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III. SEISMIC REFLECTION PROFILES OF THE WAKE-TAHITI TRANSECT IN THE CENTRAL PACIFIC OCEAN

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Introduction

This article describes seismic reflection profiles obtained in GH80–1 cruise, almost continuous on two parallel tracks along the Central Pacific Wake-Tahiti Transect. The two lines, A and B, run from 17°N to 15°S each across the Central Pacific Basin, the Manihiki Plateau, and the Penrhyn Basin, connecting sampling sites for sediments and manganese nodules (Sts. 1589 to 1618 on Line A and Sts. 1619 to 1647 on Line B) (Fig. III-1).

Two arrayed Bolt 1900B airguns of 150 in^3, operated at a pressure of 1,700 p.s.i. with firing interval of every 12 seconds, were towed as energy sources under a ship's speed of 10 knots during the survey. An arrayed GSJ-type hydrostreamer with 50 or 100 hydrophone elements was towed behind the ship, and the detected signals, processed by two amplifiers of Ithaco 451 and Ithaco 3171, were graphically displayed on two recorders. One record type on a Raytheon's UGR 196B recorder was bandpass-filtered in range of 30–150 Hz at 2 or 4 sec sweep rate, and the other on a Raytheon's LSR 1811 recorder was bandpass-filtered in range of 30–180 Hz at 5 sec sweep rate. The UGR recorder was locally used to detect detailed structure, and the LSR recorder was continuously used throughout. Together with a track map (App. III-1), all the 5-sec sweep records along the two survey lines are presented in App. III-2 (Al–A13 and B1–B14) at the back of this article.

Interpretation of the seismic records obtained was partially refered to profiles simultaneously obtained by a Raytheon's 3.5 kHz subbottom profiling system, and to results of our bttom-sampling. Existing geological and seismic reflection data were used for reference; these include results of DSDP Legs, 7, 17, and 33, previous surveys by GSJ group for the northern Central Pacific Basin, and other publications.

We thank K. TAMAKI, GSJ Marine Geology Department, for his critical reading and improvement of the draft of this report.

General acoustic stratigraphy

Acoustic stratigraphy in the northern Central Pacific Basin has been examined in detail by TAMAKI (1977), MURAKAMI and MORITANI (1979), and TAMAKI and TANAHASHI (1981). According to the most recent report of them, an acoustic sequence in GH79–1 area (10°N–13°N, 180°–165°W) consists of Unit I, Unit IIA, Unit IIB, and acoustic basement, in descending order. Unit I is characterized by transparent to semi-opaque acoustic features occasionally with very fine stratification. Unit IIA is covered by Unit I and in many cases is accompanied by reflector A′ at the top. Unit IIA is characterized by semi-opaque acoustic pattern, but becomes semi-transparent in some places. Unit IIB is

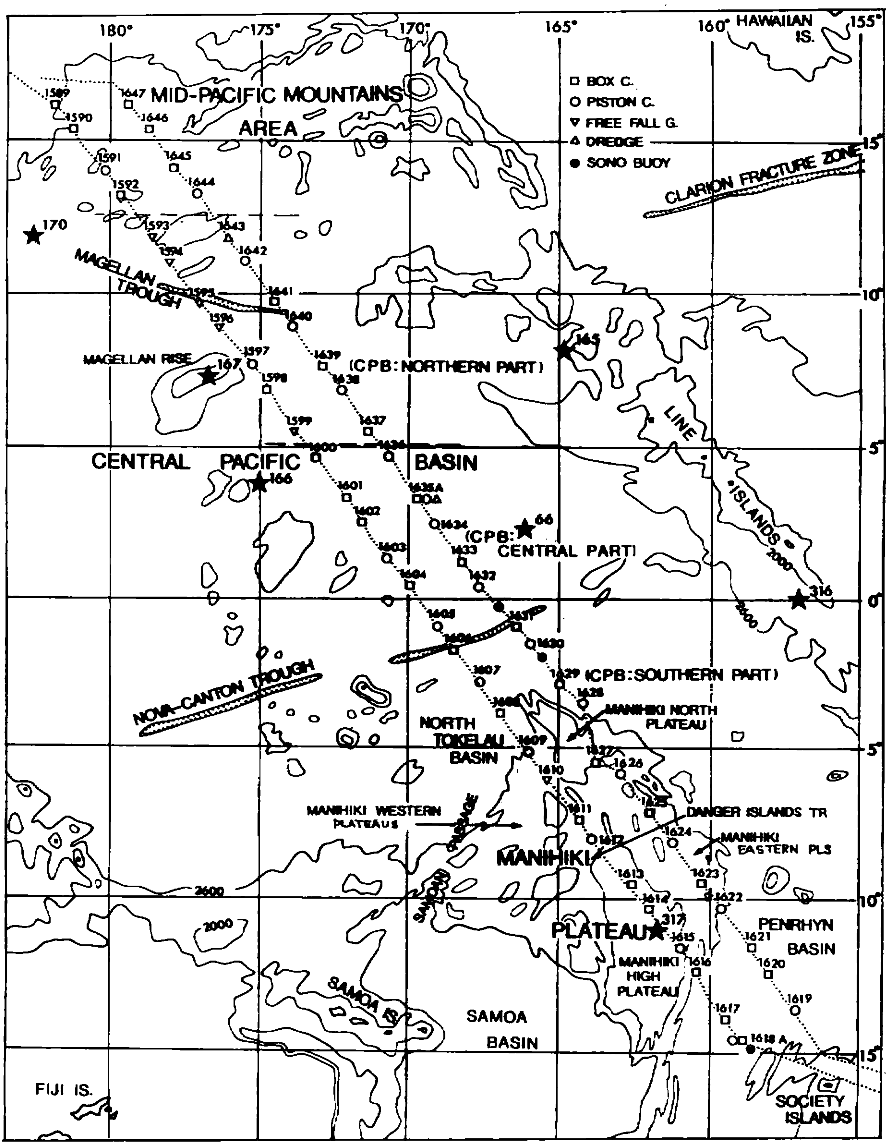

Fig. III-1 Major topographic provinces along the Wake-Tahiti Transect, with sampling sites and survey tracks in GH80–1 cruise. Solid asterisks show DSDP sites. Reproduced from Fig. I-2 of this cruise report.

separated by reflector B′ from Unit IIA and has similar acoustic nature as Unit IIA. Unit IIB lies on acoustic basement with rough surface.

We discriminate Unit I, Unit II, and acoustic basement from our records in the northern Central Pacific Basin and other areas, because Unit IIB is hardly distinguished in most places. We can also recognize acoustic facies types of Unit I after TAMAKI (1977)'s definition, e.g., Type A (completely transparent), Type B (with reflective horizons), and Type C (with coherent reflections by turbidites). Descriptions of acoustic stratigraphy in this article will be made in terms of them described above in most cases. However, we will describe sediment sequence above basement as Unit I-II in some areas

Table III-1 Correlation of acoustic stratigraphy in the GH79–1 area and the drilling result of DSDP Leg 17 (TAMAKI and TANAHASHI, 1981).

	site 165	site 166	site 170
Acoustic stratigraphy in the GH79–1 area	08°10.7′N 164°51.6′W 5,053 m	03°45.7′N 175°04.8′W 4,962 m	11°48.0′N 177°37.0′E 5,792 m
Unit I	Quat. to M. Eocene nanno and foram. chalk ooze, and rad. ooze including turbidite beds of Late Olig. to M. Eocene. (thickness: 240 m)	Quat. to M. Eocene rad. ooze with nannos. (thickness: 200 m)	Quat. to Olig. zeolitic brown clay. (thickness: 20 m)
Unit IIA	M. Eocene to Late Cret. chert and limestone. Volcanogenic turbidites. (thickness: 190 m)	M. Eocene to E. Cret. chert rad. ooze. Volcanogenic claystone and sandstone with some nannos. (thickness: 110 m)	Olig., Eocene and Cret. (?) cherty ooze and limestone. Late Cret. nanno ooze, chalk and limestone and basalt gravel. (thickness: 172 m)
Unit IIB	Volcanogenic turbidites with basalt flows. (thickness: 50 m)	(lack of Unit IIB)	Basalt (not penetrated, 4 m in thickness).
Acoustic basement	Massive basalt	Basalt	

of deep-sea basin and the Manihiki Plateau, due to difficulty of distinction of Unit I and Unit II.

Geologic age of the sediment sequence can be deduced from DSDP data in areas near the DSDP sites. According to the results of DSDP Legs 17 and 33, Unit I/Unit II boundary may be the early Oligocene to the middle Eocene, and it is possibly somewhat diachronous throughout the survey lines.

Mid-Pacific Mountains area

In the Mid-Pacific Mountains area (MPM area) north of 13°N, the sea floor tends to deepen southward gradually from 4 to 5 km, partially up to 5.6 km on Line A and tends to role at the depths of 4.3 to 5.6 km on Line B.

On Line A, an acoustic basement is exposed on the rugged sea floor in the environs of St. 1589, and to the south, it is buried beneath stratified opaque layer of 0.25 sec thick in the environs of St. 1590. The opaque layer can be identified with Unit II. Unit I does not appear to occur in general.

On Line B, small knolls with asymmetric shape occur. They are generally characterized by a steep slope on the northern flank with exposure of basement and a gentle slope of the southern flank with sediment cover. The steep slope may have originated from a faulting movement. The general features indicate a southward tilting by block movement.

We can observe an opaque layer of 0.25–0.40 sec thick (Unit II) throughout above the acoustic basement. The layer passes gradually to transparent nature in some places. The layer tends to thicken southward in each block. It is likely that the movement had continued at least during the formation of the basement and the deposition of Unit II.

Unit II is exposed almost at surface of the sea floor in most cases on the seismic profiles. Whereas, its uppermost part is represented by a transparent layer of several meters thick on 3.5 kHz records. Piston core P179 at St. 1644 indicates that the uppermost part consists of uncosolidated zeolitic mud of about 3 m thick, overlying lithified chert belonging to Unit II (NAKAO and MIZUNO, this cruise report).

Younger sedimentary layer of transparent nature on the seismic profile (Unit I-Type A) occurs in small ponds, abutting against Unit II, suggestive of a sedimentary hiatus inbetween (e.g. at the immediately north of St. 1646). The layer of Unit I may represent the continuity of the uppermost 16 m thick zeolitic brown clay of the Quaternary to Oligocene at DSDP Site 170, based on tracing of seismic profile of DSDP Leg 17 (RAFF, 1973) from its intersection with our's (between Sts. 1645 and 1646). Also, Unit II may do that of the Oligocene to late Albian sequence consisting chert, mudstone, limestone, and other lithology at the same DSDP site.

Central Pacific Basin

Northern part

Bathymetric profiles of both lines, A and B, are somewhat different from each other in the northern Central Pacific Basin which is arbitrarily defined as between 5°N and 13°N.

Bathymetry along Line A is dominantly 5–6 km deep, with rolling sea floor in the northern half and is smoothed one in the southern half. Considerably rugged sea floor by knolls occurs on the north of St. 1595, and it may represent the northwestern extension of the Magellan Trough which is definitely detected at 176°W but diminishes at 177°W on 10°N parallel (MURAKAMI and MORITANI, 1979). Topography along Line B is represented by rather smooth surface deepened southward from 5 to 6 km in general. The smooth surface is interrupted by small knolls, some of which are indented by faults. The Magellan Trough (TAMAKI *et al.*, 1979) is well developed on the south of St. 1640.

Throughout the both lines, Unit II is characterized by opaque layer of similar feature as that in the MPM area. It varies from 0.15 to 0.25 sec in thickness above the acoustic basement. Considerably thinned Unit II, resulted from basement elevation, is recognized in some places.

Unit I is hardly detected in the northernmost part as well as in the MPM area (Sts. 1593–1594 on Line A and Sts. 1643–1642 on Line B). On Line B, it occurs as the uppermost layer of transparent (Type A) or with reflection (Type B), 0.04–0.06 sec thick, between the immediately south of St. 1642 and the northern bordering ridge of the Magellan Trough (Fig. III-2). On Line A, the similar feature of Unit I seems to be developed between Sts. 1594 and 1597.

In the south of 8°–9°N, Unit I increases its thickness; from 0.12 to 0.19 sec, gradually thickened southward on Line A, and from 0.1 to 0.35 sec on Line B, except in large knoll or seamount areas on both lines. The thickened part of Unit I is characterized by coherent reflectors on both lines showing its acoustic facies of Type C. This facies

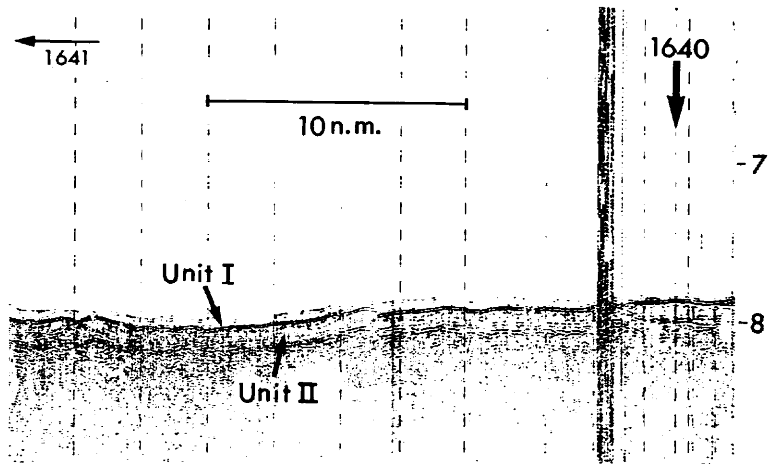

Fig. III-2 Seismic reflection record immediately north of St. 1640 in the northern Central Pacific Basin, showing acoustic facies of Unit I with reflections (Type B), overlying Unit II.

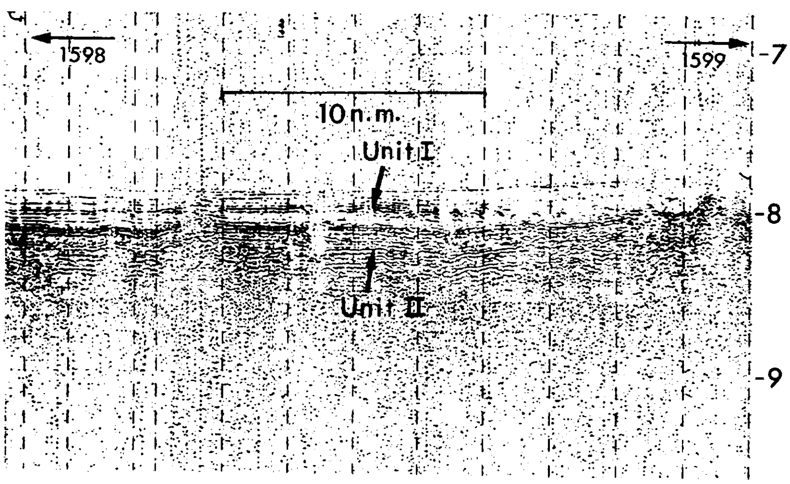

Fig. III-3 Seismic reflection record at the midway of Sts. 1598 and 1599, southeast of the Magellan Rise, showing Unit I-Type C facies.

occurs from its northern end to the midst of Sts. 1598–1599 on Line A and from the southern flank of the southern bordering ridge of the Magellan Trough to the immediately north of St. 1639 on Line A (Fig. III-3). The facies changes to Type A entirely with transparency toward the south on Line A. Such distribution of Unit I-Type C is quite consistent with MURAKAMI and MORITANI (1979)'s map (see their Fig. VI-3). The Type C facies may have been derived from turbidite deposition of materials supplied from the nearby topographic high (Magellan Rise) during the mid-Tertiary as in cases of DSDP Site 165 and the GH79–1 detailed survey area (MIZUNO *ed.*, 1981).

Line B crosses the seismic reflection survey line of DSDP Leg 17 near St. 1637, which reaches to DSDP Site 166 across Line A near St. 1600. Our seismic profiles showing thick transparent acoustic feature around our station area are well consistent with those by Leg 17 (RAFF, 1973) in the intersection (Fig. III-4). This, together with the drilling results of DSDP Site 166 (WINTERER, EWING, *et al.*, 1973), leads us to conclude that the thick Unit I-Type A sequence south of the Type C area above mentioned may represent an accumulation of radiolarian ooze through Quaternary-middle Eocene time. It may be noted that a reflectivity of the sea floor is extremely weak in the area where siliceous mud

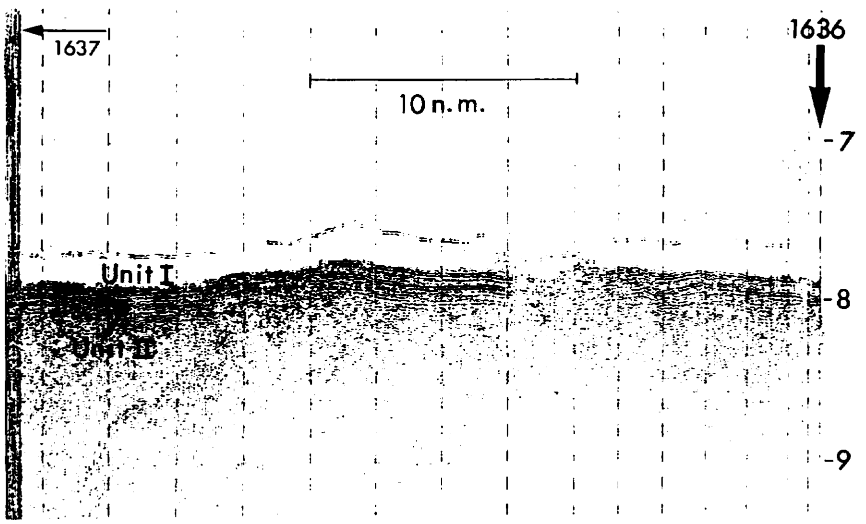

Fig. III-4 Seismic reflection record immediately north of St. 1636, showing thick transparent layer of Type A of Unit I, resting on Unit II.

