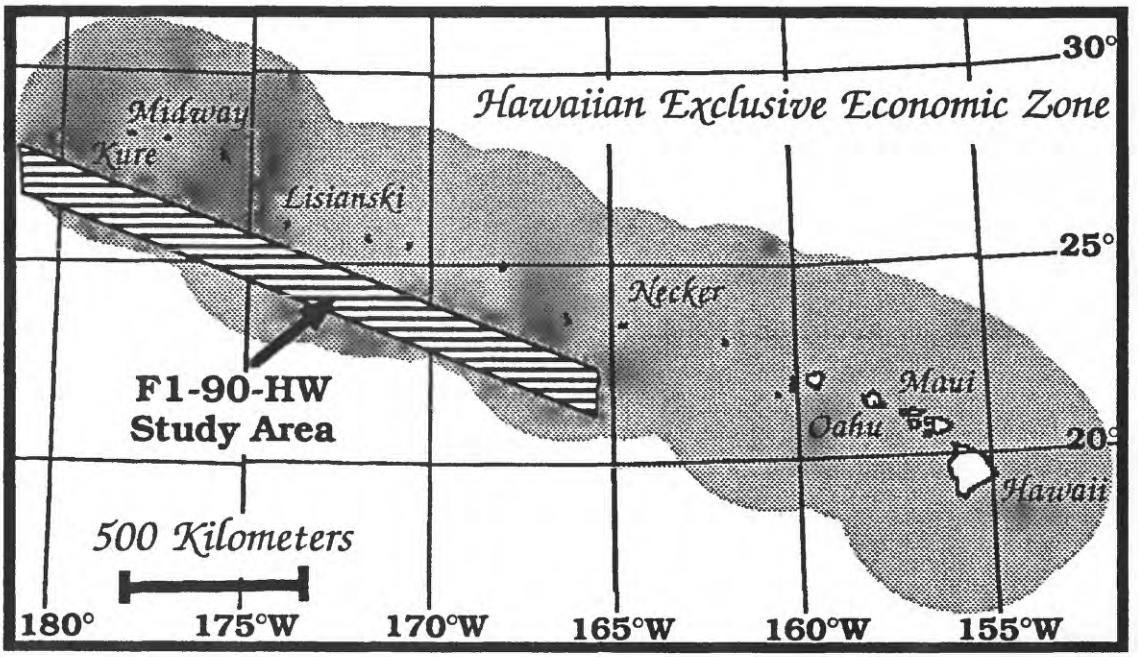
Department of the Interior
U.S. Geological Survey

Cruise Report:
GLORIA Survey of Part of the Hawaiian Exclusive Economic Zone, F1-90-HW



by

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Summary of Scientific Results

Cruise F1-90-HW is part of the cooperative United States Geological Survey (USGS) /British Institute of Oceanographic Sciences (IOS), project to map the seafloor of the U.S. Exclusive Economic Zone (EEZ) at a reconnaissance scale using the GLORIA (Geological LOng-Range Inclined Asdic) side-scanning sonar system and acoustic-reflection profilers. Cruise F1-90-HW was one of three consecutive cruises whose survey area covers the EEZ south of the Hawaiian island chain from Necker Ridge to 320 km beyond Kure Island (Figure 1). The results presented herein were derived from shipboard observations of the GLORIA images and acoustic-reflection profiles and should be regarded as preliminary.

Cretaceous Seafloor

The seafloor in the study area was formed approximately between 95 and 128 Ma at the East Pacific Rise, largely during the Cretaceous magnetic quiet zone (Atwater, 1989). Characteristic linear seafloor fabric from the horst and graben structure of the oceanic crust can be seen clearly in GLORIA images from the western portion of the survey area where local uplift or large fault offset has caused seafloor topographic expression of the ridge-crests. Spreading fabric on this portion of the seafloor strikes N20W. The faults are spaced 1.5 to 5 km apart and can be traced obliquely across the width of the study area, over 160 kilometers. Backscatter variations that manifest the fabric probably are not associated directly with the topographic relief of the horsts, but instead are due to the presence of

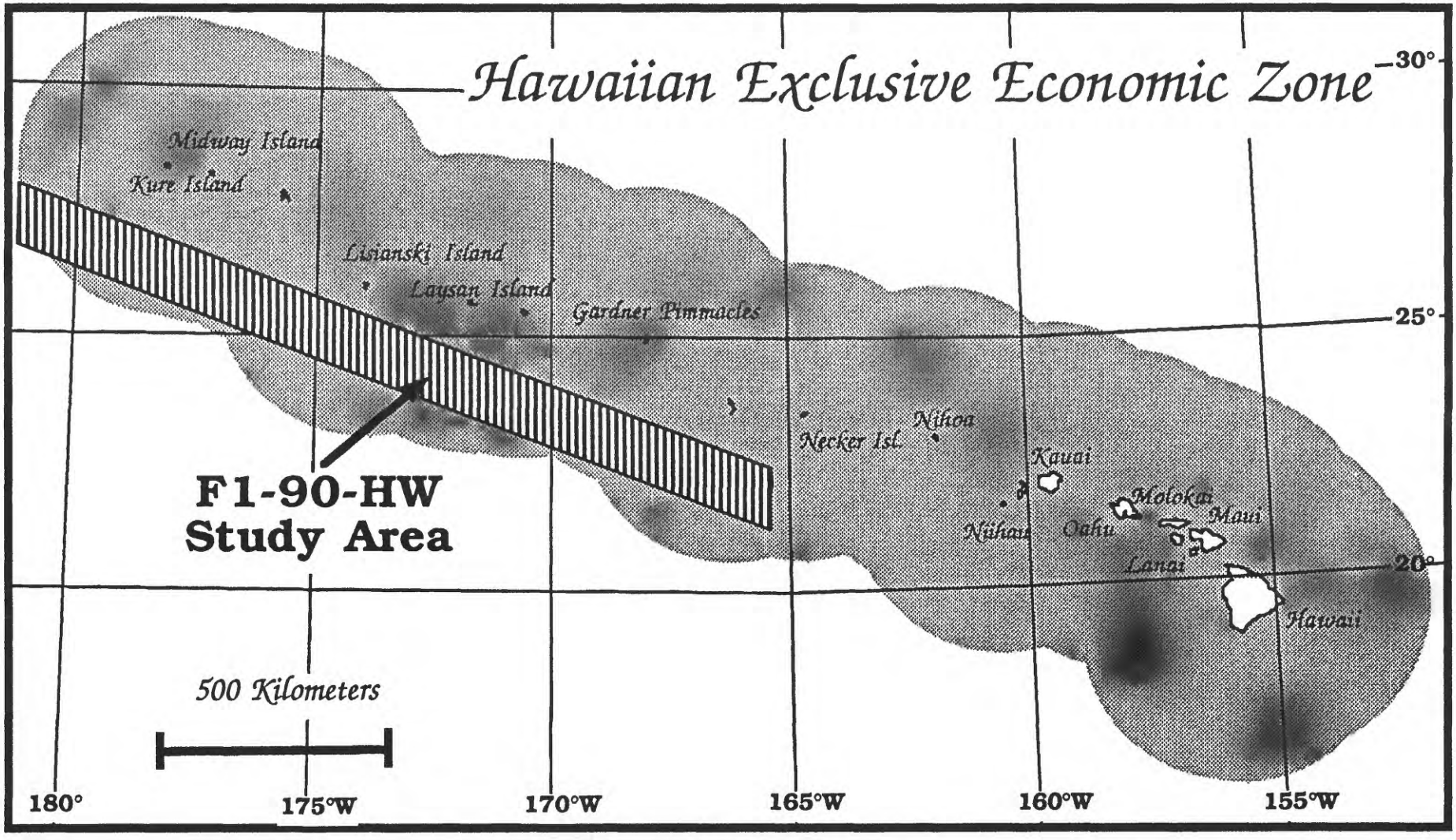

Figure 1. Location map of the Hawaiian Island EEZ and study area of F1-90-HW.

buried, strongly backscattering sediment layers within the sediment drape above the graben. Volcanic ridges and seamounts that trend parallel to the spreading fabric indicate the structural grain elsewhere, but in most places the basement fabric is masked by a relatively thick sediment drape.

(Several?) Transform faults that cross the study area with a strike of N65E are visible at the seafloor where sediment cover is thin, or where volcanic features occur above leaky segments of the faults. In particular, five lineations are interpreted as part of the Murray Fracture Zone (MFZ), a large transform fault zone that extends east to near the United States mainland. Lineated volcanic features along the MFZ appear to have issued from the faults themselves. The MFZ extends in en echelon fashion to the middle section of the adjacent study area to the south, insonified previously during F13-89-HW. Measurements suggest that the MFZ is as much as 150 km wide within the two survey areas and is defined by as many as seven faults. A fault parallel to and west of the MFZ truncates and bends the seafloor spreading fabric. The direction of bending clearly indicates a left-lateral (sinistral) sense of motion.

Four types of Cretaceous(?) seamounts were observed during the survey: I) small and smooth-surfaced, circular, low-relief seamounts with or without a summit crater and commonly having a conspicuous halo of high backscatter; II) large (>10 km across) rough-surfaced and possibly degraded, non-circular seamounts; III) small (5-10 km across) rough-surfaced and possibly degraded, non-circular seamounts; IV) very small (less than 2 km across) rough-surfaced volcanic mounds or spatter cones.

A group of Type-II volcanoes and guyots in the central portion of the study area is highly degraded by debris avalanching and gullying. This cluster of seamounts is adjacent to the the Hawaiian Ridge and therefore is

likely to have been exposed to environmental stresses in excess of those felt by other abyssal seamounts in the Mid-Pacific Mountains. These stresses include earthquake loading, crustal subsidence and arching across the main axis of the ridge, and partial volcanic overprinting by the propagating Hawaiian hot spot.

The eastern portion of the survey area is crossed by the Necker Ridge of Cretaceous Age, which appears to have formed by massive eruptions along a leaky transform-fault trending N48E. Two subsidiary ridges, parallel and west of Necker Ridge, were observed 45 and 90 km to the northwest.

An elongate sheet flow at least 800 km^2 in area was insonified near a large Type II volcano at 173° 45'W, 26° 20'N and apparently flowed downslope to the south for at least 65 km. However, the flow is nowhere more than 10 km wide. The sheet flow is interpreted to have been of low viscosity. Acoustic-reflection profiles across the flow indicate that it lies within a topographic low, and it is characterized by opaque, and characteristically weak, "mushy" reflections.

Sedimentary Features

A sequence of horizontal reflectors more than 0.6 sec (two-way travel time in reflection profiles) thick in places covers oceanic basement. The reflector sequence has a basin-fill pattern and probably is composed of turbidites. The high-resolution profiles show an acoustically transparent layer, in places containing one or more "hard" reflectors and reaching a thickness of up to 0.050 sec, that drapes the seafloor except on the steep flanks of some seamounts.

Sediment-draped seafloor in GLORIA images has a range of backscatter intensities that is in most places determined by penetration of acoustic energy beneath the seafloor and attenuated backscatter off buried features. Where the transparent drape is greater than about 0.025 sec thick and without internal hard reflectors, backscatter is weak, but where the drape is thinner, especially where the underlying material is hard or rough, or where the drape contains shallow hard reflectors, the backscatter is relatively strong.

A submarine valley system at 172° 35'W, 23° 55'N has at least two tributary channels that coalesce and apparently funnel sediment to a depocenter southeast of the study area in a region insonified during F13-89-HW. Topographic relief across the channel is less than 8 meters.

Mass Wasting Features

The distal end of a giant debris avalanche was insonified at 174° 45'W, 25° 25'N and appears to have flowed southwest from the slopes of Lisianski Island and Neva shoal, approximately 90 km upslope from the toe of the slide. The toe is characterized by large isolated blocks as much as 1 km long. The long distance of travel and the isolated-blocky nature of the slide suggest that it moved rapidly downslope.

A number of large, rough-surfaced seamounts have what appear to be gullies, debris chutes, amphitheaters, and debris avalanche deposits.

These features suggest that mass-wasting is an important component affecting the morphologic evolution of the seamounts.

INTRODUCTION

Cruise F1-90-HW was the tenth cruise of the multi-year cooperative program between the United States Geological Survey (USGS) and the British Institute of Oceanographic Sciences (IOS) to map the seafloor of the Hawaii Exclusive Economic Zone. The primary objective of the program is to produce total-coverage, mosaic maps of the seafloor within the Hawaii EEZ using acoustically derived images from the GLORIA long-range side-scanning sonar system.

Cruise F1-90-HW was the second of three consecutive surveys of the EEZ south of the Hawaiian Ridge, between Nihoa Island and 320 km west of Kure Island (Figure 1). The previous cruise, F13-89-HW, conducted in November and December, 1989, surveyed the outer portion of the EEZ, and the following cruise F2-90-HW will survey the inner portion, directly south of the Hawaiian chain. Thirteen tracklines were run during F1-90-HW to survey the intervening portion of the EEZ (Figure 2). This series of three cruises is adjacent and west of the area surveyed by F10-88-HW (McGregor et al.,1989) The remaining northern waters of the Hawaiian EEZ are scheduled to be surveyed in 1991.

Operations on-board the R/V Farnella included the collection of a variety of geophysical and acoustic data, including GLORIA long-range, dual channel, side-scan sonar images; two-channel seismic-reflection profiles using a 2620 cm^3 (160 in^3) air-gun sound source, 3.5-kHz high-

resolution profiles, 10-kHz bathymetric profiles, magnetic- and gravity-field records, and upper water-column temperature profiles using expendable bathythermographs (XBTs).

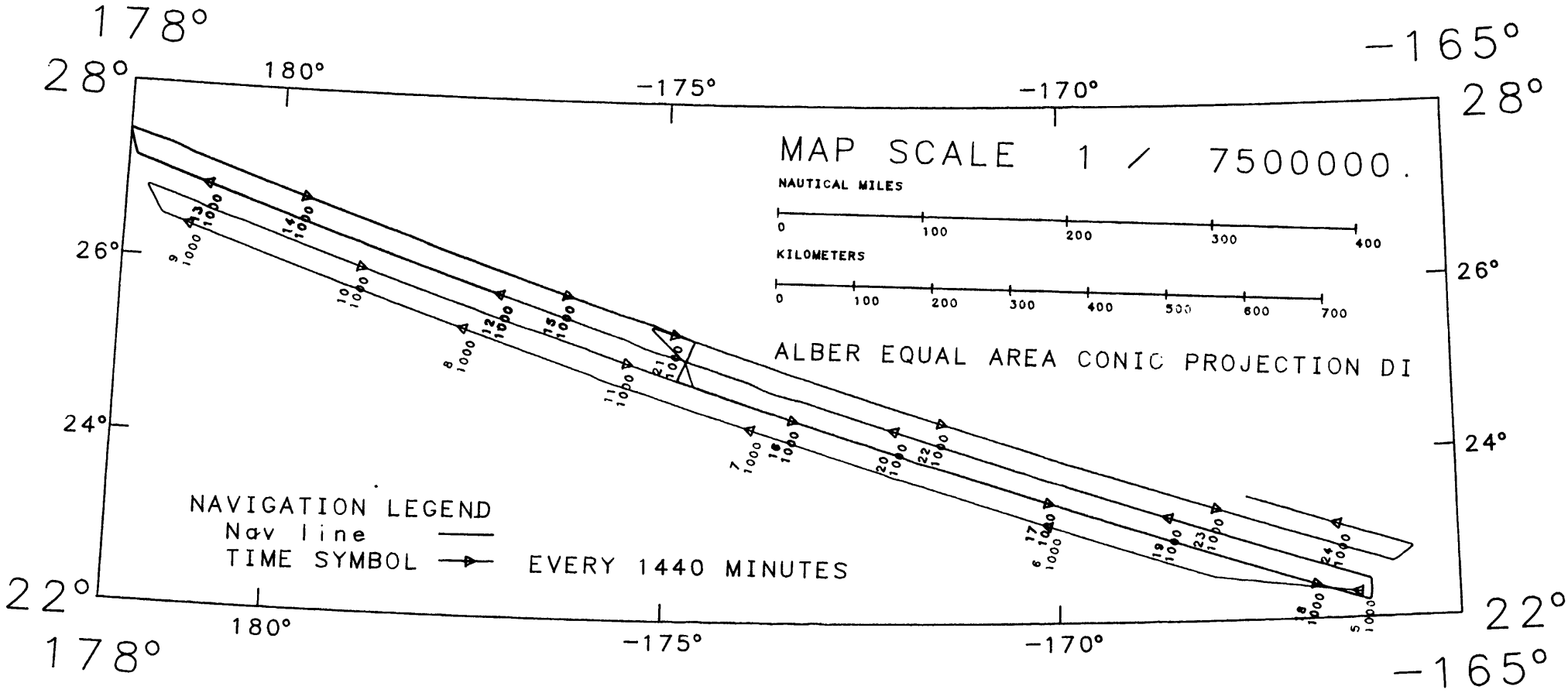

Figure 2. Trackline plot of the R.V. Farnella during F1-90-HW field operations (scale 1:7,500,000).

SCIENTIFIC STAFF FOR F1-90-HW

U.S. Geological Survey

Monty A.Hampton	Co-chief Scientist - Geologist
Robert E. Kayen	Co-chief Scientist - Civil Engineer
Kaye Kinoshita	Navigator - Watchstander
Grace Fong	Data archivist - Watchstander
Matthew Morgan	Watchstander
Jim Vaughan	Electronic Engineer

Institute of Oceanographic Sciences, U.K.

John Wilson	Co-chief Scientist - Geologist
Derek Bishop	GLORIA Engineer
Jon Campbell	GLORIA Engineer
Andrew Webb	Mech. Engineer

Research Vessel Services (RVS), Barry, U.K.

David Beasley	Navigator

JMarr (Ships Crew)

Ronald Holliday	Captain
Albert Fuller	Chief Officer
David Shaw	2nd Officer
Michael Baldwin	Chief Engineer
David Rogerson	2nd Engineer
Arthur Green	3rd Engineer
Robin Searle	Electrician
Alan Thompson	Bosun
Jimmy Springall	Seaman
Peter Appleyard	Seaman
Michael Jessop	Seaman

Thomas Caughie	Chief Cook
Pat Fitzgerald	Second Cook
David Graves	Steward

Summary of Field Operations

The R\V Farnella was used as the research platform for conducting the seafloor mapping surveys. The Farnella is under lease to the U.S. Geological Survey through the British Institute of Oceanographic Sciences (IOS), Wormley, England. IOS personnel were responsible for operations involving the GLORIA system and GLORIA image production. IOS also was in charge of scientific deck operations and maintenance of geophysical equipment. Acquisition and processing of navigation data were performed by both USGS and RVS personnel. The USGS personnel monitored the gravimeter, magnetometer, acoustic-reflection, 3.5 kHz and 10 kHz recording systems. The co-chief scientists coordinated and supervised cruise planning and shipboard operations. Additionally, co-chief scientists produced three GLORIA field mosaics and this preliminary shipboard science report.

The following cruise calender is presented in Julian Day/Greenwich Mean Time (GMT), for major operations of F1-90-HW . In order to convert to local Hawaiian time, subtract 10 hours from GMT. The Julian day 001 refers to January 1. Figure 1 provides a geographic reference for the region covered by this survey, and Figure 2 is a trackline summary to provide a reference for the progress of the survey.

The survey originally was planned to be run along 4 long lines oriented parallel to the Hawaiian Ridge, with short, orthogonal connecting lines. However, weather conditions necessitated completion of the coverage in the western third of the area before proceeding on to the eastern two-thirds. The survey was finished with an additional day of ship time, and as such, we ran fourteen hours of trackline scheduled for F2-90-HW. (Note: SOL=start of line, EOL=end of line.)

Day 003

0200; Gravity tie #1 reading at the Bishop Museum base station, Honolulu, with the portable gravimeter.

