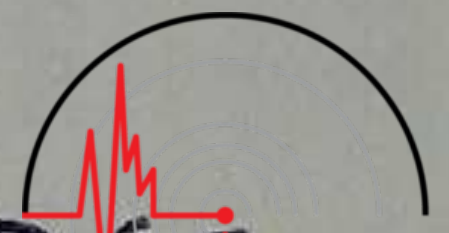


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Jan. 1962



International
Seismological
Centre

SEISMOLOGICAL BULLETIN
OF
MATSUSHIRO

JANUARY
1962

Matsushiro Seismological Observatory
Matsushiro-Machi, Hanishina-Gun,
Nagano-Ken, Japan

Latitude 36° 32' 30''N.
 Longitude 138° 12' 32''E.
 Elevation 440M.

Instrumental Constants (September 1, 1960~)

Mark	Name	Comp.	Period (sec)		Damping ratio		Magnification
Bs	Benioff Seismograph (Short Period)	N	T ₁ =1.0	T ₂ =0.23	h ₁ =0.81	h ₂ =1.4	78,000(max)
		E	T ₁ =1.0	T ₂ =0.22	h ₁ =0.60	h ₂ =1.2	68,000(max)
		Z	T ₁ =1.0	T ₂ =0.21	h ₁ =1.1	h ₂ =0.94	110,000(max)
Bl	Benioff Seismograph (Long Period)	N	T ₁ =1.0	T ₂ =70	h ₁ =0.81	h ₂ =5.5	8,600(max)
		E	T ₁ =1.0	T ₂ =62	h ₁ =0.60	h ₂ =5.1	11,000(max)
		Z	T ₁ =1.0	T ₂ =84	h ₁ =1.1	h ₂ =7.3	8,300(max)
V	Short Period Seismograph	Z	T ₁ =1.0	T ₂ =2.82	h ₁ =1.4	h ₂ =1.2	32,000(max)
G	Galitzin Seismograph	N	T ₁ =15	T ₂ =100	h ₁ =1	h ₂ =1.2	1,600(max)
		E	T ₁ =15	T ₂ =114	h ₁ =1	h ₂ =1.0	2,000(max)
		Z	T ₁ =7.5	T ₂ =70	h ₁ =0.72	h ₂ =1.0	920(max)
T	Wood—Anderson Seismograph	N	0.8		0.8		1,100
		E	0.8		0.8		1,300
L	1,000 kg Long Period Seismograph	N	33.8		0.60		104*
		E	27.1		0.39		104

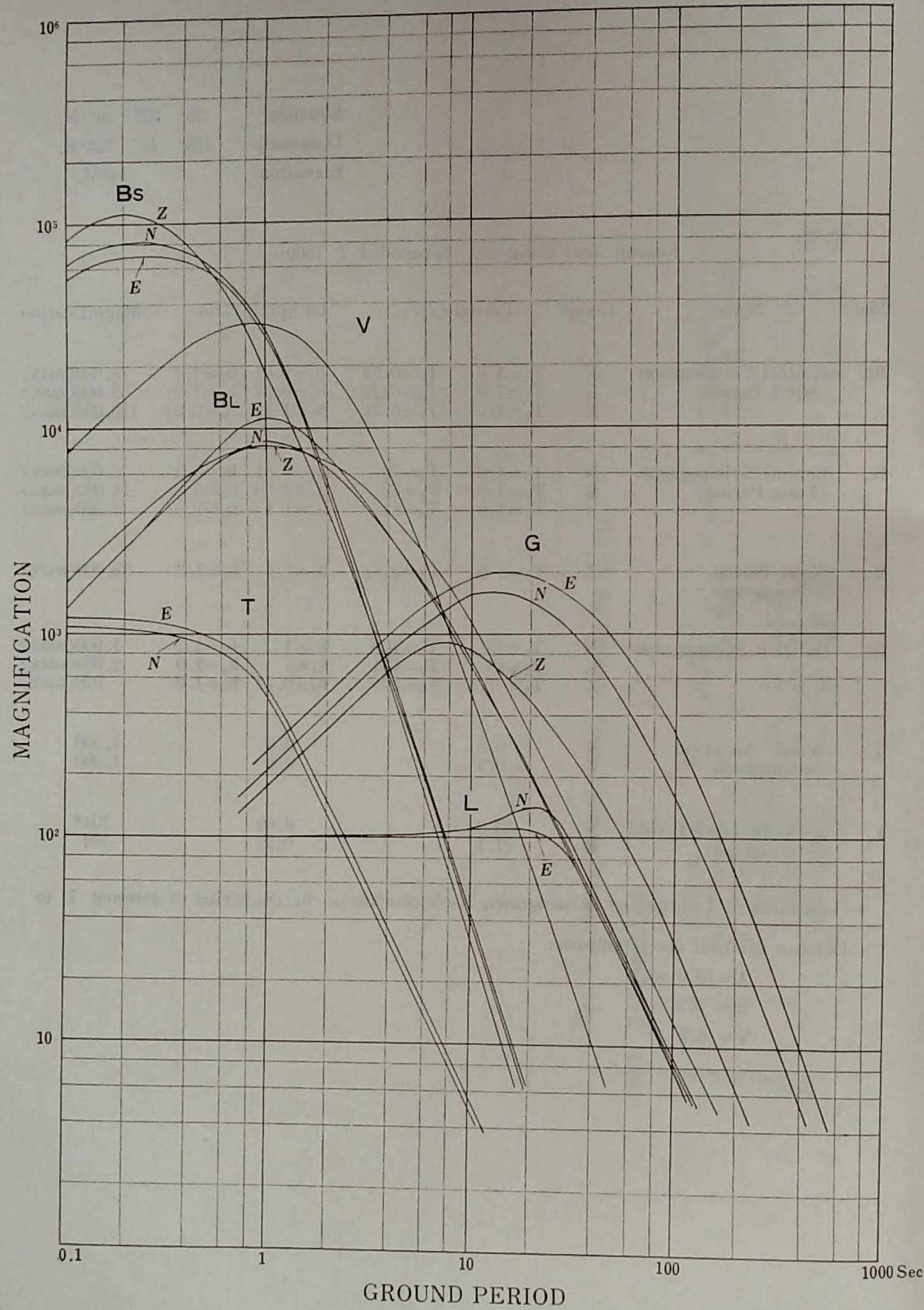
* Constants of Long-period Seismograph, N—S component in the period of January 1 to October 24, 1962 are as follows:

- T=33.8 sec.
- h = 0.6
- V = 6.7

Errata

The following corrections should be made:

Page	Column	Line	Original	Correction
Jan. 5	1	4 from top	P : N, E, C	P ₁ : N, E, C
5	1	13 from top	4. iF, Z, F NE	4. iP ₁ Z, P, NE
5	1	17 from top	F : C	P ₁ : C
5	1	3 from bottom	01 15 43.0	10 15 43.0
12	1	4 from top	e E 18 09 32	17. e E 18 09 32
12	1	5 from top	e E 19 18 10	17. e E 19 18 10



Date	Phase	Comp	h	m	s	Date	Phase	Co.	h	m	s
1.	iP	NZ	02	47	32.2	1.	eP	Z	15	16	42
	i	E			32.5		i	EZ			51.4
	eS	E		52	41		i	N			51.8
	eL	E		54	33	1.	iP	NEZ	19	18	35.7
	P : S, C						S	NEZ			42
	52.3N., 177.9E.						P : N, E, C				
	Rat Is.					1.	P	NZ	20	25	44
	h : 26 km ca.						iS	NEZ			48.4
	H=02 41 06.0						USCGS				
1.	iP	NEZ	05	18	30.3	1.	eP	Z	23	46	45
	e	NE		19	11		i	NE			49
	P : N, E, D						iPcP	Z			49 39
	39.2N., 141.6E.						eS	E			51 59
	Honshu, Japan.						eL	E			53 49
	h : 25 km ca.						52.4N., 177.7E.				
	H=05 17 35.0						Rat Is.				
							h : 27 km ca.				
							H=23 40 20.3				
							USCGS				
1.	iP	Z	06	40	51.0	2.	ePKP ₁	Z	05	43	20
	i	E			52.0		i	NEZ			23
	i	N			52.5		iPKP ₂	Z			41.2
	S	N		41	18		17.8S., 69.8W.				
1.	eP	Z	06	56	20		Peru-Bolivia border.				
	eS	E	07	01	52		h : 74 km ca.				
	e	E		03	25		H=05 23 38.2				
	51.9N., 177.8E.						USCGS				
	Rat Is.					2.	iP	Z	06	04	14.0
	h : 59 km ca.						P : D				
	H=06 49 57.9						20.1S., 175.1W.				
							Tonga Is.				
							h : 25 km ca.				
							H=05 52 45.1				
							USCGS				
1.	P	NZ	08	38	55	2.	iP	EZ	06	38	14.7
	i	E			55.5		i	N			15.2
	S	N		40	17		eS	E			54
	i	E			20		e	N			57
1.	iP	Z	10	23	27.6		i	Z			59
	L	E		30	33		P : W, C				
	P : C					2.	P	Z	07	17	10.4
	51.9N., 177.7E.						S	NE			50
	Rat Is.					2.	P	Z	11	58	08
	h : 58 km ca.						21.8S., 169.8E.				
	H=10 17 05.6						Loyalty Is. region.				
							h : 56 km ca.				
							H=11 47 31.0				
							USCGS				

January 1962

Date	Phase	Comp	h	m	S	Date	Phase	Comp	h	m	S
2.	eP	Z	12	32	52	(continued)					
	eL	E		50	26		P : C				
							9.9S., 159.7E.				
							Solomon Is. region.				
							h : 48 km ca.				
							H=12 22 58.7			USCGS	
2.	iP	Z	19	07	12.4	3.	P	Z	14	03	04
	P : C						i	E			04.3
							i	N			07.1
							i	N			18
							eS	E		04	09
							e	N			13
							e	Z			22
2.	eP	NEZ	19	10	35	3.	iP	NEZ	17	59	27.5
2.	iP	Z	19	30	41.0		eL	E	18	06	31
	i	N			41.3		P : S, W, C				
	S	NEZ		31	06		52.2N., 177.5E.				
	P : D						Rat Is.				
2.	iP	Z	20	34	46.2		h : 68 km ca.				
	e	N		35	03		H=17 53 05.3			USCGS	
	e	E			15	3.	iP	Z	18	18	22.3
	P : D						i	NE			22.5
2.	eP	EZ	23	59	43		e	E			48
3.	iP Z, P	NE	07	00	24.8		e	NE		19	56
	P : D						P : C				
							21.7S., 170.0E.				
							Loyalty Is. region.				
							h : 120 km ca.				
							H=06 49 50.9			USCGS	
3.	P	NEZ	07	44	06	3.	iP	NZ	20	53	24.5
3.	iP	NZ	09	12	45.8		eS	N		55	30
	eL	E		19	56		i	Z			38
	P : S, C						P : S, C				
3.	P	Z	10	21	06	4.	P	Z	00	01	05.9
	e	E		30	51		i	NE			06.6
3.	iP	Z	11	32	20.9		eL	E		17	13
	i	N			21.2		21.5S., 169.9E.				
	P : C						Loyalty Is. region.				
							h : 75 km ca.				
							H=23 50 28.8			USCGS	
3.	iP	Z	13	45	09.0	4.	iP	NEZ	04	16	34.8
	i	NE			09.3		iS	NE			59
							i	E		17	35
							P : N, W, C				
							35.1N., 138.9E.				
							Near coast of Honshu, Japan.				
							h : 178 km ca.				
							H=04 16 01.7			USCGS	

January 1962

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
4.	iP ₁	NEZ	04	36	37.0	(continued)					
	P ₂	NE			49		iS	NEZ	11	25	21
	eS ₂	N		37	36	4.	iP ₁ Z, P ₁	E	13	14	38.5
	P : N, E, C						iP ₂	NEZ			49
	Mag. 6½ (Mat.)						iS ₂	Z		15	35.9
	33.9N., 135.2E.						P ₁ : D				
	Near Shikoku, Japan.					4.	P	Z	21	36	17
	h : 56 km ca.						i	NE			17.4
	H=04 35 42.6				USCGS	4.	iP	NEZ	22	38	15.6
4.	P ₁	Z	05	02	55		iS	NE			18.0
	P ₂	Z		03	05		P : N, E				
	eS ₂	N			51	5.	eP	Z	00	34	20 ca.
4.	iP ₁ Z, P	NE	05	16	40.0		eS	N		43	08
	P ₂	NEZ			51		i	E			27
	eS ₂	NZ		17	40		Lq	E		50	43
	i	E			41		Lr	E		53	26
	P : C						Mag. 6¼-6½ (Mat.)				
4.	P ₁	Z	05	59	15		15.5 S., 177.7W.				
	i	N			21.1		Fiji Is. region.				
	P ₂	EZ			23.5		h : 24 km ca.				
	i	Z			38		H=00 23 32.1			USCGS	
	eS ₁	N			58	5.	eP	Z	08	19	14
	S ₂	Z	06	00	07		eS	N		28	04
	e	N			09		i	E			26
4.	iP	EZ	06	56	52.8		eLq	E		35	58
	i	N			53.1		Lr	E		39	16
	i	EZ			57		Mag. 6 (Mat.)				
	P : W, D						15.5 S., 172.5W.				
4.	iP	NZ	07	42	17.8		Tonga Is. region.				
	i	E			18.8		h : 60 km ca.				
	pP	NZ		43	06		H=08 08 07.5			USCGS	
	P : S, D					5.	eP	Z	13	32	36
	5.0S., 130.4E.						i	E			39
	Banda Sea.						i	N			40
	h : 222 km ca.						i	N		33	37
	H=07 34 44.4				USCGS		S	E		34	33
4.	iP ₁	Z	09	30	04.6	5.	P	Z	14	10	52.4
	i	NE			05.1		i	E			54.3
	iP ₂	NEZ			15		i	N			56.2
	S ₂	NEZ		31	03		eS	E		18	38
	P : C						L	E		30	39
4.	eP	Z	10	03	51		1.6 S., 100.0E.				
4.	iP	NEZ	11	25	19.2		Near south coast of Sumatra.				

