11. BATHYMETRIC, MAGNETICS, AND SEISMIC REFLECTION DATA: *CHALLENGER* LEG 14

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INTRODUCTION

The underway geophysical data collected during the *Challenger* Cruise 14 from Lisbon to San Juan (see Figure 1) is presented as two groups of profiles (Figures 2-8 and 9-32). The first group of data (Figures 2-8) consists of bathymetric and total intensity magnetic anomaly profiles displayed as a function of distance and time. The procedure used in reducing and displaying the data was that described by Talwani (1969). Local time in hours and dates is shown at the top of each figure. Positions where the track crosses integer degrees of latitude or longitude are also given near the top of each figure. Leg 14 drill site locations are labelled. The top profile indicates depth in nominal fathoms (1/400 sec reflection time); the scale is shown by the letter D. The vertical exaggeration of the depth profile is 100:1. The bottom profile represents total intensity magnetic anomalies in gammas as indicated by the scale identified M. The regional magnetic field has been removed using the IGRF coefficients of Cain *et al.,* (1968). Selected positions are annotated along with the course and speed made good between adjacent points. See navigation listing (Table 1). Distance, annotated each 200 nautical miles along the track, is indicated at the bottom of each figure. An index track map, given in Figure 1, shows the location of the track, annotated in hundreds of miles, as well as the locations of the drill sites and selected physiographic features. The navigation information annotated near the bottom represents the speed and course made good and does not correspond precisely with the dead reckoned course and speed.

The second group of data (Figures 9-32) are photographic reductions of original seismic reflection profiles. The instrumentation incorporated in the collection of this data, and also for the magnetics and precision depth data, are described briefly in the introduction chapter (1) of this volume. The depth scales in nominal fathoms are given for each profile. Note that 400 nominal fathoms represent 1.0 second of reflection time through the water layer. Sub-bottom depths can be estimated fairly well by assuming 1.0 second of reflection time represents 1.0 km of sediments. Local time and dates are also shown at the bottom of each profile as well as course information. In the case of the seismic profiles, the courses shown are courses steered and do not correspond exactly with the courses made good shown in the geophysical plots. The vertical exaggeration on these profiles is approximately 30:1. Significant breaks in the record are indicated by two hash marks, and the annotation "SC" indicates a scale change which may represent either a jump in the reference level for the record or an actual change in the sweep time (vertical scale) of the recording. Hundreds of miles are also annotated across the top of the record and correspond with the hundreds of miles shown on the geophysical profiles and on the index map of Figure 1.

The seismic data presented in Figures 9-32 must be read from right to left on each sheet. The beginning portion of the record starts at the upper right with time and distance increasing to the left. The continuation of the profile then drops down to the right side of the lower profile, and again is read from right to left. The continuation of the lower profile appears on the next page at the top profile, upper right.

The times spent on drill sites are indicated, but the precise location of the sites on the seismic profile are not given here. The drill sites are located on those portions of the records reproduced in the individual site report chapters. Selected isobaths taken from the Uchupi (1971) atlas have been incorporated into Figure 1, and only key features referred to in the geophysical narrative have been annotated there.

NARRATIVE

Between Lisbon and Site 135, *Challenger* proceeded southwest crossing the Horseshoe Abyssal Plain and up onto the Horseshoe Hills where Site 135 is located. There was no conspicuous magnetic signature associated with the topographic highs bounding the Horseshoe Abyssal Plain. Acoustic basement (seismic layer 2) was not recorded throughout this region and is expected to lie well below (>700 m) the prominent reflector recorded in the vicinity of Site 135.

Acoustic basement is first recognized near mile 400 and can be traced into and across the area of Site 136. No conspicuous magnetic anomalies are associated with the basement relief in this area. Upon departing from Site 136, the flank of the Madeira Island platform was crossed. The basement reflector could not be traced continuously from the area of Site 136 to this region. An extremely large magnetic anomaly (peak-to-peak amplitude >1000 gammas) is seen in the geophysical profile near mile 620 and represents the largest magnetic anomaly recorded in this area. This anomaly lies somewhat south and to the west of the Madeira platform. It can be correlated with anomaly "J" of Pitman and Talwani (1972) and is therefore probably not related to the nearby volcanic island platform.

Proceeding from this point southwest towards Site 137, large amplitude magnetic anomalies are observed. This observation is somewhat surprising in view of the approximate parallelism of the *Challenger* track to the anticipated magnetic lineation trends in this region and in view of the fact that the track should be seaward of the zone that

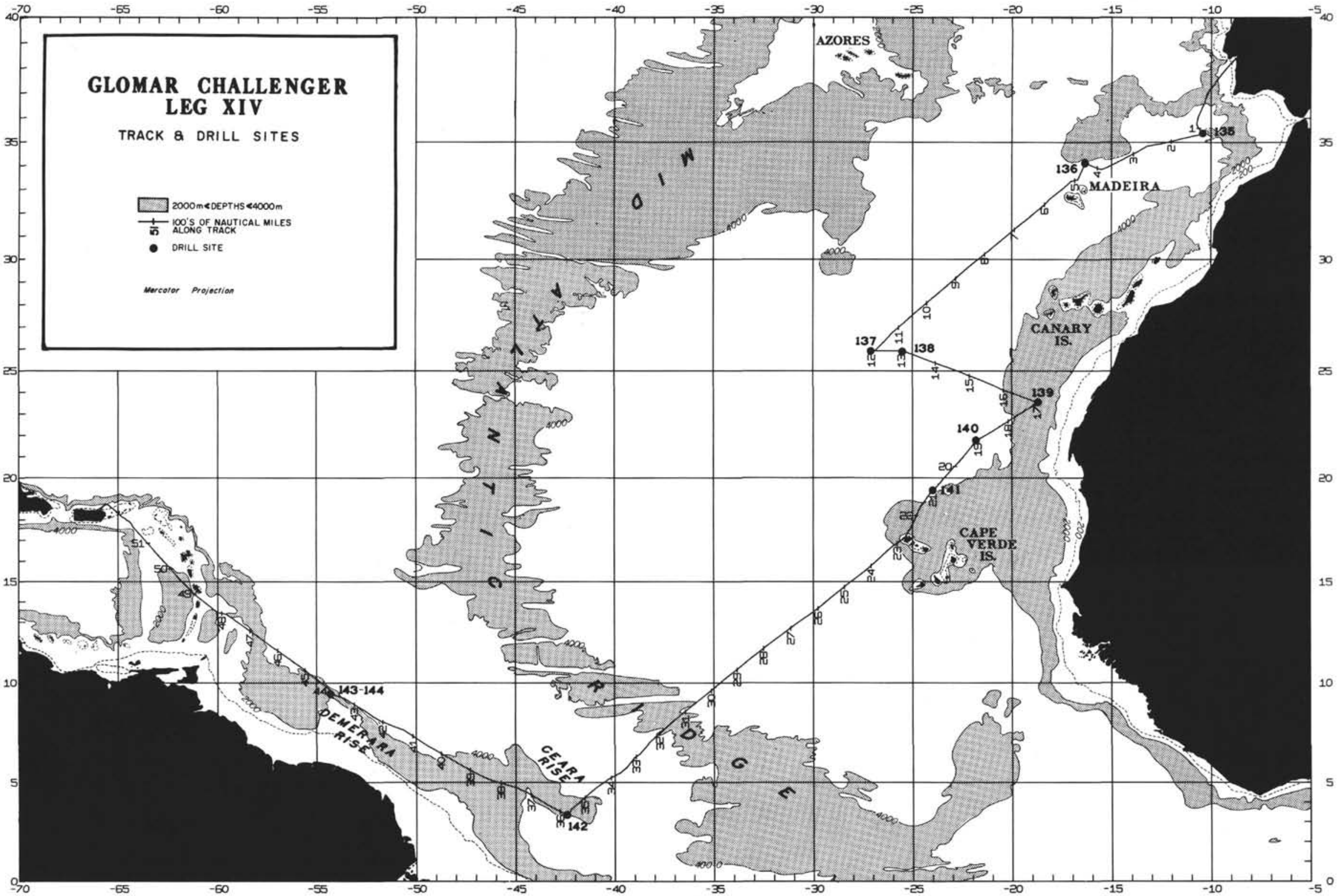


Figure 1. Challenger *Leg 14 track from Lisbon, Portugal to San Juan, Puerto Rico. Selected isobaths are from Uchupi (1971).*

TABLE 1
Navigation of *Challenger*, Leg 14

DAY	MON	YEAR	TZ	TIME	LATITUDE	LONGITUDE	DISTANCE	SPEED	COURSE	REGIONAL MAG
9	10	1970	-1.0	1218	37 8.7	-10 9.1	0.0	9.0	193	42707.
9	10	1970	-1.0	1330	36 58.2	-10 12.2	10.8	12.7	194	42650.
9	10	1970	-1.0	1410	36 50.0	-10 14.8	19.2	11.9	195	42583.
9	10	1970	-1.0	15 0	36 40.4	-10 18.0	29.2	9.7	204	42522.
9	10	1970	-1.0	16 0	36 31.5	-10 22.8	38.9	10.5	204	42334.
9	10	1970	-1.0	1850	36 4.3	-10 37.5	68.5	11.6	203	42284.
9	10	1970	-1.0	1930	35 57.2	-10 41.3	76.2	11.8	187	42209.
9	10	1970	-1.0	2024	35 46.7	-10 42.8	86.8	10.0	189	42186.
9	10	1970	-1.0	2044	35 43.4	-10 43.4	90.1	10.1	149	42168.
9	10	1970	-1.0	21 0	35 41.1	-10 41.6	92.8	9.9	149	42074.
9	10	1970	-1.0	2230	35 28.5	-10 32.1	107.7	6.6	148	42053.
9	10	1970	-1.0	23 0	35 25.7	-10 30.0	111.0	6.3	148	42023.
9	10	1970	-1.0	2346	35 21.6	-10 26.8	115.8	4.5	147	42005.
10	10	1970	-1.0	024	35 19.2	-10 24.9	118.6	3.8	334	42015.
10	10	1970	-1.0	047	35 20.5	-10 25.7	120.1	0.3	34	42017.
10	10	1970	-1.0	2 4	35 20.8	-10 25.4	120.4	0.0	141	42017.
13	10	1970	-1.0	1140	35 20.8	-10 25.4	120.5	0.3	259	42013.
14	10	1970	-1.0	152	35 20.1	-10 29.8	124.2	4.0	257	42011.
14	10	1970	-1.0	224	35 19.6	-10 32.4	126.3	8.1	257	42009.
14	10	1970	0.0	130	35 19.4	-10 33.4	127.1	9.4	257	42004.
14	10	1970	0.0	2 0	35 18.4	-10 39.0	131.8	12.5	257	41996.
14	10	1970	0.0	230	35 17.0	-10 46.4	138.1	10.9	257	41989.
14	10	1970	0.0	3 0	35 15.8	-10 53.0	143.5	11.5	257	41986.
14	10	1970	0.0	314	35 15.2	-10 56.2	146.2	9.5	257	41983.
14	10	1970	0.0	330	35 14.6	-10 59.2	148.8	10.5	257	41971.
14	10	1970	0.0	424	35 12.4	-11 10.5	158.2	10.8	256	41956.
14	10	1970	0.0	530	35 9.6	-11 24.6	170.1	9.1	256	41952.
14	10	1970	0.0	552	35 8.8	-11 28.6	173.4	10.3	255	41946.
14	10	1970	0.0	616	35 7.8	-11 33.5	177.6	10.5	256	41926.
14	10	1970	0.0	742	35 4.1	-11 51.3	192.6	10.0	256	41917.
14	10	1970	0.0	824	35 2.3	-11 59.5	199.6	9.6	256	41916.
14	10	1970	0.0	828	35 2.2	-12 0.3	200.2	10.6	256	41899.
14	10	1970	0.0	946	34 58.8	-12 16.6	214.0	10.1	258	41885.
14	10	1970	0.0	1110	34 55.9	-12 33.5	228.1	10.3	262	41884.
14	10	1970	0.0	1130	34 55.5	-12 37.6	231.6	10.0	261	41879.
14	10	1970	0.0	1230	34 54.0	-12 49.6	241.5	10.1	261	41877.
14	10	1970	0.0	1246	34 53.5	-12 52.9	244.2	10.0	258	41861.
14	10	1970	0.0	1430	34 49.9	-13 13.6	261.6	10.3	240	41775.
14	10	1970	0.0	17 8	34 36.2	-13 42.2	288.8	10.8	243	41734.
14	10	1970	0.0	1830	34 29.4	-13 58.0	303.5	10.6	243	41554.
15	10	1970	0.0	036	33 59.7	-15 7.2	368.0	10.3	246	41522.
15	10	1970	1.0	1 0	33 53.9	-15 23.2	382.4	10.5	246	41509.
15	10	1970	1.0	132	33 51.7	-15 29.4	388.0	11.3	293	41612.
15	10	1970	1.0	4 0	34 2.4	-16 0.3	415.8	9.4	292	41676.
15	10	1970	1.0	550	34 8.9	-16 19.5	433.0	8.0	295	41687.
15	10	1970	1.0	610	34 10.1	-16 22.4	435.7	2.1	301	41690.
15	10	1970	1.0	630	34 10.4	-16 23.1	436.4	3.7	108	41681.
15	10	1970	1.0	715	34 9.6	-16 20.0	439.1	0.4	69	41684.
15	10	1970	1.0	1048	34 10.1	-16 18.3	440.6	0.0	131	41684.
17	10	1970	1.0	1248	34 10.1	-16 18.2	440.7	0.1	342	41689.
17	10	1970	1.0	2020	34 10.8	-16 18.5	441.4	7.4	23	41697.
17	10	1970	1.0	2029	34 11.8	-16 18.0	442.5	8.6	203	41680.
17	10	1970	1.0	2047	34 9.4	-16 19.2	445.1	8.8	203	41554.
17	10	1970	1.0	2258	33 51.9	-16 28.4	464.3	9.3	204	41449.
18	10	1970	1.0	042	33 37.2	-16 36.3	480.3	9.2	201	41368.
18	10	1970	1.0	2 0	33 26.1	-16 41.5	492.3	9.1	259	41365.
18	10	1970	1.0	236	33 25.0	-16 48.0	497.8	9.4	259	41360.
18	10	1970	1.0	344	33 23.1	-17 0.5	508.4	9.4	256	41359.
18	10	1970	1.0	354	33 22.7	-17 2.3	510.0	10.9	225	41302.
18	10	1970	1.0	5 0	33 14.2	-17 12.5	522.0	11.1	227	41213.
18	10	1970	1.0	648	33 0.6	-17 29.9	541.9	11.0	231	41061.
18	10	1970	1.0	1012	32 37.1	-18 4.7	579.5	10.3	224	40973.
18	10	1970	1.0	1158	32 24.0	-18 19.8	597.7	11.4	228	40931.
18	10	1970	1.0	1248	32 17.6	-18 28.1	607.2	10.6	229	40922.
18	10	1970	1.0	13 0	32 16.2	-18 30.0	609.4	10.6	229	40776.
18	10	1970	1.0	1614	31 53.9	-19 0.8	643.7	10.5	231	40764.
18	10	1970	1.0	1630	31 52.1	-19 3.4	646.5	4.2	234	40757.
18	10	1970	1.0	17 0	31 50.9	-19 5.4	648.6	11.0	231	40712.
18	10	1970	1.0	18 0	31 44.0	-19 15.4	659.6	11.1	230	40672.
18	10	1970	1.0	1852	31 37.8	-19 24.1	669.2	9.0	231	40630.
18	10	1970	1.0	20 0	31 31.3	-19 33.4	679.4	9.3	230	40610.
18	10	1970	1.0	2032	31 28.2	-19 37.8	684.4	9.4	231	40477.
19	10	1970	1.0	0 0	31 7.5	-20 7.5	717.1	10.8	231	40397.
19	10	1970	1.0	148	30 55.1	-20 24.9	736.5	10.8	229	40343.
19	10	1970	1.0	3 0	30 46.7	-20 36.4	749.4	10.8	229	40315.
19	10	1970	1.0	336	30 42.5	-20 42.1	755.9	10.9	230	40210.
19	10	1970	1.0	555	30 26.1	-21 4.8	781.3	10.7	231	39985.
19	10	1970	1.0	1112	29 50.7	-21 55.8	837.9	10.5	230	39909.
19	10	1970	1.0	1258	29 38.9	-22 12.2	856.4	10.7	230	39874.
19	10	1970	1.0	1346	29 33.4	-22 19.8	865.0	10.1	228	39842.
19	10	1970	1.0	1430	29 28.5	-22 26.1	872.4	10.2	228	39794.
19	10	1970	1.0	1536	29 21.0	-22 35.8	883.7	10.5	229	39754.
19	10	1970	1.0	1631	29 14.7	-22 44.1	893.3	8.5	229	39751.
19	10	1970	1.0	1636	29 14.3	-22 44.7	894.0	8.9	229	39739.
19	10	1970	1.0	1655	29 12.4	-22 47.1	896.8	5.7	229	39731.
19	10	1970	1.0	1715	29 11.2	-22 48.8	898.7	9.8	229	39721.
19	10	1970	1.0	1730	29 9.6	-22 50.9	901.1	10.1	229	39657.
19	10	1970	1.0	19 0	28 59.7	-23 3.9	916.2	9.8	229	39616.
19	10	1970	1.0	20 0	28 53.2	-23 12.3	926.0	9.6	229	39595.
19	10	1970	1.0	2030	28 50.1	-23 16.5	930.8	10.8	229	39573.
19	10	1970	1.0	21 0	28 46.5	-23 21.1	936.2	11.0	229	39476.
19	10	1970	1.0	23 6	28 31.3	-23 41.0	959.3	10.3	230	39439.
20	10	1970	1.0	0 0	28 25.4	-23 49.1	968.6	10.0	230	39398.
20	10	1970	1.0	1 0	28 19.0	-23 57.9	978.6	10.9	231	39318.
20	10	1970	1.0	252	28 6.1	-24 15.6	998.9	10.6	228	39223.
20	10	1970	1.0	5 0	27 51.1	-24 34.8	1021.5	10.6	228	39219.
20	10	1970	1.0	5 6	27 50.4	-24 35.7	1022.5	10.7	229	39141.
20	10	1970	1.0	652	27 38.1	-24 51.8	1041.4	10.9	229	39060.
20	10	1970	1.0	840	27 25.2	-25 8.5	1061.1	10.4	228	38981.
20	10	1970	1.0	1030	27 12.5	-25 24.5	1080.1	10.9	228	38813.
20	10	1970	1.0	1410	26 45.8	-25 58.0	1120.2	3.9	227	38807.
20	10	1970	1.0	1433	26 44.8	-25 59.2	1121.7	11.1	228	38786.
20	10	1970	1.0	15 0	26 41.4	-26 3.4	1126.7	10.6	222	38650.
20	10	1970	1.0	1738	26 20.9	-26 24.3	1154.5	10.4	223	38632.
20	10	1970	1.0	18 0	26 18.1	-26 27.3	1158.3	10.3	223	38488.
20	10	1970	1.0	2057	25 55.9	-26 50.5	1188.8	10.0	270	38493.
20	10	1970	1.0	2114	25 55.8	-26 53.6	1191.6	8.3	270	38507.
20	10	1970	1.0	22 8	25 55.8	-27 1.9	1199.1	4.6	270	38508.
20	10	1970	1.0	2216	25 55.8	-27 2.6	1199.7	4.7	270	38511.
20	10	1970	1.0	2234	25 55.8	-27 4.2	1201.1	3.9	90	38510.
20	10	1970	1.0	2246	25 55.8	-27 3.3	1201.9	12.0	90	38508.
20	10	1970	1.0	2249	25 55.8	-27 2.7	1202.5	0.1	252	38508.
21	10	1970	1.0	1120	25 55.5	-27 3.6	1203.4	0.0	261	38508.
23	10	1970	1.0	2116	25 55.5	-27 3.7	1203.5	0.1	12	38516.
24	10	1970	1.0	730	25 56.5	-27 3.5	1204.5	3.9	271	38522.
24	10	1970	1.0	811	25 56.6	-27 6.5	1207.2	6.7	89	38518.
24	10	1970	1.0	828	25 56.6	-27 4.3	1209.1	6.7	180	38513.
24	10	1970	1.0	834	25 55.9	-27 4.3	1209.8	7.1	177	38504.
24	10	1970	1.0	843	25 54.9	-27 4.3	1210.9	7.1	268	38507.
24	10	1970	1.0	859	25 54.8	-27 6.4	1212.7	5.7	4	38516.
24	10	1970	1.0	911	25 56.0	-27 6.3	1213.9	7.6	92	38511.
24	10	1970	1.0	930	25 55.9	-27 3.6	1216.3	8.2	92	38505.
24	10	1970	1.0	950	25 55.8	-27 0.6	1219.1	5.8	93	38502.

