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OF
MATSUSHIRO

JANUARY , FEBRUARY
1963

Matsushiro Seismological Observatory
Matsushirō-machi , Nagano-shi,
Nagano-ken, Japan

Matsushiro Seismological Observatory , Japan

Seismological Bulletin

Latitude 36° 32' 30" N
 Longitude 133° 12' 32" E
 Elevation 440 M

Instrumental Constants

Instruments	Comp.	Period (sec)		Damping ratio		Magnification
Benioff Seismograph (Short Period)	N	T ₁ = 1.0	T ₂ = 0.23	h ₁ = 0.63	h ₂ = 1.7	103,000 (max)
	E	T ₁ = 1.0	T ₂ = 0.22	h ₁ = 0.70	h ₂ = 1.6	106,000 (max)
	Z	T ₁ = 1.0	T ₂ = 0.21	h ₁ = 0.72	h ₂ = 1.2	131,000 (max)
Benioff Seismograph (Long Period)	N	T ₁ = 1.0	T ₂ = 70	h ₁ = 0.63	h ₂ = 5.9	7,330 (max)
	E	T ₁ = 1.0	T ₂ = 62	h ₁ = 0.70	h ₂ = 5.6	9,640 (max)
	Z	T ₁ = 1.0	T ₂ = 34	h ₁ = 0.72	h ₂ = 7.3	7,590 (max)
Short Period Seismograph	Z	T ₁ = 1.0	T ₂ = 2.62	h ₁ = 1.4	h ₂ = 1.2	32,000 (max)
Galitzin Seismograph	N	T ₁ = 15	T ₂ = 100	h ₁ = 1	h ₂ = 1.2	1,350 (max)
	E	T ₁ = 15	T ₂ = 100	h ₁ = 1	h ₂ = 1.1	1,640 (max)
	Z	T ₁ = 7.5	T ₂ = 100	h ₁ = 0.76	h ₂ = 0.37	860 (max)
Wood-Anderson Seismograph	N	0.8		0.3		1,050
	E	0.8		0.3		1,200
1000 kg Long Period Seismograph	N	33.0		0.60		100
	E	30.0		0.62		100

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
1.	iP S?	Z N	07 45 44.9 46 01		PcS iS i ScS Lr	Z EZ N E Z	53 13 23 54 12 14 57 19 00 01 46
1.	iP i S P : W	EZ N Z	10 35 23.7 23.9 36 04		P : S, W, C, ... Mag. 6(Mat) 56.6N., 157.7 W. Alaska Peninsula. h: 50km ca. H= 23 39 05.6		USCGS
1.	P S	NZ N	11 39 23.1 31.6	2.	eP	Z	00 25 18
1.	P i eS e	Z Z E E	12 25 48 26 19 32 22 35 31	2.	eP	Z	03 31 38
	6.8 S., 155.9 E. Solomon Is. h: 165 km Ca. H= 12 17 38.6		USCGS		5.8 S., 150.0 E. New Britain. Is. h: 33 km ca. H= 03 23 29.5		USCGS
1.	P	Z	12 31 02	2.	P S i	NEZ NZ E	05 26 11.5 39 40
1.	P	NZ	12 34 43	2.	P	Z	09 32 43
1.	P e eL eL	Z N E N	13 51 58 53 06 55 06 38		4.6 S., 144.3 E. Northeast New Guinea. h: 51 km ca. H= 09 24 34.0		USCGS
	20.3 N., 144.6 E. Mariana Is. h: 43 km Ca. H= 13 48 06.5		USCGS	2.	P S	NZ NE	11 31 59 32 10
1.	iP S P : E	EZ N	14 18 29.5 44	2.	P S	Z Z	11 32 36 45
1.	iP	Z	14 49 18	2.	S	Z	11 33 10
	3.4 N., 122.9 E. Celebes Sea. h: 590km ca. H= 16 27 33.1		USCGS	2.	iPE, Z P: E D	PN	13 25 50.9
1.	iP i P : D	Z N	16 38 46.4 49	2.	P i	EZ N	14 19 01 52.4
	20.0 S., 175.4 W. Tonga Is. h: 130 km Ca. H= 16 27 38.1		USCGS	2.	P eS eL eL eL	NZ E E N Z	15 03 45 09 45 12 49 53 13 12
1.	iPZ, P N i P : C	17 16 10.8 N	47.6		Mag. 6- 6 1/2 (Mat) 4.1 S., 135.2 E. Near south coast of western New Guinea. h: 33 km ca. H= 14 56 05.4		USCGS
1.	iP S P : D	Z NE	20 49 34.5 56	2.	eL eL	N E	16 53 58 56 30ca.
1.	iP PcP PPP ScP	Z Z E Z	23 47 30.5 49 04 50 34 52 51				

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Date	Phase	Come	Time(GMT) h m s	Date	Phase	Comp	Time(GMT) h m s
8.	iP S P: S, D	NZ Z	13 05 06.3 34	9.	iP P: N, C 4.3 S., 123.5 E. Banda Sea. h: 174 km ca. H= 21 16 07.7	NZ	21 23 30.6 USCGS
8.	iP S	Z Z	13 06 24 50	9.	P i i	EZ N Z	22 28 52 53 29 14
8.	eP	Z	14 03 06	10.	eP i	NZ NEZ	12 53 36 43
8.	iP i S P: N, E, C	NEZ Z Z	15 15 20.7 34 16 24	10.	P	Z	15 54 58
8.	P i S i	Z NE Z Z	15 43 43.3 46.3 50 13 13	10.	iP P: S, W, C 52.6 N., 157.2 E. Kamchatka. h: 125 km ca. H= 17 14 07.3	NEZ	17 18 41.0 USCGS
			31.2 N., 130.2 E. Near south coast of Kyushu, Japan. h: 177 km ca. H= 15 46 45.5	10.	P e eL	NZ E E	19 00 01 04 26 06 16
8.	iP S P: N, W, D	NEZ N	17 53 05.1 03				13.1 N., 146.5 E. Mariana Is. h: 61 km ca. H= 18 54 46.1
8.	P S	EZ N	20 45 23 45	11.	iPZ, PNE eS L P: D	E E	01 20 24.6 47 22 46
9.	P 28.9 S., 177.4 W. Kermadec Is. h: 71 km ca. H= 02 02 38.5	Z	02 14 25				USCGS
9.	P S i e	NEZ NE Z Z	03 17 35 20 57 21 00 25 05	11.	iP i P: N, W, D	NEZ N	03 39 56.3 40 44.6
			18.6 N., 145.4 E. Mariana Is. h: 192 km ca. H= 03 13 26.4	11.	iP iS P: S, D 35.7 N., 140.5 E. Honshu, Japan. h: 85 km ca.	NEZ N	05 02 34.6 56.4 J.M.A.
9.	P 10.3 S., 124.0 E. Timor region. h: 33 km ca H= 06 53 23	Z	07 02 06	11.	iP i S P: D	Z NE NEZ	06 04 24.4 24.7 50.6
			USCGS	11.	PKP SKSP SS SS PSPS SSS	Z E N E NE E?	12 32 11 46 24 55 40 45 56 42 13 00 46
9.	iP i i P: D	Z NE N	16 47 02.0 02.3 23				(cont.)
9.	iPZ, PN P: D		20 21 43.6				

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Date	Phase	Comp	Time(GMT)	Date	Phase	Comp	Time(GMT)
			h m s				h m s
21.	eP S	Z NE	00 14 08 11.3				
					Honshu, Japan. h: 0 km ca. J.M.A.		
21.	iP P: N, D	NZ	01 53 52.9	22.	P	Z	22 34 13
21.	P i S	Z EZ Z	03 04 44 44.5 59	22.	P iS i	Z N Z	22 53 15.5 10.2 10.6
21.	P	Z	04 30 47	22.	eP	NZ	23 35 22
21.	P	Z	05 55 48	22.	iP i S	NEZ Z NE	02 25 33.0 46 50
	5.5 S., 149.0 E. New Britain region. h: 173 km ca. H= 05 43 01 USCGS				P: S, W, C		
21.	eP	Z	14 56 07	23.	iP i S	NEZ Z NE	02 25 33.0 46 50
	59.5 N., 151.2 W. Kenai Peninsula, Alaska. h: 67 km ca. H= 14 47 05.4 USCGS				P: S, W, C		
21.	iP S	NEZ N	22 19 27.5 47	23.	iP eS	NEZ N	02 34 33.0 35 25
22.	P i i	EZ N Z	11 11 43 43.5 44.0	23.	eP eL	NZ E	04 43 33 43 50
					43.9 N., 156.0 E. Kurile Is. h: 50 km ca. H= 04 39 23.3 USCGS		
22.	P eS	NZ N	14 36 23 37 02	23.	iP i e S	Z Z E N	03 49 32.0 39.4 50 12 17
22.	P i eL	Z NZ E	16 11 13 15 16 53		P: C		
	43.3 N., 155.2 E. Kurile Is. h: 50 km ca. H= 16 07 14.0 USCGS			23.	eP S	Z NEZ	14 05 01 29
22.	P i i eL	Z EZ N E	16 15 41 43 43.5 20 46	23.	iP iS P: S, W, D	NEZ Z	19 59 30.5 33.1
	43.4 N., 155.2 E. Kurile Is. h: 50 km ca. H= 16 11 42.1 USCGS			23.	iP i eS P: C	Z NZ N	20 03 51.2 52.0 04 29
22.	iP i i S i	NEZ Z N E E	22 29 23.2 29.8 56 30 00 09	23.	iP e eS P: C	Z Z E	21 56 24.1 28 53
	P: N, W 33.8 N., 140.3 E.			24.	eP S? i	Z N E	00 00 22 40 41

(cont.)

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
24.	iPZ i iPcP eS P: E C	PE N Z NE	09 37 10.0 10.3 38 25 43 29		iS P: N	NE	03 22 53.4
	6.0 S., 112.6 E. Java Sea. h: 493 km ca. H= 09 29 11.6				8.0 N., 127.0 E. Near east coast of Mindanao, Philippine Islands. h: 70 km ca. H= 04 10 36.2		
	USCGS				USCGS		
24.	P	Z	10 23 51	25.	iP iS P: S,D	NZ EZ	04 32 22.5 42.2
	10.1 S., 160.8 E. Solomon Is. h: 33km ca. H= 10 14 52.0						
	USCGS						
24.	eP eS eLq eLr	Z E E E	12 20 16 29 07 37.0 40 17	25.	eP S P i i S	EZ NE NE Z Z E	07 12 28 53 08 00 10 12.5 30 48
	Mag. 5½-5¾ (Mat.) 15.2 S., 173.6 W. Tonga Is. region. h: 33 km ca. H= 12 09 01.2				25. iP i eS P: S		
	USCGS				11 50 29.2 29.5 51 36		
24.	iP ePP i S Lq eLr P: C	Z Z Z N E Z	22 33 38.0 35 00 38 12 21 40 00 42 48	25.	iP i i i S P: C	Z Z Z Z NZ	12 53 12.7 14.5 23.5 55 32 59
	Mag. 6 (Mat.) 3.0 N., 126.8 E. Off east coast of Mindanao, Philippine Islands. h: 67 km ca. H= 22 27 32.5				Mag. 6.6 (Mat.) 21.8 N., 143.8 E. Mariana Is. region. h: 190 km ca. H= 12 49 42.0		
	USCGS				USCGS		
24.	P	Z	23 28 15	25.	iP S P: D	Z NEZ	15 07 49.0 08 10
	7.7 N., 126.0 E. Near east coast of Mindanao, Philippine Islands. h: 150 km ca. H= 23 22 16.2						
	USCGS						
25.	P	Z	00 14 21	25.	P	Z	16 07 12
	61.9 N., 148.9 W. Southern Alaska. h: 78 km ca. H= 00 05 34.8						
	USCGS						
25.	P e	NEZ E	00 26 25 55	25.	iP eS P: N,W,C	NEZ NEZ	16 17 58.5 18 22
	20.3 S., 169.6 E. Loyalty Is. region. h: 135 km ca. H= 00 16 05.7				25. P 21.1 S., 179.2 W. Fiji Is. region. h: 603 km ca. H= 16 14 07.5		
	USCGS				USCGS		
25.	iP NZ, PE i	NEZ E	03 22 24.7 25.8	25.	P e eL eL	Z E E E	20 32 42 42 40 51 00 54 55
	Mag. 5½ (Mat.)				Mag. 5½ (Mat.)		
	(cont.) -10-				(cont.)		

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
		19.0 S., 173.3 W. Tonga Is. h: 129 km ca. H= 20 21 31.6	USCGS	27.	P i S SS eLq eLr eLr eLr	Z E NE E E N E Z	19 45 58 58.5 19 54 42 59 03 20 05.6 07 51 08.0 09 56
26.	P e e	NZ E E	07 25 49 50 27 00				
27.	eP eS e	NEZ E E	01 10 09 12 37 13 04				
		25.6 N., 128.3 E. Ryukyu Is. h: 61 km ca. H= 01 06 55.4	USCGS	28.	PKP	Z	02 31 21
27.	iP i iS P: E	E NZ E	10 30 34.4 34.5 36.1				
27.	eP	Z	11 55 45	28.	iP NZ, PE i e e eS L	Z E N NZ E	04 07 34.2 35.5 09 05 13 04 09 18 35
27.	iP PcP P: N,D	NZ Z	11 56 12.8 57 35				
		59.4 N., 153.4 W. Gulf of Alaska. h: 94 km ca. H= 11 47 35.3	USCGS				
27.	P iS	NZ N	13 55 23 41	28.	iP S P: N,C	NZ NEZ	04 46 58.2 47 17
27.	eP	Z	15 36 34	28.	PZ, ePN		10 16 16
		44.3 N., 114.5 E. Idaho. h: 31 km ca. H= 15 24 45.5	USCGS				
27.	eP? eS	Z E	15 41 29 44 10	28.	iP iPcP P: C	Z Z	10 49 32.5 58.5
		26.2 N., 127.9 E. Ryukyu Is. h: 109 km ca. H= 15 33 15.7	USCGS				
27.	P PP ePPP SS eL	Z Z Z E E	18 54 12 30 56 00ca. 19 04 03 04.8	28.	P e PP eS e	NZ Z Z Z N	12 19 55 20 37 12 21 32 25 47 50
		5.2 S., 152.3 E. New Britain. h: 72 km ca. H= 18 46 14.6	USCGS				
							(cont.)

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	eLq	N	12 29 03				
	eLq	E	14				
	eLr	N	31 22				
	eLr	Z	33				
	P: D						
	Mag. $7\frac{1}{2}$ (Mat.)						
	2.6 S., 149.9 E.						
	New Britain.						
	h: 331 km ca.						
	H= 12 12 19.3						
			USCGS				
23.	eP?	Z	12 22 52	28.	P	Z	16 34 47
	e	N	53		i	Z	35 47
	i	E	56.0	28	iP	Z	17 06 26.2
	e	NE	57		i	N	27.6
					P: C		
23.	P	NEZ	12 30 40	28.	iP	EZ	19 13 11.9
	e	N	31 19		i	N	12.1
	e	Z	25		i	E	24
	i	E	34.6		S	N	33
					P: E, C		
23.	iP	NEZ	13 03 53.5	29.	iP	Z	05 20 42.2
	i	Z	14 32		i	E	42.8
	S	E	15 28		i	Z	50
	i	N	34		iS	N	21 24.2
	iScS	NE	13 55		P: C		
	i	N	19 14	29.	eP	Z	07 39 42
	i	E	16				
	eLq	N	59		12.7 S., 66.1 E.		
	Lr	N	21 53		Indian Ocean.		
	eLr	EZ	22 03		Southwest of chagos Is.		
	P: S, W, C				h: 33 km ca.		
	Mag. $7\frac{1}{4}$ - $7\frac{1}{2}$ (Mat.)				H= 07 27 17.9		
	54.7 N., 161.6 W.					USCGS	
	Alaska Peninsula.			29.	iP	NEZ	02 02 56.2
	h: 33 km ca.				i	Z	03 07.5
	H= 13 00 50.7				i	Z	19.1
			USCGS		S	NZ	04 05
28.	P	Z	13 27 09		P: N, E, D		
	i	NEZ	19.5		40.3 N., 144.2 E.		
					Off coast of		
28.	P	Z	13 57 54		Honshu, Japan.		
	55.8 N., 162.9 W.				h: 27 km ca.		
	Alaska Peniusula.				H= 08 01 26.3		
	h: 33 km ca.					USCGS	
	H= 13 49 54.7			29.	iP	Z	09 25 16.5
			USCGS		i	Z	17.5
28.	P	Z	14 00 39		i	Z	24.1
	19.7 S., 173.1 W. Fiji Is.				pP	NEZ	45.0
	h: 587 km ca.				sP	NZ	53
	H= 13 50 28.3				iSE,	SZ	28 33.0
			USCGS		i	N	40.0
28.	eP	NEZ	16 16 00		i	NZ	43.0
	S	N	18		i	E	43.5
	i	NE	19.7		ScP	Z	09 33 18
					ScS	N	36 47
28.	iP	Z	16 19 21.1		P: N, E, D		
	P: C				Mag. $5\frac{3}{4}$ (Mat.)		
	31.2 S., 177.7 W.				49.7 N., 154.9 E.		

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Date	Phase	Comp	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
					i	E	06 15 49.0
					P: S,C		
					00.2 N., 123.4 E.		
					Noethorn Celebes.		
					h: 33 km ca.		
					H= 06 08 25.4 USCGS		
29.	iP E	PZ	13 43 57.5	30.	iP	NEZ	07 05 39.3
	i	Z	44.37.5		i	N	40.7
	S	N	40		i	N	06 19
	P: E				P: S,W,D		
29.	e	E	18 22 37	30.	iP	NZ	09 55 57.8
29.	iPKP	Z	20 53 16.0		i	E	58.4
	i	N	16.4		P: N,D		
	e	Z	26		50.8 N., 157.4 E.		
	i	Z	38.6		Near coast of southern		
	PKP: D				Kamchatka.		
	21.5 S., 68.6 W.				h: 31 km ca.		
	Chile Bolivia border.				H= 09 51 23.7 USCGS		
	h: 73 km ca.						
	H= 20 33 27.0 USCGS			30.	PKP	Z	10 30 03
29.	eP	NEZ	21 13 00		i	N	28.0
	i	Z	03.3		i	Z	32 09
	ipP	Z	27.0		i	E	27
	e S	E	17 02		e	E	35 49
	e	N	18 01		SS	E	10 54 17
	i	Z	04		SSS	E	11 00 28
	L	E	54		i	E	02 28
	ScP	Z	20 04		e	N	31
	12.9 N., 143.2 E.				Lr	E	32 42
	Maria na Is.				Lr	N	47
	h: 144 km ca.				Lr	Z	33 00
	H= 21 07 57.7 USCGS				Mag. 7½ (Mat.)		
29.	P	Z	22 57 58		55.6 S., 28.3 W.		
	52.7 N., 168.4 W.				Sandwich Is. region.		
	Fox Is.				h: 33 km ca.		
	h: 33 km ca.				H= 10 10 04.1 USCGS		
	H= 22 50 22.7 USCGS			30.	P	Z	10 42 34
30.	iP	Z	03 40 18.5		29.7 N., 80.5 E.		
	i	E	23.3		India, Nepal border.		
	i	N	27.7		h: 57 km ca.		
	S	N	50		H= 10 33 59.1 USCGS		
	P: D			30.	e	NZ	11 31 00ca.
30.	iP	Z	04 48 04.6		e	EZ	32 38
	i	NE	05.0	30.	iP	Z	18 14 45.7
	iPcP	Z	49 47.8		i	E	46.2
	eS	E	54 33		iS	NE	15 02.0
	eLq	E	58 00		P: S, D		
	eLr	E	05 01 24	30.	iP	Z	19 42 46.8
	P: C				i	NEZ	47.8
	54.8 N., 161.6 W.				iS	NEZ	43 01.7
	Alaska Peninsula.				P: D		
	h: 33 km ca.						
	H= 04 39 56.3 USCGS						
30.	iP	NZ	06 15 48.4				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
30.	iP EZ, PN		23 59 17.1	31.	e	E	22 03.3
	e	N	42				
	e	N	52				
	P: E						
31.	P	Z	03 11 03				
31.	iP	NZ	05 09 53.6				
	i	NEZ	54				
	S	E	12 43				
	i	Z	13 00				
	L	E	18				
	eL	N	31				
	Lr	NE	59				
	Lr	Z	14 04				
	P: S, D						
	Mag. 6.1 (Mat.)						
	27.9 N., 126.3 E.						
	Ryukyu Is.						
	h: 33 km ca.						
	H= 05 06 46.0					USCGS	
31.	iP	Z	11 35 39.0				
	P: D						
	54.7 N., 161.7 W.						
	Alaska Peninsula.						
	h: 33 km ca.						
	H= 11 27 30.7					USCGS	
31.	iP	Z	12 54 29.6				
	iSZ, SE		50.5				
	i	N	59				
	P: E, C						
31.	iP	Z	13 31 13.1				
	iS	Z	45.0				
	P: D						
31.	e	E	14 42.4				
31.	e	E	16 06.6				
					Mineo Takehana		
31.	eP	Z	17 16 48				
	41.4 N., 50.2 E.						
	Turkmen SSR.						
	h: 33 km ca.						
	H= 17 06 04.4					USCGS	
31.	eP	Z	18 51 34				
	52.7 N., 168.7 W.						
	Fox Is.						
	h: 33 km ca.						
	H= 18 44 00.2					USCGS	
31.	eP	Z	19 16 02				
	54.2 N., 167.5 E.						
	Bering Sea.						
	h: 53 km ca.						
	H= 19 10 22.6					USCGS	

Mineo Takehana

Director

February

February							
Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
1.	P i i S	Z N N E	04 23 46 50 59 24 33		i P: C	E	20 51 49
1.	e e	E E	06 48 45 59 02	2.	PKP i i	Z N N	21 43 00 02 28
1.	P i S P: C	Z N E	08 31 28.4 29.0 32 13.4				13.9 N., 92.1 W. Off west coast of Guatemala. h: 33 km ca. H= 21 25 38* USCGRS
1.	eP 8.5 S., 159.1 E. Solomon Is. h: 144 km ca. H= 09 45 03.8	Z	09 53 35 USCGRS	3.	P iS ; D	NEZ Z	02 07 37.9 40.2
1.	eP e 3.0 S., 131.0 E. Ceram region, h: 33 km ca. H= 10 16 34.1	Z Z	10 24 14 28 USCGRS	3.	P i S P: C	EZ N NE	17 23 45.5 48.5 24 00
1.	eP e 16 44 30ca. 47 31	Z E		4.	P e	Z E	01 25 08.3 36.3 USCGRS
2.	P eS P: C	Z N	10 46 20.9 58	4.	P i S i	Z NE Z	01 29 59 30 24 38 39
2.	PNZ, ePE P: N, C 19.7 S., 174.6 W. Tonga Is. h: 77 km ca. H= 11 48 20.0		11 59 32.5 USCGRS	4.	P i i i	NEZ Z N NE	15 14 14.0 17.3 S., 167.9 E. New Hebrides Is. h: 33 km ca. H= 15 04 05.3 USCGRS
2.	P S P: D	Z NE	12 25 01.1 47.5	4.	P i i i	Z E N NE	17 57 31.2 32.0 33.0 48
2.	P i S i P: W, C	EZ N E NE	14 07 09.0 10.2 39.9 41.0	4.	P eP i	Z E	21 00 59 01 12 USCGRS
2.	eP e 20.1 N., 121.7 E. Batan Is. h: 33 km ca. H= 16 43 00.0	Z E	16 47 54 52.1 USCGRS	4.	P i S P: N, C	NZ E E	23 21 45.5 46.2 23 15
2.	P S	Z N	20 51 08.3 47 (cont.) -2-	4.	P i	NZ Z	23 25 05.0 07.0 (cont.)

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	i	Z	15.5		SS	E	21 22 28
	S	NE	28 23		iPSPS	E	24 25
	eL	E	29 28		SSS	E	27 45
	Mag. 5 (Mat.)				Lq	E	42 19
	48.5 N., 154.9 E.				Lr	Z	50 47
	Kurile Is.				Mag. 6 $\frac{1}{4}$ -6 $\frac{1}{2}$ (Mat.)		
	h: 35 km ca.				38.4 S., 73.2 W.		
	H= 23 21 09.0				Near coast of central Chile.		
	USCGS				h: 41 km ca.		
5.	eP	Z	01 07 11		H= 20 39 21.6		
	i	E	16	6.	ePKP	Z	01 41 47
5.	P	Z	01 54 57.9		SKKS	E	52 10
	i	E	58.3		Lr	E	02 33 38
	P: C				Mag. 6 $\frac{1}{4}$ (Mat.)		
	0.0., 123.8 E.				38.4 S., 73.6 W.		
	Celebes region.				Near coast of central Chile.		
	h: 164 km ca.				h: 33 km ca.		
	H= 01 47 49.8				H= 01 21 29.0		
	USCGS				USCGS		
5.	P	Z	05 08 13.0	6.	P	Z	02 04 05.0
	i	E	21		i	Z	05 33.2
	S	NE	11 49		P: D		
	L	E	13 43		7.9 S., 119.9 E.		
	L	E	17 19		Flores Sea.		
	P: C				h: 306 km ca.		
	Mag. 4 $\frac{1}{2}$ -4 $\frac{3}{4}$ (Mat.)				H= 01 55 59.2		
	19.2 N., 147.1 E.				USCGS		
	Mariana Is. region.			6.	iP	Z	02 38 33.2
	h: 33 km ca.				i	NE	33.5
	H= 05 04 03.4				P: D		
	USCGS				6.8 S., 123.5 E.		
5.	eP	Z	12 16 11		Flores Sea.		
	eL	E	28 44		h: 637 km ca.		
	53.7 N., 165.4 W.				H= 02 31 02.0		
	Fox Is. Aleutian Is.				USCGS		
	h: 33 km ca.			6.	P	Z	06 04 03.5
	H= 12 08 20.6				18.1 S., 177.6 W.		
	USCGS				Fiji Is. region.		
5.	P	Z	19 30 21.0		h: 500 km ca.		
	i	NE	21.5		H= 05 53 53.9		
	S	NE	39.5		USCGS		
	P: C			6.	P	NZ	10 28 02.3
5.	P	Z	19 35 33.5		i	E	04.4
	i	NE	38.1		S	NE	34 10
	i	N	51.7		L	E	37 07
	P: C				eL	N	52
5.	P	Z	19 41 26.7		P: C		
	31.9 S., 179.0 W.				Mag. 5 $\frac{3}{4}$ -6 (Mat.)		
	Kermadec Is.				3.5 S., 146.0 E.		
	h: 63 km ca.				Bismarck Sea.		
	H= 19 29 30.0				h: 33 km ca.		
	USCGS				H= 10 20 25.5		
	USCGS				USCGS		
5.	ePKP	Z	20 59 38	6.	eP	Z	12 57 05
	i	E	21 02 50		i	E	06.3
	iSKKS	E	09 50		22.2 S., 171.3 E.		
	eSKSP	E	13 34		Loyalty Is. region.		
	e	E	14 39		h: 101 km ca.		
	(cont.) -3-				H= 12 46 26.7		
					USCGS		

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	i	N	15	9.	P	Z	03 45 06.3
	S	E	17		P: C		
	i	N	18		15.0 S., 167.4 E.		
	P: W,D				New Hebrides Is.		
	Mag. 5.4 (Mat.)				h: 127 km ca.		
	36.3 N., 137.7 E.				H= 03 36 25.5		USCGS
	Central Honshu, Japan.						
	h: 10 km ca. JMA						
9.	P	Z	04 01 22	9.	P	N	09 02 00.7
	eS	N	28		S	E	07.6
9.	eP	Z	04 04 48	9.	eP	E	09 02 11
	eS	N	54		S	E	17
9.	P	E	04 07 58	9.	P	NEZ	09 10 19.1
	S	E	08 04		S	E	25.1
9.	P	E	04 11 16.6	9.	P	NEZ	11 52 56.9
	S	E	22.6		eS	NEZ	53 02
9.	P	E	04 12 20	9.	P	E	11 53 42
9.	P	NEZ	04 20 25		S	E	48
	S	E	32	9.	P	EZ	12 14 38.6
9.	P	Z	04 26 56		S	E	44.7
	S	E	27 02	9.	P	Z	12 41 18.3
9.	P	E	04 27 29		S	Z	24.6
	eS	E	35	9.	P	Z	13 14 28.1
9.	P	Z	04 32 13		i	E	23.5
	S	EZ	20		S	NE	34.5
9.	P	Z	04 42 42		P: C		
	S	E	48	9.	P	NEZ	13 19 27.6
9.	P	EZ	05 02 25		S	NE	33.1
	S	Z	32		P: W		
9.	P	Z	05 04 11	9.	P	NZ	13 21 40.9
	S	EZ	17		S	NE	47.5
9.	P	Z	05 09 29		F: S		
	S	E	35	9.	P	Z	13 50 42.0
9.	P	Z	06 10 37		S	NE	47.3
	S	EZ	56	9.	P	NE	13 50 44.6
9.	P	EZ	05 20 55.3		S	Z	50
	S	E	21 02	9.	P	Z	14 04 32.4
	P: W				S	NE	38.7
9.	P	Z	03 06 29.1		P: W,C		
	eL	E	16 27	9.	P	EZ	14 11 43.6
	P: C				i	N	45.1
	51.2 N., 179.8 W.				eS	E	12 10
	Andreonof Is, Aleutian Is.				i	N	13.6
	h: 33 km ca.				P: W,C		
	H= 07 59 52.9			9.	P	NEZ	14 14 47.6
	USCGS -5-				S	NE	53.3
					P: S,W		

Date	Phase	Comp	Time(GMT)	Date	Phase	Comp	Time(GMT)
			h m s				h m s
10.	P S P: W,D	NEZ NEZ	16 52 07.9 14.0	11.	eP e i i	EZ Z Z EZ Z	17 56 36 41 52.5 57 13.5 22.0
10.	P S P: N,E,C	NEZ N	19 50 18.5 25.3	11	P S S	NEZ N E	22 49 13.5 32 33
10.	P i S P: E,D	EZ N N	21 33 32.0 34.3 59.5	12.	iP eS eL P: W,D	EZ E E	00 31 25.0 35 41 41 42
10.	iP S e i eL P: S,W,C 43.7 N., 148.0 E. Kurile Is. h: Shallow	NEZ E NE N N	21 38 22.8 40 14 18 22 41 06				17.7 N., 122.3 E. Near west coast of Luzon, P.I h: 33 km ca. H= 00 26 19* USCGS
10.	P i S	Z E E	23 36 13 30.7 58	12.	eP? e e e	EZ N E N E	08 33 20 23 34 14 25 30
11.	P S	EZ NE	00 45 39 46 25.5	12.	iP S S P: S,C	NZ E N	12 27 27.3 39.3 39.5
11.	eP S e	NEZ Z NE	01 39 36 58 59	12.	eP 51.5 N., 177.9 W. Andreanof Is. Aleutian Is. h: 33 km ca. H= 15 09 46.0	Z	15 16 34
11.	P S	NZ Z	01 43 29 44 03				USCGS
11.	P S	EZ NEZ	05 01 38.0 44	12.	iP P: C 6.7 S., 147.1 E. Near north coast of New Guinea. h:120 km ca. H= 17 43 59.2	Z	17 51 53.0
11.	P S	EZ EZ	05 02 05.6 11.2				USCGS
11.	iP S P: W,D	EZ NE	05 12 35.3 41.5	12.	iP S P: S	NEZ NE	23 07 17.3 23.5
11.	iP S P: S,D	NEZ NEZ	10 09 15.7 22.0	12.	iP i S ScS SS SSS	Z NE E E E E	23 17 31.0 31.4 25 45 26 41 30 24 33 51
11.	eL eL 15.7 S., 174.7 W. Tonga Is. region. h: 33 km ca. H= 12 22 26*	E E	12 51.0 54.0				17.8 S., 178.6 W. Fiji Is. h: 533 km ca. H=23 07 23.9 USCGS
11.	iP i P: N,D	NEZ NEZ	14 02 59.2 03 18.5	13.	e	E	02 16 38 13.0 N., 57.9 E.

