Rangin, C., Silver, E., von Breymann, M. T., et al., 1990
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4. UNDERWAY GEOPHYSICS[1]

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INTRODUCTION

Underway geophysical data form an important element of the Ocean Drilling Program (ODP) insofar as these data provide the basis for (1) defining the scientific problems to be addressed by drilling, (2) site selection, and (3) interpretation of the drilling results within a regional structural and stratigraphic context. This chapter describes the acquisition and display of the underway geophysical data collected aboard the *JOIDES Resolution* during Leg 124. Other geophysical data, for example those used for site selection, are discussed in detail in individual site chapters (this volume). Detailed discussions and interpretations of the regional geophysical data in the context of the drilling results will be presented in the Scientific Results volume for Leg 124.

SHIPBOARD UNDERWAY GEOPHYSICS

The *JOIDES Resolution* is equipped to acquire, display, and process a variety of geophysical data, including underway navigation, bathymetric, magnetic, single-channel seismic reflection, and sonobuoy refraction/wide-angle reflection data. Digital logging of most of these data facilitate post-cruise processing. Navigation data, bathymetry, and magnetics data are routinely edited and corrected by the Geological Data Center (GDC) at the Scripps Institution of Oceanography under contract to ODP. Merged digital data are produced in MGD77 Exchange Format and made available, together with microfilm copies of all original analog records, to the ODP Data Bank at Lamont-Doherty Geological Observatory, Palisades, NY and to the National Geophysical Data Center, Boulder, CO.

The following sections briefly describe the equipment and methods used for underway geophysical data acquisition aboard the *JOIDES Resolution*, and discuss the data collected during Leg 124.

NAVIGATION

Equipment and Methods

Primary navigation data were acquired during Leg 124 by a Magnavox Transit/Global Positioning System (GPS) Satellite Navigator, Model MX 1107 GPS, located in the underway geophysics laboratory. Additional navigational equipment is also located on the bridge of the vessel, including a Magnavox MX 4400 GPS receiver, a Magnavox MX 702A Transit satellite receiver, as well as Decca and Loran-C radio positioning systems. GPS position fixes were available during a continuous window approximately 11 hr long each day. Transit satellite fixes were available at various times throughout the day. The satellite receiver automatically calculated dead reckoning (DR) positions between satellite fixes while operating in the Transit mode. All fixes, together with course and speed information, were recorded digitally in a computer file at selected time intervals (typically every 15–30 min during non-seismic transit segments and every 2 min while acquiring seismic data) using a Masscomp 561 super-micro computer system. These data were used to produce plots of the ship's position as a function of time. A paper printout of all of the Transit satellite fixes as well as the GPS and DR fixes at 30-min intervals was also obtained. Fixes collected while on site were averaged to produce the location for that site. A navigation plot of the ship's track between Singapore and Manila for Leg 124 is shown in Figure 1, with large-scale plots of navigation in the vicinities of each site shown in subsequent figures. The appendix (microfiche) provides a complete listing of all navigation data used for plotting the ship track during Leg 124.

Transit Between Sites

ODP Leg 124 collected underway geophysical data during transits to and between drill sites. The total underway time during Leg 124 was 12.6 days. During portions of this time the following underway data were collected:

1. 3.5- and 12-kHz precision echosounder profiles;
2. total field intensity magnetics data;
3. single-channel seismic reflection profiles; and
4. underway navigation data.

The magnetic anomaly and bathymetric profiles are shown in Figure 2. The instruments used to collect these data were maintained and operated by ODP marine technicians, in cooperation with the scientific party and the officers and crew of SEDCO-FOREX, Inc.

The *JOIDES Resolution* left Singapore on an east-northeast course that took the ship along the northwestern coast of Borneo. After rounding the northern tip of Borneo, the ship transited to the southeast, across the Sulu Ridge to Site 767 in the east-central portion of the Celebes Sea. Site 767, which can be identified on a multichannel seismic profile collected as part of a site survey by the BGR, was crossed by the *JOIDES Resolution* while collecting single-channel seismic reflection data (Figs. 3 and 4). A beacon was dropped as the ship passed over the site, and following a brief site survey the ship assumed position at Site 767 and commenced drilling operations.

Drilling operations were completed at Site 767 at 1635 UTC November 25, and the ship began the transit to Site 768 in the Sulu Sea. The *JOIDES Resolution* sailed north from Site 767 toward the Zamboanga Peninsula of western Mindanao, collected seismic data enroute (Figs. 5 and 6), and then turned northwest to cross the Sulu Ridge and entered the Sulu Sea south of the southern tip of the Zamboanga Peninsula. The ship then followed a northerly course across the southern Sulu Sea. After a short seismic survey (Figs. 7 and 8) the ship reached

[1] Rangin, C., Silver, E., von Breymann, M., et al., 1990. *Proc. ODP, Init. Repts.*, 124: College Station, TX (Ocean Drilling Program).

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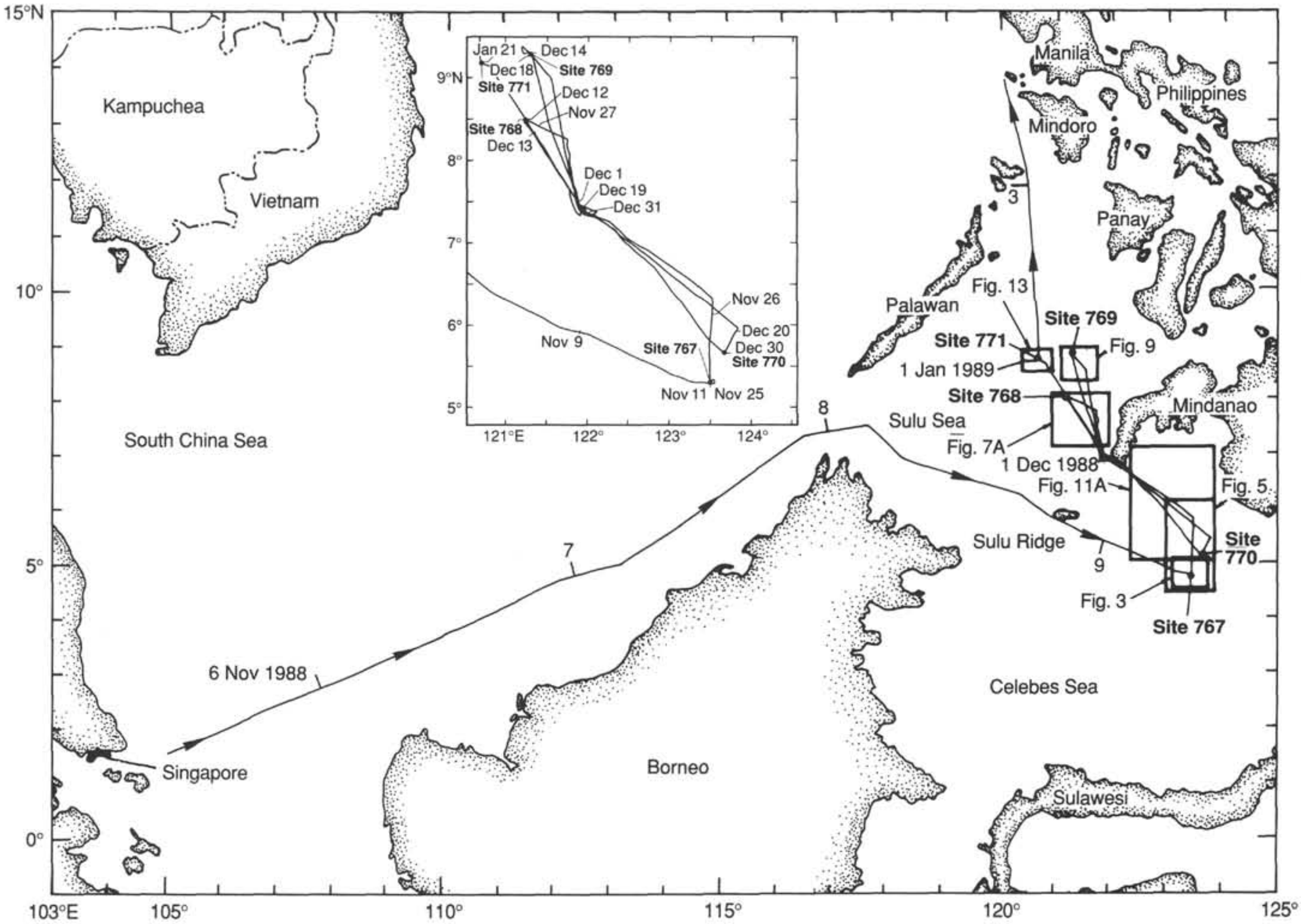

Figure 1. Preliminary track chart of ODP Leg 124. The cruise commenced in Singapore on 5 November 1988, and terminated in Manila on 4 January 1989. Site locations and course-speed change data are given in the Appendix (microfiche). Enlarged navigation plots for individual sites are shown in Figures 3, 5, 7A, 7B, 7C, 9, 9, 11A, 11B, and 13.

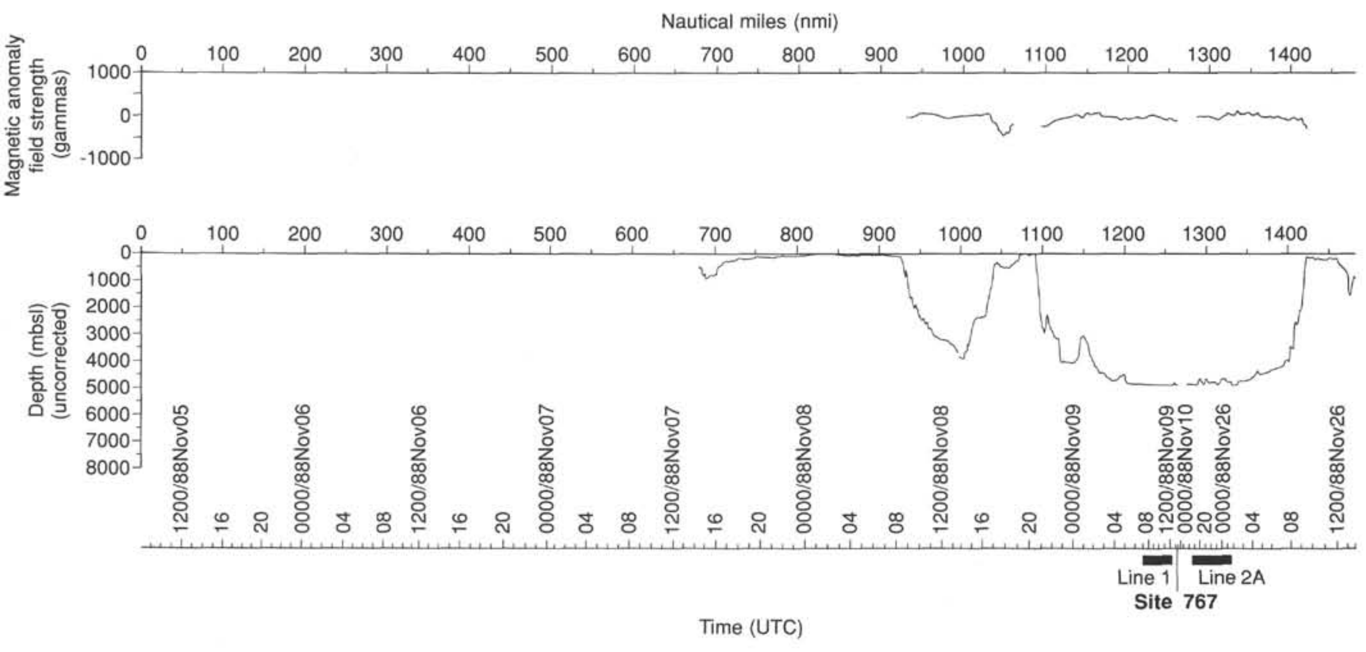

Figure 2. Magnetic anomaly and bathymetric profiles obtained during Leg 124. Solid bars indicate areas of seismic reflection coverage.

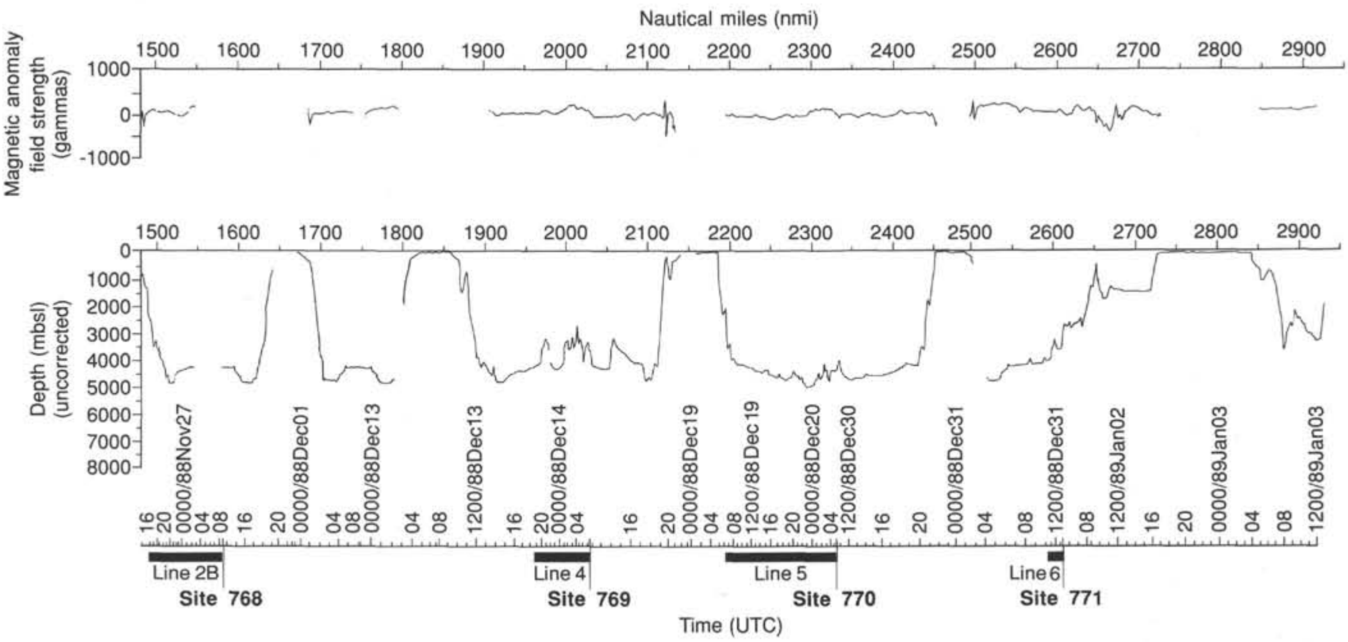

Figure 2 (continued).

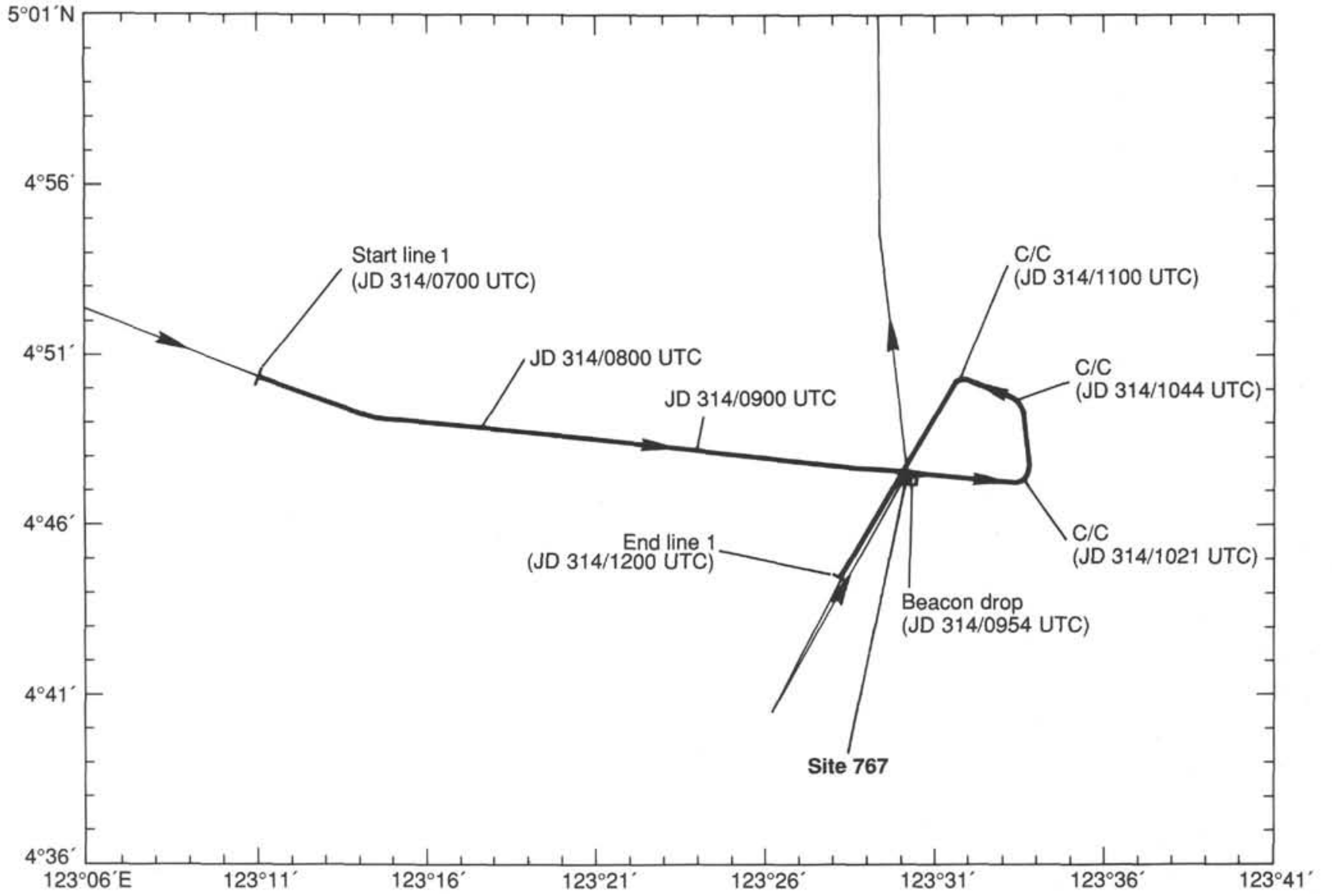

Figure 3. Navigation in the vicinity of Site 767. The heavy segment of the trackline indicates the location of analog seismic reflection line 1 (shown in Fig. 4) collected while on approach to the site. Three-digit numbers prefixed by JD are Julian Day (day of calendar year).

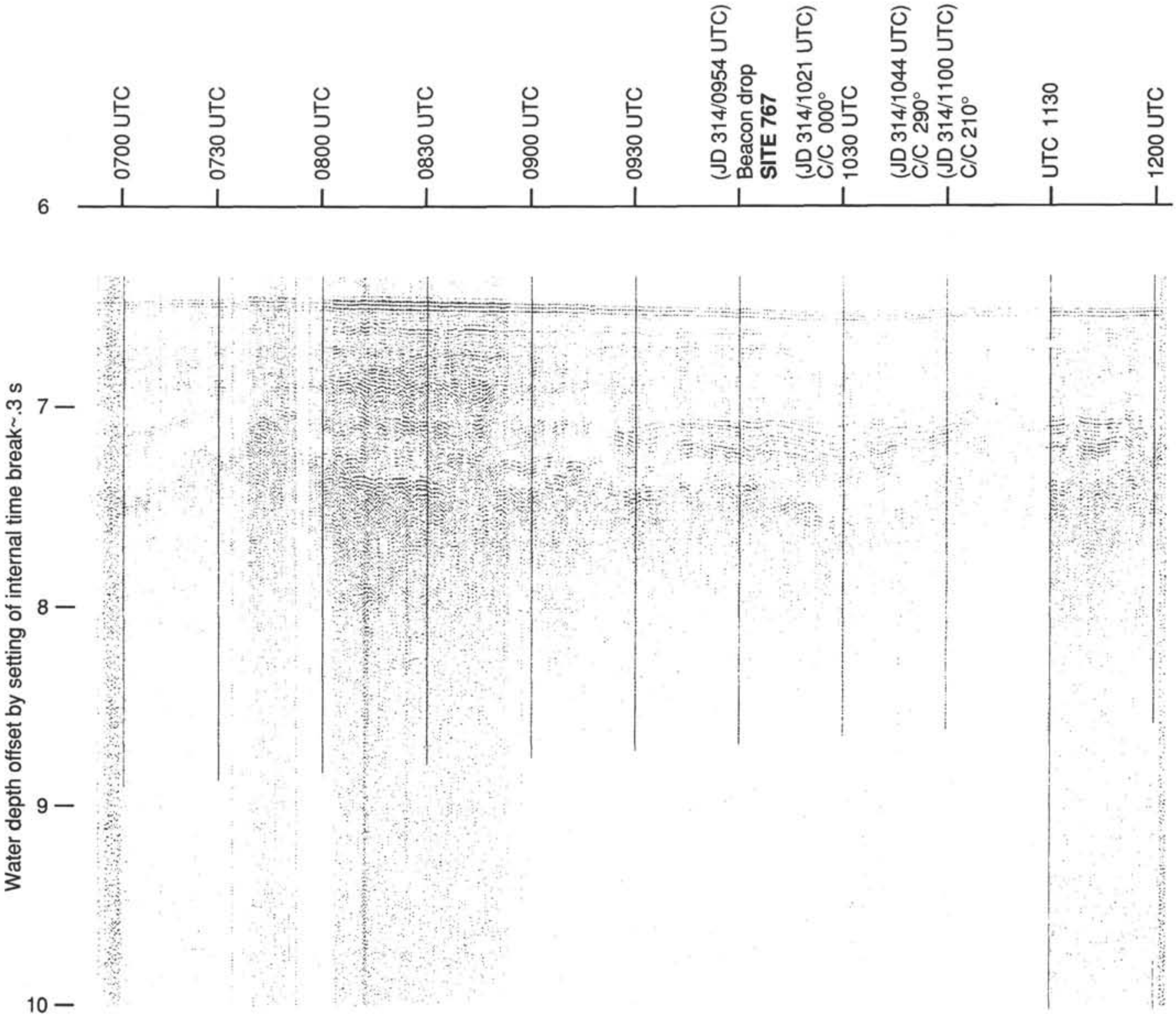

Figure 4. Analog seismic reflection profile (Line 1) (5 s sweep) in the vicinity of Site 767 in the Celebes Sea. Location of this profile is shown in Figure 3.

Site 768 in the central part of the Sulu Sea and commenced drilling activities at 0830 UTC November 27.

The *JOIDES Resolution* departed Site 768 at the termination of drilling activities on December 12, 1988, and got underway for Zamboanga City for a medical evacuation prior to occupying Site 769, located on the southern flank of Cagayan Ridge in the Sulu Sea (Fig. 9). After a brief interlude in the roadstead of Zamboanga City on December 13, the ship steamed northwestward toward Site 769. After a relatively extensive site survey of Site 769 (Figs. 9 and 10), the beacon was dropped and stationkeeping activities began at 0725 UTC December 14, 1988.

We departed Site 769 at 1135 UTC December 18, 1988, on a south-southeasterly course toward Zamboanga City and Site 770 in the northeastern part of the Celebes Sea. The ship transited the Sulu Ridge, with a brief stop in the roadstead of Zamboanga City once again, and then headed southeast into the Celebes Sea, completing an extended seismic line from the Sulu Ridge to Site 770 (Figs. 11 and 12). The beacon for Site 770 was dropped at 0435 UTC December 20, and drilling operations commenced.

