3. UNDERWAY GEOPHYSICS DATA COLLECTED ON LEG 126[1]

Patricia A. Cooper[2] and Shipboard Scientific Party[3]

INTRODUCTION

Ocean Drilling Program (ODP) Leg 126 drilled seven sites (787–793) in the Izu-Bonin region. The *JOIDES Resolution* was underway for 4 of the 57 days at sea, traveling approximately 103 nmi between the port of Tokyo and the first site (787); the ship departed Tokyo, Japan, on 22 April 1989 to begin Leg 126, and it arrived at the eastern edge of the Izu-Bonin forearc on 23 April 1989.

The first site, in the axis of Aoga Shima Canyon (proposed site BON-5C; ODP Site 787), was occupied from 24 to 26 April 1989. Drilling commenced at the next site (proposed site BON-2; ODP Sites 788 and 789), located on top of a horst on the eastern flank of the Sumisu Rift, on 28 April. Sites 790 and 791 (proposed site BON-1) within the rift graben were occupied between 29 April and 13 May 1989. Site 788 was reoccupied on 14 May and drilling was completed by 16 May. Site 792 (proposed site BON-4), which was occupied from 16 to 26 May 1989, is located within the Izu-Bonin forearc basin. Drilling at Site 793 (proposed site BON-6D) commenced 26 May.

The *JOIDES Resolution* departed from the Izu-Bonin forearc on 18 June 1989 and completed Leg 126 at Tokyo, Japan, on 19 June 1989. The track line of the cruise is shown in Figure 1. This plot was generated from global positioning system (GPS) transit satellite and Loran-C positions, course- and speed-changing data, and on- and off-site information compiled from the bridge log, the underway geophysical log, and the HIGHRES (shipboard seismic data acquisition and processing software) tape headers. The final site locations are an average of positions collected while on site.

NAVIGATION

It was not possible to carry out all site approach surveys during GPS windows; therefore, the information used to reconstruct the ship's track around each drill site is combined Loran-C and GPS data. The GPS data are preferable to Loran-C and dead-reckoning positions because of the continually updated, higher quality data available during a GPS "window." This "window" is a period of up to 12 hr each day when positioning data from three or more GPS satellites can be received. Navigation data were recorded in the Underway Geophysics Lab (UGL) by a Magnavox 1107 GPS Transit Satellite Receiver.

The GPS fixes were printed to hard copy at a user-specified rate; Loran-C fixes were logged from the UGL repeater. The sampling density depended on the nature of the survey; it was generally one fix per 15–30 min in the initial part of the survey, increasing to one fix per 1 min when approaching the site. The ship's track was assumed to proceed from point to point unless otherwise indicated from course-change information listed in the HIGHRES headers. The density of points illustrated is less than the actual amount of data collected, but it is sufficient to ensure an accurate reconstruction of the ship's track.

DATA ACQUISITION

Shipboard geophysical instrumentation included two precision echo sounders (3.5 and 12.5 kHz), a magnetometer, seismic reflection profilers, and satellite navigation systems. The instruments were maintained and operated by ODP marine technicians, in cooperation with the scientific party and the officers and crew of SEDCO-FOREX, Inc. Table 1 summarizes the amounts and types of geophysical data collected. Bathymetry, seismic reflection profiles, and magnetic data were continuously recorded along the transits. Bathymetric data were obtained from 3.5- and 12.5-kHz (Raytheon line-scan recorder system) echo sounders. The 3.5- and 12.5-kHz data are not presented here because of the volume of data involved; the data are available upon request from the ODP Database Librarian.

The seismic sources used on board the *JOIDES Resolution* during Leg 126 were two synchronized 80-in.[3] Seismic System, Inc., water guns operating at approximately 1800 psi. One 100-m-long Teledyne streamer containing 60 active sections, combined to produce a single signal, was deployed from the fantail and towed about 500 m behind the vessel at a depth of 10 m.

Five seismic lines were recorded during Leg 126, covering approximately 30 nmi (Table 1); copies are available from the ODP Database Librarian. Single-channel seismic data were displayed in real-time analog format on two Raytheon line-scan dry-paper recorders, using only streamers, an amplifier, and band-pass filters. Seismic data were also recorded with a Masscomp 561 computer (Table 2), which functions as the central unit to record, process, and display the data. Data were processed and displayed in real time on a 15-in.-wide Printronix high-resolution graphic printer (160 dots/in.) according to the parameters listed in Table 3. Raw data were recorded on magnetic tapes by means of a SEG-Y format and a density of 1600 bits/in. Seismic lines recorded with the Masscomp were reprocessed on board, using SIOSEIS software. The reprocessed data were displayed on a 22-in.-wide Versatec plotter (200 dots/in.).

MAGNETIC DATA AND BATHYMETRY

A Geometrics 801 proton precession magnetometer, towed approximately 300 m astern, was used during transits and site surveys. Total-intensity, magnetic-field data were recorded in analog format on a strip chart recorder, in digital format via the HIGHRES headers (one reading per shot), and manually every 5 min in the underway geophysics log. The magnetic field values were reduced to anomaly values by subtracting the 1985 International Geophysical Reference Field. Figure 2 shows bathymetry, magnetic anomaly, course, and speed data, plotted in profile as functions of time and distances.

