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

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 replaced 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 type of sensors and their locations were not changed and only recording system was replaced.

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. 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 LP of the Press-Ewing type with the natural-period of 15-20 seconds (long period). The long-period seismographs and the corresponding pre-filter-amplifiers were replaced in February 1981, where the outline of the introduced system is illustrated in Fig. 1. The seismic observation system was maintained by R. Sakai and K. Kaminuma through the wintering of JARE-22. 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 and long-period seismographs (Z, N-S and E-W components) are shown in Fig. 2. The system clock could not be connected to the recovered UTC from NNSS satellites and the calibration was made by the short-wave receiver. The accuracy of the read-out data can be estimated as 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 between Tokyo and Syowa Station, PDE reports by NEIS can be referenced and the local events around Syowa Station are excluded from this report.

2.1. Read-out data

The onset of the events 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 R. Sakai and K. Kaminuma and they are 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 for short-period and 1 point per second for long-period component. 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 four volumes of Non Label tape for the user. The edited tape contains tele-seismic wave forms of 114 events detected at Syowa Station and one calibration curve. The 114 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 first sheet of the gain calibration curve.

References

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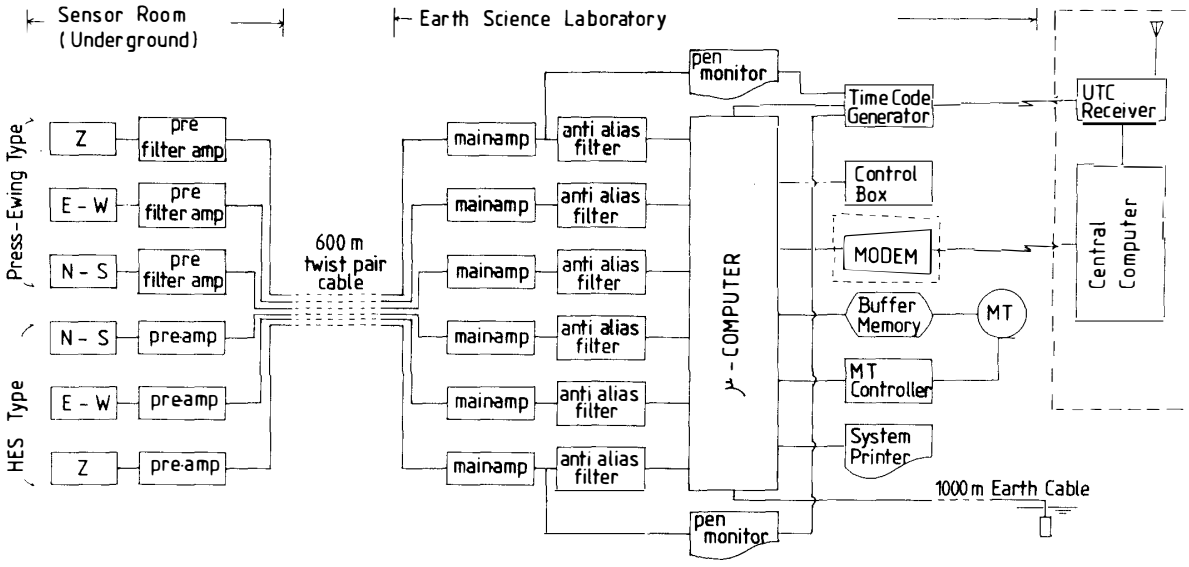


Fig. 1. The seismic observation system at Syowa Station.

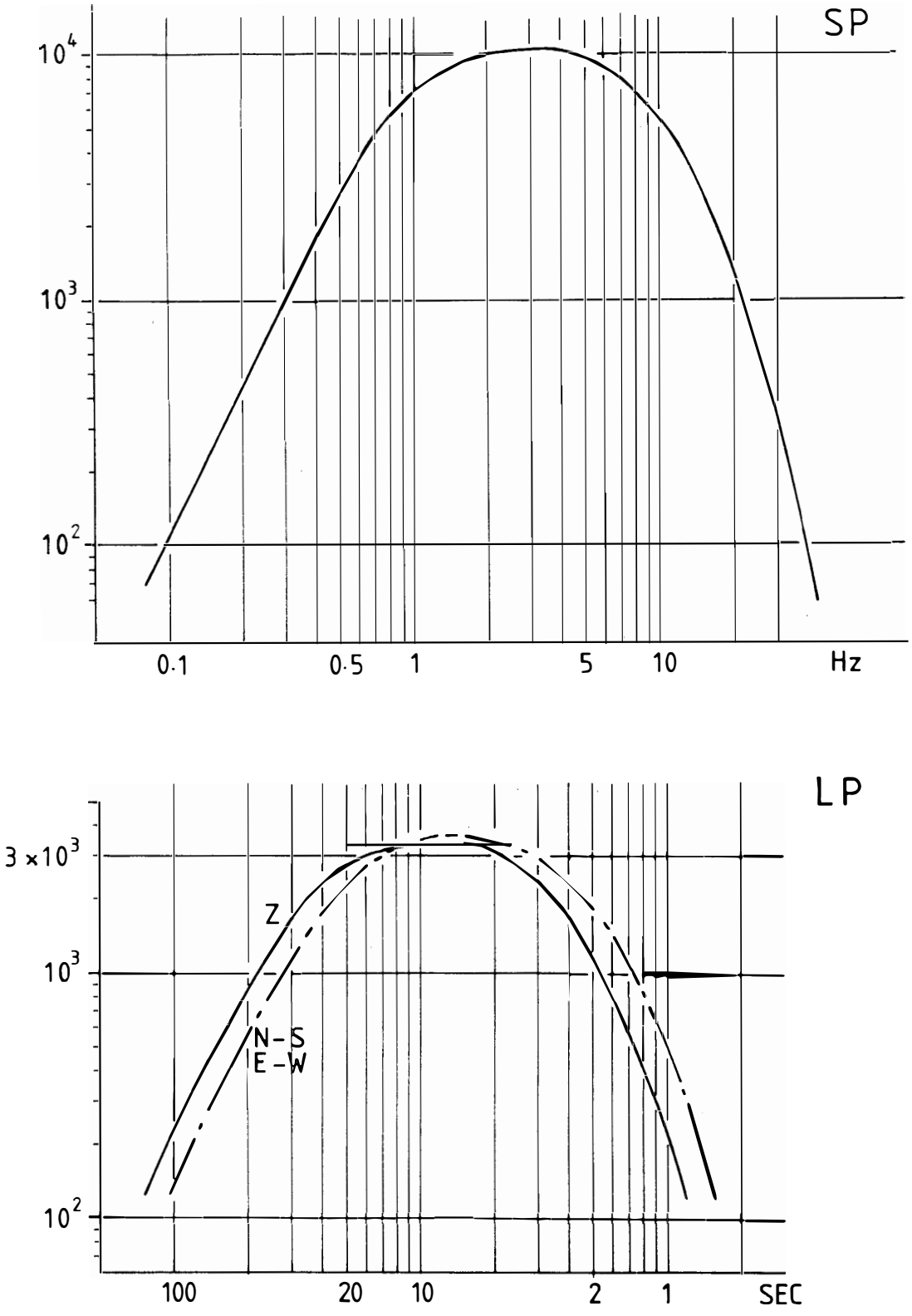


Fig. 2. Over-all frequency response of short-period and long-period seismographs.

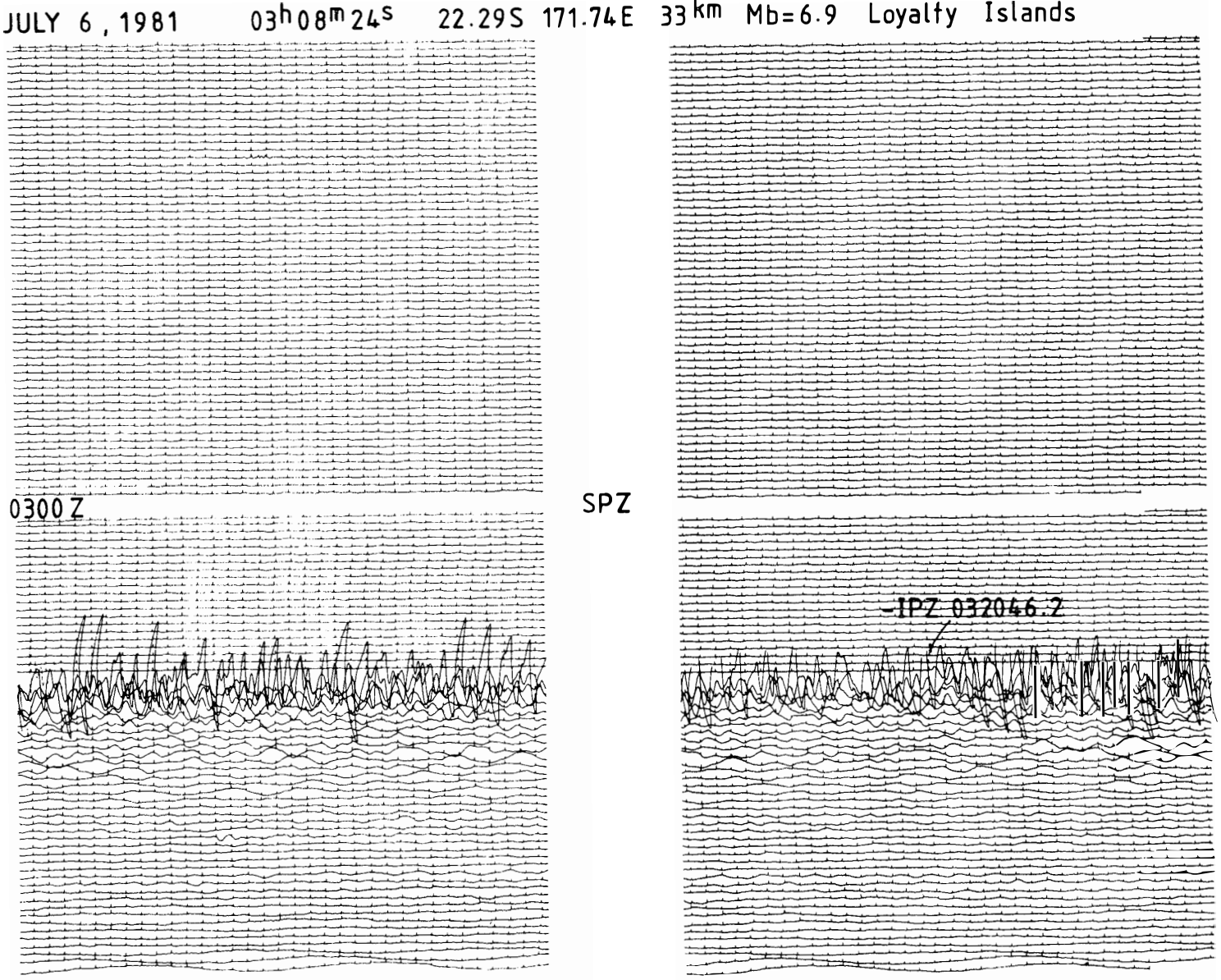


Fig. 3-1. Example of the teleseismic event.

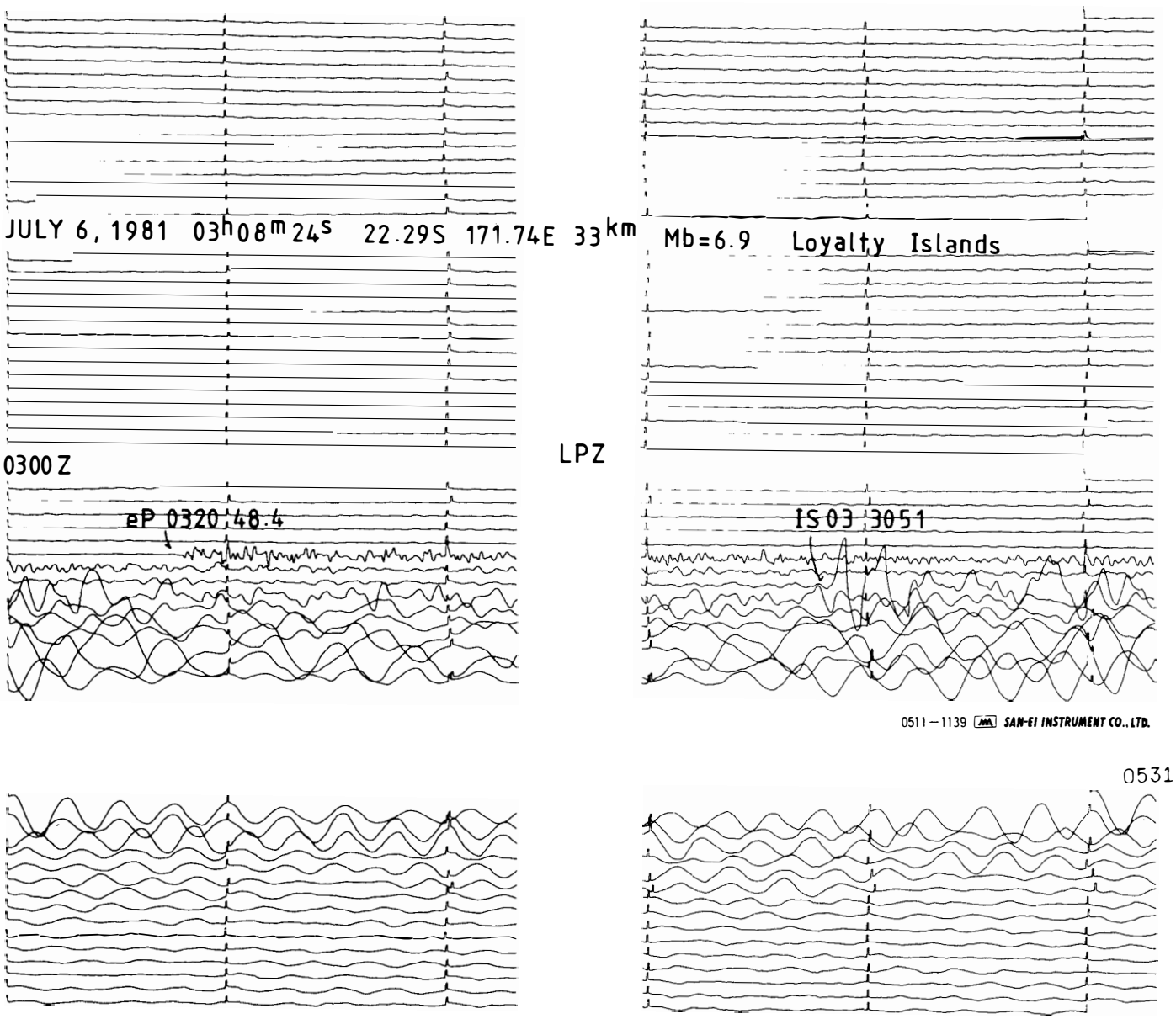


Fig. 3-2. Example of the long-period seismogram.

```
* SYSTEM CHECK *
  CHECK TIME = 113. 14. 44. 28.
  CHECK LEVEL  WES  990 NOISE LEVEL  WES  804 804 804
               HES  990              HES  822 821 822
               L.P  9A1              L.P  819 813 804
  PIO-1   OK    PIO-2   OK    MAIN   OK    HOST   OK
* CHECK END *

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 113. 22. 53. 27.  NOISE LEVEL =  81F  DETECT LEVEL =  898

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 114. 02. 14. 40.  NOISE LEVEL =  818  DETECT LEVEL =  878

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 114. 03. 36. 35.  NOISE LEVEL =  819  DETECT LEVEL =  881

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 114. 15. 16. 59.  NOISE LEVEL =  819  DETECT LEVEL =  87D


* SYSTEM CHECK *
  CHECK TIME = 114. 15. 44. 28.
  CHECK LEVEL  WES  990 NOISE LEVEL  WES  804 804 804
               HES  99E              HES  815 818 819
               L.P  9A2              L.P  819 810 804
  PIO-1   OK    PIO-2   OK    MAIN   OK    HOST   OK
* CHECK END *

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 3
  TIME = 114. 22. 03. 05.  NOISE LEVEL =  820  DETECT LEVEL =  8AA

* SHORT PERIOD *  DETECTED AT TIME = 114. 22. 03. 05.
  SEPARATE EVENT NO. = 00028   TOTAL EVENT NO. = 00030
  NOISE LEVEL =  820  DETECT LEVEL =  8AA
  SAMPLE NO. =    10  LOGGING TIME =  1800SEC

 WARNING ! NOISE LEVEL.LT.804 !

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 115. 01. 32. 49.  NOISE LEVEL =  812  DETECT LEVEL =  861

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 115. 04. 57. 35.  NOISE LEVEL =  813  DETECT LEVEL =  85F

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 3
  TIME = 115. 05. 48. 15.  NOISE LEVEL =  81B  DETECT LEVEL =  88D

* SHORT PERIOD *  DETECTED AT TIME = 115. 05. 48. 16.
  SEPARATE EVENT NO. = 00029   TOTAL EVENT NO. = 00031
  NOISE LEVEL =  81B  DETECT LEVEL =  88D
  SAMPLE NO. =    10  LOGGING TIME =  1200SEC

 WARNING ! NOISE LEVEL.LT.804 !

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 115. 09. 18. 57.  NOISE LEVEL =  812  DETECT LEVEL =  85B


* SYSTEM CHECK *
  CHECK TIME = 115. 16. 44. 28.
  CHECK LEVEL  WES  990 NOISE LEVEL  WES  804 804 804
               HES  99E              HES  81C 814 81A
               L.P  9A1              L.P  818 80C 804
  PIO-1   OK    PIO-2   OK    MAIN   OK    HOST   OK
* CHECK END *

* SHORT PERIOD *  TRIGGER ON AT CHANNEL = 2
  TIME = 115. 21. 31. 06.  NOISE LEVEL =  814  DETECT LEVEL =  867
```

Fig. 4. Message output from the tele-typewriter.

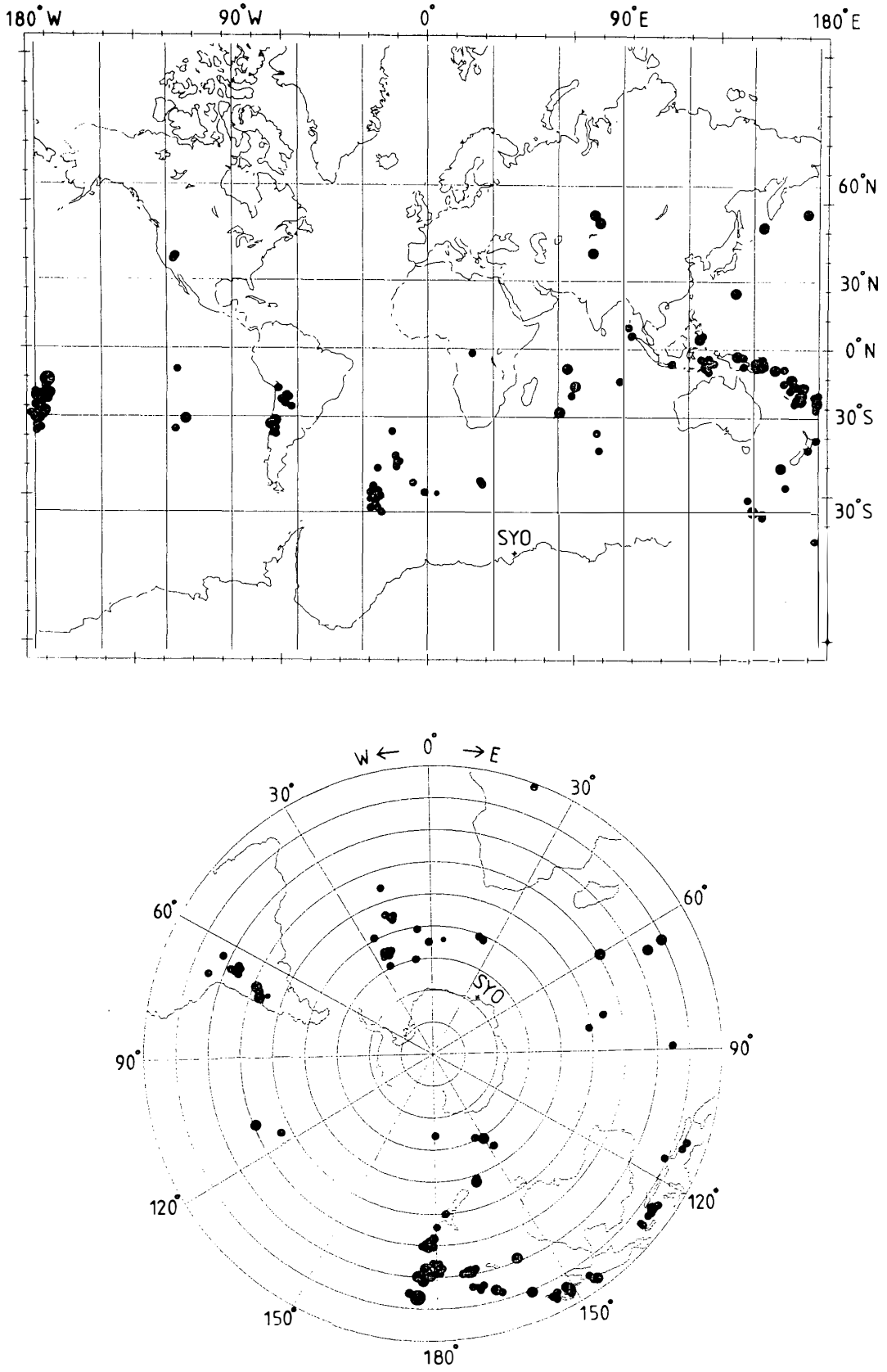


Fig. 5. Epicenters of the 114 events.

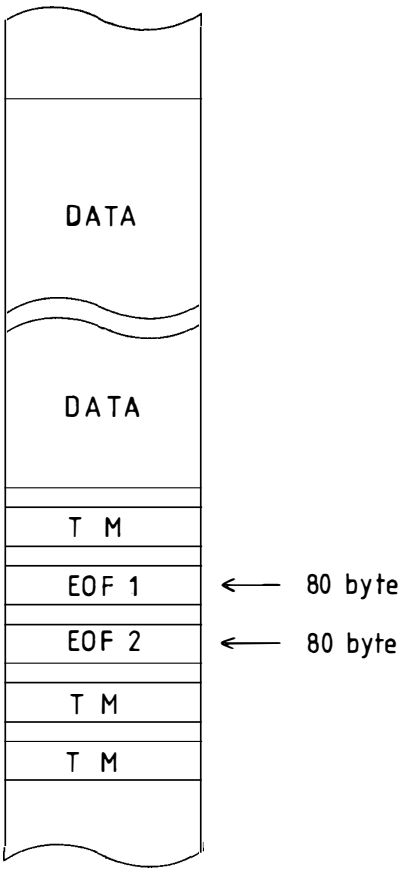


Fig. 6-1. Volume constitution.

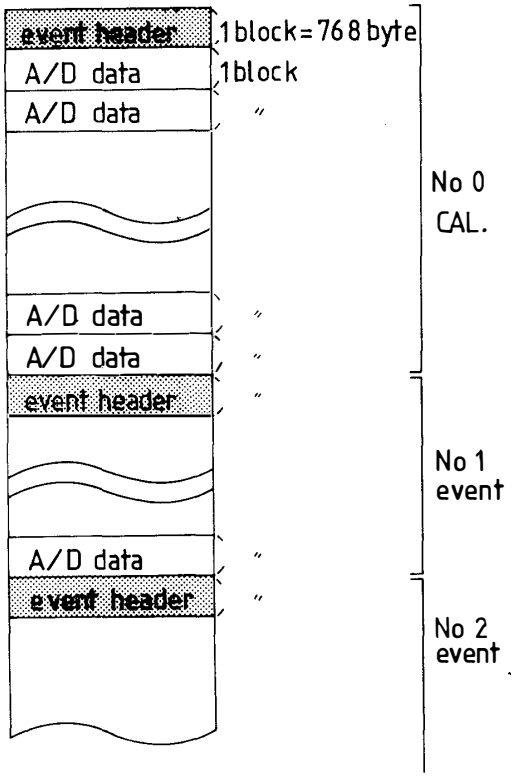
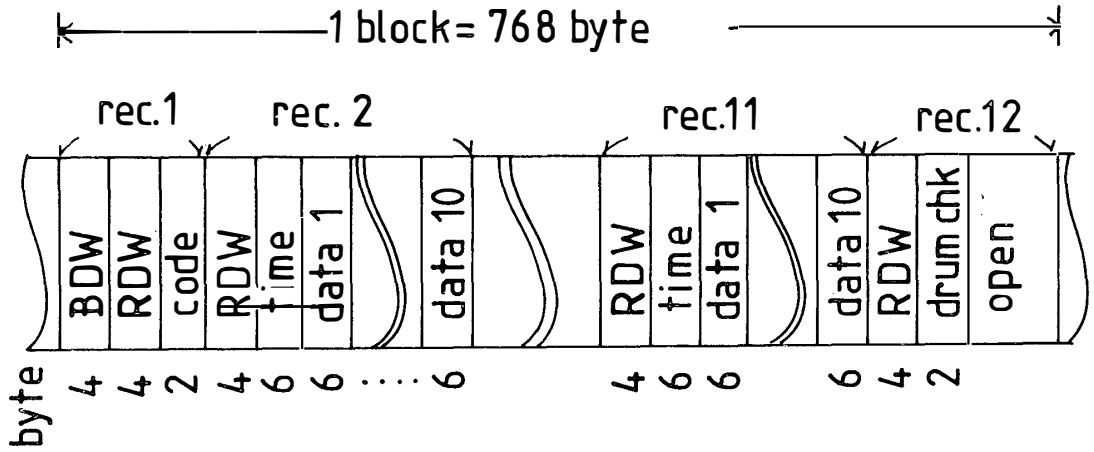


Fig. 6-2. Data constitution.

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

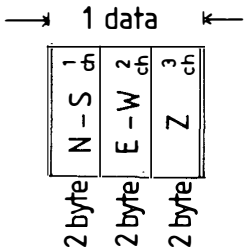
Fig. 6-3. Header of the event.



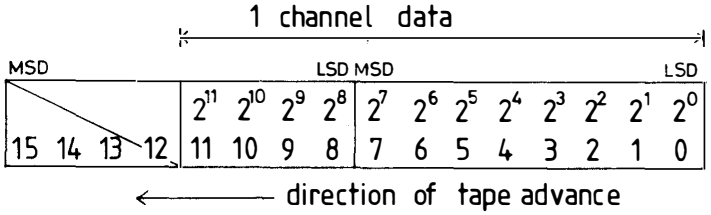
record	number	name	position	length	content
	1	BDW	0-1 2-3	2 2	byte number $(00)_{16}$
1	2	RDW	4-5 6-7	2 2	byte number $(00)_{16}$
	3	code	8-9	2	'HE'
2	4	RDW	10-11 12-13	2 2	see no. 2
	5	time	14-19	6	see Fig. 6-6
	6	data 1	20-25	6	see Fig. 6-5
	⋮				
	15	data 10	74-79	6	see Fig. 6-5
⋮					
11	112	RDW	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 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	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 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 time data.

Table 1. Read-out data.

DATE		PHASE	ARRIVAL TIME H	M	S
JAN	02	EPZ	08	36	30.4
		EPZ	15	58	06.0
	03	-IPZ	21	05	14.3
	05	+IPZ	06	17	28.8
	07	-IPZ	16	28	30.6
		+EPZ	16	38	21.4
		EPZ	20	41	21.2
	09	EPZ	23	44	13.0
	11	EPZ	15	21	56.0
		-EPZ	17	37	57.0
	12	+IPZ	15	00	05.9
	14	EPZ	11	01	29.0
	23	+IPZ	05	17	38.8
		+IPZ	22	02	29.6
	25	EPZ	10	51	34.9
	28	EPZ	19	34	19.7
	30	+IPZ	05	24	41.2
		-IPZ	09	12	33.5
FEB	01	-EPZ	04	47	06.7
		EPZ	13	37	05.7
		-IPZ	23	03	12.8
	04	EXZ	16	03	55.6
	06	+EPZ	07	34	43.1
		EPZ	07	37	34.1
		EXZ	20	25	56.1
	07	EPZ	14	42	06.2
	09	EXZ	09	48	28.9
		EXZ	10	08	53.9
	12	IPZ	11	47	47.9
	13	EPZ	16	40	05.7
	14	EPZ	07	44	64.6
		EPZ	07	08	36.2
		-ISZ	07	19	19.0
		EPZ	09	57	38.9
		+ISZ	10	00	31.8
		EXZ	22	57	02.1
	15	EPZ	07	22	11.8
		EPZ	17	42	23.7
	16	-IPZ	06	46	02.6
		-ISZ	06	58	59.6

DATE		PHASE	ARRIVAL TIME H	M	S
FEB	16	EPZ	07	02	26.5
		+EPZ	07	20	58.7
		+EPZ	07	24	58.0
		EPZ	09	56	39.3
		EPZ	11	51	08.2
		EPZ	14	51	11.6
		ESZ	14	53	51.3
		EPZ	16	29	25.2
	17	EPZ	00	30	46.6
		EXZ	01	45	09.5
		EXZ	15	30	38.0
		EXZ	17	01	46.6
	18	EPZ	00	32	45.9
		EPZ	12	25	14.1
		EXZ	22	17	10.0
	19	EXZ	08	35	23.0
		EPZ	18	59	57.5
		EPZ	19	18	05.8
		EPZ	20	56	27.7
		EPZ	21	59	00.1
		EPZ	23	18	29.5
	20	EPZ	09	52	25.6
		EPZ	11	05	57.6
	22	+EPZ	19	28	34.0
	23	EPZ	03	11	13.6
		EXZ	11	49	02.6
		-ISZ	16	25	16.8
		EPZ	19	07	03.4
		+ISZ	19	07	41.8
		+EPZ	19	31	28.3
	24	EXZ	06	05	02.7
		+IXZ	16	29	58.7
		-EXZ	21	12	09.1
		EPZ	22	42	07.4
		+EPZ	23	19	30.5
	26	EPZ	02	39	06.6
		-EPZ	06	24	10.3
		+IPZ	14	59	03.6
		-EPZ	17	31	03.4
	28	EPZ	09	30	30.1

DATE		PHASE	ARRIVAL TIME H	M	S
FEB	28	EPZ	10	39	31.7
MAR	02	+IPZ	21	31	10.0
	03	+IPZ	09	54	00.1
		EPZ	10	06	37.0
		EPZ	10	19	07.8
		EPZ	10	31	37.7
		EPZ	10	46	59.4
		EPZ	11	00	37.4
		EPZ	11	11	09.9
		IPZ	11	15	36.3
		EPZ	11	27	00.6
		EPZ	11	31	15.0
		EPZ	12	00	19.8
		EPZ	14	15	42.6
		EXZ	14	16	12.8
	04	+IPZ	10	47	56.5
		EPZ	13	09	34.0
		EPZ	18	58	33.1
	05	-IPZ	07	54	48.4
		-EXZ	07	58	43.0
		-IPZ	13	04	36.3
		EPZ	13	47	23.3
	06	+EPZ	12	14	18.8
	07	+EPZ	08	07	33.3
		EPZ	10	31	03.1
		EPZ	10	43	29.5
		EPZ	10	57	02.6
		EPZ	11	13	34.0
		EPZ	11	41	12.6
		EPZ	12	15	07.8
		+IPZ	23	41	59.3
	08	EPZ	04	07	01.8
		EPZ	11	42	35.8
		EPZ	22	00	30.6
		EPZ	22	33	29.6
	09	-IPZ	07	57	44.0
		EPZ	09	47	19.8
		EPZ	10	16	30.4
		EPZ	11	13	03.8
		EPZ	11	41	43.2

DATE		PHASE	ARRIVAL TIME H	M	S
MAR	09	EPZ	15	08	04.2
		EPZ	23	16	31.4
	10	EPZ	00	29	03.0
		EPZ	01	54	07.7
		EPZ	02	04	12.5
		+IPZ	08	01	12.2
		EPZ	12	15	41.0
		EPZ	12	31	27.1
		EPZ	20	05	06.6
		EPZ	20	22	44.9
		EPZ	20	40	20.4
		EPZ	21	20	26.0
		EPZ	21	31	49.2
		EPZ	22	26	02.6
		EPZ	22	38	43.9
		EPZ	23	09	49.9
		EPZ	23	20	29.9
	11	EPZ	00	07	12.0
		EPZ	00	18	11.5
		EPZ	01	02	39.8
		EPZ	01	18	08.7
		EPZ	01	45	40.4
		EPZ	02	06	05.2
		EPZ	02	20	02.0
		EPZ	02	35	57.2
		+EPZ	02	55	23.2
		EPZ	04	47	41.7
		ISZ	04	50	49.4
		EXZ	07	29	38.8
		EPZ	11	57	03.6
	12	+IPZ	10	55	24.6
		EPZ	16	59	19.0
		-IPZ	17	29	43.5
		-IPZ	19	11	40.7
		LP+IPZ	19	11	40.6
		+IPZ	19	32	47.0
		EPZ	20	23	22.6
		EPZ	22	41	14.1
	13	EPZ	00	28	15.4
		EPZ	00	46	15.4

DATE		PHASE	ARRIVAL TIME H	M	S
MAR	13	EPZ	01	50	29.5
		EPZ	02	06	48.4
		EPZ	02	25	08.0
		EPZ	03	03	38.5
		EPZ	03	21	10.5
	14	EPZ	23	02	56.0
		EPZ	23	07	58.0
	15	-EPZ	00	16	15.8
		EPZ	05	35	13.6
		EPZ	05	50	52.2
		EPZ	07	11	42.7
		EPZ	08	35	07.9
		EPZ	10	00	36.3
		EPZ	10	19	51.1
		EPZ	10	33	38.6
		EPZ	10	54	39.0
		EPZ	14	56	28.3
		EPZ	22	42	24.6
	16	EPZ	01	37	14.9
		-IPZ	12	38	57.5
		+IPZ	13	51	16.4
		-EXZ	14	00	36.6
		-EXZ	14	26	01.8
		-EPZ	18	08	35.5
		EPZ	01	37	14.9
	17	-IPZ	00	19	17.7
		+EPZ	05	25	24.8
		IPZ	12	26	20.7
		EXZ	14	25	28.1
	18	+IPZ	02	39	44.0
	20	-IPZ	05	25	51.3
		EPZ	17	06	28.8
		EPZ	17	36	09.5
		-EPZ	23	44	37.8
	21	-EPZ	01	13	56.6
		+EPZ	03	25	08.6
		EPZ	04	29	30.5
		-IPZ	12	34	39.4
		EPZ	16	16	59.1
		EPZ	20	41	06.7

DATE		PHASE	ARRIVAL TIME H	M	S
MAR	21	-IPZ	22	26	34.8
		-IPZ	23	05	18.5
		-ISZ	23	06	18.0
		+EXZ	23	15	27.4
	22	+EPZ	09	30	03.9
		EPZ	17	18	19.3
		EPZ	21	19	16.0
	23	-IPZ	19	38	54.3
		LP-IPZ	19	38	53.8
		-IXZ	19	39	07.0
		-EPZ	21	16	13.4
		-IPZ	23	14	08.9
	28	-EPZ	05	02	47.5
		EPZ	06	27	42.4
		-EPZ	06	44	16.1
		EPZ	23	55	22.9
	29	-EPZ	01	10	03.0
		EPZ	01	45	47.0
		-IPZ	04	22	47.4
		EPZ	05	45	17.4
		-EPZ	08	49	21.5
		EPZ	08	56	24.2
		EPZ	19	44	52.0
	30	-EPZ	00	40	11.5
		EPZ	00	48	09.1
		EPZ	10	34	54.3
		IPZ	20	55	36.2
	31	EPZ	05	31	52.2
		EPZ	05	41	32.3
		-IXZ	05	44	10.0
		EPZ	06	40	55.8
		+EPZ	12	30	30.1
		EPZ	20	38	04.0
APR	01	EPZ	05	02	09.1
		-EPZ	05	10	35.9
		-IPZ	18	13	49.1
		LP-IPZ	18	13	49.4
		LP+ISZ	18	15	42.6
		+ISZ	18	15	42.6
		LP+EXZ	18	41	42.6

DATE		PHASE	ARRIVAL TIME H	M	S
APR	01	EXZ	18	22	06.2
		IPZ	21	29	05.4
		+IPZ	22	00	57.8
	02	EPZ	04	28	21.6
		EPZ	13	54	04.1
	03	EPZ	07	36	41.0
		+EPZ	15	02	30.6
		-EPZ	13	53	43.1
		EPZ	19	48	12.3
	04	+EPZ	00	33	28.1
		EPZ	03	52	24.2
		EXZ	06	27	15.6
		EPZ	08	44	09.0
		+EXZ	18	21	14.8
		+EXZ	23	43	01.2
	05	-IPZ	03	30	22.1
		IXZ	03	30	00.1
		+IPZ	10	38	36.0
		EPZ	13	32	20.7
		-EPZ	18	01	38.7
		+EPZ	21	07	59.5
		+IPZ	21	55	53.0
		+IXZ	21	56	24.6
	06	EPZ	03	39	18.5
		+IPZ	14	44	28.6
		EPZ	15	10	02.2
		+IPZ	21	58	15.4
	07	EPZ	00	07	31.1
		-IPZ	01	38	05.9
		EPZ	04	13	27.9
		-IPZ	18	16	19.4
	08	EPZ	11	12	04.8
		EPZ	14	06	31.2
		EPZ	23	55	14.6
	09	-EPZ	00	25	23.6
		-IPZ	05	01	19.6
		+IPZ	08	44	58.9
		LP-EPZ	08	45	02.6
		LP+IPPZ	08	46	48.6
		LP-ISZ	08	51	28.2

DATE		PHASE	ARRIVAL TIME H	M	S
APR	09	LP+ILRZ	08	57	47.4
		EPZ	15	19	48.6
		EPZ	15	28	32.0
		EPZ	23	19	40.6
	10	EPZ	00	36	46.5
		EPZ	06	56	30.7
		EXZ	07	00	15.8
		EPZ	16	32	05.7
		-EPZ	17	00	47.1
	11	EPZ	02	43	51.4
		EPZ	13	43	04.8
		EPZ	19	59	56.8
	12	EPZ	07	27	55.1
		EPZ	14	36	14.7
		+IPZ	23	17	12.6
	13	EPZ	00	39	14.6
		EPZ	01	27	26.1
		EPZ	04	11	17.1
		EPZ	05	48	26.4
		EPZ	08	09	35.7
		EPZ	14	14	04.5
		EPZ	15	08	07.9
		EXZ	15	52	06.6
		-EPZ	21	31	45.7
		+ESZ	21	33	04.7
	14	EPZ	04	50	01.6
		EPZ	18	37	49.6
		-IXZ	18	44	36.6
	16	LP-IPZ	11	04	47.8
		LP-ISZ	11	09	48.9
	19	EPZ	06	09	04.6
		EPZ	12	55	23.4
	20	EPZ	15	05	11.6
		EPZ	21	54	35.0
	21	EPZ	12	20	56.7
		EPZ	14	45	52.8
		EPZ	14	48	13.7
	22	+IPZ	01	36	09.0
		EPZ	02	04	08.7
		EPZ	06	55	15.1

DATE		PHASE	ARRIVAL TIME H	M	S
APR	22	-IXZ	06	55	42.8
		+EPZ	12	34	32.6
	23	-IPZ	00	43	35.7
	24	+IPZ	14	57	43.3
		+EXZ	16	00	14.6
		EPZ	22	03	02.3
		-ISZ	22	04	05.5
		-IPZ	22	27	28.4
		EPZ	22	42	28.5
		+EPZ	23	07	29.0
	25	EPZ	00	56	25.5
		EPZ	04	24	29.6
		EPZ	05	43	14.6
		-IPZ	05	48	14.5
		EPZ	20	21	38.5
		EPZ	23	34	31.7
	26	EPZ	08	57	23.6
		EPZ	21	59	35.5
		EPZ	15	06	14.3
	27	EPZ	00	44	18.9
		EPZ	03	51	33.5
		EPZ	04	19	44.7
		-IPZ	04	41	14.6
		+EPZ	06	28	21.1
		EPZ	10	21	12.8
		-IPZ	18	25	08.1
		LP+IXZ	18	28	03.4
		LP-ISZ	18	32	13.0
		EPZ	22	43	54.8
	28	-IPZ	21	26	19.8
		LP-ISZ	21	35	39.4
		-ISZ	21	35	47.6
		EPZ	23	24	05.5
	30	EPZ	18	25	24.4
		EPZ	08	31	26.7
MAY	01	EPZ	00	48	27.0
		EPZ	07	15	55.9
	02	+IPZ	00	55	16.0
		EPZ	03	07	59.6
		EPZ	05	24	12.6

DATE		PHASE	ARRIVAL TIME H	M	S
MAY	02	EPZ	16	22	30.1
		-IXZ	16	22	56.9
	03	EPZ	17	50	03.6
		EPZ	20	34	26.7
	04	EPZ	04	57	48.3
		EPZ	20	37	44.6
	05	EPZ	00	26	11.9
		EPZ	20	53	49.7
		EPZ	22	21	58.5
	06	EPZ	07	29	22.8
		EPZ	12	48	33.6
		EPZ	17	14	37.6
		+IPZ	19	43	11.6
		+IXZ	19	43	30.8
		-IPZ	21	49	47.1
	07	EPZ	00	09	33.3
		EPZ	04	18	06.6
		EPZ	09	13	11.0
		EPZ	14	06	42.0
		EPZ	19	44	11.6
		+IPZ	20	05	53.7
	08	EPZ	01	32	31.2
		+IPZ	01	49	02.7
		+IXZ	01	49	16.7
		+IPZ	01	55	16.6
		IXZ	01	55	29.9
		-IPZ	02	31	09.7
		EPZ	03	33	21.6
		EPZ	05	38	06.7
		EPZ	12	52	02.6
		EPZ	13	12	26.4
		EPZ	14	42	39.3
		EPZ	19	53	39.0
		EPZ	21	05	43.1
		EPZ	23	50	09.2
		+ISZ	23	53	32.2
	09	EPZ	09	50	50.0
		+IXZ	09	52	26.0
		-IXZ	09	52	37.6
		+IPZ	10	01	52.3

DATE		PHASE	ARRIVAL TIME H	M	S
MAY	09	EPZ	14	05	19.5
		+IPZ	16	19	06.6
		-IPZ	17	38	26.0
		-ISZ	17	38	35.2
	10	EPZ	10	51	51.2
	11	+IPZ	06	32	52.1
		EPZ	07	44	25.6
		EPZ	14	39	44.4
		EPZ	15	26	22.0
	12	EPZ	03	03	52.2
		EPZ	09	01	51.8
	13	-IPZ	01	53	01.1
		LP-ESZ	02	04	02.0
		-IPZ	12	07	13.0
		+EPZ	15	00	47.2
		EPZ	17	02	13.8
		EPZ	20	46	27.6
	14	-IPZ	06	16	38.4
		EXZ	17	58	20.8
	15	EPZ	01	47	28.0
		+IPZ	04	03	22.3
		EPZ	14	28	33.7
	16	+IPZ	00	30	07.6
		+EXZ	13	54	03.6
	17	EXZ	00	06	14.2
		EPZ	06	36	08.7
		+IPZ	09	36	52.4
		IXZ	10	58	14.3
		+EPZ	12	15	18.0
		EPZ	14	38	16.9
		IPZ	17	16	21.2
		EPZ	22	24	26.7
	18	+IPZ	10	20	12.6
		EPZ	10	55	14.1
		EPZ	13	58	44.2
		EPZ	14	22	04.8
	19	EPZ	16	18	59.3
		+IPZ	17	24	43.0
		EPZ	21	13	08.9
	20	-EPZ	05	54	52.1

DATE		PHASE	ARRIVAL TIME H	M	S
MAY	20	-EPZ	23	26	59.1
	22	-IPZ	03	07	51.7
		-IPZ	22	24	45.3
	23	-EPZ	09	54	00.8
	25	EPZ	05	34	49.0
		IXZ	05	38	46.0
		IXZ	05	42	41.5
		IRZ	05	50	17.5
		+EPZ	10	54	01.4
	26	-EPZ	07	01	06.2
		EPZ	19	28	12.6
		EPZ	22	09	31.0
	27	-IPZ	01	56	38.9
		-IPZ	08	15	12.8
		+EPZ	08	50	57.3
		EXZ	10	00	05.0
		EXZ	16	52	30.0
	28	+IPZ	16	22	17.4
		+IPZ	22	32	59.2
	29	EPZ	12	38	27.1
		EPZ	19	31	57.4
	30	EPZ	01	31	18.3
		EPZ	09	56	51.1
		EPZ	11	22	30.6
	31	-IPZ	09	00	16.3
JUNE	01	-EPZ	00	21	13.4
		-IPZ	04	31	40.4
		+EPZ	13	52	25.5
		-IXZ	13	53	56.0
		EPZ	18	09	17.3
		-IPZ	20	01	28.5
	02	EPZ	21	01	15.0
		EPZ	23	38	34.5
	03	-IPZ	05	56	05.7
		EPZ	06	51	49.9
		+EPZ	19	46	07.2
		-IXZ	19	48	28.8
	04	EPZ	02	52	43.0
		EPZ	03	29	48.8
		+IPZ	18	06	15.7

DATE		PHASE	ARRIVAL TIME H	M	S
JUNE	04	EPZ	20	55	54.9
	05	-IPZ	07	21	41.9
		EXZ	22	19	44.4
	06	EXZ	01	07	22.0
		EPZ	05	17	25.0
		EPZ	14	33	09.6
		+IPZ	18	19	39.4
	07	EPZ	03	19	39.8
		EPZ	21	58	32.5
	08	+IPZ	12	58	51.4
		LP+IPZ	12	58	51.5
	09	-IPZ	00	40	52.0
		EPZ	00	58	13.6
		-IPZ	01	16	25.8
		EPZ	14	11	44.6
		+IPZ	19	09	42.6
	10	EPZ	01	17	17.7
		EPZ	01	29	23.0
	11	EPZ	07	38	07.1
		LP+EPZ	07	38	08.1
		EXZ	07	42	08.0
		LP EXZ	07	46	56.0
		LP LRZ	08	12	20.1
	12	EPZ	00	44	07.2
		+IXZ	00	45	11.0
		EPZ	08	12	58.7
		-IPZ	12	09	28.1
		EPZ	18	10	32.4
		+EPZ	18	48	15.7
		-IPZ	23	42	02.6
	13	EPZ	01	33	54.3
		LP-ESZ	01	47	51.3
		-IPZ	22	43	26.4
	14	EPZ	01	07	35.4
		EPZ	01	26	52.8
		-IPZ	07	48	44.3
		-EPZ	23	26	25.0
	15	-IPZ	02	40	53.1
		-IPZ	07	28	27.2
	16	-IPZ	05	53	31.0

DATE		PHASE	ARRIVAL TIME H	M	S
JUNE	16	+EPZ	07	11	16.4
		-EPZ	16	13	26.2
		-IPZ	19	02	11.2
		LP-EPZ	19	02	11.6
		LP+EXZ	19	07	11.2
		LP-EXZ	19	11	36.0
		LP-EXZ	19	13	03.2
	17	EPZ	09	54	51.0
	18	EPZ	03	06	07.0
		EPZ	06	19	45.0
		+EPZ	23	13	14.9
	19	EPZ	01	20	37.0
		EPZ	11	58	33.8
		EXZ	17	58	15.0
	20	EPZ	00	53	02.1
		EPZ	01	02	55.7
		EPZ	04	22	26.7
		-IPZ	12	44	10.3
		LP EXZ	13	17	03.2
		EPZ	16	05	21.8
	21	EPZ	01	34	20.4
		EPZ	10	41	54.3
		EPZ	17	32	51.0
	22	+IPZ	10	33	33.3
		EPZ	12	08	07.5
		LP EXZ	12	10	02.0
		EXZ	18	06	01.8
		EPZ	19	10	05.7
	23	EPZ	21	58	28.6
	24	EPZ	05	00	47.0
		EPZ	11	48	41.2
	25	EPZ	13	36	15.1
		+IPZ	19	58	10.5
		LP ER	20	08	18.0
	26	-IPZ	01	02	38.5
		LP+LPN	01	02	38.9
	23	EPZ	12	23	57.3
	26	LP EPN	12	24	04.0
	27	+IPZ	02	26	50.6
		EPZ	13	29	51.2

DATE		PHASE	ARRIVAL TIME H	M	S
JUNE	28	+IPZ	05	46	45.3
		-EPZ	05	50	31.0
		EPZ	06	57	38.2
		EXZ	14	35	22.6
		EPZ	18	42	09.3
	30	EPZ	19	37	27.2
		EPZ	23	14	08.6
JULY	01	EPZ	04	30	12.0
		EPZ	07	44	14.0
		EPZ	09	15	20.2
	03	EPZ	13	31	28.0
		EXZ	13	32	05.6
	04	+IPZ	02	11	14.3
		-IPZ	04	52	43.3
		EPZ	06	50	11.7
		EPZ	10	31	32.6
	05	EPZ	03	49	59.6
		EPZ	10	10	11.2
		EXZ	13	48	54.4
		+IPZ	19	04	09.3
	06	+IPZ	01	15	35.4
		-IPZ	03	20	44.2
		EXZ	08	37	19.2
	09	LP-ISZ	03	30	50.2
	07	+IPZ	00	48	10.4
		-IPZ	00	49	25.8
		EXZ	15	17	49.0
		EPZ	21	23	04.7
		LP EPZ	21	26	09.0
		+IPZ	23	36	23.5
		ESZ	23	46	00.2
	08	EPZ	10	28	15.3
		EPZ	12	46	26.5
		EXZ	13	35	31.2
	09	EPZ	06	01	56.6
	10	EPZ	03	55	22.6
		EXZ	09	28	18.4
		+IPZ	18	13	11.4
	11	EPZ	18	53	08.4
	12	EPZ	18	34	01.8

DATE		PHASE	ARRIVAL TIME H	M	S
JULY	13	EPZ	13	44	25.2
	14	EPZ	07	50	08.3
		EPZ	13	51	47.5
		EPZ	14	06	54.4
		EPZ	17	26	11.2
		LP EPZ	17	26	14.6
	15	EPZ	06	14	34.3
		EPZ	06	31	14.7
		EPZ	08	11	50.6
		EPZ	08	28	30.2
		EPZ	08	40	55.8
		EPZ	09	13	24.5
		EPZ	09	33	18.7
		EPZ	10	14	01.7
		+IPZ	11	13	54.0
		-IPZ	11	18	14.5
		+IPZ	11	49	49.3
		EPZ	12	30	59.0
		EPZ	15	36	35.2
		EPZ	15	44	02.3
		EPZ	17	04	04.5
		+IPZ	22	23	31.2
		EPZ	22	33	25.4
		LP EPZ	08	11	55.0
		LP-ISZ	08	22	23.0
	16	EPZ	06	21	33.6
		EPZ	10	04	56.3
		EPZ	21	05	14.3
		EPZ	21	47	31.2
	17	-IPZ	01	10	15.1
		EPZ	10	31	53.8
	18	EPZ	09	00	47.3
		+IPZ	11	26	21.2
		EPZ	13	10	21.2
		EPZ	14	03	16.5
		EPZ	16	12	15.4
	19	EPZ	03	48	37.3
		EPZ	04	55	29.8
		EPZ	22	48	44.3
	20	EPZ	00	52	18.0

DATE		PHASE	ARRIVAL TIME H	M	S
JULY	20	EPZ	03	51	33.5
		EPZ	08	32	58.4
	21	+IPZ	11	59	36.4
	22	EXZ	14	29	05.2
		EPZ	14	31	49.4
		ISZ	14	32	12.7
		IPZ	23	25	28.6
		EPZ	23	40	49.4
	23	EPZ	01	02	38.7
		EPZ	18	08	08.3
		ESZ	18	08	22.5
	24	EPZ	19	43	15.5
	26	EPZ	07	41	27.1
		EPZ	20	34	31.4
	27	EPZ	15	45	36.9
		EPZ	20	48	17.0
	28	EPZ	02	18	07.6
		+IPZ	03	13	19.6
		+IPZ	11	30	47.1
		+EPZ	17	19	49.7
		EPZ	17	36	10.0
		LP EPZ	17	36	19.6
		LP-ESZ	17	47	09.2
		LP+LQZ	18	03	15.6
		+IPZ	18	52	09.9
	29	EPZ	00	09	38.8
		+IPZ	01	23	33.9
		LP ISZ	01	33	50.0
		EPZ	01	57	33.3
		EPZ	12	53	41.8
		EPZ	13	34	34.1
		EPZ	18	02	24.9
	30	EPZ	11	17	59.3
		EPZ	14	58	36.3
		EPZ	16	51	21.0
		EPZ	18	10	36.1
	31	EPZ	09	13	35.8
		EPZ	09	46	28.9
		EPZ	10	07	22.9
		+IPZ	16	51	10.5

DATE		PHASE	ARRIVAL TIME H	M	S
JULY	31	EPZ	19	52	36.3
		EPZ	21	26	26.6
AUG	01	+IPZ	06	23	05.5
	02	EPZ	01	01	16.3
	04	EPZ	18	35	56.3
		EPZ	22	36	32.1
	05	EPZ	22	10	27.3
	06	EPZ	08	41	08.8
		EPZ	11	44	33.4
		EPZ	18	25	11.3
	07	+EPZ	11	48	27.1
		LP-EPN	11	48	30.4
		LP-ESN	11	58	54.8
		EPZ	15	27	18.4
		+IPZ	23	35	14.3
		EPZ	23	47	00.4
	08	EPZ	12	21	36.2
	09	EPZ	02	27	30.9
		EPZ	04	36	05.6
		EPZ	12	29	46.5
	10	IPZ	01	26	12.3
		EPZ	17	05	08.3
	11	EPZ	10	31	02.2
		EPZ	15	51	06.4
	12	EPZ	03	43	52.0
		EPZ	06	22	30.0
		LP IPZ	06	22	41.2
	15	+IPZ	05	00	58.3
	16	EPZ	20	21	40.5
		+IPZ	21	59	39.4
	17	EPZ	02	30	43.4
		-IPZ	17	19	19.6
		+IPZ	19	24	36.8
	18	EPZ	05	42	09.3
	19	EPZ	01	52	22.0
		EPZ	06	16	40.0
		EPZ	23	01	13.2
	20	EPZ	05	00	02.7
	21	-IPZ	01	25	38.0
		EPZ	02	06	30.5

DATE		PHASE	ARRIVAL TIME H	M	S
AUG	21	EPZ	05	46	17.6
	23	EPZ	02	12	03.5
		EPZ	09	01	36.9
		-IPZ	12	19	55.4
		EPZ	23	53	55.4
	24	EPZ	11	40	17.9
		EPZ	16	06	23.1
		EPZ	21	35	12.5
	25	+IPZ	05	31	43.6
		+IPZ	07	29	31.0
		+ISZ	07	35	18.2
		EPZ	19	04	07.1
		EXZ	19	04	52.0
	26	+IPZ	16	45	21.5
		IXZ	16	45	36.6
	28	EPZ	01	39	47.6
	29	EPZ	12	01	02.0
		EPZ	19	50	27.4
	30	+IPZ	11	48	12.9
		EPZ	19	48	57.3
	31	EPZ	10	46	18.0
SEP	01	EPZ	07	36	13.4
		-IPZ	09	42	42.8
		LP ISZ	09	53	20.0
		EPZ	19	00	45.8
		EPZ	19	24	02.8
		-IPZ	22	36	08.0
		EPZ	23	08	35.0
		EPZ	23	14	19.0
	02	+IPZ	00	08	56.1
		+IPZ	00	29	00.0
		LP ISZ	00	33	09.1
		-IPZ	00	44	47.4
		EPZ	00	49	43.2
	03	EPZ	04	43	05.6
		LP ESZ	04	53	32.0
		EPZ	05	54	30.5
		IXZ	05	55	02.5
		LP ESZ	05	58	32.8
		IXZ	06	06	19.1