Dtae	Phaae	Comp	h	m	s	Date	Phase	Comp	h	m	s
9.	P	Z	22	02	45	(continued)					
	eS	E		06	50	52.9N., 169.1W. Fox Is. h : 43 km ca. H=02 19 57.1 USCGS					
						10.	ePKP	Z	03	14	29
							e	Z		15	10
						17.1S., 68.0W. Peru-Bolivia border. h : 208 km ca. H=02 55 01.2 USCGS					
9.	iP	NEZ	22	16	46.4	10.	e	E	07	01	04
	iS N, S	E		19	09.4	10.	eP	EZ	10	01	34
	i	E			10		i	Z			45.6
	i	Z			11.7		iS	NE			47.0
	i	Z			13		P : C				
	ScP	Z		24	29	10.	iP EZ, P N		21	23	40.5
	P : N, E, D						eS	E		24	15
							i	N			16
							i	E			22.5
							P : W, C				
						11.	iP	Z	01	15	41.0
							i	N			41.6
							i	E			42.9
							S	NE			16 02
						11.	iP	EZ	01	20	01.7
							eS	NE			23
						11.	iP Z, P E		03	00	29.0
							e	E		06	09
							eL	E		07	51
							eLr	Z		09	08
							P : C				
						51.6N., 176.9E. Rat Is. h : 53 km ca. H=02 54 10.8 USCGS					
10.	iP	EZ	02	27	29.6	11.	iP	NEZ	03	09	47.7
	i	N			29.8		eL ₁	E		23	26
	PcP	Z		29	34.7		eL ₂	E		24	56
	i	EZ		30	00.0		P : S, E, C				
	eL ₁	E		36	29	28.1N., 84.8E. Nepal. h : 38 km ca.					
	eL ₂	E		39	25						
	P : W, C										

(cont.)

(cont.)

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
						20.2N., 145.9E. Mariana Is. h : 103 km ca. H=08 50 31.2 USCGS					
11.	P	Z	04	13	10.5	12.	iP	Z	11	01	23.8
11.	iP	Z	05	17	33.0		e	E		06	32
	S	E		27	58		eL	E		09	42
	SS	E		33	37		P : C				
	i	E		39	18	12.	eP	Z	11	24	58
	L	E		43	10		i	Z		25	23
	Lr	Z		52	55	12.	P	Z	11	34	24
	P : C					12.	eP	Z	13	07	21
						12.	iP	EZ	13	24	02.8
							i	Z			21.0
							iS?	N			27.2
						12.	iP	NEZ	13	39	52.6
							e	N		41	10
							e	E			12
							P : S, W, C				
						42.8N., 143.3E. Hokkaido, Japan. h : 40 km ca. J.M.A.					
11.	iP Z, P NE		06	15	45.6	12.	iP	NEZ	14	44	15.9
11.	iP	EZ	06	55	45.5		S	N		45	30.5
	PcP	Z		58	25		P : S, W, C				
	e	E	07	00	20	12.	P	Z	17	55	21.5
	eS	E		01	06		i	Z			42.5
	L	E		03	10	12.	P	NEZ	20	20	19.2
	Lr	Z		04	40		P : E				
	ScS	E		06	07	12.	eP	Z	20	59	28
	P : W, C					13.	PKP	Z	01	04	54
							i	Z		05	05
						22.7S., 68.6W. Northern Chile. h : 159 km ca. H=00 45 12.8 USCGS					
						13.	iP	NZ	02	58	13.8
							P : N				
						13.	P	Z	03	15	10
						19.1S., 177.5W. Fiji Is. h : 542 km ca. H=03 04 55.7 USCGS					

(cont.)

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
13.	iP	EZ	04	54	59.0	14.	iP	Z	12	59	51.2
✓	e	E	05	00	20	14.	iP	NEZ	13	36	02.8
	eL	E		02	30	✓	S	E		37	27
13.	e	E	05	43	15 ca.		P : S, W, C				
13.	iP	NEZ	07	16	37.1	✓	Mag. 6 (Mat.)				
	P : N, W						44.4N., 141.2E.				
13.	iP	NZ	08	25	17.2		Near Hokkaido, Japan.				
	eS	E		30	55		h : 240 km ca.		J. M. A.		
	eLq	E		33	05	14.	iP	NEZ	18	44	33.0
	eLr	EZ		35	40 ca.		P : S, E, D				
	P : N					14.	iP	Z	18	51	00.5
	Mag. 5-5¼ (Mat.)						P : C				
	2.9N., 124.8E.						11.4S., 166.5E.				
	Celebes Sea.						Santa Cruz Is.				
	h : 25 km ca.						h : 229 km ca.				
	H=08 18 18.7						H=18 41 49.5			USCGS	
13.	P	NZ	18	20	29	14.	P	Z	20	10	13
	S	EZ			51		S	NE			37
14.	iP	NEZ	00	35	20.7	15.	P	Z	01	03	32
	i	N			56	15.	eP	Z	01	21	26
	P : N, E, D					15.	eP	Z	01	30	57
14.	P	Z	02	30	37		S	N		31	37
	S	E		31	17	15.	ePKP	Z	08	41	14
14.	iP	NEZ	07	26	49.8	✓	i	Z			34.5
	S	E		28	21		13.0N., 60.5W.				
	i	Z			57		Off coast of Venezuela.				
	e	E		29	08		h : 78 km ca.				
	P : N, E, D						H=08 22 15.9			USCGS	
	43.1N., 145.1E.					15.	P	Z	09	50	16
	Hokkaido, Japan.					15.	P	Z	15	19	00.5
	h : 30 km ca.					15.	P	EZ	17	10	06
	H=07 24 47.6					15.	iP	Z	18	28	55.2
							i	Z		30	58
14.	eL	E	09	53	08		PcP	EZ		31	11
	7.5S., 158.6E.						S	E		35	17
	Solomon Is.						eL	E		39	40
	h : 49 km ca.						P : C				
	H=09 17 21.7						6.0S., 146.8E.				
							Near east coast of New Guinea.				
14.	eP	Z	10	46	22		h : 140 km ca.				
	9.6S., 160.0E.						H=18 21 12.8			USCGS	
	Solomon Is.					15.	iP	NEZ	21	15	27.0
	h : 100 km ca.						S	NZ			44
	H=10 37 32.3						P : N, E				
14.	iP	Z	11	02	23.6						
	P : C										

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
15.	iP	NEZ	23	00	18.0	(continued)					
	S	NE			46		Ceram.				
	P : S, E, D						h : 221 km ca.				
	Mag. 4.6 (Mat.)						H=16 07 01.4			USCGS	
	35.6N., 140.6E.					16.	eP	Z	17	31	02
	Near east coast of Honshu, Japan.					17.	iP	EZ, P N	04	59	50.5
	h : 30 km ca.						P : S, E, D				
15.	P	EZ	23	16	36	17.	iP	NE, P Z	06	48	49.0
	i	E		17	10.5		S	E		49	07
16.	iP	NEZ	00	45	45.3		P : S				
	P : S, E, D					17.	iP	EZ, P N	11	07	37.5
16.	iP	NEZ	05	47	04.2		P : E, C				
	i	N		26		17.	P	Z	11	40	44
16.	iP	NEZ	05	59	51		20.8S., 178.4W.				
	P : C						Fiji Is. region.				
16.	iP	NZ	06	06	03.5		h : 613 km ca.				
	i	E			03.8		H=11 30 28.2			USCGS	
	P : N, D					17.	iP	EZ	12	33	27.5
16.	iP	EZ	09	24	08.2		i	N			28.0
	i	N			39.2		P : W, C				
	P : E, D					17.	P	Z	13	27	54
16.	eP	Z	10	58	43		e	NE		34	58
	i	E		59	00.5		eL	N		38	25
	i	N			26		eL	E			50
16.	P	EZ	11	47	39	17.	iP	Z	15	08	44.7
	eS	NE		57	29		i	NEZ		09	05
	ScS	NE		58	28		i	Z			56
	e	Z			36		P : D				
	eSS	N	12	02	21	17.	P	Z	15	36	03
	L	E		08	18		eS	E		41	47
	L	N			42		L	E		43	58
	Lr	Z		11	35		Lr	Z		45	46
	Mag. 6½ (Mat.)						Mag. 5¾ (Mat.)				
	30.5S., 177.9W.						4.3N., 128.3E.				
	Kermadec Is.						Molucca Passage.				
	h : 39 km ca.						h : 25 km ca.				
	H=11 35 41.3						H=15 29 06.6			USCGS	
16.	iP	EZ	15	47	35.0	17.	P	Z	15	50	01
	S	Z			48		L	E		57	52
	i	E			49		Lr	Z		59	55
	P : W, D						Mag. 6 (Mat.)				
16.	eP	Z	16	14	07		3.9N., 126.6E.				
	3.0S., 129.4E.						Molucca Passage.				

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
h : 74 km ca. H=15 43 18.3						L E 16 12 08					
USCGS						18. P Z 16 04 35					
e	E		18	09	32	18. iP	NEZ		19	48	02.7
e	E		19	18	10	i	NE				27
e	N			20	37	i	N				58.7
eL	E			23	04	P : N					
17. iP	Z		20	33	42.0	18. eP	Z		20	19	15
P : D						e	NE			26	56
17. iP	EZ		20	37	24.7	eL	NE			28	40
i	Z				32	18. iP	EZ		21	54	50.3
e	E				38	S	NE			55	36
P : S, W, C						P : S, W, D					
17. P	Z		21	13	19	18. iP	NZ		21	58	29.7
i	NE				20.0	S	E				51
17. P	Z		21	57	14.0	i	N				53
i	N				14.5	P : S, D					
18. P	EZ		01	02	08	18. P	Z		22	07	58
18. eP	Z		06	43	08	i	E				59
18. P	Z		08	53	50	4.4 S., 129.5 E. Banda Sea.					
18. P	Z		12	06	19	h : 21 km ca. H=21 59 44.1					
iS	NE			07	00	USCGS					
18. eP	Z		13	49	25	19. P	Z		03	27	45
i	NE				25.7	S	NE			28	10
18. eP	Z		15	50	23	19. iP	Z		04	15	57.2
5.3 S., 153.7 E. Solomon Is. region. h : 83 km ca. H=15 42 25.5						P : D					
USCGS						19. iP	Z		04	30	26.7
18. P	Z		15	53	49	S	N				43
PcP	Z			55	39	P : D					
eS	N		16	00	46	19. iP	NE, P Z		06	06	05.5
e	E			01	15	S	N			10	09
eL	E			04	05	i	E				12
eLr	Z			07	48	eL	E		14		47
Lr	N				56	51.5 N., 161.1 E. Off south coast of Kamchatka. h : 29 km ca. H=06 01 09.5					
Mag. 5 1/4 (Mat.) 4.2 S., 153.6 E. New Britain. h : 127 km ca. H=15 45 40.9						USCGS					
18. P	Z		16	01	51	19. iP	EZ		12	58	28.0
i	N			02	29	i	N				28.2
(ontc.)						P : W, D					
						19. iP	Z		13	34	08.7
						P : D					

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
21.5 S., 174.6 W. Tonga Is. h : 25 km ca. H=13 22 37.0						Fiji Is. h : 558 km ca. H=12 51 52.1					
USCGS						USCGS					
19. P	Z		20	49	37	21. iP	NZ, P E		17	55	24.4
L	E			56	58	eS	E			56	53
L	N			58	26	i	NZ			57	26
10.8 N., 122.4 E. Negros, P. I. h : 99 km ca. H=20 43 24.4						P : S, W, C 43.0 N., 144.5 E. Hokkaido, Japan. h : 45 km ca. H=17 53 28.0					
USCGS						USCGS					
20. P	Z		00	11	38	22. eP	Z		03	38	31
20. iP	Z		03	59	01.5	i	E				34
i	Z				21	i	N				36
20. P	Z		14	45	48	i	N				44
20. P	E		16	22	03.2	eS	EZ			39	28
i	Z				03.5	22. P?	Z		07	33	42
i	NE				15.2	eS	E			38	17
20. iP	Z		17	19	51.8	eL	E			41	31
iS	N				55	eL	N			42	24
P : C						52.4 N., 100.0 E. Lake Baikal region. h : 68 km ca. H=07 26 45.3					
20. iP	NZ, P E		18	31	14.0	USCGS					
P : S, C						22. iP	EZ		19	17	46.0
20. iP	Z		19	00	19.0	i	N				46.4
P : D						S	E			18	28
20. iP	Z, P NE		20	06	07.6	i	N				33
P : D						P : E, D					
20. eP	Z		20	22	43	22. P	Z		20	30	54
6.6 S., 152.1 E. Off south coast of New Britain. h : 33 km ca. H=20 14 32.7						30.7 N., 80.6 E. Tibet-India border. h : 25 km ca. H=20 22 17.6					
USCGS						USCGS					
21. P	NEZ		02	33	32	22. eP	NEZ		20	37	57
S	N, eS E			34	18	S	NE			38	43
21. iP	NEZ		13	01	56.8	23. iP	Z, P NE		01	09	03.5
e	Z			03	32	eS	NE			10	10
e	N				44	P : S, W, C					
pP	Z				50	23. P	EZ		05	20	05.5
eS	E			10	05	e	Z			21	13
eSS?	E			13	56	23. P	EZ		12	30	05.5
P : C						(cont.)					
17.7 S., 178.8 W.						(cont.)					

