SEISMOLOGICAL BULLETIN OF SYOWA STATION, ANTARCTICA, 1983

Kazuo SHIBUYA
(National Institute of Polar Research, Itabashi-ku, Tokyo 173)

1. Introduction

The optical-electromagnetic seismographs at Syowa Station were replaced by the digital seismic data acquisition systems with event detection algorithm in February 1980. The outline of the introduced system is schematically illustrated in Fig. 1. There are two types of seismometers, called SP (short period) or HES with the natural period of 1 second and LP (long period) with the natural period of 12 seconds. The seismic observation system was maintained by H. Sakurai through the wintering of JARE-24 (February 1983 - January 1984).

The coordinates 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.

2. Data

The over-all frequency response and the magnification of the short-period and long-period seismographs (Z, N-S and E-W components) are shown in Fig. 2. The system clock was not connected to the recovered UTC from NNSS satellites (see Fig. 1) and the calibration was made by the short-wave receiver. The accuracy of the read-out data can be estimated as $\pm$ 0.2

seconds. 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 ability between Tokyo and Syowa Station, the PDE reports by NEIS were referred and only the tele-seismic events were edited. The graphic display outputs of the local events around Syowa Station were excluded from this report.

2.1. Read-out data

The onset of the events was picked from the pen-monitor records. Figure 3 shows examples of pen-monitor records of the Z component seismograph (4-mm/s pen-speed for SP and 2-mm/s pen-speed for LP). The onset times of tele-seismic P-arrivals were read by R. Sakai and they are listed in Table 1. Symbols E and I in the phase column denote weak and sharp onsets, respectively. The direction of ground motion is denoted by + for the upward direction and - for the downward direction. Arrival time is in UTC.

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

The current seismic observation system at Syowa Station can give us tele-seismic wave forms in a large computer compatible 9-track digital tape. Amplified seismic signals in Fig. 1 are analog-to-digital converted with the sampling rate of 10 points per second for the short-period and 1 point per second for the long-period components. The relation between the input voltage to the computer and the hexadecimal number is given in Table 2. The digital 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 consisted of 10 volumes of 1200 ft (1600 bpi) magnetic tape and the tele-typewriter message of the triggered events (see an example in Fig. 4). The original tapes were 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 77 events detected at Syowa Station. The 77 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 for short-period and 2 minutes' wave data for long-period (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 No. 1 sheet. As inferred from the graphic display outputs, some events have an erroneous gap of 1 block data-length just after the onset portion of 1 block data-length seismic signals, which might have come from the malfunctiong of the micro-computer and may be corrected by the users' software programs. We here apologize and report that the erroneous gap can also be found in the previous data reports (No.72, No.83, No.92).

This report was compiled with the help of R. Sakai, Support Section for Geophysical Observations, National Institute of Polar Research.

References

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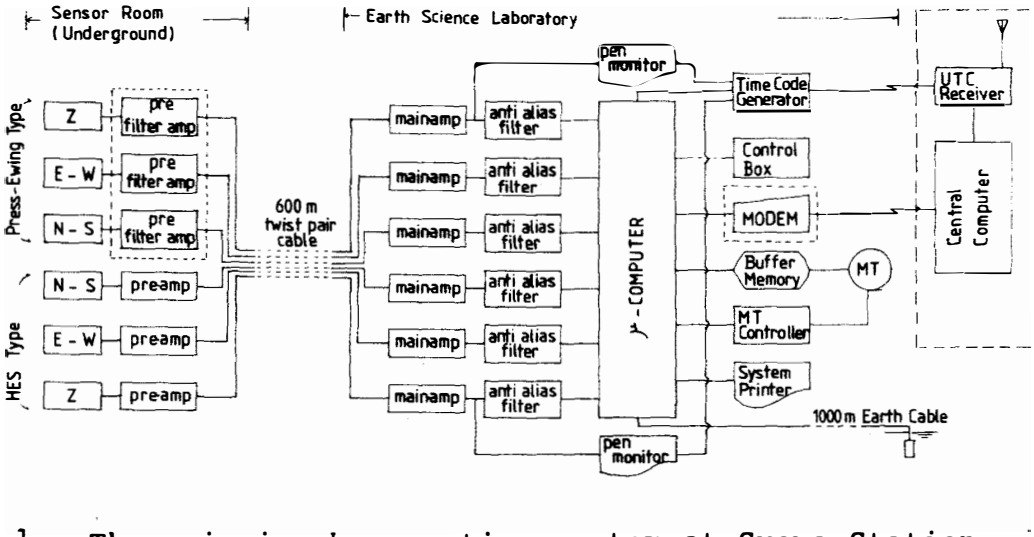

Fig. 1. The seismic obeservation system at Syowa Station.

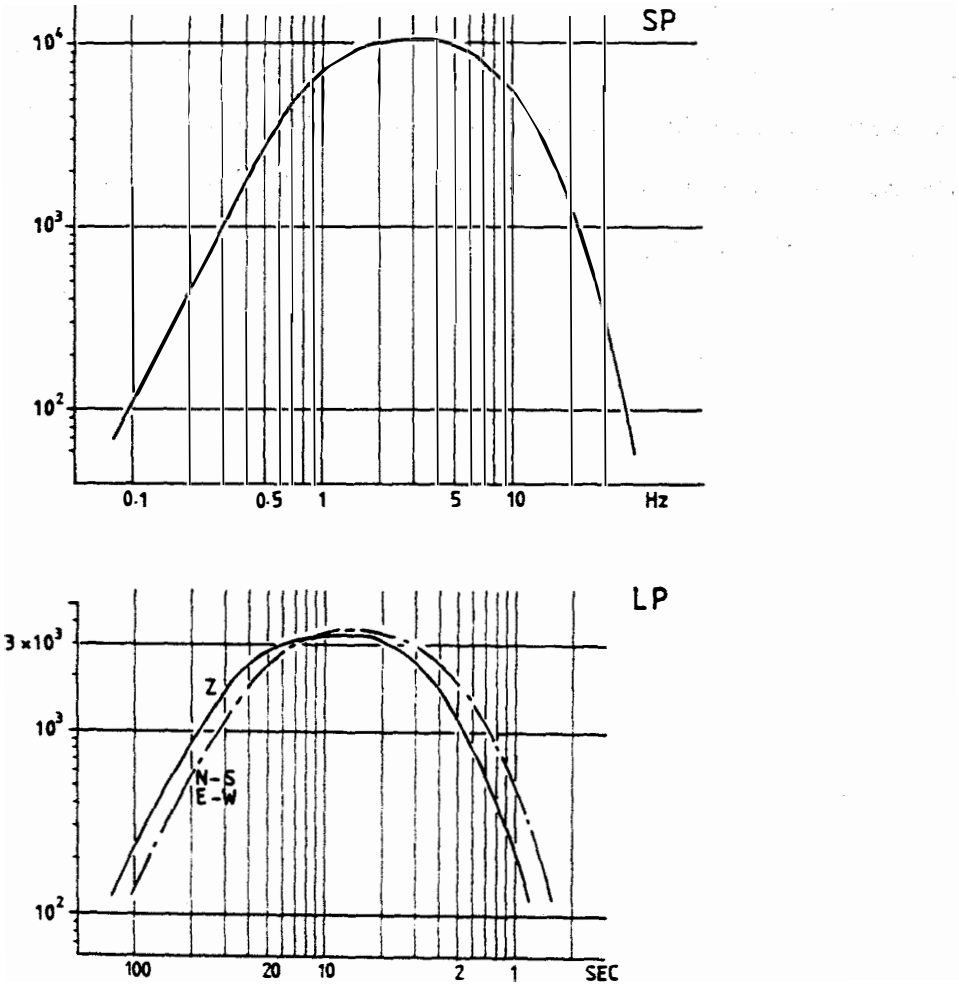

Fig. 2. Over-all frequency responses of the short-period and the long-period seismographs.

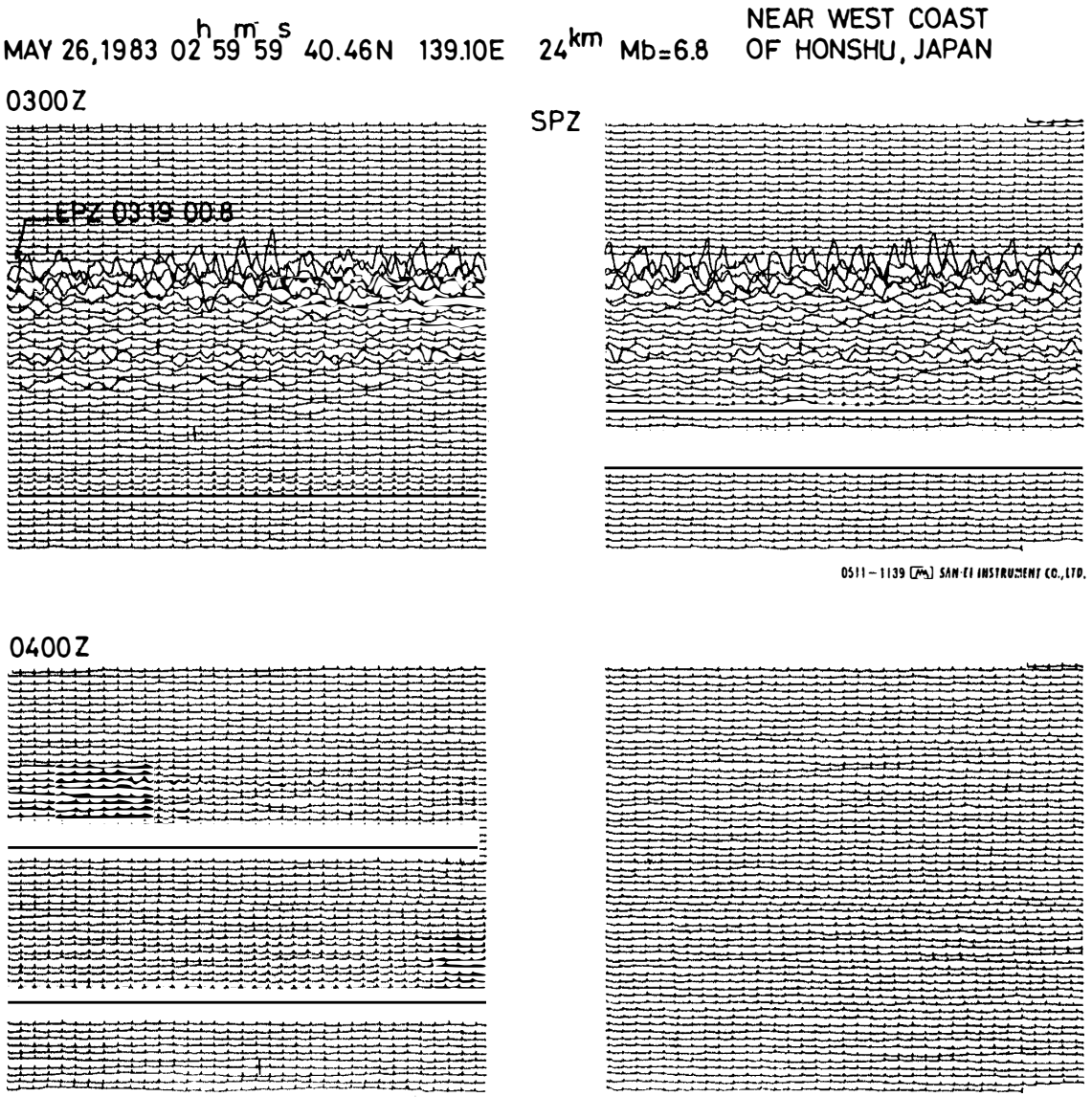

Fig. 3-1. A pen-monitor example of the short-period teleseismic event.