1500 Shipboard gravity meter system on.

1732; Gravity tie #2 at pier 2C, Port of Honolulu with the portable gravimeter.

1910; Departed Pier 2C, Port of Honolulu, weather sunny and calm.

Day 004

0004; Large data error induced while tracking signals sent to the ABC system. Weather sunny and calm.

Day 005

0127 Deploy XBT #067 (T-04).

0335 Deploy 3.5kHz and 10kHz systems.

0350 Deploy GLORIA, amplifier malfunction.

0435 Deploy magnetometer.

0900 GLORIA system on, PPA repaired, begin data collection.

1935 Deploy two-channel streamer and airgun.

2043 SOL-001 (22°31.13'N, 159°08.32'W).

2127 Pressure loss on airgun. Gun pulled and hose replaced.

2200 Airgun restarted, seismic data collection resumed. Weather sunny and calm.

Day 006

0151 Deploy XBT #068 T-04
Weather sunny and calm.

Day 007

0053 Deploy XBT #069 (T-04)
Weather partly cloudy, seas moderate 1-2 m, winds 20 knots.

Day 008

0047 Deploy XBT #070 (T-07)
Weather moderate to calm.
Transmission of Telex 1 to USGS

Day 009

0152 Crossed International Dateline at 26° 02.72'N

0040 Deploy XBT #071 (T-04)

1235 EOL-001 (26° 28.90'N, 178° 30.10'E)

1310 SOL-002 (26° 28.90'N, 178° 30.10'E)

1520 EOL-002 (26° 48.60'N, 178° 17.50'E)

1531 SOL-003 (26° 48.60'N, 178° 17.50'E)

1945 Pulled 3.5 kHz fish in order to eliminate system noise

	2007	Re-deployed 3.5-kHz fish; minor improvement in record. Weather: Seas moderate to rough. Winds 20-25 knots, seas 2-3 m.
Day 010		
	0154	Deploy XBT #072 (T-04) Weather: Winds 25 increasing to 35 knots, seas 3-5 m.
Day 011		
	1620	EOL-003 (24° 44.61'N, 174° 39.18'W). Continued deterioration of weather and shift of seas from north to east led to the decision to end line 003 and work toward the west.
	1641	SOL-004 (24° 45.87'N, 174° 38.50'W)
	1838	EOL-004 (25° 01.90'N, 174° 45.21'W)
	1848	SOL-005 (25° 02.99'N, 174° 46.30'W)
	2043	TCAG system off; air-gun change.
	2145	TGAC system on. Weather: winds 30-40 knots with gusts to 50 in the early morning, seas 5-6 m, improvement in mid-morning to winds of 20-25 knots, seas to 3 m.
Day 012	0045	Deploy XBT #073 (T-04) Weather clear and calm.
Day 013		
	0042	Deploy XBT #074 (T-04).
	1546	EOL-005 (27° 08.020'N, 178° 07.020'E).
	1554	SOL-006 (27° 08.640'N, 178° 06.060'E)
	1747	EOL-006 (27° 25.450'N, 178° 00.010'E).
	1757	SOL-007 (27° 26.210'N, 178° 00.870'E).

1852 Slow speed (5 knots) to change 3.5 kHz fish; noisy records.

1918 3.5 kHz system on, marked improvement of 3.5 kHz records.

1922 Ship speed return to normal.
Weather partly cloudy with occasional showers.
Winds increased from 10 to 30 knots.

Day 014

2204 TCAG system on, but channel two inoperative.

Day 015

1857 TCAG system off, pulling streamer, ship speed 5 knots.

1918 Ship speed returned to normal, streamer pulled.

2015 EOL-007 (25° 15.00'N, 174° 35.70'W).

2059 SOL-008 (25° 15.00'N, 174° 35.70'W).

Day 016

0001 Decrease ship speed to 6 knots, redeploy repaired streamer.

0009 EOL-008 (24° 47.86'N, 174° 49.65'W).

0024 SOL-009 (24° 47.86'N, 174° 49.65'W).

0030 Ship speed returned to normal, streamer deployed.

0057 TCAG system on, streamer operation restored.

0158 Deploy XBT #075 (T-04).
Weather: winds 20-30 knots, seas to 2 m.

Day 017

2013 TCAG off, reposition streamer 50 meters closer to ship to investigate origin of clicking noise.

2017 TCAG system on.

2358 Deploy XBT #076 (T-04).

Day 018

1502 EOL-009 (22° 16.50'N, 166° 21.60'W).

1513 SOL-010 (22° 13.00'N, 166° 07.00'W).

1652 EOL-010 (22° 26.75'N, 166° 05.85'W).

1701 SOL-011 (22° 27.67'N, 166° 06.63'W).

2338 Deploy XBT #077 (T-07) Weather: winds 20 knots, seas to 2 m and improving.

Day 019

2333 Deploy XBT #078 (T-04)
Weather: winds 10 knots, seas to 2 m and worsening in the evening.

Day 020

1135 Masscomp stopped (problem).

1315 Masscomp restarted, resumed recording.

Day 021

0026 Deploy XBT #79 (T-04).

0424 EOL-011 (25° 02.99'N, 174° 46.30'W).

0430 SOL-012 (25° 02.99'N, 174° 46.30'W).

0801 EOL-012 (25° 16.17'N, 174° 37.92'W).

0816 SOL-013 (25° 16.17'N, 174° 37.92'W).

2252 TCAG system off, change air-gun.

Day 022

0022 TCAG system on.

0045 Deploy XBT #80 (T-04).

Day 023

2123 Deploy XBT #81 (T-04).

2025 TCAG system off, Masscomp stopped.

2054 TGAC system on, Masscomp restarted, resume recording.

Day 024

0023 Deploy XBT #82 (T-07).

0142 EOL-013 (22°39.60'N, 165°50.00'W).

0156 SOL-014 (22°39.60'N, 165°50.00'W).

0342 EOL-014 (22°50.20'N, 165°35.30'W).

0353 SOL-O15 (22°50.20'N, 165°35.30'W).

1800 EOL-015 (23°27.08'N, 167°37.64'W), end data collection for F1-90-HW.

1806 Retrieve GLORIA, streamer, airgun, magnetometer, 3.5- & 10-kHz towfish.

1941 TRA-2 to Honolulu (23°27.320' N, -167°42.290'W).

Day 025

0029 Deploy XBT #83 (T-04).

Day 027

1800 Dock at Port of Honolulu, Hawaii.

Equipment Summary

A description of the equipment used for shipboard data collection is presented below. Detailed compilation of shipboard data collection and performance of equipment is recorded in the DAFE data archive for F1-90-HW. Appendix I summarizes standard operational procedures

established during the 1986 surveys (Normark et al., 1987 and 1989). Appendix 2 is an abridged version of the DAFE data record for F1-90-HW.

Gravity Meter

The gravity meter, a LaCoste and Romberg S-53, functioned continuously for the entire cruise. A land-sea gravity tie was established at pier 2C in Honolulu prior to departure by taking reference measurements at the Bishop Museum IGSN gravity base station, Honolulu, with LaCoste and Romberg model G portable gravity meter number 426. Another land-sea gravity tie was established following the cruise so that drift corrections could be applied to the data. Gravity measurements were recorded on magnetic tape and on a strip-chart recorder.

Magnetometer

The magnetometer was deployed at JD 005/0435Z. The measurements were recorded on both a strip chart and magnetic tape along with the gravity data. There were no serious problems with the system. Some spikes on measured values occurred when seas were very rough, apparently caused by sensor pitching when the ship pitched, thereby yanking the tow cable. The magnetometer was recovered on JD026/1806Z.

Expendable Bathythermographs (XBT's)

XBT probes typically were deployed once daily, beginning on JD 005, to measure the thickness of the ocean surface mixed layer and the thermocline temperature profile. Occasionally, XBT drops were canceled, or they failed due to excessive wind or ship motion. T-4 probes are capable of profiling to 460 m water depth, and T-7 XBT's can profile to 760 m. T-7 probes were deployed weekly whereas T-4 probes were used for the intervening 6 days. The system consists of an XBT launcher and receiver, a GOES satellite transmitter, and a micro-computer/controller for recording, data output, and data transmission. The system performed well. The probe was launched using a 1.5 m extension handle, off the port side of the vessel and 6 m forward of the stern. The following list is a record of the location of daily XBT drops.

Day	XBT type	Depth rating	XBT number	Latitude	Longitude
004	T-04	460 m	67	21 20.9'N	159 04.3'W
006	T-04	460 m	68	22 45.3'N	168 51.4'W
007	T-04	460 m	69	23 49.5'N	172 26.9'W
008	T-07	760m	70	24 55.0'N	176 06.9'W
009	T-04	460 m	71	26 00.0'N	179 50.2'W
010	T-04	460 m	72	26 20.4'N	179 54.0'E
012	T-04	460 m	73	25 18.8'N	175 39.6'E
012	T-04	460 m	74	26 25.1'N	179 25.7'W
016	T-04	460 m	75	24 43.9'N	174 36.4'W
017	T-04	460 m	76	22 50.1'N	168 13.6'W
018	T-07	760 m	77	22 44.9'N	167 04.0'W
019	T-04	460 m	78	23 48.0'N	170 34.6'W

021	T-07	460 m	79	24 52.4'N	174 10.2'W
022	T-04	460 m	80	24 44.9'N	172 51.8'W
023	T-04	460 m	81	22 50.3'N	166 25.8'W
024	T-07	760 m	82	22 43.0'N	166 01.0'W
025	T-04	460 m	83	23 10.7'N	166 45.3'W

3.5-kHz High-Resolution Profiling System

The 3.5-kHz transducer tow fish was deployed on JD 005/0335Z. Problems with record quality began within the first few days of the cruise. On JD 013/1852Z the tow fish was changed and the tail section was found to be loose and damaged. Record quality after repair was excellent. The tow fish was recovered on JD 024/1806Z.

10-kHz Echo-Sounding System

The 10-kHz echo-sounding tow fish was deployed on JD 005/0335Z. The system worked well, with down time only for routine maintenance. The tow fish was recovered on JD 024/1806Z.

Two-Channel Seismic-Reflection System

The two-channel seismic reflection system employs a 2600 cm^3 (160 in^3) air-gun sound source, and an 800 m weight-stabilized two-channel streamer. Two 50-m-long transducer sections are towed 500 to 600 m behind the air gun, which is fired every 10 seconds. Two-channel data is

recorded real-time on a MASSCOMP computer and displayed on a graphics monitor set to receive a one-channel, 2.3-second analog record. During the survey, two single-channel analog hard copy profiles were produced on Raytheon line scan recorders (LSR), one with 8-second sweep and the other with 6-second sweep. The memory function on the 6-second record was used to print at a constant orientation (west and north are on the left, east and south are on the right) At a speed of 8.5 knots, vertical exaggeration is about 4:1 on the 6-second record and 20:1 on the 8-second record.

The two-channel seismic reflection system had a number of problems during our survey. At JD 014/2204Z, channel one on the streamer ceased functioning. Several attempts were made to correct the malfunction, but without success. On JD 015/1857 the streamer was retrieved and found to be physically damaged in two places. The protective sleeve at the back end of the first stretch section had pulled apart, and the streamer was held together only by the conductive cables and one strength member. The missing signal problem was found in the tow cable of the streamer. These problems were corrected, and the streamer was redeployed at JD 016/0001Z. A hammering noise problem developed in the streamer cable during the last half of the cruise and apparently was related to rotation of the Farnella's propeller. A shipyard diver was hired to inspect the propeller section for foreign material. Final recovery was at 024/1806Z.

Navigation Systems

Shipboard navigation (described in Normark et al., 1987) was monitored on the bridge for steering and recorded in the lab for archival.

A USGS in-house program operating on an IBM PC AT processed both Loran and GPS signals. Loran signals from a Northstar 7000 receiver were acquired to calculate direct range on Loran stations (referred to as RhoRho navigation). Global Positioning System (GPS) signals received on a Trimble 4000 receiver provided the most accurate fixes and were available almost 16 hours per day. RhoRho navigation was used to monitor the ship's track when GPS was unavailable.

GLORIA Long Range Side-scan Sonar System

The GLORIA system was launched on JD 005/0350Z and a PPA amplifier malfunction occurred on system start-up. IOS GLORIA engineers corrected the problem by replacing the component, and the system was restarted at JD 005/0900Z. Thereafter, the system operated without problems for the duration of the survey. Logging of GLORIA data began almost immediately after deployment of the tow fish. To avoid spurious echo returns, signal transmission was suspended during course changes. The system operated continuously until the termination of the survey on JD 024/1806Z. Then, the GLORIA tow fish was recovered following the recovery of the magnetometer and seismic gear.

The deployment and operation of the GLORIA system is described in detail in IOS GLORIA logs. Technical descriptions of the GLORIA system are available in Somers et al. (1978) and Laughton (1981). A summary of the GLORIA pass record and the number of files is presented in Appendix 2. Note that one pass equals 6 hours.

GLORIA Shipboard Image Processing

The techniques employed in shipboard processing are described in detail in Normark et al. (1987 and 1989). Special shading techniques, such as those used by Normark et al. (1989), were not applied. Following the photo printing of the GLORIA passes, the images were laid down over a properly scaled, corrected and smoothed navigation plot and then mosaicked.

RESULTS

The following outline organizes the topics addressed:

1. Cretaceous seafloor and volcanic features

1a. Murray Fracture Zone

1b. Seafloor spreading fabric

1c. Seamount distribution and characteristics

1d. Cretaceous ridges

1e. Lava flows

2. Sedimentation

2a. Sediment in acoustic-reflection profiles

2b. Sediment in GLORIA images

2c. Seafloor channels

2d. Bedforms

3. Mass wasting features

3a. Debris avalanches and small scale mass wasting features.

1. Cretaceous seafloor and volcanic features

1a. Murray Fracture Zone (MFZ)

Three strongly displayed lineations and two weaker ones, both probably representing fault offset of the seafloor, were imaged in the survey and are interpreted to be part Murray Fracture Zone (Figure 3).

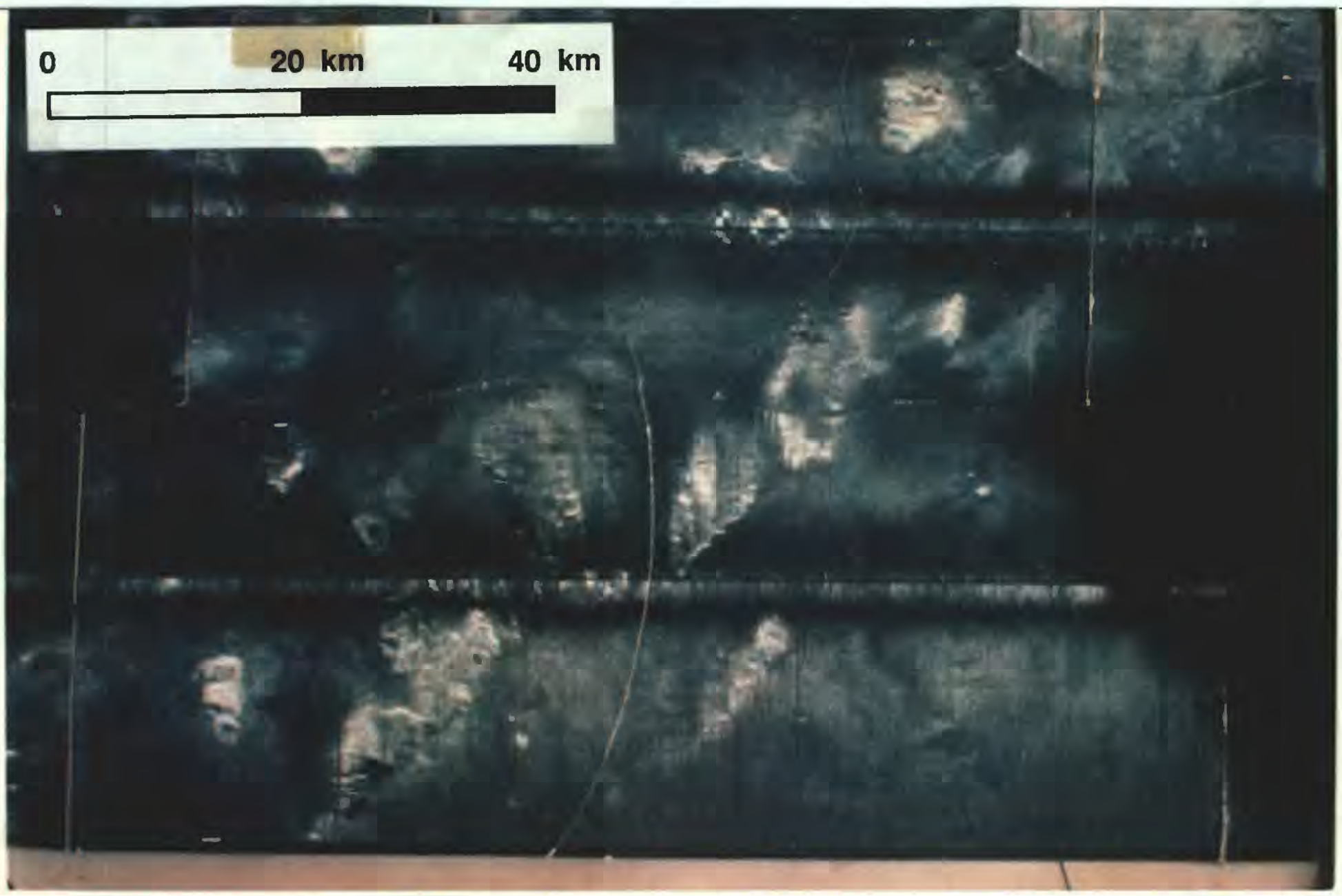

Figure 3. GLORIA sonograph of the Murray Fracture Zone (MFZ).

The lineations lie parallel to, but offset from, two additional lineations imaged to the south-east during F13-89-HW. The lineations lie between 176° 30'W and 175° 15'W and trend N65E. The three more strongly displayed lineations consist of en-echelon leaky faults. Flood basalts(?) (Volcanic ridges?) and occasional seamounts rise above the surrounding sediment along the fault trace. However, much of the survey area interpreted to be within the MFZ is sediment covered. The three lineations are spaced 8 to 9 km apart. The two more weakly expressed lineations, 37 and 75 km northeast of the stronger ones, are defined by the alignment of seamounts and volcanic ridges. For example, four seamounts aligned at N65E are centered at about 176° 'W, 24° 55'N. Two seamounts of this group produce relatively low backscatter and apparently are draped with a relatively thick section (approximately 30 meters) of acoustically transparent sediment, whereas the other two produce relatively strong backscatter and are draped with only 20 meters of sediment on average. The Murray Fracture Zone within our study area therefore is thought to comprise at least five parallel faults spanning a total width of approximately 90 km. When combined with the adjacent and parallel offset features imaged in the previous survey, the Murray Fracture zone appears to be approximately 150 km wide and has a surface outcrop expression of at least seven faults.

A fault parallel to the MFZ occurs at 179° 30'W, 26° 20'N oriented N65E. This fault truncates a prominent outcrop of oceanic basement rock to the south that clearly exhibits drag-folded spreading fabric, suggesting left-lateral motion along the fault (Figure 4). This block is interpreted to be dipping gently to the southeast, resulting in eventual burial of the seafloor spreading fabric.

