

SEISMOLOGICAL BULLETIN OF SYOWA STATION, ANTARCTICA,

1987

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1. Introduction

The seismic observation system at Syowa Station is schematically illustrated in Fig. 1. There are two types of seismometers, the one called SP (short period) or HES with the natural period of 1.0 s of the pendulum and the other called LP (long period) or PELS with the natural period of 12.0 s. HES has been operated since 1966 (Kaminuma et al., 1968). A new vault for seismographs was built in March 1970 (Kaminuma and Chiba, 1973). PELS was installed at Syowa Station in 1982. The coordinates of the 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.

The system was maintained by J. Akamatsu throughout the wintering season of JARE-28 (February 1987 - January 1988).

2. Data

The overall 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 has been connected to the recovered UTC from NNSS satellites since February 1987 (see Fig. 1). The accuracy of the read-out data can be estimated as 0.2 s. Considering the delay time of 1-2 years between the publication of this report and the observing wintering period, which is inevitable due to the restriction of transport ability between Tokyo and Syowa Station, the PDE (Preliminary Determination of Epicenters) reports by NEIS (National Earthquake Information Center) are referred to and only the teleseismic events are edited.

#### 2.1. Read-out data

The onset of the all events detected on the monitoring seismograms of the short and long periods was picked out from the pen-monitor records. The onset times of P-arrivals are listed in Table 1. Symbols E and I in the phase column denote weak and sharp onsets, respectively. The direction of the initial ground motion is denoted by + for the upward direction and - for the downward direction. Arrival time is in UTC.

Some earthquakes were determined as the local events using the data of the tripartite array network which was installed around Syowa Station in 1987 (Akamatsu et al., 1988). The local events are denoted with the symbol of the single asterisk in Table 1. The teleseismic events reported in the PDE of NEIS are shown with the serial numbers (#-xxx) in the table. The events detected on the only long period seismograms are shown with the double asterisks.

#### 2.2. Teleseismic events

Figure 3 shows the location of 250 teleseismic events of

which initial phases were detected at Syowa Station. The list of hypocenters of the teleseisms is shown in Table 2 with the same serial numbers as given in Table 1. The seismograms of these events are available from National Institute of Polar Research.

Pen-monitor examples of 17 teleseismic events are given in the Appendix. The magnitude of the events in the appendix is mostly larger than 6. Two events of #-11 and -13 were given with the short period seismograms of three components and the long period seismogram of the vertical component. The event of #-138 has no short period seismogram. Other 14 events give both short and long period seismograms of three components. However the short period seismograms of last three events of #-224, -225 and -238 were shown the vertical component of the tripartite array (Akamatsu et al., 1988).

Two events of #-109 and -110 occurred within 100 min and the seismograms of #-109 were given for two hours. The initial phases of #-110 were not detected on the long period seismograms for the large amplitude of coda waves of #-109.

### 3. Staffs of Data Process

The seismic observations at Syowa Station are organized by one of authors, K. Kaminuma and Dr. K. Shibuya of National Institute of Polar Research. Information on the seismic observation at Syowa Station is available from them. Ms. Y. Shudo of National Institute of Polar Research has scaled and edited all events, and she prepared this manuscript. The authors express their sincere thanks for her cooperation.

## References

- Akamatsu, J., Yoshikawa, S. and Kaminuma, K. (1988): Preliminary report of local seismic activity around Syowa Station, East Antarctica. Proc. NIPR Symp. Antarct. Geosci., 2, 1-6.
- Kaminuma, K. and Chiba, H. (1973): Syowa Kiti no shin-jishinkeishitsu to jishin kenchiritsu (The new seismographic vault and the detection capability of Syowa Station, Antarctica). Nankyoku Shiryô (Antarct. Rec.), 46, 67-82.
- Kaminuma, K., Eto, T. and Yoshida, M. (1968): Syowa Kiti no jishin kansoku (Seismological observation at Syowa Station, Antarctica). Nankyoku Shiryô (Antarct. Rec.), 33, 65-70.

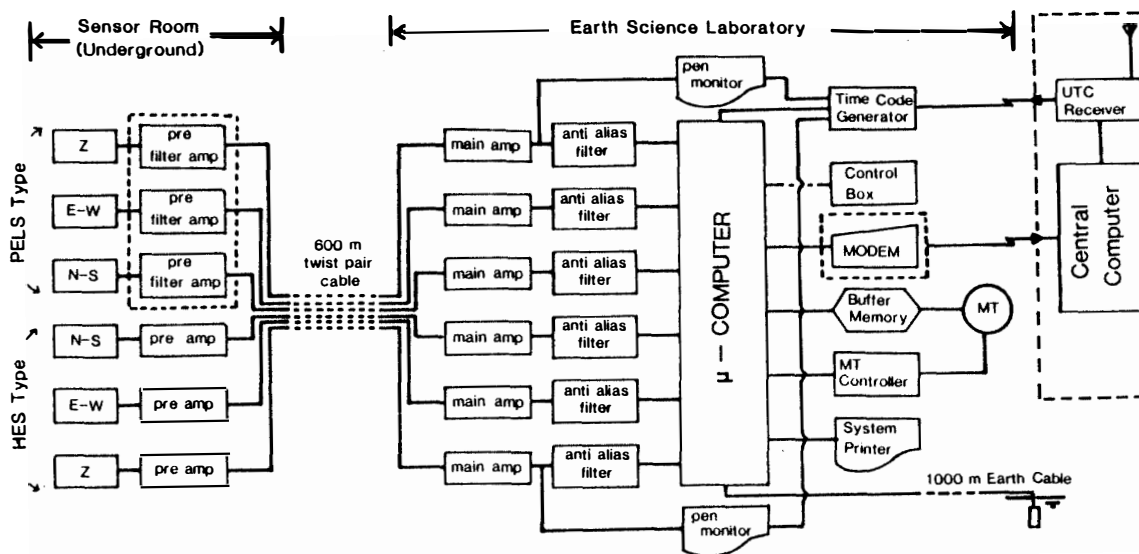


Fig. 1. The seismic observation system at Syowa Station.

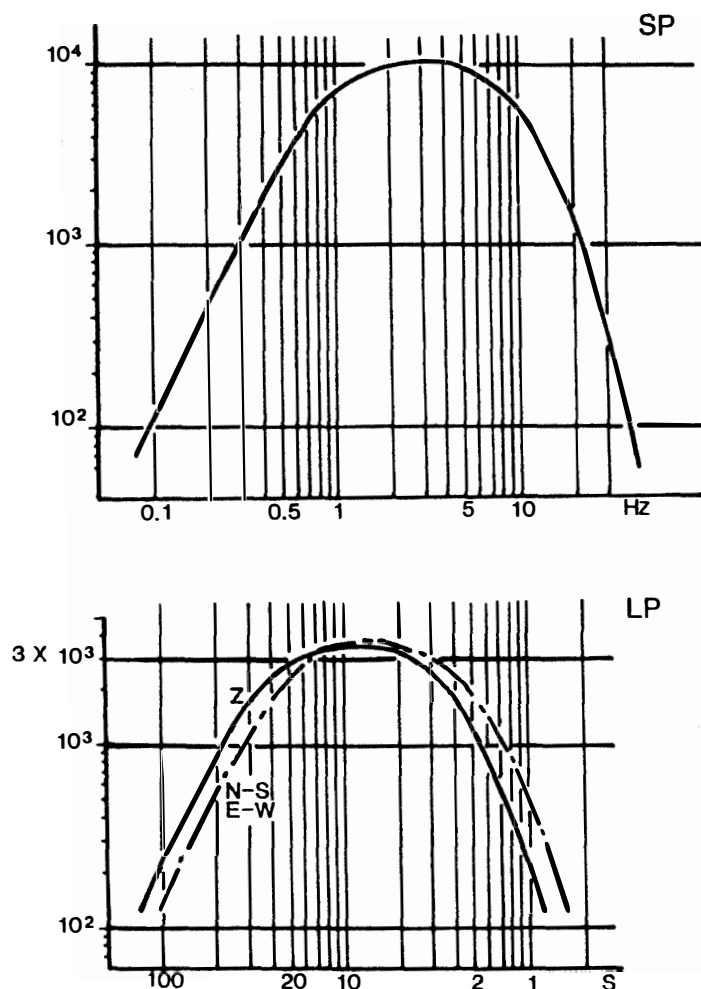


Fig. 2. Over-all frequency responses of the short-period and the long-period seismographs.

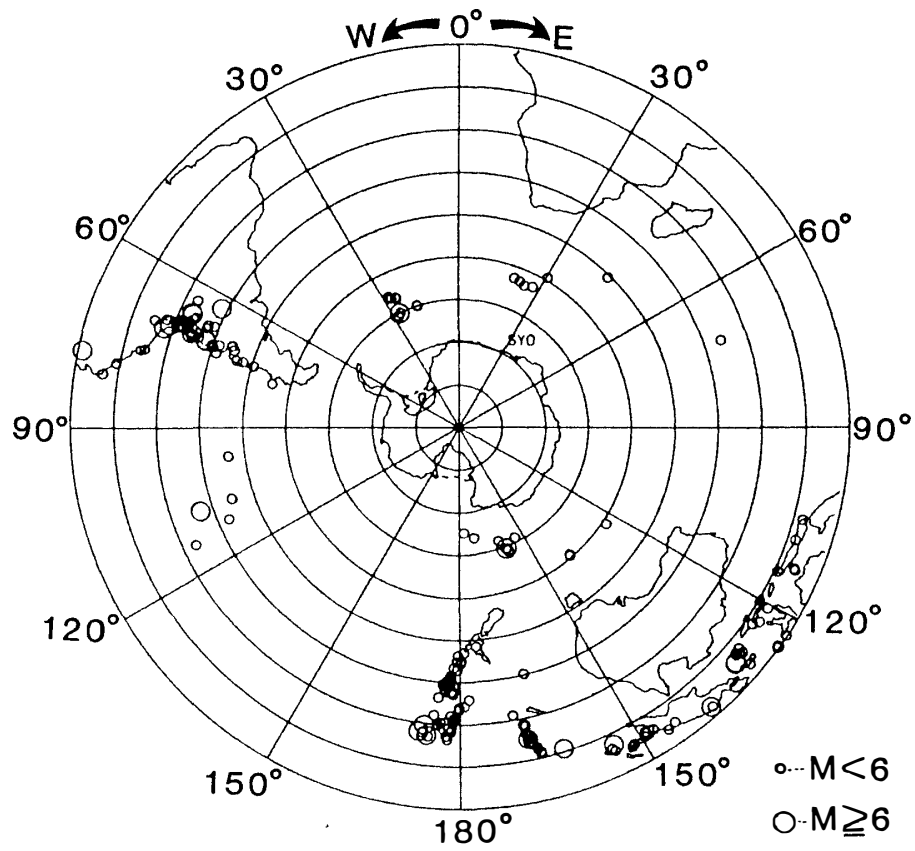
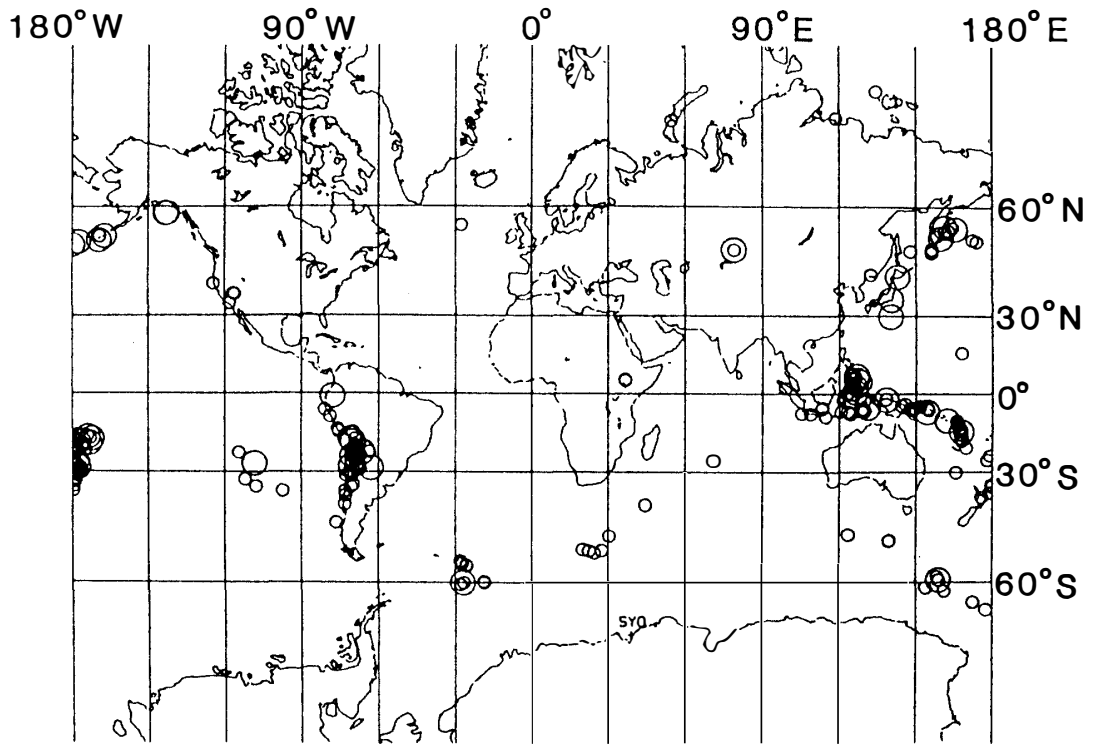


Fig. 3. Epicenters of the 250 events.

Table 1. Read-out data.

Date	Phase	Arrival time h m s	Remarks	Date	Phase	Arrival time h m s	Remarks
Jan. 02	+IPZ	07 50 17.4		Feb. 03	+IPZ	16 53 03.4	#-12
Jan. 03	+IPZ	22 16 57.8	#-1	Feb. 07	EXZ	19 31 40.2	
	LP+IPZ	22 16 58.0		Feb. 08	EPZ	03 39 28.6	*
Jan. 05	EPZ	12 31 54.5	#-2		+EPZ	18 01 51.1	
	LP+IPZ	12 31 54.4			EPZ	18 46 58.5	#-13
Jan. 09	EPZ	06 33 46.3			LP EPZ	18 46 57.5	
	EPZ	08 14 25.0		Feb. 10	-IPZ	01 11 34.9	#-14
	LP-IPZ	08 14 26.8			EPZ	06 38 17.6	
Jan. 11	+IPZ	07 42 55.7		Feb. 11	+IPZ	08 09 00.6	#-15
Jan. 13	+IPZ	11 07 13.0			+IPZ	18 03 39.0	#-16
	+EPZ	23 24 32.3		Feb. 13	+IPZ	07 31 24.1	#-17
Jan. 14	EPZ	11 22 45.2	#-3		LP+IPZ	07 31 24.0	
	LP EPZ	11 22 46.8		Feb. 14	+IPZ	17 02 07.1	
	+IPZ	12 55 18.6		Feb. 17	-IPZ	06 27 51.4	#-18
Jan. 16	+IPZ	15 18 57.7	#-4		LP+IPZ	06 27 52.3	
	LP+IPZ	15 18 58.0		Feb. 21	+IPZ	06 10 39.8	*
	-IPZ	16 40 50.9		Feb. 23	+IPZ	16 02 17.5	#-19
Jan. 21	-IPZ	04 59 15.9	#-5	Feb. 25	-IPZ	10 53 34.7	
	+IPZ	20 49 05.7	#-6		+IPZ	14 48 34.6	
Jan. 23	+IPZ	18 04 05.0	#-7	Feb. 27	EPZ	08 51 53.3	#-20
Jan. 28	+IPZ	03 45 04.3	*		LP EPZ	08 51 59.1	
	EPZ	20 22 29.9	#-8	Mar. 05	+IPZ	09 28 35.4	#-21
Jan. 29	EPZ	02 56 43.4	#-9		LP+IPZ	09 28 35.6	
	EPZ	17 33 40.6	#-10		EPZ	10 03 25.8	#-22
Jan. 30	-EPZ	22 35 31.4	#-11		-IPZ	11 06 46.2	#-23
	LP-EPZ	22 35 29.6			LP-IPZ	11 06 47.4	
Feb. 02	+IPZ	10 56 05.4	*	Mar. 06	EPZ	07 18 19.2	#-24
Feb. 03	-IPZ	00 38 34.5			EPZ	09 51 28.5	#-25
	-IPZ	10 01 43.4	*	Mar. 11	EXZ	03 01 58.0	
	EPZ	10 04 22.8	*	Mar. 18	EPZ	17 32 32.6	

Date	Phase	Arrival time h m s	Remarks	Date	Phase	Arrival time h m s	Remarks
Mar. 19	EPZ	23 04 02.5	#-26	May 10	+IPZ	15 26 50.5	
	LP+IPZ	23 04 03.6		May 11	-IPZ	02 49 27.5	
Mar. 21	-IPZ	11 01 45.1	#-27		+IPZ	10 12 39.9	#-36
Mar. 22	EPZ	03 35 33.5	#-28	May 12	+IPZ	01 43 49.9	#-37
Mar. 26	EPZ	16 30 14.6			+IPZ	04 58 32.1	*
Apr. 01	+IPZ	01 59 18.4	#-29		+IPZ	14 09 28.8	#-38
	LP+IPZ	01 59 18.4			-IPZ	16 24 17.2	#-39
Apr. 02	EPZ	21 41 30.5		May 14	EPZ	07 44 48.3	
Apr. 03	EPZ	01 36 04.4		May 15	-IPZ	13 59 22.3	
	EPZ	18 07 18.4	#-30	May 16	EPZ	03 47 03.2	
Apr. 04	EPZ	10 32 06.6		May 17	+IPZ	05 24 50.5	#-40
Apr. 05	EXZ	11 59 19.5		May 18	+IPZ	03 25 51.5	
Apr. 07	+IPZ	01 02 52.5			LP+IPZ	03 25 56.4	
Apr. 08	EXZ	06 14 47.1			EXZ	03 52 06.5	
Apr. 14	-IPZ	07 00 55.2	*	May 19	+IPZ	13 07 26.0	#-41
Apr. 16	EPZ	01 29 32.8			LP+IPZ	13 07 24.2	
	-IPZ	06 37 34.1	*	May 20	EPZ	00 02 44.5	
Apr. 17	-IXZ	01 22 00.6		May 23	+IPZ	23 58 39.2	
Apr. 18	-IPZ	13 59 39.6	#-31	May 25	EXZ	13 49 42.3	
Apr. 24	EXZ	21 30 07.8		May 31	EPZ	01 12 38.5	
Apr. 25	EPZ	02 41 47.3		June 01	-IPZ	02 01 50.7	
	EPZ	19 34 27.3	#-32		EPZ	22 46 11.3	
	LP-IPZ	19 34 29.4		June 10	+IPZ	19 36 51.3	*
Apr. 29	IPZ	14 39 44.5	#-33	June 15	+IPZ	21 16 04.7	
Apr. 30	EPZ	13 49 36.4	#-34	June 16	EPZ	20 29 20.4	
May 06	+IPZ	04 26 11.3	#-35	June 17	+IPZ	01 45 24.3	#-42
	LP+IPZ	04 26 11.4			ESH	01 55 38.2	
May 07	EXZ	03 24 03.5			LP+IPZ	01 45 24.6	
	LP EXZ	03 24 06.4		June 18	EPZ	14 16 12.3	#-43
May 09	+IPZ	16 13 33.0	*		LP EPZ	14 16 19.7	



Date	Phase	Arrival time h m s	Remarks	Date	Phase	Arrival time h m s	Remarks
June 19	+IPZ	19 11 45.8	#-44	July 09	LP+IPZ	07 33 46.5	
	LP+IPZ	19 11 46.0		July 10	+IPZ	10 57 12.3	
June 20	EPZ	00 56 27.2			EPZ	19 09 43.8	#-59
	EPZ	01 12 01.3			LP EPZ	19 09 44.4	
	+IPZ	05 51 52.2	#-45	July 11	+IPZ	00 31 13.8	#-60
	LP+IPZ	05 51 52.4			-IPZ	05 32 42.5	#-61
June 22	-IPZ	05 28 10.8	#-46		EPZ	06 35 49.4	#-62
June 26	LP EXZ	23 08 09.0		July 12	-IPZ	19 18 26.1	
	LP EXZ	23 52 58.5		July 13	+IPZ	19 26 55.4	#-63
June 27	EPZ	00 30 14.9	#-47		LP+IPZ	19 26 55.5	
	LP EPZ	00 30 07.6		July 15	+IPZ	00 04 23.4	
	-IPZ	08 47 44.4	#-48		+IPZ	00 07 09.4	#-64
	-IPZ	09 21 38.7	#-49		-IXZ	00 15 35.4	
	LP-IPZ	09 21 38.4		July 16	EXZ	16 04 50.0	
July 03	-IPZ	23 09 14.4			+IPZ	19 19 38.0	
July 06	EPZ	00 43 05.2		July 17	+IPZ	01 09 53.2	#-65
	LP EPZ	00 43 15.4			LP+IPZ	01 09 53.4	
	-EPZ	01 18 24.0	#-50		-IPZ	01 36 02.2	
	LP-EPZ	01 18 24.0		July 21	EPZ	13 38 21.5	#-66
	EPZ	03 02 34.6	#-51		LP-IPZ	13 38 26.8	
	LP EPZ	03 02 34.4		July 22	-IPZ	08 16 13.9	#-67
	EPZ	03 17 52.5	#-52	July 23	-IPZ	01 10 15.9	#-68
	EPZ	23 41 33.8	#-53		-IPZ	04 09 27.0	#-69
July 07	EPZ	10 49 06.7	#-54	July 25	+IPZ	16 26 19.3	#-70
	+IPZ	18 24 00.2	#-55		-IPZ	18 24 31.4	
	LP+IPZ	18 24 00.6		July 26	EPZ	22 11 09.8	#-71
July 08	-IPZ	12 02 31.2	#-56	July 29	EPZ	10 13 06.5	#-72
	LP-IPZ	12 02 32.2			LP+IPZ	10 13 12.5	
July 09	-IPZ	04 19 23.4	#-57		-IPZ	15 33 24.7	#-73
	EPZ	07 33 43.3	#-58		-IPZ	20 49 02.0	#-74

Date	Phase	Arrival time h m s	Remarks	Date	Phase	Arrival time h m s	Remarks
July 29	LP-IPZ	20 49 02.4		Aug. 12	LP EPZ	00 19 19.8	
	-IPZ	21 44 20.1	#-75		EPZ	04 54 20.0	#-87
	LP-IPZ	21 44 20.1			-IPZ	06 26 07.5	
July 31	+IPZ	00 40 04.4			LP-IPZ	06 26 07.5	
	+IPZ	16 39 56.8		Aug. 13	+IPZ	08 55 53.3	#-88
Aug. 01	EPZ	00 16 45.5	#-76		+IPZ	14 19 37.9	#-89
Aug. 02	+IPZ	01 17 03.0	#-77		LP+IPZ	14 19 38.1	
	-IPZ	02 19 30.2	#-78		EPZ	15 35 14.6	#-90
Aug. 03	+IPZ	02 35 36.0			LP EPZ	15 35 15.5	
	EPZ	14 19 47.3			EPZ	21 59 43.7	#-91
	-IPZ	23 24 39.3	#-79	Aug. 14	+IPZ	06 12 03.4	#-92
	EXZ	23 27 37.7			EPZ	17 59 45.5	#-93
Aug. 04	+IPZ	10 30 45.6			LP EPZ	17 59 45.4	
	+IPZ	15 14 44.6	#-80		+IPZ	22 31 34.8	
	EPZ	19 17 35.8			LP+IPZ	22 31 35.0	
	+IPZ	20 04 36.8		Aug. 15	EPZ	00 50 27.5	
	EPZ	22 27 39.4	#-81		-IPZ	09 46 17.6	#-94
Aug. 06	+IPZ	13 21 42.0			LP-IPZ	09 46 17.5	
Aug. 07	+IPZ	12 28 21.3			EPZ	14 01 38.0	
Aug. 08	EPZ	07 59 12.2	#-82		+IPZ	18 15 36.1	#-95
	LP EPZ	07 59 12.1			LP+IPZ	18 15 36.2	
	-IPZ	16 00 53.8	#-83	Aug. 16	+IPZ	21 50 03.5	#-96
	LP-IPZ	16 00 54.2			LP+IPZ	21 50 03.7	
Aug. 09	+IPZ	08 30 43.0		Aug. 19	EPZ	00 36 50.2	#-97
	+EXZ	08 35 49.7			-IPZ	08 03 59.2	#-98
Aug. 10	+IPZ	10 10 59.1	#-84		ISH	08 13 14.4	
	LP+IPZ	10 10 59.1		Aug. 20	-IPZ	05 52 18.7	#-99
Aug. 11	EPZ	02 18 26.3	#-85		ISH	06 01 47.6	
	LP EPZ	02 18 28.5		Aug. 21	+IPZ	19 57 24.6	#-100
Aug. 12	EPZ	00 19 19.3	#-86	Aug. 22	EPZ	05 29 07.2	#-101

