IG2402_3

THE UNIVERSITY OF TEXAS
MARINE SCIENCE INSTITUTE
GEOPHYSICS LABORATORY
GALVESTON, TEXAS 77550

*700 The Strand*
*713 765-2173*

20 September 1977

# RESEARCH CRUISE REPORT

SHIP NAME:
R/V *Ida Green*

OPERATING INSTITUTION:
University of Texas
Marine Science Institute
Geophysics Laboratory

CLEARANCE COUNTRY:
Costa Rica

DATES:
March - July 1977

PROJECT TITLE:
Tectonics of the Middle America Trench

PORT CALLS:

| | |
|---|---|
| Puntarenas, C.R. | 3/31/77-4/03/77 |
| " | 4/06/77-4/09/77 |
| " | 5/16/77-5/17/77 |
| " | 7/18/77-7/19/77 |

FOREIGN PARTICIPANTS:
Dr. Rodrigo Saenz, Director,
Ministry of Geology & Economics
German Leandro C.
Escuela de Geologia
Universidad de Costa Rica
San Jose, Costa Rica

SENIOR SCIENTIST:
Joel S. Watkins

DESCRIPTION OF SCIENTIFIC PROGRAM:

This project is an investigation of the geology and tectonics of the continental margin off Costa Rica. It is part of a larger overall study of the entire Middle America Trench (MAT) area between Mexico and Costa Rica. The objective of the project is to learn more about the geology and tectonics of an active plate margin. According to plate tectonic theory, an active margin is where one lithospheric plate dives beneath another and is consumed or subducted. During this process part of the oceanic plate is scraped off and thrust up and incorporated within the continental slope. Earthquakes and volcanoes are also produced. The results of this project will help in understanding the mechanisms of this process as well as resulting geometries or structure of the rocks within the crust.

OBSERVATIONS AND SAMPLES:

The data collection phase of the project was conducted from shipboard and consists of four general aspects as follows:

1) Earthquake study. The tectonics of the area are being studied by continuously monitoring all earthquakes in the area. An array of five ocean bottom seismometers (OBS's) were deployed off the Nicoya Peninsula for several months to supplement land stations already established by Dr. T. Matumoto of UT/MSI. Figure 1 shows OBS and land station locations.

OBSERVATIONS AND SAMPLES, continued:

2) Refraction study. A series of five refraction lines parallel to the trench axis were shot to determine the crustal structure beneath the continental shelf and slope. The location of four lines is shown in Figure 1. The location of the fifth line is discussed in the cruise report by Dr. Houston on Legs IG 24-7, -8, -9. Two lines were shot to land stations in order to increase their length. OBS's and sonobuoys were used as marine recording stations. These studies will supplement crustal studies being conducted on land by Dr. Matumoto.

3) Multichannel seismic reflection study. 600 nautical miles of CDP multichannel seismic reflection data were collected off Costa Rica (Fig. 2). These data will be used to determine the geology and structure of the crust beneath the entire continental margin, including the geometry of deep layers within the oceanic crust and upper mantle, the geometry of the upper part of the subducting oceanic plate beneath the slope, the structure of subduction complex beneath the slope, and the nature of the sedimentary sequences beneath the slope and shelf. A high energy source using small explosive charges (Maxipulse) was used successfully along one line for maximum penetration of seismic energy (Fig. 2). Continuous sonobuoys were recorded along this line (Fig. 3).

4) Sedimentation study. Five cores were taken from the shelf, slope, and trench off the Nicoya peninsula to study sedimentation patterns. The location of these cores is included with the accompanying cruise report of Dr. Houston for Legs IG 24-7, -8, -9.

Bathymetry and magnetic data were routinely collected along all tracts of the cruise. The tracks of Legs IG 24-2 and IG 24-3 are included here (Figs. 4 and 5). Tracks for subsequent IG 24 legs off Costa Rica are included in accompanying reports.

Location of data stored is UT/MSI Galveston (address on letterhead).