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
	i	NE	12	30	15						
	S N, eS	E		31	50						
	i	N		32	22						
	i	EZ			25						
	i	N			32.5						
23.	P	Z	15	22	37.6						
	i	E			37.7						
	i	N			38						
	S	N		23	36						
	i	E			45						
	P : D										
23.	iP	NZ	16	03	02.0						
	i	E			03.1						
	S	E		04	16.0						
	i	NZ			17.4						
	P : S, D										
23.	eP	NZ	16	06	51						
	PP	Z		08	22						
	PPP	Z		09	09						
	S E, eS N			13	00						
	eLq	NE		15	40						
	Lr	Z		20	10						
	52.5N., 169.5W.										
	Fox Is.										
	h : 25 km ca.										
	H=15 59 20.4										
	USCGS										
23.	e	E	18	18	17						
	44.6N., 12.3E.										
	Near coast of Emilia Romagna, Italy.										
	h : 61 km ca.										
	H=17 31 39.7										
	USCGS										
23.	eP ₁	Z	20	42	49						
	iP ₂ E, P ₂ N				49.5						
	P ₂	Z			49.6						
	i	Z		43	03						
24.	P	NEZ	01	11	21						
	i	NZ			47						
	e	E		13	09						
24.	PKP	Z	03	20	53.8						
	21.2S., 65.7W.										
	Southern Bolivia.										
	h : 238 km ca.										
	(cont.)										

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
	Lr	N	02	17	00						
	Lr	Z		18	00						
	P : C										
	Mag. 6 (Mat.)										
	10.7S., 161.8E.										
	Solomon Is.										
	h : 80 km ca.										
	H=01 50 11.4										
	USCGS										
25.	P?	E	02	29	17						
	S?	Z			18.4						
25.	ePKP	Z	07	45	26						
	i	N			28						
	i	E			32						
	pPKP	NEZ		46	26						
	15.8S., 69.5W.										
	Peru-Bolivia.										
	h : 209 km ca.										
	H=07 26 05.7										
	USCGS										
25.	P	NZ	09	30	35						
	i	E			36						
	i	Z			45						
	PcP	Z		34	18						
	SN, eS E			35	00						
	12.3N., 142.3E.										
	Mariana Is.										
	h : 145 km ca.										
	H=09 25 25.9										
	USCGS										
25.	e	N	09	37	28						
	e	E			45						
25.	P	NEZ	10	14	53						
	4.4S., 152.7W.										
	Line Is. region.										
	h : 50 km ca.										
	H=10 03 07.0										
	USCGS										
25.	eP	EZ	13	41	14						
	e	N			22						
	e	E		42	38						
	e	E		43	06						
	e	N			36						
25.	iP NZ, P E		20	54	29.0						
	P : N, E, D										
25.	P	Z	21	21	35.5						
	(cont.)										

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Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
27.	P	EZ	06	54	15.0	(continued)					
	i	N			15.5	i	EZ		07	16	56.0
	S?	E			36	i	N				56.5
	i	N			39	i	N			17	25
	i	Z			43	i	N				36
27.	P	NEZ	10	43	38.6	28.	iP NZ, P E		16	48	29.2
	iS	NEZ			48.5	PcP	Z			50	41
	P : N, C					eL	NE			59	39
27.	iP Z, P E		13	18	50.6	✓ P : N, C					
	i	Z			20 26	0.0, 123.9E.					
	i	NE			28	Northern Celebes region.					
	i	N			21 28	h : 101 km ca.					
	P : D					H=16 41 13.8				USCGS	
27.	P	NZ	23	20	17	28.	P	Z	16	54	26
	i	Z			29	i	E				31
	L ₁	E			46 48	S	E			57	13
	eL	Z			47.0	i	N				22
	eL ₂	E			59 43	29.	P	NEZ	02	21	11
	Mag. 5 1/4 (Mat.)					S	NEZ				23
	31.0N., 114.3W.					29.	iP NZ, P E		04	13	50.0
	Gulf of California.					S NZ, eS E				14	03
	h : 22 km ca.					P : C					
	H=23 07 42.1					29.	P	EZ	05	08	15
	USCGS					i	N				17
28.	P	NE	00	47	04.5	22.6 S., 174.5W.					
	S	NE			25	Tonga Is.					
28.	P	E	05	51	25.9	h : 25 km ca.					
	i	NZ			26.5	H=04 56 41.9				USCGS	
	i	Z			26.7	29.	P	Z	11	51	45
	S E, eS N		06	00	42	9.1 S., 157.5E.					
	i	Z			47	Solomon Is.					
	ScS	NE			01 37	h : 114 km ca.					
	Lq	E			08 27	H=11 43 12.6				USCGS	
	Lq	N			44	29.	P	Z	13	34	12
	Lr	E			12 24	12.5 S., 165.1E.					
	eLr	N			30	Santa Cruz Is.					
	Lr	Z			42	h : 100 km ca.					
	P : W					H=13 25 03.8				USCGS	
	Mag. 6 (Mat.)					29.	P	Z	15	29	53.5
	17.2 S., 172.0W.					i	E				54.1
	Tonga Is.					S	N			30	28
	h : 25 km ca.					P : D					
	H=05 40 08.2					29.	iP Z, P NE		15	39	47.5
	USCGS										
28.	P	Z	07	16	55.0	(cont.)					

January 1962

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						30.	P	NZ	15	26	34
	i	NEZ	15	39	57	i	E				36
	i	NZ			40 13	i	N			28	35
	P : N, E, D					e	NE			29	05
29.	P	Z	17	16	16	i	E				26
	i	E			16.5	i	Z				35
	i	N			18.0	✓ S	NE				36
	i	E			31	i	E				44
	i	Z			32	i	NZ				45
	i	Z			54	L	E			30	28
29.	iP	EZ	17	18	34.8	eL	N			31	00
	i	N			36.5	Mag. 5.8 (Mat.)					
	S?	EZ			47	20.7N., 144.5E.					
	i	E			19 30	Mariana Is. region.					
	P : E					h : 187 km ca.					
29.	iP	NEZ	17	46	46.0	H=15 22 49.4				USCGS	
	S	NEZ			47 05	30.	eL	E	17	44.0	
	P : N, W, C					79.4N., 123.5E.					
	36.1N., 139.9E.					Laptev Sea.					
	Honshu, Japan.					h : 63 km ca.					
	h : 95 km ca.					H=17 15 33.8				USCGS	
	J.M.A.					30.	iP	Z	18	41	06.9
29.	P	Z	17	56	22	i	N				07.4
	i	NE			23.5	eS	E				49 20
	S	EZ			56	L	E				56 20
29.	P	NEZ	18	40	30.0	L	N				57 09
	i	N			31.6	P : C					
	i	Z			45.5	18.8 S., 168.5E.					
	i	Z			51.7	New Hebrides Is. region.					
	P : D					h : 79 km ca.					
30.	iP	EZ, P N	06	52	57.5	H=18 30 52.3				USCGS	
	S	N			53 22	30.	iP	NZ	19	09	36.7
	P : E, D					i	E				37.0
30.	P	NZ	07	04	35.5	S	NE				10 33
	eL?	E			12 53	P : S, D					
	54.5N., 158.9E.					30.	P	NEZ	19	55	39.8
	Near coast of Kamchatka.					S	E				56 09
	h : 76 km ca.					i	Z				12
	H=06 59 36.9					i	N				13
	USCGS					P : N, E, D					
30.	eL	E	09	27.0		31.	eP	NEZ	00	15	08
	12.7N., 87.7W.					e	E				36 20
	Near coast of Nicaragua.					e	N				41 20
	h : 101 km ca.					(cont.)					
	H=08 34 26.8										
	USCGS										

January 1962

Date	Phase	Comp	h	m	s
(continued)					
	e	E	00	41	26
	38.5N., 70.3E. Tadzhik S.S.R. h : 60 km ca. H=00 05 57.0				
				USCGS	
31.	P	Z	01	52	47.3
	i	NE			48
	i	EZ			58
	i	N			59
	S	NEZ		53	13
	P : D				
31.	P	NEZ	01	58	45.2
	P : S, W, D				
31.	P	Z	13	48	05.0
	i	N			05.3
	S	N			51
	i	E			54
	P : W, D				
31.	P	N	20	18	05.9
	eS	N			27
	P : S				
31.	iP	Z	20	47	31.6
	i	E			31.9
	i	N			32.1
	i	Z			53
	S	Z		50	15
	i	NE			16
	P : D				
31.	iP	Z	21	07	40.1
	i	Z		08	45
	S	E		09	02
	i	N			05
	P : S, W, C				
31.	P	Z	22	33	39.1
	i	N			39.5
	i	E			40.5
	S	NEZ		34	04
	P : D				



60112

February 1962

SEISMOLOGICAL BULLETIN
OF
MATSUSHIRO

FEBRUARY
1962

Matsushiro Seismological Observatory
Matsushiro-Machi, Hanishina-Gun,
Nagno-Ken, Japan

Latitude 36° 32' 30''N,
Longitude 138° 12' 32''E,
Elevation 440M.

Instrumental Constants (September 1, 1960~)

Mark	Name	Comp.	Period (sec)		Damping ratio		Magnification
Bs	Benioff Seismograph (Short Period)	N	$T_1=1.0$	$T_2=0.23$	$h_1=0.81$	$h_2=1.4$	78,000(max)
		E	$T_1=1.0$	$T_2=0.22$	$h_1=0.60$	$h_2=1.2$	68,000(max)
		Z	$T_1=1.0$	$T_2=0.21$	$h_1=1.1$	$h_2=0.94$	110,000(max)
Bl	Benioff Seismograph (Long Period)	N	$T_1=1.0$	$T_2=70$	$h_1=0.81$	$h_2=5.5$	8,600(max)
		E	$T_1=1.0$	$T_2=62$	$h_1=0.60$	$h_2=5.1$	11,000(max)
		Z	$T_1=1.0$	$T_2=84$	$h_1=1.1$	$h_2=7.3$	8,300(max)
V	Short Period Seismograph	Z	$T_1=1.0$	$T_2=2.82$	$h_1=1.4$	$h_2=1.2$	32,000(max)
G	Galitzin Seismograph	N	$T_1=15$	$T_2=100$	$h_1=1$	$h_2=1.2$	1,600(max)
		E	$T_1=15$	$T_2=114$	$h_1=1$	$h_2=1.0$	2,000(max)
		Z	$T_1=7.5$	$T_2=70$	$h_1=0.72$	$h_2=1.0$	920(max)
T	Wood—Anderson Seismograph	N	0.8		0.8		1,100
		E	0.8		0.8		1,300
L	1,000 kg Long Period Seismograph	N	33.8		0.60		104*
		E	27.1		0.39		104

* Constants of Long-period Seismograph, N—S component in the period of January 1 to October 24, 1962 are as follows:

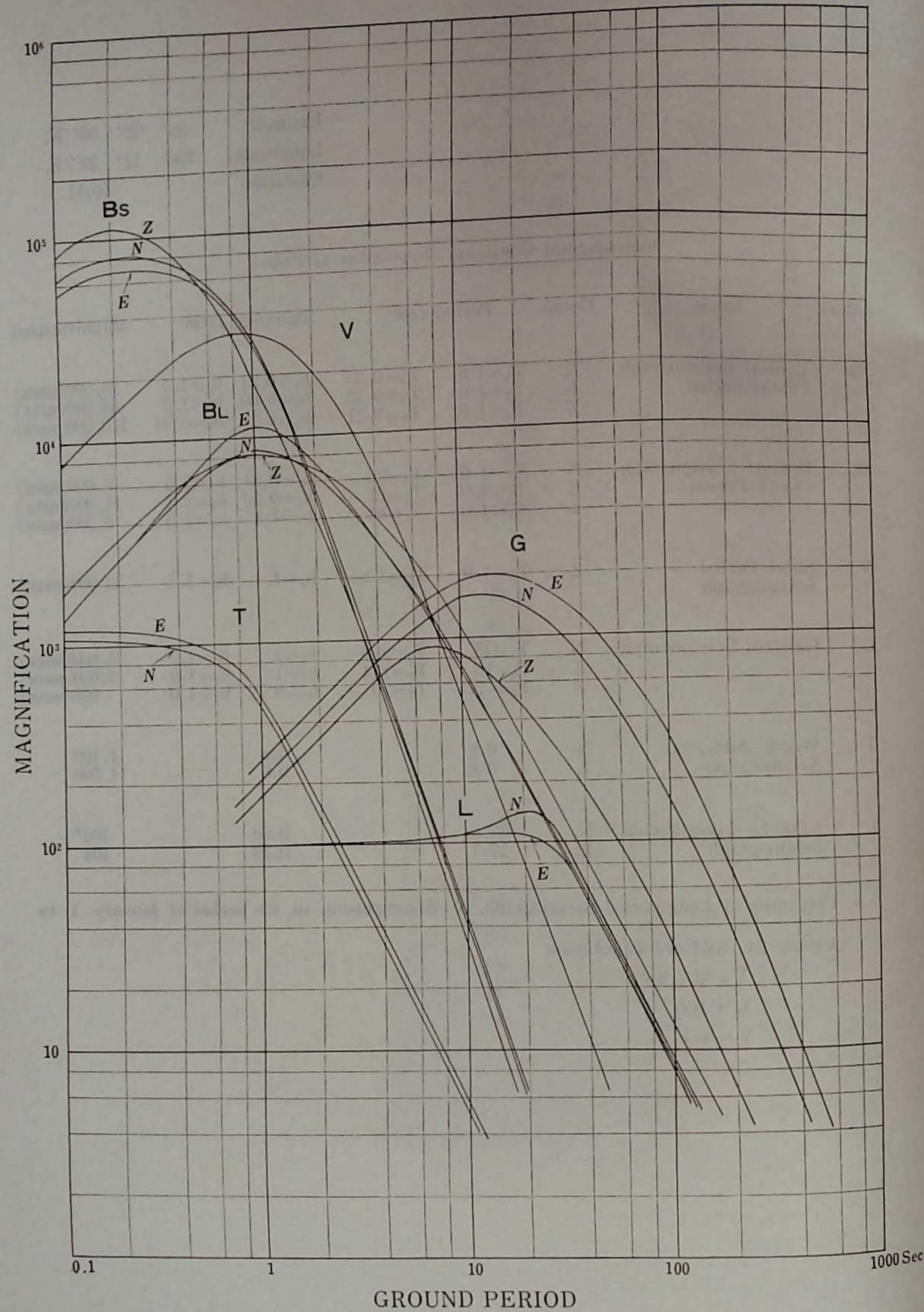
$T=33.8$ sec.
 $h=0.6$
 $V=6.7$

Errata

The following corrections should be made:

Page	Column	Line	Original	Correction
9	1	16 from top	iP Z, P N	Lead iP Z, F E
11	2	2 from top	eL S	eL E

February 1962



GROUND PERIOD

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s	
1.	P	Z	00	52	02.0	(continued)						
	eScS?	E	01	02	34		i	Z	08	02	03	
	eL	E		13	19		i	NE			07	
	P : D					2.	P	EZ	08	08	12.7	
	Mag. $5\frac{1}{2}$ - $5\frac{3}{4}$ (Mat.)						PP	Z		09	53	
	31.7 S., 177.3W.						P : C					
	Kermadec Is. region.						49.9N., 78.2E.					
	h : 30 km ca.						Kazakh, S. S. R.					
	H=00 39 54.6						h : 0 km ca.					
	USCGS						H=07 59 58.5					
1.	P	Z	00	55	57.0	2.	iP	EZ	16	14	40.3	
	P : S, W, C						i	E			56	
1.	P	Z	03	11	21		P : S, C					
	i	NE			35	2.	P	Z	16	45	10	
	S?	N			20		eS	N			51	
1.	eP	Z	05	07	52	2.	P	NEZ	17	22	43.5	
	eS	N			15		i	N			49	
1.	P	NZ	11	14	14.2		i	E			52	
	e	E			27		eS	E			24 30	
	P : N, D						i	E			57	
1.	P	Z	11	32	04.7		L	NE			25 20	
	i	N			05.0		P : S, W, C					
	P : D						Mag. $5\frac{1}{4}$ (Mat.)					
1.	P	Z	12	20	27.5		43.7N., 148.5E.					
	i	NE			27.8		Kurile Is.					
	eS?	E			03		h : 49 km ca.					
	P : D						H=17 20 11.1					
1.	P	Z	12	47	34.5		USCGS					
	S	E			53	2.	P	NZ	18	15	18.7	
2.	P	NZ	03	40	30		i	E			19	
							i	N			24	
	5.4 S., 147.3E.						P : D					
	Bismark Sea.						2.	P	EZ	23	48	33.3
	h : 161 km ca.						S	E			49 40	
	H=03 32 48.3						i	N			59	
	USCGS						eL	E			50 10	
2.	P	Z	05	44	55.5		P : E, C					
	P : C						3.	P	Z	00	45	09
	45.7N., 151.6E.						i	NZ			10.0	
	Kurile Is.						PP	E			46 42	
	h : 37 km ca.						S	E			50 50.5	
	H=05 41 38.7						i	N			52	
	USCGS						iL	E			53 48	
2.	P	NE	07	02	57		Lr	Z			56 50	
	eS	N			17							
	i	E			20							
2.	eP	EZ	08	01	59							

(cont.)

(cont.)

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
Mag. 6½-6¾ (Mat.)						i N 11 12 08					
1.2S., 137.8E.						i Z 10.6					
North of New Guinea.						eS E 50					
h : 17 km ca.						P : C					
H=00 37 53.6						4. eP Z 13 07 48					
USCGS						eL E 19 05					
3.	eP	Z	09	12	15	5.3S., 151.6E.					
	S	N		13	11	New Britain.					
3.	eP	Z	10	01	49	h : 81 km ca.					
	i	NZ			53	H=12 59 51.8					
	eS	E		02	18	USCGS					
3.	iP	NEZ	10	38	12.0	4.	P	Z	15	19	46.4
	i	NE			25		i	NE			48.4
P : N, W, C							S	NE		20	12.5
3.	eP	Z	11	49	03		i	Z			13.5
	eL	E	12	11	54	4.	iP	NEZ	16	54	21.3
17.4S., 66.9E.							S?	NE			22.0
Mascarene Is. region.						P : N, E					
h : 17 km ca.						4.	ePP	Z	21	51	53
H=11 36 19.1							e	E	22	03.5	
USCGS							eSS	E		10	07
3.	P	Z	11	53	08.2		eL	E		24	30
	i	E			09.2		Lr	E		31	54
	i	Z			21		L	Z		54	14
P : D						Mag. 6-6¼ (Mat.)					
3.	eP	NZ	18	33	55	0.5S., 20.2W.					
3.	P	NEZ	22	51	40	South Atlantic Ocean.					
4.	P	Z	01	27	27.5	h : 17 km ca.					
4.	P	NZ	03	02	50	H=21 29 33.2					
	i	N			59	USCGS					
	eS	E		09	28	4.	P	Z	23	38	42.4
	eL	E		12	41	5.	iP	Z	00	08	38.0
Mag. 5¼-5½ (Mat.)							i	N			38.4
4.6S., 119.0E.							iS	N		09	04.2
Celebes.							i	Z			06
h : 89 km ca.						P : E, C					
H=02 54 42.1						5. P EZ 07 17 55.5					
USCGS						i NZ 56.5					
4.	P	Z	04	59	31.9	S N 18 15					
	eS	NEZ	05	00	24	5. iP NEZ 12 42 35.0					
P : C						iS N 54.0					
4.	P	Z	05	40	43.2	P : S, E, D					
	i	NE			45.0	5. P EZ 16 17 42.5					
	i	E			58	(cont.)					
4.	P	Z	11	12	07.1	(cont.)					

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
	eS	N	16	18	17	H=01 55 50.4					
P : W, C						USCGS					
5.	P	EZ	17	47	51.4	6.	P Z, eP	NE	03	33	27.0
	i	NZ			52.5		e	E		35	43
	i	NEZ			53.0	P : D					
	S	N		48	18	37.8N., 140.4E.					
	i	E			21	Honshu, Japan.					
P : W, C						h : 372 km ca.					
5.	P	EZ	17	53	41.5	H=03 32 50.3					
	i	N			42.5	USCGS					
	eS	Z			54	6.	P	EZ	03	35	45.7
P : W, D							i	E			54.5
5.	P	NEZ	18	46	10.4		eS	N		36	35
	i	Z			11.4	30.0N., 132.0E.					
	i	Z			24.0	Near south coast of Kyusyu, Japan.					
	i	N			43	h : 0 km ca.					
	S	N			59	J.M.A.					
	i	Z			47	6.	iP Z, P E		07	51	24.4
P : N, W, C							i	N			32.5
5.	P	EZ	20	27	23.0	P : D					
	i	Z			23.5	6.	P	NEZ	08	26	13.3
	eS	N			41		S	E			28
P : E, D						P : N, E					
5.	P	NEZ	22	56	16.0	6.	P	EZ	17	58	42.0
	i	NEZ			16.5		iS	NE			58.3
	S	N			34.0	P : W, C					
35.7N., 139.2E.						6. P EZ 20 03 25.2					
Central Honshu, Japan.						i EZ 25.5					
h : 100 km ca.						S EZ 58					
J.M.A.						P : W, C					
6.	P	Z	01	40	54	36.2N., 141.7E.					
	S	NE			41	Honshu, Japan.					
6.	P	Z	01	58	09.1	h : 40 km ca.					
	i	NE			09.2	J.M.A.					
	i	N			20.5	7.	P	NEZ	01	15	39.5
	i	E			41		i	Z			46
	eS	E	02	00	34		eS	N		18	18
	i	N			01	7.	PKP ₁	Z	07	55	38
	eL	Z			02		ePKP ₂	Z		56	09
P : D						20.4S., 68.4W.					
29.5N., 130.4E.						Chile-Bolivia border.					
Ryukyu Is. region.						h : 222 km ca.					
h : 40km ca.						H=07 36 05.1					
USCGS						7. P Z 09 35 35.7					
(cont.)						i N 47					
(cont.)						S N 37 44.4					

February 1962

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s	
(continued)						(continued)						
	i	E	02	44	21.5	New Ireland region.						
	i	N		45	28	h : 100 km ca.						
	i	Z			37	H=18 55 32.0						
	iS	E			41.5	12.	iP	Z	06	51	40.3	
	i	E		48	00	2.0N., 128.1E.						
	iScP	Z		53	15	Halmahera.						
	ScS	E		56	44	h : 169km ca.						
	e	E			47	H=06 45 00.4						
	P : N,C					12.	iP	Z	08	47	50.2	
	Mag. 5.9 (Mat.)						iS	NE		48	06.8	
	29.6N., 139.0E.					P : D						
	South of Honshu, Japan.					12.	iP Z, P N		12	00	11.2	
	h : 400 km ca.						i	E			11.5	
	H=02 42 36.1						eS	NE		01	59	
11.	iP Z, P N		03	29	38.3	P : D						
	i	N			39.9	44.0N., 146.5E.						
	eS	E		30	14	Near coast of Hokkaido, Japan.						
	P : D					h : 113 km ca.						
11.	iP Z, P NE		04	27	47.5	H=11 57 53.3						
	S	NE		28	15	12.	iP Z, P N		13	46	10.4	
	P : C						eS	N			33	
11.	iP	Z	08	26	21.2	P : C						
	P : C					12.	iP	Z	14	26	15.8	
11.	P	Z	10	08	55		i	NEZ			16.0	
	52.0N., 168.0W.						i	N			16.5	
	Fox Is., Aleutian Is.					P : D						
	h : 50 km ca.					12.	iP	Z	17	26	54.9	
	H=10 01 24.8						iS	EZ		27	34.4	
11.	P	Z	12	27	56	P : N,E,C						
11.	iP	NEZ	15	44	21.2	Mag. 5.2 (Mat.)						
	S	E			39	34.0N., 138.2E.						
	P : W,C					Southern Honshu, Japan.						
11.	iP	NZ	19	03	23.0	h : 280 km ca.						
	i	Z			40.8	J.M.A.						
	S	E		09	28	12.	eP	Z	22	10	47	
	eLq	E		12	27	12.6N., 139.8E.						
	ScS	E		13	11	West of Mariana Is. region.						
	eLr	Z		15	40	h : 73 km ca.						
	Lr	N		16	09	H=22 05 34.9						
	P : N,C					12.	P	NZ	23	27	20	
	Mag. 6¼-6½ (Mat.)						eS	E		29	10	
	4.5S., 153.5E.						e	Z			13	
	(cont.)						(cont.)					