Date	Phase	Arrival time h m s	Remarks	Date	Phase	Arrival time h m s	Remarks
Aug. 24	EPZ	06 21 41.3		Sept.04	+IPZ	11 34 57.8	
Aug. 26	+IPZ	07 08 27.9	#-102	Sept.06	+IPZ	15 46 51.5	#-114
	ESH	07 17 56.8			+IPZ	20 19 02.5	
	LP+IPZ	07 08 28.3			+IPZ	22 13 30.6	#-115
	EPZ	13 12 28.8		Sept.07	EPZ	12 08 54.5	#-116
	EPZ	17 08 04.3	#-103		LP+IPZ	12 08 54.6	
Aug. 28	EPZ	13 29 29.7			EPZ	12 16 08.1	
Aug. 29	+IPZ	00 44 49.3			-IPZ	17 55 25.8	#-117
	-IPZ	13 04 26.3			LP-IPZ	17 55 25.9	
	EPZ	15 20 18.8	#-104		+IPZ	19 56 56.4	
	LP EPZ	15 20 21.1			EPZ	20 45 25.0	
Aug. 30	+IPZ	12 27 23.0	#-105	Sept.08	-IPZ	13 54 40.4	#-118
Aug. 31	EPZ	07 05 40.6	#-106		EPZ	16 43 31.8	
	LP EPZ	07 05 39.3			EPZ	21 48 45.8	#-119
Sept.01	+IPZ	04 37 22.3	#-107	Sept.10	-IPZ	01 05 04.8	
	ESZ	04 46 37.4			+IPZ	02 37 37.6	#-120
	LP+IPZ	04 37 22.3			ESH	02 46 56.6	
	-IPZ	22 58 24.1			LP+IPZ	02 37 37.8	
Sept.02	-IPZ	05 33 44.3			EPZ	20 44 08.8	
Sept.03	-IPZ	01 28 18.8	#-108	Sept.11	-IPZ	00 46 23.0	#-121
	EPZ	06 48 25.0	#-109		LP-IPZ	00 46 23.1	
	LP-IPZ	06 48 25.9			-IPZ	04 12 51.3	#-122
	EPZ	08 09 43.1	#-110	Sept.13	+IPZ	20 19 29.8	#-123
	EPZ	08 44 23.2	#-111		LP+IPZ	20 19 30.0	
	EPZ	09 50 35.7			EXZ	20 48 17.5	
	EPZ	11 16 31.8	#-112	Sept.14	+IPZ	10 35 07.2	
	LP+IPZ	11 16 32.0			+IPZ	10 35 48.8	
Sept.04	EPZ	01 01 08.6		Sept.15	+IPZ	17 20 39.9	
	+IPZ	04 46 39.6	#-113	Sept.16	EPZ	00 19 40.4	
	LP+IPZ	04 46 39.7		Sept.17	EPZ	05 00 20.8	#-124

Date	Phase	Arrival time h m s	Remarks	Date	Phase	Arrival time h m s	Remarks
Sept. 17	LP EPZ	05 00 23.2		Sept. 26	LP EXZ	17 40 42.5	
	+IPZ	09 37 13.4		Sept. 27	EPZ	04 20 10.5	#-136
Sept. 18	-IPZ	08 54 54.4	#-125		LP EPZ	04 20 15.5	
	LP-IPZ	08 54 54.9		Sept. 28	LP-IPZ	07 28 12.8	#-137**
Sept. 19	+IPZ	09 34 13.4	#-126		LP+IPZ	11 59 42.4	#-138**
	LP+IPZ	09 34 13.5			EPZ	13 58 48.0	#-139
	EPZ	21 31 24.7	#-127		LP+IPZ	13 58 48.5	
	LP-IPZ	21 31 24.9			+IPZ	23 22 10.4	#-140
	-IPZ	22 17 25.0	#-128		LP+IPZ	23 22 12.4	
Sept. 20	+IPZ	04 34 55.4		Sept. 29	EPZ	15 22 03.8	
	EPZ	06 10 10.5			LP EPZ	15 22 05.6	
Sept. 21	EPZ	07 09 42.6		Sept. 30	EPZ	01 52 00.9	#-141
Sept. 22	-IPZ	04 38 35.7	#-129		LP EPZ	01 52 00.9	
	EPZ	07 29 03.5			-IPZ	22 26 33.4	
	EPZ	13 05 24.6		Oct. 01	+IPZ	03 35 57.1	
	LP EPZ	13 05 24.0			EPZ	07 42 22.8	#-142
	EPZ	13 57 16.3	#-130		LP EPZ	07 42 21.8	
	LP EPZ	13 57 16.9			+IPZ	13 26 45.7	#-143
	EPZ	20 42 30.5			LP+IPZ	13 26 46.3	
	EPZ	22 25 17.8	#-131		-IPZ	15 01 47.5	#-144
Sept. 23	+IPZ	15 23 28.4	#-132		LP EPZ	15 01 47.2	
	LP+IPZ	15 23 28.4		Oct. 02	EPZ	00 08 05.0	
	+IPZ	15 31 18.8	#-133		LP EPZ	00 08 13.2	
	EXZ	23 24 51.0			-IPZ	07 56 21.7	
Sept. 24	EPZ	01 59 25.6		Oct. 03	-IPZ	03 47 01.8	#-145
	+IPZ	15 19 38.8	#-134		LP-IPZ	03 47 02.0	
Sept. 25	EXZ	07 53 34.8			+IPZ	10 28 56.4	#-146
Sept. 26	-IPZ	00 36 07.3			LP+IPZ	10 28 56.5	
	EPZ	05 50 27.5	#-135		EXZ	10 55 01.8	
	EXZ	17 40 42.3			EXZ	11 48 11.4	

Date	Phase	Arrival time h m s	Remarks	Date	Phase	Arrival time h m s	Remarks
Oct. 04	EPZ	18 54 01.7	#-147	Oct. 12	EPZ	14 10 07.3	#-158
	LP EPZ	18 54 01.5			LP EPZ	14 10 07.5	
	+IPZ	23 20 57.2	#-148	Oct. 13	+IPZ	02 55 01.8	#-159
	LP EPZ	23 20 57.3		Oct. 14	+IPZ	02 22 37.1	#-160
Oct. 05	EPZ	13 43 11.7			LP+IPZ	02 22 36.9	
Oct. 06	EPZ	04 32 05.2	#-149		+IPZ	21 04 41.0	
	LP-IPZ	04 32 05.2			+IPZ	23 42 41.1	
	EPZ	14 42 21.5		Oct. 15	EPZ	01 18 28.5	#-161
	EPZ	14 51 14.9			LP EPZ	01 18 31.5	
	EPZ	16 02 28.9			-IPZ	06 20 08.2	
	EPZ	16 20 12.3			+IPZ	14 21 07.5	
	EPZ	16 22 20.3		Oct. 16	-IPZ	07 04 52.8	#-162
	EPZ	20 31 14.2	#-150		EPZ	21 00 59.2	#-163
	LP+IPZ	20 31 13.2			LP+IPZ	21 01 00.0	
Oct. 07	-IPZ	01 03 05.6	#-151	Oct. 17	+IPZ	06 43 43.8	#-164
	LP-IPZ	01 03 06.0			LP+IPZ	06 43 43.9	
Oct. 08	+IPZ	03 33 33.0	#-152		EPZ	11 03 03.4	
	LP+IPZ	03 33 33.2		Oct. 20	+IPZ	09 43 28.0	#-165
Oct. 09	+IPZ	03 23 46.1			LP EPZ	09 43 27.4	
	EPZ	10 29 11.3	#-153	Oct. 21	EPZ	06 24 15.1	#-166
	LP-IPZ	10 29 11.3			LP+IPZ	06 24 15.4	
	+IPZ	18 15 20.1			+IPZ	07 37 29.5	#-167
Oct. 10	-IPZ	14 37 38.5	#-154		LP+IPZ	07 37 29.8	
	LP-IPZ	14 37 38.6			+IPZ	19 06 06.7	
Oct. 11	EPZ	08 17 12.8			-IPZ	23 37 38.0	#-168
	EPZ	09 51 48.8	#-155	Oct. 22	EPZ	00 13 05.4	#-169
	LP EPZ	09 51 54.2			LP-IPZ	00 13 05.2	
	+IPZ	18 14 11.7	#-156		-IPZ	12 24 27.3	#-170
	LP+IPZ	18 14 11.9			LP-IPZ	12 24 27.1	
	+IPZ	18 59 45.1	#-157	Oct. 23	+IPZ	01 19 25.5	

Date	Phase	Arrival time h m s	Remarks	Date	Phase	Arrival time h m s	Remarks
Oct. 23	+IPZ	13 47 28.9	#-171	Nov. 01	EPZ	23 19 39.8	#-183
	LP+IPZ	13 47 28.9			LP EPZ	23 19 39.5	
	+IPZ	16 19 37.7	#-172	Nov. 02	-IPZ	21 55 07.3	
	LP+IPZ	16 19 37.9		Nov. 03	+IPZ	08 27 53.4	#-184
	-IPZ	18 24 18.1			LP+IPZ	08 27 52.6	
Oct. 24	+IPZ	14 50 05.6	#-173	Nov. 05	+IPZ	09 25 06.5	
	LP+IPZ	14 50 05.9			-IPZ	19 59 00.8	#-185
Oct. 25	EPZ	16 57 51.5	#-174	Nov. 06	-IPZ	18 45 00.6	#-186
	LP EPZ	16 57 51.5			-IPZ	18 58 11.9	#-187
	EPZ	17 07 06.4	#-175		LP-IPZ	18 58 11.9	
	LP EPZ	17 07 07.1			-IPZ	20 29 29.4	
	+IPZ	23 05 06.4		Nov. 07	+IPZ	06 23 57.0	*
Oct. 27	+IPZ	13 09 40.9	#-176		+IPZ	06 24 41.2	*
	LP+IPZ	13 09 40.9			+IPZ	06 30 32.3	*
	-IPZ	22 08 15.5	#-177		+IPZ	06 48 36.8	*
	LP-IPZ	22 08 15.9			EPZ	16 37 05.4	#-188
	EXZ	22 36 21.8			LP EPZ	16 37 04.2	
Oct. 28	EPZ	09 10 09.4	#-178	Nov. 08	+IPZ	04 50 53.2	#-189
	LP-IPZ	09 10 09.4			EPZ	06 18 37.9	#-190
	-IPZ	18 33 31.4	#-179		LP EPZ	06 18 39.4	
	LP-IPZ	18 33 31.5		Nov. 09	EPZ	01 51 10.1	#-191
Oct. 29	+IPZ	20 36 40.5	#-180		LP EPZ	01 51 08.5	.
	LP+IPZ	20 36 40.5			-IPZ	17 58 02.5	#-192
	EXZ	21 01 50.6			LP-IPZ	17 58 02.5	
Oct. 30	-IPZ	20 58 44.4		Nov. 10	EPZ	20 29 55.8	#-193
Oct. 31	-IPZ	02 45 34.3		Nov. 11	+IPZ	01 08 55.6	
Nov. 01	+IPZ	08 54 02.7	#-181		EPZ	10 54 43.6	
	LP+IPZ	08 54 02.7		Nov. 12	EPZ	00 36 56.3	#-194
	+IPZ	19 09 31.3	#-182		LP-IPZ	00 36 56.3	
	LP+IPZ	19 09 31.3		Nov. 14	+IPZ	21 33 30.0	#-195

Date	Phase	Arrival time h m s	Remarks	Date	Phase	Arrival time h m s	Remarks
Nov. 15	+IPZ	03 50 02.8	#-196	Nov. 26	+IPZ	00 40 12.7	
	+IPZ	04 00 00.2			LP+IPZ	00 40 13.1	
Nov. 16	-IPZ	03 28 30.2			EPZ	01 55 23.2	#-210
	EPZ	06 13 05.2	#-197		LP+IPZ	01 55 23.4	
	-IPZ	11 49 00.0	#-198		EPZ	17 41 40.5	#-211
	LP-IPZ	11 48 59.5			LP+IPZ	17 41 40.9	
Nov. 17	EPZ	03 58 40.2		Nov. 27	+IPZ	00 14 57.0	#-212
	LP EPZ	03 58 39.7			LP+IPZ	00 14 56.9	
	EPZ	09 06 54.2	#-199		EPZ	13 18 36.9	#-213
	LP+IPZ	09 06 54.5			LP+IPZ	13 18 37.0	
Nov. 18	+IPZ	01 45 36.1	#-200		EPZ	13 46 03.5	#-214
	LP+IPZ	01 45 36.1			LP+IPZ	13 46 04.0	
	-IPZ	12 58 08.7	#-201		-IPZ	14 45 04.8	
Nov. 19	-IPZ	11 39 30.1		Nov. 28	+IPZ	04 16 33.3	#-215
Nov. 20	-IPZ	21 26 15.0	#-202		LP EPZ	04 16 33.6	
	LP-IPZ	21 26 15.1		Nov. 29	EPZ	08 07 00.5	#-216
	EPZ	21 45 21.8	#-203		LP EPZ	08 07 00.5	
Nov. 23	EPZ	12 08 45.4		Nov. 30	EPZ	04 54 27.7	#-217
Nov. 24	+IPZ	07 46 13.6	#-204		LP+IPZ	04 54 27.1	
	LP+IPZ	07 46 13.6			EPZ	19 43 16.3	#-218
	-IPZ	12 50 35.4	#-205		LP EPZ	19 43 17.5	
	EPZ	13 35 24.0		Dec. 01	EPZ	04 17 10.9	#-219
	LP EPZ	13 35 25.4			LP EPZ	04 17 11.4	
	EPZ	15 18 57.5	#-206		+IPZ	18 35 26.8	#-220
	LP+IPZ	15 18 57.6			ESH	18 45 22.3	
Nov. 25	EPZ	16 21 27.2	#-207	Dec. 02	EXZ	14 34 40.5	
	LP EPZ	16 21 27.1		Dec. 03	-IPZ	11 16 14.7	#-221
	-IPZ	17 47 53.5	#-208		LP-IPZ	11 16 14.9	
	-IPZ	20 02 49.4	#-209	Dec. 04	-IPZ	20 04 33.6	#-222
	LP-IPZ	20 02 50.0			LP-IPZ	20 04 33.6	

Date	Phase	Arrival time h m s	Remarks	Date	Phase	Arrival time h m s	Remarks
Dec. 05	EPZ	11 59 30.4		Dec. 15	+IPZ	15 16 19.8	
Dec. 06	+IPZ	18 36 22.0	#-223	Dec. 16	-IPZ	03 29 13.1	#-237
Dec. 07	+IPZ	12 39 05.3	#-224		LP-IPZ	03 29 13.1	
	LP+IPZ	12 39 05.3			EPZ	05 13 02.9	
	EPZ	13 27 31.6	#-225	Dec. 17	-IPZ	02 27 16.0	#-238
	LP EPZ	13 27 30.8			LP+IPZ	02 27 16.5	
	EPZ	19 33 23.4	#-226		-IPZ	20 34 41.8	#-239
	LP EPZ	19 33 27.8			LP-IPZ	20 34 41.9	
Dec. 08	+IPZ	14 45 07.3	#-227	Dec. 18	EPZ	22 13 21.0	
	+IPZ	14 59 49.6	#-228		LP-IPZ	22 13 21.6	
	LP+IPZ	14 59 49.6			-IPZ	23 54 07.6	
	-IPZ	17 39 06.7			LP-IPZ	23 54 08.0	
	EPZ	20 02 50.2	#-229	Dec. 19	-IPZ	10 27 15.0	#-240
	LP+IPZ	20 02 50.7		Dec. 21	LP+IPZ	09 34 14.4	#-241**
Dec. 10	EPZ	05 58 09.7	#-230	Dec. 23	+IPZ	06 54 12.5	*
	LP EPZ	05 58 09.6			+IPZ	10 23 06.4	#-242
	+IPZ	22 36 11.4			LP+IPZ	10 23 06.4	
Dec. 11	EPZ	02 15 47.2	#-231		+IPZ	17 43 50.3	#-243
	LP EPZ	02 15 47.5			LP+IPZ	17 43 50.3	
Dec. 12	EPZ	05 10 23.2	#-232	Dec. 25	EPZ	01 45 34.9	
	LP-IPZ	05 10 23.2			EPZ	23 09 16.8	#-244
Dec. 13	+IPZ	03 40 01.1	#-233		LP EPZ	23 09 17.5	
	EPZ	06 37 26.2		Dec. 27	+IPZ	03 24 00.7	#-245
	LP EPZ	06 37 26.2		Dec. 28	+IPZ	08 27 33.4	#-246
	EPZ	10 47 56.2	#-234		LP+IPZ	08 27 33.4	
	LP EPZ	10 47 56.5			EPZ	22 59 20.1	*
	EPZ	10 59 27.4	#-235	Dec. 30	+IPZ	06 51 16.6	
	-IPZ	12 35 05.8			+IPZ	12 06 46.6	#-247
	EPZ	20 54 36.3	#-236		LP+IPZ	12 06 46.6	
Dec. 15	LP+IPZ	07 06 42.7	**		EPZ	20 31 28.1	



Date	Phase	Arrival time			Remarks
		h	m	s	
Dec. 30	EPZ	21	29	31.0	#-248
	LP-IPZ	21	29	32.5	
	-IPZ	22	45	28.9	#-249
Dec. 31	+IPZ	06	35	26.8	#-250

#-No. --- corresponds to that in Table 3.

\* --- corresponds to local event.

\*\* --- has no arrival time record on  
the short period seismographs.

Table 2. List of the 250 earthquakes.

Data No.	Origin time U T C			Geographic coordinates		Region	Depth (km)	Magnitude (Mb) (Ms)		Epicentral distance (degree)	Azimuth (degree)	
	Date	h	m	s	Latitude			Longitude				
1	01/03	22	04	04.8	14.998 S	167.929 E	Vanuatu Islands	15 G	6.0	6.5	88.538	49.280 SE
2	01/05	12	11	55.7	52.448 N	169.381 W	Fox Islands, Aleutian Islands	33 N	6.1	6.7	158.697	54.353 SE
3	01/14	11	03	48.7	42.565 N	142.850 E	Hokkaido, Japan Region	102 G	6.5		133.777	96.854 SE
4	01/16	15	14	59.3	52.904 S	27.444 E	South of Africa	10 G	5.5	4.9	16.960	154.207 SW
5	01/21	04	47	03.1	6.664 S	129.815 E	Banda Sea	159 D	5.4		83.866	87.382 SE
6	01/21	20	37	03.5	6.008 S	128.836 E	Banda Sea	268	5.3		84.125	88.533 SE
7	01/23	17	51	09.2	1.646 N	126.531 E	Molucca Passage	72 D	5.6		90.433	93.448 SE
8	01/28	20	14	37.5	61.090 S	153.856 E	Balleny Islands Region	10 G	5.5	5.5	41.841	41.353 SE
9	01/29	02	43	47.6	1.265 N	126.232 E	Molucca Passage	48 D	5.8	5.9	89.970	93.590 SE
10	01/29	17	22	39.4	29.765 S	71.208 W	Near Coast of Central Chile	65 D	5.4		69.389	60.110 SW
11	01/30	22	29	42.0	60.063 S	26.916 W	South Sandwich Islands Region	48 D	6.2	7.0	28.352	74.529 SW
12	02/03	16	42	41.3	37.750 S	72.893 W	Central Chile	32 D	5.8	5.5	62.475	55.470 SW

13	02/08 18 33 58.3	6.088 S	147.689 E	East Papua New Guinea Region	55		7.4	90.708	70.952 SE
14	02/10 00 59 28.5	19.489 S	177.456 W	Fiji Islands Region	395 G	6.2		87.701	34.640 SE
15	02/11 07 56 12.9	15.834 S	167.355 E	Vanuatu Islands	24	5.9	6.4	87.579	49.573 SE
16	02/11 17 42 50.9	43.169 N	132.286 E	Near East Coast of Eastern USSR	499 D	5.5		130.583	106.408 SE
17	02/13 07 18 29.0	0.670 N	126.167 E	Molucca Passage	32	6.2	6.5	89.392	93.436 SE
18	02/17 06 16 12.1	32.793 S	179.304 W	South of Kermadec Islands	10 G	5.9	6.6	74.366	33.238 SE
19	02/23 15 49 54.6	15.854 S	167.891 E	Vanuatu Islands	234	5.9		87.706	49.073 SE
20	02/27 08 31 54.4	53.470 N	167.291 W	Fox Islands, Aleutian Islands	10 G	6.2	6.7	160.198	52.608 SE
21	03/05 09 17 05.2	24.388 S	70.161 W	Near Coast of Northern Chile	62 G	6.5	7.3	74.082	63.044 SW
22	03/05 09 51 53.4	24.432 S	70.216 W	Near Coast of Northern Chile	43 D	5.6		74.058	62.979 SW
23	03/05 10 55 12.3	24.495 S	70.701 W	Near Coast of Northern Chile	35 D	5.7		74.154	62.527 SW
24	03/06 07 06 44.0	24.089 S	70.104 W	Near Coast of Northern Chile	41 D	5.9	5.5	74.343	63.204 SW

25	03/06 09 39 54.7	24.149 S	70.118 W	Near Coast of Northern Chile	46 D	5.7	5.7	74.291	63.170 SW
26	03/19 22 51 39.2	20.397 S	176.134 W	Fiji Islands Region	214 G	5.9		87.080	33.231 SE
27	03/21 10 41 35.9	52.056 N	177.547 W	Andreanof Island, Aleutian Islands	93 G	6.0		155.819	65.002 SE
28	03/22 03 23 57.6	24.058 S	70.142 W	Near Coast of Northern Chile	40 D	5.8	5.8	74.384	63.182 SW
29	04/01 01 48 08.5	22.767 S	66.205 W	Jujuy Province, Argentina	249 G	6.1		74.303	67.165 SW
30	04/03 17 54 23.6	4.731 S	144.216 E	Near North Coast of Papua New Guinea	91	5.7		90.786	74.665 SE
31	04/18 13 40 00.6	37.248 N	116.509 W	Southern Nevada	0	5.5	4.0	145.775	34.986 SW
32	04/25 19 22 07.2	2.244 N	98.866 E	Northern Sumatera	11 D	5.9	6.6	81.522	119.721 SE
33	04/29 14 27 35.7	19.013 S	177.736 W	Fiji Islands Region	385 G	5.9		88.108	35.002 SE
34	04/30 13 30 00.0	37.233 N	116.423 W	Southern Nevada	0	5.5	4.4	145.743	35.096 SW
35	05/06 04 06 14.1	51.272 N	179.898 W	Andreanof Islands, Aleutian Islands	20 G	6.3	6.4	154.381	66.950 SE
36	05/11 09 59 34.1	4.470 N	127.709 E	Talaud Islands	94 G	5.9		93.491	93.368 SE
37	05/12 01 30 25.0	7.090 N	126.701 E	Mindanao, Philippine Islands	25 G	6.2	6.4	95.572	95.255 SE

38	05/12 13 56 26.2	5.271 S	151.342 E	New Britain Region	85 G	5.8		92.709	67.807 SE
39	05/12 16 12 37.5	21.694 S	68.222 W	Chile-Bolivia Border Region	78 D	5.5		75.972	65.757 SW
40	05/17 05 12 11.9	13.568 S	167.154 E	Vanuatu Islands	177 D	5.6		89.695	50.406 SE
41	05/19 12 56 25.2	30.284 S	71.484 W	Near Coast of Central Chile	36 D	5.6	6.0	68.990	59.672 SW
42	06/17 01 32 53.7	5.577 S	130.791 E	Banda Sea	67 G	6.6		85.230	86.868 SE
43	06/18 14 03 15.1	10.707 S	162.326 E	Solomon Islands	73 G	6.0		91.039	55.759 SE
44	06/19 19 00 05.1	21.213 S	68.362 W	Chile-Bolivia Border Region	86	5.6		76.468	65.806 SW
45	06/20 05 39 32.8	7.053 S	129.637 E	Banda Sea	87 D	5.6		83.439	87.406 SE
46	06/22 05 16 33.7	27.573 S	178.543 W	Kermadec Islands Region	292 D	5.3		79.597	33.816 SE
47	06/27 00 17 04.6	2.164 S	138.170 E	West Irian	21 G	5.7	6.5	91.059	81.218 SE
48	06/27 08 41 26.2	56.023 S	27.565 W	South Sandwich Islands Region	68 D	5.4		31.599	79.396 SW
49	06/27 09 09 05.8	14.097 S	75.979 W	Near Coast of Peru	61 D	5.9		85.620	61.336 SW
50	07/06 01 06 07.6	26.999 S	108.285 W	Easter Island Region	10 G	6.2	6.3	81.281	28.641 SW
51	07/06 02 49 42.7	14.074 S	167.828 E	Vanuatu Island	48	5.9	6.6	89.396	49.635 SE

52	07/06 03 05 00.3	13.994 S	167.781 E	Vanuatu Island	46	5.7		89.460	49.701 SE
53	07/06 23 22 06.1	53.434 N	158.318 E	Near East Coast of Kamchatka	149 D	5.3		148.473	92.444 SE
54	07/07 10 36 03.7	4.403 N	125.028 E	Talau Island	70	5.6		92.466	95.841 SE
55	07/07 18 12 53.4	25.826 S	178.169 E	South of Fiji Islands	649 D	5.3		80.608	37.130 SE
56	07/08 11 50 14.7	26.969 S	108.156 W	Easter Island Region	10 G	6.1	5.9	81.288	28.761 SW
57	07/09 04 07 34.7	20.462 S	68.796 W	Chile-Bolivia Border Region	68	5.3		77.314	65.688 SW
58	07/09 07 27 34.2	56.375 S	25.642 W	South Sandwich Islands Region	33 N	5.6	5.7	30.646	80.556 SW
59	07/10 18 49 53.9	55.137 N	165.525 E	Komandorsky Islands Region	33 N	6.1	6.3	152.409	87.864 SE
60	07/11 00 19 30.4	22.248 S	69.846 W	Northern Chile	52 D	5.1		75.983	64.103 SW
61	07/11 05 13 15.1	50.201 N	156.278 E	Kuril Islands	75 D	5.4		145.112	90.869 SE
62	07/11 06 15 51.0	82.229 N	17.556 W	Near North Coast of Greenland	10 G	5.5	5.0	153.875	165.050 SW
63	07/13 19 14 57.9	15.332 S	70.061 W	Southern Peru	241 D	5.1		82.543	66.344 SW
64	07/14 23 46 03.5	49.631 N	147.828 E	Sea of Okhotsk	576 D	5.7		141.605	97.908 SE