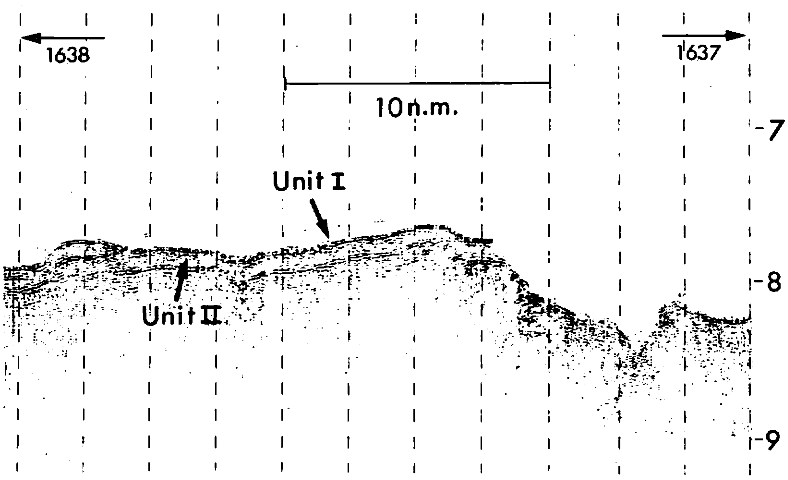

Fig. III-5 Seismic reflection record at the midway of Sts. 1637 and 1638, showing that Unit I (Type A) deeply erodes Unit II and acoustic basement at northern flank of a depression.

occupies surface sediment in the northern Central Pacific Basin, and the reflection of the sea floor is not enough to be recognized in places on our profiles.

Unit I overlies Unit II conformably in most parts of both lines. However, an unconformable relation can be seen in the southern part. The most marked feature occurs at the northern wall of shallow depression in the midst of Sts. 1637–1638 (Fig. III-5), where transparent Unit I truncates structure of Unit II and basement. This suggests that the depression had been caused by deep-sea erosion before the deposition of Unit I.

Central part

A deep-sea basin of 5.4–5.5 km deep is extensively developed in the central part of the Central Pacific Basin, 5°N to the Nova-Canton Trough. The basin is interrupted by many small knolls with relative height of several hundred meters and becomes slightly elevated to 5.3 km in depth, when the line is approached to the Nova-Canton Trough in the southern end.

Acoustic stratigraphy in the central part is very similar to that in the northern part of the Central Pacific Basin, except in the southern end of Line B. Unit II is represented by weakly stratified opaque layer of 0.15–0.25 sec thick, which is intermitted by elevations of acoustic basement in many places, occasionally accompanied by faults.

Unit I, beneath very weak reflection at its surface, is dominantly 0.2–0.25 sec thick and consists of nearly perfectly transparent nature (Type A). The unit becomes very thin or missing on some of deep-sea knolls. A good example is seen around St. 1635A. In the

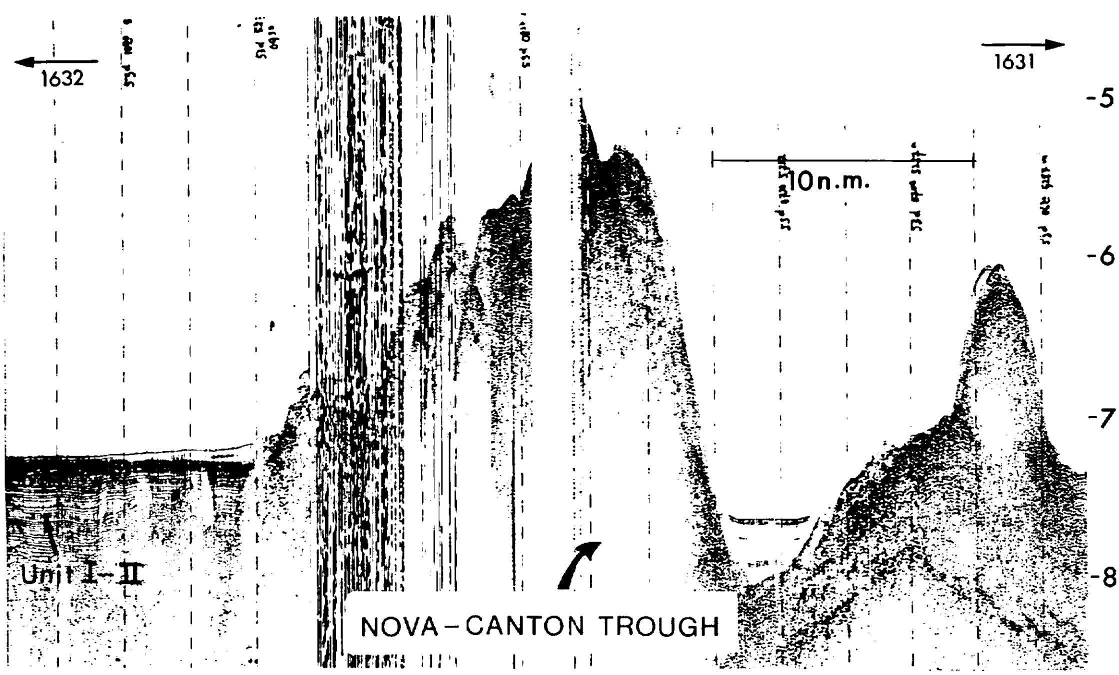

Fig. III-6 Seismic reflection record crossing the Nova-Canton Trough (on Line B), showing Unit I-II with coherent reflections, immediately north of the trough.

southern area, Unit I is generally less thick than the remainings, decreasing to 0.15 sec thick (south of St. 1604 on Line A). Unit I overlies Unit II parallelly as a whole. However, a marked diagonal relation between both units can be recognized in some areas; in the midway of Sts. 1604–1605 and immediately north of St. 1604 on Line A, and the Sts. 1634 and 1632 areas on Line B. This indicates a deep-sea hiatus between both units.

In the southern end of Line B, both units suddenly change to very thick sequence with very finely stratified coherent nature. This fills and overlies rugged basement surface. Both units can not be distinguished from each other, so that we call the sequence Unit I-II. It attains a thickness of 0.8 sec in total. The upper 0.5 sec thick part tends to be dominantly of coherent nature of reflectors, suggestive of turbidites sequence, and the remaining lower part tends to be characterized by lower frequency reflections. It seems likely that the former represents Unit I and the latter does Unit II, but the recognition of their boundary is very difficult. The Unit I-II sequence at the southern end abuts against the lower flank of the northern ridge of the Nova-Canton Trough (Fig. III-6).

Nova-Canton Trough

The Nova-Canton Trough is possibly an abundoned or jumped spreading ridge (WINTERER, 1973) as well as the Magellan Trough. It is crossed by our two lines. Its topographic and sedimentologic features are different to Line A and Line B, although much or less high bordering ridges consisting of acoustic basement are developed on the north and on the south on both lines, as suggested by ROSENDAHL (1975).

On Line A, the trough bottom is 6.5 km deep filled with 0.1 sec thick opaque layer and 0.15 sec thick transparent layer, in ascending order. The northern bordering ridge elevates 1.7 km, and the southern one does 3.7 km from the trough bottom. The ridges consist of acoustic basement, which extends down to beneath the opaque layer.

On Line B, the trough bottom is 5.7 km deep. The sediment-fill has quite different nature from that on Line A. Resting on acoustic basement, it is represented by 0.45 sec thick transparent layer. The northern ridge has a relative height of 3 km, and the southern one does that of only 1.2 km from the trough bottom.

Thus, the style of sedimentation in the trough and that of topographic development are quite different on Line A and Line B. This may imply a complicated nature of developmental and sedimentologic history of the Nova-Canton Trough and shows necessity of further detailed regional study.

Southern part and North Tokelau Basin

Acoustic feature is rather similar to that in the northern hemisphere parts as described before, in the southern Central Pacific Basin and its branch, the North Tokelau Basin. Unit I, beneath rather rugged sea floor, gradually thins toward the south on both lines.

On Line A, the rugged sea floor is declined southward from 5.2 km at the foot of the southern bordering ridge of the Nova-Canton Trough to 5.7 km at about 70 km north of St. 1607 (the southern Central Pacific Basin), and is continued to rather smooth one, rolling with small elevations, to the south (the North Tokelau Basin). Unit II of about 0.1 sec thick is discontinuously distributed, filling scattered small depressions of indented surface of acoustic basement. Unit I shows a scattered distribution throughout, with transparent nature (Type A). Its thickness greatly varies from 0.13 sec thick to vanishingly thin (the maximum thickness of 0.2 sec occurs locally). Between Sts. 1607 and 1608, the distribution is very poor.

On Line B, the sea floor tends to be gradually elevated from 5.5 to 5 km in depth toward the south (the southern Central Pacific Basin). Both units are distributed rather continuously on northern half area between the southern rim of the Nova-Canton Trough zone and the midway of Sts. 1630 and 1629. Unit I, overlying Unit II of about 0.15 sec thick, is characterized by transparent nature. Unit I tends to thin southward as a whole (from 0.2–0.3 sec thick on the north to trace on the south). Unit II becomes, toward the south, to be cut into pieces of about 0.1 sec thick, filling small ponds among many basement highs, similar to the occurrence in the southern part of Line A. Distribution of Unit I overlying that is very poor.

Manihiki Plateau region

The Manihiki Plateau is a widely elevated area of old oceanic crust of the early Cretaceous, capped by thick sediments and surrounded by deep basins. According to extensive and detailed study by WINTERER *et al.* (1974), the plateau region is divided into three, e.g., the High Plateau, the North Plateau, and the Western Plateaus, by major bathymetric feature. On the High Plateau, a 910 m sedimentary sequence was cored at Site 317 (DSDP Let 33) at a depth of about 2.6 km, together with basement basalt having a minimum age of 106 m.y. (SCHLANGER, JACKSON, *et al.*, 1976). The thick sedimentary sequence at the site is known to be characterized by Maestrichtian-Aptian rocks of mostly shallow sea origin (in lower 350 m interval) and early Eocene-Quaternary pelagic carbonates (in upper 400 m interval).

Our Line A crosses the Western Plateaus, the Danger Islands Trough, and the High Plateau. It also passes near DSDP Site 317. Line B passes the east of the North Plateau and widely crosses the northeastern deepened area of the Manihiki Plateau region, which is proposed to call the Eastern Plateaus (Chap. I, this cruise report). To avoid a confusion with names in other regions, we often call the subdivisions with a prefix of "Manihiki", e.g., "Manihiki High Plateau", too.

Manihiki High Plateau

The Manihiki High Plateau is crossed by Line A between St. 1612 (in the Danger Islands Trough) and St. 1616 (in the northern end of the Penrhyn Basin). The profile along Line A shows that the High Plateau is a broad swell faintly arched at medial part at the depths of 2.7 to 3.7 km deep, and the greater depth is found at the northern and southern rim both located on the foot of bordering ridges which are developed on the periphery of the High Plateau.

A sedimentary sequence, as much as 2.0 sec thick, is seen on the top plain. It is acoustically composed of semi-transparent layer interbedded with many reflectors. The division of Unit I and Unit II can not be adopted to the sequence, due to a large difference of acoustic facies from other areas particularly of the northern Central Pacific. When based on the sequence at St. 1614, the following correlation with the drilling results of DSDP Site 317 may be likely: a strong reflector at 0.43 sec from the sea floor at St. 1614 is correlated with the top of early Eocene cherty chalk, and a reflector at 0.80 sec

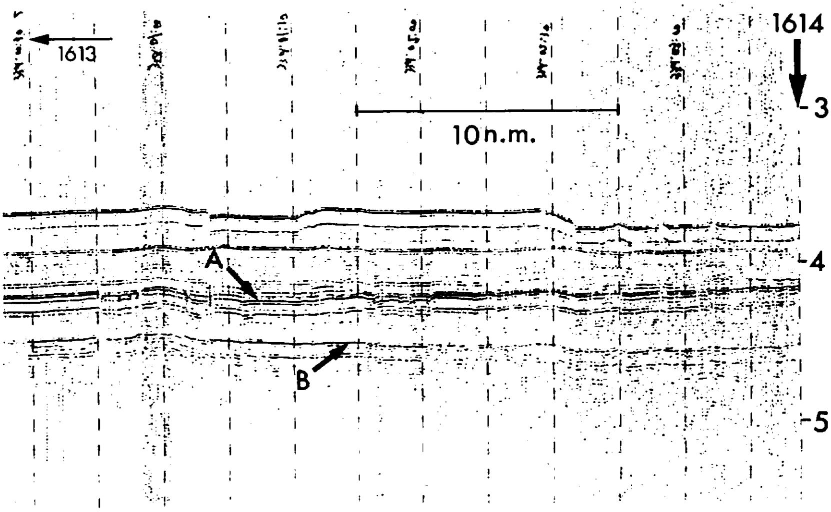

Fig. III-7 Typical seismic reflection record of the Manihiki High Plateau, immediately north of St. 1614. A—correlated with the top of early Eocene cherty chalk. B—correlated with the top of Maestrichtian to Aptian rocks.

from the sea floor at the station is correlated with the top of Maestrichtian to Aptian rocks (Fig. III-7). Basement basalt is not detected on our profile. According to the drilling results, the Quaternary-Pliocene interval consists of calcareous ooze, the Miocene-late Eocene one of calcareous ooze and chalk, and the early Eocene one of cherty chalk which is bounded above and below with unconformity during the middle Eocene. The Cretaceous interval consists of limestone, volcaniclastic sandstone-siltstone, claystone, etc.

The reflector at 0.43 sec, identified with the upper surface of early Eocene cherty chalk, continues fairly well through the profile of the High Plateau. The layer between this reflector and the top one of Cretaceous sequence is almost stable in thickness throughout, and probably abuts against the northern and southern bordering ridges of the High Plateau. Whereas, the layer above the reflector at 0.43 sec is unstable in thickness, locally thinned as seen in parts of northern and southern areas of the plateau. The thinning is very likely caused by erosion as described by SCHLANGER, JACKSON, *et al.* (1976). Also, it could have been additionally contributed by hiatus(es) or condensed sequence within the late Eocene-Quaternary interval. Our cruise found a small hiatus between the upper Quaternary (N23) and the lower Pliocene (lower N19) in piston core P164 at St. 1615 (UJIIÈ and MISHIMA, this cruise report). These may suggest that the top part of the Manihiki High Plateau was locally affected by strong bottom current during younger ages.

The southern bordering ridge has a peak of about 2 km deep, elevated 0.8 km from its foot, and is steeply stepped down to the marginal depression of the Penrhyn Basin of 5.7 km deep. The ridge dominantly consists of acoustic basement probably of Cretaceous oceanic basalt, with thin sediment covers in some places. The northern bordering ridge has an acute peak of about 2 km deep, with an elevation of 2.6 km from the northern rim of the High Plateau. It is characterized by steep slopes of both northern and southern sides. The northern flank reaches to the flat bottom of the Danger Islands Trough of 4.8 km deep.

Danger Islands Trough

The Danger Islands Trough is bounded by steep basement highs, and its flat bottom is underlain by sediment-fill of 0.8 sec or more thick. As previously described by WINTERER *et al.* (1974), the upper half is characterized by more or less strong reflectors, but the lower half has a transparent acoustic nature. The bottom of the sediments is underlain by acoustic basement. Although the upper half strong reflectors could have been largely caused by turbidites as suggested by the authors, our piston core data at St. 1612 show that calcareous mud and nannofossil ooze occupy the uppermost 8 m sequence, without any evidence of turbidite deposition (NAKAO and MIZUNO, this cruise report). Division of Unit I and Unit II is not applicable to the acoustic sequence.

Manihiki Western Plateaus

The Manihiki Western Plateaus are separated into two parts, northern and southern parts, from topographic feature.

The northern part is continued from the North Tokelau Basin and shows extremely rugged and deeply indented topography. The sea floor inclines from 5.2 km (in the north) to 2.2 km (in the south) in depth. Acoustic basement is dominantly exposed. Sediments fill the narrow depressions among the rough relief, and their acoustic nature is very similar to that in the North Tokelau Basin. The distinction of Unit I and Unit II seems difficult.

The southern part is separated from the northern one by a deep valley with steep slopes, which is located on the south of St. 1610 and is probably of fault origin. In contrast to the northern rugged part, the southern part shows a rather smoothed, plateau-like topography with the sea floor inclined southward from 3.4 to 4.3 km deep. The sedimentary sequence is mainly characterized by transparency with weak stratification, similar to that of the Manihiki High Plateau. It may be likely that a strong reflector at 0.35 sec below the sea floor in the thickest area is a continuity of the upper surface of early Eocene cherty chalk in the High Plateau.

Manihiki Eastern Plateaus

The Manihiki Eastern Plateaus lies between the northeastern rim of the High Plateau and the northern Penrhyn Basin. It is characteristically rugged by many isolated seamounts or knolls which stand on the sea floors of dominantly 4.0–4.4 km deep (partially exceeding 5 km deep) (SCHLANGER, JACKSON, *et al.*, 1976). The plateaus area is NW–SE trending as a whole, and our Line B crosses it longitudinally. Descriptions of the seismic reflection records are as follows.

The sea floors are generally of 4.0–4.4 km deep along the line. They are very roughly rolling by pronounced knolls and seamounts. Deeper sea floor occurs in the northern part of the line.

In the northernmost area (from the northern end to about 35 km north of St. 1627), general feature of sediment occurrence is almost same as the southern Central Pacific Basin in a style of filling small depressions of basement. The sediments are represented

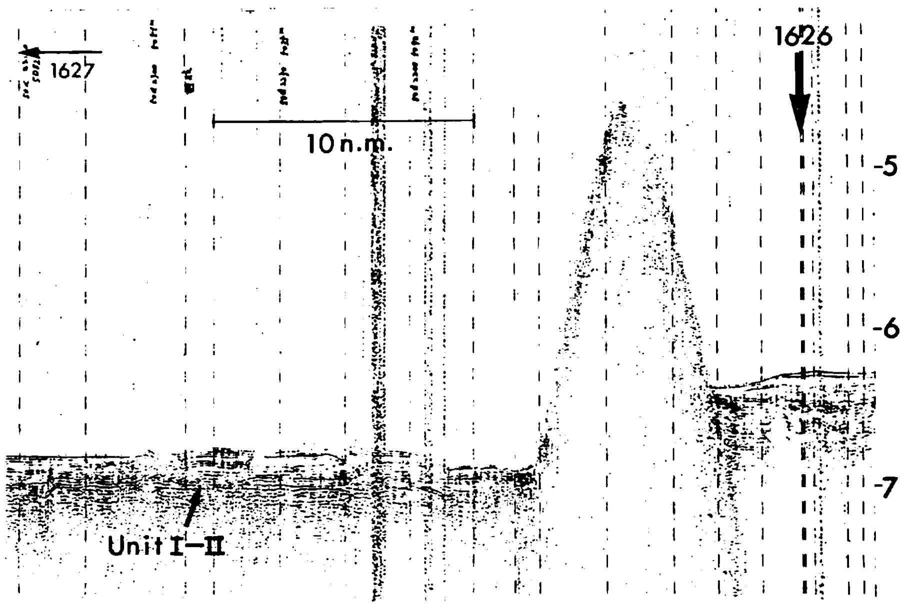

Fig. III-8 Seismic reflection record, showing thick Unit I-II with coherent reflections at St. 1626 and its immediately north.

by Unit II, nearly without Unit I.

