SHIP UTILI TION DATA REV. 5/76

SHIP NAME R/V ROBERT D. CONRAD	OPERATING INST. Lamont-Doherty Geological Observatory	
CRUISE (LEG) NO. C21-11	DATES 6/21/78 - 7/25/78	
AREA OF OPERATIONS: NW Atlantic, including Hatteras basin, Sohm basin, Nova Scotian Continental rise and slope.	PORT CALLS: PLACE: St.George's, Bermuda; St. John's, Newfoundland	DATES: 6/21/78; 7/23/78 - 7/25/78
DAYS AT SEA 33	DAYS IN PORT 2	

PARTICIPATING PERSONNEL

CODE	NAME	TITLE	AFFILIATION
1.	Charles Windisch	Chief Scientist	L-DGO
2.	H. Van Santford	Elect. Engineer	"
3.	Kenneth Winslow	Air Gun	"
4.	Arnold Stein	E. T.	"
5.	Charles Salcedo	E. T.	"

PRIMARY PROJECTS (those which govern the principal operations, area and movements of the ship)

PROJECT TITLE AND PRINCIPAL INVESTIGATOR	SPONSORING ACTIVITY	GRANT OR CONTRACT NUMBER	PARTICIPATING PERSONNEL (AS CODED ABOVE)
Marine Geophysics Talwani et al.	ONR	N000-75-C-0210	All

ANCILLARY PROJECTS (which are accomplished on a not-to-interfere basis and contribute to the overall effectiveness of the cruise)

PROJECT TITLE AND PRINCIPAL INVESTIGATOR	SPONSORING ACTIVITY	GRANT OR CONTRACT NUMBER	PARTICIPATING PERSONNEL (AS CODED ABOVE)

SIGNATURE Charles Windisch DATE Nov 9 1978
CHIEF SCIENTIST

(Continue personnel and project listings on reverse if additional space needed)

ATTACH PAGE SIZE CRUISE TRACK

COST ALLOCATION DATA

DAYS CHARGED	AGENCY OR ACTIVITY CHARGED	GRANT OR CONTRACT NO.
35	ONR	N000-75-C-0210

SIGNATURE J. E. Hayes DATE 10 Nov 78
Institution Official

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CRUISE REPORT

Ship Name: CONRAD Cruise No: 21-11

Departure: 21 June, 1978 (Date) from St. George's, Bermuda (Port)

Arrival: 23 July, 1978 (Date) at St. John's, Newfoundland (Port)

Days at Sea: 32 Days Foreign Port: 3 St. Georges June 17-June 21
No. of days in arrival port

Area of Operation:

Northwest Atlantic including Hatteras basin, Sohm basin, Nova Scotian Continental rise and slope.

Program Description: MCS coverage of Sohm and Hatteras abyssal plains to establish stratigraphic correlations between the basins; MCS and OBH study of the structure of the J-Anomaly ridge; MCS and OBH study of the ridge complex beneath the Nova Scotian continental rise and slope.

Participants: (All L-DGO unless otherwise specified)

H. Van Santford
C. Gutierrez
W. Koczynski
R. Rottier
K. Jacobs
C. Salcedo
A. Stein
K. Winslow
J. Di Bernardo
D. Hutchinson
J. Diebold
D. Holland
S. Mc Nutt
C. Windisch, Chief Scientist

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

RC21-11 departed St. Georges about 0800 21 June 1978. Departure was delayed 24 hours from the scheduled date due to missing shipments.

The first two days at sea were spent reballasting the seismic streamer in low-traffic area southeast of the Island. A factory representative from SECO, the streamer manufacturer, was on hand to assist and instruct us in this effort. Reballasting and various repairs went slowly but smoothly. The job was completed on the 22nd. The SECo rep. was sent ashore aboard the St. Georges pilot boat on the morning of the 23rd and Conrad set sail for the northern end of the Hatteras abyssal plain to begin her first MCS line.