65	07/17	01 03	37.7	55.948 N	27.683 W	South Sandwich Islands Region	102 D	5.8		134.022	134.089 SW
66	07/21	13 27	12.9	36.295 S	97.252 W	West Chile Rise	10 G	5.4	5.5	70.103	35.893 SW
67	07/22	08 03	55.1	21.176 S	169.827 E	Loyalty Islands Region	66 D	5.4		83.111	45.810 SE
68	07/23	00 58	56.6	7.154 S	120.751 E	Flores Sea	485	5.1		80.147	95.672 SE
69	07/23	03 57	58.6	23.391 S	179.785 W	South of Fiji Islands	563	5.1		83.413	35.884 SE
70	07/25	16 15	19.2	31.256 S	72.686 W	Off Coast of Central Chile	24 D	5.6		68.454	58.263 SW
71	07/26	21 59	41.9	30.210 S	165.781 E	Northwest of New Zealand	33 N	5.5	5.4	73.410	46.699 SE
72	07/29	10 01	11.2	30.205 S	177.025 W	Kermadec Islands	10 G	5.0	5.6	77.328	31.894 SE
73	07/29	15 22	33.1	28.869 S	67.150 W	La Rioja Province, Argentina	142 D	5.4		68.932	63.985 SW
74	07/29	20 37	13.4	18.240 S	178.208 W	Fiji Islands Region	625 D	5.1		88.764	35.609 SE
75	07/29	21 32	31.8	18.309 S	178.134 W	Fiji Islands Region	637	5.2		88.712	35.525 SE
76	07/31	23 56	58.0	40.415 N	124.407 W	Near Coast of Northern California	16	5.6	6.0	150.282	25.047 SW
77	08/02	00 58	06.8	49.880 N	78.917 E	Eastern Kazakh SSR	0 G	5.9	3.8	122.257	151.126 SE

78	08/02 01 59 59.8	73.339 N	54.626 E	Novaya Zemlya	0 G	5.8	3.4	142.551	172.975 SE
79	08/03 23 20 30.3	53.01 S	22.49 E	South Of Africa	10 G	4.6	4.6	17.769	144.564 SW
80	80/04 15 04 40.0	40.469 S	73.189 W	Near Coast of Central Chile	38 D	5.9	4.9	60.046	54.051 SW
81	08/04 22 15 40.5	29.292 S	176.202 W	Kermadec Islands Region	33 N	5.5	5.2	78.375	31.384 SE
82	08/08 07 48 02.3	37.004 S	178.938 E	Off East Coast of North Island, New Zealand	33	5.3	5.6	69.932	33.635 SE
83	08/08 15 48 56.7	19.022 S	69.991 W	Northern Chile	70 G	6.4	6.9	79.055	65.123 SW
84	08/10 09 58 02.9	5.888 N	125.660 E	Mindanao, Philippine Island	202	5.6		94.078	95.788 SE
85	08/11 02 14 06.8	52.706 S	20.196 E	South of Africa	10 G	4.8		18.553	140.773 SW
86	08/12 00 06 29.2	12.262 S	166.649 E	Santa Cruz Islands	114 D	5.4		90.806	51.252 SE
87	08/12 04 34 31.1	54.898 N	162.893 E	Near East Coast of Kamchatka	44 D	5.1	4.7	151.275	90.033 SE
88	08/13 08 44 07.8	30.871 S	177.987 W	Kermadec Islands	56 D	5.3		76.494	32.571 SE
89	08/13 14 00 00.0	37.061 N	116.045 W	Southern Nevada	0	5.9	4.4	145.498	35.532 SW
90	08/13 15 23 06.9	17.897 S	70.931 W	Near Coast of Peru	37 G	6.1	6.4	80.418	64.665 SW



91	08/13	21 46 53.2	14.815 S	167.985 E	Vanuatu Islands	33 N	5.6	5.2	88.729	49.280 SE
92	08/14	05 59 04.2	12.580 S	166.589 E	Santa Cruz Islands	29 G	5.6	5.8	90.484	51.217 SE
93	08/14	17 39 32.2	53.416 N	169.113 W	Fox Islands, Aleutian Islands	118 G	5.7		159.620	55.287 SE
94	08/15	09 34 47.4	23.136 S	68.574 W	Northern Chile	101 D	5.1		74.739	64.915 SW
95	08/15	18 04 23.1	28.135 S	70.884 W	Central Chile	37 G	6.0	6.1	70.809	61.013 SW
96	08/16	21 38 48.1	34.963 S	179.654 E	South of Kermadec Islands	74 *	5.5		72.052	33.574 SE
97	08/19	00 25 26.0	34.83 S	179.25 W	South of Kermadec Islands	33 N	4.8		72.397	32.691 SE
98	08/19	07 52 44.2	24.088 S	66.932 W	Salta Province, Argentina	153	5.4		73.312	66.022 SW
99	08/20	05 40 52.6	24.213 S	179.158 E	South of Fiji Islands	527	5.2		82.389	36.639 SE
100	08/21	19 44 19.0	6.526 S	154.877 E	Solomon Islands	62	5.6		92.687	64.069 SE
101	08/22	05 09 14.4	52.164 N	174.066 E	Near Islands, Aleutian Islands	33 N	5.5	4.8	153.070	75.119 SE
102	08/26	06 56 46.2	20.749 S	178.464 W	Fiji Islands Region	569 G	5.7		86.264	35.287 SE
103	08/26	16 56 10.4	29.881 S	177.376 W	Kermadec Islands	33 N	5.0		77.577	32.271 SE

104	08/29 15 14 07.8	56.504 S	25.505 W	South Sandwich Islands Region	33 N	5.0	4.9	30.498	80.507 SW
105	08/30 12 15 35.4	30.330 S	177.997 W	Kermadec Islands	56 D	5.4		77.019	32.705 SE
106	08/31 06 52 52.0	27.080 S	178.447 W	Kermadec Islands Region	309	5.0		80.097	33.845 SE
107	09/01 04 26 07.4	23.052 S	66.529 W	Jujuy Province, Argentina	199	6.0		74.145	66.770 SW
108	09/03 01 15 33.7	2.836 S	129.510 E	Ceram	20	5.7	4.8	87.325	89.054 SE
109	09/03 06 40 13.9	58.893 S	158.513 E	Macquarie Islands Region	33 N	5.9	7.3	44.873	39.862 SE
110	09/03 08 01 36.2	59.538 S	159.005 E	Macquarie Islands Region	33 N	6.1	6.8	44.409	39.130 SE
111	09/03 08 36 15.5	59.553 S	159.062 E	Macquarie Islands Region	33 N	5.4		44.409	39.084 SE
112	09/03 11 08 22.5	59.588 S	159.270 E	Macquarie Islands Region	33 N	5.5	5.9	44.425	38.927 SE
113	09/04 04 27 08.8	49.293 N	156.410 E	Kuril Islands	33 N	5.9	6.2	144.405	89.868 SE
114	09/06 15 27 22.4	49.262 N	156.266 E	Kuril Islands	43 D	5.7	5.5	144.328	89.974 SE
115	09/06 21 54 00.9	49.213 N	156.221 E	Kuril Islands	33 N	5.3	5.6	144.271	89.969 SE

116	09/07	11 57 09.4	31.089 S	177.968 W	Kermadec Islands Region	33 N	5.8	6.7	76.286	32.504 SE
117	09/07	17 43 39.6	31.218 S	177.804 W	Kermadec Islands Region	40 D	5.5	5.5	76.192	32.333 SE
118	09/08	13 35 16.1	49.612 N	156.360 E	Kuril Islands	83 D	5.6		144.653	90.220 SE
119	09/08	21 37 00.0	31.419 S	177.801 W	Kermadec Islands Region	33 N	5.2	5.1	75.996	32.284 SE
120	09/10	02 26 23.4	7.123 S	123.290 E	Banda Sea	604	5.4		81.088	93.303 SE
121	09/11	00 34 52.1	22.329 S	68.384 W	Northern Chile	130	5.4		75.431	65.380 SW
122	09/11	04 02 02.7	31.431 S	70.756 W	Chile-Argentina Border Region	90 D	5.2		67.695	59.851 SW
123	09/13	20 08 51.6	34.333 S	69.971 W	Chile-Argentina Border Region	10 G	5.8	5.6	64.755	59.346 SW
124	09/17	04 47 13.3	4.118 S	145.706 E	Near North Coast of Papua New Guinea	15	5.4	6.1	91.877	73.485 SE
125	09/18	08 43 29.3	24.269 S	69.148 W	Northern Chile	97 D	5.5		73.866	63.986 SW
126	09/19	09 21 40.8	15.001 S	75.667 W	Near Coast of Peru	28 *	5.1	5.1	84.667	61.326 SW
127	09/19	21 18 25.7	9.186 S	79.059 W	Off Coast of Northern Peru	68 D	5.7		91.239	60.055 SW
128	09/19	21 58 00.8	49.647 N	156.318 E	Kuril Islands	85 D	5.4		144.667	90.293 SE

129	09/22 04 27 33.0	27.396 S	68.148 W	Chile-Argentina Border Region	132	4.9		70.625	63.688 SW
130	09/22 13 43 37.6	0.978 S	78.050 W	Ecuador	10 G	6.1	6.2	98.698	63.642 SW
131	09/22 22 05 15.8	76.421 N	134.275 E	Laptev Sea	14 D	5.6	5.1	156.016	144.852 SE
132	09/23 15 14 56.2	50.716 S	139.279 E	South of Australia	10 G	5.8	6.1	46.871	58.781 SE
133	09/23 15 22 46.2	50.468 S	139.528 E	South of Australia	10 G	5.5	5.9	47.165	58.756 SE
134	09/24 15 00 00.0	37.228 N	116.375 W	Southern Nevada	0	5.7	4.3	145.728	35.160 SW
135	09/26 05 30 36.4	55.463 N	164.537 E	Komandorsky Islands Region	35 D	5.1	5.1	152.305	89.247 SE
136	09/27 04 06 52.8	6.533 S	81.094 W	Near Coast of Northern Peru	33 N	5.2	4.6	94.391	58.971 SW
137	09/28 07 15 38.2	18.404 S	168.266 E	Vanuatu Islands	32 D	5.4	5.9	85.362	48.006 SE
138	09/28 11 47 08.6	18.411 S	168.058 E	Vanuatu Islands	31 D	5.7	6.8	85.299	48.194 SE
139	09/28 13 46 13.9	18.546 S	168.161 E	Vanuatu Islands	25 D	5.8	6.5	85.197	48.062 SE
140	09/28 23 09 37.1	18.340 S	168.122 E	Vanuatu Islands	32 *	5.2	4.9	85.384	48.156 SE
141	09/30 01 39 28.0	18.162 S	167.865 E	Vanuatu Islands	51 D	5.4	6.3	85.486	48.441 SE
142	10/01 07 29 24.9	11.389 S	166.147 E	Santa Cruz Islands	76	5.5		91.500	51.975 SE

143	10/01 13 18 45.5	65.114 S	177.537 E	Balleny Islands Region	10 G	5.0	5.0	42.808	24.507 SE
144	10/10 14 42 20.0	34.060 N	118.080 W	Southern California	10	5.8	5.7	142.993	31.527 SW
145	10/03 03 35 10.6	17.950 S	69.247 W	Peru-Bolivia Border Region	149	5.8		79.817	66.173 SW
146	10/03 10 16 26.2	5.447 S	131.012 E	Banda Sea	74 G	6.4		85.431	86.710 SE
147	10/04 18 34 22.6	55.585 N	161.623 E	Near East Coast of Kamchatka	54 G	6.0	5.4	151.350	92.107 SE
148	10/04 23 12 56.8	61.702 S	161.157 E	Balleny Islands Region	10 G	5.2	4.5	42.951	36.356 SE
149	10/06 04 19 06.0	17.940 S	172.225 W	Tonga Islands Region	16 G	6.7	7.3	90.227	30.104 SE
150	10/06 20 11 35.1	52.956 N	159.972 E	Off East Coast of Kamchatka	34 G	6.1	6.3	148.686	90.374 SE
151	10/07 00 51 36.6	22.845 S	68.030 W	Northern Chile	106	5.6		74.833	65.507 SW
152	10/08 03 20 45.7	19.599 S	173.111 W	Tonga Islands	40 D	6.2	6.1	88.437	30.609 SE
153	10/09 10 17 38.9	7.871 S	105.256 E	Java	30 D	5.5	5.3	74.048	110.165 SE
154	10/10 14 26 36.9	6.066 S	113.153 E	Java	574	5.9		78.465	103.242 SE
155	10/11 09 40 16.7	34.909 S	107.674 W	Easter Island Cordillera	10 G	4.9	4.9	73.425	27.559 SW

156	10/11 18 02 50.7	35.004 S	179.685 E	Off East Coast of North Island, New Zealand	33 N	5.5	5.4	72.019	33.537 SE
157	10/11 18 49 13.9	36.367 S	73.034 W	Near Coast of Central Chile	23 D	5.3	4.4	63.800	55.931 SW
158	10/12 13 57 04.7	7.288 S	154.371 E	Solomon Islands	25	6.3	6.8	91.803	64.295 SE
159	10/13 02 43 27.7	21.082 S	179.223 W	Fiji Islands Region	628	4.5		85.780	35.905 SE
160	10/14 02 11 17.2	34.393 S	179.820 E	South of Kermadec Islands	72	5.6		72.639	33.580 SE
161	10/15 01 06 01.3	6.306 S	129.317 E	Banda Sea	33	5.4	5.5	84.020	87.976 SE
162	10/16 06 53 13.6	21.663 S	69.290 W	Northern Chile	102	4.9		76.351	64.812 SW
163	10/16 20 48 01.6	6.266 S	149.060 E	New Britain Region	48 G	5.9	7.4	91.006	69.609 SE
164	10/17 06 37 29.8	56.058 S	27.209 W	South Sandwich Islands Region	95 D	5.6		31.446	79.648 SW
165	10/20 09 23 36.2	52.577 N	172.320 E	Near Islands, Aleutian Islands	33 N	5.5	5.6	152.797	77.559 SE
166	10/21 06 11 33.9	23.010 S	114.418 W	Easter Island Region	10 G	5.4	4.9	86.186	23.844 SW
167	10/21 07 25 18.1	7.262 S	128.699 E	Banda Sea	128 D	5.5		82.907	88.203 SE
168	10/21 23 25 51.8	21.049 S	69.871 W	Northern Chile	74 D	5.3		77.115	64.511 SW

169	10/22 00 04 33.3	26.021 S	71.245 E	Mid-Indian Rise	10 G	4.9	5.4	46.775	139.671 SE
170	10/22 12 12 13.5	26.350 S	175.417 W	South of Tonga Islands	35 D	5.4	5.0	81.397	31.329 SE
171	10/23 13 35 45.2	20.381 S	68.871 W	Chile-Volivia Border Region	114 D	5.1		77.414	65.649 SW
172	10/23 16 00 00.0	37.142 N	116.079 W	Southern Nevada	0	5.2		145.584	35.523 SW
173	10/24 14 37 16.4	10.913 S	166.154 E	Santa Cruz Islands	171	5.5		91.957	52.106 SE
174	10/25 16 46 13.3	5.409 N	36.751 E	Ethiopia	12 G	5.6	6.2	74.316	177.062 SW
175	10/25 16 54 05.6	2.323 S	138.364 W	West Irian	33 N	6.2	7.0	90.979	80.981 SE
176	10/27 12 57 59.4	21.360 S	178.805 W	Fiji Islands Region	534 D	5.5		85.597	35.461 SE
177	10/27 21 58 17.0	28.676 S	62.929 W	Santiago Del Estero Province	605 G	6.0		67.723	67.753 SW
178	10/28 08 58 29.1	5.740 N	36.730 E	Ethiopia	10 G	5.4	5.6	74.647	177.047 SW
179	10/28 18 21 29.3	28.294 S	176.749 W	Kermadec Islands Region	34	5.4	5.4	79.246	32.081 SE
180	10/29 20 23 41.0	4.817 N	127.688 E	Talaud Islands	153 D	6.1		93.807	93.513 SE
181	11/01 08 42 06.5	28.674 S	177.553 W	Kermadec Islands Region	60	6.1		78.720	32.698 SE

182	11/01 19 03 05.3	55.504 S	27.846 W	South Sandwich Islands Region	30 D	5.3	5.1	32.102	79.783 SW
183	11/01 23 06 40.2	16.400 S	177.527 W	Fiji Islands Region	33 N	5.5	5.7	90.702	35.378 SE
184	11/03 08 15 00.3	17.204 S	173.757 W	Tonga Islands	88 G	6.1		90.665	31.680 SE
185	11/05 19 48 19.6	38.363 S	175.865 E	North Island, New Zealand	169	4.9		67.989	35.774 SE
186	11/06 18 34 23.0	22.828 S	63.641 W	Salta Province, Argentina	535	5.2		73.388	69.435 SW
187	11/06 18 47 35.0	22.801 S	63.583 W	Salta Province, Argentina	538 G	5.8		73.394	69.498 SW
188	11/07 16 23 55.9	5.634 N	126.614 E	Mindanao, Philippine Islands	80 G	6.2		94.183	94.809 SE
189	11/08 04 38 57.9	28.750 S	177.393 W	Kermadec Islands Region	72 *	5.0		78.677	32.542 SE
190	11/08 06 06 04.7	18.353 S	67.873 E	Vanuatu Islands	23	5.3		85.305	48.380 SE
191	11/09 01 43 07.1	63.778 S	172.467 E	Balleny Islands Region	10 G	5.4	5.1	43.239	28.209 SE
192	11/09 17 46 18.8	22.123 S	69.573 W	Northern Chile	44	5.4	4.8	76.012	64.392 SW
193	11/10 20 17 54.4	5.642 S	113.354 E	Java Sea	34 *	5.1	4.5	78.932	103.203 SE
194	11/12 00 24 40.0	17.209 S	177.306 W	Fiji Islands Region	393 D	5.5		89.958	34.996 SE



195	11/14 21 20 43.0	0.188 S	125.140 E	Molucca Sea	60	5.5		88.222	94.086 SE
196	11/15 03 31 06.7	49.871 N	78.791 E	Eastern Dazakh SSR	0 G	6.0	4.8	122.227	151.215 SE
197	11/16 05 59 50.1	6.832 N	126.225 E	Mindanao, Philippine Islands	67	5.5		95.161	95.604 SE
198	11/16 11 44 23.2	49.320 S	30.433 E	South of Africa	10 G	5.5	4.3	20.066	162.398 SW
199	11/17 08 46 53.3	58.586 N	143.270 W	Gulf of Alaska	10 G	6.6	6.9	169.631	8.313 SE
200	11/18 01 34 00.1	8.094 S	108.793 E	Java	66 D	5.5		75.048	106.674 SE
201	11/18 12 46 44.8	26.285 S	70.506 W	Near Coast of Northern Chile	41	5.7	6.4	72.418	62.039 SW
202	11/20 21 19 47.7	55.489 S	28.018 W	South Sandwich Islands Region	30 D	5.5		32.175	79.658 SW
203	11/20 21 38 55.5	55.469 S	27.986 W	South Sandwich Islands Region	33 N	5.5		32.179	79.708 SW
204	11/24 07 39 58.2	56.076 S	27.481 W	South Sandwich Islands Region	90 D	5.6		31.529	79.401 SW
205	11/24 12 39 03.5	23.936 S	179.776 W	South of Fiji Islands	501 *	5.1		82.885	35.750 SE
206	11/24 15 06 09.1	16.976 S	174.026 W	Tonga Islands	143 D	5.6		90.838	31.977 SE
207	11/25 16 08 35.6	5.601 S	149.390 E	New Britain Region	141 G	5.7		91.743	69.526 SE

208	11/25 17 28 01.0	73.658 N	118.711 E	Near Coast of Central Siberia	10 G	5.1		151.164	145.047 SE
209	11/25 19 58 53.5	53.482 S	24.583 E	South of Africa	10 G	4.8		16.905	147.996 SW
210	11/26 01 43 14.0	8.247 S	124.155 E	Timor	33 N	5.8	6.5	80.352	92.080 SE
211	11/26 17 28 54.7	16.351 S	168.119 E	Vanuatu Islands	18 *	5.6	6.3	87.292	48.722 SE
212	11/27 00 02 08.0	0.234 S	125.064 E	Molucca Sea	33 N	5.8	5.7	88.152	94.141 SE
213	11/27 13 05 52.6	16.263 N	168.132 E	Vanuatu Islands	33	5.5	5.5	118.474	58.672 SE
214	11/27 13 33 18.0	16.373 S	168.117 E	Vanuatu Islands	29	5.4	6.4	87.270	48.717 SE
215	11/28 04 03 45.2	0.338 S	124.864 E	Molucca Sea	34	5.9	5.8	87.983	94.290 SE
216	11/29 07 57 21.6	45.715 S	76.512 W	Off Coast of Southern Chile	22 D	5.6	5.0	56.145	49.027 SW
217	11/30 04 41 41.3	0.097 S	124.993 E	Molucca Sea	58 D	5.4		88.254	94.256 SE
218	11/30 19 23 19.5	58.679 N	142.786 W	Gulf of Alaska	10 G	6.7	7.6	169.747	6.960 SE
219	12/01 04 04 12.6	17.768 S	172.904 W	Tonga Islands Region	29 D	5.4	5.5	90.272	30.772 SE
220	12/01 18 23 32.7	22.094 S	178.080 W	South of Fiji Islands	388 D	5.4		85.032	34.639 SE
221	12/03 11 04 38.6	21.380 S	68.215 W	Chile-Bolivia Border Region	117 D	5.5		76.263	65.878 SW

222	12/04	19 51 35.7	5.777 S	154.555 E	Solomon Islands	145 G	5.9		93.290	64.617 SE
223	12/06	18 16 34.4	54.567 N	161.438 E	Near East Coast of Kamchatka	35 D	5.4	4.2	150.492	90.958 SE
224	12/07	12 26 11.7	13.632 S	167.393 E	Vanuatu Islands	48	5.7	6.2	89.700	50.165 SE
225	12/07	13 14 34.9	13.559 S	167.454 E	Vanuatu Islands	33 N	5.8	6.3	89.787	50.129 SE
226	12/07	19 20 24.9	13.453 S	167.358 E	Vanuatu Islands	33 N	5.3	5.1	89.862	50.249 SE
227	12/08	14 33 34.7	33.384 S	178.527 W	South of Kermadec Islands	33 N	4.8		73.943	32.437 SE
228	12/08	14 47 59.1	32.636 S	112.034 W	Easter Island Cordillera	10 G	5.5	4.7	76.344	24.320 SW
229	12/08	19 56 54.3	40.585 S	44.574 E	Atlantic-Indian Rise	10 G	5.4	5.3	28.420	172.035 SE
230	12/10	05 52 16.2	60.409 S	27.810 W	South Sandwich Islands Region	33 N	5.1	5.8	28.414	73.353 SW
231	12/11	02 03 09.6	22.156 S	174.797 W	Tonga Islands Region	37 *	5.6	5.8	85.618	31.644 SE
232	12/12	04 51 50.5	29.692 N	140.025 E	South of Honshu, Japan	164 G	6.3		121.248	92.127 SE
233	12/13	03 21 04.8	49.989 N	78.844 E	Eastern Kazakh SSR	0 G	6.1	4.5	122.349	151.214 SE

234	12/13	10 42 26.6	60.003 S	18.499 W	Southwestern Atlantic Ocean	10 G	5.4	5.0	25.432	81.221 SW
235	12/13	10 53 55.1	59.864 S	18.540 W	Southwestern Atlantic Ocean	10 G	5.3		25.544	81.417 SW
236	12/13	20 46 34.0	49.042 S	123.505 E	South of Australia	10 G	5.4	5.4	43.155	72.360 SE
237	12/16	03 17 54.3	23.736 S	67.350 W	Chile-Argentina Border Region	158	4.6		73.777	65.782 SW
238	12/17	02 08 19.9	35.362 N	140.214 E	Near East Coast of Honshu, Japan	63 D	6.0		126.443	94.871 SE
239	12/17	20 22 58.3	9.169 S	114.610 E	South of Bali Island	46 G	5.7	5.5	76.078	100.727 SE
240	12/19	10 14 45.2	0.184 S	122.900 E	Minahassa Peninsula	156	5.1		87.422	96.180 SE
241	12/21	09 23 01.3	36.308 S	179.473 W	East of North Island, New Zealand	64	5.4		70.919	32.505 SE
242	12/23	10 10 20.5	0.159 S	124.884 E	Molucca Sea	61 D	5.7		88.157	94.336 SE
243	12/23	17 31 52.9	29.09 S	177.74 W	Kermadec Islands	33 N	4.8		78.278	32.767 SE
244	12/25	22 56 48.9	19.830 S	175.682 W	Tonga Islands	196 G	5.7		87.723	32.934 SE
245	12/27	03 05 04.7	49.864 N	78.758 E	Eastern Kazakh SSR	0 G	6.1	4.5	122.214	151.237 SE
246	12/28	08 16 21.3	28.055 S	70.615 W	Central Chile	52 D	6.1		70.798	61.279 SW

247	12/30	11 56 19.2	35.053 S	70.797 W	Chile-Argentina Border Region	90 D	5.7		64.342	58.350 SW
248	12/30	21 16 29.5	6.498 S	148.960 E	New Britain Region	22	5.4	5.7	90.754	69.624 SE
249	12/30	22 34 28.5	27.498 S	67.432 W	Catamarca Province Argentina	139	4.8		70.298	64.276 SW
250	12/31	06 29 33.5	60.069 S	26.522 W	South Sandwich Islands Region	15 D	5.3	5.5	28.211	74.818 SW