Feature of sedimentation becomes quite different in the remaining part of Line B. Rather smoothed sea floors, except knolls and seamounts, are filled with sediments of 0.25–0.45 sec thick, between around St. 1627 and St. 1625. They are characterized by very finely stratified or coherent reflections in general (Fig. III-8). The acoustic feature can not be correlated with that in other areas of the survey lines, and it is difficult to discriminate the difference between Unit I and Unit II. The sediment-fill of Unit I-II largely consists probably of calcareous turbidites throughout, derived from the Manihiki High Plateau, from the nature of the reflections and the evidence of a piston core (P169 at St. 1626; NAKAO and MIZUNO, this cruise report).

Between Sts. 1625 and 1623, the sea floors of 4.0–4.4 km deep are underlain by sediments with somewhat different acoustic stratigraphy. At the uppermost part, a transparent layer of 0.10–0.15 sec thick appears. Its nature is similar to Unit I-Type C. It is underlain by a strong reflector in some places, which passes to less strong or diminishes in other places. The lower part (below the reflector) is characterized by acoustic feature which seems to be indicative of turbidites origin. Local unconformity occurs within sediment sequence of about 0.9 sec thick. The acoustic feature of the sediments is very similar to that on the Manihiki High Plateau and Western Plateaus, and seems to be suggestive of distribution of calcareous ooze or chalk.

Along Line B, the Manihiki Eastern Plateaus is separated from the Penrhyn Basin by a high seamount with a peak of 2 km deep.

Penrhyn Basin

The Penrhyn Basin is characterized by slightly rolling topography of 5.2–5.3 km deep. Greater depth occurs in a faulted depression at the northern rim of the basin on Line A (5.7 km deep).

Acoustic feature is similar to that in the southern part of the southern Central Pacific Basin. Upon acoustic basement, an opaque layer of as much as 0.05 sec thick is distributed extensively but intermittently. This opaque layer may be correlated with Unit II. In most places, the distinction of the acoustic basement from the opaque layer is difficult. A transparent layer covers the opaque layer very locally (e.g., near St. 1617 and St. 1618), separated by a strong reflector. The transparent layer is possibly correlated with Unit I. The depression of the northern rim of the Penrhyn Basin on Line A is filled with finely stratified layer of 0.55 sec thick, suggestive of turbidite deposition and representing Unit I-II possibly. The distribution pattern of Unit II suggests that there had been regional tectonic movement of faulting after the formation of basement and deposition of Unit II.

Though we have no evidence of geologic ages of Unit I and Unit II in the Penrhyn Basin as yet, the results of drillings at DSDP Sites 316 and 318 suggest that the strong reflector probably of chert or cherty chalk could be of the early Oligocene.

Summary and conclusions

Sediment sequences on acoustic basement are divided into Unit I (above) and Unit II (below), in most areas of deep-sea basin along the Wake-Tahiti Transect, excluding the Manihiki Plateau region and other some places.

Unit II is represented by opaque layer occasionally stratified. It tends to thin systematically southward as a whole; 0.40–0.25 sec in the MPM area, 0.25–0.15 sec in the northern and middle parts of the Central Pacific Basin, 0.15–0.10 sec in the southern part of the basin and the North Tokelau Basin, and 0.05 sec in the Penrhyn Basin, in thickness. In many places the top of Unit II is accompanied by a strong reflector probably of chert or cherty chalk, which occupies the uppermost part of Cretaceous-middle Eocene (in most cases) sequence of Unit II.

Unit I, when present, is mostly represented by transparent layer (Type A). The thickest part as much as 0.35 sec thick is typically developed in deep-sea basin areas of the central Central Pacific Basin (except for knoll or seamount areas). The unit is diminishingly thin or missing in the northern and southern regions of the transect in general and also in knoll or seamount areas of the central Central Pacific Basin. From existing lithologic data, together with our's, Unit I in the northern and southern regions may consist of pelagic (occasionally zeolitic) clay, but that in the central regions of siliceous ooze or siliceous clay. Unit I includes, exceptionally, coherent very fine reflections (Type C), possibly caused from mid-Tertiary turbidites deposition, near the Magellan Rise.

Unit I/Unit II boundary may be fluctuated from middle Eocene to early Oligocene time, being possibly some diachronous throughout the transect. The boundary shows a deep-sea hiatus between Unit I and Unit II, occasionally accompanied by erosion or tectonic movement inbetween, in some places of the MPM area and northern-central part of the Central Pacific Basin.

Quite different acoustic facies of Unit I-II occurs in the immediately north of the Nova-Canton Trough and the immediately south of the Manihiki Plateau. It is represented by very thick sequence of acoustically coherent reflections, suggestive of turbidite origin.

Main part of the Manihiki Plateau region is characterized by peculiar acoustic stratigraphy. The sedimentary sequence of 2.0 sec thick (at maximum) can not be described in terms of the unit division here adopted. On the Manihiki High Plateau, there is developed the sediment sequence of Cretaceous-Quaternary, characterized by transparency to subtransparency with weak stratification. Two marked reflectors within the sequence may represent the top of early Eocene cherty chalk and the top of Maestrichtian-Aptian rocks, and they are traceable throughout the High Plateau. The former reflector is supposedly continued to the southern part of the Manihiki Western Plateaus. This and characteristics of acoustic feature suggest that almost identical sedimentation has occured through the High Plateau and the southern part of the Western Plateaus at least during the late Eocene-Quaternary time. Main part of the Eastern Plateaus consists of Unit I-II with coherent reflections of 0.25 sec thick, which suggest a calcareous turbidites accumulation derived from the Manihiki High Plateau during the Cretaceous-Quaternary time. Other parts of the Manihiki Plateau region show almost similar acoustic feature as part of the southern Central Pacific Basin, consisting of Unit II and rather poorly developed Unit I.

Summarinzing the above descriptions, both units, Unit I and Unit II show quite different features of distribution of thickness and acoustic facies. Unit I is characterized by regionally varying thickness and acoustic facies, whereas Unit II tends to be gradually thinned toward the south as a whole, having nearly identical, opaque acoustic facies in deep-sea basin. Unit I, resting on Unit II with deep-sea hiatus in part, is represented by thick transparent layer resulted from fast accumulation of siliceous sediments in deep-sea basin area of the central region of the transect, whereas the unit tends to be diminishingly thin on deep-sea knolls. Unit I in the northern and southern regions of the transect is thinned, with transparency or reflective horizon contributed by slow accumulation of pelagic clay. In some deep-sea basins near large seamount, ridge, and plateau, Unit I is characterized by mid-Tertiary turbidites origin coherent acoustic nature (near the Magellan Rise), or the entire sedimentary sequence of Unit I-II is represented by the same acoustic nature (near the Nova-Canton Trough and the Manihiki High Plateaus), suggesting turbidites deposition through the Cretaceous-Quaternary time. On shallower bottom of the Manihiki High Plateau and parts of the Manihiki Western and Eastern Plateaus, there has been accumulation of calcareous ooze/chalk during the late Eocene to Quaternary, which is represented by transparent or subtransparent acoustic facies with weak stratification. The bottoms of the Magellan, the Nova-Canton, and the Danger Islands Trough are filled with sediments of different acoustic nature from each other, showing different sedimentary processes during geologic ages. Markedly different sedimentation occurred even within the same trough, as seen in the Nova-Canton Trough.

Cenozoic hiatuses in the Pacific Ocean have been discussed by DOUGLAS and MOORE (1973), VAN ANDEL *et al.* (1975), MOORE *et al.* (1978), and others. The authors established the most marked, widespread Tertiary-Cretaceous hiatus and the middle-late Eocene one well developed as well. On our profiles, the former is possibly hidden in the opaque reflections of Unit II, but the latter may be represented by the discontinuation of Unit II and Unit I, which appears to be concentrated in the northern hemisphere part of two survey lines. The middle Eocene unconformity seen on the Manihiki High Plateau (SCHLANGER, JACKSON, *et al.*, 1976) and possibly the hiatus found in the southeastern area of the Manihiki Eastern Plateaus may correspond with the above-cited middle-late Eocene hiatus. A mid-late Neogene hiatus has been also described and discussed in relation to origin of manganese nodules in the eastern margin of the northern Central Pacific Basin (MIZUNO, *ed.*, 1981). This is not evidenced in the transect. Our piston core data (NAKAO and MIZUNO, this cruise report) ellucidate existence of hiatuses in various levels from Neogene to Quaternary in many places including the Manihiki Plateau region, but these are not detectable in the seismic records, too.

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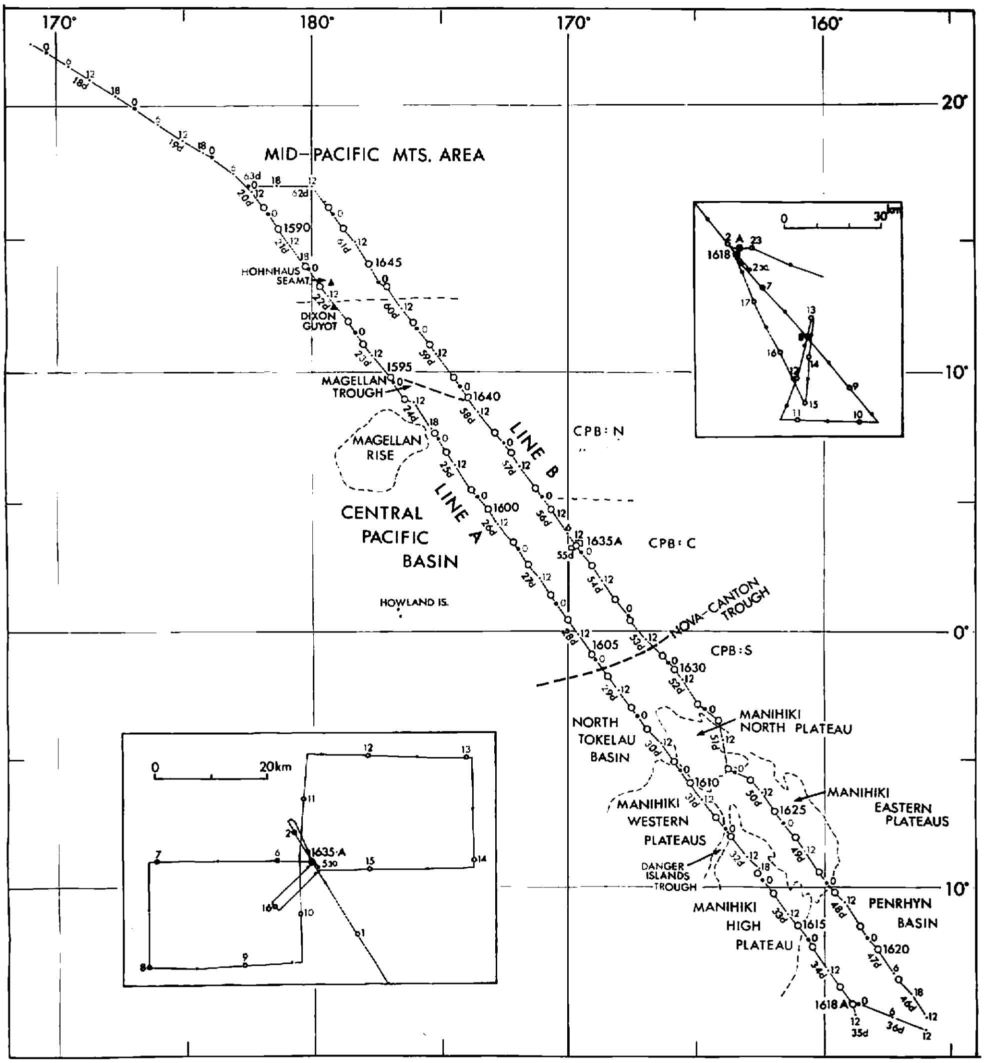
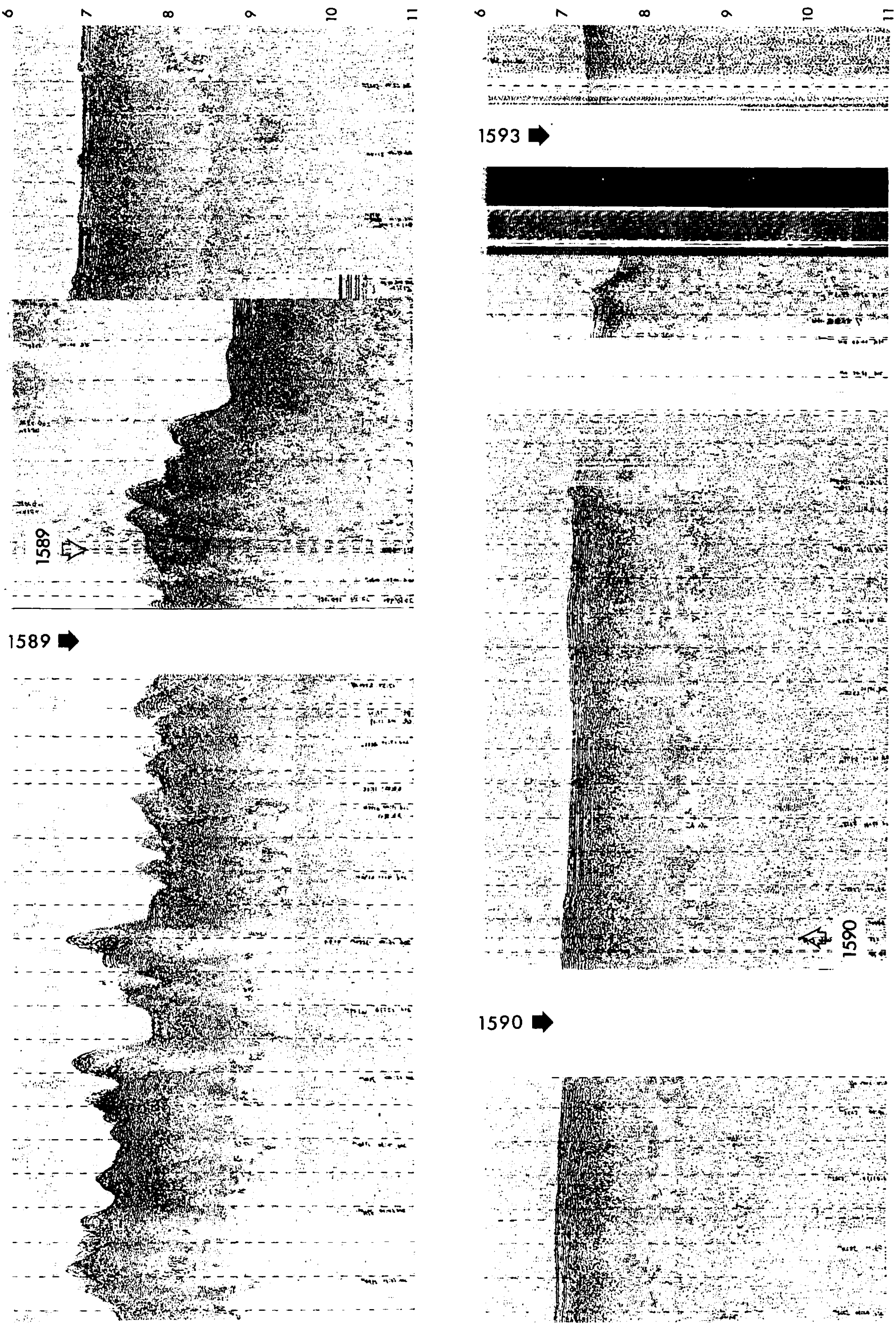


Appendix III-1 Survey tracks (Lines A and B) denoted with positions of the mid-night (0) and the noon (12) of each day (19d–36d and 46d–63d). Open circle shows sampling site. See Fig. III-1 for general bathymetry and location of DSDP holes. Reproduced from Fig. I-3 of this cruise report.

Appendix III-2 All the 5-sec sweep records along Line A (A1–A13) and Line B (B1–B14). Two-way acoustic travel time is shown in right (in principle), left, or inside of each profile, in seconds. Heavy solid arrow and open one indicate break of the survey by bottom-sampling operation and passing of the ship on sampling site, respectively. The profiles along each line from north to south are arranged from left to right and from top to bottom on successive each page.