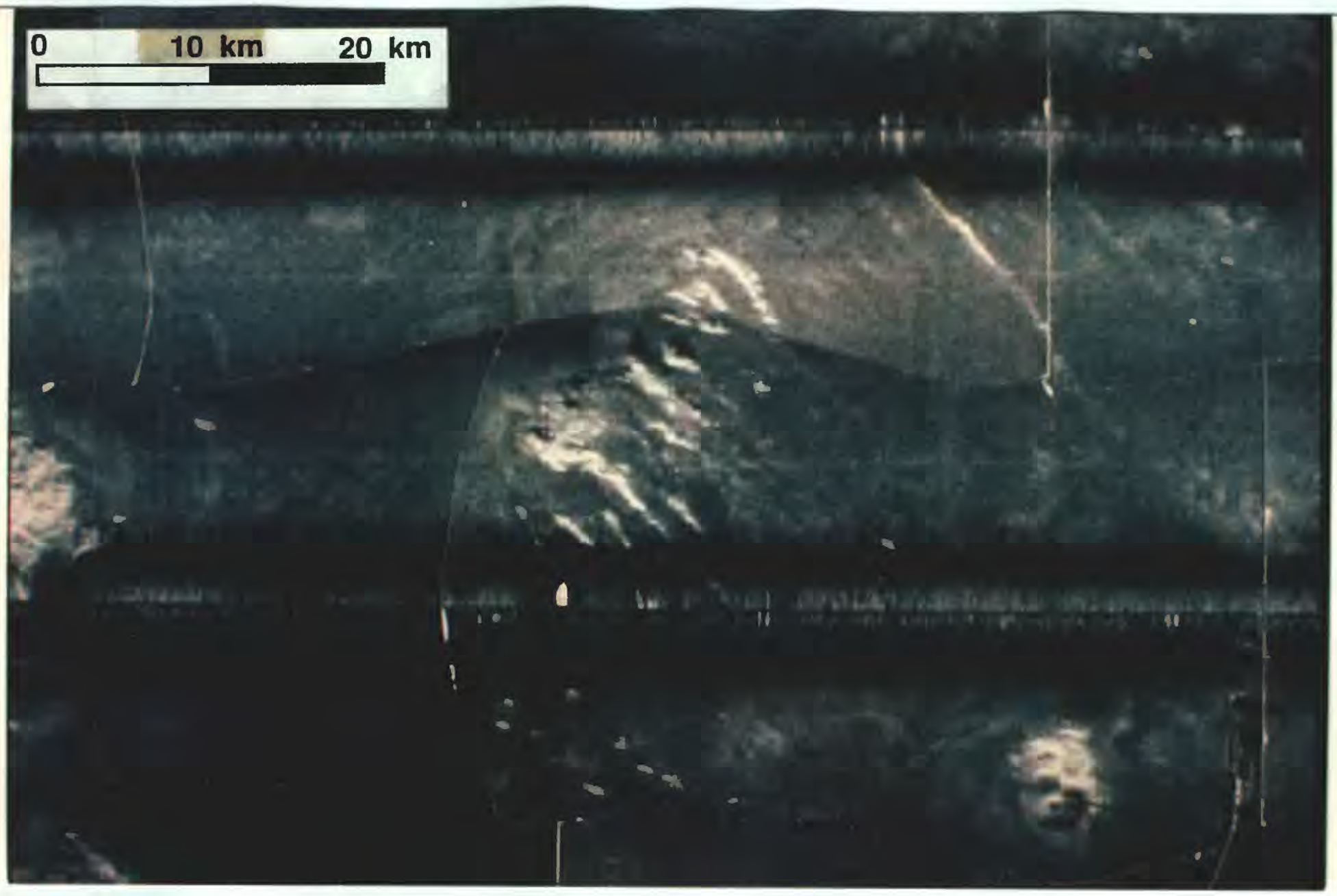

Figure 4. GLORIA sonograph of seafloor spreading fabric and left lateral strike-slip faulting parallel to the MFZ system.

1b. Seafloor spreading fabric

Seafloor spreading fabric can be seen clearly where original Cretaceous basement rock outcrops or is overlain by a relatively thin (<20 meter) veneer of acoustically transparent sediment. The most apparent expression of the horst and graben fabric is at the west end of the study area, between 178° 40'W and 178° 00'E (Figure 5). Horsts in this abyssal hills province strike uniformly N25W to N26W and are spaced 1.5 to 5 km apart. Individual horsts can be traced obliquely across the width of the survey area, approximately 160 kilometers. The spreading fabric was generated at the East Pacific Rise approximately 95-128 M.a.

The distinct alternating backscatter intensity across the spreading fabric between 178° 40'W and 178° 00'E may be caused by; (1) different sediment thickness over the ridges compared to the valleys, resulting is variations in backscatter from buried features (see below); (2) different sediment properties over the ridges compared to the valleys; and (3) topography of the ridge and valley fabric itself. In support of the first and second possibilities, the transparent layer that drapes much of the study area appears to thin over the graben and includes a hard layer with a strong acoustic signature. This reflective layer typically is not present above the horsts. In support of the third case, topographic expression of the spreading fabric is displayed in the reflection profiles However, the variations in backscatter intensity do not change character with direction of insonification, which supports the first two possibilities and argues against the third. The abyssal hills region may have formed in response to upward

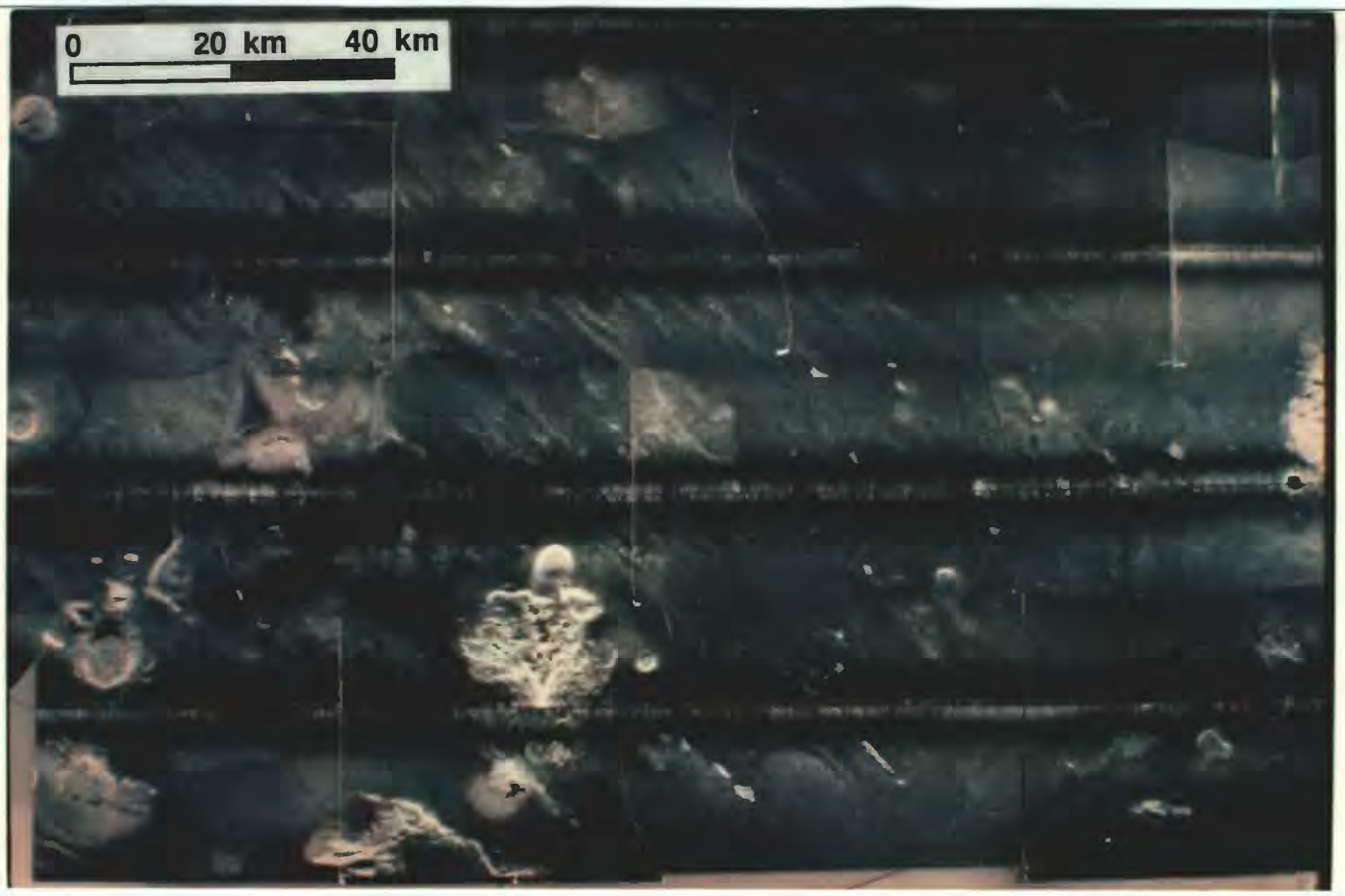

Figure 5. Seafloor spreading fabric across the western portion of the study area.

crustal flexure not present in other portions of the survey area, or it may be due to larger offset of the normal faults.

1c. Seamount distribution and characteristics

Four seamount types are present within the survey region, although some seamounts possess characteristics attributable to more than one type. The four general types are:

I) small (generally 3-10 km across) smooth-surfaced, circular, low-relief seamounts with or without summit craters.
II) large (>10 km across) rough-surfaced, possibly degraded, non-circular seamounts.
III) small (5-10 km across) rough-surfaced, possibly degraded, non-circular seamounts.
IV) very small (less than 2 km across) rough-surfaced volcanic mounds or spatter cones.

The following tables list all seamounts classifiable as TYPE-I,-II,or -III. Seamounts are listed by longitude, with the seamount farthest west listed first, followed by seamounts to the east.

TYPE I: Small (less than 10 mi), round, low-relief seamounts					
Location	No	Diam. (mi.)	Flow Features	Summit Crater	Comments
178° 18'E 26° 57'N	1	2.7	No	No	

178° 32'E 26° 48'N	2	2.6	No	Yes	
178° 34'E 26° 30'N	3	3.0	No	Yes	Possibly degraded on west side
178° 43'E 27° 08'N	4	3.6	No	No	
179° 10'E 26° 27'N	5	2.8	No	Possible	North of degraded volcano
179° 15'E 26° 15'N	6	1.5	Possibly to north	Possible	
179° 41'W 26° 25'N	7	2.1	No	Yes	North of degraded volcano
177° 19'W 25° 49'N	8	1.2	North, possibly south	No	May have subsidiary volcano.
175° 55'W 25° 32'N	9	1.6	No	No	
175° 25'W 26° 40'N	10	1.2	?	No	
169° 36'W 22° 50'N	11	4.5	No	No	
169° 24'W 22° 48'N	12	4.0	Yes	Yes	Adjacent seamount to south may be type-1 volcano
169° 12'W 23° 06'N	13	4.2	No	Yes	
169° 00'W 22° 57'N	14	3.6	No	No	
168° 54'W 22° 42'N	15	1.2	Yes	Yes	
168° 48'W 22° 48'N	16	3.0	No	No	West side possibly degraded
168° 20'W 23° 00'N	17	3.9	No	No	
168° 00'W 22° 45'N	18	4.5	No	?	
167° 25'W 23° 05'N	19	3.0	No	Yes	
167° 10'W 22° 51'N	20	2.4	No	Yes	
167° 10'W 22° 45'N	21	3.0	No	Yes	
166° 26'W 22° 24'N	22	2.9	No	No	
166° 22'W 22° 10'N	23	2.1	No	No	
166° 16'W 26° 08'N	24	2.9	No	No	

166° 10'W 22° 25'N	25	3.8	No	No	

TYPE II: Large, non-circular and rough-surfaced seamounts					
Location	No	Diam. (mi.)	Flow Features	Summit Crater	Comments
178° 45'E 26° 12'N	26	5-6	Possible	No	Difficult to interpret, at edge of mosaic
179° 45'W 26° 20'N	27	9.6	No	No	Very strong backscatter, rough surface
179° 06'W 26° 21'N	28	8.1	No	No	Very rough surface
177° 55'W 26° 23'N	29	12.0	Yes	?	
177° 20'W 25° 45'N	30	12.5	No	No	Very strong backscatter, rough surface
177° 09'W 25° 07'N	31	7.5	No	No	May be composite of smaller volcanoes, low backscatter intensity.
175° 40'W 24° 36'N	32	~15	No	No	
174° 10'W 24° 47'N	33	6.0	No	No	
174° 00'W 24° 35'N	34	6.0	No	No	Gullied
173° 58'W 24° 20'N	35	6.0	No	Yes	
173° 51'W 24° 38'N	36	10.0	No	No	
173° 47'W 24° 20'N	37	15.0	No	Yes	Prominent volcanic ridge to south
173° 45'W 24° 50'N	38	~15	No	Yes	May be source of lava flow(?) to the east.

173° 06'W 24° 20'N	39	8.0	No	No	
173° 00'W 24° 00'N	40	10x30	No	No	Highly degraded guyot with well developed ampitheaters and debris flows. Debris blocks up to 3 km wide
172° 45'W 24° 50'N	41	~40.0	No	No	Highly degraded guyot, well defined amphitheaters. Possible reef on summit. Large volcanic ridge on eastern flank.
168° 10'W 22° 24'N	42	15+	Yes	No	Ridge feature is composite of many volcanoes

3: Small, non-circular, rough-surfaced or degraded seamounts					
Location	No	Diam. (mi.)	Flow Features	Summit Crater	Comments
178° 18'E 26° 29'N	43	3.5	No	No	
178° 18'E 26° 33'N	44	1.2	No	No	
178° 30'E 26° 54'N	45	2.6	No	No	
178° 30'E 27° 00'N	46	3.0	No	No	
179° 03'E 26° 14'N	47	1.8	Strong halo	No	Seamount on horst of seafloor spreading fabric
179° 30'E 26° 24'N	48	3.3	No	No	Surrounded and topped by unusual cluster of very small volcanic mounds

179° 05'W 25° 57'N	49	3.0	Possible	No	Possible small debris flow below ampitheater.
178° 27'W 25° 00'N	50	up to 5.0	No	No	Field of at least 13 rough-surfaced seamounts
178° 24'W 25° 42'N	51		No	No	
178° 03'W 25° 48'N	52	1.0	No	No	
176° 00'W 24° 48'N	53	3.0	No	No	Elongated axis strikes N60E.
175° 30'W 24° 36'N	54	6.0	No	No	Associated with MFZ (group 58, 54)
175° 24'W 25° 00'N	55	1.9	No	No	Associated with MFZ (group 53, 55, 57)
175° 20'W 25° 17'N	56	4.5	Flow to South	No	Volcanic ridge axis strikes N20E
175° 12'W 25° 05'N	57	5.0	No	No	Associated with MFZ (group 53, 55, 57)
175° 00'W 24° 55'N	58	3.5	No	No	Associated with MFZ (group 58, 54)

A number of small, typically isolated volcanoes of round, low-relief (Type I) occur throughout the F1-90-HW study area. They have a peripheral, steep slope that appears on the GLORIA images as a narrow band of strong backscatter surrounding a relatively low-backscatter, relatively flat central area (Figure 6, seamount in top center). The topography is confirmed in acoustic profiles across these features. These volcanoes are similar in morphology to many of those studied on or adjacent to the East Pacific Rise (Fornari, 1984).

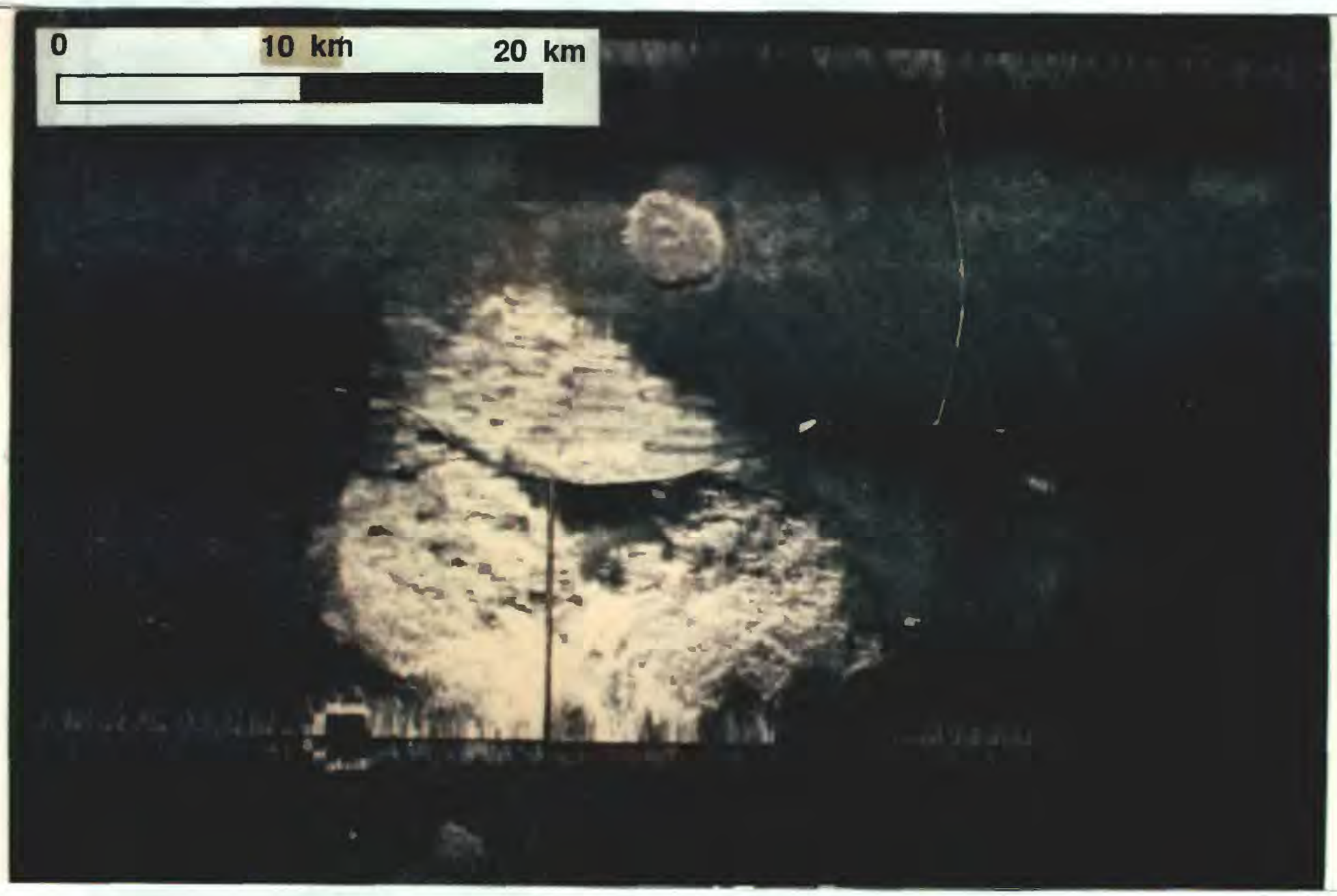

Figure 6. Type 1 (top center) and Type 2 (middle center)seamounts.

A conspicuous halo region surrounds many Type I volcanoes. The halo is irregular in shape and almost certainly is not a GLORIA processing artifact. Rather, the halos may represent volcanic material (lava flows, ejecta) shed from the seamount during its formation, or sediment deposited subsequently through mass-wasting.

Large, steep, and rough-surfaced seamounts of generally high backscatter intensity (Type II) occur in the study area. These volcanoes are highly mottled and irregular in shape on the GLORIA images, and they may be a cluster of volcanic mounds super-imposed upon one another during a dome building process (Figure 6, seamount in middle center). The Type-II Cretaceous (?) seamounts do not appear to be oriented along any lineaments or faults.

A group of large seamounts and guyots is located south of the main axis of the Hawaiian Island chain between 173°W, 24°N and 174°W, 25°N (Figure 7). They probably are Cretaceous in age, older than the adjacent Hawaiian islands. Horizon Guyot, a large, extensively studied Cretaceous tablemount 660 km to the southeast, rises approximately 3,500 m above the abyssal seafloor to within 1,400 m of the sea surface, similar to the guyots in our study area (Heezen et al., 1971). Characteristic of these seamounts are one or more flank ridges emanating from the main volcanic cone, similar to the Puna ridge at the southeast end of Hawaii (Holcomb et al. 1988). The ridges are extensively gullied, and several possess well developed amphitheaters, below which lie large debris avalanche fans. Individual blocks incorporated within the slide debris are as much as 3 km across, and some of the slide material may be collapsed coral reefs.

