SHIP UTILIZATION DATA

Rev. 4/83

HIP NAME 27-08	OPERATING INST.	ICIPATING PERSONNEL
RUISE (LEG) NO. 27-08	DATES Sep. 4-28, 1986	
AREA OF OPERATIONS: Central Indian Ocean	PORT CALLS: PLACE / DATES Perth — 8-24 to 9-4-86 Port Louis — 9-28 to 10-2-86	
DAYS AT SEA ~~24~~ 28 / DAYS IN PORT 5		

CODE	NAME	TITLE	AFFILIATION
1.	Jeffrey K, Weissel	Chief Scientist	LDGO
2.	Rose A. Weissel	Scientist	LDGO
3.	Patience A. Cowie	Scientist	LDGO
4.	Neal W. Driscoll	Scientist	URI

(Over)

Use Reverse If Additional Space Required.

WAS RESEARCH CONDUCTED IN FOREIGN WATERS? No COUNTRY: ____

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)
Seismic Stratigraphy of Broken Ridge: A Response to Rifting Processes P.I. - Jeffrey K. Weissel	NSF	OCE 85-16918	ALL
DISCIPLINE			

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 [signature] DATE 3-2-87

CHIEF SCIENTIST

TOTAL SCIENTISTS 7 TOTAL TECHNICIANS 6

TOTAL GRAD STUDENTS 1 TOTAL STUDENTS/OBSERVERS ____

ATTACH PAGE SIZE CRUISE TRACK

COST ALLOCATION DATA

DAYS CHARGED	AGENCY OR ACTIVITY CHARGED	GRANT OR CONTRACT No
33	N.S.F.	OCE 83-16163 5-24982

SIGNATURE [signature] DATE 13 Mar 87

Institution Official

NAME	TITLE	AFFILIATION
5. Carolyn Keyes	Scientist	LDGO
6. Kevin R. MacKenzie	Scientist	UTex/AUSTIN
7. Jiri Savrda	Scientist	UTex/AUSTIN
8. James Smith	Science Officer	LDGO
9. Paul Bennett	Elect. Tech.	LDGO
10. Ropate Qali	Air Gun Tech.	LDGO
11. Martin Iltsche	Compressor Eng.	LDGO
12. Joseph Stennett	Elec. Tech.	LDGO
13. William VanSteveninck	Technician	LDGO

Mar. 19, 1987

TO:

Barbee, W.D.	-	UNOLS
Dudley, J.	-	LDGO
Gerard, S.	-	LDGO
✓Hayes, D.	-	LDGO
Cox, L.	-	LDGO
Lotti, R.	-	LDGO
Raleigh, B.	-	LDGO
Ruddiman, W.	-	LDGO
Ryan, W.F.B.	-	LDGO
Sykes, L.R.	-	LDGO
Takahashi, T.	-	LDGO
Science Officer	-	CONRAD
Captain	-	CONRAD

RESEARCH CRUISE REPORT

R/V ROBERT D. CONRAD 27-08

Attached is a copy of a cruise report for the above CONRAD cruise.

Ann Burns

Ann Burns
Marine Office

Enc.

CRUISE REPORT RC27-08
PERTH, AUSTRALIA TO PORT LOUIS, MAURITIUS
AUGUST 30, 1986 - SEPTEMBER 28, 1986

Participating Personnel

Weissel J.K., Chief Scientist
MacKenzie K., Scientist/Watchstander
Smith J.A., Science Officer
Cowie P.A., Watchstander
Driscoll N., Watchstander
Keyes C.M., Watchstander
Savrda J., Watchstander
Weissel R.A., Watchstander/Data Technician
Stennett J., Electronics Technician
Van Steveninck W., Electronics Technician
Bennett P., Technician
Iltzsche M., Airgun Engineer
Qali Maiwiriwiri R., Technician

Synopsis

R. D. CONRAD Leg 27-08 departed Fremantle, the port of Perth, Western Australia at 1800 hrs (local) 30 August 1986 to pursue the following objectives: a) to map the seismic stratigraphy over the west-central portion of Broken Ridge in preparation for ODP drilling there in 1988, b) to perform a 1-day site survey at 27.5°S on the Ninetyeast Ridge in preparation for ODP drilling, and c) to obtain dredged samples from the west, east and central parts of the scarp of Broken Ridge to help determine its age and composition. The cruise track is shown in Figure 1. Note that a breakdown of the starboard engine after steaming 400 n.m. necessitated our return to Fremantle. The problem was fixed in 24 hours and we sailed from Fremantle for the second time at 1720 hrs (local) 4 September 1986. Port Louis, Mauritius was reached at 0800 hrs 28 September 1986, after steaming more than 6000 n.m. and meeting the majority of the cruise objectives.

