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MEMORANDUM

December 19, 1983

TO: Dr. Arthur E. Maxwell
FROM: Yosio Nakamura *YN*
RE: Cruise Report - FM 20-02

The R/V Fred H. Moore cruise FM 20-02 for the OBS portion of the ESPLASSOBS (Expanding Spread Profiling, Large Aperture Swath Shooting and Ocean Bottom Seismometer) experiment in the Gulf of Mexico took place on 27 November through 4 December, 1983. The primary objective of the cruise was to collect OBS refraction data from the four lines that were covered earlier by the two-ship ESP during the cruise FM 20-01. In addition to the OBS data, multichannel reflection data from a 6-channel streamer and sonobuoys were also acquired for the same lines. Also performed during the cruise were the reformatting and copying of multichannel data tapes from the preceding cruise FM 20-01 using the ship-board computer.

The cruise went smoothly and well, due mainly to the highly commendable performance of both the crew of the ship and of the members of the scientific and engineering support group, who gave up a part of their Thanksgiving holiday for this cruise. The fine weather throughout the cruise, with a steady 3 to 5 foot sea except for a brief period of 5 to 7 foot sea on 2-3 December, helped us to complete the cruise as planned. A total of 16 OBS deployments were made at planned locations, and all were recovered successfully on time.

The following personnel participated in the scientific party:

Chief Scientist:	Yosio Nakamura
OBS Operation:	Paul McPherson, Bill O'Brien
OBS Trainees:	Chris Bennett, Subir Chatterjee, Joe Ebeniro
Navigation:	Patty Ganey, Julie McEuen, Dale Sawyer
Multichannel/Electronics:	Ken Griffiths, Sterling Gilfillan
General Scientific (Mostly Tape Processing):	Tom Davies
Airgun Operation:	Oscar Febres-Cordero, George Pearcy

A copy of the pre-cruise test plan, which was followed very closely without difficulty and sometimes ahead of schedule, is attached. A summary of activities during the cruise follows: (Please see also Ken Griffiths' report on the multichannel work.)

Sunday, November 27

12:00 Left Galveston
16:00 Conducted a fire drill

Monday, November 28

04:34:35 Deployed OBS No. 1 for line 4 at 26°57.33'N, 93°20.70'W (all geographic coordinates are those indicated by the Northstar 6000 LORAN-C receiver located in the ship's laboratory); LORAN-C TD's: TDW=11376.9, TDX=25891.9; depth=694 fms
06:01:30 Deployed OBS No. 2 for line 4 at 26°50.46'N, 93°28.86'W; TDW=11375.7, TDX=25783.3; depth=728 fms
08:38:20 Deployed OBS No. 3 for line 4 at 26°34.86'N, 93°46.99'W; TDW=11373.8, TDX=25543.8; depth=780 fms
09:46:54 Deployed OBS No. 4 for line 4 at 26°27.87'N, 93°55.10'W; TDW=11372.9, TDX=25438.6; depth=876 fms
10:13-11:29 Deployed 6-channel streamer
13:00-14:00 Deployed two 2000 cubic inch air guns, towed at about 35 foot depth and tested
13:15-13:27 Lost both engines of the ship
14:00:01 Started shooting line 4 at 26°26.54'N, 93°55.93'W; TDW=11374.0, TDX=25425.8, cruising at about 5 knots and shooting both guns simultaneously at 2000 psi and at 30 second intervals, or approximately every 77 m
14:10 Port air gun developed an air leak, and had to be retrieved for a repair
15:10 Deployed sonobouy No. 1
16:29 Replaced the air hose on the port air gun; slowed down for redeployment of the air gun
16:33 Port engine was out of gear for a short duration
17:30 Port air gun was back in operation
18:37 Deployed sonobouy No. 2
22:40 Reached the end of the primary line; slowed down to about 4 knots, reducing the shot intervals to approximately 62 m
22:50 Starboard air gun went bad; shot the remainder of the line with the port gun only

Tuesday, November 29

00:00:01 Completed the last shot of line 4 at 27°01.63'N, 93°15.39'W; TDW=11378.2, TDX=25962.3
00:00-00:15 Retrieved port air gun
00:40-01:10 Retrieved streamer

Tuesday, November 29 (Cont'd)