DAY	MON	YEAR	TZ	TIME	LATITUDE	LONGITUDE	DISTANCE	SPEED	COURSE	REGIONAL MAG
24	10	1970	1.0	10 0	25 55.7	-26 59.5	1220.0	4.0	94	38501.
24	10	1970	1.0	1010	25 55.7	-26 58.8	1220.7	12.3	91	38479.
24	10	1970	1.0	11 0	25 55.5	-26 47.4	1230.9	9.3	92	38449.
24	10	1970	1.0	1230	25 55.1	-26 31.9	1244.9	9.8	89	38436.
24	10	1970	1.0	1318	25 55.1	-26 23.2	1252.7	9.6	89	38424.
24	10	1970	1.0	14 0	25 55.2	-26 15.8	1259.4	10.3	89	38407.
24	10	1970	1.0	15 0	25 55.3	-26 4.3	1269.7	9.5	90	38374.
24	10	1970	1.0	17 0	25 55.4	-25 43.2	1288.6	9.7	90	38371.
24	10	1970	1.0	1711	25 55.4	-25 41.2	1290.4	7.4	90	38362.
24	10	1970	1.0	1754	25 55.4	-25 35.4	1295.7	7.2	92	38358.
24	10	1970	1.0	1811	25 55.4	-25 33.1	1297.7	3.7	93	38357.
24	10	1970	1.0	1816	25 55.3	-25 32.7	1298.1	4.0	89	38356.
24	10	1970	1.0	1820	25 55.3	-25 32.4	1298.3	3.9	89	38355.
24	10	1970	1.0	1831	25 55.3	-25 31.6	1299.0	5.0	270	38358.
24	10	1970	1.0	1850	25 55.4	-25 33.4	1300.6	4.0	271	38359.
24	10	1970	1.0	1856	25 55.4	-25 33.8	1301.0	0.1	56	38358.
24	10	1970	1.0	2022	25 55.4	-25 33.8	1301.1	0.0	211	38358.
26	10	1970	1.0	610	25 55.3	-25 33.8	1301.3	0.1	88	38355.
27	10	1970	1.0	745	25 55.3	-25 32.0	1302.9	3.3	110	38348.
27	10	1970	1.0	815	25 54.8	-25 30.3	1304.5	8.6	110	38209.
27	10	1970	1.0	1158	25 43.9	-24 56.8	1336.6	9.0	111	38006.
27	10	1970	1.0	1710	25 27.4	-24 8.2	1383.4	9.1	109	37993.
27	10	1970	1.0	1730	25 26.4	-24 5.0	1386.4	9.8	109	37934.
27	10	1970	1.0	19 0	25 21.5	-23 49.7	1401.2	10.1	110	37902.
27	10	1970	1.0	1945	25 18.9	-23 41.8	1408.8	10.7	110	37839.
27	10	1970	1.0	2110	25 13.6	-23 26.1	1423.9	10.8	110	37803.
27	10	1970	1.0	22 0	25 10.5	-23 16.8	1432.9	10.7	110	37727.
27	10	1970	1.0	2344	25 4.1	-22 57.5	1451.5	10.4	110	37717.
28	10	1970	1.0	0 0	25 3.1	-22 54.6	1454.3	10.5	110	37653.
28	10	1970	1.0	134	24 57.6	-22 37.5	1470.7	10.5	113	37633.
28	10	1970	1.0	2 0	24 55.9	-22 32.9	1475.2	10.4	113	37567.
28	10	1970	1.0	330	24 49.9	-22 17.1	1490.8	10.4	111	37505.
28	10	1970	1.0	5 0	24 44.2	-22 1.0	1506.4	10.5	111	37492.
28	10	1970	1.0	518	24 43.1	-21 57.8	1509.6	10.2	111	37424.
28	10	1970	1.0	7 0	24 36.9	-21 39.9	1527.0	10.1	111	37369.
28	10	1970	1.0	824	24 31.8	-21 25.3	1541.1	10.2	113	37260.
28	10	1970	1.0	11 0	24 21.4	-20 58.6	1567.6	10.1	113	37258.
28	10	1970	1.0	11 2	24 21.2	-20 58.3	1568.0	9.8	115	37152.
28	10	1970	1.0	1334	24 10.7	-20 33.7	1592.7	10.3	111	37097.
28	10	1970	1.0	15 0	24 5.3	-20 18.6	1607.5	10.2	111	37045.
28	10	1970	1.0	1622	24 0.3	-20 4.4	1621.5	10.2	109	36948.
28	10	1970	1.0	19 9	23 50.8	-19 35.0	1649.9	10.8	110	36916.
28	10	1970	1.0	20 0	23 47.7	-19 25.6	1659.1	10.2	109	36906.
28	10	1970	1.0	2018	23 46.7	-19 22.4	1662.2	10.3	111	36812.
28	10	1970	1.0	2252	23 37.1	-18 55.6	1688.5	9.3	113	36807.
28	10	1970	1.0	23 0	23 36.6	-18 54.4	1689.8	9.5	113	36766.
29	10	1970	1.0	010	23 32.3	-18 43.3	1700.8	4.5	115	36758.
29	10	1970	1.0	040	23 31.4	-18 41.0	1703.1	0.6	260	36757.
29	10	1970	1.0	244	23 31.2	-18 42.3	1704.2	0.0	180	36757.
30	10	1970	1.0	520	23 31.2	-18 42.3	1704.3	0.3	241	36741.
30	10	1970	1.0	2018	23 28.8	-18 47.1	1709.3	4.3	238	36735.
30	10	1970	1.0	2041	23 27.9	-18 48.6	1710.9	10.4	238	36723.
30	10	1970	1.0	21 0	23 26.1	-18 51.7	1714.2	11.1	238	36564.
31	10	1970	1.0	1 0	23 2.8	-19 32.6	1758.5	10.7	238	36561.
31	10	1970	1.0	1 6	23 2.2	-19 33.5	1759.5	10.9	237	36453.
31	10	1970	1.0	350	22 46.1	-20 0.9	1789.4	11.1	238	36382.
31	10	1970	1.0	538	22 35.5	-20 19.3	1809.5	11.0	237	36361.
31	10	1970	1.0	610	22 32.4	-20 24.6	1815.3	10.8	237	36355.
31	10	1970	1.0	620	22 31.4	-20 26.3	1817.1	10.3	237	36313.
31	10	1970	1.0	728	22 25.1	-20 36.8	1828.7	10.6	237	36245.
31	10	1970	1.0	914	22 14.9	-20 53.9	1847.5	10.9	238	36201.
31	10	1970	1.0	1026	22 8.0	-21 5.9	1860.6	10.9	240	36138.
31	10	1970	1.0	1214	21 58.1	-21 24.2	1880.3	10.8	241	36115.
31	10	1970	1.0	1256	21 54.4	-21 31.4	1887.8	10.2	241	36112.
31	10	1970	1.0	13 0	21 54.1	-21 32.0	1888.5	9.6	241	36092.
31	10	1970	1.0	1343	21 50.8	-21 38.5	1895.4	10.5	240	36066.
31	10	1970	1.0	1430	21 46.6	-21 46.1	1903.6	3.4	245	36063.
31	10	1970	1.0	1450	21 46.1	-21 47.2	1904.7	0.5	323	36066.
31	10	1970	1.0	1540	21 46.5	-21 47.5	1905.1	0.1	181	36054.
1	11	1970	1.0	2 2	21 45.0	-21 47.5	1906.6	0.0	223	36053.
2	11	1970	1.0	434	21 44.9	-21 47.6	1906.7	0.0	52	36054.
4	11	1970	1.0	12 0	21 45.0	-21 47.5	1906.8	0.5	211	36046.
4	11	1970	1.0	1410	21 44.0	-21 48.2	1907.9	8.1	219	36001.
4	11	1970	1.0	1510	21 37.7	-21 53.7	1916.1	7.2	219	35978.
4	11	1970	1.0	1546	21 34.4	-21 56.7	1920.4	10.8	220	35960.
4	11	1970	1.0	16 4	21 31.9	-21 58.9	1923.6	11.1	219	35719.
4	11	1970	1.0	20 0	20 57.9	-22 28.3	1967.3	9.9	219	35702.
4	11	1970	1.0	2018	20 55.6	-22 30.3	1970.3	6.9	218	35694.
4	11	1970	1.0	2032	20 54.3	-22 31.4	1971.9	10.9	219	35668.
4	11	1970	1.0	2058	20 50.6	-22 34.5	1976.6	10.9	221	35637.
4	11	1970	1.0	2130	20 46.2	-22 38.6	1982.4	11.0	223	35580.
4	11	1970	1.0	2230	20 38.1	-22 46.6	1993.4	10.5	222	35323.
5	11	1970	2.0	220	20 0.6	-23 22.9	2044.1	11.0	222	35294.
5	11	1970	2.0	250	19 56.5	-23 26.9	2049.6	11.2	219	35218.
5	11	1970	2.0	4 6	19 45.6	-23 36.4	2063.8	10.7	225	35197.
5	11	1970	2.0	432	19 42.3	-23 39.9	2068.4	10.5	220	35074.
5	11	1970	2.0	645	19 24.4	-23 55.9	2091.8	8.0	280	35083.
5	11	1970	2.0	712	19 25.1	-23 59.6	2095.4	7.6	282	35087.
5	11	1970	2.0	725	19 25.4	-24 1.4	2097.0	6.7	18	35098.
5	11	1970	2.0	738	19 26.8	-24 0.9	2098.5	7.9	106	35093.
5	11	1970	2.0	749	19 26.4	-23 59.4	2100.0	2.2	112	35091.
5	11	1970	2.0	8 0	19 26.3	-23 59.0	2100.4	14.2	192	35079.
5	11	1970	2.0	8 7	19 24.6	-23 59.4	2102.0	11.4	282	35084.
5	11	1970	2.0	815	19 25.0	-24 1.0	2103.5	3.3	279	35085.
5	11	1970	2.0	825	19 25.1	-24 1.5	2104.1	3.6	21	35089.
5	11	1970	2.0	834	19 25.6	-24 1.3	2104.6	6.4	107	35084.
5	11	1970	2.0	847	19 25.2	-23 59.9	2106.0	0.5	138	35084.
5	11	1970	2.0	848	19 25.2	-23 59.9	2106.0	0.0	335	35084.
5	11	1970	2.0	1042	19 25.2	-23 59.9	2106.1	0.0	159	35084.
7	11	1970	2.0	9 8	19 25.1	-23 59.9	2106.1	0.0	343	35084.
7	11	1970	2.0	1050	19 25.2	-23 59.9	2106.1	0.6	39	35084.
7	11	1970	2.0	1051	19 25.2	-23 59.9	2106.2	3.0	34	35096.
7	11	1970	2.0	1134	19 27.0	-23 58.6	2108.3	6.3	34	35106.
7	11	1970	2.0	1150	19 28.4	-23 57.6	2110.0	5.3	212	35101.
7	11	1970	2.0	12 0	19 27.6	-23 58.1	2110.9	7.2	213	35083.
7	11	1970	2.0	1225	19 25.1	-23 59.8	2113.9	9.3	219	35054.
7	11	1970	2.0	13 0	19 20.8	-24 3.5	2119.3	11.6	218	35041.
7	11	1970	2.0	1312	19 19.0	-24 4.9	2121.6	11.7	218	35031.
7	11	1970	2.0	1322	19 17.5	-24 6.2	2123.6	11.6	218	34969.
7	11	1970	2.0	1420	19 8.5	-24 13.5	2134.8	10.0	214	34873.
7	11	1970	2.0	16 0	18 54.7	-24 23.4	2151.5	10.6	214	34751.
7	11	1970	2.0	18 0	18 37.2	-24 36.0	2172.7	11.7	210	34716.
7	11	1970	2.0	1830	18 32.2	-24 39.2	2178.6	10.7	211	34690.
7	11	1970	2.0	1854	18 28.5	-24 41.5	2182.8	10.8	203	34612.
7	11	1970	2.0	20 0	18 17.6	-24 46.3	2194.7	10.7	203	34418.
7	11	1970	2.0	2244	17 50.5	-24 58.1	2224.0	11.4	209	34330.
8	11	1970	2.0	0 0	17 37.9	-25 5.5	2238.4	9.4	209	34233.
8	11	1970	2.0	142	17 24.0	-25 13.6	2254.4	7.7	209	34127.
8	11	1970	2.0	4 0	17 8.6	-25 22.7	2272.0	9.6	232	34047.
8	11	1970	2.0	616	16 55.3	-25 40.7	2293.8	11.3	238	33988.
8	11	1970	2.0	8 2	16 44.7	-25 58.4	2313.7	10.7	229	33904.
8	11	1970	2.0	10 0	16 30.9	-26 14.9	2334.8	10.8	229	33902.
8	11	1970	2.0	10 2	16 30.7	-26 15.2	2335.1	10.6	227	33725.

TABLE 1 – *Continued*

DAY	MON	YEAR	TZ	TIME	LATITUDE	LONGITUDE	DISTANCE	SPEED	COURSE	REGIONAL MAG
8	11	1970	2.0	14 0	16 1.8	-26 47.2	2377.3	10.1	226	33677.
8	11	1970	2.0	15 8	15 53.9	-26 55.8	2388.7	9.8	229	33562.
8	11	1970	2.0	1812	15 34.4	-27 19.5	2418.7	10.8	232	33503.
8	11	1970	2.0	1944	15 24.1	-27 32.9	2435.3	10.2	232	33389.
8	11	1970	2.0	23 0	15 3.8	-28 0.3	2468.5	10.1	232	33355.
9	11	1970	2.0	0 0	14 57.6	-28 8.5	2478.6	9.1	230	33353.
9	11	1970	2.0	0 4	14 57.2	-28 9.0	2479.2	10.3	232	33289.
9	11	1970	2.0	152	14 45.8	-28 24.1	2497.8	10.3	232	33250.
9	11	1970	2.0	258	14 38.7	-28 33.3	2509.1	9.3	232	33249.
9	11	1970	2.0	3 0	14 38.6	-28 33.5	2509.4	10.6	232	33186.
9	11	1970	2.0	444	14 27.2	-28 48.4	2527.7	10.4	230	33094.
9	11	1970	2.0	712	14 10.6	-29 8.7	2553.5	10.5	230	33016.
9	11	1970	2.0	920	13 56.3	-29 26.6	2575.9	10.6	231	33010.
9	11	1970	2.0	930	13 55.2	-29 28.0	2577.7	10.4	231	32926.
9	11	1970	2.0	1150	13 39.9	-29 47.4	2602.0	10.4	234	32920.
9	11	1970	2.0	12 0	13 38.9	-29 48.9	2603.8	10.8	234	32841.
9	11	1970	2.0	1428	13 23.3	-30 11.0	2630.3	10.8	234	32840.
9	11	1970	2.0	1430	13 23.1	-30 11.3	2630.7	10.7	234	32788.
9	11	1970	2.0	16 8	13 12.8	-30 25.8	2648.1	10.5	235	32672.
9	11	1970	2.0	20 0	12 49.3	-30 59.7	2688.7	10.5	235	32638.
9	11	1970	2.0	21 8	12 42.4	-31 9.6	2700.5	10.7	231	32578.
9	11	1970	2.0	2254	12 30.6	-31 24.8	2719.5	10.4	234	32433.
10	11	1970	2.0	346	12 0.7	-32 6.5	2770.1	10.9	233	32373.
10	11	1970	2.0	538	11 48.4	-32 23.0	2790.4	10.5	233	32347.
10	11	1970	2.0	630	11 43.0	-32 30.5	2799.5	10.5	231	32225.
10	11	1970	2.0	1016	11 18.2	-33 1.9	2839.0	9.9	230	32218.
10	11	1970	2.0	1030	11 16.7	-33 3.8	2841.3	10.3	230	32144.
10	11	1970	2.0	1244	11 1.9	-33 21.6	2864.3	10.5	232	32136.
10	11	1970	2.0	13 0	11 0.1	-33 23.9	2867.1	9.4	232	31941.
10	11	1970	2.0	20 0	10 19.2	-34 16.6	2933.1	13.2	230	31862.
10	11	1970	2.0	2158	10 2.7	-34 36.9	2959.1	13.3	229	31861.
10	11	1970	2.0	22 0	10 2.4	-34 37.3	2959.5	10.3	229	31803.
10	11	1970	2.0	2344	9 50.5	-34 50.9	2977.5	10.0	229	31787.
11	11	1970	2.0	014	9 47.2	-34 54.7	2982.5	10.0	230	31703.
11	11	1970	2.0	256	9 29.8	-35 15.6	3009.4	10.6	232	31455.
11	11	1970	2.0	1114	8 35.2	-36 25.3	3097.3	10.3	231	31433.
11	11	1970	2.0	1158	8 30.5	-36 31.2	3104.8	10.4	232	31432.
11	11	1970	2.0	12 0	8 30.3	-36 31.5	3105.2	10.3	230	31380.
11	11	1970	2.0	1344	8 18.8	-36 45.4	3123.1	10.2	229	31302.
11	11	1970	2.0	1610	8 2.4	-37 4.2	3147.9	10.3	229	31181.
11	11	1970	2.0	20 0	7 36.4	-37 34.4	3187.6	10.1	229	31092.
11	11	1970	2.0	2254	7 17.1	-37 56.8	3216.9	6.7	227	31019.
12	11	1970	3.0	110	7 2.1	-38 12.8	3238.8	11.8	222	30833.
12	11	1970	3.0	516	6 26.0	-38 45.2	3287.2	11.5	234	30785.
12	11	1970	3.0	7 0	6 14.3	-39 1.6	3307.2	11.5	236	30784.
12	11	1970	3.0	7 2	6 14.0	-39 1.9	3307.6	8.2	218	30628.
12	11	1970	3.0	1130	5 45.0	-39 24.7	3344.4	8.1	229	30616.
12	11	1970	3.0	12 0	5 42.4	-39 27.7	3348.4	8.5	229	30554.
12	11	1970	3.0	1428	5 28.7	-39 43.7	3369.4	9.2	241	30530.
12	11	1970	3.0	16 8	5 21.2	-39 57.3	3384.8	9.4	242	30491.
12	11	1970	3.0	19 0	5 8.4	-40 21.0	3411.7	9.2	234	30444.
12	11	1970	3.0	21 8	4 56.9	-40 36.8	3431.2	9.6	235	30393.
12	11	1970	3.0	2326	4 44.1	-40 54.8	3453.3	9.8	233	30354.
13	11	1970	3.0	1 0	4 34.7	-41 7.1	3468.7	9.8	229	30348.
13	11	1970	3.0	112	4 33.5	-41 8.6	3470.6	10.1	229	30272.
13	11	1970	3.0	344	4 16.7	-41 28.0	3496.2	9.7	231	30220.
13	11	1970	3.0	540	4 4.8	-41 42.6	3515.1	11.0	226	30205.
13	11	1970	3.0	6 4	4 1.7	-41 45.8	3519.5	10.4	229	30123.
13	11	1970	3.0	842	3 43.8	-42 6.4	3546.8	12.5	225	30100.
13	11	1970	3.0	914	3 39.1	-42 11.2	3553.4	8.2	212	30055.
13	11	1970	3.0	1024	3 31.0	-42 16.3	3563.0	7.2	215	30010.
13	11	1970	3.0	1147	3 22.9	-42 22.0	3572.9	4.5	219	30003.
13	11	1970	3.0	1212	3 21.4	-42 23.2	3574.8	3.2	18	30005.
13	11	1970	3.0	1220	3 21.8	-42 23.1	3575.2	0.7	310	30007.
13	11	1970	3.0	1252	3 22.0	-42 23.3	3575.6	0.0	290	30010.
15	11	1970	3.0	13 6	3 22.3	-42 24.0	3576.3	0.2	296	30019.
16	11	1970	3.0	047	3 23.1	-42 25.6	3578.1	10.1	295	30131.
16	11	1970	3.0	3 2	3 32.7	-42 46.2	3600.8	11.0	296	30227.
16	11	1970	3.0	446	3 40.9	-43 3.4	3619.8	10.4	300	30348.
16	11	1970	3.0	652	3 51.9	-43 22.4	3641.7	9.7	301	30365.
16	11	1970	3.0	710	3 53.4	-43 24.9	3644.6	9.2	301	30588.
16	11	1970	3.0	1122	4 13.4	-43 58.3	3683.4	9.9	301	30639.
16	11	1970	3.0	1214	4 17.7	-44 5.7	3692.1	10.0	300	30771.
16	11	1970	3.0	1430	4 29.1	-44 25.4	3714.7	9.2	296	30864.
16	11	1970	3.0	1620	4 36.5	-44 40.5	3731.5	9.3	295	30972.
16	11	1970	3.0	1830	4 44.9	-44 59.0	3751.7	9.2	287	31202.
16	11	1970	3.0	2348	4 59.1	-45 45.8	3800.6	8.5	285	31211.
17	11	1970	3.0	0 1	4 59.5	-45 47.6	3802.4	9.1	285	31252.
17	11	1970	3.0	1 0	5 1.9	-45 56.3	3811.3	8.4	285	31297.
17	11	1970	3.0	210	5 4.5	-46 5.7	3821.1	9.0	284	31331.
17	11	1970	3.0	3 0	5 6.3	-46 13.0	3828.6	9.0	292	31373.
17	11	1970	3.0	352	5 9.2	-46 20.3	3836.4	8.8	294	31479.
17	11	1970	3.0	558	5 16.7	-46 37.3	3854.9	9.0	294	31481.
17	11	1970	3.0	6 0	5 16.8	-46 37.5	3855.2	9.0	297	31646.
17	11	1970	3.0	9 0	5 29.2	-47 1.7	3882.2	9.2	299	31788.
17	11	1970	3.0	1126	5 39.9	-47 21.4	3904.5	9.1	299	31939.
17	11	1970	3.0	14 0	5 51.4	-47 41.7	3927.8	8.9	300	32475.
17	11	1970	3.0	2258	6 31.3	-48 51.2	4007.6	9.3	301	32542.
18	11	1970	3.0	0 1	6 36.3	-48 59.6	4017.4	9.3	298	32584.
18	11	1970	3.0	042	6 39.3	-49 5.3	4023.7	9.2	299	32732.
18	11	1970	3.0	3 2	6 49.8	-49 24.1	4045.2	9.0	304	33074.