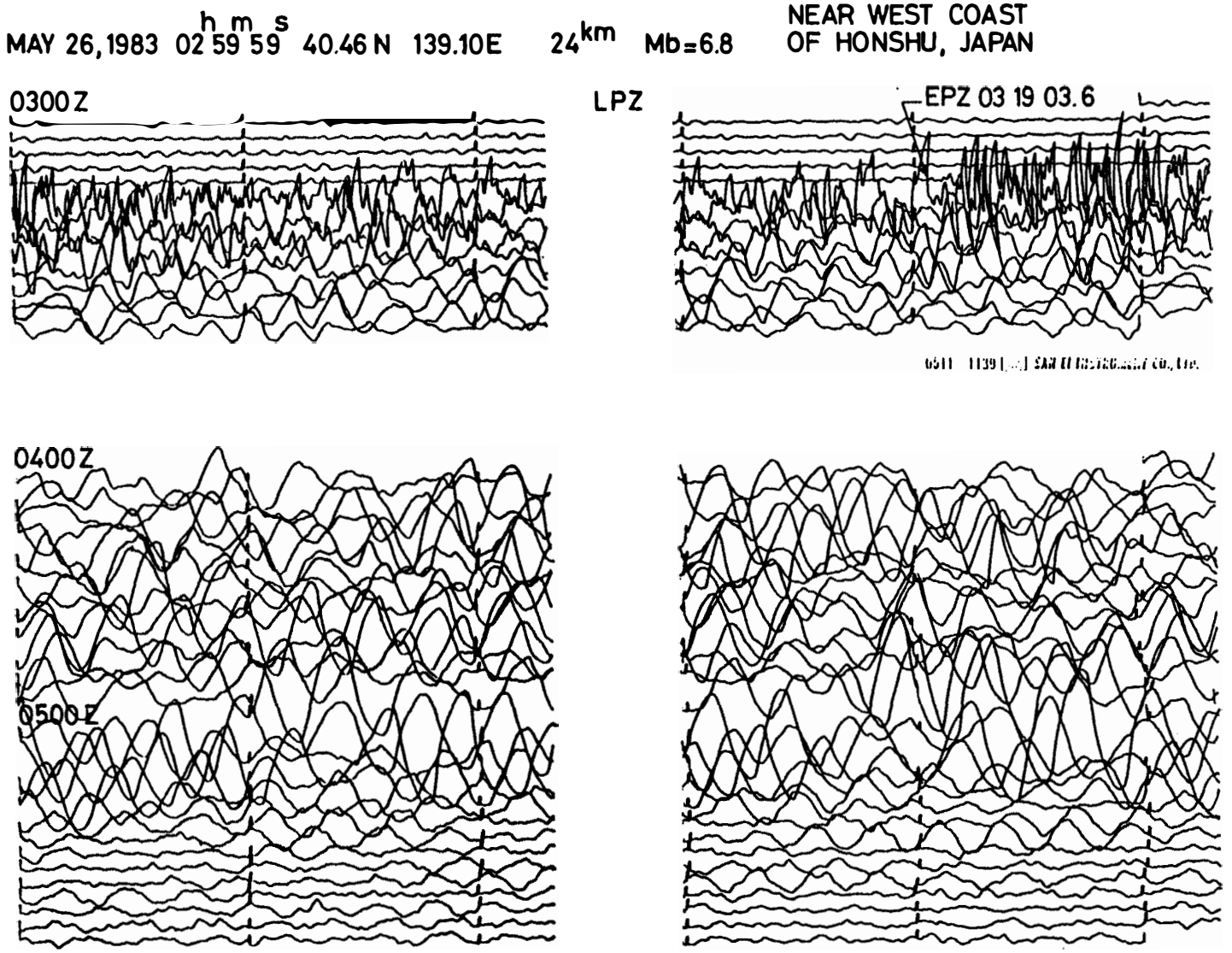

Fig. 3-2. A pen-monitor example of the long-period teleseismic event.

```
DH-4
* CHANGE END *

DL-6
* CHANGE END *

KH-4
* CHANGE END *

KH-3
* CHANGE END *

KL-7
* CHANGE END *

KL-6
* CHANGE END *

NH-1800
* CHANGE END *


* SYSTEM CHECK *
  CHECK TIME = 293. 19. 53. 36.
  CHECK LEVEL  WES  99A NOISE LEVEL  WES  804 804 804
               HES  99F              HES  80F 80F 80F
               L.P  99F              L.P  807 82A 82C
  PIO-1   OK    PIO-2   OK    MAIN   OK    HOST   OK
* CHECK END *

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 1
  TIME = 293. 22. 03. 03.  NOISE LEVEL =  810  DETECT LEVEL =  830

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 3
  TIME = 294. 08. 25. 06.  NOISE LEVEL =  80F  DETECT LEVEL =  842

* SHORT PERIOD *  DETECTED AT TIME = 294. 08. 25. 06.
  SEPARATE EVENT NO. = 00007   TOTAL EVENT NO. = 00007
  NOISE LEVEL =  80F  DETECT LEVEL =  842
  SAMPLE NO. =    10  LOGGING TIME =  1200SEC

 WARNING ! NOISE LEVEL.LT.804 !


* SYSTEM CHECK *
  CHECK TIME = 294. 20. 53. 36.
  CHECK LEVEL  WES  99E NOISE LEVEL  WES  804 804 804
               HES  99E              HES  80F 80F 80F
               L.P  99F              L.P  807 82A 82C
  PIO-1   OK    PIO-2   OK    MAIN   OK    HOST   OK
* CHECK END *

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 1
  TIME = 295. 03. 31. 43.  NOISE LEVEL =  80F  DETECT LEVEL =  832

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 295. 04. 27. 27.  NOISE LEVEL =  80F  DETECT LEVEL =  82D

* LONG PERIOD *   TRIGGER ON AT CHANNEL = 3
  TIME = 295. 04. 27. 31.  NOISE LEVEL =  82F  DETECT LEVEL =  97D

* SHORT PERIOD *  DETECTED AT TIME = 295. 04. 27. 27.
  SEPARATE EVENT NO. = 00008   TOTAL EVENT NO. = 00008
  NOISE LEVEL =  80F  DETECT LEVEL =  82D
  SAMPLE NO. =    10  LOGGING TIME =  1800SEC

 WARNING ! NOISE LEVEL.LT.804 !

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 1
  TIME = 295. 04. 54. 46.  NOISE LEVEL =  827  DETECT LEVEL =  879

 WARNING ! NOISE LEVEL.LT.804 !

* SHORT PERIOD *  DETECTED AT TIME = 295. 04. 55. 11.
  SEPARATE EVENT NO. = 00009   TOTAL EVENT NO. = 00009
  NOISE LEVEL =  827  DETECT LEVEL =  879
  SAMPLE NO. =    10  LOGGING TIME =   440SEC

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 1
  TIME = 295. 05. 00. 17.  NOISE LEVEL =  81D  DETECT LEVEL =  857
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Fig. 4. Message outputs from the tele-typewriter.

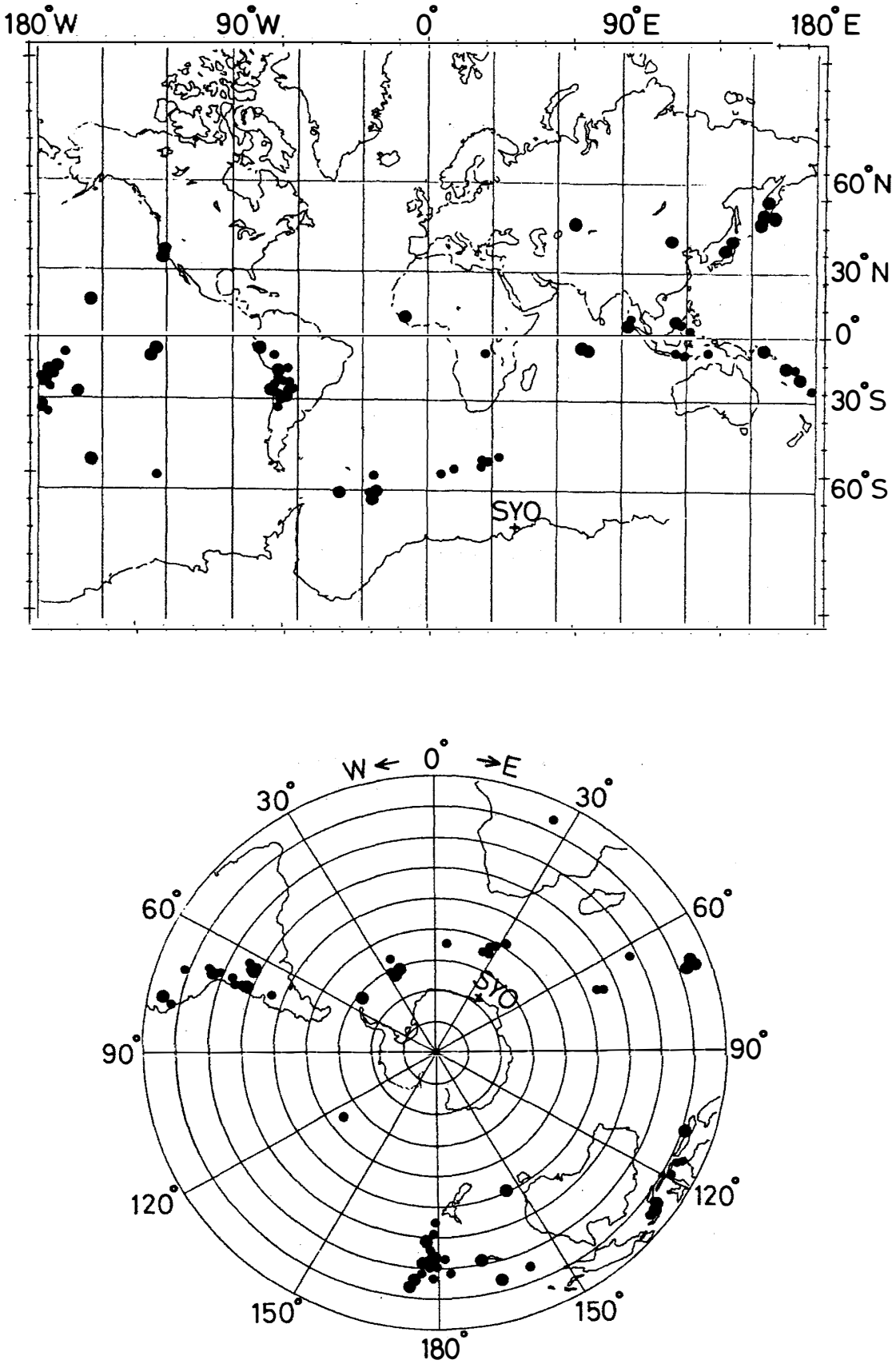


Fig. 5. Epicenters of the 77 events.

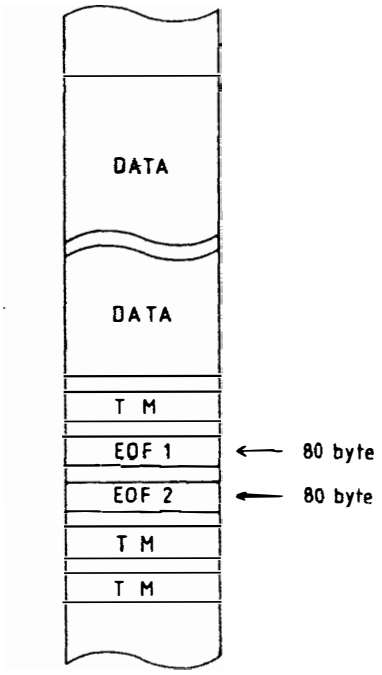


Fig. 6-1. Volume constitution.

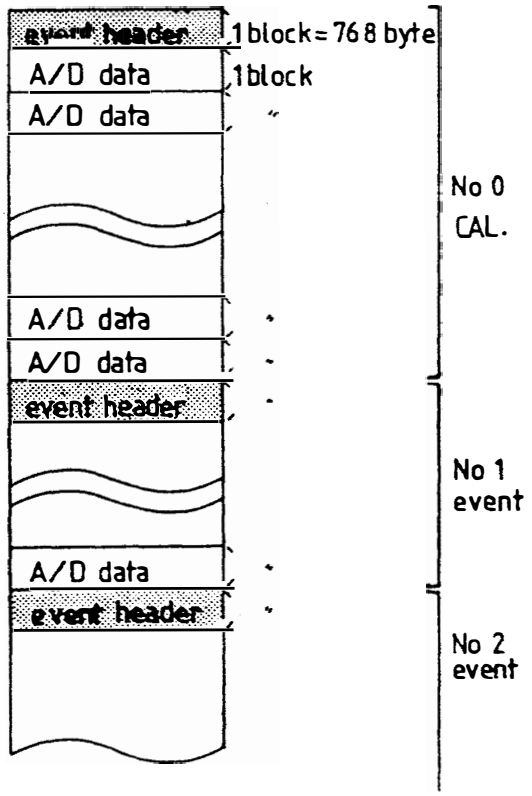
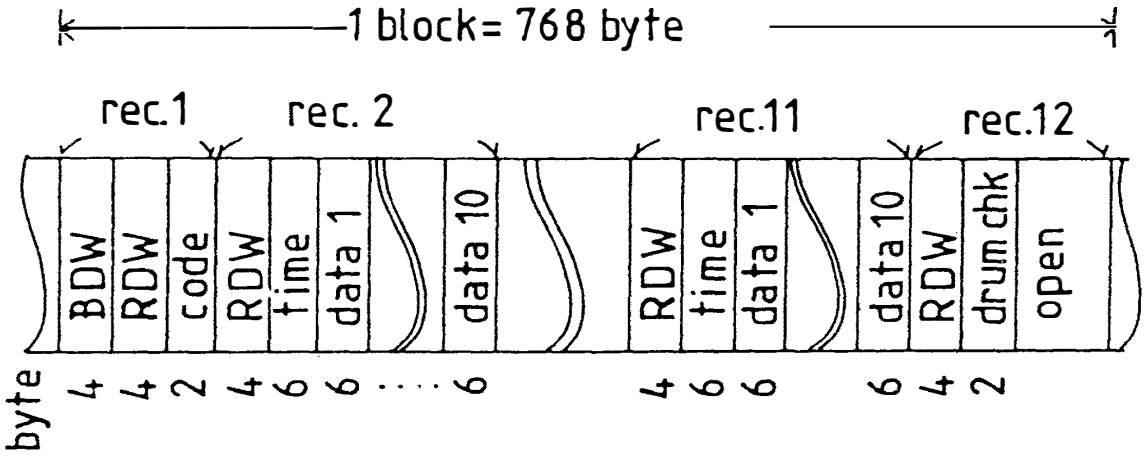


Fig. 6-2. Data constitution.

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 acquisition 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

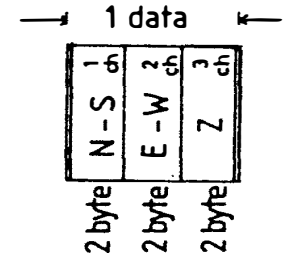
Fig. 6-3. Header of the event.



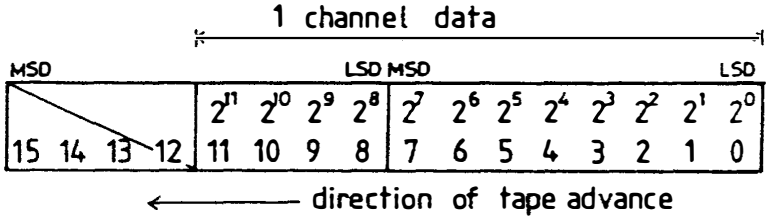
record	number	name	position	length	content
	1	BDW	0-1 2-3	2 2	byte number $(00)_{16}$
1	2	RDW	4-5 6-7	2 2	byte number $(00)_{16}$
	3	code	8-9	2	'HE'
2	4	RDW	10-11 12-13	2 2	see no. 2
	5	time	14-19	6	see Fig. 6-6
	6	data 1	20-25	6	see Fig. 6-5
	⋮				
	15	data 10	74-79	6	see Fig. 6-5
⋮					
11	112	RDW	640-641 642-643	2 2	see no. 2
	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
12	124	RDW	710-711 712-713	2 2	see no. 2
	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 converted data in one block.

1. data sequence



2. data format



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	S	7	3	P	2	1	0	6	4

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

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 399day
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 23hour
5	minute	10-th digit 4, 2, 1	1-st digit 8, 4, 2, 1	max 59minute
6	second	10-th digit 4, 2, 1	1-st digit 8, 4, 2, 1	max 59second

Time data — BCD number

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

Table 1. Read-out data.

DATE		PHASE	ARRIVAL TIME H	M	S
JAN	01	LP EPZ	02	57	36.4
		-IPZ	05	43	48.5
		LP+IPZ	05	43	49.6
	02	+IPZ	18	42	44.3
		+IPZ	22	20	43.0
		EPZ	22	38	33.6
	03	EPZ	06	09	51.3
	04	+IPZ	03	20	51.2
	05	+IPZ	02	20	51.4
		LP-IPZ	02	20	52.8
		+IPZ	11	59	26.7
	06	+IPZ	20	09	01.4
	07	+IPZ	03	44	00.6
		EPZ	06	36	15.3
	08	-IPZ	00	00	34.6
		LP-IPZ	00	00	36.4
		-IPZ	08	15	04.4
		+IPZ	11	34	37.8
		LP-IPZ	11	34	38.0
		EPZ	13	12	37.2
		LP EPZ	13	12	38.8
		-IPZ	15	18	20.5
		LP+IPZ	15	18	21.2
	09	+EPZ	11	02	37.8
		-EPZ	21	23	43.7
		LP EPZ	21	23	14.8
	10	+IPZ	09	29	09.6
		LP+IPZ	09	29	08.8
		EPZ	12	25	34.0
		LP EPZ	12	25	50.8
		-IPZ	12	42	33.7
		LP+IPZ	12	42	33.2
		+ESZ	12	51	54.3
		EPZ	21	17	21.4
	14	EPZ	22	58	03.6
	15	+IPZ	01	09	46.0
	16	+IPZ	02	40	07.8
		LP-IPZ	02	40	07.2
		EPZ	22	21	44.3
	17	+IPZ	00	46	05.9
JAN	17	-IPZ	09	53	00.3
		EXZ	10	03	24.2
		-IPZ	10	34	59.6
		EXZ	12	59	27.7
	18	+IPZ	15	29	35.9
		LP EPZ	15	29	30.0
	19	EPZ	23	51	55.8
	20	EPZ	07	46	16.5
	21	EPZ	04	31	14.1
	22	EPZ	06	56	11.7
		LP-IPZ	06	56	10.0
		+IPZ	11	44	18.2
	23	-IPZ	16	47	44.8
		LP+IPZ	16	47	44.4
		EPZ	17	12	37.2
	24	EPZ	08	36	20.7
		EPZ	13	22	27.1
		+IPZ	23	22	13.0
		LP-IPZ	23	22	12.1
	26	-IPZ	01	17	02.2
	23	EPZ	04	50	17.0
	26	EPZ	04	53	29.0
		-IPZ	16	13	46.7