# APPENDIX

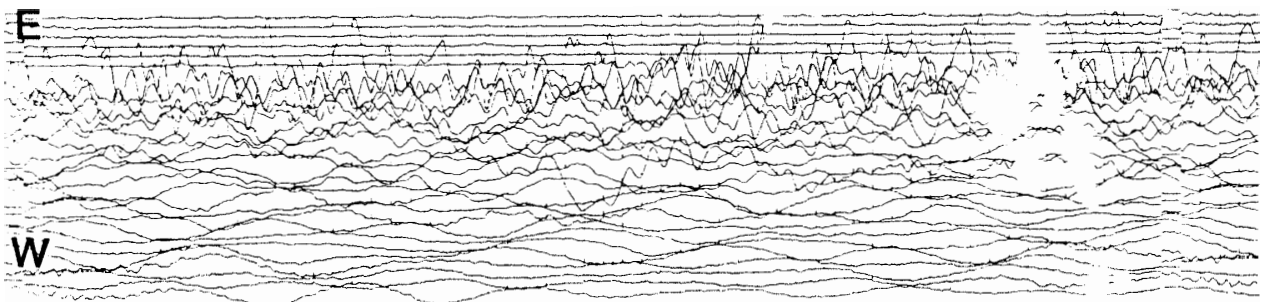
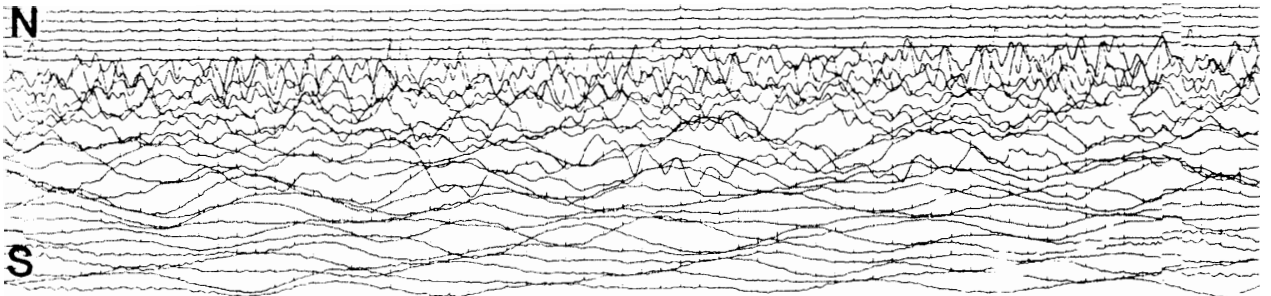
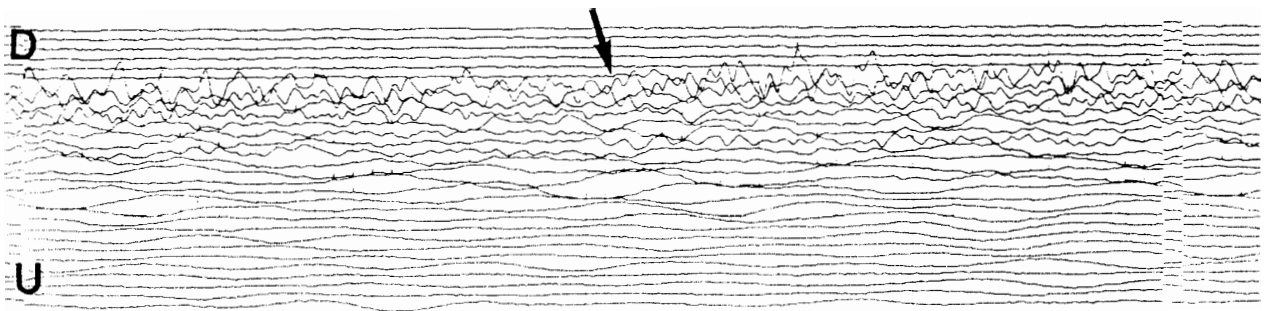
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JAN. 30 22h29m42.0s

60.063 S, 29.916 W, 48 km Mb 6.2 Ms 7.0

South Sandwich Islands Region

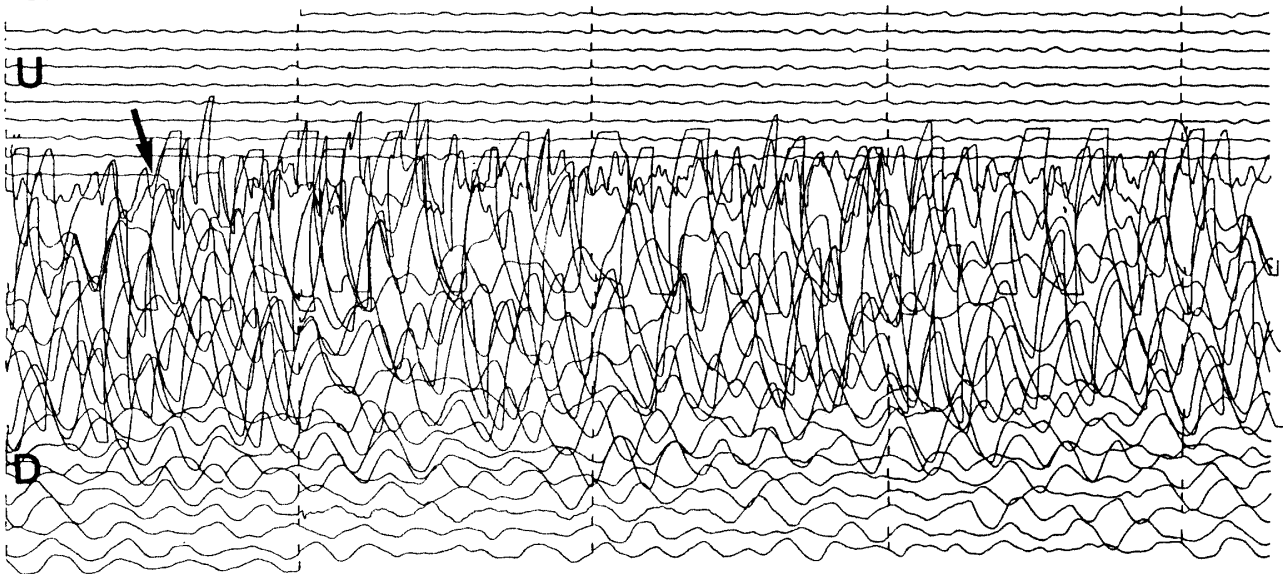
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LP

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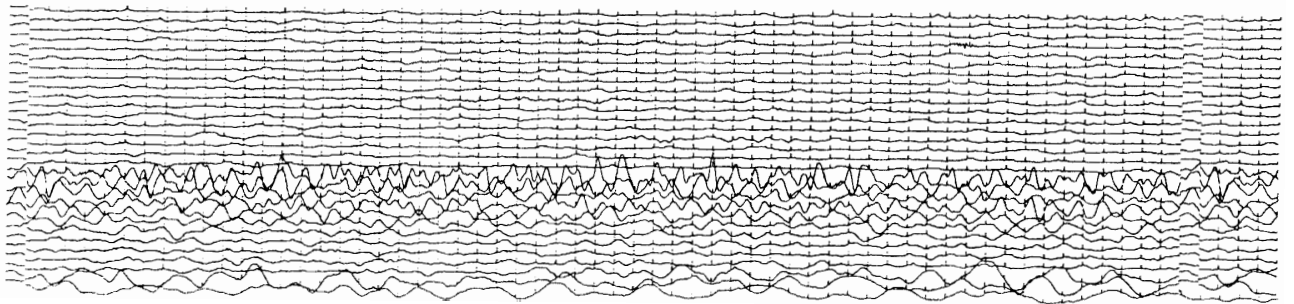
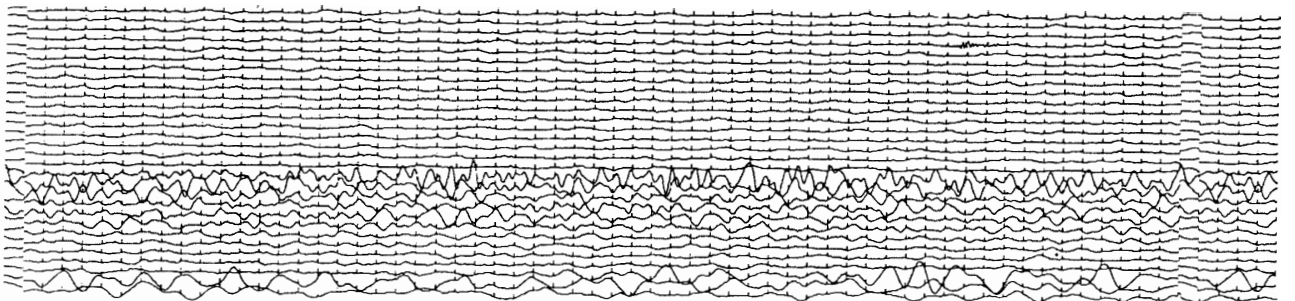
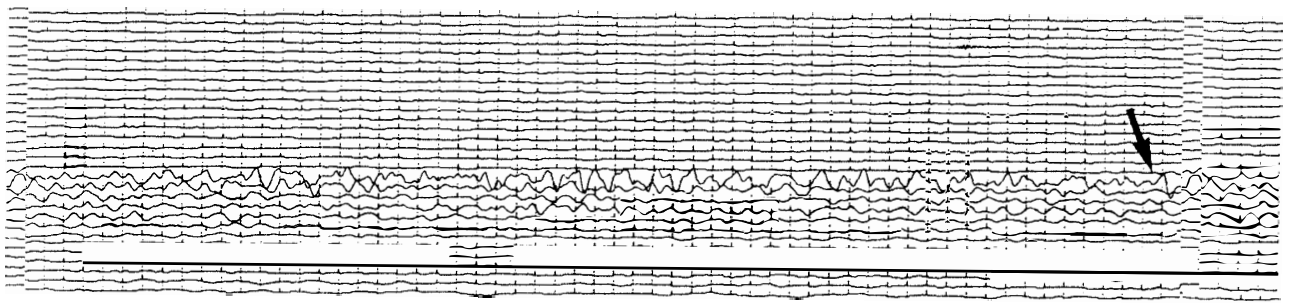
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6.088 S, 147.689 E, 55 km Ms 7.4

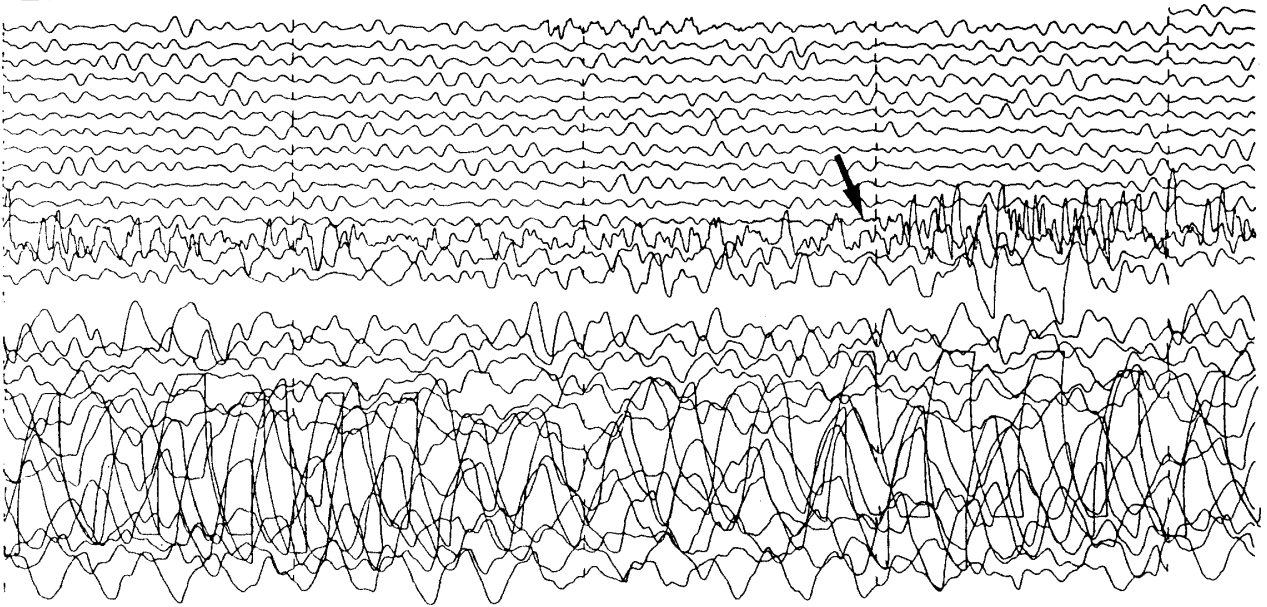
East Papua New Guinea Region

SP





LP



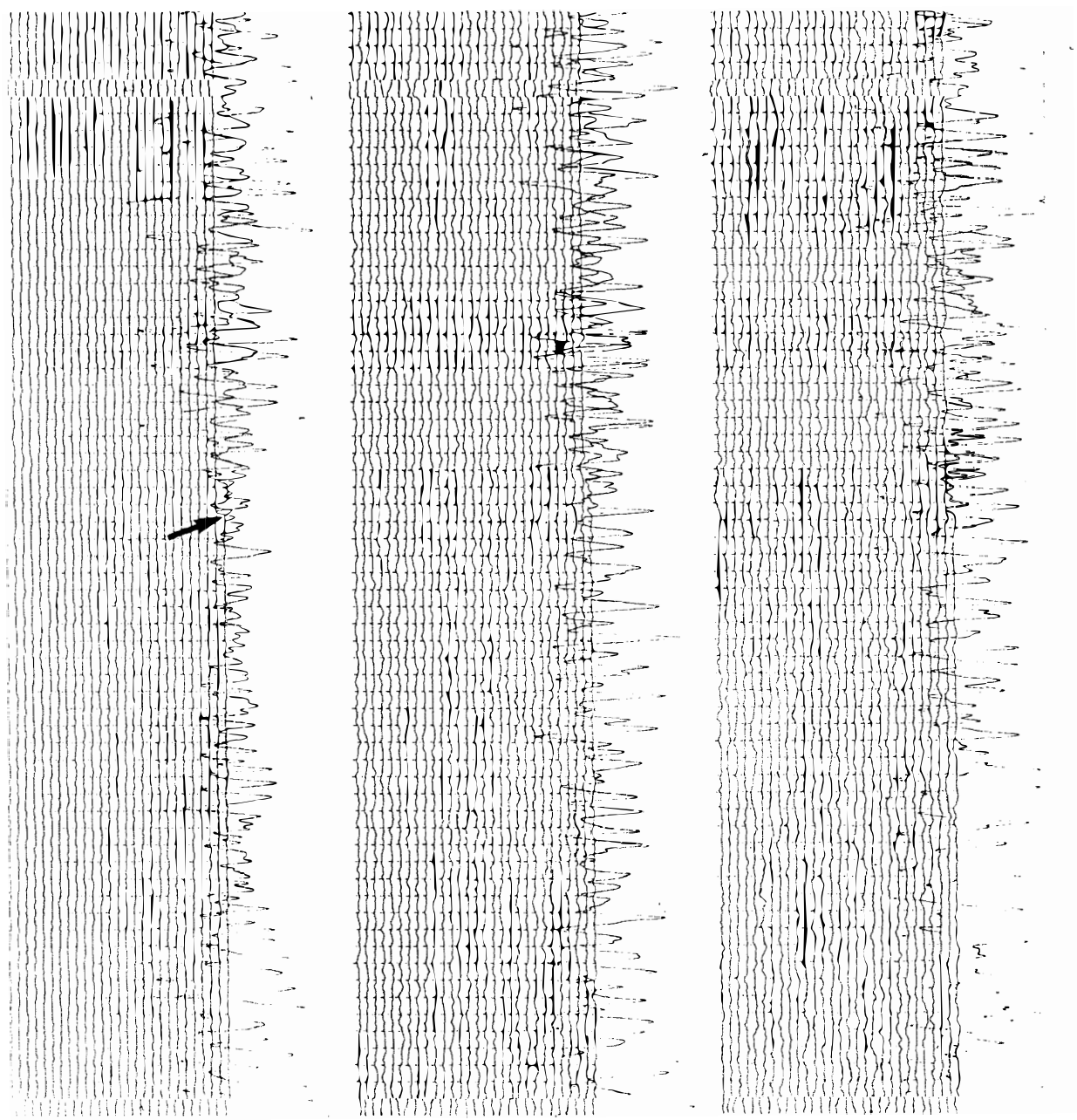
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MAR. 5 09h17m05.2s

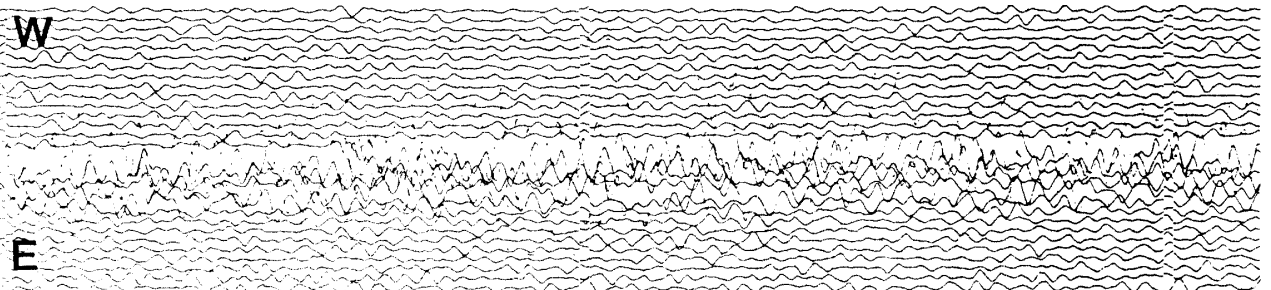
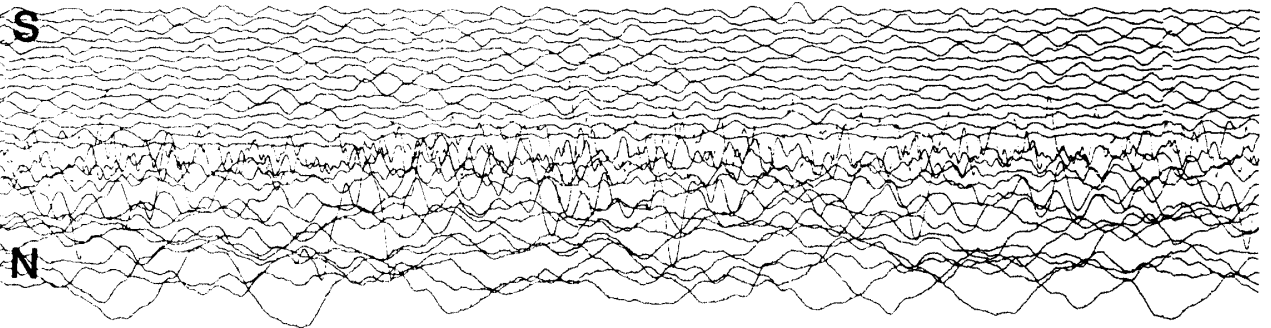
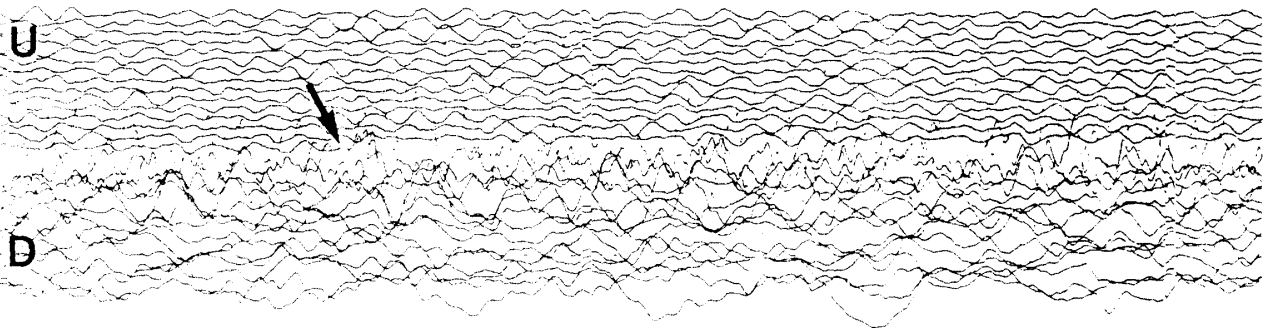
24.388 S, 70.161 W, 62 km Mb 6.5 Ms 7.3

Near Coast of Northern Chile

SP



LP



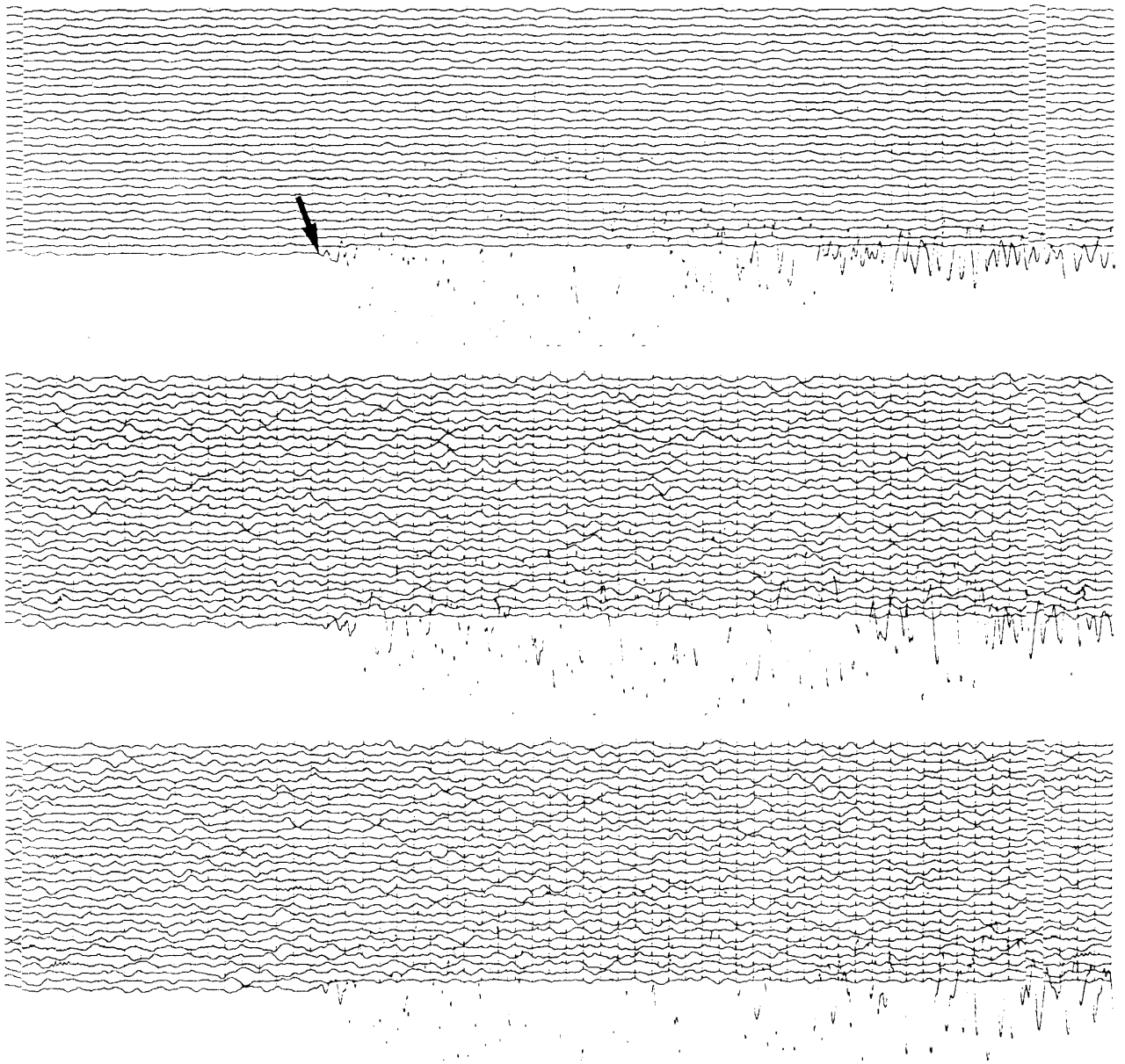
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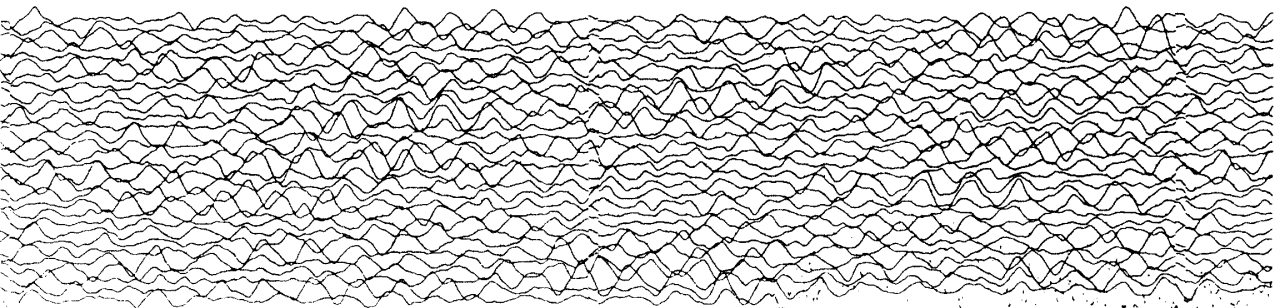
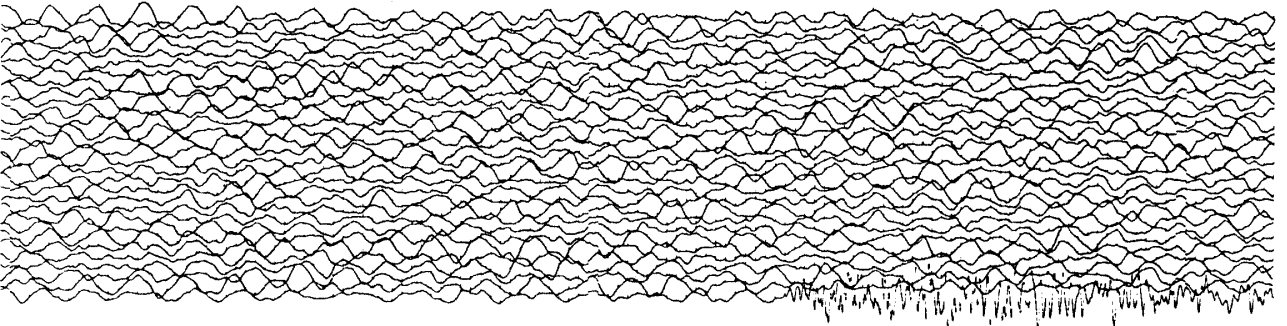
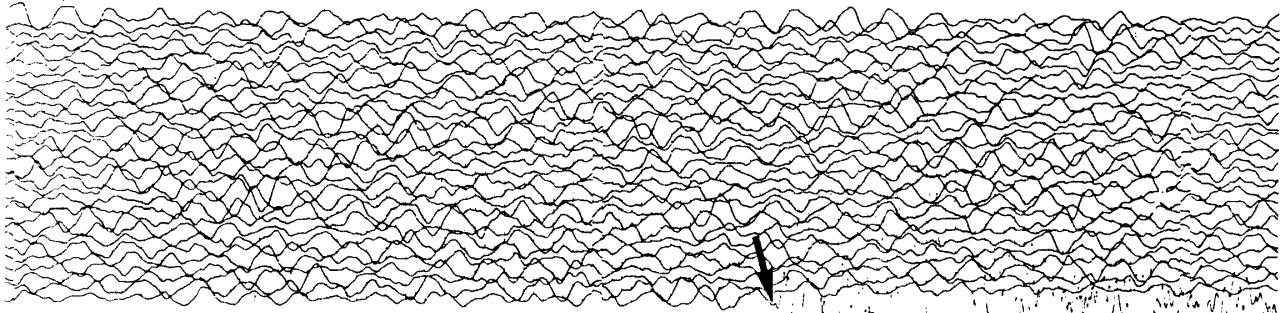
22.767 S, 66.205 W, 249 km Mb 6.1