Line #147 was almost continuous from the northern Hatteras A.P. to the central Sohm A.P. except for some minor gaps in the early part due to airgun/compressor problems. For the most part the line was shot with two 466 in^3 air guns without wave-shape kits.

The proposed objective to record stratigraphic continuity between the Hatteras and Nares basins was not entirely successful because large unmapped basement features intervened in the gap between the New England Seamounts through which we supposed the sediments flowed from one basin to the other. Furthermore the entire seamount zone appears to be structurally high in the vicinity of our crossing. It appears that sediments older than the Horizon A family of reflectors have probably not had access through this gap. A more likely access probably lies to the northwest of our crossing, but we could not justify taking time to do a survey for this feature.

In any case the acoustic stratigraphy immediately to either side of the New England Seamount chain is quite similar - enough so that reasonable extrapolations can probably be made across the seamount trend.

The entire sedimentary section thickens markedly to the Northeast along line 147 as basement depth increases in quasi step-like fashion. Sonobuoys were run every 60-120 NMi. Refractions were strong initially but seemed to die out rather rapidly with range. Strong mantle reflections were not apparent.

Line 148 continued from the end of #147 in the central Sohm plain southeastward across the J-Anomaly ridge. The sedimentary section thins rather uniformly in this direction. A series of basement ridges(?) with what appear to be smooth intervening zones of strongly reflecting basement suggests some sort of ponding of volcanics or possibly very strongly reflecting sediments as one approaches the J-Anomaly ridge. The sedimentary section thins abruptly at the ridge, as we had suspected. The ridge also has some surface expression in this area which we did not expect. The deepest part of the identifiable sedimentary section is clearly missing on the eastern side of the ridge. Having completed our MCS line we prepared for OBH stations on either side of the ridge. Most of line 147 was completed with four 466 in^3 air guns - two with wave shape kits, two without.

OBH 1,2,3,4,5. First OBH drops involved two instruments (Drops 1 & 2). Instruments were surveyed in and seemed to be in good working order. Conrad ran off some 15 NMi northeast, then turned to run southwest along the M-O side of the ridge. The first portion of the line was shot with sonobuoys and airguns as we approached the OBH site. Explosive shots began at the OBH point and continued to the end of the line. Shot sizes were 2.5 - 80# TNT tetryl @ 2 - 5 min schedule depending upon range. After completing our SW run we reversed the line with a long range sonobuoy. About 3/4 of the way through the sonobuoy run a radio signal from one of the OBH's was picked up. We broke off the line to chase it down some 31 NMi from the original drop point. The great drift

distance suggested that the instrument had released shortly after being surveyed in. Cause of premature release was traced to an injured battery cable. The second instrument was picked up on schedule at the drop site. Tape playback did not identify any useful data for this one good instrument, probably because one of the pressure connectors had leaked and partially shorted some of the electronics.

Moving to the M-4 side of the ridge we dropped two more OBH's - this time as the endpoints of a reversed line. Again the line was shot with 2.5 - 80# TNT tetryl. Both instruments were recovered on schedule - both recorded data.

We decided that in order to complete our data set we would have to reshoot our first line with a good OBH. Assuming the J-Anomaly held first priority we mortgaged 1/2 ton of explosives intended for the "Buried Ridge" project later in the leg and reshot our first line in parallel with a long range sonobuoy.

In this instance the OBH release did not work. We waited 12 hrs during which time the pinger, at least, continued to operate well - but no buoy. Our remaining hope was that the battery voltage would drop to a point where the buoy would release automatically, but this could take some 18 hrs or more.

We decided the only way to recover the project at this point was to thoroughly MCS both M-0 and M-4 lines using as many sonobuoys as possible. At some point we would recross the OBH drop site and, if fate were kind, the instrument would have surfaced. Fate was not kind. The pinger was still working well after some 36 hrs. We gave up and went on to the next job. MCS lines 149, 150 and 151 cover the J-Anomaly work area.

