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CRUISE REPORT

Ship Name: CONRAD   Cruise No: 1906

Departure: 24 Jan. 1976 (Date) from New York (Port)

Arrival: 23 Feb. 1976 (Date) at San Juan (Port)

Days at Sea: 30   Days Foreign Port: 4 (No. of days in arrival port)

Area of Operation: Western North Atlantic

Program Description: Acoustics and Near-Bottom Processes

Participants: (All L-DGO unless otherwise specified)

1. Bryan, George	L-DGO	Co-Chief Sci.
2. Tucholke, Brian	L-DGO	Co-Chief Sci.
3. Shirley, Don	U. Texas, Austin	Visiting Sci.
4. Kostecki, John	L-DGO	Sedimentologist
5. Roth, Mark	"	Core Describer
6. Crowell, Bruce	"	E.T.
7. Iltzsche, Martin	"	Airgun Tech.
8. Kelly, Wayne	"	Gravity Tech.
9. Boardman, Peter	"	Gravity Tech.
10. Mattson, John	"	Core Bos'n.
11. Holland, Michael	"	Cameraman

All inquiries regarding cruise should be made to the chief scientist.

General Synthesis and Data Acquisition

Conrad departed Brooklyn Navy Yard at 1500 hours on 24 January 1976 to conduct investigations on acoustics and near-bottom processes in the Western North Atlantic Ocean and arrived in San Juan at 0800 hours on 23 February 1976 having substantially accomplished all objectives despite recurrent equipment failures. Gear was streamed at 1230 hours on 25 January when weather and sea-state had somewhat abated, and a profiler line was run to connect Joides Sites 105, 387 and 386 for acoustic-stratigraphic studies. Two sonobuoy runs were made over each of the last two sites to amplify reflector/drilling correlations. The first piston core was obtained on the western Bermuda Rise in the V2609 detailed survey area around Joides Sites 6 and 7. This core was taken from a red clay area which showed a reflective bottom but no subbottoms in 3.5 kHz records; velocity probe measurements on the core revealed monotonically increasing velocities with depth in core at a gradient of about 1.3 sec^{-1}. Although we had planned to take two more cores at this location, we opted to proceed to the southwestern Bermuda Rise to take advantage of better weather conditions and provide time to evaluate and, hopefully, repair the malfunctioning water brake on the coring winch.

We subsequently occupied "acoustic" stations on 1) the southwestern Bermuda Rise (near 26°N, 70°W) where we obtained four piston cores, one hydrophone-pinger series, two camera-nephelometer lowerings, two sonobuoys, one bottom-temperature measurement, and two surface-plankton tows; 2) the northwestern Greater Antilles Outer Ridge (near 24°N, 69°W) where we obtained three piston cores, one hydrophone-pinger series, two camera nephelometer lowerings, two sonobuoys and one surface-plankton tow; 3) the proximal Nares Abyssal Plain (near 23°N, 66°W) where we obtained four piston cores (and one unsuccessful box core), one hydrophone-pinger series, two camera-nephelometer lowerings and two sonobuoys; 4) the distal Nares Abyssal Plain (near 24°N, 60°W) where we obtained one dual-barrel gravity core, three hydrophone-pinger series, and one camera-nephelometer run; and 5) the eastern Greater Antilles Outer Ridge (near 22°N, 66°W) where we obtained one dual-barrel gravity core, two hydrophone-pinger series, one camera-nephelometer and two sonobuoys. Sonobuoys were not run on the distal Nares Abyssal Plain because of the irregular basement and thin sediment cover. In total, eleven of the piston cores and the two dual-barrel gravity cores were subjected to detailed laboratory measurements of velocity and to physical properties sampling for shore-lab analysis. For nine piston cores, D. Shirley (U. Texas-Austin) obtained correlative velocity information with the ARL nose-cone velocimeter. The dual-barrel gravity corer was constructed aboard the ship and used on the hydrowinch at the last two acoustic stations after the coring winch failed.

In addition to these station operations, acoustic surveys were conducted for acoustic stratigraphic purposes at the following locations: 1) southwestern Bermuda Rise (3.5 and 12 kHz, profiler), 2) proximal Nares Abyssal Plain (3.5 and 12 kHz, brief survey), 3) distal Nares Abyssal Plain (3.5 and 12 kHz, profiler).