DATE		PHASE	ARRIVAL TIME H	M	S
SEP	04	-EPZ	08	33	31.0
		-IPZ	11	27	40.0
		LP+IPZ	11	37	14.0
		+IPZ	11	44	15.8
		EPZ	16	10	21.4
		EPZ	18	59	01.0
	05	EPZ	12	53	14.8
	06	-IPZ	01	19	27.8
		-IPZ	11	15	03.0
		LP+IPZ	11	25	17.2
		EPZ	16	54	39.3
	07	EPZ	15	23	14.5
		+IPZ	18	58	16.5
		IPZ	19	24	55.2
	08	+EPZ	00	09	38.9
		EPZ	08	35	23.4
	10	+IPZ	14	30	02.6
	11	-IPZ	08	45	12.5
		EXZ	08	54	44.8
	12	EPZ	01	17	52.7
		EPZ	10	21	10.7
	13	+IPZ	02	36	15.2
		EXZ	02	46	12.4
		+IPZ	06	33	27.3
		EPZ	07	30	39.3
		LP+EPZ	07	30	43.5
		EPZ	17	15	50.3
	14	EPZ	13	02	48.7
		EXZ	13	14	16.7
	15	EPZ	01	07	58.4
		+IPZ	01	09	35.0
		EPZ	05	13	43.3
		EPZ	08	52	46.1
		+IPZ	14	24	29.7
	16	+IPZ	11	53	11.4
		EPZ	12	13	12.4
		EPZ	20	11	32.2
		EPZ	22	06	28.4
	17	EPZ	03	19	38.7
		EPZ	06	31	34.0

DATE		PHASE	ARRIVAL TIME H	M	S
SEP	17	EPZ	08	35	41.9
		LP ISZ	08	46	02.4
		LP EXZ	09	05	28.0
		IPZ	12	54	41.5
		EPZ	14	29	42.4
	18	EPZ	15	29	28.5
	19	EPZ	09	08	36.5
		-IPZ	11	51	14.6
		+IPZ	11	53	31.9
		EPZ	11	56	25.6
		EPZ	12	10	19.4
		EPZ	18	12	28.9
	20	EPZ	00	02	35.8
		EXZ	04	57	33.0
		-IPZ	05	48	55.1
		+IPZ	10	12	14.5
		LP EXZ	10	22	22.0
		-IPZ	10	59	33.7
		EPZ	18	38	53.0
	22	EPZ	15	25	40.0
	24	EPZ	15	54	32.1
		EPZ	21	15	45.7
	25	+IPZ	14	42	45.0
		LP-IPZ	14	42	43.6
		LP-ESZ	14	52	26.8
		-IPZ	16	55	10.1
	26	EPZ	11	27	10.0
	27	EPZ	08	24	18.7
	28	EPZ	10	08	04.4
		EPZ	12	04	37.9
		EXZ	12	08	06.8
		-IPZ	18	07	41.0
		LP IPZ	18	07	42.8
		-ISZ	18	17	06.0
		LP ISZ	18	17	04.8
		EPZ	18	53	19.2
	29	-IPZ	10	08	03.0
		EPZ	21	32	08.7
	30	EPZ	07	17	33.8
		EPZ	12	13	08.9

DATE		PHASE	ARRIVAL TIME H M S
SEP	30	EPZ	13 18 36.2
OCT	01	+EPZ	00 10 28.4
		-IPZ	12 34 27.2
		+IPZ	16 14 20.4
		-IPZ	17 24 27.7
		+IPZ	19 19 38.4
		EPZ	19 36 11.7
	04	-IPZ	00 14 37.6
		+IPZ	10 40 47.0
	06	EXZ	08 00 07.8
	07	+IPZ	03 13 51.5
		LP IPZ	03 13 52.8
		+IPZ	03 23 16.1
		LP EXZ	03 27 17.9
		+IPZ	08 46 03.8
		+IPZ	13 29 28.4
	08	-IPZ	22 37 49.8
	09	+IPZ	12 32 42.0
	10	EPZ	00 40 19.7
		EPZ	03 23 14.9
		EPZ	05 18 12.4
		IPZ	11 01 03.2
	11	-IPZ	00 48 49.1
		+IPZ	00 57 34.2
		-EPZ	01 51 06.8
		-IPZ	10 44 20.1
		-EPZ	12 30 24.2
	12	EPZ	07 11 29.6
		EPZ	12 38 29.4
	13	EPZ	01 10 45.1
		+IPZ	03 44 28.0
		EPZ	07 29 50.4
		EXZ	07 31 11.9
		-IPZ	13 09 40.1
		-IPZ	16 12 22.5
	14	-IPZ	01 18 00.1
		-IPZ	01 25 01.1
		EPZ	03 40 15.3
		EPZ	07 15 18.9
		EPZ	22 52 16.0

DATE		PHASE	ARRIVAL TIME H M S
OCT	15	EPZ	02 06 00.0
		EPZ	10 32 05.6
		+IPZ	18 57 45.9
		EPZ	19 33 15.4
		EPZ	22 52 16.0
	16	+IPZ	03 36 31.0
		LP IPZ	03 36 31.8
		EXZ	03 45 47.6
		LP ISZ	03 45 22.2
		EXZ	03 53 07.8
		+EXZ	04 04 54.3
		EPZ	08 34 15.9
		-IPZ	14 54 08.7
		+IPZ	19 29 17.6
		EPZ	21 07 52.0
		+IPZ	21 14 14.4
		EXZ	22 02 26.1
	17	EPZ	06 18 57.5
		+IPZ	06 57 02.6
		LP+IPZ	06 57 04.1
		LP+ISZ	07 07 03.6
		+ISZ	07 07 04.6
		LP IXZ	07 08 23.5
		-IPZ	12 21 32.5
		-IPZ	14 42 43.6
		LP EPZ	14 42 46.5
		EPZ	20 16 19.6
	18	+IPZ	04 15 59.0
	19	EPZ	07 25 30.6
		EPZ	07 54 56.8
	20	EPZ	09 19 40.5
		EPZ	10 39 57.4
		-IPZ	14 03 32.6
		EXZ	14 05 52.1
		+IPZ	14 36 16.0
	21	EPZ	07 41 00.5
	22	+IPZ	03 52 52.9
		EPZ	07 46 01.0
		EPZ	08 31 46.5
		-IPZ	11 50 36.9

DATE		PHASE	ARRIVAL TIME H M S
OCT	22	EPZ	17 46 58.2
		EPZ	21 55 47.3
	23	EPZ	02 51 01.3
		EXZ	13 17 30.1
		EXZ	13 37 51.6
	24	+IPZ	05 09 32.5
	25	EPZ	03 40 12.9
		LP IXZ	03 53 02.5
		EPZ	07 19 49.2
		EPZ	13 09 04.4
	26	IPZ	06 11 21.6
		IPZ	10 02 52.2
		EPZ	16 16 49.0
		EPZ	20 06 41.5
	27	EPZ	00 51 32.4
		EPZ	01 21 23.4
		EPZ	04 07 34.4
		EPZ	08 37 57.4
		EPZ	17 17 17.1
	28	+IPZ	04 36 11.0
		LP IPZ	04 36 12.8
		EPZ	19 17 15.5
	29	EPZ	08 50 27.5
		EPZ	16 48 42.2
	30	+IPZ	07 21 43.3
		IXZ	09 24 01.2
		EPZ	10 06 19.2
		EPZ	15 03 19.8
		EPZ	10 58 50.5
		EPZ	17 45 33.5
		EPZ	18 36 31.7
		+IPZ	20 31 04.7
	31	-IPZ	04 47 50.9
		EPZ	05 04 27.5
		EPZ	07 27 12.7
		EPZ	08 29 33.5
		-IPZ	12 53 42.9
		EPZ	16 07 18.5
		EPZ	18 03 55.4
		EPZ	19 16 10.6

DATE		PHASE	ARRIVAL TIME H	M	S
NOV	01	+IPZ	01	39	20.8
		-IPZ	07	29	23.5
		EPZ	12	14	52.6
	02	EPZ	03	08	00.6
		+IPZ	03	48	53.4
		ISZ	03	51	54.2
		-IPZ	04	04	09.4
		+IPZ	10	46	25.4
		ESZ	10	49	29.0
		EPZ	12	49	37.0
		+IPZ	21	23	20.9
	03	+IPZ	14	07	27.1
	04	EPZ	06	07	05.2
		EPZ	08	29	01.4
		-IPZ	14	50	58.2
		LP-ISZ	15	01	08.1
		-IPZ	22	39	52.4
	05	-IPZ	07	35	43.6
		EPZ	10	36	50.4
		EPZ	11	06	47.6
		EPZ	12	36	21.5
	06	-IPZ	10	49	49.6
		EPZ	12	51	13.8
		EPZ	13	54	45.6
		EPZ	15	50	42.7
		EPZ	17	00	48.5
		IXZ	17	01	01.4
		LP EXZ	17	11	40.8
	07	EPZ	00	08	27.2
		EPZ	01	50	15.5
		+IPZ	03	40	38.5
		LP-IPZ	03	40	40.0
		LP-IPZ	03	49	28.0
		IRZ	03	57	05.0
		EPZ	04	08	56.7
		EPZ	09	52	11.4
		LP ESZ	09	59	53.0
		+IPZ	12	12	08.1
	08	-IPZ	13	52	16.0
		LP ISZ	14	01	16.5

DATE		PHASE	ARRIVAL TIME H	M	S
NOV	08	+IPZ	22	16	03.8
		EPZ	22	51	07.5
	09	EPZ	04	06	50.5
		EPZ	04	36	20.3
		EPZ	07	53	23.7
		-IPZ	09	33	18.4
		-IXZ	09	33	38.8
		-IPZ	17	05	00.4
		+IPZ	23	04	19.4
	10	+IPZ	05	03	14.3
	11	-IPZ	00	09	15.8
		-IPZ	08	15	30.2
		EPZ	17	13	38.3
		EPZ	18	55	25.3
		EPZ	19	11	19.5
		+IPZ	20	19	38.4
	12	EPZ	02	56	00.5
		EPZ	03	26	24.4
		IXZ	03	26	25.8
		EPZ	08	31	22.4
		+IPZ	15	19	38.5
		+IPZ	17	42	41.1
	13	EPZ	02	33	49.4
		+IPZ	13	06	18.3
		EPZ	19	59	18.6
	14	+IPZ	03	18	07.4
		EPZ	08	11	23.7
		EPZ	11	56	59.6
		EPZ	21	33	51.6
		EPZ	22	27	47.4
	15	EPZ	07	00	32.2
		IXZ	07	00	05.3
		EPZ	07	03	08.5
		EPZ	20	26	17.2
	16	+IPZ	01	32	50.4
		+IPZ	04	12	16.0
		-IPZ	05	08	02.8
		-IPZ	08	13	01.5
		EPZ	10	04	21.3
		-IPZ	14	05	36.3

DATE		PHASE	ARRIVAL TIME H	M	S
NOV	16	LP-IPZ	14	05	36.1
		+IPZ	19	54	06.6
		LP+IPZ	19	53	06.1
		-IPZ	20	50	38.8
		EPZ	22	54	30.6
	17	-IPZ	07	22	44.9
		LP-IPZ	07	22	45.1
		IXZ	07	23	03.2
		-IPZ	16	32	02.8
		LP-IPZ	16	32	02.2
	18	EPZ	06	59	03.5
		+IPZ	09	28	30.7
		LP+IPZ	09	28	30.8
		LP IRZ	09	53	28.0
		EPZ	13	41	27.7
		+IPZ	17	49	45.4
		IXZ	17	49	59.7
		LP+IPZ	17	49	46.1
		+IPZ	17	54	18.0
		LP+IPZ	17	54	18.1
		+IPZ	18	06	36.4
		LP+IPZ	18	06	36.2
		IRZ	18	19	15.0
		EPZ	18	36	59.8
		EPZ	23	19	03.5
	19	EPZ	00	22	04.2
		+IPZ	04	39	59.7
		+IPZ	05	47	25.8
		LP+IPZ	05	47	25.8
		EPZ	07	31	34.6
		EPZ	12	55	02.0
		EPZ	16	39	53.5
	20	-IPZ	06	04	12.1
		+IPZ	12	07	19.8
		+IPZ	14	06	44.2
		IPZ	14	51	54.9
		IXZ	14	51	59.8
		EPZ	16	28	14.4
		EPZ	20	00	19.2
		EPZ	21	19	02.4

DATE		PHASE	ARRIVAL TIME H	M	S
NOV	20	EPZ	22	45	22.3
	21	EPZ	02	25	21.5
		EPZ	04	04	05.5
		IPZ	19	39	38.4
		IXZ	19	39	43.2
	22	EPZ	05	47	19.5
		EPZ	11	58	03.1
		-IPZ	13	59	12.3
		LP-IPZ	13	59	12.9
		EPZ	15	19	24.0
		EPZ	22	23	20.6
	23	EPZ	10	36	39.3
		EPZ	14	09	53.2
		EPZ	16	14	29.7
		EPZ	17	44	44.9
		EPZ	19	15	15.1
	24	+IPZ	04	47	15.6
		EPZ	04	56	22.5
		-EPZ	16	55	08.8
		EPZ	19	13	04.3
		-IPZ	23	42	51.6
	25	EPZ	00	02	13.2
		-IPZ	19	14	57.3
		+IPZ	21	02	46.6
	26	-IPZ	00	02	54.6
		ESZ	00	05	03.4
		EPZ	11	44	15.4
		+IPZ	22	16	46.1
	27	EPZ	14	15	22.3
		EPZ	16	52	08.2
		+IPZ	17	42	24.0
		LP+IPZ	17	42	24.0
		+IPZ	19	51	47.9
	28	EPZ	00	21	08.9
		+IPZ	01	42	17.6
		EPZ	02	27	23.8
	29	EPZ	02	09	05.2
	28	EPZ	03	41	16.0
		+IPZ	06	17	40.7
		LP+IPZ	06	17	40.0

DATE		PHASE	ARRIVAL TIME H	M	S
NOV	28	EPZ	23	36	54.1
		EPZ	23	43	10.0
	29	+IPZ	03	54	05.0
		EPZ	13	27	53.8
		EPZ	14	33	39.2
		LP EPZ	14	33	39.0
		EPZ	14	45	04.0
		EXZ	14	45	04.8
		EPZ	15	37	24.6
		+IPZ	23	42	49.7
	30	-IPZ	15	54	28.0
		EXZ	16	22	48.5
		LP EPZ	18	41	57.4
DEC	01	EPZ	17	57	53.6
		LP-IPZ	17	57	53.8
		EXZ	18	02	50.5
		-EPZ	18	02	50.6
		EPZ	18	10	19.2
		LP-EPZ	18	10	19.0
	02	+IPZ	05	29	31.3
		LP+IPZ	05	29	31.8
		+EPZ	06	43	49.4
		LP-EPZ	06	43	49.4
		EPZ	12	43	13.6
		EPZ	15	27	11.6
		LP-EPZ	15	27	11.9
		LP-EXZ	15	29	21.4
		-IPZ	19	12	11.2
		LP+IPZ	19	12	11.0
		LP+IXZ	19	31	26.2
		EPZ	22	24	35.0
		EPZ	23	45	48.4
		LP EPZ	23	49	48.2
	03	EPZ	22	14	27.5
	04	EPZ	11	33	54.9
		EPZ	16	26	36.3
	05	EPZ	14	12	43.2
		-IPZ	18	59	25.6
		LP-IPZ	18	59	25.4
		LP EXZ	19	27	10.6

DATE		PHASE	ARRIVAL TIME H	M	S
DEC	06	EPZ	06	18	54.4
		EPZ	13	03	54.9
		LP-IPZ	13	03	55.0
		EPZ	18	40	07.0
	07	EPZ	05	52	36.5
	08	EPZ	02	15	05.6
		-IPZ	08	30	52.0
		EPZ	09	54	48.5
		EPZ	22	11	38.6
	09	EPZ	02	06	38.6
		-IPZ	03	30	03.8
		EPZ	14	54	35.9
	11	EPZ	00	58	23.0
		EPZ	07	14	43.6
		+IPZ	09	58	54.9
		LP+IPZ	09	58	55.6
		EPZ	12	44	13.0
	12	LP EPZ	05	11	24.6
		EPZ	11	06	19.7
		LP IPZ	11	06	20.6
		EPZ	11	44	10.7
		- EPZ	12	09	54.0
		EPZ	23	43	02.2
		LP EPZ	23	43	02.6
	13	+IPZ	01	52	22.6
		LP+IPZ	01	52	23.0
		EPZ	13	37	25.6
		+IPZ	20	47	28.5
		LP+IPZ	20	47	29.0
		LP-EXZ	21	12	56.6
	14	EPZ	04	05	01.3
		+IPZ	09	39	12.3
		LP+IPZ	09	39	12.2
		+IPZ	12	12	02.9
		LP+IPZ	12	12	02.6
	15	-IPZ	12	42	25.9
	16	EPZ	10	23	28.4
	19	EPZ	12	53	46.4
		EPZ	14	26	03.8
		LP EPZ	14	25	54.8

DATE		PHASE	ARRIVAL TIME H	M	S
DEC	19	LP IXZ	14	29	54.8
		EPZ	16	50	03.6
	20	+IPZ	00	41	29.3
		EPZ	02	22	17.8
		EPZ	17	38	39.6
	21	+IPZ	02	02	08.4
		EPZ	02	48	26.8
		-IPZ	10	13	11.2
		LP EPZ	23	43	48.8
	22	EPZ	05	51	35.0
		EPZ	08	05	45.6
		EPZ	21	50	24.8
		EPZ	22	46	08.4
	23	-IPZ	00	42	30.9
		LP EPZ	00	42	29.0
		LP+IXZ	00	44	14.2
		EPZ	09	11	21.9
		EPZ	17	12	21.0
		+IPZ	19	00	22.0
		LP+IPZ	19	00	22.2
	24	EPZ	04	59	19.8
		+IPZ	05	45	14.6
		LP+IPZ	05	45	14.6
		LP+IXZ	05	49	14.6
		-IPZ	06	13	28.2
		EPZ	07	38	22.6
		EPZ	07	42	55.2
		EPZ	07	59	01.1
		EPZ	08	12	02.2
		EPZ	08	48	31.2
		EPZ	09	09	52.0
		EPZ	09	11	13.2
		EPZ	09	55	28.0
		EPZ	13	14	31.3
		LP EPZ	13	14	32.2
		-IPZ	19	13	10.9
		LP EPZ	19	13	10.6
		LP EPZ	19	56	45.4
		EPZ	19	56	44.9
		LP+IPZ	22	48	21.4

DATE		PHASE	ARRIVAL TIME H	M	S
DEC	25	EPZ	00	41	19.3
		LP-IPZ	00	41	22.2
		+IPZ	09	23	59.7
		LP+IPZ	09	24	00.0
		LP+IPZ	11	00	37.4
		EPZ	11	00	43.9
	26	EPZ	00	42	40.4
		LP EPZ	03	22	45.4
		EPZ	03	22	59.1
		EPZ	06	27	36.2
		EPZ	08	29	19.8
		+IPZ	08	40	08.0
		EPZ	10	07	39.4
		-IPZ	11	27	16.9
		LP-IPZ	11	27	43.0
		LP+IPZ	17	17	25.0
		+IPZ	17	17	25.4
		+IPZ	18	05	24.1
		EPZ	19	12	21.1
		-IPZ	22	02	54.7
		-IXZ	22	13	53.1
	27	+IPZ	04	02	10.7
		-IXZ	04	12	08.1
		EPZ	05	26	22.1
		EPZ	06	34	42.5
		LP+IPZ	06	34	42.6
		EPZ	10	43	17.0
		LP EPZ	10	43	20.6
		EPZ	12	28	05.8
		LP+IPZ	17	29	30.2
		+IPZ	17	29	30.6
		LP EXZ	18	30	32.6
		-IPZ	21	36	22.6
	28	EPZ	08	09	09.2
		+IPZ	12	53	08.5
		EPZ	15	28	44.6
		EPZ	16	49	51.1
		EPZ	20	02	14.8
		EPZ	21	10	43.2
	29	EPZ	11	22	51.5

DATE		PHASE	ARRIVAL TIME H	M	S
DEC	29	+IPZ	19	18	21.2
	30	EPZ	08	47	42.0
		EPZ	12	51	19.0
		EPZ	16	10	51.4
		EPZ	19	59	56.7
		EPZ	21	47	45.4
		LP EPZ	21	47	46.2
	31	EPZ	03	10	59.4
		EPZ	05	38	39.2
		+IPZ	07	06	21.2
		EPZ	10	34	09.5
		EPZ	23	53	08.9

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 114 earthquakes.

DATA NO.	ORIGINE TIME UTC DATE	HR	MN	SEC	GEGRAPHIC COODINATES LATITUDE	LONGITUDE	REGION	DEPTH KM	MAGNITUDE MB	EPICENTRAL DISTANCE DEG.	AZIMUTH DEG.	COMMENT
1	01/23	21	54	41	29.682 S	60.839 E	ATLANTIC INDIAN RISE	10	6.1	41.306	151	
2	01/30	05	18	27	56.115 S	27.195 W	SOUTH SANDWICH IS.	128	4.1	31.425	280	
3	01/30	08	52	44	51.744 N	176.274 E	RAT ISLAND, ALEUTIAN	33	6.3	153.417	72	
4	02/01	04	35	25	11.139 S	117.314 E	SOUTH OF SUMBAWA	33	5.6	75.332	97	
5	02/06	07	23	06	21.094 S	178.934 W	FIJI ISLANDS	618	5.6	85.940	36	
6	02/20	09	40	55	33.275 S	178.908 W	SOUTH OF KERMADEC ISLANDS	33	5.6	74.122	33	
7	03/09	07	46	29	23.567 S	66.347 W	JUJUY PROVINCE, ARGENTINA	185	5.3	73.651	293	
8	03/23	19	28	10	33.661 S	71.892 W	NEAR COAST OF VALPALAISO	46	5.8	66.043	302	
9	04/01	18	03	36	27.310 S	63.320 W	SANTIAGO PROV., ARGENTINA	554	5.9	69.177	292	S

10	04/05	03 17 53	6.134 S	154.508 E	SOLOMON ISLANDS	413	5.8	93.006	65	
11	04/05	21 50 07	55.908 S	27.382 W	SOUTH SANDWICH IS.	89	5.6	31.652	280	
12	04/09	08 37 09	59.779 S	150.235 E	WEST OF MACQUARIE ISLANDS	10	6.1	42.205	45	
13	04/16	10 58 30	55.989 S	27.442 W	SOUTH SANDWICH IS.	86	5.8	31.610	280	
14	04/24	21 50 06	13.426 S	166.421 E	VANUATU ISLANDS	33	6.1	89.719	51	
15	04/25	05 36 41	22.249 S	179.413 E	SOUTH OF FIJI IS.	588	5.7	84.470	37	
16	04/27	18 17 33	57.591 S	148.079 E	WEST OF MACQUARIE ISLANDS	10	5.7	43.551	48	
17	04/28	21 14 48	23.721 S	179.981 E	SOUTH OF FIJI IS.	540	6.0	83.164	36	S
18	05/13	01 39 54	5.829 N	127.008 E	PHILIPPINE ISLANDS	145	6.0	83.164	36	
19	05/15	03 57 07	56.073 S	26.962 W	SOUTH SANDWICH IS.	100	5.5	31.375	280	
20	05/22	02 55 22	6.562 S	132.255 E	TANIMBAR ISLANDS	73	5.8	84.931	85	
21	05/25	05 25 14	48.786 S	164.357 E	OFF W. COAST OF NEW ZEALAND	33	6.1	55.659	41	LP
22	05/25	01 45 10	25.363 S	179.848 E	SOUTH OF FIJI IS.	460	5.3	81.545	36	
23	05/28	16 10 07	14.692 S	167.280 E	VANUATU ISLANDS	125	5.9	88.750	50	
24	05/28	22 18 55	5.682 S	151.409 E	NEW BRITAIN REGION	71	6.0	92.413	68	
25	05/30	09 47 17	49.152 S	164.743 E	AUCKLAND ISLANDS	33	5.7	55.407	41	
26	06/03	05 47 44	35.560 S	17.040 W	SOUTH ATANTIC RIGDE	10	5.8	45.377	253	

27	06/06 18 00 00	37.303 N	116.326 W	SOUTHERN NEVADA	0	5.5	145.545	324	N	
28	06/08 12 44 04	16.332 S	168.027 E	VANUATU ISLANDS	201	4.0?	87.389	49		
29	06/13 01 26 03	60.171 S	154.712 E	WEST OF MACQUARIE ISLANDS	10	5.8	42.961	41	LP only	
30	06/16 18 56 03	56.405 S	24.814 W	SOUTH SANDWICH IS.	53	5.6	30.354	279		
31	06/20 12 31 48	21.379 S	169.451 E	LOYALTY ISLANDS	33	5.5	82.943	46		
32	06/25 19 51 21	41.697 S	79.929 E	MID-INDIAN RISE	10	5.2	34.573	121	LP only	
33	06/26 00 51 06	30.269 S	178.986 W	KERMADEC ISLANDS	184	5.7	77.025	34		
34	06/28 05 41 57	54.549 S	5.908 E	BOUVET ISLANDS	10	4.8	21.025	244		
35	07/04 04 41 09	30.327 S	178.896 W	KERMADEC ISLANDS	172	5.3	76.986	33		
36	07/05 18 52 20	30.141 S	177.953 W	KERMADEC ISLANDS	58	5.4	77.352	33		
37	07/06 03 08 24	22.293 S	171.742 E	LOYALTY ISLANDS	33	6.9	82.648	44	S, LP	
38	07/07 23 24 48	22.920 S	179.469 W	SOUTH OF FIJI IS.	535	5.5	84.057	36		
39	07/14 17 18 46	36.818 S	78.491 E	MID-INDIAN RISE	10	5.5	84.057	126		
40	07/15 07 59 08	17.260 S	167.601 E	VANUATU ISLANDS	30	5.6	86.388	49	LP	
41	07/18 11 15 18	22.677 S	66.238 W	JUJUY PROVINCE, ARGENTINA	246	5.0	74.441	293		
42	07/21 11 47 00	15.436 S	167.473 E	VANUATU ISLANDS	143	5.8	88.093	50		
43	07/28 11 19 01	20.845 S	178.219 W	KERMADEC ISLANDS	59	5.4	86.330	35		

44	07/29	01	11	12	21.617 S	169.627 E	LOYALTY ISLANDS	40	5.7	82.760	46	
45	08/17	17	07	41	25.451 S	179.058 W	SOUTH OF FIJI IS.	383	5.5	81.686	35	
46	08/21	01	15	08	34.118 S	70.090 W	CHILE-ARGENTINA BORDER REGION	117	4.9	65.064	301	
47	08/23	12	00	26	48.718 N	157.390 E	KURIL ISLANDS	40	6.0	144.210	88	
48	08/25	05	20	21	34.613 S	179.647 W	SOUTH OF KERMADEC ISLANDS	69	5.4	72.680	33	
49	08/25	07	16	58	22.894 S	175.854 W	TONGA ISLANDS	33	5.9	84.808	32	
50	08/26	16	32	16	5.343 S	151.476 E	NEW BRITAIN REGION	74	5.7	92.753	68	
51	09/01	09	29	32	14.990 S	173.169 W	SAMOA ISLANDS	33	7.0	93.023	32	LP
52	09/03	04	29	52	6.519 N	126.268 E	MINDANAO, PHILIPPINE ISLANDS	93	5.8	94.911	95	
53	09/06	11	02	40	21.451 S	169.577 E	LOYALTY ISLANDS	28	6.0	82.906	46	S
54	09/11	08	33	40	23.308 S	179.083 E	SOUTH OF FIJI IS.	556	5.1	83.373	37	
55	09/13	02	17	18	49.882 N	78.971 E	EASTERN KAZAKH SSR	0	6.0	122.183	151	N
56	09/13	07	25	11	60.904 S	19.769 W	SOUTHWESTERN ATLANTIC OCEAN	10	5.3	25.245	281	
57	09/15	14	12	03	6.374 S	130.673 E	BANDA SEA	86	5.9	84.538	87	
58	09/16	11	48	07	55.448 S	1.493 W	BOUVET ISLANDS	10	5.1	22.774	255	
59	09/17	06	19	08	6.564 S	127.912 E	BANDA SEA	33	5.8	83.370	89	

60	09/20	10	48	17	23.124 S	66.566 W	JUJUY PROVINCE, ARGENTINA	207	5.1	74.135	293	
61	09/21	22	19	52	29.982 S	177.865 W	KERMADEC ISLANDS	33	5.5	77.523	33	
62	09/28	17	56	19	29.307 S	179.229 W	KERMADEC ISLANDS	335	5.9	77.910	34	S
63	09/29	10	00	17	62.173 S	154.022 E	BALLENY ISLANDS	10	5.5	41.042	40	
64	10/04	00	01	32	4.570 S	146.123 E	EAST PAPUA NEW GUINEA REGION	33	5.9	91.666	73	
65	10/07	03	02	13	20.752 S	178.632 W	FIJI ISLANDS REGION	620	5.8	86.334	35	S
66	10/07	13	19	20	11.443 S	66.277 E	MID-INDIAN RISE	10	6.0	60.102	149	
67	10/09	12	19	40	9.979 S	162.046 E	SOLOMON ISLANDS	50	6.0	91.729	56	
68	10/11	00	50	32	45.793 S	14.125 W	SOUTH ATLANTIC RIDGE	10	5.0	35.267	258	
69	10/11	01	44	03	45.033 S	15.280 W	SOUTH ATLANTIC RIDGE	10	4.9	36.332	258	
70	10/13	13	01	53	59.304 S	25.082 W	SOUTH SANDWICH IS.	67	5.1	28.264	283	
71	10/16	03	25	42	33.134 S	73.074 W	OFF COAST OF CENTRAL CHILE	33	6.2	66.892	303	LP
72	10/16	21	01	44	56.397 S	27.350 W	SOUTH SANDWICH IS.	122	5.7	31.260	281	S
73	10/17	06	44	55	7.101 S	128.974 E	BANDA SEA	179	6.1	83.254	88	S
74	10/17	14	35	40	45.509 S	15.180 W	SOUTH ATLANTIC RIDGE	10	5.6	35.883	258	
75	10/18	03	57	02	49.866 N	78.898 E	EASTERN KAZAKH SSR	0	6.0	122.155	151	N

76	10/28	04	34	17	31.272 S	110.649 W	EASTER ISLANDS	10	6.2	77.557	334	LP
77	10/31	03	40	41	7.448 S	128.602 E	BANDA SEA	169	5.4	82.799	88	
78	10/31	04	42	11	52.238 S	4.675 W	SOUTH ATLANTIC RIDGE	10	5.1	26.496	254	
79	11/02	03	44	55	52.944 S	27.297 E	SOUTH OF AFRICA	10	5.5	17.070	206	
80	11/02	21	10	26	12.198 N	92.855 E	ANDAMAN ISLANDS	33	5.7	89.231	128	
81	11/04	14	38	10	20.046 S	174.276 W	TONGA ISLANDS	33	6.3	87.883	32	S
82	11/05	07	23	22	21.549 S	170.147 E	LOYALTY ISLANDS	33	5.8	82.959	45	
83	11/06	10	42	57	59.713 S	26.238 W	SOUTH SANDWICH IS.	33	5.5	28.370	284	
84	11/06	16	47	49	3.558 S	143.790 E	NEAR N. COAST OF PAPUA NEW GUINEA	33	6.2	91.803	75	
85	11/07	03	29	51	32.199 S	71.336 W	NEAR COAST OF CENTRAL CHILE ?	65	6.2	67.230	301	LP
86	11/07	09	42	55	17.088 S	66.691 E	MASCARENE ISLANDS	10	6.0	54.672	148	
87	11/08	13	41	20	6.169 S	112.154 E	JAVA	633	5.8	78.125	104	
88	11/11	15	00	00	37.108 N	116.049 W	SOUTHERN NEVADA ?	0		145.545	324	
89	11/13	12	55	18	24.036 S	65.312 W	SALT PROVINCE, ARGENTINA	287	5.1	72.872	293	
90	11/15	20	18	17	65.635 S	179.899 E	BALLENY ISLANDS	10	5.5	42.738	23	LP
91	11/16	01	26	34	55.995 S	27.272 W	SOUTH SANDWICH IS.	93	5.5	31.545	280	

92	11/16	05	00	45	43.967 S	16.201 W	SOUTH ATLANTIC RIDGE	10	5.3	37.586	258	
93	11/16	19	42	38	33.886 S	179.695 W	SOUTH OF KERMADEC ISLANDS	33	5.5	73.376	33	S
94	11/18	09	17	30	2.282 S	22.813 E	ZAIRE REPUBLIC	7	5.8	67.596	198	
95	11/18	17	37	48	29.516 S	177.228 W	KERMADEC ISLANDS	33	5.6	78.099	32	
96	11/24	23	30	32	22.504 S	170.635 E	LOYALTY ISLANDS	30	5.6	82.168	45	
97	11/25	23	51	16	20.943 S	178.863 W	FIJI ISLANDS REGION	614	5.9	86.101	36	S
98	11/28	23	31	28	32.182 S	178.282 W	SOUTH OF KERMADEC IS	33	5.1	75.305	33	
99	11/30	15	42	28	17.016 S	69.848 W	PERU-BOLIVIA BORDER	133	5.4	80.910	294	
100	12/01	17	46	43	37.112 S	179.712 E	OFF E. COAST OF N.Z.	35	5.7	70.133	33	
101	12/02	05	17	20	7.413 S	128.801 E	BANDA SEA	133	5.7	82.903	88	
102	12/02	19	01	53	15.756 S	88.387 E	SOUTH INDIAN OCEAN	10	5.7	61.367	124	
103	12/06	12	50	48	6.171 S	152.045 E	NEW BRITAIN REGION	33	6.0	92.165	67	
104	12/13	01	39	14	6.387 S	154.929 E	SOLOMON ISLANDS	50	5.9	92.904	64	
105	12/14	12	05	54	56.363 S	26.481 W	SOUTH SANDWICH IS.	104	5.8	30.979	280	
106	12/23	18	47	18	15.452 S	173.754 W	TONGA ISLANDS	73	5.6	92.462	32	
107	12/24	05	33	20	29.970 S	177.610 W	KERMADEC ISLANDS	28	6.0	77.584	32	S, LP
108	12/24	13	02	39	30.238 S	177.277 W	KERMADEC ISLANDS	33	5.3	77.387	32	

109	12/24	22 36 27	30.374 S	177.362 W	KERMADEC ISLANDS	36	5.2	77.239	32	
110	12/26	11 16 03	24.017 S	66.463 W	SALTA PROVINCE, ARGENTINA	188	5.0	73.271	294	
111	12/26	17 05 32	29.934 S	177.741 W	KERMADEC ISLANDS	33	6.1	77.594	33	S, LP
112	12/27	03 43 14	49.909 N	78.873 E	EASTERN KAZAKH SSR	0	6.2	122.191	151	N
113	12/27	17 18 45	40.507 S	176.314 E	NORTH IS., N.Z.	38	5.4	66.175	35	
114	12/29	19 06 31	30.240 S	177.885 W	KERMADEC ISLANDS	61	5.5	77.269	33	

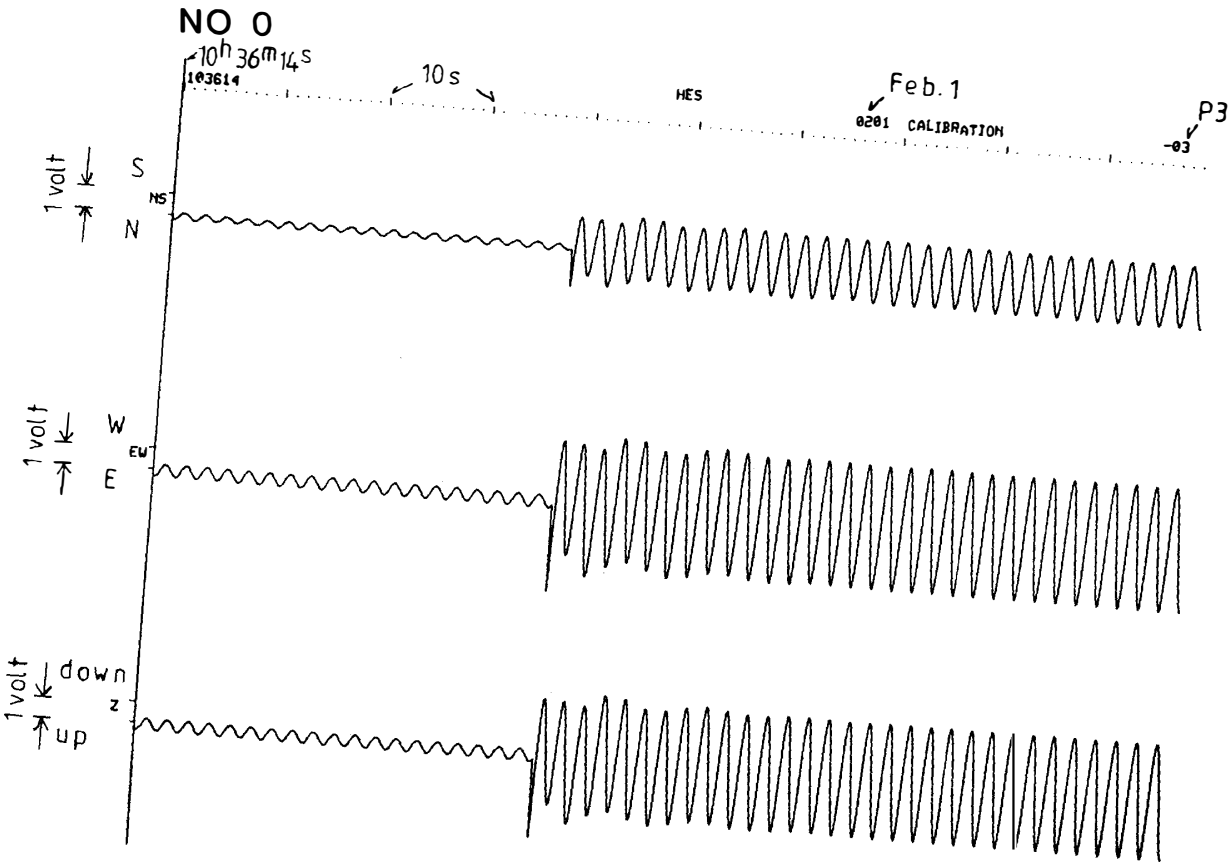
(i) The events and the epicentral data are picked from PDE reports.

(ii) N in the comment column means nuclear explosion.

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

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

(V) Azimuth indicates the anti-clockwisely measured angle from South Pole to Syowa Station to Epicenter.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10 s
HES
Feb. 1
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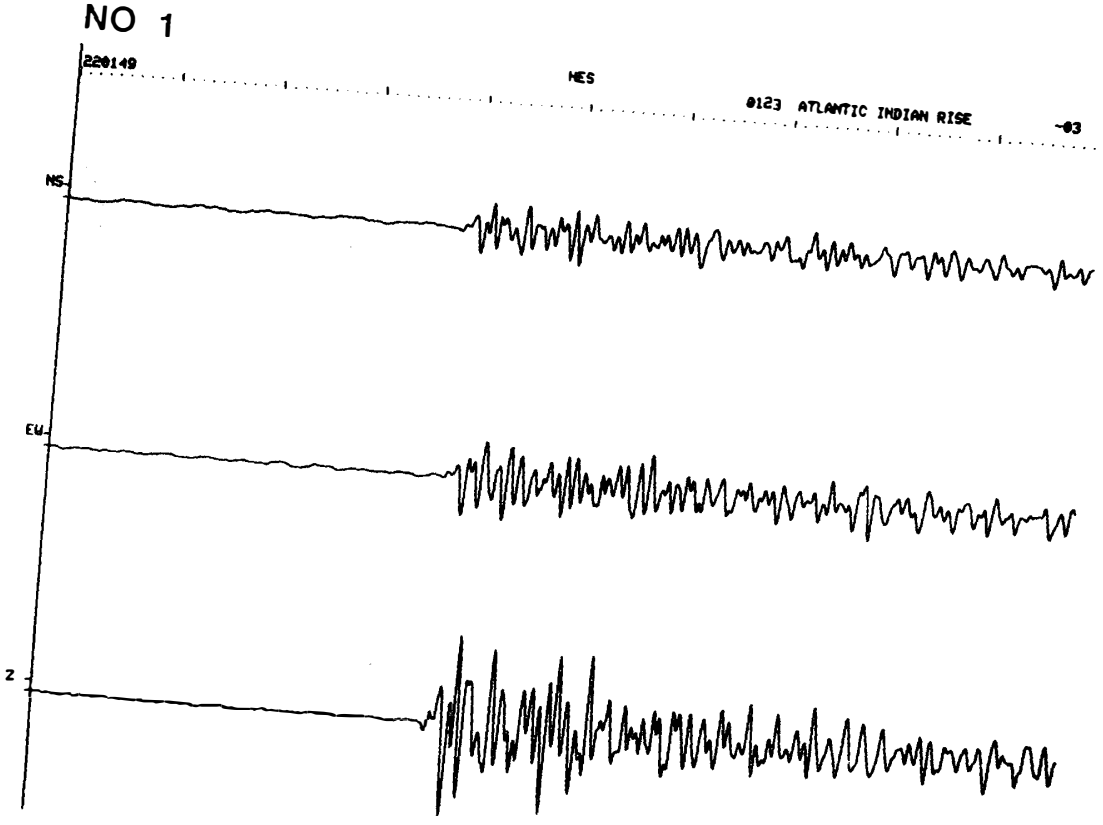
P3
-03
1 volt
S
N
NS
1 volt
W
E
EW
1 volt
down
up
Z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-03
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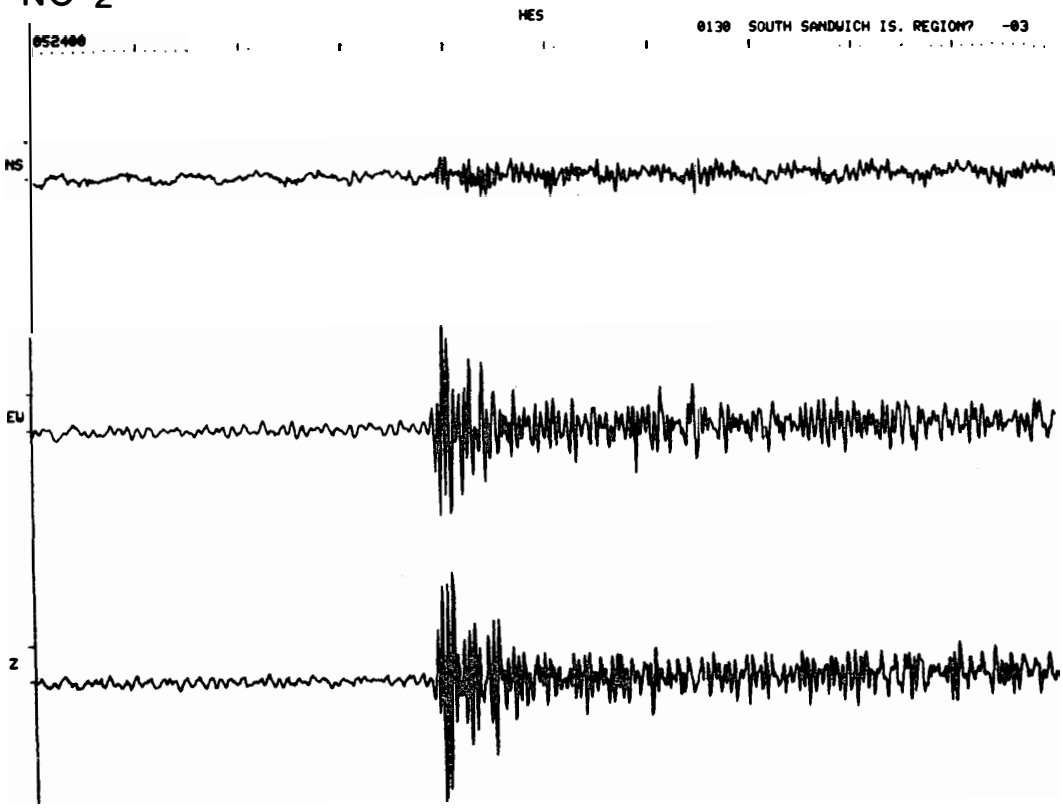
NO 2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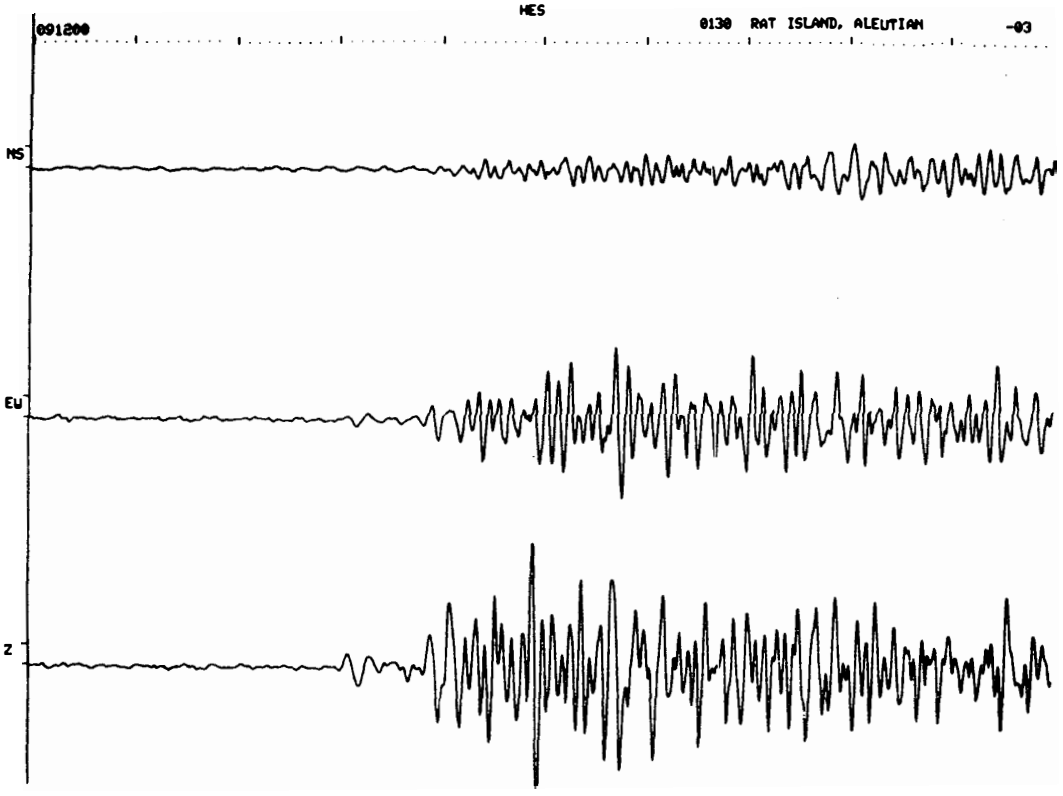
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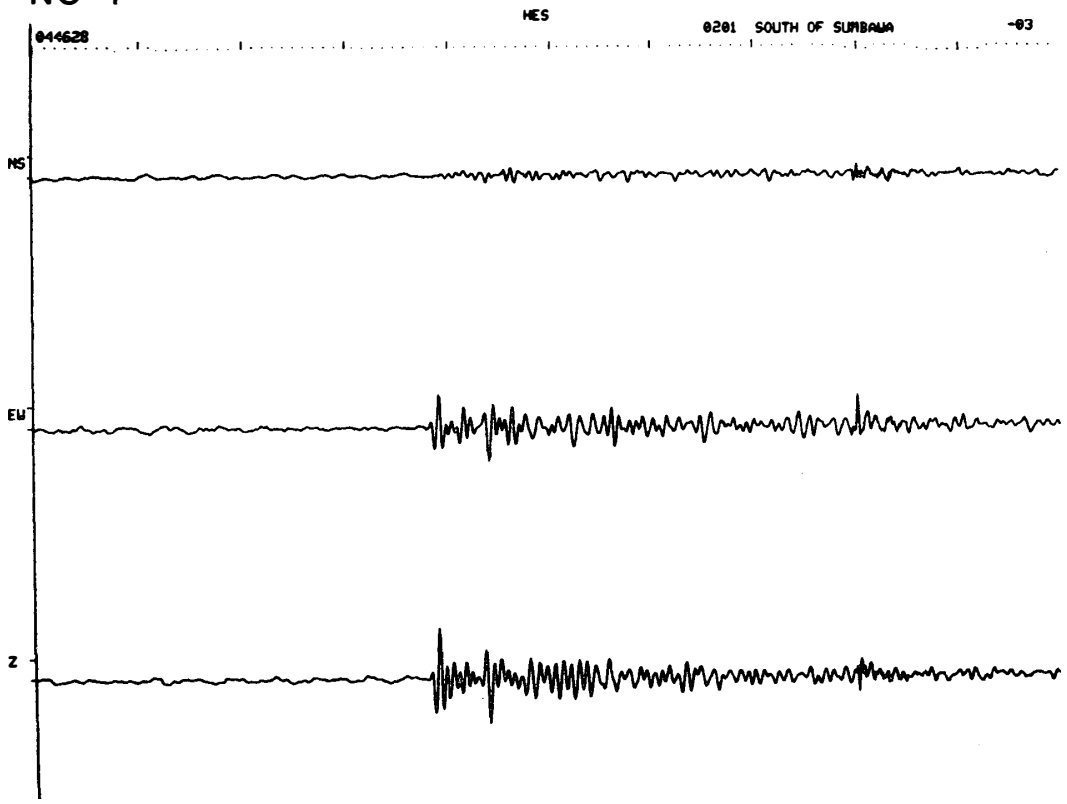
NO 4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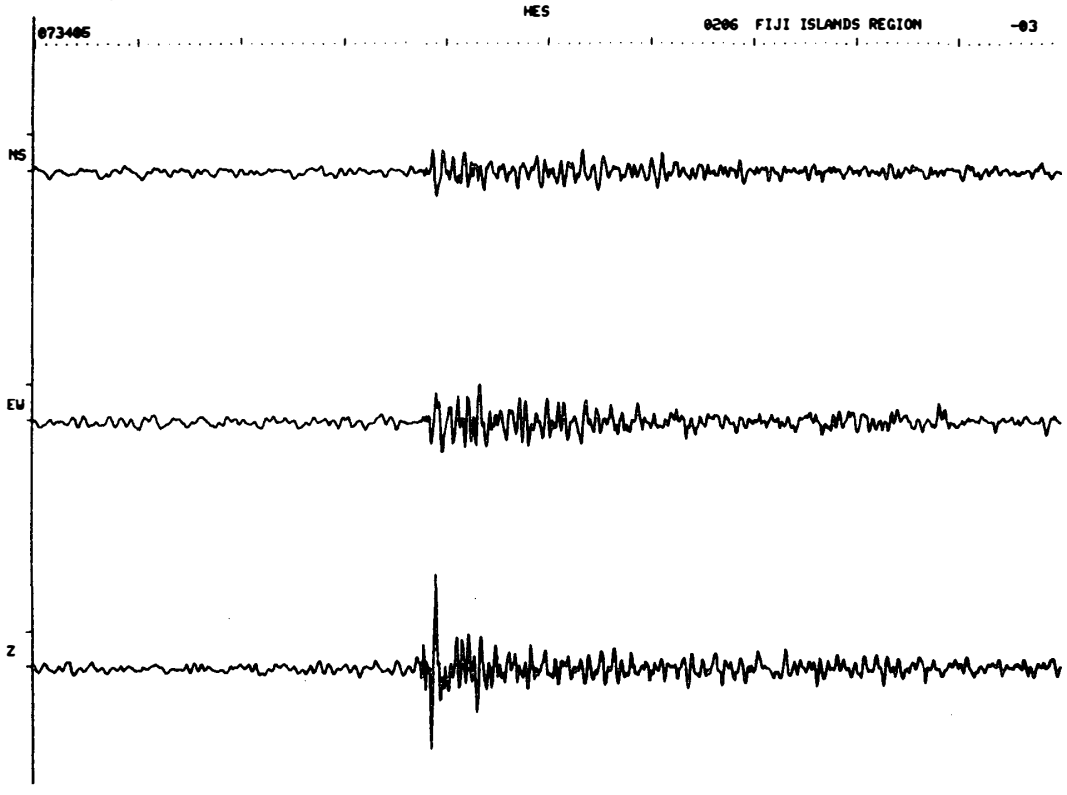
Z