SINGLE-CHANNEL SEISMIC REFLECTION PROFILES

A map view of the bathymetry of the Izu-Bonin region traversed on Leg 126 is shown together with the ship's track in Figure 1. The single-channel seismic reflection profiles with their

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[1] Taylor, B., Fujioka, K., et al., 1990. *Proc. ODP, Init. Repts.*, 126: College Station, TX (Ocean Drilling Program).

[2] Hawaii Institute of Geophysics, University of Hawaii at Manoa, 2525 Correa Road, Honolulu, HI 96822.

[3] Shipboard Scientific Party is as given in the list of participants preceding the contents.

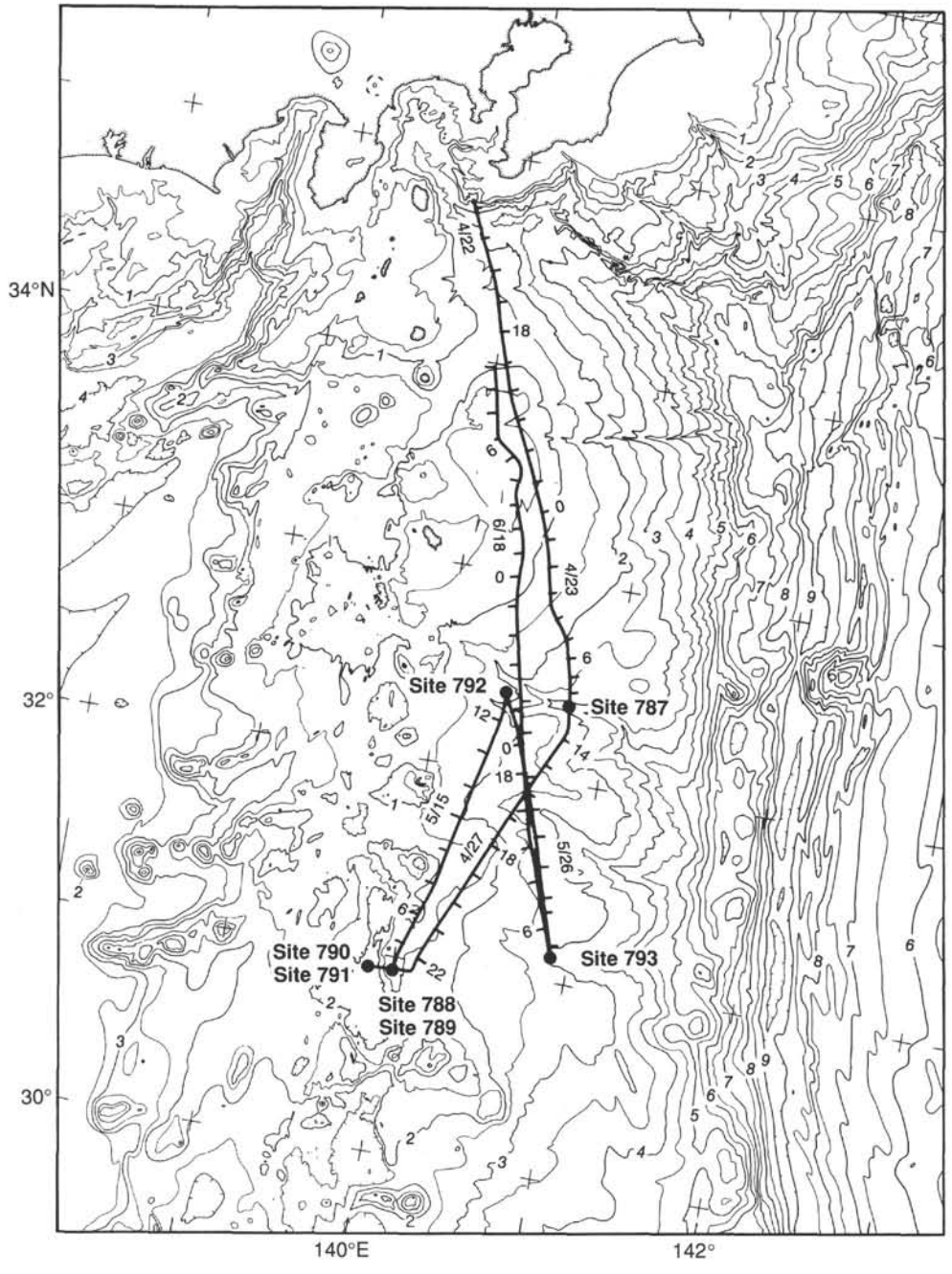

Figure 1. Leg 126 track line on a bathymetric map contoured at 500 m by B. Taylor.

corresponding track segments are shown in Figures 3 through 10. Bad traces were blanked. The traces were band-pass filtered (25–65 Hz); a three-trace, equally weighted, running-slant mix and automatic gain control were applied to all traces. For Lines 2 through 4, the signal was muted to seafloor; signal losses caused by water-gun malfunctions made the seafloor somewhat difficult to distinguish in parts of Line 1. The seismic lines are summarized below.

