Seismological Bulletin of Syowa Station, Antarctica,

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1. Introduction

For the previous ten years, seismograms at Syowa Station
were recorded on a microfilm.   The microfilms were developed
everyday at the station and the arrival times of clear phases
from world-wide earthquakes were read.   The read-out data were
sent to the Environmental Research Laboratories throughout the
wintering period.   The maintenance of the system is rather a
hard work for only one member of JARE (Japanese Antarctic
Research Expedition) who is also responsible for the maintenance
of other geophysical observation systems such as all-sky camera
and flux-gate magnetometer.   On the other hand, the recording
system of world-wide seismic network has been replacing from the
analog type to the digital type in order to supply computer
compatible data for the detailed study of earthquakes.   A new
seismic observation system was introduced on the above two
backgrounds to Syowa Station in February 1980 by JARE-21.
The sensors and their locations were not replaced and only
recording system was replaced in 1980.

The co-ordinates of seismographic vault are 69°00'31.7"S in
latitude and 39°35'31.6"E in longitude.   The elevation is 20 m
above the mean sea level.   There are two types of seismographs,

one called HES (Hagiwara's Electric Seismograph) with the natural-period of 1 second (short period), and the other called Press-Ewing with the natural-period of 15-20 seconds (long period). The outline of the introduced system is illustrated in Fig. 1. The long-period seismographs and the corresponding pre-filter-amplifiers in Fig. 1 were in performance tests and the obtained data are not described here. The detailed reports on the design and the performance of the introduced system will be given later.

2. Data

The over-all frequency response and the magnification of the short-period seismographs (Z and E-W components) is shown in Fig. 2. As for N-S component, the magnification is as half as that of Z and E-W components. The system clock in Fig. 1 was calibrated by the recovered UTC from the altered 400 MHz (one wave) NNSS receiver, Shibuya and Kaminuma (1982), and the absolute accuracy of 0.1 second for the obtained data is maintained from April 1 to December 31, 1980. Considering the delay time of 1-2 years between the publication of this report and the observing wintering period, which is inevitable from the restriction of transport between Tokyo and Syowa Station, PDE reports by NEIS are referenced and the local events around Syowa Station are not described in this report.

2.1. Read-out data

The seismograms in January were recorded on a microfilm by JARE-20 and the onset of clear phases were re-read by Ms. Kokubun and Mr. Sakai. They are listed in Table 1. The onset

of the events after January was detected from the pen-monitor
records.   Figure 3 shows examples of pen-monitor records of
the Z component seismograph (4-mm/s pen-speed).   The onset
time of tele-seismic P-arrivals was read by K. Shibuya and
listed in Table 1.   Symbols E and I in phase column denote
weak and sharp onsets, respectively.   The direction of ground
motion is denoted by + for upward direction and - for downward
direction.   Arrival time is in UTC.

2.2.   Digital data in a 9-track computer compatible tape

One of the main reason for the introduction of the new
seismic observation system to Syowa Station is the digital
data acquisition of tele-seismic wave forms in a large computer
compatible 9-track tape.   Amplified seismic signals are analog-
to-digital converted with the sampling rate of 10 points per
second.   The relation between the input voltage to the computer
and the hexadecimal number is given in Table 2.   The data
acquisition system is controlled by the event-triggering method
of STA/LTA ratio (Peterson *et al.*, 1976) which is programmed in
a micro-computer.   The obtained original data consists of 10
volumes of 2400 ft (1600 bpi) magnetic tape and the tele-
typewriter message of the triggered events (see an example in
Fig. 4).   The original tapes are compiled by considering the
PDE reports and edited into one volume of Non Label tape for
the user.   The edited tape contains tele-seismic wave forms of
91 events detected at Syowa Station and one calibration
curve.   The 91 events are listed in Table 3 and their locations
are mapped in Fig. 5.   The data on an edited tape has a block

structure.   The tape format is specified as follows:

(1)   Volume constitution of the edited tape is specified in Fig. 6-1.

(2)   The data structure in Fig. 6-1 is specified in Fig. 6-2.

(3)   Header of the event in Fig. 6-2 is specified in Fig. 6-3. Numerals in content column are written usually by binary number.

(4)   One block of A/D data in Fig. 6-2 is specified in Fig. 6-4. It consists of 768 bytes and contains 10 seconds' wave data (rec. 2-rec. 11).

(5)   One data in Fig. 6-4 consists of 3 channels (N-S, E-W and Z components).   Data format of each channel is specified in Fig. 6-5.

(6)   Time data in Fig. 6-3 (record number 6) and in Fig. 6-4 are specified in Fig. 6-6.

In the appendix, examples of waveform output of each event (10 blocks) to the graphic display are shown.   Explanation of the output is given in the first sheet of the gain calibration curve.

<div align="center">References</div>

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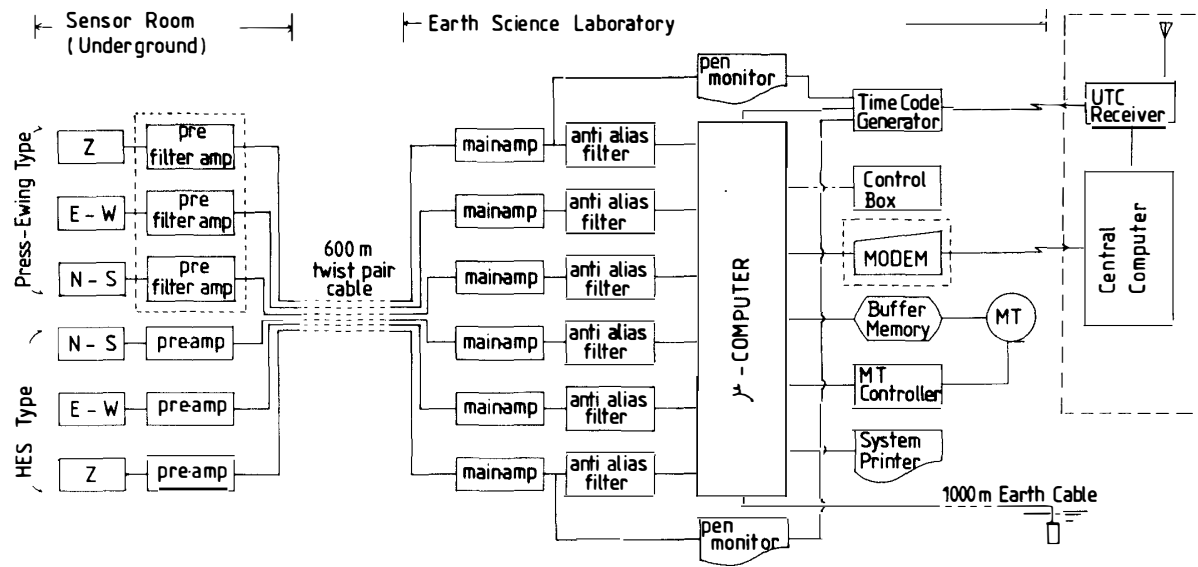   Antarctica, 1973. JARE Data Rep., 31, 44p.

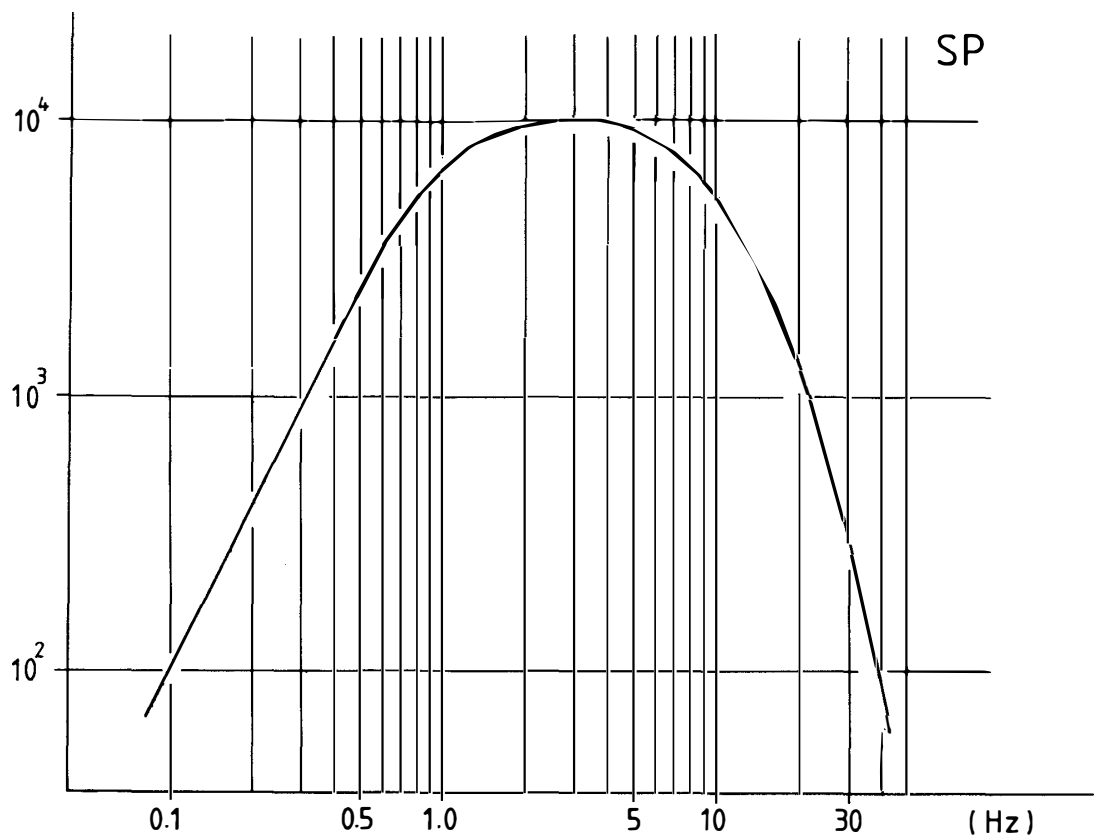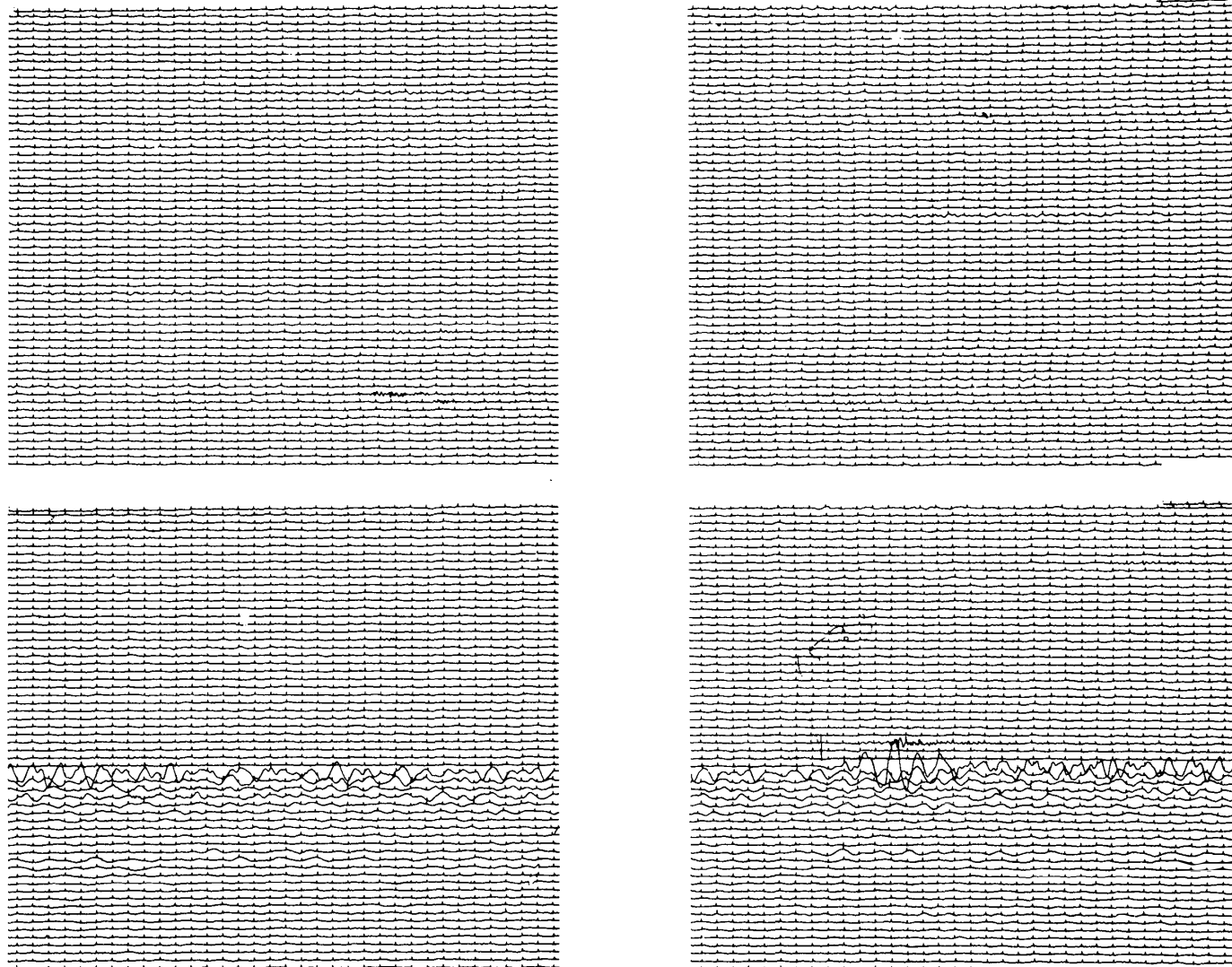Fig. 1.　The seismic observation system at Syowa Station.

Fig. 2.　Over-all frequency response of HES.

SEP 26, 1980   1400 Z
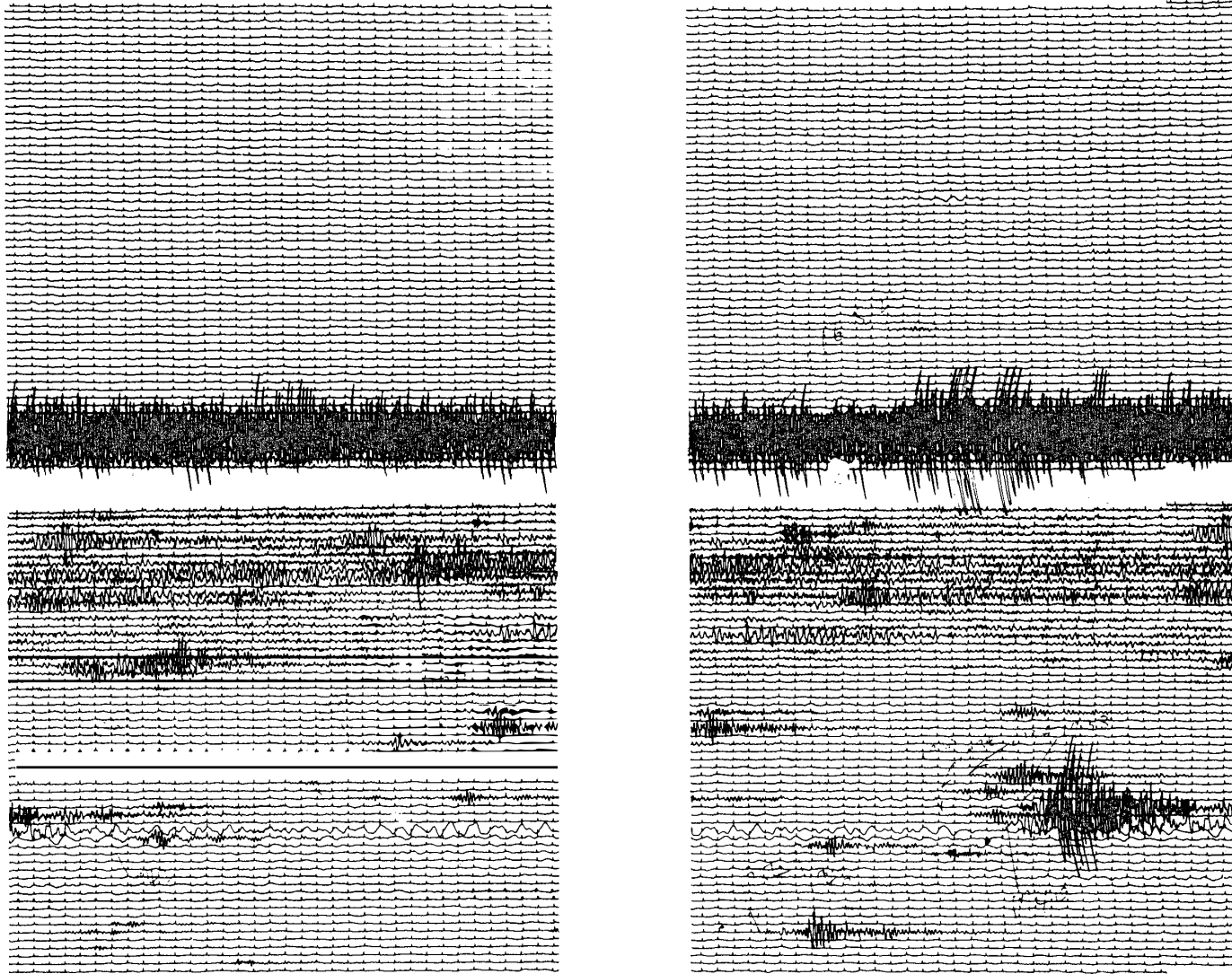
Fig. 3-1.   Example of the teleseismic event.

SEP 26, 1980   1600Z

0511-1139 [AA] *SAN-EI INSTRUMENT CO., LTD.*

Fig. 3-2.   Example of the icequake activities.

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* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 287. 21. 06. 16.  NOISE LEVEL = 812  DETECT LEVEL =  84A

* TRIPARTITE *     TRIGGER ON AT CHANNEL = 6
  TIME = 287. 21. 07. 34.  NOISE LEVEL = 800  DETECT LEVEL =  836

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 3
  TIME = 287. 21. 07. 34.  NOISE LEVEL = 800  DETECT LEVEL =  836

* SHORT PERIOD *  DETECTED AT TIME = 287. 21. 07. 34.
  SEPARATE EVENT NO. = 00168   TOTAL EVENT NO. = 00194
  NOISE LEVEL = 800  DETECT LEVEL =  836
  SAMPLE NO. =    10  LOGGING TIME =  120SEC

    WARNING ! NOISE LEVEL.LT.804

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 287. 21. 32. 52.  NOISE LEVEL = 812  DETECT LEVEL =  848

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 287. 21. 45. 28.  NOISE LEVEL = 812  DETECT LEVEL =  849

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 287. 21. 58. 46.  NOISE LEVEL = 812  DETECT LEVEL =  848

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 287. 22. 14. 20.  NOISE LEVEL = 812  DETECT LEVEL =  84A

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 287. 22. 30. 29.  NOISE LEVEL = 812  DETECT LEVEL =  848

    WARNING ! NOISE LEVEL.LT.804

* SHORT PERIOD *  DETECTED AT TIME = 287. 22. 30. 31.
  SEPARATE EVENT NO. = 00169   TOTAL EVENT NO. = 00195
  NOISE LEVEL = 812  DETECT LEVEL =  848
  SAMPLE NO. =    10  LOGGING TIME =   44SEC

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 287. 22. 41. 21.  NOISE LEVEL = 812  DETECT LEVEL =  848

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 287. 22. 57. 23.  NOISE LEVEL = 812  DETECT LEVEL =  84A

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 1
  TIME = 287. 23. 00. 13.  NOISE LEVEL = 80A  DETECT LEVEL =  828

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 287. 23. 11. 38.  NOISE LEVEL = 812  DETECT LEVEL =  848

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 287. 23. 25. 07.  NOISE LEVEL = 812  DETECT LEVEL =  84F

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 3
  TIME = 287. 23. 37. 15.  NOISE LEVEL = 808  DETECT LEVEL =  82E
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00793

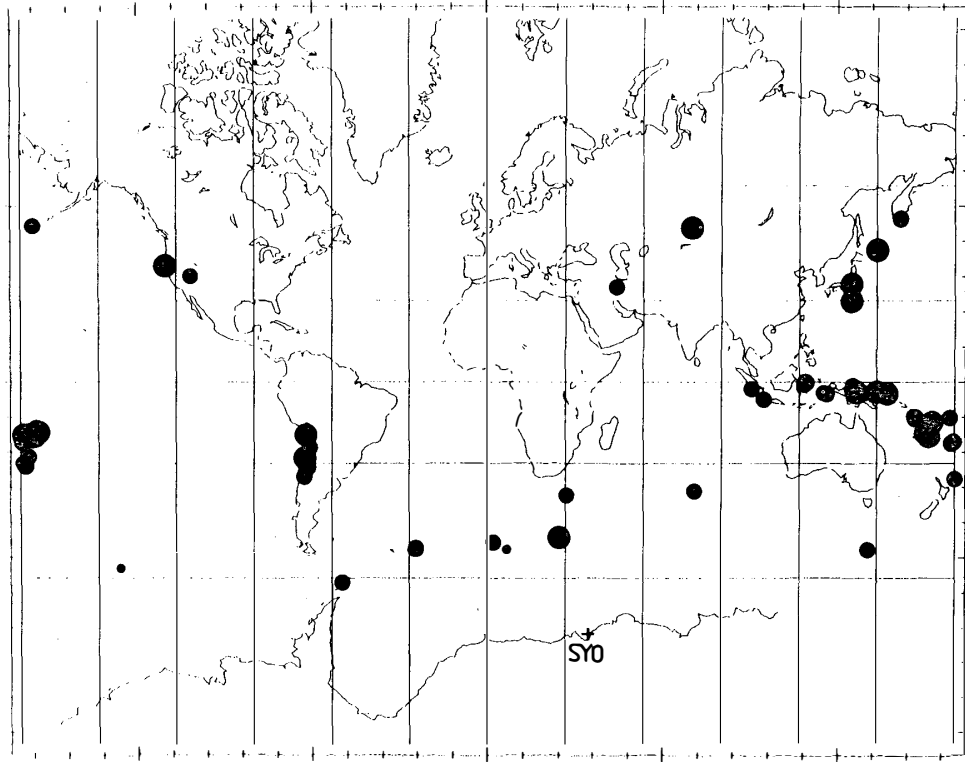Fig. 4.   Message output from the tele-typewriter.
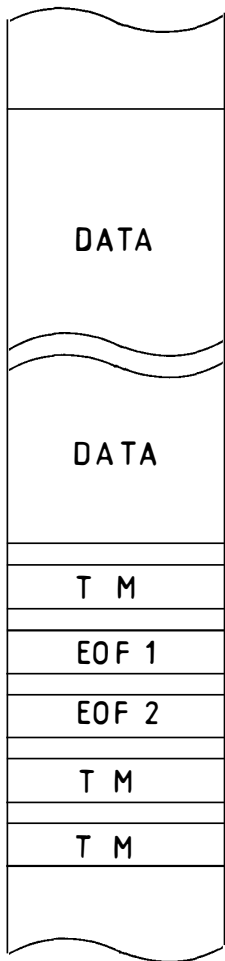
Fig. 5.   Epicenters of the 91 events.
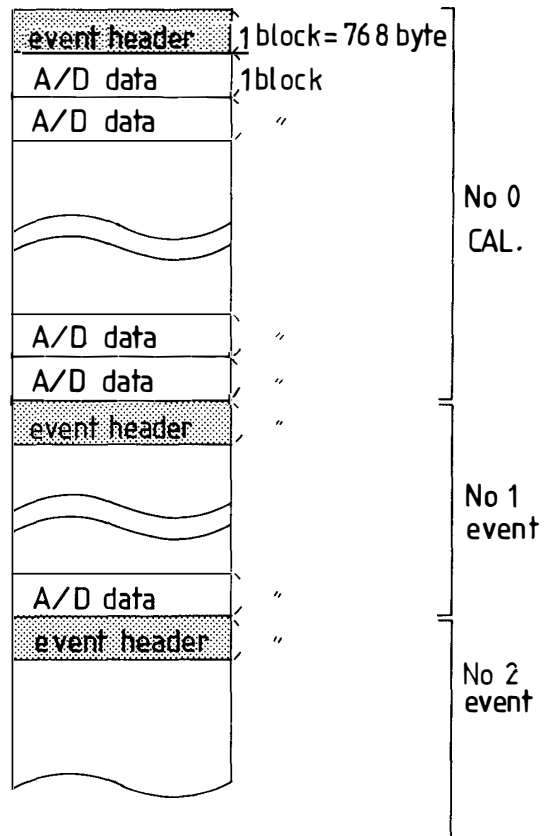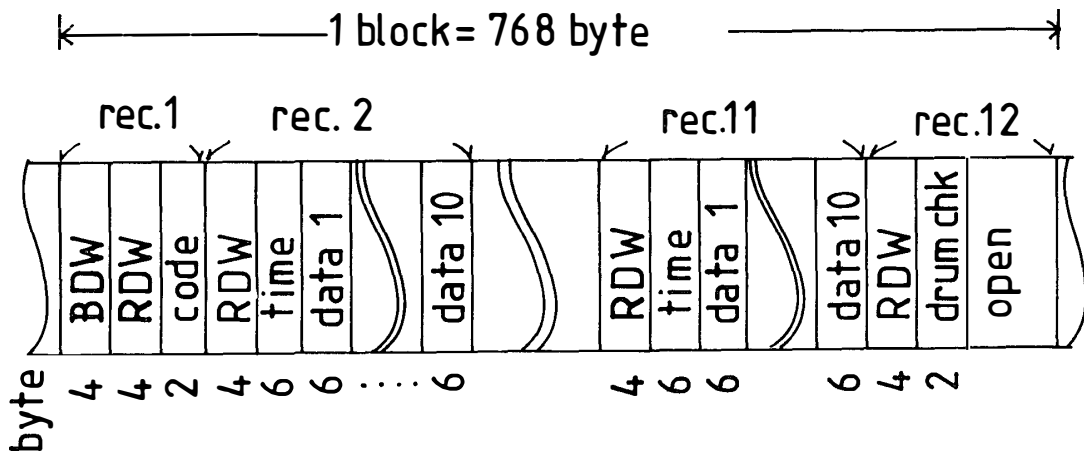

Fig. 6-1.   Volume constitution.

Fig. 6-2.   Data constitution.

record	number	name	position	length	content
	1	BDW	0-1 2-3	2 2	byte number $(00)_{16}$
1	2	RDW	4-5 6-7	2 2	byte number $(00)_{16}$
	3	code	8-9	2	' B'
2	4	RDW	10-11 12-13	2 2	see no. 2
	5	event code	14-15	2	'HE'
	6	event no.	16-17	2	see Table 3
	7	total no.	18-19	2	dummy
	8	triggered time	20-25	6	see Fig. 6-6
	9	noise level	26-31	6	LTA
	10	K-value	32-33	2	threshold value
	11	triggered level	34-35	2	STA
	12	channel no.	36-37	2	3
	13	data acqui-sition time	38-39	2	1800 or 1200 or 440 s
	14	sample rate	40-41	2	10 samples/s
	15	block no.	42-43	2	181 or 121 or 45
	16	total block number	44-45	2	dummy
3	17	RDW	46-47 48-49	2 2	see no. 2
	18	origin time	50-67	18	PDE report
	19	latitude	68-75	8	PDE report
	20	longitude	76-85	10	PDE report
	21	region name	86-109	24	PDE report
	22	depth	110-117	8	PDE report
	23	dummy	118-119	2	' '
	24	magnitude	120-123	4	MB in PDE report
	25	magnitude	124-125	4	MS in PDE report
	26	dummy	126-127	2	' '
	27	comment	128-143	16	see Table 3
4	28	open	144-767	622	$(40)_{16}$

1 block length = 768 byte

Fig. 6-3.　Header of the event.

record	number	name	position	length	content
	1	BDW	0-1 2-3	2 2	byte number $(00)_{16}$
1	2	RDW	4-5 6-7	2 2	byte number $(00)_{16}$
	3	code	8-9	2	'HE'
	4	RDW	10-11 12-13	2 2	see no. 2
2	5	time	14-19	6	see Fig. 6-6
	6	data 1	20-25	6	see Fig. 6-5
	⋮				
	15	data 10	74-79	6	see Fig. 6-5
⋮					
	112	RDW	640-641 642-643	2 2	see no. 2
11	113	time	644-649	6	see Fig. 6-6
	114	data 1	650-655	6	see Fig. 6-5
	⋮				
	123	data 10	704-709	6	see Fig. 6-5
	124	RDW	710-711 712-713	2 2	see no. 2
12	125	drum check	714-715	2	$(FF)_{16}$: NG $(00)_{16}$: OK
	126	open	716-767	52	$(40)_{16}$

Fig. 6-4.   Constitution of A/D data in one block.

1. data sequence

→ 1 data ←

ch 1 N-S	ch 2 E-W	ch 3 Z
2 byte	2 byte	2 byte

2. data format

1 channel data

MSD					LSD	MSD							LSD
				2^{11}	2^{10} 2^9 2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
15	14	13	12	11	10 9 8	7	6	5	4	3	2	1	0

← direction of tape advance
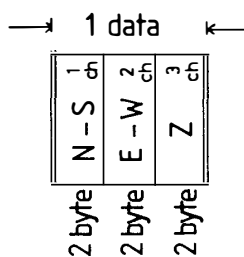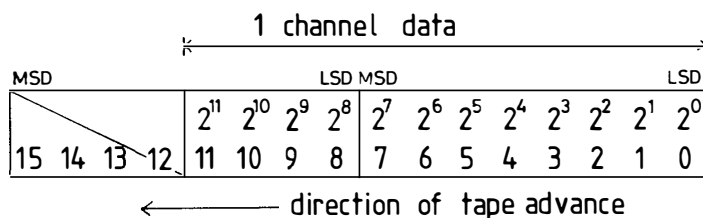
3. track number and bit

bit	2^2	2^0	2^4	P	2^5	2^6	2^7	2^1	2^3
track No	1	2	3	4	5	6	7	8	9
data name	5	7	3	P	2	1	0	6	4

Fig. 6-5.   Data format of the sampled wave.

No	item	1 byte $2^7, 2^6, 2^5, 2^4, 2^3, 2^2, 2^1, 2^0$		comment
		higher	lower	
1	dummy	$(40)_{16}$		
2	day	$(0)_{16}$	100-th digit 8, 4, 2, 1	max 399 day
3		10-th digit 8, 4, 2, 1	1-st digit 8, 4, 2, 1	
4	hour	10-th digit 2, 1	1-st digit 8, 4, 2, 1	max 23 hour
5	minute	10-th digit 4, 2, 1	1-st digit 8, 4, 2, 1	max 59 minute
6	second	10-th digit 4, 2, 1	1-st digit 8, 4, 2, 1	max 59 second

Time data —— BCD number

Fig. 6-6.   Format of the time data.

Table 1. Read-out data.

