

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

Processed Strong-Motion Records  
From the Solomon Islands Earthquakes of December 13, 1981  
and March 18, 1983

by

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Open-File Report 85-261

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature. Any use of trade names is for descriptive purposes only and does not imply endorsement by the USGS.

## CONTENTS

	Page
Abstract -----	1
Processed strong-motion records from the Solomon Islands	
earthquakes of December 12, 1981 and March 3, 1983 -----	2
Digitizing and processing -----	3

### Tables

1. Source parameters -----	6
2. Peak values of processed records -----	7
3. Long period, low frequency, filter parameters -----	8

### Figures

1. Map showing location of Bougainville Island -----	9
2. Map showing epicenters and instrument locations -----	10
3. Copies of original records -----	11

### Appendix

Computer Plots -----	18
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## ABSTRACT

The U.S. Geological Survey (USGS) has maintained some contact with operators of other strong-motion accelerograph networks throughout the world. As a result, the USGS occasionally receives a small number of records for routine processing. This report describes the processing of five records from a network on Bougainville Island, Papua New Guinea.

Three earthquakes, two on December 13, 1981 and one on March 18, 1983, occurred in the Solomon Islands region. The first two events, magnitude 6.0  $M_L$  and magnitude 5.7  $M_L$  were recorded at the 460 Bench, Panguna Mine Station on Bougainville Island; the third event, magnitude 7.9  $M_s$ , was recorded at stations in Arawa Town, at Bato Bridge, and in Panguna on Bougainville Island.

This report contains the processed records from these events.

## Processed Strong-Motion Records from Solomon Islands Earthquakes

December 13, 1981 (0139 UTC and 1324 UTC) and

March 18, 1983 (0905 UTC)

### Earthquake Data

Figures 1 and 2 show the location of Bougainville Island, Papua New Guinea and three earthquakes that occurred in the Solomon Islands region that were recorded by strong-motion accelerographs located on Bougainville Island.

The largest of these earthquakes was a magnitude 7.9 ( $M_S$ ) and was recorded by the Arawa Town, Bato Bridge and BVE 80 (Panguna) stations. All stations, except Bato Bridge are known to be located either in Arawa or Panguna areas (Kevin McCue, Bougainville Copper, written commun., October 1983). Based on Kevin McCue's estimates of epicentral distances (Table 2), Bato Bridge is believed to be in the same area.

The two earthquakes, on December 13, 1981, were recorded by the 460 Bench (Panguna Mine) station. These events were magnitude 5.9  $M_B$  (0139 UTC) and 5.5  $M_B$  (1324 UTC). Source data for all three events are listed in Table 1.

### Station Data

<u>Arawa Town</u>	1/4 g SMA-1 located on rock. Elevation 30 m.
<u>Bato Bridge</u>	1/2 g SMA-1 located on rock. Elevation 30 m.
<u>Bench (Panguna Mine)</u>	1/2 g SMA-1 located on rock.
<u>BVE 80 (Panguna)</u>	1 g SMA-1 located on volcanic ash over weathered rock. Elevation 300 m.

### Records Data

Figure 3a through 3g present reproductions of the original records. Negatives were scaled for peak amplitudes; the scaled uncorrected and corrected data are presented in Table 2.

## DIGITIZING AND PROCESSING

The computer plots provide a visual description of the recorded accelerations and their processed results. They are reproduced in the Appendix. These plots may be used to measure specific earthquake or record parameters directly and to select records for further study using available digital data.

The steps for processing are:

1. A commercial digitizing firm (IOM-TOWILL in Santa Clara, California) digitizes the records on a trace-following, computer-controlled laser scanner. The data is digitized at unequal time intervals, at an average of 600 samples per second.
2. If a strong-motion record has a duration longer than about 10 sec, then it is divided into approximately 10 sec segments, each segment being digitized separately. The segments are reassembled using specially inserted vertical lines, the lines mark the end and/or beginning of each segment. Each vertical line is digitized twice, once in each adjacent segment, and then used in reassembling the record.
3. The UNCORRECTED DATA are prepared by subtracting the digitized reference traces from the data traces; and using the digitized time marks to determine the time scale. The instrument sensitivities scale the ordinates to accelerations.
4. The data are passed through a correction algorithm that applies a high-frequency filter (50 Hz), instrument corrections, base line correction, in the form of a low frequency filter, and decimation to 200 sps. Plots of the CORRECTED ACCELERATION, VELOCITY, and DISPLACEMENTS for the three components of each recording are included. Butterworth filter parameters for each station are listed in table 3.

5. The maximum relative velocity response spectra (RV) are calculated for damping values of 0, 2, 5, 10 and 20 percent of critical. This RESPONSE SPECTRA are calculated for a period range starting at 0.04 sec and ending with the long period corresponding to the low frequency filter limit used in the base-line correction algorithm. The dashed curve on this plot is the unsmoothed Fourier amplitude spectrum, FAS, calculated at the same periods as the relative velocity response spectra.

The second RESPONSE SPECTRUM plot is that of the pseudo-velocity response spectra, PSRV, calculated for the same five damping values used in calculating the RV spectra. This tripartite plot also has the values for the maximum relative displacement response spectrum (RD) as well as the pseudo-acceleration spectrum (PSAA).

6. FOURIER AMPLITUDE SPECTRA, calculated by FFT, are presented on linear and log-log axes to accent the particular characteristics at each end of the spectrum.

Initial selection of filters for Step 4 are based on the convention of retaining a period content somewhat longer than the strong motion duration of the records. The final Butterworth filter parameters are chosen to eliminate any apparent serious noise content in the calculated displacements.

The digital data from which these plots are produced are available on tape from the National Geophysical Data Center (NGDC), NOAA, Mail Stop E/GC11, 325 Broadway, Boulder, Colorado 80303.

For a more complete description see: Converse, A., 1984; AGRAM: A Series of Computer Programs for Processing Digitized Strong-Motion Accelerograms, Version 2.0; USGS Open-File Report 81-525.

## Computer Plots

The Appendix contains computer plots for the following processing stages:

Uncorrected accelerogram.

Corrected acceleration velocity and displacement.

Relative velocity response spectra linear plot.

Response spectra, tripartite log-log plot.

Fourier amplitude spectrum calculated by FFT, linear plot.

Fourier amplitude spectrum calculated by FFT, log-log plot.

Table 1: Source Data for Papua New Guinea Events\*

1. Date	12/13/81	2. Date	12/13/81
Time	0139 14.3 UTC	Time	1324 17.3 UTC
Epicenter	6.387S, 154.929E	Epicenter	6.343S, 154.923E
Depth	50 Km	Depth	48 Km
Magnitude	5.9 $M_B$ , 6.0 $M_L$ +	Magnitude	5.5 $M_B$ , 5.7 $M_L$ +
3. Date	03/18/83		
Time	0905 50.0		
Epicenter	4.833S, 153.581E		
Depth	89 Km		
Magnitude	7.9 $M_S$ , 7.7 $M_S$ +		

\* Unless otherwise noted, all seismological data in this report is taken from Preliminary Determination of Epicenters (PDE) published by the U.S. Geological Survey.

+ Kevin McCue, Bougainville Copper, written communication, Oct. 1983.



Table 2: Peak Value of Processed Records

Earthquake	Station	Distances (Km)		Components	Peak Acceleration		Corrected Peak Motion		
		Epi	Hypo		Scaled* (g)	Digitized (cm/s <sup>2</sup> )	Accel. (cm/s <sup>2</sup> )	Vel. (cm/s)	Disp. (cm)
		(All distance + 10 Km)							
13 Dec. 1981 0139 UTC	460 Bench, Panguna Mine	= 63	= 80	Long.	.07	- 70.56	- 73.10	- 1.54	0.11
				Up	.02	22.13	27.94	- 0.78	0.11
				Tran.	.08	- 79.99	- 95.33	- 1.36	- 0.19
13 Dec. 1981 1324 UTC	460 Bench, Panguna Mine	= 64	= 80	Long.	.03	- 25.16	25.74	0.61	- 0.03
				Up	.02	15.56	16.15	0.32	0.02
				Tran.	.04	41.31	- 62.43	0.91	- 0.07
18 March 1983 0905 UTC	Arawa Town	=267	=281	Long.	.02	- 22.06	- 21.64	- 3.35	1.51
				Up	.02	17.97	18.00	- 6.11	-3.56
				Tran.	.02	- 25.34	- 25.77	- 5.52	2.15
	Bato Bridge	=271	=285	Long.	.04	- 34.94	- 33.93	- 4.00	-1.20
				Up	.02	18.62	18.47	- 3.40	1.27
				Tran.	.03	- 32.59	- 32.29	- 4.12	-1.92
	BVE 80 [Panguna]	=271	=285	Long.	.30	283.43	283.51	28.64	3.56
				Up	.12	115.15	115.41	- 5.62	1.07
				Tran.	.27	271.54	269.65	-17.91	- 2.61

\* Scaled from Duplicate Records

Table 3: Long-Period, Low Frequency, Filter Parameters

	Final Butterworth (Hz)	Order	Original Butterworth (Hz)	Order
Arawa Town	0.125	4	0.083	4
Bato Bridge	0.20	4	0.125	4
Bench (0139)	0.50	4	0.25	4
Bench (1324)	1.0	4	0.125	4
BVE 80 (Panguna Mine)	0.20	4	0.125	4

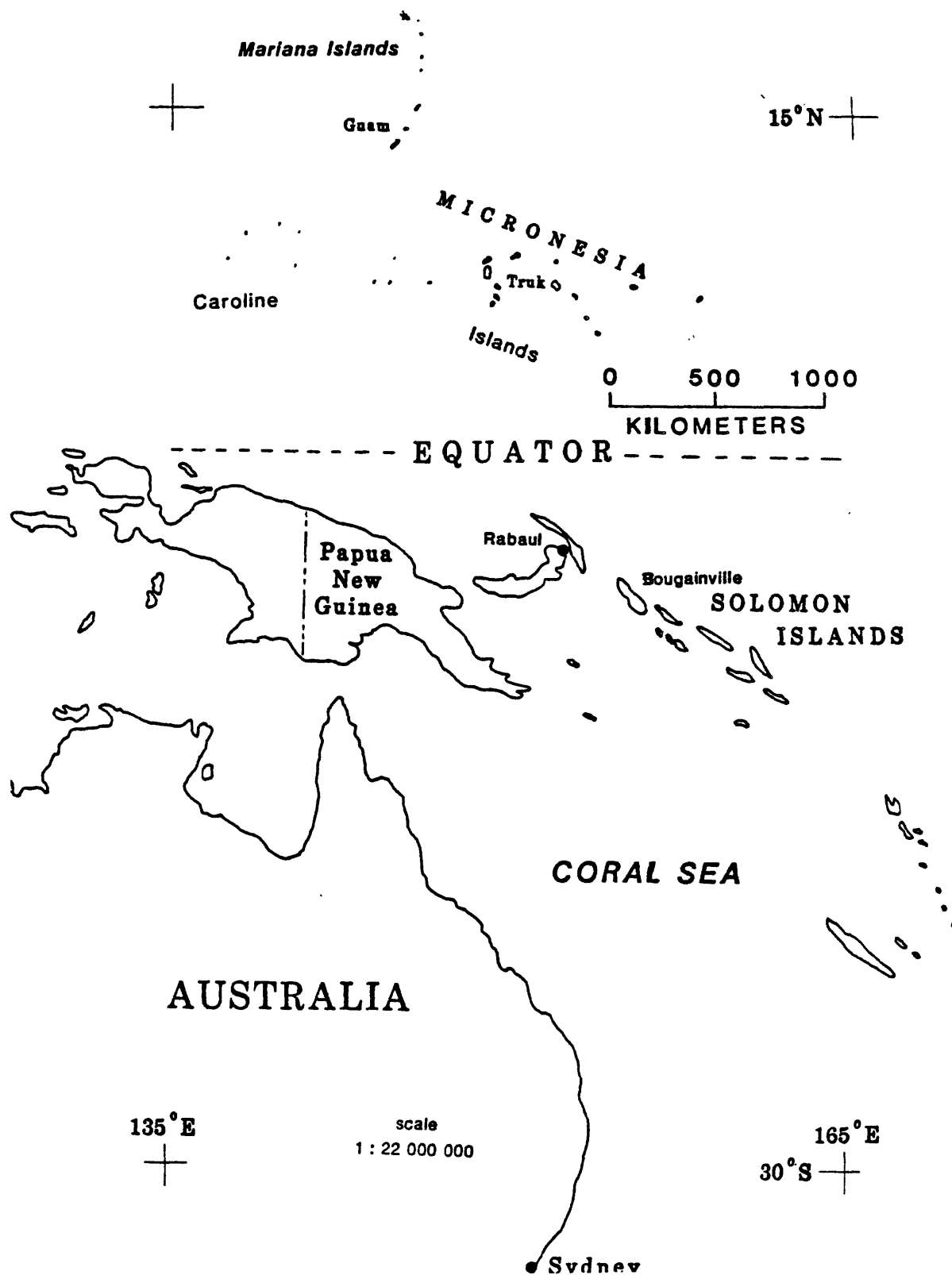


FIGURE 1: Map showing location of Bougainville Island.

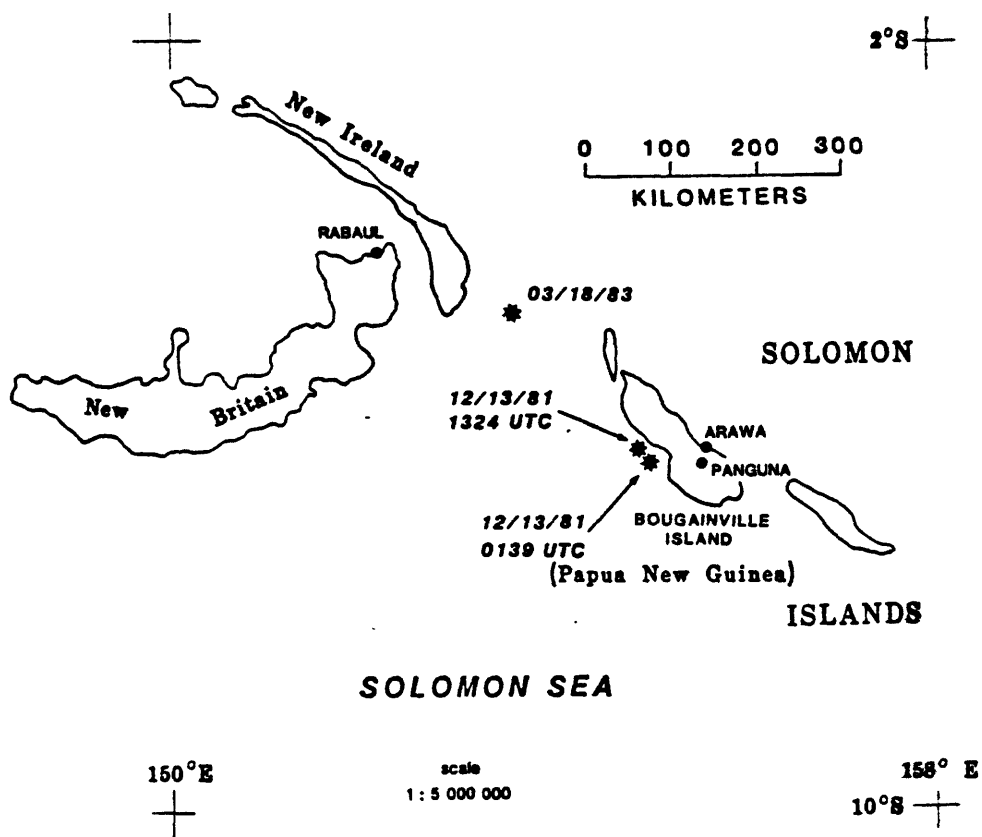


FIGURE 2: Map showing epicenters and strong-motion instrument locations.

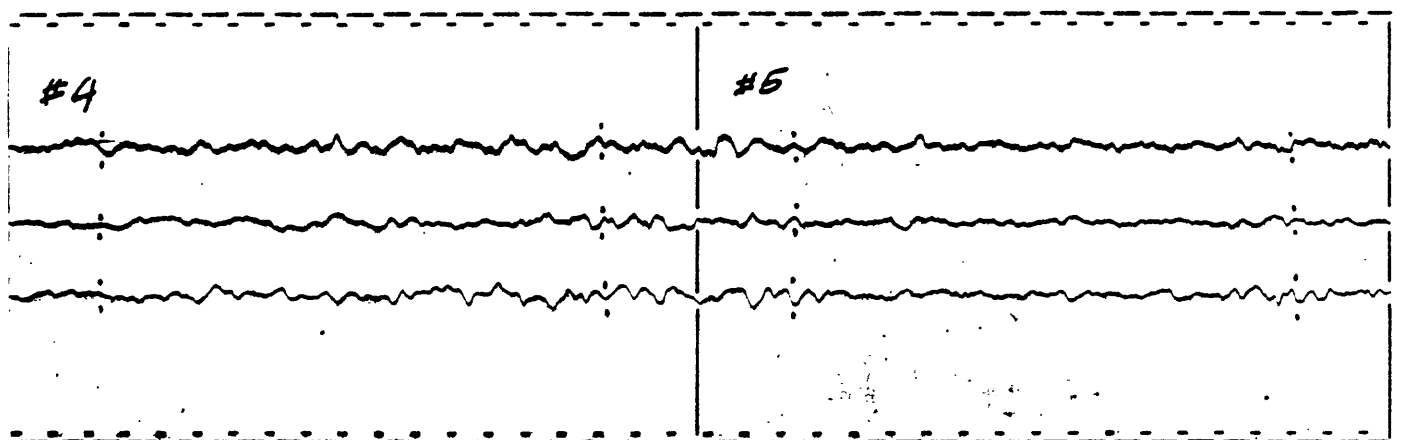
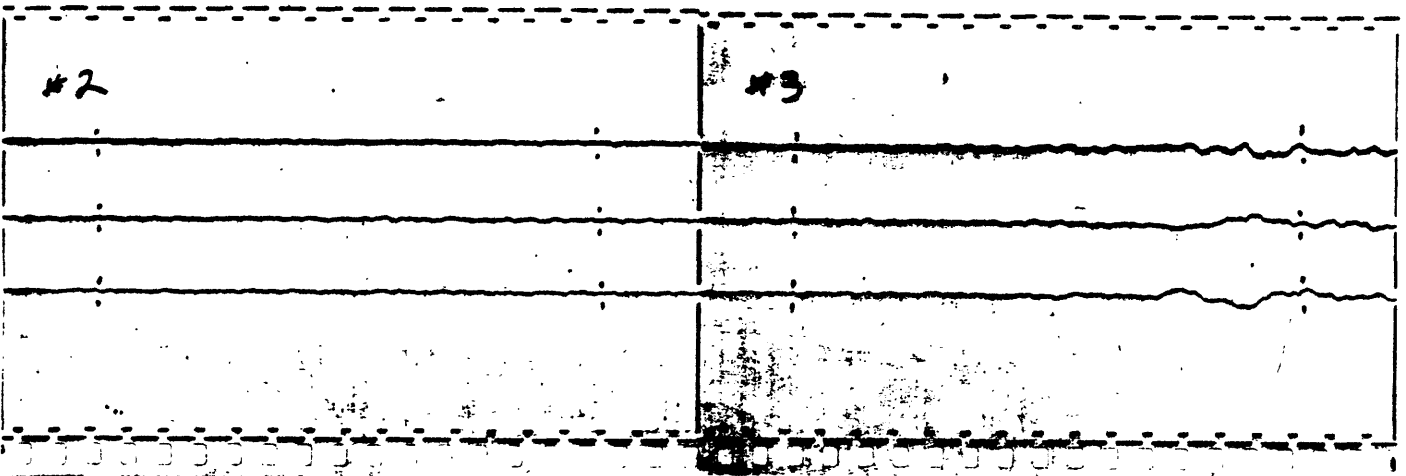
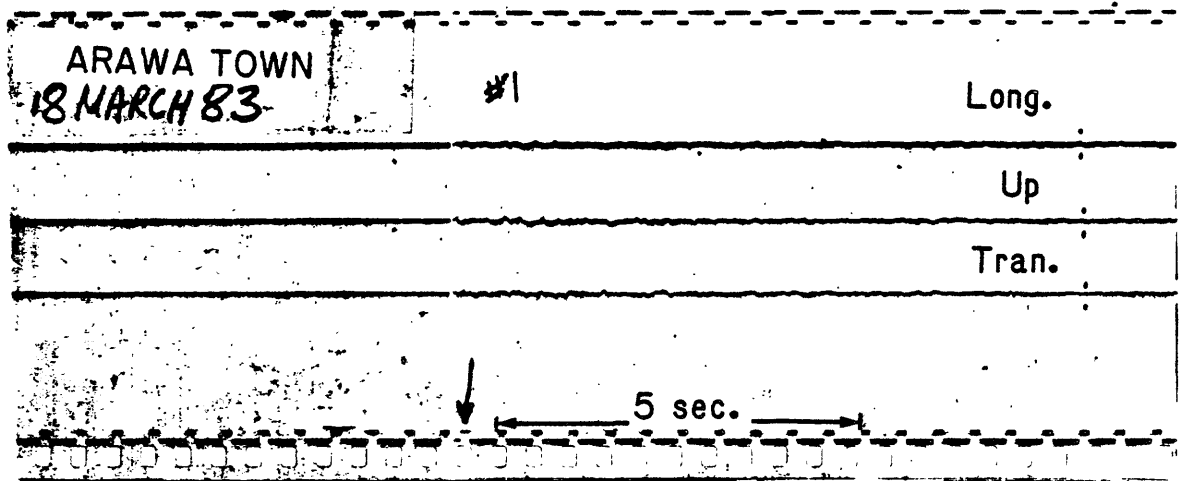


FIGURE 3A: Original records, Arawa Town.

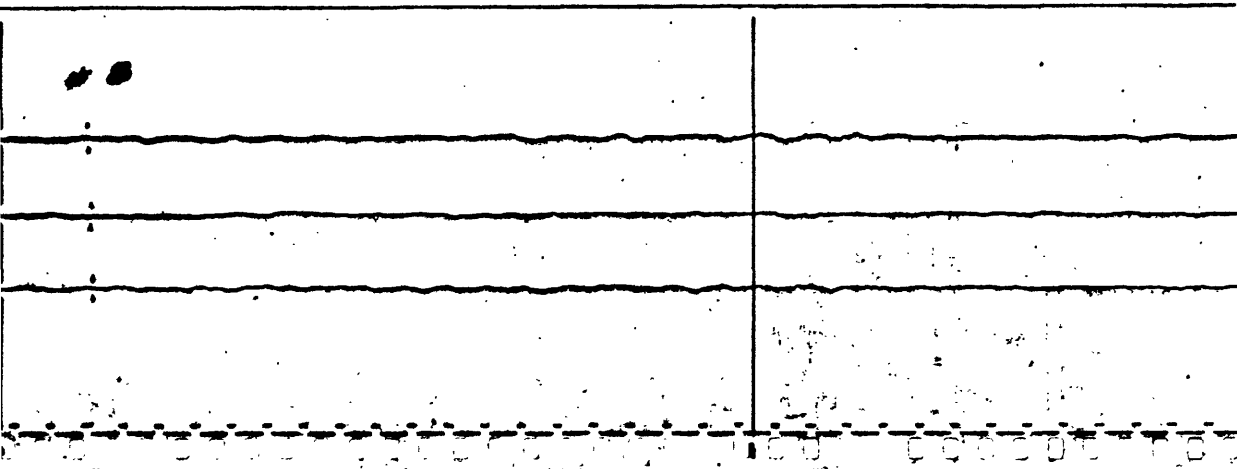
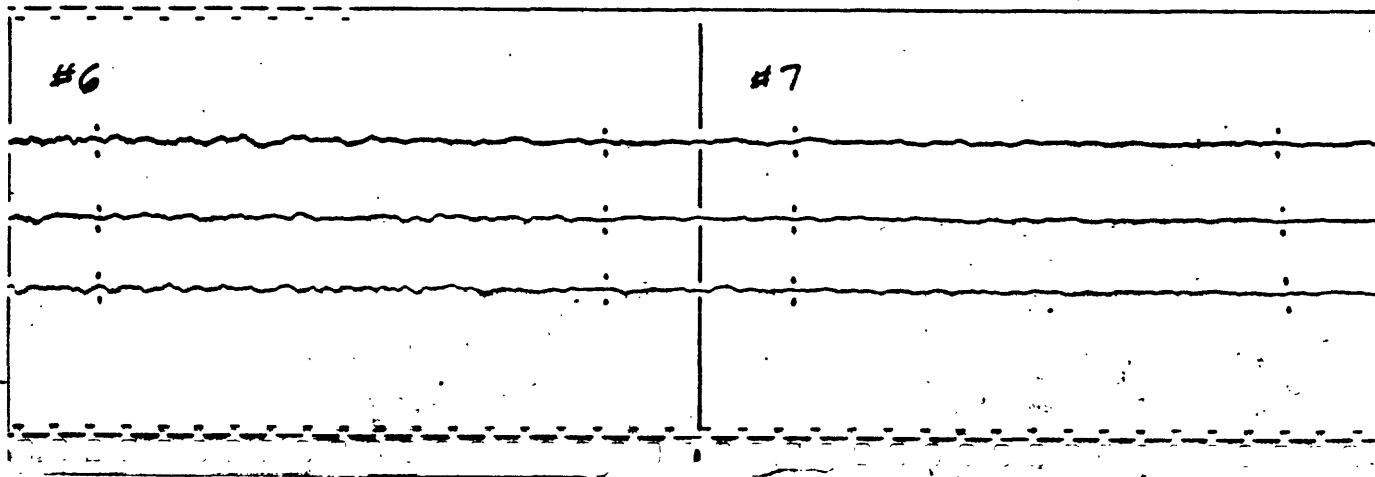
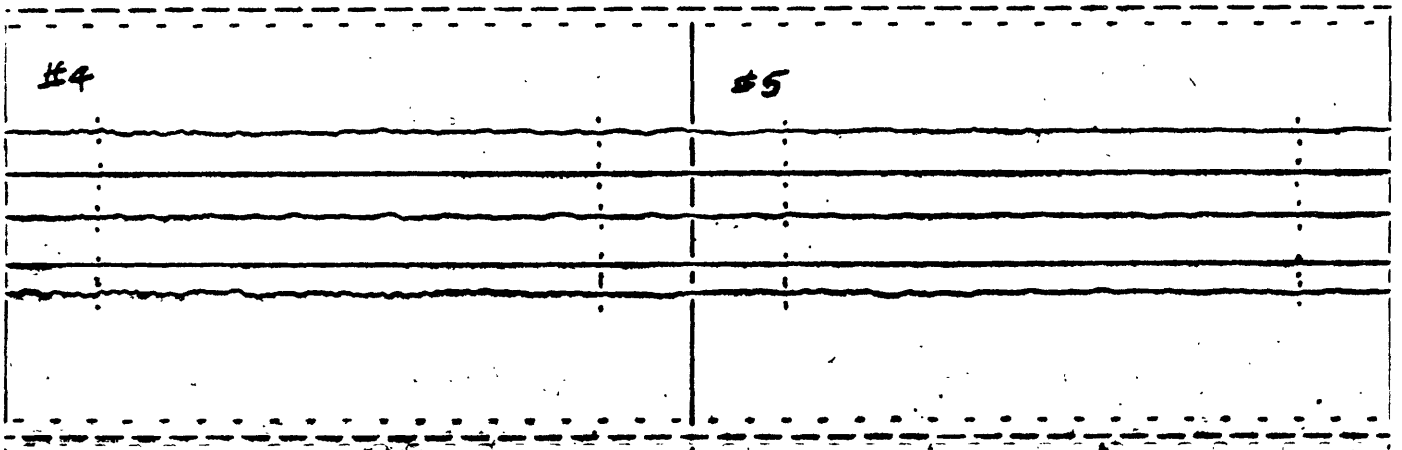
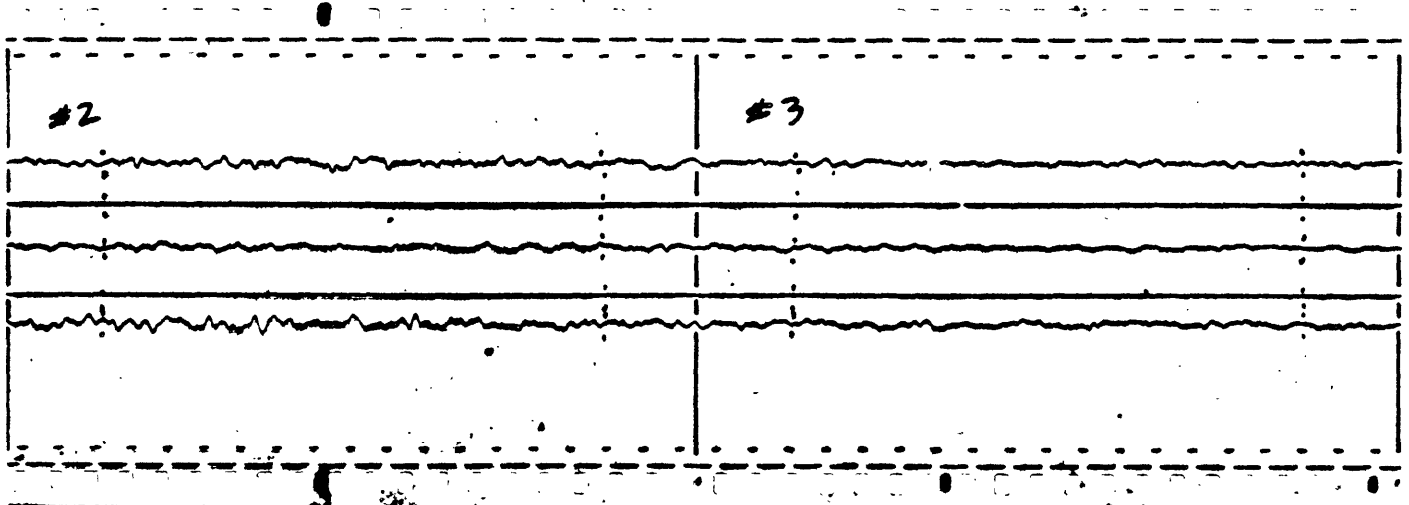
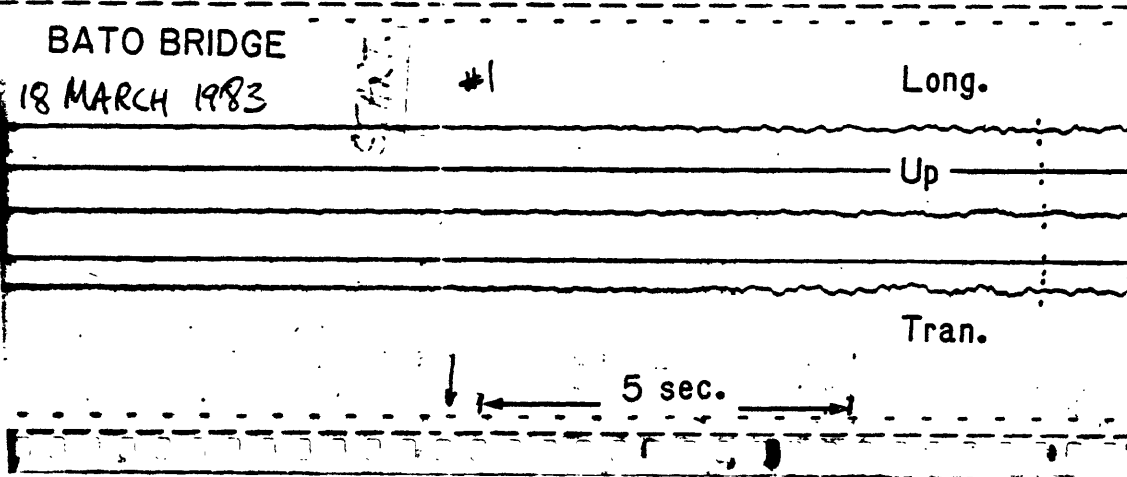


FIGURE 3B: Arawa continued.



#6	#7

#8	

FIGURE 3D: Bato Bridge continued.



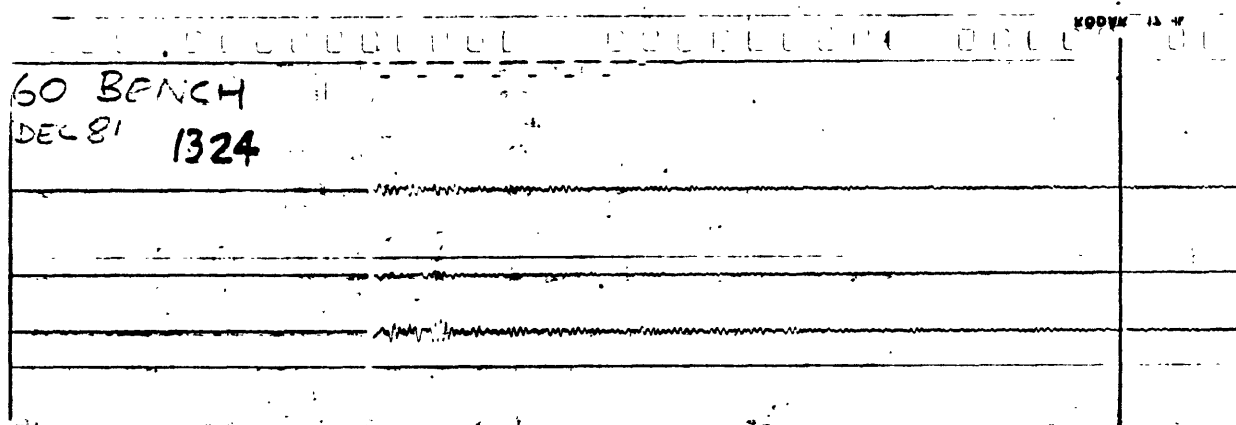
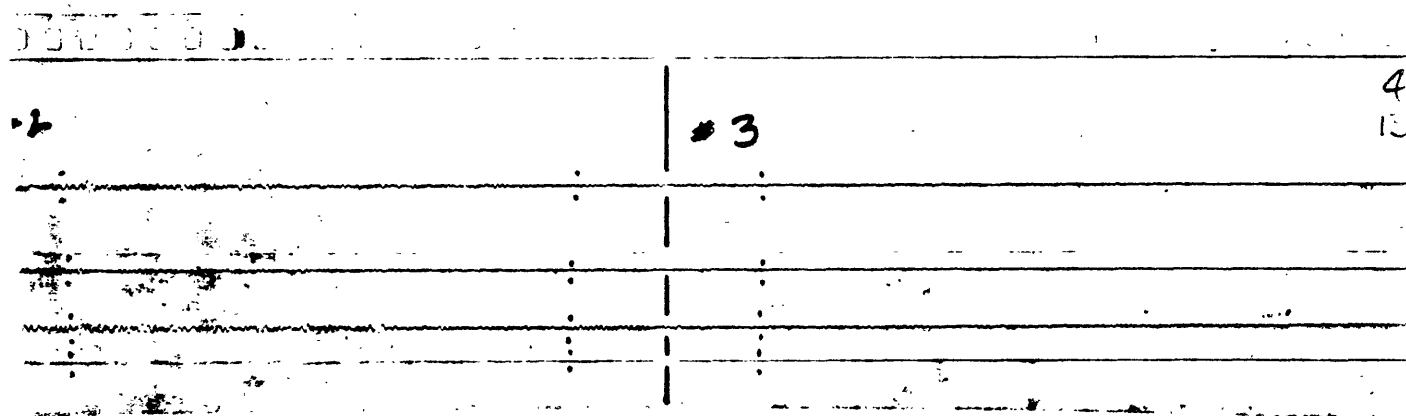
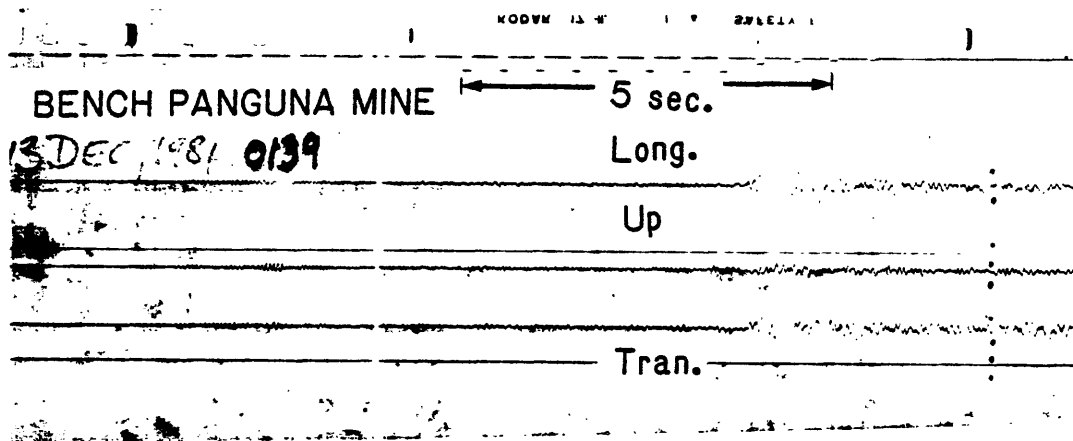


FIGURE 3E: Original records, Bench, Panguna Mine.

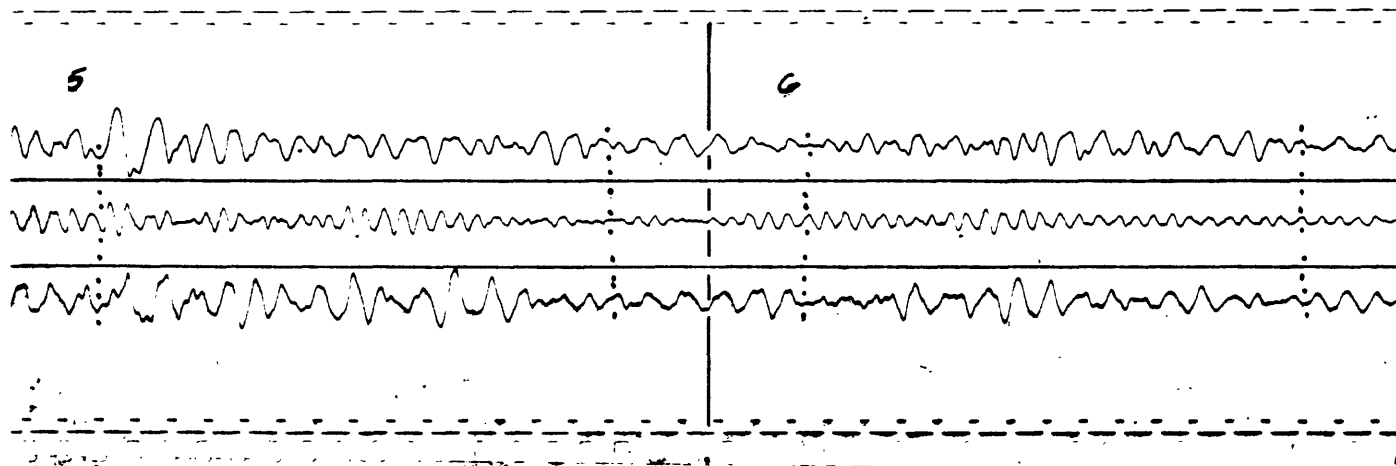
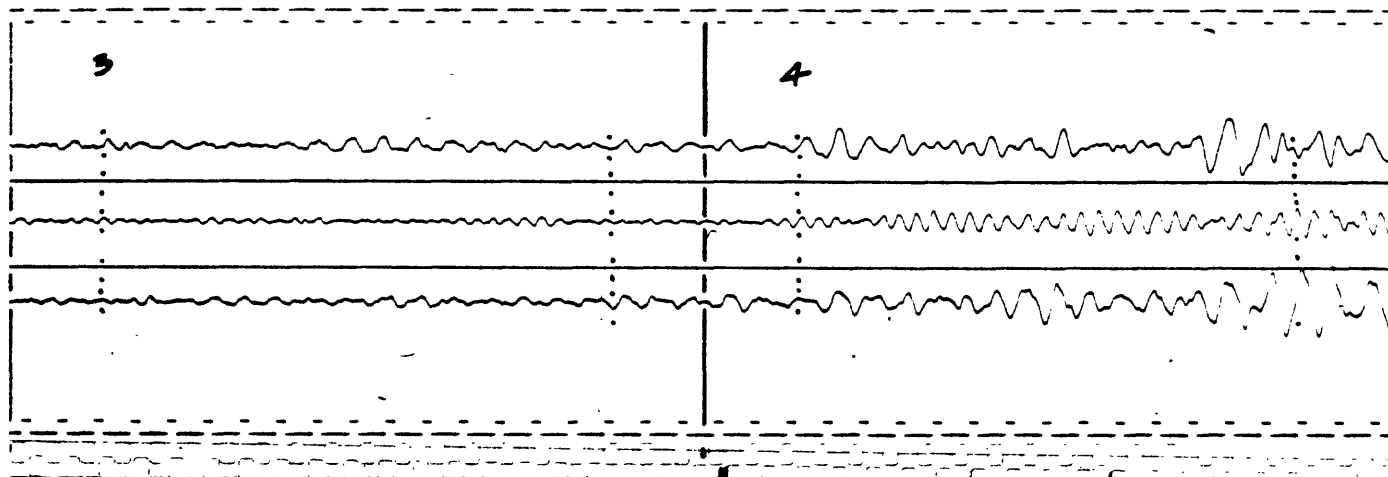
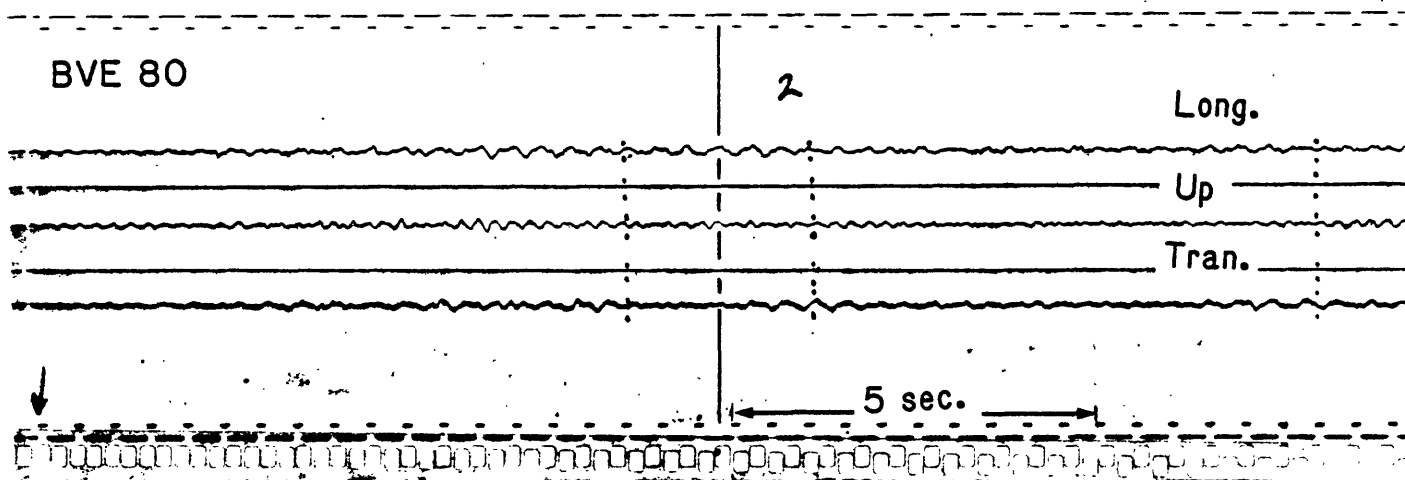


FIGURE 3F: Original records, BVE 80.

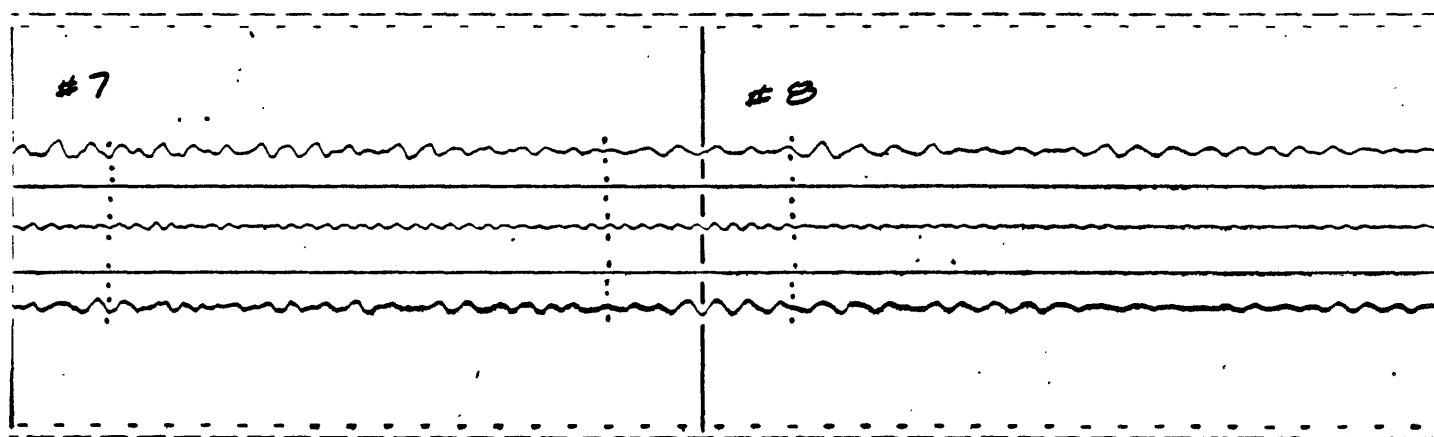


FIGURE 3G: BVE continued.

# APPENDIX

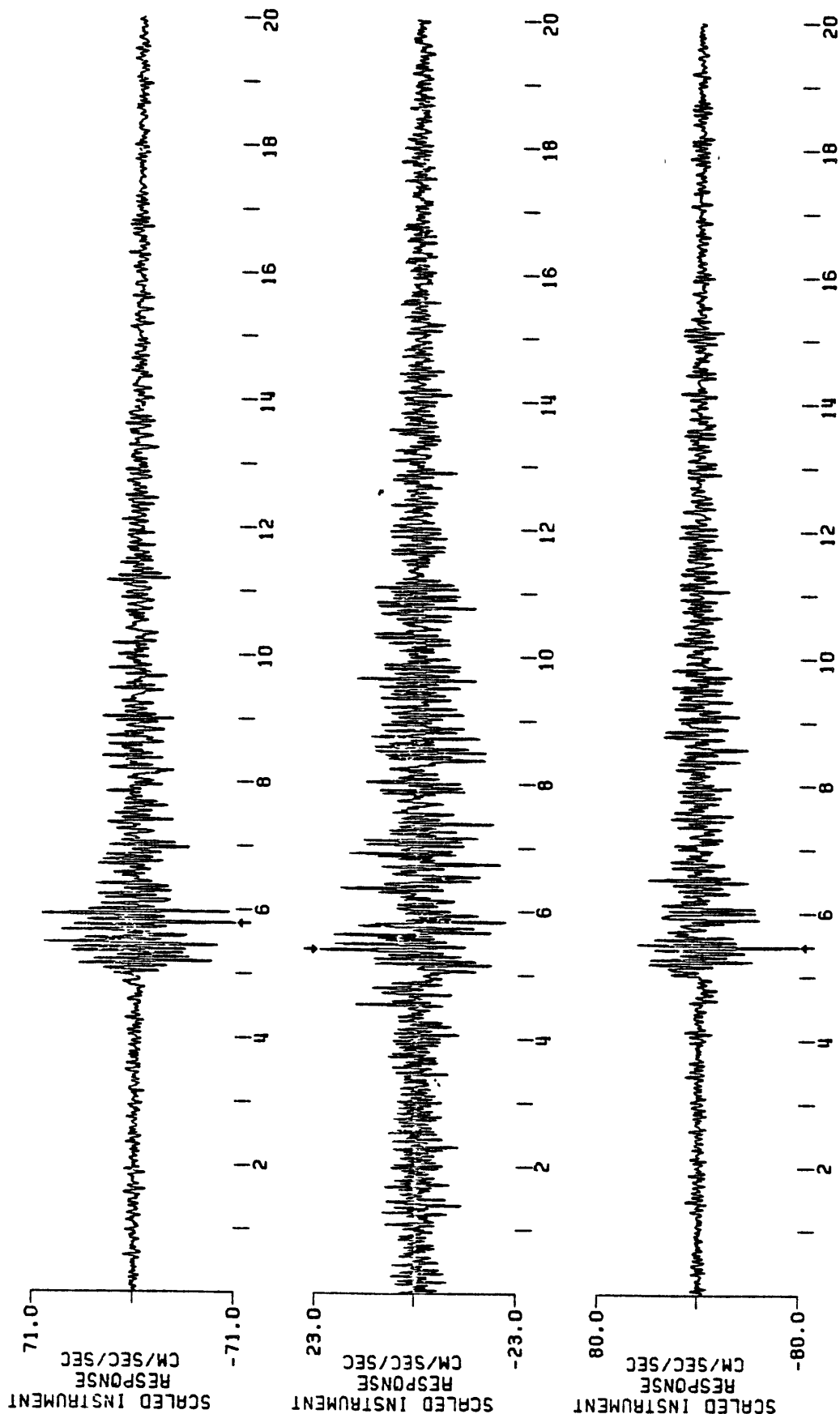
Station	<u>Page No.</u> for plots of six processing steps*					
	1	2	3	4	5	6
460 Bench, Panguna Mine	19	22	31	37	43	49
13 December, 1981; 0139 UTC						
Long., Up, Tran.						
460 Bench, Panguna Mine	21	28	34	40	46	52
13 December, 1981; 1324 UTC						
Long., Up, Tran.						
Arawa Town	55	67	102	111	120	129
18 March, 1983; 0905 UTC						
Long., Up, Tran.						
Bato Bridge	59	79	105	114	123	132
18 March, 1983; 0905 UTC						
Long., Up, Tran.						
BVE 80 (Panguna)	63	91	128	117	126	135
18 March, 1983; 0905 UTC						
Long., Up, Tran.						

\*Processing stages and plot format:

- 1) Uncorrected accelerogram
- 2) Corrected acceleration, velocity, displacement
- 3) Relative velocity response spectrum, linear plot
- 4) Response spectrum, tripartite log-log plot
- 5) Fourier amplitude spectrum, linear plot
- 6) Fourier, amplitude spectrum, log-log plot

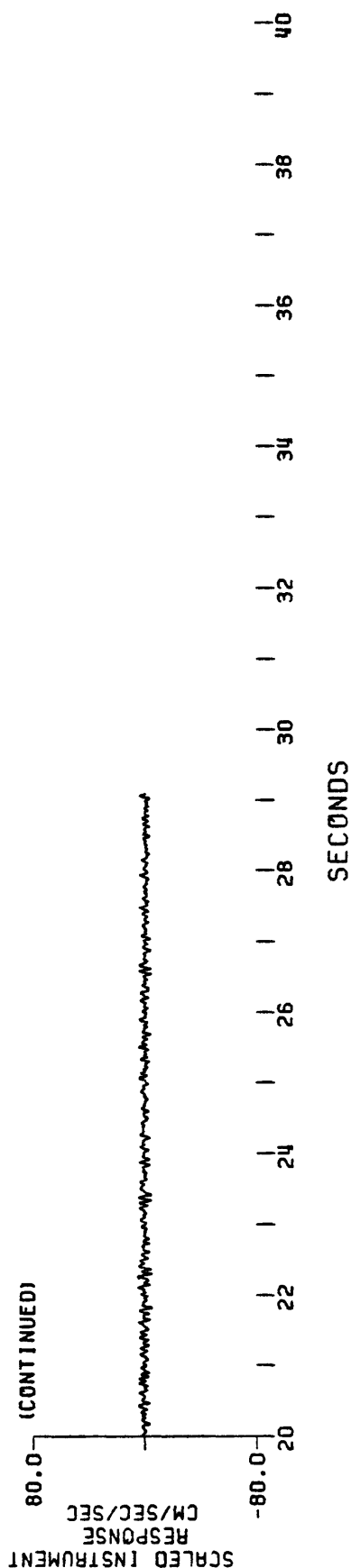
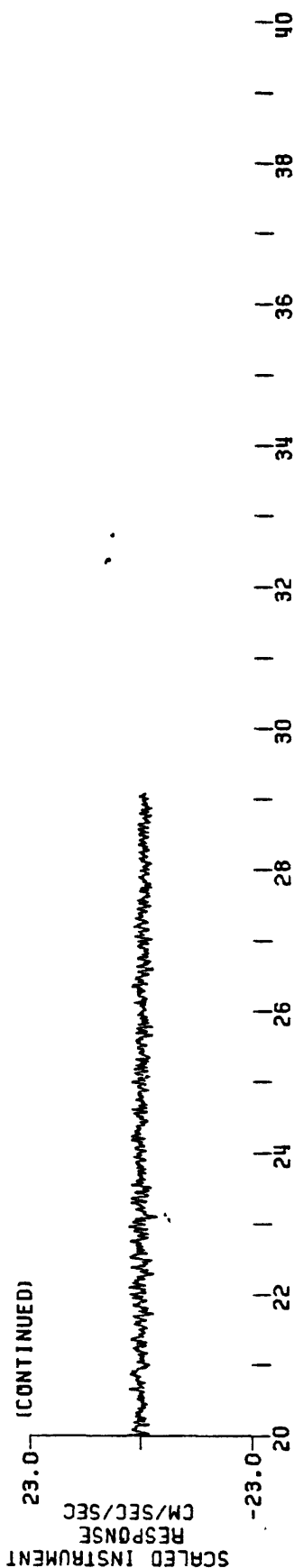
In column 1 each plot contains all three components. For column 2 through 6, the indicated page number refers to the first three components for this record.

UNCORRECTED ACCELEROGRAM  
 BENCH, PAPUA NEW GUINEA  
 LONG. VERT. TRAN  
 EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC  
 PEAK VALUES (CM/SEC/SEC): -70.56 22.13 -79.99



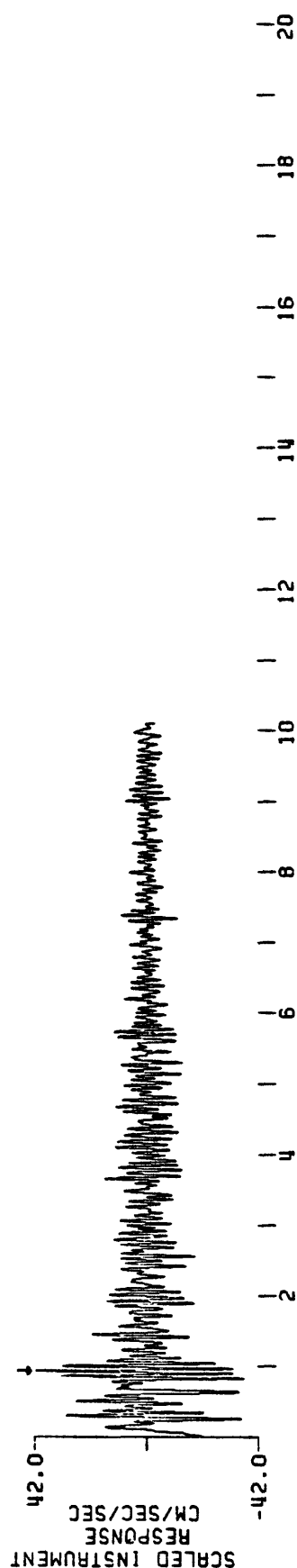
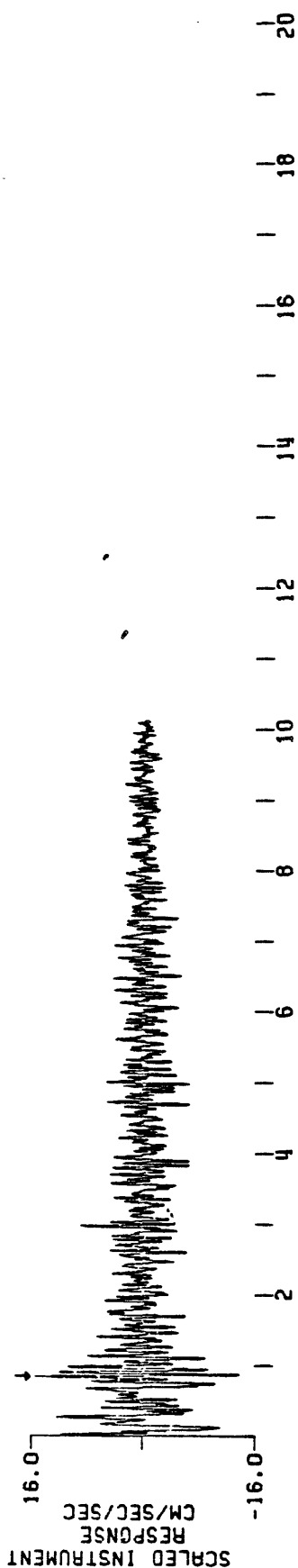
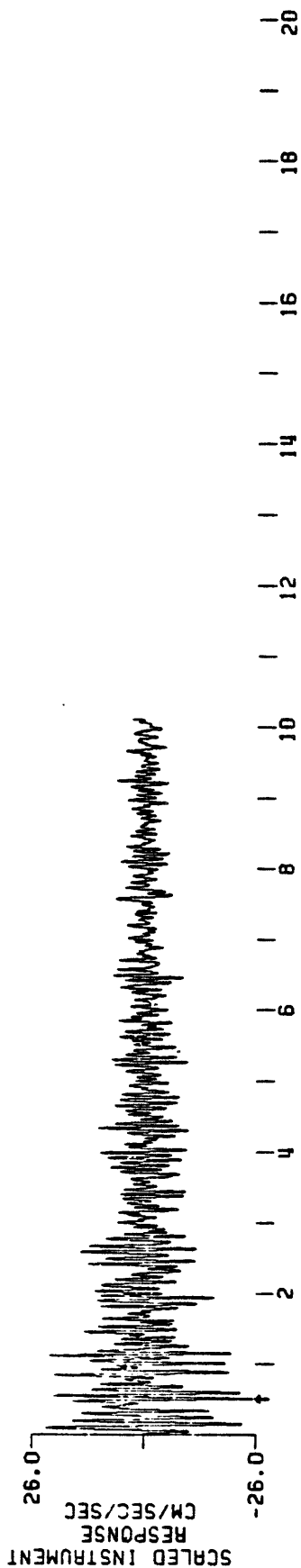
UNCORRECTED ACCELEROGRAM  
 BENCH, PAPUA NEW GUINEA  
 LONG VERT. TRAN.

EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC  
 PEAK VALUES (CM/SEC/SEC): -70.56 22.13 -79.99



UNCORRECTED ACCELEROGRAM  
BENCH, PAPUA NEW GUINEA  
LONG VERT. TRAN.

EARTHQUAKE OF DECEMBER 13, 1983 1324 UTC  
PEAK VALUES (CM/SEC/SEC): -25.16 15.56 41.31

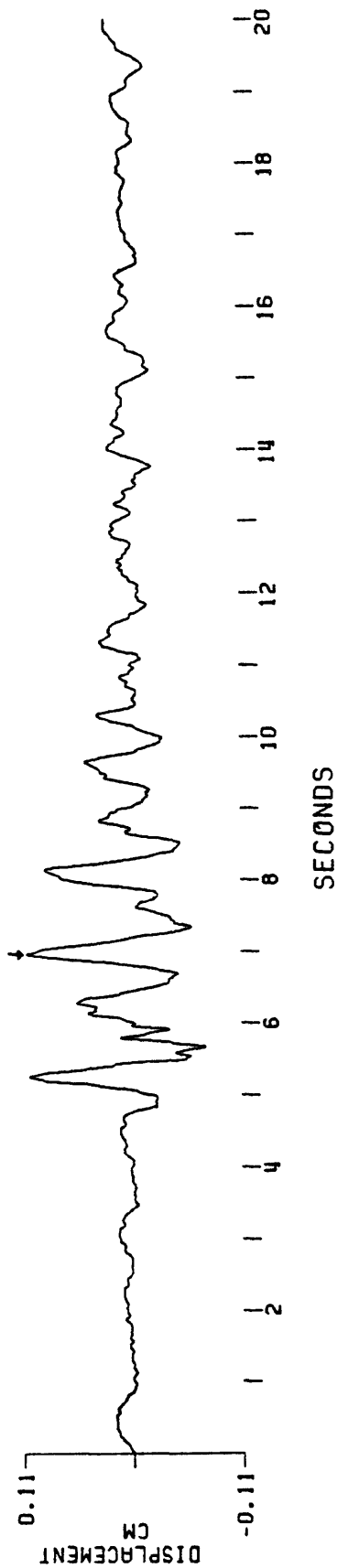
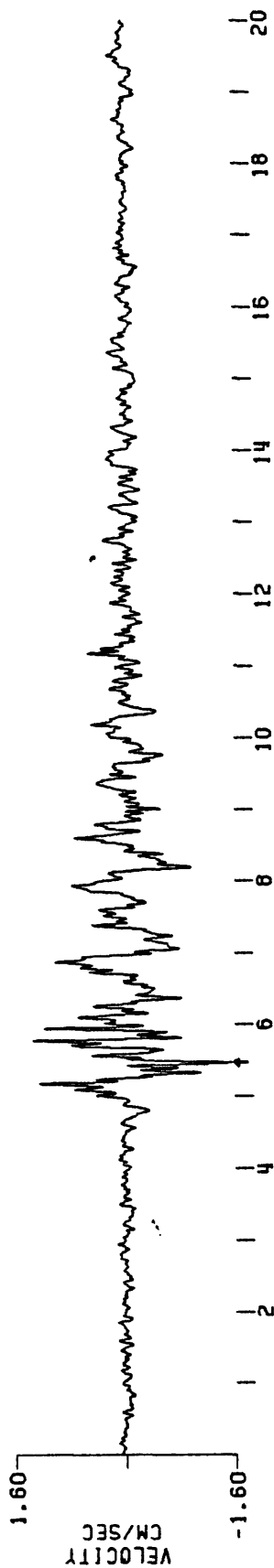
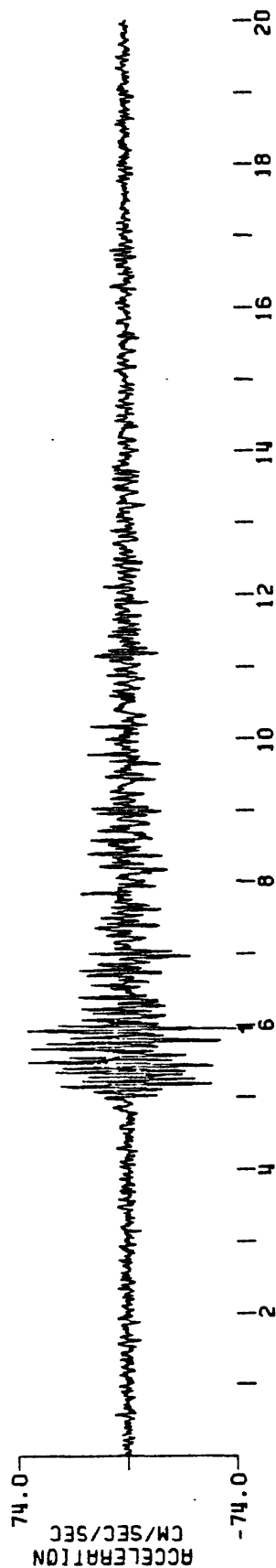


SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
BENCH, PAPUA NEW GUINEA  
LONG.

EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC  
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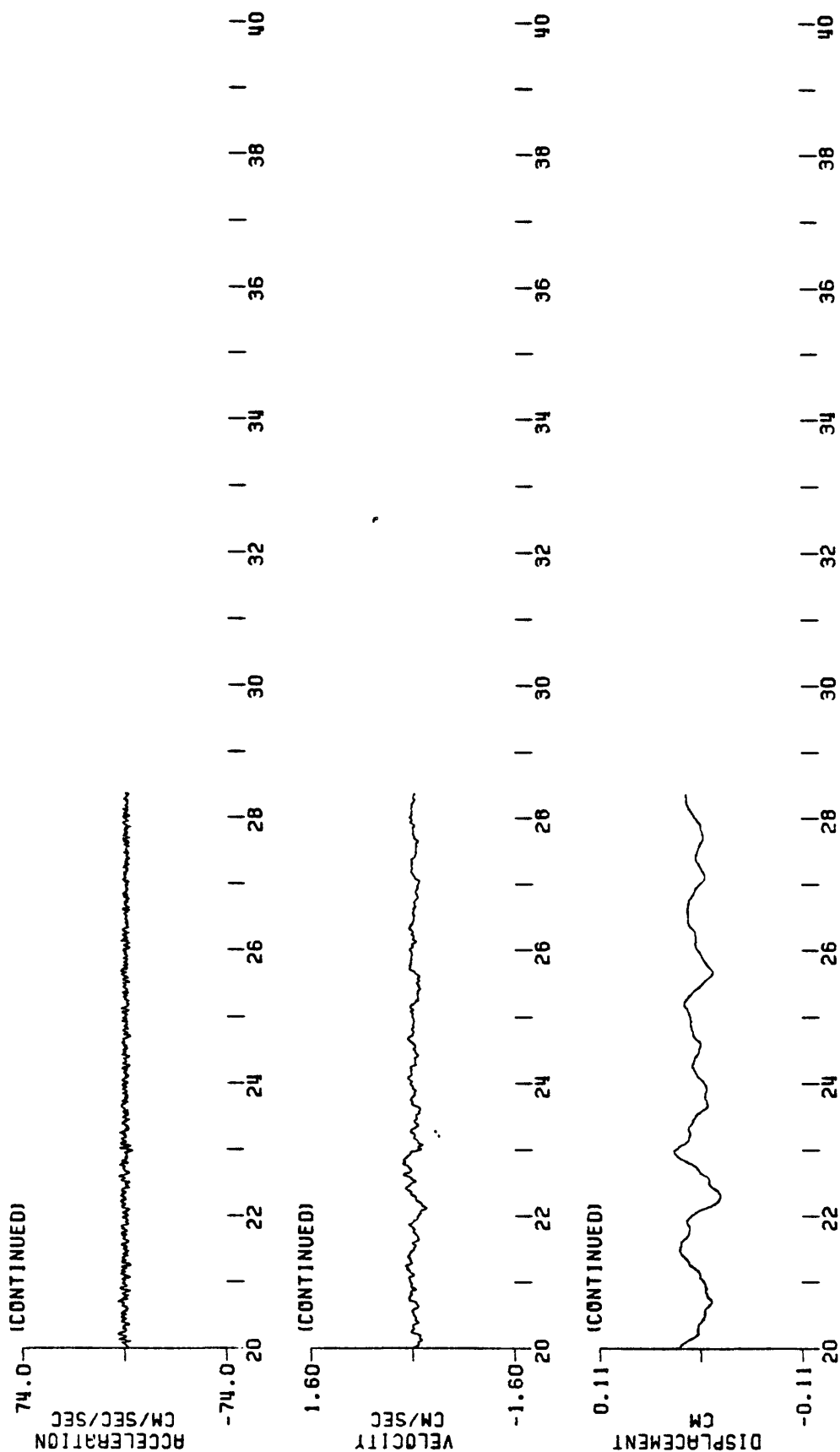


CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
BENCH, PAPUA NEW GUINEA

LONG. EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC

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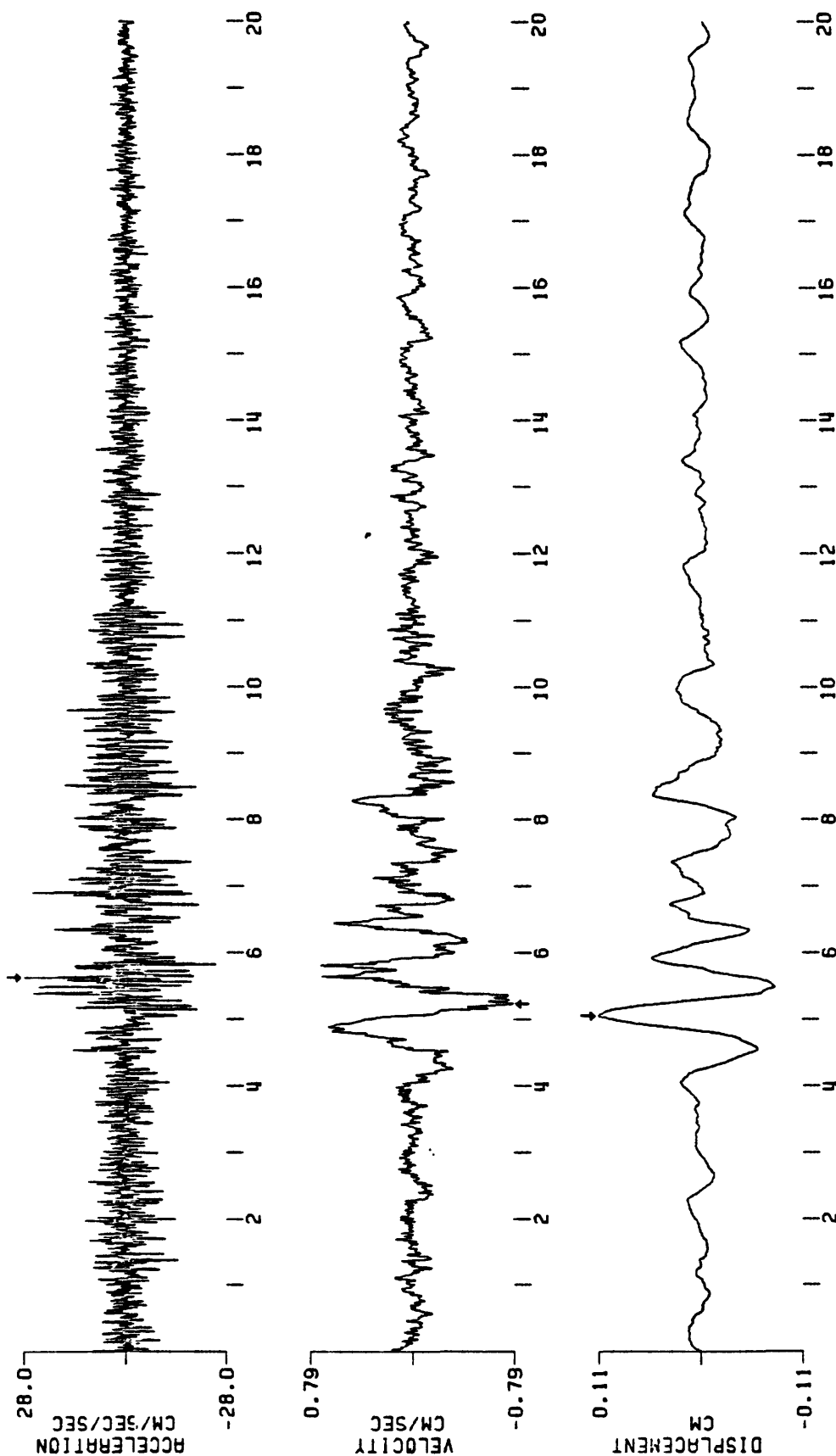


SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
BENCH, PAPUA NEW GUINEA

VERT.  
EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC

BUTTERWORTH FILTER AT 0.50 HZ, ORDER 4  
PEAK VALUES: ACCEL=27.94 CM/SEC/SEC, VELOCITY=-0.78 CM/SEC, DISPL=0.11 CM



SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
BENCH, PAPUA NEW GUINEA

VERT.

EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC  
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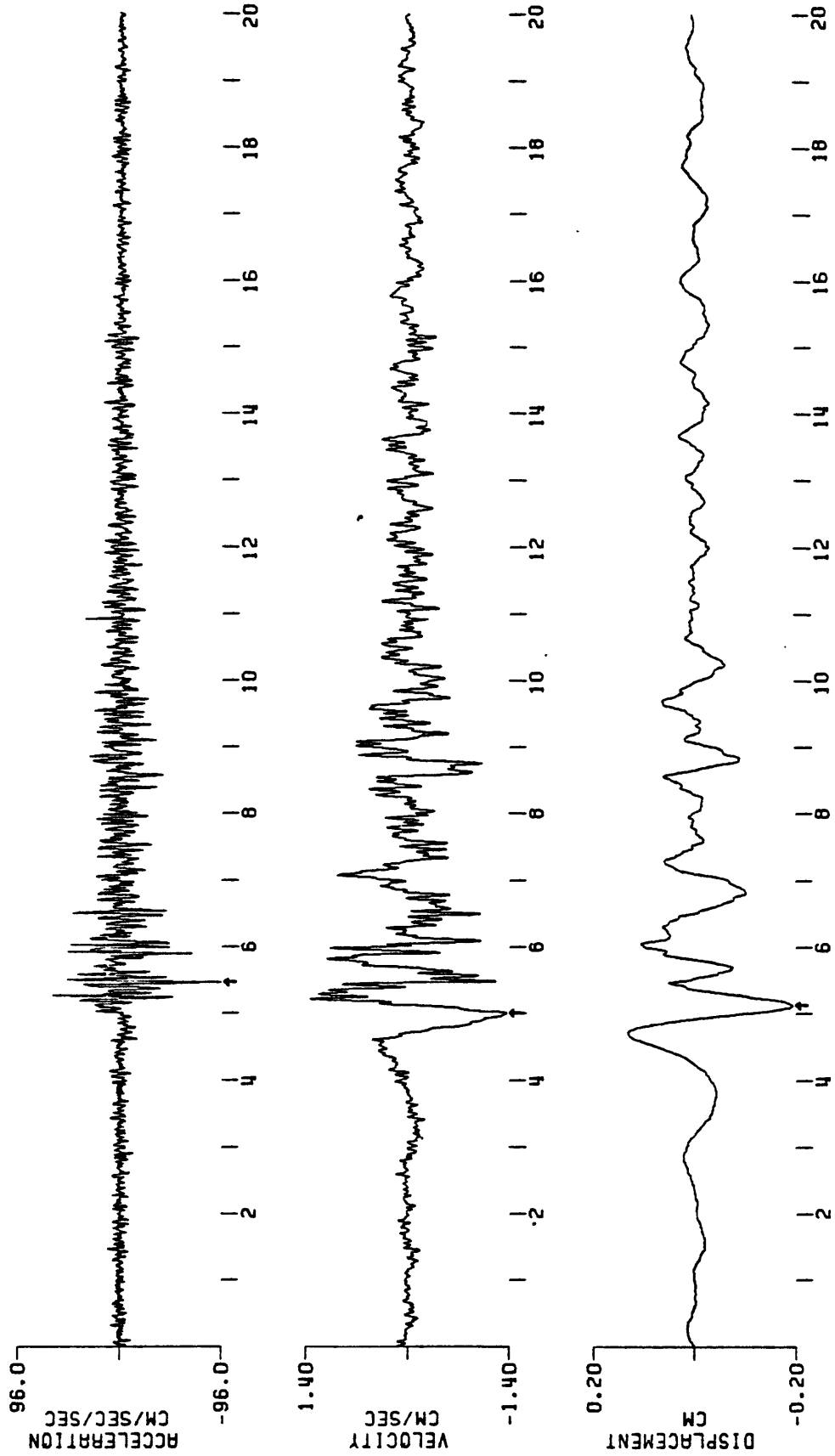


CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
BENCH, PAPUA NEW GUINEA

TRAN. EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC

BUTTERWORTH FILTER AT 0.50 HZ, ORDER 4

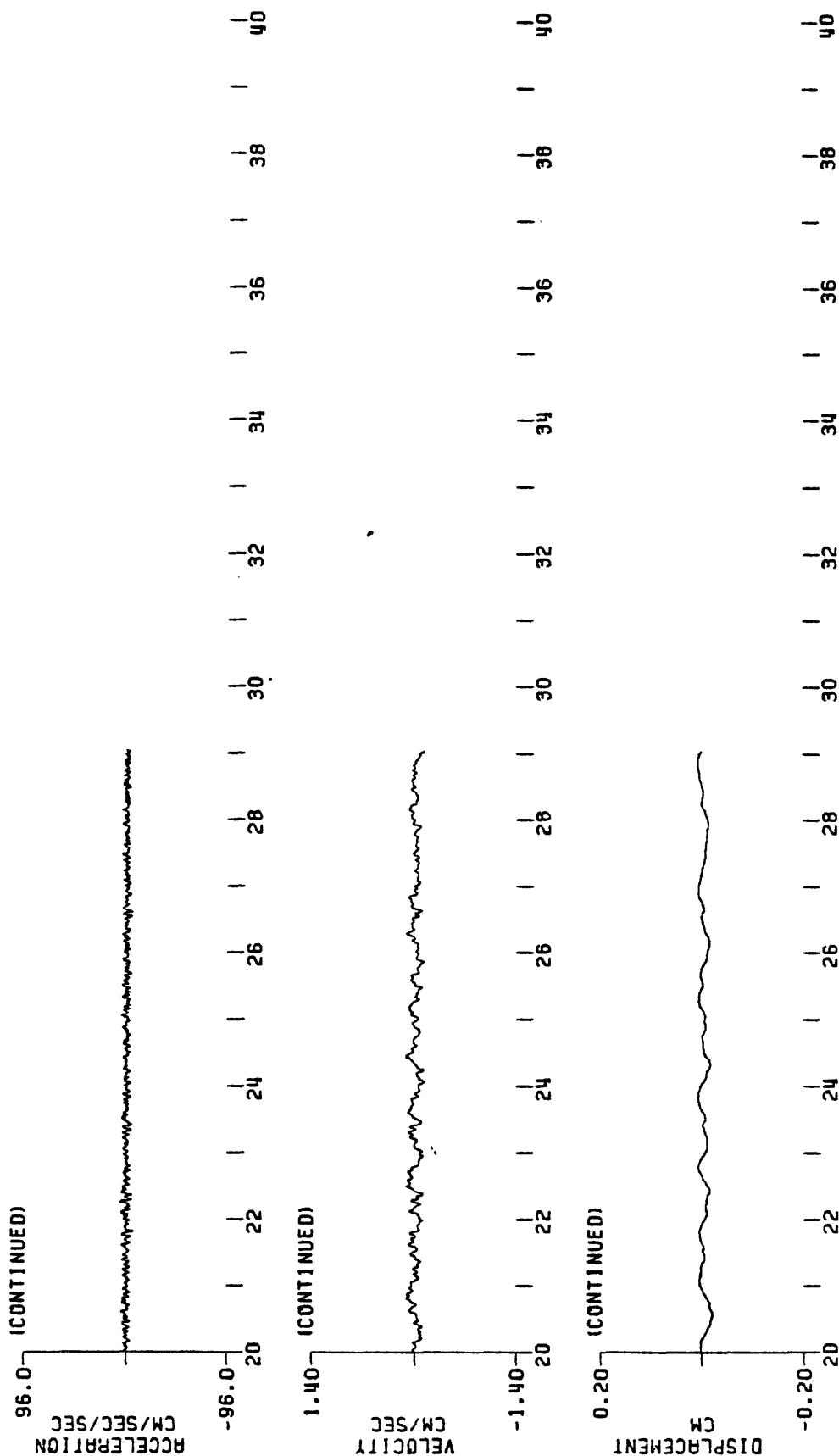
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CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
BENCH, PAPUA NEW GUINEA  
TRAN.

EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC  
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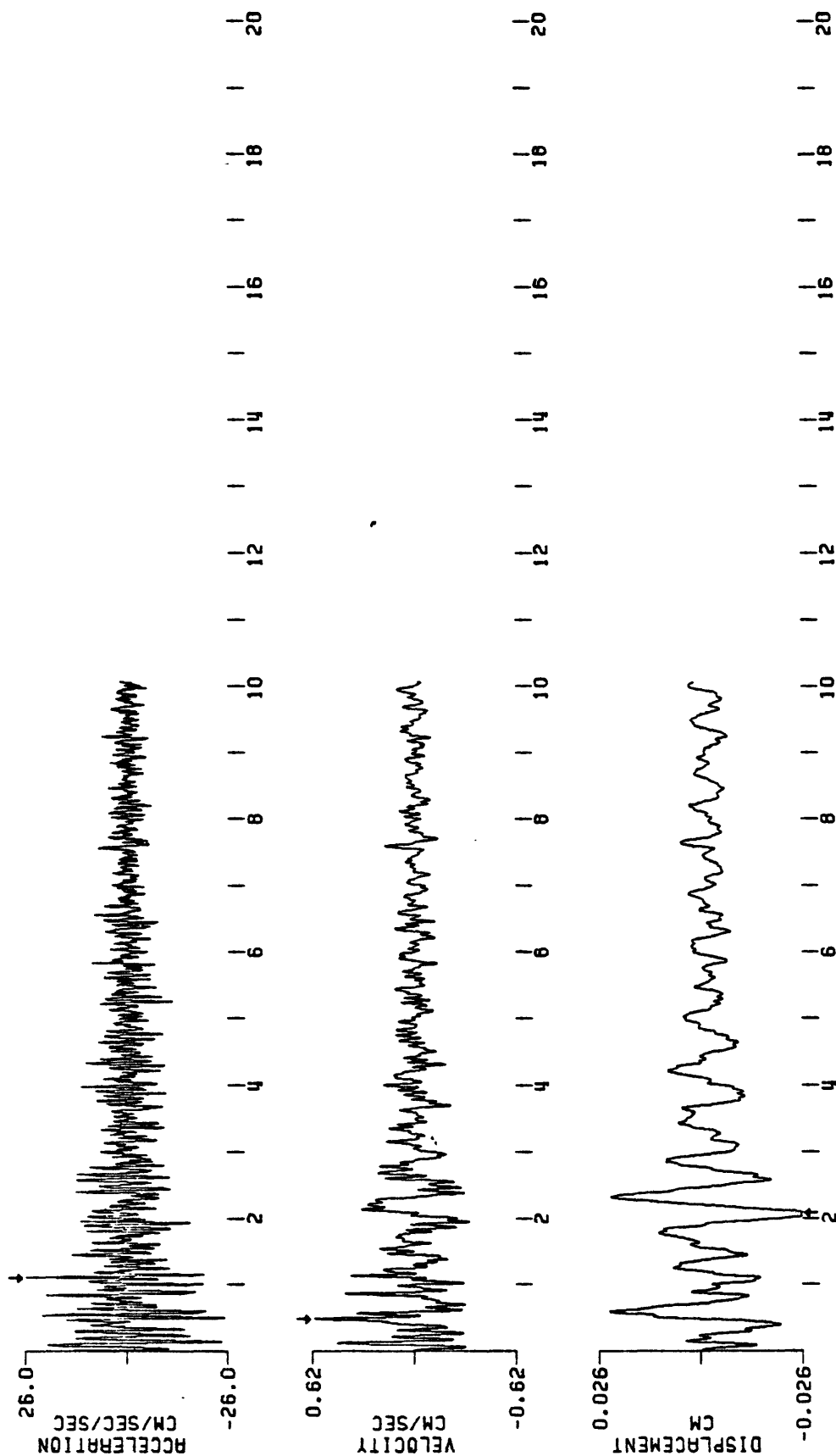


SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
BENCH, PAPUA NEW GUINEA

LONG.  
EARTHQUAKE OF DECEMBER 13, 1983 1324 UTC  
BUTTERWORTH FILTER AT 1.0 HZ ORDER 4

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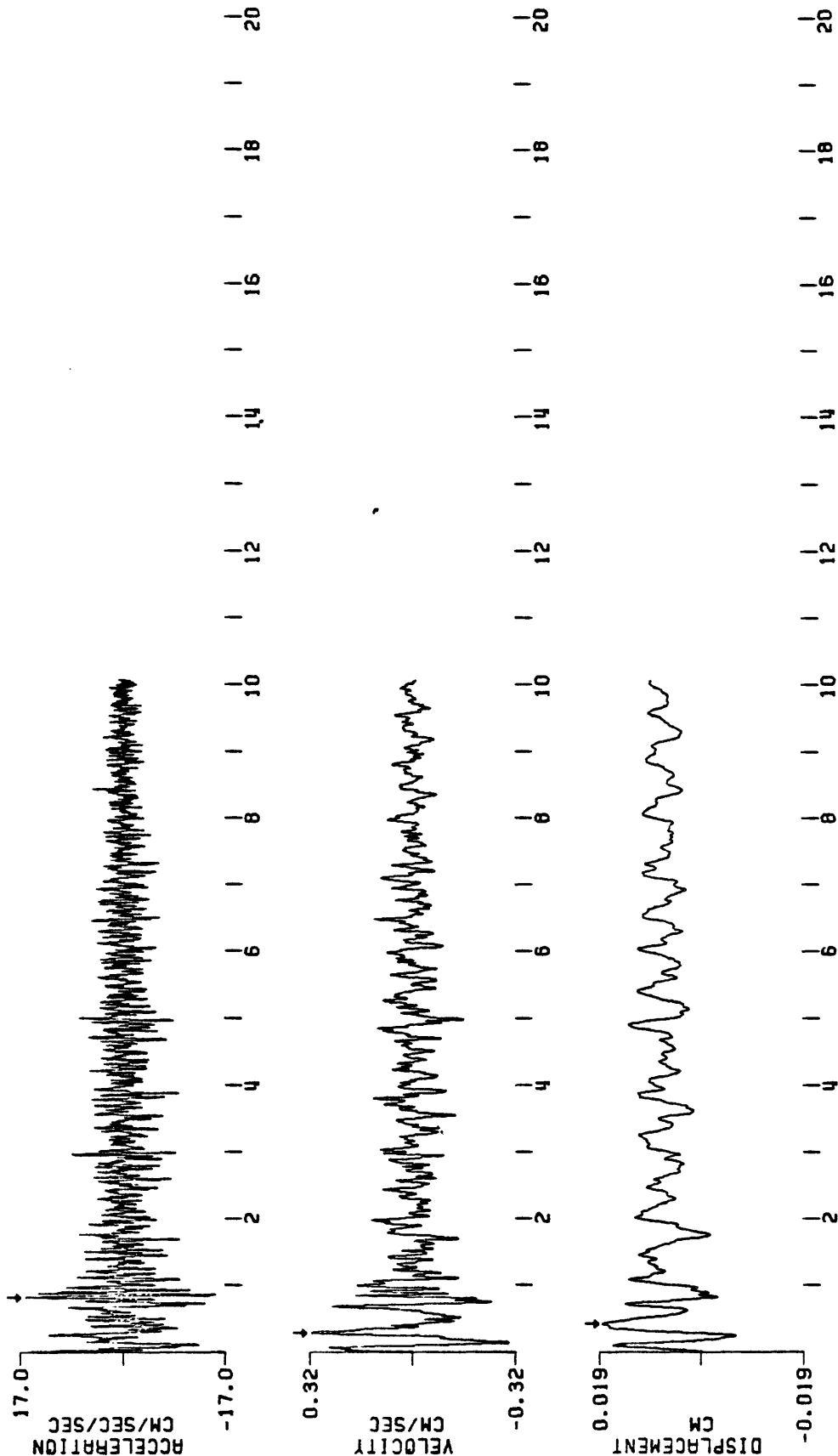
SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
BENCH, PAPUA NEW GUINEA

VERT.  
EARTHQUAKE OF DECEMBER 13, 1983 1324 UTC

BUTTERWORTH FILTER AT 1.0 HZ, ORDER 4

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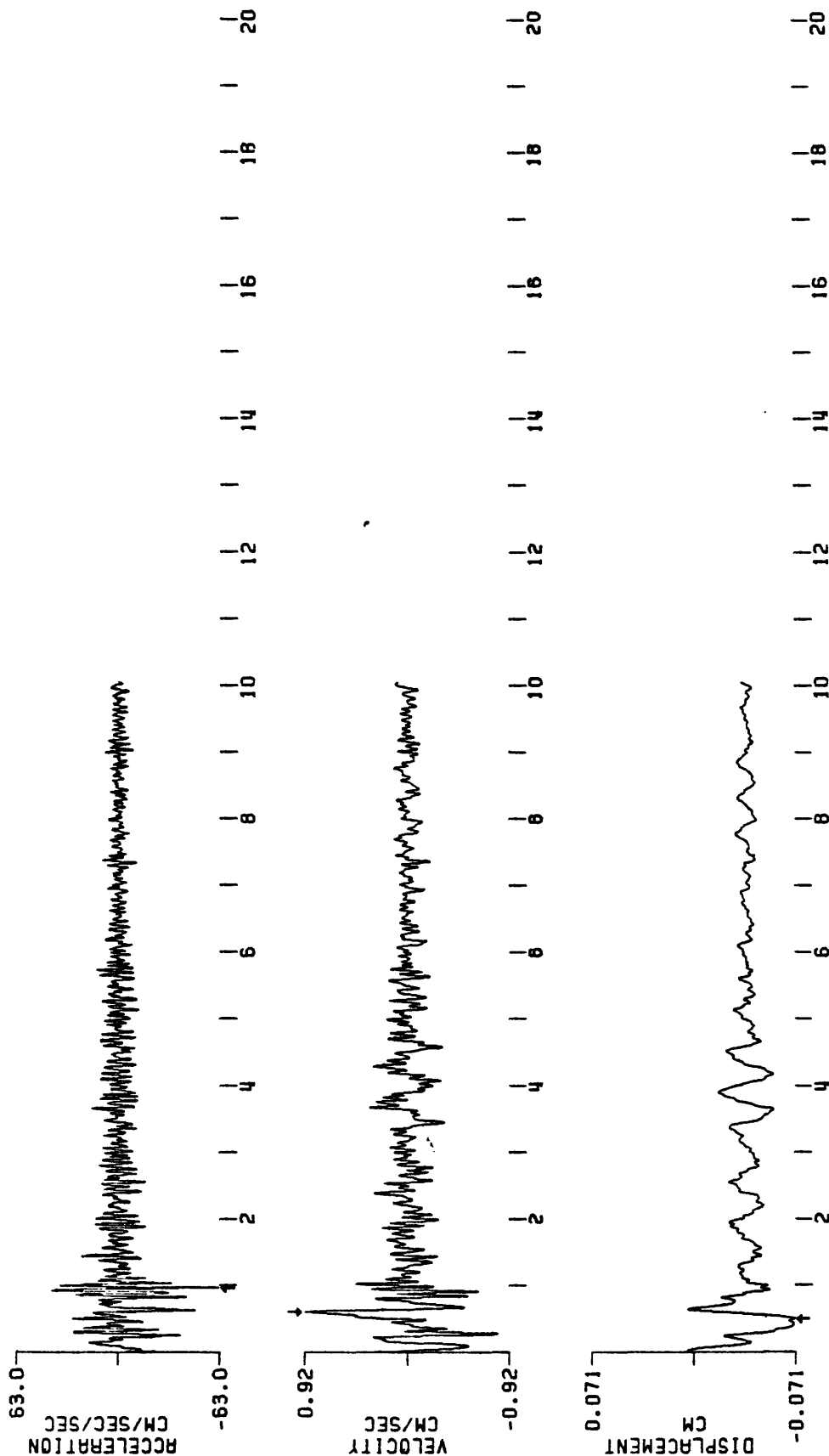
SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
BENCH, PAPUA NEW GUINEA

TRAN.

EARTHQUAKE OF DECEMBER 13, 1983 1324 UTC  
BUTTERWORTH FILTER AT 1.0 HZ, ORDER 4

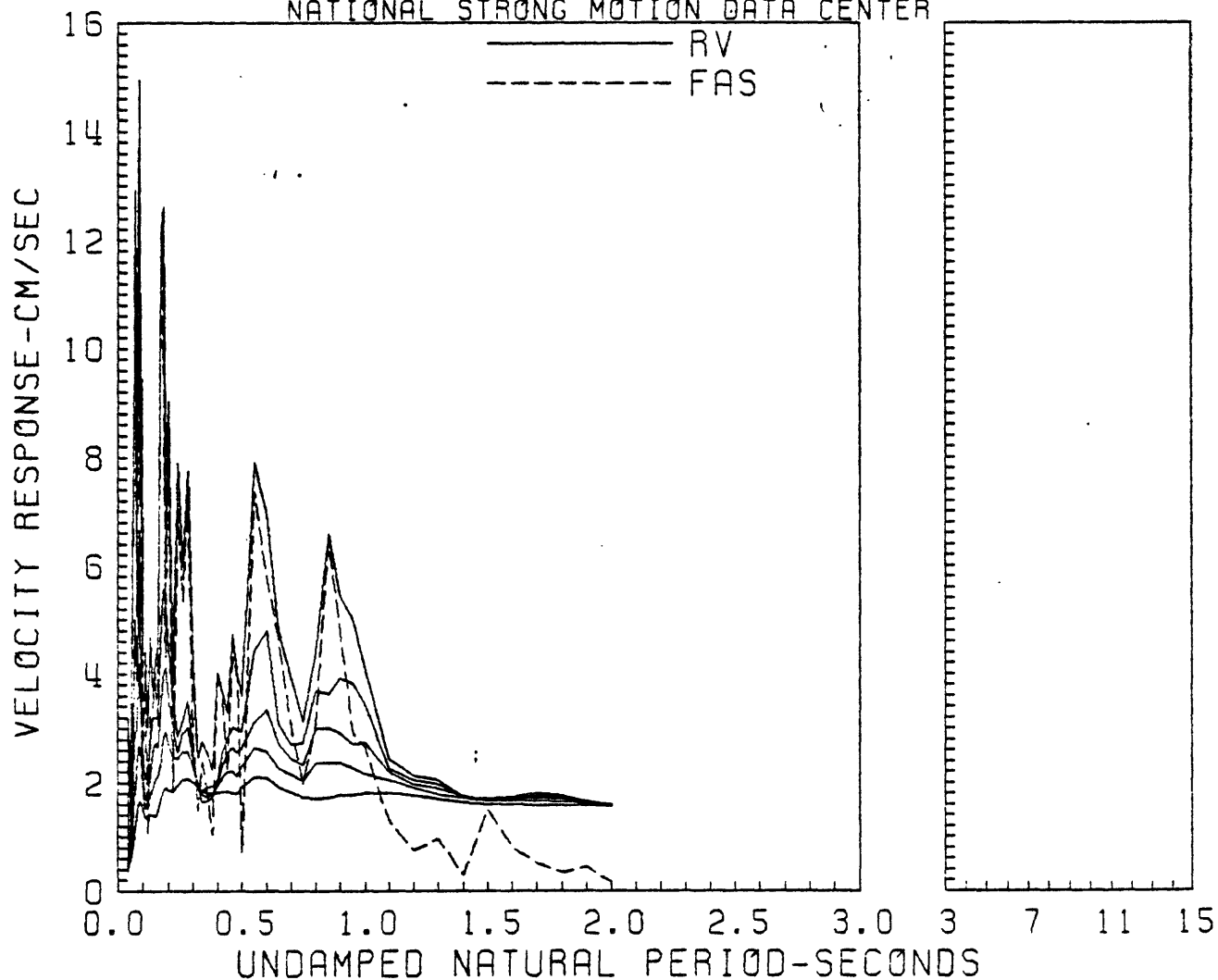
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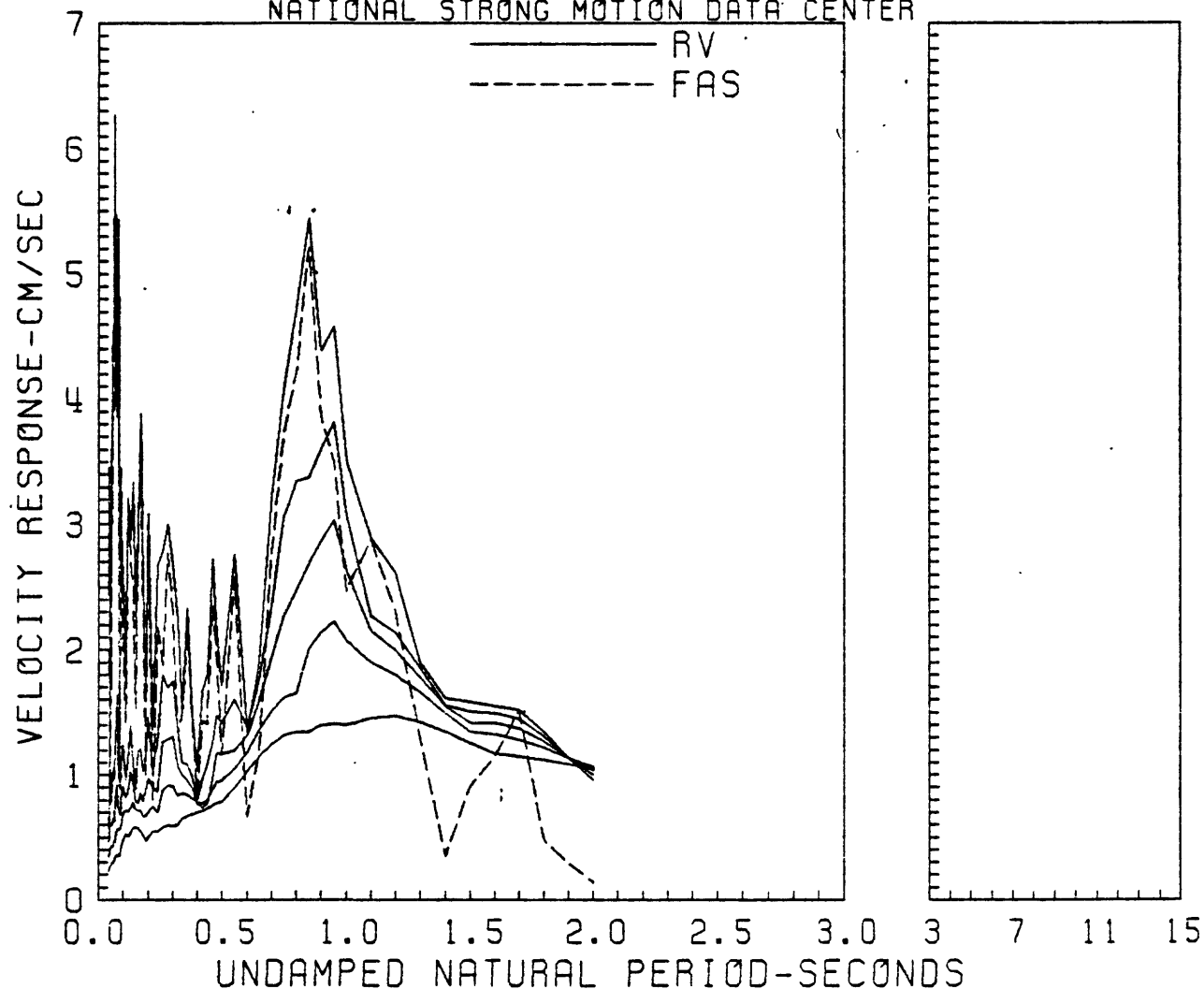
SECONDS



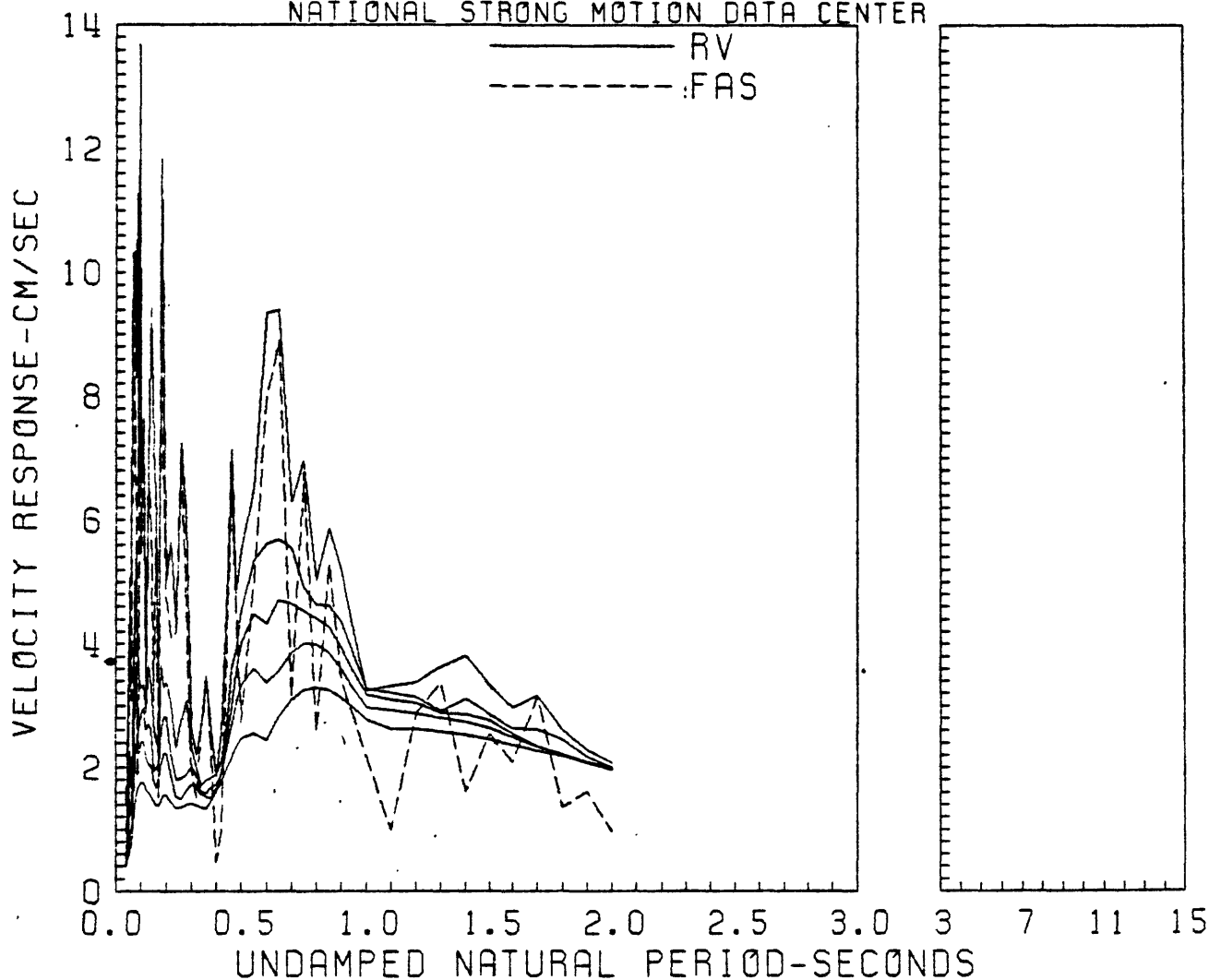
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 BENCH, PAPUA NEW GUINEA, 12/13/83, 0139UTC LONG.  
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 FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



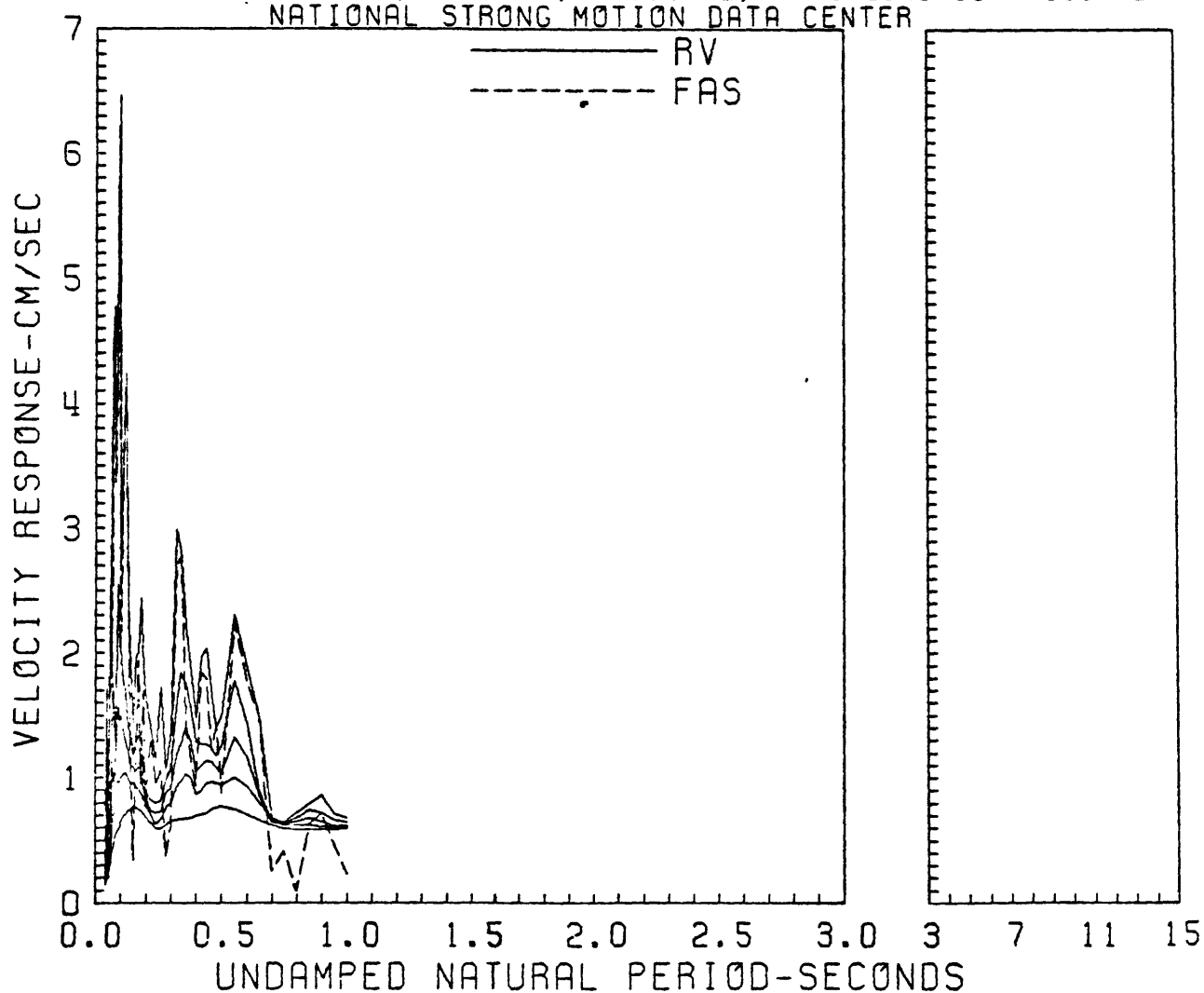
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 NATIONAL STRONG MOTION DATA CENTER



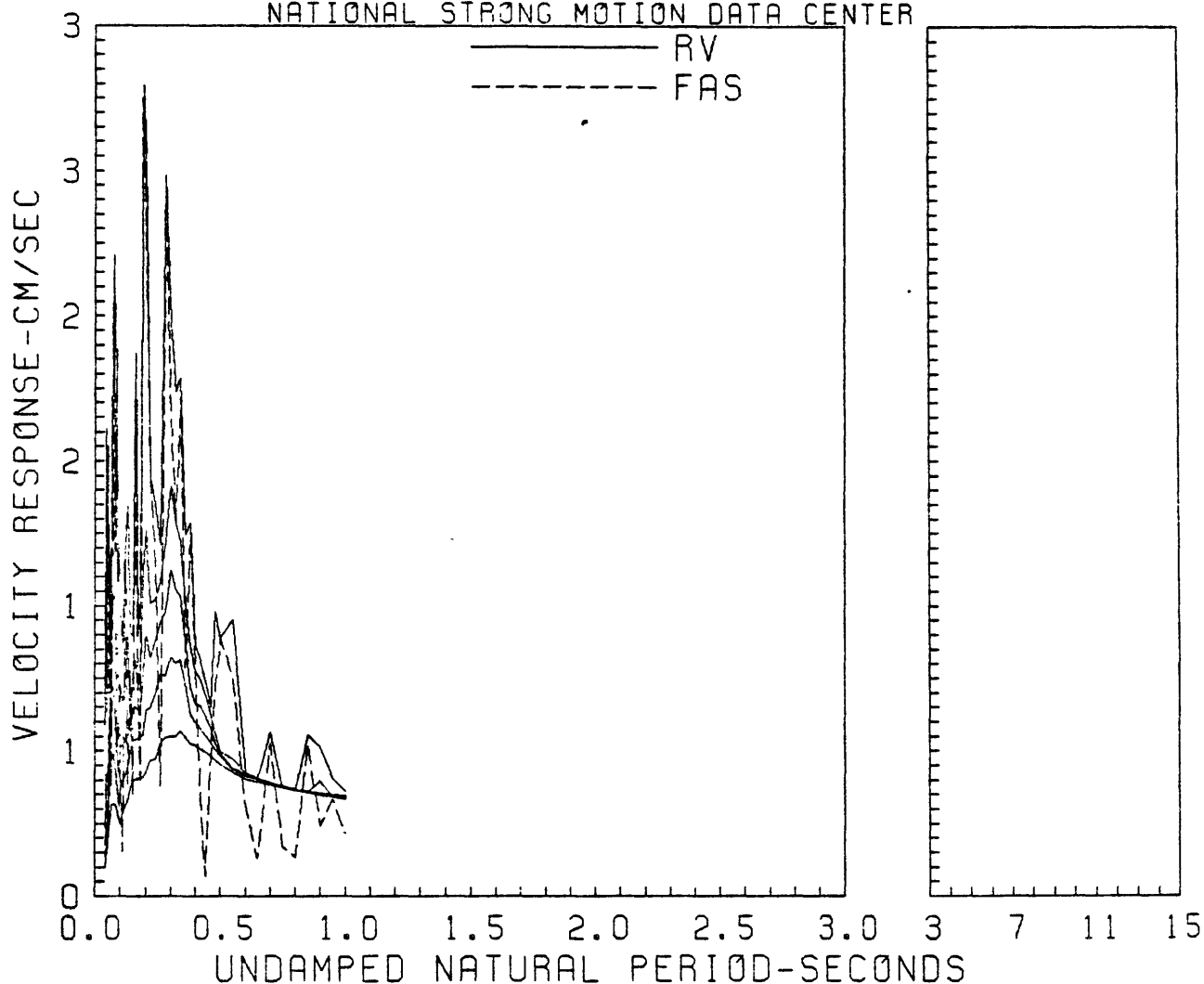
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 NATIONAL STRONG MOTION DATA CENTER



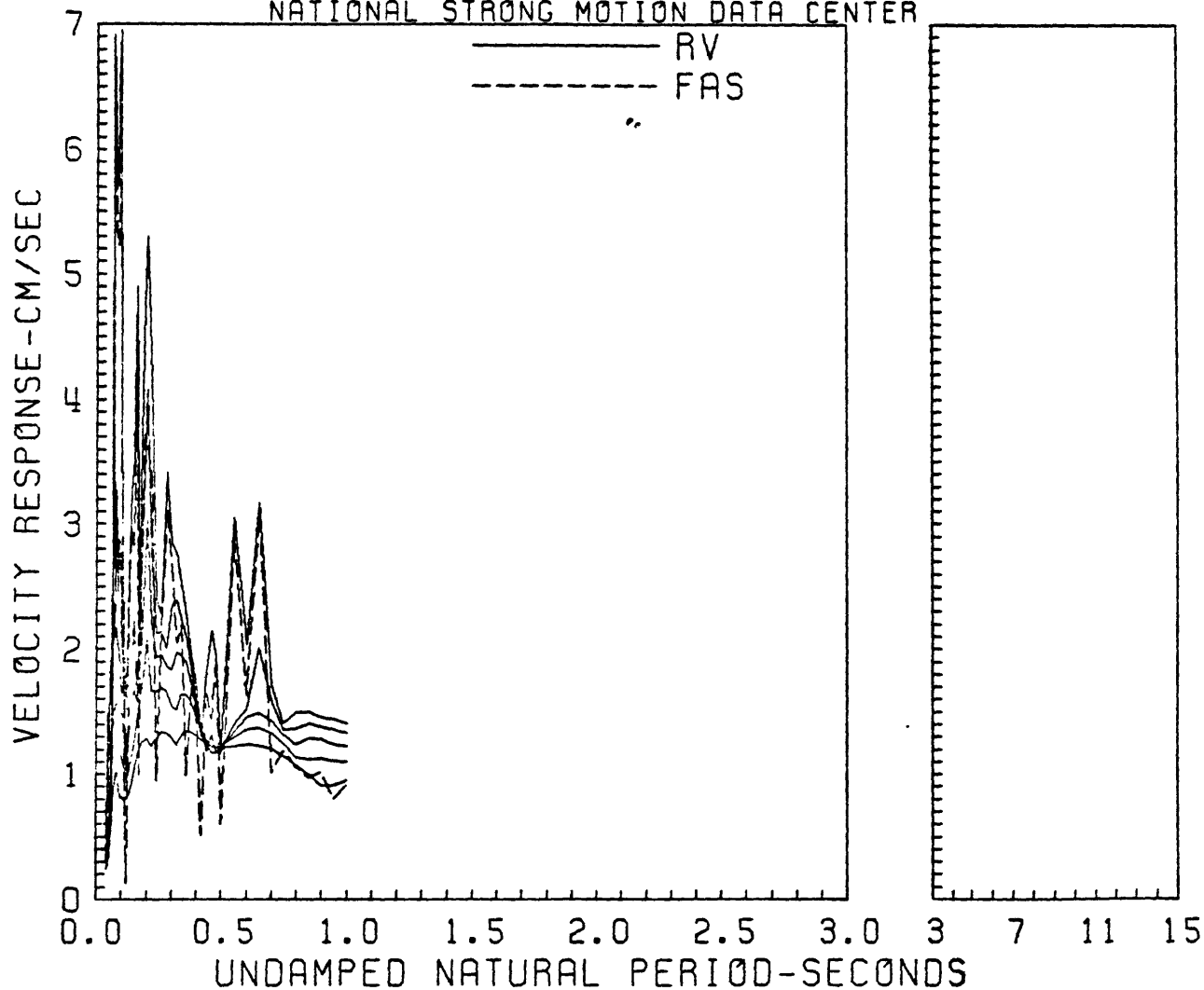
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 FILTERS: BUTTERWORTH, ORDER 4, 1.000 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



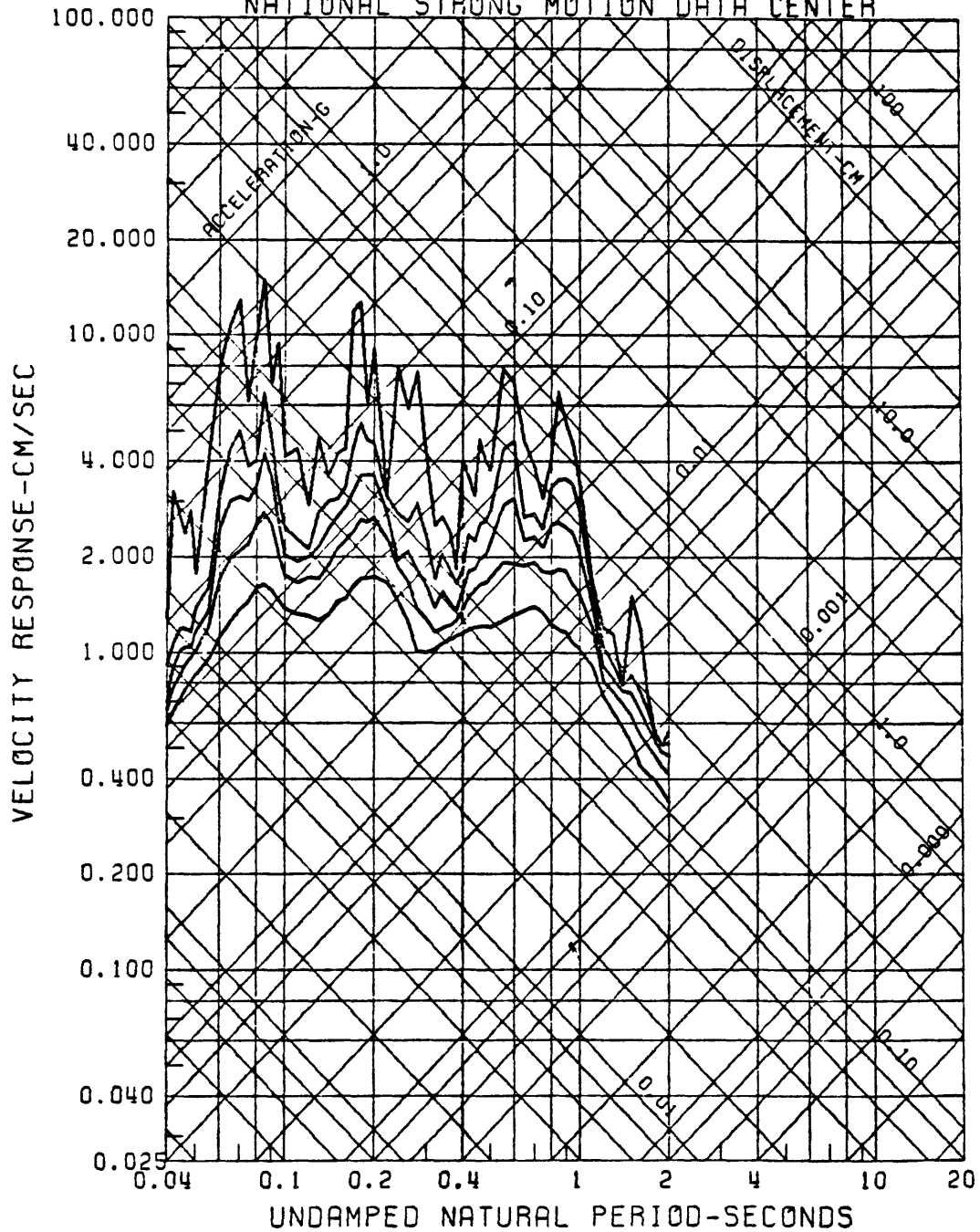
RELATIVE VELOCITY RESPONSE SPECTRUM  
 BENCH, PAPUA NEW GUINEA, 12/13/83, 1324UTC UP  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 1.000 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



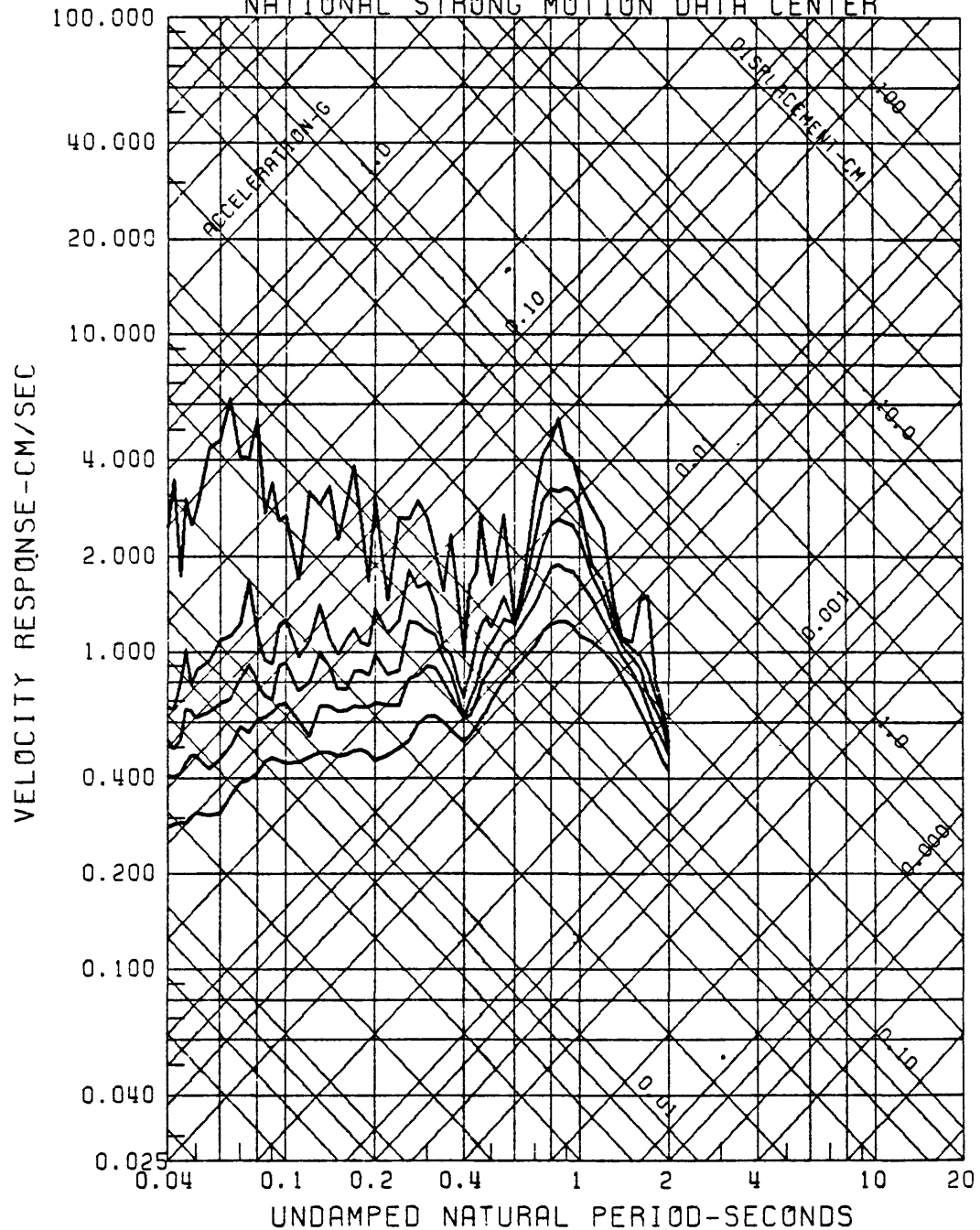
RELATIVE VELOCITY RESPONSE SPECTRUM  
 BENCH, PAPUA NEW GUINEA, 12/13/83, 1324UTC TRAN.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 1.000 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



RESPONSE SPECTRA  
 BENCH, PAPUA NEW GUINEA, 12/13/83, 0139UTC LONG.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER

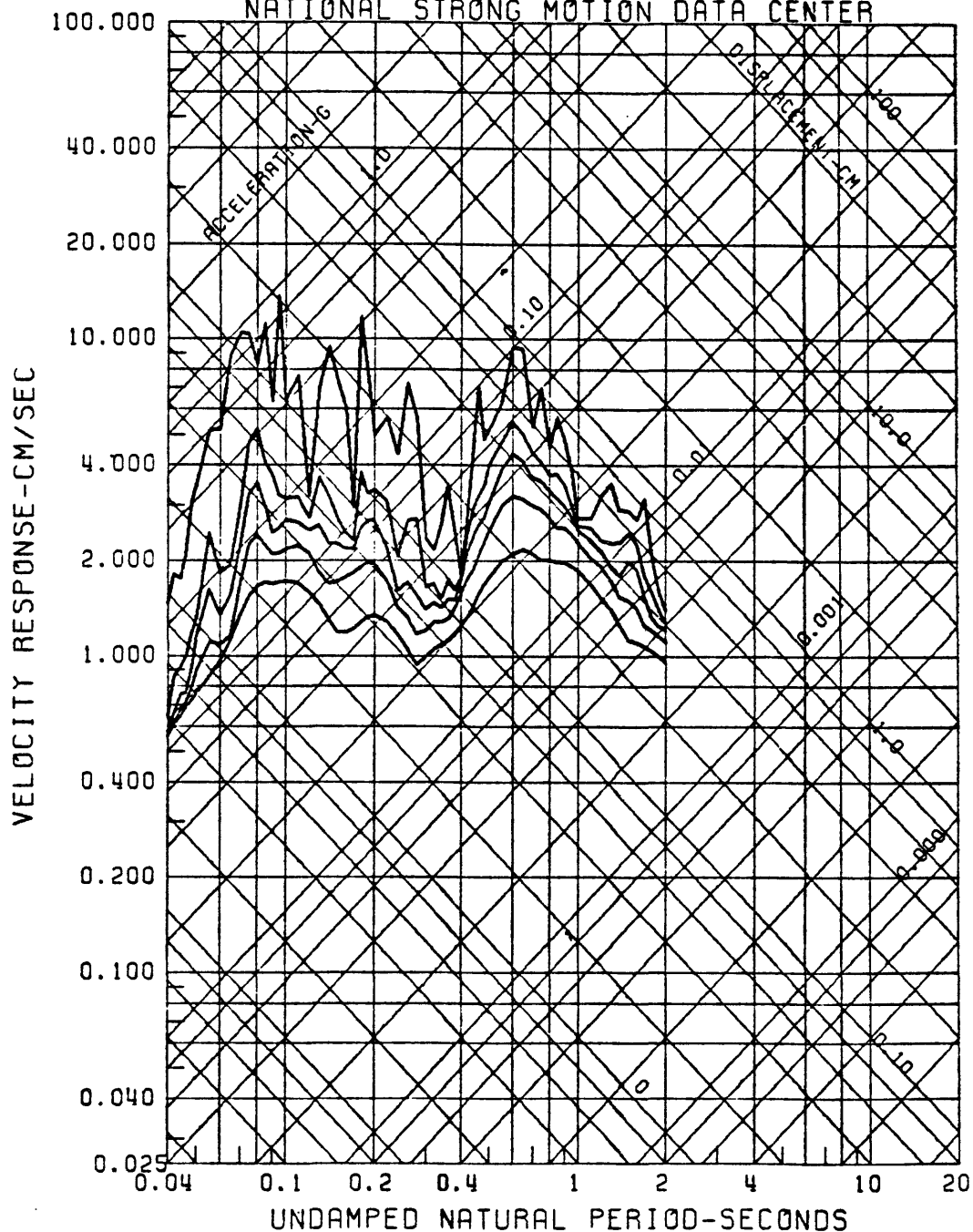


RESPONSE SPECTRA  
 BENCH, PAPUA NEW GUINEA, 12/13/83, 0139UTC UP  
 0.2,5,10,20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER

