SCRIPPS INSTITUTION OF OCEANOGRAPHY

FINAL REPORT

OF THE

R/V THOMAS WASHINGTON

ARIADNE EXPEDITION LEG 3

Thomas H. Shipley[1] and Gregory F. Moore[2]

Co-chief Scientists

Puntarenas, Costa Rica to San Diego, California

6 - 28 April 1982

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06 June 1983

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INTRODUCTION

Convergent margins have been the subject of intense interest for the past few years since the first simple dynamic models for accretion at the base of inner trench slopes were published by Seely et al. and Karig in 1974. Drilling results from the Shikoku Trench (J. C. Moore and Karig, 1976) supported these models, but subsequent drilling and geophysical surveys from other margins have demonstrated the complexity of active margins and the inadequacy of simple models (Scholl et al., 1977). The concept of sediment accretion at the toe of the trench slope seems to fit those margins with large amounts of sediment in the trench (e.g., Makran Trench, White and Klitgord, 1976; Sunda Trench, Karig et al., 1979), but drilling and geophysical surveys in trenches with less sediment suggest either limited accretion (Japan, von Huene et al., 1978; Mexico, J. C. Moore et al., 1979), sediment subduction (Guatemala, von Huene et al., 1980) or even tectonic erosion (e.g., Mariana, Hussong et al., 1978; Peru-Chile, Hussong et al., 1976). The present lack of our knowledge of subduction zones lags far behind our knowledge of other tectonic regimes such as spreading center-transform systems where second order processes are now becoming well known.

The mechanics of the accretion process remain obscure, partly because of the lack of high-resolution data from the base of trench slopes. We do not fully appreciate the effect of seiment thickness or convergence rate on structural styles. Changes in structural style and mode of accretion between different arc systems have been observed, but the spatial variations at geologically significant scales (a few kilometers) have not. In arcs where accretion has been demonstrated, the amount of sediment that is apportioned between accretion and subduction has not been adequately documented.

Sedimentary processes acting on trench inner slopes also are poorly known. Slumping appears to be an important process, but convincing data concerning the scale and amount of slumping is lacking. The role of submarine canyons in transporting sediment to the trench and to trench slope basins is becoming better known (McMillen, 1982), but high-resolution observations are still needed to understand trench and trench slope sedimentation.

The combination of standard multichannel seismic surveys with wide track spacing and deep-sea drilling in the Middle America Trench seems to have generated as many questions as it has answered. It is obvious that the major problem with the existing data set is lack of resolution. Vertical resolution is lacking because of the previous use of airgun arrays designed for deep penetration, while horizontal resolution is poor because of the wide track spacing necessary for choosing optimum drill sites. Increasing the resolution of our data will increase our understanding of subduction zone processes. High-resolution, problem-oriented studies similar to those carried out over spreading centers are needed.

The purpose of ARIADNE, Leg 3 was to conduct an integrated high-resolution (broadband) digital single channel seismic reflection and Sea Beam bathymetric study of three sites along the Middle America Trench (Fig. 1). Many of the unanswered problems discussed above were addressed at these sites. The high resolution data provided detailed structural and deformation information. The Sea Beam data provide accurate physiographic information which can be directly compared to the seismic reflection data and also record spatial variations away from the reflection data. The combination of techniques should provide an excellent method to study structural variations over large areas of the sea floor. The principal advantage of the Middle America Trench is that it is now the best known trench, with the most extensive data base available and where drilling data suggest both sediment accretion and subduction occur. The regional tectonic framework has been defined, and the optimum locations for detailed study were readily located. Our work was conducted off the Nicoya Peninsula of Costa Rica (Fig. 2 and 3), off Guatemala (Fig. 4), and off Guerrero, Mexico (Fig. 5).

The overall objectives of our study are to understand tectonic and sedimentary processes along the Middle America Trench in order to produce a reasonably well-constrained working hypothesis for sediment accretion and subduction in trenches.

DATA PROCESSING

Some seabeam data processing was completed on board the ship before arriving in San Diego. Post-cruise processing continued for almost a year. The final bathymetric charts were prepared at a 20 m contour interval.

The seismic reflection data was processed, mainly filter, AGC and displayed on the Prime computer for microfilming. Some data was migrated in an attempt to charpen the structure (Fig. 8).

RESULTS

Off Costa Rica, a relatively thick (.5 - .7 sec) section of pelagic sediments covers the oceanic crust (Fig. 6). As the oceanic crust enters the trench, normal faults develop on the trench outer slope. The normal faults

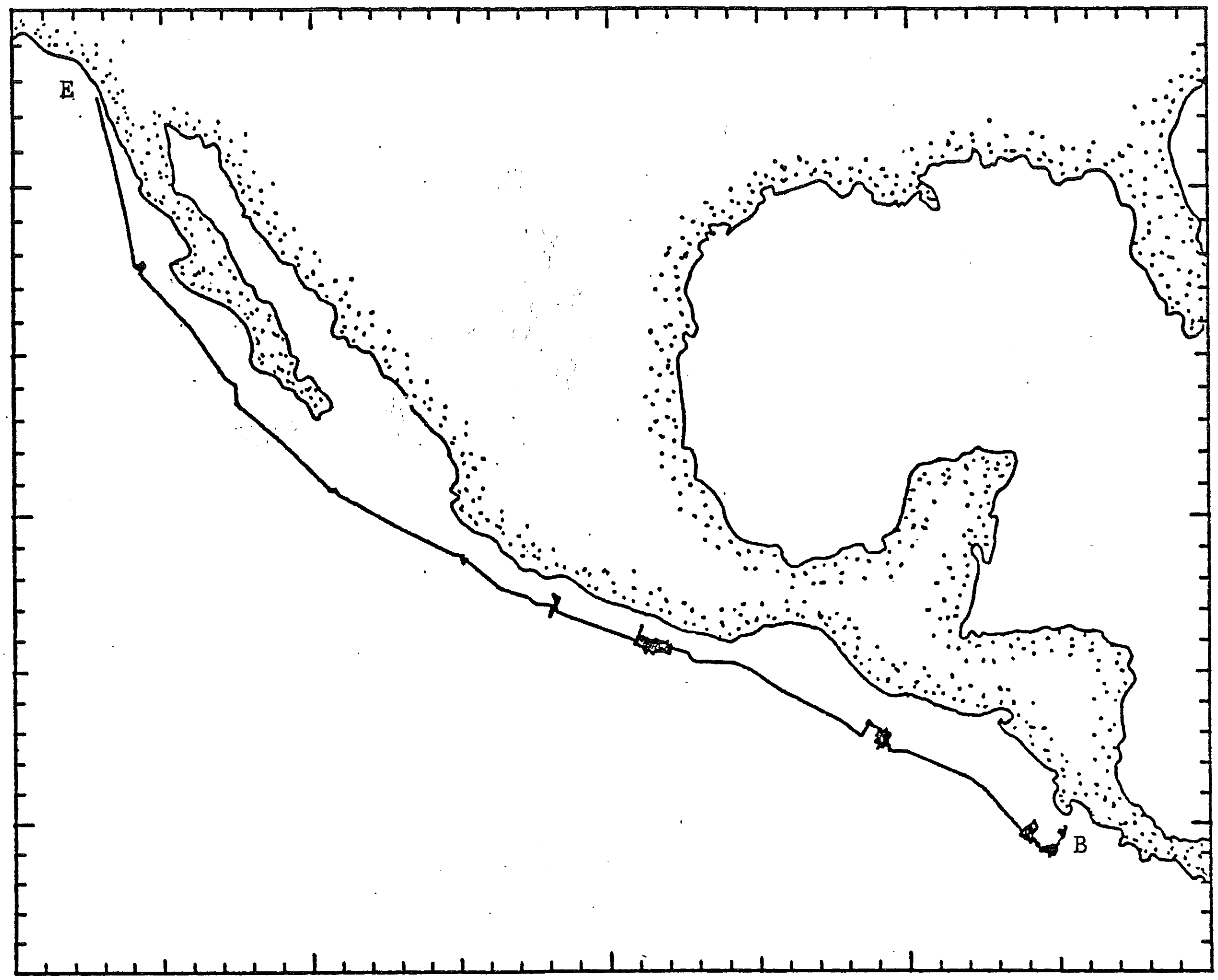

Figure 1. Thomas Washington Ariadne Leg 1 cruise track beginning in Puntarenas, Costa Rica and ending in San Diego, U.S.A.

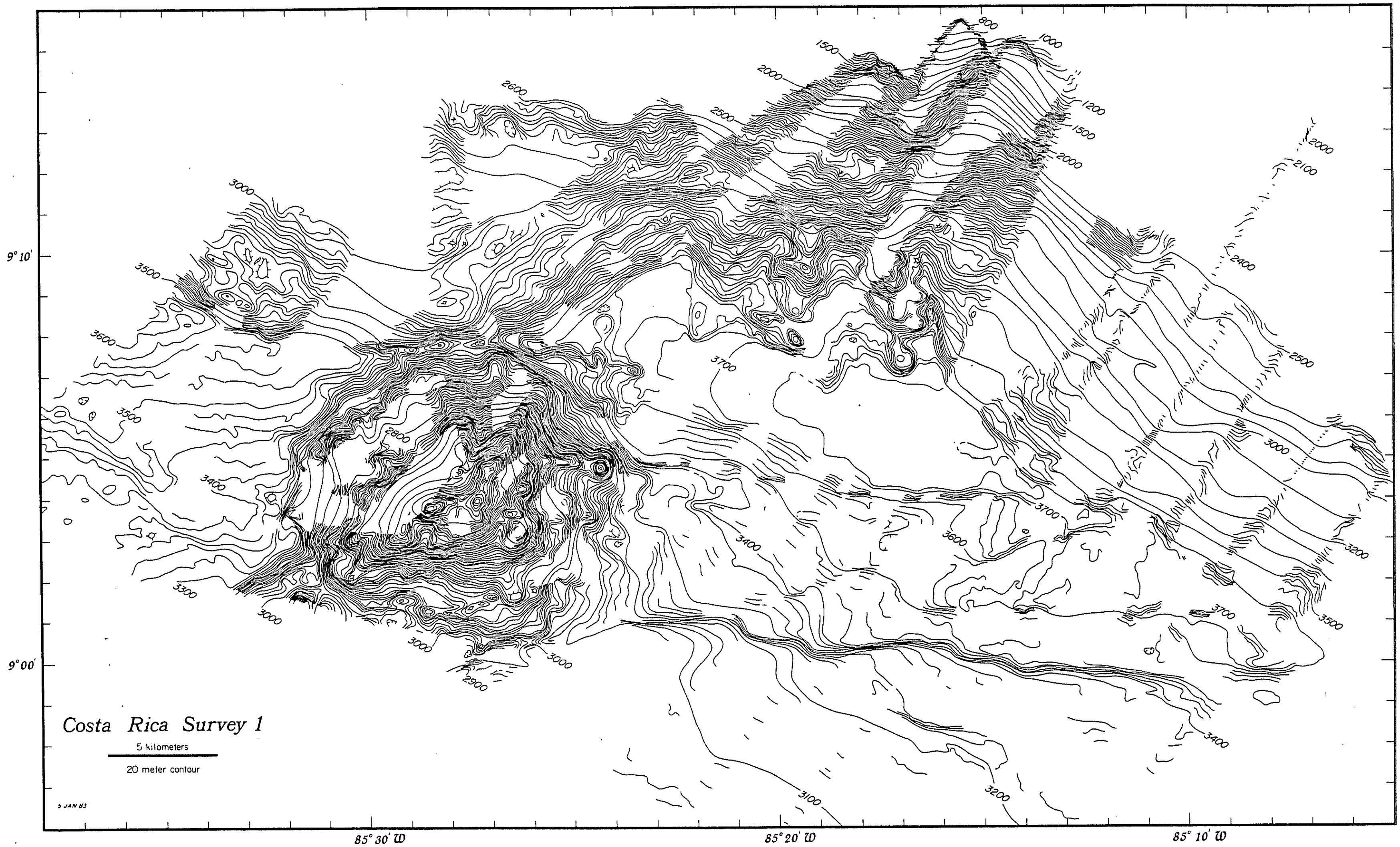

Figure 2. Seabeam chart off Costa Rica where a large composite seamount is entering the trench. Trench is offset along a regional bathymetric high associated with small volcanoes extending SW.

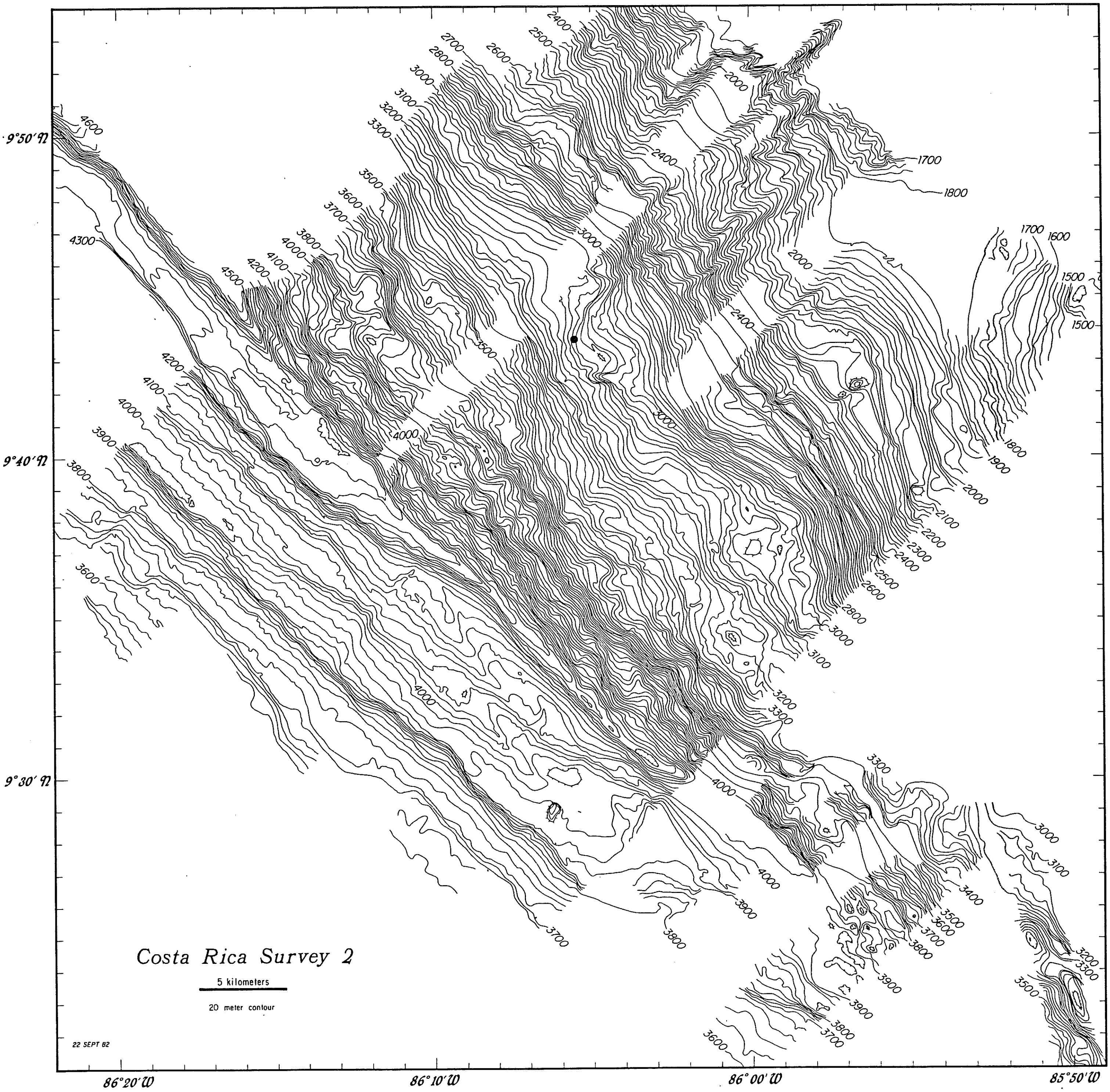

Figure 3. Seabeam chart of another portion of Costa Rica. Here the oceanic plate fabric is parallel to the trench.