DATE	PHASE	ARRIVAL TIME H M S	PERIOD (S)	AMP (MM)	DATE	PHASE	ARRIVAL TIME H M S	PERIOD (S)	AMP (MM)
JAN 01	+EPZ	12 05 13.8	0.6	0.6	JAN 01	LP-EXE	17 39 09.4	25.3	20.0
	EPN	12 05 14.1				LP-EXN	17 39 04.7	22.5	15.0
	+EPE	12 05 14.6	1.1	1.0		LP-LRZ	17 47 28.1	18.8	52.0
	-EPZ	15 55 08.5	1.0	1.1		LP+LRE	17 47 33.8	17.8	41.0
	EPN	15 55 10.0			JAN 02	-EPZ	11 27 38.8	1.0	1.0
	EPE	15 55 08.4				+EPN	11 27 37.8	1.1	0.4
	EPZ	16 12 31.3				EPE	11 27 37.9		
	+EPN	16 12 32.0	1.4	1.2		+IPZ	21 11 01.8	1.2	8.2
	LP-EPPE	17 02 43.1	7.5	2.0		+EPN	21 11 02.1	1.2	1.0
	LP-EPPN	17 02 43.1	9.4	2.0		+IPE	21 11 01.8	1.2	3.0
	LP-EPPZ	17 02 41.3	9.4	4.5		LP-EPE	21 12 05.6	13.1	5.0
	EXZ	17 02 50.5				LP-EPN	21 12 05.6	16.9	2.0
	EXN	17 02 50.5				+EXZ	21 22 29.5	2.3	2.3
	EXE	17 02 51.2				+EXN	21 22 30.8	1.9	1.5
	LP-SKSE	17 08 39.4	11.3	9.0		+EXE	21 22 30.2	2.4	2.7
	LP-EXE	17 09 51.6	11.3	9.0		LP-ISKS1E	21 22 31.9	13.1	20.0
	LP+EPSE	17 12 48.8	12.2	25.0		LP-ESKS1N	21 22 31.9	11.3	8.5
	LP-EPSN	17 12 48.8	13.1	11.0		LP-ISE	21 23 11.3	10.3	27.0
	LP+EPSZ	17 12 48.8	16.9	15.0		LP-ISN	21 23 11.3	9.4	18.0
	LP-EPSSN	17 19 05.6	26.3	19.0		LP+IXE	21 23 26.3	9.4	32.0

DATE	PHASE	ARRIVAL TIME H M S	PERIOD (S)	AMP (MM)
JAN 02	+EPZ	21 23 39.0	0.8	1.0
	-EPN	21 23 40.0	1.0	1.0
	LP-PSE	21 24 43.1	16.9	27.0
	LP-EXE	21 44 13.1	21.6	18.0
	LP+LRN	21 45 18.8	18.8	18.0
	LP-LRE	21 45 31.9	24.4	25.0
	LP-EXN	21 47 50.6	20.6	34.0
	LP-EXE	21 47 46.9	20.6	19.0
	+IPZ	22 01 30.3	1.2	7.0
	+EPN	22 01 31.8	0.6	0.5
	+IPE	22 01 30.4	1.1	2.5
	+IPZ	22 43 23.0	1.0	1.5
	EPN	22 43 23.1		
	+EPE	22 43 24.8	0.8	0.8
JAN 03	+IPZ	10 56 49.9	1.5	2.1
	+EPE	10 56 48.5	1.5	1.4
	LP-EXE	11 05 13.1	15.0	2.0
	LP+EXN	11 05 15.0	15.0	3.5
	+IPZ	18 23 14.2	3.1	0.1
	+IPN	18 23 14.4	2.3	3.0
	+IPE	18 23 14.5	2.5	2.1
	LP+EPZ	18 23 15.0	5.6	2.0
	LP-ESE	18 32 41.3	12.2	2.5

DATE	PHASE	ARRIVAL TIME H M S	PERIOD (S)	AMP (MM)
JAN 03	LP+ESN	18 32 39.4	13.1	5.0
	LP-LRN	18 47 46.9	17.8	13.0
	LP-LRZ	18 47 52.5	17.8	15.0
	+IPZ	20 35 35.8	1.1	5.0
	+IPN	20 35 36.1	1.0	0.5
	+IPE	20 35 35.6	1.1	2.3
	-EPZ	21 19 37.5	1.3	3.0
	-EPE	21 19 38.0	1.2	1.0
JAN 04	+IPZ	04 57 20.2	0.9	1.5
	-IPE	04 57 20.5	0.9	0.8
	+EPZ	06 35 24.0	0.6	1.0
	EPE	06 35 25.9		
JAN 05	-EXZ	10 43 42.0	1.0	1.0
	EXN	10 43 42.3		
JAN 07	+EPZ	15 26 22.4	1.9	5.6
	-EPN	15 26 24.0	1.0	1.1
	-IPE	15 26 23.3	1.5	3.6
JAN 08	-IPZ	10 21 52.2	0.8	1.0
	+EPN	10 21 51.2	1.2	0.8
	EPE	10 21 52.0		
	-IPZ	19 32 16.0	0.9	1.5
	EPN	19 32 16.3		
	-EPE	19 32 16.6	0.6	1.0

DATE	PHASE	ARRIVAL TIME H M S	PERIOD (S)	AMP (MM)	DATE	PHASE	ARRIVAL TIME H M S	PERIOD (S)	AMP (MM)
JAN 09	IPZ	03 20 33.2			JAN 16	LP+LRE	04 45 20.6	19.7	4.0
	-IPN	03 20 33.9	1.5	3.2		LP-LRN	04 46 26.3	18.8	3.0
	+IPE	03 20 33.8	1.5	5.0		LP-LRZ	04 45 56.3	17.8	2.0
	LP+LRZ	03 57 18.8	16.9	2.0	JAN 18	-IPN	01 22 18.5	1.5	4.0
	LP+LRE	03 57 46.9	18.8	1.5		-IPE	01 22 17.8	1.0	2.9
JAN 12	LP+ESN	15 56 20.6	13.1	3.5		EPZ	04 12 04.5		
	LP-LRN	16 26 18.8	19.7	6.0		+EPN	04 12 04.0	1.0	0.7
	LP+LRE	16 26 20.6	19.7	3.0		-EPE	04 12 04.5	1.0	1.1
	LP-LRZ	16 26 20.6	18.8	5.0		LP-EPE	22 04 22.5	15.0	1.5
JAN 14	LP-ESE	04 34 18.8	13.1	2.0		LP+EPPE	22 06 26.3		
	LP-ESN	04 34 16.9				LP+ISE	22 11 28.1	26.3	7.0
	LP-LRE	04 53 16.9	17.8	7.0		LP+ISN	22 11 28.1	14.1	8.0
	LP-LRN	04 53 33.8	18.8	4.0		LP-ESSE	22 15 15.0	14.1	9.0
	LP+EXZ	04 55 50.6	18.8	2.0		LP+ESSN	22 15 18.8	15.0	7.0
	LP-EXZ	05 31 16.9	18.8	12.0		LP+LRE	22 23 58.1	18.8	27.0
	LP+ESE	12 42 41.3	9.4	4.0		LP-LRN	22 24 54.4	14.1	11.0
	LP-ISN	12 42 39.4	11.3	8.0	JAN 20	IPZ	12 32 35.0		
	LP-LRE	13 07 13.1	17.8	9.0		+EPN	12 32 35.4	0.8	1.0
	LP-LRZ	13 07 22.5	18.8	9.0		+IPE	12 32 35.0	1.2	4.5
	LP-EXE	13 10 26.3	18.8	13.0	JAN 22	EPZ	18 49 40.5		
	LP+EXZ	13 10 22.5	17.8	14.0		EPE	18 49 39.5		
	LP-EXN	13 11 06.6	17.8	12.0		+EPZ	22 00 49.8	0.7	1.2

DATE	PHASE	ARRIVAL TIME H M S	PERIOD (S)	AMP (MM)
JAN 22	+EPN	22 00 50.9	0.7	3.0
JAN 23	-IPZ	02 11 26.0	1.0	1.5
	EPN	02 11 26.9		
	EPE	02 11 26.2		
	-IPZ	02 53 54.5	2.0	7.6
	+IPE	02 53 55.0	1.4	3.5
	+EPZ	07 12 31.3	1.7	9.0
	EPE	07 12 32.6	1.8	3.6
	+IPZ	08 32 08.7	1.1	8.0
	+EPN	08 32 09.2	1.2	2.0
	+IPE	08 32 08.9	1.1	2.0
JAN 24	LP+EXE	20 18 30.0	16.9	4.0
	LP-EXN	20 18 18.8	17.8	7.0
	LP-EXZ	20 18 16.9	17.8	9.0
JAN 27	+EPN	16 49 29.0	1.0	1.5
	LP+EXZ	17 16 20.6	22.5	2.0
	LP+EXE	17 16 54.4	18.8	2.0
	LP-EXN	17 16 39.4		
JAN 30	+EPZ	15 00 01.6	1.1	3.1
	+EPN	15 00 02.0	0.8	1.7
	-EPE	15 00 01.8	0.8	1.3

DATE	PHASE	ARRIVAL TIME H M S	DATE	PHASE	ARRIVAL TIME H M S	DATE	PHASE	ARRIVAL TIME H M S
FEB 1	-EPZ	17 50 24.3	MAR 23	-EPZ	07 19 26.1	MAY 16	-EPZ	14 00 06.3
3	+IPZ	19 51 06.8	24	IPZ	14 44 24.1	23	EPZ	10 45 16.0
7	EPZ	10 58 30.8	24	EPZ	20 49 54.1	25	EPZ	16 53 27.5
9	+IPZ	19 40 49.2	26	-IPZ	04 11 59.6	25	EPZ	20 04 32.8
12	EPZ	03 33 38.8	APR 3	-IPZ	13 45 23.3	26	+EPZ	18 53 33.5
15	EPZ	07 55 37.5	13	+IPZ	00 11 23.8	26	+EPZ	21 03 17.0
17	-EPZ	19 22 18.0	13	+EPZ	18 16 54.8	27	EPZ	10 31 06.6
18	-EPZ	17 29 01.9	18	EPZ	19 51 23.8	27	+EPZ	13 14 28.5
19	-EPZ	04 11 50.0	20	EPZ	16 58 11.0	27	+EPZ	15 10 39.1
19	-EPZ	09 09 10.0	20	+EPZ	08 21 37.3	31	-EPZ	09 37 33.5
21	-EPZ	11 25 42.0	21	+EPZ	10 50 26.2	31	EPZ	10 48 18.4
21	+EPZ	23 30 27.0	21	EPZ	17 12 37.3	31	EPZ	12 29 49.0
27	-IPZ	03 16 36.3	21	EPZ	22 54 58.0	31	EPZ	13 37 24.4
29	EPZ	11 26 44.4	21	IXZ	22 55 37.0	31	-EPZ	18 21 28.3
MAR 2	-EPZ	23 20 22.1	22	EPZ	00 31 56.7	JUN 1	+IPZ	03 35 17.9
7	-EPZ	08 37 06.9	MAY 5	EPZ	21 12 50.7	1	+IPZ	17 13 25.1
8	EPZ	22 24 29.9	9	-EPZ	22 40 57.7	1	+EPZ	23 23 58.2
14	-IPZ	14 31 37.7	10	+EPZ	01 59 31.4	2	-IPZ	21 18 17.1
20	EPZ	20 04 00.4	12	+IPZ	14 35 57.9	2	IXZ	23 00 08.5
20	EPZ	22 39 48.1	12	EPZ	16 50 28.6	4	EPZ	05 57 44.5
20	EPZ	23 30 51.3	14	EPZ	11 39 09.1	5	EPZ	06 33 41.0
22	EPZ	10 47 22.4	15	EPZ	19 10 48.1	5	-EPZ	10 12 28.8

DATE	PHASE	ARRIVAL TIME H M S	DATE	PHASE	ARRIVAL TIME H M S	DATE	PHASE	ARRIVAL TIME H M S
JUN 7	EPZ	03 56 50.6	JUN 21	EPZ	11 22 06.0	JUL 7	EPZ	17 52 06.3
8	-EPZ	21 30 25.3	21	+IPZ	20 24 42.9	8	+IPZ	04 52 31.4
11	IXZ	01 27 31.6	22	EPZ	03 19 06.7	8	+IPZ	23 32 18.3
11	-EPZ	08 21 32.7	23	EPZ	10 06 32.3	9	EXZ	00 06 08.2
11	+EPZ	14 32 08.8	23	-IPZ	16 56 05.6	9	EPZ	11 13 22.5
11	+EXZ	14 50 36.1	23	EPZ	20 25 21.0	9	EPZ	11 39 48.3
12	EPZ	03 34 38	23	EPZ	21 16 39.5	9	EPZ	21 09 51.2
13	+IPZ	19 05 38.9	24	IPZ	06 23 12.4	9	EPZ	21 17 17.6
14	EPZ	19 27 40.3	25	EPZ	19 01 10.0	11	+IPZ	06 50 53.9
14	EPZ	19 44 31.7	25	+EPZ	23 31 29.0	13	+IPZ	06 31 05.0
15	EPZ	23 59 45.1	26	EPZ	12 24 06.2	14	IPZ	16 26 57.5
16	-EPZ	05 56 43.9	26	EPZ	18 32 46.4	14	+IPZ	16 53 23.2
16	+IPZ	21 01 06.9	26	EPZ	20 32 06.8	14	EPZ	21 33 38.4
17	EXZ	08 54 41.1	27	EPZ	07 03 46.1	15	EPZ	02 36 03.5
18	EPZ	07 50 13	28	EPZ	05 45 37.2	15	EPZ	03 04 25.9
18	EPZ	09 25 02.0	28	EPZ	20 27 16	15	EXZ	03 51 41.3
18	+EPZ	09 31 41.4	29	EPZ	07 39 08.2	15	EPZ	03 55 11.1
18	EPZ	11 02 19.0	29	EPZ	08 53 09.7	15	EPZ	14 02 23.4
18	EPZ	13 16 56.0	JUL 5	EPZ	16 55 02.4	15	EPZ	14 19 54.8
18	EPZ	17 28 28.5	5	+EPZ	23 02 46.2	16	-IPZ	20 09 42.8
19	EPZ	08 43 29.6	6	-IPZ	12 34 09.2	17	EPZ	10 49 47.4
20	-EPZ	19 03 18.0	7	-IPZ	17 22 51.7	17	IPZ	14 17 57.3

DATE	PHASE	ARRIVAL TIME H M S	DATE	PHASE	ARRIVAL TIME H M S	DATE	PHASE	ARRIVAL TIME H M S
JUL 17	+IPZ	19 55 20.3	AUG 4	EPZ	04 06 59	SEP 7	EPZ	04 56 20.5
18	EPZ	13 53 36.1	13	EPZ	21 46 03.2	8	+EPZ	16 47 49.2
18	+IPZ	16 13 07.1	14	EPZ	04 34 29.7	9	+IPZ	05 59 36.7
19	-IPZ	12 03 18.5	14	EPZ	05 15 20.8	10	-EPZ	07 52 30.9
20	-IPZ	12 31 20.2	18	+IPZ	17 50 04.6	11	EPZ	04 20 48.8
20	-IPZ	21 31 57.2	19	EPZ	16 23 05.5	11	EPZ	13 17 14
21	EPZ	16 47 19.8	19	EPZ	21 14 29.0	12	+EPZ	20 12 10.2
21	+IPZ	21 33 19.4	20	EPZ	10 50 48.2	12	+EPZ	20 28 33.9
22	-IPZ	07 18 40.0	21	EPZ	12 40 18.3	13	+EPZ	17 26 56.9
23	EPZ	16 24 49.4	24	EPZ	20 23 13.1	13	+IPZ	21 55 28.3
24	EPZ	15 42 25.2	25	EPZ	21 59 41.2	14	+IPZ	03 01 36.2
24	EPZ	17 13 58.7	25	EPZ	22 09 24.3	14	EPZ	14 37 37
25	+IPZ	19 24 39.5	29	EXZ	10 48 23.9	15	-IPZ	04 35 23.1
27	EPZ	20 01 41.0	30	EXZ	17 57 19.8	15	+IPZ	23 43 32.3
28	EPZ	19 05 06.6	31	+EPZ	14 25 38.3	16	+EPZ	22 16 09.7
28	IPZ	20 25 55.8	31	EPZ	16 41 55	17	EPZ	05 20 42.8
29	+EPZ	03 24 50.2	SEP 1	EPZ	01 46 31.6	18	EPZ	11 37 59.3
29	EPZ	15 12 47.5	1	EPZ	14 09 25.1	18	EPZ	13 47 38.3
AUG 2	EPZ	16 00 32.2	2	EPZ	05 46 24.8	20	-EPZ	03 42 02.9
3	+IPZ	03 11 07.3	2	EPZ	16 38 46.3	20	EPZ	17 56 10.7
3	EPZ	07 32 54	3	EXZ	15 39 12.5	20	EPZ	18 41 30.5
3	-IPZ	13 54 04.0	6	EPZ	16 18 05.5	20	EPZ	20 00 06

DATE	PHASE	ARRIVAL TIME H M S	DATE	PHASE	ARRIVAL TIME H M S	DATE	PHASE	ARRIVAL TIME H M S
SEP 20	EPZ	20 10 22.1	SEP 28	EPZ	08 56 14.2	OCT 8	EPZ	16 16 29
20	EPZ	20 18 37.2	28	EPZ	09 11 45.4	9	EPZ	11 45 30
20	EPZ	20 26 16.9	28	EPZ	09 24 17.0	9	+IPZ	16 32 48.0
20	EPZ	20 38 42	28	EPZ	10 04 07.7	10	EPZ	12 43 55.5
20	EPZ	20 48 04.4	28	EPZ	10 29 30.5	16	EPZ	01 43 54
21	EPZ	01 13 37.3	28	EPZ	10 52 06	18	-EPZ	10 06 46.8
22	-IPZ	18 29 27.3	28	EPZ	11 16 18.8	19	+EPZ	15 16 22.2
23	+IPZ	05 57 07.7	28	EPZ	11 27 00.0	20	+IPZ	11 07 49.2
24	-IPZ	18 04 10.1	28	+IPZ	14 35 58.3	20	+IPZ	19 55 16.7
24	+EPZ	18 13 19.6	28	EPZ	15 51 55.8	23	EPZ	15 20 07.3
26	+EPZ	15 33 41	28	EPZ	16 31 05.4	23	+IPZ	23 22 54.6
26	+IPZ	17 40 53.0	28	EPZ	16 44 36.3	24	-IPZ	03 37 55.6
26	EPZ	19 40 30.9	28	+IPZ	18 39 06.6	24	EPZ	04 54 13.3
27	EPZ	00 27 10.2	29	EPZ	12 47 36.4	24	EPZ	15 12 23
27	EPZ	01 56 23.6	30	EPZ	08 18 45.1	25	EPZ	07 12 27
27	EPZ	10 27 36.7	OCT 3	-IPZ	02 05 04.2	25	EPZ	09 18 06.1
27	EPZ	10 44 00.4	3	+EPZ	18 08 32.0	25	EPZ	11 12 23.8
27	EPZ	11 57 15.3	4	+EPZ	04 50 37.1	25	EPZ	16 32 23.4
27	EPZ	12 38 46.3	5	EPZ	15 43 41.8	25	+IPZ	20 47 24.7
28	EPZ	01 16 11.3	5	-IPZ	17 30 21.6	26	EPZ	07 19 34.2
28	IPZ	03 27 51.5	6	-IPZ	15 00 15.4	26	EPZ	19 30 54.1
28	EPZ	08 36 57	8	EPZ	09 30 08.7	27	EPZ	13 17 57.0

DATE	PHASE	ARRIVAL TIME H M S	DATE	PHASE	ARRIVAL TIME H M S	DATE	PHASE	ARRIVAL TIME H M S
OCT 28	+IPZ	02 50 01.3	NOV 20	EPZ	19 27 58.9	DEC 12	EPZ	13 25 14.1
29	EPZ	02 26 32.5	21	EPZ	15 16 00.9	14	+IPZ	04 06 03.4
29	EPZ	17 56 35.3	23	EPZ	18 53 15	14	EPZ	06 47 24.0
30	EPZ	10 05 23.4	23	EPZ	23 38 19	15	-IPZ	08 25 15.8
NOV 1	+EPZ	16 12 24.7	24	-EPZ	01 46 21.8	17	EPZ	01 00 11.8
3	EPZ	07 47 05.1	24	+EPZ	04 33 17.9	19	EPZ	03 10 10.2
3	EPZ	22 24 05.3	25	+IPZ	06 14 31.7	19	+IPZ	23 51 27.9
4	EPZ	05 11 22.2	28	IPZ	20 34 29.8	20	-IPZ	20 37 15.1
4	+IPZ	20 45 46.5	29	EPZ	07 00 08.7	22	EPZ	13 11 15.1
5	EPZ	18 27 04.5	30	+IPZ	12 37 08.9	23	-IPZ	10 06 39.4
8	EPZ	10 47 24.6	DEC 5	EPZ	22 05 00.3	23	EPZ	12 37 55.6
8	-EPZ	21 47 05.1	5	-EPZ	17 31 32.2	25	-IPZ	00 06 42.7
8	EPZ	23 14 37.2	5	EPZ	17 44 39.5	25	-IPZ	06 43 24.1
10	+IPZ	16 35 27.9	6	+IPZ	22 20 35.6	25	EPZ	06 56 13.5
11	+IPZ	10 41 15.4	8	EPZ	05 49 32.2	26	-IPZ	06 03 18.6
12	EPZ	05 49 58	8	+EPZ	19 26 34.8	28	+IPZ	15 30 01.3
13	EPZ	20 11 22.4	9	EPZ	00 11 05.1	28	EPZ	17 14 43
15	+IPZ	03 21 47.6	9	-IPZ	05 27 43.4	29	EPZ	12 10 25.5
15	-IPZ	22 18 32.3	9	EPZ	09 11 07.3	31	-IPZ	14 12 41.9
17	+EPZ	19 18 42.1	9	IPZ	09 55 18.1			
19	EPZ	20 45 42.5	11	-IPZ	18 26 45.3			
19	EPZ	21 08 23.9	12	EPZ	12 25 43.4			

Table 2. A/D conversion of input voltage.

Input volt	Hexadecimal number
+10	FFF
+ 9	F33
+ 8	E66
+ 7	D99
+ 6	CCC
+ 5	C00
+ 4	B33
+ 3	A66
+ 2	999
+ 1	8CC
0	800
- 1	733
- 2	666
- 3	599
- 4	4CC
- 5	400
- 6	333
- 7	266
- 8	199
- 9	0CC
-10	000

Table 3.   List of the 91 earthquakes.

DATA NO.	ORIGINE TIME U T C DATE HR MN SEC	GEGRAPHIC COODINATES LATITUDE LONGITUDE	REGION	DEPTH KM.	MAGNITUDE G S MB MSZ		EPICENTRAL DISTANCE DEG.	AZIMUTH DEG.	COMMENT
1	05/16 13 55 15.5	48.059 S 31.569 E	South of Africa	10 G	5.2		21.461	165.249 SW	
2	05/26 18 41 42.9	19.364 S 69.238 W	Northern Chile	114 D	6.1		78.555	65.776 SW	
3	05/27 13 01 34.8	18.649 S 174.748 W	Tonga Islands	33 N	6.1		89.115	32.301 SE	
4	06/25 23 18 20.4	5.233 S 151.686 E	New Britain Region	49 D	6.2	6.5	92.875	67.467 SE	
5	07/08 23 19 19.8	12.410 S 166.381 E	Santa Cruz Islands	33 N	5.9	7.5	90.628	51.445 SE	
6	07/09 11 24 50.6	12.630 S 166.017 E	Santa Cruz Islands	33 N	5.4	5.9	90.316	51.723 SE	
7	07/13 06 20 30.3	33.474 S 70.151 W	Chile-Argentina Border	103 D	5.6		65.719	59.685 SW	
8	07/14 16 15 01.7	29.273 S 177.154 W	Kermadec Islands	49	5.8	6.6	78.314	32.227 SE	
9	07/14 16 41 22.1	29.426 S 177.003 W	Kermadec Islands	33 N	5.4		78.194	32.062 SE	
10	07/14 21 24 09.6	57.346 S 142.415 W	S. Pacific Cordillera	10 G	4.9		53.861	1.321 SE	
11	07/16 19 56 46.7	4.456 S 143.521 E	Papua New Guinea	84	6.5		90.824	75.382 SE	

12	07/17 10 36 49.5	12.512 S 166.332 E	Santa Cruz Islands	46		5.3	5.4	90.517	51.462 SE	
13	07/17 14 06 30.8	23.598 S 179.025 E	South of Fiji Islands	564	D	5.0		83.040	36.908 SE	
14	07/17 19 42 23.2	12.525 S 165.916 E	Santa Cruz Islands	33	N	5.8	7.9	90.387	51.847 SE	
15	07/18 13 40 40.0	12.597 S 166.264 E	Santa Cruz Islands	48		5.3	5.3	90.417	51.501 SE	
16	07/19 11 52 20.6	28.997 S 69.675 W	Chile-Argentina Border	110	D	6.1		69.724	61.861 SW	
17	07/20 21 20 03.9	17.865 S 178.625 W	Fiji Islands Region	591	D	6.0		89.095	36.067 SE	
18	07/21 16 34 25.6	12.499 S 166.458 E	Santa Cruz Islands	79		5.7		90.565	51.348 SE	
19	07/21 21 20 24.7	12.287 S 166.509 E	Santa Cruz Islands	80		5.9		90.781	51.360 SE	
20	07/22 07 06 23.0	20.302 S 169.607 E	Vanuatu Islands	122	D	6.1		83.969	46.257 SE	
21	07/24 15 30 05.6	22.000 S 170.144 E	Loyalty Islands	33	N	5.4	5.8	82.484	45.303 SE	
22	07/25 19 05 00.1	37.256 N 116.477 W	Southern Nevada	0		5.5	4.2	145.524	34.937 SW	N
23	07/29 03 11 56.3	13.101 S 166.338 E	Vanuatu Islands	48		5.9	6.7	89.958	51.288 SE	
24	08/02 15 47 26.1	11.086 S 165.433 E	Santa Cruz Islands	33	N	5.7	6.3	91.619	52.715 SE	
25	08/03 03 00 49.7	35.251 S 69.991 W	Chile-Argentina Border	151	D	5.3		64.026	59.090 SW	

26	08/18 17 38 11.4	29.995 S 178.128 W	Kermadec Islands	33 N	5.3	4.6	77.424	32.909 SE	
27	08/19 16 14 49.3	55.795 S 147.319 E	West of Macquarie	10 G	5.3		44.897	49.635 SE	
28	08/19 21 01 29.0	3.579 S 140.037 E	West Irian	33 N	5.8	5.6	90.420	78.943 SE	
29	08/21 12 07 20.1	41.318 S 80.508 E	Mid-Indian Rise	10 G	5.6	6.3	35.103	120.840 SE	
30	08/24 20 10 04.2	15.222 S 173.674 E	Tonga Islands	39 D	6.0	6.2	89.872	43.868 SE	
31	08/31 14 12 40.1	12.499 S 166.462 E	Santa Cruz Islands	42 D	5.6	5.1	90.566	51.344 SE	
32	08/31 16 29 31.1	0.157 S 123.001 E	Minahassa Peninsula	97	5.3		87.507	96.062 SE	
33	09/11 13 06 09.4	23.507 S 179.197 W	South of Fiji Islands	416	4.5		83.504	35.331 SE	
34	09/12 20 00 26.5	31.971 S 177.976 W	South of Kermadec	17 D	5.1	4.9	75.534	32.322 SE	
35	09/14 02 42 39.3	49.976 N 78.889 E	Eastern Kazakh SSR	0 G	6.2	4.2	122.239	151.062 SE	N
36	09/15 04 28 13.7	61.387 S 56.429 W	South Shetland Islands	33 N	5.8	5.8	36.863	52.944 SW	
37	09/20 03 37 01.0	55.728 S 3.049 E	Bouvet Island	27 D	5.0		22.754	113.953 SW	
38	09/22 18 17 55.9	7.126 S 107.655 E	Java	141	5.4		75.647	108.112 SE	
39	09/23 05 45 36.3	29.738 S 178.803 W	Kermadec Islands	224	5.0		77.540	33.554 SE	

40	09/24 17 52 17.2	18.799 S	177.872 W	Fiji Islands Region	569		5.2		88.347	35.165	SE	
41	09/24 17 54 24.1	35.450 N	139.964 E	East of Honshu, Japan	73	D	6.0		126.291	94.952	SE	
42	09/26 15 20 37.1	3.225 S	142.237 E	N. of Papua New Guinea	33	N	5.9	6.5	91.522	77.010	SE	
43	09/28 14 29 41.5	55.974 S	27.573 W	South Sandwitch Island	96		5.6		31.750	79.824	SW	W
44	09/28 18 25 59.7	6.310 S	154.809 E	Solomon Islands	68		6.0		92.888	64.176	SE	
45	10/03 18 03 49.0	54.079 S	8.118 E	Bouvet Islands	10	G	4.8		20.838	120.246	SW	
46	10/08 09 17 35.2	0.004 S	123.278 E	Minahassa Peninsula	152	D	5.5		87.748	95.857	SE	
47	10/08 09 43 17.5	15.219 S	174.015 W	Tonga Islands	33	N	5.5	4.9	92.598	32.297	SE	
48	10/08 16 04 45.6	5.366 S	103.118 E	Southern Sumatera	33	N	5.8	6.3	75.769	113.103	SE	
49	10/09 11 32 56.4	19.269 S	169.743 E	Vanuatu Islands	33	N	5.4	5.4	84.993	46.419	SE	
50	10/09 16 19 38.2	15.379 S	173.420 W	Tonga Islands	33	N	5.7	6.0	92.555	31.702	SE	
51	10/12 03 34 14.1	49.958 N	79.085 E	Eastern Kazakh SSR	0	G	5.9	4.3	122.256	150.913	SE	N
52	10/19 15 03 35.4	6.108 S	145.520 E	Papua New Guinea	125	D	5.8		89.975	72.946	SE	
53	10/20 10 54 42.2	6.271 S	154.838 E	Solomon Islands	65		5.7		92.934	64.161	SE	

54	10/23 23 10 41.2	6.605 S	129.622 E	Banda Sea	160	5.8		83.903	87.570 SE	
55	10/24 03 25 34.4	21.989 S	170.165 E	Loyalty Islands	33 N	5.8	6.7	82.499	45.287 SE	
56	10/25 07 00 07.9	21.982 S	170.025 E	Loyalty Islands	33 N	5.7	6.7	82.470	45.415 SE	
57	10/25 11 00 05.1	21.890 S	169.853 E	Loyalty Islands	33 N	5.8	7.2	82.514	45.596 SE	
58	10/25 11 58 10.1	21.887 S	169.666 E	Loyalty Islands	33 N	5.5		82.469	45.765 SE	
59	10/25 16 20 04.8	22.313 S	170.380 E	Loyalty Islands	33 N	5.9	6.5	82.244	45.005 SE	
60	10/28 02 38 10.0	30.464 S	177.940 W	Kermadec Islands	33 N	5.6	5.6	77.005	32.639 SE	
61	10/29 17 44 14.0	21.492 S	169.469 E	Loyalty Islands	33 N	5.5	6.4	82.796	46.052 SE	
62	10/30 09 53 06.3	22.238 S	169.546 E	Loyalty Islands	33 N	5.8	5.8	82.103	45.775 SE	
63	11/03 22 17 50.9	56.150 S	27.061 W	South Sandwitch	88	5.2		31.432	80.037 SW	
64	11/04 20 26 00.7	53.817 N	160.741 E	East of Kamchatka	33 D	5.9	5.5	149.519	90.283 SE	
65	11/05 18 15 03.7	2.701 S	122.058 E	Sulawesi	46	5.6	5.5	84.810	96.040 SE	
66	11/08 10 27 34.0	41.117 N	124.253 W	Northern California	19 D	6.2	7.2	150.681	25.491 SW	
67	11/08 21 35 43.1	24.341 S	67.654 W	Chile-Argentina	103	5.4		73.401	65.397 SW	
68	11/10 16 24 40.5	31.576 S	67.468 W	San Juan Province	21	5.7	5.4	66.632	62.755 SW	
69	11/11 10 36 58.2	51.422 S	28.796 E	South of Africa	10 G	6.2	6.7	18.454	158.339 SW	L

70	11/13 19 51 33.7	55.639 N	161.411 E	East of Kamchatka	33 N	5.4	4.9	151.194	91.952 SE	
71	11/17 19 06 59.1	31.691 S	178.121 W	Kermadec Islands	47 D	5.2	5.6	75.778	32.511 SE	
72	11/19 20 33 09.4	6.513 S	131.529 E	Tanimbar Islands	33 N	5.7	5.4	84.672	85.827 SE	
73	11/21 14 56 13.4	51.798 N	176.141 W	Andreanof Islands	53	5.6	5.7	155.871	62.412 SE	
74	11/24 01 34 53.2	22.539 S	179.117 E	South of Fiji Islands	617	5.3		84.085	37.074 SE	
75	11/25 06 04 02.9	34.857 S	70.743 W	Chile-Argentina Border	96	5.1		64.621	58.618 SW	
76	11/29 06 48 46.9	35.346 S	179.960 E	E. of North Islands, N.Z.	33 N	5.7	5.7	71.859	33.248 SE	
77	11/30 12 24 39.8	19.426 S	175.850 W	Tonga Islands	202	6.0		88.145	33.163 SE	
78	12/02 13 17 03.3	27.134 S	176.474 W	Kermadec Islands	27	5.5	5.4	80.524	32.100 SE	
79	12/03 21 23 08.6	30.245 S	178.012 W	Kermadec Islands	33 N	5.6		77.204	32.752 SE	
80	12/05 07 14 18.0	24.739 S	178.382 E	South of Fiji Islands	545	5.3		81.797	37.212 SE	S wave only
81	12/08 19 13 45.3	14.835 S	166.838 E	Vanuatu Islands	33 N	5.6	5.9	88.446	50.329 SE	
82	12/14 03 47 06.6	49.932 N	79.005 E	Eastern Kazakh SSR	0 G	5.9	4.1	122.217	150.963 SE	N

83	12/15 08 12 45.4	17.593 S 172.300 W	Tonga Islands	33 N	6.1	6.3	90.601	30.223 SE
84	12/17 00 47 54.7	21.417 S 169.875 E	Loyalty Islands	86	6.0		82.972	45.707 SE
85	12/19 02 57 57.4	21.339 S 174.359 W	Tonga Islands	33 N	5.9	6.1	86.568	31.403 SE
86	12/19 23 32 41.9	30.581 N 140.643 E	South of Honshu, Japan	82 D	6.2		122.143	91.821 SE
87	12/22 12 51 21.0	34.503 N 50.590 E	Iran	41	5.5	5.2	103.606	170.637 SE
88	12/23 09 53 42.6	16.290 S 178.165 E	Fiji Islands	33 N	5.9	5.7	89.915	39.415 SE
89	12/25 06 32 46.0	31.480 S 67.140 W	San Juan Province	122 D	5.1		66.616	63.077 SW
90	12/26 05 51 45.3	22.214 S 179.594 W	South of Fiji Islands	592	5.5		84.675	35.983 SE
91	12/31 10 32 11.0	46.460 N 151.453 E	Kuril Islands	33 N	6.1	6.5	140.083	91.675 SE

i) The events and their epicentral data are picked from the PDE reports.

ii) N in the comment column means nuclear explosion.

iii) W or L in the comment column means that the event was sampled by 50 pps or 1 pps sampling rate. The specification of the data is not explained and their display outputs are not given.