Date	Phase	Comp	Time(GMT)	Date	Phase	Comp	Time(GMT)
			h m s				h m s
	Arabian Sea. h: 33 km ca. H= 01 34 40.4				13. iP Z 23 50 37.7 i E 39.5 P: C 19.6 N., 143.7 E. Mariana Is. h: 156 km ca. H= 23 46 27.6		
13.	e	E	03 17.4		USCGS		
13.	P	Z	03 30 26	13.	eP	Z	23 53 45
	e	N	35		e	NEZ	59
	e	Z	31 52	14.	eS	E	07 04 42
	e	E	32 03		eL	E	10 24
13.	P	NEZ	08 54 15		eL	E	12 12
	i	N	19.0		Mag. 6 - 6½ (Mat.) 10.1 S., 160.3 E. Solomon Is. h: 64 km ca. H= 06 48 30.3		
	S	EZ	57 38		USCGS		
	e	NE	48	14.	P	NEZ	07 12 35.4
	i	Z	57		iPcP	Z	14 26
	e	Z	58.6		iScP	Z	18 00
	L	E	58.7		S	Z	55
	L	N	59		S	N	58
	L	EZ	09 00 06		e	E	19 02
	P: N,E,C				ScS	E	22 21
	Mag. 6.8 (Mat.)				SS	NE	27
	24.5 N., 121.8 E.				SS	Z	29
	Northern Formosa.				L	E	23 42
	h: 33 km ca.				ePKPKPZ		44 09
	H= 08 50 02.2				P: N,W,C		
13.	eP	EZ	09 34 52		Mag. 6½ (Mat.)		
	24.8 N., 121.7 E.				7.2 S., 123.2 E.		
	Northern Formosa.				Banda Sea.		
	h: 33 km ca.				h: 197 km ca.		
	H= 09 30 34.6				H= 07 04 40.8		
	USCGS				USCGS		
13.	iPZ,PN		18 22 54.0	14.	PKP	NZ	12 28 39
	i	NEZ	55.0		SS	E	50 18
	iPPP	Z	26 03		SSS	E	55 40
	iPPP	E	05		e	N	47
	S	NE	30 10		Lq1	E	13 05.6
	i	Z	34		e	N	07.6
	L	E	35.9		Lr1	NZ	16.0
	L	NE	37.8		Mag. 6½ (Mat.)		
	P: N,C				00.9 N., 30.0 W.		
	Mag. 7 (Mat.)				Mid - Atlantic Ocean.		
	9.9 S., 160.8 E.				h: 33 km ca.		
	Solomon Is.				H= 12 09 11.4		
	h: 29 km ca.				USCGS		
	H= 18 13 55.1				USCGS		
	USCGS				USCGS		
13.	iPNZ,PE		21 28 37.1	14.	eP	NEZ	12 53 30
	P: N,E,C				17.7 S., 168.0 E.		
					New Hebrides Is.		
					h: 33 km ca.		
					H= 12 43 23.5		
					USCGS		
13.	iP	EZ	22 23 48.1	14.	eP	NEZ	12 53 30
	i	N	50.5		17.7 S., 168.0 E.		
	eS	NE	24 22		New Hebrides Is.		
	P: W,C				h: 33 km ca.		
					H= 12 43 23.5		
					USCGS		
13.	iP	Z	22 51 24.7	14.	iP	NEZ	13 44 40.4
	i	NE	24.3		e	NE	46 04
	S	Z	32		e	Z	17
	P: C				P: S,E,D.		

Date	Phase	Comp	Time(GMT)	Date	Phase	Comp	Time(GMT)
			h m s				h m s
15.	iP P: D	Z	12 03 15.3				
					Flores Sea.		
					h: 561 km ca.		
					H= 10 46 22.0		USCGS
15.	P i e	Z E NE	12 31 18.2 20.0 42	16.	e e	N NE	12 25 34 31.0
					0.6 S., 147.5 E.		
					Admiralty Is. region.		
					h: 33 km ca.		
					H= 12 12 39.1		USCGS
15.	P i e S P: D	NEZ N N EZ	15 00 22.0 28.0 41 43	16.	P i eScP P: C	Z NE EZ	12 28 29 29.9 33 11
					36.5 N., 70.5 E.		
					Hindu Kush.		
					h: 216 km ca.		
					H= 12 19 31.1		USCGS
15.	e	E	16 03 14	16.	iP S e P: E,C	EZ N E	22 25 23.5 44 45
15.	P iPcP eL eL	Z Z E E	16 38 17 39 33.5 50.0 55 02				
					4.3 N., 96.3 E.		
					Sumatra.		
					h: 30 km ca.		
					H= 16 29 19.0		USCGS
15.	iP P: N, D	NZ	20 25 31.9	16.	iP S i P: N,E,C	NEZ NE NE	23 16 20.7 27 28
15.	P S	Z NE	22 39 14.5 40 41.5	16.	iP S P: C	EZ E	23 19 25.0 31.5
16.	P eS P: E	EZ N	00 28 23.5 43	16.	eP i P: C	Z NE	08 41 21.6 22.0
16.	iP i P: C	Z NE	08 41 21.6 22.0				
					17.7 S., 178.6 W.		
					Fiji Is. region.		
					h: 534 km ca.		
					H= 08 31 17.5		USCGS
16.	e eL eL	NE N Z	08 43 50 44 50 46.6	17.	eP eS eL	NEZ E Z	02 36 02 ca. 39 22 41 40
					24.1 N., 122.5 E.		
					Ryukyu Is.		
					h: 33 km ca.		
					H= 02 31 40.3		USCGS
16.	iP i i e eS e e P: N, E, C	NEZ Z E N NE N E	10 54 07.5 58 24.2 26.5 59 34 11 00 10 03 43 06.5	17.	P i e	Z N Z	07 01 06.5 06 53 20.3
					4.8 S., 144.2 E.		
					Northeast New Guinea.		
					h: 35 km ca.		
					H= 06 53 20.3		USCGS
16.	iP i i e eS e e P: N, E, C	NEZ Z E N NE N E	10 54 07.5 58 24.2 26.5 59 34 11 00 10 03 43 06.5	17.	iP i e	EZ N Z	12 05 22.4 22.5 37
					7.0 S., 117.3 E.		
				17.	P iS	Z NZ	12 28 16.6 24.5

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
22.	ePN e	PZ Z	11	17	28 18 37	24.	PN, iPZ eS? e	Z N	04	01	55.5 02 16 28
	30.3 S., 173.6 W. Kermadec Is. h: 113 km ca. H= 11 05 42.0						P: D				
22.	iP i eS P: C	Z N N	12	17	42.0 42.2 18 26	24.	iPKP iPPKP? P: D	Z Z	05	57	47.4 58 19.6
	40.6 N., 20.5 E. Albania Greece border. h: 33 km ca. H= 14 12 54.4						15.1 S., 72.5W. Near coast of southern Peru. h: 105 km ca. H= 05 38 20.6				
22.	eP	Z	14	25	24	24.	eP	Z	06	46	29
	4.0 S., 131.0 E. Near north coast of Ceram. h: 33 km ca. H= 21 38 30*						19.7 S., 177.5 W. Fiji Is. region. h: 5.41 km ca. H= 06 36 11.3				
22.	eL e e	E N E	14	56	36 15 05 22 48	24.	iP P: D	Z	13	18	16.4
	18.1 N., 71.3 W. Near south coast of Dominican Republic h: 50 km ca. H= 21 14 06.1						13.3 S., 175.4 W. Tonga Is. region. h: 209 km ca. H= 13 07 26.4				
22.	eL	E	22	08	56	25.	P1 iP2 iS	Z Z NEZ	05	44	01.5 03.0 23.0
	49.4 N., 158.6 E. Kurile Is. region. h: 50 km ca. H= 17 12 47.4						51.1 N., 159.3 E. Off coast of Kamchatka. h: 40 km ca. H= 07 13 47*				
23.	iP iS	Z NE	08	46	26.0 29.0	25.	iP eS P: S, D	NZ N	08	02	55.3 04 16
	28.1 S., 65.4 W. San Luis Province, Argentina. h: 32 km ca. H= 08 03 20.1						Mag. 5½ (Mat.) 10.4 N., 121.8 E. Near west coast of Panay, P.I. h: 46 km ca. H= 09 11 23.7				
23.	iP iS i P: N., W.C	NEZ NE Z	12	18	49.8 19 18.6 19.0	25.	eP eL eL	Z E N	09	17	25 24 15 30
	28.1 S., 65.4 W. San Luis Province, Argentina. h: 32 km ca. H= 08 03 20.1						Near west coast of Panay, P.I. h: 46 km ca. H= 09 11 23.7				
23.	iP iS P: N, W, D	NEZ Z	12	54	36.7 39.0	25.	eP	Z	15	28	46.9
	28.1 S., 65.4 W. San Luis Province, Argentina. h: 32 km ca. H= 08 03 20.1						(cont.)				
23.	P e e	NEZ E N	17	17	15 20 04 12						

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	iS P: C	N	15 28 53.2		eS eL	NE NE	23 55 25 56 15
25.	iP i P: N,D	NZ E	16 02 16.7 16.9		Mag. $5\frac{1}{2}$ - $5\frac{1}{2}$ (Mat) 15.5 N., 121.3 E. Central Luzon, P.I. h: 33 km ca. H= 23 45 16.8 USCGS		
25.	P i S i eL L P: D	Z E N E N EZ	17 15 05.0 06.7 18 14 28 20 00 09	26.	iP iS P: N, W	NEZ N	00 22 20.2 25.3
	Mag. $5\frac{1}{2}$ - $5\frac{3}{4}$ (Mat) 24.4 N., 123.4 E. Near east coast of Formosa. h: 33 km ca. H= 17 11 01.7 USCGS			26.	P iS	Z Z	00 49 18.3 23.8
25.	iP i	Z N	19 26 33.1 27 07.8	26.	iP iS	Z EZ	01 05 20.2 35.8
	19.5 N., 121.8 E. Off coast of northern Luzon, P.I. h: 33 km ca. H= 19 21 49.6 USCGS			26.	eP SN,	Z iSE	01 42 01 07.8
25.	P iS	Z NEZ	20 00 38.9 44.9	26.	iP iS P: D	Z NEZ	02 09 13.5 19.3
25.	iP i S P: E,C	EZ N EZ	20 11 53.6 58.1 59.3	26.	eP eS	Z E	02 18 21 22 21
25.	P e	NZ N	20 19 58 21 48		19.3 N., 121.0 E. Coast of northern Luzon, P.I. h: 56 km ca. H= 02 13 20.5 USCGS		
25.	P iS	EZ EZ	21 05 19.7 25.3	26.	iP iS P: D	Z NE	03 47 24.3 30.0
25.	P iS	Z NEZ	21 30 08.9 14.8	26.	iP iS P: D	Z N	04 38 04.7 10.5
25.	iP iS	EZ Z	22 00 02.2 07.8	26.	P iS	Z NE	04 52 22.3 24.8 49
25.	iP iS P: E,D	EZ NEZ	22 11 07.3 13.1	26.	eP e eL	Z E N	07 41 06 12.3
25.	iP iS	Z N	22 34 26.5 32.3	26.	P eS	NEZ NE	10 19 59 22 16 23 05
25.	eP iS	Z NEZ	23 10 47 52.4	26.	P i S	Z N N	10 29 25 30 14
25.	eP e	Z N	23 50 45 51 16 (cont.) -15-	26.	P i S	Z N N	13 40 05 06.5 40
				26.	eP eL eL	Z E N	14 55 20 53 19 36

Date	Phase	Comp.	Time(GMT)		
			h	m	s
26.	iP S P: N,E,C	NEZ E	16	38	47.3 39 17
26.	iP iS P: E,C	EZ N	16	43	24.3 54.6
26.	iP iS P: D	Z NEZ	19	15	37.8 43.6
26.	P iS	Z NEZ	19	17	16.3 22.3
26.	iP i PP? iPcS SN, iS i SS SS i ePKPPKP?Z P: N,C Mag. 7½ - 7½ (Mat) 7.5 S., 146.2 E. Eastern New Guinea. h: 171 km ca. H= 20 14 08.7	NEZ NEZ EZ Z EZ NE E N Z Z	20	22	03.9 05.3 23 05 27 20 28 16 25 31 44 50 32 02 53 16
26.	iP i iS i P: C	Z NE Z N	22	42	39.5 39.8 43 01.0 03.0
27.	iP iS	Z NEZ	02	52	36.1 42.0
27.	S?	EZ	04	25	03
27.	iP iS P: E,C	EZ NEZ	04	25	06.3 12.4
27.	P S	NEZ N	04	32	51 57
27.	iP i i i i ePcS i iS i i iL L iL	NZ E Z N Z Z Z N E Z E N E	04	38	03.8 04.7 12.8 40 27 35.6 43 39 45 44 40 51 53 47 23 53 49 24 (cont.)

Date	Phase	Comp.	Time(GMT)		
			h	m	s
	L iL P: N,C Mag. 7 (Mat.) 6.0 S., 149.4 E. New Britain region. h: 52 km ca. H= 04 30 00.8	N Z	04	51	19 24
27.	eP 6.3 S., 149.2 E. New Britain region. h: 59 km ca. H= 05 24 02.1	Z	05	32	04
27.	iP S	Z Z	05	38	32.1 38.0
27.	eP i eS?	Z N N	06	56	05 16 31
27.	e e e	E N E	07	10	43 11 19 17 22
27.	iPKP 14.7 S., 73.3 W. Southern Peru. h: 110 km ca. H= 11 00 45.3	NZ	11	20	08.2
27.	P S	NEZ N	11	20	31.1 54.8
27.	iP iS P: N	NZ NEZ	17	56	37.2 43.7
27.	P i i S	Z E N N	18	24	03.6 07.0 07:4 25 14
27.	iP iS P: N	N NE	18	30	38.9 39.8
27.	iP iS P: C	Z NEZ	19	44	04.9 10.4
27.	iP iS P: S,E	NEZ E	20	00	57.9 01 03.6
27.	iPN e P: S 4.6 S., 152.9 E. New Britain. h: 100 km ca. H= 20 28 34.9	PZ E	20	36	27.4 47

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
27.	P	EZ	20 38 17	28.	iP	NEZ	13 42 45.7
	e	E	46 28		iS	EZ	51.7
	eL	E	48 35		P: N,E,C		
	eL	N	49.2	28.	e	E	15 58 41
27.	iP	Z	23 44 28.0	28.	iP	NZ	16 47 44.4
	P: C				S	N	50.4
	54.8 N., 161.6 W.				P: N		
	Alaska Peninsula.			28.	iP	Z	19 36 45.3
	h: 33 km. ca.				i	NE	46.1
	H= 23 36 20.4				S	NE	37 03
	USCGS			28.	iP	NEZ	21 32 52.1
28.	P	EZ	00 11 09		S	NZ	58.3
	S	NE	15		P: N,E,C		
28.	iP	EZ	00 12 37.0	28.	P	Z	22 21 03.0
	iS	NE	43.0		iS	NEZ	08.5
	P: E			28.	iP	NEZ	22 37 55.0
28.	P	NEZ	01 09 56		S	N	38 01
					P: N,E,C		
28.	eP	Z	01 43 51	28.	P	EZ	22 44 03.1
	i	Z	44 11		S	NEZ	08.9
	eSSS	E	02 04 06	28.	eP	NEZ	22 52 19
	eL	E	06 50		eS	E	24
	16.3 S., 66.0 E.			28.	iP	Z	22 53 21.2
	Indian Ocean.				iS	E	27.1
	h: 33 km ca.				P: D		
	H= 01 31 13.2			28.	iP	NEZ	23 00 59.9
	USCGS				iS	NEZ	01 05.9
28.	eP	Z	05 07 16	28.	P	EZ	23 03 34.4
	eL	E	10 20ca		iS	EZ	39.9
	eL	N	25	28.	PN, IP	EZ	23 12 58.1
28.	iP	EZ	06 15 58.5		S	N	13 05.1
	i	N	58.7		P: E,C		
	i	N	16 11.0	28.	P	Z	23 24 34.8
	iS	N	43.2		iS	NZ	40.3
	i	NZ	47	28.	P	EZ	23 39 04
	i	E	51		S	NEZ	10
	P: E,D						
	Mag. 5.0 (Mat.)						
	38.0 N., 142.0 E.						
	Near east coast of northern						
	Honshu, Japan.						
	h: 40 km ca.						
	JMA						
28.	iP	NEZ	09 01 41.1				
	S	N	02 05				
	P: S,E,D						
28.	iP	Z	11 04 43.7				
	i	NE	43.9				
	S	NE	50				
	P: C						
28.	iP	NEZ	13 28 52.3				
	iS	NEZ	58.0				
	P: N,E,C						

Mineo Takehana
Director

11 NOV 1960

SEISMOLOGICAL BULLETIN
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MARCH , APRIL
1963

Matsushiro Seismological Observatory
Matsushiro-machi , Nagano-shi,
Nagano-ken , Japan

Matsushiro Seismological Observatory , Japan

Seismological Bulletin

Latitude 36° 32' 30" N
 Longitude 135° 12' 32" E
 Elevation 440 M

Instrumental Constants

Instruments	Comp.	Period (sec)		Damping ratio		Magnification
Benioff Seismograph (Short Period)	N	$T_1= 1.0$	$T_2= 0.23$	$h_1= 0.63$	$h_2= 1.7$	103,000 (max)
	E	$T_1= 1.0$	$T_2= 0.22$	$h_1= 0.70$	$h_2= 1.6$	106,000 (max)
	Z	$T_1= 1.0$	$T_2= 0.21$	$h_1= 0.72$	$h_2= 1.2$	131,000 (max)
Benioff Seismograph (Long Period)	N	$T_1= 1.0$	$T_2= 70$	$h_1= 0.63$	$h_2= 5.9$	7,330 (max)
	E	$T_1= 1.0$	$T_2= 62$	$h_1= 0.70$	$h_2= 5.6$	9,640 (max)
	Z	$T_1= 1.0$	$T_2= 34$	$h_1= 0.72$	$h_2= 7.3$	7,590 (max)
Short Period Seismograph	Z	$T_1= 1.0$	$T_2= 2.62$	$h_1= 1.4$	$h_2= 1.2$	32,000 (max)
Galitzin Seismograph	N	$T_1= 15$	$T_2= 100$	$h_1= 1$	$h_2= 1.2$	1,350 (max)
	E	$T_1= 15$	$T_2= 100$	$h_1= 1$	$h_2= 1.1$	1,640 (max)
	Z	$T_1= 7.5$	$T_2= 100$	$h_1= 0.76$	$h_2= 0.37$	860 (max)
Wood-Anderson Seismograph	N	0.3		0.3		1,050
	E	0.3		0.3		1,200
1000 kg Long Period Seismograph	N	33.0		0.60		100
	E	30.0		0.62		100

March , 1963

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
1.	iP iS	NEZ NEZ	00	12	32.7 39.0	1.	iP iS P:C	Z NZ	05	34	39.9 45.8
1.	eP iS	Z E	00	22	08 14.4	1.	S	Z	05	53	07.0
1.	S	Z	00	25	01	1.	P iS	Z NZ	06	21	16.8 22.2
1.	P S	Z E	00	46	10.3 15.6	1.	eP S	Z Z	06	26	26 31.9
1.	eP S	Z NEZ	01	55	01 06.6	1.	eP S	Z Z	06	45	40 45.6
1.	P S P:C	Z NZ	02	17	28.5 34.6	1.	eP S	Z Z	06	46	19 24.1
1.	P S P:D	Z Z	02	31	31.6 37.5	1.	eS	Z	06	47	08
1.	S	Z	02	38	31.3	1.	S	Z	06	49	10
1.	S	Z	03	14	23	1.	eP iS	Z Z	06	56	47 51.1
1.	P S	Z N	03	36	43 49	1.	eP iS	Z Z	07	40	36 41.7
1.	P S P:C	Z Z	03	50	17.6 23.8	1.	P iS	Z Z	07	48	00 05.8
1.	P S	Z Z	04	25	21.1 27.0	1.	S	Z	07	53	45.9
1.	P	Z	04	49	41	1.	S	Z	08	24	37
	18.2 S., 177.9 W. Fiji Is. region. h: 568 km ca. H= 04 39 34.3					1.	P iS P:D	Z Z	08	34	27.1 33.0
			USCGS			1.	eP S	Z Z	08	40	33 38.6
1.	i	Z	05	01	35	1.	P	Z	08	43	28
1.	eP eS	Z Z	05	14	06 11	1.	P	Z	08	52	05
1.	iP iS P:C	Z NZ	05	22	13.9 18.7	1.	iS	Z Z	08	56	49
1.	i	Z	05	26	23	1.	i	Z	08	56	49
1.	eP S	Z Z	05	28	31 37.4	1.	P S	Z Z	09	06	50.6 56.5
1.	iP iS P : N, C	NEZ Z	05	31	51.1 56.9	1.	S	Z	09	07	12
						1.	i	Z	09	21	00
						1.	S	Z	09	21	51

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
1.	eP	Z	09	24	29	1.	S	Z	10	21	13
	e	Z			31						
	iS	Z			35.2	1.	S	Z	10	21	35.1
1.	eP	Z	09	25	06	1.	iP	E	10	23	33.6
	S	Z			11.9		iSZSN				44.5
1.	i	Z	09	27	14	1.	eP	Z	10	25	50
							S	Z			54.9
1.	eP	Z	09	29	33	1.	eP	Z	10	29	12
	S	Z			38.6		S	NZ			17.6
1.	eP	Z	09	30	03	1.	i	Z	10	34	16
	S	Z			09.1						
1.	S	Z	09	30	33.1	1.	eP	Z	10	34	49
							eS	Z			55
1.	P	Z	09	38	59.0	1.	S	Z	10	37	07.1
	S	Z			39 04.7						
1.	i	Z	09	44	57	1.	e	Z	10	37	52.6
1.	P	Z	09	52	19	1.	i	Z	10	38	01
	iS	Z			25.4						
1.	S	Z	09	52	58.1	1.	i	Z	10	40	35
1.	iPNEPZ	Z	09	56	33.6	1.	e	Z	10	42	17
	i				36.0	1.	i	Z	10	43	24
	P: S, E					1.	eP	Z	10	44	07
1.	iP	Z	09	56	37.1		eS	Z			13
	S	Z			42.7	1.	e	Z	10	45	17
1.	S?	Z	09	57	39.3	1.	P	Z	10	47	09.1
1.	i	Z	10	00	02		iS	Z			14.9
1.	S	Z	10	02	18.0	1.	P	Z	10	47	23
1.	eP	Z	10	03	28		i	EZ			43
	S	Z			33.7		S	NZ			48 30
1.	P	Z	10	05	13.6		L	E			49 09
							L	Z			12
1.	iP	Z	10	05	17.9	Mag. 5.4 (Mat.)					
	iS	Z			23.7	41.2 N., 142.9 E.					
						South of Hokkaido, Japan,					
						h: 41 km ca.					
						H= 10 45 55.7 USCGS					
1.	P	Z	10	10	30.9	1.	iP	Z	10	51	21.6
	iSNSE				36.9		S	Z			27.2
	P:C					1.	eP	Z	10	53	36
1.	P	Z	10	13	10.4		S	Z			42.2
	iSNSZ				16.1	1.	eP	Z	10	57	24
1.	S	Z	10	13	29.7		S	Z			30.4
1.	P	Z	10	17	39.1	1.	P	Z	11	09	08.6
	S	Z			45.0		S	Z			14.3