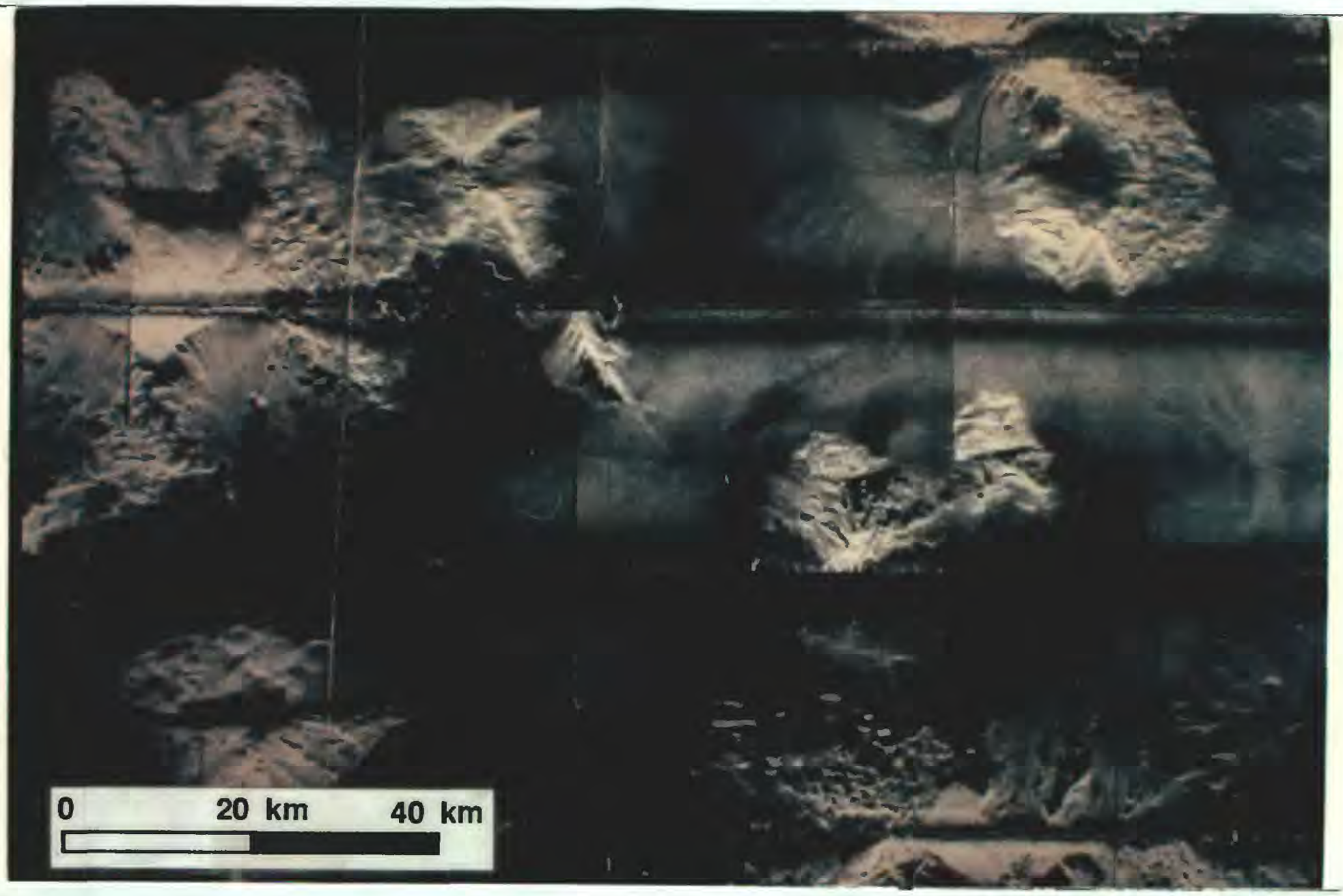

Figure 7. Guyots in the central portion of the study area.

As in our study area, debris flows that emanate from the summit sediment cap and bedrock flanks of Horizon Guyot are present in talus deposits and onto the adjacent abyssal seafloor, suggesting that mass wasting is an important process that controlls the morphology of these seamounts (Schwab et al., 1988, Kayen et al., 1990). Although the group of large seamounts may be Cretaceous in age, their close proximity to the Hawaiian Ridge probably exposed them to higher levels of environmental loading compared to seamounts elsewhere. These environmental stresses include earthquake loading, crustal subsidence and arching due to loading by the ridge, and partial volcanic overprinting by the propagating Hawaiian hot spot. This may have caused more extensive mass wasting relative to other, isolated large abyssal seamounts.

Discontinuous, strongly backscattering edges occur along the perimeter of the summit cap of the two largest guyots They are most clearly visible on the southerly edge of the guyots' rim. Possibly, these are drowned reefs.

Type III seamounts are rough-surfaced and largely non-circular (Figure 8). They probably are Cretaceous in age and formed on the seafloor soon after its creation at the East Pacific Rise some 95-128 Ma.

Very small (less than 1.5 km across) seamounts and volcanic mounds are classified as Type IV. This group was not cataloged in the tables above. Type IV seamounts are spread over most of the study area and uncommonly occur in clusters. These seamounts probably are also Cretaceous in age.

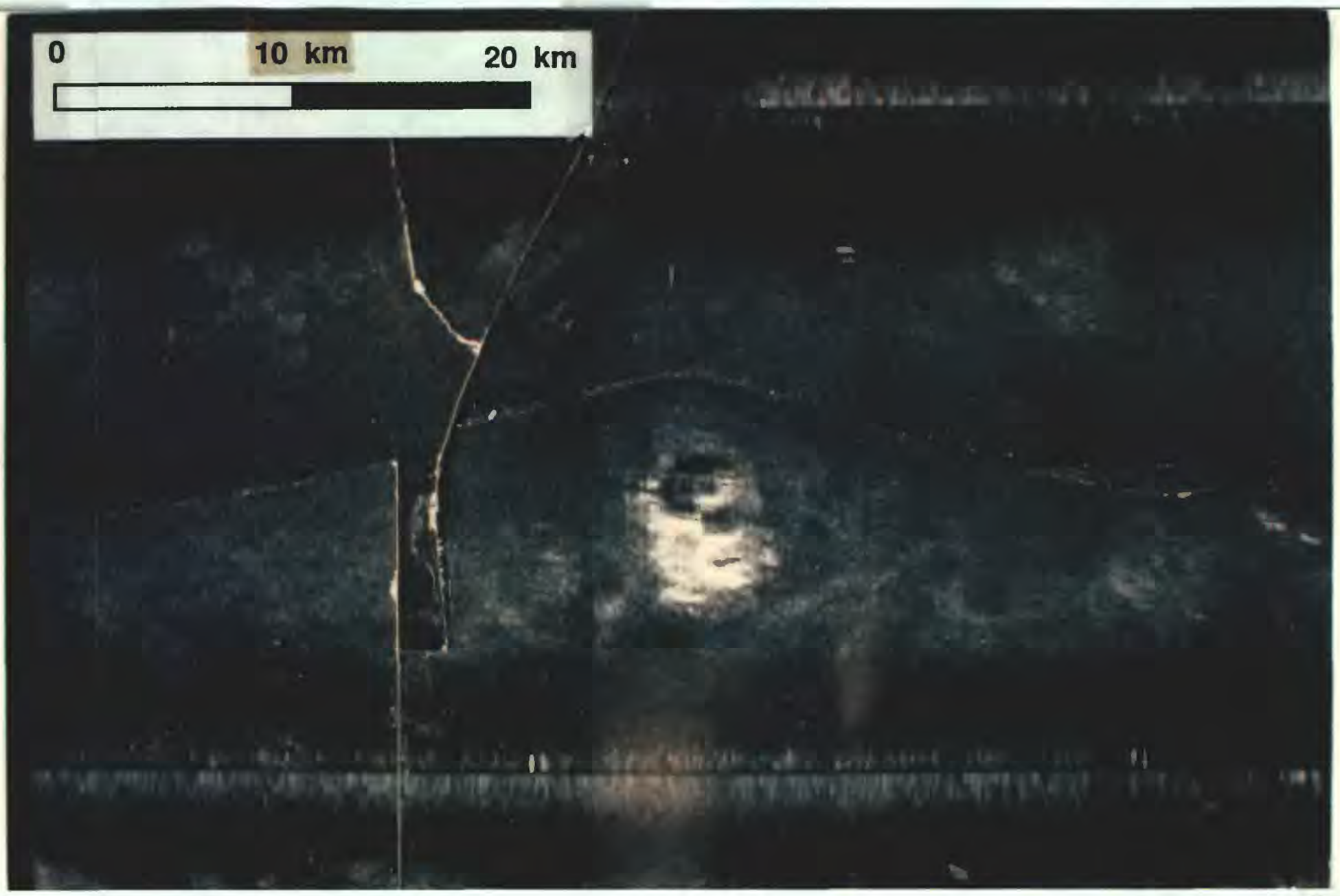

Figure 8. Type 3 seamount characterized by its relatively small size and bright, rough backscatter intensity.

1d. Cretaceous ridges

Necker Ridge at the east end of the survey area appears to have formed from massive eruptions along three parallel leaky transform faults that trend N48E. The crests of the volcanic ridges are spaced at 45 km and separated by two intervening sediment-filled basins (Figure 9). The most southern and massive ridge is Necker Ridge, which is, on average, 25 km wide and rises 3,200 m above the abyssal seafloor to within 1,600 m of the sea-surface. More detailed discussions of Necker Ridge were made by Pickthorn et al. (in press) and Torresan et al. (in press).

1e. Lava flows

A long sheet flow was insonified near a large Type II volcano at 173° 45'W, 26° 20'N. It apparently flowed downslope to the south for at least 65 km. However, the flow is nowhere more than 10 km across. The sheet flow is interpreted to have had low viscosity (Figure 10). Acoustic profiles across the flow indicate that it lies within a shallow topographic depression and has an opaque, and characteristically weak, "mushy" reflector, similar to lava flows imaged off Oahu (Torresan, et al., 1989), and Hawaii (Normark et al., 1987). The flow covers at least 820 km^2 and surrounds three isolated kapuki. The lava flow possibly extends another 20 miles toward the south but is obscured by a thicker sediment drape.

Figure 9. Necker ridge and an adjacent ridge to the northwest. The intervening region is a sediment filled basin.

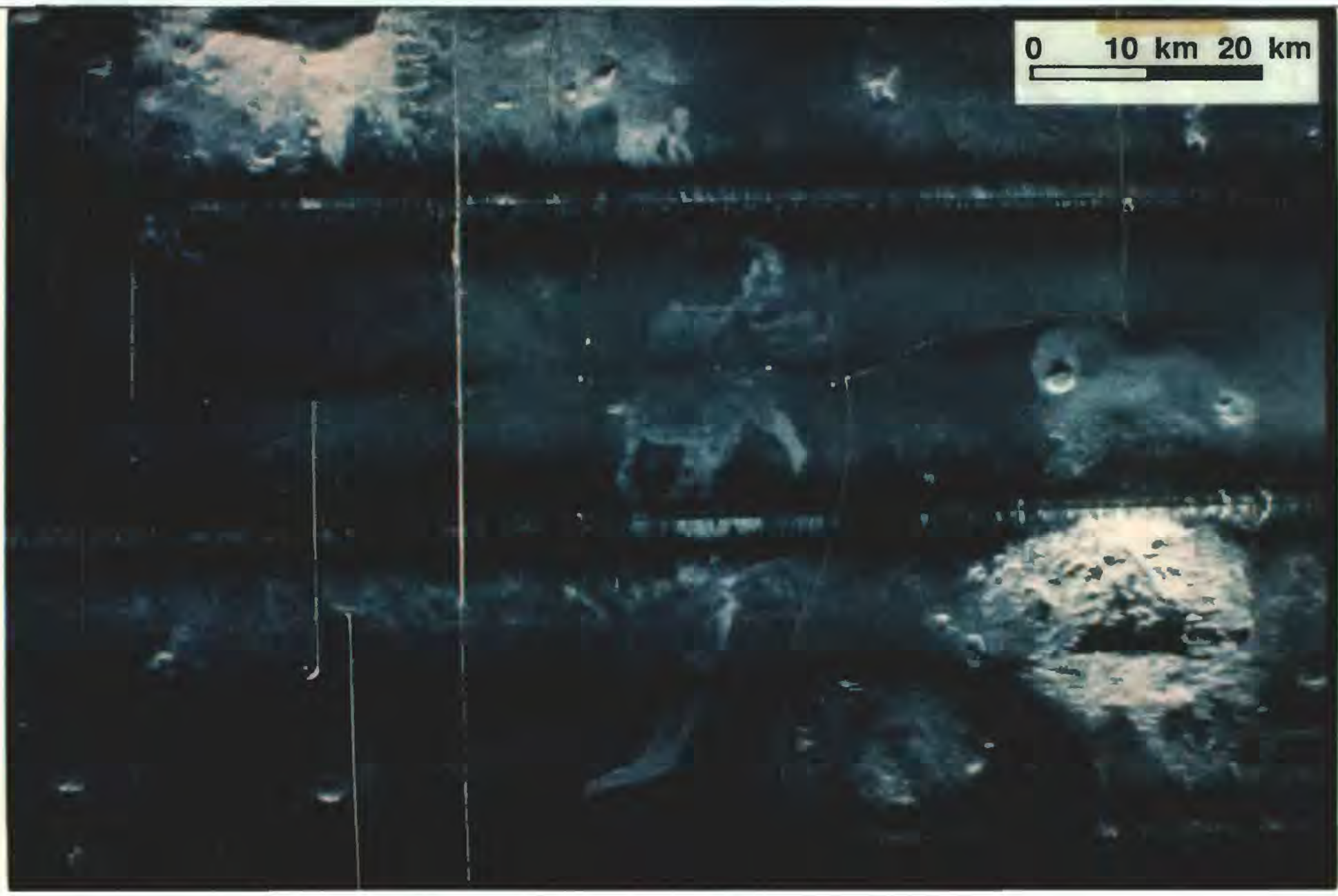

Figure 10. Lava flow following low topography between seamounts.

2. Sedimentation

2a. Sediment in acoustic-reflection profiles

The air-gun profiles show a sequence of nearly horizontal, parallel reflectors that reach a thickness of more than 0.6 sec (two-way travel time) over oceanic basement. The reflectors have a basin fill pattern; that is, reflectors truncate against, rather than drape, the irregular basement surface. The reflector sequence is absent in places where the oceanic crust reaches the seafloor. The sequence has been interpreted as turbidite and hemipelagic basin fill (Torresan et al. in press).

The 3.5-kHz profiles show a transparent drape, most likely pelagic or hemipelagic sediment, covering the seafloor throughout most of the area. This layer is up to 0.050 sec thick but most commonly is between 0.010 and 0.030 sec thick (Figure 11). Its upper surface (the seafloor) is a sharp, strong reflector. Internally, the layer may be either totally transparent, or it may contain one or a few continuous to discontinuous, sharp to prolonged reflectors, especially near seamounts and volcanic ridges. These internal reflectors probably are volcaniclastic sediment beds formed by material shed off the adjacent rock masses. The transparent layer drapes most topographic features such as basement ridges and seamounts, but it is undetectable over some of the seamounts that have strong backscatter in the GLORIA images. For example, the guyots and seamounts in the vicinity of 24° 40' N, 173° 40'W typically are not draped by the transparent layer. Instead, their surface has an opaque, prolonged reflector that suggests bare volcanic rock or volcanoclastic sediment.

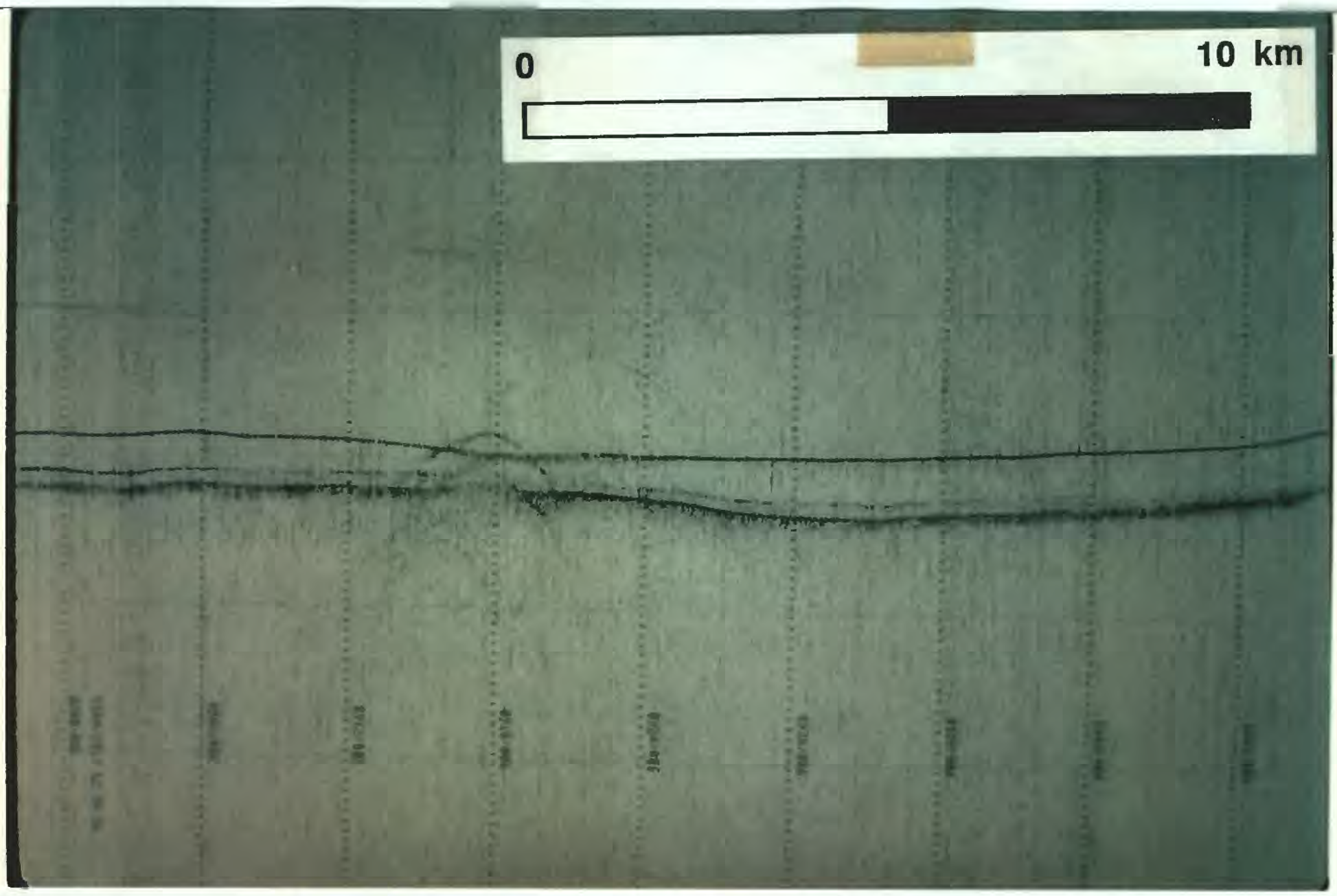

Figure 11. 3.5 kHz record of the transparent sediment layer.

Most commonly, a prolonged to opaque reflector is present at the base of the transparent layer. In some places, hyperbolic reflections occur along the basal reflector. Uncommonly, stratified sediment is visible beneath the transparent layer.