$12^h38^m16^s$

10 s

HES

Feb. 2

123816

0202) GAIN CALIBRATION -01

1 volt

S

NS

N

1 volt

W

EU

E

1 volt

down

z

up

HES

0516 SOUTH OF AFRICA -01

135930

NS

EU

z
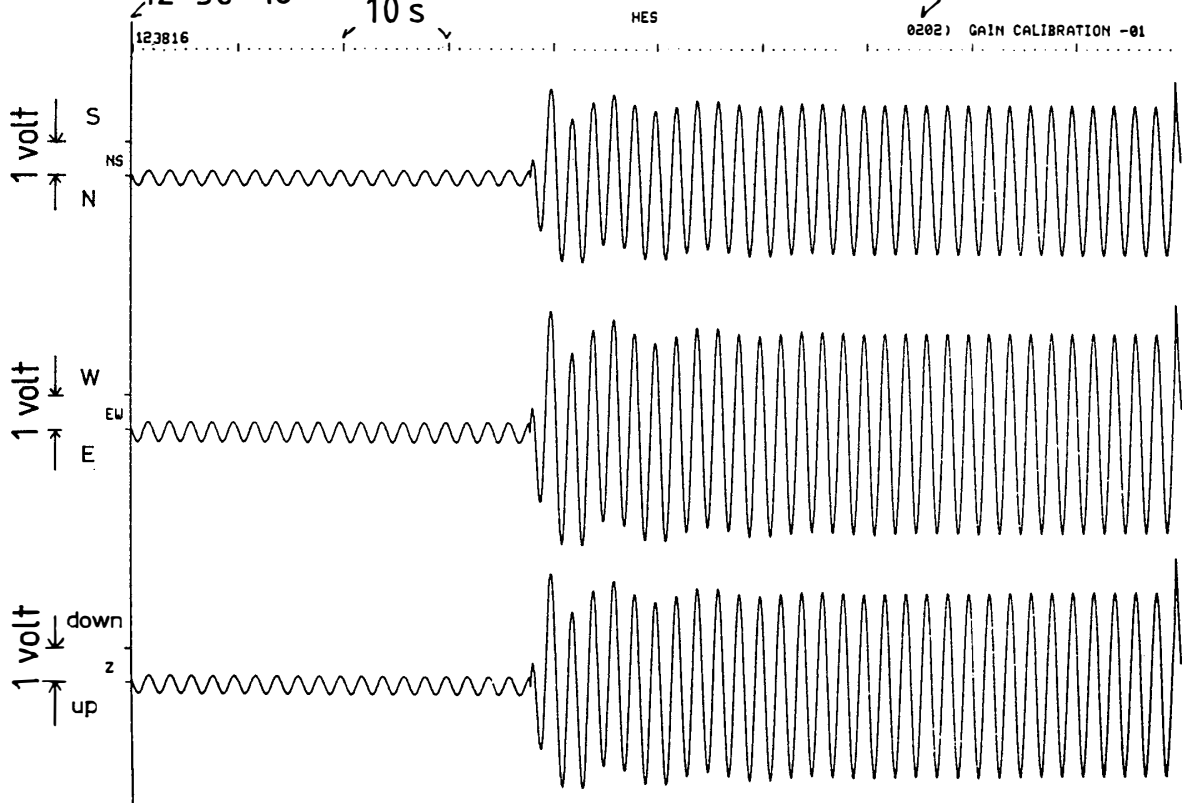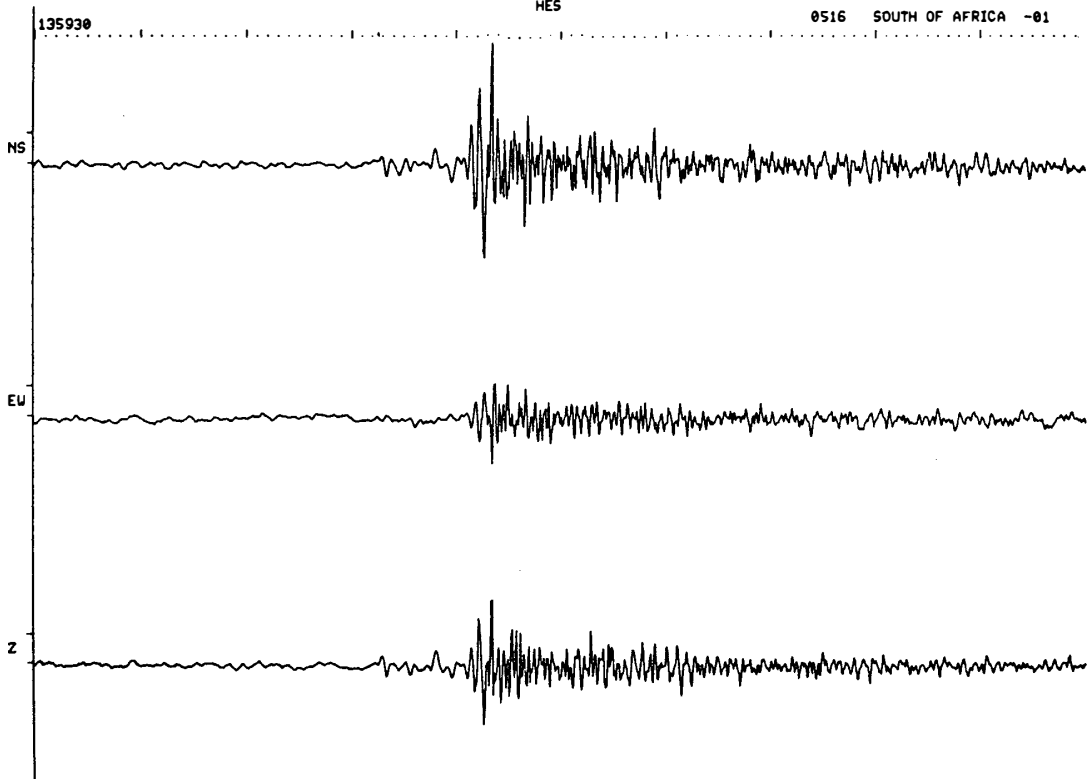
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185253

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EU

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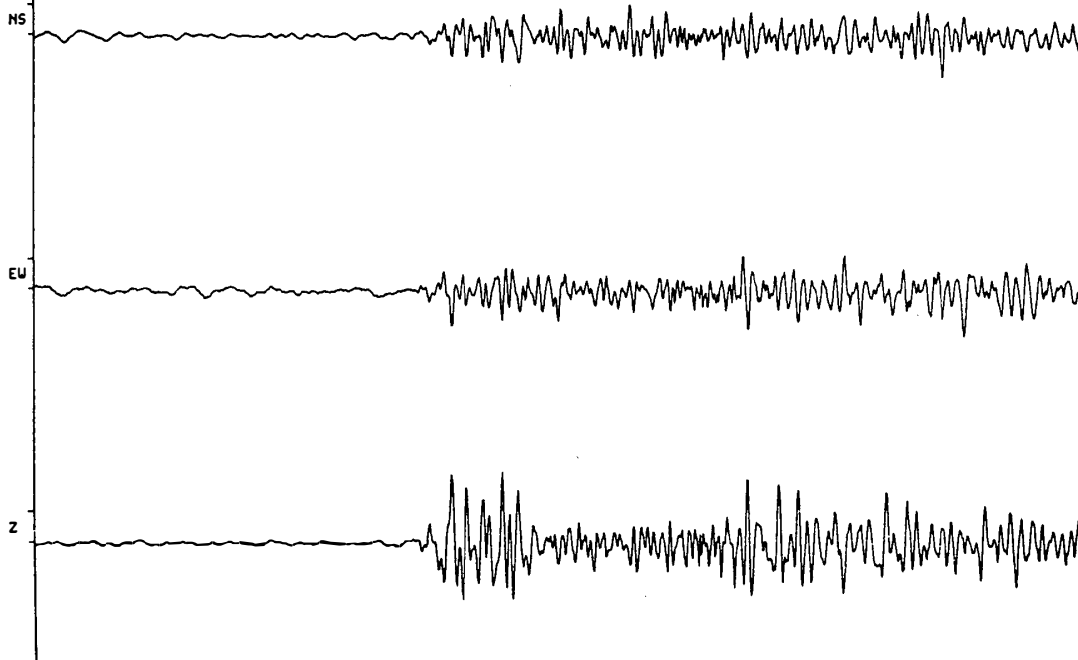
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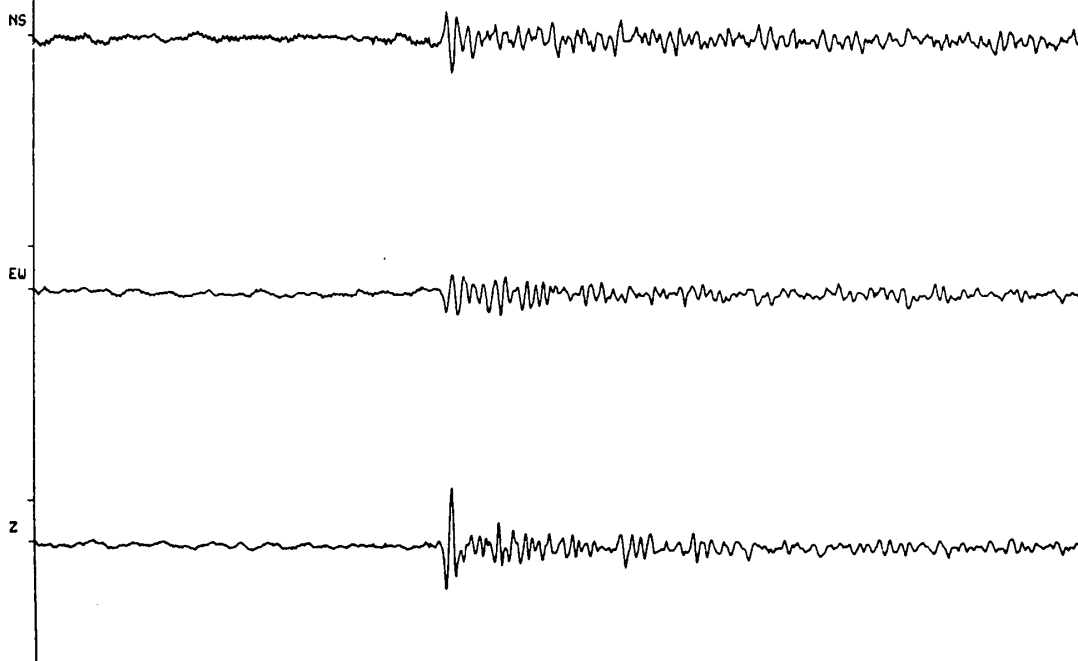
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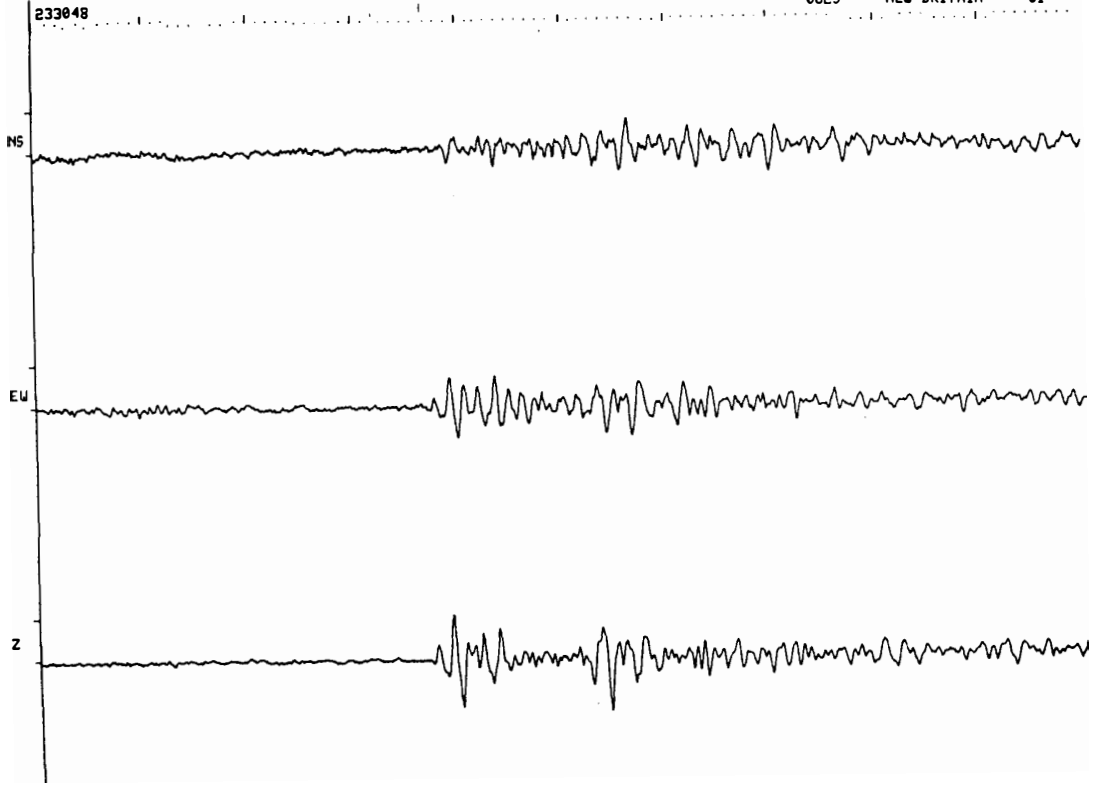
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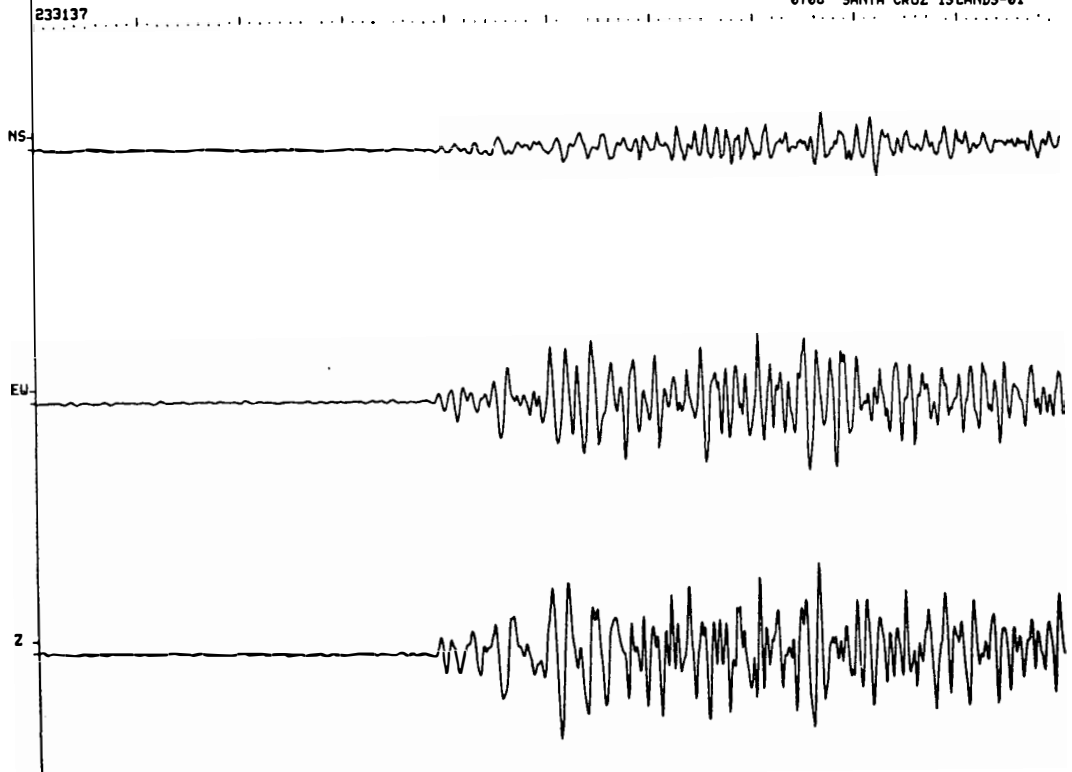
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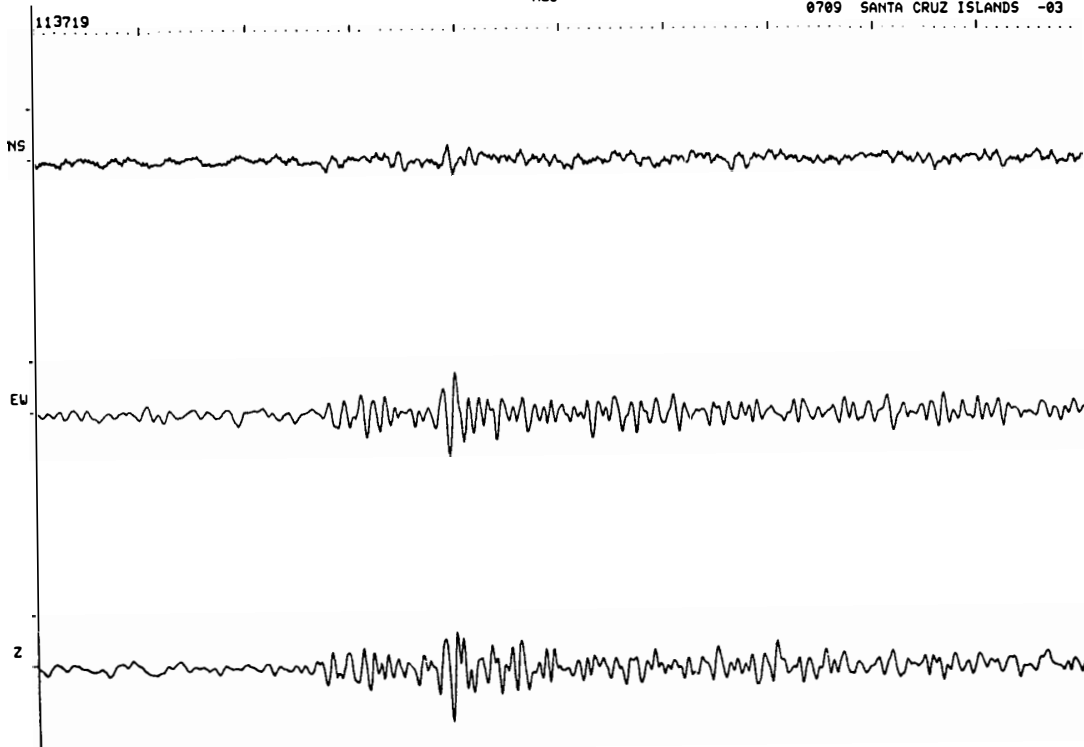
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063022

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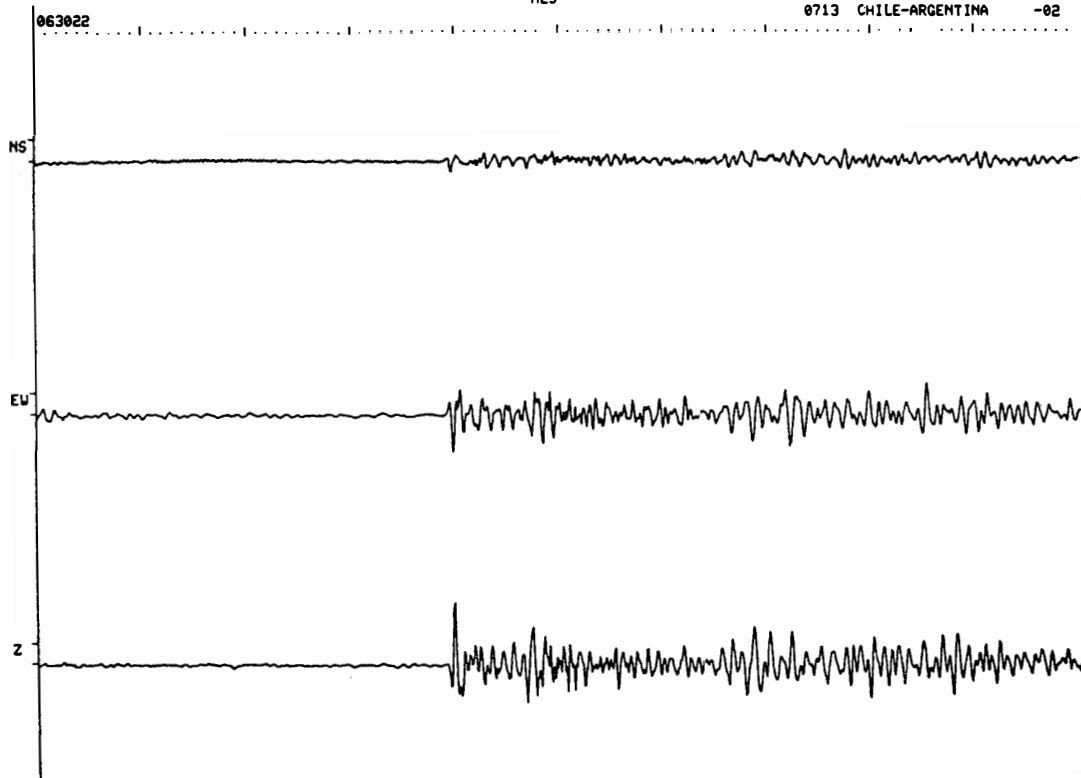
NO 8

HES

0714KERMADEC ISLANDS   -01

NS

EU

Z

NO 9

HES

165252   0714   KERMADEC ISLANDS -01

NS

EU

Z

NO   10

HES   0714   CORDILLERA   -02

NS

EW

Z

NO   11

HES   0716PAPUA NEU GUINEA   -01

NS.

EW.

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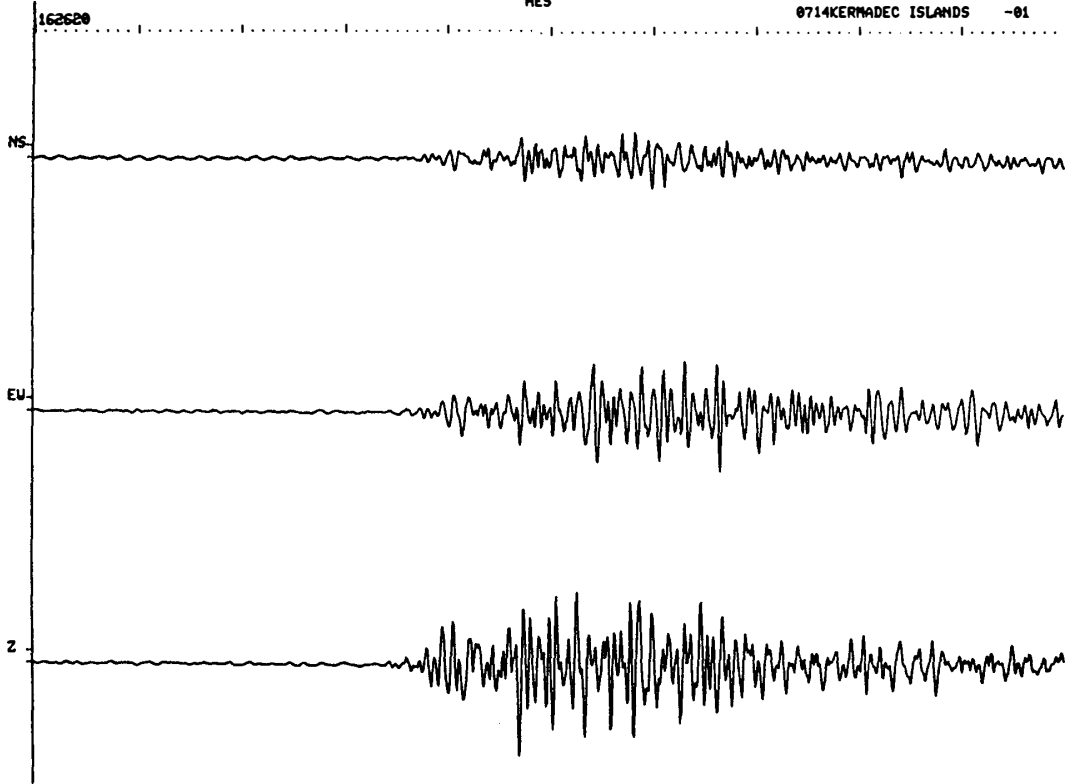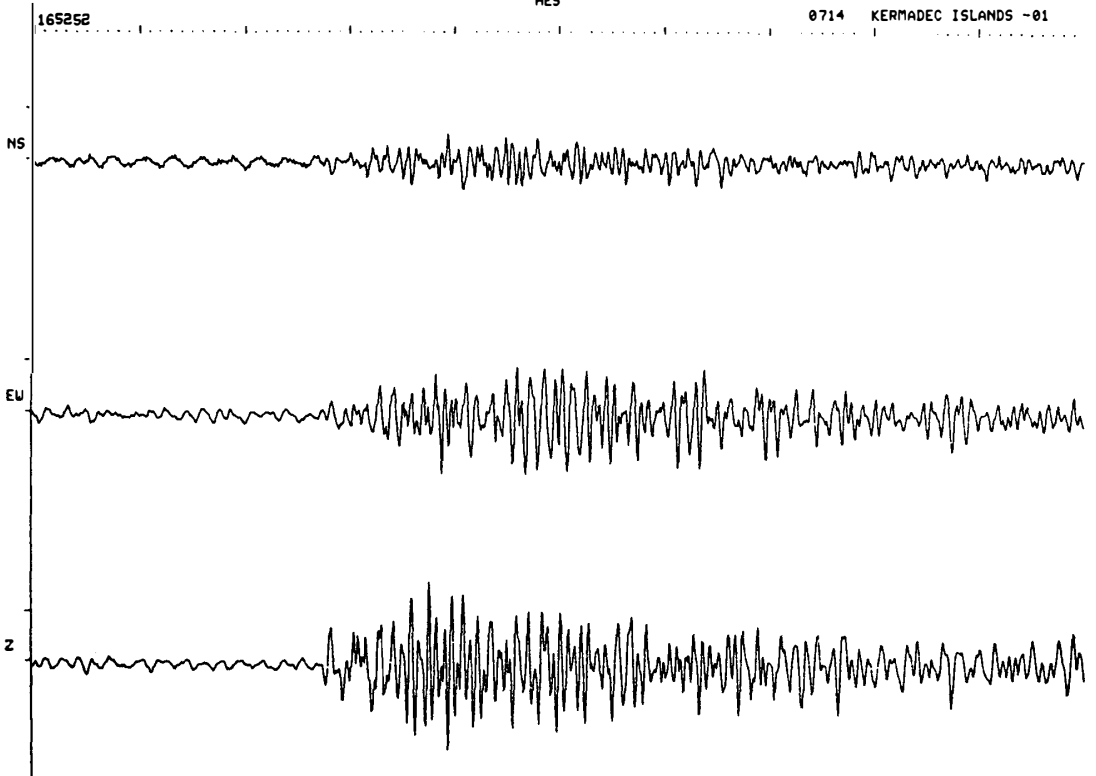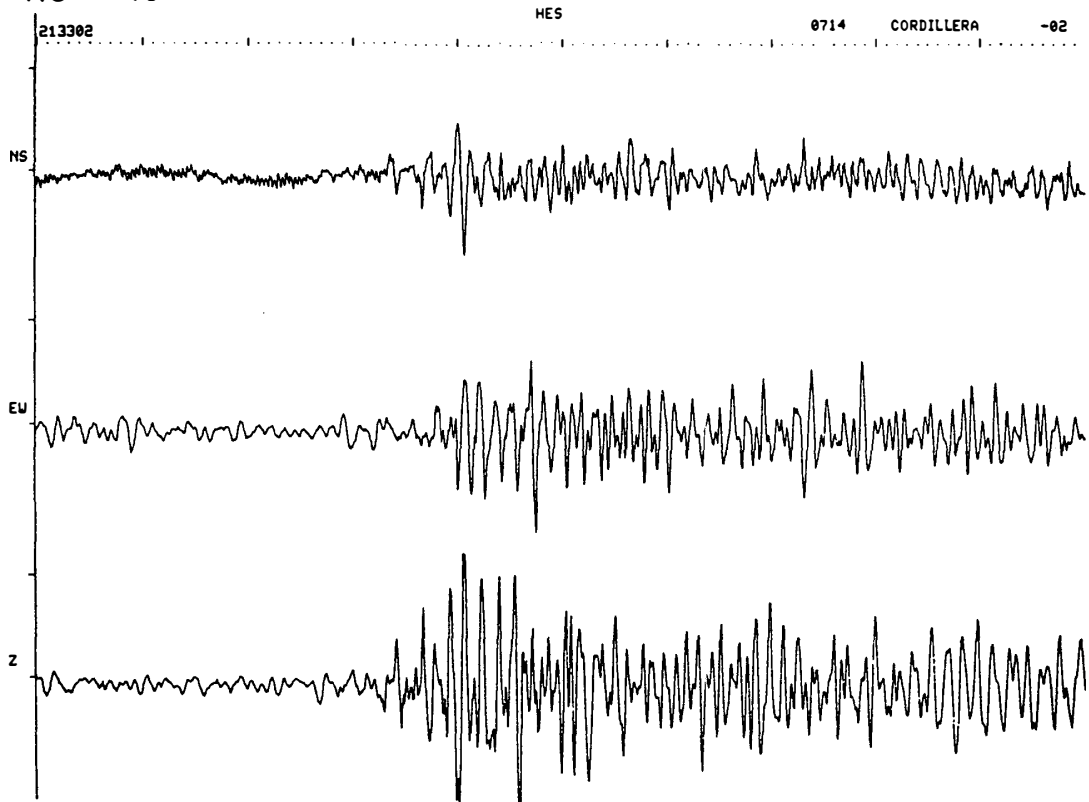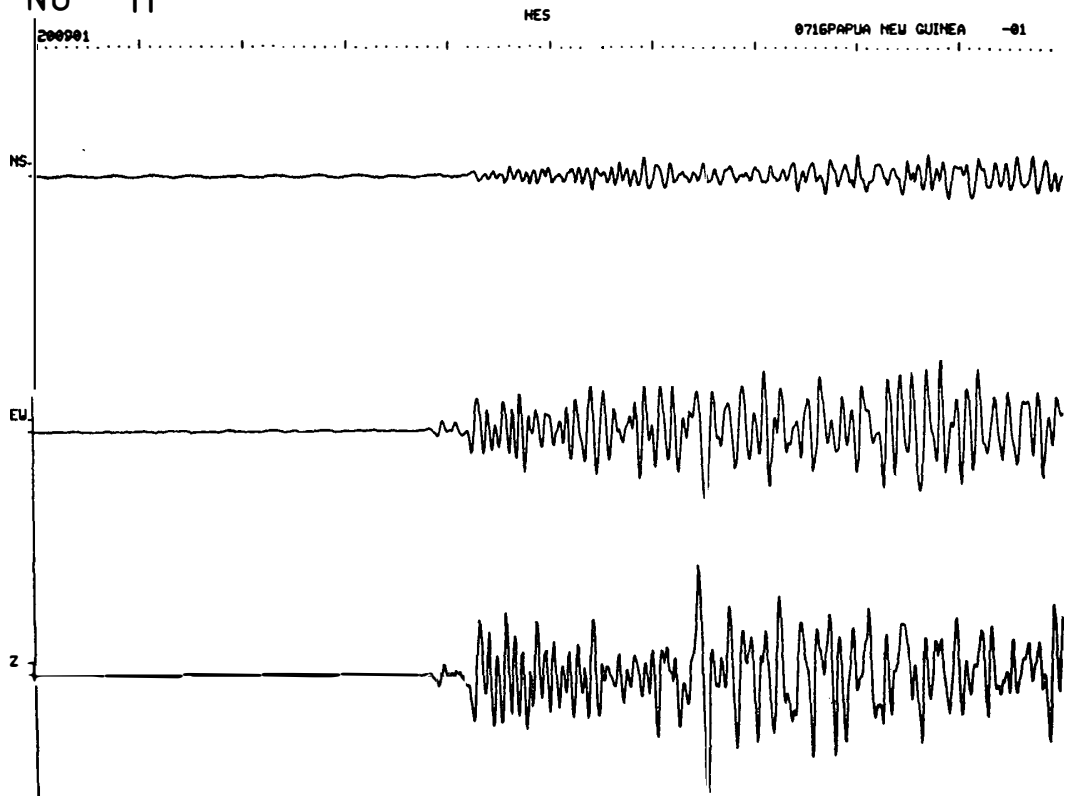
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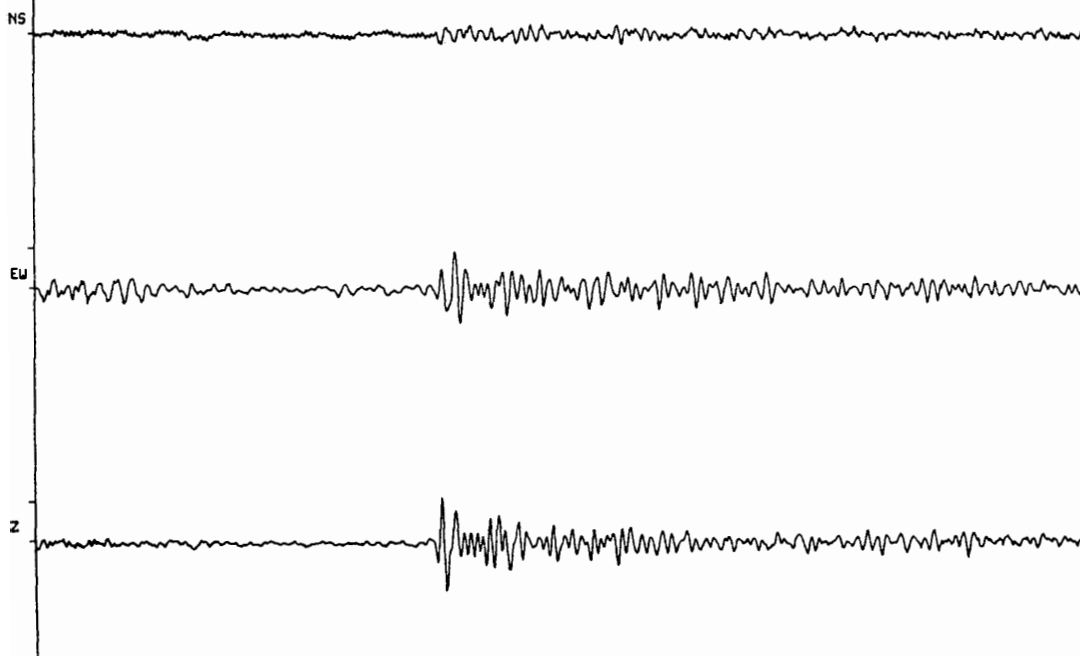
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141716 HES 0717 FIJI ISLANDS -02

