88 51 29.40 W = 12387.2 X = 28761.2	0543:55	27 46 29.10 88 51 29.59 W = 12387.6 X = 28760.6	1707:19
6	27 46 49.80 88 52 22.80 W = 12381.3 X = 28753.8	0554:28	27 46 36.79 88 52 21.58 W = 12381.8 X = 28753.2	1751:07
7	27 47 00.60 88 53 16.20 W = 12375.3 X = 28746.6	0602:48	27 46 49.34 88 53 15.48 W = 12375.7 X = 28746.0	1838:24
North end of line:		27 57 33.6 N	88 49 43.6 W	
South end of line:		27 35 53.3 N	88 55 03.6 W	

TABLE 2. Summary of source and detector characteristics, shooting and recording schedules and record lengths.

Signal Source: 36-gun tuned array of the GEKO Longeva:
 5754 cubic inches at 2000 psi at a
 nominal depth of 9.1 m

Detectors:

OBS 1 & OBS 2: 3-component 10 Hz units
 OBS 3 & OBS 4: 3-component self-leveling 4.5 Hz units
 OBS 5 & OBS 7: 1-component (4.5 Hz vertical) units
 OBS/OBH 6: 2-component (hydrophone, 4.5 Hz vertical) unit

Shooting Schedule:

shots 1-406: from 0800:00 to 1230:00 on 11 Oct
 shot interval: 40.000 sec (exact)
 ship velocity: 4.86 knots at 192 degrees
 shot spacing: 100 m (approximate)

Recording Schedule:

OBS #	Shots	From	To	Interval
1,2,	1-205	00/0800:05	00/1015:58.200	40 - 2/60
5,7	206-406	00/1016:38	01/1230:04.667	40 + 2/60
	1-50	01/1230:40	01/1303:20.000	40
3	1-195	00/0800:05	00/1009:18.533	40 - 2/60
	196-406	00/1009:58	01/1230:05.000	40 + 2/60
	1-50	01/1230:40	01/1303:20.000	40
4	1-185	00/0800:04	00/1002:37.867	40 - 2/60
	186-406	00/1003:18	01/1230:05.333	40 + 2/60
	1-50	01/1230:40	01/1303:20.000	40

406 data records (3 blocks each) for each OBS
 50 noise records (3 blocks each) for each OBS
 sample interval = 4.032 ms (for all OBS)
 OBS 1 - OBS 4: 8.225 sec records (3 channels)
 OBS 6: 12.338 " " (2 ")
 OBS 5 & OBS 7: 24.676 " " (1 ")

TABLE 3. Coordinates (deg, min, sec) and Loran-C TD's of the three offshore platforms used as calibration points for the Microphase navigation system.

Shell SH ST 26A (South Timbalier area)

28 59 07.610 N
90 09 42.013 W
W = 11716.4
X = 28353.2

SHSP 42-1

28 54 56.522 N
89 22 19.912 W
W = 12069.8
X = 28806.2

Shell SH - COGNAC - MC - 194

28 47 28.760 N
89 03 22.682 W
W = 12230.2
X = 28956.0