Following completion of drilling activities at Site 770 in the Celebes Sea on December 30, 1988, the *JOIDES Resolution* got underway for Site 771 in the Sulu Sea at 0955 UTC. The ship proceeded northwestward to cross the Sulu Ridge west of the Zamboanga Peninsula and arrived at Site 771 on the Cagayan Ridge on December 31, 1988. After a brief site survey (Figs. 13 and 14), the beacon was dropped at 1332 UTC December 31.

BATHYMETRY

Equipment and Methods

Bathymetric data were acquired using both 3.5- and 12-kHz systems. A total of 2119 nmi of bathymetric data were collected during Leg 124, and a generalized bathymetric profile, along

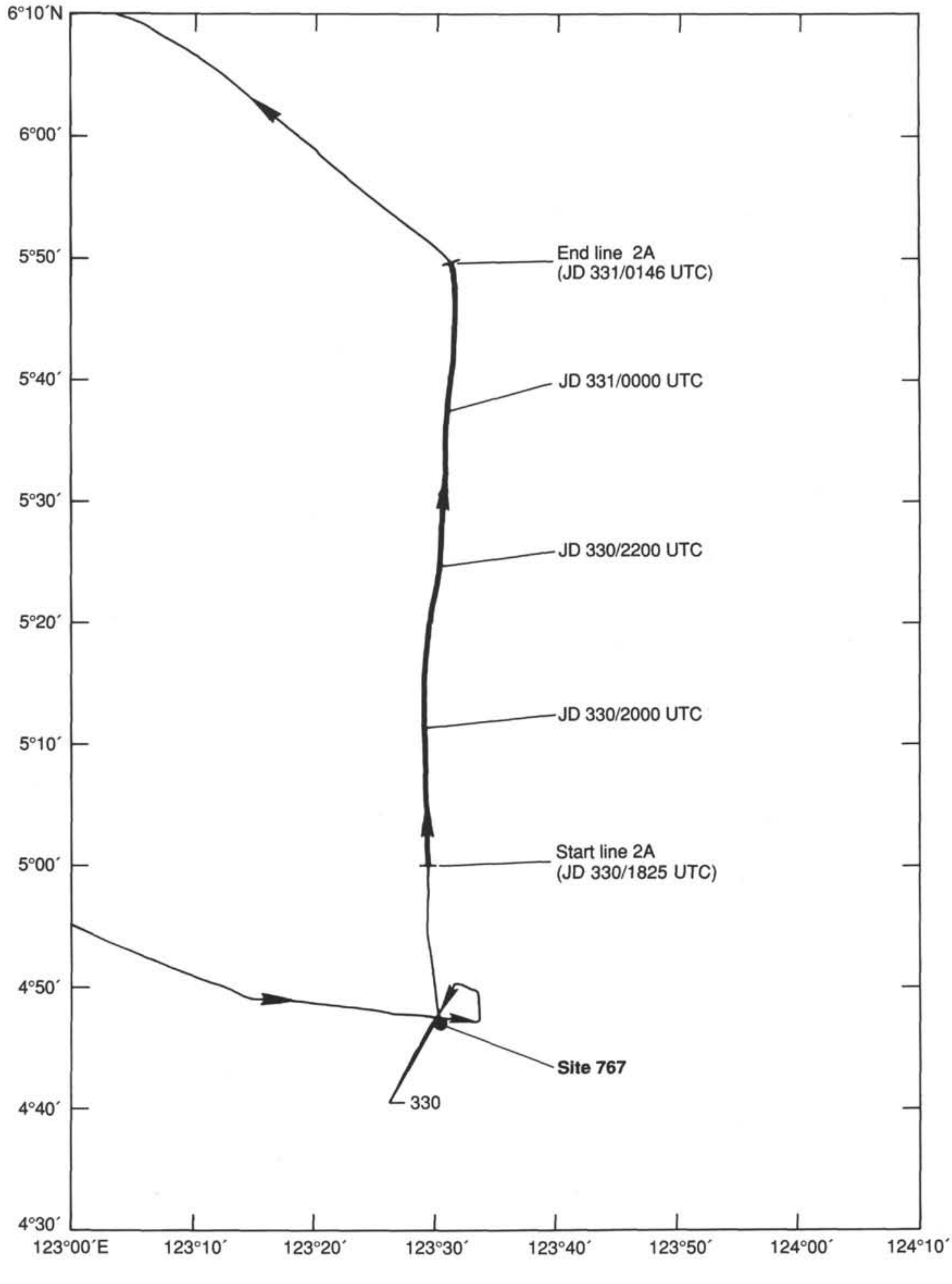

Figure 5. Navigation in the vicinity of Site 767. The heavy segment of the trackline indicates the location of digital seismic reflection line 2A (shown in Fig. 6) collected immediately after departing Site 767. Three-digit numbers prefixed by JD are Julian days.

with the magnetic anomaly profile, is presented in Figure 2. Data for both 3.5- and 12-kHz systems were displayed using Raytheon Model 1807M LSR (Line Scan Recorder) recorders operated at a 1-s sweep rate. The 3.5-kHz system utilized a Raytheon PTR105B transceiver and 12 Raytheon transducers, while the 12-kHz system used a Raytheon PTR105B transceiver driving an EDO 323B transducer. Both systems normally operate with CESP-III correlators. Transducers for both systems were mounted in a recently installed sonar dome for improved noise conditions at high ship speeds and in rough weather conditions. Data quality for both the 3.5- and 12-kHz systems was very good during the transit from Singapore to Site 767, even though the high ship speeds during much of the transit were not ideal for echo sounder data acquisition. Water depth determinations

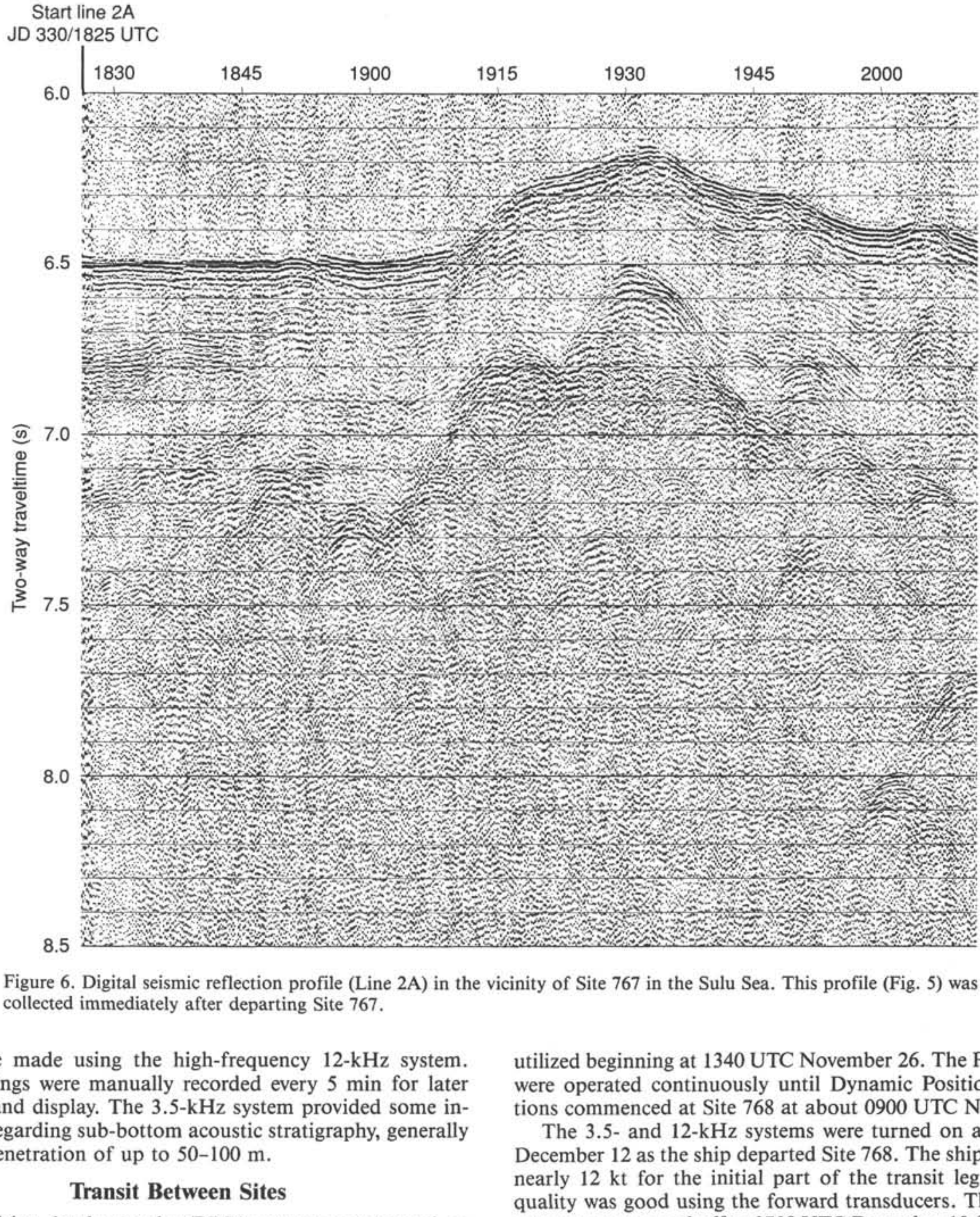

Figure 6. Digital seismic reflection profile (Line 2A) in the vicinity of Site 767 in the Sulu Sea. This profile (Fig. 5) was collected immediately after departing Site 767.

on-site were made using the high-frequency 12-kHz system. Depth readings were manually recorded every 5 min for later processing and display. The 3.5-kHz system provided some information regarding sub-bottom acoustic stratigraphy, generally providing penetration of up to 50–100 m.

Transit Between Sites

The precision depth recorder (PDR) systems were turned on and data acquisition began at 1430 UTC November 7, JD (Julian Day, day of calendar year) 312, off the northwest coast of Sabah. Seas were relatively calm for the entire transit so good records were obtained, even at ship speeds of 12–14 kt. Both the 3.5- and 12-kHz PDR systems were operated continuously during the transit to Site 767. The site was occupied at 1230 UTC November 9.

Following the completion of drilling activities at Site 767, the 3.5-kHz system was turned on at 1705 UTC November 25, at the commencement of the transit to Site 768. The 12-kHz system was not initially available. After intermittent problems of various kinds, it was operational again at 2330 UTC November 25, using the aft hull-mounted transducer. Record quality was poor with this transducer. The forward 12-kHz transducer was utilized beginning at 1340 UTC November 26. The PDR systems were operated continuously until Dynamic Positioning operations commenced at Site 768 at about 0900 UTC November 27.

The 3.5- and 12-kHz systems were turned on at 2305 UTC December 12 as the ship departed Site 768. The ship's speed was nearly 12 kt for the initial part of the transit leg, but record quality was good using the forward transducers. The two PDR systems were turned off at 0708 UTC December 13 for the medical evacuation at Zamboanga City, but were turned back on at 0813 UTC when the ship got underway for Site 769. The 3.5- and 12-kHz systems were turned off at 0725 UTC, December 14 following the site survey for Site 769. Both systems were turned on at 1135 UTC December 18, upon the departure from Site 769. Both systems were continuously operated during the Sulu Sea crossing to Zamboanga City and were turned off at 2142 UTC December 18 during the approach to the port. The 12-kHz PDR system was turned on at 0230 UTC December 19, upon departing Zamboanga City, using the aft transducer. Use of the forward transducers interfered with the bridge echo sounder in shallow water. The 3.5-kHz system was turned on at 0415 UTC. The 3.5- and 12-kHz systems were turned off at 0510 UTC December 20, for Site 770.

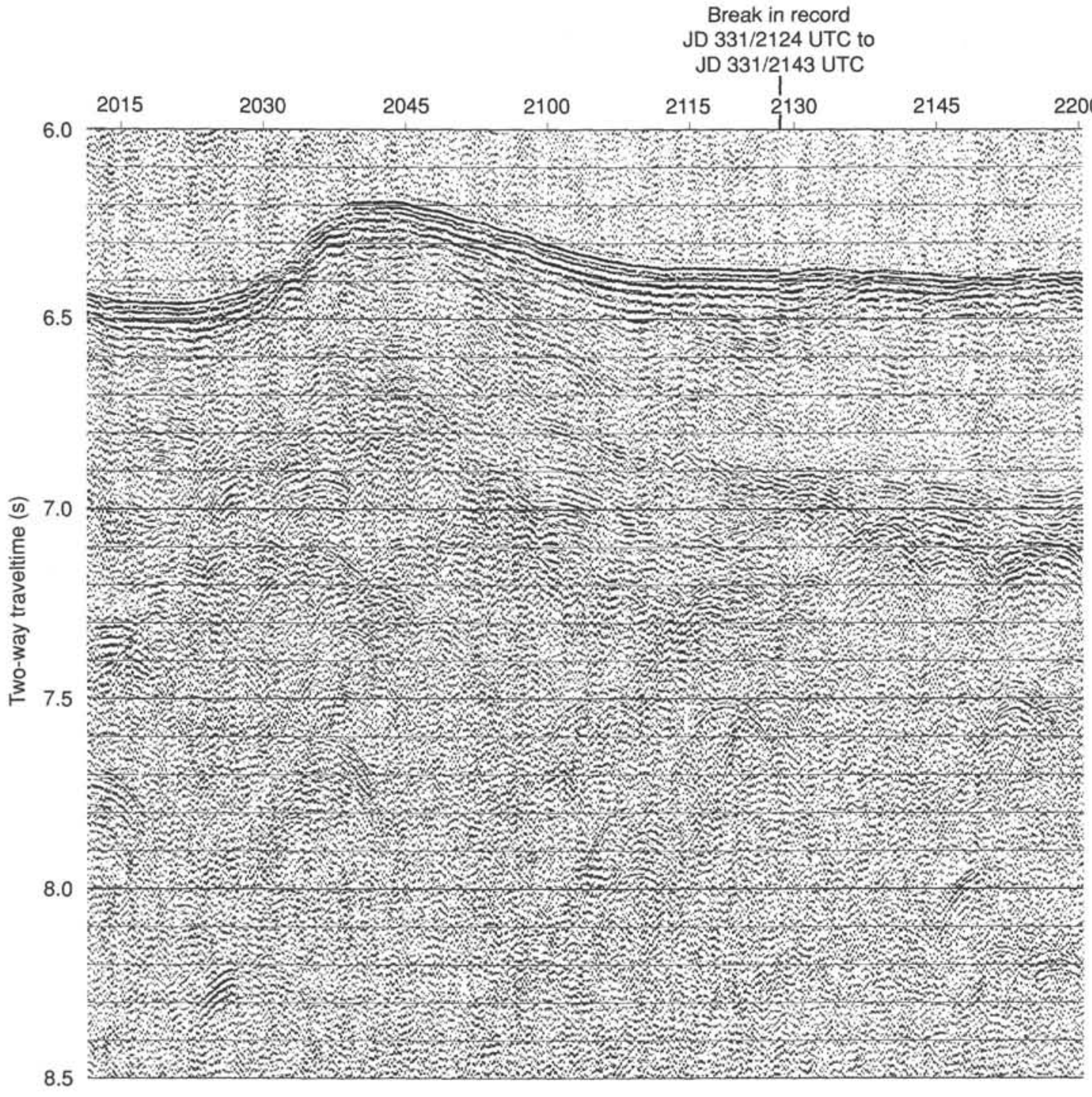

Figure 6 (continued).

The 3.5- and 12-kHz systems were turned on at 0955 UTC December 30, 1988, as the ship departed Site 770. The 12-kHz signal was weak when the aft transducers were used at high ship speed (13 kt), so the forward transducer was used intermittently during this transit leg. The results from the forward transducer were generally poor at high speeds as well. The 3.5- and 12-kHz systems were secured at 1355 UTC December 31, 1988, for station-keeping at Site 771.

MAGNETICS

Equipment and Methods

Total magnetic field intensity measurements were collected along the ship's track by a Geometrics 801 proton-precession magnetometer. The sensor was towed approximately 400 m behind the ship. Measurements were made at 3-s intervals with a sensitivity of about 1 nT. Values were digitally recorded in the header of the seismic reflection data on the Masscomp computer every 99 s during non-seismic transit periods and once per shot while acquiring seismic reflection data. The magnetics data were also graphically displayed in analog form on a strip-chart recorder in real time, with manual log entries of magnetic field intensity made every 5 min. Magnetics data over 1399 nmi were collected during Leg 124. The magnetics data were later processed by GDC to remove the regional field (1985 IGRF); results are shown in Figure 2.

Transits Between Sites

The magnetometer was deployed on November 8 at 0815 UTC, with data acquisition beginning at 0820 UTC. The ship's position at the time was approximately 6°44.9′N, 118°38.3′E, along the western side of the Sulu Sea (Fig. 1). After tuning, the magnetometer signal strength was strong, and high-quality data were recorded across the western flank of the Sulu Sea until 1811 UTC November 8, when the shallow water depths anticipated across the Sulu Ridge necessitated retrieval of the magnetometer. After transiting the Sulu Ridge and entering the Celebes Sea, the magnetometer was again deployed at 2036 UTC November 8. Magnetics data were continuously acquired across the Celebes Sea to Site 767, where, after a brief survey, the magnetometer was retrieved at 1155 UTC November 9.

The magnetometer was deployed at 1635 UTC November 25 for the transit to Site 768. The magnetometer was retrieved at 0905, November 26 for the shallow-water crossing of the Sulu

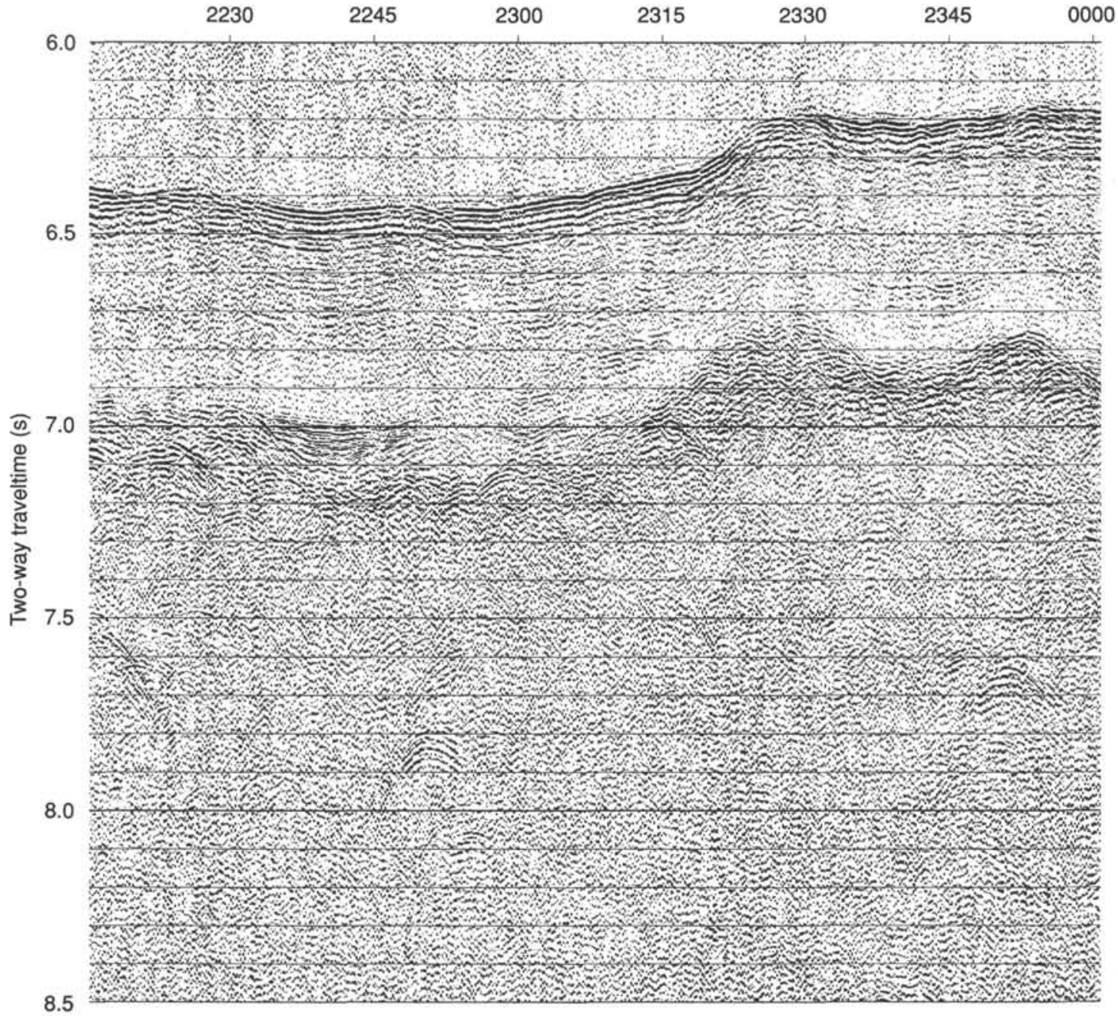

Figure 6 (continued).

Ridge south of the Zamboanga Peninsula and redeployed at 1310 UTC November 26, in the Sulu Sea. The magnetometer was secured at 0314 UTC November 27 at Site 768.

The magnetometer was deployed at 2330 UTC December 12 as the *JOIDES Resolution* departed Site 768. The magnetometer was retrieved at 0240 UTC December 13 as the ship approached the shallow water of the Sulu Ridge. The magnetometer was deployed again at 1320 UTC December 13 as the ship transited the Sulu Sea toward Site 769. The magnetometer was turned off and retrieved at 0654 UTC December 14 following the survey at Site 769.

Following the ship's departure from Site 769, the magnetometer was deployed at 1157 UTC December 18. The magnetometer was recovered at 2050 UTC December 18 during the approach to the shallow Sulu Ridge and Zamboanga City. The magnetometer was redeployed at 0425 UTC December 19. Signal strength was poor and noisy from approximately 2300 UTC December 19 until about 0130 UTC December 20. The magnetometer was retrieved at 0425 UTC December 20 prior to the ship occupying Site 770.

The magnetometer was again deployed at 1010 UTC December 30 for the transit between Sites 770 and 771. Good signal strength typified magnetics data until 2134 UTC, when the magnetometer was pulled in for the shallow-water transit across the Sulu Ridge. The magnetometer was redeployed at 0130 UTC December 31 in the Sulu Sea. The magnetometer was retrieved at 1305 UTC immediately prior to occupation of Site 771.

SEISMIC REFLECTION PROFILING

Equipment and Methods

Single-channel seismic reflection data were collected along approximately 390 nmi during Leg 124. Portions of the ship's track along which seismic reflection data were collected are shown as heavy lines in Figures 3, 5, 7A, 7B, 7C, 9, 11A, 11B and 13. These data were acquired as follows:

Seismic Source

The seismic sources used for underway reflection profiling during Leg 124 consisted of two Seismic Systems, Inc. (SSC) 80-in^3 water guns fired at approximately 2000 psi. The guns were towed approximately 14 m apart, roughly 25 m behind the ship in special towing frames engineered by ODP. The guns were towed at depths ranging between about 6 m and 13 m, depending on ship speed. Repetition rates between shots was typically 14 s.