Jujuy Province, Argentina

SP



LP



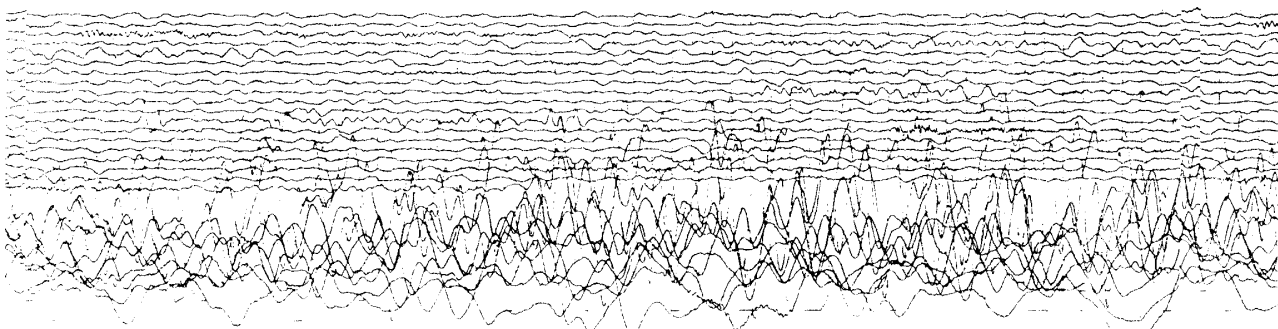
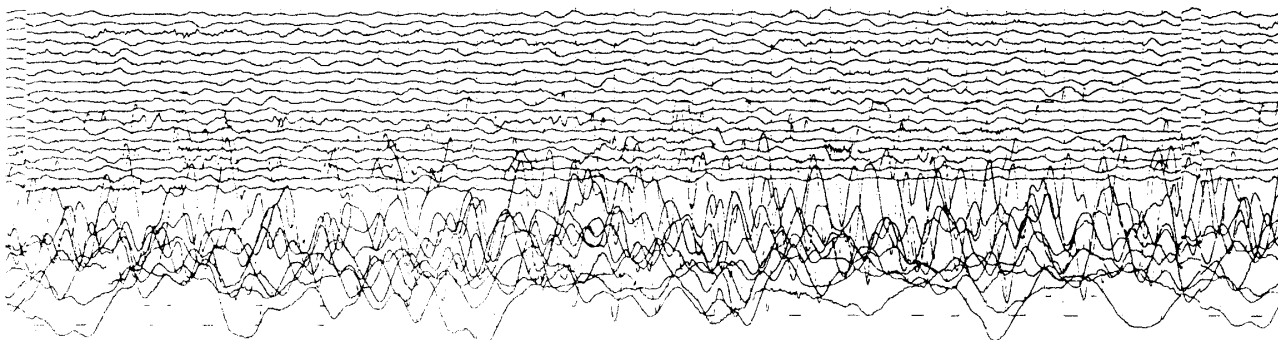
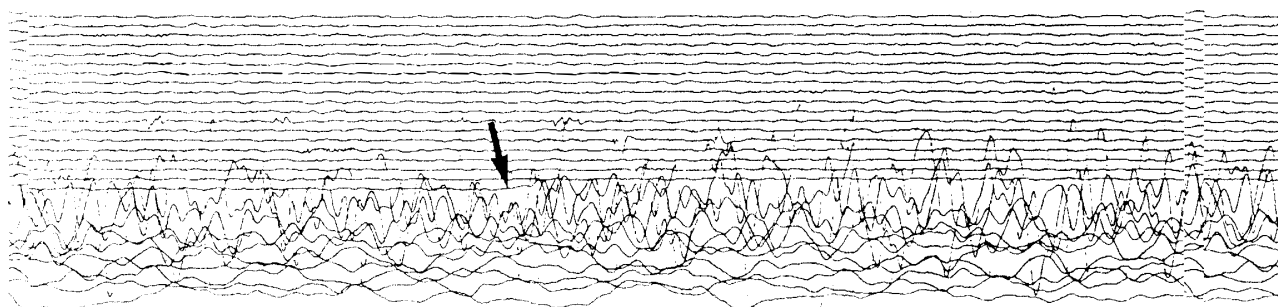
**#-109**

**SEPT. 3 06h40m13.9s**

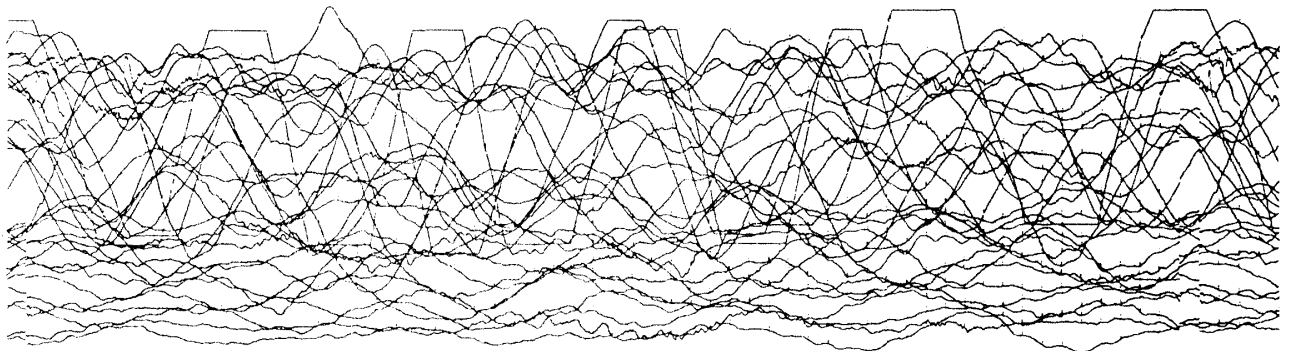
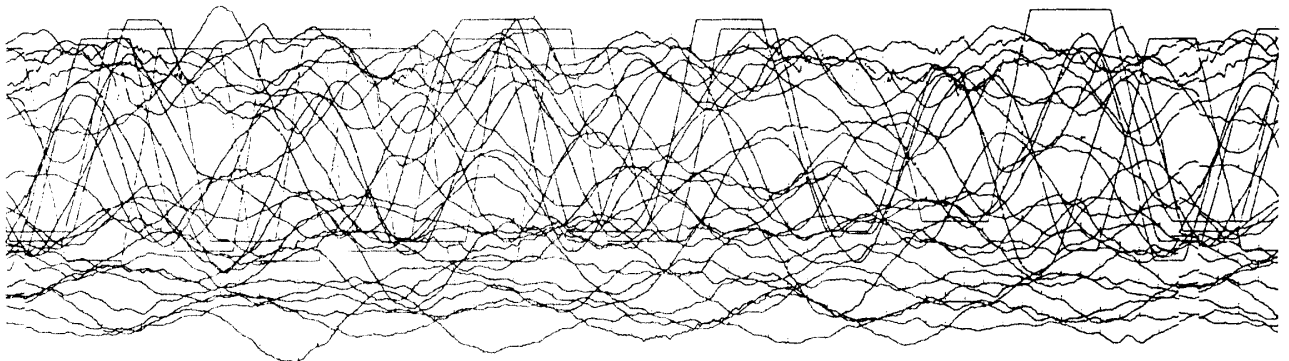
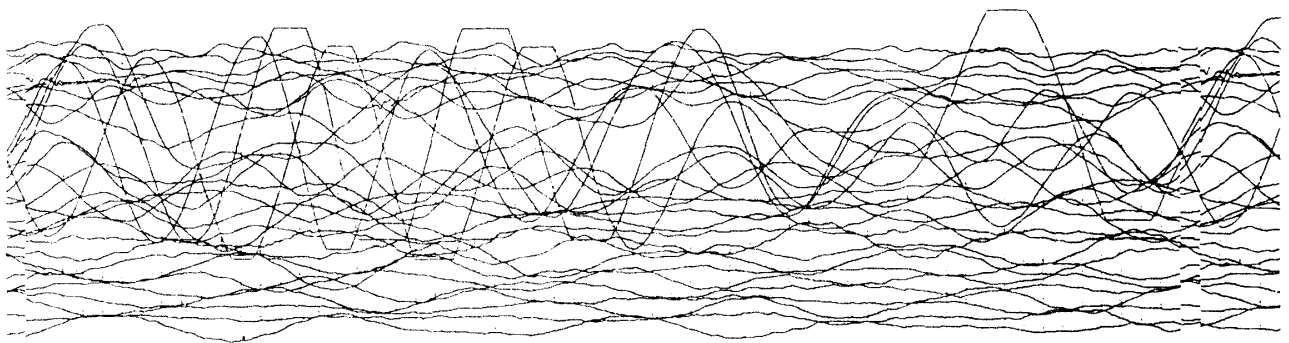
**58.893 S, 158.513 E, 33 km Mb 5.9 Ms 7.3**

**Macquarie Islands Region**

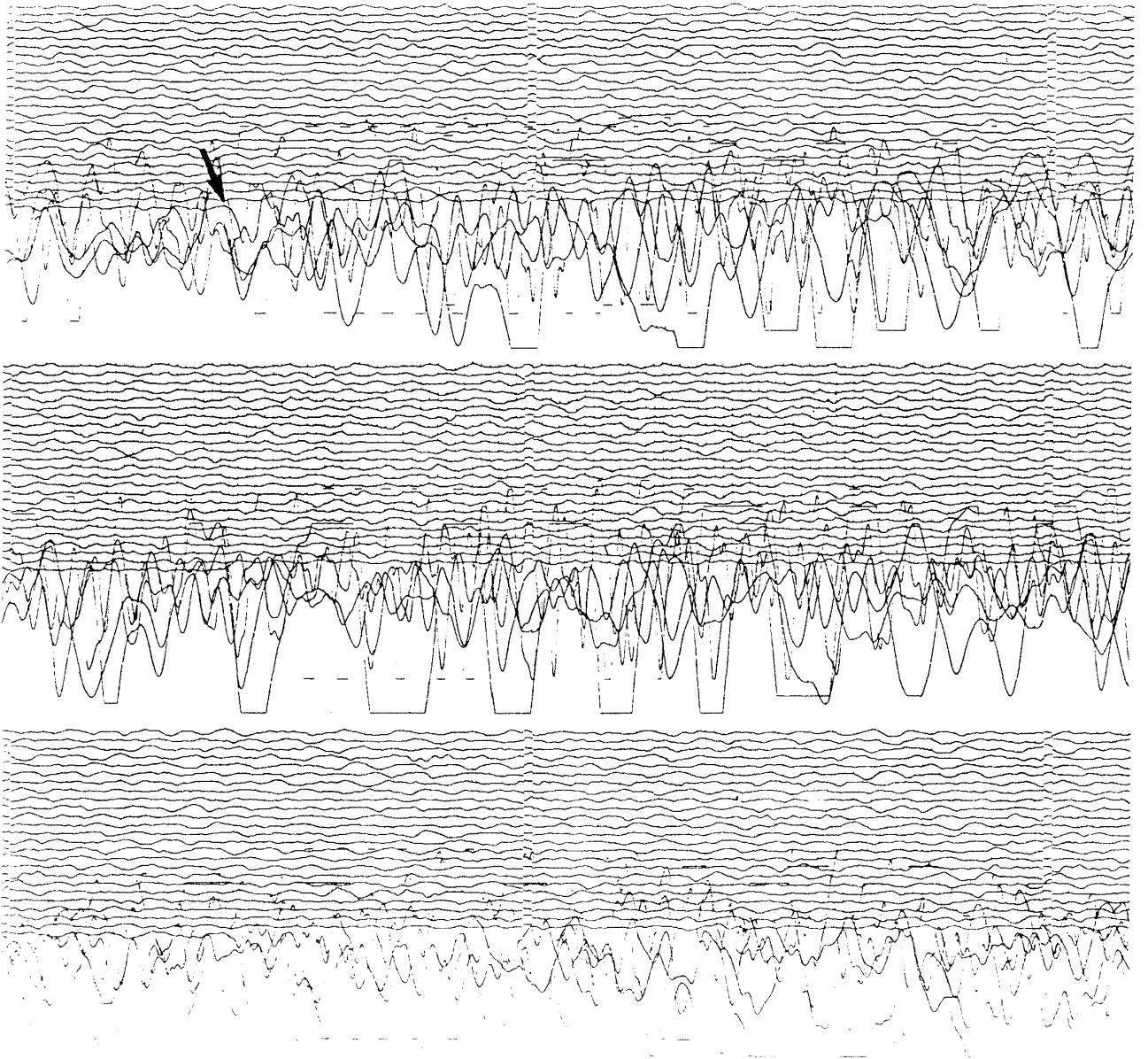
**SP-1**



SP-2

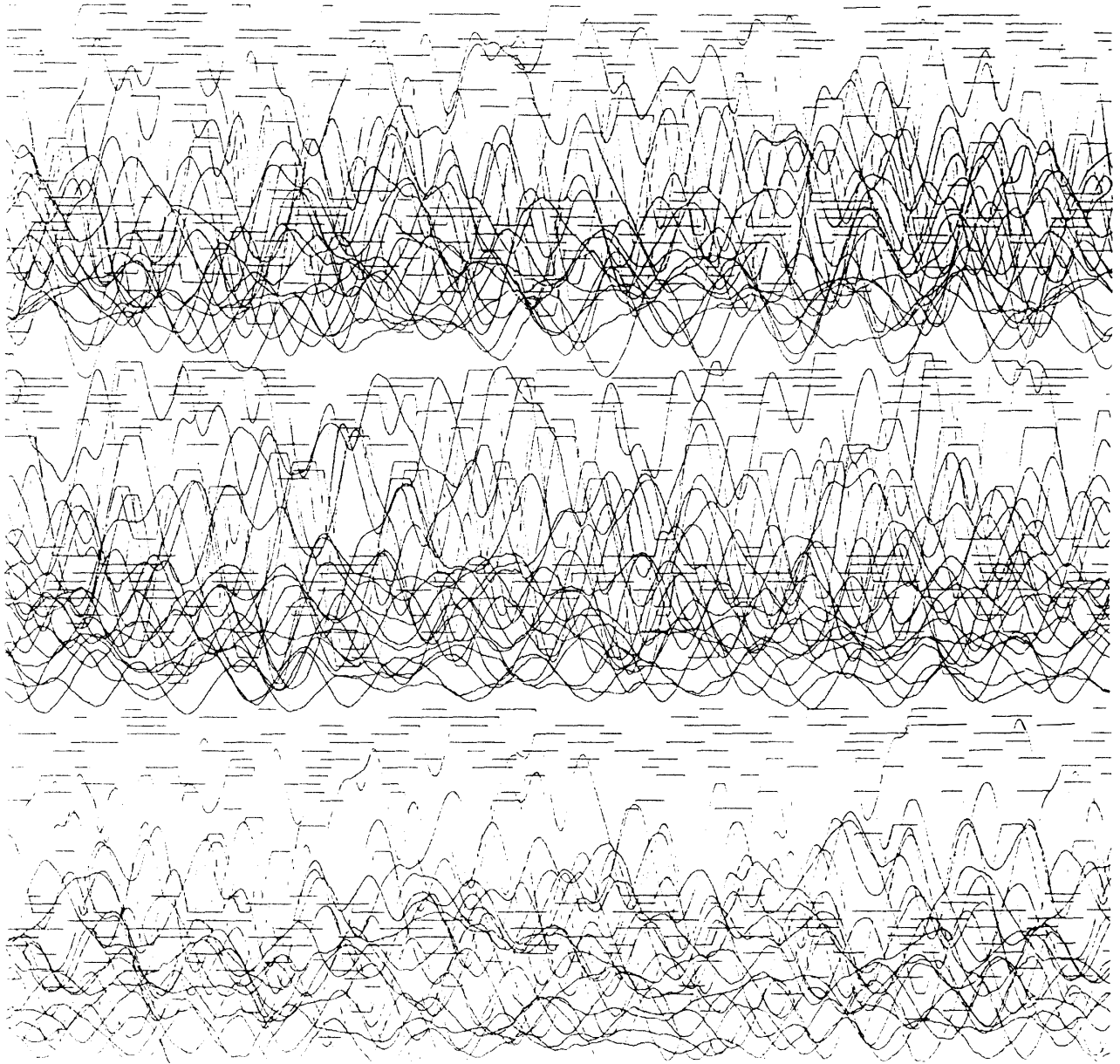


LP-1





LP-2



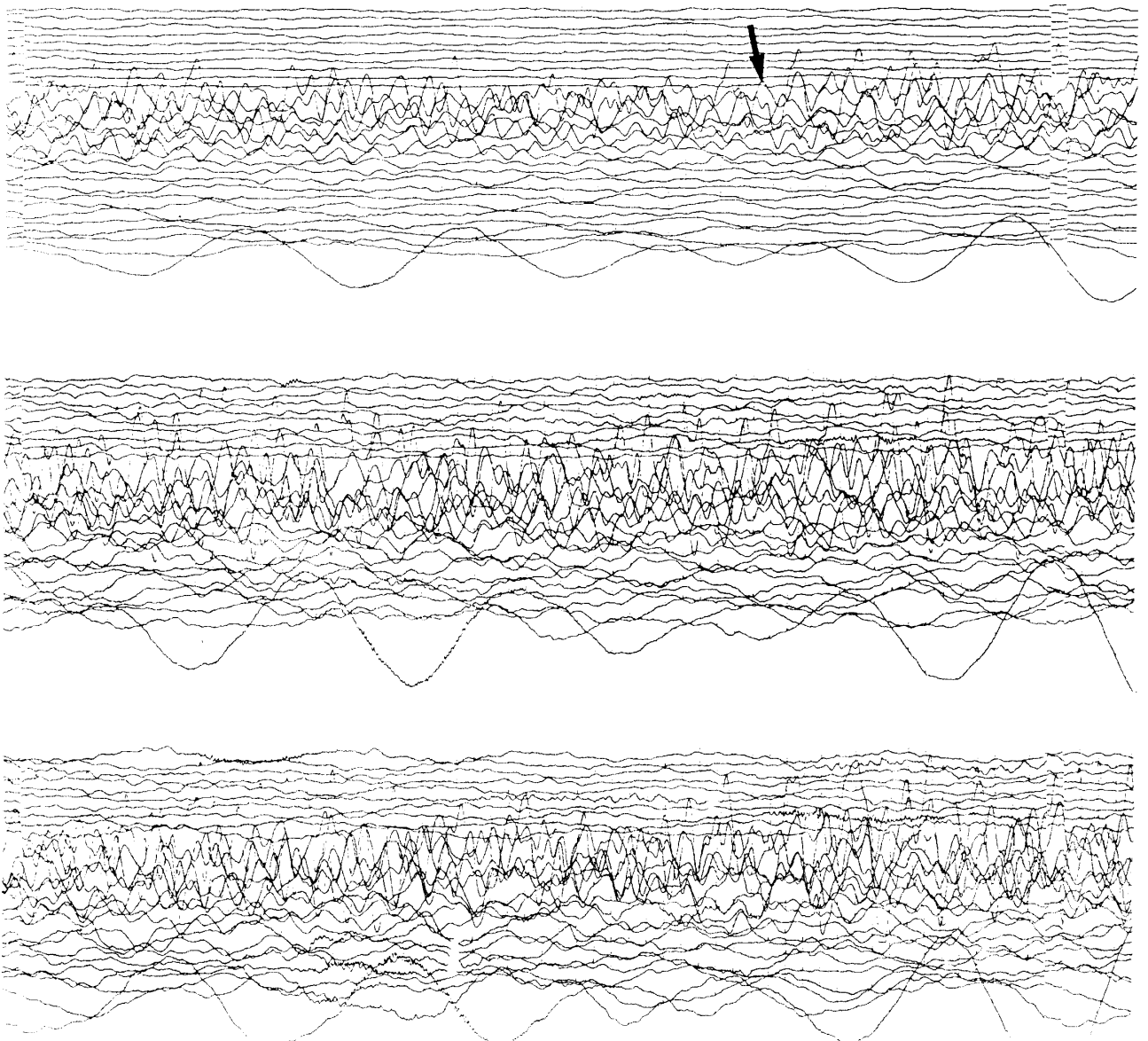
#-110

SEPT. 3 08h01m36.2s

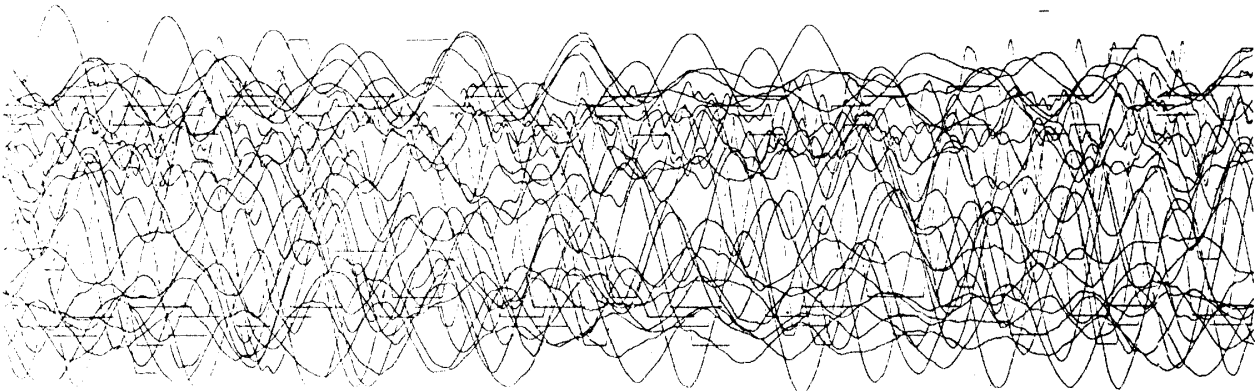
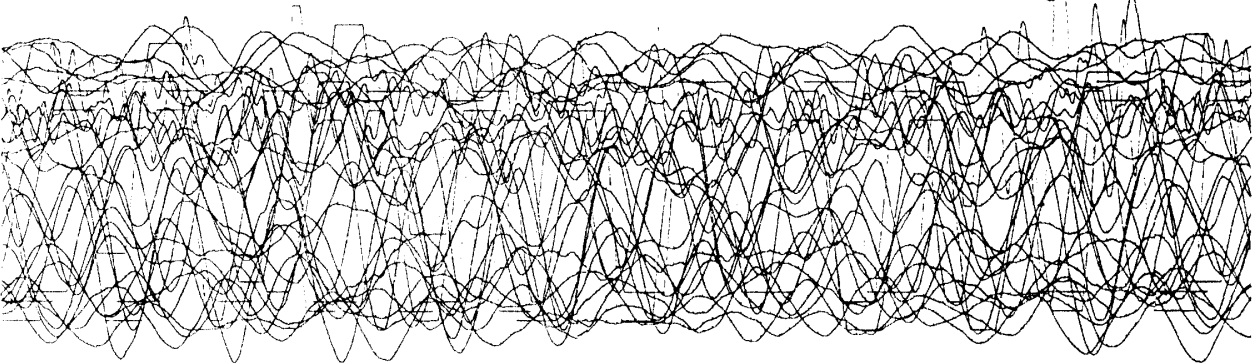
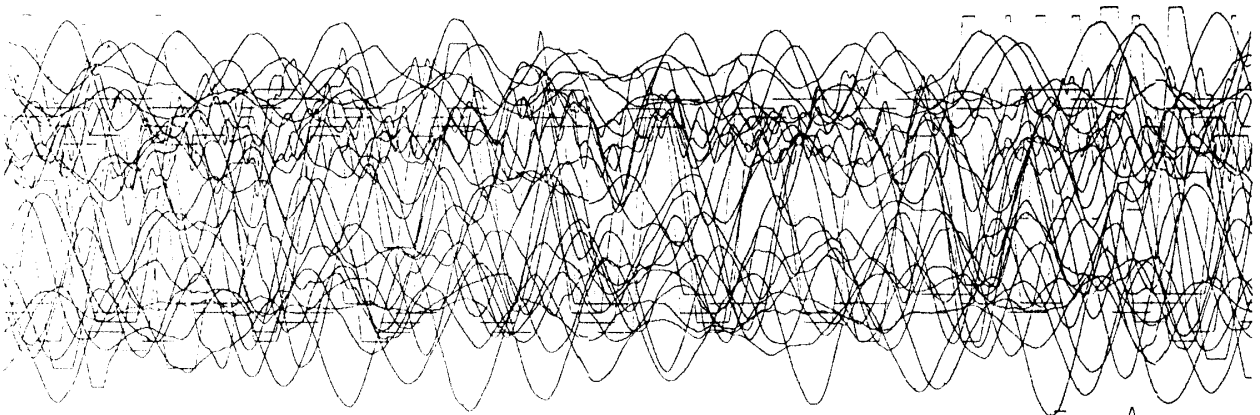
59.538 S, 159.005 E, 33 km Mb 6.1 Ms 6.8