Date	Phase	Comp,	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
1.	iP iS P:C	Z Z	11 10 43.4 54.1	1.	P S	Z Z	13 02 48.1 53.9
1.	i	Z	11 16 44.6	1.	S	Z	13 08 34.6
1.	S	Z	11 22 29.7	1.	S	Z	13 12 53
1.	P S	Z Z	11 26 05.0 10.3	1.	eP eS	Z Z	13 16 02 08
1.	S	Z	11 27 33.7	1.	S	Z	13 25 22.6
1.	S?	Z	11 33 33	1.	e	Z	13 31 43
1.	iP iS	EZ NE	11 34 21.1 26.5	1.	i	Z	13 37 20
1.	i	Z	11 36 07.6	1.	iP iS P: C	Z NZ	13 39 22.1 23.1
1.	P iSN,SZ	Z	11 37 16.9 22.9	1.	eP iSN,SZ	Z	13 40 43 43.6
1.	eP iS	Z Z	11 41 13 19.1	1.	i	Z	13 43 59
1.	S?	Z	11 45 07	1.	eP eS	Z Z	13 50 52 53
1.	iP S P: C	Z Z	11 52 24.0 30	1.	eP iSN,SE	Z	13 54 43 49.1
1.	eP S	Z Z	11 54 27 33	1.	e	Z	13 53 53
1.	S	Z	11 54 43	1.	eP eS	Z Z	14 06 01 07
1.	eP eS	Z Z	11 55 16 22	1.	eP S	Z Z	14 14 33 43.9
1.	i	Z	12 08 14	1.	eP S	Z Z	14 20 20.2 27
1.	iP iS P:C	EZ Z	12 15 50.1 53.5	1.	P P: D	NZ	14 33 46.0
1.	P S	Z Z	12 34 54.6 35 00.5	42.2 N., 141.2 E. Near south coast of Hokkaido, Japan. h: 33 km ca. H= 14 32 20			
1.	eP S	Z Z	12 45 34 39.6	USCGS			
1.	e	Z	12 48 41	1.	i	Z	14 37 45
1.	eP S	Z Z	12 51 57 52 02.6	1.	eP S	Z Z	15 04 53 05 03
1.	iP iS	NEZ NE	12 53 06.0 11.3	1.	i	Z	15 07 22.6
				1.	P S	Z Z	15 13 17.6 23

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
1.	i	Z	15 21 52	1.	eP	Z	20 52 29
1.	eP	Z	15 24 59		eS	Z	35
	S	Z	25 05	1.	eP	Z	21 07 40
1.	iP	Z	16 02 45.8		eS	Z	46
	S	NZ	51.4	1.	eP	Z	21 10 52
	P:C				S	Z	57.9
1.	eP	Z	16 18 21	1.	eP	Z	21 22 29
	S	Z	27.0		S	Z	35.1
1.	iP	Z	16 29 55.2	1.	eP	Z	23 06 55
	S	Z	30 01 ca.		eL	E	10 20
	P: C						22.9 N., 144.2 E.
1.	i	Z	16 53 17.7				Volcano Is. region.
1.	iP	Z	17 04 12.6				h: 72 km ca.
	iS	NZ	18.5				H= 23 03 30.7 USCGS
	P: C			1.	e	Z	23 09 21
1.	eP	Z	17 06 27	1.	eP	Z	23 20 41
	iS	N	32.9		S	Z	47
	i	Z	33.1	1.	S	Z	23 41 15
1.	i	Z	17 08 51	1.	S	Z	23 47 15
1.	P	Z	17 15 23.0	2.	P	Z	00 28 19.7
	S	NZ	29.1				5.1 S., 144.3 E.
	P: C						North eastern New Guinea.
1.	P	Z	18 05 28.6				h: 69 km ca.
	S	Z	34.6				H= 00 20 32.3 USCGS
1.	e	Z	18 27 02	2.	eP	Z	00 36 41
1.	eP	Z	18 47 16		S	Z	46.8
	eS	Z	23	2.	iP	NEZ	01 23 58.6
1.	S	Z	19 22 12.3		iS	Z	24 01.7
					P: D		
1.	iP	Z	19 40 54.9	2.	iP	NEZ	01 28 43.4
	S	NZ	41 00.3		iS	NZ	49.4
	P: C				P: N, C		
1.	P	Z	20 17 14	2.	e	Z	01 29 04
	iS	Z	19.5	2.	eP	Z	01 32 13
	i	Z	20.1		iS	NSZ	19.6
1.	eLq	E	20 12.0	2.	iP	Z	01 42 43.0
	Lr	E	22 34		P: D		
							6.5 S., 131.4 E.
							Banda Sea.
							h: 33 km ca.
							H= 01 34 40.9 USCGS
1.	e	Z	20 25 05	2.	P	Z	01 54 39.0
					S	Z	35.6

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
2.	iP S P: C	NEZ Z	02 19 19.4 25.4	2.	eP iS	Z Z	09 49 15 21.5
2.	iP iS P: D	Z NZ	03 05 20.1 23.1	2.	iP iS i P: N, C	NE Z N	10 14 13.1 18.9 19.3
2.	eP eS	Z Z	03 27 24 30	2.	iP iS i P: D	Z N Z	10 30 29.0 31.8 32.0
2.	iP iS P: N, C	NEZ NZ	03 38 07.8 13.3	2.	i	Z	10 31 07
2.	iP iS	EZ NZ	05 07 46.9 52.6	2.	iP iS P: N, C	NEZ NZ	11 01 24.3 30.1
2.	eP eL 1.8 S., 143.6 E. North of New Guinea. h: 129 km ca. H= 05 39 07.4	Z E	05 46 20 55 10	2.	P i e L P: N, C 46.0 N., 153.0 E. Kurile Is. region. h: 33 km ca. H= 11 12 01.3	NZ NEZ N NE	11 15 26.7 37 19 44 21 10
2.	iP iS P: N, E, C	NEZ	06 26 13.9 19.8	2.	eP iS	Z NZ	11 49 06 12/0
2.	iP iS P: N, C	NEZ NZ	06 27 39.2 45.1	2.	iP iS i P: D	Z N Z	11 49 25.0 30.7 31.1
2.	iP iS P: E, C	EZ SE	06 53 04.6 10.1	2.	i	Z	11 49 44.1
2.	iP S	E Z	06 59 38.6 46	2.	iP S	NEZ E	11 54 14.9 20.6
2.	i	EZ	07 05 49	2.	eP iS	Z NEZ	11 57 07 13.1
2.	e	Z	07 13 12	2.	P iS	Z NZ	12 33 44.1 49.7
2.	P S P: N	NZ Z	08 12 05.6 11.1	2.	P S	Z NZ	14 00 32.6 38.2
2.	iP i S i i Lr P: S, C 46.1 N., 153.1 E. Kurile Is. region. h: 33 km ca. H= 09 25 55.0	NZ E N E N NEZ	09 29 20.1 20.6 32 19 20 33 16 34 53	2.	P S	Z Z	14 47 23.8 30.3
				2.	P S	Z Z	14 56 44 50.7
				2.	P	Z	16 03 37
							40.1 N., 152.9 E. Kurile Is. region. h: 140 km ca. H= 16 05 00
							USCGS

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
2.	S e L	E N E	16 13 35 20 47 22 49	3.	P S	Z NE	12 44 34 38
	10.1 N., 126.1 E. Mindanao, P.I. region. h: 92 km ca. H= 16 06 56.3			3.	P S	Z E	12 55 21.6 25.0
	USCGS			3.	iP i iS i	NEZ E NE NEZ	23 01 22.0 02 26 37.6 38.1
2.	eP S	Z Z	18 02 15 20.3		P: N,C Mag. 5.8 (Mat.) 30.7 N., 136.9 E. South of Honshu, Japan. h: 491 km ca. H= 22 59 44.9		
2.	iP iS	Z NZ	18 35 08.7 14.6		USCGS		
2.	iP iSZ, SNE P: N,C	NEZ	18 57 45.6 51.1	3.	P iS	Z NE SZ	23 03 59.9 05 15.2
2.	eP eS	Z Z	19 46 11 17	4.	iP i iSZ SN	Z E	01 46 18.1 18.6 24.7
2.	P eS	NEZ Z	20 29 39 45	4.	i	Z	03 03 40
2.	iP iS P: S,W,D	NEZ NZ	20 48 43.3 49.0	4.	iP i P: C	Z E	03 22 28.3 30
2.	i	Z	22 59 35	4.	i	Z	03 22 57.9
2.	iP iS	EZ Z	23 11 12.6 18.8	4.	iP iS P: N,E,C	NEZ EZ	03 53 45.8 51.4
2.	P	Z	23 24 27.6	4.	iP i S	Z E E	06 10 09.6 10.3 16
2.	P S	Z E	23 56 21 27	4.	P S	E NE	06 10 20 26.6
2.	S i	N Z	23 56 37.1 37.6	4.	i	Z	07 25 22
3.	eP S	Z Z	02 16 20 26	4.	iP S i i P: S,W,D	Z NE N E	07 27 26.6 32 34.2 35
3.	P eS	Z Z	02 56 07 13	4.	eP i eS e eL	Z N N N N	07 51 50 55 08 00 20 11 40 16.0
3.	P iS	Z Z	04 26 13 19.3		82.9 N., 7.7 W. North Polar region. h: 33 km ca. H= 07 41 51.0		
3.	P i P: D	Z NE	06 35 44.1 53		USCGS		
3.	iP iS i P: N,D	NZ NE Z	10 29 05.6 11.1 11.3				
3.	eP S	Z NE	12 12 09 15				

Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
4.	eP	NEZ	09 01 02	4.	eP	Z	19 14 26
4.	iP	EZ	10 47 09.6	i	E		26.6
	i	N	10.6				
	P: W, C						
4.	P	NZ	12 41 16	4.	P	Z	20 52 32
	47.7 N., 152.1 E.			4.	P	Z	21 57 12.0
	Krile Is. region.			i	N		13.0
	h: 140 km ca.			eS	NE		58 33
	H= 12 37 44.6	USCGS					
4.	P	Z	12 53 51	5.	eP	NEZ	00 01 30
	46.3 N., 153.1 E.			5.	i	Z	00 01 44
	Kurile Is. region.			5.	P	Z	00 03 52
	h: 33 km ca.			S	Z		57.8
	H= 12 50 16.2	USCGS		5.	eP	Z	01 45 54
4.	P	NEZ	13 42 58.1	S	Z		46 00.5
i	N		43 00	5.	eP	Z	02 02 11
i	E		01.6	S	Z		17
S	N		46 24	5.	P	Z	03 05 01.5
L	NE		47 33	S	E		35
L	Z		48 03	P: D			
	P: S, W, D			5.	i	NEZ	04 57 42
	Mag. 6 (Mat.)			5.	P	Z	05 00 13.0
	24.2 N., 121.7 E.			i	Z		37
	Formosa.						
	h: 33 km ca.						
	H= 13 38 41.0	USCGS					
4.	P	Z	15 22 53.1	5.	i	NEZ	04 57 42
i	E		56.1	5.	P	Z	05 00 13.0
P: C				i	Z		37
	35.2 N., 25.4 E.						
	Crete.						
	h: 42 km ca.						
	H= 15 10 19.2	USCGS					
4.	P	Z	15 58 44	5.	PKP	Z	07 24 12
4.	PKP	Z	16 02 14	e	E		27 45
L	NE		47.0	L	E		08 10 00
	Mag. 6- 6½ (Mat.)			eL	N		30
	4.5 S., 81.6 W.						
	Off coast of northern Peru.						
	h: 33 km ca.						
	H= 15 43 04.0	USCGS					
4.	iP	EZ	16 52 22.2	5.	iP	Z	09 22 22.4
iSZSN			27.9	P: D			
4.	iP	NZ	17 34 32.8				
S	NEZ		38.3				
P: N							
4.	P	Z	18 27 33	5.	P	Z	12 31 45.9
S	NEZ		39	iSNSE			32 20.5
				P: C			

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
7.	iP iS i P: N,D	NEZ Z NE	09 28 30.9 36.0 37.0				
					19.2 S., 169.6 E. New Hebrides Is. h: 33km ca. H= 03 24 57.2		USCGS
7.	iP iSNZSE P: C	NEZ	10 16 24.2 33.0	8.	iPNZPE S P: S,D	NE	03 36 28.7 37 47
7.	ePKP PP PP i SS i i SSS SSS i i Lq Lq Lr	NEZ E Z E E E N E N E E E E N NEZ	12 36 23 40 04 10 50 36 59 42 13 00 52 56 04 46 53 08 43 12 29 17 50 18 50 26 30	8.	P i eLq Lr eLr	NZ Z E E N	03 43 28 44 59 14 04 03 50 52
					19.3 S., 169.6 E. New Hebrides Is. h: 33 km ca. H=03 33 03.4		USCGS
				8.	P	NEZ	07 01 00
				8.	P i S	Z NZ NEZ	03 55 44.5 47 54
				8.	P S?	Z NEZ	14 51 07.3 09.4
				8.	L	E	16 04.0
7.	P 50.3 N., 178.6 E. Rat Is. Aleutian Is. h: 33 km ca. H= 13 43 01.2	Z	13 49 28.0				
					1.1 N., 29.9 W. Mid - Atlantic Ocean. h: 33 km ca. H= 15 06 05.3		USCGS
7.	P e ePP 36.1 N., 71.2 E. Hindu Kush. h: 202 km H= 21 49 32.6	Z E Z	21 58 28 57 59 10	8.	P P: C	Z	16 15 24.0
					21.3 S., 170.2 E. Loyalty Is. region. h: 108 km ca. H= 16 04 54.0		USCGS
8.	iP i S Lq Lr P: C Mag. 5 $\frac{1}{4}$ (Mat.) 19.2 S., 169.7 E. New Hebrides Is. h: 33 km ca. H= 02 44 31.5	Z NE E E E	02 54 56.5 57.0 03 03 32 10 45 14 25	8.	iP i S i P: C	Z N E N	16 40 40.3 55 41 20 20.5
				8.	P i i i P: D	Z E N N	16 49 23.5 23.8 24.0 56
				8.	P i S? P: N,C	NZ N N	19 40 04.2 05 35
8.	iPZPNE eS Lq eLr P: W,C	E E E	03 35 19.7 43 46 51 06 54 44	8.	iPEZPN SNeSE P: S,W,D		22 33 13.0 40

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
9.	iP i i S P: E, D	EZ N E NE	00 01 32.5 33.0 54 02 09		eL	E	17 10.3
					6.7 N., 123.9 E. Near south coast of Mindanao, P.I. h: 33 km ca. H= 16 56 13 USC GS		
9.	iP i S P: S, D	NZ E NE	01 06 35.0 35.5 54	9.	iP i iS P: C	Z N NE	18 53 29.8 29.9 46.9
9.	eP eL eL	Z E N	02 28 28 54 04 56 09	9.	P i S i L L	NZ E E N E N	19 03 26 28 09 33 10 44 12 32 13 24
	21.9 N., 62.0 E. Arabian Sea. h: 33 km ca. H= 02 17 39.5 USC GS				3.2 S., 147.1 E. New Britain region. h: 33 km ca. H= 18 55 49.0 USC GS		
9.	iP i e S L P: D	Z NE N E N	06 46 50.4 50.8 48 08 44 49 40	9.	S? L	E E	21 32 29 35 30
	46.1 N., 141.0 E. Kurile Is. region. h: 31 km ca. H= 06 44 23.2 USC GS			9.	iP i e P: D	Z NE E	22 54 13.5 13.8 23 02 45
9.	iPEZPN S P: E	N	09 54 21.6 26		21.5 S., 179.0 W. Fiji Is. region. h 529 km ca. H= 22 43 50.5 USC GS		
9.	iP i i S P: D	Z N E NE	11 27 54.6 54.8 55.0 29 00	10..	eL	E	00 03 14
9.	eP iS i	NEZ N E	11 40 08 48.5 50	10..	iP i pP i eSS eL eLr P: C	Z NE Z Z E E E	01 29 18.4 18.5 47.5 30 09 41 52 43 37 46 22
9.	iPNZPE i S i L eL P: C	Z E N E N	16 31 19.0 28 37 26 36 40 29 43		15.2 S., 167.2 E. New Hebrides Is. h: 142 km ca. H= 01 19 38.1 USC GS		
	3.2 S., 147.0 E. Bismarck Sea. h: 33 km ca. H= 16 23 44.3 USC GS			10.	iPNZ PE i i eS L L P: S, W, C	Z Z E E N	01 34 47.0 36 11.5 37 23 41 52 47 53 48 50
9.	P i eS	Z N E	17 02 40 45 08 50		Mag. 5½- 5½ (Mat.) 56.2 N., 153.8 W.		
	(cont.)				(cont.)		

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
		Kodiak I., Alaska. h: 33 km ca. H= 01 26 04.1			i	Z	11 51 42.2
		USCGS			i	N	53
					S	E	52 13
					i	N	16
10.	P	EZ	02 57 44.0		P: N, E, D		
	i	N	44.8		39.4 N., 141.7 E.		
	i	Z	50.0		Near coast of Honshu, Japan.		
	i	N	53		h: 60 km ca.		
	PP	N	58 05		H= 11 50 26.3	USCGS	
	S	N	03 01 11	10.	iP	EZ	13 55 59.6
	i	E	12		i	N	56 00.0
	i	Z	14		S	NEZ	19
	L	NE	02 20		P: D		
	L	Z	03 45	10	P	NZ	13 57 59.0
		P: W, D			PcP1	Z	14 00 28
		Mag. 6 - 6 $\frac{1}{2}$ (Mat.)			eS	E	03 30
		24.7 N., 122.1 E			L	E	05 50
		Near east coast of Formosa.			L	N	06 40
		h: 33 km ca.					
		H= 02 53 33.0	USCGS				
10.	iPZPE		03 55 22.9		P: N, C		
	i	N	23.0		Mag. 5- 5 $\frac{1}{2}$ (Mat.)		
	S	NE	56 18		2.4 N., 126.6 E.		
		P: E, D.			Celebes. Sea.		
					h: 41 km ca.		
					H= 13 51 04.3	USCGS	
10.	iP	Z	04 30 32.5	10.	iP	NEZ	19 22 34.3
	i	N	32.9		S?	N	38
	i	E	33.0				
		P: C			P: N, D		
10.	iP	NEZ	05 38 42.0	11.	P	EZ	03 25 35.5
	iSNESZ		58.4		S?	E	26 11
		P: N, E, D					
10.	iP	NEZ	08 31 03.7	11.	iP	NEZ	04 23 05.0
		P: S, W, C			S	Z	14
		54.5 N., 159.1 E.					
		Kamchatka.			P: N, C		
		h: 33 km ca.		11.	iP	NZ	06 23 15.8
		H= 08 25 52	USCGS		i	Z	32.5
10.	ePKP1	Z	11 11 40		i	E	46
	ipPKP	Z	57.0		i	N	54
	i	N	58		i	E	24 13
	PKP2	Z	12 12				
	i	E	16		P: C		
	i	N	20	11.	IPZPE		07 39 35.5
	SKKS	E	22 00		eS	E	49 46
	e	E	30 25		eSSS	E	58 38
	SS	E	35 48		eL	E	03 08 34
	L	E	12 01 38		L	N	11.0
		Mag. 5 $\frac{3}{4}$ - 6 (Mat.)			L	E	13 52
		29.9 S., 71.2 W.					
		Near coast of central Chile			P: C		
		h: 70 km ca.			Mag. 5 $\frac{1}{2}$ - 5 $\frac{3}{4}$ (Mat.)		
		H= 10 51 48.1	USCGS		38.1 N., 29.3 E.		
					Turkey		
					h: 33 km ca.		
					H= 07 27 22.0	USCGS	
10.	iP	Z	11 51 27.8	11.	iP	NEZ	09 12 45.0
		(cont.)	-12-				(cont.)

Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
	P: D			12.	P	Z	18 18 29
	18.7 S., 177.6 W.			12.	iP	Z	20 43 31.9
	Fiji Is. region.				P: C		
	h: 402 km ca.				7.1 S., 156.0 E.		
	H= 09 02 19.8	USCGS			Solomon Is.		
11.	P	Z	09 50 00		h: 97 km ca.		
	0.0., 130.4 E.				H= 20 40 12.8	USCGS	
	Halmahera region.			13.	iP	Z	09 10 29.0
	h: 33 km ca.				i	Z	42.5
	H= 09 42 51.2	USCGS			P: C		
11.	iP	Z	10 36 33.6	13.	iP	NEZ	10 05 29.6
	ep P	Z	37 32		S	NE	32
	P: D			13.	iPNPZ		10 55 20.9
	36.7 N., 71.1 E.				i	E	21.9
	Hindu Kush.				i	NZ	56 16
	h: 189 km ca.				i	Z	23
	H= 10 27 42.1	USCGS			P: N		
11.	iP	NEZ	12 54 56.4		33.1 N., 141.4 E.		
	i	Z	55 06.5		Off coast of southern Honshu,		
	i	N	56 02		Japan.		
	P: S, W, C				h: 47 km ca.		
11.	iP	NZ	14 23 34.6		H= 10 54 15.8	USCGS	
	S	NE	24 40				
	i	NE	42	14.	iP	EZ	08 05 21.5
	P: S, D				i	E	30.4
	31.1 N., 138.2 E.				i	Z	31.9
	South of Honshu, Japan.				S	E	09 40
	h: 396 km ca.				i	N	44
	H= 14 22 08.4	USCGS			eL	E	13 32
11.	iP	Z	15 26 58.5		P: C		
	e	E	29 43		Mag. 5 $\frac{1}{2}$ - 5 $\frac{3}{4}$ (Mat.)		
	P: D				19.0 N., 120.4 E.		
11.	eL	E	18 18 50		Off coast of northern Luzon,		
					P.I.		
11.	P	Z	20 25 02		h: 51 km ca.		
	16.2 S., 167.7 E.				H= 08 00 15.6	USCGS	
	New Hebrides Is.			14.	iP	NEZ	10 06 55.8
	h: 33 km ca.				S	NEZ	58
	H= 20 14 59.8	USCGS			P: S		
11.	e	E	20 48 40	14.	iPZPN		11 55 56.5
					P: D		
11.	iP	Z	23 01 39.5	14.	iP	Z	13 21 26.1
	i	N	40		P: C		
	S	NE	02 04		53.0 N., 164.9 W.		
	P: D				Fox Is, Aleution Is.		
12.	iPZPNE		08 10 55.5		h: 33 km ca.		
	e	E	15 05		H= 18 13 19.1	USCGS	
	eL	E	17 41	14.	iP	Z	18 34 12.3
	P: W, C				i	Z	21.3
	53.9 N., 160.6 E.				i	Z	33 07
	Kamchatka.				eL	E	22
	h: 33 km ca.				eL	E	39 47
	H= 08 05 49.8	USCGS					(cont.)

Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMY) h m s
	P: C						
	46.5 N., 153.4 E.				Assam, India.		
	Kurile Is.				h: 40 km ca.		
	h: 32 km ca.				H= 03 35 22.5		USCGS
	H= 18 30 40.6						
14.	iP	Z	20 05 04.8	16.	iP	NEZ	05 07 00
	i	Z	11.0		i	Z	03 13
	P: C				i	E	22
					i	N	27
					i	Z	34.3
15.	iP	NEZ	00 11 25.0		40.5 N., 142.6 E.		
	P: S,E				Off coast of NE Honshu,		
	5.0 S., 129.6 E.				Japan.		
	Banda Sea.				h: 40 km ca.		JMA
	h: 295 km ca.			16.	iP	Z	08 43 30.3
	H= 00 04 01.3				i	NE	31.2
					i	NE	42
15.	P	NEZ	00 22 00		i	NE	49 09
	eS	E	26 17		i	Z	51 26
	eLq	E	27 15		S	E	31
	Lr	E	28 26		Lq	N	52 16
	Mag. 6 (Mat.)				Lq	E	35
	3.4 N., 126.4 E.				Lr	N	54 00
	Mindanao, P.I.				Lr	E	07
	h: 117 km ca.				P: C		
	H= 00 16 01.3				Mag. 7½ (Mat.)		
					46.5 N., 154.7 E.		
15.	iP	NEZ	05 11 07.4		Kurile Is. region.		
	i	E	21		h: 26 km ca.		
	P: S,W,C				H= 08 44 48.3		USCGS
15.	eP	Z	10 59 20	16.	P	Z	11 20 13
	i	E	45		i	N	19
	e	E	11 08 41		i	N	25.4
	17.5 N., 119.3 E.				i	N	32
	Off west coast of Luzon, P.I.			16.	iP	Z	13 29 45.3
	h: 33 km ca.				P: D		
	H= 10 53 59.8				20.3 S., 174.1 W.		
					Tonga Is.		
15.	iP	Z	12 53 48.7		h: 33 km ca.		
	S	E	54 04.9		H= 13 13 17.6		USCGS
	i	N	05.5				
	P: D			16.	iP	Z	13 47 34.3
15.	iP	NEZ	14 57 17.0		i	N	45.6
	P: N,E,D				i	N	49 15
15.	iP	NZ	18 52 10.1		P: D		
	i	NZ	12		42.6 N., 145.0 E.		
	S	E	53 37		Off coast of Hokkaido, Japan.		
	P: N,D				h: 20 km ca.		JMA
	42.3 N., 142.3 E.			16.	iP	NEZ	13 51 07.5
	Near south coast of Hokkaido,				S?	N	17.3
	Japan.				P: N,E		
	h: 33 km ca.			16.	P	EZ	13 26 32.4
	H= 18 50 34.7				i	NZ	33.9
					S	N	58.3
16.	iP	Z	03 42 58.3		P: W,C		
	P: C						
	26.1 N., 92.8 E.						

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
21.	iPNZPE P: S,E,D		04 14 32.8	23.	eL	E	23 11 00ca,
21.	iP iS P: N,W,C	NEZ NEZ	10 06 27.4 50.8	24.	iP i i i i SP PP S i L i L L	Z E N Z Z Z N E E E N E	02 15 55.4 56.9 57.9 16 04 29 17 29 22 50 55 27 12 28 10 30 58 31 02
21.	iPZPE eS P: C	NE	20 11 32.0 12 04	P: D Mag. 6 - 6½ (Mat.) 9.7 S., 120.4 E. Sunba I. region. h: 33 km ca. H= 02 07 12.8 USCGS			
21.	iP iS P: C	NEZ Z	22 49 14.9 21.5	24.	iP	Z	02 31 58.4 51.6 N., 173.3 W. Andreanof Is, Aleutian Is. h: 55 km ca. H= 02 24 49.2 USCGS
21.	P i i	NEZ N N	22 59 15 48 53	24.	eP eS	Z Z	06 36 20 46
21.	eP i	NE E	23 39 41 48	24.	P i eS eL	Z N N NE	09 39 27 29.4 45 30 48 35
	47.0 N., 155.6 E. Kurile Is. h: 69 km ca. H= 23 35 55.4 USCGS			3.2 S., 146.8 E. Bismarck Sea. h: 33 km ca. H= 09 31 50.4 USCGS			
22.	iP i iS P: S,E,D	NEZ NE NE	02 39 09.5 10.0 27.0	24.	iP i eL P: D	Z NE NE	09 49 21.4 21.9 58 00
	36.7 N., 139.5 E. Honshu, Japan. h: 83 km ca. H= 02 38 50.1 USCGS			Mag. 5½ - 5¾ (Mat.) 9.0 N., 125.6 E. Mindanao region, P.I. h: 51 km ca. H= 09 43 20.2 USCGS			
22.	eL eL	E N	02 47 33 48 40	24.	iPNZPE S	E	12 06 16.4 07 47
22.	iP eS P: D	Z E	04 00 08.2 02 50	P: S,C 44.8 N., 141.9 E. Near coast of northern Hokkaido, Japan. h: 195 km ca. H= 12 04 12.7 USCGS			
	46.0 N., 148.4 E. Kurile Is. h: 115 km ca. H= 03 57 23.8 USCGS			24.	P	Z	12 55 17 (cont.)
22.	P eL eL	NEZ E N	08 35 30 56 43 57 35				
22.	eL	E	09 59 50				
22.	P S	NEZ N	12 41 55.9 42 00.4				
22.	e e	E NE	13 07 24 20 08				
23.	P eS	Z NE	04 07 18 43ca.				