Line 152 recorsses the J-Anomaly and continues Northwest across the Sohm plain and the Nova Scotian continental rise and slope to join one of the many industry MCS lines crossing the Nova Scotian shelf. Sonobuoy coverage is quite dense. Higher velocity sedimentary intervals become increasingly

conspicuous in the deeper part of the basin section as the older layers thicken toward the continent. The pre β (?) section is unusually thick near the foot of the rise.

Transition from uniformly stratified basin deposits to the chaotically disturbed continental rise structures that are typical of the rise and slope off Nova Scotia is extremely abrupt and occurs at a slight topographic break on the lower continental rise. Deep sub-bottom structure shows little hope of a simple interpretation here or elsewhere along the rise. In fact one wonders if it can be reasonably interpreted at all.

Lines 153-158 by and large comprise a series of crossings along the strike of the burried ridge. Ridge composition has been variously interpreted as overpressured shale and salt. Our lines were intended to locate some portion of the ridge with reasonably subdued structure which might allow profiling the underlying basement with the OBH. This seemed to be a vain hope at first. There is considerable bottom topography. Most topographic features are probably glacial in origin, but a few appear to have structural roots related to various deep folds or diapirs. However the topo and structure on the northeastern ends of the lines near the Laurentian channel showed some promise by having only a few large salt(?) intrusions as opposed to the layerless confusion observed elsewhere. Some 2-4 seconds of moderately stratified and relatively undisturbed sediments could be seen between the domes.

We dropped our two remaining OBH's in this area. Some technical difficulties delayed the drop of the second instrument and did not leave us time to survey in the first. The line was shot as before with 2.5 - 80# charges on a 2-5 min. schedule. Last shot was a single 160#.

The first instrument dropped returned on schedule with what seemed to be good data.

The pinger on the second instrument remained on for the entire experiment indicating programming or switching difficulties. The instrument was still on the floor after 11 hours. In order to kill time usefully, we decided to complete a proposed single channel line from the drop zone to the intersection of lines 147 and 148. We returned to the drop zone some 36 hours later. The pinger which had been very weak when we left could no longer be detected. We then ran a survey of the area for possible radio signals indicating the buoy had surfaced. No luck - so we abandoned the site to complete our scheduled single channel work.

The remaining single channel study involved a run to the southeast followed by a dog leg to the NE to cross the supposed trends of the Newfoundland fracture zone and the Newfoundland ridge. The basin sediments in this area are very difficult to penetrate down to basement even with two large air guns at 5 kt running speeds. Possibly their deltaic composition contributes to the problem in some degree.

The Newfoundland F.Z. and the Ridge are buried beneath the continental rise apron along the southwestern edge of the Grand Banks. Both features are easily distinguished and appear to be capped with old, strongly reflecting sediments. The sedimentary basin between the F.Z. and the Ridge would be an interesting feature for future MCS study as would the basin on the continental side of the Newfoundland Ridge. In fact the entire Grand Banks ocean - continent transition would make an excellent study.

RC 21-11

Equipment

By and large most systems worked very well.

MCS Streamer handling continues to be difficult depending upon sea state and weather. A set of controls on the fantail to manipulate ships screw and rudder would be a great help in this respect.

Air/gun/compressor operators are young and very inexperienced. The latter deficiency weighs most heavily upon the compressor operation. As of St. Johns they were working well together as operators. Serious mechanical problems will require professional help from the engine room until M. Iltzsche returns on Bergen II.

DFS IV & associated gear worked well except for an intermittent problem in a tape transport power supply. The problem has been located and repaired.

Alter Lab All systems worked well.

Deck Gear Winches etc. were in general in very poor condition from lack of maintenance. Very obviously ship's priorities lie elsewhere.

Scientific Personnel. The three new electronics technicians seemed to work well together and with others aboard. It is too early to tell how they will shape up until they have had more hands-on maintenance experience. Input from H. Van Santford was extremely helpful in getting the new techs oriented toward maintenance problems. All ET's have worked both MCS and alter lab watches. W. Koczynski shows promise as a potential senior MCS technician to replace Carlos Gutierrez.

Other Matters. There is a certain potential for personnel conflict aboard which would be discussed.