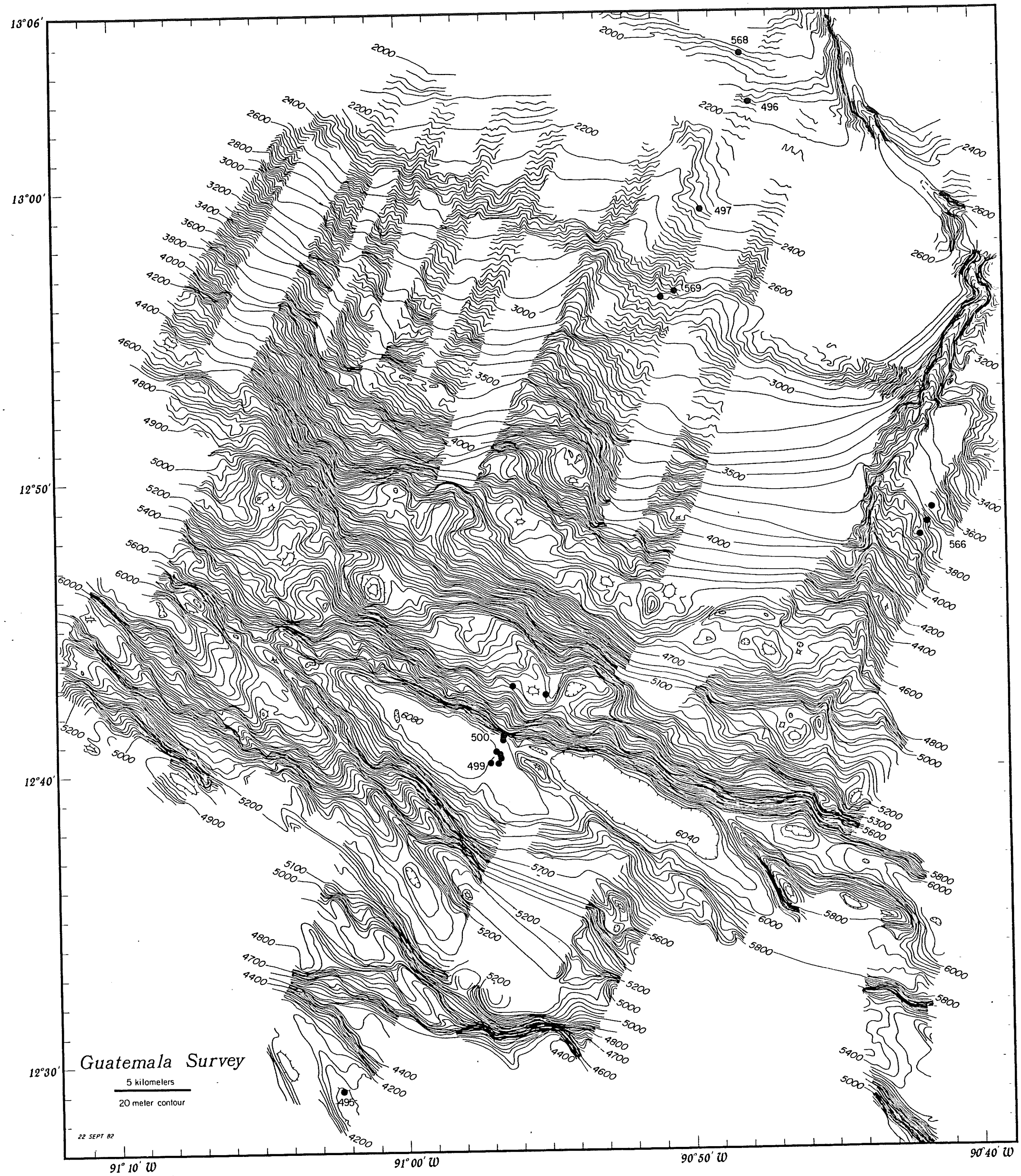

Figure 4. Seabeam chart off Guatemala. Trench basins formed by the plate fabric oblique to the trench.

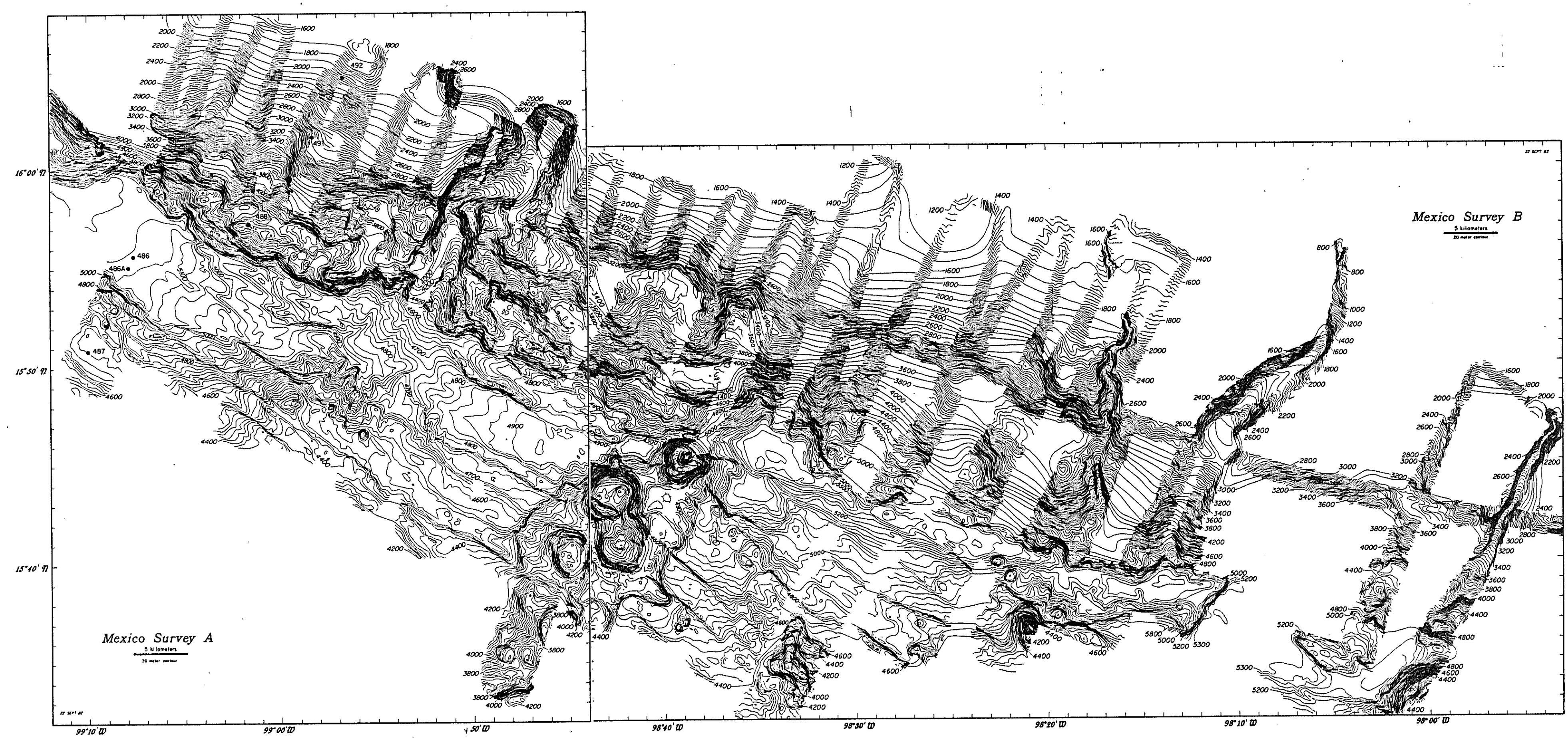

Figure 5. Seabeam survey off Mexico. Wide trench axis to NW is associated with thick trench fill delivered by the Rio Ometepec submarine canyon. Note complex lower slope adjacent to the area with thick trench fill.

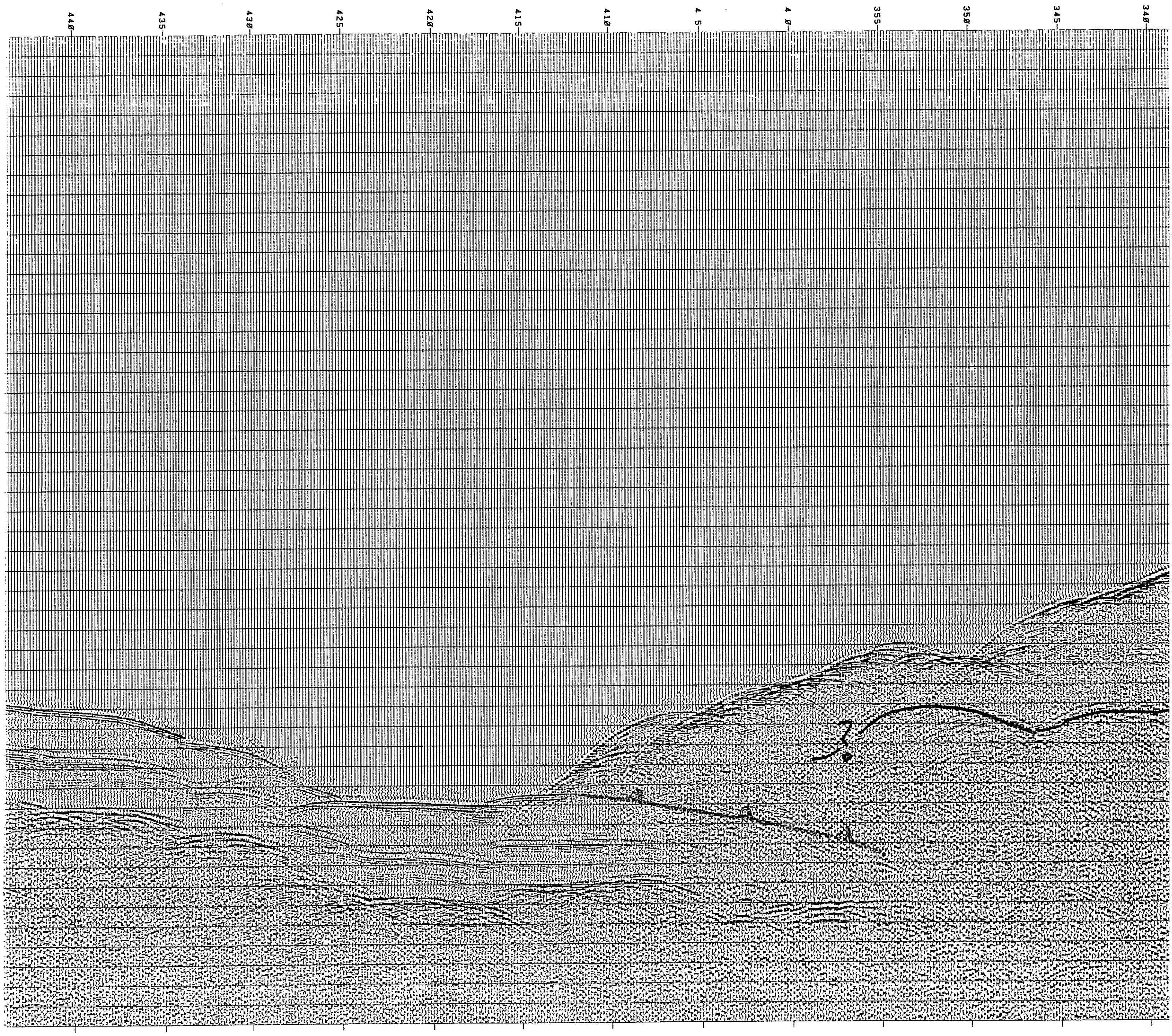

Figure 6. Seismic section off Costa Rica. Oceanic sediment, to left, are highly stratified.

have a spacing of approximately 2-3 km and vertical offsets of 100-750 meters, and are oriented approximately parallel to the trend of the trench. The pelagic sediments can be traced several kilometers landward beneath the trench slope. There is no evidence for significant accretion such as thrusting or folding of the sediments at the base of the trench slope or development of basins on the landward trench slope (Fig. 7). The bathymetric trends on the landward trench slope are slightly oblique to the trend of the Trench. The slope down to the trench is relatively smooth and is not interrupted by major benches. A large seamount is being subducted at 81 degrees West. The trench axis is offset significantly where the seamount enters the trench (Fig. 2).

Off Guatemala, the normal faults on the trench outer slope are highly oblique to the trench axis and divide the trench into small, diamond shaped subbasins (Fig. 4). The depths of the subbasins are different, and each contains a different amount of sediment fill. San Jose Canyon is incised 50 meters at a water depth of 1500 meters, and cuts into the trench slope with a major right angle bend at a water depth of about 2000 meters. The incision of the canyon axis decreases downslope, and the canyon dies out at about 5000 meters water depth. The canyon apparently empties into a bench about 1000 meters above the trench floor. The landward trench slope contains several benches that are oriented parallel to the trend of the trench axis (Fig. 8).

Off Mexico, the normal faults on the outer trench slope are again approximately parallel to the trend of the trench axis. The trench floor is segmented into a number of subbasins, and each basin has a different amount of sediment fill (Fig. 5). Ometepec Canyon dumps a significant amount of sediment into one of these basins. We were able to trace a channel system on a submarine fan that is built in the trench at the mouth of Ometepec Canyon.

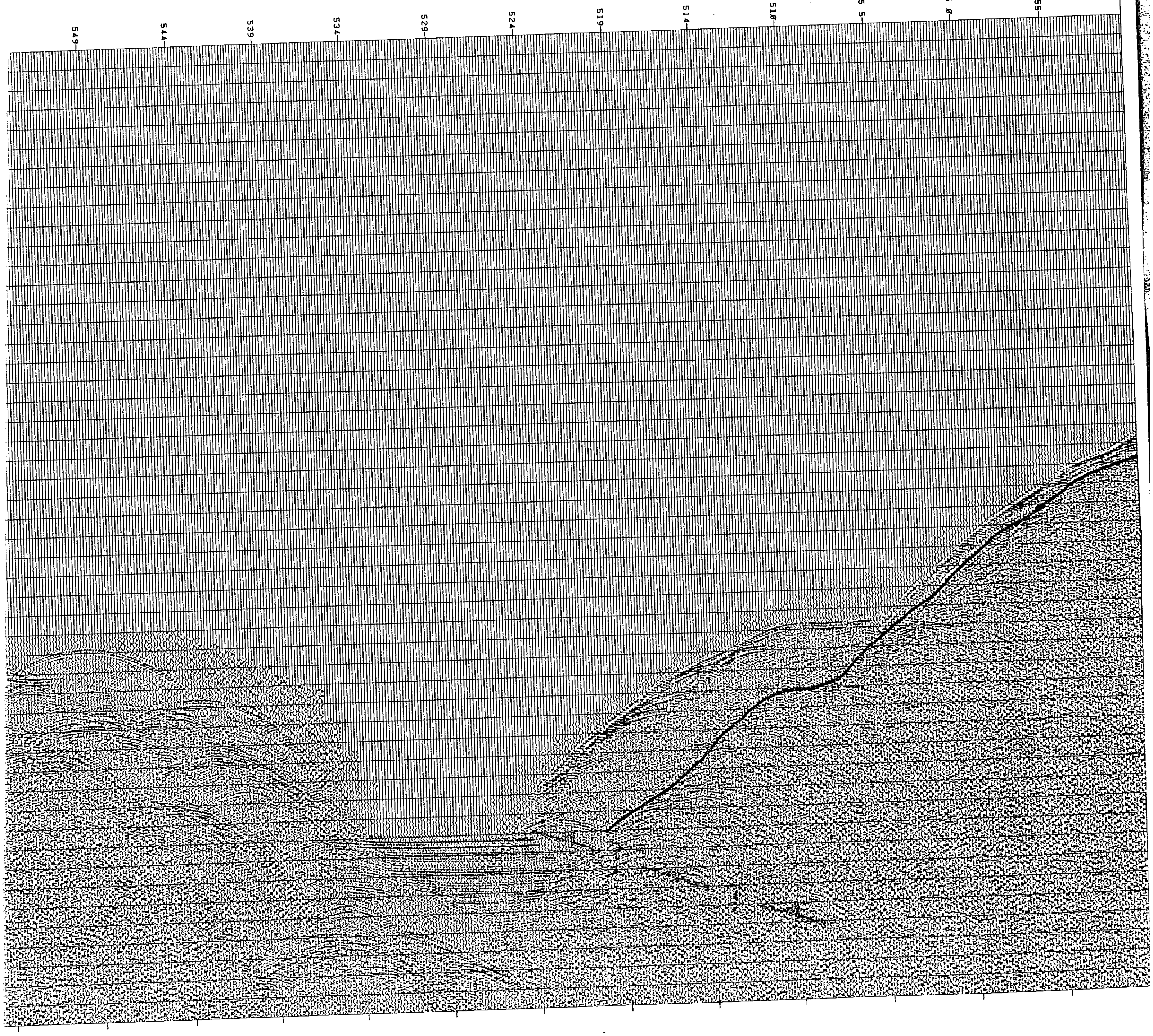

Figure 8. Portion of seismic reflection line off Guatemala. Horst and graben structures well-developed on seaward side. While benches are common on the landward, right side, their origin remains unclear.

Although Ometepec Canyon cuts all the way to the trench, other canyons to the East die out before reaching the trench. They apparently end at a large bench a few hundred meters above the trench floor. There is considerable evidence for accretion of the trench sedimentary fill in this area (Fig. 9). Folds are developed at the base of the trench slope, landward-dipping reflections are seen, and slope basins have formed.