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February 1962

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
						14.	P	Z	02	15	53
						Bonin Is. region.					
						6.2N., 126.8E.					
						h : 168 km ca.					
						Near coast of Mindanao, P. I.					
						h : 101 km ca.					
						H=02 09 28.5					
13.	eP	Z	00	11	21	USCGS					
	S	E			51	14.	iP Z, P N		02	54	49.3
13.	eP	EZ	02	26	27		i	E			50.0
	i	EZ			27.8	eL E 03 03 39					
	eL	N		30	43	P : C					
	L	E		32	00	0.1N., 123.8E.					
	49.0N., 156.2E.					Northern Celebes.					
	Kurile Is.					h : 96 km ca.					
	h : 45 km ca.					H=02 47 30.7					
	H=02 22 15.2					USCGS					
13.	P	Z	05	07	24	14.	iPKP ₁	Z	06	55	52
	e	N			35		e	Z			55
	S	E			44		i	Z			56 05.5
13.	P	Z	05	16	41		ePKP ₂	Z			24
	i	E			42.0		PP	Z	07	00	03
	S	E		17	02		i	EZ			06 46
13.	e	E	07	59	35		i	Z			09 00
	eL	E	08	00	41		i	Z			10 10
13.	iP	Z	20	35	39.4		eSS	E			18 43
	i	N			39.9		e	E			20 30
	i	E			40.1		SSS	E			25 53
	eL	E		37	30		Lr	Z			47 44
	P : C						L	N			53 22
	42.9N., 145.8E.						L	Z			56 57
	Near coast of Hokkaido, Japan.					PKP ₁ : C					
	h : 40 km ca.					Mag. 7½-7¾ (Mat.)					
13.	iP	NZ	21	09	22.1	38.1S., 73.1W.					
	i	E			22.4	Near coast of Chile.					
	S	NE			43.6	h : 44 km ca.					
	P : S					H=06 36 01.3					
13.	iP	Z	22	18	20.9	USCGS					
	S	NE		19	02	14.	ePKP	Z	08	49	03
	P : D					38.2S., 73.1W.					
13.	iP	NEZ	23	03	10.9	Near coast of Chile.					
	iS	NE			28.0	h : 40 km ca.					
	P : S,E,D					H=08 29 00.1					
	35.9N., 139.1E.					USCGS					
	Central Honshu, Japan.					14. iP Z 11 49 58.2					
	h : 120 km ca.					5.7N., 126.0E.					
	J.M.A.					Near coast of Mindanao, P. I.					
						h : 147 km ca.					
						H=11 43 35.1					
						USCGS					

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Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						18.	iPKP	Z	17	44	12.8
P : C						✓	eSS	E	18	03	11
52.7N., 169.7W.						✓	PSPS	E		04	18
Fox Is., Aleutian Is.						✓	eSSS	E		07	38
h : 29 km ca.							e	E		17	00
H=22 28 22.8							eLr	E		19	39
USCGS							PKP : C				
18.	iP	Z	01	32	44.8		Mag. 6-6¼ (Mat.)				
	i	N			46.1		8.1N., 74.6W.				
	i	Z			47		Northern Colombia.				
	i	E			47.6		h : 70 km ca.				
	i	Z			55.2		H=17 25 17.3				
	e	Z		35	26		USCGS				
	i	E			27	18.	P	Z	22	35	55.0
	S	E			36		i	Z		36	06
	iLr	E			38		eS	E		44	18
P : C							eL	E		50	21
49.2N., 156.6E.						P : C					
Kurile Is.						15.5 S., 166.8 E.					
h : 46 km ca.						New Hebrides Is.					
H=01 28 34.9						h : 45 km ca.					
USCGS						H=22 26 06.5					
18.	eL	NE	07	52	18	18.	iP	Z	23	28	20.0
18.	iP	NEZ	08	26	52.5	✓	i	Z			33.5
	i	Z			52.8	✓	P : C				
	iS	Z			27	18.	iP	NEZ	23	46	13.2
P : N, E							e	E			30
18.	iP	NEZ	08	39	16.0		i	N			32
	i	N			26.1		i	EZ			32.5
P : N, E, D						P : N, W, C					
18.	iP	Z	10	43	59.8	19.	e	Z	00	43	27
✓	i	NZ			44		e	E		48	11
	i	E			00.2	19.	iP	E	00	50	46.6
	eS	E			45		i	Z			56.0
	i	E			23.0		i	Z		51	34
	L	E			30	P : E					
P : C						19.	iP	Z	03	03	33.0
41.2N., 142.7E.						P : C					
East coast of Honshu, Japan.						52.3N., 158.4E.					
h : 60 km ca.						Near coast of Kamchatka.					
J.M.A.						h : 32 km ca.					
18.	P	Z	13	36	59.2	H=02 58 46.9					
	iS	Z			37	USCGS					
18.	iP	EZ	14	14	46.4	19.	i	N	04	49	34
	eS	N			15	19.	iP	Z	06	06	50.1
P : W, C						(cont.)					

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
	i	E	06	06	50.3		e	E	10	37	57
	S	N			07		P : E, D				
19.	iP	Z	09	36	26.8		25.9 S., 178.4 E.				
P : C						South of Fiji Is. region.					
19.	P	Z	11	16	01		h : 655 km ca.				
20.2 S., 175.1 W.						H=10 07 26.6					
Tonga Is.						USCGS					
h : 95 km ca.						20.	iP	NEZ	16	07	41.8
H=11 04 46.6						✓	S	EZ, eS N		09	10
USCGS						✓	i	N			13
19.	iP	E	18	38	16.0		ePKPPKP?				
P : W							Z			46	36
19.	P	Z	23	57	21.8	P : S, W, C					
	i	E			22.0	Mag. 6.2 (Mat.)					
P : C						42.7N., 145.5E.					
20.	P	EZ	02	50	38.6	Near coast of Hokkaido, Japan.					
	iS	NEZ			43.8	h : 60 km ca.					
P : E, C						J.M.A.					
20.	P	Z	02	51	31	20.	iP	Z	19	12	12.2
	iS	Z			35.7		i	N			12.4
20.	iP	Z	03	21	22.0		i	Z			20.9
	i	Z			47.4		eL	E		15	34
20.	iP	NEZ	05	04	59.4	P : D					
	iS	NEZ			05	46.8N., 152.8E.					
P : N, E, C						Kurile Is.					
20.	eP	NEZ	09	25	01	h : 22 km ca.					
✓	i	Z			26	H=19 08 39.8					
	S	N			32	USCGS					
	i	E			21	20.	e	Z	20	24	27
✓	eSS	E			36	50.6 S., 110.8 E.					
	L	NE			38	South of Australia.					
	eL	E			42	h : 31 km ca.					
Mag. 5½-5¾ (Mat.)						H=20 11 13.7					
6.8N., 92.5E.						USCGS					
Nicobar Is.						20.	P	Z	22	09	41.7
h : 29 km ca.						✓	i	Z			45.0
H=09 15 55.1						✓	i	EZ		11	14
USCGS						✓	S	E		15	17
20.	iP	EZ, P N	10	17	50.7		i	N			24
	PcP	Z			18	i Z, e NE					
	S	E			26	18 04					
	eSS	N			31	L E					
	eSS	E			22	20 04					
	eSSS	E			34	L NEZ					
(cont.)						22 50					
(cont.)						Mag. 6¼-6½ (Mat.)					
(cont.)						26.1N., 96.8E.					
(cont.)						Northern Burma.					
(cont.)						h : 25 km ca.					
(cont.)						H=22 02 38.2					
(cont.)						USCGS					

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
Mag. 5-5¼ (Mat.) 0.1 S., 122.3 E. Northern Celebes. h : 25 km ca. H=08 44 48.8 USCGS						26.	P	NEZ	15	17	25
							S	NE			43.4
26.	P	NZ	15	26	54	Mag. 6¾ (Mat.) 37.4 S., 73.2 W. Near coast of Central Chile. h : 40 km ca. H=12 40 48.9 USCGS					
26.	P	Z	15	58	03	27.	iPKP ₁	Z	14	23	04.4
	S	Z		59	50		PKP ₂	Z			36.3
P : D 44.7 N., 146.6 E. Kurile Is. h : 25 km ca. H=15 55 33.7 USCGS						PKP ₁ : C 19.2 S., 69.4 W. Northern Chile. h : 140 km ca. H=14 03 27.3 USCGS					
26.	e	E	17	01	40	27.	iP	Z	14	28	55.8
	eL	E		11	16	P : D 2.7 S., 130.1 E. Ceram Sea. h : 40 km ca. H=14 21 24.5 USCGS					
26.	P	EZ	21	37	51	27.	iP	NEZ	19	43	30.8
6.9 S., 150.5 E. New Britain. h : 60 km ca. H=21 29 42.3 USCGS							e	E		44	21
27.	iP	NZ, P E	06	01	15.0	P : N, E, D					
P : S, C 63.0 N., 150.0 W. Central Alaska. h : 100 km ca. H=05 52 28.5 USCGS						27.	iP	NEZ	21	21	25.8
27.	iP	Z	06	41	16.6	P : N, E, D					
	eS	E		46	38	27.	iP	NEZ	21	39	30.4
	L	N		51	34	P : N, D					
	L	E			47	27.	iP	NEZ	23	17	27.5
P : D 27.7 N., 101.9 E. Szechwan, China. h : 40 km ca. H=06 34 55.4 USCGS							i	NE			35.0
27.	PKP ₁	Z	13	00	43		i	Z			37.6
	PKP ₂	Z		01	09.8	P : N, W, D					
	PP	Z		04	42	28.	iP	Z, P E	04	12	47.5
	SKKS	E		11	20		i	N			49.0
	SKKKS	E		13	39		i	E			50.0
(cont.)							S	E		13	16
						P : C					
						28.	P	Z	04	39	22
							i	NE			23.3

Date	Phase	Comp	h	m	s
(continued)					
	S	EZ	04	39	50
28.	eL	E	05	38	00 ca.
2.5 S., 140.5 E. Near north coast of New Guinea. h : 25 km ca. H=05 19 54.1 USCGS					
28.	P	Z	07	20	56.1
	i	N			57.1
	i	EZ			57.9
	eS	E		21	51
	L	E			59
Mag. 6.2 (Mat.) 31.4 N., 139.2 E. South of Honshu, Japan. h : 62 km ca. H=07 19 44.5 USCGS					
28.	iP	NEZ	07	27	22.1
P : S, D					
28.	P	Z	08	03	23
	i	NZ			25.3
	i	NE		04	19.6
28.	iP	Z, P E	08	20	36.8
	S	E			47
	i	Z			49.1
28.	P	NEZ	08	24	08
28.	P	NEZ	08	51	40
	S	NE		52	42.6
28.	P	NEZ	12	11	13.6
28.	P	Z	14	13	18
	e	Z		15	19
28.	P	NEZ	18	10	43
51.6 N., 179.6 W. Andreanof Is., Aleutian Is. h : 60 km ca. H=18 04 09.0 USCGS					
28.	iP	Z	18	51	52.5
	i	Z			56.3
	i	Z		52	23.6
28.	e	E	20	53	00
	eL	E	21	02	20



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SEISMOLOGICAL BULLETIN
OF
MATSUSHIRO

MARCH
1962

Matsushiro Seismological Observatory
Matsushiro-Machi, Hanishina-Gun,
Nagno-Ken, Japan

Latitude 36° 32' 30''N.
Longitude 138° 12' 32''E.
Elevation 440M.

Instrumental Constants (September 1, 1960~)

Mark	Name	Comp.	Period (sec)		Damping ratio		Magnification
Bs	Benioff Seismograph (Short Period)	N	$T_1=1.0$	$T_2=0.23$	$h_1=0.81$	$h_2=1.4$	78,000(max)
		E	$T_1=1.0$	$T_2=0.22$	$h_1=0.60$	$h_2=1.2$	68,000(max)
		Z	$T_1=1.0$	$T_2=0.21$	$h_1=1.1$	$h_2=0.94$	110,000(max)
Bl	Benioff Seismograph (Long Period)	N	$T_1=1.0$	$T_2=70$	$h_1=0.81$	$h_2=5.5$	8,600(max)
		E	$T_1=1.0$	$T_2=62$	$h_1=0.60$	$h_2=5.1$	11,000(max)
		Z	$T_1=1.0$	$T_2=84$	$h_1=1.1$	$h_2=7.3$	8,300(max)
V	Short Period Seismograph	Z	$T_1=1.0$	$T_2=2.82$	$h_1=1.4$	$h_2=1.2$	32,000(max)
G	Galitzin Seismograph	N	$T_1=15$	$T_2=100$	$h_1=1$	$h_2=1.2$	1,600(max)
		E	$T_1=15$	$T_2=114$	$h_1=1$	$h_2=1.0$	2,000(max)
		Z	$T_1=7.5$	$T_2=70$	$h_1=0.72$	$h_2=1.0$	920(max)
T	Wood—Anderson Seismograph	N	0.8		0.8		1,100
		E	0.8		0.8		1,300
L	1,000 kg Long Period Seismograph	N	33.8		0.60		104*
		E	27.1		0.39		104