Chronology of Principal Events

Aug 30 1100z - main lab watch started
Aug 31 0530z - single watergun single-channel seismics, magnetics on at 0530z
Sept01 0000z - stbd. main engine down, turned around and headed back to Fremantle at half ahead.
Sept 03 0540z - alongside at Fremantle awaiting engine repair
Sept 04 0520z - departed Fremantle for the second time
1200z - watches restarted
Sept 05 0030z - watergun streamer and magnetometer deployed, collecting single-channel seismics and magnetics data
Sept 07 0300z - underway gear hauled for dredge station
0415z - dredge sta. #7 commenced (Table 1)
0930z - dredge aboard, unsuccessful
1000z - collecting seismics and magnetics again

Sept 08 0302z - gear hauled for dredge station
0523z - dredge sta. #8 commenced (Table 1)
0930z - dredge aboard, successful
1000z - start Broken Ridge seismic survey (2 waterguns), plus magnetometer
1738z - deploy sonobuoy #1 (Table 2), the first of 82 sonobuoys on Broken Ridge and the southern part of Ninetyeast Ridge
Sept 14 0403z - underway gear secured for dredge station
0600z - dredge sta. #9 commenced (Table 1)
1200z - dredge aboard, successful
1250z - dredge sta. #10 commenced (Table 1)
1730z - dredge aboard, successful
1800z - resume Broken Ridge seismic survey
Sept 16 1600z - secure underway gear for core station
1851z - core sta. #73 commenced (Table 1)
1934z - core at surface, successful
2025z - resume Broken Ridge seismic survey
Sept 18 1700z - secure underway gear for dredge station, completion of Broken Ridge seismic survey
1736z - dredge sta. # 11 commenced
2230z - dredge aboard, manganese crusts only
2300z - gear redeployed, steaming to Ninetyeast Ridge
Sept 20 0643z - commence Ninetyeast Ridge site survey
2222z - Ninetyeast Ridge survey completed
Sept 22 0130z - end single channel seismics RC27-08
Sept 27 0800z - end main lab watch; end magnetics, continue with 3.5 kHz PDR and gravity to Port Louis

Comments on Equipment

The quality of the single channel seismics obtained during RC2708 is the best I have ever seen. Minor adjustments made to the French streamer by Jim Smith and Joe Stennett after I was on board for RC2706 improved an already superb instrument. The waterguns performed satisfactorily over a three week period of almost constant use. Towards the end of the leg, however, breakdowns with the guns and plumbing became more frequent probably due to heavy usage.

Since we attempted five dredges and one piston core I will comment on the over-the-side equipment. The new deep sea winch has had its "teething problems" since its installation last spring. The breaking systems ,in particular, still do not function properly. Bill Van Steveninck installed a tensiometer read-out in the lab above the 3.5 kHz echosounder. This proved a great boon during dredging operations because I could see the seafloor, the height of the dredge wire pinger above bottom, and the tension on the wire all simultaneously. The main criticism I have is in the design of the rock dredges on board for RC2708. I feel the current design is inferior to the design of dredges I used on R/V VEMA between 1975 and 1980. I prefer the following features in dredge design: a) larger frame with serrated jaws, b) a chain bridle instead of the rigid/hinged design, c) a larger weight further in front of the frame, and d) a larger chain bag with a weight attached at the back. Mainly I believe that the current design is too small and too light.

To my unexpected delight, the Nova data logger performed very well throughout the leg. Data reduction facilities continue to be primitive on CONRAD. Hovever, Rose Anne Weissel was able to get most of the "Brown book" software installed and running on the MS-DOS Compaq. We were able to plot track charts, PDR data and magnetics along track on the HP ink pen plotter using the PLOT88 software library linked to the Brown book programs. The Compaqs are ideal for this kind of off-line data reduction, but we had no direct interface to the data acqisition/storage facilities on board. A cost effective solution (<$2000.) would be to network an MS-DOS Compaq to those on the ethernet using Sun's PC-NFS. The Brown Book programs could then be used to remotely process the acquired underway data which would reside in exported disk files.

Preliminary Scientific Results

The survey on Broken Ridge took about 11 days during which a strike line/dip line grid of single channel seismic reflection profiling was the main activity (Fig. 2). These data were digitally recorded for later on shore processing. Because of the excellent quality of the monitor records, we were able to begin a preliminary scientific interpretation while at sea.