NO 5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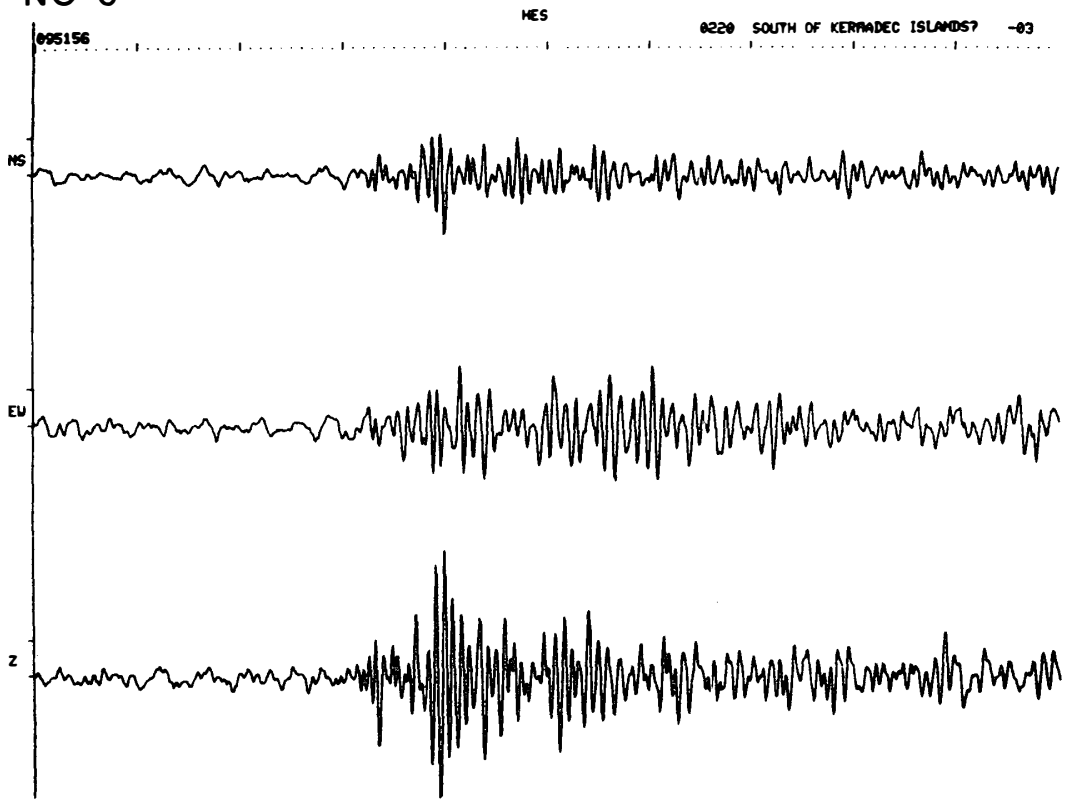
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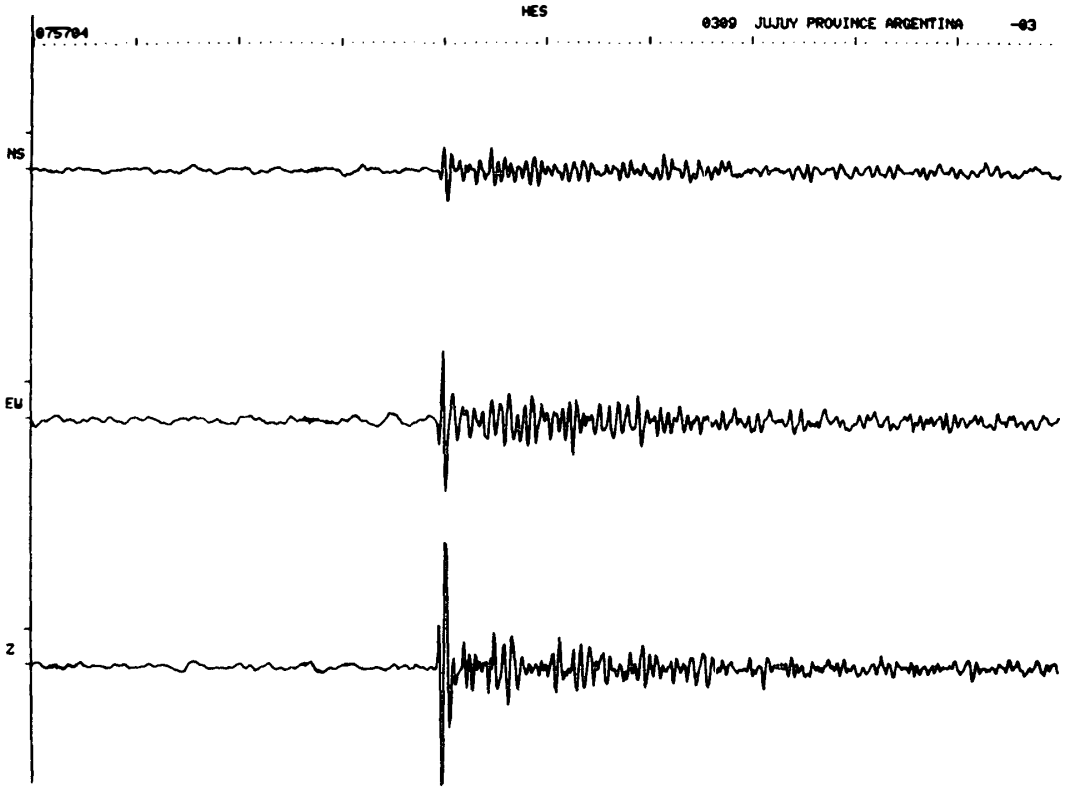
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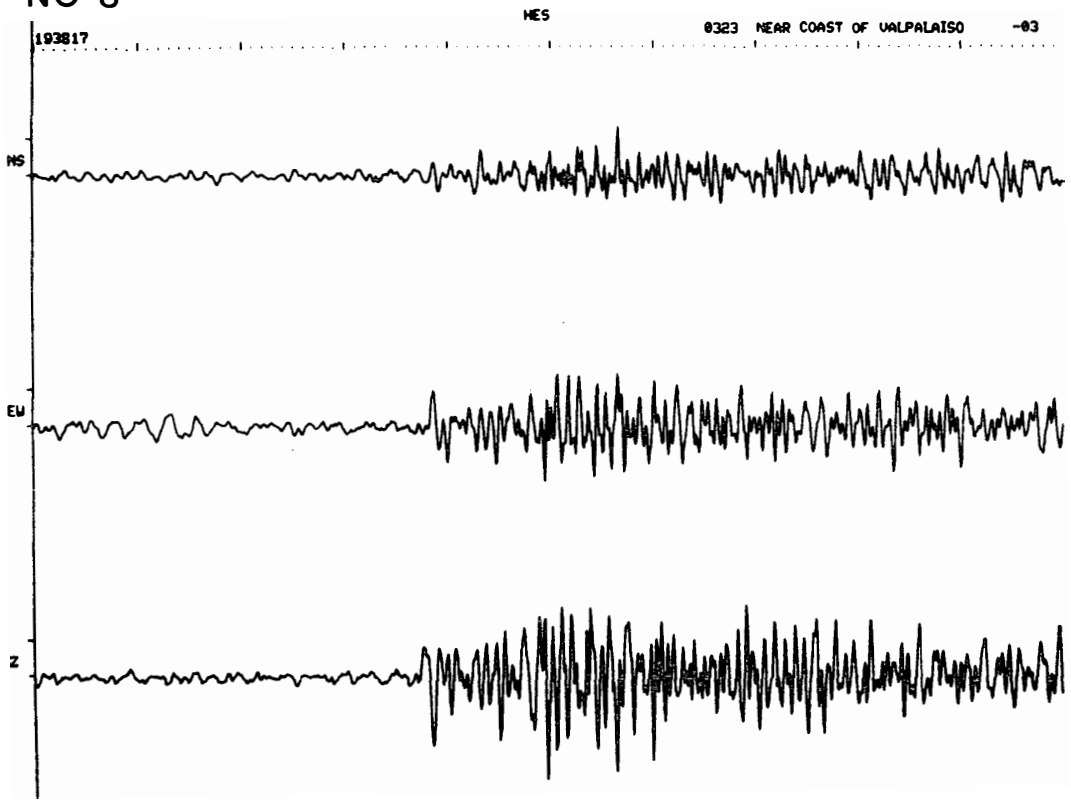
NO 8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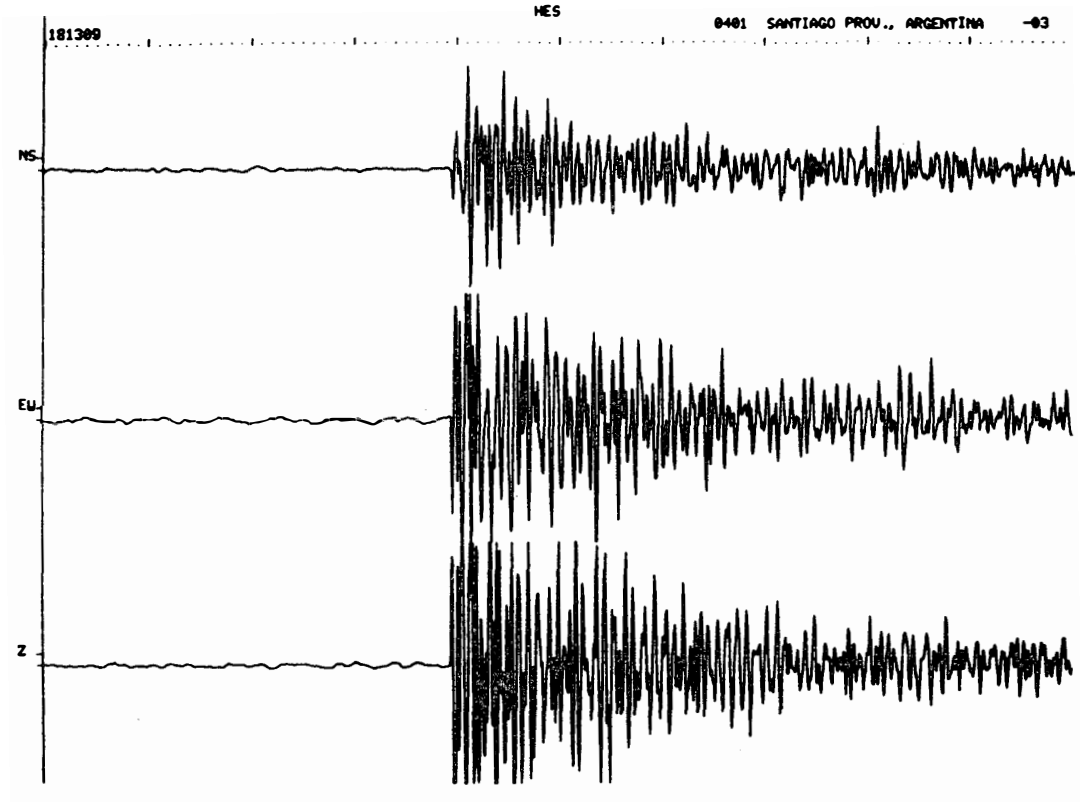
NO 9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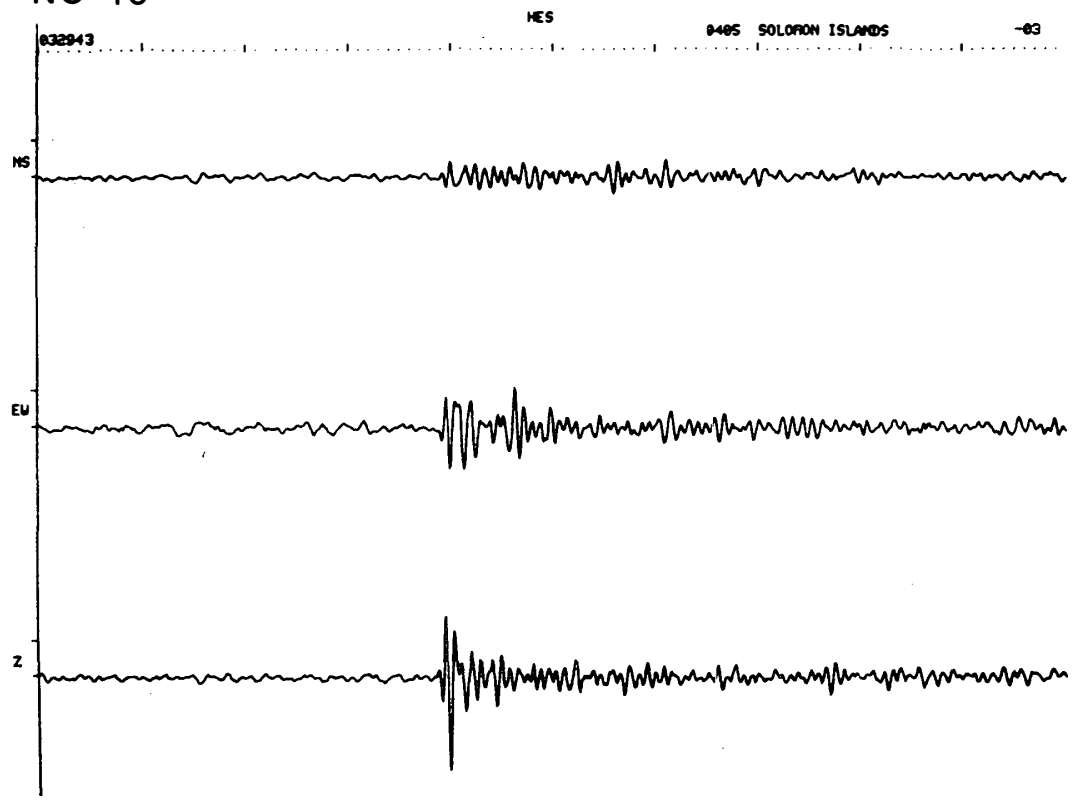
NO 10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-03
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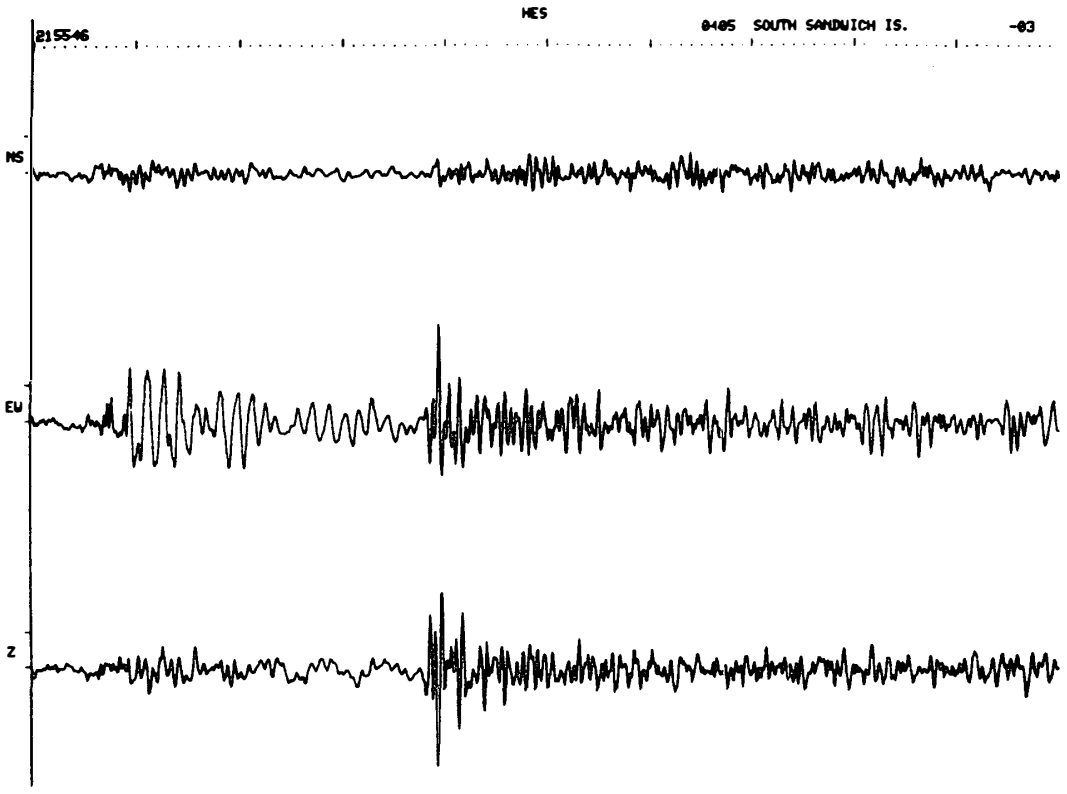
NO 11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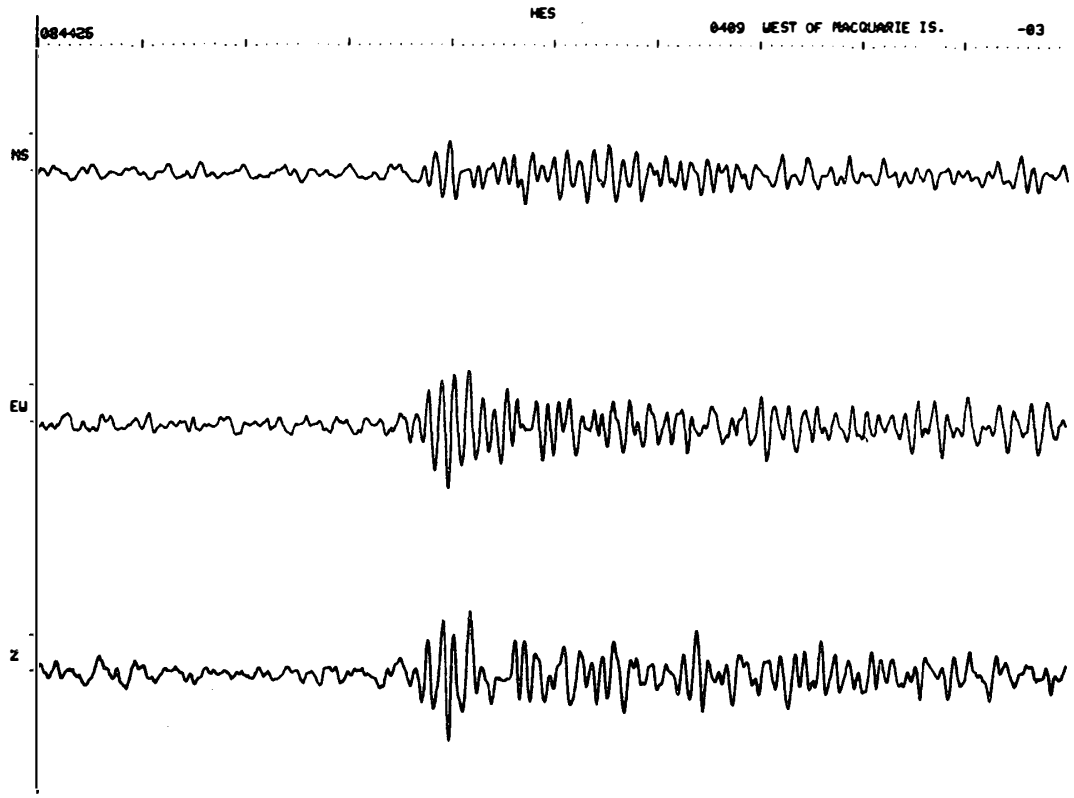
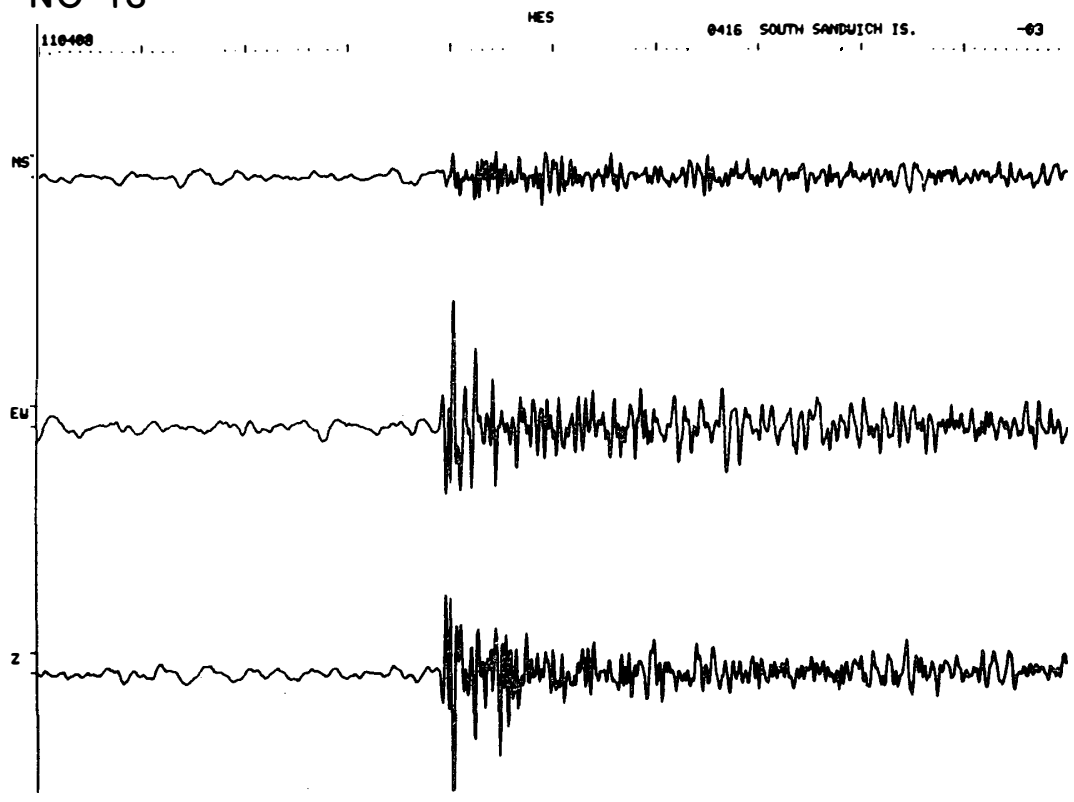
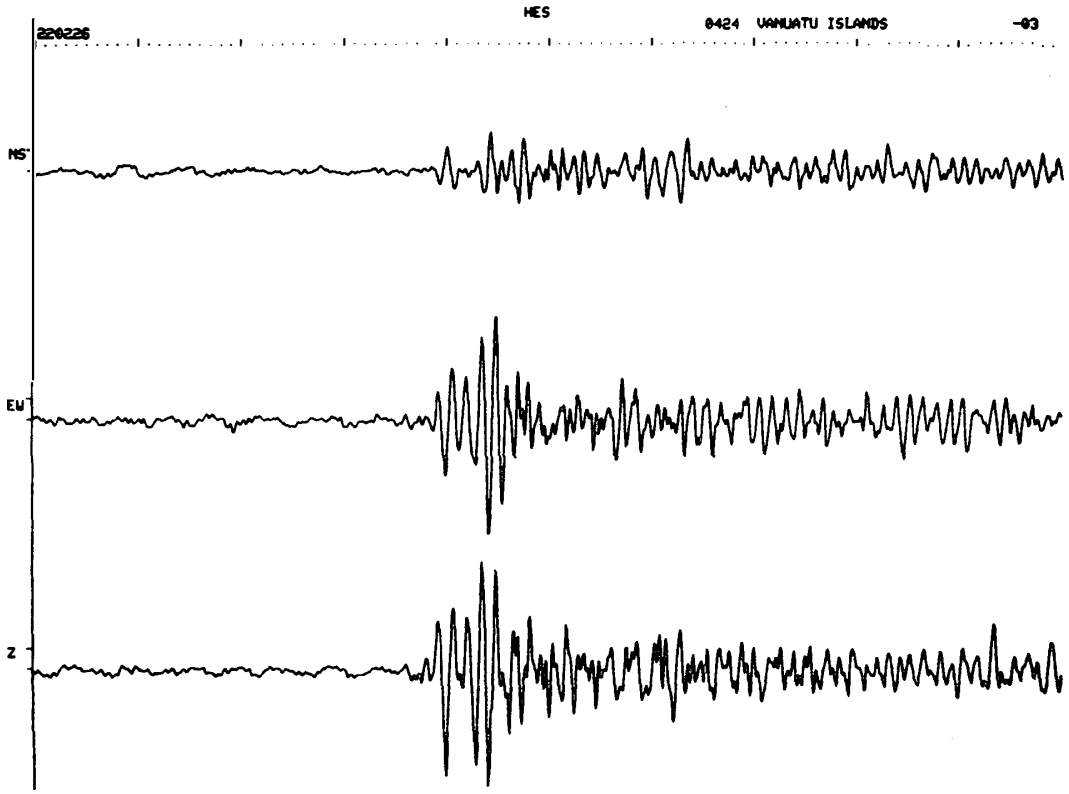
NO 12