	27	-IPZ	12	06	24.3
		-IPZ	19	12	45.7
	28	-IPZ	03	27	31.6
		EPZ	07	34	22.7
		-IPZ	14	36	05.5
		EPZ	15	23	28.4
		EPZ	16	30	50.9
		EPZ	23	21	22.0
		+IPZ	23	22	25.3
FEB	01	+EPZ	04	34	21.5
		EPZ	22	38	29.5
	07	EPZ	11	19	19.0
		+EPZ	17	12	59.0
		+IPZ	18	35	09.5
	08	+EPZ	07	18	21.0
		LP-EPZ	07	18	22.8
	09	EPZ	14	16	21.0
FEB	12	-EPZ	09	00	26.7
	13	EPZ	14	50	47.8
		LP EPZ	14	50	11.2
	14	EPZ	03	40	05.0
		LP+EPZ	03	40	14.0
		LP EPZ	08	31	02.4
	19	EPZ	20	26	50.8
	20	+IPZ	11	03	07.0
	21	EPZ	22	43	27.4
	23	EPZ	16	45	52.5
		+EPZ	20	39	43.0
	24	EPZ	18	32	32.0
		EXZ	18	34	53.0
	25	+IPZ	16	44	46.5
		-IPZ	22	16	36.0
		+IPZ	23	01	43.0
		LP EPZ	23	01	43.2
	26	EPZ	00	37	30.0
		LP-EPZ	07	28	26.0
		-IPZ	07	30	26.2
		EPZ	21	46	15.0
	27	EPZ	02	14	31.5
		LP EPZ	02	15	10.0
		-IPZ	12	33	16.2
MAR	01	+IPZ	00	46	43.5
		LP EPZ	00	46	44.0
		EPZ	01	03	24.0
		EPZ	03	49	52.5
	04	LP EPZ	14	09	42.0
	05	-EPZ	22	27	34.0
	09	+IPZ	00	17	19.7
		-EPZ	18	36	15.4
	10	-EPZ	03	19	52.0
		EPZ	14	13	19.1
		EPZ	18	10	11.6
		EPZ	22	09	40.2
	11	EPZ	07	36	19.3
		EPZ	09	36	15.4
	12	-EPZ	01	06	15.8
		+EPZ	01	49	14.2

DATE		PHASE	ARRIVAL TIME H	M	S
MAR	12	LP EPZ	09	02	13.2
		+EPZ	09	02	24.6
	15	EPZ	17	02	20.5
	18	+EPZ	08	49	39.1
		+IPZ	09	18	58.5
		LP+IPZ	09	19	57.2
	21	EPZ	07	56	55.0
	23	-IPZ	18	40	28.0
		+EPZ	20	40	02.4
	24	LP EXZ	00	52	34.0
		EPZ	12	12	21.0
	25	-EPZ	07	56	16.7
	26	EPZ	04	34	28.5
		-EPZ	20	39	40.0
APR	03	EPZ	06	40	09.7
		-EPZ	19	33	22.3
	04	+IPZ	03	03	56.8
		LP-IPZ	03	03	57.2
		LP+IXZ	03	14	14.8
		LP+EXZ	03	30	32.8
		+IPZ	19	24	03.0
		+IPZ	23	32	14.6
		LP-IPZ	23	32	14.6
		LP-ISZ	23	35	34.0
	05	+IPZ	00	11	38.0
		LP-IPZ	00	11	38.4
	06	-EPZ	14	09	30.4
	07	-EPZ	22	16	39.8
	08	EPZ	08	01	13.2
	10	EPZ	21	56	02.3
		+IPZ	17	16	01.0
	12	-IPZ	12	21	07.0
		LP+EPZ	12	24	28.8
	13	EPZ	16	04	31.5
		EPZ	17	40	25.9
	14	+IPZ	19	24	39.0
		LP-EPZ	19	24	39.8
	15	+IPZ	00	22	01.5
		LP+EPZ	00	22	02.0
		-EPZ	05	32	19.5

DATE		PHASE	ARRIVAL TIME H	M	S
APR	15	-IPZ	15	11	39.7
	17	+IPZ	14	19	23.0
	22	EPZ	03	31	15.4
	23	+IPZ	09	31	49.4
	24	-IPZ	03	41	46.3
		LP EXZ	09	59	00.0
	27	EPZ	08	36	34.6
	29	+EPZ	22	29	42.1
MAY	03	+IPZ	00	02	15.8
		EPZ	15	51	22.5
	04	EPZ	02	25	11.5
		EPZ	11	37	32.0
	06	EPZ	07	14	59.0
		EPZ	17	35	06.0
		EPZ	17	55	11.4
	07	EPZ	01	18	33.5
		+EPZ	12	55	59.0
		EPZ	22	47	30.2
	08	EPZ	13	34	00.0
	09	EPZ	08	08	39.9
		LP-EPZ	11	08	18.4
		-EPZ	11	08	33.0
		EPZ	12	37	41.5
		LP EPZ	14	11	22.4
		EPZ	15	07	09.5
		EPZ	21	57	45.0
		LP EXZ	23	07	06.0
	10	EPZ	04	43	21.0
		EPZ	06	27	20.6
		EPZ	08	36	12.3
		+IPZ	11	15	36.1
		+EPZ	18	40	41.0
		LP EPZ	18	44	41.2
		EPZ	22	34	23.6
	11	+IPZ	00	30	06.6
		EPZ	19	09	24.0
		+EPZ	22	00	57.5
	12	EPZ	03	02	44.0
		+EPZ	09	59	27.0
		EPZ	11	50	17.0

DATE		PHASE	ARRIVAL TIME H	M	S
MAY	12	EPZ	13	10	13.5
	13	-IPZ	06	42	45.0
	14	-EPZ	09	47	27.7
		EPZ	15	57	28.2
		EPZ	19	58	54.4
	15	EPZ	00	26	11.0
		-IPZ	00	36	52.4
		LP-IPZ	00	36	52.6
		LP EXZ	01	09	17.2
		EPZ	04	47	53.4
		EPZ	08	46	24.3
		EPZ	19	52	25.2
	16	EPZ	20	36	12.3
	17	-EPZ	11	31	14.6
		EPZ	16	14	48.7
	18	EPZ	04	10	05.5
		EPZ	18	59	05.3
	20	EPZ	21	14	23.0
		-EPZ	21	58	27.7
	21	EPZ	19	36	10.8
		EPZ	20	27	09.5
	22	EPZ	23	45	44.7
	23	EPZ	01	06	04.6
		+IPZ	07	07	38.6
		LP+IPZ	07	07	38.6
		EPZ	11	20	03.5
		EPZ	20	40	12.5
	24	+IPZ	08	44	08.7
		+IPZ	10	15	08.1
		EPZ	18	18	23.4
		EPZ	18	37	58.5
		EPZ	18	43	11.0
	25	-IPZ	00	55	01.9
		-IPZ	13	57	09.2
		-EPZ	17	43	58.6
		EPZ	18	45	06.2
		EPZ	19	08	09.2
		+EPZ	19	25	22.2
		EPZ	19	59	50.0
	26	EPZ	03	19	00.8

DATE		PHASE	ARRIVAL TIME H	M	S
MAY	26	LP EPZ	03	19	03.6
		EPZ	04	16	07.7
		EPZ	14	54	04.0
	27	EPZ	20	04	53.5
		EPZ	20	26	59.6
		EPZ	20	41	37.2
	28	EPZ	08	31	51.0
	29	+IPZ	05	05	09.0
		EPZ	07	15	30.0
		EPZ	11	45	00.4
	30	EPZ	02	39	46.0
		-IPZ	14	58	26.3
		-IPZ	16	15	05.1
		EPZ	17	31	01.6
	31	-EPZ	08	41	29.2
		EPZ	09	33	23.0
		EPZ	11	56	10.0
		EPZ	13	35	51.6
		EPZ	22	27	34.0
JUNE	01	-IPZ	02	12	38.1
		LP EPZ	02	12	38.4
		+IPZ	20	14	44.0
		LP EPZ	20	14	44.0
		EPZ	20	34	12.4
		-EPZ	23	50	27.7
	02	EPZ	14	16	11.0
		-IPZ	20	24	41.4
	03	EPZ	13	06	05.5
	05	+IPZ	00	55	17.4
		EPZ	03	20	04.0
		+IPZ	17	08	37.7
	06	EPZ	13	25	58.6
		-IPZ	16	33	46.7
		EPZ	21	32	16.0
	07	EPZ	16	10	49.5
		-IPZ	20	44	51.4
		LP-IPZ	20	44	52.2
		EPZ	21	02	04.0
	08	EPZ	21	17	49.1
		EPZ	22	22	56.0

DATE		PHASE	ARRIVAL TIME H	M	S
JUNE	10	+IPZ	22	51	32.9
	11	EPZ	04	53	09.0
		EPZ	19	06	29.0
		EPZ	20	37	04.7
		+IPZ	20	44	46.0
	12	IPZ	02	55	40.6
		EPZ	05	15	56.5
		-IPZ	10	25	34.0
		EPZ	12	14	38.0
		EPZ	20	30	33.0
	13	EPZ	21	15	00.0
		EPZ	23	07	51.4
	14	EPZ	14	06	57.0
		EPZ	15	29	36.0
		+IPZ	20	25	31.0
	15	EPZ	04	38	52.0
		EPZ	05	00	40.3
		+IPZ	06	21	04.5
		EPZ	09	09	01.0
		EPZ	23	30	56.3
	16	EPZ	05	05	15.6
		EPZ	22	41	29.3
	17	EPZ	03	04	23.3
		LP+EPZ	11	44	30.8
		+IPZ	11	44	31.2
		+IPZ	22	22	01.3
	18	EPZ	03	29	49.5
		EPZ	11	32	36.0
		EPZ	11	46	56.3
	19	EPZ	06	24	58.3
		EPZ	08	38	38.0
		EPZ	09	46	07.0
	20	-IPZ	05	55	06.6
		LP+IPZ	05	55	06.6
		IPZ	06	01	49.5
		LP-ISZ	06	04	38.0
		EXZ	06	04	48.3
		EPZ	06	57	47.7
		EPZ	15	31	40.6
		EPZ	23	38	01.3

DATE		PHASE	ARRIVAL TIME H	M	S
JUNE	21	EPZ	02	14	13.0
		+IPZ	03	57	02.0
		-EPZ	06	44	40.7
		LP-IPZ	06	44	40.7
		+IPZ	07	09	37.8
		EPZ	15	27	04.0
		EPZ	17	16	24.0
		+IPZ	17	25	19.0
		EPZ	18	04	04.0
		EPZ	19	05	10.0
	22	EPZ	17	54	35.0
	23	EPZ	11	25	27.4
		+EPZ	12	13	43.5
		LP EPZ	12	15	38.0
		LP EXZ	12	31	06.4