Macquarie Islands Region

SP



LP



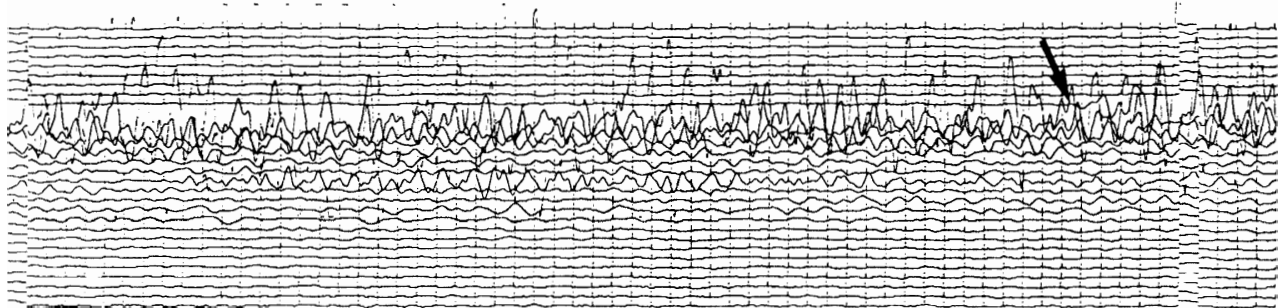
#-116

SEPT. 7 11h57m09.4s

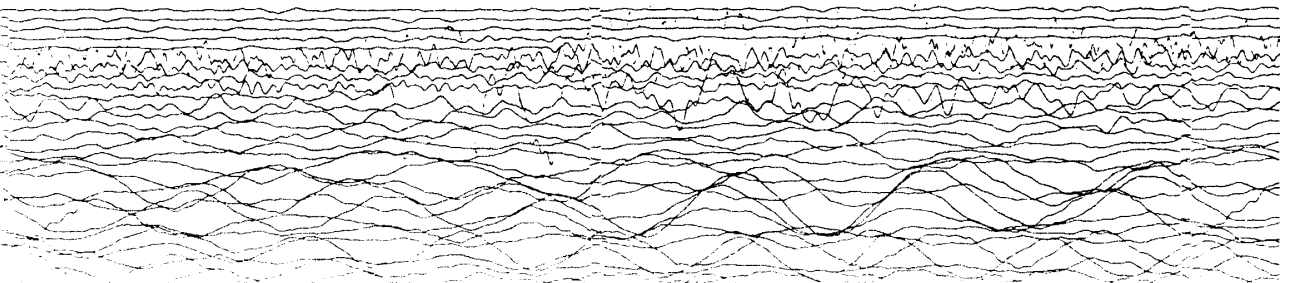
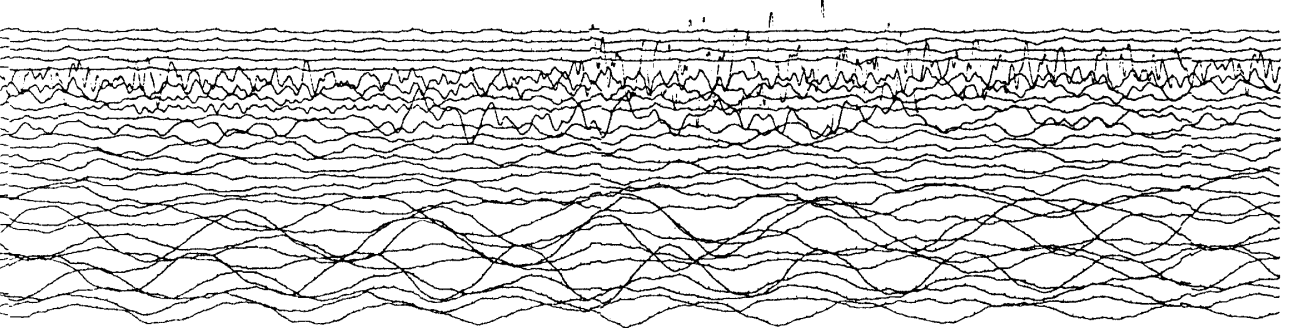
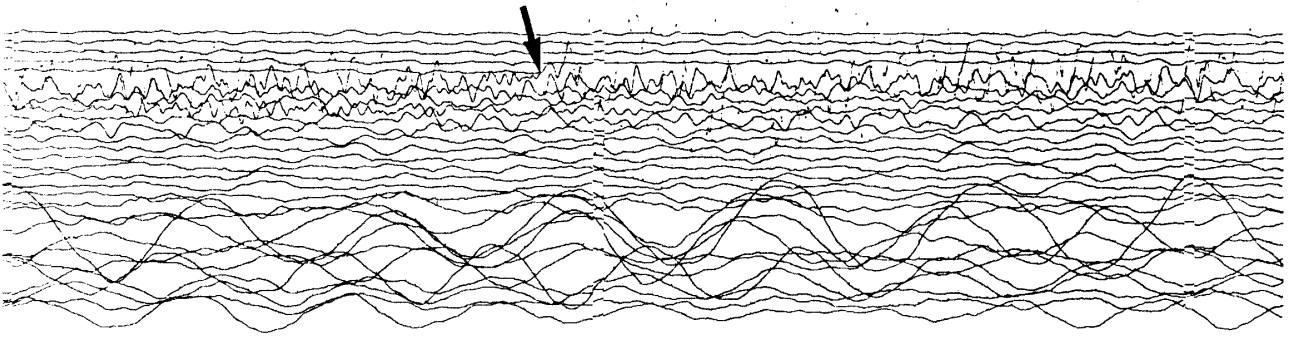
31.089 S, 177.968 W, 33 km Mb 5.8 Ms 6.7

Kermadec Islands Region

SP



LP.



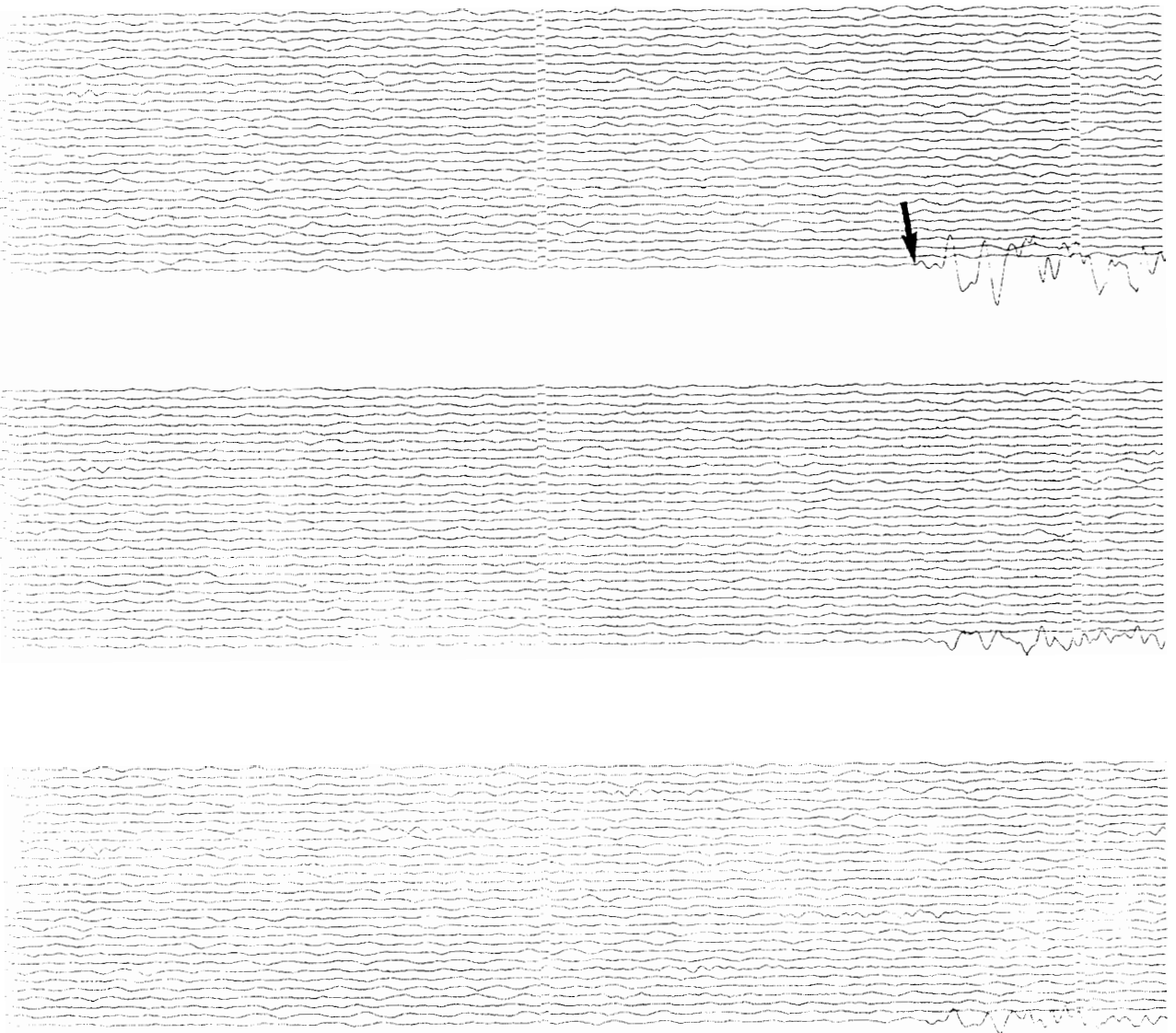
#-138

SEPT. 28 11h47m08.6s

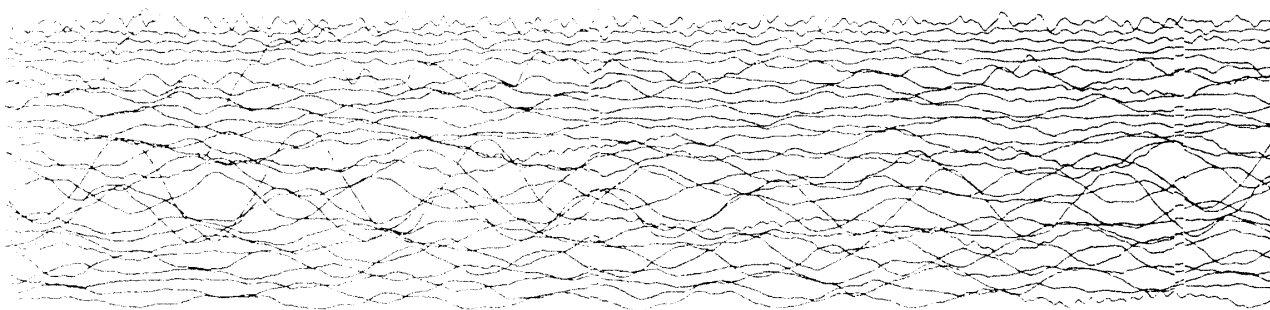
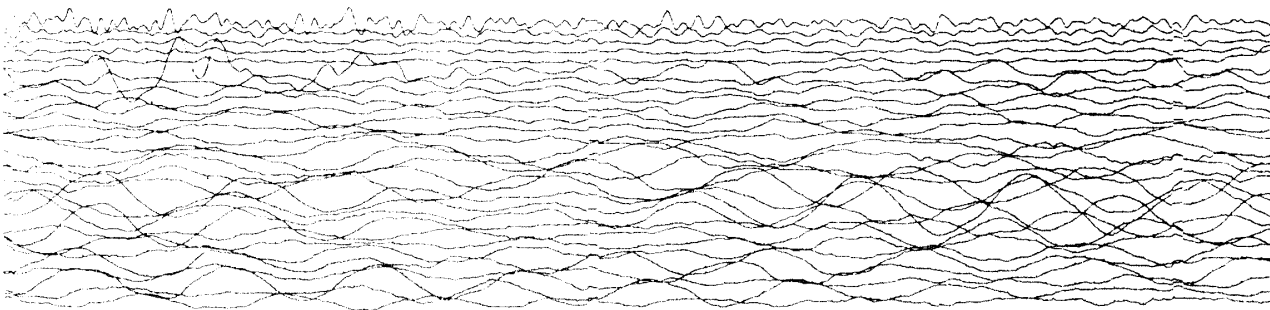
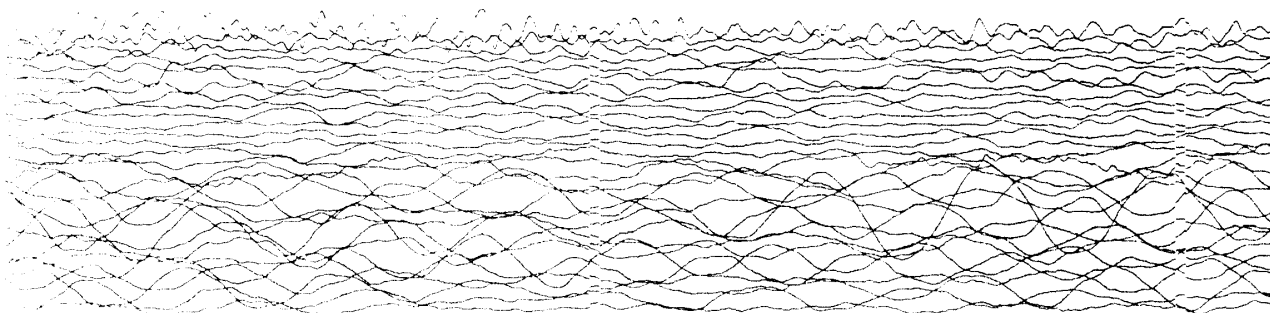
18.411 S, 168.058 E, 31 km Mb 5.7 Ms 6.8

Vanuatu Islands

LP-1



LP-2



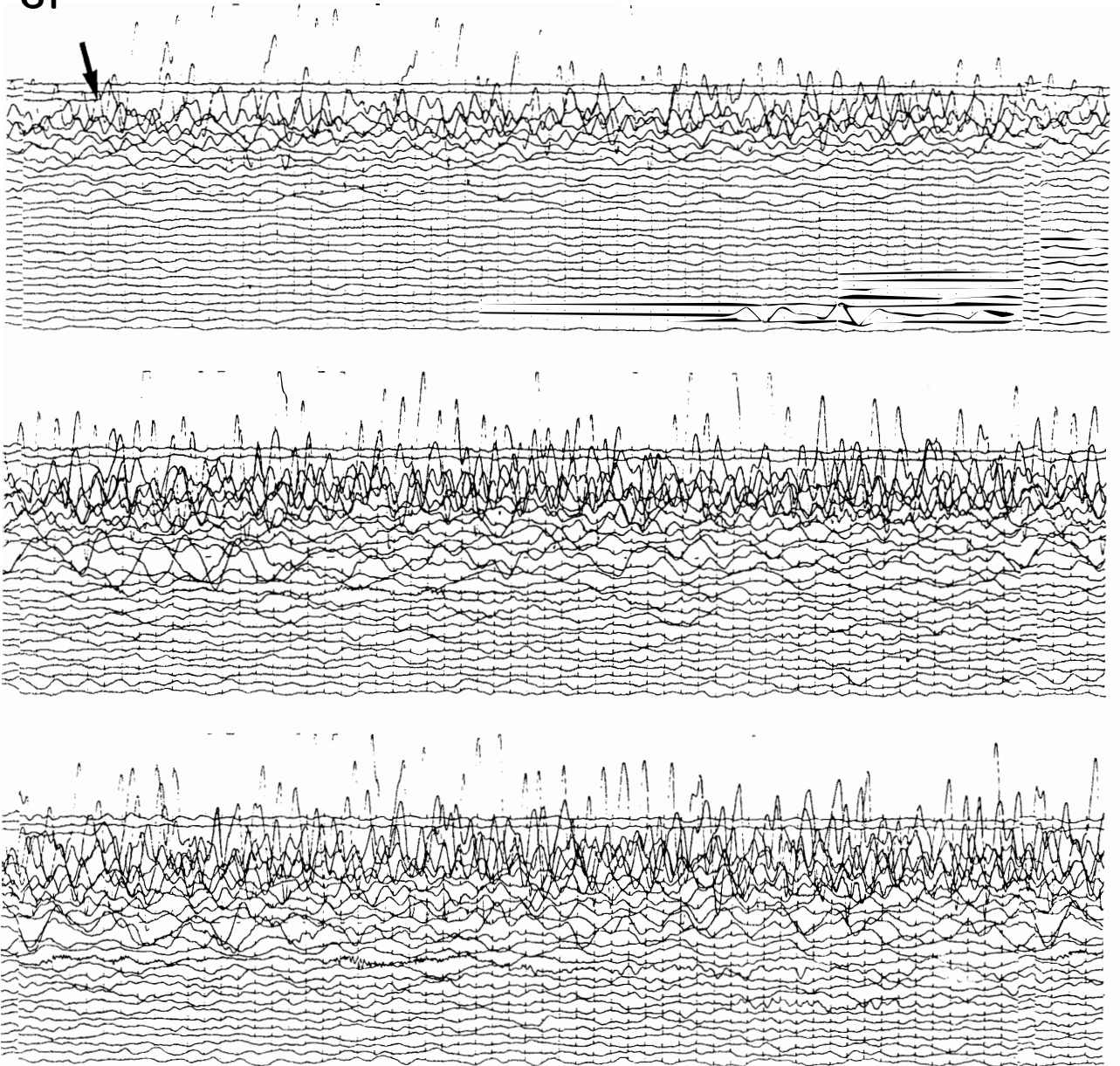
#-149

OCT. 6 04h19m06.0s

17.940 S, 172.225 W, 16 km Mb 6.7 Ms 7.3

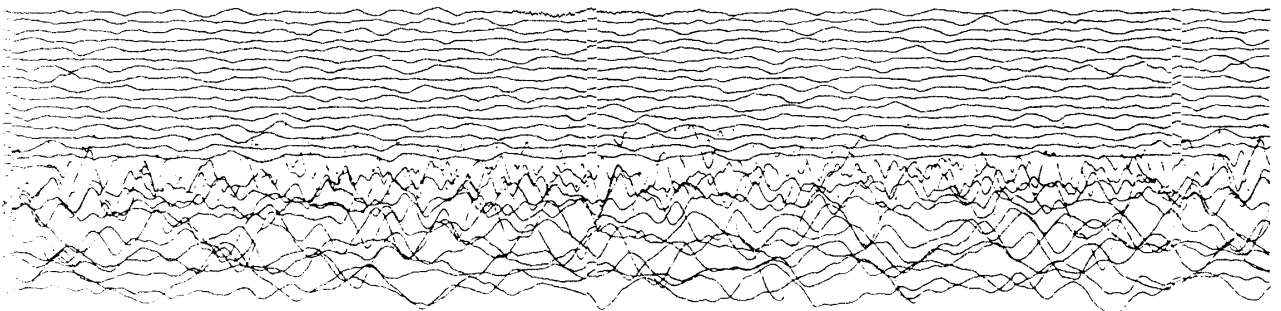
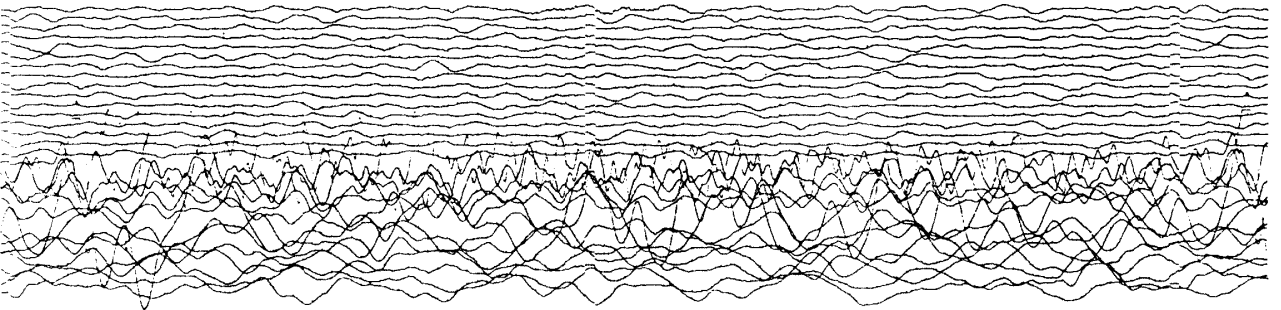
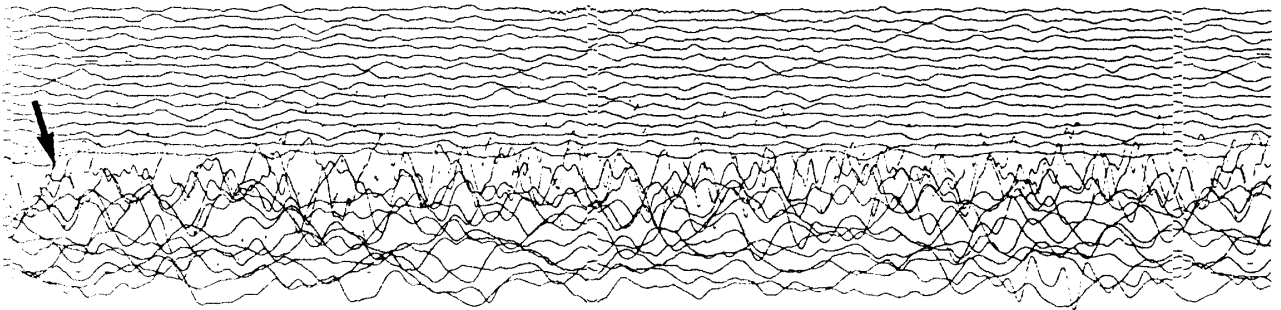
Tonga Islands Region

SP





LP.



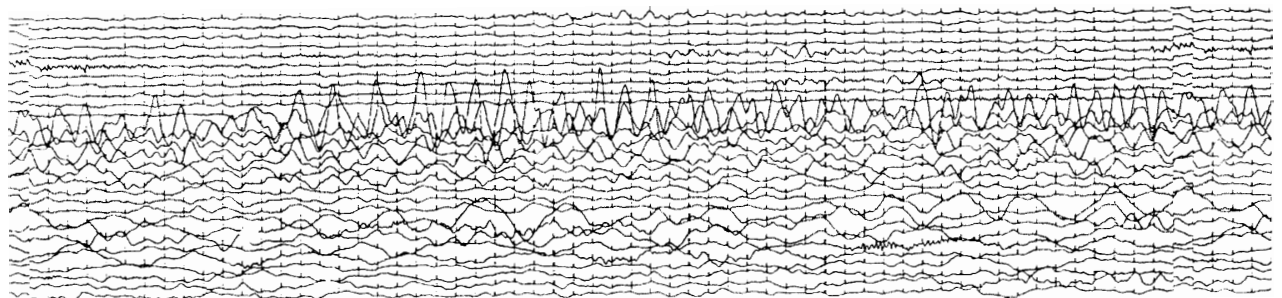
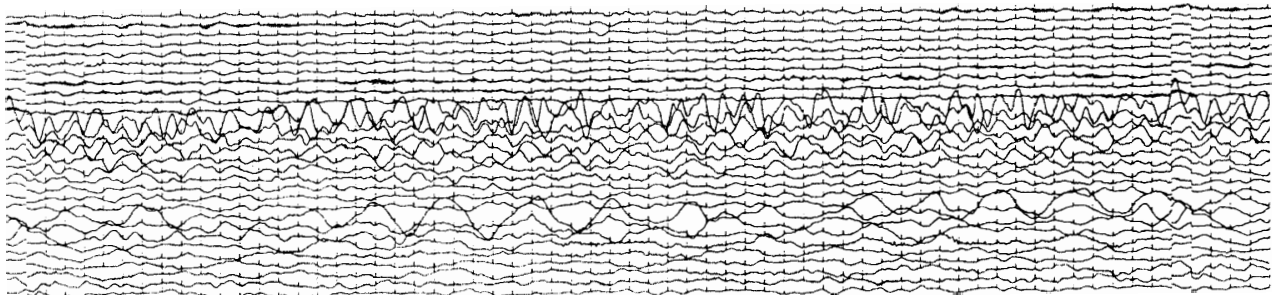
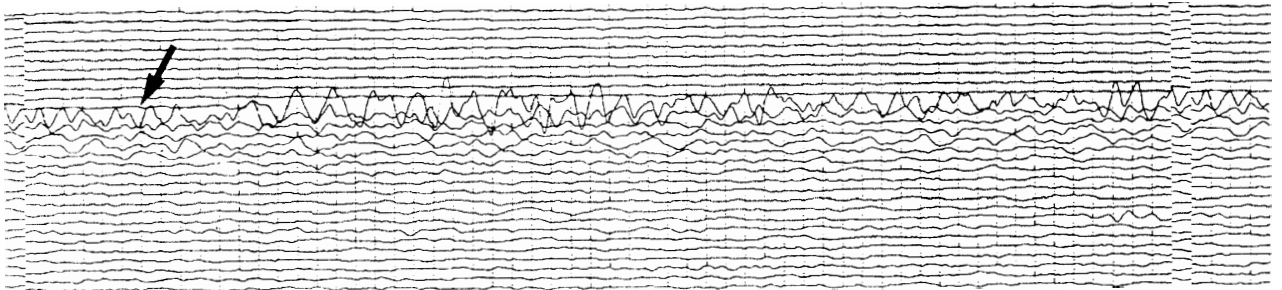
#-158