Seismic Line 1 was collected en route to Site 787 along the track segment shown in Figure 3. The processed digital seismic profile is shown in Figure 4 (from Julian Day 113/0723 UTC, shotpoint 4147, to Julian Day 113/1155 UTC, shotpoint 5281). Basement depth is highly variable, from 4.8 s beneath the canyon walls to approximately 6.0 s at Site 787.

Seismic Line 2 was collected en route to Site 788 along the track segment shown in Figure 5. The processed digital seismic profile is shown in Figure 6 (from Julian Day 117/2237 UTC, shotpoint 5815, to Julian Day 118/0030 UTC, shotpoint 6317). The profile shows a stratified sequence, cut by normal faults, on the footwall uplift forming the eastern flank of the Sumisu Rift.

No single-channel seismic data were collected en route to Site 789.

Seismic Line 3 was collected en route to Site 790 along the track segment shown in Figure 7. The processed digital seismic profile is shown in Figure 8 (from Julian Day 119/0450 UTC, shotpoint 6375, to Julian Day 119/0700 UTC, shotpoint 7017). This section shows a half graben filled with syn-rift sedimentary sequence. To the west, the base of the syn-rift sequence cannot

Table 1. Geophysical data coverage.

Port: Tokyo	to Site 787	to Site 788	to Site 790	to Site 792	to Site 793
Line number	Line 1	Line 2	Line 3	Line 4	Line 5
Navigation and bathymetric data:					
Start time	JD 112/1600	JD 117/1200	JD 119/0445	JD 136/0356	JD 145/2209
End time	JD 113/1200	JD 118/0030	JD 119/0703	JD 136/1556	JD 146/0728
Shotpoint intervals	3588–5401	5442–6368	6370–7047	7182–8553	8648–8988
Distance (nmi)	68.0	51.0	5.4	46.6	40.2
Total: 211.2 nmi					
Magnetic data:					
Shotpoint intervals	3590–5298	5448–6333	6373–7018	7195–8553	8648–8696
Distance (nmi)	67.0	50.0	5.0	45.9	39.0
Total: 206.9 nmi					
Seismic reflection data:					
Shotpoint intervals	4147–5401	5821–6367	6395–7030	7490–8527	None
Distance (nmi)	12.4	4.3	5.0	7.8	
Total: 29.5 nmi					

Table 2. Seismic data, real-time recording parameters.

	Line 1	Line 2	Line 3	Line 4
Start at	32°30.970′N, 140°45.010′E	30°55.271′N, 140°06.452′E	30°54.910′N, 140°00.810′E	32°18.748′N, 140°22.940′E
End at	32°22.580′N, 140°39.700′E	30°55.298′N, 140°00.327′E	30°54.890′N, 139°51.080′E	32°24.040′N, 140°22.779′E
Source				
(water/air guns, size)	two 80-in.^{3} water guns 1800 psi	two 80-in.^{3} water guns 1800 psi	two 80-in.^{3} water guns 1800 psi	two 80-in.^{3} water guns 1800 psi
Streamer				
(port or starboard)	Port	Port	Port	Port
Analog 1:				
Low cut (Hz)	150	150	150	145
High cut (Hz)	40	40	40	40
Gain: amp (db)	80	80	80	80
Analog 2:				
Low cut (Hz)	100	100	100	100
High cut (Hz)	30	30	30	30
Gain: amp (db)	80	80	80	80

Table 3. Seismic data processing parameters.

	Line 1	Line 2	Line 3	Line 4
Data window (ms):				
From	3000	1000	1000	1000
To	7750	5750	5750	5750
AGC:				
Response time (ms)	3000	1000	1000	1000
Gain (%)	20	20	20	20
Zero-phase band-pass filter:				
High cut (Hz)	150	150	150	150
Taper width	24	24	24	24
Low cut (Hz)	30	30	30	30
Taper width	24	24	24	24

be readily discerned, but it appears to "step up" via a series of antithetic normal faults that extend into basement. The syn-rift sediments are cut by numerous synthetic and antithetic normal growth faults, some of which extend from the basement to the surface. To the east, the graben is bounded by a large normal fault zone with bathymetric relief of more than 1000 m.

No single-channel seismic data were collected en route to Site 791.

No single-channel seismic data were collected en route to the reoccupation of Site 788.

Seismic Line 4 was collected en route to Site 792 along the track segment shown in Figure 9. The processed digital seismic profile is shown in Figure 10 (from Julian Day 136/1215 UTC, shotpoint 7490, to Julian Day 136/1553 UTC, shotpoint 8526). Basement depth is highly variable, approximately 3.2 s at Site 792.

No single-channel seismic data were collected en route to Site 793.

No single-channel seismic data were collected en route to Tokyo, Japan, after leaving Site 793.