HES
084425
0409 WEST OF MACQUARRIE IS.
-03
NS
EW
Z

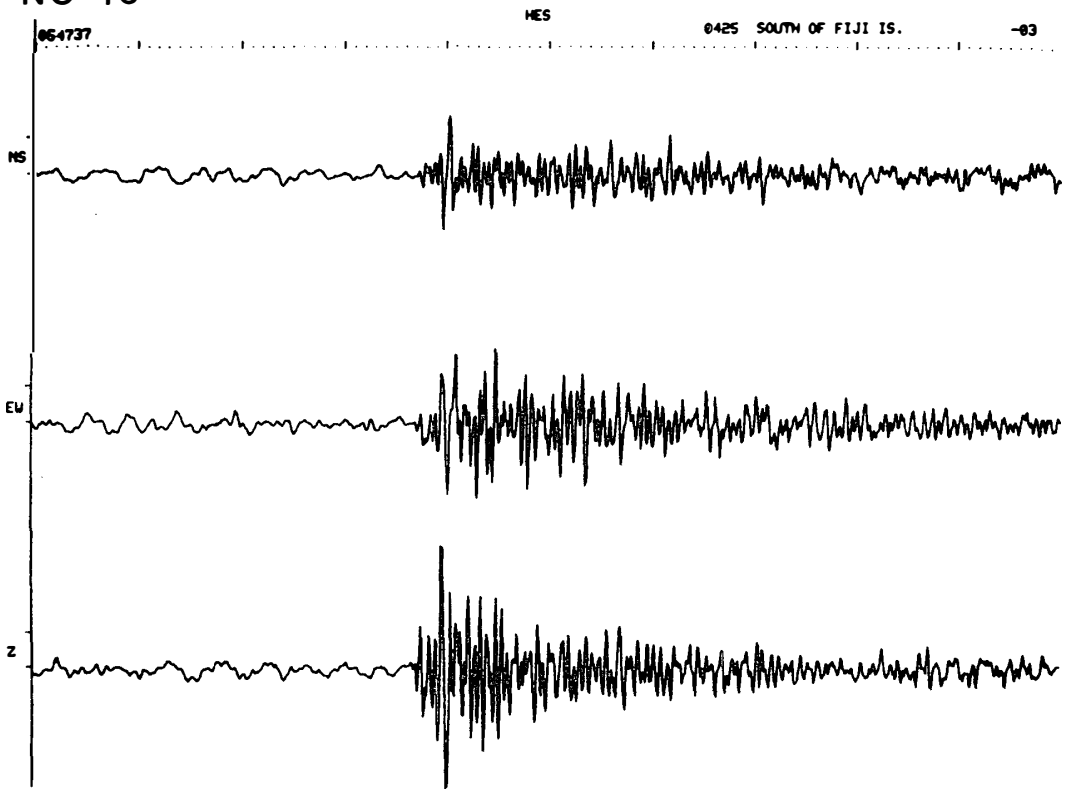
NO 13


HES
110408
0416 SOUTH SANDWICH IS.
-03
NS
EW
Z

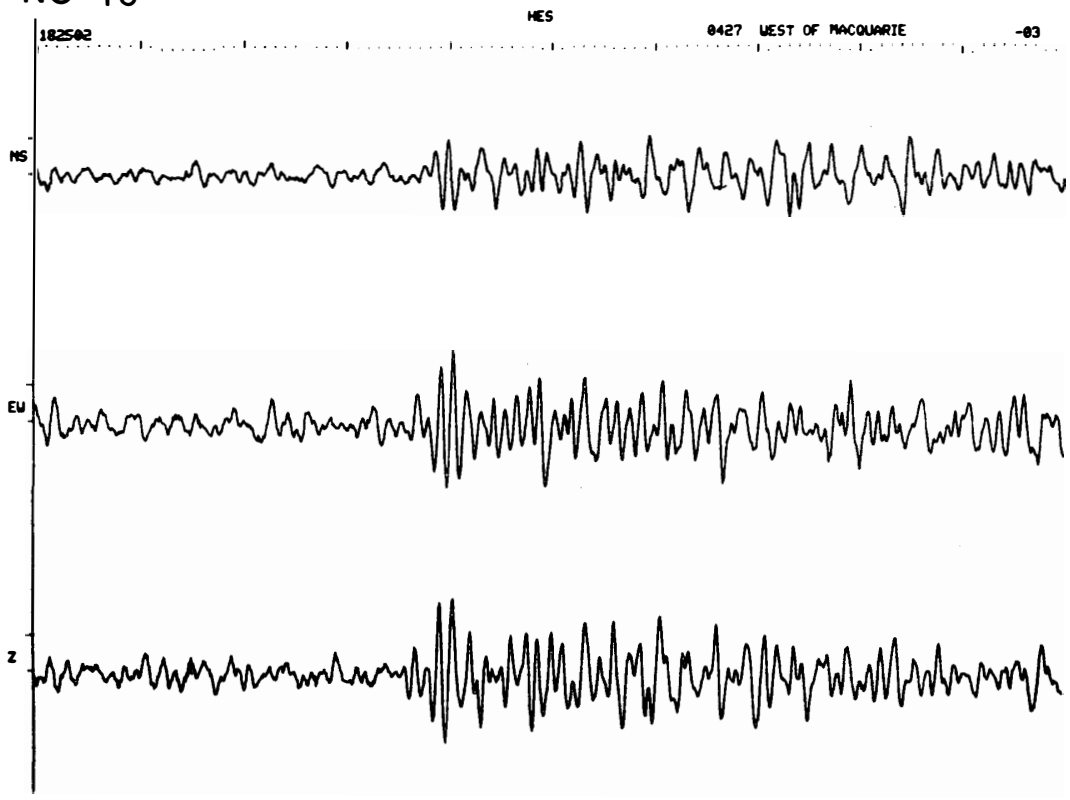
NO 14


HES
0424 VANUATU ISLANDS
-03
220226
NS
EW
Z

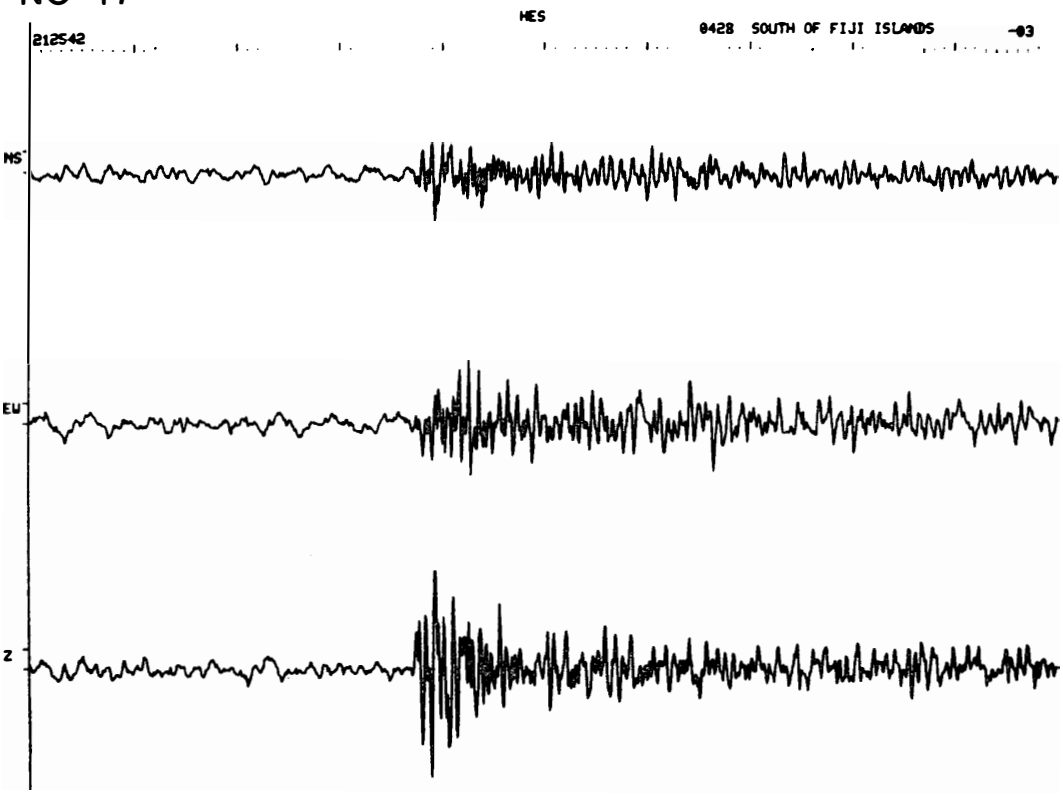
NO 15


HES
0425 SOUTH OF FIJI IS.
-03
064737
NS
EW
Z

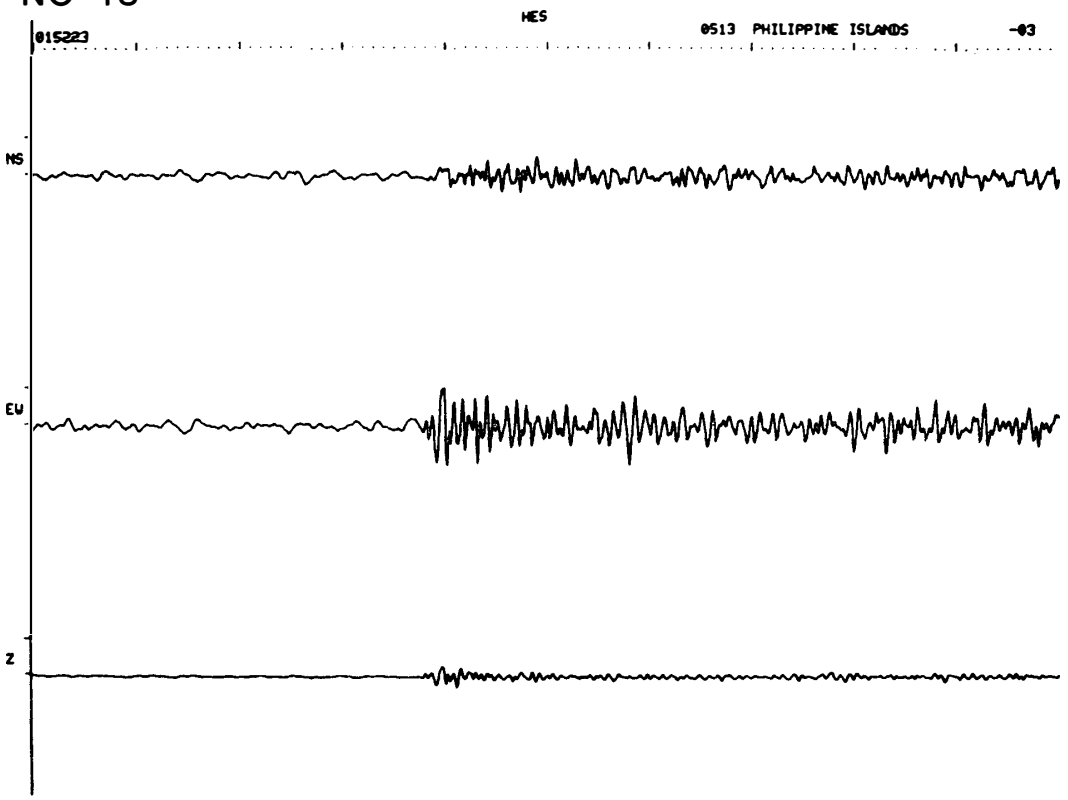
NO 16


MES
182502
0427 WEST OF MACQUARIE
-03
NS
EW
Z

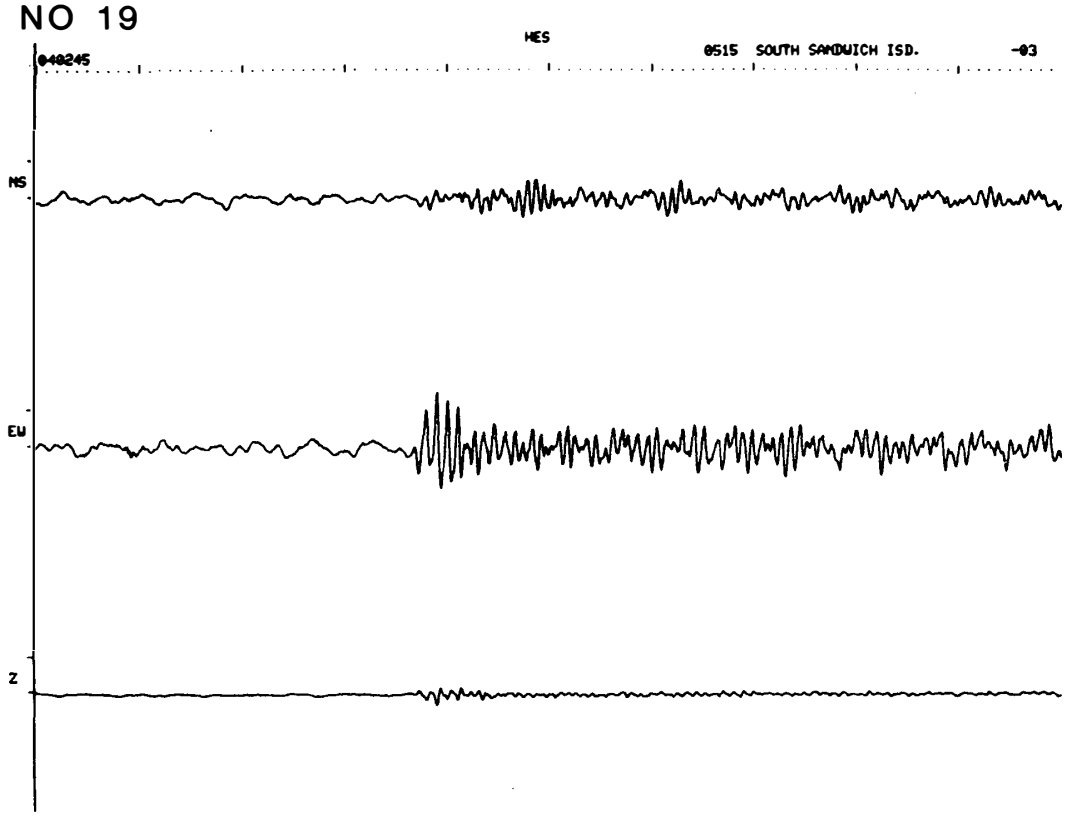
NO 17


MES
212542
0428 SOUTH OF FIJI ISLANDS
-03
NS
EW
Z

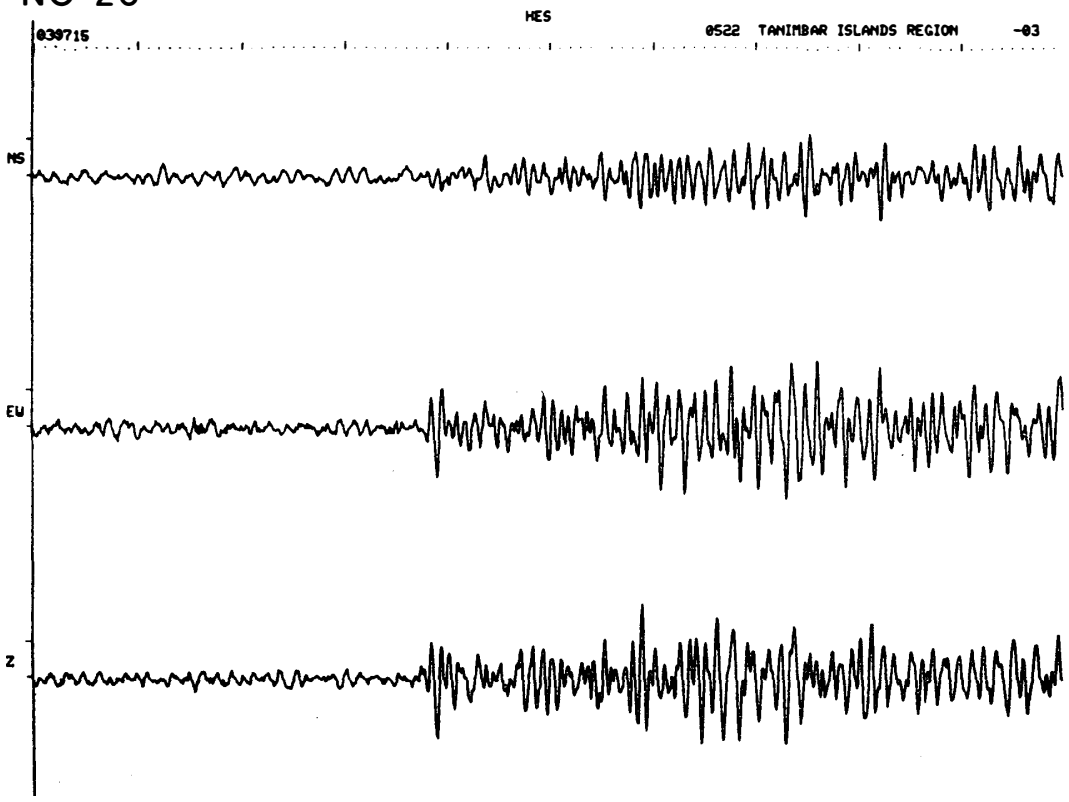
NO 18


HES
0513 PHILIPPINE ISLANDS
-03
015223
NS
EW
Z

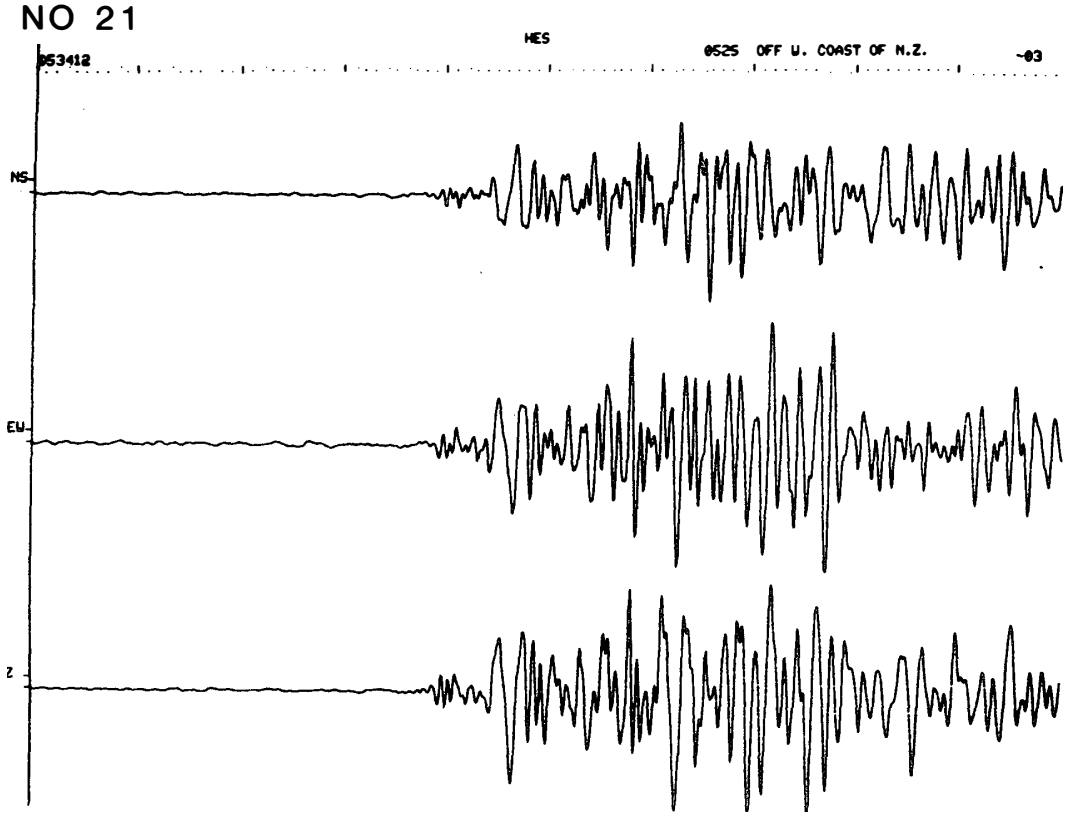
NO 19


HES
0515 SOUTH SANDWICH ISD.
-03
040245
NS
EW
Z

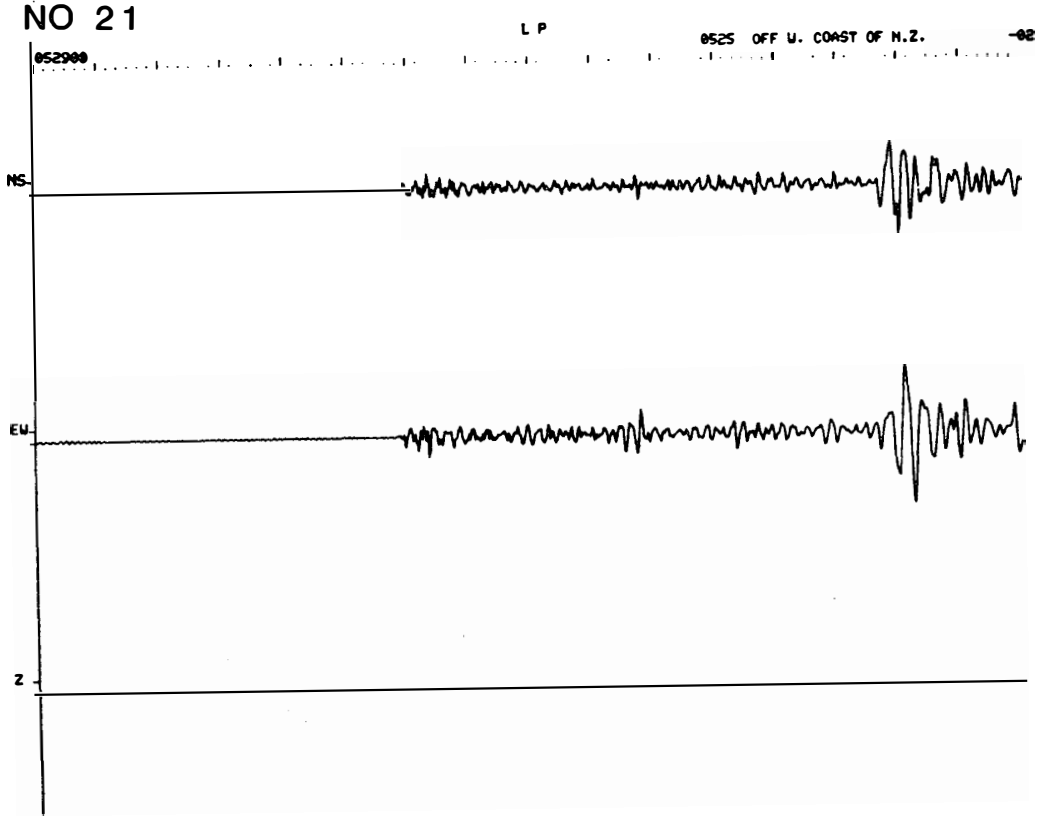
NO 20


HES
039715
0522 TANIMBAR ISLANDS REGION -03
NS
EW
Z

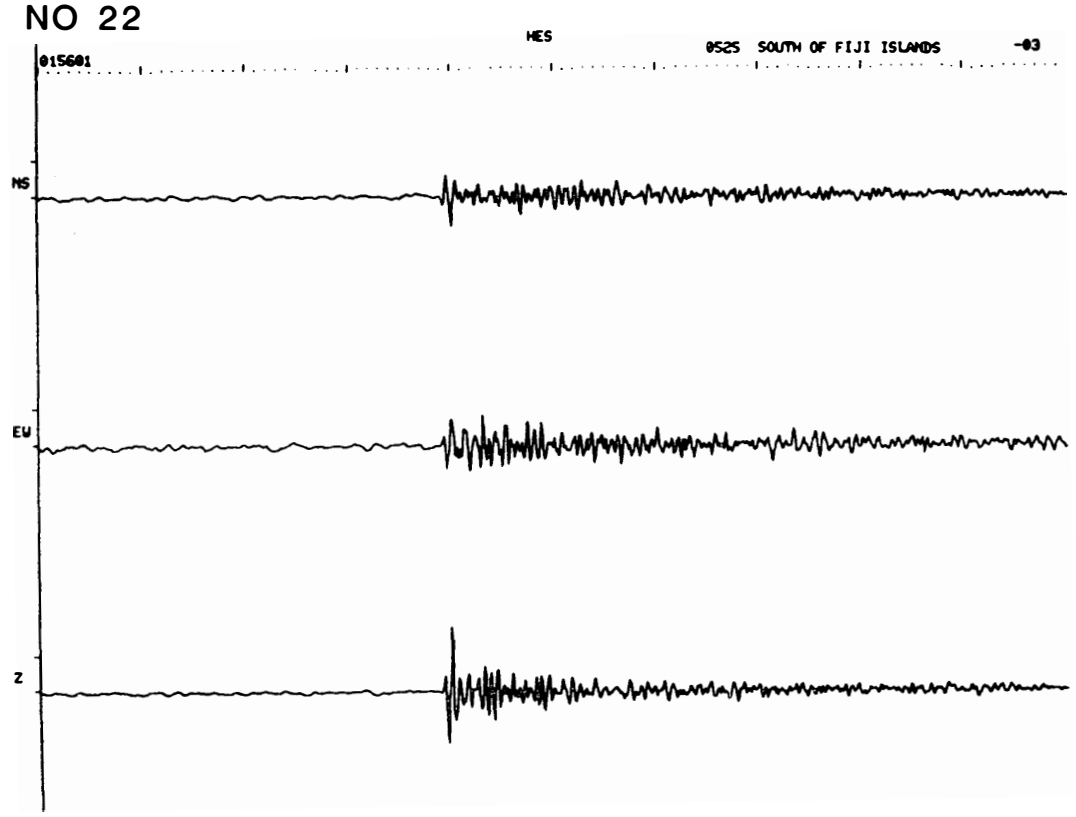
NO 21


HES
053412
0525 OFF W. COAST OF N.Z. -03
NS
EW
Z

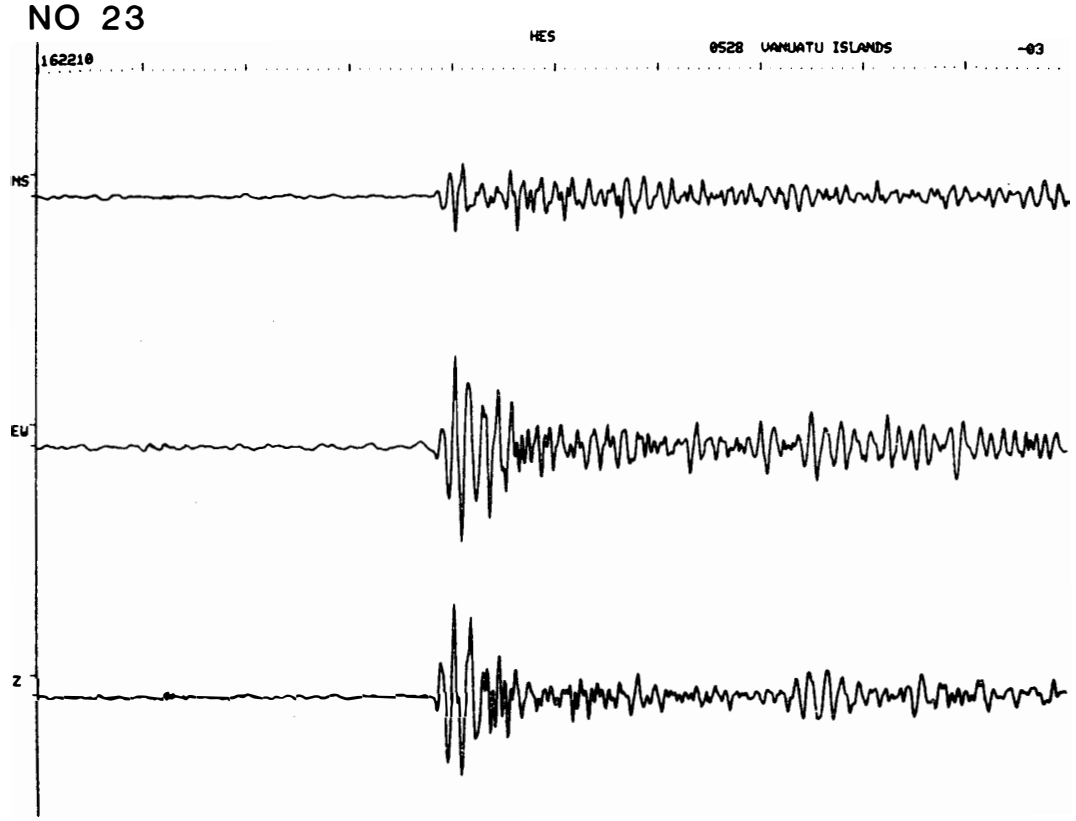
NO 21


L P
052900
0525 OFF U. COAST OF N.Z.
-02
NS
EW
Z

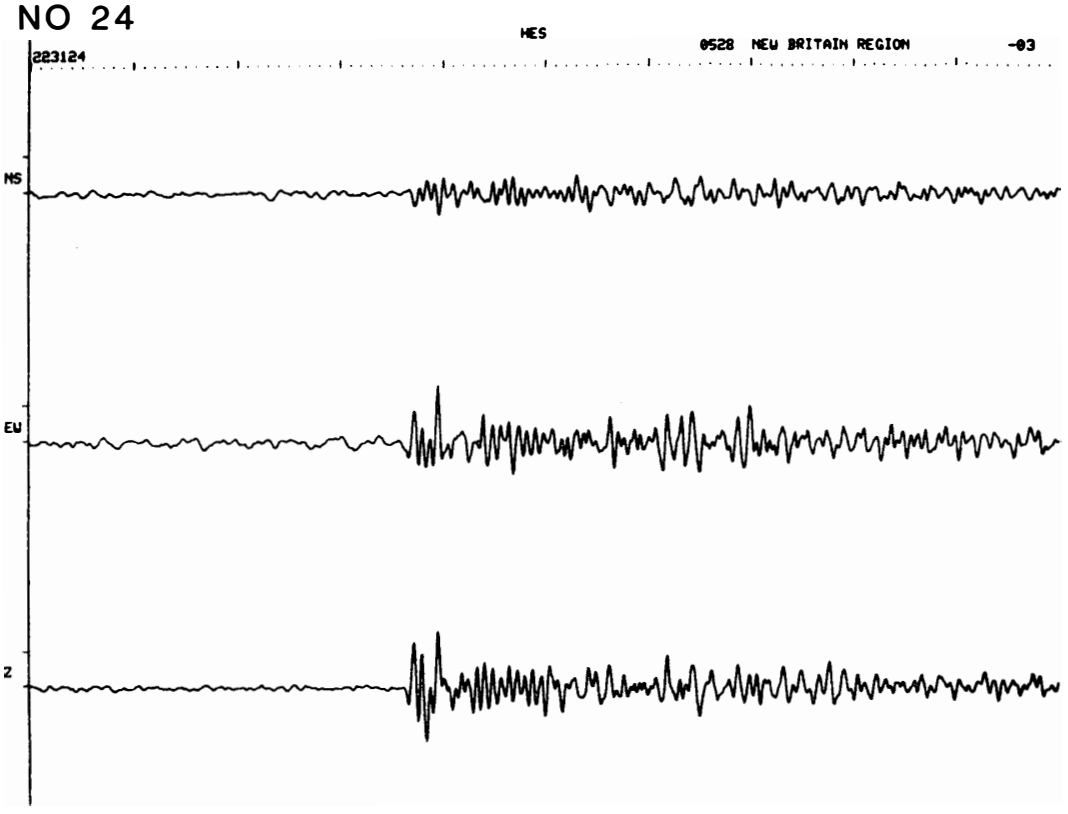
NO 22


HES
015601
0525 SOUTH OF FIJI ISLANDS
-03
NS
EW
Z

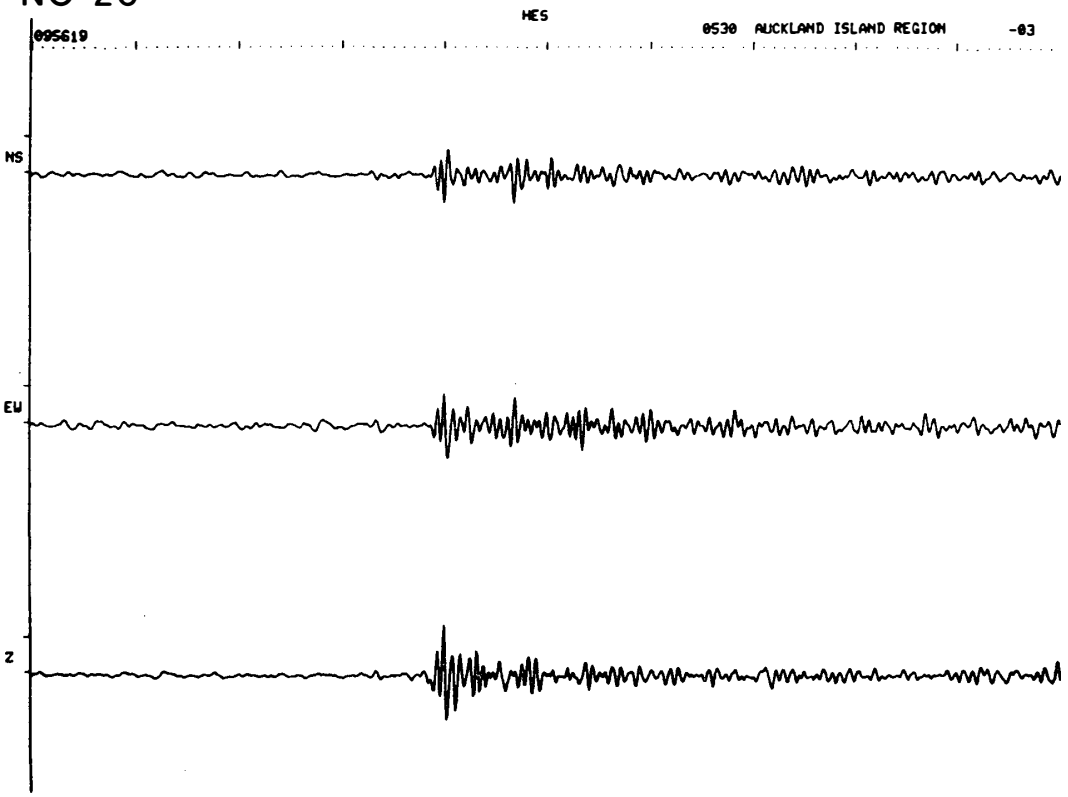
NO 23


HES
0528 VANUATU ISLANDS -03
162210
NS
EW
Z

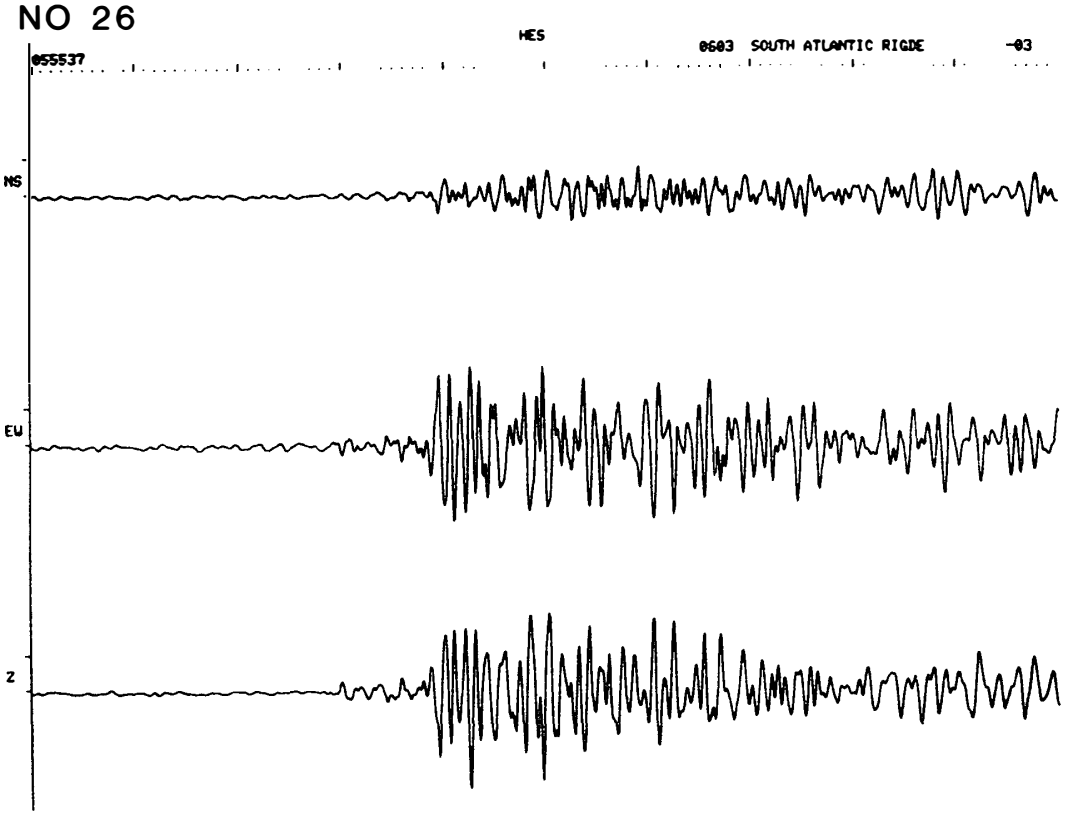
NO 24


HES
0528 NEW BRITAIN REGION -03
223124
NS
EW
Z

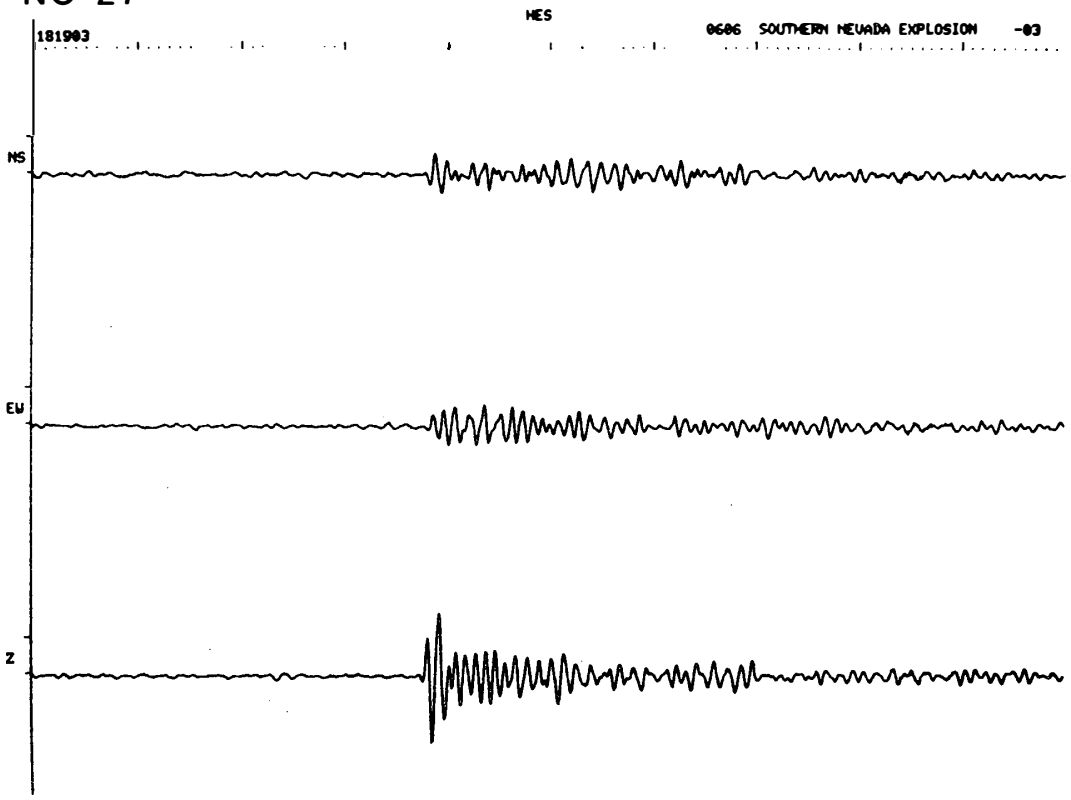
NO 25


HES
0530 AUCKLAND ISLAND REGION -03
095619
NS
EW
Z

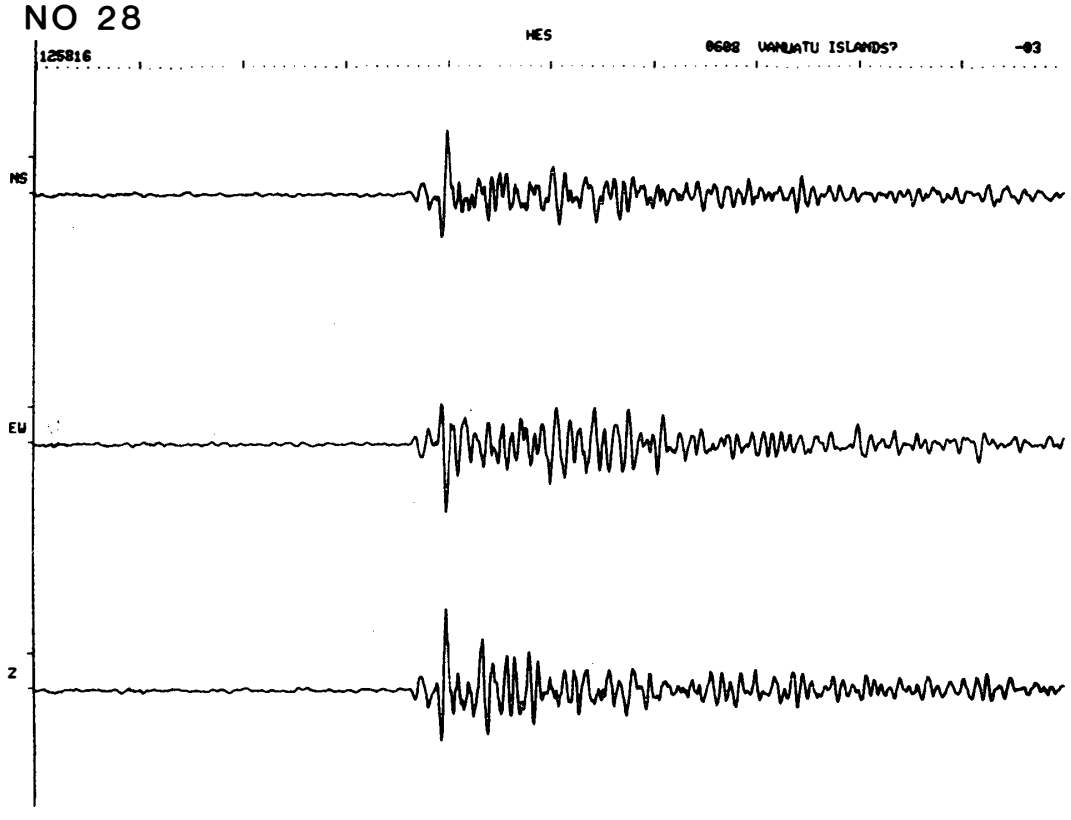
NO 26


HES
0603 SOUTH ATLANTIC RIGDE -03
055537
NS
EW
Z

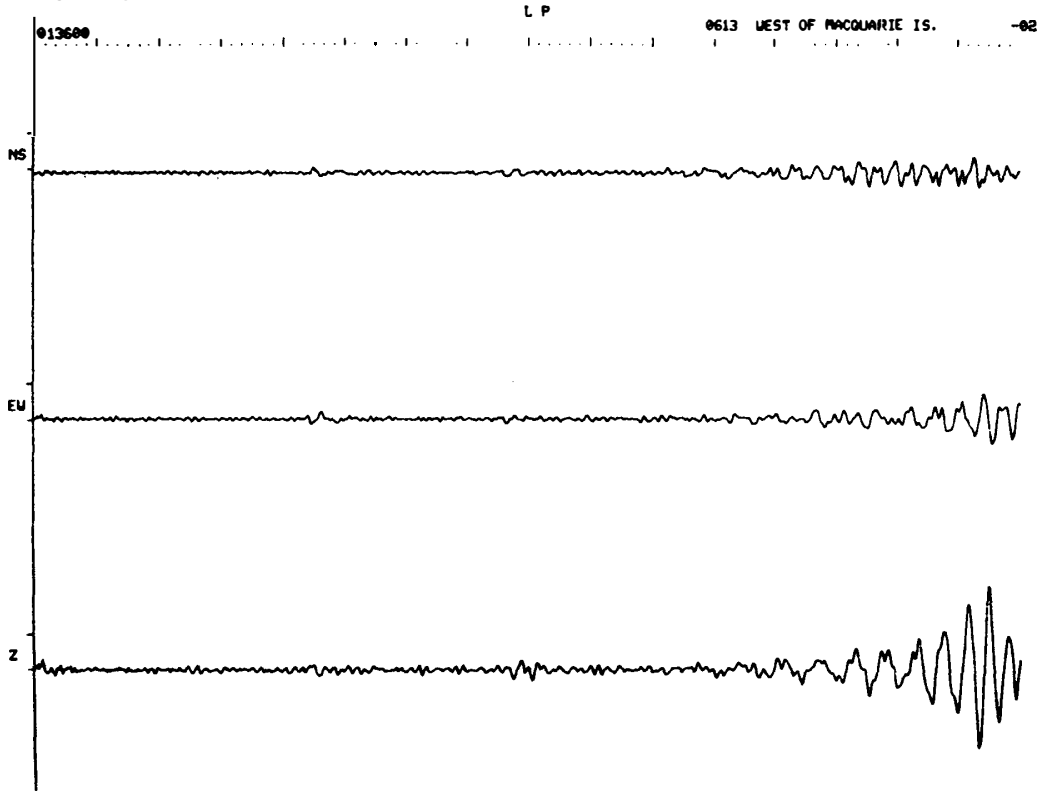
NO 27


HES
181903
0606 SOUTHERN NEVADA EXPLOSION -03
NS
EW
Z

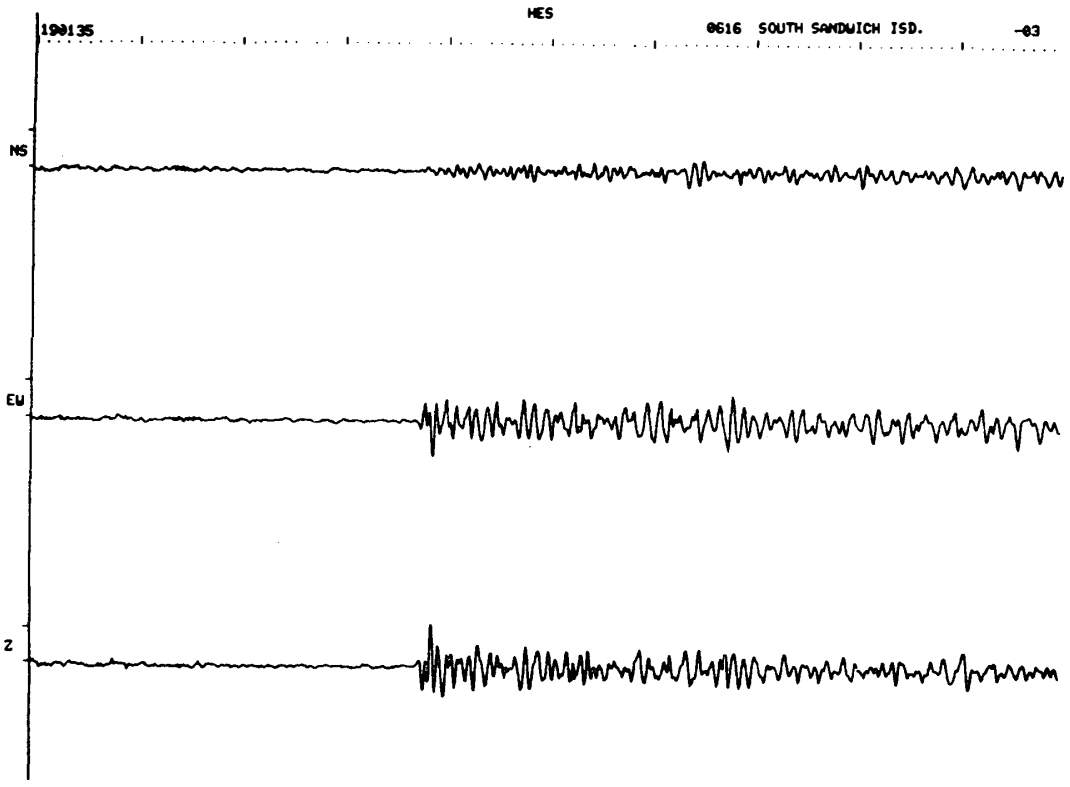
NO 28


HES
125816
0608 VANUATU ISLANDS? -03
NS
EW
Z

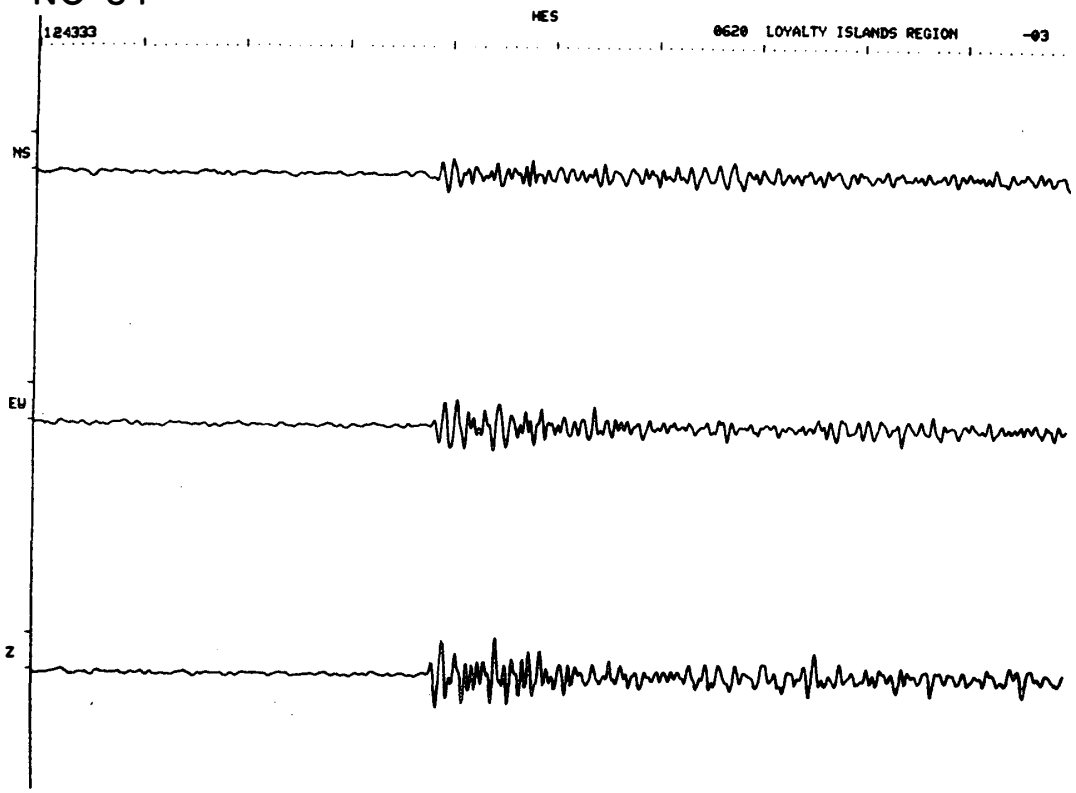
NO 29


L P
013600
0613 WEST OF MACQUARIE IS.
-02
NS
EW
Z

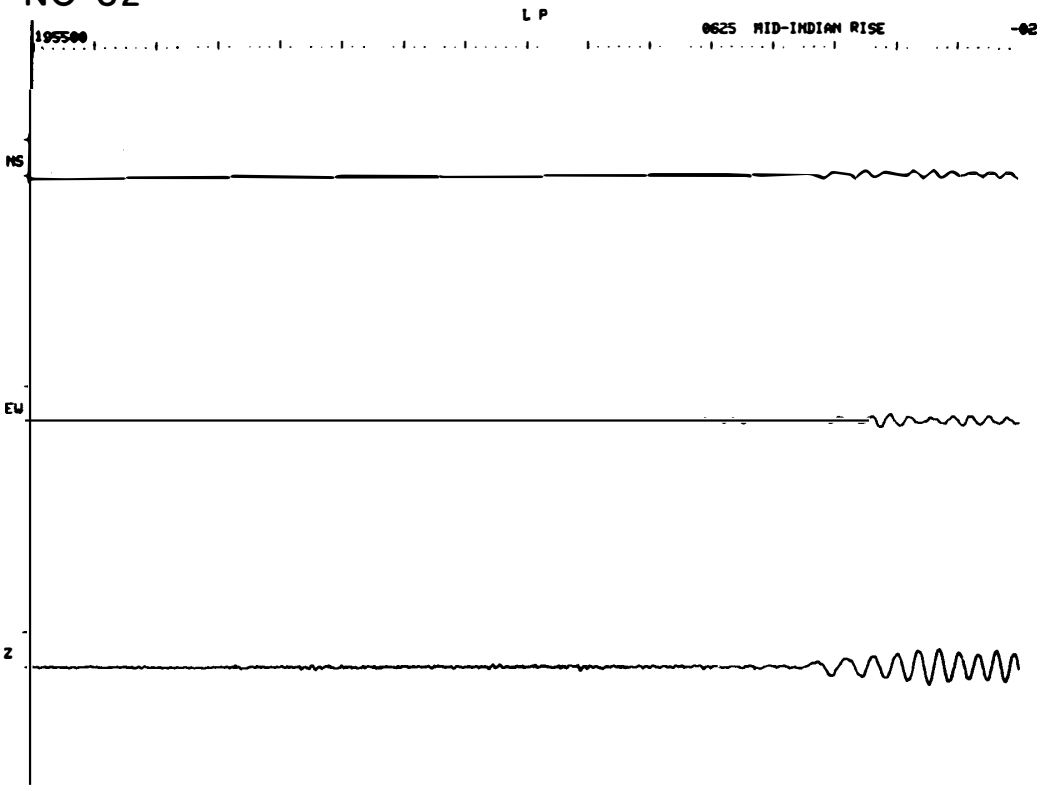
NO 30


HES
190135
0616 SOUTH SANDWICH ISD.
-03
NS
EW
Z

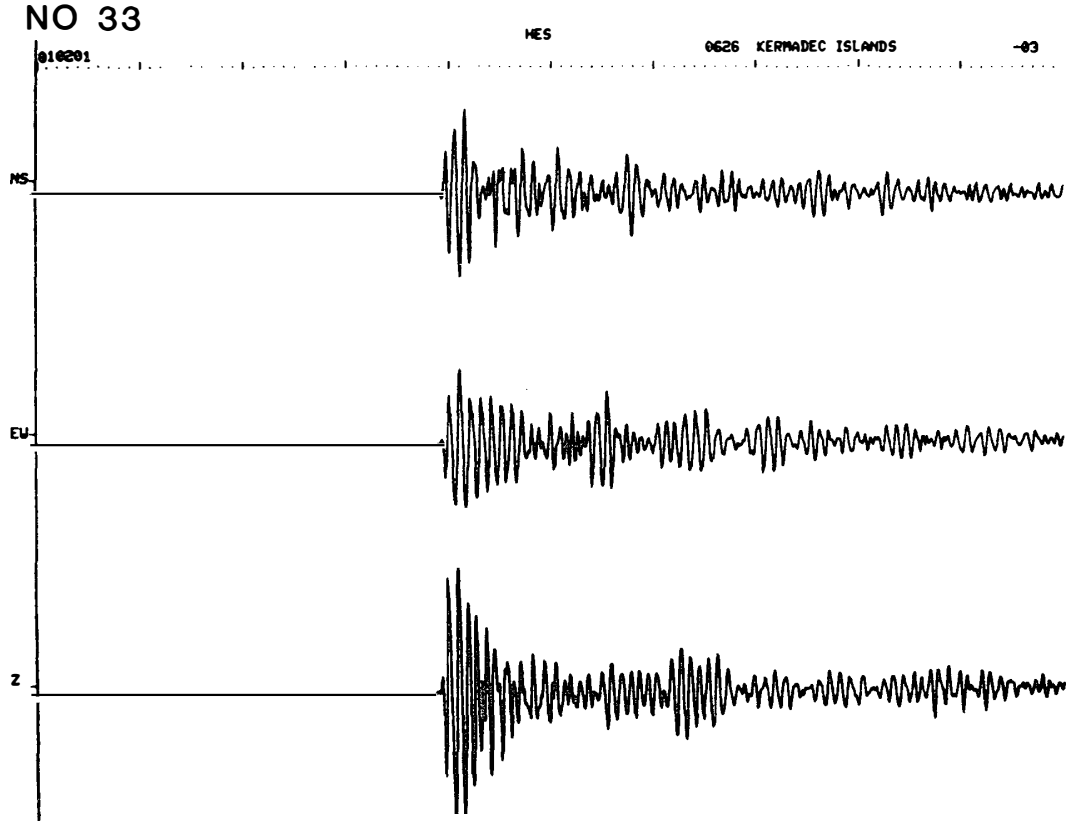
NO 31


MES
124333
0620 LOYALTY ISLANDS REGION -03
NS
EW
Z

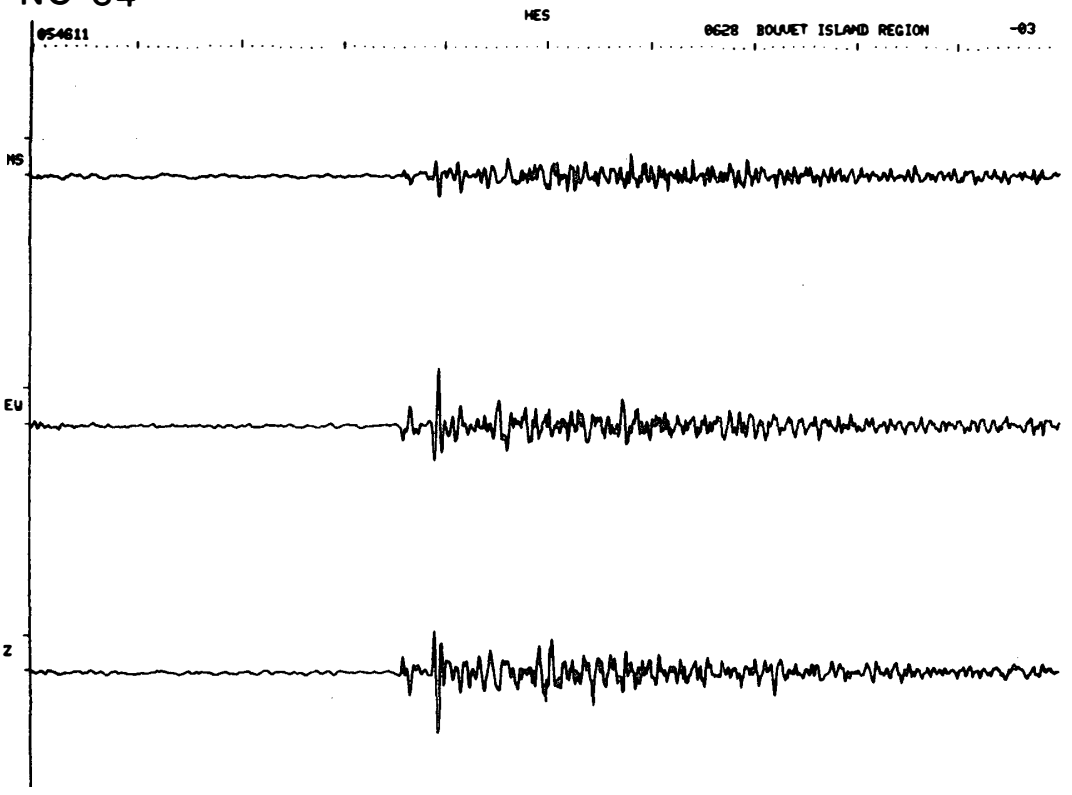
NO 32


L P
195500
0625 MID-INDIAN RISE -02
NS
EW
Z

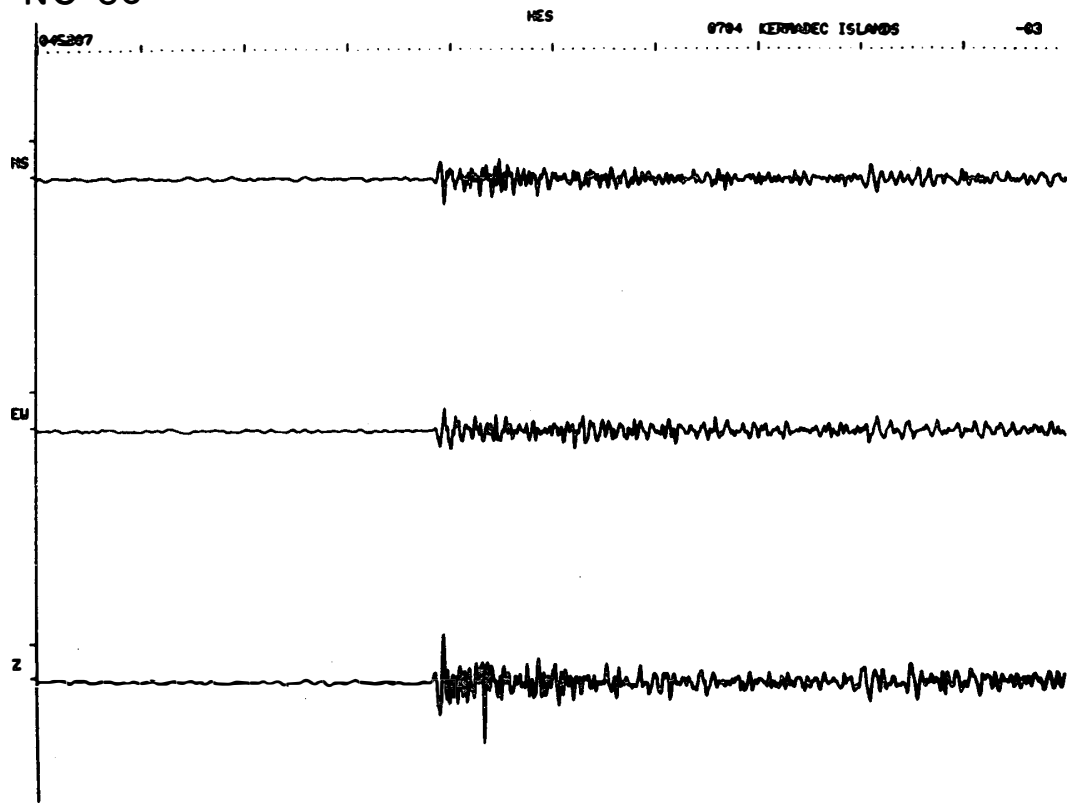
NO 33


MES
010201
0626 KERMADEC ISLANDS -03
NS
EW
Z

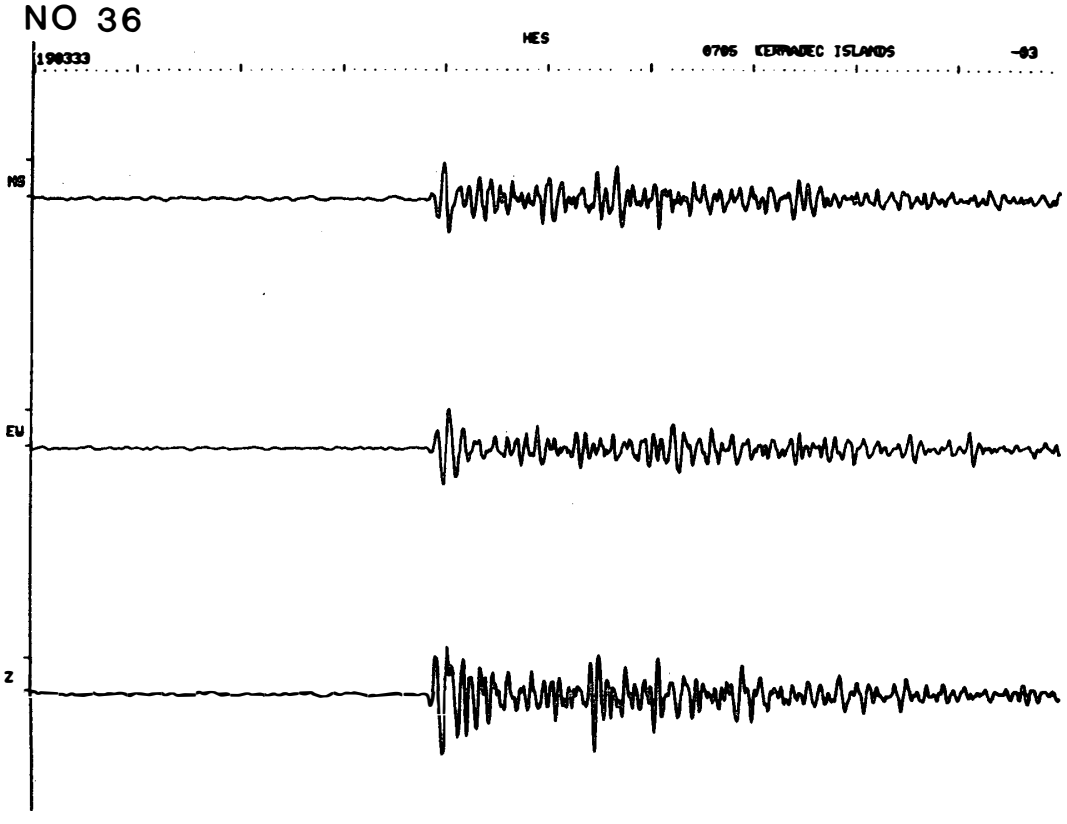
NO 34


MES
054611
0628 BOUVET ISLAND REGION -03
NS
EW
Z

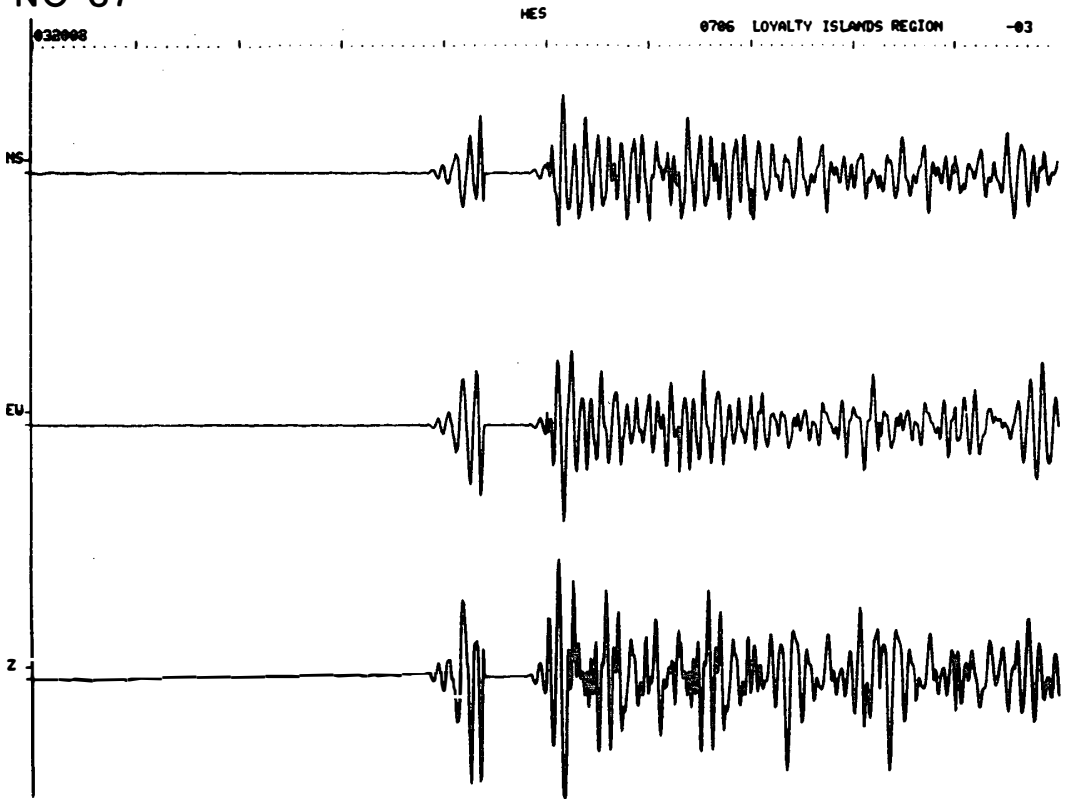
NO 35


HES
0704 KERMADEC ISLANDS
-03
045207
NS
EW
Z

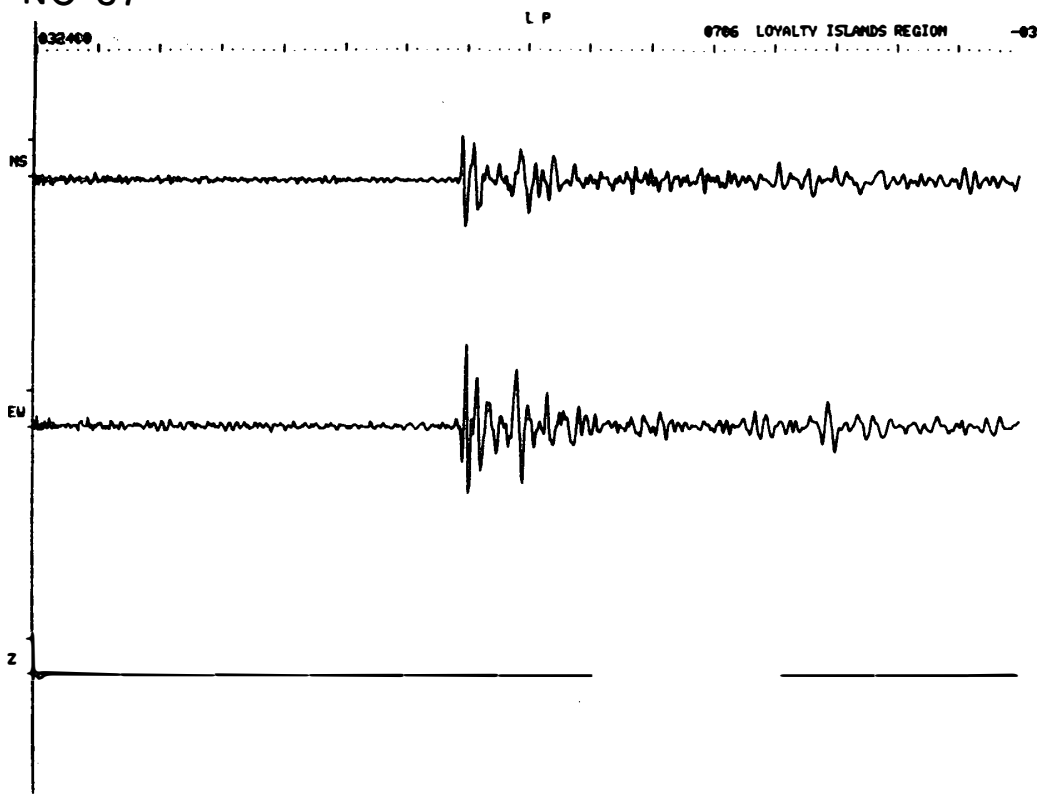
NO 36


HES
0705 KERMADEC ISLANDS
-03
190333
NS
EW
Z