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EW

Z

NO 14

104907

0717 SANTA CRUZ ISLANDS -03

NS

EU

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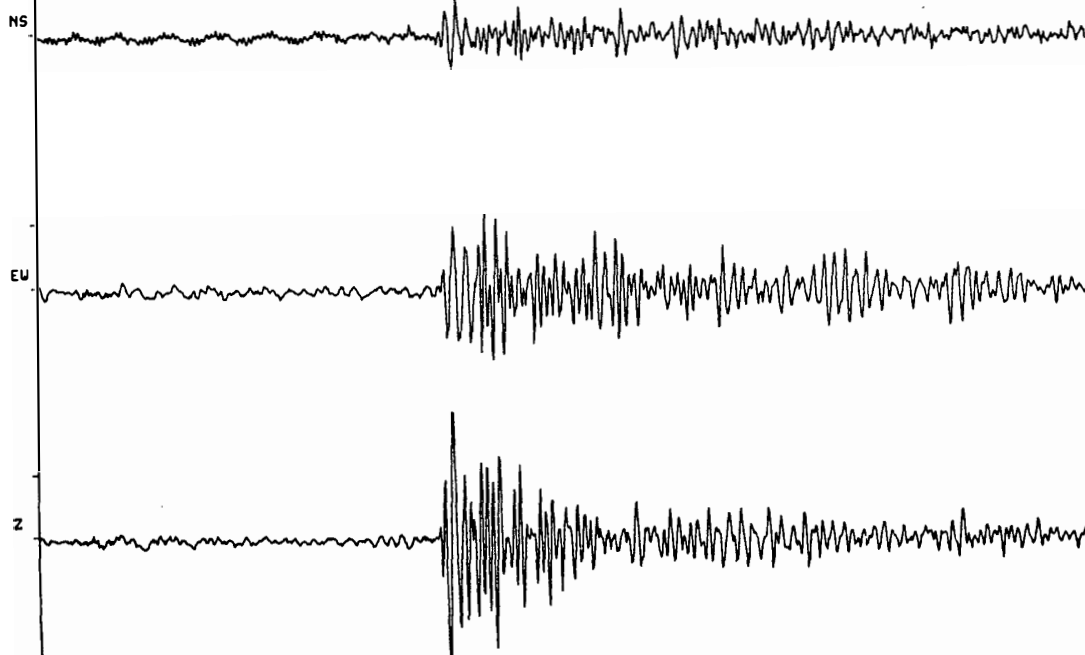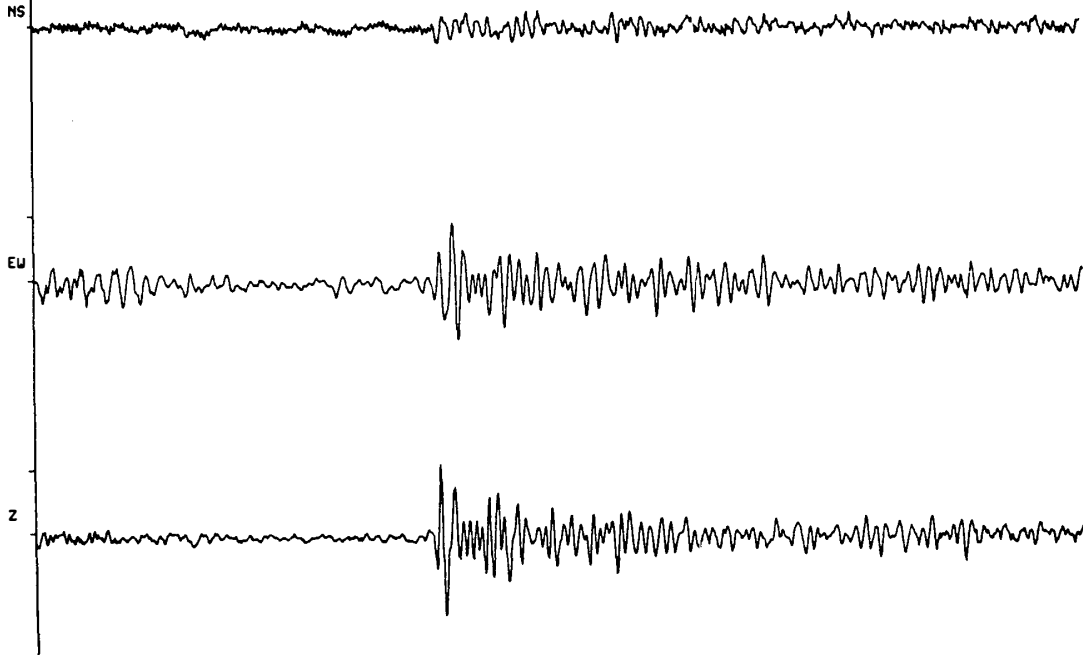
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0718 SANTA CRUZ ISLANDS-01

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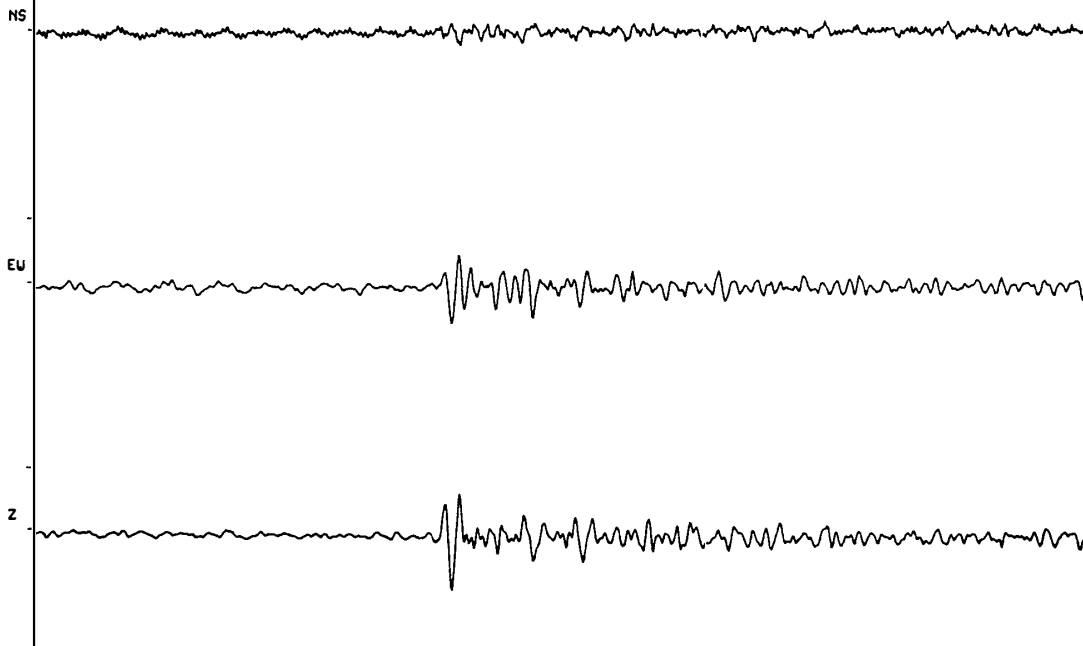
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HES 0719CHILE-ARGENTINA ♦ -01

120236

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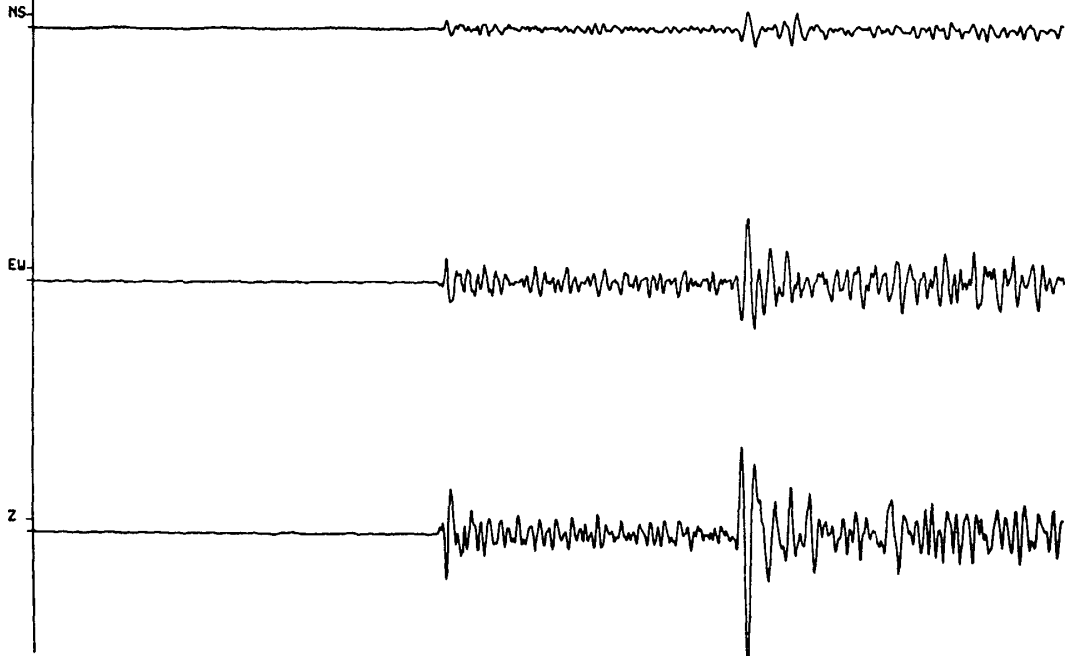
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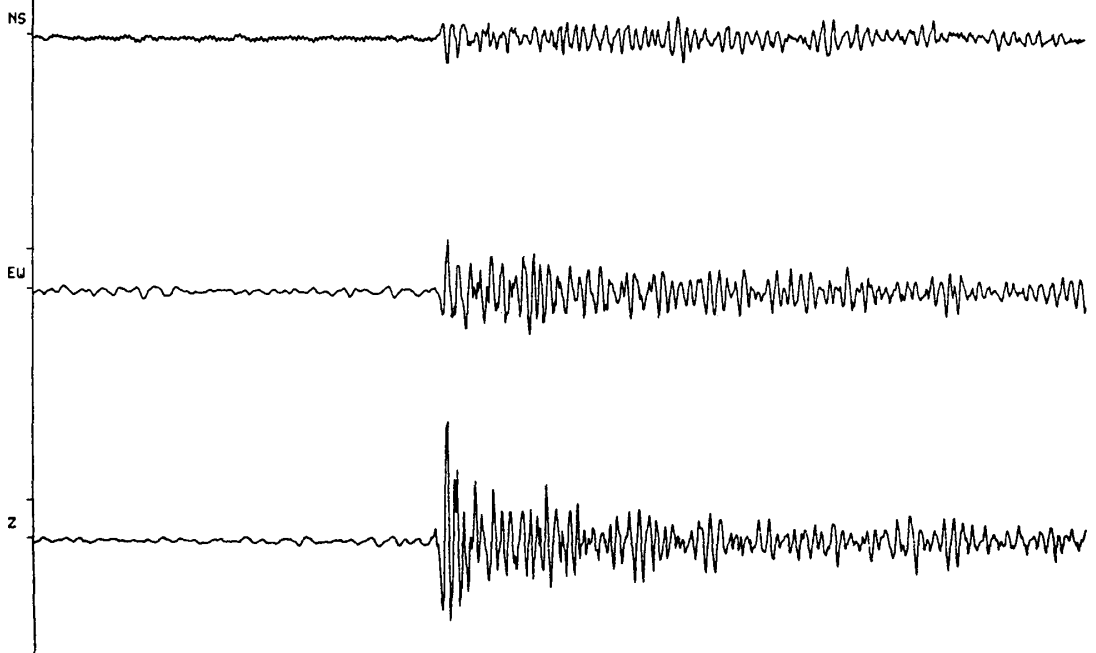
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164639

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NO 19

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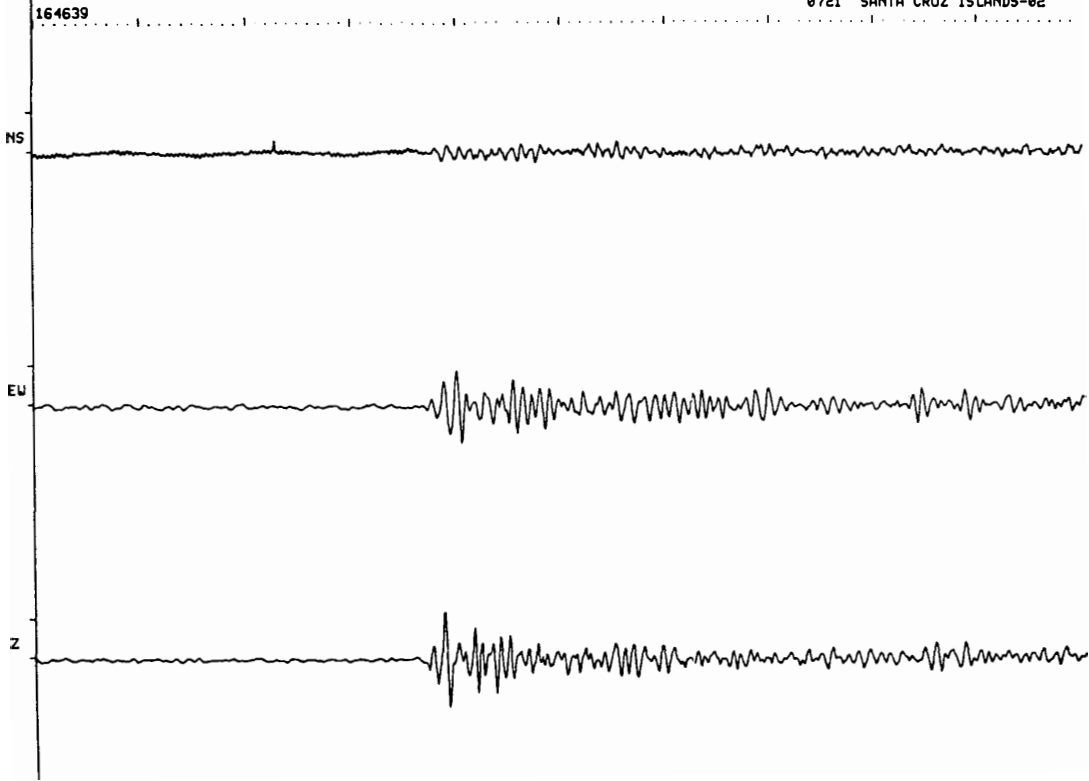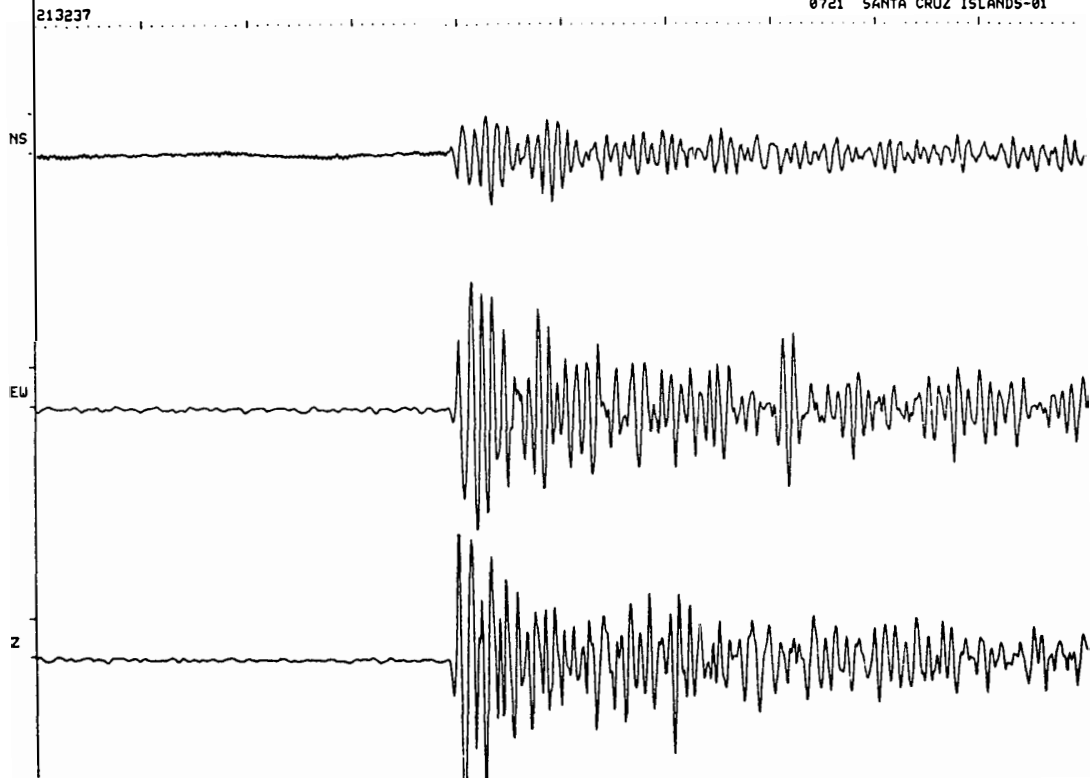
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154156 HES 0724 LOYALTY ISLANDS -01

NS

EW

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NO 22

192358   HES   0725   SOUTH NEVADA   -01

NS

EU

Z

NO 23

032410   HES   0729   VANUATU ISLANDS -01

NS

EU

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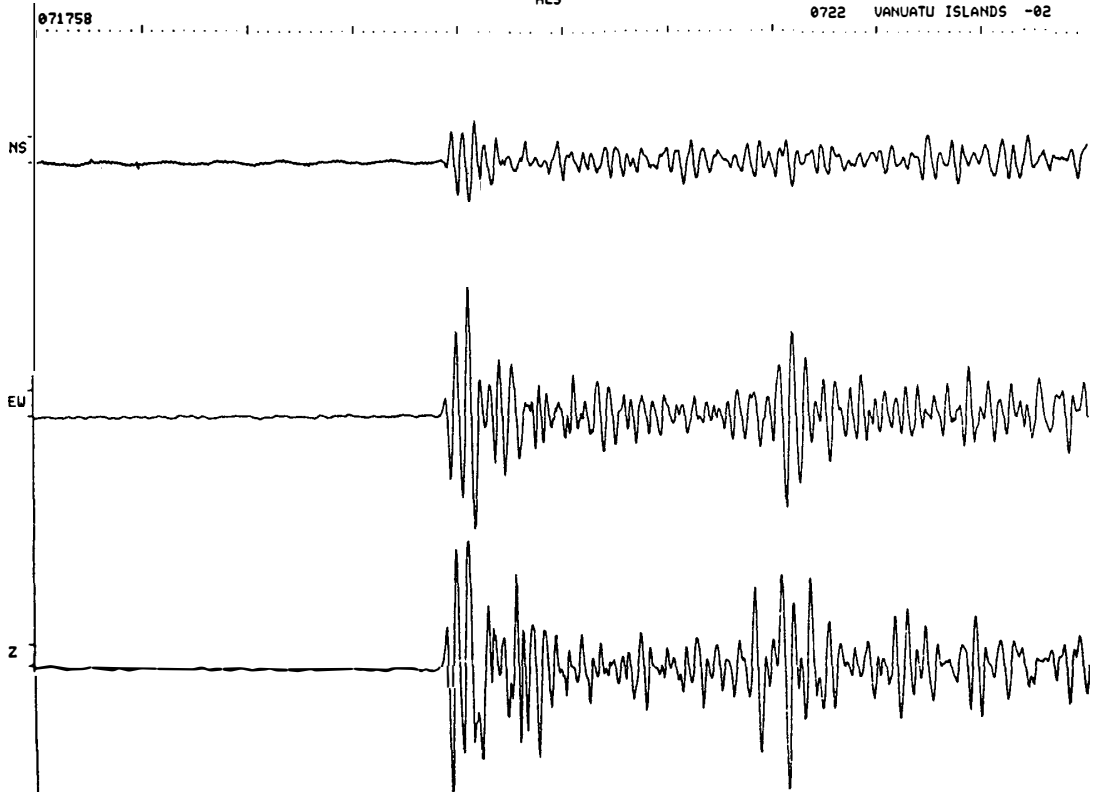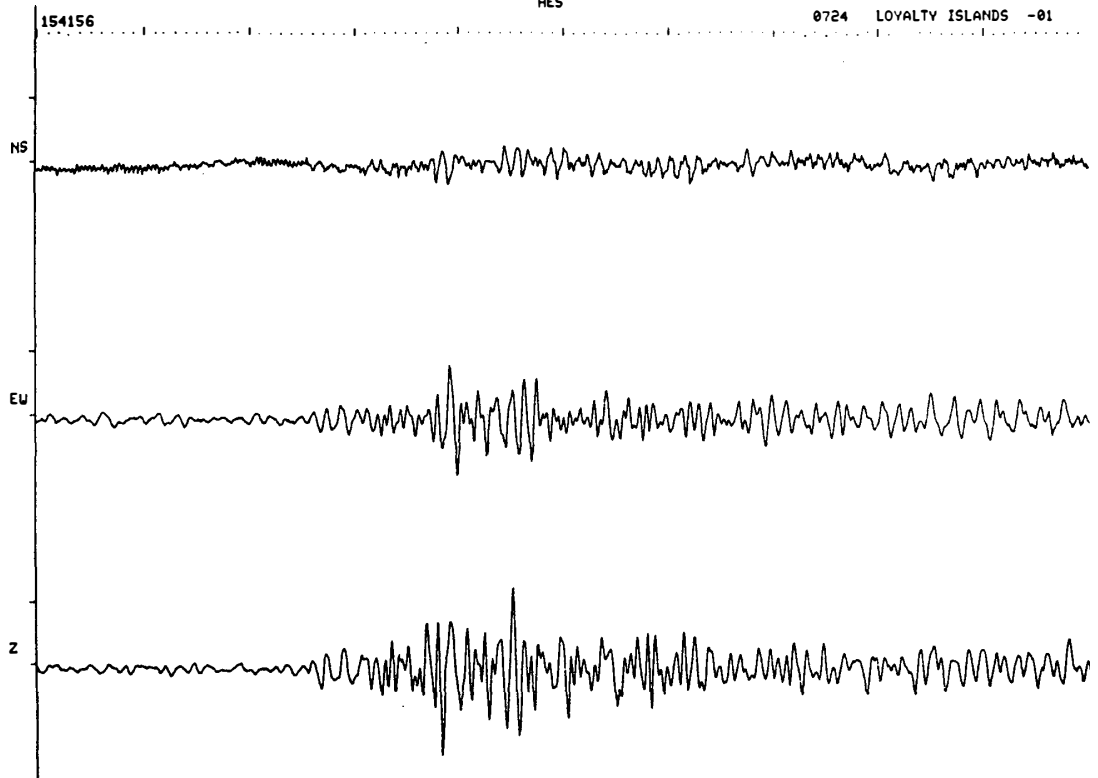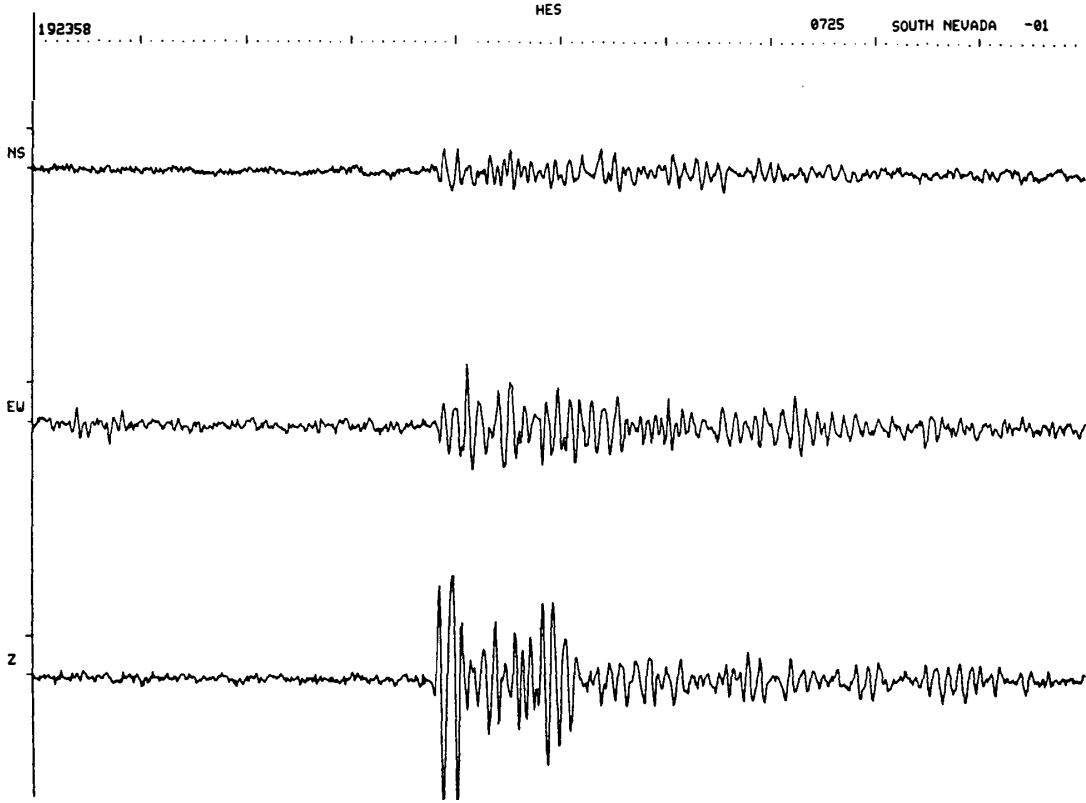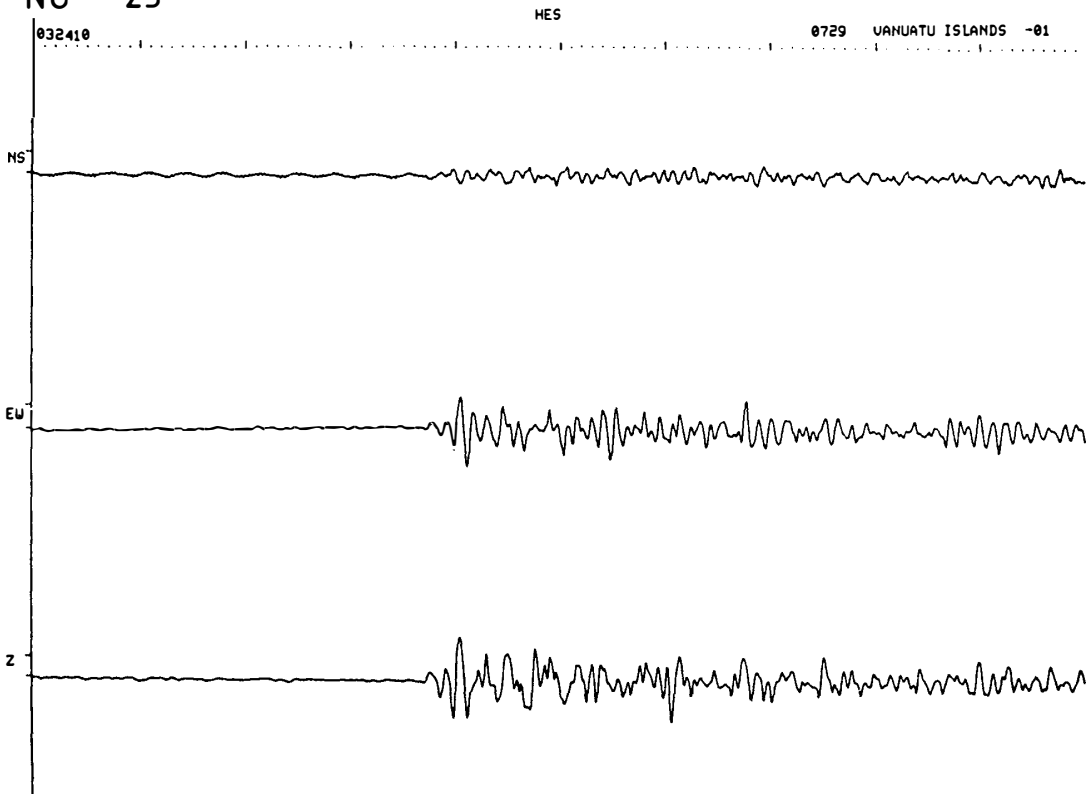
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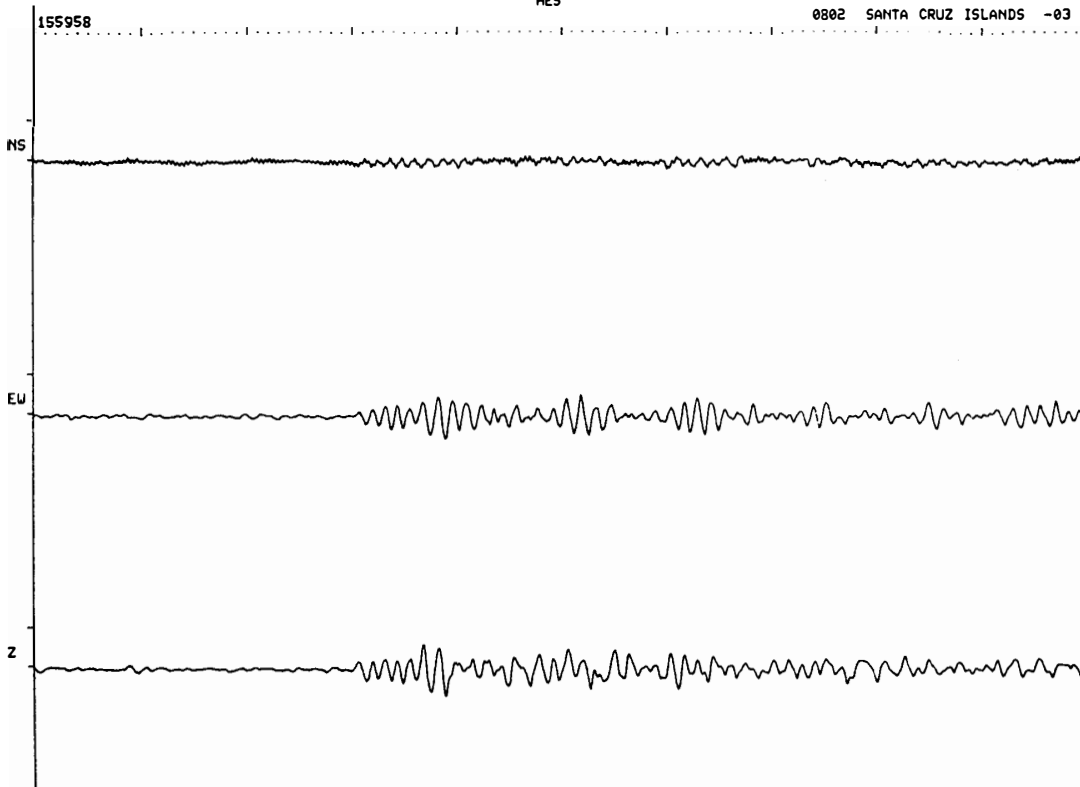
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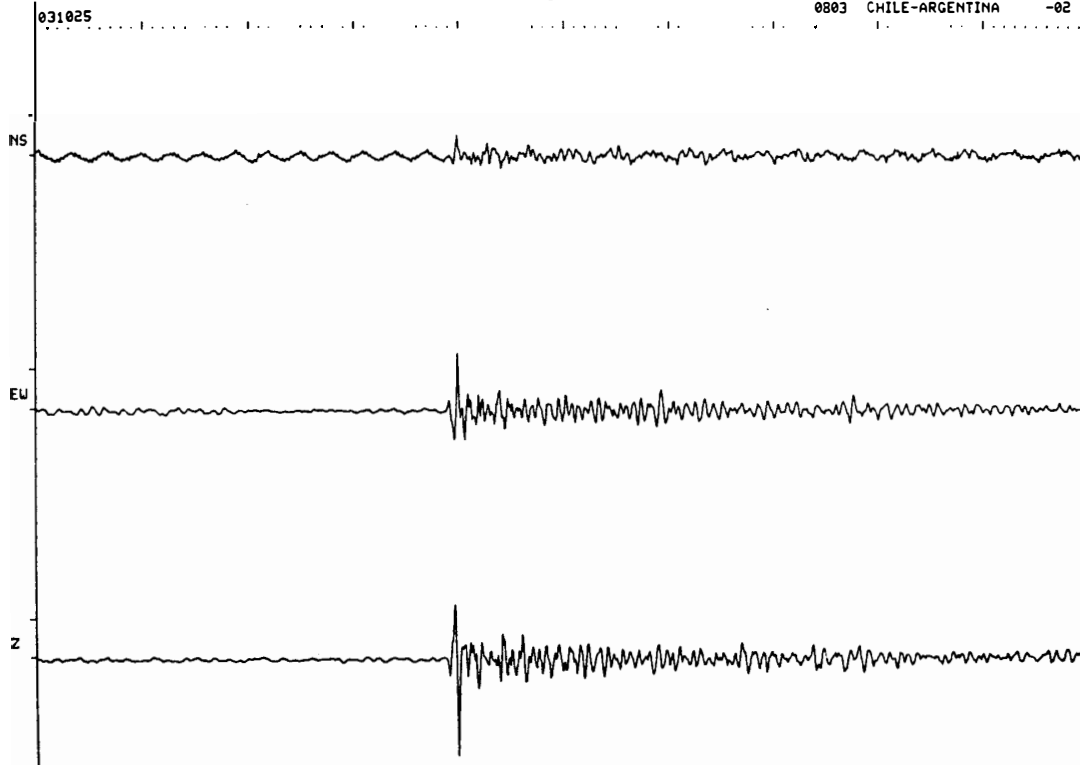
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174922

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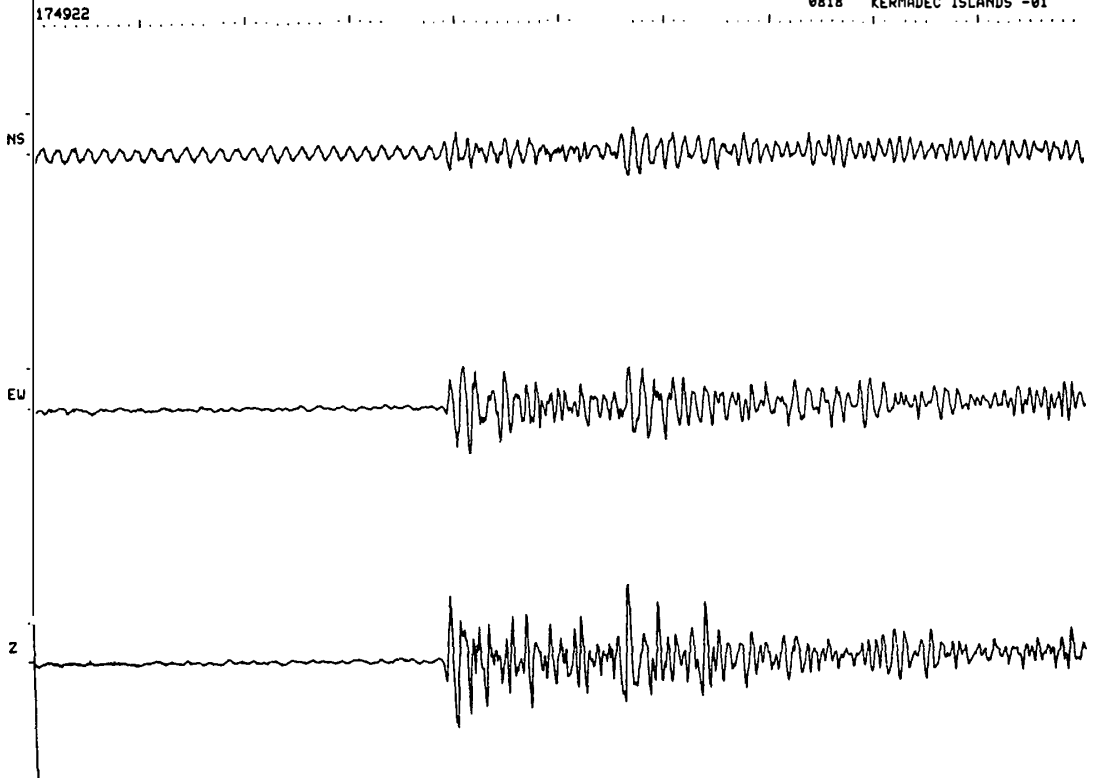
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0819 WEST OF MACQUARIE -01