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
	i	E	12	55	19	25.	iP	EZ	20	39	23.6	
	i	Z			19.4		iS	NE			32.0	
	S	NE	13	04	37		P: W					
	SS	E		09	20	25.	P	E	22	32	30	
	L	NE		17	00		iS	NE			33.0	
	Mag. 6½ (Mat.)											
	34.4 N., 47.9 E.											
	Western Iran.											
	h: 33 km ca.											
	H= 12 44 03.2											
	USCGS											
24.	iP	Z	16	12	04.9	25.	P	E	22	32	30	
	eS	N			22		iS	NE			33.0	
	P: C					25.	P	Z	22	55	27	
24.	P	Z	19	27	51		i	E			29.0	
	eS	NE		28	23		i	NZ			32.0	
24.	iP	NEZ	21	42	06.9		i	E		56	40.0	
	S	N		47	30		PcP	NZ			49.0	
	eL	E		50	00		S	E	23	02	53	
	eL	N			07		eL	E		11	53	
	P: S,W,C						eL	N		12	00ca.	
	Mag. 5½ - 5½ (Mat.)						Mag. 6 - 5½ (Mat.)					
	51.8 N., 178.1 W.						0.7 N., 96.5 E.					
	Andreanof Is, Aleution Is.						Off southwest coast of					
	h: 57 km ca.						Sumatra.					
	H= 21 35 24.4						h: 30 km ca.					
	USCGS						H= 22 46 16.2					
	USCGS						USCGS					
24.	P	NEZ	21	44	42	26.	iP	EZ	03	04	05.7	
24.	P	Z	22	10	38		i	N			06.7	
25.	P	Z	04	00	42		i	E			16.0	
	14.0 N., 121.9 E.						S	N			32.0	
	Southern Luzon, P.I.						P: E,D					
	h: 33 km ca.					26.	P	Z	07	32	01	
	H= 03 55 01						S	NE			12.5	
	USCGS					26.	iP	NZ	09	51	47.5	
25.	iP	Z	10	05	05.2		i	E			49.0	
	S	NE			29		S	E		53	25	
	P: C						L	E		54	24	
25.	iPEZPN		12	06	16.2		P: S,D					
	S	NE			27	26.	iP	NEZ	10	00	13.0	
	i	Z			30		i	NEZ			16.0	
	P: E,D						i	NEZ			18.0	
25.	iP	NEZ	20	10	36.0		i	E			52	
	eS	N		11	00		PP	E	03	10		
	P: E,D						S	E	09	52		
25.	P	Z	20	30	19		ScS	N	10	24		
	S	E		41	25		ScS	Z		28		
	SS	E		47	35		L	E	20	54		
	L	E		54	35		i	Z	21	12		
	Mag. 6-6½ (Mat.)						Lr	N	24	34		
	56.3 S., 149.9 E.						Lr	Z		40		
	Macquarie Is. region.						P: S,E,C					
	h: 39 km ca.						Mag. 7½ - 7½ (Mat.)					
	H= 20 17 03.8						29.7 S., 177.8 W.					
	USCGS -18-						Kermadec Is.					
							h: 45 km ca.					
							H= 09 48 19.7					
							USCGS					
						26.	iP	Z	11	57	56.3	
							i	Z			58 10	
							P: D					
							30.1 S., 177.4 W.					

(cont.)

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
		Kermadec Is. region. h: 50 km ca. H= 11 46 02.5	USCGS	26.	iP S P: N,C	NZ NE	21 50 41.0 51 13
26.	iPZPE P: C	29.9 S., 177.6 W. Kermadec Is. h: 60 km ca. H= 12 51 39.7	USCGS	26.	P	N	21 55 46
26.	P		13 03 34.2	26.	P S	E N	22 00 32.0 59
	i		13 36 54	26.	P S	Z N	22 11 56 12 24
	S		56.2	26.	P S P: S	NEZ N	22 14 21.0 44
	i		46 32	26.	P S	Z E	22 21 10 40
	ScS?		35	26.	iP S P: C	Z NE	22 22 16.0 48
	i		47 46	26.	iP S P: N,E	NE N	22 25 20.0 48
	L		55 08	26.	P S	NE NE	22 26 53 27 20
	Lr		57 20	26.	iP S P: S,E,D	NEZ E	22 37 34.2 38 03
	Lr		14 01 00				
		Mag. 7 - 7½ (Mat.) 29.8 S., 177.9 W. Kermadec Is. h: 42 km ca. H= 13 25 02.6	USCGS				
26.	P		14 44 28	26.	P S	NE NE	22 26 53 27 20
		18.0 S., 168.0 E. New Hebrides Is. h: 32 km ca. H= 14 34 16.5	USCGS	26.	iP S P: S,E,D	NEZ E	22 37 34.2 38 03
26.	iP P: D		17 20 52.5				
26.	iP eS? P: S,W,C		17 46 10.4 47 35				
26.	iP iS P: N,E,D		19 50 09.5 52 02.0				
		44.4 N., 146.7 E. Kurile Is. h: 110 km ca. H= 19 47 46.0	USCGS	26.	P	NE	22 50 51
26.	iP P: D		21 01 48.0	26.	P i P: C	Z E	23 01 11 13.5
26.	iP S P: N,E,C		21 35 13.2 44	26.	P S	NEZ NE	23 13 39 14 11
		Mag. 6.9 (Mat.) 36.0 N., 135.7 E. Off coast of Fukui Pref, Japan. h: 33 km ca. H= 21 34 41.1	USCGS	26.	eP i S	Z NE N	23 23 05 07 36
				26.	P S P: C	Z N	23 26 22.0 53
				26.	P S	E E	23 45 52 46 20

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
23.	P	NZ	00 38 54	28.	P	Z	22 18 52
	P: S,D 66.3 N., 20.2 W. Iceland. h: 33 km ca. H= 00 26 27				28. iP Z 23 41 07.3 i N 09.1 eS N 51 07 eL N 00 02 00 ca. 29.6 S., 177.5 W. Kermadec Is. h: 54 km ca. H= 23 29 14.6		
28.	iPZPE		01 37 47.8		USCGS		
	P: C						
28.	iP	NEZ	02 08 49.6	29.	P	Z	00 54 49
	P: W,C 51.9 N., 156.5 E. Southern Kamchatka. h: 147 km ca. H= 02 04 26.3				S N 55 17		
	USCGS			29.	eP	Z	03 23 43
					e NE 46 S NE 24 09		
28.	eP	EZ	03 50 43	29.	eP	Z	06 14 20
	eS? N 51 08				10.3 S., 160.7 E. Solomon Is. h: 32 km ca. H= 06 05 19.9		
					USCGS		
23.	iP	NEZ	09 51 11.6	29.	iP	NE	06 28 26.3
	S E 54 47				S N 49 P: E		
	P: S,E,D 49.0 N., 154.9 E. Kurile Is. region. h: 53 km ca. H= 09 47 10.5				29. iP NEZ 06 32 57.3 S NE 33 22 P: S,E,D Mag.4.6 (Mat.) 35.6 N., 140.5 E. Central part of Chiba Pref, Japan. h: 33 km ca. H= 06 32 24.5		
	USCGS				USCGS		
28.	iP	NEZ	11 24 25.8				
	i Z 42.3						
	P: S,E,D 30.2 S., 177.8 W. Kermadec Is. h: 38 km ca. H= 11 12 31.3						
	USCGS						
28.	eL	E	11 46 00 ca.	29.	eP	Z	07 43 52
					e N 55 eS E 44 19		
28.	P	NEZ	14 46 04.0				
	iS NE 30.8						
	P: N,E,C						
28.	P	NZ	16 38 12	29.	iPNPE		08 18 41.3
	iS E 41.3				S NE 56 P: S		
28.	eP	Z	19 28 53				
	i N 55.8						
	i E 56.3						
	S NE 29 24			29.	P	NE	08 49 00
					eS Z 15		
28.	P	Z	20 24 38.3				
	i NE 42.8						
	S E 25 11			29.	P	Z	09 02 15
					e E 27 S E 04 44		
28.	P	Z	21 33 58				
	i NE 34 02.8						
	S N 32			29.	P	E	12 23 43
					S E 24 12		
28.	P	NE	21 46 45	29.	P	Z	18 26 07
	S NE 47 13						
				29.	P	Z	20 27 25
					(cont.)		

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	Lr	N	05 22 13		P: N,C		
	Lr	E	44		9.2 S., 123.9 E.		
	Mag. 5 $\frac{1}{2}$ - 5 $\frac{1}{2}$ (Mat.)				Sawu Sea.		
	6.1 S., 149.1 E.				h: 33 km ca.		
	New Britain.				H= 01 33 52.8		
	h: 65 km ca.						
	H= 04 58 31.6						
	USCGS						
2.	iP	NE	05 20 24.6	3.	PKP	Z	01 55 39
	iS	E	25.6		4.8 S., 78.4 W.		
	P: N,W				Peru-Ecuador. border.		
					h: 33 km ca.		
					H= 01 35 59.3		USCGS
2.	P	NEZ	11 44 57	3.	iPE Z, PN		03 11 25.5
	iPcP	Z	46 03		eS	NE	58
	e	E	12 03.6		P: E,D		
	5.8 S., 105.0 E.						
	Sumatra.						
	h: 91 km ca.						
	H= 11 35 51.4						
	USCGS						
2.	e	E	12 56.6	3.	P	Z	08 02 34
2.	e	E	13 13.7		11.9 S., 167.2 E.		
2.	P	EZ	14 35 12		Santa Cruz Is.		
	e	E	34		h: 33 km ca.		
2.	iPNZ, PE		14 58 27.9		H= 07 53 00.7		USCGS
	P: S,C						
2.	eP	Z	15 41 37ca.	3.	iP	Z	11 24 33.3
	44.7 N., 110.5 W.				i	N	33.8
	Yellowstone National park,				i	E	34.5
	Wyoming.				eS	N	25 06
	h: 33 km ca.				P: C		
	H; 15 29 42.6						
	USCGS						
2.	iP	NEZ	16 26 04.1	3.	P	Z	11 33 42.4
	iPcP	Z	28 14.6		29.6 S., 177.2 W.		
	eSPP	Z	55		Kermadec Is. region.		
	iS	EZ	31 46.6		h: 48 km ca.		
	i	E	32 34		H= 11 21 49.0		USCGS
	e	E	34 09				
	L	NE	40				
	P: N,E,D						
	Mag. 5 $\frac{1}{2}$ - 5 $\frac{3}{4}$ (Mat.)						
	53.2 N., 171.7 W.						
	Andreanof Is.						
	h: 142 km ca.						
	H= 16 18 55.6						
	USCGS						
2.	e	E	17 34.6	3.	iPZ, PNE		12 03 04.7
	e	E	49.4		PPE		28
2.	eP	Z	17 42 05		eSE		06 52
	i	NE	05.6		PcPZ		56
	iS	NE	34.4		P: D.		
					19.1 N., 121.4 E.		
					Babuyan Is, P.I.		
					h: 71 km ca.		
					H= 11 58 07.2		USCGS
3.	iP	NZ	01 42 25.6	3.	iS	NEZ	12 09 07.6
	eL	E	52.7				

Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
3.	iS	NEZ	12 22 56.6		eLr	NZ	15 43 30
3.	iP	Z	12 42 33.8		Mag. 6 - 6 $\frac{1}{2}$ (Mat.)		
	iS	NEZ	35.9		55.4 S., 123.2 W.		
	P: D				South Pacific Ocean.		
3.	iS	NEZ	12 49 49.8		h: 33 km ca.		
3.	iP	NEZ	12 58 00.4		H= 14 47 55.5	USCGS	
	iS	NEZ	02.4	3.	iP	EZ	15 24 30.2
	P: N				iS	NEZ	32.2
3.	P	Z	12 58 49.3	3.	iP	NZ	15 26 37.3
	iS	NEZ	51.5		i	EZ	40.6
3.	iS	NEZ	13 00 32.7		PcP	Z	28 25
3.	P	Z	13 33 13.1		P: N,C		
	iS	NEZ	15.0		6.1 S., 149.1 E.		
3.	iP	Z	13 57 22.0		New Britain.		
	iS	E	24.0		h: 61 km ca.		
	P: S,D				H= 15 18 36.4	USCGS	
3.	iS	NEZ	14 04 28.9	3.	iS	NEZ	15 29 32.8
3.	P	Z	14 20 37.6	3.	P	Z	15 31 39
	iS	NEZ	39.7		iS	NEZ	41.0
3.	iS	Z	14 20 44.6	3.	iS	NEZ	15 44 55.5
3.	iS	NEZ	14 21 18.1	3.	P	NZ	16 03 53
3.	iS	NEZ	14 22 38.1		i	NZ	58
3.	iS	NEZ	14 24 39.5		i	Z	04 33
3.	iS	Z	14 25 21.0		i	Z	05 04
3.	iS	NEZ	14 25 30.1		61.1 N., 143.1 W. Alaska.		
3.	P	Z	14 29 06.2		h: 78 km ca.		
	iS	NEZ	08.1		H= 15 54 51.7	USCGS	
3.	iP	Z	14 34 54.5	3.	iS	NEZ	16 14 51.6
	iS	NE	56.7	3.	iS	NEZ	16 17 53.0
	P: W,D			3.	P	Z	16 18 53
3.	iS	NEZ	14 51 50.1		i	E	20 31
3.	ePKP	Z	15 06 43		i	N	33
	eSKS	E	14 00		i	Z	43
	PS	NE	18 12		i	N	21 08
	SS	E	24 31	3.	P	NEZ	16 59 34
	eSS	N	47		i	E	43.2
	ScSScS	E	27 56		iS	E	17 00 32.5
	SSS	NE	29 25	3.	iP	NEZ	17 35 04.0
	eLq	E	36 00		iS	NE	10.3
	G	N	37 19		P: N,E		
	G	E	37 26	3.	iP	EZ	17 41 45.0
	eLr	E	42 26		iS	NE	46.9
					P: E,D		
				3.	iS	NEZ	17 42 51.6
				3.	iP	Z	17 48 41.4
					iS	NEZ	43.2
					P: D		
				3.	iS	NEZ	17 55 11.1

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
3.	S	NEZ	17 59 48		iS	NE	21 12 11.5
					P: N,W,D		
3.	iS	NEZ	18 12 30.5	3.	iS	NEZ	21 13 44.5
3.	iS	NEZ	18 12 42.6	3.	iS	NEZ	21 14 34.7
3.	iS	NEZ	18 30 52.7	3.	iS	NEZ	21 15 13.6
3.	iS	NEZ	18 55 40.3	3.	iS	NEZ	21 19 12.8
3.	iS	NEZ	19 01 10.9	3.	iS	NEZ	21 36 24.9
3.	iP	Z	19 04 50.9	3.	iP	NEZ	22 03 26.0
	25.2 S., 179.5 W.				iS	NEZ	28.1
	Fiji Is. region.				P: N,W,D		
	h: 409 km ca.						
	H= 18 54 07.3		USCGS	3.	iS	NEZ	22 04 42.4
3.	P?	Z	19 05 44	3.	iS	NEZ	22 17 14.1
	i	Z	46.5	3.	iS	NEZ	22 22 41.9
	14.4 N., 146.7 E.			3.	iS	NEZ	22 24 51.4
	Mariana Is.		USCGS	3.	iS	NEZ	22 26 22.4
	h: 33 km ca.			3.	iS	NEZ	22 49 02.7
	H= 19 00 38.0			3.	iS	NEZ	22 54 51.2
3.	iS	NEZ	19 06 25.0	3.	iS	NEZ	22 56 48.6
3.	iS	NEZ	19 07 22.6	3.	iS	NE	22 58 50.6
3.	iS	NEZ	19 22 10.9	3.	iS	NEZ	23 04 13.9
3.	iS	NEZ	19 29 55.8	3.	iS	NEZ	23 14 50.6
3.	iS	NEZ	19 34 12.3	3.	iS	NEZ	23 16 17.6
3.	P	Z	19 40 08	3.	iS	NEZ	23 17 07.2
3.	iS	NEZ	20 56 19.3	3.	S	Z	23 17 10
3.	iP	NEZ	20 59 21.3	3.	iS	NEZ	23 17 43.7
	iS	NE	23.2	3.	iS	NEZ	23 17 43.7
	P: S,W,D			3.	iS	EZ	23 21 04.5
3.	iS	NEZ	20 59 50.7	3.	iS	NEZ	23 21 56.3
3.	iS	NEZ	21 03 03.1	3.	iS	NEZ	23 23 40.6
3.	iS	NEZ	21 03 12.7	3.	iS	NEZ	23 25 11.1
3.	iS	NEZ	21 04 31.8	3.	iS	NEZ	23 25 37.4
3.	iP	NEZ	21 04 48.4	3.	iS	NEZ	23 26 38.5
	iS	NE	50.4				
	P: N,W,D						
3.	iS	NEZ	21 10 16.3				
3.	iS	NEZ	21 11 39.3				
3.	iP	NEZ	21 12 09.6				

Date	Phase	Comp,	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
3.	iS	NEZ	23	27	10.5	4.	P	Z	03	43	12
3.	iP	EZ	23	28	19.8		iS	N			13.7
	iS	NEZ			21.7	4.	iS	N	03	43	39.7
	P: E,D					4.	iS	N	03	47	58.6
3.	iP	NEZ	23	30	56.7	4.	iS	N	03	50	16.9
	iS	N			58.7						
	P: S,E,D					4.	eP	Z	04	01	35
3.	iS	NEZ	23	31	32.1		e	Z			53
3.	iS	NEZ	23	31	43.2	4.	P	Z	04	05	25.6
3.	iS	NEZ	23	34	15.7		iS	N			27.4
3.	P	Z	23	36	05.2	4.	iS	NZ	04	47	51.5
	iS	NE			07.2	4.	iS	NEZ	05	27	03.4
3.	P	Z	23	36	42.9	4.	P	EZ	05	27	40
	iS	NE			44.9		iS	NEZ			41.8
3.	iS	NEZ	23	37	20.5	4.	iP	E	05	39	21.4
3.	iS	EZ	23	38	19.8		S	E			50
3.	iS	NEZ	23	38	35.9		P: W				
3.	iS	Z	23	40	25.6	4.	eP	Z	05	51	04
3.	iS	NEZ	23	45	56.7		iS	NZ			05.9
4.	iP	Z	00	08	12.4	4.	iP	NEZ	06	13	29.7
	iS	NEZ			14.4		iS	Z			31.6
	P: D					4.	P	Z	06	14	36.4
4.	iS	EZ	00	27	11.4		iS	NE			38.1
4.	iS	NZ	00	50	15.9	4.	iS	Z	06	14	42.9
4.	iS	NEZ	01	34	50.7	4.	iS	NEZ	06	15	53.0
4.	iS	NEZ	01	49	16.1	4.	P	EZ	06	16	45
4.	S	Z	02	15	49.4		iS	NEZ			46.7
4.	iS	N	03	03	38.6	4.	iS	NEZ	06	19	31.4
4.	iP	Z	03	09	48.4	4.	iS	E	06	29	08.5
	iS	N			50.5	4.	iS	NZ	06	56	01.9
	P: D					4.	P	Z	06	59	40.4
4.	iS	NEZ	03	13	43.1		iS	NZ			42.4
4.	iS	N	03	19	52.9	4.	iS	NZ	07	00	54.8
4.	iS	NE	03	27	29.3	4.	P	Z	07	11	43.1
4.	iP	EZ	03	31	41.4		iS	N			45.1
	iS	NE			43.3	4.	P	Z	10	02	20
	P: E										

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
4.	iP S P: N,E,D	NEZ NE	10 27 17.2 34.3	5.	iS	EZ	02 17 36.2
4.	iS	N	12 00 18.2	5.	eP	Z	02 38 03
4.	iS	NEZ	13 16 56.3	30.2 S., 177.7 W. Kermadec Is. region. h: 33 km ca. H= 02 26 11.1			USCGS
4.	iS	NEZ	13 18 51.8	5.	iS	NEZ	03 46 44.3
4.	P eL	NEZ N	13 48 15 55 41	5.	iS	N	03 46 47.0
			21.2 N., 119.5 E. South of Formosa. h: 19 km ca. H= 13 43 20	5.	iS	EZ	04 10 25.6
			USCGS	5.	iP iS	NEZ N	04 10 42.5 44.4
4.	P S	EZ NZ	17 32 11 40	5.	P e	Z Z	04 15 03 10
4.	eP i	Z NEZ	17 47 36 40.3	5.	iP iS P: D	Z NE	04 24 14.9 16.9
4.	iP S? i P: C	Z N N	19 54 17.5 55 04 07	5.	iPZ, PN i S P: C	E NEZ N	04 33 03.9 14.4 34 06
4.	iP P: D	Z	21 04 25.9	5.	iP iS P: W	EZ NE	06 26 56.1 57.8
4.	iS	NZ	22 01 08.9	5.	iS	Z	06 27 05.4
4.	eP	Z	22 13 03ca.	5.	iP iS	EZ NEZ	06 50 40.2 42.2
			30.3 S., 177.8 W. Kermadec Is. region. h: 36 km ca. H= 22 01 03.3	5.	iS	Z	06 50 46.1
			USCGS	5.	eP	Z	06 58 49
4.	i	Z	23 04 40.7	1.6 S., 99.4 E. Off west coast of Sumatra. h: 33 km ca. H= 06 49 43.4			USCGS
4.	iS	NEZ	23 42 44.7	5.	P e i i	NEZ E Z NZ	07 23 11 33 39.4 39.9
4.	P	Z	23 56 45	5.	P iS	Z EZ	07 49 50.4 52.6
5.	S	Z	00 07 53	5.	P	NE	08 14 49
5.	S	Z	00 09 18	5.	iS	NEZ	08 16 02.7
5.	iP i S	Z NEZ NE	00 52 51.1 53.1 53 36	5.	iS	EZ	08 17 20.3
			38.7 N., 142.0 E. Off east coast of Honshu, Japan. h: 51 km ca. H= 00 51 54.7				
			USCGS				
5.	P? i i	Z N Z	01 35 41 41.6 42.4				

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
9.	iF i S P: C	Z E N	04 35 07.7 18.7 53				
					Santa Cruz Is. region. h: 64 km ca. H= 22 57 47.0 USCGS		
9.	eP i 17.8 S., 163.0 E. New Hebrides Is. region. h: 35 km ca. H= 04 32 26.3	Z NZ	04 42 34 43.0	10.	iP i iS P: D	Z N N	05 45 49.8 50.0 46 36.5
9.	iP S P: E	EZ N	07 29 20.3 29 21	10.	P i i S Lq eLr	Z N E N N Z	07 58 59 59.5 59 00 08 05 47 09 37 12.6
9.	P iS	NEZ N	08 41 04 25.0				Mag. 6 (Mat.) 9.2 S., 125.0 E. Timor. h: 33 km ca. H= 07 50 30.2 USCGS
9.	iP P: E, D	EZ	08 45 57.0	10.	P	Z	08 37 13 52.4 N., 170.5 W. Fox Is. h; 33 km ca. H= 08 29 30 USCGS
9.	iP i i i P: C	Z NE E N	13 49 39.1 39.5 50 22.2 22.7	10.	iP P: S, W	NEZ	10 21 42.7
9.	iP i i S P: S, C	NEZ NE E NE	14 03 18.8 19.0 23.3 26	10.	eP eS? eL	Z E E	11 48 19 51 13 54 26
9.	eL 4.0 S., 151.0 E. New Britain region. h: 33 km ca. H= 14 54 04.5	N	15 13 51	10.	eP	Z	12 37 27 18.4 S., 177.7 W. Fiji Is. region. h: 553 km ca. H= 12 27 35.8 USCGS
9.	iP iS i P: D	Z N Z	17 42 24.5 27.7 28.4	10.	eP	NZ	12 52 18
9.	eP eL 10.5 N., 122.6 E. Panay, Philippine Is. h: 55 km ca. H= 13 41 54.2	Z E	18 47 59 54 47	10.	iP i iS i P: C	Z E N EZ	16 18 09.0 19 30.6 37.4 38.1
9.	P i i i eS e	NZ EZ N N N E	20 55 28 28.8 30.8 38.2 56 21 22	10.	iP S P: N., E, C	NEZ N	19 43 45.1 44 13.5
9.	P 11.6 S., 166.1 E	Z	23 07 09 (cont.)	11.	iPZ, PNZ iS	NE	00 24 54.3 25 22.0
				11.	PZ, ePNE S P: D	N	01 40 42.7 41 43.7

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
11.	P i	Z E	03	05	38 40	11.	P i	Z EZ	16	32	29.1 37.1
	1.9 N., 128.0 E. Halmahera. region. h: 33 km ca. H= 02 58 40.7 USCGS					11.	P S	NEZ NEZ	16	53	46.5 48.4
	P: N,W,D					11.	P i L	Z Z E	17	05	17.5 26.0 48 05
11.	P i S i	Z E E N	05	25	12.2 15.6 39.7 44	11.	P i L	Z Z E	17	05	17.5 26.0 48 05
	Mag. 5½ - 5¾ (Mat.) 60.2 S., 13.7 W. Sandwich Is. region. h: 33 km ca. H= 16 45 25.1 USCGS					11.	P i	EZ Z	17	14	47.4 21.9
	P: E,D					11.	P S	Z NZ	17	30	43.2 45.1
11.	iP i PcP?	Z E Z	09	42	05.5 06 43 24.8	11.	iP iS	NEZ NEZ	18	56	42.0 48.4
	9.9 S., 116.2 E. South of Sumbawa. h: 33 km ca. H= 09 33 10.1 USCGS						P: N,E,C				
	P: C					11.	iP i	EZ Z	22	01	11.0 21.9
11.	P S	NEZ Z	09	48	23.1 52.6	11.	P S	EZ EZ	23	13	00.2 14.2
	P: S,W,C					11.	P S	EZ EZ	23	13	00.2 14.2
11.	iPZ,PN S i	N E	10	03	22.6 11 27 43	12.	iPEZ,PN eS e L	E E E	00	50	09.9 57.0 01 00.8 05 28
	46.8 N., 155.5 E. Kurile Is. region. h: 30 km ca. H= 10 04 36.9 USCGS						P: W,D				
	P: S,W,C						31.9 N., 78.8 E. Northern India. h: 33 km ca. H= 00 41 27.9 USCGS				
11.	P i	Z NZ	11	06	48.2 49.1	12.	P i e	NZ E E	04	09	14 15 14 38
	52.4 N., 155.1 E. Near west coast of Kamchatka. h: 33 km ca. H= 11 02 17 USCGS					12.	iPNEZ S	E E	04	29	37.2 30 15.7
	P: C						P: N,W,C				
11.	iP i	NEZ NE	11	47	47.7 48 18.2	12.	P S	EZ N	07	42	27.5 43 11.2
	63.7 N., 148.6 W. Central Alaska. h: 70 km ca. H= 11 35 56.0 USCGS						P: W,C				
	P: S,W,C					12.	iP i eS pS	Z NEZ N NE	08	53	56.6 54 12.7 09 03 20 04 22
11.	P	Z	13	10	22.6		(cont.)				
	53.8 N., 164.8 W. Fox Is. h: 33 km ca. H= 13 02 29.9 USCGS										