Broken Ridge was rifted from the northern part of the Kerguelen Plateau prior to mid-Eocene time (magnetic anomaly 18 lies adjacent to the foot of the south-facing scarp of Broken Ridge). Between longitudes 93° and 94°E, Broken Ridge is a simple, flexurally uplifted rift flank, the footwall block or lower plate in the parlance of detachment tectonics. We observed more complicated rift structures as we steamed along the strike of Broken Ridge from the east. The stratigraphy observed in the seismic records clearly portrays the effects of the rifting process on Broken Ridge. A sedimentary section ~1500 m thick was clearly deposited on Broken Ridge prior to rifting. This sequence is presumably dominated by carbonates, and is at least Santonian age (~85 Ma) in its lower part according to previous drilling at Site 255. The major question for future drilling is whether this pre-rift sequence was deepening or shallowing with time, the latter being a response to precursory uplift, a property of active rifting processes. The west-central section of Broken Ridge was flexurally uplifted during rifting probably due to removal of the hanging wall block (containing the adjacent portion of Kerguelen Plateau) forming an E-W trending ridge initially ~1000m above sea level. Erosion of this exposed material and post-rift subsidence of Broken Ridge produced a distinctive erosional unconformity overlain by mid-Eocene lagoonal sediments. A Neogene pelagic cap has been acquired on the crest of Broken Ridge due to continued subsidence to the present day. The grid of seismic lines will allow us to map areally the stratigraphy across the west-central part of Broken Ridge with confidence. In addition, the many sonobuoys obtained during the seismic survey (Table 2) will afford good velocity control in the sedimentary section that will benefit future on shore processing of the digital data. The sonobuoy data will be reduced by Kevin MacKenzie (University of Texas/Austin). The processed single channel seismics and sonobuoy data set will form the basis for selecting drill sites on Broken Ridge for ODP Leg 122.

Dredged samples from the scarp at Broken Ridge (Table 1) have a direct bearing on settling the important question concerning the age and composition of the basement. It is presently unknown whether Broken Ridge (and the conjugate part of the Kerguelen Plateau) are continental fragments with affinities to the East Antarctic craton, or whether these features are the result of "hot spot" volcanism on early-to-mid Cretaceous oceanic lithosphere. The crystalline rocks obtained in dredges #8-10, all appear to be basalts with various degrees of weathering (Table 1). Petrolgic and geochemical analyses of these samples will be undertaken by John Mahoney (HIG/University of Hawaii). Age determinations using the 40Ar/39Ar technique will be done by Bob Duncan (University of Oregon).

An age of Early Miocene (23.2 - 17.6 Ma) has been determined by Ken Miller (L-DGO) from the core catcher sample for piston core #73 (Table 1).

We also conducted about 16 hours of geophysical survey on the southern part of the Ninetyeast Ridge near 27.5°S (Fig. 3). The data obtained included digitally recorded single channel seismics and 12 sonobuoys. These data will be processed at the Institute for Geophysics, University of Texas at Austin. The resulting information will be used to choose a site for drilling on ODP Leg 122.

