4. UNDERWAY GEOPHYSICS[1]

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INTRODUCTION

The selection of sites for Ocean Drilling Program (ODP) Leg 122 utilized the Australian Bureau of Mineral Resources (BMR) 1986 seismic reflection data from the Wombat Plateau for Sites 759, 760, and 764. Petroleum-exploration-industry seismic reflection lines were used to locate Sites 762 and 763 close to industry wells Eendracht-1 and Vinck-1, respectively. Seismic reflection lines collected during Leg 122 were used to locate Site 761. Underway geophysics measurements were made aboard *JOIDES Resolution* on approach to all sites and during transects.

Measurements of bathymetry and total magnetic field were made during all transects. Seismic reflection profiles were recorded for site surveys, and for transits on the Wombat Plateau and between Sites 762 and 763, at speeds of 5–7 kts. Sonobuoy reflection-refraction profiles were recorded at most sites.

Instrumentation on board involved two precision echo-sounders (3.5 and 12 kHz), a proton precession magnetometer, a single-channel digital seismic-reflection profiling system, and a Global Positioning System (GPS/Transit) satellite navigation system. The instruments were maintained and operated by the ODP marine technicians in cooperation with the scientific party.

NAVIGATION

Navigation data were collected both in the underway geophysics lab using a Magnavox MX1107 satellite-navigation system (SATNAV), and (independently) on the bridge using a Magnavox MX4400 satellite-navigation system. Positions obtained using the underway geophysical navigation system were recorded on magnetic tape each minute, and on paper every 30 minutes during non-seismic transits. In addition, ship's speed and heading were recorded every 12 seconds (i.e., each shot point) during seismic operations.

The more accurate GPS satellite window was only available about 10 hours per day when at least three satellites were accessable. Transit satellite fixes were received every 1–1.5 hours. The ship tracks for Leg 122 are shown in Figures 1–11 and navigation details are given in the Appendix (microfiche in back pocket). Navigation was reduced post cruise by Ray Tracey at BMR and Xiaotao Du at ODP.

BATHYMETRY

Bathymetric data were recorded with both 3.5- and 12-kHz echo-sounder systems that have signal correlators. The signals were recorded on two Ratheon recorders at sweep speeds of 1 s (750 m scale). The quality of the records was generally very poor, especially on high-speed transits (10–12 kt), because of large ship motion and ship noise. At slower speeds, better quality 3.5-kHz bathymetric records were recorded, but sub-bottom penetration remained too poor to decipher the thickness and bedding characteristics of the upper 50 m of sediments.

One major problem of both echo-sounders was the very high noise level of the ship (compounded by the position of the transducer on the ship's hull); this problem was to be addressed in part during the subsequent port call. Another problem was the wide beam width of the outgoing signal; narrow-beam echo sounders give good resolution even at steep slopes and high relief.

MAGNETICS

Total-intensity measurements of the Earth's magnetic field were obtained with a Geometrics 801 proton procession magnetometer. The sensor was towed approximately 500 m astern. Measurements were made at 3-s intervals with 1 nT sensitivity. The data were recorded continuously on a graphic recorder and in the header of seismic tapes (once per 12 s) during seismic surveys, or every 1 min during non-seismic transits. The magnetometer was used routinely. Noise levels on the data were about 3–8 nT.

SEISMIC REFLECTION PROFILES

Seismic lines collected during ODP Leg 122 (Table 1) were recorded using equipment and parameters listed in Table 2. All seismic lines are shown in Figures 12–19 and sonobuoy #4 is shown in Figure 20. The seismic source was two 12.5 cm^3 water guns operating at 1700–2000 psi and towed about 14 m apart (starboard and port davits) and about 25 m behind the ship. Reflections were recorded by a Teledyne "high-speed" streamer that included a 100-m-long "active" section containing 60 hydrophones and a 30-m-long stretch section. The head of the streamer was normally about 317 m behind the ship. The seismic source and streamer were towed at estimated depths of 8–10 m and 10–15 m, respectively. Depth stabilizing "birds" were not used on the streamer because of their ineffectiveness when previously employed (e.g., Leg 119), and the unreliable values produced by the streamer's depth monitoring system.

The seismic recording system consisted of a Super-Micro 561 Masscomp computer, which recorded the seismic data on magnetic tape (Table 2) and displayed the data on a 37.5-cm-wide high-resolution graphic printer (160 dots per 2.5 cm). The system theoreticaly had the capability to do real-time processing (e.g., automatic gain control [AGC] and filtering); however, these options were not used. This was because there is insufficient capability in the Masscomp computing system to process in real-time at a 12-s shot-repetition rate.

Raw data were filtered (25–250 Hz) and recorded on 1600 bpi magnetic tape in SEG-Y format at a 1-ms sample rate for 5 s. The water-gun fire rate was set at 12 s. Seismic data were also displayed during acquisition in analog form on two Raytheon recorders, at sweep rates of 2.5 s and 5 s, with filter settings of 25–150 Hz. Onboard processing was severely impeded by (1) several hardware problems, unaddressed by the electrical technicians as they tried to repair the regulated power system after its failures; and (2) the need to define

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[1] Haq, B. U., von Rad, et al., 1990. *Proc. ODP, Init. Repts.*, 122: College Station, TX (Ocean Drilling Program).

[2] Division of Marine Geosciences and Petroleum Geology, Bureau of Mineral Resources, Canberra, Australia.

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

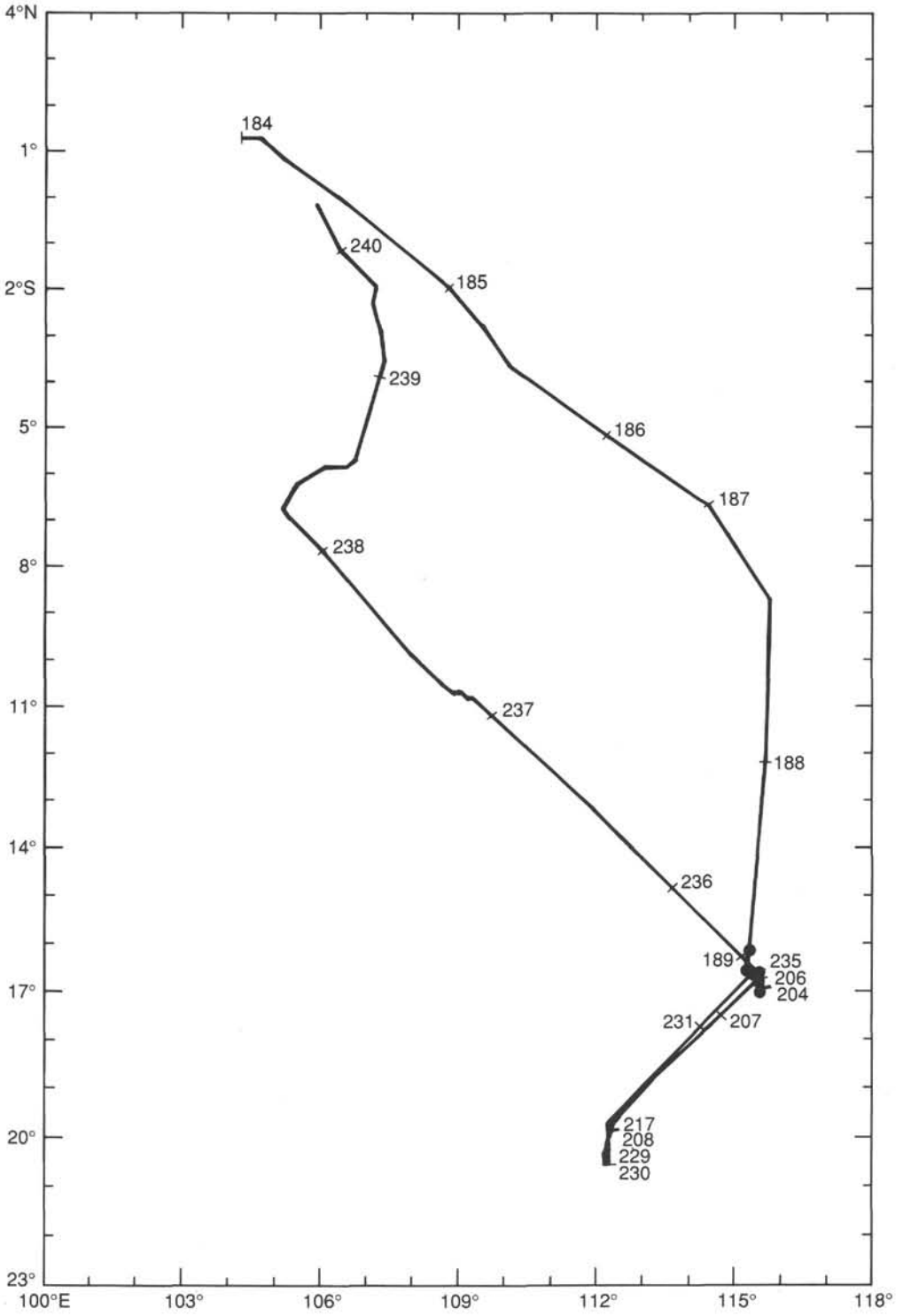

Figure 1. General navigation plot of ODP Leg 122, generated from satellite-navigation and course-speed data given in Table 4. Navigation plots for groups of sites are shown in Figures 2 to 11.

missing software and write it into the system. Processing of all single-channel data collected during Leg 122 was carried out by Simon Kravis at BMR after the cruise. Processing involved spiking, deconvolution, and filtering.

SONOBUOY DATA

During most site surveys, sonobuoys were recorded along seismic lines just prior to crossing the proposed drill site to provide additional velocity-versus-depth data. The sonobuoy equipment, field parameters, and data for all sites are listed in Table 3. Seismic signals from the Navy 53B sonobuoys were received by a high-frequency Realistic receiver. The data were displayed in real time on a Raytheon graphic recorder and were recorded digitally on the Masscomp computer system along with the vertical-incident seismic-reflection data. Five sonobuoys were recorded, one at each site except Site 759.

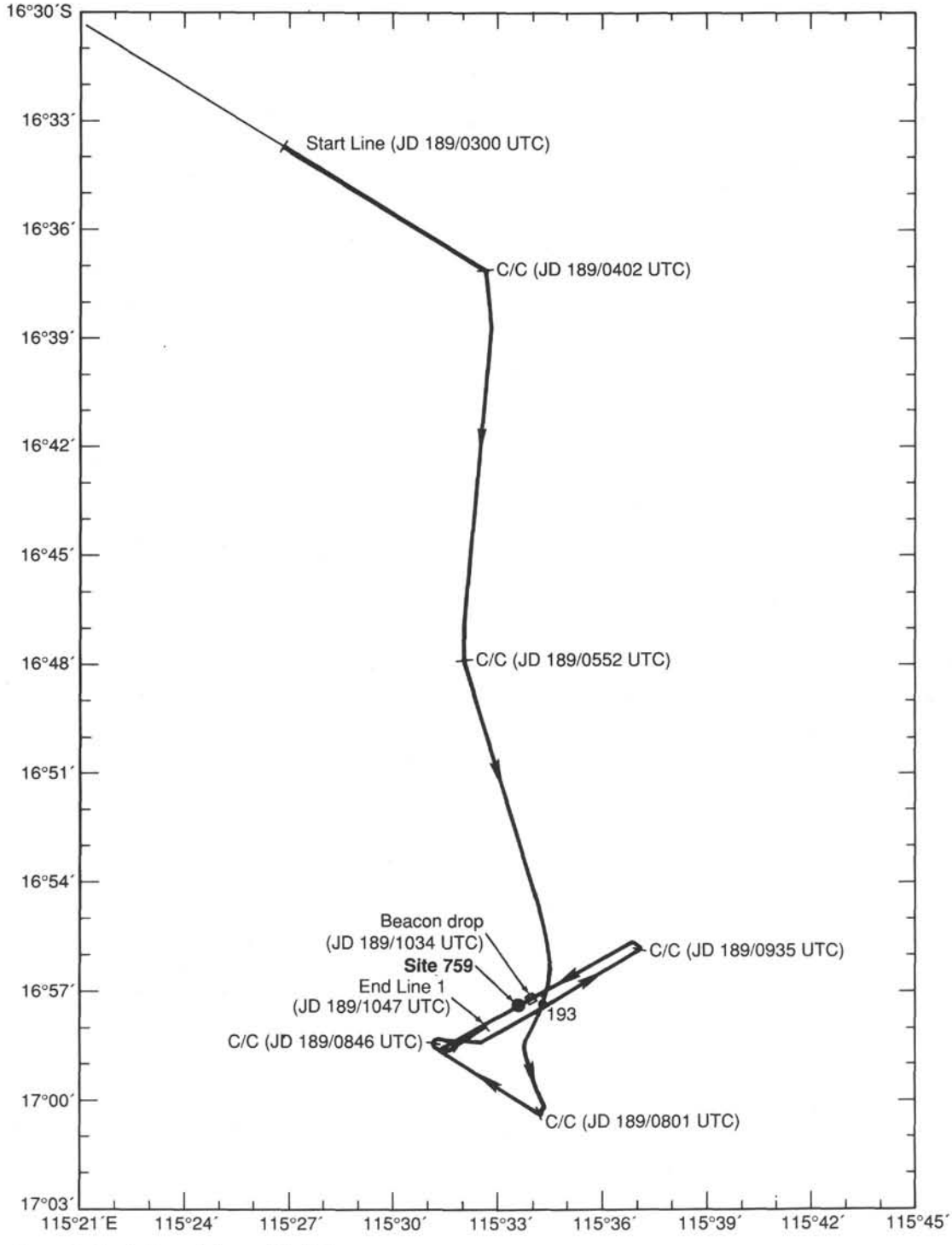

Figure 2. Navigation plot near Site 759.

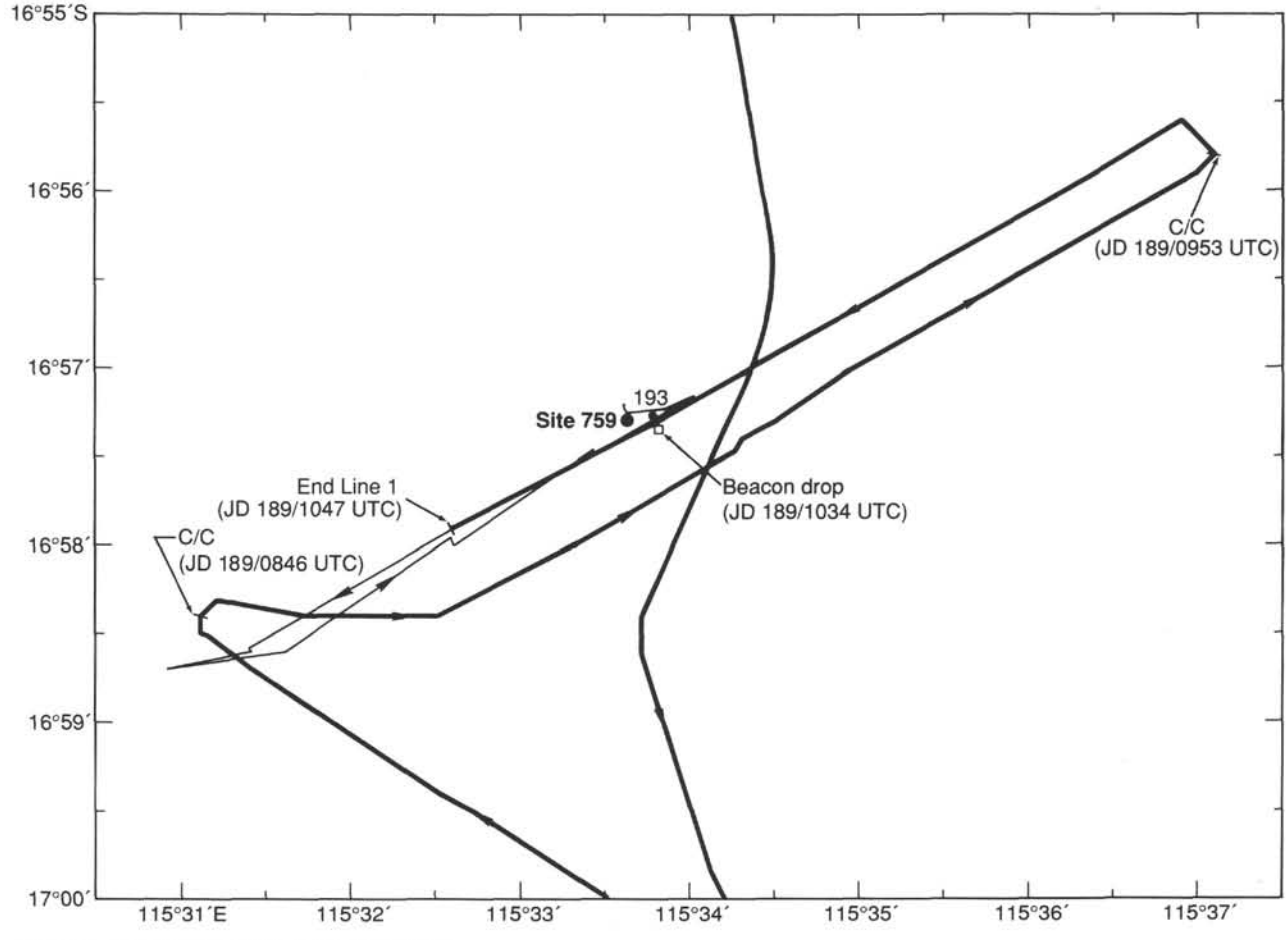

Figure 3. Enlarged navigation plot of Site 759.

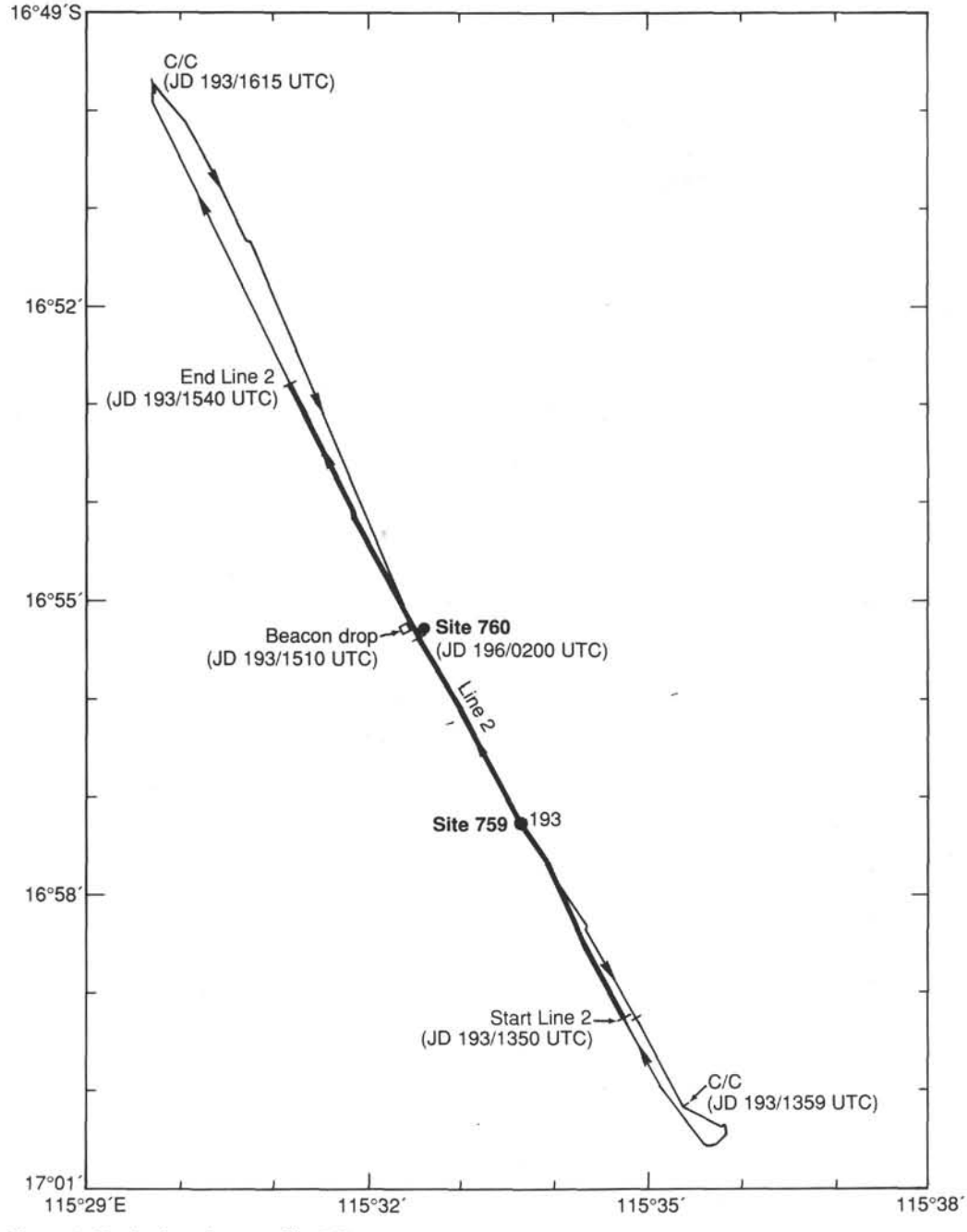

Figure 4. Navigation plot near Site 760.