		+IPZ	19	16	35.0
		EPZ	19	22	37.2
		-EPZ	20	36	03.0
	24	EPZ	01	49	23.5
		EPZ	02	48	31.4
		EPZ	05	30	16.9
		LP EPZ	07	38	16.8
		LP EXZ	08	11	56.8
		-EPZ	15	16	01.2
		EPZ	20	47	31.6
	25	EPZ	00	37	55.0
		EPZ	01	06	28.0
		+IPZ	01	36	46.0
		-EPZ	02	45	42.0
		-IPZ	10	14	53.0
		LP EPZ	10	16	47.6
		-EPZ	15	16	18.0
		EPZ	15	53	16.4
		EXZ	16	17	25.5
		-EPZ	19	21	38.6
	26	EPZ	15	26	10.6
		EPZ	15	44	37.3
	27	EPZ	08	37	53.6
		EPZ	13	27	00.0
		EPZ	14	21	34.6

DATE		PHASE	ARRIVAL TIME H M S
JUNE	27	EPZ	16 50 02.0
		EPZ	22 03 00.0
	28	-EPZ	03 46 43.0
	29	EPZ	11 27 07.7
		EPZ	18 02 14.0
		EPZ	20 23 46.5
	30	EPZ	02 49 02.0
		EPZ	09 33 02.0
		-EPZ	17 50 54.4
		EPZ	19 29 20.0
		EPZ	22 22 27.6
JULY	01	EPZ	01 07 43.0
		-IPZ	03 27 52.4
		-EPZ	12 03 25.5
		EPZ	12 03 26.2
	02	+IPZ	09 46 25.5
		-IPZ	09 46 26.2
	03	EPZ	03 03 18.0
		EPZ	03 07 27.0
		EPZ	04 44 31.6
		EPZ	06 24 07.5
		LP EXZ	18 14 17.6
	04	+IPZ	11 39 13.0
		EPZ	15 29 55.7
		EPZ	15 53 16.4
		EPZ	21 11 09.0
	05	-EPZ	06 07 53.3
		LP-IPZ	06 07 53.8
	06	LP EXZ	06 26 42.8
	05	-EPZ	10 10 04.6
		-EPZ	11 23 57.5
		LP+IPZ	11 23 58.2
		LP EXZ	11 52 14.8
		EXZ	13 07 23.3
		EPZ	16 43 10.3
	07	EPZ	01 15 12.0
		EPZ	05 42 03.7
		LP EXZ	06 14 04.2
		EPZ	09 20 24.6
		LP EPZ	16 17 54.8

DATE		PHASE	ARRIVAL TIME H M S
JULY	07	EPZ	16 17 59.0
		LP EXZ	16 47 05.6
		EPZ	19 41 21.3
		EPZ	19 59 24.5
		+IPZ	20 46 00.7
		+IPZ	22 26 11.2
	08	-IPZ	02 15 05.0
		EPZ	11 33 18.6
		EPZ	19 51 40.4
		EPZ	20 13 59.5
	09	+IPZ	08 00 29.2
		EPZ	19 10 51.6
		EPZ	20 10 47.4
	11	EPZ	03 30 49.5
		-EPZ	13 03 35.2
		LP EPZ	13 08 37.2
		EPZ	14 58 07.0
		EPZ	22 31 02.0
		EPZ	22 45 07.0
	12	EPZ	11 47 50.0
		LP-EPZ	15 30 02.6
		-EPZ	15 3[illegible] 05.0
		EPZ	17 06 02.0
	13	EPZ	15 18 43.4
	14	+EPZ	20 01 01.5
	15	EPZ	10 58 53.3
	16	+IPZ	08 07 36.9
		EPZ	08 22 28.5
		+IPZ	11 37 14.1
	17	EPZ	04 09 19.0
		-IPZ	14 58 34.0
		+IPZ	22 08 01.0
		+IPZ	22 24 29.4
	18	EPZ	11 22 06.8
		+EPZ	19 55 00.7
	19	EPZ	18 03 01.0
		EPZ	20 07 04.0
		EPZ	23 27 27.0
	20	EPZ	15 53 13.4
		-IPZ	23 10 38.0

DATE		PHASE	ARRIVAL TIME H M S
JULY	21	+IPZ	07 23 06.8
		LP EPZ	07 23 07.8
	22	+IPZ	02 49 17.2
		LP EPZ	02 49 16.8
		LP EPZ	02 59 32.8
		+IPZ	02 59 33.0
		+IPZ	04 02 39.0
		EPZ	06 53 45.0
	23	EPZ	08 33 52.0
		-EPZ	18 37 59.4
	24	EPZ	01 04 26.0
		LP EPZ	01 04 26.8
		+IPZ	23 26 56.8
		LP-IPZ	23 26 57.8
		+IPZ	23 50 09.9
		LP EPZ	23 50 10.6
	25	EPZ	21 41 25.2
		EPZ	22 20 42.0
		+IPZ	22 51 17.4
	26	EPZ	02 12 55.8
		EPZ	04 15 46.6
	27	+IPZ	13 42 17.0
	28	EPZ	01 52 39.3
		EPZ	21 33 34.6
	29	EPZ	02 31 51.5
		-IPZ	11 37 08.0
		EPZ	18 16 13.0
	30	EPZ	17 36 46.7
		EPZ	23 37 03.0
	31	EPZ	06 17 03.0
		EPZ	10 39 03.6
AUG	01	EPZ	04 45 05.0
		+EPZ	14 18 44.0
		LP EPZ	14 18 45.0
	02	+EPZ	11 43 53.9
		-IPZ	12 54 44.3
	03	-EPZ	04 02 27.5
		LP EPZ	04 02 27.5
		EPZ	04 17 47.5
		-IPZ	05 14 09.6

DATE		PHASE	ARRIVAL TIME H M S
AUG	03	EPZ	08 44 54.0
		EPZ	10 10 50.5
		+EPZ	18 30 22.0
		LP EPZ	18 31 22.0
		-IPZ	22 37 47.4
	04	-IPZ	00 38 09.7
	05	-IPZ	00 32 18.5
		+IPZ	00 53 27.0
		+IPZ	05 38 24.4
		LP EPZ	05 38 25.9
		+IPZ	06 34 15.5
		+IPZ	07 15 22.2
		-EPZ	13 37 04.8
		EPZ	18 52 34.0
		EPZ	19 45 02.5
		EPZ	21 21 16.3
	06	EPZ	00 10 34.0
		LP EPZ	16 02 27.0
		LP EXZ	16 41 05.0
		-IPZ	16 55 02.7
		EPZ	18 17 34.7
		+IPZ	22 50 09.9
		LP-IPZ	22 50 10.6
	07	EPZ	16 34 13.0
		+IPZ	21 24 11.7
		EPZ	22 49 51.2
	08	+EPZ	02 15 22.3
		+EPZ	04 06 57.0
		EPZ	19 03 07.0
	09	EPZ	07 49 09.0
		EPZ	20 43 18.0
		-IPZ	22 44 29.7
	10	EPZ	18 17 20.5
		+IPZ	20 18 15.8
		EPZ	20 41 45.9
	11	+IPZ	23 09 04.9
		EPZ	23 31 00.3
	12	EPZ	11 24 18.5
		EPZ	21 39 12.0
		EPZ	22 17 19.5

DATE		PHASE	ARRIVAL TIME H M S
AUG	13	+IPZ	15 51 19.4
		-EPZ	20 42 35.0
		LP EPZ	20 42 35.8
		LP EXZ	22 39 17.0
		-EPZ	22 39 56.1
		EPZ	23 07 15.0
	14	EPZ	07 39 45.0
		EPZ	20 04 41.2
		LP EPZ	20 04 41.8
		LP-IPZ	20 22 02.4
	15	EPZ	02 13 50.4
		EPZ	19 05 00.6
	16	-IPZ	05 33 07.0
		EPZ	14 11 32.4
	17	-IPZ	09 41 27.2
		+IPZ	11 15 33.9
		LP-IPZ	11 15 34.0
		LP EXZ	12 28 12.6
	19	EPZ	11 02 14.9
	20	+IPZ	06 31 12.7
		LP-IPZ	06 31 13.0
		EPZ	08 41 24.2
		EPZ	13 27 16.1
	21	EPZ	08 47 23.5
		+IPZ	23 09 14.0
	22	+IPZ	06 06 08.7
		EPZ	12 58 51.3
		EPZ	23 13 09.7
	23	EPZ	03 11 24.0
		EPZ	14 36 59.8
		EPZ	19 19 47.5
		EPZ	20 14 17.0
		EPZ	23 52 47.0
	24	-EPZ	13 55 15.0
	25	EPZ	01 37 50.5
		EPZ	01 58 10.4
		EPZ	07 00 37.0
		-EPZ	20 42 12.0
		LP EPZ	20 42 13.8
	26	EPZ	03 21 00.0

DATE		PHASE	ARRIVAL TIME H M S
AUG	27	EPZ	04 38 58.4
		EPZ	19 03 20.6
	29	EPZ	10 30 07.7
		EPZ	17 07 11.0
		EPZ	23 37 20.0
	30	+IPZ	09 03 20.4
		LP+IPZ	09 03 21.4
	31	EPZ	03 15 19.0
		EPZ	11 37 28.0
SEP	01	-IPZ	08 35 39.4
		+IPZ	14 19 39.8
		-IPZ	18 03 35.8
		LP EPZ	18 03 36.0
		EPZ	18 17 49.5
		EPZ	19 37 31.0
		-IPZ	20 13 49.0
		LP+IPZ	20 13 49.8
	02	EPZ	01 52 30.8
		EPZ	22 48 22.3
	03	+IPZ	10 30 51.5
	04	+EPZ	21 05 15.5
	05	EPZ	04 19 26.5
		EPZ	18 58 04.4
		EPZ	19 20 04.7
		EPZ	19 32 30.6
		EPZ	19 45 48.8
		EPZ	21 10 33.8
	06	EPZ	01 22 06.0
		EPZ	20 10 30.3
	07	EPZ	00 15 25.6
		-EPZ	19 42 05.5
		LP+IPZ	19 42 06.2
		LP EXZ	20 51 00.2
	08	EPZ	00 15 34.0
		EPZ	05 41 57.0
		-EPZ	13 02 07.8
	09	-EPZ	09 35 51.5
		+IPZ	16 58 12.0
	10	+IPZ	01 49 32.5
		EPZ	11 45 56.0

DATE		PHASE	ARRIVAL TIME H	M	S
SEP	11	EPZ	00	41	21.0
		EPZ	11	50	10.4
		EPZ	11	52	52.0
		+IPZ	17	04	25.2
		EPZ	19	08	06.0
	12	EPZ	01	03	25.4