2b. Sediment in GLORIA images

Sediment-covered seafloor has a range of backscatter intensities on GLORIA images, depending on the thickness of the transparent layer, the presence of internal reflectors within the transparent layer, and the nature of material or topography beneath the transparent layer. GLORIA's acoustic energy maypenetrate up to 0.025 ms through the transparent layer and therefore in many places the images could display the backscatter characteristics of buried features. To wit, the images are dark along tracklines where the transparent layer is greater than about 0.025 sec thick, expecially if no internal reflectors are present and the underlying surface is smooth. At the other extreme, the backscatter is strong surrounding the guyots where a dark, prolonged reflector in the 3.5-kHZ profiles suggests volcaniclastic sediment at the seafloor. Farther away along some tracklines, the backscatter decreases gradationally to dark shades, and the 3.5 kHz profile shows a thickening transparent layer that is absent close to the seamount or guyot. Elsewhere, in the abyssal hills province at the western end of the area, the Cretaceous seafloor grain is manifest as a pattern of elongate, alternating light and dark backscatter contrasts that do not vary with direction of insonofication, suggesting that the contrast is not due to the topography associated with the hills. The 3.5 kHz profiles

indicate the presence of a strong reflector within the transparent layer, only in the valleys between the hills, and this reflector likely explains the backscatter contrasts. Other examples of backscatter variation in areas covered by the transparent drape exist throughout the area. Evidently, GLORIA acoustic energy can penetrate up to a few tens of meters of pelagic sediment to return backscattered energy from buried features.

2c. Seafloor channels

A sea-channel/sediment-dispersal system was identified at 172° 35'W, 23° 55'N. At least two tributary channels coalesce and appear to funnel sediment toward the southeast, to a region insonified during F13-89-HW. Here, other tributaries transport sediment from seamounts south and west of the channel to a depocenter located at approximately 172° 00'W, 23° 20'N. A topographic low across the channel measured at three transit line crossings (1 during F1-90-HW, 2 during F13-89-HW) does not exceed 8 meters and is, in places, barely perceptible below the backround variations in topography.

2d. Bedforms

An area of possible current-generated bedforms exists in the vicinity of the guyots, centered at about 172° 10'W 24° 40'N (Figure 12). The GLORIA images have a sinuous, alternating light and dark pattern, with a repetition length of about 1.5 km. The 3.5 kHz profiles show a relatively complicated stratigraphy and structure, with a discontinuous transparent layer, truncated reflectors, and some wavy reflectors. Possibly, regional

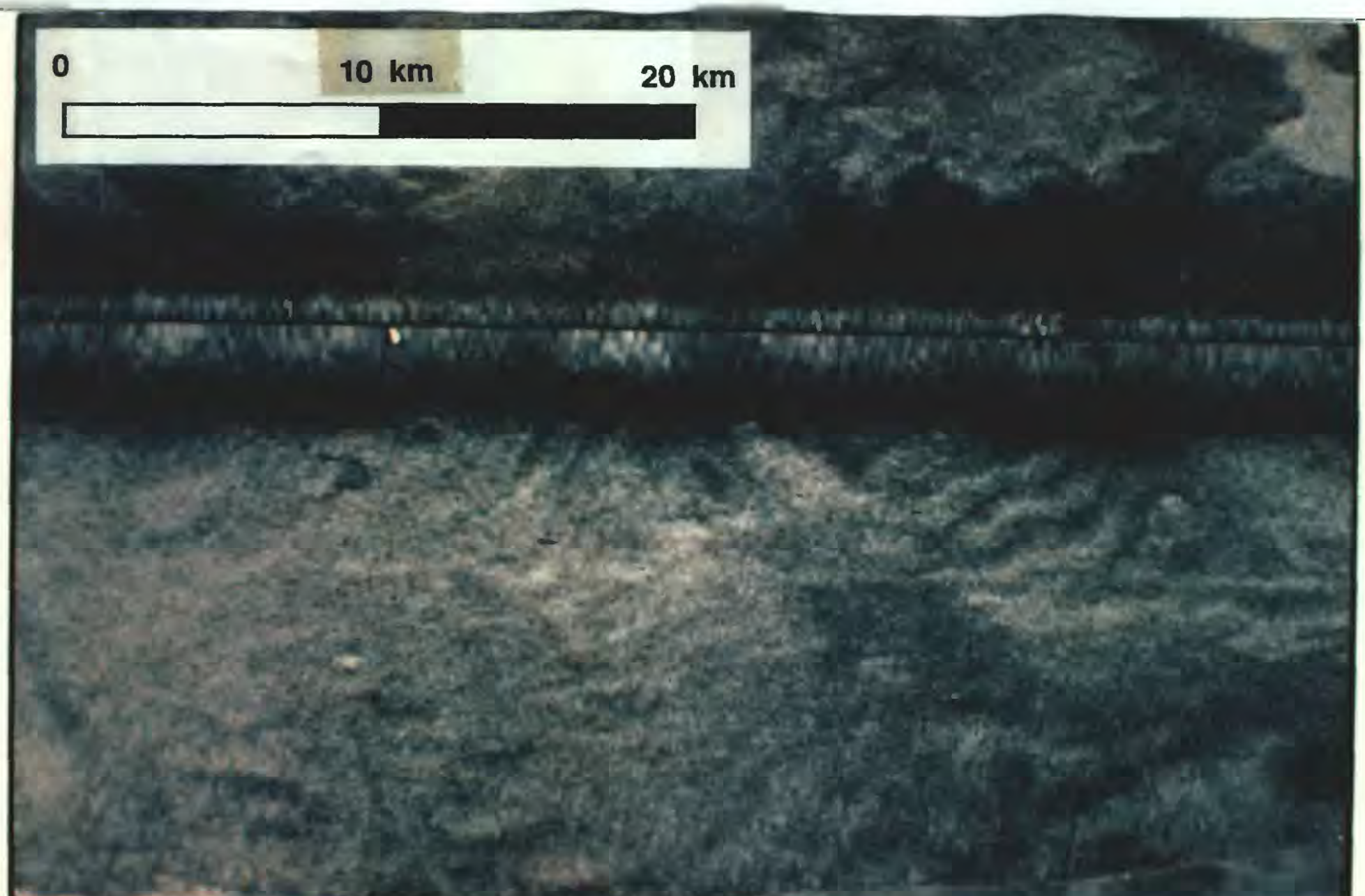

Figure 12. Bedform field in the centreal portion of the study area.

currents around the guyots are intensified to erosional, bedform-producing levels.

3. Mass wasting features

3a. Debris avalanches and small scale mass wasting features.

A giant debris avalanche, informally named the Neva slide, is similar to features imaged with GLORIA off the Hawaiian Islands (Moore et al., 1989). This slide was insonified at 174° 45'W, 25° 25'N and may have flowed southwest from the slopes of Lisianski Island and Neva shoal, approximately 90 km upslope from the toe of the slide. The toe of the slide is characterized by large isolated blocks incorporated in an apparently finer matrix of debris (Figure 13). Individual slide blocks are as much as 1 km long. The broad fan of isolated blocks at the toe, as well as the apparently large distance between source area and distal deposits suggest that the slide was a fast moving and highly mobilized debris avalanche. The following survey, F2-90-HW, will image the upper portion of the slide and the source area which will better define the slide morphology and run-out length.

A number of large, rough-surfaced seamounts appear to have gullies and debris chutes, and several have well developed ampitheaters and debris avalanche deposits. These features suggest that mass wasting is an important component that affects the morphologic development of seamounts. As stated in section 1c, the Cretaceous seamount cluster near the Hawaiian islands may have been exposed to higher levels of

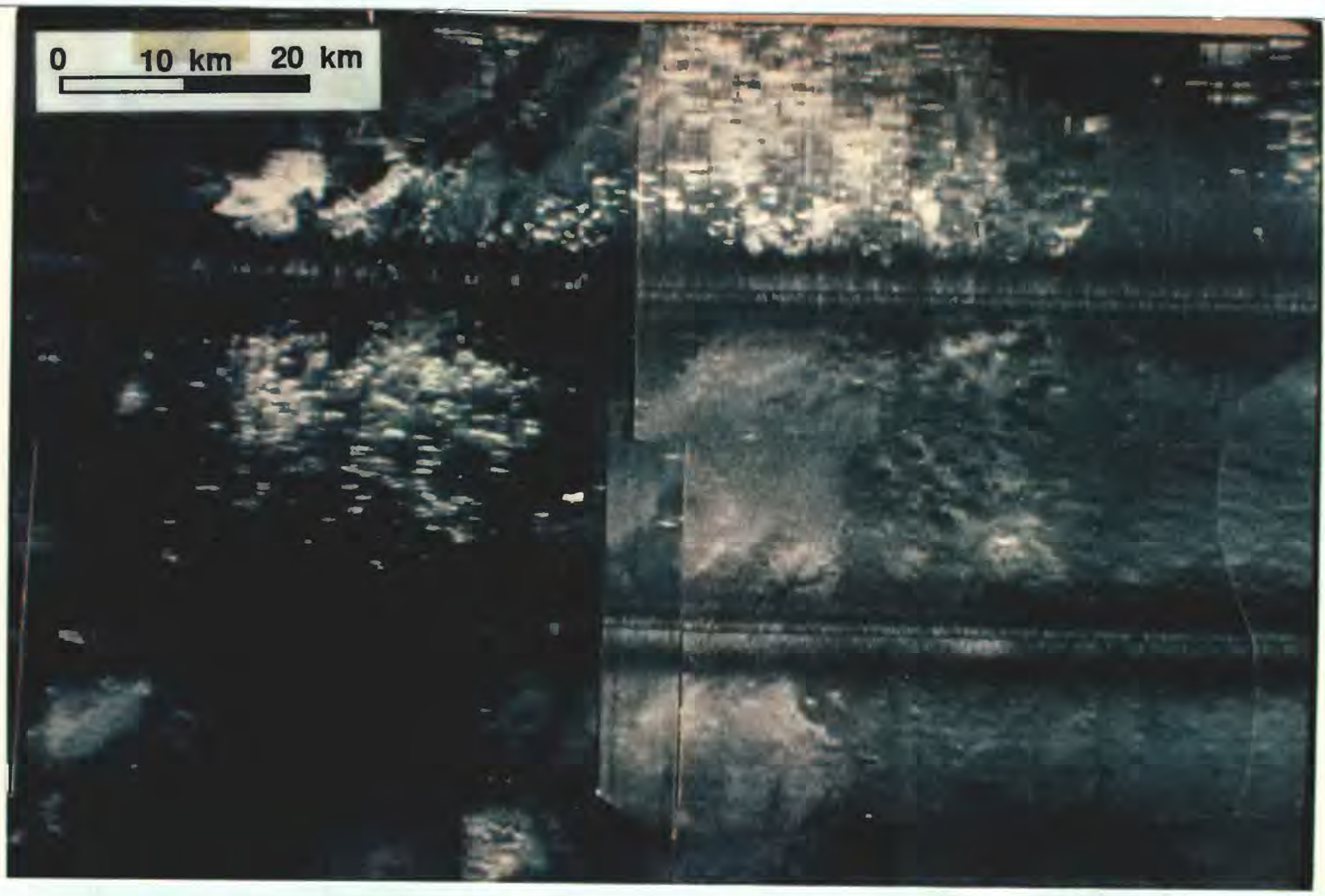

Figure 13. Massive debris flow deposit insonified by GLORIA in the central portion of the study area.

environmental loading than seamounts in other regions of the abyssal seafloor. This cluster appears to be extensively eroded in GLORIA images, particularly the two guyots.

ACKNOWLEDGEMENTS

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APPENDIX I

EQUIPMENT SETTINGS AND COMMENTS

3.5 kHz SYSTEM

LSR Recorder	Mode - Continuous PAPER - 100 lpi SWEEP - 1 sec PROGRAM - As required

	GAIN - Mid CONTRAST - Mid THRESHOLD - Min
PTR Transceiver	GAIN - 6 POWER - max PULSE WIDTH - Not used
IOS Correlator	OUTPUT LEVEL - 4-5 ATTENUATOR - 11.5

Fish Depth Compensation 7 m.

10 Khz SYSTEM

MUFAX Recorder	ATTENUATOR - -6 to -18 TIME MARKS - 6 min. PULSE LENGTH - 2.8 to 5 FISH DEPTH - 2x5 m GATING SELECTOR - 6 FATHOMS/METERS - Meters TRIGGER (Left/Center) -as required for scale changes TVG - not used GATING - Use to "see" bottom through outgoing pulse.

MAGNETOMETER/GRADIOMETER

Soltec Recorder	CHART SPEED - 40 cm/hr Full scale at 100 gamma range

GRAVIMETER

Soltec Recorder	CHART SPEED - 10 cm/hr

SEISMIC REFLECTION SYSTEM

LSR Recorder	DISPLAY - Normal STYLUS SCAN - 2 sec PAPER - 120 lpi MEMORY SWEEP - 6 sec FILTER - out POLARITY - + GAIN 10 to 2 O'clock CONTRAST -30 to -40 THRESHOLD - 2
Krohn - Hite Filter	20-120 Hz
Masscomp	GAIN SETTING: Pre-amp 0 Post-amp 6 to 18
DMD Delay Box	As required for DWD

Appendix 2.
DAFE data archive

DAFE CRUISE DATA INDEX

FOR

F1 90 HW
SHIP: Farnella
CHIEF SCIENTIST: Hampton/Kayen

TIME DATUM: GREENWICH MEAN TIME

LISTING GENERATED: 27-Mar-1990

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE STATION	SAMPLE	REEL	LATITUDE DEC DEG	LONGITUDE DEC DEG	ROLL R	SAMP C	U DPTH N

DATA CATEGORY = HYDROLOGICAL

*******SYSTEM = TEMPERATURE/SALINITY/CONDUCTANCE GAUGES

*******DATA OR EQUIPMENT CODE = EXP. BATHY THERMOGRAPH

D-DEPLOYMENT OF SCIENTIFIC GEAR	90 005 0127		SAMPLE DEPLOY XBT #67 (T-04)	;TRA1;		;0067	20.82987	-155.25188		Y;4500;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 006 0151		SAMPLE DEPLOY XBT #68 (T-04)	;0001;		;0068	22.75750	-168.86040		Y;4650;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 007 0053		SAMPLE DEPLOY XBT #69 (T-04)	;0001;		;0069	23.82595	-172.44870		Y;4685;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 008 0047		SAMPLE DEPLOY XBT #70 (T-07)	;0001;		;0070	24.90995	-176.11790		Y;5180;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 009 0040		SAMPLE DEPLOY XBT #71 (T-04)	;0001;		;0071	25.99930	-179.83980		Y;5515;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 010 0154		SAMPLE DEPLOY XBT #72 (T-04)	;0003;		;0072	26.33950	179.89620		Y;5495;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 012 0045		SAMPLE DEPLOY XBT #73 (T-04)	;0005;		;0073	25.31305	-175.66260		Y;5080;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 013 0042		SAMPLE DEPLOY XBT #74 (T-04)	;0005;		;0074	26.41970	-179.43120		Y;5360;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 016 0158		SAMPLE DEPLOY XBT #75 (T-04)	;0009;		;0075	24.73120	-174.60270		Y;5000;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 017 2358		SAMPLE DEPLOY XBT #76 (T-04)	;0009;		;0076	22.83280	-168.21860		Y;4762;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 018 2338		SAMPLE DEPLOY XBT #77 (T-07)	;0011;		;0077	22.75000	-167.06650		Y;4770;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 019 2333		SAMPLE DEPLOY XBT #78 (T-04)	;0011;		;0078	23.80080	-170.57890		Y;4636;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 021 0026		SAMPLE DEPLOY XBT #79 (T-04)	;0011;		;0079	24.87390	-174.17140		Y;4918;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 022 0045		SAMPLE DEPLOY XBT #80 (T-04)	;0013;		;0080	24.74930	-172.86350		Y;2540;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 023 2123		SAMPLE DEPLOY XBT #81 (T-04)	;0013;		;0081	22.83950	-166.43395		Y;4658;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 024 0023		SAMPLE DEPLOY XBT #82 (T-07)	;0013;		;0082	22.71730	-166.01291		Y;4650;m	
D-DEPLOYMENT OF SCIENTIFIC GEAR	90 025 0029		SAMPLE DEPLOY XBT #83 (T-04)	;TRAN;		;0083				Y;4700;m	
W-INVENTORY OF SCIENTIFIC GEAR	90 027 0415		EXP. BATHY THERMOGRAPH	;	;	;			;	;	

DATA CATEGORY = VESSEL DATA

*******SYSTEM = NAVIGATION

*******DATA OR EQUIPMENT CODE = INTEGRATED NAV

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C-FLOPPY DISK OR PUNCH CARDS   90 003 1811     START  START OF DISK #01     ;PORT;   ;0001  15.46733 -115.28308 ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 009 1908     END    END OF DISK #01      ;0003;   ;0001  26.63840  178.87920 ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 009 1909     START  START OF DISK #02     ;0003;   ;0002  26.63765  178.88190 ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 014 2116     END    END OF DISK #02      ;0007;   ;0002  26.32670 -178.17630 ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 014 2118     START  START OF DISK #03     ;0007;   ;0003  26.32540 -178.17160 ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 015 2122     END    END OF DISK #03      ;0008;   ;0003  25.19340 -174.66290 ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 015 2128     START  START OF DISK #04     ;0008;   ;0004  25.18010 -174.67000 ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 021 1710     END    END OF DISK #04      ;0013;   ;0004  25.06070 -173.92210 ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 021 1711     START  START OF DISK #05     ;0013;   ;0005  25.06005 -173.91970 ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 023 1309     END    END OF DISK #05      ;0013;   ;0005  23.19350 -167.61885 ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 023 1405     START  START OF DISK #06     ;0013;   ;0006  23.15440 -167.48530 ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 025 0750     END    END OF DISK #06     ;TRAN;   ;0006                ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 025 0800     START  START OF DISK #07     ;TRAN;   ;0007                ;   ;
C-FLOPPY DISK OR PUNCH CARDS   90 026 2300     END    END OF DISK #07     ;TRAN;   ;0007                ;   ;


G-PAPER PRINTER LISTING        90 003 1811     START  START OF ROLL #01     ;PORT;   ;0001  15.46733 -115.28308 ;   ;
G-PAPER PRINTER LISTING        90 026 2300     END    END OF ROLL #01      ;TRAN;   ;0001                ;   ;
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                                                                ROLL
RECORDING MEDIA        DATE AND TIME    STATUS     ACTIVITY        LINE STA- REEL  LATITUDE  LONGITUDE R SAMP U
                                                                   TION SAMPLE DEC DEG   DEC DEG  C DPTH N

*******DATA OR EQUIPMENT CODE = LORAN C

W-INVENTORY OF SCIENTIFIC GEAR  90 027 0415          LORAN C              ;  ;  ;                    ;  ;
*******DATA OR EQUIPMENT CODE = GPS SATELLITE

W-INVENTORY OF SCIENTIFIC GEAR  90 027 0415          GPS SATELLITE        ;  ;  ;                    ;  ;


*******DATA OR EQUIPMENT CODE = CRUISE

K-SHIP MOVEMENTS              90 003 1908      START  LV HONOLULU-START F190HW;TRAN;   ;      15.63027 -116.49749 ;   ;
K-SHIP MOVEMENTS              90 027 0400      END    END OF CRUISE/END OF F1-;TRAN;   ;                0;-HW ;


*******DATA OR EQUIPMENT CODE = LORAN C RHO-RHO

W-INVENTORY OF SCIENTIFIC GEAR  90 027 0415          LORAN C RHO RHO      ;  ;  ;                    ;  ;