DAY	MON	YEAR	TZ	TIME	LATITUDE	LONGITUDE	DISTANCE	SPEED	COURSE	REGIONAL MAG
18	11	1970	3.0	810	7 15.5	-50 3.0	4091.5	9.8	303	33385.
18	11	1970	3.0	1224	7 38.3	-50 38.1	4133.1	10.7	295	33404.
18	11	1970	3.0	1240	7 39.5	-50 40.7	4136.0	11.0	290	33651.
18	11	1970	3.0	1622	7 53.5	-51 19.2	4176.6	10.6	293	33765.
18	11	1970	3.0	18 0	8 0.3	-51 35.3	4194.0	10.5	293	33833.
18	11	1970	3.0	19 0	8 4.4	-51 45.1	4204.5	11.0	300	33963.
18	11	1970	3.0	2036	8 13.2	-52 0.5	4222.1	10.5	303	34042.
18	11	1970	3.0	2134	8 18.8	-52 9.1	4232.3	10.3	304	34232.
18	11	1970	3.0	2354	8 32.3	-52 29.1	4256.3	9.8	304	34317.
19	11	1970	3.0	1 0	8 38.4	-52 38.2	4267.0	9.6	299	34366.
19	11	1970	3.0	142	8 41.6	-52 44.1	4273.7	9.5	300	34418.
19	11	1970	3.0	226	8 45.0	-52 50.2	4280.7	9.3	302	34536.
19	11	1970	3.0	4 4	8 53.0	-53 3.4	4296.0	9.7	302	34709.
19	11	1970	3.0	621	9 4.7	-53 22.4	4318.1	3.6	314	34715.
19	11	1970	3.0	633	9 5.2	-53 22.9	4318.8	9.2	302	34794.
19	11	1970	3.0	738	9 10.6	-53 31.4	4328.8	9.2	301	34846.
19	11	1970	3.0	822	9 14.1	-53 37.3	4335.5	9.5	291	34892.
19	11	1970	3.0	9 6	9 16.6	-53 43.9	4342.5	9.7	289	35001.
19	11	1970	3.0	1052	9 22.3	-54 0.1	4359.6	10.5	287	35056.
19	11	1970	3.0	1145	9 25.0	-54 9.1	4368.8	4.3	299	35064.
19	11	1970	3.0	12 0	9 25.6	-54 10.1	4369.9	11.7	298	35119.
19	11	1970	3.0	1238	9 29.0	-54 16.7	4377.3	11.0	227	35100.
19	11	1970	3.0	13 4	9 25.7	-54 20.2	4382.0	9.7	43	35107.
19	11	1970	3.0	1314	9 26.9	-54 19.1	4383.7	9.4	43	35114.
19	11	1970	3.0	1323	9 27.9	-54 18.1	4385.1	0.3	323	35120.
19	11	1970	3.0	1528	9 28.4	-54 18.5	4385.7	0.0	62	35120.
19	11	1970	3.0	2232	9 28.5	-54 18.3	4385.9	0.0	260	35121.
21	11	1970	3.0	1148	9 28.5	-54 18.7	4386.3	0.0	30	35131.
23	11	1970	3.0	1615	9 29.8	-54 17.9	4387.8	6.0	225	35115.
23	11	1970	3.0	1652	9 27.2	-54 20.6	4391.5	3.0	225	35114.
23	11	1970	3.0	1654	9 27.1	-54 20.7	4391.6	0.0	30	35116.
23	11	1970	3.0	2326	9 27.2	-54 20.6	4391.7	0.0	162	35115.
24	11	1970	3.0	114	9 27.2	-54 20.5	4391.8	0.1	79	35113.
24	11	1970	3.0	154	9 27.2	-54 20.5	4391.8	0.0	270	35113.
24	11	1970	3.0	638	9 27.2	-54 20.5	4391.9	0.0	0	35113.
24	11	1970	3.0	838	9 27.2	-54 20.5	4391.9	0.0	45	35113.
24	11	1970	3.0	1024	9 27.3	-54 20.5	4391.9	0.1	166	35113.
24	11	1970	3.0	1110	9 27.2	-54 20.5	4391.9	0.0	327	35113.
24	11	1970	3.0	13 0	9 27.2	-54 20.5	4392.0	0.1	82	35113.
24	11	1970	3.0	1336	9 27.3	-54 20.5	4392.0	0.1	231	35113.
24	11	1970	3.0	1444	9 27.2	-54 20.5	4392.1	0.0	236	35113.
24	11	1970	3.0	1632	9 27.2	-54 20.5	4392.1	0.0	90	35113.
24	11	1970	3.0	1816	9 27.2	-54 20.5	4392.2	0.0	76	35113.
24	11	1970	3.0	2210	9 27.2	-54 20.4	4392.2	0.0	257	35113.
25	11	1970	3.0	024	9 27.2	-54 20.5	4392.3	0.0	16	35133.
27	11	1970	3.0	1210	9 29.6	-54 19.8	4394.8	8.8	0	35237.
27	11	1970	3.0	1324	9 40.5	-54 19.8	4405.7	10.2	306	35286.
27	11	1970	3.0	1358	9 43.9	-54 24.5	4411.5	10.3	309	35444.
27	11	1970	3.0	1544	9 55.3	-54 39.0	4429.7	11.0	307	35563.
27	11	1970	3.0	17 0	10 3.6	-54 50.4	4443.7	11.2	307	35770.
27	11	1970	3.0	1910	10 18.0	-55 10.2	4468.0	11.7	310	35857.
27	11	1970	3.0	20 0	10 24.3	-55 17.8	4477.7	11.1	310	36056.
27	11	1970	3.0	22 0	10 38.6	-55 35.0	4499.9	11.1	306	36246.
28	11	1970	3.0	0 0	10 51.6	-55 53.5	4522.1	11.3	306	36368.
28	11	1970	3.0	115	10 59.8	-56 5.2	4536.2	6.8	306	36382.
28	11	1970	3.0	130	11 0.8	-56 6.6	4537.9	11.2	306	36411.
28	11	1970	3.0	148	11 2.7	-56 9.3	4541.3	11.1	306	36459.
28	11	1970	4.0	118	11 6.0	-56 14.0	4546.9	11.3	306	36573.
28	11	1970	4.0	228	11 13.6	-56 24.9	4560.0	11.3	305	36873.
28	11	1970	4.0	534	11 33.6	-56 54.1	4595.0	11.1	305	37103.
28	11	1970	4.0	758	11 48.8	-57 16.5	4621.7	11.1	306	37359.
28	11	1970	4.0	1036	12 5.9	-57 40.8	4650.9	10.9	306	37536.
28	11	1970	4.0	1226	12 17.7	-57 57.2	4670.8	10.8	305	37678.
28	11	1970	4.0	1356	12 27.0	-58 10.8	4687.0	10.8	304	37684.
28	11	1970	4.0	14 0	12 27.4	-58 11.4	4687.8	10.7	305	37872.
28	11	1970	4.0	16 0	12 39.7	-58 29.3	4709.1	10.6	305	38245.
28	11	1970	4.0	20 0	13 4.1	-59 4.7	4751.4	12.2	307	38410.
28	11	1970	4.0	2130	13 15.0	-59 19.8	4769.8	11.0	305	38564.
28	11	1970	4.0	23 5	13 25.0	-59 34.5	4787.2	11.0	280	38617.
29	11	1970	4.0	0 0	13 26.8	-59 44.7	4797.3	10.8	280	38702.
29	11	1970	4.0	130	13 29.6	-60 1.2	4813.6	11.1	309	39457.
29	11	1970	4.0	851	14 20.4	-61 6.6	4894.8	11.1	316	39604.
29	11	1970	4.0	1010	14 30.9	-61 17.1	4909.5	10.4	316	40091.
29	11	1970	4.0	1450	15 5.7	-61 51.9	4957.9	9.9	316	40108.
29	11	1970	4.0	15 0	15 6.9	-61 53.1	4959.5	8.9	318	40392.
29	11	1970	4.0	18 6	15 27.4	-62 12.3	4987.2	8.7	320	40637.
29	11	1970	4.0	2048	15 45.4	-62 27.9	5010.6	9.9	318	40811.
29	11	1970	4.0	2230	15 57.9	-62 39.6	5027.4	9.7	315	40856.
29	11	1970	4.0	2258	16 1.1	-62 43.0	5032.0	9.5	317	40957.
30	11	1970	4.0	0 0	16 8.4	-62 49.9	5041.8	9.7	317	41044.
30	11	1970	4.0	052	16 14.5	-62 55.8	5050.2	9.1	320	41094.
30	11	1970	4.0	124	16 18.2	-62 59.1	5055.0	10.6	318	41222.
30	11	1970	4.0	234	16 27.4	-63 7.7	5067.4	9.9	321	41528.
30	11	1970	4.0	530	16 49.9	-63 26.7	5096.3	9.6	317	41775.
30	11	1970	4.0	8 0	17 7.5	-63 43.7	5120.3	9.8	317	41785.
30	11	1970	4.0	8 6	17 8.3	-63 44.4	5121.3	9.2	318	41958.
30	11	1970	4.0	954	17 20.6	-63 56.0	5137.9	9.2	316	42196.
30	11	1970	4.0	1226	17 37.4	-64 13.1	5161.3	8.7	328	42209.
30	11	1970	4.0	1234	17 38.4	-64 13.8	5162.5	9.1	331	42274.
30	11	1970	4.0	1312	17 43.4	-64 16.7	5168.3	9.3	331	42357.
30	11	1970	4.0	14 0	17 49.9	-64 20.5	5175.7			42357.

includes the Keathley anomaly sequence. This portion of the track should pass through the middle Cretaceous magnetic "quiet zone" or "disturbed zone" of Pitman and Talwani (1972); Larson and Pitman (1972). The acoustic basement is not recorded much past mile 700. The highly reflective bottom surface is characteristic of the sea floor from mile 700 to about mile 900 where the bottom character changes and a significant amount of the energy is transmitted and reflected from internal horizons. There is a slight suggestion from the seismic records that piercement structures are present near mile 1000.

Isolated basement peaks are again observed near mile 1050 and can be traced into the area of Sites 137 and 138 and well up on to the lower continental rise. A pronounced topographic high separates Sites 137 and 138 and is discussed in some detail in Chapters 4, 5, and 27, and also by Lattimore *et al.,* (1972). Note that this topographic feature is associated with a very large negative magnetic anomaly. Anomaly "J" was again observed near mile 1400. The Keathley sequence of the anomalies should be recognized between the base of the continental rise and approximately mile 1700. These anomalies are not well displayed even though the track trends at roughly right angles to the anticipated trend. The eastern Atlantic marginal quiet zone described by Heirtzler and Hayes (1967) is encountered near mile 1680. The change in the character of the anomalies at the quiet zone boundary is not abrupt. A well layered sediment sequence is present on the lower and middle continental rise between mile 1350 and mile 2150, and several details of the sediment disposition are discussed in the Site 139, 140, and 141, Chapters (6, 7, and 8).

Site 140 was drilled at the magnetic quiet zone boundary which is very clearly illustrated near mile 1900 on the geophysical profile. The basement horizon is not recorded at this point by the *Challenger* records but lies at a depth of about 1.7 km below the sea floor as indicated by unpublished LDGO sonobuoy data (J. Ewing, pers. comm.). The Keathley sequence of anomalies is recorded between mile 1900 and approximately mile 2200 where anomaly "J" is again conspicuously displayed. There are no conspicuous magnetic anomalies associated with the piercement structures near Site 141. However, none would be expected from surface measurements in view of the small dimensions of the structures and their great depths (>4400 m) below sea level.

On departing from Site 141, *Challenger* passed close to the western group of the Cape Verde Islands and from about mile 2160 to mile 2350 very little sub-bottom information was recorded on the seismic profiling system. This may reflect a preponderance of highly reflective volcanogenic material in the vicinity of the platform. Additional piercement type structures may be indicated in the region from about mile 2350 through mile 2400.

The central Atlantic was then traversed en route to Site 142. Magnetic anomalies from about mile 2700 to the area of the Ceara Rise, near mile 3500, are of very low amplitude, only about 100 gammas peak-to-peak even though the basement relief is extremely large, typically ranging from 500 to 1000 fathoms (900-1800 m). The *Challenger* track crossed the mid-Atlantic Ridge system near 8°N. However, the ridge system is so highly disrupted by major fracture zones that the precise location of the ridge crest is not obvious. The rough bottom morphology indicates that numerous fracture zones are present between mile 2700 and 3200. The regional seaward gradient of the sea floor and of the sediment layer ends at about mile 2720 and from that point on only isolated ponds of sediment are seen between the major elements of relief of the ridge system. These ponds of sediment are not connected with one another as evidenced by the fact that they occur at a variety of levels ranging in depths from about 3200 to 2300 fm. The surface sediments are generally flat-lying or gently tilted and the ponds contain numerous flat-lying internal reflectors. Near mile 3100 the sediment disposition changes from flat-lying or gently tilted, layered sediments to acoustically transparent sediments.

The amplitudes of the magnetic anomalies increase abruptly when the flanks of the Ceara Rise are encountered near mile 3500. The basement is not recorded on the *Challenger* records beneath the Ceara Rise, but its presence is indicated at isolated spots from Conrad seismic records as described in Chapter 12, (this volume). The sediment sequence forming the abyssal plain north of the Ceara Rise is illustrated between miles 3340 and 3460. The top of the abyssal plain lies at a level of about 2500 fathoms. In contrast, the top of the Ceara Rise Abyssal Plain sediments south of the Ceara Rise rest at a level of about 2300 fathoms.

On departing from the Ceara Rise, *Challenger* made a long traverse across the Amazon Cone between miles 3700 and 4100. Magnetic anomalies in this region are typically of long apparent wave lengths (~200 km) and low amplitude, (<50 gammas peak-to-peak). The Amazon Cone sediments are highly reflective and small scale, local tectonism and intrusion is indicated in many places (e.g., mile 3860).

The flank of the Demerara Rise was crossed near mile 4250 enroute to Sites 143 and 144 located at the northern flank of the Demerara Rise. The seismic data from the *Challenger* is very poor for this region. On departure from Site 144, shown near mile 4400, one prominent reflective zone can be traced continuously from about mile 4400 to mile 4640 where the ship passed across the Barbados Ridge. Magnetic anomalies across this ridge and the Lesser Antilles arc are of very low amplitude and long wave length except near Martinique where shallow volcanic sources are indicated near mile 4880 by the short wave length, high amplitude magnetic anomalies. Extremely thick sequences of well layered sediments were recorded over the Granada Trough and the Aves swell between miles 5000 and about mile 5120. Beyond that point no significant sediment accumulations were recorded on the seismic profiler system, however, magnetic anomalies in amplitudes increase abruptly.

The towed geophysical gear was retrieved prior to entering San Juan to allow for maneuvering in the narrow Virgin Island passage.

REFERENCES

Cain, J. C., Hendricks, S., Daniels, W. E. and Jensen, J. C., (1968). Computation of the main geomagnetic field from spherical harmonic expansions. *Data User's Note* NSSDC68-11, Greenbelt, Md.

Larson, R. L. and Pitman, W. C., III (in press), 1972. World-wide correlation of Mesozoic magnetic anomalies and its implications. *Bull. Geol. Soc. Amer.*

Lattimore, R. K., Harbison, R. N. and Rona, P. A., 1971. Structural lineations, northern Canary Basin, central NE Atlantic (abstract). *Amer. Geophys. Union Trans.*, **52**, (4), 250.

Pitman, W. C., III and Talwani, M. (1972). Sea-floor spreading in the north Atlantic, *Geol. Soc. Amer. Bull.*, **83**, p. 619-646.

Talwani, M. (1969). A computer system for the reduction, storage and display of underway data acquired at sea. Lamont-Doherty Geological Observatory of Columbia University. Technical Report, No. 1, Cu-1-69 N00014-67-A-0108-0004.

Uchupi, E., 1971. Bathymetric atlas of the Atlantic, Caribbean, and Gulf of Mexico; Woods Hole Oceanographic Institution, Reference No. 71-72, unpublished manuscript.

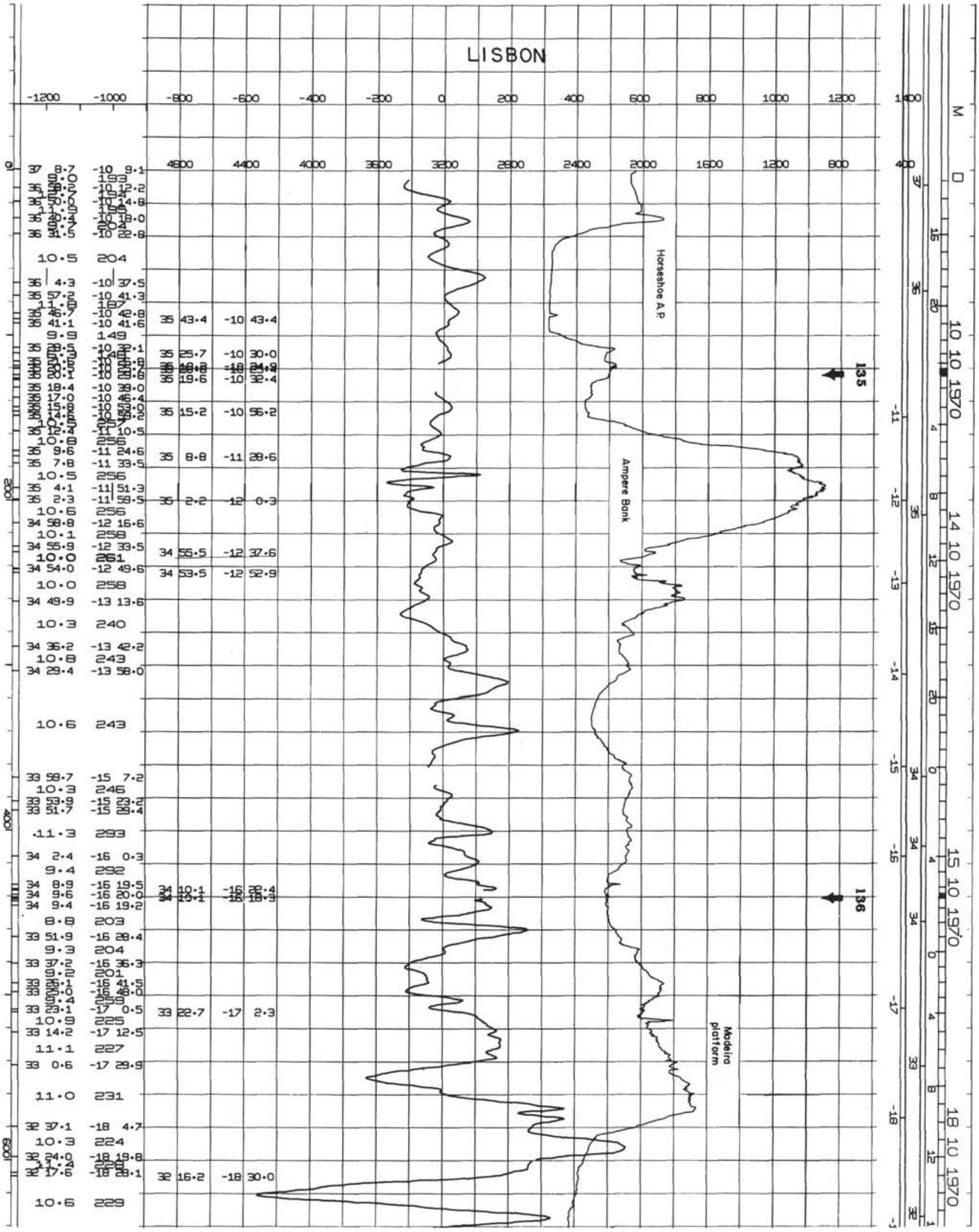
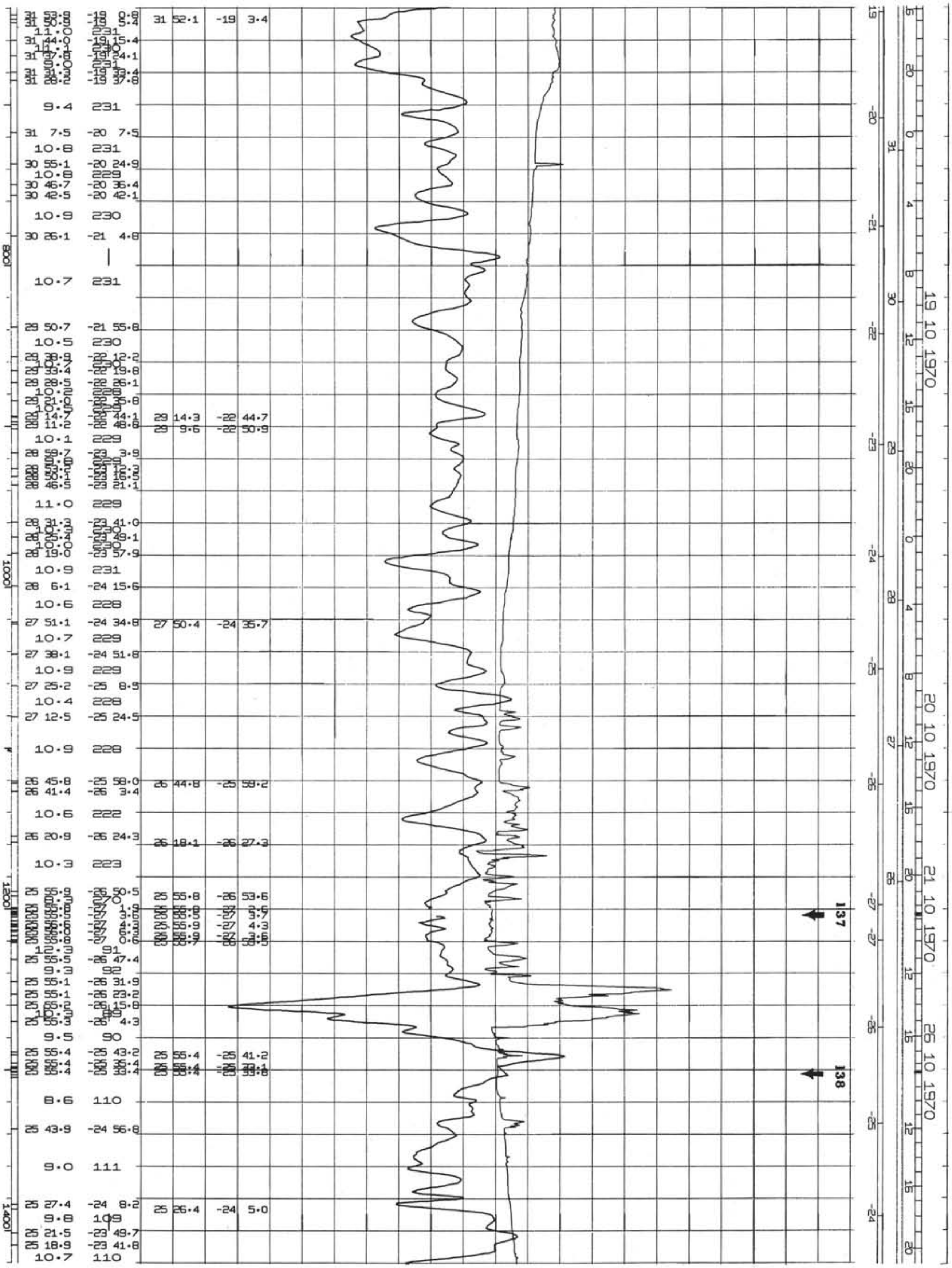

LISBON
Horseshoe A.P.
Ampere Bank
Madeira platform
135
136
M
D
10 10 1970
14 10 1970
15 10 1970
18 10 1970

Figure 2.