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NO 28

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NO 29

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NS

EW

Z

—44—
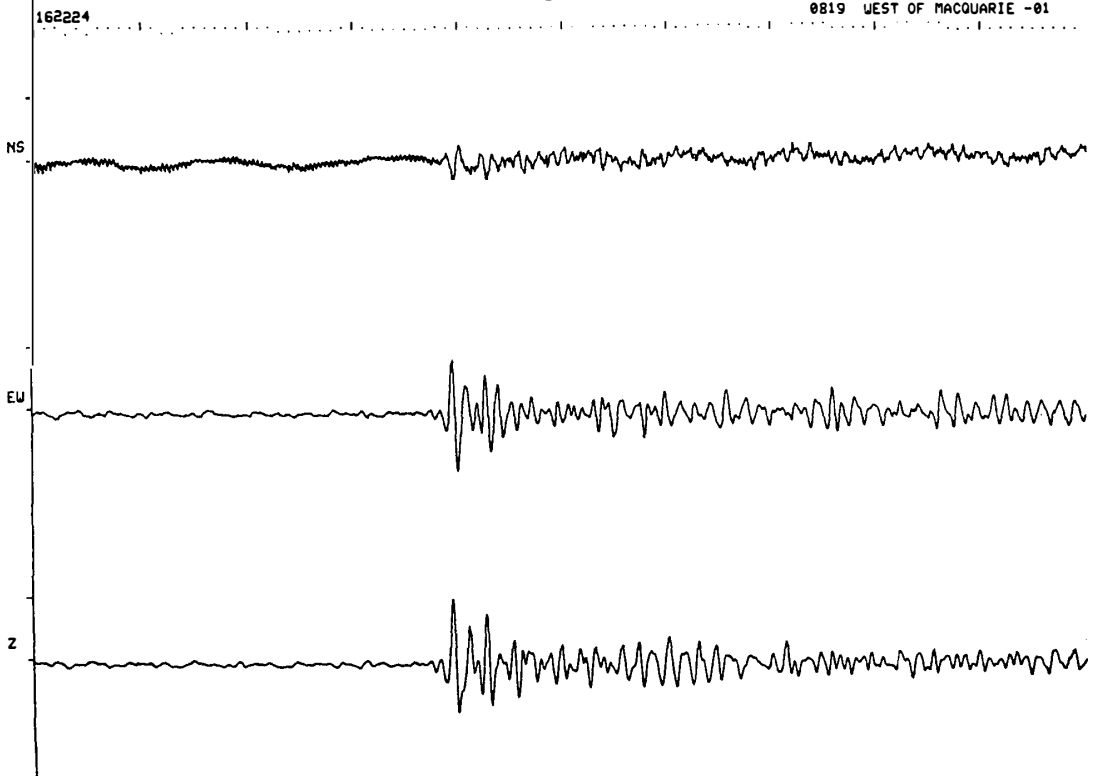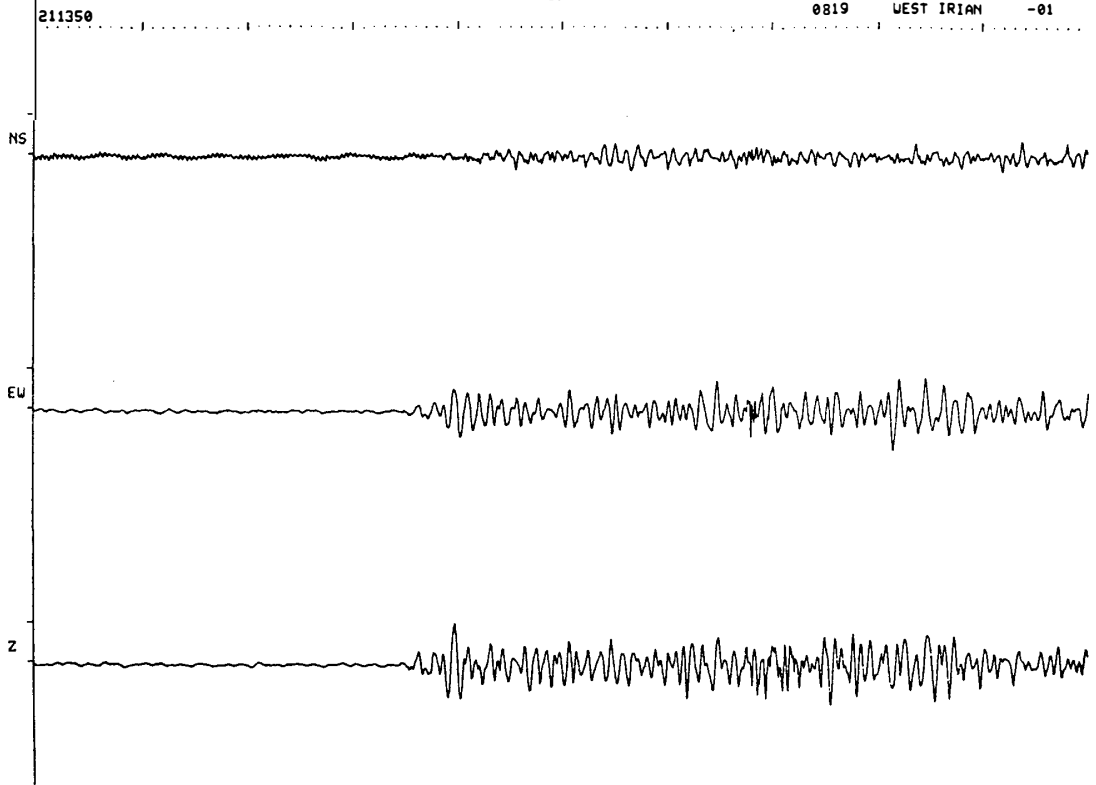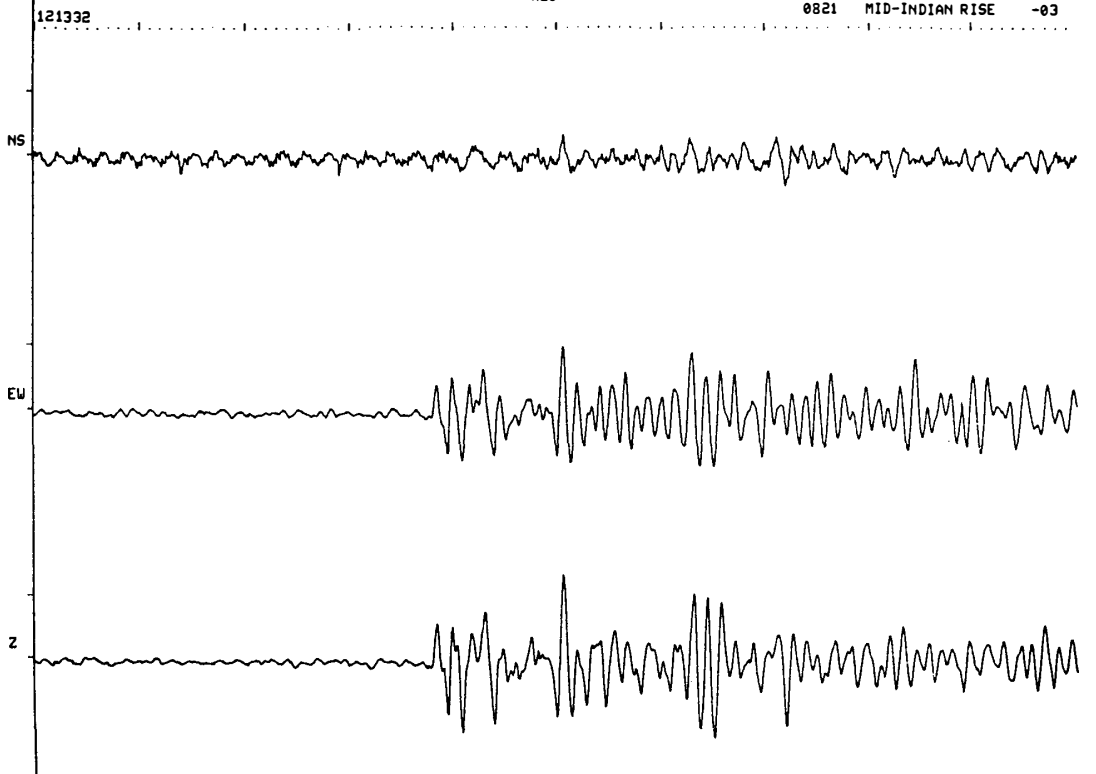
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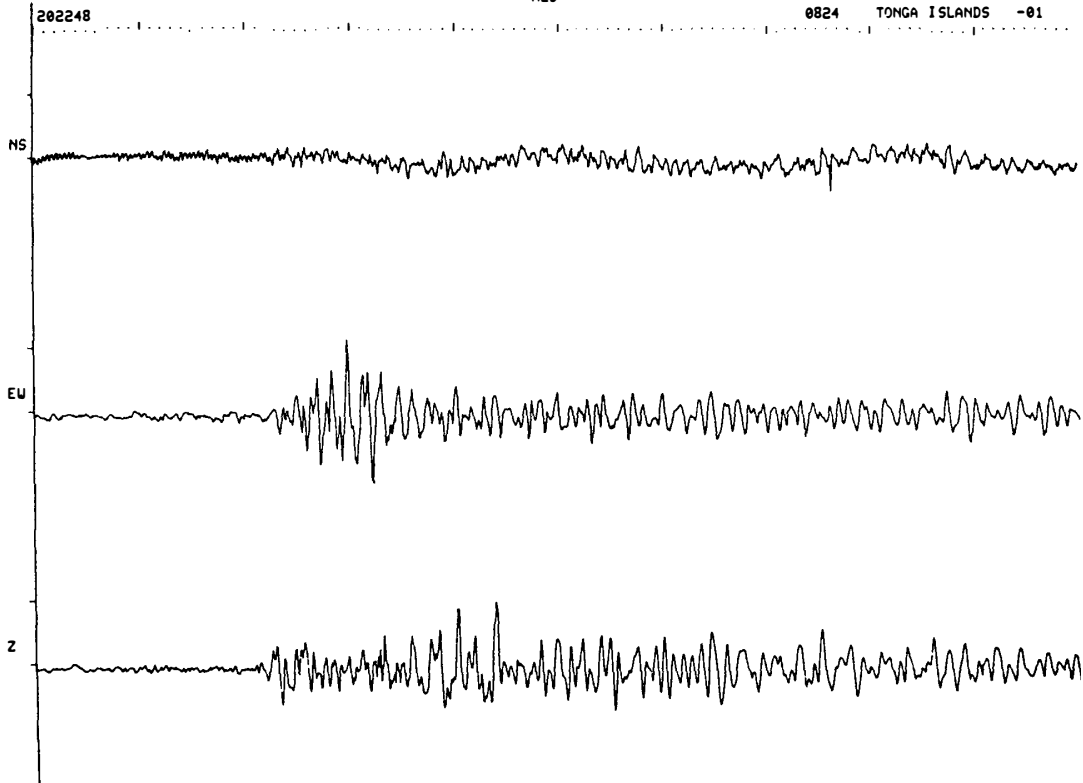
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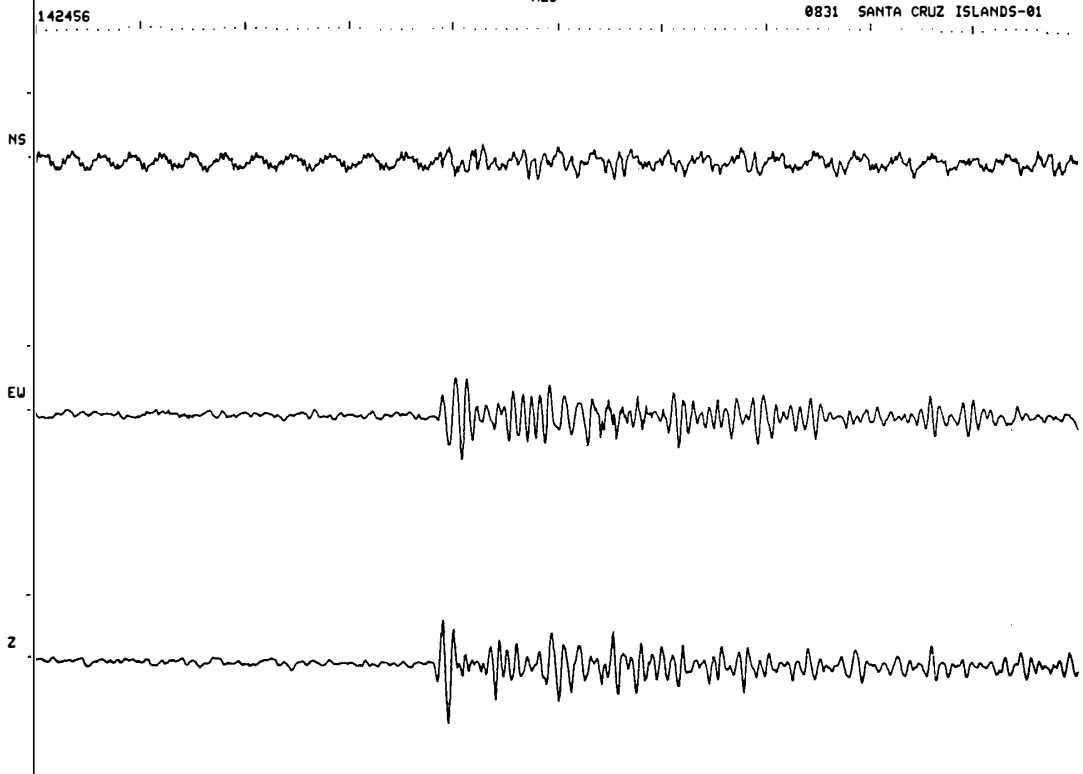
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164127　　　　　　　　　　　　　　　　　　　　0831 MINAHASSA PENINSULA-01

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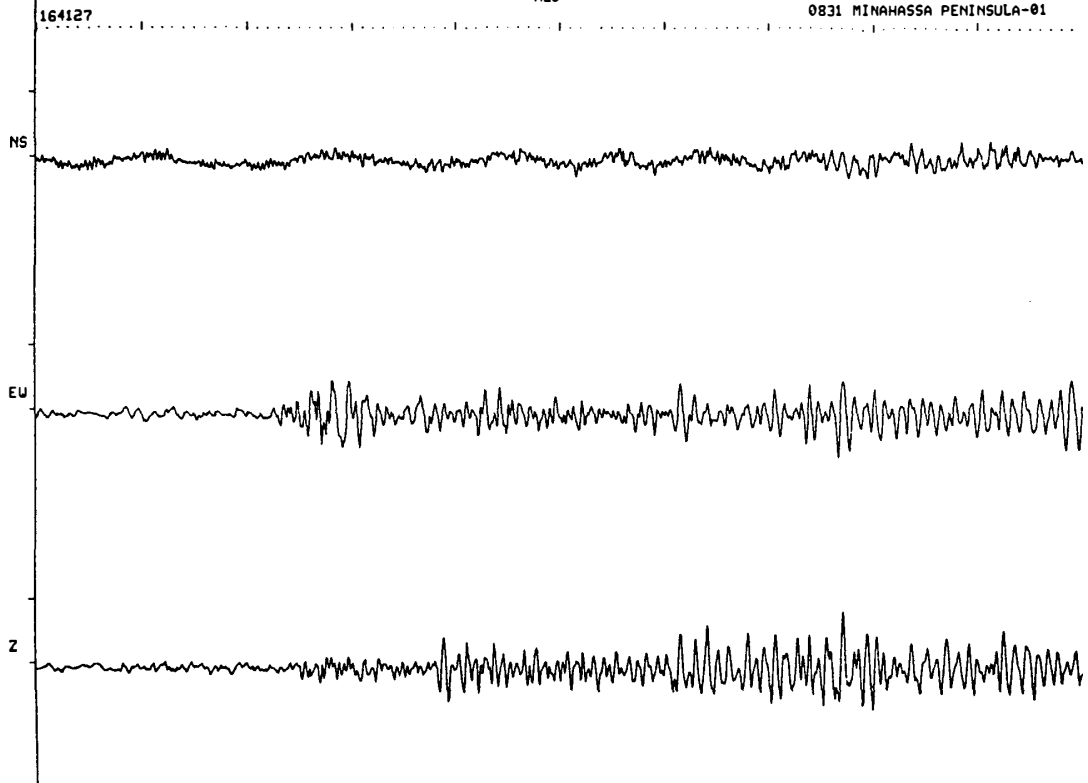
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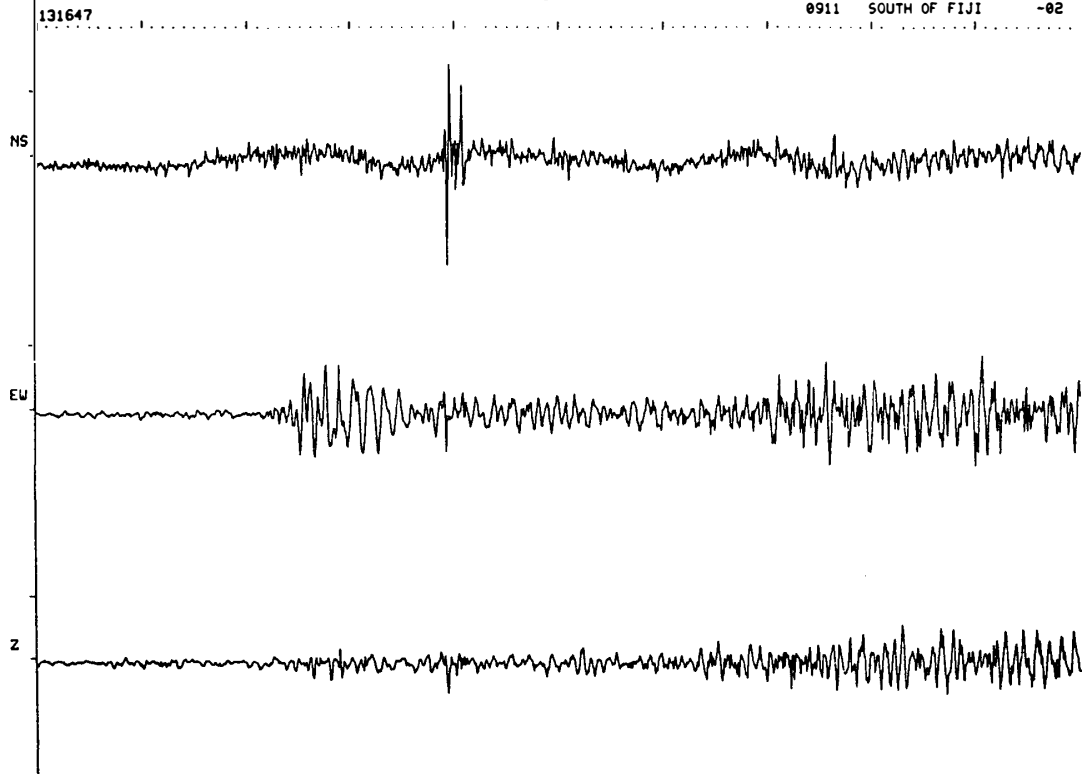
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201129

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HES 0914 EASTERN KAZAKH SSR-02

030055

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043441 HES 0915 SOUTH SHETLAND -01

NS

EW

Z

NO 37

034121 HES 0920 BOUVET ISLAND -02

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EW

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NO 38

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NO 39

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EU

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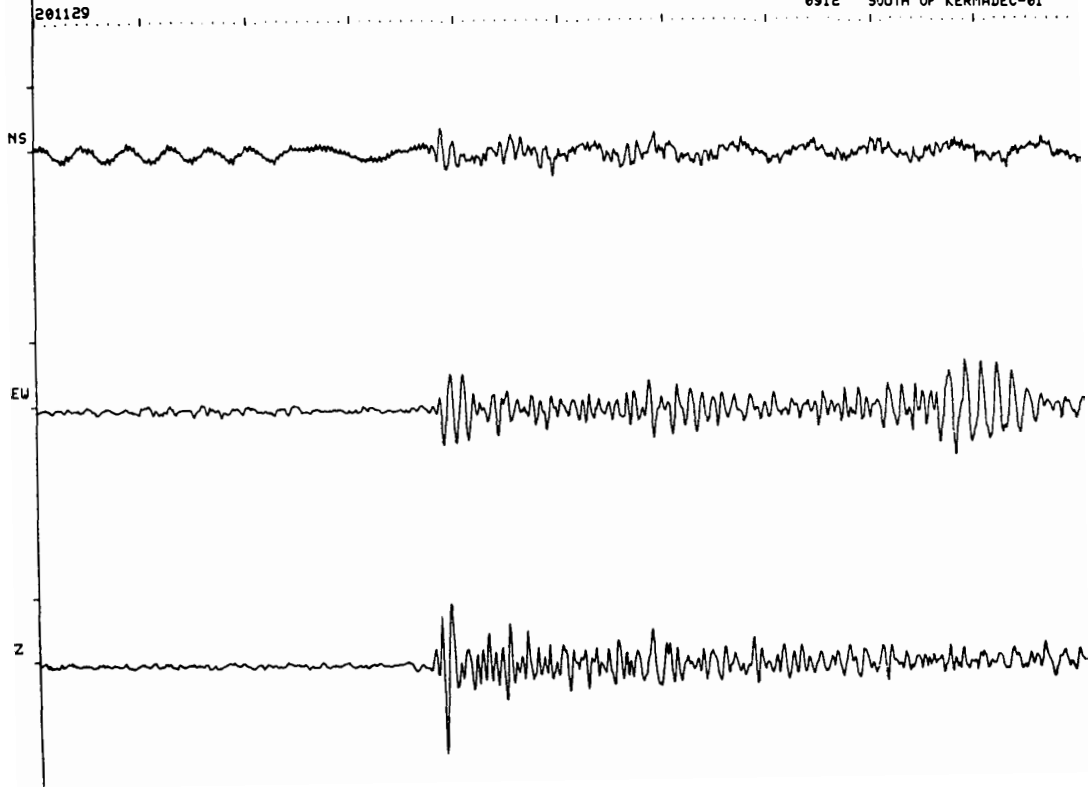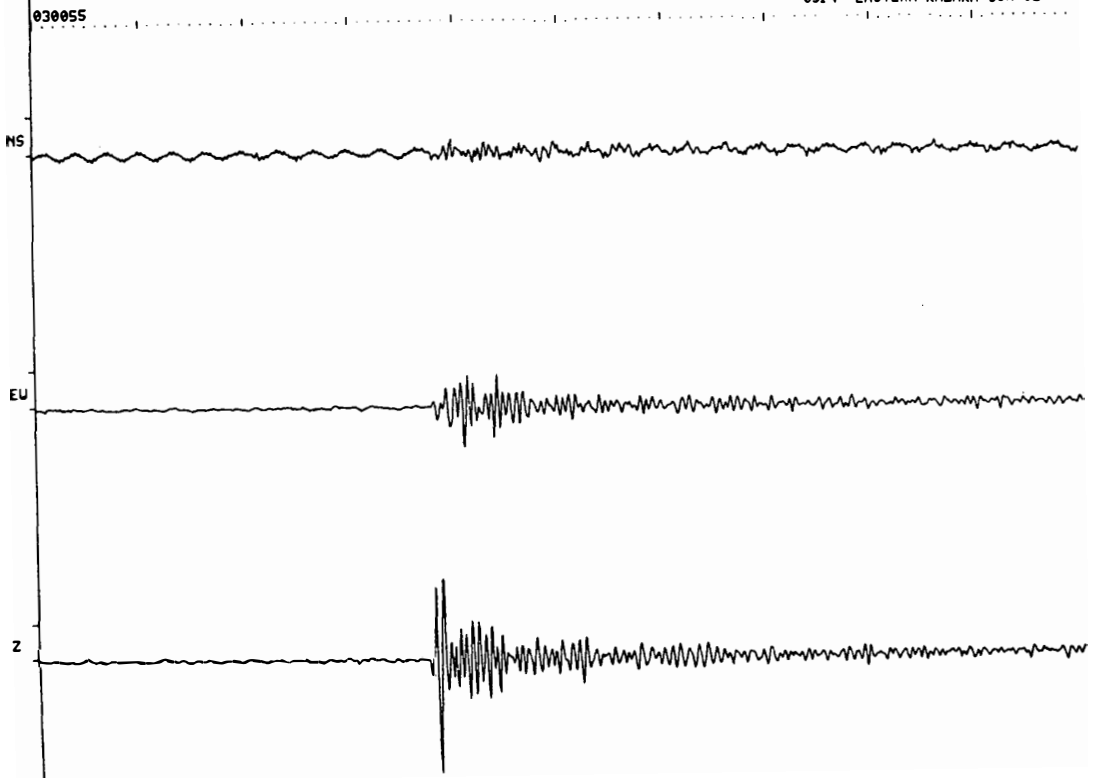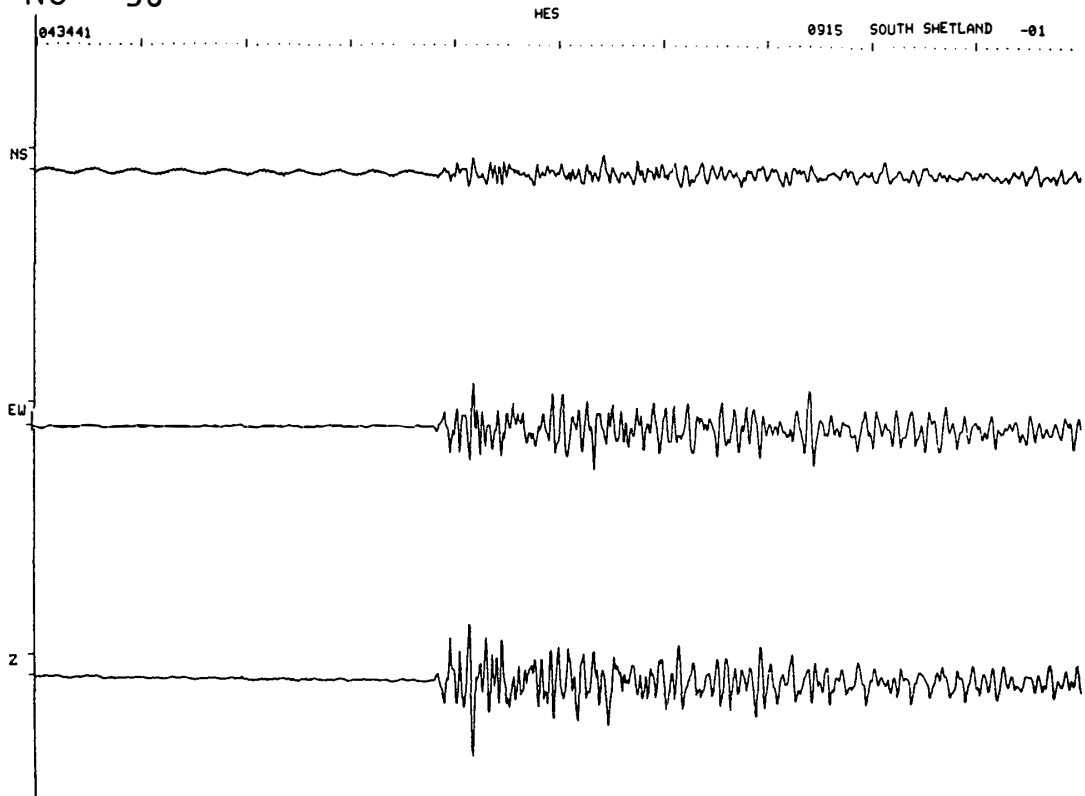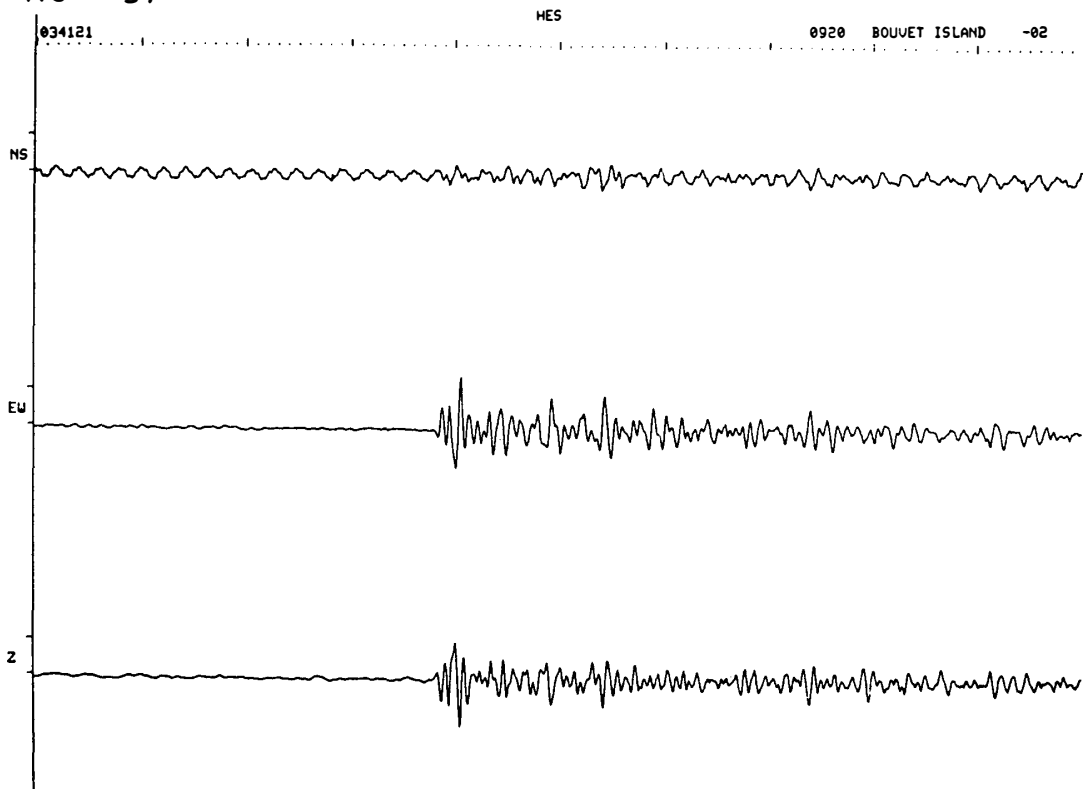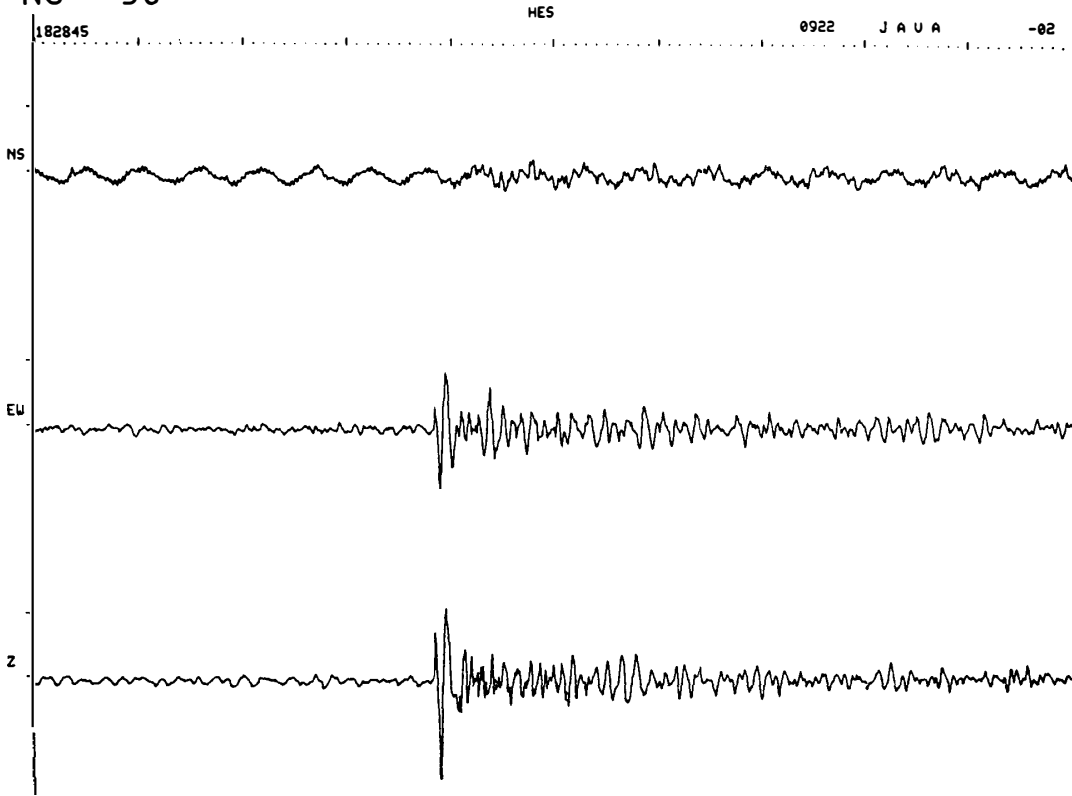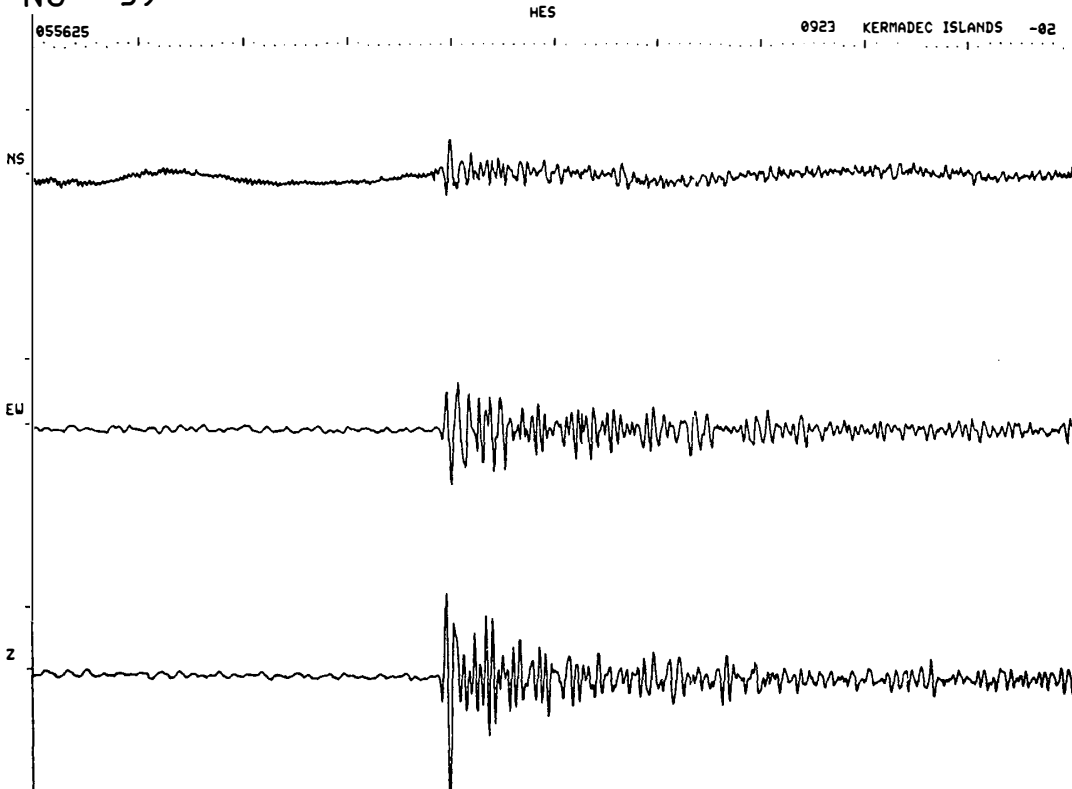
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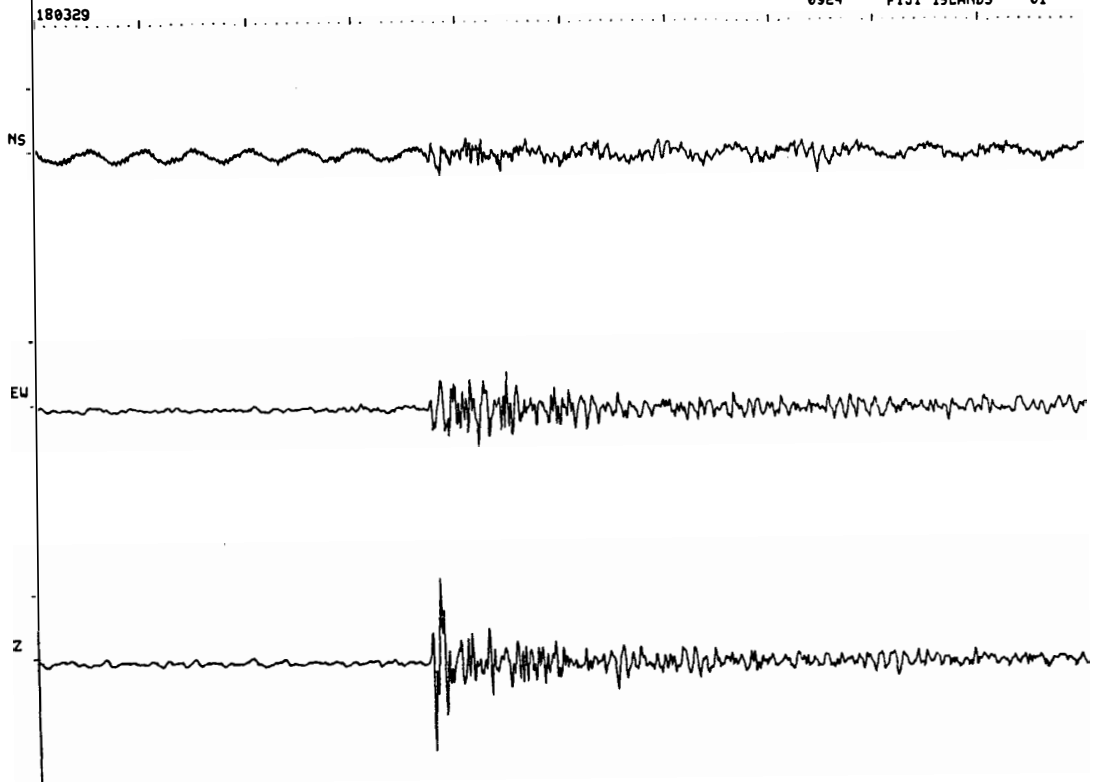
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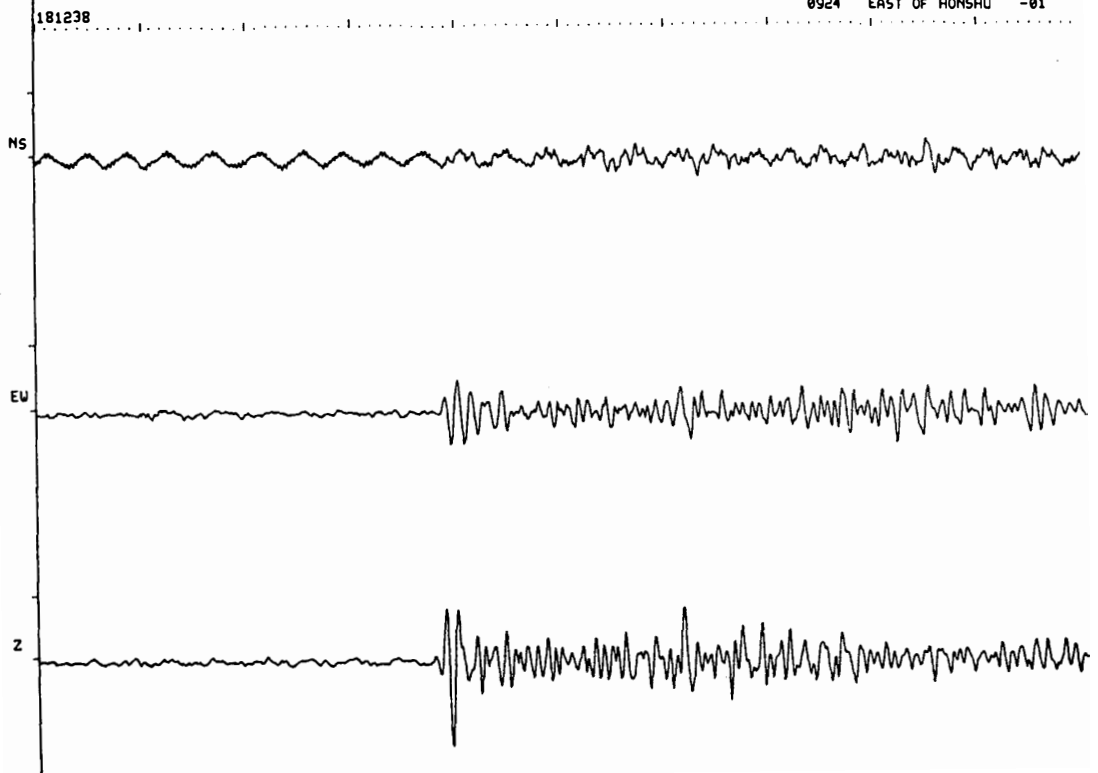
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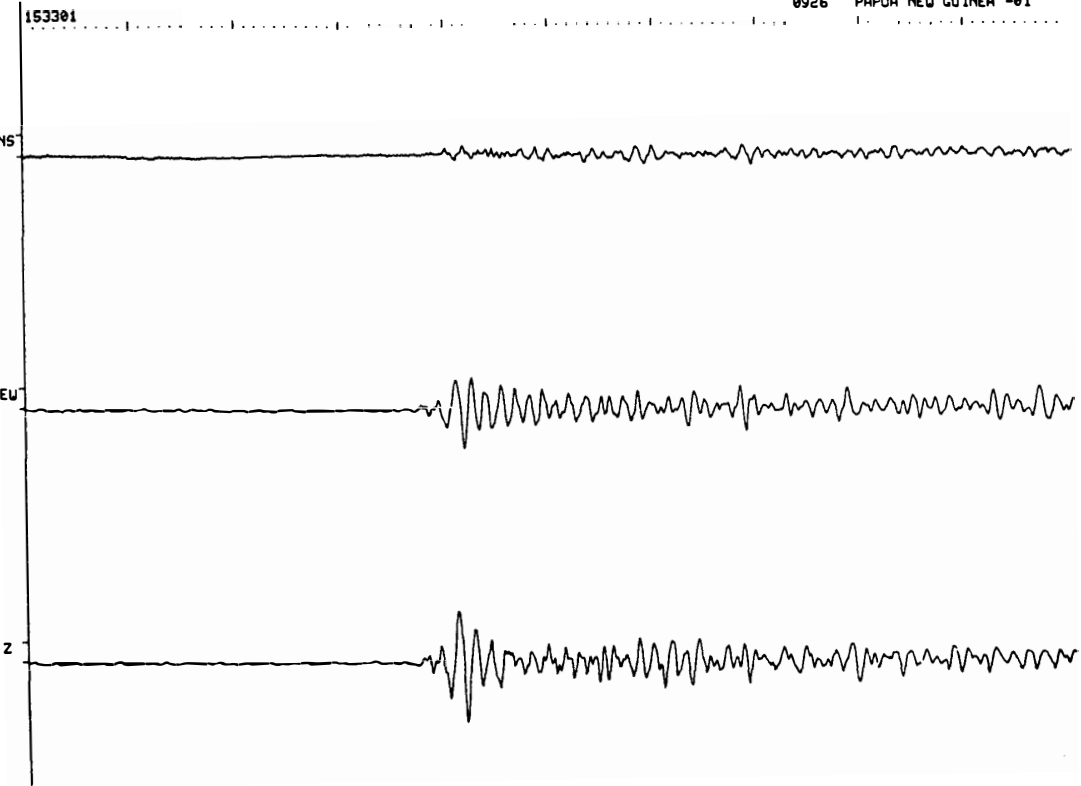
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0928 SOLOMON ISLANDS -01