Jeffrey K. Weissel
Chief Scientist

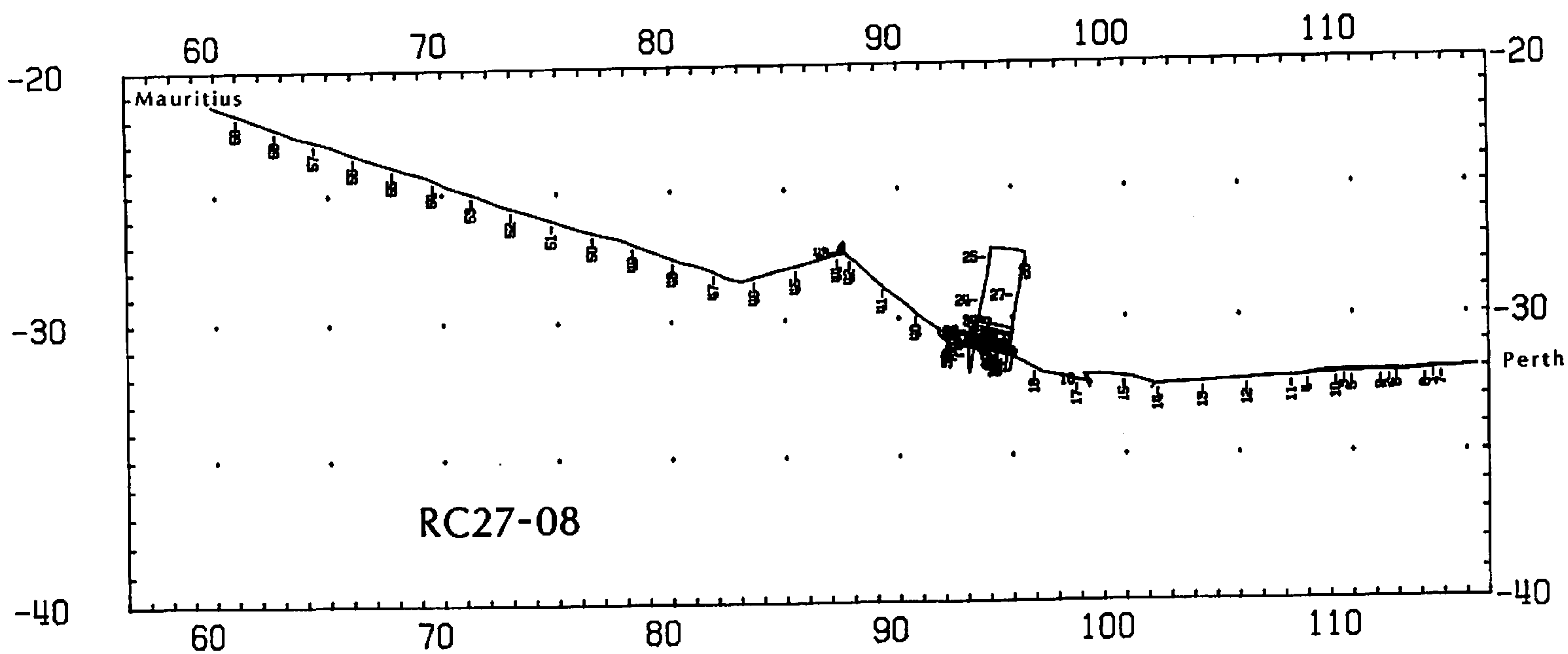

__Figure 1__ Track of __Robert D. Conrad__ leg RC27-08 in the central Indian Ocean. Numbers are hundreds of n.m.

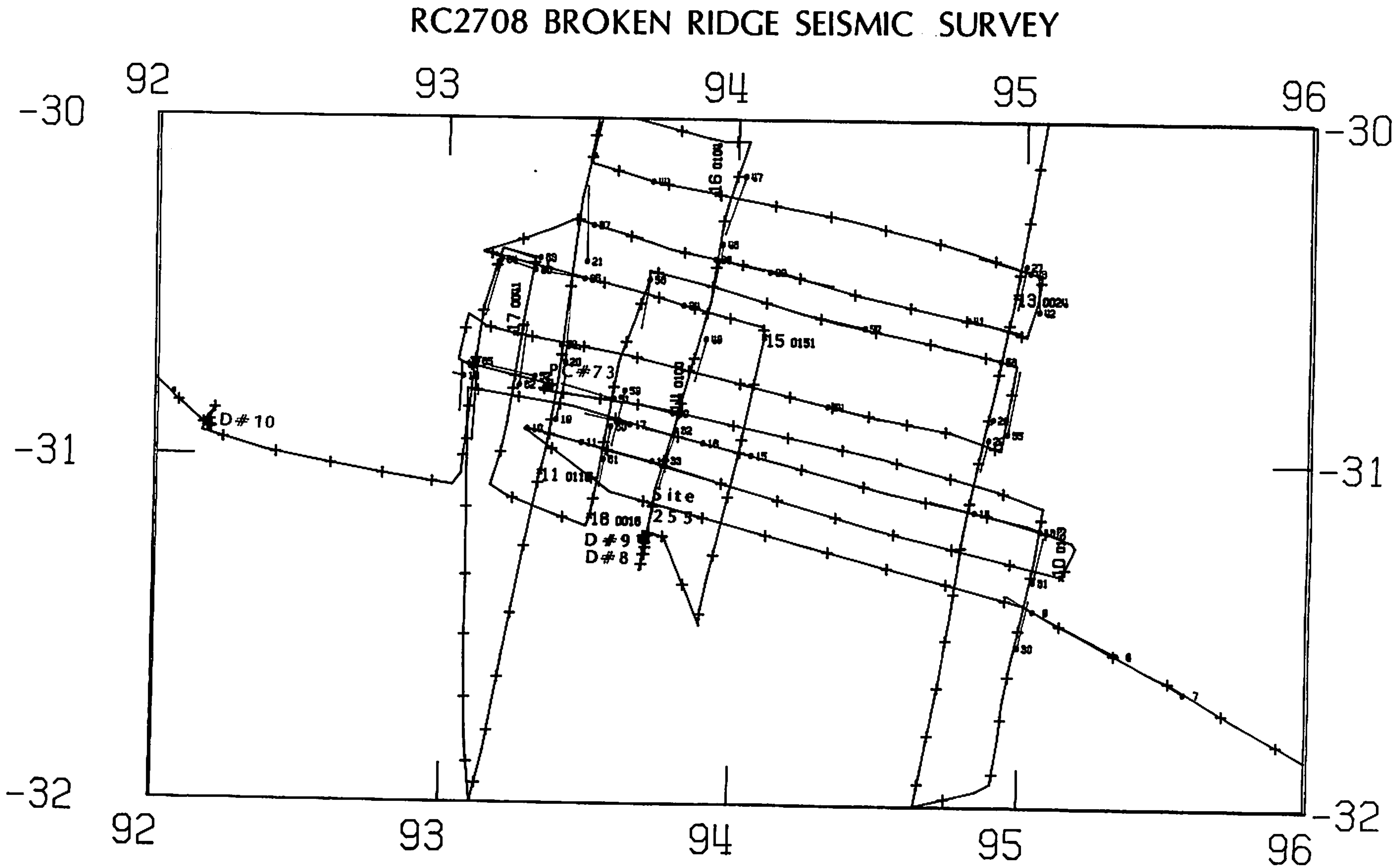

Figure 2 Dipline/strikeline single-channel seismic survey over the west-central part of Broken Ridge. Thin lines with numbered dots are sonobuoy locations. Crosses on the shiptrack are hourly marks. Locations of dredges #8-10, piston core #73, and DSDP site 255 are indicated.