Hydrophone Streamer

One 100-m Teledyne Model 178 hydrophone streamer was towed from the fantail during Leg 124. The streamer was towed

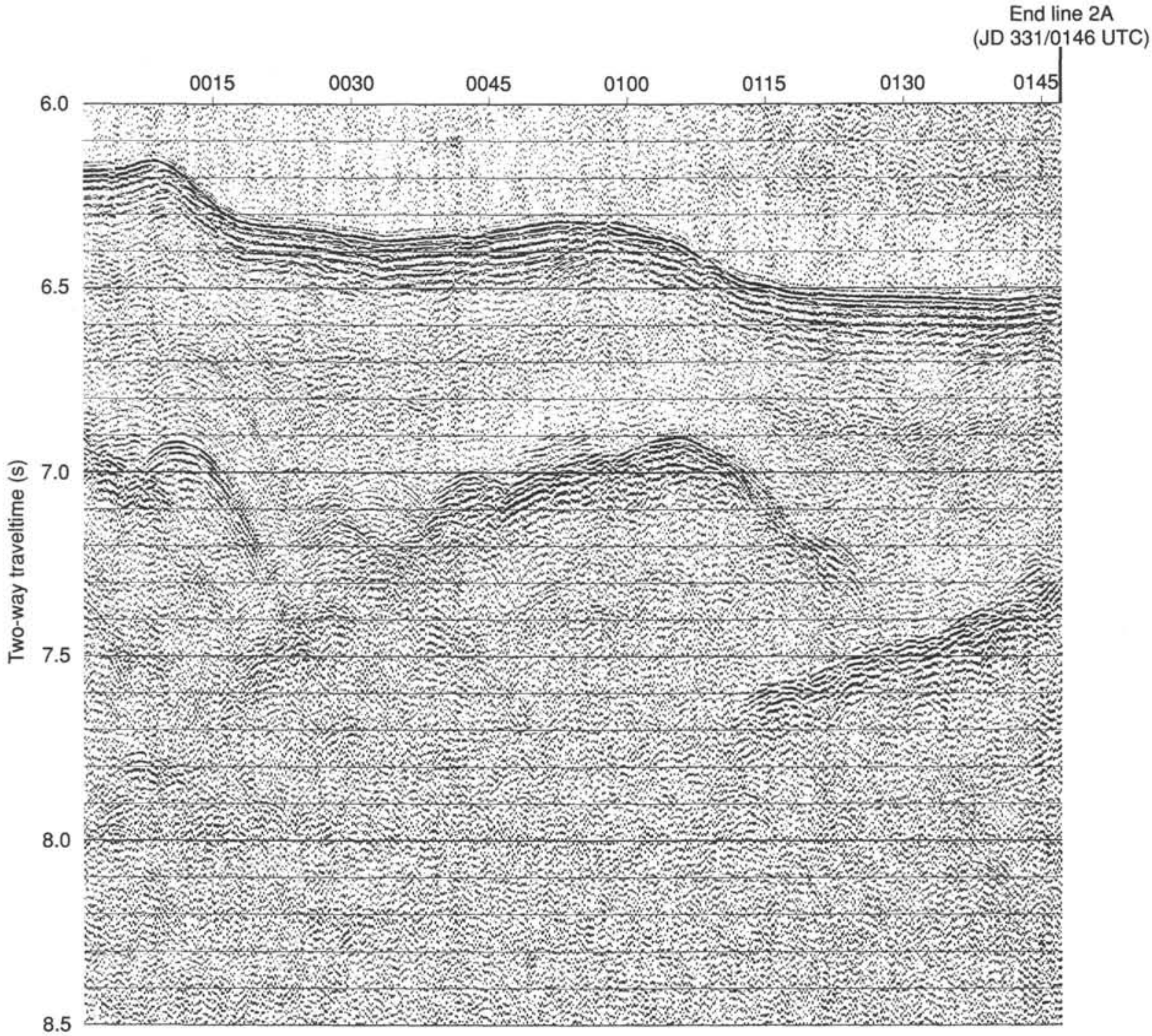

Figure 6 (continued).

approximately 500 m behind the vessel at a depth of between 15 and 20 m. The output signals of the 60 active hydrophone elements of the streamer were summed to produce a single seismic signal.

Seismic Data Recording

Real-time analog seismic reflection data were displayed on two Raytheon Model 1807M LSR recorders (Table 1). The seismic signal from the hydrophone streamer was amplified and band-pass filtered at 40–150 Hz prior to display. The seismic reflection data were also simultaneously recorded in digital format by a Masscomp 561-based acquisition system using the HIGHRES software package. Data were filtered (40–150 Hz) and displayed in real time on a 15-in. Printronix high-resolution graphics printer capable of 160 dots per inch (DPI) resolution. Filtered seismic data were recorded on Cipher tape drives in SEG-Y format at 1600 bytes/inch (BPI) density. These digitally-recorded seismic data were reprocessed and displayed by ODP personnel following Leg 124. Reprocessing parameters are shown in Table 2.

Transits Between Sites

The ship was slowed for initial deployment of the seismic streamer and water guns at 0630 UTC November 9, on the transit to Site 767. The system was deployed in deep water of the Celebes Sea following the crossing of the shallow Sulu Ridge. The port seismic streamer was initially deployed, but it produced a noisy seismic signal, so it was retrieved and replaced by the starboard streamer. Following seismic gear deployment, the ship proceeded in an easterly direction at a speed of approximately 7 kt toward Site 767. The site was crossed at approximately 0953 UTC November 9. A beacon was dropped at 0954 UTC, and we continued the seismic survey of Site 767 until 1200 UTC (Figs. 3 and 4). The seismic reflection gear was retrieved at approximately 1200 UTC November 9, prior to coming on station at Site 767.

The water guns and streamer were deployed at 1635 UTC November 25 at the beginning of the transit from Site 767 to Site 768 (Figs. 5 and 6). Some start-up problems were experienced with the tape drives used for seismic recording. The digital seismic acquisition system failed at Shot 1303, 2124 UTC, but was back online for Shot 1399 at 2143 UTC. The system was retrieved at 0146 UTC November 25 for the shallow-water transit across the Sulu Ridge. The seismic gear was redeployed at 1335 UTC November 26 in the Sulu Sea. Seismic reflection data were collected at a ship speed of about 5 kt during the approach to Site 768 (Figs. 7 and 8). After a site survey located the structural and stratigraphic position of Site 768 on reflection profiles,

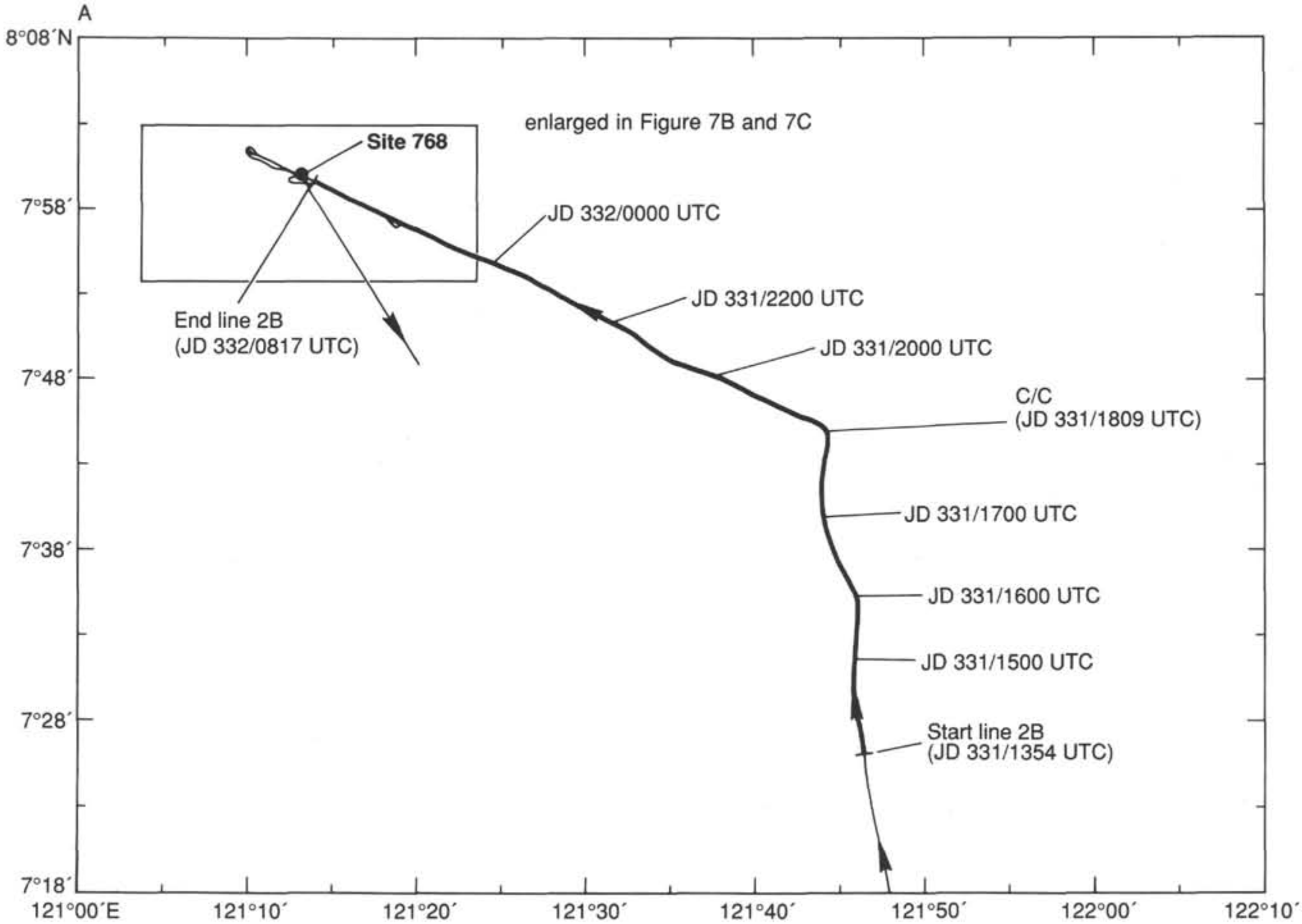

Figure 7. **A.** Navigation in the vicinity of Site 768. The heavy segment of the trackline indicates the location of digital seismic reflection line **2B** (shown in Fig. 8) collected while on approach to Site 768. **B.** Enlarged navigation plot of a portion of the trackline in the vicinity of Site 768. Due to the repeated number of sweeps over Site 768, this trackline is divided into two segments for clarity. The remaining portion of trackline on the approach to this site is seen in C. The heavy segment of the trackline indicates the location of digital seismic reflection line **2B** (shown in Fig. 8) collected while on approach to Site 768. **C.** Enlarged navigation plot of the final approach to Site 768. The heavy segment of the trackline indicates the location of digital seismic reflection line **2B** (shown in Fig. 8), collected while on approach to Site 768. Three-digit numbers prefixed by JD are Julian Days.

a total of three beacons were dropped. Following deployment of the third beacon, the seismic reflection gear was retrieved at 0830 UTC November 27, and drilling operations commenced at Site 768.

The single-channel seismic reflection system was deployed at 1843 UTC December 13 to begin the site survey for Site 769. Ship's speed at the beginning of the survey was approximately 8.5 kt under good weather conditions. Record quality was good. The high-pressure air supply hose to the starboard water gun failed at 1850 UTC, but the gun was repaired and operational at 2000 UTC. The seismic reflection gear was recovered at 0710 UTC December 14, following beacon drop for Site 769. Figure 9 displays the trackline in the vicinity of Site 769 and Figure 10 shows a seismic reflection profile across the site.

The seismic reflection gear was deployed at 0425 UTC December 19, for a site survey of Site 770. The starboard water gun developed an air leak at 0445 UTC and was repaired and operational by 0528 UTC. The port air gun hose failed at 0530 UTC and was repaired and redeployed at 0657 UTC. The port water gun blast phone signal became weak at 2030 UTC December 19, and was repaired by 2110 UTC. The seismic gear was recovered at 0505 UTC December 20 at Site 770 following the acquisition of a high-quality reflection profile across the southern flank of the Sulu Ridge and the northern portion of the Celebes Sea. Figure 11 displays the ship trackline covering the area of seismic reflection profiling in the vicinity of Site 770. Figure 12 shows seismic reflection profile line 5.

Most of the transit between Site 770 and Site 771 was run at high speed, which precluded acquisition of seismic reflection data. Upon approach to the site, however, the ship was slowed to about 6 kt and reflection profiling began at 1005 UTC, December 31, 1988 (Fig. 13). High-quality data were acquired across Site 771 (Fig. 14). The seismic gear was retrieved for the final time on Leg 124 at 1355 UTC, December 31, 1988, prior to the commencement of drilling activities at Site 771.

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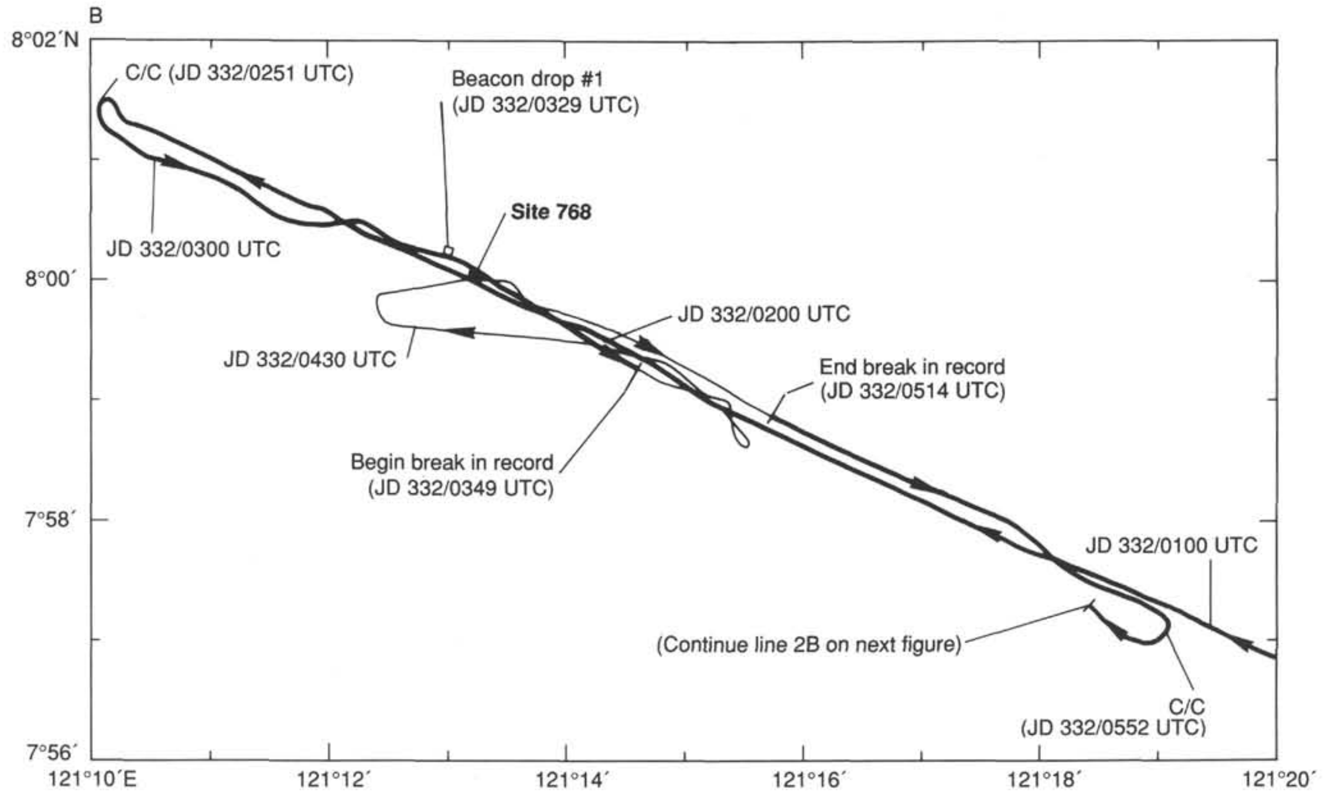

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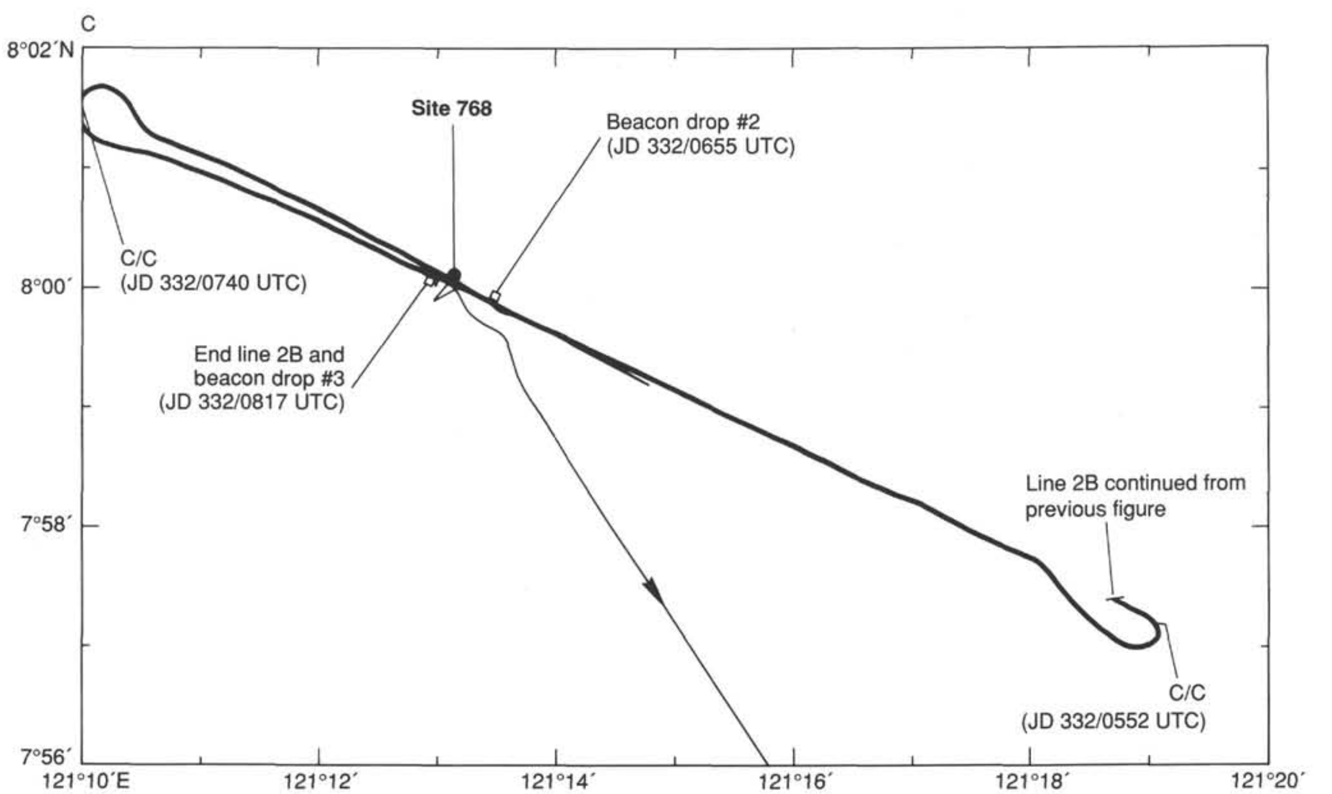

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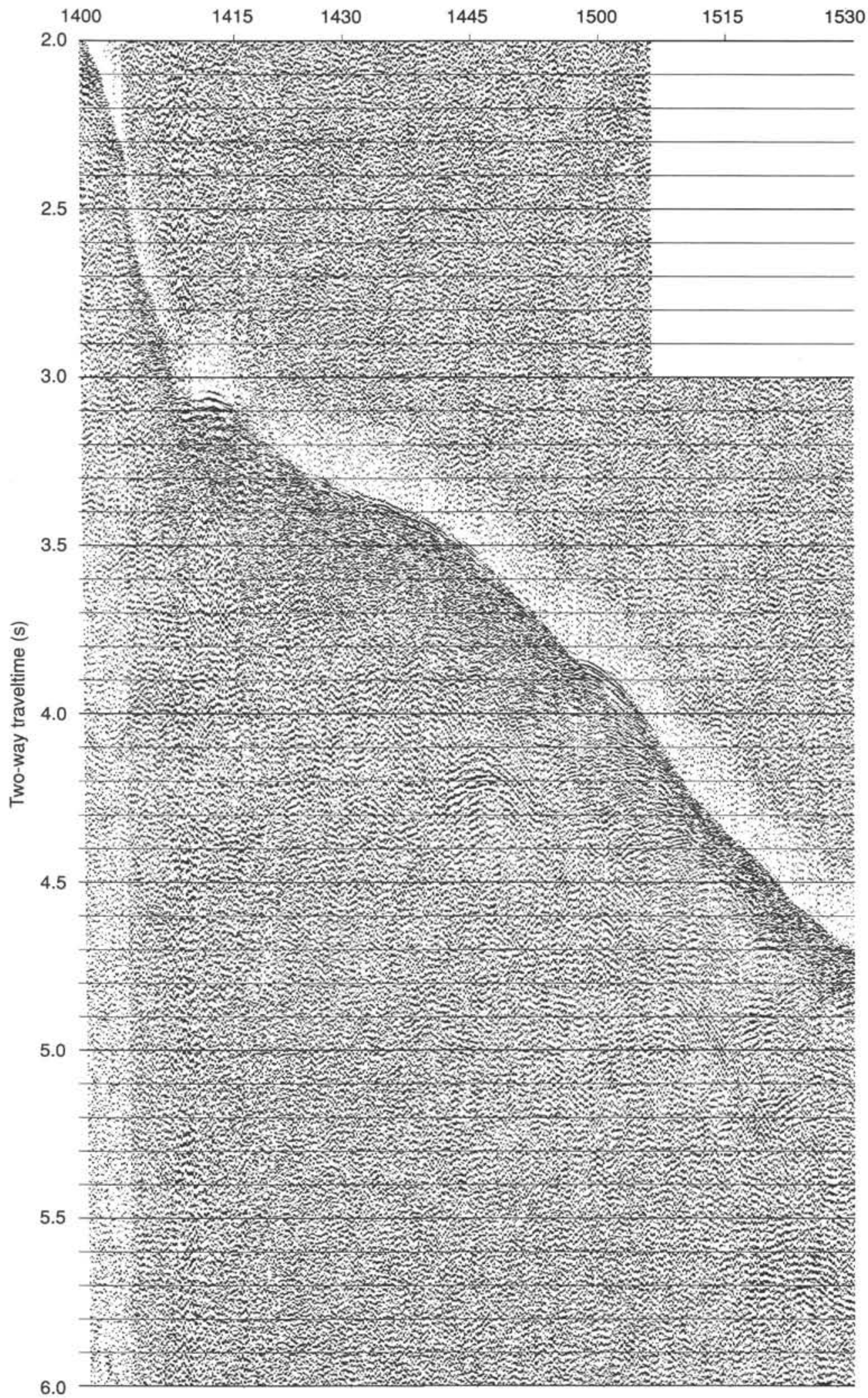
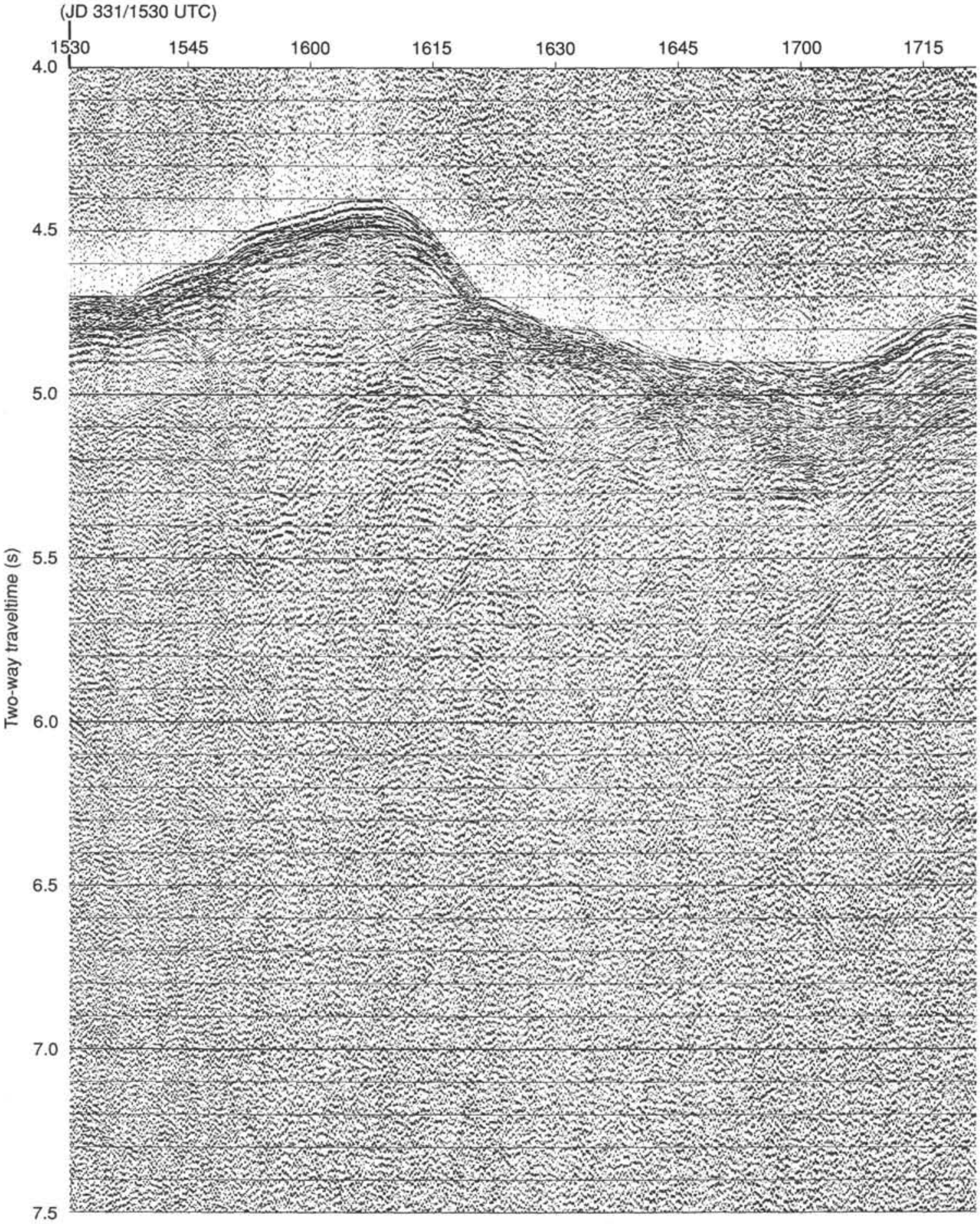


Figure 8. Digital seismic reflection profile (Line 2B) in the vicinity of Site 768 in the Sulu Sea. This profile is shown in Figures 7A, 7B, and 7C.