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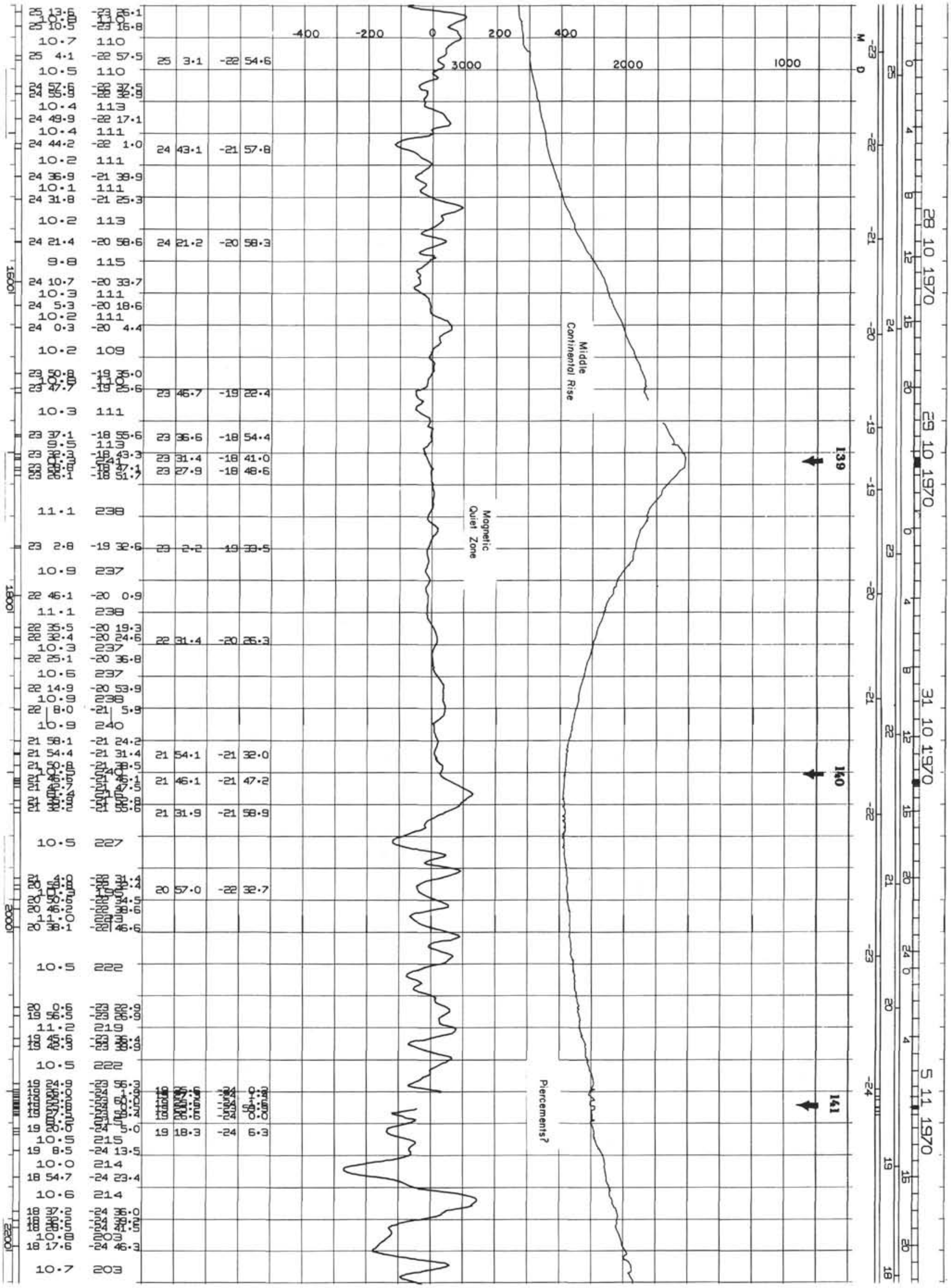

-400
-200
0
200
400
3000
2000
1000
M
D
Middle Continental Rise
Magnetic Quiet Zone
Piercements?
139
140
141
28 10 1970
29 10 1970
31 10 1970
5 11 1970

Figure 4.

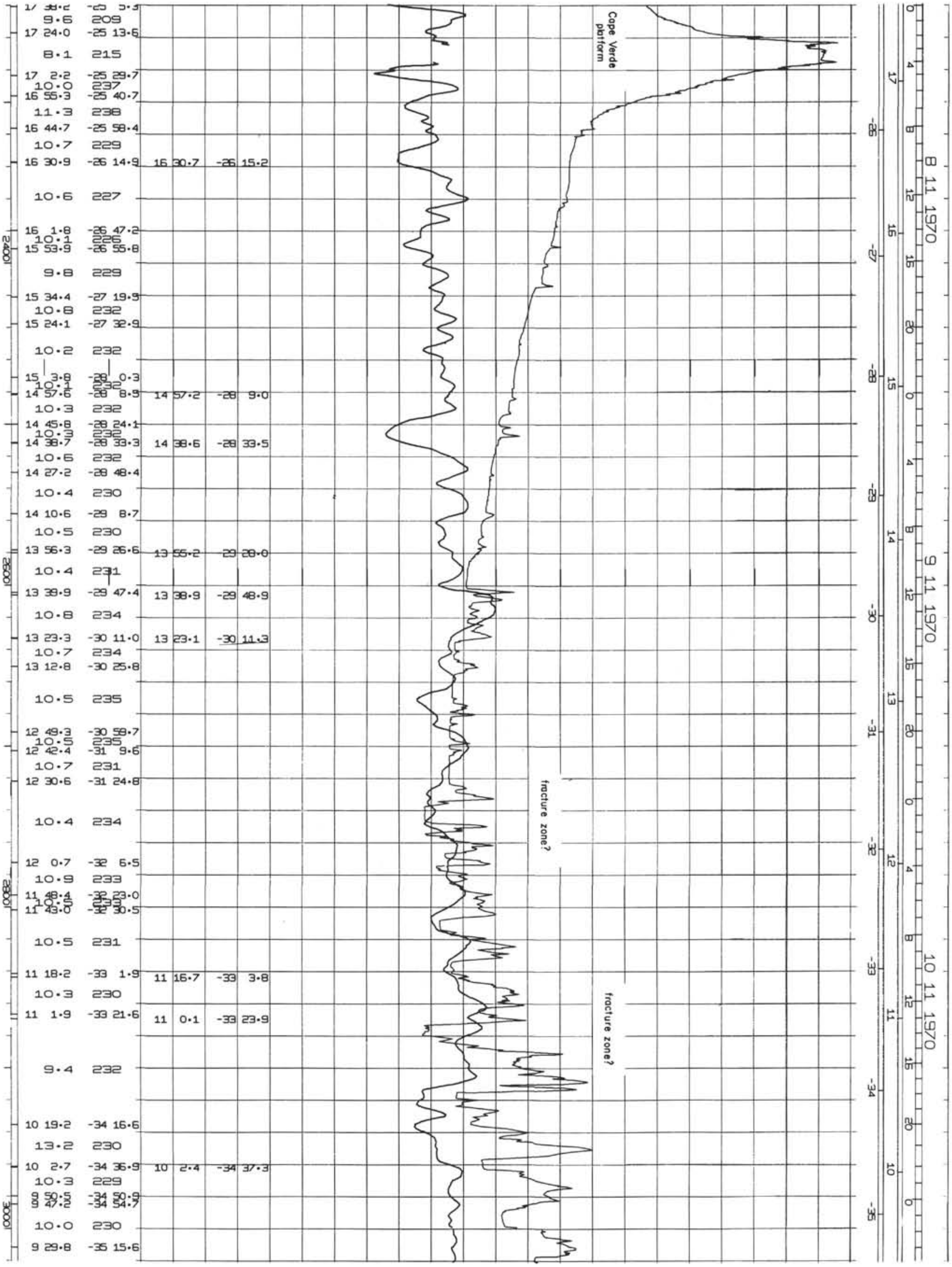
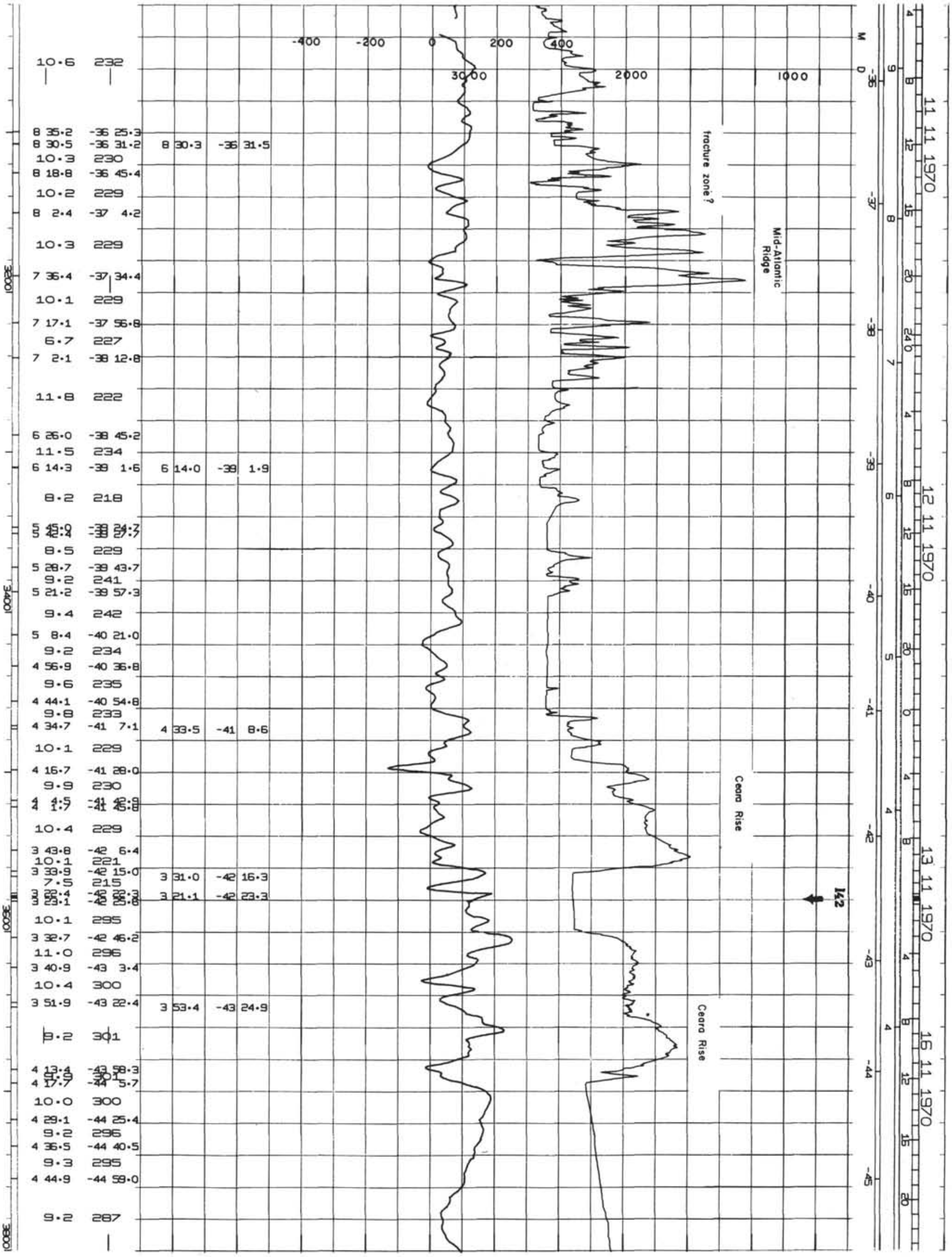

Cape Verde platform
fracture zone?
fracture zone?
8 11 1970
9 11 1970
10 11 1970

Figure 5.



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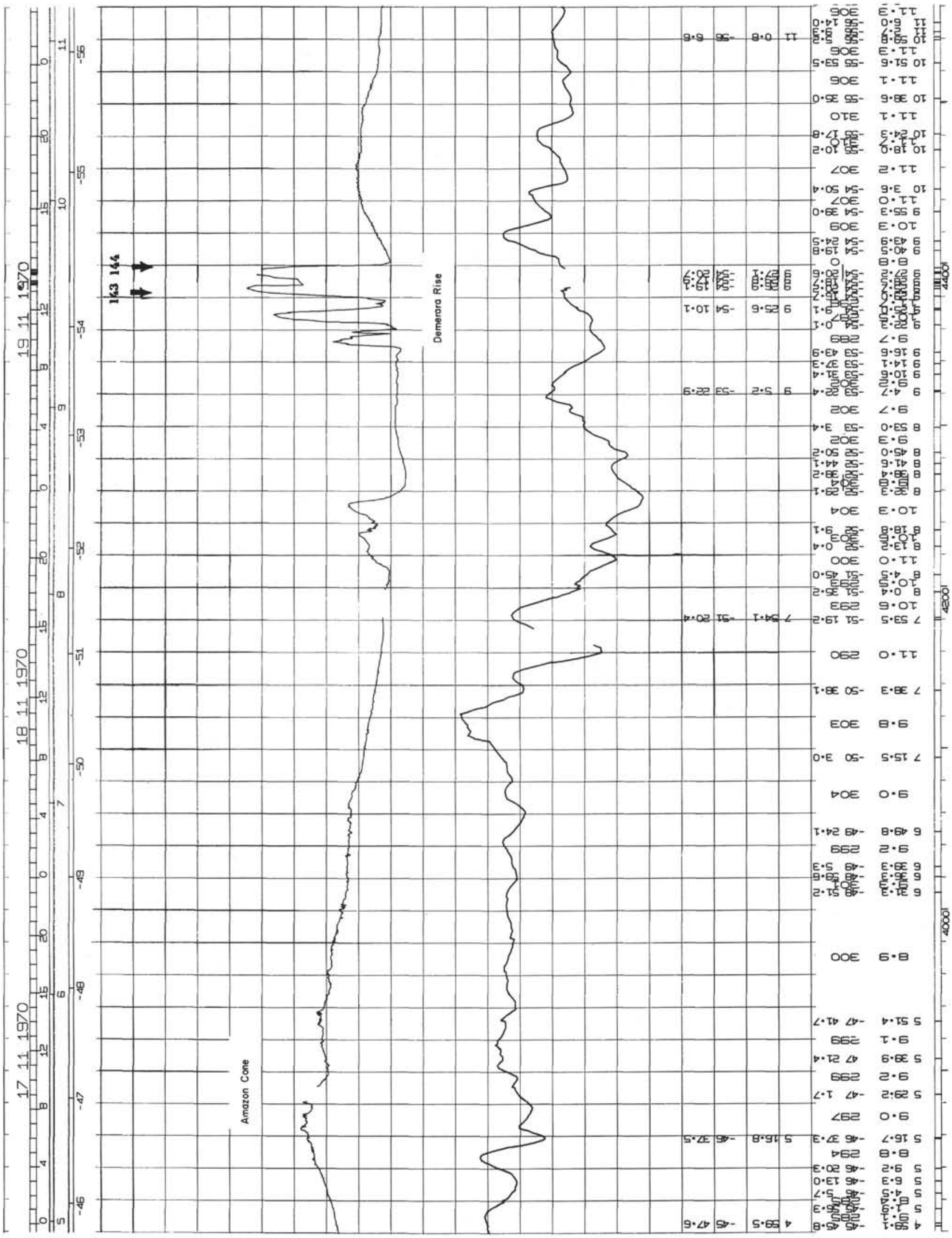

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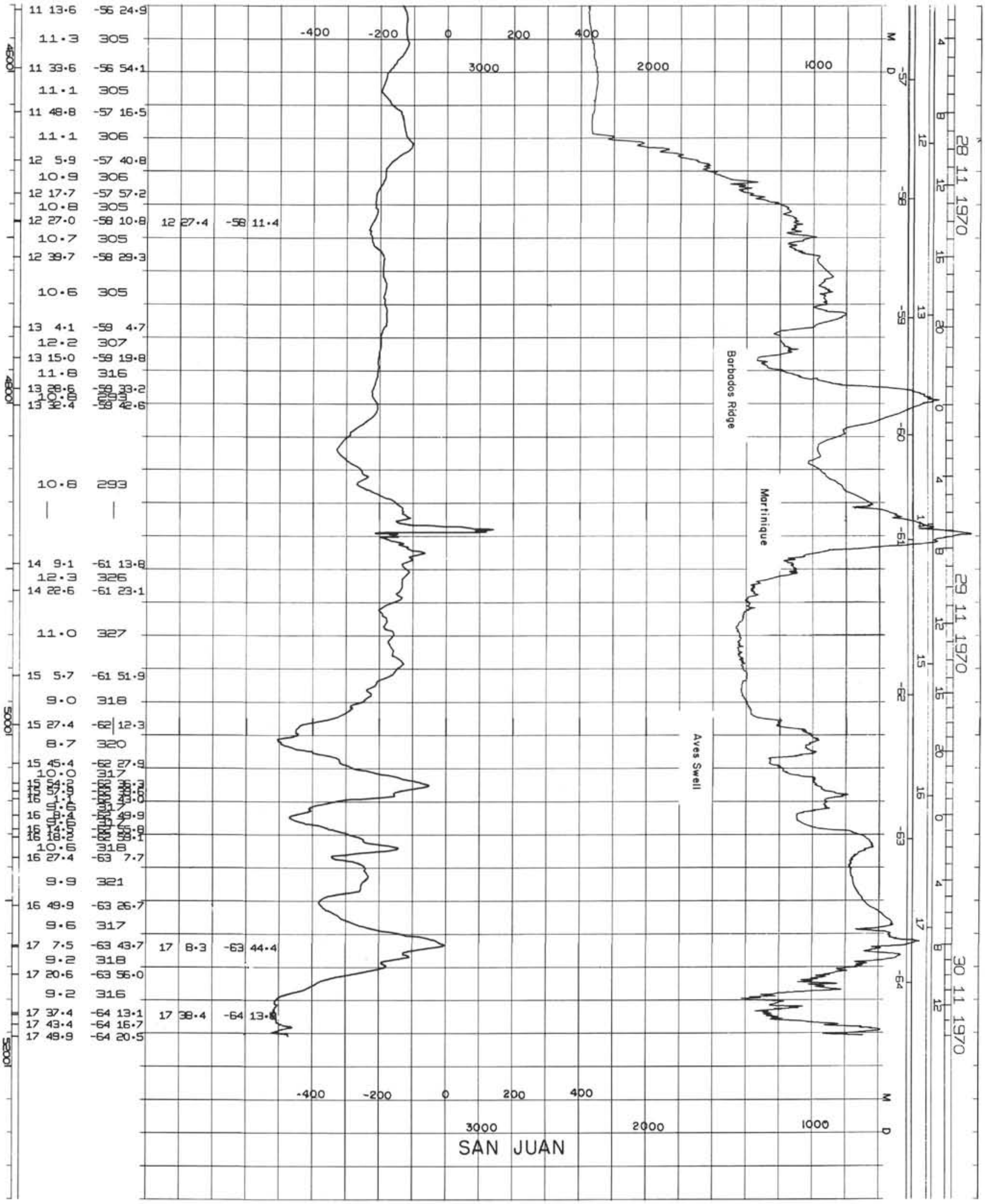

-400
-200
0
200
400
M
3000
2000
1000
D
Barbados Ridge
Martinique
Aves Swell
28 11 1970
29 11 1970
30 11 1970
12 27.4 -58 11.4
17 8.3 -63 44.4
SAN JUAN

Figure 8

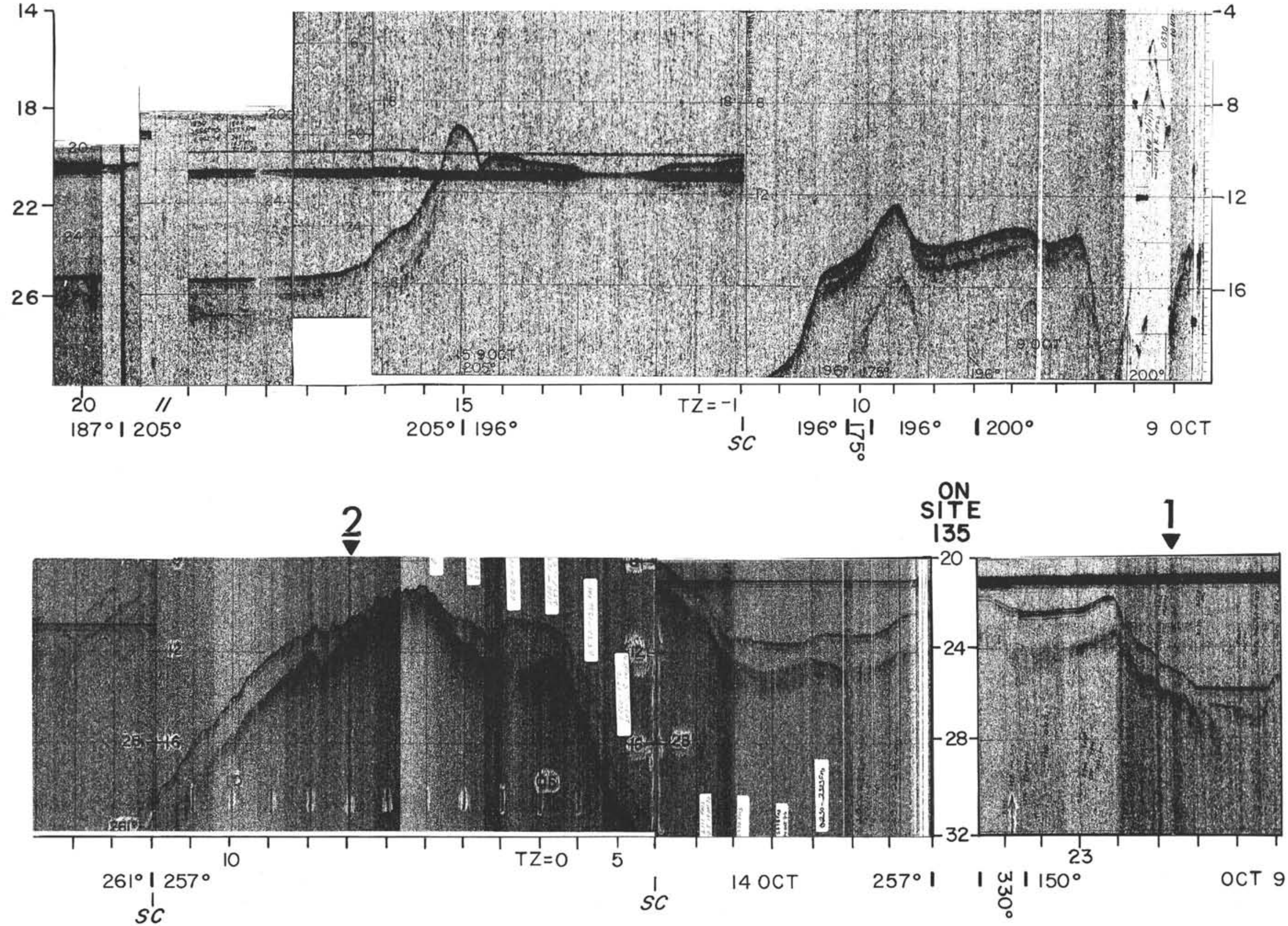
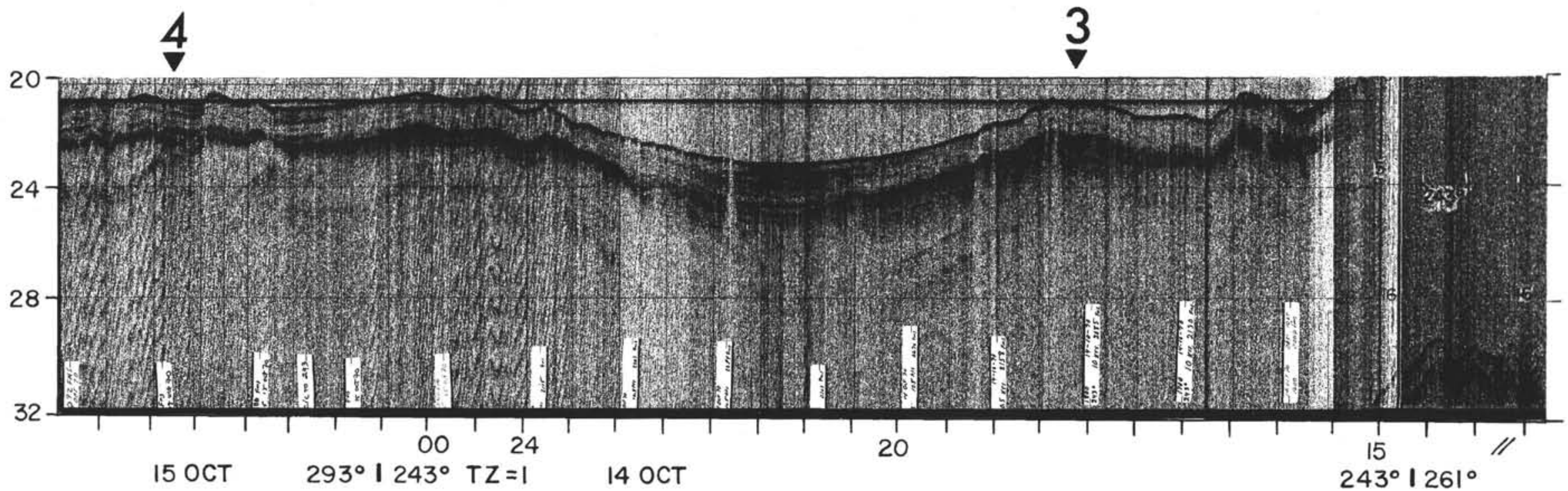

14
18
22
26
-4
-8
-12
-16
20
//
15
TZ=-1
10
187° | 205°
205° | 196°
SC
196°
175°
196°
200°
9 OCT
200°
2
ON
SITE
135
1
20
24
28
32
10
TZ=0
5
261° | 257°
SC
SC
14 OCT
257°
330°
150°
23
OCT 9

Figure 9.