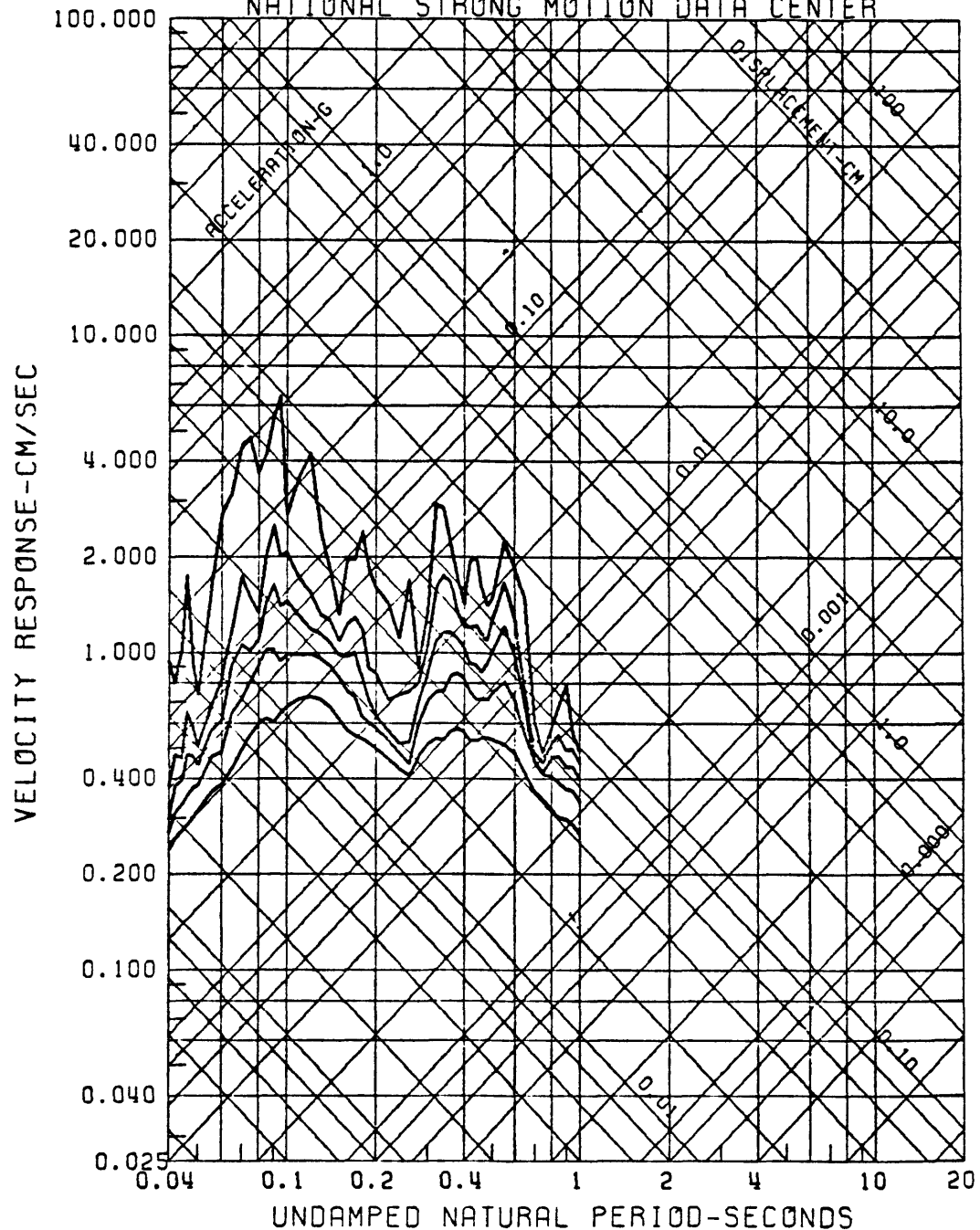




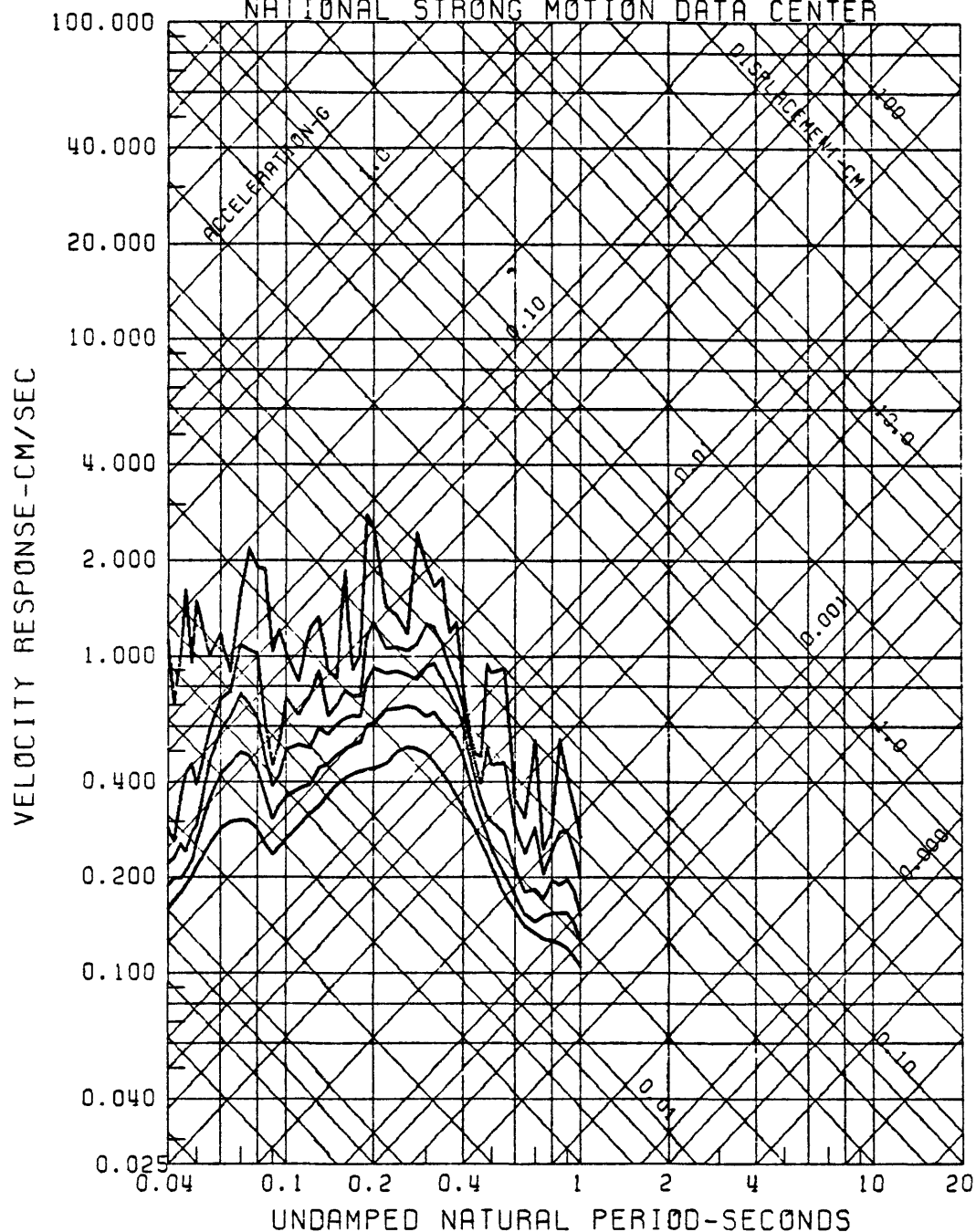
RESPONSE SPECTRA  
 BENCH, PAPUA NEW GUINEA, 12/13/83, 0139UTC TRAN.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



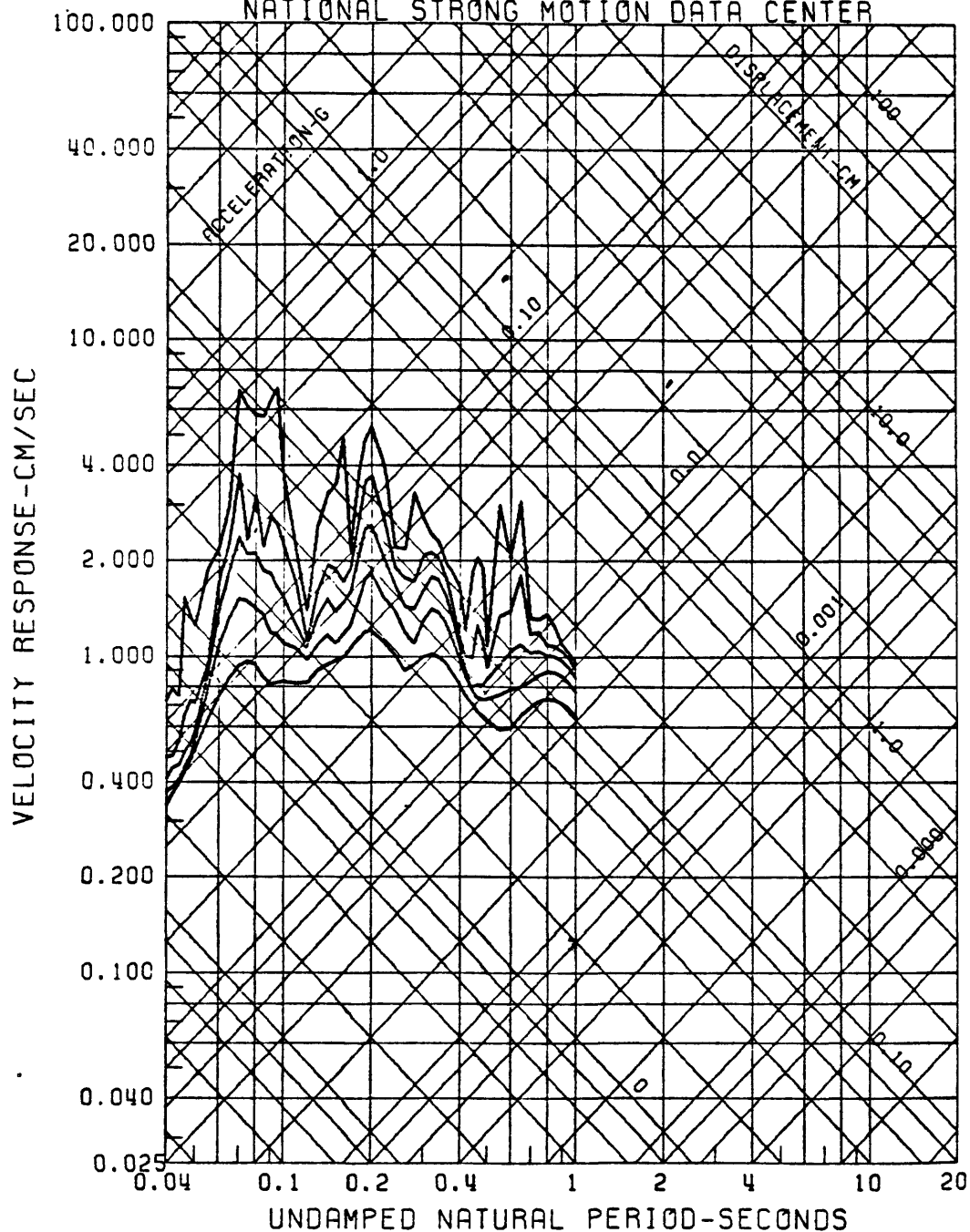
RESPONSE SPECTRA  
 BENCH, PAPUA NEW GUINEA, 12/13/83, 1324UTC LONG.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 1.000 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER

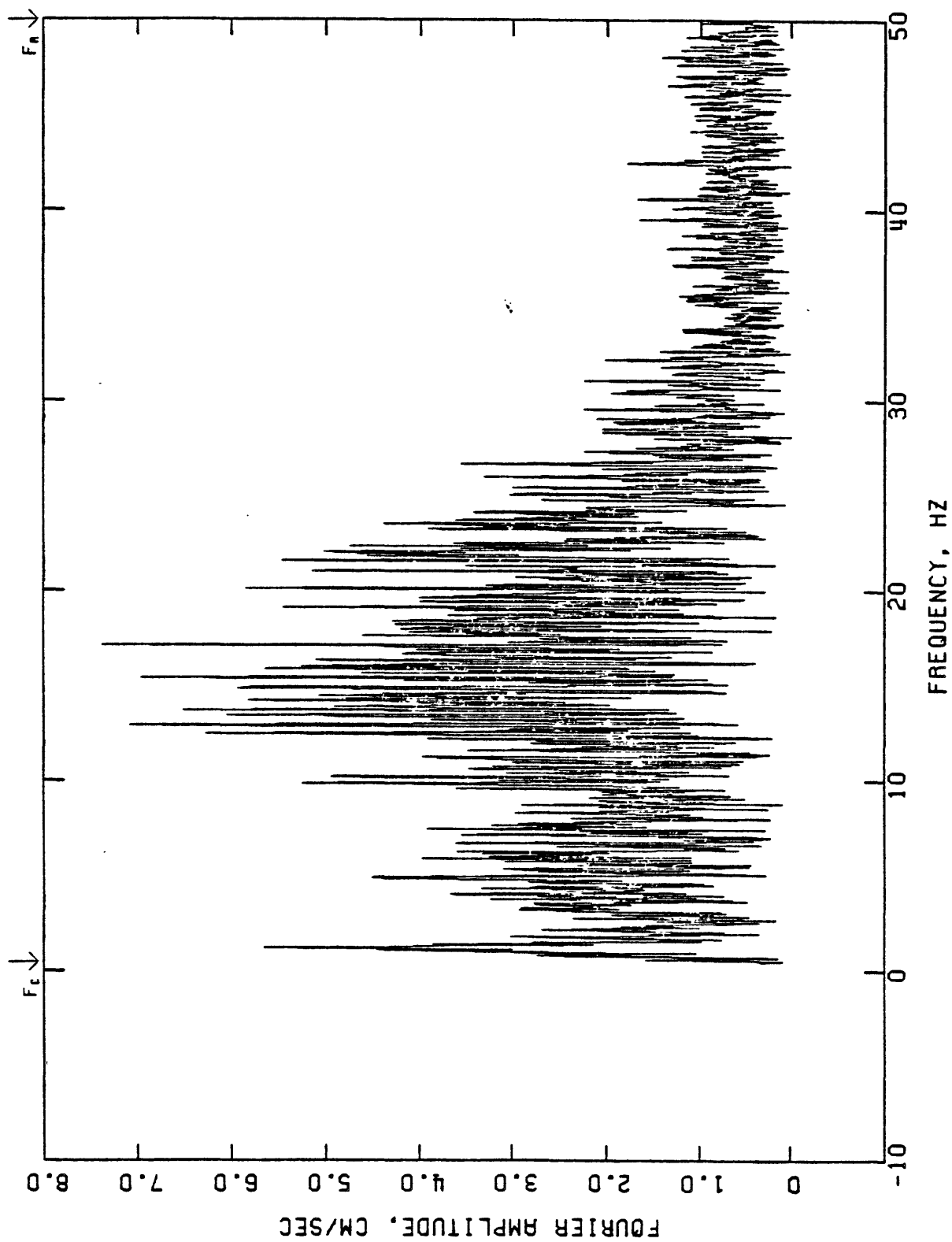


RESPONSE SPECTRA  
 BENCH, PAPUA NEW GUINEA, 12/13/83, 1324UTC UP  
 0.2,5,10,20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 1.000 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



RESPONSE SPECTRA  
 BENCH, PAPUA NEW GUINEA, 12/13/83, 1324UTC TRAN.  
 0,2,5,10,20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 1.000 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER





FIGURE

FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.

BENCH, PAPUA NEW GUINEA

VERT EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC

BUTTERWORTH FILTER AT 0.50 HZ, ORDER 4

DATA BAND PASSED FROM 0.50 TO 50.00 HZ.

COMPUTING OPTIONS= ZCROSS, NOISE.

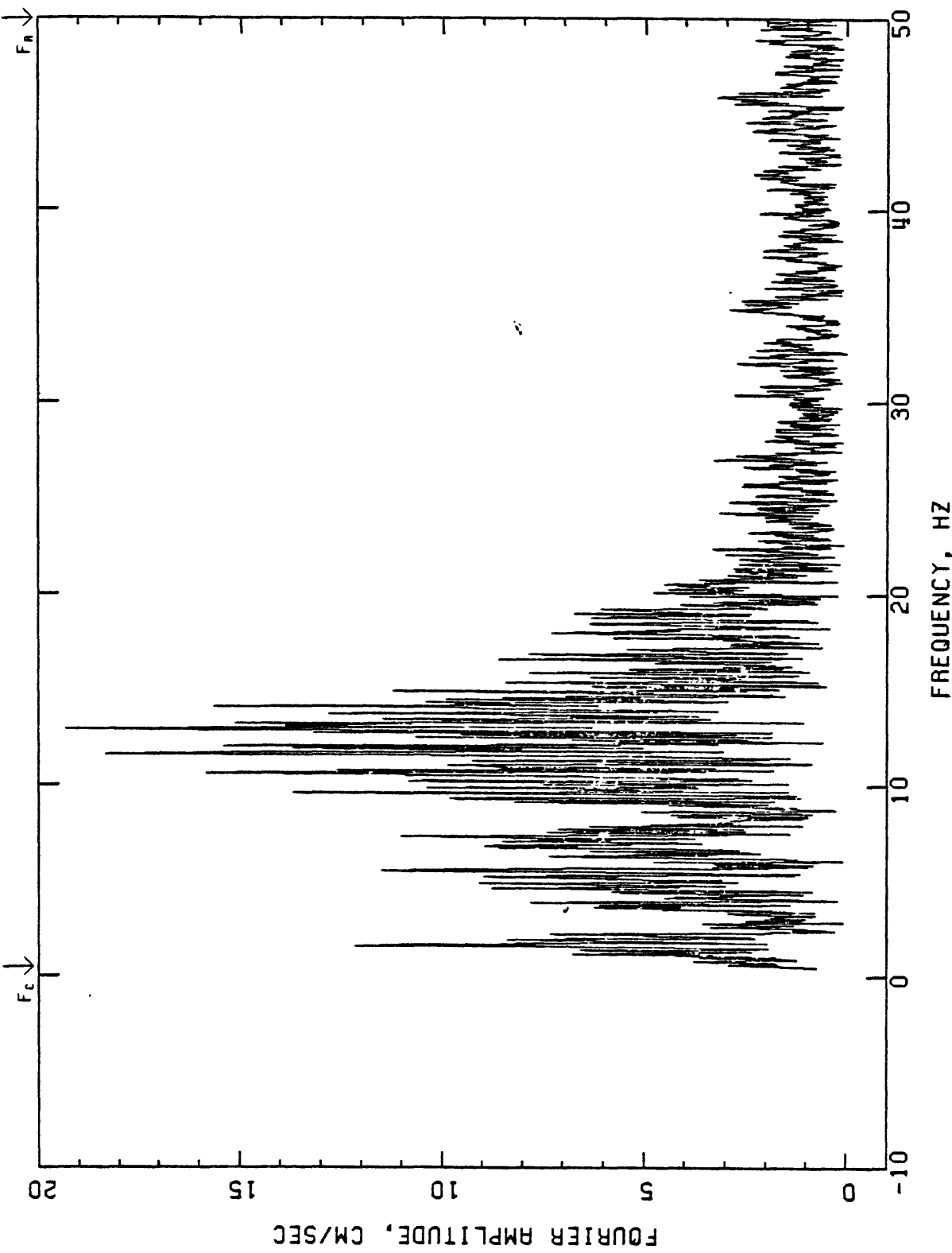
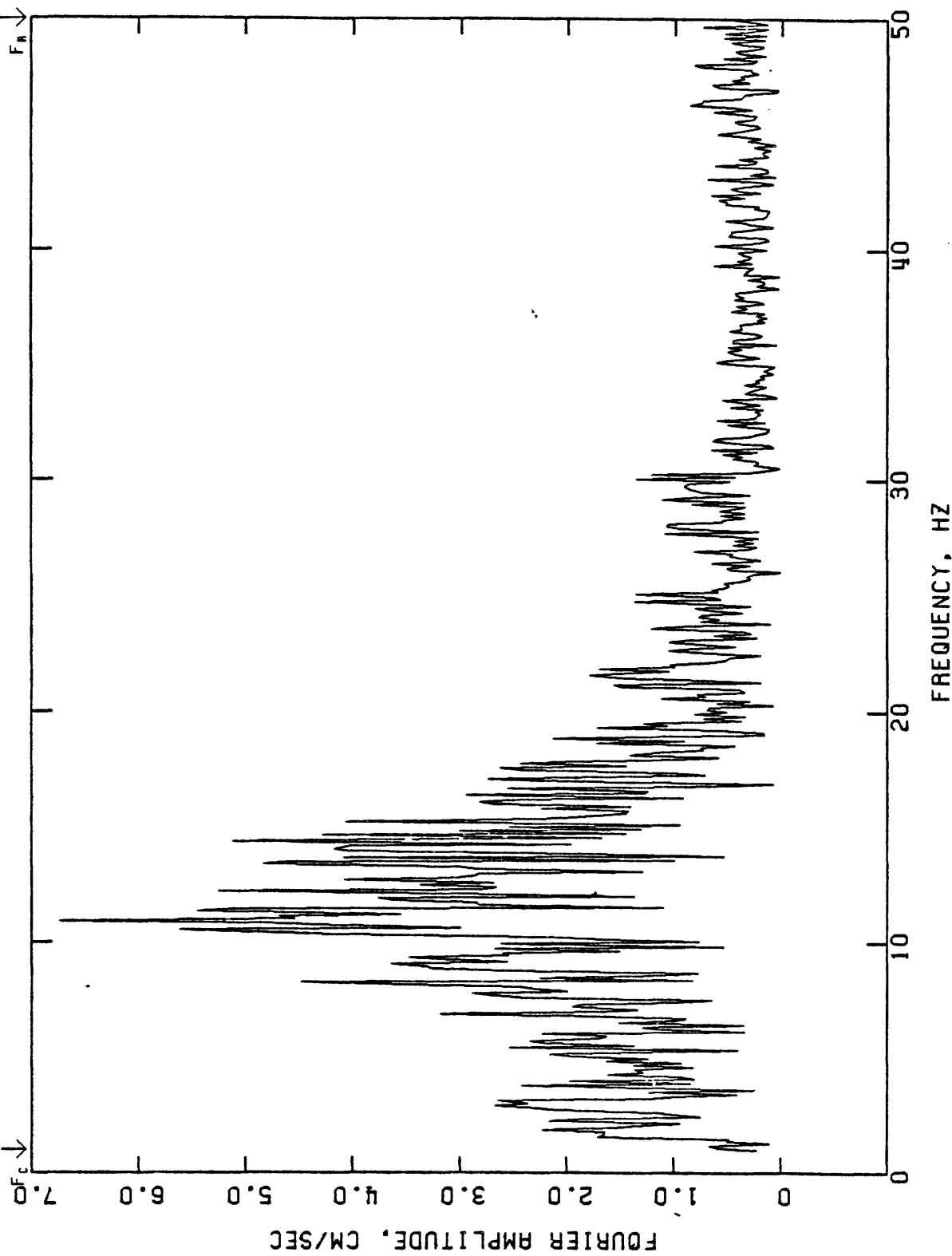


FIGURE  
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
BENCH, PAPUA NEW GUINEA  
TRAN.  
EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC  
BUTTERWORTH FILTER AT 0.50 HZ, ORDER 4  
DATA BAND PASSED FROM 0.50 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONOISE.



FIGURE

FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.

BENCH, PAPUA NEW GUINEA

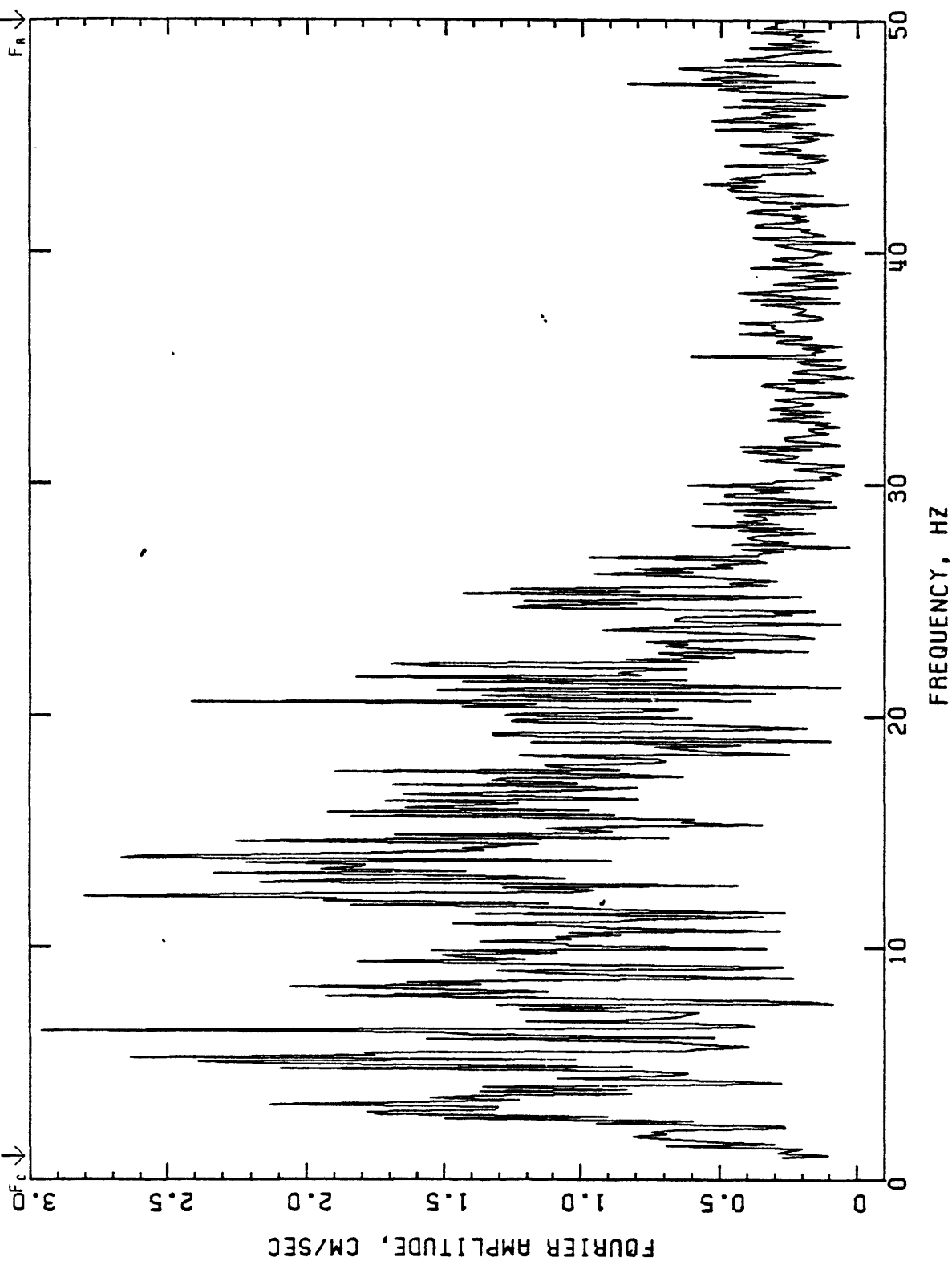
LONG.

EARTHQUAKE OF DECEMBER 13, 1983 1324 UTC

BUTTERWORTH FILTER AT 1.0 HZ, ORDER 4

DATA BAND PASSED FROM 1.00 TO 50.00 HZ.

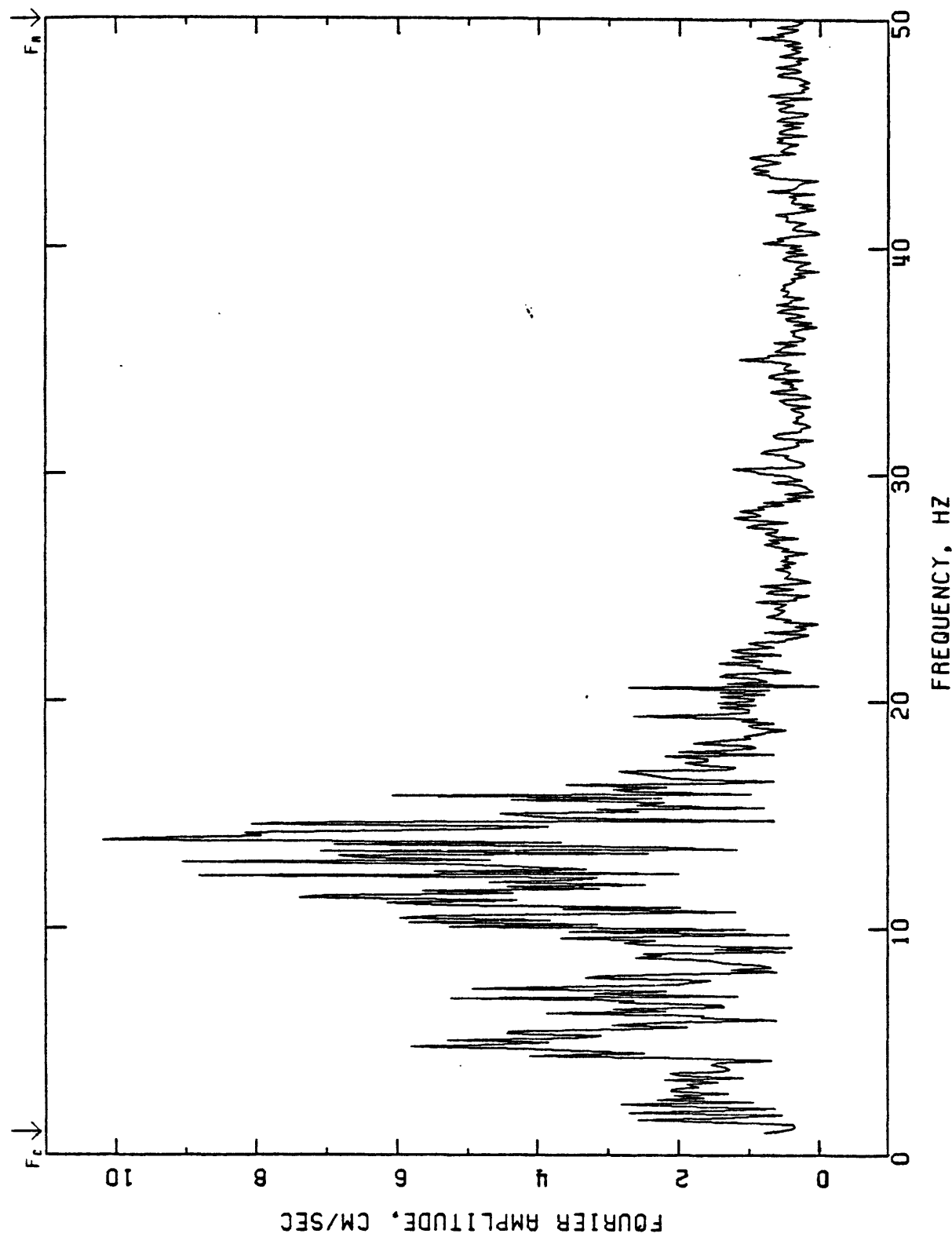
COMPUTING OPTIONS= ZCROSS, NONOISE.



FIGURE

FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
BENCH, PAPUA NEW GUINEA  
VERT.  
EARTHQUAKE OF DECEMBER 13, 1983 1324 UTC  
BUTTERWORTH FILTER AT 1.0 HZ ORDER 4  
DATA BAND PASSED FROM 1.00 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NOISE.





FIGURE

FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
 BENCH, PAPUA NEW GUINEA  
 TRAN.  
 EARTHQUAKE OF DECEMBER 13, 1983 1324 UTC  
 BUTTERWORTH FILTER AT 1.0 HZ, ORDER 4  
 DATA BAND PASSED FROM 1.00 TO 50.00 HZ.  
 COMPUTING OPTIONS= ZCROSS, NOISE.

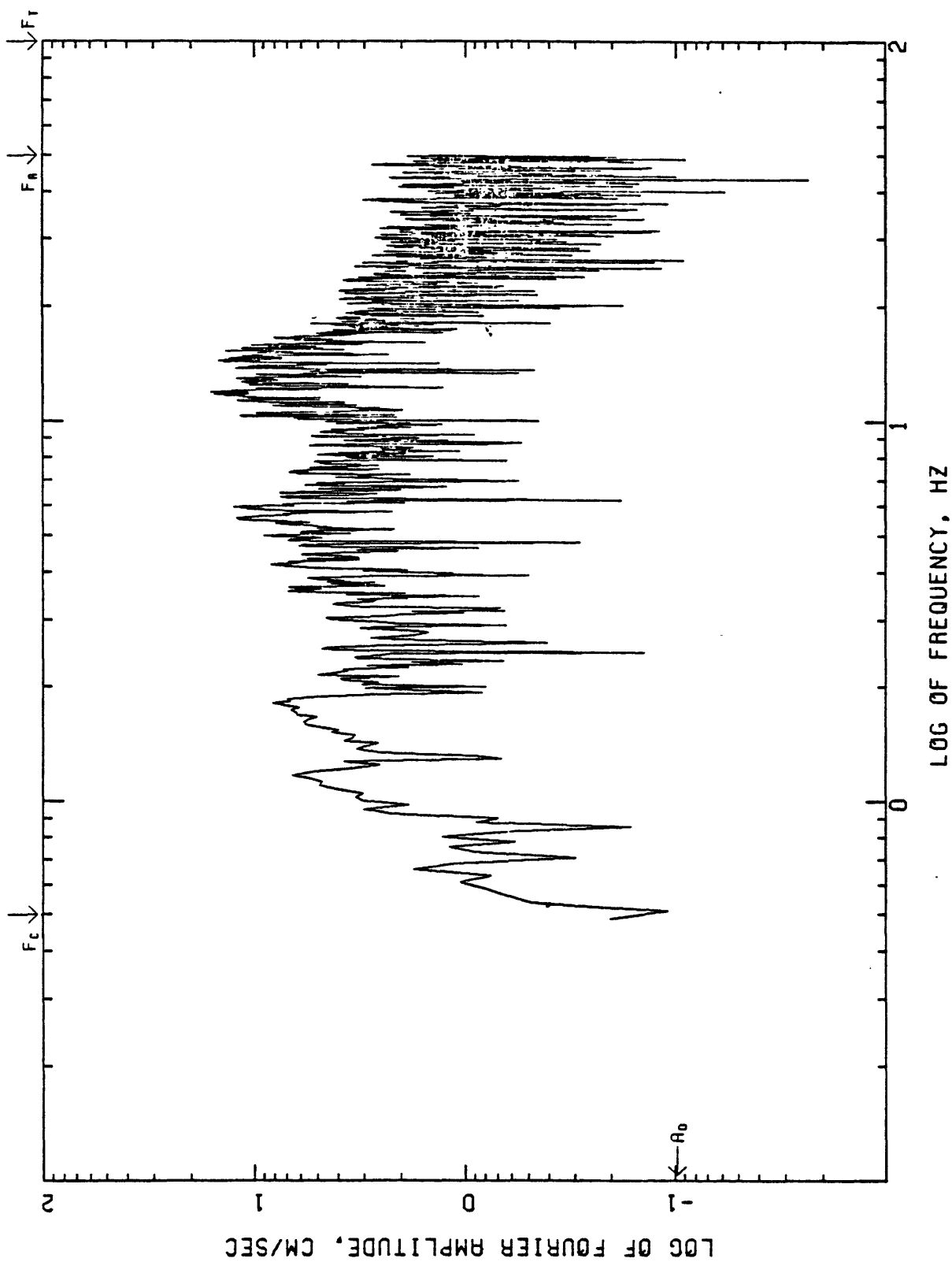
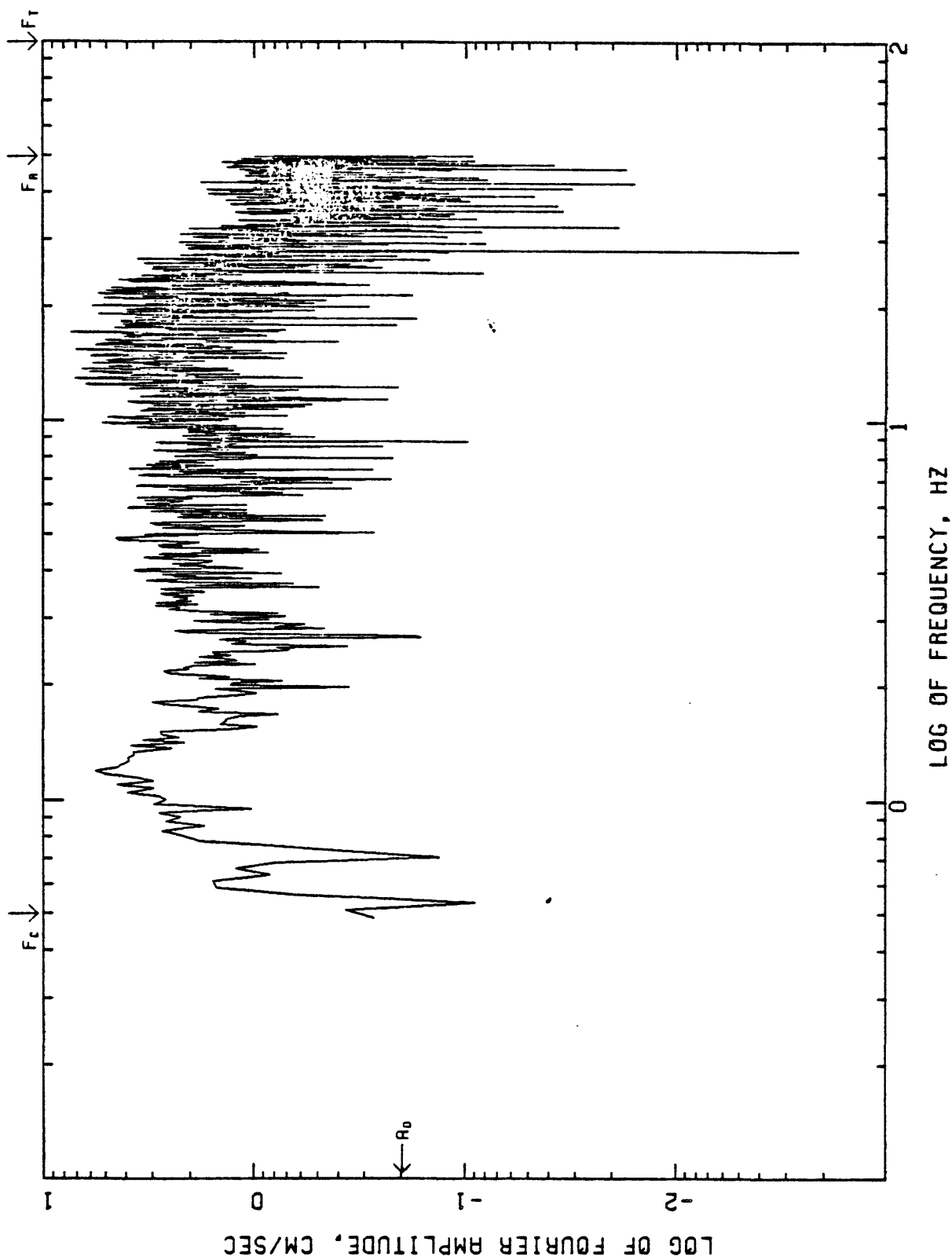


FIGURE  
LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
BENCH, PAPUA NEW GUINEA  
LONG.  
EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC  
BUTTERWORTH FILTER AT 0.50 HZ, ORDER 4  
DATA BAND PASSED FROM 0.50 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONOISE.



FIGURE

LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
BENCH, PAPUA NEW GUINEA  
VERT.  
EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC  
BUTTERWORTH FILTER AT 0.50 HZ, ORDER 4  
DATA BAND PASSED FROM 0.50 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONNOISE.

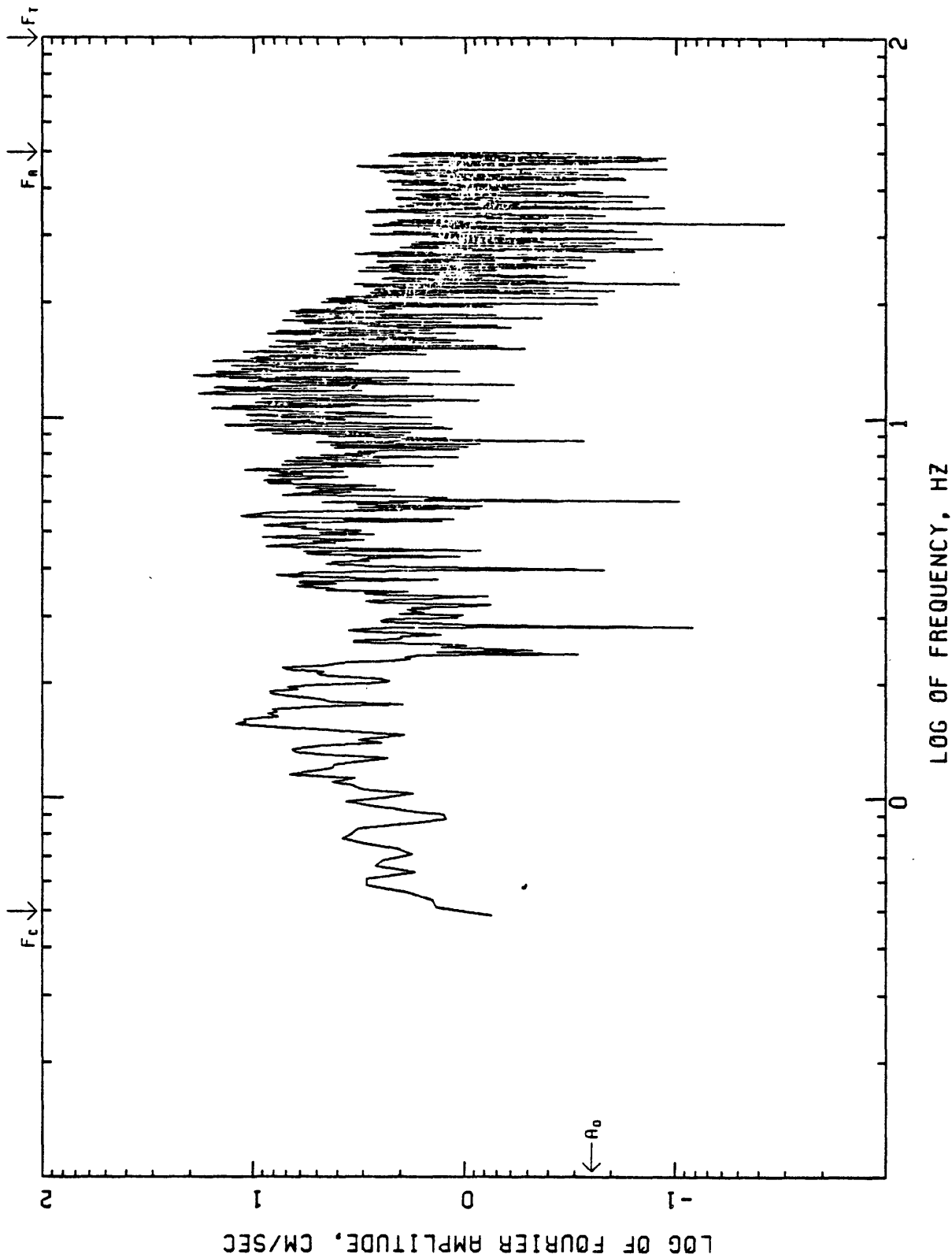


FIGURE  
 LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
 BENCH, PAPUA NEW GUINEA  
 EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC  
 BUTTERWORTH FILTER AT 0.50 HZ, ORDER 4  
 DATA BAND PASSED FROM 0.50 TO 50.00 HZ.  
 COMPUTING OPTIONS= ZCROSS, NONNOISE.

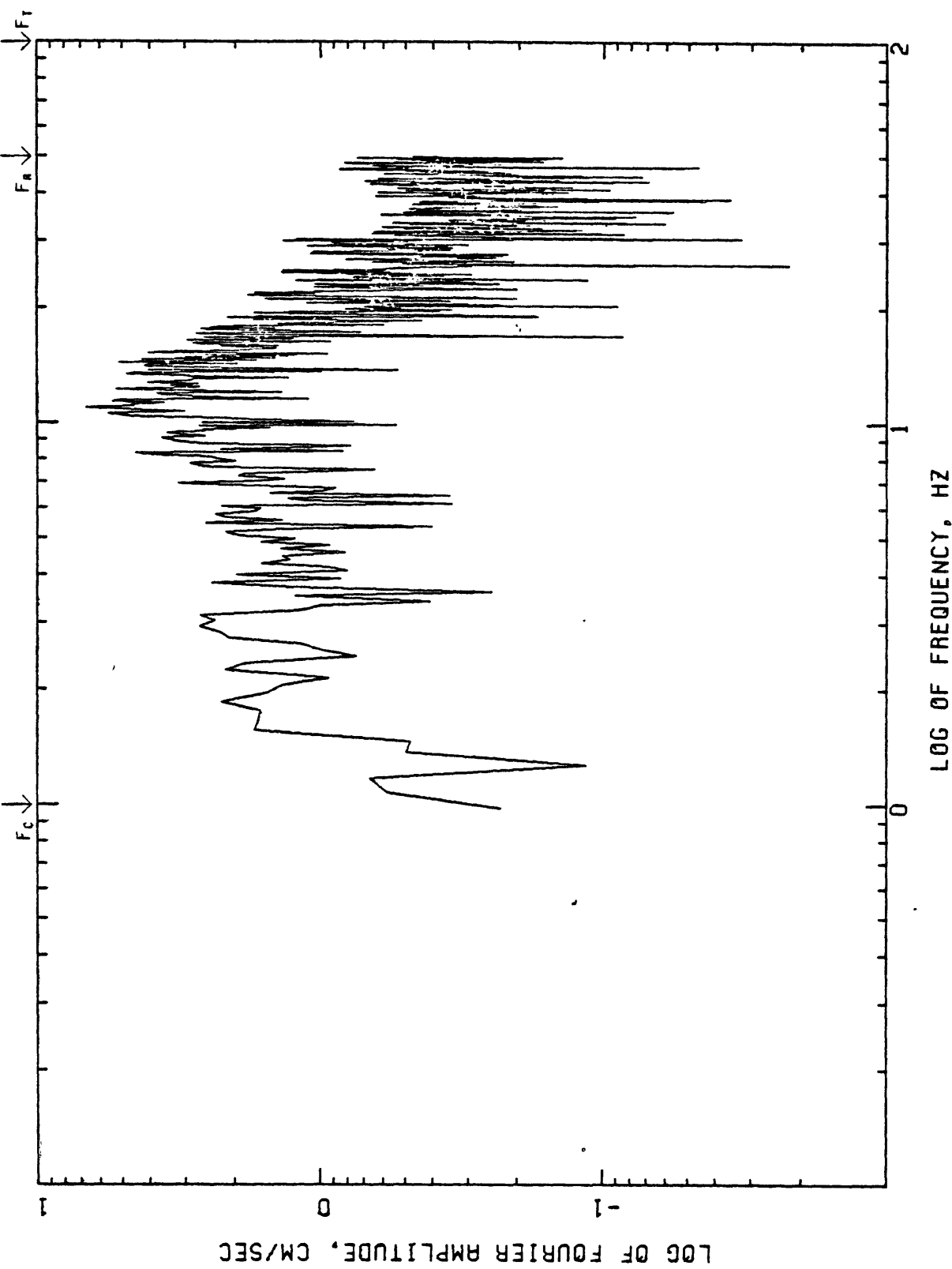


FIGURE  
 LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
 BENCH, PAPUA NEW GUINEA  
 LONG  
 EARTHQUAKE OF DECEMBER 13, 1983 1324 UTC  
 BUTTERWORTH FILTER AT 1.0 HZ ORDER 4  
 DATA BAND PASSED FROM 1.00 TO 50.00 HZ.  
 COMPUTING OPTIONS= ZCROSS,NON0ISE.

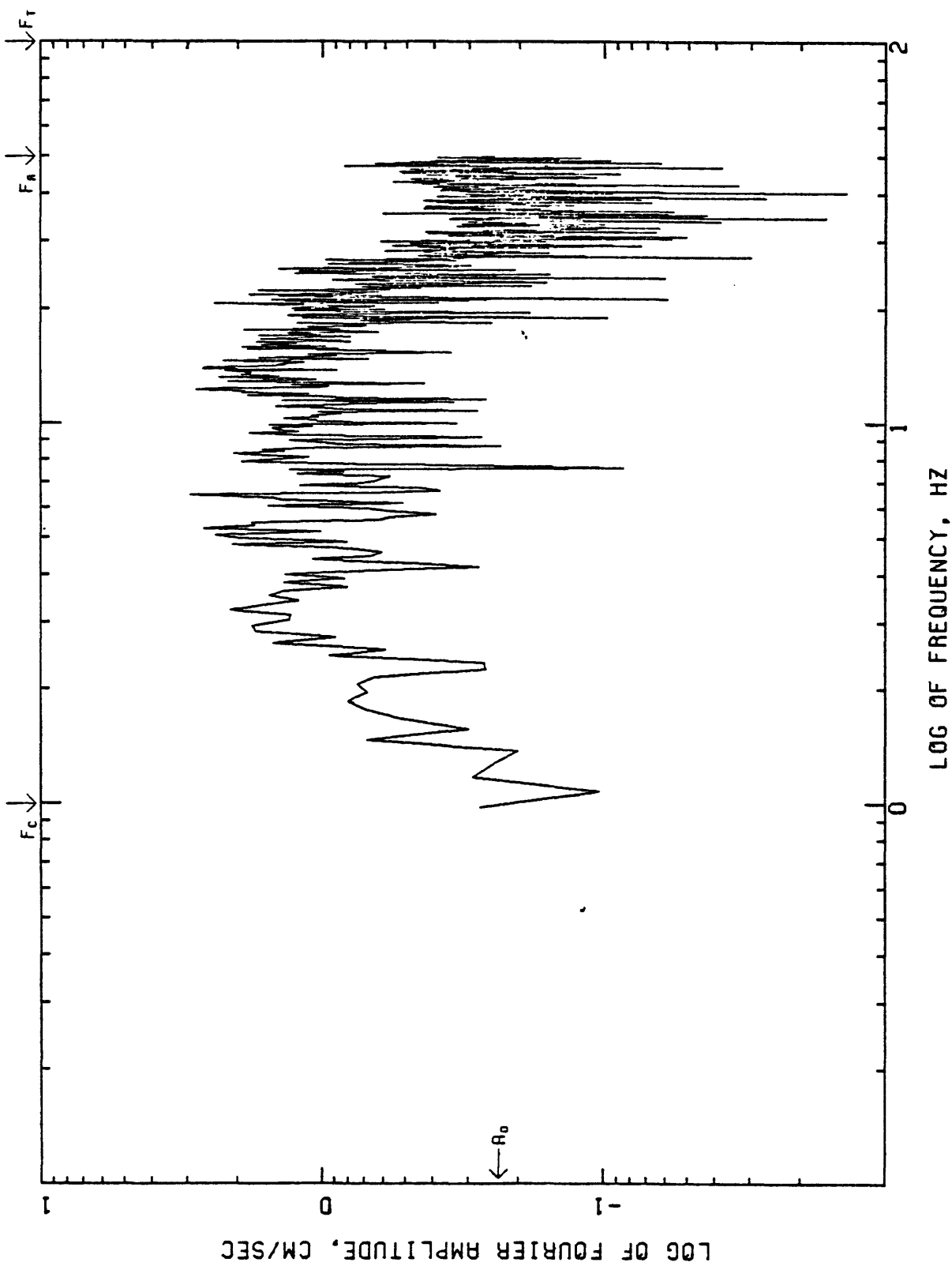


FIGURE  
 LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
 BENCH, PAPUA NEW GUINEA  
 VERT.  
 EARTHQUAKE OF DECEMBER 13, 1983 1324 UTC  
 BUTTERWORTH FILTER AT 1.0 HZ, ORDER 4  
 DATA BAND PASSED FROM 1.00 TO 50.00 HZ.  
 COMPUTING OPTIONS= ZCROSS, NOISE.

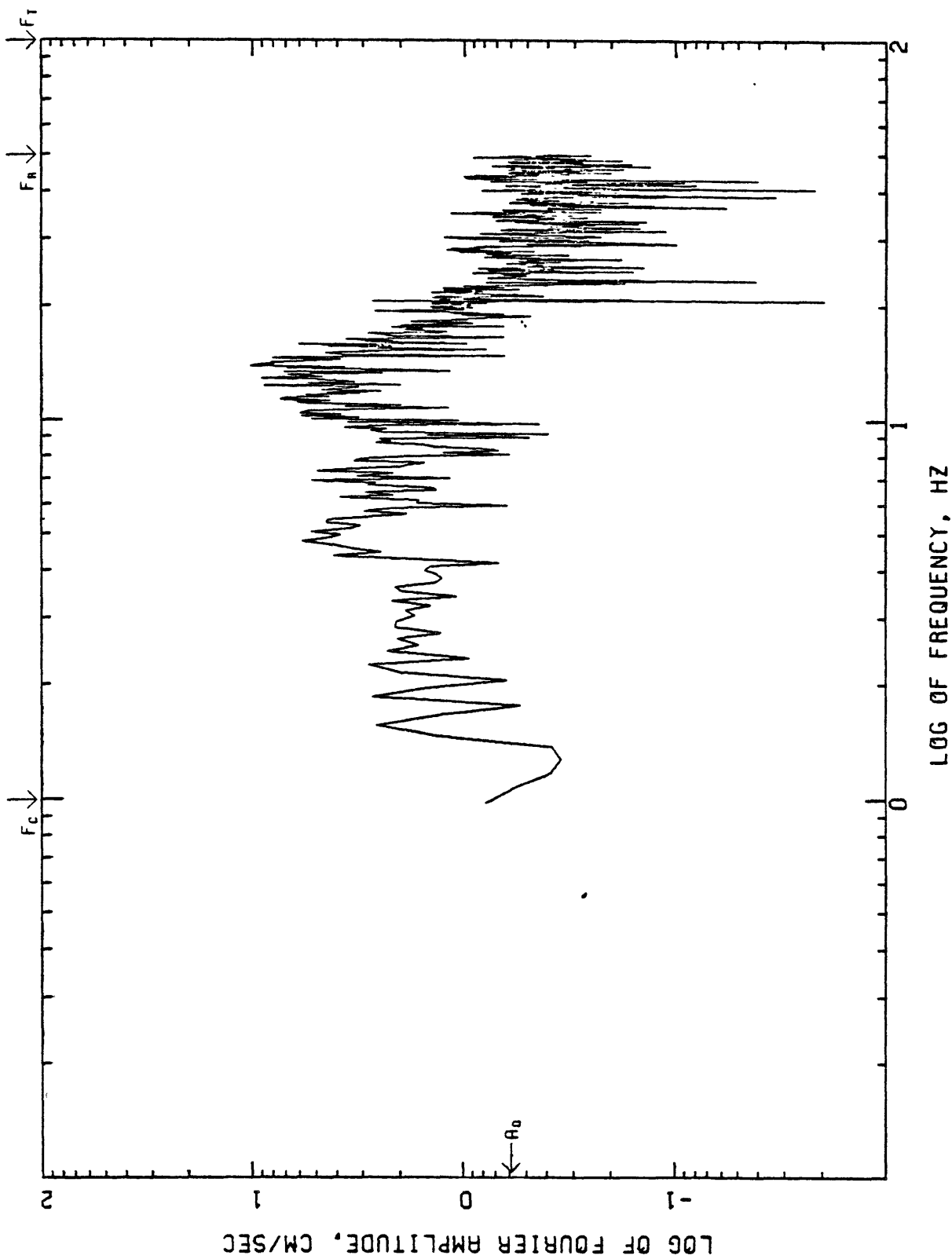


FIGURE  
 LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
 BENCH, PAPUA NEW GUINEA  
 TRAN.  
 EARTHQUAKE OF DECEMBER 13, 1983 1324 UTC  
 BUTTERWORTH FILTER AT 1.0 HZ, ORDER 4  
 DATA BAND PASSED FROM 1.00 TO 50.00 HZ.  
 COMPUTING OPTIONS= ZCROSS, NONOISE.

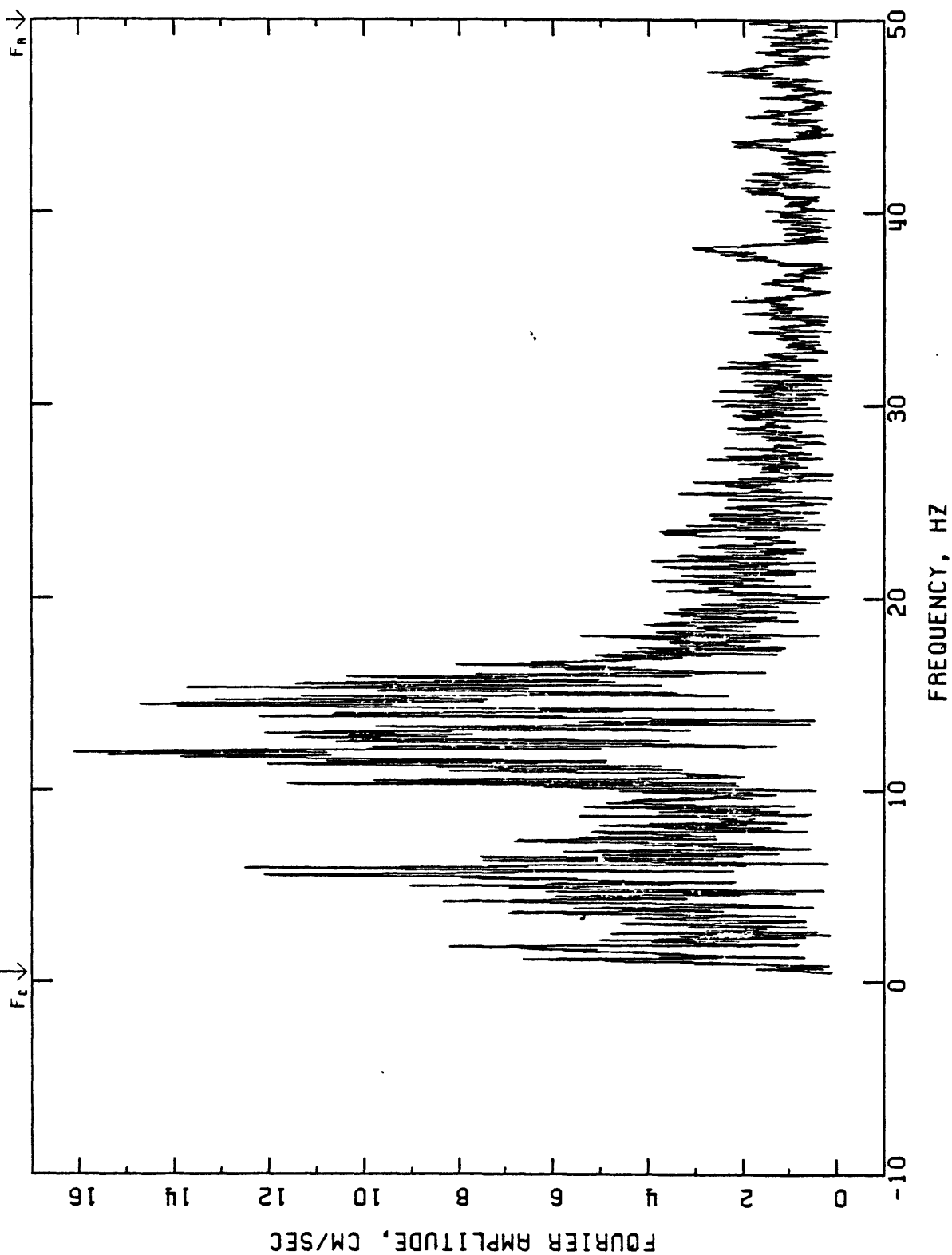
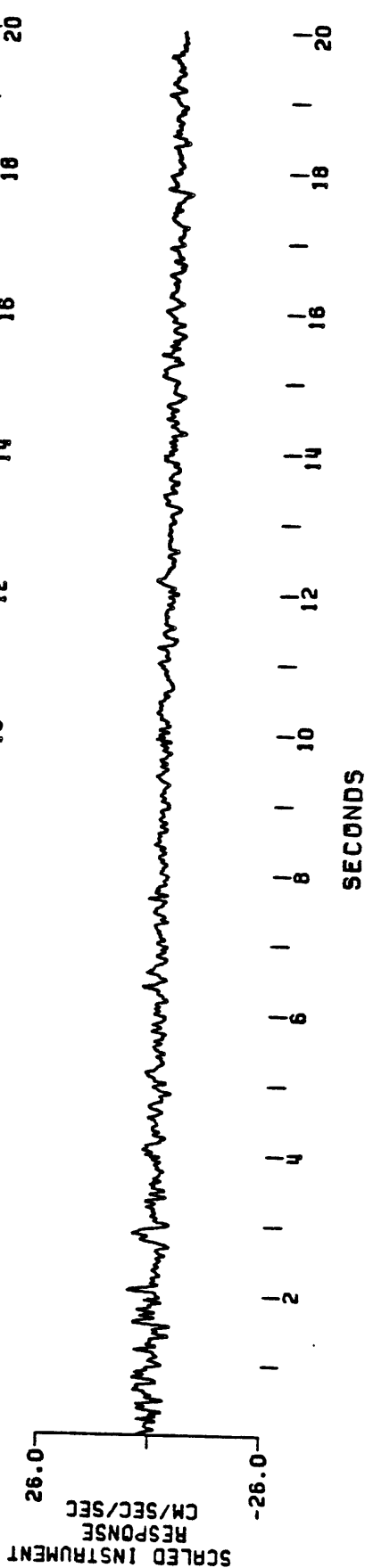
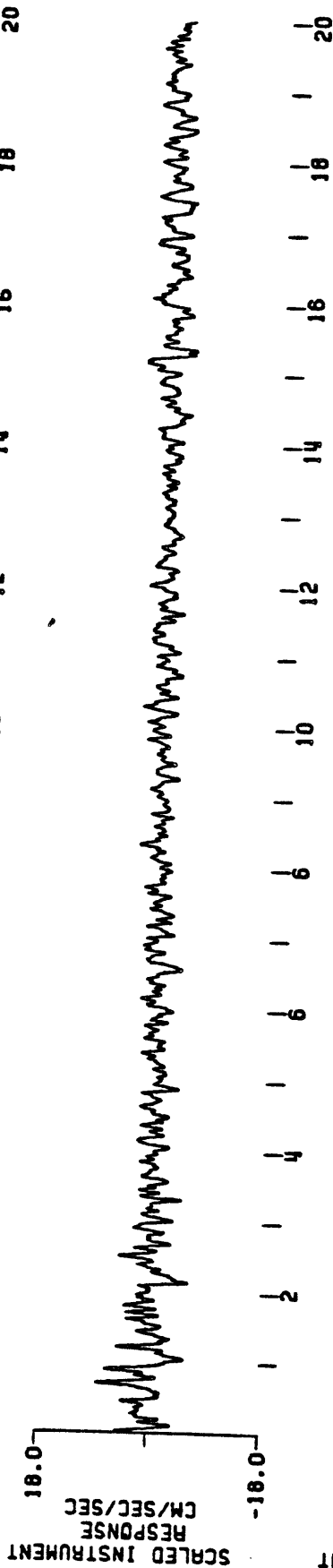
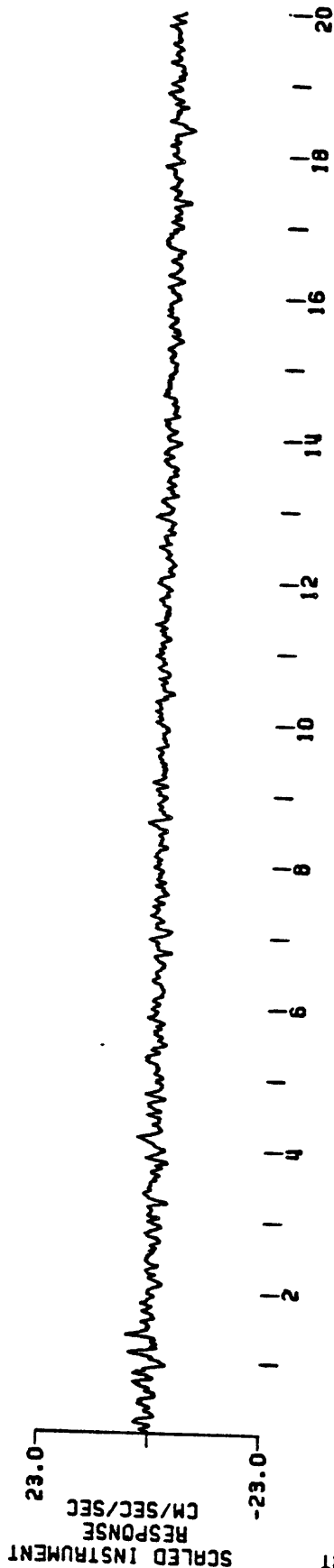


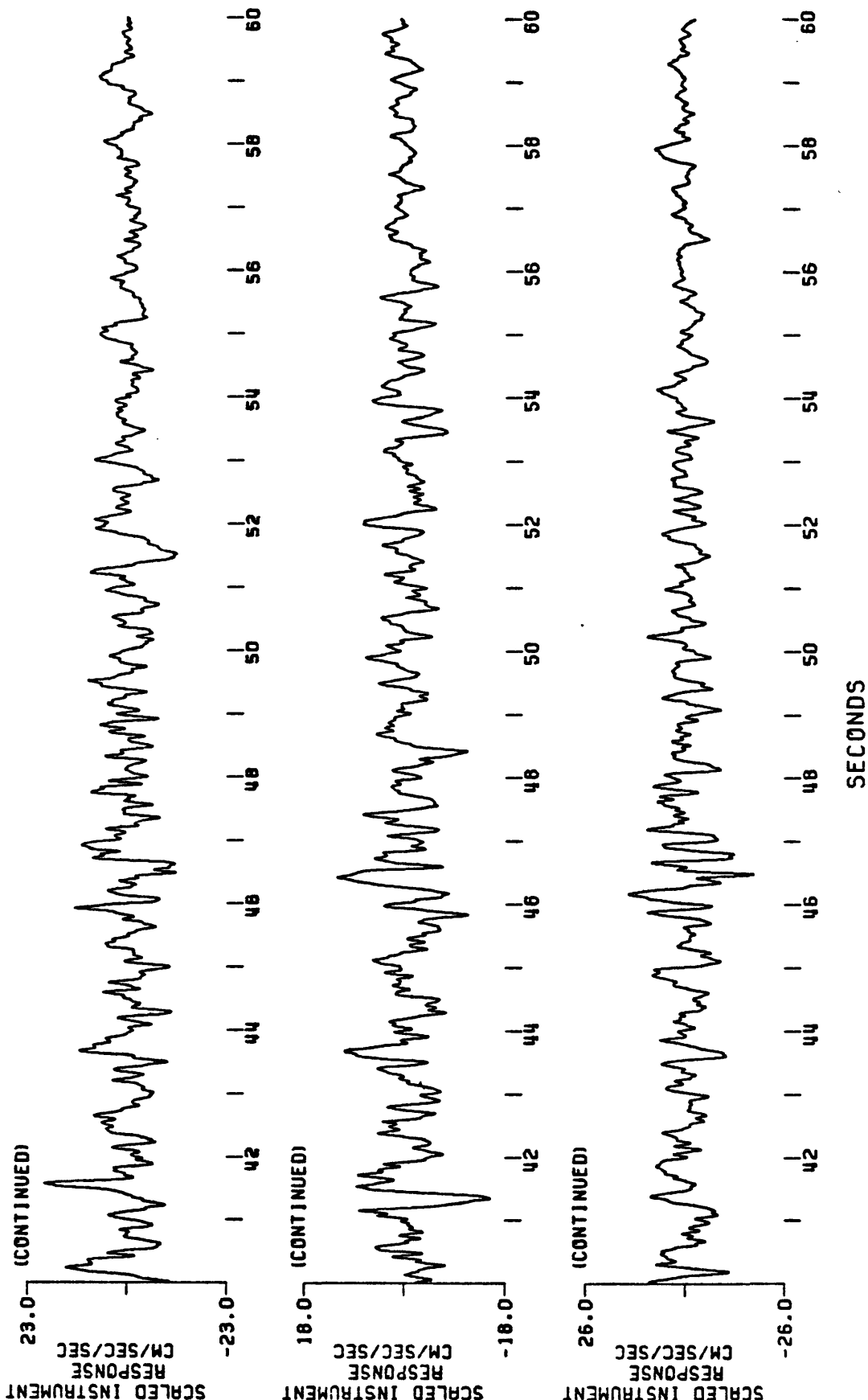
FIGURE  
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
BENCH, PAPUA NEW GUINEA  
LONG.  
EARTHQUAKE OF DECEMBER 13, 1983 0139 UTC  
BUTTERWORTH FILTER AT 0.50 HZ, ORDER 4  
DATA BAND PASSED FROM 0.50 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONOISE.



