35. UNDERWAY GEOPHYSICAL DATA FROM DEEP SEA DRILLING PROJECT LEG 61: NAVIGATION, BATHYMETRY, MAGNETICS, AND SEISMIC PROFILES[1]

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INTRODUCTION

Leg 61, which was devoted to drilling at Site 462 in the Nauru Basin, began at Apra Harbor, Guam, Mariana Islands on May 22, 1979 and ended at Majuro Atoll, Marshall Islands, on July 29, 1979. In the course of the cruise, the *Glomar Challenger* logged 2395 miles of steaming, during which the following data were collected: bathymetric data for 2015 miles, magnetic data for 2020 miles, and seismic reflection data for 2028 miles. These data were recorded at sea under the direction of Laboratory Officers G. Bode and M. Lehman. Data processing after the cruise was carried out by the Scripps Institution of Oceanography Geologic Data Center. Leg 61 is referenced as Geologic Data Center Cruise I.D. No. 124. The following forms of data are available from the Information Handling Group, Deep Sea Drilling Project, A-031, Scripps Institution of Oceanography, La Jolla, California 92093:

1) Profiles of depths and magnetic anomalies plotted versus distance. Dates (day/month) and positions of major course changes (greater than 30°) are annotated. Sections of track having sub-bottom profiler (airgun) records are identified by a solid black line along the bottom of the profile.

2) Navigation listing of times and positions of course and speed changes, fixes, and drift velocity.

3) Depth compilation plots, in meters (assumed sound velocity of 1500 m/s), at approximately 1-mile spacing, plotted at 4 in./degree, with standard Defense Mapping Agency Hydrographic Center Office B.C. Series boundaries (see index chart).

4) Plots of magnetic anomaly profiles along track—map scale = ½"/degree; anomaly scale between 15°N and 15°S latitude = 500 gamma/inch; anomaly scale north of 15°N and south of 15°S = 1000 gamma/inch; from values retrieved at approximately 1 mile spacing and regional field removed using the 1975 IGRF.

5) Card decks of navigation, depth and magnetics.

6) S.I.O. Sample Index—list of the drill sites and beginning and end times and positions of all underway records collected on the cruise leg.

7) Microfilm or Xerox copies of:
   a) Echosounder records (12 kHz, 3.5 kHz)
   b) Sub-bottom profiler records (airgun)
   c) Magnetometer records
   d) Underway data log

Beginning with Leg 45 (December 1975), depths are recorded on the *Glomar Challenger* in meters (1500 m/s velocity). Prior to Leg 45, depths were recorded in fathoms (800 fm/s velocity). Beginning with Leg 54 (June 1977), the magnetic regional field is removed, using the 1975 IGRF.

METHODS

Navigation. Satellite fixes and course and speed changes were encoded aboard the *Challenger* from data given in the underway geophysical log. The data were keypunched on shore and put through a navigation smoothing program, edited on the basis of reasonable ship-drift velocities and a deck of corrected navigation points punched out for later merging with the depth and magnetic data. Table 1 contains detailed time, position, satellite-fix, distance, course, speed, and drift data. The ship's track, with day and hour ticks in GMT, is shown as Figure 1.

Depth. The depths scaled from echo sounders (1500 m/s calibrated sound velocity) were recorded at sea in the underway geophysical log book at 5-minute intervals. The depths were keypunched on shore and edited in the same fashion as the magnetics. The bathymetric profiles obtained are shown on Figure 2 where they are keyed to both nautical miles (n.m.) from Guam and the day and hour time ticks shown on Figure 1.

Magnetics. The magnetics scaled from analog records produced on the Geometrics Magnetometer were recorded at sea in the underway geophysical log book in gammas at 5-minute intervals. The magnetics were keypunched on shore, put through a profile program, and edited by comparison to the original analog records. These magnetic profiles are shown in Figure 2, where they are keyed to both n.m. from Guam and the day and hour ticks shown on Figure 1.

Seismic Profiles. The energy sources were Bolt air guns. Generally 120- and 80-in.^{3} guns were streamed as a pair. Occasionally, one or both of these were pulled for repairs, and 20- and 40-in.^{3} guns used as replacements. Returns were recorded on 2 EPC recorders. Number 1 (EDO #1 on the records) was set for a 10-second sweep with the band-pass filter set at the 20-to-80-Hz range. Recorder number 2 (EDO #2 on the records) was set for a 5-second sweep, with a trigger delay of 2 to 5 seconds, depending on the water depth, and a band-pass filter setting of 40 to 160 Hz. Photographs of the records are reproduced in this chapter as Figure 3A to 3JJ, keyed to the bathymetric, magnetic, time, and distance data shown in Figure 2. Figures 3A to 3JJ have been annotated to point up particular geologic features. Each photograph therefore can be located along the Leg 61 track shown in Figure 1.

RESULTS AND DISCUSSION

Glomar Challenger left Apra Harbor on the west coast of Guam and steered south to clear Cocos Island at the south tip of Guam. The southern third of Guam is a remnant of a volcanic caldera of Miocene age, the western half of which was down-faulted and now lies below sea level (Tracey et al., 1964). The bathymetry

[1] *Initial Reports of the Deep Sea Drilling Project*, Volume 61.

Table 1. Navigation data for Leg 61.

				LATITUDE		LONGITUDE				ACTUAL DRIFT			DR			PROB. ERROR			DRIFT		
DA	MO	YR	TIME	DEG	MIN	DEG	MIN	DIST	SPEED	CSE	SPEED	HED	SPEED	CSE	CMNT	(SMAJ×SMIN@AZ)			DIST	TIME	NO.
22	5	1978	* 350	13	26.00	144	34.50	0.0	4.1	155	0.9	0	5.0	160	DR	0.00	0.00	0	0.0	0.0	3
22	5	1978	357	13	25.6	144	34.7	0.5	6.5	157	0.9	0	7.4	160	C/S						4
22	5	1978	4 6	13	24.7	144	35.1	1.5	6.5	180	0.9	0	7.4	180	C/C						5
22	5	1978	452	13	19.7	144	35.1	6.4	8.7	180	0.9	0	9.6	180	C/S						6
22	5	1978	* 5 8	13	17.40	144	35.10	8.7	9.7	184	0.7	262	9.6	180	SATL	0.00	0.00	0	1.3	1.3	8
22	5	1978	550	13	10.6	144	34.6	15.5	8.9	105	0.7	262	9.6	103	C/C						9
22	5	1978	* 622	13	9.40	144	39.30	20.3	8.0	105	1.6	271	9.6	103	SATL	0.00	0.00	0	1.0	1.2	11
22	5	1978	658	13	8.1	144	44.1	25.1	8.0	104	1.6	271	9.6	102	C/C						12
22	5	1978	* 8 6	13	5.90	144	53.10	34.2	8.3	101	1.3	286	9.6	102	SATL	0.00	0.00	0	2.9	1.7	14
22	5	1978	*1236	12	58.60	145	30.60	71.4	8.2	103	1.4	276	9.6	102	SATL	0.00	0.00	0	6.0	4.5	16
22	5	1978	14 0	12	56.0	145	42.1	82.9	8.4	103	1.4	276	9.8	102	C/S						17
22	5	1978	*1554	12	52.40	145	58.00	98.8	8.4	101	1.4	287	9.8	102	SATL	0.00	0.00	0	4.7	3.3	19
22	5	1978	*1616	12	51.80	146	1.10	101.9	8.2	103	1.6	275	9.8	102	SATL	0.00	0.00	0	0.6	0.4	21
23	5	1978	0 0	12	37.1	147	4.2	165.2	8.2	103	1.6	275	9.8	102							22
23	5	1978	* 018	12	36.50	147	6.60	167.6	8.6	102	1.2	282	9.8	102	SATL	0.00	0.00	0	13.2	8.0	24
23	5	1978	* 418	12	29.40	147	40.90	201.8	8.2	98	1.7	299	9.8	102	SATL	0.00	0.00	0	5.0	4.0	26
23	5	1978	* 6 8	12	27.20	147	56.10	216.9	8.4	101	1.4	290	9.8	102	SATL	0.00	0.00	0	3.2	1.8	28
23	5	1978	*1328	12	15.80	148	58.20	278.6	8.3	102	1.5	284	9.8	102	SATL	0.00	0.00	0	10.3	7.3	30
23	5	1978	1538	12	12.2	149	16.3	296.6	8.5	134	1.5	284	9.8	130	C/C						31
23	5	1978	1558	12	10.2	149	18.3	299.4	8.3	102	1.5	284	9.8	102	C/C						32
23	5	1978	*16 2	12	10.10	149	18.90	300.0	8.2	102	1.6	281	9.8	102	SATL	0.00	0.00	0	3.9	2.6	34
23	5	1978	*1818	12	6.20	149	37.40	318.5	7.7	103	2.1	278	9.8	102	SATL	0.00	0.00	0	3.8	2.3	36
23	5	1978	*20 4	12	3.10	149	50.90	332.0	7.8	104	2.0	275	9.8	102	SATL	0.00	0.00	0	3.8	1.8	38
23	5	1978	2348	11	56.1	150	19.7	361.1	7.8	106	2.0	275	9.8	104	C/C						39
24	5	1978	0 0	11	55.7	150	21.3	362.7	7.8	106	2.0	275	9.8	104							40
24	5	1978	* 110	11	53.10	150	30.20	371.8	7.8	102	2.0	291	9.8	104	SATL	0.00	0.00	0	10.4	5.1	42
24	5	1978	131	11	52.5	150	32.9	374.5	7.8	101	2.0	291	9.8	103	C/C						43
24	5	1978	* 228	11	51.10	150	40.40	382.0	7.9	101	1.9	291	9.8	103	SATL	0.00	0.00	0	2.6	1.3	45
24	5	1978	* 256	11	50.40	150	44.10	385.6	7.5	98	2.4	298	9.8	103	SATL	0.00	0.00	0	0.9	0.5	47
24	5	1978	* 330	11	49.80	150	48.40	389.9	7.1	101	2.7	290	9.8	103	SATL	0.00	0.00	0	1.4	0.6	49
24	5	1978	* 416	11	48.80	150	53.90	395.4	7.8	100	2.1	294	9.8	103	SATL	0.00	0.00	0	2.1	0.8	51
24	5	1978	* 518	11	47.40	151	2.00	403.4	7.8	101	2.0	290	9.8	103	SATL	0.00	0.00	0	2.2	1.0	53
24	5	1978	543	11	46.8	151	5.2	406.7	7.8	104	2.0	290	9.8	105	C/C						54
24	5	1978	* 552	11	46.50	151	6.40	407.8	7.6	103	2.2	291	9.8	105	SATL	0.00	0.00	0	1.2	0.6	56
24	5	1978	* 738	11	43.40	151	19.80	421.3	7.6	105	2.2	283	9.8	105	SATL	0.00	0.00	0	3.9	1.8	58
24	5	1978	1358	11	30.5	152	7.3	469.6	6.4	106	2.2	283	8.6	105	C/S						59
24	5	1978	*1410	11	30.20	152	8.60	470.9	7.3	104	1.3	291	8.6	105	SATL	0.00	0.00	0	14.3	6.5	61
24	5	1978	1421	11	29.9	152	9.9	472.2	8.5	104	1.3	291	9.8	105	C/S						62
24	5	1978	*1438	11	29.30	152	12.30	474.6	8.1	110	1.8	265	9.8	105	SATL	0.00	0.00	0	0.7	0.5	64
24	5	1978	1443	11	29.1	152	12.9	475.3	8.1	107	1.8	265	9.8	103	C/C						65
24	5	1978	*1558	11	26.10	152	22.80	485.4	8.2	105	1.7	273	9.8	103	SATL	0.00	0.00	0	2.5	1.3	67
24	5	1978	*17 0	11	23.90	152	31.10	493.8	8.1	105	1.7	273	9.8	103	SATL	0.00	0.00	0	1.8	1.0	69
25	5	1978	0 0	11	9.2	153	27.0	550.6	8.1	105	1.7	273	9.8	103							70
25	5	1978	* 010	11	8.80	153	28.30	551.9	8.4	101	1.4	294	9.8	103	SATL	0.00	0.00	0	12.4	7.2	72
25	5	1978	034	11	8.2	153	31.6	555.3	8.4	99	1.4	294	9.8	101	C/C						73
25	5	1978	* 324	11	4.50	153	55.60	579.1	8.9	98	1.0	307	9.8	101	SATL	0.00	0.00	0	4.7	3.2	75
25	5	1978	* 352	11	3.90	153	59.80	583.2	9.1	100	0.7	288	9.8	101	SATL	0.00	0.00	0	0.5	0.5	77
25	5	1978	* 428	11	2.90	154	5.30	588.7	9.0	100	0.8	291	9.8	101	SATL	0.00	0.00	0	0.4	0.6	79
25	5	1978	* 630	10	59.70	154	23.60	607.0	8.8	100	1.0	294	9.8	101	SATL	0.00	0.00	0	1.8	2.0	81
25	5	1978	*1350	10	49.00	155	28.50	671.6	8.0	103	1.9	272	9.8	101	SATL	0.00	0.00	0	7.5	7.3	83
25	5	1978	*15 6	10	46.70	155	38.50	681.7	8.5	103	1.3	270	9.8	101	SATL	0.00	0.00	0	2.4	1.3	85
25	5	1978	*1538	10	45.70	155	43.00	686.2	8.2	105	1.7	259	9.8	101	SATL	0.00	0.00	0	0.8	0.5	87
25	5	1978	*1750	10	40.90	156	0.80	704.3	8.4	104	1.5	264	9.8	101	SATL	0.00	0.00	0	3.8	2.2	89
25	5	1978	*1936	10	37.30	156	15.40	719.1	8.1	104	1.8	267	9.8	101	SATL	0.00	0.00	0	2.7	1.8	91
25	5	1978	2136	10	33.4	156	31.3	735.3	7.5	104	1.8	267	9.2	101	C/S						92
25	5	1978	*2316	10	30.30	156	43.60	747.7	7.6	101	1.6	279	9.2	101	SATL	0.00	0.00	0	6.6	3.7	94
26	5	1978	0 0	10	29.2	156	49.2	753.3	7.6	101	1.6	279	9.2	101							95
26	5	1978	* 1 4	10	27.60	156	57.30	761.5	8.2	102	1.0	271	9.2	101	SATL	0.00	0.00	0	2.9	1.8	97
26	5	1978	130	10	26.8	157	0.8	765.0	8.8	102	1.0	271	9.8	101	C/S						98
26	5	1978	* 3 6	10	23.90	157	14.80	779.1	7.6	101	2.2	282	9.8	101	SATL	0.00	0.00	0	2.1	2.0	100
26	5	1978	* 340	10	23.10	157	19.10	783.4	8.4	99	1.4	290	9.8	101	SATL	0.00	0.00	0	1.3	0.6	102
26	5	1978	* 710	10	18.30	157	48.50	812.7	8.9	100	1.0	294	9.8	101	SATL	0.00	0.00	0	5.1	3.5	104
26	5	1978	749	10	17.3	157	54.3	818.4	8.9	102	1.0	294	9.8	103	C/C						105
26	5	1978	1510	10	4.1	158	59.0	883.5	8.8	104	1.0	294	9.8	105	C/C						106
26	5	1978	*1526	10	3.50	159	1.30	885.9	9.2	109	0.9	241	9.8	105	SATL	0.00	0.00	0	8.1	8.3	108
26	5	1978	*1828	9	54.50	159	28.10	913.8	8.8	108	1.1	258	9.8	105	SATL	0.00	0.00	0	2.7	3.0	110
26	5	1978	1832	9	54.3	159	28.7	914.3	8.2	109	1.1	258	9.2	105	C/S						111
27	5	1978	0 0	9	40.0	160	11.8	959.2	8.2	109	1.1	258	9.2	105							112
27	5	1978	1 0	9	37.4	160	19.7	967.4	8.8	108	1.1	258	9.8	105	C/S						113
27	5	1978	* 140	9	35.50	160	25.30	973.2	9.0	108	1.0	253	9.8	105	SATL	0.00	0.00	0	8.3	7.2	115
27	5	1978	2 8	9	34.2	160	29.3	977.4	9.0	104	1.0	253	9.8	101	C/C						116
27	5	1978	* 252	9	32.60	160	35.80	984.0	9.7	103	0.4	201	9.8	101	SATL	0.00	0.00	0	1.2	1.2	118
27	5	1978	* 330	9	31.20	160	41.90	990.2	9.0	107	1.3	232	9.8	101	SATL	0.00	0.00	0	0.3	0.6	120
27	5	1978	* 438	9	28.20	160	51.80	1000.4	8.2	107	1.8	253	9.8	101	SATL	0.00	0.00	0	1.5	1.1	122
27	5	1978	* 6 0	9	24.90	161	2.70	1011.6	8.8	105	1.2	249	9.8	101	SATL	0.00	0.00	0	2.6	1.4	124
27	5	1978	645	9	23.2	161	9.2	1018.2	8.8	103	1.2	249	9.8	99	C/C						125
27	5	1978	*1132	9	13.80	161	50.60	1060.2	9.1	101	0.8	255	9.8	99	SATL	0.00	0.00	0	6.7	5.5	127
27	5	1978	1210	9	12.7	161	56.3	1065.9	9.1	98	0.8	255	9.8	96	C/C						128
27	5	1978	*1358	9	10.50	162	12.70	1082.3	8.8	97	1.0	268	9.8	96	SATL	0.00	0.00	0	2.0	2.4	130
27	5	1978	*1432	9	9.90	162	17.70	1087.2	8.4	97	1.4	271	9.8	96	SATL	0.00	0.00	0	0.6	0.6	132
27	5	1978	*15 8	9	9.30	162	22.80	1092.3	8.9	96	0.9	275	9.8	96	SATL	0.00	0.00	0	0.9	0.6	134
27	5	1978	*1618	9	8.20	162	33.20	1102.6	9.0	94	0.9	297	9.8	96	SATL	0.00	0.00	0	1.2	1.2	136
27	5	1978	1919	9	6.3	163	0.6	1129.7	9.0	145	0.9	197	9.8	143	C/C						137
27	5	1978	2210	8	45.2	163	15.3	1155.4	9.0	149	0.9	297	9.8	146	C/C						138
28	5	1978	0 0	8	31.0	163	24.1	1172.0	9.0	149	0.9	297	9.8	146							139
28	5	1978	011	8	29.6	163	24.9	1173.6	8.9	118	0.9	297	9.8	118	C/C						140
28	5	1978	* 050	8	26.90	163	30.10	1179.4	8.5	122	1.4	272	9.8	118	SATL	0.00	0.00	0	7.6	8.5	142
28	5	1978	112	8	25.2	163	32.8	1182.6	8.5	121	1.4	272	9.8	117	C/C						143
28	5	1978	* 126	8	24.20	163	34.50	1184.6	9.3	118	0.5	276	9.8	117	SATL	0.00	0.00	0	0.9	0.6	145
28	5	1978	151	8	22.4	163	38.0	1188.4	9.3	116	0.5	276	9.8	115	C/C						146
28	5	1978	* 236	8	19.30	163	44.30	1195.4	9.1	117	0.8	273	9.8	115	SATL	0.00	0.00	0	0.7	1.2	148

Table 1. (Continued).