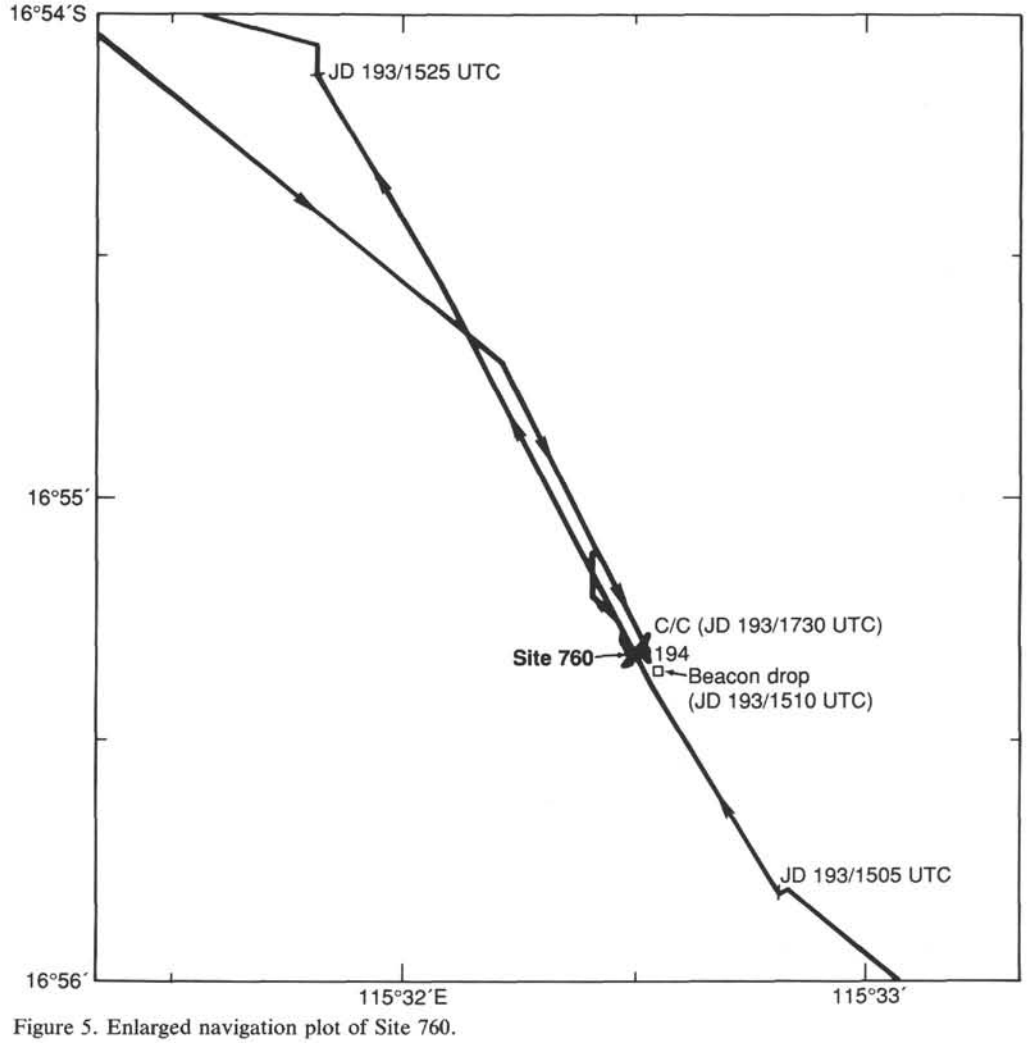

Figure 5. Enlarged navigation plot of Site 760.

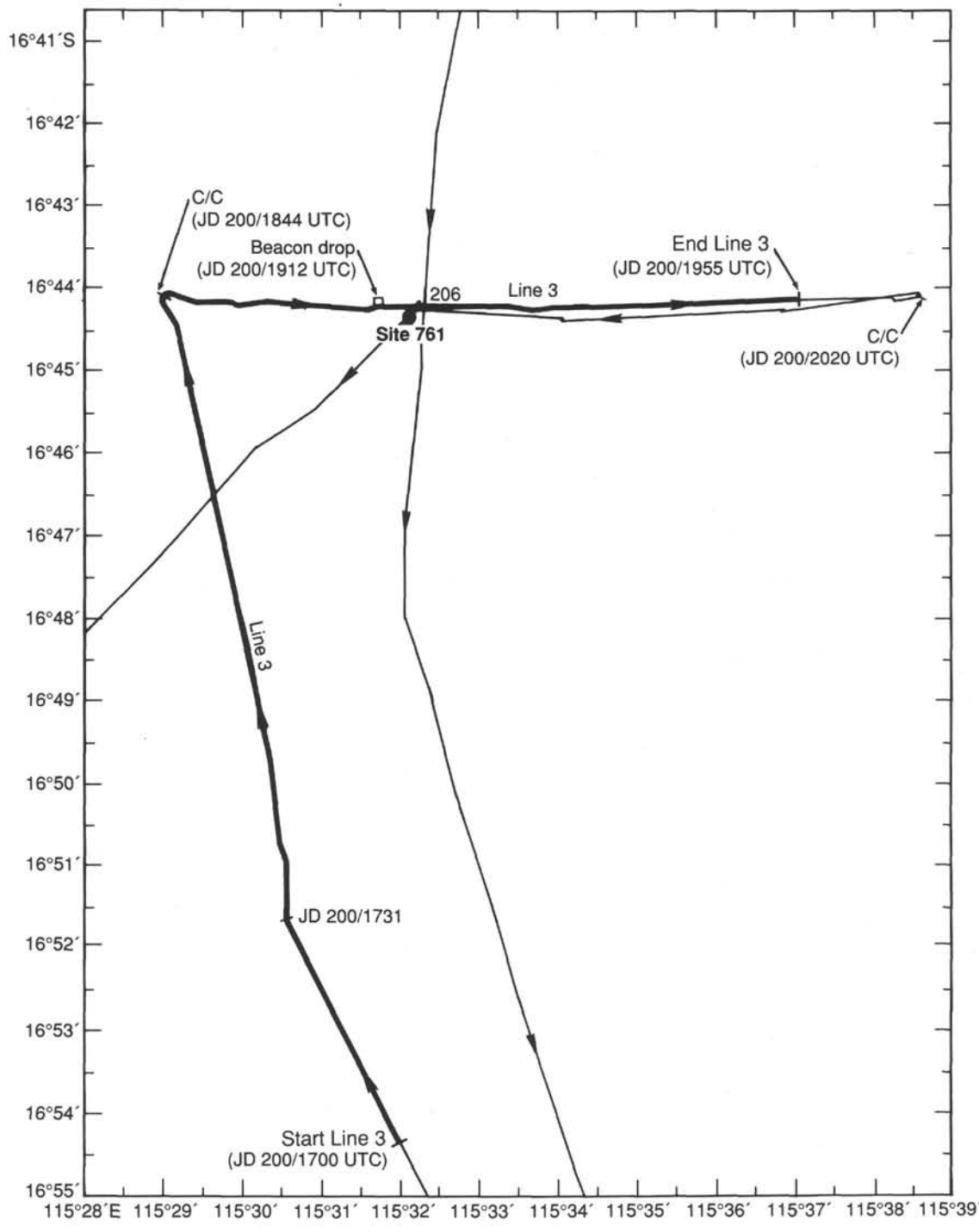

Figure 6. Navigation plot near Site 761.

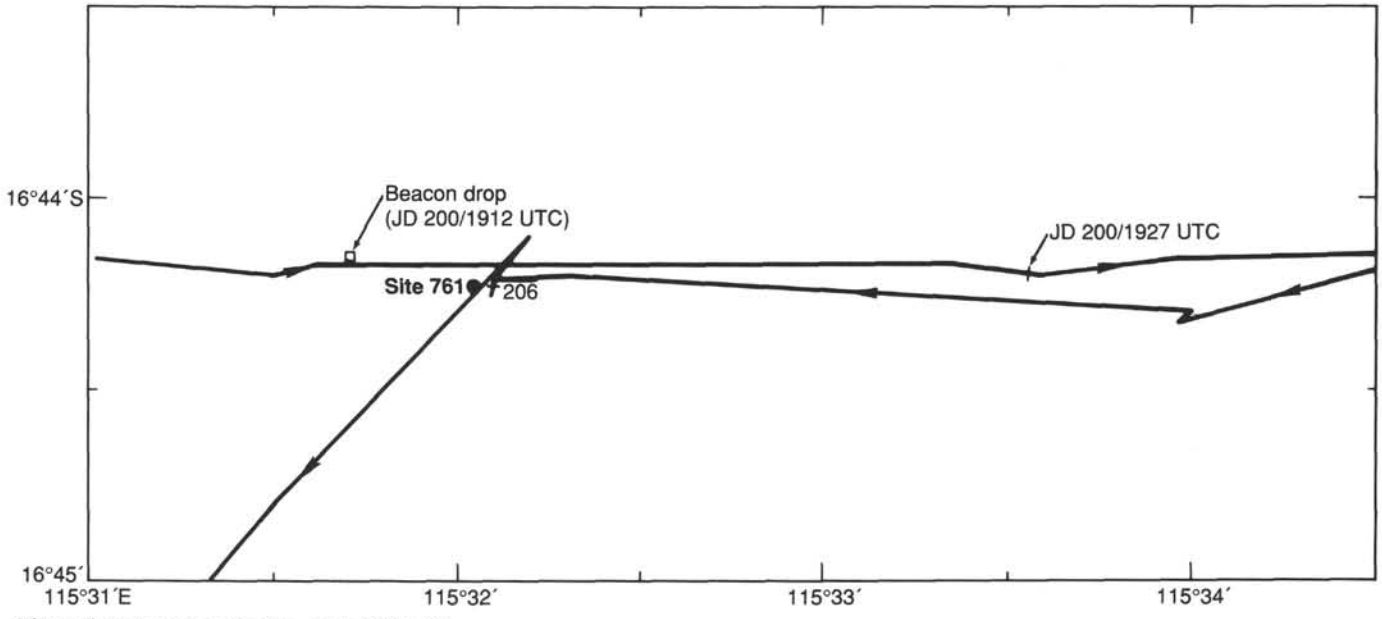

Figure 7. Enlarged navigation plot of Site 761.

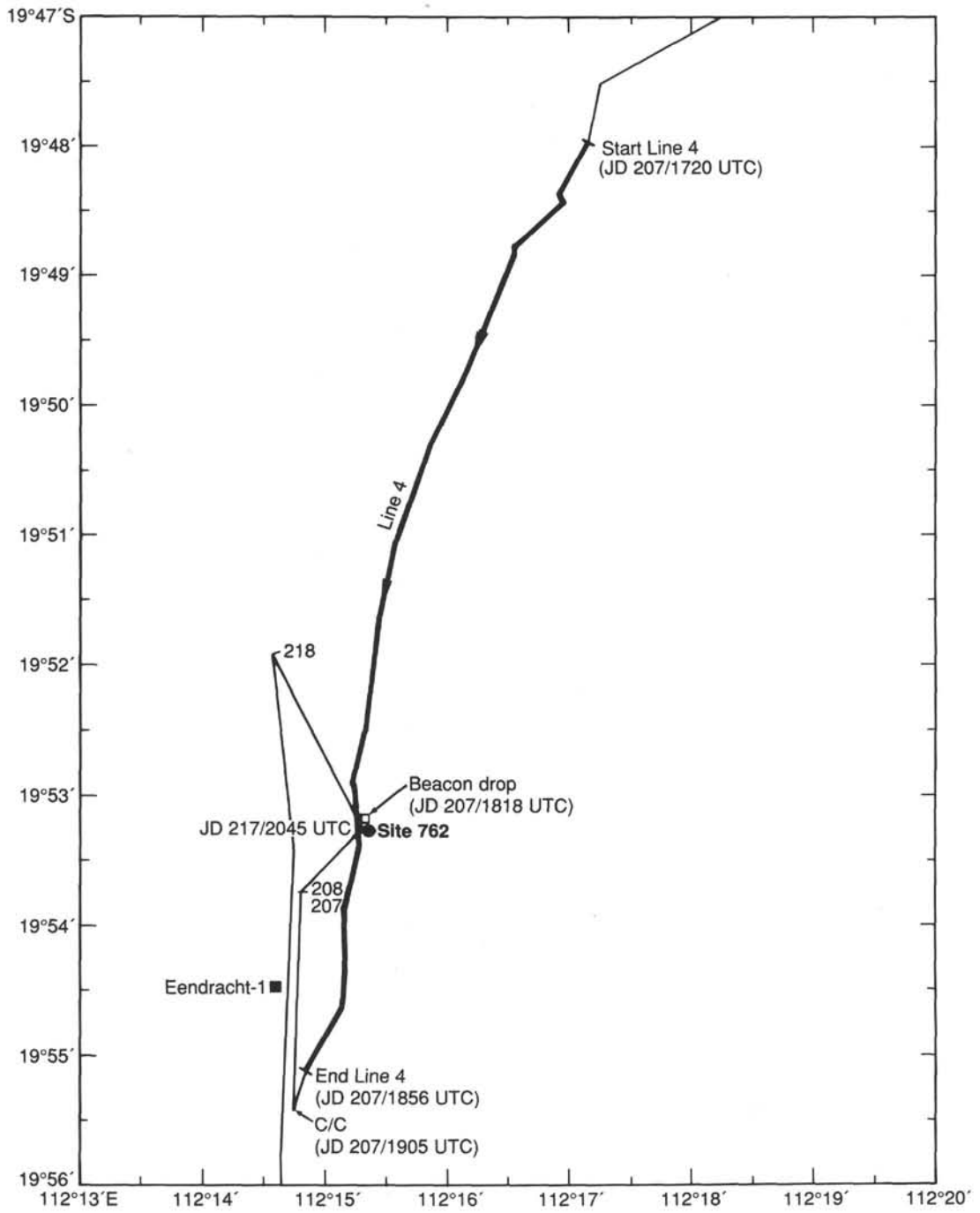

Figure 8. Enlarged navigation plot near Site 762.

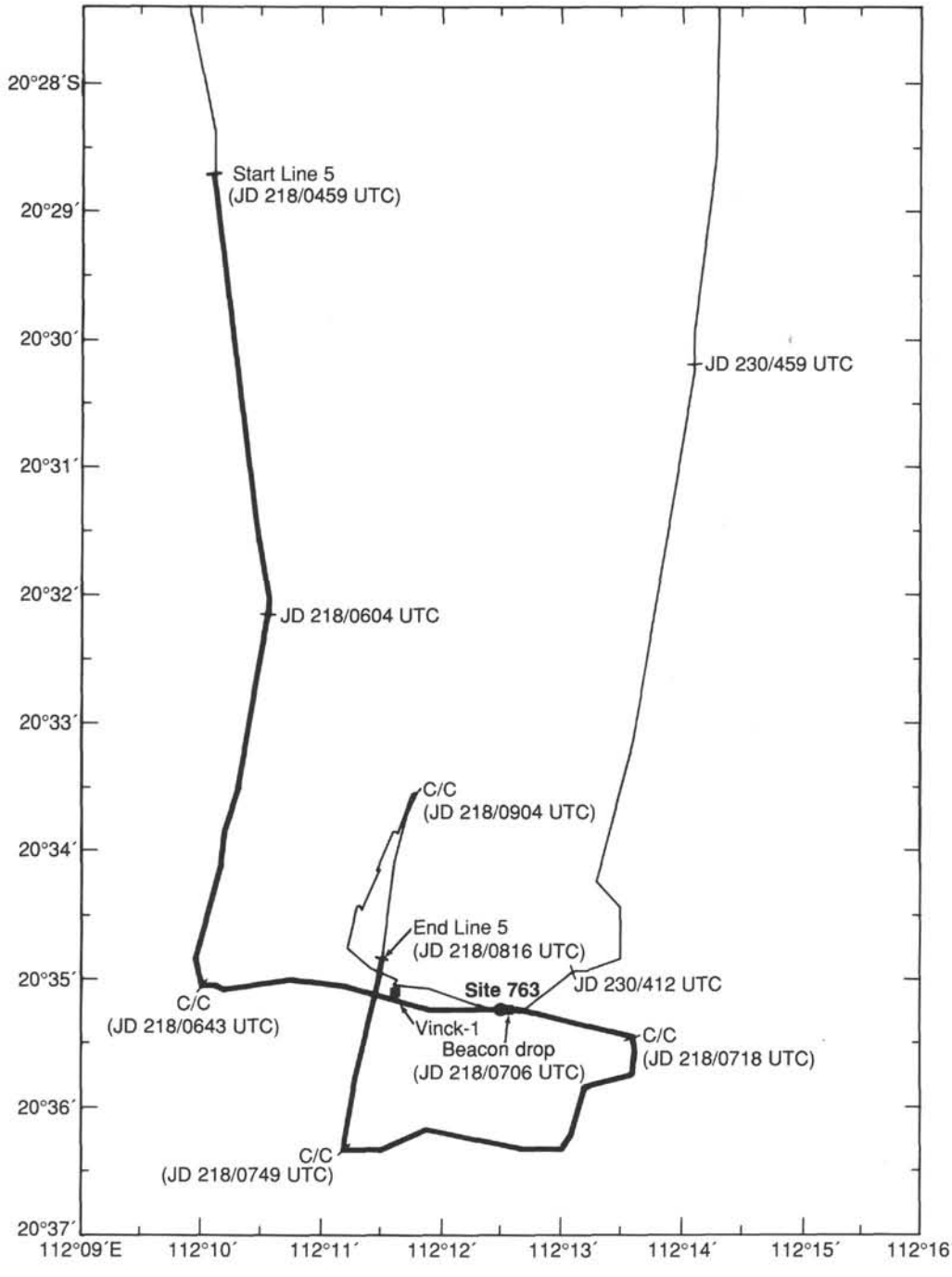

Figure 9. Enlarged navigation plot near Site 763.

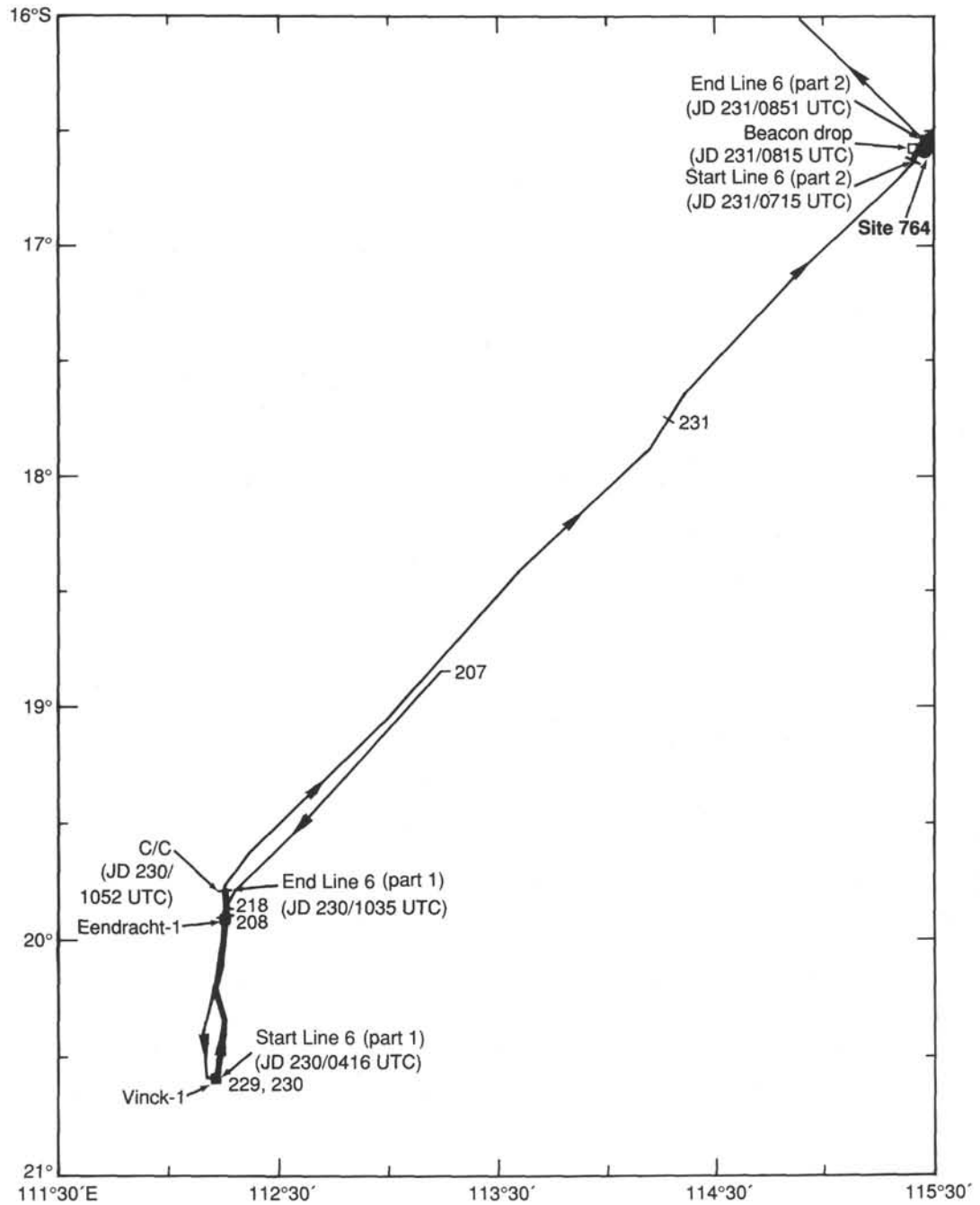

Figure 10. Navigation plot from Site 763 to Site 764.

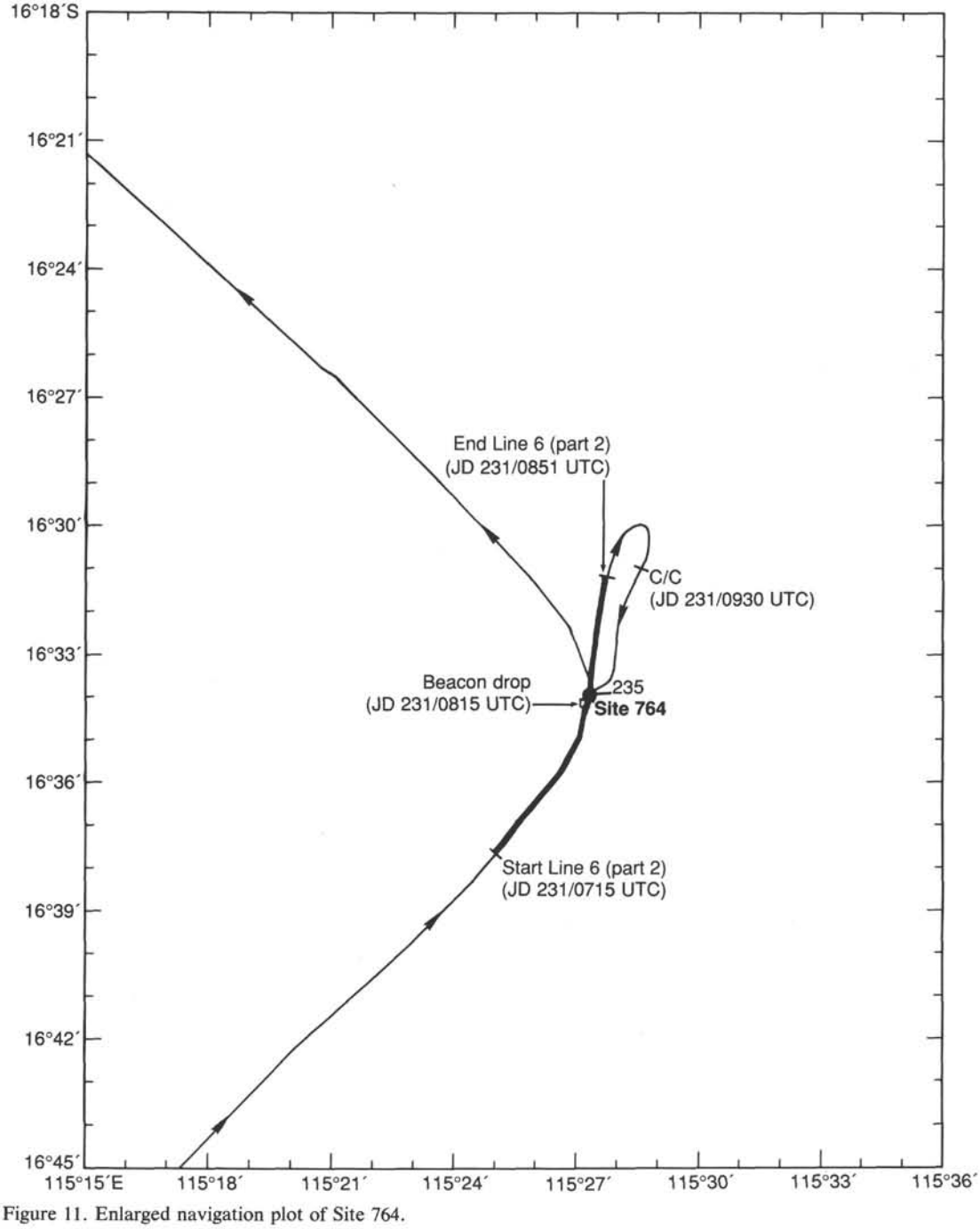

Figure 11. Enlarged navigation plot of Site 764.