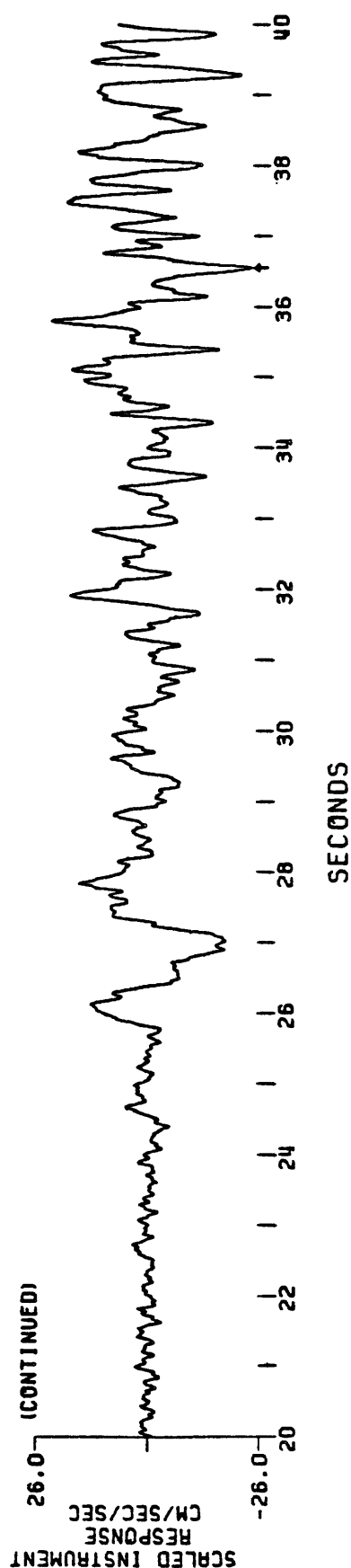
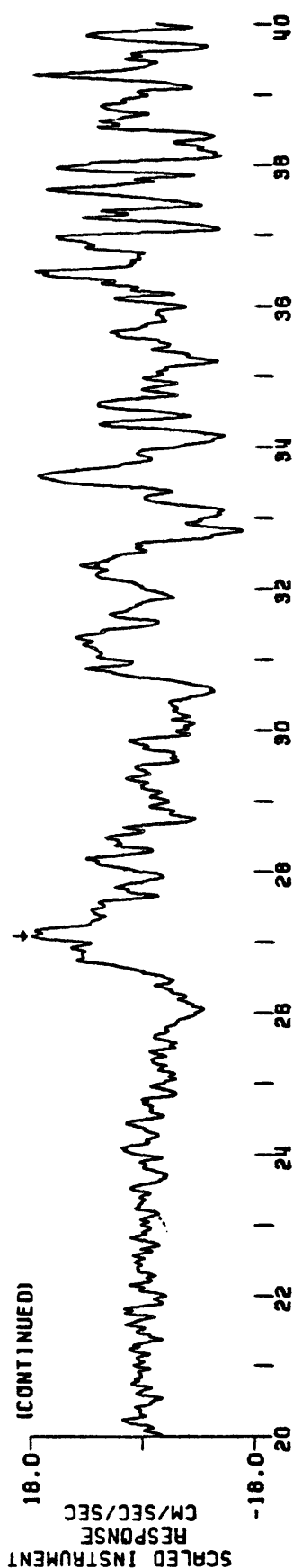
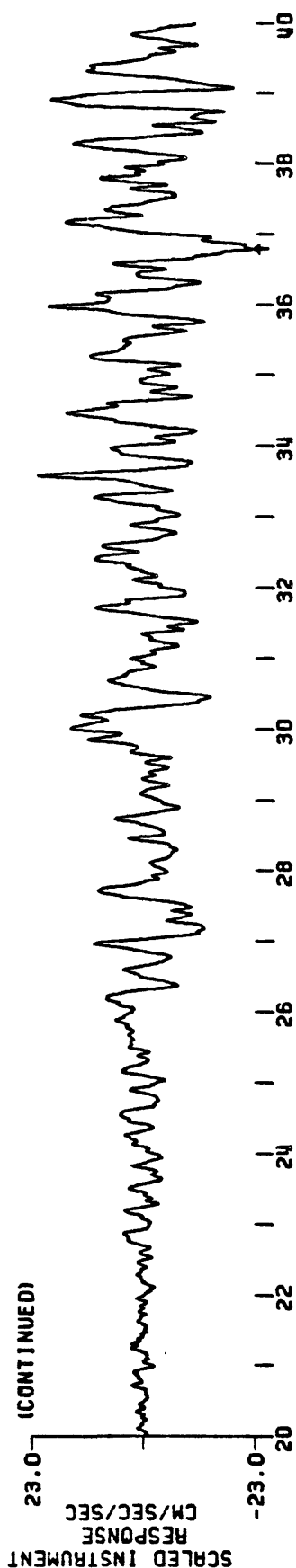
UNCORRECTED ACCELEROGRAM  
 ARAWA TOWN, PAPUA NEW GUINEA  
 LONG. VERT. TRAN.  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 PEAK VALUES (CM/SEC/SEC): -22.06 17.97 -25.34



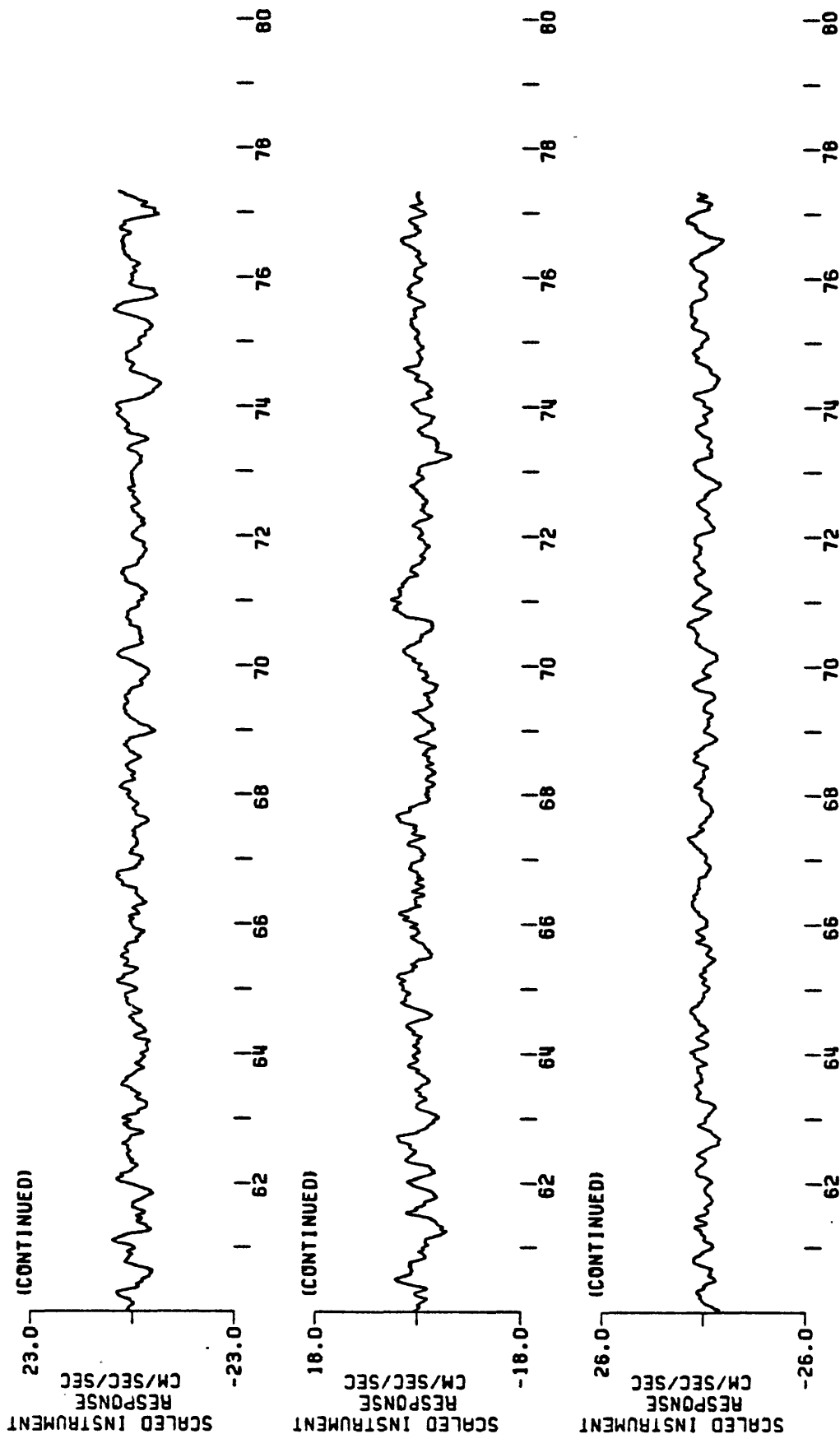
UNCORRECTED ACCELEROGRAM  
 ARAWA TOWN, PAPUA NEW GUINEA  
 LONG. VERT. TRAN.  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 PEAK VALUES (CM/SEC/SEC): -22.06 17.97 -25.34



UNCORRECTED ACCELEROGRAM  
 ARAWA TOWN, PAPUA NEW GUINEA  
 LONG. VERT. TRAN.  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 PEAK VALUES (CM/SEC/SEC): -22.06 17.97 -25.34

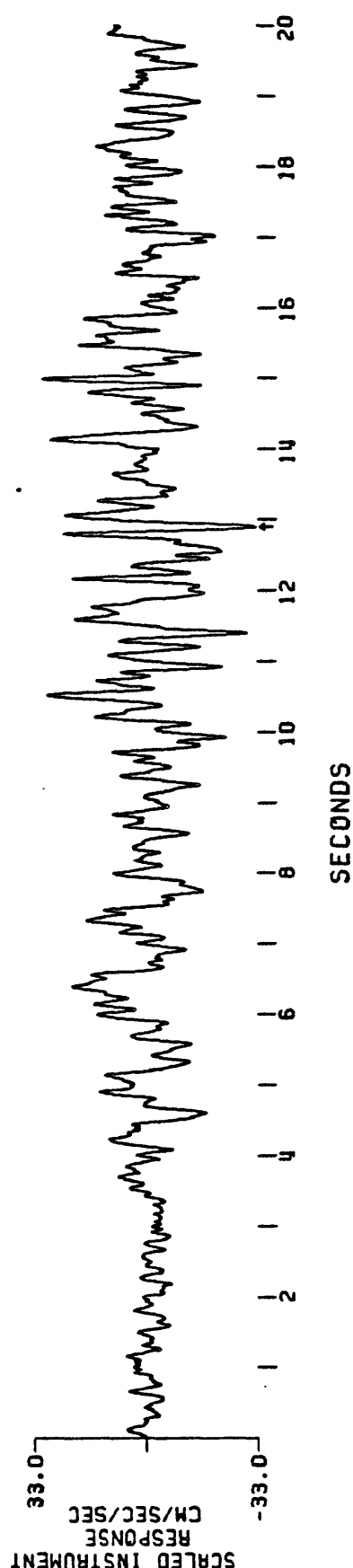
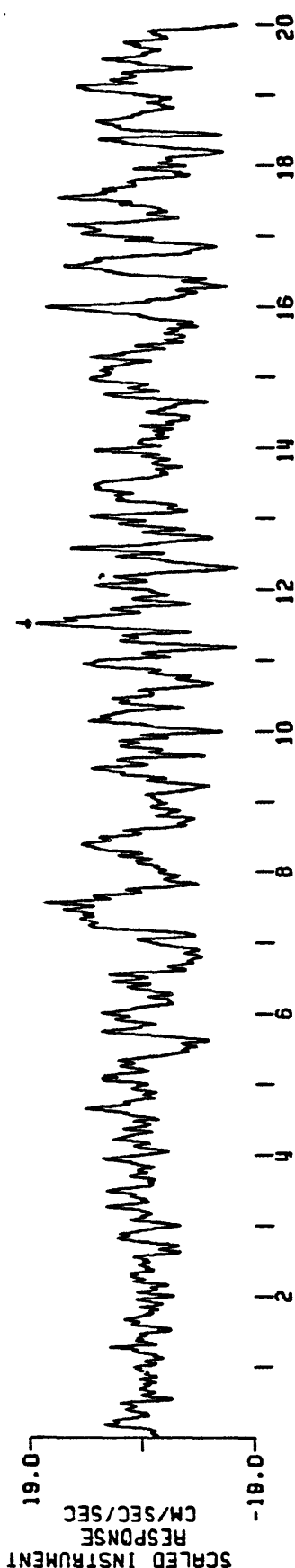
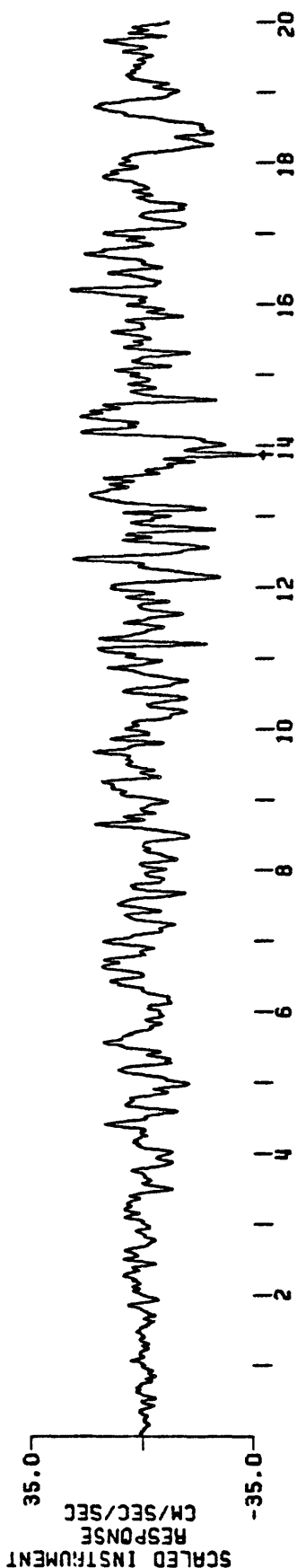


UNCORRECTED ACCELEROGRAM  
 ARAWA TOWN, PAPUA NEW GUINEA  
 LONG. VERT. TRAN.  
 PEAK VALUES (CM/SEC/SEC): -22.06 0905 UTC  
 17.97 -25.34

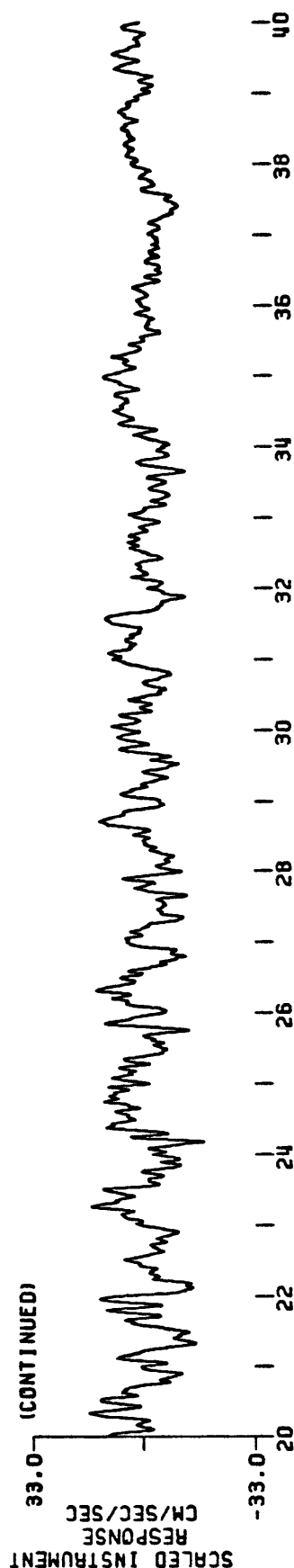
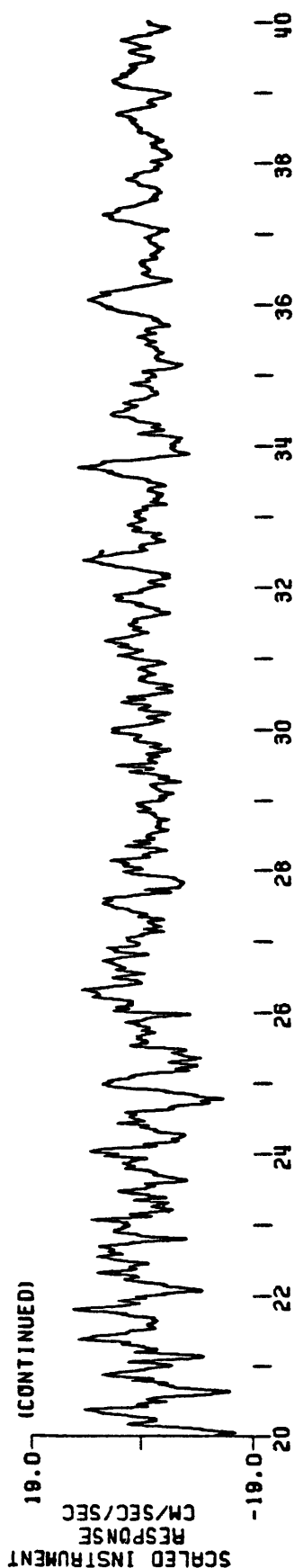
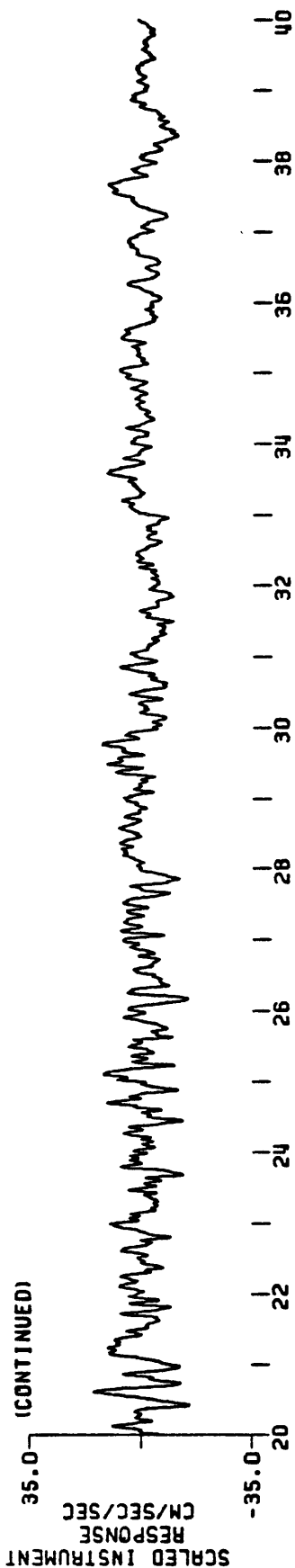


UNCORRECTED ACCELEROGRAM  
 BATO BRIDGE, PAPUA NEW GUINEA  
 LONG. VERT. TRAN.

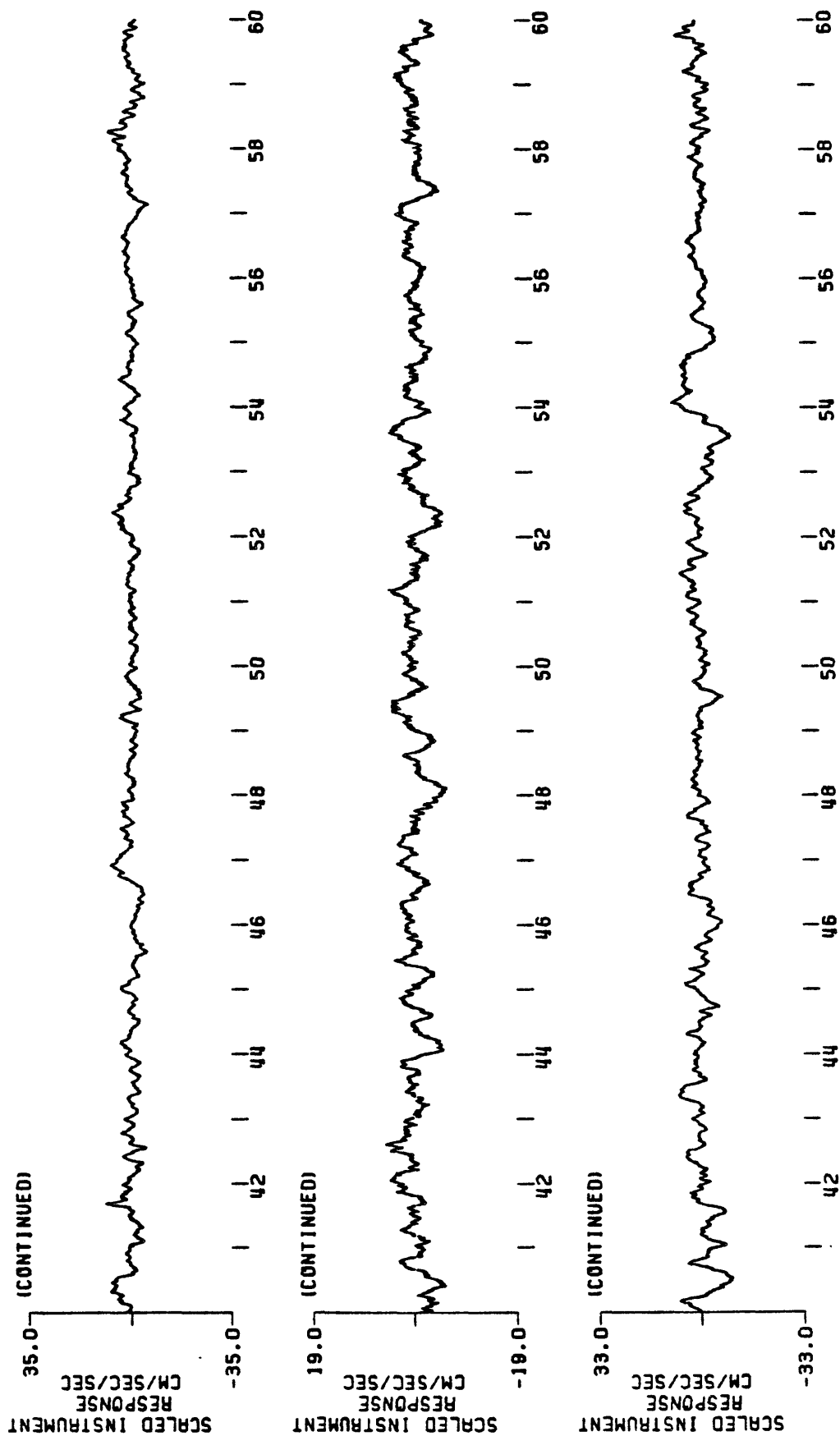
EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 PEAK VALUES (CM/SEC/SEC): -34.94 18.62 -32.59



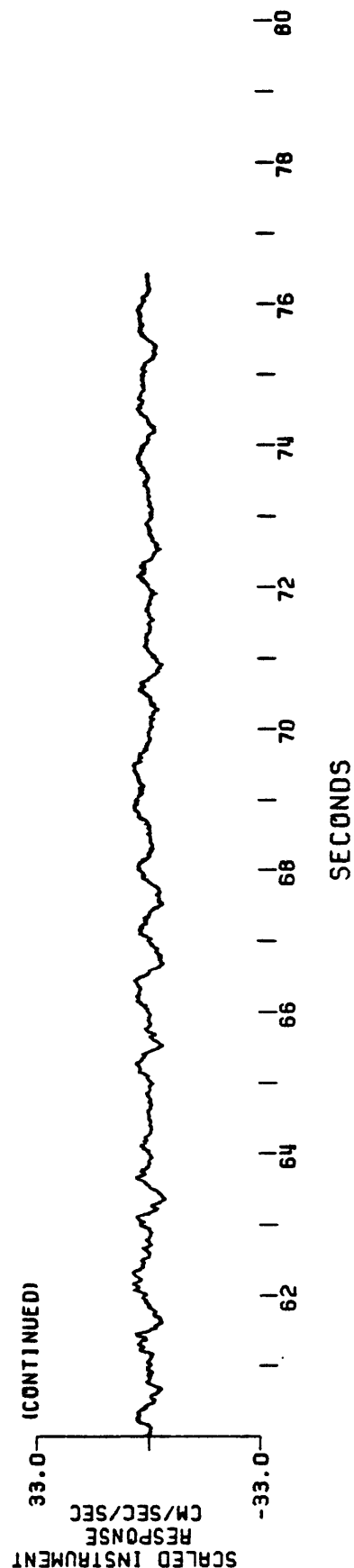
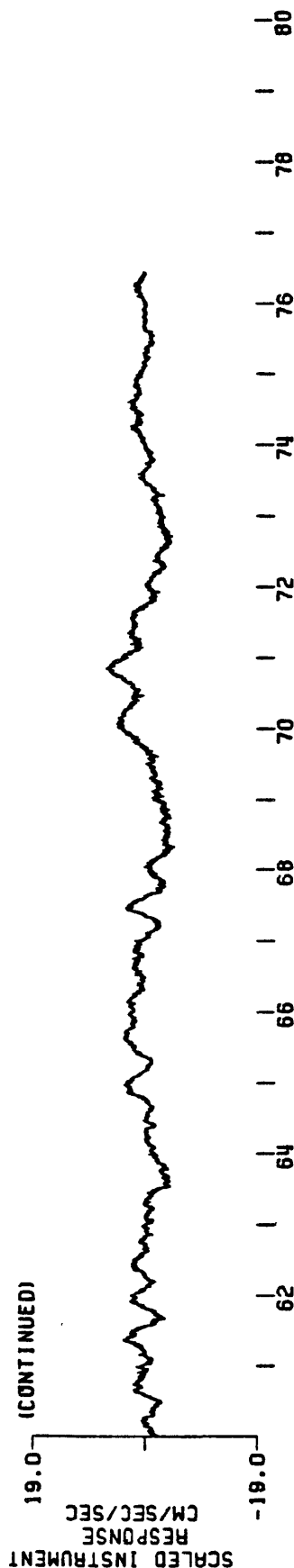
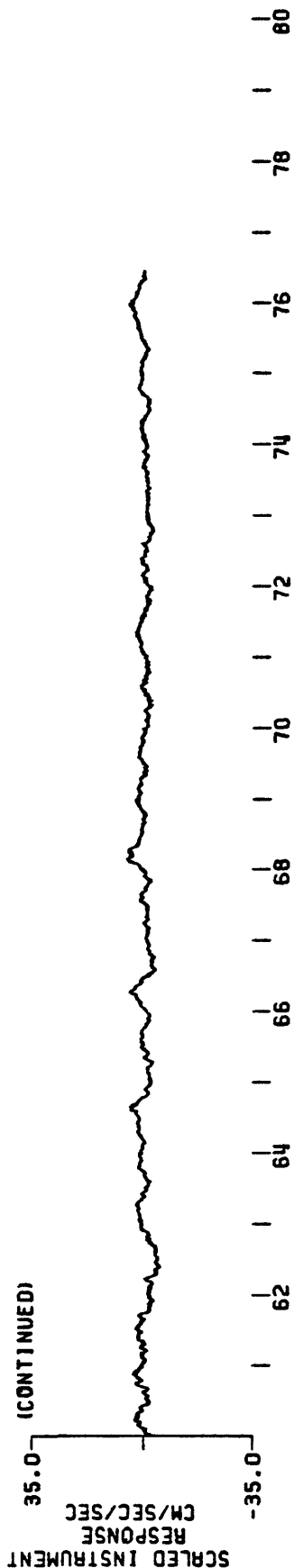
UNCORRECTED ACCELEROGRAM  
 BATO BRIDGE, PAPUA NEW GUINEA  
 LONG. VERT. TRAN.  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 PEAK VALUES (CM/SEC/SEC): -34.94 18.62 -32.59



UNCORRECTED ACCELEROGRAM  
 BATO BRIDGE, PAPUA NEW GUINEA  
 LONG. VERT. TRAN.  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 PEAK VALUES (CM/SEC/SEC): -34.94 18.62 -32.59

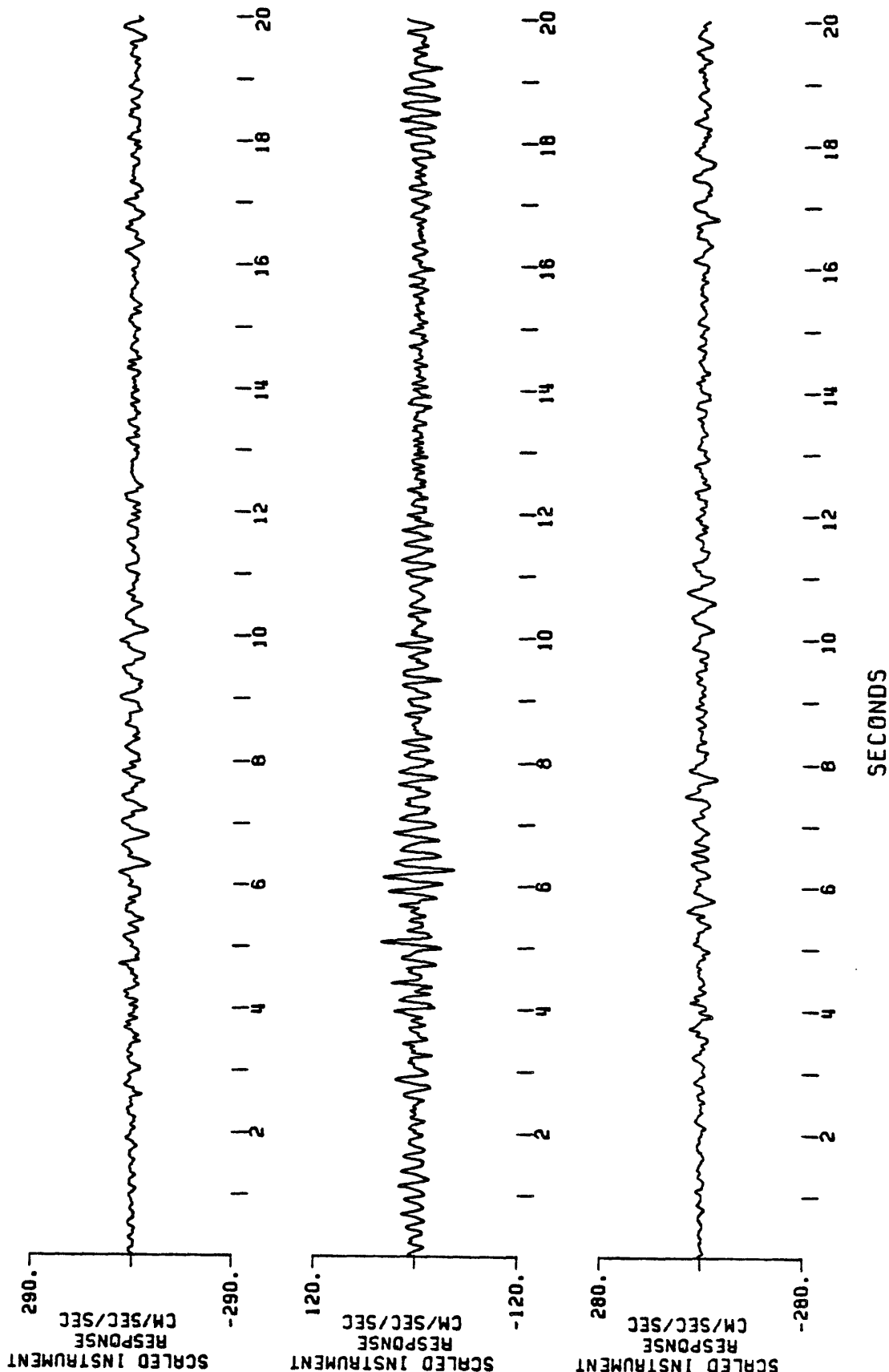


UNCORRECTED ACCELEROGRAM  
 BATO BRIDGE, PAPUA NEW GUINEA  
 LONG., VERT., TRAN.  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 PEAK VALUES (CM/SEC/SEC): -34.94 18.62 -32.59

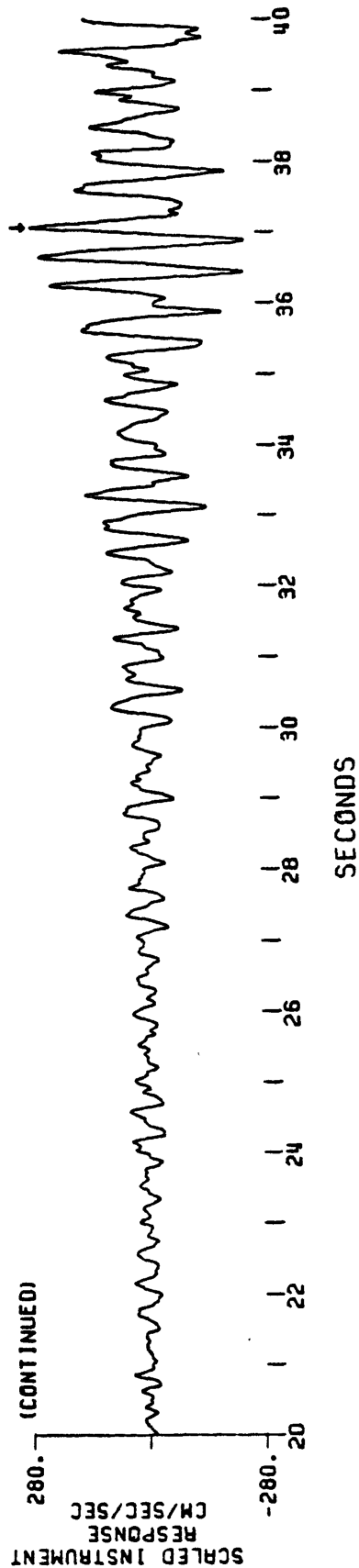
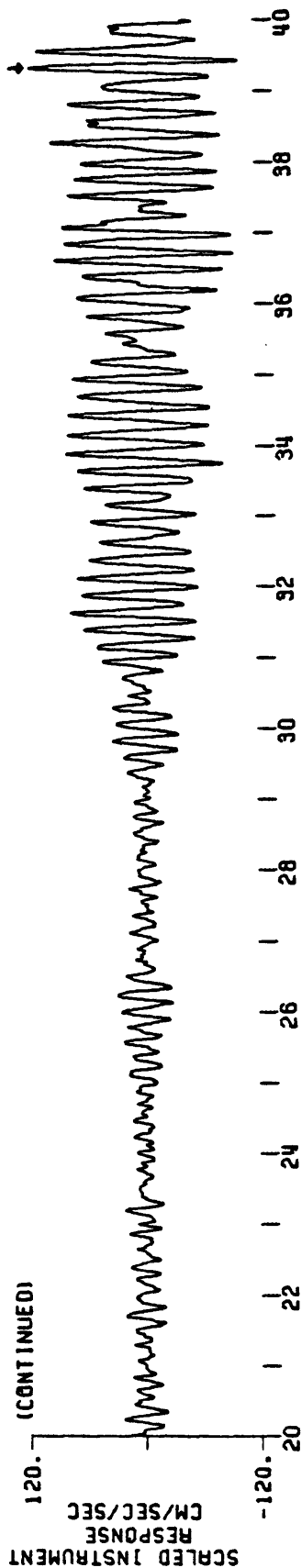
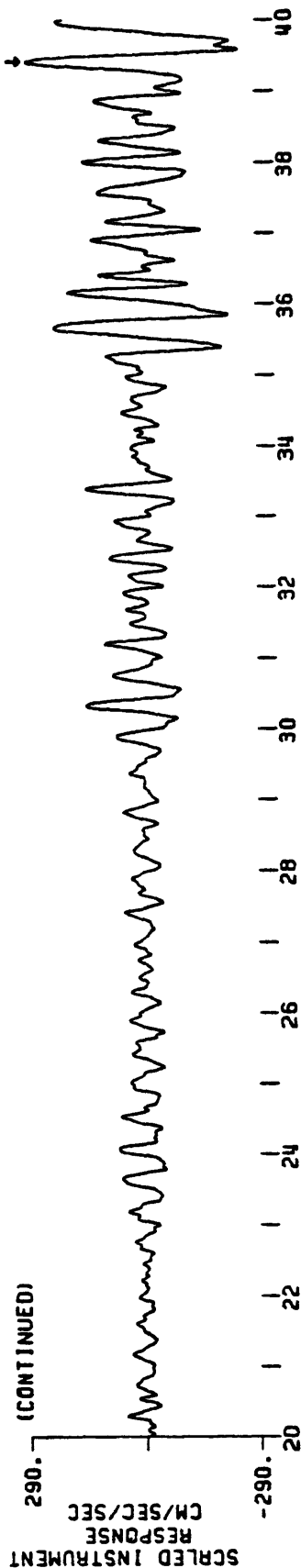




UNCORRECTED ACCELEROGRAM  
 BVE 80, PAPUA NEW GUINEA  
 LONG., VERT., TRAN.  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 PEAK VALUES (CM/SEC/SEC): 283.43 115.15 271.54



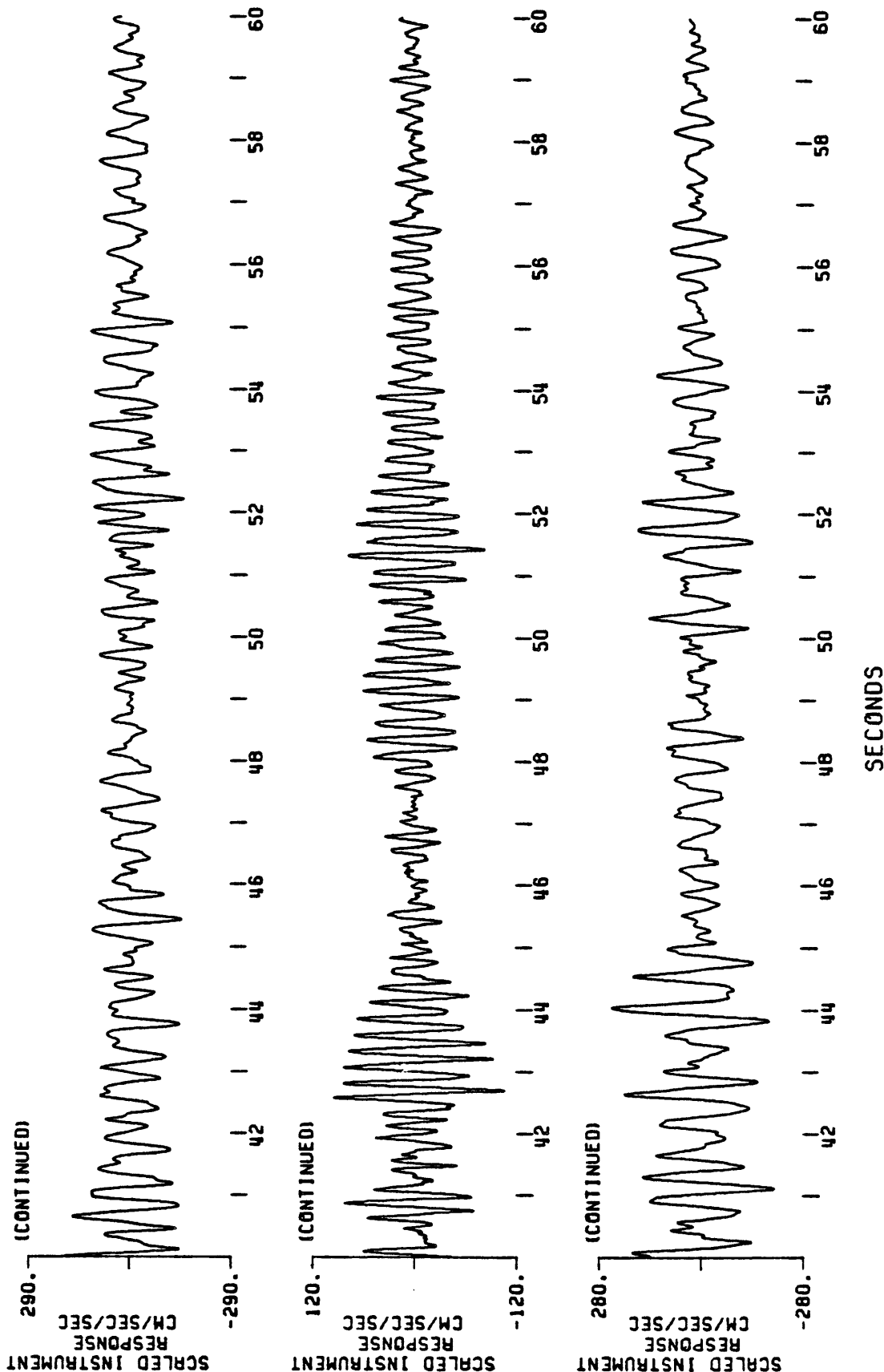
UNCORRECTED ACCELEROGRAM  
 BVE 80, PAPUA NEW GUINEA  
 LONG. VERT. TRAN.  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 PEAK VALUES (CM/SEC/SEC): 283.43 115.15 271.54



UNCORRECTED ACCELEROGRAM  
 BVE 80, PAPUA NEW GUINEA  
 LONG., VERT., TRAN.

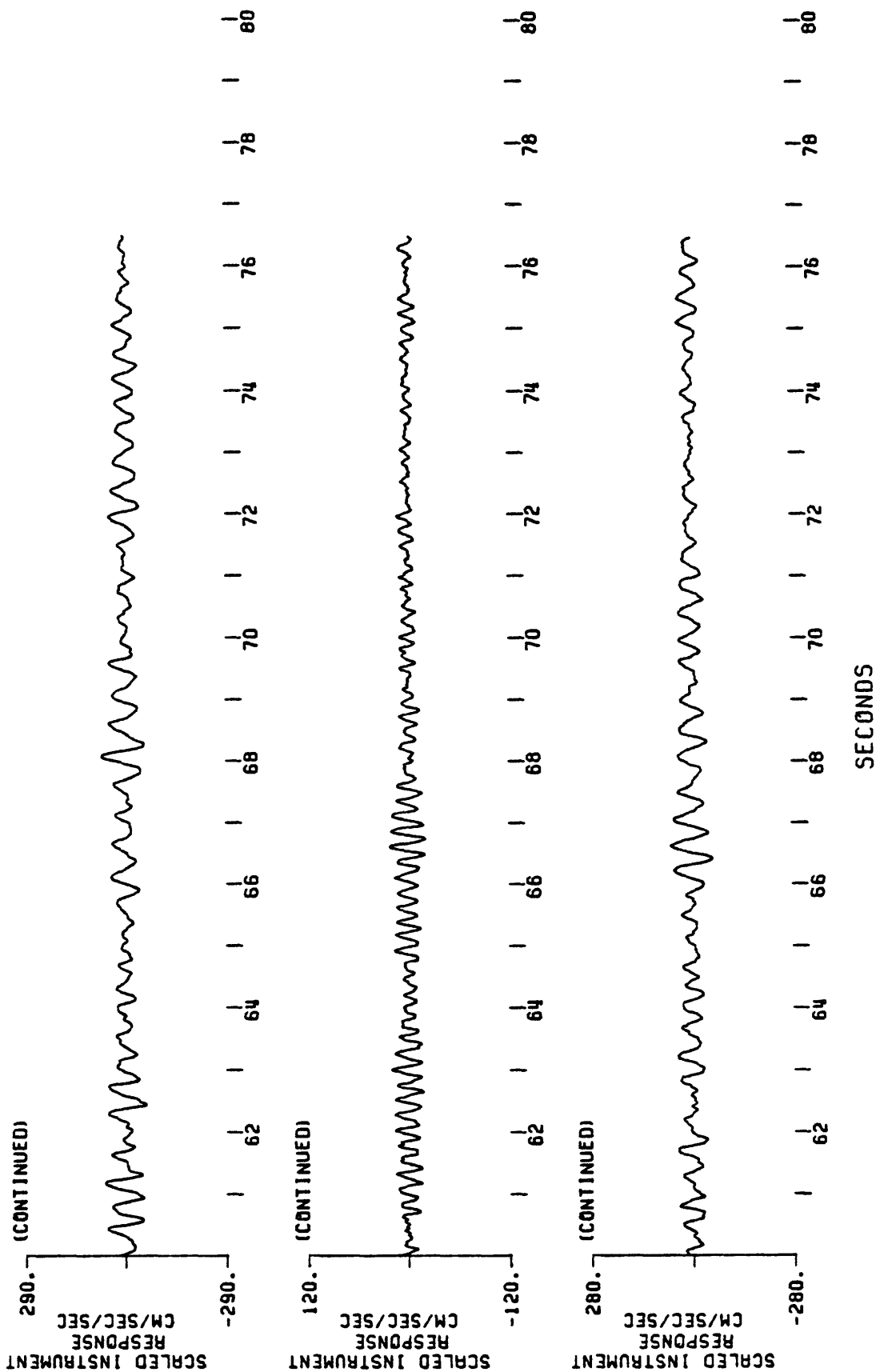
EARTHQUAKE OF MARCH 18, 1983 0905 UTC

PEAK VALUES (CM/SEC/SEC): 283.43 115.15 271.54



UNCORRECTED ACCELEROGRAM  
 BVE 80, PAPUA NEW GUINEA  
 LONG. VERT. TRAN.

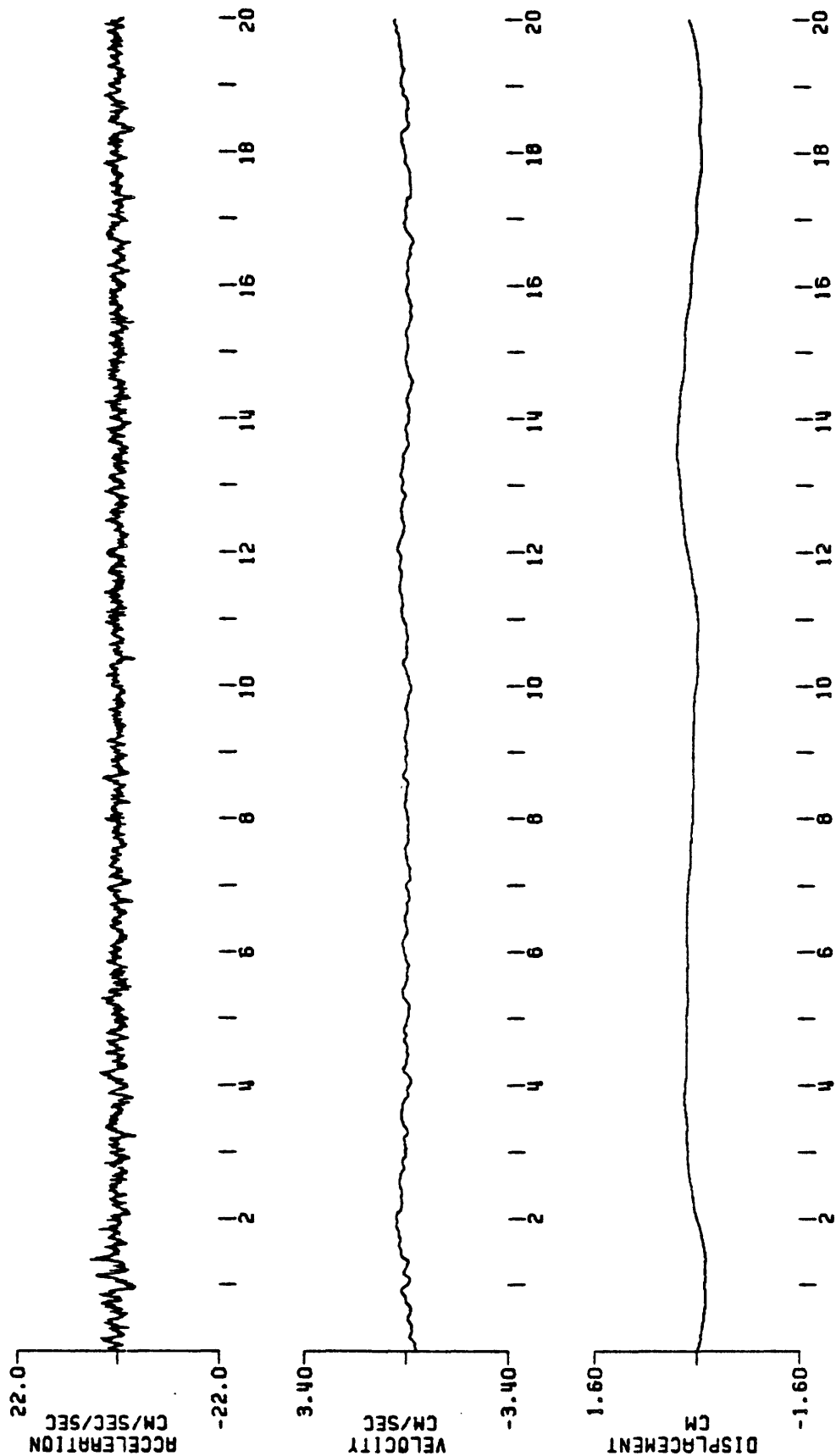
EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 PEAK VALUES (CM/SEC/SEC): 283.43 115.15 271.54



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 ARAWA TOWN, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4

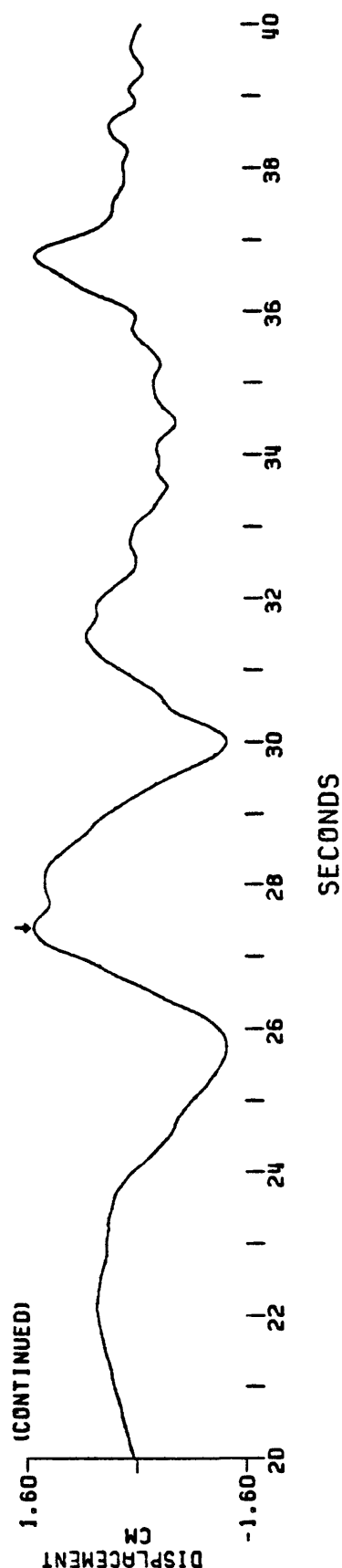
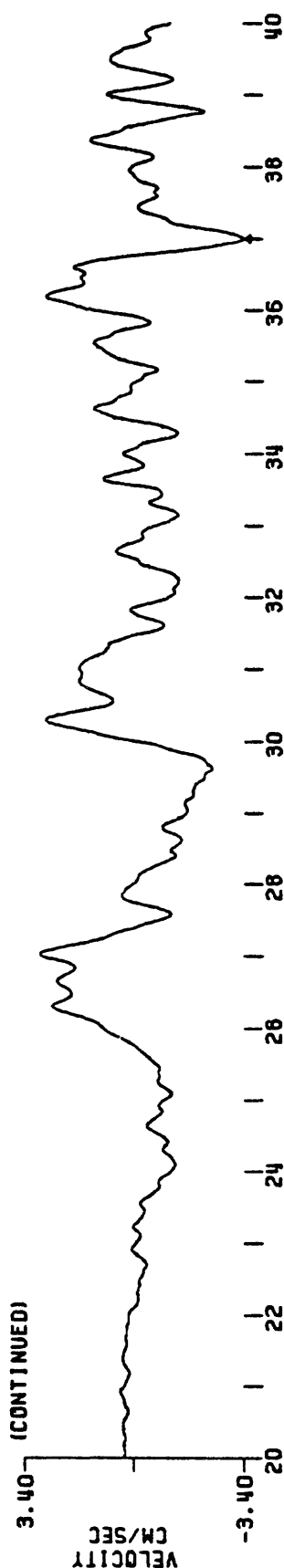
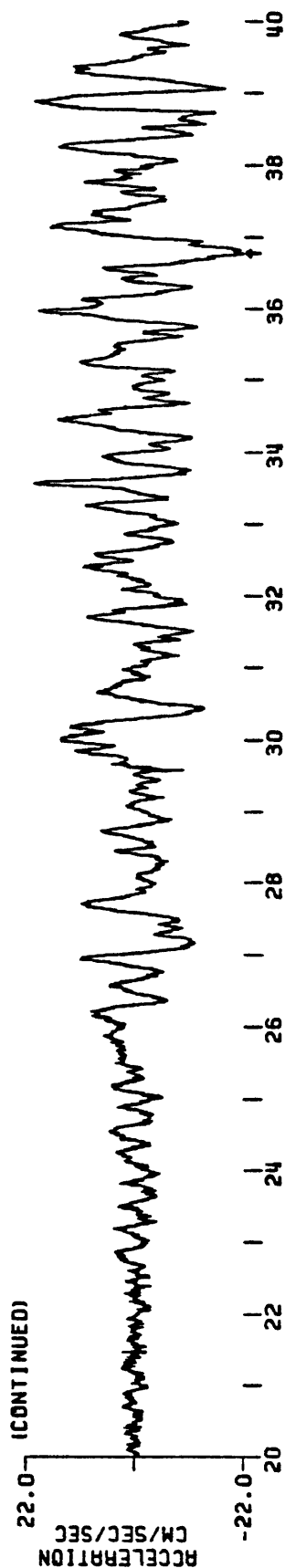
PEAK VALUES: ACCEL=-21.64 CM/SEC/SEC, VELOCITY=-3.35 CM/SEC, DISPL=1.51 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 ARAWA TOWN, PAPUA NEW GUINEA  
 LONG.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4

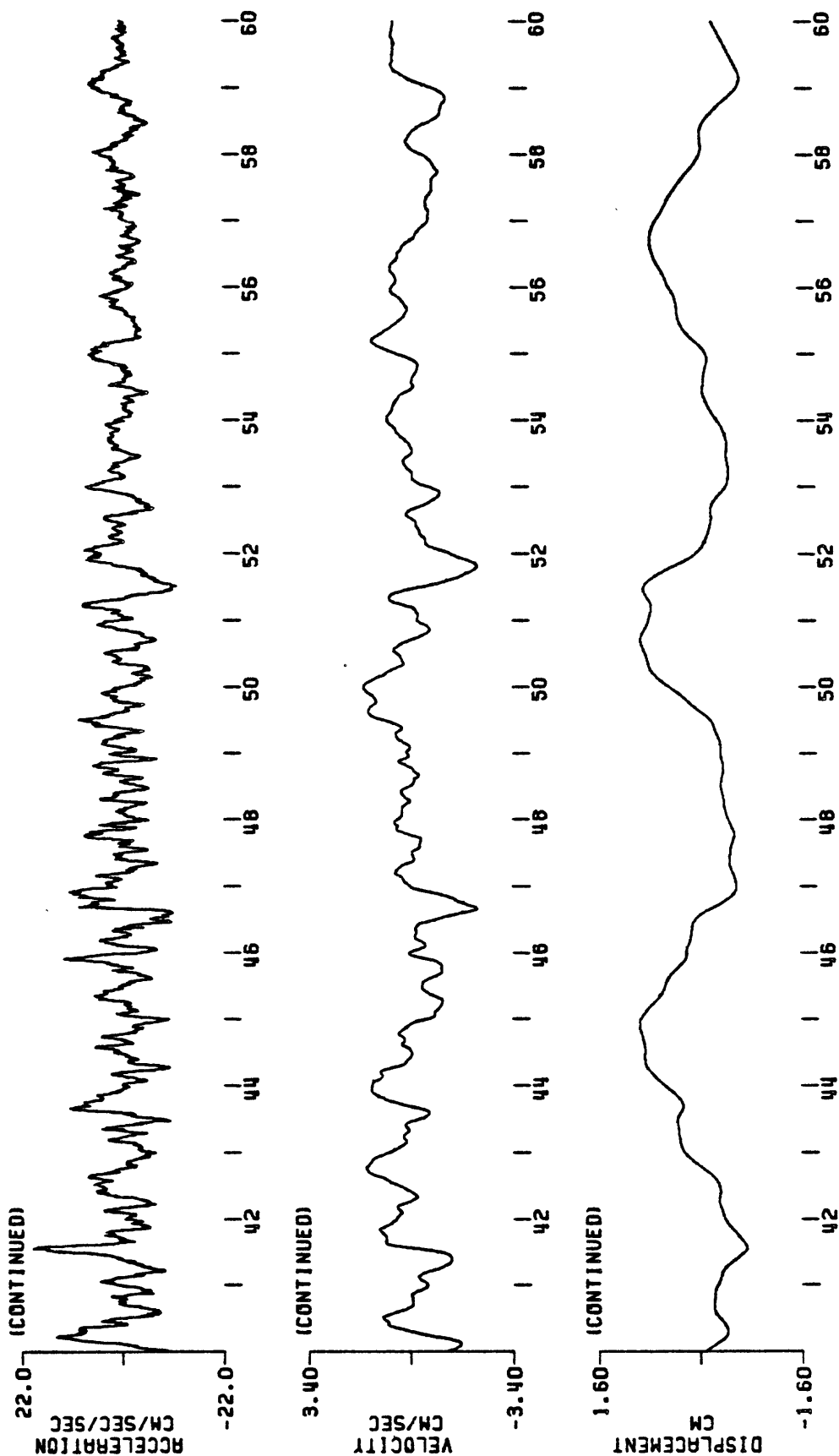
PEAK VALUES: ACCEL=-21.64 CM/SEC/SEC, VELOCITY=-3.35 CM/SEC, DISPL=1.51 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
ARAWA TOWN, PAPUA NEW GUINEA  
LONG.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4