				LATITUDE		LONGITUDE				ACTUAL DRIFT			DR			PROB. ERROR			DRIFT		
DA	MO	YR	TIME	DEG	MIN	DEG	MIN	DIST	SPEED	CSE	SPEED	HED	SPEED	CSE	CMNT	(SMAJ×SMIN@AZ)			DIST	TIME	NO.
28	5	1978	* 314	8	16.70	163	49.50	1201.2	8.8	119	1.2	266	9.8	115	SATL	0.00	0.00	0	0.5	0.6	150
28	5	1978	* 348	8	14.30	163	53.90	1206.2	9.0	116	0.8	281	9.8	115	SATL	0.00	0.00	0	0.7	0.6	152
28	5	1978	5 0	8	9.5	164	3.7	1217.0	8.4	116	0.8	281	9.2	115	C/S						153
28	5	1978	* 640	8	3.30	164	16.40	1231.0	9.0	114	0.3	335	9.2	115	SATL	0.00	0.00	0	2.4	2.9	155
28	5	1978	710	8	1.5	164	20.5	1235.5	9.0	116	0.3	335	9.2	117	C/C						156
28	5	1978	842	7	55.5	164	33.1	1249.3	9.6	116	0.3	335	9.8	117	C/S						157
28	5	1978	1025	7	48.3	164	48.0	1265.7	6.9	153	0.3	335	7.2	153	C/CS						158
28	5	1978	11 5	7	44.2	164	50.1	1270.3	6.9	158	0.3	335	7.2	158	C/C						159
28	5	1978	1111	7	43.5	164	50.4	1271.0	6.9	181	0.3	335	7.2	180	C/C						160
28	5	1978	1150	7	39.0	164	50.3	1275.5	6.9	153	0.3	335	7.2	153	C/C						161
28	5	1978	*1226	7	35.30	164	52.20	1279.7	6.5	148	1.0	13	7.2	153	SATL	0.00	0.00	0	1.7	5.8	163
28	5	1978	*1312	7	31.10	164	54.90	1284.7	7.0	152	0.2	358	7.2	153	SATL	0.00	0.00	0	0.8	0.8	165
28	5	1978	1330	7	29.2	164	55.9	1286.8	7.0	163	0.2	358	7.2	163	C/C						166
28	5	1978	14 3	7	25.6	164	57.0	1290.6	7.0	167	0.2	358	7.2	167	C/C						167
28	5	1978	*1416	7	24.10	164	57.40	1292.1	6.8	167	0.4	350	7.2	167	SATL	0.00	0.00	0	0.3	1.1	169
28	5	1978	1434	7	22.1	164	57.9	1294.2	6.8	164	0.4	350	7.2	164	C/C						170
28	5	1978	*15 0	7	19.30	164	58.70	1297.1	7.1	162	0.3	45	7.2	164	SATL	0.00	0.00	0	0.4	0.7	172
28	5	1978	1512	7	18.0	164	59.1	1298.5	7.1	158	0.3	45	7.2	160	C/C						173
28	5	1978	1516	7	17.5	164	59.3	1299.0	7.2	143	0.3	45	7.2	145	C/C						174
28	5	1978	*1550	7	14.30	165	1.80	1303.0	7.2	145	0.0	0	7.2	145	S462	0.00	0.00	0	0.3	0.8	176
28	5	1978	1550	7	14.3	165	1.8	1303.0	0.0	0	0.0	0	0.0	500	STOP						177
7	6	1978	*22 0	7	14.30	165	1.80	1303.0	0.0	26	0.0	26	0.0	500	DEP	0.00	0.00	0	0.1	246.2	179
9	6	1978	* 3 5	7	14.50	165	1.90	1303.3	0.0	0	0.0	0	0.0	500	462A	0.00	0.00	0	0.3	29.1	181
8	7	1978	*1850	7	14.50	165	1.90	1303.3	1.4	319	1.4	319	0.0	500	DEP	0.00	0.00	0	0.1	711.8	183
8	7	1978	1850	7	14.5	165	1.9	1303.3	5.7	97	1.4	319	6.8	105	U/W						184
8	7	1978	1924	7	14.1	165	5.1	1306.5	6.0	81	1.4	319	6.8	91	C/C						185
8	7	1978	*1958	7	14.60	165	8.50	1309.9	6.6	90	0.3	296	6.8	91	SATL	0.00	0.00	0	1.6	1.1	187
8	7	1978	*2226	7	14.60	165	24.80	1326.0	7.0	90	0.2	54	6.8	91	SATL	0.00	0.00	0	0.7	2.5	189
8	7	1978	*2348	7	14.60	165	34.40	1335.6	6.8	90	0.2	2	6.8	91	SATL	0.00	0.00	0	0.3	1.4	191
9	7	1978	0 0	7	14.6	165	35.8	1336.9	6.8	90	0.2	2	6.8	91							192
9	7	1978	* 140	7	14.70	165	47.20	1348.3	7.1	88	0.5	39	6.8	91	SATL	0.00	0.00	0	0.4	1.9	194
9	7	1978	* 340	7	15.20	166	1.50	1362.5	6.8	88	0.4	1	6.8	91	SATL	0.00	0.00	0	1.0	2.0	196
9	7	1978	4 0	7	15.3	166	3.8	1364.7	6.8	90	0.4	1	6.8	93	C/C						197
9	7	1978	* 912	7	15.30	166	39.40	1400.1	6.6	93	0.2	277	6.8	93	SATL	0.00	0.00	0	2.0	5.5	199
9	7	1978	*10 6	7	15.00	166	45.40	1406.0	7.2	92	0.4	69	6.8	93	SATL	0.00	0.00	0	0.2	0.9	201
9	7	1978	1125	7	14.7	166	54.9	1415.5	8.2	92	0.4	69	7.8	93	C/S						202
9	7	1978	*1132	7	14.70	166	55.90	1416.4	8.9	90	1.2	67	7.8	93	SATL	0.00	0.00	0	0.7	1.4	204
9	7	1978	1138	7	14.7	166	56.8	1417.3	10.3	90	1.2	67	9.2	93	C/S						205
9	7	1978	*1152	7	14.70	166	59.20	1419.7	9.0	94	0.2	246	9.2	93	SATL	0.00	0.00	0	0.4	0.3	207
9	7	1978	*15 2	7	12.90	167	27.90	1448.2	8.7	95	0.6	247	9.2	93	SATL	0.00	0.00	0	0.7	3.2	209
9	7	1978	1745	7	10.9	167	51.5	1471.8	9.5	95	0.6	247	10.0	93	C/S						210
9	7	1978	*2048	7	8.60	168	20.50	1500.6	9.7	94	0.3	248	10.0	93	SATL	0.00	0.00	0	3.6	5.8	212
9	7	1978	2121	7	8.2	168	25.9	1505.9	9.7	89	0.3	248	10.0	88	C/C						213
9	7	1978	*2136	7	8.30	168	28.30	1508.4	9.8	84	0.7	340	10.0	88	SATL	0.00	0.00	0	0.3	0.8	215
9	7	1978	2242	7	9.4	168	39.1	1519.1	6.6	82	0.7	340	6.8	88	C/S						216
9	7	1978	*2250	7	9.50	168	40.00	1520.0	8.0	88	1.2	88	6.8	88	DR	0.00	0.00	0	0.9	1.2	218
9	7	1978	2250	7	9.5	168	40.0	1520.0	1.2	88	1.2	88	0.0	500	PORT						219
14	7	1978	2131	7	15.3	171	3.7	1662.7	4.4	292	1.2	88	5.5	287	U/W						220
14	7	1978	*2134	7	15.37	171	3.50	1663.0	5.6	284	0.3	209	5.5	287	SATL	0.00	0.00	0	142.8	118.7	222
14	7	1978	2141	7	15.5	171	2.9	1663.6	9.1	285	0.3	209	9.0	287	C/S						223
14	7	1978	*22 8	7	16.57	170	58.88	1667.7	10.0	285	1.0	272	9.0	287	SATL	0.00	0.00	0	0.2	0.6	225
14	7	1978	*2230	7	17.55	170	55.31	1671.4	9.9	282	1.2	238	9.0	287	SATL	0.00	0.00	0	0.4	0.4	227
15	7	1978	0 0	7	20.5	170	40.7	1686.2	9.9	282	1.2	238	9.0	287							228
15	7	1978	* 014	7	20.96	170	38.43	1688.5	9.7	284	0.8	253	9.0	287	SATL	0.00	0.00	0	2.2	1.7	230
15	7	1978	3 2	7	27.7	170	12.0	1715.5	9.6	293	0.8	253	9.0	296	C/C						231
15	7	1978	* 714	7	43.28	169	34.51	1755.8	9.5	289	1.3	223	9.0	296	SATL	0.00	0.00	0	5.6	7.0	233
15	7	1978	*1132	7	56.26	168	55.59	1796.5	10.2	298	1.3	313	9.0	296	SATL	0.00	0.00	0	5.5	4.3	235
15	7	1978	12 2	7	58.7	168	51.0	1801.6	9.3	242	1.3	313	9.0	234	C/C						236
15	7	1978	1435	7	47.4	168	29.8	1825.5	8.7	214	1.3	313	9.0	206	C/C						237
15	7	1978	*1524	7	41.54	168	25.79	1832.6	9.7	211	1.1	259	9.0	206	SATL	0.00	0.00	0	5.1	3.9	239
15	7	1978	1637	7	31.4	168	19.6	1844.4	10.1	251	1.1	259	9.0	250	C/C						240
15	7	1978	1839	7	24.8	168	0.1	1864.9	10.1	266	1.1	259	9.0	267	C/C						241
15	7	1978	*1852	7	24.61	167	57.89	1867.0	10.1	269	1.2	280	9.0	267	SATL	0.00	0.00	0	3.8	3.5	243
15	7	1978	*2038	7	24.15	167	39.85	1884.9	10.2	268	1.3	277	9.0	267	SATL	0.00	0.00	0	2.1	1.8	245
15	7	1978	*2144	7	23.81	167	28.50	1896.2	10.0	269	1.1	284	9.0	267	SATL	0.00	0.00	0	1.4	1.1	247
15	7	1978	*23 4	7	23.54	167	15.00	1909.6	10.5	270	1.5	287	9.0	267	SATL	0.00	0.00	0	1.5	1.3	249
15	7	1978	*2326	7	23.53	167	11.14	1913.4	9.8	269	0.9	294	9.0	267	SATL	0.00	0.00	0	0.6	0.4	251
16	7	1978	0 0	7	23.5	167	5.5	1919.0	9.8	269	0.9	294	9.0	267							252
16	7	1978	* 262	7	23.11	166	35.60	1948.7	10.2	272	1.4	305	9.0	267	SATL	0.00	0.00	0	3.2	3.6	254
16	7	1978	* 8 4	7	24.92	165	43.96	1999.9	10.1	268	1.1	273	9.0	267	SATL	0.00	0.00	0	7.3	5.0	256
16	7	1978	835	7	24.7	165	38.7	2005.1	10.1	254	1.1	273	9.0	252	C/C						257
16	7	1978	12 0	7	15.4	165	5.4	2039.5	6.6	255	1.1	273	5.5	252	C/S						258
16	7	1978	1221	7	14.8	165	3.1	2041.8	5.1	256	1.1	273	4.0	252	C/S						259
16	7	1978	*1236	7	14.50	165	1.90	2043.0	4.0	252	0.0	350	4.0	252	462A	0.00	0.00	0	5.1	4.5	261
16	7	1978	1236	7	14.5	165	1.9	2043.0	0.0	350	0.0	350	0.0	500	STOP						262
27	7	1978	* 1 8	7	14.55	165	1.89	2043.1	0.3	289	0.3	289	0.0	500	SATL	0.00	0.00	0	0.1	252.5	264
27	7	1978	524	7	14.9	165	0.7	2044.3	5.2	90	0.3	289	5.5	91	U/W						265
27	7	1978	530	7	14.9	165	1.3	2044.8	8.7	90	0.3	289	9.0	91	C/S						266
27	7	1978	630	7	14.9	165	10.1	2053.5	8.7	89	0.3	289	9.0	90	C/C						267
27	7	1978	* 650	7	14.91	165	13.01	2056.4	8.5	88	0.5	301	9.0	90	SATL	0.00	0.00	0	1.7	5.7	269
27	7	1978	* 836	7	15.41	165	28.20	2071.5	8.5	88	0.6	294	9.0	90	SATL	0.00	0.00	0	1.0	1.8	271
27	7	1978	9 0	7	15.5	165	31.6	2074.9	8.4	92	0.6	294	9.0	93	C/C						272
27	7	1978	*1420	7	14.31	166	16.98	2119.9	8.4	91	0.7	299	9.0	93	SATL	0.00	0.00	0	3.5	5.7	274
27	7	1978	*1828	7	13.73	166	51.90	2154.6	8.6	91	0.5	309	9.0	93	SATL	0.00	0.00	0	2.9	4.1	276
28	7	1978	* 146	7	12.80	167	54.92	2217.1	8.4	92	0.7	281	9.0	93	SATL	0.00	0.00	0	4.0	7.3	278
28	7	1978	* 740	7	10.74	168	44.55	2266.4	8.6	90	0.6	321	9.0	93	SATL	0.00	0.00	0	3.9	5.9	280
28	7	1978	8 2	7	10.7	168	47.7	2269.5	5.1	88	0.6	321	5.5	93	C/S						281
28	7	1978	814	7	10.8	168	48.8	2270.6	8.6	87	0.6	321	9.0	90	C/CS						282
28	7	1978	*1012	7	11.68	169	5.85	2287.5	8.6	88	0.6	310	9.0	90	SATL	0.00	0.00	0	1.6	2.5	284
28	7	1978	*12 2	7	12.35	169	21.68	2303.3	8.2	88	0.8	286	9.0	90	SATL	0.00	0.00	0	1.1	1.8	286
28	7	1978	*2112	7	14.34	170	37.73	2378.7	7.7	88	1.3	281	9.0	90	SATL	0.00	0.00	0	7.4	9.2	288
28	7	1978	*2144	7	14.48	170	41.86	2382.8	8.0	90	1.0	270	9.0	90	SATL	0.00	0.00	0	0.8	0.5	290
28	7	1978	*2334	7	14.52	170	56.71	2397.5	8.0	90	0.0	0	9.0	90	SATL	0.00	0.00	0	1.9	1.8	291

Notes: *Time = GMT: Hours and minutes. Distance = nautical miles. Speed = knots. Course = azimuth (0-360°). DA = day. MO = month. DEG = degree. MIN = minutes. DIST = distance. CSE = course. HED = heading (azimuth). COMNT = comment. SATL = satellite. C/C = course change. C/S = speed change. U/W = under way. DEP = depart.

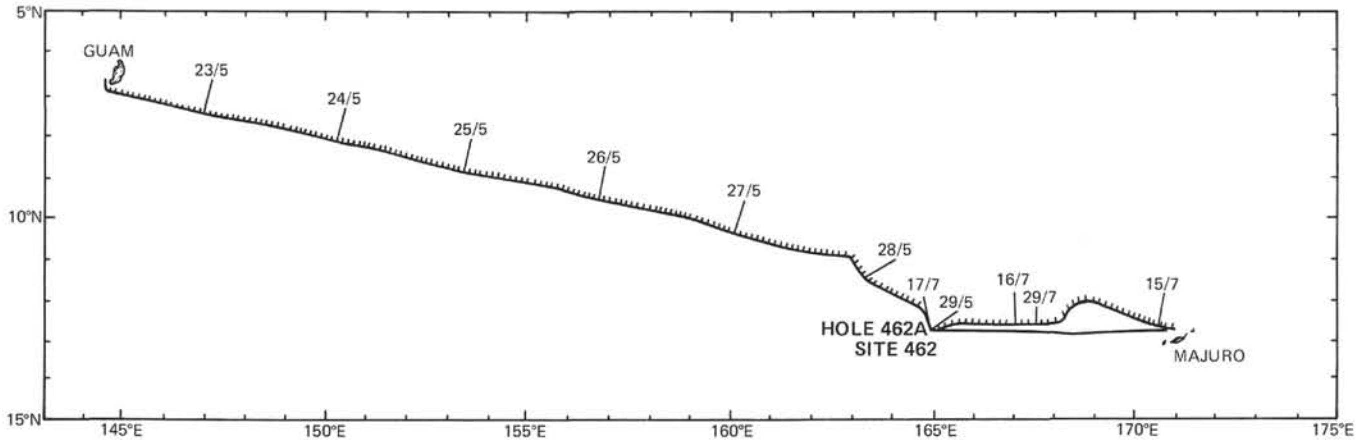

Figure 1. Track of *Glomar Challenger* on Leg 61: Guam to Site 462, Site 462 to Majuro and return, and Site 462 to Majuro. Hour and day/month time ticks shown are in GMT, e.g., 23/5 is 0000 23 May GMT position. See Table 1 for details.

(Fig. 3A, 0430Z–0545Z) can be interpreted as a downfaulted volcanic cone. After a course change to 103° to make for the Nauru Basin, we crossed the Mariana Ridge, the inner trench wall, and the Mariana Trench proper, where a maximum depth of 9750 meters (uncorrected) was recorded (Fig. 3B, 1630Z). Between the outer trench wall and the Mariana Basin, we passed a cluster of seamounts, just starting their journey into the Mariana Trench, the easternmost of which is capped by a drowned reef overlain by pelagic sediments (Fig. 3D). The uppermost reflector taken to be from the reef wall (0615Z) is 2.65 seconds two-way travel time below sea level, a depth of 1990 meters (uncorrected). The region around Enewetak and Bikini to the north has subsided approximately 1600 meters since 70 m.y. ago (Schlanger and Premoli-Silva, this volume). The drowned reef therefore could be of Late Cretaceous age.

West of this reef-capped guyot, the Mariana Basin proper is a relatively featureless plain with a maximum depth along the Leg 61 track of 5890 meters (uncorrected), as seen in Figure 3G. Only a few small volcanic hills project above the sediment cover and a few small diapir structures are present (Fig. 3F). The magnetic profile is also very flat at about the 0-gamma level. It is difficult to pick any sharp seismic horizon as volcanic basement, but at 1630Z, 24/5, the section resembles that drilled at Site 462 (Fig. 3X); a series of widely and equally spaced reflectors at 8.25-second two-way travel time, below 0.45 seconds of presumed sediment, are acoustically similar to the top of the sill complex at Site 462. At DSDP Site 61, drilled at 12°05.8′N, 147° 03.9′E, at the western extremity of the Mariana Basin (Winterer and Riedel et al., 1971), Upper Cretaceous mudstones lie above amygdaloidal basalt, within which the drill stopped. Reflectors below this "basement" suggested that up to 100 meters of sediment might exist below the basalt. It appears that a sill-and-flow complex similar to but thinner than that in the Nauru Basin may also exist in the Mariana Basin.

The eastern boundary of the Mariana Basin is formed by a group of seamounts (Fig. 3N). Between these seamounts and the western Marshall Islands, a semi-transparent sediment layer with bathymetric relief lies above a flatter set of reflectors (Fig. 3O). The uppermost layer probably is a turbidite sequence molded by bottom currents.

Before reaching the Nauru Basin proper, we passed over seamounts in the western Marshalls southwest of Ujelang Atoll (Figs. 3R, S); typical moating can be seen where sediments around seamounts have been eroded. We also passed over Heezen Guyot, because we had picked this guyot as a possible alternate site if time were available after drilling at Site 462. Heezen Guyot appears to lack a well-defined reef cap, but does have a well-developed pelagic cap (Fig. 3U). The guyot also has a marked magnetic signature (Fig. 2). The Nauru Basin proper is a flat plain, with a depth of about 5180 meters (uncorrected), upon which can be seen turbidite channels and levees (Figure 3W) (see site survey chapter, this volume). Site 462, in the center of the Nauru Basin, was occupied at 1550Z, 28/5 (Fig. 3X). The site was located on anomaly M-26 (Fig. 2) of Larson and Hilde (1975) (see site chapter, this volume).

After drilling operations at Site 462, we steamed to Majuro Atoll for a port stop and crew change. Figures 3Y to 3CC show the progressively thinning sedimentary layers as the *Glomar Challenger* approached Majuro.

Upon leaving Majuro Atoll to return to Site 462, we decided to head west-northwest and pass between Namu and Ailinglapalap Atolls, in order to gain additional seismic information on the Marshalls area and the eastern Nauru Basin (Fig. 1). The sedimentary apron on the Marshalls reaches thicknesses up to 1-second two-way travel time (Figure 3EE), similar to those seen around the Line Islands drilled on Leg 33 (Schlanger, Jackson, et al., 1976). The northeast edge of the Nauru Basin (Figs. 3HH and 3II) has a fairly complex acoustic stratigraphy. Rapid lateral changes in reflector thicknesses are seen, and small diapir structures are present (2215Z, 15/7 on Fig. 3HH). At 0630Z, 16/7 (Fig. 3II), there appears to be a boundary between the northeast Nauru Basin and what we might refer to as the central

Nauru Basin. Northeast of the small volcanic hill that marks the boundary, the sedimentary cover shows irregular reflectors. Between this hill and Site 462 (Fig. 3JJ), the reflectors above the sill complex are flat, but appear to pinch out to the east against a shallowing basement.

Following completion of the renewed drilling at Site 462, *Glomar Challenger* proceeded directly to Majuro Atoll over the same route we had taken previously.

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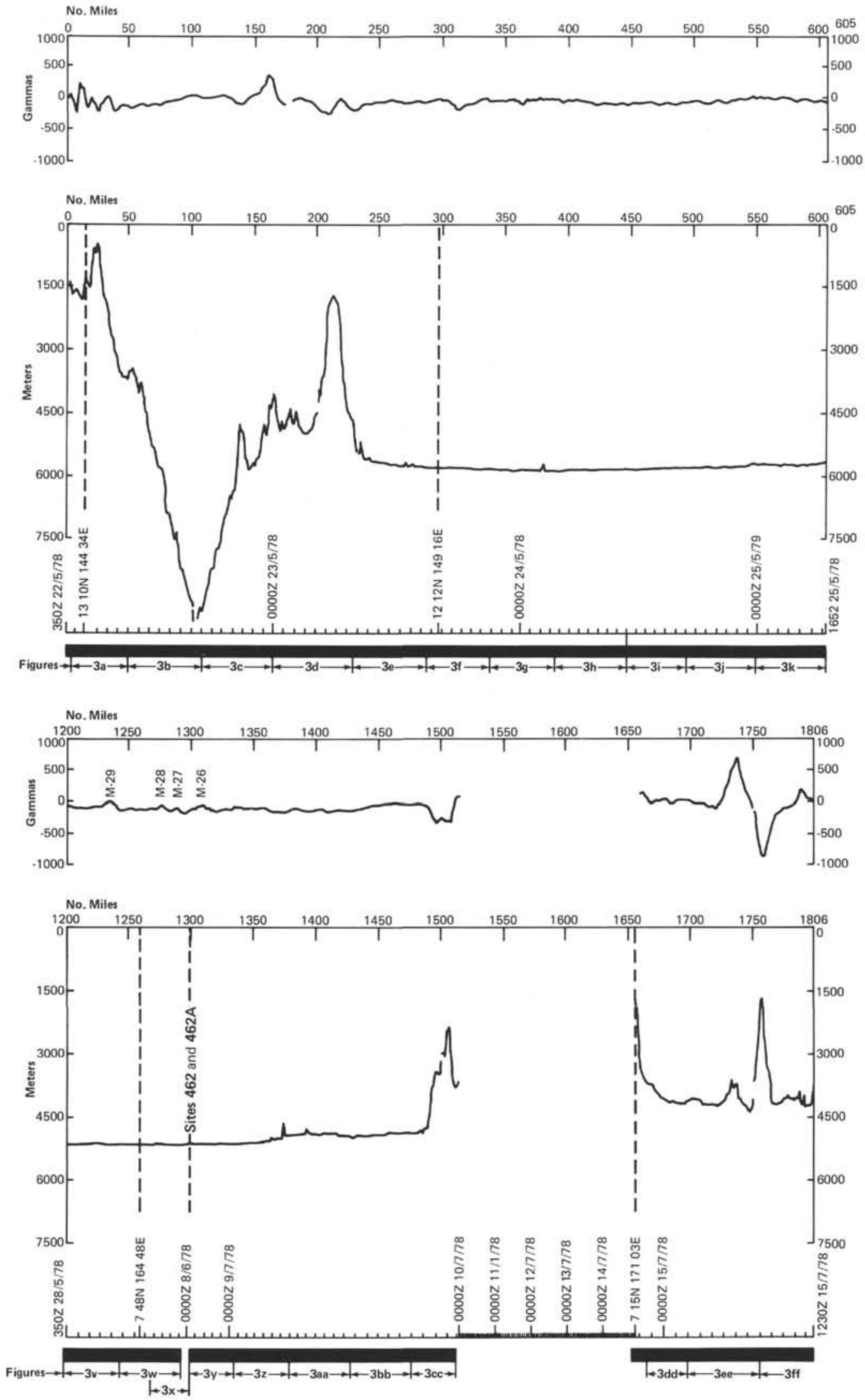


Figure 2. Bathymetry (in meters), magnetic (in gammas) along *Glomar Challenger* track. Keyed to hour and day/month ticks shown on Figure 1, and to nautical miles from Guam. Shown along the solid black bar are the locations of seismic profiles reproduced as Figures 3A to 3JJ.