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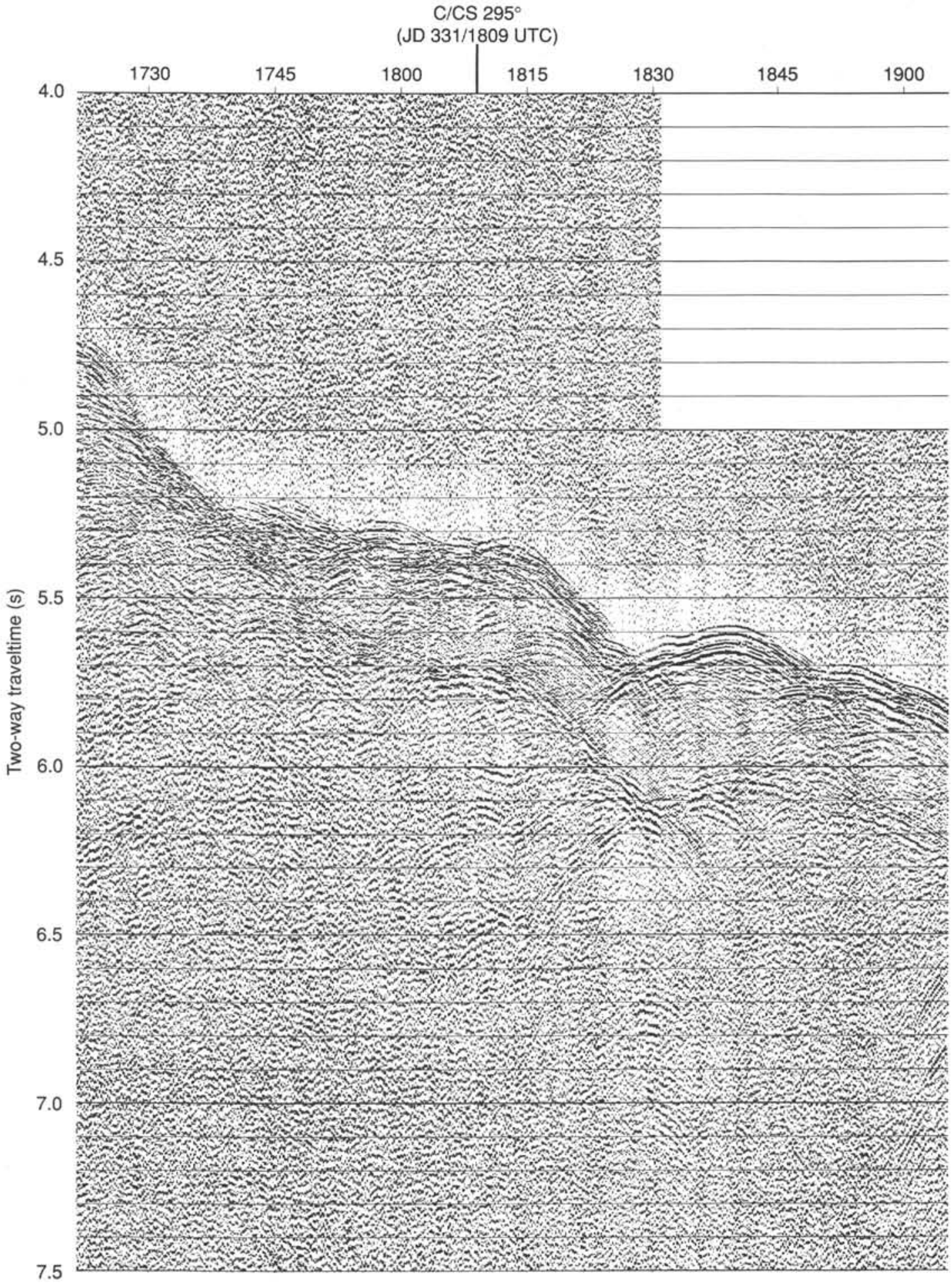

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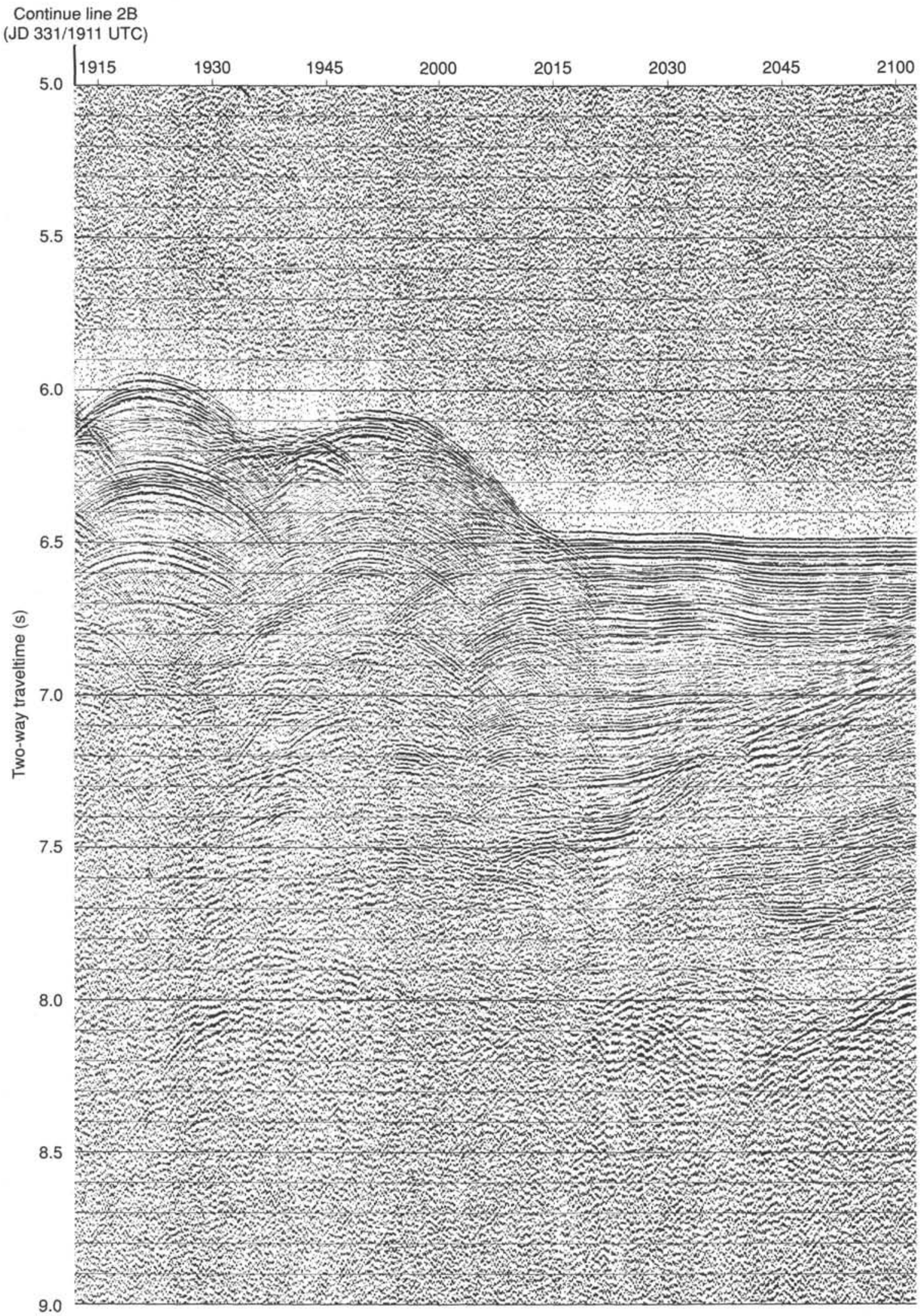

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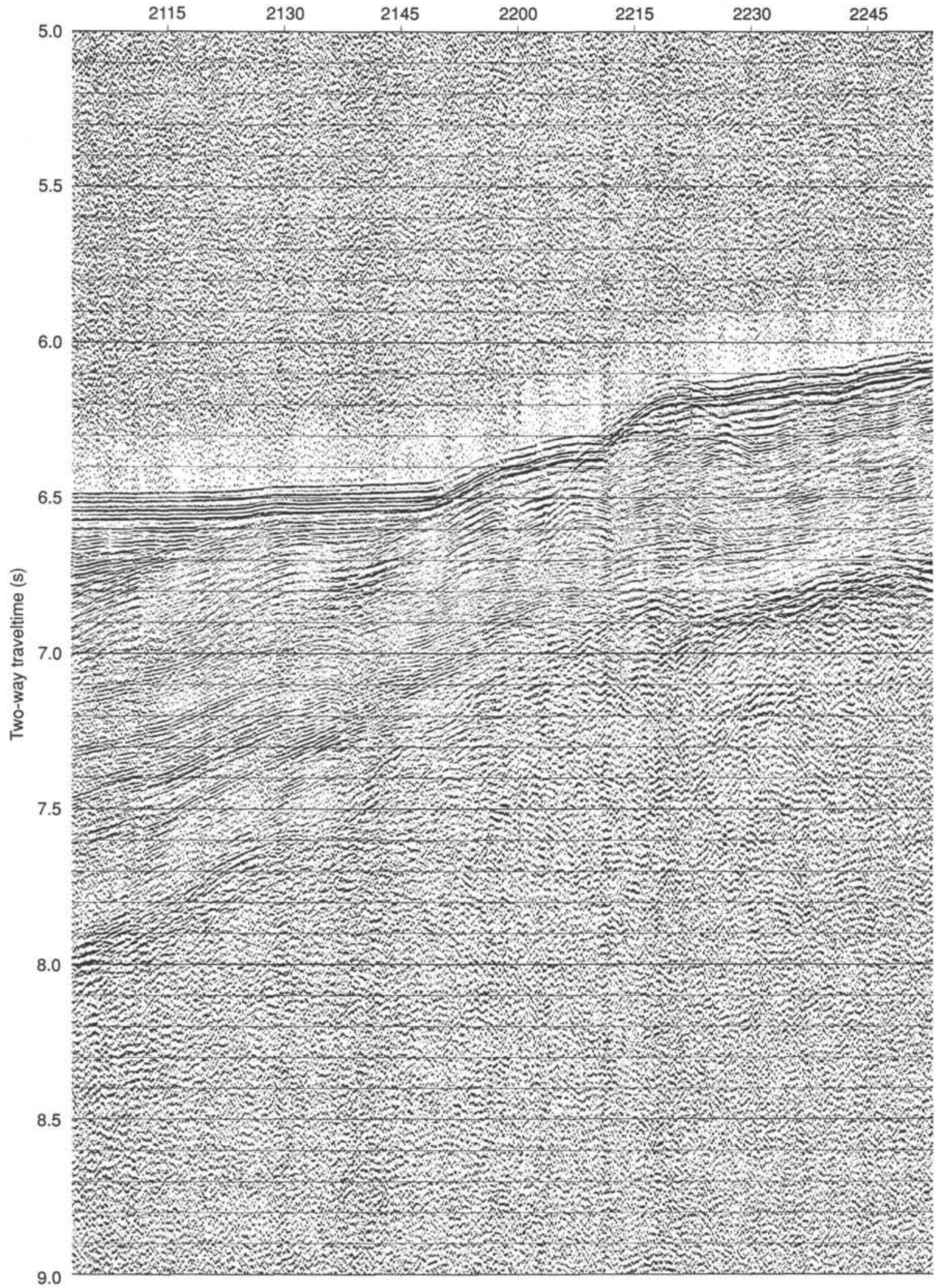

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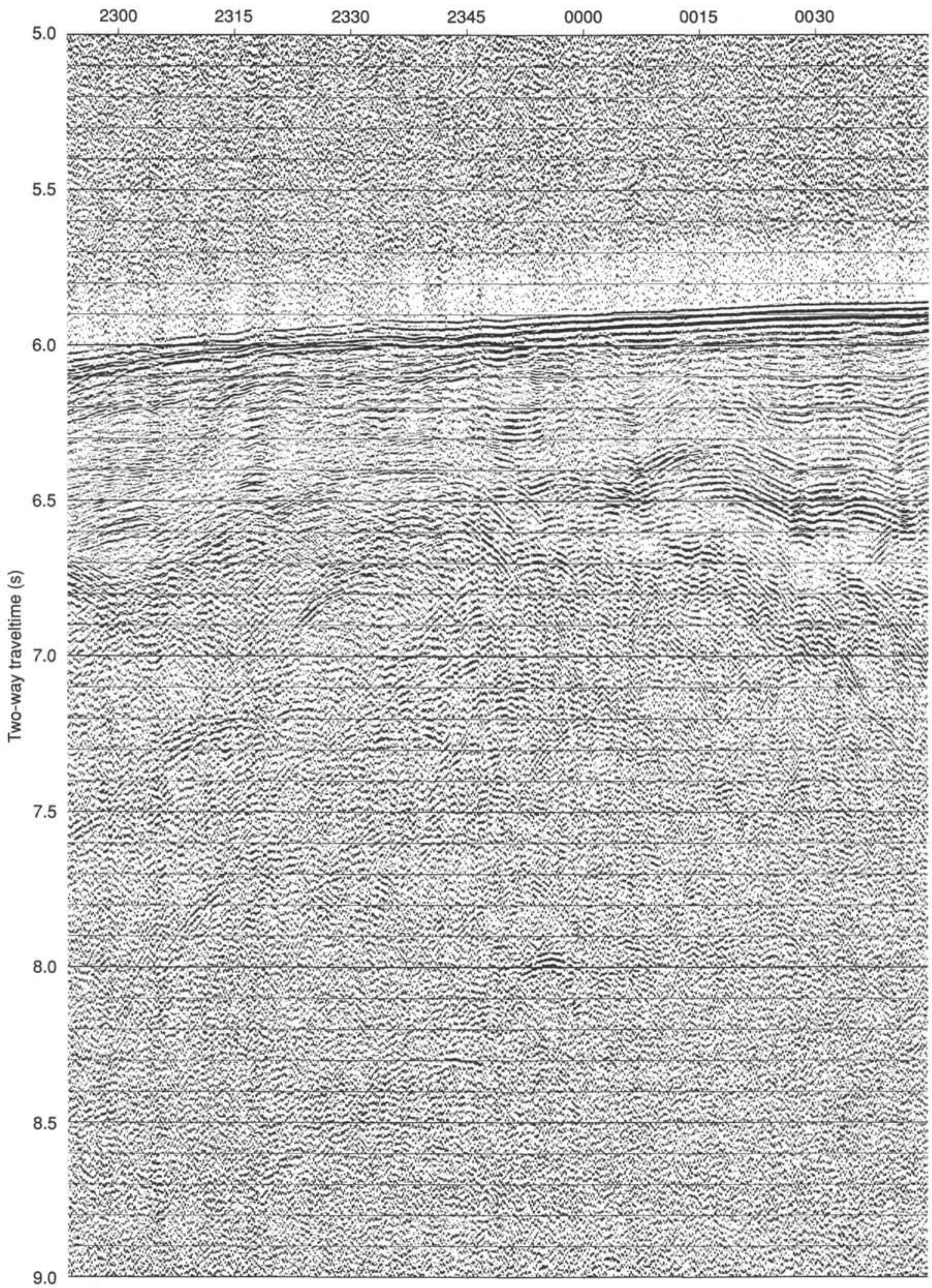

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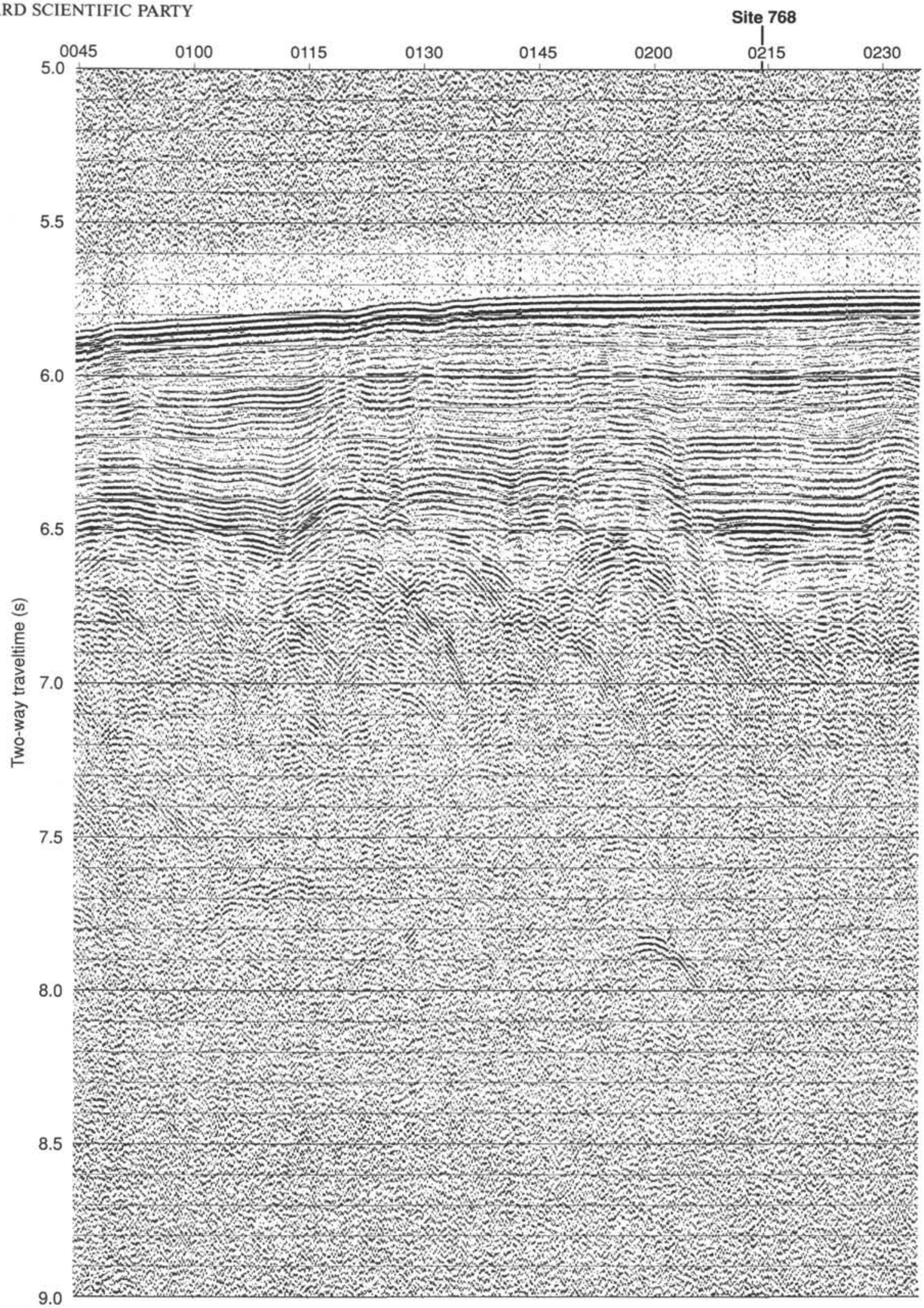

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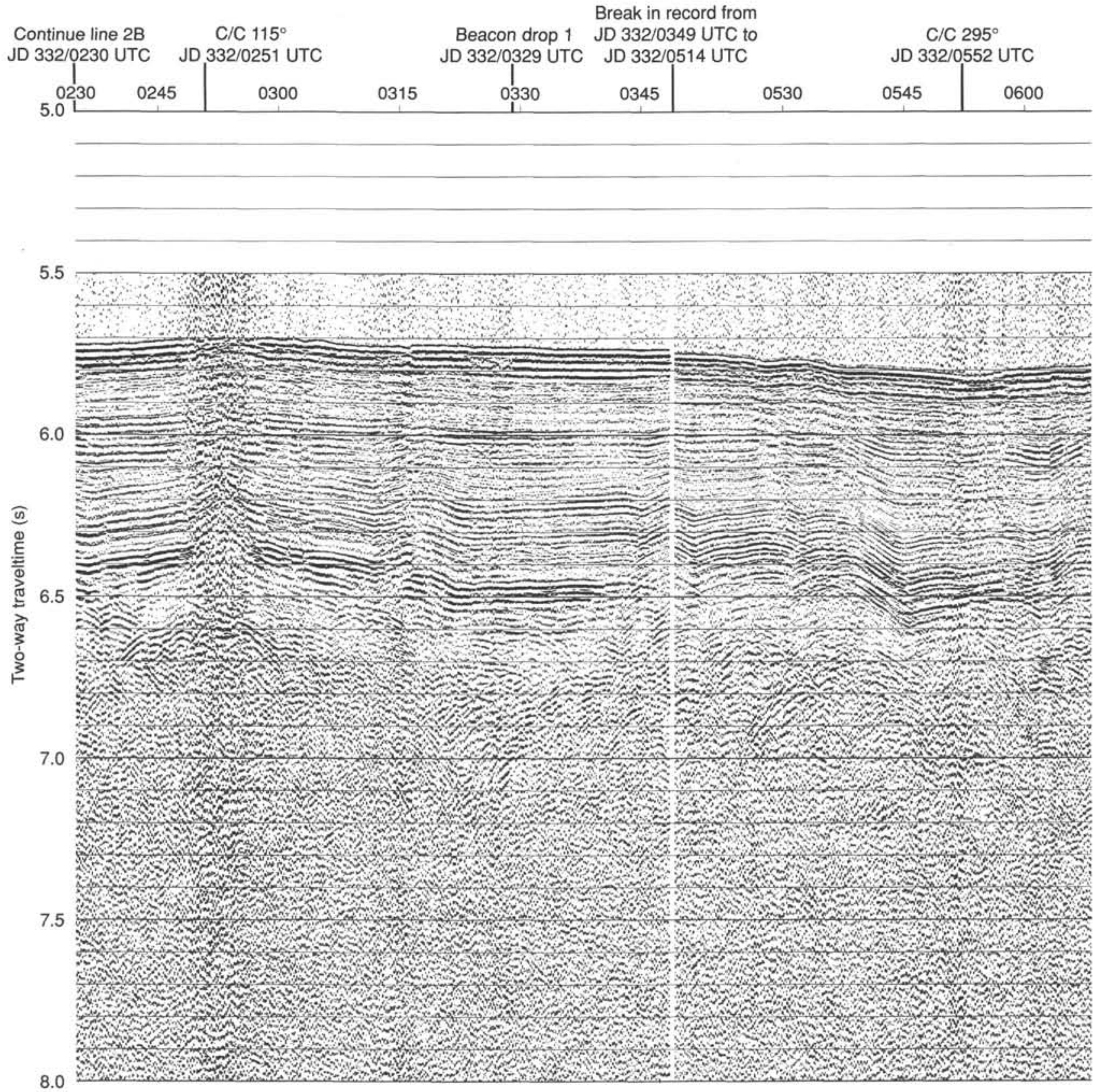