4
3
20
24
28
32
00
24
20
15
15 OCT
293° | 243° TZ=1
14 OCT
243° | 261°

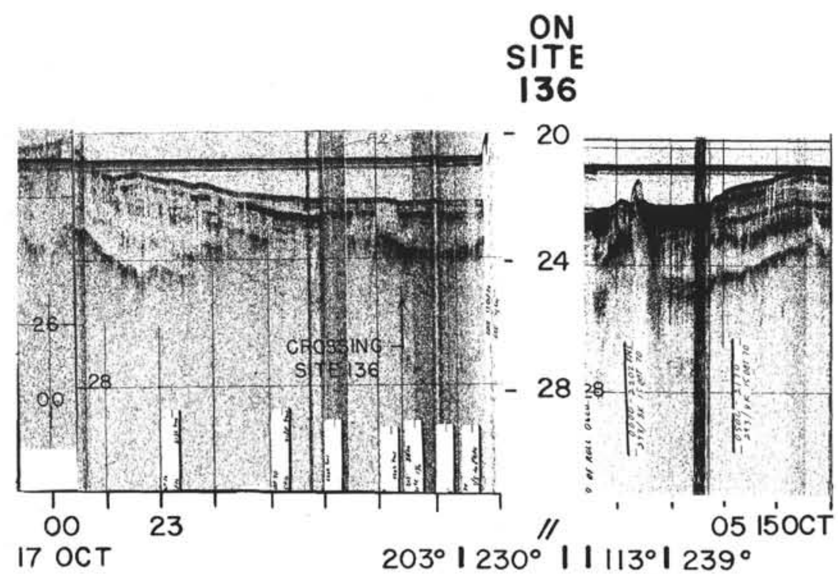
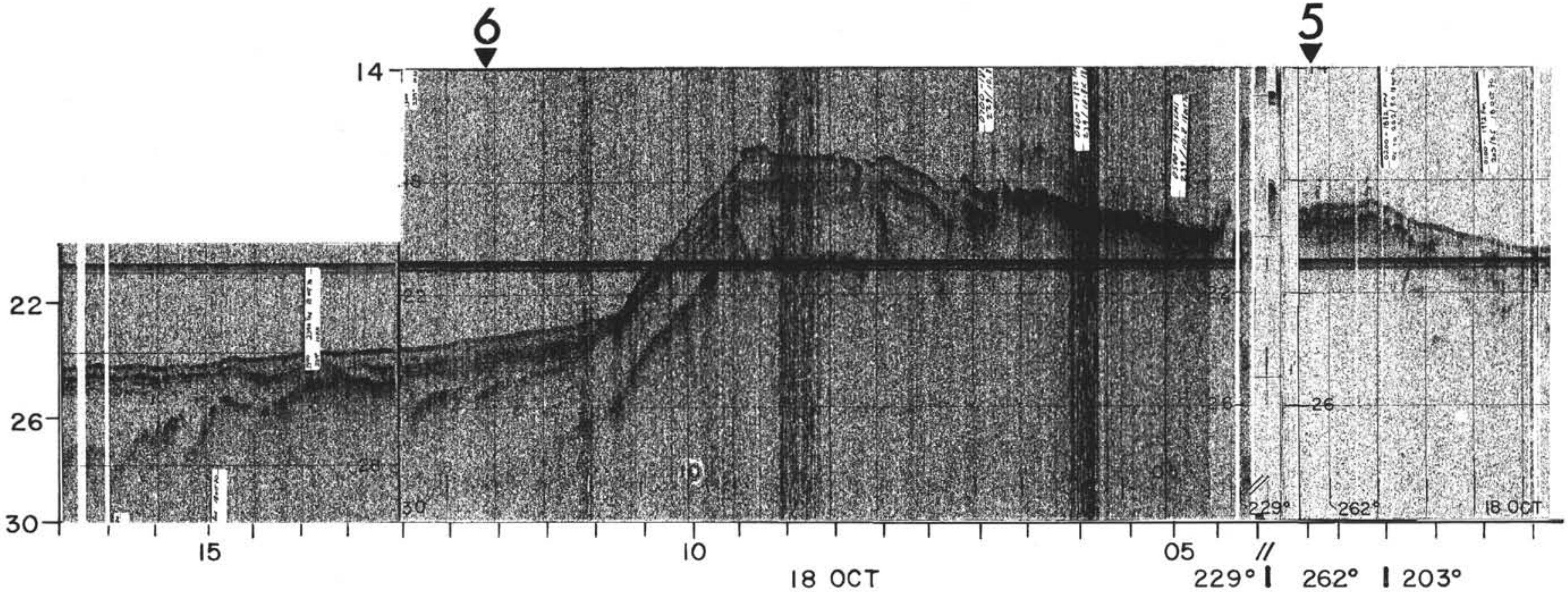

ON
SITE
136
20
24
28
CROSSING
SITE 136
00
23
05 15OCT
17 OCT
203° | 230° | | 113° | 239°

Figure 10.



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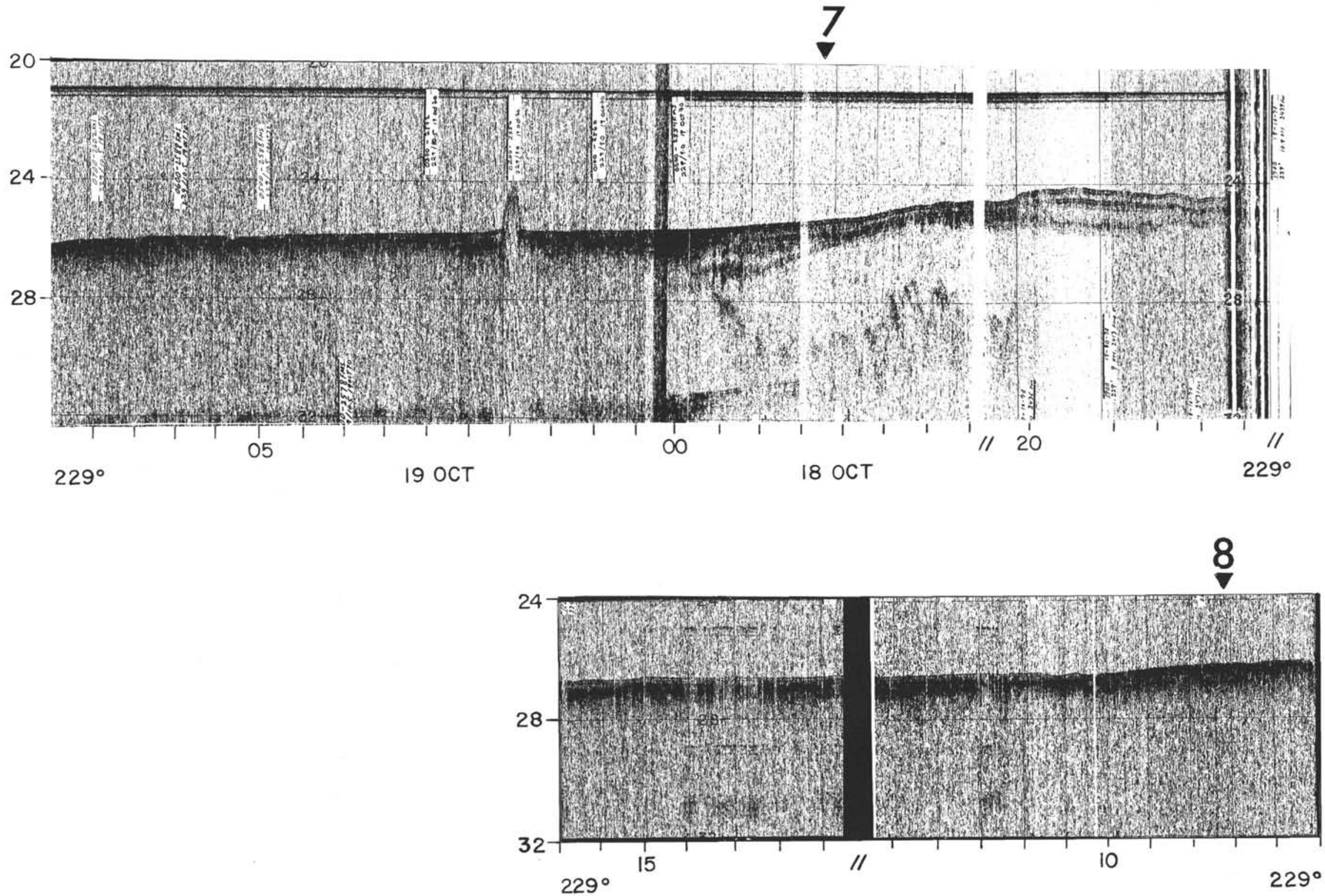

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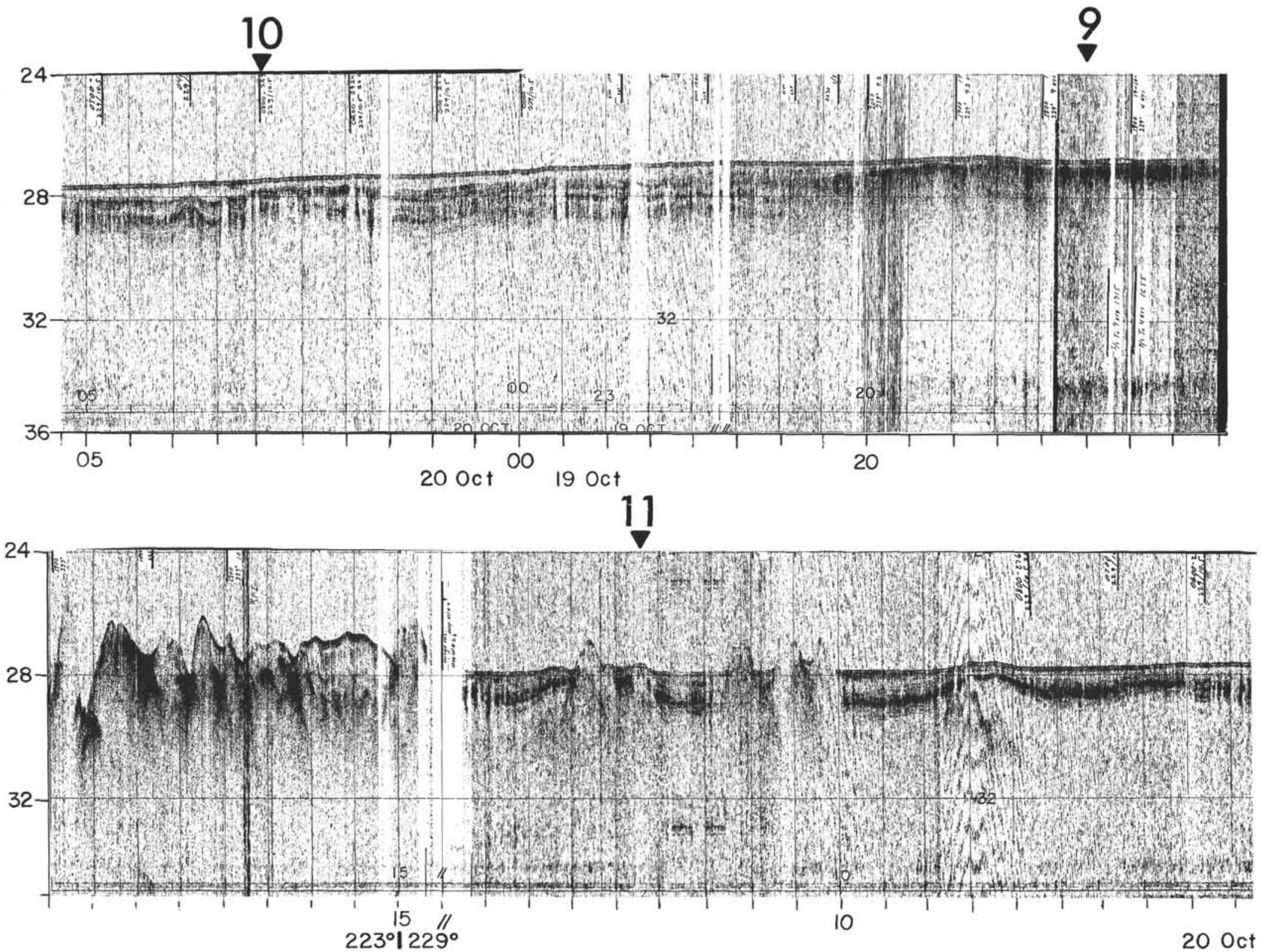

10
9
24
28
32
36
05
00
20
20 Oct
19 Oct
11
24
28
32
15
//
223°|229°
10
20 Oct

Figure 13.

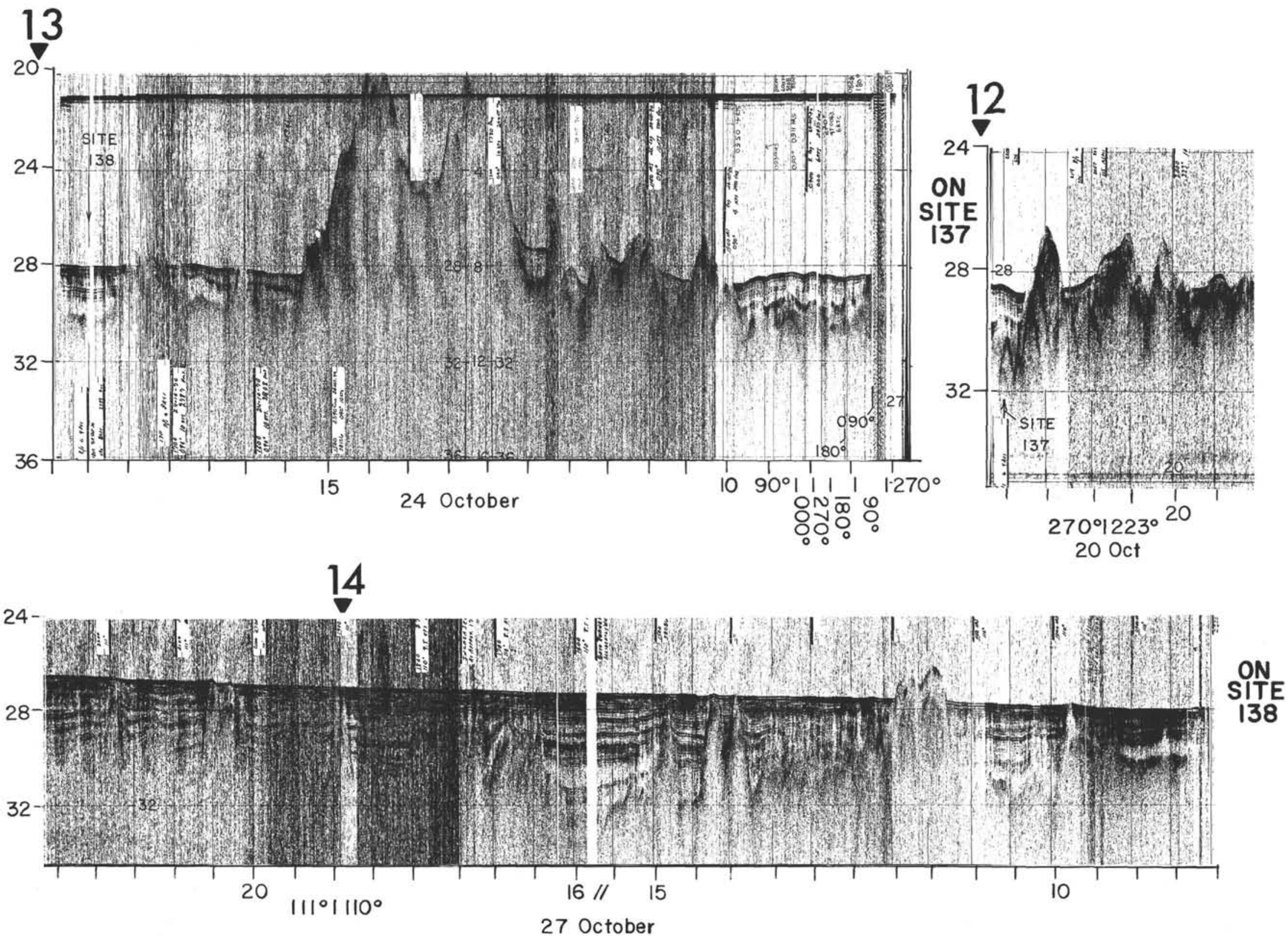

13
20
24
28
32
36
SITE
138
15
24 October
10 90° 000° 270° 180° 90° 270°
090°
180°
27
12
24
ON
SITE
137
28
32
SITE
137
270° 223°
20
20 Oct
14
24
28
32
ON
SITE
138
20
111° 110°
16 // 15
10
27 October

Figure 14.

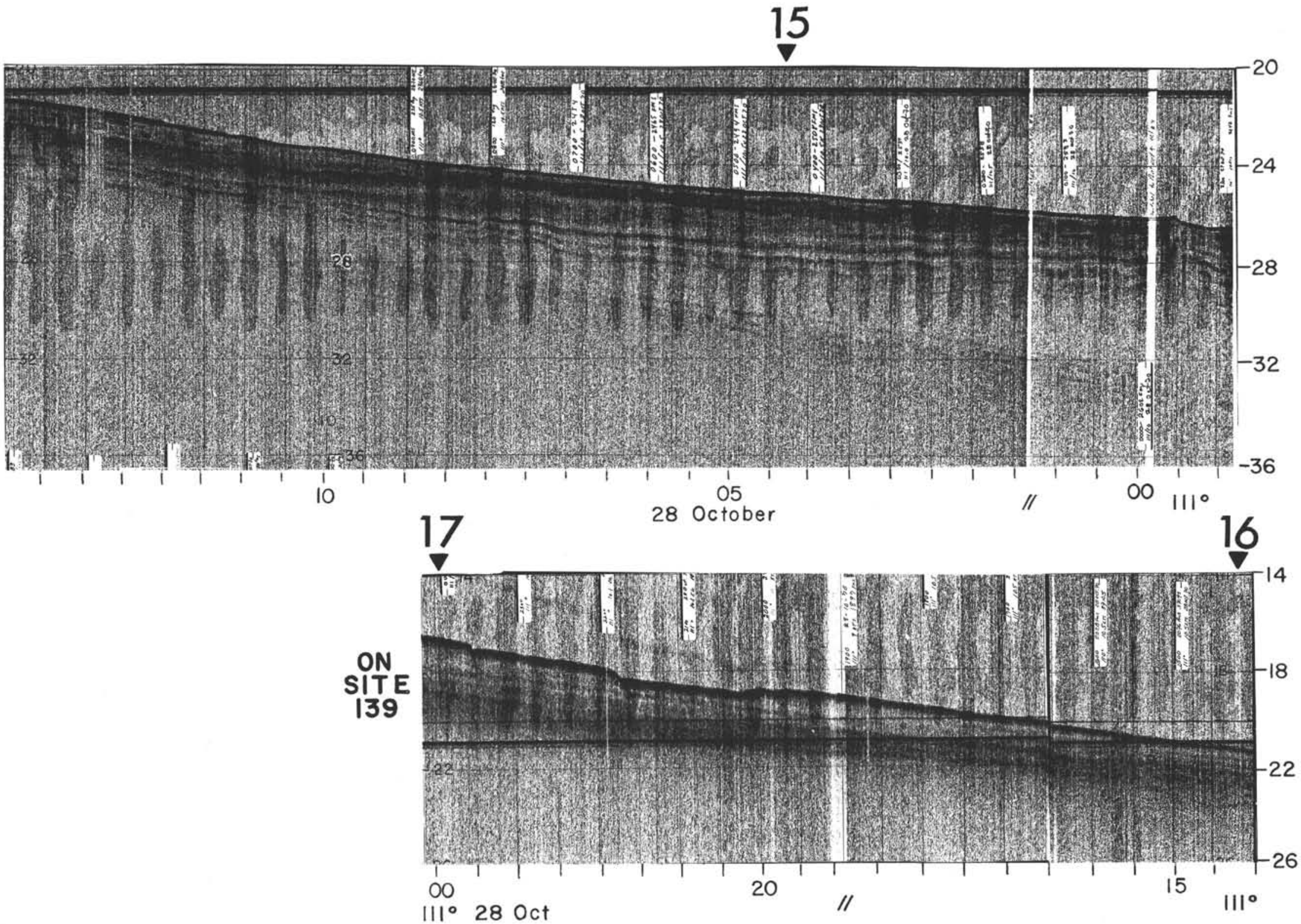

15
20
24
28
32
36
10
05
28 October
00
111°
17
16
ON SITE 139
14
18
22
26
00
111° 28 Oct
20
15
111°

Figure 15.