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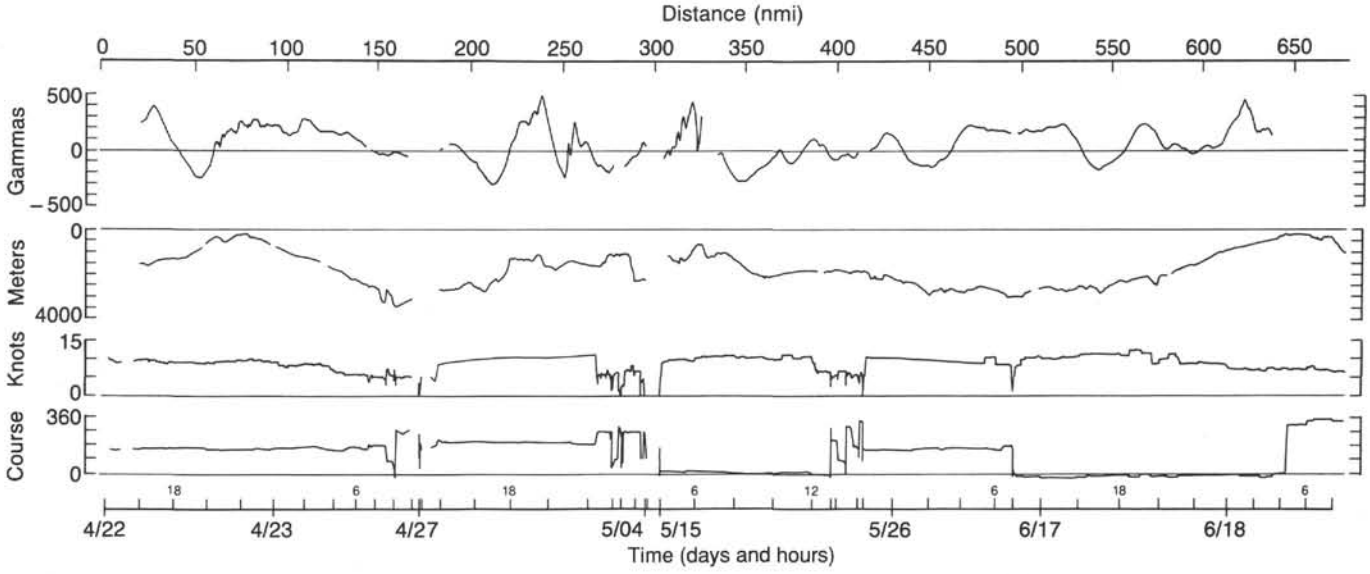

Figure 2. Magnetic anomaly, bathymetry, speed, and course data, plotted as functions of linear distance and nonlinear time.

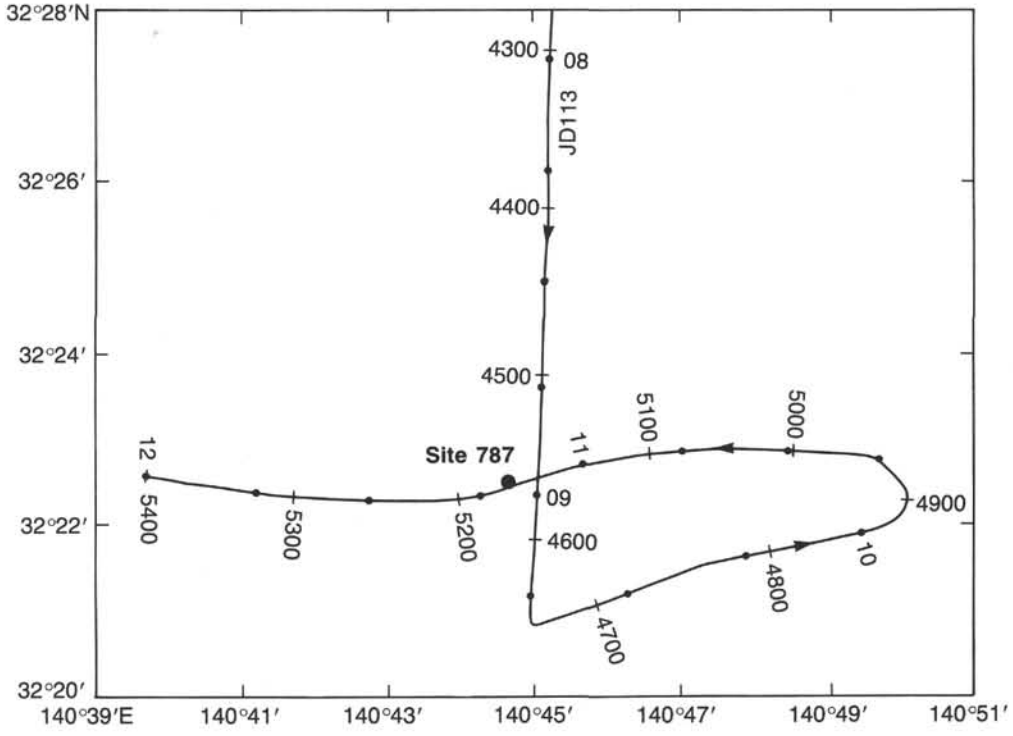

Figure 3. Ship track for single-channel seismic Line 1 (from south of Tokyo, Japan, to Site 787).