NAME AND ADDRESS OF CONTACT TO WHOM INQUIRIES REGARDING CRUISE SHOULD BE MADE:

Richard T. Buffler
University of Texas
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Geophysics Laboratory
700 The Strand
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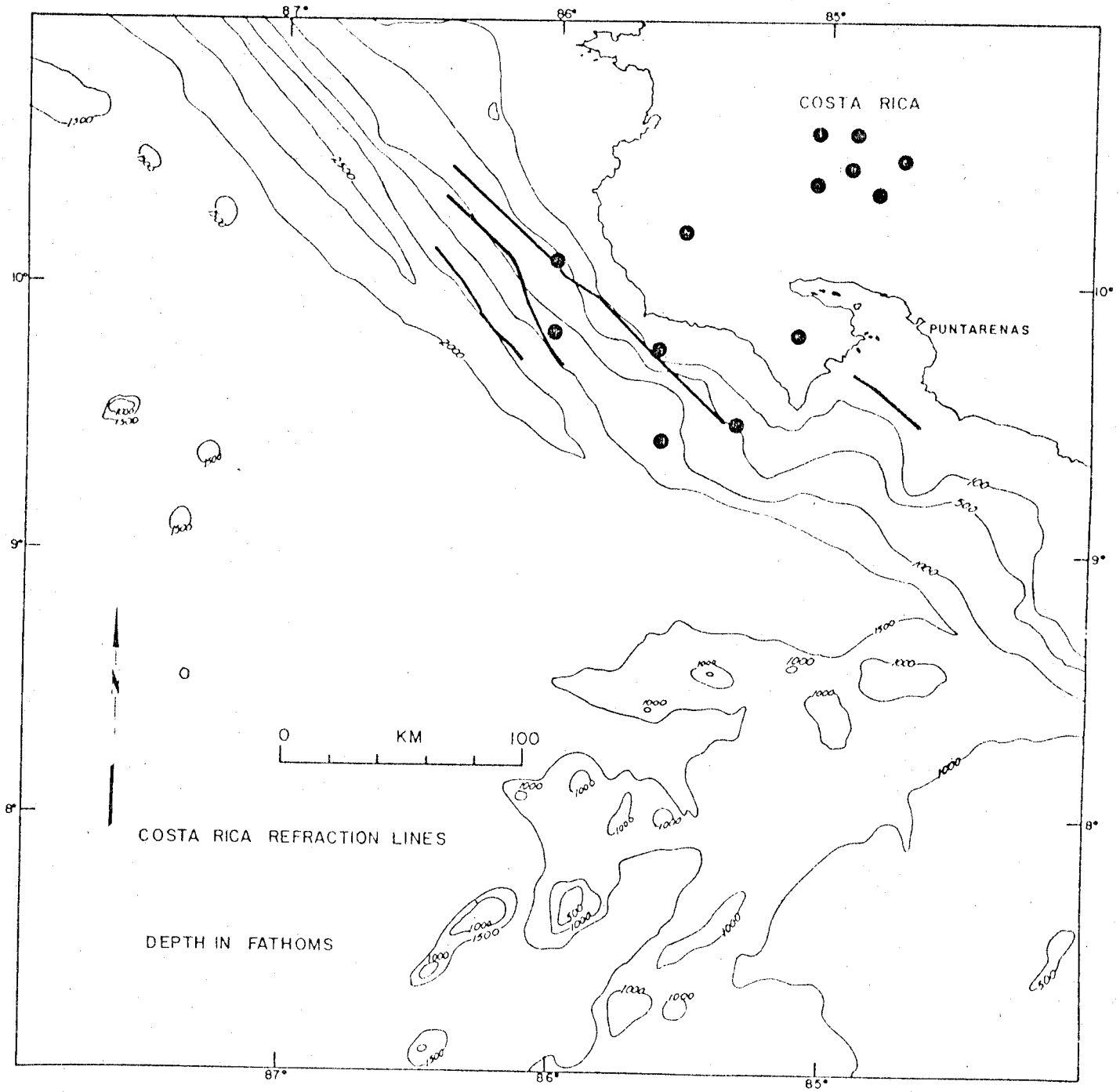
87°
86°
85°
COSTA RICA
PUNTARENAS
10°
9°
8°
0
KM
100
COSTA RICA REFRACTION LINES
DEPTH IN FATHOMS