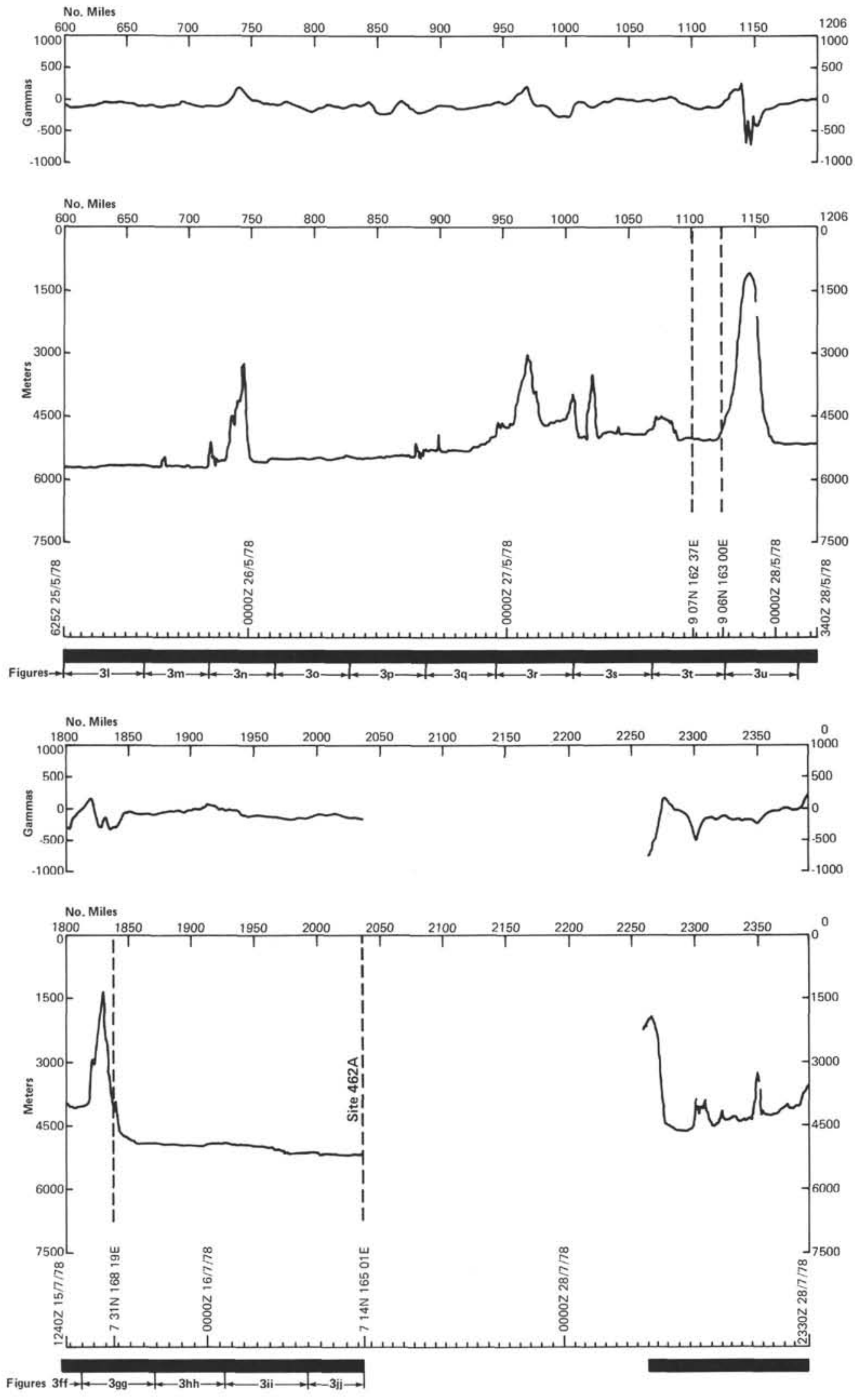
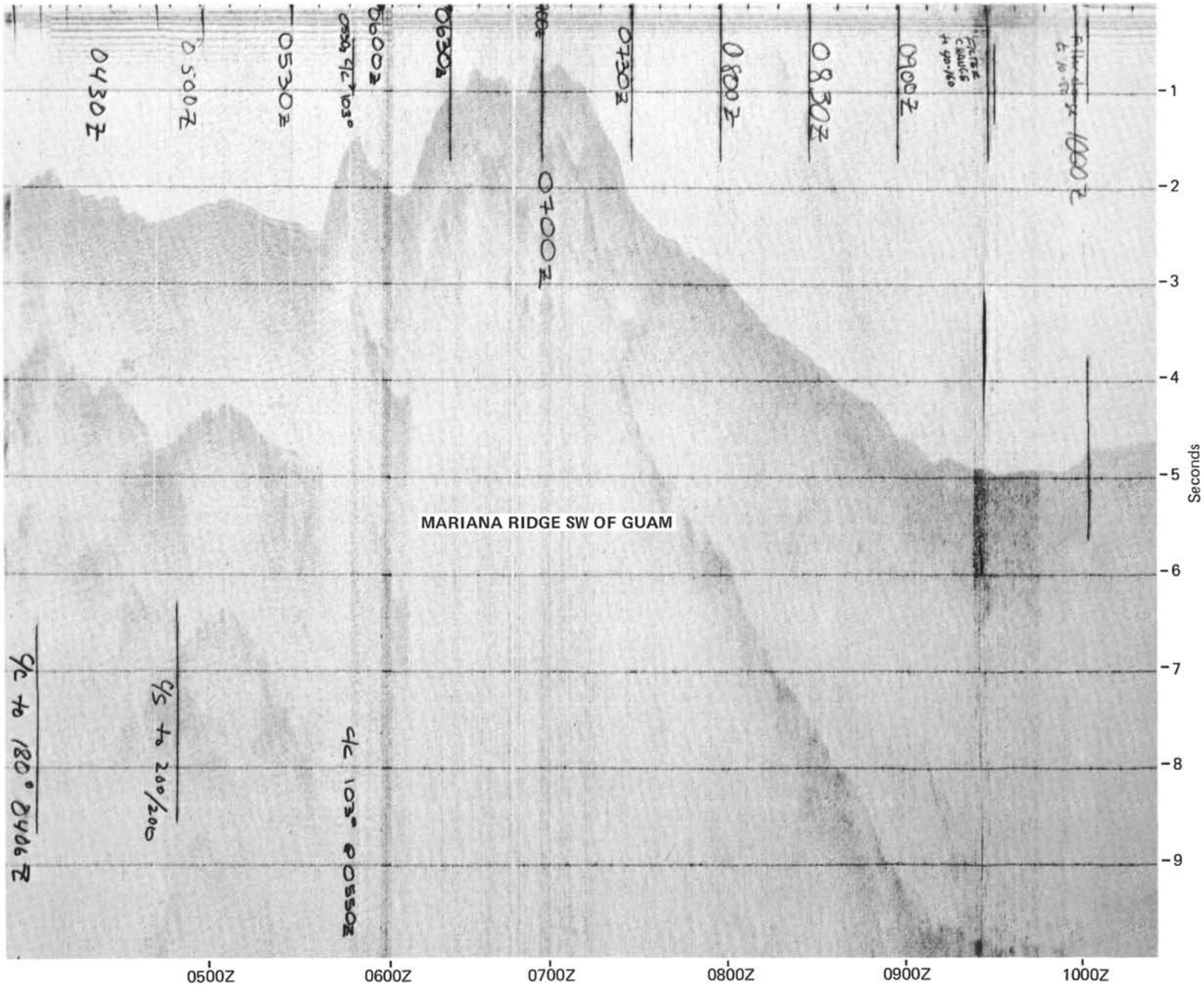


Figure 2. (Continued).



MARIANA RIDGE SW OF GUAM
Seconds
1
2
3
4
5
6
7
8
9
0500Z
0600Z
0700Z
0800Z
0900Z
1000Z

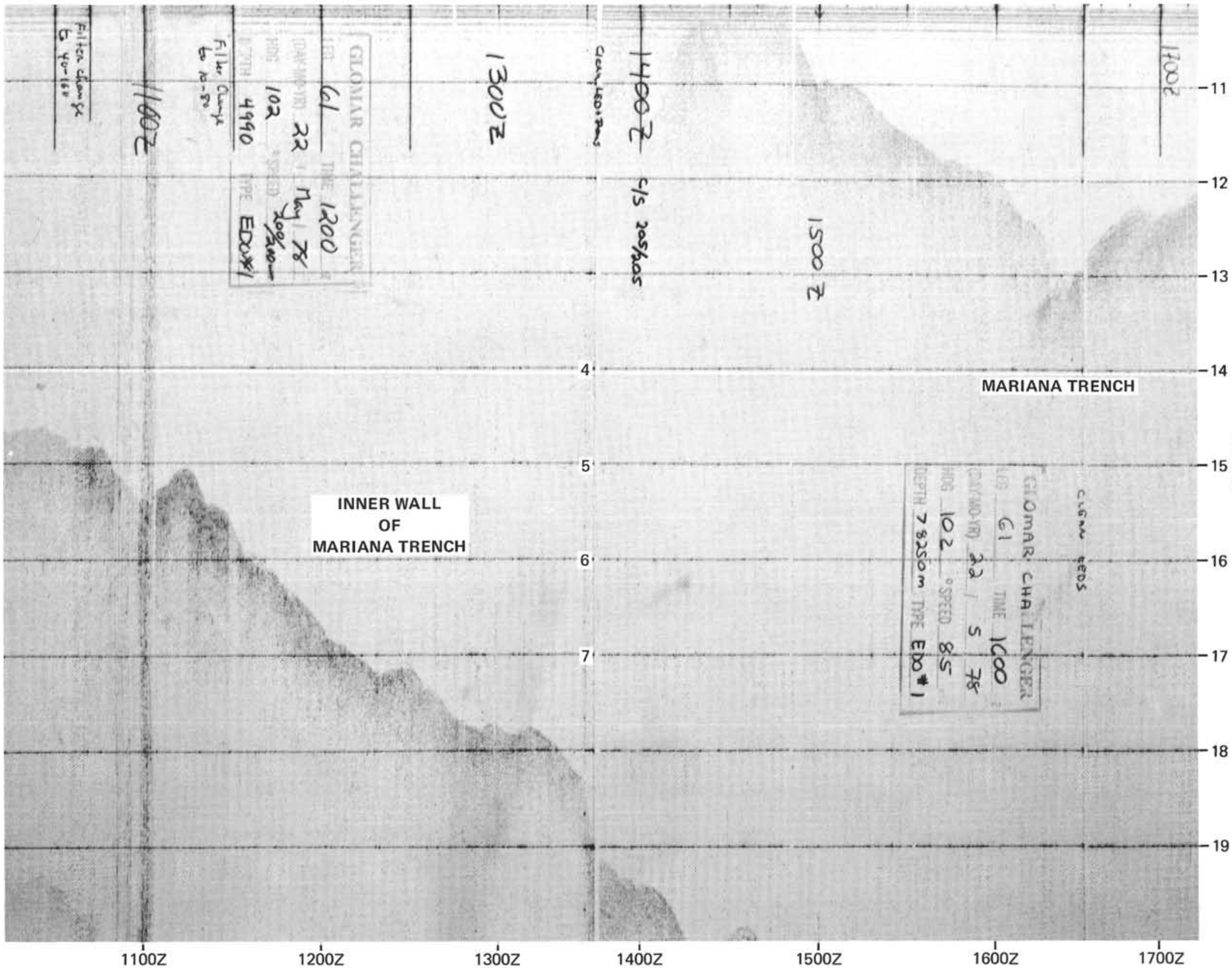
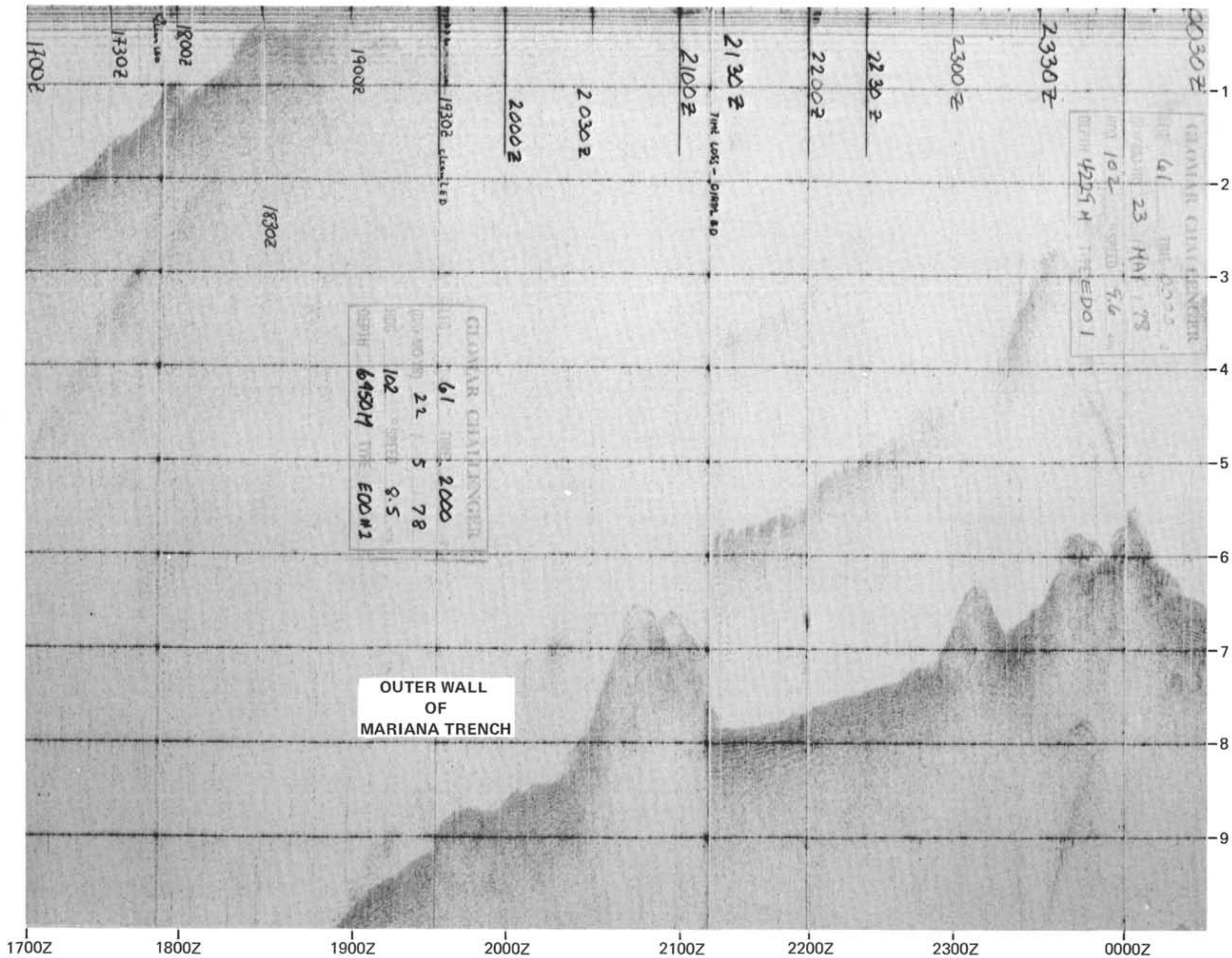


Figure 3. Seismic profiles made during Leg 61. See text for descriptions.


OUTER WALL
OF
MARIANA TRENCH
Seconds
1
2
3
4
5
6
7
8
9
1700Z
1800Z
1900Z
2000Z
2100Z
2200Z
2300Z
0000Z

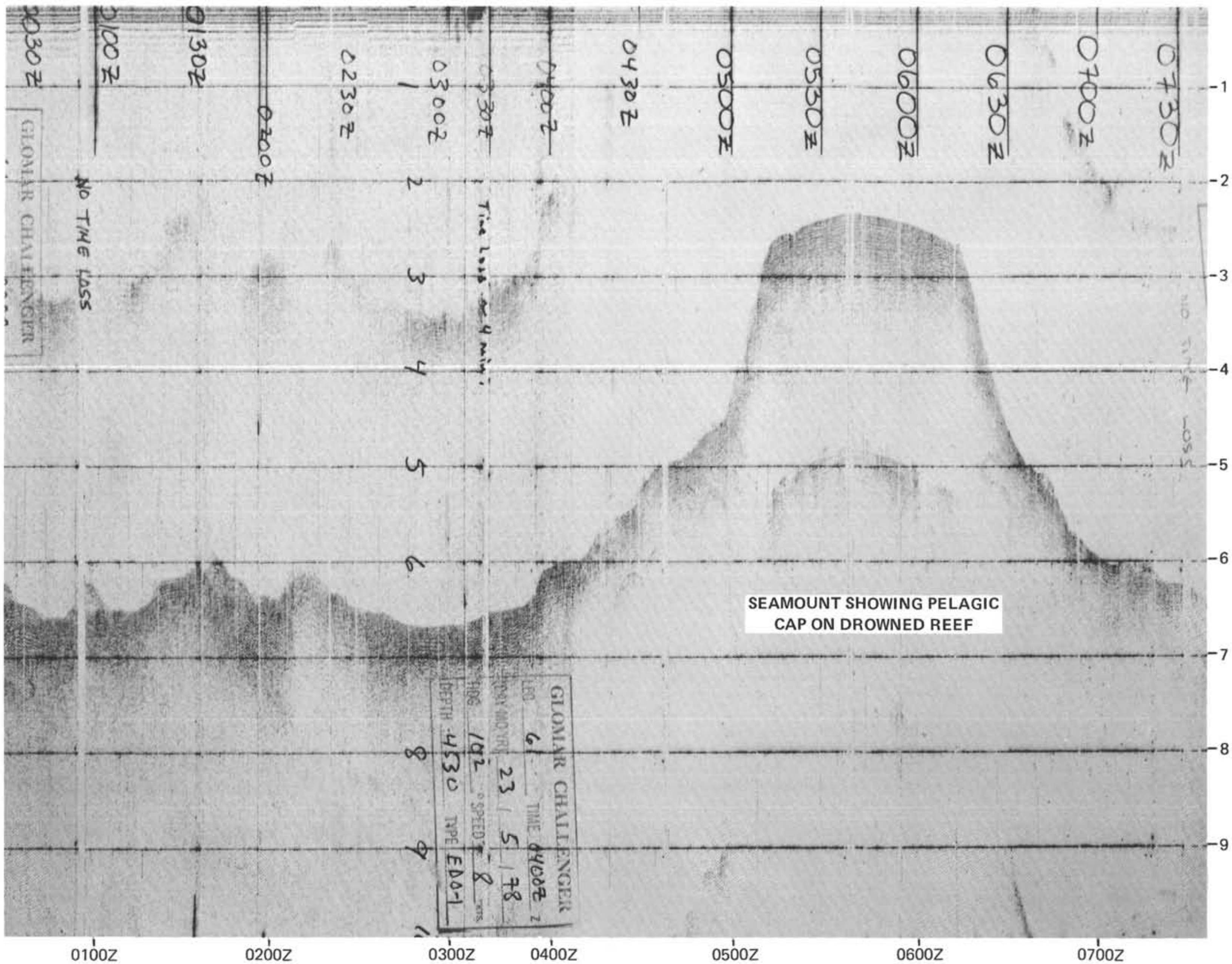
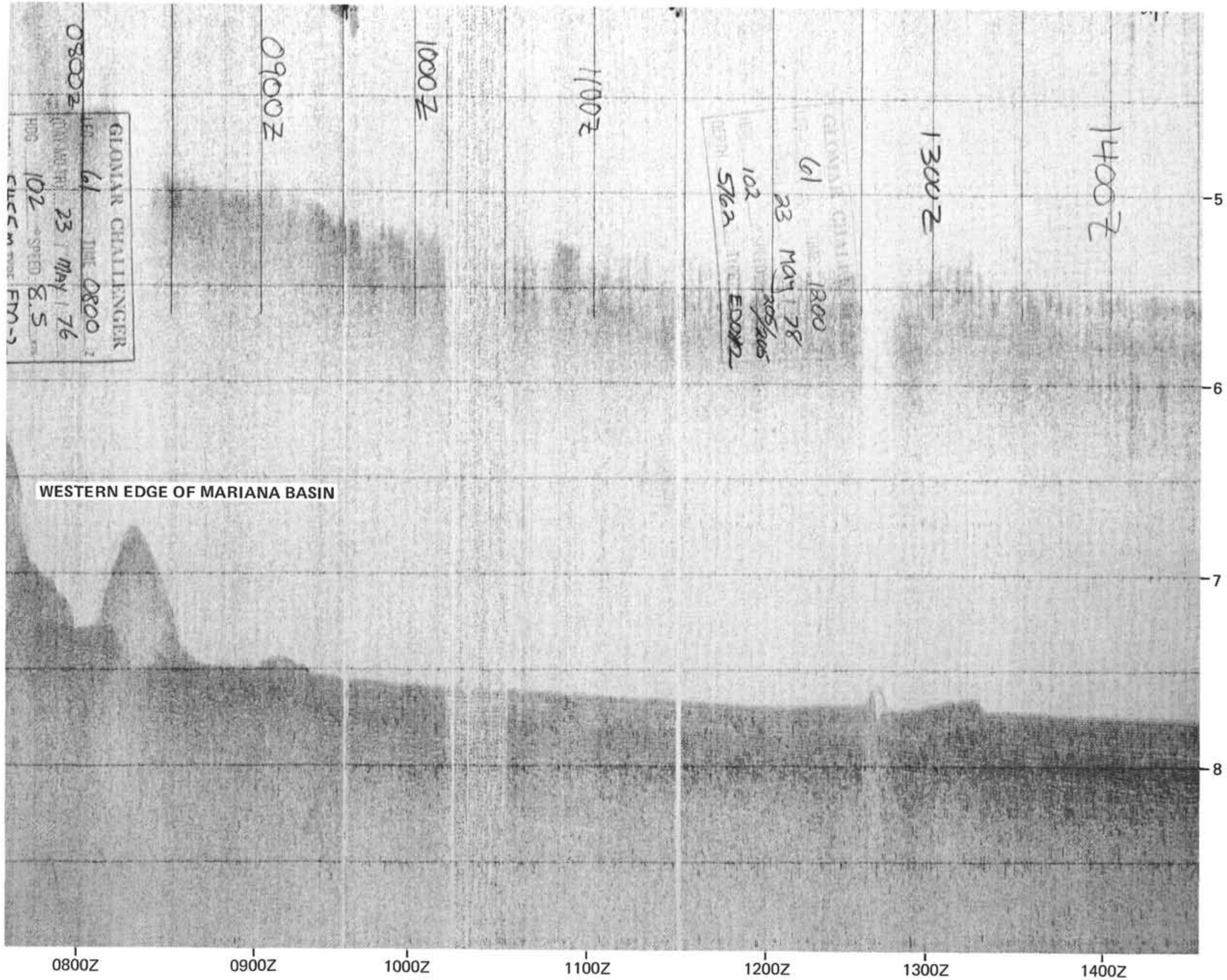


Figure 3. (Continued).