*******DATA OR EQUIPMENT CODE = TRACKLINE

K-SHIP MOVEMENTS              90 005 2043      START  START OF LINE #01      ;0001;   ;      22.51855 -168.06080 ;   ;
K-SHIP MOVEMENTS              90 009 1235      END    END OF LINE #01        ;0001;   ;      26.48195  178.50120 ;   ;
K-SHIP MOVEMENTS              90 009 1310      START  START OF LINE #02      ;0002;   ;      26.53910  178.43810 ;   ;
K-SHIP MOVEMENTS              90 009 1520      END    END OF LINE #02        ;0002;   ;      26.79470  178.26750 ;   ;
K-SHIP MOVEMENTS              90 009 1531      START  START OF LINE #03      ;0003;   ;      26.80705  178.28340 ;   ;
K-SHIP MOVEMENTS              90 011 1625      END    END OF LINE #03        ;0003;   ;      24.75030 -174.65780 ;   ;
K-SHIP MOVEMENTS              90 011 1641      START  START OF LINE #04      ;0004;   ;      24.77240 -174.65020 ;   ;
K-SHIP MOVEMENTS              90 011 1836      END    END OF LINE #04        ;0004;   ;      25.02690 -174.75190 ;   ;
K-SHIP MOVEMENTS              90 011 1848      START  START OF LINE #05      ;0005;   ;      25.05090 -174.77010 ;   ;
K-SHIP MOVEMENTS              90 013 1546      END    END OF LINE #05        ;0005;   ;      27.13230  178.11720 ;   ;
K-SHIP MOVEMENTS              90 013 1554      START  START OF LINE #06      ;0006;   ;      27.14560  178.10240 ;   ;
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K-SHIP MOVEMENTS    90 013 1747    END   END OF LINE #06      ;0006;  ;    27.42365  178.00230 ;  ;
K-SHIP MOVEMENTS    90 013 1757    START  START OF LINE #07    ;0007;  ;    27.43515  178.01500 ;  ;
K-SHIP MOVEMENTS    90 015 2051    END   END OF LINE #07      ;0007;  ;    25.26420 -174.63950 ;  ;
K-SHIP MOVEMENTS    90 015 2059    START  START OF LINE #08    ;0008;  ;    25.24530 -174.63820 ;  ;
K-SHIP MOVEMENTS    90 016 0009    END   END OF LINE #08      ;0008;  ;    24.82015 -174.84590 ;  ;
K-SHIP MOVEMENTS    90 016 0024    START  START OF LINE #09    ;0009;  ;    24.80030 -174.83350 ;  ;
K-SHIP MOVEMENTS    90 018 1502    END   END OF LINE #09      ;0009;  ;    22.20570 -166.12520 ;  ;
K-SHIP MOVEMENTS    90 018 1513    START  START OF LINE #10    ;0010;  ;    22.21855 -166.10971 ;  ;
K-SHIP MOVEMENTS    90 018 1653    END   END OF LINE #10      ;0010;  ;    22.44650 -166.09770 ;  ;
K-SHIP MOVEMENTS    90 018 1701    START  START OF LINE #11    ;0011;  ;    22.46105 -166.11186 ;  ;
K-SHIP MOVEMENTS    90 021 0424    END   END OF LINE #11      ;0011;  ;    25.05180 -174.77600 ;  ;
K-SHIP MOVEMENTS    90 021 0430    START  START OF LINE #12    ;0012;  ;    25.05980 -174.78830 ;  ;
K-SHIP MOVEMENTS    90 021 0801    END   END OF LINE #12      ;0012;  ;    25.39995 -175.17620 ;  ;
K-SHIP MOVEMENTS    90 021 0816    START  START OF LINE #13    ;0013;  ;    25.41690 -175.16050 ;  ;
K-SHIP MOVEMENTS    90 024 0142    END   END OF LINE #13      ;0013;  ;    22.65960 -165.83150 ;  ;
K-SHIP MOVEMENTS    90 024 0156    START  START OF LINE #14    ;0014;  ;    22.66340 -165.79800 ;  ;
K-SHIP MOVEMENTS    90 024 0342    END   END OF LINE #14      ;0014;  ;    22.81010 -165.56960 ;  ;
K-SHIP MOVEMENTS    90 024 0353    START  START OF LINE #15    ;0015;  ;    22.83005 -165.57036 ;  ;
K-SHIP MOVEMENTS    90 024 1800    END   END OF LINE #15      ;0015;  ;    23.45130 -167.62700 ;  ;
K-SHIP MOVEMENTS    90 024 1941    START  START TRAN TO HONOLULU  ;TRAN;  ;                ;  ;
K-SHIP MOVEMENTS    90 027 0400    END   END TRAN HONO PIER34   ;TRAN;  ;                ;  ;
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RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
A-ANALOG PAPER ROLLS	90 005 0346	START	START OF ROLL #01	;TRA1;	;0001	21.22721	-158.21330	;	;		
A-ANALOG PAPER ROLLS	90 006 2000	END	END OF ROLL #01	;0001;	;0001	23.59420	-171.66420	;	;		
A-ANALOG PAPER ROLLS	90 006 2001	START	START OF ROLL #02	;0001;	;0002	23.59505	-171.66660	;	;		
A-ANALOG PAPER ROLLS	90 009 0825	END	END OF ROLL #02	;0001;	;0002	26.31265	179.08550	;	;		
A-ANALOG PAPER ROLLS	90 009 0826	START	START OF ROLL #03	;0001;	;0003	26.31330	179.08330	;	;		
A-ANALOG PAPER ROLLS	90 011 1842	END	END OF ROLL #03	;0004;	;0003	25.04030	-174.75870	;	;		
A-ANALOG PAPER ROLLS	90 011 1844	START	START OF ROLL #04	;0005;	;0004	25.04440	-174.76170	;	;		
A-ANALOG PAPER ROLLS	90 011 2112	END	END OF ROLL #04	;0005;	;0004	25.13970	-175.14400	;	;		
A-ANALOG PAPER ROLLS	90 011 2115	START	START OF ROLL #05	;0005;	;0005	25.14165	-175.15160	;	;		
A-ANALOG PAPER ROLLS	90 014 0624	END	END OF ROLL #05	;0007;	;0005	26.91890	179.79330	;	;		
A-ANALOG PAPER ROLLS	90 014 0627	START	START OF ROLL #06	;0007;	;0006	26.91665	179.80030	;	;		
A-ANALOG PAPER ROLLS	90 016 1824	END	END OF ROLL #06	;0009;	;0006	24.02410	-172.21260	;	;		
A-ANALOG PAPER ROLLS	90 016 1828	START	START OF ROLL #07	;0009;	;0007	24.02150	-172.20360	;	;		
A-ANALOG PAPER ROLLS	90 019 0624	END	END OF ROLL #07	;0011;	;0007	23.04910	-168.06300	;	;		
A-ANALOG PAPER ROLLS	90 019 0627	START	START OF ROLL #08	;0011;	;0008	23.05120	-168.07000	;	;		
A-ANALOG PAPER ROLLS	90 021 1825	END	END OF ROLL #08	;0013;	;0008	25.00670	-173.73990	;	;		
A-ANALOG PAPER ROLLS	90 021 1829	START	START OF ROLL #09	;0013;	;0009	25.00355	-173.73040	;	;		
A-ANALOG PAPER ROLLS	90 024 0648	END	END OF ROLL #09	;0015;	;0009	22.96280	-166.00500	;	;		
A-ANALOG PAPER ROLLS	90 024 0650	START	START OF ROLL #10	;0015;	;0010	22.96430	-166.00980	;	;		
A-ANALOG PAPER ROLLS	90 024 1806	END	END OF ROLL #10	;0015;	;0010	23.45460	-167.64000	;	;		
W-INVENTORY OF SCIENTIFIC GEAR	90 027 0415		10 KHZ BATHYMETRY	;	;	;			;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 005 0346	ON	SYS ON: BA10 DEPLYD	;TRA1;	;0001	21.22721	-158.21330	;	;		

X-OPERATION OF SCIENTIFIC GEAR 90 024 1806 OFF SYS OFF: END DATA COLL ;0015; ;0010 23.45460 -167.64000 ; ;

*******DATA OR EQUIPMENT CODE = 3.5KH BATHYMETRY

A-ANALOG PAPER ROLLS	90 005 0351	START	START OF ROLL #01	;TRA1;	;0001 21.24150 -158.31983 ; ;
A-ANALOG PAPER ROLLS	90 006 1957	END	END OF ROLL #01	;0001;	;0001 23.59165 -171.65690 ; ;
A-ANALOG PAPER ROLLS	90 006 1959	START	START OF ROLL #02	;0001;	;0002 23.59335 -171.66180 ; ;
A-ANALOG PAPER ROLLS	90 007 2009	END	END OF ROLL #02	;0001;	;0002 24.69775 -175.41630 ; ;
A-ANALOG PAPER ROLLS	90 007 2011	START	START OF ROLL #03	;0001;	;0003 24.69910 -175.42140 ; ;
A-ANALOG PAPER ROLLS	90 008 2020	END	END OF ROLL #03	;0001;	;0003 25.81080 -179.20500 ; ;
A-ANALOG PAPER ROLLS	90 008 2022	START	START OF ROLL #04	;0001;	;0004 25.81240 -179.21020 ; ;
A-ANALOG PAPER ROLLS	90 009 1235	END	END OF ROLL #04	;0001;	;0004 26.48195 178.50120 ; ;
A-ANALOG PAPER ROLLS	90 009 1240	START	START OF ROLL #05	;0002;	;0005 26.48620 178.48900 ; ;
A-ANALOG PAPER ROLLS	90 010 0509	END	END OF ROLL #05	;0003;	;0005 26.20310 -179.63730 ; ;
A-ANALOG PAPER ROLLS	90 010 0513	START	START OF ROLL #06	;0003;	;0006 26.20025 -179.62750 ; ;
A-ANALOG PAPER ROLLS	90 010 2008	END	END OF ROLL #06	;0003;	;0006 25.55900 -177.44710 ; ;
A-ANALOG PAPER ROLLS	90 010 2010	START	START OF ROLL #07	;0003;	;0007 25.55750 -177.44230 ; ;
A-ANALOG PAPER ROLLS	90 011 1836	END	END OF ROLL #07	;0004;	;0007 25.02690 -174.75190 ; ;
A-ANALOG PAPER ROLLS	90 011 1842	START	START OF ROLL #08	;0005;	;0008 25.04030 -174.75870 ; ;
A-ANALOG PAPER ROLLS	90 012 2007	END	END OF ROLL #08	;0005;	;0008 26.19945 -178.67580 ; ;
A-ANALOG PAPER ROLLS	90 012 2008	START	START OF ROLL #09	;0005;	;0009 26.20020 -178.67860 ; ;

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STATION	SAMPLE	REEL	DEC DEG LATITUDE	DEC DEG LONGITUDE	R	C	SAMP DPTH	U N
-ANALOG PAPER ROLLS	90 013 0546	END	END OF ROLL #09	;0005;		;0009	26.64980	179.78140	;		;		
-ANALOG PAPER ROLLS	90 013 0551	START	START OF ROLL #10	;0005;		;0010	26.65370	179.76740	;		;		
A-ANALOG PAPER ROLLS	90 013 1748	END	END OF ROLL #10	;0006;		;0010	27.42580	178.00230	;		;		
A-ANALOG PAPER ROLLS	90 013 1800	START	START OF ROLL #11	;0007;		;0011	27.43480	178.02160	;		;		
A-ANALOG PAPER ROLLS	90 014 2007	END	END OF ROLL #11	;0007;		;0011	26.38085	-178.34740	;		;		
A-ANALOG PAPER ROLLS	90 014 2009	START	START OF ROLL #12	;0007;		;0012	26.37940	-178.34250	;		;		
A-ANALOG PAPER ROLLS	90 016 0009	END	END OF ROLL #12	;0008;		;0012	24.82015	-174.84590	;		;		
A-ANALOG PAPER ROLLS	90 016 0018	START	START OF ROLL #13	;0009;		;0013	24.80550	-174.84330	;		;		
A-ANALOG PAPER ROLLS	90 016 2010	END	END OF ROLL #13	;0009;		;0013	23.95270	-171.98170	;		;		
A-ANALOG PAPER ROLLS	90 016 2012	START	START OF ROLL #14	;0009;		;0014	23.95100	-171.97730	;		;		
A-ANALOG PAPER ROLLS	90 017 2011	END	END OF ROLL #14	;0009;		;0014	22.98945	-168.73890	;		;		
A-ANALOG PAPER ROLLS	90 017 2036	START	START OF ROLL #15	;0009;		;0015	22.97150	-168.68250	;		;		
A-ANALOG PAPER ROLLS	90 018 1655	END	END OF ROLL #15	;0010;		;0015	22.45120	-166.09990	;		;		
A-ANALOG PAPER ROLLS	90 018 1658	START	START OF ROLL #16	;0011;		;0016	22.45740	-166.10520	;		;		
A-ANALOG PAPER ROLLS	90 019 2006	END	END OF ROLL #16	;0011;		;0016	23.64700	-170.07170	;		;		
A-ANALOG PAPER ROLLS	90 019 2009	START	START OF ROLL #17	;0011;		;0017	23.64915	-170.07930	;		;		
A-ANALOG PAPER ROLLS	90 021 0425	END	END OF ROLL #17	;0011;		;0017	25.05295	-174.77830	;		;		
A-ANALOG PAPER ROLLS	90 021 0427	START	START OF ROLL #18	;0012;		;0018	25.05545	-174.78250	;		;		
A-ANALOG PAPER ROLLS	90 021 2010	END	END OF ROLL #18	;0013;		;0018	24.92540	-173.47890	;		;		
A-ANALOG PAPER ROLLS	90 021 2021	START	START OF ROLL #19	;0013;		;0019	24.91750	-173.45340	;		;		
A-ANALOG PAPER ROLLS	90 022 2006	END	END OF ROLL #19	;0013;		;0019	23.90960	-170.05510	;		;		
A-ANALOG PAPER ROLLS	90 022 2008	START	START OF ROLL #20	;0013;		;0020	23.90800	-170.05040	;		;		
A-ANALOG PAPER ROLLS	90 023 2010	END	END OF ROLL #20	;0013;		;0020	22.89330	-166.60660	;		;		
A-ANALOG PAPER ROLLS	90 023 2012	START	START OF ROLL #21	;0013;		;0021	22.89170	-166.60190	;		;		
A-ANALOG PAPER ROLLS	90 024 0142	END	END OF ROLL #21	;0013;		;0021	22.65960	-165.83150	;		;		
A-ANALOG PAPER ROLLS	90 024 0144	START	START OF ROLL #22	;0014;		;0022	22.65850	-165.82670	;		;		
A-ANALOG PAPER ROLLS	90 024 1806	END	END OF ROLL #22	;0015;		;0022	23.45460	-167.64000	;		;		
W-INVENTORY OF SCIENTIFIC GEAR	90 027 0415		3.5 KHZ BATHYMETRY	;	;	;				;	;		
X-OPERATION OF SCIENTIFIC GEAR	90 005 0351	ON	SYS ON: BA35 DEPLYD	;TRA1;		;0001	21.24150	-158.31983	;		;		
X-OPERATION OF SCIENTIFIC GEAR	90 009 1945	OFF	SYS OFF: PULL 3.5 FISH	;0003;		;0005	26.60520	178.97520	;		;		

X-OPERATION OF SCIENTIFIC GEAR 90 009 2007 ON SYS ON: FISH DEPLD ;0003; ;0005 26.58895 179.01650 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 013 1854 OFF SYS OFF:CHG FISH ;0007; ;0011 27.39920 178.15960 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 013 1918 ON SYS ON:FISH CHGD ;0007; ;0011 27.38660 178.20320 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 017 0716 OFF SYS OFF: CLEAN RECRDR ;0009; ;0014 23.52210 -170.52530 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 017 0717 ON SYS ON: RECRDR CLEANED ;0009; ;0014 23.52140 -170.52310 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 017 0722 OFF SYS OFF: CLEAN RECRDR ;0009; ;0014 23.51790 -170.51190 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 017 0723 ON SYS ON: RECDR CLEANED ;0009; ;0014 23.51725 -170.50980 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 019 0437 OFF SYS OFF: RCDR REPAIRS ;0011; ;0016 22.97205 -167.80440 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 019 0503 ON SYS ON: RCDR RESTORED ;0011; ;0016 22.99165 -167.86850 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 024 1806 OFF SYS OFF: END DATA COLL ;0015; ;0022 23.45460 -167.64000 ; ;

*******SYSTEM = SHIPBOARD GRAVITY

*******DATA OR EQUIPMENT CODE = GRAVITY + MAGNET

M-DIGITAL MAGNETIC TAPES 90 003 1840 START START OF TAPE #01 ;PORT; ;0001 15.55023 -115.90093 ; ;
M-DIGITAL MAGNETIC TAPES 90 005 1731 END END OF TAPE #01 ;TRA1; ;0001 22.46425 -167.57040 ; ;
M-DIGITAL MAGNETIC TAPES 90 005 1733 START START OF TAPE #02 ;TRA1; ;0002 22.46485 -167.57600 ; ;
M-DIGITAL MAGNETIC TAPES 90 007 1305 END END OF TAPE #02 ;0001; ;0002 24.39190 -174.36070 ; ;
M-DIGITAL MAGNETIC TAPES 90 007 1307 START START OF TAPE #03 ;0001; ;0003 24.39350 -174.36580 ; ;
M-DIGITAL MAGNETIC TAPES 90 009 1320 END END OF TAPE #03 ;0002; ;0003 26.55920 178.42430 ; ;

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
M-DIGITAL MAGNETIC TAPES	90 009 1322	START	START OF TAPE #04 -GRVM	;0002;	;0004	26.56320	178.42180	;	;		
M-DIGITAL MAGNETIC TAPES	90 011 1412	END	END OF TAPE #04	;0003;	;0004	24.83190	-174.94550	;	;		
M-DIGITAL MAGNETIC TAPES	90 011 1414	START	START OF TAPE #05	;0003;	;0005	24.83070	-174.94110	;	;		
M-DIGITAL MAGNETIC TAPES	90 013 1413	END	END OF TAPE #05	;0005;	;0005	27.06030	178.37420	;	;		
M-DIGITAL MAGNETIC TAPES	90 013 1415	START	START OF TAPE #06	;0005;	;0006	27.06185	178.36860	;	;		
M-DIGITAL MAGNETIC TAPES	90 015 1436	END	END OF TAPE #06	;0007;	;0006	25.55550	-175.58970	;	;		
M-DIGITAL MAGNETIC TAPES	90 015 1438	START	START OF TAPE #07	;0007;	;0007	25.55400	-175.58450	;	;		
M-DIGITAL MAGNETIC TAPES	90 017 1412	END	END OF TAPE #07	;0009;	;0007	23.24370	-169.59300	;	;		
M-DIGITAL MAGNETIC TAPES	90 017 1414	START	START OF TAPE #08	;0009;	;0008	23.24230	-169.58830	;	;		
M-DIGITAL MAGNETIC TAPES	90 019 0447	END	END OF TAPE #08	;0011;	;0008	22.97975	-167.82890	;	;		
M-DIGITAL MAGNETIC TAPES	90 019 0449	START	START OF TAPE #09	;0011;	;0009	22.98125	-167.83390	;	;		
M-DIGITAL MAGNETIC TAPES	90 021 0206	END	END OF TAPE #09	;0011;	;0009	24.94850	-174.42420	;	;		
M-DIGITAL MAGNETIC TAPES	90 021 0208	START	START OF TAPE #10	;0011;	;0010	24.95000	-174.42940	;	;		
M-DIGITAL MAGNETIC TAPES	90 023 0153	END	END OF TAPE #10	;0013;	;0010	23.67935	-169.24980	;	;		
M-DIGITAL MAGNETIC TAPES	90 023 0155	START	START OF TAPE #11	;0013;	;0011	23.67800	-169.24510	;	;		
M-DIGITAL MAGNETIC TAPES	90 024 1948	END	END OF TAPE #11	;TRAN;	;0011			;	;		
M-DIGITAL MAGNETIC TAPES	90 024 1950	START	START OF TAPE #12	;TRAN;	;0012			;	;		
M-DIGITAL MAGNETIC TAPES	90 025 0750	END	EOT #12: LAB POWER LOSS	;TRAN;	;0012			;	;		
M-DIGITAL MAGNETIC TAPES	90 025 0803	START	START OF TAPE #13	;TRAN;	;0013			;	;		
M-DIGITAL MAGNETIC TAPES	90 026 2300	END	END OF TAPE #13	;TRAN;	;0013			;	;		
*******DATA OR EQUIPMENT CODE = GRAV, MAG, BATHYMETRY, AND NAVIGATION											
M-DIGITAL MAGNETIC TAPES	90 005 1000	START	SOT ABC/NAV,DEPTH,GRAV,M;TRA1;		;0001	22.29628	-166.18150	G;	;		
M-DIGITAL MAGNETIC TAPES	90 024 1806	END	EOT ABC/NAV,DEPTH,GRAV,M;0015;		;0001	23.45460	-167.64000	G;	;		
W-INVENTORY OF SCIENTIFIC GEAR	90 027 0415		ABC SYSTEM(NAV,MAG,GRAV);	;	;			;	;		
*******DATA OR EQUIPMENT CODE = SHIPBOARD GRAVTY											
A-ANALOG PAPER ROLLS	90 003 1841	START	START OF ROLL #01	;PORT;	;0001	15.55309	-115.92225	;	;		
A-ANALOG PAPER ROLLS	90 010 2207	END	END OF ROLL #01	;0003;	;0001	25.47435	-177.16920	;	;		
A-ANALOG PAPER ROLLS	90 010 2210	START	START OF ROLL #02	;0003;	;0002	25.47240	-177.16240	;	;		