Following completion of the final "acoustic station" we proceeded to about 21°N, 67°W on the Antilles Outer Ridge where earlier geophysical studies indicated the presence of shallow mantle which might be detected in long-range sonobuoys. At this location we tested an SSQ-41 sonobuoy with a special adaptive battery pack provided by H. Van Santford. The buoy failed after about 10 minutes, and an SSQ-57 buoy was subsequently launched which performed adequately but failed to record a mantle refraction.

From this location, a N-S profile was recorded at about 5 kts across the Puerto Rico Trench near 67°30'W, and three crossings of Mona Canyon (two at about 5 kts) were obtained before proceeding into San Juan. The standard profiling speed during the entire cruise was limited to about 7-7.5 kts to avoid placing undue stress on the towing harness for the 120 in.^{3} airgun. Gravity and magnetics were routinely recorded in underway operations.

Equipment Performance and Problems

1. Large-area camera. Handling problems are minimal provided the hydro davit is raised about one foot to allow the frame to clear the waist deck. The housings were pressure tested to 5000 meters prior to installing internal components and were found to be waterproof. On this test lowering a kink was thrown in the hydro wire about 20 feet above the camera frame, apparently because of kiting due to the lesser weight of the frame without the complete set of components installed. The wire was checked and found to be undamaged before it was again used.

Bottom photographs were attempted unsuccessfully at three stations with this camera before any pictures were obtained. In these test stages the components were checked repeatedly, and trip line length was set at 16', 12' and 14'. We finally determined that exposure of the camera film was due only to the nephelometer light source and not to the strobe. Rebuilding the trip line so that it would not catch on the bottom of the camera frame solved the problem of the strobe not triggering, and good pictures were then obtained.

2. Box corer. The box core was used one time, as a gravity corer, but it failed to close. The design of the jaws and teeth appears to place too much stress normal to the jaws during corer penetration to allow the jaws to open the additional

inch necessary to trip the closing mechanism. The fact that there is no crane to handle this instrument and that it must be mounted outboard under the coring A-frame presents two problems: first it is a safety hazard to handle the corer in this fashion, and secondly, with the corer mounted outboard of the rail there is no way to open the side of the box for study of lithology and primary sedimentary structures - thus the main purpose of the instrument is defeated.

3. Piston corer. Problems were encountered with the piston corer on two occasions. Core 16 did not trip and came up with one wrap of wire above the trigger arm encircling the corehead. This occurred after repair of the water brake and was probably caused by a short interval when the corer was lowered too rapidly. The excessive rolling of the ship made it difficult to evenly control the rate of corer descent by the water brake. Descent at about 60 fm/min was normally required to insure that the corer penetrated bottom within one hour of launching (the recording time of the cassette for the nose-cone velocimeter was only one hour). It was after this incident that the coring bos'n noticed a click in the coring winch gears, and it is possible that the transient stress of the corer hanging up on the wire damaged the gear. However, the gears had not been previously monitored so that they could equally well have been damaged at some time earlier in the leg

or prior to the leg. On this core a new jaw had been installed in the trip-arm come-along; it was of improper length and the allowable adjustment of the trigger bar was apparently not sufficient to provide the 1" throw necessary to arm the trigger mechanism. It would appear advisable to standardize the sizes of these component parts so such mismatches do not occur in the future. This problem however is considered to be independent of the wire-wrap on the corehead noted above.

Core 19 also did not trip. In this case the old jaw had been replaced in the trigger-arm come-along, but incorrect adjustment of the trigger bar apparently prevented arming of the corer.

4. Hydrowinch. The gears in the manual override on the hydrowinch locked up, necessitating the removal of the worm gear for proper winding.

Seismics

Eels. For some reason the ship was permitted to leave New York with two dead eels - not noisy eels or otherwise marginal eels - dead eels. The trouble was a cut cable in one case and a badly kinked and twisted leader section in the other case. With these problems corrected we found we had one very good eel and one which was quite noisey below about 20 Hz.

The better eel then began going dead intermittently under tension at about 7 knots. At 3 or 4 knots the trouble disappeared. After a lot of effort on the part of Bruce Crowell, the problem was isolated to a particular active section which was removed. The phone string of this section had a pair of soldered connections which were not covered with insulation and which could have touched each other intermittently and under tension. This is the only explanation we could come up with.

While the string was apart we noticed signs of deformation of the hydrophones: one end is opening up. The phones are cemented between two parallel nylon stress members which are then pulled together with a ty-wrap quite near the phone. This results in considerable squeezing of the phone. The phones were still functioning but such distortion of the case cannot be very good for them.