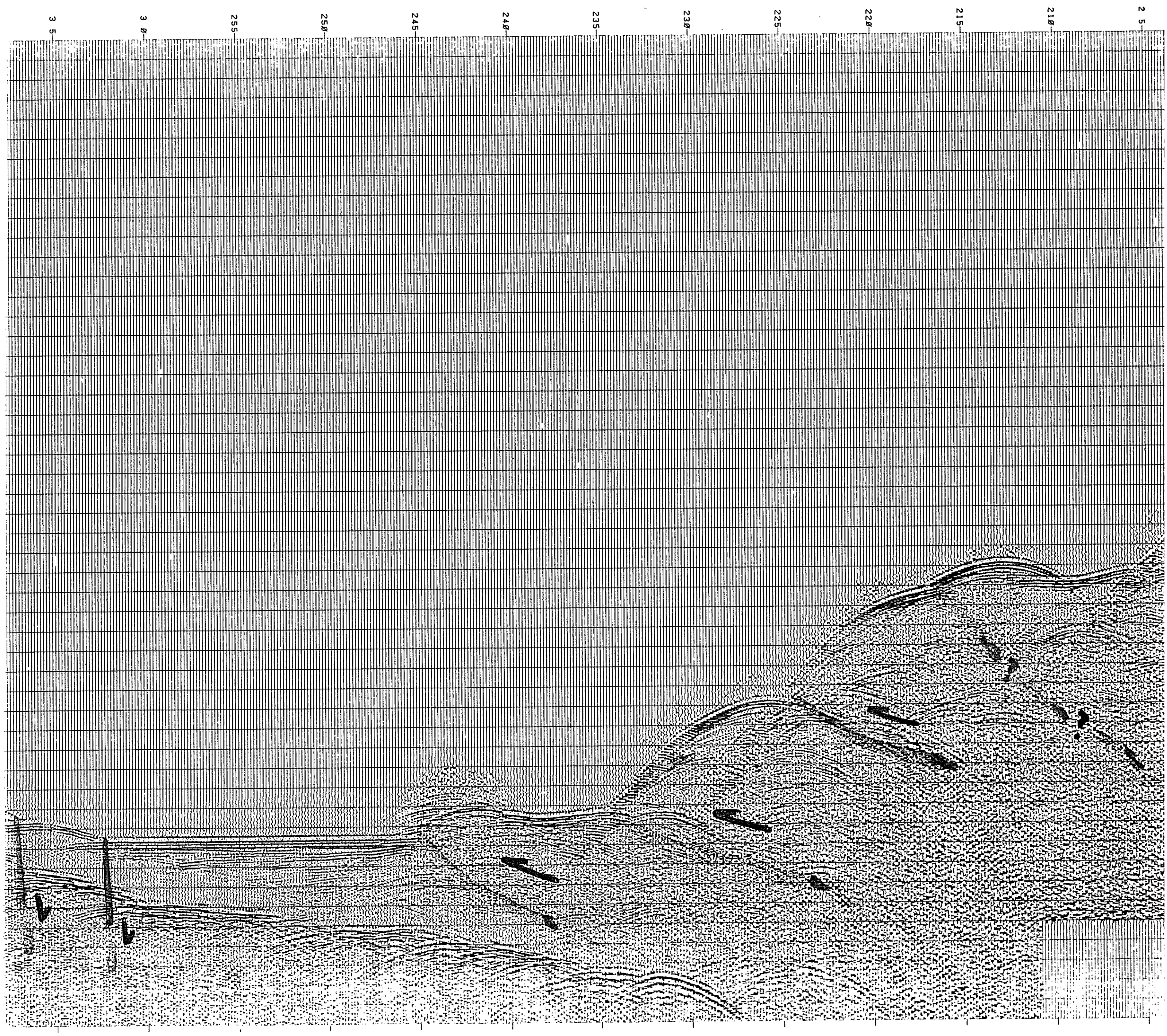

Figure 9. Example of the trench axis of Mexico. The top of the oceanic plate dips landward, right. Drag folds associated with thrust faults provide evidence for sediment accretion here.

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APPENDIX I

Published Abstracts

MORPHOLOGY AND STRUCTURE OF THE MIDDLE AMERICA TRENCH FROM MULTIBEAM ECHO SOUNDER AND SEISMIC REFLECTION DATA No 05602

MOORE, G.F.* and SHIPLEY, T.H., Scripps Institution of Oceanography, La Jolla, CA 92093

A recent survey of the Middle America Trench with a multibeam echo-sounder (Seabeam) and a watergun seismic reflection system provided high-resolution morphologic and structural data. Off Costa Rica, normal faults seaward of the trench are spaced 2-3 km, have vertical offsets of 100-750 m, and are oriented parallel to the trend of the trench. Pelagic sediments continue several km landward beneath the trench slope. The bathymetric trends on the landward trench slope are slightly oblique to the trend of the trench. The inner trench slope is relatively smooth and is not interrupted by major benches. A large seamount is being subducted at 81°W, offsetting the trench axis.

Off Guatemala, normal faults are highly oblique to the trench axis and divide the trench into small subbasins. The depths of the basins are different, and each contains a different amount of sediment fill. San Jose Canyon apparently empties into a bench about 1000 m above the trench floor. The landward trench slope contains several benches that are oriented parallel to the trend of the trench axis.

Off Mexico, normal faults are nearly parallel to the trench. The trench floor is segmented by seamounts intersecting the trench, and each basin has a different amount of sediment fill. Ometepec Canyon funnels a large amount of sediment into one of these basins, and a submarine fan is built in the trench at the canyon's mouth. Although Ometepec Canyon cuts all the way to the trench, canyons to the east apparently end at a bench a few hundred meters above the trench.

Landward-dipping reflectors and folded trench sediments provide evidence for accretion of trench sediments off Mexico, but off Guatemala and Costa Rica, there is very little trench fill, and evidence for accretion is ambiguous.

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Geological Society of America Abstracts, v. 14, p. 570, 1982

<u>Sediment Offscraping Along the Middle America Trench</u>

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G.F. MOORE (Cities Service Research, Box 3908, Tulsa, OK 74104)
<u>A.M. VOLPE</u> (Scripps Institution of Oceanography, La Jolla, CA 92093)

Variations in shallow structure and sediment offscraping (accretion) near the base of the inner trench slope are chronicled in 85 high resolution seismic reflection profiles and Sea Beam bathymetric swaths recorded across the Middle America Trench. The deformation in the turbidite filled trench axis includes thrust faults and associated small folds, and benches 20 to 100 m high. Evidently the trench fill is offscraped and accreted to the lower slope as thrust bounded units. Only a few seismic profiles suggest offscraping of portions of the hemipelagic and pelagic oceanic plate section. The location of turbidite fill in the trench is mainly controlled by submarine canyons which incise the shelf or slope and funnel shallow water sediments into deeper water. Some of these canyons extend all the way to trench axis while others terminate in mid-slope. Sediment transport along the trench axis is influenced by the oceanic plate relief and trends, convergence rate and sedimentation rate.

This preliminary analysis of the Middle America Trench data indicates that the main decollement forms between the trench turbidite fill and underlying oceanic plate sediments. If shallow offscraping primarily occurs where there is trench fill then the depositional regime directly influences the deformation style along the margin. These data do not provide evidence concerning underplating or subduction at deeper structural levels.

Transactions of the American Geophysical Union, v. 63, p. 1112, 1982

SEDIMENT ACCRETION AND SUBDUCTION IN THE MIDDLE AMERICA TRENCH

Thomas H. Shipley (Scripps Institution of Oceanography, La Jolla, CA 92093 USA)

Gregory F. Moore (Cities Service Research, Tulsa, OK 74104 USA)

Alan M. Volpe (Scripps Institution of Oceanography, La Jolla, CA 92093 USA)

DSDP drilling has confirmed that both shallow structural level sediment accretion and subduction occur in different parts of the Middle America Trench. In an effort to determine why sediment is accreted only along some parts of this arc, we collected a dense network of high resolution seismic and Sea Beam bathymetric data. These data provide a detailed description of the sediment, morphology and structure of the lower slope region.

On the accretionary lower slope off Mexico, 20 to 100 m high ridges and benches occur in the turbidite-filled trench. These features are parallel to the oceanic plate lineations and slightly oblique to the base of the trench slope. Small thrust faults which produce the ridges and uplifted turbidite benches appear to be either rooted in the turbidite fill or within the underlying oceanic sedimentary section. These trench turbidites are then accreted to the lower slope in thrust-bounded packets. It is unclear why the thrust fault trends are parallel to the oceanic plate structures since the faults do not appear to be rooted in the basement based on the few seismic sections that have been migrated so far.

In the non-accretionary Guatemalan area, the trench contains only minor muddy turbidite fill and the outer slope has well-developed horst and graben structures with 200 m of relief and a thick hemipelagic and pelagic section. No structures are observed in the trench or lower slope which resemble those off Mexico. The main decollement has not been identified yet in the seismic data but is probably rooted in or at the top of the oceanic section. There is no evidence for base of slope accretion off Guatemala.

The differences in the accretionary process along the Middle America Trench result largely from variations in trench sedimentation along the arc since only trench fill appears to be accreted to the lower slope. Presently, trench fill is provided by submarine canyons which funnel shallow-water sediments downslope. Transport of turbidites parallel to the trench depends on the sedimentation rate, convergence rate and oceanic plate relief and structural trends. The DSDP drilling results have shown that turbidites have been supplied sporadically to the trench off Mexico since early Pliocene and perhaps never in significant quantities off Guatemala. While offscraped deposits are a significant component of some "accretionary wedges", they apparently are accreted only when significant trench fill or oceanic plate sections of high porosity are entering the trench. Thus, the evolution of a particular convergent margin and the composition of the accretionary wedge will be sensitive to the sedimentary history.

To be presented at: International Seminar on the Formation of Ocean Margins, Ocean Research Institute, University of Toyko, November, 1983.

INFORMAL REPORT AND INDEX OF NAVIGATION, DEPTH, MAGNETIC AND SUBBOTTOM PROFILER DATA

(Issued June 1982)

ARIADNE EXPEDITION

LEG 3

Puntarenas, Costa Rica (6 April 1982)
to
San Diego, Calif. (28 April 1982)

R/V T. Washington

Co-Chief Scientists - T. Shipley & G. Moore (SIO)

Resident Marine Tech - R. Gilchrist

Post-Cruise Processing and Report Preparation
by S.I.O. Geological Data Center

Data Collection Funded by NSF
Grant Number OCE80-24472
and JOI, Inc.
Data Processing funded by SIA and NSF

NOTE
This is an index of underway geophysical data edited and processed shortly after the completion of the cruise leg and is intended primarily for informal use within the institution. This document is not to be reproduced or distributed outside Scripps without prior approval of the chief scientist or the Geological Data Center, Scripps Institution of Oceanography, La Jolla, California 92093.

GDC Cruise I.D.# - 193

INFORMAL REPORT AND INDEX OF NAVIGATION, DEPTH (SEA BEAM), MAGNETIC AND SUBBOTTOM PROFILER DATA

Contents:

Index Chart - gives track of cruise leg, dates, ports, and mileage of each type of data collected.

Track Charts - annotated with dates (day/month) and hour ticks. The scale is .312 in/degree longitude.

Profiles - depth and magnetic anomaly vs. distance. Dates (day/month) and positions of major course changes (greater than 30 degrees) are annotated. Sections of track having subbottom profiler (airgun) records have a wide black line along the bottom of the profile. Sections having Sea Beam are indicated by a narrow line.

Sample Index - list of beginning and end times and positions of all underway records as well as all other samples (geology, biology, physical oceanography, etc.) collected on the cruise leg.

For information on the availability and reproduction costs of data in the following forms, contact S. M. Smith, Curator, Geological Data Center, Scripps Institution of Oceanography, La Jolla, California 92093. Phone (714) 452-2752.

1. Navigation listing of times and positions of course and speed changes, fixes and drift velocity.
2. Depth Compilation Plots - Compilation plots at the traditional scale of 4"/degree longitude (1:1,000,000) are no longer produced for Sea Beam cruises. Custom plots may be requested of vertical beam (2&2/3 degree beam width) depths retrieved at one minute intervals of ship time.
3. Plots of magnetic anomaly profiles along track - map scale = 1.2inch/degree, anomaly scale between 15N and 15 S latitude = 500 gamma/inch, anomaly scale north of 15N and south of 15S = 1000 gamma/inch, from values retrieved at approximately 1 mile spacing and regional field removed using the 1980 IGRF.
4. Separate time series files of navigation, depth and magnetics or data merged in the MGD77 Exchange format on magnetic tape.
5. Microfilm or Xerox copies of:
   a. Echosounder records - 12 and 3.5 kHz frequency
   b. Subbottom profiler records (airgun)
   c. Magnetometer records
   d. Underway data log

Rev June 1982 (Sea Beam)

S.I.O. Sea Beam Data

As of June 1982 the institution's procedures for handling Sea Beam data are still evolving. The following forms are available, subject to approval of the cruise leg chief scientist.

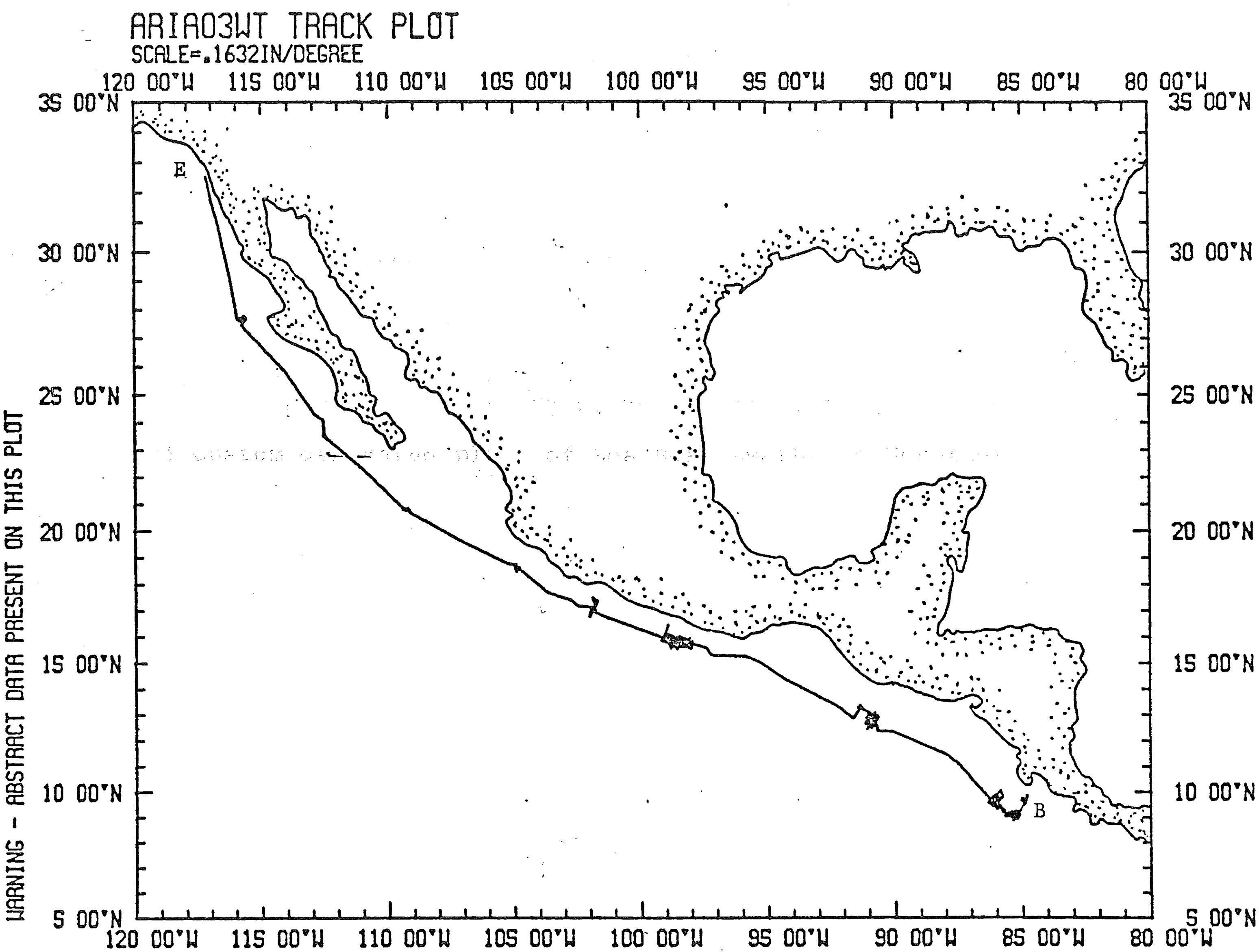
1) Archive copy of contour swath books generated in real time on board ship available for inspection at the data center.

2) Microfilm (35mm flowfilm) containing swath books plus, for some cruises, the UGR monitor record and navigation listings.