Table 1. Summary of underway geophysical data collected during Leg 122.

Line number	Seismic line start time	Seismic line end time	Site number	Beacon time	Sonobuoy number	Sonobuoy time	Data collected[a]
1	188/0430	189/0205	—	—	—	—	B,M
1	189/0205	189/0300	—	—	—	—	S,B,M
1	189/0300	190/0420	[b]764	—	—	—	S,B,M
1	189/0420	189/0550	[b]761	—	—	—	S,B,M
1	189/0550	189/1047	759	189/1034	—	—	S,B,M
2	193/1400	193/1665	760	193/1510	1	193/1415	S,So,B,M
3	200/1700	200/1850	761	—	2	193/1914	S,So,B,M
3	200/1850	200/2005	761	200/1912	3	193/1922	S,So,B,M
4	206/1805	207/1705	—	—	—	—	S,B,M
4	207/1705	207/1905	762	207/1818	4	207/1805	S,So,B,M
5	218/0050	218/0430	—	—	—	—	S,B,M
5	218/0430	218/0750	763	208/0706	—	—	S,B,M
5	218/0750	218/0830	—	—	—	—	S,B,M
6	230/0400	230/1512	763	—	5	230/0427	S,So,B,M
6	230/1512	231/0705	—	—	—	—	S,B,M
6	231/0705	231/0851	764	230/0815	6	230/0805	S,So,B,M

Note: All times are given in Julian day/UTC.
[a] Key to data type: B = bathymetry; M = total field magnetic data; S = seismic reflection data; So = sonobuoy data.
[b] Site survey lines collected during Leg 122 while in transit to Site 759.

Table 2. Parameters for collection and display of underway geophysical data for Leg 122.

Seismic Reflection Acquisition
  Source: two 80-in^3 water guns
  Shot rate: 12 s
Seismic Paper Records
  Raytheon 1: sweep = 5 s
  Raytheon 2: sweep = 2.5 s for seismic reflection
  sweep = 5 s for sonobuoy
Records on Magnetic Tape
  Seismic reflection: 5 s records
  Magnetics: 0 s (header only)
  Recording rate: 12 s for seismic reflection
  60 s for magnetics
  Channels recorded: 1 for seismic reflection only
  2 for seismic reflection and sonobuoy
  Filters: 25–250 Hz
  Tape density: 1600 BPI
  Format: SEG Y

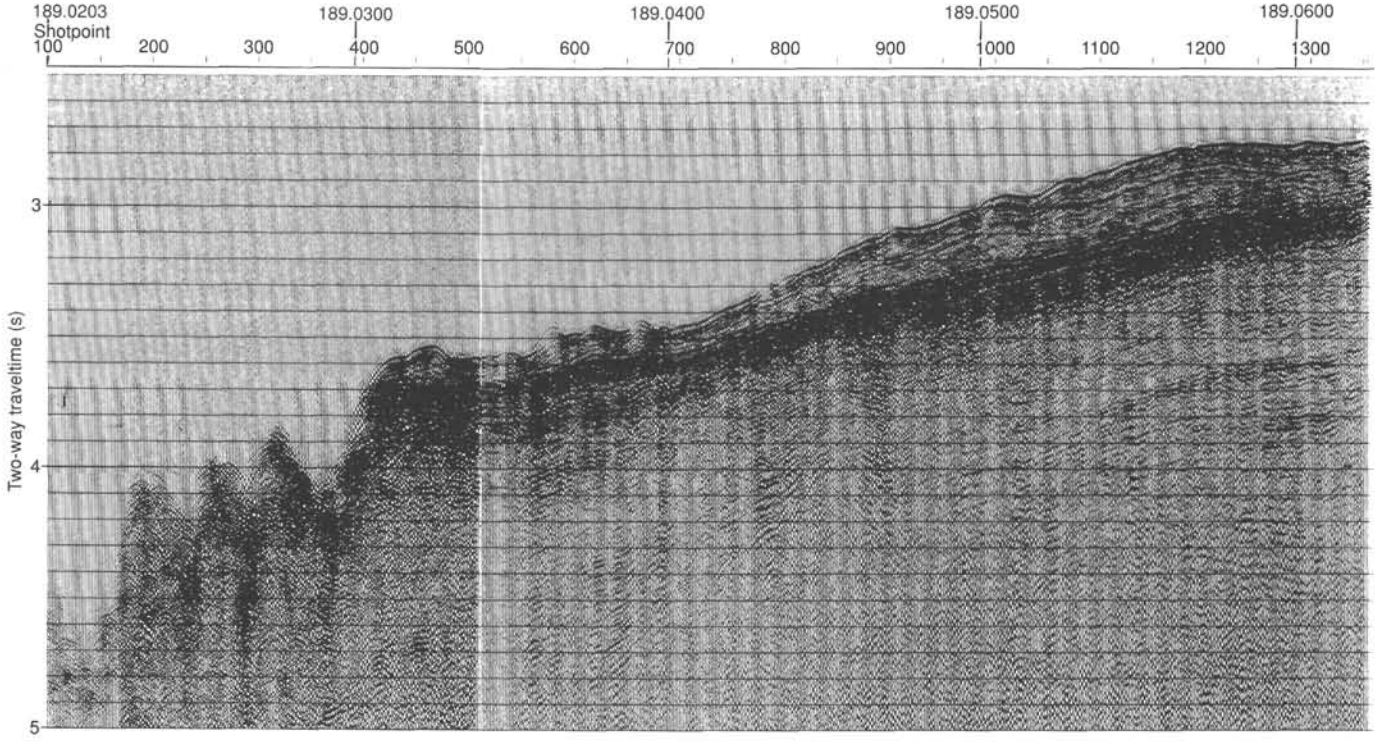

Figure 12. Seismic line 122-1 (part 1) collected during Leg 122. Location is shown in Figure 2.

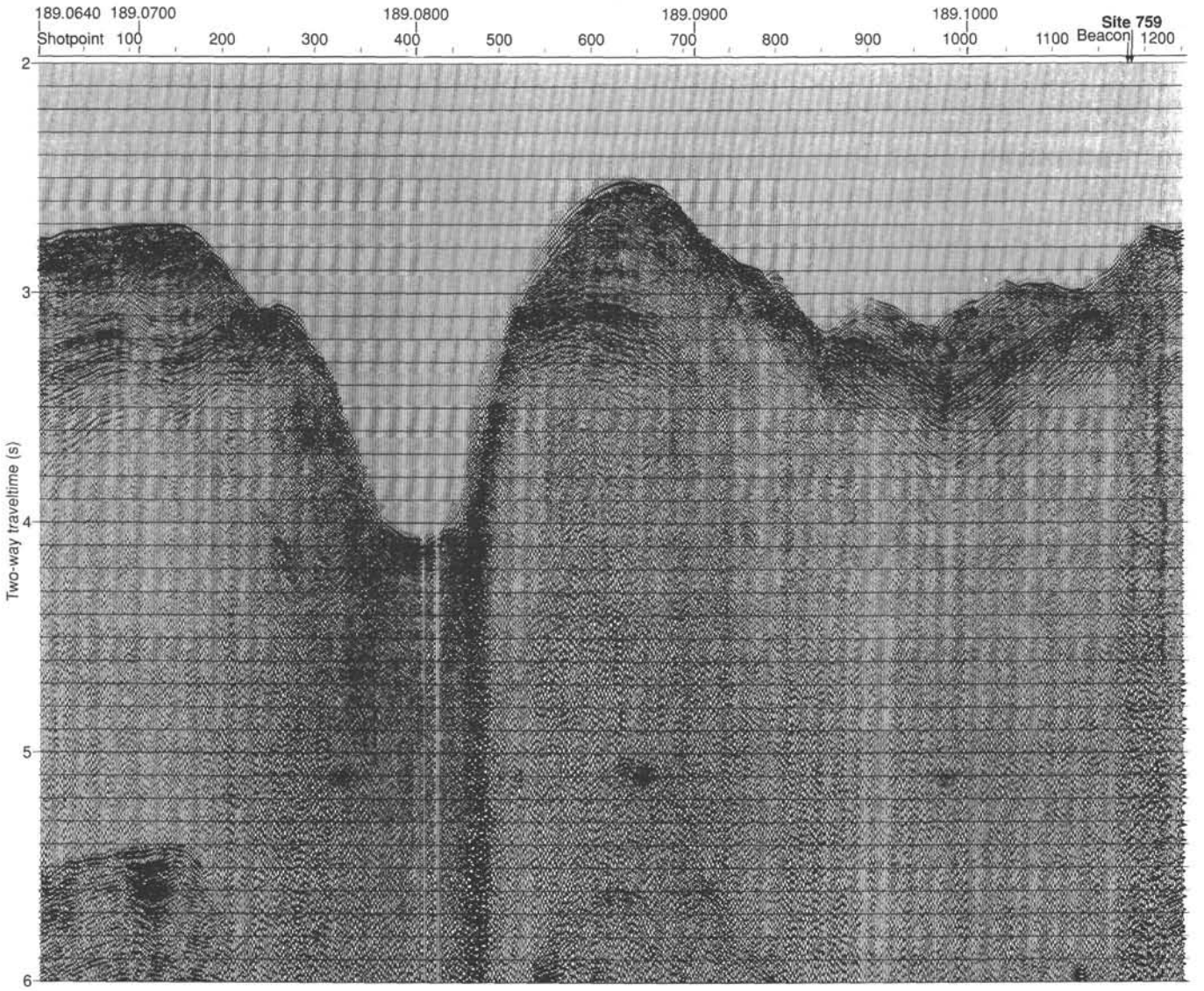

Figure 13. Seismic line 122-1 (part 2) collected during Leg 122, and including the site survey for Site 759. Location is shown in Figures 2 and 3.

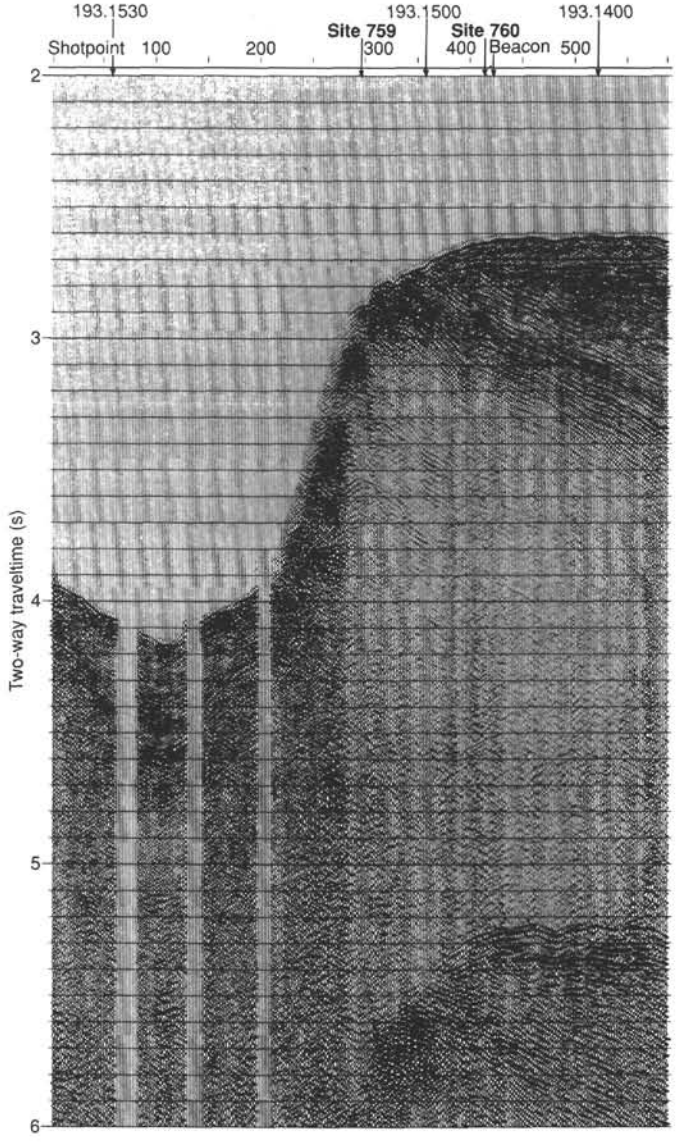

Figure 14. Seismic line 122-2 collected during Leg 122 as site survey line for Site 760. Location is shown in Figure 4.

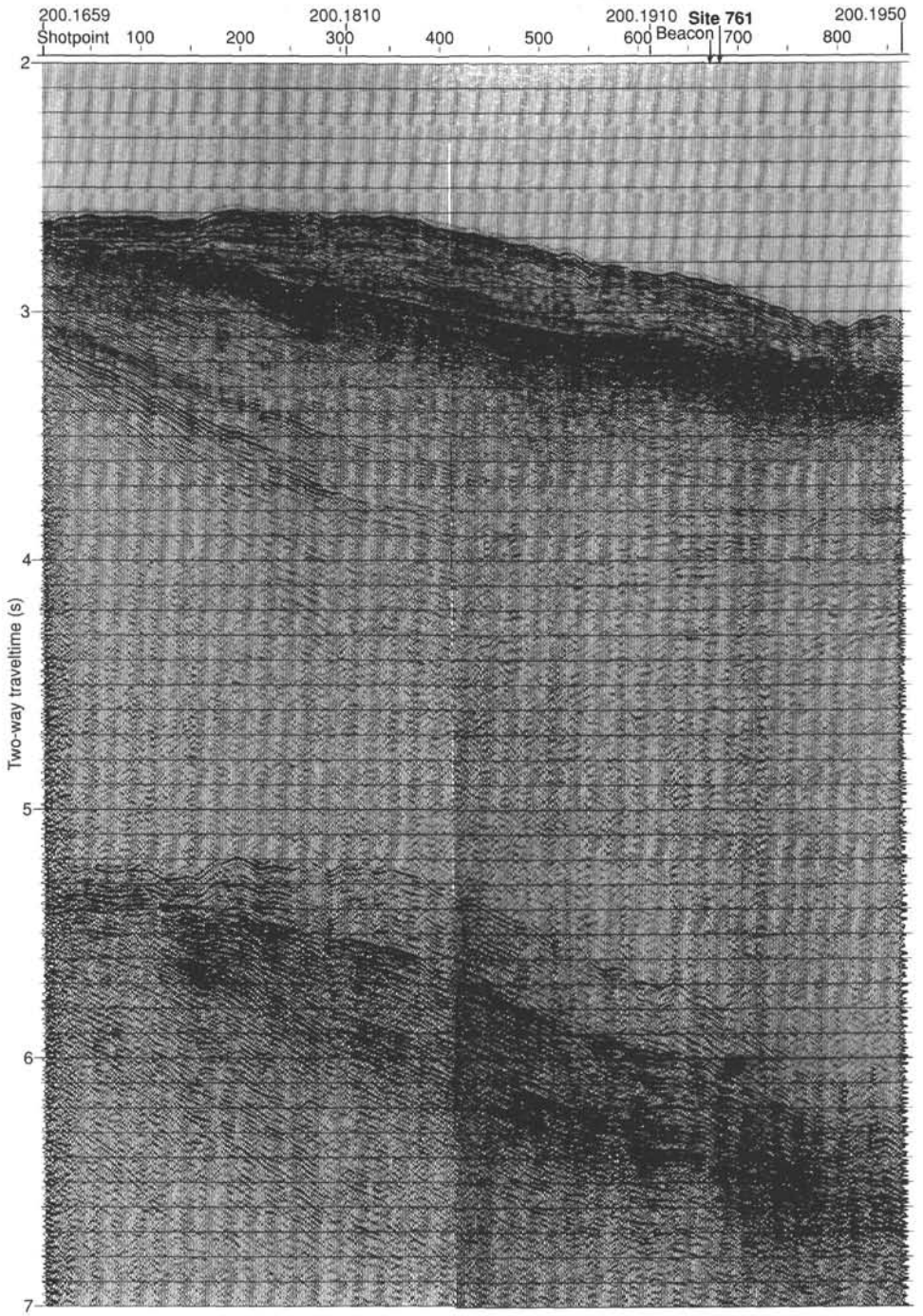

Figure 15. Seismic line 122-3 collected during Leg 122 as site survey line for Site 761. Location is shown in Figures 6 and 7.

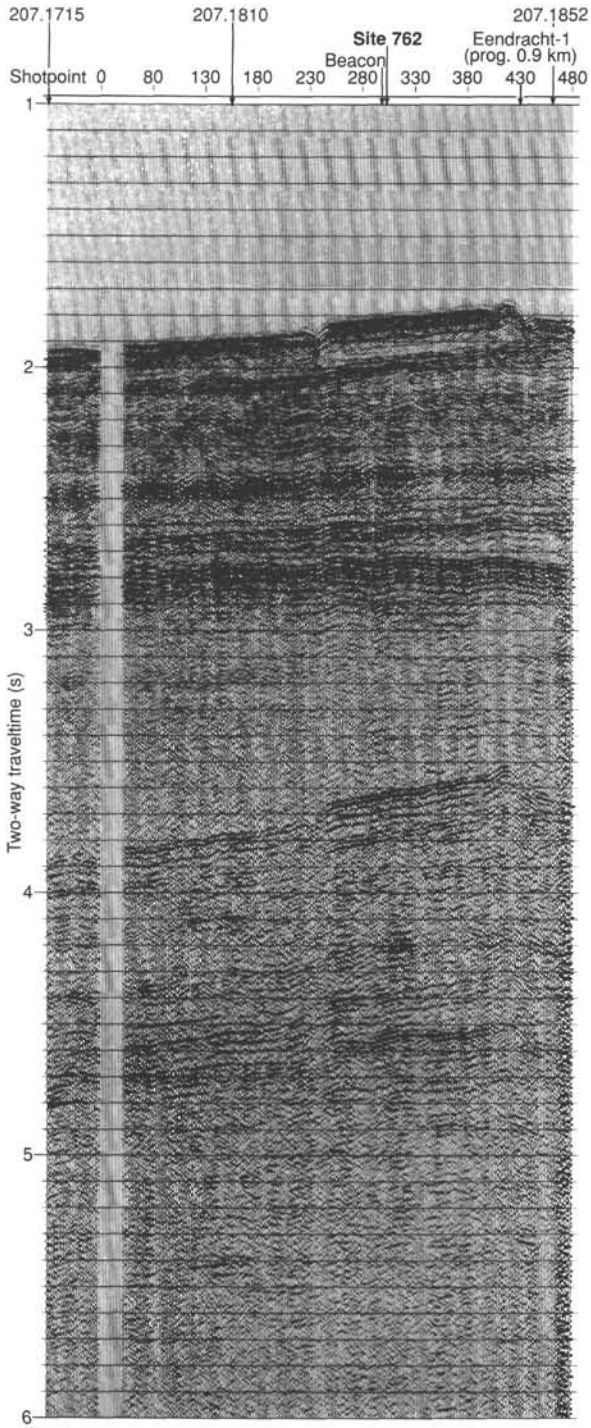

Figure 16. Seismic line 122-4 collected during Leg 122 as site survey line for Site 762. Location is shown in Figure 8.

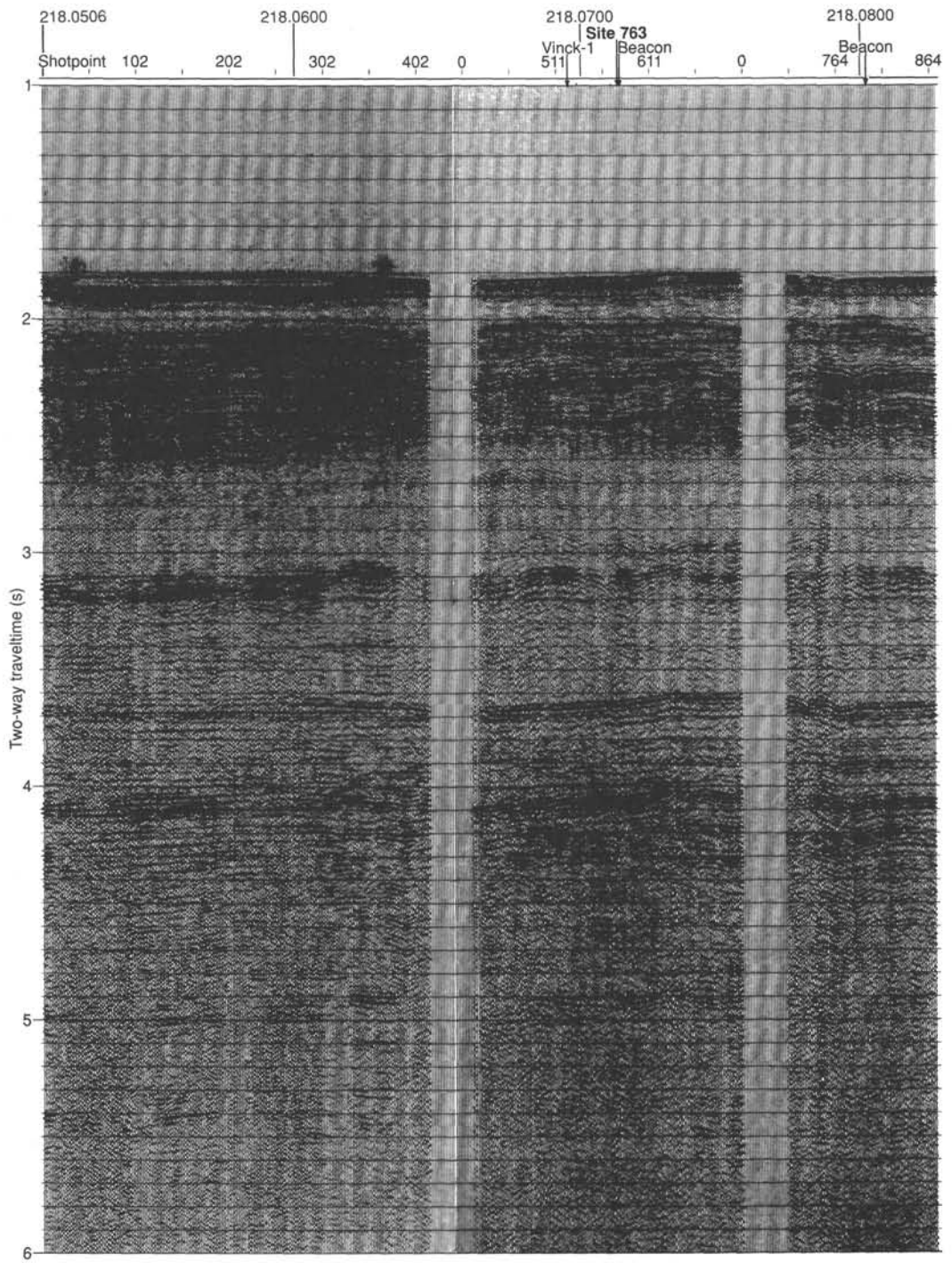

Figure 17. Seismic line 122-5 collected during Leg 122 as site survey line for Site 763. Location is shown in Figure 9.