		EPZ	14	29	24.6
		EPZ	15	56	06.0
		LP EPZ	16	00	07.4
	13	-EPZ	02	16	20.4
		EPZ	05	50	24.8
		EPZ	12	04	28.5
		EPZ	19	43	25.4
		EPZ	22	36	40.7
	14	+EPZ	00	57	34.6
		+EPZ	11	43	19.0
		EXZ	11	54	09.2
	15	EPZ	17	15	24.5
	16	EPZ	04	34	12.6
		-EPZ	07	56	09.0
		+IPZ	08	20	58.1
		LP EPZ	08	20	58.4
	17	+IPZ	00	53	24.3
		LP EPZ	00	53	25.0
		-IPZ	04	53	10.4
		-IPZ	06	09	15.0
		LP+IPZ	06	09	15.8
		EPZ	07	31	16.4
		+EPZ	12	24	43.6
		LP+EPZ	12	24	44.0
		-EPZ	12	52	16.0
		LP EXZ	13	01	09.4
		EPZ	22	31	23.9
	18	-EPZ	06	48	31.0
		EPZ	09	26	17.0
		+EPZ	19	55	57.0
	19	EPZ	00	11	43.0
	21	+EPZ	10	18	44.5
		-EPZ	10	39	50.5
	22	+IPZ	19	32	57.0

DATE		PHASE	ARRIVAL TIME H	M	S
SEP	23	EPZ	09	27	05.2
		LP EPZ	09	27	05.4
	25	EPZ	09	10	03.5
		-IPZ	13	29	28.8
		-EPZ	21	01	37.2
	26	EPZ	08	56	03.0
		EPZ	09	23	50.0
		+EPZ	11	11	24.8
		LP EPZ	11	11	26.2
	27	EPZ	11	39	12.5
		LP EPZ	13	05	36.0
		LP EXZ	13	23	00.0
	29	-IPZ	02	17	26.3
		-EPZ	06	45	00.6
		EPZ	07	24	11.8
		-ISZ	07	24	27.8
		+IPZ	11	06	26.0
		EPZ	23	49	28.8
	30	EPZ	07	23	04.6
		EPZ	13	56	51.8
OCT	02	EPZ	17	29	28.4
		EPZ	20	56	32.5
		EPZ	23	13	46.0
	03	EPZ	22	30	45.8
	04	+IPZ	19	03	38.5
		LP-IPZ	19	03	39.4
		LP EXZ	19	32	52.2
		+IPZ	19	38	22.0
	05	EPZ	02	33	46.1
	06	+IPZ	02	06	03.6
		+IPZ	15	13	14.4
	08	-IPZ	08	03	35.0
		LP EPZ	08	03	35.0
		+ISZ	08	06	05.9
		EPZ	09	07	16.0
		EPZ	21	34	59.6
		+IPZ	22	46	30.0
	09	+IPZ	11	37	07.9
		LP-IPZ	11	37	08.6
		LP EXZ	12	02	47.0

DATE		PHASE	ARRIVAL TIME H	M	S
OCT	09	EPZ	21	56	13.0
	10	EPZ	03	45	02.7
		-EPZ	14	21	46.7
	11	EPZ	00	59	19.4
		EPZ	08	41	02.0
	12	EPZ	00	19	50.5
		EPZ	01	04	11.0
		EPZ	01	25	03.5
		EPZ	02	36	39.2
		EPZ	03	51	43.1
		+IPZ	11	44	44.8
	13	-IPZ	05	14	06.2
		+IPZ	09	12	02.0
		EPZ	13	18	47.0
	14	EPZ	06	48	09.6
	15	EPZ	11	09	59.6
		LP EPZ	11	09	59.6
		EPZ	12	46	06.4
	16	-IPZ	05	45	15.8
		LP-IPZ	05	45	15.8
		-IPZ	10	11	21.7
		LP+IPZ	10	11	22.6
	17	EPZ	13	38	08.0
		LP-IPZ	13	38	08.2
		LP-EXZ	14	14	26.8
		EPZ	15	18	50.4
		LP EPZ	19	55	56.8
	18	EPZ	03	01	09.0
		+EPZ	05	42	27.0
		+IPZ	06	40	46.5
		EPZ	16	13	38.3
	19	EPZ	18	32	22.0
	20	EPZ	02	18	23.6
		EPZ	06	54	05.4
	21	-IPZ	08	25	06.0
		LP+IPZ	08	25	06.0
	22	+IPZ	04	27	20.6
		LP-IPZ	04	27	21.0
		LP+IPZ	04	59	07.2
		EPZ	05	37	56.7

DATE		PHASE	ARRIVAL TIME H M S
OCT	22	-EPZ	05 59 07.8
		-IPZ	13 13 23.3
		LP+IPZ	13 13 23.8
		-EPZ	20 37 13.7
		EPZ	22 14 14.1
	24	+IPZ	00 48 48.2
	25	-EPZ	00 49 11.0
		LP EPZ	00 49 10.0
	26	+EPZ	02 14 01.5
		EPZ	05 49 43.0
		IPZ	10 58 16.3
		-IPZ	14 40 36.0
	27	EXZ	09 25 09.6
		+EPZ	19 56 36.4
	28	EPZ	06 07 01.6
		LP+IPZ	14 25 57.0
		+EPZ	14 25 57.5
		EPZ	20 11 19.4
	29	EPZ	01 10 20.5
		EPZ	23 49 07.4
		EPZ	23 59 00.6
	30	LP EPZ	04 30 57.8
		LP EXZ	05 07 45.2
		EPZ	12 04 02.2
	31	EPZ	01 23 29.8
		+IPZ	17 49 46.5
		LP-IPZ	17 49 47.8
		EPZ	19 38 40.3
NOV	01	EPZ	21 56 50.5
	02	EPZ	05 34 52.0
		EPZ	09 49 16.6
	04	EPZ	08 52 18.6
		EPZ	20 56 48.1
	06	+EPZ	09 50 44.5
		LP EPZ	09 50 45.8
	07	EPZ	08 52 21.1
		LP EPZ	08 52 22.6
		-EPZ	08 55 27.4
		EPZ	16 39 31.6
		LP EPZ	16 36 32.4

DATE		PHASE	ARRIVAL TIME H M S
NOV	09	-EPZ	02 09 08.7
		+EPZ	04 28 59.3
		EPZ	06 32 43.5
		LP EPZ	06 32 45.8
		-EXZ	06 32 54.2
	10	EPZ	08 41 14.8
	11	+IPZ	21 32 34.0
		EPZ	22 20 22.2
		EPZ	22 30 14.0
		EPZ	22 42 17.0
		EPZ	22 44 51.5
	12	-IPZ	14 05 54.5
		+IPZ	23 41 10.9
	14	EPZ	05 19 20.5
	15	-EPZ	10 50 27.9
		EPZ	17 37 59.3
	16	LP EPZ	04 16 10.6
		EPZ	13 57 48.0
		EPZ	16 32 08.1
		+IPZ	22 19 13.4
	17	-EPZ	10 49 37.4
		LP EPZ	10 49 38.2
		EPZ	10 51 32.6
	18	EPZ	08 48 59.4
		+EPZ	16 40 01.0
	19	EPZ	04 44 46.0
		EPZ	07 31 04.6
	20	EPZ	05 10 22.5
		EPZ	07 15 52.2
		+IPZ	20 44 43.9
		LP-IPZ	20 44 45.0
	21	EPZ	05 08 46.8
	22	EPZ	03 30 14.8
		EPZ	05 14 57.5
		EPZ	09 04 13.0
		EPZ	11 21 00.2
		LP EPZ	14 34 50.6
		EPZ	16 12 59.8
		EPZ	19 23 58.0
	23	+EPZ	06 00 25.8

DATE		PHASE	ARRIVAL TIME H M S
NOV	23	-EPZ	09 25 09.6
		EPZ	11 23 43.3
		EPZ	12 10 45.4
	24	EPZ	02 03 33.4
		+IPZ	05 42 39.0
		LP EPZ	05 42 39.8
		-EXZ	06 09 08.8
		EPZ	08 30 41.4
		EPZ	21 50 35.2
	25	-IPZ	11 26 59.7
		+IPZ	20 06 23.0
		LP-IPZ	20 06 23.0
		LP EXZ	20 29 26.6
		EPZ	22 07 23.3
		-IPZ	23 09 39.5
	26	EPZ	17 10 46.2
		EPZ	23 39 02.3
	28	-EPZ	19 19 51.4
	29	EPZ	03 05 22.4
		EPZ	03 36 54.2
		EPZ	03 49 31.5
		EPZ	20 03 27.7
		EPZ	22 31 28.4
		-EPZ	23 53 00.5
	30	EPZ	00 40 14.2
		EPZ	10 04 47.5
		LP EPZ	10 22 24.2
		-EPZ	17 56 44.3
		LP+IPZ	17 56 47.0
		-IXZ	18 25 41.0
		EPZ	21 52 54.0
DEC	01	EPZ	05 56 30.5
		EPZ	07 30 50.3
		EPZ	09 22 01.7
		EPZ	22 40 16.7
	02	EPZ	02 54 12.4
		LP EPZ	03 25 01.0
		LP EXZ	04 12 14.2
		EPZ	06 51 13.7
		EPZ	07 46 57.1

DATE		PHASE	ARRIVAL TIME H	M	S
DEC	02	EPZ	15	12	19.2
		EPZ	17	12	36.2
	03	EPZ	01	37	04.0
		EPZ	05	01	54.3
		EPZ	06	52	39.0
		EPZ	07	10	03.0
		EPZ	17	54	01.8
		LP+IPZ	17	54	02.2
		LP EXZ	18	02	27.8
		LP EXZ	18	15	33.8
	04	EPZ	02	20	34.4
		EPZ	19	43	58.1
	05	EPZ	01	24	35.3
		EPZ	04	30	34.6
		EPZ	08	22	43.2
		EPZ	12	01	29.9
		EPZ	21	13	56.2
	06	EPZ	01	21	25.2
		EPZ	07	31	12.4
	07	EPZ	16	33	32.5
		EPZ	18	57	57.5
	08	EPZ	01	17	01.8
		EPZ	01	38	04.7
		+IPZ	02	30	56.6
		EPZ	10	13	13.3
		EPZ	11	12	37.6
		EPZ	21	23	21.5
	09	EPZ	06	48	52.1
		+IPZ	22	20	08.4
	10	EPZ	18	46	24.0
		-IPZ	22	23	04.2
	11	LP-EPZ	09	27	37.0
		LP-EXZ	10	09	53.0
		-EPZ	12	27	36.8
	12	+IPZ	09	38	14.2
		LP-IPZ	09	38	15.0
	15	+IPZ	03	59	03.5
		LP-IPZ	03	59	04.2