3) Sea Beam merged tapes - Sea Beam data merged with navigation (navigation is edited to the extent that poor fixes are removed after inspection of drift vectors between fix pairs. No editing is done on the basis of adjusting to overlapping Sea Beam swaths.)

4) Custom generated plots of Sea Beam swaths on Mercator projection in four colors at variable plot scales and contour intervals. There are provisions to adjust positions of individual track lines and to edit out beams (bad data or overlapping data on inside of turns).

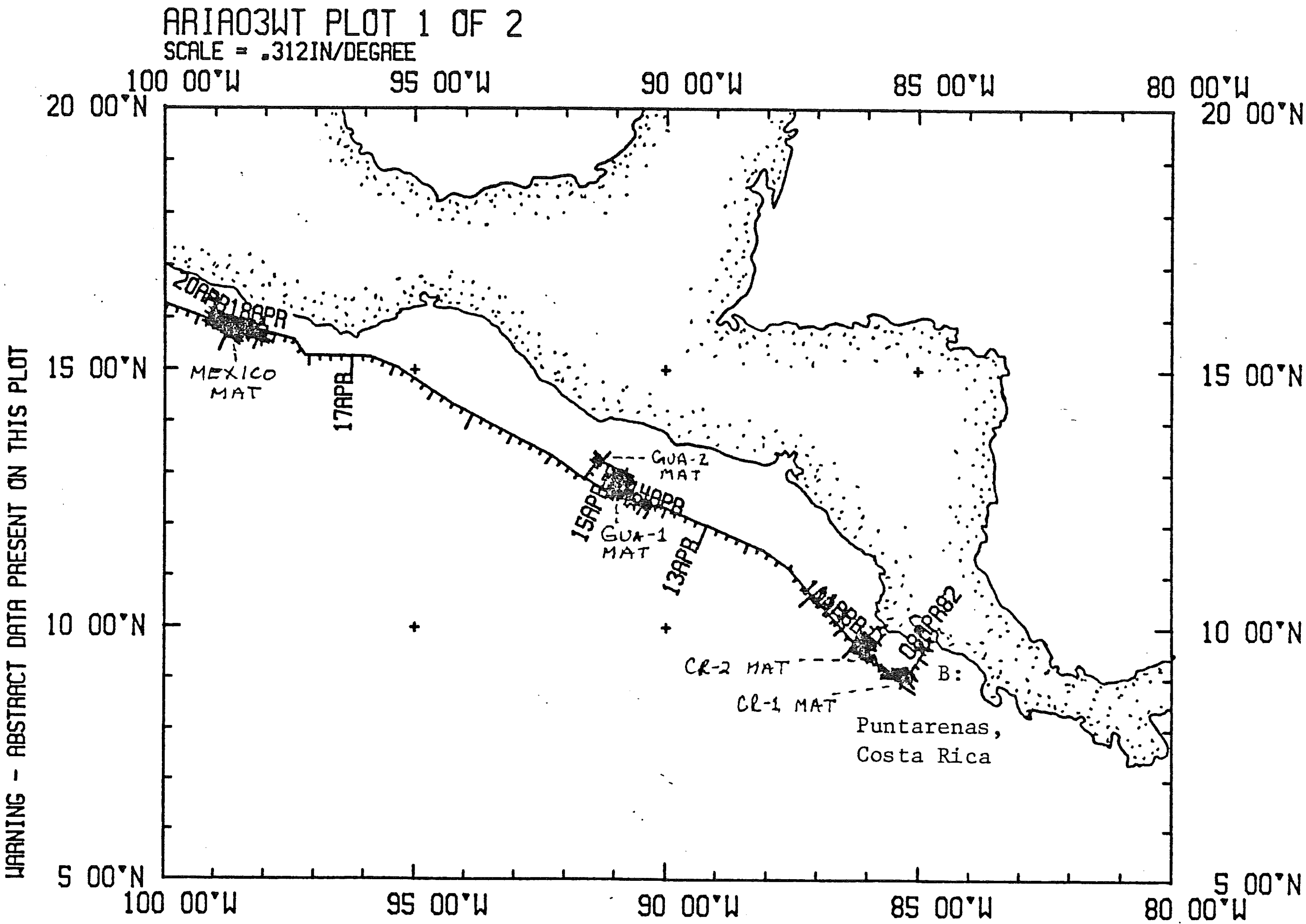
S. M. Smith June 1982



ARIADNE EXPEDITION
LEG 3

Co-Chief Scientists: T. Shipley & G. Moore (SIO)
Ports: Puntarenas, Costa Rica - San Diego, Calif.
Dates: 6 - 28 April, 1982
Ship: R/V T. Washington

TOTAL MILEAGE OF UNDERWAY DATA COLLECTED
1) Cruise - 5280 miles
2) Bathymetry - 5110 miles
3) Magnetics - 5170 miles
4) Seismic Reflection - 3985 miles
5) Gravity - 4656 miles
6) Seabeam - 5280 miles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Puntarenas,
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ARIA03WT PLOT 2 OF 2
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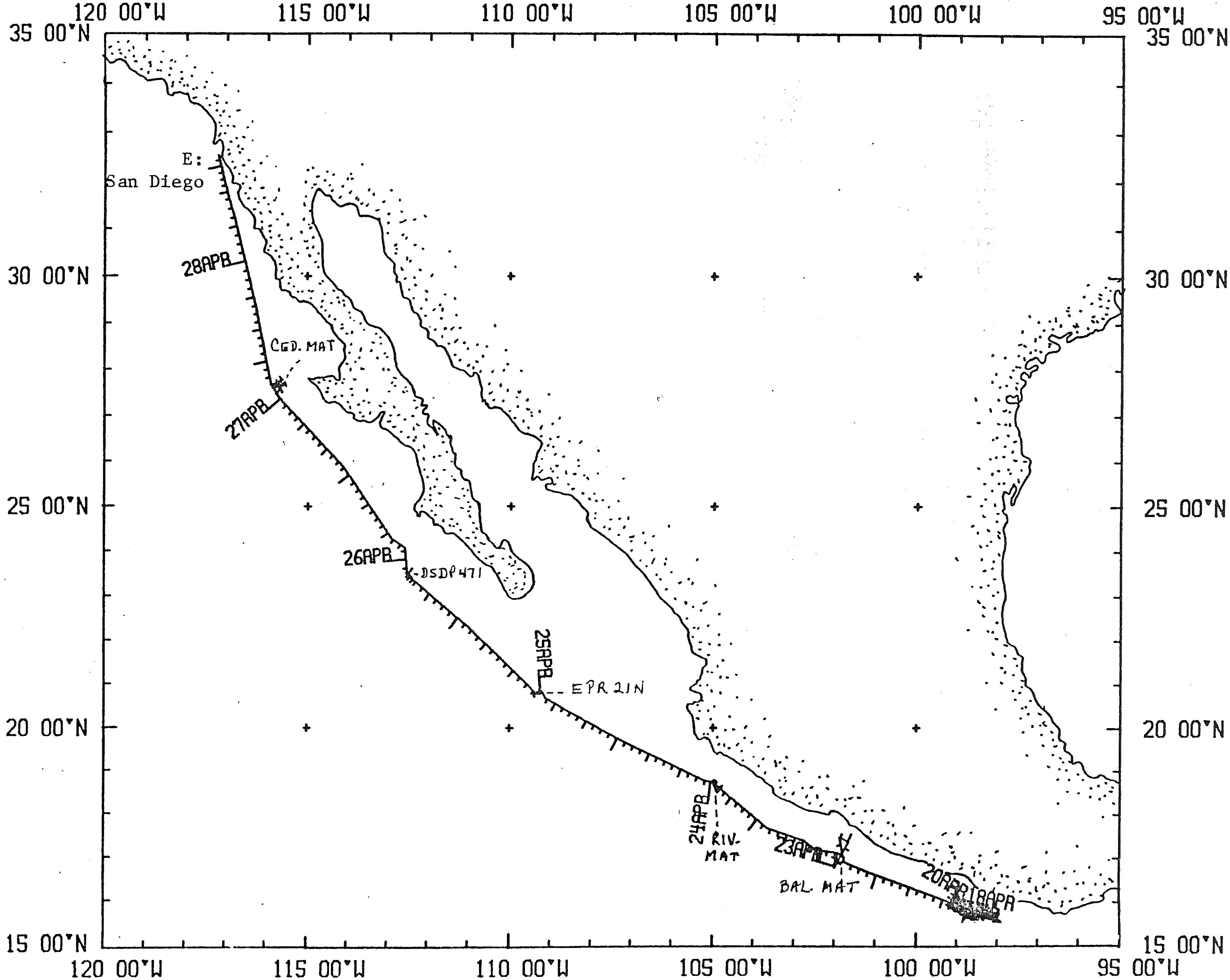