02:31 Sighted OBS No. 1
02:42 Recovered OBS No. 1 at 26°57.12'N, 93°20.10'W; TDW=11378.6, TDX=25897.3; data recorded as programmed
04:00 Sighted OBS No. 2
04:08 Recovered OBS No. 2 at 26°50.34'N, 93°28.34'W; TDW=11376.8, TDX=25787.9; data recorded as programmed
07:01 Sighted OBS No. 3
07:09 Recovered OBS No. 3 at 26°35.00'N, 93°46.72'W; TDW=11373.9, TDX=25547.1; no data recorded
08:37 Sighted OBS No. 4
08:45 Recovered OBS No. 4 at 26°28.20'N, 93°54.92'W; TDW=11372.6, TDX=25441.4; data recorded as programmed
14:25 Deployed OBS No. 1 for line 5 at 25°59.83'N, 93°07.59'W; TDW=11523.5, TDX=25835.4; depth=1681 fms
15:37:30 Deployed OBS No. 2 for line 5 at 25°59.76'N, 93°18.65'W; TDW=11499.0, TDX=25725.2; depth=1673 fms
18:03:30 Deployed OBS No. 3 for line 5 at 25°59.73'N, 93°43.66'W; TDW=11447.7, TDX=25474.8; depth=1675 fms
19:27 Deployed OBS No. 4 for line 5 at 25°59.61'N, 93°54.74'W; TDW=11426.9, TDX=25363.0; depth=1681 fms
20:33-21:36 Deployed 6-channel streamer
23:00-24:00 Deployed both air guns and tested

Wednesday, November 30

00:00:02 Began line 5 shooting at 25°59.76'N, 93°55.68'W; TDW=11425.0, TDX=25354.0, cruising at 5 knots
00:15 Deployed sonobouy No. 3
03:11 Deployed sonobouy No. 4
04:07 Starboard air gun developed air leak; slowed down to retrieve it for repair
05:08 Starboard air gun repaired; slowed down to redeploy it
06:34 Deployed a sonobouy, but it was found to be weak
07:11 Deployed sonobouy No. 5
08:56 Reached to end of the primary line; slowed down to about 4 knots for the extension line
10:00:02 Completed the last shot of line 5 at 25°59.96'N, 93°01.41'W; TDW=11537.5, TDX=25897.3
10:05-10:25 Retrieved air guns
10:33-10:53 Retrieved streamer
12:39 Sighted OBS No. 1
12:49 Recovered OBS No. 1 at 25°59.46'N, 93°08.06'W; TDW=11523.2, TDX=25829.7; data recorded as programmed
13:57 Sighted OBS No. 2
14:06 Recovered OBS No. 2 at 25°59.51'N, 93°19.09'W; TDW=11498.5, TDX=25270.0; data recorded as programmed
17:07 Sighted OBS No. 3

Wednesday, November 30 (Cont'd)

17:13 Recovered OBS No. 3 at 25°59.63'N, 93°43.76'W; TDW=11447.7, TDX=25473.4; no data recorded
18:34 Sighted OBS No. 4
18:40 Recovered OBS No. 4 at 26°00.02'N, 93°54.83'W; TDW=11426.0, TDX=25363.2; data recorded as programmed

Thursday, December 1

04:53:56 Deployed OBS No. 1 for line 3 at 26°50.62'N, 94°25.57'W; TDW=11282.3, TDX=25200.2; depth=702 fms
05:59:26 Deployed OBS No. 2 for line 3 at 26°53.53'N, 94°36.26'W; TDW=11222.7, TDX=24872.2; depth=772 fms
* 10:11:49 Deployed OBS No. 4 for line 3 at 27°02.61'N, 95°11.15'W; TDW=11206.9, TDX=24773.2; depth=730 fms
10:30-11:30 Deployed streamer
13:15-13:34 Deployed air guns
14:00:02 Began line 3 shooting at 27°02.57'N, 95°11.49'W; TDW=11206.6, TDX=24769.6
14:14 Deployed sonobouy No. 6
16:55 Deployed sonobouy No. 7 - dud
17:00 Deployed sonobouy No. 8 - dud
17:10 Deployed sonobouy No. 9
18:52 Deployed sonobouy No. 10
23:21 Port gun stopped firing
23:27 Started pulling port gun out of water
23:28 Port gun started firing