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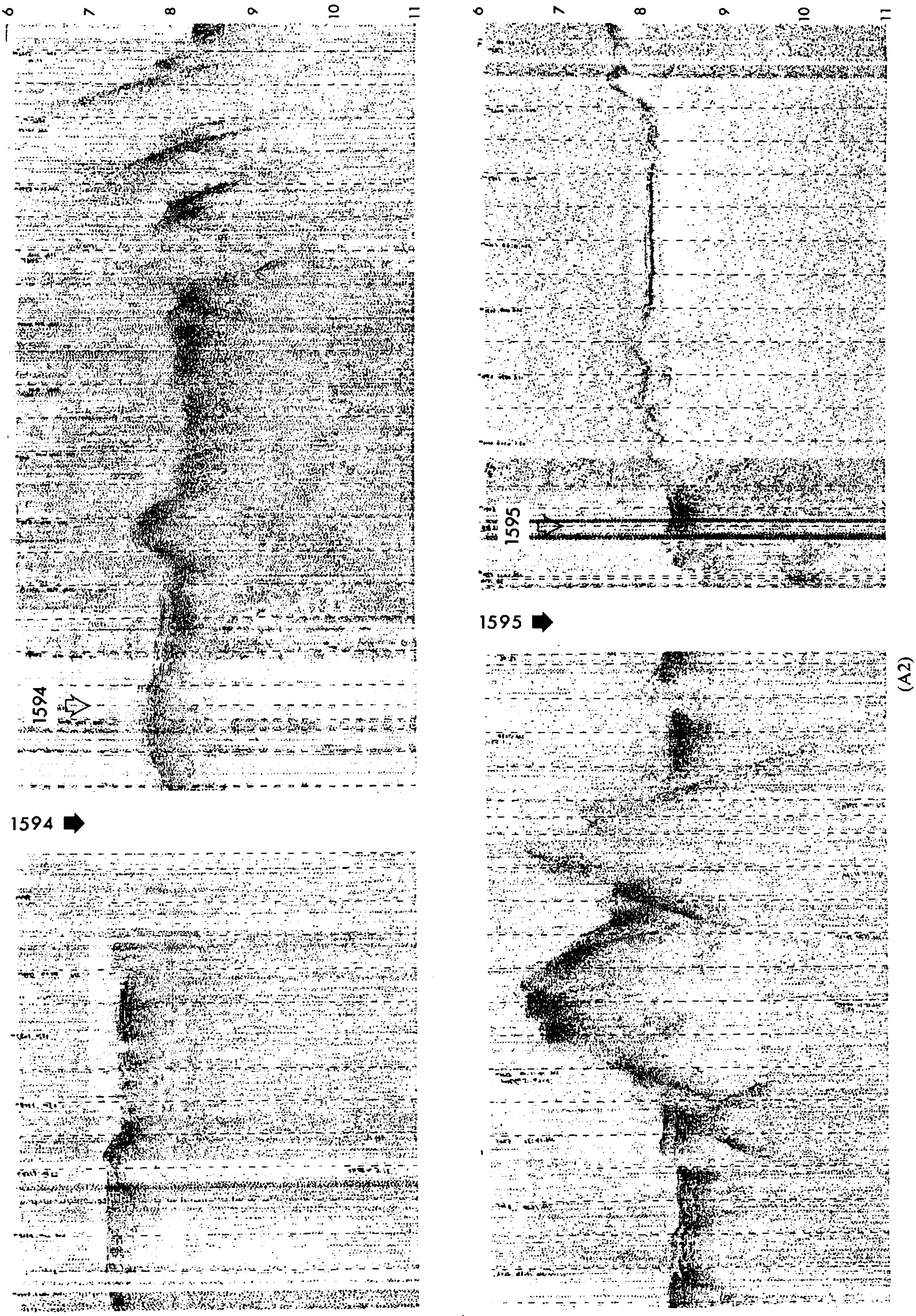

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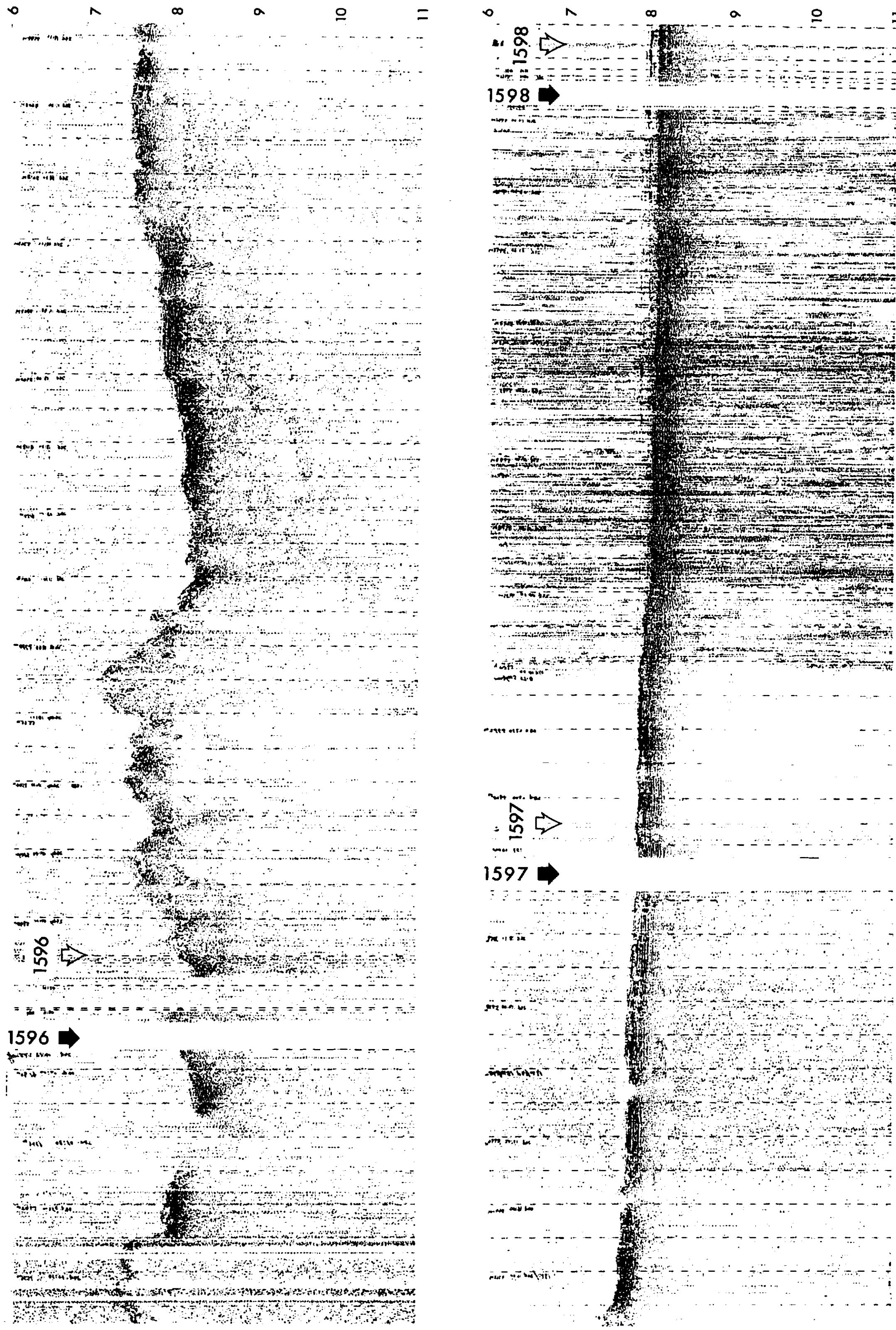

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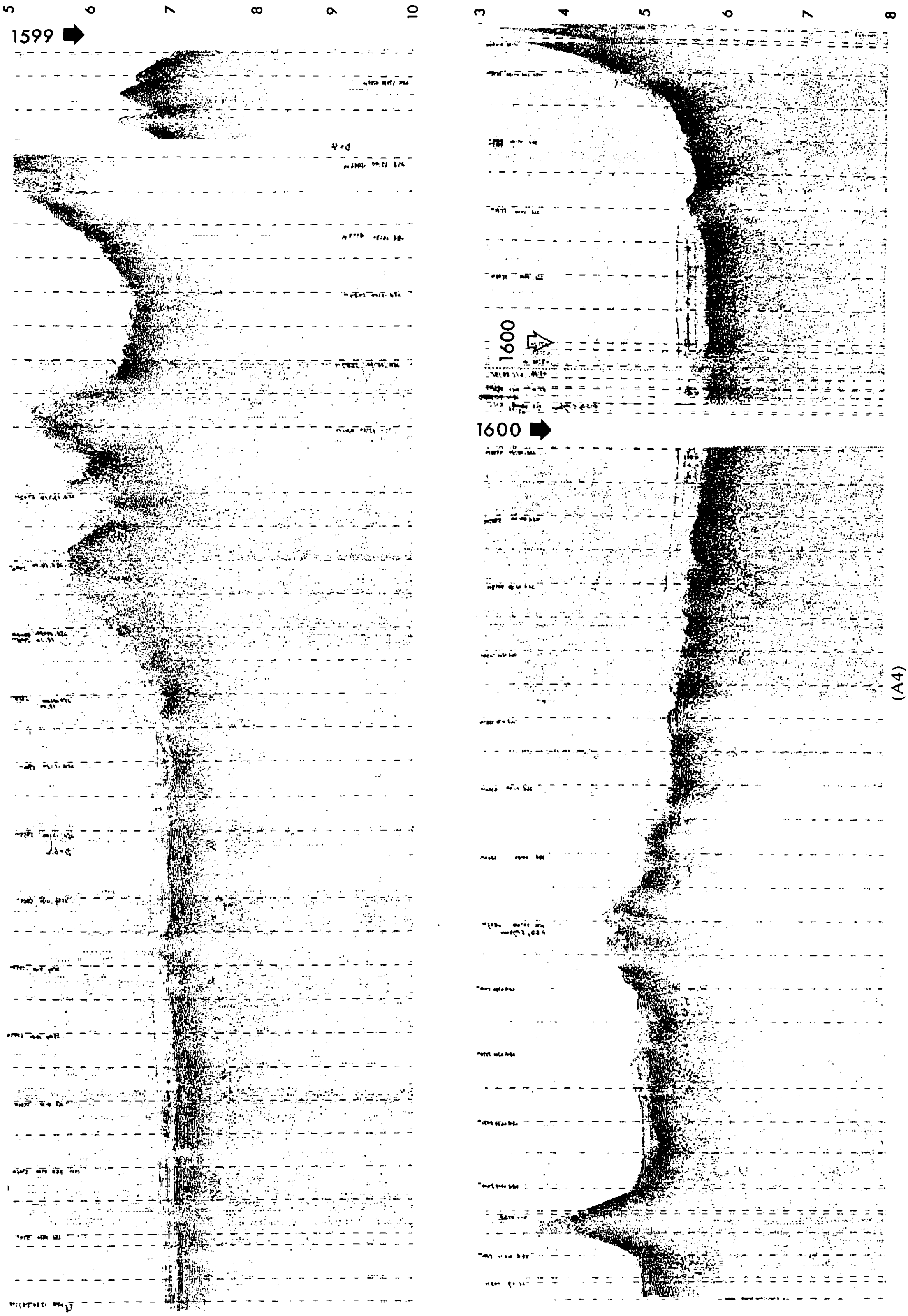
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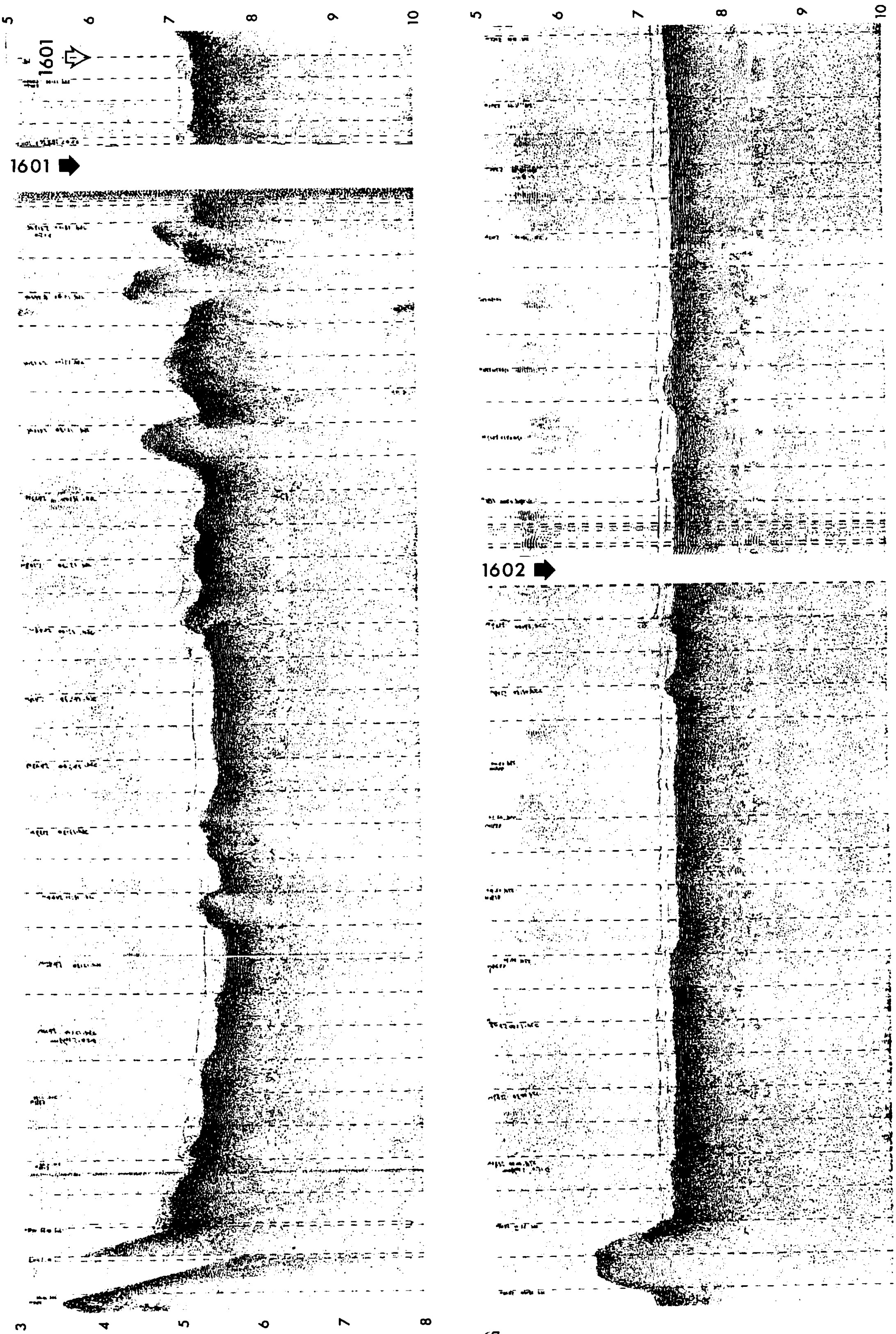

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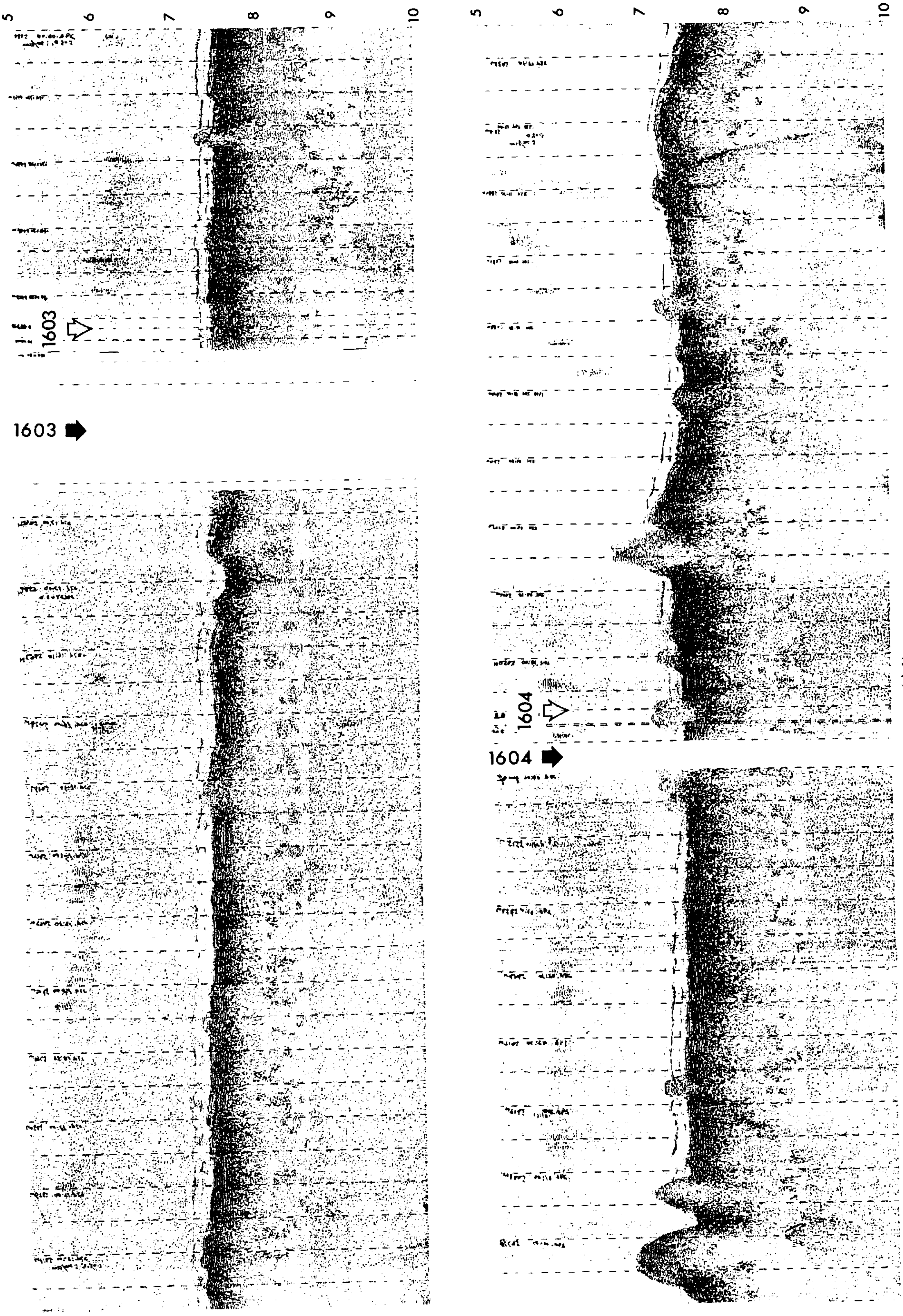

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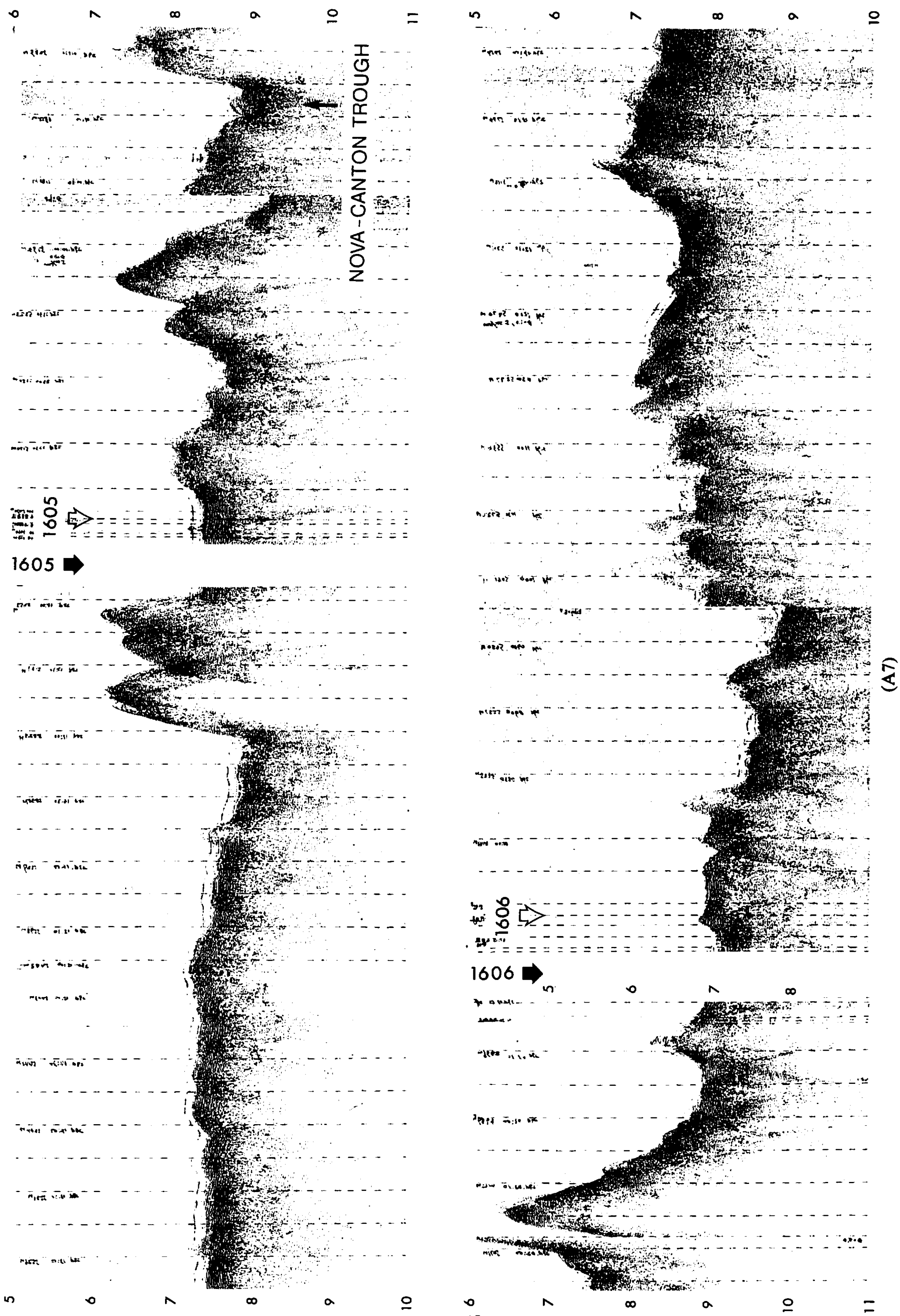