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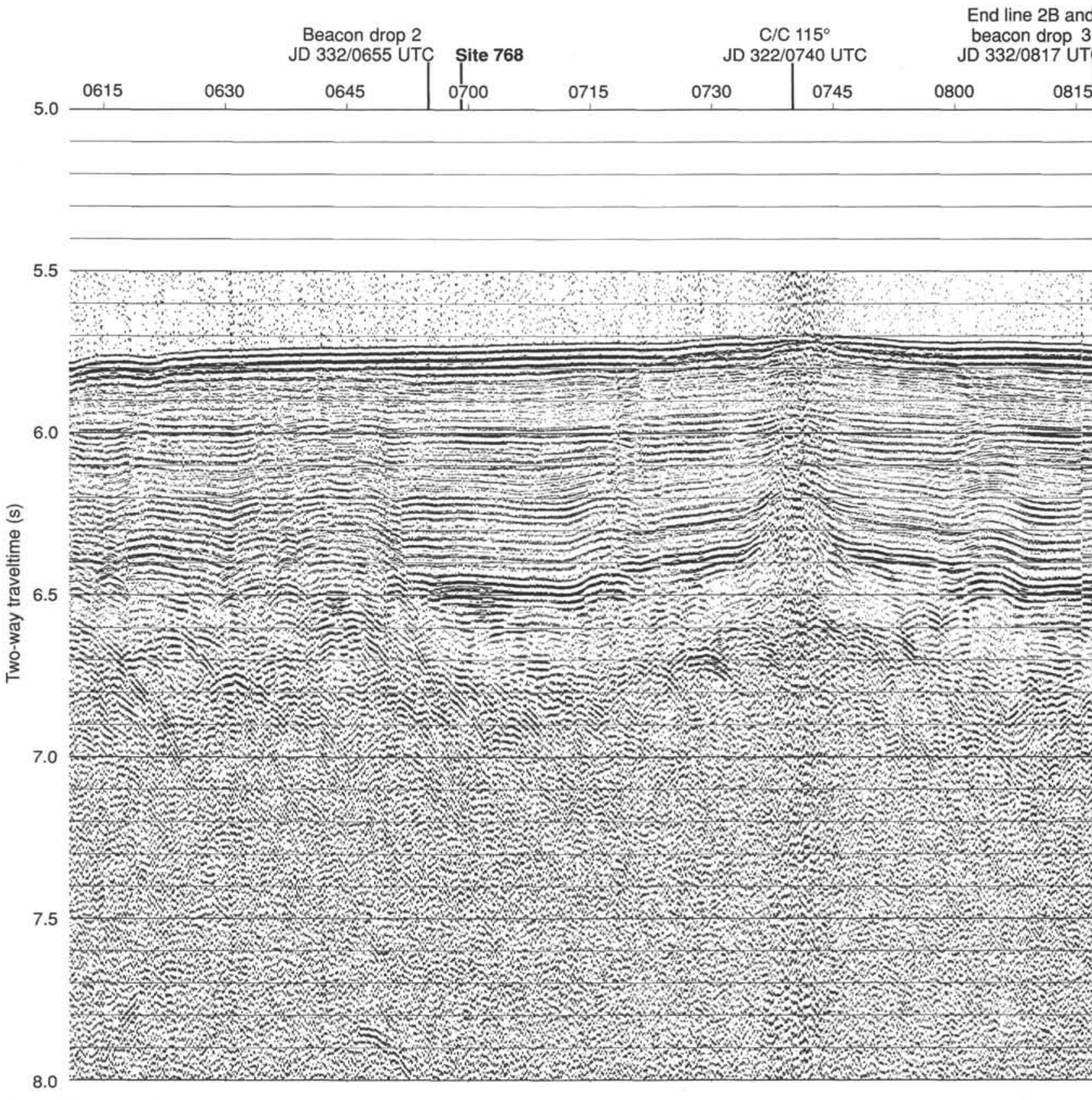

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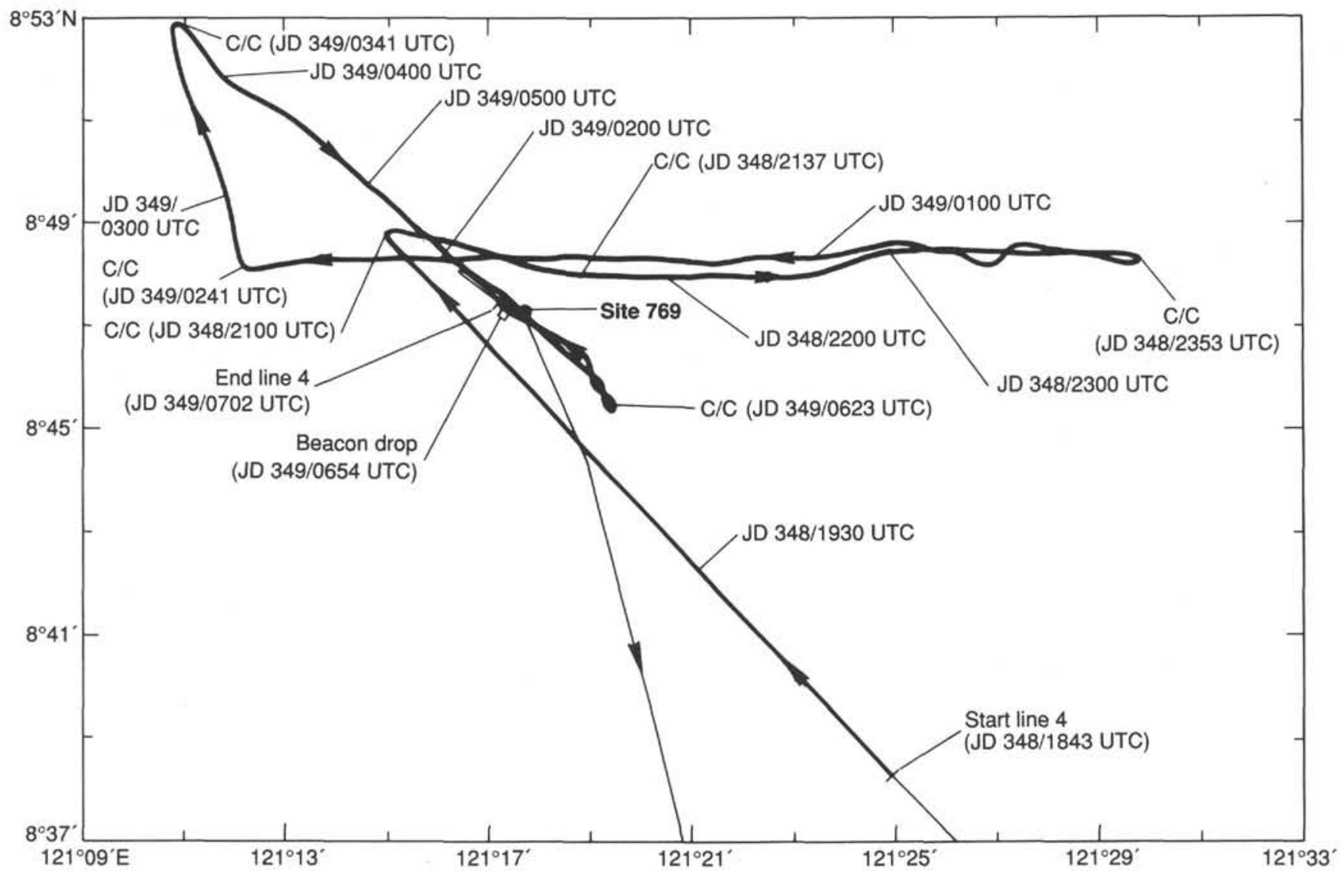

Figure 9. Navigation in the vicinity of Site 769. The heavy segment of the trackline indicates the location of digital seismic reflection line 4 (shown in Fig. 10) collected while on approach to Site 769. Three-digit numbers prefixed by JD are Julian Days.

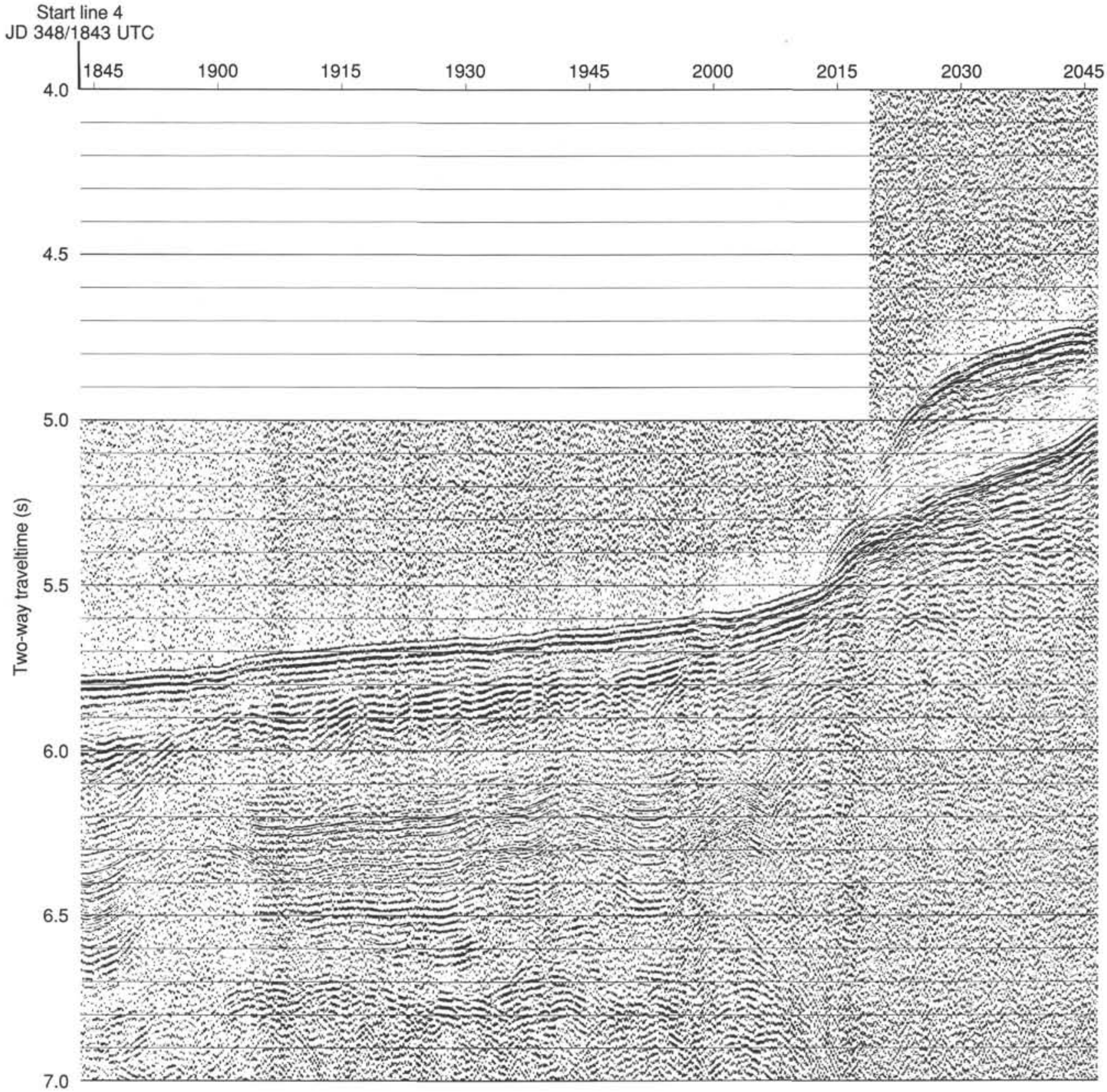

Figure 10. Digital seismic reflection profile (Line 4) in the vicinity of Site 769 in the Sulu Sea. This profile is shown in Figure 9.

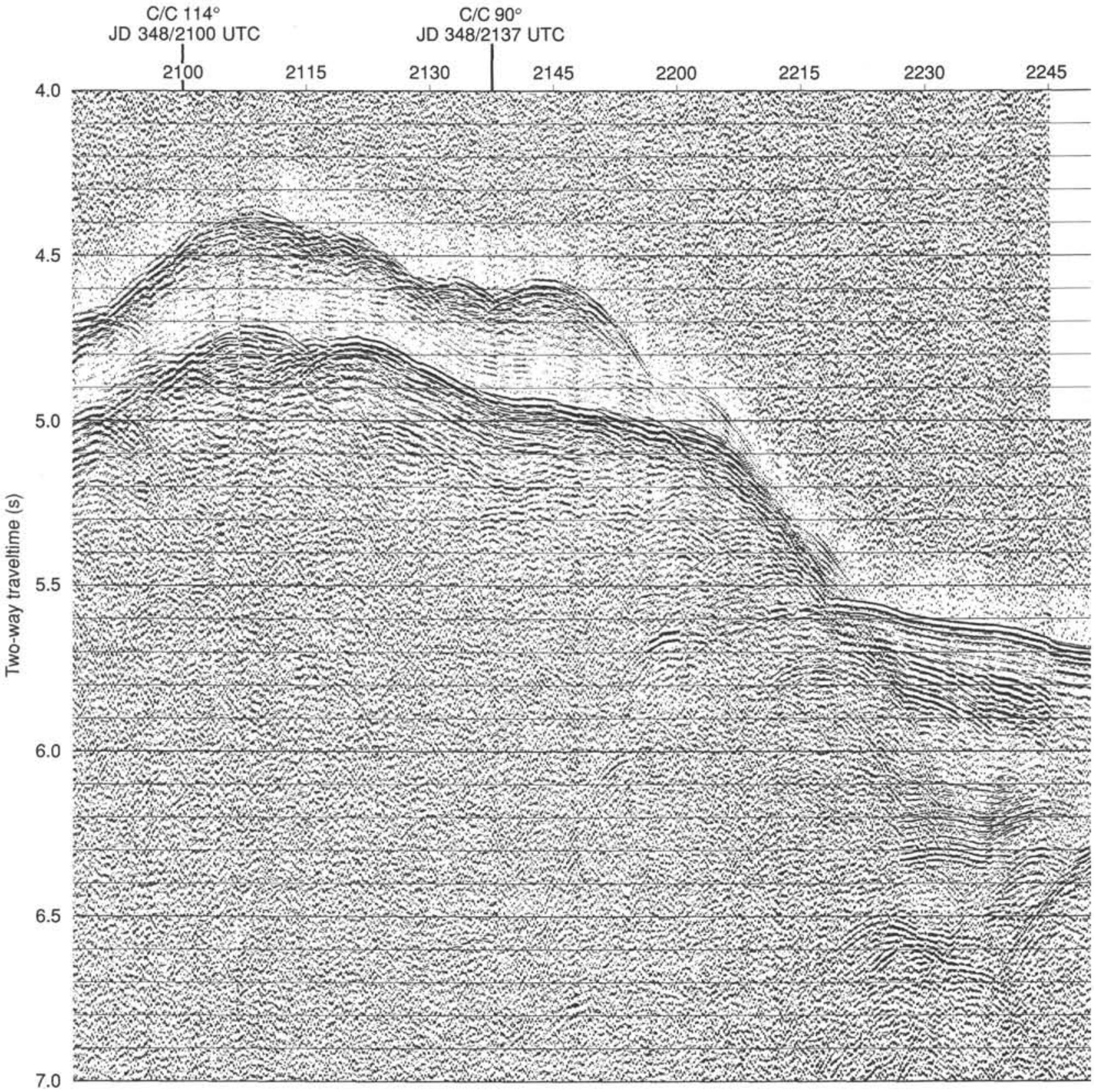

Figure 10 (continued).

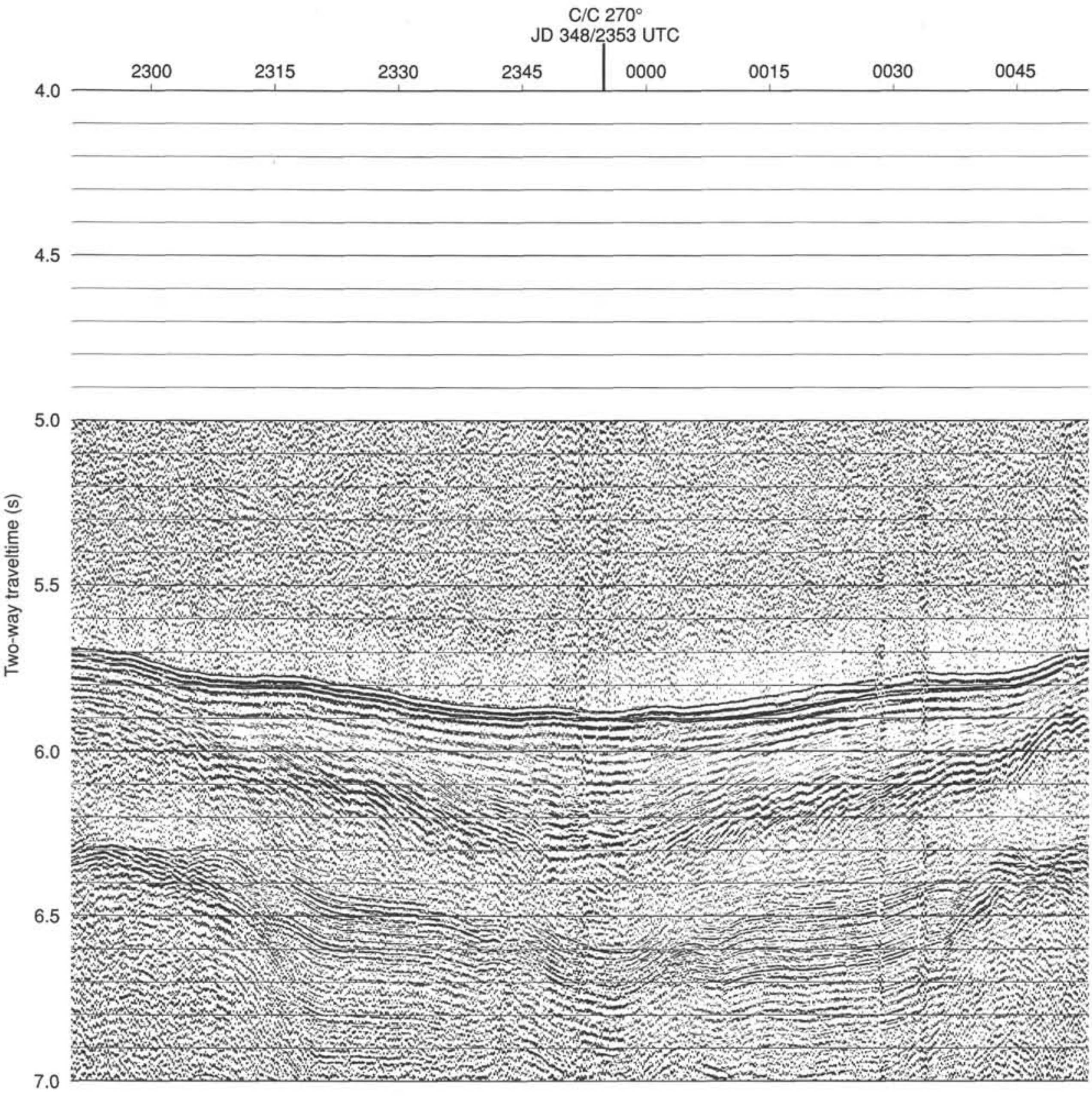

Figure 10 (continued).

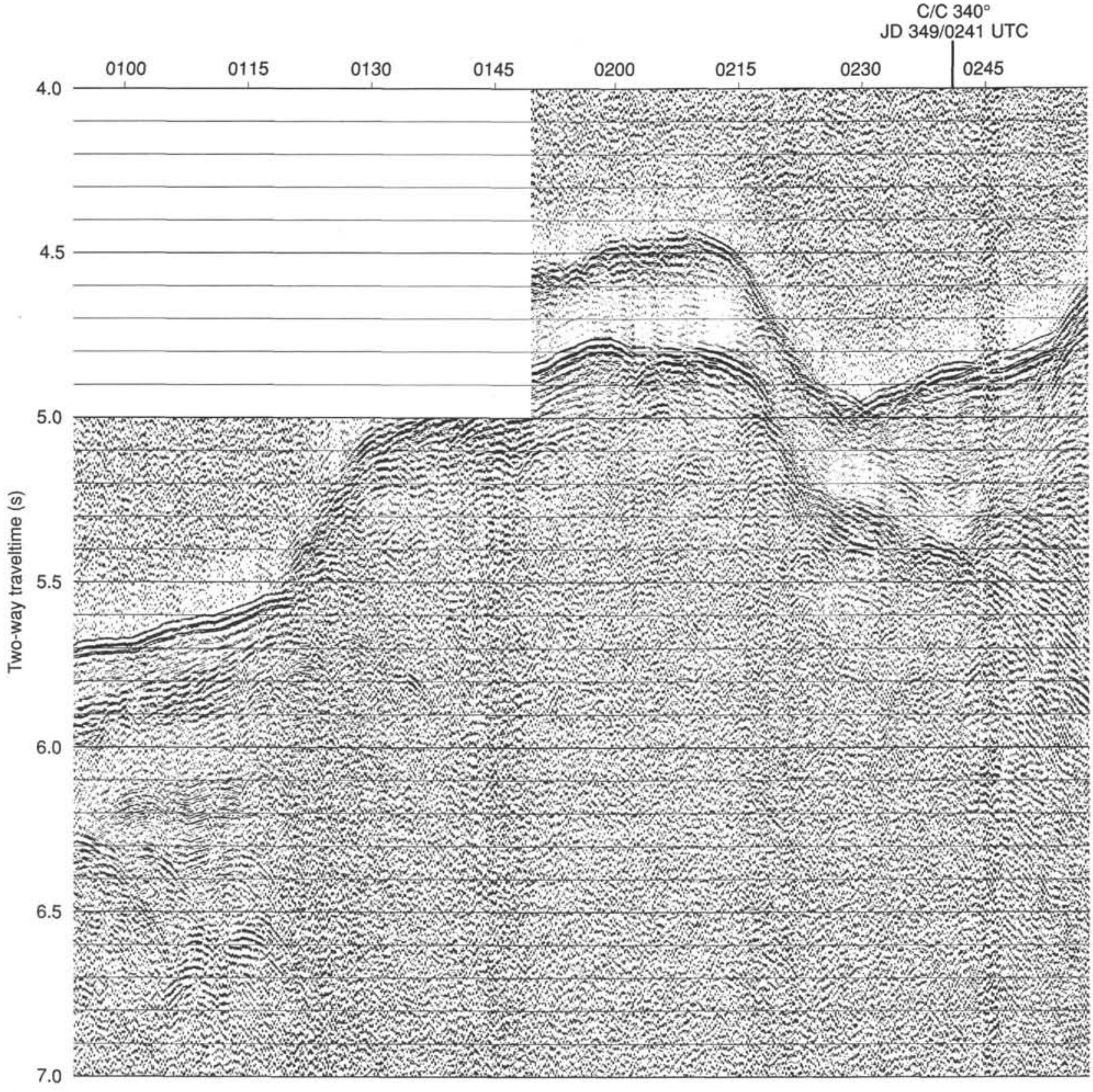

Figure 10 (continued).