Fig. 1

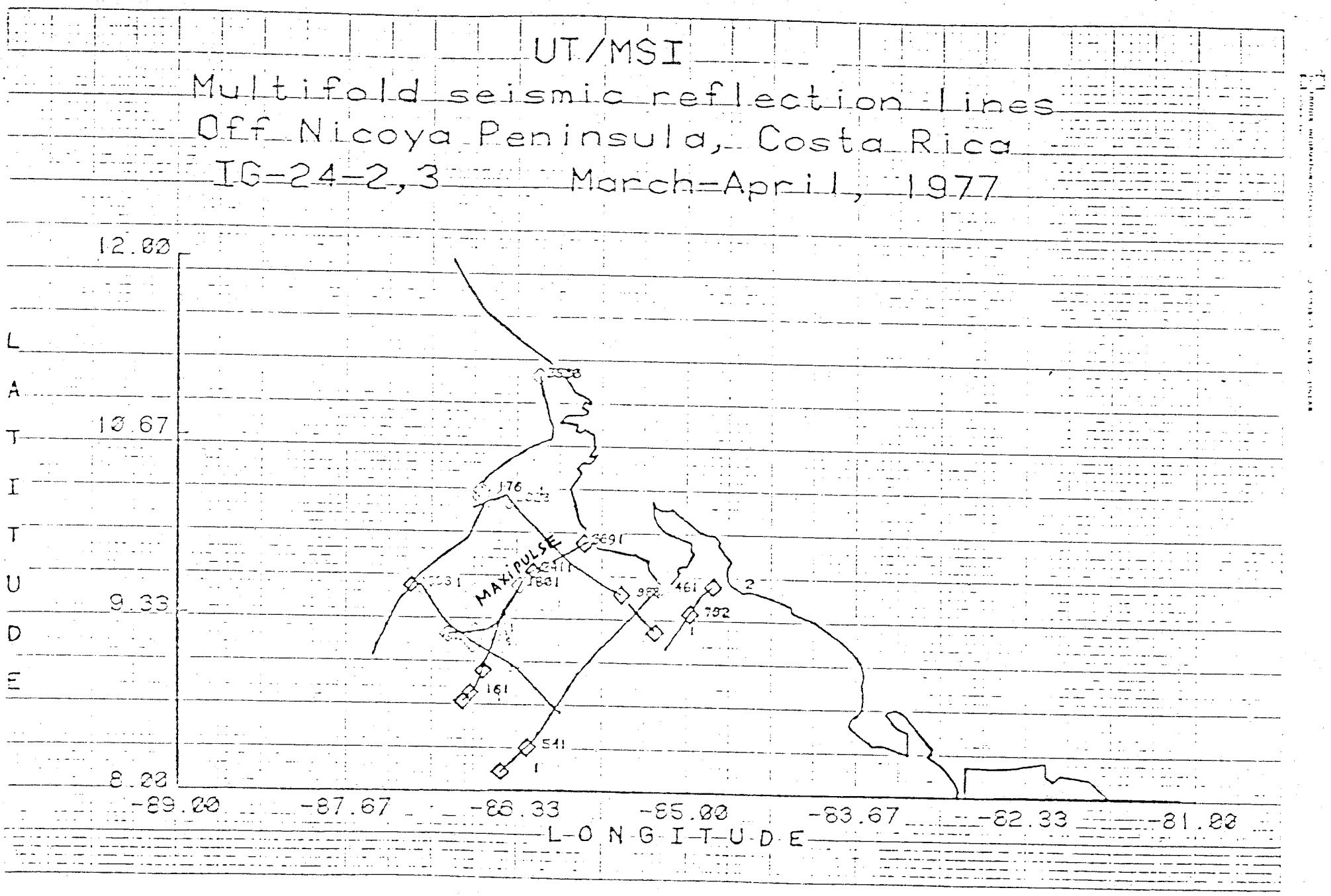
UT/MSI
Multifold seismic reflection lines
Off Nicoya Peninsula, Costa Rica
IG-24-2,3 March-April, 1977
12.00
10.67
9.33
8.00
LATITUDE
-89.00
-87.67
-86.33
-85.00
-83.67
-82.33
-81.00
LONGITUDE
MAXIPULSE
176
691
461
782
161
541