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	e	E	09 06 29	13.	eP	Z	02 34 49
	sSS?	N	09 49		i	NZ	50.4
	Lq	E	16 57	13.	PKP	Z	02 39 52
	Lr	E	21 10		i	Z	40 03
	P: D				i	N	19
	Mag. $5\frac{3}{4}$ - 6 (Mat.)				i	Z	35
	39.0 S., 176.7 E.				PP	Z	42 45
	North Island, New Zealand.				PKS	Z	43 25
	h: 106 km ca.				SKKS?	E	49 24
	H= 08 41 56.7	USCGS			SS	E	03 00 46
12.	P	Z	09 13 29		Mag. $6\frac{1}{4}$ - $6\frac{1}{2}$ (Mat.)		
	i	E	29.7		5.2 S., 76.5 W.		
	S	N	14 10		Central Peru.		
12.	iP	NE	10 23 37.7		h: 125 km ca.		
	i	N	38.1		H= 02 20 57.5	USCGS	
	S	NE	58.2	13.	P	Z	03 31 30.3
	P: E,C				i	Z	36.6
12.	iPZ, PNE		10 46 13.7		P: C		
	i	Z	47 28		19.2 S., 175.3 W.		
	S	NE	51		Tonga Is. region.		
	P: S,C				h: 222 km ca.		
	44.9 N., 141.1 E.				H= 03 20 33.5	USCGS	
	Sea of Japan.			13.	P	Z	03 45 28.6
	h: 214 km ca.			13.	P	EZ	07 30 31.6
	H= 10 44 16.8	USCGS			i	NE	34.6
12.	iP	EZ	12 45 34.3		i	N	41.6
	S	N	36.2		i	Z	43.6
	P: W,D				e	E	31 22
12.	iP	EZ	13 11 13.7		S	NE	27.1
	iS	NE	19.9	13.	P	EZ	11 24 42.8
	P: E,C				i	NEZ	43.5
12.	P	Z	13 45 04.2		S	N	25 13
	i	Z	25.7		P: D		
	eS	E	50 34		36.7 N., 140.8 E.		
	L	NE	53 13		Near coast of central		
	Mag. $4\frac{3}{4}$ - 5 (Mat.)				Honshu, Japan.		
	51.6 N., 175.0 W.				h: 111 km ca.		
	Andreanof Is.				H= 11 24 13.0	USCGS	
	h: 33 km ca.			13.	P	NZ	14 38 51.9
	H= 13 38 03.0	USCGS			i	E	54
12.	eP	Z	20 02 17		S	N	44 44
	e	E	22.5		Lq	E	48 09
	e	E	27.1		Lr	Z	50 20
12.	P	Z	20 59 27		P: S,D		
	eS	E	21 08 46		Mag. $6\frac{1}{4}$ (Mat.)		
	L	E	20 28		3.4 S., 135.4 E.		
	Mag. $5\frac{1}{4}$ - $5\frac{1}{2}$ (Mat.)				Near north coast of New Guinea.		
	16.7 S., 173.7 W.				h: 31 km ca.		
	Tonga Is. region.				H= 14 31 21.0	USCGS	
	h: 33 km ca.			13.	P	NZ	14 39 03.5
	H= 20 48 16.7	USCGS			S	EZ	19
					P: N,D		

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
19.	P	Z	15	54	26	20.	e	N	05	03.5	
19.	eP	Z	16	36	14	20.	P	Z	06	00	31.5
	i	NZ			14.8		i	EZ			32.0
	PP	Z			37 46		S	NE			56
	PPP	Z			38 15	20.	P	EZ	06	26	34.5
	S	N			42 12		S	E			37.6
	L	NE			45 06		P: E				
	Lr	Z			46 36	20.	eP	Z	06	30	05
	Mag. $5\frac{1}{4}$ - $5\frac{1}{2}$ (Mat.)						e	E			36.0
	1.3 S., 128.8 E.					20.	P	Z	07	08	36
	Halmahera region.						i	NEZ			37.3
	h: 33 km ca.						eS	E			12.9
	H= 16 28 52.3						eL	NE			15.5
19.	eP	Z	19	04	19	52.4 N., 160.0 E.					
	e	E		13	35	Off coast of Kamchatka.					
19.	P	Z	20	48	55.6	h: 33 km ca.					
	i	Z			59.6	H= 07 03 45.1					
	eS	E			55 10	20.	P	EZ	08	16	49.3
	eL	E			58 06		S	NE			53.5
	1.4 S., 128.9 E.						P: E				
	Halmahera region.					20.	P	Z	15	53	16
	h: 33 km ca.						S	NE			54 44
	H= 20 41 34.5					20.	P	EZ	18	23	02
	USCGS						e	N			04
19.	eP	Z	22	56	10		iS	NE			24.6
	29.9 S., 177.7 W.					20.	P	EZ	18	42	19.8
	Kermadec Is.						eS	E			43 38
	h: 41 km ca.						P: E				
	H= 22 44 16.8					20.	P	EZ	19	43	50.5
	USCGS					20.	P	NEZ	20	37	07
19.	P	Z	23	20	53		S	E			41 06
	i	N			58		L	E			42 50
	S	E			21 16.6		Lr	Z			43 53
	i	N			17.6		P: N				
19.	P	Z	23	41	51.8	Mag. $5\frac{1}{4}$ - $5\frac{1}{2}$ (Mat.)					
	P: C					52.3 N., 159.5 E.					
20.	iPZ, PE		00	53	13.1	Off coast of Kamchatka.					
	eS	E			55 37	h: 33 km ca.					
	P: E, D					H= 20 32 16.2					
	46.4 N., 151.1E.										USCGS
	Kurile Is.					20.	P	NEZ	21	36	09.1
	h: 102 km ca.						iS	E			27.1
	H= 00 50 00.6						P: N, W, C				
20.	eP	Z	01	15	20.6	21.	eP	Z	04	42	32
	i	NZ			22.5		i	Z			52.1
	i	E			26		S	NE			46 05
	S	N			21 13		i	E			13.8
	L	N			24 10		L	N			47 11
	eLr	Z			25 40						(cont.)
	Mag. $5\frac{1}{4}$ - $5\frac{1}{2}$ (Mat.)										
	1.2S., 128.9 E.										
	Halmahera region.										
	h: 28 km ca.										
	H= 01 07 57.8										
	USCGS										

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	eL	E	04 47 23	21.	eP	Z	20 45 53
	Mag. 6-6½ (Mat.)			21.	P	Z	21 25 18
	24.1 N., 122.1 E.				0.9 S., 128.1 E.		
	Near east coast of Formosa.				Halmahera region.		
	h: 33 km ca.				h: 33 km ca.		
	H= 04 38 21.7				H= 21 17 58.5		
21.	P	Z	04 49 41	21.	P	Z	22 08 01
21.	iP	Z	07 48 51.0	21.	P	Z	23 24 12
	iS	E	49 11.1		i	E	19.7
21.	eP	Z	09 20 08		1.5 S., 128.7 E.		
	e	E	22 31		Halmahera region.		
	e	N	58		h: 33 km ca.		
	26.8 N., 123.5 E.				H= 23 16 50.5		
	Ryukyu Is. region.				USCGS		
	h: 28 km ca.			22.	iP	Z	00 57 58.2
	H= 09 17 05.2				iS	NE	58 28
21.	iP	Z	10 31 51.0	22.	iP	Z	01 56 04.7
	i	E	52.6		P: D		
	P: D				7.0 S., 129.2 E.		
21.	P	Z	10 39 00		Banda Sea.		
	iS	E	25.9		h: 135 km ca.		
	i	Z	26.7		H= 01 48 09.0		
21.	P	Z	10 46 05.0	22.	eP	Z	02 46 45
	i	Z	48 10		S	E	47 12
	iS	N	21	22.	iP	Z	07 37 26.1
	eG	E	55 20		e	E	48 48
	ScS	E	56 07		e	E	08 03 34
	L	N	57 35		P: C		
	Mag. 5½ (Mat.)				29.9 S., 177.6 W.		
	3.2 S., 146.9 E.				Kermadec Is. region.		
	Bismarck Sea.				h: 33 km ca.		
	h: 33 km ca.				H= 07 25 30.8		
	H= 10 38 30.0				USCGS		
21.	iP	Z	10 57 02.0	22.	P	Z	08 38 24
	P: D				5.1 S., 154.1 E.		
21.	P	Z	11 57 48		Solomon Is. region.		
					h: 132 km ca.		
					H= 08 30 30.5		
					USCGS		
21.	iP	NEZ	13 03 02.5	22.	P	Z	09 21 48
	iS	NE	20	22.	eP	Z	10 46 25
	P: N,E,C				12.2 N., 143.6 E.		
	Mag. 4.8 (Mat.)				Mariana Is. region.		
	35.6 N., 138.2 E.				h: 33 km ca.		
	Honshu, Japan.				H= 10 41 12.7		
	h: 46 km ca.				USCGS		
	H= 13 02 45.3			22.	iPNZ,PE		15 02 34.1
21.	iP	Z	15 20 47.5		i	E	43
	i	Z	22 25.6		S	N	03 04
21.	iP	Z	19 13 43.0		e	E	42
	S	E	14 01		P: S,E,D		
	P: C						

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
22.	iP	Z	15 18 06.8	23.	eP	Z	14 15 29
	P: D				42.6 N., 19.5 E.		
					Yugoslavia - Albania border..		
					h: 38 km ca.		
					H= 14 02 56.8	USCGS	
22.	eP	Z	15 49 28	23.	iP	Z	15 42 54.9
					P: C		
					17.8 S., 173.7 W.		
					Fiji Is. region.		
					h: 533 km ca.		
					H= 15 32 50.1	USCGS	
22.	iP	Z	19 16 48.9	23.	P	Z	17 26 54
	S	NEZ	17 00		i	E	27 13
	P: D				i	N	14.6
23.	eP	Z	02 54 24	23.	P	NZ	19 00 05
					i	E	06.1
					P: S,D		
					5.1 S., 146.1 E.		
					Near east coast of		
					New Guinea.		
					h: 134 km ca.		
					H= 18 52 24.4	USCGS	
23.	eP	Z	02 57 20	23.	iP	EZ	19 01 26.6
	PcP	Z	03 00 18		iS	NZ	32.1
	S	E	02 09		i	E	32.6
	e	N	18		P: E		
	e	E	03 16	23.	iP	Z	21 40 05.3
	eL	E	43		S	N	35
	eL	N	04 52		P: D		
	Mag. 5½ - 5½ (Mat.)			23.	P	Z	23 44 43
	46.9 N., 103.7 E.				S	N	45 40
	Outer Mongolia.			24.	iP	Z	03 05 19.7
	h: 33 km ca.				i	N	47.7
	H= 02 51 17.2	USCGS			P: D		
23.	eP	NEZ	06 44 53	24.	L	E	04 24 05ca.
	eL	E	47 07		L	N	25 10ca.
23.	PKP	Z	07 39 40		17.2 S., 174.5 W.		
					Tonga Is. region.		
					h: 190 km ca.		
					H= 03 55 06.6	USCGS	
				24.	eP	Z	05 59 06
					e	E	20 07 54
					e	N	08 43
					eL	N	15 29
					1.1 S., 127.2 E.		
					Halmahera region.		
					h: 33 km ca.		
					H= 05 51 44.1	USCGS	
23.	iP	EZ	11 46 02.3	24.	iP	Z	10 19 01.6
	i	N	02.6		iS	Z	07.7
	i	NE	23.8				(cont.)
	e	E	48 20				
	P: W,D						

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
25.	iP iS	Z EZ	17	00	08.0 08.8	26.	iP iS? P: E,D	EZ NE	20	43	09.2 21.5
25.	P	Z	17	03	11	26.	eP S	Z NEZ	22	09	46 10 02
25.	iP iS	NEZ Z	17	12	21.1 21.9	26.	P e S eL	Z E E N	23	49	13.5 52 49 55 54 00
25.	iPZ, PN i 21.6 S., 178.0 W. Fiji Is. Region. h: 380 km ca. H= 17 50 25.3	E	18	01	05.2 06.0						
25.	P	Z	20	26	00						USCGS
25.	P i	Z NZ	21	06	25 42	27.	eP i i	Z Z E	00	48	45 53.3 49 53
25.	iP eS i P: S, D	NZ N E	21	39	02.0 59 40 10	27.	iP S i	Z Z E	01	22	53.2 55.2 57.2
26.	iPE Z, PN i P: E, D	Z N	02	30	04.0 36	27.	P i	NEZ Z	02	02	37 40
26.	iP i P: D 41.8 N., 142.2 E. Near south coast of Hokkaido, Japan. h: 0 km ca.	Z Z	04	08	59.7 09 08.5	27.	iP i eS	Z N NE	05	26	01.5 08.6 53
26.	iP iS	EZ N	05	51	12.2 38.0	27.	P i i	NZ N E	06	10	19 11 17 19
26.	iP eS i	Z E N	12	16	28.9 17 28 45	27.	iP iSE, SN P: W	EZ	06	37	43.8 56.2
26.	iP 64.4 N., 148.3 W. Central Alaska. h: 139 km ca. H= 15 22 51.3	Z	15	31	20.1	27.	iP i i i i i PP eS i i L ScS eLr L P: D Mag. 6½ - 6½ (Mat.) 0.6 S., 128.4 E. Halmahera region. h: 33 km ca. H= 08 42 53	Z N E E N Z Z N N E E Z N	08	50	17.8 18.2 18.8 27.0 28 51 59 52 08 56 12 23 24 59 06 09 00 43 01 10 20
26.	iPKP1 iPKP2 iPKP2. PKP1 : D 18.1 S., 69.0 W. Peru - Chile border. h: 110 km ca. H= 16 44 12.0	Z Z N	17	03	50.9 04 24 27						USCGS
26.	eP	Z	20	24	48						USCGS

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
27.	eP i	Z Z	08 58 06 19		e eL eL eL	E E N E	02 00 25 07 15 09 36 41
27.	iP	Z	11 16 46.7		Mag. $5\frac{1}{2}$ - $5\frac{1}{2}$ (Mat.) 1.1 S., 128.6 E. Halmahera region. h: 26 km ca. H= 01 51 06.8 USCGS		
27.	iP i i i	Z Z Z Z	11 23 16.3 23.3 53 24 03	28.	iP i i i	NEZ N N E	04 07 03.3 21 10 05 11
27.	iP i P: C	EZ NE	11 29 22.0 53.2		30.9 N., 131.1 E. Southern Kyushu, Japan. h: 64 km ca. H= 04 05 05.5 USCGS		
27.	eP? iS i	NZ NE Z	12 33 24 41.5 42.0	28.	iP S P: D	Z N	11 49 53.0 50 51
27.	P 61.4 N., 148.3 W. Southern Alaska. h: 39 km ca. H= 15 10 10.5	Z	15 19 13	28.	eP iS	Z NE	11 54 41 47.3
27.	P i S i	Z NE E N	17 10 09 09.7 31 32	28.	iP S i	Z N E	13 12 03.2 45 46
27.	eP 16.5 S., 172.6 W. Tonga Is. h: 33 km ca. H= 18 54 34.3	Z	19 05 38	28.	iP iS P: S,E,D	NEZ NE	13 27 19.6 .21.3
27.	P S P: S,E,D	NEZ NZ	19 38 52.7 39 52	28.	iP i 17.6 S., 173.5 W. Fiji Is. h: 505 km ca. H= 14 16 05.9	Z N	14 26 12.5 12.7
27.	eP i i	Z Z E	19 49 43 56.4 57.1		USCGS		
27.	eP e	Z N	20 18 13 19 10	28.	P	Z	14 47 07
27.	P	NZ	21 07 18	28.	SP P: C	Z	16 15 33.4
28.	iP i P: S,C	NZ Z	00 45 10.7 13.5	28.	PKP	Z	16 59 03
28.	eP i e eS	Z N N N	01 58 27 30.3 02 00 14 04 23 (cont.)		21.5 S., 67.6 W. Southern Bolivia. h: 147 km ca. H= 16 38 50.7 USCGS		
				28.	P i i	Z Z E	17 29 34 36.2 30 44.4
				28.	iPZ,PNE P: N,C		17 35 38.3
					0.6 S., 128.5 E. Halmahera. h: 33 km ca. H= 17 23 20 USCGS		

Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
28.	iP P: W,D	EZ	18 09 02.5		e e eL	NE E N	24 33 34 46 40 47
28.	P 9.8 S., 160.3 E. Solomon Is. h: 30 km.ca. H= 18 13 30.9	Z	18 22 27 USCGS	29.	iP P: N,D	NZ	16 39 41.8
28.	iP i P: D	EZ E	18 27 51.9 28 13.4	29.	P i i	Z N E	21 15 17 16 14 15
28.	P eS	Z N	18 59 00 19 00 00	29.	iPZ,PE PP S ScP L Lr eScS P: W,C Mag. $6\frac{1}{2}$ - $6\frac{1}{2}$ (Mat.) 51.4 N., 173.6 E. Andreanof Is. h: 60 km ca. H= 21 44 17.1	Z E Z N Z E	21 50 40.6 51 43 55 55 57 12.5 58 22 59 21 22 01 14 USCGS
28.	iP P: C 36.1 N., 71.3 E. Hindu Kush. h: 150 km ca. H= 19 50 11.4	Z	19 59 14.0 USCGS	29.	iP P: D	EZ	22 11 17.8
28.	iPNZ,PE iS P: N 39.3 N., 141.0 E. Near east coast of Honshu, Japan. h: 33 km ca. H= 23 21 35	Z	23 22 23.8 23 02.3 USCGS	30.	iP iS P: S,W,D	NEZ Z	00 08 44.3 57.2
29.	eP i eS	Z E N	04 36 05 06 38	30.	P	Z	01 03 26
29.	eP i i i e eL eL Mag. $4\frac{1}{2}$ - $4\frac{3}{4}$ (Mat.) 23.9 N., 121.6 E. Northern Luzon, P.I. h: 118 km ca. H= 05 03 37.2	EZ Z E E E N E	05 07 56 08 03.3 03.8 47.1 11 15 ca. 12 30 ca. 32 ca. USCGS	30.	iP PP i iS i iL i P: S,D Mag. $6\frac{1}{2}$ - 7 (Mat.) 0.7 S., 129.0 E. Halmahera region. h: 33 km ca. H= 00 58 18.3	NZ Z N E N NE Z	01 05 38.0 07 12 15 11 29 32 14 20 52 USCGS
29.	eP S	EZ NEZ	06 04 03 31	30.	iP	Z	01 35 03.7
29.	eP i S	Z E N	09 43 27 28 44 08	30.	iP S P: S,E,D 35.4 N., 140.2 E. Honshu, Japan. h: 70 km.	NEZ NZ	01 48 57.3 49 22 JMA
29.	eP?	Z	15 21 50 (cont.) -46-	30.	P 7.3 N., 126.5 E. Near coast of mindanao, P.I. h: 34 km ca. H= 02 34 53.3	Z	02 41 07 USCGS

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
30.	iP	Z	03	32	28.6						
	i	NE			28.8						
	51.2 N., 178.6 E.										
	Rat. Is.										
	h: 50 km ca.										
	H= 03 26 04.2 USCGS										
30.	P	NEZ	07	14	19						
	e	N		18	21 ca.						
	e	E			23 ca.						
	S	E		19	36						
	eL	E		21	30						
	eL	N			31						
	Mag. 5 $\frac{1}{4}$ (Mat.)										
	51.6 N., 178.4 E.										
	Rat Is.										
	h: 64 km ca.										
	H= 07 07 55.9 USCGS										
30.	eP	Z	07	22	51						
30.	eP	Z	10	29	32						
	e	N			35 45						
	10.6 N., 94.4 E.										
	Andaman Is. region.										
	h: 33 km ca.										
	H= 10 20 54 USCGS										
30.	P	Z	12	03	29						
	S	N			04 27						
30.	P	Z	18	34	44						
	S	EN			35 09						
	i	Z			10						
30.	ePKP	Z	19	02	30						
	SS	E			22 50						
	SSS	E			28 34						
	eL	E			46 58						
	Mag. 5 $\frac{3}{4}$ - 6 (Mat.)										
	8.2 S., 79.9 W.										
	Near coast of Peru.										
	h: 60 km ca.										
	H= 13 43 14.0 USCGS										
30.	iP	NEZ	20	40	09.1						
	S	E			33						

Mineo Takehana
Director,

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Matsushiro Seismological Observatory
Matsushiro-machi, Nagano-shi,
Nagano-ken , Japan.

Matsushiro Seismological Observatory , Japan

Seismological Bulletin

Latitude 36° 32' 30"N.

Longitude 138° 12' 32"E.

Elevation 440 M.

Instrumental Constants

Instruments	Comp.	Period (sec)		Damping ratio		Magnification
Benioff Seismograph (Short Period)	N	T ₁ = 1.0	T ₂ = 0.23	h ₁ = 0.68	h ₂ = 1.7	103,000 (max)
	E	T ₁ = 1.0	T ₂ = 0.22	h ₁ = 0.70	h ₂ = 1.6	106,000 (max)
	Z	T ₁ = 1.0	T ₂ = 0.21	h ₁ = 0.72	h ₂ = 1.2	131,000 (max)
Benioff Seismograph (Long Period)	N	T ₁ = 1.0	T ₂ = 70	h ₁ = 0.68	h ₂ = 5.9	7,330 (max)
	E	T ₁ = 1.0	T ₂ = 62	h ₁ = 0.70	h ₂ = 5.6	9,640 (max)
	Z	T ₁ = 1.0	T ₂ = 84	h ₁ = 0.72	h ₂ = 7.3	7,590 (max)
Short Period Seismograph	Z	T ₁ = 1.0	T ₂ = 2.82	h ₁ = 1.4	h ₂ = 1.2	32,000 (max)
Galitzin Seismograph	N	T ₁ = 15	T ₂ = 100	h ₁ = 1	h ₂ = 1.2	1,350 (max)
	E	T ₁ = 15	T ₂ = 100	h ₁ = 1	h ₂ = 1.1	1,640 (max)
	Z	T ₁ = 7.5	T ₂ = 100	h ₁ = 0.76	h ₂ = 0.87	860 (max)
Wood-Anderson Seismograph	N	0.3		0.3		1,050
	E	0.3		0.8		1,200
1000 kg Long Period Seismograph	N	33.0		0.60		100
	E	30.0		0.62		100

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
1.	P i	Z Z	01 12 17. 30.9	2.	iP eS P: N, C	NZ N	08 04 44.3 05 05
	52.4 N., 174.5 W. Andreanof Is. h: 73 km ca. H= 01 05 17.7 USCGS			2.	P i i eS?	Z N E N	11 17 21.4 27.0 37.5 13 10
1.	eP S i	Z NZ E	04 43 53 44 55 58	2.	iP iS P: E, D	EZ NEZ	16 56 53.6 59.9
	34.8 N., 133.7 E. Western Honshu, Japan. h: 40 km ca. JMA			3.	e eL	E E	01 06 44 14 18
1.	i i i	Z E N N	04 51 39 40.8 41.1 52 21.3	3.	e	Z	01 12 21
1.	iP i ipP iS i L ePKPPKP P: D	Z NE NEZ N E NE Z	10 13 29.0 29.5 14 02 21 47 43 28 57 42 34	3.	iP i P: D	Z NE	08 44 59.2 59.5
	Mag. 6½ - 6¾ (Mat.) 19.0 S., 169.0 E. New Hebrides Is. h: 140 km ca. H=10 03 20.0 USCGS			3.	iP e eS P: E, D	EZ Z N	10 01 53.8 02 30 40
1.	eP i S i	EZ NE N E	13 17 16 35.4 18 41 42	3.	P iS i i	EZ Z E N	10 15 04.4 30.4 30.7 31.3
	34.0 N., 132.5 E. Western Honshu, Japan. h: 10 km ca. JMA			3.	P	Z	10 50 36
1.	iP i eS P: W, C	EZ N N	17 09 36.9 51 10 03	3.	iPZ, PN eS eLq Lr P: C	N N N	11 05 47.2 15 00 22 48 26 52
	Mag. 5½ - 5¾ (Mat.) 15.0 S., 173.3 W. Tonga. Is. h: 33 km ca. H= 10 54 43.0 USCGS			3.	iP i S P: C	Z E N	11 15 42.8 43.1 16 42.7
1.	IP i S P: W, C	EZ N N	19 21 49.5 22 02 15	3.	iP i eS e	EZ N E N	12 31 00.1 23 41 43
1.	P i eS	Z N E	20 57 39.7 47.5 53 29	3.	iP S i P: C	Z EZ N	13 25 51/3 26 47 47.8
2.	i i	NZ E	01 50 15.0 15.7				
2.	P	Z	02 06 06				

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
	e	E	09	05	20							
	eSS	E		08	27	8.	iPEZ, PN		18	21	37.7	
	eSS	N			32	e	E			22	37	
	eL	E		11	20	e	N				39	
	P: D					P: S, E, C						
	54.9 N., 163.9 W.											
	Unimak Is.					8.	iP	NEZ	20	13	27.8	
	h: 89 km ca.					eS	N			14	04	
	H= 08 50 56.0			USCGS		P: S, E						
8.	iP	NEZ	09	57	36.4	8.	P	E	21	28	10.0	
	eS	E		58	49	i	Z				10.2	
	i	N			58	i	N				10.7	
	eL	E		59	13	eS	N		29	09		
	P: N, E, D					i	E				11	
	Mag. 5.0 (Mat.)					32.1 N., 141.5 E.						
	South of Honshu, Japan.					h: 39 km ca.						
	H= 08 50 56.0			USCGS		H= 21 26 53.4			USCGS			
8.	iP	NEZ	10	22	46.6	8.	iP	NZ	23	45	05.7	
	iSN, SE			23	18	iS	NE				06.4	
	P: S, E, D					i	Z				06.8	
	Mag. 6.4 (Mat.)					P: N, E, C						
	36.3 N., 141.2 E.											
	Near east coast of Honshu, Japan.			JMA								
	h: 40 km ca.											
8.	iP	NZ	11	40	11.1	9.	iP	Z	04	42	45.1	
	i	E			11.3	i	NE				45.5	
	i	E			14.8	e	E		52	22	ca.	
	P: S, C					P: D						
8.	P	Z	11	50	12.8	9.	eP	NZ	05	20	37	
	i	NEZ			22.5	i	E				45.1	
	eS	NE		51	07	S	E			21	59	
8.	eL	E	13	22	25 ca.	9.	P	NZ	08	27	15	
	eL	N		24	07	S	N				58	
8.	iP	NZ	15	30	31.0	i	E				59.7	
	i	E			31.9	9.	iP	NEZ	08	30	35.6	
	ePP	NZ		31	53	i	E				37.5	
	iPcP	Z		33	13.3	P: S, W, C						
	eS	NE		35	56							
	eL	E		38	00 ca.	9.	iP	NEZ	11	24	56.3	
	eL	N		39	49	eS	E			26	02	
	P: N, C					i	E				04	
	Mag. 5 $\frac{1}{4}$ - 5 $\frac{1}{2}$ (Mat.)					eL	N				46	
	5.3 N., 125.7 E.					P: S, E, D						
	Off coast of Mindanao, P.I.					31.7 N., 142.3 E.						
	h: 70 km ca.					South of Honshu, Japan.						
	H= 15 24 00.3			USCGS		h: 33 km ca.						
	H= 15 24 00.3			USCGS		H= 11 23 29.3			USCGS			
8.	eP	Z	16	20	43	9.	eP	Z	11	23	54	
	i	NEZ			44.3	e	Z				29 15	
	eS	E			59	i	N				36.6	
	i	N		21	00							
8.	iPZ, PE		16	49	20.4	9.	eP	Z	11	42	32	
	i	N			20.7	e	E				47 07	
	P: E, C											

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
9.	eP	Z	15 33 05	10.	iP	EZ	10 23 37.5
	i	E	34 03.6		iS	N	57.6
	i	N	05.5		i	E	59.6
	eL	E	39 41		P: W,C		
	eL	N	53 33	10.	eL	E	11 52 20ca.
	eL	E	58 58		8.4 S., 67.6 E.		
	eL	E	58 42		Indian Ocean.		
	eL	N	16 06 53		h: 33 km ca.		
9.	iP	Z	20 53 03.7		H= 11 09 41.6		USCGS
	eL	E	21 06 29	10.	P	EZ	13 37 48
	P: D				e	Z	38 20
	53.9 N., 165.2 W.				i	E	24.0
	Fox Is.			10.	iPNZ, PE	NEZ	13 57 44.7
	h: 33 km ca.				iS		50.9
	H= 20 45 13.8		USCGS		P: N,D		
9.	P	Z	22 18 18.0	10.	iP	EZ	14 20 05.1
	i	N	21.7		i	E	09.7
	i	Z	19 41		i	N	11
	S	N	48.0		S	EZ	47.5
	i	E	49.9		P: E,D		
9.	eP	Z	23 27 32	10.	iP	Z	18 12 35.1
	iS	E	28 00.0		i	NE	35.5
	i	N	01.2		e	Z	46
10.	iP	Z	01 51 31.7		e	N	13 05
	i	E	32.0		P: C		
	i	N	40.0	10.	ePKP	Z	22 41 55
	i	EZ	41.5		i	E	42 04.5
	eS	E	53 20		e	Z	45 19
	e	N	33		e	NE	29
	P: C				eSKS	E	49 09
	30.2 N., 130.8 E.				eSS	N	23 02 07
	South of Kyushu, Japan.				eSS	E	15
	h: 33 km ca.				eSSS	E	07 13
	H= 01 49 25*		USCGS		eSSS	N	03.0 ca.
10.	eP	Z	03 09 17		eLq	N	17 15
10.	iP	Z	04 39 07.5		eLr	Z	26 00ca.
	i	N	08.0		eLr	E	10
	eS	E	47 13		eLr	N	28 40
	P: D				Mag. $6\frac{1}{2}$ - $6\frac{3}{4}$ (Mat.)		
	20.0 S., 163.1 E.				2.2 S., 77.6 W.		
	Loyalty Is.				Ecuador.		
	h: 33 km ca.				h: 33 km ca.		
	H= 04 28 41.8		USCGS		H= 22 22 42.2		USCGS
10.	eL	E	05 10 37ca.	11.	e	E	07 05 27
10.	iP	EZ	06 17 46.9	11.	iP	Z	09 09 51.0
	iS	NEZ	48.5		P: C		
10.	iP	NZ	10 21 24.1	11.	iP	Z	17 07 32.0
	iS	N	22 30.0		i	N	32.7
	i	Z	30.6		S	NE	03 39
	e	E	23.3		P: D		
	P: N,C						