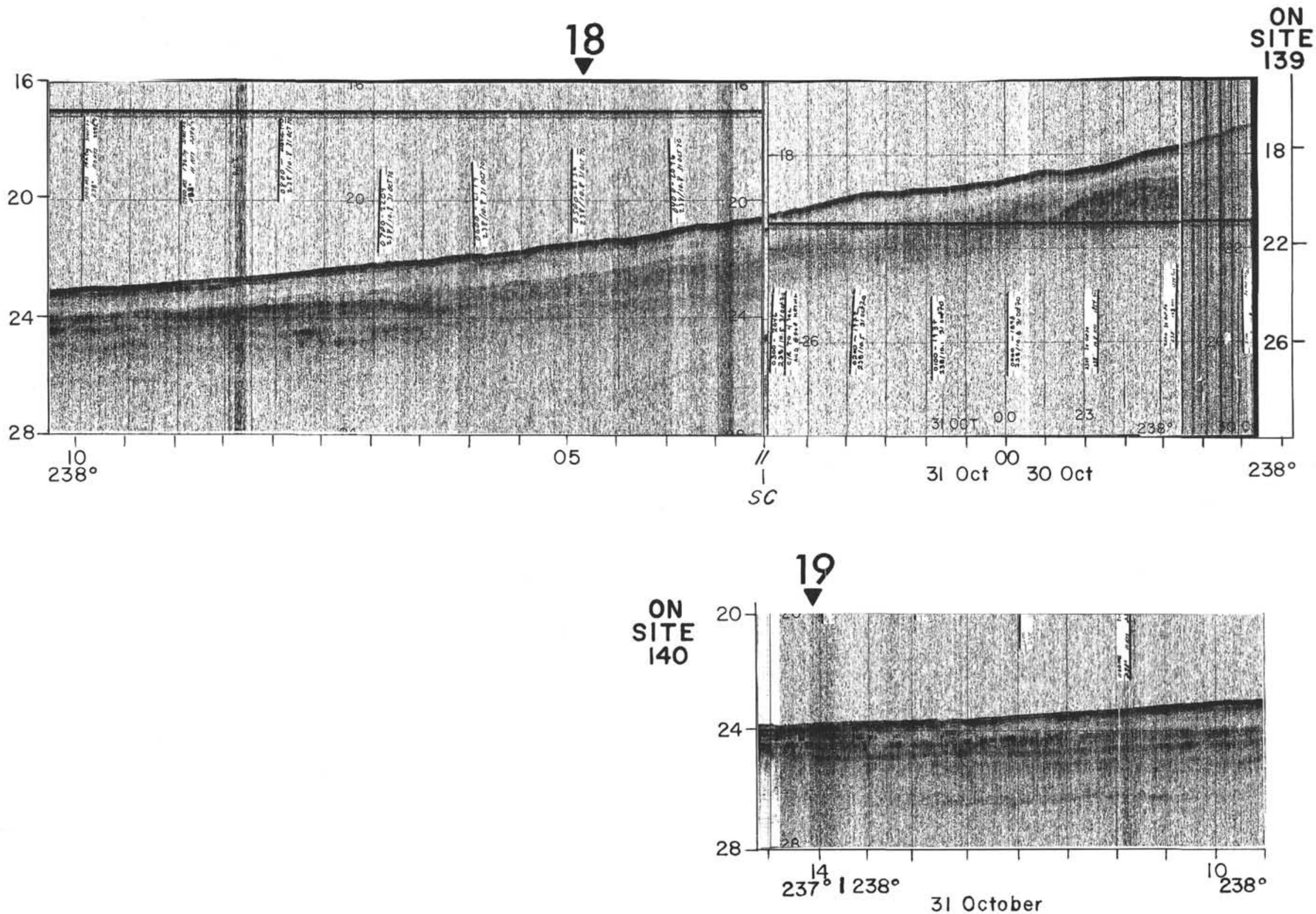
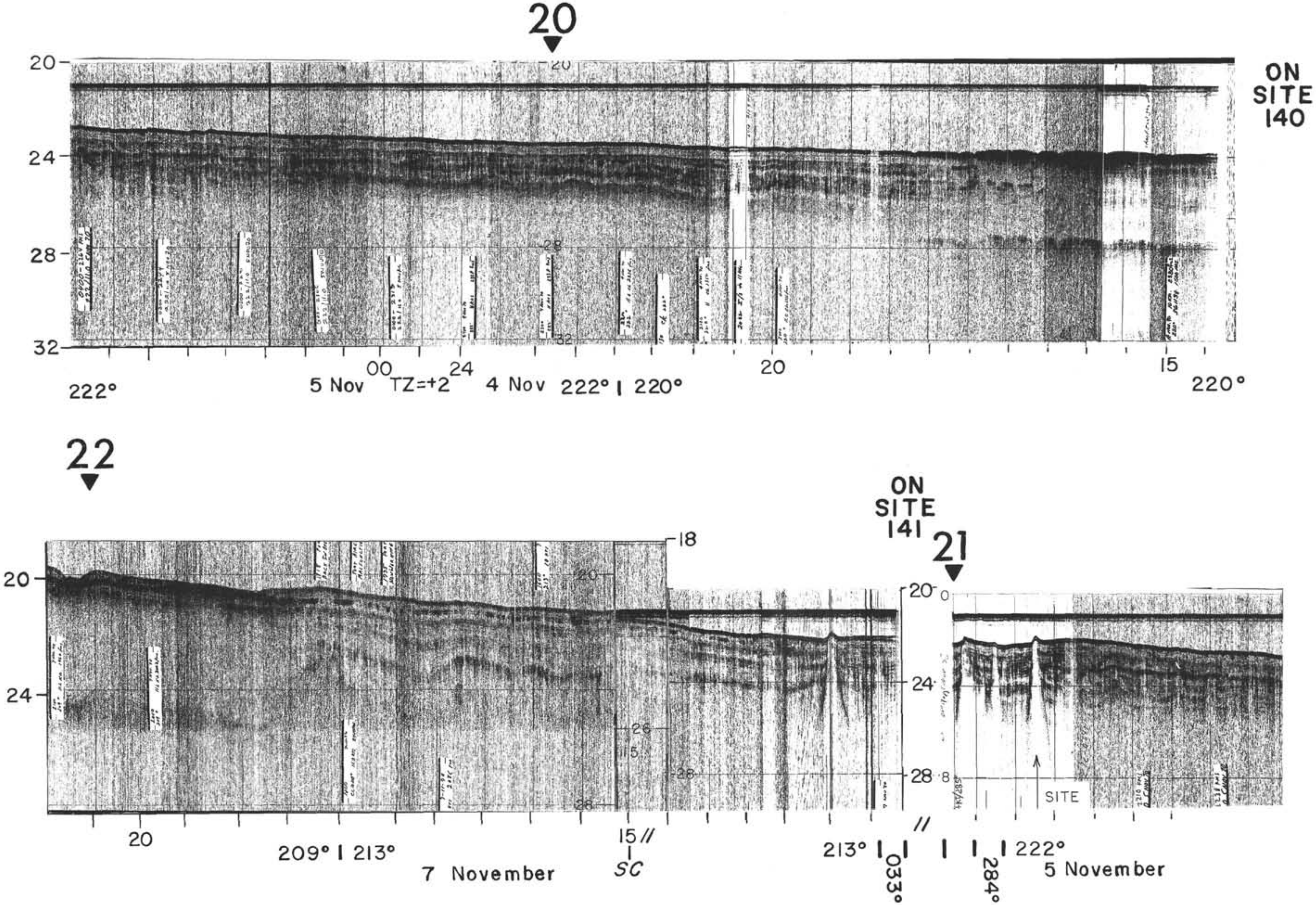

18
ON
SITE
139
16
20
24
28
18
22
26
10
238°
05
SC
31 Oct
00
30 Oct
238°
19
ON
SITE
140
20
24
28
14
237°
238°
10
238°
31 October

Figure 16.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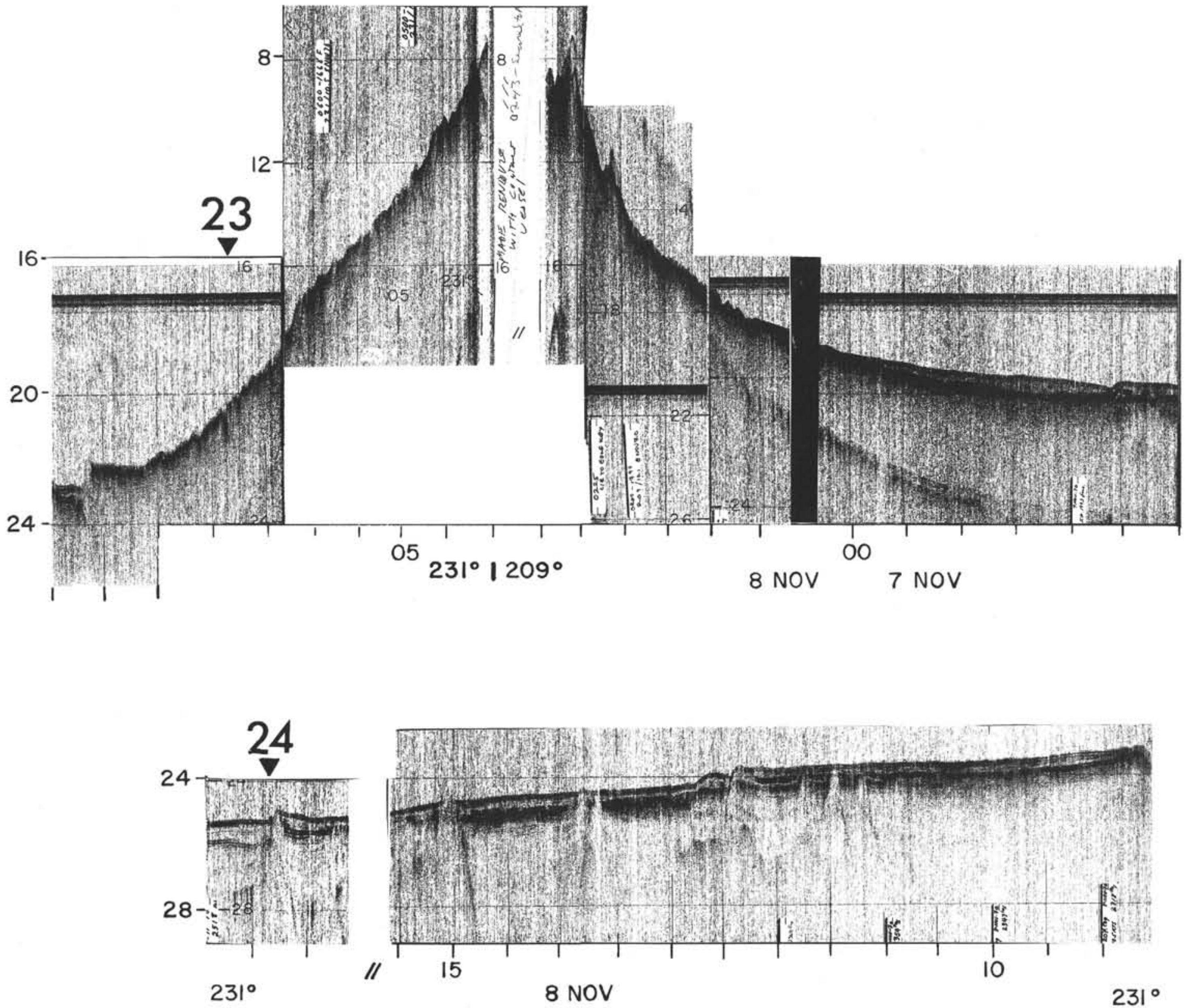
ON SITE 140
20
24
28
32
00
24
20
15
222°
5 Nov
TZ=+2
4 Nov
222° | 220°
220°
22
ON SITE 141
21
18
20
24
28
SITE
20
209° | 213°
7 November
15 //
SC
213°
033°
284°
222°
5 November

Figure 17.



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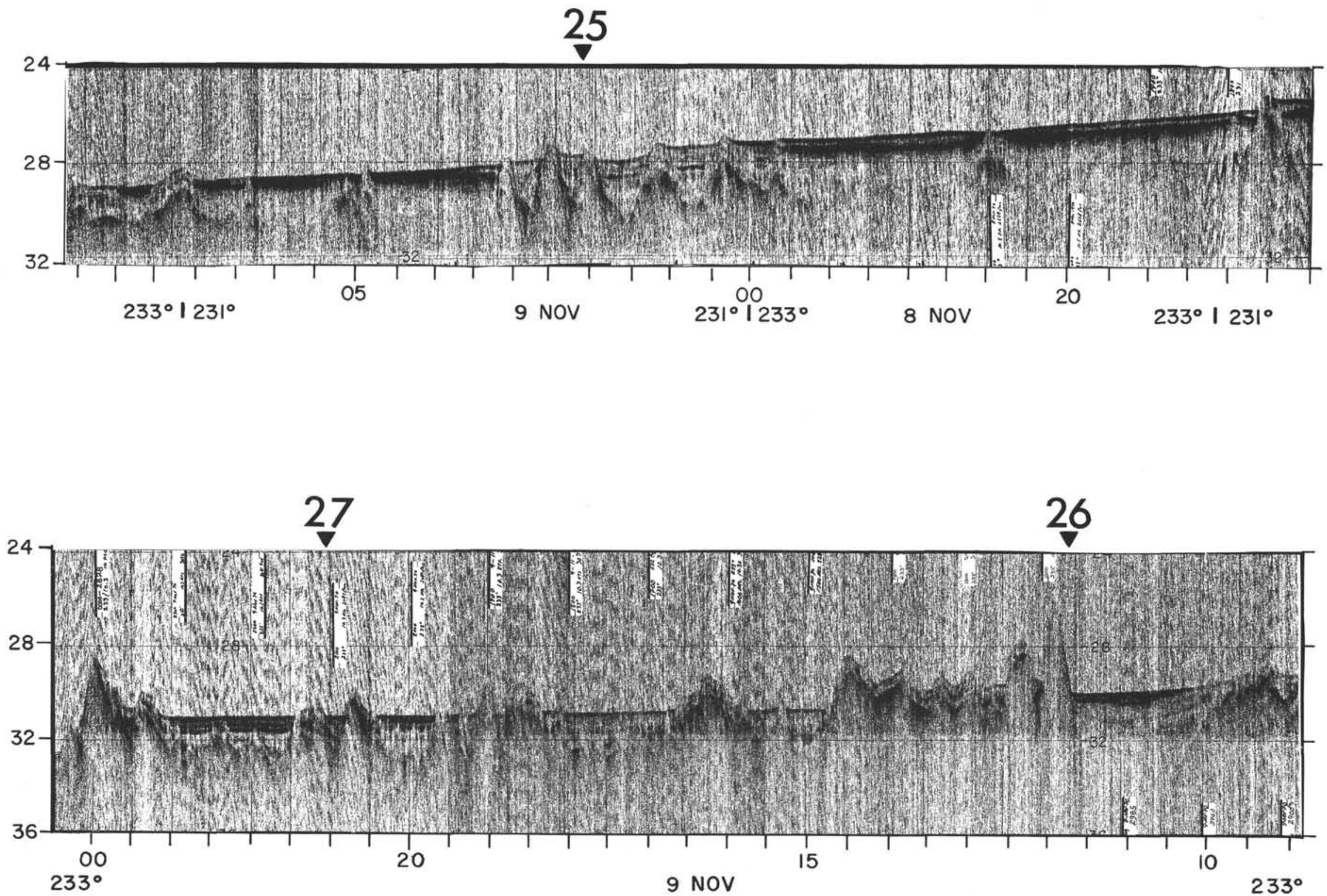

25
24
28
32
05
00
20
233° | 231°
9 NOV
231° | 233°
8 NOV
233° | 231°
27
26
24
28
32
36
00
20
15
10
233°
9 NOV
233°

Figure 19.

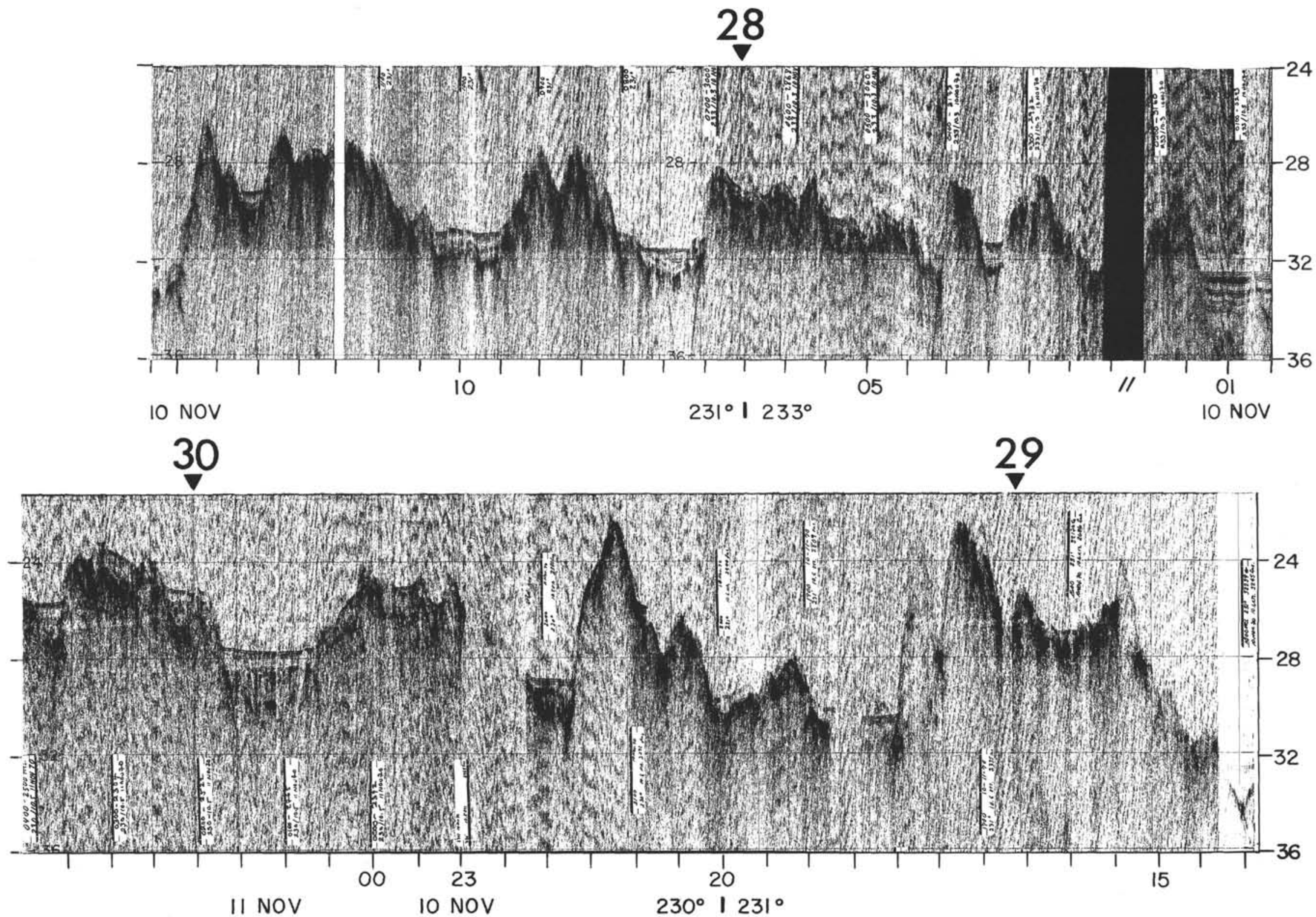
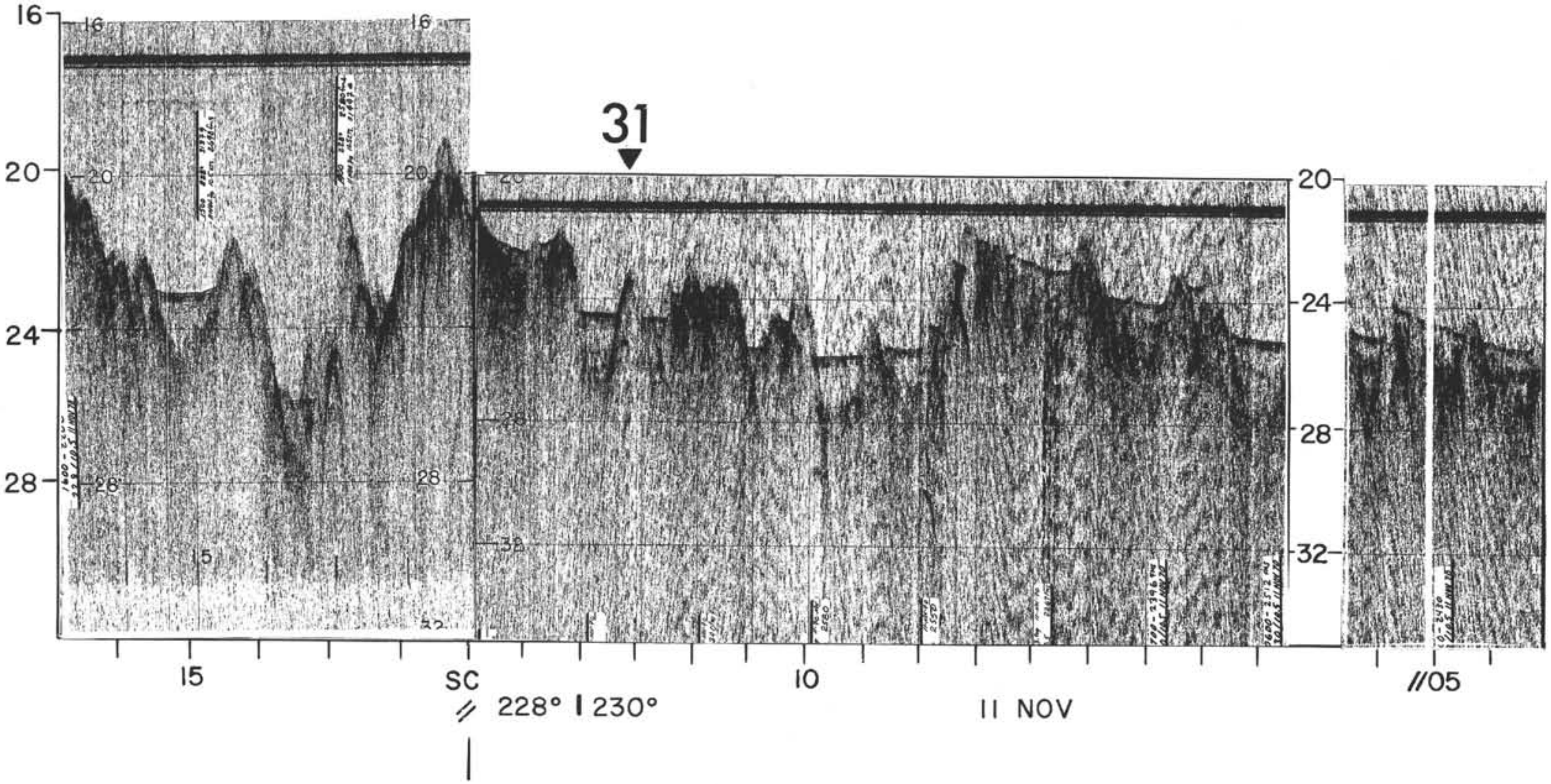

28
24
28
32
36
10
05
//
01
10 NOV
231° | 233°
10 NOV
30
29
24
28
32
36
00
23
20
15
11 NOV
10 NOV
230° | 231°

Figure 20.