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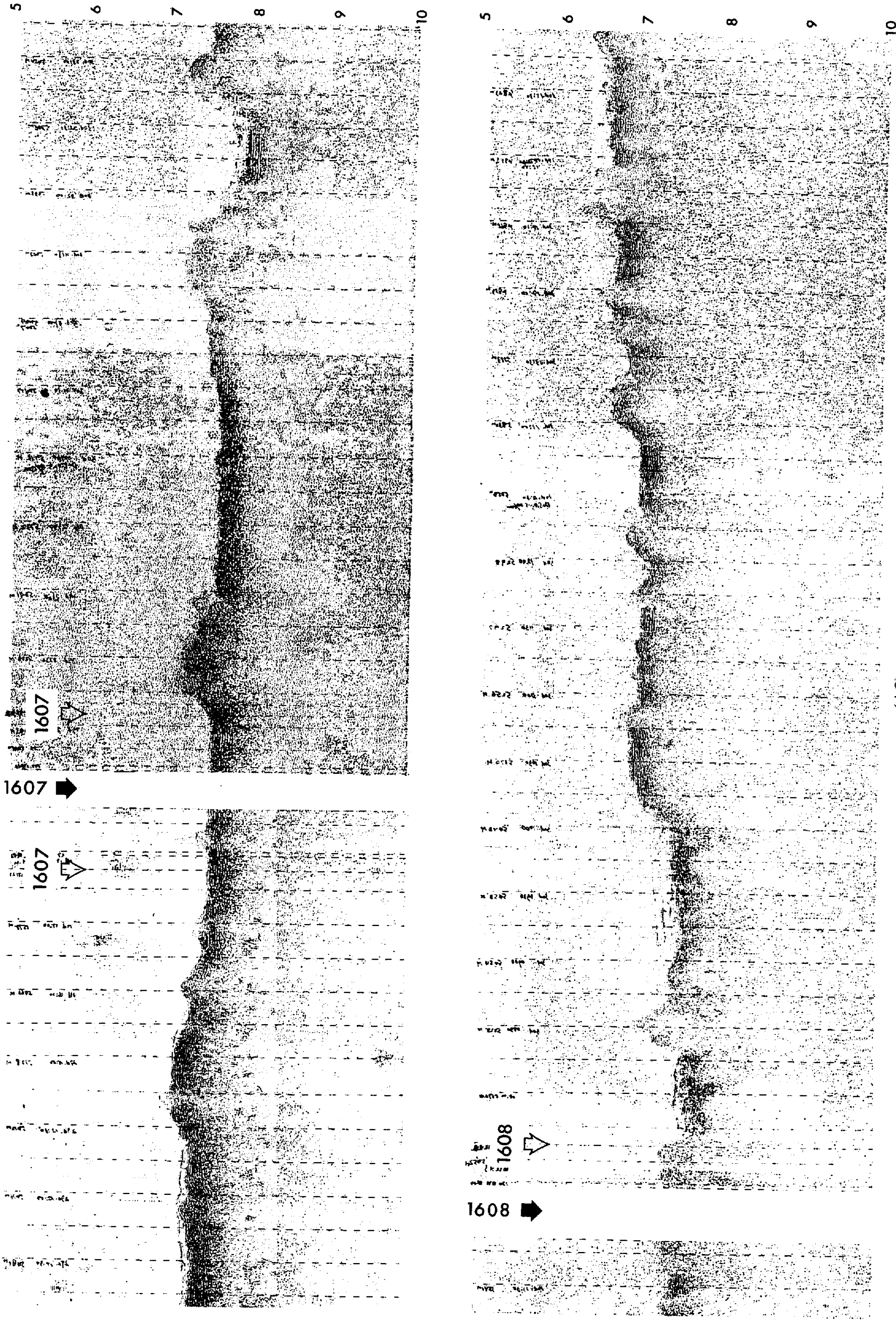

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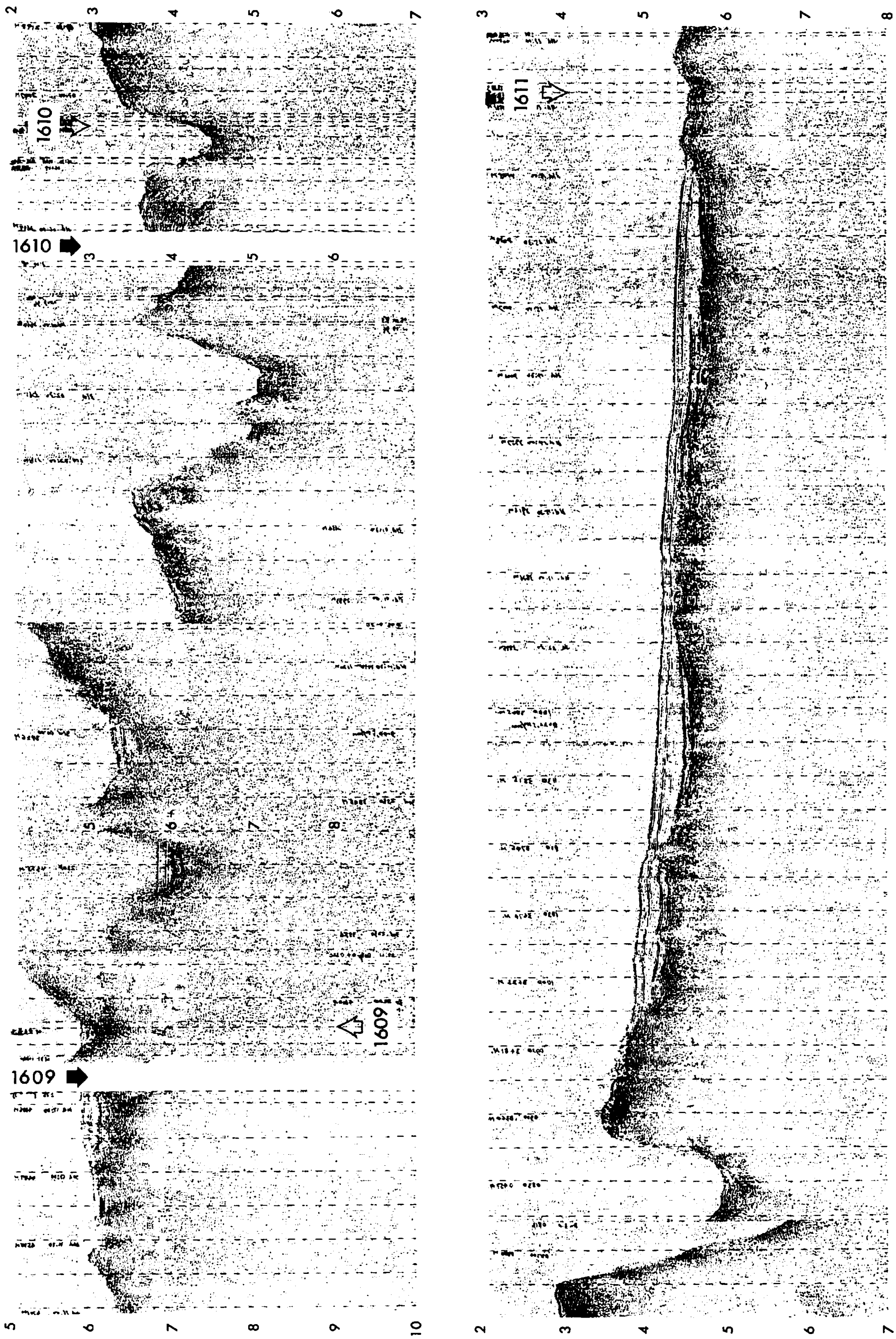

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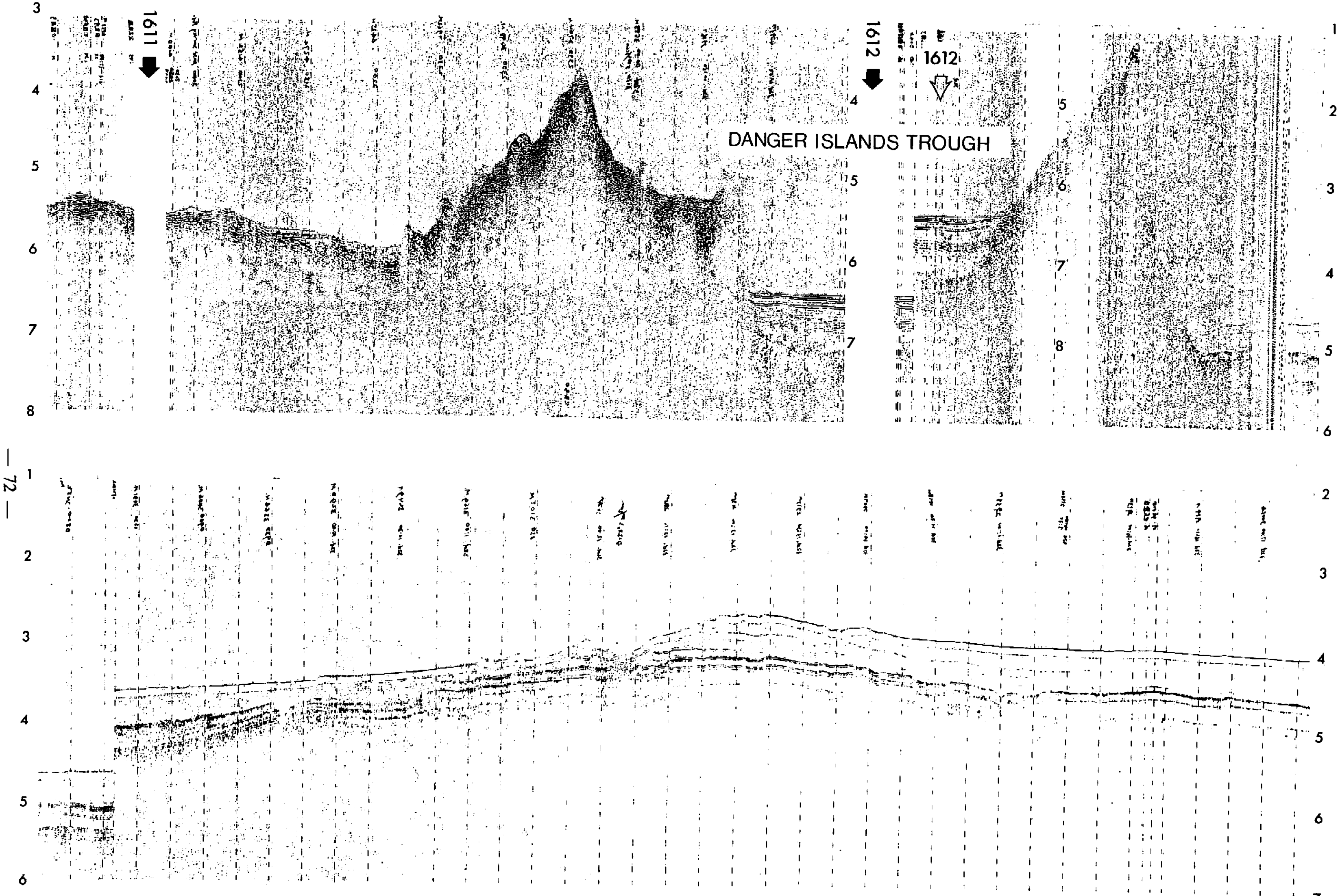

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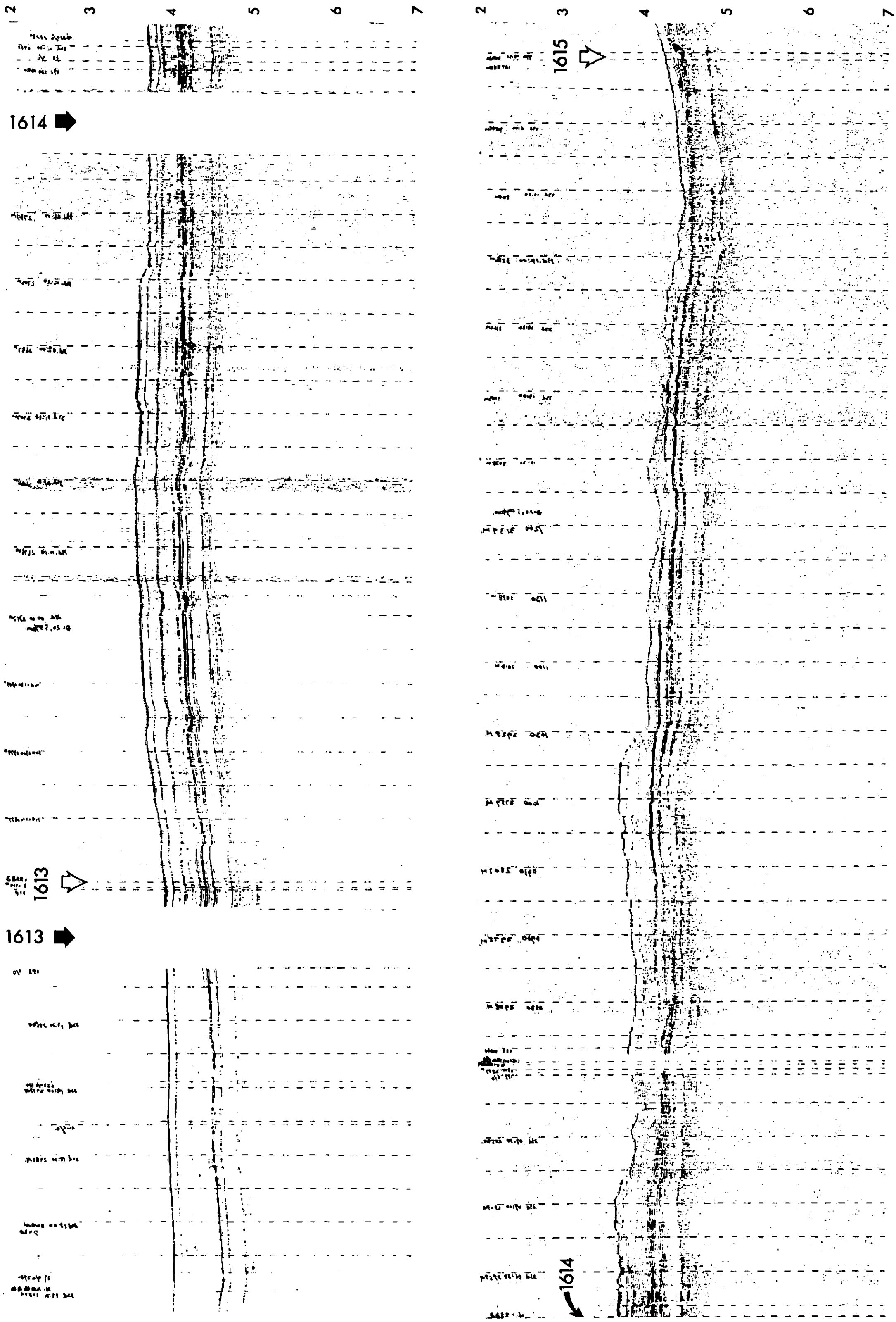

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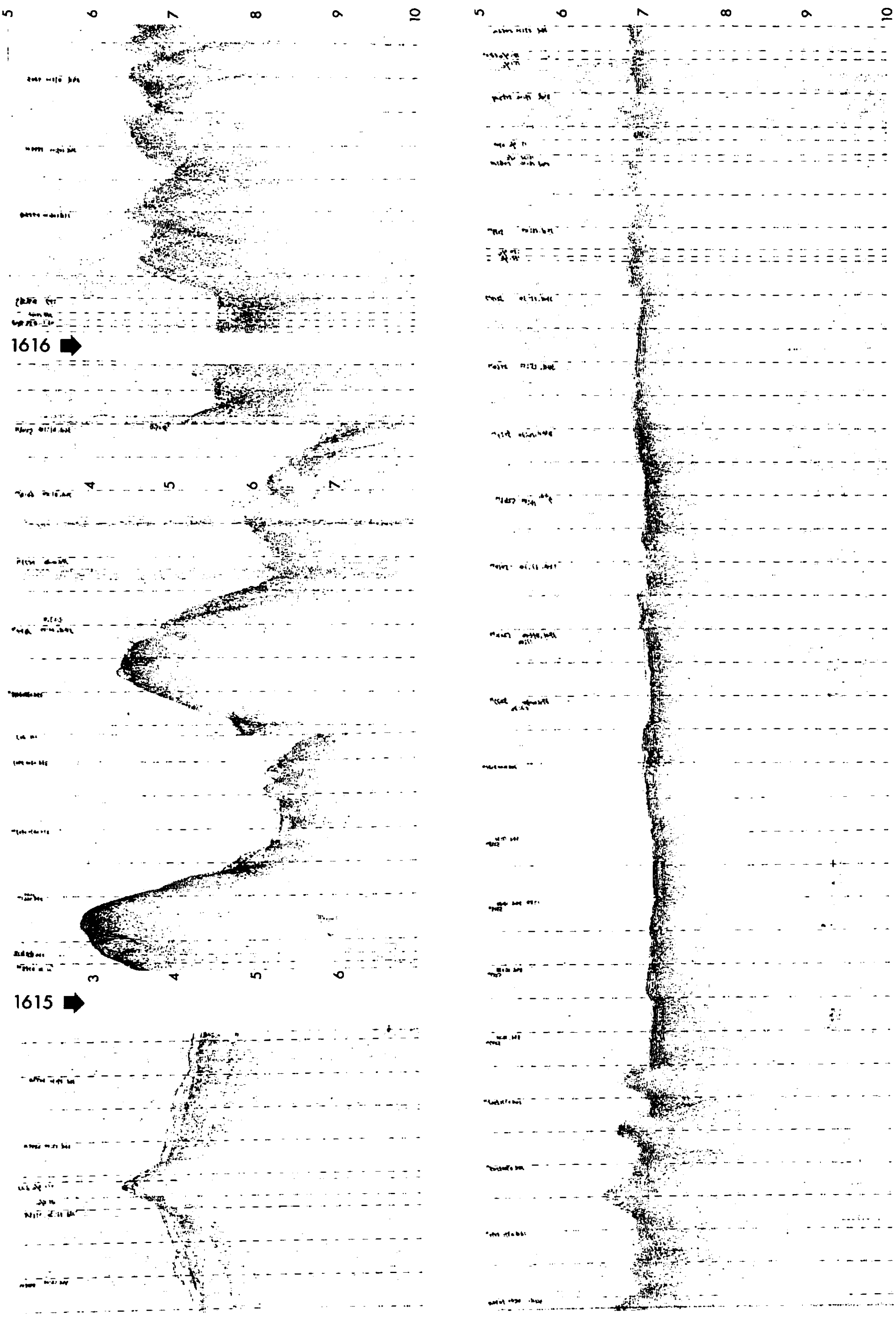