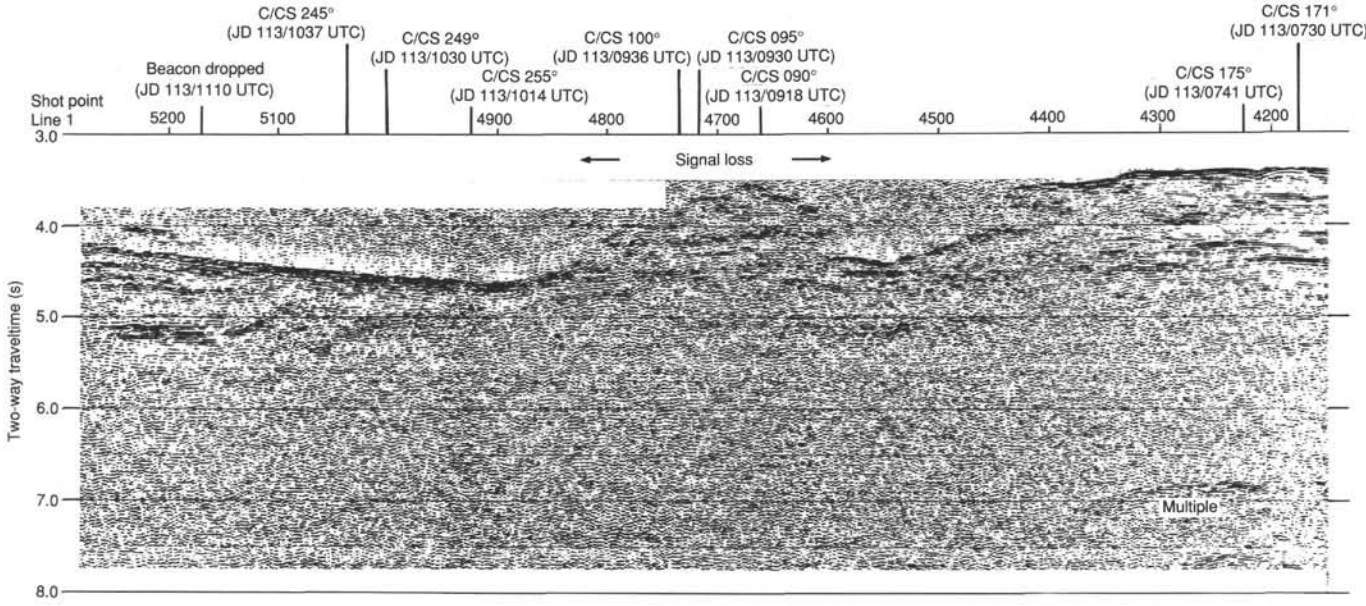

Figure 4. Processed single-channel seismic reflection from Line 1. Track line is shown in Figure 3.

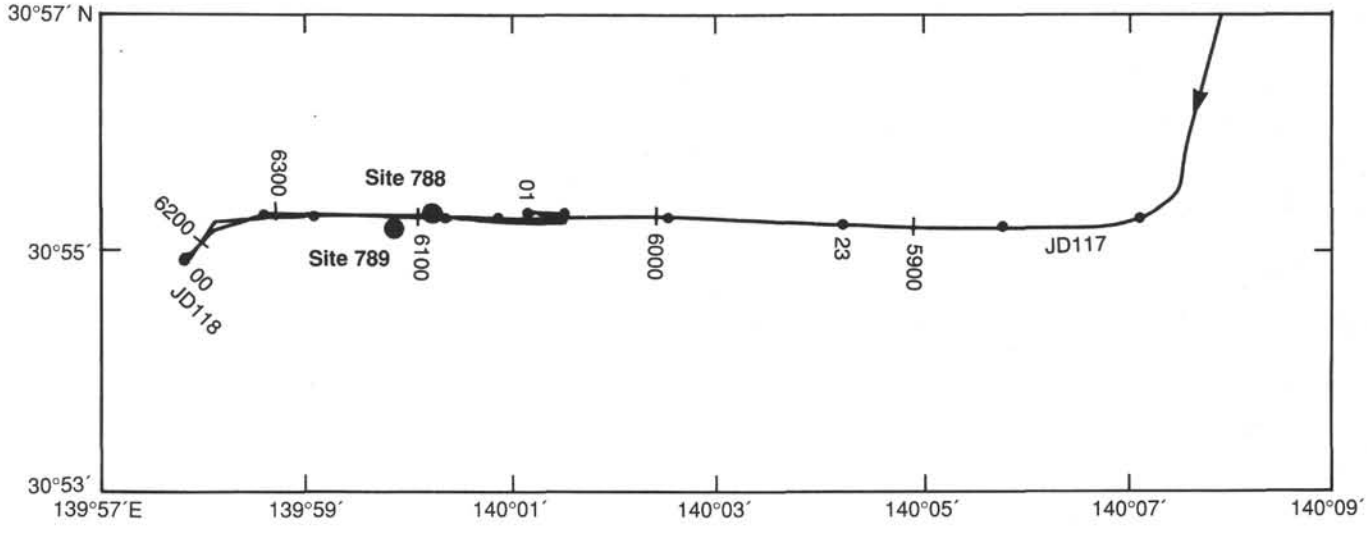

Figure 5. Ship track for single-channel seismic Line 2 (from Site 787 to Site 788).