		EXZ	04	09	20.8
		-IPZ	04	33	11.3

DATE		PHASE	ARRIVAL TIME H	M	S
DEC	15	LP+IPZ	04	33	12.2
		EPZ	14	24	36.9
		LP-IPZ	14	24	37.6
	16	-EPZ	02	51	42.7
		EPZ	16	49	39.5
		EPZ	20	04	46.8
		EPZ	20	27	12.0
	17	EPZ	11	29	12.0
		+EPZ	15	59	29.0
		+IPZ	16	04	59.4
	18	EPZ	03	00	23.1
		EPZ	17	40	26.6
		EPZ	17	57	05.7
	19	-IPZ	14	09	24.9
	20	EPZ	08	30	42.1
		EPZ	11	00	54.2
		EPZ	16	19	04.7
		EPZ	17	11	48.0
		LP EPZ	17	11	51.0
		EPZ	18	59	49.0
		EPZ	23	25	42.4
	21	+IPZ	12	15	10.0
		LP+IPZ	12	15	11.0
		-IXZ	12	25	11.4
		EPZ	12	43	05.1
		+IPZ	13	50	58.0
		EPZ	23	45	22.0
		LP EPZ	23	45	17.6
	22	EPZ	01	15	13.3
		+EPZ	04	24	25.6
		LP+IPZ	04	24	27.0
		EPZ	12	03	42.0
	23	EPZ	11	28	56.1
		+IPZ	15	43	11.9
		+EPZ	18	32	15.0
		+EPZ	23	07	27.9
	24	EPZ	08	54	51.1
		-EPZ	18	33	34.1
	25	EPZ	02	42	41.7
	26	LP-IPZ	12	58	04.2

DATE		PHASE	ARRIVAL TIME H	M	S
DEC	26	+IPZ	13	57	03.5
		+EPZ	14	03	22.0
		-EPZ	17	57	36.6
	27	EPZ	00	47	58.2
		EPZ	23	25	53.2
	28	EPZ	00	36	28.0
		EPZ	06	37	17.6
		EPZ	09	47	37.2
		EPZ	14	20	55.1
		EPZ	21	20	42.5
	29	-IPZ	13	19	46.9
	30	EPZ	09	52	44.2
	31	LP-IPZ	00	06	37.0
		EPZ	00	06	37.6
		EXZ	00	10	11.6

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 79 earthquakes.

Data number	Origine time UTC date	hr	mn	sec	Geographic coordinates latitude	longitude	Region	Depth (km)	Magnitude (mb)	Epicentral distance (degree)	Azimuth (degree)	Comment
1	01/01	05	31	56.1	16.943°S	69.114°W	Peru-Bolivia Border	172	5.7	80.736	293	S
2	01/08	11	21	29.5	15.394°S	173.330°W	Tonga Islands	33	6.1	92.601	32	
3	01/10	12	32	21.6	27.237°S	63.301°W	Santiago Prov., Argentina	558	5.7	69.238	292	S
4	02/07	18	23	16.6	29.707°S	177.837°W	Kermadec Islands	52	6.0	77.799	33	S
5	02/25	22	49	54.7	18.268°S	69.438°W	Northern Chile	146	5.9	79.606	294	S
6	02/26	07	10	59.1	49.243°N	155.601°E	Kuril Islands	56	6.0	144.008	91	
7	03/01	00	42	45.6	53.397°S	24.846°E	South of Africa	10	5.2	17.045	211	S
8	03/18	09	05	50.0	4.883°S	153.581°E	New Ireland Region	89	6.5	93.880	66	S
9	03/21	07	44	17.7	21.466°S	175.451°W	Tonga Islands	68	6.3	86.279	32	
10	04/04	02	51	34.3	5.723°N	94.722°E	Northern Sumatera	79	6.6	83.615	125	S
11	04/04	23	12	47.1	49.408°N	155.602°E	Kuril Islands	51	6.1	144.147	91	
12	04/04	23	58	59.0	15.038°S	167.289°E	Vanuatu Islands	123	6.2	88.425	50	

13	04/11 17 03 41.7	35.550°S	179.252°W	East of North Isl., New Zealand	50	5.7	71.851	33	
14	04/12 12 07 54.5	4.843°S	78.103°W	Peru-Equador Border	104	6.5	95.008	298	
15	04/15 00 09 33.3	19.221°S	175.469°W	Tonga Islands	227	5.7	88.462	33	
16	05/02 23 42 37.7	36.219°N	120.317°W	Central California	10	6.2	145.282	331	
17	05/26 02 59 59.6	40.462°N	139.102°E	Near West Coast of Honshu, Japan	24	6.8	130.511	99	LP
18	06/01 01 59 54.6	17.038°S	174.605°W	Tonga Islands	180	6.2	90.756	33	
19	06/01 20 09 57.8	53.049°S	9.724°E	South of Africa	10	5.7	21.122	236	S
20	06/02 20 12 50.7	9.512°S	71.249°W	Peru-Brazil Border	599	5.9	88.392	293	
21	06/07 20 40 26.5	50.685°S	29.103°E	South of Africa	10	5.5	19.028	201	S
22	06/10 22 39 09.2	24.183°S	176.329°W	South of Fiji Isl.	47	5.7	83.464	33	
23	06/20 05 43 37.7	23.579°S	179.098°E	South of Fiji Isl.	544	5.5	83.117	37	S
24	06/21 06 25 27.3	41.346°N	139.099°E	Hokkaido, Japan	10	6.7	131.291	99	
25	06/25 10 03 17.4	32.835°S	178.791°W	S. of Kermadec Isl.	46	5.6	74.575	33	
26	07/02 09 34 04.9	5.747°N	94.715°E	Northern Sumatora	93	5.7	83.636	125	
27	07/05 05 58 21.4	55.849°S	123.404°W	Easter Island Cordillera	10	5.5	54.743	348	
28	07/05 11 11 39.8	22.599°S	171.020°E	Loyalty Islands	33	6.1	82.177	44	
29	07/07 20 35 38.1	7.271°S	27.844°E	Zaire Republic	10	5.8	62.174	193	

30	07/11	12 56 28.3	60.889°S	53.020°W	South Shetland Isl.	10	6.1	36.209	305	LP
31	07/17	21 56 16.6	31.411°S	178.125°W	Kermadec Isl. Reg.	49	5.6	76.087	33	
32	07/21	07 11 33.8	22.193°S	68.451°W	Northern Chile	126	5.5	75.622	295	
33	07/22	02 36 40.7	14.636°S	167.332°E	Vanuatu Islands	163	5.2	88.820	50	
34	07/24	00 52 25.1	27.995°S	176.382°W	Kermadec Islands	71	5.5	79.743	32	
35	07/24	23 07 30.9	53.930°N	158.372°E	Near Coast of Kamchatka	180	6.1	148.845	93	
36	07/24	23 38 09.8	8.141°S	119.504°E	Flores Isl. Region	48	5.8	78.892	96	
37	08/02	12 43 40.9	7.194°S	117.445°E	Bali Sea	604	5.4	79.037	99	
38	08/03	03 58 21.0	52.120°S	27.942°E	South of Africa	10	5.4	17.775	204	S
39	08/03	18 17 42.2	17.395°S	167.914°E	Vanuatu Islands	33	5.5	86.346	49	
40	08/06	22 37 54.9	6.518°S	130.119°E	Banda Sea	160	5.8	84.207	87	
41	08/17	10 55 54.1	55.867°N	161.287°E	Near E. Coast of Kamchatka	63	6.6	151.417	93	LP
42	08/20	06 19 30.7	8.530°S	117.563°E	Sumbawa Isl. Region	156	5.5	77.839	98	
43	08/25	01 33 12.1	49.008°S	31.058°E	South of Africa	10	4.8	20.469	196	S
44	09/01	17 59 29.0	52.484°S	25.838°E	South of Africa	10	5.3	17.751	209	LP,S
45	09/01	20 01 47.0	17.330°S	69.932°W	Peru-Bolivia Border	105	6.0	80.645	294	
46	09/16	08 09 26.6	24.032°S	179.796°W	South of Fiji	510	6.0	82.913	36	S

47	10/04	18	52	13.3	26.535°S	70.563°W	Near Coast of Northern Chile	15	6.4	72.258	298	S
48	10/04	19	26	58.0	26.339°S	70.654°W	Near Coast of Northern Chile	31	5.7	72.470	298	
49	10/16	05	32	28.7	1.084°N	121.052°E	Minahassa Peninsula	40	6.0	88.006	98	
50	10/16	09	59	46.5	23.681°S	70.129°W	Near Coast of Northern Chile	66	5.7	74.780	297	
51	10/21	08	14	18.1	30.773°S	69.194°W	Chile-Argentina Border	117	5.5	67.884	299	