Fig. 2

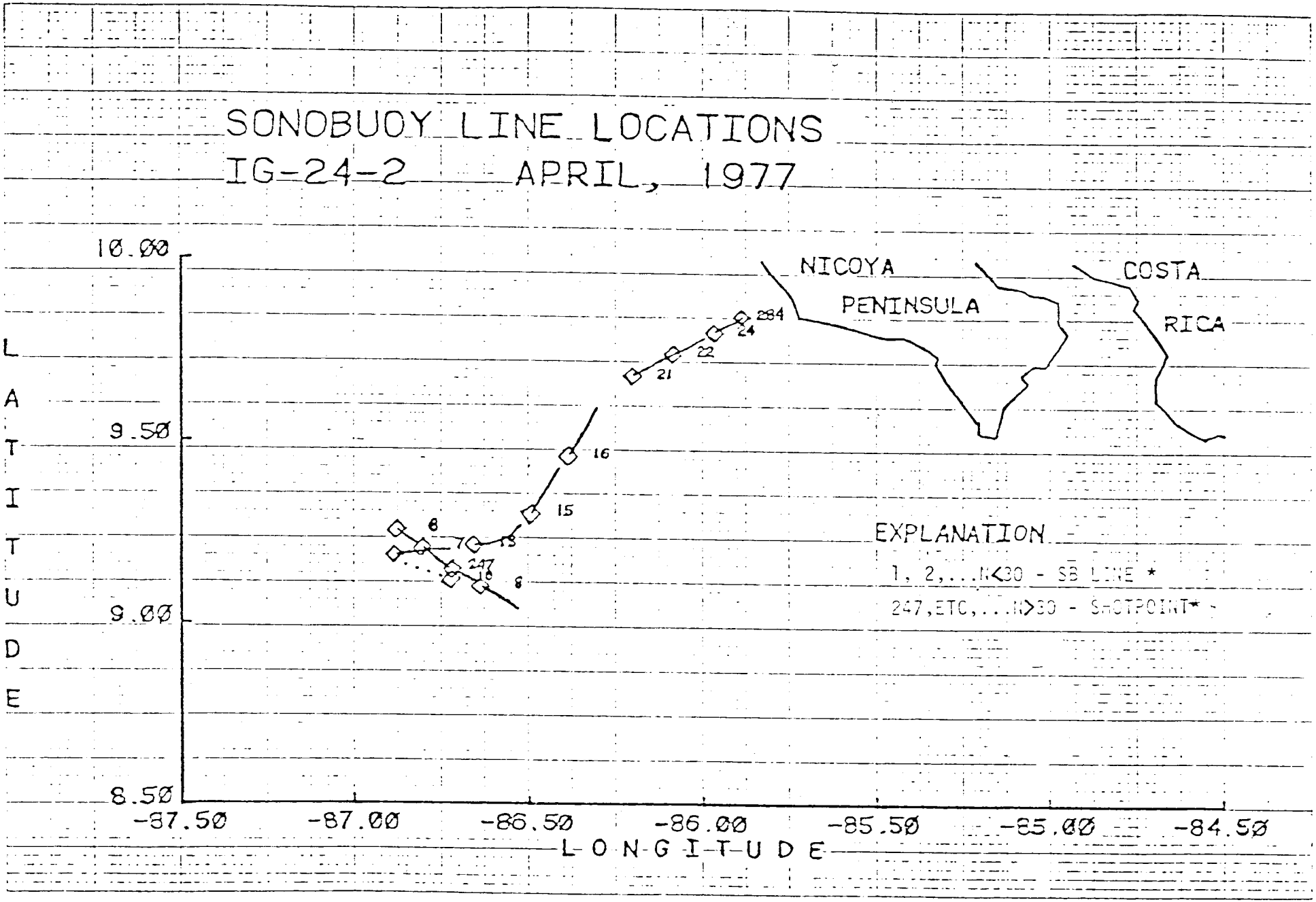
SONOBUOY LINE LOCATIONS
IG-24-2 APRIL, 1977
10.00
9.50
9.00
8.50
LATITUDE
-87.50
-87.00
-86.50
-86.00
-85.50
-85.00
-84.50
LONGITUDE
NICOYA
PENINSULA
COSTA
RICA
284
24
22
21
16
15
8
7
247
EXPLANATION
1, 2,...N<30 - SB LINE *
247,ETC,...N>30 - SHOTPOINT*