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A-ANALOG PAPER ROLLS          90 018 1724      END    END OF ROLL #02        ;0011;    ;0002  22.47940 -166.16830 ;   ;
A-ANALOG PAPER ROLLS          90 018 1725      START  START OF ROLL #03      ;0011;    ;0003  22.48010 -166.17081 ;   ;
A-ANALOG PAPER ROLLS          90 026 2006      END    END OF ROLL #03        ;TRAN;    ;0003                  ;   ;
A-ANALOG PAPER ROLLS          90 026 2007      START  START OF ROLL #04      ;TRAN;    ;0004                  ;   ;
A-ANALOG PAPER ROLLS          90 027 1637      END    END OF ROLL #04        ;PORT;    ;0004                  ;   ;


W-INVENTORY OF SCIENTIFIC GEAR  90 027 0415          SHIPBOARD GRAVITY      ;   ;   ;                      ;   ;


X-OPERATION OF SCIENTIFIC GEAR  90 003 1500     ON     SYS ON: GRVTY METER ON  ;PORT;    ;0000  14.92136 -111.21377 ;   ;
X-OPERATION OF SCIENTIFIC GEAR  90 025 0750     OFF    SYS OFF: LAB POWER LOSS ;TRAN;    ;0012                  ;   ;
X-OPERATION OF SCIENTIFIC GEAR  90 025 0757     ON     SYS ON: POWER RSTRD     ;TRAN;    ;0013                  ;   ;
X-OPERATION OF SCIENTIFIC GEAR  90 027 0430     OFF    SYS OFF: END DATA COLL  ;PORT;    ;0000                  ;   ;


*******SYSTEM = HIGH RESOLUTION ACOUSTICS

*******DATA OR EQUIPMENT CODE = GLORIA SIDE SCAN

A-ANALOG PAPER ROLLS          90 005 0428      START  START OF ROLL #01      ;TRA1;    ;0001  21.34726 -159.10813 ;   ;
A-ANALOG PAPER ROLLS          90 024 1800      END    END OF ROLL #01        ;0015;    ;0001  23.45130 -167.62700 ;   ;
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RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE STATION	STA- REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
M-DIGITAL MAGNETIC TAPES	90 005 0428	START	START OF TAPE #01	;TRA1;	;0001	21.34726	-159.10813	;		;
M-DIGITAL MAGNETIC TAPES	90 009 0400	START	START OF TAPE #02	;0001;	;0002	26.13280	179.70150	;		;
M-DIGITAL MAGNETIC TAPES	90 009 0400	END	END OF TAPE #01	;0001;	;0001	26.13280	179.70150	;		;
M-DIGITAL MAGNETIC TAPES	90 013 0400	START	START OF TAPE #03	;0005;	;0003	26.56780	-179.93510	;		;
M-DIGITAL MAGNETIC TAPES	90 013 0400	END	END OF TAPE #02	;0005;	;0002	26.56780	-179.93510	;		;
M-DIGITAL MAGNETIC TAPES	90 017 0400	END	END OF TAPE #03	;0009;	;0003	23.65310	-170.96580	;		;
M-DIGITAL MAGNETIC TAPES	90 017 0400	START	START OF TAPE #04	;0009;	;0004	23.65310	-170.96580	;		;
M-DIGITAL MAGNETIC TAPES	90 021 0400	END	END OF TAPE #04	;0011;	;0004	25.03330	-174.71570	;		;
M-DIGITAL MAGNETIC TAPES	90 021 0400	START	START OF TAPE #05	;0011;	;0005	25.03330	-174.71570	;		;
M-DIGITAL MAGNETIC TAPES	90 024 1800	END	END OF TAPE #05	;0015;	;0005	23.45130	-167.62700	;		;
W-INVENTORY OF SCIENTIFIC GEAR	90 027 0415		GLORIA SIDE SCAN	;	;	;		;		;
X-OPERATION OF SCIENTIFIC GEAR	90 005 0400	ON	SYS ON: GLORIA DEPLYD	;TRA1;	;0000	21.26722	-158.51159	;		;
X-OPERATION OF SCIENTIFIC GEAR	90 005 0428	OFF	SYS OFF: PPA REPAIRS	;TRA1;	;0001	21.34726	-159.10813	;		;
X-OPERATION OF SCIENTIFIC GEAR	90 005 0901	ON	SYS ON: PPA REPAIRED	;TRA1;	;0001	22.12763	-164.92449	;		;
X-OPERATION OF SCIENTIFIC GEAR	90 024 1800	OFF	SYS OFF:END DATA-GLOR	;0015;	;0005	23.45130	-167.62700	;		;
*******SYSTEM = STATION GRAVITY										
*******DATA OR EQUIPMENT CODE = LAND TIE										
O-NUMERICAL DATA OBSERVATION	90 003 1732		SAMPLE LAND TIE #1-PIER 2C/HONO;PORT;	;		15.35585	-114.45218	;		;
O-NUMERICAL DATA OBSERVATION	90 027 0415		SAMPLE GRAV LAND TIE/PIER 34	;PORT;	;0000			;		;
*******SYSTEM = SHIPBOARD MAGNETICS										
*******DATA OR EQUIPMENT CODE = SHIPBOARD MAGGY										

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A-ANALOG PAPER ROLLS      90 005 0452     START  START OF ROLL #01     ;TRA1;   ;0001  21.41587 -159.61946 ;   ;
A-ANALOG PAPER ROLLS      90 007 0414     END    END OF ROLL #01       ;0001;   ;0001  23.98480 -172.98260 ;   ;
A-ANALOG PAPER ROLLS      90 007 0415     START  START OF ROLL #02     ;0001;   ;0002  23.98560 -172.98530 ;   ;
A-ANALOG PAPER ROLLS      90 009 0400     END    END OF ROLL #02       ;0001;   ;0002  26.13280  179.70150 ;   ;
A-ANALOG PAPER ROLLS      90 009 0403     START  START OF ROLL #03     ;0001;   ;0003  26.13495  179.69440 ;   ;
A-ANALOG PAPER ROLLS      90 011 0318     END    END OF ROLL #03       ;0003;   ;0003  25.28270 -176.47380 ;   ;
A-ANALOG PAPER ROLLS      90 011 0319     START  START OF ROLL #04     ;0003;   ;0004  25.28205 -176.47150 ;   ;
A-ANALOG PAPER ROLLS      90 013 0221     END    END OF ROLL #04       ;0005;   ;0004  26.49790 -179.69520 ;   ;
A-ANALOG PAPER ROLLS      90 013 0222     START  START OF ROLL #05     ;0005;   ;0005  26.49850 -179.69780 ;   ;
A-ANALOG PAPER ROLLS      90 015 0219     END    END OF ROLL #05       ;0007;   ;0005  26.10485 -177.44820 ;   ;
A-ANALOG PAPER ROLLS      90 015 0220     START  START OF ROLL #06     ;0007;   ;0006  26.10410 -177.44580 ;   ;
A-ANALOG PAPER ROLLS      90 017 0210     END    END OF ROLL #06       ;0009;   ;0006  23.72490 -171.20590 ;   ;
A-ANALOG PAPER ROLLS      90 017 0211     START  START OF ROLL #07     ;0009;   ;0007  23.72430 -171.20370 ;   ;
A-ANALOG PAPER ROLLS      90 019 0208     END    END OF ROLL #07       ;0011;   ;0007  22.86190 -167.43490 ;   ;
A-ANALOG PAPER ROLLS      90 019 0209     START  START OF ROLL #08     ;0011;   ;0008  22.86265 -167.43736 ;   ;
A-ANALOG PAPER ROLLS      90 021 0215     END    END OF ROLL #08       ;0011;   ;0008  24.95540 -174.44730 ;   ;
A-ANALOG PAPER ROLLS      90 021 0216     START  START OF ROLL #09     ;0011;   ;0009  24.95620 -174.44990 ;   ;
A-ANALOG PAPER ROLLS      90 023 0206     END    END OF ROLL #09       ;0013;   ;0009  23.67030 -169.21910 ;   ;
A-ANALOG PAPER ROLLS      90 023 0207     START  START OF ROLL #10     ;0013;   ;0010  23.66960 -169.21670 ;   ;
A-ANALOG PAPER ROLLS      90 024 1800     END    END OF ROLL #10       ;0015;   ;0010  23.45130 -167.62700 ;   ;
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RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STA-TION	REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
W-INVENTORY OF SCIENTIFIC GEAR	90 027 0415		SHIPBOARD MAGGY	;	;	;			;		;
X-OPERATION OF SCIENTIFIC GEAR	90 005 0435	ON	SYS ON:DEPLOYED MAGGY	;TRA1;		;0001	21.36727	-159.25726	;		;
X-OPERATION OF SCIENTIFIC GEAR	90 024 1824	OFF	SYS OFF: END DATA COL	;0015;		;0011			;		;
*******SYSTEM = MULTI-CHANNEL SEISMIC											
*******DATA OR EQUIPMENT CODE = 2 CHANNEL AIRGUN											
A-ANALOG PAPER ROLLS	90 005 1935	START	START OF ROLL #01	;TRA1;		;0001	22.49795	-167.88900	;		;
A-ANALOG PAPER ROLLS	90 005 1940	START	START OF ROLL #01	;TRA1;		;0001	22.49880	-167.90020	;		;
A-ANALOG PAPER ROLLS	90 006 2004	END	END OF ROLL #01	;0001;		;0001	23.59760	-171.67380	;		;
A-ANALOG PAPER ROLLS	90 006 2008	START	START OF ROLL #02	;0001;		;0002	23.60100	-171.68320	;		;
A-ANALOG PAPER ROLLS	90 007 2012	END	END OF ROLL #02	;0001;		;0002	24.69980	-175.42400	;		;
A-ANALOG PAPER ROLLS	90 007 2014	START	START OF ROLL #03	;0001;		;0003	24.70110	-175.42920	;		;
A-ANALOG PAPER ROLLS	90 008 2022	END	END OF ROLL #03	;0001;		;0003	25.81240	-179.21020	;		;
A-ANALOG PAPER ROLLS	90 008 2024	START	START OF ROLL #04	;0001;		;0004	25.81420	-179.21530	;		;
A-ANALOG PAPER ROLLS	90 009 1520	END	END OF ROLL #04	;0002;		;0004	26.79470	178.26750	;		;
A-ANALOG PAPER ROLLS	90 009 1525	START	START OF ROLL #05	;0003;		;0005	26.80445	178.26980	;		;
A-ANALOG PAPER ROLLS	90 010 2011	END	END OF ROLL #05	;0003;		;0005	25.55675	-177.43990	;		;
A-ANALOG PAPER ROLLS	90 010 2013	START	START OF ROLL #06	;0003;		;0006	25.55525	-177.43500	;		;
A-ANALOG PAPER ROLLS	90 011 1631	END	END OF ROLL #06	;0003;		;0006	24.75415	-174.64890	;		;
A-ANALOG PAPER ROLLS	90 011 1636	START	START OF ROLL #07	;0004;		;0007	24.76230	-174.64700	;		;
A-ANALOG PAPER ROLLS	90 012 2009	END	END OF ROLL #07	;0005;		;0007	26.20105	-178.68140	;		;
A-ANALOG PAPER ROLLS	90 012 2011	START	START OF ROLL #08	;0005;		;0008	26.20270	-178.68690	;		;
A-ANALOG PAPER ROLLS	90 013 1546	END	END OF ROLL #08	;0005;		;0008	27.13230	178.11720	;		;
A-ANALOG PAPER ROLLS	90 013 1551	START	START OF ROLL #09	;0006;		;0009	27.13935	178.10610	;		;
A-ANALOG PAPER ROLLS	90 014 2010	END	END OF ROLL #09	;0007;		;0009	26.37870	-178.34010	;		;
A-ANALOG PAPER ROLLS	90 014 2011	START	START OF ROLL #10	;0007;		;0010	26.37790	-178.33750	;		;
A-ANALOG PAPER ROLLS	90 016 0009	END	END OF ROLL #10	;0008;		;0010	24.82015	-174.84590	;		;

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A-ANALOG PAPER ROLLS      90 016 0015     START  START OF ROLL #11     ;0009;   ;0011  24.80965 -174.84610 ;   ;
A-ANALOG PAPER ROLLS      90 016 2013     END    END OF ROLL #11       ;0009;   ;0011  23.95020 -171.97530 ;   ;
A-ANALOG PAPER ROLLS      90 016 2016     START  START OF ROLL #12     ;0009;   ;0012  23.94780 -171.96910 ;   ;
A-ANALOG PAPER ROLLS      90 017 1215     END    END OF ROLL #12       ;0009;   ;0012  23.32615 -169.86830 ;   ;
A-ANALOG PAPER ROLLS      90 017 1223     START  START OF ROLL #13     ;0009;   ;0013  23.32040 -169.84950 ;   ;
A-ANALOG PAPER ROLLS      90 018 1503     END    END OF ROLL #13       ;0009;   ;0013  22.20565 -166.12305 ;   ;
A-ANALOG PAPER ROLLS      90 018 1507     START  START OF ROLL #14     ;0010;   ;0014  22.20775 -166.11566 ;   ;
A-ANALOG PAPER ROLLS      90 019 2107     END    END OF ROLL #14       ;0011;   ;0014  23.69080 -170.22470 ;   ;
A-ANALOG PAPER ROLLS      90 019 2109     START  START OF ROLL #15     ;0011;   ;0015  23.69235 -170.22980 ;   ;
A-ANALOG PAPER ROLLS      90 021 0424     END    END OF ROLL #15       ;0011;   ;0015  25.05180 -174.77600 ;   ;
A-ANALOG PAPER ROLLS      90 021 0428     START  START OF ROLL #16     ;0012;   ;0016  25.05680 -174.78460 ;   ;
A-ANALOG PAPER ROLLS      90 021 2027     END    END OF ROLL #16       ;0013;   ;0016  24.91310 -173.43860 ;   ;
A-ANALOG PAPER ROLLS      90 021 2030     START  START OF ROLL #17     ;0013;   ;0017  24.91100 -173.43100 ;   ;
A-ANALOG PAPER ROLLS      90 022 2010     END    END OF ROLL #17       ;0013;   ;0017  23.90640 -170.04550 ;   ;
A-ANALOG PAPER ROLLS      90 022 2017     START  START OF ROLL #18     ;0013;   ;0018  23.90090 -170.02900 ;   ;
A-ANALOG PAPER ROLLS      90 023 2014     END    END OF ROL #18        ;0013;   ;0018  22.89010 -166.59711 ;   ;
A-ANALOG PAPER ROLLS      90 023 2016     START  START OF ROLL #19     ;0013;   ;0019  22.88850 -166.59241 ;   ;
A-ANALOG PAPER ROLLS      90 024 0146     END    END OF ROLL #19       ;0013;   ;0019  22.65780 -165.82190 ;   ;
A-ANALOG PAPER ROLLS      90 024 0148     START  START OF ROLL #20     ;0014;   ;0020  22.65770 -165.81700 ;   ;
A-ANALOG PAPER ROLLS      90 024 1806     END    END OF ROLL #01       ;0015;   ;0001  23.45460 -167.64000 ;   ;
A-ANALOG PAPER ROLLS      90 024 1806     END    END OF ROLL #20       ;0015;   ;0020  23.45460 -167.64000 ;   ;
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RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STATION	REEL	SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	ROLL C	R DPTH	SAMP N	U
M-DIGITAL MAGNETIC TAPES	90 005 1935	START	START OF TAPE #01		;TRA1;		;0001	22.49795	-167.88900		;		;
M-DIGITAL MAGNETIC TAPES	90 005 2043	END	END OF TAPE #01		;TRA1;		;0001	22.51855	-168.06080		;		;
M-DIGITAL MAGNETIC TAPES	90 005 2045	START	START OF TAPE #02		;0001;		;0002	22.52005	-168.06580		;		;
M-DIGITAL MAGNETIC TAPES	90 006 0456	END	END OF TAPE #02		;0001;		;0002	22.89360	-169.31560		;		;
M-DIGITAL MAGNETIC TAPES	90 006 0457	START	START OF TAPE #03		;0001;		;0003	22.89435	-169.31810		;		;
M-DIGITAL MAGNETIC TAPES	90 006 1306	END	END OF TAPE #03		;0001;		;0003	23.27360	-170.59000		;		;
M-DIGITAL MAGNETIC TAPES	90 006 1307	START	START OF TAPE #04		;0001;		;0004	23.27430	-170.59240		;		;
M-DIGITAL MAGNETIC TAPES	90 006 2118	END	END OF TAPE #04		;0001;		;0004	23.65050	-171.86740		;		;
M-DIGITAL MAGNETIC TAPES	90 006 2118	START	START OF TAPE #05		;0001;		;0005	23.65050	-171.86740		;		;
M-DIGITAL MAGNETIC TAPES	90 007 0529	END	END OF TAPE #05		;0001;		;0005	24.04405	-173.18030		;		;
M-DIGITAL MAGNETIC TAPES	90 007 0530	START	START OF TAPE #06		;0001;		;0006	24.04480	-173.18290		;		;
M-DIGITAL MAGNETIC TAPES	90 007 1340	END	END OF TAPE #06		;0001;		;0006	24.41910	-174.45230		;		;
M-DIGITAL MAGNETIC TAPES	90 007 1341	START	START OF TAPE #07		;0001;		;0007	24.41985	-174.45500		;		;
M-DIGITAL MAGNETIC TAPES	90 007 2151	START	START OF TAPE #08		;0001;		;0008	24.76705	-175.68020		;		;
M-DIGITAL MAGNETIC TAPES	90 007 2151	END	END OF TAPE #07		;0001;		;0007	24.76705	-175.68020		;		;
M-DIGITAL MAGNETIC TAPES	90 007 2214	END	EOT #8		;0001;		;0008	24.78470	-175.73990		;		;
M-DIGITAL MAGNETIC TAPES	90 007 2218	START	START OF TAPE #09		;0001;		;0009	24.78750	-175.75010		;		;
M-DIGITAL MAGNETIC TAPES	90 008 0629	END	END OF TAPE #09		;0001;		;0009	25.17335	-177.01470		;		;
M-DIGITAL MAGNETIC TAPES	90 008 0630	START	START OF TAPE #10		;0001;		;0010	25.17410	-177.01730		;		;
M-DIGITAL MAGNETIC TAPES	90 008 1440	END	END OF TAPE #10		;0001;		;0010	25.55420	-178.31370		;		;
M-DIGITAL MAGNETIC TAPES	90 008 1441	START	START OF TAPE #11		;0001;		;0011	25.55490	-178.31630		;		;
M-DIGITAL MAGNETIC TAPES	90 008 2254	END	END OF TAPE #11		;0001;		;0011	25.92860	-179.59790		;		;
M-DIGITAL MAGNETIC TAPES	90 008 2255	START	START OF TAPE #12		;0001;		;0012	25.92930	-179.60030		;		;
M-DIGITAL MAGNETIC TAPES	90 009 0703	END	END OF TAPE #12		;0001;		;0012	26.25955	179.26700		;		;
M-DIGITAL MAGNETIC TAPES	90 009 0703	START	START OF TAPE #13		;0001;		;0013	26.25955	179.26700		;		;
M-DIGITAL MAGNETIC TAPES	90 009 1235	END	END OF TAPE #13		;0001;		;0013	26.48195	178.50120		;		;
M-DIGITAL MAGNETIC TAPES	90 009 1310	START	START OF TAPE #14		;0002;		;0014	26.53910	178.43810		;		;
M-DIGITAL MAGNETIC TAPES	90 009 1520	END	END OF TAPE #14		;0002;		;0014	26.79470	178.26750		;		;
M-DIGITAL MAGNETIC TAPES	90 009 1531	START	START OF TAPE #15		;0003;		;0015	26.80705	178.28340		;		;
M-DIGITAL MAGNETIC TAPES	90 009 2343	START	START OF TAPE #16		;0003;		;0016	26.43815	179.56270		;		;
M-DIGITAL MAGNETIC TAPES	90 009 2343	END	END OF TAPE #15		;0003;		;0015	26.43815	179.56270		;		;
M-DIGITAL MAGNETIC TAPES	90 010 0753	START	START OF TAPE #17		;0003;		;0017	26.09075	-179.25570		;		;