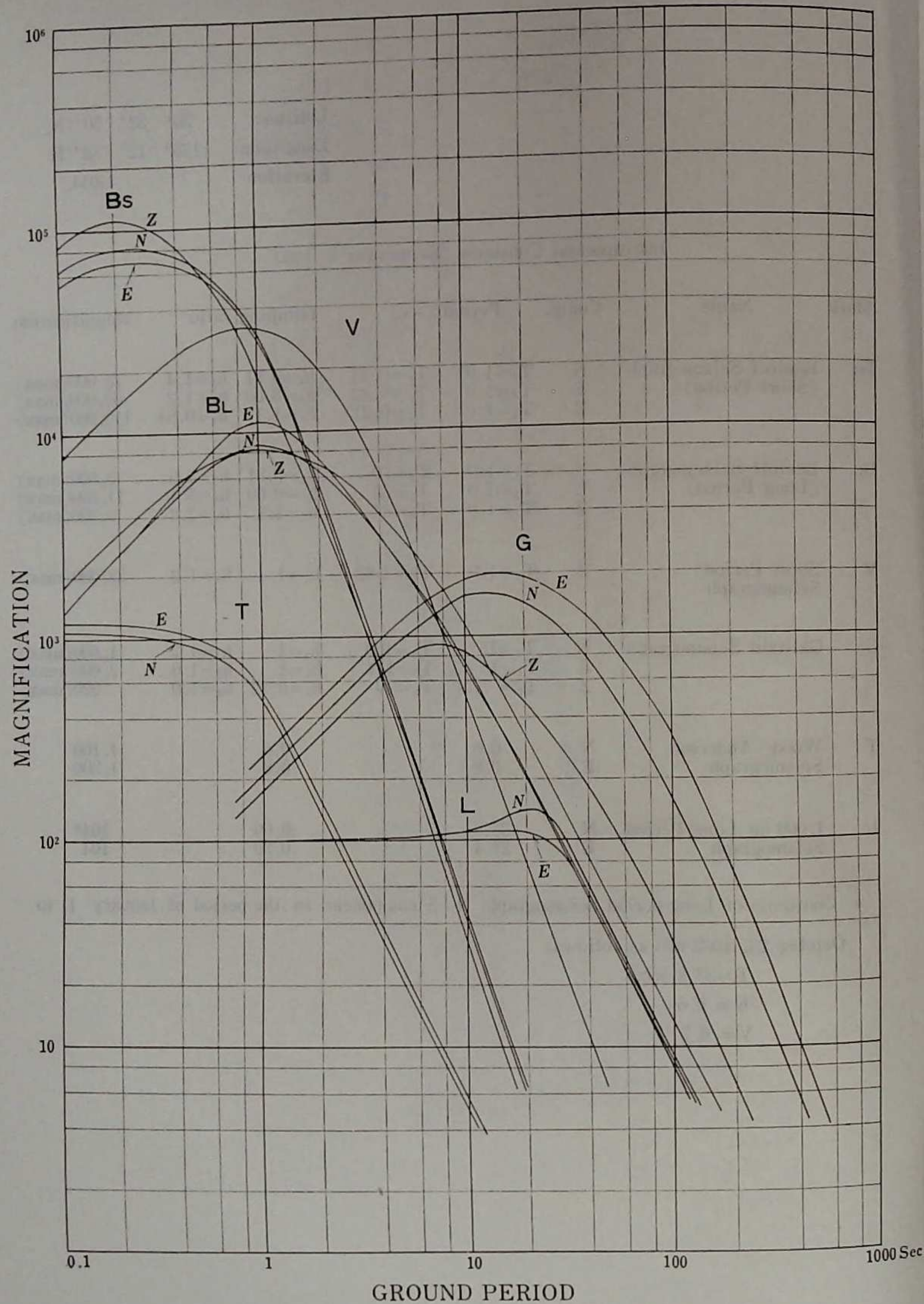
* Constants of Long-period Seismograph, N—S component in the period of January 1 to October 24, 1962 are as follows:

$T=33.8$ sec.
 $h=0.6$
 $V=6.7$

Errata

The following corrections should be made:

	Page	Column	Line				
Mar.	7	2	14 from top	Hindu Kusu.	read	Hindu Kush.	
	9	2	8 from bottom	h: 315 km ca.		h : 135 km ca.	



GROUND PERIOD

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s	
1.	P	EZ	01	59	38.9	(continued)						
	i	N			39.0	H=12 21 16.6 USCGS						
	S	N			56	1.	iP	NEZ	12	44	32	
	P : E					1.	P	NEZ	15	34	47.6	
1.	iP	Z	02	32	05.6		S	N		35	14	
	eL	E	03	19	20	1.	e	E	18	04	22	
	15.7 S., 74.4 W.						1.	iP	EZ	18	37	21.8
	Southern Peru.							i	N			22.0
	h : 62 km ca.							i	Z			34
	H=02 12 37.2							eS	E			39 07
	USCGS							eL	E			30
1.	iP	Z	04	52	55.7		P : E, D					
	i	NE			55.8		43.0 N., 146.2 E.					
	P : D						Near east coast of Hokkaido, Japan.					
1.	iP	NEZ	04	55	44.1		h : 48 km ca.					
	i	N			45.3		H=18 35 12.9 USCGS					
	eS	Z			58 38		1.	P	EZ	23	51	13.7
	i	E			41			i	N			13.8
	L	E			59 10			ePPP	Z			54 34
	P : N, E, C							S	NE			59 27
	Mag. 5-5 1/4 (Mat.)							eSS	E	00	03	22
	25.7 N., 124.8 E.							eLq	E		05	54
	Ryukyu Is.							eLr	E		08	19
	h : 52 km ca.							P : E, D				
	H=04 51 57.2							Mag. 6 1/4 - 6 1/2 (Mat.)				
	USCGS							14.0 S., 172.5 E.				
1.	P Z, eP N		05	37	07		Samoa Is.					
	i	EZ			38 08		h : 73 km ca.					
1.	eP	EZ	05	38	55		H=23 41 14.5 USCGS					
	e	EZ			39 55		2.	iP	EZ	00	34	12.5
1.	iP	NEZ	07	52	02.8			S	Z			13.5
	S	NE			29		P : D					
	P : N, W, C						2.	iP	EZ	00	52	45.2
1.	eP	Z	09	49	18			i	N			45.7
	e	Z			50 22		P : E, D					
	e	E			36		2.	eP	Z	04	25	27
1.	iP	NZ	09	54	21.0		0.8 N., 123.9 E.					
	i	E			21.2		Celebes.					
	S	Z			55 11		h : 194 km ca.					
	P : S, C						H=04 18 09.0 USCGS					
1.	P	NZ	12	25	22.4		2.	P	Z	04	53	47
	i	E			22.9			i	NE			48
	49.4 N., 155.3 E.							i	E			55 09
	Kurile Is.							i	Z			11
	h : 86 km ca.						(cont.)					

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
	S	NEZ	15	45	14		i	E	08	30	43.7
	P : N, W, D						i	E			45.5
5.	P	Z	16	51	29		P : S				
	eL	NE		55	47	6.	eS	E	13	33	24
19.1N., 121.1E. Off northwest coast of Luzon, P. I. h : 14 km ca. H=16 46 23.9 USCGS							eL	E		45	08
5.	P	EZ	17	27	49.4	41.9N., 127.0W. Off coast of California. h : 25 km ca. H=13 12 58.7 USCGS					
5.	P	Z	20	10	29.0	6.	P	Z	15	37	52
P : D							i	Z			54.8
5.	P	Z	21	09	15		eL	E		43	42
40.3N., 125.1W. Off coast of California. h : 25 km ca. H=20 57 52.1 USCGS							12.5 N., 143.9E. Mariana Is. h : 33 km ca. H=15 32 33.0 USCGS				
5.	eL	E	23	47	31	6.	iP	NZ	16	51	02.2
6.	eP	Z	05	50	50		i	E			02.5
	i	Z		51	23		eS	NEZ		52	02
6.	P	Z	06	04	07.6		P : S, D				
	i	N			09.7	6.	iP	NZ	17	37	45.0
	PcP	Z		05	43		S	N		38	05
	i	E			44		P : S, C				
	e	E		06	02	6.	iP	NZ	18	44	31.1
	eS	E		10	48		S	E			46.5
	eL	N		13	52		P : S, C				
	eL	E		14	25	6.	P	Z	18	58	54
P : C Mag. 6 1/4 (Mat.) 13.7N., 93.7E. Andaman Is. h : 18 km ca. H=05 55 42.3 USCGS							12.1S., 167.8E. Santa Cruz Is. h : 60 km ca. H=18 49 22.0 USCGS				
6.	P	EZ	07	27	22.8	6.	eP	Z	19	02	36
	i	N			23.0		eL	E		06	39
	S	NE			40	6.	eL	E	20	53.0	
P : W						6.	iP	Z	22	06	10.2
6.	eP	Z	07	32	43		S	NE			32.0
	i	Z		33	58		P : C				
	eS	E		37	08	6.	P	Z	22	18	47.5
	eL	E		38	28		P : D				
6.	iP	NZ	08	30	43.5	6.	eP	Z	22	33	20
(cont.)							i	Z			33
							eL	E		37	05
							eL	N			14

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
7.	P	EZ	05	06	52.5		P : C				
	i	N		07	05	7.	iP	EZ	19	15	53.9
	i	N			27		i	Z		16	04.0
	e	E		10	10		iPcP N P : E, D 52.4N., 174.5W. Andreanof Is., Aleutian Is. h : 25 km ca. H=19 08 46.9 USCGS				
7.	eP	Z	07	03	42	7.	iP	Z	19	29	07.0
	i	NEZ			51		P : D 36.4N., 71.6E. Hindu Kusu. h : 100 km ca. H=19 20 01.1 USCGS				
7.	P	EZ	09	18	58.5	7.	iP	EZ	22	04	33.0
	i	EZ		19	22		i	N			33.1
7.	iP	NEZ	11	04	41.2		P : W, D 0.0., 123.9E. Celebes. h : 25 km ca. H=21 57 08.8 USCGS				
	S	NEZ		07	06	8.	P	EZ	06	11	57.4
	i	NEZ			34		i	N			57.5
	ScS	NE		14	49		S	E		12	11.5
P : S, E, D Mag. 7.0 (Mat.) 19.3N., 145.3E. Mariana Is. h : 680 km ca. H=11 01 00.4 USCGS							i	N			12.0
7.	P	EZ	11	30	06		P : E				
7.	eP	Z	11	38	37 ca.	8.	eP?	Z	07	42	13
7.	P	Z	11	50	03.8		iS	N			52.0
	eS	N			43		i	EZ			53.5
7.	iP	NZ	14	03	13.3	8.	iP	NZ	08	15	48.0
	eS	N		07	08		i	E			48.5
	eL	E		09	17		S	N		19	44
P : S, D 17.2N., 147.1E. Mariana Is. h : 41km ca. H=13 58 32.4 USCGS							eL	E		21	55
7.	eP	Z	14	24	55		P : N, C 17.9N., 146.5E. Mariana Is. h : 131 km ca. H=08 11 12.9 USCGS				
	i	Z		26	32	8.	P	NEZ	08	45	24
7.	iP	Z	15	20	47.3		S	E			45
	eL	E		27	42		i	N			47
P : D 51.5N., 160.6E. Off southeast coast of Kamchatka. h : 20 km ca. H=15 15 53.1 USCGS						8.	iP	NEZ	10	50	27.5
7.	P	NZ	15	51	33.9	(cont.)					
7.	iP	Z	18	34	19.9	(cont.)					
	i	NE			20.0	(cont.)					
	eS	N		35	39	(cont.)					

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Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						9.	P	Z	17	40	33.0
✓ S	NE	10	53	11							
L	N			45							
P : S, W, C											
46.0N., 152.7E.											
Kurile Is.											
h : 48 km ca.											
H=10 47 03.9											USCGS
8. eP	Z	20	59	42		9.	P	Z	18	29	10.5
eL	E	21	08.1			eS	NE			30	06
1.2N., 126.1E.						9.	P	Z	22	15	28.9
Molucca Passage.						✓ S	E			21	45
h : 43km ca.						L	N			24	53
H=20 52 38.1						L	E				55
8. PKP	Z	21	08	24.5		L	NE			28	38
eSS	E			32	52						
eL	E			50.2							
Mag. 5 $\frac{3}{4}$ -6 (Mat.)											
44.9S., 79.4W.											
Off coast of southern Chile.											
h : 25 km ca.											
H=20 48 38.1											USCGS
8. iP	NEZ	22	12	09.8		9.	eP	Z	22	44	51
S	NEZ			27.5		i	NZ			48	17.5
P : S, E, D						10.	P	NEZ	01	03	10.2
9. iP	NEZ	03	45	24.5		10.	iP	Z	01	05	16.8
P : S, W, D											
9. P	NEZ	05	45	56.5							
S	N			46	24						
i	E				25						
9. iP	E	07	07	30.8							
eS	E			15	54						
e	E				19.1						
P : W											
18.4S., 178.7W.											
Fiji Is.											
h : 472 km ca.											
H=06 57 08.7											USCGS
9. eL	E	08	02.5			10.	eP	EZ	08	48	36
9. eL	E	12	31	14		eL	E			52	42
9. P	EZ	14	10	37		eL	Z			55	26
i	N				51						
9. eP	E	15	07	57							
S	N				08						
					15.5						

(cont.)

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Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
						i	N		07	29	03
						ePPP	NE			32	16
						S	NE			37	05
						eL	E			45	09
						eL	N			46	00
						Mag. 5 $\frac{1}{2}$ -5 $\frac{3}{4}$ (Mat.)					
						13.9S., 172.1E.					
						New Hebrides Is. region.					
						h : 133 km ca.					
						H=07 18 56.7					USCGS
						11. iP	NEZ	08	12	21.5	
						S	NE				39.4
						P : N, E, D					
						11. iP	NEZ	09	18	23.2	
						S?	NE				34
						P : E, D					
						11. P	Z	10	16	56	
						i	E			17	04
						i	N				05
						S	N				35
						11. iP	NEZ	14	16	57.2	
						S	NEZ			17	19
						i	N				29
						P : S, E					
						11. iP	EZ	15	30	00	
						i	N				00.6
						pP	Z				28
						✓ sP	NE				44
						eS	E			34	52
						i	NE			35	03
						L	N			36	56
						L	E			37	03
						P : E, C					
						52.3N., 178.0E.					
						Rat Is., Aleutian Is.					
						h : 315 km ca.					
						H=15 23 40.7					USCGS
						11. iP	Z	15	36	17.9	
						P : D					
						11. iP	NEZ	16	20	10.1	
						i	N				38
						P : S, E, D					

(cont.)

(cont.)