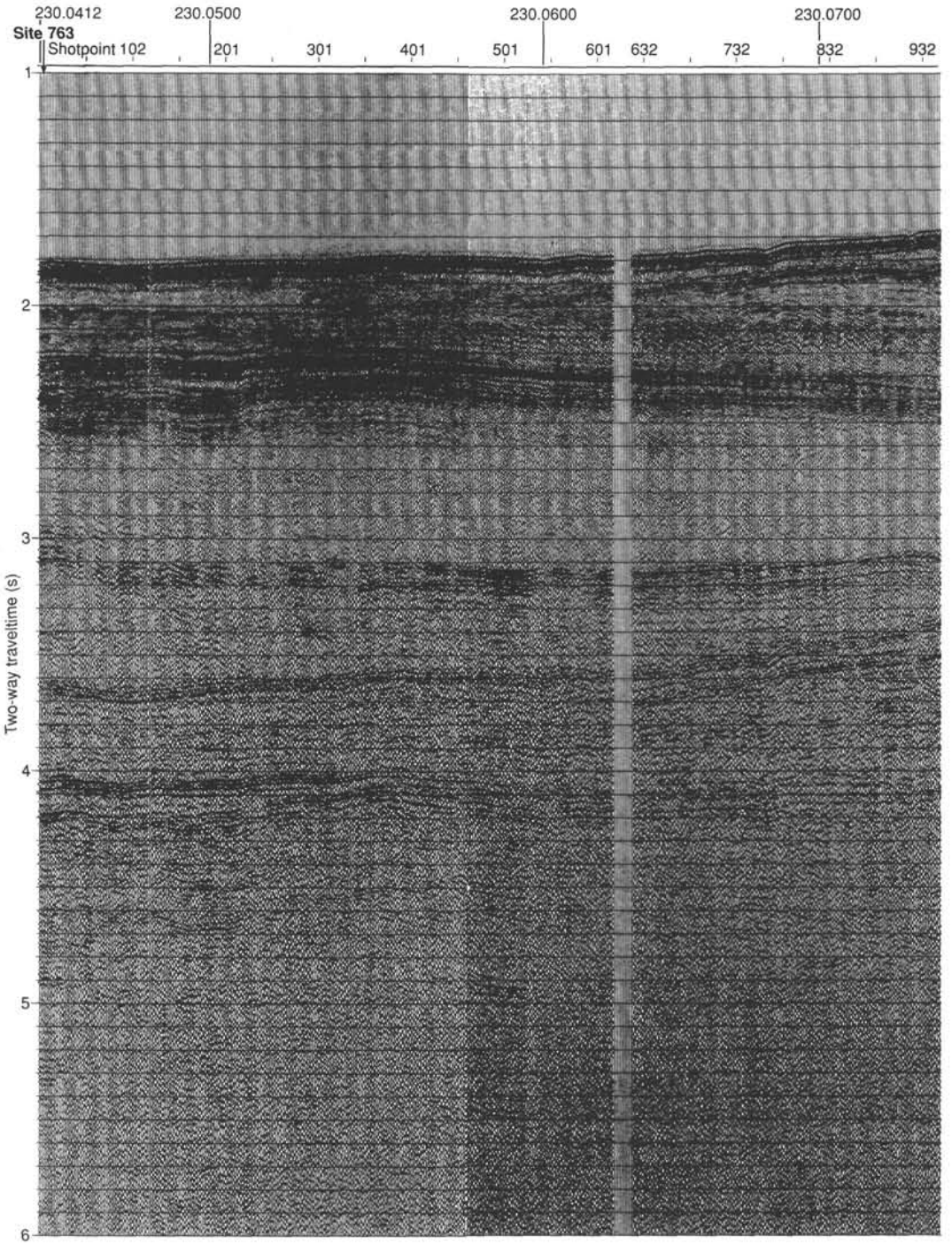

Figure 18. Seismic line 122-6 (part 1) collected during Leg 122 tying Sites 762 and 763. Location is shown in Figure 10.

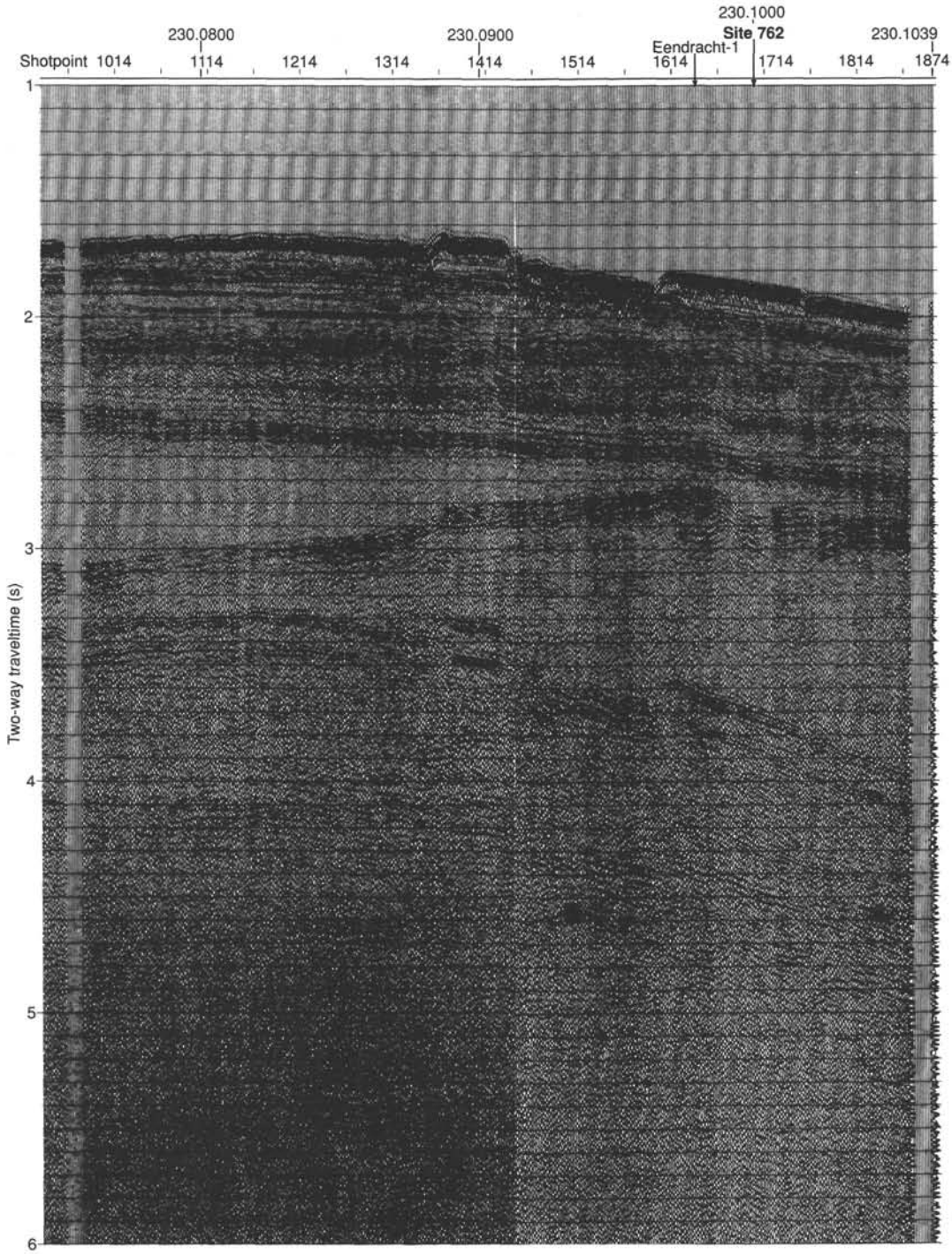

Figure 18 (continued).

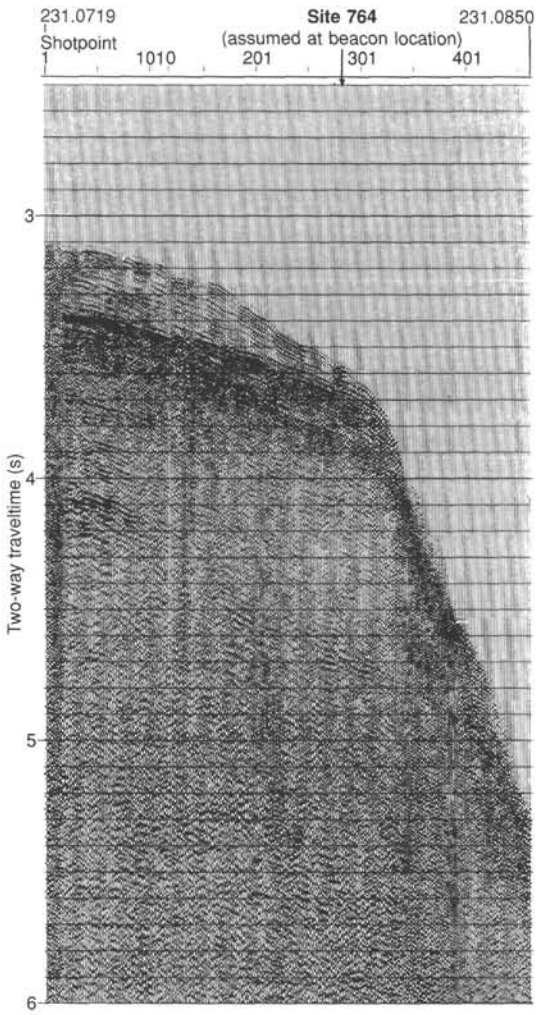

Figure 19. Seismic line 122-6 (part 2) collected during Leg 122 as a site survey line for Site 764. Location is shown in Figure 11.

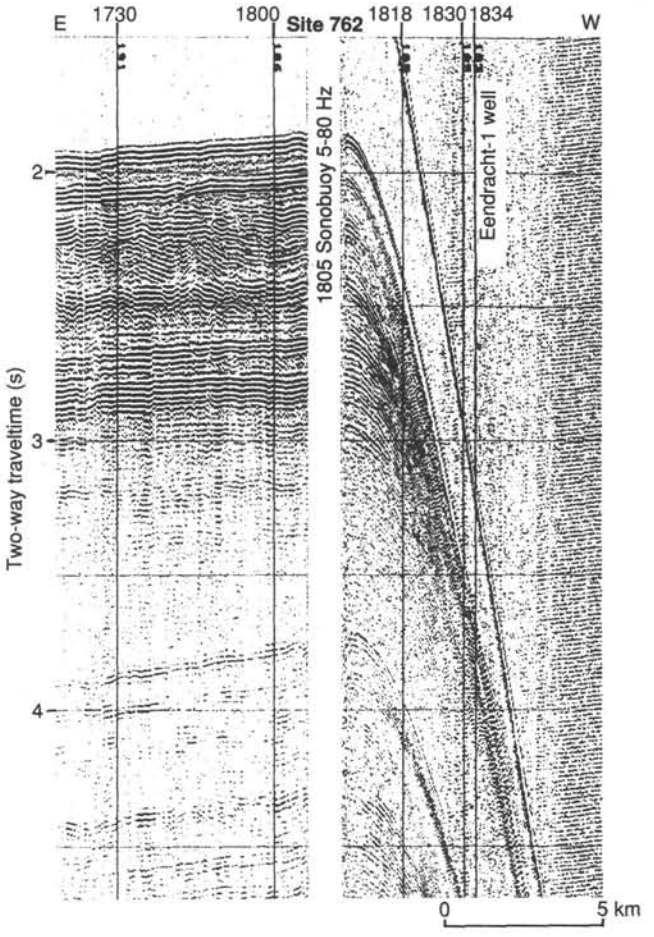

Figure 20. Sonobuoy #4 near Site 762.

Table 3. Details of collection and display of sonobuoy data for Leg 122.

Sonobuoy	Line	Site	Channel	Geophone depth (m)	Maximum offset (km)	Filter (Hz)
1	2	760	14	27	9	20–200
2	3	761	2	2?	2	20–100
3	3	761	3	27	6	5–50
4	4	762	4	27	8	5–80
5	6	763	2	27	12	10–80
6	6	764	3	2?	7	10–80

Note: Record length = 5 s; filter setting for magnetic tape recording = 25–250 Hz.

APPENDIX

Summary of navigation for Leg 122 showing satellite fixes, and course- and speed-change data used to generate trackline plots shown in Figures 1 through 11.

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
2 July	184	1030	−1	17.84	104	15.42	0.0	11.2	92	GF
2	184	1048	−1	17.70	104	18.80	3.4	11.6	93	c/cs
2	184	1051	−1	17.70	104	19.40	4.0	11.1	96	c/cs
2	184	1054	−1	17.70	104	19.90	4.5	11.3	107	c/cs
2	184	1100	−1	17.33	104	21.00	5.6	12.4	104	GF
2	184	1106	−1	17.03	104	22.20	6.9	11.2	106	GF
2	184	1112	−1	16.70	104	23.30	8.0	11.8	106	c/cs
2	184	1118	−1	16.40	104	24.40	9.2	11.0	87	c/cs
2	184	1121	−1	16.40	104	25.00	9.7	11.7	83	c/cs
2	184	1127	−1	16.60	104	26.10	10.9	11.4	89	c/cs
2	184	1130	−1	16.59	104	26.70	11.5	11.9	91	GF
2	184	1130	−1	16.60	104	26.70	11.5	12.0	85	c/cs
2	184	1136	−1	16.69	104	27.90	12.7	11.5	84	GF
2	184	1142	−1	16.80	104	29.00	13.8	11.7	84	c/cs
2	184	1154	−1	17.10	104	31.40	16.2	11.6	83	c/cs
2	184	1200	−1	17.23	104	32.52	17.3	12.2	81	GF
2	184	1209	−1	17.50	104	34.30	19.1	12.2	81	c/cs
2	184	1215	−1	17.70	104	35.50	20.4	12.2	87	c/cs
2	184	1227	−1	17.80	104	38.00	22.8	12.2	88	c/cs
2	184	1230	−1	17.84	104	38.58	23.4	12.8	90	GF
2	184	1233	−1	17.80	104	39.20	24.1	11.9	115	c/cs
2	184	1236	−1	17.60	104	39.80	24.6	11.9	129	c/cs
2	184	1242	−1	16.80	104	40.70	25.8	12.7	130	c/cs
2	184	1300	−1	14.39	104	43.62	29.7	13.5	130	GF
2	184	1309	−1	13.10	104	45.20	31.7	12.2	159	c/cs
2	184	1312	−1	12.50	104	45.40	32.3	12.8	129	c/cs
2	184	1315	−1	12.10	104	45.90	32.9	13.5	131	c/cs
2	184	1321	−1	11.23	104	46.92	34.3	12.6	132	SF
2	184	1327	−1	10.40	104	47.90	35.6	12.6	128	c/cs
2	184	1330	−1	10.00	104	48.36	36.2	13.1	128	GF
2	184	1336	−1	9.20	104	49.40	37.5	13.2	131	c/cs
2	184	1342	−1	8.30	104	50.40	38.8	13.2	130	c/cs
2	184	1432	−1	1.20	104	58.80	49.8	13.4	130	GF
2	184	1500	0	57.20	105	3.60	56.1	13.3	129	GF
2	184	1730	0	36.40	105	29.70	89.5	13.2	126	GF
2	184	1800	0	32.50	105	35.00	96.0	13.0	126	GF
2	184	1900	0	24.90	105	45.60	109.1	10.2	126	GF
2	184	2346	0	−3.60	106	24.80	157.6	13.6	129	SF
3	185	1300	1	57.00	108	44.50	337.5	12.2	128	GF
3	185	1300	1	57.00	108	44.50	337.5	12.1	138	c/cs
3	185	1400	2	6.00	108	52.60	349.6	13.0	138	GF
3	185	1500	2	15.70	109	1.30	362.6	13.1	138	GF
3	185	1700	2	35.20	109	18.70	388.7	13.0	143	GF
3	185	1700	2	35.20	109	18.70	388.7	13.0	141	c/cs
3	185	1800	2	45.30	109	26.90	401.7	13.4	138	GF
3	185	1800	2	45.30	109	26.90	401.7	13.4	142	c/cs
3	185	1900	2	55.80	109	35.20	415.1	13.5	146	GF
3	185	2256	3	39.90	110	5.00	468.3	12.3	125	GF
4	186	1130	5	9.40	112	11.50	623.0	11.5	141	GF
4	186	1130	5	9.40	112	11.50	623.0	11.6	125	c/cs
4	186	1200	5	12.70	112	16.30	628.8	12.1	127	GF
4	186	1330	5	23.50	112	30.90	646.9	12.4	125	GF
4	186	1430	5	30.60	112	41.10	659.3	12.4	124	GF
4	186	1600	5	41.10	112	56.50	677.8	12.6	125	GF
4	186	1800	5	55.50	113	17.20	703.0	12.5	124	GF
4	186	1958	6	9.30	113	37.60	727.5	12.1	126	SF
4	186	2230	6	27.10	114	2.60	758.1	11.9	126	SF
4	186	2322	6	33.20	114	11.00	768.4	11.8	125	SF
5	187	0020	6	39.70	114	20.40	779.8	11.8	128	SF
5	187	0108	6	45.50	114	27.90	789.2	12.3	147	SF
5	187	1130	8	32.10	115	37.50	916.2	12.3	147	c/cs
5	187	1230	8	42.40	115	44.20	928.4	17.4	150	GF
5	187	1230	8	42.40	115	44.20	928.4	20.0	179	c/cs
5	187	1300	8	52.40	115	44.40	938.4	15.1	179	GF
5	187	1400	9	7.50	115	44.60	953.6	12.6	176	GF
5	187	1400	9	7.50	115	44.60	953.6	12.6	179	c/cs
5	187	1500	9	20.10	115	44.90	966.2	13.3	188	GF
5	187	1600	9	33.30	115	43.10	979.5	12.5	178	GF
5	187	1600	9	33.30	115	43.10	979.5	12.5	181	c/cs
5	187	1700	9	45.80	115	42.90	992.0	12.7	183	GF
5	187	1700	9	45.80	115	42.90	992.0	12.7	180	c/cs
5	187	1800	9	58.50	115	42.80	1004.7	13.1	182	GF
5	187	1900	10	11.60	115	42.30	1017.8	11.8	182	GF

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
5	187	2000	10	23.40	115	41.80	1029.6	13.3	179	GF
5	187	2000	10	23.40	115	41.80	1029.6	13.3	182	c/cs
5	187	2206	10	51.30	115	40.90	1057.5	12.4	185	GF
5	187	2354	11	13.60	115	38.90	1079.9	12.6	180	SF
6	188	0430	12	11.78	115	39.18	1138.1	12.5	185	SF
6	188	0557	12	29.90	115	37.70	1156.2	12.8	190	c/cs
6	188	0606	12	31.70	115	37.40	1158.1	12.4	191	c/cs
6	188	0623	12	35.20	115	36.70	1161.6	12.6	190	c/cs
6	188	0632	12	37.00	115	36.30	1163.5	12.7	190	c/cs
6	188	0647	12	40.20	115	35.80	1166.7	12.8	190	c/cs
6	188	0656	12	42.00	115	35.40	1168.6	12.8	190	c/cs
6	188	0725	12	48.10	115	34.30	1174.8	12.5	190	c/cs
6	188	0731	12	49.40	115	34.00	1176.0	12.7	190	c/cs
6	188	0755	12	54.40	115	33.10	1181.1	12.3	191	c/cs
6	188	0801	12	55.60	115	32.90	1182.4	12.7	190	c/cs
6	188	0810	12	57.50	115	32.50	1184.3	12.4	191	c/cs
6	188	0818	12	59.08	115	32.20	1185.9	12.3	186	SF
6	188	0831	13	1.70	115	31.90	1188.6	12.4	186	c/cs
6	188	0846	13	4.80	115	31.60	1191.7	12.5	186	c/cs
6	188	0858	13	7.30	115	31.30	1194.2	12.2	186	c/cs
6	188	0916	13	10.90	115	30.90	1197.8	12.3	186	c/cs
6	188	0925	13	12.80	115	30.70	1199.7	12.5	186	c/cs
6	188	1000	13	20.00	115	29.90	1207.0	12.4	186	SF
6	188	1001	13	20.20	115	29.90	1207.2	12.6	186	c/cs
6	188	1007	13	21.50	115	29.80	1208.4	12.3	186	c/cs
6	188	1031	13	26.40	115	29.30	1213.3	12.3	185	c/cs
6	188	1046	13	29.40	115	29.00	1216.4	12.4	185	c/cs
6	188	1113	13	35.00	115	28.50	1222.0	12.2	185	c/cs
6	188	1134	13	39.20	115	28.20	1226.3	12.3	185	c/cs
6	188	1149	13	42.30	115	27.90	1229.3	12.1	185	c/cs
6	188	1150	13	42.50	115	27.90	1229.5	12.6	183	SF
6	188	1204	13	45.40	115	27.70	1232.5	12.7	183	c/cs
6	188	1230	13	50.90	115	27.40	1238.0	13.2	187	GF
6	188	1234	13	51.80	115	27.30	1238.8	13.1	188	c/cs
6	188	1251	13	55.50	115	26.80	1242.6	13.0	189	c/cs
6	188	1300	13	57.40	115	26.49	1244.5	12.6	183	GF
6	188	1301	13	57.60	115	26.50	1244.7	12.9	182	c/cs
6	188	1313	14	0.20	115	26.40	1247.3	12.8	181	c/cs
6	188	1349	14	7.90	115	26.20	1255.0	12.7	181	c/cs
6	188	1400	14	10.20	115	26.20	1257.3	12.7	182	GF
6	188	1413	14	13.00	115	26.10	1260.1	12.7	182	c/cs
6	188	1419	14	14.20	115	26.10	1261.4	12.4	181	c/cs
6	188	1425	14	15.50	115	26.00	1262.6	12.8	182	c/cs
6	188	1443	14	19.30	115	25.90	1266.4	12.7	182	c/cs
6	188	1452	14	21.20	115	25.80	1268.3	12.7	182	c/cs
6	188	1500	14	22.90	115	25.80	1270.0	12.6	182	GF
6	188	1519	14	26.90	115	25.70	1274.0	12.5	183	c/cs
6	188	1525	14	28.10	115	25.60	1275.3	12.2	182	c/cs
6	188	1534	14	30.00	115	25.60	1277.1	12.7	182	c/cs
6	188	1552	14	33.80	115	25.50	1280.9	13.0	182	c/cs
6	188	1600	14	35.50	115	25.40	1282.6	12.1	183	GF
6	188	1616	14	38.70	115	25.30	1285.9	11.8	184	c/cs
6	188	1628	14	41.10	115	25.10	1288.2	12.3	183	c/cs
6	188	1637	14	42.90	115	25.00	1290.1	12.1	183	c/cs
6	188	1649	14	45.30	115	24.90	1292.5	11.7	182	c/cs
6	188	1700	14	47.48	115	24.81	1294.6	12.4	182	GF
6	188	1701	14	47.70	115	24.80	1294.8	12.9	183	c/cs
6	188	1719	14	51.60	115	24.60	1298.7	12.8	185	c/cs
6	188	1725	14	52.80	115	24.50	1300.0	12.7	185	c/cs
6	188	1737	14	55.40	115	24.30	1302.5	12.9	185	c/cs
6	188	1800	15	0.30	115	23.90	1307.5	12.1	185	GF
6	188	1813	15	2.90	115	23.70	1310.1	12.0	185	c/cs
6	188	1900	15	12.30	115	22.80	1319.5	12.5	186	GF
6	188	1901	15	12.50	115	22.80	1319.7	12.8	186	c/cs
6	188	1945	15	21.82	115	21.84	1329.1	12.4	185	SF
6	188	1952	15	23.26	115	21.72	1330.5	11.6	184	GF
6	188	2000	15	24.80	115	21.60	1332.1	12.8	185	GF
6	188	2030	15	31.20	115	21.06	1338.5	12.8	185	GF
6	188	2100	15	37.60	115	20.50	1344.9	13.3	186	GF
6	188	2116	15	41.10	115	20.10	1348.5	13.3	186	c/cs
6	188	2132	15	44.68	115	19.74	1352.0	13.3	185	SF
6	188	2140	15	46.40	115	19.60	1353.8	13.4	186	c/cs
6	188	2149	15	48.40	115	19.40	1355.8	13.1	185	c/cs
6	188	2158	15	50.40	115	19.20	1357.8	13.3	185	c/cs
6	188	2213	15	53.70	115	18.90	1361.1	11.8	184	c/cs
6	188	2216	15	54.30	115	18.90	1361.7	13.1	186	c/cs