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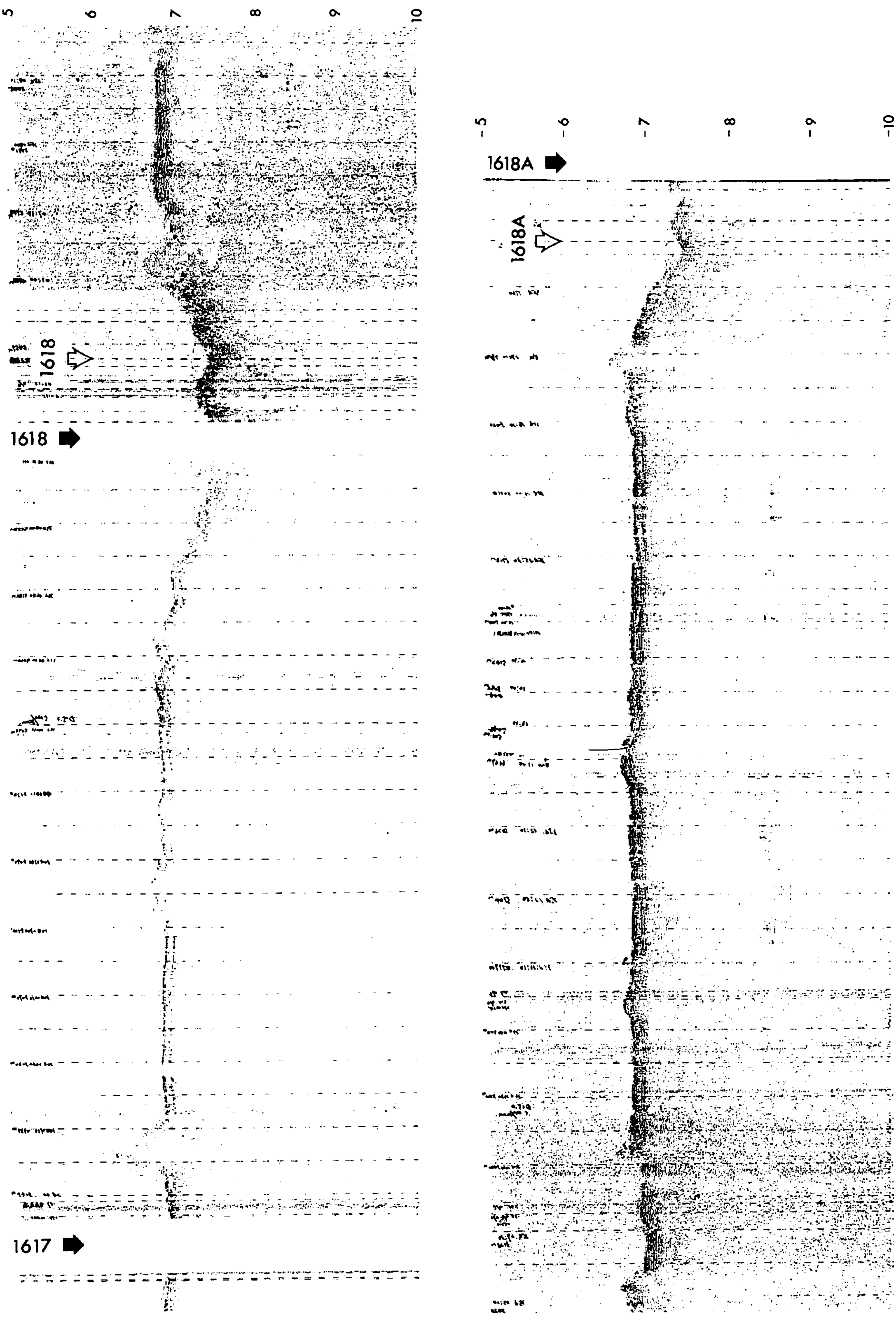

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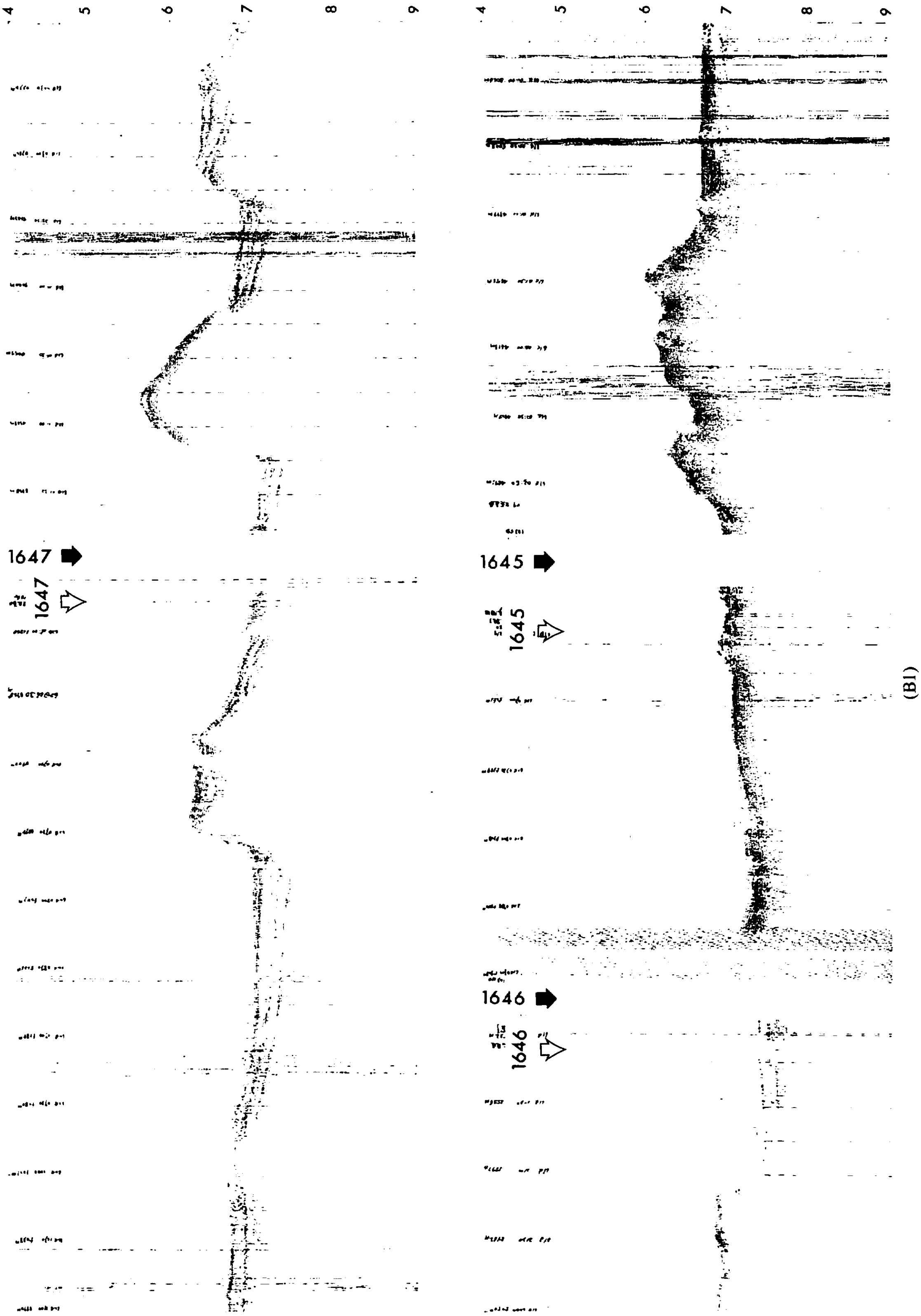
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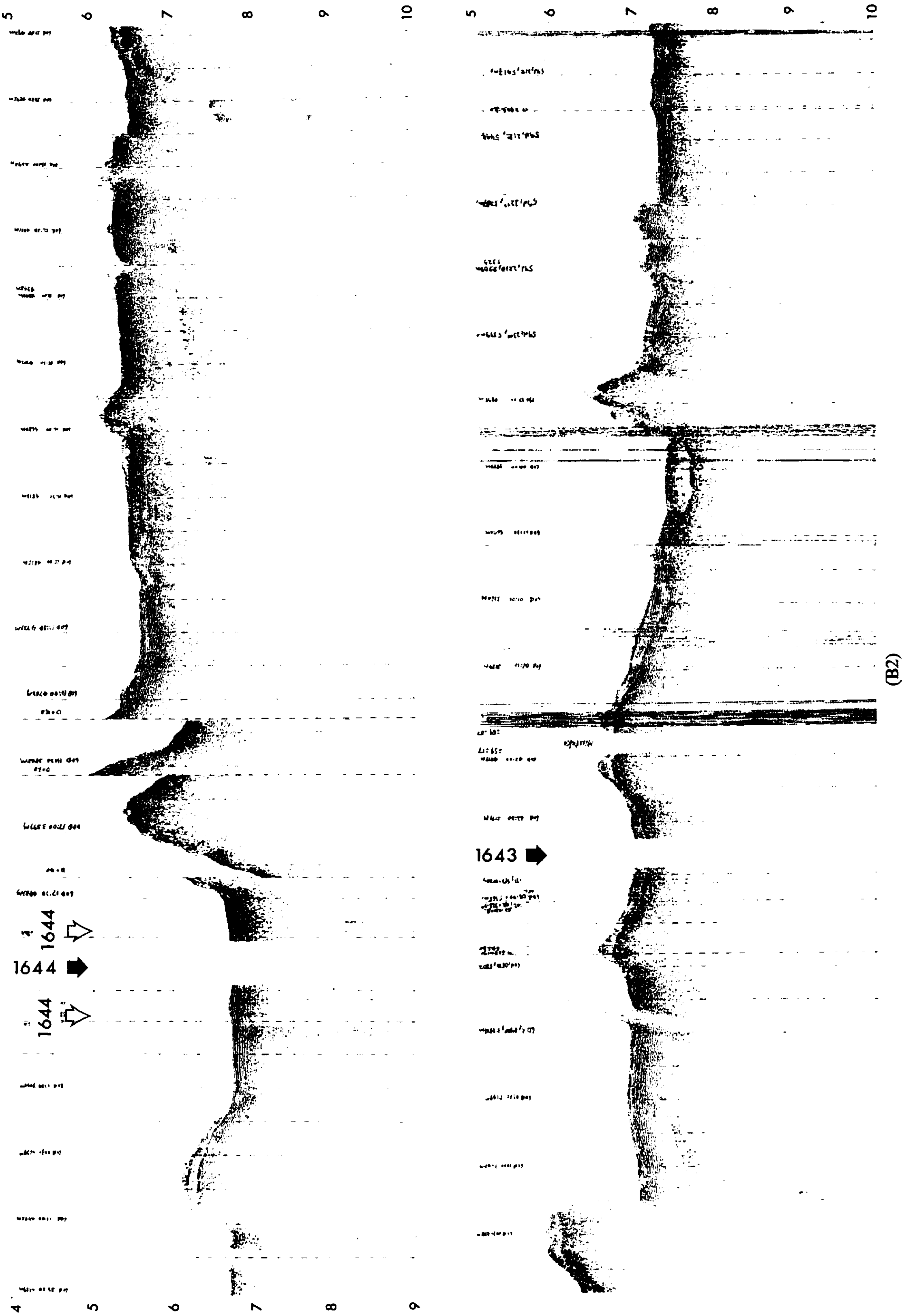
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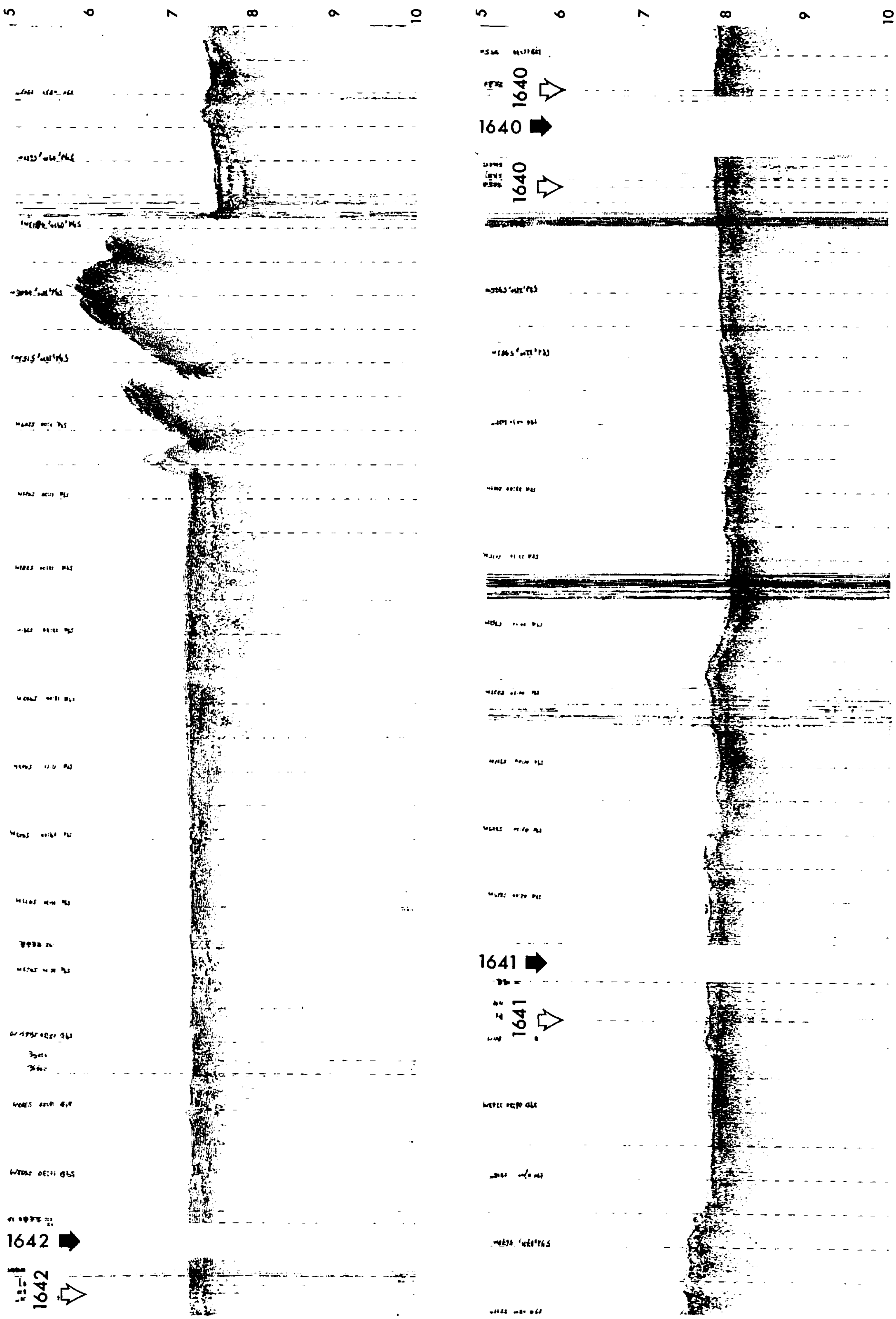

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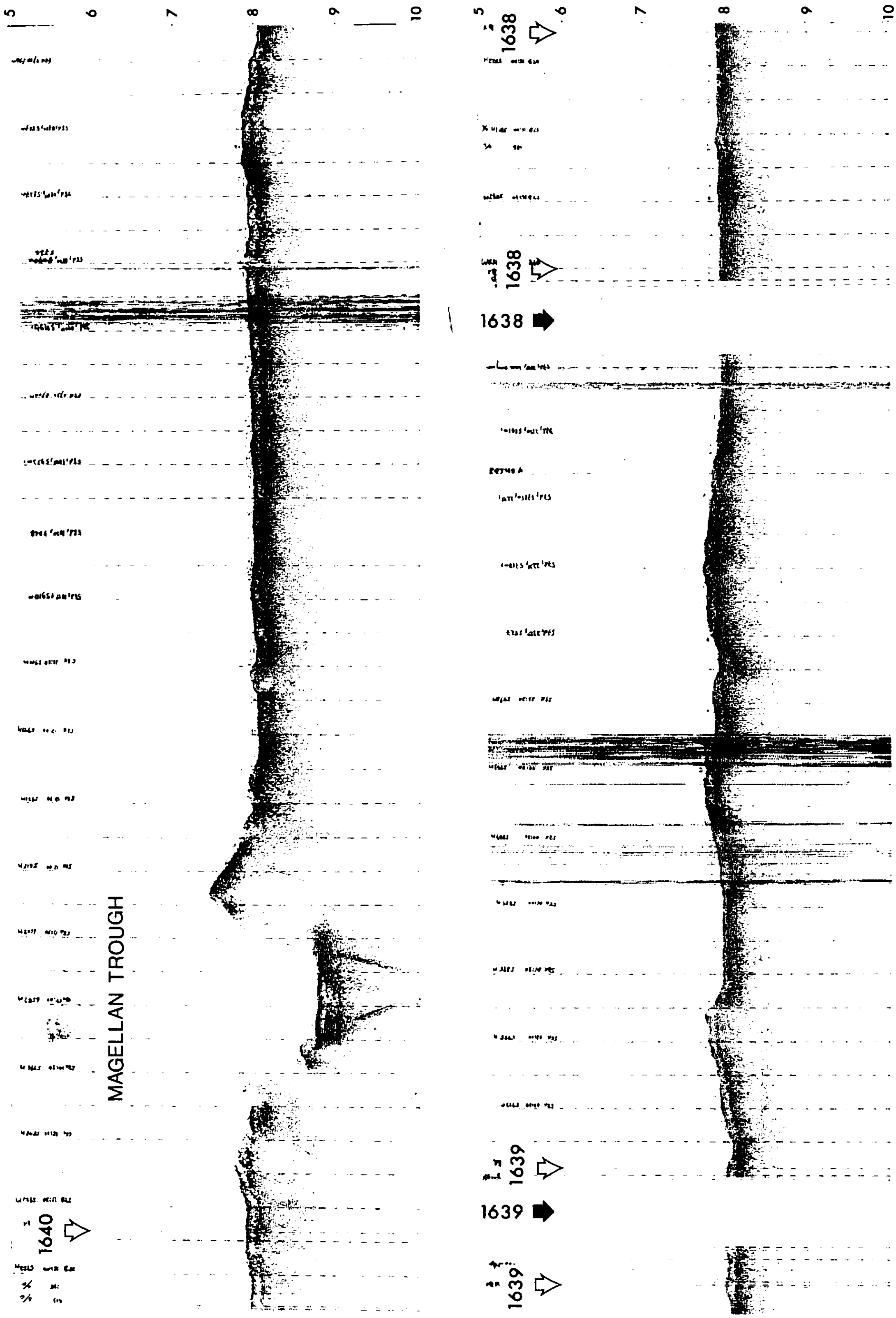