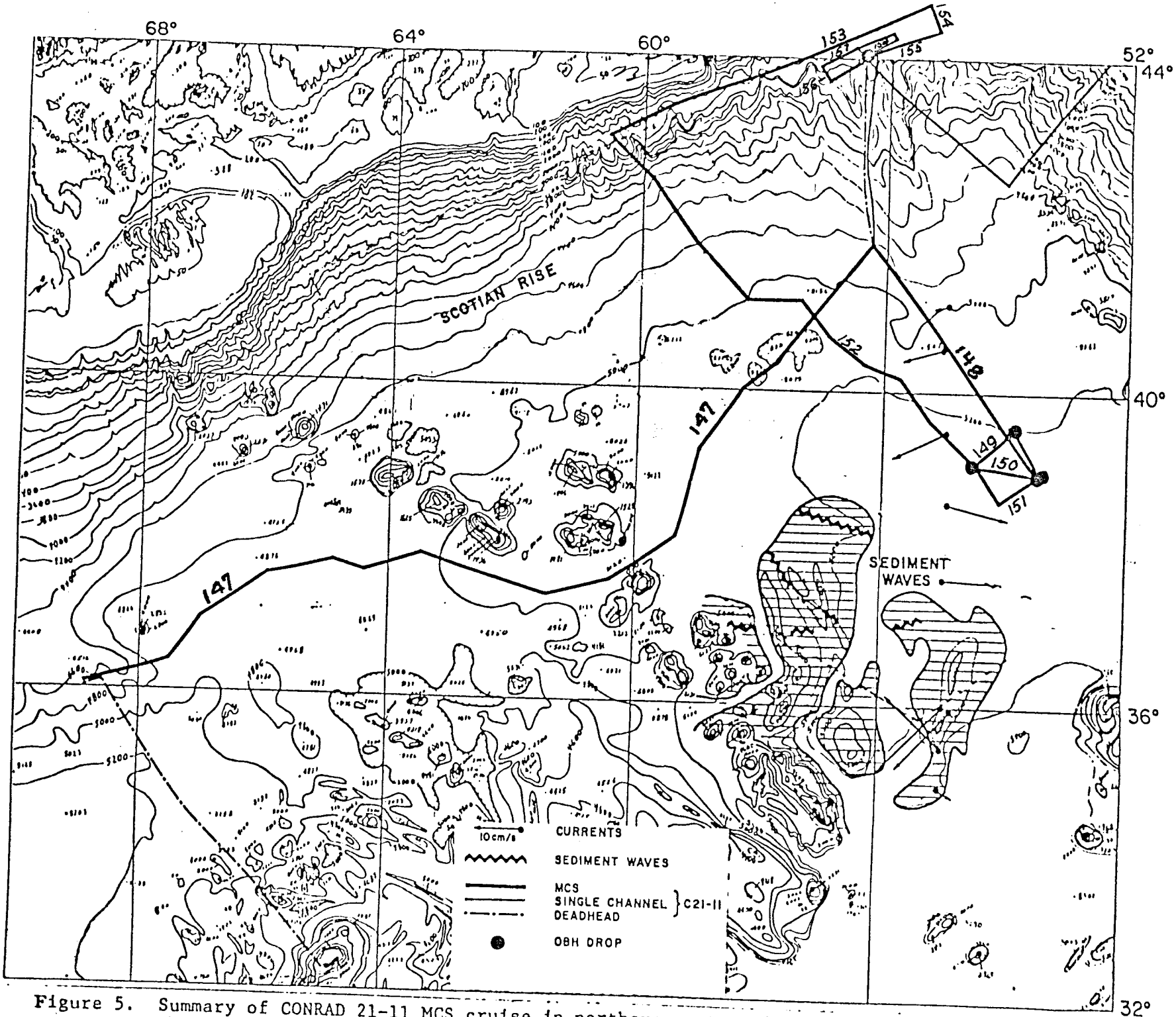

Figure 5. Summary of CONRAD 21-11 MCS cruise in northern western Atlantic.