183824

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NO 45

180753   1003 BOUVET ISLAND   -01

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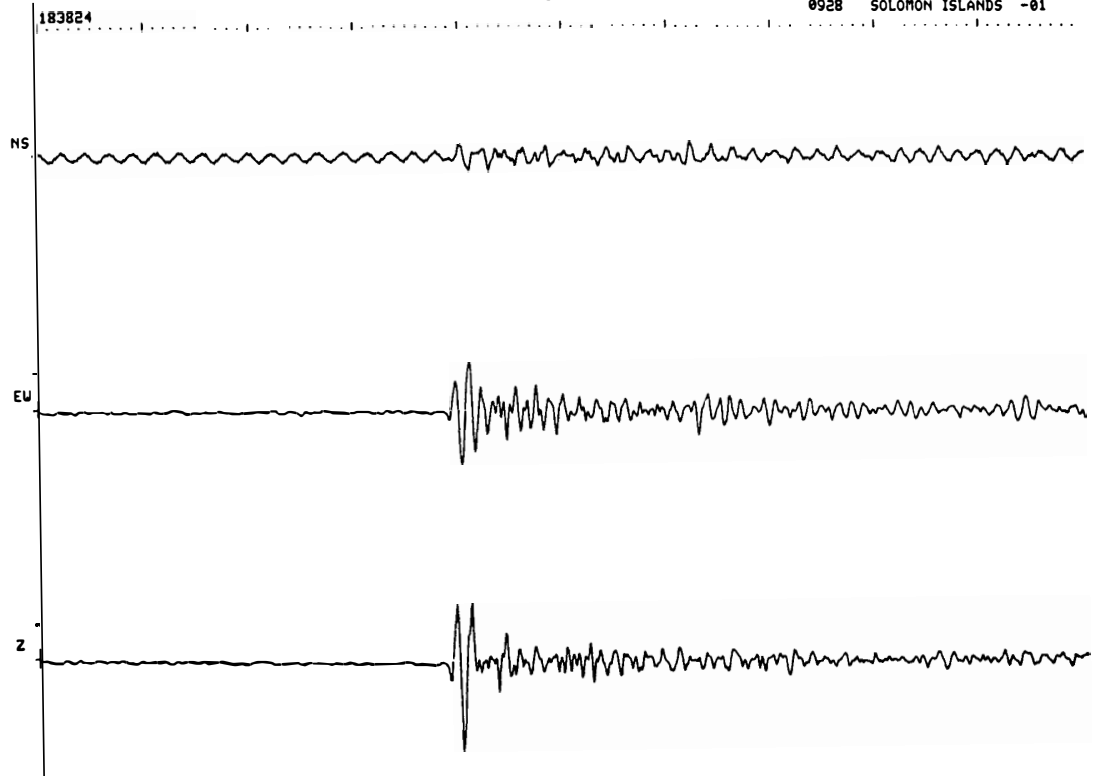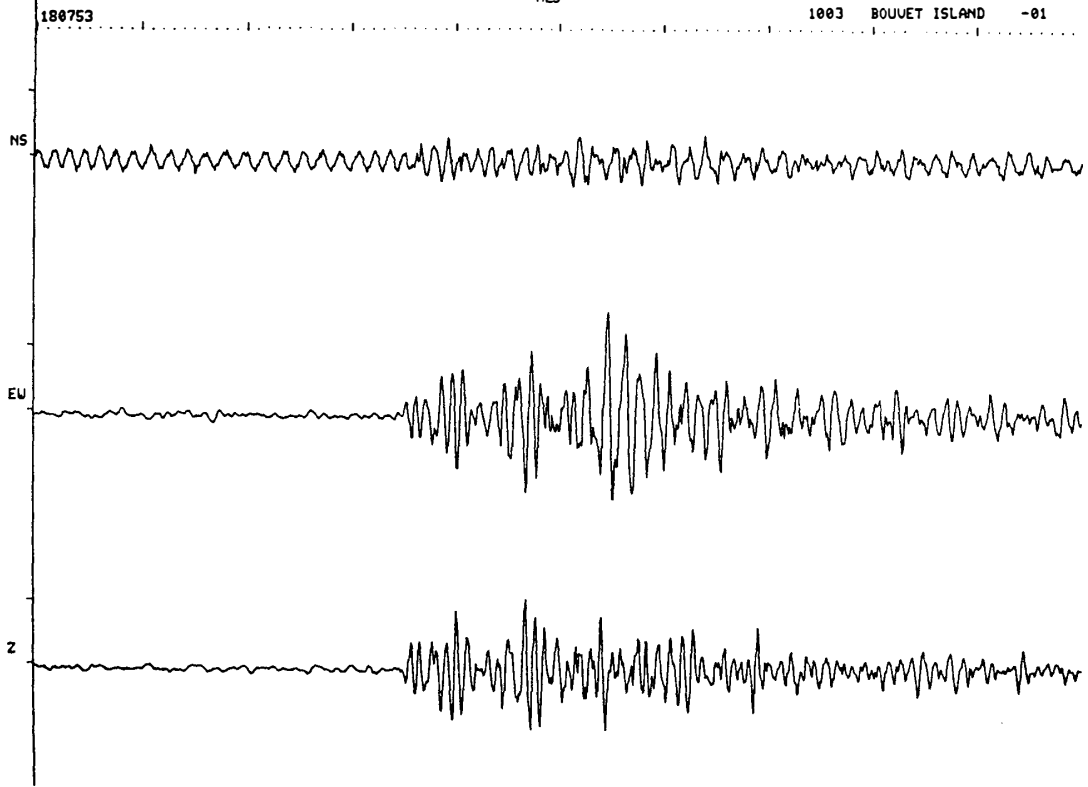
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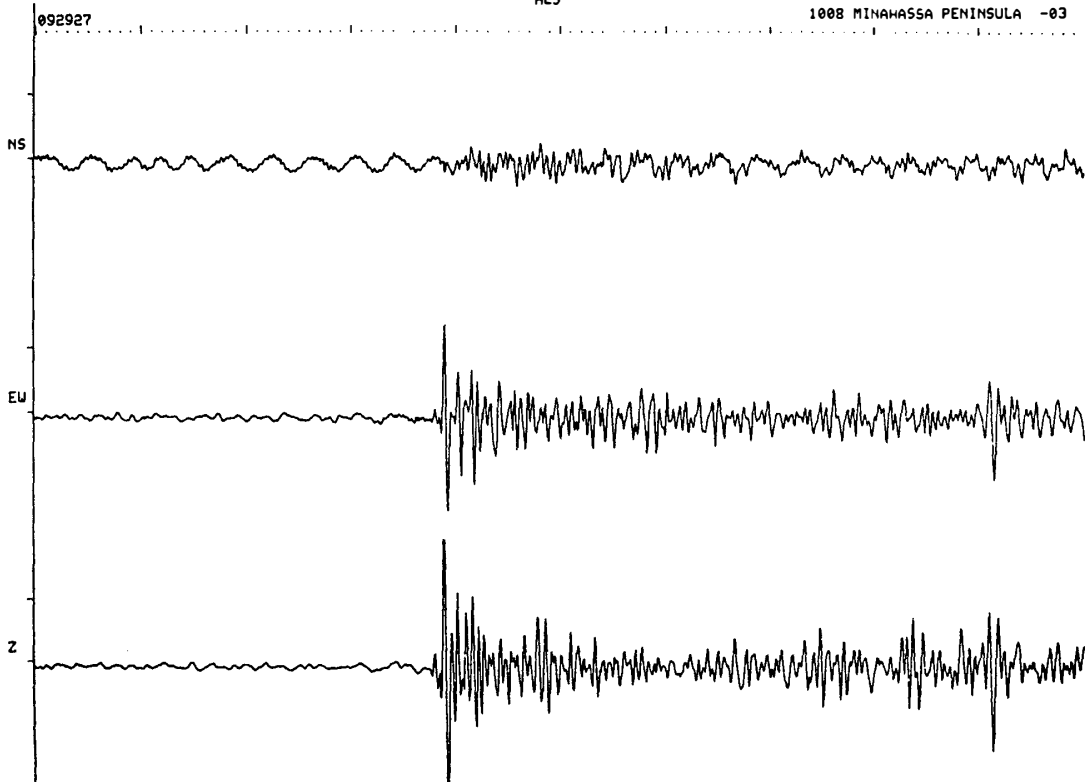
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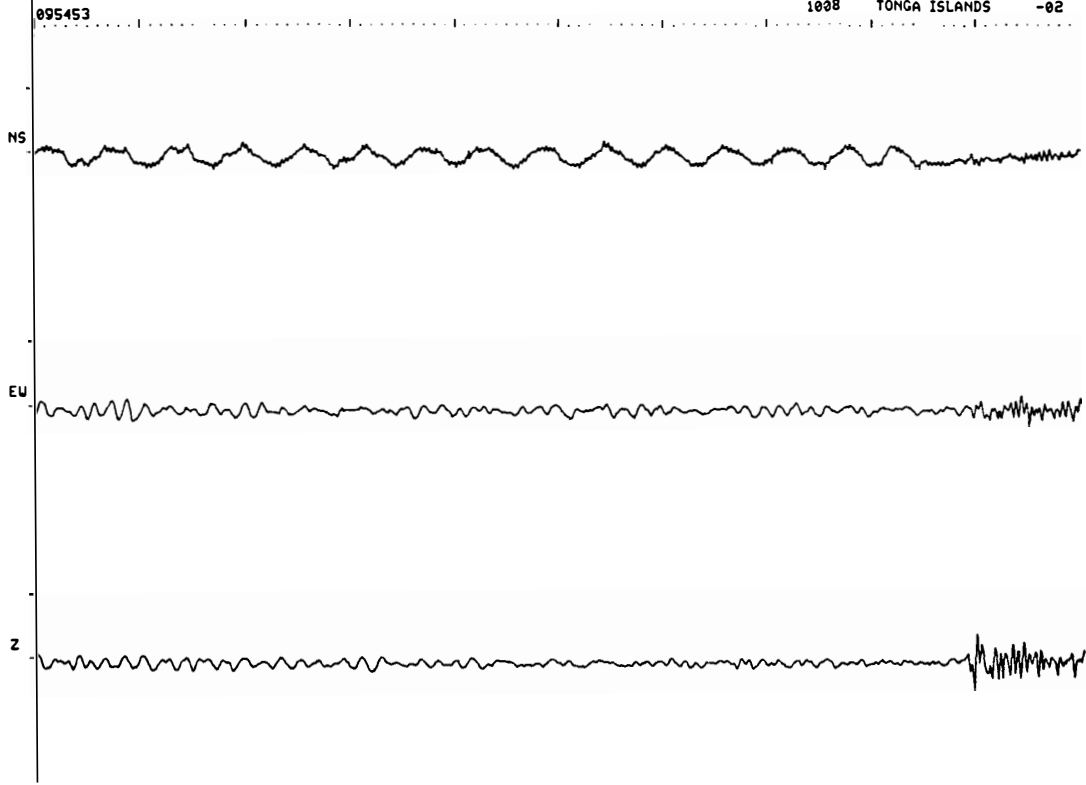
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NO 47