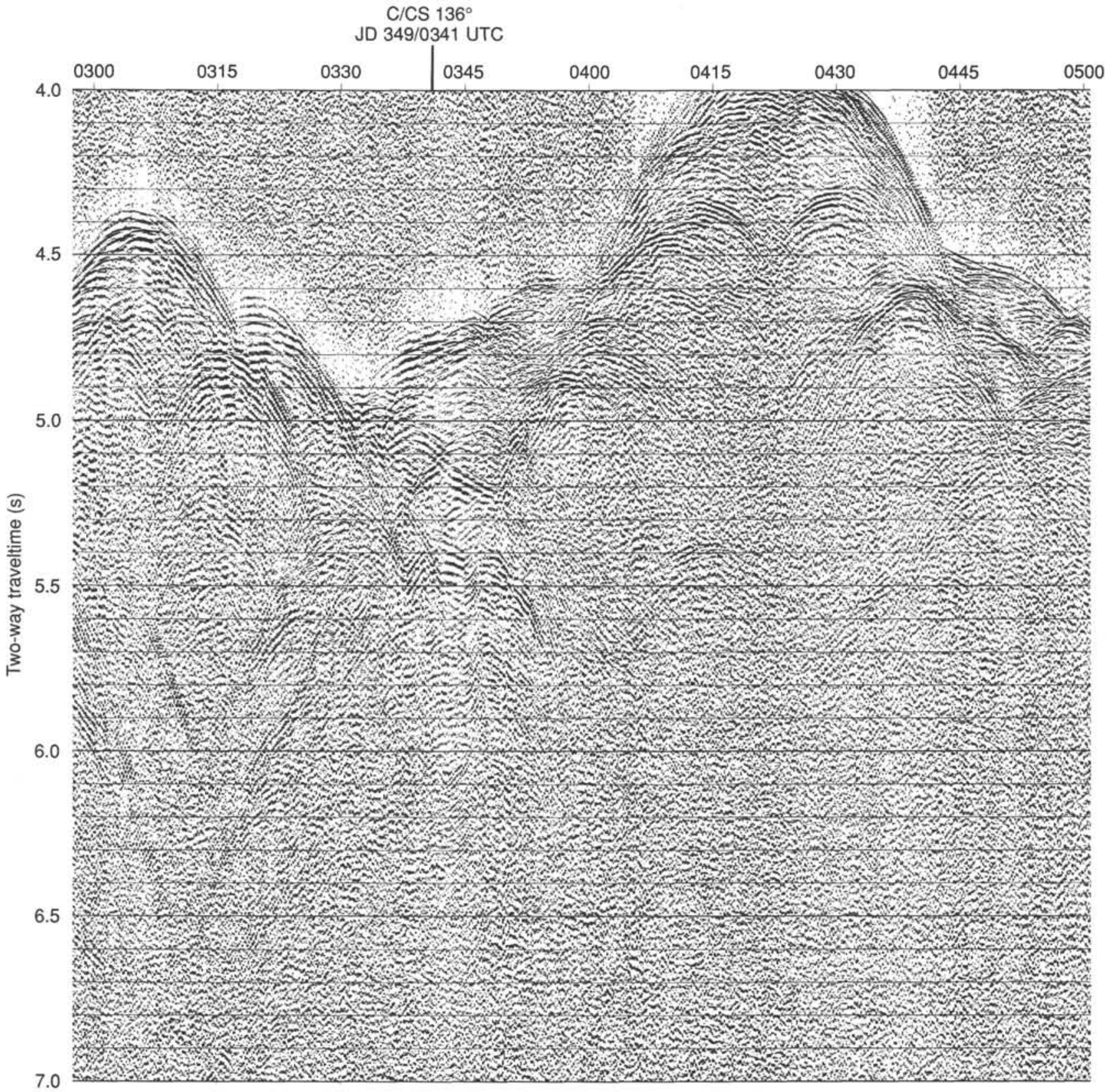

Figure 10 (continued).

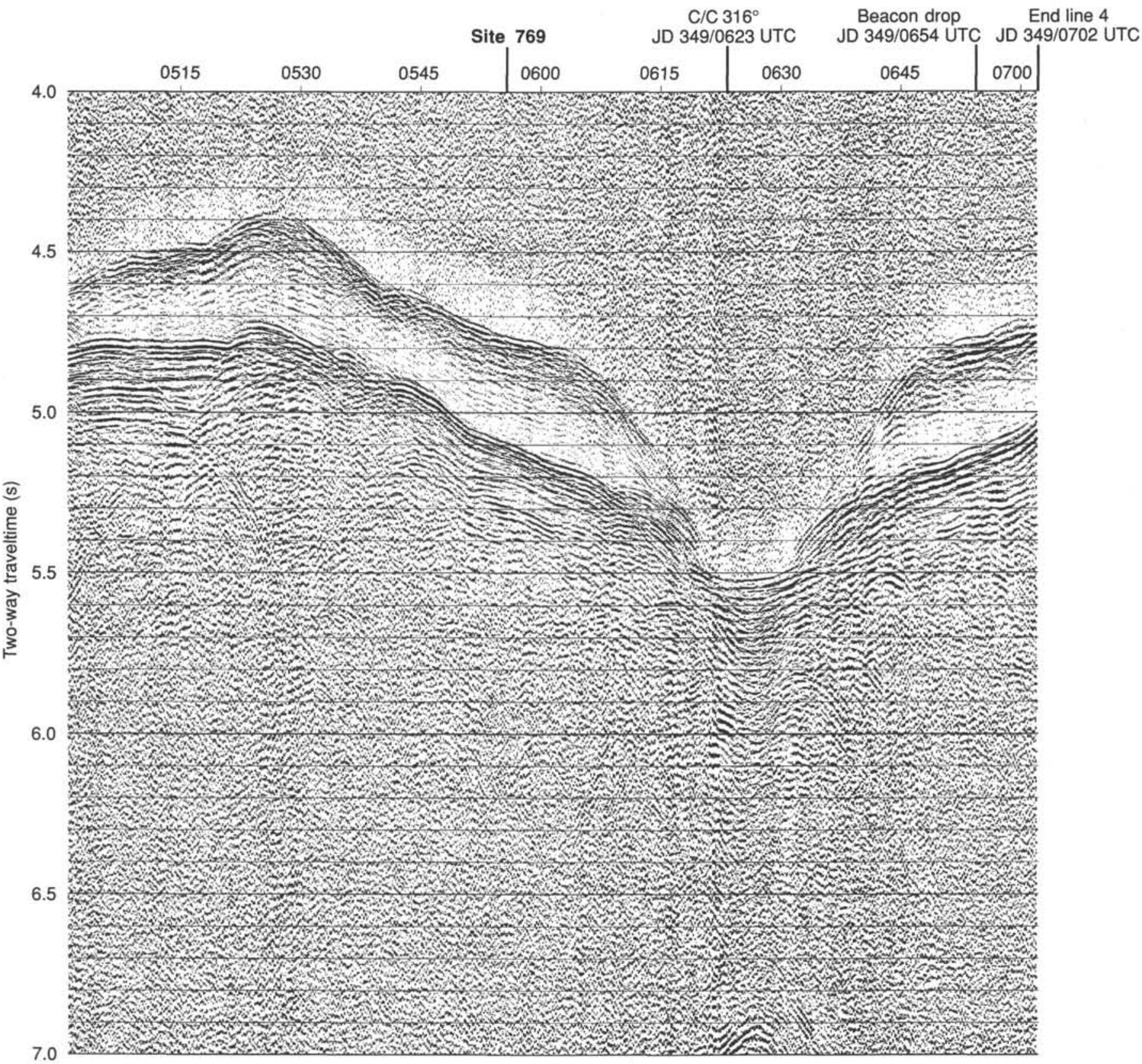

Figure 10 (continued).

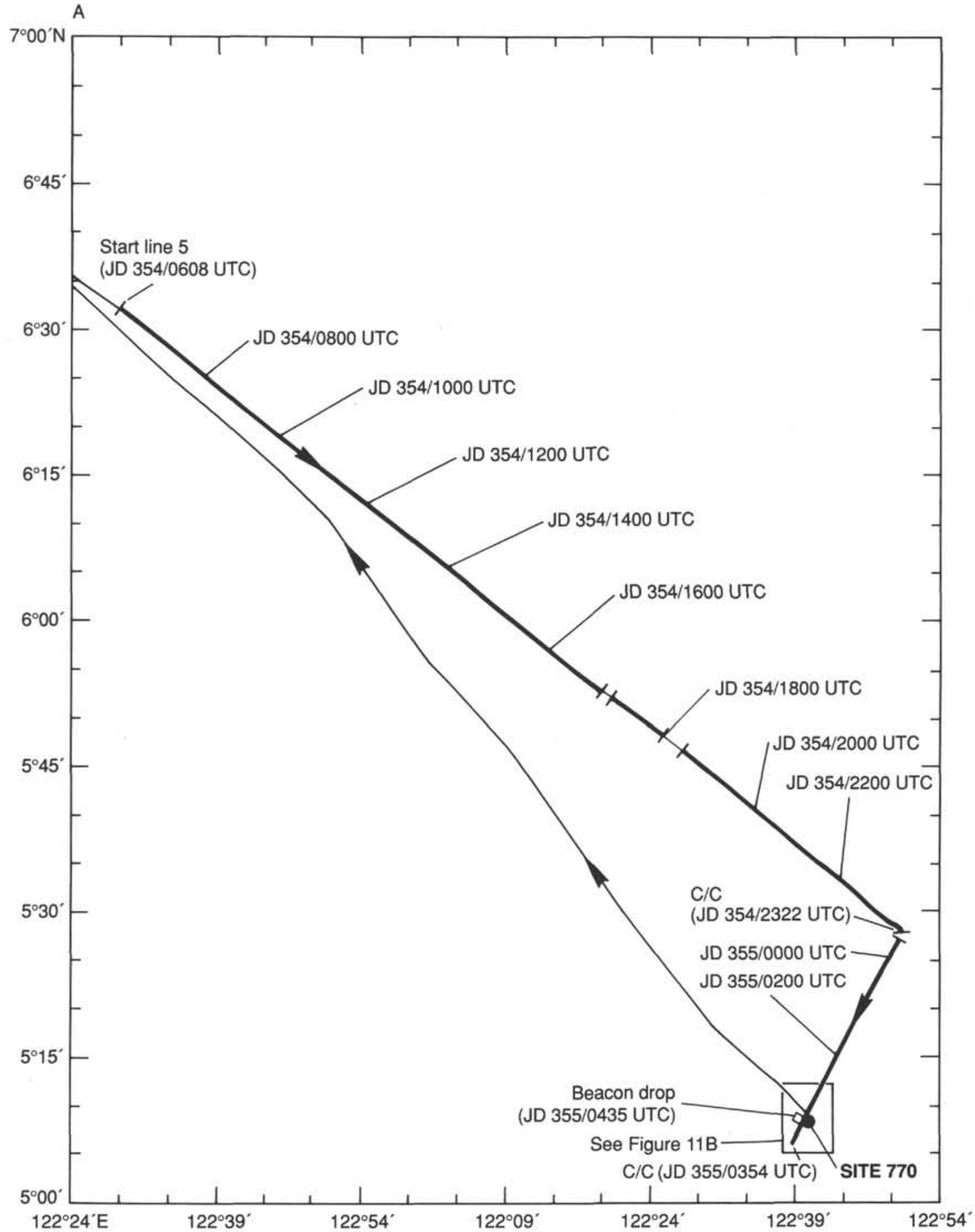

Figure 11. **A.** Navigation in the vicinity of Site 770. The heavy segment of the trackline indicates the location of digital seismic reflection line 5 (shown in Fig. 12) collected while on approach to Site 770. **B.** Enlarged navigation plot of the trackline in the immediate vicinity of Site 770. The heavy segment of the trackline indicates the location of digital seismic reflection line 5 (shown in Fig. 12) collected while on approach to Site 770. Three-digit numbers prefixed by JD are Julian Days.

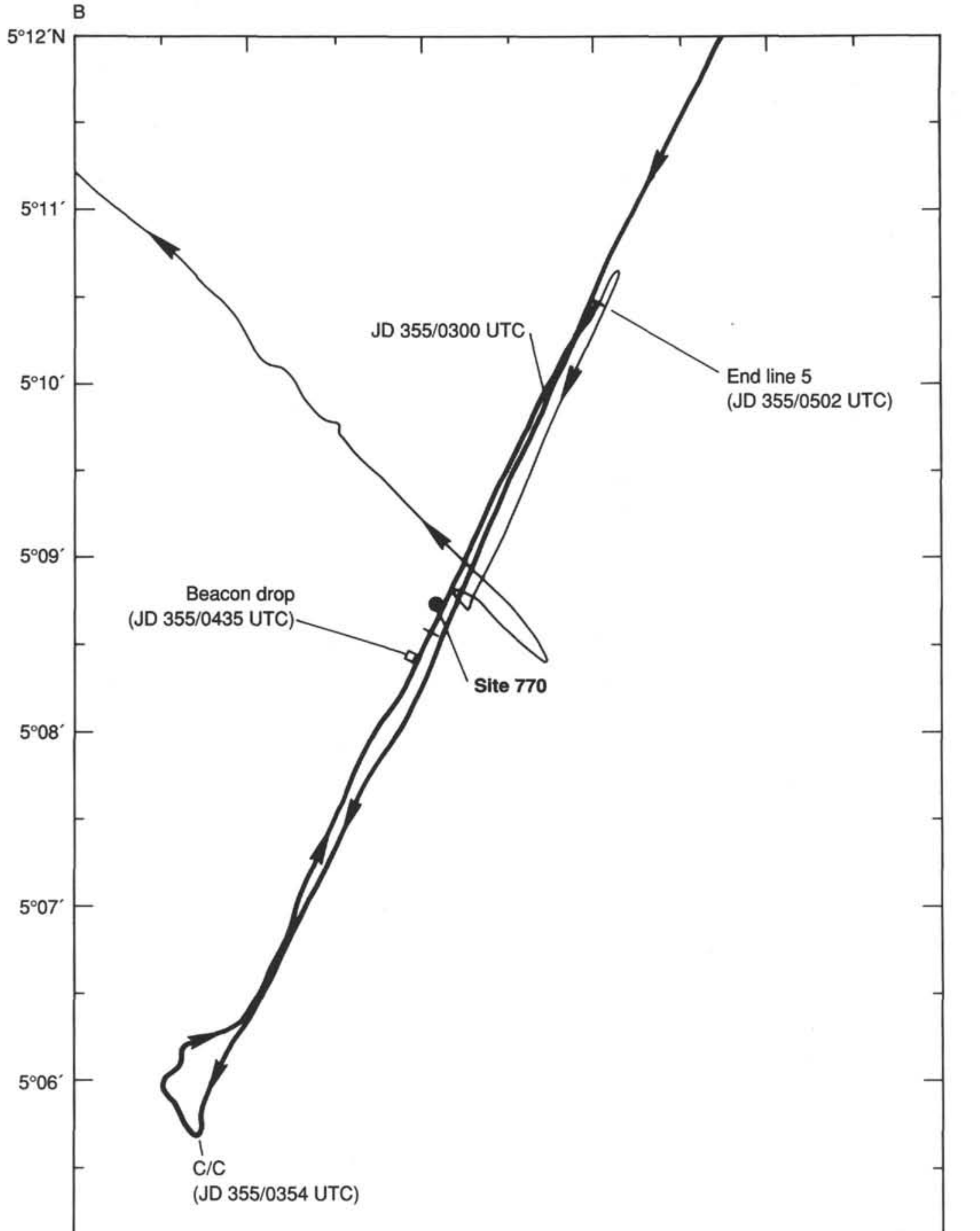

Figure 11 (continued).

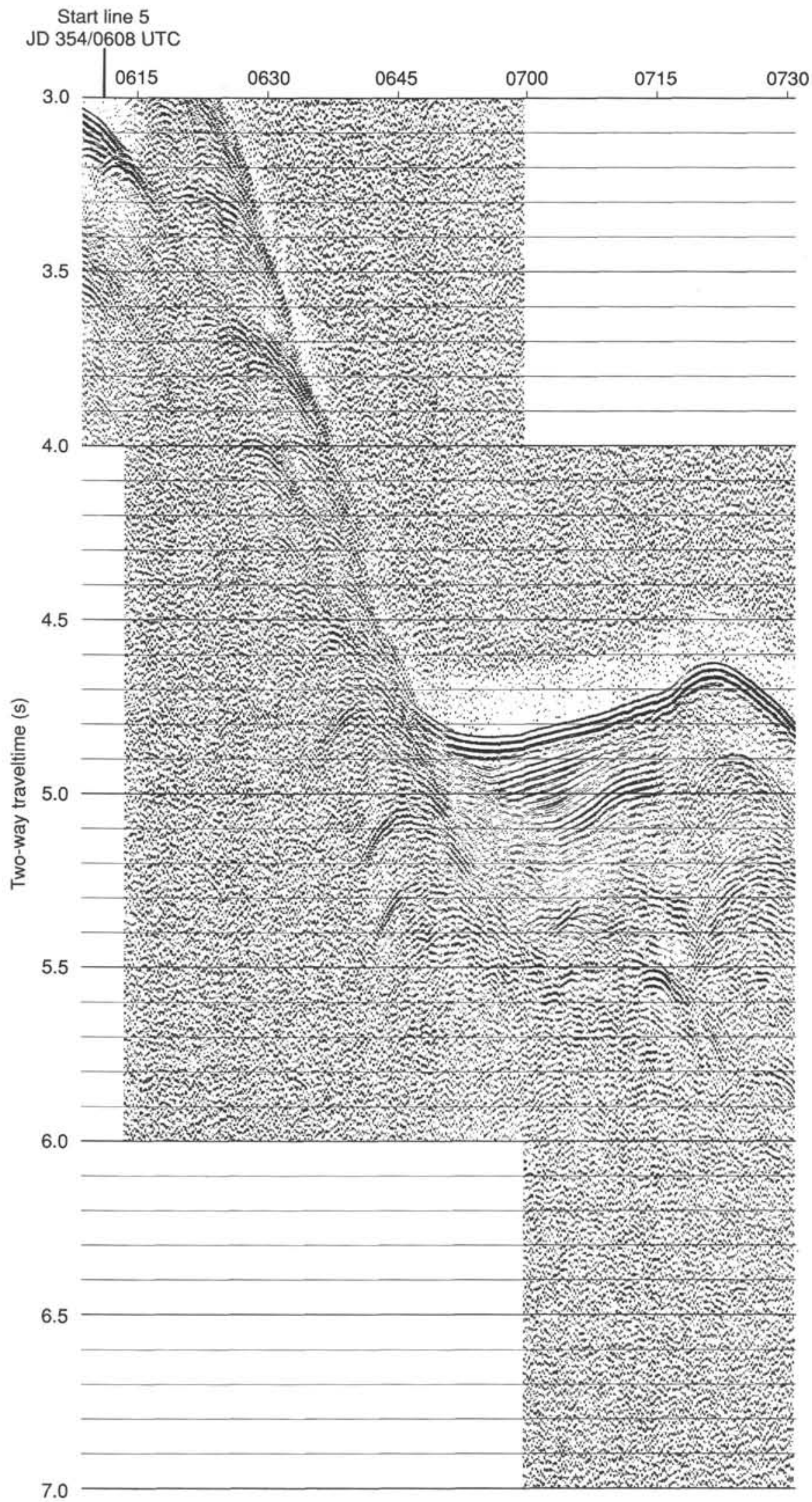

Figure 12. Digital seismic reflection profile (Line 5) in the vicinity of Site 770 in the Celebes Sea. This profile is shown in Figures 11A and 11B.

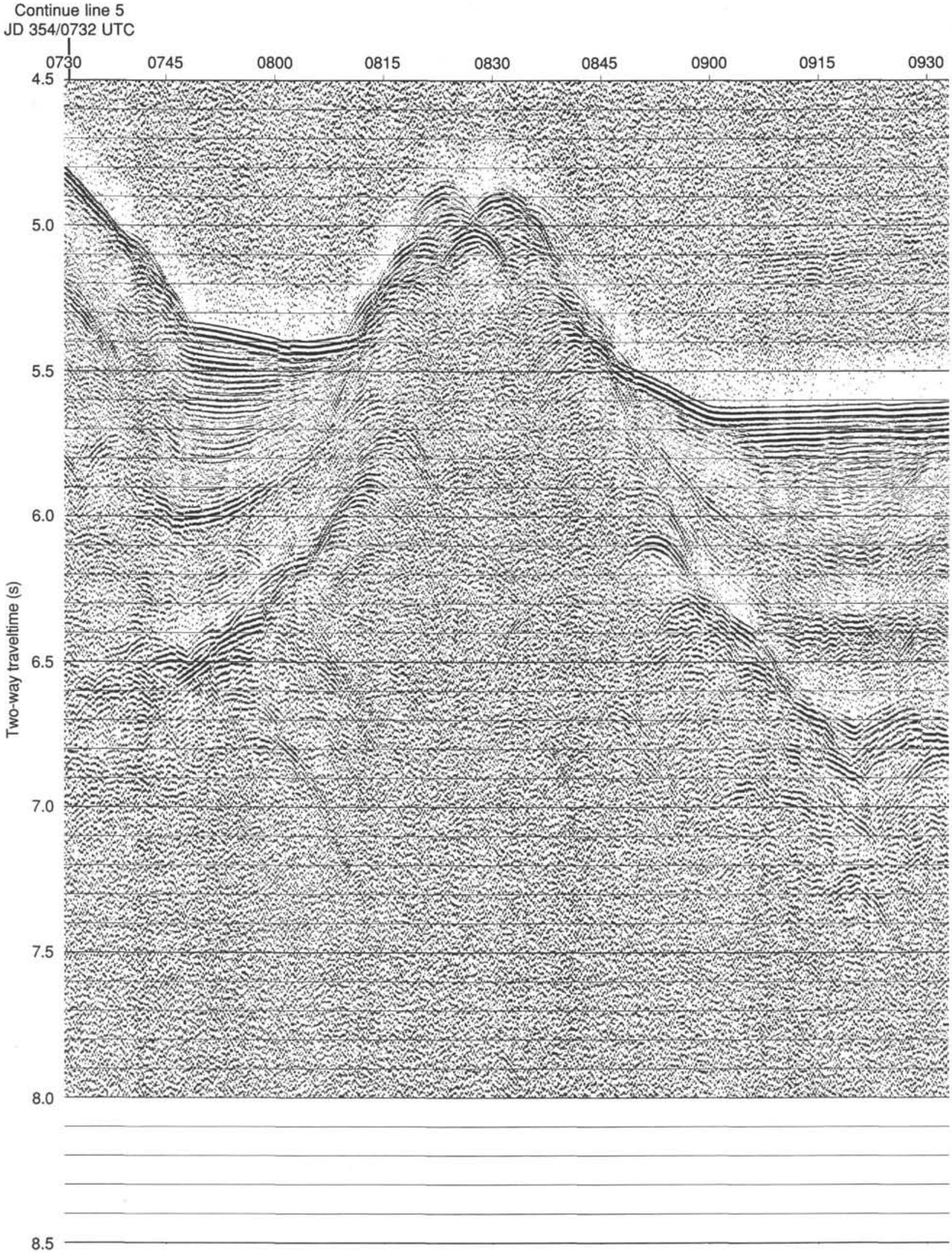

Figure 12 (continued).