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
6	188	2225	15	56.30	115	18.70	1363.7	13.1	186	c/cs
6	188	2240	15	59.50	115	18.30	1366.9	13.2	185	c/cs
6	188	2255	16	2.80	115	18.10	1370.2	13.1	185	c/cs
6	188	2310	16	6.10	115	17.80	1373.5	13.4	185	c/cs
6	188	2319	16	8.10	115	17.60	1375.5	13.0	185	c/cs
6	188	2330	16	10.43	115	17.40	1377.9	13.1	181	SN
6	188	2343	16	13.30	115	17.40	1380.7	13.4	181	c/cs
6	188	2358	16	16.60	115	17.30	1384.1	13.2	181	c/cs
6	188	2359	16	16.84	115	17.28	1384.3	12.7	182	SF
7	189	0000	16	17.10	115	17.30	1384.5	12.7	182	c/cs
7	189	0016	16	20.40	115	17.10	1387.9	12.7	182	c/cs
7	189	0031	16	23.60	115	17.00	1391.1	12.8	183	c/cs
7	189	0046	16	26.80	115	16.80	1394.3	12.8	183	c/cs
7	189	0055	16	28.70	115	16.70	1396.2	12.9	183	c/cs
7	189	0110	16	32.00	115	16.60	1399.4	12.2	213	c/cs
7	189	0116	16	33.00	115	15.90	1400.7	11.5	118	c/cs
7	189	0119	16	33.30	115	16.40	1401.2	9.5	91	c/cs
7	189	0122	16	33.30	115	16.90	1401.7	8.0	95	c/cs
7	189	0125	16	33.30	115	17.30	1402.1	6.0	94	c/cs
7	189	0131	16	33.30	115	18.00	1402.7	2.0	105	c/cs
7	189	0143	16	33.50	115	18.40	1403.1	7.0	94	c/cs
7	189	0144	16	33.46	115	18.48	1403.2	6.6	91	SN
7	189	0148	16	33.50	115	18.90	1403.7	3.7	91	c/cs
7	189	0149	16	33.50	115	19.00	1403.7	6.3	91	c/cs
7	189	0153	16	33.50	115	19.40	1404.2	7.2	91	c/cs
7	189	0155	16	33.50	115	19.70	1404.4	9.9	92	c/cs
7	189	0156	16	33.50	115	19.90	1404.6	6.3	92	c/cs
7	189	0200	16	33.50	115	20.30	1405.0	5.8	91	c/cs
7	189	0203	16	33.50	115	20.60	1405.3	6.4	92	c/cs
7	189	0208	16	33.50	115	21.20	1405.8	3.8	92	c/cs
7	189	0209	16	33.50	115	21.20	1405.9	6.4	92	c/cs
7	189	0239	16	33.60	115	24.60	1409.1	5.3	91	c/cs
7	189	0241	16	33.60	115	24.70	1409.2	6.4	92	c/cs
7	189	0300	16	33.70	115	26.90	1411.3	6.0	122	c/cs
7	189	0303	16	33.90	115	27.10	1411.6	6.2	121	c/cs
7	189	0316	16	34.60	115	28.30	1412.9	6.3	122	c/cs
7	189	0346	16	36.20	115	31.10	1416.0	6.3	122	c/cs
7	189	0402	16	37.11	115	32.58	1417.7	6.0	126	SN
7	189	0402	16	37.10	115	32.60	1417.7	5.6	147	c/cs
7	189	0403	16	37.20	115	32.60	1417.8	5.6	178	c/cs
7	189	0414	16	38.20	115	32.70	1418.8	5.9	179	c/cs
7	189	0422	16	39.00	115	32.70	1419.6	6.0	185	c/cs
7	189	0452	16	42.00	115	32.40	1422.6	5.9	185	c/cs
7	189	0519	16	44.60	115	32.20	1425.3	6.9	185	c/cs
7	189	0521	16	44.90	115	32.20	1425.5	6.0	185	c/cs
7	189	0539	16	46.70	115	32.00	1427.3	3.2	184	c/cs
7	189	0540	16	46.70	115	32.00	1427.4	5.9	184	c/cs
7	189	0551	16	47.80	115	32.00	1428.5	5.8	168	c/cs
7	189	0552	16	47.89	115	31.98	1428.5	5.8	162	SN
7	189	0602	16	48.80	115	32.30	1429.5	6.0	163	c/cs
7	189	0613	16	49.90	115	32.60	1430.6	6.1	163	c/cs
7	189	0629	16	51.40	115	33.10	1432.2	6.1	163	c/cs
7	189	0639	16	52.40	115	33.40	1433.3	6.0	163	c/cs
7	189	0700	16	54.39	115	34.08	1435.3	6.0	169	SN
7	189	0709	16	55.30	115	34.30	1436.3	6.0	169	c/cs
7	189	0714	16	55.80	115	34.40	1436.8	6.0	171	c/cs
7	189	0721	16	56.50	115	34.50	1437.5	5.9	190	c/cs
7	189	0726	16	56.90	115	34.40	1437.9	6.1	206	c/cs
7	189	0730	16	57.31	115	34.20	1438.4	6.5	200	SN
7	189	0735	16	57.80	115	34.00	1438.9	6.4	206	c/cs
7	189	0741	16	58.40	115	33.70	1439.5	6.4	180	c/cs
7	189	0743	16	58.60	115	33.70	1439.7	6.4	161	c/cs
7	189	0755	16	59.80	115	34.10	1441.0	6.6	166	c/cs
7	189	0759	17	0.20	115	34.30	1441.5	5.5	202	c/cs
7	189	0800	17	0.30	115	34.20	1441.6	4.0	233	c/cs
7	189	0801	17	0.40	115	34.20	1441.6	3.5	288	c/cs
7	189	0804	17	0.30	115	34.00	1441.8	5.0	301	c/cs
7	189	0811	17	0.00	115	33.50	1442.4	5.4	305	c/cs
7	189	0821	16	59.50	115	32.70	1443.3	4.7	309	c/cs
7	189	0824	16	59.40	115	32.50	1443.5	4.5	303	c/cs
7	189	0841	16	58.70	115	31.40	1444.8	4.3	302	c/cs
7	189	0845	16	58.51	115	31.14	1445.1	4.7	308	SF
7	189	0845	16	58.50	115	31.10	1445.1	4.1	352	c/cs
7	189	0846	16	58.40	115	31.10	1445.1	4.2	47	c/cs
7	189	0848	16	58.30	115	31.20	1445.3	4.7	94	c/cs
7	189	0854	16	58.40	115	31.70	1445.7	5.7	93	c/cs

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
7	189	0902	16	58.40	115	32.50	1446.5	5.4	60	c/cs
7	189	0912	16	58.00	115	33.30	1447.4	5.7	61	c/cs
7	189	0917	16	57.74	115	33.78	1447.9	6.5	59	GF
7	189	0921	16	57.50	115	34.20	1448.3	5.7	64	c/cs
7	189	0922	16	57.47	115	34.26	1448.4	5.3	56	GF
7	189	0923	16	57.40	115	34.30	1448.5	5.1	53	c/cs
7	189	0925	16	57.30	115	34.50	1448.7	6.2	55	c/cs
7	189	0930	16	57.02	115	34.92	1449.2	6.7	61	GF
7	189	0940	16	56.48	115	35.94	1450.3	5.9	60	SN
7	189	0952	16	55.90	115	37.00	1451.5	5.7	21	c/cs
7	189	0953	16	55.80	115	37.10	1451.6	4.7	342	c/cs
7	189	0955	16	55.70	115	37.00	1451.7	4.4	276	c/cs
7	189	0957	16	55.60	115	36.90	1451.9	4.8	240	c/cs
7	189	1003	16	55.90	115	36.40	1452.4	5.7	241	c/cs
7	189	1033	16	57.30	115	33.80	1455.2	5.7	241	c/cs
7	189	1047	16	57.90	115	32.60	1456.5	5.5	241	c/cs
7	189	1102	16	58.58	115	31.38	1457.9	5.6	242	GF
7	189	1102	16	58.60	115	31.40	1457.9	5.7	255	c/cs
7	189	1107	16	58.70	115	30.90	1458.4	4.0	265	GF
7	189	1107	16	58.70	115	30.90	1458.4	7.6	81	c/cs
7	189	1112	16	58.60	115	31.60	1459.0	7.8	57	c/cs
7	189	1121	16	57.95	115	32.58	1460.2	6.5	57	GF
7	189	1121	16	58.00	115	32.60	1460.2	6.3	59	c/cs
7	189	1130	16	57.46	115	33.42	1461.1	7.6	60	GF
7	189	1130	16	57.50	115	33.40	1461.1	1.9	62	c/cs
7	189	1151	16	57.15	115	34.02	1461.8	1.3	245	GF
7	189	1200	16	57.23	115	33.84	1462.0	0.0	265	GF
7	189	2000	16	57.25	115	33.61	1462.2	0.0	90	S759
11	193	0930	16	57.25	115	33.61	1462.2	0.0	342	S759
11	193	1322	16	57.22	115	33.60	1462.2	0.1	178	GF
11	193	1322	16	57.20	115	33.60	1462.2	3.4	147	c/cs
11	193	1335	16	57.85	115	34.02	1463.0	6.2	146	GF
11	193	1340	16	58.28	115	34.32	1463.5	4.4	153	GF
11	193	1340	16	58.30	115	34.30	1463.5	6.3	154	c/cs
11	193	1345	16	58.75	115	34.56	1464.0	6.6	149	GF
11	193	1350	16	59.22	115	34.86	1464.6	6.1	153	GF
11	193	1355	16	59.67	115	35.10	1465.1	5.9	152	GF
11	193	1400	17	0.11	115	35.34	1465.6	5.7	135	GF
11	193	1400	17	0.10	115	35.30	1465.6	5.4	118	c/cs
11	193	1405	17	0.32	15	35.76	1466.0	6.3	137	GF
11	193	1405	17	0.30	115	35.80	1466.0	5.6	180	c/cs
11	193	1406	17	0.40	115	35.80	1466.1	4.3	219	c/cs
11	193	1408	17	0.50	115	35.70	1466.3	2.7	294	c/cs
11	193	1410	17	0.49	115	35.58	1466.3	4.7	304	GF
11	193	1410	17	0.50	115	35.60	1466.3	5.5	324	c/cs
11	193	1413	17	0.30	115	35.40	1466.6	5.9	320	c/cs
11	193	1415	17	0.12	115	35.28	1466.8	6.2	325	GF
11	193	1418	16	59.90	115	35.10	1467.1	6.4	330	c/cs
11	193	1420	16	59.68	115	34.98	1467.3	5.8	331	GF
11	193	1425	16	59.26	115	34.74	1467.8	5.7	331	GF
11	193	1430	16	58.84	115	34.50	1468.3	5.9	332	GF
11	193	1435	16	58.40	115	34.26	1468.8	5.6	338	GF
11	193	1440	16	57.97	115	34.08	1469.3	6.1	334	GF
11	193	1440	16	58.00	115	34.10	1469.3	5.9	332	c/cs
11	193	1445	16	57.53	115	33.84	1469.7	6.1	326	GF
11	193	1450	16	57.11	115	33.54	1470.3	6.0	332	GF
11	193	1455	16	56.67	115	33.30	1470.8	5.9	332	GF
11	193	1455	16	56.70	115	33.30	1470.8	5.9	332	c/cs
11	193	1500	16	56.23	115	33.06	1471.2	5.9	332	GF
11	193	1505	16	55.79	115	32.82	1471.7	6.2	325	GF
11	193	1505	16	55.80	115	32.80	1471.7	6.2	326	c/cs
11	193	1510	16	55.36	115	32.52	1472.3	5.9	332	GF
11	193	1515	16	54.92	115	32.28	1472.8	5.9	331	GF
11	193	1519	16	54.60	115	32.10	1473.2	5.6	334	c/cs
11	193	1520	16	54.49	115	32.04	1473.2	6.0	333	GF
11	193	1524	16	54.10	115	31.80	1473.6	6.3	333	c/cs
11	193	1525	16	54.04	115	31.80	1473.8	5.9	332	GF
11	193	1530	16	53.60	115	31.56	1474.2	6.4	334	GF
11	193	1535	16	53.12	115	31.32	1474.8	6.2	333	GF
11	193	1540	16	52.66	115	31.08	1475.3	6.1	333	GF
11	193	1544	16	52.30	115	30.90	1475.7	6.3	333	c/cs
11	193	1545	16	52.20	115	30.84	1475.8	6.3	334	GF
11	193	1550	16	51.73	115	30.60	1476.3	6.4	334	GF
11	193	1555	16	51.25	115	30.36	1476.9	6.1	333	GF
11	193	1600	16	50.80	115	30.12	1477.4	6.7	336	GF
11	193	1605	16	50.29	115	29.88	1477.9	5.7	331	GF

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
11	193	1610	16	49.88	115	29.64	1478.4	2.5	0	GF
11	193	1615	16	49.67	115	29.64	1478.6	6.4	140	GF
11	193	1620	16	50.08	115	30.00	1479.1	8.5	151	GF
11	193	1625	16	50.70	115	30.36	1479.9	8.0	154	GF
11	193	1630	16	51.30	115	30.66	1480.5	6.6	335	GF
11	193	1630	16	51.30	115	30.70	1480.5	7.3	156	c/cs
11	193	1700	16	54.70	115	32.20	1484.2	3.5	154	c/cs
11	193	1712	16	55.30	115	32.52	1484.9	0.1	180	GF
11	193	1730	16	55.32	115	32.52	1484.9	4.2	157	GF
11	193	1730	16	55.30	115	32.50	1484.9	0.1	0	c/cs
11	193	1800	16	55.26	115	32.52	1485.0	0.5	219	GF
11	193	1812	16	55.33	115	32.46	1485.1	0.0	63	GF
12	194	0200	16	55.32	115	32.48	1485.1	0.0	90	S760
18	200	1645	16	55.32	115	32.48	1485.1	2.7	334	S760
18	200	1646	16	55.28	115	32.46	1485.1	2.4	0	GF
18	200	1647	16	55.24	115	32.46	1485.2	5.0	316	GF
18	200	1648	16	55.18	115	32.40	1485.3	2.7	0	GF
18	200	1650	16	55.09	115	32.40	1485.3	4.6	338	GF
18	200	1652	16	54.95	115	32.34	1485.5	5.9	324	GF
18	200	1653	16	54.87	115	32.28	1485.6	4.6	338	GF
18	200	1655	16	54.73	115	32.22	1485.7	5.6	342	GF
18	200	1657	16	54.55	115	32.16	1485.9	5.9	324	GF
18	200	1658	16	54.47	115	32.10	1486.0	3.5	326	GF
18	200	1659	16	54.40	115	32.10	1486.1	8.9	326	c/cs
18	200	1700	16	54.30	115	31.98	1486.2	6.2	326	GF
18	200	1705	16	53.87	115	31.68	1486.8	5.7	333	GF
18	200	1705	16	53.90	115	31.70	1486.8	5.9	339	c/cs
18	200	1710	16	53.41	115	31.50	1487.2	5.8	334	GF
18	200	1711	16	53.30	115	31.50	1487.3	5.8	331	c/cs
18	200	1715	16	52.98	115	31.26	1487.7	5.9	332	GF
18	200	1720	16	52.54	115	31.02	1488.2	5.9	332	GF
18	200	1725	16	52.11	115	30.78	1488.7	5.8	332	GF
18	200	1730	16	51.68	115	30.54	1489.2	5.9	338	GF
18	200	1731	16	51.60	115	30.50	1489.3	5.8	357	c/cs
18	200	1735	16	51.20	115	30.48	1489.7	6.0	355	GF
18	200	1738	16	50.90	115	30.50	1490.0	6.4	352	c/cs
18	200	1740	16	50.69	115	30.42	1490.2	6.1	354	GF
18	200	1745	16	50.18	115	30.36	1490.7	6.3	354	GF
18	200	1750	16	49.66	115	30.30	1491.2	6.5	348	GF
18	200	1755	16	49.13	115	30.18	1491.8	6.3	348	GF
18	200	1758	16	48.80	115	30.10	1492.1	6.2	346	c/cs
18	200	1800	16	48.62	115	30.06	1492.3	6.4	348	GF
18	200	1805	16	48.10	115	29.94	1492.8	6.3	347	GF
18	200	1810	16	47.59	115	29.82	1493.4	6.5	346	GF
18	200	1811	16	47.50	115	29.80	1493.5	6.5	348	c/cs
18	200	1815	16	47.06	115	29.70	1493.9	6.5	348	GF
18	200	1820	16	46.53	115	29.58	1494.4	6.4	348	GF
18	200	1825	16	46.01	115	29.46	1495.0	6.6	348	GF
18	200	1830	16	45.47	115	29.34	1495.5	6.4	348	GF
18	200	1835	16	44.95	115	29.22	1496.1	6.7	348	GF
18	200	1840	16	44.41	115	29.10	1496.6	7.2	339	GF
18	200	1840	16	44.40	115	29.10	1496.6	6.7	323	c/cs
18	200	1843	16	44.10	115	28.90	1497.0	4.8	360	c/cs
18	200	1844	16	44.10	115	28.90	1497.0	2.6	47	c/cs
18	200	1845	16	44.03	115	28.92	1497.1	4.2	84	GF
18	200	1846	16	44.00	115	29.00	1497.1	5.2	105	c/cs
18	200	1850	16	44.11	115	29.34	1497.5	5.5	103	GF
18	200	1851	16	44.10	115	29.40	1497.6	6.4	93	c/cs
18	200	1854	16	44.10	115	29.80	1497.9	6.7	87	c/cs
18	200	1855	16	44.14	115	29.88	1498.0	6.3	84	GF
18	200	1858	16	44.10	115	30.20	1498.3	6.1	93	c/cs
18	200	1900	16	44.12	115	30.42	1498.5	6.9	94	GF
18	200	1905	16	44.16	115	31.02	1499.1	6.9	91	GF
18	200	1909	16	44.20	115	31.50	1499.6	6.9	89	c/cs
18	200	1910	16	44.17	115	31.62	1499.7	6.9	90	GF
18	200	1915	16	44.17	115	32.22	1500.3	6.2	90	GF
18	200	1920	16	44.17	115	32.76	1500.8	6.9	90	GF
18	200	1925	16	44.17	115	33.36	1501.3	6.8	89	GF
18	200	1927	16	44.20	115	33.60	1501.6	6.9	89	c/cs
18	200	1930	16	44.16	115	33.96	1501.9	6.9	89	GF
18	200	1935	16	44.15	115	34.56	1502.5	7.6	89	GF
18	200	1940	16	44.14	115	35.22	1503.1	6.9	89	GF
18	200	1945	16	44.13	115	35.82	1503.7	6.9	88	GF
18	200	1950	16	44.11	115	36.42	1504.3	6.8	88	GF
18	200	1952	16	44.10	115	36.70	1504.5	7.0	88	c/cs
18	200	1955	16	44.09	115	37.02	1504.9	6.2	89	GF