OCT. 12 13h57m04.7s

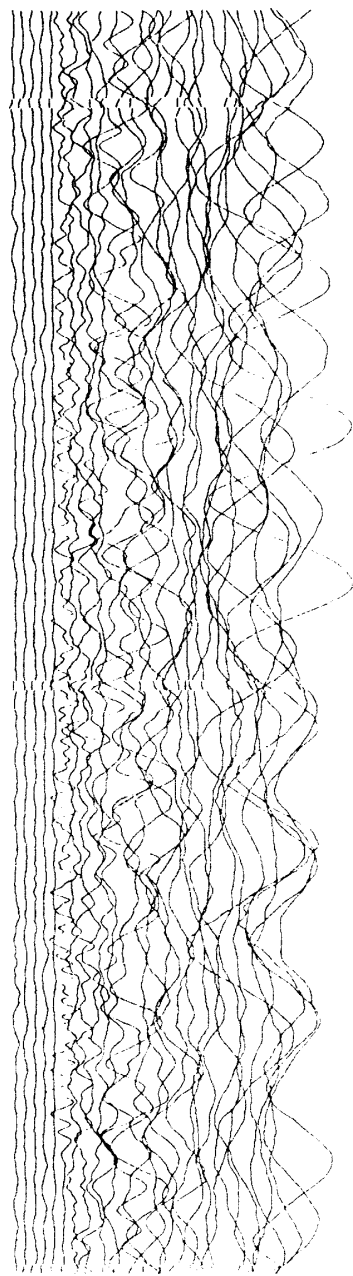
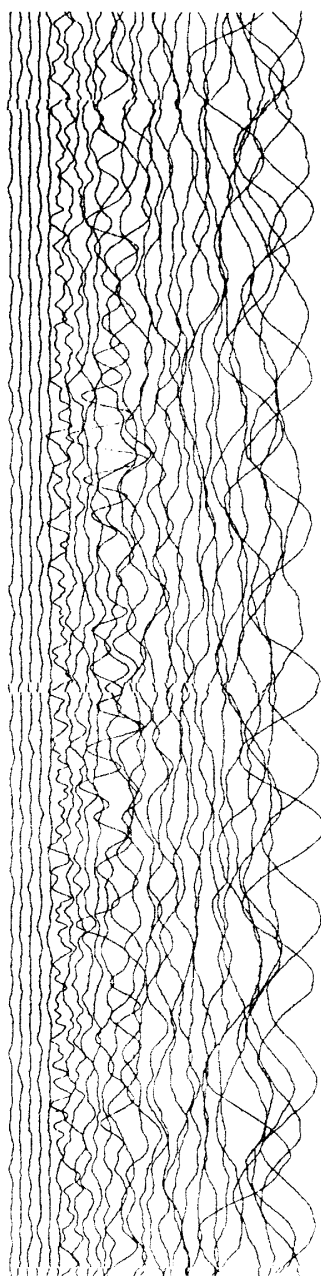
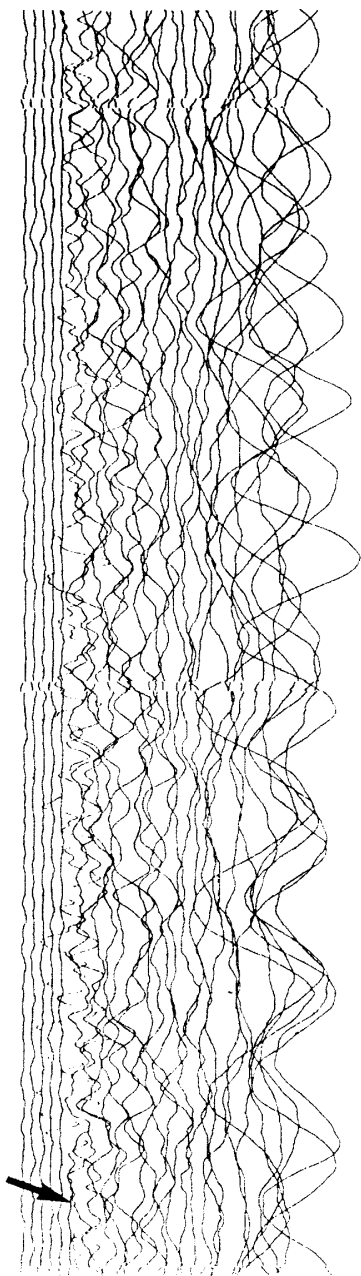
7.288 S, 154.371 E, 25 km Mb 6.3 Ms 6.8

Solomon Islands

SP



LP



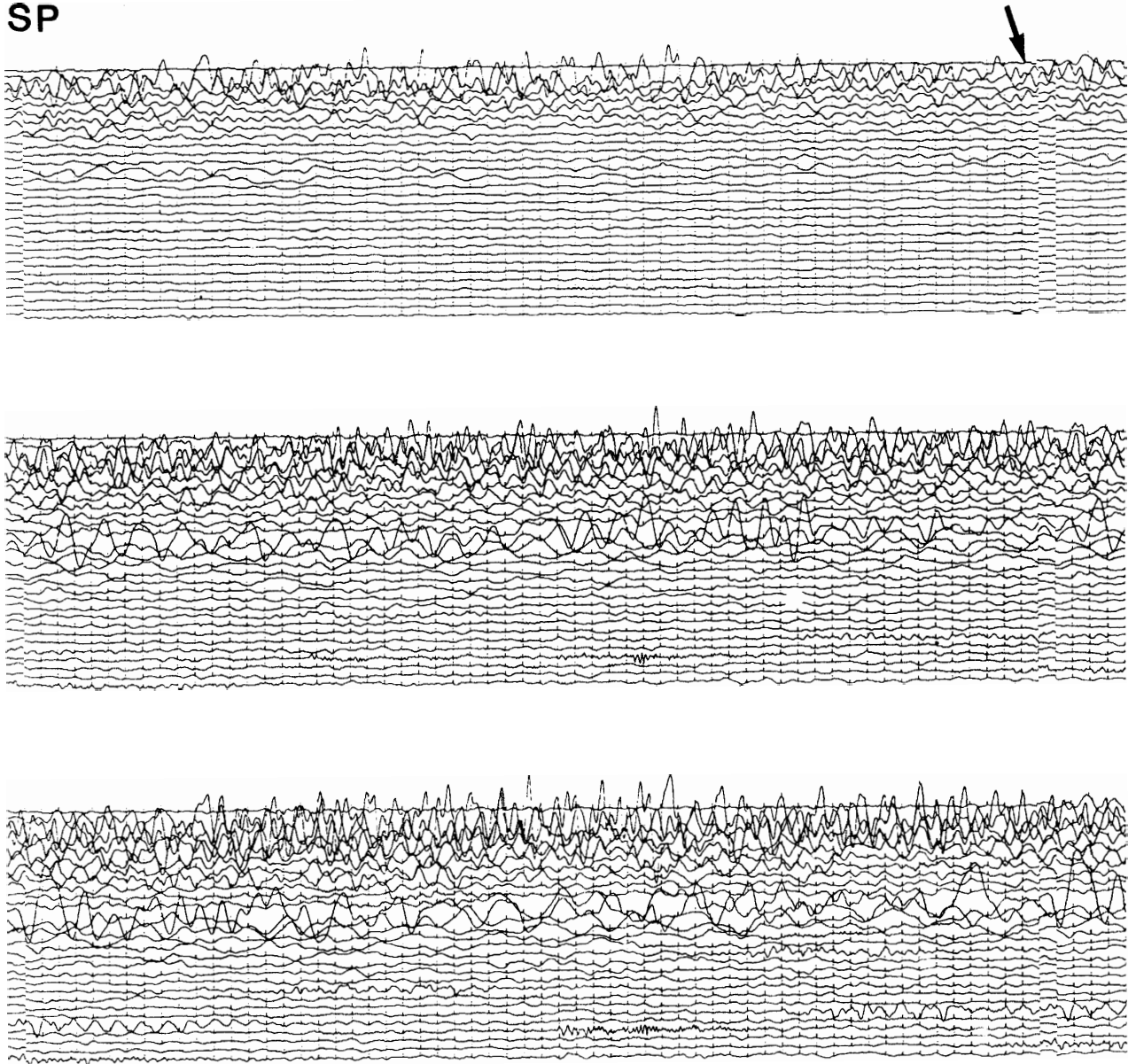
#-163

OCT. 16 20h48m01.6s

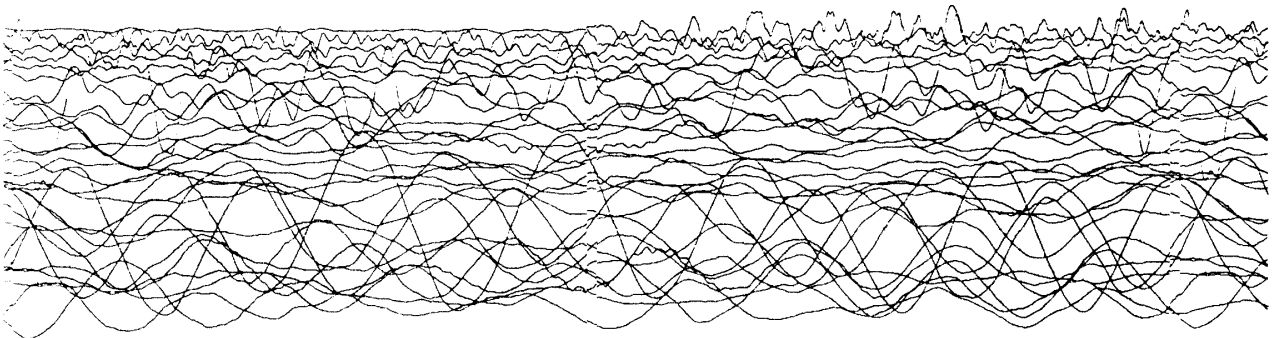
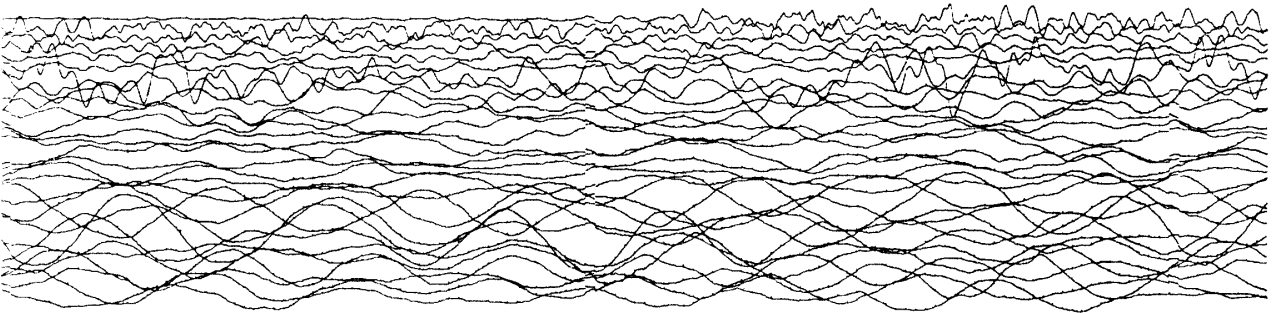
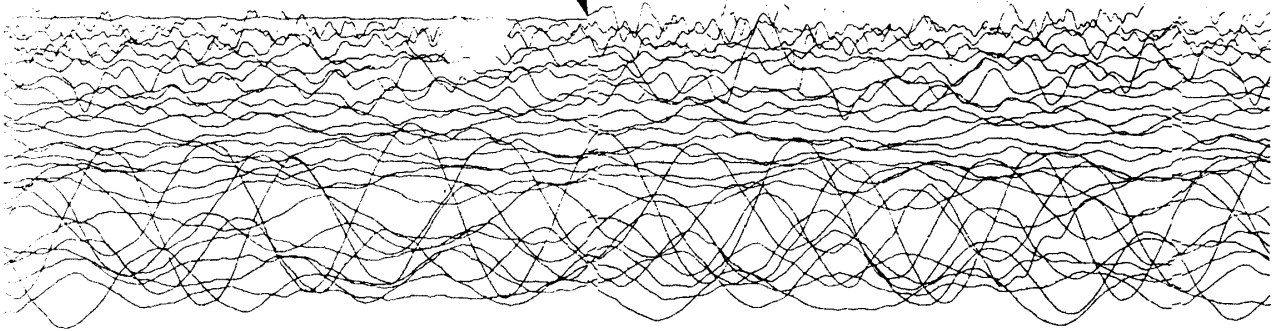
6.266 S, 149.060 E, 48 km Mb 5.9 Ms 7.4

New Britain Region

SP



LP



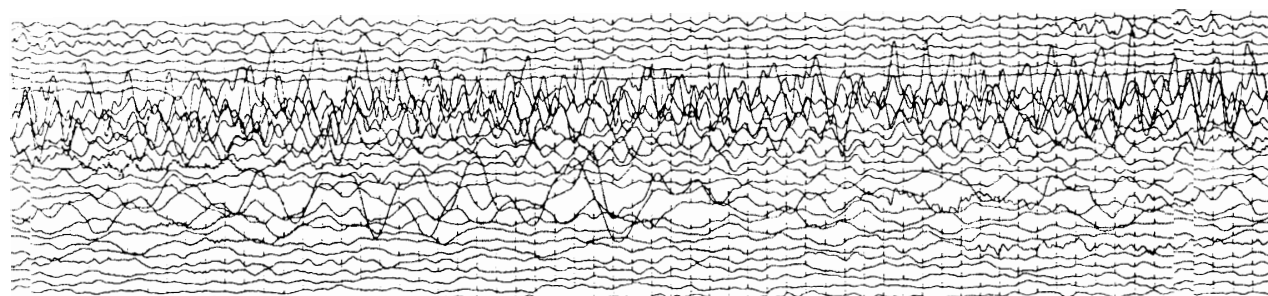
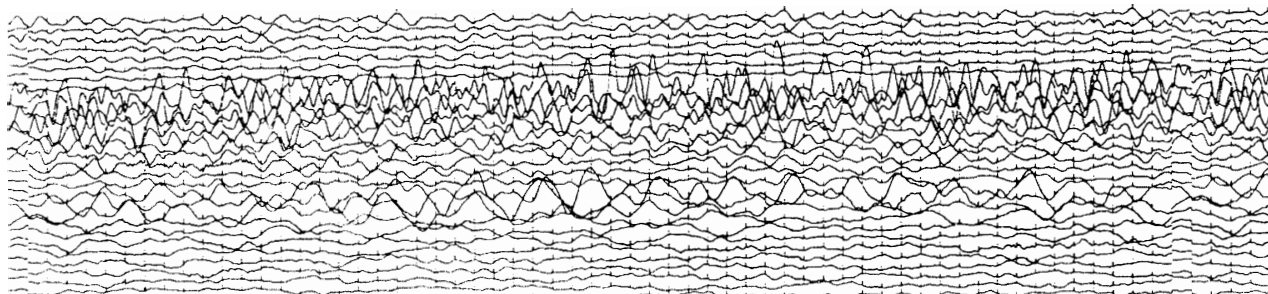
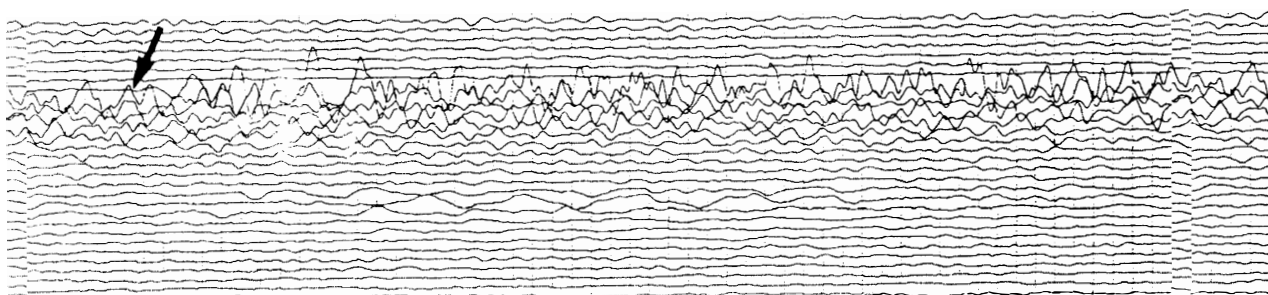
#-175

OCT. 25 16h54m05.6s

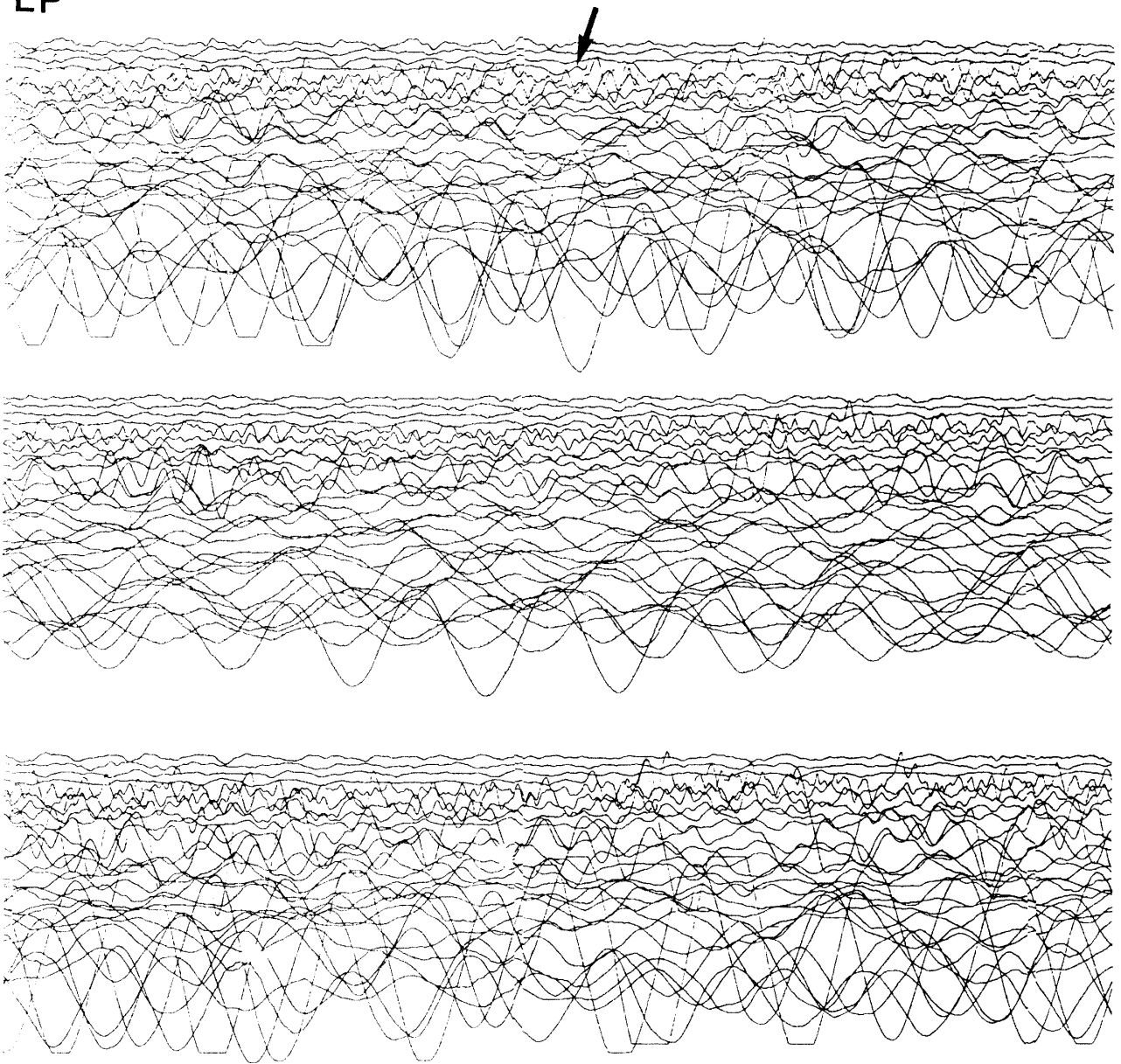
2.323 S, 138.364 W, 33 km Mb 6.2 Ms 7.0

West Irian

SP



LP



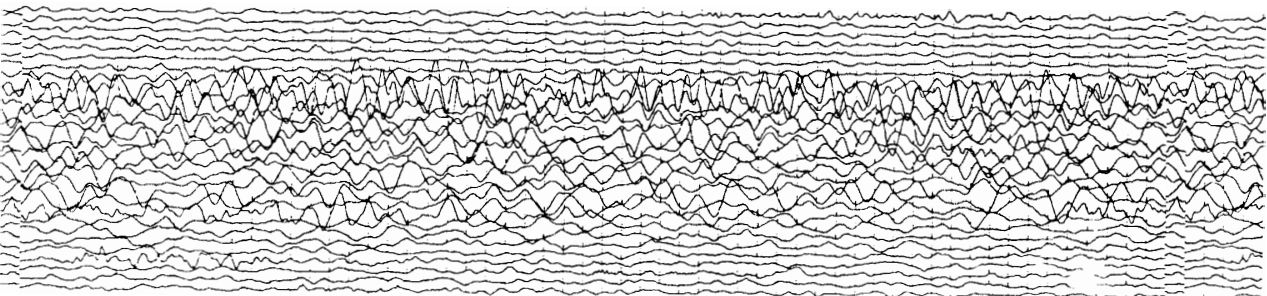
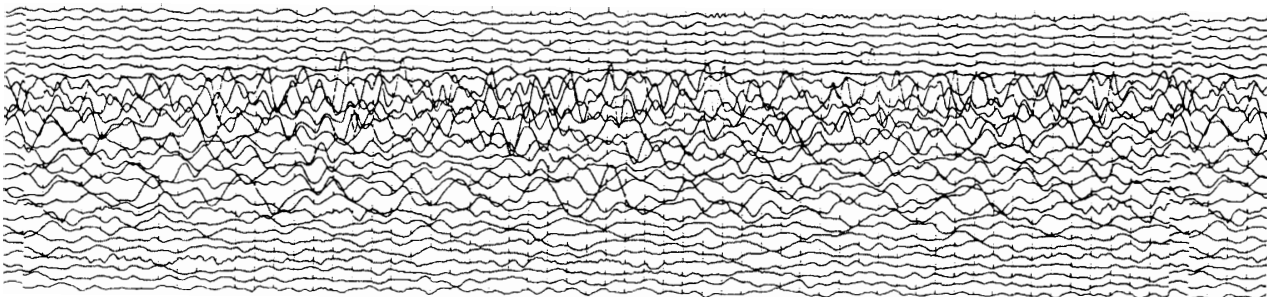
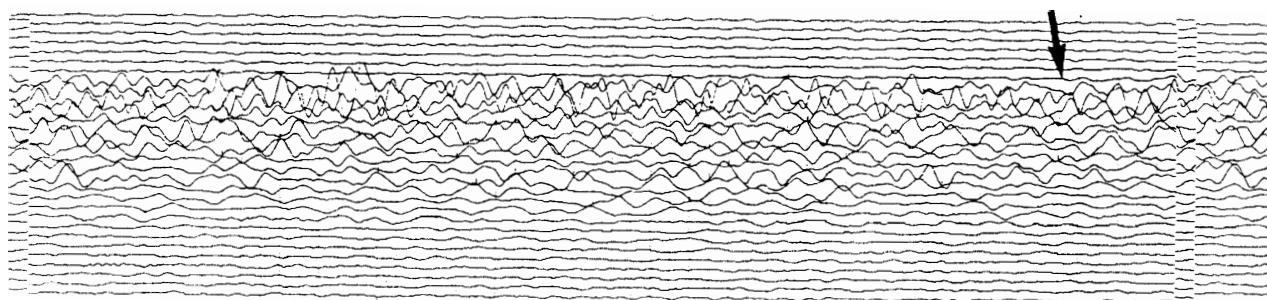
#-199

NOV. 17 08h46m53.3s

58.586 N, 143.270 W, 10 km Mb 6.6 Ms 6.9

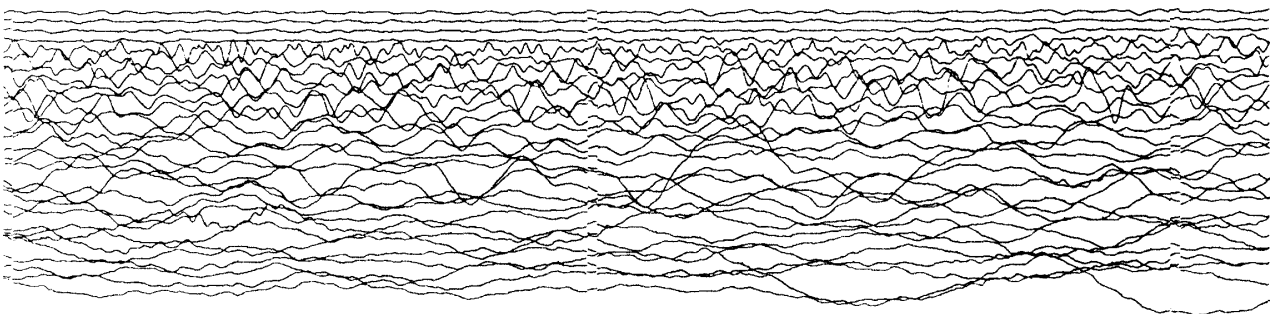
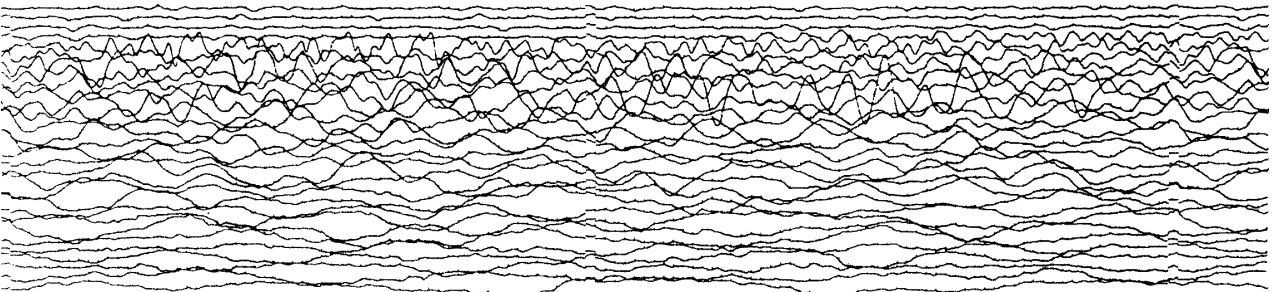
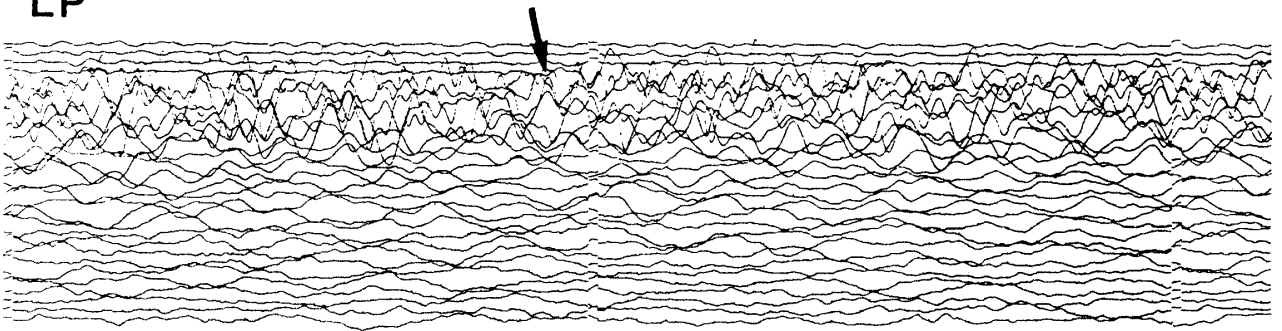
Gulf of Alaska