M-DIGITAL MAGNETIC TAPES 90 010 0753 END END OF TAPE #16 ;0003; ;0016 26.09075 -179.25570 ; ;
M-DIGITAL MAGNETIC TAPES 90 010 1604 END END OF TAPE #17 ;0003; ;0017 25.74200 -178.06430 ; ;
M-DIGITAL MAGNETIC TAPES 90 010 1605 START START OF TAPE #18 ;0003; ;0018 25.74125 -178.06160 ; ;
M-DIGITAL MAGNETIC TAPES 90 011 0015 END END OF TAPE #18 ;0003; ;0018 25.39015 -176.88370 ; ;
M-DIGITAL MAGNETIC TAPES 90 011 0016 START START OF TAPE #19 ;0003; ;0019 25.38960 -176.88130 ; ;
M-DIGITAL MAGNETIC TAPES 90 011 0827 END END OF TAPE #19 ;0003; ;0019 25.06790 -175.74540 ; ;
M-DIGITAL MAGNETIC TAPES 90 011 0827 START START OF TAPE #20 ;0003; ;0020 25.06790 -175.74540 ; ;
M-DIGITAL MAGNETIC TAPES 90 011 1625 END END OF TAPE #20 ;0003; ;0020 24.75030 -174.65780 ; ;
M-DIGITAL MAGNETIC TAPES 90 011 1641 START START OF TAPE #21 ;0004; ;0021 24.77240 -174.65020 ; ;
M-DIGITAL MAGNETIC TAPES 90 011 1836 END END OF TAPE #21 ;0004; ;0021 25.02690 -174.75190 ; ;
M-DIGITAL MAGNETIC TAPES 90 011 1844 START START OF TAPE #22 ;0005; ;0022 25.04440 -174.76170 ; ;
M-DIGITAL MAGNETIC TAPES 90 012 0255 END END OF TAPE #22 ;0005; ;0022 25.41020 -175.98910 ; ;
M-DIGITAL MAGNETIC TAPES 90 012 0256 START START OF TAPE #23 ;0005; ;0023 25.41090 -175.99150 ; ;
M-DIGITAL MAGNETIC TAPES 90 012 1106 END END OF TAPE #23 ;0005; ;0023 25.78390 -177.26250 ; ;
M-DIGITAL MAGNETIC TAPES 90 012 1106 START START OF TAPE #24 ;0005; ;0024 25.78390 -177.26250 ; ;
M-DIGITAL MAGNETIC TAPES 90 012 1918 END END OF TAPE #24 ;0005; ;0024 26.16000 -178.53940 ; ;
M-DIGITAL MAGNETIC TAPES 90 012 1918 START START OF TAPE #25 ;0005; ;0025 26.16000 -178.53940 ; ;
M-DIGITAL MAGNETIC TAPES 90 013 0329 END END OF TAPE #25 ;0005; ;0025 26.54545 -179.86120 ; ;
M-DIGITAL MAGNETIC TAPES 90 013 0330 START START OF TAPE #26 ;0005; ;0026 26.54620 -179.86360 ; ;
M-DIGITAL MAGNETIC TAPES 90 013 1140 END END OF TAPE #26 ;0005; ;0026 26.93360 178.80850 ; ;
M-DIGITAL MAGNETIC TAPES 90 013 1140 START START OF TAPE #27 ;0005; ;0027 26.93360 178.80850 ; ;
M-DIGITAL MAGNETIC TAPES 90 013 1546 END END OF TAPE #27 ;0005; ;0027 27.13230 178.11720 ; ;

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STATION	SAMPLE	REEL	LATITUDE DEC DEG	LONGITUDE DEC DEG	ROLL C	R	SAMP DPTH	U N
M-DIGITAL MAGNETIC TAPES	90 005 1935	START	START OF TAPE #01				;TRA1;	;0001	22.49795	-167.88900	;	;	
M-DIGITAL MAGNETIC TAPES	90 005 2043	END	END OF TAPE #01				;TRA1;	;0001	22.51855	-168.06080	;	;	
M-DIGITAL MAGNETIC TAPES	90 005 2045	START	START OF TAPE #02				;0001;	;0002	22.52005	-168.06580	;	;	
M-DIGITAL MAGNETIC TAPES	90 006 0456	END	END OF TAPE #02				;0001;	;0002	22.89360	-169.31560	;	;	
M-DIGITAL MAGNETIC TAPES	90 006 0457	START	START OF TAPE #03				;0001;	;0003	22.89435	-169.31810	;	;	
M-DIGITAL MAGNETIC TAPES	90 006 1306	END	END OF TAPE #03				;0001;	;0003	23.27360	-170.59000	;	;	
M-DIGITAL MAGNETIC TAPES	90 006 1307	START	START OF TAPE #04				;0001;	;0004	23.27430	-170.59240	;	;	
M-DIGITAL MAGNETIC TAPES	90 006 2118	END	END OF TAPE #04				;0001;	;0004	23.65050	-171.86740	;	;	
M-DIGITAL MAGNETIC TAPES	90 006 2118	START	START OF TAPE #05				;0001;	;0005	23.65050	-171.86740	;	;	
M-DIGITAL MAGNETIC TAPES	90 007 0529	END	END OF TAPE #05				;0001;	;0005	24.04405	-173.18030	;	;	
M-DIGITAL MAGNETIC TAPES	90 007 0530	START	START OF TAPE #06				;0001;	;0006	24.04480	-173.18290	;	;	
M-DIGITAL MAGNETIC TAPES	90 007 1340	END	END OF TAPE #06				;0001;	;0006	24.41910	-174.45230	;	;	
M-DIGITAL MAGNETIC TAPES	90 007 1341	START	START OF TAPE #07				;0001;	;0007	24.41985	-174.45500	;	;	
M-DIGITAL MAGNETIC TAPES	90 007 2151	START	START OF TAPE #08				;0001;	;0008	24.76705	-175.68020	;	;	
M-DIGITAL MAGNETIC TAPES	90 007 2151	END	END OF TAPE #07				;0001;	;0007	24.76705	-175.68020	;	;	
M-DIGITAL MAGNETIC TAPES	90 007 2214	END	EOT #8				;0001;	;0008	24.78470	-175.73990	;	;	
M-DIGITAL MAGNETIC TAPES	90 007 2218	START	START OF TAPE #09				;0001;	;0009	24.78750	-175.75010	;	;	
M-DIGITAL MAGNETIC TAPES	90 008 0629	END	END OF TAPE #09				;0001;	;0009	25.17335	-177.01470	;	;	
M-DIGITAL MAGNETIC TAPES	90 008 0630	START	START OF TAPE #10				;0001;	;0010	25.17410	-177.01730	;	;	
M-DIGITAL MAGNETIC TAPES	90 008 1440	END	END OF TAPE #10				;0001;	;0010	25.55420	-178.31370	;	;	
M-DIGITAL MAGNETIC TAPES	90 008 1441	START	START OF TAPE #11				;0001;	;0011	25.55490	-178.31630	;	;	
M-DIGITAL MAGNETIC TAPES	90 008 2254	END	END OF TAPE #11				;0001;	;0011	25.92860	-179.59790	;	;	
M-DIGITAL MAGNETIC TAPES	90 008 2255	START	START OF TAPE #12				;0001;	;0012	25.92930	-179.60030	;	;	
M-DIGITAL MAGNETIC TAPES	90 009 0703	END	END OF TAPE #12				;0001;	;0012	26.25955	179.26700	;	;	
M-DIGITAL MAGNETIC TAPES	90 009 0703	START	START OF TAPE #13				;0001;	;0013	26.25955	179.26700	;	;	
M-DIGITAL MAGNETIC TAPES	90 009 1235	END	END OF TAPE #13				;0001;	;0013	26.48195	178.50120	;	;	
M-DIGITAL MAGNETIC TAPES	90 009 1310	START	START OF TAPE #14				;0002;	;0014	26.53910	178.43810	;	;	
M-DIGITAL MAGNETIC TAPES	90 009 1520	END	END OF TAPE #14				;0002;	;0014	26.79470	178.26750	;	;	
M-DIGITAL MAGNETIC TAPES	90 009 1531	START	START OF TAPE #15				;0003;	;0015	26.80705	178.28340	;	;	
M-DIGITAL MAGNETIC TAPES	90 009 2343	START	START OF TAPE #16				;0003;	;0016	26.43815	179.56270	;	;	
M-DIGITAL MAGNETIC TAPES	90 009 2343	END	END OF TAPE #15				;0003;	;0015	26.43815	179.56270	;	;	
M-DIGITAL MAGNETIC TAPES	90 010 0753	START	START OF TAPE #17				;0003;	;0017	26.09075	-179.25570	;	;	

M-DIGITAL MAGNETIC TAPES 90 019 0112 START START OF TAPE #45 ;0011; ;0045 22.81960 -167.29761 ; ;
M-DIGITAL MAGNETIC TAPES 90 019 0924 END END OF TAPE #45 ;0011; ;0045 23.18240 -168.50230 ; ;
M-DIGITAL MAGNETIC TAPES 90 019 0924 START START OF TAPE #46 ;0011; ;0046 23.18240 -168.50230 ; ;
M-DIGITAL MAGNETIC TAPES 90 019 1735 END END OF TAPE #46 ;0011; ;0046 23.53840 -169.68980 ; ;
M-DIGITAL MAGNETIC TAPES 90 019 1736 START START OF TAPE #47 ;0011; ;0047 23.53910 -169.69240 ; ;
M-DIGITAL MAGNETIC TAPES 90 020 0146 END END OF TAPE #47 ;0011; ;0047 23.89550 -170.88630 ; ;
M-DIGITAL MAGNETIC TAPES 90 020 0147 START START OF TAPE #48 ;0011; ;0048 23.89615 -170.88870 ; ;
M-DIGITAL MAGNETIC TAPES 90 020 0957 START START OF TAPE #49 ;0011; ;0049 24.24045 -172.03910 ; ;
M-DIGITAL MAGNETIC TAPES 90 020 0957 END END OF TAPE #48 ;0011; ;0048 24.24045 -172.03910 ; ;
M-DIGITAL MAGNETIC TAPES 90 020 1135 END EOT #49: MASS CMP PBLM ;0011; ;0049 24.31185 -172.28000 ; ;
M-DIGITAL MAGNETIC TAPES 90 020 1315 START START OF TAPE #50 ;0011; ;0050 24.38725 -172.53260 ; ;
M-DIGITAL MAGNETIC TAPES 90 020 2021 END END OF TAPE #50 ;0011; ;0050 24.67180 -173.56980 ; ;
M-DIGITAL MAGNETIC TAPES 90 020 2022 START START OF TAPE #51 ;0011; ;0051 24.67240 -173.57210 ; ;
M-DIGITAL MAGNETIC TAPES 90 021 0424 END END OF TAPE #51 ;0011; ;0051 25.05180 -174.77600 ; ;
M-DIGITAL MAGNETIC TAPES 90 021 0430 START START OF TAPE #52 ;0012; ;0052 25.05980 -174.78830 ; ;
M-DIGITAL MAGNETIC TAPES 90 021 0801 END END OF TAPE #52 ;0012; ;0052 25.39995 -175.17620 ; ;
M-DIGITAL MAGNETIC TAPES 90 021 0816 START START OF TAPE #53 ;0013; ;0053 25.41690 -175.16050 ; ;
M-DIGITAL MAGNETIC TAPES 90 021 1627 END END OF TAPE #53 ;0013; ;0053 25.08955 -174.02430 ; ;
M-DIGITAL MAGNETIC TAPES 90 021 1628 START START OF TAPE #54 ;0013; ;0054 25.08880 -174.02190 ; ;
M-DIGITAL MAGNETIC TAPES 90 022 0039 END END OF TAPE #54 ;0013; ;0054 24.75355 -172.87750 ; ;
M-DIGITAL MAGNETIC TAPES 90 022 0039 START START OF TAPE #55 ;0013; ;0055 24.75355 -172.87750 ; ;
M-DIGITAL MAGNETIC TAPES 90 022 1702 END END OF TAPE #56 ;0013; ;0056 24.05090 -170.49580 ; ;

RECORDING MEDIA	DATE AND TIME	STATUS	ACTIVITY	LINE	STATION	REEL SAMPLE	LATITUDE DEC DEG	LONGITUDE DEC DEG	R C	SAMP DPTH	U N
M-DIGITAL MAGNETIC TAPES	90 022 1703	START	START OF TAPE #57	;0013;	;0057		24.05020	-170.49340	;	;	
M-DIGITAL MAGNETIC TAPES	90 022 2209	END	END OF TAPE #55	;0013;	;0055		23.82825	-169.76980	;	;	
M-DIGITAL MAGNETIC TAPES	90 022 2209	START	START OF TAPE #56	;0013;	;0056		23.82825	-169.76980	;	;	
M-DIGITAL MAGNETIC TAPES	90 023 0112	END	END OF TAPE #57	;0013;	;0057		23.70840	-169.34590	;	;	
M-DIGITAL MAGNETIC TAPES	90 023 0113	START	START OF TAPE #58	;0013;	;0058		23.70770	-169.34360	;	;	
M-DIGITAL MAGNETIC TAPES	90 023 0924	START	START OF TAPE #59	;0013;	;0059		23.35280	-168.15280	;	;	
M-DIGITAL MAGNETIC TAPES	90 023 0924	END	END OF TAPE #58	;0013;	;0058		23.35280	-168.15280	;	;	
M-DIGITAL MAGNETIC TAPES	90 023 1735	END	END OF TAPE #59	;0013;	;0059		23.00555	-166.98961	;	;	
M-DIGITAL MAGNETIC TAPES	90 023 1736	START	START OF TAPE #60	;0013;	;0060		23.00480	-166.98720	;	;	
M-DIGITAL MAGNETIC TAPES	90 023 2025	END	END OF TAPE #60	;0013;	;0060		22.88155	-166.57091	;	;	
M-DIGITAL MAGNETIC TAPES	90 023 2054	START	START OF TAPE #61	;0013;	;0061		22.86050	-166.50270	;	;	
M-DIGITAL MAGNETIC TAPES	90 024 0141	END	END OF TAPE #61	;0013;	;0061		22.66025	-165.83385	;	;	
M-DIGITAL MAGNETIC TAPES	90 024 0156	START	START OF TAPE #62	;0014;	;0062		22.66340	-165.79800	;	;	
M-DIGITAL MAGNETIC TAPES	90 024 0342	END	END OF TAPE #62	;0014;	;0062		22.81010	-165.56960	;	;	
M-DIGITAL MAGNETIC TAPES	90 024 0352	START	START OF TAPE #63	;0015;	;0063		22.82860	-165.56850	;	;	
M-DIGITAL MAGNETIC TAPES	90 024 1203	END	END OF TAPE #63	;0015;	;0063		23.19160	-166.76286	;	;	
M-DIGITAL MAGNETIC TAPES	90 024 1204	START	START OF TAPE #64	;0015;	;0064		23.19230	-166.76530	;	;	
M-DIGITAL MAGNETIC TAPES	90 024 1808	END	END OF TAPE #64	;0015;	;0064				;	;	
W-INVENTORY OF SCIENTIFIC GEAR	90 027 0415		TWO CHANNEL AIR GUN	;	;	;			;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 005 1935	ON	SYS ON: TCAG DEPLYD	;TRA1;	;0001		22.49795	-167.88900	;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 005 2127	OFF	SYS OFF:GUN LOST PRSS	;0001;	;0002		22.55165	-168.17210	;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 005 2200	ON	SYS ON:AIR GUN RSTRD	;0001;	;0002		22.57680	-168.25630	;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 011 2043	OFF	SYS OFF: CHG AIR GUN	;0005;	;0022		25.12040	-175.06970	;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 011 2145	ON	SYS ON: AIR GUN CHGD	;0005;	;0022		25.16280	-175.22740	;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 015 1857	OFF	SYS OFF: PULLING STRMR	;0007;	;0034		25.35615	-174.91260	;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 016 0057	ON	SYS ON: STRMR RESTORED	;0009;	;0035		24.77695	-174.75720	;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 016 2220	OFF	SYS OFF:UNKWN NOISE ON	;0009;	;0037		23.85970	-171.68890	;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 016 2223	ON	SYS ON:NOISE CONTINUES	;0009;	;0037		23.85830	-171.68210	;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 016 2356	OFF	SYS OFF:NOISE CONTINUES	;0009;	;0037		23.80400	-171.47420	;	;	
X-OPERATION OF SCIENTIFIC GEAR	90 017 0005	ON	SYS ON:NOISE CONTINUES	;0009;	;0037		23.79900	-171.45680	;	;	

X-OPERATION OF SCIENTIFIC GEAR 90 017 0011 OFF SYS OFF:NOISE CONTINUES ;0009; ;0037 23.79605 -171.44710 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 017 0111 ON SYS ON:NOISE CONTINUES ;0009; ;0037 23.76200 -171.33230 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 017 2013 OFF SYS OFF:REPOSTN STRMR ;0009; ;0040 22.98800 -168.73420 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 017 2017 ON SYS ON:STRMR REPOS 50M ;0009; ;0040 22.98505 -168.72460 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 020 1135 OFF SYS OFF: MASS COMP PBLM ;0011; ;0049 24.31185 -172.28000 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 020 1315 ON SYS ON: MASS COMP RSTRD ;0011; ;0050 24.38725 -172.53260 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 021 2252 OFF SYS OFF: CHG AIR GUN ;0013; ;0054 24.82180 -173.11230 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 022 0022 ON SYS ON: AIR GUN CHGD ;0013; ;0054 24.76530 -172.91640 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 023 2025 OFF SYS OFF: PBLM MASS COMP ;0013; ;0060 22.88155 -166.57091 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 023 2054 ON SYS ON: MASS COMP RSTRD ;0013; ;0061 22.86050 -166.50270 ; ;
X-OPERATION OF SCIENTIFIC GEAR 90 024 1808 OFF SYS OFF: END DATA COLL ;0015; ;0064 ; ;