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Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						12.	P	Z	02	20	31.1
19.4N., 144.9E.							i	E			31.5
Mariana Is. region.						P : C					
h : 428 km ca.						34.1N., 70.9E.					
H=16 16 24.1						Hindu Kush.					
USCGS						h : 44 km ca.					
11.	P?	Z	16	22	10	H=02 11 09.6					
	S	N		23	20	12.	iP	NEZ	02	41	26.1
11.	iP	NEZ	17	47	23.3		S	N		42	07
	i	E			44		i	N			08.4
	e	E		48	48	P : N, W, C					
P : N, E, D						12.	iP	NEZ	04	48	10.3
11.	P	EZ	19	25	07.5		S	NE			15
	i	N			08	P : S, W, C					
	i	N			16.5	12.	P	Z	05	20	14
PP	NE			26	14		eL	E		26	51
S	N			30	00	12.	PKP	Z	10	00	26
i	NEZ				25	✓	SP	E		11	50
i	NE				43		eSSS	E		18	52
L	E		31	28	30		e	E		22	52
L	N				30		eLq	E		27	11
Lr	E		33	09			eLr	E		33	50
Lr	N			27		9.0N., 83.0W.					
Mag. 6½ (Mat.)						Costa Rica.					
9.0N., 126.7E.						h : 113 km ca.					
Near east coast of Mindanao, P. I.						H=09 41 45.7					
h : 25 km ca.						USCGS					
H=19 19 05.6						12.	iP	NZ, P E	10	30	42.5
11.	eP	Z	20	04	44		S	NEZ			46
8.7N., 126.3E.						P : S, C					
Mindanao, P. I.						12.	iPKP	Z	11	59	10.8
h : 171 km ca.							i	N			13.5
H=19 58 49.6							i	Z	12	00	41
USCGS							i	Z			58
11.	iP	NEZ	20	12	43.7		i	E		02	18
	i	NE		13	30	✓	PPP	Z		03	21
	i	NE			32.5		eSKS?	E		05	54
P : N, E, D							e	NE		10	35
12.	iP	Z	01	14	18.0		SS	NE		17	49
	eS	E		19	45		SSS	E		21	32
	L	E		21	42		e	E		25	38
P : D							Lq	E		29	28
4.6N., 125.8E.							e	E		31	53
Celebes Sea.							Lr	Z		37	40
h : 44 km ca.						(cont.)					
H=01 07 38.7											
12.	iP	Z	02	08	13.7						

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
	L	E	12	41	50	P : N, W, C					
P : D						Mag. 4. 2 (Mat.)					
Mag. 6¾-7 (Mat.)						35.9N., 141.2E.					
8.1N., 83.0W.						Honshu, Japan.					
Near south coast of Panama and						h : 40 km ca.					
Costa Rica.						J. M. A.					
h : 58 km ca.						13.	iP	NZ	11	36	28.3
H=11 40 12.8							i	E			28.5
USCGS							i	Z			29.5
12.	iP	NEZ	12	14	33.6	P : S, D					
	i	EZ			38	2.9N., 128.8E.					
	S?	NE		17	50	Molucca Passage.					
P : N, E, D						h : 152 km ca.					
12.	eL	E	16	08	00	H=11 29 48.6					
12.	iP	Z	17	29	55.0	USCGS					
P : C						13.	eP	Z	18	35	58
16.1S., 168.2E.							e	E			40 52
New Hebrides Is.						13.	iP	Z, P N	20	45	41.4
h : 172 km ca.						P : C					
H=17 20 07.8						13.	eP	Z	21	51	24
USCGS							eS?	E		57	25
12.	P	Z	19	38	22.5		e	N	22	00	34
10.6S., 161.4E.							eL	E		04	14
Solomon Is. region.						14.	P	Z	02	50	27
h : 138 km ca.							S	N		51	42
H=19 29 25.8						USCGS					
12.	iP	NZ	23	32	19.1	14.	P	Z	08	33	28.1
	S	NE			43		i	Z			40
P : N, D							eS	E		39	42
13.	P	Z	02	19	29		eL	E		43	15
	S	NE			38.5	P : D					
13.	iP	NEZ	06	08	01.3	8.8N., 126.8E.					
	i	NE			10.4	Mindanao, P. I.					
	S	NE			12.2	h : 28 km ca.					
P : S, W, C						H=08 27 22.4					
37.3N., 138.3E.						USCGS					
Honshu, Japan.						14.	e	E	11	02	40
h : 42 km ca.						14.	iP	Z	12	11	41.2
H=06 07 47.4							S	NE		12	25
USCGS							i	N			28
13.	P	Z	06	11	50.3	P : C					
	i	Z			04.5	14.	iP	NZ	13	50	42.3
13.	iP	NEZ	08	01	23.3		S	NEZ			56
	i	EZ			26.5	P : S, C					
	S	E			53.9	14.	iP	NEZ	13	54	18.9
	i	Z			54.6		S	NEZ		55	06.0
(cont.)						P : S, W, D					

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Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
14.	iP	EZ	14	03	31.2	15.	P	Z	12	01	16
	i	NE			39		i	EZ			20
	P : E, C						S	NEZ			41
14.	iP	Z	18	31	22.0	15.	iP	NEZ	13	17	21.2
	i	NE			22.7		i	Z			36
	i	N			35		P : D				
	S	N			34		20.6 S., 178.8 W.				
	i	E			37		Fiji Is. region.				
	P : C				10		h : 623 km ca.				
14.	e	E	18	50	45		H=13 07 06.9				
14.	iP	NEZ	19	38	54.5	15.	e	E	15	11	10
	P : N, E, C						L	E		15	49
14.	P	Z	20	21	37	15.	iP	Z	17	36	33.6
	S	N			56		i	Z			44.7
14.	iP Z, P	NE	20	43	41.0		i	NE		37	38
	S	NE			44		i	Z			39
	i	N			07		P : D				
	P : C					15.	iP	NEZ	19	00	10.9
14.	e	E	21	52	16		S	NE			21.0
15.	P	EZ	00	43	05.0		P : S, W, C				
	i	N			05.5	15.	iP	Z	22	11	11.1
	i	Z			14.5		i	Z			21
	P : C						i	NE			23
15.	P	Z	01	10	36		i	E		13	00
	S	E			48		P : C				
15.	iP	NEZ	01	54	31.0	15.	iP	NEZ	22	58	19.5
	eS	E			57		i	NE			22
	eL	NE			47		P : W				
	P : N, E, D					16.	iP	NZ	00	52	10.6
	45.7 N., 151.3 E.						S	NEZ			13.5
	Kurile Is. region.						P : N, D				
	h : 43 km ca.					16.	iP	NEZ	01	29	27.0
	H=01 51 19.4						e	E			48
	USCGS						S	E		30	16
15.	iP	Z	04	44	42.4		i	E			24
	i	N			43		P : N, E, D				
	e	E			55	16.	iP	NEZ	07	06	26.2
	e	E	05	00	00		i	Z			42
	P : D						S?	N			55
15.	iP	Z	05	30	42.5		P : S, E, C				
	i	NE			42.8	16.	P	NEZ	09	45	31
	S	EZ			58		i	N			44
	P : D						e	E		48	38
15.	P	Z	10	17	31						
	S	NEZ			35						

(cont.)

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Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						17.	iP	NEZ	13	50	49.0
	e	E	09	52	10		S	NEZ		51	14
	26.8 N., 127.2 E.						P : S, E, D				
	Ryukyu Is. region.					17.	iP	Z	13	55	46.2
	h : 176 km ca.						S	EZ		56	11.4
	H=09 42 24.7						P : D				
	USCGS					17.	P	NEZ	13	57	00
16.	P	NZ	15	36	40		S	NE		24	5
	eS	E			45	40					
	eG?	E			53	56	17.	iP	Z	14	02
	e	E			56	56		S	NE		08.4
	e	E	16	00	24		P : C				33
	21.7 S., 173.0 E.										
	New Hebrides Is. region.					17.	iP	Z	14	09	35.0
	h : 216 km ca.						S	NEZ			59
	H=15 26 00.6						P : D				
	USCGS					17.	iP	Z	14	51	36.9
16.	P	NEZ	19	52	01		i	Z			39
	i	NZ			11.4		S	NE		52	00
	S	E			59	33	P : C				
	eLq	E	20	04	54						
	eLr	E			07	26	17.	iP	NEZ	17	51
	Mag. 5 3/4 (Mat.)							P : S, W, C			26.0
	10.8 S., 165.7 E.					17.	iP	NEZ	18	03	24.1
	Santa Cruz Is. region.						S	E		07	20
	h : 25 km ca.						L	E		09	35
	H=19 42 39.2						P : S, W, C				
	USCGS						51.4 N., 159.2 E.				
16.	P	NZ	20	06	36.5		Kurile Is. region.				
	i	E			37.5		h : 25 km ca.				
	S	EZ			07	12	H=17 58 38.6				
	S	NEZ	03	38	45.0		USCGS				
	P : N, E, C					17.	P	Z	19	02	51.8
17.	iP	NEZ	03	38	45.0		eL	E		10	14
	S	NEZ			39	18	eL	E		12	22
	P : N, E, C						P : D				
17.	P	Z	04	32	47.4		9.8 N., 122.5 E.				
	i	Z			53		Near east coast of Negros I., P. I.				
17.	iP	NEZ	06	39	15.0		h : 25 km ca.				
	S	Z			25.5		H=18 56 39.3				
	P : S, W, C						USCGS				
17.	iP	EZ, P N	09	31	46.7	17.	iPKP	Z	21	06	53.0
	i	N			32	03	PP	Z		09	13
	i	N			15		e	E		17	34
	i	Z			45		SS	E		26	54
	P : W, C						SSS	E		31	48
17.	P	Z	11	33	37		L	E		41	51
	e	E			45	26	L	N		43	00

(cont.)

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
	L	Z	21	50	19	Off coast of northern Honshu, Japan.					
	L	E			37	h : 33 km ca.					
	P : D					H=05 28 21.3					
	Mag. 7 (Mat.)					USCGS					
	10.6N., 43.7W.					18. iP NZ 06 51 28.6					
	North Atlantic Ocean.					i E 29.7					
	h : 25 km ca.					S E 53					
	H=20 47 31.7					i E 54					
18.	iP	NEZ	00	26	19.5	P : N, C					
	i	Z			28.4	18. iP NZ, P E 06 54 26.3					
	P : N, E, D					S NEZ 51					
18.	P	Z	00	52	23	i Z 53					
	36.0S., 176.9W.					P : S, C					
	Off coast of North I., New Zealand.					18. iP NZ, P E 09 47 43.7					
	h : 25 km ca.					S EZ 48 09.5					
	H=00 40 09.8					P : N, C					
18.	P	Z	01	38	33	18. e E 14 12 42					
	i	Z			35	18. e E 15 06 49					
	27.7S., 177.3W.					e E 13 28					
	Kermadec Is. region.					9.1N., 126.4E.					
	h : 89 km ca.					Mindanao, P. I.					
	H=01 26 51.0					h : 44 km ca.					
18.	iP	NEZ	02	24	45.0	H=14 54 59.3					
	S	N			25 13	USCGS					
	P : N, E, D					18. iP NEZ 15 43 05.5					
18.	iP	NZ, P E	03	16	23.7	eSKS E 53 26					
	S	E			24 30	eSS E 59 28					
	eSS	E			28 40	eLq E 16 05 10					
	L	NE			31 20	eLr E 09 20					
	L	E			34 46	eL E 14 16					
	P : N, C					eL Z 24 13					
	16.5S., 168.2E.					P : S, E, C					
	New Hebrides Is. region.					40.6N., 19.6 E.					
	h : 14 km ca.					Southern Albania.					
	H=03 06 18.8					h : 25 km ca.					
18.	iP	NEZ	05	29	39.3	H=15 30 31.6					
	S	N			30 36	USCGS					
	i	E			41	18. iP Z 20 24 08.7					
	i	NE			50	i NE 10.8					
	P : S, W, C					PP? N 30					
	Mag. 5 (Mat.)					S NE 28 24					
	40.6N., 142.4E.					Lq E 30 13					
						Lq N 20					
						Lr EZ 31 36					

(cont.)