Friday, December 2

00:00:02 Completed last shot of line 3 at 26°49.12'N, 94°19.66'W; TDW=11293.5, TDX=25256.2
00:05-00:20 Retrieved air guns
00:20-00:58 Retrieved streamer
02:29 Sighted OBS No. 1
02:38 Recovered OBS No. 1 at 26°50.99'N, 94°25.45'W; TDW=11281.8, TDX=25202.9; data recorded as programmed
04:00 Sighted OBS No. 2
04:07 Recovered OBS No. 2 at 26°53.86'N, 94°36.21'W; TDW=11262.1, TDX=25101.8; data recorded as programmed
07:01 Sighted OBS No. 3
07:06 Recovered OBS No. 3 at 26°59.92'N, 95°00.62'W; TDW=11222.4, TDX=25871.7; data recorded as programmed
08:37 Sighted OBS No. 4
08:42 Recovered OBS No. 4 at 27°02.73'N, 95°11.24'W; TDW=11206.6, TDX=24772.8; data recorded as programmed
14:27:54 Deployed OBS No. 1 for line 2 at 27°46.56'N, 95°13.91'W; TDW=11136.6, TDX=24949.0; depth=142 fms
* 08:36:48 Deployed OBS No. 3 for line 3 at 26°59.83'N, 95°00.54'W; TDW=11222.7, TDX=24872.2; depth=772 fms

Friday, December 2 (Cont'd)

15:52:27 Deployed OBS No. 2 for line 2 at 27°46.56'N, 95°13.91'W; TDW=11144.4, TDX=25064.7; depth=195 fms
19:15:00 Deployed OBS No. 3 for line 2 at 27°48.83'N, 94°37.30'W; TDW=11164.6, TDX=25326.8; depth=193 fms
21:07:40 Deployed OBS No. 4 for line 2 at 27°49.47'N, 94°25.97'W; TDW=11174.9, TDX=25444.2; depth=146 fms
21:34-22:00 Deployed streamer
23:15- Deployed air guns

Saturday, December 3

00:00:02 Began line 2 shooting at 27°49.58'N, 94°22.27'W; TDW=11178.6, TDX=25481.9
00:06 Deployed sonobouy No. 11
02:43 Deployed sonobouy No. 12
05:51 Deployed sonobouy No. 13
09:06 Reached end of primary line; slowed down to 4 knots for extension line
10:00:02 Completed line 2 shooting at 27°46.21', 95°19.46'W; TDW=11132.8, TDX=24892.1
10:04-10:15 Retrieved air guns
10:20- Retrieved streamer
12:26 Sighted OBS No. 1
12:33 Recovered OBS No. 1 at 27°46.60'N, 95°13.76'W; TDW=11136.6, TDX=24950.7; data recorded as programmed
13:56 Sighted OBS No. 2
14:03 Recovered OBS No. 2 at 27°47.26'N, 95°02.51'W; TDW=11144.6, TDX=25066.2; no data recorded
16:58 Sighted OBS No. 3
17:03 Recovered OBS No. 3 at 27°48.86'N, 94°37.20'W; TDW=11164.7, TDX=25328.0; data recorded as programmed
18:23:30 Sighted OBS No. 4
18:30 Recovered OBS No. 4 at 27°49.44'N, 94°25.84'W; TDW=11175.2, TDX=25445.4; data recorded as programmed

Sunday, December 4

06:30 Returned to Galveston

The cruise was generally quite successful. As usual, the navigation team maintained excellent ship tracks, certain air gun problems on the earlier lines were quickly solved, and we obtained good quality refraction data from 13 of the 16 OBS deployments. Everybody involved in the cruise, especially including those who worked hard during the Thanksgiving holiday week on the preparation for the cruise, should be highly commended for the success.

There were a few problems which surfaced during this experiment:

- (1) Three OBS's, which worked perfectly in the laboratory environment, did not function properly in the cold environment of the deep ocean floor. Re-examination of low-temperature performance of some key components of the OBS system and a low-temperature testing of OBS's may be required to prevent further failures.
- (2) A failure to process a purchase order expeditiously through the University channels forced us to shorten the data acquisition from 6 of the 16 deployed OBS's because of the shortage of proper recording tapes. We definitely need some improvement in this area.
- (3) Deploying OBS's from the stern of the ship is not only difficult but also dangerous to both our personnel and to the OBS even in not so heavy sea conditions. We need to work out a better deployment method.
- (4) LORAN-C worked well for navigating to retrace earlier ESP lines. However, a calibration of LORAN-C by satellite fixes to obtain absolute locations appears to be successful only on line 2, which was the shallowest of the four lines and the doppler sonar was probably able to track the water bottom. Further work is needed to solve this problem.