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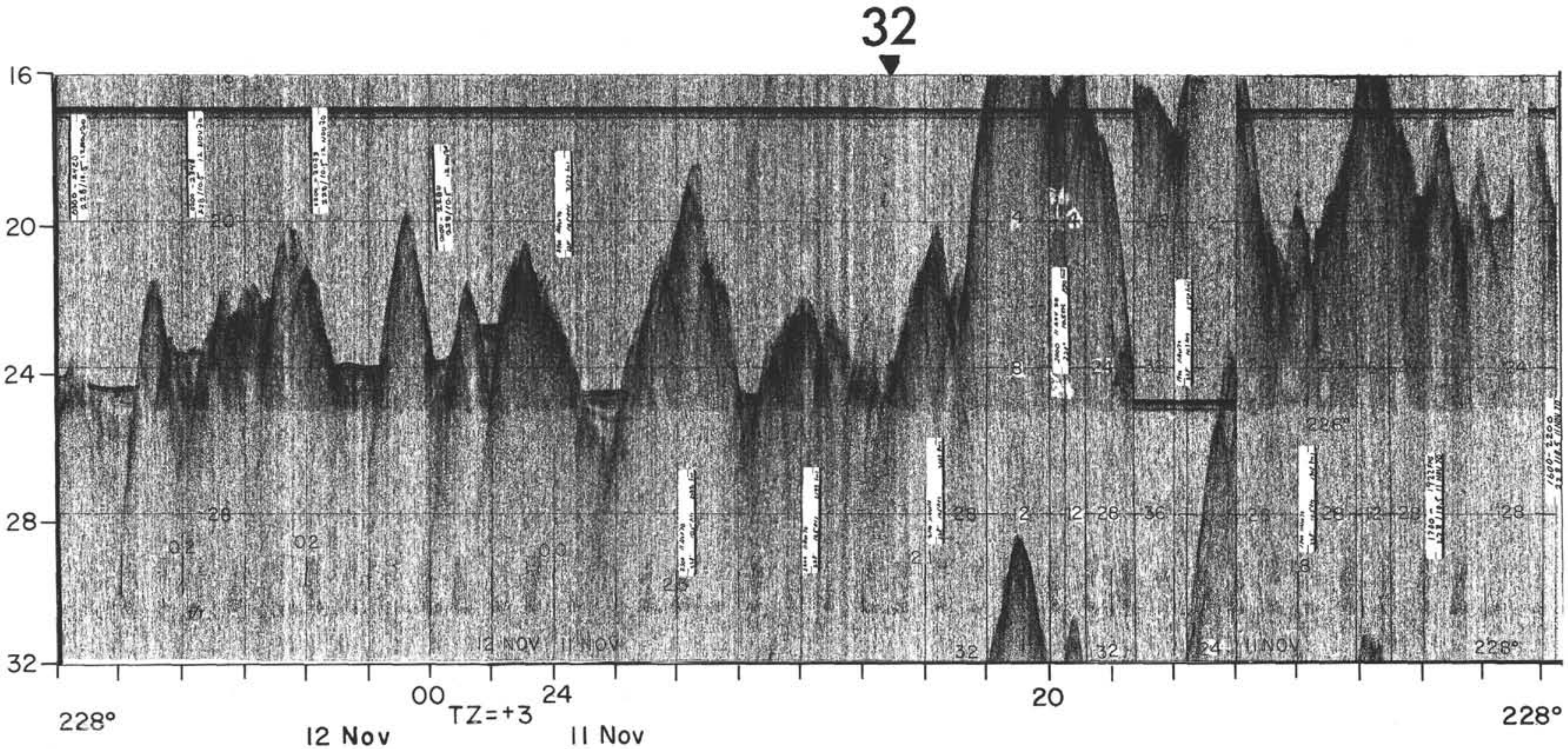

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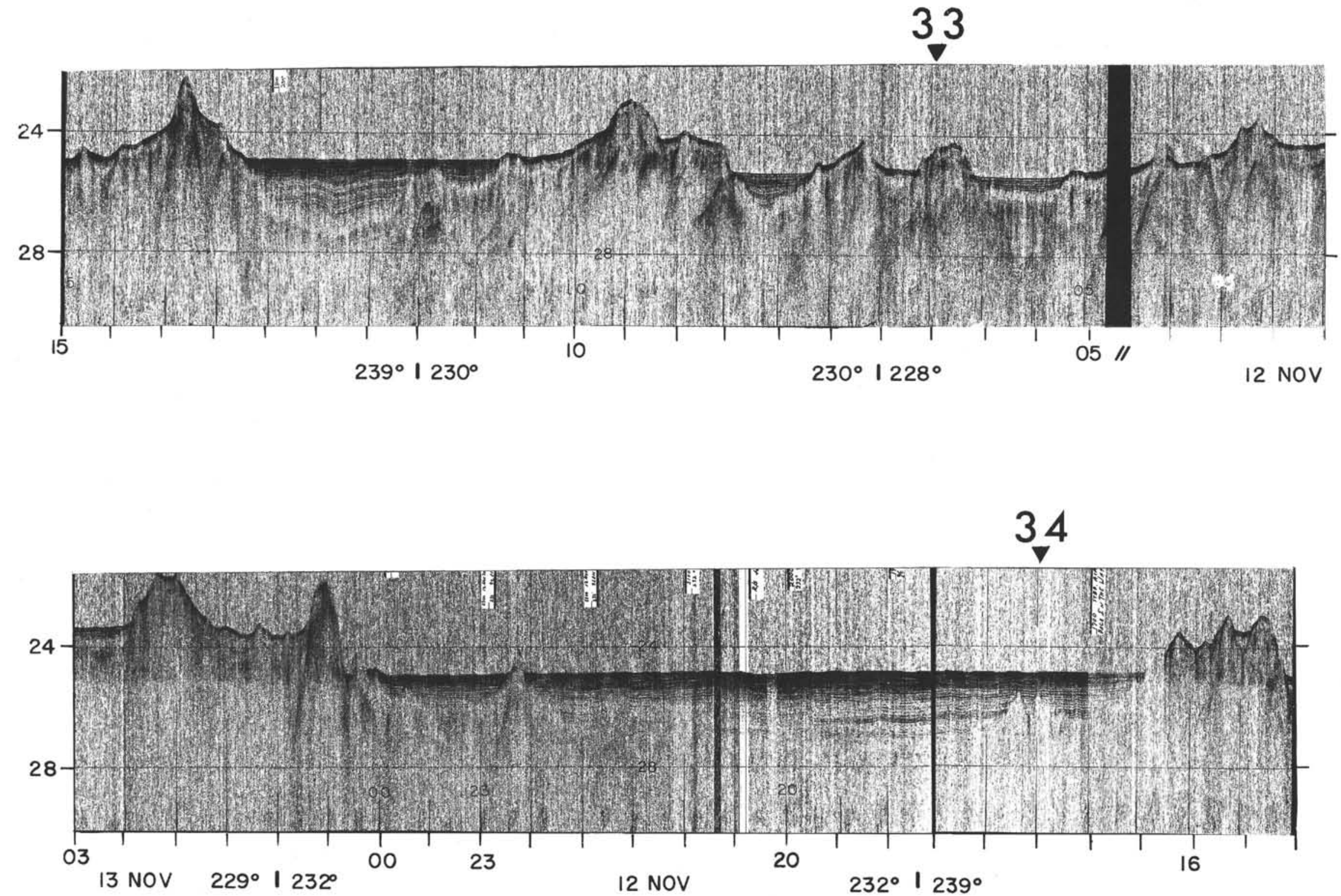
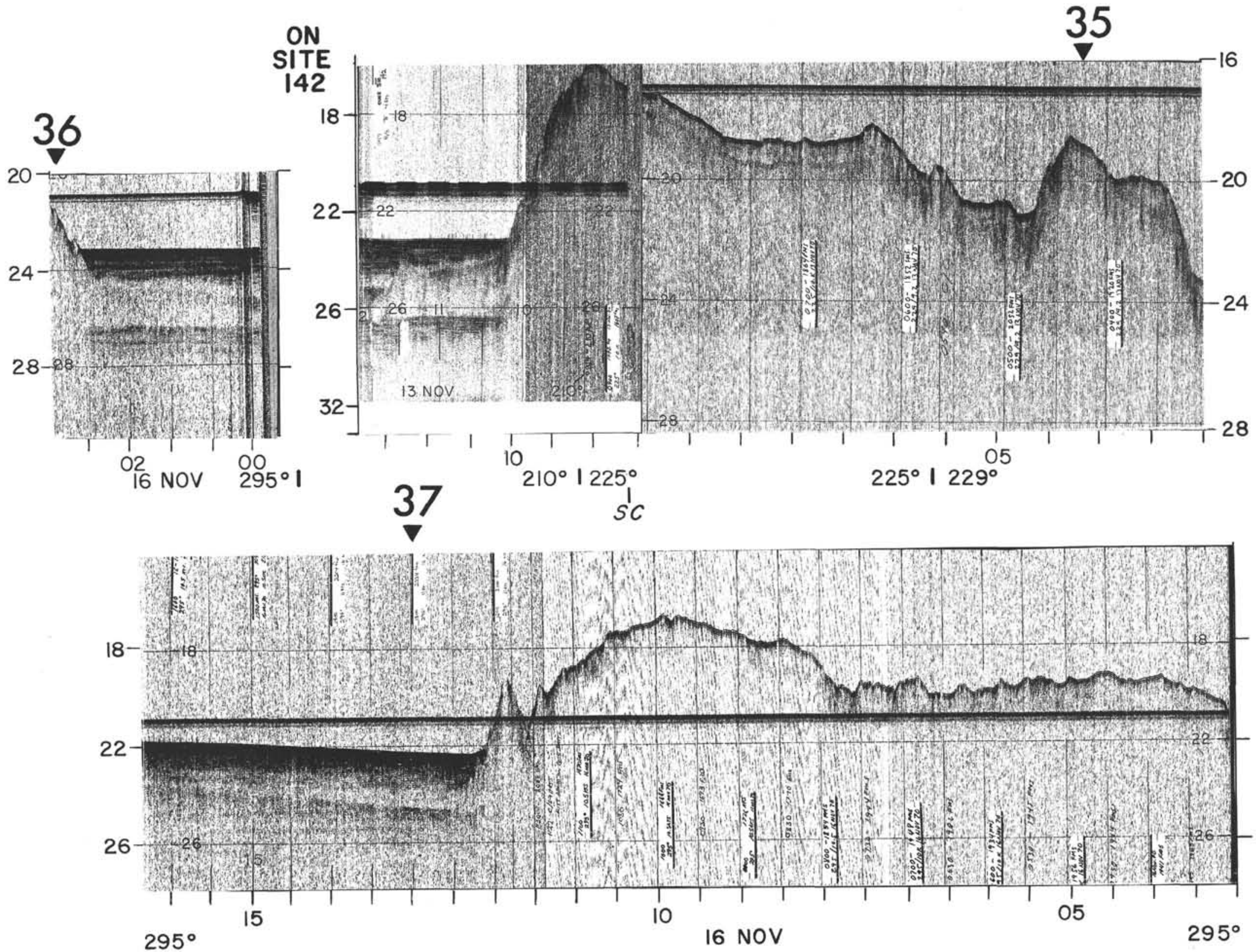
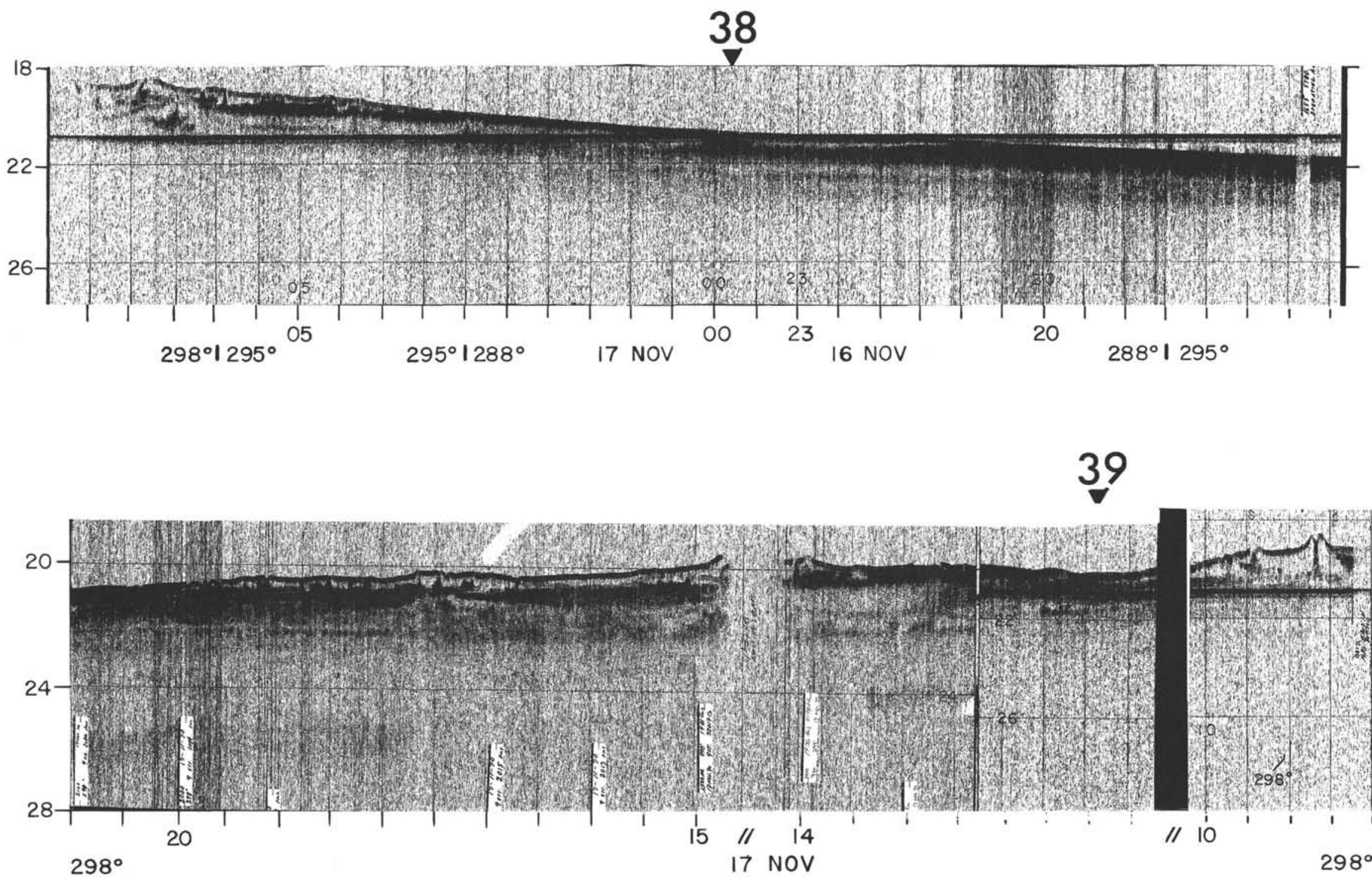

33
24
28
15
10
05 //
239° | 230°
230° | 228°
12 NOV
34
24
28
03
13 NOV
229° | 232°
00
23
12 NOV
20
232° | 239°
16

Figure 23.



ON SITE 142
35
36
37
16
18
20
22
24
26
28
32
13 NOV
10
210° | 225°
SC
05
225° | 229°
02
16 NOV
00
295° |
15
295°
10
16 NOV
05
295°

Figure 24.


38
18
22
26
05
00
23
20
298° | 295°
295° | 288°
17 NOV
16 NOV
288° | 295°
39
20
24
28
15
//
14
// 10
298°
17 NOV
298°
Figure 25.

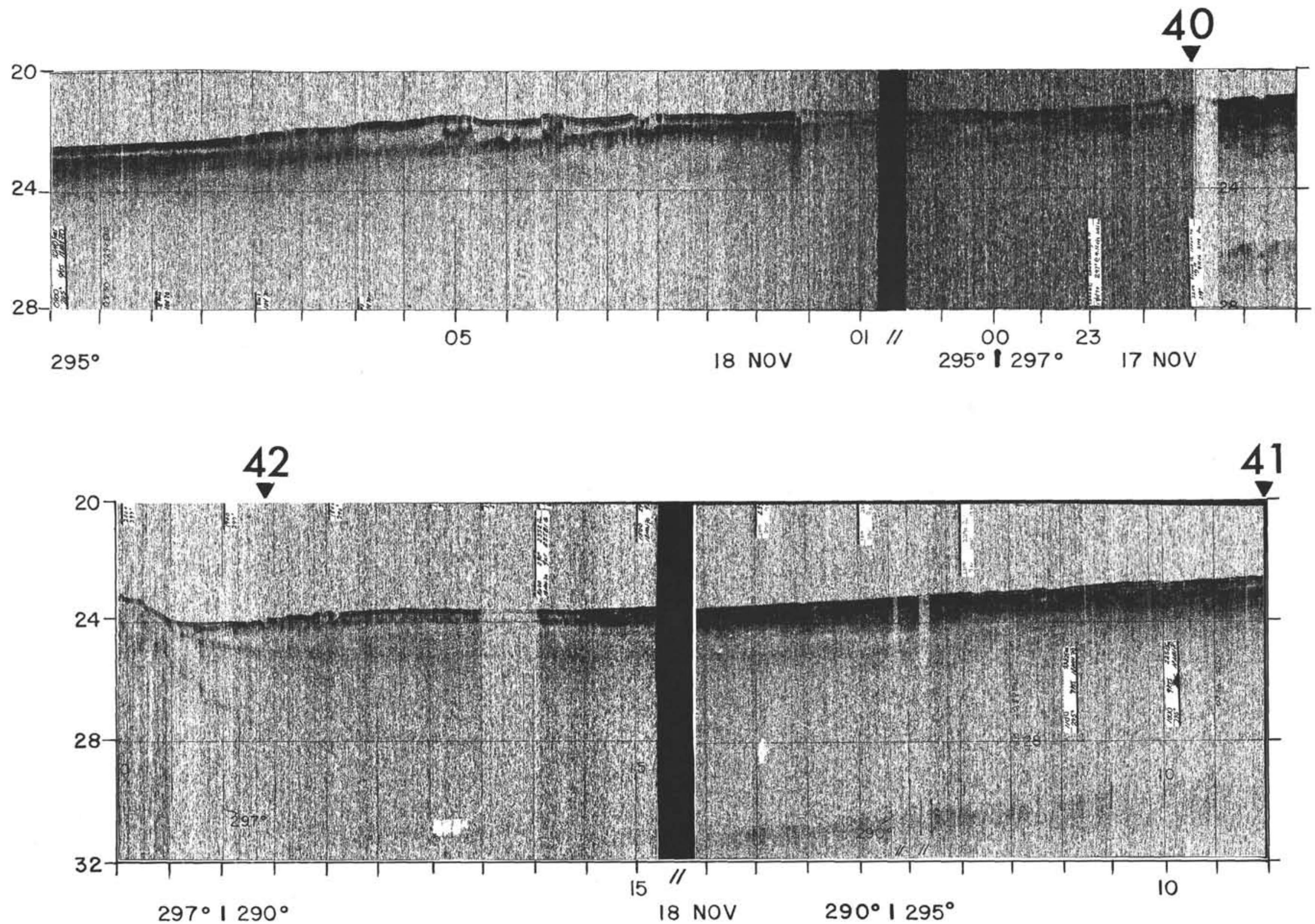
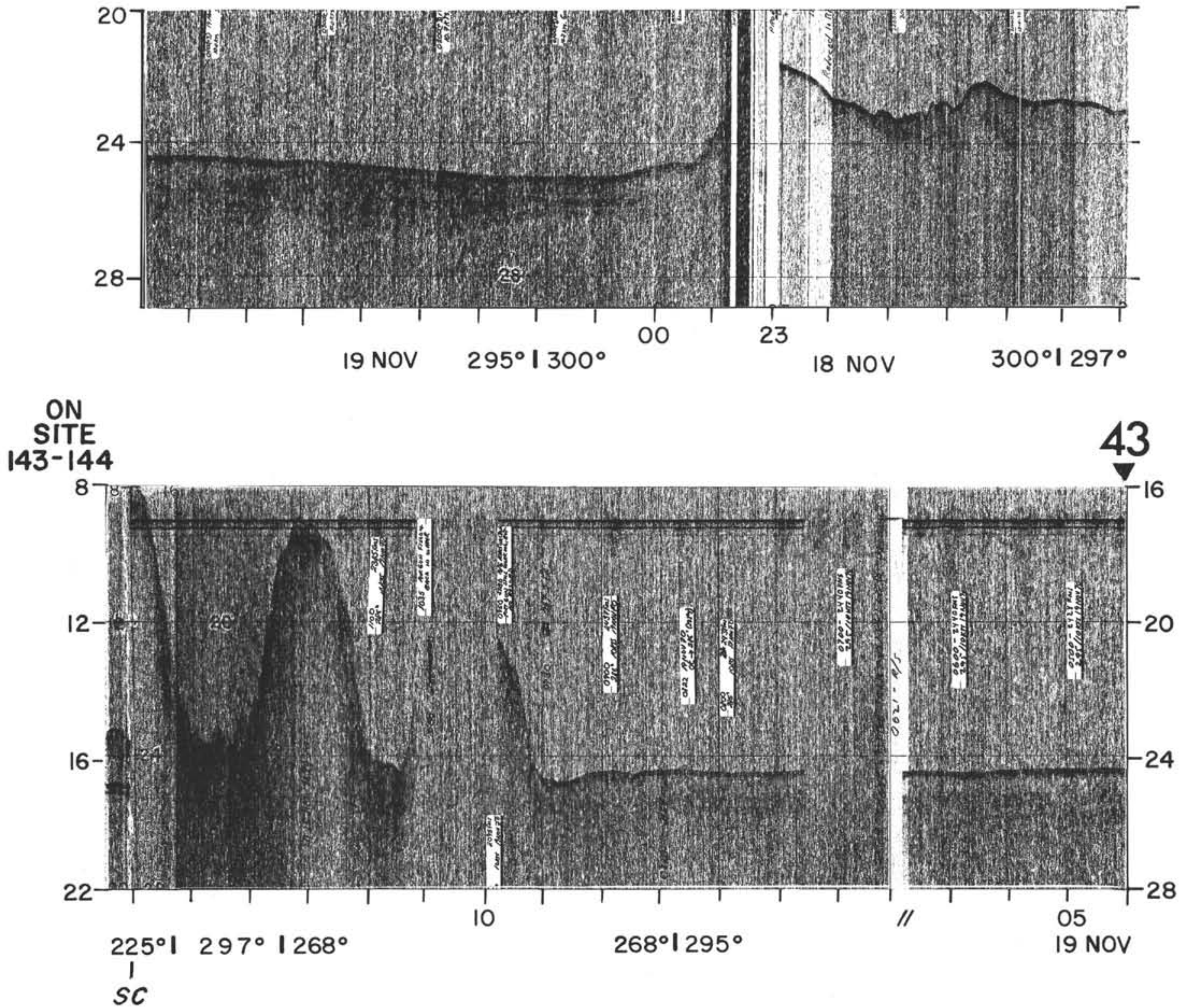

40
20
24
28
05
01 //
00
23
295°
18 NOV
295° | 297°
17 NOV
42
41
20
24
28
32
15 //
10
297° | 290°
18 NOV
290° | 295°
297°
290°

Figure 26.