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
	P : D					19. iP NEZ 00 46 30.4					
	Mag. 6 1/4-6 1/2 (Mat.)					S NEZ 34					
	23.7N., 114.5E.					P : S, E, D					
	Kwangtung Province, China.					19. P Z 01 01 05					
	h : 43 km ca.					S NE 29					
	H=20 18 54.3					19. P NEZ 01 23 31.6					
19.	iP	NEZ	00	46	30.4	S NEZ 35.5					
	USCGS					P : N, E, D					
						19. iP Z 02 23 59.7					
						S N 24 26					
						P : D					
19.	P	Z	05	04	27	19. P Z 05 04 27					
	e	E			14 03	eSSS E 29 30					
	eSSS	E			29 30	eL E 37 00					
	eL	E			37 00	57.3S., 147.2E.					
	About 900 miles South of Tasmania.					h : 25 km ca.					
	H=04 49 31.7					USCGS					
19.	iP	NEZ	06	01	47.0	19. iP NEZ 06 01 47.0					
	i	Z			02 12	i Z 02 12					
	PP	N			03 12	PP N 03 12					
	PcP	Z			57	PcP Z 57					
	eS	NE			07 27	eS NE 07 27					
	i	NE			31	i NE 31					
	i	NEZ			33	i NEZ 33					
	eL	E			10 20	eL E 10 20					
	eL	E			13 16	eL E 13 16					
	eL	N			20	eL N 20					
	eL	Z			29	eL Z 29					
	P : N, E, C					Mag. 5 1/4 (Mat.)					
	0.3N., 123.5E.					Near south coast of Minahossa					
	Peninsula, Celebes Is.					h : 53 km ca.					
	H=05 54 24.4					USCGS					
						19. iP NEZ 06 08 10					
						i Z 15					
						19. P NEZ 13 51 27.4					
						i N 29					
						S NE 41					
						i Z 44					
						P : E, C					
19.	P	NEZ	16	35	47	19. P NEZ 16 35 47					
	S	NEZ			50	S NEZ 50					
19.	P	Z	17	31	21	19. P Z 17 31 21					
	i	EZ			32 03	i EZ 32 03					
19.	iP	NEZ	18	05	43.1	19. iP NEZ 18 05 43.1					
	S	NEZ			59	S NEZ 59					
	P : N, W, C					19. iP EZ 18 41 06.3					
19.	iP	EZ	18	41	06.3	i Z 22					
	i	Z			22	P : W, D					
	P : W, D					19. iP NEZ 20 06 15.5					
19.	iP	NEZ	20	06	15.5	S? N 46					
	S?	N			46	P : S, E, D					
	P : S, E, D					19. iP NEZ 21 04 02.3					
19.	iP	NEZ	21	04	02.3	P : S, E, C					
	P : S, E, C					19. iP EZ, P N 21 06 26.9					
19.	iP	EZ, P N	21	06	26.9	i N 29.3					
	i	N			29.3	PcP Z 07 37.3					
	PcP	Z			07 37.3	P : W, D					
	P : W, D					4.3S., 103.1E.					
	Near south coast of Sumatra.					h : 100 km ca.					
	H=20 57 24.2					USCGS					
19.	iP	Z	21	23	53.8	19. iP Z 21 23 53.8					
	P : C					20. P NEZ 05 21 42					
20.	P	NEZ	05	21	42	i N 48					
	i	N			48	i N 22 16					
	i	N			22 16	i Z 28					
	i	Z			28	20. P Z 07 19 48					
20.	P	Z	07	19	48	i NEZ 50					
	i	NEZ			50	i Z 15					
20.	PKP	NZ	11	19	07	eL E 12 11 17					
	i	Z			15	20. iP NEZ 13 17 58.3					
	eL	E			12 11 17	S NEZ 18 16					
20.	iP	NEZ	13	17	58.3	P : S, W					
	S	NEZ			18 16						

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s	
20.	iP	NEZ	15	40	22.8	21.	iP	Z	15	34	19.1	
	i	NEZ			32		i	NE			19.5	
	iS?	Z		41	10		i	NE		38	27	
	i	NEZ			16		P : C					
	P : N, E, C						21.	iP	NZ	20	36	56.0
	Mag. 5.4 (Mat.)							i	E			56.2
	33.7N., 135.1E.							iS	NEZ		37	11.6
	Honshu, Japan.							P : S, C				
	h : 40 km ca.						21.	P	EZ	21	08	06.6
	20.	P	Z	18	56	16		i	N			07.2
		i	NE			22		P : C				
		i	Z			50		48.6N., 153.4E.				
		S	NE		58	49		Kurile Is.				
		L	E		59	20		h : 25 km ca.				
	22.8N., 143.2E.							H=21 04 15.6				
	Mariana Is. region.							USCGS				
	h : 98 km ca.						21.	iP	NEZ	23	05	42.0
	H=18 52 55.8							PcP	Z		06	56.0
	20.	eL	E	23	25	58		pP	Z		07	28
		eL	E		29	00		pP	N			34
	32.0N., 94.6E.							sP	Z		08	36
	Tibet.							ScP	Z		09	55
	h : 25 km ca.							ePcS	E		10	56
	H=23 10 38.1							iS	NEZ		11	57.0
	21.	P	Z	02	01	50.6		ScS	E		14	45
	62.1N., 152.7W.							Lq	E		15	18
	Southern Alaska.							eL	Z		16	40
	h : 122 km ca.							P : S, W, D				
	H=01 53 13.3							5.9S., 113.0E.				
	21.	P	N	02	41	02.0		Java Sea.				
		i	Z			02.6		h : 631 km ca.				
		i	E			02.9		H=22 57 51.2				
	P : N							USCGS				
	22.2S., 170.4E.						21.	iP	EZ, P N	23	18	10.7
	Loyalty Is.							P : N, W, D				
	h : 25 km ca.						22.	iP	EZ	00	27	35.2
	H=02 30 18.5							i	N			36.0
	21.	iP	EZ	06	49	16.0		i	E		28	20
		i	N			17.9		pP	Z		29	20
		i	N			24		PP	NE			38
		i	N			48		sP	Z		30	25
		i	N			50		sPP	Z		32	18
		i	E			04		PcS	NEZ			52
		i	Z			07		iS	EZ		33	52.0
	P : W, C							ScS	N		36	42

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s		
(continued)						(continued)							
	L	E	00	37	23		e	N	14	29	53		
	L	Z		44.0			i	E			55		
	P : W, C						i	Z		30	15		
	5.9S., 112.9E.						i	E			22		
	Java Sea.						i	N			25		
	h : 611 km ca.						P : W, C						
	H=00 19 43.1						22.	iP	NZ	15	20	37.0	
	22.	iP	NZ	00	45	26.2		i	E			37.4	
		i	E			27.5		PP	N		22	15	
		PcP	Z		46	43		PP	E			26	
	P : S, D						PPP	EZ				54	
	6.0S., 113.0E.						iS	E		26	37.0		
	Java Sea.						iLq	E		29	42		
	h : 595 km ca.						iLq	N		30	00		
	H=00 37 36.8						L	Z		31	33		
	22.	iP	Z, P N	01	04	05.3		W ₂	E	17	27.0		
		i	E			06.0		P : N, C					
		i	Z			40		Mag. 6½-6¾ (Mat.)					
	P : S, C						3.2S., 142.3E.						
	22.	iP	Z	01	33	51.5		Near north coast of New Guinea.					
		i	E			53		h : 25 km ca.					
	P : C						H=15 13 03.9						
	18.9S., 173.1W.							USCGS					
	Fiji Is.						22.	eP	Z	16	23	45	
	h : 60 km ca.						2.1S., 139.3E.						
	H=01 50 52.4						Near north coast of New Guinea.						
	USCGS						h : 44 km ca.						
	22.	P	Z	02	02	12		H=16 16 26.4					
	USCGS							USCGS					
	22.	iP	EZ	09	35	58.0		22.	P	Z	16	26	00
		i	E			36		22.	PKP	Z	19	18	33
		S	NZ			11.5		i	Z			42.5	
	P : E, D						i	E				50	
	22.	P	Z	12	15	02		pPKP	Z		19	31	
	16.3 S., 167.5E.						28.1 S., 67.5W.						
	New Hebrides Is.						Catamarca Province, Argentina.						
	h : 45 km ca.						h : 217 km ca.						
	H=12 05 03.2						H=18 59 00.8						
	USCGS							USCGS					
	22.	PKP	Z	12	27	18		22.	iPKP	NZ	21	10	03.0
	32.2S., 66.9W.							i	E			03.5	
	San Luis Province, Argentina.							sPKP	Z			51.5	
	h : 249 km ca.						P : N, D						
	H=12 07 05.5						15.7 S., 68.7W.						
	USCGS						Bolivia.						
	22.	P	EZ	14	29	49.5							

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s	
(continued)						27.	P	N	10	12	53.0	
New Britain region.							i	E			53.1	
h : 122 km ca.							i	Z			53.3	
H=15 20 41.8							i	E			14 46	
USCGS							S	NE			15 00	
26.	PKP ₁	Z	16	52	43		L	E			16 28	
	i	E			45		eL	Z				
	i	Z			55		P : N					
	PKP ₂	Z		53	07		44.1N., 147.3E.					
	PKP ₂	E			10		Kurile Is.					
	PP	E		56	34		h : 31 km ca.					
	SKS?	Z		59	40		H=10 10 26.1					
	SKS	N			47	27.	iP	Z	15	00	40.0	
	SKKS	E	17	03	33		P : C					
	PS	E		07	07		20.3S., 177.6W.					
	PPS	E		09	50		Tonga Is.					
	SS	E		16	38		h : 510 km ca.					
	PSPS or SPSP	E		17	54		H=14 50 15.2					
	SSS	E		21	17	27.	P	Z	18	07	25.5	
	i	E		28	26		i	N			25.7	
	Lq	E		34	26		i	E			26.0	
	Lr	E		44	15		i	Z			34	
	W ₂	E			58.0		S	NEZ			48	
	Mag. 6 (Mat.)						i	N			08 17	
	40.6S., 73.3W.						P : C					
	Near coast of southern Chile.					28.	P	Z	01	00	58	
	h : 32 km ca.						i	NEZ			01 44	
	H=16 32 43.6						36.6N., 71.6E.					
	USCGS						Hindu Kush.					
26.	P	NZ	23	41	20.0		h : 108 km ca.					
	i	E			20.5		H=00 51 54.7					
	S	NEZ			35		USCGS					
	P : S,C					28.	P	NZ	01	47	29.9	
27.	iP NZ, P E		05	30	07.5		i	E			30.4	
	i	NZ			36.5		i	NEZ			48 00	
	sP	E			37.5		P : N,D					
	ScP	Z		35	45		28.	P	Z	04	14	24.2
	PcS	NE		36	12		i	E			25.6	
	eS	E			15		i	N			26.3	
	L	E		39	25		i	E			51	
	P : N,E,C						i	E			15 19	
	3.9S., 129.1E.						PcP	Z			38	
	Ceram region.						S E, eS Z				21 53	
	h : 96 km ca.						Lq	E			24 20	
	H=05 22 32.0											
	USCGS											

Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s	
(continued)						29.	iP	NEZ	07	48	01.9	
	Lr	E	04	31	00		S	E			20	
	Lr	Z		33	00		i	N			26	
	eL	N		38	00		P : S,E,D					
	P : D						36.1N., 139.9E.					
	Mag. 5½-5¾ (Mat.)						Honshu, Japan.					
	1.4N., 97.5E.						h : 70 km ca.				J. M. A.	
	Near south coast of Sumatra.					29.	iP	NEZ	13	39	03.7	
	h : 74 km ca.						S	NE			34	
	H=04 05 24.6						i	Z			36	
	USCGS						P : N,W,C					
28.	eL	E	14	59	23	29.	P	Z	19	41	27.4	
	19.4N., 108.6W.						79.2N., 2.7E.					
	Off coast of Jalisco, Mexico.						Svalbard region.					
	h : 43 km ca.						h : 25 km ca.					
	H=14 14 45.2						H=19 31 08.8				USCGS	
28.	iP	Z	23	34	04.5	29.	iP	Z	20	16	20.5	
	i	NE			05		i	N			20.7	
	i	Z			28		i	E			21	
	P : D						PP	Z			17 51	
29.	eS?	E	00	22	04		PPP?	E			18 11	
	L	E			36		PcP	Z			35	
29.	iP	NZ	01	56	50.4		S	NE			22 10	
	i	E			50.5		Lq	E			25 00	
	P : N,D						Lr	NZ			27 30	
	51.8N., 157.2E.						P : C					
	Near south coast of Kamchatka.						Mag. 6¼ (Mat.)					
	h : 155 km ca.						0.5S., 127.4E.					
	H=01 52 25.4						Halmahera region.					
29.	eP	NEZ	03	39	57		h : 25 km ca.					
	S	NE			41 51		H=20 09 01.9				USCGS	
	i	N			56		29.	P	NEZ	21	20	03.7
	32.7N., 130.7E.						eS	NE			24 05	
	Kyusyu, Japan.						eL	E			26 10	
	h : 25 km ca.						L	E			27 40	
	J. M. A.						P : W,D					
29.	iP	NEZ	04	47	24.3		20.7N., 120.6E.					
	S	NE			38		North of Luzon, P. I.					
	P : S,W,C						h : 94 km ca.					
29.	iP	E	06	03	52.1		H=21 15 16.0				USCGS	
	i	EZ			04 15		29.	e	E	22	48.0	
	i	N			20		30.	P	Z	00	10	58.5
	i	E			05 11		i	N			58.7	
	e	E			06 16							
	P : W											

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Date	Phase	Comp	h	m	s	Date	Phase	Comp	h	m	s
(continued)						(continued)					
	i	E	00	10	59.7		i	Z	06	48	02
	PcP	Z		14	39		i	EZ			29
	eL	E		17.0		31.	S?	N	07	55	43
	P : D						i	E			55
	12.9 N., 143.0E.						L	E		56	44
	Mariana Is.						L	N		57	28
	h : 134 km ca.						i	Z		58	10
	H=00 05 56.1						Lr	NE			23
30.	eP	NZ	06	41	54		9.8N., 121.6E.				
	eS?	E		42	31		Negros I., P. I. region.				
	i	N			32		h : 156 km ca.				
	i	N			54		H=07 44 36.0				
	i	E			56	31.	P	NEZ	16	43	55.0
30.	iP Z, P N		13	38	00.5		i	Z		44	10
	i	E			00.8		P : S, D				
	iS N, S E				16.8	31.	P	Z	19	34	34
30.	iP Z, P E		14	16	35		i	Z			37.1
30.	iP	NEZ	14	34	50.7		i	E			37.5
	P : S, E, D						i	N			37.6
	28.7 S., 179.0W.						iS N, S E				58
	Kermadec Is.						i	Z		35	03.8
	h : 292 km ca.						P : C				
	H=14 23 33.6					31.	P	EZ	23	13	52.6
30.	P	Z	16	54	20		i	N			54.7
	S NE, eS Z						i	N		14	28
31.	iP	Z	03	12	07.5		i	EZ			34
	i	NE			08.0		i	N			36
	S	N			34		i	Z			51
	i	E			35		P : W, C				
	P : D										
31.	eP	Z	06	46	54						
	(cont.)										