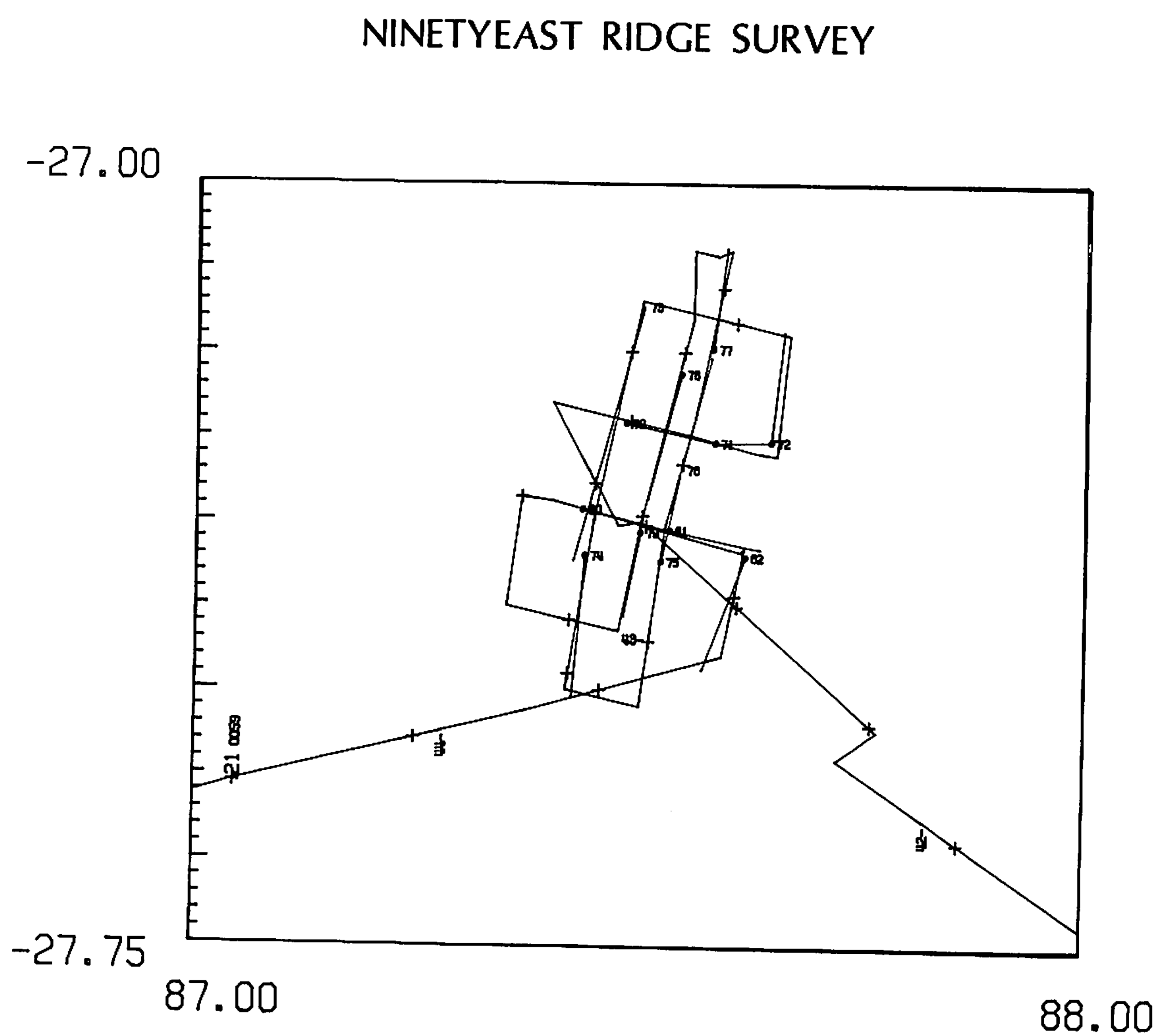

Figure 3 Site survey on the southern part of Ninetyeast Ridge conducted during RC27-08. Thin lines with numbered dots are sonobuoy locations.

TABLE 1.

DREDGE AND CORE SAMPLES FROM BROKEN RIDGE TAKEN ON RC2708

SAMPLE	DATE	LAT. (S)	LONG. (E)	DEPTH(m)	NATURE OF SAMPLE(S)
Core #73	Sept 16	30° 47.72'	93° 21.48'	1222	290 cm calcareous ooze
Dredge #7	Sept 07	32° 33'	101° 12'	3670-3210	No sample
Dredge #8	Sept 08	32° 24'	98° 20'	2250-2020	300 lb. of weathered basalt
Dredge #9	Sept 14	31° 16'	93° 42'	3400-?	60 lb basalt boulder
Dredge #10	Sept 14	31° 14'	93° 43'	2670-1890	500 lb. basalt fragments and sedimentary rocks
Dredge #11	Sept 18	30° 55'	92° 11'	2194-2070	Manganese crusts

TABLE 2

RC27-08 SONOBUOYS

SB	TIME Start	(GMT) Stop	DATE	DEPLOY Lat	DEPLOY Lon	TERMINATE Lat	TERMINATE Lon	LENGTH NM	DIRECTION/ LINE
1	1738	1846	8 Sep 86	-32°10.06	99°44.93	-32°08.57	99°28.40	12.32	276°/EF
2	1850	1955	8 Sep 86	-32°08.63	99°29.31	-32°07.28	99°14.39	11.96	275°/EF
3	1955	2102	8 Sep 86	-32°07.28	99°14.39	-32°05.59	98°58.77	12.08	273°/EF
4	1625	1735	8 Sep 86	-32°19.93	98°05.59	-32°17.04	07°51.62	12.72	287°/F'G