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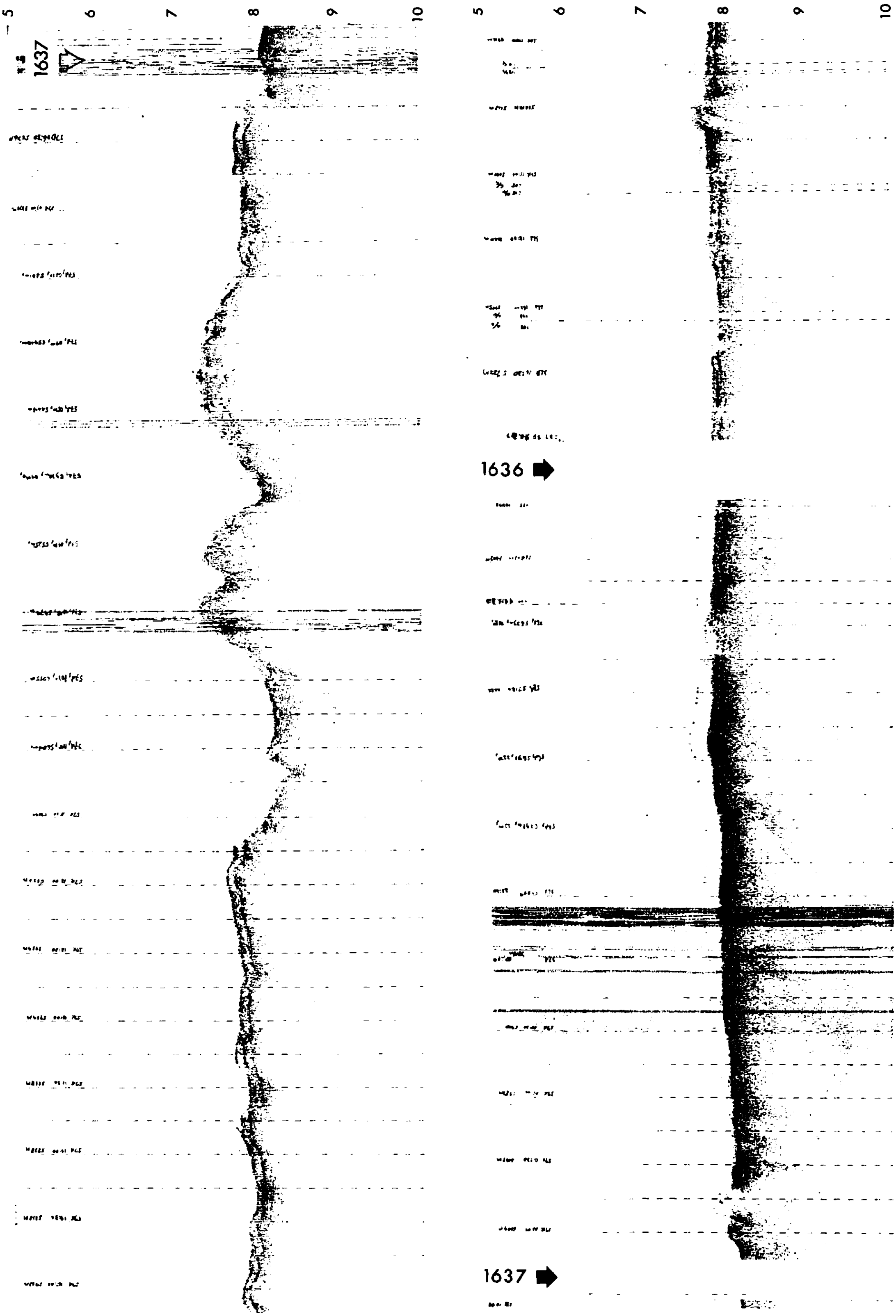

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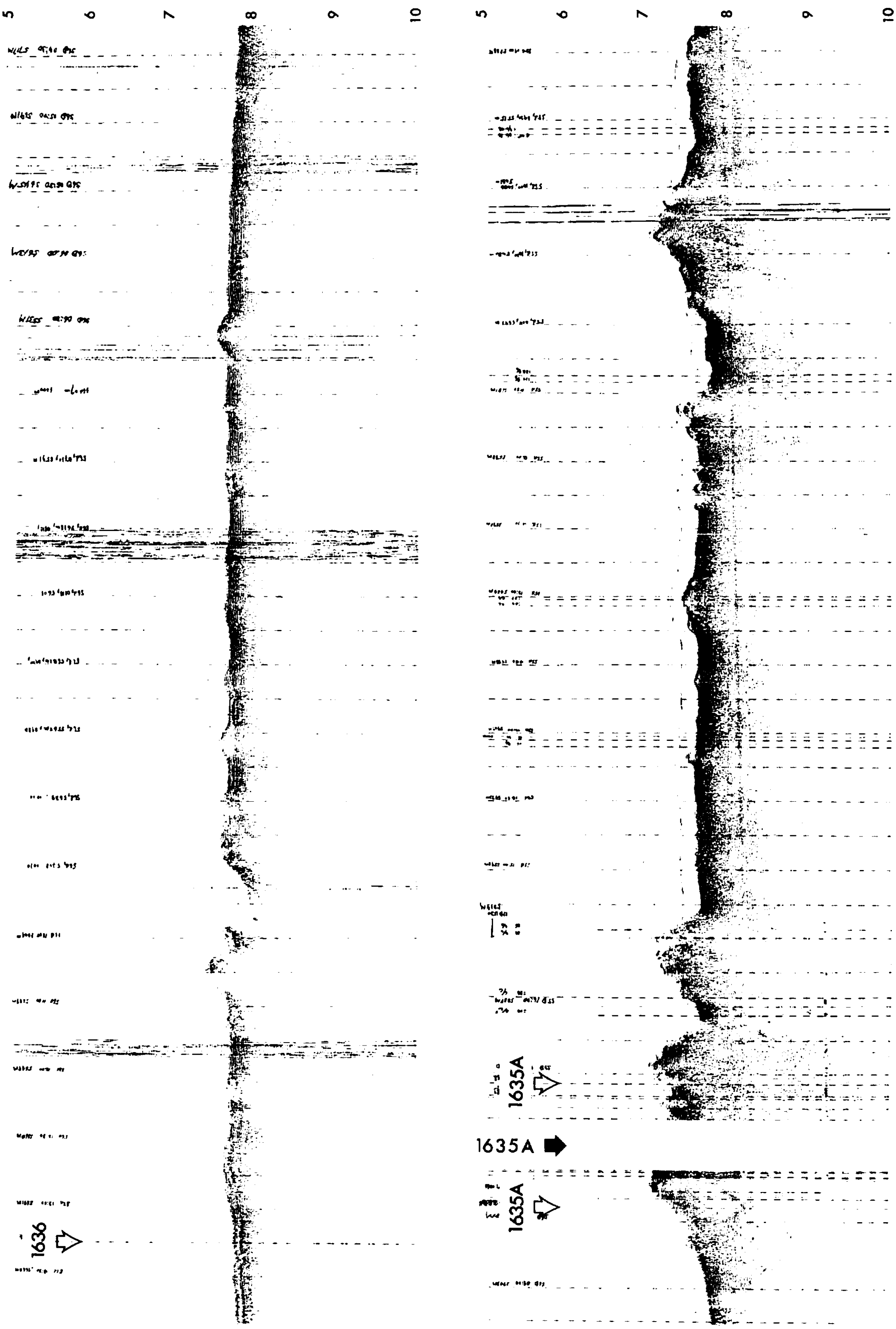

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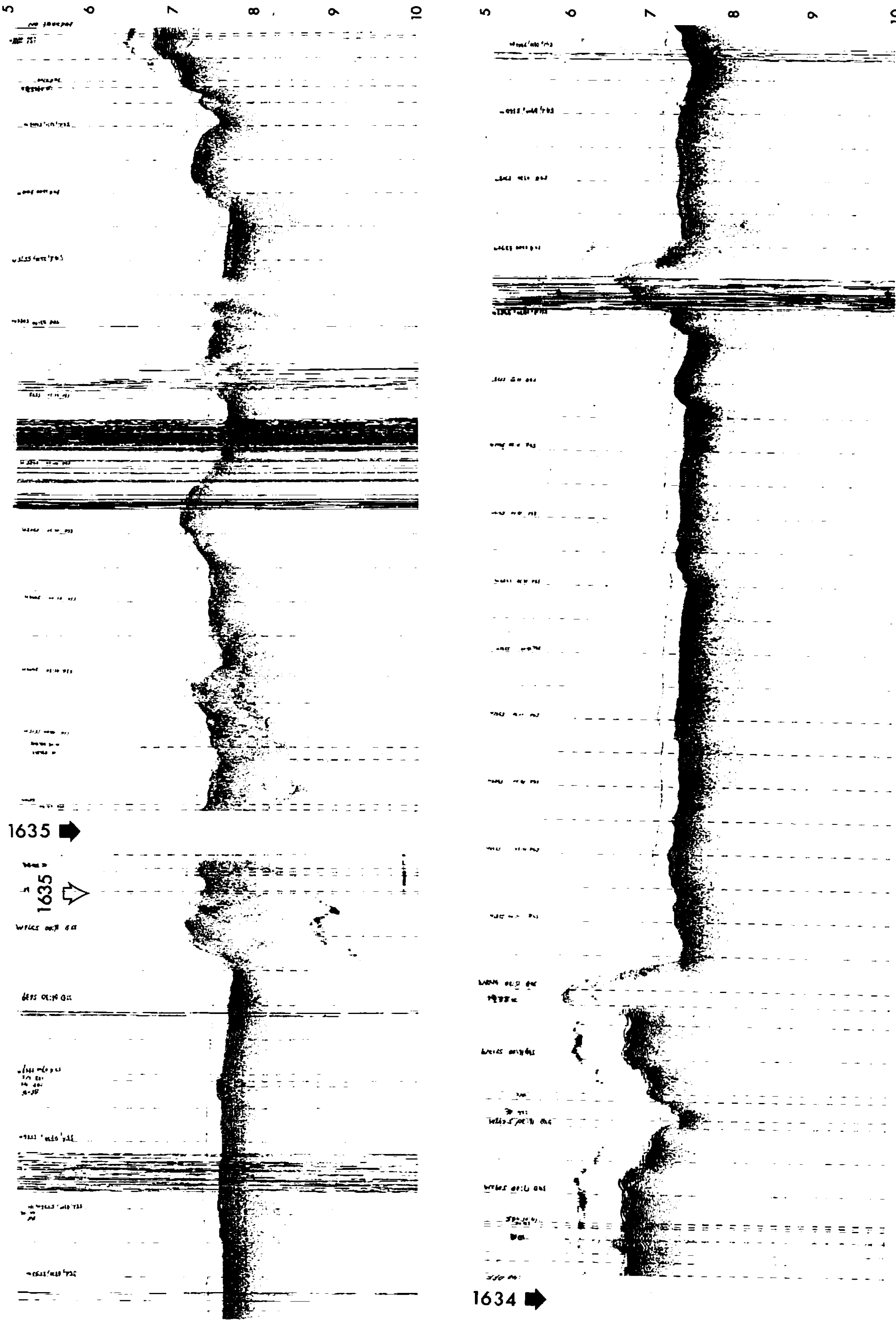

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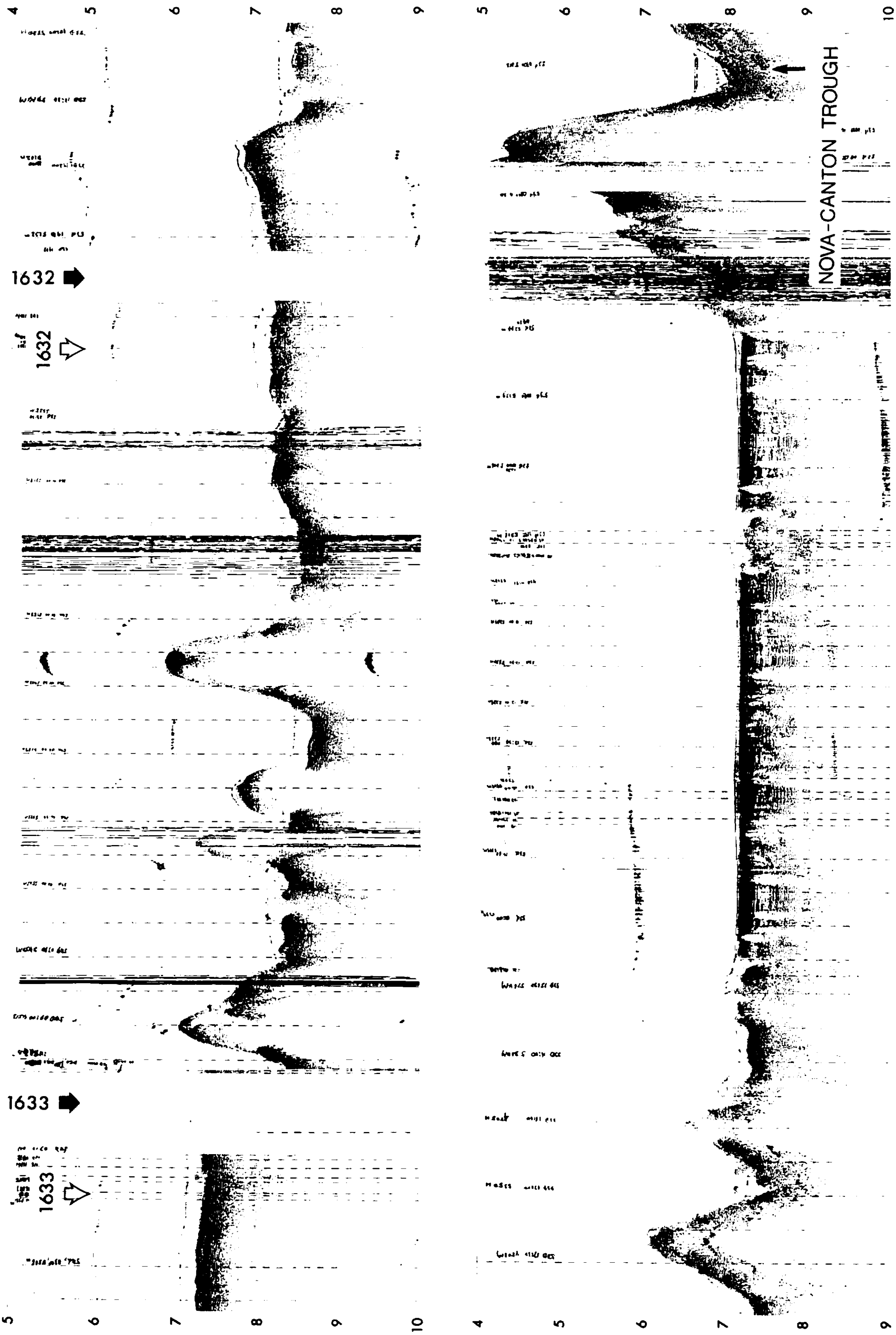

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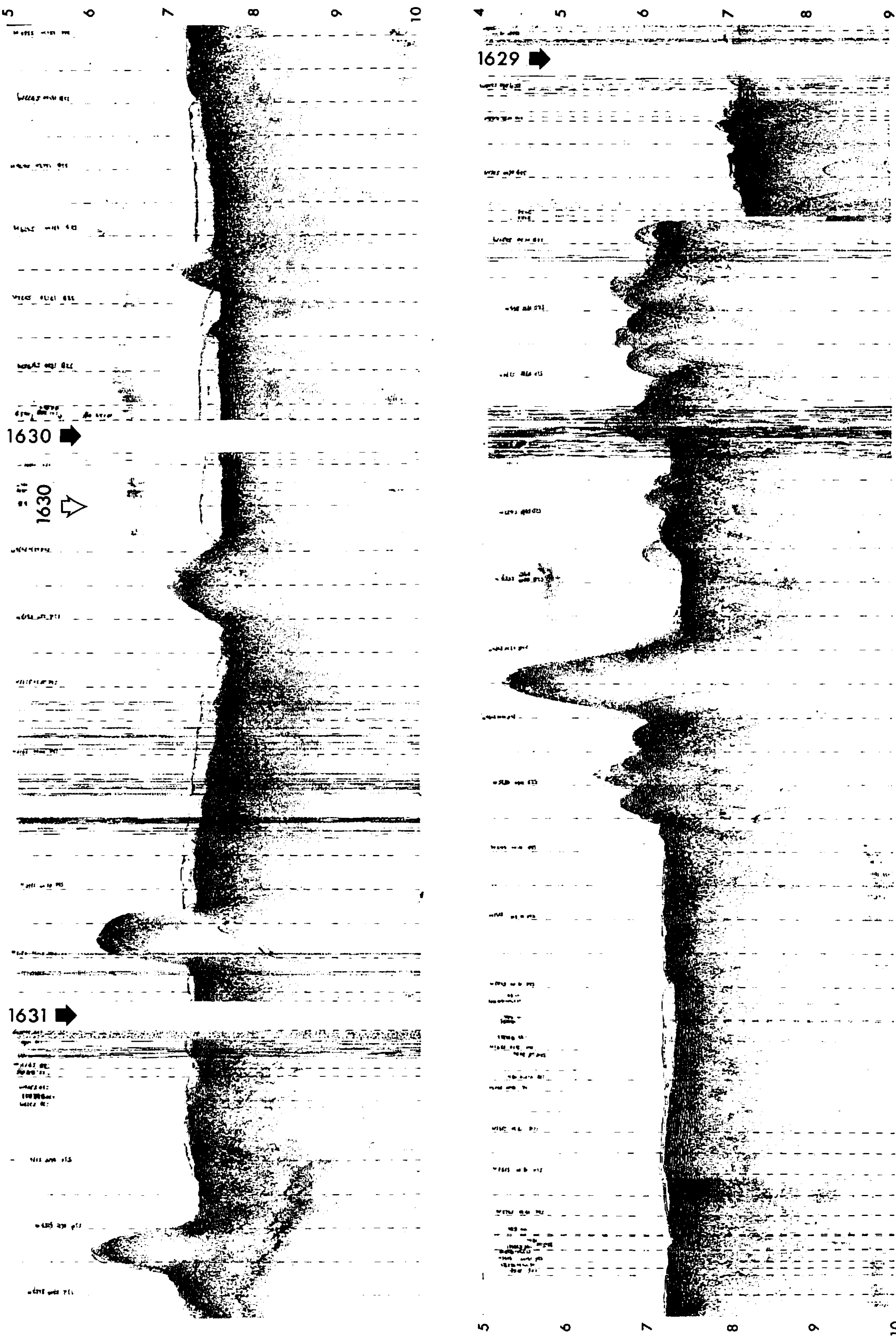