Air guns. The 120 in^3 Bolt gun was used exclusively on this leg. The unit performed extremely well in general. Two problems arose but they were not the fault of the gun itself. First, one gun failed after two days because a large brass nut had got inside the ports. The nut was smashed into three pieces and had scored several surfaces in the gun. The surfaces are apparently not critical and have been cleaned up enough to be used. The guns had been delivered to the ship with the ports taped up and the tape was not removed until launching. The nut was not part of the gun design.

Second, the plastic-lined high-pressure air hose developed a leak where it connects to the gun. It was replaced with the same kind of hose and failed in the same way 24 hours later. We then put in a 5-foot section of hose which had steel reinforcement in it and had no more trouble. (This hose turned out to be the kind used for hydraulic jacks and strictly speaking should probably not be used for compressed air.)

Compressors. We began the leg with K-44 #1 (inboard), running at 600 RPM. This supplied about 1100 p.s.i. at 12 sec rep rate to the 120 in^3 Bolt gun. After about one day of running the oil pressure began falling from a high of about 22 psi to about 9 psi in a 24-hour period. Specs call for 10-15 psi. We switched to K-44 #2, running at 430 RPM and got about 1100 psi at a 15-sec rep rate.

We replaced the innermost oil seal at the aft end of the crankshaft. (This seal is between the high-pressure side of the lubrication system and the sump.) The oil pressure then stayed constant at 18 psi.

For the rest of the leg we ran both compressors and got 1800 psi at 12 sec rep rate.

Coring

Core winch

1. The water brake had been hooked up wrong when the winch was reinstalled in New York. As a result the brake stayed full on (i.e., slowest descent) regardless of the position of the control valve. The first two nose-cone velocimeter records were lost because the cassette tape ran out before the core reached the bottom.

It was found that the side-chamber vents were connected to the center-chamber vent, giving a direct external path for water from the output side back into the intake side. The pump could not pump itself dry even with the control valve shut off.

We separated the side-chamber vents from the center-chamber vent, but did not run the former back to the top of the make-up tank. This reinforcement could be done when the ship returns to New York and would make for a neater system. In the meantime, the brake appears to function correctly.

2. In the Lebus wind, the brass bushing between the rocker shaft and the sheave started working out with a core on its way down. The core was recovered to relieve the tension and the bearing was found to slide easily on the sheave. Temporary repairs were made by swaging the sides of the bushing with a center punch at several points around its circumference. This worked satisfactorily but the bushing should probably be replaced at overhaul. It was also noted that the rocker shaft was pitted to some extent. It was checked by Ludas in San Juan.

3. The pin holding the accumulator chain to the accumulator wheel was loose and tended to slide out during coring operations. This was modified by Ludas in San Juan.

4. Trouble in the planetary gear train was first suspected about Feb. 9 when a noise was noticed in the vicinity of the train. This was a sharp klunk occurring regularly between 5 and 6 times per revolution of the drum. Gear ratios indicated that a broken tooth on the pinion would give 16.5 klunks/rev, on a planet: 5.1 klunks/rev, and on the ring gear: 1 klunk/rev. The planetary was drained and flushed with diesel fuel, but there was no sign of metal chips. On Feb. 13 the planetary seized up with about 1300 fm of wire out, while going down slowly on the water brake (brake full on).

Subsequently it was found that two adjacent teeth on a planet and one tooth on the pinion were broken, and two or three teeth on the ring gear were deformed. These gears were replaced in San Juan.

When the core winch seized up, it was necessary to cut the core wire to retrieve the 1300 fm of wire out together with the corer and pinger via the anchor windlass. This was accomplished in about five hours. 1500 fm of new wire was received in San Juan and attached to the wire left on the drum by a long splice.

Ship Performance and Problems

1. The lack of a crane on the ship curtailed the scientific program in that the box corer could not be adequately handled and the Troika camera sled, for which several tows were planned, could not be handled at all without the crane. For launching and recovery of such heavy or awkward equipment some type of crane is imperative.