WESTERN EDGE OF MARIANA BASIN
Seconds
5
6
7
8
0800Z
0900Z
1000Z
1100Z
1200Z
1300Z
1400Z
GLOMAR CHALLENGER

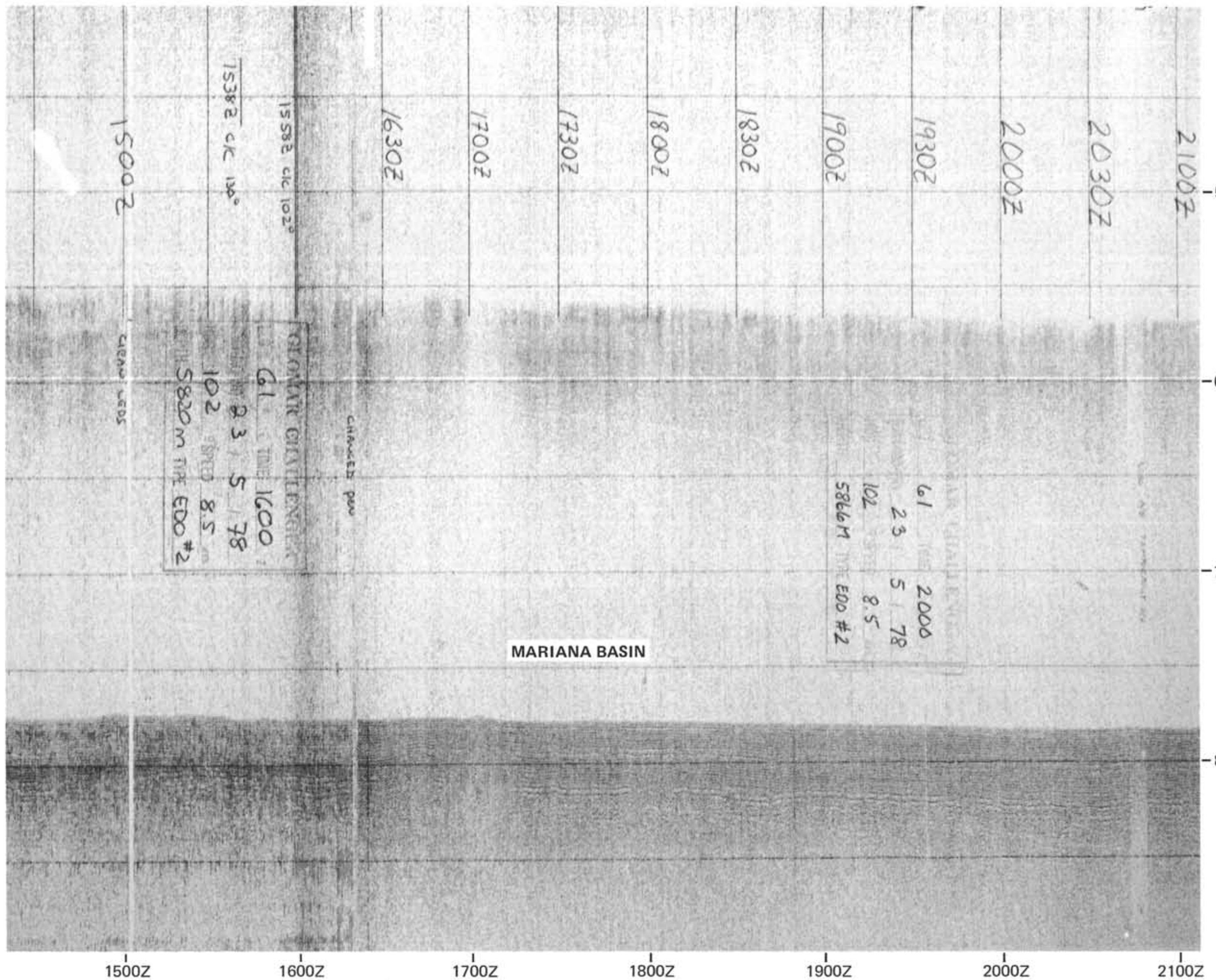
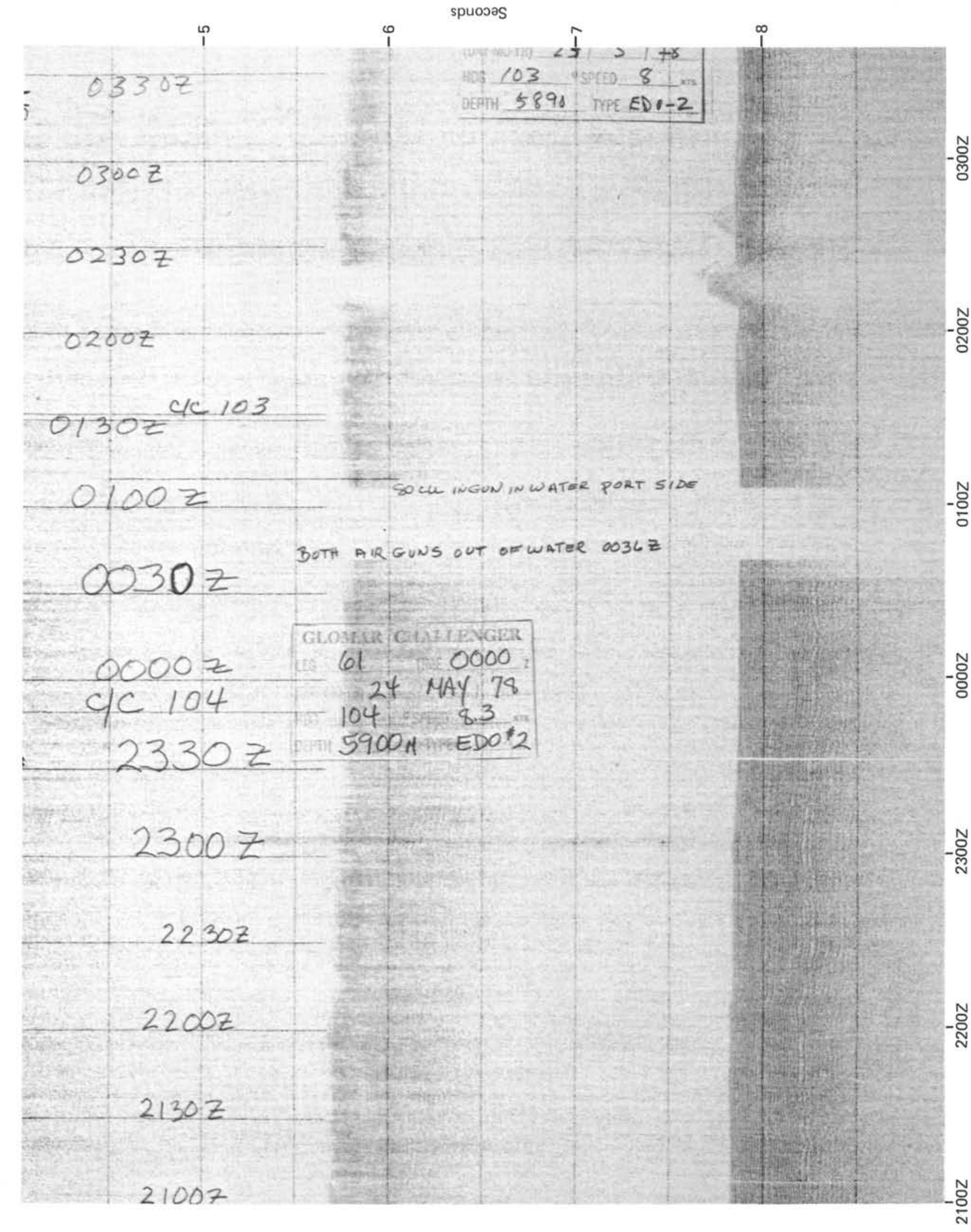


Figure 3. (Continued).


Seconds
5
6
7
8
2100Z
2200Z
2300Z
0000Z
0100Z
0200Z
0300Z
GLOMAR CHALLENGER
BOTH AIR GUNS OUT OF WATER 0036Z

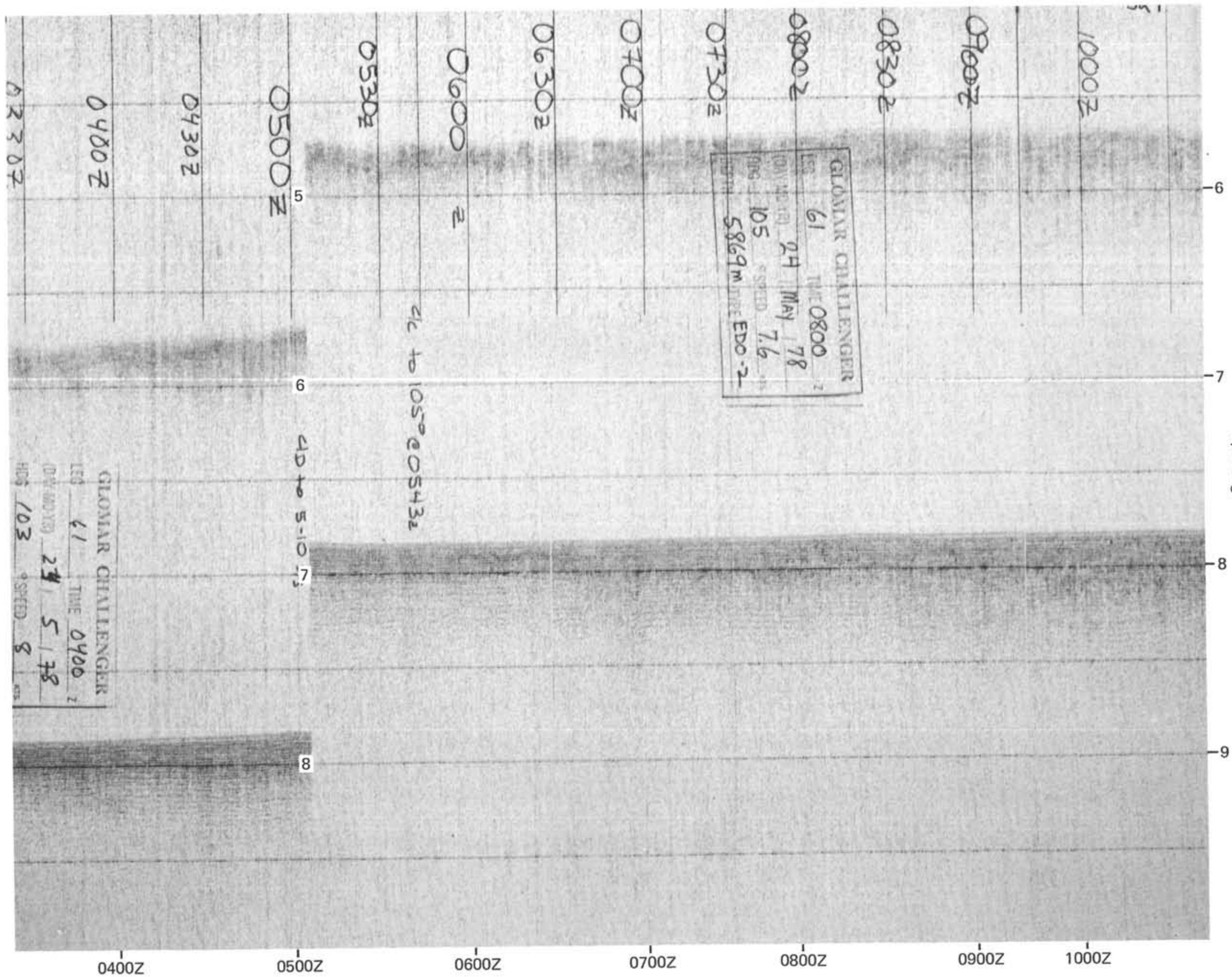
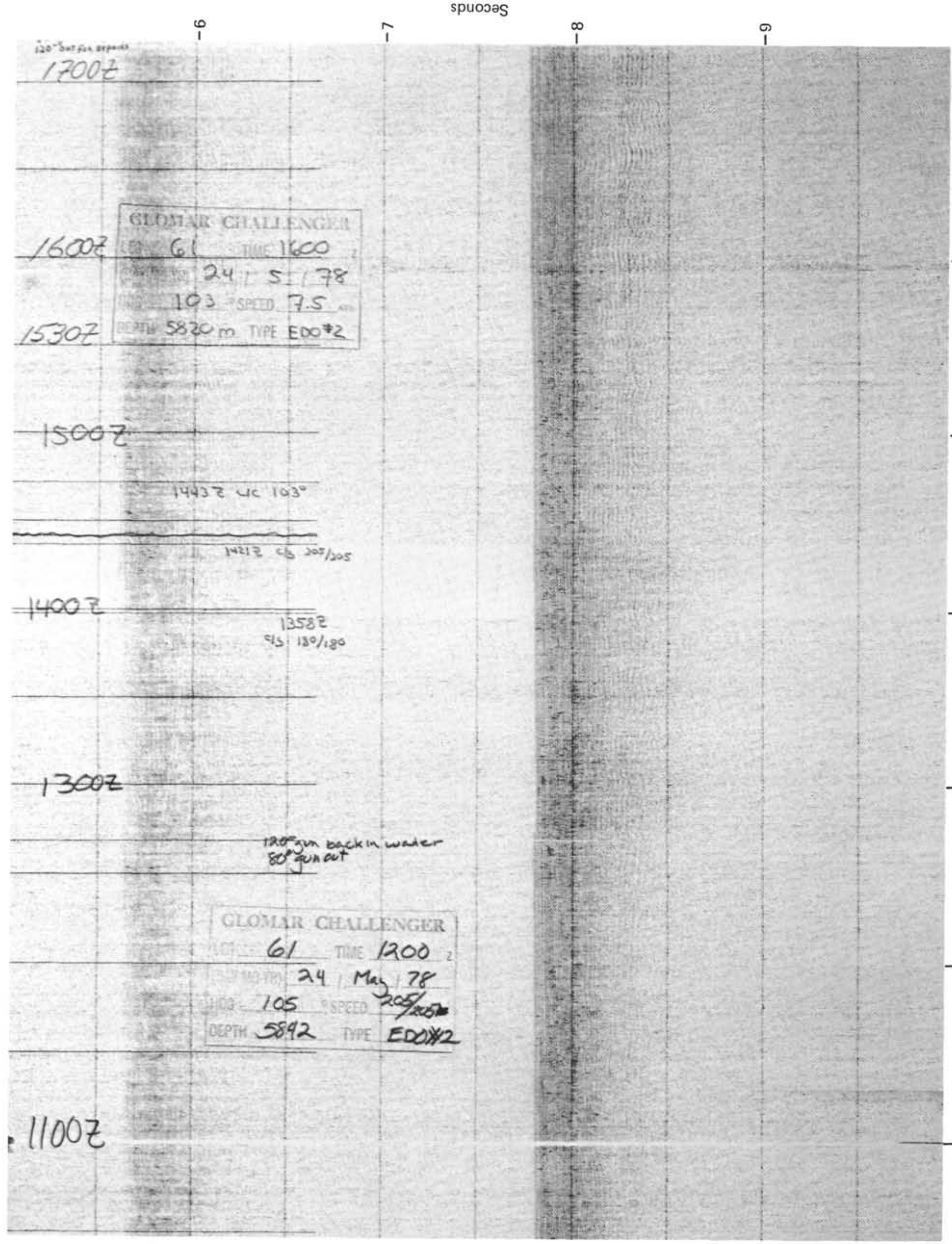


Figure 3. (Continued).


Seconds
6
7
8
9
1100Z
1200Z
1300Z
1400Z
1500Z
1600Z
1700Z
GLOMAR CHALLENGER
61 TIME 1600
24 / 5 / 78
103 SPEED 7.5
DEPTH 5820 m TYPE EDO #2
GLOMAR CHALLENGER
61 TIME 1200
24 / May / 78
105 SPEED
DEPTH 5892 TYPE EDO #2
1700Z
1600Z
1530Z
1500Z
1443Z c/c 103°
1400Z
1358Z
1300Z
1100Z

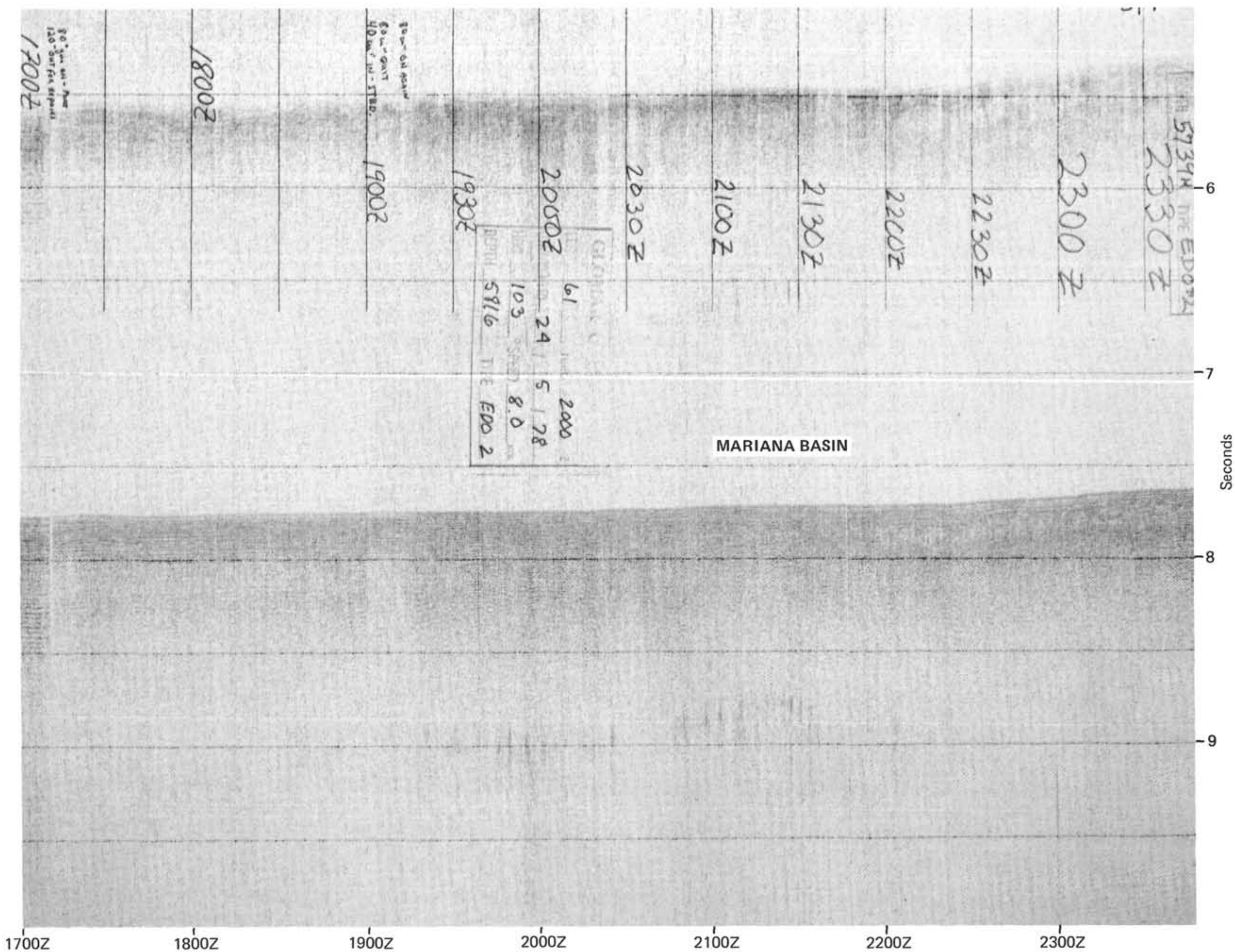
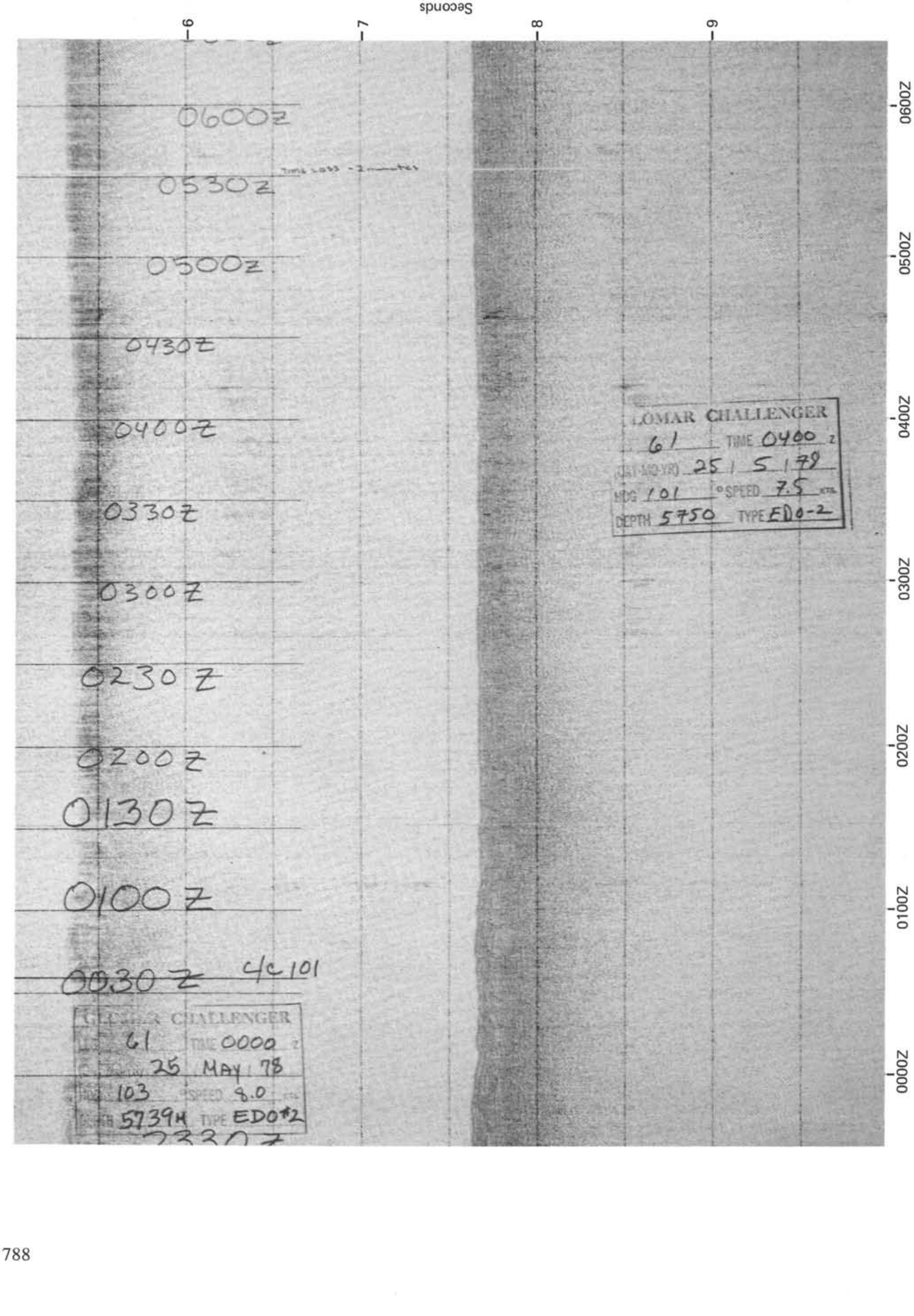


Figure 3. (Continued).