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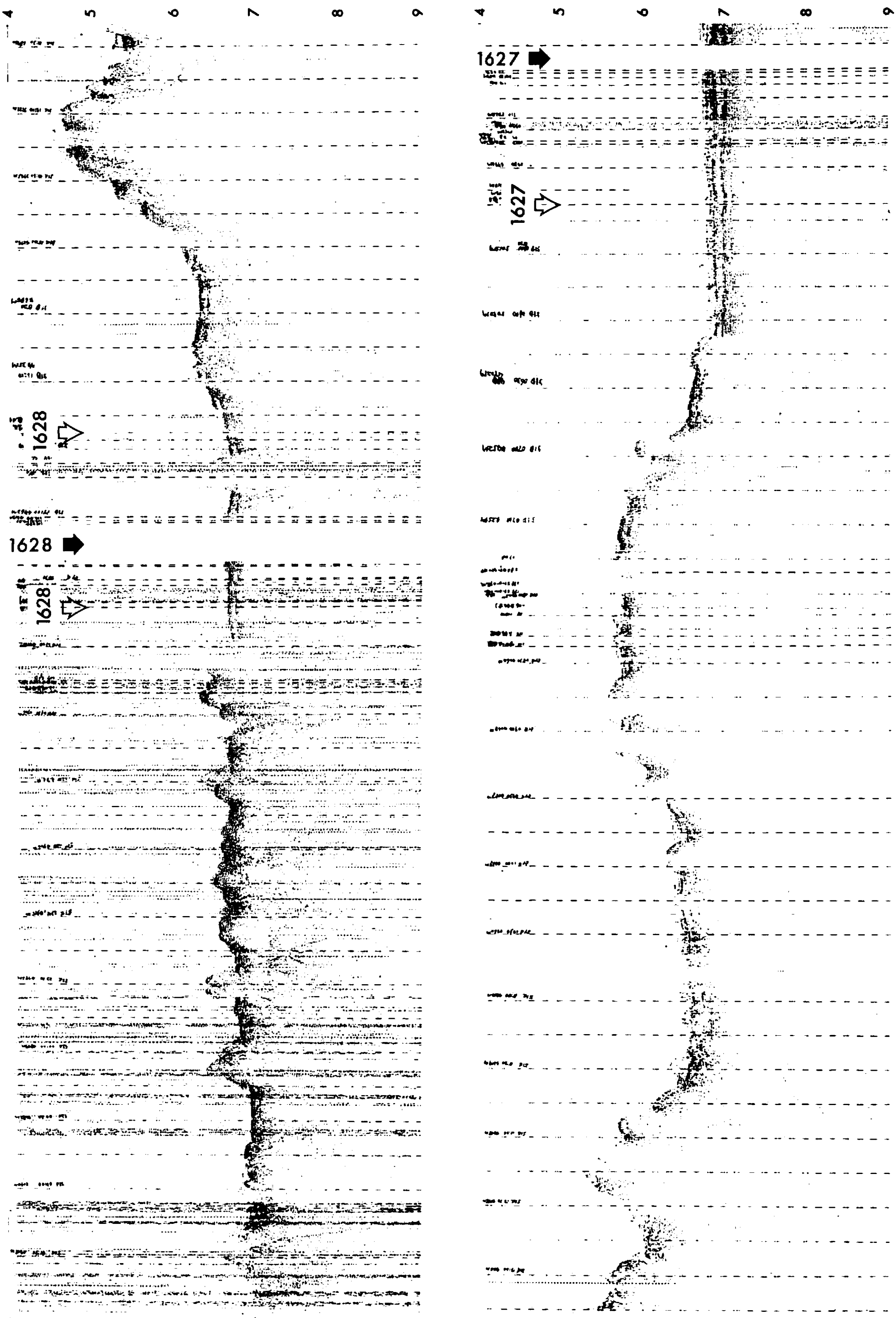

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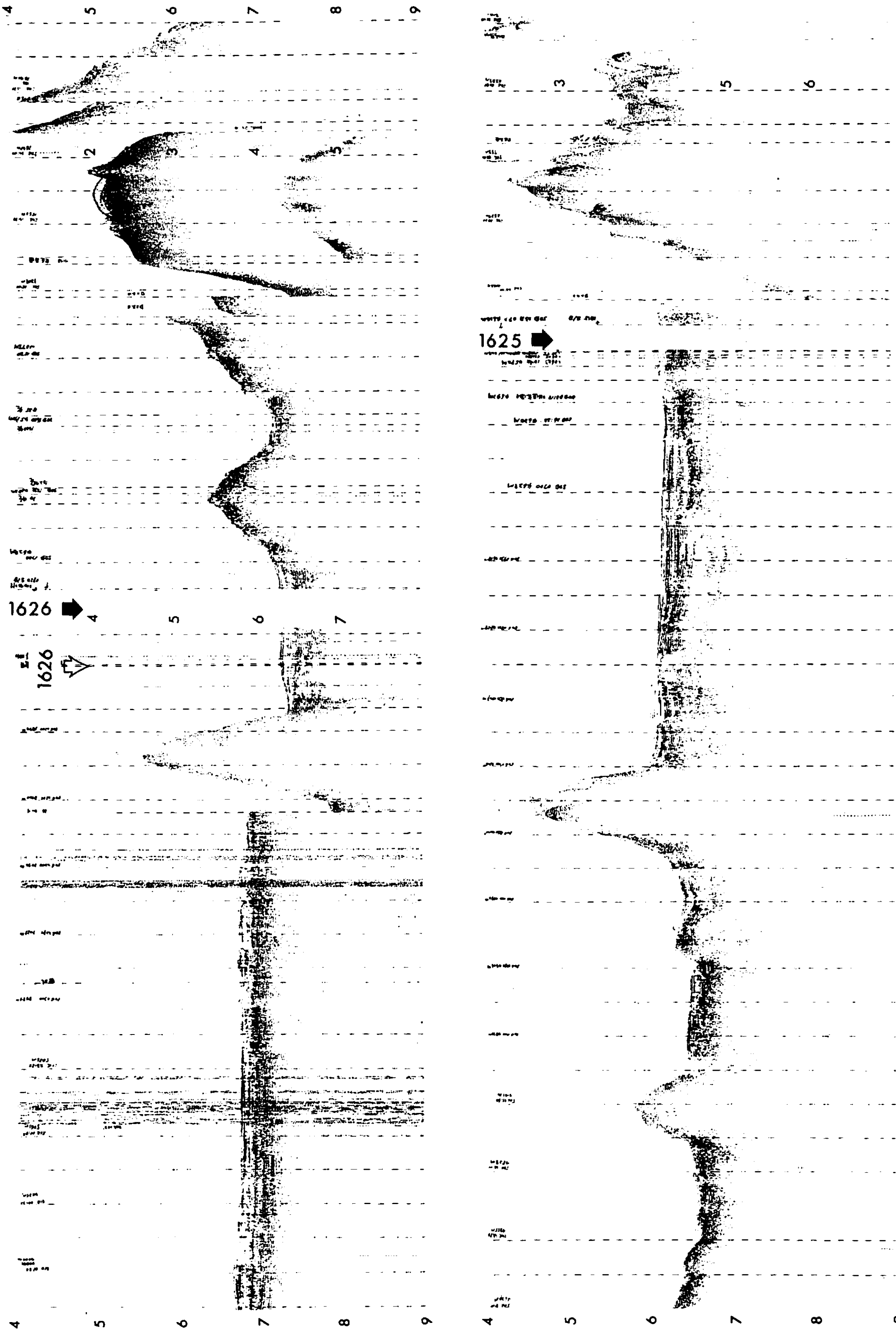

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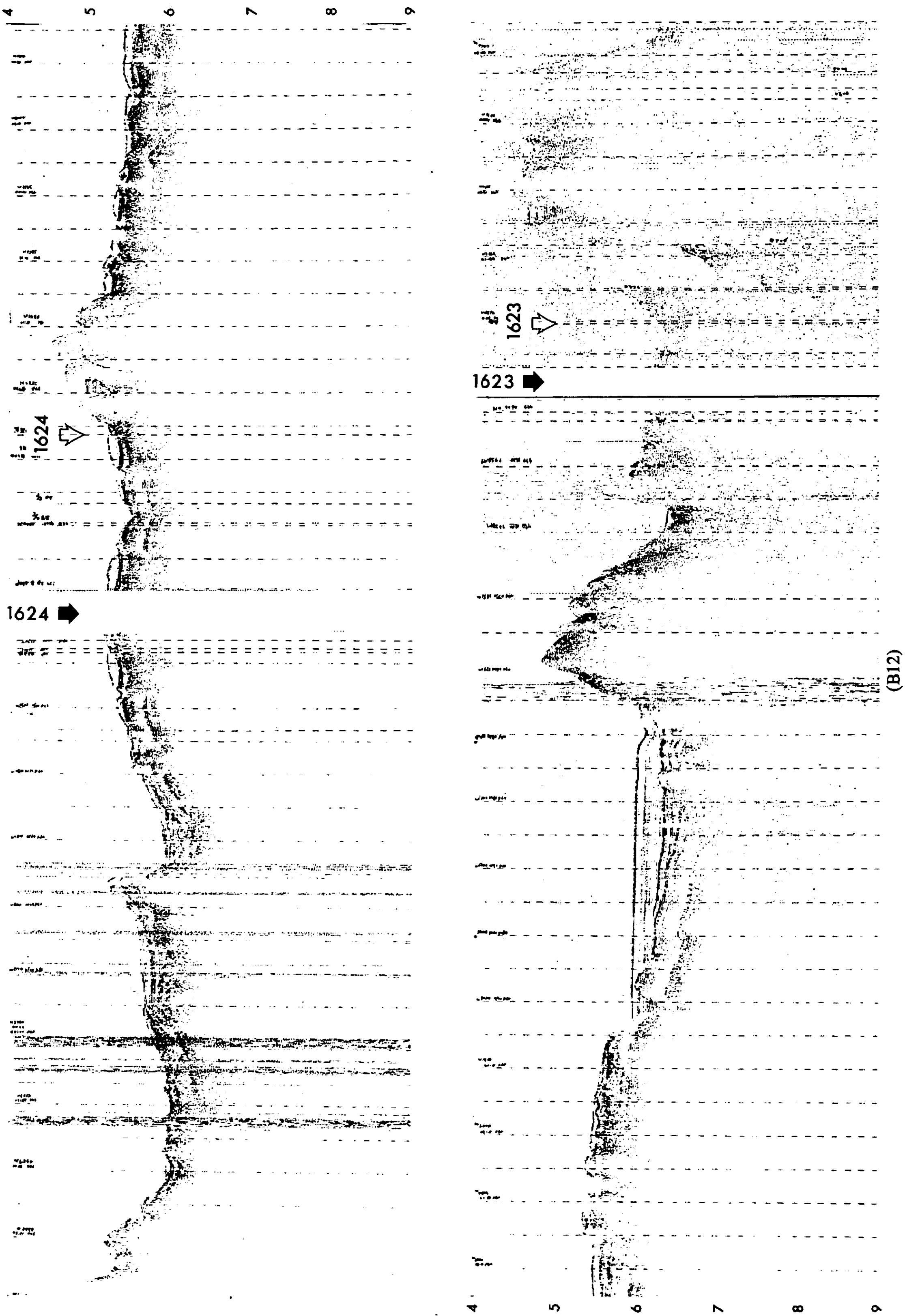
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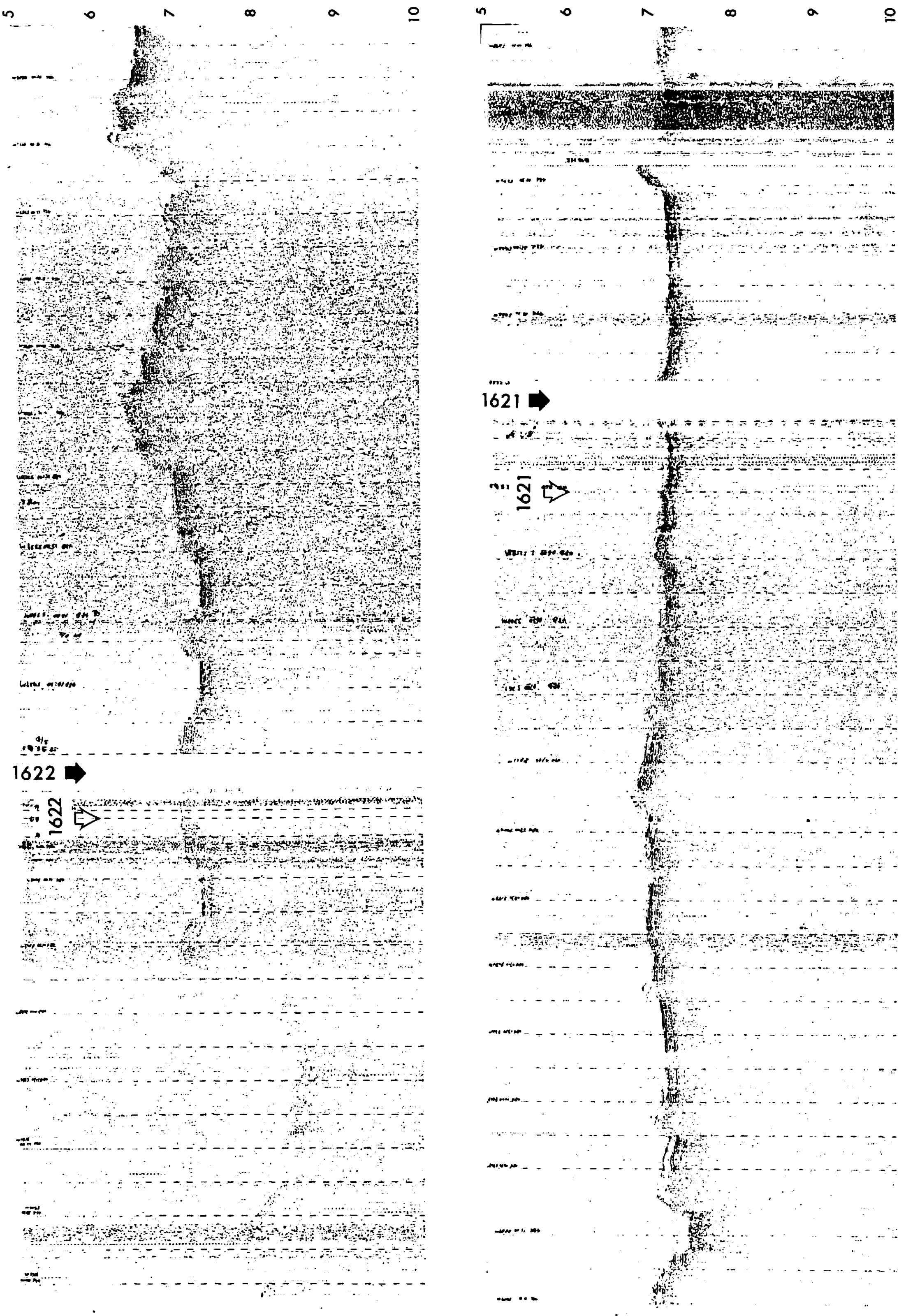

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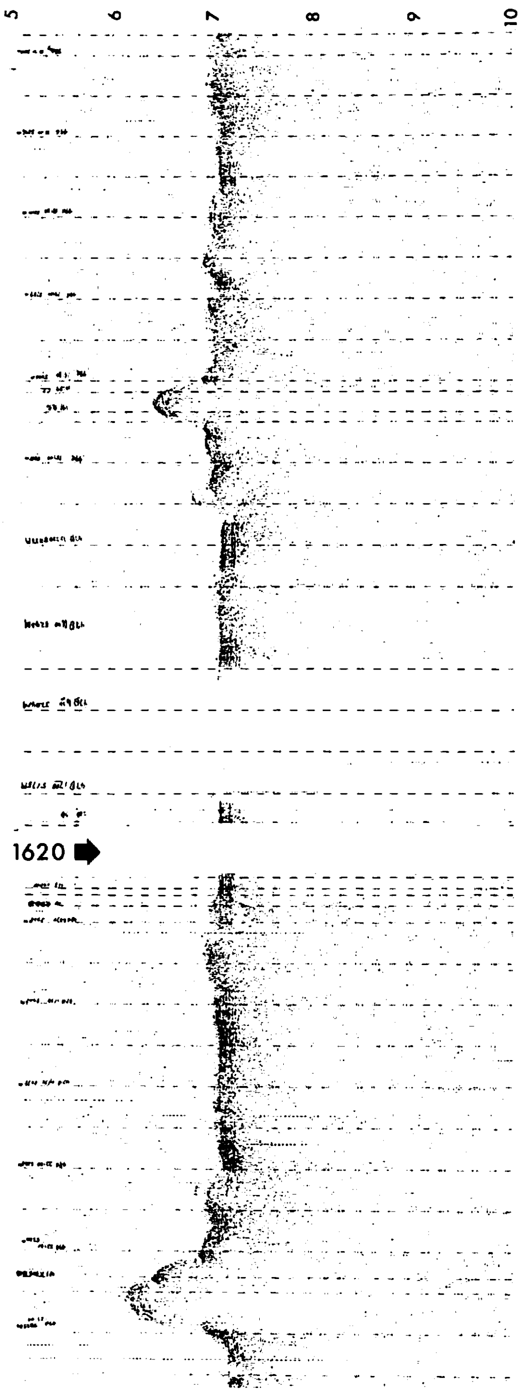

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