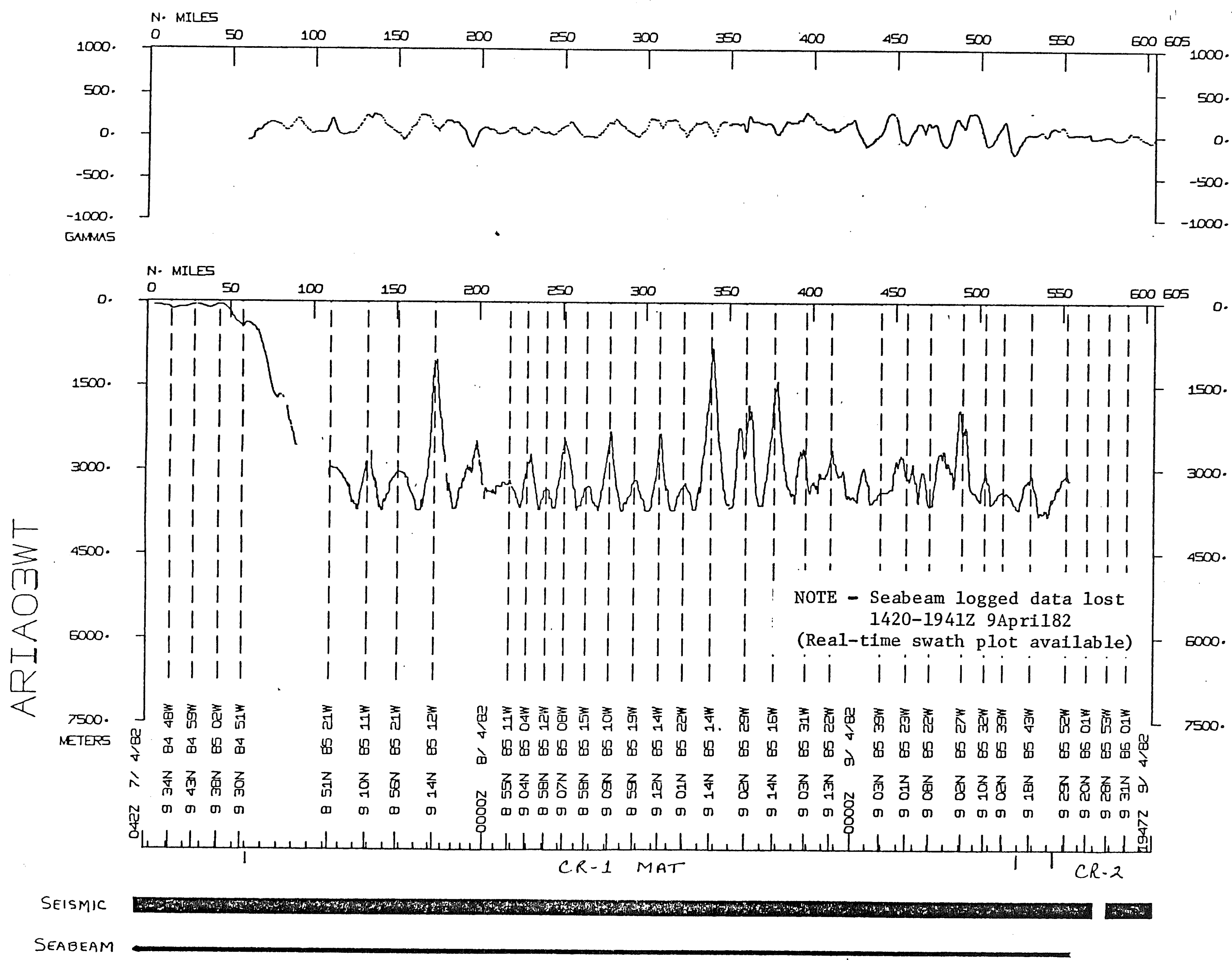

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8 55N 85 11W
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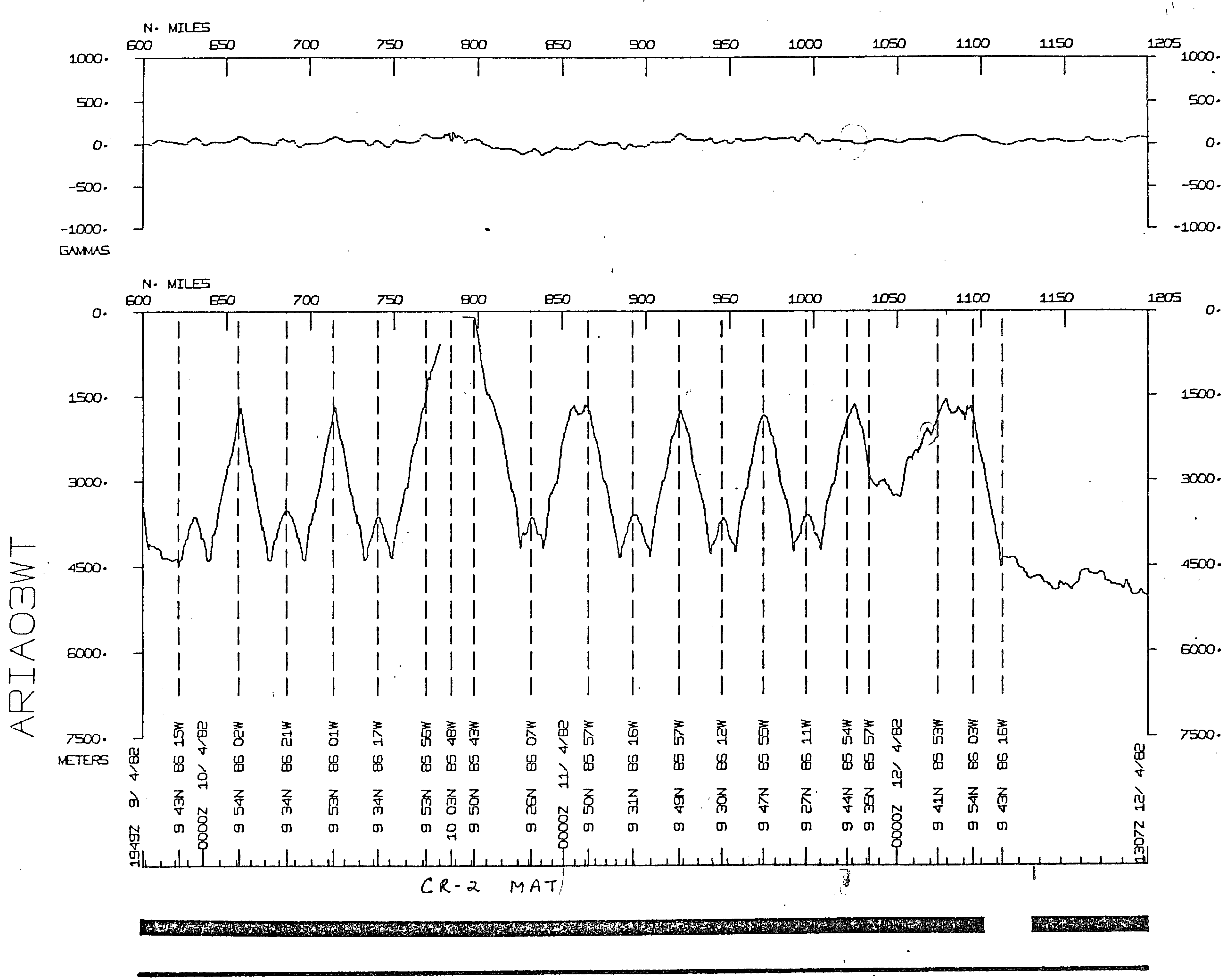
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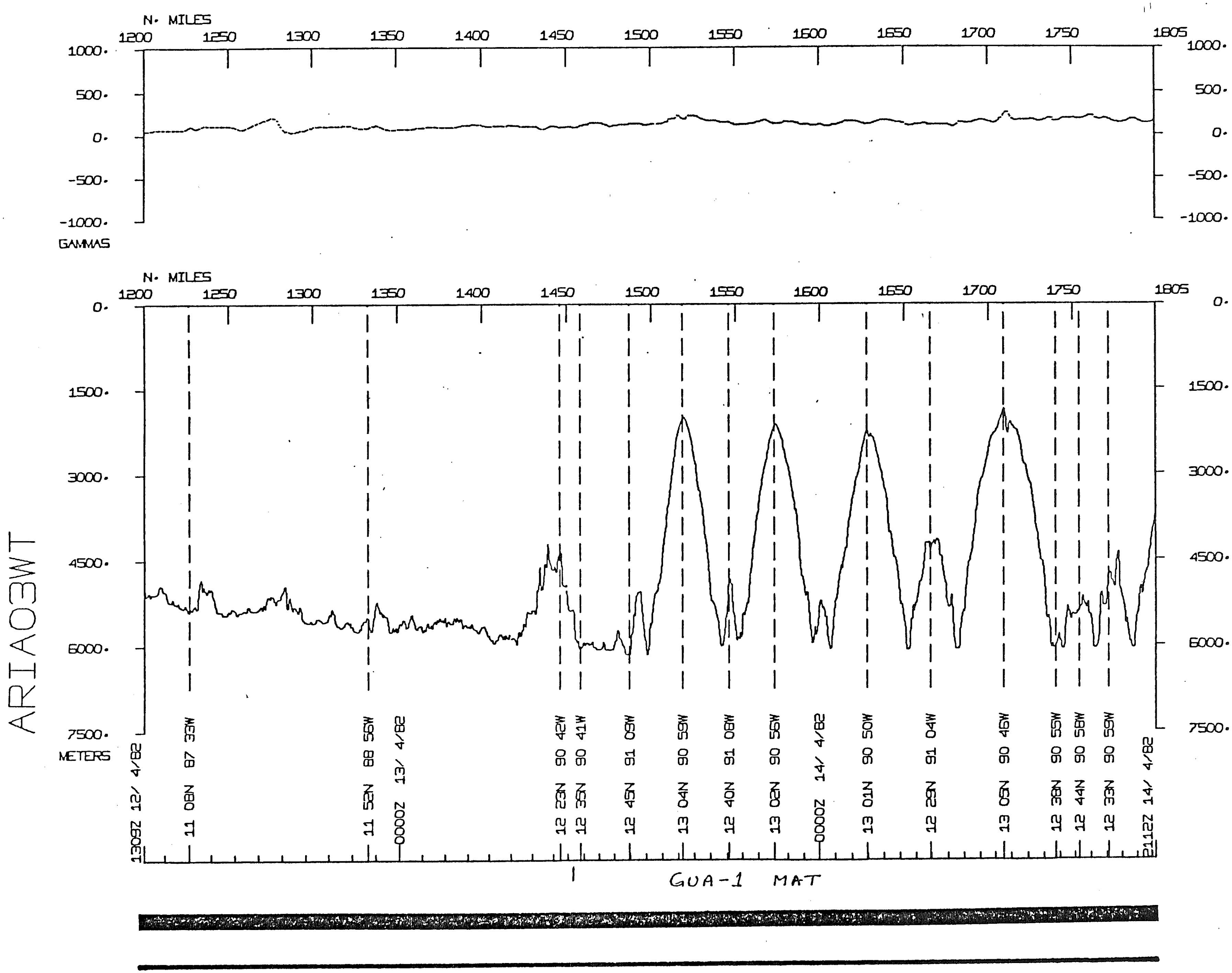
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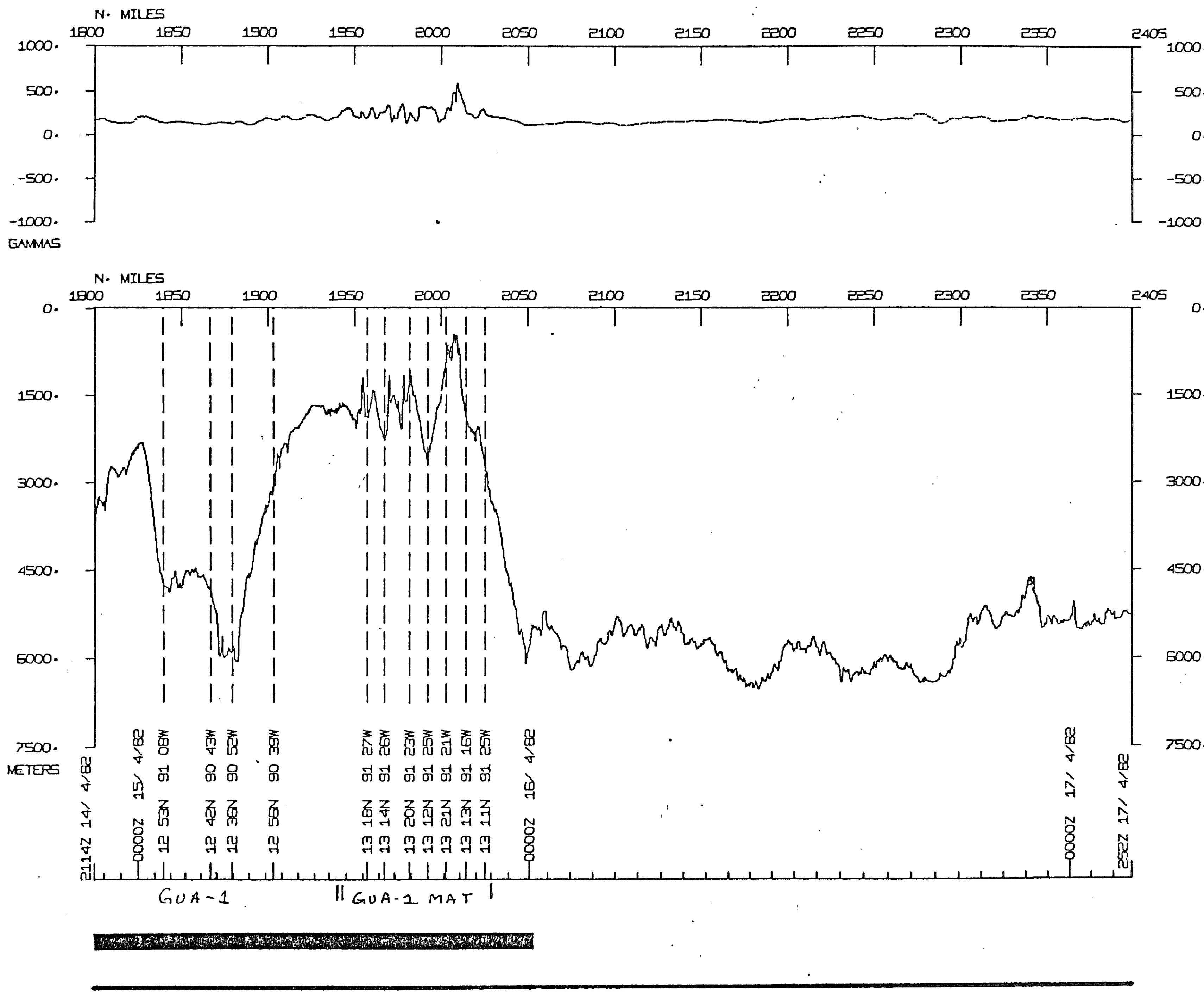
12 35N 90 41W
12 45N 91 09W
13 04N 90 59W
12 40N 91 08W
13 02N 90 56W
0000Z 14/ 4/82
13 01N 90 50W
12 29N 91 04W
13 05N 90 46W
12 38N 90 55W
12 44N 90 58W
12 33N 90 59W
2112Z 14/ 4/82
GUA-1 MAT

ARIAO3WT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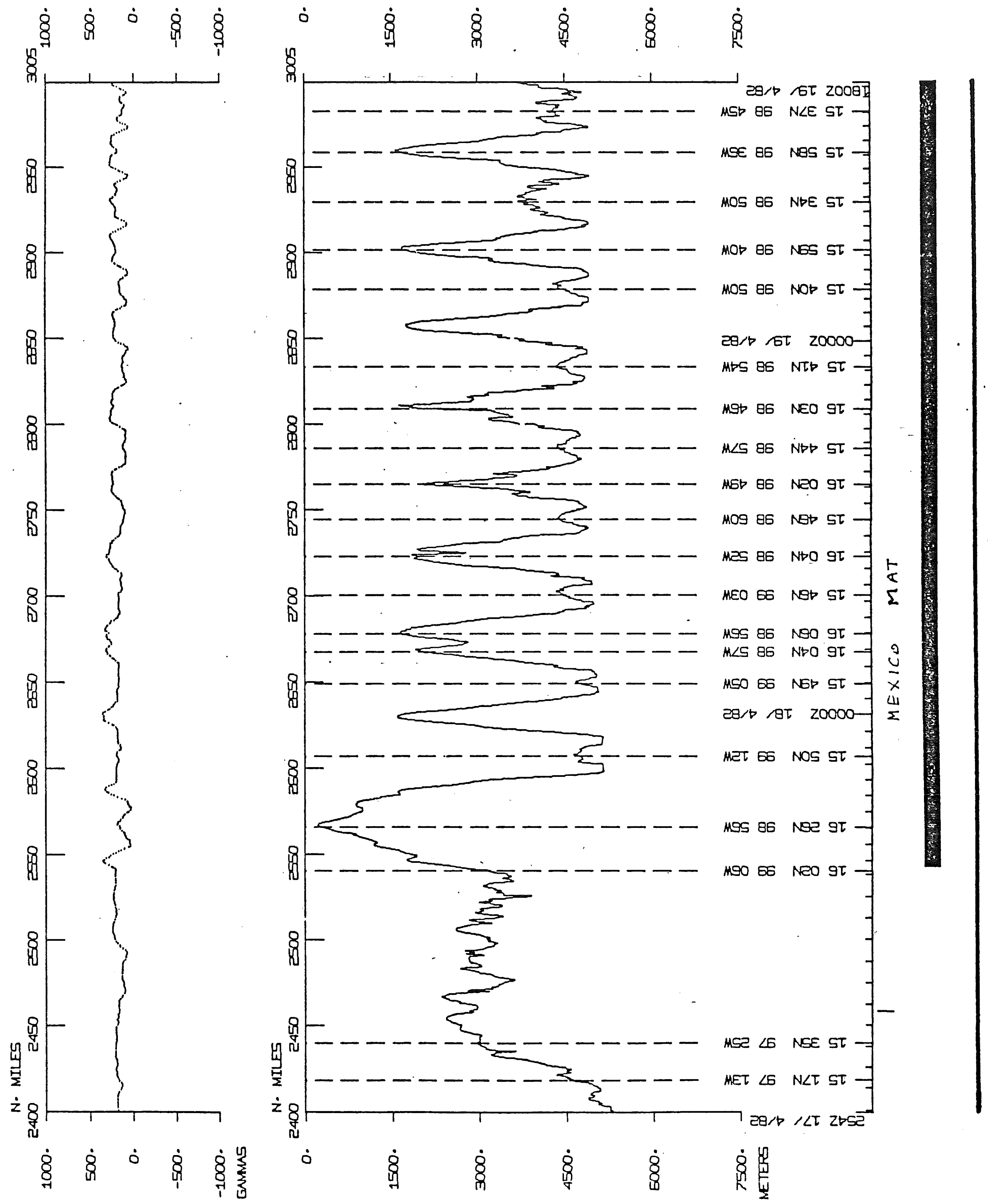
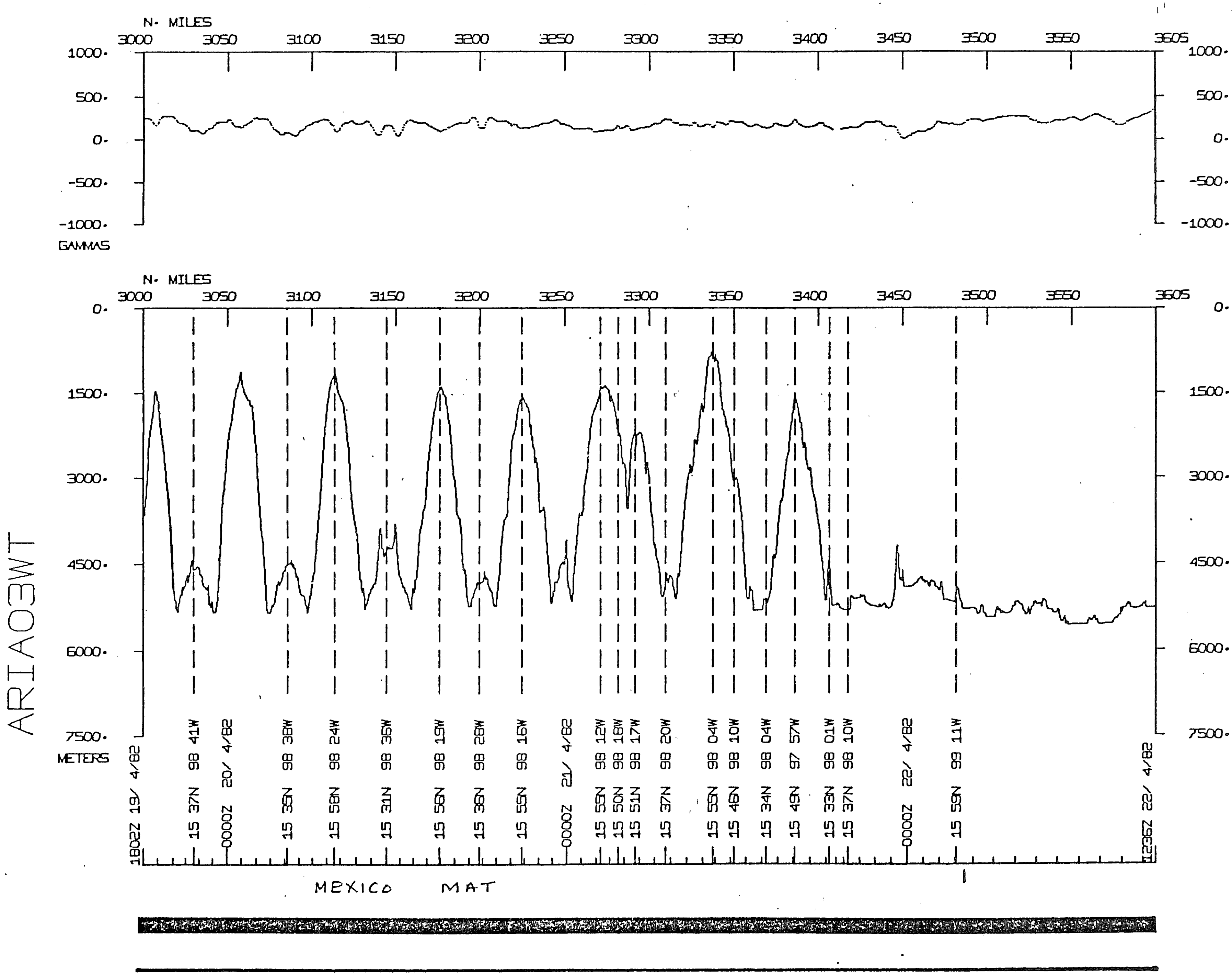
1850
1900
1950
2000
2050
2100
2150
2200
2250
2300
2350
2405
1000.
500.
0.
-500.
-1000.
GAMMAS
N. MILES
0.
1500.
3000.
4500.
6000.
7500.
METERS
2114Z 14/ 4/82
0000Z 15/ 4/82
12 53N 91 08W
12 42N 90 43W
12 36N 90 52W
12 56N 90 39W
13 18N 91 27W
13 14N 91 26W
13 20N 91 23W
13 12N 91 25W
13 21N 91 21W
13 13N 91 16W
13 11N 91 25W
0000Z 16/ 4/82
0000Z 17/ 4/82
252Z 17/ 4/82
GUA-1
GUA-1 MAT