Seconds
6
7
8
9
0000Z
0100Z
0200Z
0300Z
0400Z
0500Z
0600Z

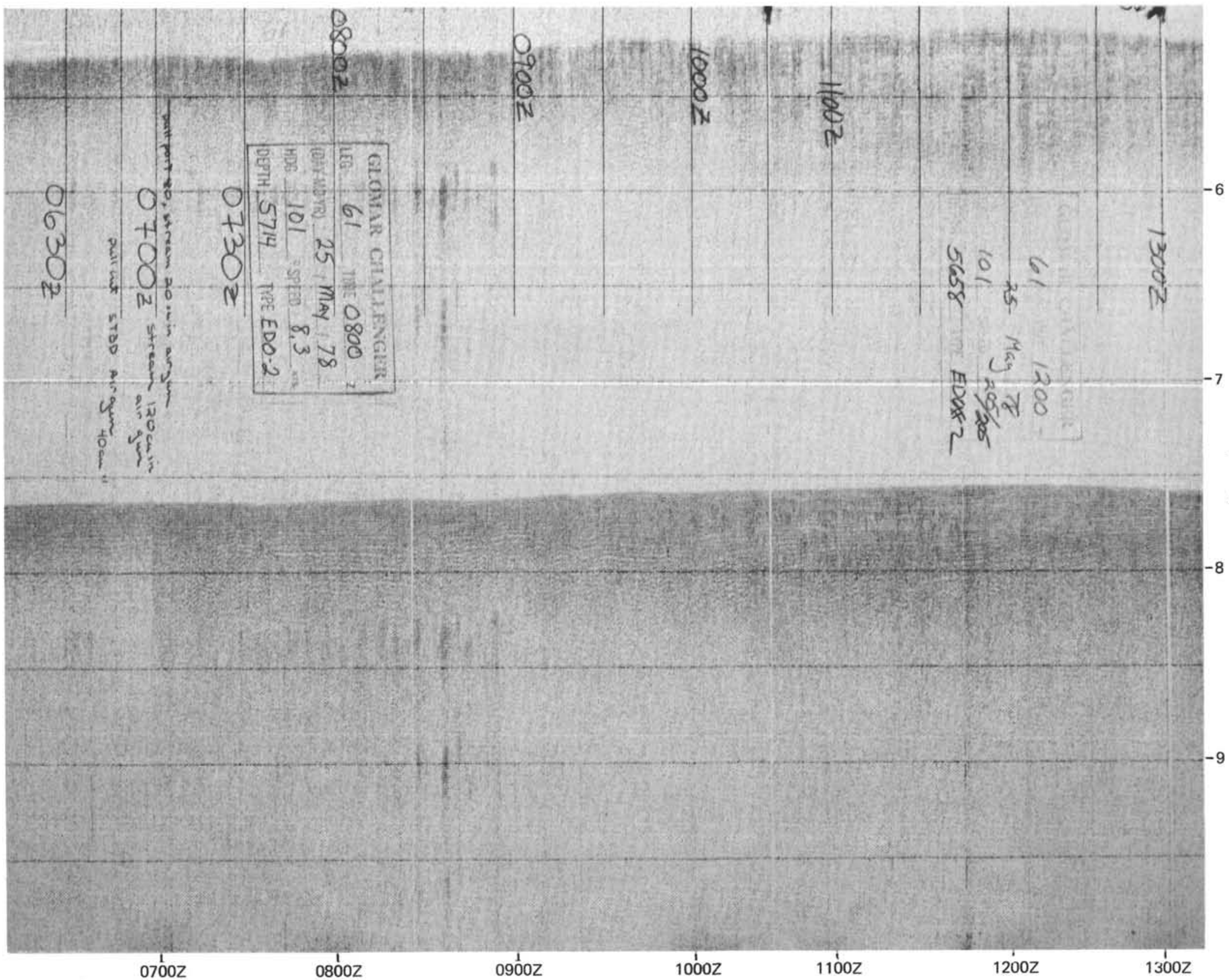
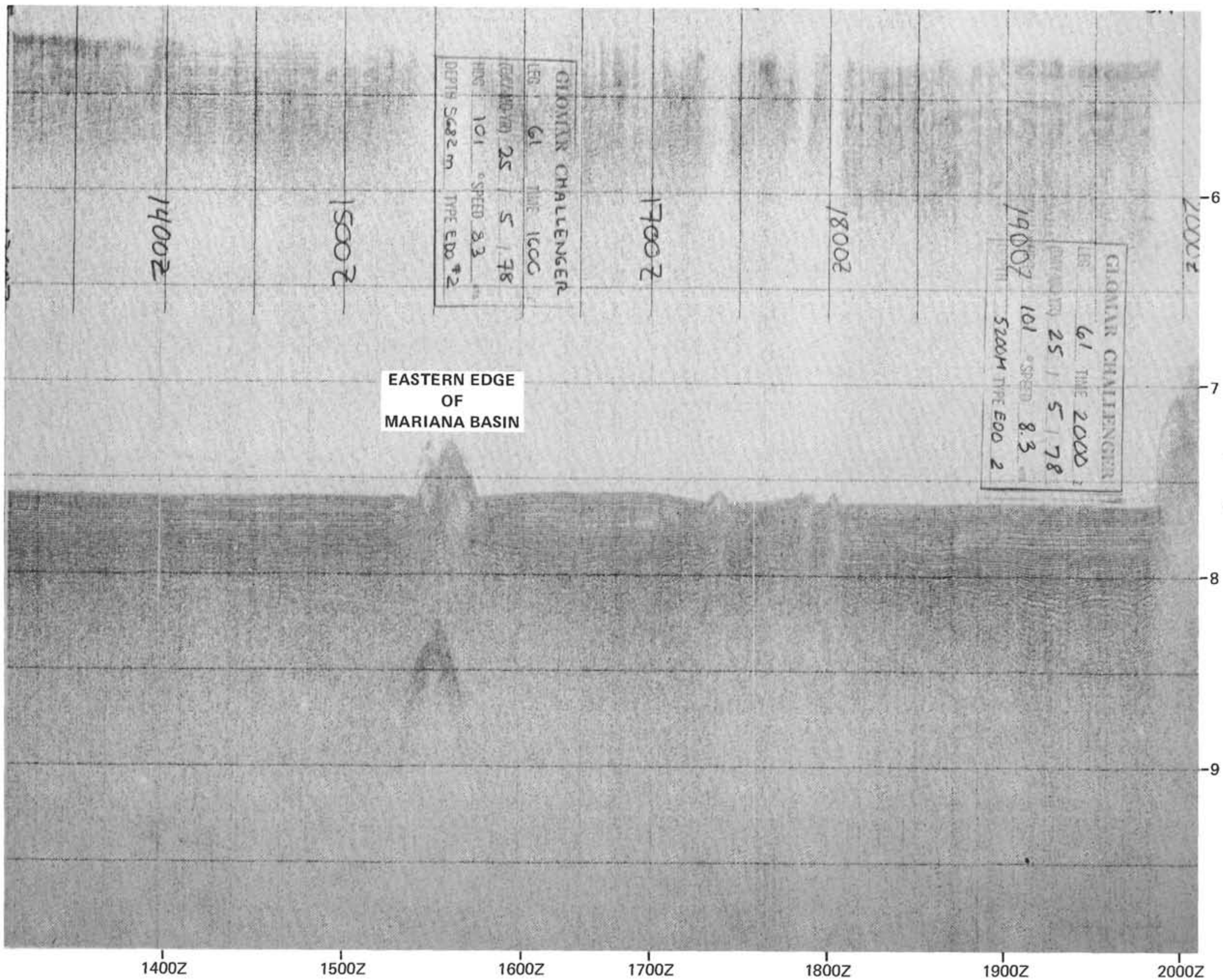


Figure 3. (Continued).


EASTERN EDGE
OF
MARIANA BASIN
6
7
8
9
Seconds
1400Z
1500Z
1600Z
1700Z
1800Z
1900Z
2000Z

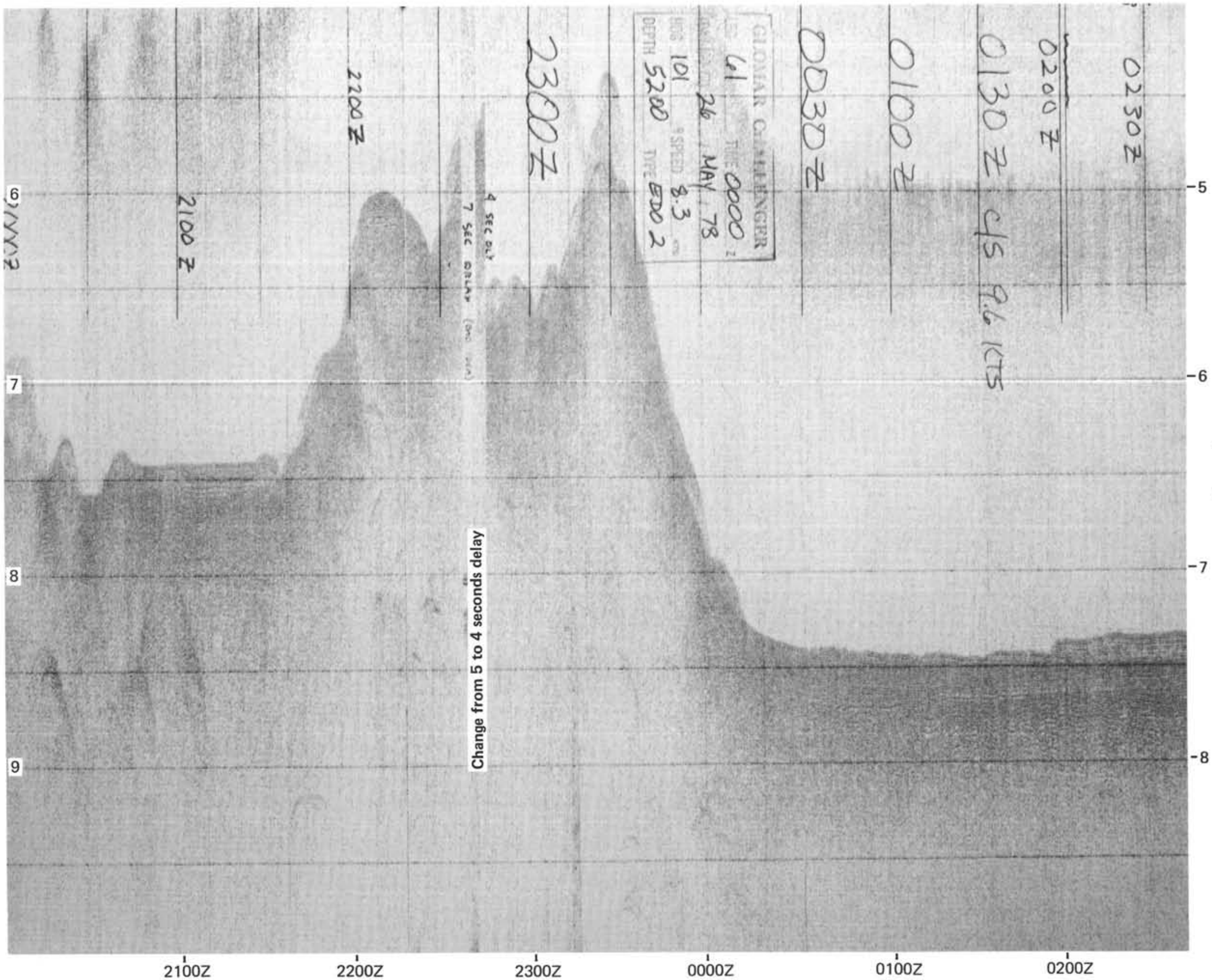
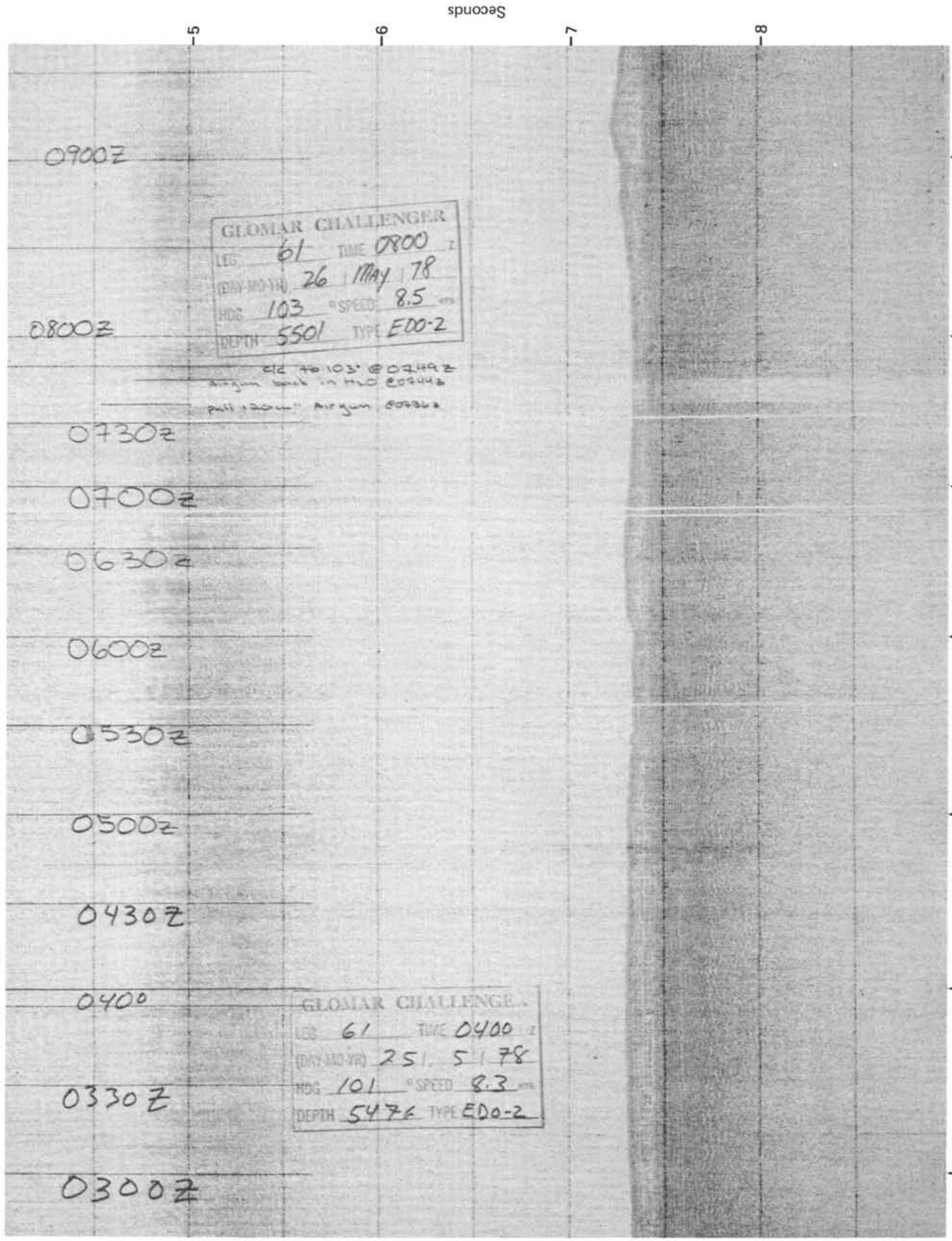


Figure 3. (Continued).


Seconds
5
6
7
8
0900Z
0800Z
0700Z
0600Z
0500Z
0400Z
0300Z
GLOMAR CHALLENGER
LEG 61 TIME 0800 Z
(DAY-MO-YR) 26 May 78
HDG 103 ° SPEED 8.5 KTS
DEPTH 5501 TYPE EDO-2
GLOMAR CHALLENGER
LEG 61 TIME 0400 Z
(DAY-MO-YR) 25 5 78
HDG 101 ° SPEED 8.3 KTS
DEPTH 5476 TYPE EDO-2

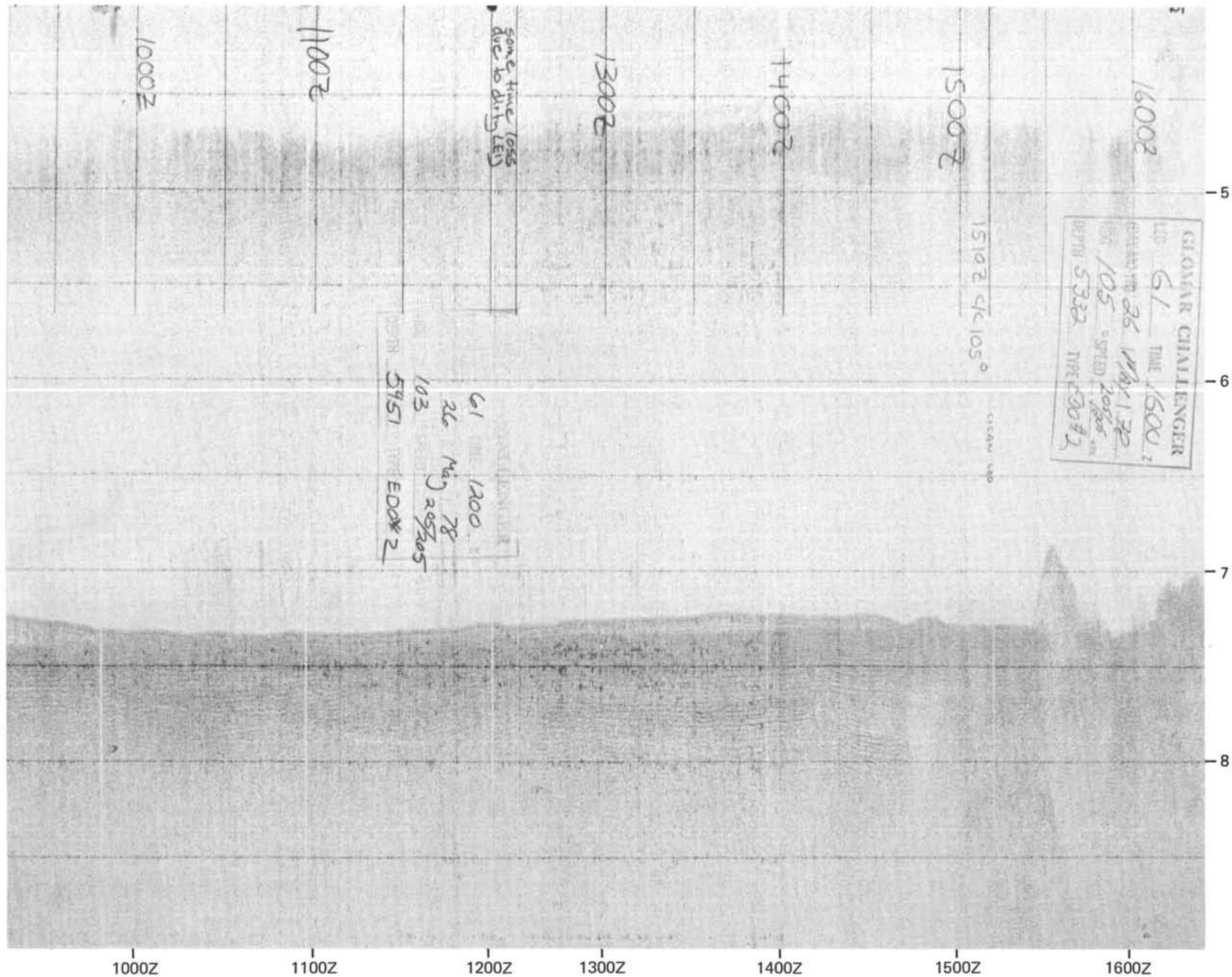
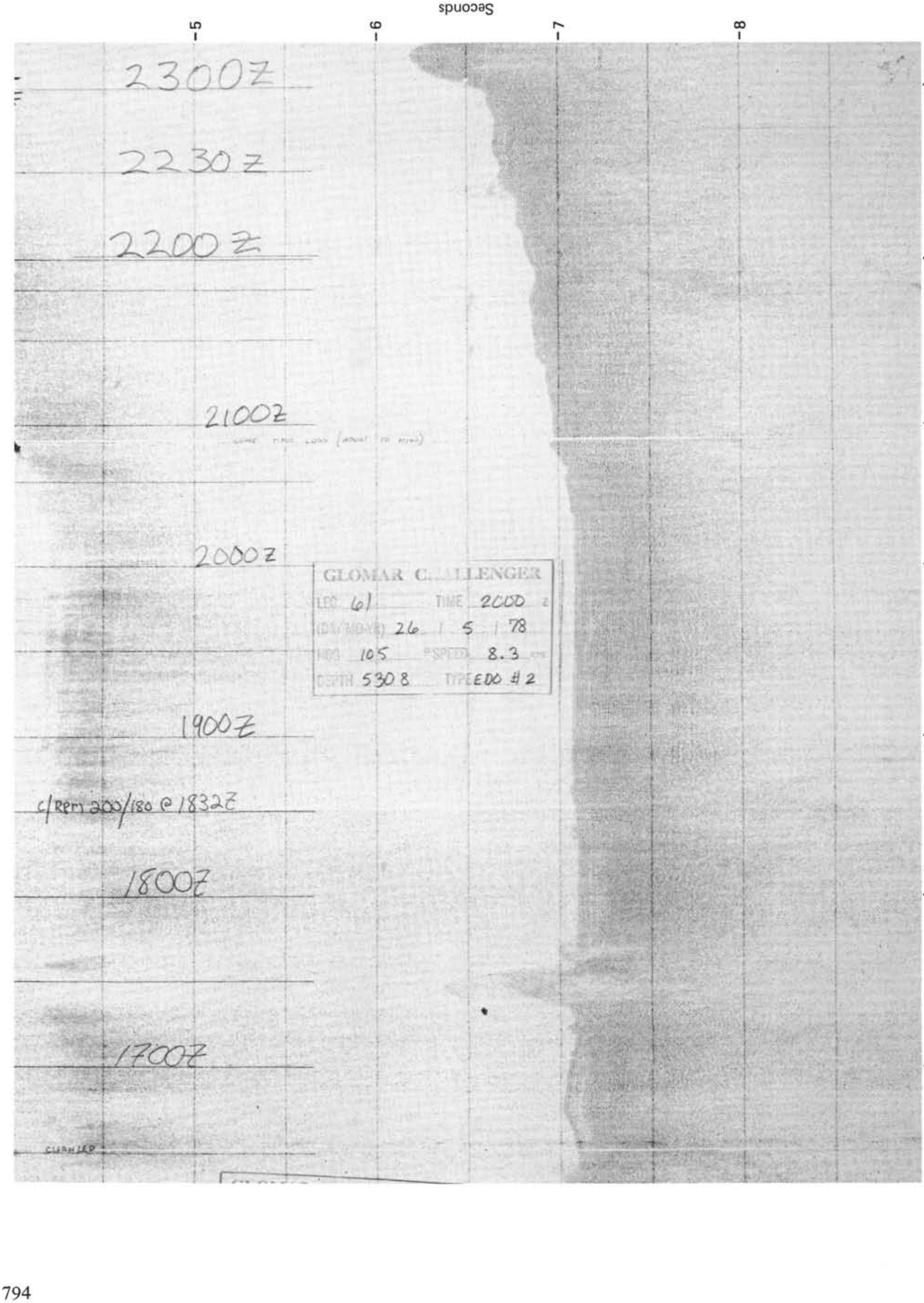


Figure 3. (Continued).


Seconds
-5
-6
-7
-8
2300Z
2200Z
2100Z
2000Z
1900Z
1800Z
1700Z
2300Z
2230Z
2200Z
2100Z
2000Z
1900Z
c/Rem 200/180 @ 1832Z
1800Z
1700Z
GLOMAR C...LLENGER
LEG 61 TIME 2000 Z
26 / 5 / 78
105 SPEED 8.3
DEPTH 5308 TYPE EDO #2