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
11.	P S S ePcP L L P: E	E E N E E N	17 53 55 57 18 20 58 19 40 49		P: C		
					57.5 S., 159.4 E.		
					Macquarie Is. region.		
					h: 44 km ca.		
					H= 09 42 53.3	USCGS	
11.	eP e	Z E	22 22 07 23 13	12.	P e ePcP eS eScS eLr	Z NZ EZ NE E N	19 30 05 09 32 10 36 14 39 13 40 03
					3.4 S., 146.9 E.		
					Bismarck Sea.		
					h: 33 km ca.		
					H= 19 22 30.3	USCGS	
12.	P iSN,SEZ	Z	00 38 03 26.5	12.	iP i i e eS iS iScS eL	NZ E Z EZ E NEZ N NE	20 17 17.7 18.4 28.4 20 12 24 12 17 27 21 29.5
					P: N,D		
					Mag. 6 $\frac{1}{2}$ (Mat.)		
					57.4 N., 153.9 W.		
					Kodiak Island, Alaska.		
					h: 20 km ca.		
					H= 20 08 43.0	USCGS	
12.	eP eS	NZ N	02 45 00 46 09	12.	iP i i S L P: C	Z N E N NE	20 42 43.5 43.6 44.0 47 06 50.0
					Mag. 5 (Mat.)		
					55.9 N., 163.1 E.		
					Near east coast of Kamchatka.		
					h: 33 km ca.		
					H= 20 37 12.9	USCGS	
12.	iP P: S,E,D	NEZ	03 07 48.7	12.	iP S P: S,W,C	Z E	23 56 52.0 57 22
12.	P e S e	Z N N E	03 36 46.5 37 00 06.3 07	13.	iP iS P: N,E,C	NEZ NE	00 55 13.1 53.3
12.	eP e S	Z NE NE	09 00 09 10 30	13.	eP i	Z Z	01 13 05 13.3
12.	P ePP eSKS eL e	NZ E E E E	09 55 18.3 10 00 22 07 34 23.9 33.4 (cont.) -7-	13.	iP i iS i i P: S,C	NZ E N E E Z	01 35 02.0 02.5 10.3 11.1 11.5

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
13.	eP i i i	Z N EZ NZ	02	03	58 59 00 36	13.	iP i S S P: E,C	EZ N N E	17	41	26.3 26.5 47 49
13.	iPZ,PN eS e P: C	N E	03	16	45.5 51 53	13.	iP e P: D	Z N	17	43	21.6 23
13.	iP S iS P: S,W	NEZ N E	03	30	54.6 31 01 01.5						5.5 S., 154.6 E. Solomon Is. region. h: 386 km ca. H= 17 35 46* USCGS
13.	iP iS i P: D	Z NZ E	03	42	41.2 47.5 48.0	13.	iP i e P: C	Z NE N	17	59	04.3 04.6 13 00 35
13.	iP S P: S,E,D	NEZ NE	05	59	55.5 06 00 12						61.1 N., 150.8 W. Kenai Peninsula region, Alaska. h: 93 km ca. H= 17 50 20.4 USCGS
13.	iP P: N,E,C	NEZ	07	19	15.9	13.	iPZ,PE i P: C	Z	18	22	56.3 23 08
13.	P i i	Z N E	07	21	23.0 23.4 23.5						20.6 S., 70.7 W. Near coast of northern Chile. h: 33 km ca. H= 18 03 04.4 USCGS
											25.7 S., 179.6 E. Fiji Is. region. h: 453 km ca. H= 07 10 38.4 USCGS
13.	iP S e P: S,W,C	NEZ E N	09	45	26.0 45 37 42	13.	iP e P: N,E,C	NEZ N	19	02	16.9 03 30
											40.2 N., 142.7 E. Near east coast of northern Honshu, Japan. h: 40 km ca. JMA
13.	PKP ePS eL eL	Z E E E	13	02	31ca. 12 35 29.0 39.2	13.	P i e eL e P: C	Z N E E E	22	56	08.6 08.8 23 02 58 06.7 10.5
											14.5 S., 92.9 W. Mexico - Guatemala border. h: 60 km ca. H= 12 44 00.7 USCGS
13.	iPNZ,PE eS e eLq P: S,D	E N E	14	17	56.8 26 11 16 33 22	13.	P e	Z Z	04	58	20.6 59 53
											19.5 S., 169.3 E. New Hebrides Is. h: 163 km ca. H= 14 07 46.8 USCGS
						14.	P i	Z NEZ	07	35	47.6 51.1

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
14.	iPZ, PE e P: C	NE	12 42 13.1 43	15.	P Z 38.5 N., 75.5 E. Hindu Kush region. h: 33 km ca. H= 06 35 24.8		06 44 11 USCGS
14.	iP S P: E,C	NEZ NEZ	12 55 55.8 56 02	15.	e e	N E	07 04 14 05 36
14.	P P: C 57.3 N., 154.2 W. Kodiak I, Alaska. h: 37 km ca. H= 13 50 40.9	Z	13 59 22.1 USCGS	15.	iP S P: N,W,D	NEZ N	08 15 53.0 16 05
14.	iP i ePcP P: S,D 5.6 S., 127.8 E. Banda Sea. h: 405 km ca. H= 15 06 46.1	NZ E Z	15 16 10.2 10.6 17 51 USCGS	15.	iP eS P: N,E,C	NEZ NE	09 30 45.9 31 07
14.	e e	Z Z	16 34 09 37 31	15.	P i i S i	EZ NZ E N E	12 03 48 57.5 04 03.0 38.5 44.0
14.	e e e	Z NE NEZ	18 46 36 37 47 31	15.	e	E	13 03.1
14.	e 4.1 S., 152.8 E. New Britain. h: 53 km ca. H= 23 14 47.0	E	23 32 21 USCGS	15.	eP eS e	NEZ Z NE	15 36 24 39 50 41.0 24.1 N., 122.3 E. Off east coast of Formosa. h: 33 km ca. H= 15 32 11.3 USCGS
15.	iP ePcP S S Lq ScS eL P:N,C Mag. 5½ - 6 (Mat.) 3.4 S., 146.3 E. Bismarck Sea. h: 33 km ca. H= 02 52 39.7	NZ Z E N N E Z	03 00 16.6 02 20 06 24 27 09 31 57 11 28 USCGS	15.	eP NEZ		21 59 00
15.	P i e S	EZ N N NE	04 31 55.1 56.6 32 27 36	16.	iP P: C 22.6 S., 171.6 E. New Hebrides region. h: 79 km ca. H= 01 23 04.7	Z	01 38 46.5 USCGS
15.	P e e e S	NEZ Z N N N	04 43 53 44 22 26 33 45 03	16.	P e	Z NE	02 19 48.7 49
				16.	eP eS i	Z N E	03 42 33 43 14 15
				15.	P i eS eLr e e e P: N,C Mag. 5½ - 5½ (Mat.) 0.3 S., 128.5 E. Halmahera region. h: 50 km ca. H= 15 52 18.4	NZ E NE E N Z Z	15 59 34.5 35.0 16 05 25 03 17 25 48 12 24 USCGS

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)	
			h m s				h m s	
16.	iP i P: S, D	NZ E	16 08 21.0 21.2		P: C Mag. 5½ - 5½ (Mat.) 15.7 N., 120. E. Near west coast of Luzon, P.I. h: 80 km ca. H= 06 09 18.2			
16.	iP S P: N, C	NZ NE	16 17 34.0 18 23		USCGS			
16.	iP i i iPcP L P: D Mag. 5¼ - 5½(Mat.) 1.0 S., 128.8 E. Halmahera region. h: 33 km ca. H= 16 17 59.8	Z N E Z E	16 25 13.9 19.0 19.4 27 33.5 34 00				USCGS	
16.	e	Z	16 35 31					
16.	eP S e	EZ E N	18 39 08 40 02 04					
16.	iP i S S	Z	19 30 12.9		17.6 S., 178.7 W. Fiji Is. region. h: 510 km ca. H= 19 20 05.7		USCGS	
16.	iP S e P: N, E, D 41.6 N., 142.0 E. South of Hokkaido, Japan. h: 65 km ca. H= 22 05 53.4	NEZ N E	22 07 19.6 08 43.5 46				USCGS	
17.	P e eS eL 45.3 N., 150.8 E. Kurile Is. region. h: 33 km ca. H= 04 06 36.2	Z NE NE NE	04 09 38.5 39 12 03 28				USCGS	
17.	iP i i i iPP S i Lq Lr	Z N E Z E N N NEZ	06 14 46.0 46.3 47.0 15 14 22 19 06 13 20 24 22 00				(cont.) - 10-	
				17.	P S e L P: S, W, C 41.3 N., 142.3 E. Near east coast of Honshu, Japan. h: 40 km ca.	NEZ NEZ N E	06 16 13.5 17 02 06 22 16.5 23 04 06 36 14.2 37 07 07 44 36.0 31.0 S., 179.8 W. Kermadec Is. region. h: 358 km ca. H= 07 33 17.5	USCGS
				17.	iP i S S	Z N N E	09 42 59.9 43 00 44 16 17	
				17.	iPZ, PNE S P: N, W, C 32.3 N., 140.7 E. South of Honshu, Japan. h: 115 km ca. H= 10 34 54.8	NE NE	10 36 04.7 37 06	USCGS
				17.	iP S e L P: S, W, C 41.3 N., 142.3 E. Near east coast of Honshu, Japan. h: 40 km ca.	NEZ NEZ N E	12 10 32.5 11 40 44 48	JMA
				17.	P 14.1 S., 74.2 W. Southern Peru. h: 51 km ca. H= 14 11 01.5	Z	14 30 28	USCGS
				17.	iP S P: N, D	NEZ NE	14 43 13.0 32	
				17.	iP i	Z NE	16 10 01.7 02.0	(cont.)

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	S P: C	N	16 10 43	13.	iP P: D	Z	03 56 48.3
17.	P e	NEZ N	17 23 00 24 44	13.	iP i P: N,W,C	NEZ... EZ	09 22 49.0 23 14.0
17.	iP P: W,C	EZ	18 40 31.2	13.	iP i P: E,C	EZ N	09 40 26.0 36.7
17.	P i eS eG P: D 0.8 S., 123.8 E. Halmahera region. h: 231 km ca. H= 21 31 12*	Z N NE E	21 38 09.3 12.0 44 04 46 52	13.	iPNZ,PE ePPP S S Lq Lr F: S,W,D Mag. 5 $\frac{3}{4}$ (Mat.) 8.2 S., 115.6 E. Bali. h: 39 km ca. H= 12 20 31.9	Z N E E Z	12 29 18.5 32 12 36 23 25 41 38 43 30
17.	iP i eS P: N,D 24.4 S., 177.2 W. Tonga Is. region. h: 70 km ca. H= 22 40 06.7	NZ E E	22 51 33.9 34.0 23 00 55	13.	iP i i S i P: D	Z Z NE NZ E	12 49 51.3 53.5 54.9 50 22 26
17.	eP 13.5 N., 142.5 E. Mariana Is. region. h: 163 km ca. H= 23 04 58*	Z	23 09 53	13.	iPZ,PN i S e P: D 3.2 S., 115.7 E. Bali. h: 63 km ca. H= 13 03 35.8	E E N	13 12 18.5 19.3 19 12 19
17.	P	EZ	23 33 30	13.	eP eS eL 16.0N., 119.5 E. Near west coast of Luzon, P.I. h: 47 km ca. H= 16 43 12.3	Z Z N NE	14 01 41 16 43 55 53 17 55 00
13.	iP i S P: C	Z E NE	02 06 19.0 20.5 07 27.0	13.	ePKP1 SKKS e eSS eSSS eLr Mag. 5 $\frac{3}{4}$ - 6 (Mat.) 29.6 S., 68.5 W. Larioja Province, Argentina. h: 29 km ca. H= 05 33 25.0	Z E E E E E	05 53 34 06 04 17 12 20 13 00 22 30 45.0
13.	iP eS i P: E,D	EZ E Z	04 36 51.5 37 06 07	13.	iP i S P: W,C	EZ N N	17 42 04.0 05.0 35
13.	ePKP1 SKKS e eSS eSSS eLr Mag. 5 $\frac{3}{4}$ - 6 (Mat.) 29.6 S., 68.5 W. Larioja Province, Argentina. h: 29 km ca. H= 05 33 25.0	Z E E E E E	05 53 34 06 04 17 12 20 13 00 22 30 45.0	13.	P i	EZ NE	13 31 03 03.7
13.	iP S P: C	Z NE	03 11 26.0 12 11.5				

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
18.	i	Z	20 24 03.7	19.	P	EZ	08 26 28.3
	i	NEZ	05.0				
18.	iP	NEZ	20 36 22.0	19.	eP	Z	09 54 03
	S	E	40.5		eS	E	40
	P: N,E,D			19.	iP	Z	09 57 29.4
18.	eP	Z	21 05 35		P: D		
	eS	N	06 42		4.1 S., 103.1 E.		
	e	E	43		Off coast of Sumatra.		
18.	eP	Z	22 26 35		h: 96 km ca.		
	eS	EZ	27 28		H= 09 48 26.0		USCGS
	i	N	29.5	19.	e	E	10 45 38
18.	i	NE	22 28 21	19.	iP	NZ	11 09 33.9
18.	iP	Z	23 17 36.3		i	E	36.6
	i	NE	36.5		P: S,D		
	e	E	18 32		1.5 N., 126.0 E.		
	S	NE	19 02		Molucca Sea.		
	P: C				h: 106 km ca.		
	41.0 N., 142.0 E.				H= 11 02 36*		USCGS
	Off east coast of Honshu,			19.	iP	Z	13 53 51.9
	Japan.				i	N	53.0
	h: 52 km ca.				S	E	54 46
	H= 23 16 16.9		USCGS		S	Z	47
					P: D		
18.	eP	Z	23 51 30	19.	P	NEZ	15 35 22
	49.5 N., 156.2 E.			19.	iP	NZ	18 21 24.5
	Kurile Is. region.				S	NZ	27.1
	h: 70 km ca.			19.	iP	NZ	19 27 58.0
	H= 23 47 17.3		USCGS		i	E	59.0
19.	PKP	Z	01 22 53		i	Z	30 32.0
	i	Z	55.0		eS	E	33 22
	iPP	E	26 42		eG	E	36 06
	i	E	27 03		P: S,D		
	i	N	42		2.3 N., 128.6 E.		
	i	E	32 31		Halmahera region.		
	iSKKS	NE	33 38		h: 166 km ca.		
	i	E	40		H= 19 21 22*		USCGS
	e	E	35 52	19.	P	EZ	20 19 20.0
	eSKSP	E	37 08	19.	iP	NZ	21 40 19.9
	e	E	15		i	E	20.1
	e	E	41 54		P: S,D		
	eSS	E	46 30	19.	iPKP	Z	21 54 40.0
	e	E	33		e	N	59 28
	e	E	47.4		e	E	22 03 48
	eL	E	02 12.0		e	N	05 55
	eL	N	12.5		ePPS	N	08 00
	Mag. 7 $\frac{1}{4}$ - 7 $\frac{1}{2}$ (Mat.)				ePPS	E	04
	46.5 S., 75.1 W.				eSS	N	12 29
	Coast of southern Chile.				e	E	38
	h: 33 km ca.				eSSS	N	16 50
	H= 01 03 04.1		USCGS		eLq	N	25 50
19.	P	Z	07 13 05.7				(cont.)
	e	E	06				
	i	Z	13.7				
	eS	N	50				

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	eSSS	E	01 40 10	21.	P	Z	17 39 30
	eL	N	48 38		i	E	35
	eL	E	54		ePP	E	41 36
	Mag. 5½ - 5¼ (Mat.)				S	E	46 52
	56.0 S., 123.9 W.				eSS	E	50 31
	South Pacific Ocean.				eL	N	51 48
	h: 33 km ca.				eL	E	53
	H= 00 58 07.4				Mag. 6 - 6¼ (Mat.)		
	USCGS				11.1 S., 163.3 E.		
21.	P	EZ	04 35 47		Solomon Is. region.		
21.	iP	Z	09 48 47.8		h: 33 km ca.		
	i	NEZ	50		H= 17 30 15.4		
	S	NEZ	52 12		USCGS		
	P: D			21.	iP	Z	18 01 26.7
	18.9 N., 146.0 E.				P: C		
	Mariana Is. region.				22.1 S., 179.5 W.		
	h: 180 km ca.				Fiji Is. region.		
	H= 09 44 40.3				h: 579 km ca.		
	USCGS				H= 17 51 07.7		
	USCGS				USCGS		
21.	P	EZ	10 53 36	21.	iP	NEZ	18 33 11.7
	S	NE	54 01		i	Z	19.5
21.	iP	NEZ	11 34 30.3		S	NEZ	27.4
	S	NE	33.5		P: S, E, D		
	P: S, W			21.	iPNZ, PE	EZ	19 32 21.3
21.	iP	NZ	13 46 59.5		i	EZ	38
	P: N, C				P: N, E, D		
21.	P	NEZ	15 01 00	21.	P	NEZ	21 21 48
	i	EZ	26.4		S	E	50
21.	iP	NEZ	16 04 23.9	21.	iP	EZ	23 10 34.0
	S	NE	33		S	NEZ	40.5
	P: N, E, C				P: W, C		
21.	iP	Z	16 28 11.7	21.	P	NEZ	23 58 02
	i	NE	12.0		S	NE	05
	e	E	32 37	22.	P	EZ	00 06 20
	eL	E	34 43		S	NEZ	22
	P: C			22.	P	EZ	00 13 28
	51.4 N., 159.1 E.				S	NE	42
	Off east coast of Kamchatka.			22.	eP	Z	02 37 05
	h: 33 km ca.				i	E	11
	H= 16 23 28.9				i	N	14
	USCGS				S	E	44 34
21.	iP	NEZ	17 11 14.9		eL	E	49 48
	i	Z	16.8		eL	N	50 20
	i	E	24		Mag. 5¾ (Mat.)		
	S	Z	25		11.3 S., 163.2 E.		
	S	NE	33		Solomon Is. region.		
	P: S, E, D				h: 60 km ca.		
	Mag. 3.9 (Mat.)				H= 02 27 56.3		
	36.3 N., 140.3 E.				USCGS		
	Near east coast of Honshu,			22.	iP	NEZ	04 09 46.0
	Japan.				S	NEZ	53.5
	h: 33 km ca.				P: S, W, C		
	H= 17 10 47.6				USCGS		
	USCGS				USCGS		

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
22.	eS eL	E E	05 07 31 10 16		Lr	E	15 59 53
					Mag. 6 - 6½ (Mat.) 4.3 N., 127.9 E. Molucca Passage. h: 58 km ca. H= 15 42 48.6 USCGS		
22.	iP i P: D	Z Z	05 45 36.4 44	22.	iF i i PP eL P: E,D	EZ N Z Z E	16 33 27.1 28 57 35 13.5 41 57
					52.2 N., 165.3 W. Fox Is. h: 33 km ca. H= 16 25 36.8 USCGS		
22.	iP S i P: W,D	EZ N E	07 47 18.7 34 35	22.	P i i	Z EZ EZ	19 18 52 19 24 34
22.	eP eS eL	Z E E	10 27 37 35 15 42 22	22.	P i	NEZ NE	21 03 38 04 10
	11.0 S., 163.5 E. Solomon Is. region. h: 37 km ca. H= 10 18 27.0 USCGS			22.	iP i i PPP S eL P: D	Z NE Z NEZ E	22 01 49.1 49.6 04 37 08 55 12 56
22.	iP S P: E,D	EZ N	11 21 31.5 22 08		Mag. 5 ½ (Mat.) 8.2 S., 115.7 E. Java Sea. h: 33 km ca. H= 21 53 02.5 USCGS		
22.	P i i i	Z E NE NE	12 34 24 43 35 13 47	22.	iP i PcP eS eL P: N,C	NZ E Z E E	00 58 42.1 42.5 01 01 09 04 37 06 45
					1.6 N., 126.4 E. Molucca Passage. h: 33 km ca. H= 00 51 40.3 USCGS		
22.	P i i PP i iS i Lq Lq Lr Lr Lr	Z NEZ NEZ Z E NE NE NE Z N E Z	14 00 41 42.1 57 01 14 03 47 58.0 04 20 44 05 00 53 57 06 40	23.	eS eL	E E	02 43 55 53 50
	Mag. 6½ - 6½ (Mat.) 48.6 N., 154.7 E. Kurile Is. region. h: 22 km ca. H= 13 56 43.0 USCGS				11.1 S., 163.5 E. Solomon Is. region. h: 33 km ca. H= 02 27 07.2 USCGS		
22.	iP i P: D	Z Z	15 37 22.5 25.5	23.	P	Z	03 43 44
22.	P i PP eS i eL eL Lr Lr	Z NZ E NE Z E N N Z	15 49 23 24 50 40 54 36 55 43 56 43 50 58 57 59 16		15.0 S., 176.7 W. Fiji Is. region. h: 279 km ca. H= 03 33 19.1 USCGS		

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
23.	P	Z	03	44	43	23.	iP	Z	10	51	49.7	
	S	E		52	12		i	NE			50.0	
	eSS	E		55	46		i	N		52	19	
	eL	E		57	53		P: C					
	eL	Z	04	00	16							
Mag. $6\frac{1}{4}$ - $6\frac{1}{2}$ (Mat.)						23.	PKP	Z	12	16	39	
10.9 S., 163.3 E.							e	E		41	18	
Solomon Is. region.							44.7 S., 75.7 W.					
h: 33 km ca.							Off coast of southern Chile.					
H= 03 35 34.7			USCGS				h: 33 km ca.			H= 11 56 45.6		
									USCGS			
23.	eP	E	05	39	20	23.	eL	E	13	06	42	
	7.9 S., 115.3 E.						23.		P	Z	14	24
Java Sea.								P	Z	15	18	27
h: 33 km ca.								i	EZ			31
H= 05 30 18.6			USCGS					PcP	Z	21	16	
23.	iP	Z	07	01	44.0	23.	eS	E	23	36		
	i	NE			44.4		PcS	Z	24	53		
	eS	E	04	45			eL	N	25	07		
	i	E			56		eL	E			10	
	P: D						eLr	N	27	33		
18.4 N., 145.2 E.						eLr	E			44		
Mariana Is. region.						Mag. $5\frac{1}{4}$ - $5\frac{1}{2}$ (Mat.)						
h: 478 km ca.						6.0 N., 126.1 E.						
H= 06 57 51.8			USCGS			Near east coast of Mindanao,						
						P.I.						
23.	P	Z	07	57	15	23.	iP	Z	16	31	07.0	
	eS	E	08	04	47		i	E			16	
eL	E		12	38	eS	E		33	53			
Mag. $5\frac{1}{2}$ (Mat.)						eL	E		34	25		
11.2 S., 163.3 E.						P: C						
Solomon Is. region.						46.6 N., 152.3 E.						
h: 17 km ca.						Kurile Is. region.						
H= 07 47 59.7			USCGS			h: 52 km ca.			H= 16 27 42.5			
									USCGS			
23.	iPZ,PNE		08	52	20.4	23.	P	Z	17	28	33	
	P: D						S	N				54
20.7 S., 177.9 W.						i	E				56	
Fiji Is. region.						23.	eL	E	19	03	00	
h: 477 km ca.							14.5 N., 105.2 W.					
H= 08 41 54.7			USCGS			Off west coast of Mexico.						
						h: 33 km ca.			H= 18 21 13.3			
									USCGS			
23.	P	Z	10	27	06	23.	P	Z	21	54	47	
	36.6 N., 30.0 E.						52.1 N., 173.6 W.					
Near south coast of Turkey.						Andreanof Is. region.						
h: 226 km ca.						h: 60 km ca.						
H= 10 15 03.9			USCGS			H= 21 37 36.3			USCGS			
23.	iPZ,PNE		10	37	26.6	23.	P	Z	21	54	47	
	S?	N			57		52.1 N., 173.6 W.					
P: D						Andreanof Is. region.						
						h: 60 km ca.						
						H= 21 37 36.3			USCGS			
23.	iPEZ,PN		10	44	06.2	24.	P	Z	06	38	22	
	S	EZ			32		i	Z			32	
	i	N			38							
	P: N,W,C											
	36.9 N., 141.0 E.											
Near east coast of Honshu,												
Japan.												
h: 39 km ca.												
H= 10 43 30.6			USCGS									

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
26.	P PcP	Z Z	00 51 11.5 52 48.5				
	6.9 S., 155.6 E. Solomon Is. h: 37 km ca. H= 00 42 56.1				22.5 N., 144.0 E. Volcano Is. region. h: 33 km ca. H= 18 32 48.1		
			USCGS				USCGS
26.	e e	E E	01 43 14 50 30	26.	eP e e	NZ E N	18 38 50 51 42 21
26.	eP i i	Z NZ E	02 32 03 28 29	26.	eP i eL	Z Z E	21 06 25 42.5 12 00
	48.5 N., 156.4 E. Kurile Is. h: 33 km ca. H= 21 02 19.2				48.5 N., 156.4 E. Kurile Is. h: 33 km ca. H= 21 02 19.2		
			USCGS				USCGS
26.	iPEZ,PN i P: E,C	NE	03 26 37.7 27 10	26.	iP PcP S i Lq Lq Lr Lr L	NEZ Z E N E N N E Z	23 12 05.0 15 49 16 20 30 17 47 18 00 56 19 11 43
	53.2 N., 159.8 E. Near east coast of Kamchatka. h: 33 km ca. H= 04 43 09.4				P: N,E,D Mag. 6 - 6 $\frac{1}{4}$ (Mat.) 55.2 N., 159.9 E. Near east coast of Kamchatka. h: 47 km ca. H= 23 06 55.0		
			USCGS				USCGS
26.	iPZ,PE S P: D	NEZ	04 56 36.3 39.8	26.	P i S eL Lr	Z E NE E E	23 42 20 7.2 S., 128.3 E. Banda Sea. h: 293 km ca. H= 23 34 49.0
	Mag. 5 $\frac{1}{2}$ (Mat.) 51.5 N., 159.2 E. Near east coast of Kamchatka. h: 33 km ca. H= 04 52 23.4				Mag. 5 $\frac{1}{2}$ (Mat.) 51.5 N., 159.2 E. Near east coast of Kamchatka. h: 33 km ca. H= 04 52 23.4		
			USCGS				USCGS
26.	P i S eL Lr	NZ E NE E E	04 57 12 13 05 01 20 02 42 03 50	27.	P e	Z E	01 53 35 02 15 38
	Mag. 5 $\frac{1}{2}$ (Mat.) 51.5 N., 159.2 E. Near east coast of Kamchatka. h: 33 km ca. H= 04 52 23.4				Mag. 5 $\frac{1}{2}$ (Mat.) 51.5 N., 159.2 E. Near east coast of Kamchatka. h: 33 km ca. H= 04 52 23.4		
			USCGS				USCGS
26.	P i i	Z Z NEZ	06 49 52 12 26 21 30 45.5	27.	P i i	Z N E	02 31 12 32 08 11
	Mag. 5 $\frac{1}{2}$ (Mat.) 51.5 N., 159.2 E. Near east coast of Kamchatka. h: 33 km ca. H= 04 52 23.4				Mag. 5 $\frac{1}{2}$ (Mat.) 51.5 N., 159.2 E. Near east coast of Kamchatka. h: 33 km ca. H= 04 52 23.4		
			USCGS				USCGS
26.	iPKP iPKP P: D	Z NE	13 03 24.6 25.3	27.	iP i i	NEZ N E	03 44 33.0 45 10 12
	16.7 S., 72.2 W. Southern Peru. h: 60 km ca. H= 12 43 43.1				P: N,E,C		
			USCGS				USCGS
26.	P i eL	Z NE E	18 36 17 19 39 30	27.	iP PcP S Lq Lq Lr Lr L	NEZ Z E E N E N Z	04 03 56.3 07 38 08 12 09 52 54 11 00 08 36
	Mag. 6 - 6 $\frac{1}{4}$ (Mat.)				P: S,W,C Mag. 6 - 6 $\frac{1}{4}$ (Mat.)		
			(cont.)				(cont.)

Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
			55.3 N., 160.1 E. Near east coast of Kamchatka. h: 54 km ca. H= 03 53 47.9				
			USCGS				
27.	iP	Z	07 07 42.0	27.	iPKP	Z	22 13 15.5
			54.3 N., 159.8 E. Near east coast of Kamchatka. h: 33 km ca. H= 07 02 27.0		pPKP	Z	45
			USCGS		P: C		
27.	e	E	08 44 17				18.9 S., 69.5 W. Chile-Bolivia border. h: 110 km ca. H= 21 53 43.9
							USCGS
27.	iP	NZ	09 41 15.7	27.	iP	NEZ	22 30 32.3
	i	E	16.0		i	N	31 03
	S	NE	42 02		P: S,E,D		
	P: S,D			27.	iP	Z	22 46 13.2
27.	iPZ,PE		09 53 07.5		i	Z	24
	i	Z	19.0		i	N	30
	i	N	54 16		S	E	47 07
	P: D				P: D		
27.	iP	NEZ	15 22 50.4	28.	iP	NEZ	00 06 31.6
	i	Z	52.5		P: S,C		
	i	EZ	23 55				
	P: N,W,D			28.	iP	NEZ	01 17 07.3
27.	iP	NZ	16 27 22.1		S	NE	18 12
	i	Z	28.3		e	E	25
	eL	E	35 53		P: S,E,D		
	eL	E	37 55				
	eL	N	38 00				
	P: N,D						
	Mag. 5½ - 5½ (Mat.)						
	0.6 S., 130.1 E.						
	Halmahera region.						
	h: 33 km ca.						
	H= 16 20 09.6						
							USCGS
27.	iPEZ,PN		17 20 51.6	28.	P	Z	01 26 38
	i	N	21 25		i	Z	45
	i	E	28.4				
	i	NE	37				
	P: E,D						
27.	iP	NEZ	21 18 57.6	28.	eL	E	04 09 48
	i	Z	19 03.4	28.	iP	NEZ	05 01 09.4
	i	Z	12.4		e	E	02 12
	S	NEZ	12.7		e	N	52
	P: S,E,D				P: S,W,C		
27.	iPZ,PE		21 30 13.1	28.	P	Z	05 57 18
	i	NZ	18.2		i	NE	19
	S	NE	36		S?	NE	34
	e	E	33 34		i	N	40
	P: C			28.	iPZ,PN		09 45 42.4
27.	iP	EZ	21 53 37.5		i	N	46 41
	S	NZ	52.3		P: C		
	P: W,C			28.	P	NEZ	11 44 10
					i	NZ	52
				28.	iP	Z	17 49 50.1
					i	NE	50.4
					i	E	55
					i	N	58
					i	N	50 22
							(cont.)

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
	i F: D	E	17	50	28	29.	iP i i i F: N,E,D	NEZ NZ N E	01	15	44.3
28.	eP eL	Z E	18	02	36 09 32					16	18 20
28.	eP i e e	Z Z E N	20	35	34 36 45 43 09 17	29.	iP i i i P: N,E,C	NEZ NEZ NE N	01	19	58.5 20 07 27 31
28.	P i i S	Z E NZ N	21	05	25 26 27 56	29.	iP S P: S,D	NEZ NEZ	01	54	42.3 55 07
28.	P i i S e	NZ NEZ E N E	21	07	39 45 10 25 35 40	29.	P i i i i P: C	NEZ E N E N	02	48	31.7 41 43 49 05 08
	47.5 N., 152.4 E. Kurile Is. region. h: 120 km ca. H= 21 04 10.0										
	USCGS					29.	P S	NEZ Z	03	00	41 01 03
28.	P eS e eL eL	NZ E N N E	21	44	04 43 23 29 50 14 22	29.	P i i S	Z NEZ E NE	04	32	33 37 46 33 09
	12.5 N., 142.1 E. Mariana Is. region. h: 33 km ca. H= 21 38 49.5										
	USCGS					29.	P i	Z Z	04	58	54 59 05
	57.4 N., 154.0 W. Kodiak I., Alaska. h: 55 km ca. H= 04 50 17.5										
	USCGS					29.	eP	Z	06	00	21
28.	iP i S i i P: N,W,C Mag. 4.3 (Mat.) 35.5 N., 141.0 E. Near east coast of Honshu, Japan. h: 60 km ca.	NEZ Z NEZ Z NE	21	59	00.5 09 32 34 38	29.	P i	NZ E	07	39	21 40 32
	JMA					29.	iP P: N,W,C 17.7 S., 178.8 W. Fiji Is. h: 512 km ca. H= 03 27 44.5				
	USCGS										
29.	P 28.3 N., 52.2 E. Western Iran. h: 45 km ca. H= 00 47 50.3	Z	00	59	00	29.	eP i i eS eL eL eL eL	Z Z E NE E N N E	03	45	47 46 05 20 54 32 59 12 15 09 09 18 43
	USCGS										
29.	iPNZ,PE P: C 13.1 S., 178.0 W. Fiji Is. region. h: 472 km ca. H= 01 02 05.3		01	12	20.0	29.	eP i i eS eL eL eL eL Mag. 5.4 - 5.2 (Mat.) 27.2 N., 59.3 E. Southern Iran.	Z Z E NE E N N E	03	45	47 46 05 20 54 32 59 12 15 09 09 18 43
	USCGS										

Date	Phase	Comp.	Time(GMT)		
			h	m	s
31.	iPEZ,PN		05	03	55.0
	S	E		04	34
	i	N			36
	P: W,C				

31.	iPNZ,PE		05	34	38.4
	e	N		39	11
	e	E			33
	eL	N		41	11
	eL	E			32
	P: S,C				
	55.2 N., 160.0 E.				
	Near east coast of Kamchatka.				
	h: 61 km ca.				
	H= 05 29 30.4		USCGS		

31.	iPZ,PN		06	14	38.2
	S	E		23	45
	e	N			48
	e	E		31	05
	eL	E		34	47
	eL	N		35	16
	eL	Z			37
	P: C				
	Mag. 6 (Mat.)				
	15.1 S., 173.3 W.				
	Tonga Is. region.				
	h: 33 km ca.				
	H= 06 03 34.9		USCGS		

31.	P	Z	17	17	37
	e	E		20	00
	e	N			42
	e	E		21	13

31.	iP	EZ	17	26	57.4
	S	NEZ		27	09
	P: W,C				

Mineo Takehana
Director

June , 1963

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)	
			h m s				h m s	
1.	iP EZ, P N S E i E e E L N L E		00 09 52.9 18 58 19 26 27 00 30 14 35			0.1 N., 123.1 E. Celebes region. h: 145 km ca. H= 19 36 04.4	USCGS	
	P: W,C Mag. 6 - 6½ (Mat.) 15.1 S., 173.4 W. Samoa Is. region. h: 33 km ca. H= 23 58 49.7		USCGS	1.	iP Z P: C		21 13 58.6 22.2 S., 169.6 E. Loyalty Is. region. h: 35 km ca. H= 21 03 17.3	USCGS
1.	eP Z		02 05 00	1.	iP NEZ ePP Z S NE eScS E eSSS E Lr E Lr N Lr Z		21 24 56.0 27 27 34 02 33 41 52 45 26 45 46 23	
1.	P NEZ i N		02 11 05 12.6		P: N,W,C Mag. 6½ (Mat.) 15.2 S., 173.5 W. Samoa Is. region. h: 33 km ca. H= 21 13 52.7		USCGS	
	46.7 N., 152.4 E. Kurile Is. h: 33 km ca. H= 02 07 38.2		USCGS	1.	iP NEZ S E P: S,W,D		08 02 37.0 58	
1.	iP NEZ S E		08 02 37.0 58	1.	iP Z i N pP Z P: D		10 59 04.5 05.5 29.6	
	36.4 N., 71.5 E. Hondu Kush. h: 70 km ca. H= 10 49 54.8		USCGS		36.4 N., 71.5 E. Hondu Kush. h: 70 km ca. H= 10 49 54.8		USCGS	
1.	P Z i Z eL E eL E		12 42 03.5 14.5 59 35 13 03 42	2.	iP NZ i E i N S E P: N,C		01 21 13.0 13.5 42.5 47.5	
	15.0 S., 172.4 W. Tonga Is. h: 33 km ca. H= 12 30 55.8		USCGS	2.	iP NZ, P E i Z i E P: S		02 32 34.5 40.0 50.0	
1.	iP Z, P NE i Z eL E eL N P: D		18 28 58.5 29 00.8 39 30 45	2.	iP Z i E i Z eS NE eL E Lr N P: D		10 08 12.2 13.0 20 15 20 18 53 22 00	
	49.7 N., 109.7 E. Chita region, USSR. h: 33 km ca. H= 18 24 07.0		USCGS		Mag. 5½ - 5¾ (Mat.) 6.1 S., 154.4 E. Solomon Is. region. h: 49 km ca. H= 10 00 00.1		USCGS	
1.	iP NEZ eL E P: S,W,D		19 43 17.2 20 19 00ca.					

(cont.)

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
4.	iP S P: S,E,C	NEZ N	09	21	03.8 37	5.	iP EZ, P N P: E,D		06	48	10.7
4.	P S	Z E	11	44	25 42	5.	iP eS e P: S,E	NEZ NE E	09	13	23.7 14 34 50
4.	P e L Mag. 6 (Mat.) 30.5 S., 177.8 W. Kermadec Is. h: 33 km ca. H= 11 54 09.1	Z E E	12	06	07 16 43 32 00 ca.						
4.	P e 30.4 S., 177.6 W. Kermadec Is. h: 33 km ca. H= 13 05 56.3	Z E	13	17	54 45 00	5.	iP EZ, P N P: E,C 14.9 S., 166.8 E. New Hebrides Is. h: 37 km ca. H= 10 12 09.0		10	21	59
4.	iP P: S,D 4.8 S., 129.9 E. Banda Sea. h: 188 km ca. H= 14 44 05.2	NZ	14	51	37.6	5.	eL 3.6 S., 149.6 E. Bismarck Sea. h: 33 km ca. H= 11 20 07.3	E	11	37	35
4.	iP i eS eL i P: N,C 18.9 N., 146.2 E. Mariana Is. h: 110 km ca. H= 19 21 56.6	NZ E Z E E	19	26	09.4 10.6 29 10 30 39	5.	iP e P: S,W,C	NEZ Z	19	47	40.1 52
4.	iP Z, P NE eS ScP PcS L L Lr Lr Lr P: D Mag. 6½ - 6¼ (Mat.) 1.2 S., 127.3 E. Halmahera region. h: 31 km ca. H= 21 04 42.3	N Z E E N N Z E	21	12	05.4 17 42 50 55 20 55 21 07 23 43 24 10 12	5.	iP i eL P: N,C	NZ E E	22	27	44.3 45.1 59 35
4.	eP Z 22 31 04					5.	P PP PPP eS e e L L Mag. 5½ - 6 (Mat.) 3.0 S., 119.5 E. Celebes. h: 75 km ca. H= 22 54 28.7	Z Z E E N E E N	23	02	22 04 17 51 08 48 11 00 16 12 21 39
4.	eP Z 22 31 04					6.	iP i P: D	Z E	01	11	17.3 19.1

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
8.	e	E	18 40 07 ca.		P: E,D		
	e	E	54 09 ca.		12.2 S., 166.9 E.		
8.	iP	NEZ	20 41 02.9		Santa Cruz Is. region.		
	i	N	03.6		h: 233 km ca.		
	i	Z	04.1		H= 07 42 20.3	USCGS	
	P: N,W,C						
8.	eP	Z	21 59 42		eL	E	10 25 49
	eL	E	22 09 36		eL	E	30 10
					77.9 N., 9.2 E.		
					Svalbard region.		
8.	iP EZ, P N	N	22 53 32.0		h: 63 km ca.		
	eS	E	54 08.6		H= 09 39 06.9	USCGS	
	P: E,C						
8.	P	Z	23 16 30		9.	iP	NEZ
	eL	E	39 47		S	NE	12 23 41.1
					P: S,W,C		24 00
9.	iP	Z	00 55 09.4		9.	iP	NEZ
	i	N	10.1		P: N,W,C		12 47 44.1
	i	E	11				
	S	NZ	56 26		9.	P	EZ
	i	E	30.6		eS	Z	14 00 14
	e	N	01 02 34		eS	NE	01 12
	e	E	06 30				
	eL	E	10 20		9.	eP	Z
	P: C				e	N	14 50 10
	27.3 N., 138.0 E.				eL	N	15 03 23
	Bonin Is. region.						07 00
	h: 267 km ca.				9.	P	Z
	H= 00 53 00.8		USCGS		9.	P	NEZ
							19 04 53
9.	eL	E	01 56 50 ca.		9.	P	NEZ
	eL	N	57 05				19 39 38
	23.5 S., 176.0 W.				10.	e	E
	Tonga Is. region.				eL	E	00 32 03
	h: 33 km ca.				L	N	39 22
	H= 01 30 32.2		USCGS				45
					10.	e	E
9.	P	Z	02 35 54		L	E	01 20 33
	e	E	40 35 ca.				23 12
9.	eP	Z	04 08 06		10.	eL	E
	17.5 S., 168.0 E.				eL	E	02 36 33
	New Hebrides Is.						46 07
	h: 33 km ca.				10.	iP NZ, P E	04 29 44.5
	H= 03 57 57.9		USCGS		i	E	46.1
					pP	NE	30 15.1
					PP	EZ	33 23
9.	eP	Z	06 29 42		SKS	N	40 17
					S	E	50
9.	eP	Z	07 14 57		pS	Z	41 13
	51.0 N., 173.8 E.				SS	E	46 55
	Rat Is. region, Aleutian Is.				Lq	E	53 40
	h: 70 km ca.				Lr	N	58 05
	H= 07 09 28.8		USCGS		P: N,C		
					Mag. 6 $\frac{1}{4}$ - 6 $\frac{1}{2}$ (Mat.)		
9.	iP EZ, P N	N	07 50 28.3		55.4 S., 146.4 E.		
	i	NE	51		800km west of Macquarie Is.		
	eL	E	08 31 00 ca.		h: 33 km ca.		
			(cont.)		H= 04 16 37.7		USCGS

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
10.	iF i i	NE N Z	05 27 22.7 32.5 36		ScS eL	E E	12 37 14 39 00
	P: N,C 55.2 S., 146.3 E. 300km west of Macquarie Is. h: 33 km ca. H= 05 14 15.6				P: N,C 4.6 S., 152.0 E. New Britain. h: 174 km ca. H= 12 19 56.1		
			USCGS				USCGS
10.	iP i i sP i PP pPP SKS S pS SS L L	Z NE E E N Z N N E N NE E N	06 52 11.1 11.6 25.9 53.1 53 27 55 52 56 05 07 02 45 03 19 44 09 23 16 23 18 40	10.	iP NZ, P iS P: N,C	E NE	13 03 53.1 04 07.1
	P: D Mag. $6\frac{1}{2}$ - $6\frac{3}{4}$ (Mat.) 55.3 S., 146.1 E. 300km west of Macquarie Is. h: 18 km ca. H= 06 39 04.0				P: N,C		
			USCGS				
10.	iP i	NEZ N	08 01 11.5 17.1	10.	e	E	17 24 49
	P: S,W,C 51.5 N., 178.5 W. Andreanof Is. region, Aleutian Is. h: 33 km ca. H= 07 54 28.2						
			USCGS				
10.	iP S P: S	NEZ NZ	10 25 17.1 39.9	10.	iP i i L	Z N E NE E	20 59 45.6 46.4 47.1 21 02 09 03 00
	P: S				P: C		
10.	iF i pP i S L Lr	NEZ NE Z E E E E	10 51 42.1 55 52 05 53 28 55 41 58 05 11 00 22	10.	iP i i L L	NEZ E N Z N	18 42 29.3 55 47 53 48 23 49 56.6 51 45.1
	P: S,W,C Mag. $5\frac{1}{2}$ (Mat.) 50.9 N., 160.2 E. Off coast of Kamchatka. h: 33 km ca. H= 10 46 58.1				P: N,W,C		
			USCGS				
10.	iP NZ, P pP PcP sS	E Z Z E	12 27 36.5 28 15 29 24 34 50	11.	P i i i ScP i S ScS L L	Z N E Z NZ E N E E N	00 06 35 37.1 40 07 28 12 16.9 13 48 16 05 17 23 19 05
	(cont.)				Mag. $5\frac{1}{2}$ - $5\frac{3}{4}$ (Mat.) 4.5 S., 152.8 E. New Britain. h: 69 km ca. H= 23 58 44.3		
			USCGS				USCGS
				11.	e eL	E NE	01 44 28 49 41
				11.	e	E	02 47.0
				11.	P eL	Z E	03 34 58 53 31
					37.1 N., 70.3 E. Hindu Kush.		
							(cont.)

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
			h: 38 km ca. H= 03 25 40.7	11.	iP S P: N,E	NEZ NE	18 13 03.7 15
11.	iP eL P: C	Z E	04 24 31.0 52 31	11.	iP S P: N,E,C	Z Z	18 14 03.5 10
			59.8 N., 153.0 W. Cook Inlet, Alaska. h: 50 km ca. H= 04 15 49.4	11.	P S	Z Z	18 14 15 22
11.	P	Z	06 32 40	11.	iP S	Z NEZ	18 15 01.5 09
11.	iP Z, P N i eS L P: C	Z E E	13 17 13.5 18 44 24 32 28 18	11.	L	NE	18 28 37
			63.1 N., 151.4 W. Central Alaska. h: 31 km ca. H= 13 09 31.4				30.7 N., 86.9 E. Tibet. h: 33 km ca. H= 18 07 24.1
11.	F S	Z NZ	13 41 03.5 10	11.	eP	Z	18 43 30
11.	iP iS P: N,E	Z N	14 54 55.3 55 02.5				37.7 N., 69.4 E. Hindu Kush. h: 200 km ca. H= 18 34 24.4
11.	iP P: D	Z	15 36 05.5	11.	iP i iS	EZ NEZ NEZ	18 49 47.8 48.0 55.0
			31.8 N., 116.2 W. Baja California. h: 33 km ca. H= 15 23 42.3	11.	ePKP	Z	18 53 39
11.	iP iS N, S E P: N,E	EZ	16 36 41.7 48.5				4.9 N., 77.5 W. Near west coast of Colombia. h: 33 km ca. H= 18 34 30.6
11.	iP iS N, S EZ P: E,C	EZ	16 55 22.3 29.3	11.	iP iS P: E,C	EZ N	21 20 43.9 51.2
11.	iP P: C	Z	17 23 36.5	12.	iP iS P: N,E,D	NEZ N	00 08 16.4 52.2
			23.1 S., 179.6 W. Fiji Is. h: 550 km ca. H= 17 13 11.5	12.	iP iS P: E	NEZ NEZ	00 34 47.9 54.9
11.	iP P: C	Z	17 24 01.5	12.	iP iS P: E	EZ N	00 44 10.0 17.1
			23.2 S., 179.7 W. Fiji Is. h: 550 km ca. H= 17 13 36.2	12.	e	E	01 39 14
				12.	P iS	E NE	01 41 20.6 27.7
				12.	iP eS P: E,D	EZ E	02 35 52.5 56

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
12.	iP Z, P E		02 39 34.2	13.	ePKP? Z		05 50 49
	i E		35.4		22.8 S., 67.3 W.		
	iS E		41.4		Chile-Bolivia border.		
	P: C				h: 33 km ca.		
					H= 05 30 41		USCGS
12.	iP	NEZ	02 52 33.9	13.	iP	NEZ	03 21 56.4
	i	Z	46		S	NE	22 34
	S	E	53 46		P: N,E		
	L	E	54 09	13.	iP	NZ	10 42 38.0
	L	N	15		i	E	38.4
	P: N,W				i	E	43 13.5
	30.8 N., 142.0 E.				i	N	20.7
	South of Honshu, Japan.				e	NE	52 20
	h: 33 km ca.				P: S,D		
	H= 02 50 53.8		USCGS		6.1 S., 130.1 E.		
12.	iP Z, P NE		03 31 43.8		Banda Sea.		
	eS N		50		h: 150 km ca.		
	P: C				H= 10 34 52.4		USCGS
12.	iP	EZ	06 40 53.9	13.	iP	EZ	16 03 11.5
	S	NE	41 01		i	N	12.0
	P: W,C				eS	E	30
12.	eP	NZ	09 29 44		P: E,D		
	i	N	46.4	13.	iP	NZ	17 34 39.5
	iS	N	30 26.4		iPP	Z	36 28.1
12.	iP	NEZ	12 42 04.8		isPP	EZ	43.8
	iS	N	08.1		PcS	NZ	40 18
	i	Z	29.9		e	N	42 05
	P: N,E,C				e	E	43 55
12.	iP	NEZ	12 46 52.2		Lq	E	44 55
	iS	N	55.6		Lr	N	43 07
	P: N,E				eLr	Z	21
12.	P	Z	13 13 52		Lr	E	31
	17.0 S., 173.4 W.				P: D		
	Tonga Is.				Mag. 5½ (Mat.)		
	h: 33 km ca.				4.6 S., 153.2 E.		
	H= 13 02 47.9		USCGS		New Britain.		
					h: 54 km ca.		
					H= 17 26 41.1		USCGS
12.	iP	NEZ	16 04 30.2	13.	iP	NE	18 50 07.5
	P: N,E,C				i	E	08.0
12.	iP	E	19 59 01.1		i	Z	19.8
	iS	NE	25.7		eS	NE	51 18
	P: E				L	E	53
12.	P	Z	22 47 09		P: N,C		
13.	iP	E	00 32 44.1	13.	P	Z	21 42 44
	S	Z	47		i	N	49.0
	P: D			13.	iP	EZ	22 55 11.7
13.	eS	Z	00 32 56		eS	E	37
13.	eP	Z	00 32 53		P: W,C		
	iS	NE	33 01	14.	eP	Z	09 37 36
					iS	NEZ	44.0

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
14.	P iS	NEZ Z	10 06 46.5 59	15.	P i e	Z N Z	10 09 45 51.5 11 13
14.	iP iS P: W,C	EZ NE	10 50 39.0 45.7	15.	e	E	12 13 06
14.	iP S P: C	Z NEZ	13 23 59.0 24 23	15.	P	Z	15 19 52.7
14.	e	E	13 23.9	15.	ePKP eSKS e eSSS Lq eLr	Z E E E NE E	15 49 57 57 00 16 10 26 15 14 25 52 32.3
14.	iP iS P: E,C	Z EZ	13 49 41.7 43.5	Mag. 5 $\frac{1}{2}$ (Mat.) 36.3 S., 93.9 W. Off coast of central Chile. h: 33 km.ca. H= 15 30 37.7 USCGS			
14.	iP P: N,E,D	Z	14 28 44.6	15.	iP Z, P i P: S,C	NE Z	15 56 31.1 16 00 28.7
14.	iP P: S,E,C	Z	16 23 46.6	16.	iP iS i P: C	Z E N	02 54 57.0 56 24.0 28.5
14.	iP S P: C	Z E	16 40 47.7 41 04	44.3 N., 135.5 E. Sea of Japan region. h: 438 km ca. H= 02 53 24 USCGS			
14.	e	E	18 17 20	16.	P i S	Z Z E	03 08 49.4 50.3 09 22
14.	iP iS i P: W,D	EZ N E	23 07 59.8 08 29.7 30.0	16.	P i eS e	NE NZ E N	04 45 19 20.4 46 45 58
15.	iP N, P eS P: N,C	Z E	00 08 40.2 09 04	42.7 N., 142.0 E. Hokkaido, Japan. h: 80 km ca. H= 04 43 49.0 USCGS			
15.	P e	Z Z	02 27 59 23 06	16.	iP S P: N,C	NZ E	07 50 43.1 58.5
53.2 N., 167.0 W. Fox Is., Aleutian Is. h: 33 km ca. H= 02 20 11.5 USCGS				15.0 S., 177.8 W. Fiji Is. region. h: 350 km ca. H= 05 01 52.0 USCGS			
15.	iP P: C	Z	05 12 02.8	16.	P i i i P: C	EZ Z E E	09 46 29.4 32.4 32.6 37.7
15.	e	E	08 19.7	16.	eP e	Z Z	13 56 56 58 45
15.	P	Z	08 20 51	4.5 S., 153.0 E. New Ireland. (cont.)			
15.	e	E	08 43.3				
15.	iP Z, P iS P: D	NE NE	10 06 05.1 26.1				

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
17.	iP	NZ	20	20	01.9	18.	P	Z	09	39	15
	i	E			02.4						
	i	Z			11.0						
	e	NE			12						
	eL	E			33.1						
	eL	E			43.6						
	P: N,C										
	20.4 S., 174.4 W.										
	Tonga Is.										
	h: 33 km ca.										
	H= 20 03 37.0										USCGS
17.	iP Z, P E		21	53	05.1	18.	eL	E	13	01	6
	iS	NEZ			08.9						
	P: D										
17.	iP	NEZ	23	11	13.7	18.	iP Z, P N		16	06	36.4
	iPcP	Z		12	23.9		S	E		07	03
	i	Z			40.7		P: C				
	iPcS	Z		16	15.1	18.	iP	NEZ	19	16	50.2
	i	E			23		eS?	N		17	04
	i	Z			44.4		P: S,E,D				
	eS	E		18	35	18.	eP	Z	23	20	07
	esS	E		19	07		12.6 N., 124.2 E.				
	esSS	E		22	52		Southern Luzon, P.I.				
	eG	E		25	15		h: 16 km ca.				
	P: N,E,C						H= 23 14 23.9				
	Mag. 5 $\frac{1}{4}$ - 5 $\frac{1}{2}$ (Mat.)										
	4.1 S., 102.2 E.										
	Near south coast of Sumatra.										
	h: 73 km ca.										
	H= 23 02 06.6										USCGS
17.	iP	NEZ	23	26	29.9	18.	P	EZ	23	58	41
	iS	N			59.7		eS	N		59	13
	P: S,E,C						e	E			16
18.	iP Z, P NE		02	18	29.6	19.	iP	Z	00	51	04.7
	i	Z			31.5		i	E			05.6
	i	Z			32.8		iS	E			46.6
	eS	N		19	20		P: C				
	P: E,D										
13.	P	Z	04	04	56	19.	eP	Z	02	27	26
	e	Z			05 05		e	E			37 30
	eS	NE			07 01		eL	E			45.4
	i	Z			19		eL	E			52.9
	i	NEZ			03 07		23.6 S., 174.9 W.				
	P: D						Tonga Is. region.				
	29.0 N., 129.9 E.						h: 55 km ca.				
	Ryukyu Is.						H= 02 15 54.1				
	h: 33 km ca.										
	H= 04 02 31.0										
					USCGS	19.	iP	NE	04	03	53.6
13.	P	Z	04	14	02		iS	NEZ		04	22
13.	eP	Z	09	32	28		P: S,W				
	eS	E			33 00	19.	iP	NEZ	04	07	13.4
							S	NEZ			37
							P: N,W,C				
						19.	iP	NEZ	07	50	52.9
							i	E		51	45
							P: S,W,D				
						19.	iP	NEZ	09	15	35.6
							ePP	NE		17	09
							S	E		20	46
							i	E			48
							iLq	E		23	15
							iLq	N			20
							Lr	NE		25	00
											(cont.)