5	1735	1836	8 Sep 86	-32°17.04	97°51.62	-32°14.47	97°38.92	10.75	284°/F'G
6	1836	1945	8 Sep 86	-32°14.47	97°38.92	-32°11.19	97°23.46	12.35	286°/F'G
7	0445	0522	9 Sep 86	-31°39.68	95°34.06	-31°36.48	95°27.17	6.68	298°/GH
8	0601	0729	9 Sep 86	-31°33.13	95°20.02	-31°25.73	95°02.48	15.84	297°/GH
9	0730	0803	9 Sep 86	-31°25.73	95°02.48	-31°23.16	94°57.19	5.94	297°/GH
10	1620	1729	9 Sep 86	-30°54.89	93°16.86	-30°57.28	93°28.21	17.01	299°/JK, 105°/KL
11	1729	1839	9 Sep 86	-30°57.28	93°28.21	-31°00.49	93°42.88	12.59	105°/KL
12	1840	1947	9 Sep 86	-31°00.49	93°42.88	-31°03.72	93°55.75	11.98	104°/KL
13	0312	0415	10 Sep 86	-31°11.91	95°03.69	-31°08.72	94°50.00	11.91	282°/MN
14	0416	0458	10 Sep 86	-31°08.72	94°50.00	-31°06.82	94°40.79	7.78	282°/MN
15	0752	0836	10 Sep 86	-30°59.21	94°03.44	-30°57.33	93°53.71	8.21	284°/MN
16	0839	0934	10 Sep 86	-30°57.15	93°53.38	-30°54.79	93°41.51	10.19	283°/MN
17	0949	1031	10 Sep 86	-30°54.00	93°38.21	-30°52.25	93°28.91	7.88	281°/MN
18	1231	1344	10 Sep 86	-30°45.82	93°03.36	-30°52.02	93°02.63	13.28	280°/MN, 180°/NO
19	0200	0243	11 Sep 86	-30°53.34	93°22.77	-30°45.85	93°24.58	7.70	008°/OP
20	0255	0317	11 Sep 86	-30°43.15	93°24.50	-30°28.86	93°25.74	3.89	007°/OP