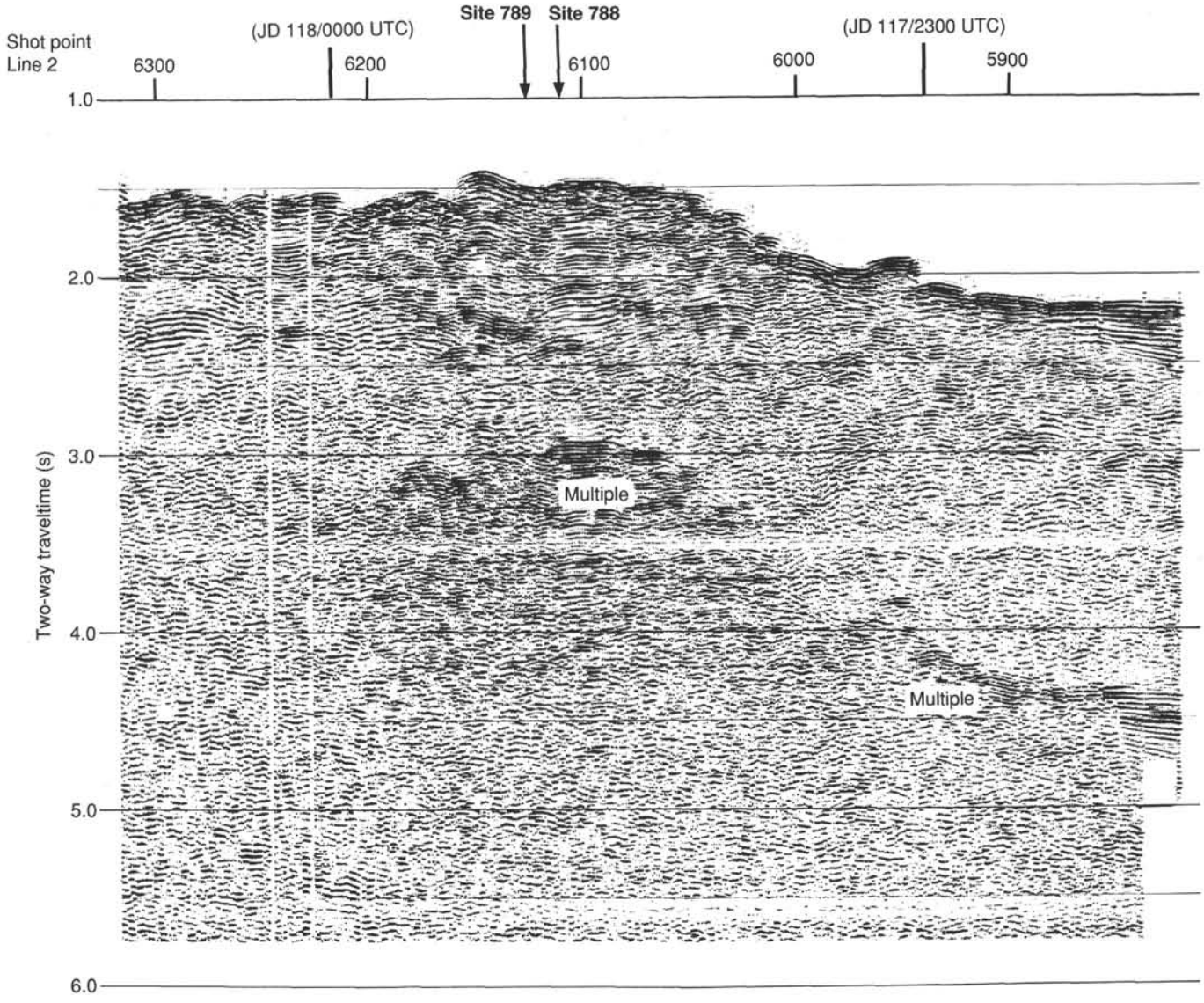

Figure 6. Processed single-channel seismic reflection from Line 2. Track line is shown in Figure 5.