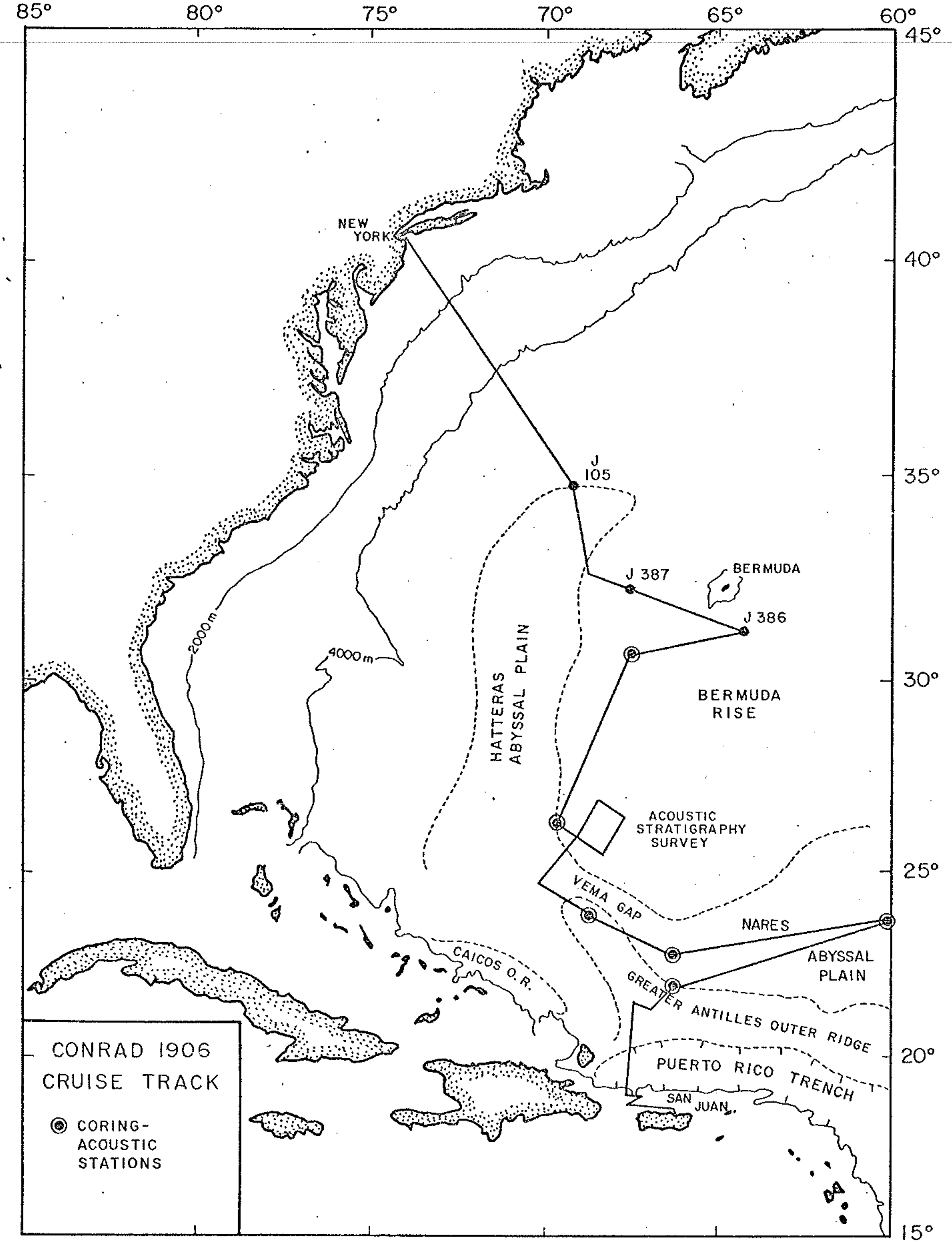
2. Slushing of the hydro and STD winches with rust-preventive grease after our final stations resulted in a dangerously slick sludge coating the main deck because the drains below these winches run directly onto the waist deck. These outlets should be modified to drain over the side of the ship or into a holding tank.

3. With the heeling tanks inoperative the roll of the

ship was excessive - out of all proportion with the seas experienced on the leg. It was not severe enough to prevent any of the operations from being carried out but it hampered the work and reduced overall efficiency. Camera hits were often very difficult to see. Some of the mechanical problems in the winches may have been caused or aggravated by the heavy roll. In particular excursions of the accumulator on the core winch were quite large and may have contributed to the failure of the planetary gears.

4. There were two instances of leaking from fuel tanks: an intermittent leaking to the outside which was thought to be from #10 tank via the shaft alley, and a hole rusted through the top of #9 tank into the machine shop.

5. Morale on the ship seemed to be very good. With the exception of a few last minute replacements, the attitude of personnel in all departments was one of cooperation, interest and general satisfaction in the job. On the other hand, there was more than usual discussion of wage levels on the ship compared with the shipping industry as a whole.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