MEXICO MAT
1800Z 19/ 4/82
15 37N 98 45W
15 58N 98 36W
15 34N 98 50W
15 59N 98 40W
15 40N 98 50W
0000Z 19/ 4/82
15 41N 98 54W
16 03N 98 46W
15 44N 98 57W
16 02N 98 49W
15 46N 98 60W
16 04N 98 52W
15 46N 99 03W
16 06N 98 56W
16 04N 98 57W
15 49N 99 05W
0000Z 18/ 4/82
15 50N 99 12W
16 26N 98 56W
16 02N 99 06W
15 35N 97 25W
15 17N 97 13W
2542 17/ 4/82
N. MILES
METERS
GAMMAS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N. MILES
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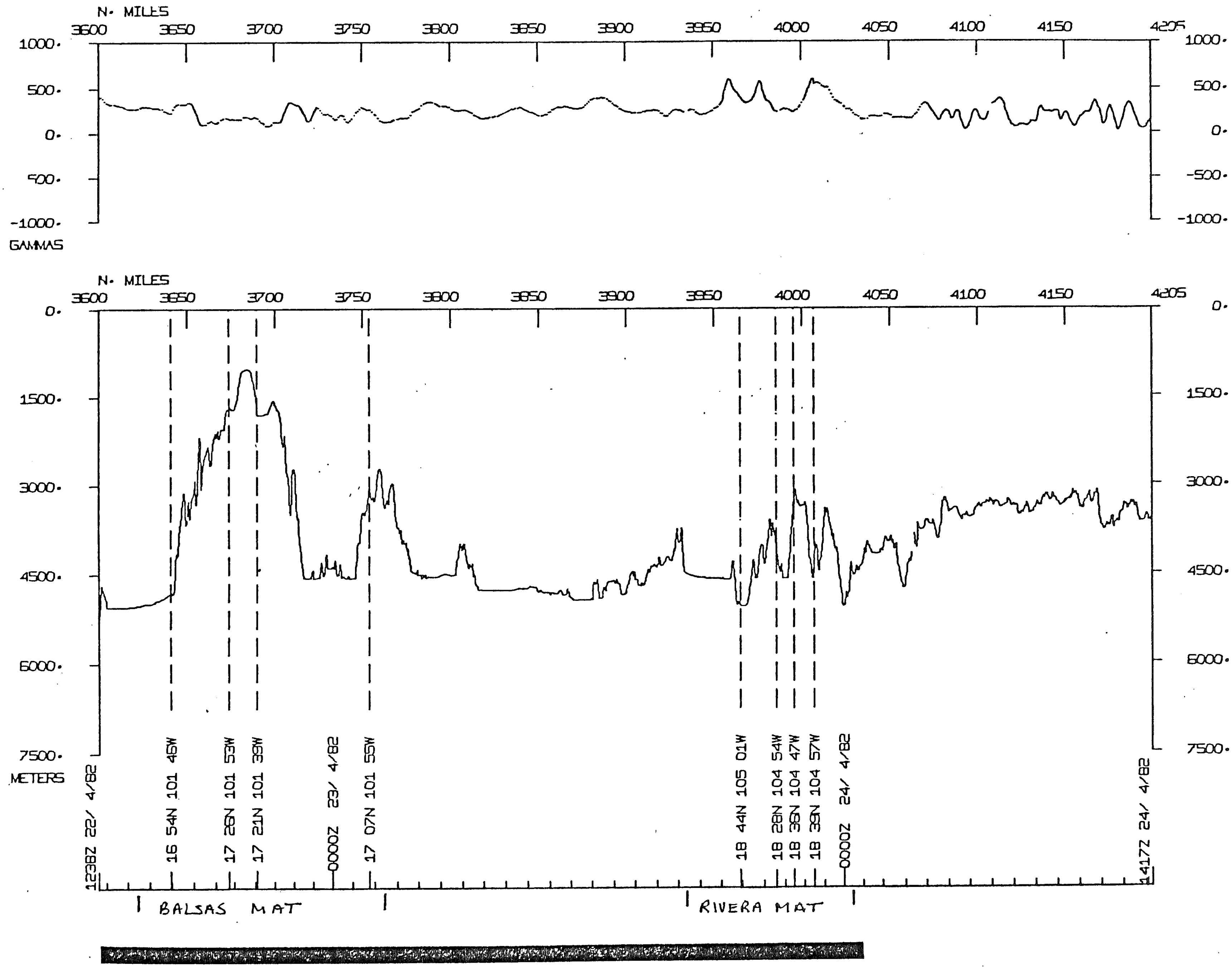
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
3550
3605
1000.
500.
0.
-500.
-1000.
GAMMAS
0.
1500.
3000.
4500.
6000.
7500.
METERS
1802Z 19/ 4/82
15 37N 98 41W
0000Z 20/ 4/82
15 35N 98 38W
15 58N 98 24W
15 31N 98 36W
15 56N 98 19W
15 36N 98 28W
15 55N 98 16W
0000Z 21/ 4/82
15 55N 98 12W
15 50N 98 18W
15 51N 98 17W
15 37N 98 20W
15 55N 98 04W
15 46N 98 10W
15 34N 98 04W
15 49N 97 57W
15 33N 98 01W
15 37N 98 10W
0000Z 22/ 4/82
15 59N 99 11W
1236Z 22/ 4/82
MEXICO MAT

ARIA03WT



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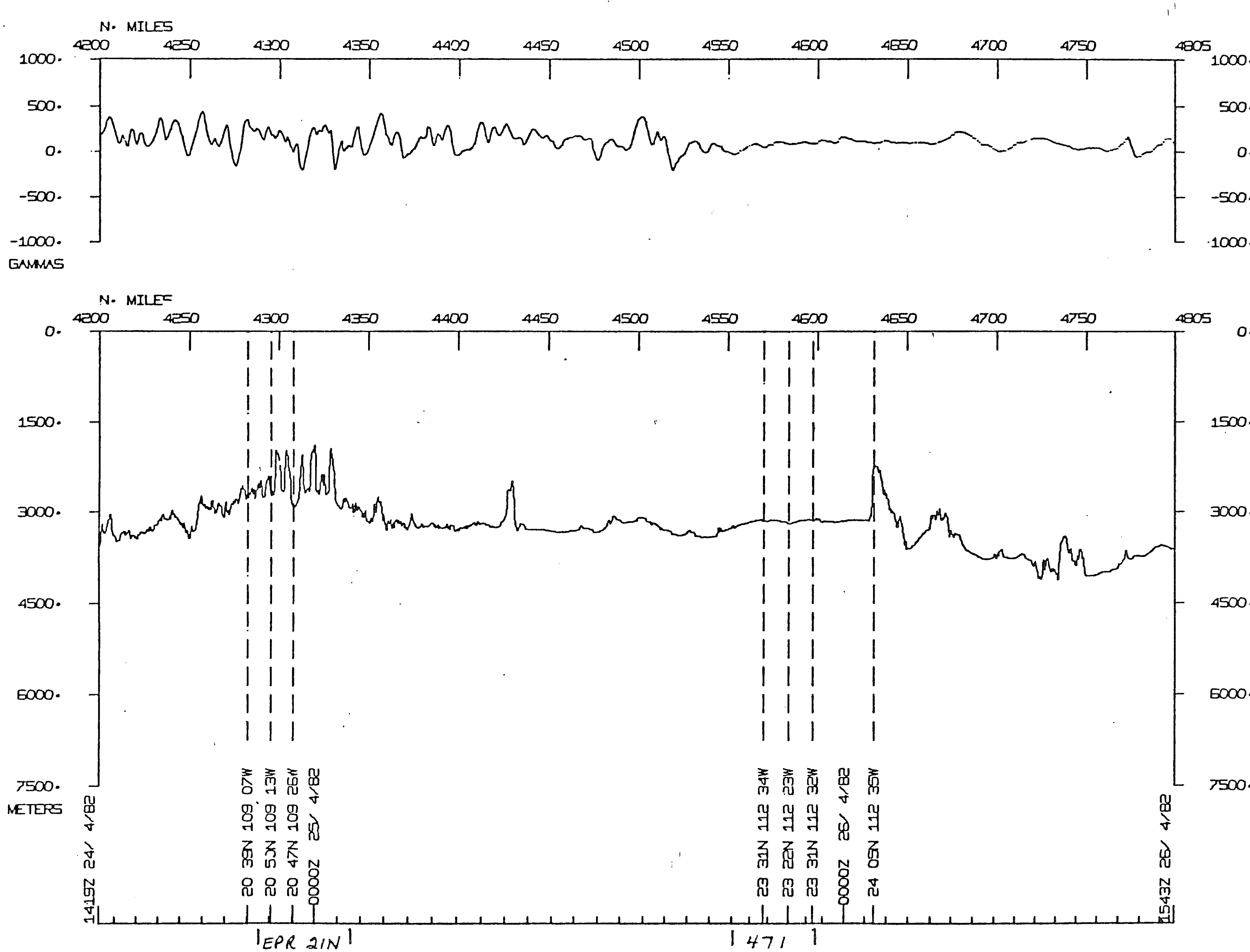
3650
3700
3750
3800
3850
3900
3950
4000
4050
4100
4150
4205
1000.
500.
0.
-500.
-1000.
GAMMAS
0.
1500.
3000.
4500.
6000.
7500.
METERS
1238Z 22/ 4/82
16 54N 101 46W
17 26N 101 53W
17 21N 101 39W
0000Z 23/ 4/82
17 07N 101 55W
18 44N 105 01W
18 28N 104 54W
18 36N 104 47W
18 39N 104 57W
0000Z 24/ 4/82
1417Z 24/ 4/82
BALSAS MAT
RIVERA MAT

ARIAO3WT



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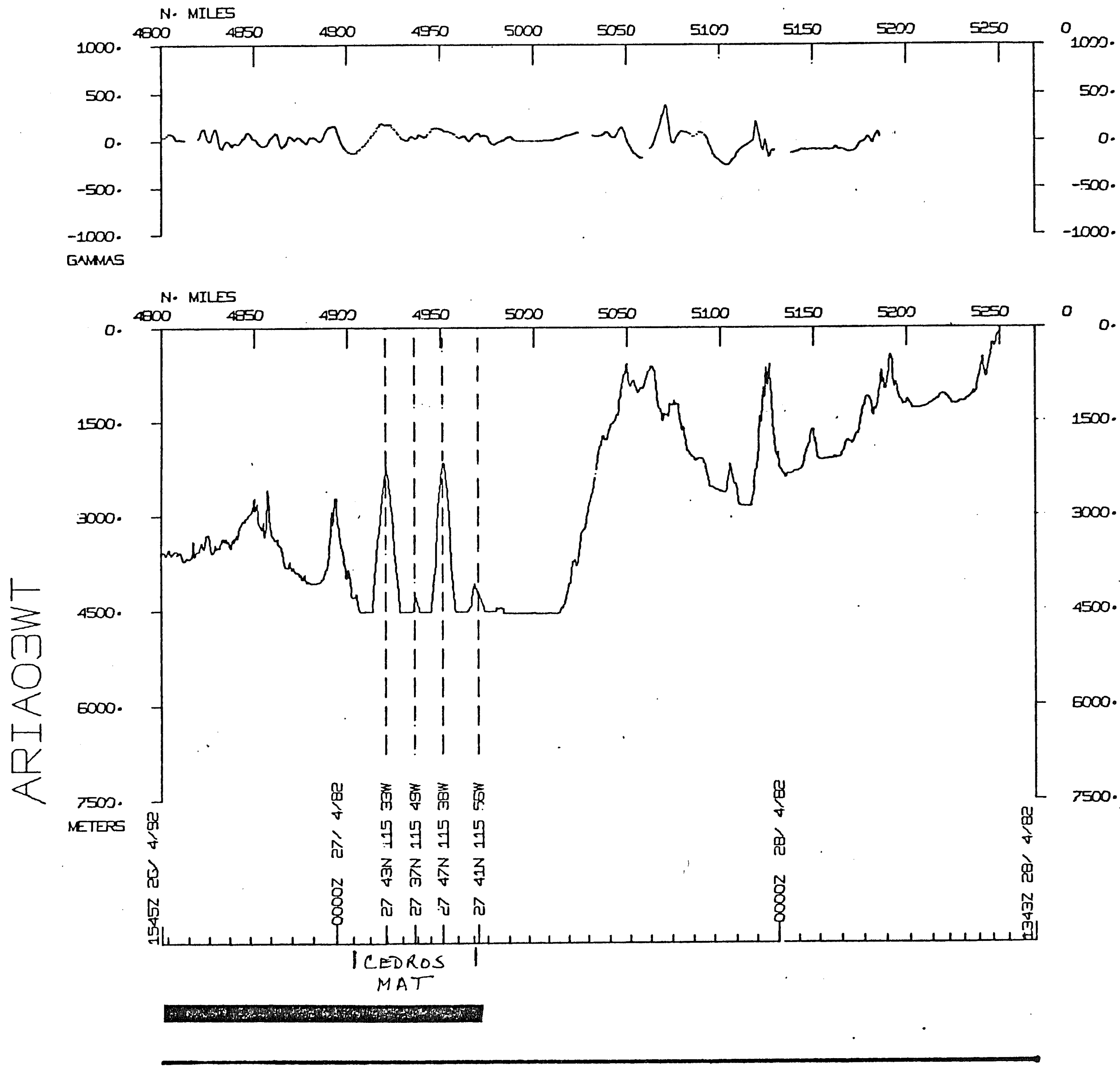
4350
4400
4450
4500
4550
4600
4650
4700
4750
4805
1000.
500.
0.
-500.
-1000.
GAMMAS
0.
1500.
3000.
4500.
6000.
7500.
METERS
14197 24/ 4/82
20 39N 109 07W
20 53N 109 13W
20 47N 109 26W
0000Z 25/ 4/82
23 31N 112 34W
23 22N 112 23W
23 31N 112 32W
0000Z 26/ 4/82
24 05N 112 35W
1543Z 26/ 4/82
EPR 21N
471


ARIAO3WT
N. MILES
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4850
4900
4950
5000
5050
5100
5150
5200
5250
1000.
500.
0.
-500.
-1000.
GAMMAS
0
1500.
3000.
4500.
6000.
7500.
METERS
1545Z 26/ 4/82
0000Z 27/ 4/82
27 43N 115 33W
27 37N 115 49W
27 47N 115 38W
27 41N 115 56W
0000Z 28/ 4/82
1343Z 28/ 4/82
CEDROS MAT

S.I.O. Sample Index

(Issued June 1982)

ARIADNE EXPEDITION

Leg 3

Puntarenas, Costa Rica (6 April 1982)
to
San Diego, Calif. (28 April 1982)

R/V T. Washington

Co-Chief Scientists - T. Shipley & G. Moore (SIO)

Resident Marine Technician - R. Gilchrist

Post-Cruise Processing and Report Preparation
by S.I.O. Geological Data Center

Index Encoding Funded by NSF
Grant Number OCE80-22996
Index Processing and Report Preparation
funded in part by SIA

The Sample Index is a first level interdisciplinary listing of time, position, sample identification and disposition of all samples, records and measurements collected on this cruise leg. The index data are encoded at sea by the resident technician and processed on shore by the S.I.O. Geological Data Center shortly after the completion of the cruise leg.

Positions are interpolated on the basis of sample time by comparison to a single, edited navigation file. Samples beginning at one time and position and ending at another are entered on two consecutive cards. Disposition and sample type are represented by three and four character codes to permit future computer searches on these parameters. (Listings defining these codes are available from the Geological Data Center.)

GDC Cruise I.D.# -193

S.I.O. SAMPLE INDEX   GENERATED 01JUL82

*** ARIA03WT SAMPLE INDEX   (ARIA03WT) ***

```
                60E         120E         180          120W         60W          0W
     .....+.....+.....+.....+.....+.....+.....+.....+.....+.....+.....+.....+
85N                   'X' = SHIP'S TRACK BY 5 DEGREE SQUARE                    85N
80N                                                           0    0000        80N
75N                     0                              0 00000 0000000000      75N
70N               000000000000                      0000 0 00 0  00000000      70N
65N    0000 00000000000000000000000000000    0000000000000000  00   0000    0  65N
60N  0000000000000000000000000000000000      00000000000000   00     00        60N
55N   0   00000000000000000000000     00       0    00000000   000            0 55N
50N  0000000000000000000000000000    0               000000000 0000          00 50N
45N 0000000000 000000000000000000                     000000000000 0           45N
40N   0 00   00 0000000000000000  0                   000000000000             40N
35N     0 00000 000000000000000 0                      000000000            0  35N
30N 000      00000000000000000   0                     X0000000            00  30N
25N 0000000000 0000000000000                           XX000   0          000  25N
20N 0000000 0000  000 00000                0            XX0    00         000  20N
15N 00000000 00    0   00    0                           XXX0    0        000  15N
10N 000000000      0      0  0                              XX            000  10N
 5N 0000000000               0                               XX0000       000   5N
 0N   0000000          00 00                                  000000            0N
 5S   000000            0 0 0 00                              0000000           5S
10S    00000              0      00                           000000000        10S
15S    00000                   0 0                             0000000         15S
20S   000000 0               00000                              000000         20S
25S    0000   0             0000000                             000000         25S
30S     00                  00000000                             0000          30S
35S     00                  00  000      0                     00000           35S
40S                              00     0                      000             40S
45S                               0                            00              45S
50S                                                            00              50S
55S                                                            0               55S
60S                                                                            60S
65S                                                                            65S
70S            00       00000000000                              0             70S
75S 00000000000000000000000000000000000                  0    00000       0000 75S
80S 0000000000000000000000000000000000        000000000000000000000   0000000  80S
85S 0000000000000000000000000000000000        0000000000000000000000000000000  85S
90S 000000000000000000000000000000000000000000000000000000000000000000000000   90S
     .....+.....+.....+.....+.....+.....+.....+.....+.....+.....+.....+.....+
                60E         120E         180          120W         60W          0W
```

06APR82 - PUNTARENAS,C.R.

TO

28APR82 - SAN DIEGO,CAL.