52	10/22	04	21	35.0	60.665°S	25.451°W	South Sandwich Isl.	24	6.5	27.409	285	S,LP
53	10/22	05	32	10.0	60.490°S	25.682°W	South Sandwich Isl.	33	5.4	27.614	285	
54	10/22	13	07	39.1	60.620°S	25.392°W	South Sandwich Isl.	33	6.2	27.421	285	LP
55	10/25	00	36	23.4	1.131°N	120.858°E	Minahassa Peninsula	33	5.8	87.980	99	
56	10/28	14	06	06.6	44.058°N	113.857°W	Eastern Idaho	10	6.2	151.460	317	
57	10/31	17	37	56.2	9.016°S	119.180°E	Sumba Isl. Region	83	6.0	77.966	96	
58	11/06	09	38	39.9	20.145°S	177.678°W	Fiji Isl. Region	387	5.6	87.123	35	S
59	11/16	16	13	00.0	19.430°N	155.454°W	Hawaii	12	6.4	129.541	19	
60	11/17	10	39	30.9	28.192°S	63.185°W	Santiago Prov. Argentina	575	5.4	68.318	292	
61	11/20	20	32	20.5	7.450°S	130.645°E	Tanimbar Isl. Region	59	6.0	83.532	86	
62	11/23	05	48	33.5	18.105°S	178.333°W	Fiji Isl. Region	607	5.6	88.969	36	

63	11/24 05 30 34.2	7.481°S	128.168°E	Banda Sea	179	6.4	82.614	89	S,LP
64	11/25 19 56 07.8	40.451°S	155.507°E	S.E. of Australia	19	6.0	61.137	52	
65	11/30 17 46 00.6	6.852°S	72.110°E	Chagos Archipelago Region	10	6.6	65.726	144	S,LP
66	12/03 17 43 14.8	6.463°S	71.417°E	Chagos Archipelago Region	10	6.3	65.959	144	
67	12/08 02 19 10.9	19.216°S	178.378°W	Fiji Islands	627	5.5	87.881	36	
68	12/12 09 26 07.0	7.583°S	127.288°E	Banda Sea	137	6.1	82.203	89	
69	12/15 04 22 33.4	33.099°S	70.120°W	Chile-Argentina Border	100	5.9	66.018	300	
70	12/19 13 58 41.1	22.342°S	63.688°W	Salta Province, Argentina	521	5.1	73.899	290	
71	12/21 12 05 06.3	28.190°S	63.172°W	Santiago Prov., Argentina	602	6.2	68.315	292	LP
72	12/21 12 15 06.9	28.042°S	63.008°W	Santiago Prov., Argentina	609	5.9	68.397	292	
73	12/22 04 11 29.2	11.866°N	13.529°W	Northwest Africa	11	6.4	88.779	232	
74	12/22 11 53 37.9	28.309°S	62.990°W	Santiago Prov., Argentina	593	5.1	68.145	292	
75	12/24 18 21 50.7	20.144°S	178.319°W	Fiji Islands	599	5.4	86.992	35	
76	12/26 13 50 44.5	55.919°S	27.762°W	South Sandwich Island Region	89	5.8	31.778	281	
77	12/30 23 52 39.9	36.372°N	70.738°E	Hindu Kush Region?	215	6.6	107.657	154	

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

(ii) LP in the comment column means that digital long-period seismogram was obtained.

(iii) S in the comment column means that clear S-phase was obtained.

(iV) Azimuth indicates the anti-clockwisely measured angle from South Pole to Syowa Station to Epicenter.

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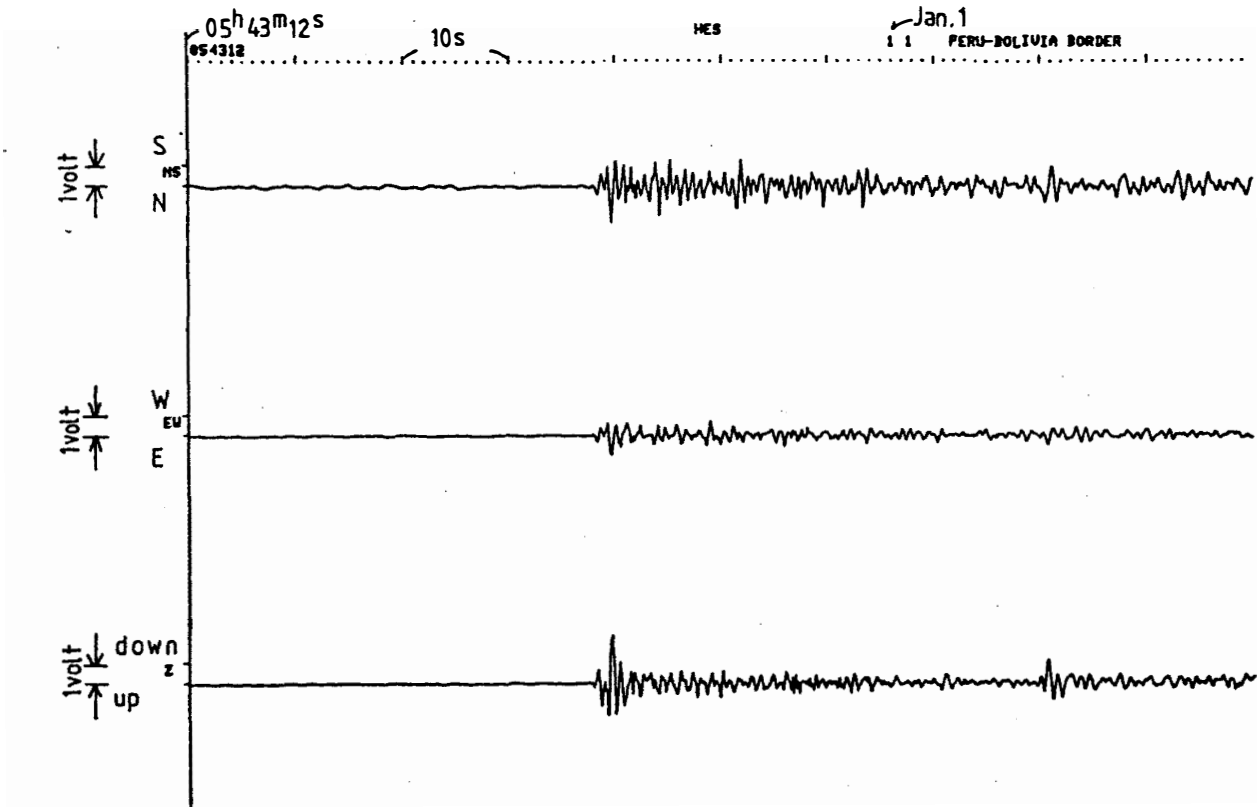
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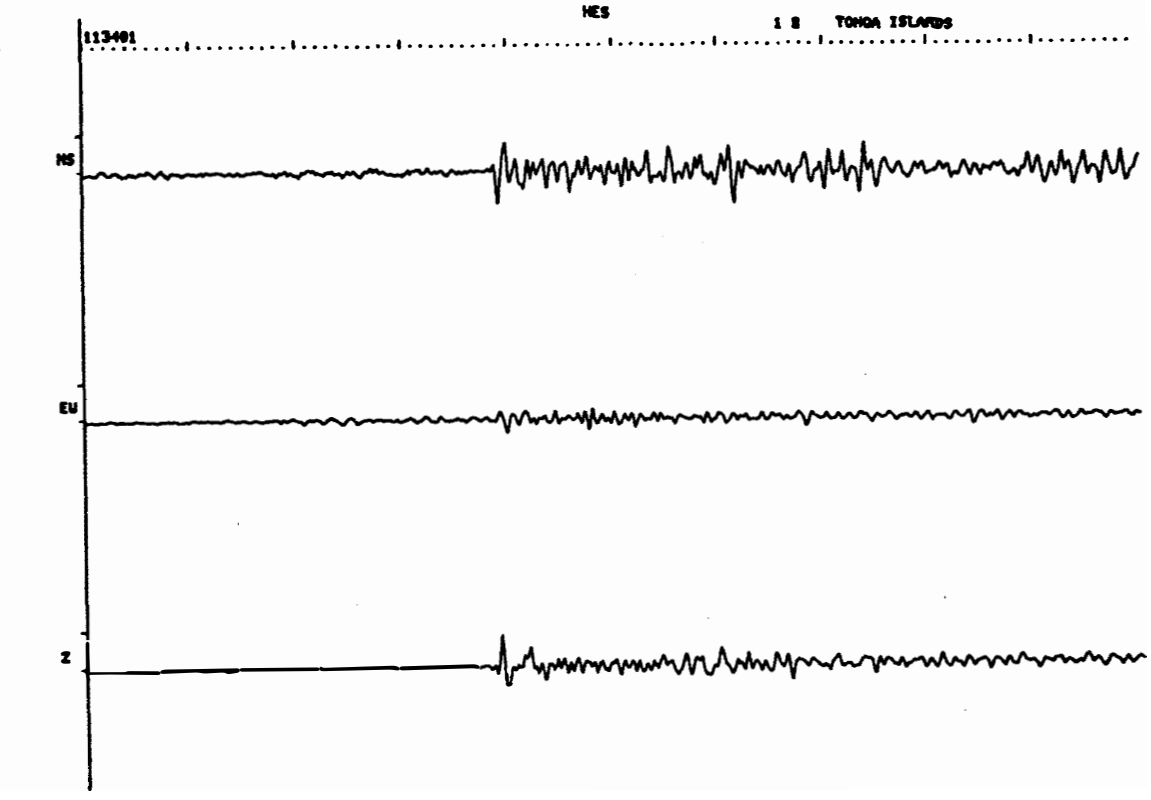
down
Z
up

NO.2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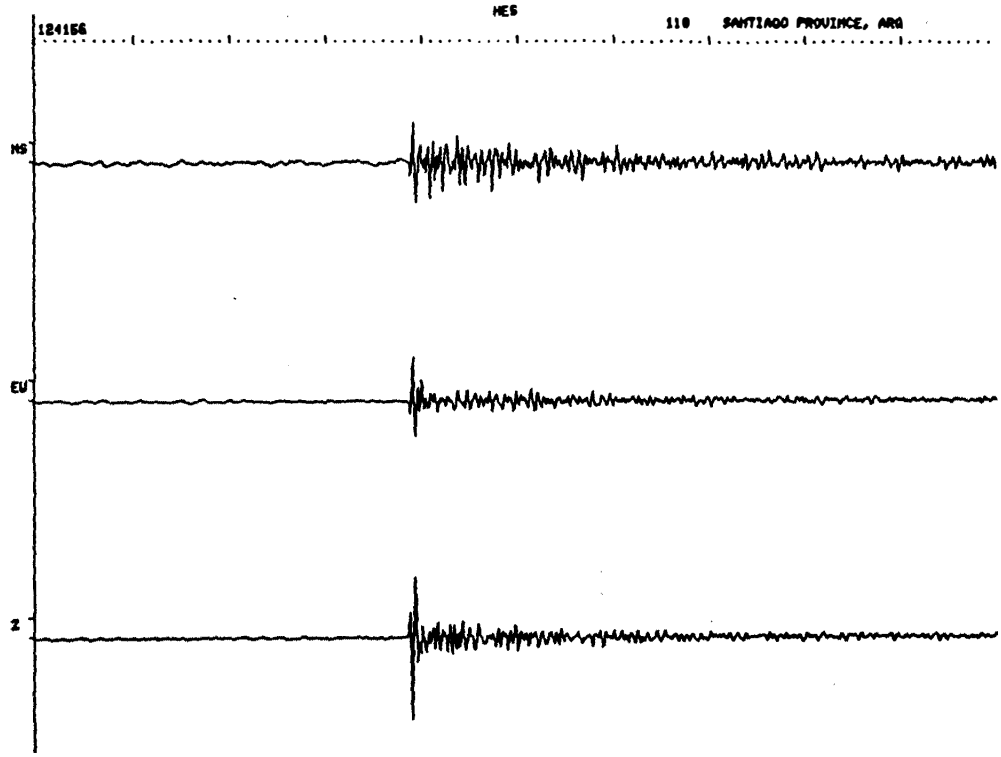
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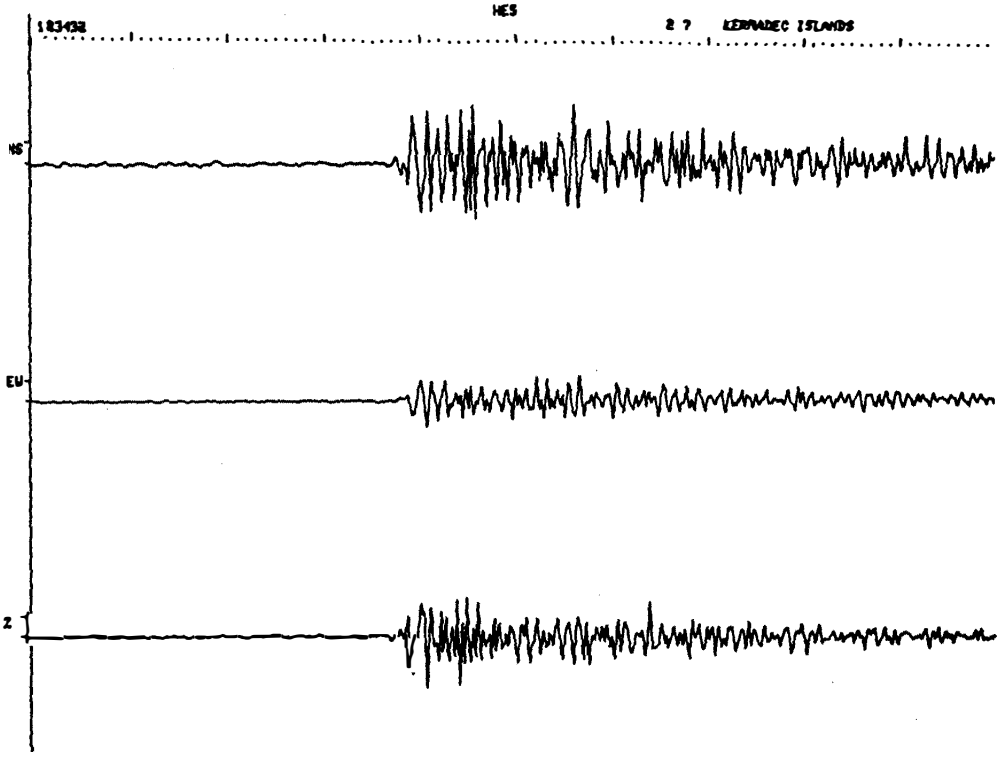
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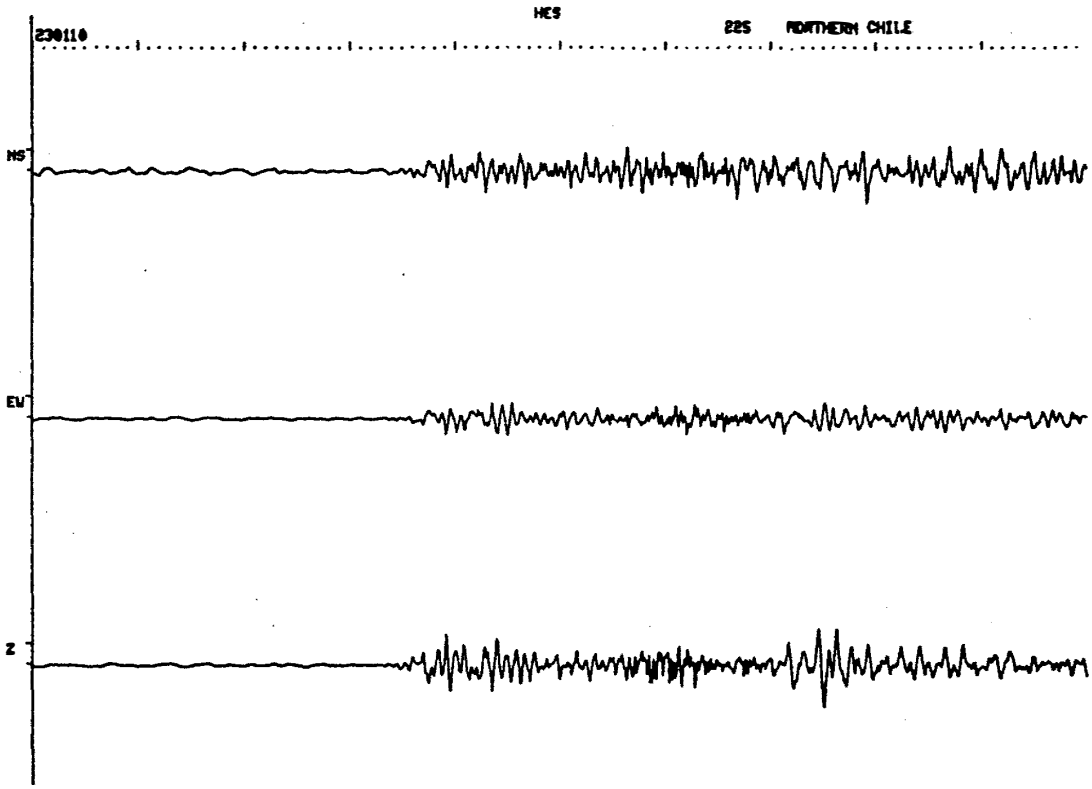
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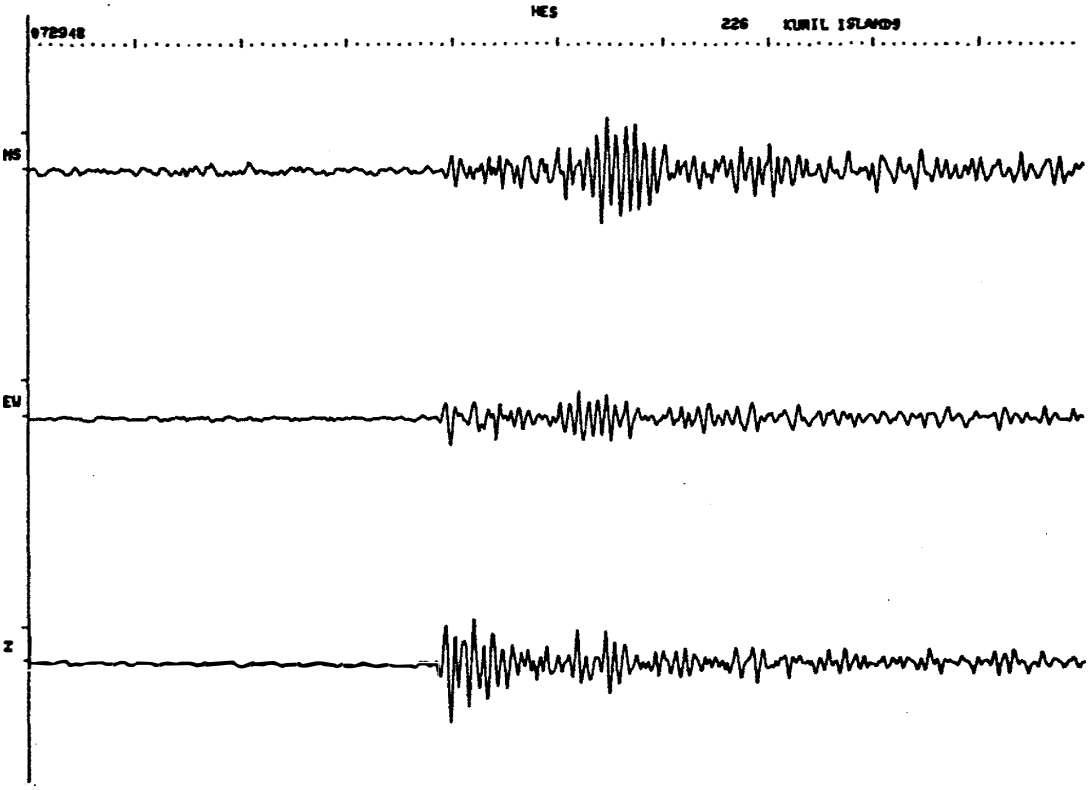
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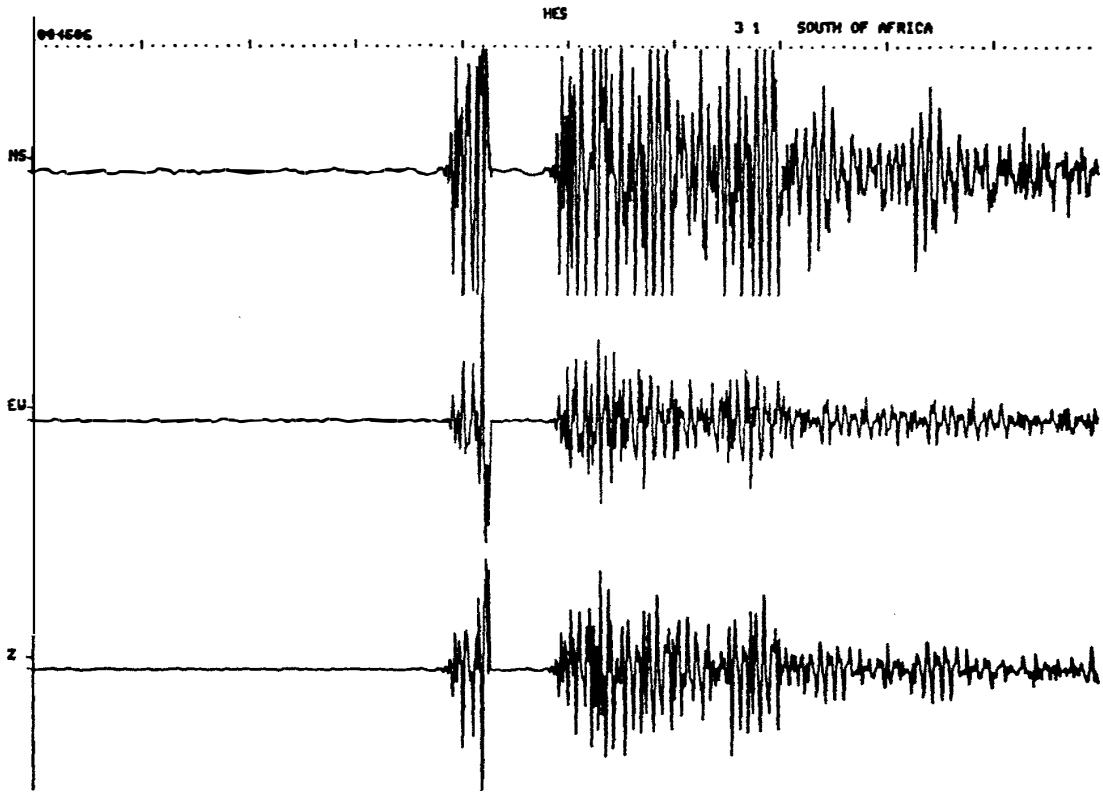
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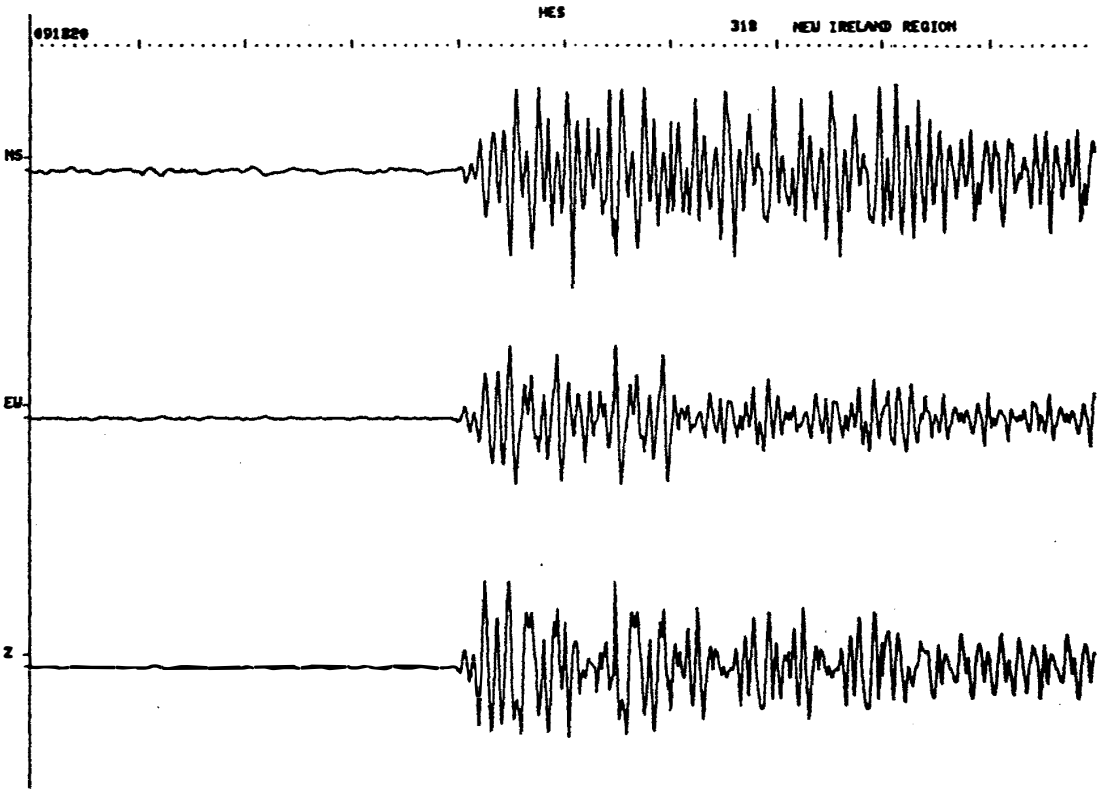
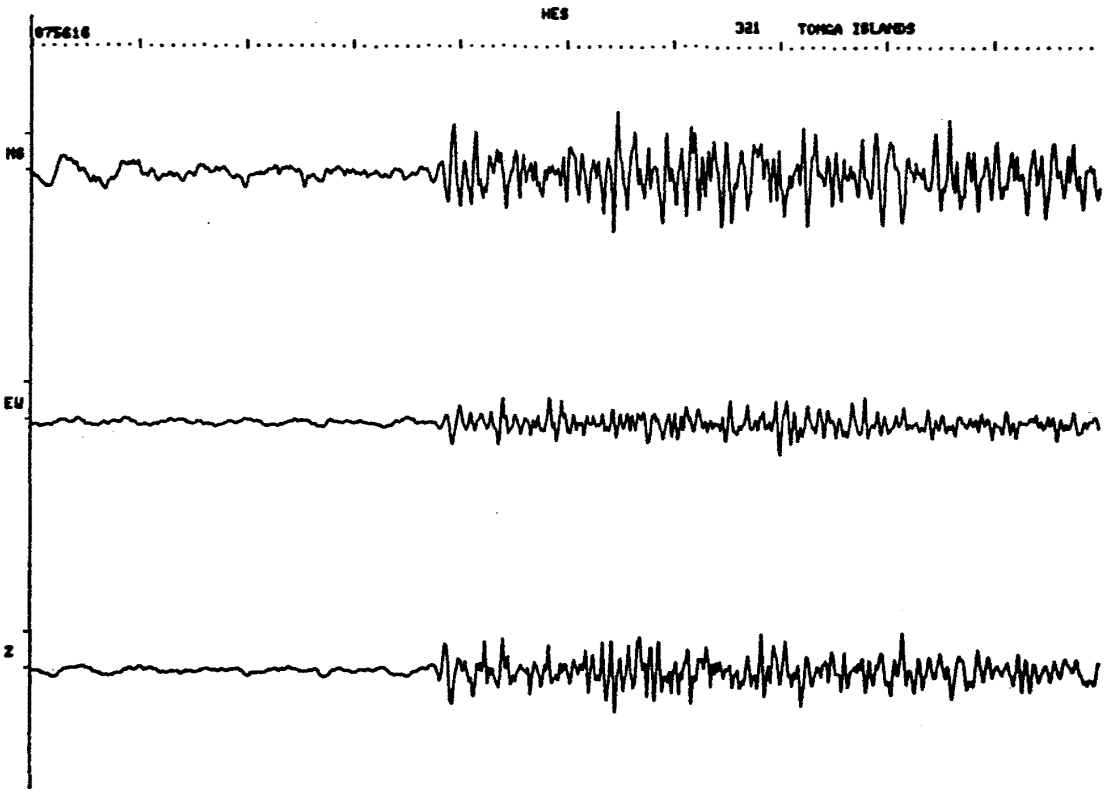

HES
091820
318 NEW IRELAND REGION
NS
EW
Z

NO.9



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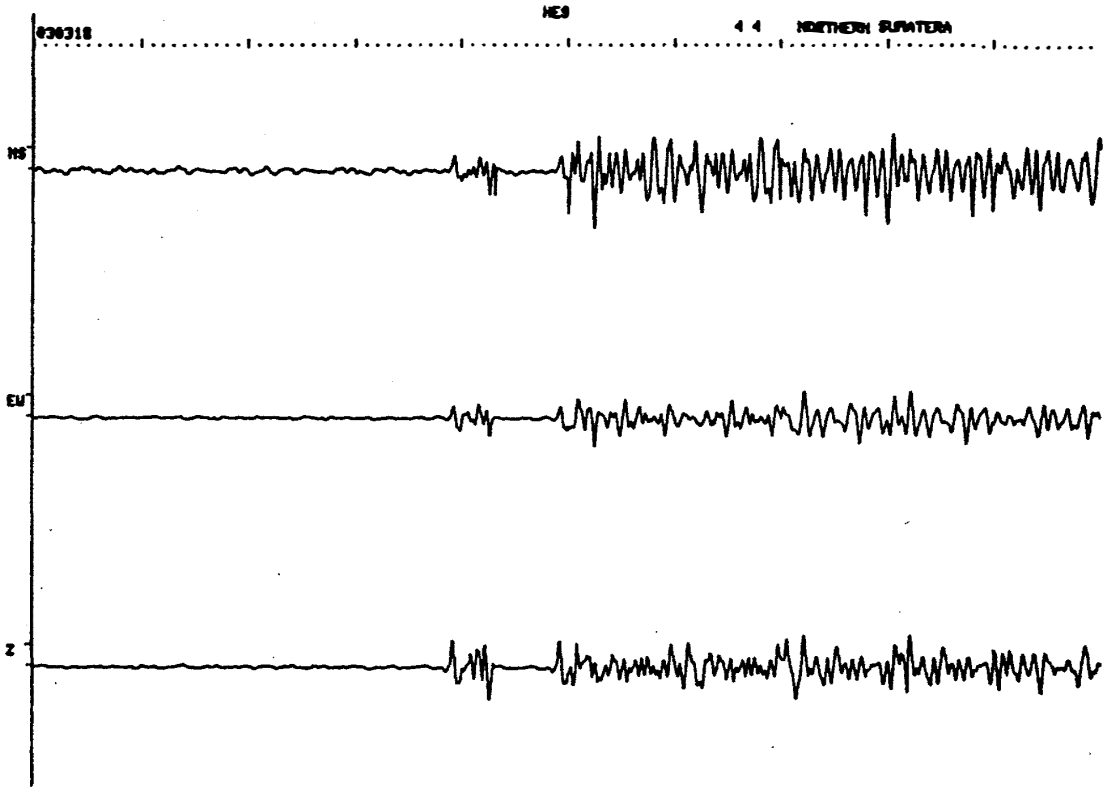
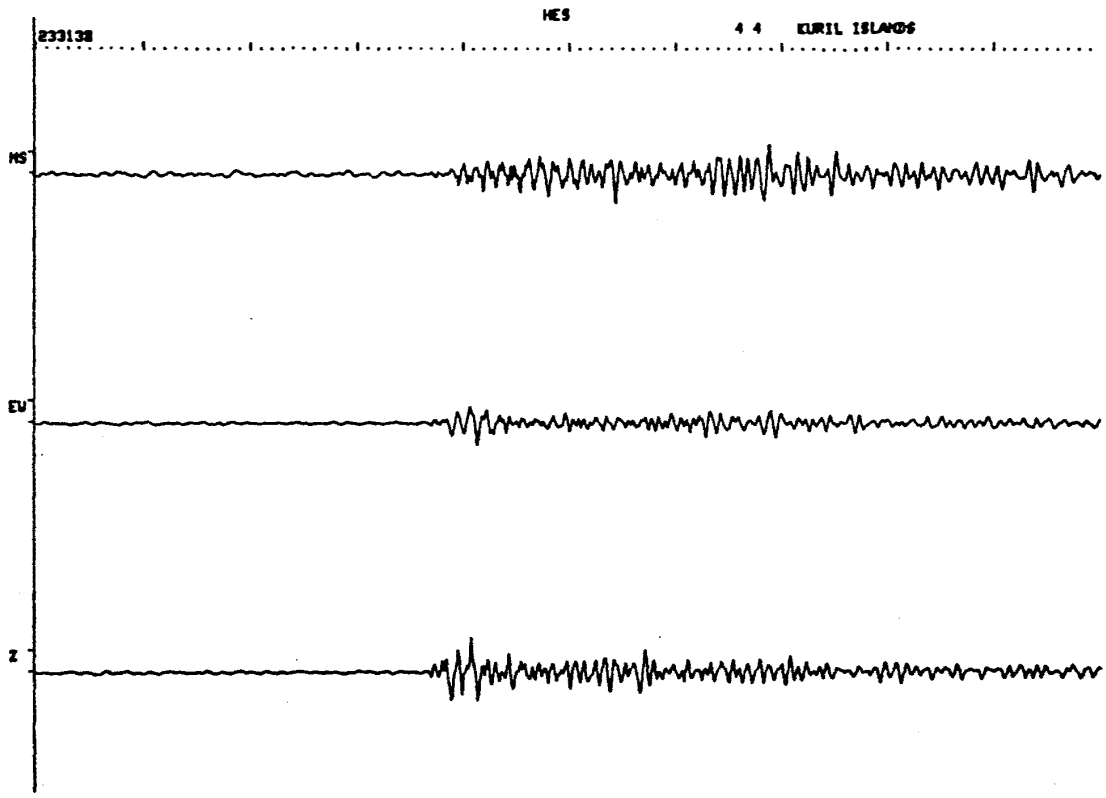
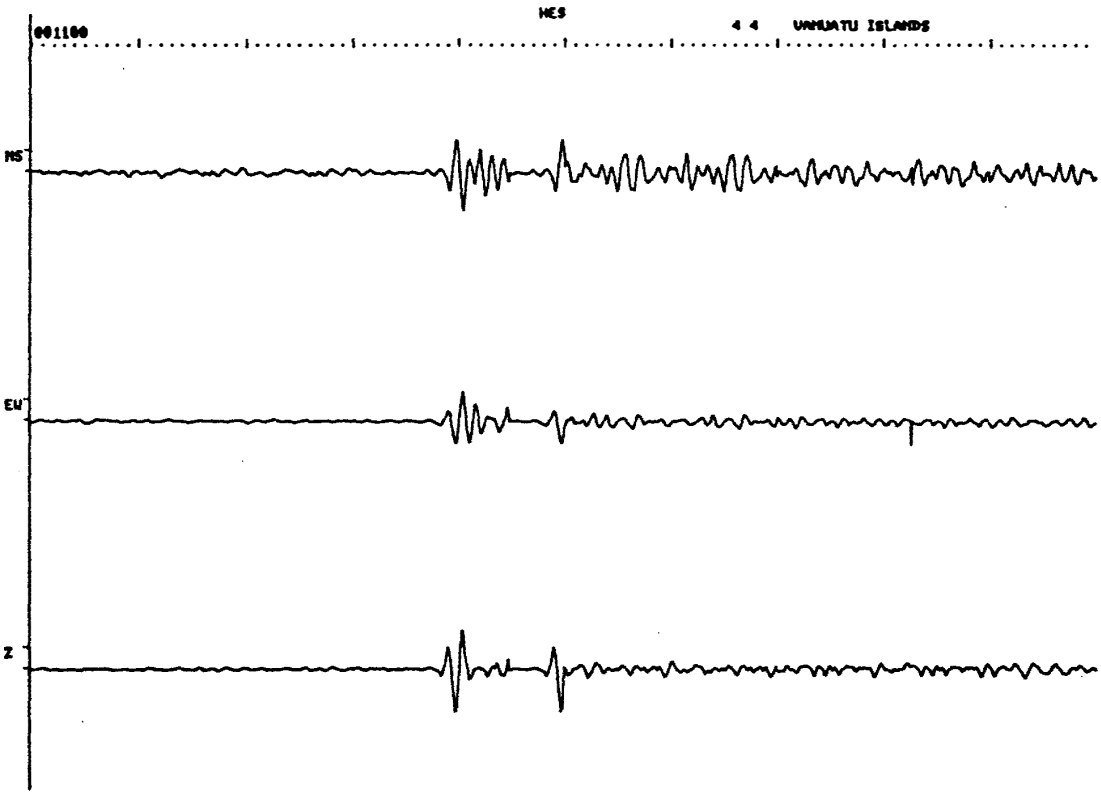


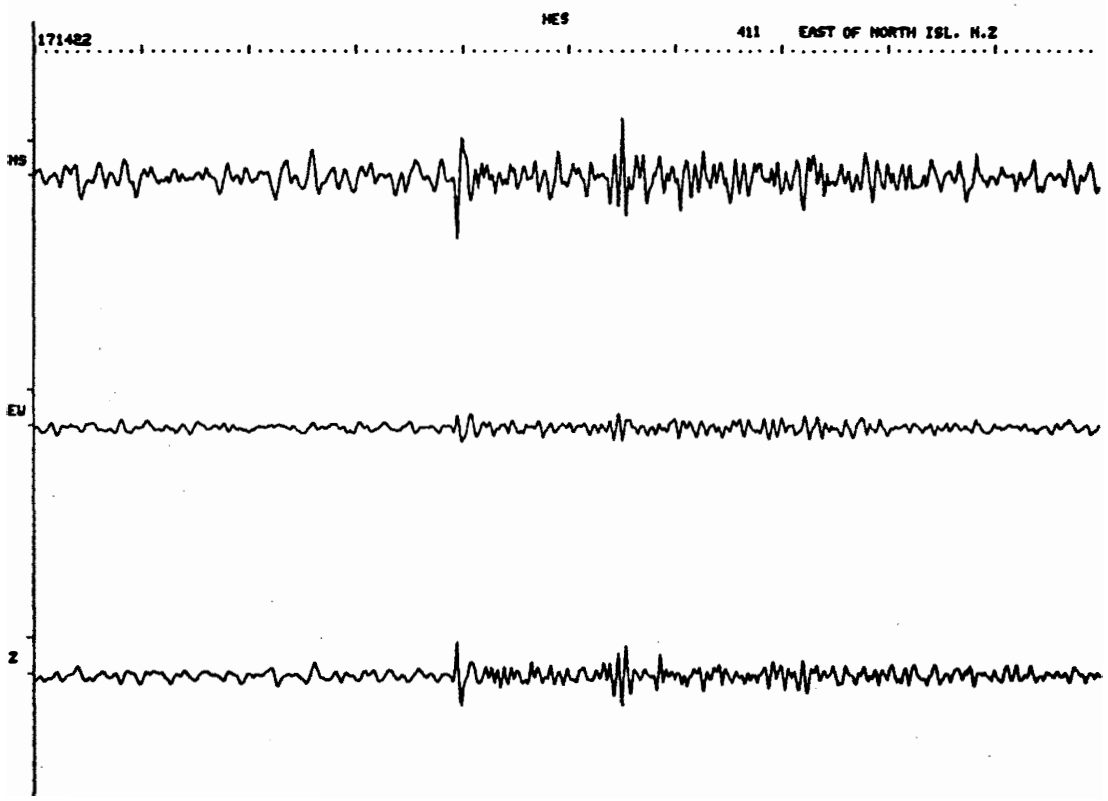
NO.11


HES
233138
4 4 KURIL ISLANDS
NS
EW
Z

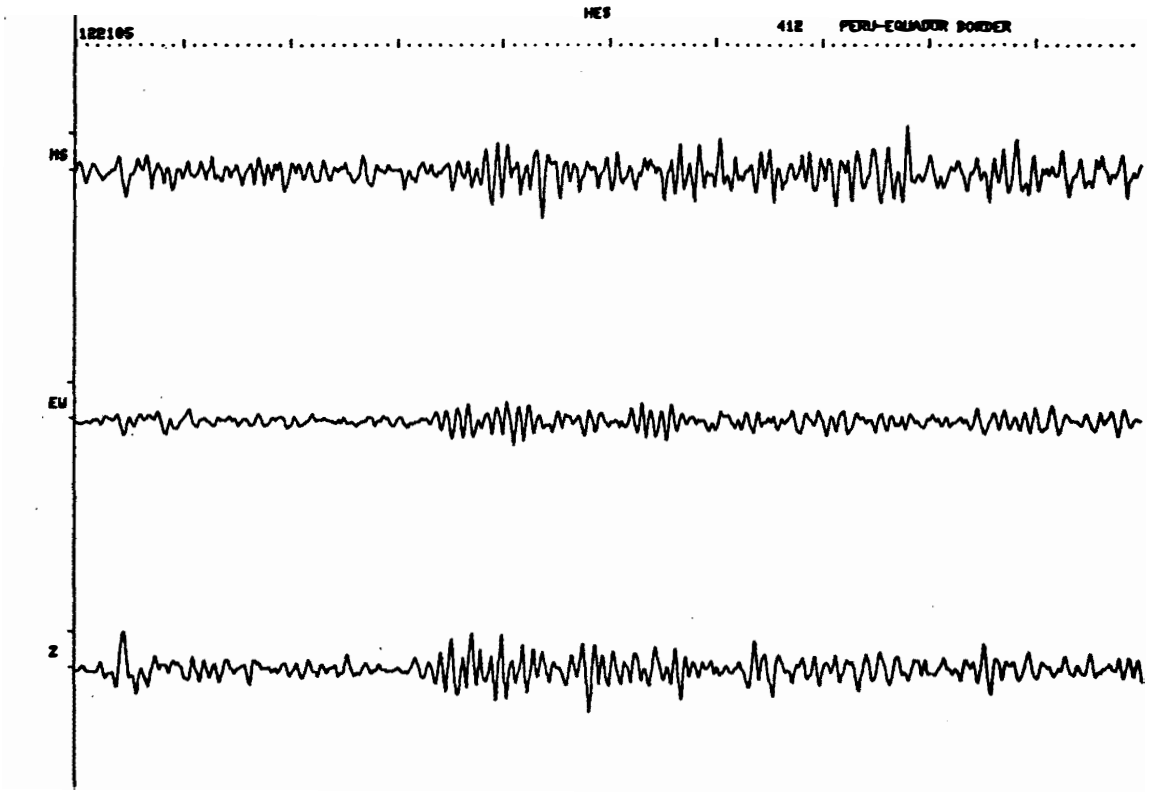
NO.12


HES
001100
4 4 VANUATU ISLANDS
NS
EW
Z

NO.13


HES
171422
411 EAST OF NORTH ISL. N.Z
NS
EW
Z

NO.14


HES
122105
412 PERU-EQUADOR BORDER
NS
EW
Z

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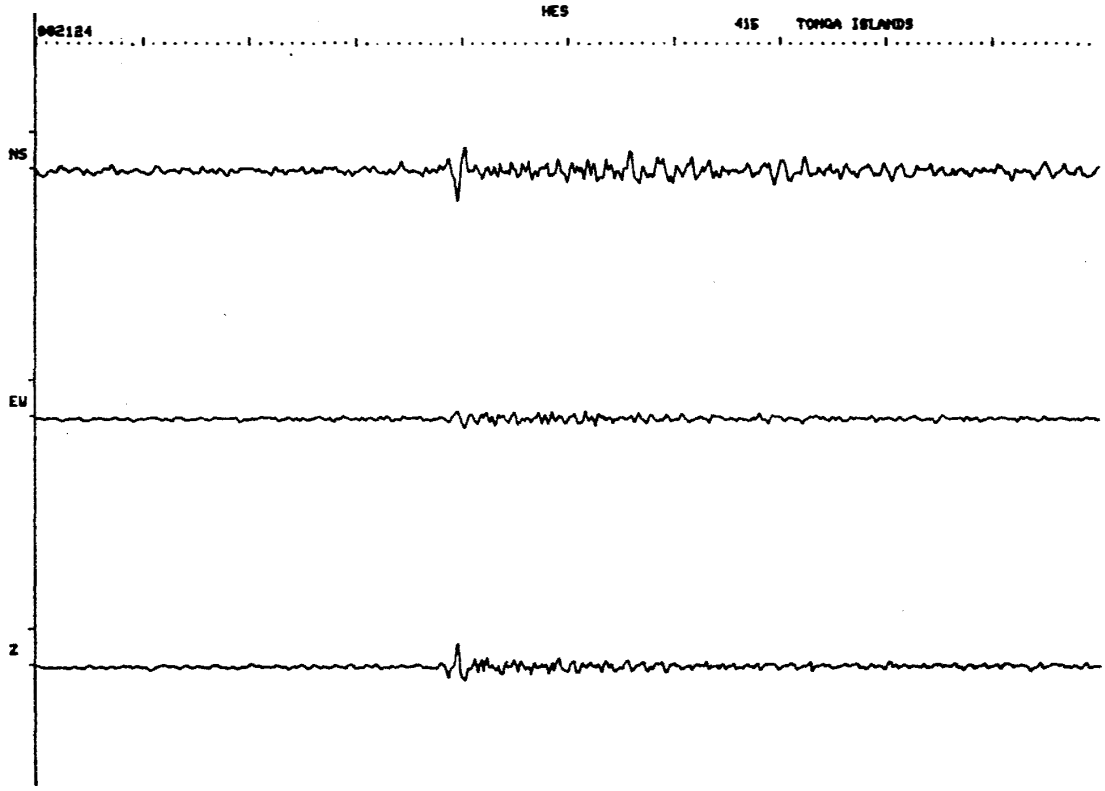
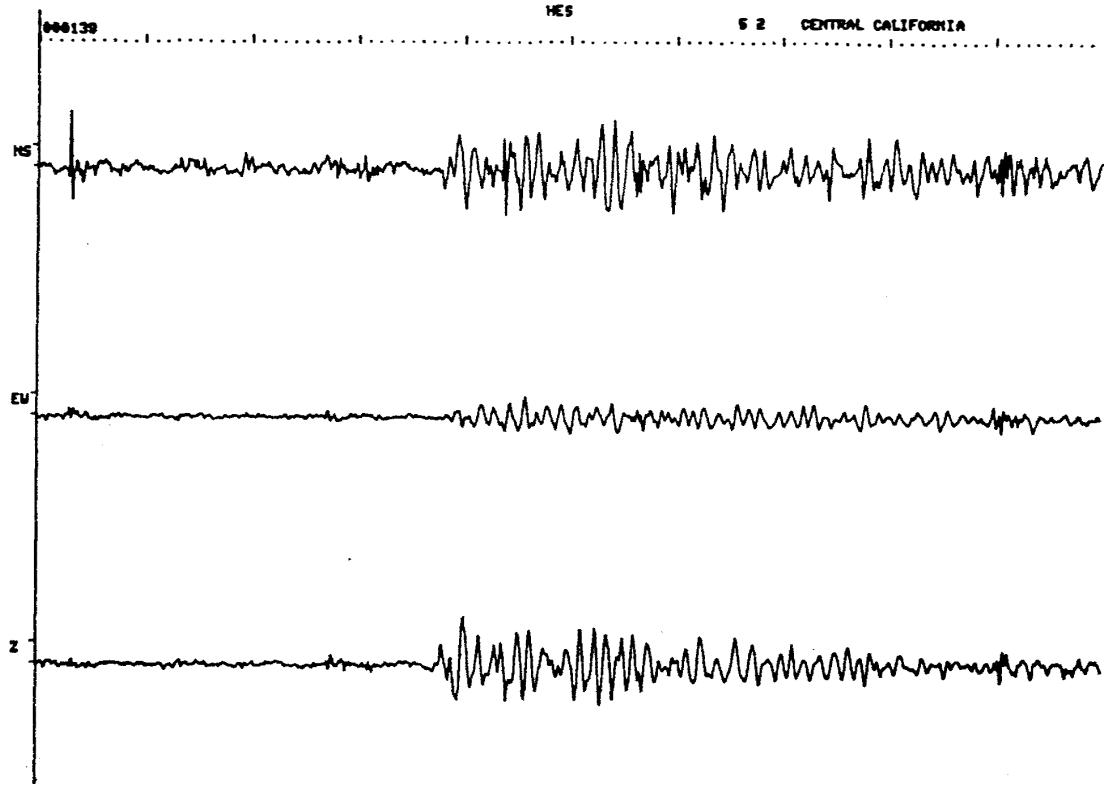
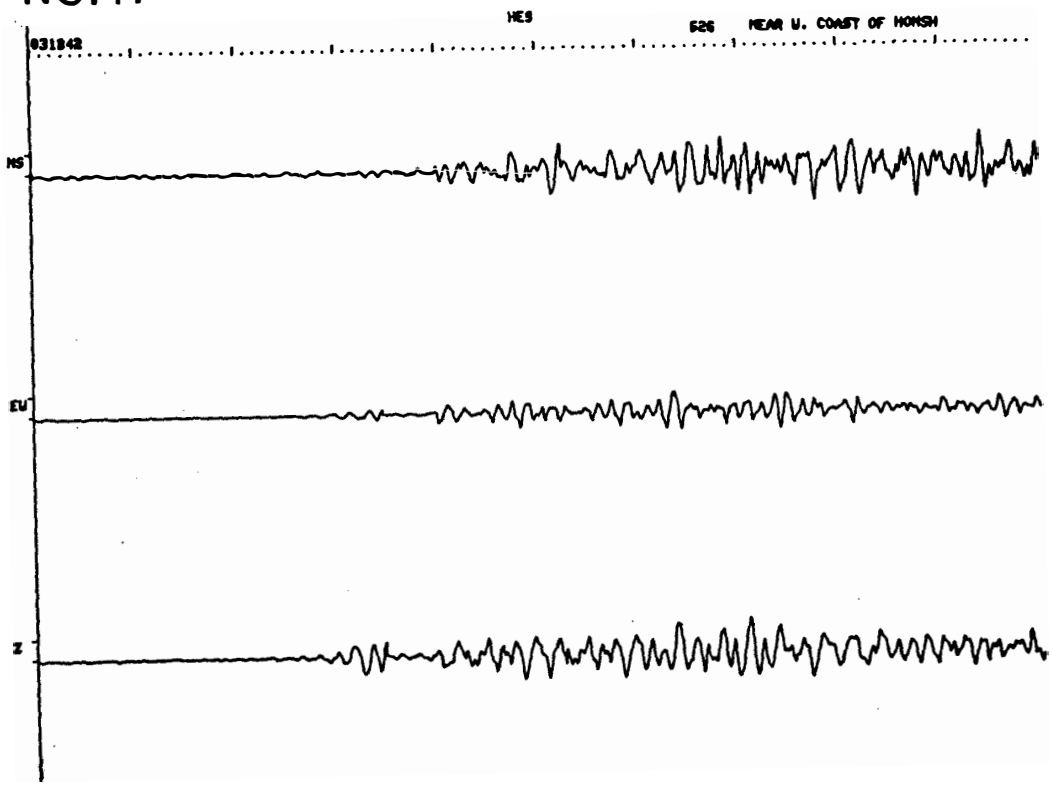

HES
415 TONGA ISLANDS
NS
EW
Z

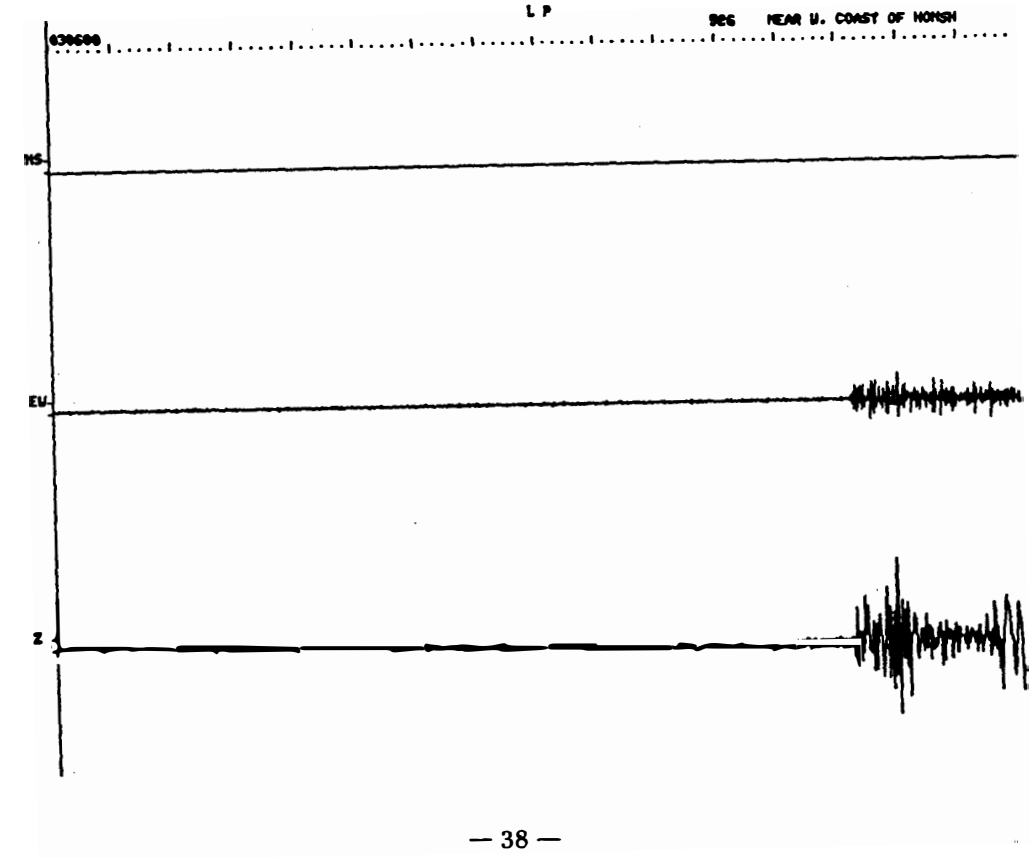
NO.16


HES
5 2 CENTRAL CALIFORNIA
NS
EW
Z

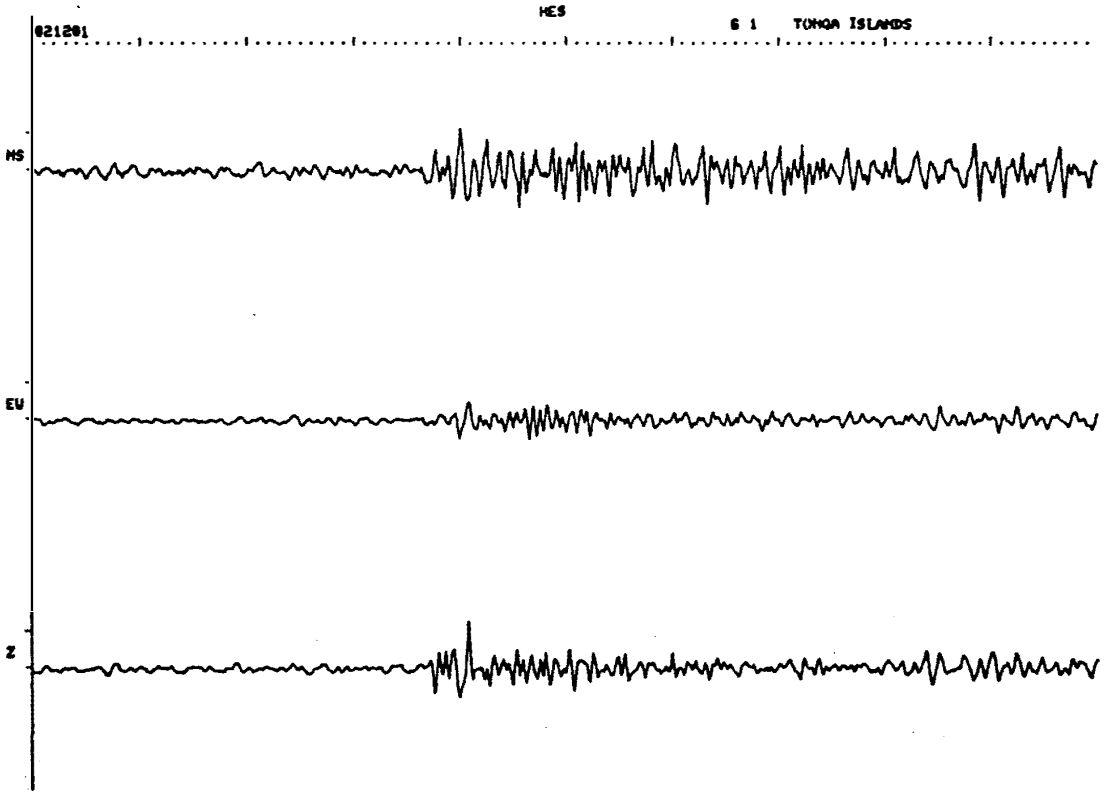
NO.17


HES
526 NEAR U. COAST OF HONSH
031842
NS
EW
Z

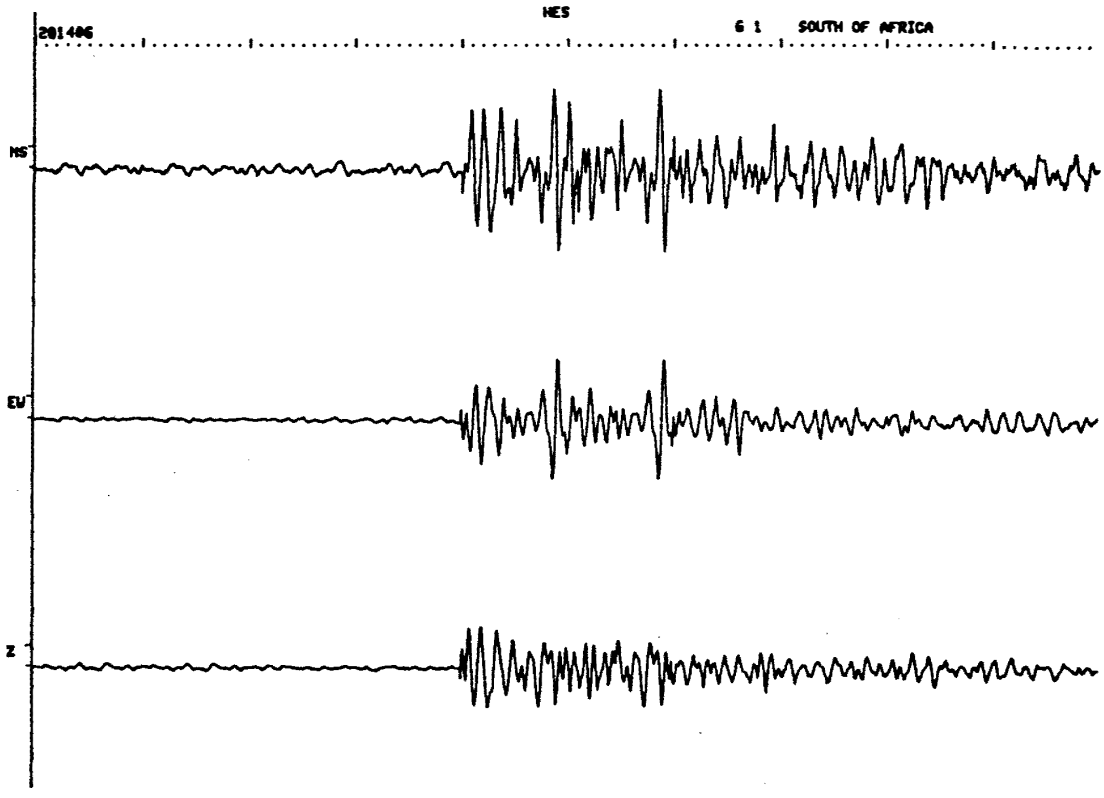
NO.17


L P
926 NEAR U. COAST OF HONSH
030600
NS
EW
Z

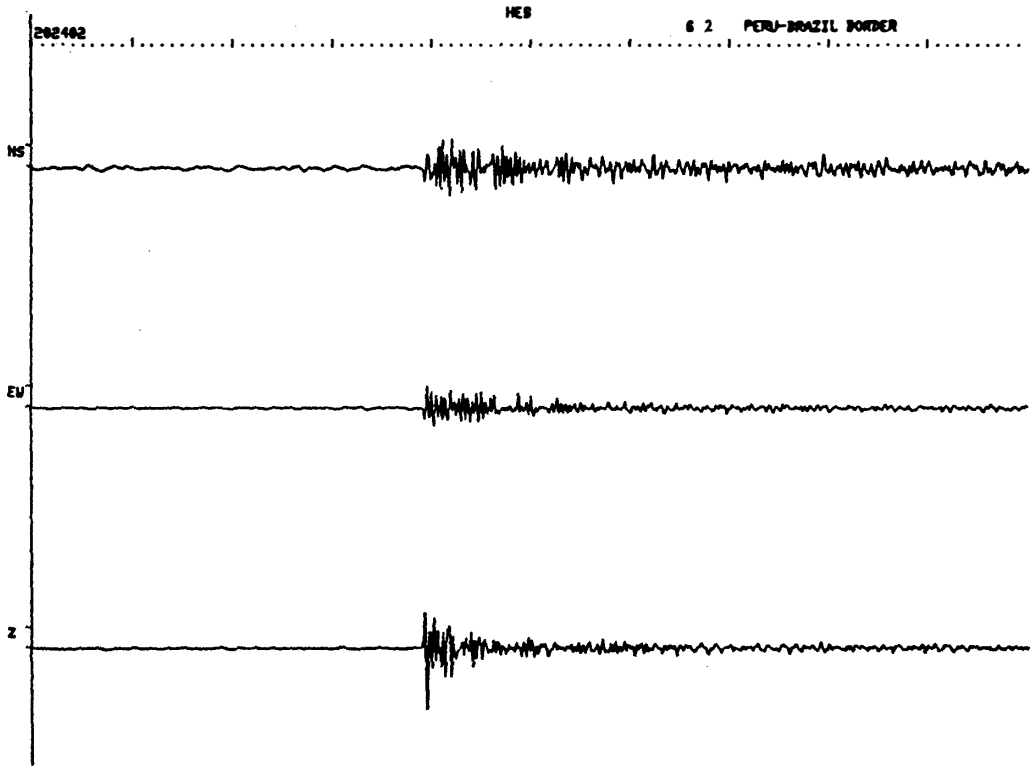
NO.18


HES
021201
6 1 TONGA ISLANDS
NS
EW
Z

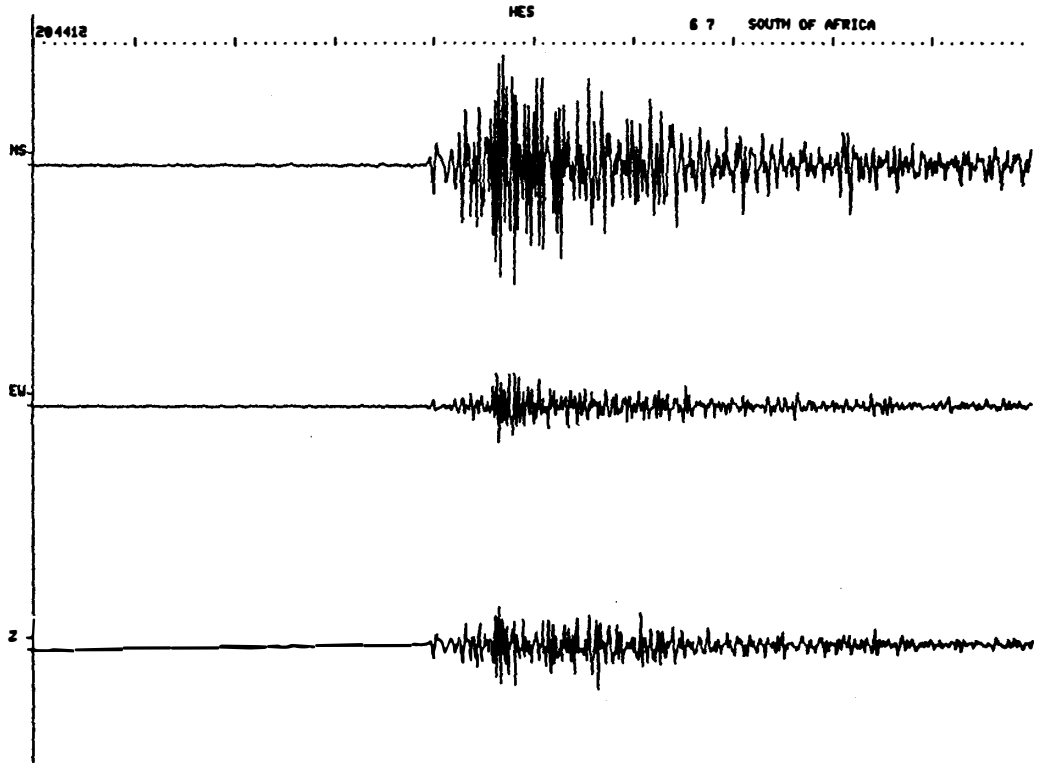
NO.19


HES
201406
6 1 SOUTH OF AFRICA
NS
EW
Z

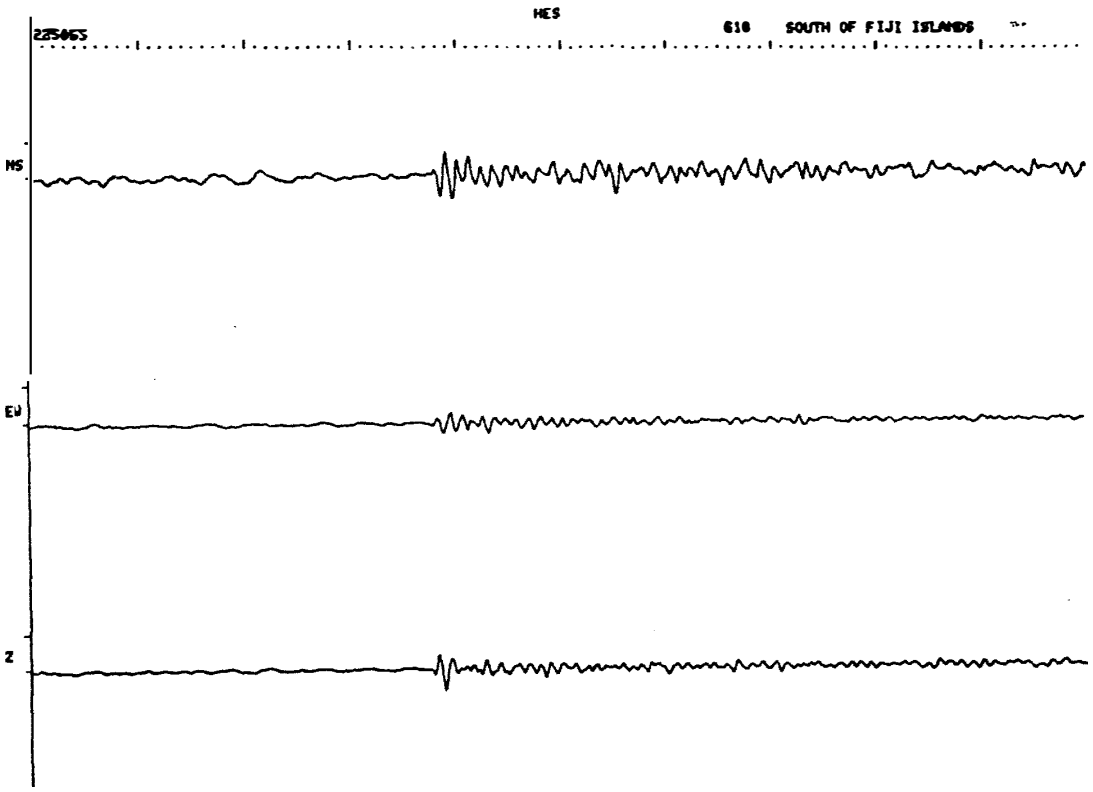
NO.20


HES
202402
6 2 PERU-BRAZIL BORDER
NS
EW
Z

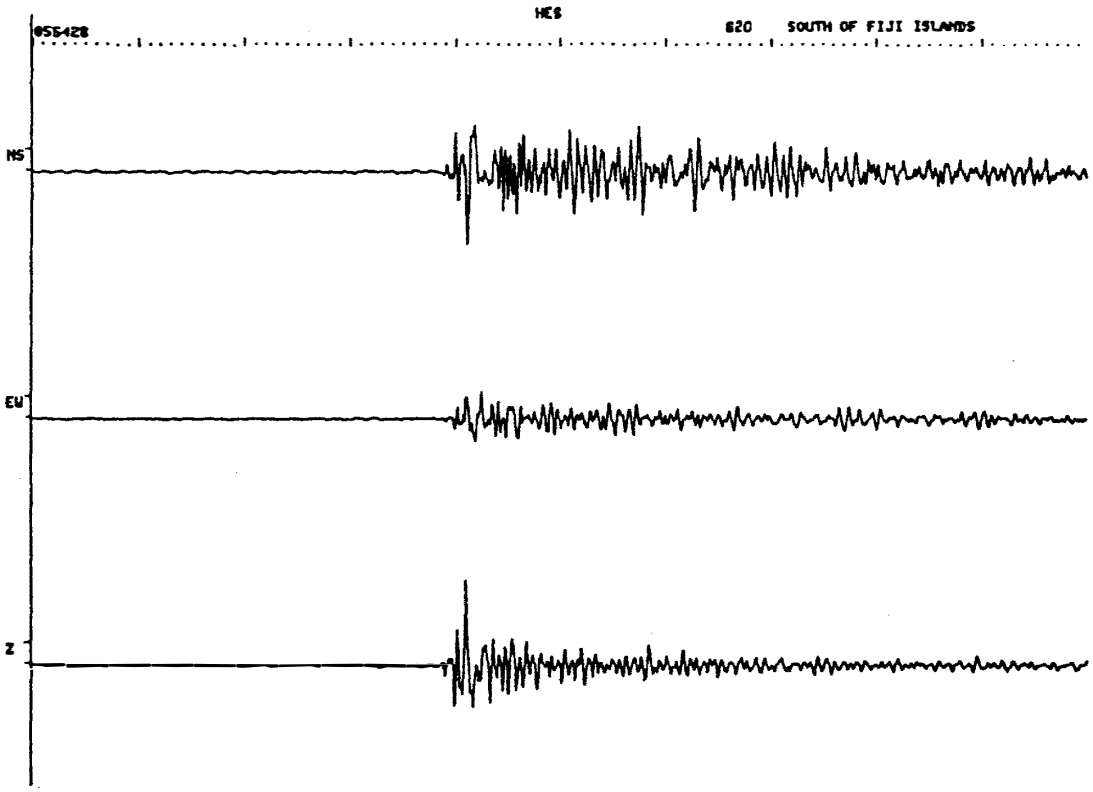
NO.21


HES
204412
6 7 SOUTH OF AFRICA
NS
EW
Z

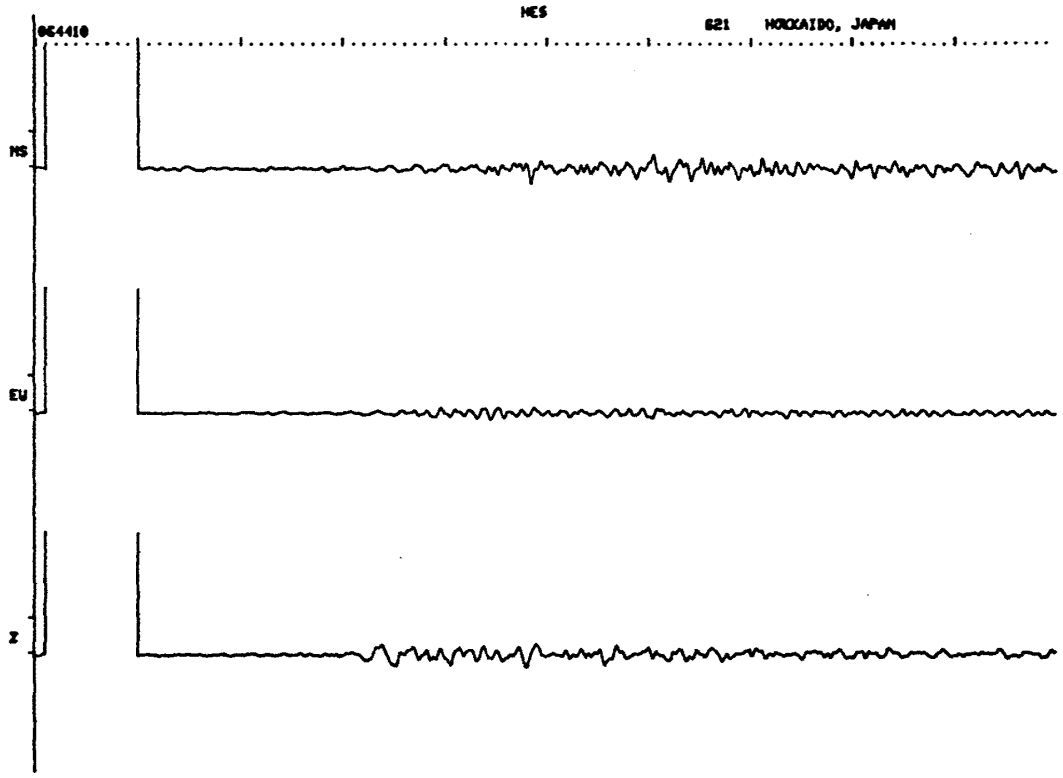
NO.22


HES
225063
618 SOUTH OF FIJI ISLANDS
NS
EW
Z

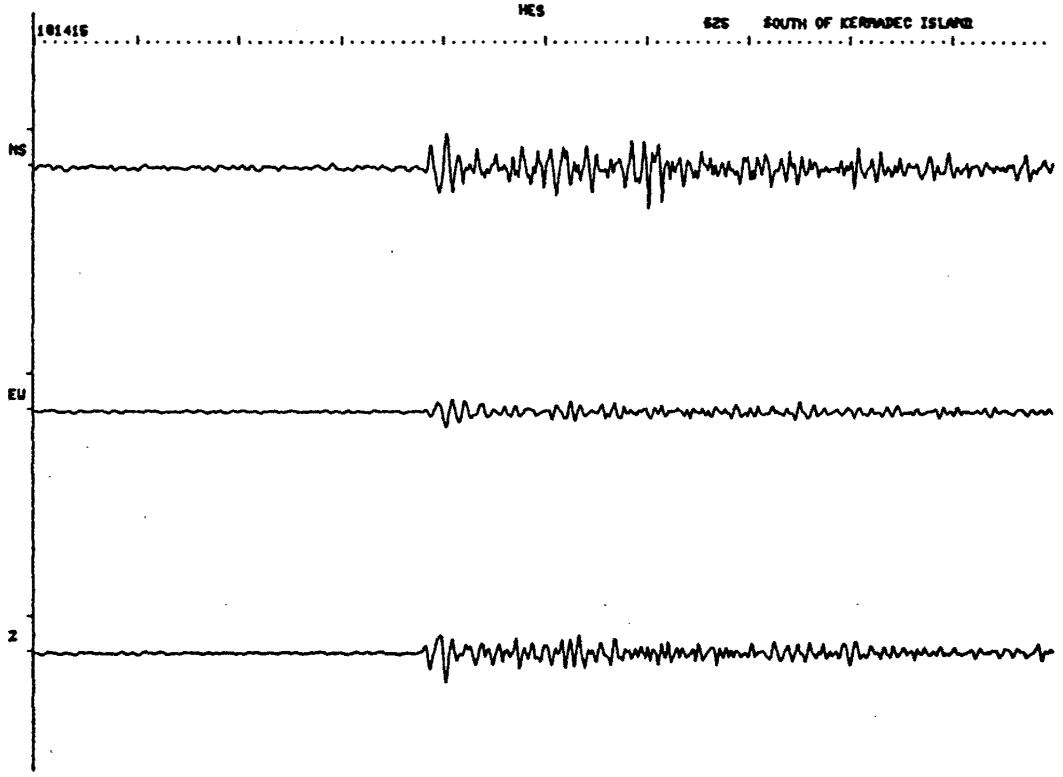
NO.23


HES
055428
620 SOUTH OF FIJI ISLANDS
NS
EW
Z

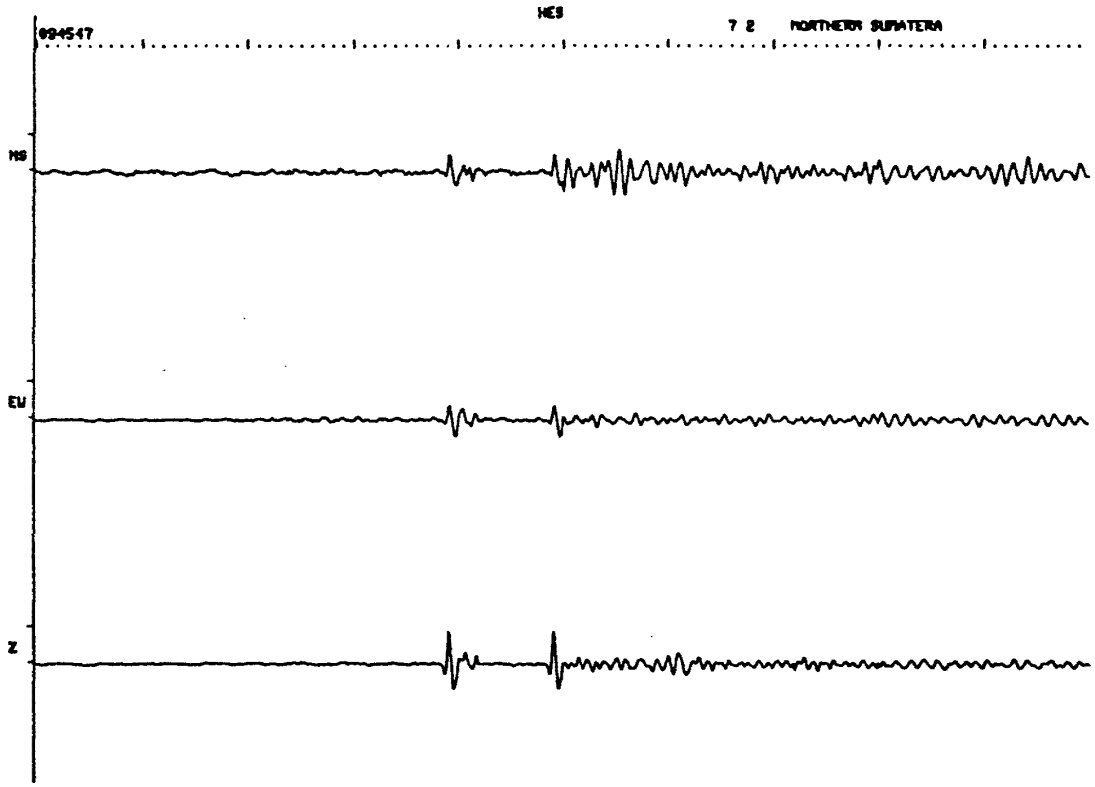
NO.24


HES
064418
621 HOKKAIDO, JAPAN
NS
EW
Z

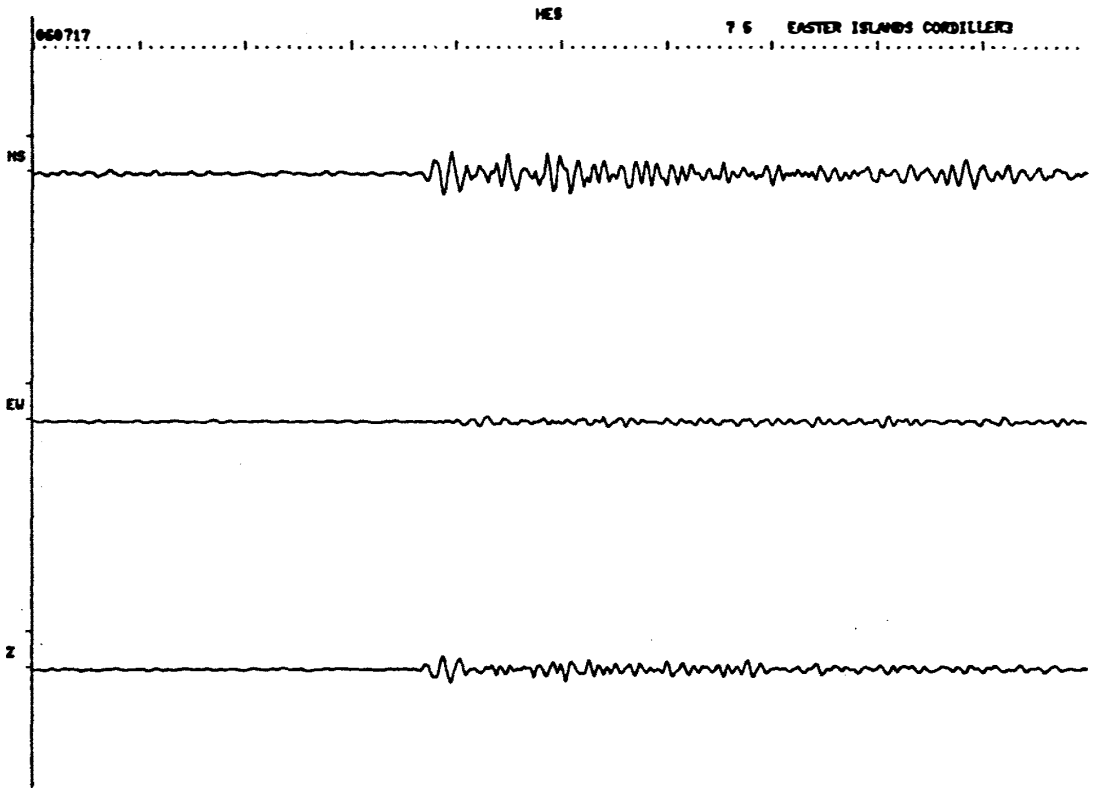
NO.25


HES
101416
625 SOUTH OF KERMADEC ISLAND
NS
EW
Z

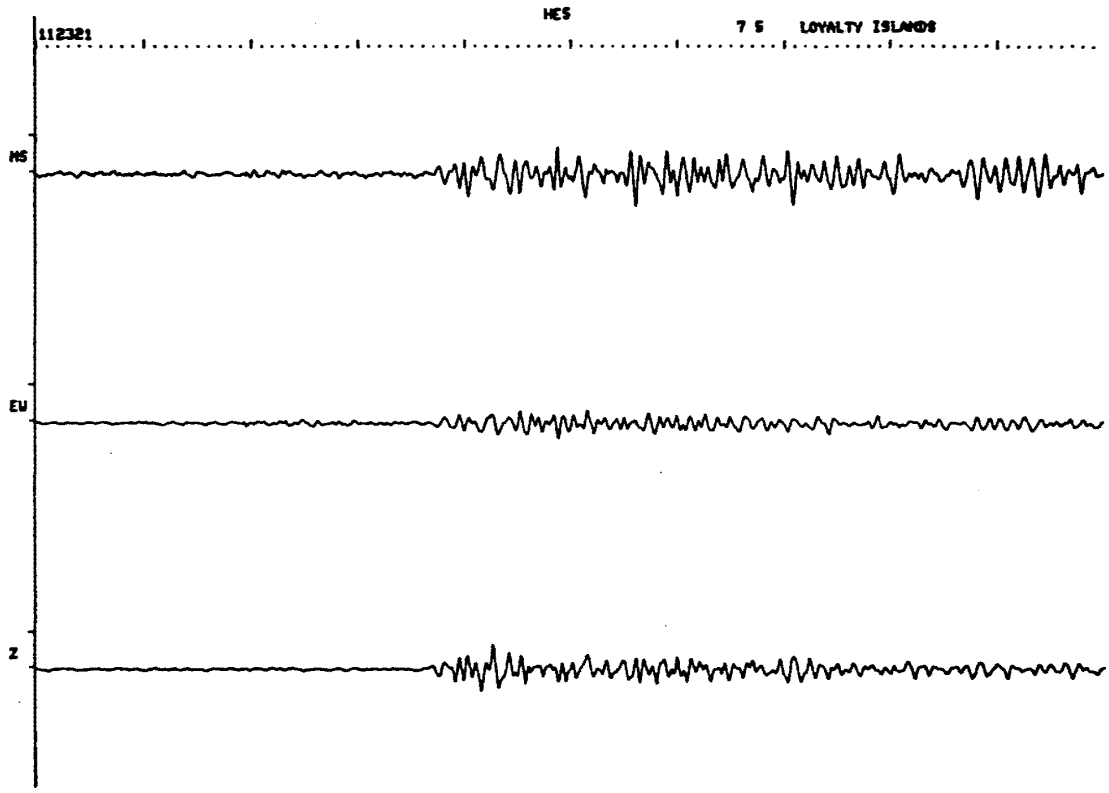
NO.26


HES
7 2 NORTHERN SUMATERA
094547
NS
EW
Z

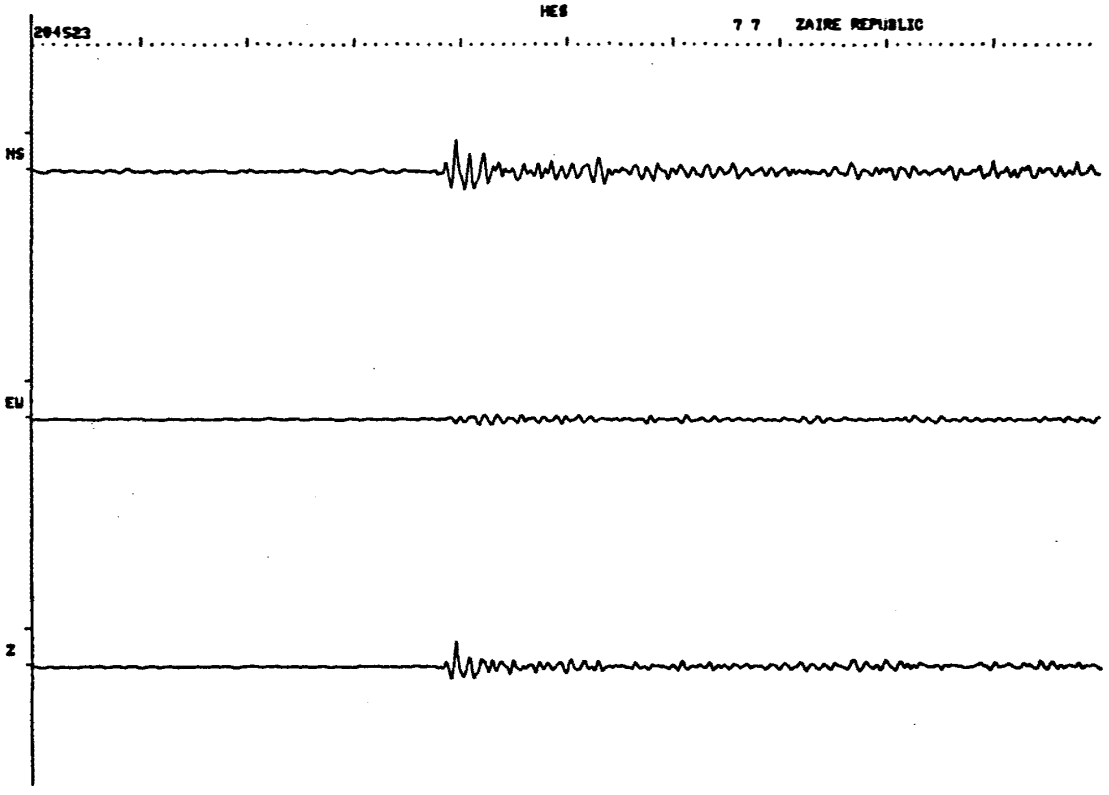
NO.27


HES
7 6 EASTER ISLANDS CORDILLERA
060717
NS
EW
Z

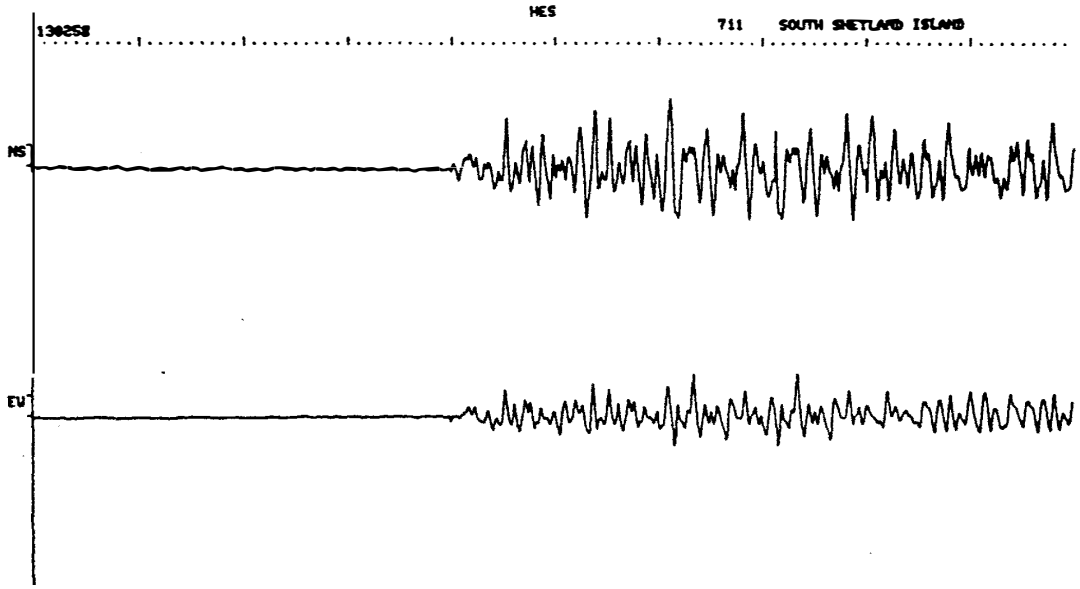
NO.28


HES
112321
7 5 LOYALTY ISLANDS
NS
EW
Z

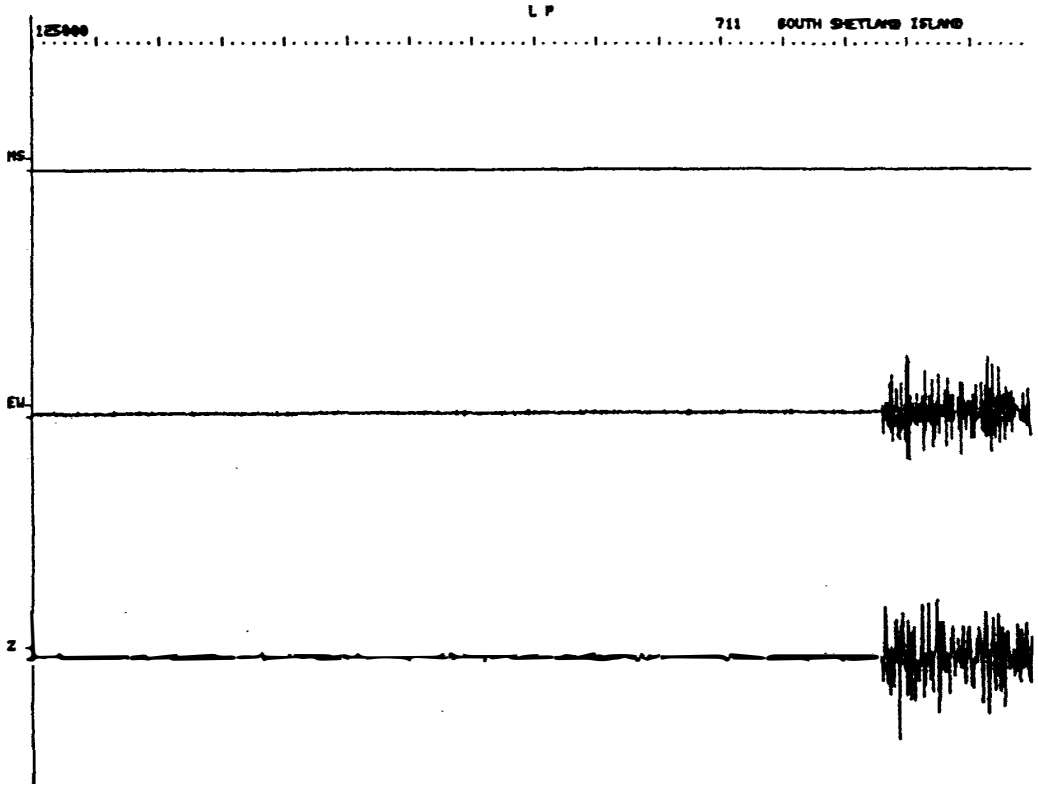
NO.29


HES
204523
7 7 ZAIRE REPUBLIC
NS
EW