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NO 48

161600

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NO 49

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114356

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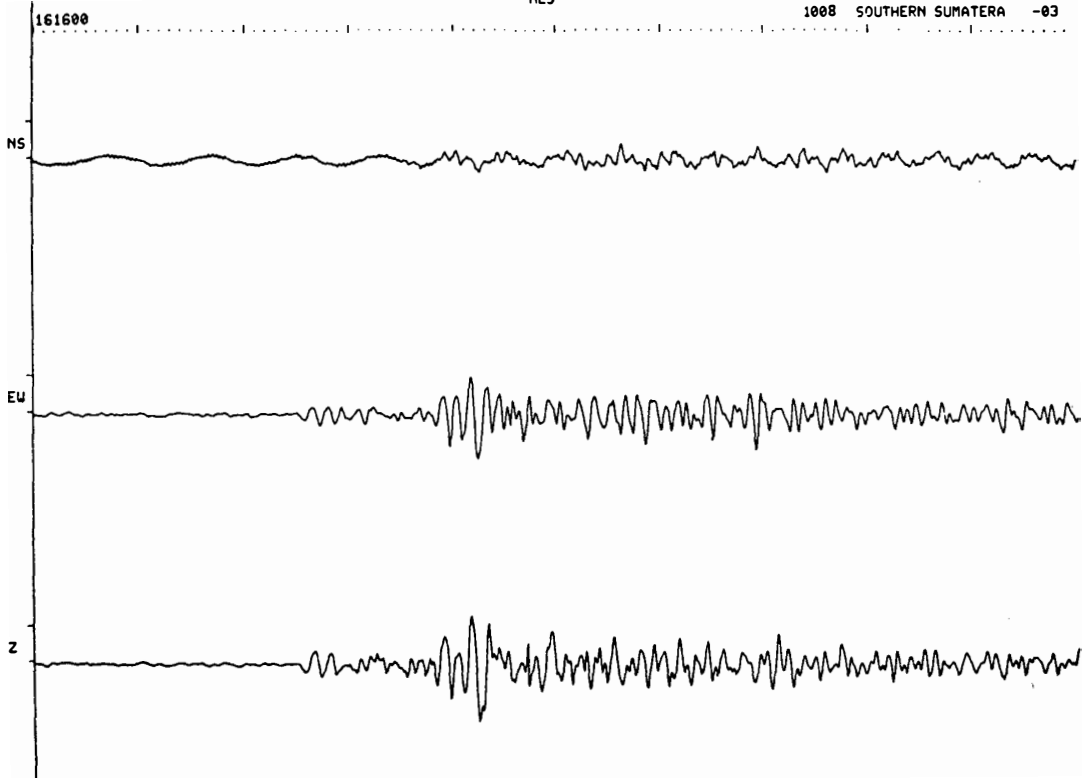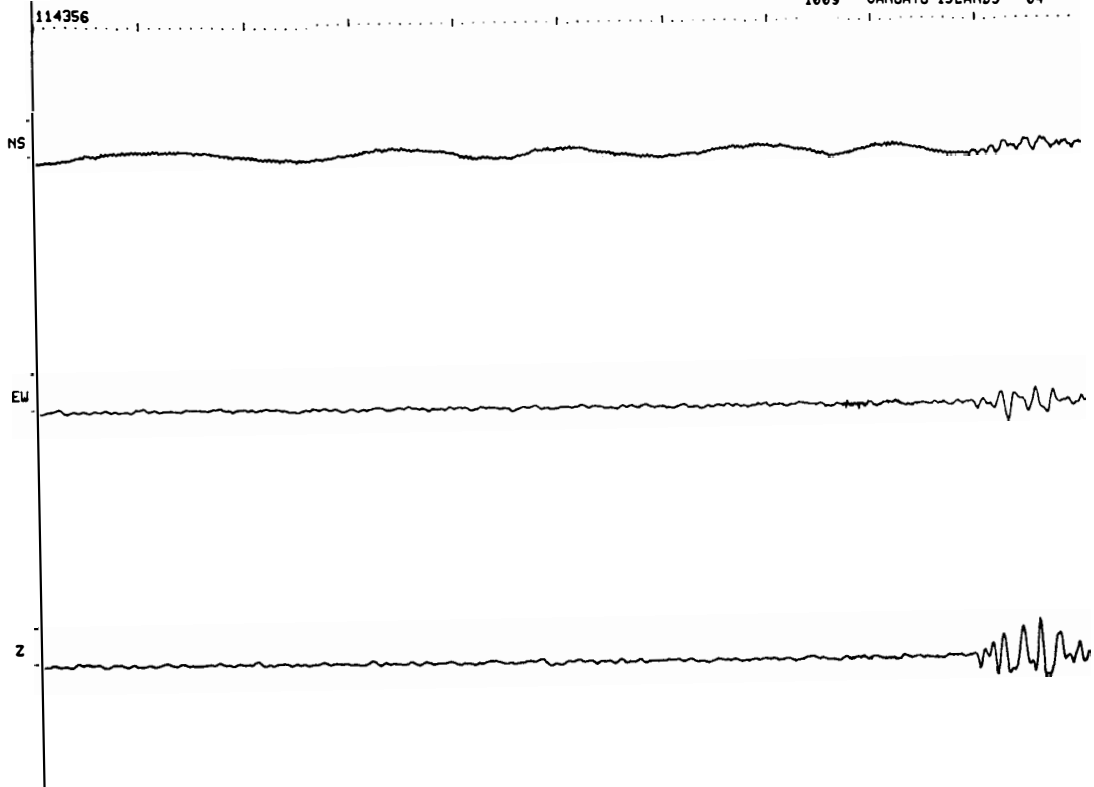
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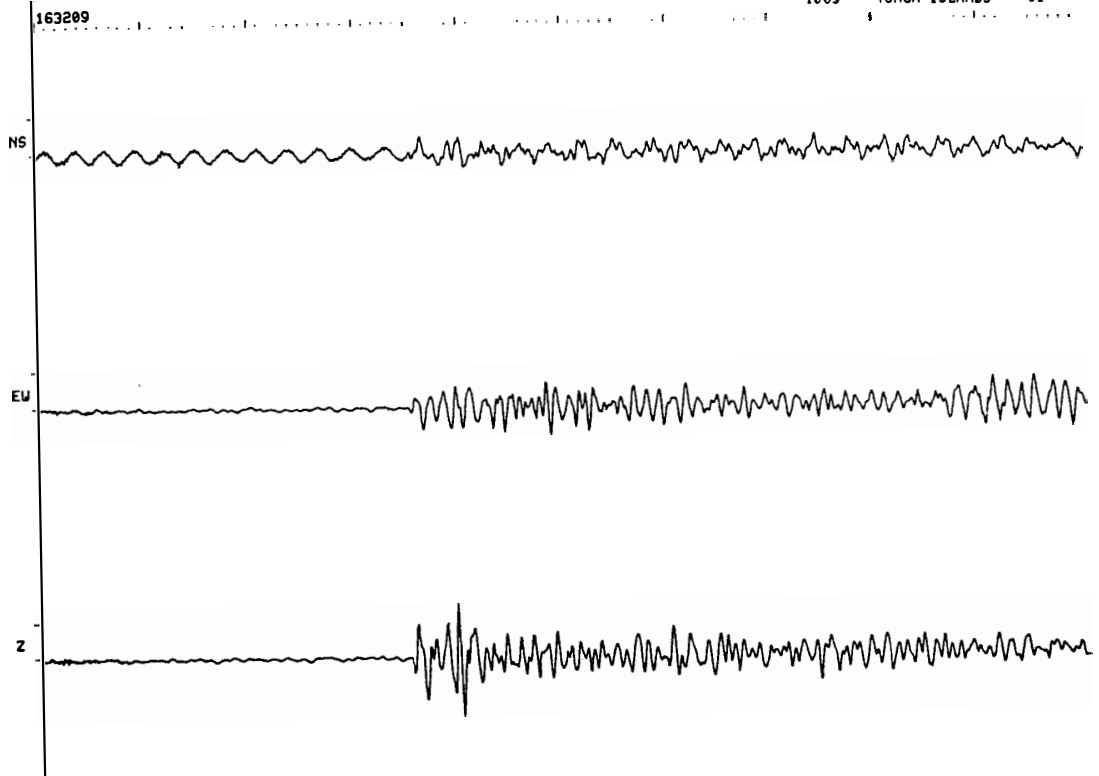
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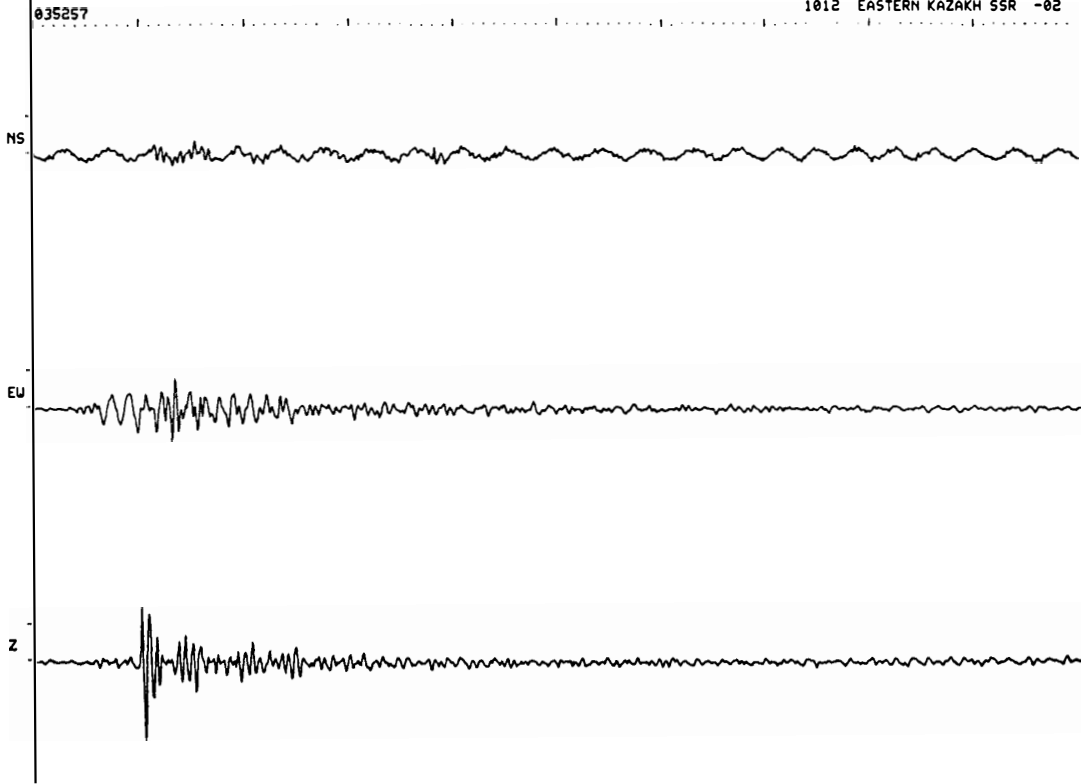
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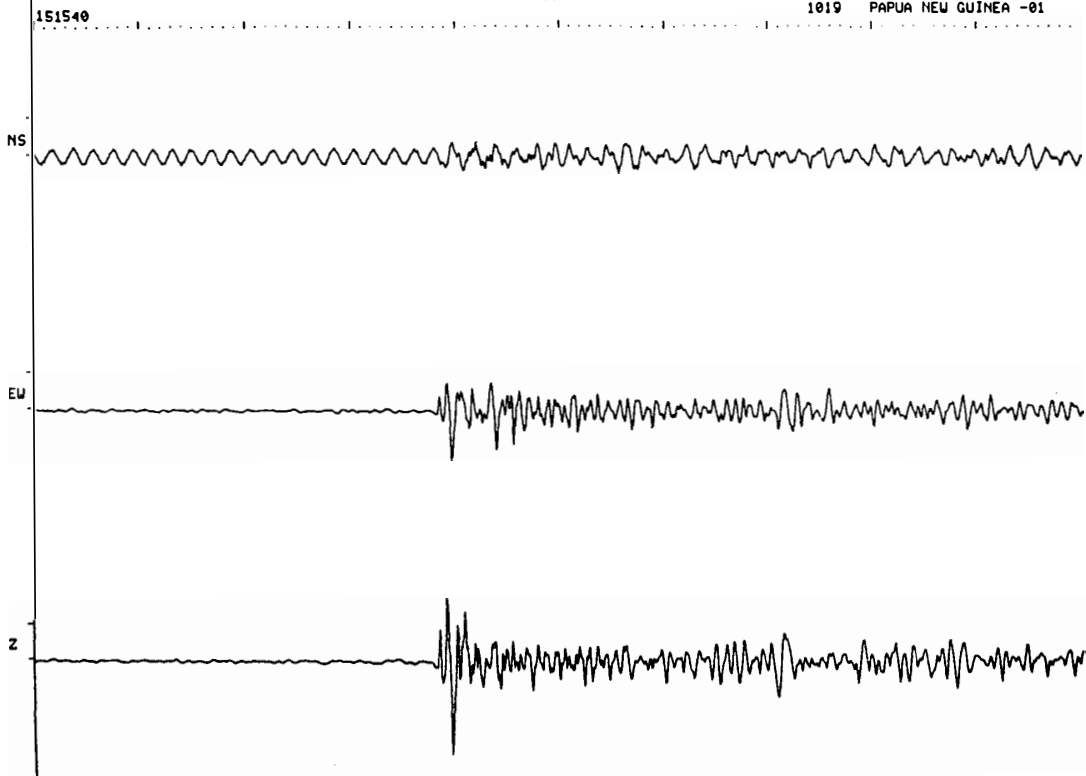
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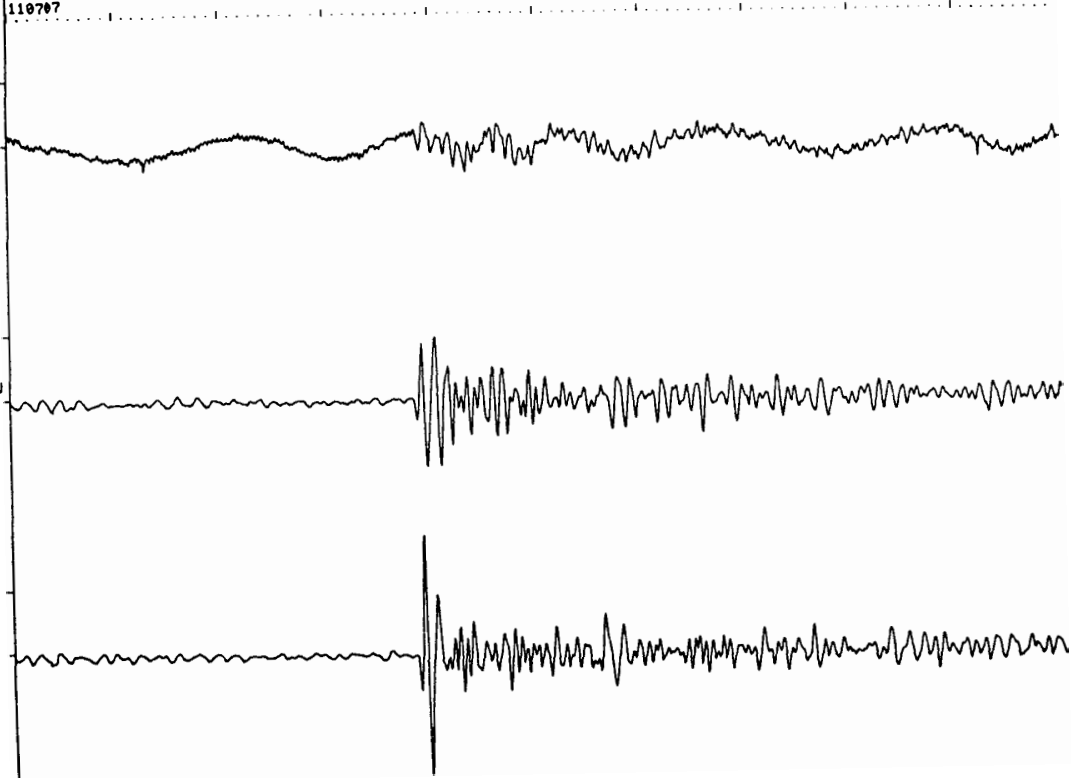
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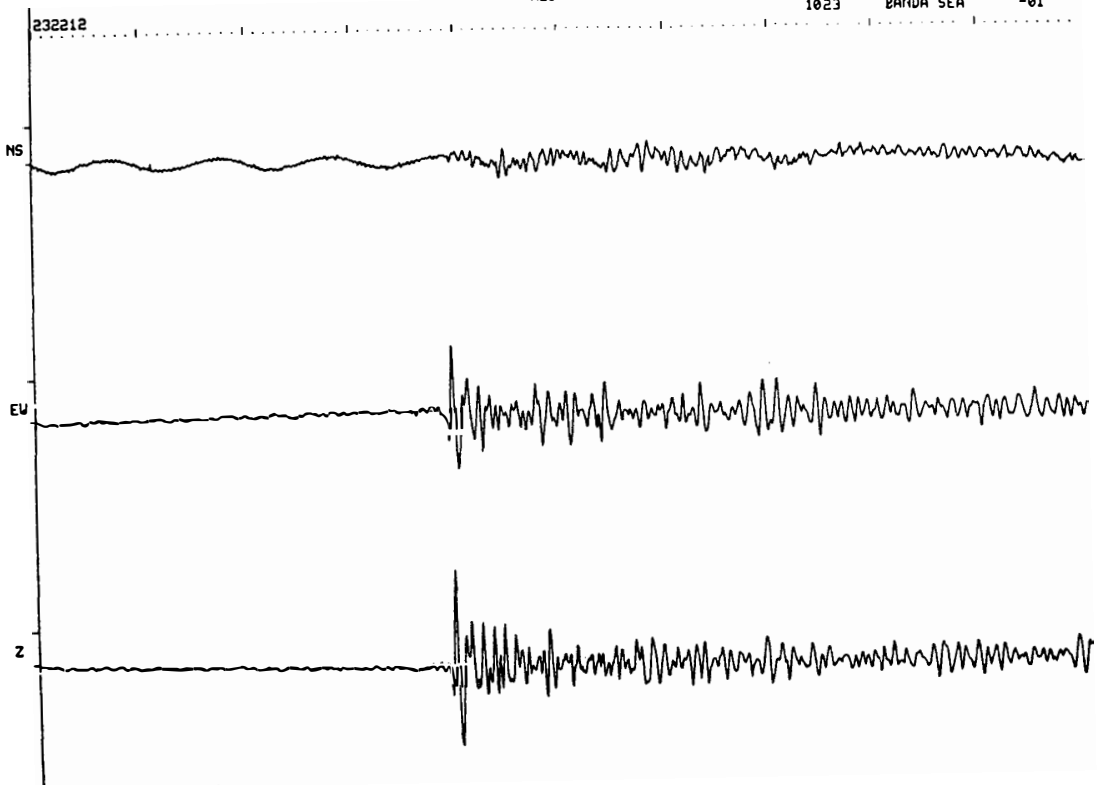
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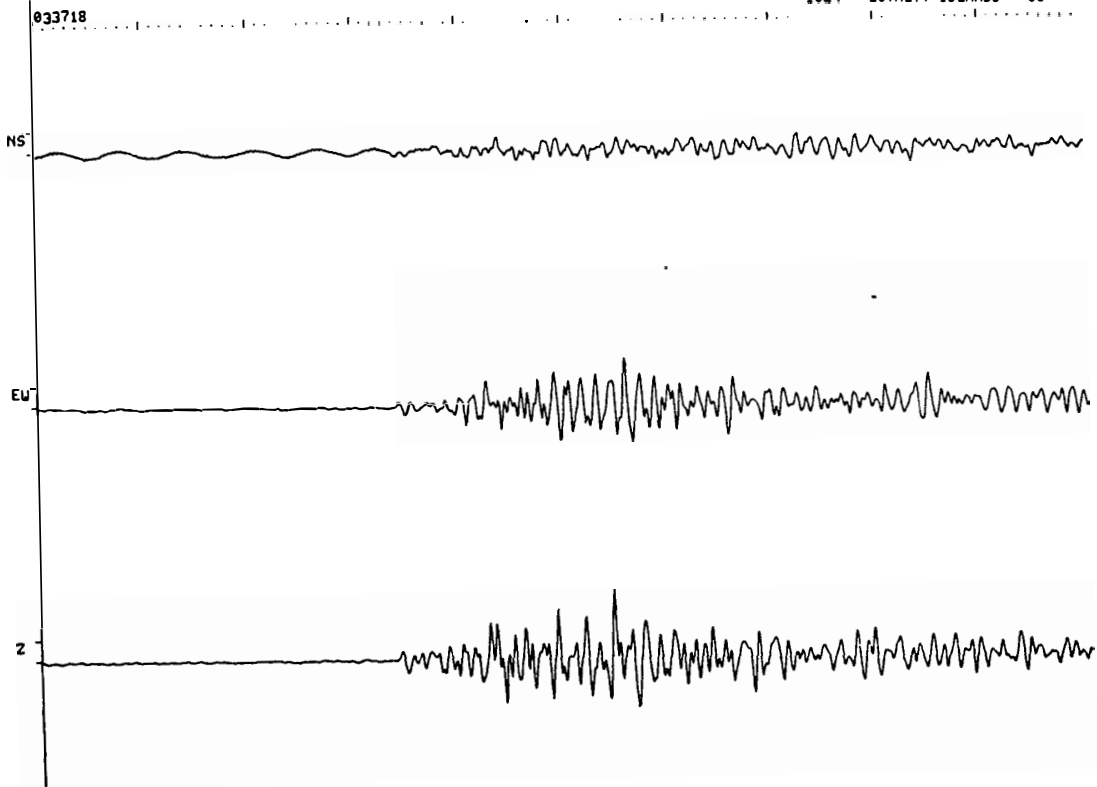
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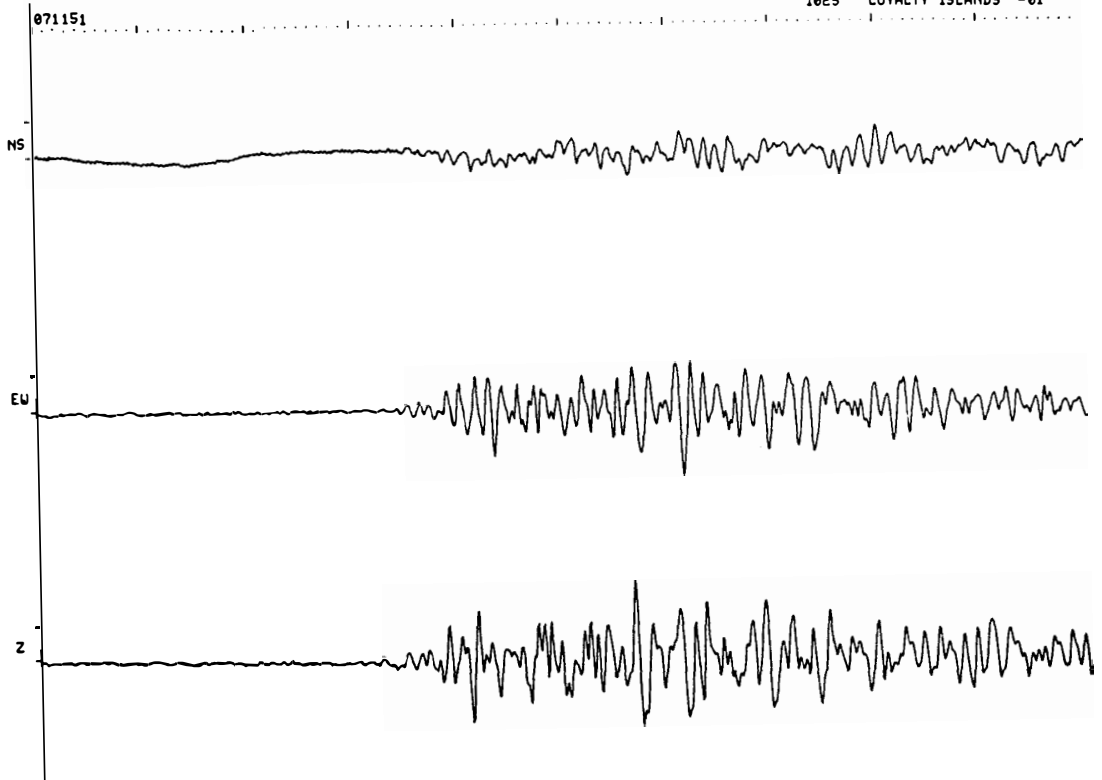
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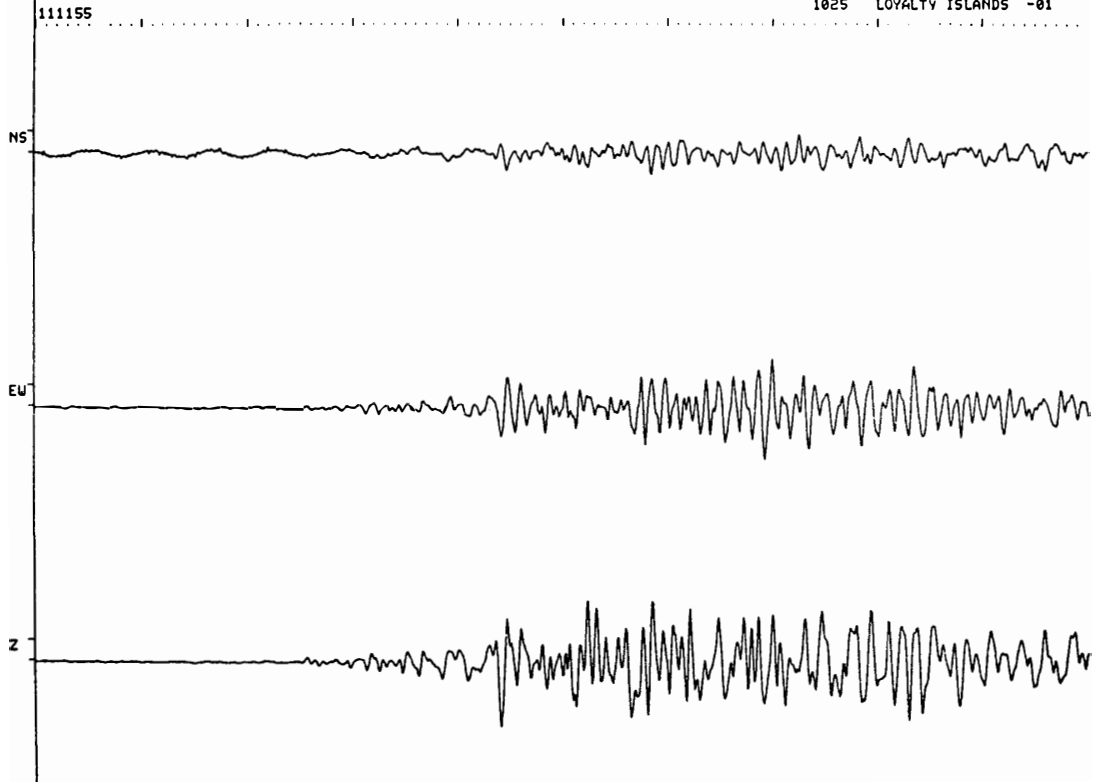
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120952