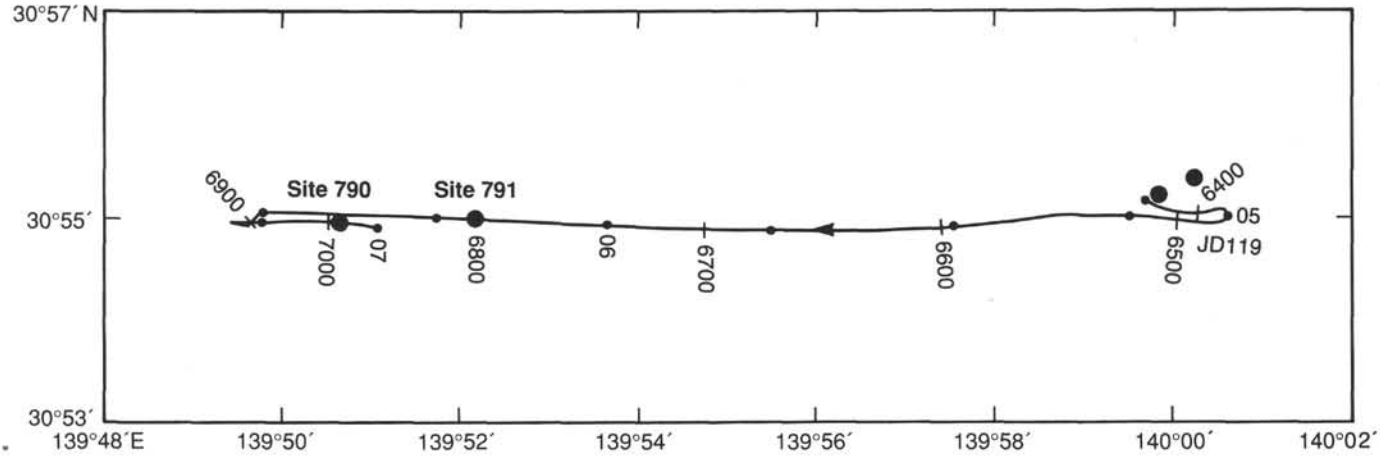

Figure 7. Ship track for single-channel seismic Line 3 (from Site 789 to Site 790).

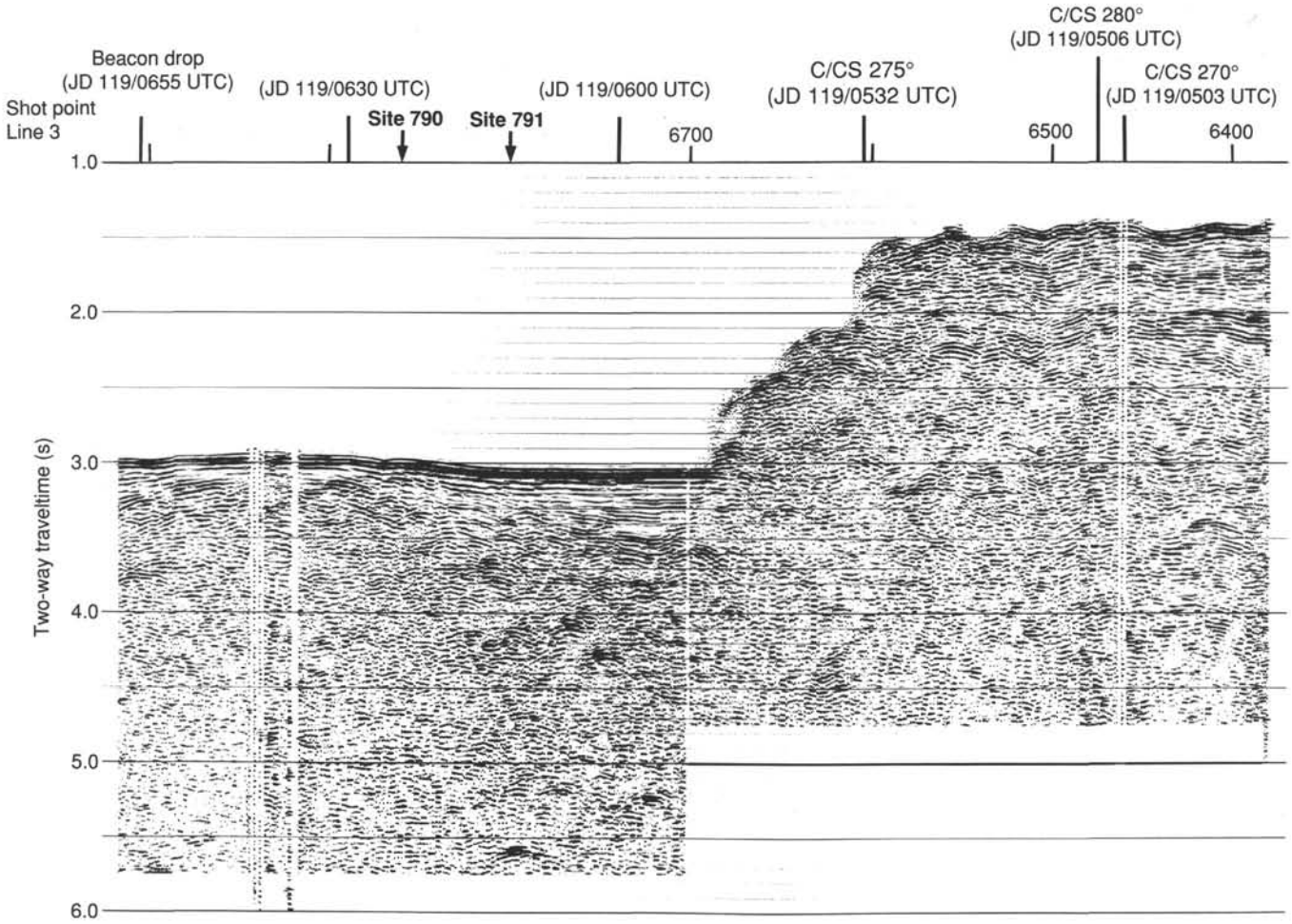

Figure 8. Processed single-channel seismic reflection from Line 3. Track line is shown in Figure 7.