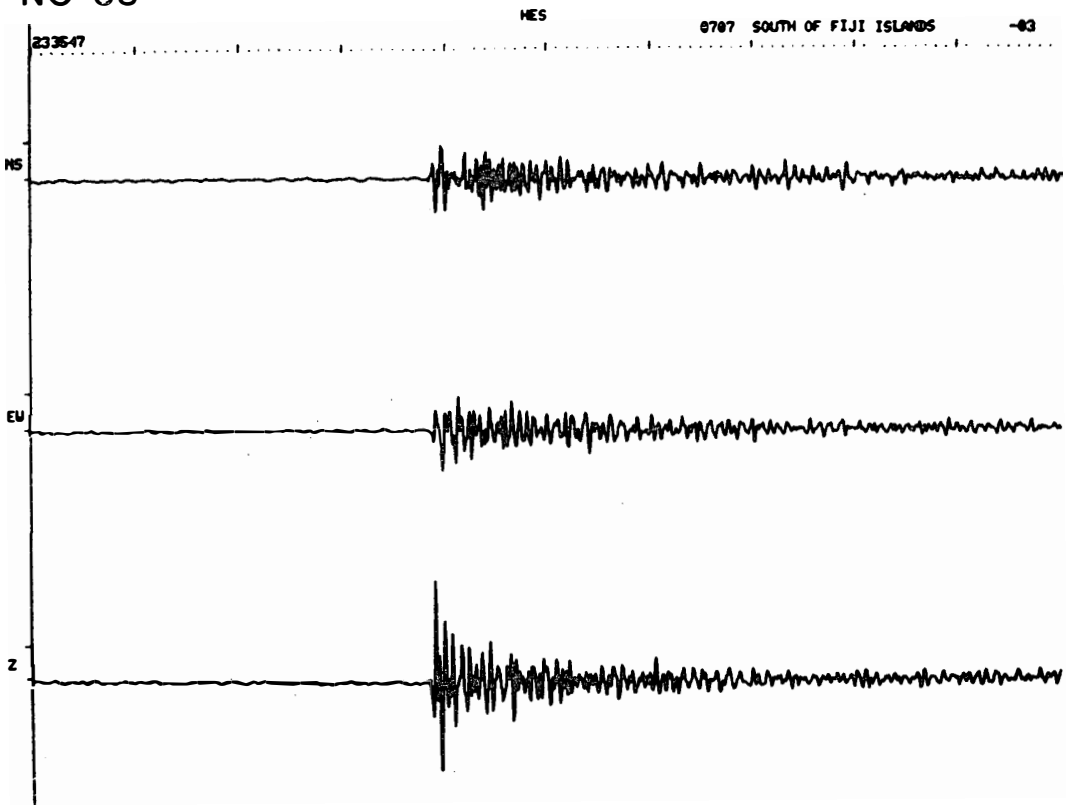
NO 37


HES
0706 LOYALTY ISLANDS REGION -03
032000
NS
EW
Z

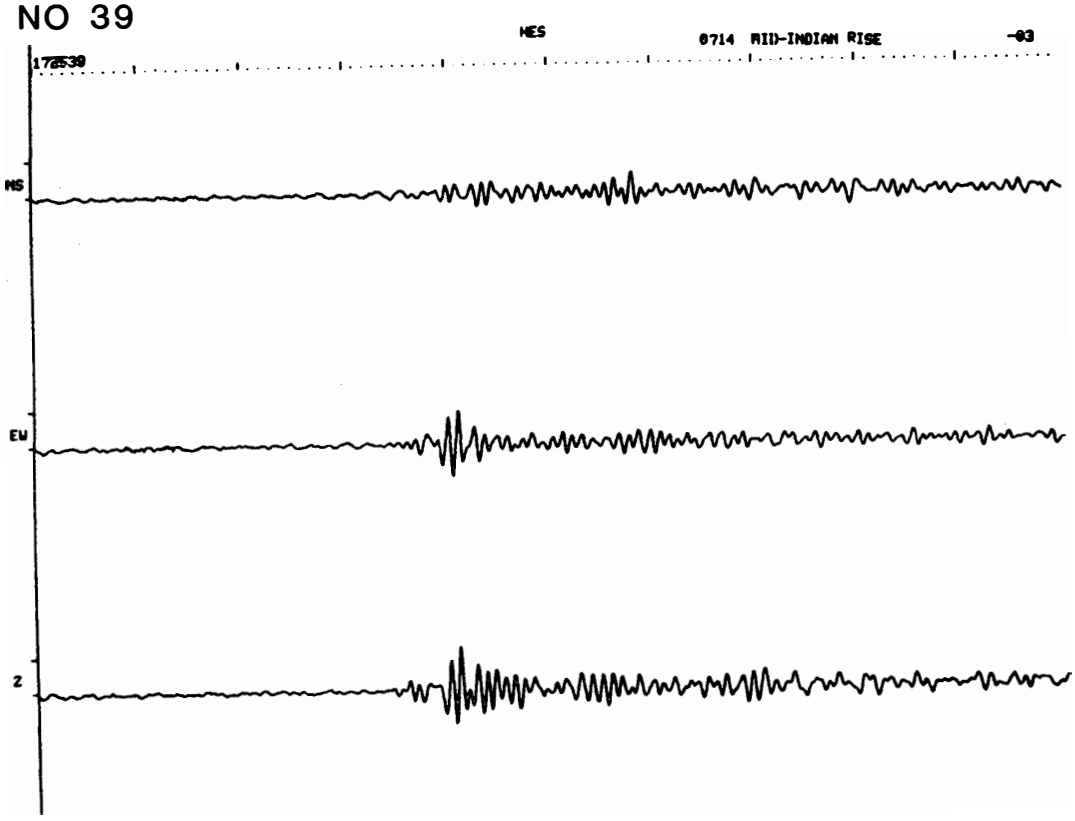
NO 37


L P
0706 LOYALTY ISLANDS REGION -03
032400
NS
EW
Z

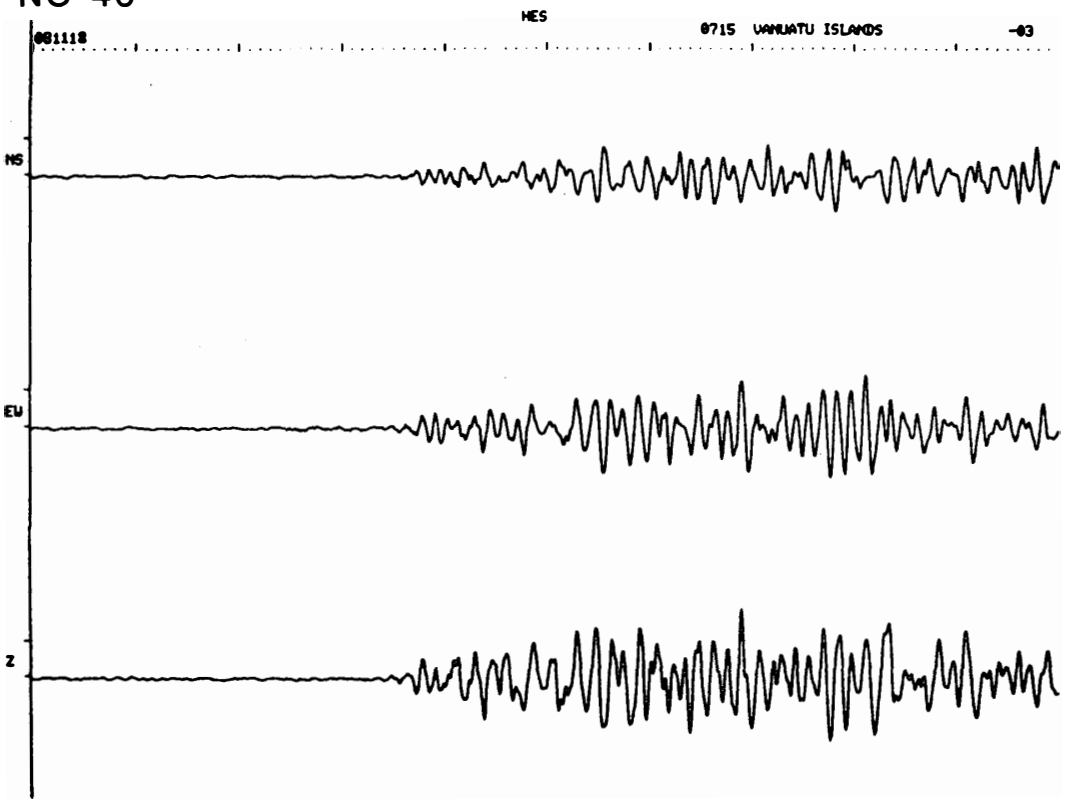
NO 38


MES
0707 SOUTH OF FIJI ISLANDS -03
233547
NS
EW
Z

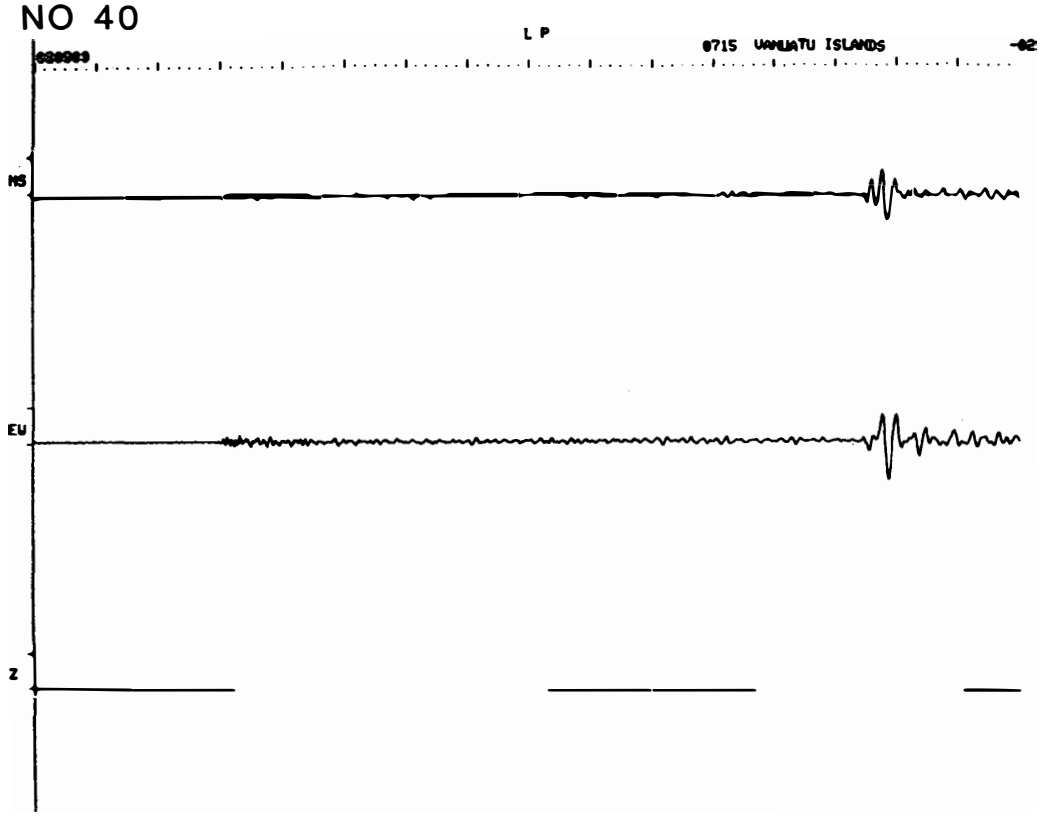
NO 39


MES
0714 MID-INDIAN RISE -03
172539
NS
EW
Z

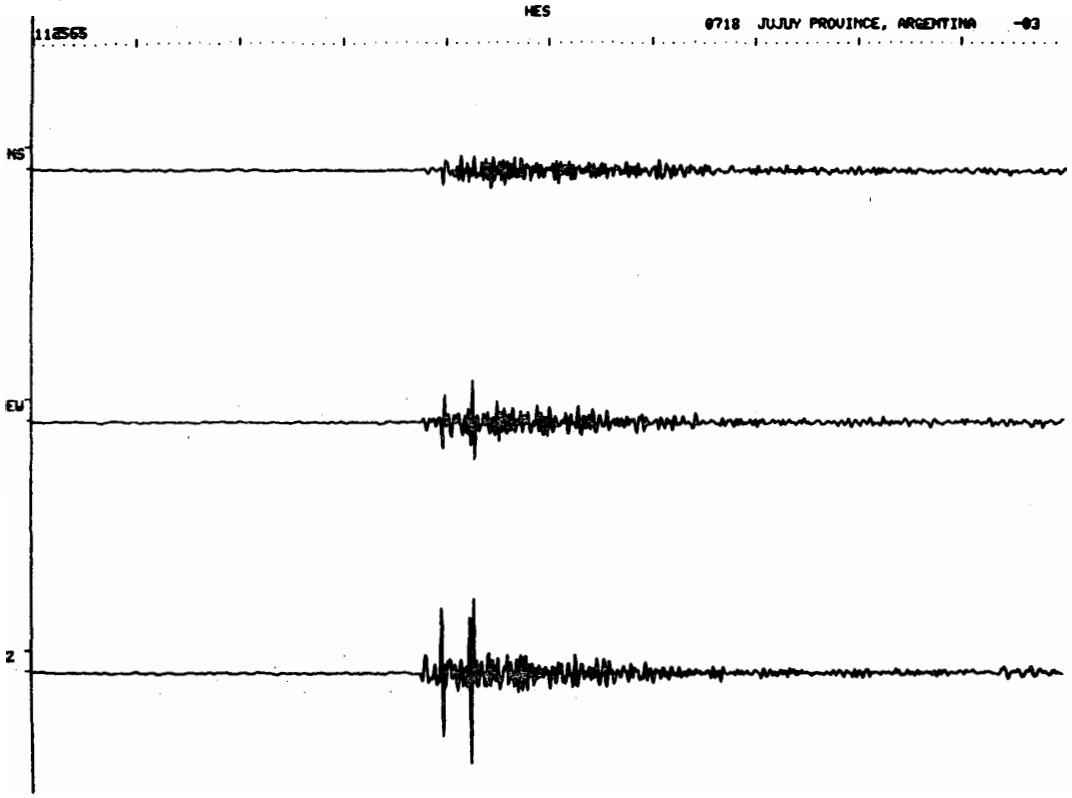
NO 40


HES
0715 VANUATU ISLANDS
-03
NS
EW
Z

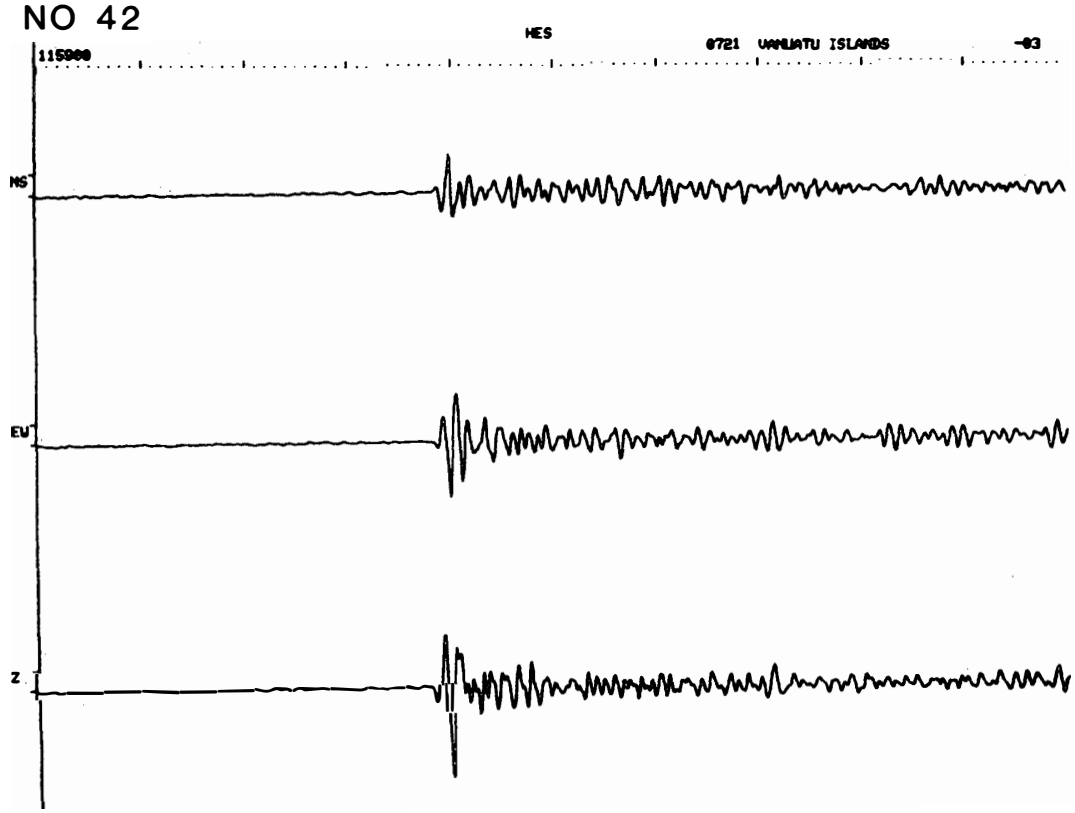
NO 40


L P
0715 VANUATU ISLANDS
-02
NS
EW
Z

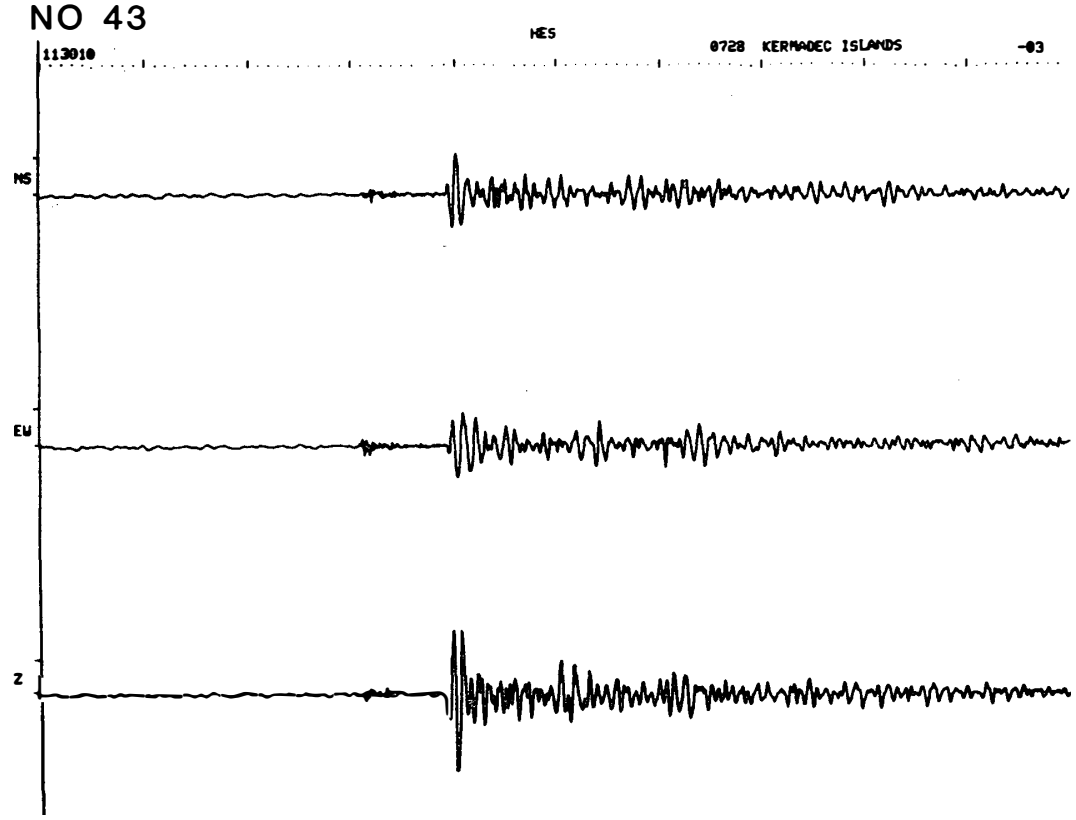
NO 41


HES
0718 JUJUY PROVINCE, ARGENTINA -03
NS
EW
Z

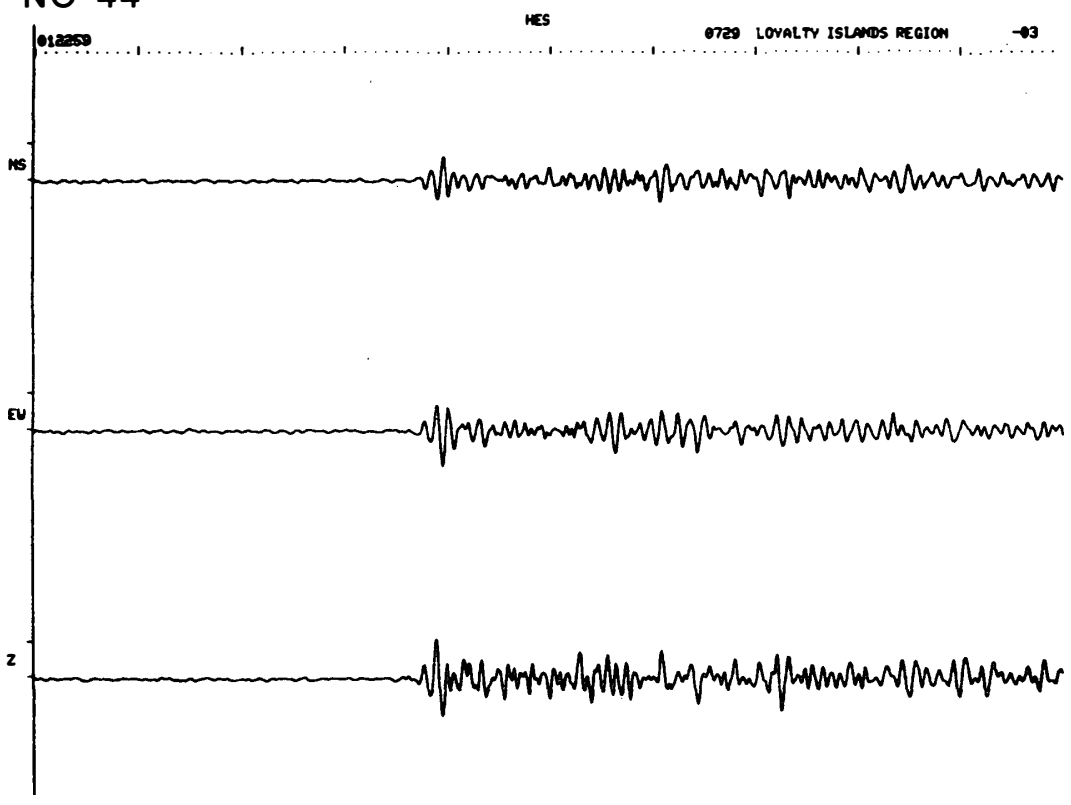
NO 42


HES
0721 VANUATU ISLANDS -03
NS
EW
Z

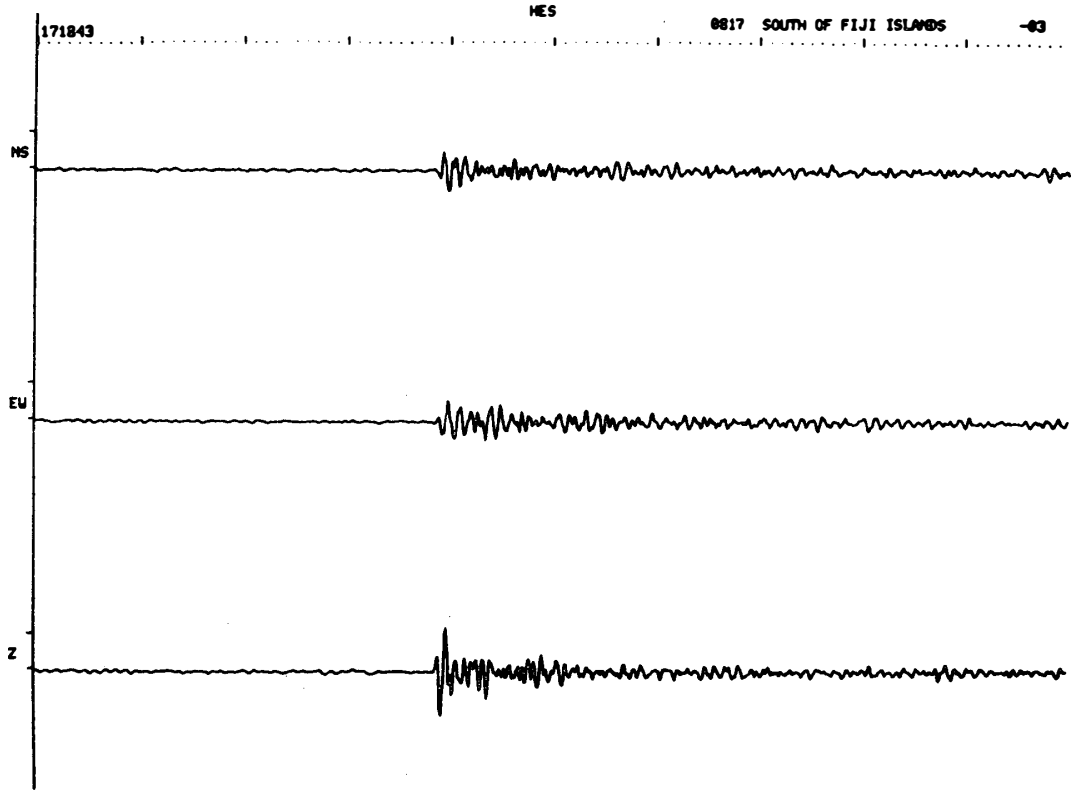
NO 43


HES
0728 KERMADEC ISLANDS -03
113010
NS
EW
Z

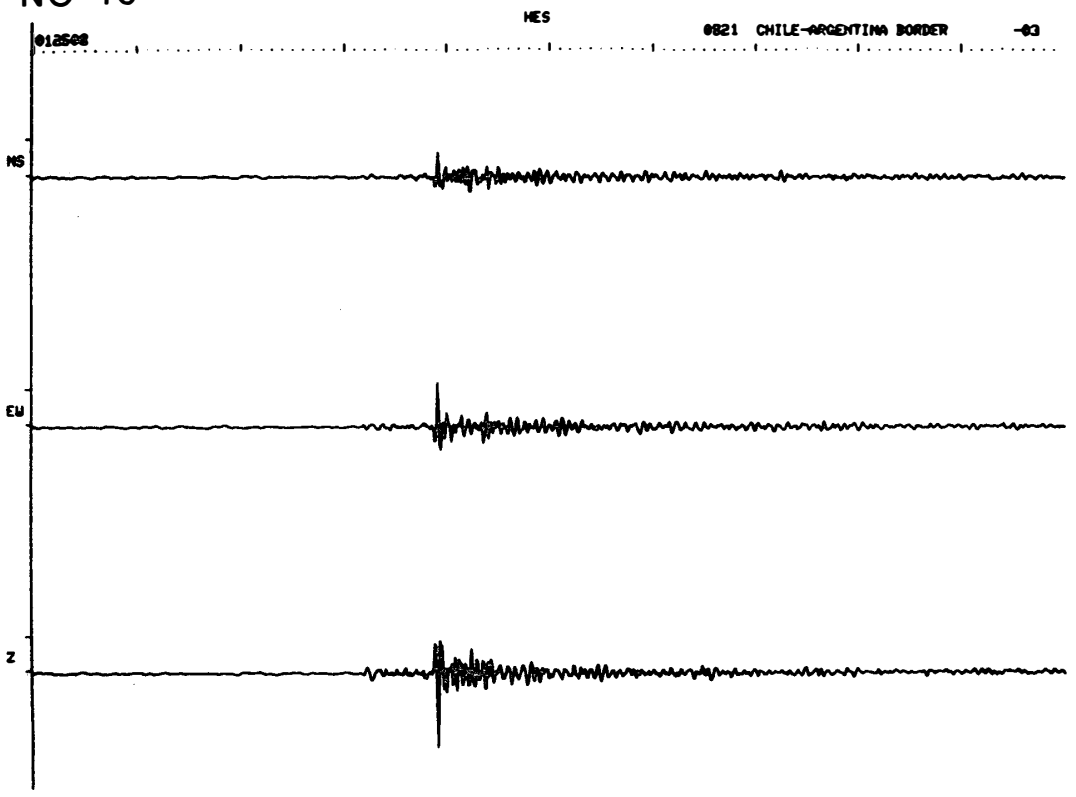
NO 44


HES
0729 LOYALTY ISLANDS REGION -03
013259
NS
EW
Z

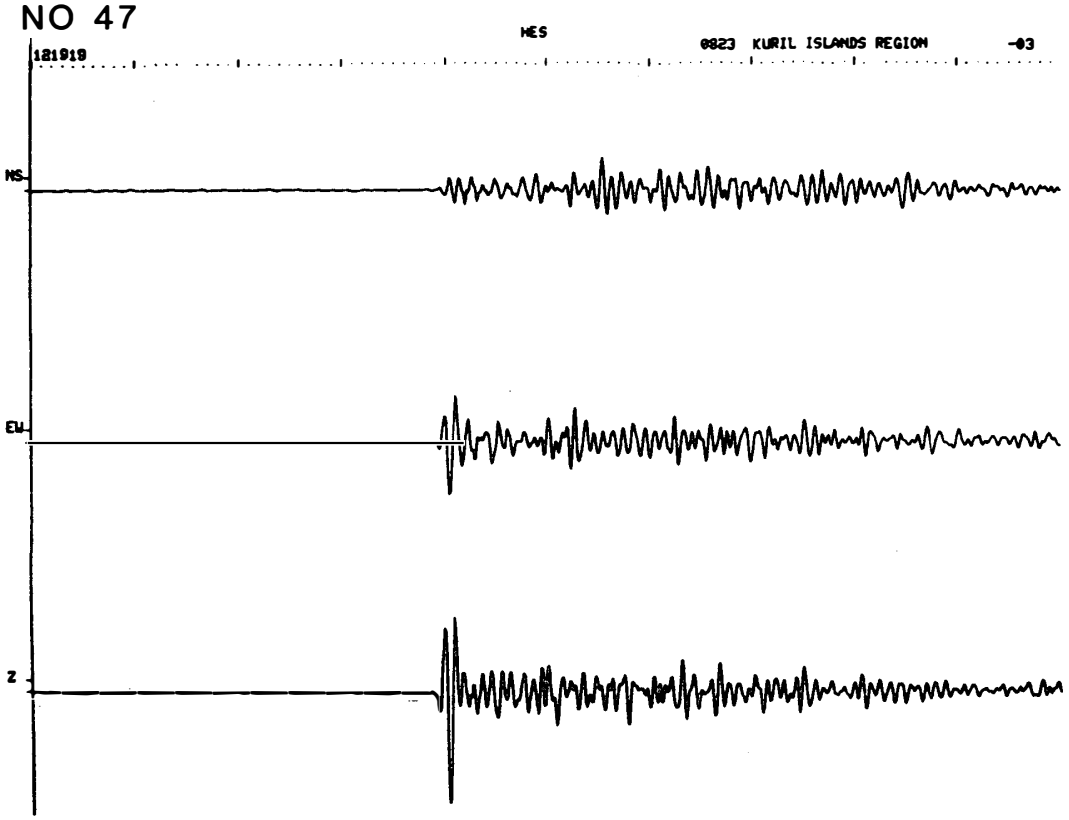
NO 45


HES
171843
0817 SOUTH OF FIJI ISLANDS -03
NS
EW
Z

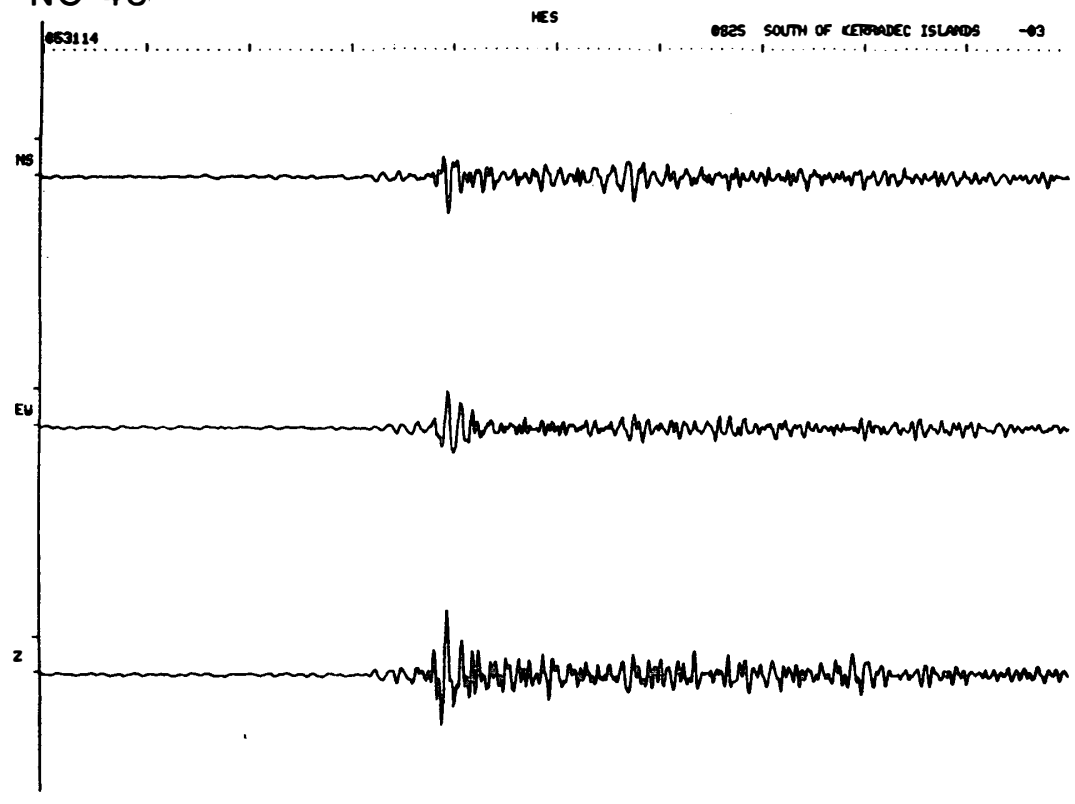
NO 46


HES
0821 CHILE-ARGENTINA BORDER -03
NS
EW
Z

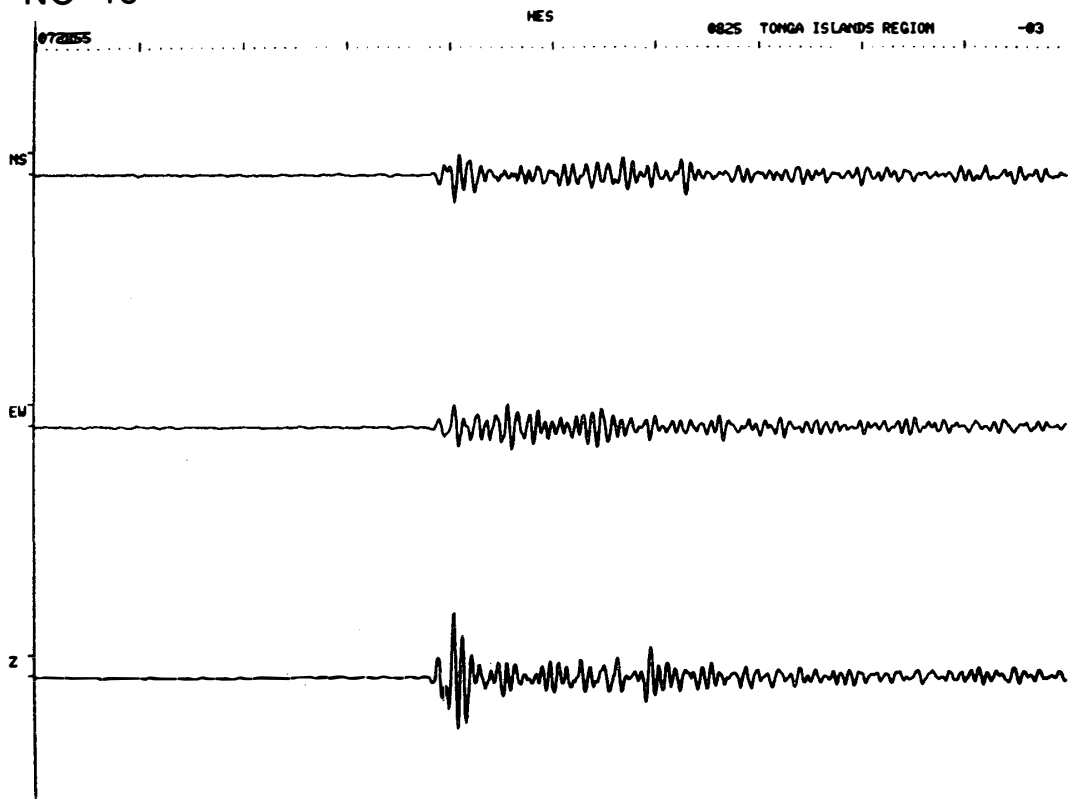
NO 47


HES
0823 KURIL ISLANDS REGION -03
121919
NS
EW
Z

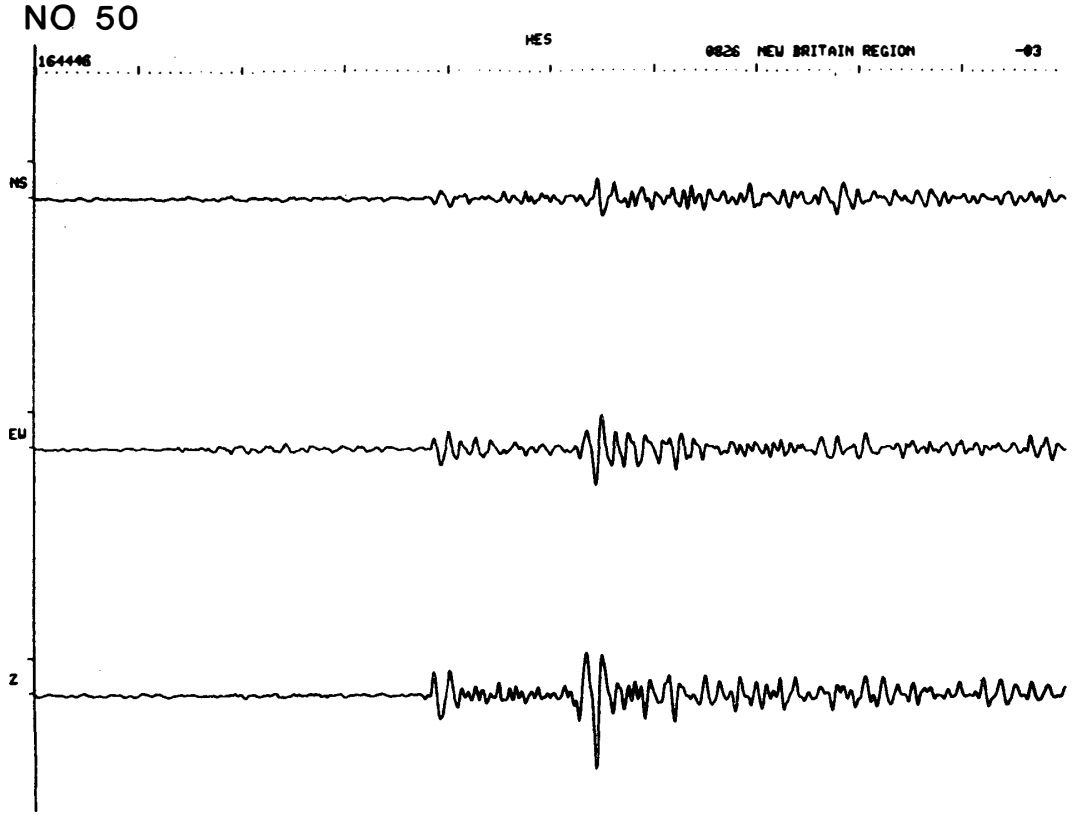
NO 48


HES
0825 SOUTH OF KERMADEC ISLANDS -03
053114
NS
EW
Z

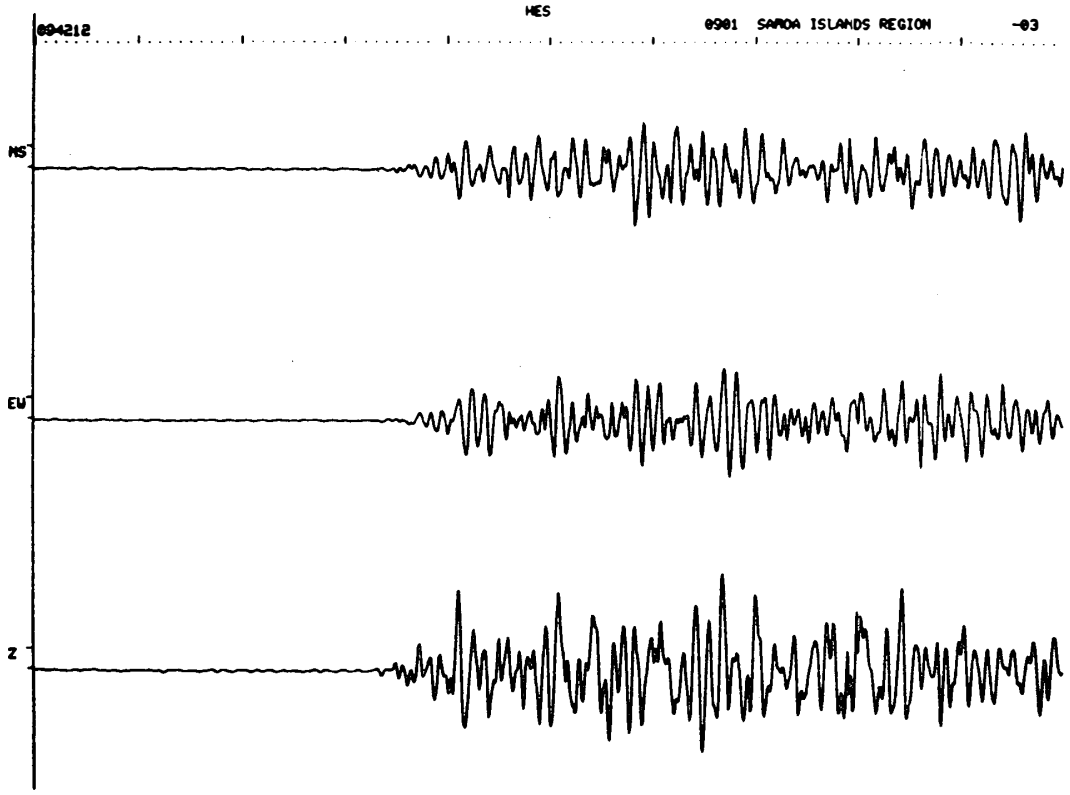
NO 49


HES
0825 TONGA ISLANDS REGION -03
NS
EW
Z

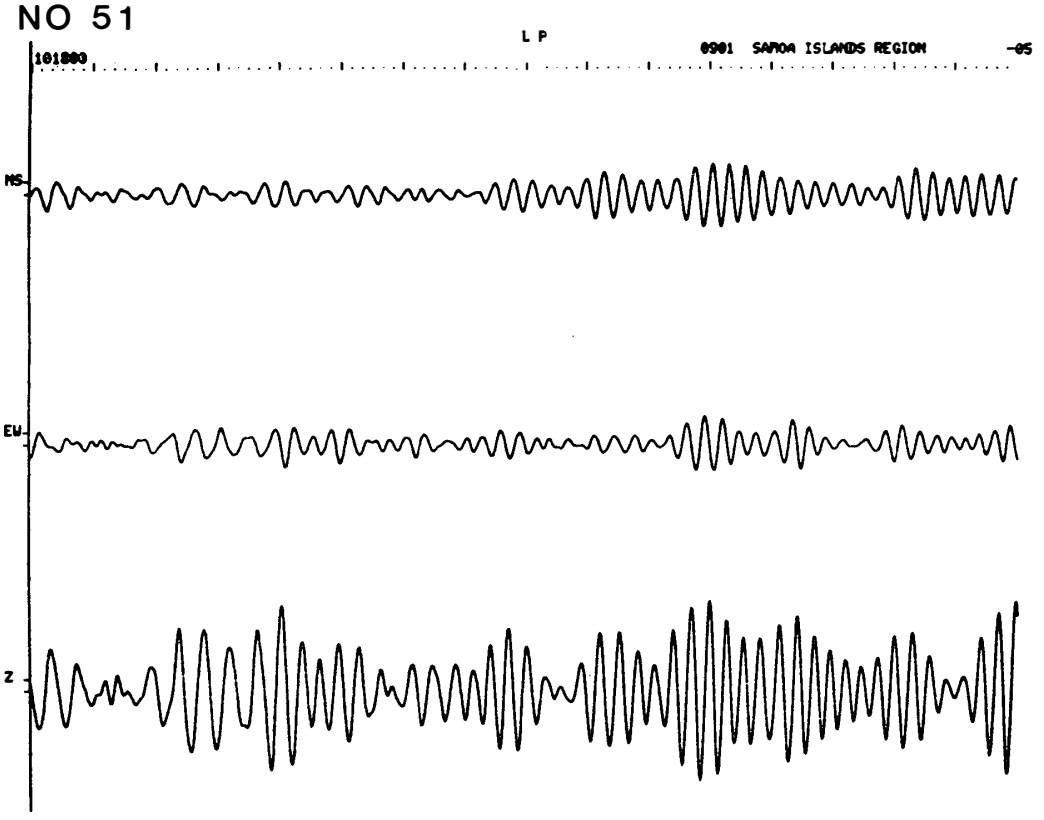
NO 50


HES
0826 NEW BRITAIN REGION -03
NS
EW
Z

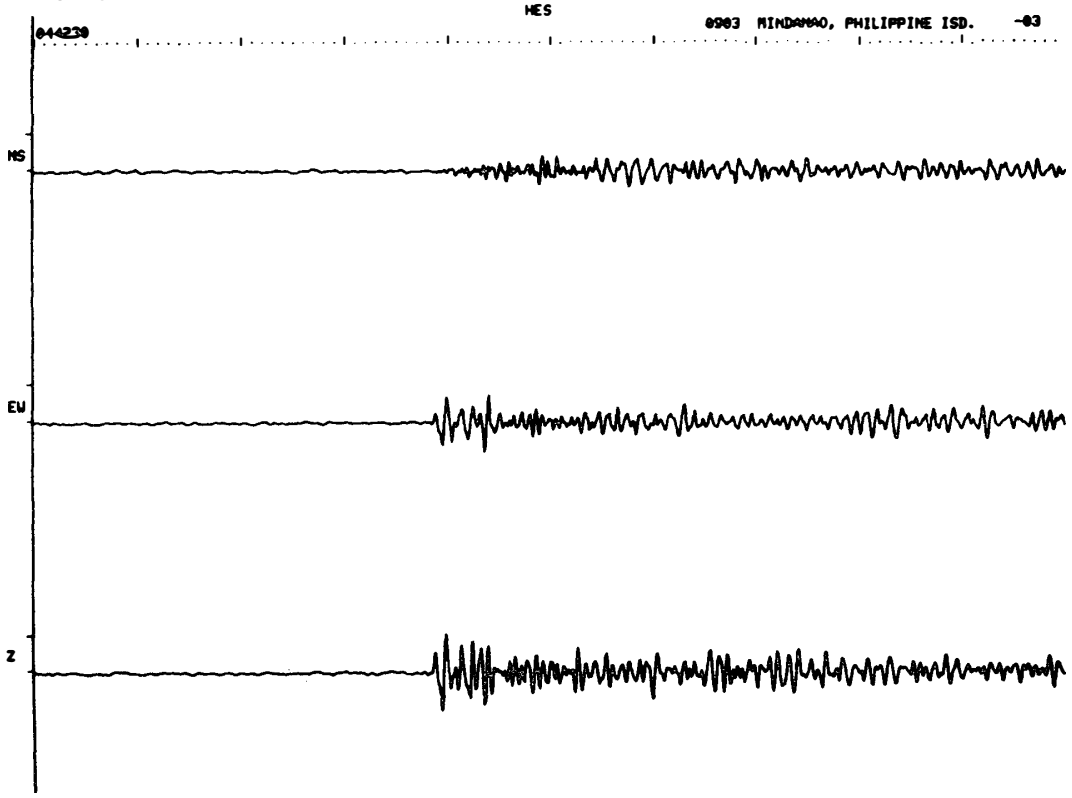
NO 51


HES
0901 SAMOA ISLANDS REGION
-03
NS
EW
Z

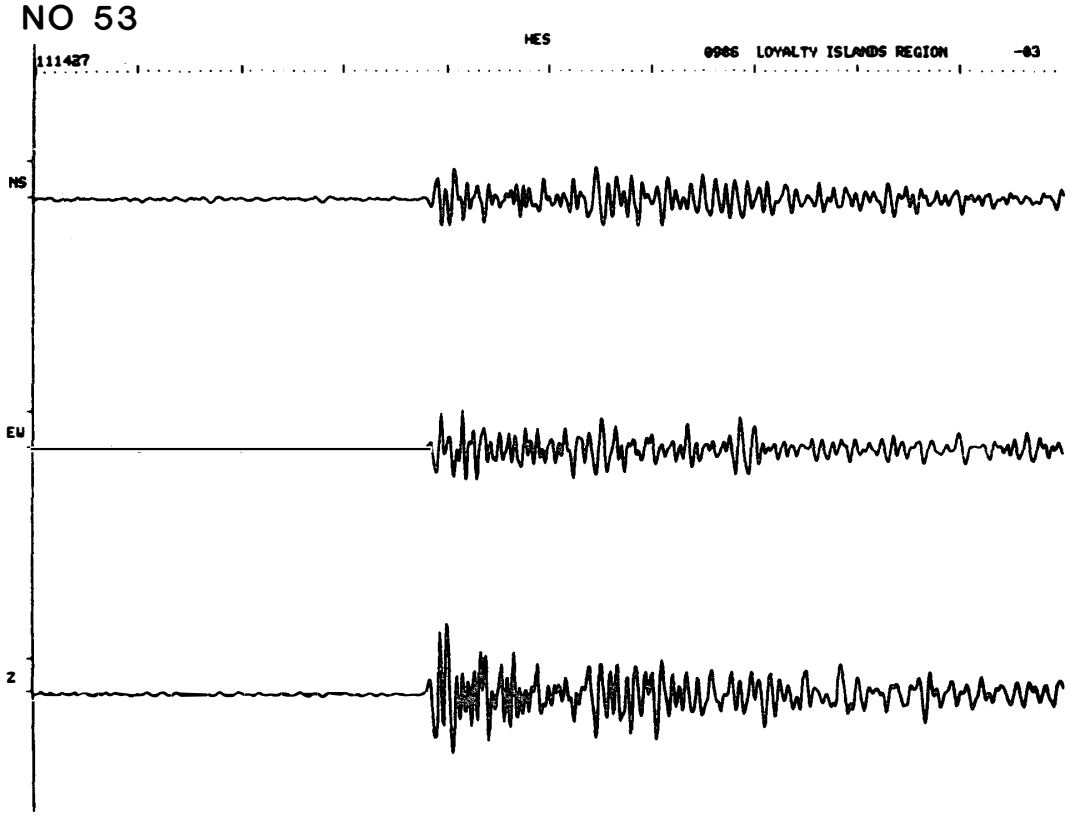
NO 51


L P
0901 SAMOA ISLANDS REGION
-05
NS
EW
Z

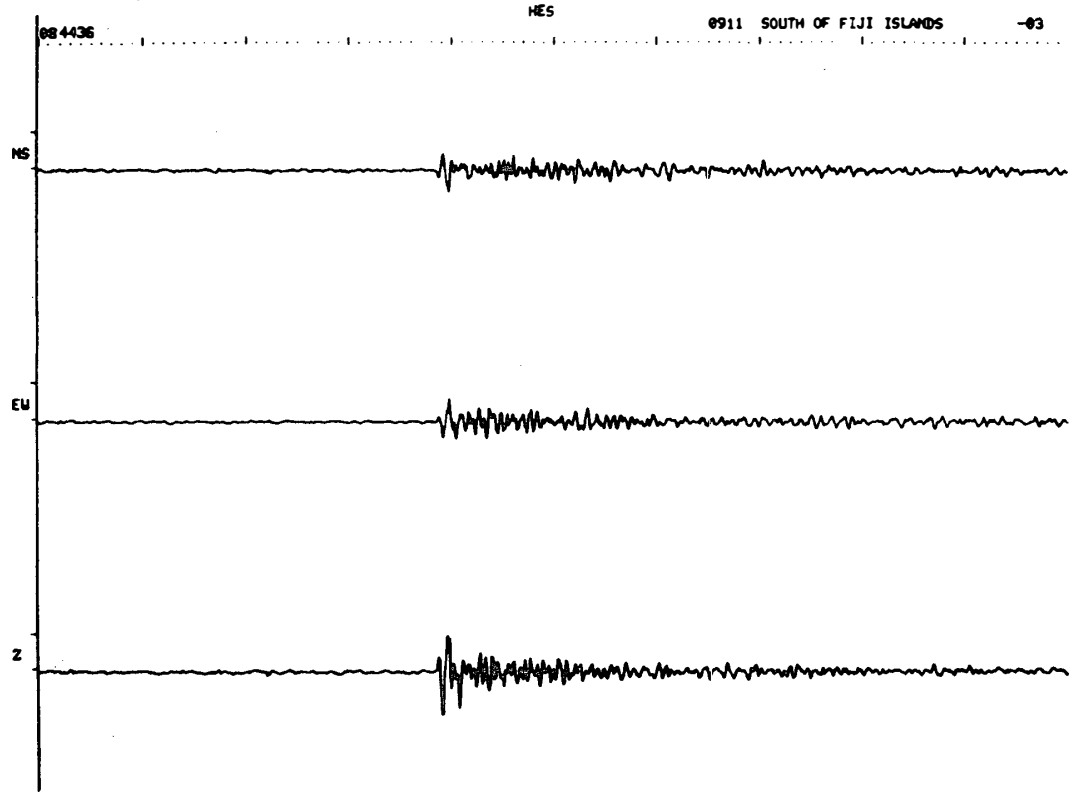
NO 52


HES
0903 MINDANAO, PHILIPPINE ISD. -03
044230
NS
EW
Z

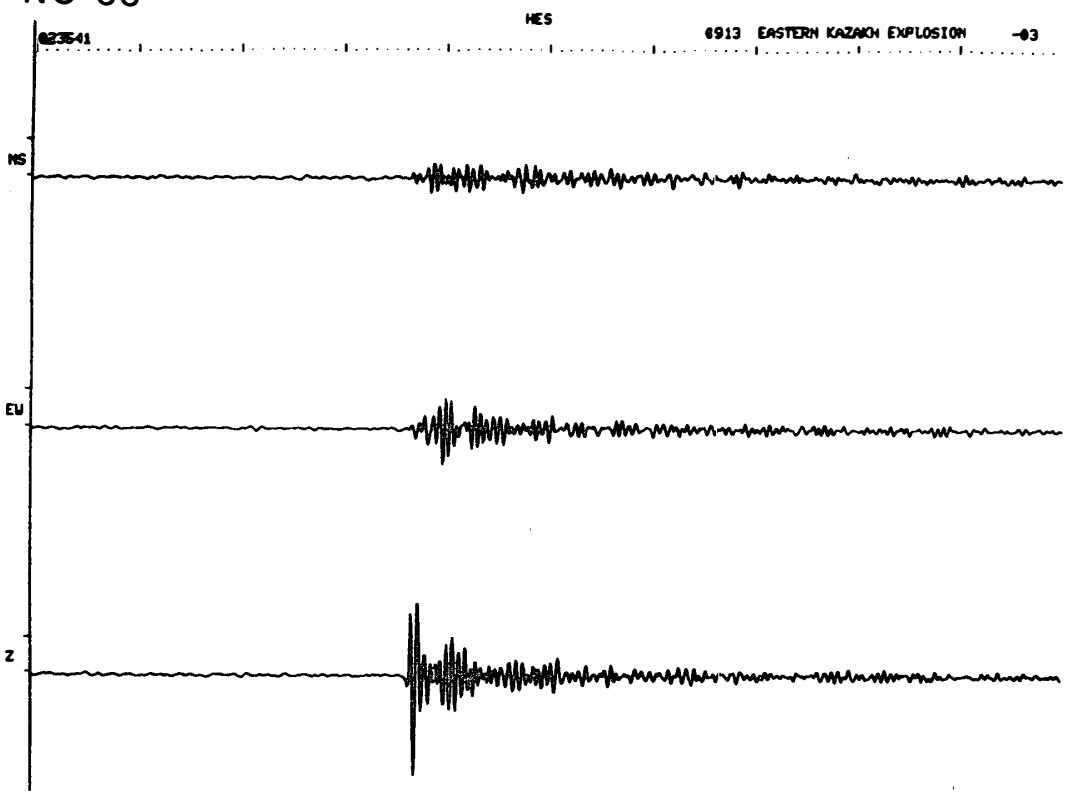
NO 53


HES
0906 LOYALTY ISLANDS REGION -03
111427
NS
EW
Z

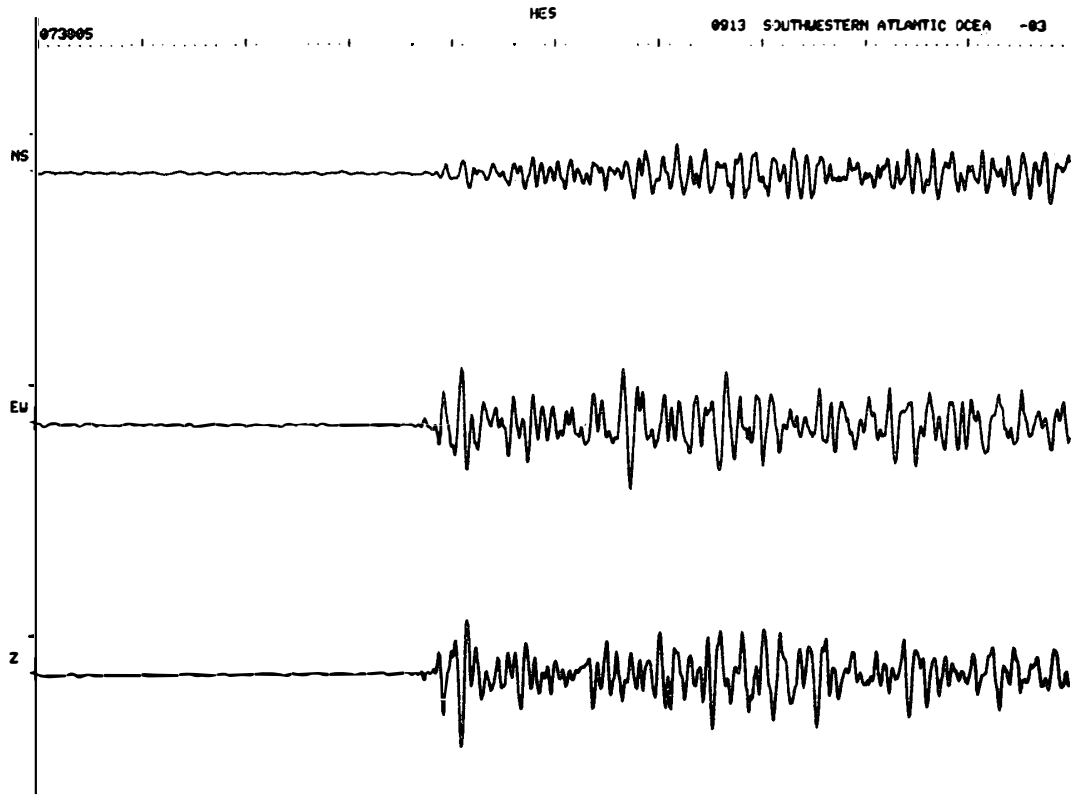
NO 54


HES
0911 SOUTH OF FIJI ISLANDS -03
084436
NS
EW
Z

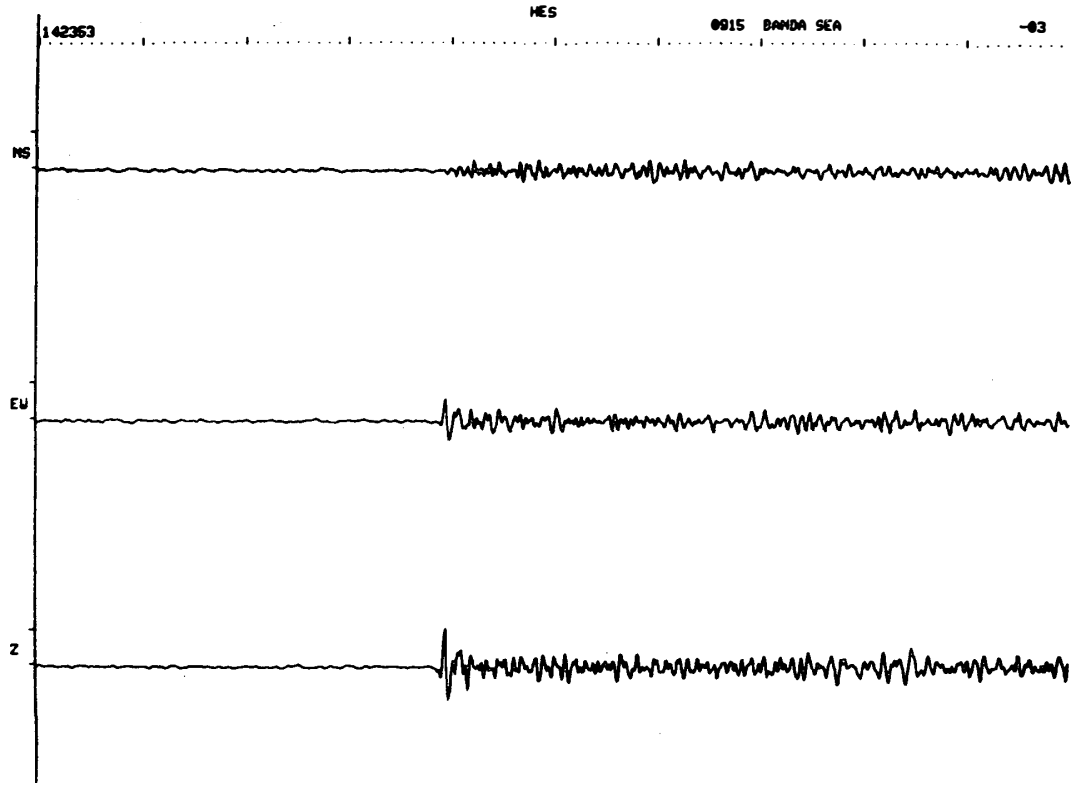
NO 55


HES
0913 EASTERN KAZAKH EXPLOSION -03
023541
NS
EW
Z

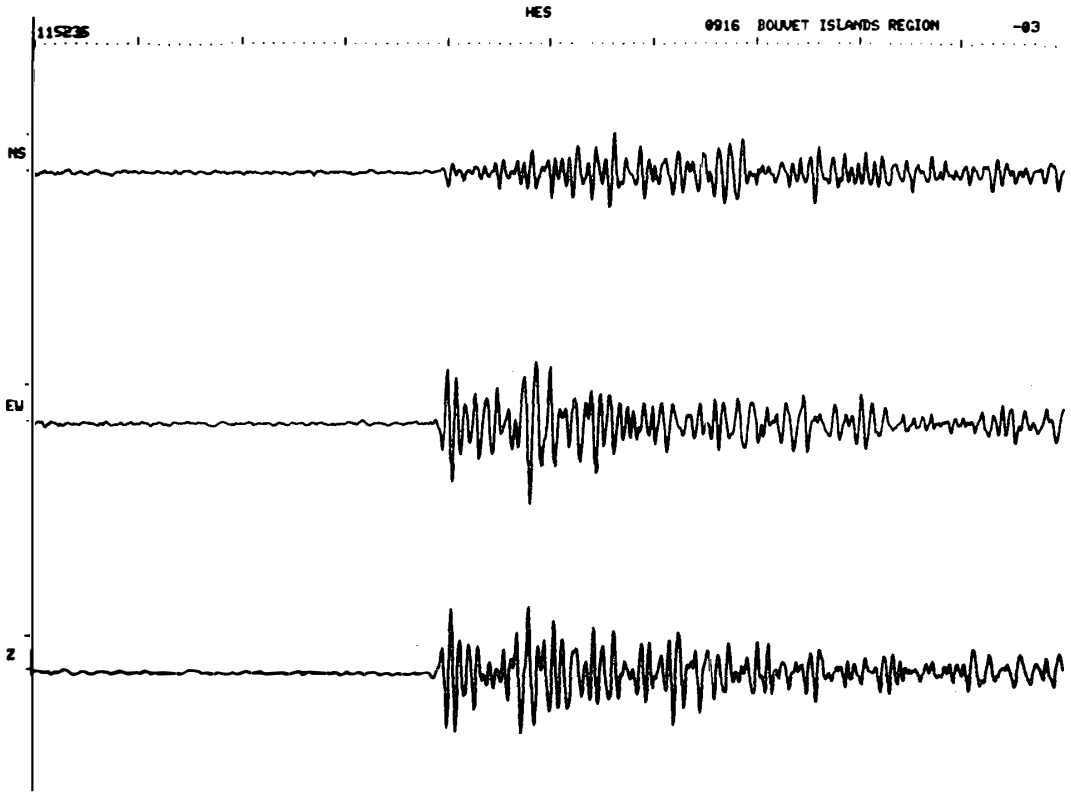
NO 56


HES
073005
0913 SOUTHWESTERN ATLANTIC OCEA -03
NS
EW
Z

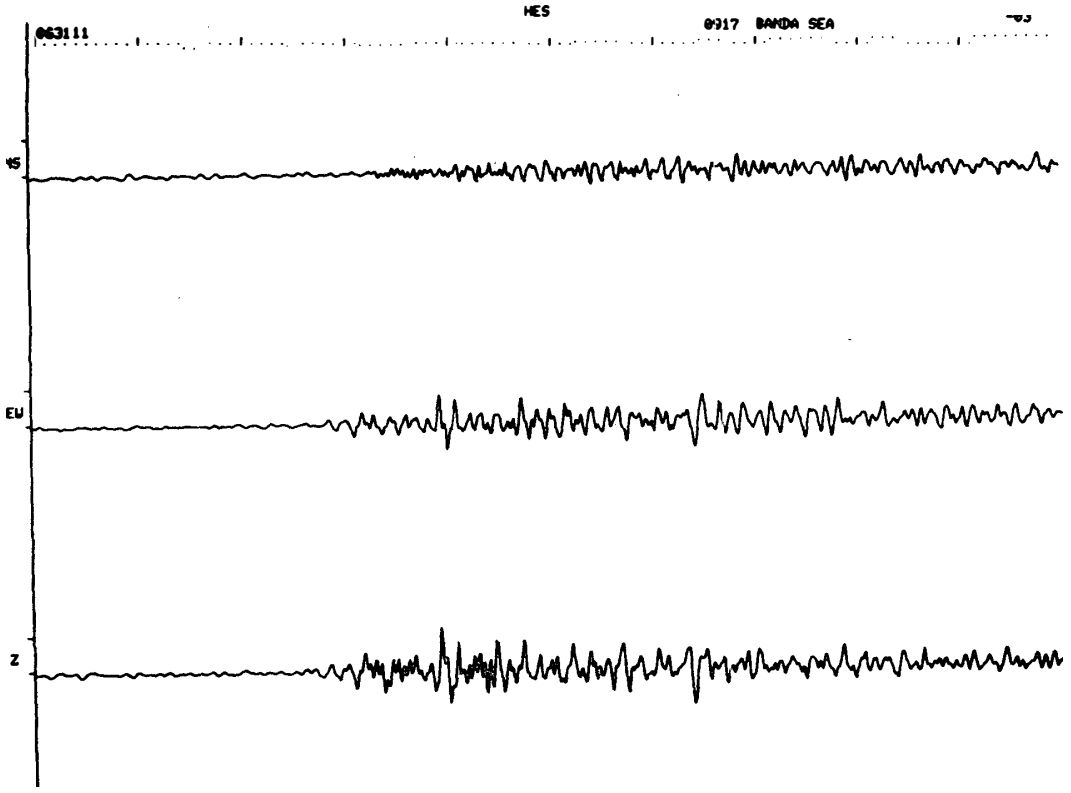
NO 57


HES
142353
0915 BANDA SEA -03
NS
EW
Z

NO 58


HES
0916 BOUVET ISLANDS REGION
NS
EW
Z

NO 59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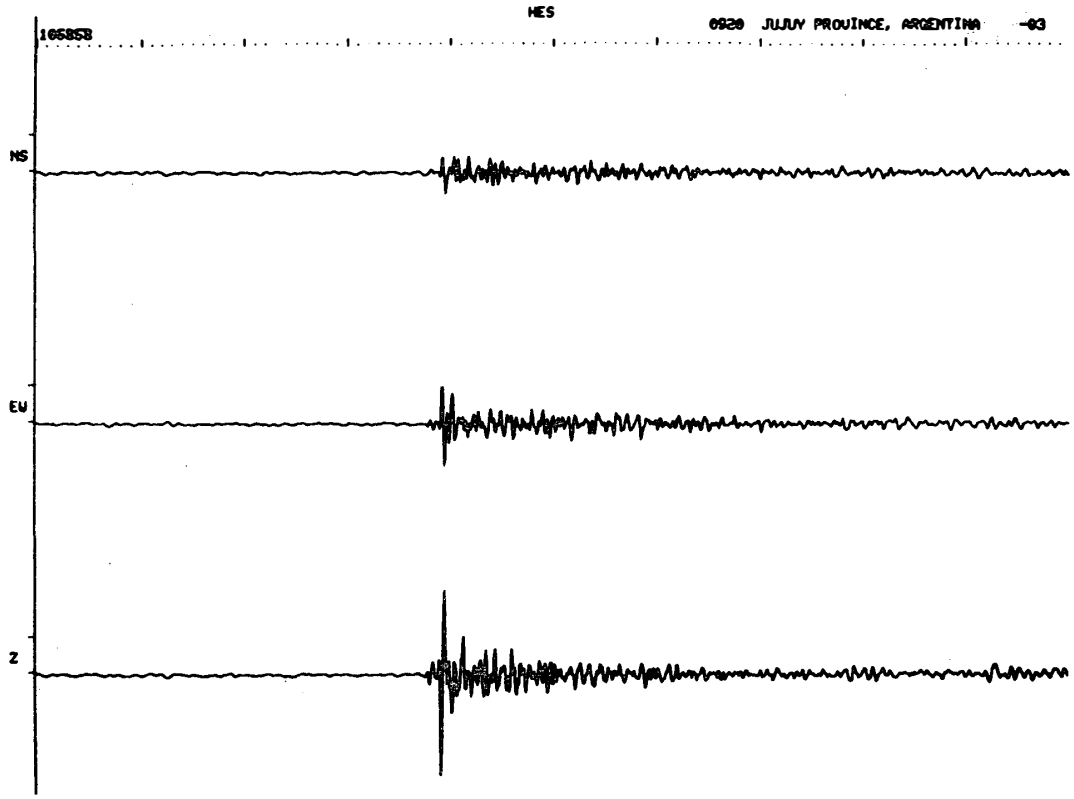
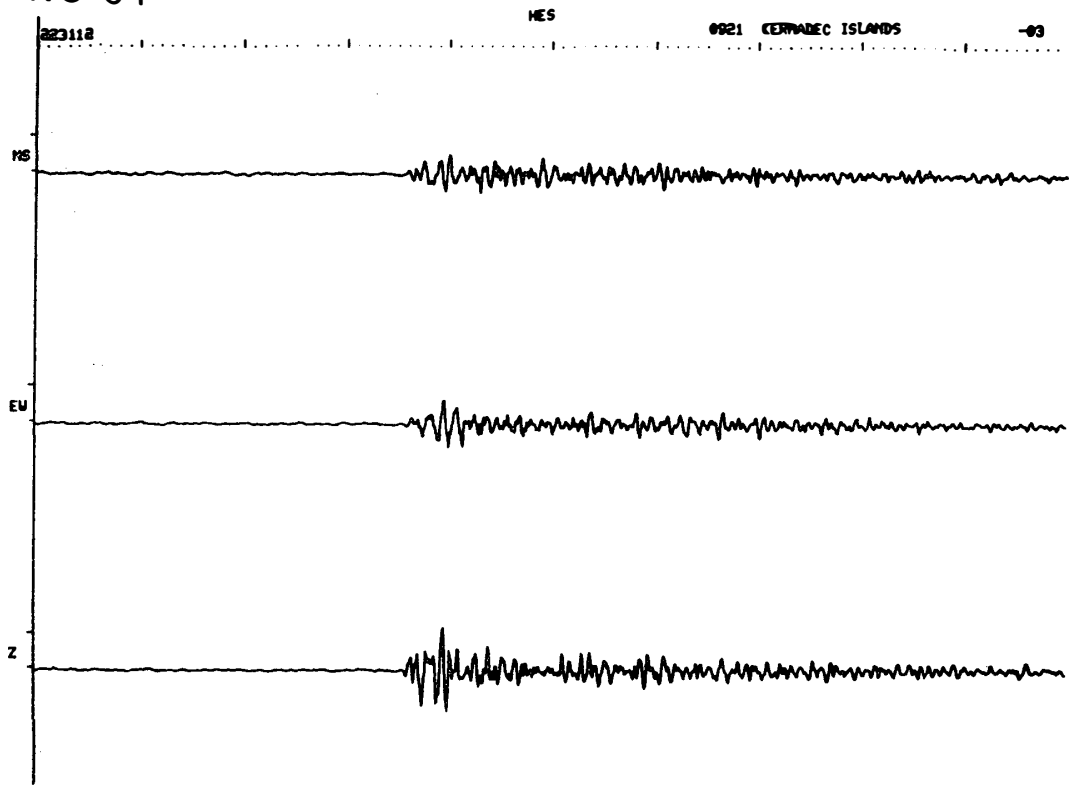
0917 BANDA SEA
NS
EW
Z