Fig. 3

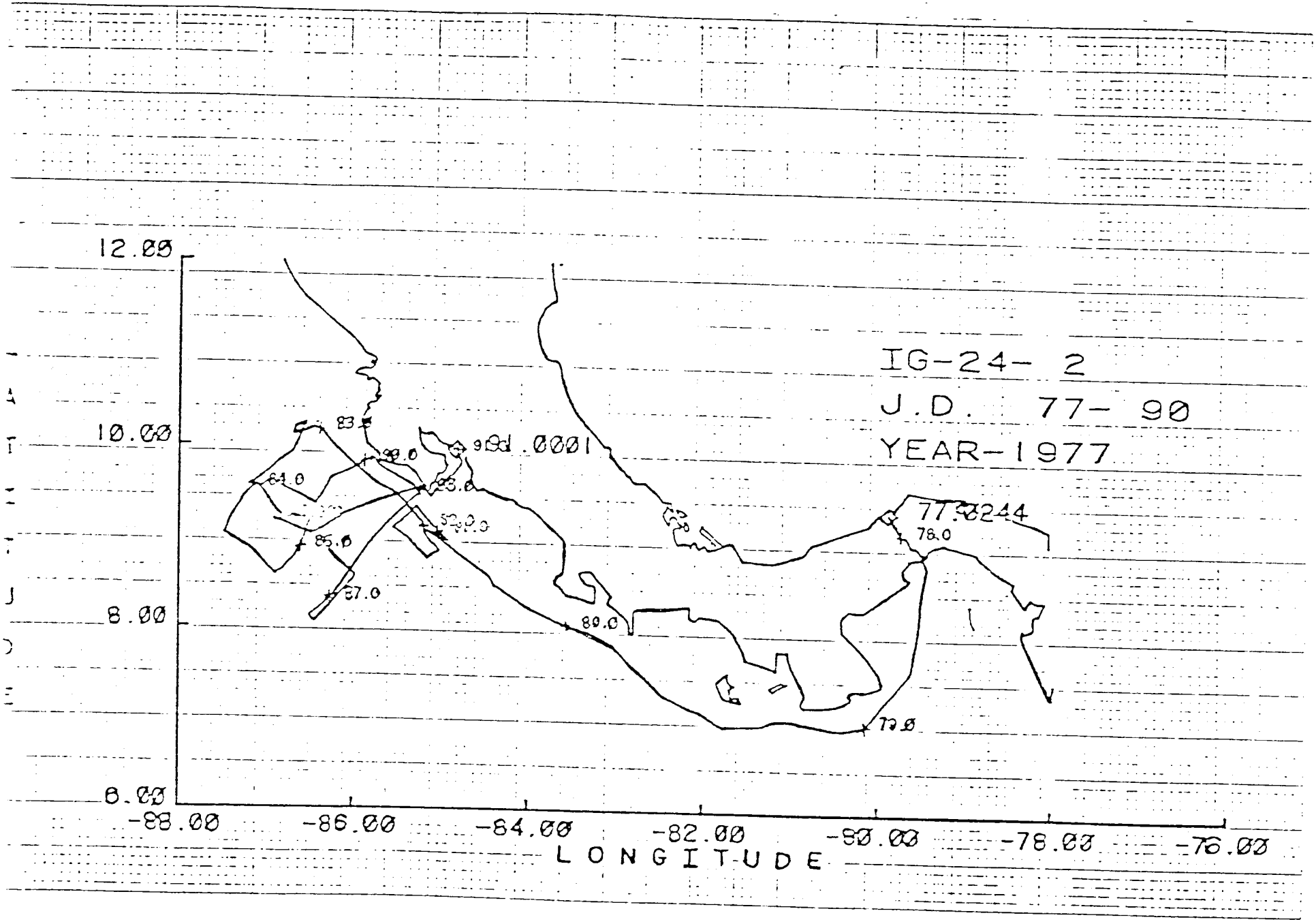
IG-24- 2
J.D. 77- 90
YEAR-1977
12.00
10.00
8.00
6.00
-88.00
-86.00
-84.00
-82.00
-80.00
-78.00
-76.00
LONGITUDE
83
84.0
85.0
87.0
89.0
78.0
79.0