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
18	200	2000	16	44.08	115	37.56	1505.4	6.9	88	GF
18	200	2005	16	44.06	115	38.16	1505.9	5.0	93	GF
18	200	2005	16	44.10	115	38.20	1505.9	1.4	87	c/cs
18	200	2020	16	44.04	115	38.52	1506.3	1.9	85	GF
18	200	2020	16	44.00	115	38.50	1506.3	10.1	263	c/cs
18	200	2030	16	44.23	115	36.78	1508.0	10.1	263	GF
18	200	2030	16	44.20	115	36.80	1508.0	10.1	268	c/cs
18	200	2046	16	44.33	115	33.96	1510.7	10.2	268	SF
18	200	2046	16	44.30	115	34.00	1510.7	2.2	273	c/cs
18	200	2130	16	44.20	115	32.30	1512.3	0.2	282	c/cs
18	200	2217	16	44.21	115	32.10	1512.5	0.0	180	SF
18	200	2235	16	44.22	115	32.10	1512.5	0.0	180	SF
19	201	0005	16	44.23	115	32.10	1512.5	0.0	198	SF
19	201	0145	16	44.26	115	32.09	1512.5	0.0	14	S761
24	206	1300	16	44.22	115	32.10	1512.6	0.0	54	S761
24	206	1805	16	44.10	115	32.20	1512.7	4.0	226	c/cs
24	206	1820	16	44.80	115	31.50	1513.7	8.8	226	c/cs
24	206	1826	16	45.42	115	30.84	1514.6	12.3	237	GF
24	206	1830	16	45.87	115	30.12	1515.4	11.2	222	GF
24	206	1840	16	47.30	115	28.80	1517.3	11.8	222	c/cs
24	206	1841	16	47.41	115	28.68	1517.5	11.6	225	GF
24	206	1855	16	49.30	115	26.70	1520.2	11.8	225	c/cs
24	206	1913	16	51.80	115	24.00	1523.7	11.7	225	c/cs
24	206	1928	16	53.90	115	21.90	1526.7	11.9	225	c/cs
24	206	1940	16	55.50	115	20.10	1529.0	11.6	225	c/cs
24	206	1958	16	58.00	115	17.50	1532.5	12.0	225	c/cs
24	206	2013	17	0.10	115	15.30	1535.5	12.1	225	c/cs
24	206	2038	17	3.65	115	11.58	1540.5	11.9	223	SF
24	206	2049	17	5.30	115	10.00	1542.7	11.7	223	c/cs
24	206	2116	17	9.10	115	6.20	1548.0	11.3	223	c/cs
24	206	2122	17	9.90	115	5.40	1549.1	11.8	223	c/cs
24	206	2137	17	12.10	115	3.30	1552.1	11.7	223	c/cs
24	206	2155	17	14.60	115	0.80	1555.6	11.7	223	c/cs
24	206	2204	17	15.90	114	59.50	1557.3	10.9	223	c/cs
24	206	2207	17	16.30	114	59.10	1557.9	11.9	223	c/cs
24	206	2220	17	18.16	114	57.30	1560.5	12.2	226	SF
24	206	2228	17	19.30	114	56.10	1562.1	12.0	226	c/cs
24	206	2246	17	21.80	114	53.30	1565.7	12.2	226	c/cs
24	206	2255	17	23.00	114	52.00	1567.5	13.0	226	c/cs
24	206	2258	17	23.50	114	51.50	1568.2	12.0	226	c/cs
24	206	2307	17	24.70	114	50.10	1570.0	12.3	226	c/cs
24	206	2325	17	27.30	114	47.30	1573.6	12.6	228	c/cs
24	206	2327	17	27.56	114	46.98	1574.1	12.8	233	SF
24	206	2331	17	28.10	114	46.30	1574.9	12.6	232	c/cs
25	207	0001	17	32.00	114	41.00	1581.2	12.6	231	c/cs
25	207	0008	17	32.87	114	39.84	1582.7	12.4	225	SF
25	207	0013	17	33.60	114	39.10	1583.7	12.8	226	c/cs
25	207	0104	17	41.20	114	30.90	1594.6	12.5	225	c/cs
25	207	0115	17	42.86	114	29.22	1596.9	12.0	226	SF
25	207	0125	17	44.30	114	27.70	1598.9	11.8	226	c/cs
25	207	0140	17	46.30	114	25.50	1601.9	11.6	225	c/cs
25	207	0146	17	47.10	114	24.70	1603.0	12.0	226	c/cs
25	207	0158	17	48.80	114	22.90	1605.4	12.0	226	c/cs
25	207	0210	17	50.50	114	21.10	1607.8	11.8	226	c/cs
25	207	0216	17	51.30	114	20.20	1609.0	11.6	225	c/cs
25	207	0231	17	53.40	114	18.00	1611.9	11.5	225	c/cs
25	207	0238	17	54.31	114	16.98	1613.3	12.0	230	SF
25	207	0243	17	55.00	114	16.20	1614.3	12.0	230	c/cs
25	207	0310	17	58.40	114	11.80	1619.7	12.2	231	c/cs
25	207	0317	17	59.30	114	10.70	1621.1	11.9	230	c/cs
25	207	0341	18	2.40	114	6.90	1625.9	11.6	230	c/cs
25	207	0356	18	4.30	114	4.50	1628.8	11.7	230	c/cs
25	207	0414	18	6.60	114	1.70	1632.3	11.4	230	c/cs
25	207	0427	18	8.16	113	59.70	1634.8	10.3	225	SF
25	207	0435	18	9.10	113	58.70	1636.1	10.2	225	c/cs
25	207	0444	18	10.20	113	57.50	1637.7	9.8	224	c/cs
25	207	0450	18	10.90	113	56.80	1638.6	10.3	224	c/cs
25	207	0508	18	13.10	113	54.60	1641.7	10.0	224	c/cs
25	207	0521	18	14.71	113	52.98	1643.9	10.7	226	SF
25	207	0523	18	15.00	113	52.70	1644.3	10.6	226	c/cs
25	207	0538	18	16.80	113	50.70	1646.9	9.7	226	c/cs
25	207	0544	18	17.50	113	50.00	1647.9	9.9	226	c/cs
25	207	0547	18	17.80	113	49.60	1648.4	10.5	226	c/cs
25	207	0556	18	18.90	113	48.40	1649.9	10.3	226	c/cs
25	207	0609	18	20.45	113	46.74	1652.2	11.1	234	SF
25	207	0611	18	20.70	113	46.40	1652.5	11.4	233	c/cs

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
25	207	0614	18	21.00	113	45.90	1653.1	10.6	235	c/cs
25	207	0623	18	21.90	113	44.60	1654.7	10.5	233	c/cs
25	207	0629	18	22.60	113	43.70	1655.7	10.7	233	c/cs
25	207	0638	18	23.50	113	42.40	1657.3	10.5	234	c/cs
25	207	0640	18	23.74	113	42.06	1657.7	10.2	221	SF
25	207	0641	18	23.90	113	41.90	1657.8	10.9	220	c/cs
25	207	0653	18	25.50	113	40.50	1660.0	10.2	220	c/cs
25	207	0702	18	26.70	113	39.40	1661.6	10.4	220	c/cs
25	207	0705	18	27.10	113	39.06	1662.1	10.3	226	SF
25	207	0708	18	27.50	113	38.70	1662.6	9.8	227	c/cs
25	207	0711	18	27.80	113	38.30	1663.1	10.5	227	c/cs
25	207	0717	18	28.50	113	37.50	1664.1	10.0	226	c/cs
25	207	0723	18	29.20	113	36.70	1665.1	10.6	226	c/cs
25	207	0732	18	30.30	113	35.50	1666.7	9.9	228	c/cs
25	207	0738	18	31.00	113	34.70	1667.7	10.4	226	c/cs
25	207	0747	18	32.00	113	33.50	1669.3	11.3	226	c/cs
25	207	0755	18	33.07	113	32.40	1670.8	10.9	227	SF
25	207	0814	18	35.40	113	29.70	1674.2	10.4	226	c/cs
25	207	0817	18	35.80	113	29.34	1674.8	10.7	226	SF
25	207	0826	18	36.90	113	28.10	1676.4	11.3	227	c/cs
25	207	0841	18	38.90	113	26.00	1679.2	11.8	226	c/cs
25	207	0853	18	40.50	113	24.20	1681.5	11.5	226	c/cs
25	207	0902	18	41.70	113	22.80	1683.3	11.2	224	c/cs
25	207	0932	18	45.70	113	18.70	1688.9	10.8	224	c/cs
25	207	0935	18	46.10	113	18.30	1689.4	11.3	224	c/cs
25	207	0944	18	47.30	113	17.10	1691.1	10.8	224	c/cs
25	207	0950	18	48.10	113	16.30	1692.2	11.0	224	c/cs
25	207	1002	18	49.70	113	14.60	1694.4	11.6	225	c/cs
25	207	1008	18	50.50	113	13.80	1695.6	11.1	225	c/cs
25	207	1013	18	51.14	113	13.08	1696.5	11.1	223	SF
25	207	1020	18	52.10	113	12.20	1697.8	11.5	223	c/cs
25	207	1026	18	52.90	113	11.30	1698.9	11.5	222	c/cs
25	207	1032	18	53.80	113	10.50	1700.1	11.0	222	c/cs
25	207	1044	18	55.40	113	9.00	1702.3	11.4	221	c/cs
25	207	1053	18	56.70	113	7.80	1704.0	11.1	222	c/cs
25	207	1056	18	57.10	113	7.40	1704.5	10.2	221	c/cs
25	207	1059	18	57.50	113	7.00	1705.1	11.0	223	c/cs
25	207	1102	18	57.90	113	6.60	1705.6	10.0	222	c/cs
25	207	1105	18	58.30	113	6.30	1706.1	11.1	222	c/cs
25	207	1123	19	0.70	113	3.90	1709.4	11.4	222	c/cs
25	207	1141	19	3.29	113	1.50	1712.9	10.9	222	GF
25	207	1147	19	4.10	113	0.70	1713.9	10.3	223	c/cs
25	207	1153	19	4.90	112	60.00	1715.0	11.2	222	c/cs
25	207	1156	19	5.30	112	59.60	1715.5	10.1	223	c/cs
25	207	1200	19	5.77	112	59.10	1716.2	11.5	222	GF
25	207	1202	19	6.10	112	58.80	1716.6	12.5	221	c/cs
25	207	1208	19	7.00	112	58.00	1717.8	12.1	221	c/cs
25	207	1211	19	7.45	112	57.54	1718.5	11.3	220	GF
25	207	1223	19	9.20	112	56.00	1720.7	11.3	218	c/cs
25	207	1226	19	9.62	112	55.62	1721.3	11.5	219	GF
25	207	1232	19	10.50	112	54.90	1722.4	11.3	223	c/cs
25	207	1241	19	11.77	112	53.64	1724.1	10.6	223	GF
25	207	1247	19	12.50	112	52.90	1725.2	10.9	224	c/cs
25	207	1253	19	13.30	112	52.10	1726.3	10.7	223	c/cs
25	207	1300	19	14.25	112	51.18	1727.5	11.8	224	GF
25	207	1314	19	16.30	112	49.20	1730.3	12.1	223	c/cs
25	207	1315	19	16.40	112	49.02	1730.5	11.6	221	SF
25	207	1320	19	17.10	112	48.30	1731.5	11.1	221	c/cs
25	207	1326	19	17.97	112	47.58	1732.6	10.9	223	GF
25	207	1329	19	18.40	112	47.20	1733.1	11.5	222	c/cs
25	207	1332	19	18.80	112	46.80	1733.7	10.9	223	c/cs
25	207	1340	19	19.90	112	45.70	1735.1	11.0	223	c/cs
25	207	1341	19	20.00	112	45.60	1735.3	10.3	222	GF
25	207	1359	19	22.30	112	43.40	1738.4	9.8	222	c/cs
25	207	1400	19	22.43	112	43.32	1738.6	11.3	222	GF
25	207	1402	19	22.70	112	43.10	1738.9	12.2	224	c/cs
25	207	1411	19	24.03	112	41.70	1740.8	10.9	223	GF
25	207	1411	19	24.00	112	41.70	1740.8	11.0	223	c/cs
25	207	1420	19	25.20	112	40.50	1742.4	10.3	224	c/cs
25	207	1426	19	26.00	112	39.70	1743.5	10.3	224	c/cs
25	207	1430	19	26.47	112	39.24	1744.2	11.4	223	GF
25	207	1432	19	26.70	112	39.00	1744.5	12.4	224	c/cs
25	207	1435	19	27.20	112	38.50	1745.2	11.9	221	c/cs
25	207	1441	19	28.09	112	37.68	1746.3	11.0	221	GF
25	207	1450	19	29.30	112	36.50	1748.0	11.1	221	c/cs
25	207	1456	19	30.17	112	35.76	1749.1	9.0	221	GF

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
25	207	1459	19	30.50	112	35.40	1749.5	8.9	221	c/cs
25	207	1500	19	30.62	112	35.34	1749.7	12.4	223	GF
25	207	1508	19	31.80	112	34.10	1751.3	11.6	224	c/cs
25	207	1511	19	32.24	112	33.72	1751.9	10.0	224	GF
25	207	1514	19	32.60	112	33.30	1752.4	10.4	224	c/cs
25	207	1529	19	34.50	112	31.50	1755.0	11.0	222	c/cs
25	207	1530	19	34.61	112	31.32	1755.2	12.6	223	GF
25	207	1532	19	34.90	112	31.00	1755.6	12.2	225	c/cs
25	207	1541	19	36.20	112	29.64	1757.4	10.4	225	GF
25	207	1541	19	36.20	112	29.60	1757.4	10.4	225	c/cs
25	207	1550	19	37.30	112	28.50	1759.0	10.6	226	c/cs
25	207	1556	19	38.10	112	27.70	1760.1	9.5	226	c/cs
25	207	1600	19	38.50	112	27.18	1760.7	11.0	226	GF
25	207	1602	19	38.80	112	26.90	1761.1	12.3	226	c/cs
25	207	1605	19	39.20	112	26.40	1761.7	11.9	227	c/cs
25	207	1611	19	39.99	112	25.50	1762.9	10.4	227	GF
25	207	1620	19	41.10	112	24.30	1764.5	10.9	227	c/cs
25	207	1627	19	41.92	112	23.28	1765.7	9.8	225	SF
25	207	1629	19	42.10	112	23.00	1766.1	9.4	225	c/cs
25	207	1630	19	42.26	112	22.92	1766.2	11.8	227	GF
25	207	1641	19	43.73	112	21.24	1768.4	10.7	227	GF
25	207	1653	19	45.20	112	19.60	1770.5	10.2	227	c/cs
25	207	1656	19	45.54	112	19.20	1771.0	8.2	226	GF
25	207	1700	19	45.92	112	18.78	1771.6	9.7	224	GF
25	207	1705	19	46.50	112	18.20	1772.4	8.0	223	c/cs
25	207	1715	19	47.48	112	17.22	1773.7	7.6	223	GF
25	207	1715	19	47.50	112	17.20	1773.7	5.7	194	c/cs
25	207	1720	19	47.94	112	17.10	1774.2	5.6	198	GF
25	207	1722	19	48.10	112	17.00	1774.4	5.8	216	c/cs
25	207	1725	19	48.35	112	16.86	1774.6	6.2	223	GF
25	207	1725	19	48.40	112	16.90	1774.6	6.3	220	c/cs
25	207	1730	19	48.75	112	16.50	1775.2	5.9	217	GF
25	207	1730	19	48.80	112	16.50	1775.2	5.6	201	c/cs
25	207	1735	19	49.19	112	16.32	1775.6	5.7	201	GF
25	207	1740	19	49.63	112	16.14	1776.1	6.0	207	GF
25	207	1745	19	50.08	112	15.90	1776.6	5.8	202	GF
25	207	1747	19	50.30	112	15.80	1776.8	5.9	199	c/cs
25	207	1750	19	50.54	112	15.72	1777.1	5.8	201	GF
25	207	1755	19	50.99	112	15.54	1777.6	6.0	197	GF
25	207	1757	19	51.20	112	15.50	1777.8	5.9	191	c/cs
25	207	1800	19	51.47	112	15.42	1778.1	5.8	187	GF
25	207	1805	19	51.95	112	15.36	1778.6	5.7	187	GF
25	207	1810	19	52.42	112	15.30	1779.0	5.7	194	GF
25	207	1815	19	52.88	112	15.18	1779.5	6.0	174	GF
25	207	1815	19	52.90	112	15.20	1779.5	5.9	173	c/cs
25	207	1820	19	53.37	112	15.24	1780.0	5.7	194	GF
25	207	1825	19	53.83	112	15.12	1780.5	5.7	180	GF
25	207	1830	19	54.31	112	15.12	1781.0	1.9	187	GF
25	207	1839	19	54.60	112	15.10	1781.2	2.1	205	c/cs
25	207	1856	19	55.10	112	14.80	1781.8	1.9	204	c/cs
25	207	1905	19	55.40	112	14.70	1782.1	2.7	2	c/cs
25	207	1942	19	53.72	112	14.76	1783.8	0.1	44	SF
26	208	0245	19	53.23	112	15.26	1784.5	0.0	90	S762
4 August	217	2045	19	53.23	112	15.26	1784.5	0.4	333	S762
5	218	0039	19	51.88	112	14.52	1786.0	5.1	173	SF
5	218	0057	19	53.40	112	14.70	1787.5	11.3	182	c/cs
5	218	0109	19	55.70	112	14.60	1789.8	11.8	182	c/cs
5	218	0118	19	57.40	112	14.60	1791.5	12.2	183	c/cs
5	218	0133	20	0.50	112	14.40	1794.6	12.2	183	c/cs
5	218	0151	20	4.10	112	14.20	1798.2	12.3	183	c/cs
5	218	0202	20	6.37	112	14.10	1800.5	10.3	194	SF
5	218	0206	20	7.00	112	13.90	1801.2	10.3	194	c/cs
5	218	0215	20	8.50	112	13.50	1802.7	10.3	194	c/cs
5	218	0248	20	14.00	112	12.00	1808.4	10.3	194	c/cs
5	218	0305	20	16.80	112	11.20	1811.3	10.3	194	c/cs
5	218	0332	20	21.30	112	10.00	1815.9	9.7	195	c/cs
5	218	0335	20	21.80	112	9.90	1816.4	9.0	192	c/cs
5	218	0344	20	23.10	112	9.60	1817.8	8.9	192	c/cs
5	218	0351	20	24.14	112	9.36	1818.8	4.0	168	SF
5	218	0356	20	24.50	112	9.40	1819.1	4.0	168	c/cs
5	218	0408	20	25.20	112	9.60	1819.9	5.6	175	c/cs
5	218	0411	20	25.50	112	9.60	1820.2	3.9	170	c/cs
5	218	0435	20	27.10	112	9.90	1821.8	6.1	179	c/cs
5	218	0438	20	27.40	112	9.90	1822.1	3.9	173	c/cs
5	218	0453	20	28.30	112	10.10	1823.1	3.8	174	c/cs
5	218	0459	20	28.70	112	10.10	1823.4	3.9	173	c/cs

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
5	218	0539	20	31.28	112	10.44	1826.0	2.0	171	SF
5	218	0600	20	31.96	112	10.56	1826.7	2.4	180	GF
5	218	0604	20	32.12	112	10.56	1826.9	3.0	190	GF
5	218	0608	20	32.30	112	10.50	1827.1	3.1	206	c/cs
5	218	0609	20	32.36	112	10.50	1827.1	4.1	189	GF
5	218	0614	20	32.70	112	10.44	1827.5	4.4	189	GF
5	218	0619	20	33.06	112	10.38	1827.8	4.9	188	GF
5	218	0623	20	33.40	112	10.30	1828.2	4.9	188	c/cs
5	218	0624	20	33.46	112	10.32	1828.2	5.3	192	GF
5	218	0628	20	33.80	112	10.20	1828.6	5.3	192	c/cs
5	218	0630	20	33.98	112	10.20	1828.8	6.1	196	GF
5	218	0634	20	34.37	112	10.08	1829.2	5.4	196	GF
5	218	0638	20	34.70	112	10.00	1829.5	5.4	188	c/cs
5	218	0639	20	34.80	112	9.96	1829.6	5.6	180	GF
5	218	0641	20	35.00	112	10.00	1829.8	3.6	116	c/cs
5	218	0643	20	35.00	112	10.10	1829.9	6.9	91	c/cs
5	218	0644	20	35.04	112	10.20	1830.0	6.1	82	GF
5	218	0649	20	34.97	112	10.74	1830.6	5.6	89	GF
5	218	0652	20	35.00	112	11.00	1830.8	5.4	108	c/cs
5	218	0654	20	35.02	112	11.22	1831.0	5.3	107	GF
5	218	0700	20	35.17	112	11.76	1831.5	5.1	105	GF
5	218	0702	20	35.20	112	11.90	1831.7	5.3	89	c/cs
5	218	0709	20	35.20	112	12.60	1832.3	7.6	96	GF
5	218	0710	20	35.20	112	12.70	1832.5	7.6	103	c/cs
5	218	0714	20	35.33	112	13.26	1833.0	6.0	101	GF
5	218	0717	20	35.40	112	13.60	1833.3	5.0	122	c/cs
5	218	0718	20	35.40	112	13.60	1833.3	5.5	196	c/cs
5	218	0719	20	35.52	112	13.62	1833.4	4.5	198	GF
5	218	0721	20	35.70	112	13.60	1833.6	5.1	247	c/cs
5	218	0724	20	35.76	112	13.32	1833.8	5.0	238	GF
5	218	0725	20	35.80	112	13.20	1833.9	5.0	202	c/cs
5	218	0730	20	36.19	112	13.08	1834.3	4.3	222	GF
5	218	0732	20	36.30	112	13.00	1834.5	5.6	262	c/cs
5	218	0735	20	36.30	112	12.70	1834.8	6.6	285	c/cs
5	218	0742	20	36.14	112	11.88	1835.5	7.2	241	SF
5	218	0745	20	36.30	112	11.50	1835.9	6.0	262	c/cs
5	218	0747	20	36.30	112	11.30	1836.1	4.1	304	c/cs
5	218	0749	20	36.30	112	11.20	1836.2	3.1	11	c/cs
5	218	0800	20	35.70	112	11.30	1836.8	3.1	10	c/cs
5	218	0816	20	34.90	112	11.50	1837.6	3.1	10	c/cs
5	218	0830	20	34.10	112	11.60	1838.4	1.1	12	c/cs
5	218	0904	20	33.51	112	11.76	1839.0	4.0	8	GF
5	218	0904	20	33.50	112	11.80	1839.0	4.1	199	c/cs
5	218	0909	20	33.83	112	11.64	1839.4	4.1	199	GF
5	218	0909	20	33.80	112	11.60	1839.4	4.0	210	c/cs
5	218	0914	20	34.12	112	11.46	1839.7	4.1	216	GF
5	218	0914	20	34.10	112	11.50	1839.7	3.9	200	c/cs
5	218	0919	20	34.43	112	11.34	1840.0	3.7	194	GF
5	218	0919	20	34.40	112	11.30	1840.0	3.7	201	c/cs
5	218	0924	20	34.72	112	11.22	1840.3	4.0	201	GF
5	218	0924	20	34.70	112	11.20	1840.3	2.7	132	c/cs
5	218	0929	20	34.87	112	11.40	1840.6	2.7	132	GF
5	218	0929	20	34.90	112	11.40	1840.6	3.4	100	c/cs
5	218	0930	20	34.88	112	11.46	1840.6	3.4	100	GF
5	218	0930	20	34.90	112	11.50	1840.6	2.8	115	c/cs
5	218	0934	20	34.96	112	11.64	1840.8	2.8	115	GF
5	218	0934	20	35.00	112	11.60	1840.8	2.8	107	c/cs
5	218	0939	20	35.03	112	11.88	1841.0	2.9	110	GF
5	218	0944	20	35.11	112	12.12	1841.3	2.8	107	GF
5	218	0944	20	35.10	112	12.10	1841.3	1.4	110	c/cs
5	218	0949	20	35.15	112	12.24	1841.4	1.4	100	GF
5	218	0954	20	35.17	112	12.36	1841.5	1.6	122	GF
5	218	0954	20	35.20	112	12.40	1841.5	0.4	180	c/cs
5	218	0959	20	35.20	112	12.36	1841.6	0.0	90	GF
5	218	1530	20	35.20	112	12.50	1841.7	0.0	90	S763
16	229	0100	20	35.20	112	12.50	1841.7	0.0	101	S763
17	230	0329	20	35.23	112	12.66	1841.8	0.8	53	SF
17	230	0412	20	34.90	112	13.10	1842.4	6.3	117	c/cs
17	230	0413	20	34.90	112	13.20	1842.5	6.8	57	c/cs
17	230	0416	20	34.80	112	13.50	1842.8	6.4	354	c/cs
17	230	0419	20	34.40	112	13.50	1843.1	6.1	331	c/cs
17	230	0422	20	34.20	112	13.30	1843.4	6.6	12	c/cs
17	230	0432	20	33.10	112	13.60	1844.5	6.5	9	c/cs
17	230	0448	20	31.40	112	13.90	1846.3	6.5	8	c/cs
17	230	0459	20	30.20	112	14.10	1847.5	6.5	7	c/cs
17	230	0502	20	29.90	112	14.10	1847.8	6.5	7	c/cs