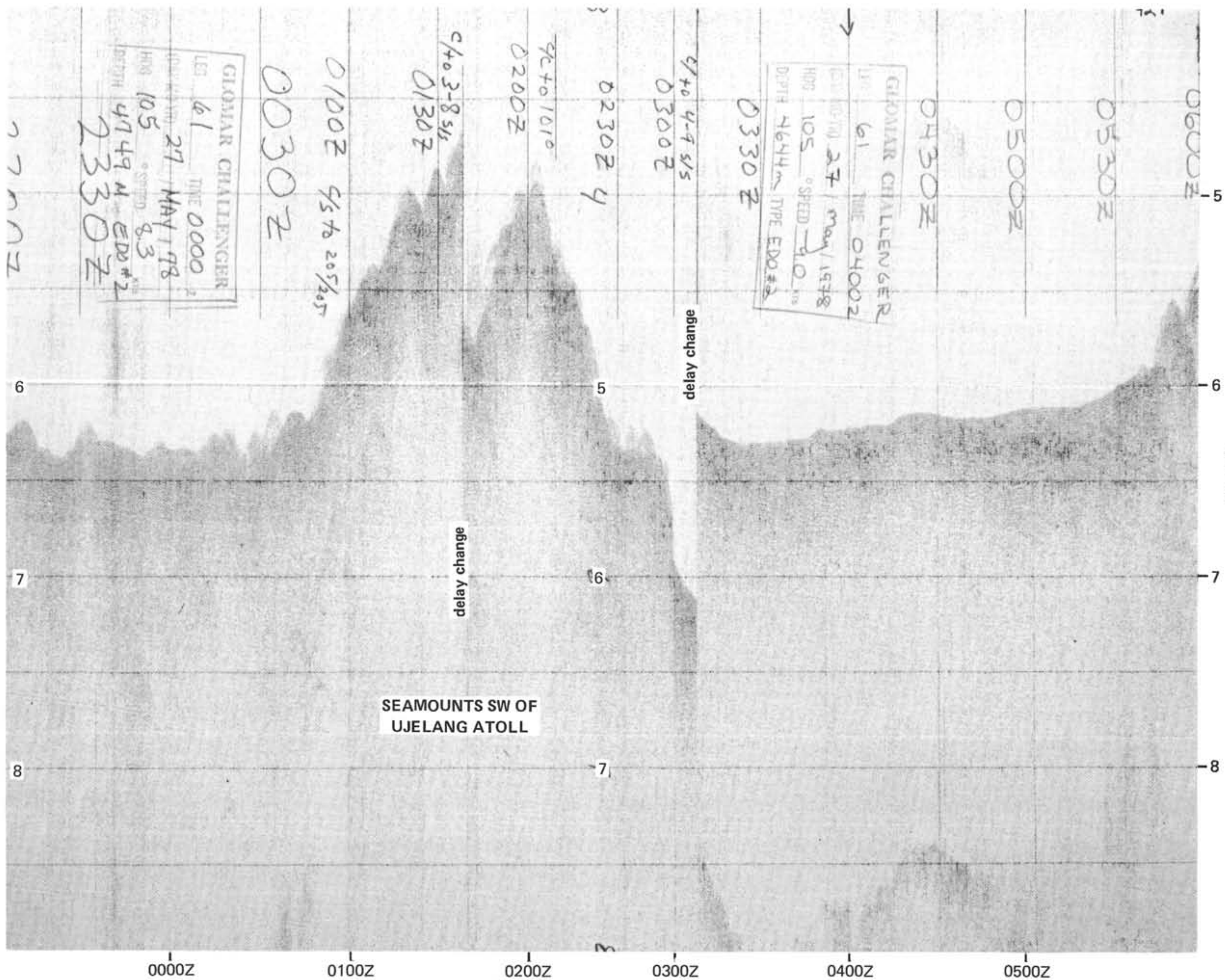
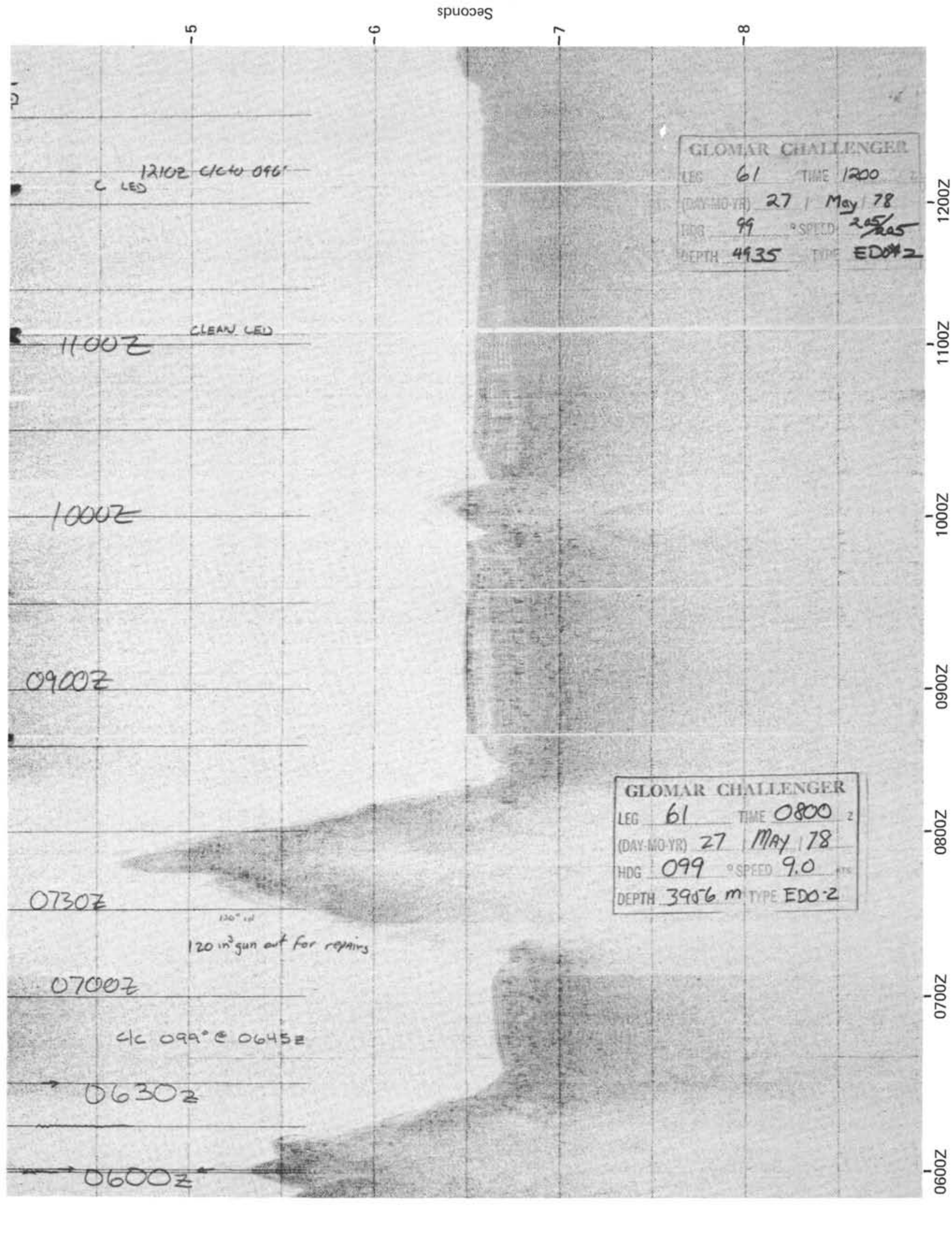


Figure 3. (Continued).


Seconds
5
6
7
8
0600Z
0700Z
0800Z
0900Z
1000Z
1100Z
1200Z
GLOMAR CHALLENGER
LEG 61 TIME 0800 Z
(DAY-MO-YR) 27 MAY 78
HDG 099 ° SPEED 9.0
DEPTH 3956 m TYPE EDO-2
GLOMAR CHALLENGER
LEG 61 TIME 1200
(DAY-MO-YR) 27 May 78
HDG 99
DEPTH 4935
120 in³ gun out for repairs
CLEAN LED

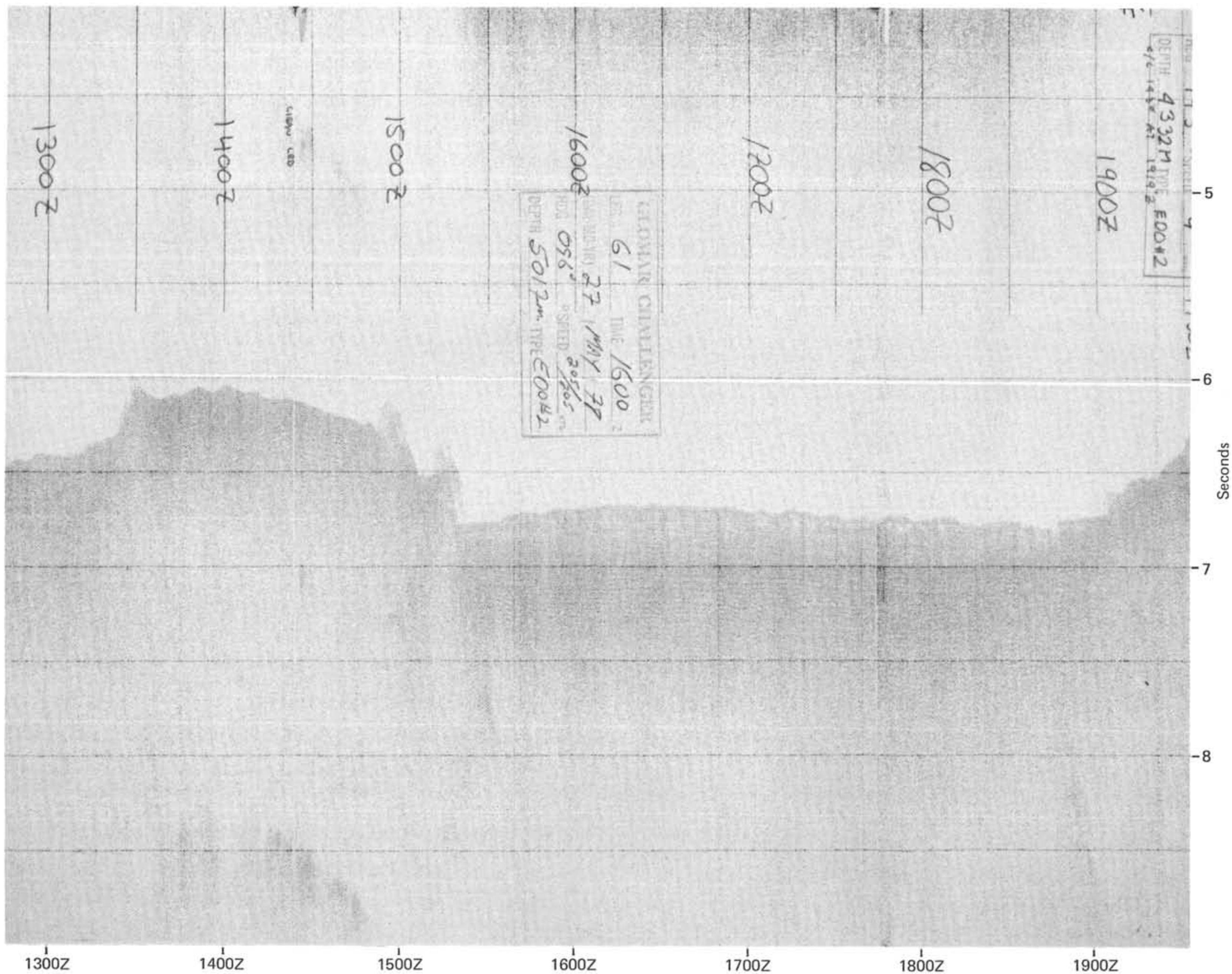
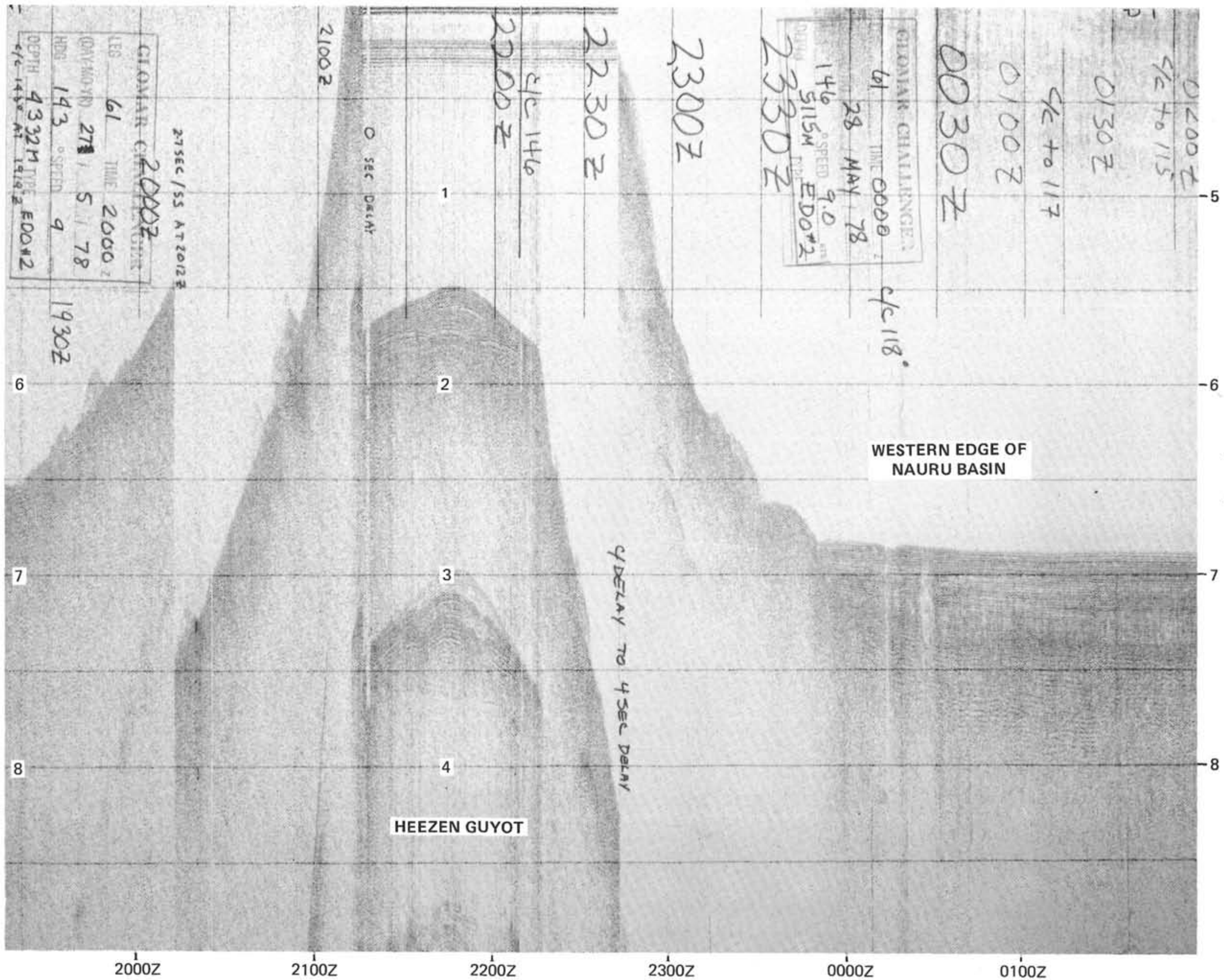


Figure 3. (Continued).


1
2
3
4
5
6
7
8
Seconds
HEEZEN GUYOT
WESTERN EDGE OF
NAURU BASIN
2000Z
2100Z
2200Z
2300Z
0000Z
0100Z

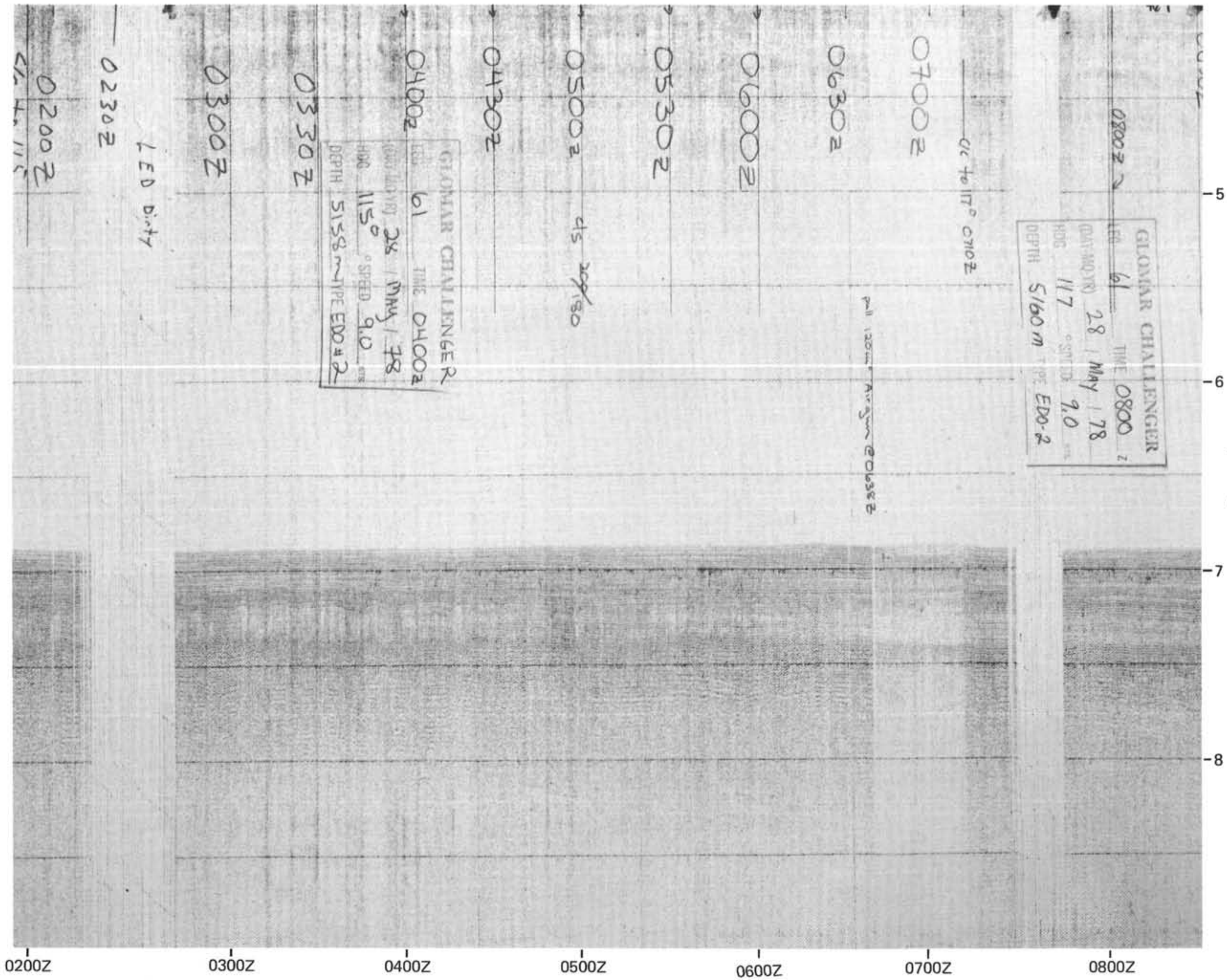
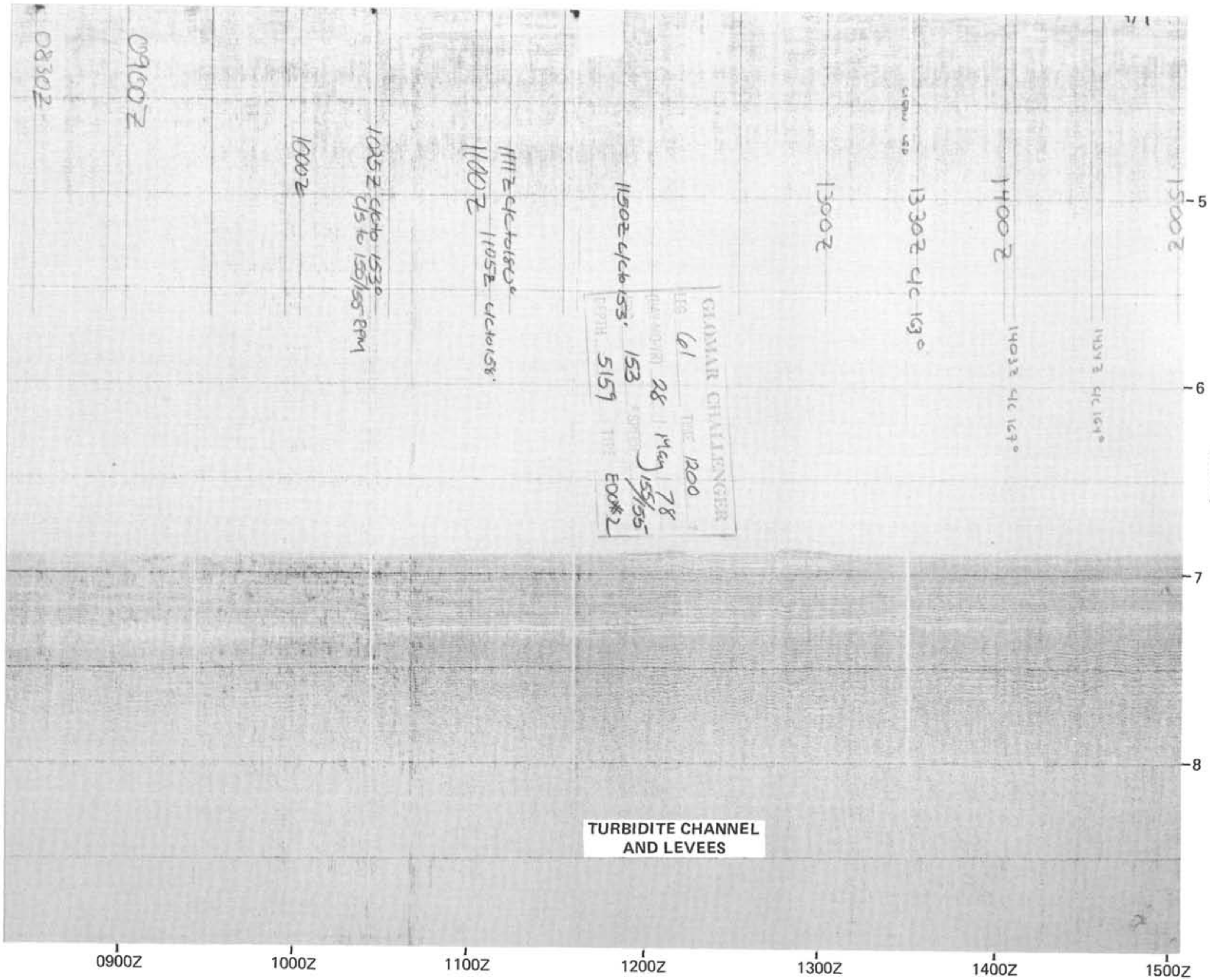


Figure 3. (Continued).


TURBIDITE CHANNEL
AND LEVEES
0900Z
1000Z
1100Z
1200Z
1300Z
1400Z
1500Z
Seconds
5
6
7
8
GLOMAR CHALLENGER

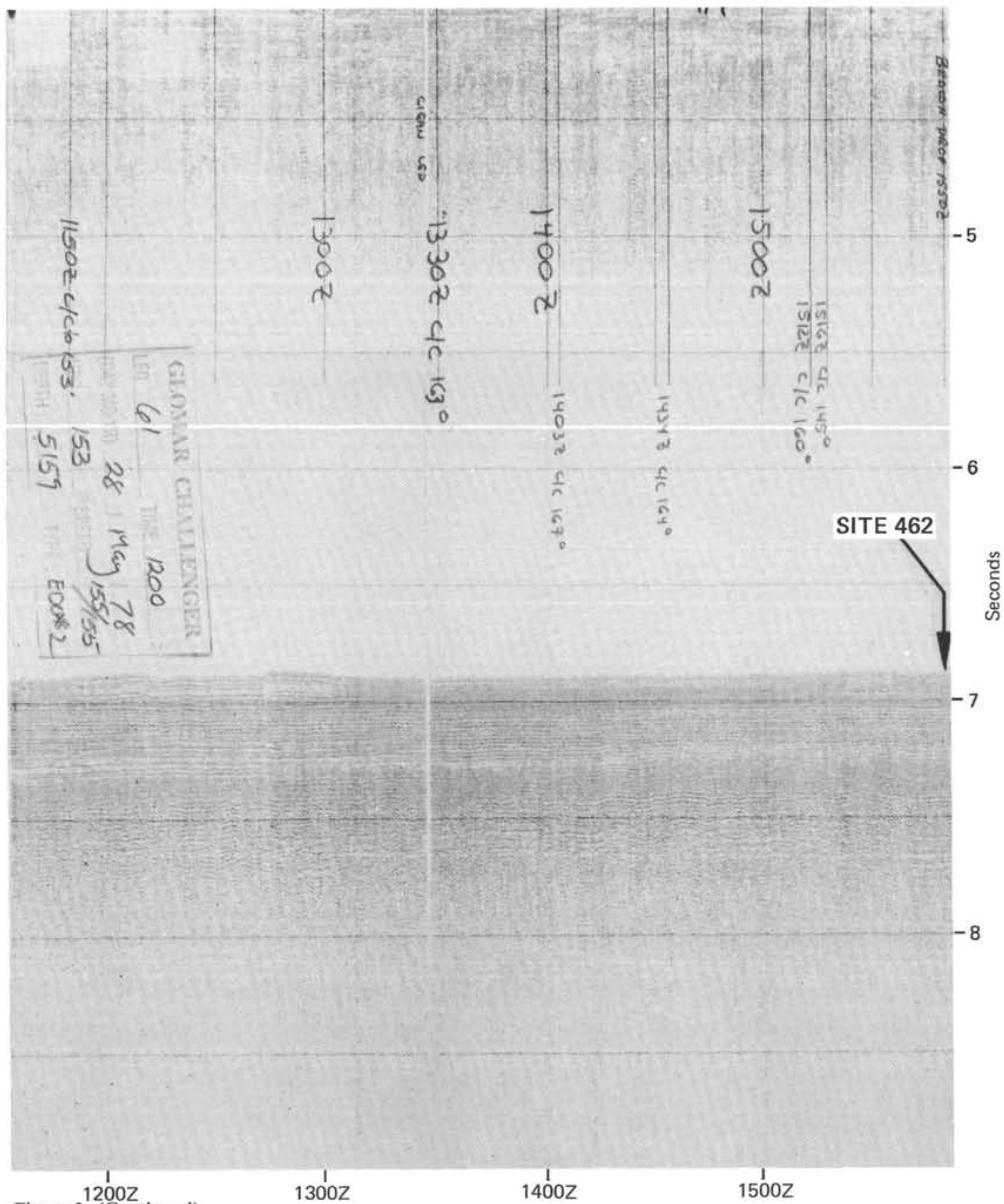
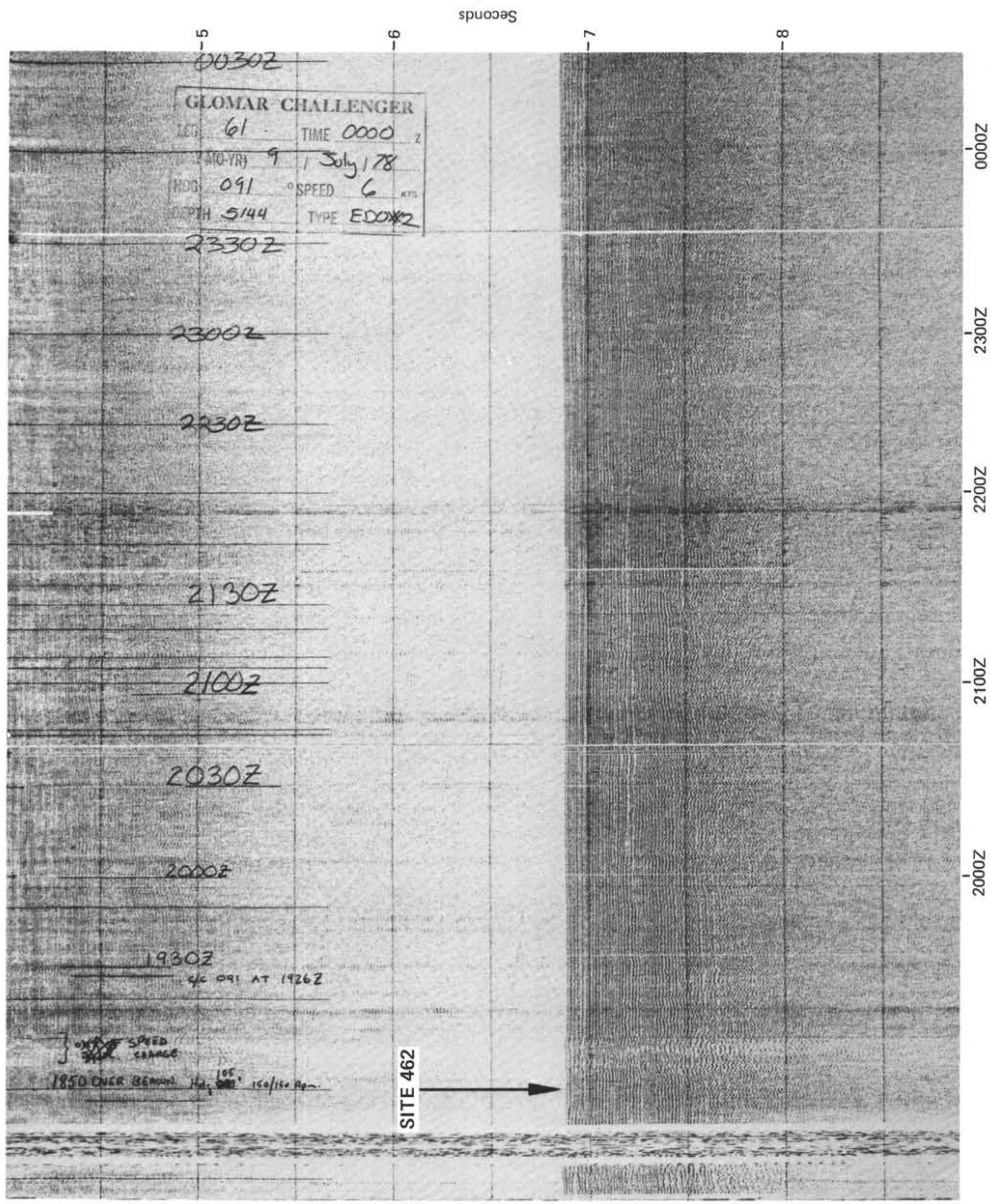