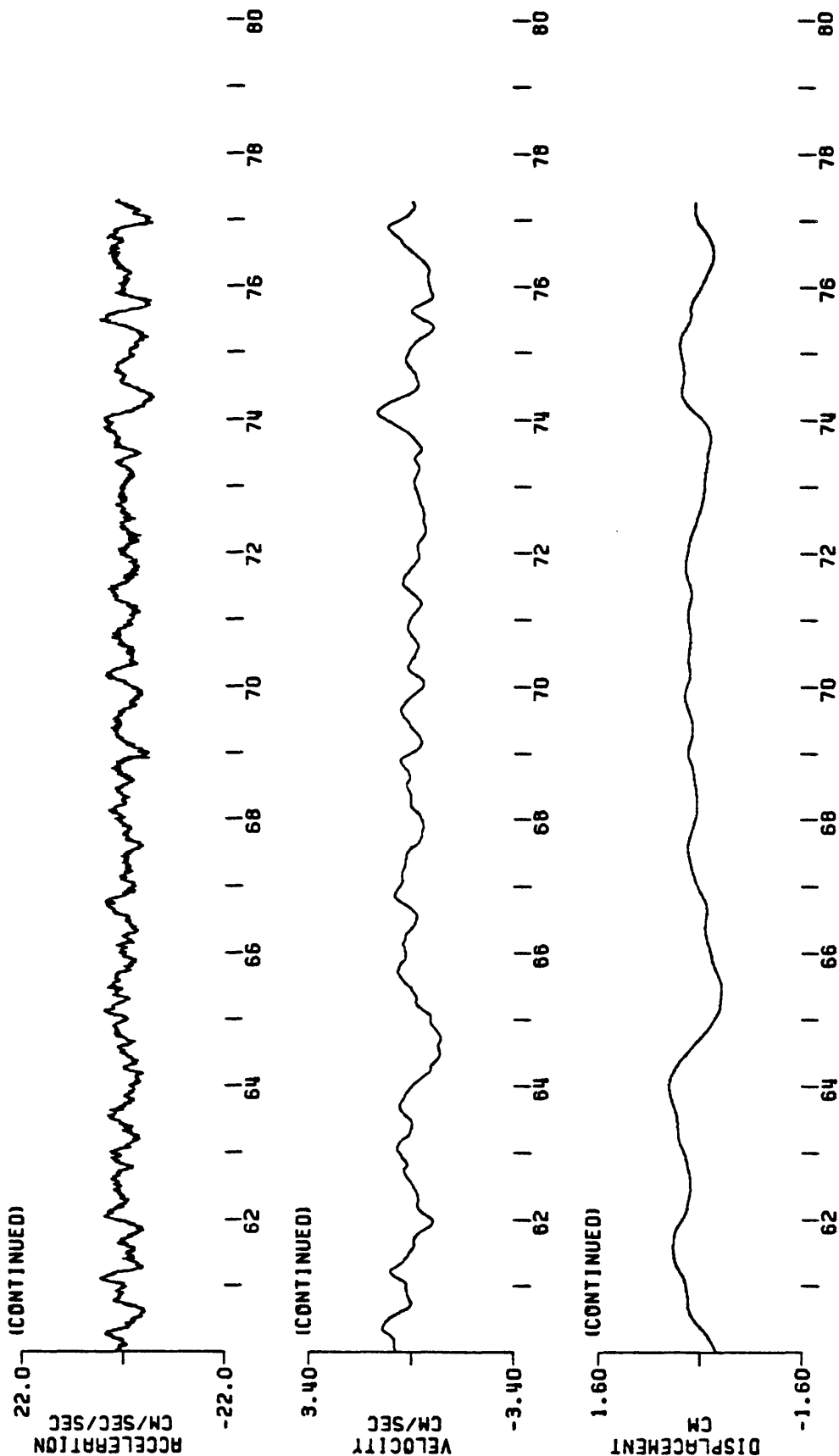
PEAK VALUES: ACCEL=-21.64 CM/SEC/SEC, VELOCITY=-3.35 CM/SEC, DISPL=1.51 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
ARAWA TOWN, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4

PEAK VALUES: ACCEL=-21.64 CM/SEC/SEC, VELOCITY=-3.35 CM/SEC, DISPL=1.51 CM



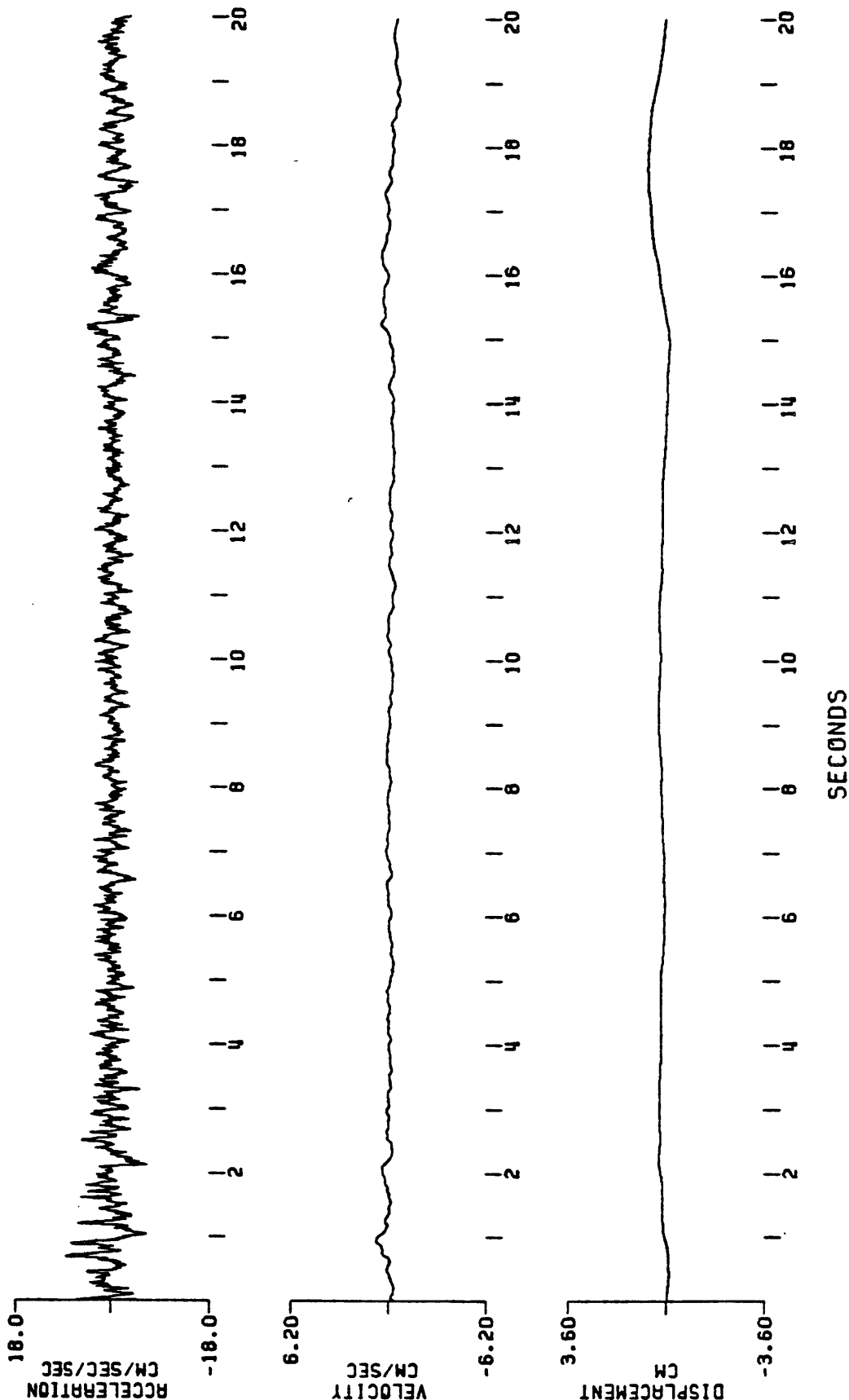
SECONDS



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 ARAWA TOWN, PAPUA NEW GUINEA  
 VERT.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4

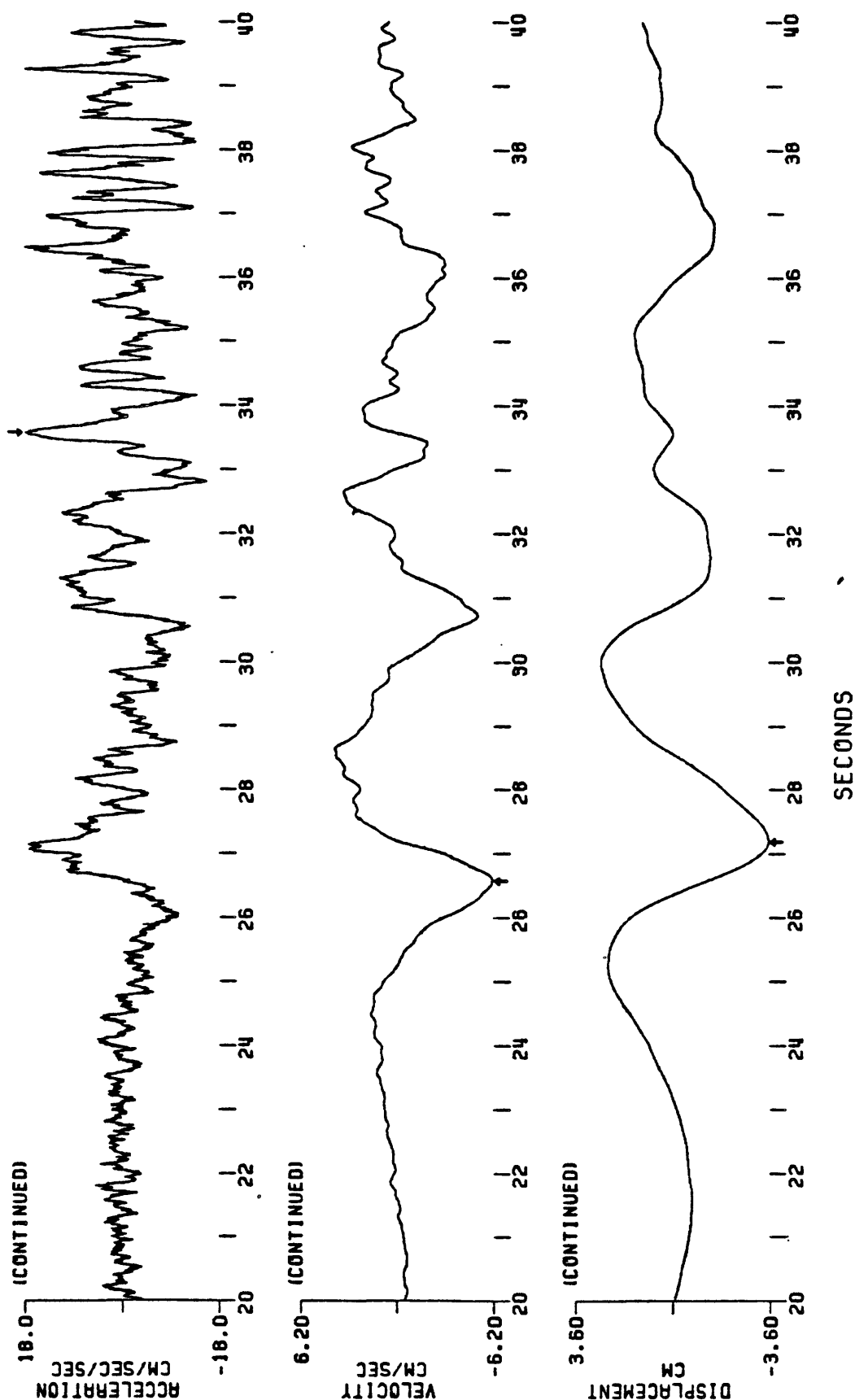
PEAK VALUES: ACCEL=18.00 CM/SEC/SEC, VELOCITY=-6.11 CM/SEC, DISPL=-3.56 CM



# CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS ARAWA TOWN, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4

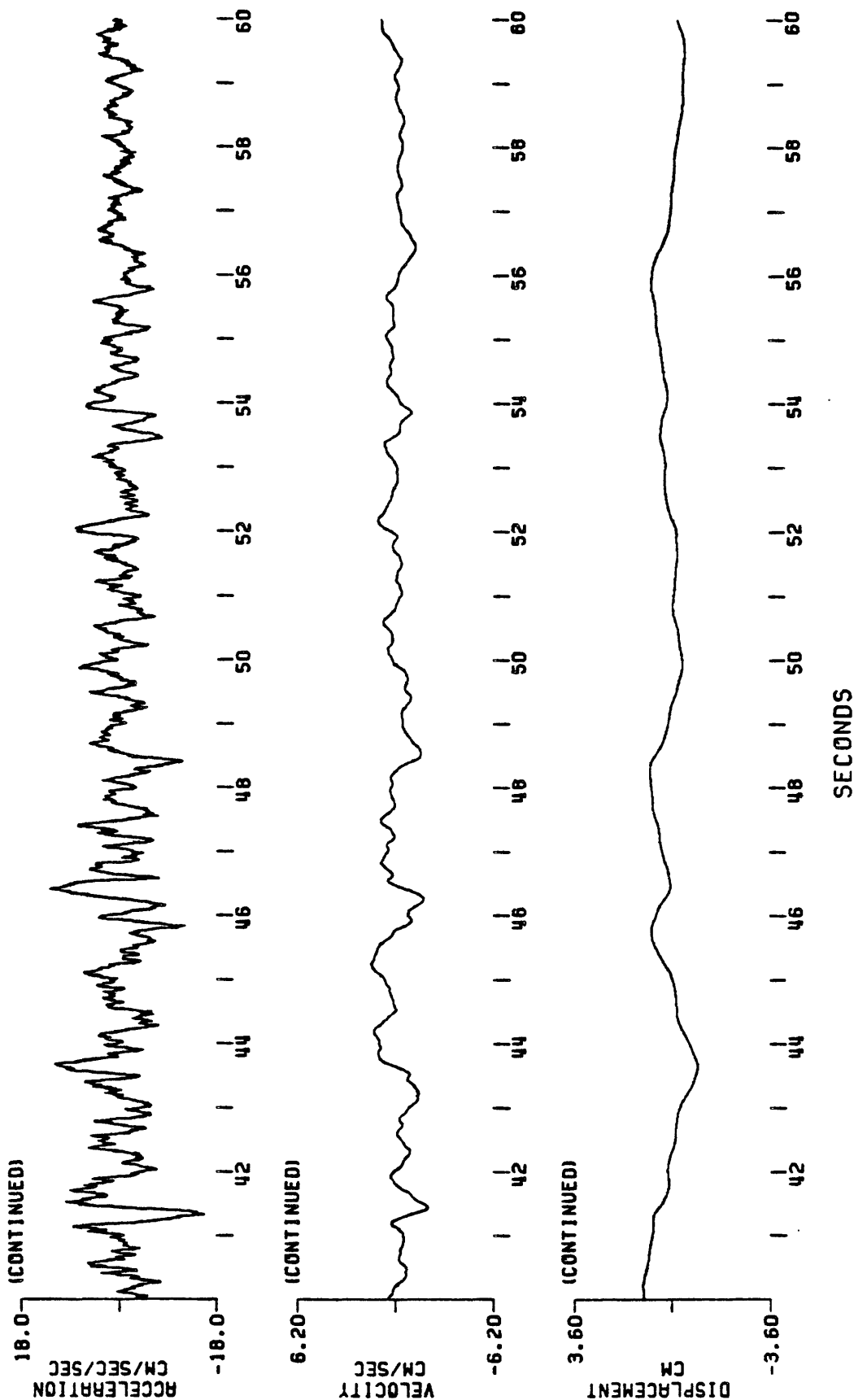
PEAK VALUES: ACCEL=18.00 CM/SEC/SEC, VELOCITY=-6.11 CM/SEC, DISPL=-3.56 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
ARAWA TOWN, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4

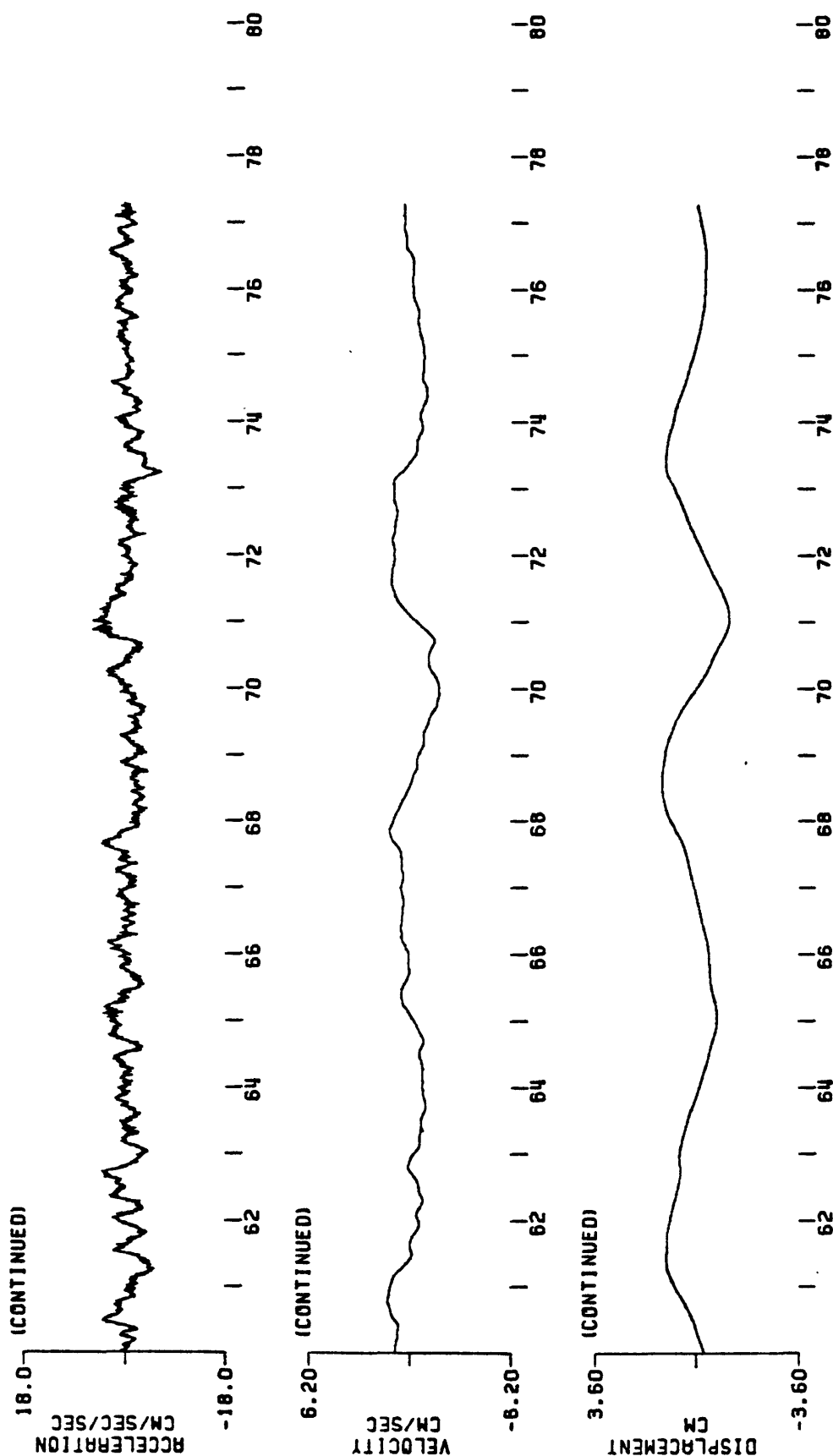
PEAK VALUES: ACCEL=18.00 CM/SEC/SEC, VELOCITY=-6.11 CM/SEC, DISPL=-3.56 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
ARAWA TOWN, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4

PEAK VALUES: ACCEL=18.00 CM/SEC/SEC, VELOCITY=-6.11 CM/SEC, DISPL=-3.56 CM

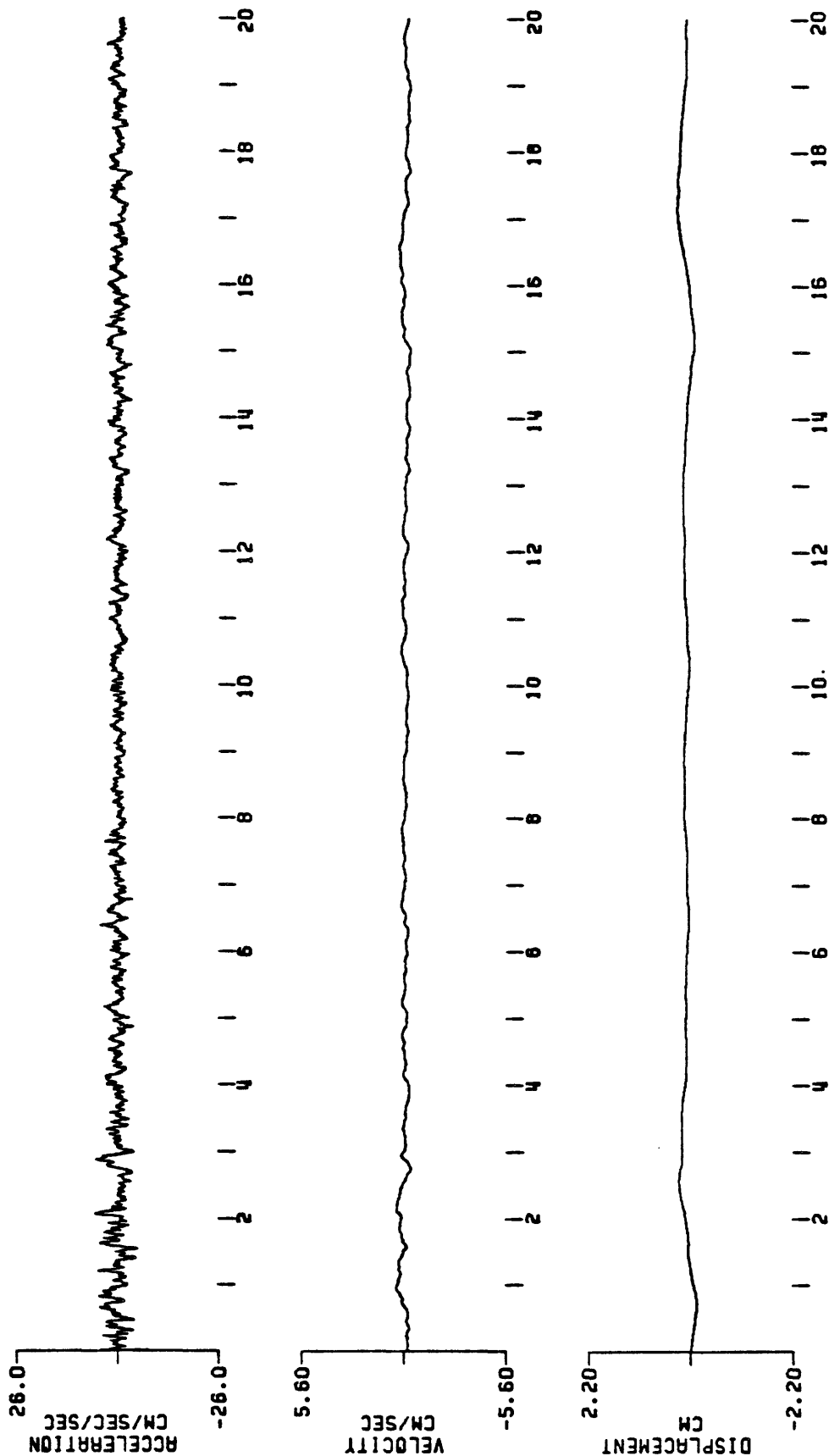


SECONDS

# CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS ARAWA TOWN, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4

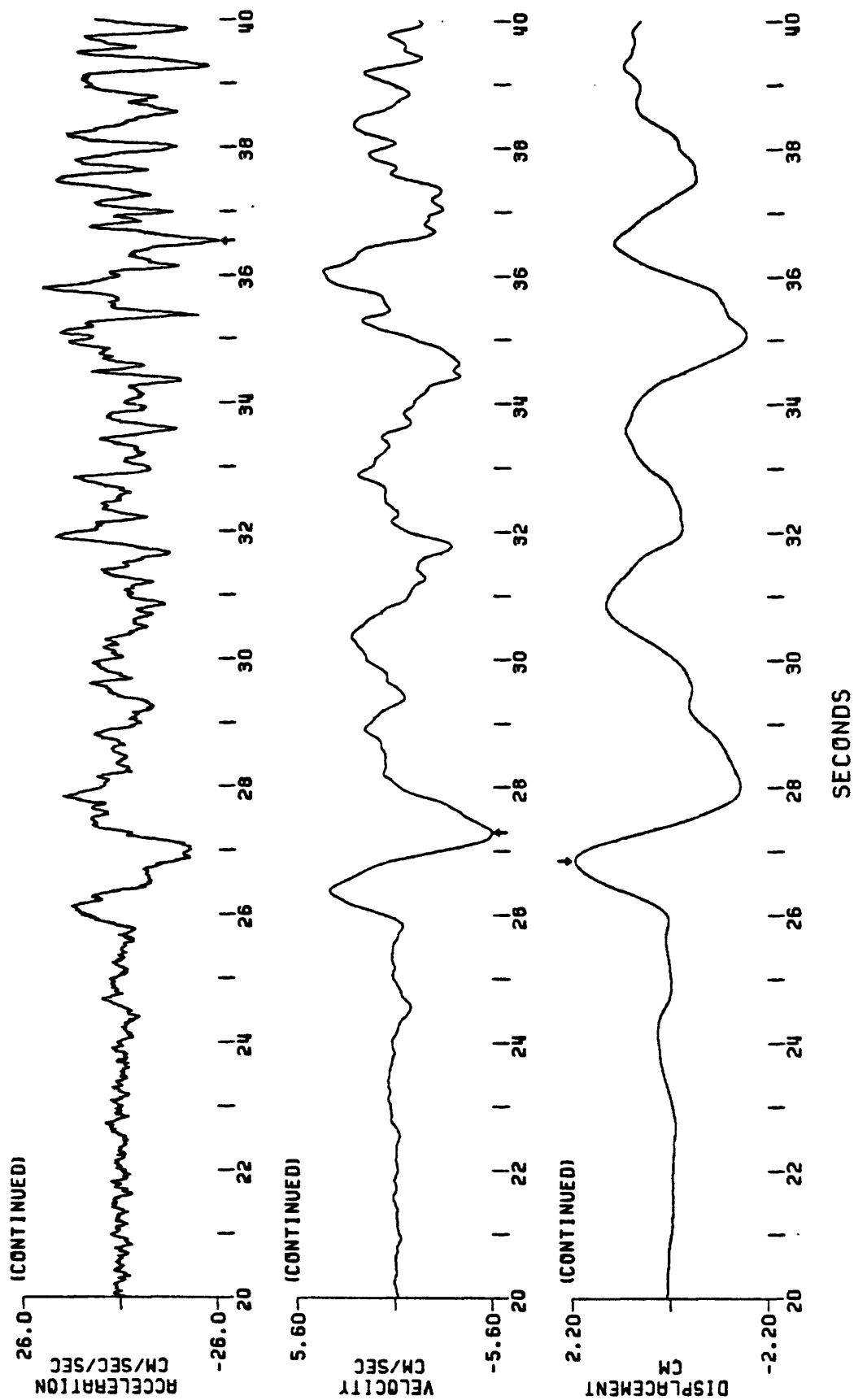
PEAK VALUES: ACCEL=-25.77 CM/SEC/SEC, VELOCITY=-5.52 CM/SEC, DISPL=2.15 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 ARAWA TOWN, PAPUA NEW GUINEA  
 TRAN.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4

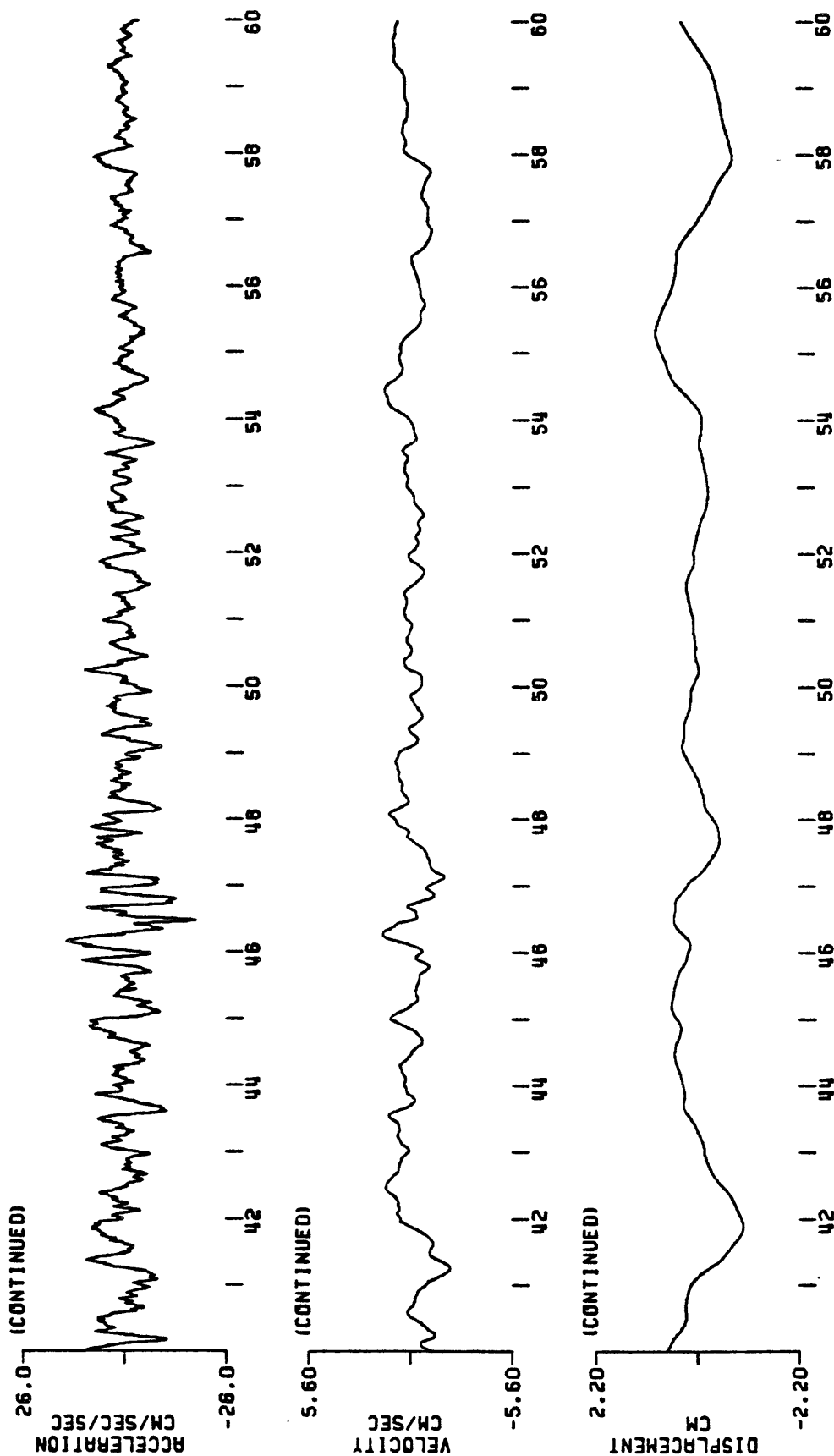
PEAK VALUES: ACCEL=-25.77 CM/SEC/SEC, VELOCITY=-5.52 CM/SEC, DISPL=2.15 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 ARAWA TOWN, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4

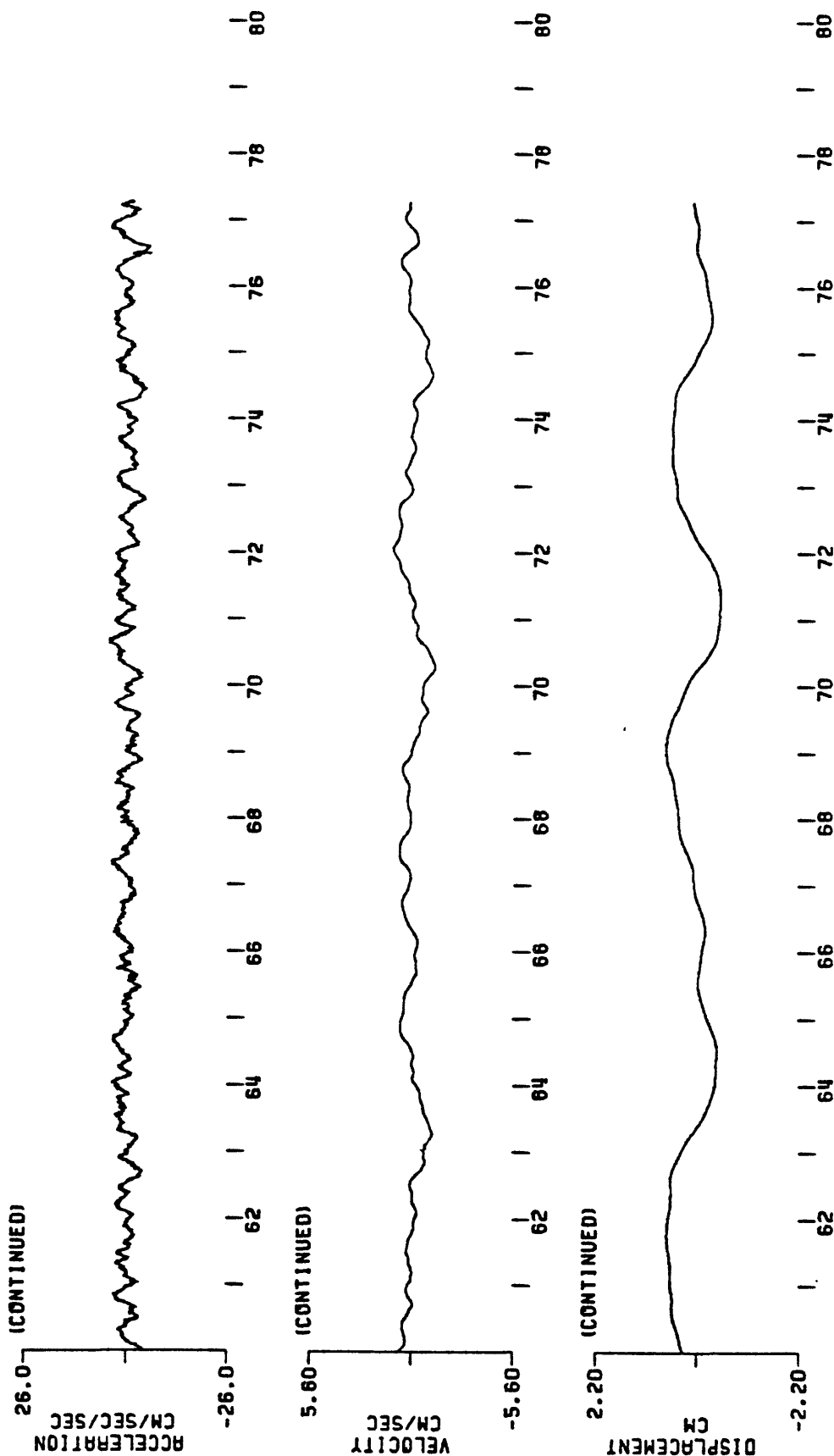
PEAK VALUES: ACCEL=-25.77 CM/SEC/SEC, VELOCITY=-5.52 CM/SEC, DISPL=2.15 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 ARAWA TOWN, PAPUA NEW GUINEA  
 TRAN.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERTWORTH FILTER AT 0.125 HZ, ORDER 4

PEAK VALUES: ACCEL=-25.77 CM/SEC/SEC, VELOCITY=-5.52 CM/SEC, DISPL=2.15 CM

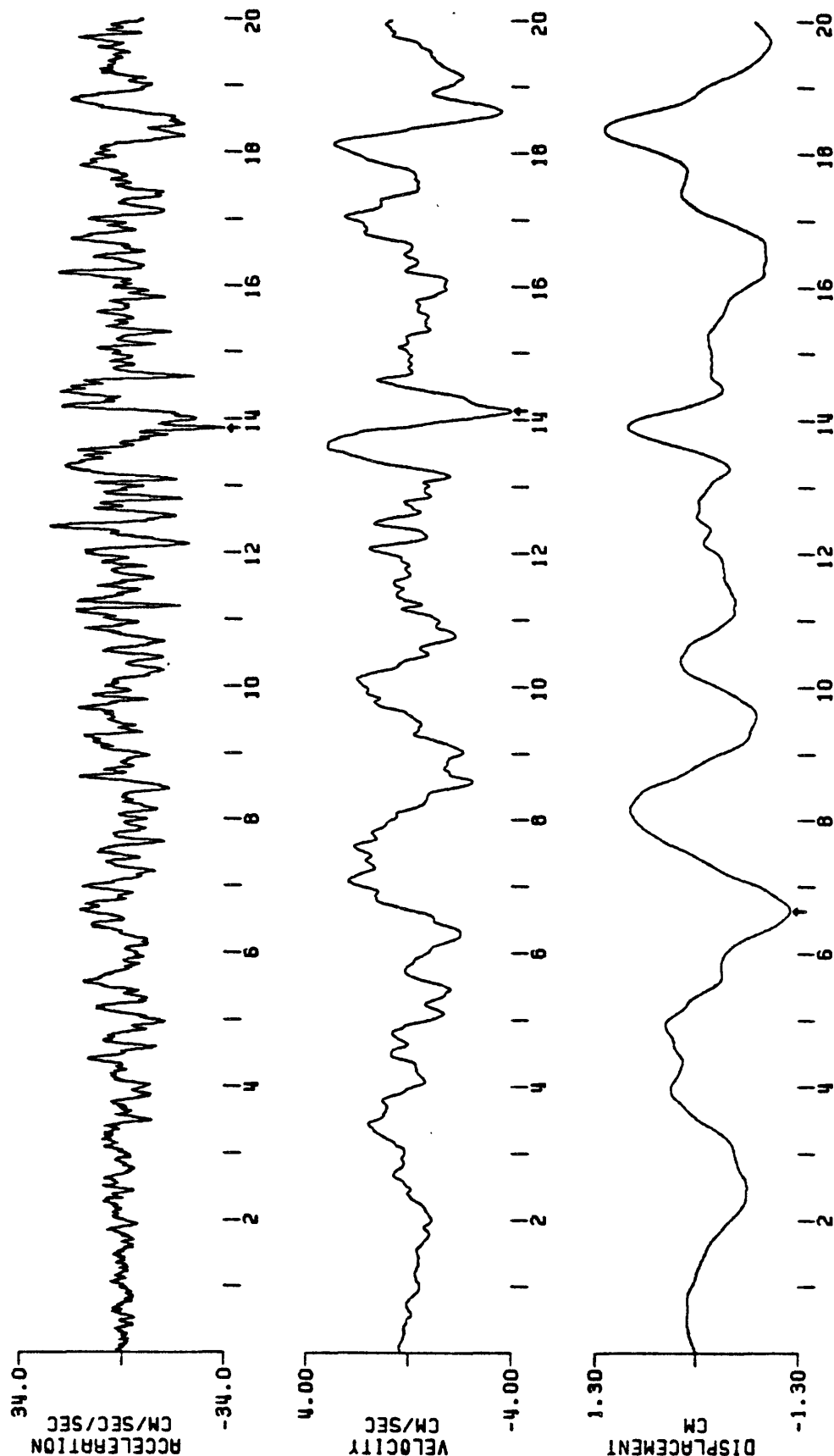




# CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS BATO BRIDGE, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

PEAK VALUES: ACCEL=-33.93 CM/SEC/SEC, VELOCITY=-4.00 CM/SEC, DISPL=-1.20 CM

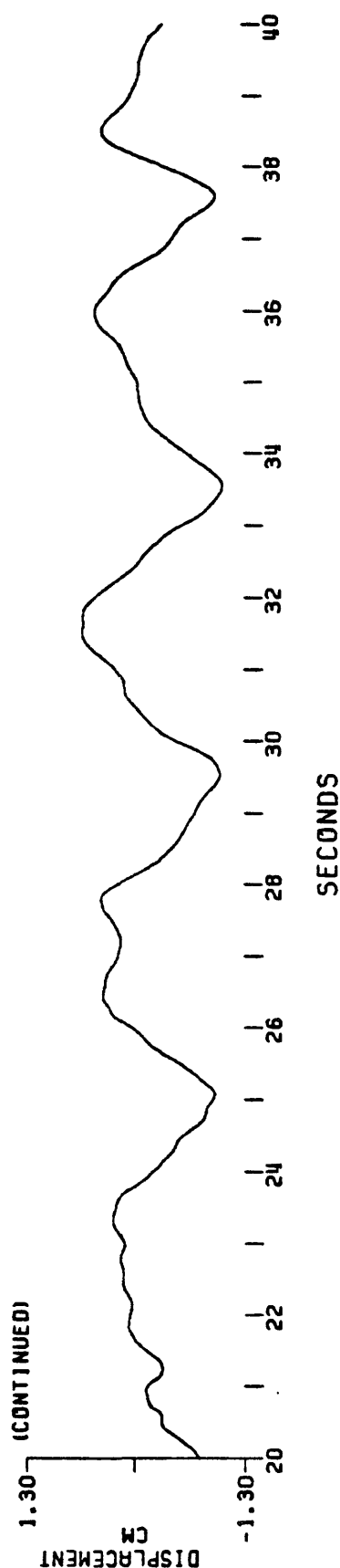
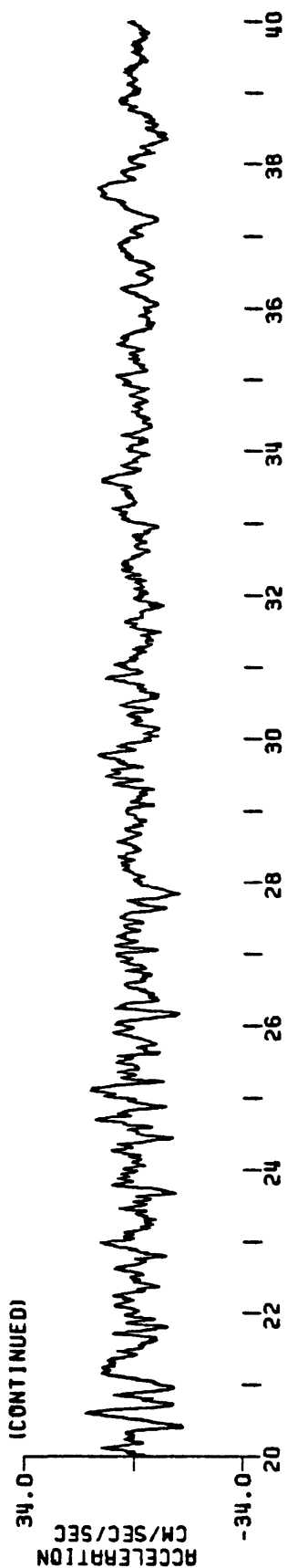


SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BATO BRIDGE, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

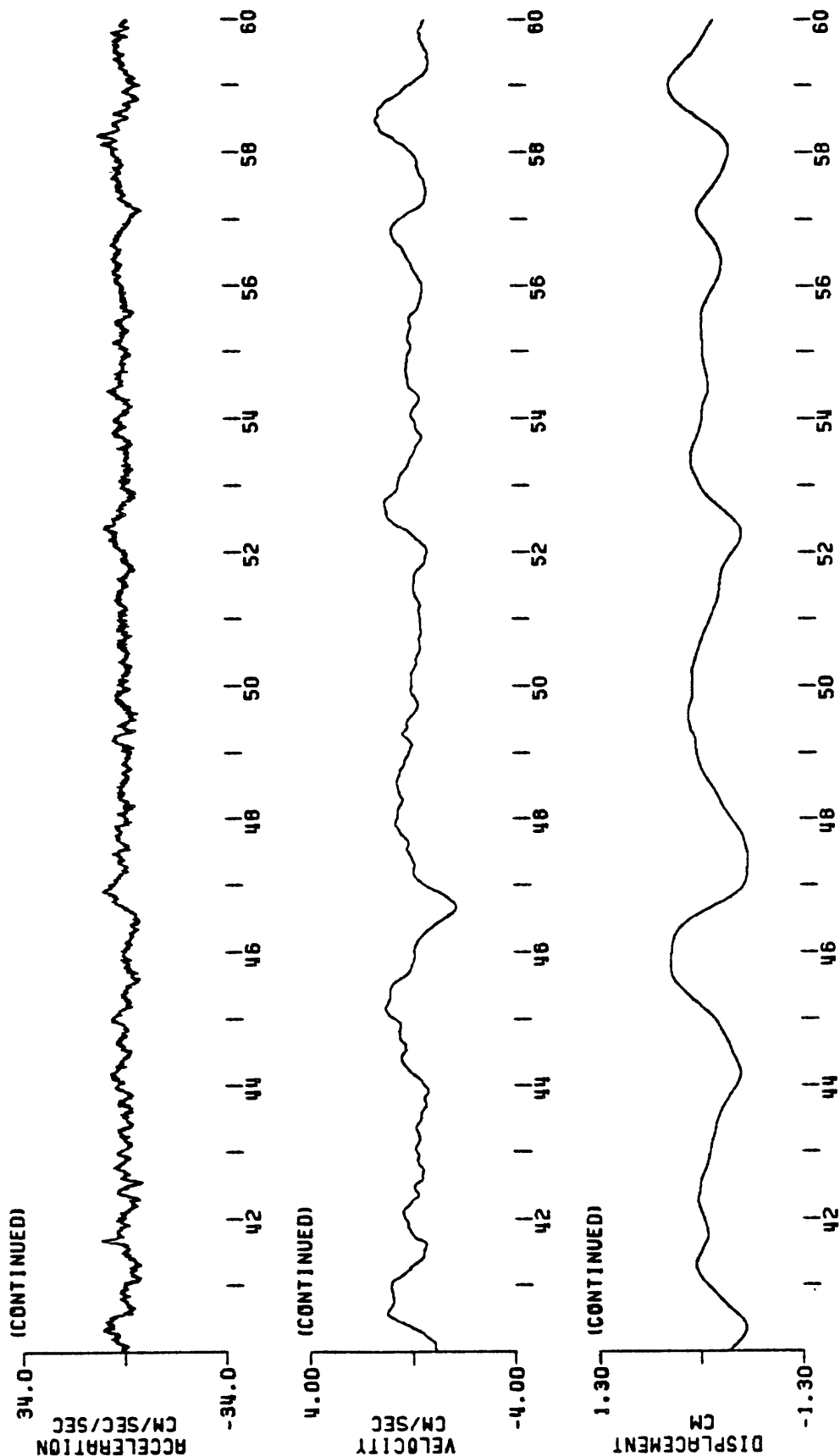
PEAK VALUES: ACCEL=-33.93 CM/SEC/SEC, VELOCITY=-4.00 CM/SEC, DISPL=-1.20 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BATO BRIDGE, PAPUA NEW GUINEA  
 LONG.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

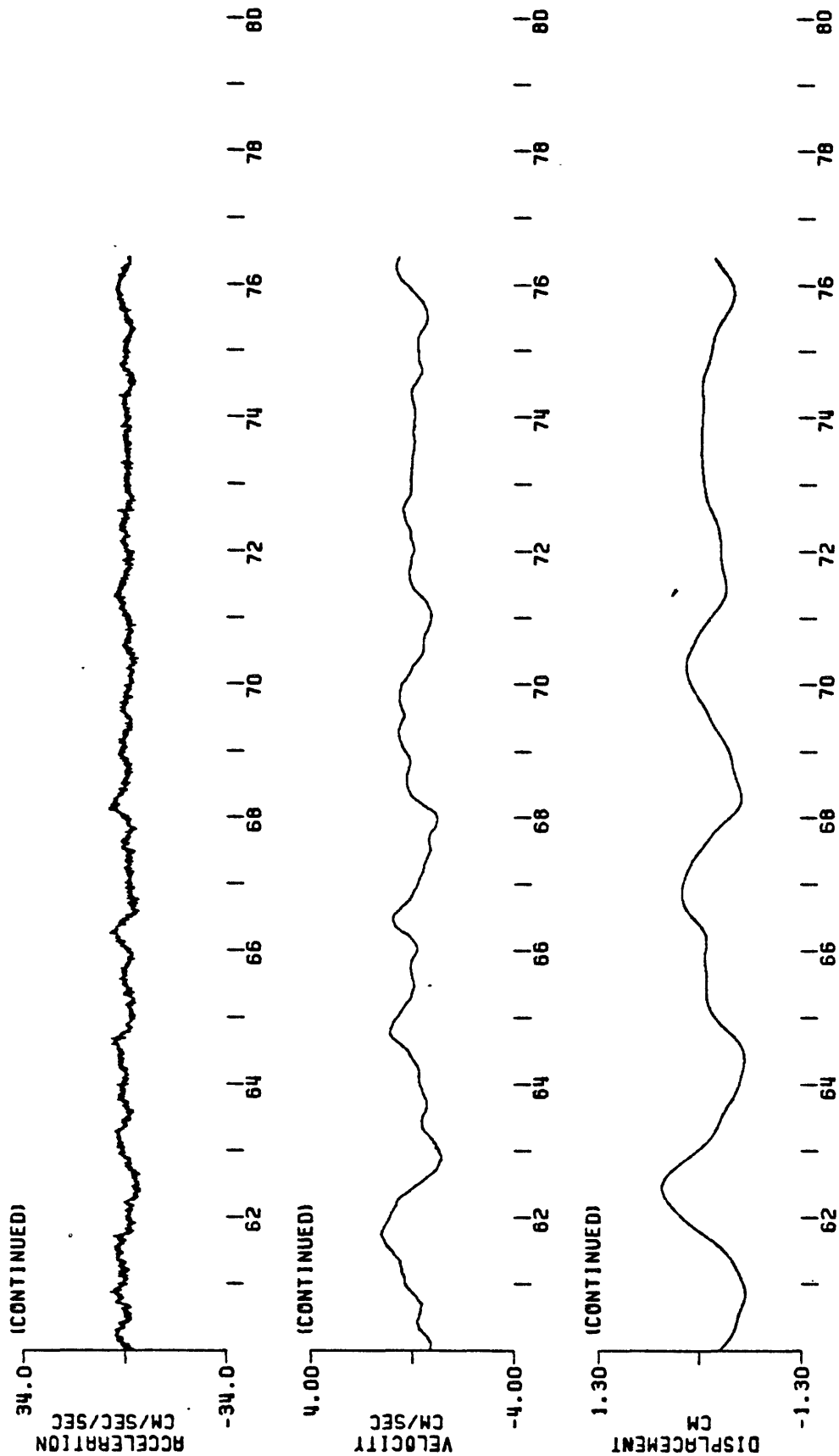
PEAK VALUES: ACCEL=-33.93 CM/SEC/SEC, VELOCITY=-4.00 CM/SEC, DISPL=-1.20 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BATO BRIDGE, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

PEAK VALUES: ACCEL=-33.93 CM/SEC/SEC, VELOCITY=-4.00 CM/SEC, DISPL=-1.20 CM

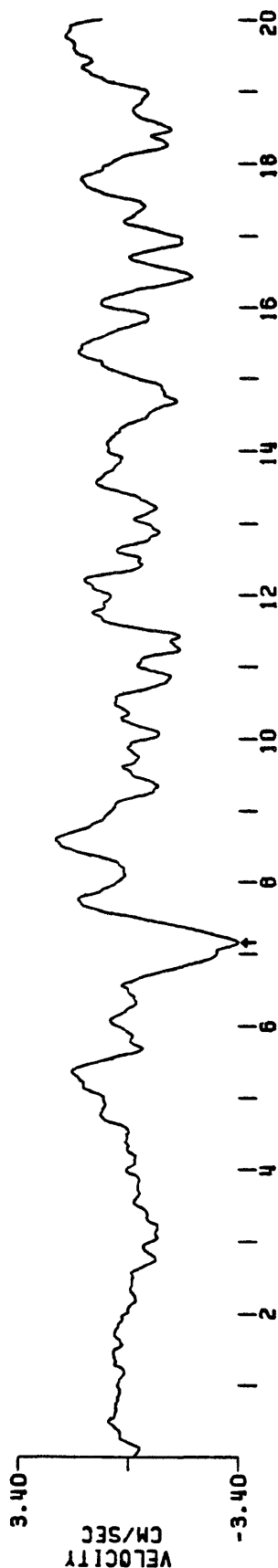
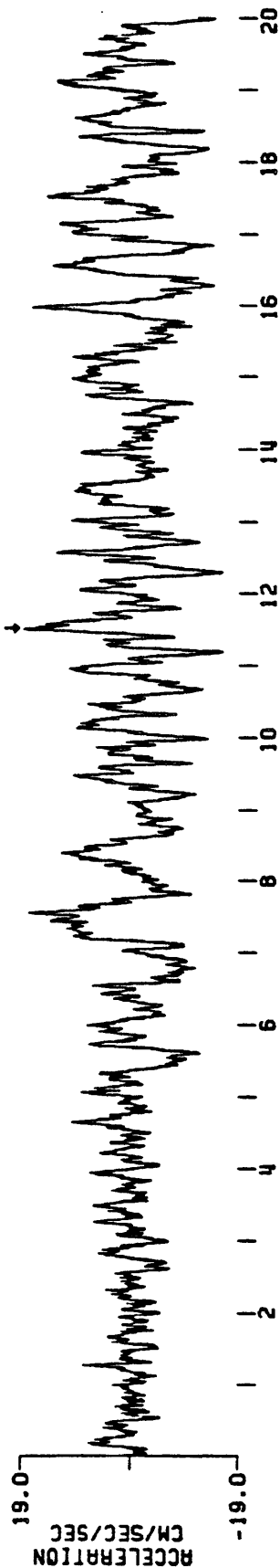


SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BATO BRIDGE, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

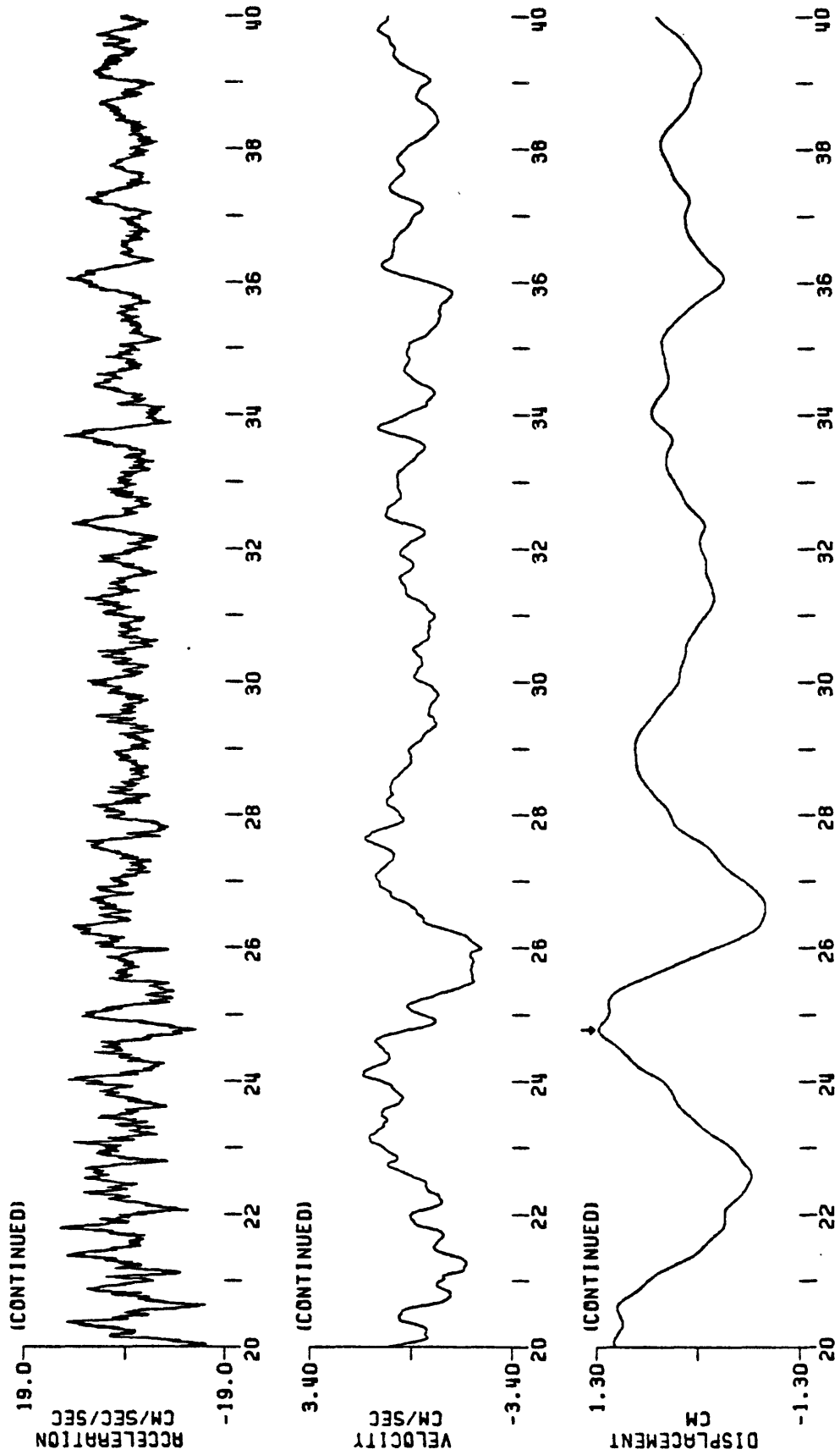
PEAK VALUES: ACCEL=18.47 CM/SEC/SEC, VELOCITY=-3.40 CM/SEC, DISPL=1.27 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
BATO BRIDGE, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.20 HZ. ORDER 4

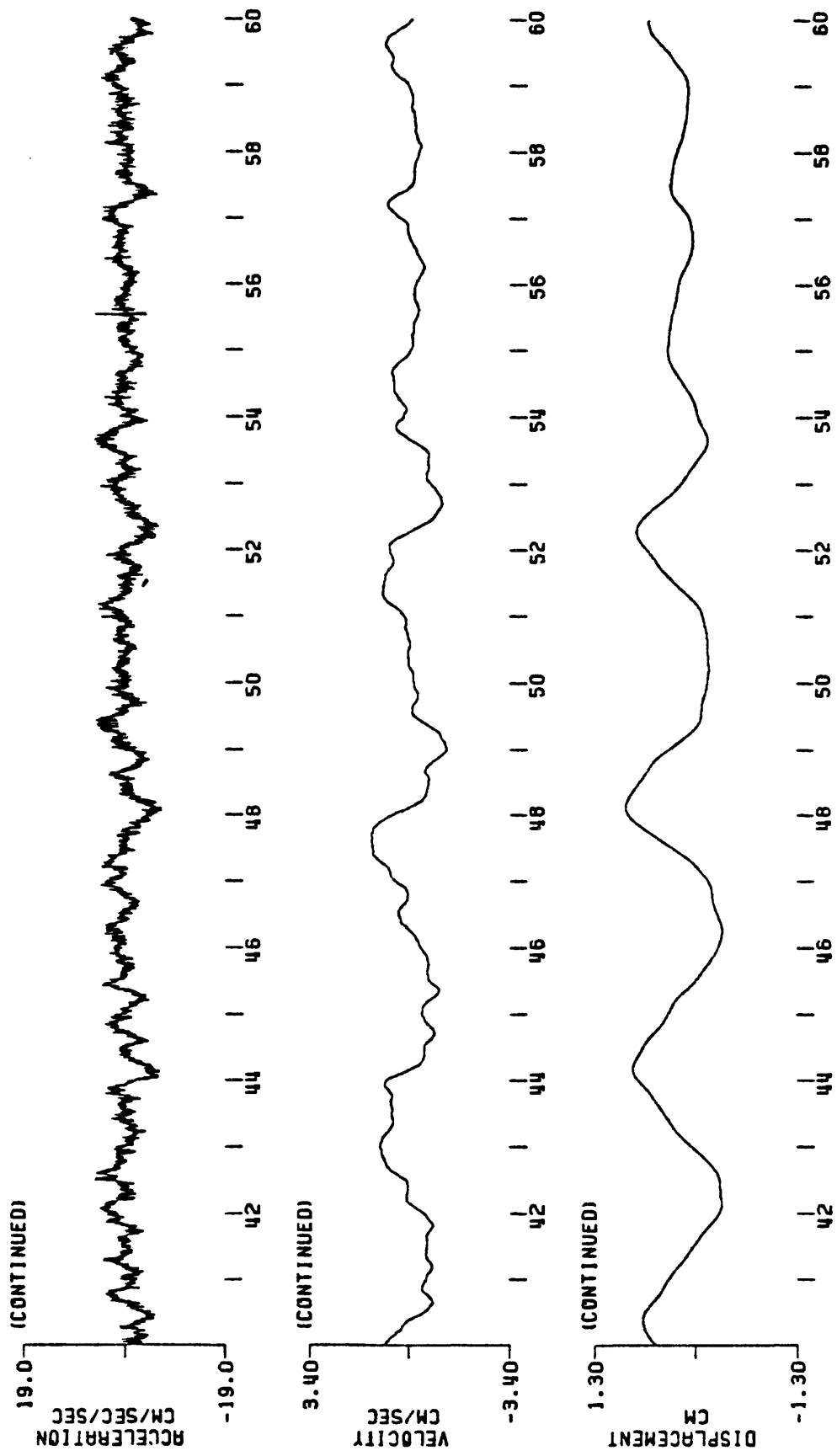
PEAK VALUES: ACCEL=18.47 CM/SEC/SEC, VELOCITY=-3.40 CM/SEC, DISPL=1.27 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BATO BRIDGE, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

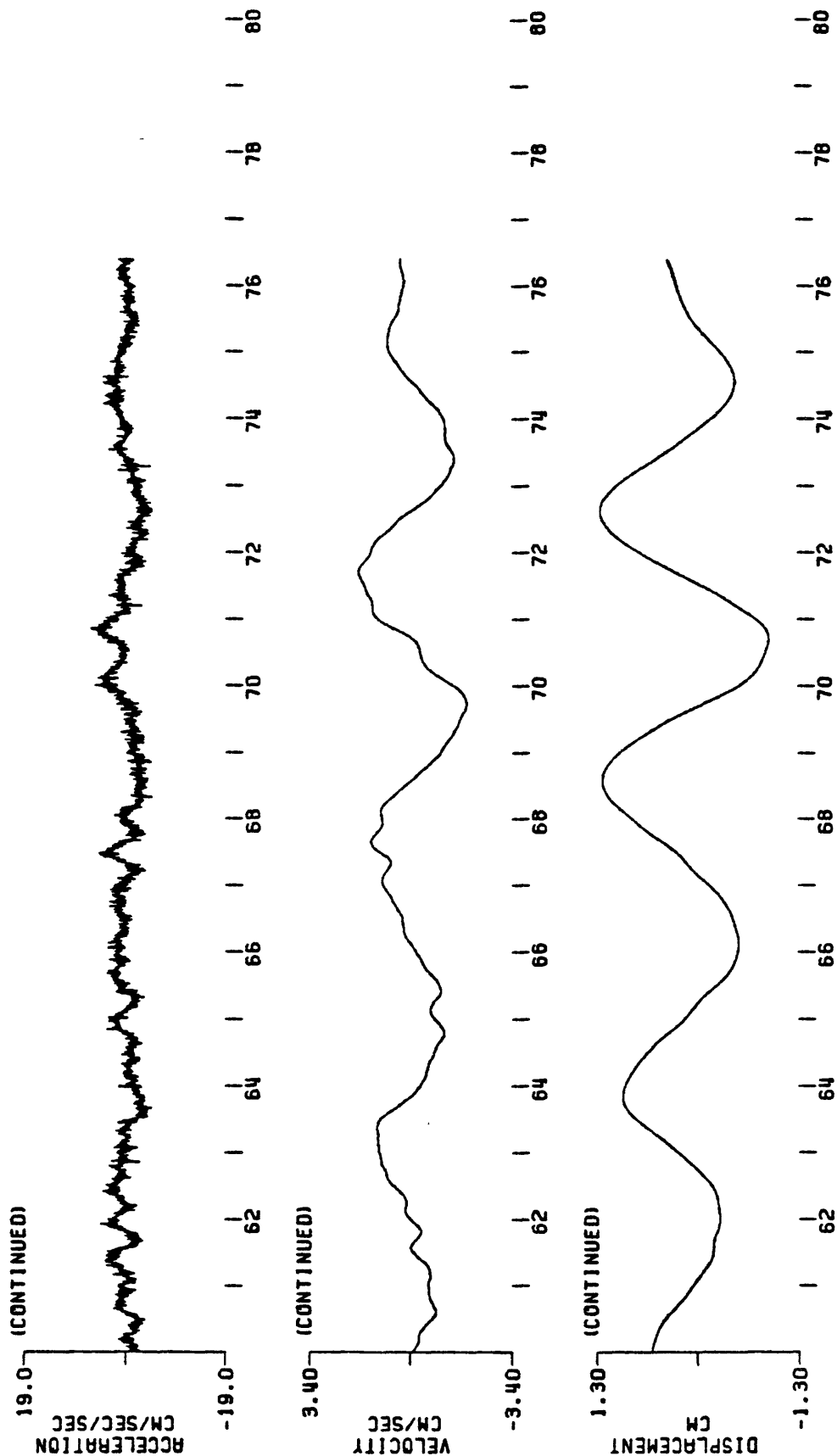
PEAK VALUES: ACCEL=18.47 CM/SEC/SEC, VELOCITY=-3.40 CM/SEC, DISPL=1.27 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BATO BRIDGE, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