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NO   59

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163142

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NO   60

HES   1028   KERMADEC ISLANDS -01

024919

NS

EU

Z

NO   61

175508

NS

EU

Z

NO   62

100443

NS

EU

Z

NO 63

NS

EU

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NO 64

NS

EU

Z

NO 65

182657   HES   1105   S U L A W E S I   -01

NS

EW

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NO 66

104648   HES   1108   N.CALIFORNIA   -01

NS

EW

Z

NO 67

214623   1108   CHILE-ARGENTINA -01

NS

EU

Z

NO 68

163448   1110   SAN JUAN PROVINCE -01

NS

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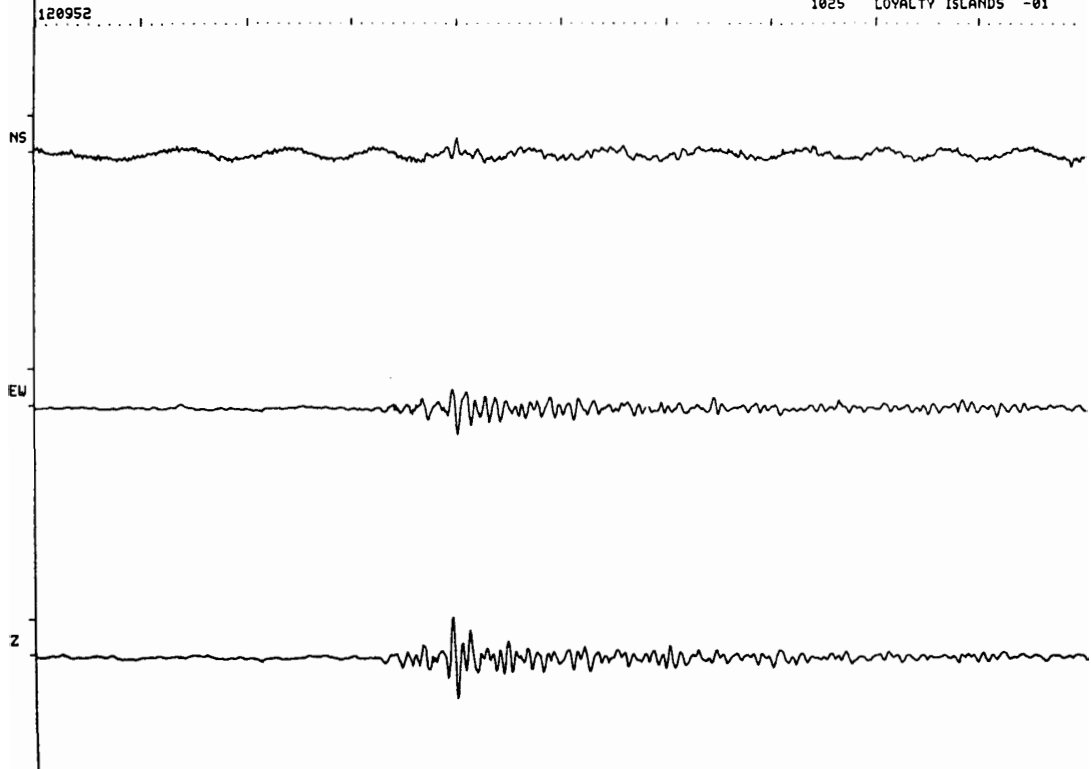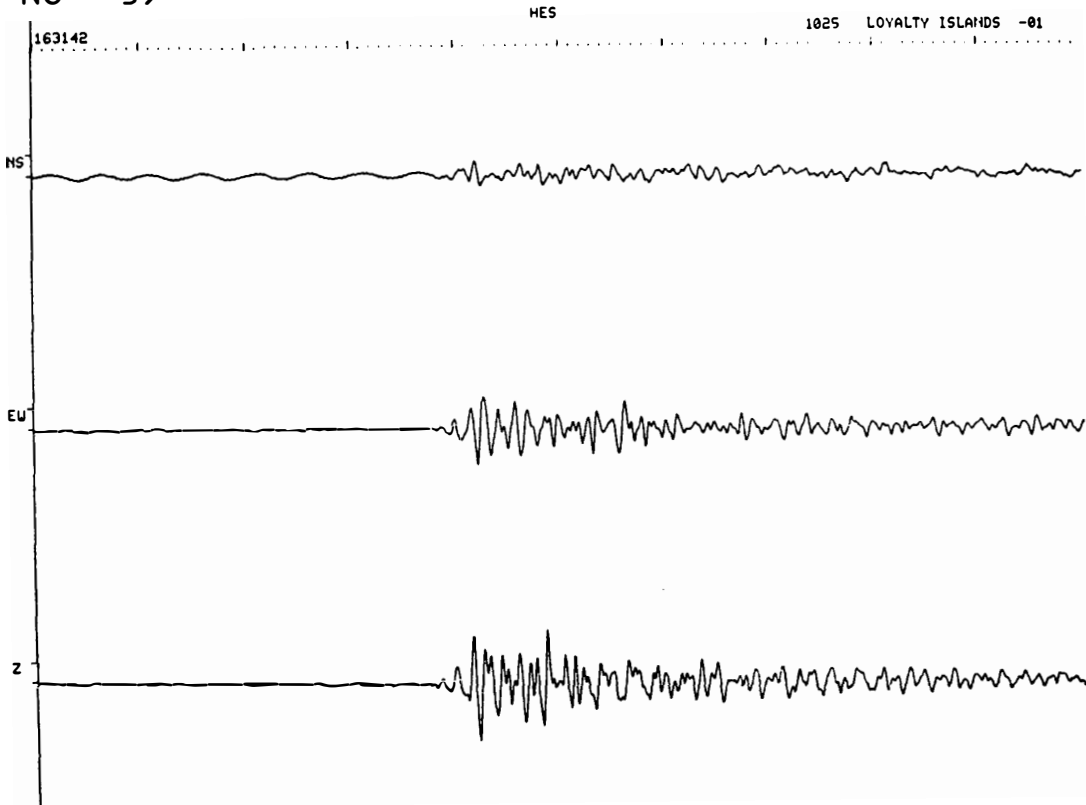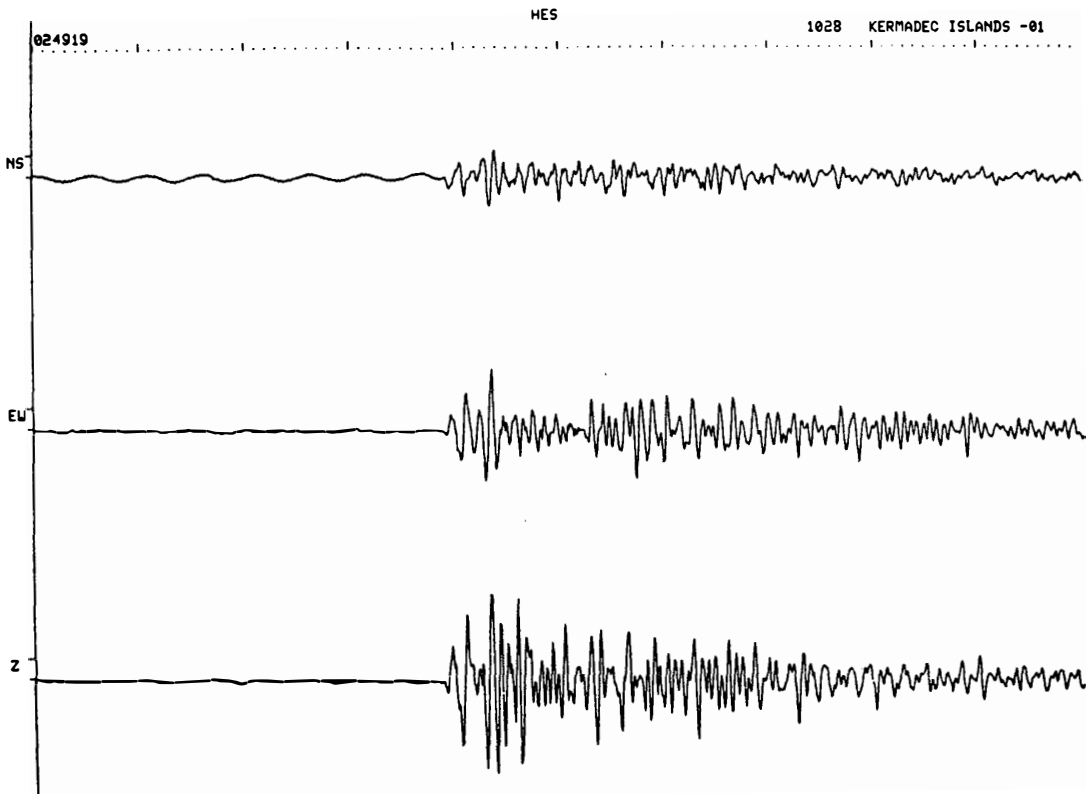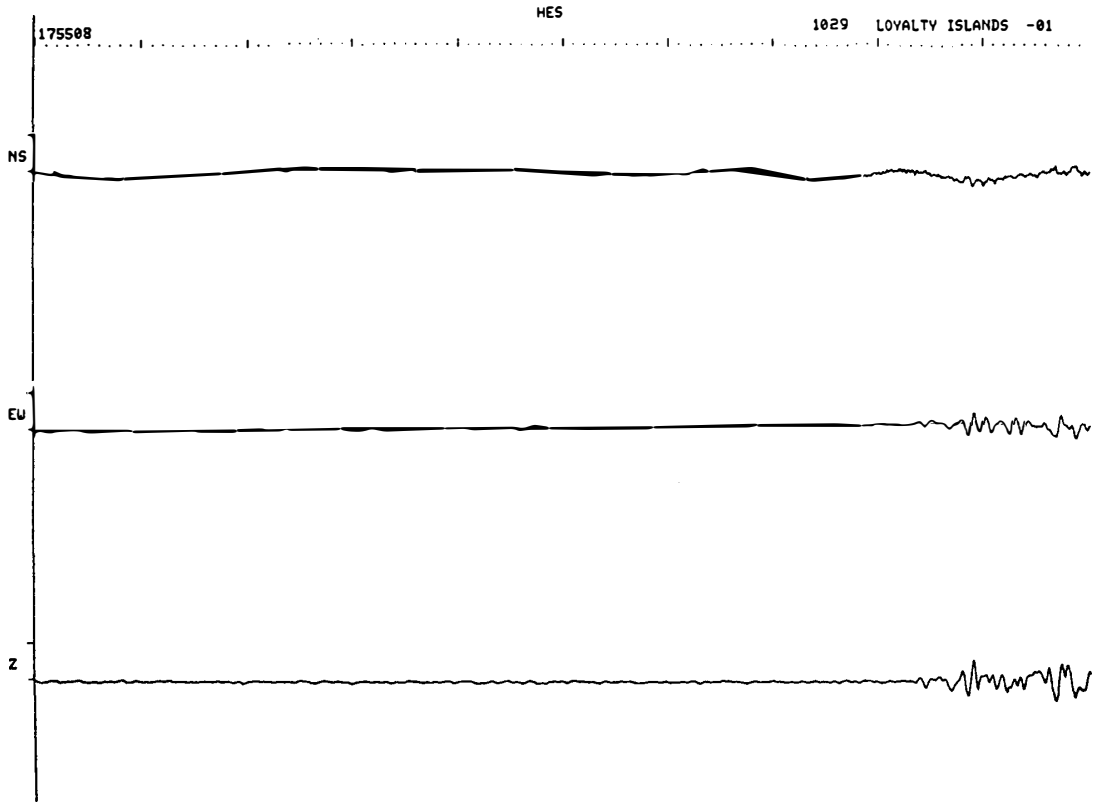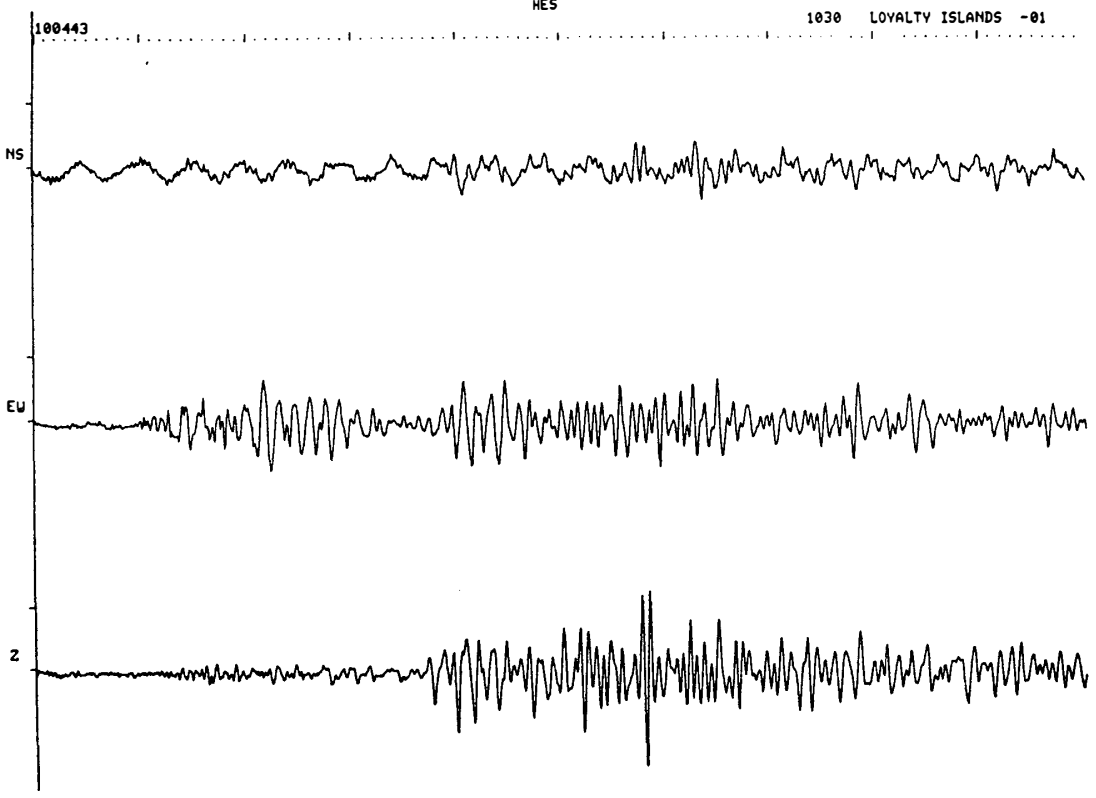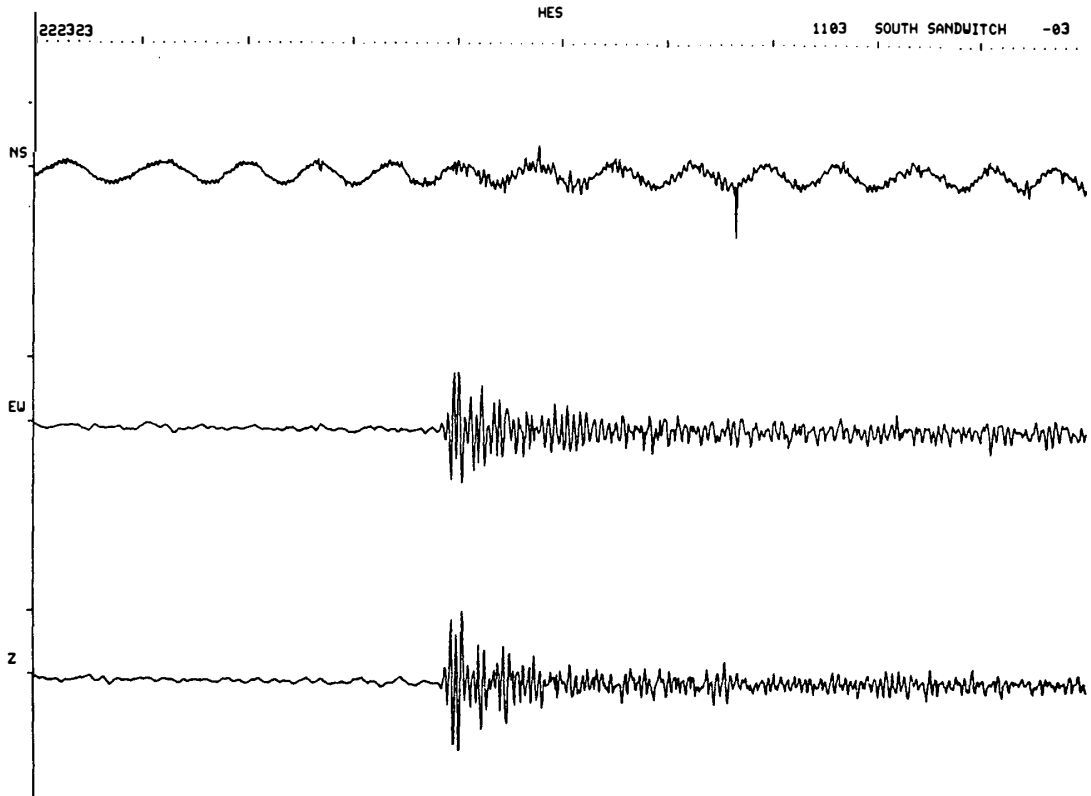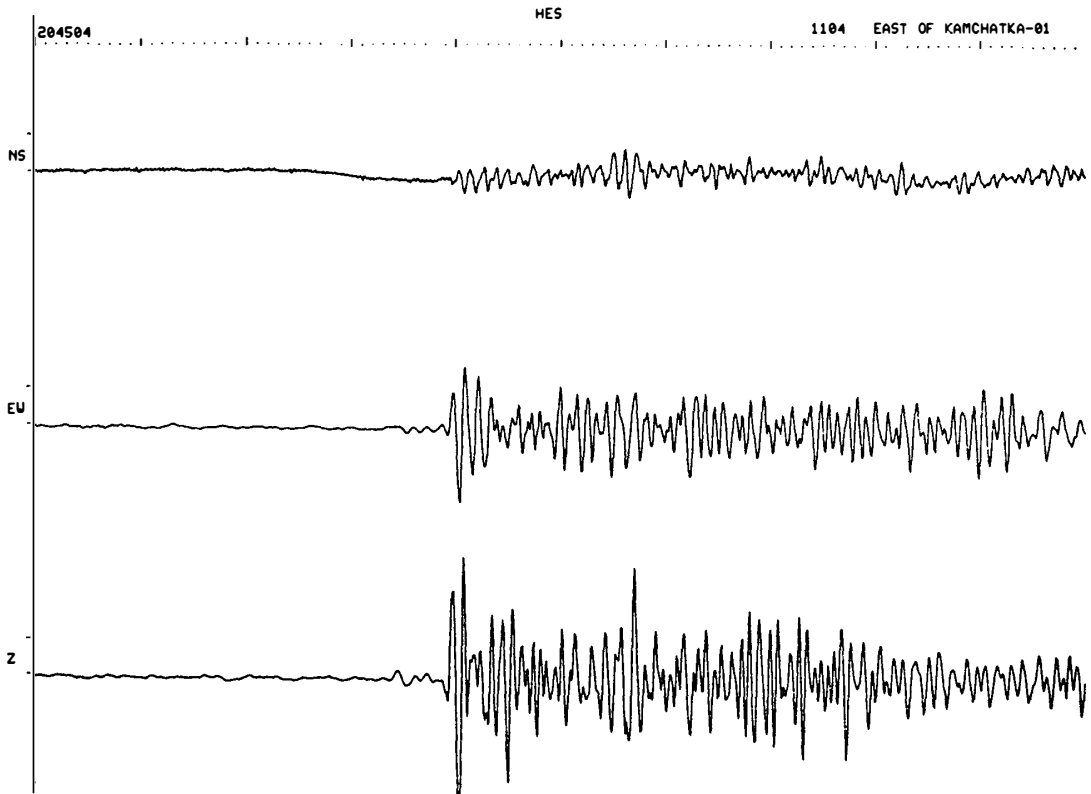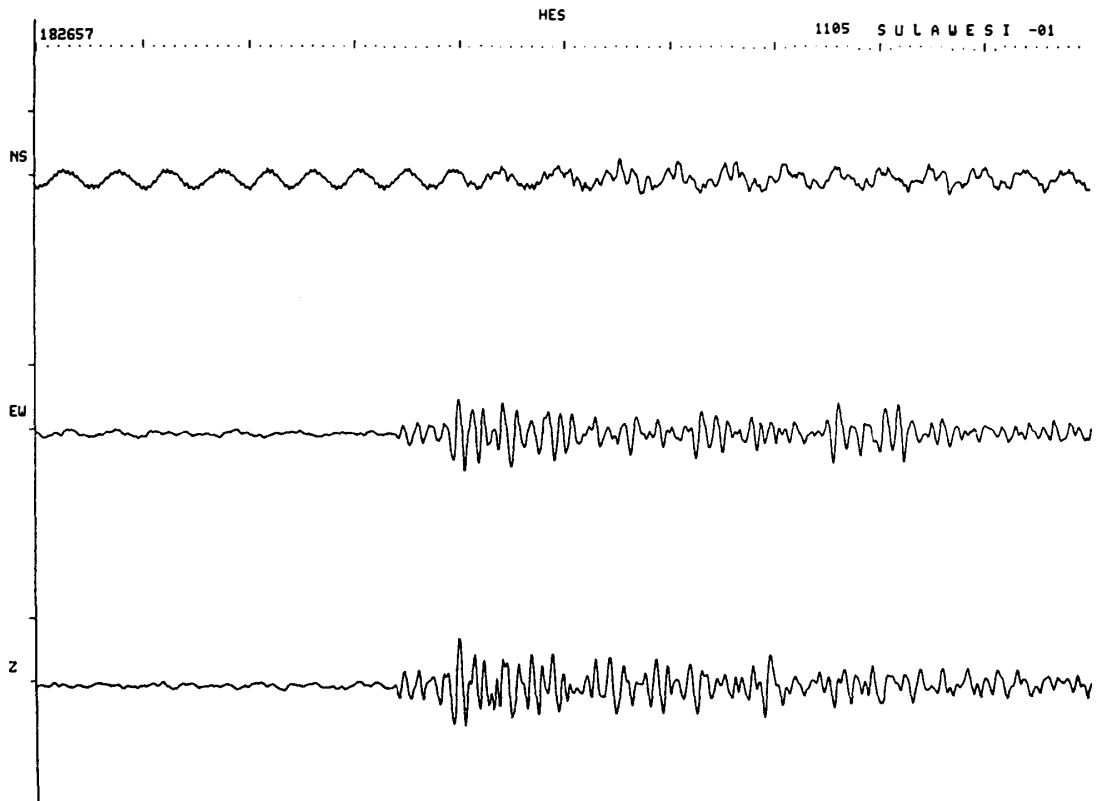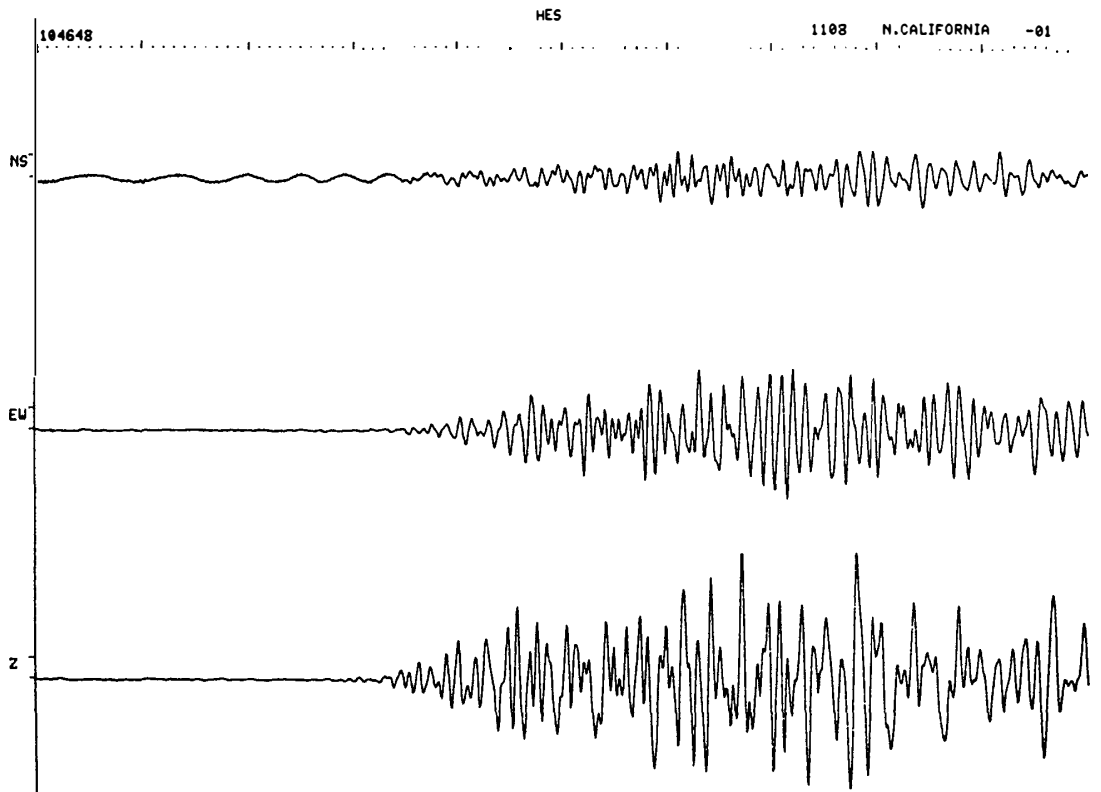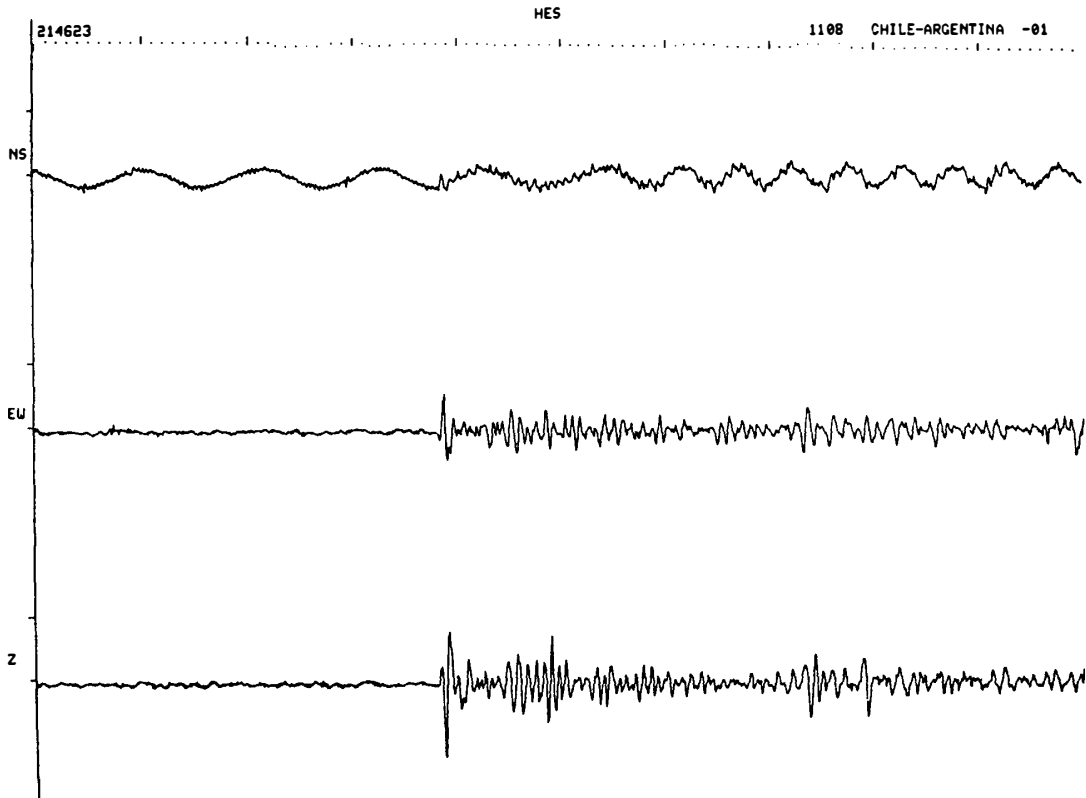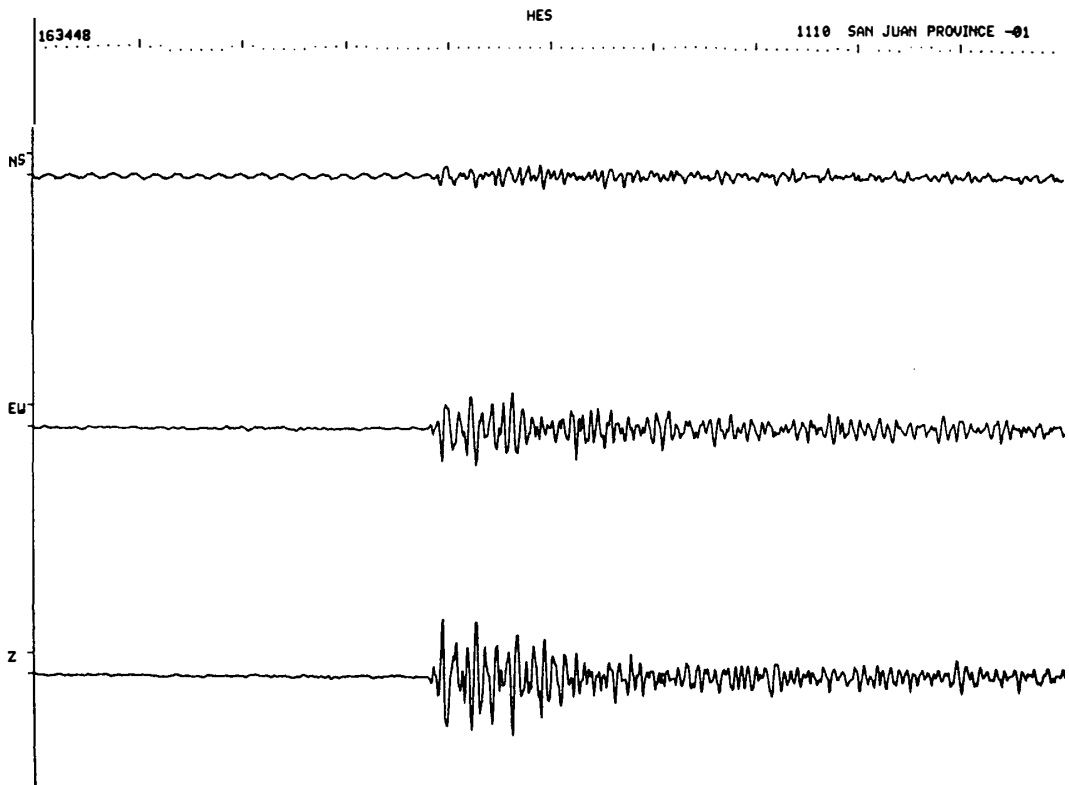
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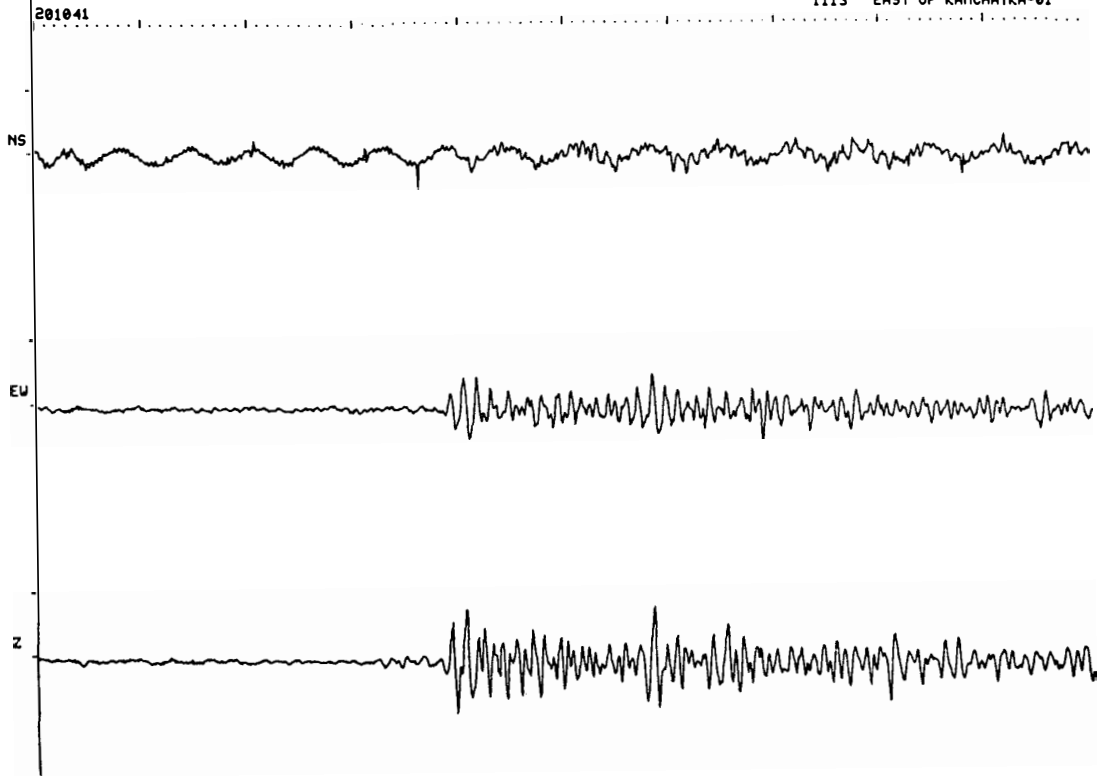
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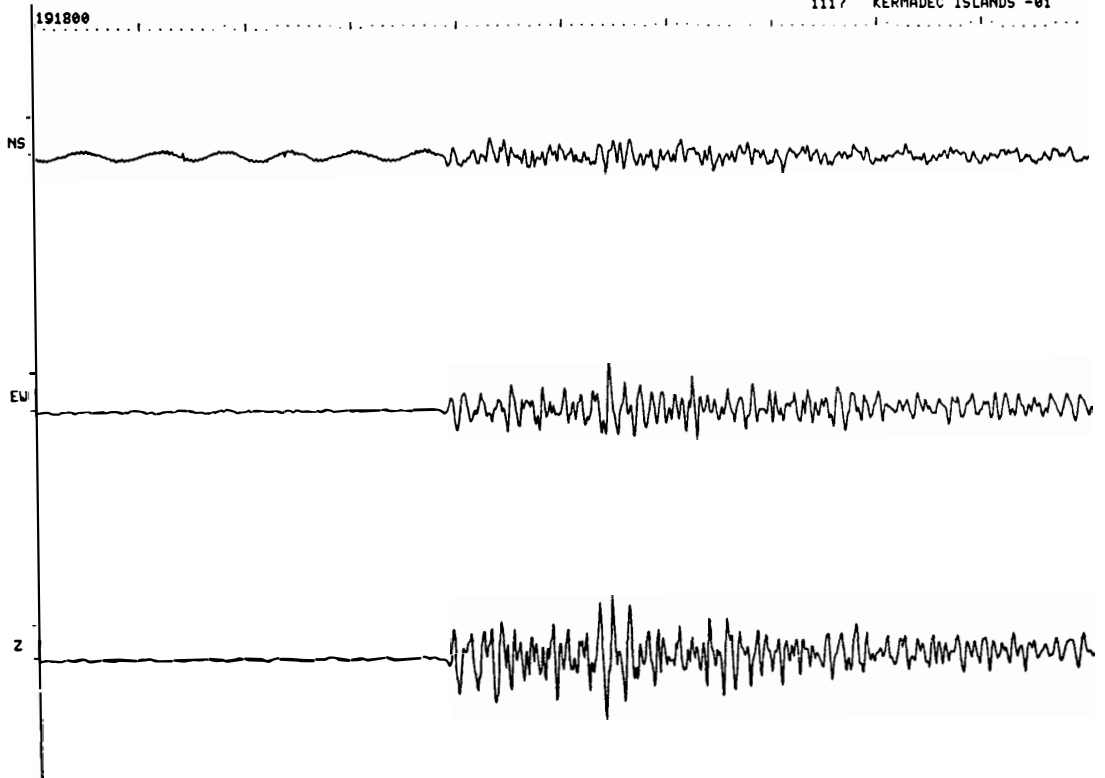
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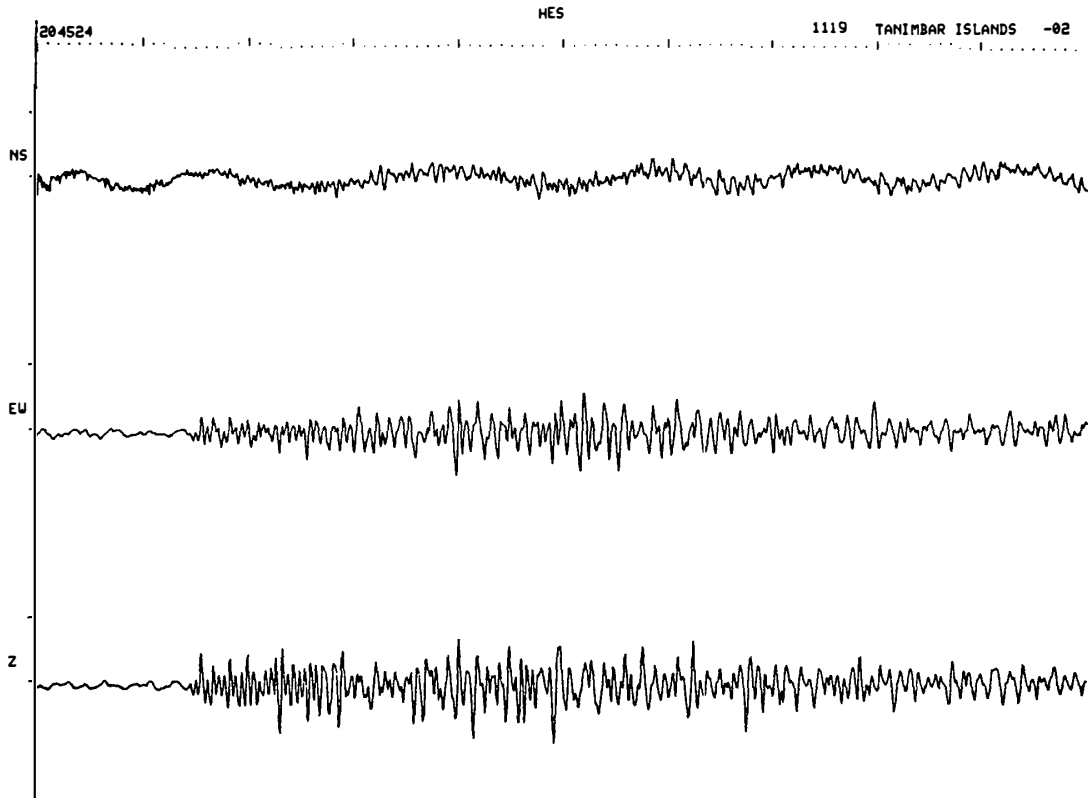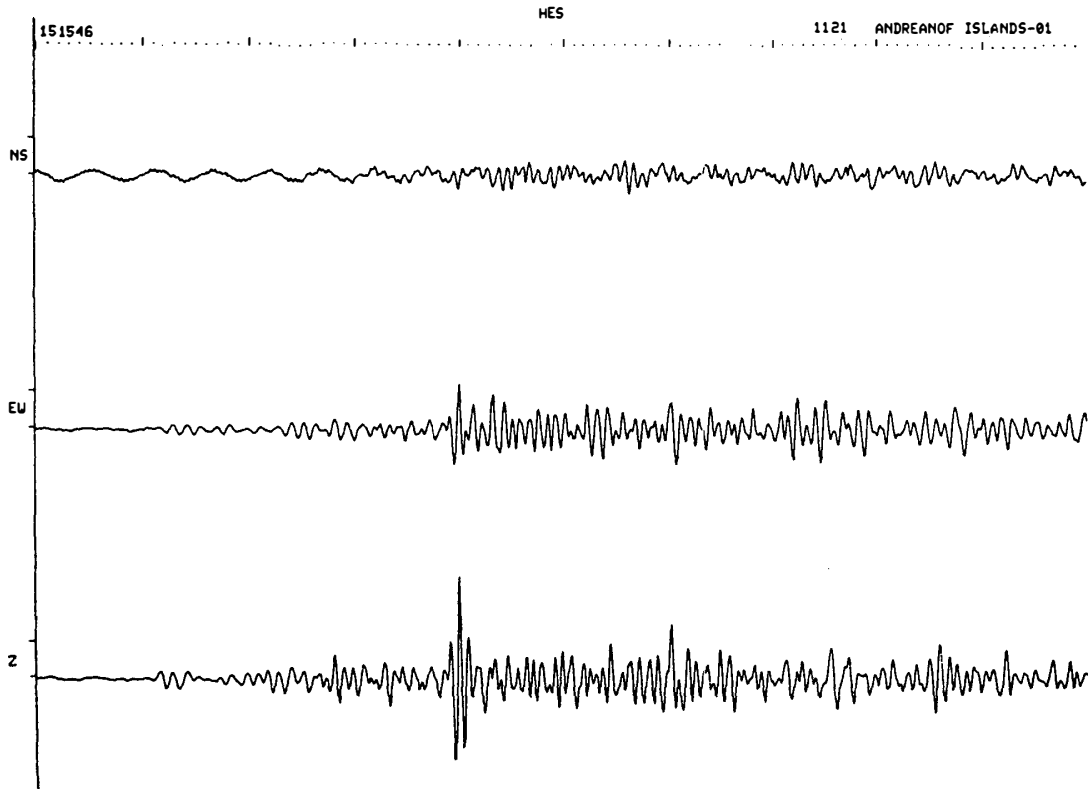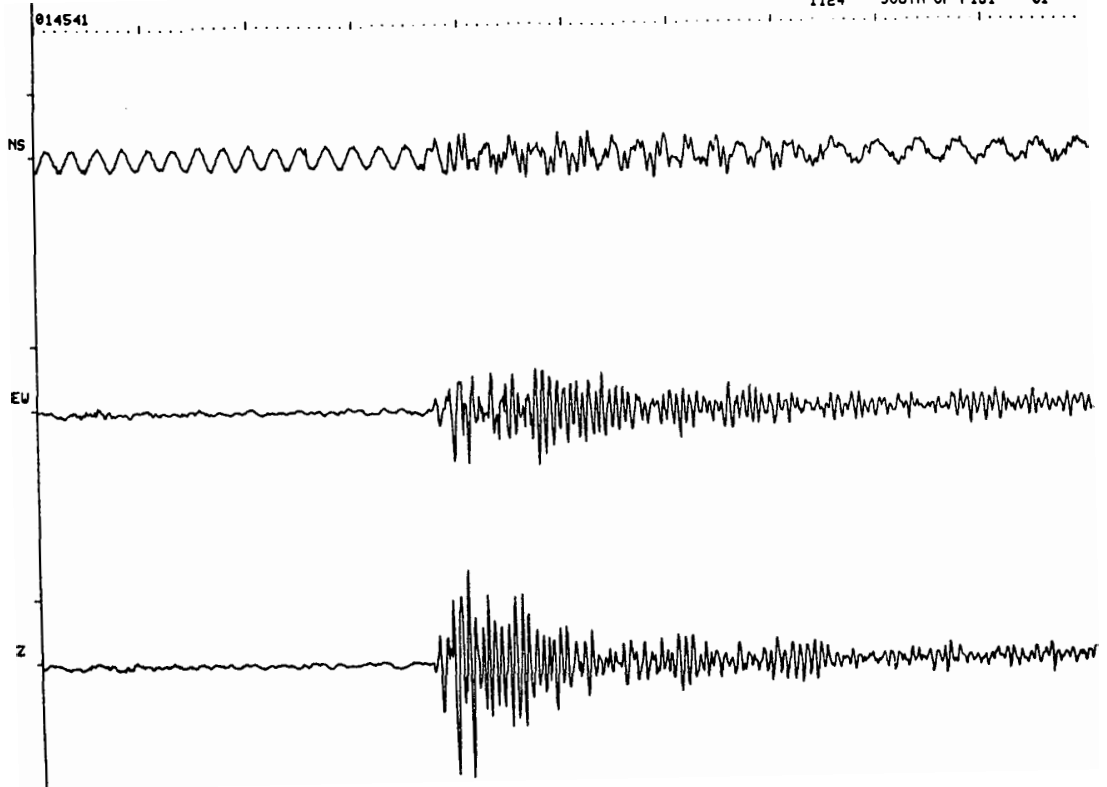
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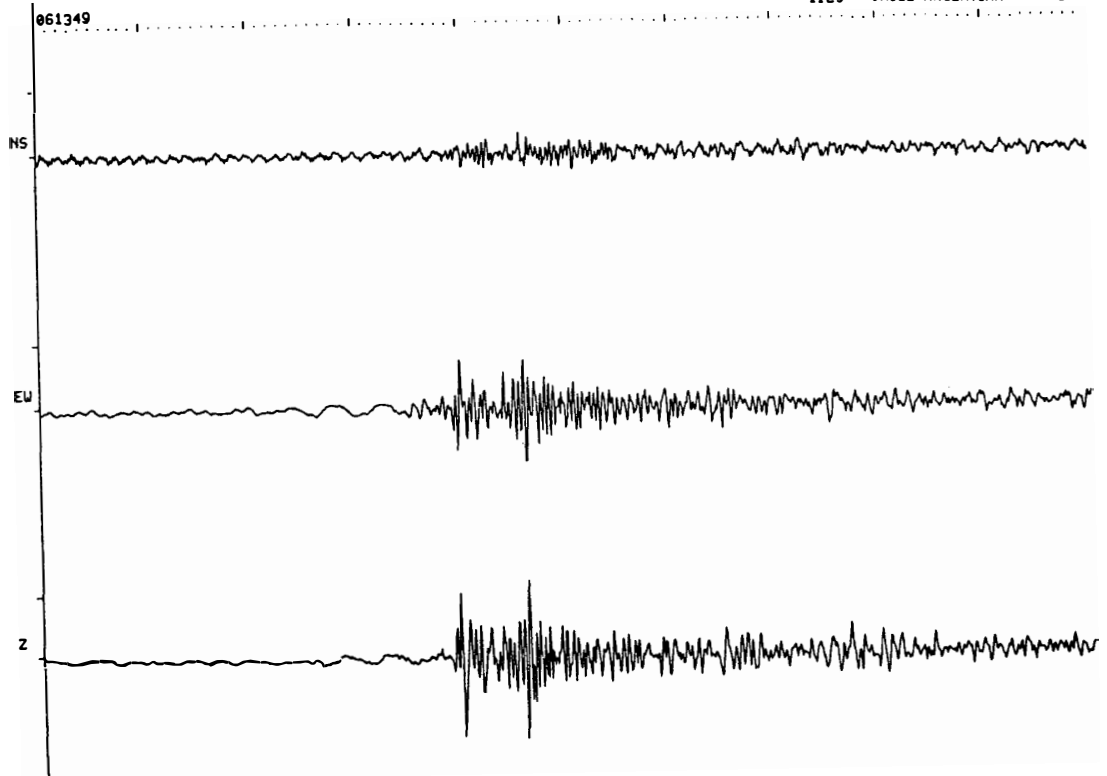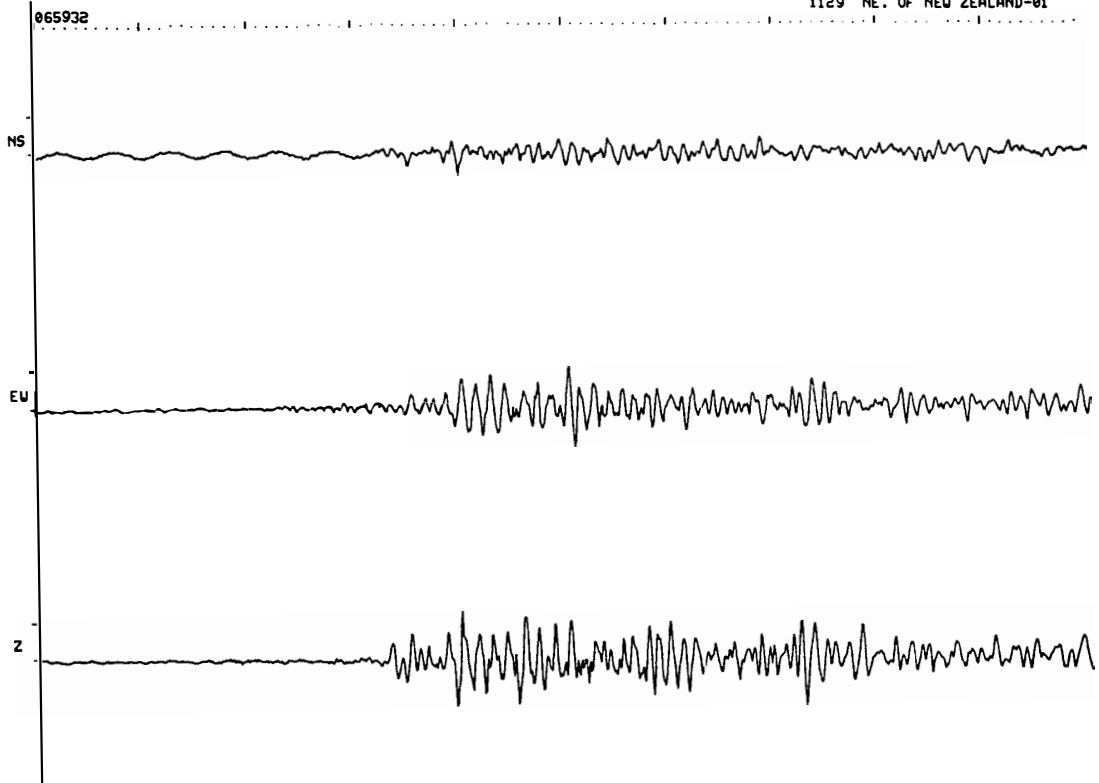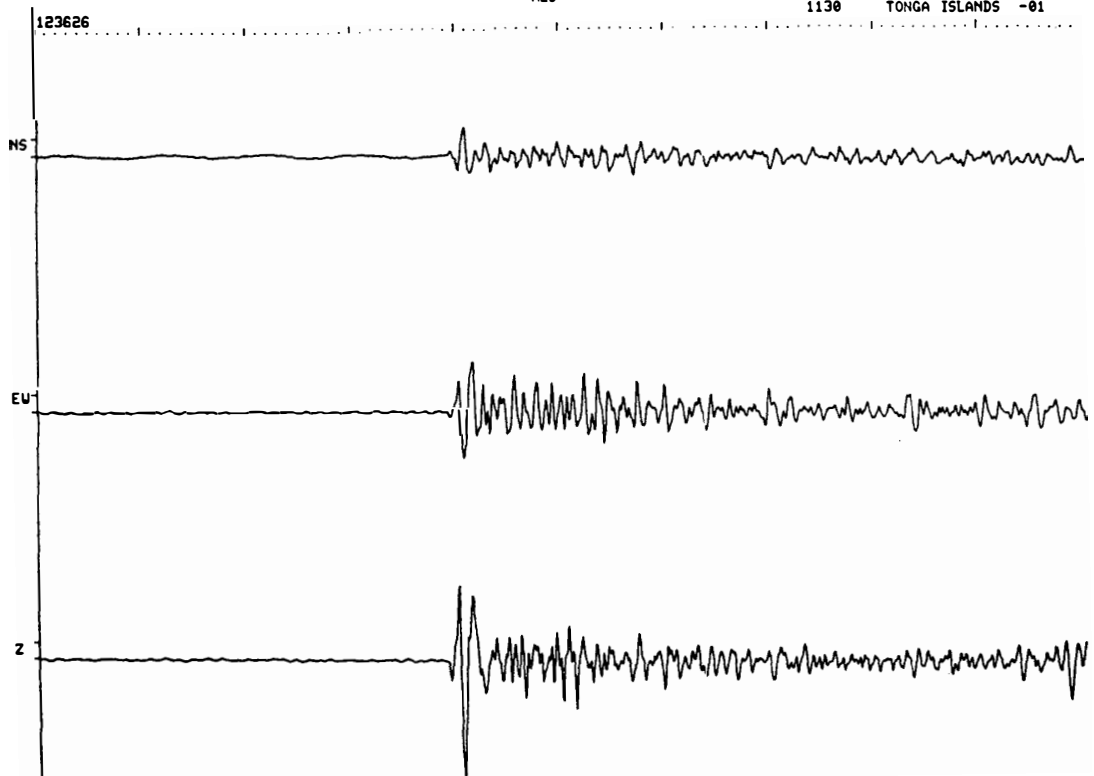
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