Z

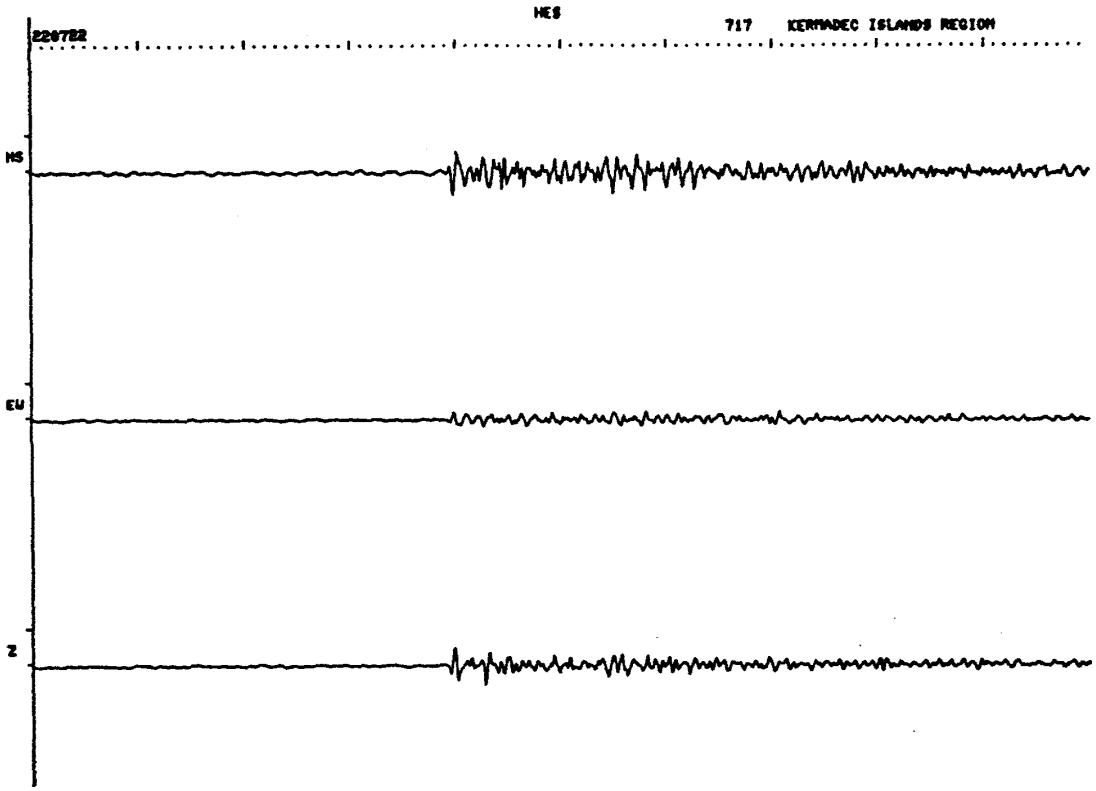
NO.30


HES
711 SOUTH SHETLAND ISLAND
NS
EW

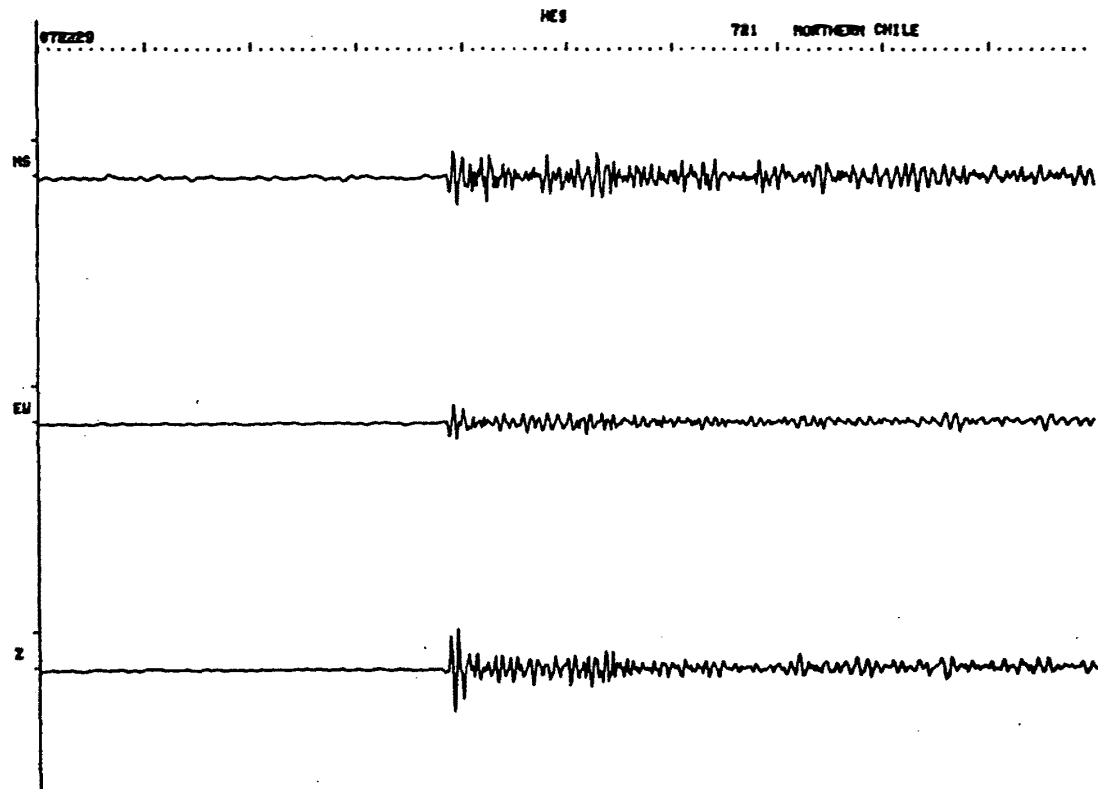
NO.30


L P
711 SOUTH SHETLAND ISLAND
NS
EW
Z

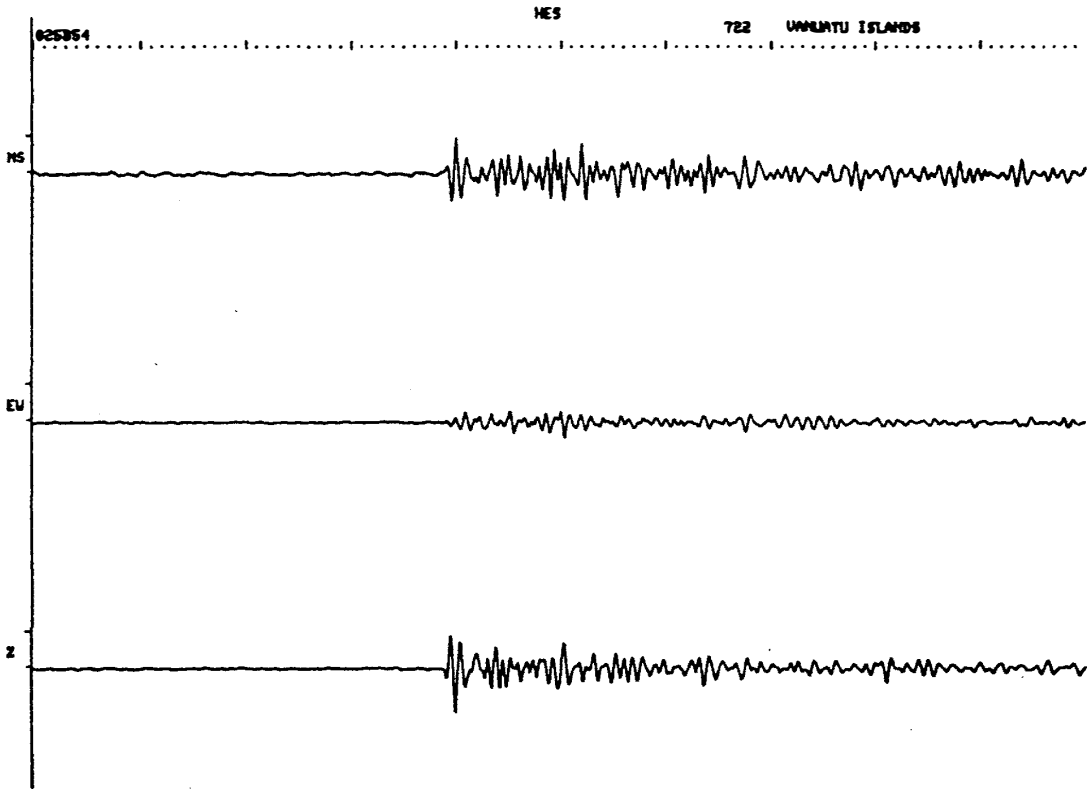
NO.31


HES
717 KERMADEC ISLANDS REGION
220782
NS
EW
Z

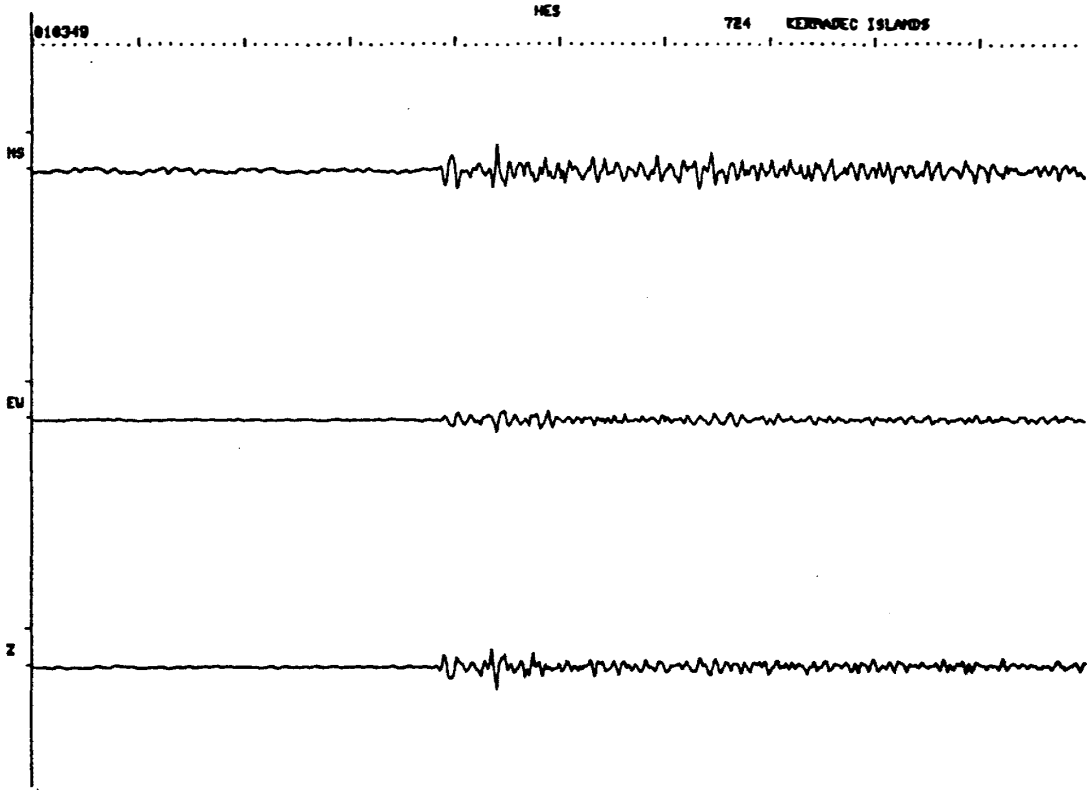
NO.32


HES
721 NORTHERN CHILE
NS
EW
Z

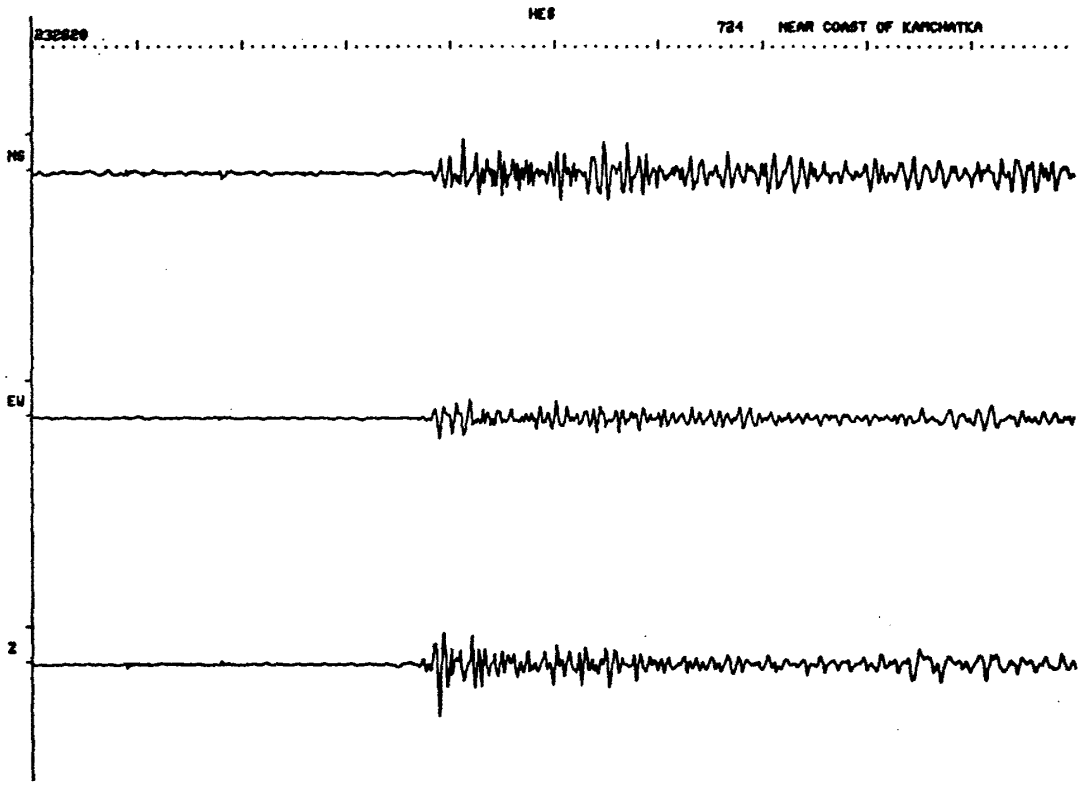
NO.33


HES
025854
722 VANUATU ISLANDS
NS
EW
Z

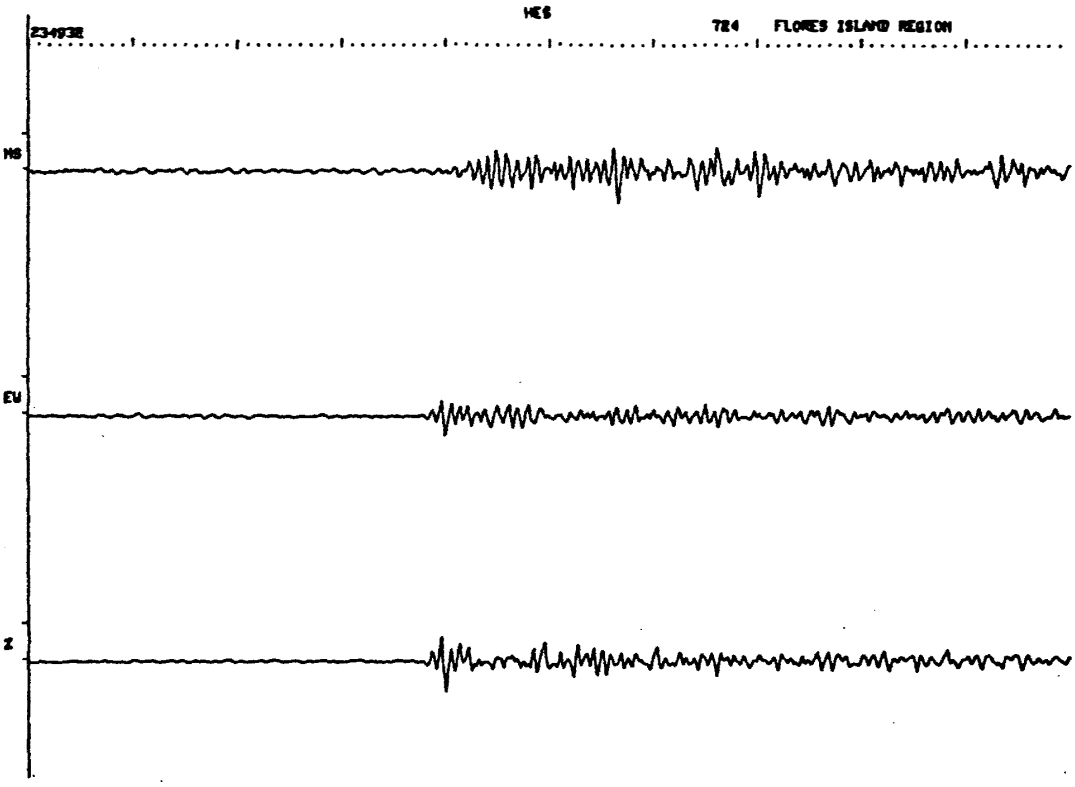
NO.34


HES
010349
724 KERMADEC ISLANDS
NS
EW
Z

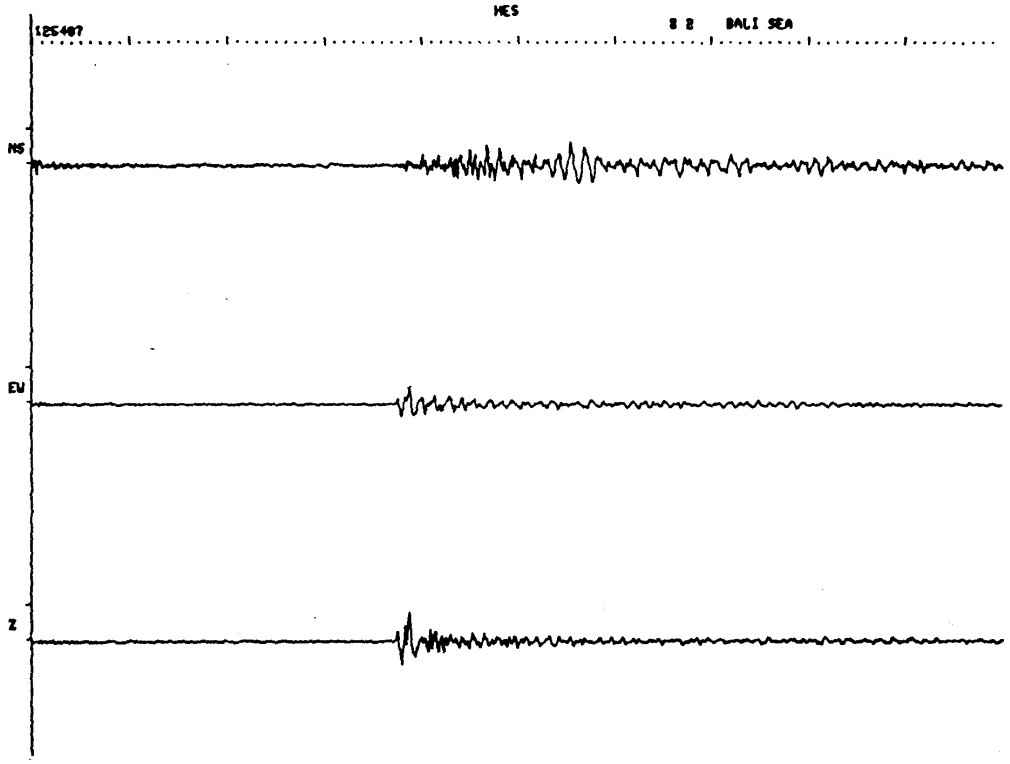
NO.35


HES
724 NEAR COAST OF KAMCHATKA
NS
EW
Z

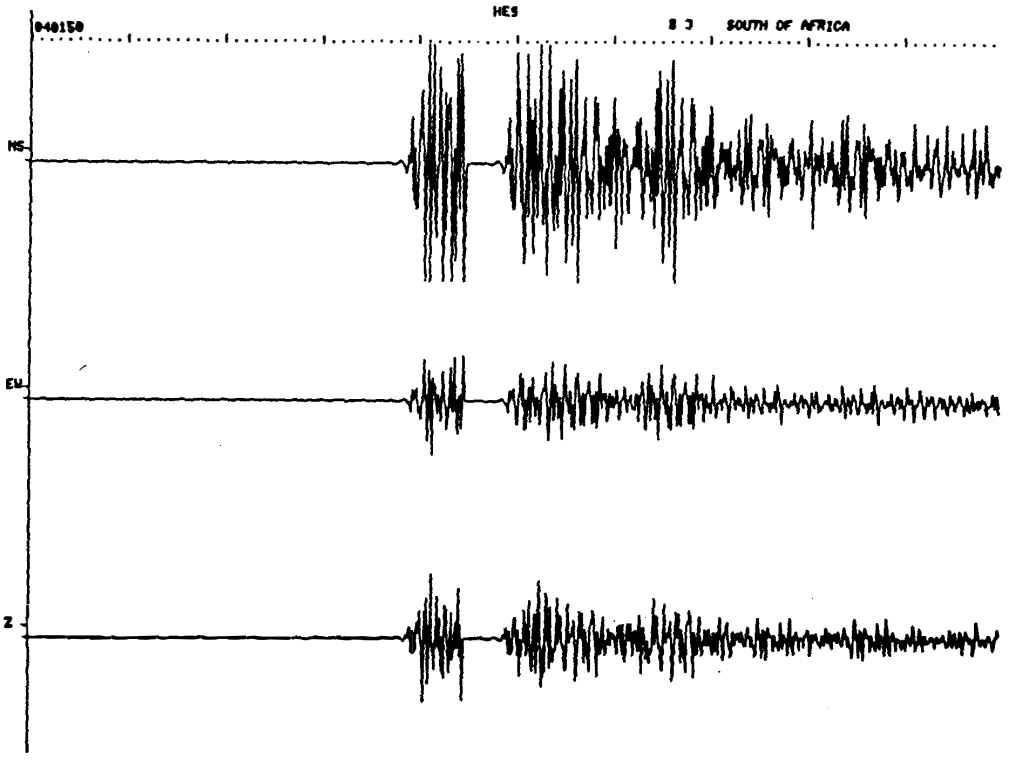
NO.36


HES
724 FLORES ISLAND REGION
NS
EW
Z

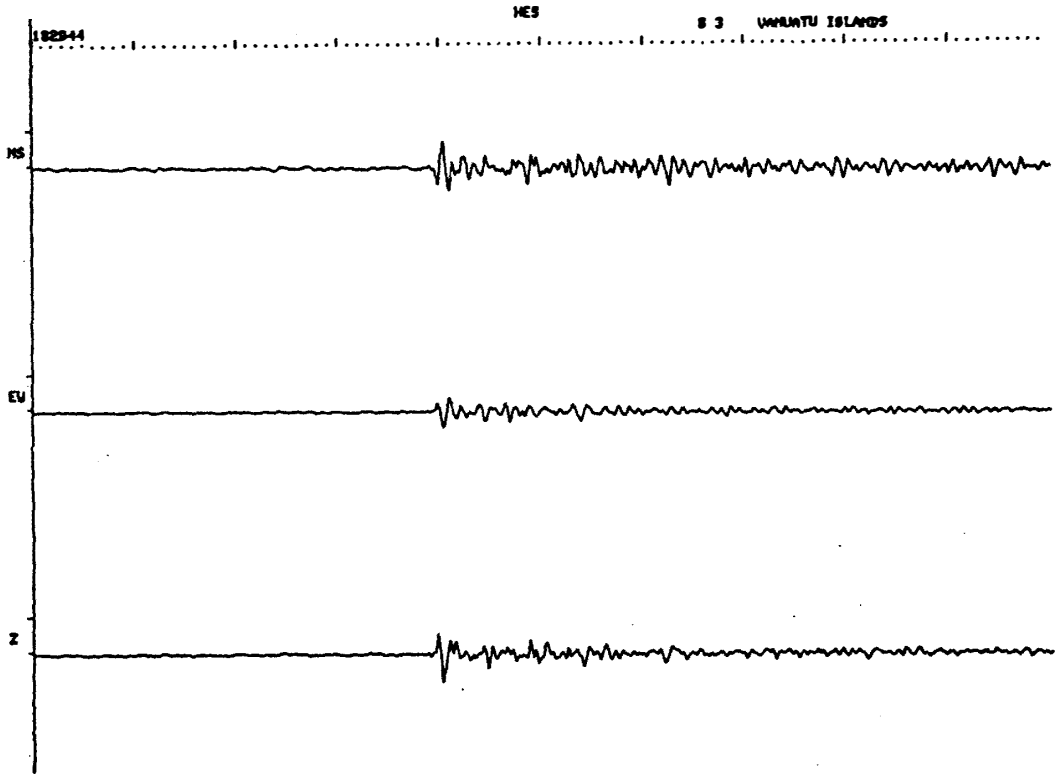
NO.37



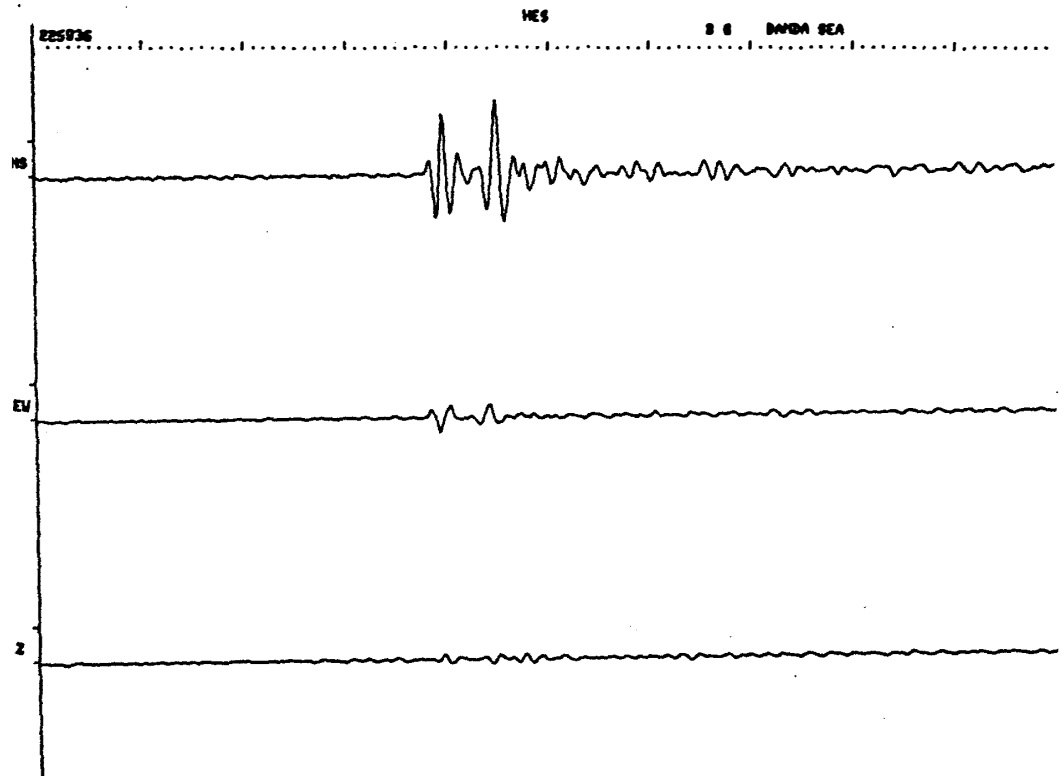
NO.38



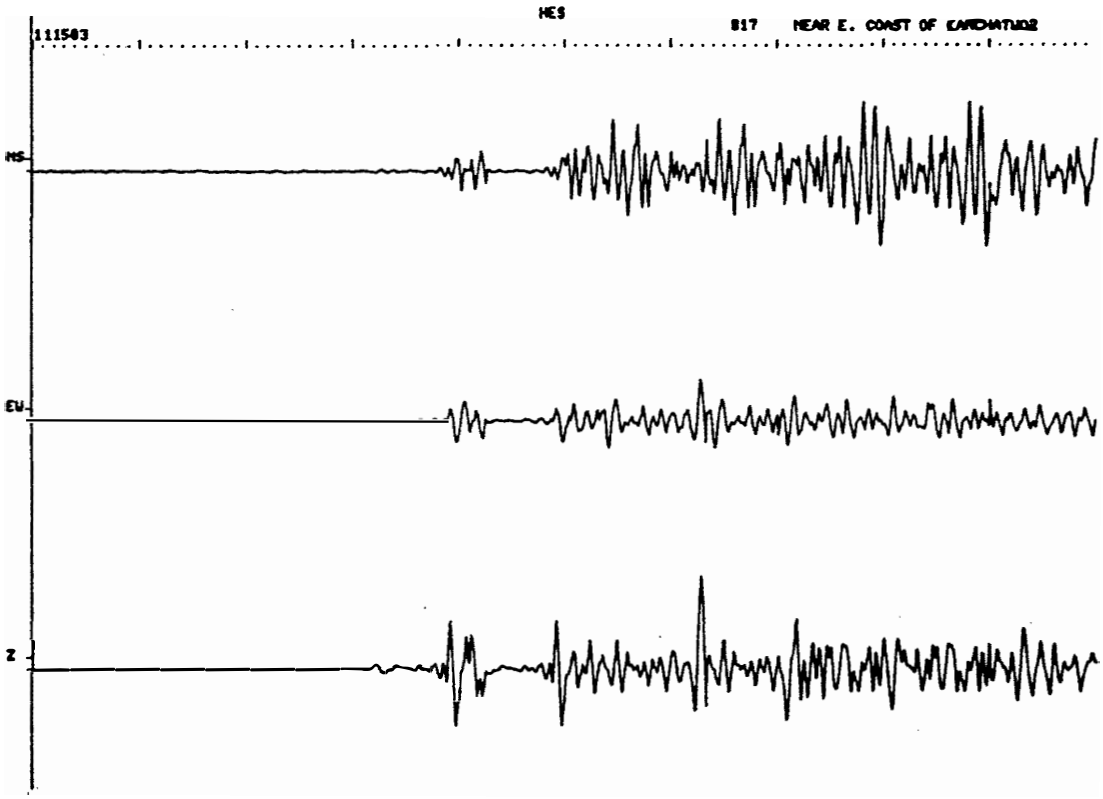
NO.39


HES
182944
M 3 VANUATU ISLANDS
NS
EW
Z

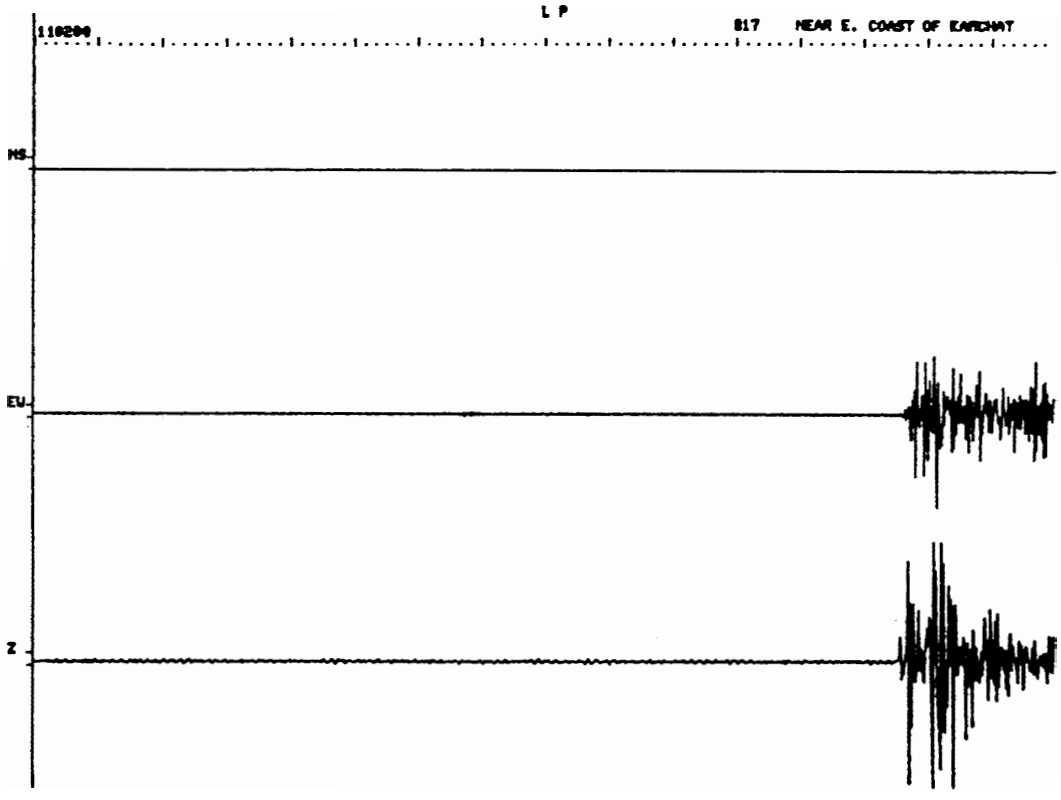
NO.40


HES
225936
M 6 BANDA SEA
NS
EW
Z

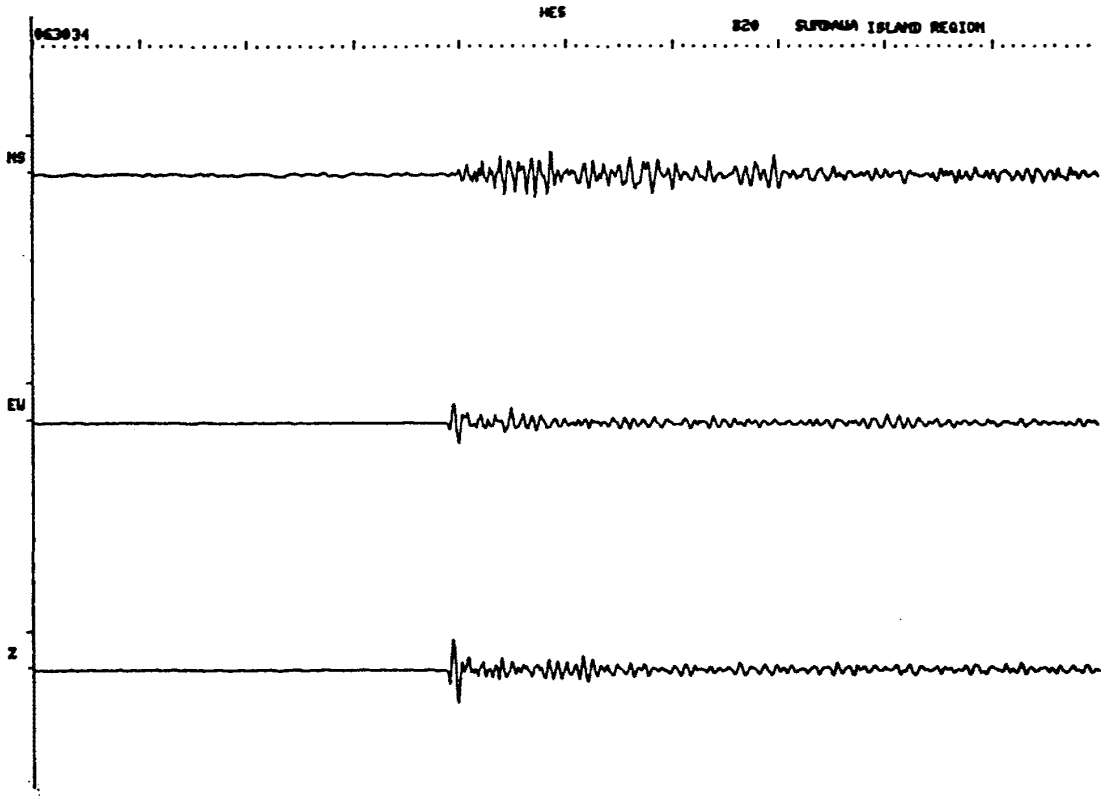
NO.41


HES
111503
817 NEAR E. COAST OF KAMCHATKA
NS
EW
Z

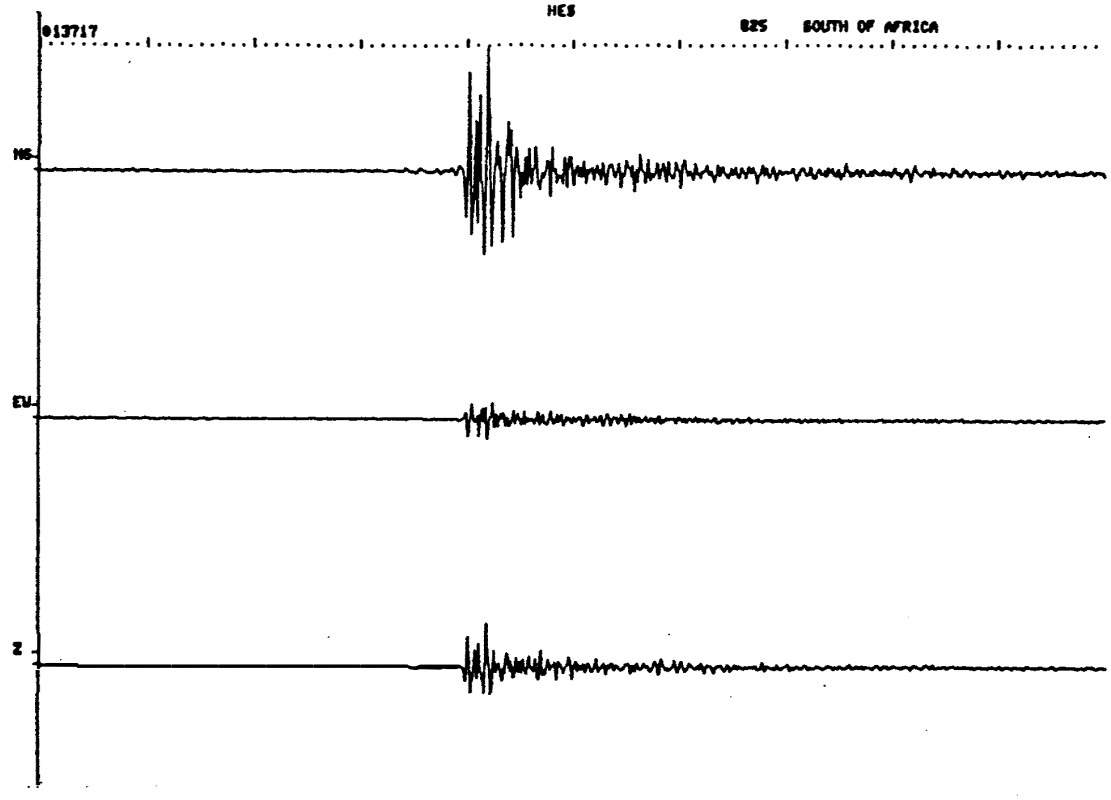
NO.41


L P
110200
817 NEAR E. COAST OF KAMCHAT
NS
EW
Z

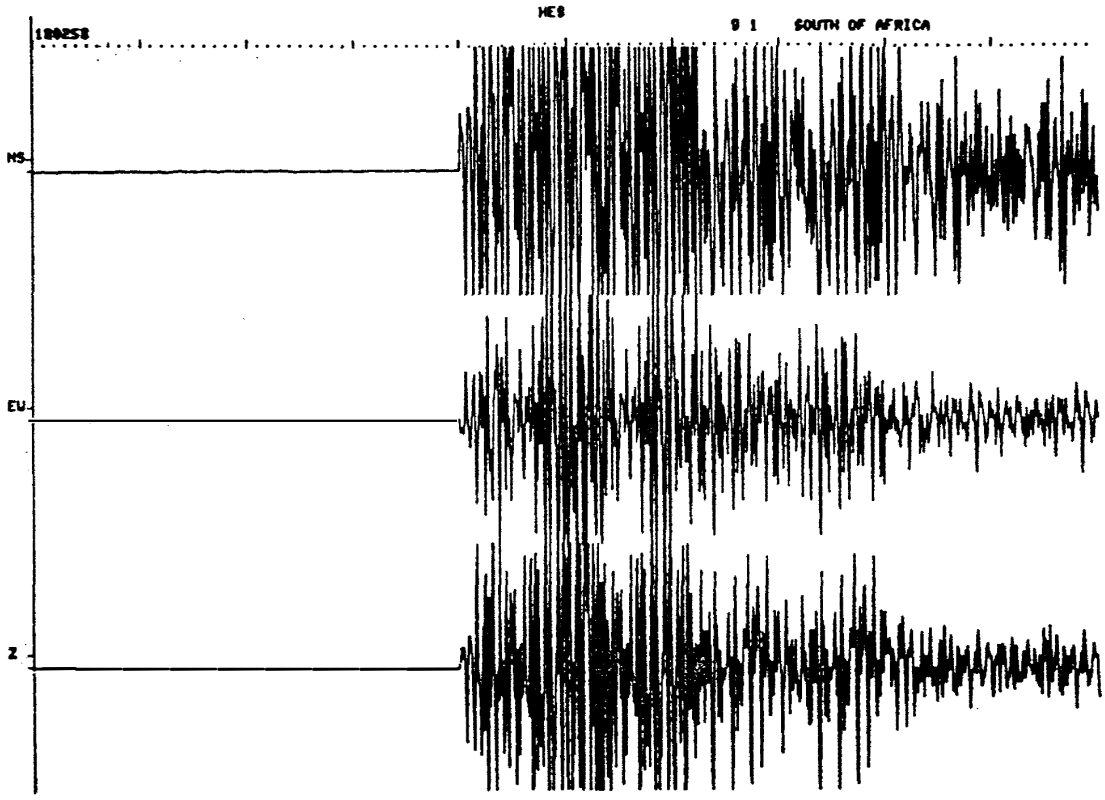
NO.42


HES
063034
820 SUNDANA ISLAND REGION
NS
EW
Z

NO.43


HES
013717
825 SOUTH OF AFRICA
NS
EW
Z

NO.44



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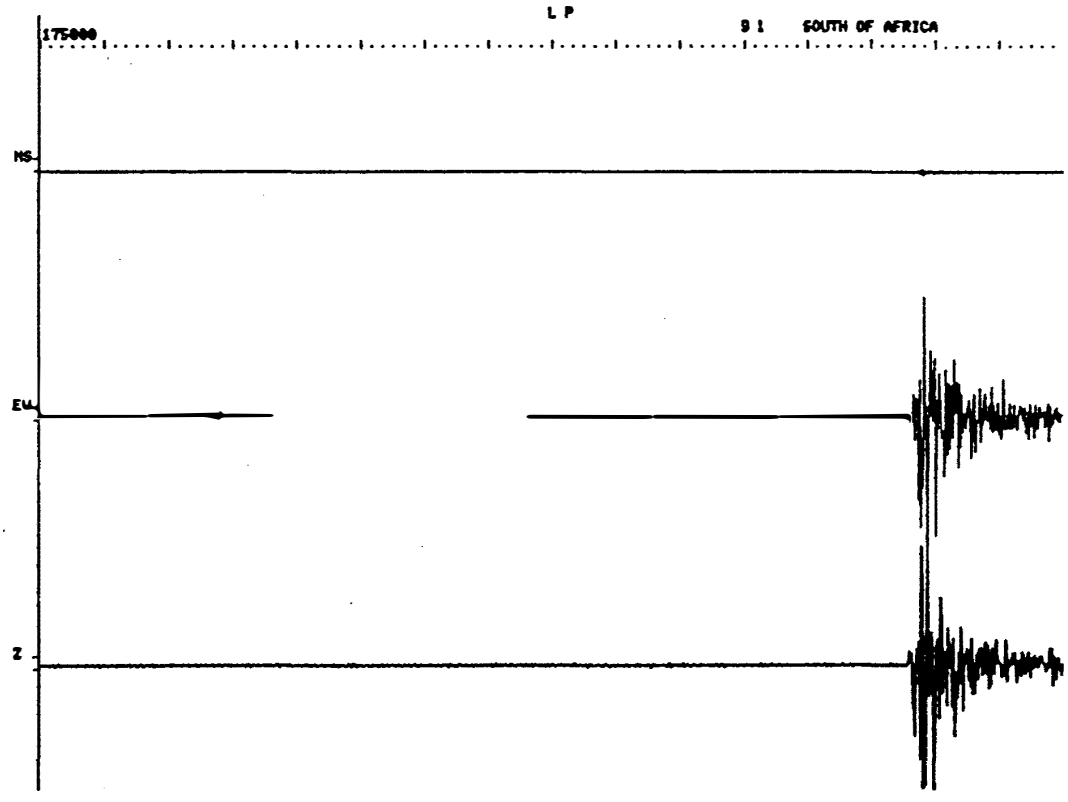

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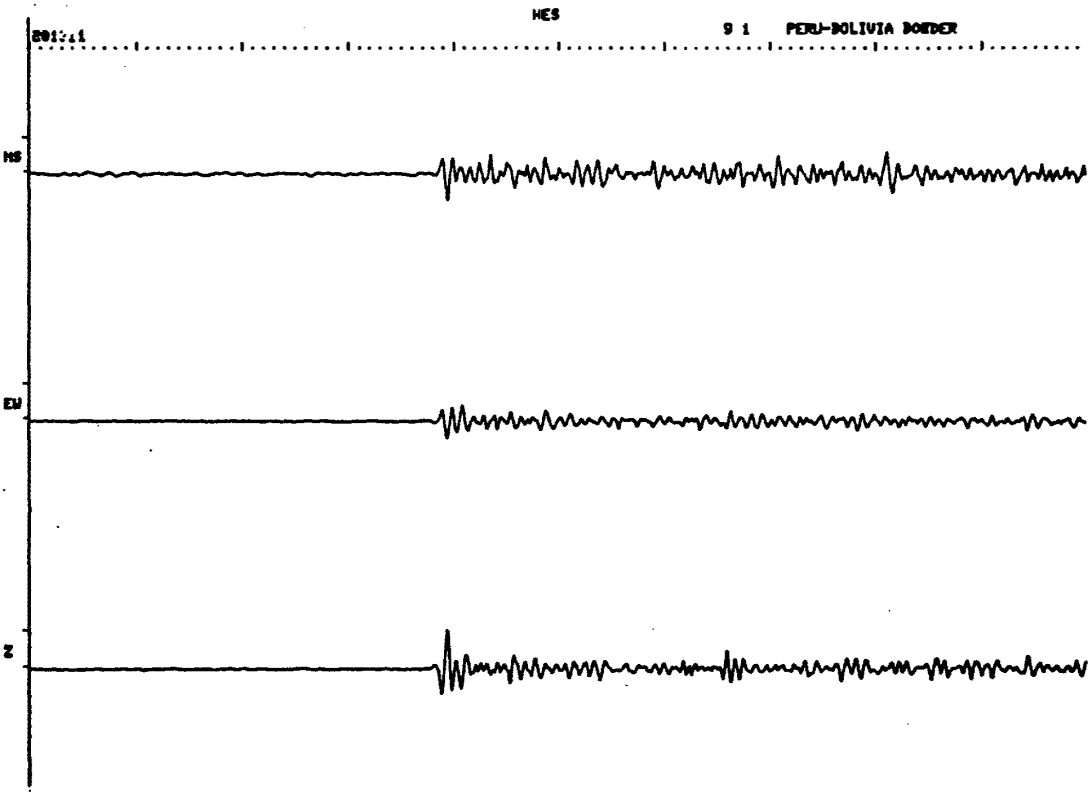

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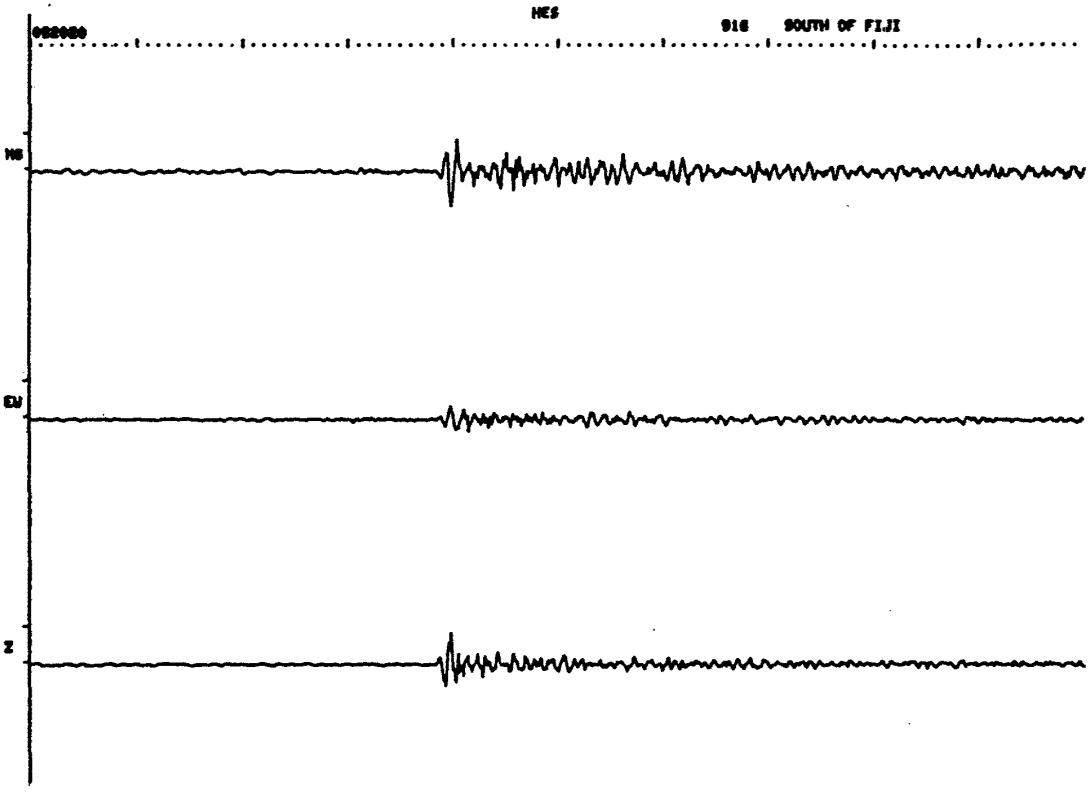
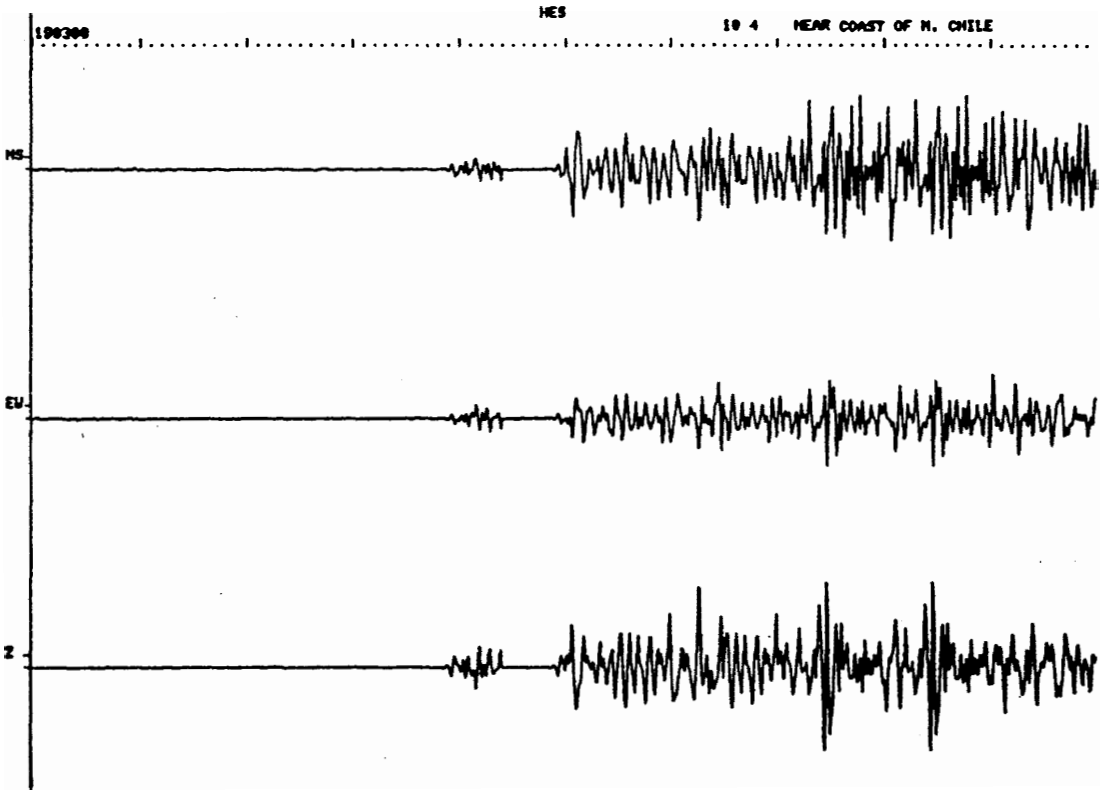
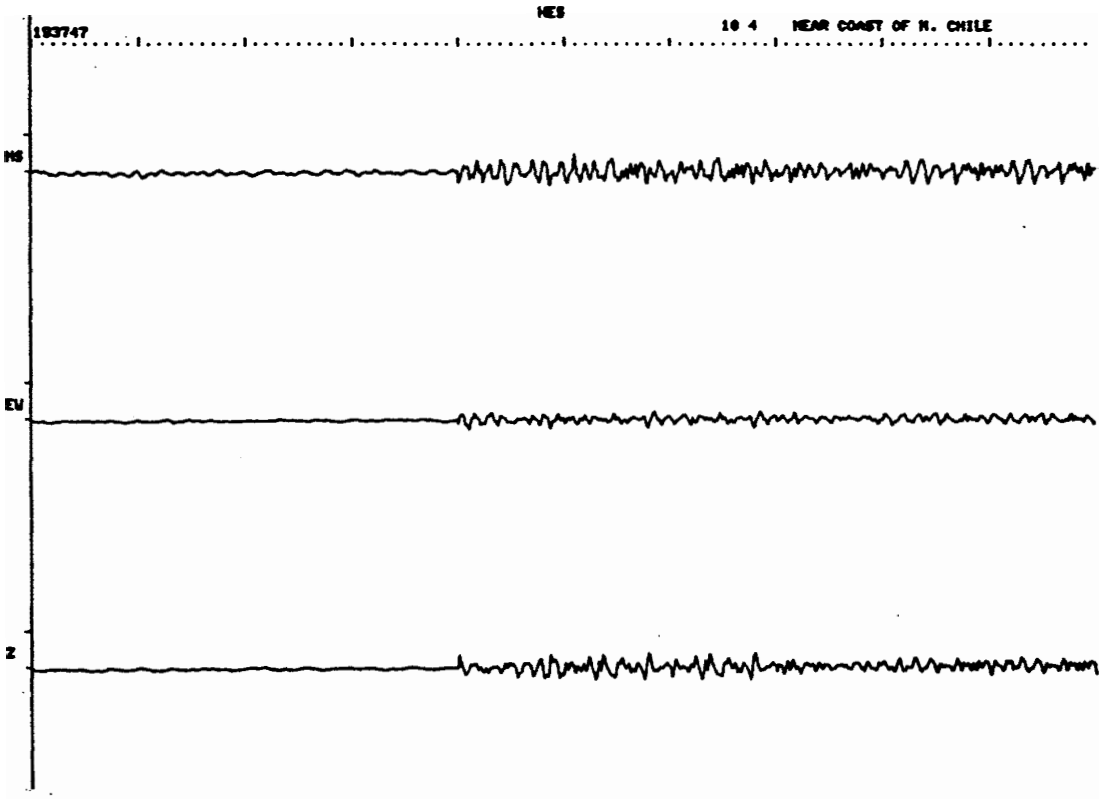


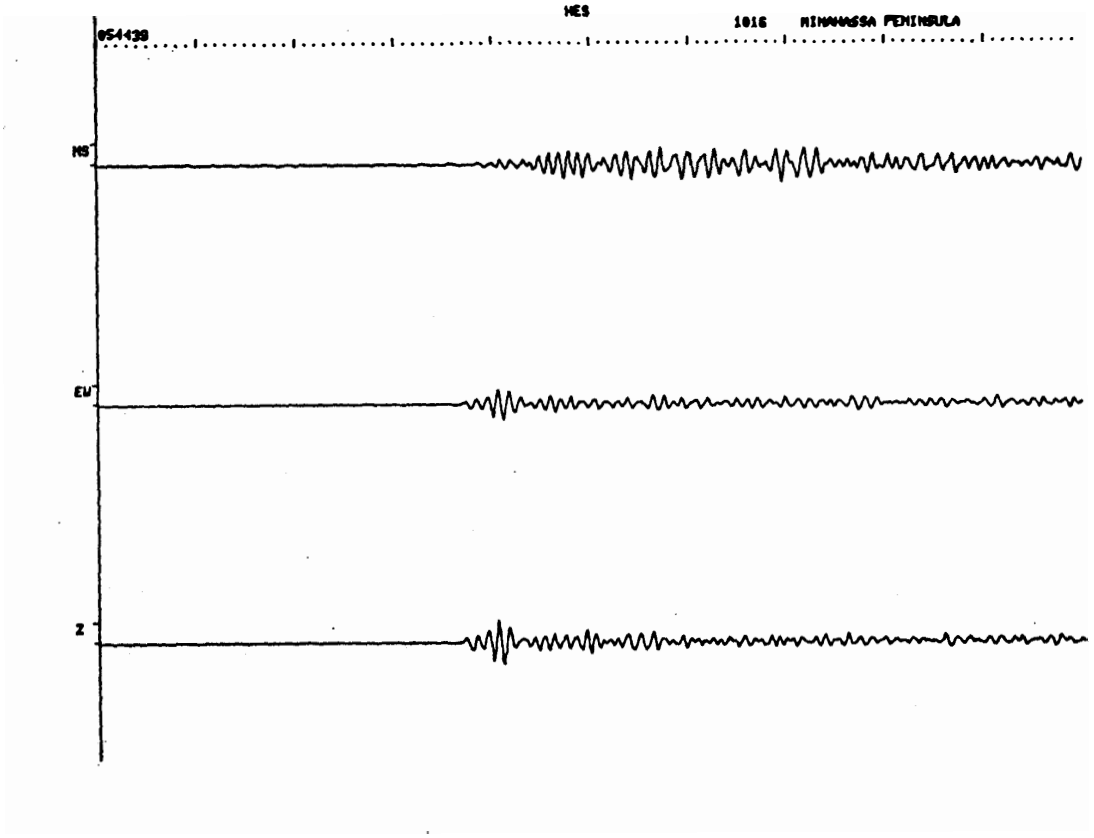
NO.47


HES
190300
10 4 NEAR COAST OF N. CHILE
NS
EW
Z

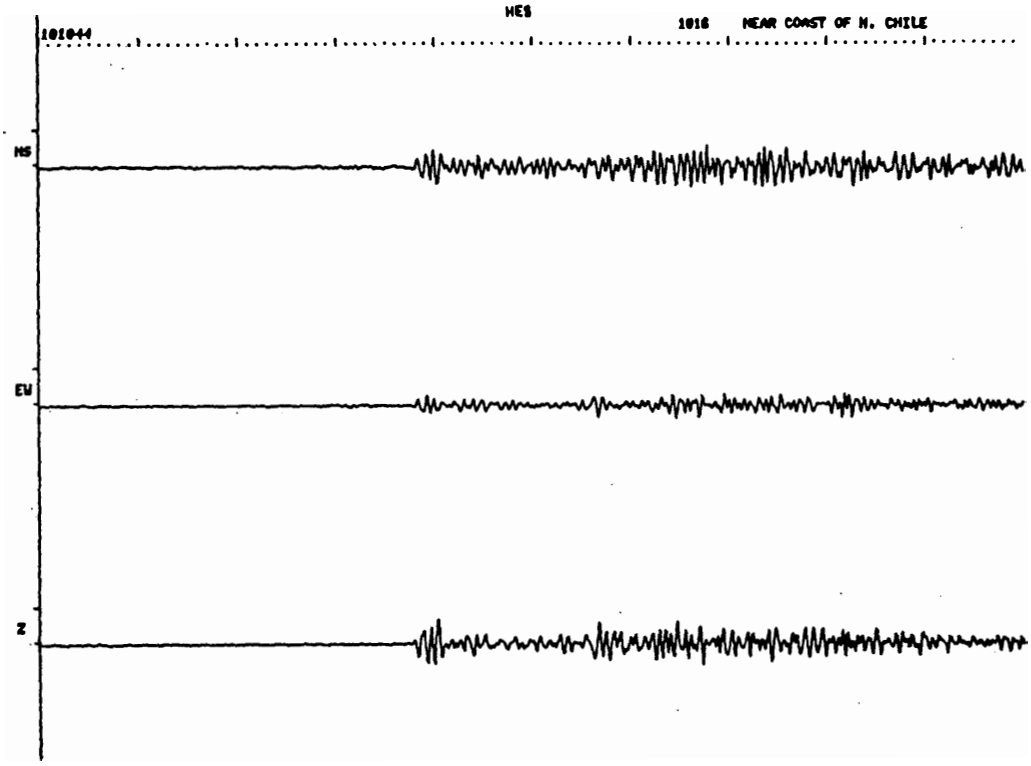
NO.48


HES
193747
10 4 NEAR COAST OF N. CHILE
NS
EW
Z

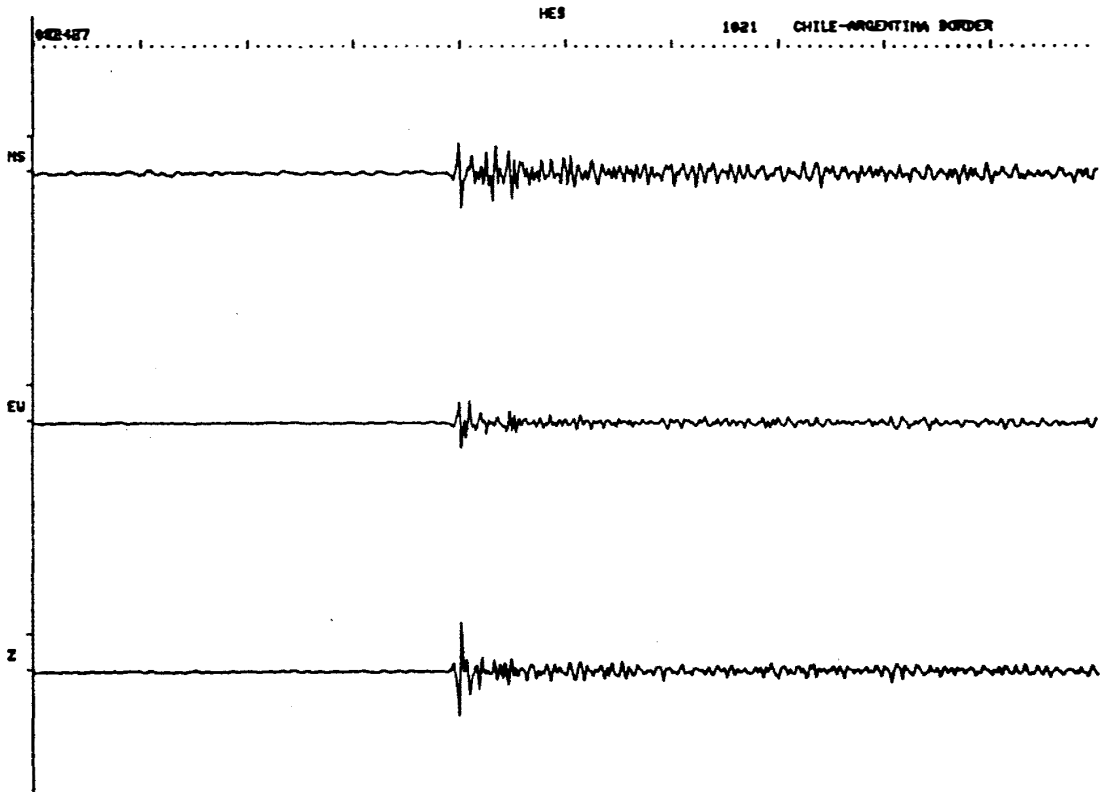
NO.49


HES
1016 MINAHASSA PENINSULA
054439
NS
EW
Z

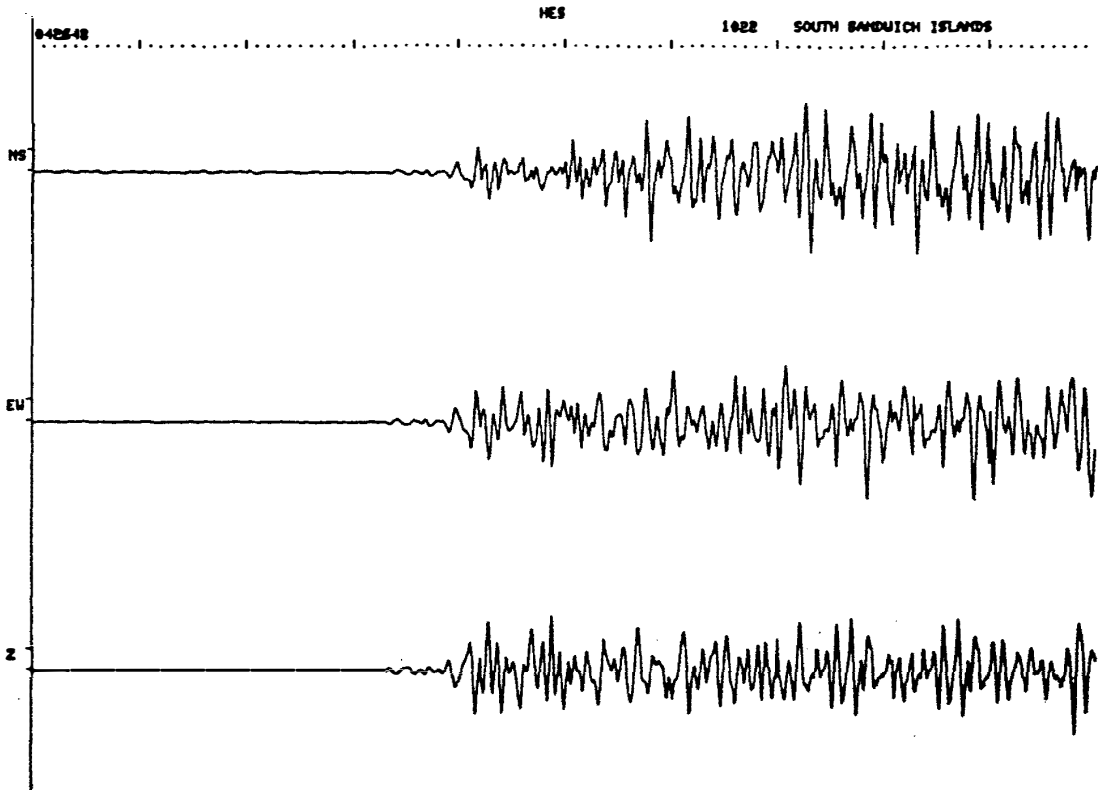
NO.50


HES
1016 NEAR COAST OF N. CHILE
101044
NS
EW
Z

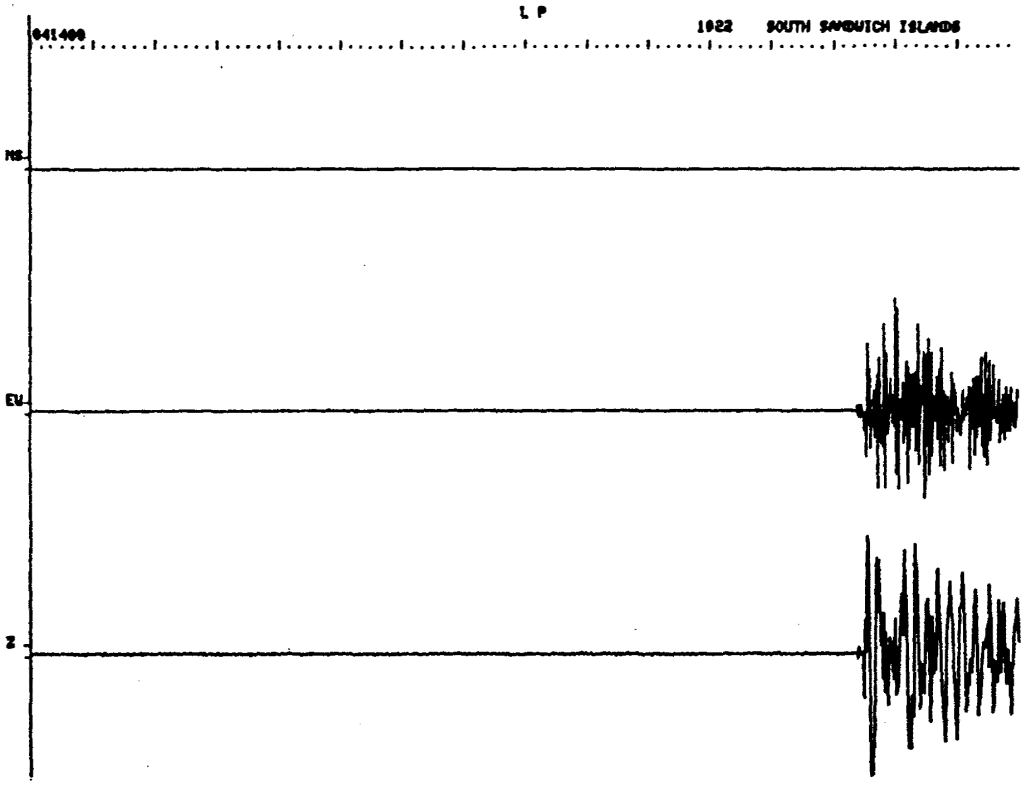
NO.51


HES
1021 CHILE-ARGENTINA BORDER
NS
EW
Z

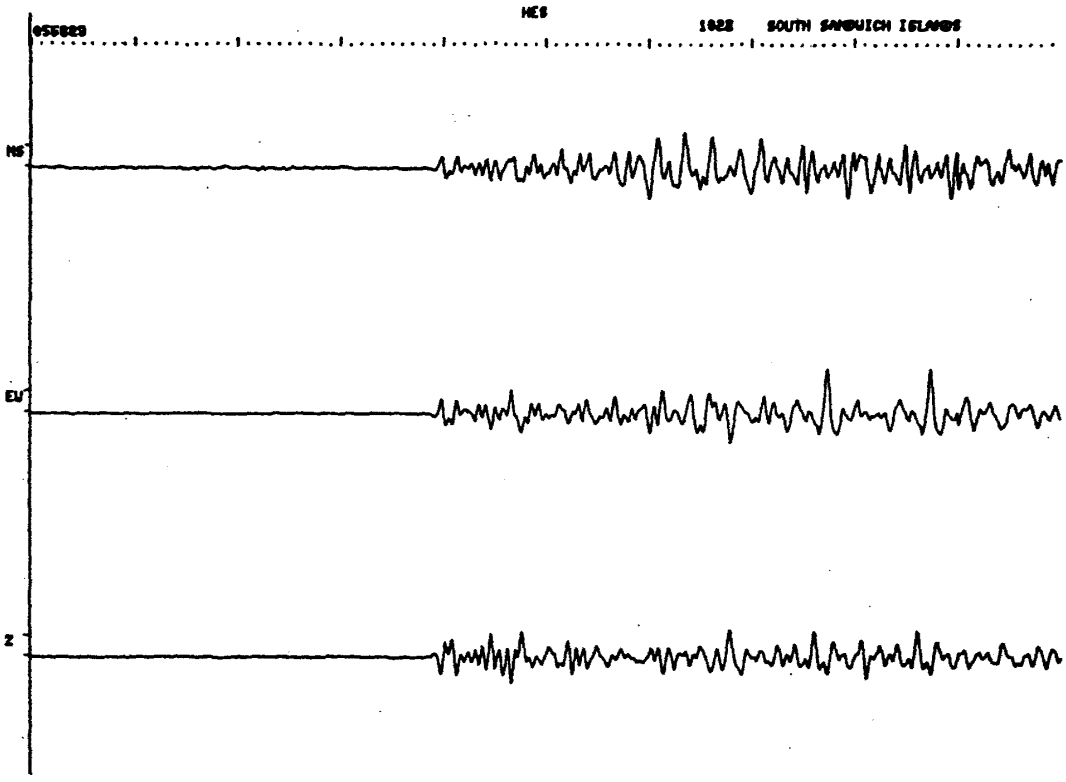
NO.52


HES
1022 SOUTH SANDWICH ISLANDS
NS
EW
Z

NO.52


L P
1922 SOUTH SANDWICH ISLANDS
NS
EW
Z

NO.53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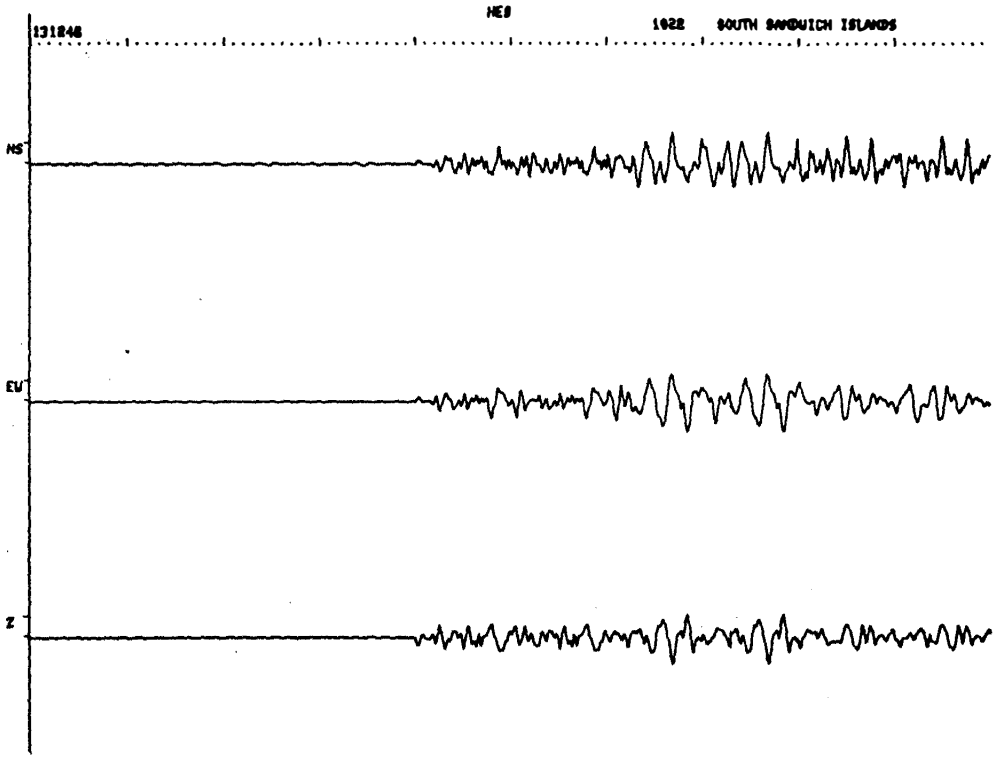
1922 SOUTH SANDWICH ISLANDS
NS
EW
Z

NO.54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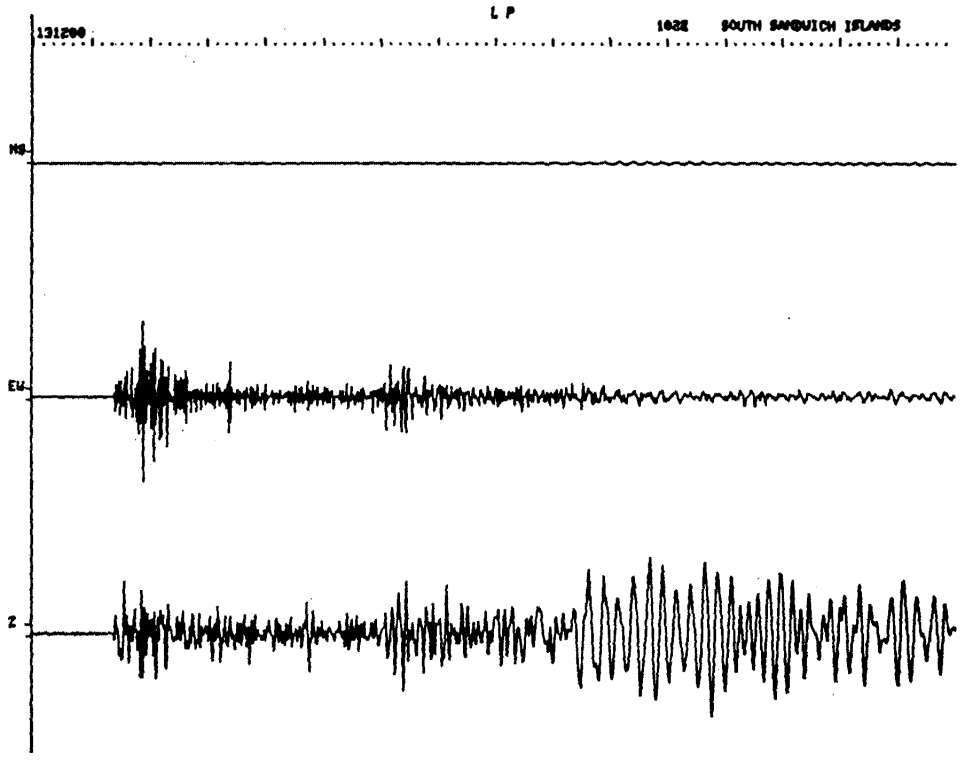
NS
EW
Z

NO.54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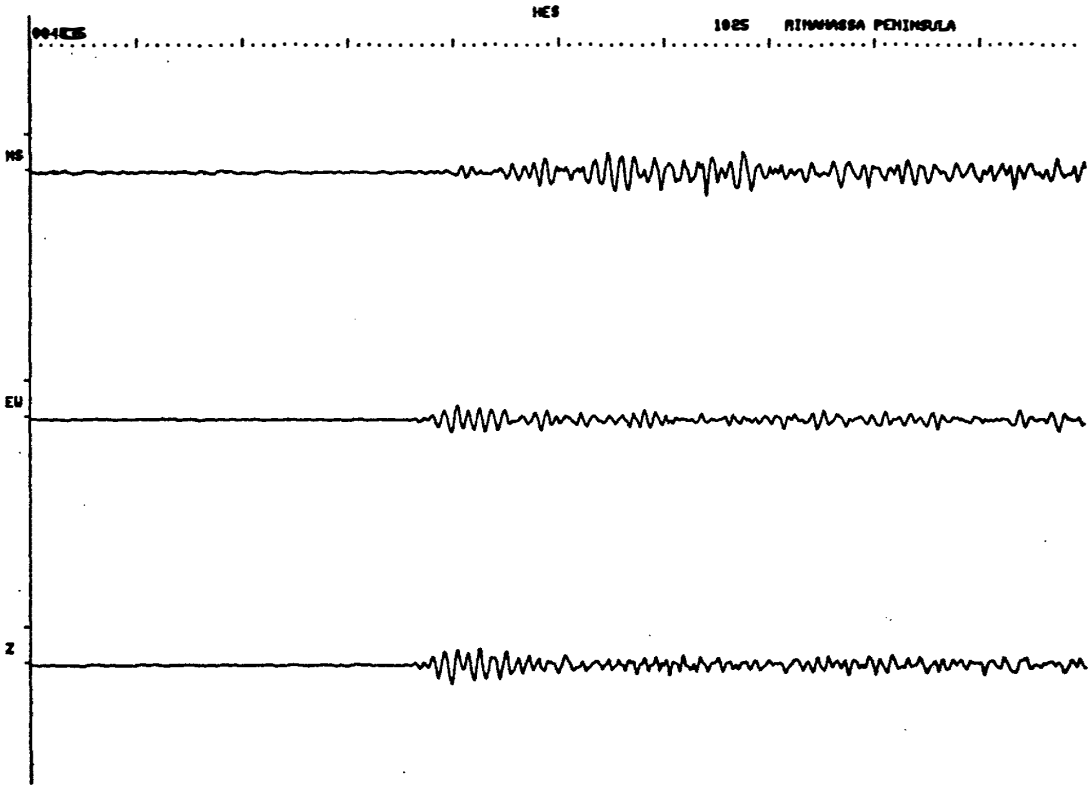
NS
EW
Z

NO.55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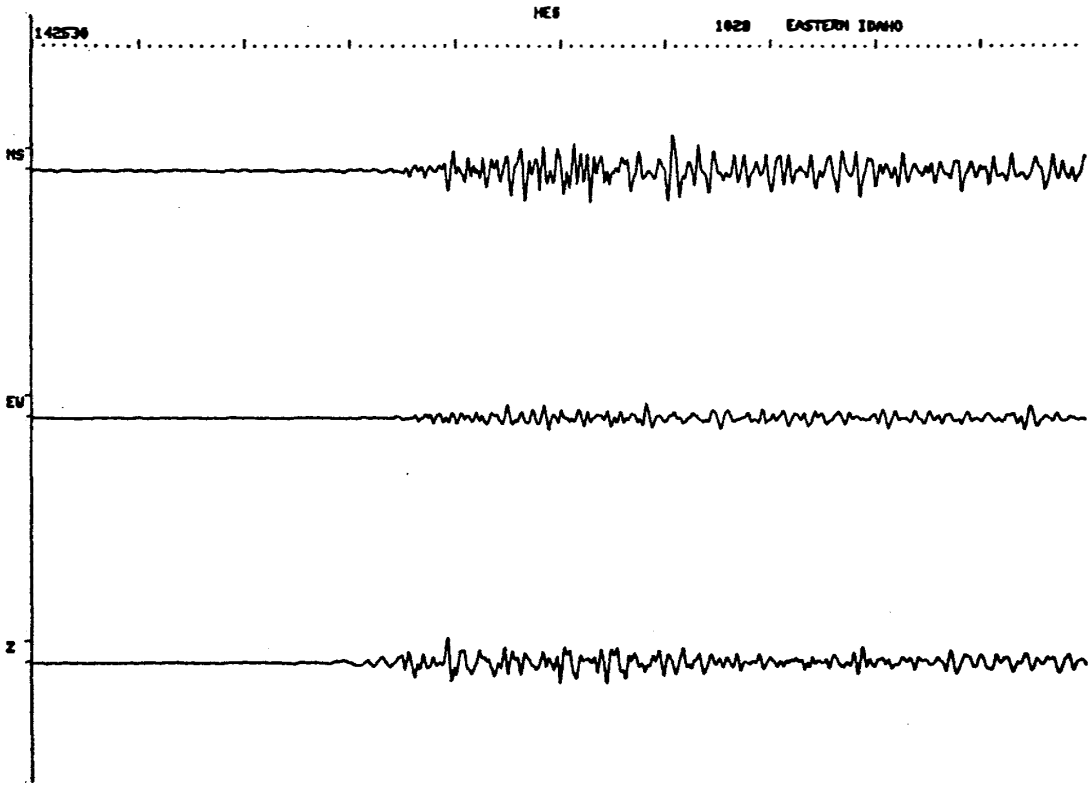
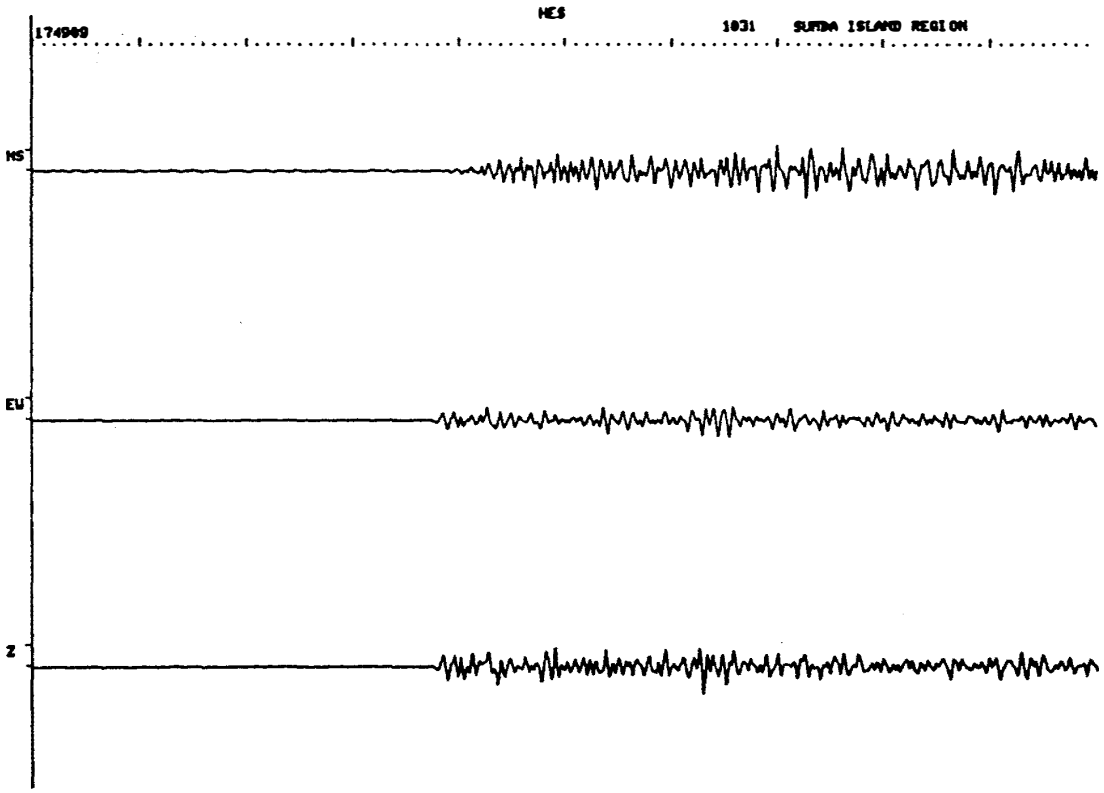
1025 RINAHASSA PENINSULA
NS
EW
Z

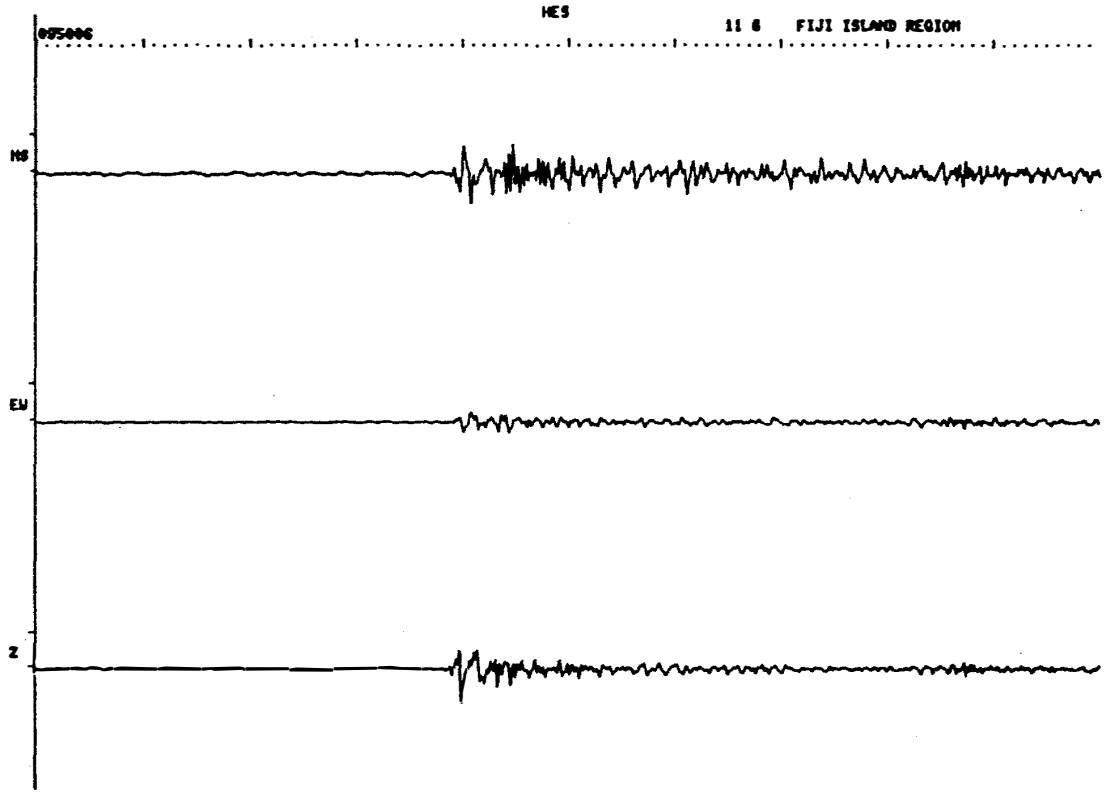
NO.56


HES
1028 EASTERN IDAHO
NS
EW
Z

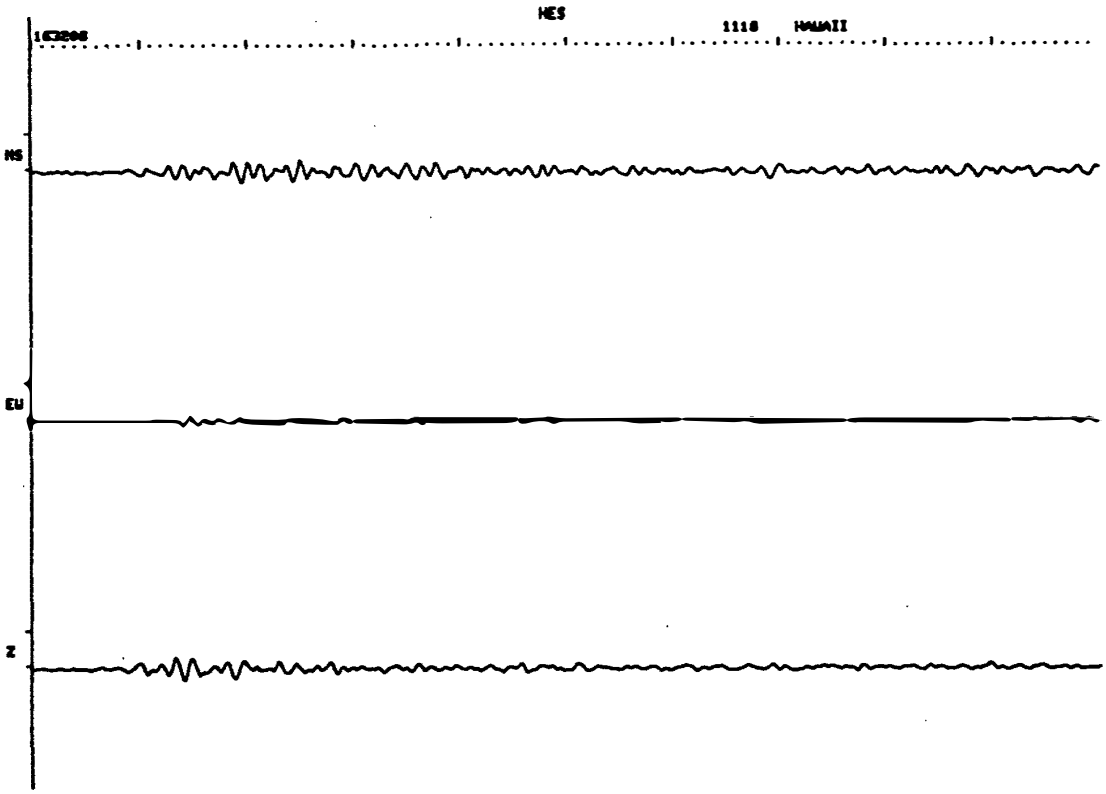
NO.57


HES
174909
1031 SUNDA ISLAND REGION
NS
EW
Z

NO.58


HES
055006
11 8 FIJI ISLAND REGION
NS
EW
Z

NO.59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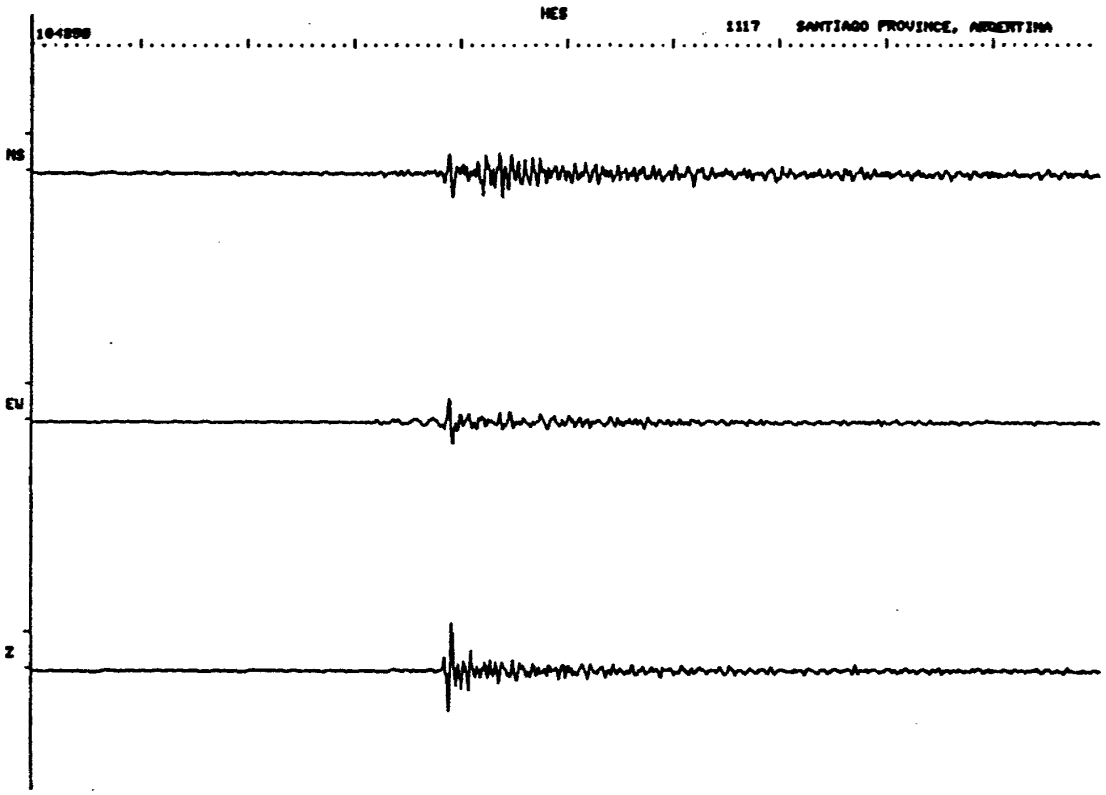
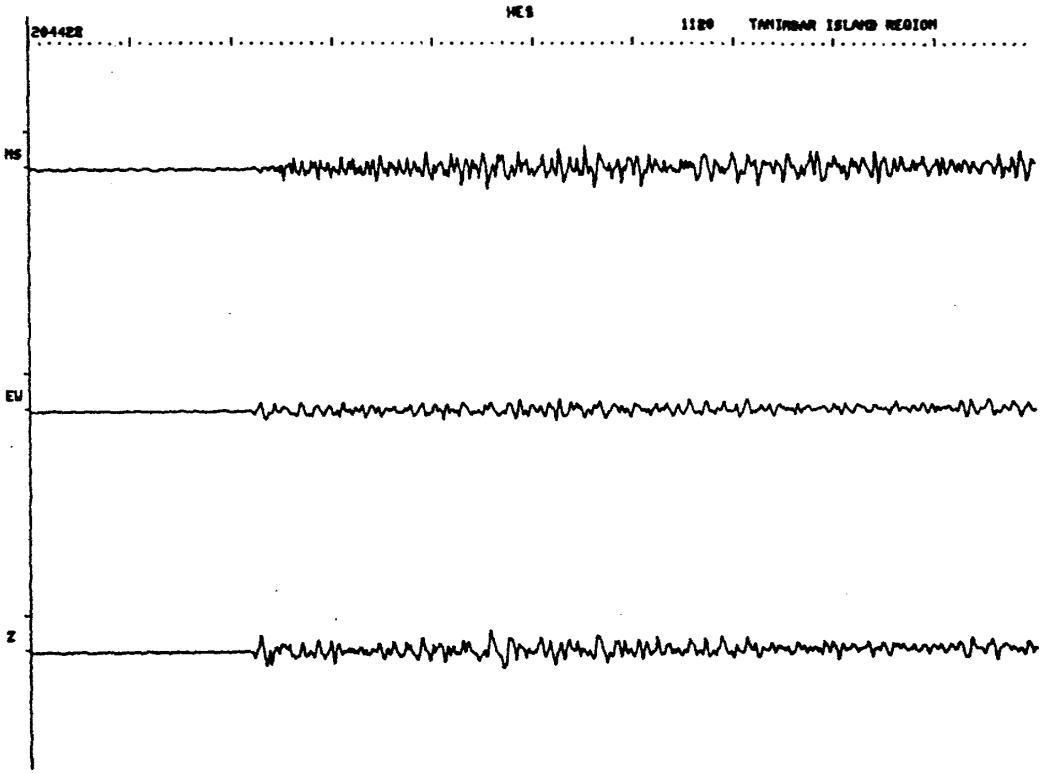
1118 HAWAII
NS
EW
Z

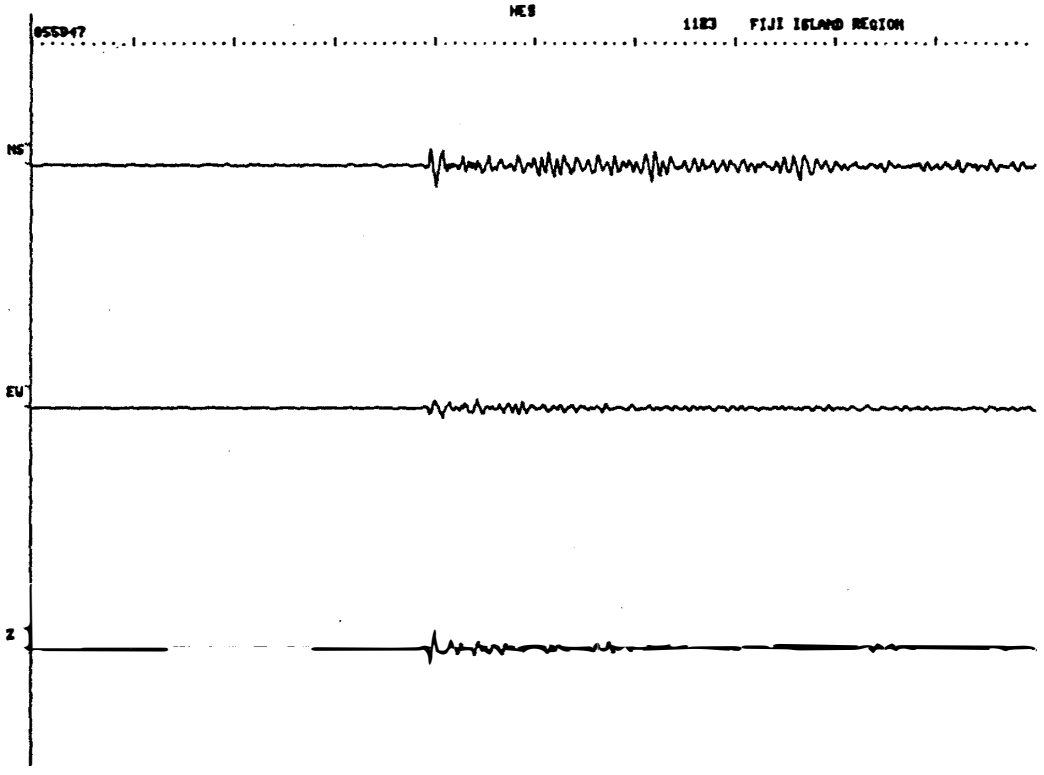
NO.60


HES
1117 SANTIAGO PROVINCE, ARGENTINA
NS
EW
Z

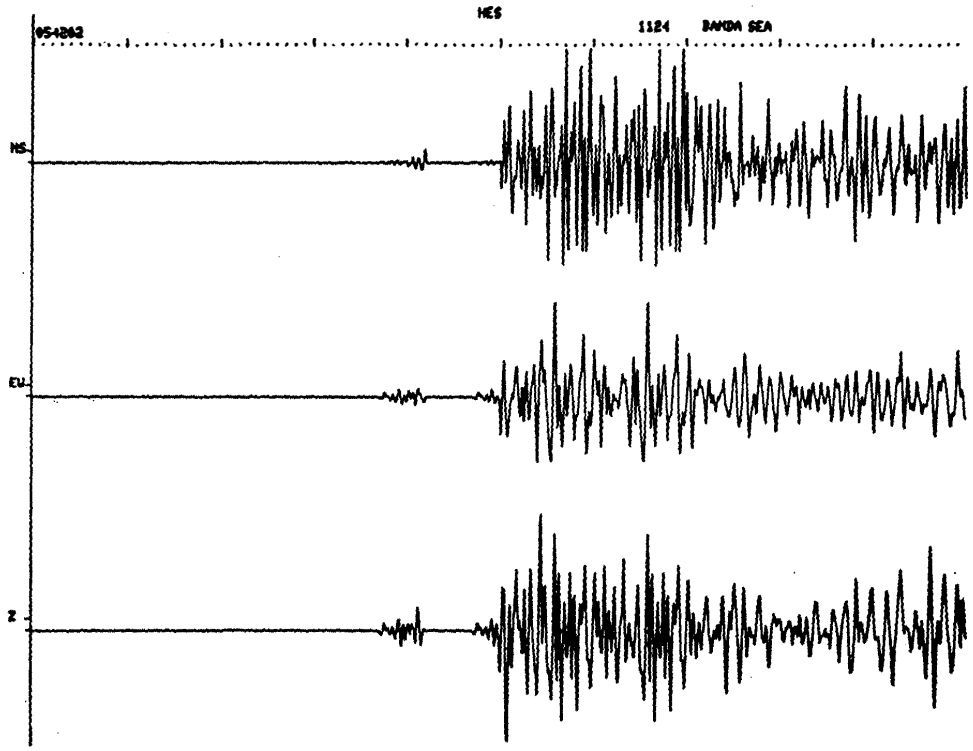
NO.61


HES
204428
1120 TANIMBAR ISLAND REGION
NS
EW
Z

NO.62


HES
055947
1123 FIJI ISLAND REGION
NS
EW
Z

NO.63



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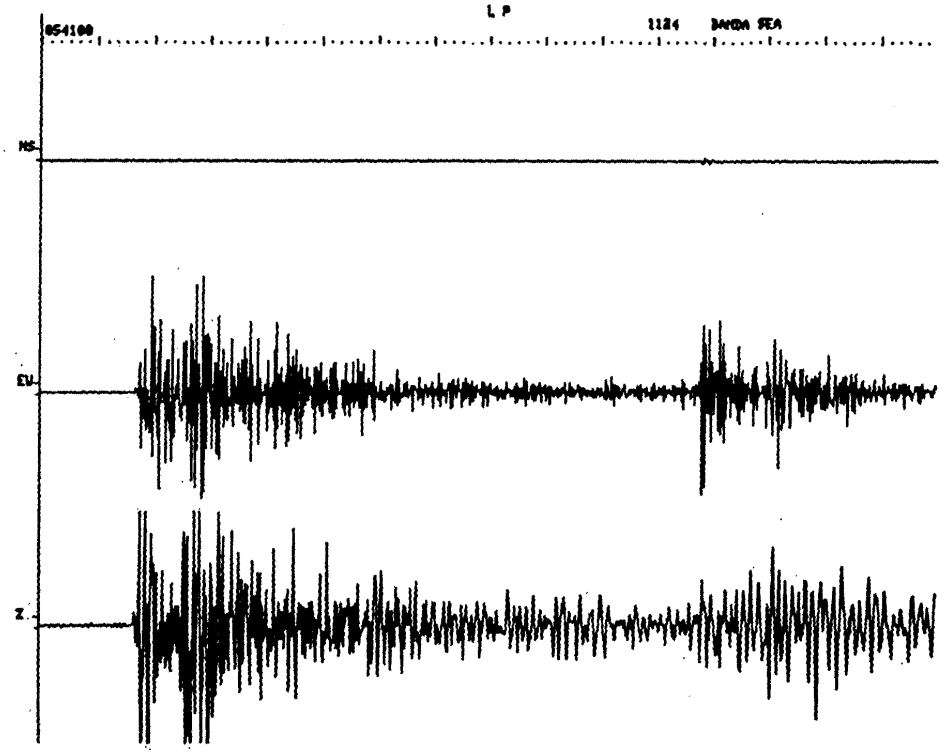
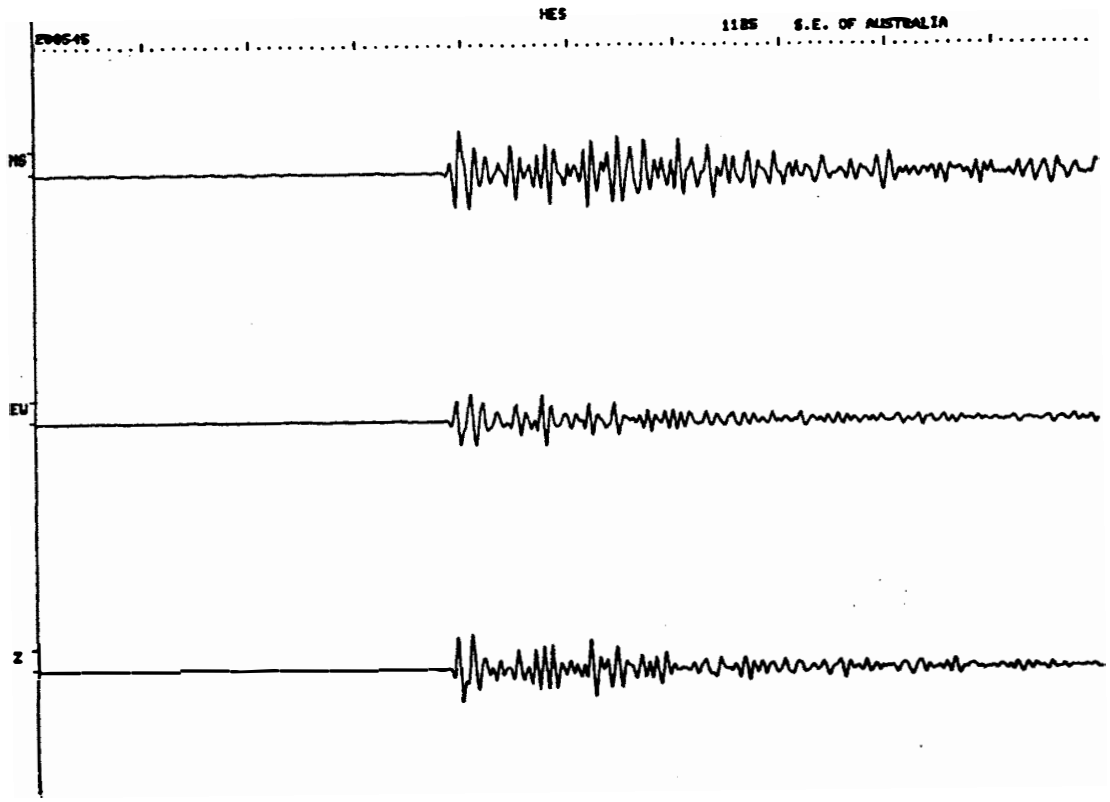
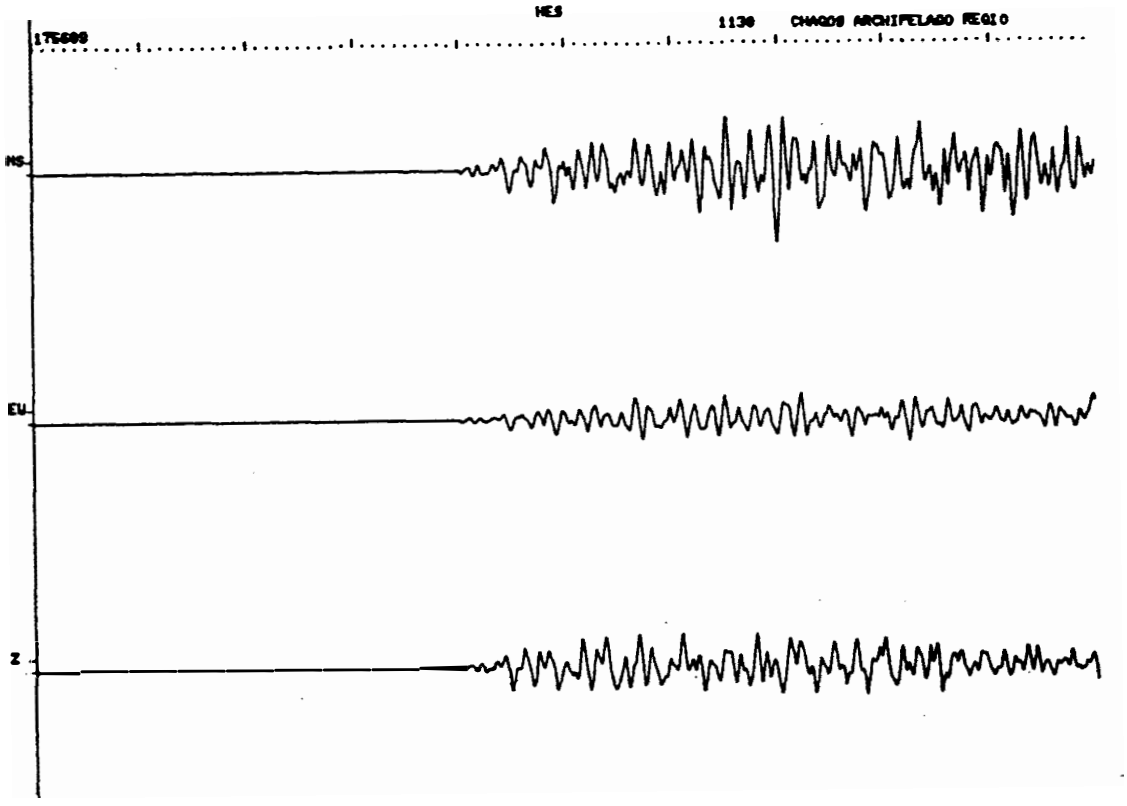


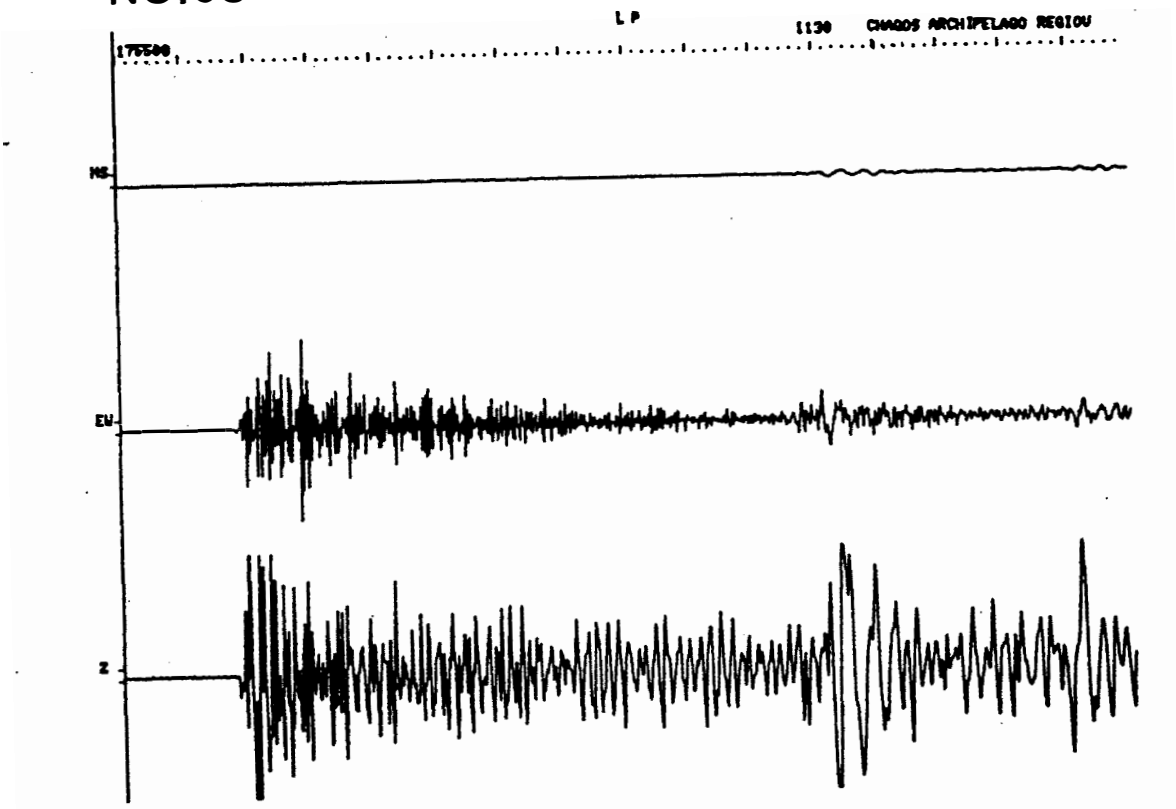
NO.64


HES
1135 S.E. OF AUSTRALIA
NS
EW
Z

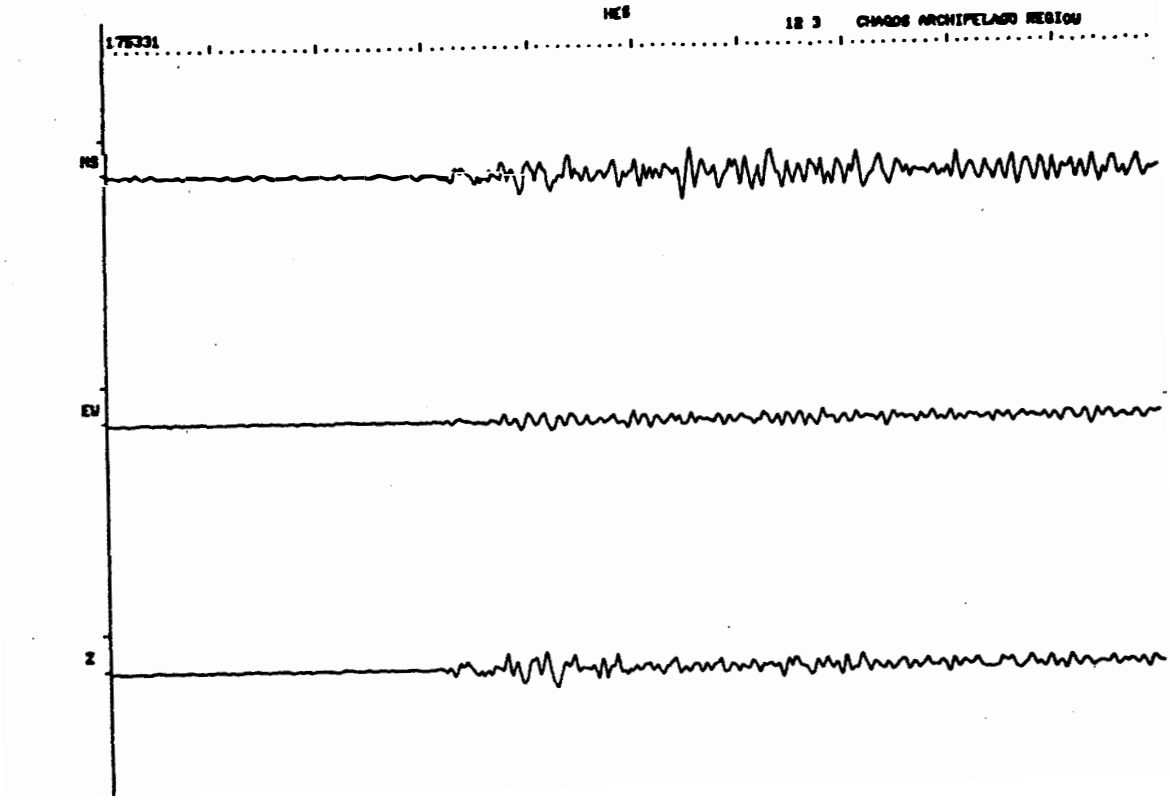
NO.65


HES
1130 CHAGOS ARCHIPELAGO REGIO
NS
EW
Z

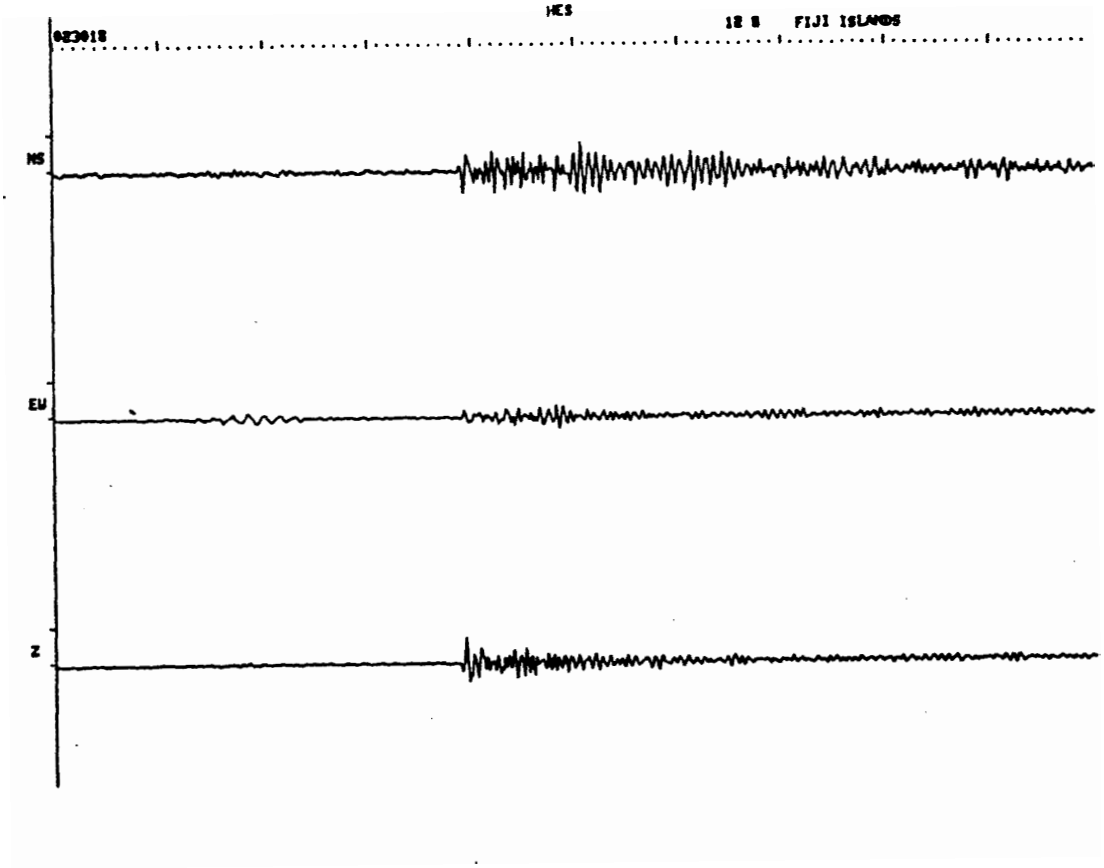
NO.65


LP
1130 CHAOS ARCHIPELAGO REGION
NS
EW
Z

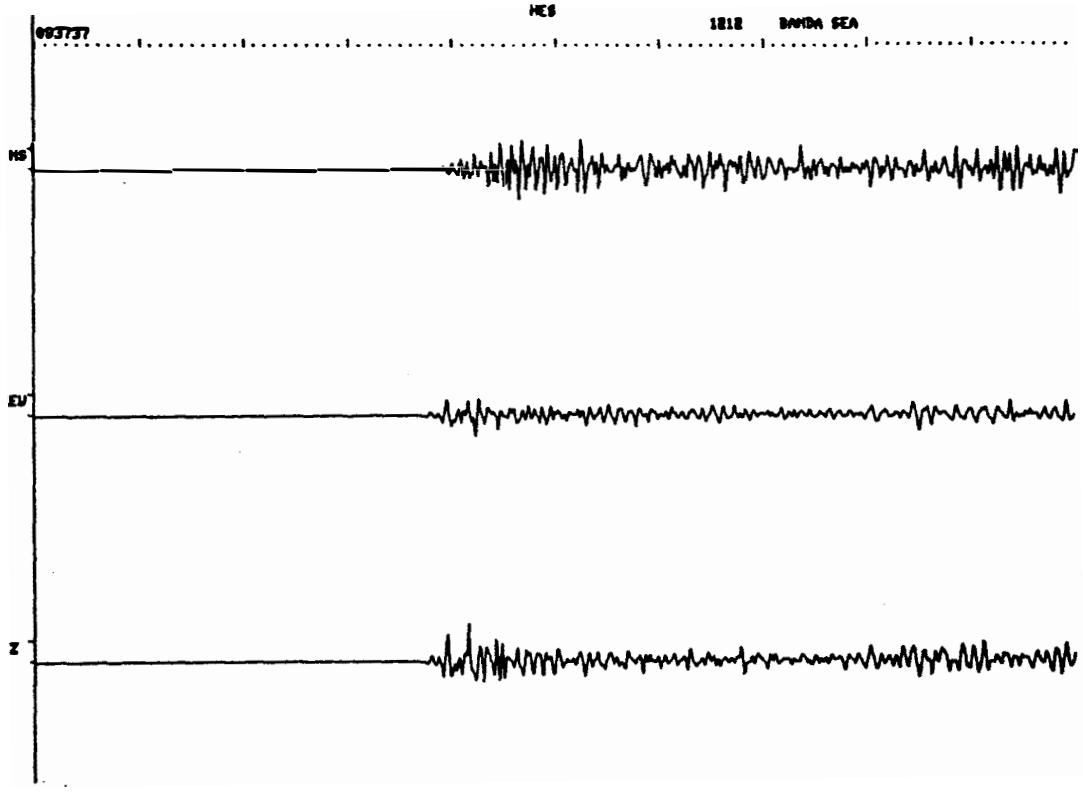
NO.66


HES
12 3 CHAOS ARCHIPELAGO REGION
NS
EW
Z

NO.67


HES
12 8 FIJI ISLANDS
023018
NS
EW
Z

NO.68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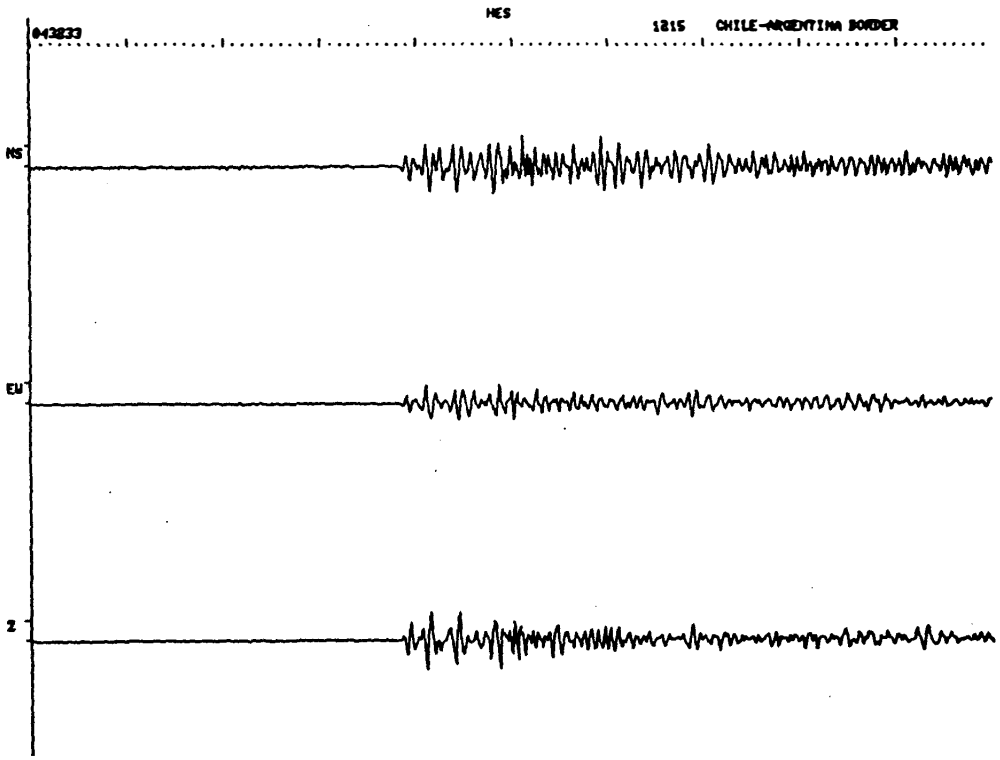
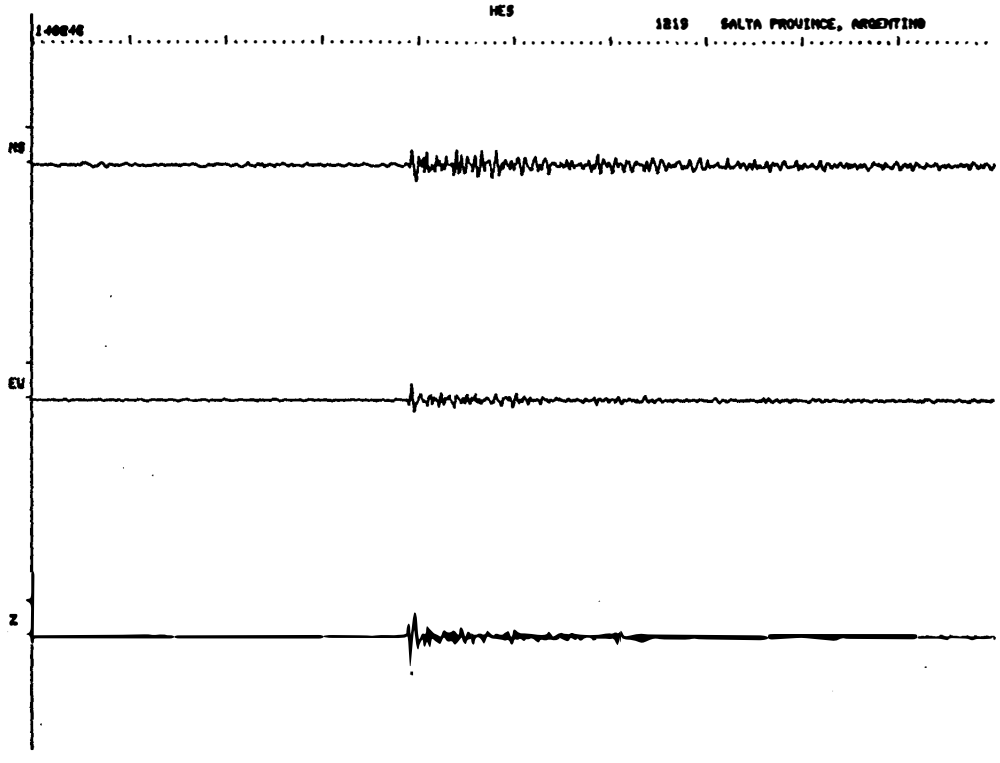
1818 BANDA SEA
093737
NS
EW
Z

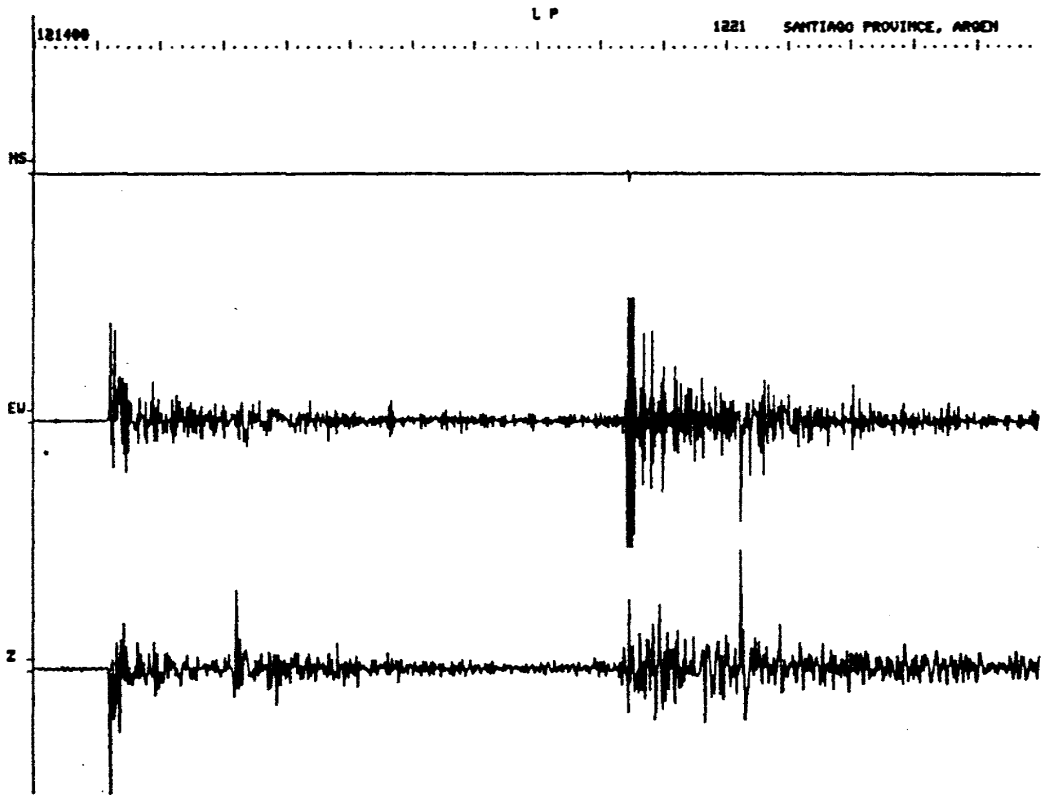
NO.69


HES
043833
1215 CHILE-ARGENTINA BORDER
NS
EW
Z

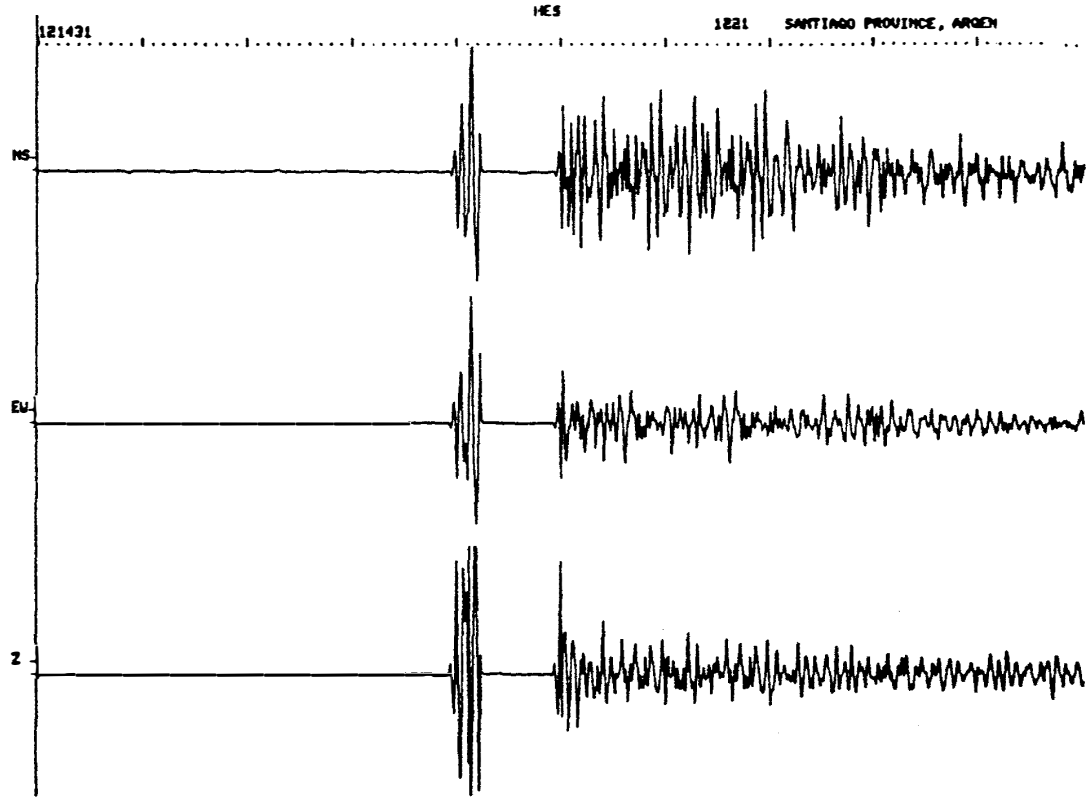
NO.70


HES
140846
1219 SALTA PROVINCE, ARGENTINA
NS
EW
Z

NO.71


L P
121400
1221 SANTIAGO PROVINCE, ARGEN
NS
EW
Z

NO.71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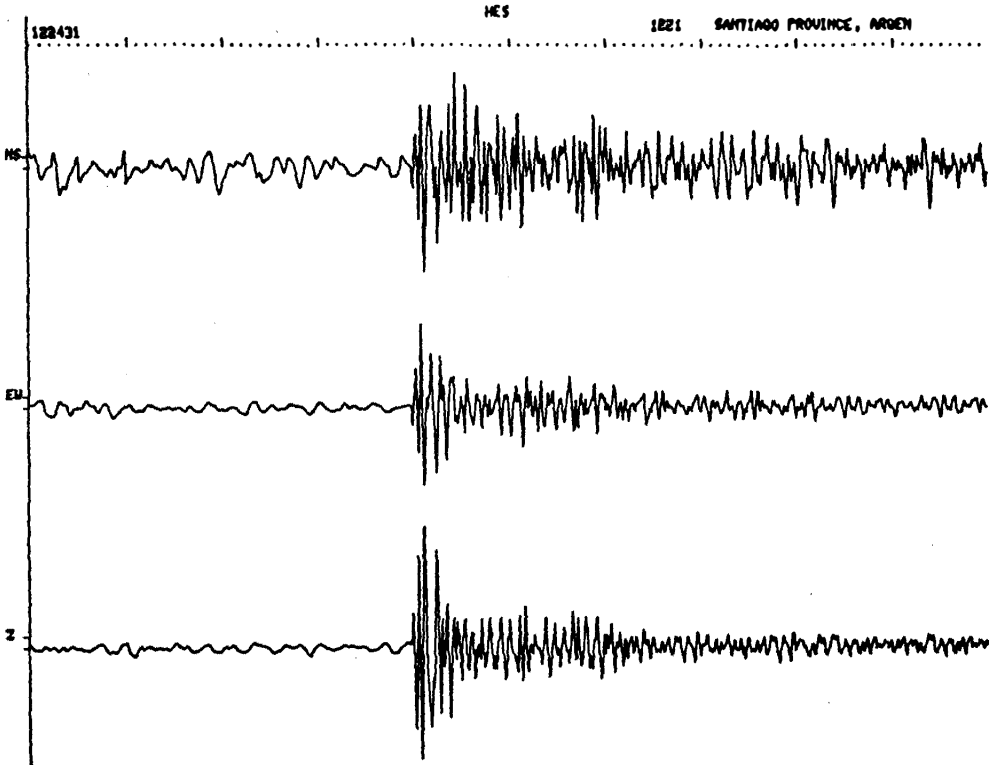
121431
1221 SANTIAGO PROVINCE, ARGEN
NS
EW
Z

NO.72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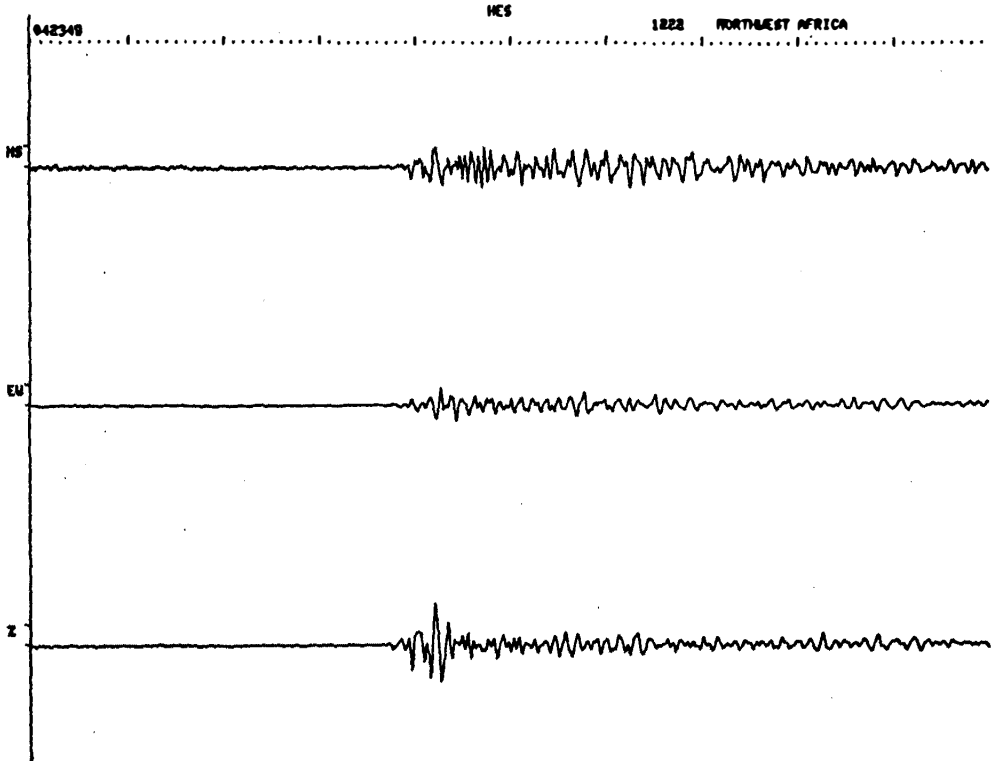
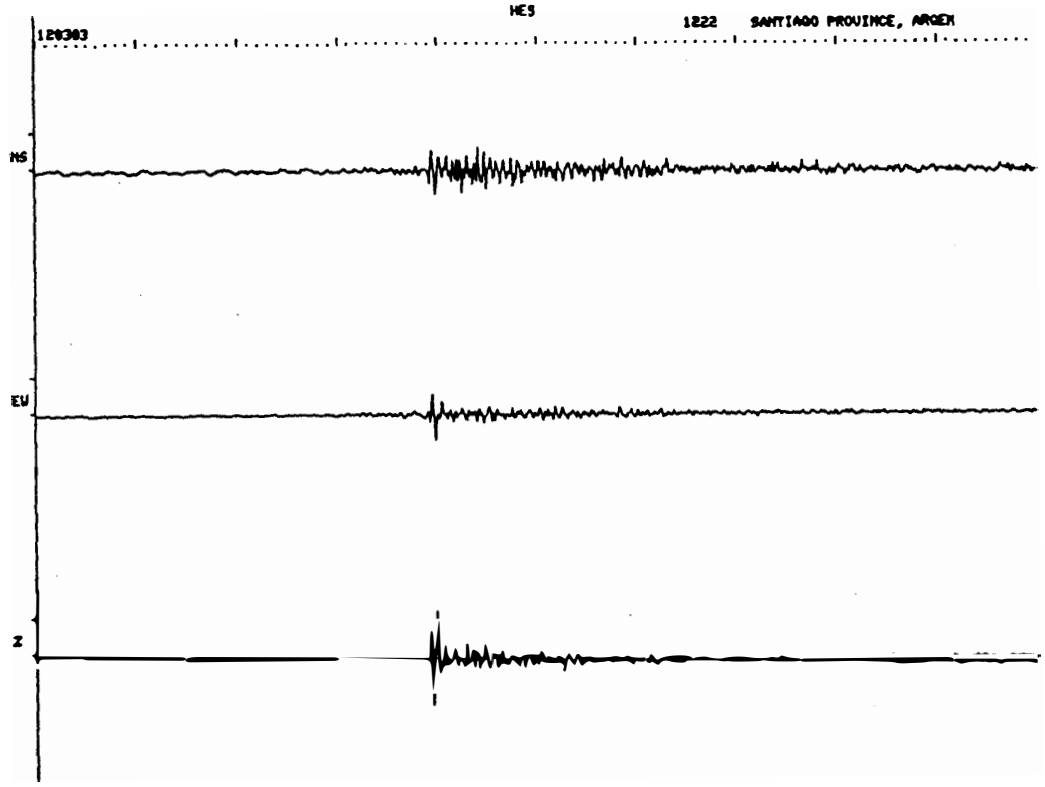
122431
1221 SANTIAGO PROVINCE, ARGEN
NS
EW
Z

NO.73


HES
042349
1228 NORTHWEST AFRICA
NS
EW
Z

NO.74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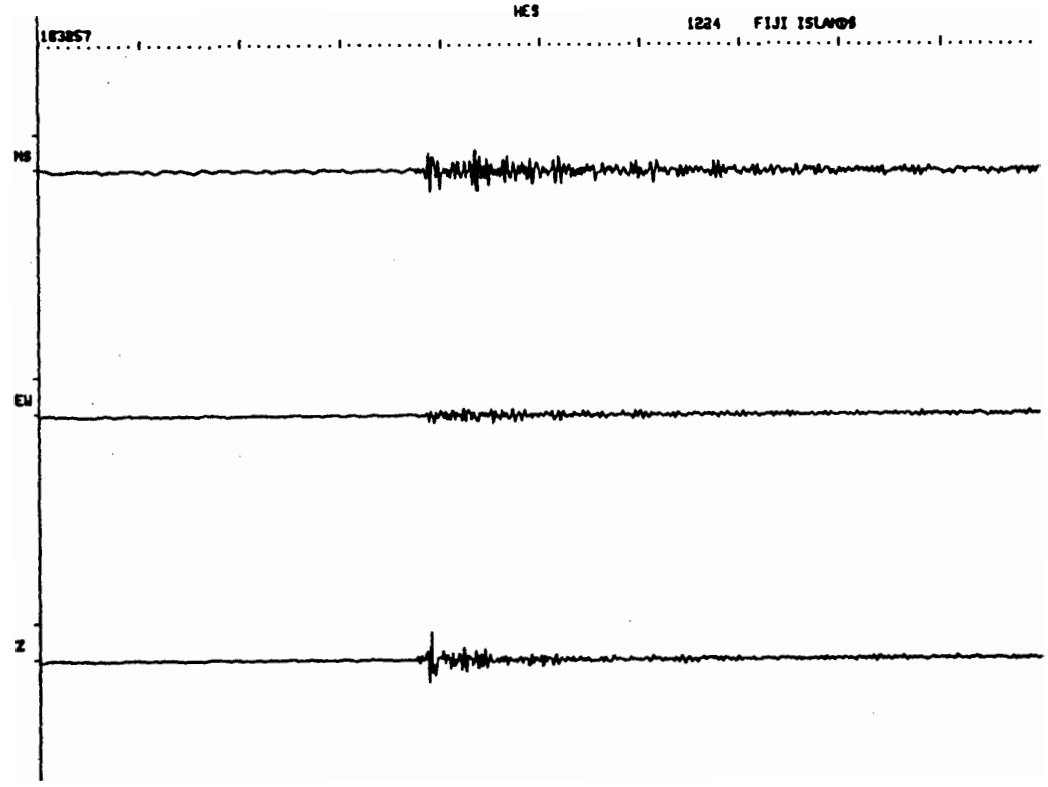
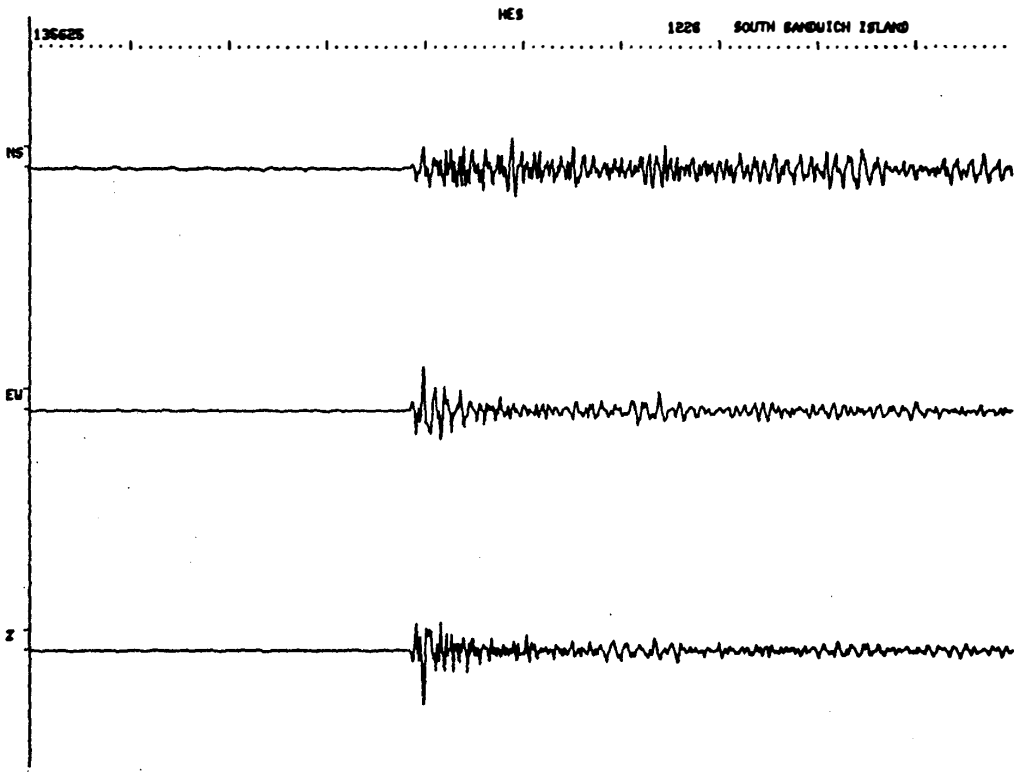
1222 SANTIAGO PROVINCE, ARGEN
120303
NS
EW
Z

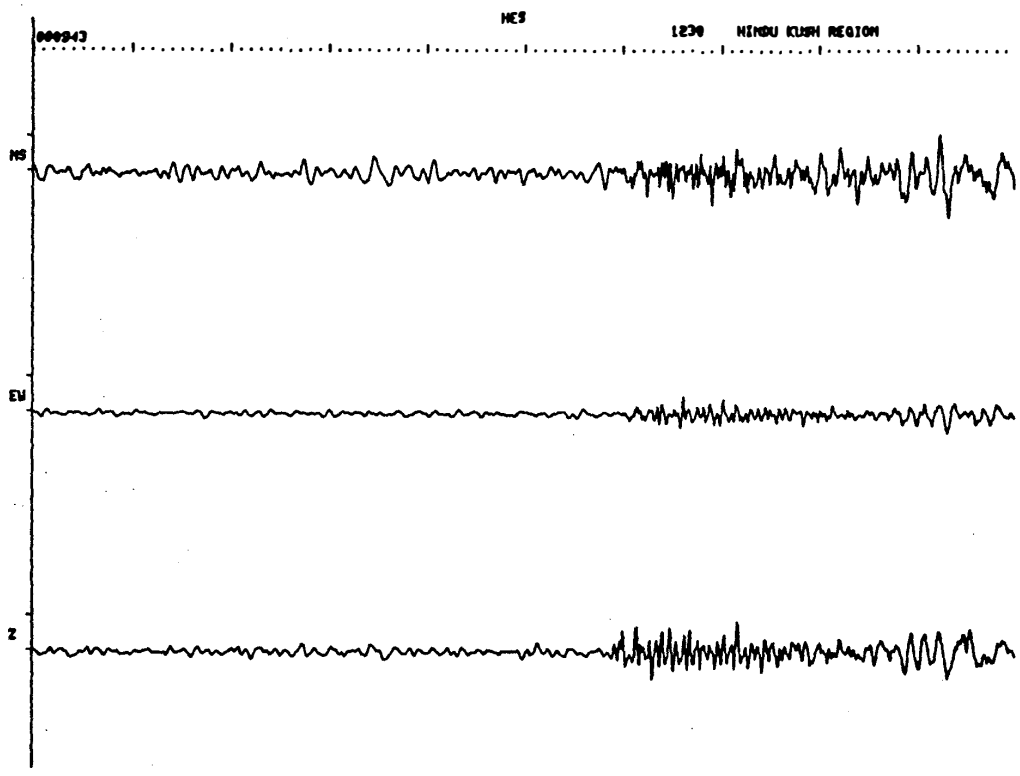
NO.75


HES
1224 FIJI ISLANDS
183857
NS
EW
Z

NO.76


HES
135625
1226 SOUTH SANDWICH ISLAND
NS
EW
Z

NO77


HES
000943
1230 HINDU KUSH REGION
NS
EW
Z