PEAK VALUES: ACCEL=18.47 CM/SEC/SEC, VELOCITY=-3.40 CM/SEC, DISPL=1.27 CM

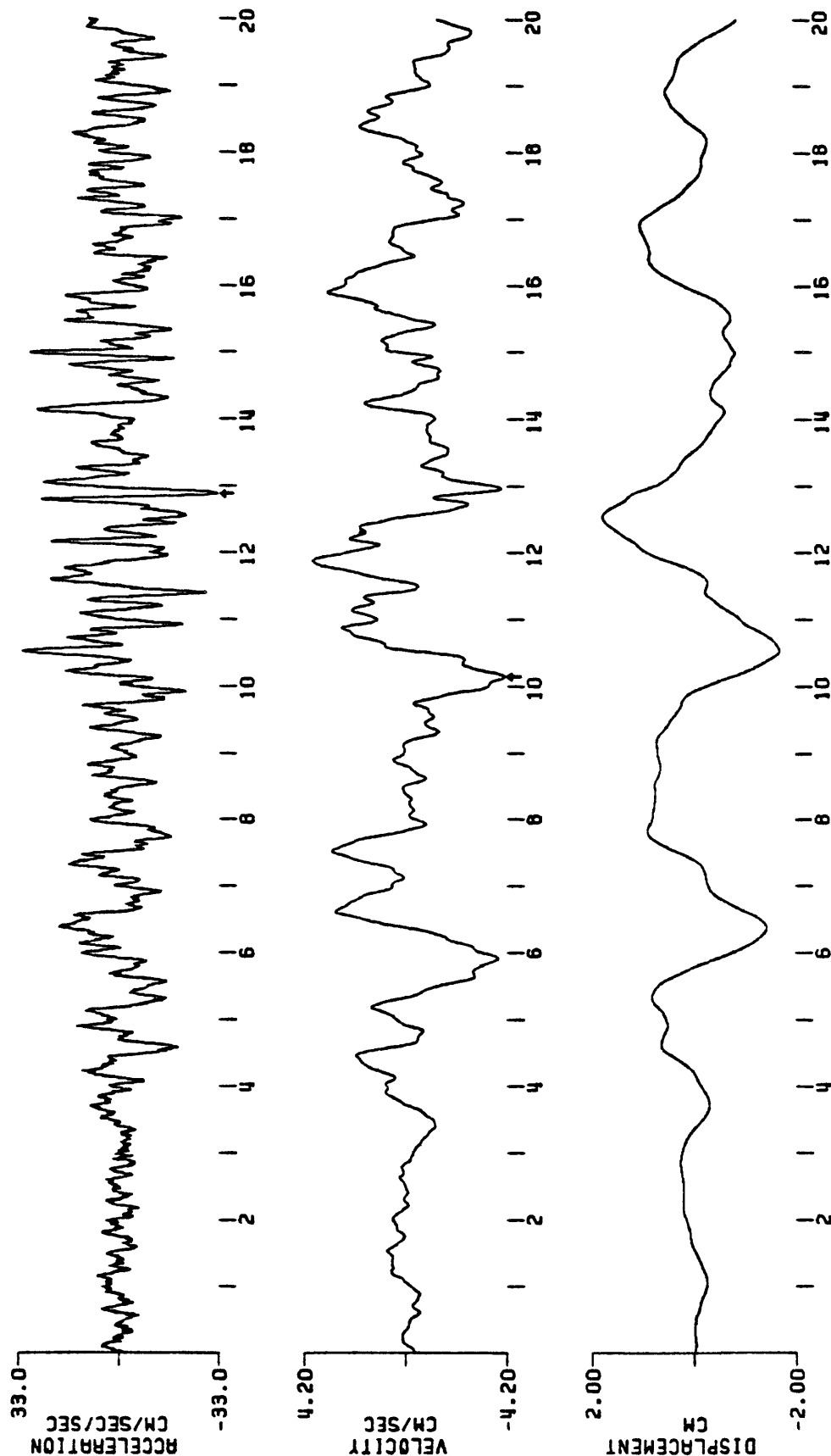




CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BATO BRIDGE, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

PEAK VALUES: ACCEL=-32.29 CM/SEC/SEC, VELOCITY=-4.12 CM/SEC, DISPL=-1.92 CM

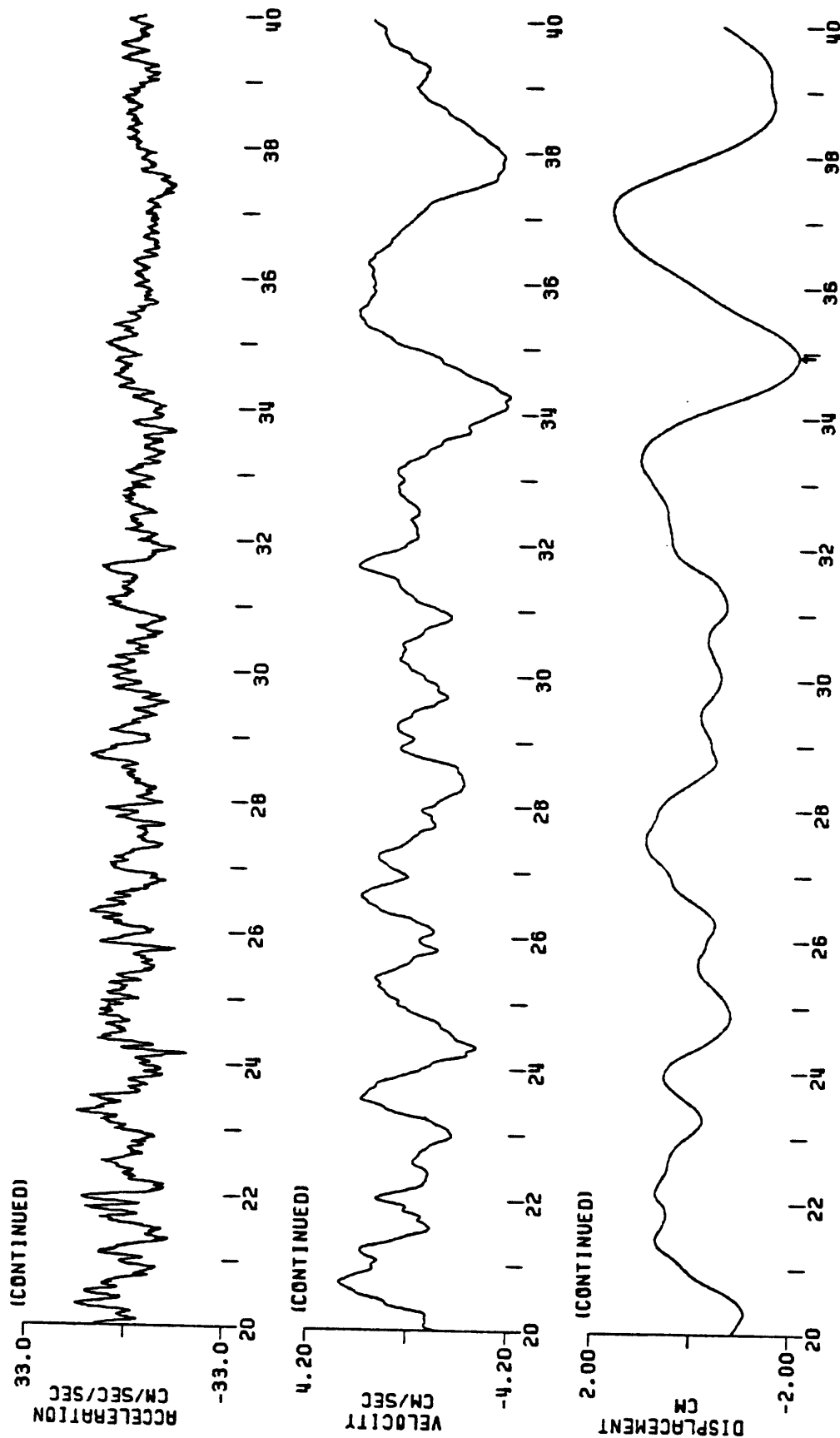


SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BATO BRIDGE, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

PEAK VALUES: ACCEL=-32.29 CM/SEC/SEC, VELOCITY=-4.12 CM/SEC, DISPL=-1.92 CM

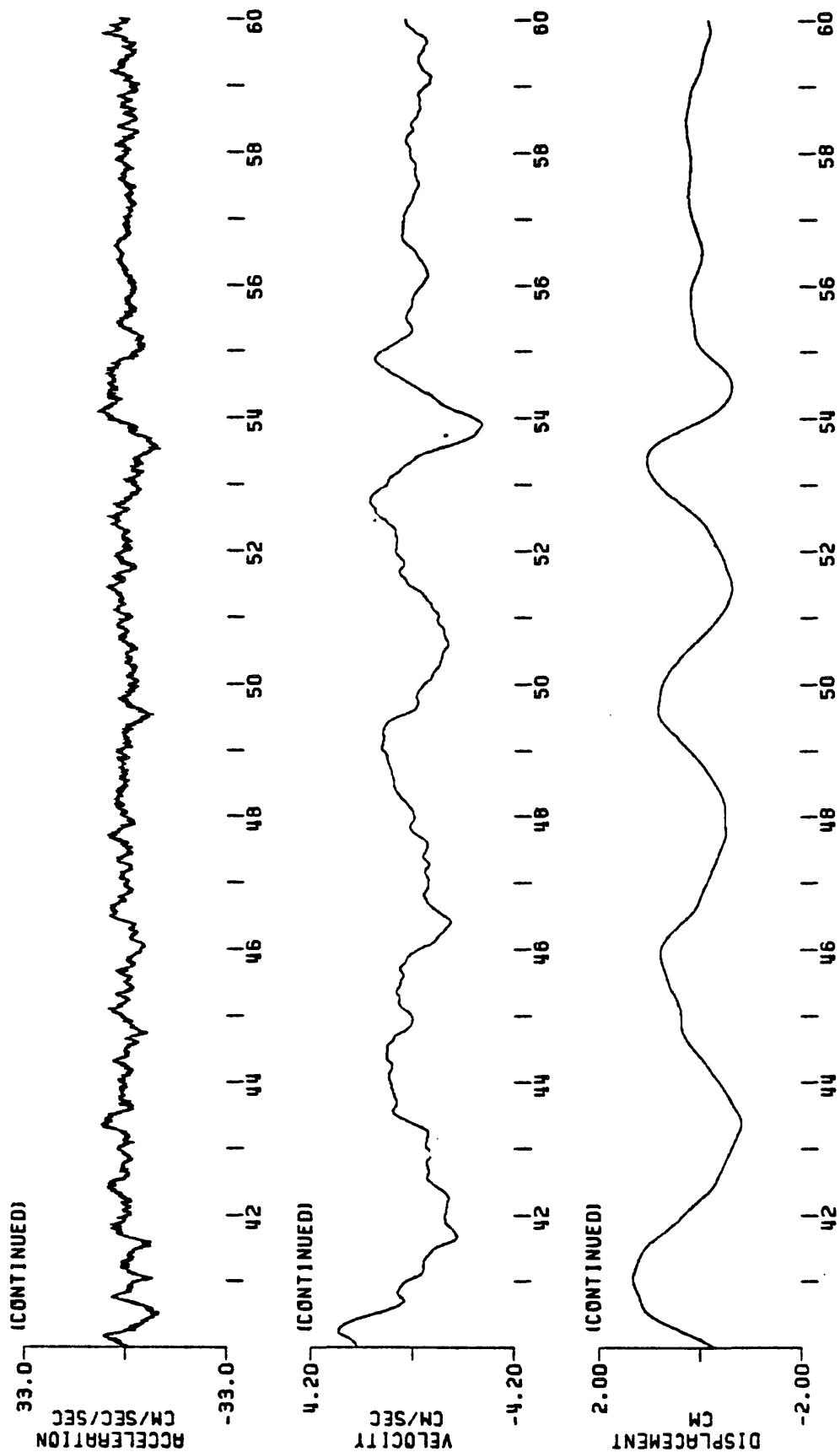


SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BATO BRIDGE, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

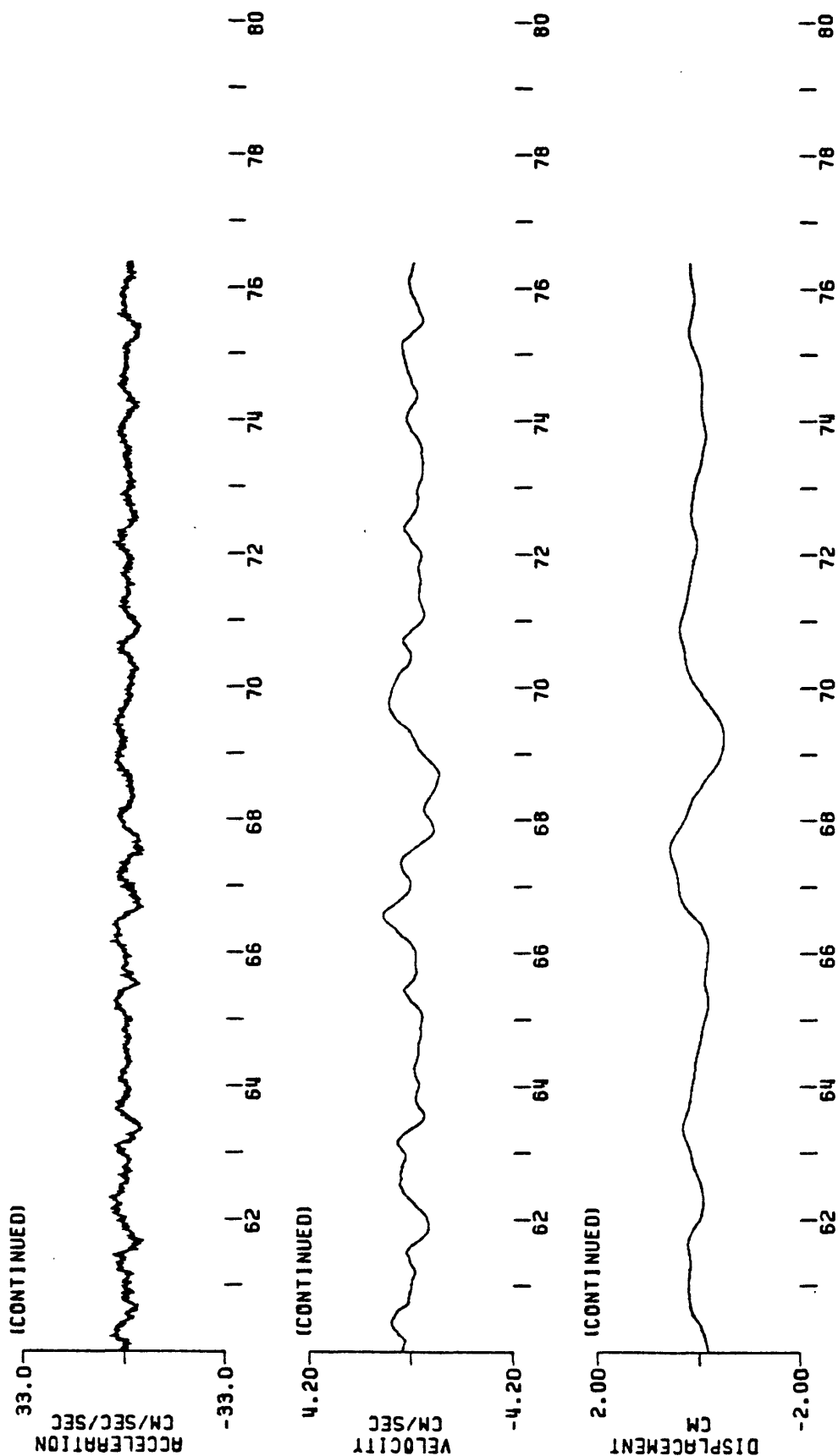
PEAK VALUES: ACCEL=-32.29 CM/SEC/SEC, VELOCITY=-4.12 CM/SEC, DISPL=-1.92 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BATO BRIDGE, PAPUA NEW GUINEA  
 TRAN.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

PEAK VALUES: ACCEL=-32.29 CM/SEC/SEC, VELOCITY=-4.12 CM/SEC, DISPL=-1.92 CM

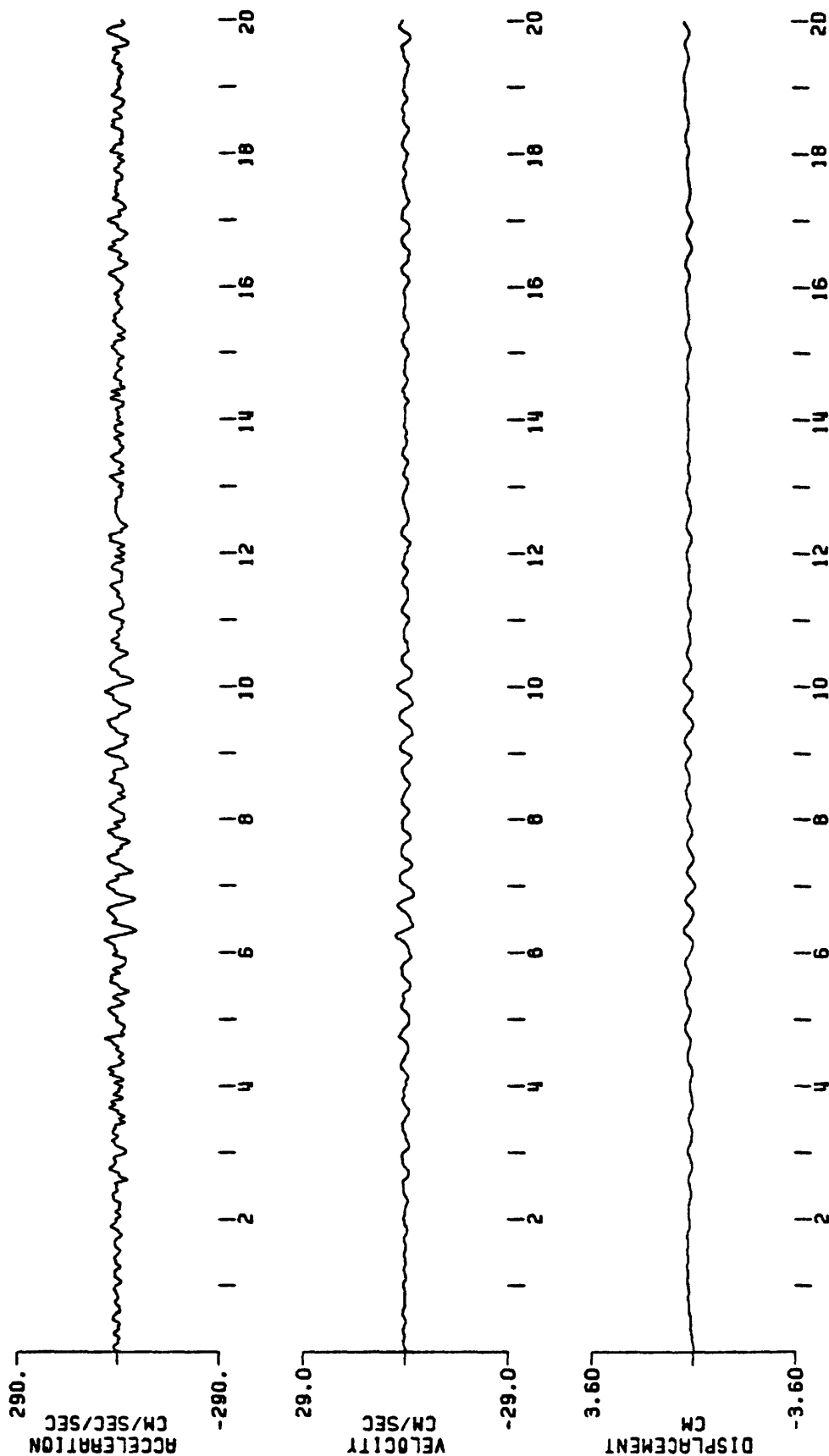


SECONDS

# CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS BVE 80, PAPUA NEW GUINEA

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ ORDER 4

PEAK VALUES: ACCEL=283.51 CM/SEC/SEC, VELOCITY=28.64 CM/SEC, DISPL=3.56 CM

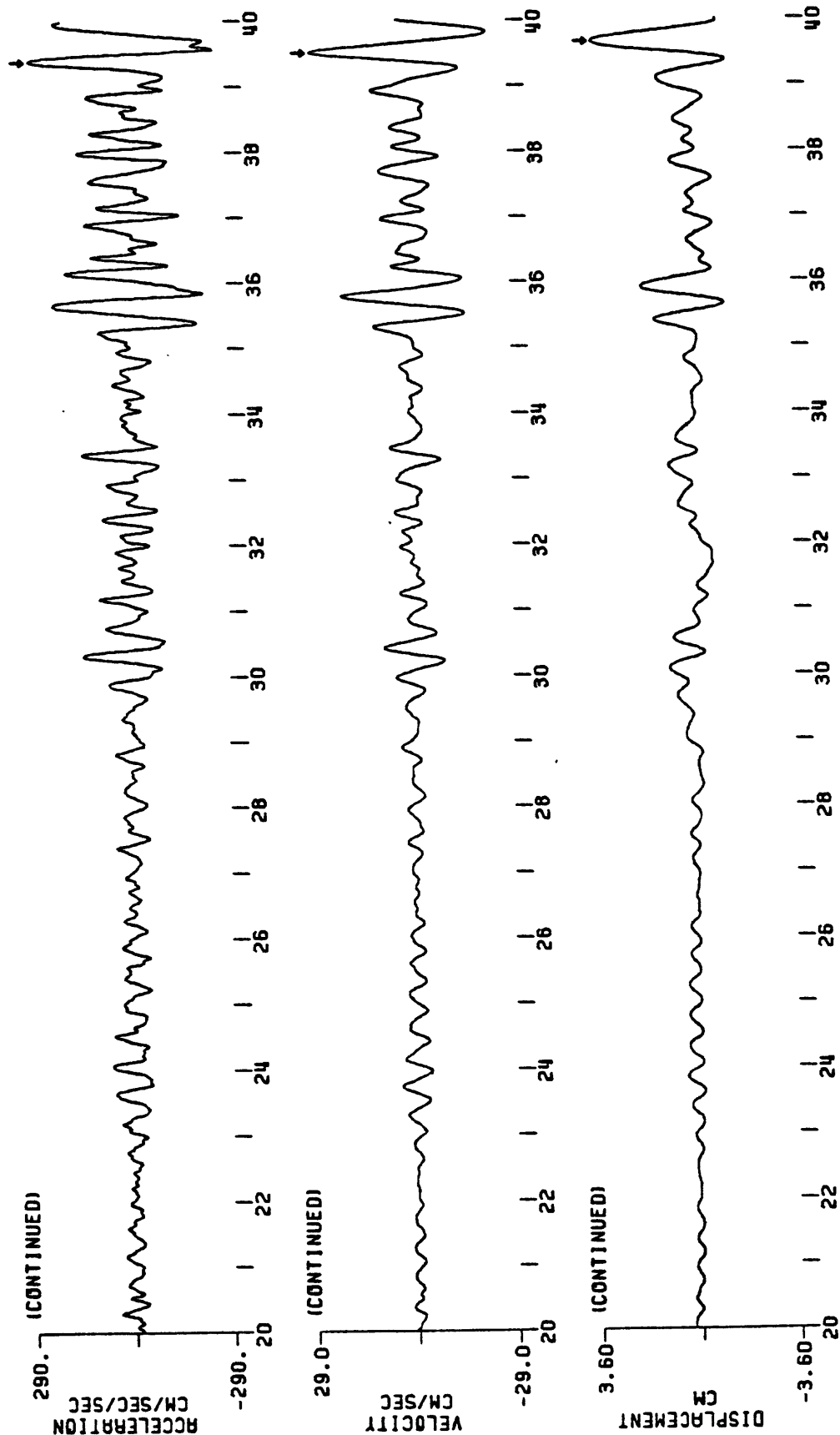


SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BVE 80, PAPUA, NEW GUINEA  
 LONG.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ ORDER 4

PEAK VALUES: ACCEL=283.51 CM/SEC/SEC, VELOCITY=28.64 CM/SEC, DISPL=3.56 CM

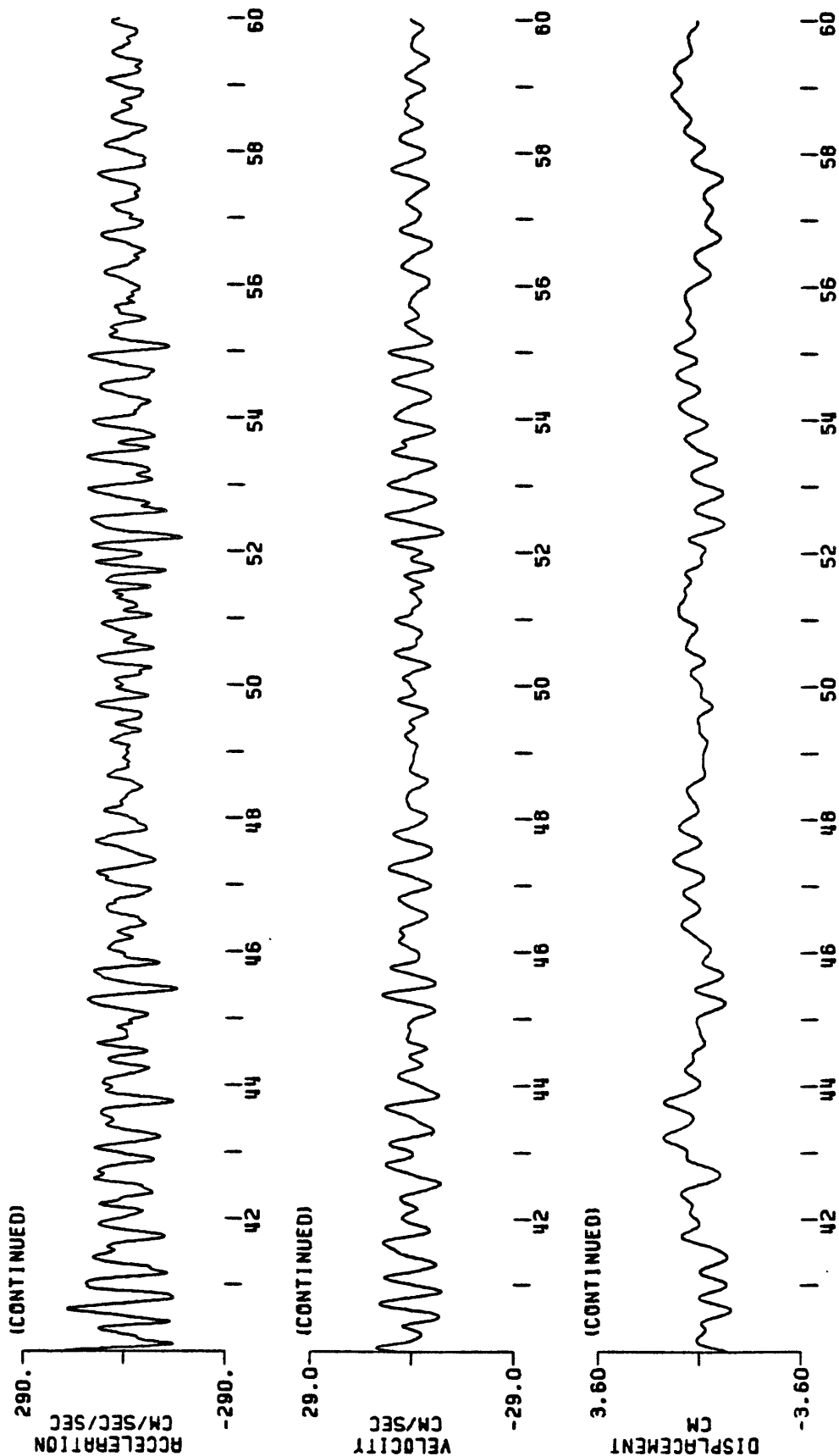


SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BVE 80, PAPUA NEW GUINEA  
 LONG.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ ORDER 4

PEAK VALUES: ACCEL=283.51 CM/SEC/SEC, VELOCITY=28.64 CM/SEC, DISPL=3.56 CM



SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BVE 80, PAPUA NEW GUINEA  
 LONG.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ ORDER 4

PEAK VALUES: ACCEL=283.51 CM/SEC/SEC, VELOCITY=28.64 CM/SEC, DISPL=3.56 CM

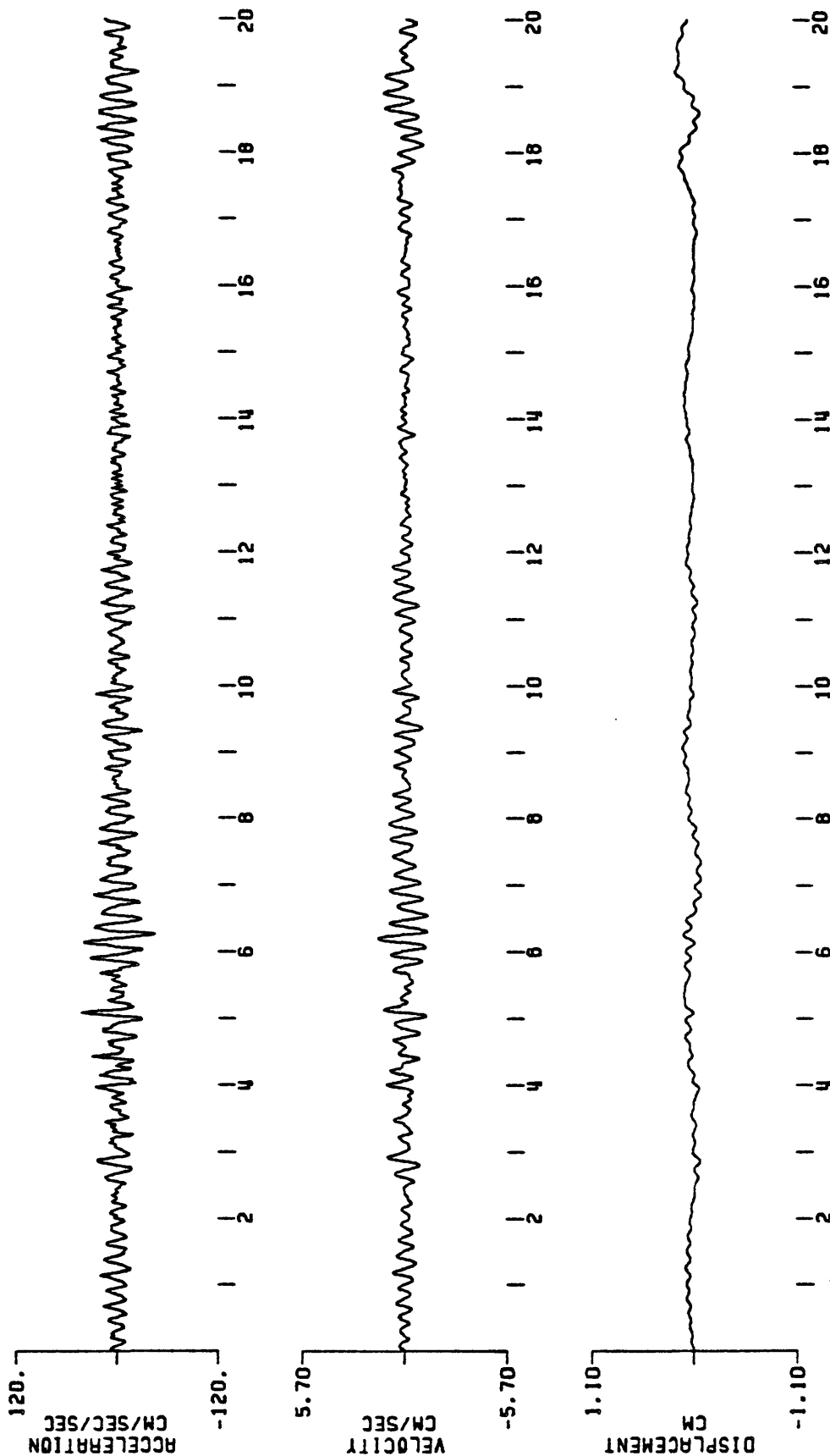




# CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS BVE 80, PAPUA, NEW GUINEA

VERT.  
EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

PEAK VALUES: ACCEL=115.41 CM/SEC/SEC, VELOCITY=-5.62 CM/SEC, DISPL=1.07 CM

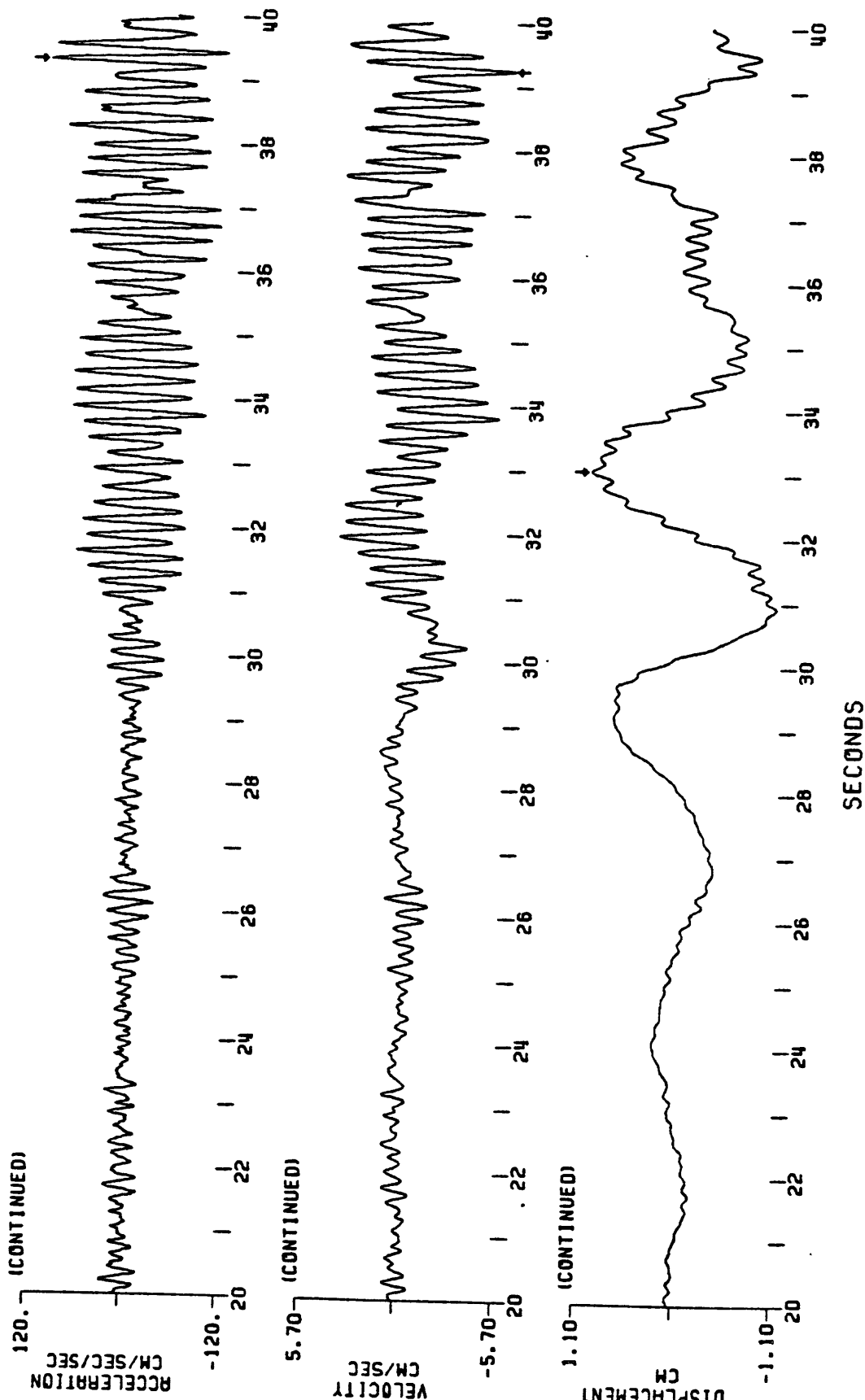


SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BVE' 80, PAPUA, NEW GUINEA  
 VERT.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ. ORDER 4

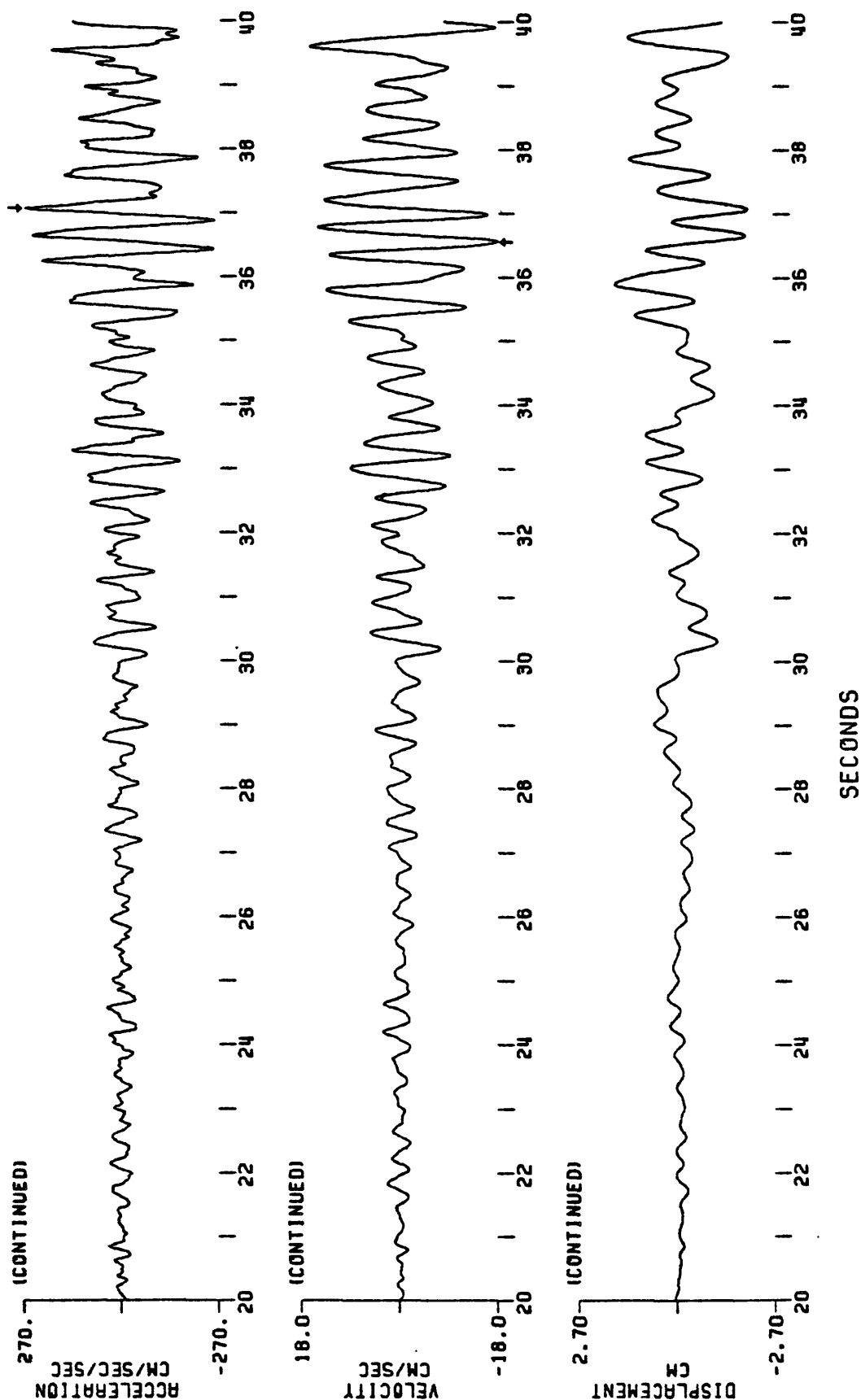
PEAK VALUES: ACCEL=115.41 CM/SEC/SEC, VELOCITY=-5.62 CM/SEC, DISPL=1.07 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BVE 80, PAPUA NEW GUINEA

TRAN.  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

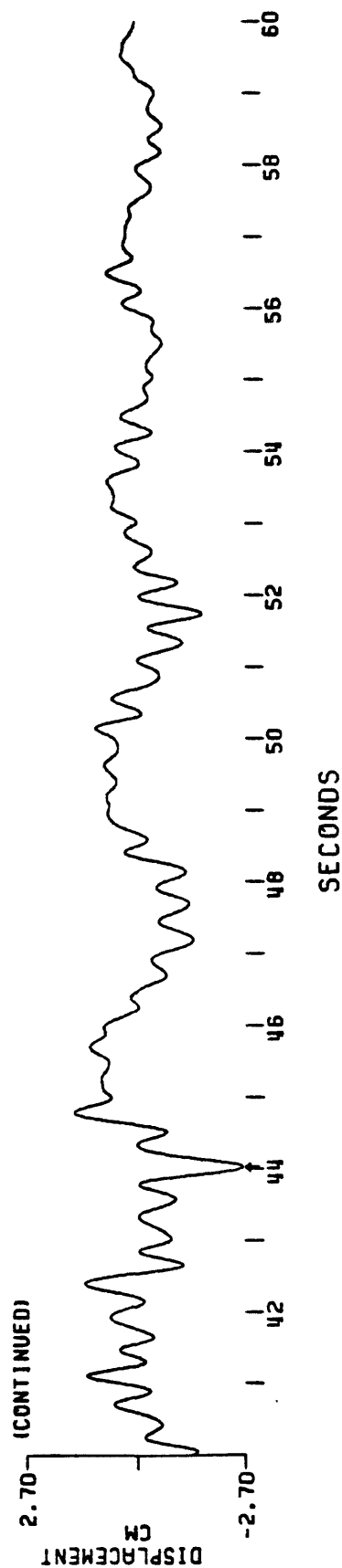
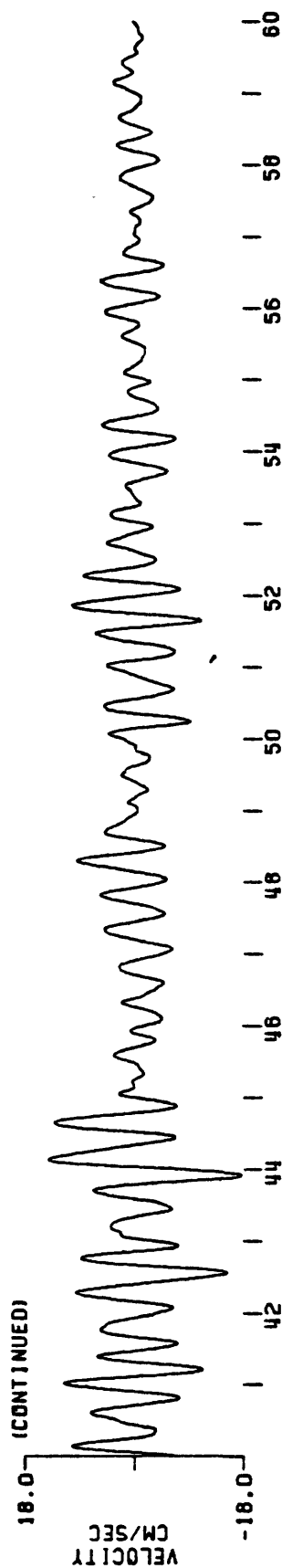
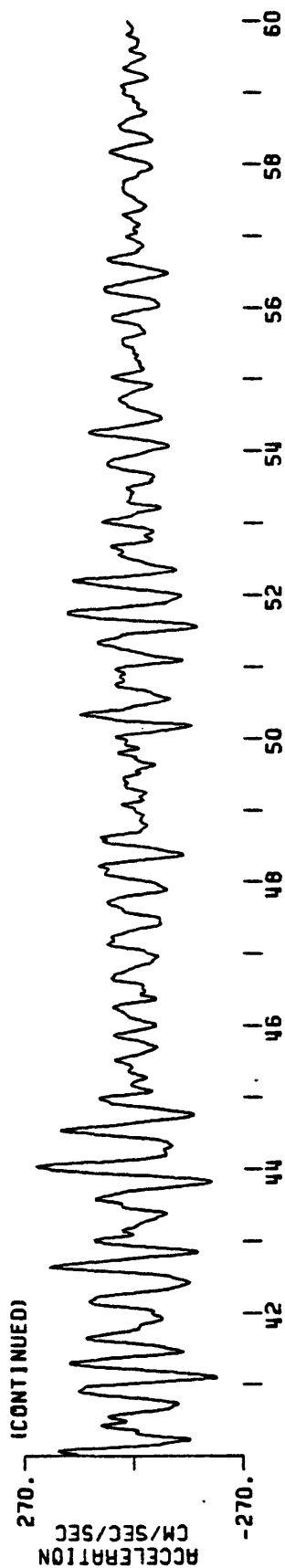
PEAK VALUES: ACCEL=269.65 CM/SEC/SEC, VELOCITY=-17.91 CM/SEC, DISPL=-2.61 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BVE 80, PAPUA, NEW GUINEA  
 TRAN.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

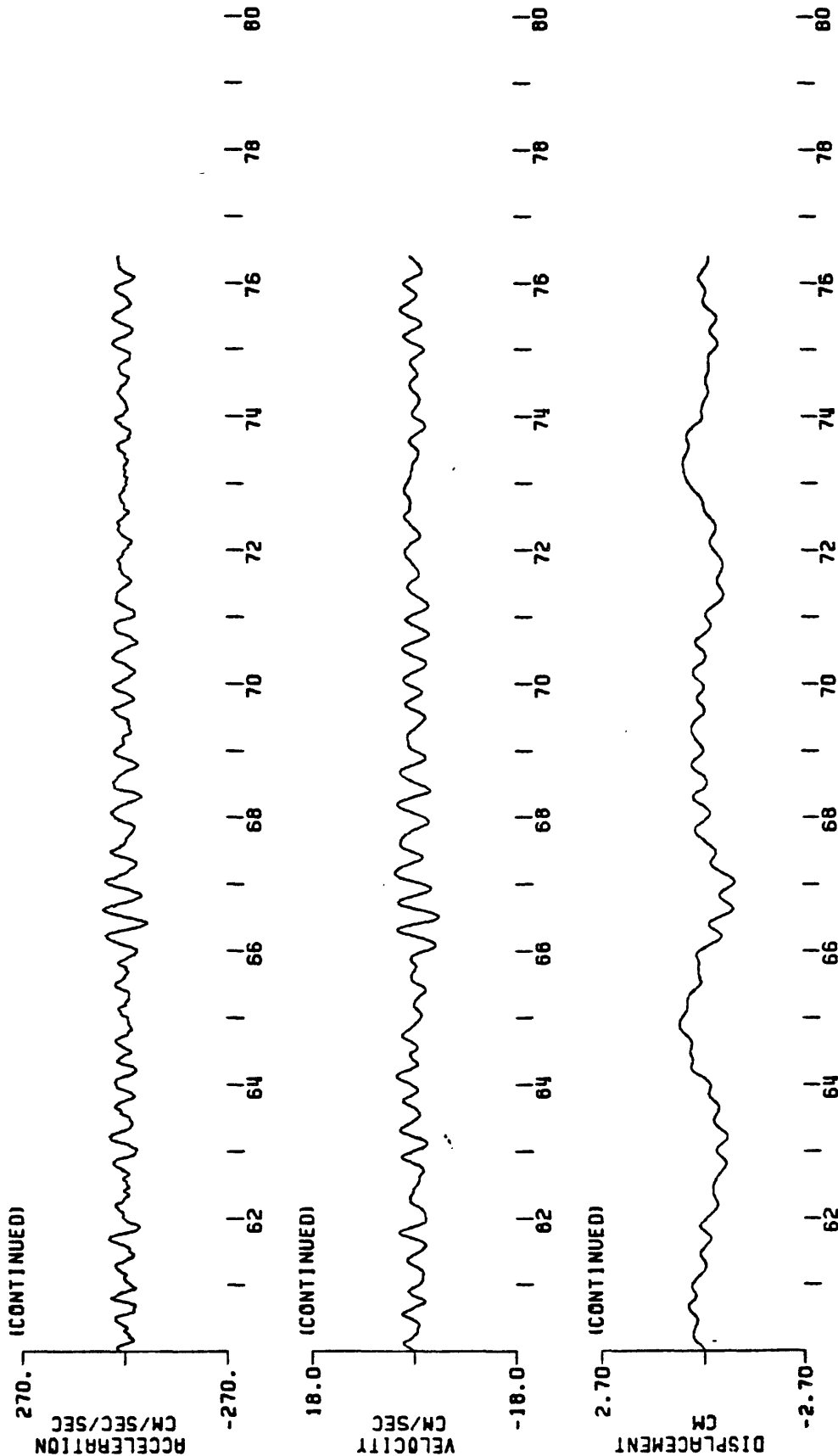
PEAK VALUES: ACCEL=269.65 CM/SEC/SEC, VELOCITY=-17.91 CM/SEC, DISPL=-2.61 CM



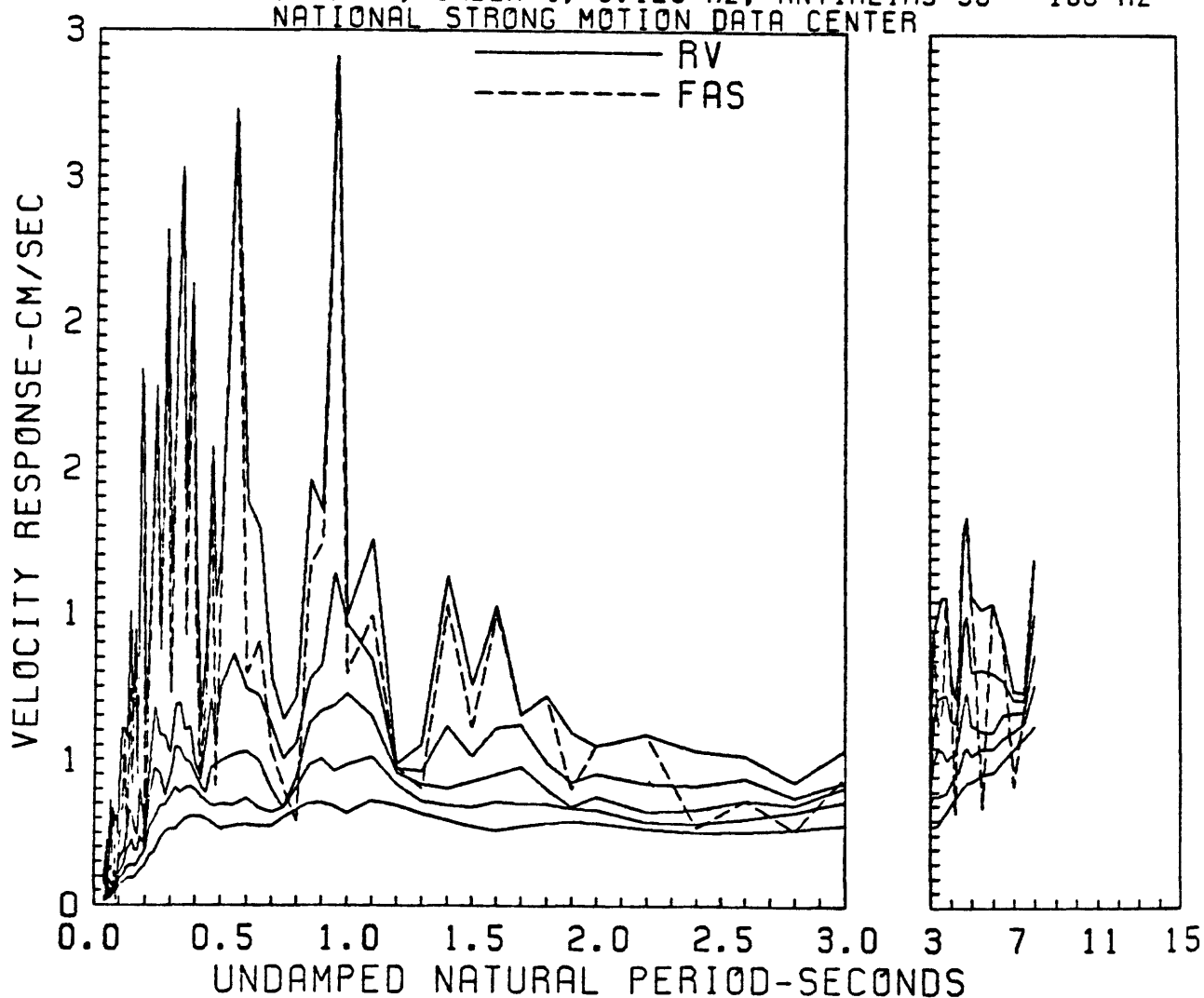
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS  
 BVE 80, PAPUA, NEW GUINEA  
 TRAN.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ ORDER 4

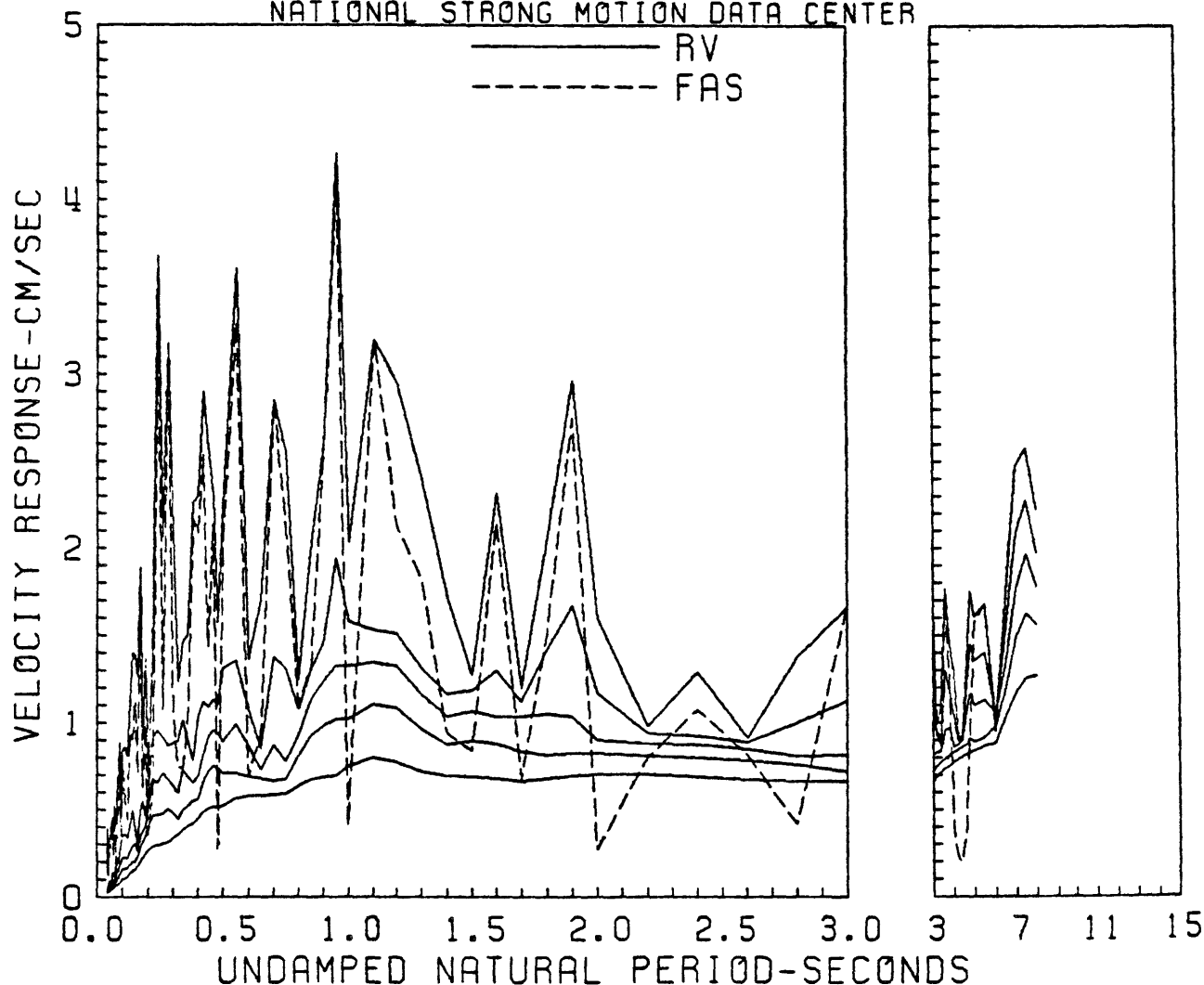
PEAK VALUES: ACCEL=269.65 CM/SEC/SEC, VELOCITY=-17.91 CM/SEC, DISPL=-2.61 CM



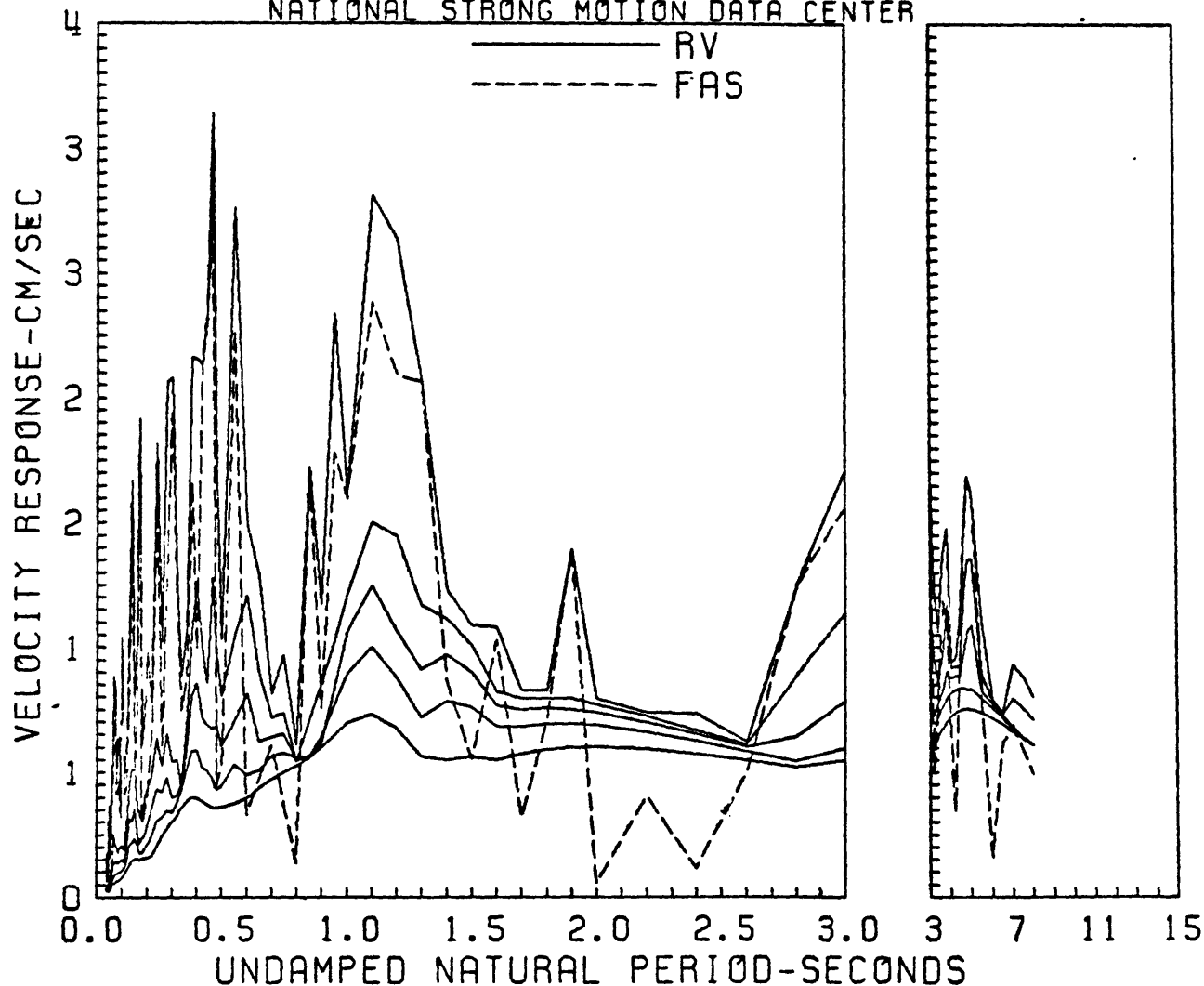
RELATIVE VELOCITY RESPONSE SPECTRUM  
 ARAWA TOWN, PAPUA NEW GUINEA, 3/18/83, 0905UTC LONG.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



RELATIVE VELOCITY RESPONSE SPECTRUM  
 ARAWA TOWN, PAPUA NEW GUINEA, 3/18/83, 0905UTC UP  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER

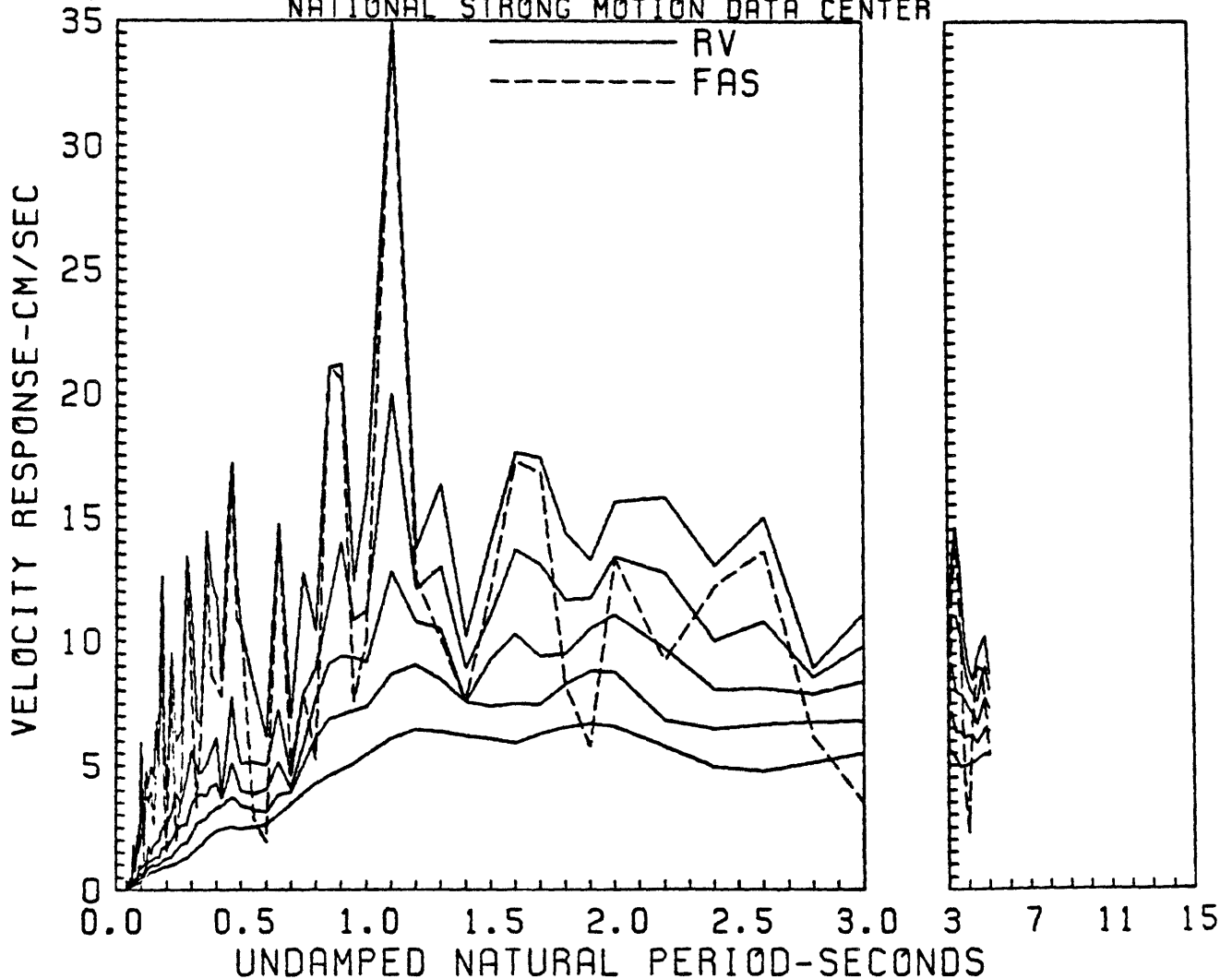


RELATIVE VELOCITY RESPONSE SPECTRUM  
 ARAWA TOWN, PAPUA NEW GUINEA, 3/18/83, 0905UTC TRAN.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER