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
17	230	0514	20	28.60	112	14.28	1849.1	7.5	1	SF
17	230	0532	20	26.30	112	14.30	1851.4	7.5	1	c/cs
17	230	0602	20	22.60	112	14.40	1855.1	7.5	1	c/cs
17	230	0628	20	19.30	112	14.52	1858.4	7.6	345	SF
17	230	0636	20	18.30	112	14.20	1859.4	7.6	345	c/cs
17	230	0647	20	17.00	112	13.90	1860.8	7.6	346	c/cs
17	230	0651	20	16.50	112	13.70	1861.3	7.6	345	c/cs
17	230	0721	20	12.80	112	12.70	1865.2	7.6	346	c/cs
17	230	0726	20	12.15	112	12.54	1865.8	7.5	8	SF
17	230	0750	20	9.20	112	13.00	1868.8	7.5	9	c/cs
17	230	0802	20	7.70	112	13.20	1870.3	7.5	9	c/cs
17	230	0819	20	5.60	112	13.60	1872.5	7.5	9	c/cs
17	230	0847	20	2.10	112	14.10	1876.0	7.5	9	c/cs
17	230	0900	20	0.50	112	14.40	1877.6	7.5	9	c/cs
17	230	0902	20	0.20	112	14.40	1877.9	7.5	9	c/cs
17	230	0903	20	0.10	112	14.40	1878.0	7.6	11	c/cs
17	230	0912	19	59.00	112	14.70	1879.1	7.6	16	c/cs
17	230	0928	19	57.00	112	15.30	1881.2	7.5	5	c/cs
17	230	0953	19	53.90	112	15.54	1884.3	8.1	355	SF
17	230	0958	19	53.20	112	15.50	1885.0	8.1	356	c/cs
17	230	1028	19	49.20	112	15.20	1889.0	8.1	356	c/cs
17	230	1038	19	47.80	112	15.10	1890.4	8.1	355	c/cs
17	230	1052	19	46.00	112	14.90	1892.3	7.2	32	c/cs
17	230	1056	19	45.50	112	15.20	1892.7	7.4	28	c/cs
17	230	1101	19	45.00	112	15.50	1893.3	7.3	30	c/cs
17	230	1114	19	43.60	112	16.30	1894.9	7.3	30	c/cs
17	230	1120	19	43.00	112	16.70	1895.7	7.3	30	c/cs
17	230	1125	19	42.50	112	17.00	1896.3	7.3	30	c/cs
17	230	1126	19	42.40	112	17.10	1896.4	11.2	35	c/cs
17	230	1129	19	41.90	112	17.40	1897.0	11.2	35	c/cs
17	230	1131	19	41.60	112	17.70	1897.3	11.2	36	c/cs
17	230	1141	19	40.11	112	18.84	1899.2	10.3	43	SF
17	230	1141	19	40.10	112	18.80	1899.2	10.3	44	c/cs
17	230	1147	19	39.40	112	19.60	1900.2	10.3	45	c/cs
17	230	1150	19	39.00	112	19.98	1900.7	10.7	42	GF
17	230	1153	19	38.60	112	20.40	1901.3	10.8	41	c/cs
17	230	1200	19	37.66	112	21.24	1902.5	11.4	44	GF
17	230	1205	19	37.00	112	21.90	1903.5	11.4	43	c/cs
17	230	1208	19	36.60	112	22.40	1904.0	11.4	44	c/cs
17	230	1226	19	34.10	112	24.90	1907.5	11.4	44	c/cs
17	230	1230	19	33.54	112	25.44	1908.2	11.5	46	GF
17	230	1250	19	30.90	112	28.40	1912.1	11.5	46	c/cs
17	230	1300	19	29.55	112	29.82	1914.0	11.8	48	GF
17	230	1302	19	29.30	112	30.10	1914.4	11.8	48	c/cs
17	230	1305	19	28.89	112	30.60	1915.0	10.3	48	SF
17	230	1305	19	28.90	112	30.60	1915.0	11.3	46	c/cs
17	230	1310	19	28.24	112	31.32	1915.9	11.7	48	GF
17	230	1326	19	26.10	112	33.80	1919.0	11.7	48	c/cs
17	230	1330	19	25.61	112	34.38	1919.8	11.7	47	GF
17	230	1353	19	22.60	112	37.90	1924.3	11.7	47	c/cs
17	230	1359	19	21.80	112	38.80	1925.5	12.7	47	c/cs
17	230	1400	19	21.61	112	38.94	1925.7	11.9	46	GF
17	230	1417	19	19.30	112	41.50	1929.0	11.9	46	c/cs
17	230	1429	19	17.70	112	43.30	1931.4	11.9	46	c/cs
17	230	1430	19	17.52	112	43.50	1931.6	12.1	47	GF
17	230	1447	19	15.20	112	46.20	1935.1	12.1	46	c/cs
17	230	1450	19	14.80	112	46.60	1935.7	12.1	46	c/cs
17	230	1453	19	14.35	112	47.10	1936.3	11.7	49	SF
17	230	1456	19	14.00	112	47.60	1936.8	11.7	49	c/cs
17	230	1500	19	13.45	112	48.18	1937.6	12.2	46	GF
17	230	1502	19	13.20	112	48.50	1938.0	12.2	46	c/cs
17	230	1530	19	9.21	112	52.80	1943.7	12.6	45	GF
17	230	1541	19	7.60	112	54.50	1946.0	12.6	45	c/cs
17	230	1600	19	4.73	112	57.48	1950.0	12.9	43	GF
17	230	1605	19	3.90	112	58.30	1951.1	13.0	42	c/cs
17	230	1614	19	2.50	112	59.60	1953.0	13.0	42	c/cs
17	230	1630	18	59.95	113	2.10	1956.5	13.3	41	GF
17	230	1632	18	59.60	113	2.40	1956.9	13.3	42	c/cs
17	230	1635	18	59.10	113	2.90	1957.6	13.3	41	c/cs
17	230	1644	18	57.60	113	4.30	1959.6	13.3	41	c/cs
17	230	1656	18	55.60	113	6.10	1962.2	13.3	42	c/cs
17	230	1704	18	54.31	113	7.38	1964.0	13.4	43	GF
17	230	1800	18	45.20	113	16.40	1976.5	13.6	41	GF
17	230	2004	18	24.10	113	35.90	2004.6	16.0	46	GF
17	230	2042	18	17.10	113	43.60	2014.7	13.9	47	GF
17	230	2300	17	55.30	114	8.30	2046.7	13.9	46	c/cs

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
17	230	2314	17	53.10	114	10.80	2049.9	11.9	33	GF
17	230	2330	17	50.50	114	12.60	2053.1	11.9	33	c/cs
17	230	2342	17	48.50	114	14.00	2055.5	11.9	33	c/cs
18	231	0000	17	45.50	114	16.00	2059.0	11.9	33	c/cs
18	231	0027	17	41.00	114	19.10	2064.4	11.9	33	c/cs
18	231	0040	17	38.90	114	20.60	2066.9	13.1	43	GF
18	231	0048	17	37.60	114	21.80	2068.7	13.1	43	c/cs
18	231	0100	17	35.70	114	23.70	2071.3	13.1	43	c/cs
18	231	0109	17	34.30	114	25.10	2073.3	13.1	43	c/cs
18	231	0130	17	30.90	114	28.40	2077.9	13.1	43	c/cs
18	231	0133	17	30.40	114	28.90	2078.5	13.1	43	c/cs
18	231	0136	17	30.00	114	29.30	2079.2	13.1	44	c/cs
18	231	0200	17	26.20	114	33.20	2084.4	13.1	44	c/cs
18	231	0203	17	25.70	114	33.60	2085.1	13.1	44	c/cs
18	231	0218	17	23.40	114	36.00	2088.3	13.1	43	c/cs
18	231	0224	17	22.40	114	36.90	2089.6	13.1	43	c/cs
18	231	0257	17	17.10	114	42.10	2096.9	13.1	43	c/cs
18	231	0330	17	11.90	114	47.20	2104.1	13.1	43	c/cs
18	231	0342	17	9.90	114	49.10	2106.7	13.1	43	c/cs
18	231	0353	17	8.18	114	50.82	2109.1	13.9	46	SF
18	231	0357	17	7.50	114	51.50	2110.0	13.9	46	c/cs
18	231	0412	17	5.10	114	54.10	2113.5	13.9	50	c/cs
18	231	0421	17	3.80	114	55.80	2115.6	13.9	50	c/cs
18	231	0442	17	0.60	114	59.70	2120.4	13.9	50	c/cs
18	231	0512	16	56.10	115	5.20	2127.4	13.9	49	c/cs
18	231	0533	16	52.90	115	9.00	2132.3	13.9	48	c/cs
18	231	0540	16	51.80	115	10.30	2133.9	12.5	43	GF
18	231	0545	16	51.00	115	11.00	2134.9	12.5	44	c/cs
18	231	0612	16	47.00	115	15.10	2140.5	12.5	44	c/cs
18	231	0630	16	44.38	115	17.88	2144.3	12.0	44	GF
18	231	0648	16	42.63	115	19.87	2147.0	12.0	44	c/cs
18	231	0658	16	41.02	115	21.57	2149.2	4.7	40	c/cs
18	231	0704	16	39.85	115	22.83	2151.0	3.9	38	c/cs
18	231	0710	16	38.57	115	24.13	2152.8	3.5	37	c/cs
18	231	0719	16	37.23	115	25.46	2154.5	3.7	34	c/cs
18	231	0726	16	36.68	115	26.04	2155.3	3.5	15	c/cs
18	231	0733	16	36.13	115	26.41	2156.0	3.8	16	c/cs
18	231	0800	16	34.82	115	27.19	2157.5	6.5	27	GF
18	231	0803	16	34.64	115	27.26	2157.7	6.5	27	c/cs
18	231	0830	16	32.92	115	27.57	2159.5	5.4	44	GF
18	231	0833	16	32.71	115	27.62	2159.7	5.3	45	c/cs
18	231	0851	16	31.24	115	27.85	2161.2	5.3	44	c/cs
18	231	0910	16	30.17	115	28.41	2162.4	2.3	73	c/cs
18	231	0930	16	31.16	115	28.63	2163.8	5.5	209	GF
18	231	1000	16	32.97	115	28.03	2165.7	0.7	145	GF
18	231	1025	16	33.57	115	27.96	2166.3	1.3	147	SF
18	231	1030	16	33.66	115	27.88	2166.4	0.1	270	GF
18	231	1100	16	33.91	115	27.53	2166.8	0.1	154	GF
18	231	1115	16	33.96	115	27.43	2166.9	0.0	90	S764
22	235	1145	16	33.96	115	27.43	2164.7	11.2	338	S764
22	235	1155	16	32.23	115	26.70	2166.5	4.2	320	GF
22	235	1200	16	31.96	115	26.46	2166.9	3.9	319	GF
22	235	1204	16	31.80	115	26.30	2167.1	9.6	315	c/cs
22	235	1205	16	31.65	115	26.16	2167.3	4.7	323	GF
22	235	1210	16	31.34	115	25.92	2167.7	5.2	319	GF
22	235	1215	16	31.01	115	25.62	2168.1	5.3	314	GF
22	235	1219	16	30.80	115	25.40	2168.5	5.3	316	c/cs
22	235	1230	16	30.07	115	24.66	2169.4	5.1	317	GF
22	235	1235	16	29.76	115	24.36	2169.9	5.0	316	GF
22	235	1240	16	29.46	115	24.06	2170.3	5.0	316	GF
22	235	1245	16	29.16	115	23.76	2170.7	5.0	316	GF
22	235	1250	16	28.86	115	23.46	2171.1	5.1	317	GF
22	235	1255	16	28.55	115	23.16	2171.5	7.9	316	GF
22	235	1255	16	28.60	115	23.20	2171.5	7.9	316	c/cs
22	235	1300	16	28.08	115	22.68	2172.2	3.0	316	GF
22	235	1300	16	28.10	115	22.70	2172.2	9.3	312	c/cs
22	235	1305	16	27.56	115	22.08	2173.0	10.7	313	GF
22	235	1307	16	27.30	115	21.80	2173.3	10.7	315	c/cs
22	235	1310	16	26.94	115	21.42	2173.9	12.0	312	GF
22	235	1313	16	26.50	115	21.00	2174.5	12.1	311	c/cs
22	235	1315	16	26.27	115	20.64	2174.9	12.3	313	GF
22	235	1320	16	25.57	115	19.86	2175.9	12.9	311	GF
22	235	1325	16	24.86	115	19.02	2177.0	11.9	314	GF
22	235	1325	16	24.90	115	19.00	2177.0	12.4	314	c/cs
22	235	1330	16	24.15	115	18.24	2178.0	12.9	311	GF
22	235	1335	16	23.44	115	17.40	2179.1	12.4	313	GF

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
22	235	1340	16	22.73	115	16.62	2180.1	12.8	311	GF
22	235	1345	16	22.03	115	15.78	2181.2	12.6	312	GF
22	235	1346	16	21.90	115	15.60	2181.4	12.6	312	c/cs
22	235	1355	16	20.63	115	14.16	2183.3	12.8	311	GF
22	235	1400	16	19.93	115	13.32	2184.3	12.3	313	GF
22	235	1404	16	19.40	115	12.70	2185.1	12.3	312	c/cs
22	235	1405	16	19.23	115	12.54	2185.3	12.4	313	GF
22	235	1410	16	18.52	115	11.76	2186.4	12.4	314	GF
22	235	1415	16	17.80	115	10.98	2187.4	13.0	312	GF
22	235	1420	16	17.07	115	10.14	2188.5	12.6	314	GF
22	235	1425	16	16.34	115	9.36	2189.6	12.6	315	GF
22	235	1430	16	15.60	115	8.58	2190.6	13.2	313	GF
22	235	1434	16	15.00	115	7.90	2191.5	13.5	314	c/cs
22	235	1435	16	14.84	115	7.74	2191.7	12.9	315	GF
22	235	1440	16	14.08	115	6.96	2192.8	12.9	316	GF
22	235	1445	16	13.31	115	6.18	2193.9	12.8	315	GF
22	235	1450	16	12.55	115	5.40	2194.9	13.3	313	GF
22	235	1455	16	11.80	115	4.56	2196.0	12.6	315	GF
22	235	1500	16	11.06	115	3.78	2197.1	12.5	314	GF
22	235	1505	16	10.33	115	3.00	2198.1	12.6	314	GF
22	235	1510	16	9.60	115	2.22	2199.2	12.6	315	GF
22	235	1515	16	8.86	115	1.44	2200.2	12.6	315	GF
22	235	1520	16	8.12	115	0.66	2201.3	13.2	315	GF
22	235	1522	16	7.80	115	0.30	2201.7	12.5	315	c/cs
22	235	1525	16	7.37	114	59.88	2202.3	12.0	316	GF
22	235	1525	16	7.40	114	59.90	2202.3	12.9	316	c/cs
22	235	1530	16	6.60	114	59.10	2203.4	12.9	316	GF
22	235	1535	16	5.83	114	58.32	2204.5	12.9	316	GF
22	235	1540	16	5.06	114	57.54	2205.6	13.0	316	GF
22	235	1545	16	4.28	114	56.76	2206.6	12.8	315	GF
22	235	1549	16	3.70	114	56.10	2207.5	12.7	315	c/cs
22	235	1550	16	3.52	114	55.98	2207.7	12.9	316	GF
22	235	1555	16	2.75	114	55.20	2208.8	13.4	314	GF
22	235	1600	16	1.98	114	54.36	2209.9	12.6	315	GF
22	235	1605	16	1.24	114	53.58	2210.9	12.8	315	GF
22	235	1610	16	0.49	114	52.80	2212.0	12.7	315	GF
22	235	1615	15	59.74	114	52.02	2213.1	13.2	313	GF
22	235	1616	15	59.60	114	51.90	2213.3	13.3	313	c/cs
22	235	1619	15	59.10	114	51.30	2214.0	13.2	313	c/cs
22	235	1620	15	58.98	114	51.18	2214.2	13.4	313	GF
22	235	1625	15	58.22	114	50.34	2215.3	13.0	316	GF
22	235	1630	15	57.44	114	49.56	2216.4	13.1	313	GF
22	235	1631	15	57.30	114	49.40	2216.6	13.2	313	c/cs
22	235	1635	15	56.69	114	48.72	2217.5	13.0	316	GF
22	235	1640	15	55.91	114	47.94	2218.6	13.4	314	GF
22	235	1645	15	55.13	114	47.10	2219.7	12.9	316	GF
22	235	1650	15	54.36	114	46.32	2220.8	13.4	314	GF
22	235	1655	15	53.59	114	45.48	2221.9	13.3	313	GF
22	235	1700	15	52.83	114	44.64	2223.0	12.8	315	GF
22	235	1705	15	52.07	114	43.86	2224.0	13.4	313	GF
22	235	1710	15	51.31	114	43.02	2225.2	13.2	313	GF
22	235	1715	15	50.56	114	42.18	2226.3	13.0	312	GF
22	235	1720	15	49.83	114	41.34	2227.3	13.1	312	GF
22	235	1725	15	49.10	114	40.50	2228.4	13.2	312	GF
22	235	1728	15	48.70	114	40.00	2229.1	12.6	312	c/cs
22	235	1730	15	48.38	114	39.66	2229.5	12.5	312	GF
22	235	1731	15	48.20	114	39.50	2229.7	13.1	312	c/cs
22	235	1735	15	47.66	114	38.82	2230.6	12.5	314	GF
22	235	1740	15	46.94	114	38.04	2231.6	13.0	312	GF
22	235	1745	15	46.21	114	37.20	2232.7	13.0	312	GF
22	235	1750	15	45.49	114	36.36	2233.8	13.2	312	GF
22	235	1755	15	44.75	114	35.52	2234.9	12.9	311	GF
22	235	1800	15	44.04	114	34.68	2236.0	13.0	312	GF
22	235	1805	15	43.31	114	33.84	2237.1	12.5	314	GF
22	235	1810	15	42.59	114	33.06	2238.1	11.1	311	GF
22	235	1815	15	41.98	114	32.34	2239.0	13.8	313	GF
22	235	1831	15	39.40	114	29.60	2242.7	13.9	313	c/cs
22	235	1907	15	33.70	114	23.20	2251.1	13.1	313	c/cs
22	235	2019	15	22.90	114	11.40	2266.8	13.1	314	c/cs
22	235	2058	15	16.90	114	5.10	2275.4	13.8	314	c/cs
22	235	2107	15	15.50	114	3.50	2277.4	13.1	314	c/cs
22	235	2204	15	6.80	113	54.30	2289.9	13.1	314	c/cs
22	235	2228	15	3.10	113	50.40	2295.1	13.2	314	c/cs
22	235	2313	14	56.20	113	43.10	2305.0	13.2	314	c/cs
22	235	2328	14	53.90	113	40.70	2308.3	13.2	315	c/cs
22	235	2331	14	53.40	113	40.20	2309.0	13.2	314	c/cs

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
23	236	0000	14	48.90	113	35.50	2315.4	13.2	314	c/cs
23	236	0007	14	47.90	113	34.30	2316.9	13.0	314	c/cs
23	236	0013	14	46.90	113	33.40	2318.2	13.3	314	c/cs
23	236	0040	14	42.80	113	28.90	2324.2	13.3	314	c/cs
23	236	0116	14	37.20	113	23.00	2332.2	13.3	316	c/cs
23	236	0149	14	31.90	113	17.80	2339.5	13.4	316	c/cs
23	236	0210	14	28.50	113	14.40	2344.2	13.3	316	c/cs
23	236	0213	14	28.00	113	14.00	2344.9	13.4	316	c/cs
23	236	0249	14	22.20	113	8.20	2352.9	13.3	315	c/cs
23	236	0300	14	20.47	113	6.43	2355.4	13.1	317	GDRT
23	236	0313	14	18.40	113	4.40	2358.2	12.9	317	c/cs
23	236	0343	14	13.60	112	59.90	2364.7	13.5	317	c/cs
23	236	0346	14	13.10	112	59.40	2365.3	12.9	317	c/cs
23	236	0400	14	10.94	112	57.33	2368.3	12.7	315	GDRT
23	236	0407	14	9.90	112	56.30	2369.8	12.8	315	c/cs
23	236	0425	14	7.20	112	53.40	2373.7	12.8	315	c/cs
23	236	0452	14	3.10	112	49.20	2379.4	12.9	314	c/cs
23	236	0500	14	1.90	112	47.97	2381.2	13.2	315	GDRT
23	236	0510	14	0.30	112	46.40	2383.4	13.1	315	c/cs
23	236	0600	13	52.54	112	38.49	2394.3	13.1	316	GPS
23	236	0604	13	51.90	112	37.90	2395.2	13.1	315	c/cs
23	236	0622	13	49.10	112	35.00	2399.1	13.2	316	c/cs
23	236	0643	13	45.80	112	31.70	2403.7	13.3	316	c/cs
23	236	0652	13	44.40	112	30.30	2405.7	13.2	316	c/cs
23	236	0700	13	43.11	112	28.99	2407.5	12.7	315	GDRT
23	236	0725	13	39.40	112	25.20	2412.8	12.7	315	c/cs
23	236	0749	13	35.70	112	21.50	2417.9	12.7	315	c/cs
23	236	0800	13	34.08	112	19.78	2420.2	13.4	315	GDRT
23	236	0813	13	32.00	112	17.70	2423.1	13.5	315	c/cs
23	236	0855	13	25.40	112	10.70	2432.5	13.3	315	c/cs
23	236	0920	13	21.55	112	6.68	2438.1	11.9	318	GPS
23	236	0922	13	21.30	112	6.40	2438.5	12.1	318	c/cs
23	236	0937	13	19.00	112	4.30	2441.5	12.1	318	c/cs
23	236	0955	13	16.30	112	1.80	2445.1	11.6	318	c/cs
23	236	0958	13	15.90	112	1.40	2445.7	11.9	316	c/cs
23	236	1000	13	15.62	112	1.15	2446.1	13.4	313	GPS
23	236	1013	13	13.60	111	58.90	2449.0	13.5	311	c/cs
23	236	1030	13	11.14	111	55.97	2452.8	13.1	311	GPS
23	236	1046	13	8.90	111	53.30	2456.3	12.9	311	c/cs
23	236	1100	13	6.87	111	50.93	2459.3	13.1	311	GPS
23	236	1125	13	3.30	111	46.70	2464.8	13.2	312	c/cs
23	236	1130	13	2.52	111	45.89	2465.9	13.1	312	GPS
23	236	1149	12	59.80	111	42.70	2470.0	13.1	312	c/cs
23	236	1200	12	58.16	111	40.87	2472.4	13.2	312	GPS
23	236	1230	12	53.76	111	35.82	2479.0	13.3	312	GPS
23	236	1243	12	51.90	111	33.60	2481.9	13.2	312	c/cs
23	236	1300	12	49.38	111	30.76	2485.6	13.1	311	GPS
23	236	1304	12	48.80	111	30.10	2486.5	13.2	311	c/cs
23	236	1316	12	47.10	111	28.00	2489.1	13.5	311	c/cs
23	236	1319	12	46.60	111	27.50	2489.8	13.2	311	c/cs
23	236	1330	12	45.02	111	25.66	2492.2	13.4	311	GPS
23	236	1346	12	42.70	111	22.90	2495.8	13.5	311	c/cs
23	236	1400	12	40.60	111	20.47	2499.0	13.5	312	GPS
23	236	1407	12	39.50	111	19.30	2500.5	13.4	313	c/cs
23	236	1430	12	36.01	111	15.45	2505.7	13.5	313	GPS
23	236	1500	12	31.42	111	10.38	2512.4	13.4	312	GPS
23	236	1507	12	30.40	111	9.20	2514.0	13.6	313	c/cs
23	236	1516	12	29.00	111	7.70	2516.0	13.4	313	c/cs
23	236	1530	12	26.84	111	5.34	2519.1	13.4	313	GPS
23	236	1540	12	25.30	111	3.70	2521.4	13.6	313	c/cs
23	236	1552	12	23.40	111	1.70	2524.1	13.1	313	c/cs
23	236	1555	12	23.00	111	1.20	2524.8	13.5	313	c/cs
23	236	1600	12	22.21	111	0.33	2525.9	13.4	313	GPS
23	236	1630	12	17.62	110	55.31	2532.6	13.4	313	GPS
23	236	1646	12	15.20	110	52.60	2536.2	13.7	313	c/cs
23	236	1658	12	13.30	110	50.60	2538.9	13.5	313	c/cs
23	236	1700	12	12.98	110	50.27	2539.4	13.4	313	GPS
23	236	1730	12	8.44	110	45.25	2546.1	13.1	314	GPS
23	236	1731	12	8.30	110	45.10	2546.3	13.2	313	c/cs
23	236	1734	12	7.80	110	44.60	2546.9	13.1	314	c/cs
23	236	1758	12	4.20	110	40.70	2552.2	13.0	314	c/cs
23	236	1800	12	3.93	110	40.39	2552.6	13.0	315	GDRT
23	236	1825	12	0.10	110	36.50	2558.0	13.1	316	c/cs
23	236	1830	11	59.34	110	35.68	2559.1	13.1	315	GDRT
23	236	1855	11	55.50	110	31.80	2564.6	12.7	315	c/cs
23	236	1900	11	54.70	110	31.01	2565.6	13.2	310	GDRT