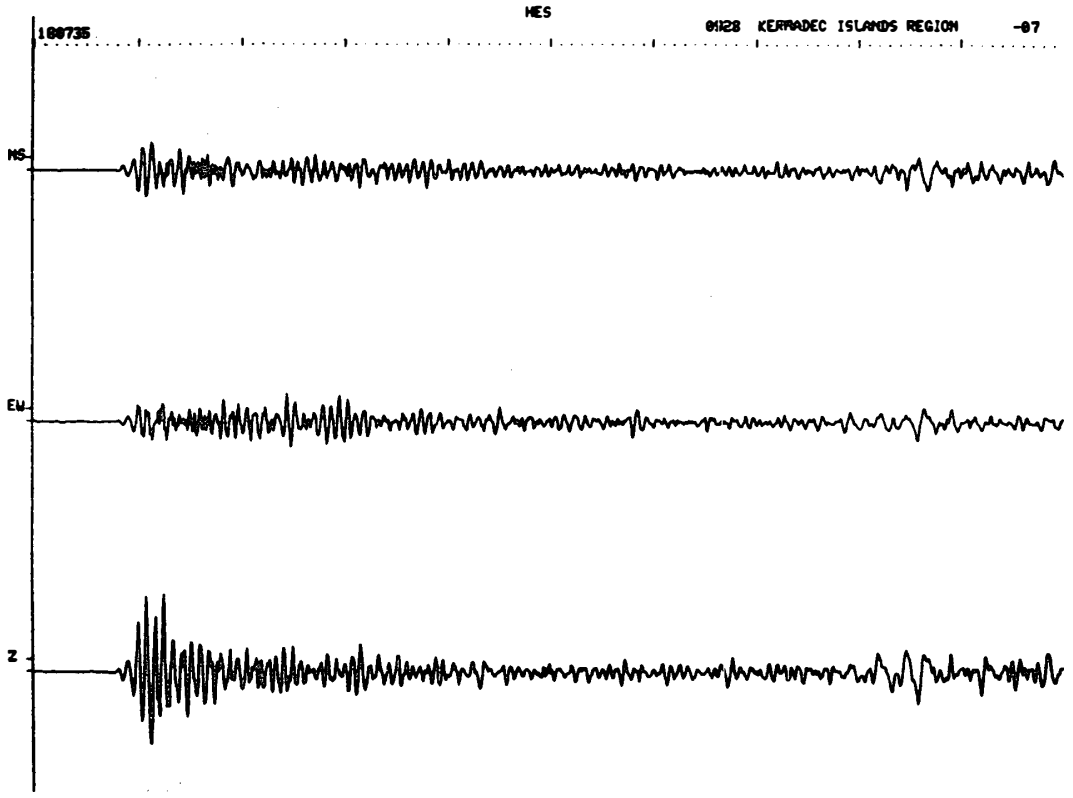
NO 60


HES
0920 JUJUY PROVINCE, ARGENTINA -03
165858
NS
EW
Z

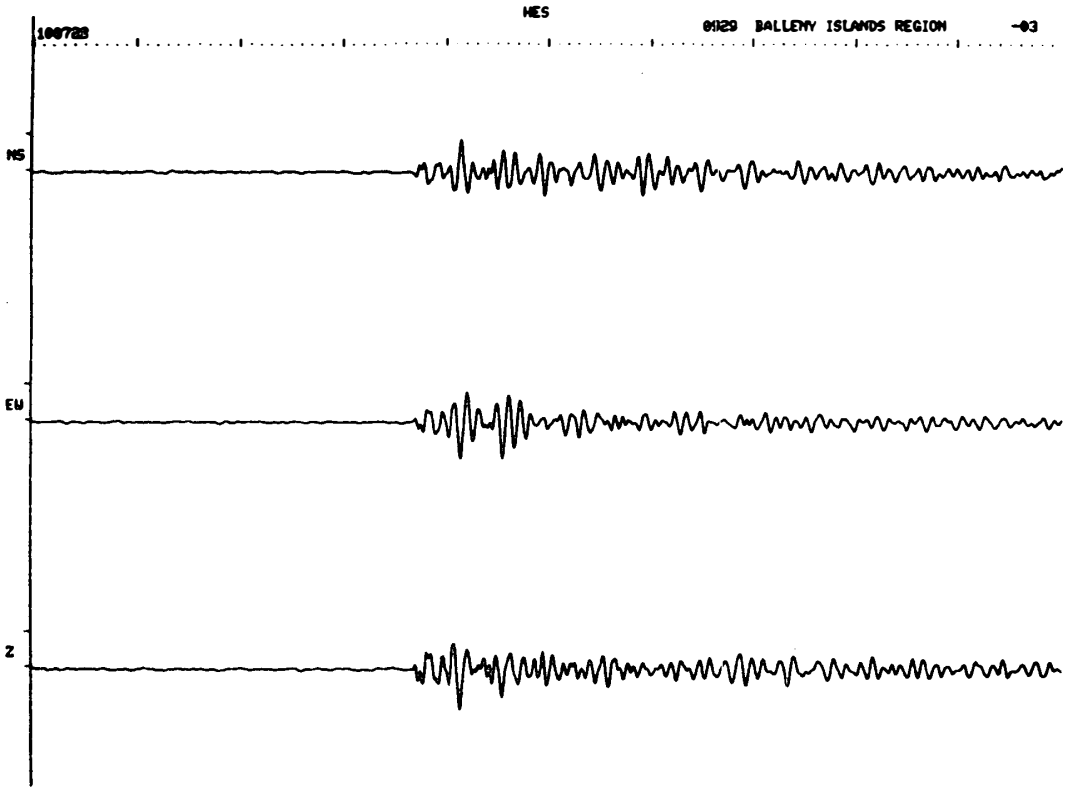
NO 61


HES
0921 KERMADEC ISLANDS -03
223118
NS
EW
Z

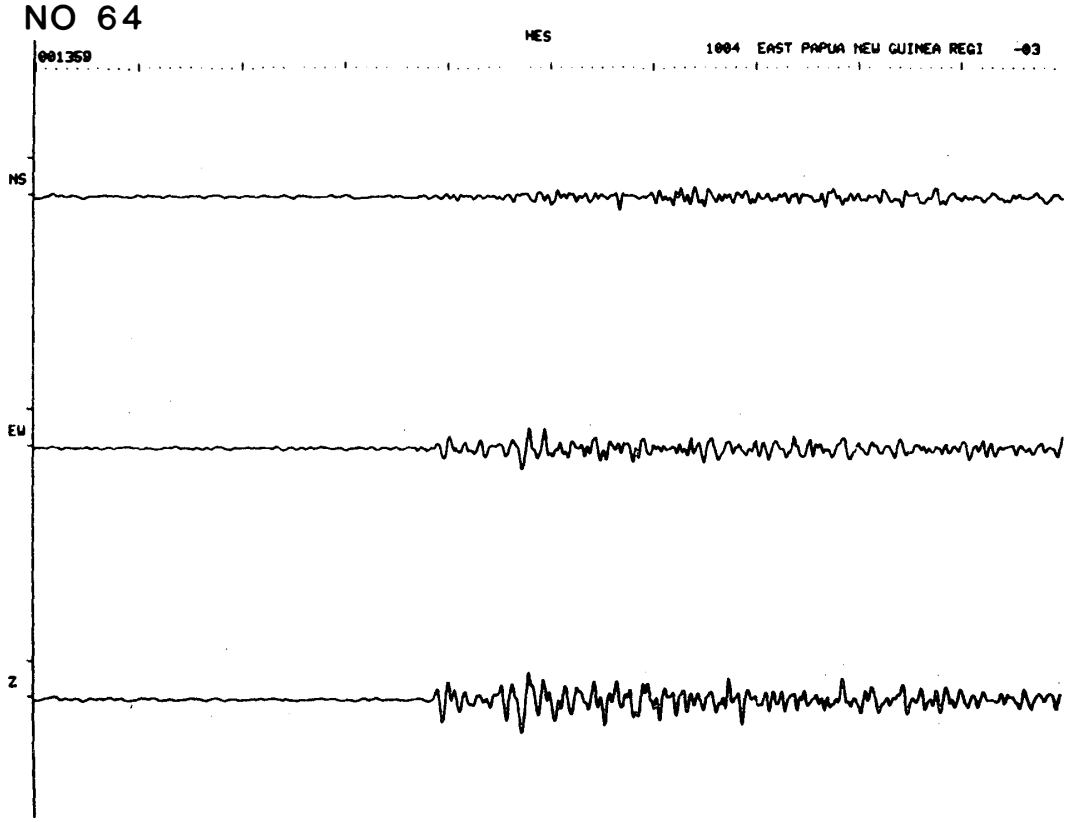
NO 62


MES
100735
01128 KERMADEC ISLANDS REGION -07
NS
EW
Z

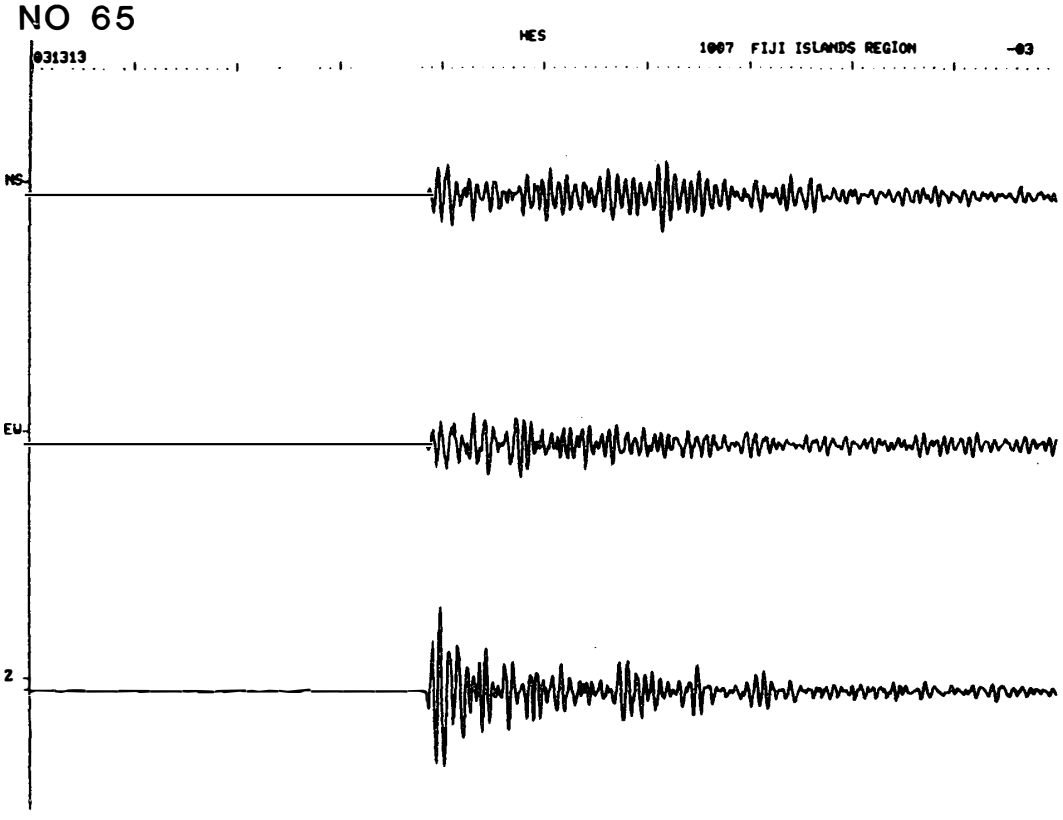
NO 63


MES
100723
01129 BALLENY ISLANDS REGION -03
NS
EW
Z

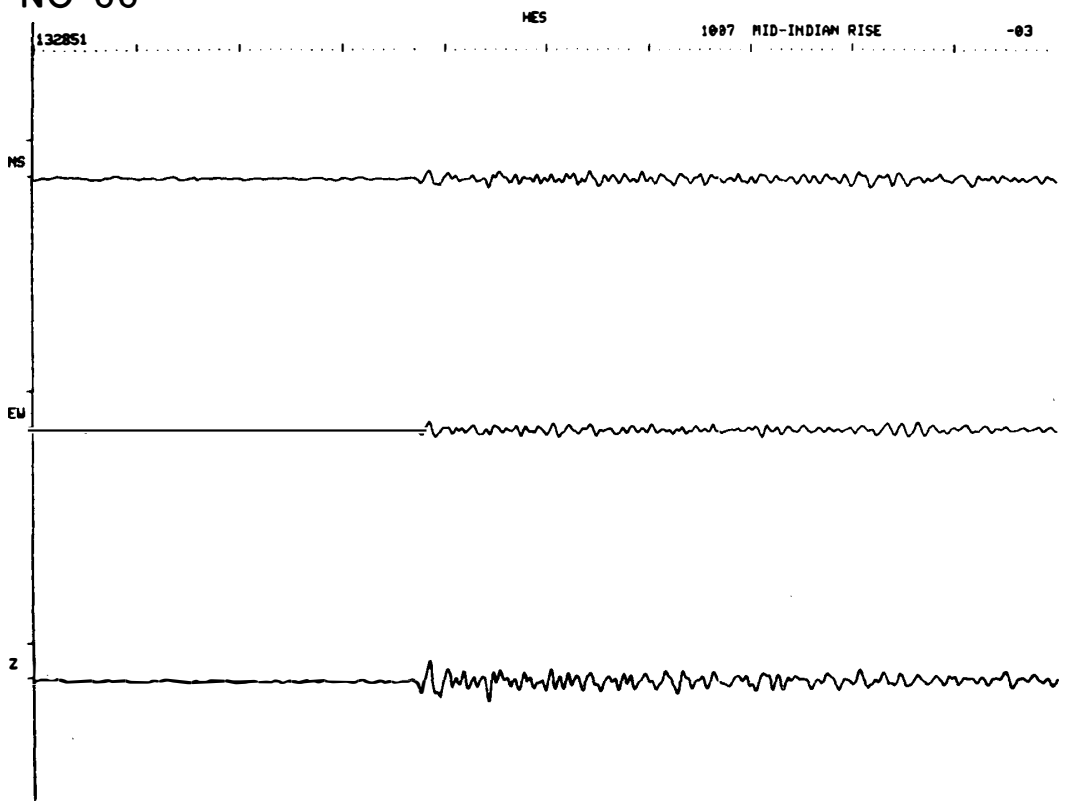
NO 64


HES
1004 EAST PAPUA NEW GUINEA REGI -03
001359
NS
EW
Z

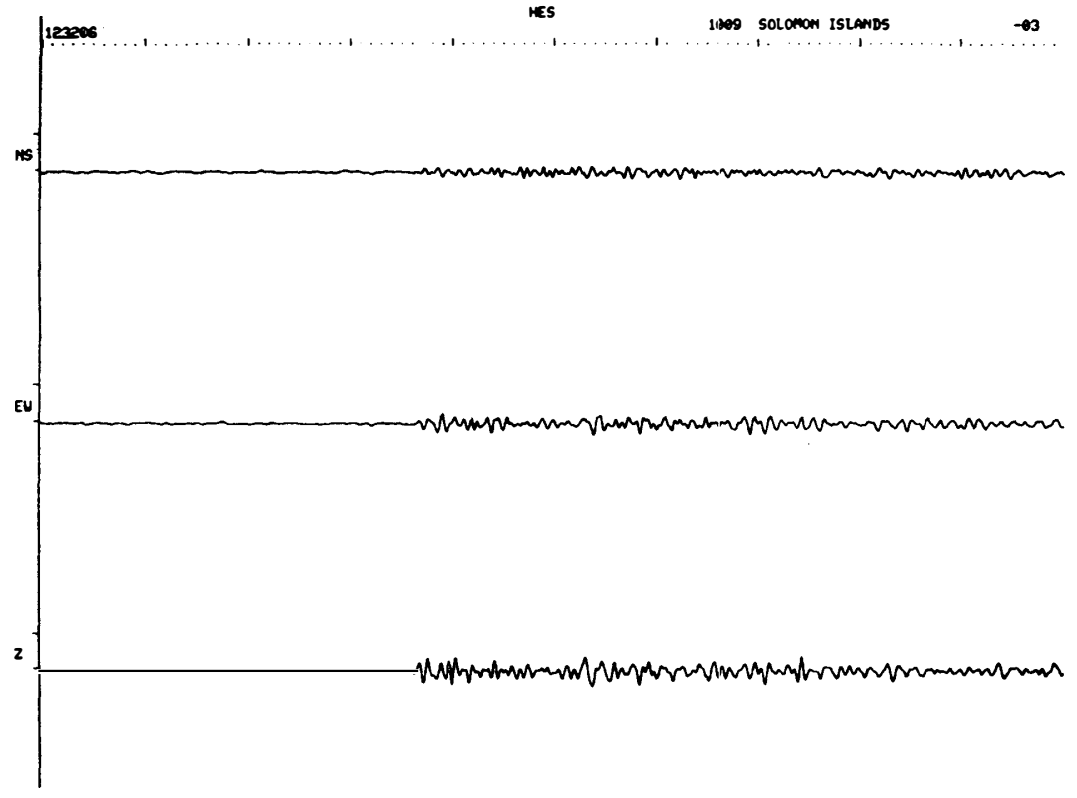
NO 65


HES
1007 FIJI ISLANDS REGION -03
031313
NS
EW
Z

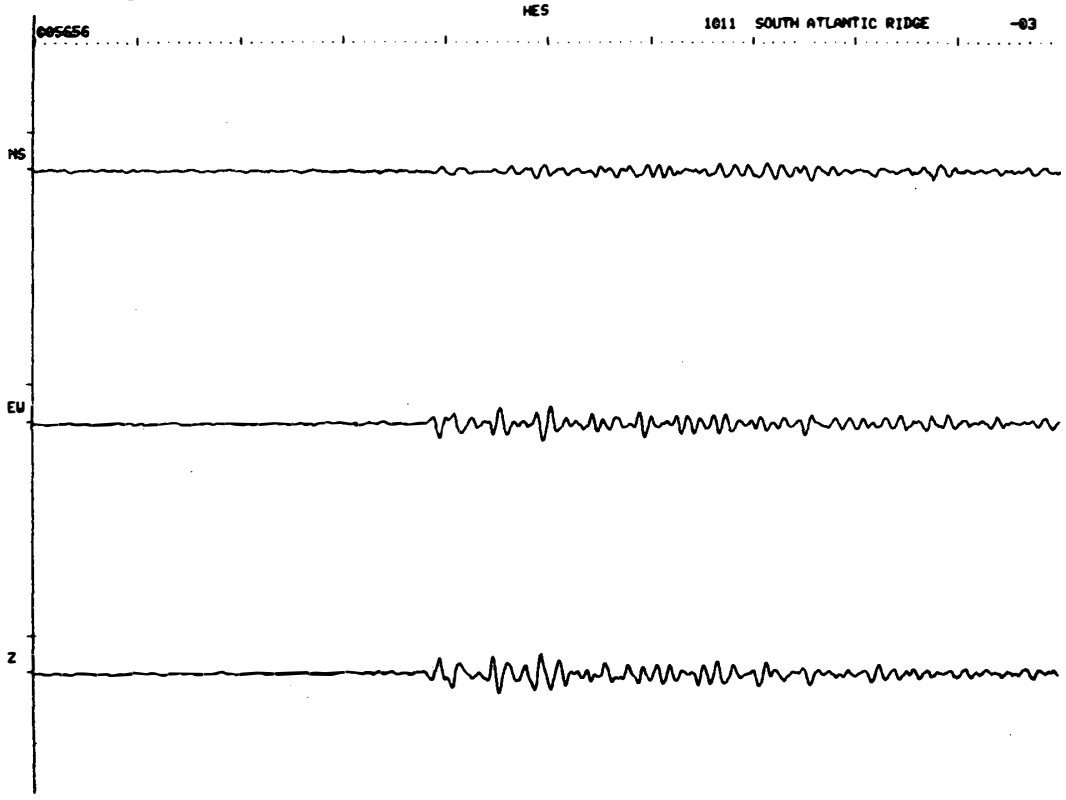
NO 66


MES
1007 MID-INDIAN RISE
-03
132851
NS
EW
Z

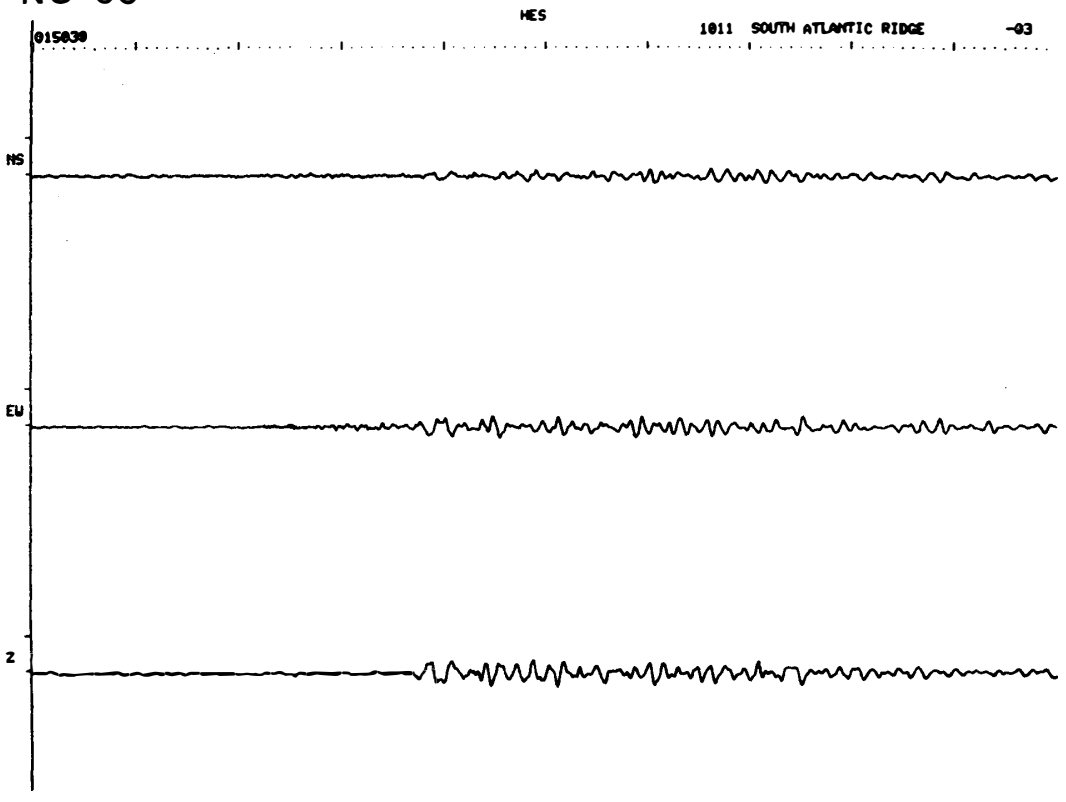
NO 67


MES
1009 SOLOMON ISLANDS
-03
123206
NS
EW
Z

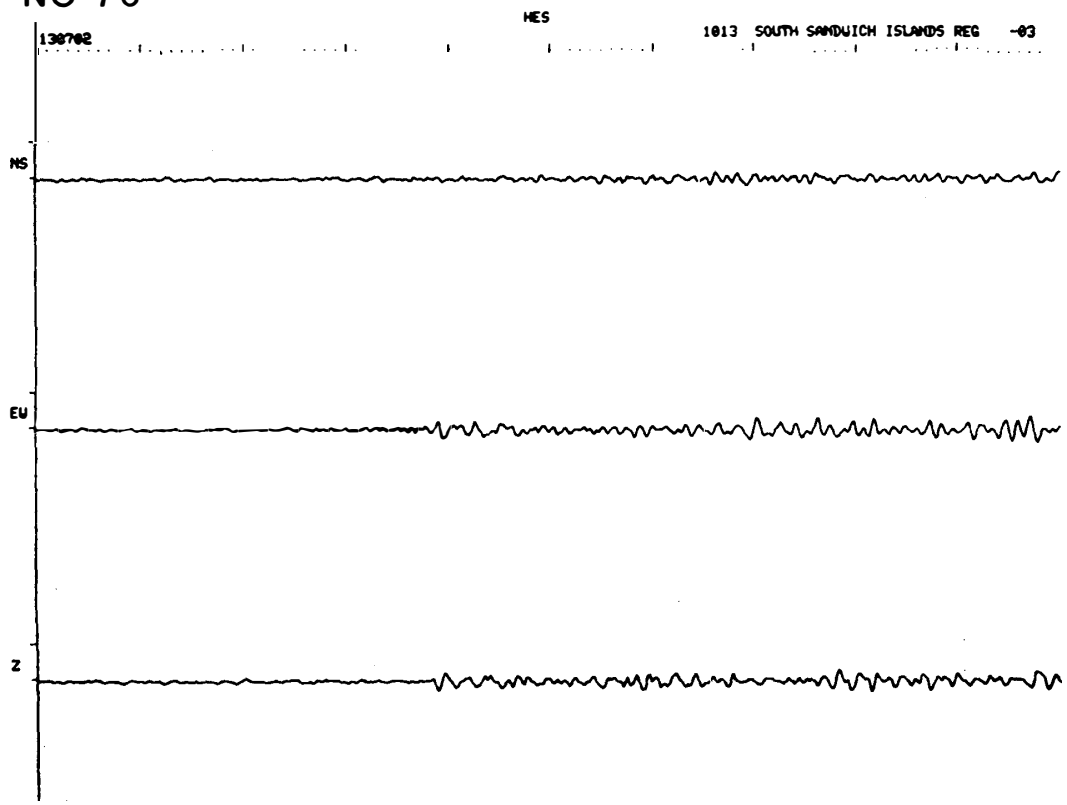
NO 68


HES
005656
1011 SOUTH ATLANTIC RIDGE -03
NS
EW
Z

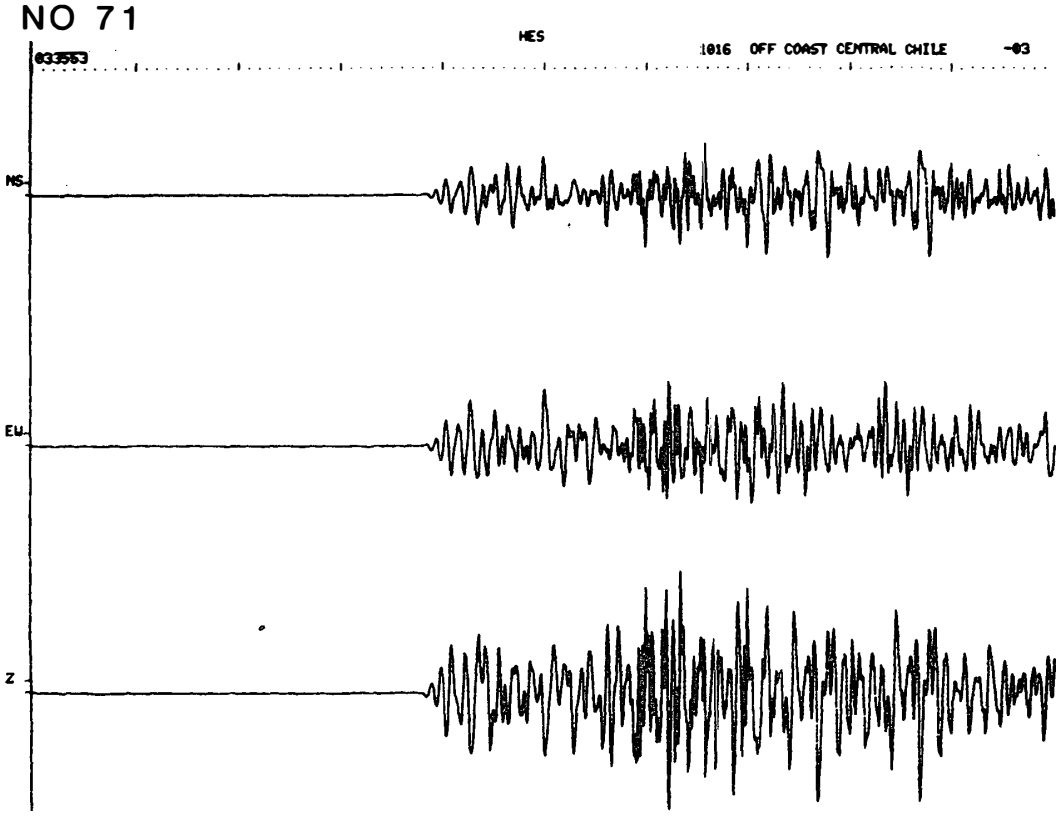
NO 69


HES
015030
1011 SOUTH ATLANTIC RIDGE -03
NS
EW
Z

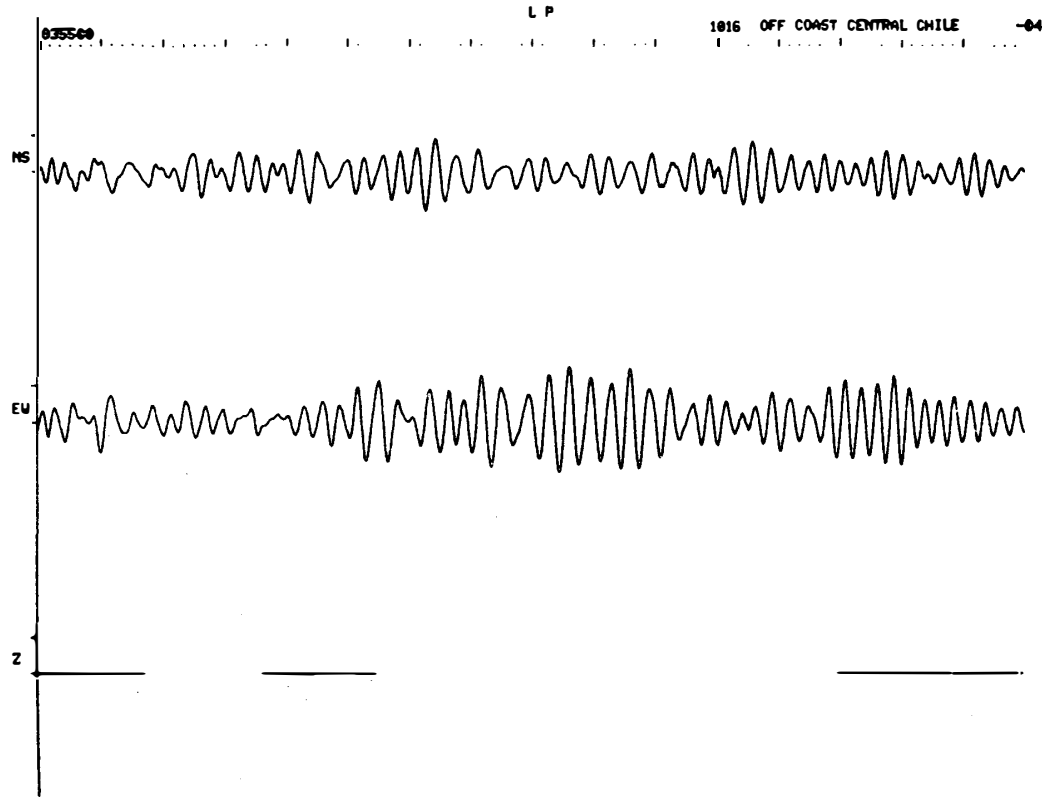
NO 70


HES
1013 SOUTH SANDWICH ISLANDS REG -03
130702
NS
EW
Z

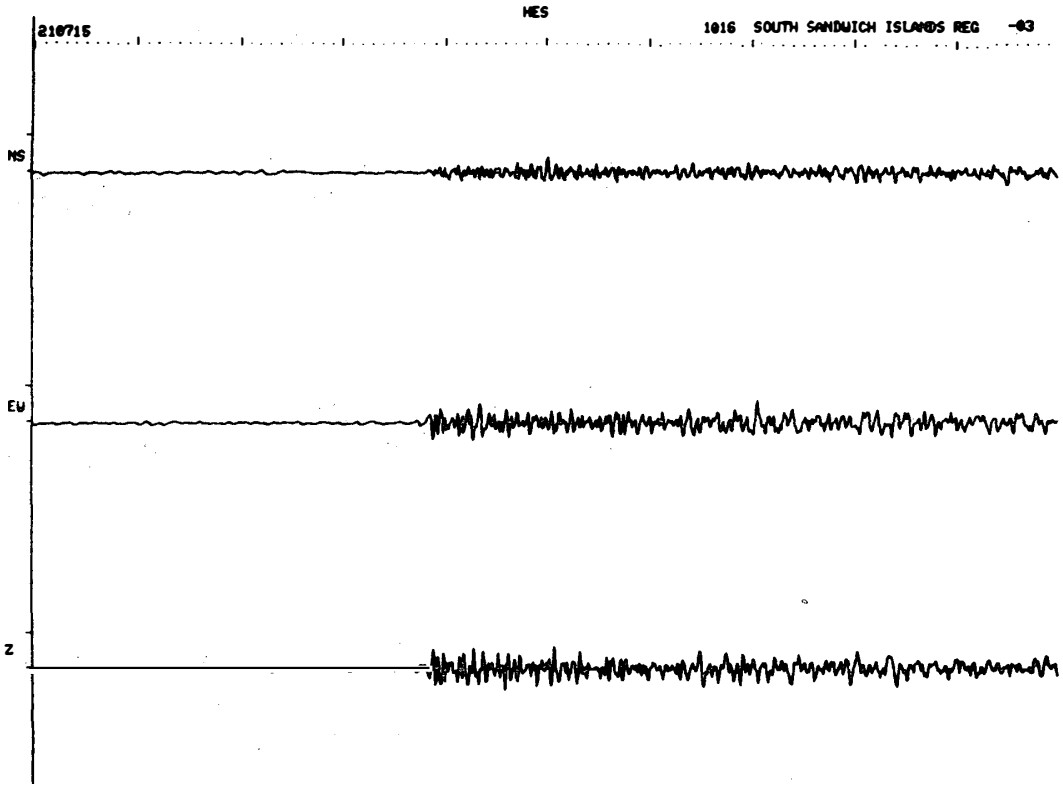
NO 71


HES
1016 OFF COAST CENTRAL CHILE -03
033553
NS
EW
Z

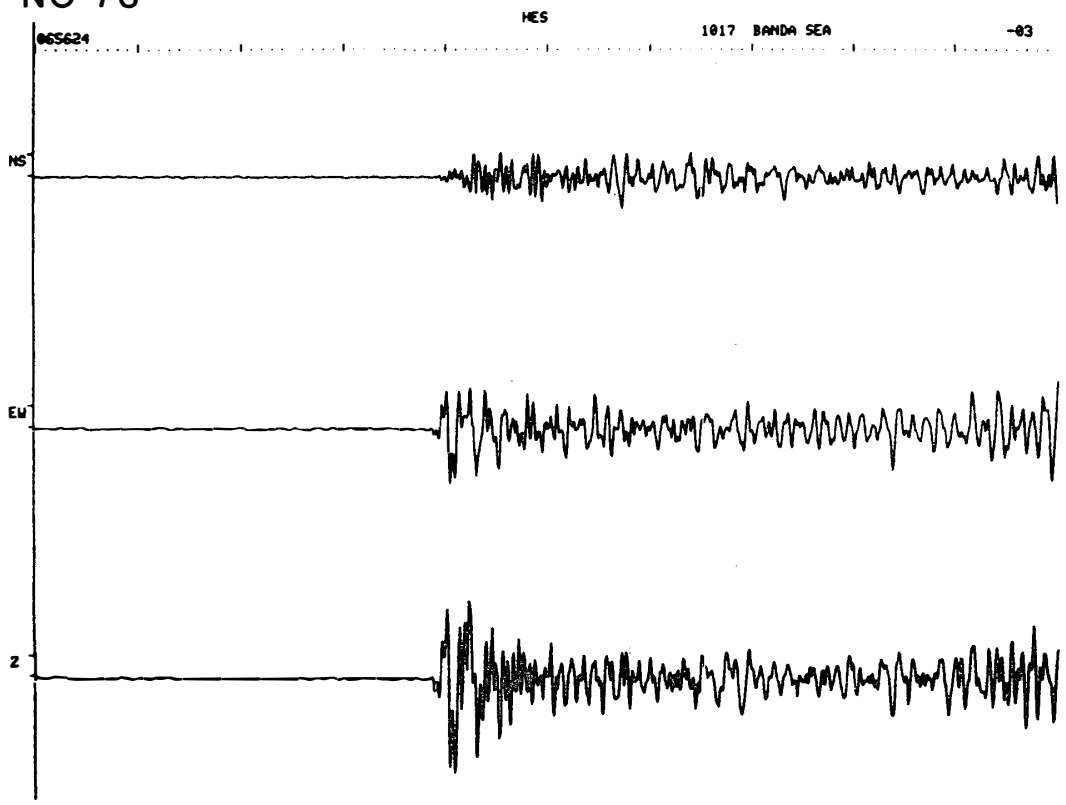
NO 71


L P
035500
1016 OFF COAST CENTRAL CHILE -04
NS
EW
Z

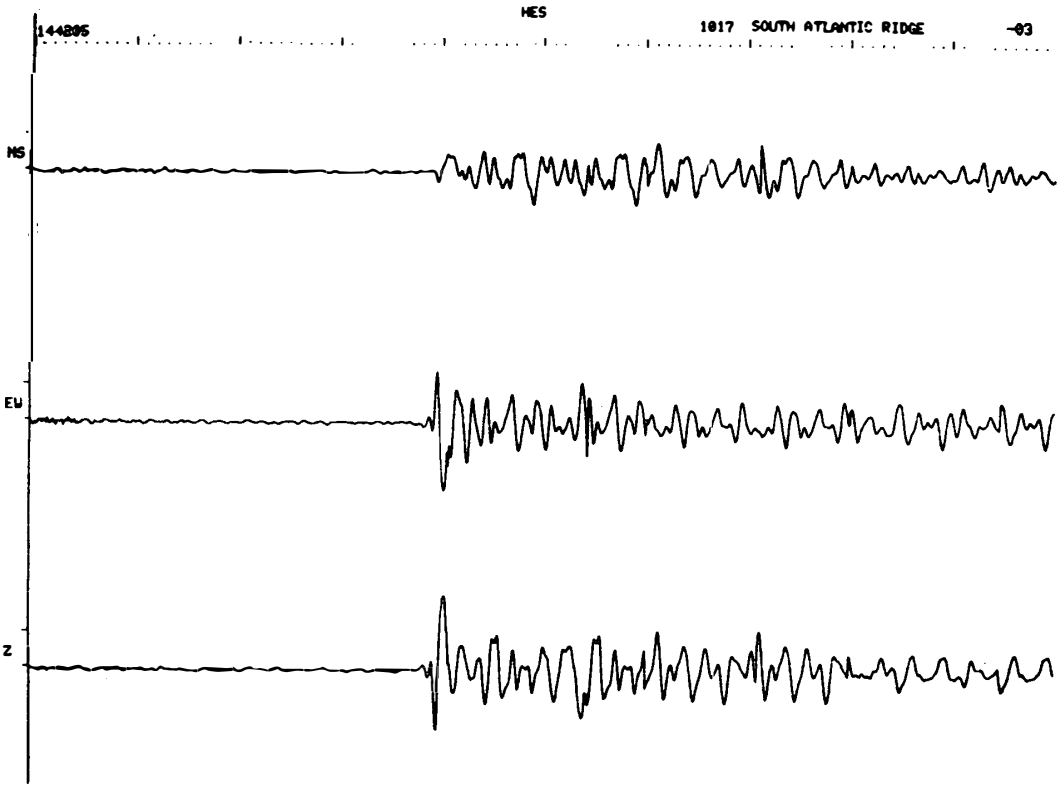
NO 72


MES
210715
1016 SOUTH SANDWICH ISLANDS REG -03
NS
EW
Z

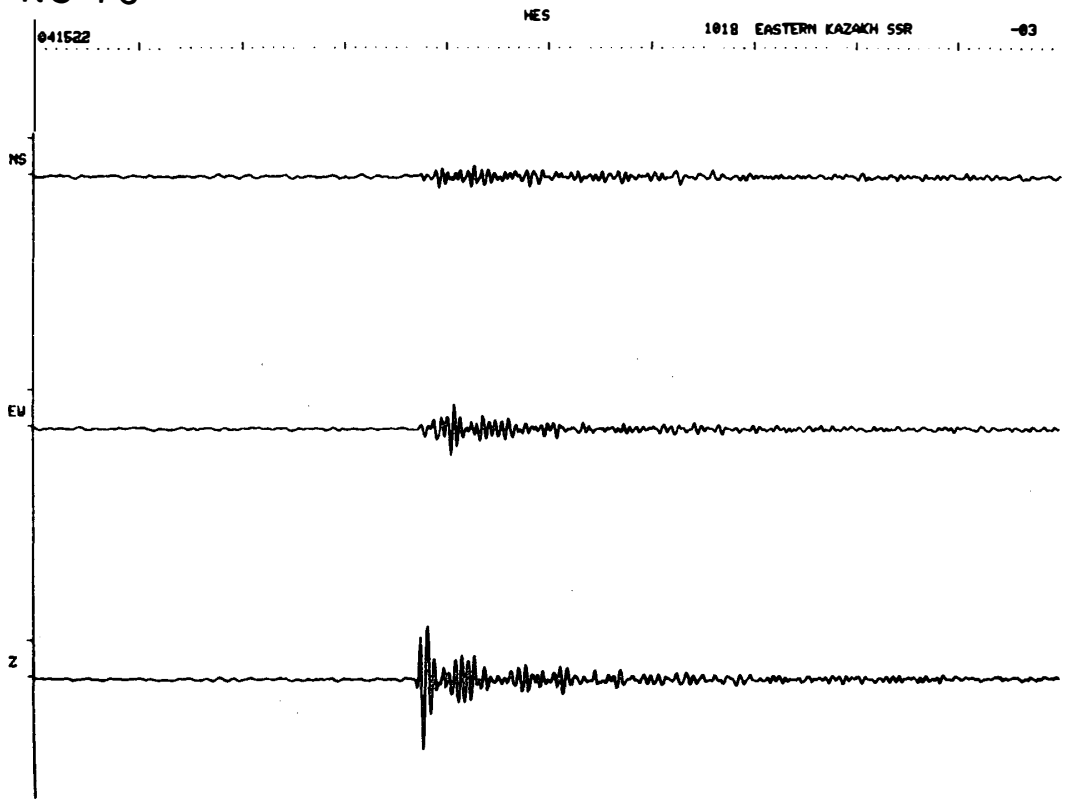
NO 73

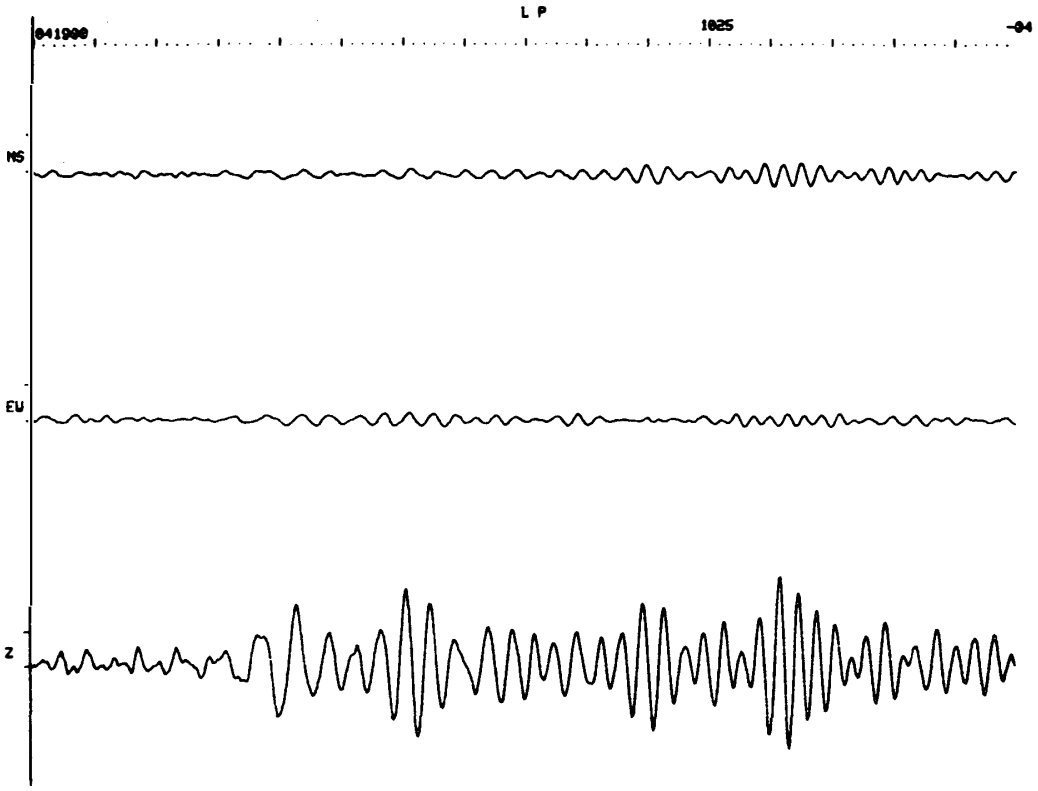

HES
1017 BANDA SEA
-03
065624
NS
EW
Z

NO 74

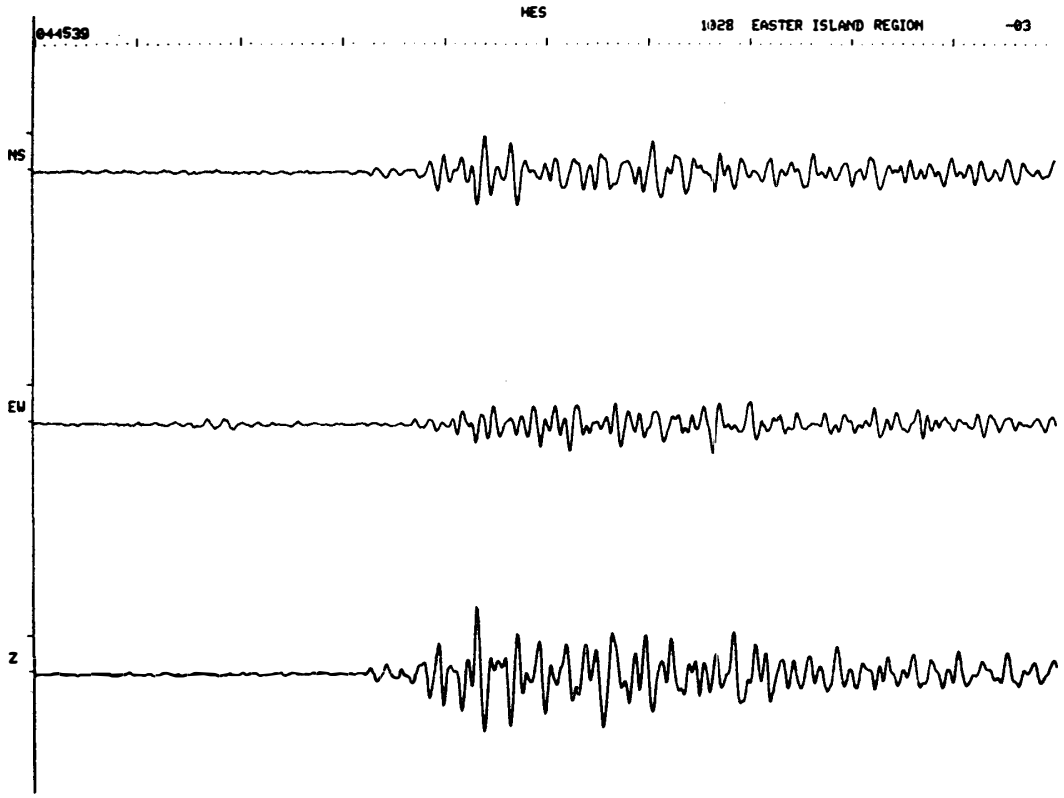

HES
1017 SOUTH ATLANTIC RIDGE
-03
144806
NS
EW
Z

NO 75

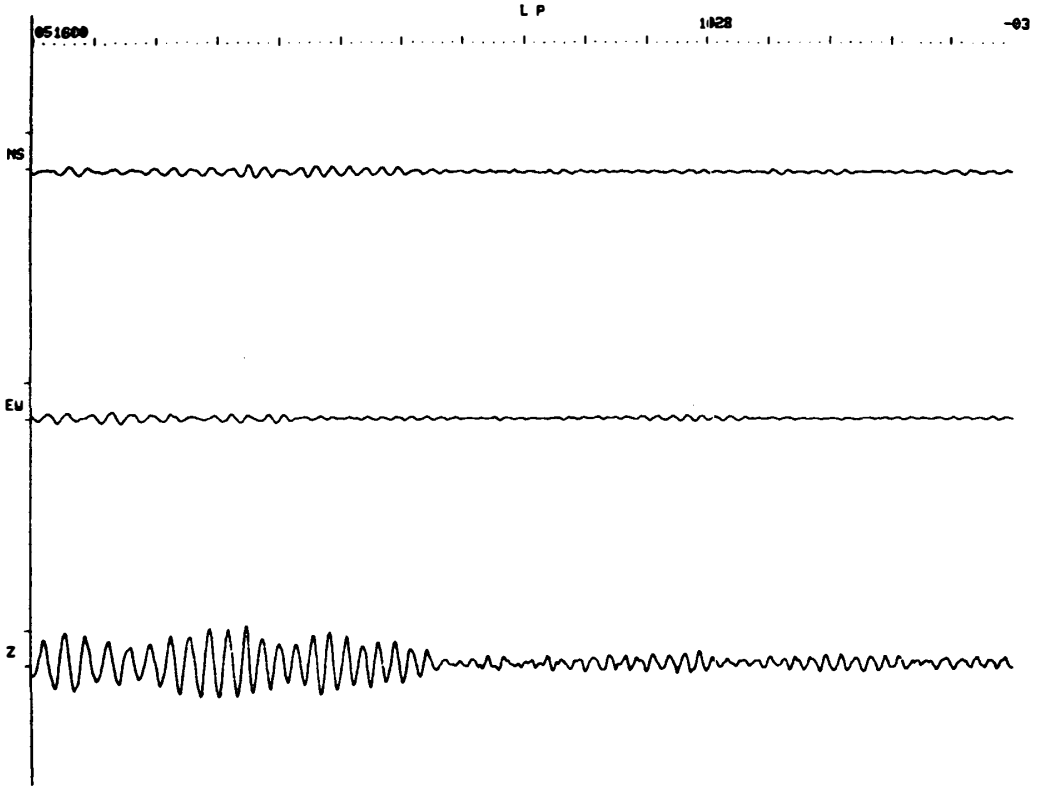

HES
041522
1018 EASTERN KAZAKH SSR
-03
NS
EW
Z


L P
041900
1025
-04
NS
EW
Z

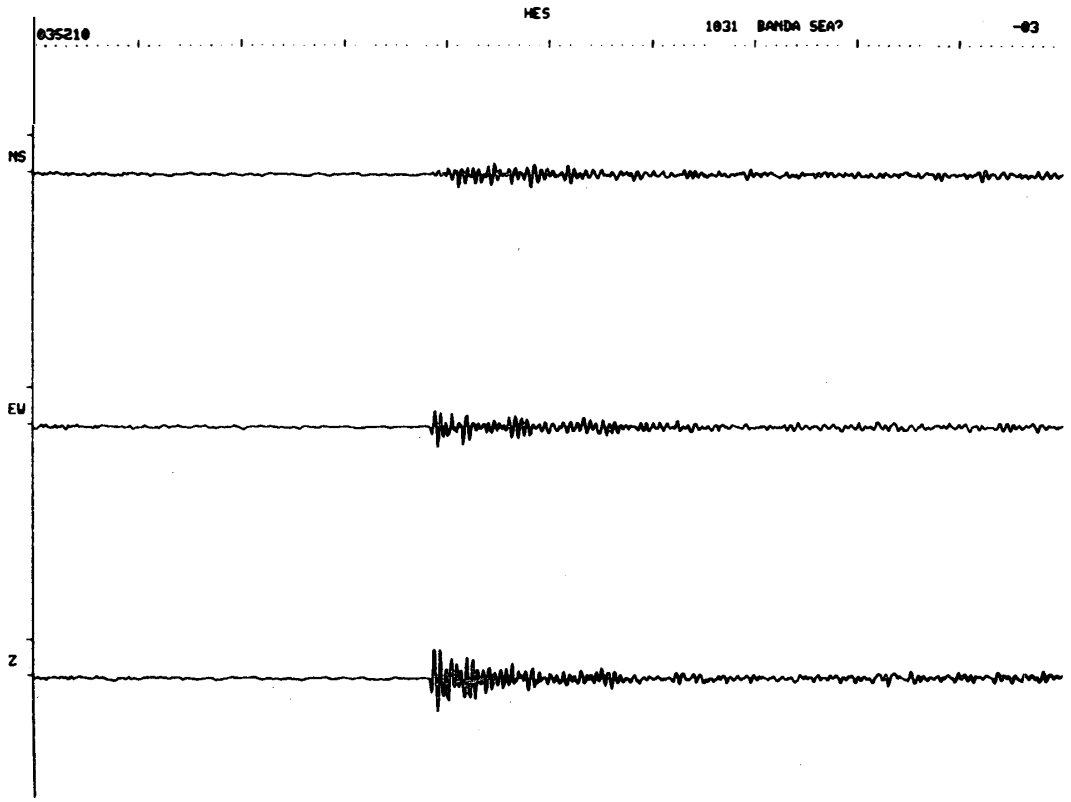
NO 76


MES
044539
1028 EASTER ISLAND REGION -03
NS
EW
Z

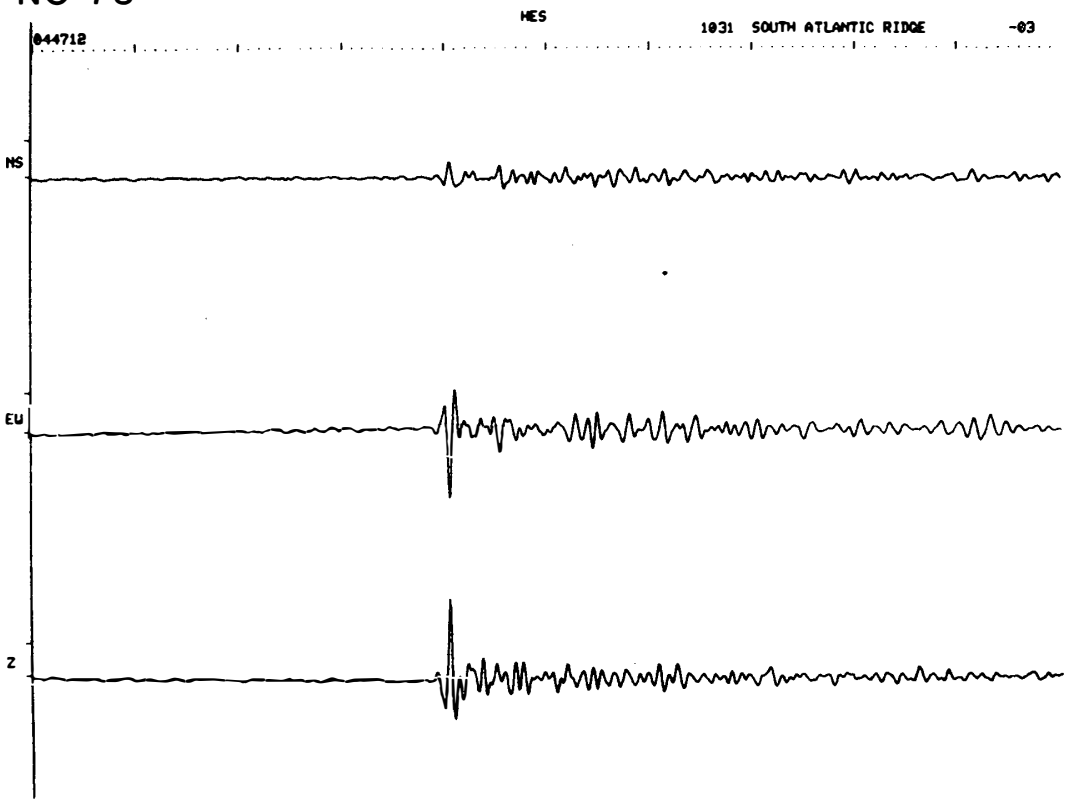
NO 76


L P
051600
1028 -03
NS
EW
Z

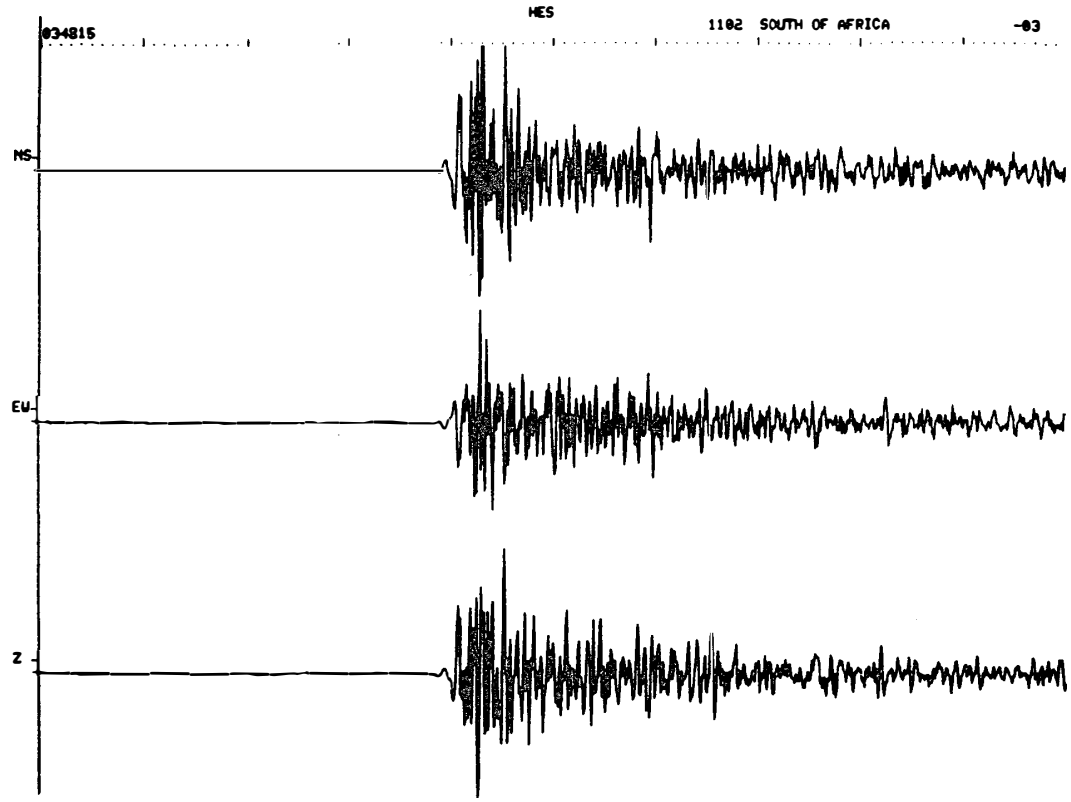
NO 77


HES
035210
1031 BANDA SEA?
-03
NS
EW
Z

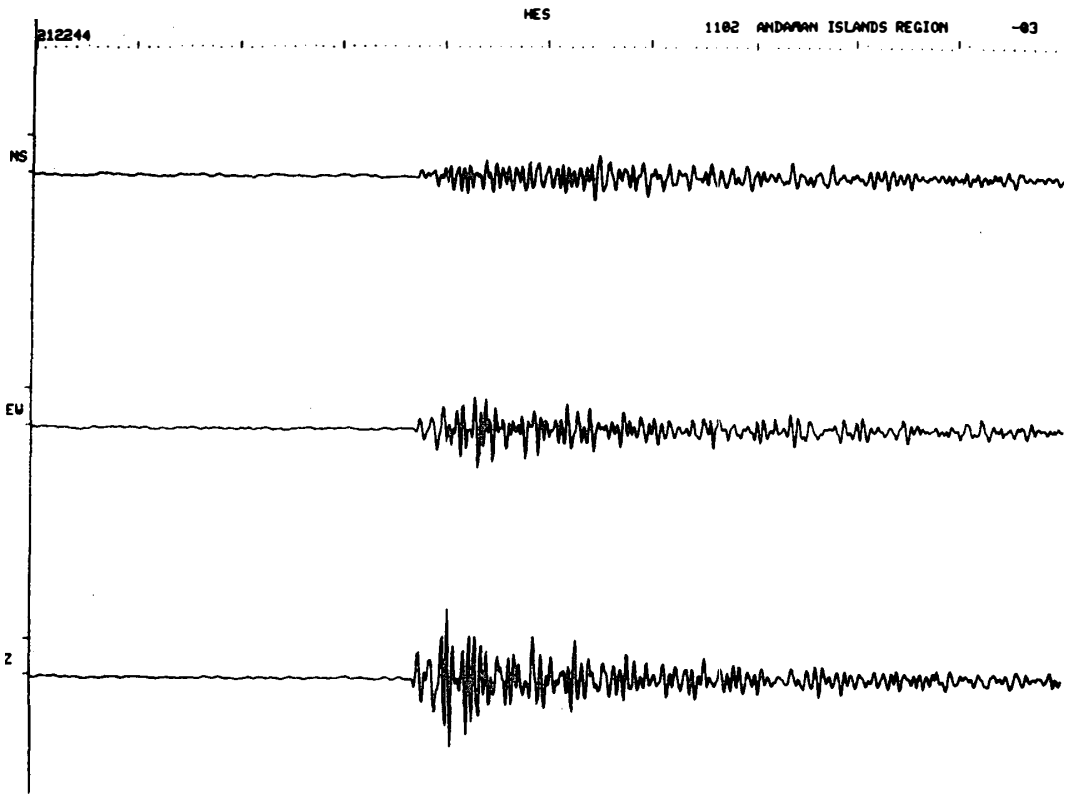
NO 78


HES
044712
1031 SOUTH ATLANTIC RIDGE