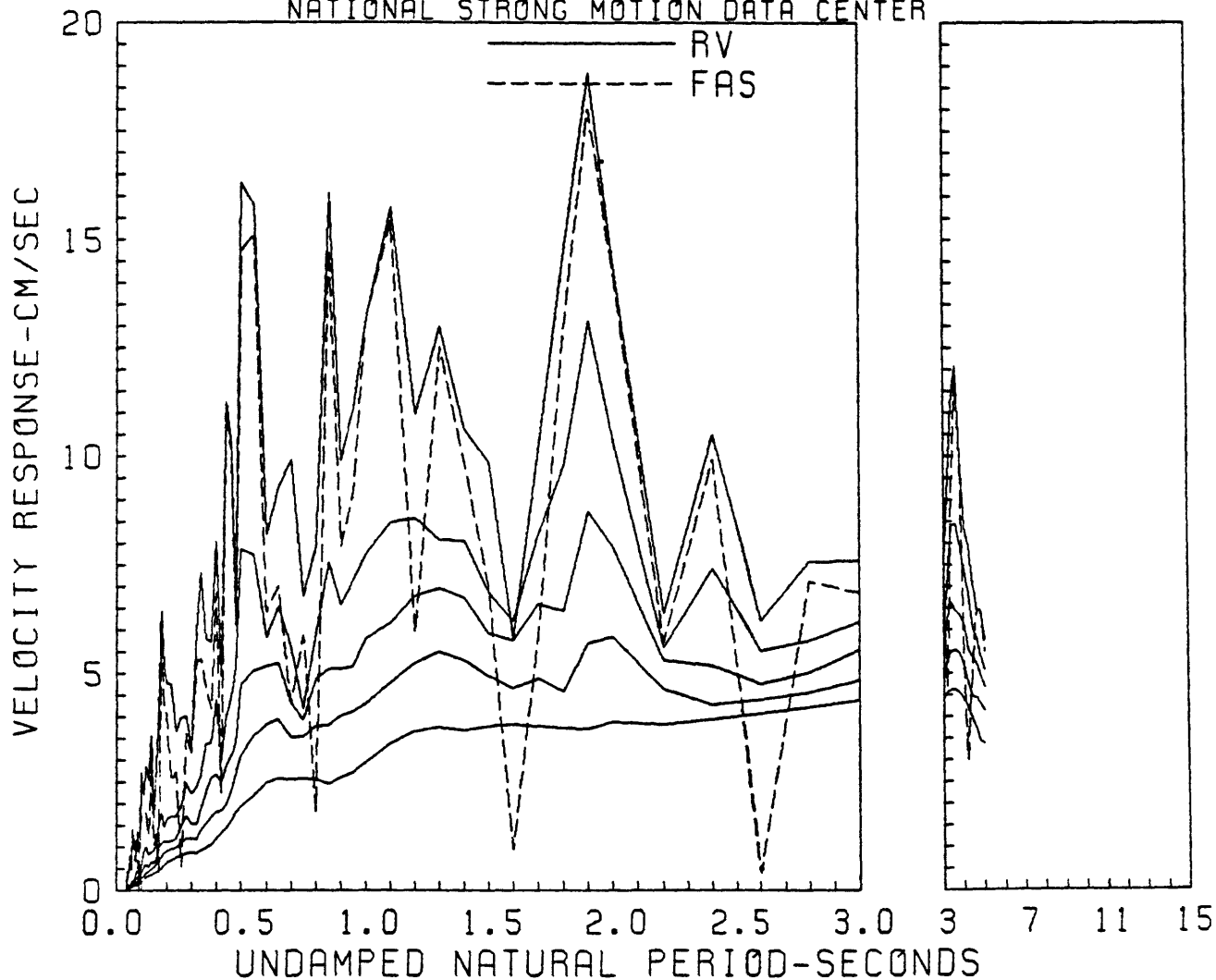




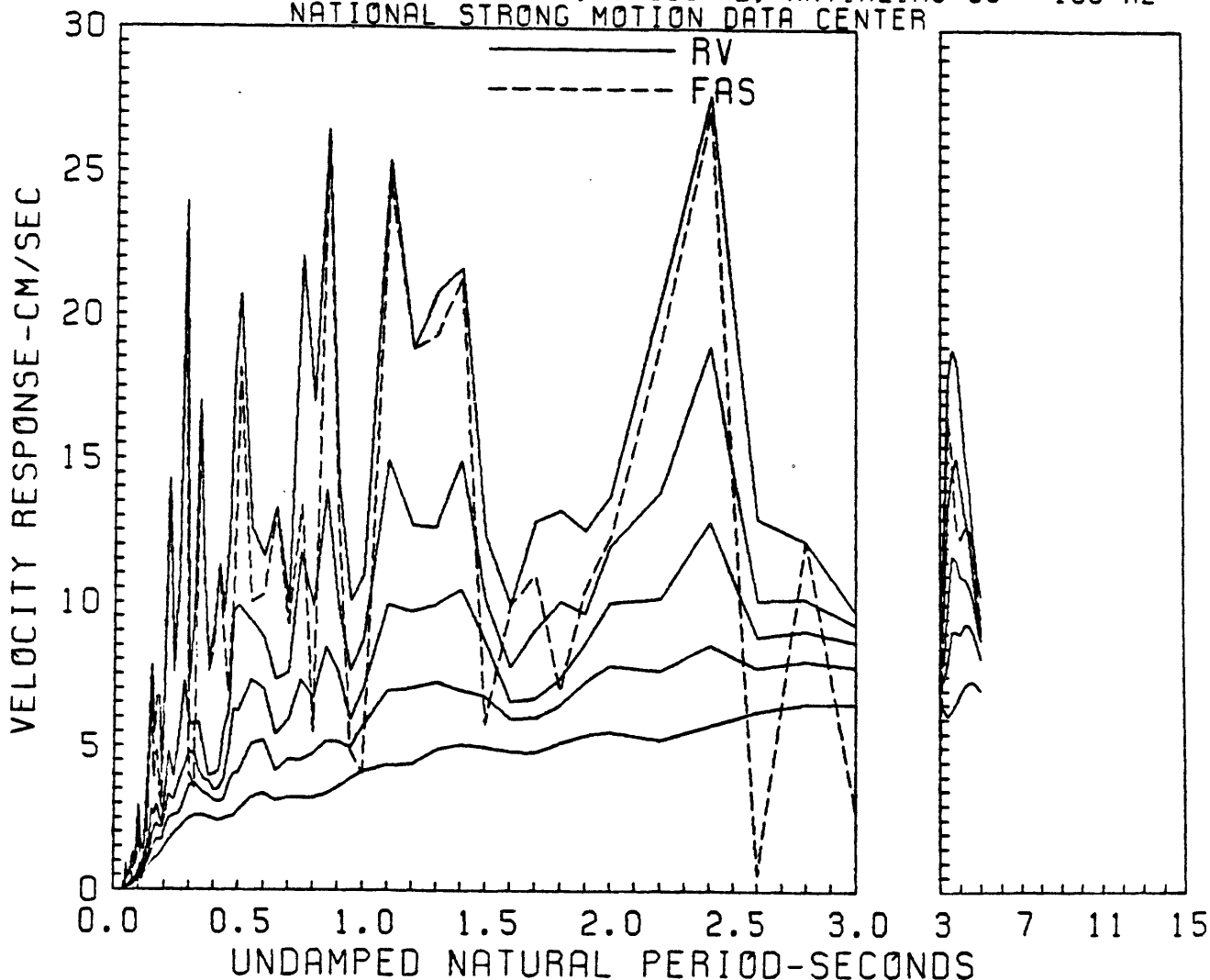
RELATIVE VELOCITY RESPONSE SPECTRUM  
 BATO BRIDGE, PAPUA NEW GUINEA, 3/18/83, 0905UTC LONG.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.200 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



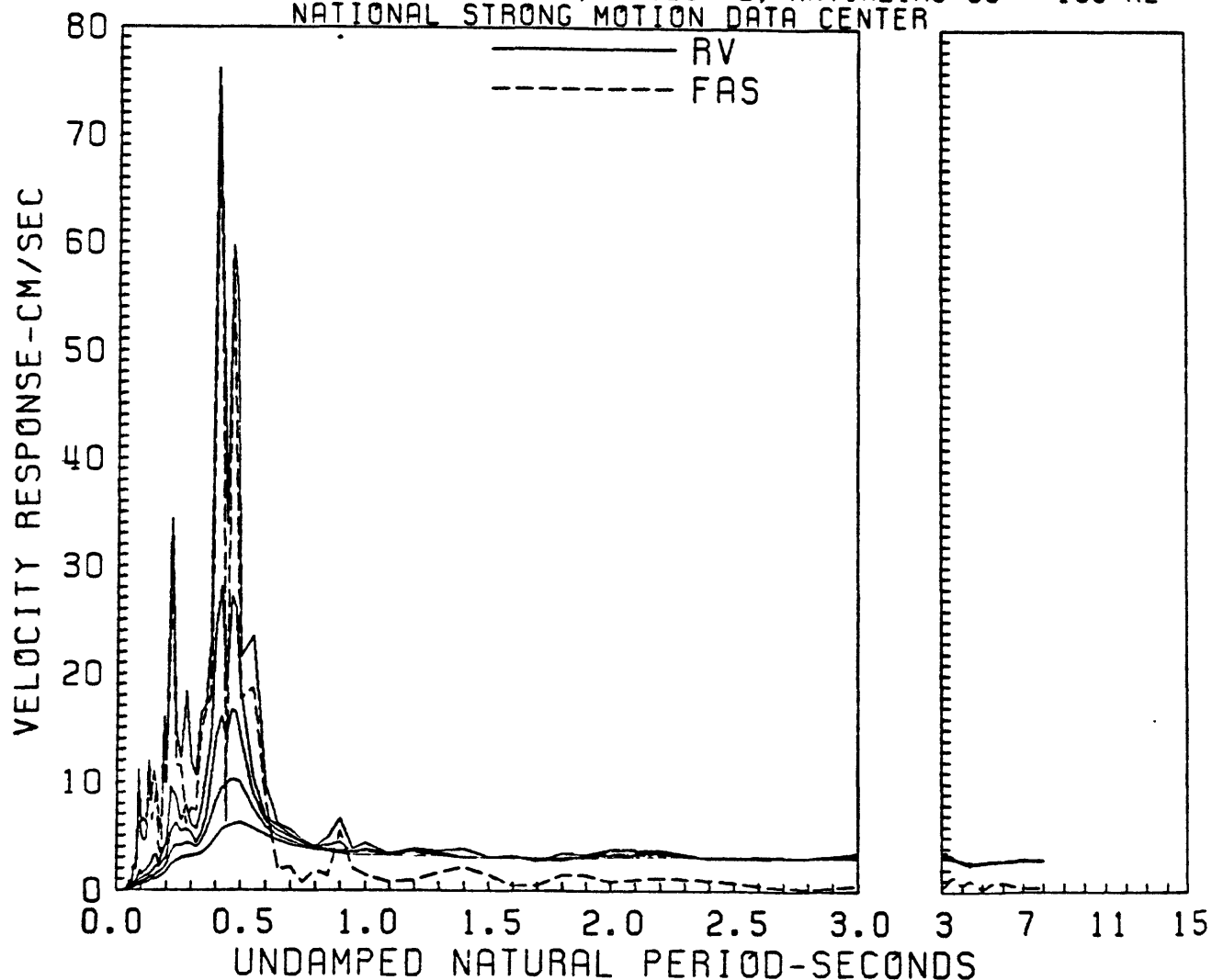
RELATIVE VELOCITY RESPONSE SPECTRUM  
 BATO BRIDGE, PAPUA NEW GUINEA, 3/18/83, 0905UTC UP  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.200 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



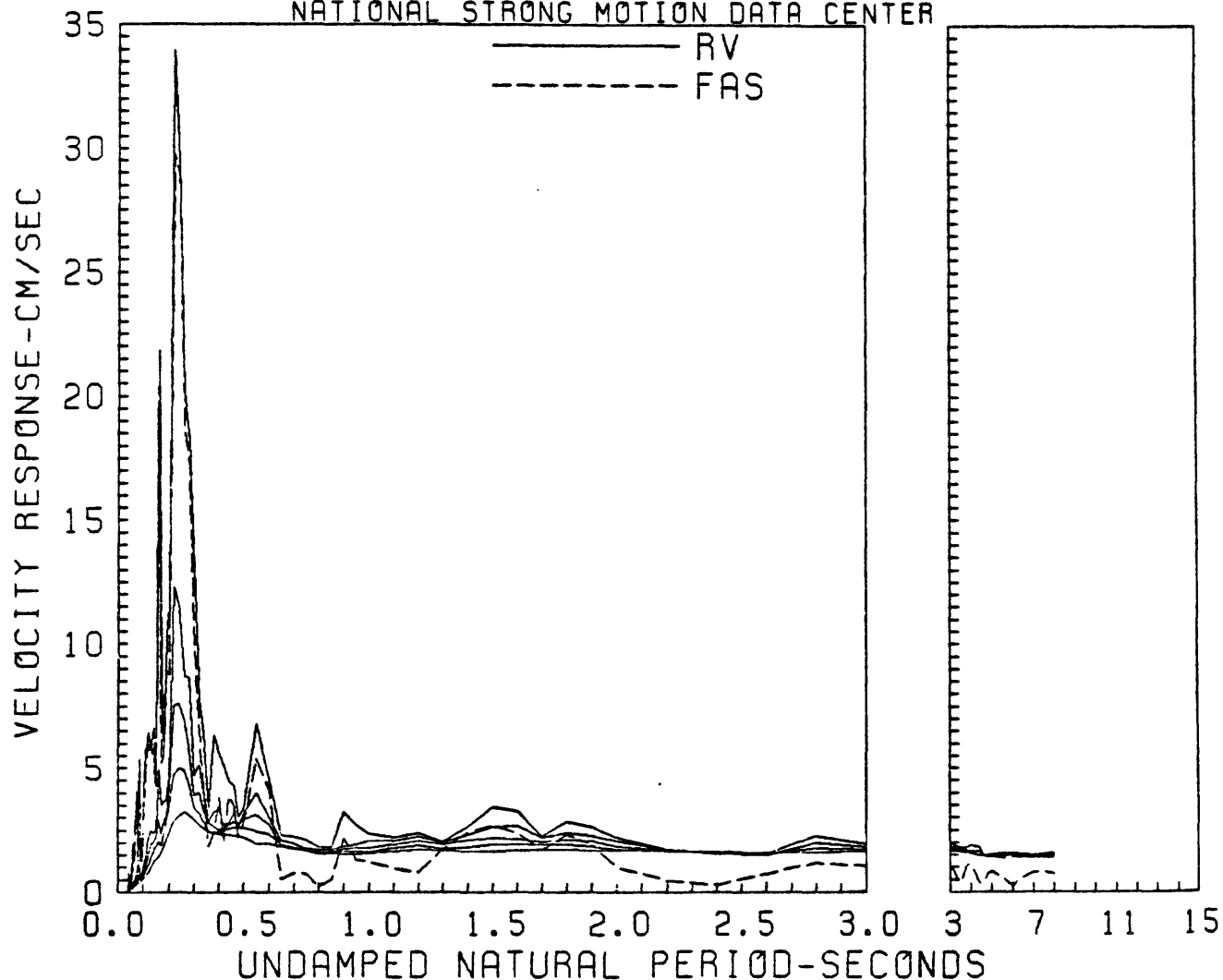
RELATIVE VELOCITY RESPONSE SPECTRUM  
 BATO BRIDGE, PAPUA NEW GUINEA. 3/18/83. 0905UTC TRAN.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4. 0.200 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



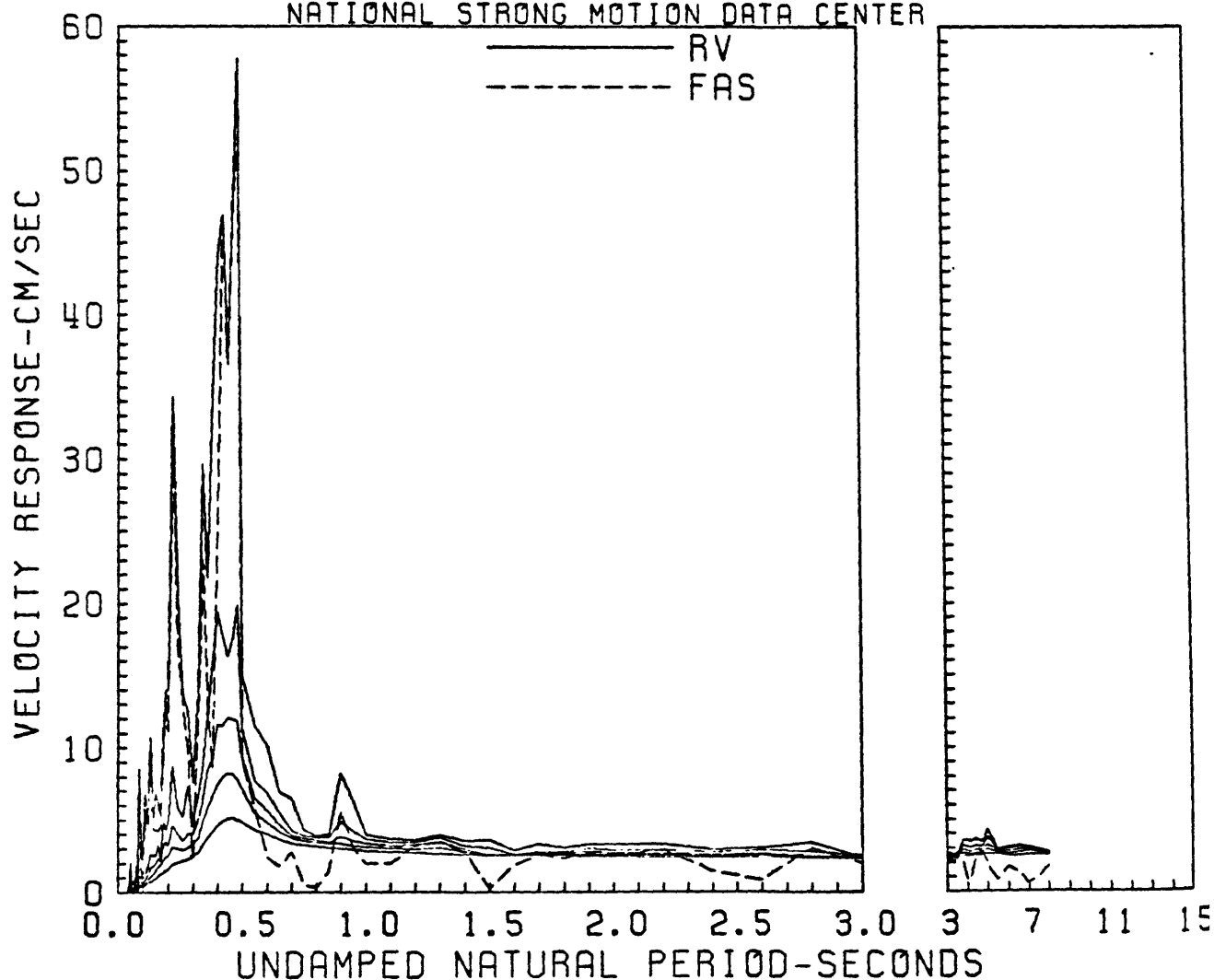
RELATIVE VELOCITY RESPONSE SPECTRUM  
 BVE 80, PAPUA NEW GUINEA, 3/18/83, 0905UTC LONG.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



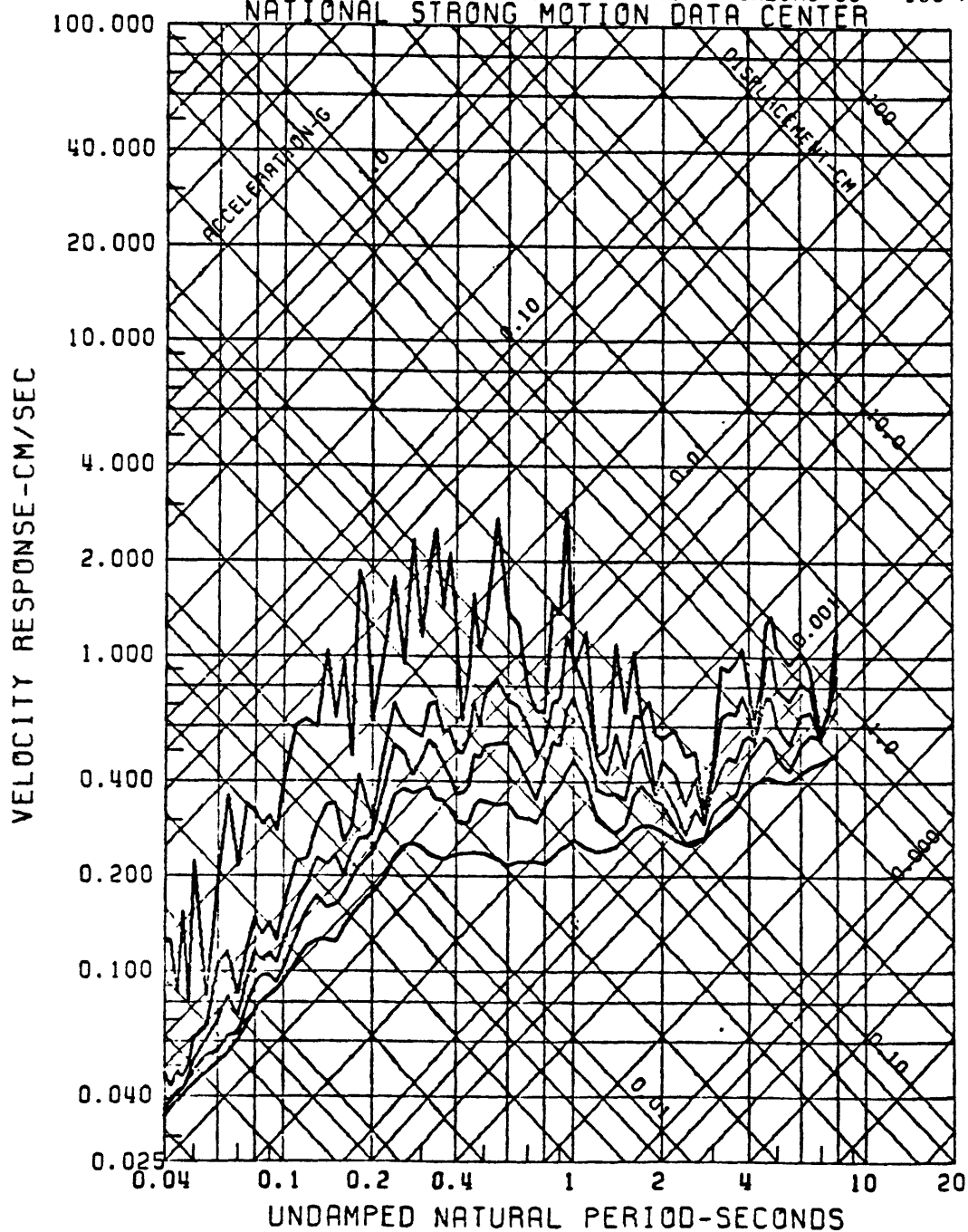
RELATIVE VELOCITY RESPONSE SPECTRUM  
 BVE 80, PAPUA NEW GUINEA, 3/18/83, 0905UTC UP  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



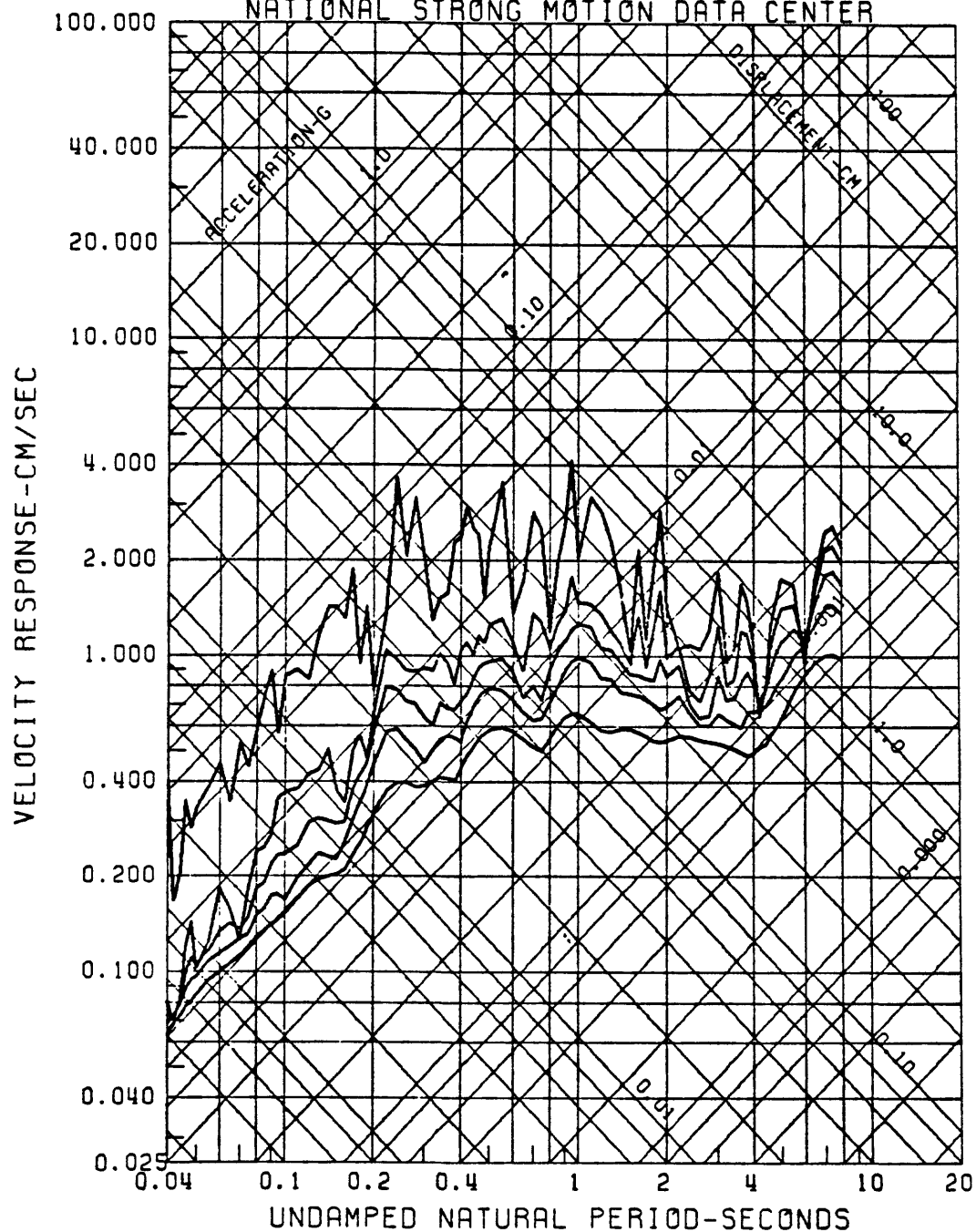
RELATIVE VELOCITY RESPONSE SPECTRUM  
 BVE 80, PAPUA NEW GUINEA, 3/18/83, 0905UTC TRAN.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



RESPONSE SPECTRA  
 ARAWA TOWN, PAPUA NEW GUINEA, 3/18/83, 0905 UTC LONG.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER

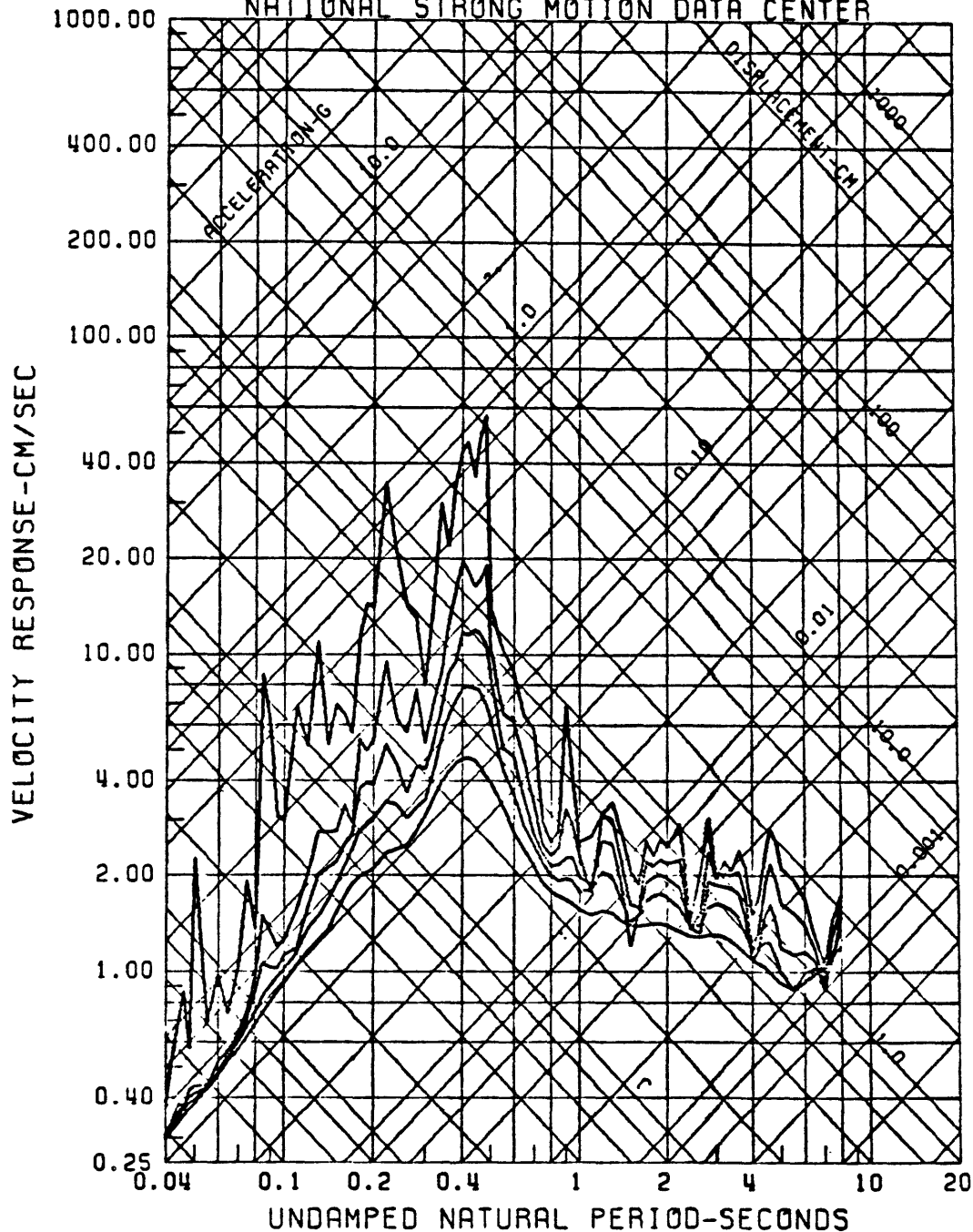


RESPONSE SPECTRA  
 ARAWA TOWN, PAPUA NEW GUINEA, 3/18/83, 0905UTC UP  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER

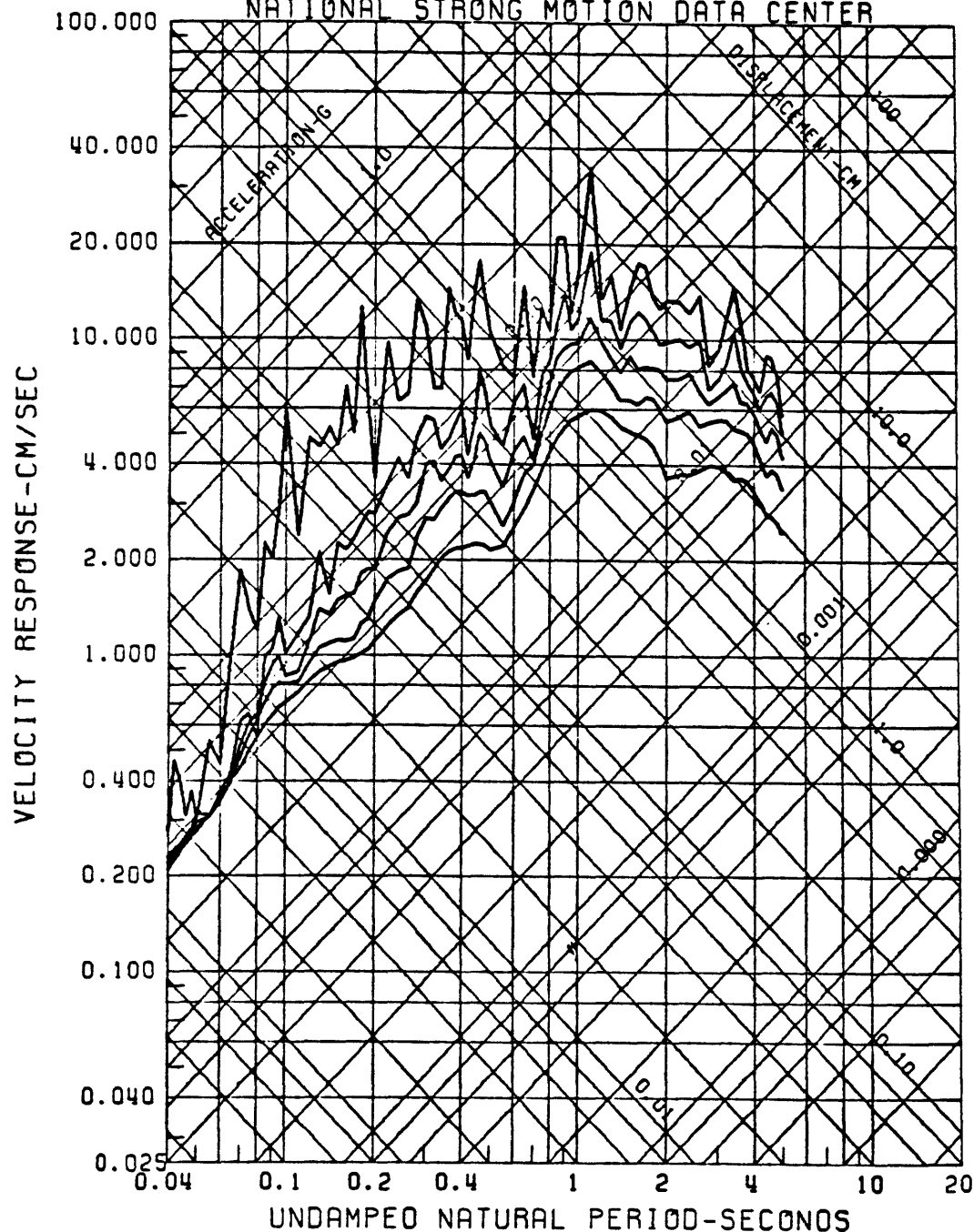




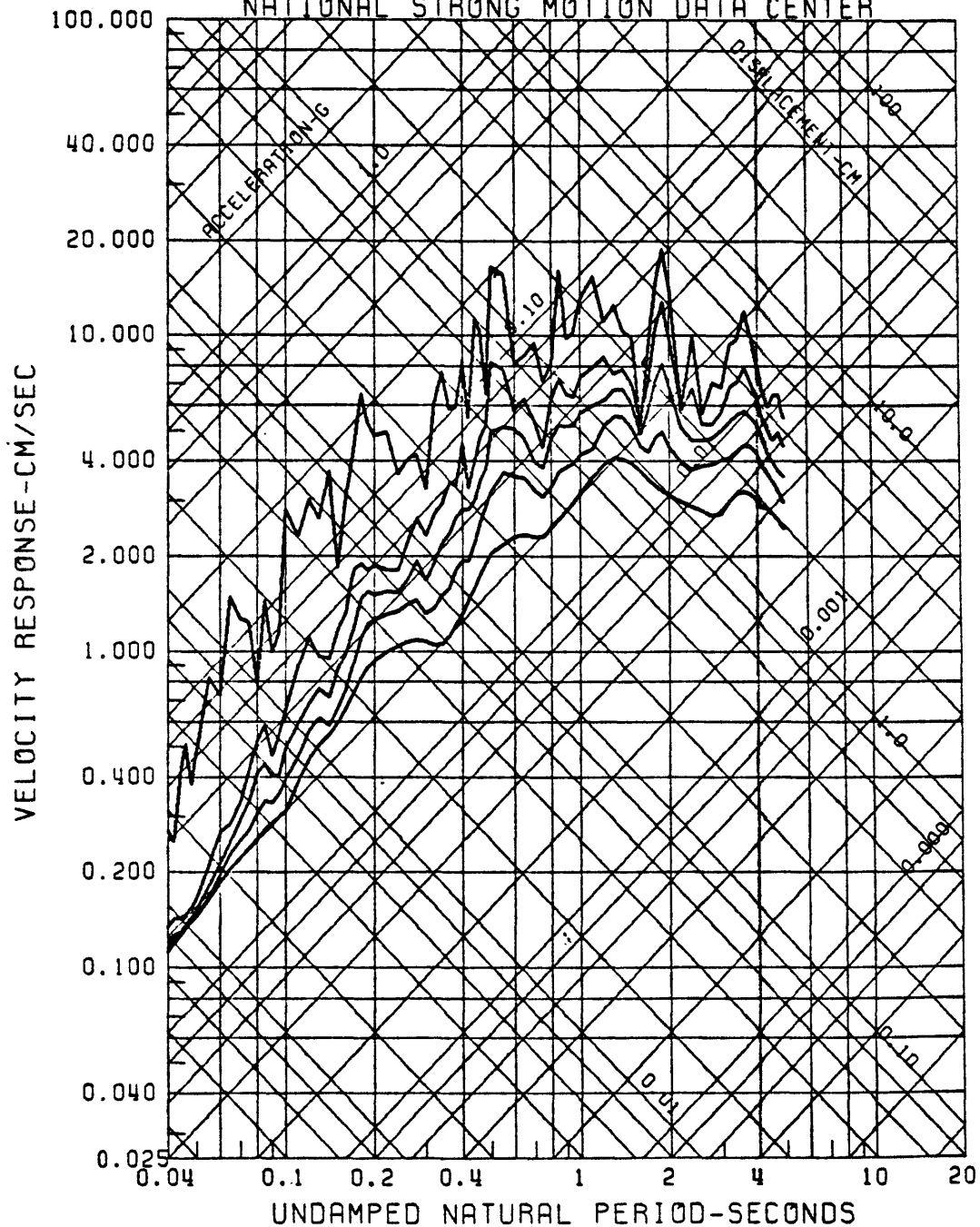
RESPONSE SPECTRA  
 BVE 80, PAPUA NEW GUINEA, 3/18/83, 0905 UTC TRAN.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



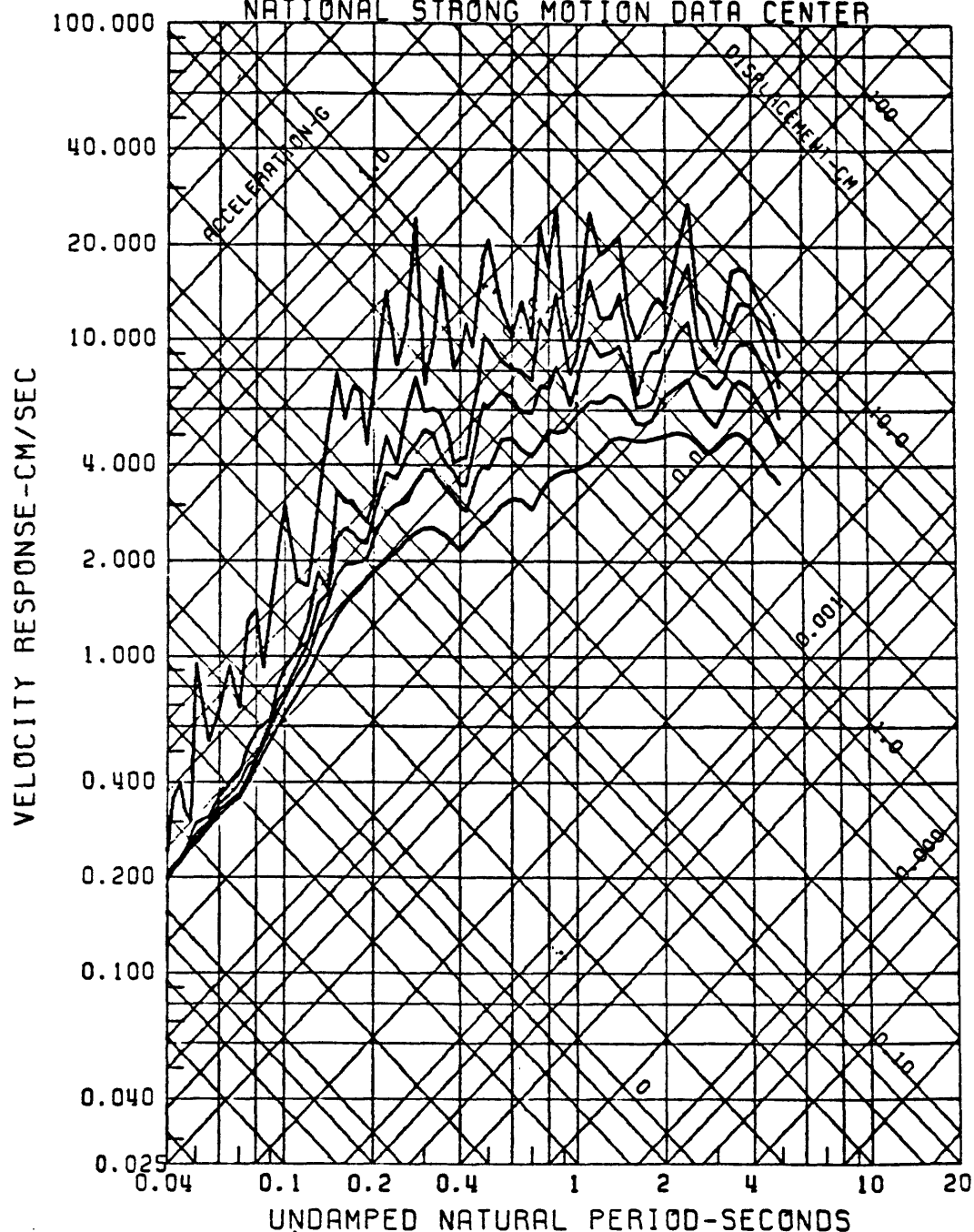
RESPONSE SPECTRA  
 BATO BRIDGE, PAPUA NEW GUINEA, 3/18/83, 0905 UTC LONG.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.200 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



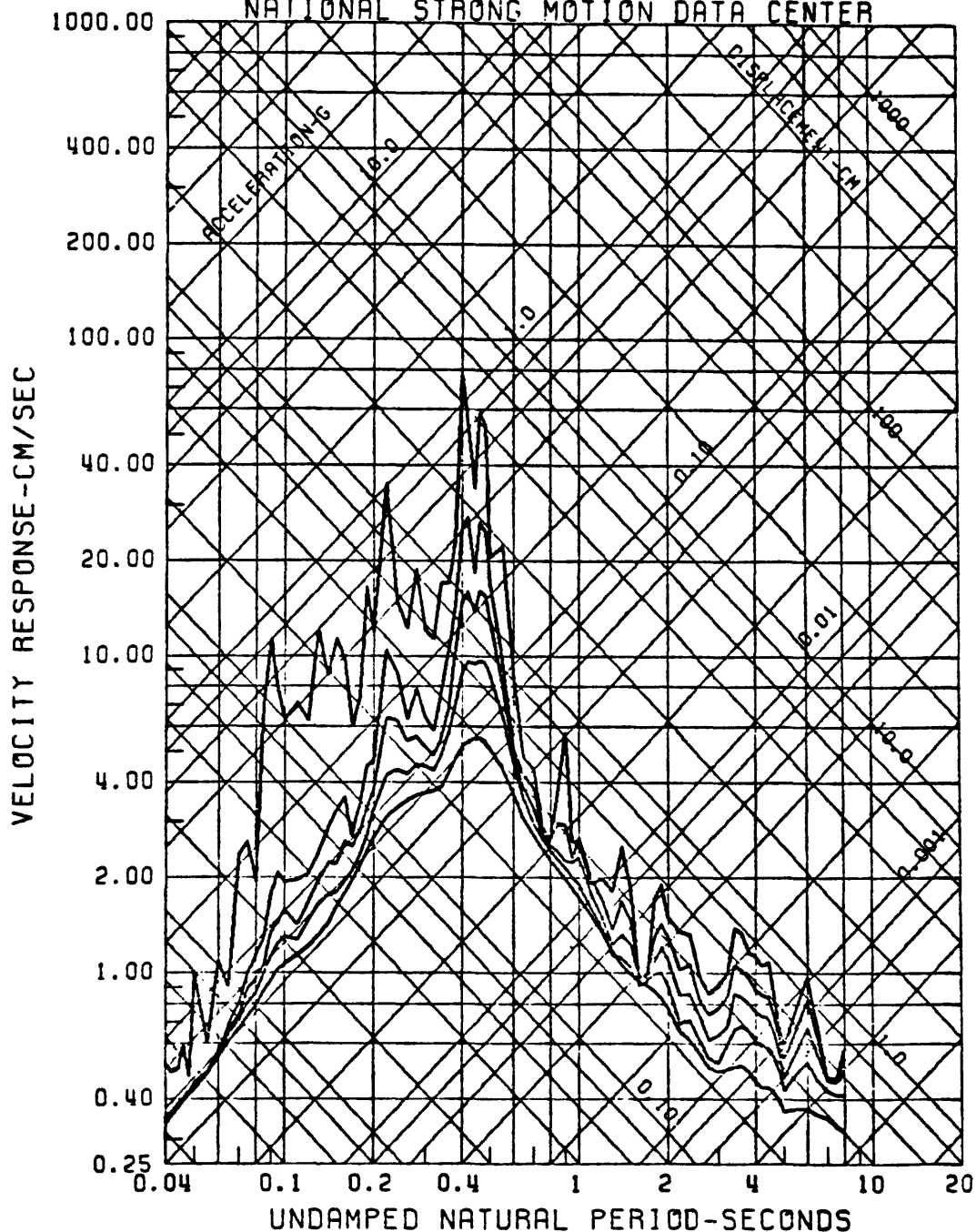
RESPONSE SPECTRA  
 BATO BRIDGE, PAPUA NEW GUINEA, 3/18/83, 0905 UTC UP  
 0, 2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.200 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



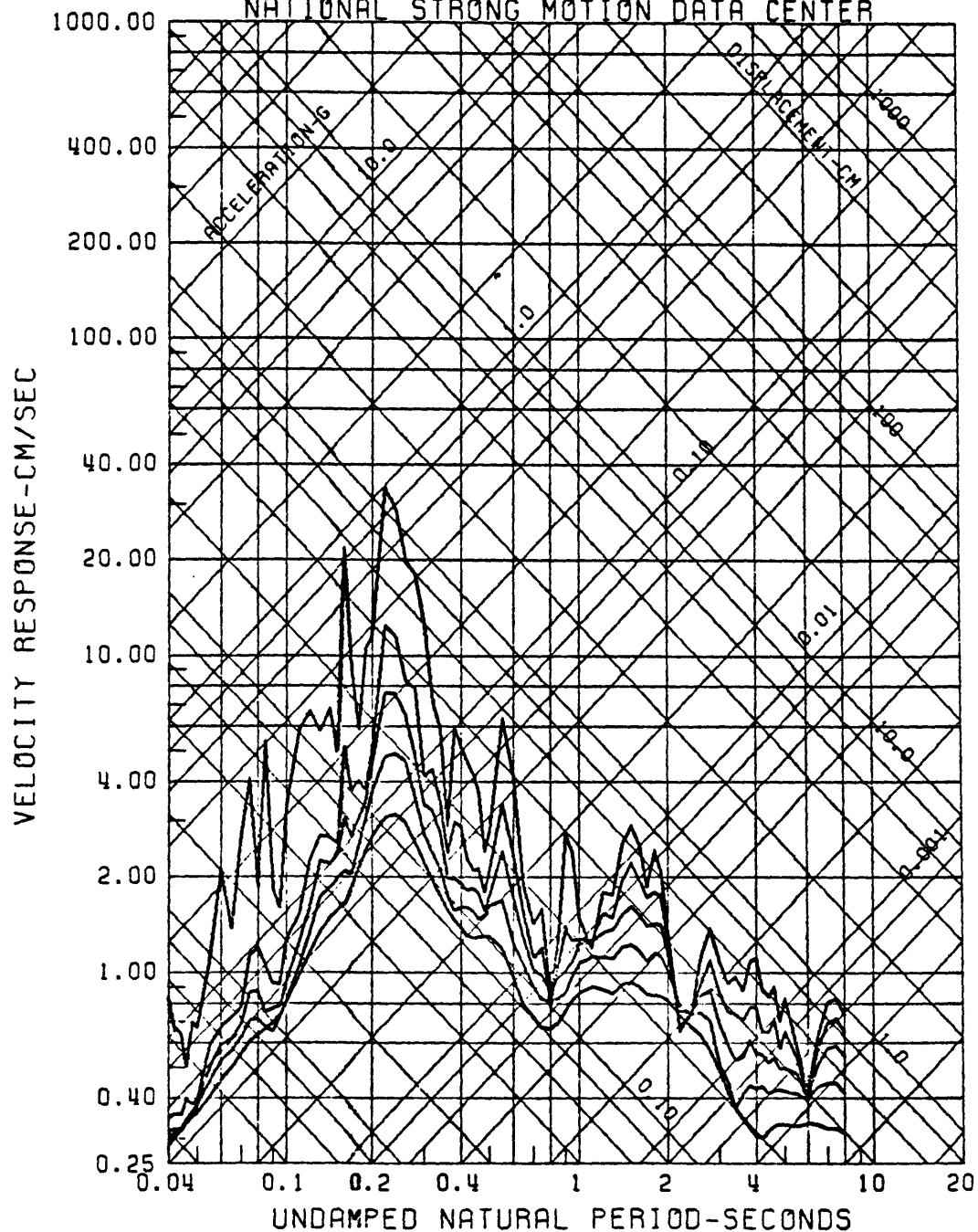
RESPONSE SPECTRA  
 BATO BRIDGE, PAPUA NEW GUINEA, 3/18/83, 0905UTC TRAN.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.200 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



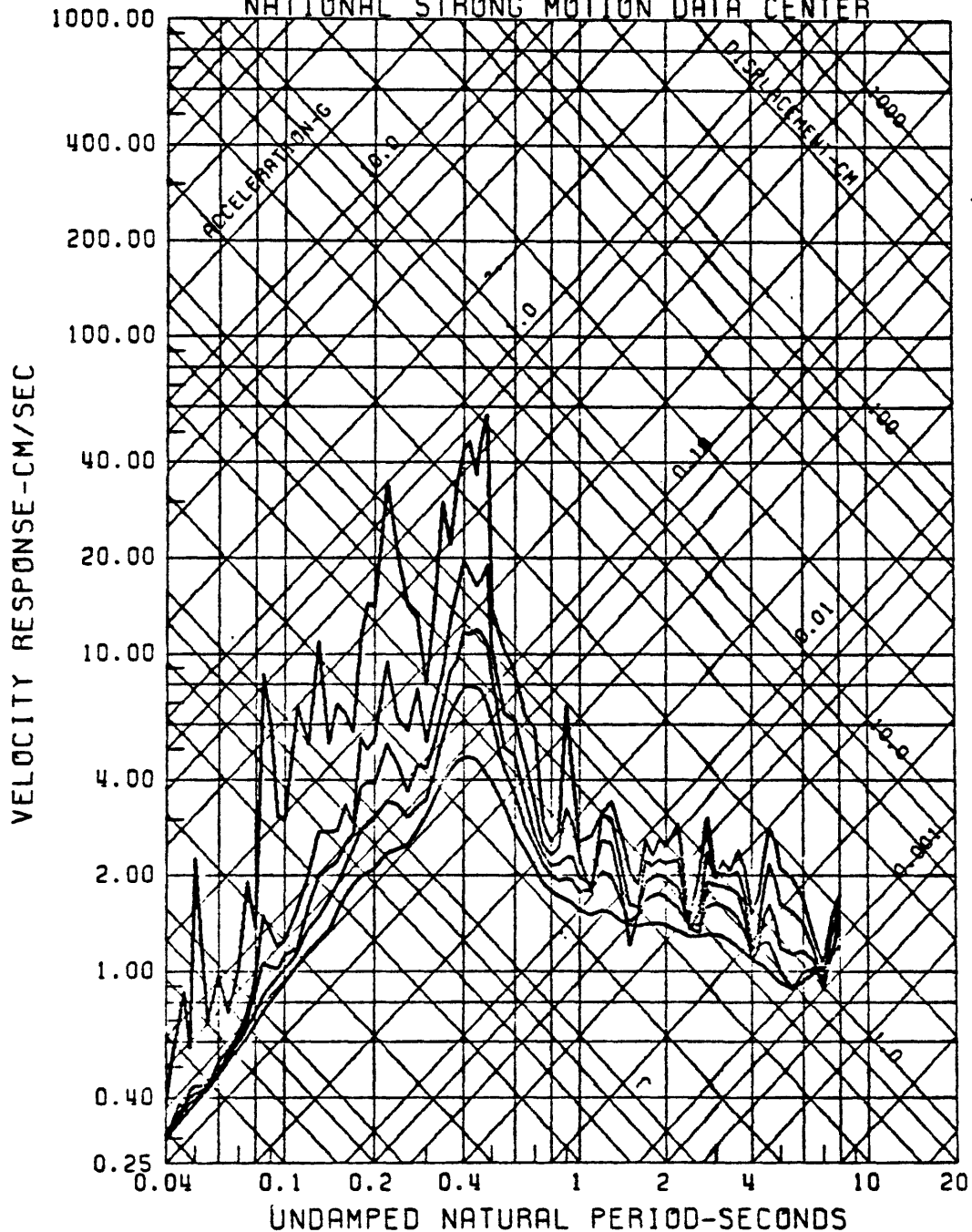
RESPONSE SPECTRA  
 BVE 80, PAPUA NEW GUINEA, 3/18/83, 0905UTC LONG.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



RESPONSE SPECTRA  
 BVE 80, PAPUA NEW GUINEA, 3/18/83, 0905 UTC UP  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



RESPONSE SPECTRA  
 BVE 80, PAPUA NEW GUINEA, 3/18/83, 0905 UTC TRAN.  
 0.2, 5, 10, 20 PERCENT CRITICAL DAMPING  
 FILTERS: BUTTERWORTH, ORDER 4, 0.125 HZ; ANTIALIAS 50 - 100 HZ  
 NATIONAL STRONG MOTION DATA CENTER



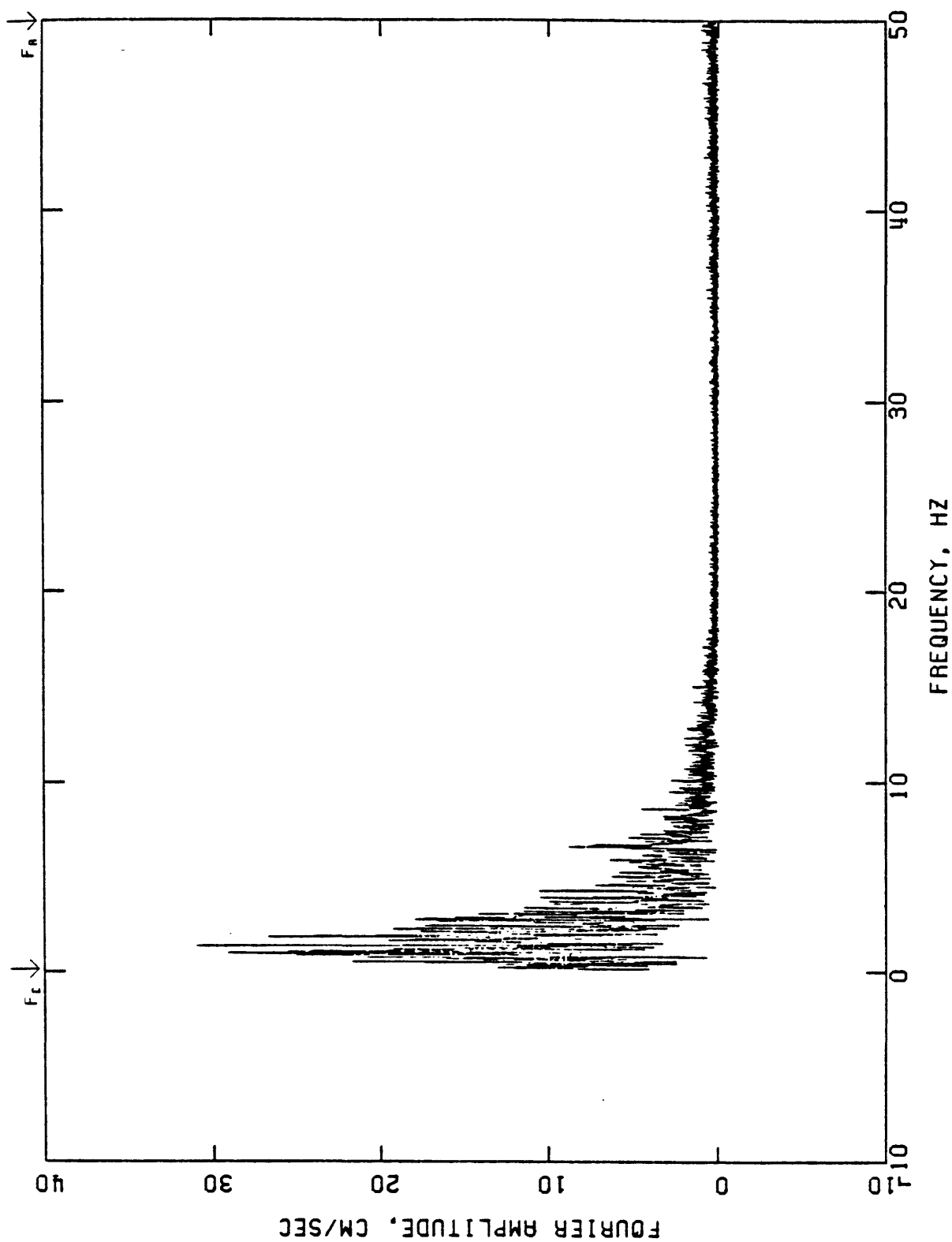


FIGURE  
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
ARAWA TOWN, PAPUA NEW GUINEA  
LONG.  
EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.125 HZ ORDER 4  
DATA BAND PASSED FROM 0.13 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONOISE.



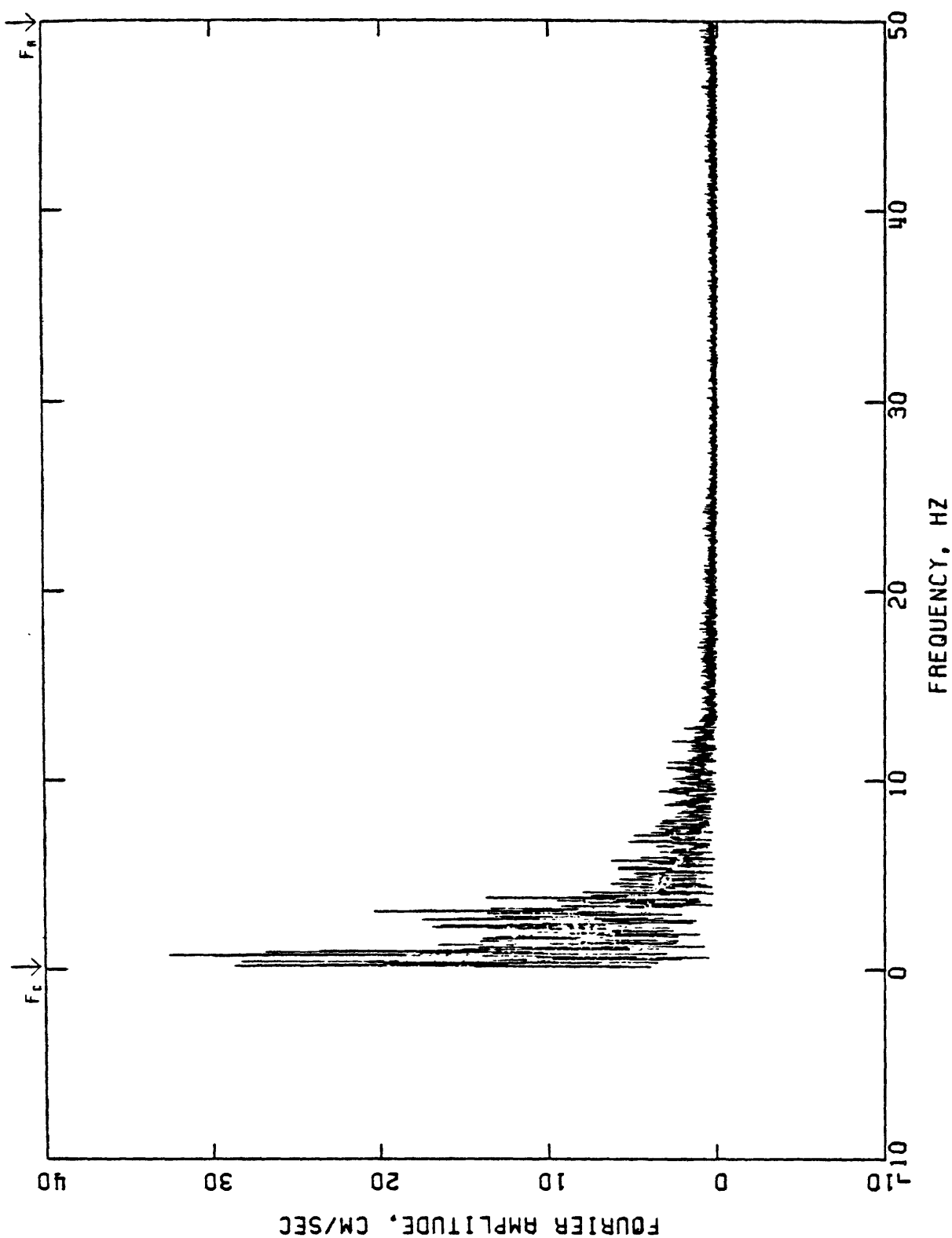


FIGURE  
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
ARAWA TOWN, PAPUA NEW GUINEA  
EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.125 HZ ORDER 4  
DATA BAND PASSED FROM 0.13 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONOISE.