MCS Acquisition Log Index

Line	Time and Dates	Tape Nos.	Shot Pts.
147	2133 May 25-0112, 2 July 1978	6513-6821	1-30359
148	0203, 2 July-1907, 3 July 1978	6822-6903	1-7593
149	1608, 8 July-0236, 9 July 1978	6904-6923	1-1840
150	0325, 9 July-1431, 9 July 1978	6924-6943	1-1951
151	1533, 9 July-0036, 10 July 1978	6944-6959	1-1591
152	0148, 10 July-1239, 12 July 1978	6960-7074	1-12539(?)
152A	0109, 12 July-1410, 13 July 1978	7075-7095	1-1410*
153	1504, 13 July-1306, 15 July 1978	7096-7172	1-8093
154	1521, 15 July-1756, 15 July 1978	7173-7178	1-1807
155	1915, 15 July-1301, 16 July 1978	7179-7212	1-3127
156	1413, 16 July-1700, 16 July 1978	7213-7218	1-494
157	1811, 16 July-0529, 17 July 1978	7219-7241	1-1987
158	0550, 16 July-0841, 16 July 1978	7242-7247	2047-2099 1-449

*Line 152A is a continuation of #152. Shot counter zeroed due to power crash at end of 152. Hence new line was started.

DIGITALLY RECORDED SONOBUOYS

Sono.#	Line#	Date	Time	MCS Tapes	
208	147	25 June, 1978	1902-2048	6541-6544	4
209	147	25 June, 1978	2319-0245	6548-6555	8
210	147	26 June, 1978	1317-1645	6575-6581	7
211	147	26 June, 1978	2200-0106	6591-6597	7
212	147	27 June, 1978	1809-2100	6629-6634	6
213	147	28 June, 1978	0903-1150	6656-6661	6
214	147	29 June, 1978	2250-0152	6725-6731	7
215	147	30 June, 1978	1047-1322	6748-6753	6
216	147	30 June, 1978	1327-1433	6753-6755	3
217	147	30 June, 1978	2119-0045	6768-6774	7
218	147	1 July, 1978	1303-1629	6799-6806	8
219	148	2 July, 1978	1218-1543	6842-6849	8
220	148	3 July, 1978	0937-1210	6884-6890	7
227	149	8 July, 1978	2049-2330	6912-6918	7
228	149	9 July, 1978	0000-0236	6919-6923	5
229	151	9 July, 1978	1600-1900	6944-6949	6
230	151	9 July, 1978	1903-2108	6949-6952	4
231	151	9 July, 1978	2118-0017	6953-6958	6
232	152	10 July, 1978	0207-0420	6960-6964	5
233	152	10 July, 1978	0422-0605	6964-6966	3
234	152	10 July, 1978	0609-0830	6967-6970	4
235	152	10 July, 1978	2133-0044	6991-6996	6
236	152	11 July, 1978	1333-1659	7016-7022	7
237	152	12 July, 1978	0901-1217	7047-7053	7
238	152	12 July, 1978	1221-1503	7053-7057	5
239	152	12 July, 1978	1506-1800	7057-7062	6
240	152	12 July, 1978	1802-2130	7062-7068	7
241	152A	12 July, 1978	2133-0126	7068-7075	8
242	152A	13 July, 1978	0132-0508	7075-7081	7
243	152A	13 July, 1978	0521-0915	7081-7087	7
244	152A	13 July, 1978	0926-1109	7088-7090	3
245	153	14 July, 1978	1021-1341	7127-7132	6
246	153	15 July, 1978	0833-1155	7164-7170	7
247	155	16 July, 1978	0851-1149	7204-7210	7
248	157	16 July, 1978	2201-0122	7226-7233	8

Total Buoys 35

Total Tapes with Sonobuoys 208

S U M M A R Y

First Tape #: 6513

Last Tape #: 7241

Total Tapes: 728

No. Legs: 13

No. Shot Pts: ∿73,240

No. Sonobuoys on Tape: 35

No. Tapes with Sonoguoys: 208