TABLE 2 (Con't)

SB	TIME Start	(GMT) Stop	DATE	DEPLOY Lat	DEPLOY Lon	TERMINATE Lat	TERMINATE Lon	LENGTH NM	DIRECTION/ LINE
21	0429	0531	11 Sep 86	-30°25.39	93°28.76	-30°12.17	93°28.71	11.22	008°/OP
22	0725	0810	11 Sep 86	-29°57.50	93°34.72	-29°43.03	93°37.07	8.38	013°/OP
23	1249	1306	11 Sep 86	-28°54.02	93°48.51	-28°39.93	93°51.75	14.01	010°/OP
24	0150	0230	12 Sep 86	-27°26.75	94°56.34	-27°28.06	95°04.23	7.15	098°/PQ
25	0445	0543	12 Sep 86	-27°32.21	95°32.02	-27°37.23	95°36.47	8.99	109°,192°/PQR
26	1606	1659	12 Sep 86	-29°10.29	95°16.03	-29°16.08	95°13.278	8.99	193°/QR
27	2346	0038	13 Sep 86	-30°25.40	94°59.99	-30°32.82	94°58.21	7.61	188°/QR
28	0255	0303	13 Sep 86	-30°52.37	94°53.51	-30°53.00	94°53.04	1.03	185°/QR
29	0322	0408	13 Sep 86	-30°56.00	94°52.65	-31°01.31	94°51.02	5.99	188°/QR
30	1544	1640	13 Sep 86	-31°32.13	94°59.43	-31°23.96	95°01.60	8.32	013°/ST
31	1659	1742	13 Sep 86	-31°20.65	95°02.43	-31°13.02	95°04.47	7.40	015°/TU
32	0118	0155	14 Sep 86	-30°54.91	93°47.78	-30°59.97	93°45.90	5.40	196°/UV
33	0158	0232	14 Sep 86	-31°00.34	93°45.76	-31°05.22	93°44.38	5.16	197°/UV
34	0425	0535	15 Sep 86	-30°32.96	93°48.95	-30°30.31	93°38.41	9.94	282°/XY
35	0626	0713	15 Sep 86	-30°28.42	93°28.33	-30°27.18	93°19.37	7.84	279°/XY
36	0719	0810	15 Sep 86	-30°27.01	93°18.09	-30°23.95	93°07.41	8.62	278°/XY
37	1015	1109	15 Sep 86	-30°18.96	93°30.09	-30°21.20	93°40.13	9.38	106°/Z-AA
38	1232	1325	15 Sep 86	-30°24.82	93°55.38	-30°26.72	94°05.35	9.23	101°/Z-AA
39	1333	1430	15 Sep 86	-30°26.99	94°05.79	-30°29.25	94°19.86	9.99	102°/Z-AA
40	1446	1450	15 Sep 86	-30°29.95	93°23.01	---	---	---	105°/Z-AA

TABLE 2 (Con't)

SB	TIME Start	(GMT) Stop	DATE	DEPLOY Lat	DEPLOY Lon	TERMINATE Lat	TERMINATE Lon	LENGTH NM	DIRECTION/ LINE
41	1658	1755	15 Sep 86	-30°34.91	94°48.03	-30°37.09	94°59.15	9.93 NM	100°/ZAA
42	1831	1918	15 Sep 86	-30°33.31	95°02.74	-30°26.86	95°02.49	7.97 NM	017°/MA-BB, 285°/BB-CC
43	1926	2022	15 Sep 86	-30°26.51	95°00.85	-30°23.98	94°50.08	9.49 NM	286°/BB-GG
44	0223	0332	16 Sep 86	-30°11.18	93°42.20	-30°08.23	93°30.12	11.20 NM	278°/BB-GG
45	0341	0427	16 Sep 86	-30°06.68	93°30.06	-29°58.28	93°31.80	8.11 NM	009°/CC-DD
46	0501	0551	16 Sep 86	-29°59.62	93°37.35	-30°01.71	93°46.75	8.58 NM	106°/DD-EE
47	0756	0916	16 Sep 86	-30°10.15	94°01.47	-30°20.33	93°57.27	11.41 NM	194°/EE-FF
48	0930	1038	16 Sep 86	-30°22.16	93°56.85	-30°31.22	93°54.81	9.72 NM	188°/EE-FF
49	1135	1233	16 Sep 86	-30°38.89	93°53.69	-30°46.21	93°51.41	7.92 NM	194°/EE-FF
50	1323	1418	16 Sep 86	-30°52.01	93°47.05	-30°49.97	93°36.92	8.78 NM	279°/FF-GG
51	1429	1522	16 Sep 86	-30°49.61	93°34.80	-30°47.02	93°23.80	8.71 NM	281°/FF-GG
52	2100	2148	16 Sep 86	-30°45.74	93°18.20	-30°44.10	93°09.33	7.81 NM	276°/FF-GG
53	0130	0152	17 Sep 86	-30°40.11	93°23.63	-30°40.93	93°27.57	3.68 NM	104°/HH-II
54	0647	0808	17 Sep 86	-30°50.46	94°19.17	-30°52.66	94°29.73	9.66 NM	104°/HH-II
55	1120	1221	17 Sep 86	-30°54.94	94°56.57	-30°43.77	94°58.95	10.54 NM	010°/II-JJ
56	1249	1345	17 Sep 86	-30°42.01	94°54.94	-30°39.90	94°43.01	8.86 NM	279°/JJ-KK
57	1515	1612	17 Sep 86	-30°36.51	94°26.54	-30°34.55	94°15.98	9.02 NM	280°/JJ-KK
58	1926	2020	17 Sep 86	-30°28.50	93°41.79	-30°37.018	93°40.182	8.14 NM	195°/KK-LL
59	2138	2217	17 Sep 86	-30°48.12	93°36.98	-30°57.73	93°34.40	5.96 NM	193°/KK-LL
60	2222	2256	17 Sep 86	-30°54.45	93°34.23	-30°59.408	93°32.988	5.19 NM	190°/KK-LL