SP





LP



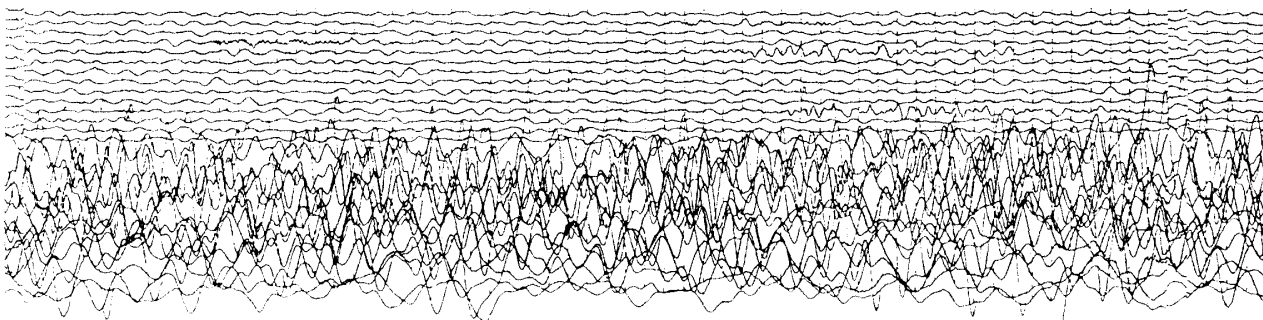
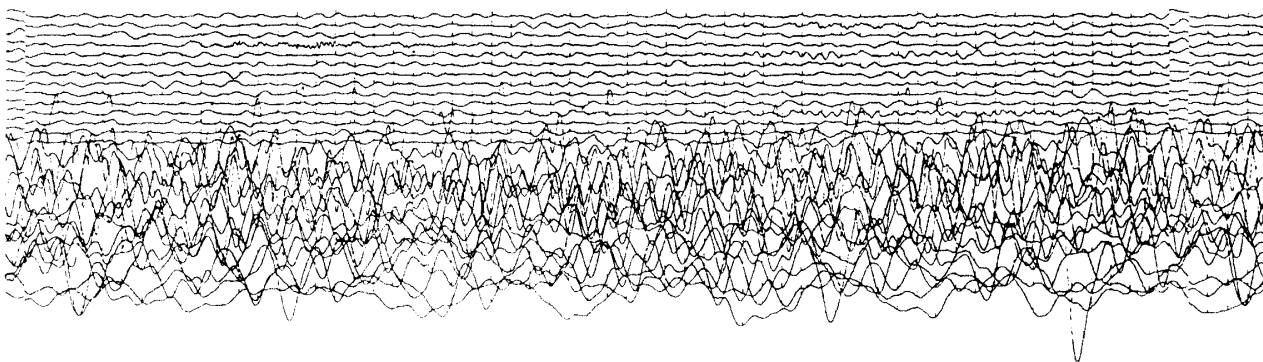
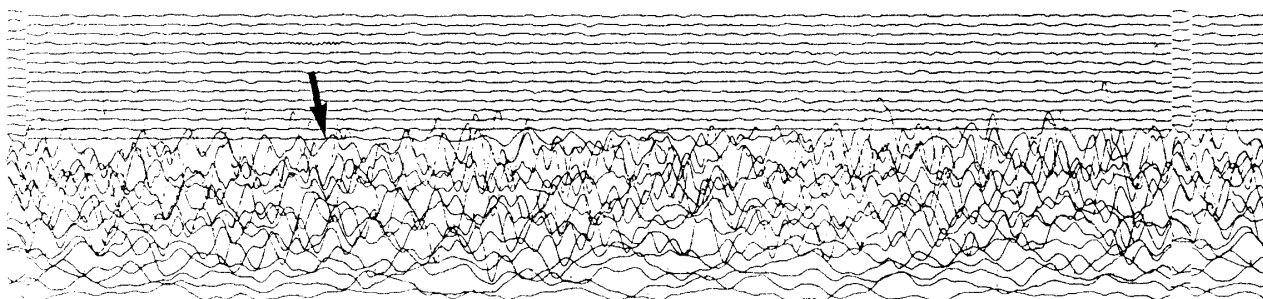
#-218

NOV. 30 19h23m19.5s

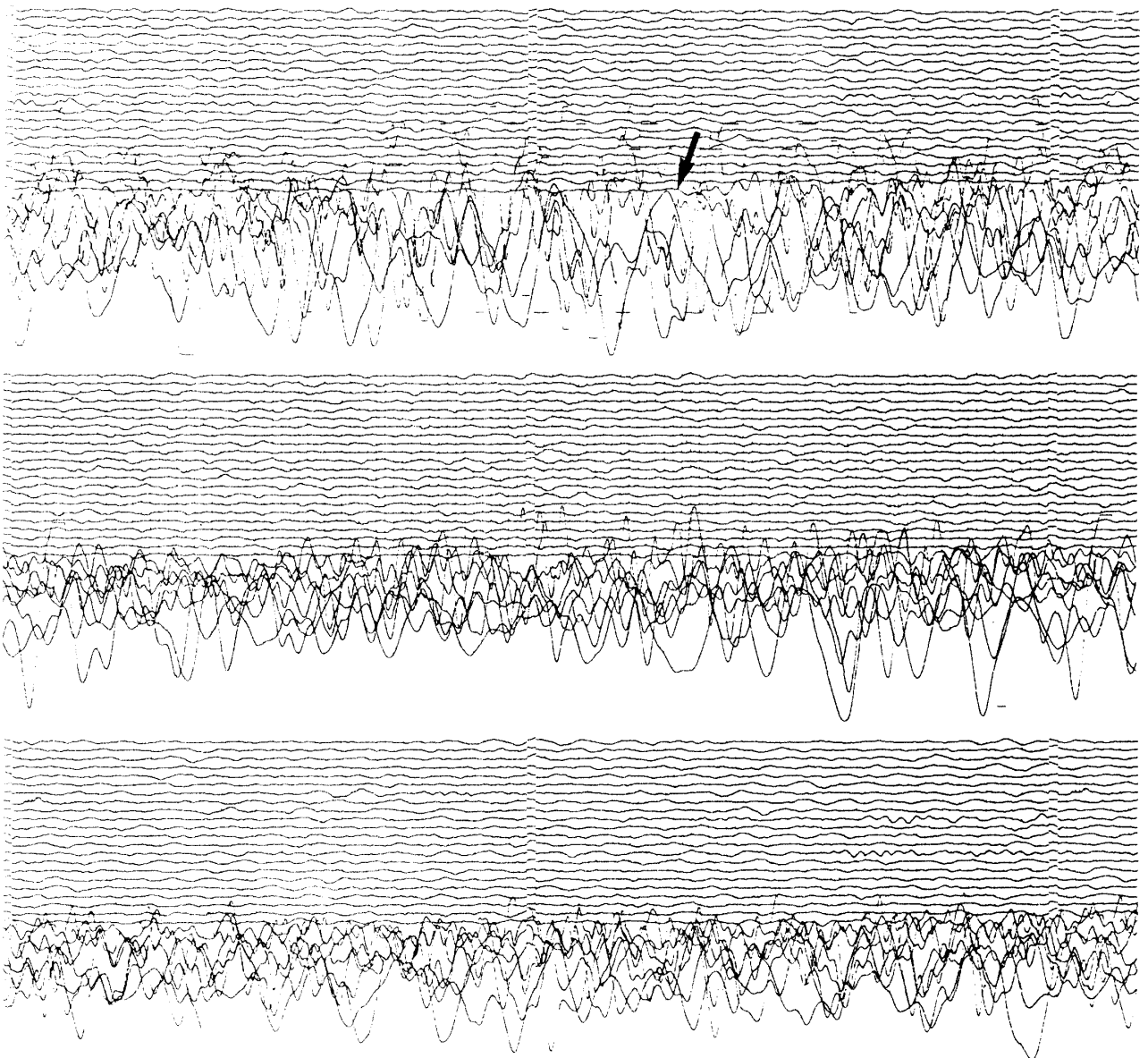
58.679 N, 142.786 W, 10 km Mb 6.7 Ms 7.6

Gulf of Alaska

SP



LP



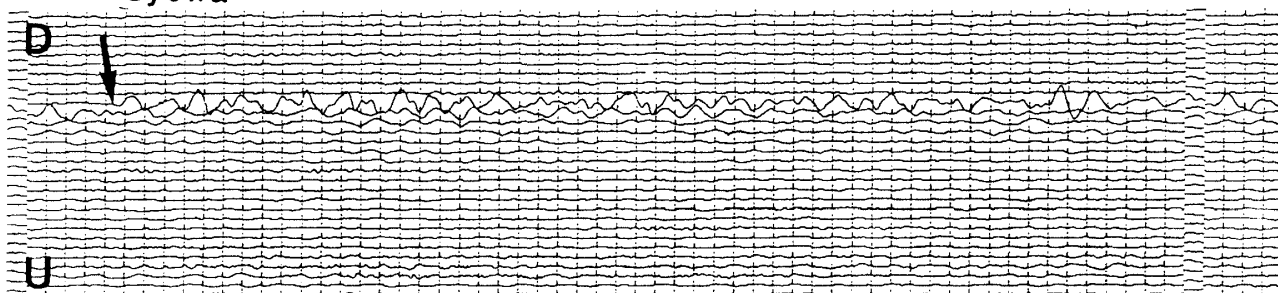
#-224

DEC. 7 12h26m11.7s

13.632 S, 167.393 E, 48 km Mb 5.7 Ms 6.2

Vanuatu Islands

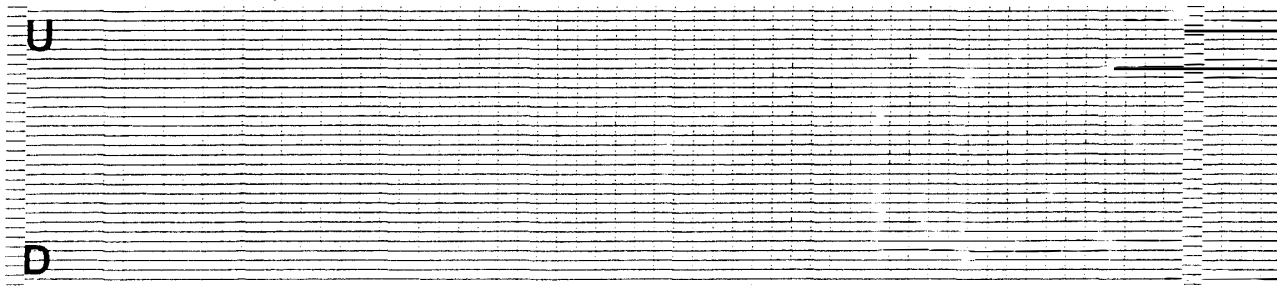
SP  
Syowa



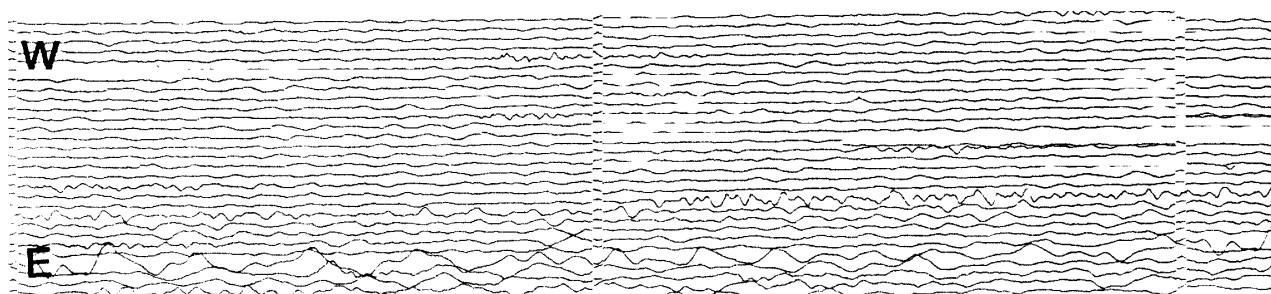
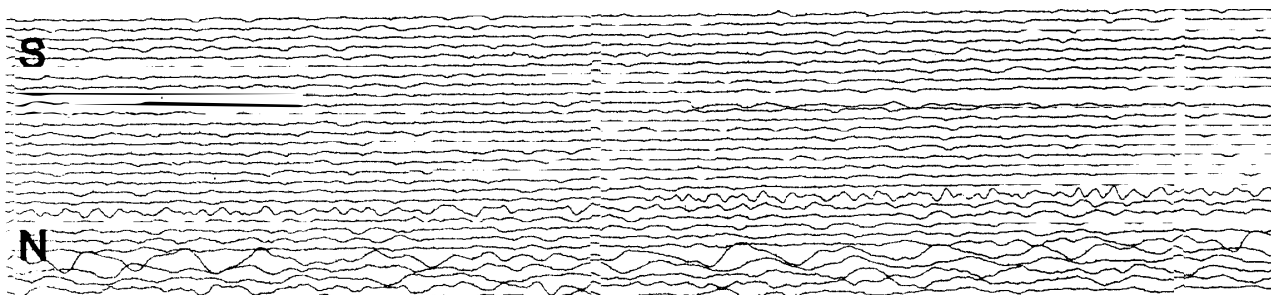
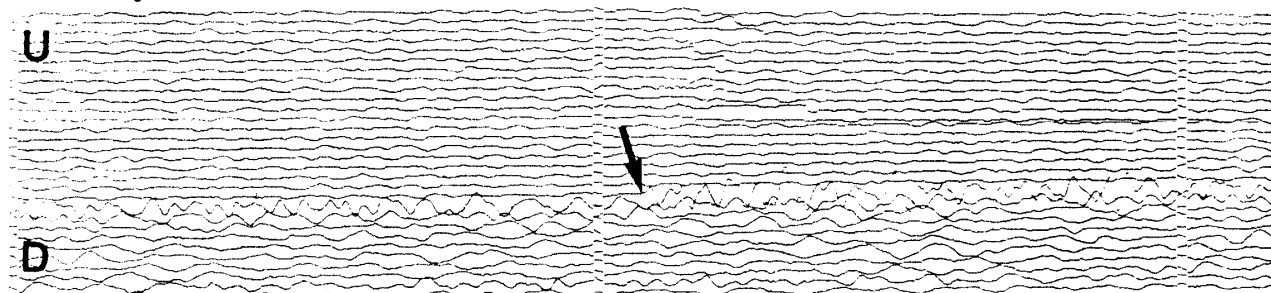
Langhovde



Tottuki Pt.



LP Syowa



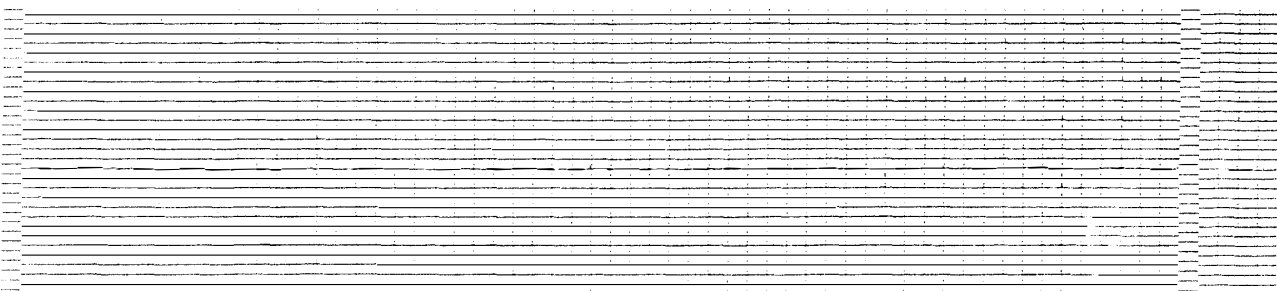
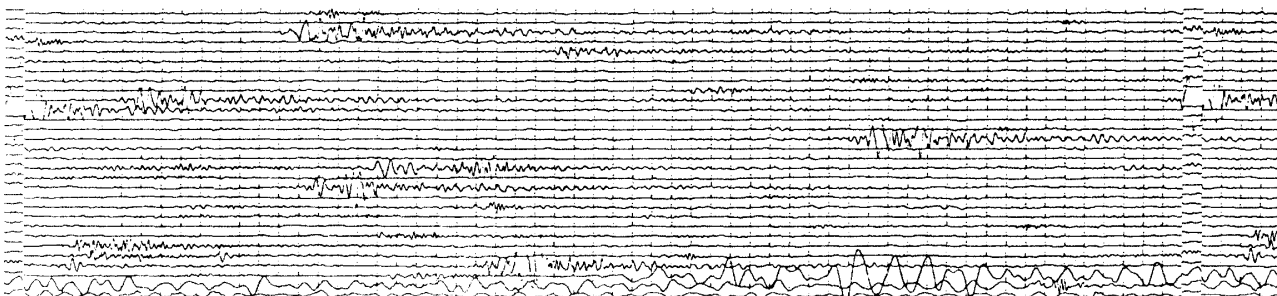
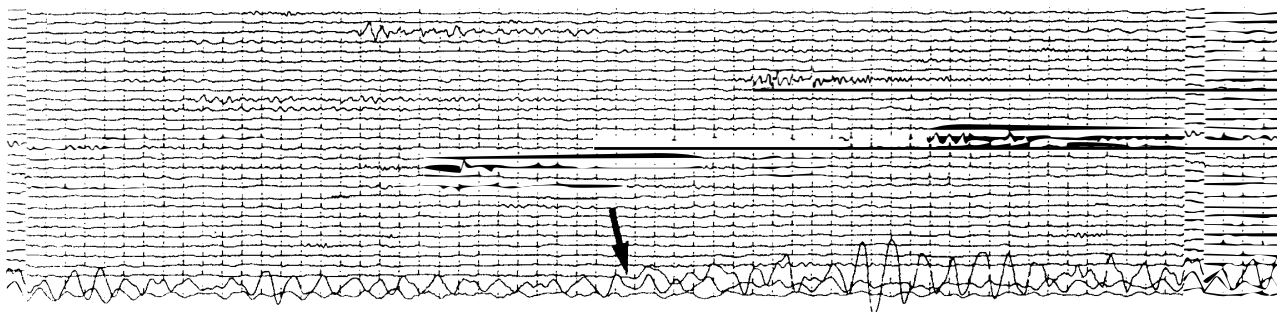
#-225

DEC. 7 13h14m34.9s

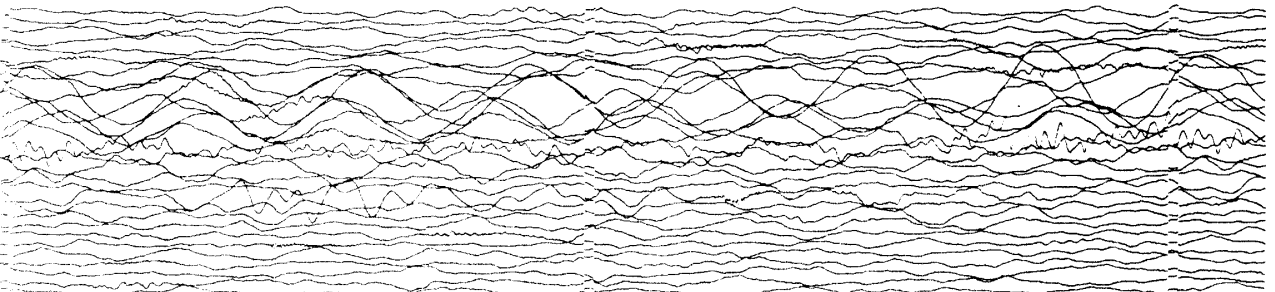
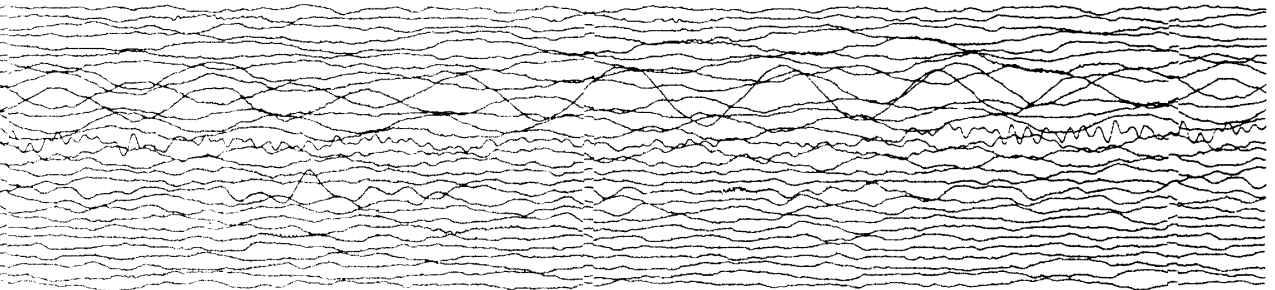
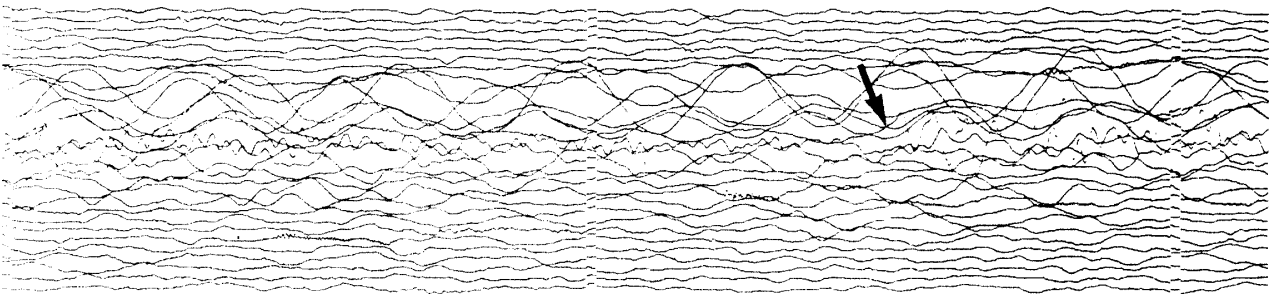
13.559 S, 167.454 E, 33 km, Mb 5.8 Ms 6.3

Vanuatu Islands

SP



LP



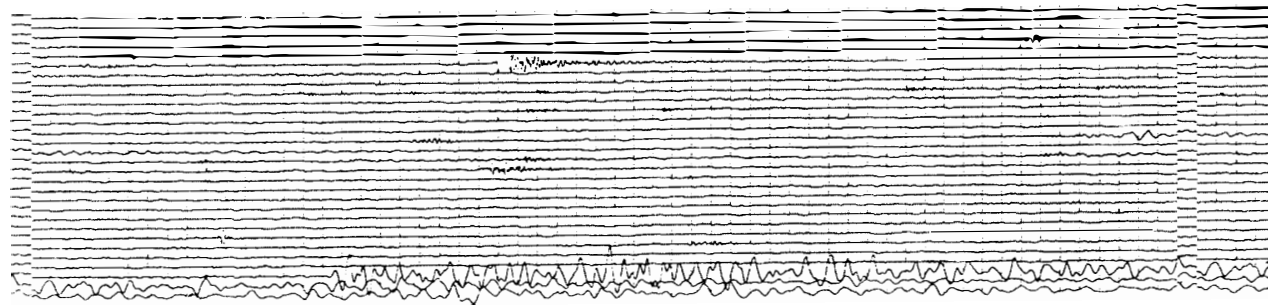
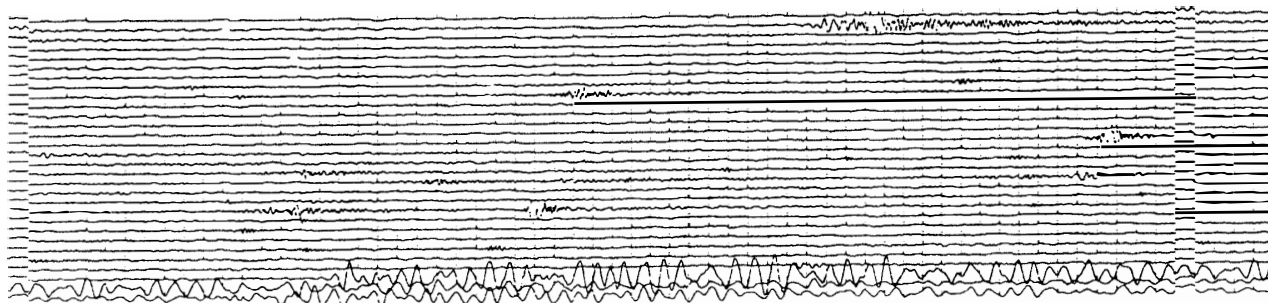
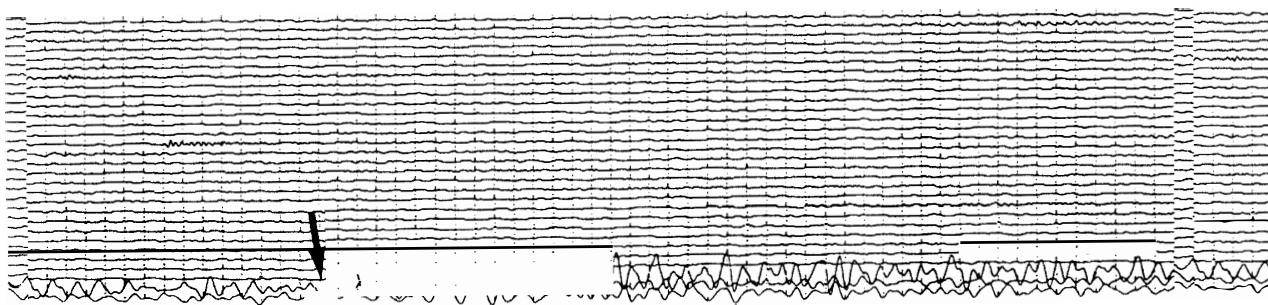
#-238

DEC. 17 02h08m19.9s

35.362 N, 140.214 E, 63 km Mb 6.0

Near East Coast of Honshu, Japan

SP





LP