Fig. 4

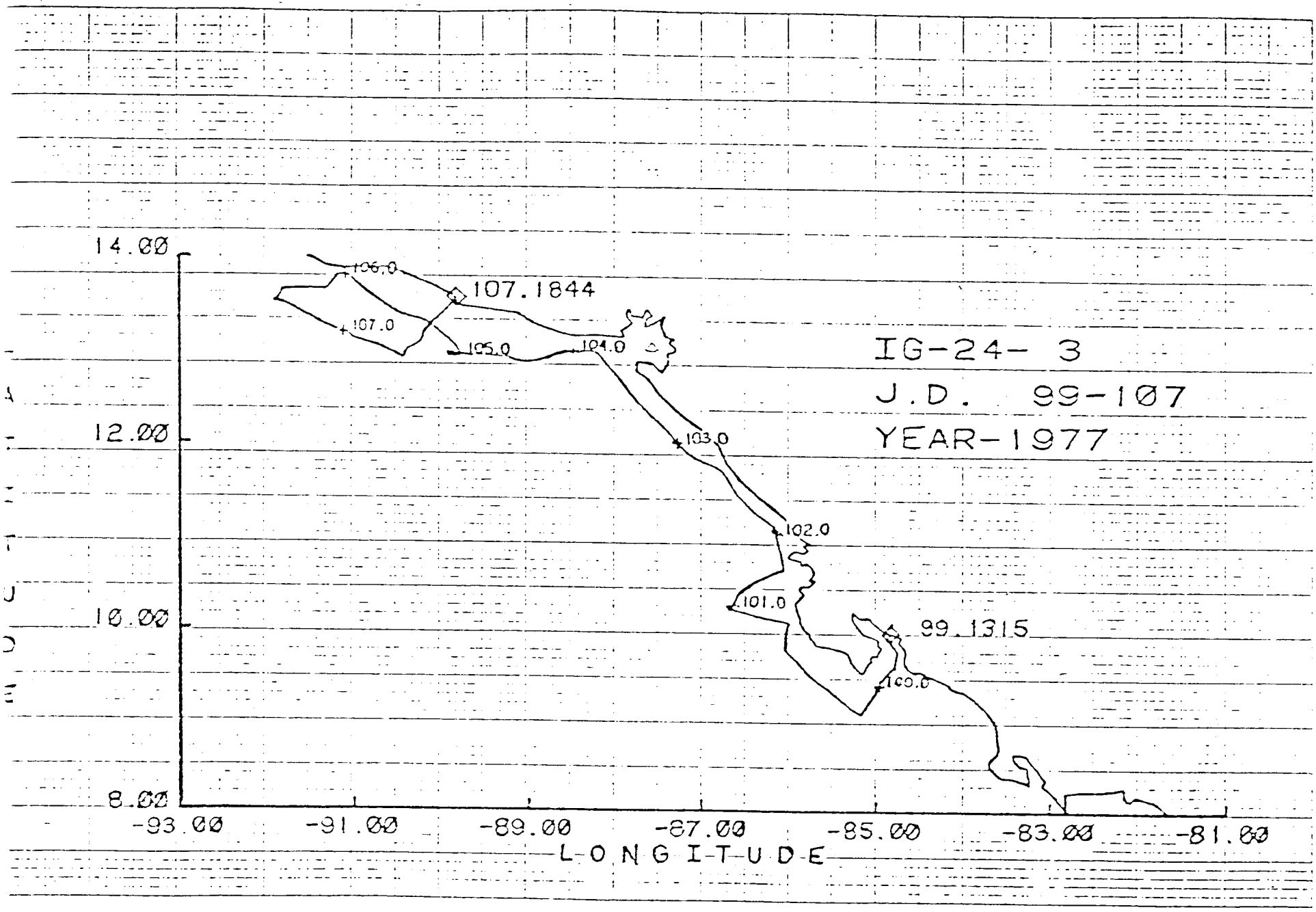
14.00
12.00
10.00
8.00
106.0
107.1844
107.0
105.0
104.0
103.0
102.0
101.0
99.1315
100.0
IG-24- 3
J.D. 99-107
YEAR-1977
-93.00
-91.00
-89.00
-87.00
-85.00
-83.00
-81.00
LONGITUDE

Fig. 5