TABLE 2 (Con't)

SB	TIME Start	(GMT) Stop	DATE	DEPLOY Lat	DEPLOY Lon	TERMINATE Lat	TERMINATE Lon	LENGTH NM	DIRECTION/ LINE
61	2302	2340	17 Sep 86	-31°00.25	93°32.78	-31°04.87	93°31.96	5.73	189°/KK-LL
62	0405	0503	18 Sep 86	-30°47.23	93°15.05	-30°36.32	93°16.53	10.20	011°/MM-NN
63	0608	0639	18 Sep 86	-30°24.84	93°19.05	-30°23.37	93°11.90	5.26	281°/NN-OO
64	0656	0805	18 Sep 86	-30°25.33	93°10.93	-30°35.02	93°07.78	10.38	187°/OO-PP
65	0906	0959	18 Sep 86	-30°43.36	93°06.19	-30°51.16	93°05.27	8.20	182°/OO-PP
66	0012	0113	19 Sep 86	-30°49.33	92°03.40	-30°42.44	91°54.33	10.48	312°/RR-SS
67	0234	0328	19 Sep 86	-30°33.12	91°41.68	-30°27.03	91°33.45	9.30	311°/RR-SS
68	0415	0510	19 Sep 86	-30°21.30	91°26.31	-30°15.10	91°17.90	9.39	311°/RR-SS
69	1238	1344	19 Sep 86	-29°26.04	90°18.87	-29°18.33	90°08.64	11.58	307°/RR-SS
70	0802	0832	20 Sep 86	-27°14.09	87°28.82	-27°15.23	87°34.84	4.92	103°/1-2
71	0832	0858	20 Sep 86	-27°15.23	87°34.84	-27°15.16	87°38.63	4.21	102°/1-2
72	0858	0945	20 Sep 86	-27°15.16	87°38.63	-27°08.66	87°39.45	8.09	011°/2-3
73	1044	1212	20 Sep 86	-27°07.22	87°29.93	-27°22.21	87°25.36	14.86	190°/4-5
74	1217	1304	20 Sep 86	-27°21.91	87°26.12	-27°30.36	87°25.36	8.06	190°/4-5
75	1423	1457	20 Sep 86	-27°22.23	87°31.25	-27°17.09	87°32.50	5.85	011°/6-7
76	1458	1537	20 Sep 86	-27°16.79	87°32.56	-27°10.23	87°34.55	6.67	015°/6-7
77	1540	1614	20 Sep 86	-27°09.68	87°34.65	-27°03.74	87°35.55	5.86	013°/6-7
78	1707	1754	20 Sep 86	-27°11.20	87°32.49	-27°18.55	87°30.30	7.91	195°/8-9
79	1805	1836	20 Sep 86	-27°20.53	87°29.84	-27°25.51	87°28.74	5.14	191°/9-10
80	2035	2112	20 Sep 86	-27°19.15	87°25.96	-27°20.40	87°31.81	5.70	104°/12-13
81	2111	2142	20 Sep 86	-27°20.40	87°31.81	-27°21.51	87°37.98	5.11	106°/12-13
82	2145	2229	20 Sep 86	-27°21.96	87°36.95	-27°28.66	87°34.12	7.34	189°/13-14