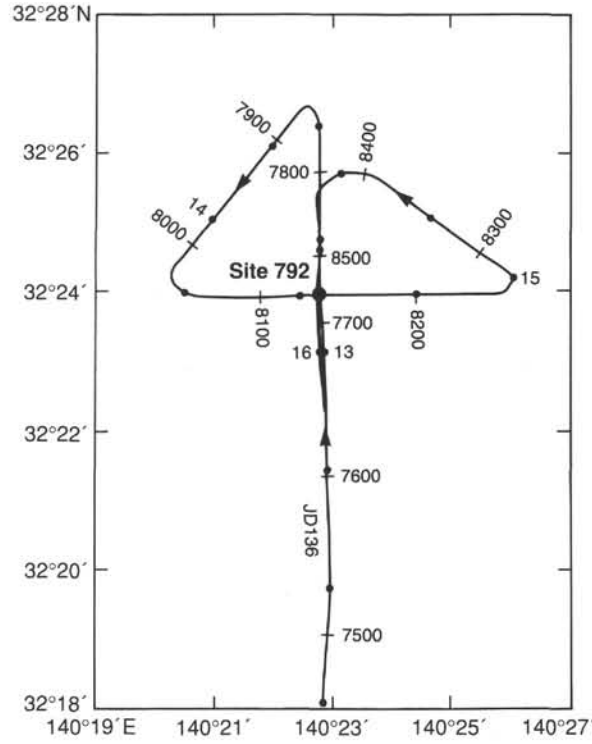

Figure 9. Ship track for single-channel seismic Line 4 (from Site 788 to Site 792).

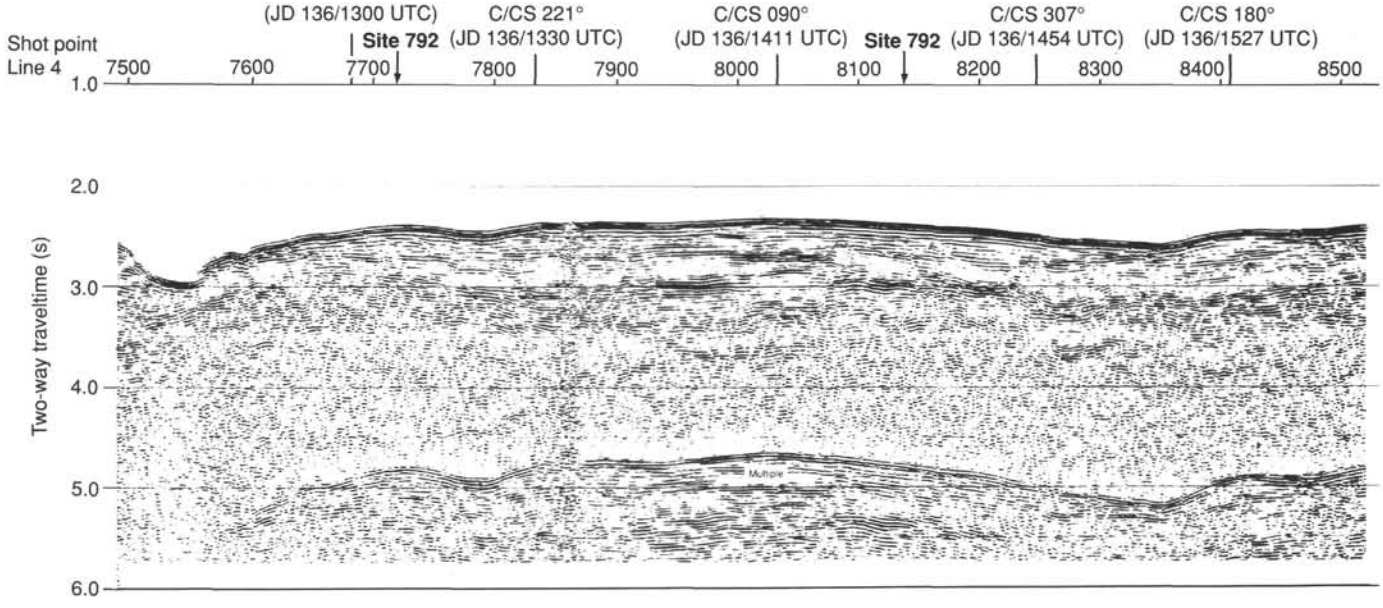

Figure 10. Processed single-channel seismic reflection from Line 4. Track line is shown in Figure 9.