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
23	236	1901	11	54.60	110	30.80	2565.8	13.7	310	c/cs
23	236	1958	11	46.20	110	20.60	2578.8	13.5	310	c/cs
23	236	2000	11	45.96	110	20.27	2579.3	14.5	311	GDRT
23	236	2010	11	44.40	110	18.40	2581.7	14.5	312	c/cs
23	236	2034	11	40.50	110	14.00	2587.5	14.5	312	c/cs
23	236	2100	11	36.31	110	9.20	2593.8	12.5	312	GDRT
23	236	2113	11	34.50	110	7.10	2596.5	12.6	314	c/cs
23	236	2119	11	33.60	110	6.20	2597.8	12.5	316	c/cs
23	236	2200	11	27.44	110	0.22	2606.3	13.5	314	GDRT
23	236	2210	11	25.90	109	58.60	2608.5	13.4	314	c/cs
23	236	2237	11	21.70	109	54.10	2614.6	13.6	314	c/cs
23	236	2246	11	20.30	109	52.60	2616.6	13.3	314	c/cs
23	236	2300	11	18.16	109	50.29	2619.8	13.4	313	GDRT
23	236	2301	11	18.00	109	50.10	2620.0	13.6	313	c/cs
23	236	2313	11	16.20	109	48.10	2622.7	13.2	314	c/cs
23	236	2316	11	15.70	109	47.60	2623.4	13.8	313	c/cs
23	236	2322	11	14.80	109	46.60	2624.7	13.6	313	c/cs
23	236	2325	11	14.30	109	46.10	2625.4	13.6	313	c/cs
23	236	2346	11	11.10	109	42.50	2630.2	13.7	313	c/cs
23	236	2349	11	10.60	109	42.00	2630.9	13.7	314	c/cs
23	236	2352	11	10.10	109	41.50	2631.6	13.6	313	c/cs
24	237	0000	11	8.90	109	40.10	2633.4	13.6	313	c/cs
24	237	0019	11	5.90	109	36.90	2637.7	13.8	313	c/cs
24	237	0022	11	5.50	109	36.40	2638.4	13.6	313	c/cs
24	237	0055	11	0.40	109	30.80	2645.8	13.7	313	c/cs
24	237	0100	10	59.62	109	29.96	2647.0	13.9	310	GDRT
24	237	0110	10	58.10	109	28.10	2649.3	13.9	310	c/cs
24	237	0146	10	52.80	109	21.60	2657.6	13.8	310	c/cs
24	237	0204	10	50.20	109	18.40	2661.8	13.7	310	c/cs
24	237	0207	10	49.70	109	17.80	2662.5	13.4	302	c/cs
24	237	0210	10	49.40	109	17.30	2663.1	14.6	270	c/cs
24	237	0216	10	49.40	109	15.80	2664.6	14.9	256	c/cs
24	237	0228	10	50.10	109	12.80	2667.6	15.3	265	c/cs
24	237	0231	10	50.20	109	12.10	2668.3	13.0	314	c/cs
24	237	0234	10	49.70	109	11.60	2669.0	13.5	309	c/cs
24	237	0237	10	49.30	109	11.00	2669.6	13.7	311	c/cs
24	237	0304	10	45.20	109	6.30	2675.8	13.6	312	c/cs
24	237	0325	10	42.00	109	2.70	2680.6	13.8	312	c/cs
24	237	0337	10	40.10	109	0.70	2683.3	14.8	251	c/cs
24	237	0340	10	40.40	108	60.00	2684.1	14.6	241	c/cs
24	237	0358	10	42.50	108	56.10	2688.5	14.8	242	c/cs
24	237	0407	10	43.50	108	54.10	2690.7	15.3	254	c/cs
24	237	0410	10	43.70	108	53.30	2691.4	13.8	311	c/cs
24	237	0413	10	43.30	108	52.80	2692.1	13.9	307	c/cs
24	237	0422	10	42.00	108	51.10	2694.2	13.7	306	c/cs
24	237	0431	10	40.80	108	49.40	2696.3	13.9	306	c/cs
24	237	0507	10	35.90	108	42.50	2704.6	13.9	307	c/cs
24	237	0530	10	32.74	108	38.22	2709.9	13.6	311	GPS
24	237	0531	10	32.60	108	38.00	2710.1	13.7	311	c/cs
24	237	0546	10	30.40	108	35.40	2713.6	13.5	311	c/cs
24	237	0600	10	28.30	108	32.96	2716.7	13.4	313	GPS
24	237	0616	10	25.90	108	30.30	2720.3	13.6	314	c/cs
24	237	0630	10	23.70	108	27.95	2723.5	13.6	313	GPS
24	237	0652	10	20.30	108	24.20	2728.5	13.5	314	c/cs
24	237	0700	10	19.06	108	22.91	2730.3	13.3	316	GPS
24	237	0707	10	17.90	108	21.80	2731.8	13.4	316	c/cs
24	237	0737	10	13.10	108	17.00	2738.5	13.5	316	c/cs
24	237	0800	10	9.42	108	13.37	2743.7	13.2	313	GDRT
24	237	0819	10	6.50	108	10.30	2747.9	13.1	312	c/cs
24	237	0837	10	3.90	108	7.30	2751.8	13.2	312	c/cs
24	237	0855	10	1.20	108	4.30	2755.8	13.1	313	c/cs
24	237	0900	10	0.49	108	3.54	2756.9	13.0	315	GPS
24	237	0907	9	59.40	108	2.40	2758.4	13.0	318	c/cs
24	237	0928	9	56.00	107	59.30	2763.0	13.2	317	c/cs
24	237	0930	9	55.73	107	59.04	2763.4	13.0	317	GPS
24	237	1000	9	50.98	107	54.54	2769.9	12.9	318	GPS
24	237	1016	9	48.40	107	52.20	2773.3	12.9	318	c/cs
24	237	1030	9	46.22	107	50.12	2776.3	12.9	318	GPS
24	237	1049	9	43.20	107	47.30	2780.4	12.9	318	c/cs
24	237	1122	9	38.00	107	42.50	2787.5	12.9	318	c/cs
24	237	1130	9	36.69	107	41.30	2789.2	12.9	318	GPS
24	237	1137	9	35.60	107	40.30	2790.7	12.9	318	c/cs
24	237	1200	9	31.94	107	36.89	2795.7	13.0	317	GPS
24	237	1201	9	31.80	107	36.70	2795.9	12.4	318	c/cs
24	237	1204	9	31.30	107	36.30	2796.5	12.9	319	c/cs
24	237	1216	9	29.40	107	34.60	2799.1	12.9	319	c/cs

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
24	237	1230	9	27.06	107	32.62	2802.1	12.8	320	GPS
24	237	1234	9	26.40	107	32.10	2803.0	12.6	319	c/cs
24	237	1240	9	25.50	107	31.20	2804.2	12.7	320	c/cs
24	237	1300	9	22.22	107	28.47	2808.5	12.8	320	GPS
24	237	1307	9	21.10	107	27.50	2810.0	12.8	320	c/cs
24	237	1328	9	17.60	107	24.60	2814.5	12.3	321	c/cs
24	237	1330	9	17.28	107	24.35	2814.9	12.7	321	GPS
24	237	1331	9	17.10	107	24.20	2815.1	12.4	320	c/cs
24	237	1340	9	15.70	107	23.00	2816.9	13.1	321	c/cs
24	237	1355	9	13.20	107	20.90	2820.2	12.4	320	c/cs
24	237	1400	9	12.37	107	20.22	2821.2	12.0	321	GPS
24	237	1407	9	11.30	107	19.30	2822.6	12.7	321	c/cs
24	237	1428	9	7.80	107	16.50	2827.1	12.7	322	c/cs
24	237	1430	9	7.48	107	16.24	2827.5	12.4	322	GPS
24	237	1500	9	2.61	107	12.35	2833.7	12.3	322	GPS
24	237	1504	9	2.00	107	11.80	2834.5	12.4	318	c/cs
24	237	1522	8	59.20	107	9.30	2838.3	12.4	318	c/cs
24	237	1530	8	57.99	107	8.20	2839.9	12.2	319	GPS
24	237	1600	8	53.38	107	4.13	2846.0	12.7	319	GPS
24	237	1613	8	51.30	107	2.30	2848.8	11.7	319	c/cs
24	237	1630	8	48.78	107	0.14	2852.1	12.3	320	GPS
24	237	1700	8	44.10	106	56.14	2858.2	11.7	320	GDRT
24	237	1710	8	42.60	106	54.90	2860.2	12.6	320	c/cs
24	237	1722	8	40.70	106	53.20	2862.7	12.7	320	c/cs
24	237	1800	8	34.49	106	48.04	2870.7	13.3	320	GDRT
24	237	1813	8	32.30	106	46.20	2873.6	13.3	320	c/cs
24	237	1837	8	28.20	106	42.70	2878.9	12.5	320	c/cs
24	237	1900	8	24.47	106	39.63	2883.7	11.2	320	GDRT
24	237	1907	8	23.50	106	38.80	2885.0	11.8	320	c/cs
24	237	1922	8	21.20	106	36.80	2888.0	11.3	319	c/cs
24	237	1937	8	19.10	106	34.90	2890.8	12.0	318	c/cs
24	237	2000	8	15.65	106	31.85	2895.4	13.7	320	GDRT
24	237	2001	8	15.50	106	31.70	2895.7	12.8	319	c/cs
24	237	2031	8	10.70	106	27.40	2902.1	13.7	319	c/cs
24	237	2049	8	7.60	106	24.70	2906.2	12.8	319	c/cs
24	237	2100	8	5.80	106	23.14	2908.5	11.4	319	GDRT
24	237	2116	8	3.50	106	21.10	2911.6	12.2	319	c/cs
24	237	2131	8	1.20	106	19.10	2914.6	11.4	319	c/cs
24	237	2200	7	56.99	106	15.49	2920.2	12.0	321	GDRT
24	237	2204	7	56.40	106	15.00	2921.0	12.6	321	c/cs
24	237	2207	7	55.90	106	14.60	2921.6	11.9	321	c/cs
24	237	2225	7	53.10	106	12.30	2925.1	12.1	320	c/cs
24	237	2249	7	49.40	106	9.20	2930.0	13.1	318	c/cs
24	237	2300	7	47.62	106	7.58	2932.4	13.5	317	GDRT
24	237	2301	7	47.50	106	7.40	2932.6	12.3	317	c/cs
24	237	2304	7	47.00	106	7.00	2933.2	12.5	317	c/cs
24	237	2313	7	45.70	106	5.70	2935.1	13.2	316	c/cs
24	237	2316	7	45.20	106	5.20	2935.7	13.3	316	c/cs
24	237	2337	7	41.90	106	1.90	2940.4	13.2	316	c/cs
24	237	2355	7	39.00	105	59.10	2944.4	12.3	316	c/cs
25	238	0000	7	38.29	105	58.42	2945.4	12.6	316	GDRT
25	238	0000	7	38.30	105	58.40	2945.4	12.6	316	c/cs
25	238	0028	7	34.10	105	54.30	2951.3	12.9	316	c/cs
25	238	0049	7	30.80	105	51.10	2955.8	12.7	316	c/cs
25	238	0100	7	29.14	105	49.49	2958.1	13.2	315	GDRT
25	238	0125	7	25.30	105	45.50	2963.6	14.1	315	c/cs
25	238	0137	7	23.30	105	43.50	2966.5	13.8	316	c/cs
25	238	0140	7	22.80	105	43.00	2967.1	13.1	315	c/cs
25	238	0200	7	19.72	105	39.88	2971.5	12.8	316	GDRT
25	238	0203	7	19.30	105	39.40	2972.2	13.0	316	c/cs
25	238	0300	7	10.39	105	30.72	2984.5	13.8	311	GDRT
25	238	0400	7	1.29	105	20.24	2998.4	12.7	329	GDRT
25	238	0500	6	50.43	105	13.61	3011.1	12.5	329	GDRT
25	238	0530	6	45.10	105	10.30	3017.3	15.6	38	c/cs
25	238	0555	6	40.00	105	14.30	3023.8	15.7	46	c/cs
25	238	0600	6	39.05	105	15.28	3025.1	13.0	33	GPS
25	238	0630	6	33.60	105	18.80	3031.6	13.1	40	GPS
25	238	0630	6	33.60	105	18.80	3031.6	13.0	26	c/cs
25	238	0700	6	27.74	105	21.65	3038.1	12.5	26	GPS
25	238	0800	6	16.48	105	27.17	3050.6	11.6	32	GPS
25	238	0800	6	16.50	105	27.20	3050.6	11.6	34	c/cs
25	238	0830	6	11.67	105	30.43	3056.4	12.3	32	GPS
25	238	0830	6	11.70	105	30.40	3056.4	11.9	62	c/cs
25	238	0900	6	8.87	105	35.72	3062.4	10.9	58	GPS
25	238	0900	6	8.90	105	35.70	3062.4	12.0	61	c/cs
25	238	0930	6	5.92	105	40.97	3068.4	11.3	60	GPS

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
25	238	1000	6	3.11	105	45.92	3074.0	11.1	59	GPS
25	238	1030	6	0.26	105	50.68	3079.5	10.4	54	GPS
25	238	1100	5	57.20	105	54.90	3084.7	10.8	70	GPS
25	238	1100	5	57.20	105	54.90	3084.7	10.5	48	c/cs
25	238	1130	5	53.68	105	58.83	3090.0	9.5	46	GPS
25	238	1200	5	50.39	106	2.24	3094.7	11.7	38	GPS
25	238	1200	5	50.40	106	2.20	3094.7	10.8	88	c/cs
25	238	1230	5	50.24	106	7.67	3100.1	10.7	87	GPS
25	238	1230	5	50.20	106	7.70	3100.1	10.7	90	c/cs
25	238	1300	5	50.21	106	13.04	3105.5	10.4	92	GPS
25	238	1300	5	50.20	106	13.00	3105.5	10.4	92	c/cs
25	238	1330	5	50.37	106	18.26	3110.7	11.7	93	GPS
25	238	1330	5	50.40	106	18.30	3110.7	10.8	95	c/cs
25	238	1400	5	50.85	106	23.67	3116.1	11.2	84	GPS
25	238	1430	5	50.31	106	29.26	3121.7	10.9	89	GPS
25	238	1500	5	50.19	106	34.73	3127.1	11.4	98	GPS
25	238	1500	5	50.20	106	34.70	3127.1	11.0	48	c/cs
25	238	1530	5	46.49	106	38.80	3132.6	11.2	44	GPS
25	238	1530	5	46.50	106	38.80	3132.6	11.2	51	c/cs
25	238	1600	5	42.96	106	43.15	3138.2	11.1	18	GPS
25	238	1630	5	37.71	106	44.91	3143.7	10.3	53	GPS
25	238	1630	5	37.70	106	44.90	3143.7	11.6	12	c/cs
25	238	1700	5	32.02	106	46.12	3149.5	9.3	14	GPS
25	238	1700	5	32.00	106	46.10	3149.5	9.3	17	c/cs
25	238	1730	5	27.57	106	47.48	3154.2	11.3	16	GPS
25	238	1900	5	11.20	106	52.10	3171.2	10.4	17	c/cs
25	238	1930	5	6.20	106	53.60	3176.4	10.3	19	c/cs
25	238	2000	5	1.34	106	55.30	3181.5	9.2	27	GDRT
25	238	2100	4	53.14	106	59.46	3190.7	13.0	20	GDRT
25	238	2100	4	53.10	106	59.50	3190.7	13.9	16	c/cs
25	238	2130	4	46.40	107	1.40	3197.7	14.0	11	c/cs
25	238	2200	4	39.60	107	2.80	3204.7	13.0	15	c/cs
25	238	2300	4	26.97	107	6.18	3217.8	12.9	15	GDRT
26	239	0130	3	55.70	107	14.40	3250.1	13.0	11	c/cs
26	239	0200	3	49.32	107	15.59	3256.6	10.9	14	GDRT
26	239	0200	3	49.30	107	15.60	3256.6	10.9	17	c/cs
26	239	0230	3	44.10	107	17.20	3262.0	11.0	28	c/cs
26	239	0300	3	39.23	107	19.79	3267.5	13.7	15	GDRT
26	239	0330	3	32.60	107	21.60	3274.4	14.5	354	c/cs
26	239	0400	3	25.39	107	20.83	3281.7	14.4	355	GDRT
26	239	0400	3	25.40	107	20.80	3281.7	14.5	351	c/cs
26	239	0430	3	18.20	107	19.60	3288.9	14.4	352	c/cs
26	239	0500	3	11.10	107	18.70	3296.1	14.5	350	c/cs
26	239	0530	3	3.95	107	17.38	3303.4	13.4	358	GPS
26	239	0600	2	57.27	107	17.10	3310.1	13.3	352	GPS
26	239	0600	2	57.30	107	17.10	3310.1	13.3	345	c/cs
26	239	0630	2	50.83	107	15.39	3316.7	13.1	347	GPS
26	239	0700	2	44.48	107	13.87	3323.3	12.6	345	GPS
26	239	0800	2	32.29	107	10.69	3335.9	12.3	345	GPS
26	239	0800	2	32.30	107	10.70	3335.9	12.3	345	c/cs
26	239	0830	2	26.35	107	9.12	3342.0	12.2	346	GPS
26	239	0900	2	20.43	107	7.67	3348.1	12.4	344	GPS
26	239	0905	2	19.40	107	7.40	3349.1	12.2	7	c/cs
26	239	0930	2	14.39	107	7.99	3354.2	12.4	9	GPS
26	239	0934	2	13.60	107	8.10	3355.0	12.4	13	c/cs
26	239	1000	2	8.35	107	9.32	3360.4	12.3	5	GPS
26	239	1000	2	8.30	107	9.30	3360.4	12.2	6	c/cs
26	239	1030	2	2.27	107	9.98	3366.5	12.0	13	GPS
26	239	1030	2	2.30	107	10.00	3366.5	12.1	3	c/cs
26	239	1100	1	56.25	107	10.32	3372.5	12.5	4	GPS
26	239	1105	1	55.20	107	10.40	3373.6	12.5	316	c/cs
26	239	1115	1	53.70	107	9.00	3375.7	10.5	317	c/cs
26	239	1130	1	51.79	107	7.15	3378.3	10.2	312	GPS
26	239	1130	1	51.80	107	7.10	3378.3	10.2	311	c/cs
26	239	1200	1	48.45	107	3.28	3383.4	10.3	311	GPS
26	239	1230	1	45.07	106	59.42	3388.5	10.3	313	GPS
26	239	1300	1	41.56	106	55.66	3393.7	10.3	313	GPS
26	239	1330	1	38.03	106	51.90	3398.8	10.3	315	GPS
26	239	1400	1	34.40	106	48.22	3404.0	9.9	314	GPS
26	239	1400	1	34.40	106	48.20	3404.0	10.3	316	c/cs
26	239	1430	1	30.68	106	44.63	3409.2	10.1	317	GPS
26	239	1500	1	27.01	106	41.17	3414.2	10.0	317	GPS
26	239	1530	1	23.33	106	37.78	3419.2	10.1	316	GPS
26	239	1600	1	19.67	106	34.30	3424.3	10.4	316	GPS
26	239	1630	1	15.93	106	30.69	3429.5	10.2	316	GPS
26	239	1700	1	12.26	106	27.14	3434.6	10.5	318	GDRT

APPENDIX (continued).

Date (1988)	Julian day	Time (UTC)	Distance (nmi)	South latitude (deg)	(min)	East longitude (deg)	(min)	Actual speed (kt)	course (deg)	Comments[a]
26	239	1730	1	8.40	106	23.60	3439.8	10.5	332	c/cs
26	239	1800	1	3.72	106	21.17	3445.1	10.0	332	GDRT
26	239	1900	0	54.89	106	16.40	3455.1	11.3	336	GDRT
26	239	2000	0	44.57	106	11.89	3466.4	10.0	331	GDRT
26	239	2100	0	35.76	106	7.09	3476.4	12.7	334	GDRT
26	239	2200	0	24.42	106	1.47	3489.1	9.2	332	GDRT
26	239	2300	0	16.29	105	57.14	3498.3	8.7	330	GDRT
27	240	0000	0	−8.82	105	52.77	3506.9	8.7	330	GDRT

[a] SN, SF = Satellite navigation; c/cs = change of course; GPS = Global Positioning System; GF = adjusted between satellite fixes; UTC = Universal Time Coordinated; S759, etc. = Site 759, etc.; GDRT = dead reckoning.