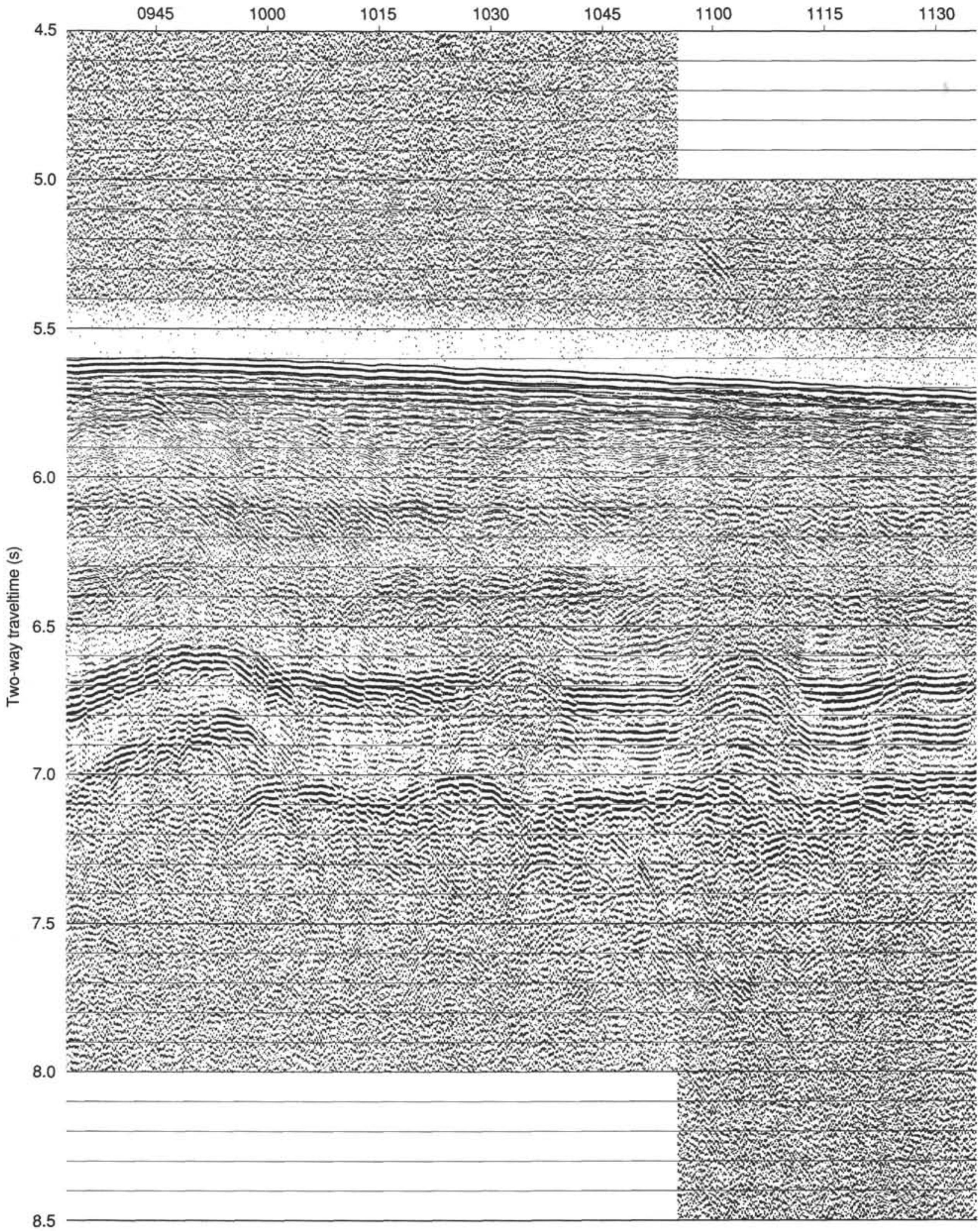

Figure 12 (continued).

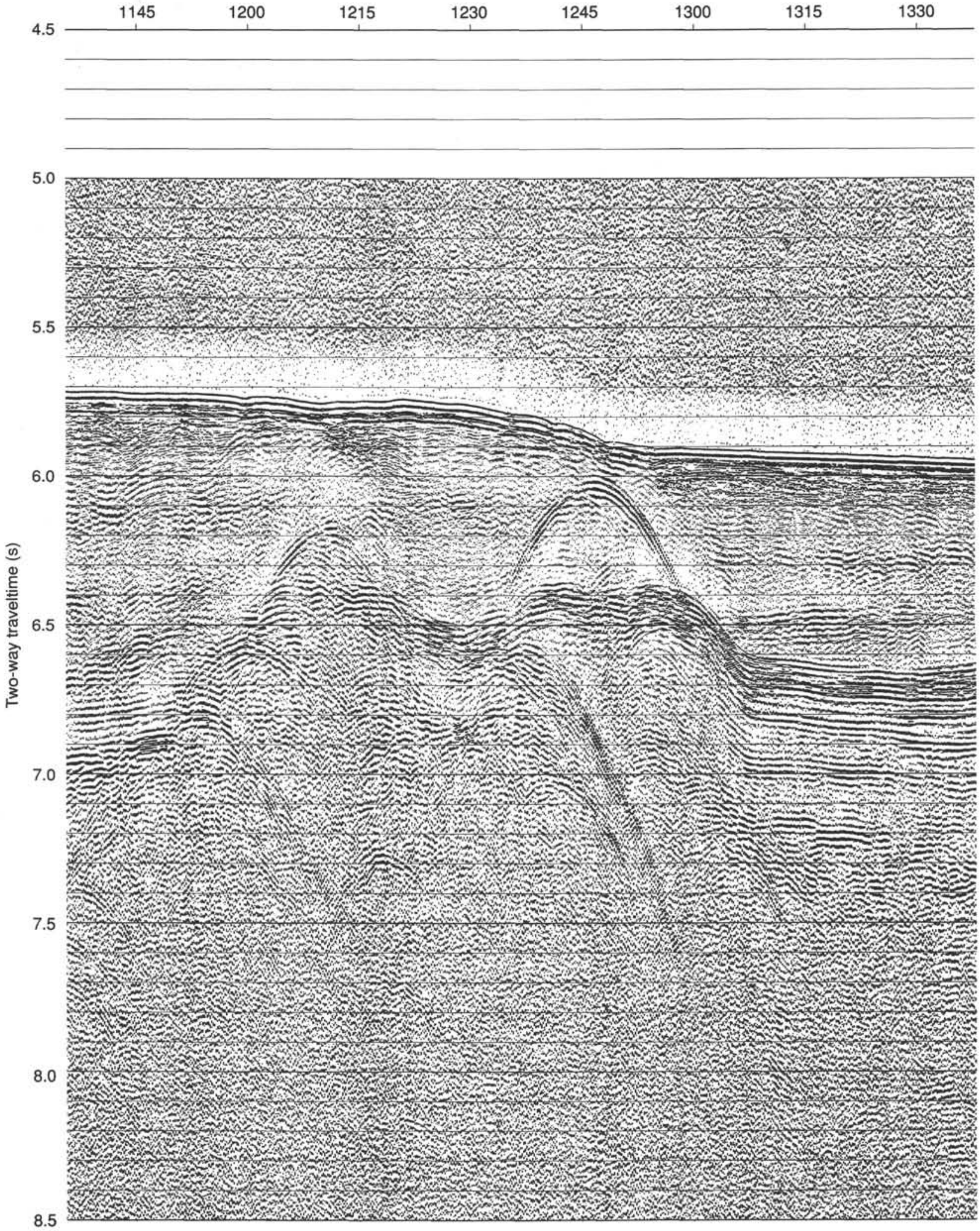

Figure 12 (continued).

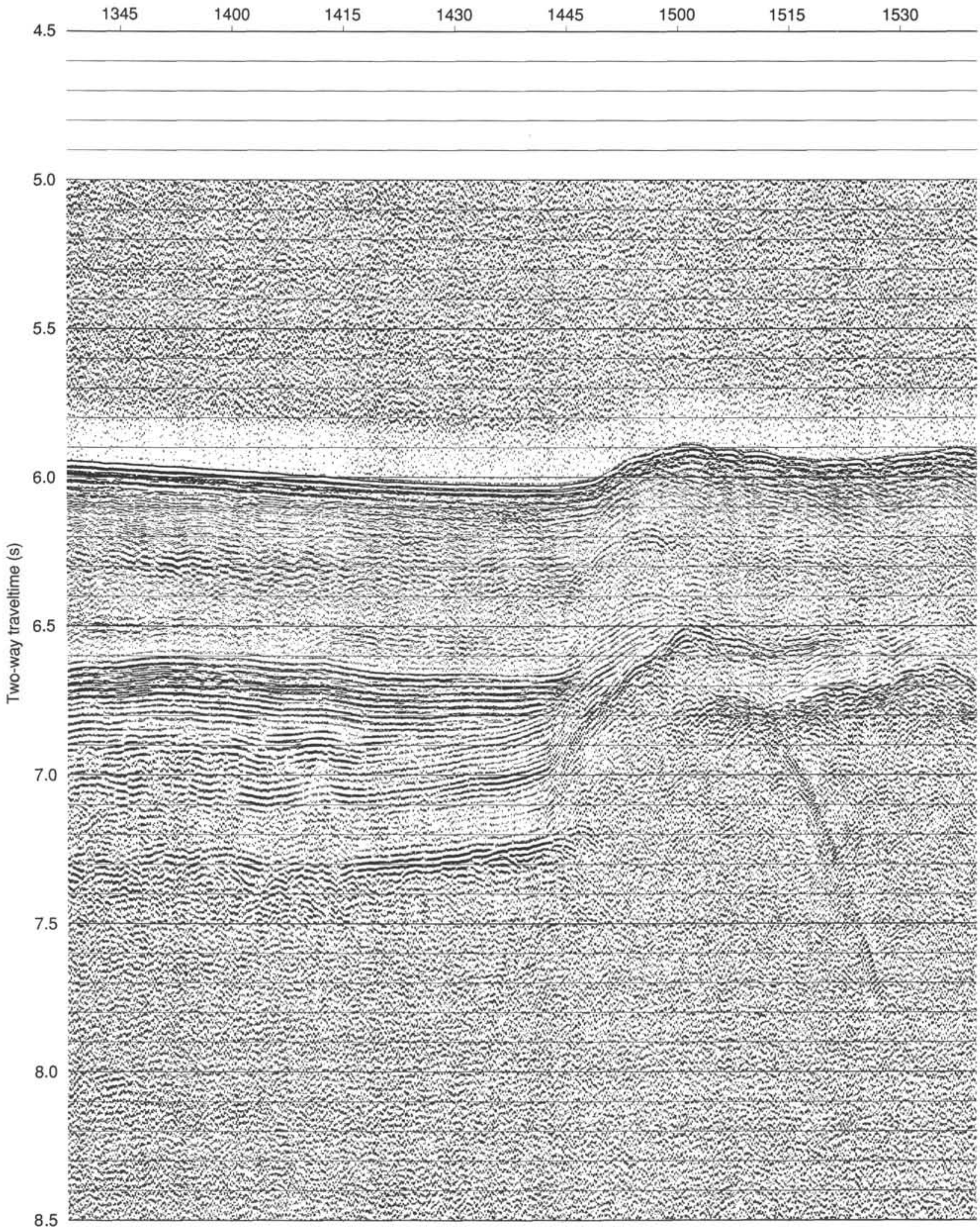

Figure 12 (continued).

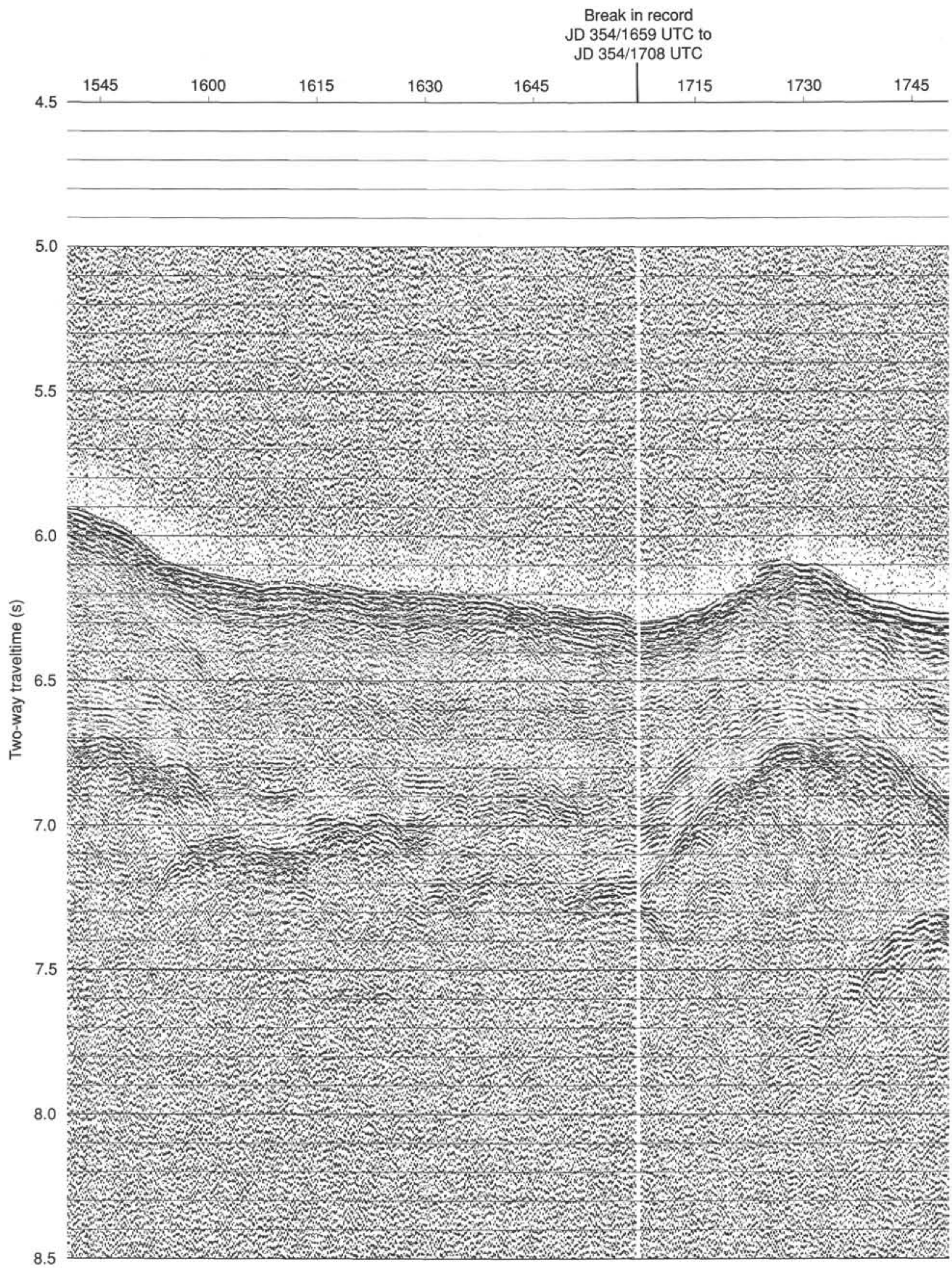

Figure 12 (continued).

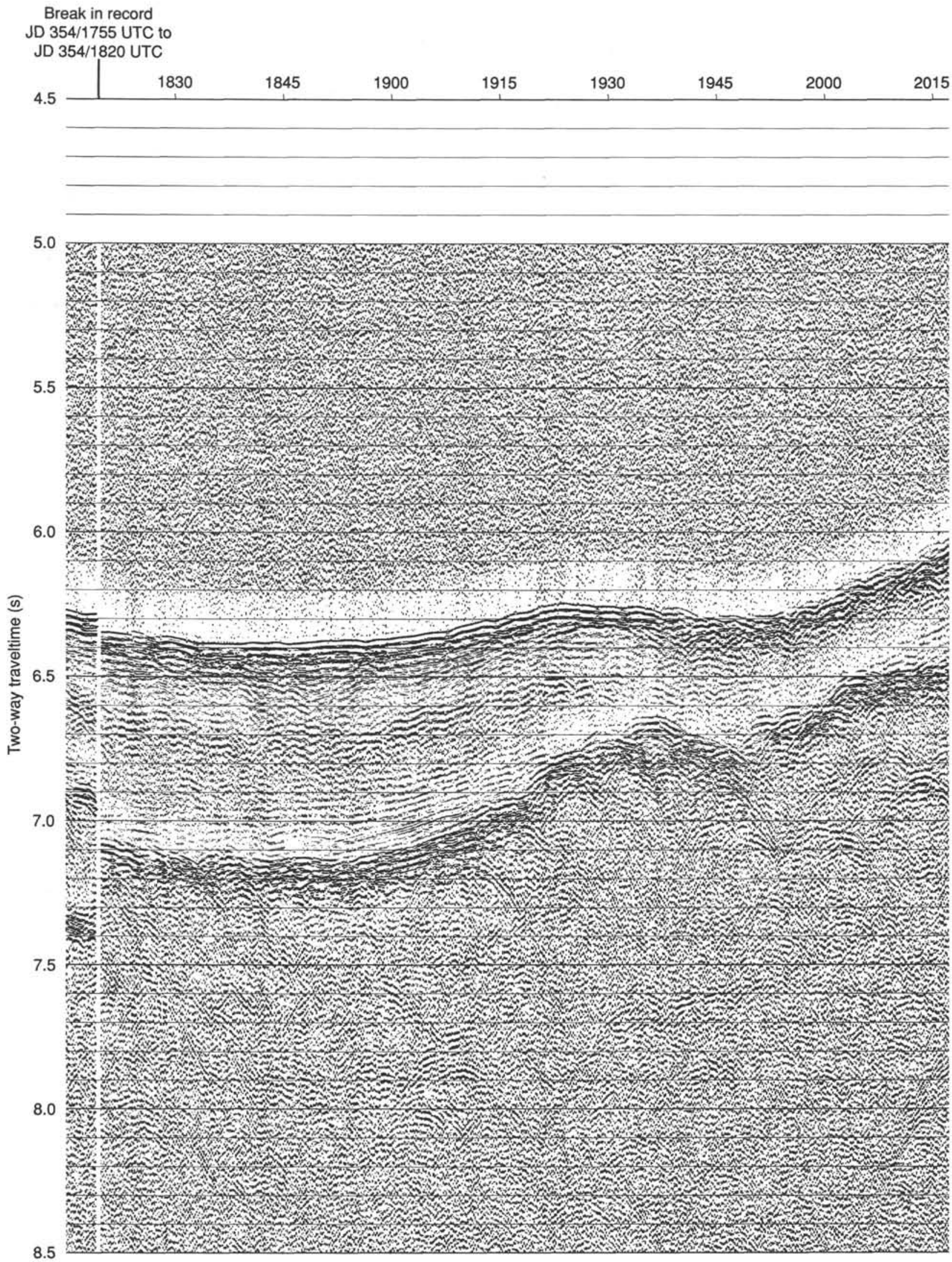

Figure 12 (continued).

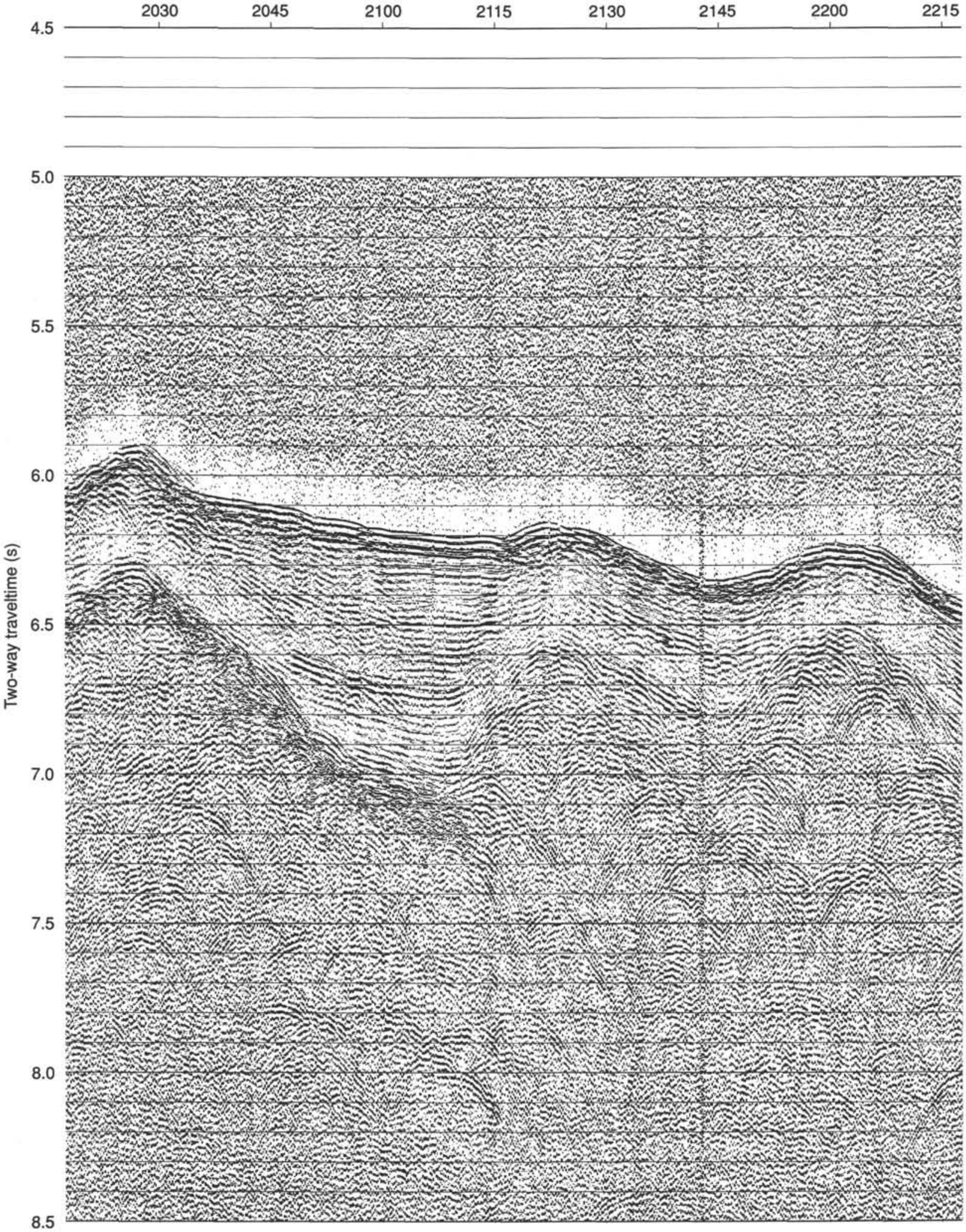

Figure 12 (continued).