Figure 3. (Continued).


Seconds
5
6
7
8
SITE 462
0000Z
2300Z
2200Z
2100Z
2000Z

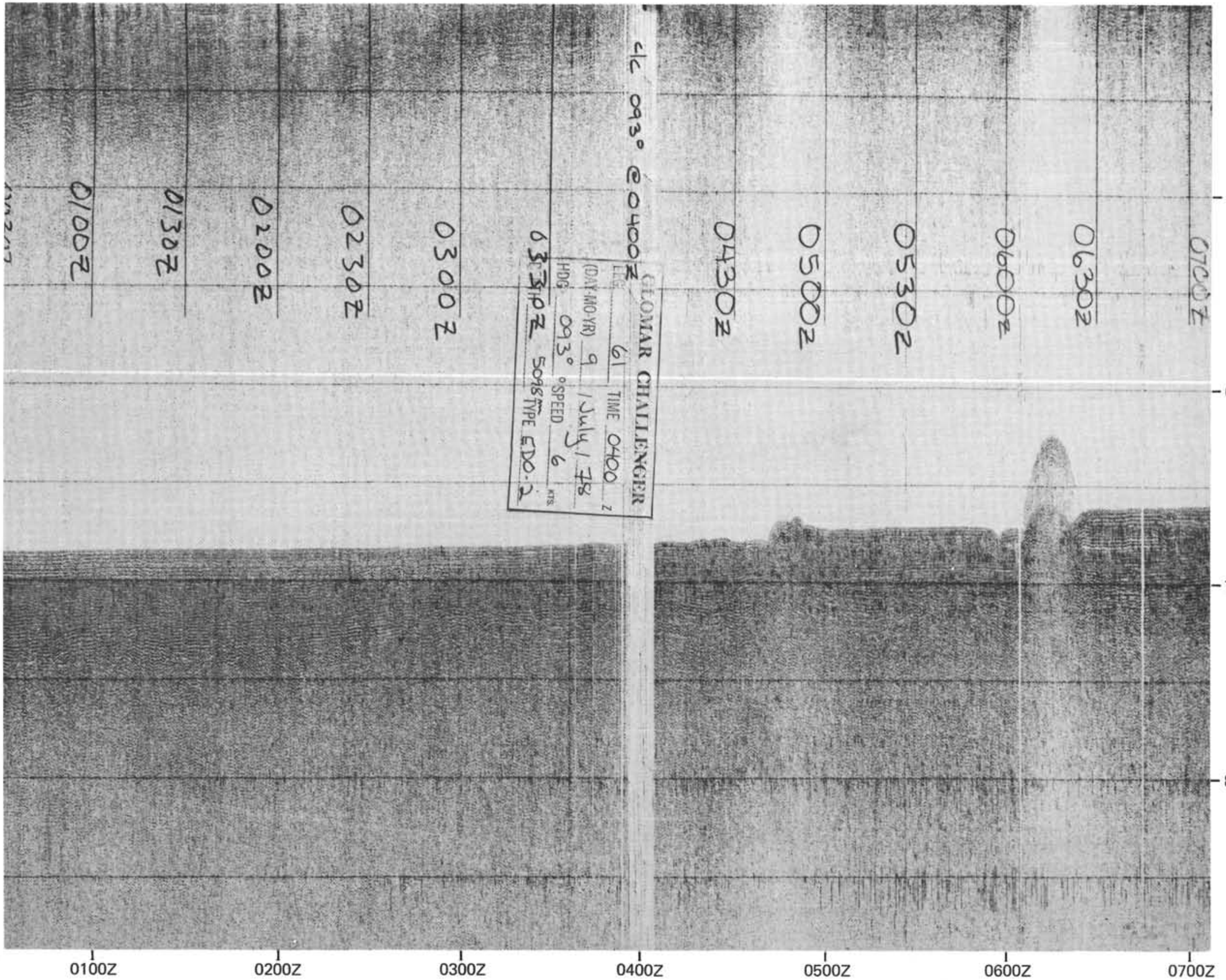
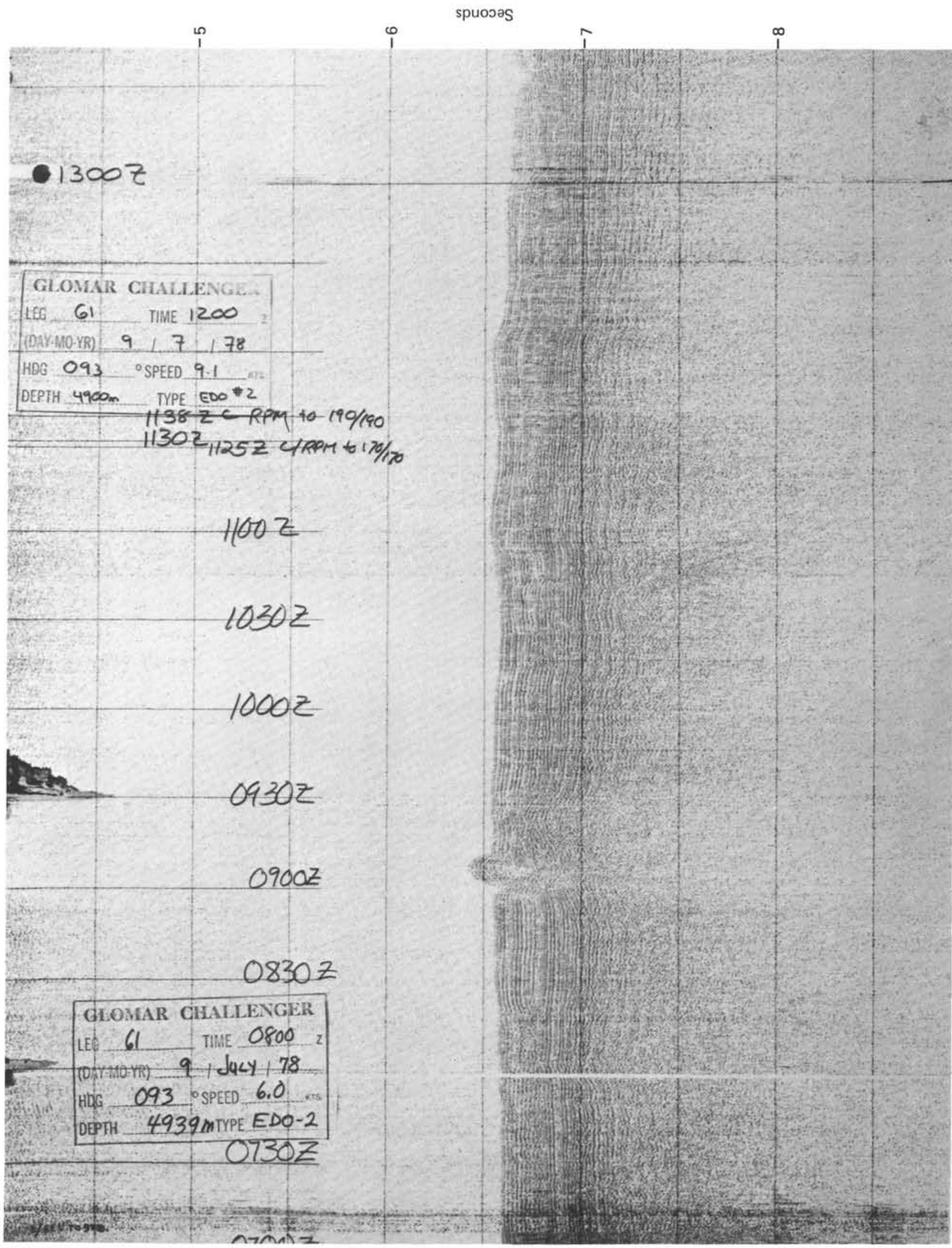


Figure 3. (Continued).


Seconds
5
6
7
8
1300Z
1200Z
1100Z
1000Z
0900Z
0800Z
GLOMAR CHALLENGER
LEG 61 TIME 1200 Z
(DAY-MO-YR) 9 / 7 / 78
HDG 093 °SPEED 9.1 KTS
DEPTH 4900m TYPE EDO #2
GLOMAR CHALLENGER
LEG 61 TIME 0800 Z
(DAY-MO-YR) 9 / JULY / 78
HDG 093 °SPEED 6.0 KTS
DEPTH 4939m TYPE EDO-2
1300Z
1138 Z RPM to 190/190
1130Z 1125Z RPM to 170/170
1100 Z
1030Z
1000Z
0930Z
0900Z
0830Z
0730Z

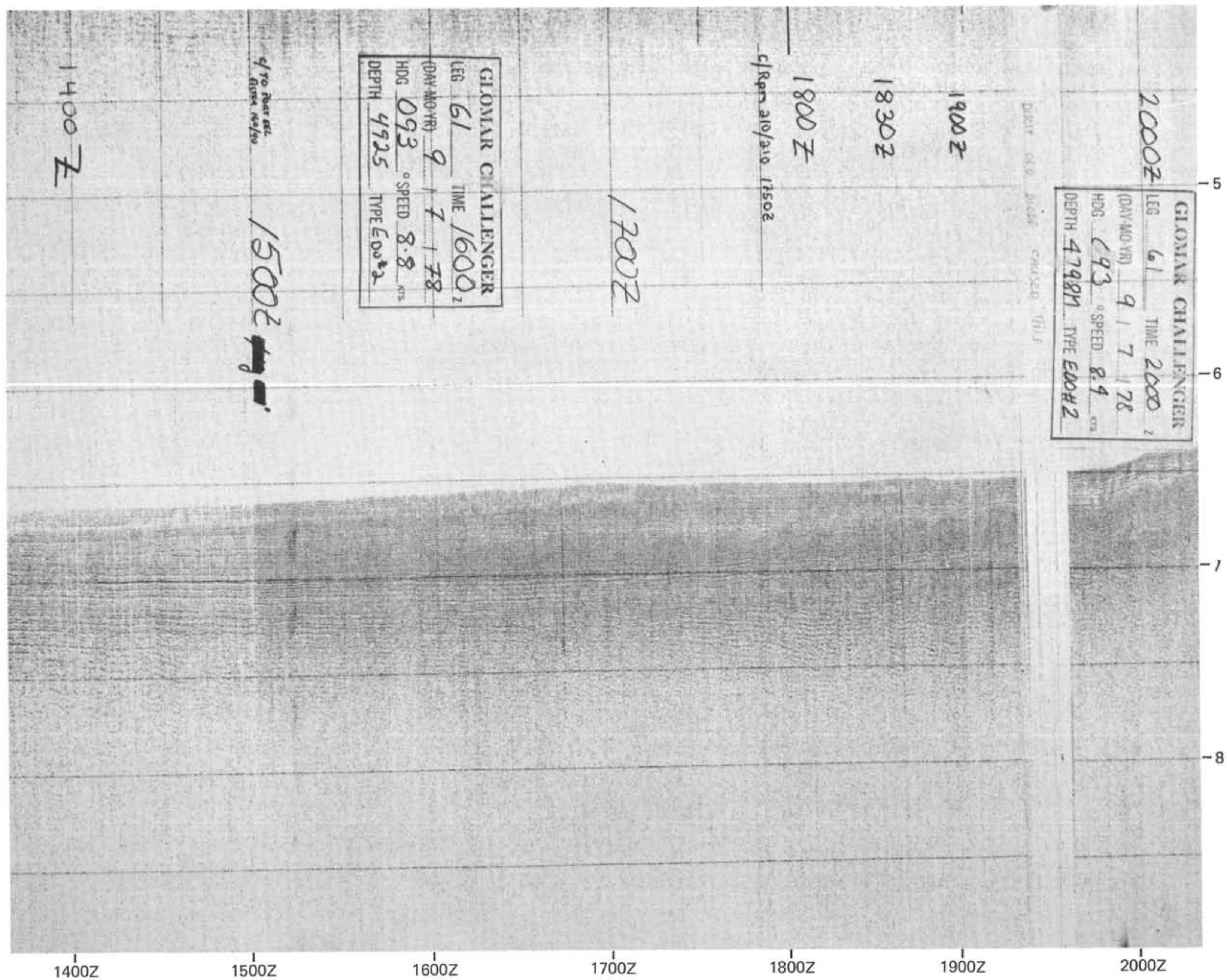
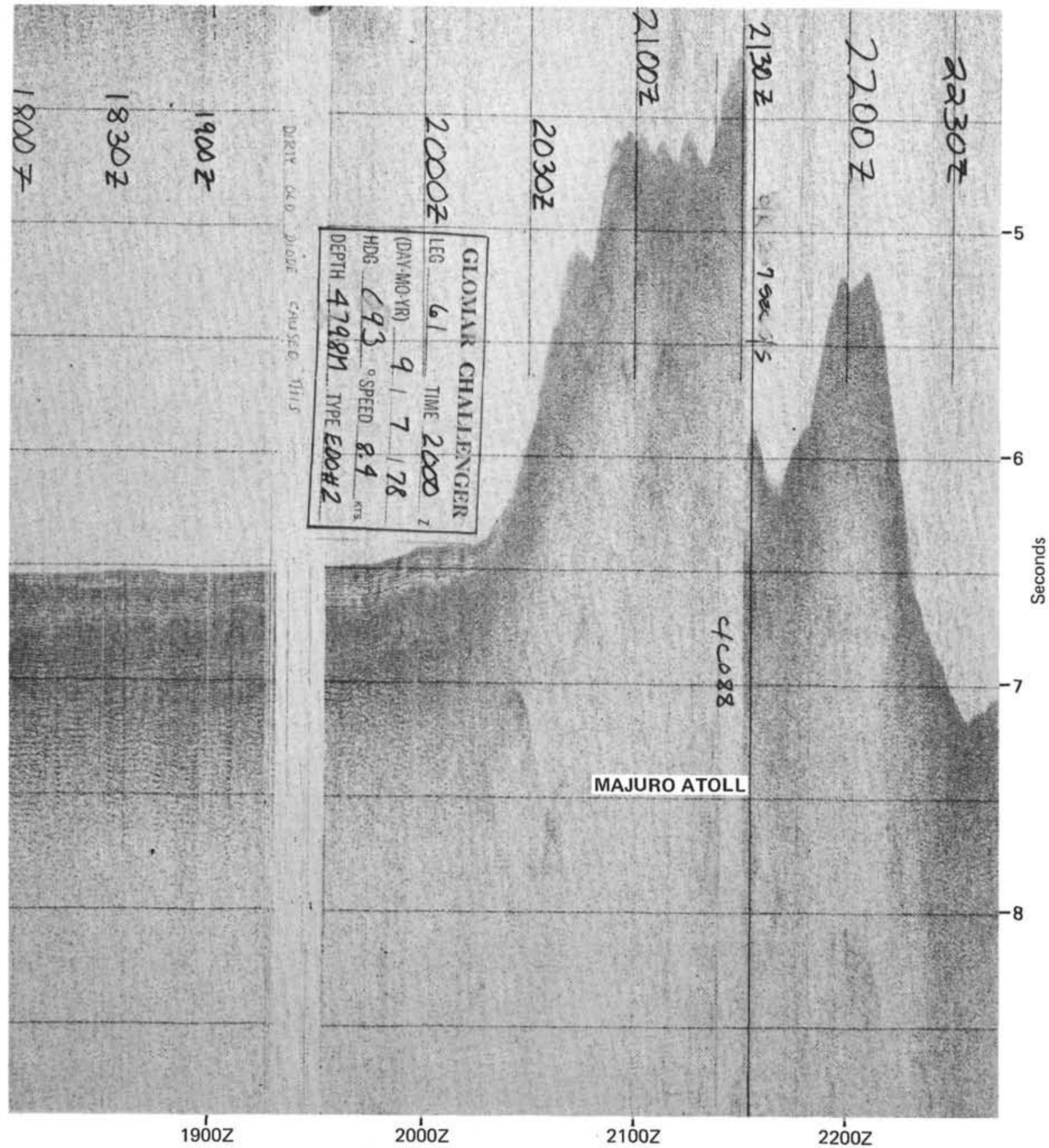


Figure 3. (Continued).


1800Z
1830Z
1900Z
2000Z
2030Z
2100Z
2130Z
2200Z
2230Z
GLOMAR CHALLENGER
LEG 61 TIME 2000 Z
(DAY-MO-YR) 9 / 7 / 78
HDG 093 ° SPEED 8.4 KTS.
DEPTH 4798M TYPE EDO#2
MAJURO ATOLL
5
6
7
8
Seconds
1900Z
2000Z
2100Z
2200Z

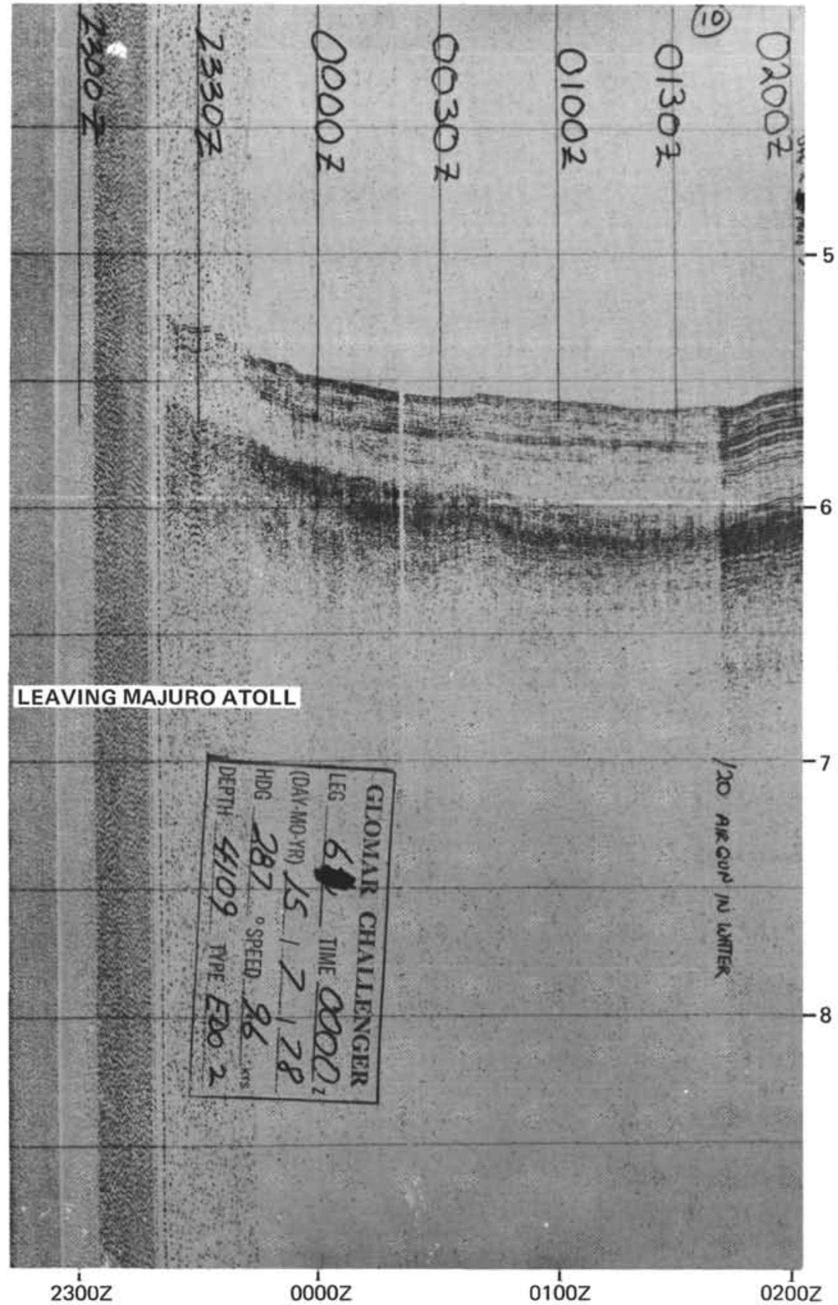
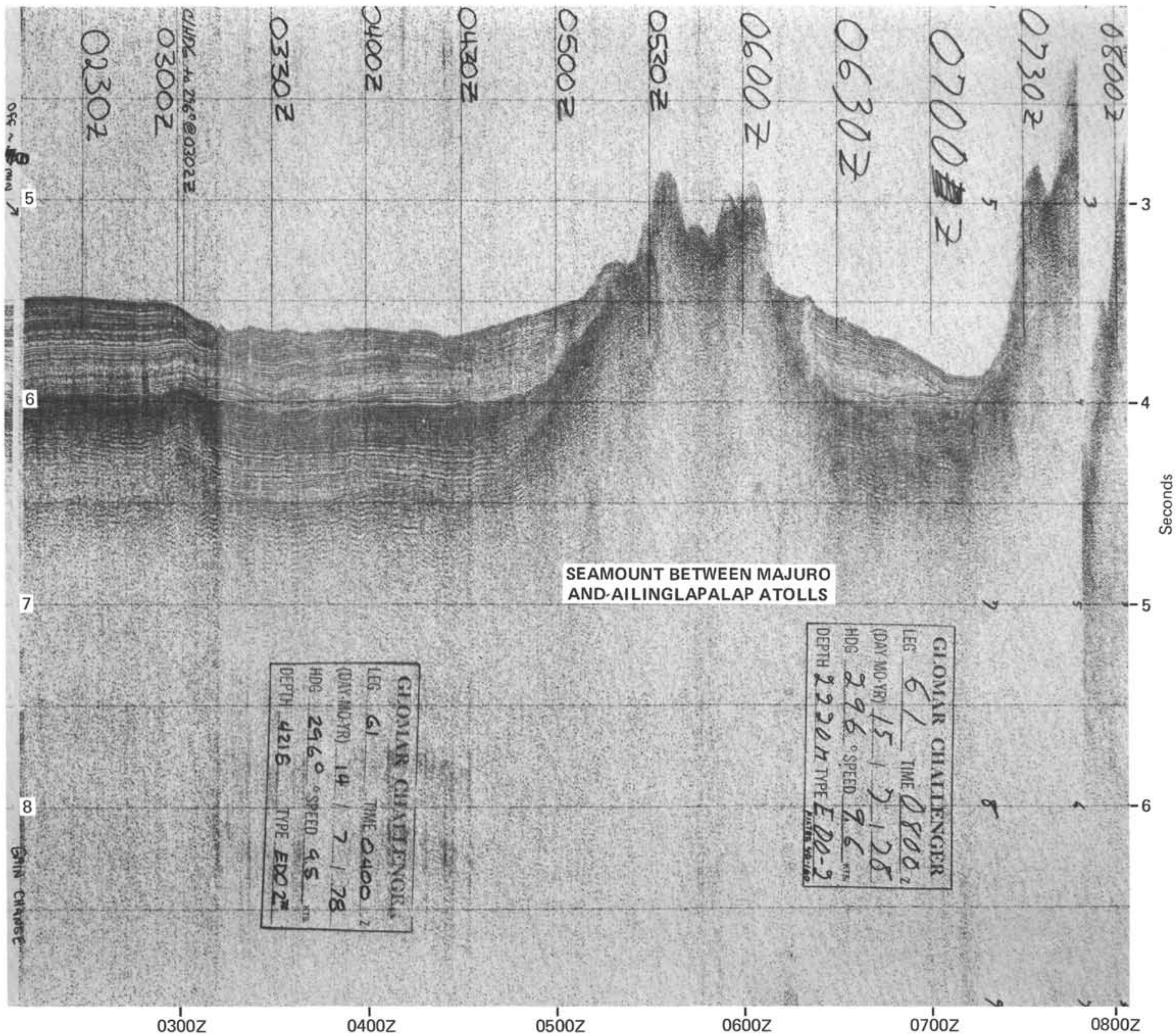