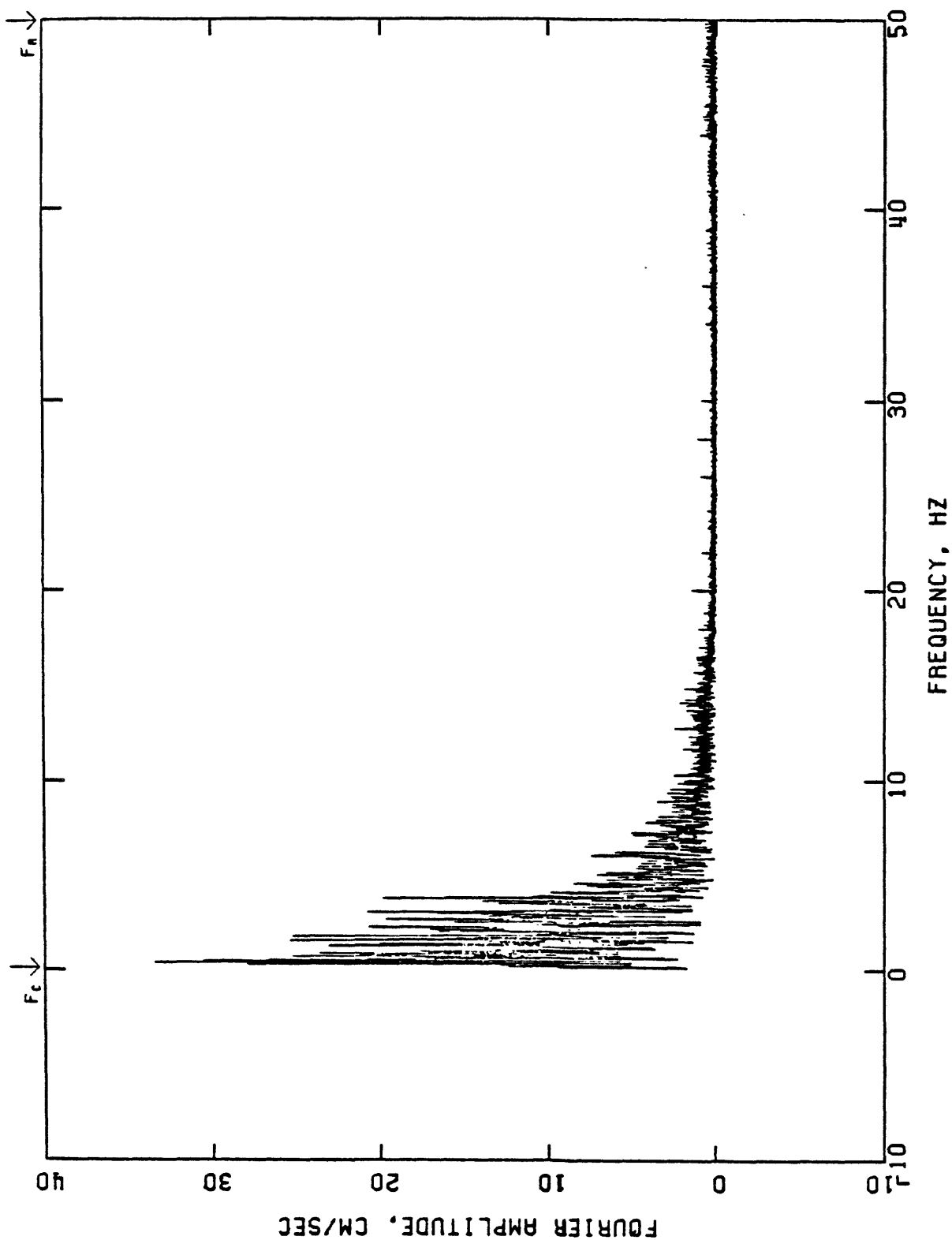


FIGURE  
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
ARAWA TOWN, PAPUA NEW GUINEA  
TRAN.  
EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.125 HZ ORDER 4  
DATA BAND PASSED FROM 0.13 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONOISE.

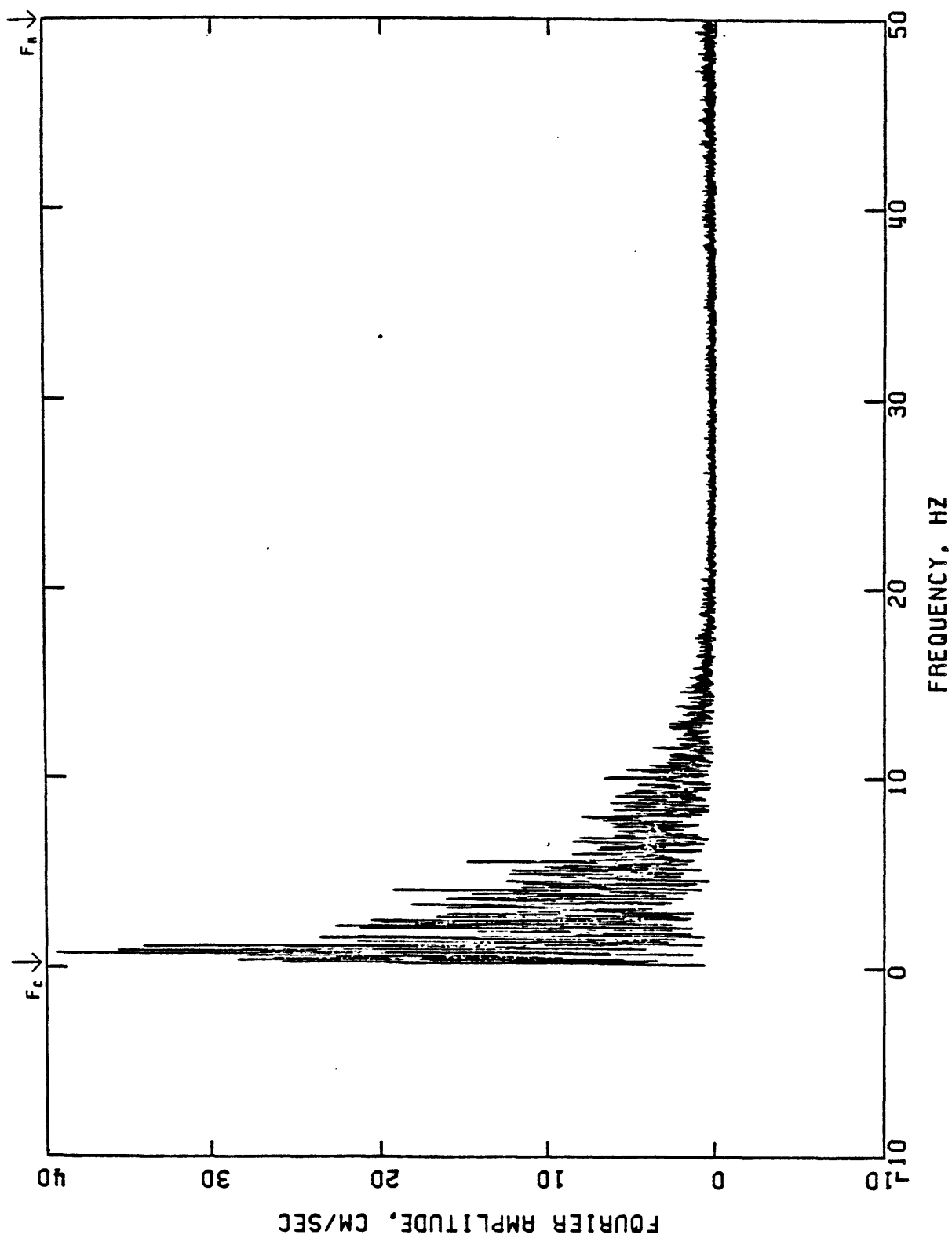
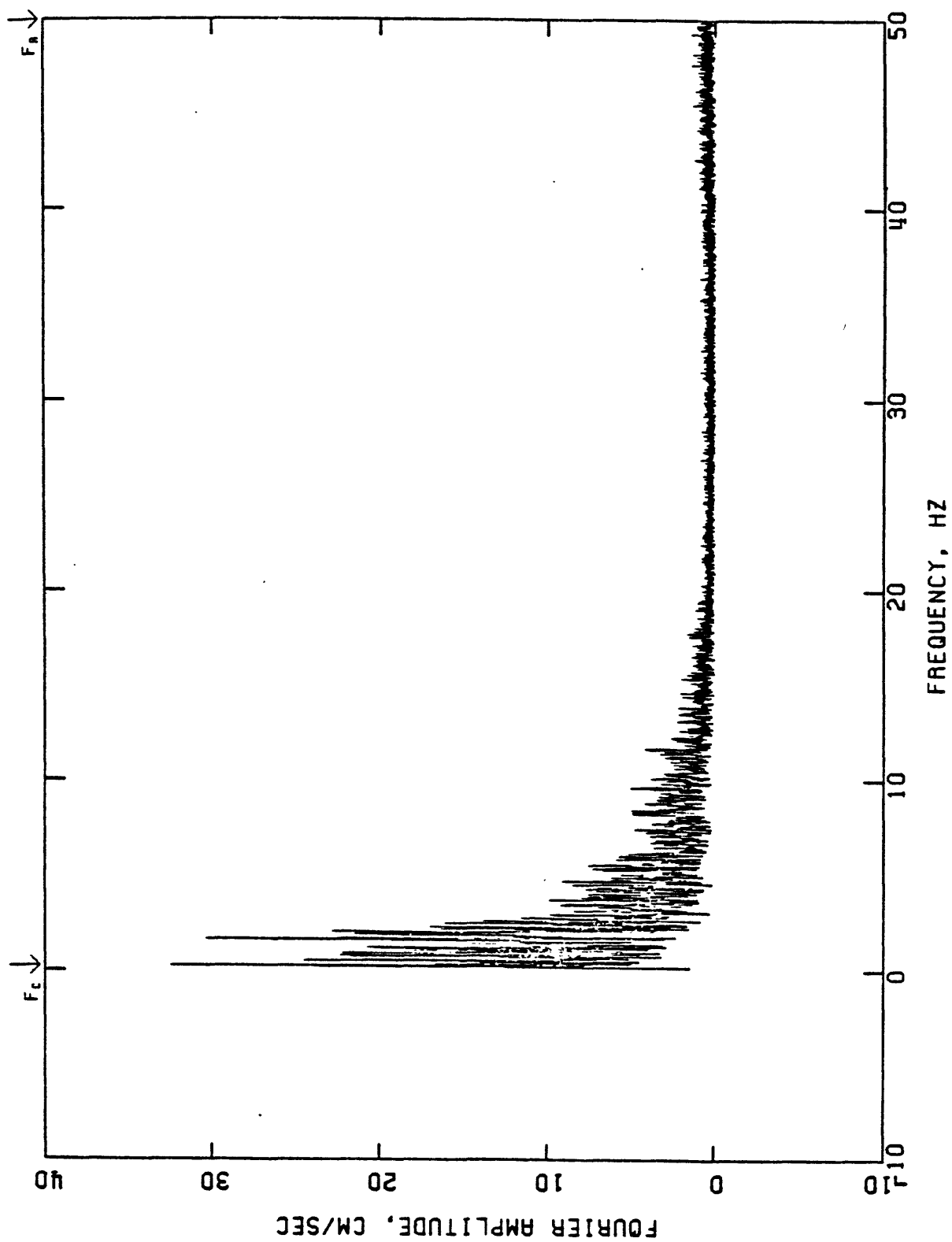


FIGURE  
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
BATO BRIDGE, PAPUA NEW GUINEA  
LONG.  
EARTHQUAKE OF MARCH 18, 1983, 0905 UTC  
BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4  
DATA BAND PASSED FROM 0.20 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONOISE.



FIGURE

FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.

BATO BRIDGE, PAPUA NEW GUINEA

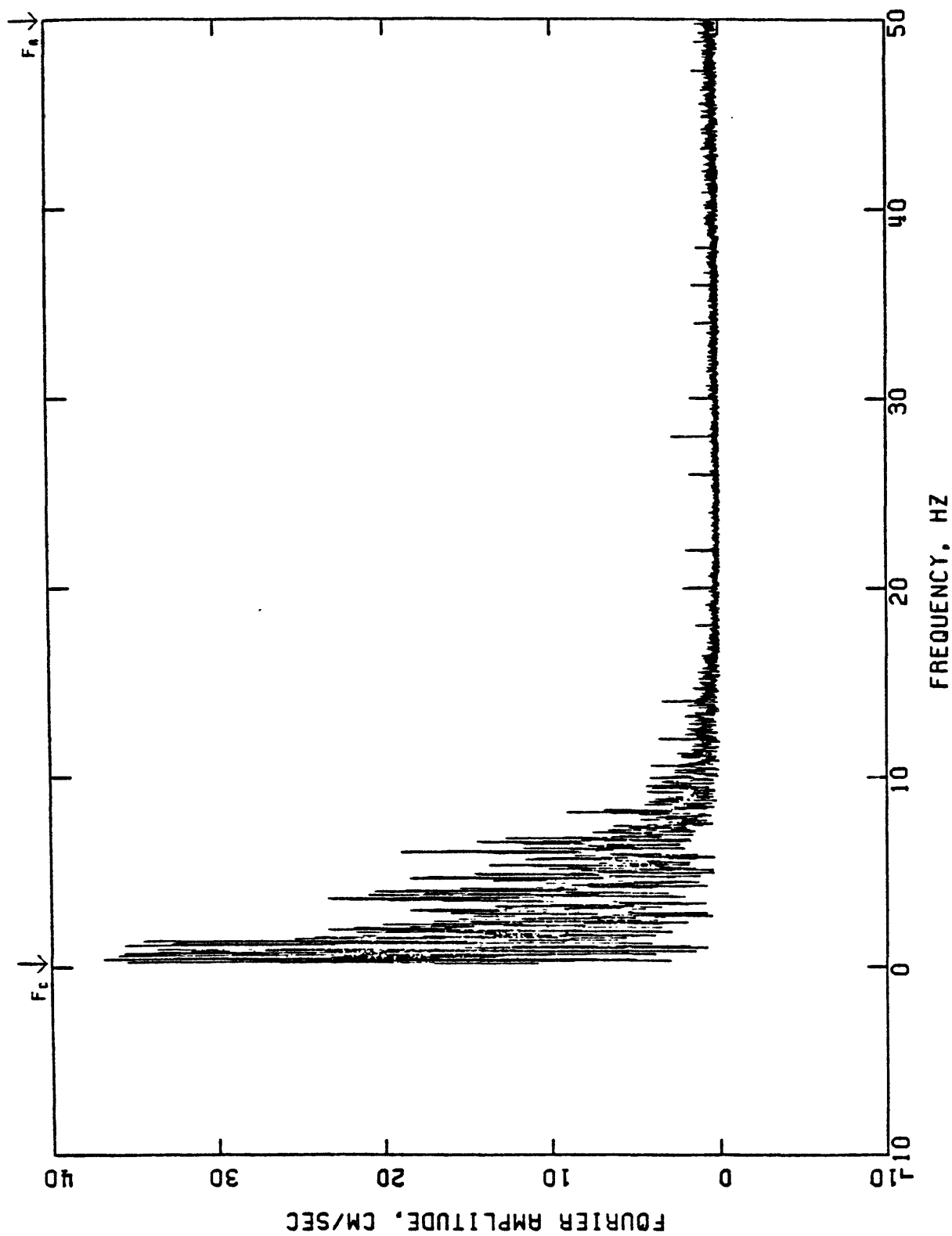
VERT.

EARTHQUAKE OF MARCH 18, 1983 0905 UTC

BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

DATA BAND PASSED FROM 0.20 TO 50.00 HZ.

COMPUTING OPTIONS= ZCROSS, NONOISE.



FIGURE

FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.

BATO BRIDGE, PAPUA NEW GUINEA

TRAN, EARTHQUAKE OF MARCH 18, 1983 0905 UTC

BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4

DATA BAND PASSED FROM 0.20 TO 50.00 HZ.

COMPUTING OPTIONS= ZCROSS, NONOISE.

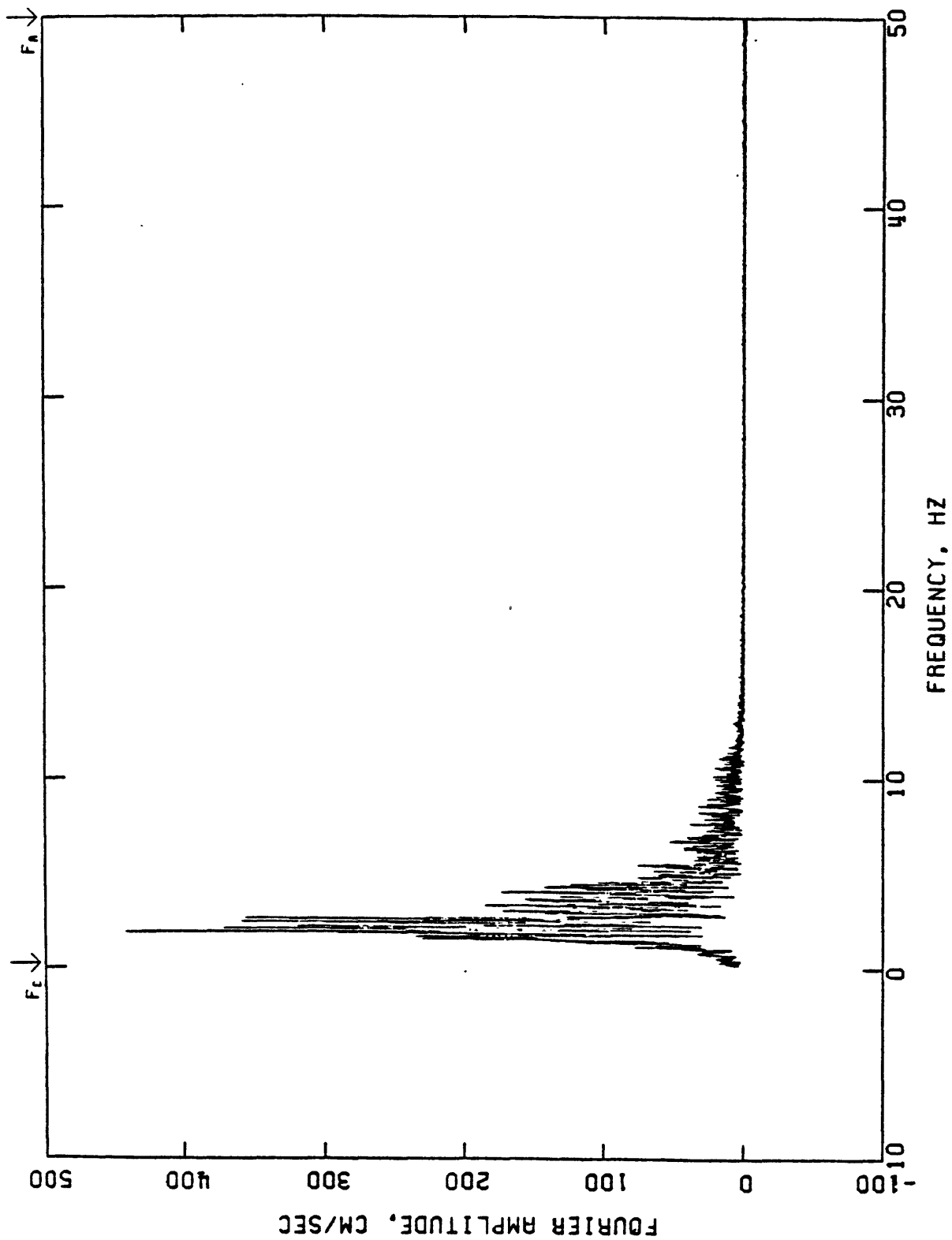


FIGURE  
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
BVE 80, PAPUA NEW GUINEA  
LONG  
EARTHQUAKE OF MARCH 18, 1983, 0905 UTC  
BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4  
DATA BAND PASSED FROM 0.20 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONNOISE.

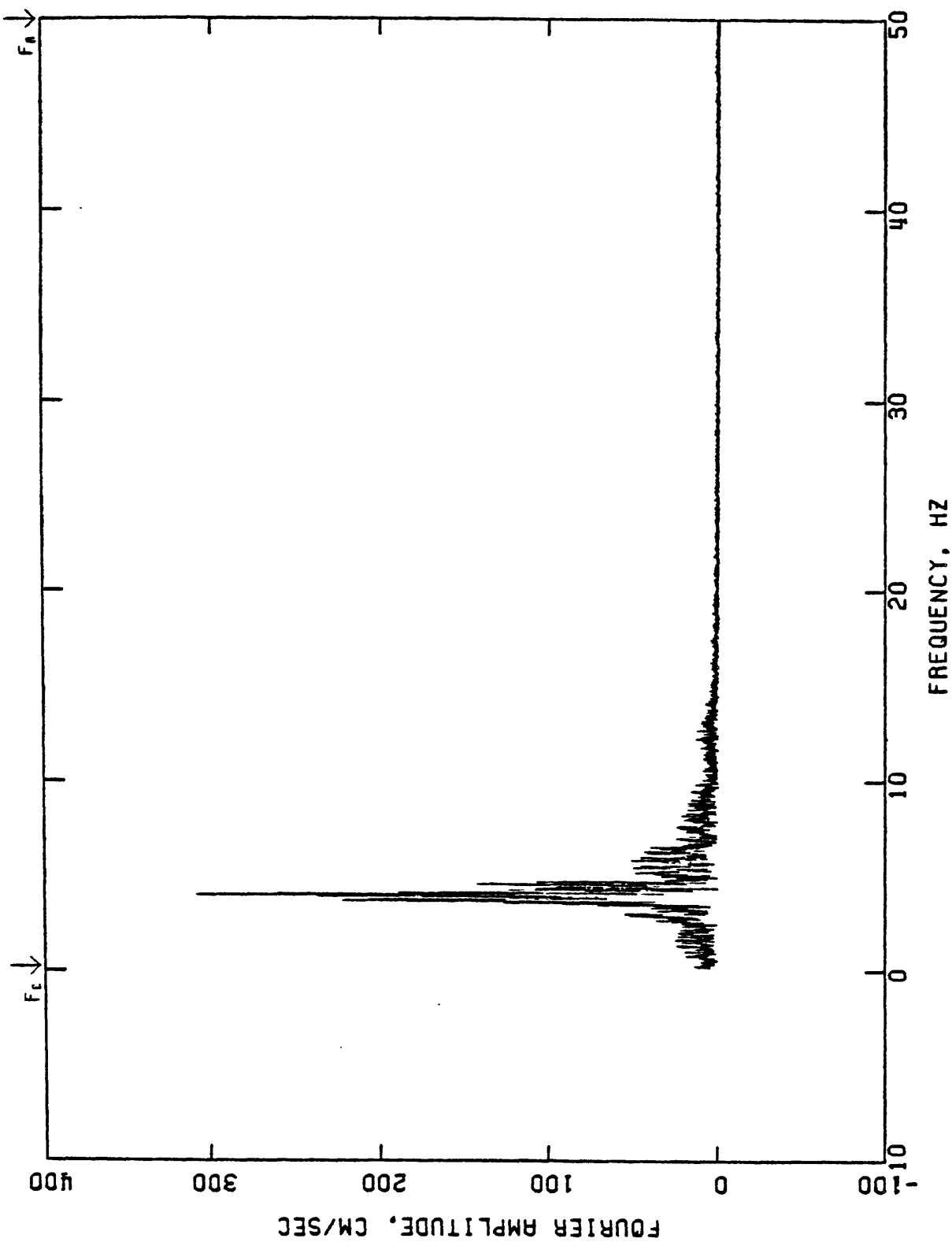


FIGURE  
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
BVE 80, PAPUA NEW GUINEA  
VERT. EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4  
DATA BAND PASSED FROM 0.20 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONOISE.

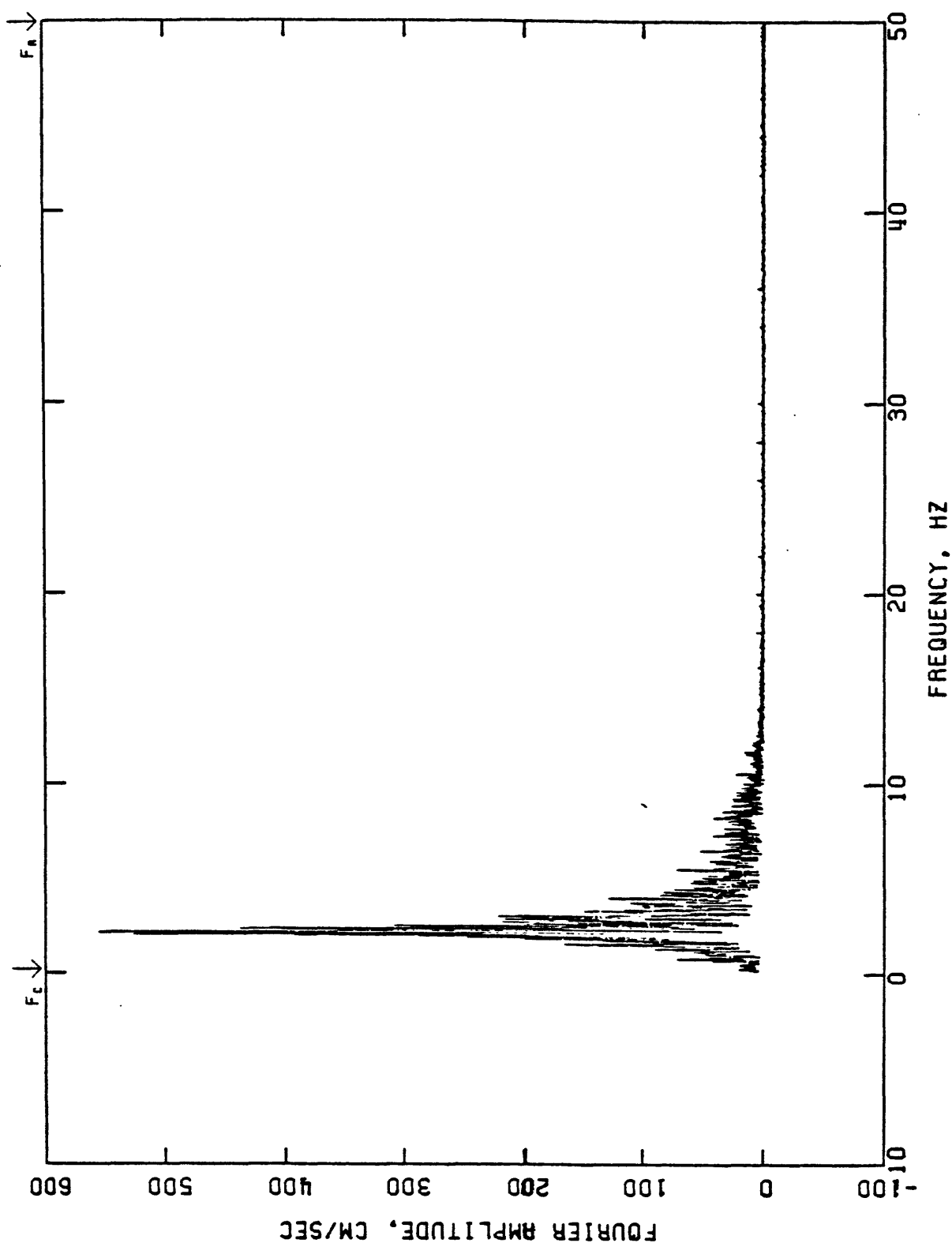
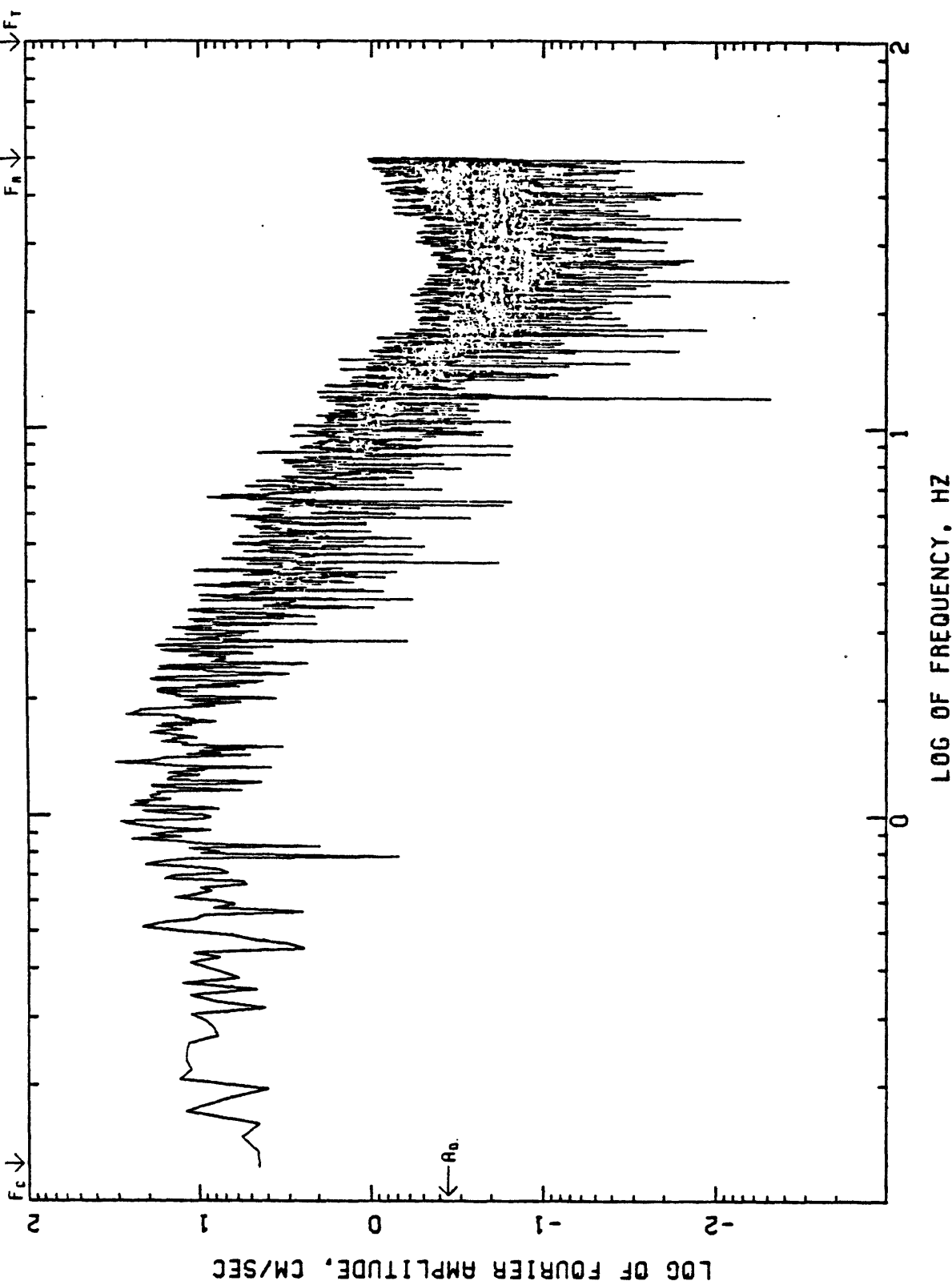


FIGURE  
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
BVE 80, PAPUA NEW GUINEA  
TRAN.  
EARTHQUAKE OF MARCH 18, 1983, 0905 UTC  
BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4.  
DATA BAND PASSED FROM 0.20 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONOISE.





FIGURE

LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.

ARAWA TOWN, PAPUA NEW GUINEA

LONG

EARTHQUAKE OF MARCH 18, 1983 0905 UTC

BUTTERWORTH FILTER AT 0.125 HZ ORDER 4

DATA BAND PASSED FROM 0.13 TO 50.00 HZ.

COMPUTING OPTIONS= ZCROSS, NONOISE.

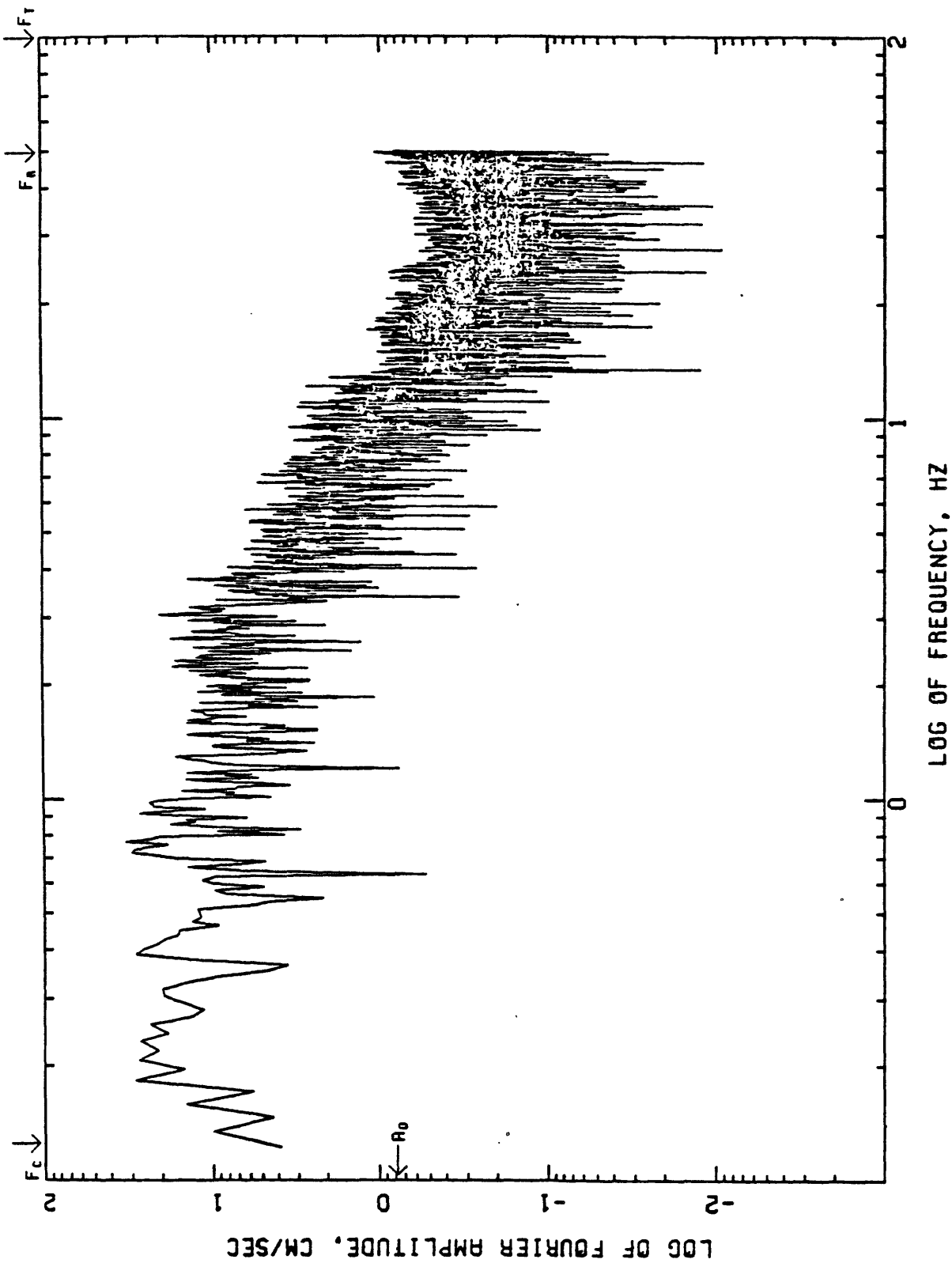


FIGURE  
 LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
 ARAWA TOWN, PAPUA NEW GUINEA  
 VERT. EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.125 HZ, ORDER 4  
 DATA BAND PASSED FROM 0.13 TO 50.00 HZ.  
 COMPUTING OPTIONS= ZCROSS, NONOISE.

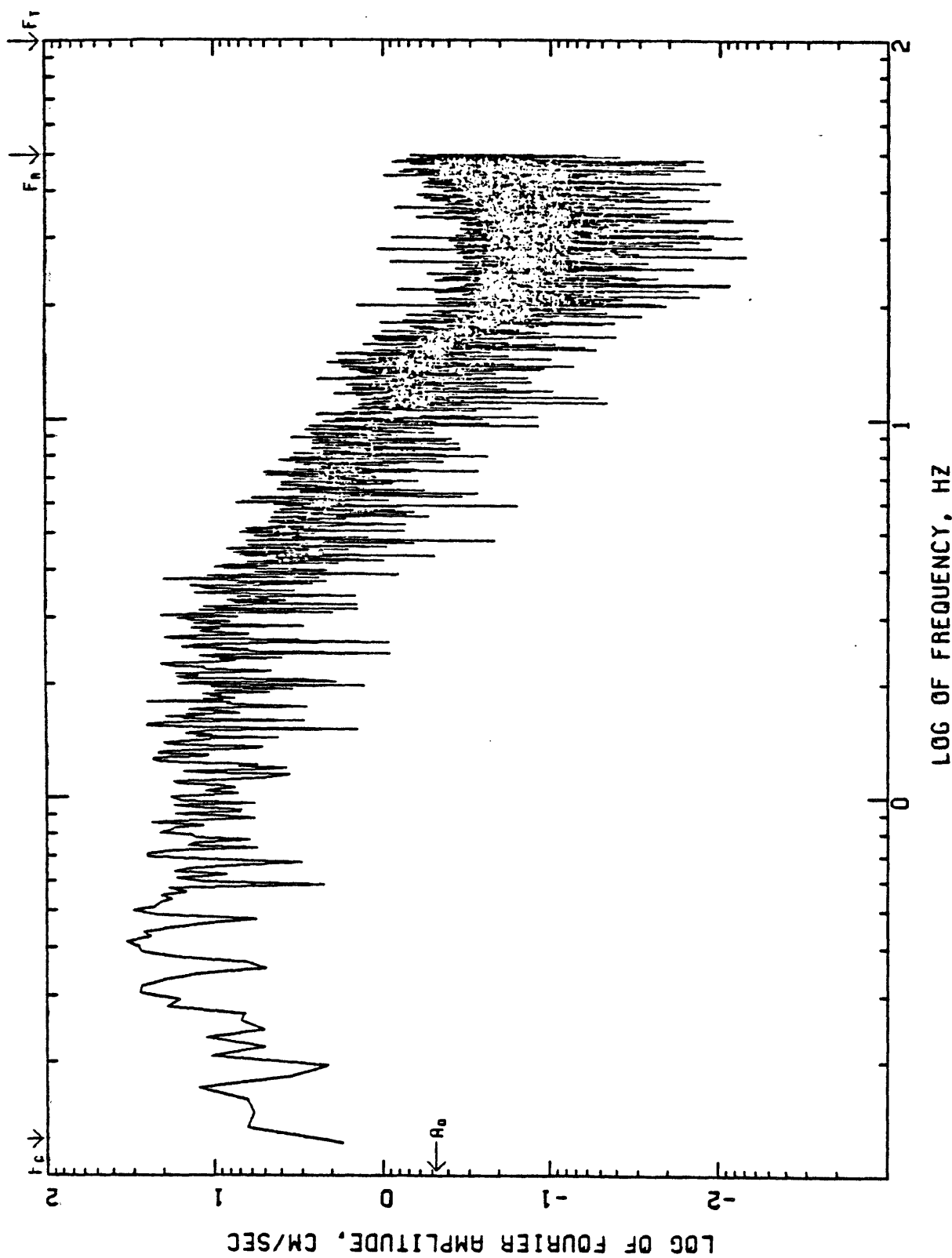
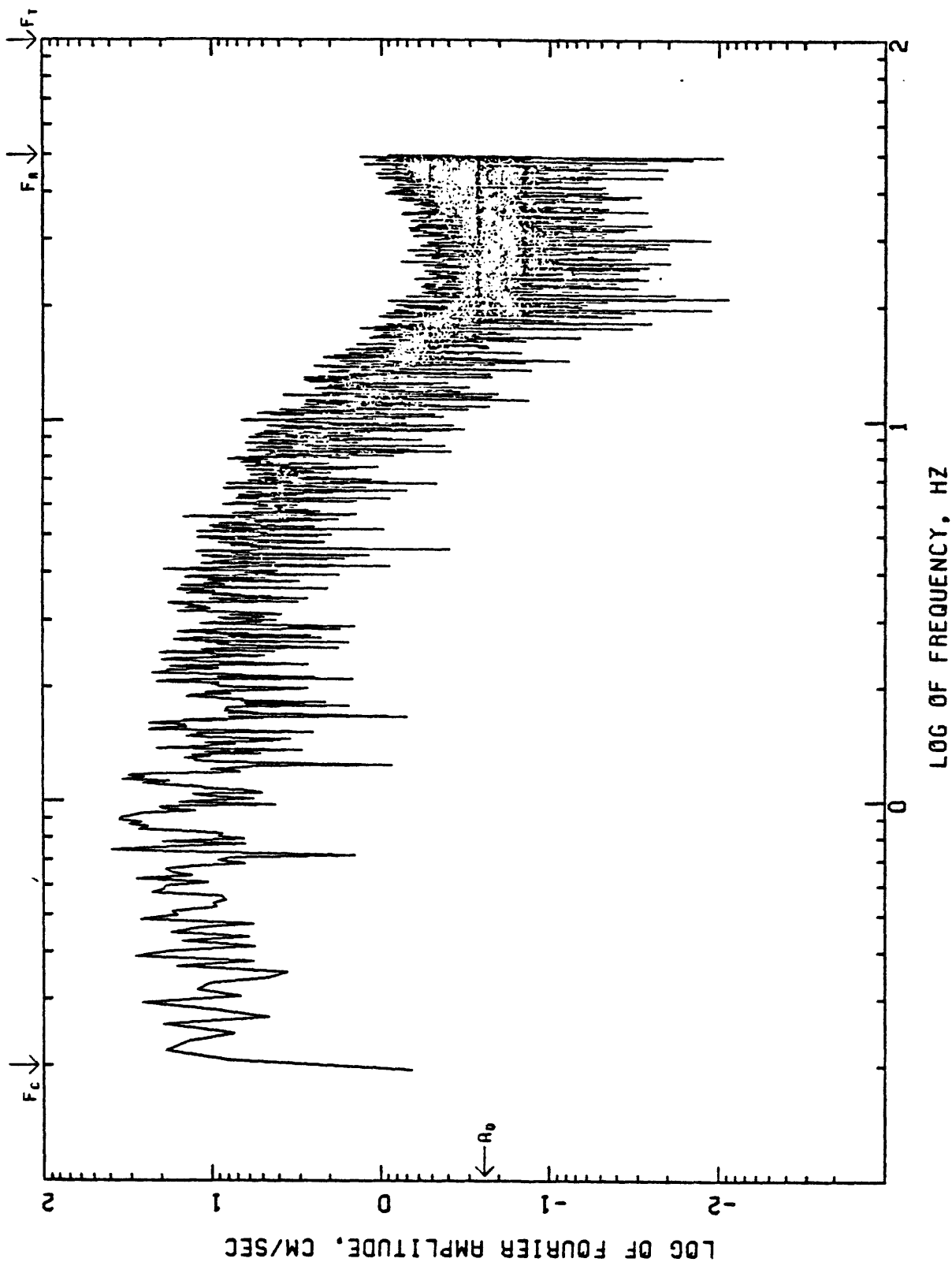


FIGURE  
 LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
 ARAWA TOWN, PAPUA NEW GUINEA  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.125 HZ ORDER 4  
 DATA BAND PASSED FROM 0.13 TO 50.00 HZ.  
 COMPUTING OPTIONS= ZCROSS, NONOISE.



FIGURE

LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
 BATO BRIDGE, PAPUA NEW GUINEA  
 LONG.  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4  
 DATA BAND PASSED FROM 0.20 TO 50.00 HZ.  
 COMPUTING OPTIONS= ZCROSS, NONOISE.

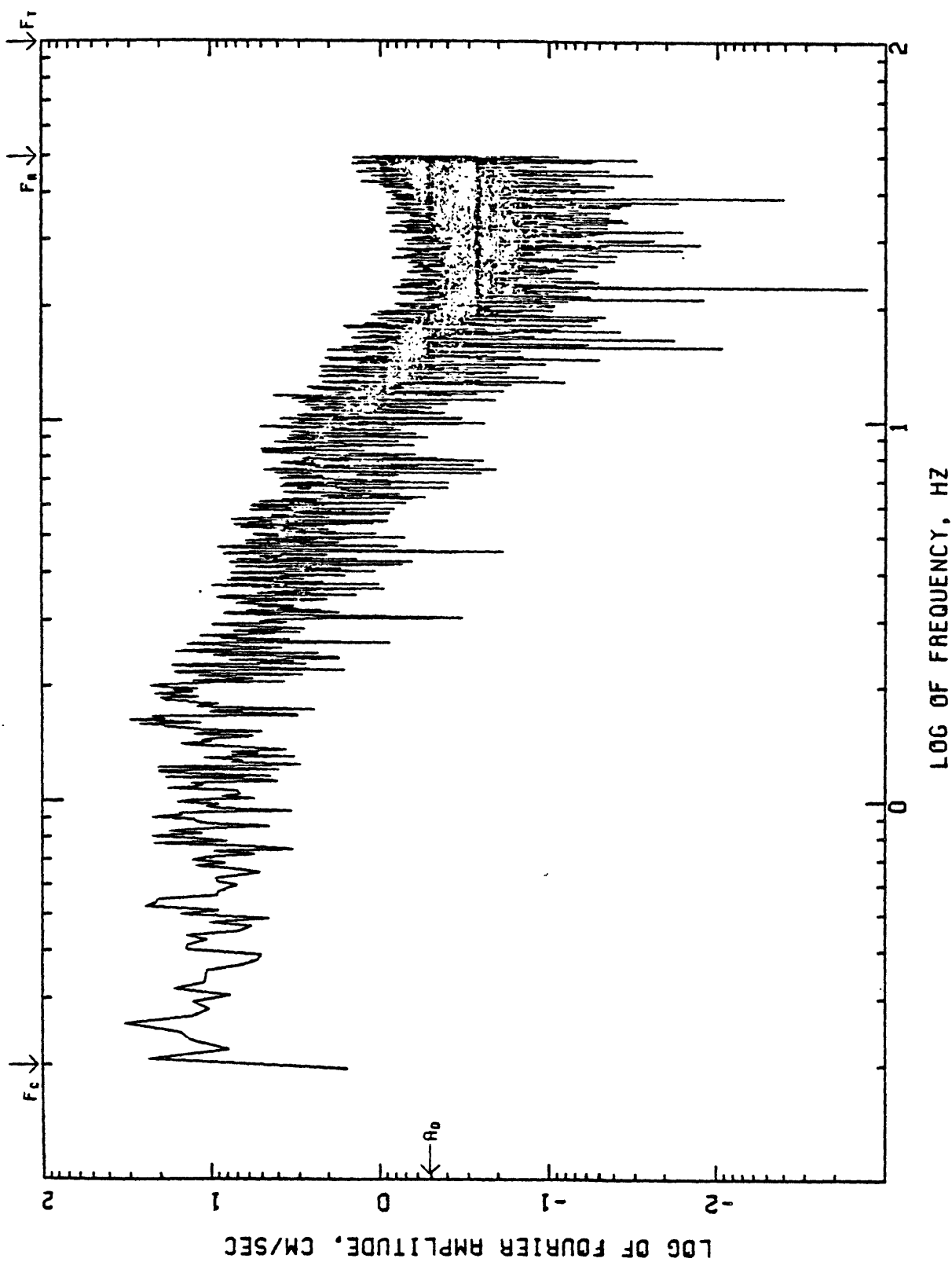


FIGURE  
LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
BATO BRIDGE, PAPUA NEW GUINEA  
VERT. EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4  
DATA BAND PASSED FROM 0.20 TO 50.00 HZ.  
COMPUTING OPTIONS= 2CROSS, NONOISE.

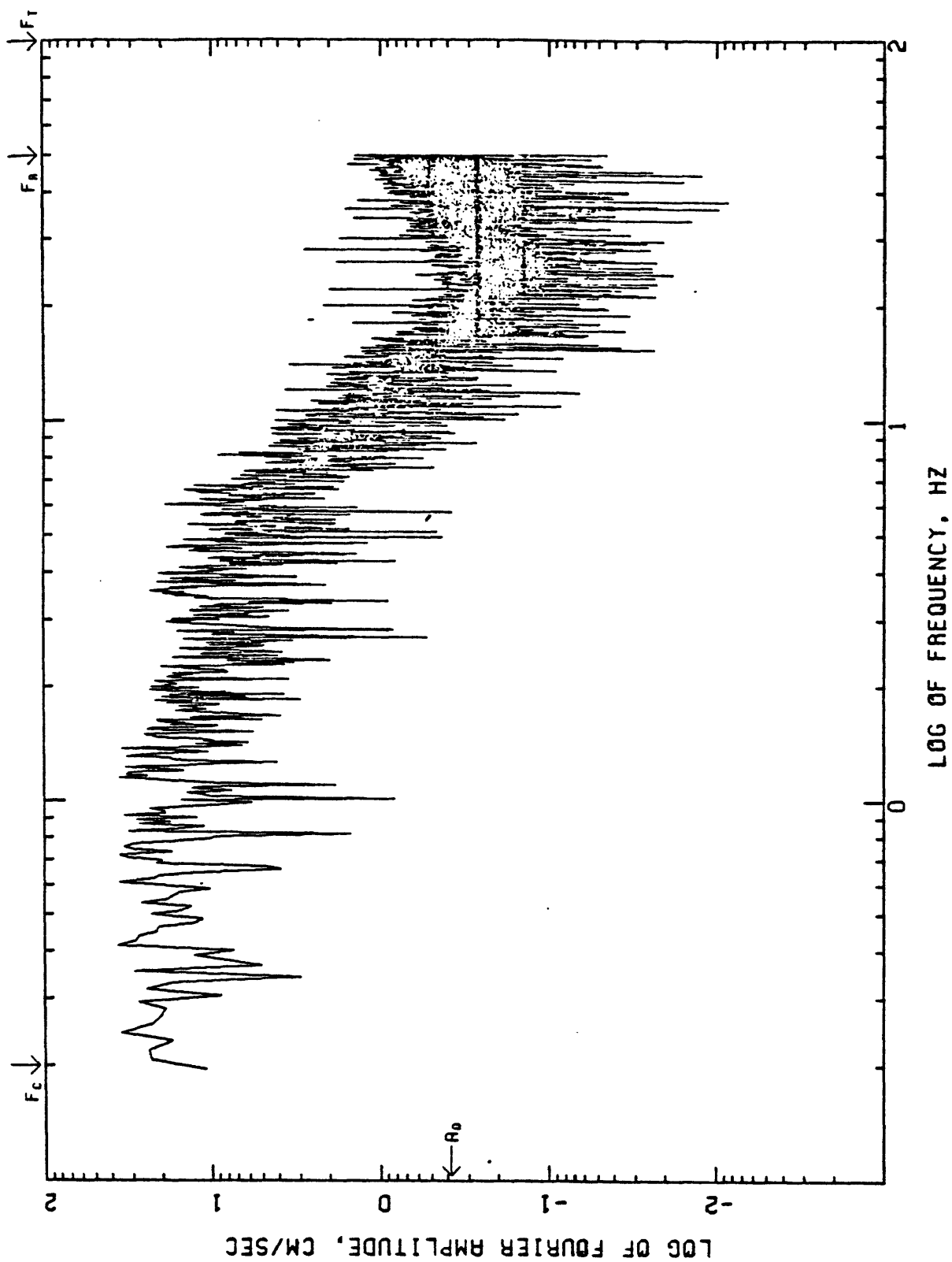


FIGURE  
 LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
 BATO BRIDGE, PAPUA NEW GUINEA  
 TRAN.  
 EARTHQUAKE OF MARCH 18, 1983, 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4  
 DATA BAND PASSED FROM 0.20 TO 50.00 HZ.  
 COMPUTING OPTIONS= ZCROSS, NONOISE.

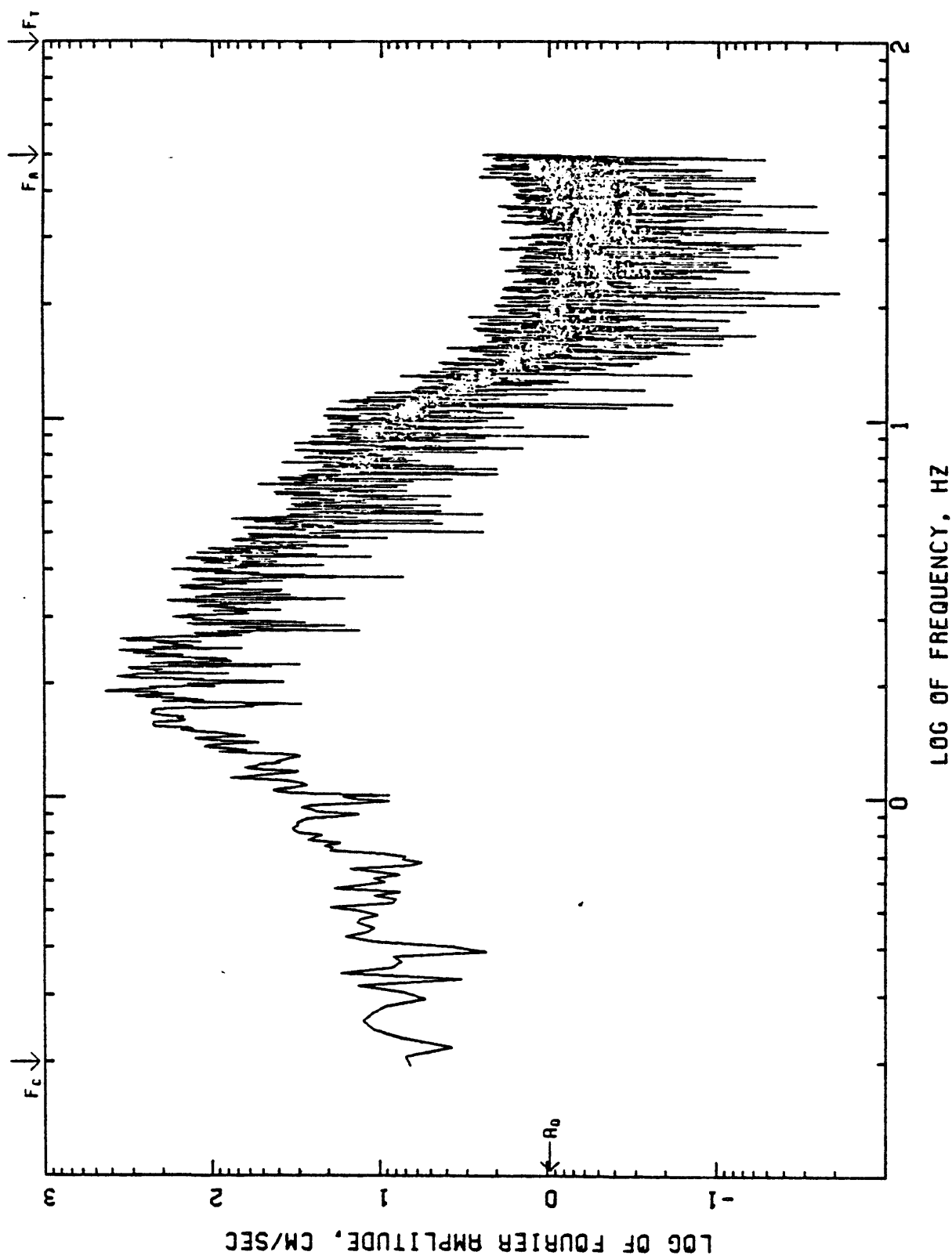


FIGURE  
 LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
 BVE 80, PAPUA NEW GUINEA  
 LONG  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4  
 DATA BAND PASSED FROM 0.20 TO 50.00 HZ.  
 COMPUTING OPTIONS= ZCROSS, NONOISE.

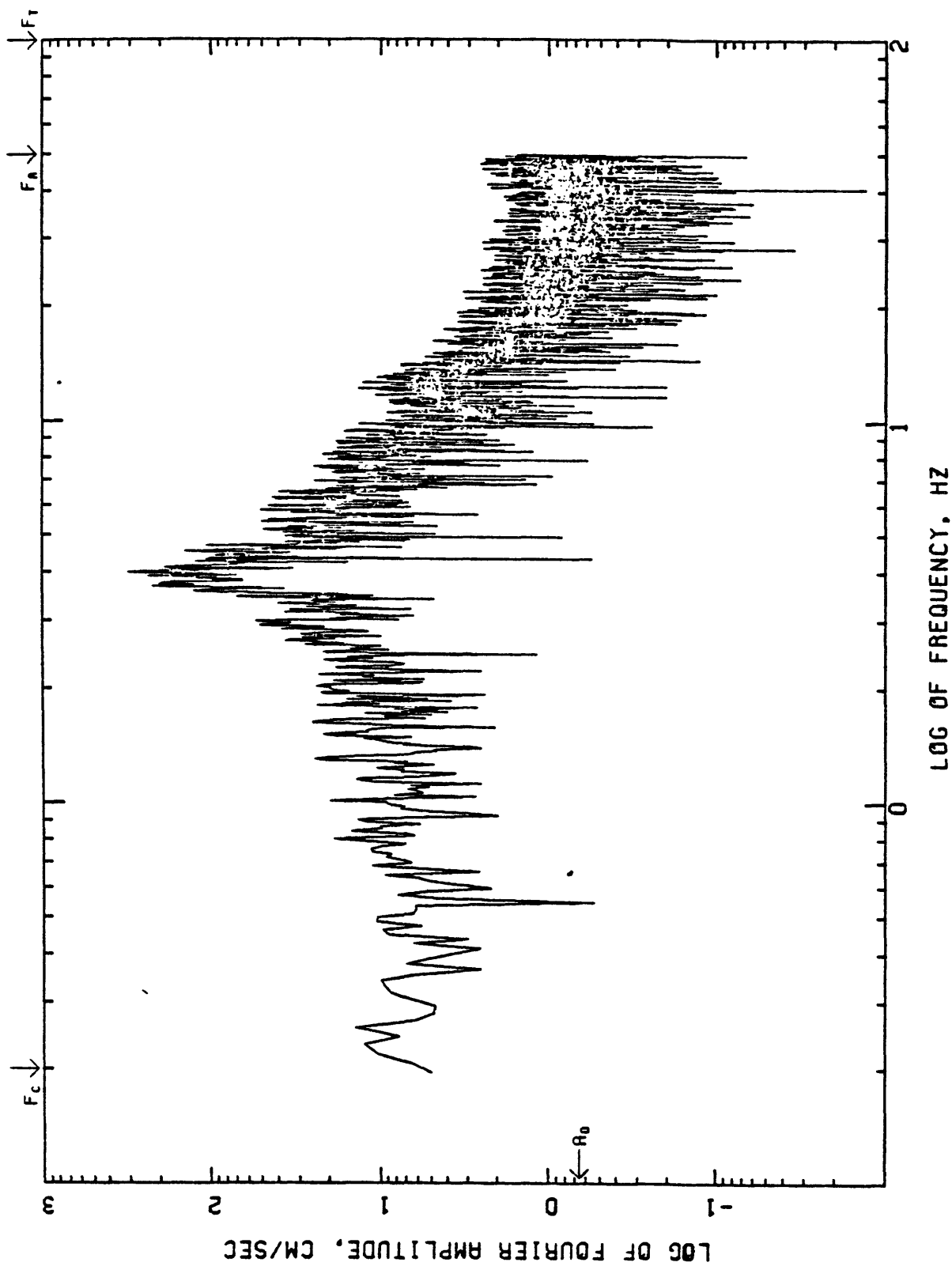


FIGURE  
LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
BVE 80, PAPUA NEW GUINEA  
VERT  
EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4  
DATA BAND PASSED FROM 0.20 TO 50.00 HZ.  
COMPUTING OPTIONS= ZCROSS, NONOISE.



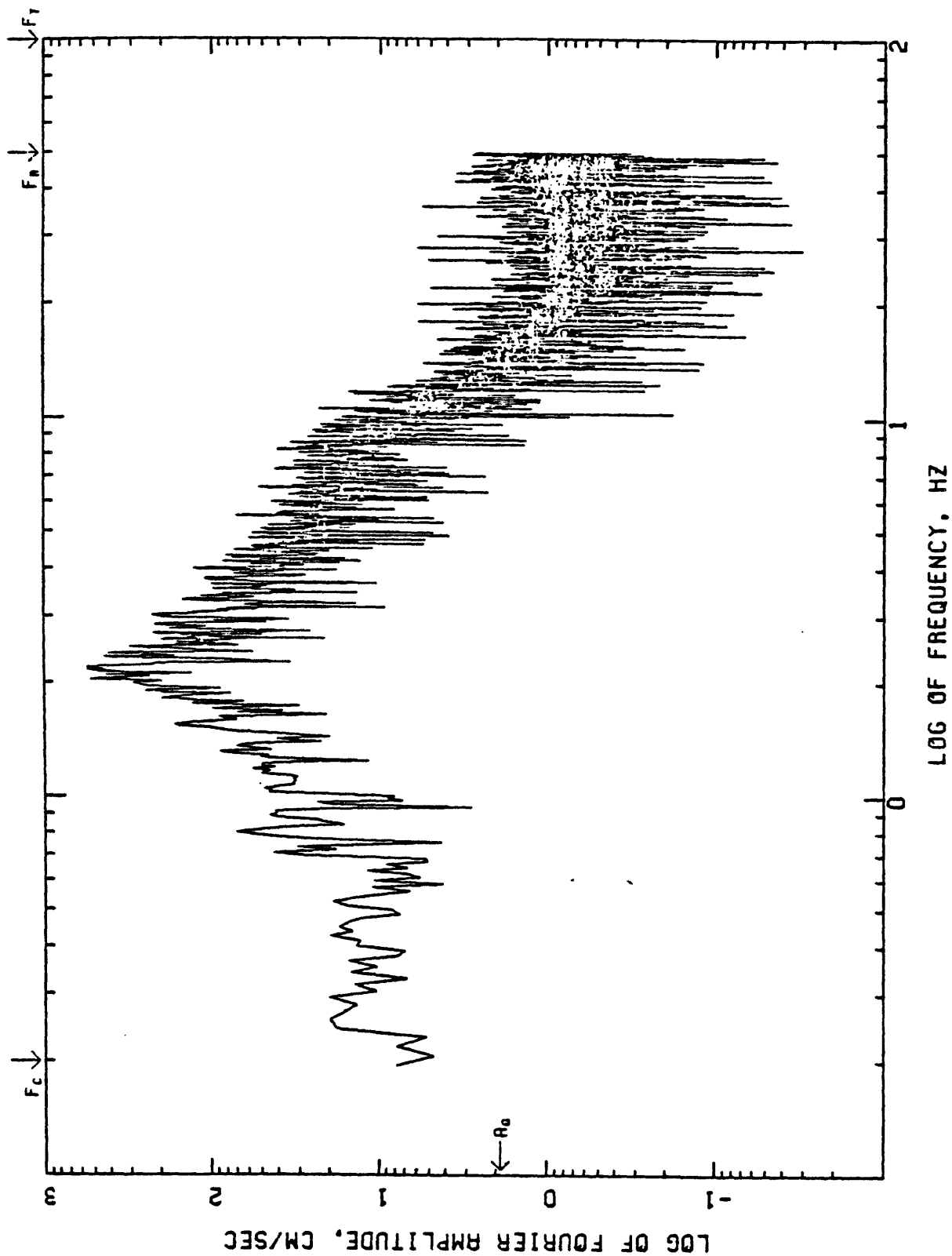


FIGURE  
 LOG-LOG FOURIER AMPLITUDE SPECTRUM OF ACCELERATION.  
 BVE 80, PAPUA NEW GUINEA  
 TRAN.  
 EARTHQUAKE OF MARCH 18, 1983 0905 UTC  
 BUTTERWORTH FILTER AT 0.20 HZ, ORDER 4  
 DATA BAND PASSED FROM 0.20 TO 50.00 HZ.  
 COMPUTING OPTIONS= ZCROSS, NONOISE.