CHIEF SCIENTISTS - SHIPLEY,T. GRD

MOORE,G. GRD

SHIP - R/V THOMAS WASHINGTON (SIO)

PRODUCED BY GEOLOGICAL DATA CENTER,SCRIPPS INSTITUTION
OF OCEANOGRAPHY, LA JOLLA, CALIFORNIA 92093

NUMBER OF SAMPLES OF CLASS 'TYPE' GOING TO DESTINATION 'DISP'

DISP	BT	DP	GV	LB	MB	MG	PE	SP	SR	TG	TOTAL
GDC	7	4	2	1	33	2	1	17	20	1	88
GRD					1		5				6
MPL							2				2
MTG							3				3
SIX							5				5
TOTAL	7	4	2	1	34	2	16	17	20	1	104

SAMPLE 'TYPE' CODES USED ABOVE

BT = BATHYTHERMOGRAM
DP = DEPTH
GV = GRAVITY
LB = LOG BOOKS
MB = MULTI-BEAM (SEABEAM) ECHOSOUNDER
MG = MAGNETICS (TOWED VEHICLE, SURFACE, TOTAL FIELD)
PE = PERSONNEL IN SCIENTIFIC PARTY
SP = SEISMIC REFLECTION PROFILE AIRGUN
SR = SEISMIC RUN
TG = THERMOGRAPH

SAMPLE 'DISP' CODES USED ABOVE

GDC = GEOLOGICAL DATA CENTER -- S. SMITH (EXT. 2752)
GRD = GEOLOGICAL RESEARCH DIVISION (EXT. 3360)
MPL = MARINE PHYSICAL LAB. (EXT 2305)
MTG = MARINE TECHNOLOGY GROUP (EXT 4194)
SIX = SCRIPPS INSTITUTION NON-EMPLOYEE - CONTACT D. UTTER (EXT.3675)

CAT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
					ARIA03WT SAMPLE INDEX				ARIA03WT

*** PORTS ***

2315	6/ 4/82	LGPT B	PUNTARENAS,C.R.	09 59. N	84 50. W	F	ARIA03WT
1500	28/ 4/82	LGPT E	SAN DIEGO,CAL.	32 43. N	117 11. W	F	ARIA03WT

PERSONNEL

*** NAME ***	*** TITLE ***	*** AFFILIATION ***
1 SHIPLEY,T.	CHIEF SCIENTIST	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA CAL. 92093
2 MOORE,G.	CHIEF SCIENTIST	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA CAL. 92093
3 GILCHRIST,R.	RESIDENT TECH	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA CAL. 92093
4 STUBER,D.	COMPUTER TECH	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA CAL. 92093
5 SMITH,W.	SEABEAM OPERATOR	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA CAL. 92093
6 CRAMPTON,P.	AIRGUN TECH	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA CAL. 92093
7 HENKART,P.	SP. PROGRMR.	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA CAL. 92093
8 PAVLICEK,V.	DEVLMT. ENG.	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA CAL. 92093
9 ROUMP,J.	STUDENT	SCRIPPS INSTITUTION NON-EMPLOYEE - CONTACT D. UTTER (EXT.3675)
10 REED,D.	STUDENT	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA CAL. 92093
11 DE MOUSTIER,C.	STUDENT	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA CAL. 92093
12 VOLPE,A.	STUDENT	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA CAL. 92093
13 SIU,D.(COSTA RICA)	OBSERVER	SCRIPPS INSTITUTION NON-EMPLOYEE - CONTACT D. UTTER (EXT.3675)
14 LEANDRO,G.(C.RICA)	OBSERVER	SCRIPPS INSTITUTION NON-EMPLOYEE - CONTACT D. UTTER (EXT.3675)
15 ARIAS,L.(GUATEMA.)	OBSERVER	SCRIPPS INSTITUTION NON-EMPLOYEE - CONTACT D. UTTER (EXT.3675)
16 SANDOVAL,H.	MEXICAN OBSERVER	SCRIPPS INSTITUTION NON-EMPLOYEE - CONTACT D. UTTER (EXT.3675)

NOTES AN 'X' IN THE (B)EGIN/(E)ND COLUMN FOLLOWING THE SAMPLE CODE INDICATES NO SAMPLE OR DATA RECOVERED .
A 'C' INDICATES CONTINUATION OF DATA COLLECTION FROM BEFORE THE BEGINNING OR AFTER THE END OF THIS LEG. (MOORED BOTTOM INSTRUMENTS, FOR EXAMPLE).
THE NUMBER APPEARING IN THE COLUMNS BETWEEN THE SAMPLE IDENTIFIER AND THE DISPOSITION CODE, FOR MANY SAMPLE ENTRIES, IS THE WATER DEPTH IN CORRECTED METERS.

UNDERWAY DATA CURATOR - STUART SMITH (EXT.2752)

*** LOG BOOKS ***

GMT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
2315	6/ 4/82			LBUW B	UNDERWAY WATCH LOG	GDC	09 48.6N	84 46.8W	S ARIA03WT
1200	28/ 4/82			LBUW E	UNDERWAY WATCH LOG	GDC	32 18.4N	117 08.7W	S ARIA03WT

*** FATHOGRAMS ***

GMT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
2332	6/ 4/82			DPR3 B	EPC 3.5KHZ R-01	GDC	09 48.6N	84 46.8W	S ARIA03WT
2125	10/ 4/82			DPR3 E	EPC 3.5KHZ R-01	GDC	09 27.5N	86 07.5W	S ARIA03WT
2133	10/ 4/82			DPR3 B	EPC 3.5KHZ R-02	GDC	09 28.1N	86 06.9W	S ARIA03WT
1935	24/ 4/82			DPR3 E	EPC 3.5KHZ R-02	GDC	20 32.2N	108 48.8W	S ARIA03WT
1942	24/ 4/82			DPR3 B	EPC 3.5KHZ R-03	GDC	20 32.8N	108 50.2W	S ARIA03WT
2204	27/ 4/82			DPR3 E	EPC 3.5KHZ R-03	GDC	29 56.9N	116 28.6W	S ARIA03WT
2210	27/ 4/82			DPR3 B	EPC 3.5KHZ R-04	GDC	29 58.0N	116 28.9W	S ARIA03WT
1140	28/ 4/82			DPR3 E	EPC 3.5KHZ R-04	GDC	32 15.7N	117 08.3W	S ARIA03WT

*** MAGNETOMETER ***

GMT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
0705	7/ 4/82			MGRA B	MAGNETICS R-01	GDC	09 31.4N	84 53.8W	S ARIA03WT
0305	17/ 4/82			MGRA E	MAGNETICS R-01	GDC	15 17.6N	96 56.5W	S ARIA03WT
0315	17/ 4/82			MGRA B	MAGNETICS R-02	GDC	15 17.9N	96 58.7W	S ARIA03WT
0454	28/ 4/82			MGRA E	MAGNETICS R-02	GDC	31 14.0N	116 49.3W	S ARIA03WT

*** SEISMIC REFLECTION PROFILES ***

GMT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
0005	7/ 4/82			SPRF B	AIRGUN-FAST 4S R-01	GDC	09 48.6N	84 46.8W	S ARIA03WT
1647	9/ 4/82			SPRF E	AIRGUN-FAST 4S R-01	GDC	09 28.4N	85 53.3W	S ARIA03WT
1704	9/ 4/82			SPRF B	AIRGUN-FAST 4S R-02	GDC	09 29.3N	85 55.2W	S ARIA03WT
0515	12/ 4/82			SPRF E	AIRGUN-FAST 4S R-02	GDC	09 49.3N	86 08.9W	S ARIA03WT
0739	13/ 4/82			SPRF B	AIRGUN-FAST 4S R-03	GDC	12 25.7N	90 42.5W	S ARIA03WT
1023	15/ 4/82			SPRF E	AIRGUN-FAST 4S R-03	GDC	13 06.0N	90 52.8W	S ARIA03WT
1029	15/ 4/82			SPRF B	AIRGUN-FAST 4S R-04	GDC	13 06.4N	90 53.7W	S ARIA03WT
0011	16/ 4/82			SPRF E	AIRGUN-FAST 4S R-04	GDC	12 53.3N	91 38.3W	S ARIA03WT
1437	17/ 4/82			SPRF B	AIRGUN-FAST 4S R-05	GDC	16 04.8N	99 05.4W	S ARIA03WT
0408	20/ 4/82			SPRF E	AIRGUN-FAST 4S R-05	GDC	15 34.9N	98 38.2W	S ARIA03WT
0418	20/ 4/82			SPRF B	AIRGUN-FAST 4S R-06	GDC	15 34.2N	98 36.9W	S ARIA03WT
1727	21/ 4/82			SPRF E	AIRGUN-FAST 4S R-06	GDC	15 32.9N	98 03.6W	S ARIA03WT

GMT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
1949	21/ 4/82			SPRF	B AIRGUN-FAST 4S R-07	GDC	15 34.3N	98 07.9W	S ARIA03WT
0239	23/ 4/82			SPRF	E AIRGUN-FAST 4S R-07	GDC	17 09.1N	102 07.3W	S ARIA03WT
0250	23/ 4/82			SPRF	B AIRGUN-FAST 4S R-08	GDC	17 09.2N	102 09.7W	S ARIA03WT
0100	24/ 4/82			SPRF	E AIRGUN-FAST 4S R-08	GDC	18 45.8N	105 13.5W	S ARIA03WT
1848	25/ 4/82			SPRF	B AIRGUN-FAST 4S R-09	GDC	23 24.4N	112 26.4W	S ARIA03WT
0902	27/ 4/82			SPRF	E AIRGUN-FAST 4S R-09	GDC	27 40.3N	115 54.8W	S ARIA03WT
0005	7/ 4/82			SPRS	B AIRGUN-SLOW 8S R-01	GDC	09 48.6N	84 46.8W	S ARIA03WT
1705	9/ 4/82			SPRS	E AIRGUN-SLOW 8S R-01	GDC	09 29.4N	85 55.3W	S ARIA03WT
1711	9/ 4/82			SPRS	B AIRGUN-SLOW 8S R-02	GDC	09 29.7N	85 56.1W	S ARIA03WT
0515	12/ 4/82			SPRS	E AIRGUN-SLOW 8S R-02	GDC	09 49.3N	86 08.9W	S ARIA03WT
0739	13/ 4/82			SPRS	B AIRGUN-SLOW 8S R-03	GDC	12 25.7N	90 42.5W	S ARIA03WT
0703	15/ 4/82			SPRS	E AIRGUN-SLOW 8S R-03	GDC	12 44.9N	90 46.4W	S ARIA03WT
0709	15/ 4/82			SPRS	B AIRGUN-SLOW 8S R-04	GDC	12 45.6N	90 45.7W	S ARIA03WT
0011	16/ 4/82			SPRS	E AIRGUN-SLOW 8S R-04	GDC	12 53.3N	91 38.3W	S ARIA03WT
1437	17/ 4/82			SPRS	B AIRGUN-SLOW 8S R-05	GDC	16 04.8N	99 05.4W	S ARIA03WT
0408	20/ 4/82			SPRS	E AIRGUN-SLOW 8S R-05	GDC	15 34.9N	98 38.2W	S ARIA03WT
0415	20/ 4/82			SPRS	B AIRGUN-SLOW 8S R-06	GDC	15 34.4N	98 37.3W	S ARIA03WT
0414	21/ 4/82			SPRS	E AIRGUN-SLOW 8S R-06	GDC	15 47.2N	98 18.9W	S ARIA03WT
0420	21/ 4/82			SPRS	B AIRGUN-SLOW 8S R-07	GDC	15 47.8N	98 19.3W	S ARIA03WT
0100	24/ 4/82			SPRS	E AIRGUN-SLOW 8S R-07	GDC	18 45.8N	105 13.5W	S ARIA03WT
1848	25/ 4/82			SPRS	B AIRGUN-SLOW 8S R-08	GDC	23 24.4N	112 26.4W	S ARIA03WT
0902	27/ 4/82			SPRS	E AIRGUN-SLOW 8S R-08	GDC	27 40.3N	115 54.8W	S ARIA03WT

SEABEAM SWATH BOOK - REALTIME CONTOUR SWATH

GMT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
1232	7/ 4/82			MBSB	B SB SURVEY SWATH BOOK	GRD	08 52.2N	85 22.3W	S ARIA03WT
1145	28/ 4/82			MBSB	E 1 THRU 11	GRD	32 16.4N	117 08.4W	S ARIA03WT
0124	7/ 4/82			MBSB	B SB SWATH BOOK 01	GDC	09 41.6N	84 47.3W	S ARIA03WT
1638	7/ 4/82			MBSB	E SB SWATH BOOK 01	GDC	08 57.5N	85 21.3W	S ARIA03WT
1638	7/ 4/82			MBSB	B SB SWATH BOOK 02	GDC	08 57.5N	85 21.3W	S ARIA03WT
0134	10/ 4/82			MBSB	E SB SWATH BOOK 02	GDC	09 50.1N	86 06.6W	S ARIA03WT
0134	10/ 4/82			MBSB	B SB SWATH BOOK 03	GDC	09 50.1N	86 06.6W	S ARIA03WT
0936	12/ 4/82			MBSB	E SB SWATH BOOK 03	GDC	10 15.2N	86 45.2W	S ARIA03WT
0936	12/ 4/82			MBSB	B SB SWATH BOOK 04	GDC	10 15.2N	86 45.2W	S ARIA03WT
0458	14/ 4/82			MBSB	E SB SWATH BOOK 04	GDC	12 45.8N	90 56.9W	S ARIA03WT

GMT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
0458	14/ 4/82			MBSB	B SB SWATH BOOK 05	GDC	12 45.8N	90 56.9W	S ARIA03WT
0845	16/ 4/82			MBSB	E SB SWATH BOOK 05	GDC	13 48.2N	93 14.5W	S ARIA03WT
0846	16/ 4/82			MBSB	B SB SWATH BOOK 06	GDC	13 48.2N	93 14.7W	S ARIA03WT
0256	18/ 4/82			MBSB	E SB SWATH BOOK 06	GDC	15 56.8N	99 01.2W	S ARIA03WT
0256	18/ 4/82			MBSB	B SB SWATH BOOK 07	GDC	15 56.8N	99 01.2W	S ARIA03WT
1354	20/ 4/82			MBSB	E SB SWATH BOOK 07	GDC	15 49.4N	98 24.3W	S ARIA03WT
1354	20/ 4/82			MBSB	B SB SWATH BOOK 08	GDC	15 49.4N	98 24.3W	S ARIA03WT
1725	22/ 4/82			MBSB	E SB SWATH BOOK 08	GDC	17 12.1N	101 51.4W	S ARIA03WT
1725	22/ 4/82			MBSB	B SB SWATH BOOK 09	GDC	17 12.1N	101 51.4W	S ARIA03WT
1153	24/ 4/82			MBSB	E SB SWATH BOOK 09	GDC	19 44.7N	107 21.5W	S ARIA03WT
1153	24/ 4/82			MBSB	B SB SWATH BOOK 10	GDC	19 44.7N	107 21.5W	S ARIA03WT
0348	26/ 4/82			MBSB	E SB SWATH BOOK 10	GDC	24 24.7N	112 57.5W	S ARIA03WT
0348	26/ 4/82			MBSB	B SB SWATH BOOK 11	GDC	24 24.7N	112 57.5W	S ARIA03WT
0235	28/ 4/82			MBSB	E SB SWATH BOOK 11	GDC	30 46.3N	116 43.1W	S ARIA03WT
0235	28/ 4/82			MBSB	B SB SWATH BOOK 12	GDC	30 46.3N	116 43.1W	S ARIA03WT
1133	28/ 4/82			MBSB	E SB SWATH BOOK 12	GDC	32 14.7N	117 08.2W	S ARIA03WT

SEABEAM MAG TAPE - RAW LOGGED DATA

GMT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
2112	31/ 3/82			MBMT	B SB MAG TAPE 01	GDC	09 48.6N	84 46.8W	S ARIA03WT
0400	11/ 4/82			MBMT	E SB MAG TAPE 01	GDC	09 43.6N	86 05.0W	S ARIA03WT
0400	11/ 4/82			MBMT	B SB MAG TAPE 02	GDC	09 43.6N	86 05.0W	S ARIA03WT
1240	17/ 4/82			MBMT	E SB MAG TAPE 02	GDC	15 56.7N	98 47.1W	S ARIA03WT
1240	17/ 4/82			MBMT	B SB MAG TAPE 03	GDC	15 56.7N	98 47.1W	S ARIA03WT
1145	28/ 4/82			MBMT	E SB MAG TAPE 03	GDC	32 16.4N	117 08.4W	S ARIA03WT

SEABEAM MONITOR RECORD - VERTICAL BEAM

GMT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
2329	6/ 4/82			MBMR	B SB UGR MONITOR R-01	GDC	09 48.6N	84 46.8W	S ARIA03WT
1812	8/ 4/82			MBMR	E SB UGR MONITOR R-01	GDC	09 10.3N	85 21.2W	S ARIA03WT
1828	8/ 4/82			MBMR	B SB UGR MONITOR R-02	GDC	09 11.9N	85 19.2W	S ARIA03WT
1145	28/ 4/82			MBMR	E SB UGR MONITOR R-02	GDC	32 16.4N	117 08.4W	S ARIA03WT