20
24
28
00
23
19 NOV
295° | 300°
18 NOV
300° | 297°
ON SITE 143-144
43
8
12
16
22
16
20
24
28
10
//
05
225° | 297° | 268°
268° | 295°
19 NOV
SC

Figure 27.

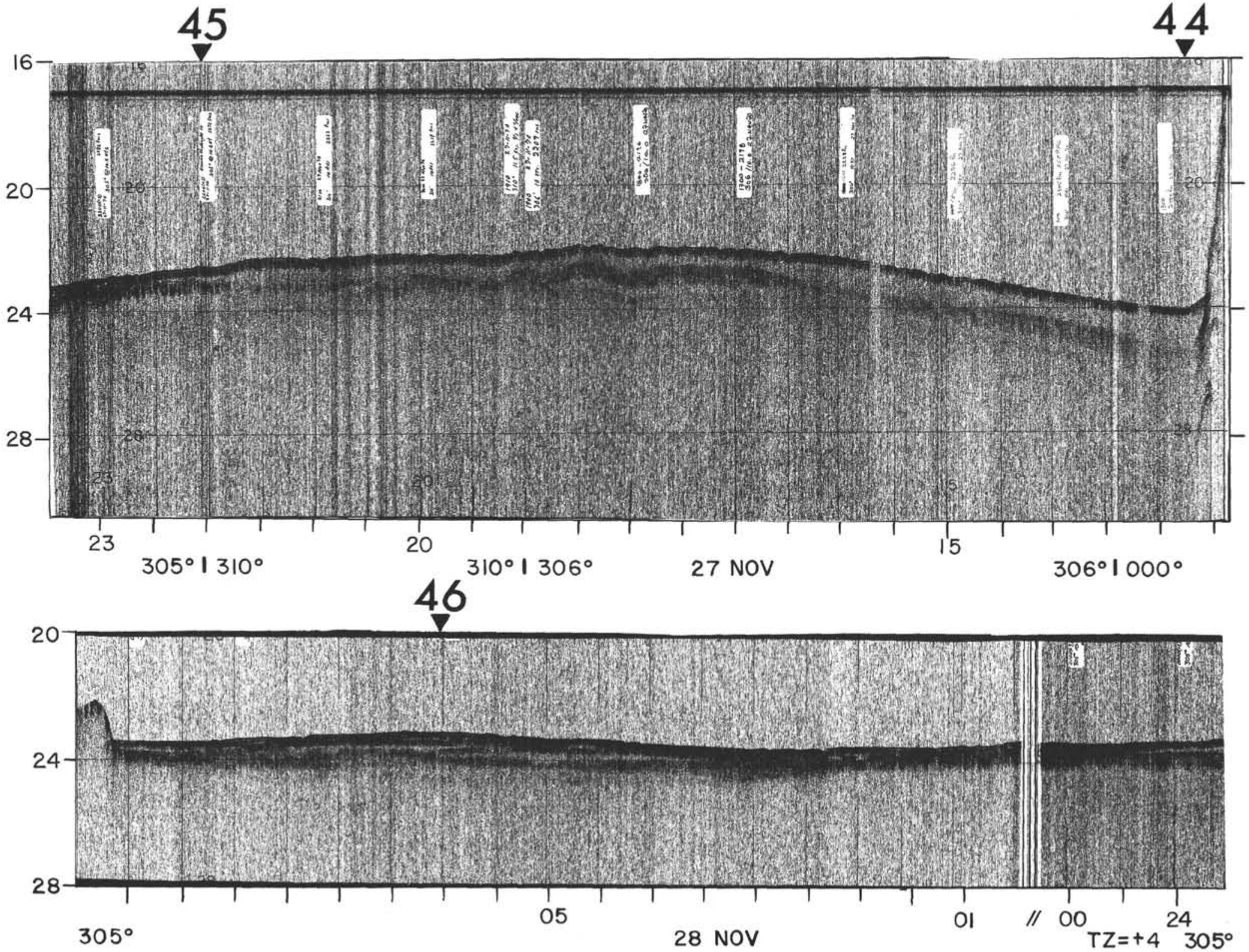

45
44
16
20
24
28
23
20
15
305° | 310°
310° | 306°
27 NOV
306° | 000°
46
20
24
28
05
01
// 00
24
305°
28 NOV
TZ=+4
305°

Figure 28.

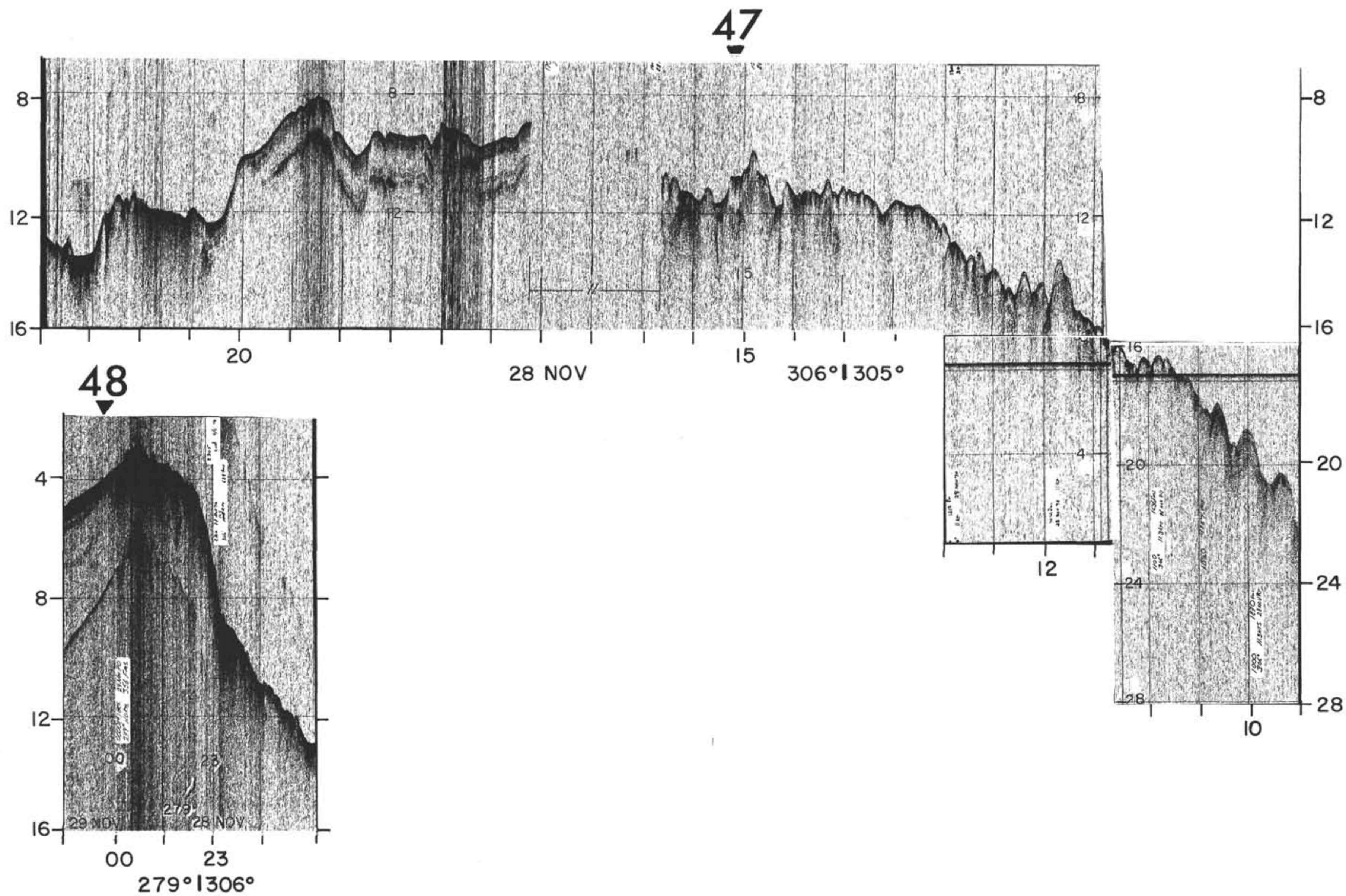

47
48
8
12
16
20
24
28
4
20
28 NOV
15
306° | 305°
12
10
00
23
29 NOV
28 NOV
279° | 306°

Figure 29.

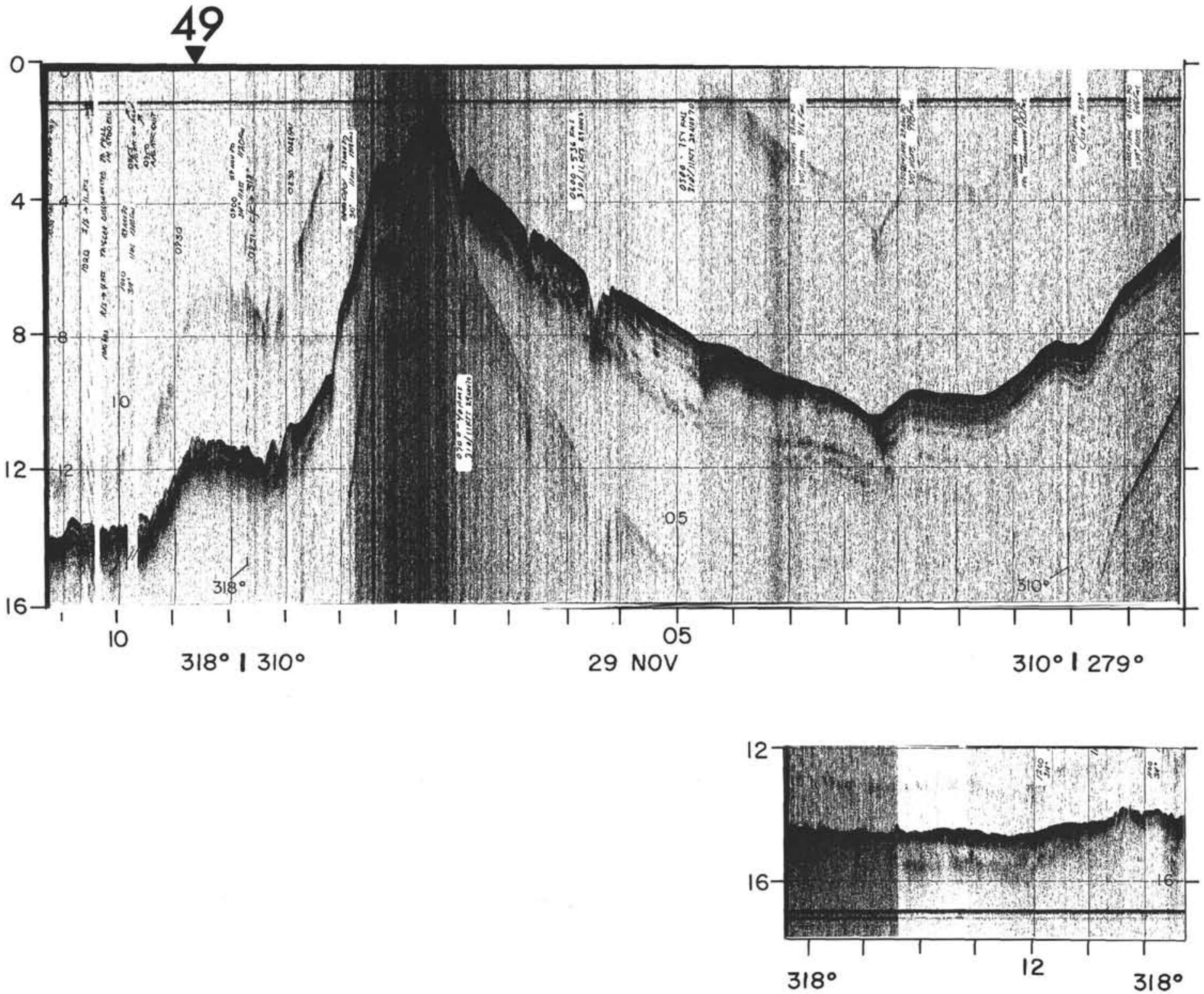


Figure 30.

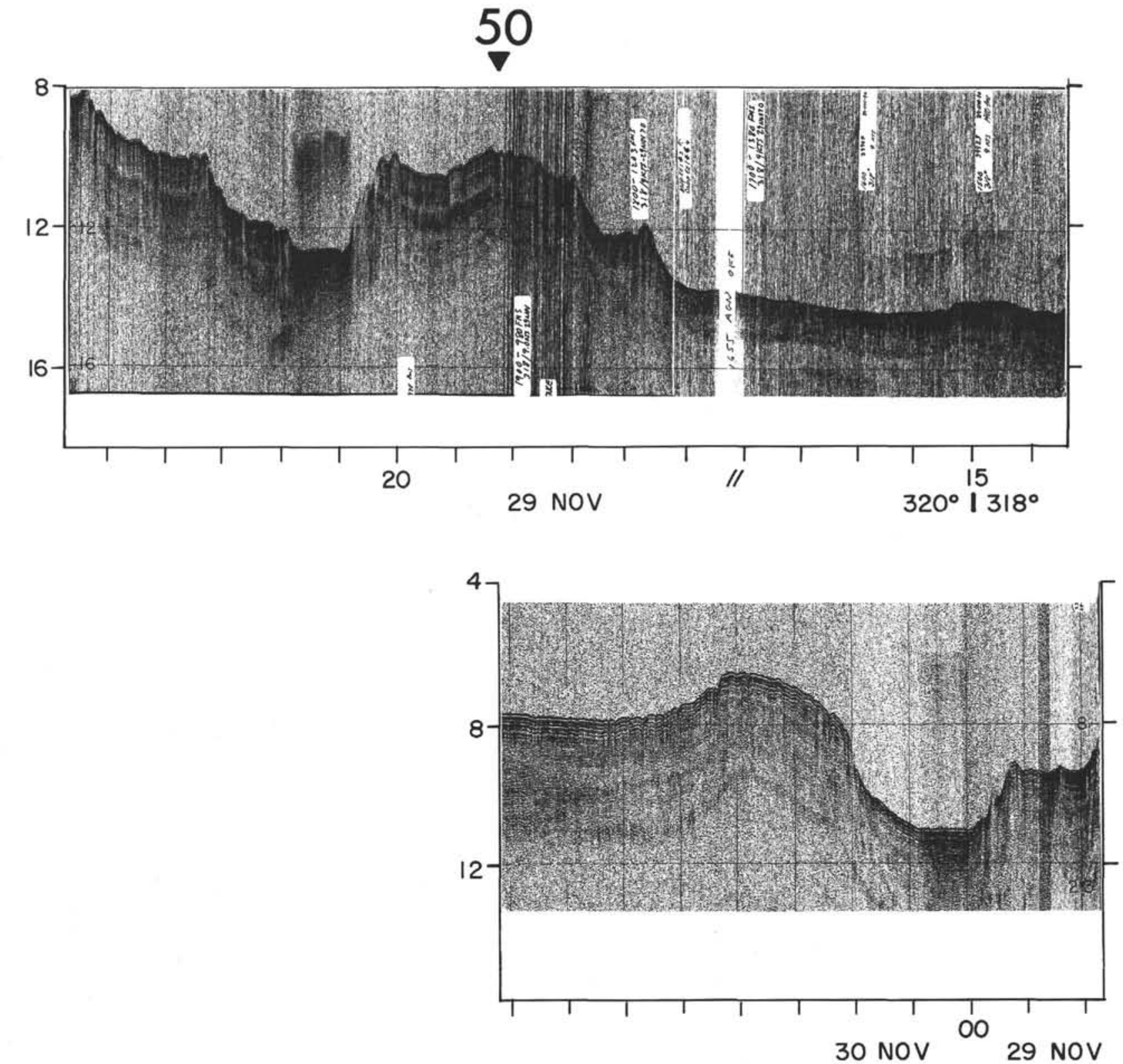


Figure 31.

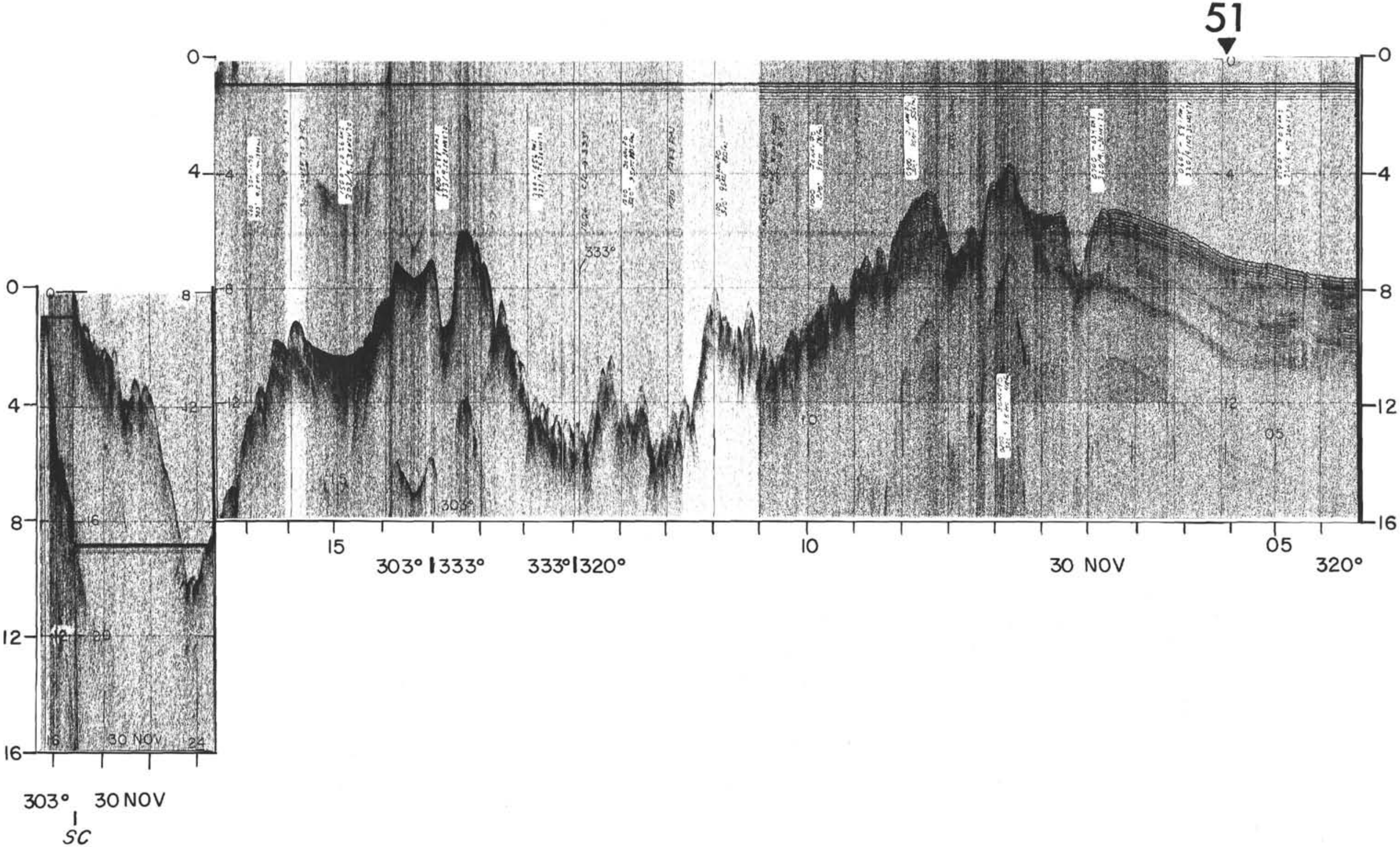


Figure 32.