Figure 3. (Continued).


SEAMOUNT BETWEEN MAJURO
AND AILINGLAPALAP ATOLLS
Seconds
3
4
5
6
0300Z
0400Z
0500Z
0600Z
0700Z
0800Z
GLOMAR CHALLENGER

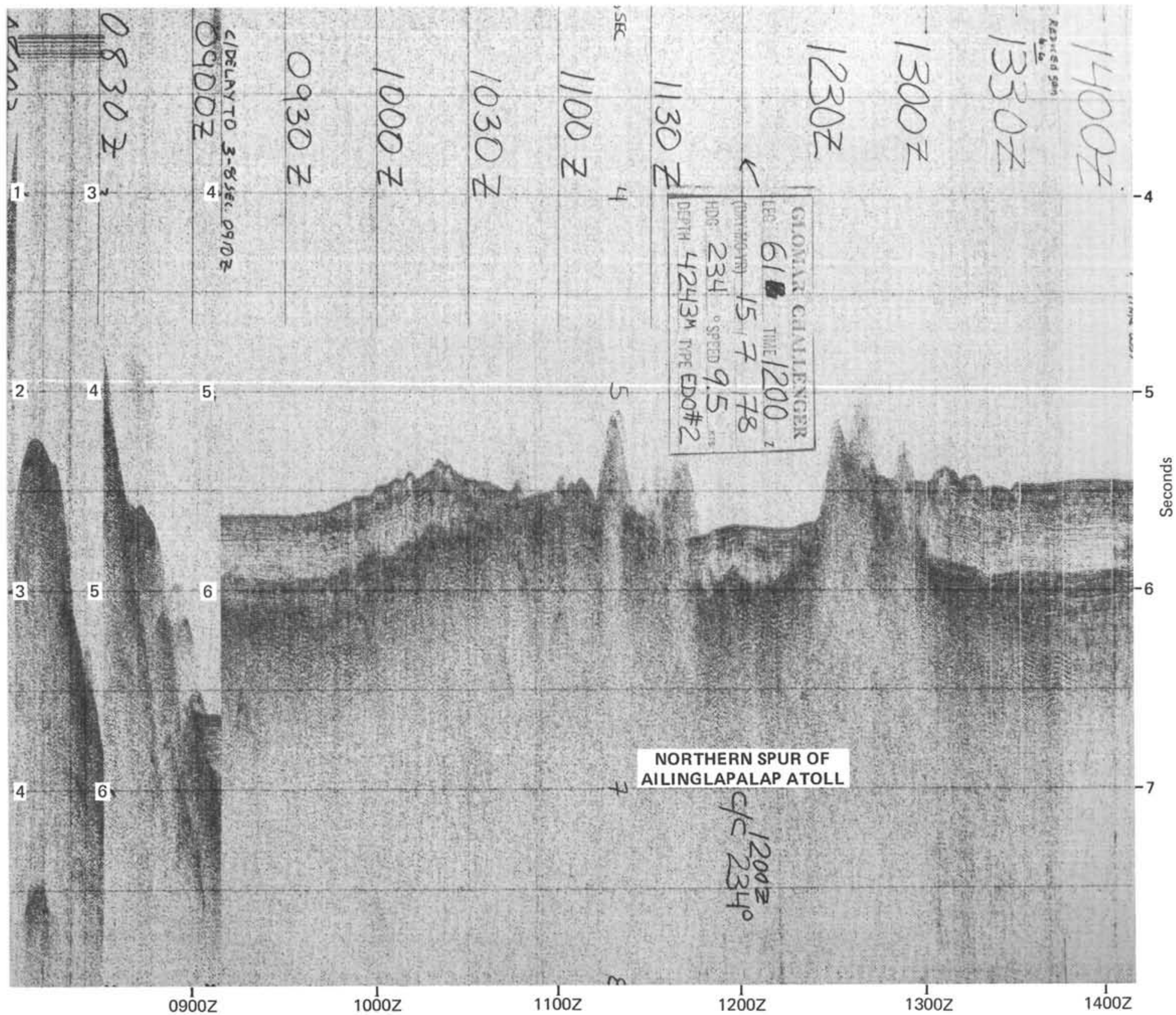
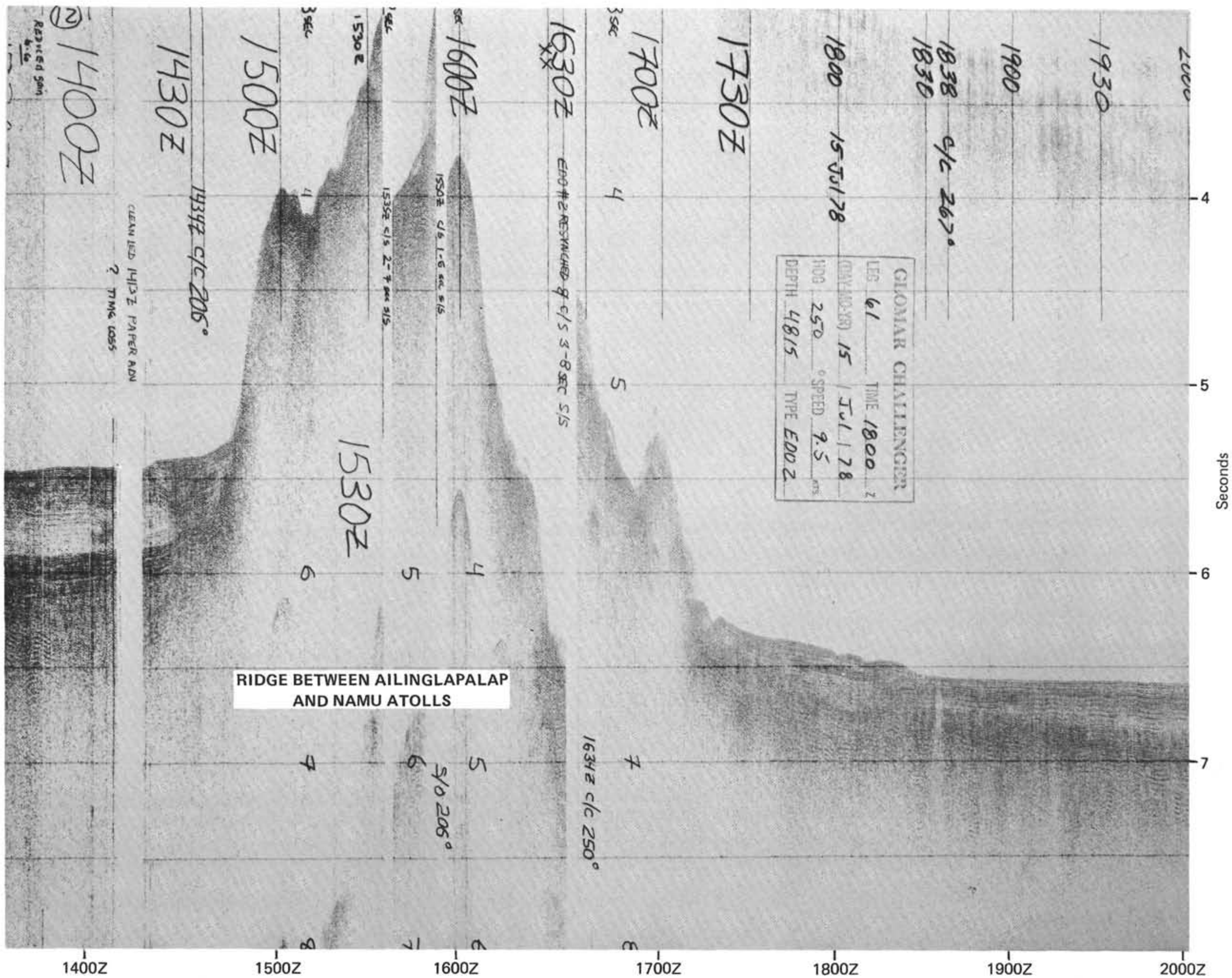


Figure 3. (Continued).


RIDGE BETWEEN AILINGLAPALAP
AND NAMU ATOLLS
1400Z
1500Z
1600Z
1700Z
1800Z
1900Z
2000Z
Seconds
4
5
6
7
GLOMAR CHALLENGER

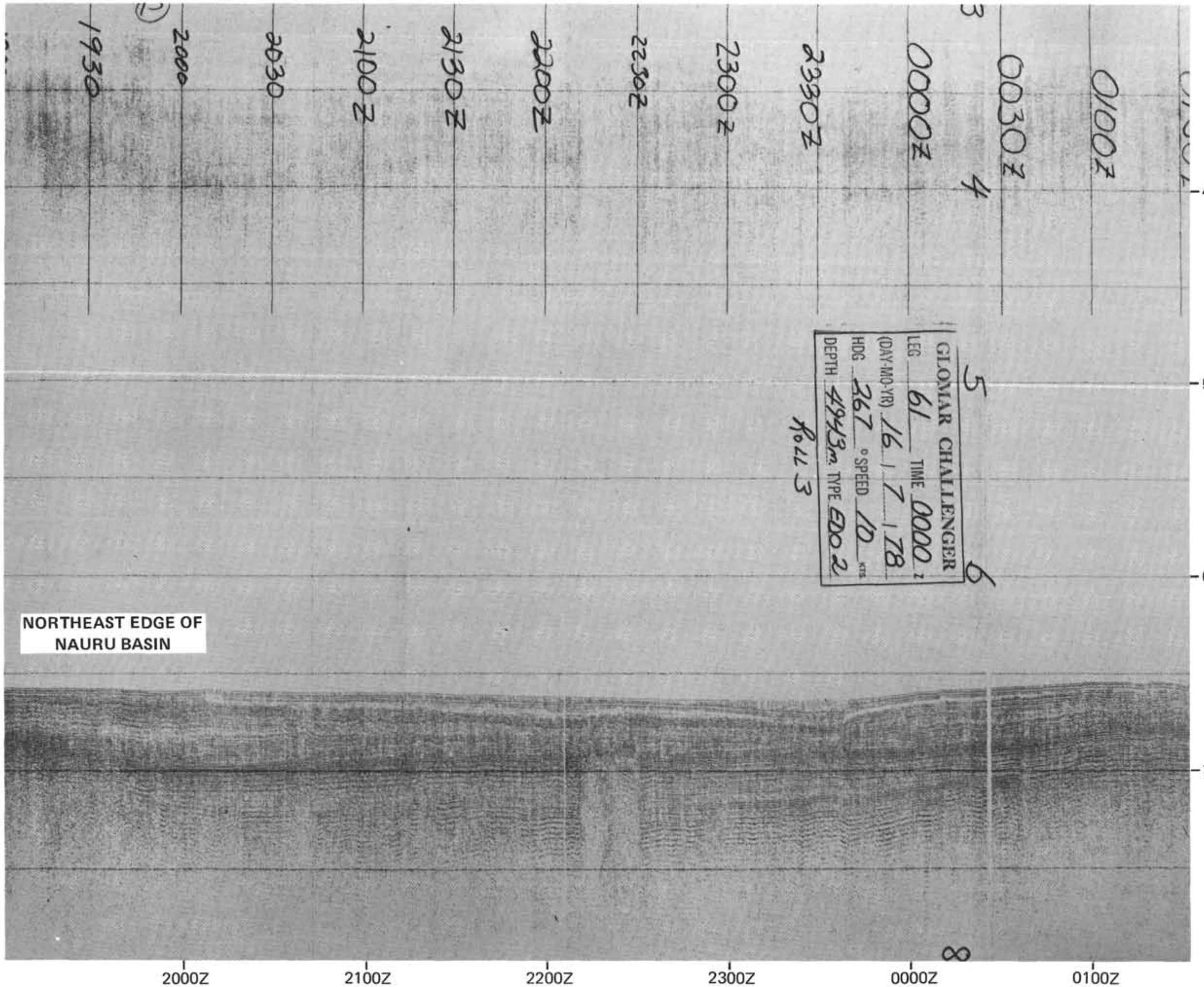
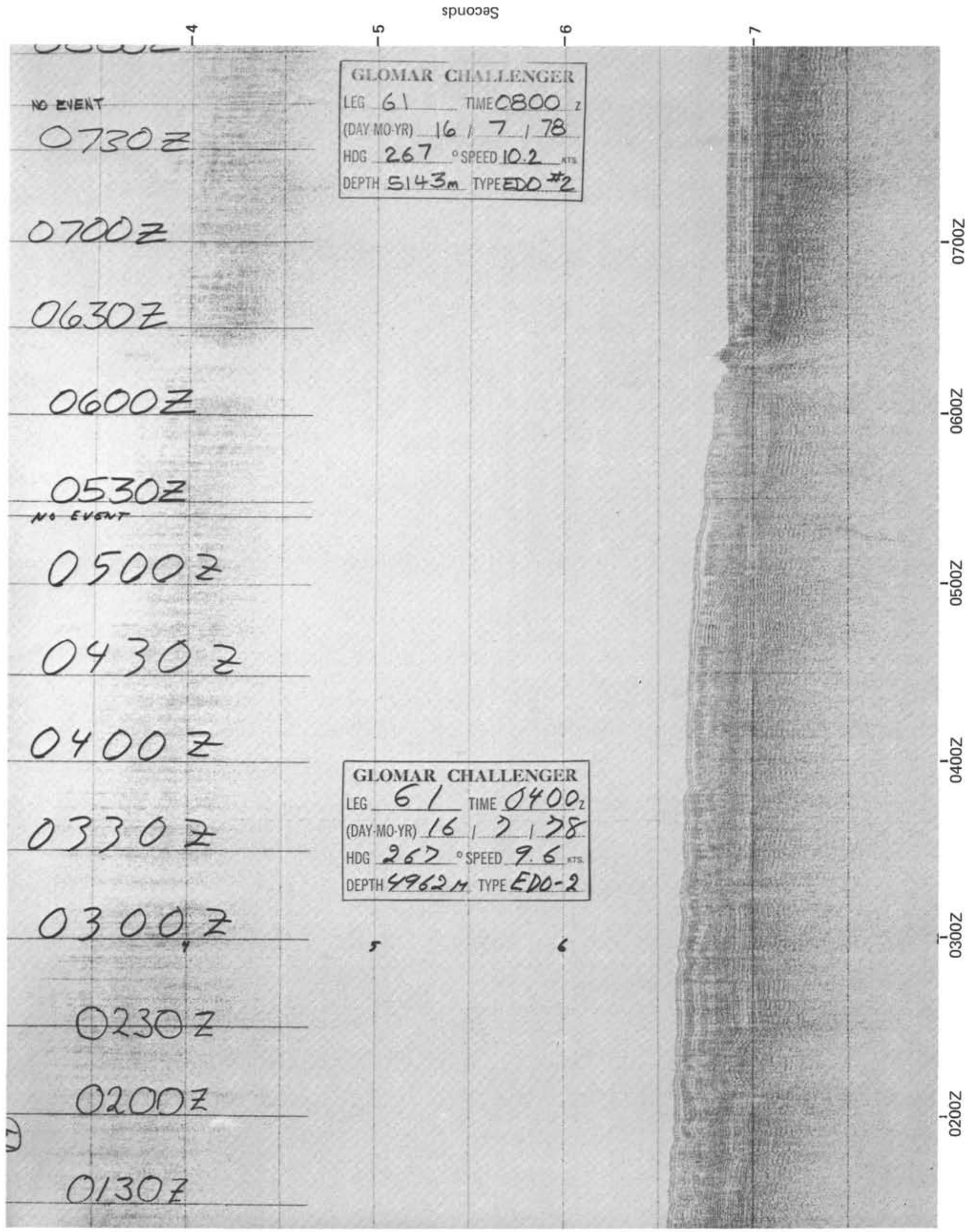


Figure 3. (Continued).


Seconds
4
5
6
7
GLOMAR CHALLENGER
LEG 61 TIME 0800 Z
(DAY-MO-YR) 16 / 7 / 78
HDG 267 ° SPEED 10.2 KTS.
DEPTH 5143m TYPE EDO #2
NO EVENT
0730Z
0700Z
0630Z
0600Z
0530Z
NO EVENT
0500Z
0430Z
0400Z
GLOMAR CHALLENGER
LEG 61 TIME 0400 Z
(DAY-MO-YR) 16 / 7 / 78
HDG 267 ° SPEED 9.6 KTS.
DEPTH 4962M TYPE EDO-2
0330Z
0300Z
0230Z
0200Z
0130Z
0700Z
0600Z
0500Z
0400Z
0300Z
0200Z

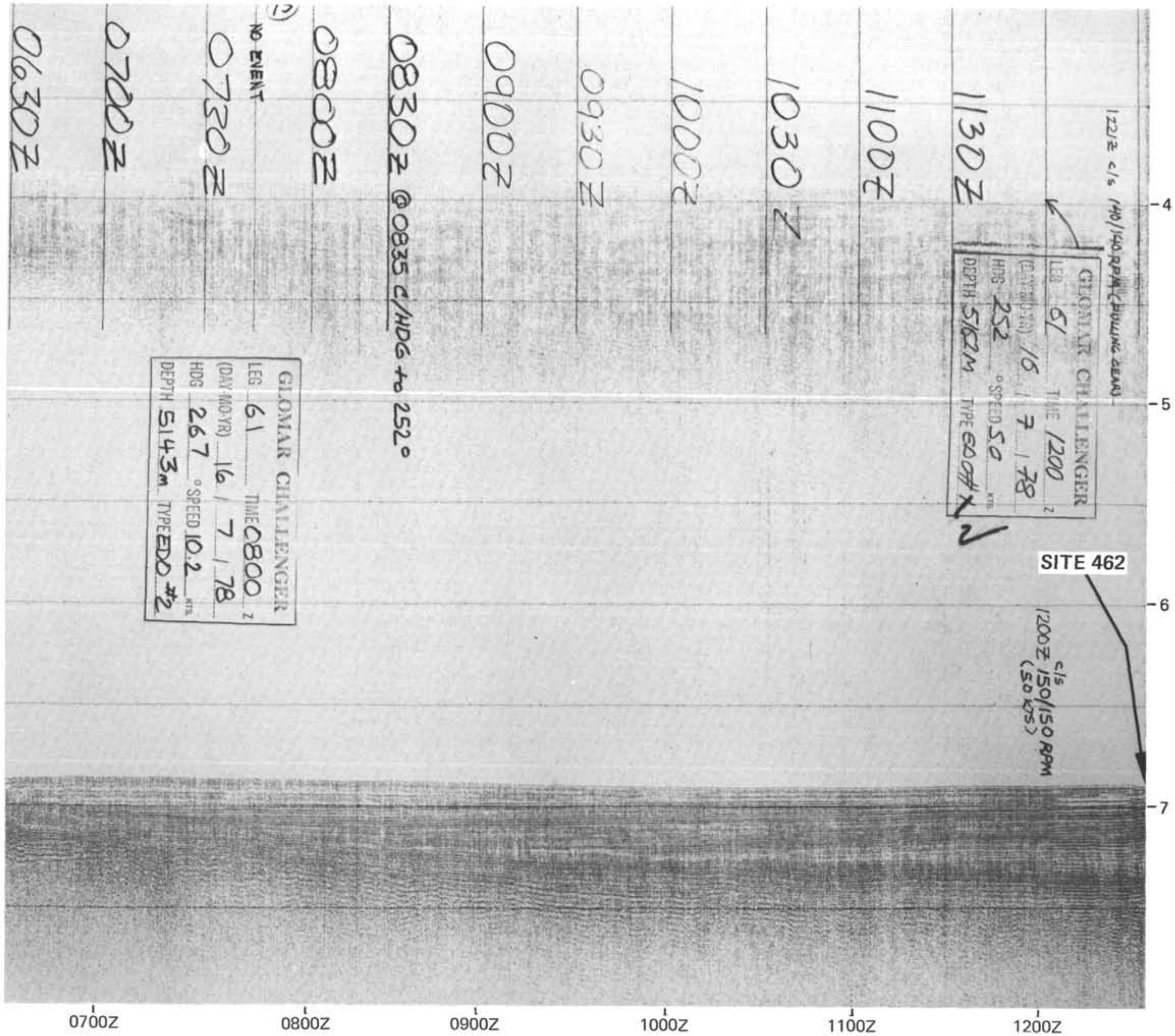


Figure 3. (Continued).