SEABEAM SOUND VELOCITY PROFILE

GMT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
1940	7/ 4/82			MBVP	B SOUND VELOCITY 01	GDC	09 14.0N	85 14.8W	S ARIA03WT
0455	13/ 4/82			MBVP	E SOUND VELOCITY 01	GDC	12 23.9N	90 11.9W	S ARIA03WT
0455	13/ 4/82			MBVP	B SOUND VELOCITY 02	GDC	12 23.9N	90 11.9W	S ARIA03WT
0335	24/ 4/82			MBVP	E SOUND VELOCITY 02	GDC	18 58.6N	105 43.4W	S ARIA03WT

GMT TIME	D /M /Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.		LEG-SHIP CRUISE
0335	24/ 4/82			MBVP	B SOUND VELOCITY 03	GDC	18 58.6N	105 43.4W	S	ARIA03WT
1732	24/ 4/82			MBVP	E SOUND VELOCITY 03	GDC	20 22.3N	108 23.9W	S	ARIA03WT
1732	24/ 4/82			MBVP	B SOUND VELOCITY 04	GDC	20 22.3N	108 23.9W	S	ARIA03WT
1611	25/ 4/82			MBVP	E SOUND VELOCITY 04	GDC	23 05.0N	112 01.0W	S	ARIA03WT
1611	25/ 4/82			MBVP	B SOUND VELOCITY 05	GDC	23 05.0N	112 01.0W	S	ARIA03WT
1608	26/ 4/82			MBVP	E SOUND VELOCITY 05	GDC	26 19.9N	114 31.8W	S	ARIA03WT
1608	26/ 4/82			MBVP	B SOUND VELOCITY 06	GDC	26 19.9N	114 31.8W	S	ARIA03WT
1145	28/ 4/82			MBVP	E SOUND VELOCITY 06	GDC	32 16.4N	117 08.4W	S	ARIA03WT

SEABEAM SURVEY

0900	7/ 4/82			MBSV	B SURVEY CR-1 MAT	GDC	09 20. N	85 00. W	B	ARIA03WT
1100	9/ 4/82			MBSV	E SURVEY CR-1 MAT	GDC	08 40. N	85 50. W	B	ARIA03WT
1315	9/ 4/82			MBSV	B SURVEY CR-2 MAT	GDC	10 00. N	85 40. W	B	ARIA03WT
0745	12/ 4/82			MBSV	E SURVEY CR-2 MAT	GDC	09 20. N	86 30. W	B	ARIA03WT
0815	13/ 4/82			MBSV	B SURVEY GUA-1 MAT	GDC	13 10. N	90 30. W	B	ARIA03WT
1230	15/ 4/82			MBSV	E SURVEY GUA-1 MAT	GDC	12 20. N	91 20. W	B	ARIA03WT
1245	15/ 4/82			MBSV	B SURVEY GUA-2 MAT	GDC	13 30. N	91 00. W	B	ARIA03WT
2200	15/ 4/82			MBSV	E SURVEY GUA-2 MAT	GDC	12 00. N	91 40. W	B	ARIA03WT
0730	17/ 4/82			MBSV	B SURVEY MEXICO MAT	GDC	16 20. N	98 00. W	B	ARIA03WT
0330	22/ 4/82			MBSV	E SURVEY MEXICO MAT	GDC	15 30. N	99 30. W	B	ARIA03WT
1430	22/ 4/82			MBSV	B SURVEY BALSAS MAT	GDC	17 40. N	101 30. W	B	ARIA03WT
0230	23/ 4/82			MBSV	E SURVEY BALSAS MAT	GDC	16 40. N	102 20. W	B	ARIA03WT
1630	23/ 4/82			MBSV	B SURVEY RIVERA MAT	GDC	19 00. N	104 40. W	B	ARIA03WT
0030	24/ 4/82			MBSV	E SURVEY RIVERA MAT	GDC	18 20. N	105 10. W	B	ARIA03WT
2130	24/ 4/82			MBSV	B SURVEY EPR 21N	GDC	21 00. N	109 00. W	B	ARIA03WT
0130	25/ 4/82			MBSV	E SURVEY EPR 21N	GDC	20 30. N	109 40. W	B	ARIA03WT
1800	25/ 4/82			MBSV	B SURVEY DSDP SITE 471	GDC	23 40. N	112 10. W	B	ARIA03WT
2230	25/ 4/82			MBSV	E SURVEY DSDP SITE 471	GDC	23 10. N	112 50. W	B	ARIA03WT
0100	27/ 4/82			MBSV	B SURVEY CEDROS MAT	GDC	28 00. N	115 20. W	B	ARIA03WT
0902	27/ 4/82			MBSV	E SURVEY CEDROS MAT	GDC	27 20. N	116 00. W	B	ARIA03WT

SEISMIC RUN, SINGLE SONOBUOY

0121	11/ 4/82			SRSS	SONOBUOY 36	GDC	09 46.4N	85 52.7W	S	ARIA03WT
0153	11/ 4/82			SRSS	SONOBUOY 37	GDC	09 48.6N	85 55.3W	S	ARIA03WT
2235	11/ 4/82			SRSS	SONOBUOY 38	GDC	09 37.0N	85 58.9W	S	ARIA03WT
2242	11/ 4/82			SRSS	SONOBUOY 39	GDC	09 37.9N	85 59.7W	S	ARIA03WT
2254	11/ 4/82			SRSS	SONOBUOY 40	GDC	09 39.5N	86 01.1W	S	ARIA03WT

GMT TIME	D/M/Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
2306	11/ 4/82			SPSS	SONOBUOY 41	GDC	09 40.9N	86 02.6W	S ARIA03WT
2229	14/ 4/82			SPSS	SONOBUOY 42	GDC	12 54.0N	90 46.0W	S ARIA03WT
2249	14/ 4/82			SPSS	SONOBUOY 43	GDC	12 55.2N	90 49.0W	S ARIA03WT
0137	15/ 4/82			SPSS	SONOBUOY 44	GDC	12 52.6N	91 07.6W	S ARIA03WT
0247	15/ 4/82			SPSS	SONOBUOY 45	GDC	12 48.6N	90 58.2W	S ARIA03WT
0319	15/ 4/82			SPSS	SONOBUOY 46	GDC	12 46.6N	90 53.8W	S ARIA03WT
0957	15/ 4/82			SPSS	SONOBUOY 47	GDC	13 04.3N	90 48.8W	S ARIA03WT
1115	15/ 4/82			SPSS	SONOBUOY 48	GDC	13 08.7N	91 00.0W	S ARIA03WT
0230	22/ 4/82			SPSS	SONOBUOY 49	GDC	15 57.2N	99 06.9W	S ARIA03WT
1727	23/ 4/82			SRSS	SONOBUOY 50	GDC	18 30.9N	104 48.3W	S ARIA03WT
1740	23/ 4/82			SRSS	SONOBUOY 51	GDC	18 32.6N	104 50.4W	S ARIA03WT
1859	25/ 4/82			SRSS	SONOBUOY 52	GDC	23 25.7N	112 27.9W	S ARIA03WT
2008	25/ 4/82			SRSS	SONOBUOY 53	GDC	23 29.5N	112 30.9W	S ARIA03WT
2138	25/ 4/82			SRSS	SONOBUOY 54	GDC	23 26.9N	112 26.4W	S ARIA03WT
2141	25/ 4/82			SPSS	SONOBUOY 55	GDC	23 27.3N	112 26.8W	S ARIA03WT

GRAVIMETRIC RECORDS CURATOR L.M. DORMAN (EXT.2406)

GMT TIME	D/M/Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
2200	9/ 4/82			GVRA	B GRAVITY R-01	GDC	09 42.0N	86 14.0W	S ARIA03WT
0535	26/ 4/82			GVRA	E GRAVITY R-01	GDC	24 40.7N	113 12.3W	S ARIA03WT
0541	26/ 4/82			GVRA	B GRAVITY R-02	GDC	24 41.6N	113 13.1W	S ARIA03WT
1400	28/ 4/82			GVRA	E GRAVITY R-02	GDC	32 32.5N	117 13.1W	S ARIA03WT

*** BATHYTHERMOGRAPH ***

GMT TIME	D/M/Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
1940	7/ 4/82			BTXP	XBT 01	GDC	09 14.0N	85 14.8W	S ARIA03WT
2157	13/ 4/82			BTXP	XBT 02	GDC	12 57.1N	90 56.7W	S ARIA03WT
1125	17/ 4/82			BTXP	XBT 03	GDC	15 52.0N	98 31.4W	S ARIA03WT
1313	23/ 4/82			BTXP	XBT 04	GDC	18 02.3N	104 06.5W	S ARIA03WT
1530	24/ 4/82			BTXP	XBT 05	GDC	20 09.4N	108 01.9W	S ARIA03WT
1515	25/ 4/82			BTXP	XBT 06	GDC	22 57.8N	111 50.7W	S ARIA03WT
1536	26/ 4/82			BTXP	XBT 07	GDC	26 15.6N	114 26.7W	S ARIA03WT

*** THERMOGRAPH ***

GMT TIME	D/M/Y DATE	LOC TIME	LOC TZ	CODE SAMP	SAMPLE IDENT.	CODE DISP	LAT.	LONG.	LEG-SHIP CRUISE
2315	6/ 4/82			TGRC	B THERMOGRAPH SHEETS	GDC	09 48.6N	84 46.8W	S ARIA03WT
1300	28/ 4/82			TGRC	E 1 THRU 21	GDC	32 26.2N	117 10.9W	S ARIA03WT

9900 END SAMPLE INDEX ARIA03WT

APPENDIX 4

DESCRIPTION OF GEOPHYSICAL SYSTEMS

Bathymetry

The R/V THOMAS WASHINGTON is equipped with a multibeam echosounding system (Seabeam) that produces a bathymetric map with a swath width that is approximately 3/4 of the water depth. Thus, off Guatemala where the trench depth is 6000 meters, the swaths are 4500 meters wide. The Seabeam bathymetric survey system comprises two major subsystems: a narrow beam echo sounder (Model 853-E) and an echo processor (Model 875-C). The narrow beam echo sounder uses 16 beams, each 2-2/3 degree wide, to measure water depth across the ship's track. The echo processor uses a mini computer as the central control and processing element, providing for automatic control of the system. The sonar signal originates in the transmitter signal generator which produces two low impedance 12.158 KHZ sinewaves in quadrature. A gated key pulse 7ms wide (1ms in shallow water) is sent by the timing unit in the echo processor module. A Universal Graphic Recorder usually determines the ping period. The signal is then fed into a pitch resolver unit which steers the transmitted beam pattern by varying the phase relationship of the signal output of each of the 20 resolvers relative to a pitch signal from the vertical gyro. This insures vertical projection of the sonar transmission within the limits of ±10 degree of pitch with a 1/4 degree accuracy. Each resolver feeds a separate power amplifier which in turn drives one of the 20 transducers in the projector array. Each transducer contains 4 magnetostrictive elements, and the array is mounted along the keel in a fore-and-aft direction. The transmitted beam pattern thus obtained is 54 degrees wide athwartship and 2-2/3 degrees in the fore-and-aft direction at the 3 db down point. The receiving unit is a 40 ceramic line hydrophone array mounted athwartship. The signal appearing at each hydrophone goes through an associated preamplifier which makes 4 quadrature outputs available. A resistor matrix then performs a vector summation on the 160 lines from the preamplifiers, and yields a set of 16 unstabilized preformed beams, each 2-2/3 degree wide fore-and-aft and 20 degree wide athwartship. The receiving beam pattern therefore covers 21-1/3 degree on each side of the ship's vertical. As a result the projector hydrophone combination outlines on the sea floor 16 squares 2-2/3 degree wide, in a vertical plane with the ship's fore-and-aft axis, but roll dependent athwartship. The 16 preformed beams are then sent on one hand to the echo processor receivers, and on the other hand to the sonar roll compensator. In the echo processor, the signal coming from the sonar line drivers is fed into 16 identical receivers. Each receiver comprises a narrow band amplifier centered at 12.158 KHZ, a detector and a DC amplifier. The EP receivers output linear detected signals which are sent to the analog to digital (A/D) converter in the computer. The computer also receives roll and heading information through a synchro to digital (S/D) converter, and performs the various corrections such as: Ray bending, slant-range calculation, roll compensation, etc. The final product is a set of depths and distances across the ship's track which are subsequently used to generate contour maps.

Seismic Reflection

The seismic system consisted of two 80 cubic inch Seismic Systems Inc. (SSI) waterguns and two 550 cubic inch Bolt airguns as sources. The waterguns were used during most of our operations, because their broad band sigaft direction at the 3 db down point. The receiving unit is a 40 ceramic line hydrophone array mounted athwartship. The signal appearing at each hydrophone goes through an associated preamplifier which makes 4 quadrature outputs available. A resistor matrix then performs a vector summation on the 160 lines from the preamplifiers, and yields a set of 16 unstabilized preformed beams, each 2-2/3 degree wide fore-and-aft and 20 degree wide athwartship. The receiving beam pattern therefore covers 21-1/3 degree on each side of the ship's vertical. As a result the projector hydrophone combination outlines on the sea floor 16 squares 2-2/3 degree wide, in a vertical plane with the ship's fore-and-aft axis, but roll dependent athwartship. The 16 preformed beams are then sent on one hand to the echo processor receivers, and on the other hand to the sonar roll compensator. In the echo processor, the signal coming from the sonar line drivers is fed into 16 identical receivers. Each receiver comprises a narrow band amplifier centered at 12.158 KHZ, a detector and a DC amplifier. The EP receivers output linear detected signals which are sent to the analog to digital (A/D) converter in the computer. The computer also receives roll and heading information through a synchro to digital (S/D) converter, and performs the various corrections such as: Ray bending, slant-range calculation, roll compensation, etc. The final product is a set of depths and distances across the ship's track which are subsequently used to generate contour maps.

Seismic Reflection

The seismic system consisted of two 80 cubic inch Seismic Systems Inc. (SSI) waterguns or two 550 cubic inch Bolt airguns as sources. The waterguns were used during most of our operations, because their broad band signal allows higher resolution than the airguns. A Teledyne 50 element hydrophone streamer was used as the receiving system. The seismic signals were recorded on analog recorders, as well as being digitized by an analog to digital converter and recorded on magnetic tape for later processing.

Gravity and Magnetics

Gravity measurements were made by a Graf-Askania Gravimeter. Readings were taken every minute and logged on magnetic tape by a shipboard computer system.

Magnetics measurements were made by a Varian magnetometer. Readings were made every minute and logged by the shipboard computer.

APPENDIX 5

CRUISE NARRATIVE

06 April	2300Z depart Punarenas, Costa Rica; deploy two 80 cubic inch waterguns, hydrophone streamer, and magnetometer; begin survey of Middle America Trench south of Nicoya Peninsula.
12 April	0600Z end survey off Costa Rica; begin transit to Guatemala
13 April	0800Z arrive at Guatemala Survey site; deploy waterguns, streamer and begin survey south of San Jose, Guatemala.
15 April	2300Z Complete survey off Guatemala; begin transit to Mexico, surveying Middle America Trench with Seabeam system.
17 April	1400Z Arrive at Mexico survey site; deploy waterguns, streamer and begin survey southeast of Acapulco, Mexico.
22 April	0300Z Complete survey southeast of Acapulco; transit northwest along Trench Axis. 0700Z Begin short survey of Trench at intersection with Rio Balsas Canyon.
23 April	0200Z Complete survey; transit northwest along Trench axis. 1800Z Begin Survey of Trench at intersection with Rivera Fracture Zone.

2300Z Complete survey; begin transit to San Diego.

24 April 2000Z to 2330Z Conduct short survey over seamounts northwest of East Pacific Rise axis at 20 degrees 50 min North.

2330Z Continue transit to San Diego.

28 April 1500Z Arrive San Diego.

APPENDIX 6

CRUISE PARTICIPANTS

T. H. Shipley	Co-Chief Scientist	Scripps Inst. Oceanography
G. F. Moore	Co-Chief Scientist	Scripps Inst. Oceanography
F. V. Pavlicek	Seabeam Technician	S.I.O.
P. J. Crampton	Airgun Technician	S.I.O.
W. L. Smith	Seabeam Technician	S.I.O.
P. C. Henkart	Seismic Programmer	S.I.O.
R. J. Gilchrist	Resident Technician	S.I.O.
D. V. Stuber	Computer Technician	S.I.O.
A. M. Volpe	Student	S.I.O.
C. P. de Moustier	Student	S.I.O.
J. Roump	Student	France
D. L. Reed	Student	S.I.O.
D. Siu Arriola	Observer	Costa Rica
G. Leandro Calvo	Observer	Costa Rica
L. F. Arias Lopez	Observer	Guatemala
J. H. Sandoval-Ochoa	Observer	Mexico