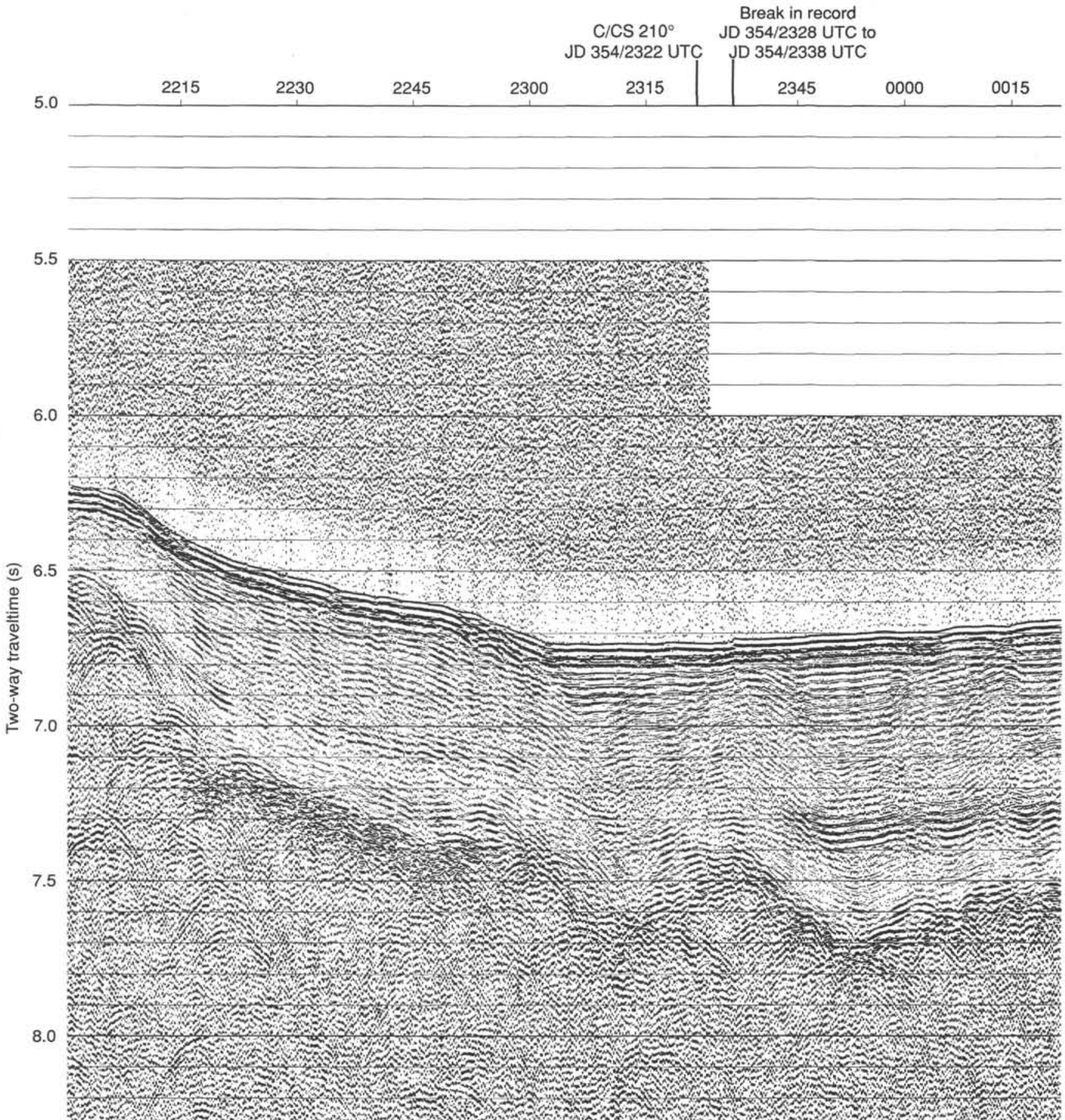

Figure 12 (continued).

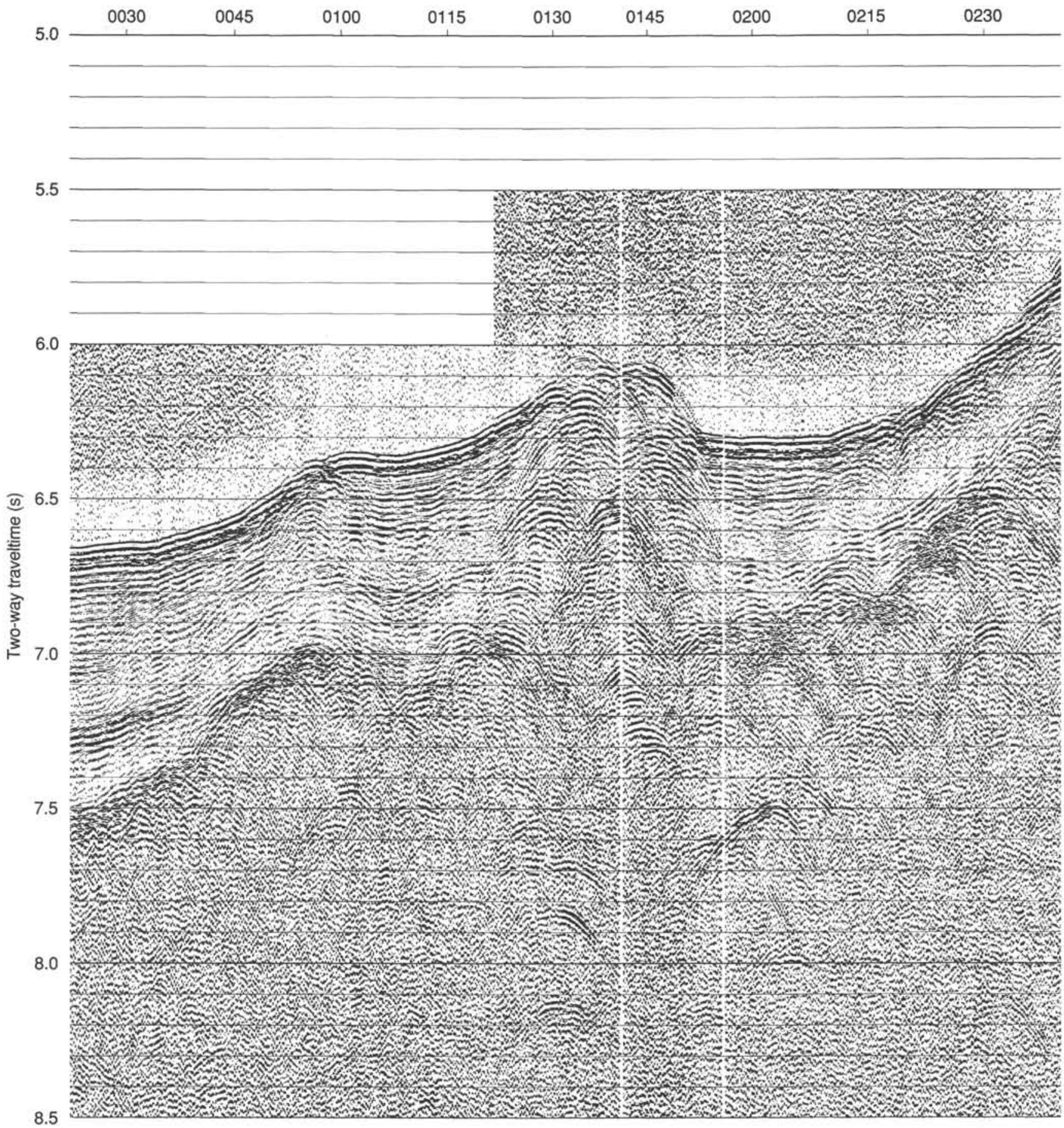

Figure 12 (continued).

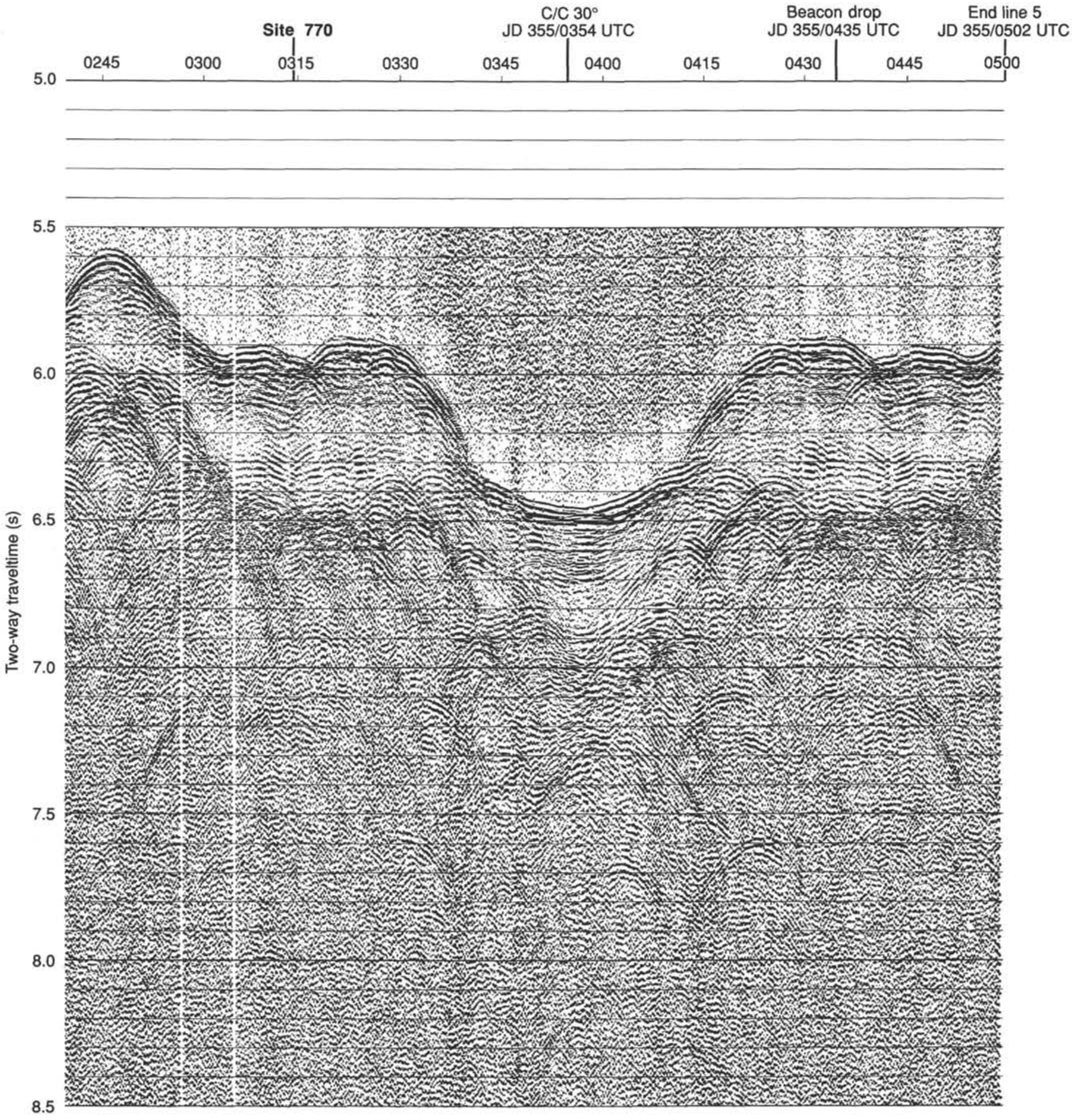

Figure 12 (continued).

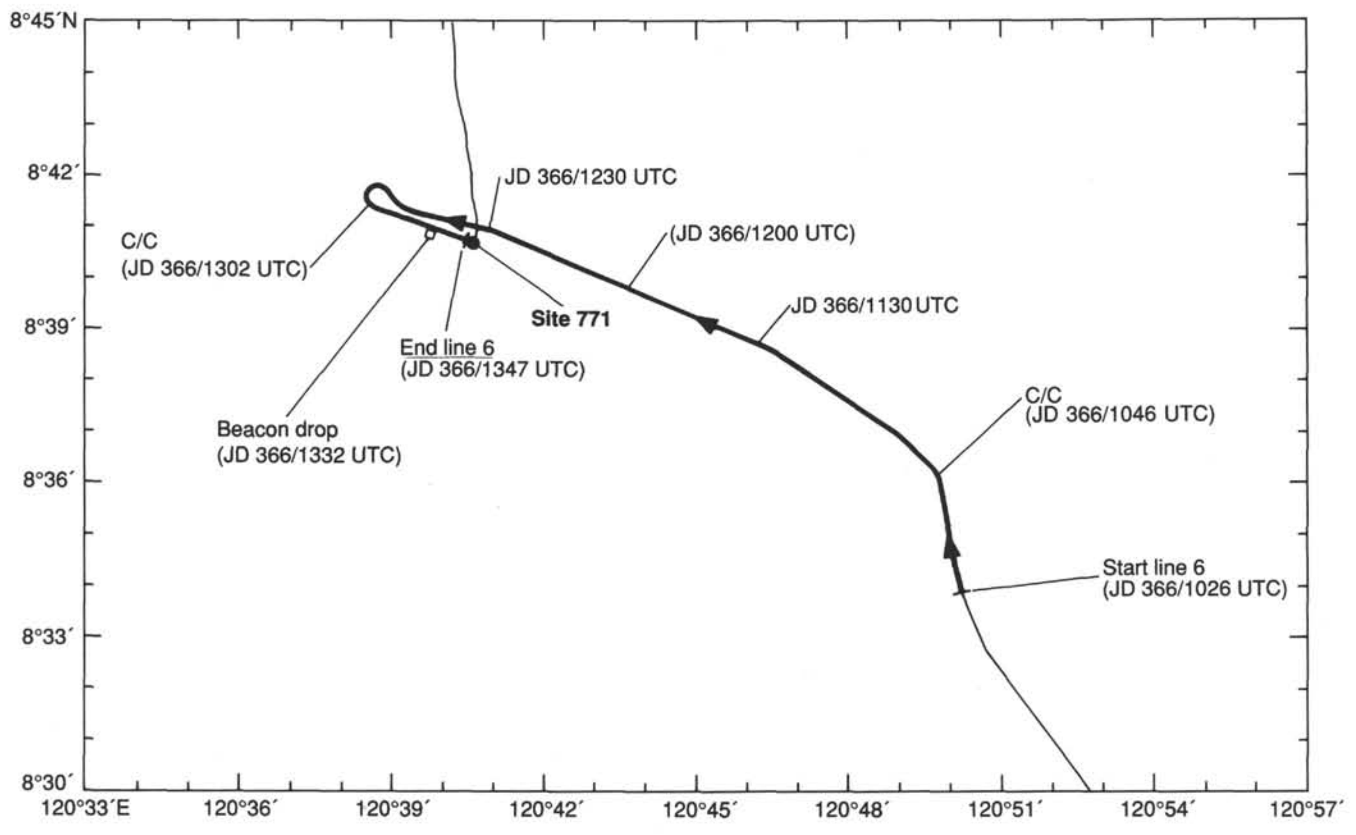

Figure 13. Navigation in the vicinity of Site 771. The heavy segment of the trackline indicates the location of digital seismic reflection line 6 (shown in Fig. 14) collected while on approach to Site 771. Three-digit numbers prefixed by JD are Julian Days.

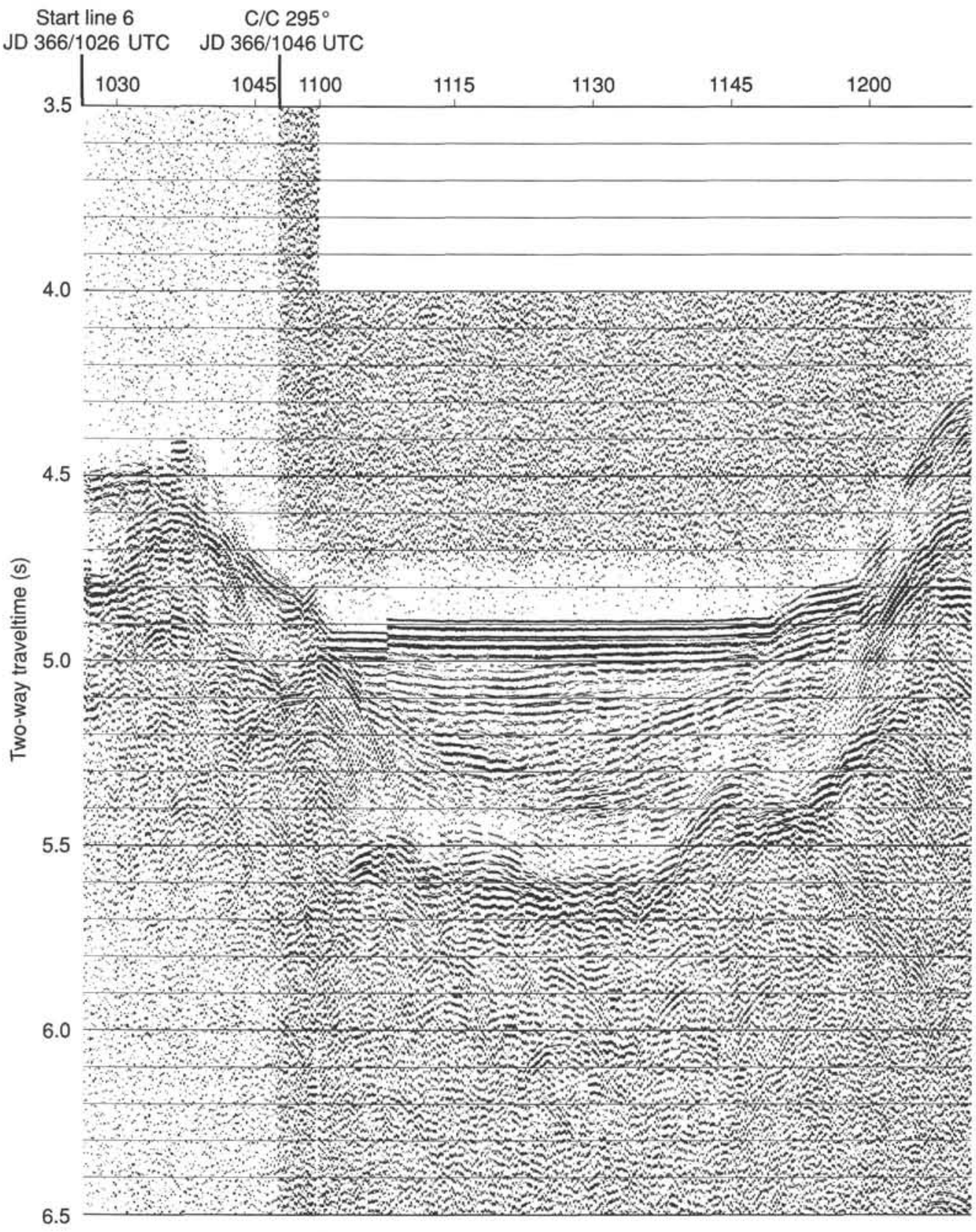

Figure 14. Digital seismic reflection profile (Line 6) in the vicinity of Site 771 in the Celebes Sea. This profile is shown in Figure 13.

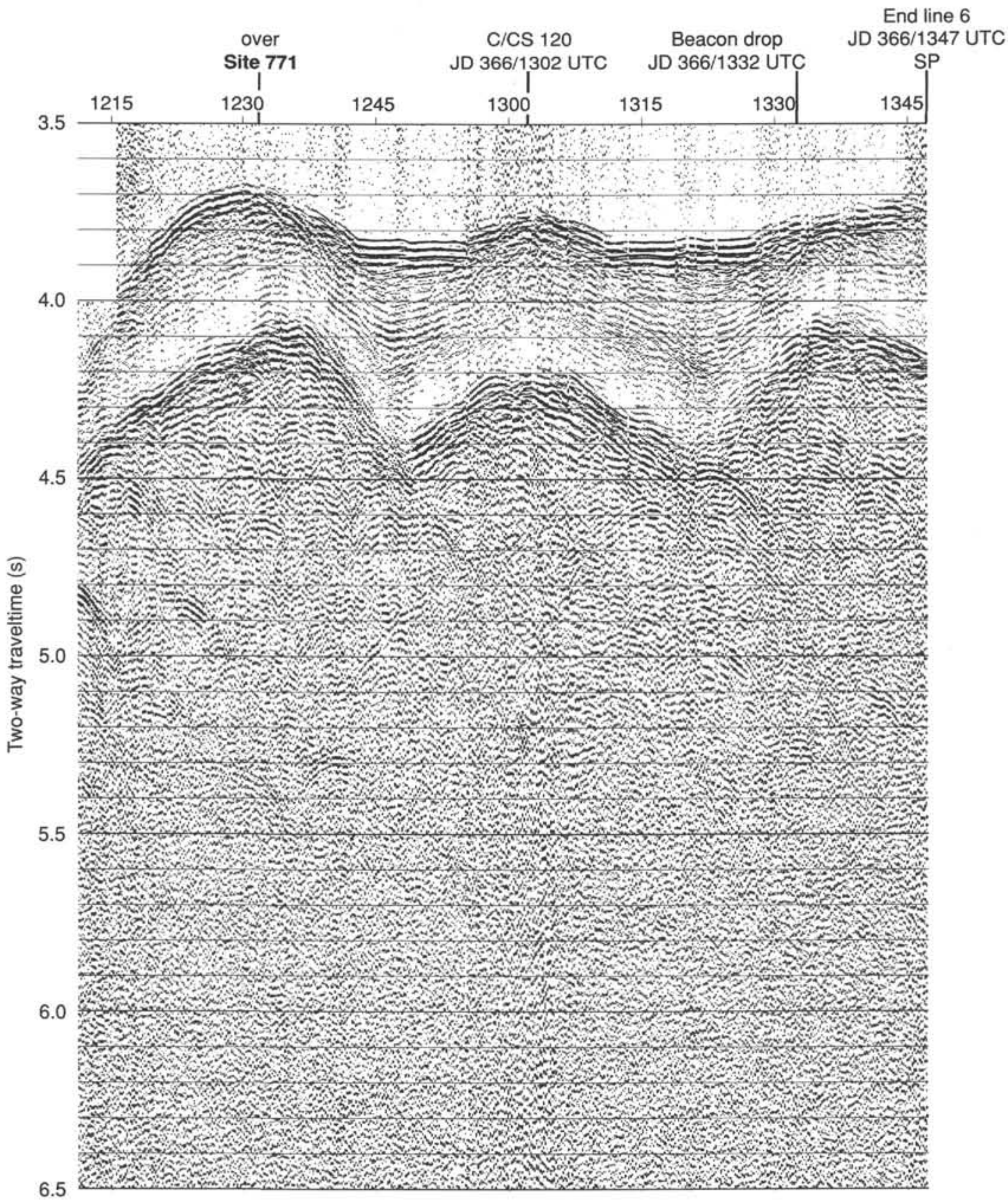

Figure 14 (continued).

Table 1. Seismic reflection data real-time recording parameters.

	Line 1	Line 2A	Line 2B	Line 4	Line 5	Line 6
Start at	4° 50.3'N 123° 11.2'E	5° 00.0'N 123° 11.2'E	7° 26.1'N 123° 29.2'E	8° 38.3'N 121° 46.4'E	6° 31.9'N 121° 24.9'E	8° 33.8'N 122° 28.6'E
120° 50.3'E						
End at	Site 767	5° 49.7'N 123° 31.8'E	Site 768	Site 769	Site 770	Site 771
Source	Two 80-in.^{3} water guns	Two 80-in.^{3} water guns	Two 80-in.^{3} water guns	Two 80-in.^{3} water guns	Two 80-in.^{3} water guns	Two 80-in.^{3} water guns
Streamer	Starboard	Port	Port	Port	Port	Port
EDO-1						
High cut (Hz)	150	150	150	150	150	150
Low cut (Hz)	40	40	40	40	40	40
EDO-2						
High cut (Hz)	150	150	150	150	150	150
Low cut (Hz)	40	40	40	40	40	40

Table 2. Seismic-data processing and re-processing parameters.

		Line 2B					Line 5			
	Line 2A	Part A	Part B	Part C	Part D	Line 4	Part A	Part B	Part C	Line 6
Data window (ms):										
From	6000	2000	4000	5000	5000	4000	3000	4500	5000	3500
To	8500	6000	7500	8000	9000	7000	7000	8500	8500	6500
Zero-phase band pass filter:										
Window length (ms)	500	500	500	500	500	500	500	500	500	500
High cut (Hz)	150	150	150	150	150	150	150	150	150	150
Taper width (ms)	25	25	25	25	25	25	25	25	25	25
Low cut (Hz)	35	35	35	35	35	35	35	35	35	35
Taper width (ms)	25	25	25	25	25	25	25	25	25	25