-03
NS
EW
Z

NO 79


HES
034815
1102 SOUTH OF AFRICA
-03
NS
EW
Z

NO 80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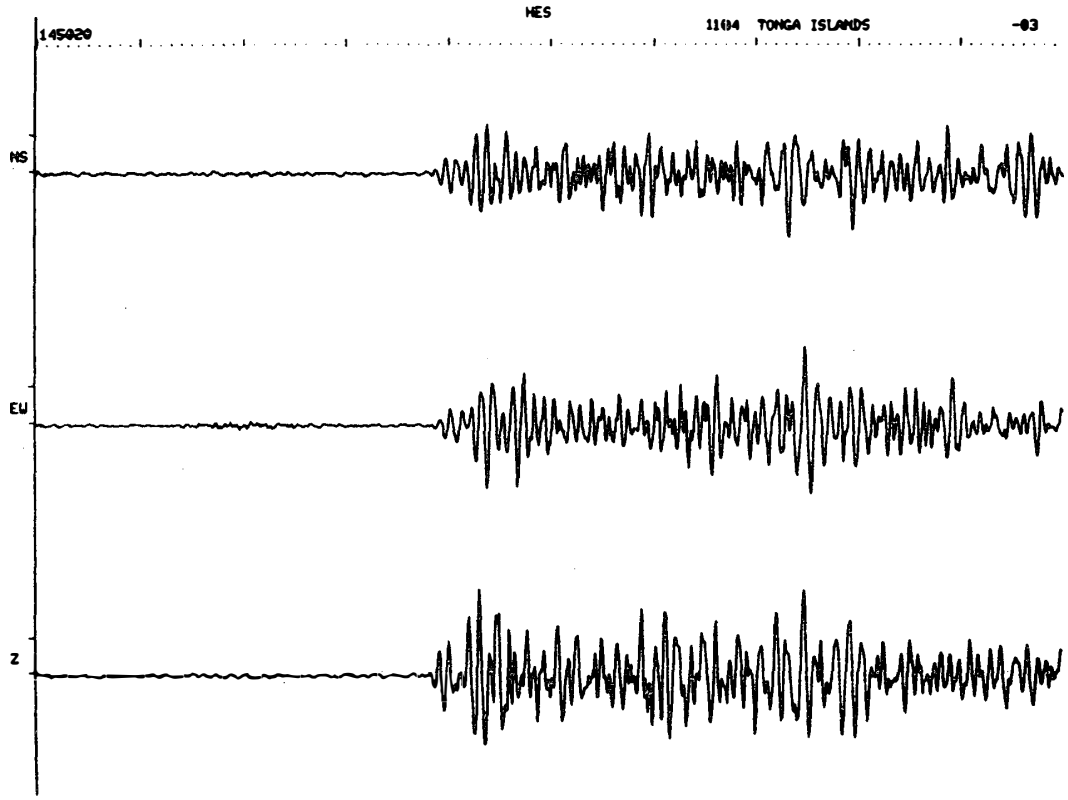
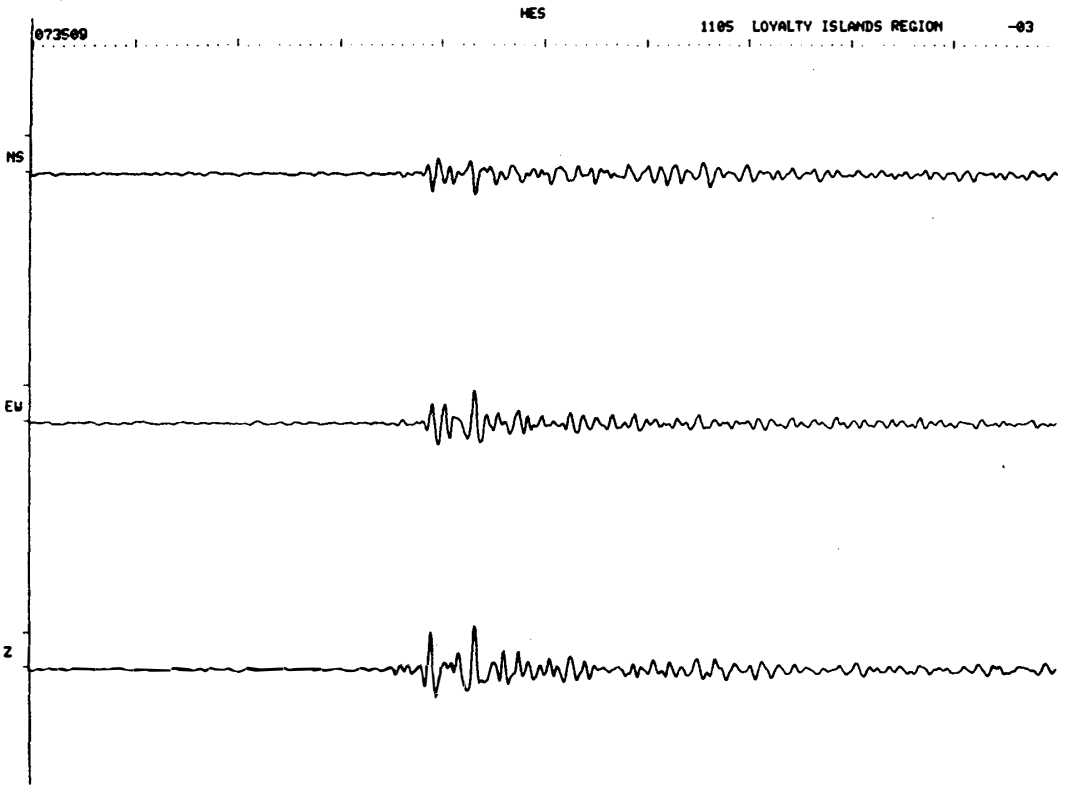
212244
1102 ANDAMAN ISLANDS REGION
-03
NS
EW
Z

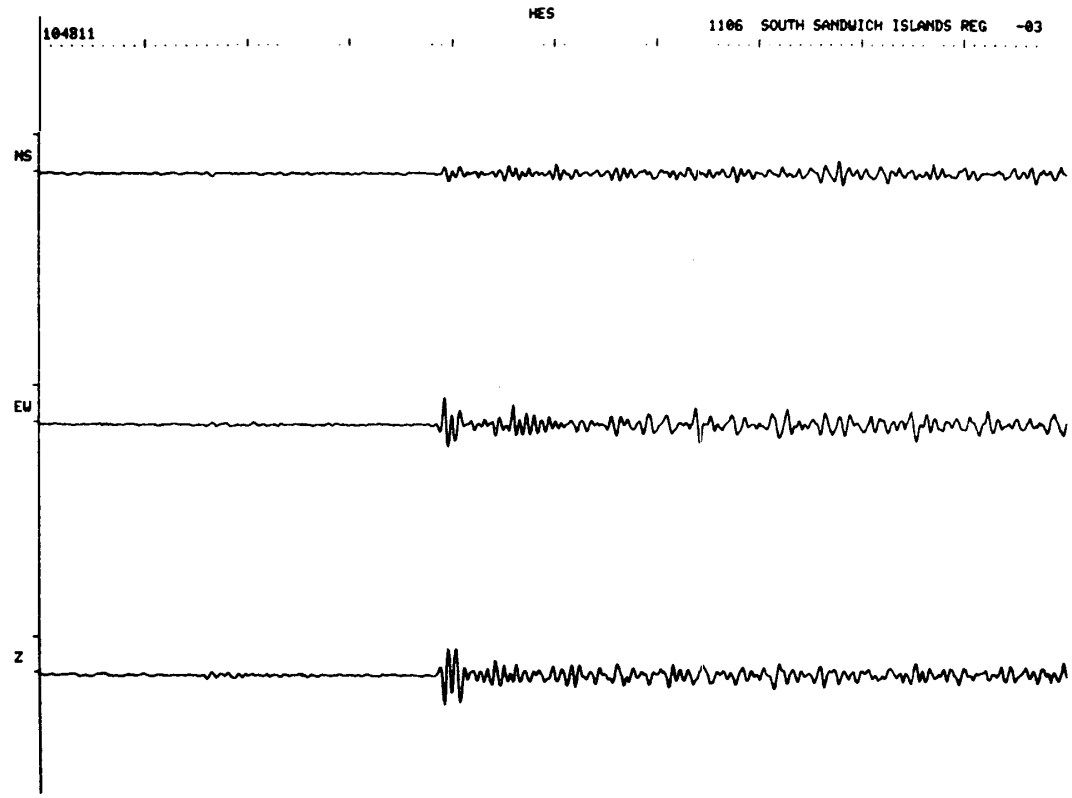
NO 81


HES
1104 TONGA ISLANDS
-03
145020
NS
EW
Z

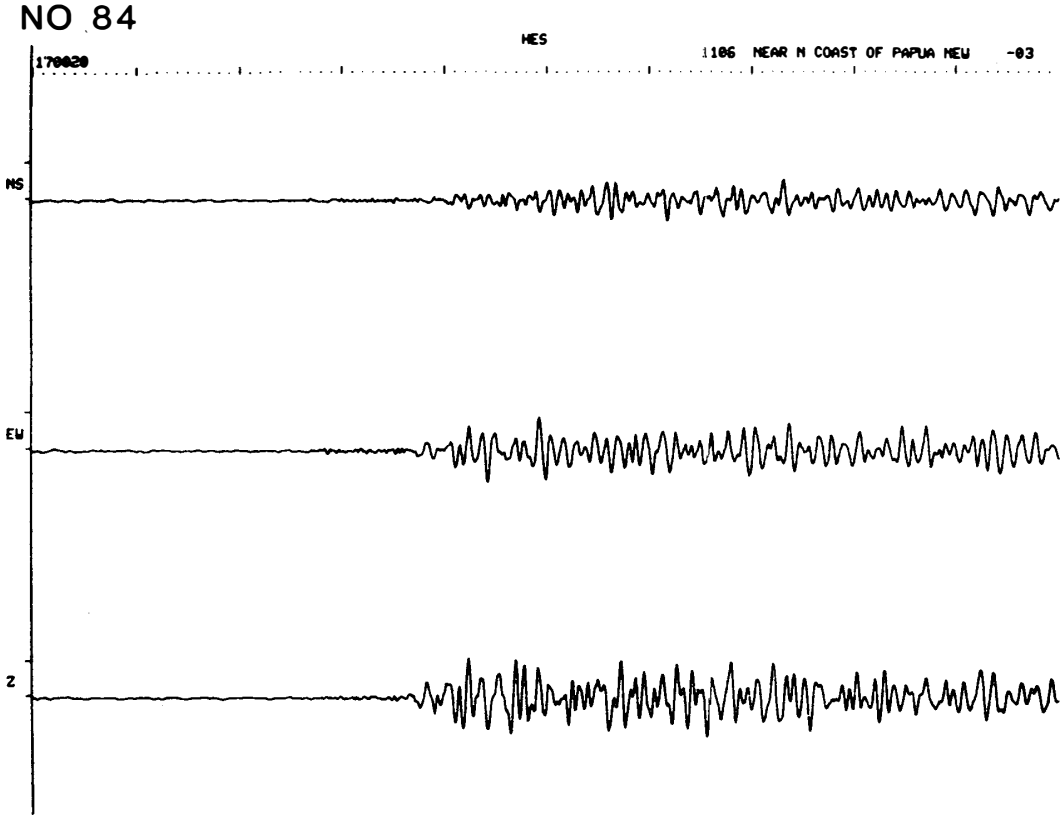
NO 82


HES
1105 LOYALTY ISLANDS REGION
-03
073500
NS
EW
Z

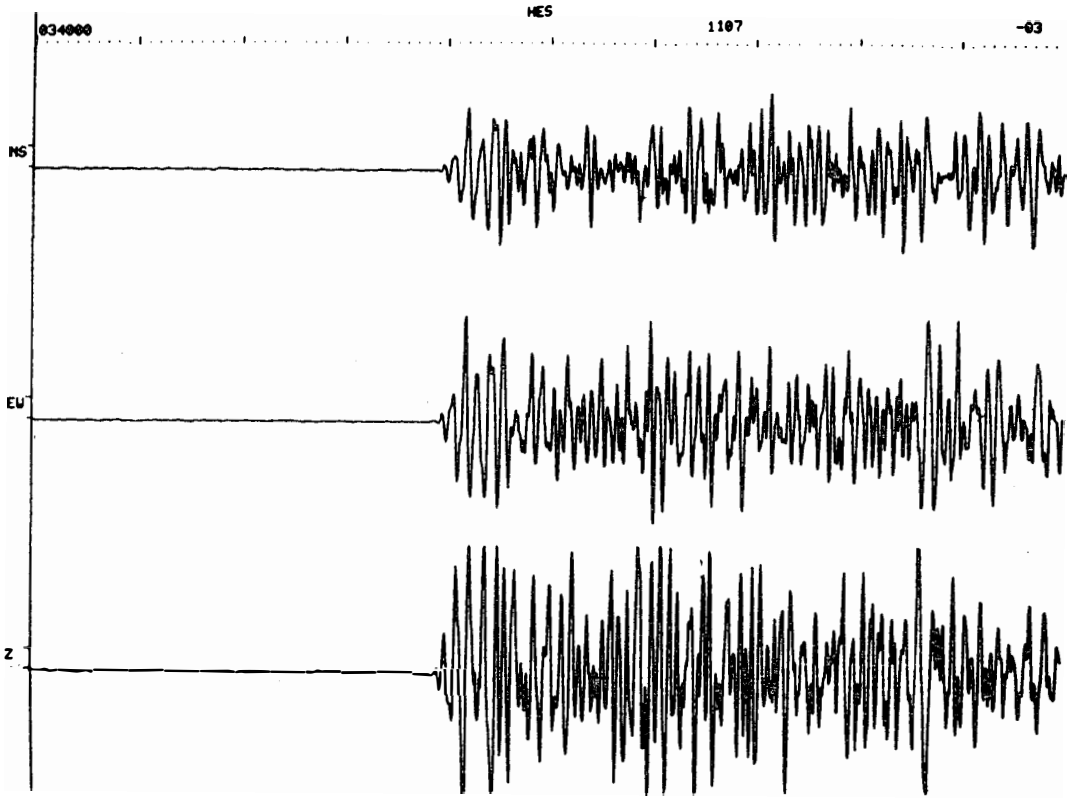
NO 83


HES
1106 SOUTH SANDWICH ISLANDS REG -03
104811
NS
EW
Z

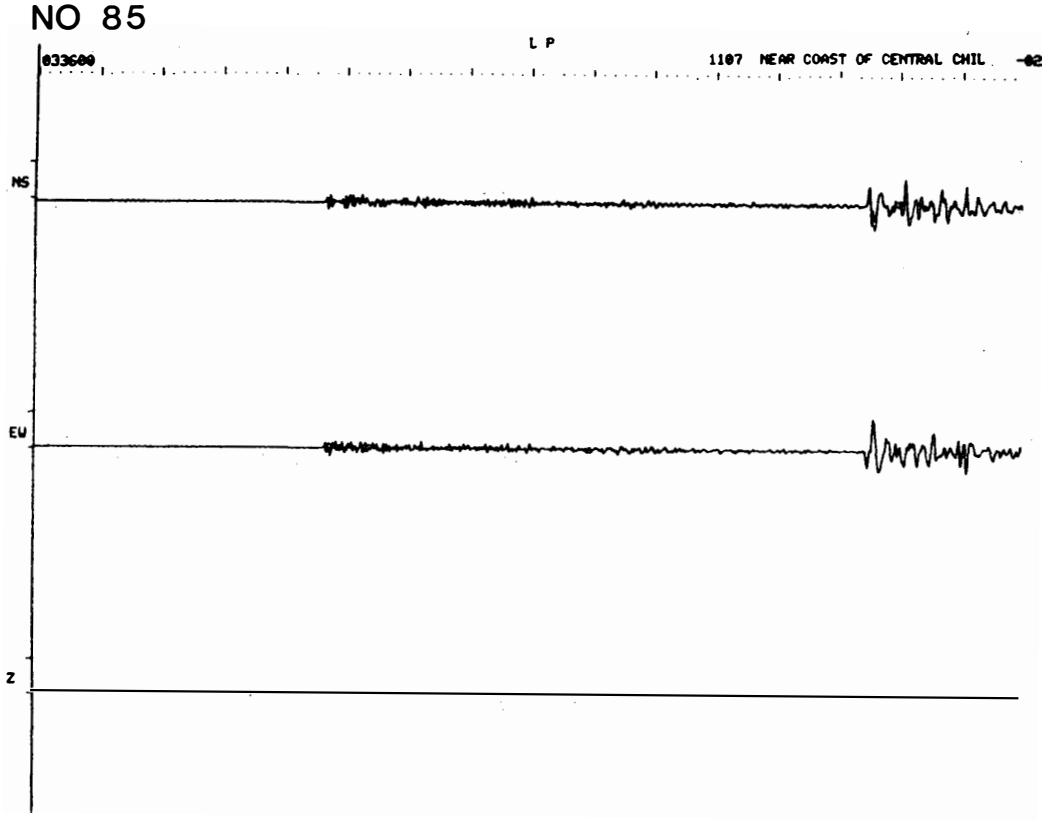
NO 84


HES
1106 NEAR N COAST OF PAPUA NEW -03
170020
NS
EW
Z

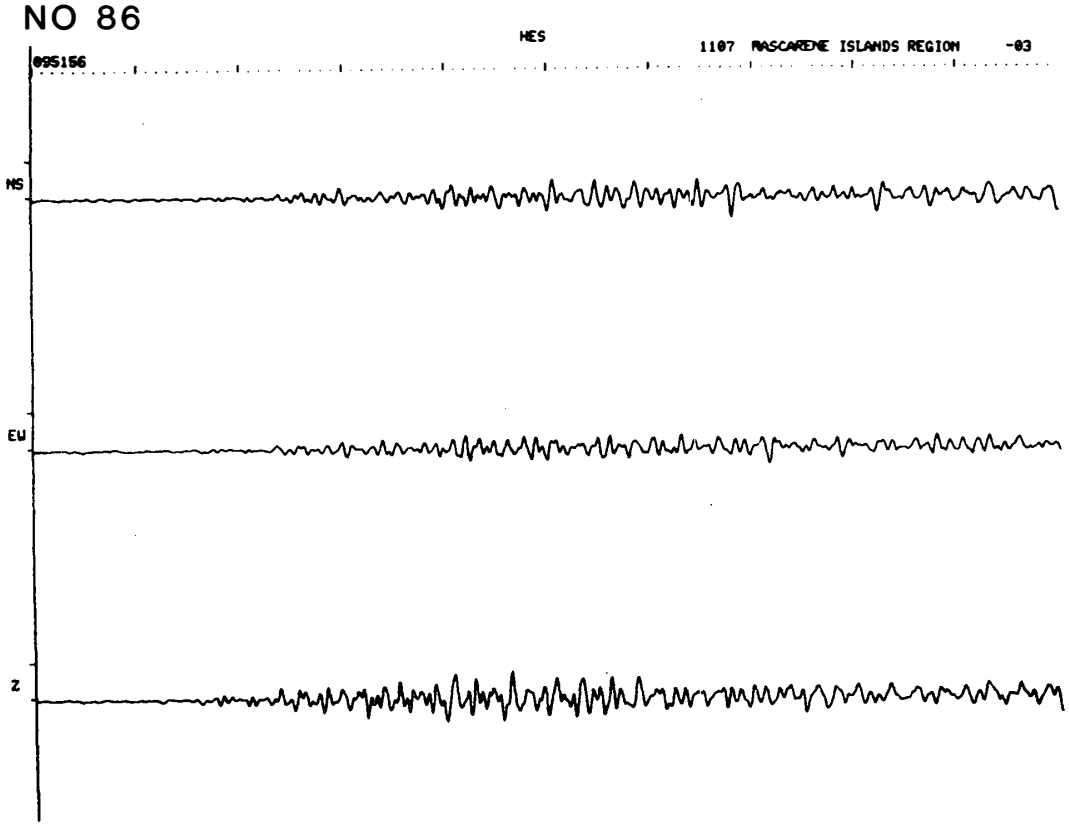
NO 85


MES
034000
1107
-03
NS
EW
Z

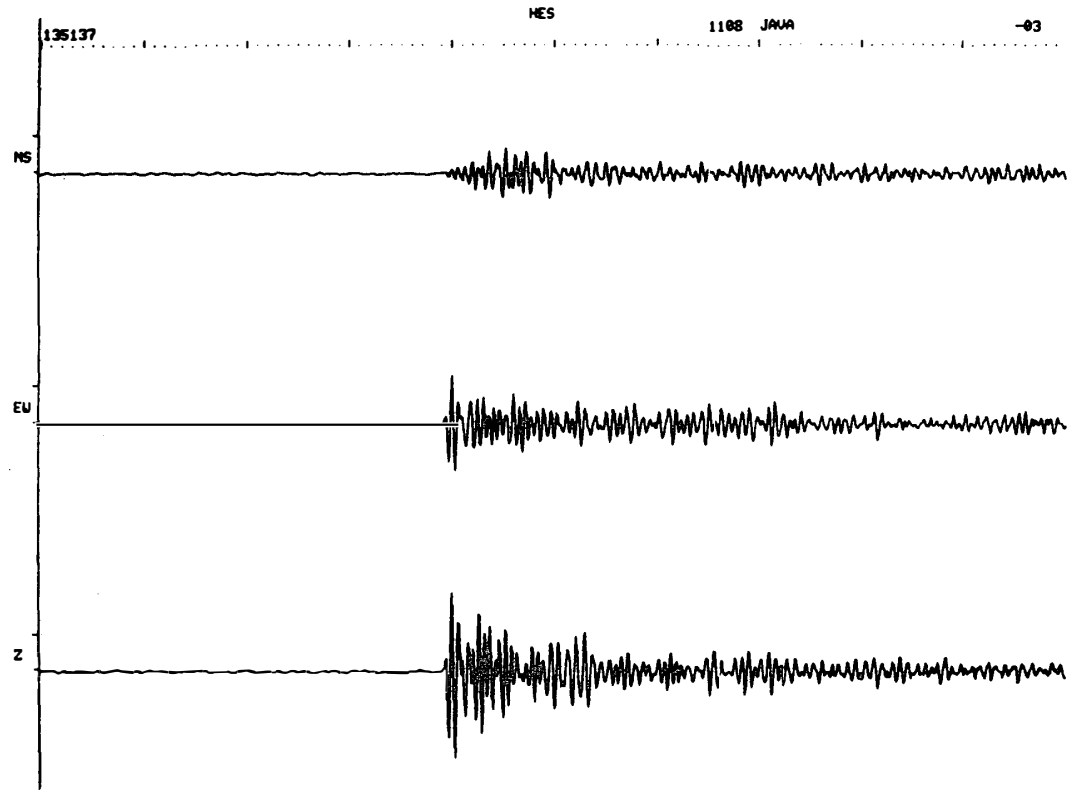
NO 85


L P
033600
1107 NEAR COAST OF CENTRAL CHIL
-02
NS
EW
Z

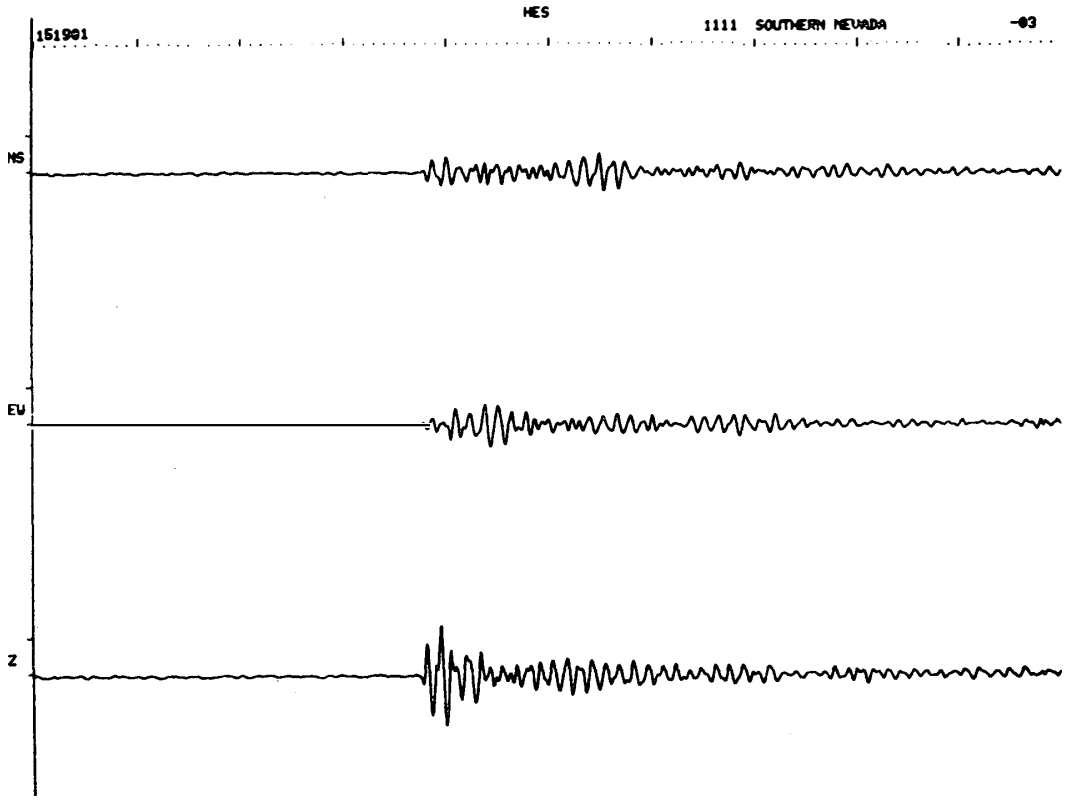
NO 86


HES
1107 MASCARENE ISLANDS REGION -03
095156
NS
EW
Z

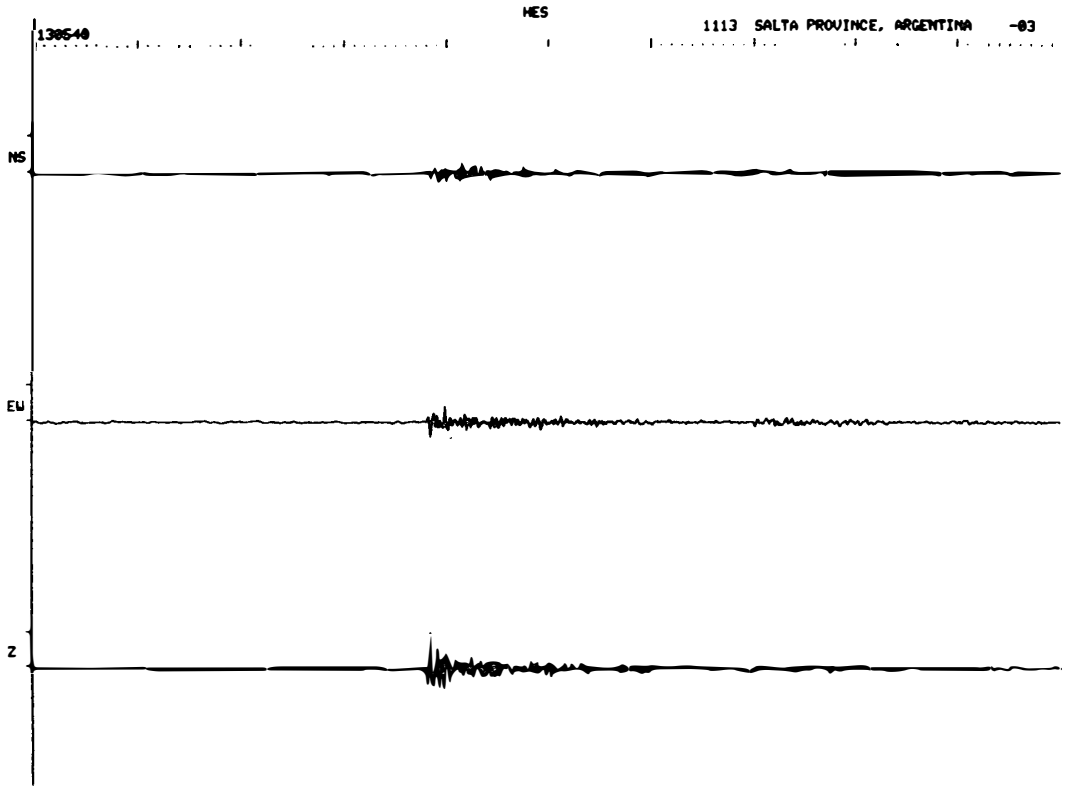
NO 87


HES
1108 JAVA -03
135137
NS
EW
Z

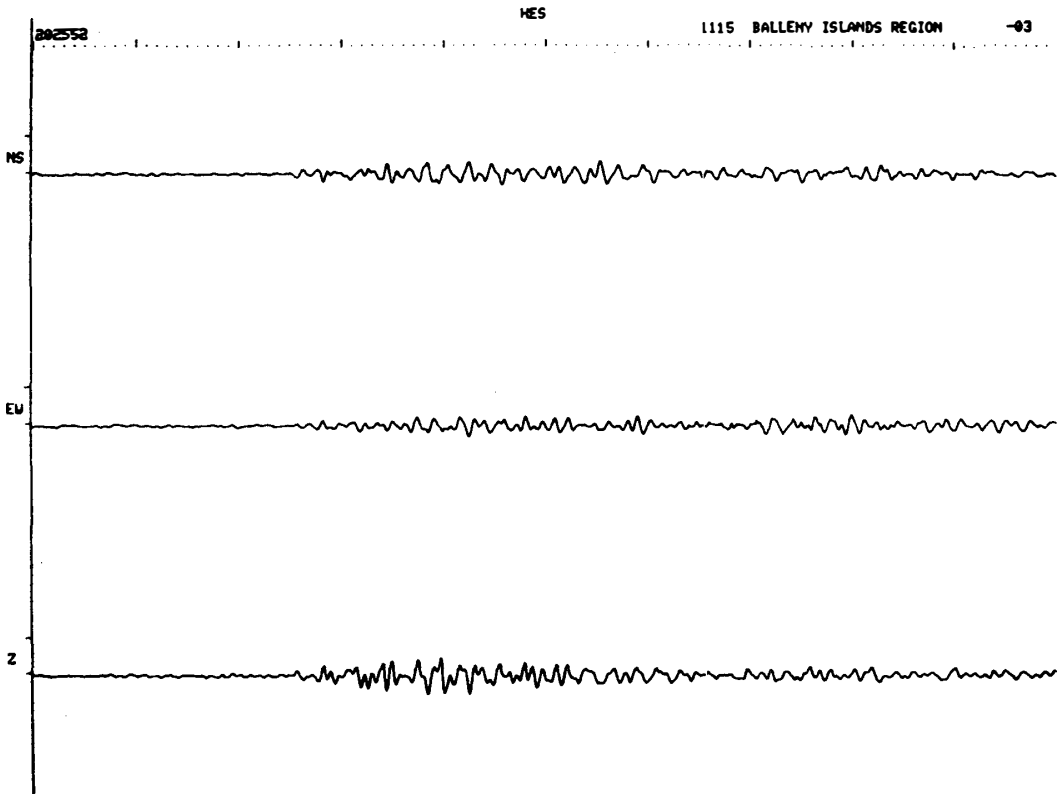
NO 88


HES
1111 SOUTHERN NEVADA
-03
151901
NS
EW
Z

NO 89


HES
1113 SALTA PROVINCE, ARGENTINA
-03
130540
NS
EW
Z

NO 90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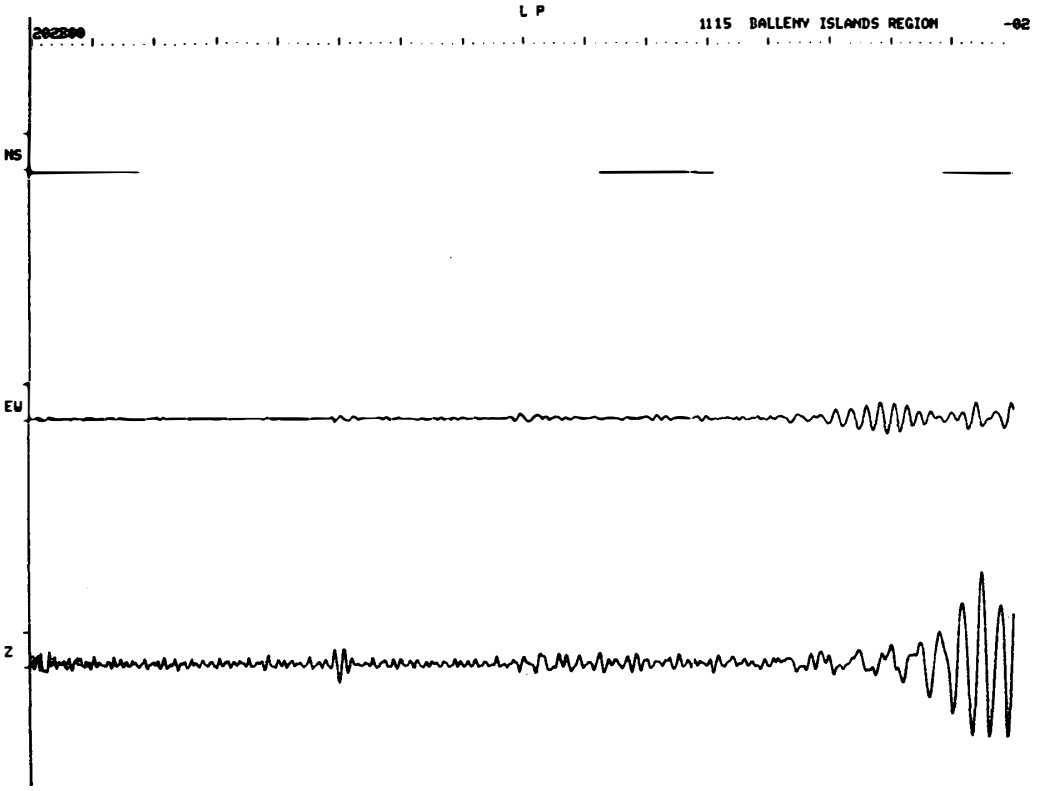
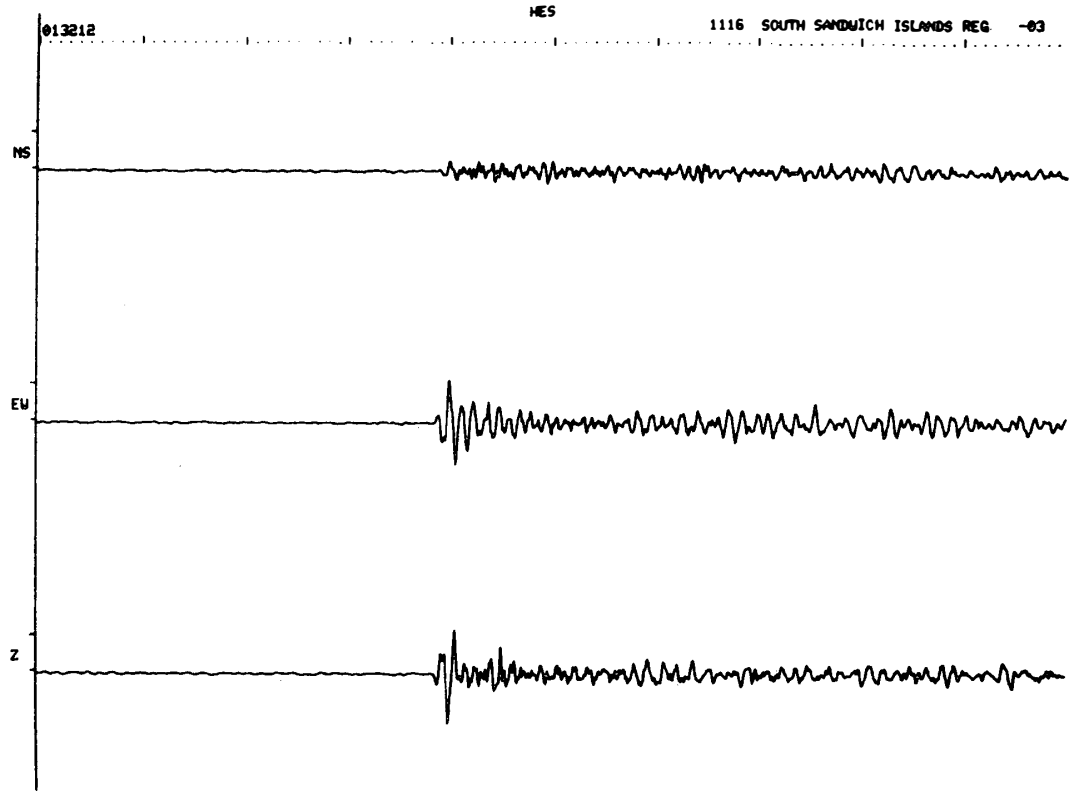
202552
1115 BALLENY ISLANDS REGION -03
NS
EW
Z

NO 90


L P
202800
1115 BALLENY ISLANDS REGION -02
NS
EW
Z

NO 91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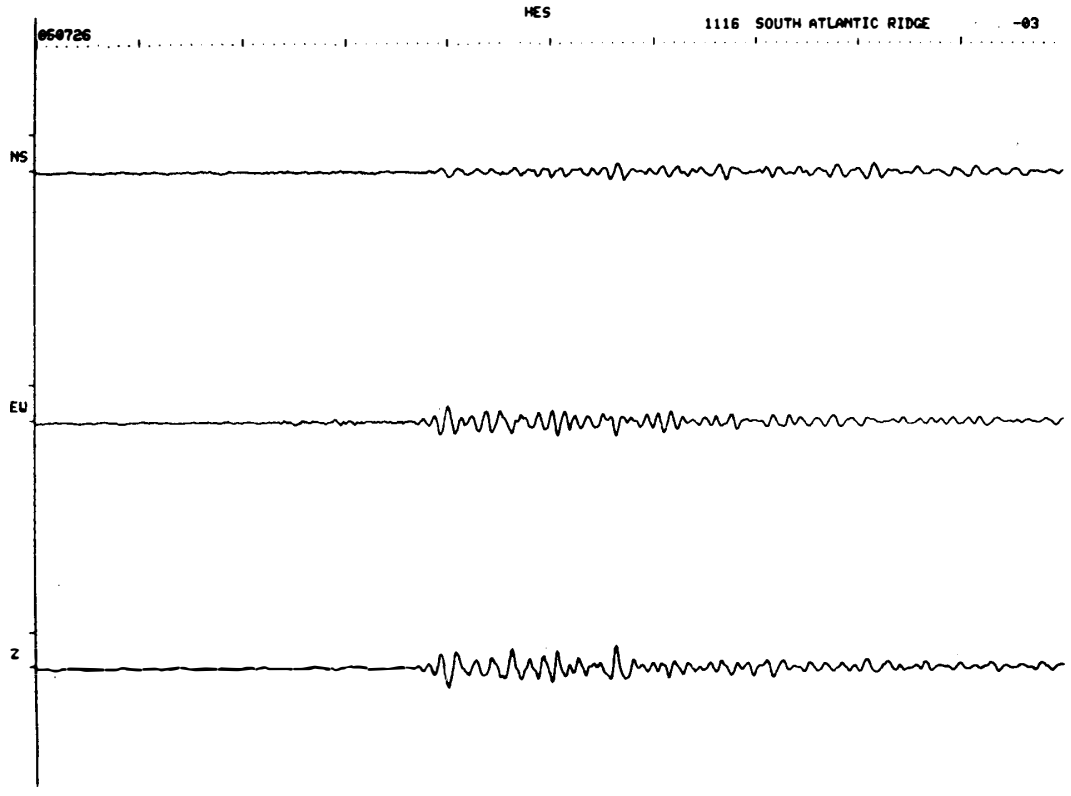
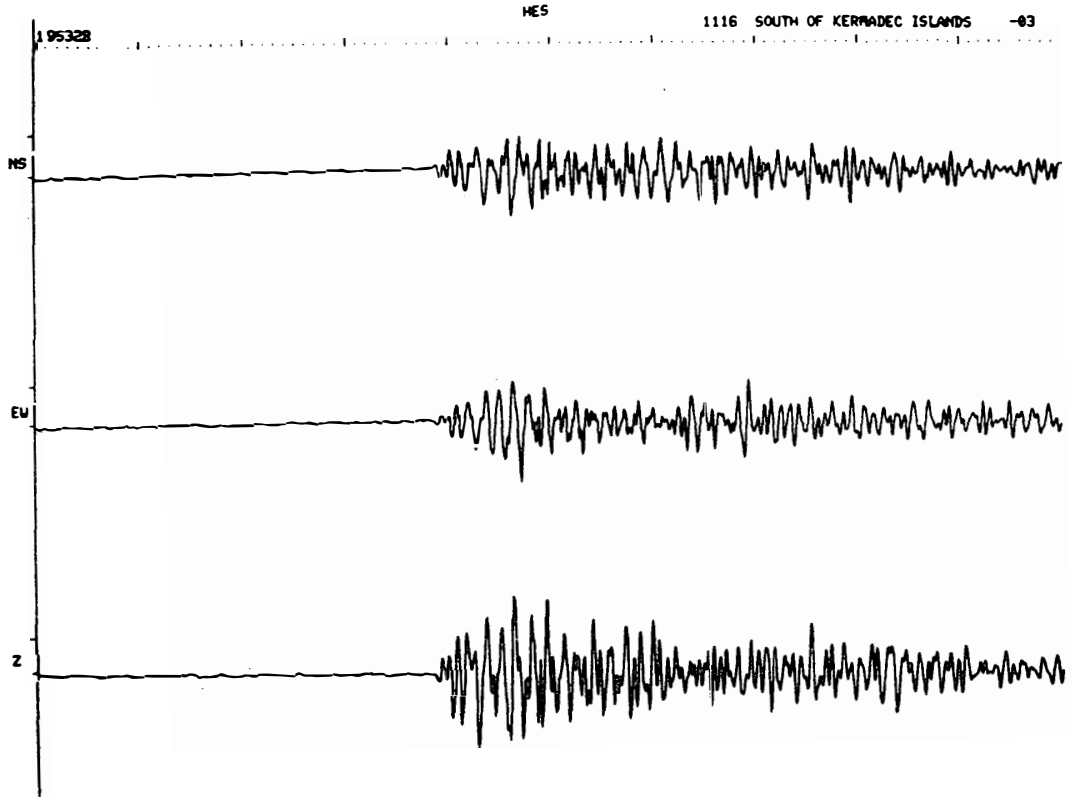
013212
1116 SOUTH SANDWICH ISLANDS REG -03
NS
EW
Z

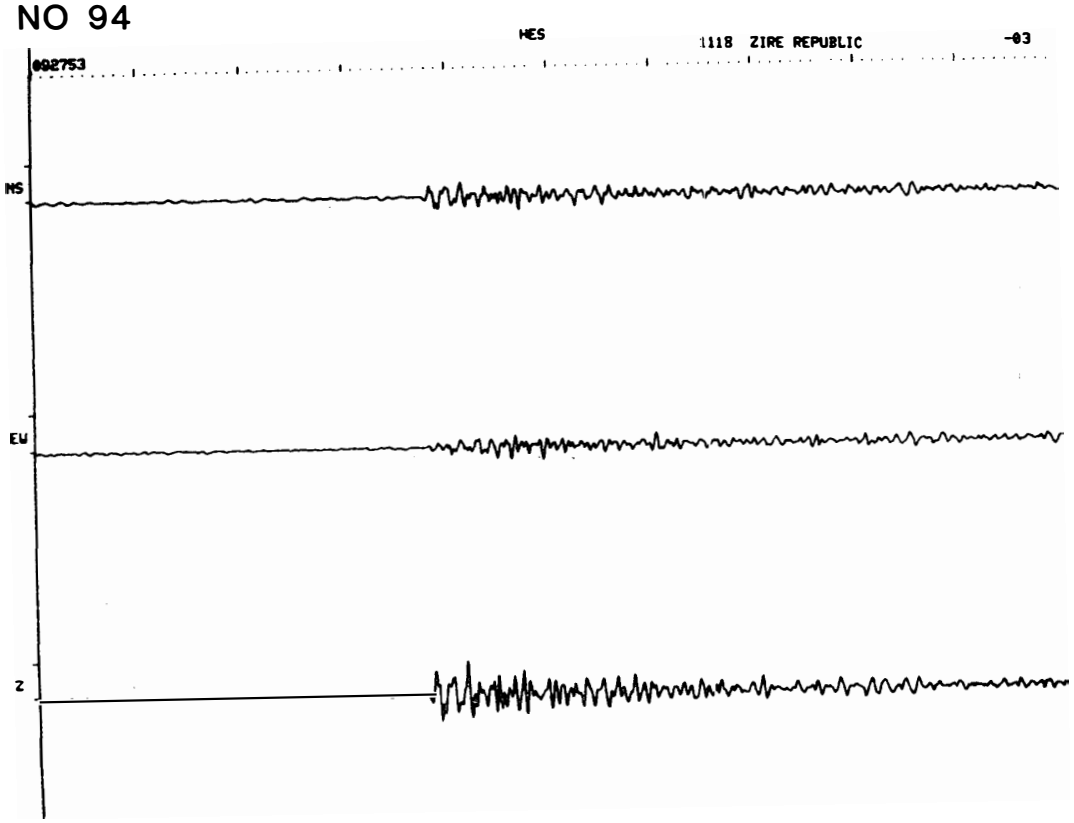
NO 92


HES
050726
1116 SOUTH ATLANTIC RIDGE -03
NS
EW
Z

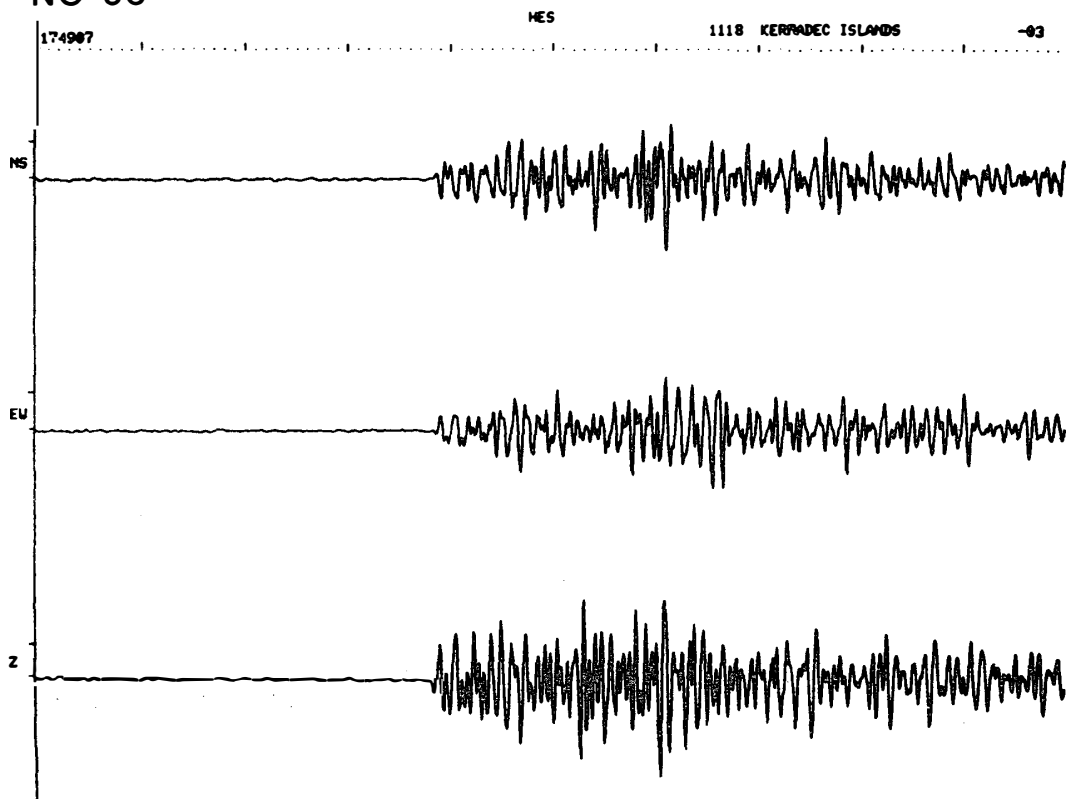
NO 93


HES
1116 SOUTH OF KERMADEC ISLANDS -03
195328
NS
EW
Z

NO 94


HES
1118 ZIRE REPUBLIC -03
092753
NS
EW
Z

NO 95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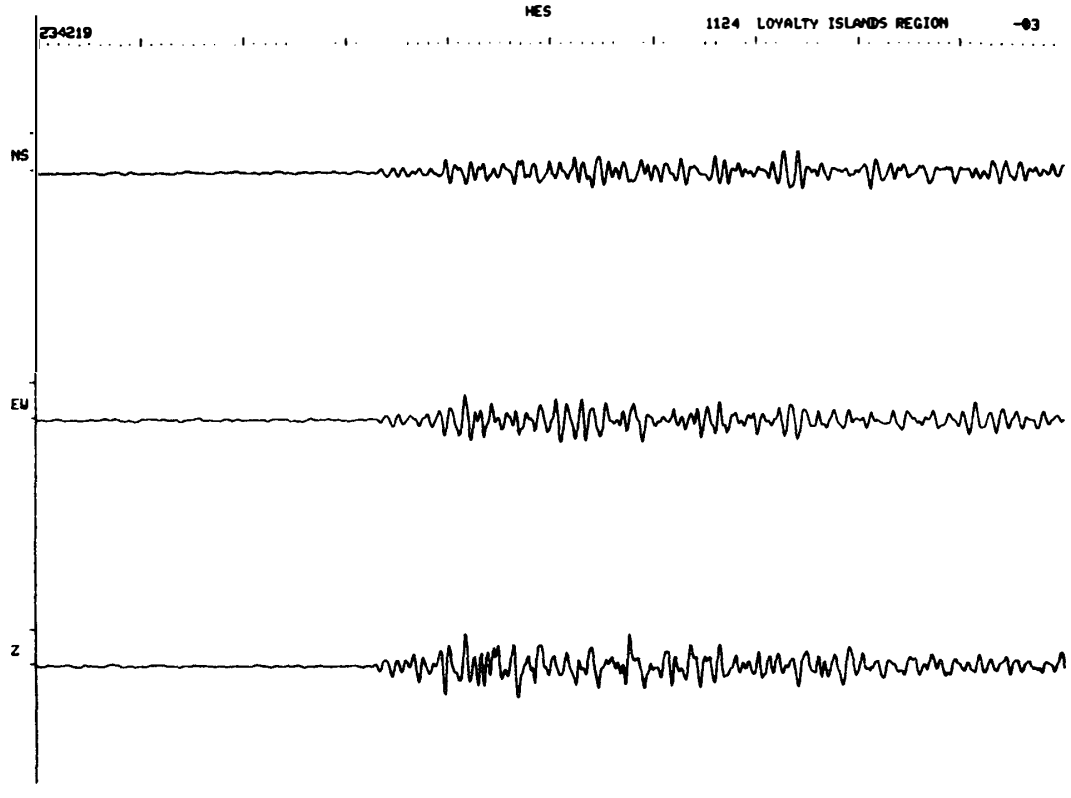
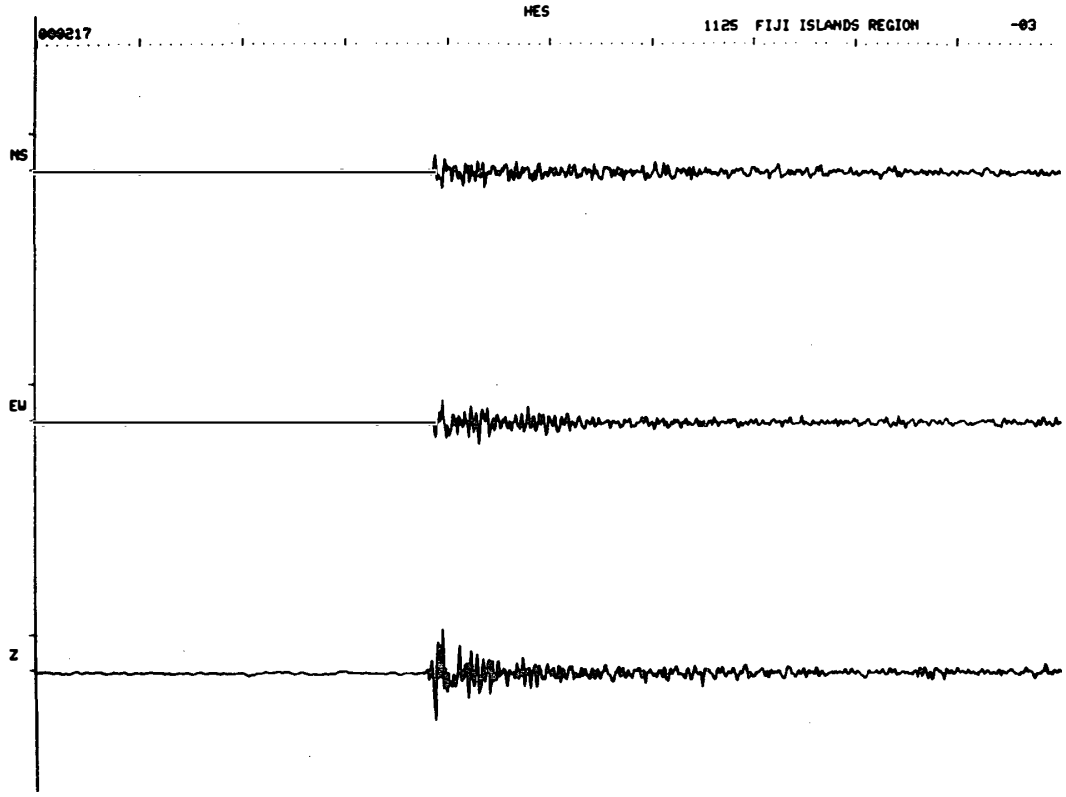
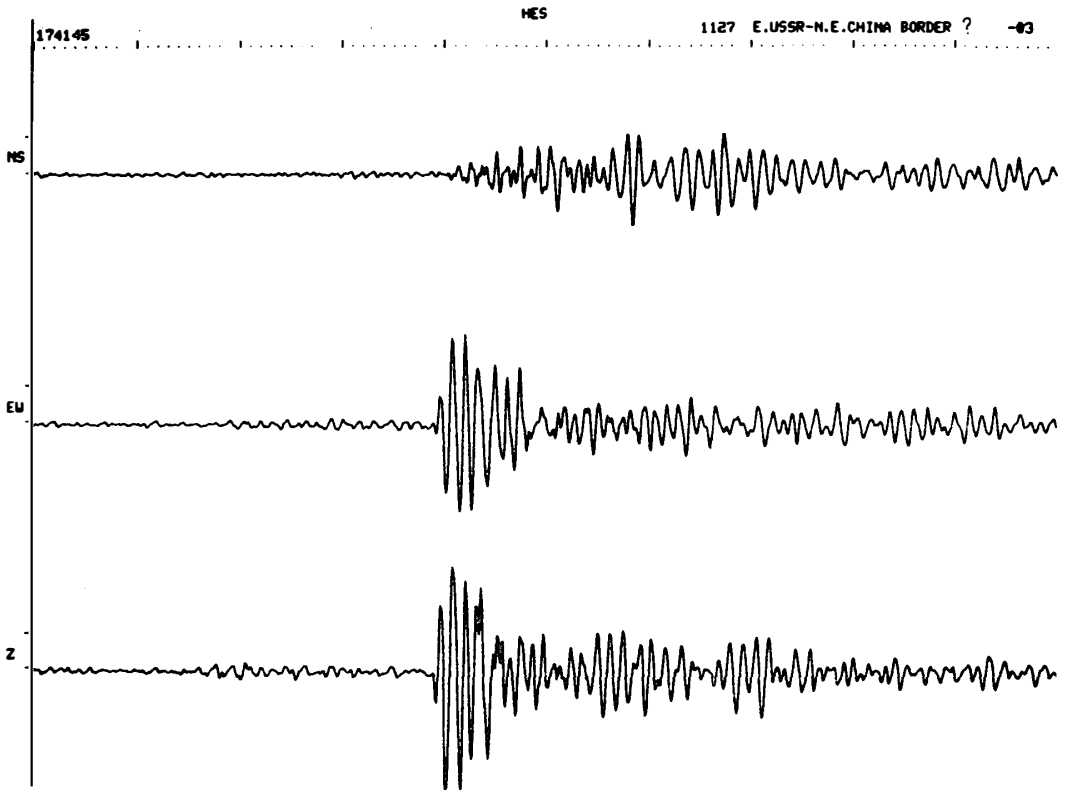
174907
1118 KERRADEC ISLANDS
-03
NS
EW
Z