YN:km

Copy: Scientific Party
Research Scientists and Research Associates
Phil Roper
Archie Roberts
Bill Mitchell
Bruce Collins
Dave Canham
Eleanor Picard
Ann Ginder

OBS EXPERIMENT PLAN

Dates: November 27 - December 4, 1983 (Sunday-Sunday)

Lines: Line 2: 27°49.54'N, 94°24.63'W to 27°46.20'N, 95°19.83'W
 Line 3: 27° 3.04'N, 95°12.57'W to 26°49.09'N, 94°19.94'W
 Line 4: 26°27.05'N, 93°56.08'W to 27° 1.02'N, 93°16.48'W
 Line 5: 25°59.58'N, 93°56.11'W to 25°59.91'N, 93° 1.73'W

Each line consists of a 45 nm (83 km) primary line and a 4 nm (7 km) extension. Coordinates given are for Northstar 6000.

OBS's on Each Line: Four OBS's, 4.5 Hz vertical, at 1.25, 11.25, 33.75 and 43.75 nm (2.32, 20.84, 62.51 and 81.03 km) from one end of the line.

Ship Schedule: (R/V Fred H. Moore)

Nov. 27	12:00	Depart from Galveston	
Nov. 28	05:30	Start Line 4	(156 nm from seabouy)
Nov. 29	09:00	End Line 4	
	15:30	Start Line 5	(51 nm from Line 4)
Nov. 30	19:00	End Line 5	
Dec. 1	05:30	Start Line 3	(57 nm from Line 5)
Dec. 2	09:00	End Line 3	
	15:30	Start Line 2	(44 nm from Line 3)
Dec. 3	19:00	End Line 2	
Dec. 4	05:00	Return to Galveston	(89 nm to seabouy)

Detailed Schedule for Each Line:

<u>Lines 4 & 3</u>	<u>Lines 5 & 2</u>	<u>Activity</u>	
05:30-06:00	15:30-16:00	Deploy OBS #1	
07:00-07:30	17:00-17:30	Deploy OBS #2	(10 nm from OBS #1)
10:00-10:30	20:00-20:30	Deploy OBS #3	(22.5 nm from OBS #2)
11:30-12:00	21:30-22:00	Deploy OBS #4	(10 nm from OBS #3)
12:00-13:00	22:00-23:00	Deploy Streamer	
13:00-13:30	23:00-23:30	Make a Wide 180° Turn	
13:30-14:00	23:30-24:00	Deploy and Test Air Guns	
14:00-23:00	00:00-09:00	Shoot Primary Line	(45 nm @ 5 knots)
23:00-24:00	09:00-10:00	Shoot Extension Line	(4 nm @ 4 knots)
00:00-00:30	10:00-10:30	Retrieve Air Guns	

00:30-01:00	10:30-11:00	Make a Wide 180° Turn
01:00-02:00	11:00-12:00	Retrieve Streamer
02:30-03:00	12:30-13:00	Recover OBS #1
04:00-04:30	14:00-14:30	Recover OBS #2
07:00-07:30	17:00-17:30	Recover OBS #3
08:30-09:00	18:30-19:00	Recover OBS #4

Shooting Schedule:

<u>Line</u>	<u>Shot Nos.</u>	<u>Time</u>	<u>Interval</u>
4 & 3	1-1201	14:00:00 - 24:00:00	30 sec
5 & 2	1-1201	00:00:00 - 10:00:00	30 sec

Recording Schedule:

<u>OBS #</u>	<u>Shot Nos.</u>	<u>Record Start Time</u>		<u>Interval</u>
		<u>Lines 4 & 3</u>	<u>Lines 5 & 2</u>	
1	1- 420	14:00:10-17:29:40	00:00:10-03:29:40	30 sec
	421-1080	17:30:10-22:59:29	03:30:10-08:59:29	30-1/60
	1081-1201	23:00:00-00:00:02	09:00:00-10:00:02	30+1/60
2	1- 180	14:00:10-15:29:40	00:00:10-01:29:40	30
	181- 840	15:30:10-20:59:29	01:30:10-06:59:29	30-1/60
	841-1201	21:00:00-00:00:06	07:00:00-10:00:06	30+1/60
3	1- 360	14:00:00-16:59:30	00:00:00-02:59:30	30 *
	361-1201	17:00:00-00:00:14	03:00:00-10:00:14	30+1/60
4	1- 120	14:00:00-14:59:30	00:00:00-00:59:30	30
	121-1201	15:00:00-00:00:18	01:00:00-10:00:18	30+1/60

*If 450 ft tape, use the following:

181- 360	15:30:00-16:59:30	01:30:00-02:59:30	30
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Sampling Interval: 10.008 msec

Record Length: 20.4 sec