NO 96

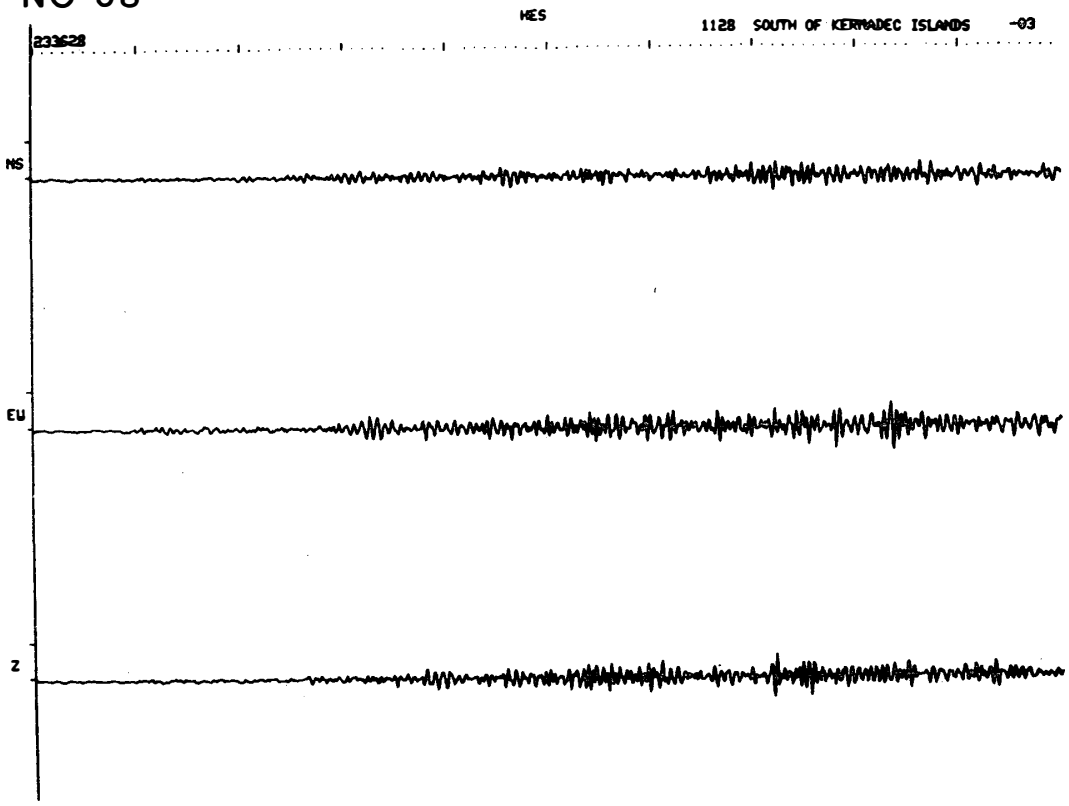

HES
234219
1124 LOYALTY ISLANDS REGION
-03
NS
EW
Z

NO 97

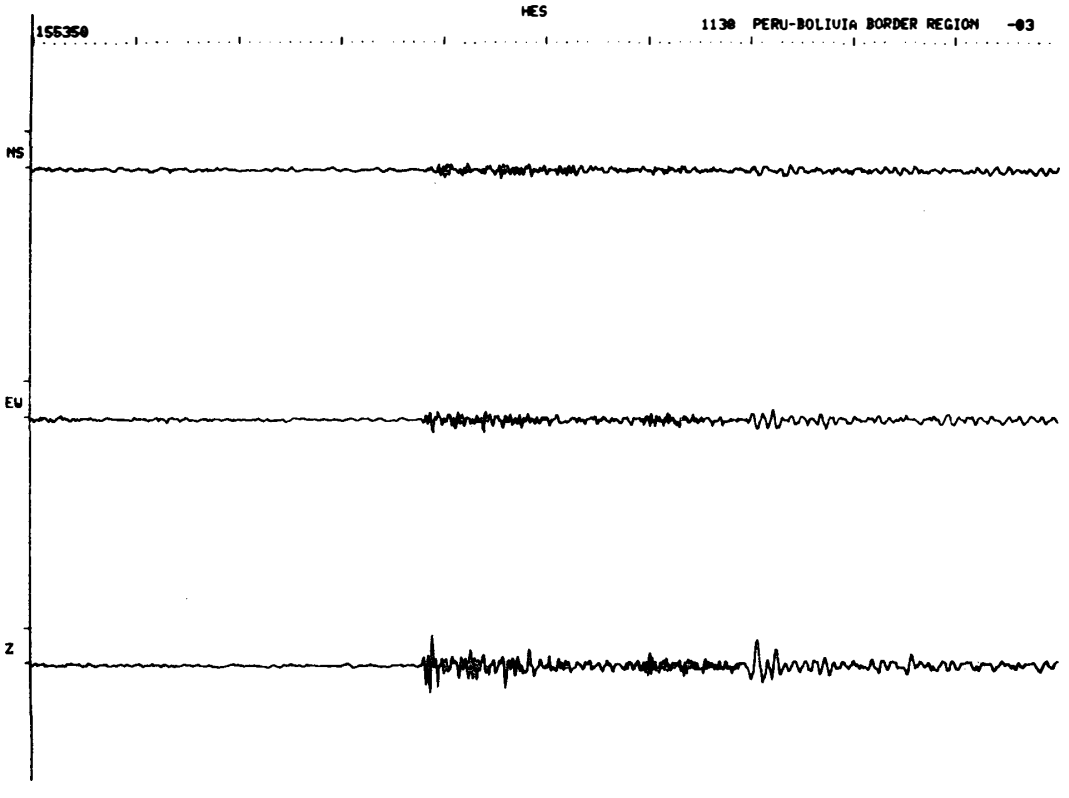

HES
000217
1125 FIJI ISLANDS REGION -03
NS
EW
Z


HES
174145
1127 E.USSR-N.E.CHINA BORDER ? -03
NS
EW
Z

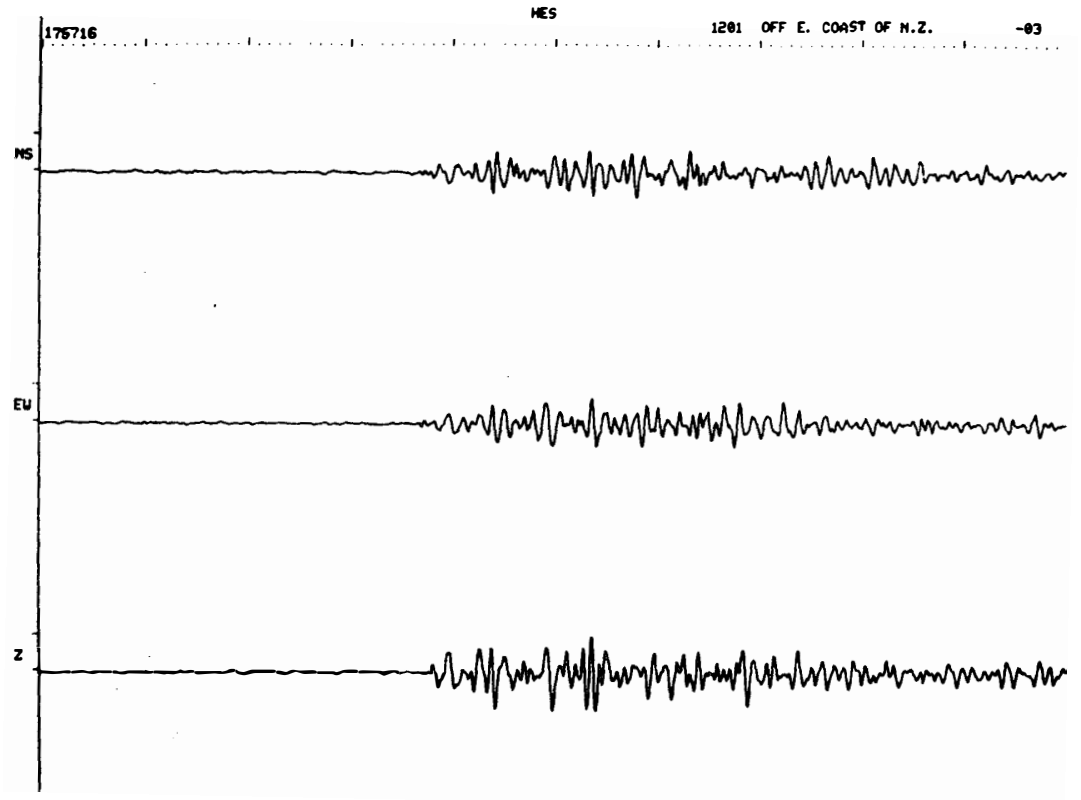
NO 98


HES
1128 SOUTH OF KERMADEC ISLANDS -03
233628
NS
EW
Z

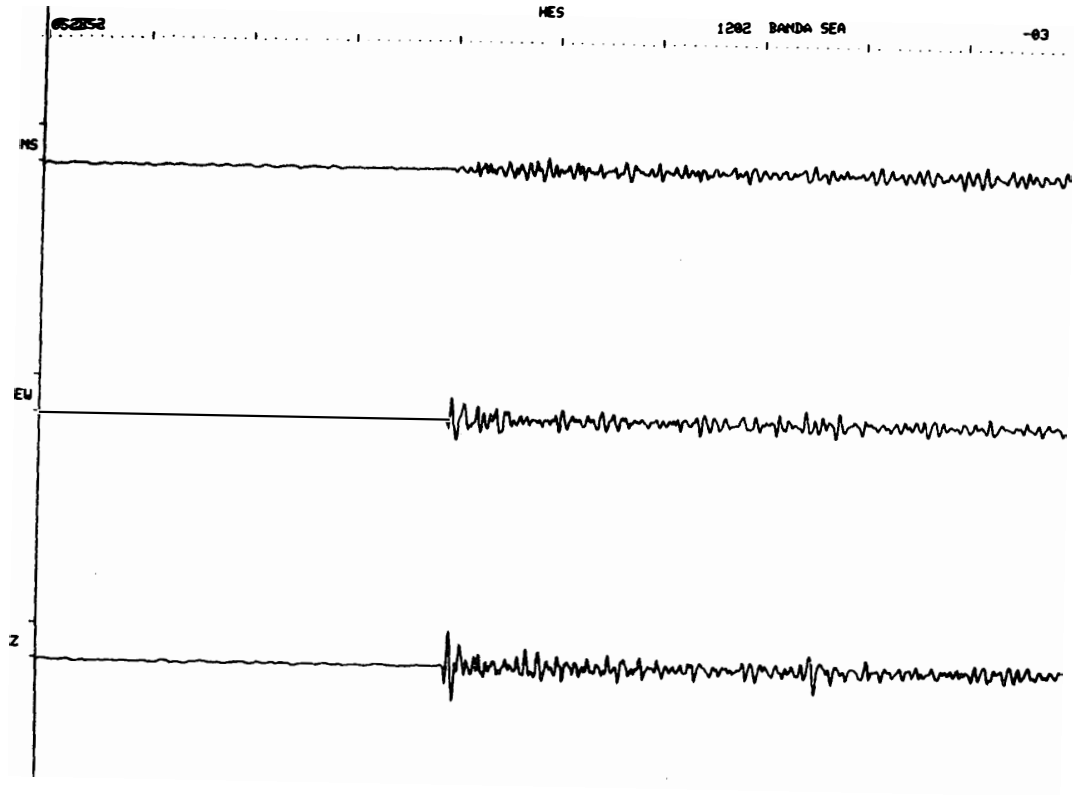
NO 99


HES
1130 PERU-BOLIVIA BORDER REGION -03
155350
NS
EW
Z

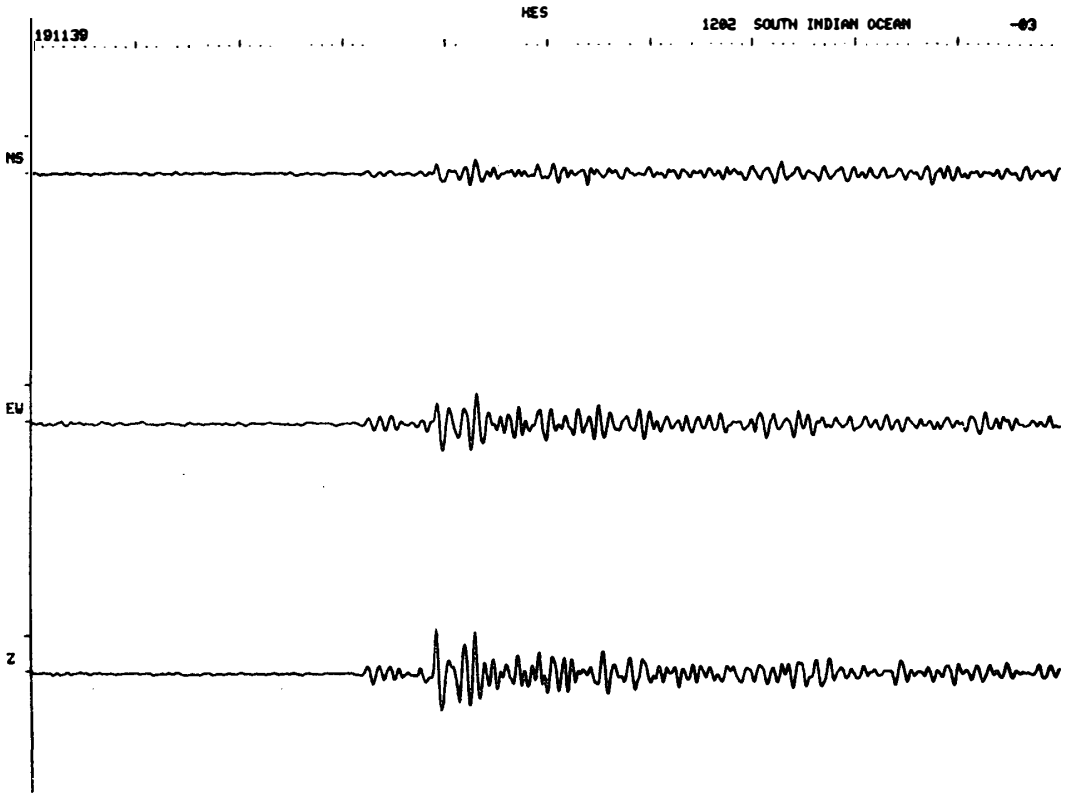
NO 100


HES
175716
1201 OFF E. COAST OF N.Z.
-03
NS
EW
Z

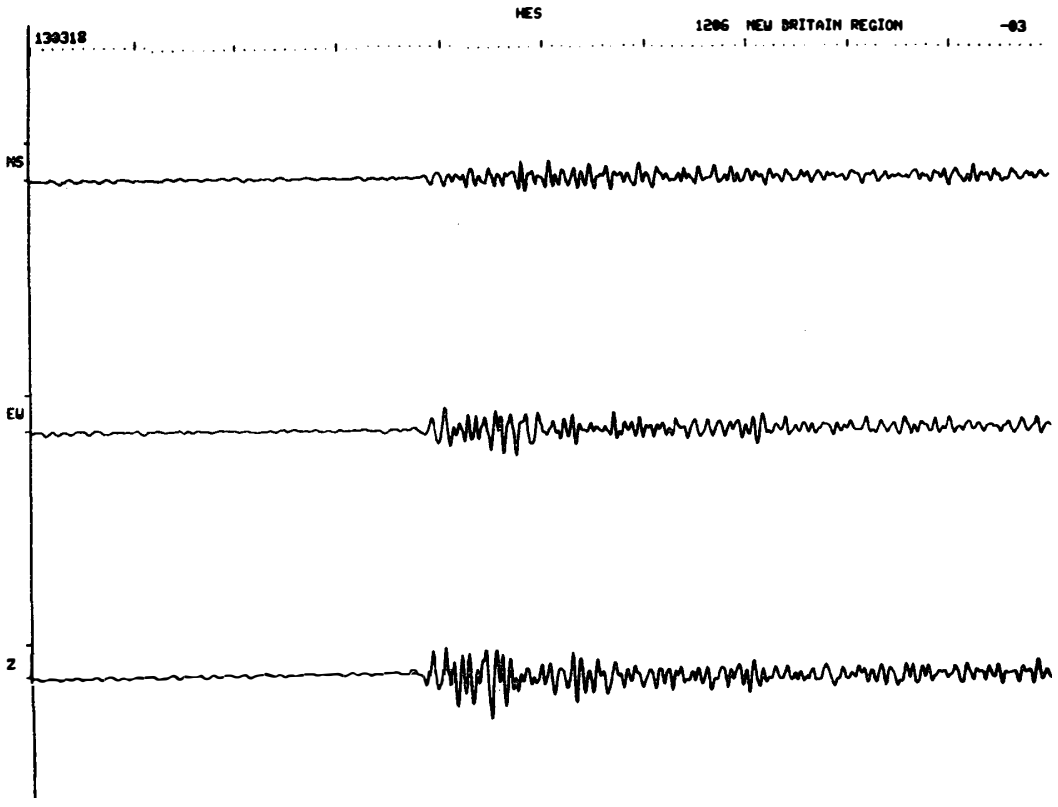
NO 101


HES
1202 BANDA SEA
-03
NS
EW
Z

NO 102


HES
191139
1202 SOUTH INDIAN OCEAN -03
NS
EW
Z

NO 103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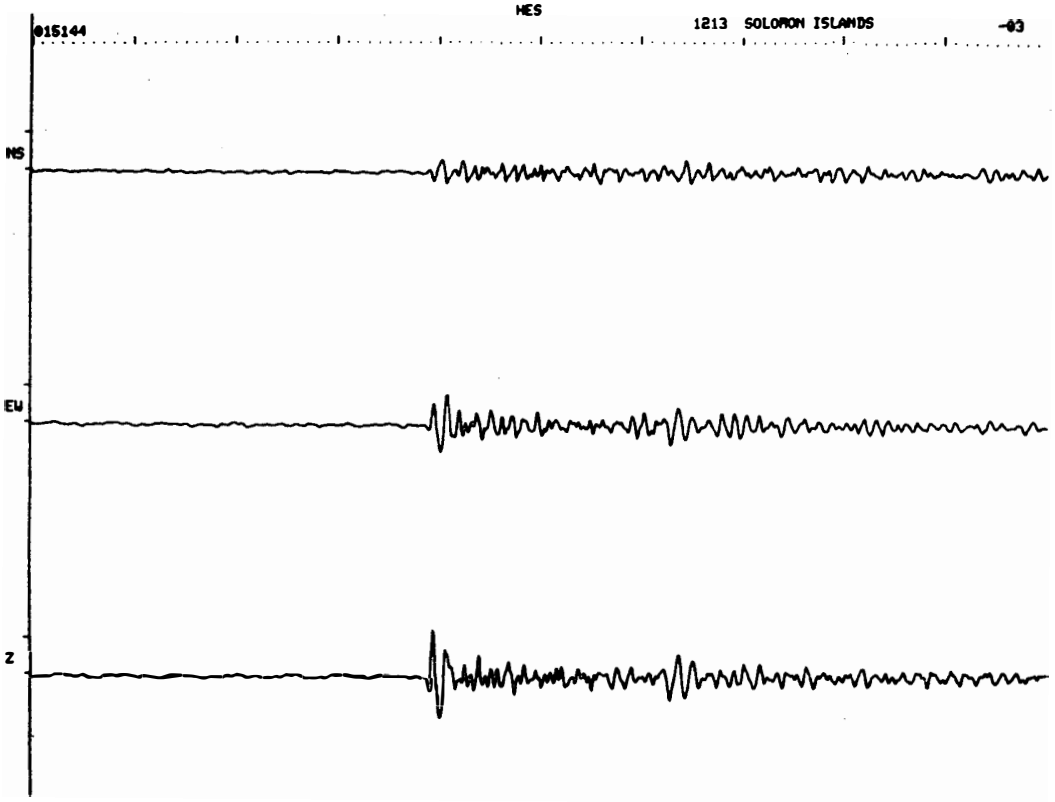
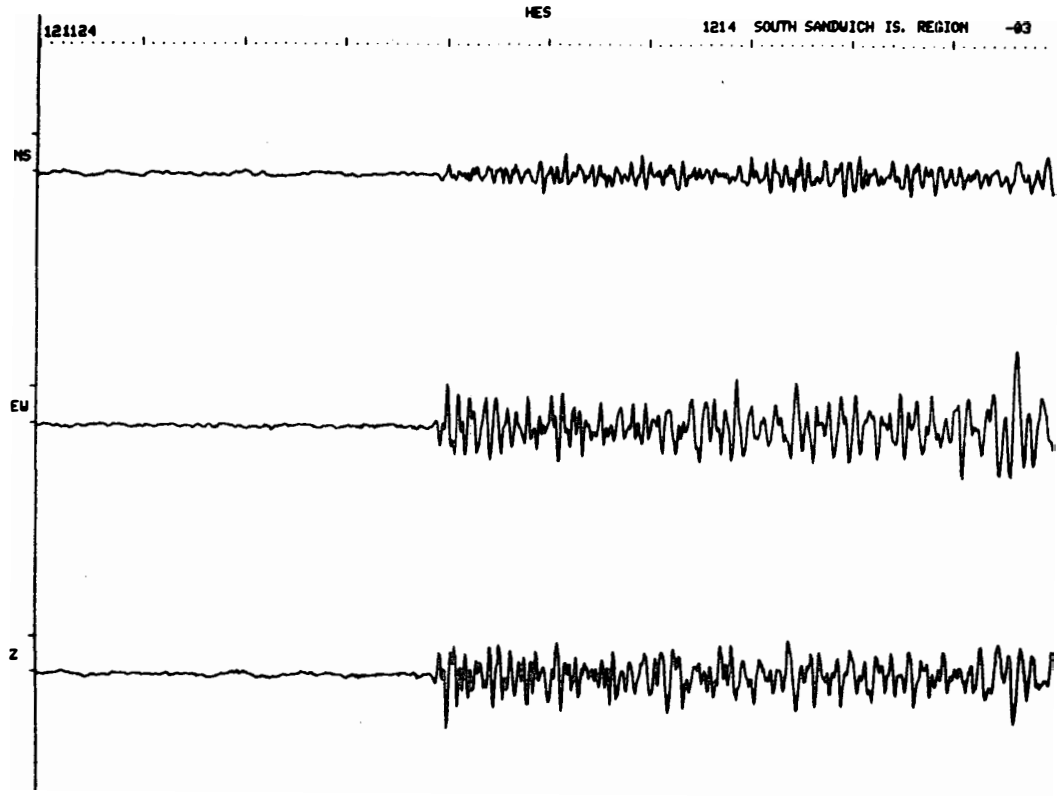
130318
1206 NEW BRITAIN REGION -03
NS
EW
Z

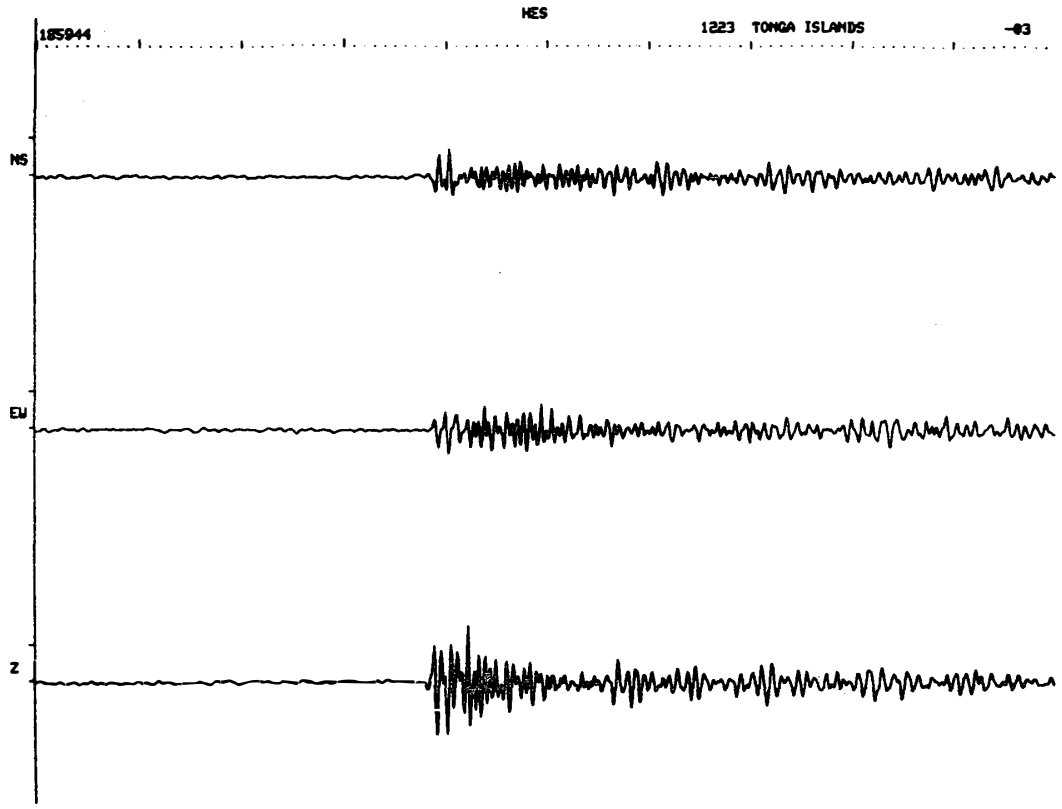
NO 104


MES
015144
1213 SOLOMON ISLANDS -03
NS
EW
Z

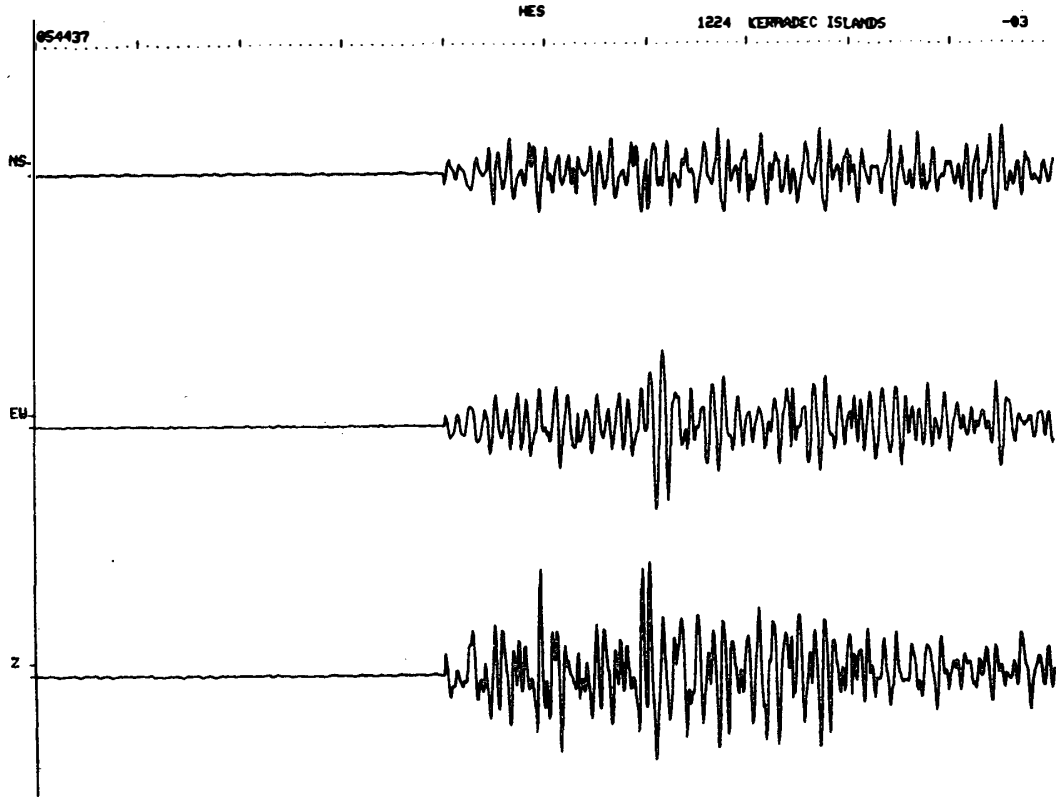
NO 105


MES
121124
1214 SOUTH SANDWICH IS. REGION -03
NS
EW
Z

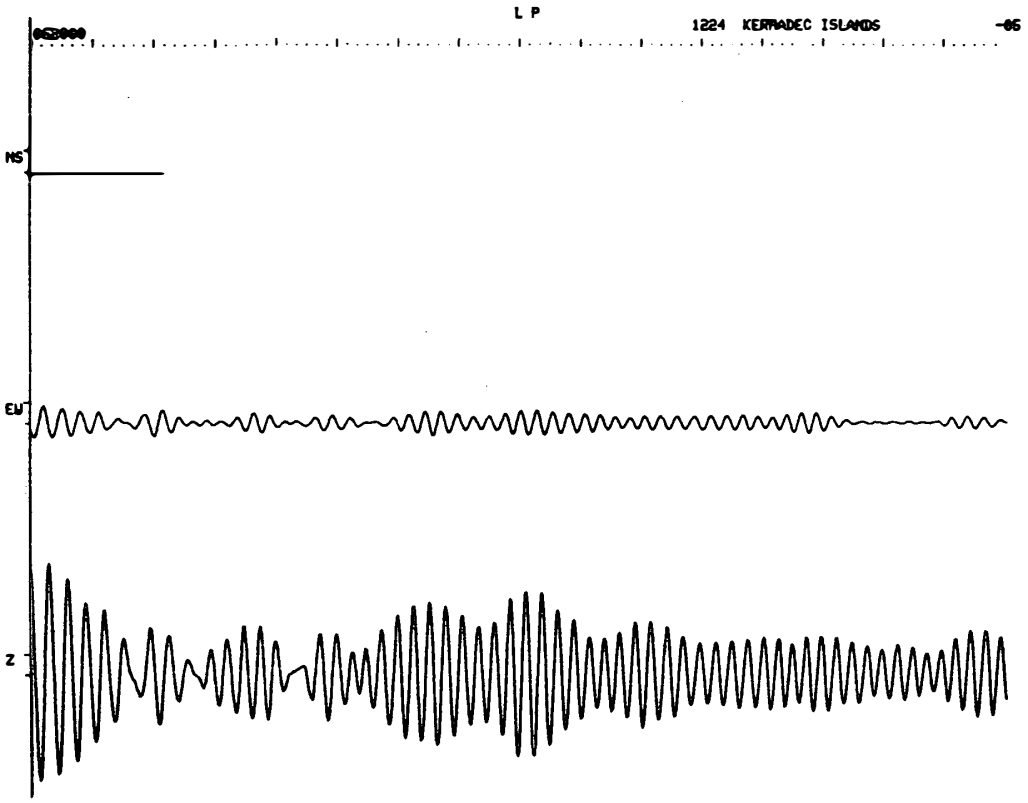
NO 106


HES
185944
1223 TONGA ISLANDS
-03
NS
EW
Z

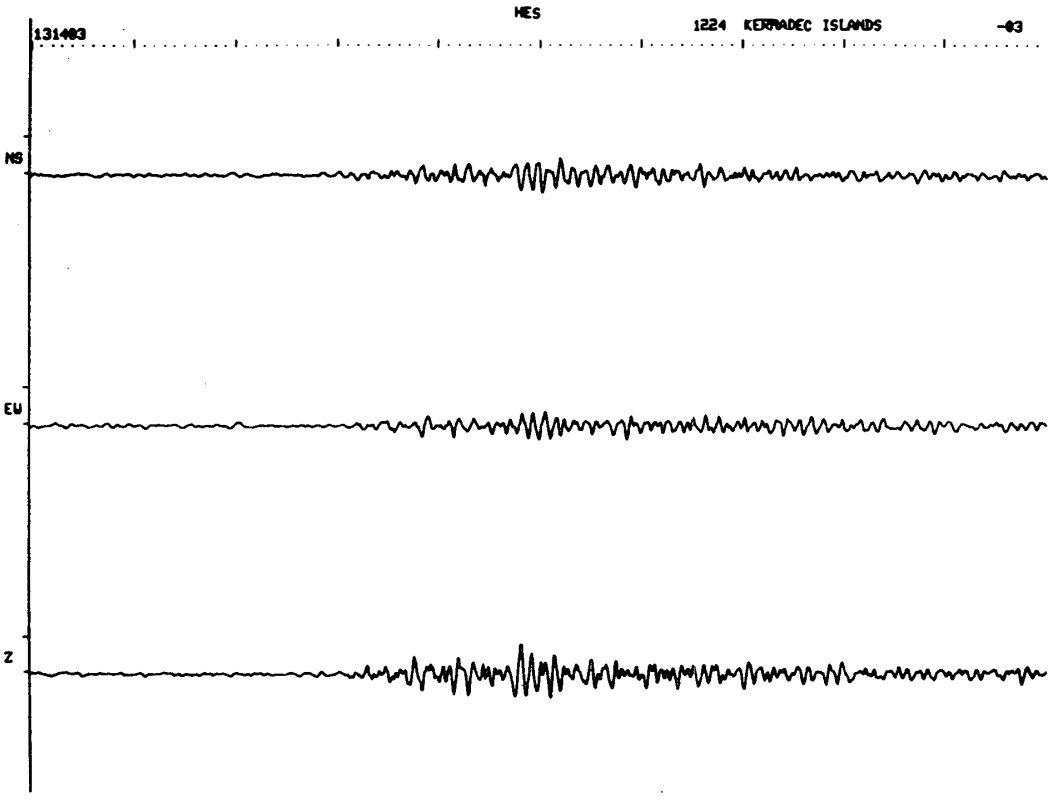
NO 107


HES
054437
1224 KERMADEC ISLANDS
-03
NS
EW
Z

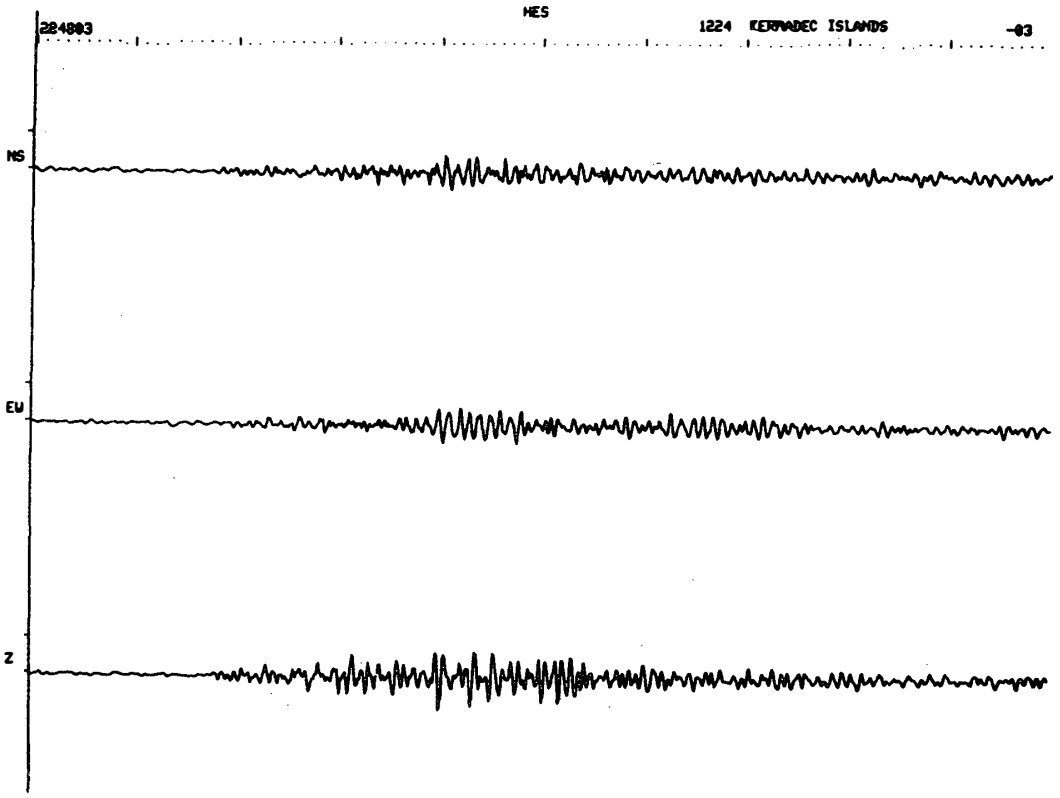
NO 107


L P
1224 KERMADEC ISLANDS
NS
EW
Z

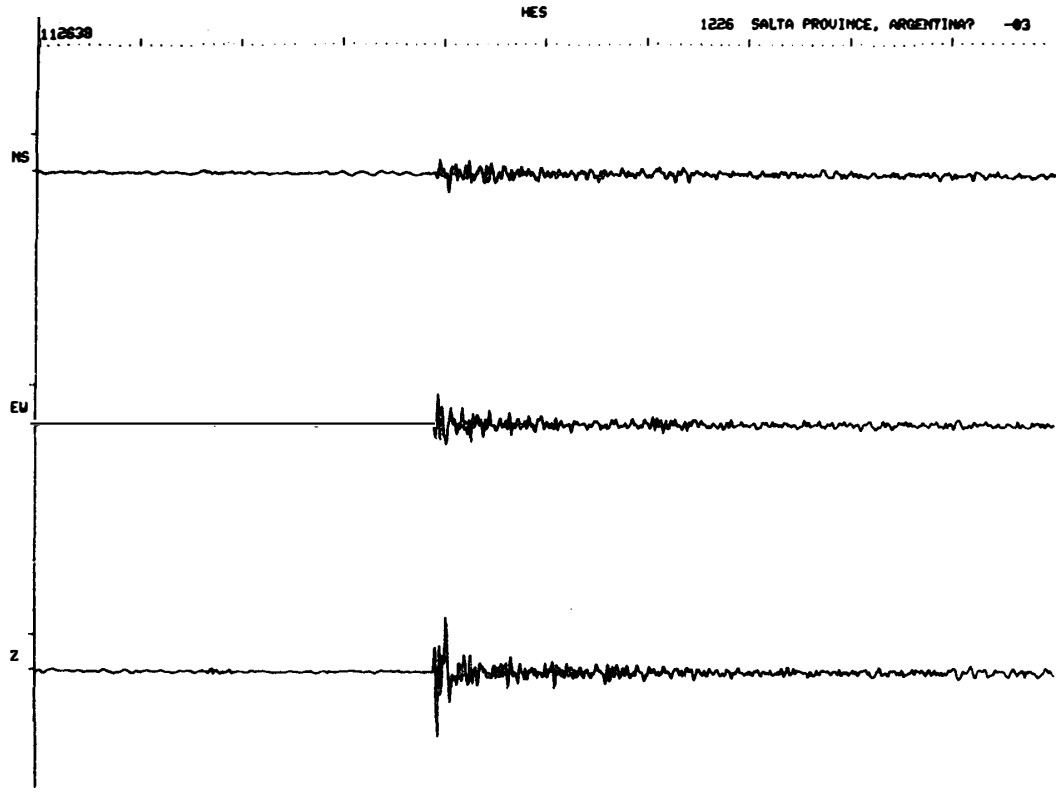
NO 108


MES
1224 KERMADEC ISLANDS
NS
EW
Z

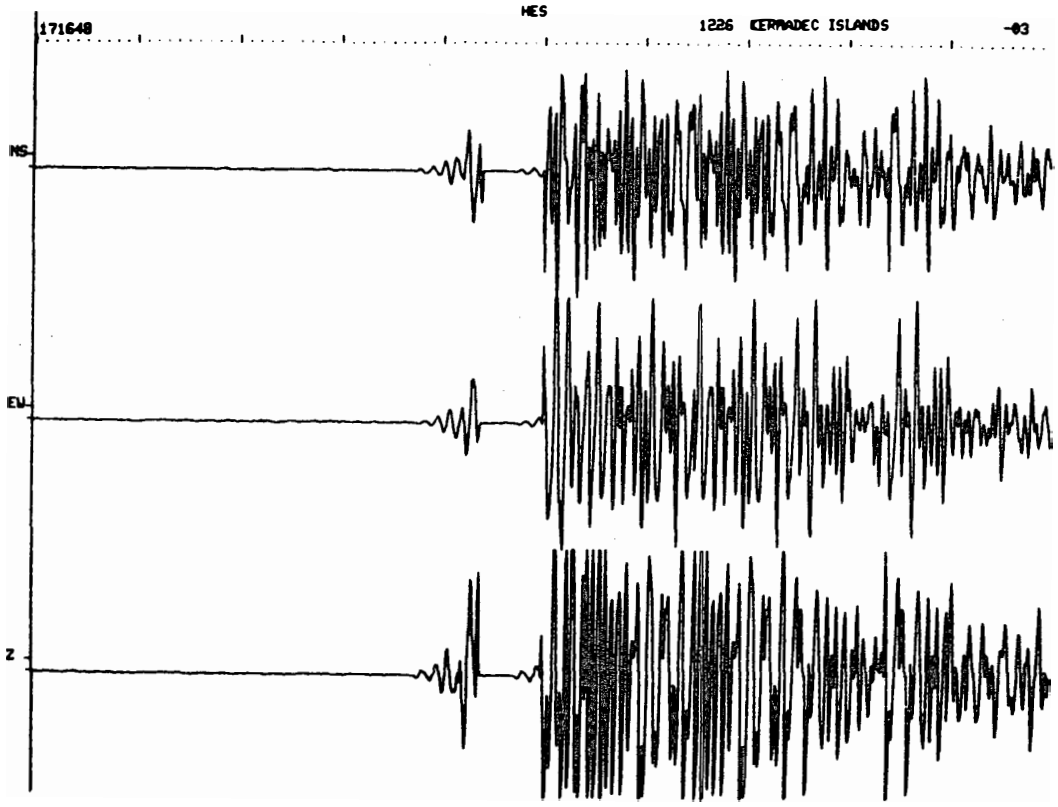
NO 109


HES
284803
1224 KERMADEC ISLANDS -03
NS
EW
Z

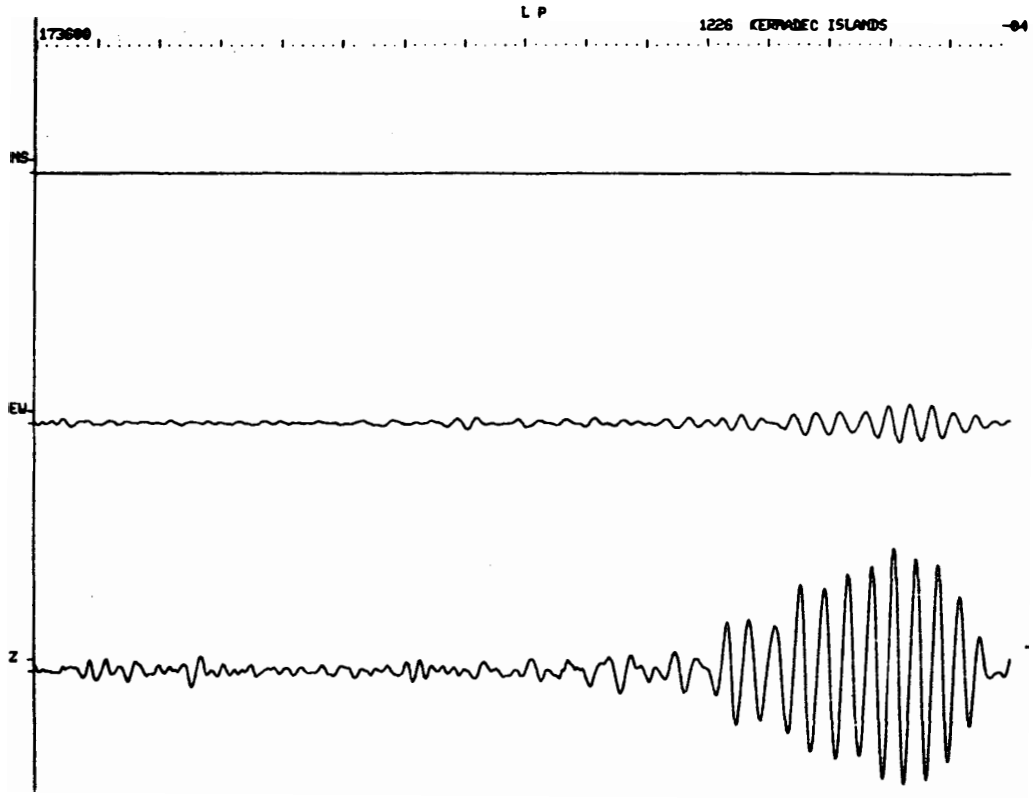
NO 110


HES
112630
1226 SALTA PROVINCE, ARGENTINA? -03
NS
EW
Z

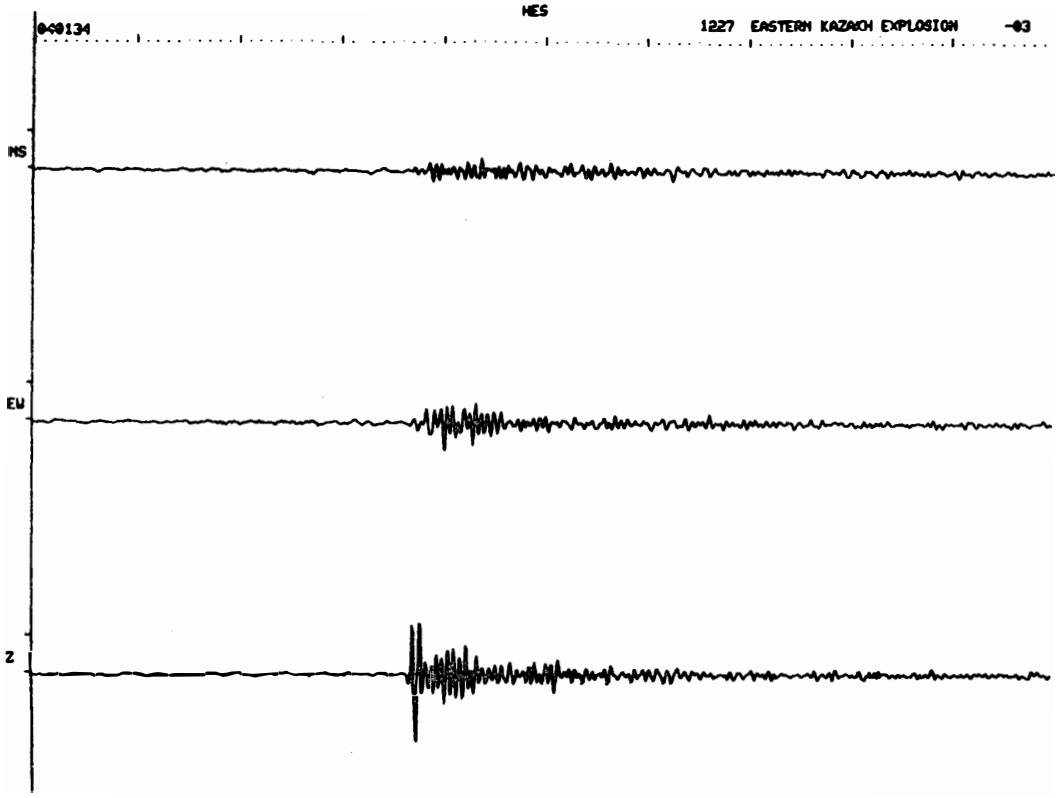
NO 111


HES
171648
1226 KERMADEC ISLANDS
-03
NS
EW
Z

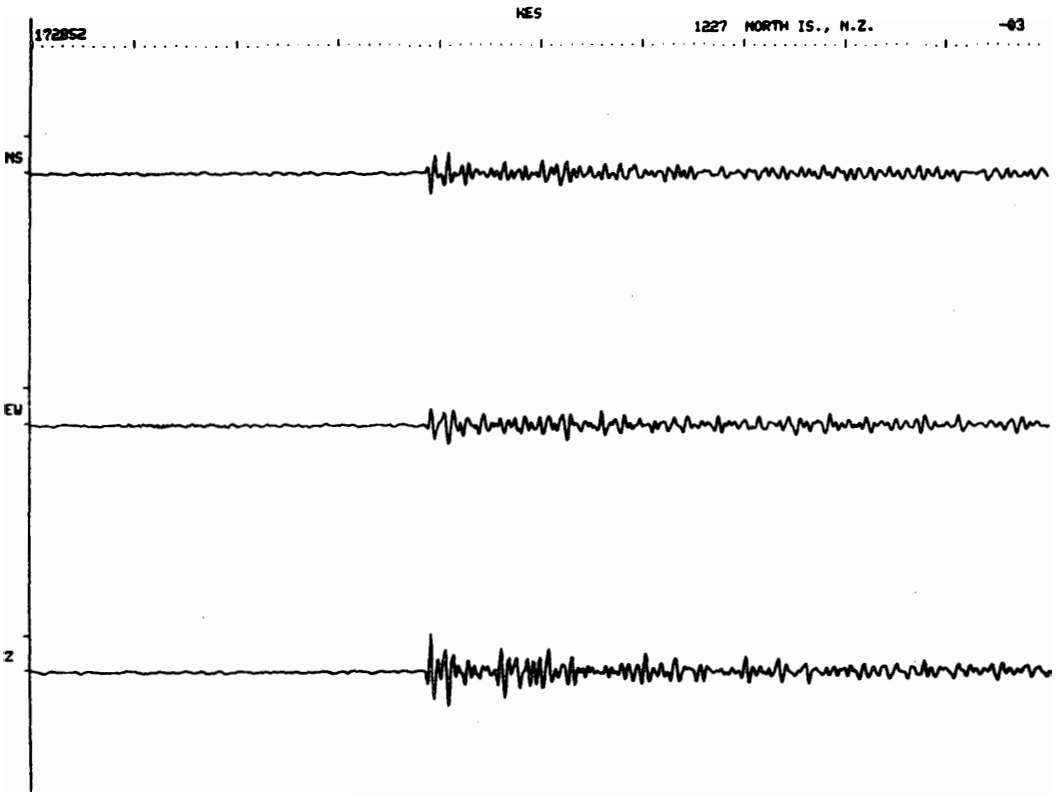
NO 111


L P
173600
1226 KERMADEC ISLANDS
-04
NS
EW
Z

NO 112


MES
040134
1227 EASTERN KAZAKH EXPLOSION -03
NS
EW
Z

NO 113


MES
172852
1227 NORTH IS., N.Z. -03
NS
EW
Z

NO 114