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	Lr	Z	09 25 11		i	N	18 08 20.9
	i	NE	58		i	NE	09 04
	P: N,E,C				P: C		
	Mag. 6 - 6 $\frac{1}{2}$ (Mat.)			19.	iP	Z	18 29 36.4
	4.7 N., 126.5 E.				i	NE	36.6
	Talaud Is. region.				ipP	N	30 18.1
	h: 83 km ca.				i	E	21.2
	H= 09 09 04.0				iPP	Z	31 25.9
	USCGS				ScP	Z	34 51
19.	iP	NEZ	09 53 13.5		eS	N	35 22
	S	NE	19.6		e	E	29
	P: N,E				i	N	33.0
19.	iP	NEZ	10 30 02.8		i	Z	36 07.7
	iS	NE	26.9		iScS	NE	39 09
	P: S,E,D				SSS	E	40 56
19.	iP	EZ	10 55 03.2		3.5 S., 153.4 E.		
	epP	Z	19		New Ireland region.		
	esPP	E	56 53		h: 279 km ca.		
	ScP	Z	11 00 49		H= 18 22 09.6		
	eS	E	01 08		USCGS		
	e	N	25	19.	iP NZ, P E		23 03 10.2
	eLq	NE	04 33		S	E	04 22
	Lr	NE	07 34		P: N,W,C		
	L	E	09 23		Mag. 5.8 (Mat.)		
	P: E,C				31.5 N., 140.3 E.		
	Mag. 5 $\frac{1}{2}$ - 5 $\frac{1}{2}$ (Mat.)				South of Honshu, Japan.		
	25.0 N., 92.1 E.				h: 38 km ca.		
	Assam, India.				H= 23 01 51.5		
	h: 51 km ca.				USCGS		
	H= 10 47 24.7				USCGS		
19.	iP EZ, P N		11 53 29.4	20.	iP	NEZ	00 57 13.0
	i	E	49.4		eS	NE	58 12
	iS	N	53.4		P: N,W,C		
	P: E,D				36.3 N., 144.5 E.		
19.	P	NE	12 07 43		Off east coast of Honshu,		
	e	Z	51		Japan.		
	eS	E	14 33		h: 33 km ca.		
	eLq	E	18 16		H= 00 56 04.1		
	Lr	E	20 05		USCGS		
	Mag. 5 $\frac{1}{2}$ - 5 $\frac{1}{2}$ (Mat.)			20.	P	Z	01 09 30
	9.3 S., 153.8 E.				i	Z	35.5
	Solomon Is.			20.	eP	Z	01 20 09
	h: 33 km ca.				i	Z	18.6
	H= 11 58 55.0			20.	P	Z	03 24 33
	USCGS			20.	iP	Z	08 50 49.6
19.	P	Z	13 36 16.4		i	N	51 27.0
19.	eP	Z	17 54 55		i	EZ	27.4
	63.2 N., 146.3 W.				P: C		
	Alaska.			20.	iP	EZ	10 24 46.1
	h: 33 km ca.			20.	iP	Z	12 01 22.9
	H= 17 46 01.7				S	E	02 30
	USCGS				i	NEZ	32
19.	iP	Z	18 07 23.4		P: C		
	i	Z	08 20.4		31.6 N., 140.2 E.		
	(cont.)				(cont.)		

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	South of Honshu, Japan. h: 33 km ca. H= 12 00 05.0						
			USCGS				
20.	iP Z P E		12 45 42.0	21.	iPKP 1	Z	12 38 03.6
	i	E	44.0		i	N	04.0
	i	Z	46.5		i	E	05
	iS	Z	46 06.7		PKP 2	NZ	20.6
	P: C				i	Z	21
					P: D		
					23.7 S., 66.6 W.		
					Jujuy Province, Argentina.		
					h: 221 km ca.		
					H= 12 18 26.9		
					USCGS		
20.	iP	NE	17 43 04.9	21.	eP	Z	13 16 04
	i	NE	22.9		i	NZ	05.8
	P: N,C				i	E	06.0
20.	iP EZ, P N		20 22 28.6		i	N	30
	S	E	47		S	NE	37
	P: E,D				i	Z	41.1
20.	iP	Z	22 55 36.8	21.	P	NE	13 17 08.1
	P: C				i	Z	09.1
					15.1 S., 173.3 W.		
					Samoa Is. region.		
					h: 33 km ca.		
					H= 13 05 54		
					USCGS		
20.	iP	Z	22 58 07.6	21.	P	Z	13 47 24.4
	i	NZ	08.4		i	NE	25.6
	i	Z	19		i	N	47
	eS	E	23 07 50		e	N	49 05
	eSS	E	12 54		S	NE	32
	eLq	E	17 33		L	E	57
	eLr	E	21 05		L	N	50 43
	P: C				L	Z	53
	Mag. 5½ (Mat.)				P: C		
	27.9 S., 176.6 W.				47.9 N., 130.3 E.		
	Kermadec Is.				Eastern Manchuria.		
	h: 41 km ca.				h: 33 km ca.		
	H= 22 46 18.1				H= 13 44 24.6		
	USCGS				USCGS		
20.	iP	NEZ	23 23 08.6	21.	iP	NZ	14 11 42.8
	e	N	26		i	E	43.8
	P: N,E,C				S	E	12 47
	52.9 N., 168.6 W.				i	NZ	48.6
	Fox Is., Aleutian Is.				P: S,D		
	h: 33 km ca.						
	H= 23 15 33.4						
	USCGS						
21.	iP	Z	00 20 24.6	21.	iP	Z	14 19 32.1
	P: C				i	N	32.3
21.	P	NEZ	02 13 19.1		i	E	33.1
21.	iP EZ, P N		04 00 12.3		P: C		
	i	E	23		12.7 S., 167.4 E.		
	i	N	28		Santa Cruz Is.		
	P: E,C				h: 275 km ca.		
					H= 14 10 11		
					USCGS		
21.	eP	NEZ	06 50 29	21.	iP	Z	14 36 46.4
	eS?	E	51 10		i	N	47.0
21.	eP	Z	07 14 58		i	E	48.0
	S	E	15 36		e	E	41 19
	i	N	40		P: C		
					(cont.)		

Date	Phase	Comp.	Time(GMT)
			h m s
			Northwestern Manchuria. h: 33 km ca. H= 20 51 56.8 USCGS
22.	P	Z	21 39 56
	i	NE	58
	i	Z	40 09
			30.1 S., 177.2 W. Kermadec Is. region. h: 33 kmca. H= 21 27 58.4 USCGS
22.	iP	NEZ	23 26 07.8
	i	NE	08.2
	eS	N	55
			P: S,D
23.	P	Z	04 01 25.3
	i	NE	26.7
	i	Z	46
	eS	NE	11 15
	eLq	E	19 31
	Lr	E	25 20
	Lr	N	28
			Mag. $5\frac{1}{2}$ - $5\frac{3}{4}$ (Mat.) 29.6 S., 177.9 W. Kermadec Is. region. h: 55 km ca. H= 03 49 33.9 USCGS
23.	eP	Z	04 37 02
	S N, eS	E	45
23.	P	Z	05 10 20.7
	S	NE	44
23.	iP	EZ, P N	08 17 48.1
	i	Z	57
	S	NE	59
			P: E,D
23.	P	NE	09 01 03
	i	Z	04.2
	L	E	12 15
	eL	N	13 24
			P: C 6.0 S., 146.6 E. New Guinea. h: 61 km ca. H= 03 53 09.6 USCGS
23.	iP	EZ	09 04 35.0
	i	N	35.9
	i	Z	42.2
	S	E	05 07
	i	Z	11
	i	N	13
			P: E,D Mag. 4.6 (Mat.) 37.7 N., 141.7 E. (cont.)

Date	Phase	Comp.	Time(GMT)
			h m s
			Near east coast of Honshu, Japan. h: 39 km ca. H= 09 03 49.0 USCGS
23.	P	Z	11 00 33.0
	i	NE	38.4
	sPP	Z	03 17
			P: D 9.0 S., 113.1 E. Off south coast of Java. h: 157 km ca. H= 10 51 48.8 USCGS
23.	P	Z	18 32 25
	i	E	29
	i	N	30
	S?	NE	36 44
			12.3 N., 140.7 E. Mariana Is. region. h: 42 km ca. H= 18 27 11.8 USCGS
23.	iP	NZ	21 15 16.2
	i	E	17.2
			P: N,D
23.	eP	NEZ	21 16 33
24.	P	Z	01 40 26
			15.3 S., 69.4 W. Peru-Bolivia border. h: 179 km ca. H= 01 21 03.5 USCGS
24.	iP	NEZ	04 35 23.2
	pPPP	Z	33 41
	ScP	Z	40 41
	i	Z	52
	S	NE	42 25
	i	Z	35
	i	E	38
	ScS	NE	45 14
	SS	NEZ	46 26
	Lq	N	47 08
	Lq	E	30
	Lr	Z	53 22
			P: N,E,D Mag. $5\frac{1}{2}$ (Mat.) 59.5 N., 151.7 W. Cook Inlet. h: 52 km ca. H= 04 26 37.9 USCGS
24.	P	Z	05 52 34
			59.4 N., 151.5 W. Cook Inlet. h: 57 km ca. H= 05 43 48.1 USCGS

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
24.	eP	Z	10	27	15	24.	eP	Z	16	59	27
							i	NE			29
	52.8 N., 131.9 W. Queen Charlotte Is. region. h: 33 km ca. H= 10 17 02.5 USCGS						52.3 N., 171.2 W. Fox Is., Aleutian Is. h: 33 km ca. H= 16 52 06.2 USCGS				
24.	eP	Z	11	32	02	24.	P	Z	19	06	00
	i	NE			05						
	eS	E			36		4.6 S., 101.3 E. Off south coast of Sumatra. h: 33 km ca. H= 18 56 43.6 USCGS				
24.	eP	NEZ	12	33	45						
	i	E			52						
	eS	NE			37 31						
24.	P	Z	13	29	23.2	24.	P	EZ	21	23	20.2
	i	N			29.3		i	N			21
	i	E			31		i	N			31
	eS?	NE			39 19		S	NE			43
	eL	E			49 20	24.	eP	Z	22	30	37
	eL	N			56 29		i	E			38
	25.5 S., 175.6 W. Tonga Is. region. h: 233 km ca. H= 13 18 02.2 USCGS						i	N			41
							S	NE			44
24.	eP	Z	14	19	03	25.	iP	NEZ	00	00	37.2
	i	NE			09		S	EZ			51
							P: W.				
24.	eP	NEZ	15	11	52	25.	iP	Z	02	54	20.3
	15.5 S., 177.5 W. Fiji Is. region. h: 412 km ca. H= 15 01 44.2 USCGS						i	N			34
							S	NEZ			43
							P: D				
24.	eP	Z	16	03	06	25.	eL	NE	04	33	54
24.	iP Z, P N		16	24	37.5	25.	iP	EZ	06	50	23.3
	i	E			37.7		i	N			24
	i	Z			45		S	NEZ			31
	PcP	NZ			26 47		P: W, C				
	S	NE			30 32	25.	P	Z	14	41	23.3
	Lq	N			33 09		i	NE			35
	Lq	E			40		PcP	Z			42 45
	ScS	NE			34 46		PP	Z			43 21
	Lr	E			35 17		S E, eS N				
	Lr	Z			23		eL	E			55 39
	P: D						eL	N			59.0
	Mag. 5 $\frac{1}{2}$ (Mat.)						P: C				
	52.3 N., 171.2 W. Fox Is. region, Aleutian Is. h: 33 km ca. H= 16 17 15.4 USCGS						3.4 S., 106.5 E. Near south coast of Java. h: 73 km ca. H= 14 32 14.3 USCGS				
24.	eP	NEZ	16	33	20	25.	iP	Z	16	15	09.7
	52.4 N., 171.2 W. Andreanof Is., Aleutian Is. h: 34 km ca. H= 16 25 53.6 USCGS						P: C				
							20.4 S., 176.1 W. Tonga Is. region. h: 250 km ca. H= 16 04 19.3 USCGS				

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
25.	iP i P: S,W,C	NEZ NE	17	18	51.7 19 16		i PPP i PcP? eS i L L P: D	NE N E Z N E N	09	48	09.2 49 43 45 50 50 53 29 55 50 57 38 45
25.	iP i S P: E,C	EZ N EZ	20	59	23.8 23.9 21 00 11						
26.	P NZ, eP eS i eL eL	E N E E N	04	45	41 50 00 03 51 28 52 00						
											Mag. 5½ - 5½ (Mat.) 4.6 N., 126.3 E. Off coast of Mindanao, P.I. h: 33 km ca. H= 09 41 31.2 USCGS
26.	eP iS E, S N	Z	05	54	53 55 12.2	26.	iP Z, P N i P: N,W,D	Z	14	17	55 18 31
											36.4 N., 76.9 E. Sinkiang Province, China. h: 33 km ca. H= 14 09 13.0 USCGS
26.	iP Z, P N i S? P: W,C	E N	05	58	59.2 59 34 40	26.	P P	Z	17	29	17
											24.2 N., 95.2 E. Northern Burma. h: 80 km ca. H= 17 21 56.6 USCGS
26.	P i S?	E NZ E	06	23	51.7 52.5 24 40	26.	PKP eSKKS PS SS SSS i eLq eLr	Z E E E NE E N N	18	01	34 10 14 13 19 20 07 24 54 23 19 34 32 44 22
											Mag. 6¼ - 6½ (Mat.) 7.1 N., 82.3 W. Near south coast of Panama. h: 20 km ca. H= 17 42 40.6 USCGS
26.	P i i i	NZ E N E	07	23	50.8 51.0 24 05 07	27.	P i	Z E	00	16	37 38
											18.5 S., 177.7 W. Fiji Is. h: 397 km ca. H= 00 06 13.0 USCGS
26.	iP iS P: D	NEZ NEZ	08	00	29.0 31.4	27.	iPKP P: C	Z	03	32	06.2
											25.6 S., 64.6 W. Salta Province, Argentina. h: 60 km ca. H= 03 11 40.9 USCGS
26.	eL eL	N E	08	05	20 06 10	27.	P i	Z N	07	17	29.2 29.7
											(cont.)
26.	iP EZ, P N i S L P: N,E,D	EZ E NE E	08	34	18.2 39 35 08 26						
											38.9 N., 142.0 E. Near coast of northern Honshu, Japan. h: 33 km ca. H= 08 33 18.7 USCGS
25.	P	Z	09	48	08.2 (cont.)						

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
	i	E	07	17	31		i	E	15	42	48.3
	i	Z			51		S	E			48 28
	S	E			25 17		L	N			53 30
	eL	NE			32.0		L	E			55 28
	P: C 60.5 N., 140.7 W. Yukon Territory. h: 29 km ca. H= 07 08 01.7 USC GS						P: N,E,C Mag. 5 $\frac{1}{4}$ (Mat.) 14.4 N., 93.7 E. Andaman Is. region. h: 33 km ca. H= 15 32 53.1 USC GS				
27.	eP	Z	09	45	46	27.	P NZ, eP E		15	46	36
	i	E			46.7						
	i	N			47.7						
	iS	NE			46 28.2	27.	iP	NEZ	18	59	17.2
27.	iP	NEZ	11	42	42.5		iS NE, S Z				23.3
	S	NEZ			43 01		P: N,E				
	P: N,E,D					27.	P	NZ	19	16	04
27.	iP	Z	11	55	45.6		i	E			05.2
	i	N			45.7		i	N			05.8
	i	E			45.3		i	N			11
	P: C 8.3 S., 111.2 E. Near coast of Java. h: 180 km ca. H= 11 46 57.9 USC GS						i	E			12
							i	Z			18
27.	P	Z	12	33	19.1	27.	P	Z	23	28	39
	i	E			34.7		i	E			40
	i	Z			35.7		i	N			41
	i	N			36.1		e	NE			30 03
	i	N			45		eS	E			31 40
	30.1 S., 177.7 W. Kermadec Is. region. h: 44 km ca. H= 12 21 25.1 USC GS						48.0 N., 152.9 E. Kurile Is. region. h: 109 km ca. H= 23 25 02.6 USC GS				
27.	iP	NZ	14	21	24.2	28.	P	Z	00	22	51.5
	i	E			24.4		i	E			51.8
	S?	E			22 43		i	N			52
	P: S,D						i	E			23 07
27.	iP	NEZ	15	08	58.6		i	NE			09
	i	Z			09 08.7	23.	P Z, eP E		02	42	02
	S	N			50		i	N			05
	i	E			52		i	EZ			11
	P: N,E,D 39.1 N., 140.7 E. Northern Honshu, Japan. h: 114 km ca. H= 15 08 09 USC GS						i	N			12
							i	E			59 40
27.	P	NEZ	15	16	00		eL	E	03	03	38
27.	iP	NEZ	15	41	10.2		eL	N			09.0
	i	EZ			11.1		Mag. 5 $\frac{1}{2}$ - 5 $\frac{3}{4}$ (Mat.) 27.5 S., 66.1 E. Indian Ocean. h: 33 km ca. H= 02 28 51.6 USC GS				
	i	N			11.2	28.	eP	Z	03	44	00
	iPcP	NZ			42 47.7		P	NEZ	04	38	42.7
	(cont.)						eS	N			40 30
							i	E			30
							P: N,E,D (cont.)				

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)				
			h	m	s				h	m	s		
29.	P	Z	05	42	25	29.	P	NZ	14	24	25.0		
	i	NE			23.6		i	E			27.8		
	S?	E		45	24		i	Z			34.6		
	i	N			29		i	NE			34.7		
	i	E			34		S	N		27	29		
L	E			45	i	E			34				
L	N			46	10	e	N		28	35			
46.4 N., 153.3 E. Kurile Is. region. h: 33 km ca. H= 05 38 56.2 USC GS						P: S,C 46.1 N., 153.2 E. Kurile Is. region. h: 33 km ca. H= 14 20 56.3 USC GS							
29.	eP	Z	08	39	17	29.	eP	NZ	14	33	29		
	8.7 S., 119.8 E. Flores Sea. h: 75 km ca. H= 08 30 17.0 USC GS						i	N			42		
29.	P	Z	10	26	11	29.	i	N			34		
	i	Z			19.7		e	N			30		
	i	E			28.7		i	E			39		
	i	Z			29								
29.	P	Z	12	32	44	29.	eP	Z	17	12	50		
	i	NE			45.4		i Z, e NE				56		
29.	P	NZ	12	49	08	29.	S?	N			15		
	i	E			10.7		P	Z	18	45	43.7		
	PP	N			54		i	N			44.1		
	i	E			56		S	N			43		
	PcP	Z			52		i	N			45		
	S	NE			53		L	N			49		
	eL	N			55		L	E			40		
	L	E			56		08	P: C				50	
	11.6 N., 142.7 E. Mariana Is. region. h: 30 km ca. H= 12 43 47.5 USC GS						46.3 N., 153.4 E. Kurile Is. region. h: 33 km ca. H= 18 42 14.8 USC GS						
	29.	P	Z	13	09		45	29.	P	NEZ	20	20	10
i		E			46	i	E				13		
i		N			48	i	N				17		
PP		N			10	i	Z				20		
11.7 N., 142.8 E. Mariana Is. h: 33 km ca. H= 13 04 23.5 USC GS					S	E				23			
29.	P	Z	13	09	45	29.	eL	E			24		
	i	E			46		eL	N			17		
	i	N			48		46.3 N., 153.5 E. Kurile Is. region. h: 33 km ca. H= 20 16 40.6 USC GS						
	PP	N			10		24	29.	P	Z	21	56	
	11.7 N., 142.8 E. Mariana Is. h: 33 km ca. H= 13 04 23.5 USC GS						i		NEZ			12	
29.	iP	NEZ	13	17	37.7	29.	i	Z			22		
	i	Z			18		09	29.	P	Z	22	00	
	S?	N			20		17		i	Z			
	P: N,E,D 46.4 N., 153.7 E. Kurile Is. region. h: 33 km ca. H= 13 14 04.2 USC GS						S		E			01	
	29.	eP	Z	13	24		24		29.	i	N		
i		E			29								
i	N			33		29.	P	Z	22	03			
46.4 N., 153.7 E. Kurile Is. region. h: 33 km ca. H= 13 14 04.2 USC GS							i	E			28.0		
29.	eP	Z	13	24	24	29.	i	N			04		
	i	E			29		S	NEZ			30		
	i	N			33		P: C						

Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
29.	S	NE	22 06 14	30.	iP	EZ	06 54 25.1
					i	N	25.6
29.	iP	Z	23 11 42.1		PcP	Z	55 33
	P: D				S E, eS N		07 01 23
	16.8 S., 172.9 W.				sS	E	02 41
	Tonga Is. region.				e	E	04 49
	h: 33 km ca.				L	E	07 27
	H= 23 00 09	USCGS			P: E,C		
					2.5 S., 102.4 E.		
30.	P	NZ	00 45 55		Sumatra.		
	i	E	56.6		h: 160 km ca.		
	46.5 N., 153.4 E.				H= 06 45 36.8	USCGS	
	Kurile Is. region.						
	h: 33 km ca.			30.	iP Z, P N		07 42 25.1
	H= 00 42 23.1	USCGS			i	E	34.6
					i	Z	34.7
30.	eP?	Z	01 43 21		i	Z	44 27
	i	Z	34		P: C		
	eS?	N	44 16		47.1 N., 152.4 E.		
					Kurile Is. region.		
30.	P	NZ	01 44 28		h: 79 km ca.		
	eS	N	48 48		H= 07 38 57.9	USCGS	
	eL	E	49 30				
	11.8 N., 142.5 E.			30.	P	Z	10 37 10
	Mariana Is. region.				i	NE	10.8
	h: 33 km ca.				iS	E	15.1
	H= 01 39 05.4	USCGS			i	NZ	15.5
30.	iP	Z	01 46 43.7	30.	iP	NEZ	14 46 44.1
	i	NE	49.1		S	NE	47 02
	eS	E	47 09		P: N,E,D		
	i	E	15	30.	P	EZ	14 53 44
	i	Z	17		i	N	55
	P: D				eS?	E	59 27
30.	iP	NZ	04 21 44.5	30.	iP	Z	15 29 54.7
	i	E	45		i	NE	55
	S	N	59		S	NE	30 26
	i	E	22 04		P: C		
	P: S,D			30.	P	NZ	16 16 52
					e	E	20 10
30.	P	NZ	04 24 33	30.	P	NEZ	16 34 49
	i	E	30		e	E	38 38
	eS	NE	28 53		e	N	39 08
	eL	E	30 23		eL	E	40 49
	eL	N	31 40		46.7 N., 153.2 E.		
	11.7 N., 142.6 E.				Kurile Is. region.		
	Mariana Is. region.				h: 33 km ca.		
	h: 33 km ca.				H= 16 31 15.1	USCGS	
	H= 04 19 17.0	USCGS					
				30.	iP	Z	22 08 21.4
30.	iP	NEZ	04 40 16.1		i	N	21.6
	iS Z, S N		19.2		i	Z	31
	P: S,W,D				S	E	11 12
30.	P	N	05 26 06		e	N	22
	i	Z	07		i	E	30
	i	E	07.7				
	i	Z	30				
	i	E	50				

(cont.)

Date	Phase	Comp.	Time(GMT)		
			h	m	s
	L	E	22	11	50
	L	N		12	21
	L	Z		14	47

P: C

46.5 N., 153.2 E.

Kurile Is. region.

h: 33 km ca.

H= 22 04 52.8

USCGS

30.	eP	Z	23	39	50
	eS	NE		40	43

Date	Phase	Comp.	Time(GMT)		
			h	m	s

Mineo Takehana

Director

12 MAY 1969

SEISMOLOGICAL BULLETIN
OF
MATSUSHIRO

JULY , AUGUST
1963

Matsushiro Seismological Observatory
Matsushiro-machi, Nagano-shi,
Nagano-ken , Japan

Matsushiro Seismological Observatory , Japan

Seismological Bulletin

Latitude 36° 32' 30"N.

Longitude 138° 12' 32"E.

Elevation 440 M.

Instrumental Constants

Instruments	Comp.	Period (sec)		Damping ratio		Magnification
Benioff Seismograph (Short Period)	N	T ₁ = 1.0	T ₂ = 0.23	h ₁ = 0.68	h ₂ = 1.7	103,000 (max)
	E	T ₁ = 1.0	T ₂ = 0.22	h ₁ = 0.70	h ₂ = 1.6	106,000 (max)
	Z	T ₁ = 1.0	T ₂ = 0.21	h ₁ = 0.72	h ₂ = 1.2	131,000 (max)
Benioff Seismograph (Long Period)	N	T ₁ = 1.0	T ₂ = 70	h ₁ = 0.68	h ₂ = 5.9	7,330 (max)
	E	T ₁ = 1.0	T ₂ = 62	h ₁ = 0.70	h ₂ = 5.6	9,640 (max)
	Z	T ₁ = 1.0	T ₂ = 84	h ₁ = 0.72	h ₂ = 7.8	7,590 (max)
Short Period Seismograph	Z	T ₁ = 1.0	T ₂ = 2.82	h ₁ = 1.4	h ₂ = 1.2	32,000 (max)
Galitzin Seismograph	N	T ₁ = 15	T ₂ = 100	h ₁ = 1	h ₂ = 1.2	1,350 (max)
	E	T ₁ = 15	T ₂ = 100	h ₁ = 1	h ₂ = 1.1	1,640 (max)
	Z	T ₁ = 7.5	T ₂ = 100	h ₁ = 0.76	h ₂ = 0.87	860 (max)
Wood-Anderson Seismograph	N	0.3		0.8		1,050
	E	0.3		0.8		1,200
1000 kg Long Period Seismograph	N	33.0		0.60		100
	E	30.0		0.62		100

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
1.	eP	Z	00	24	03		i	E	14	02	16.4
1.	P	NZ	00	47	36		S	NE		03	28
	i	E			38.6		i	Z			29
	i	E	48	25			P: N,C				
1.	iP	NEZ	01	18	11.3	1.	P	N	14	28	23.6
	S	NE			53.6		i	Z			24.6
	i	Z			58						
	P: E,D					1.	iP	NZ	15	15	21.1
1.	iP	EZ	02	39	07.2		i	E			21.5
	S	NE			35		i	E			43
	P: E,C						i	NE			55
							i	NE	16	12	
							e	E			29
							P: S,C				
1.	eP	Z	04	13	59	1.	P	Z	18	03	47
	eScS	E		23	48		i	Z			55
	eL	E		32	35						
	17.4 S., 167.6 E.						20.8 S., 169.2 E.				
	New Hebrides Is.						Loyalty Is.				
	h: 33 km ca.						h: 33 km ca.				
	H= 04 03 42.9				USCGS		H= 17 53 12				USCGS
1.	iP	NZ	04	33	40.5	1.	iP	NEZ	18	30	48.8
	i	E			41.6		S	NEZ			54.9
	S	NE			34		P: S,E,C				
	P: S,D										
1.	iP	Z	06	41	59.4	1.	iP	NEZ	20	18	11.4
	P: D						i	Z			15.0
	25.7 S., 179.1 E.						S	NEZ			33
	Fiji Is. region.						P: C				
	h: 583 km ca.										
	H= 06 31 27				USCGS	1.	iP	Z	20	28	44.5
							P: D				
							4.7 S., 103.7 E.				
							Off south coast of Sumatra.				
							h: 91 km ca.				
							H= 20 19 40.6				USCGS
1.	iP	NEZ	07	37	54.1	1.	iP	NEZ	20	49	12.5
	i	Z			38		P: S,C				
	i	NE			22						
	P: N,E,D										
1.	iP	NEZ	08	39	06.9	1.	iP	Z	21	17	05.0
	iS	NE			09.3		eL	E			25
	P: D						eL	N			27
							P: C				
							37.0 N., 96.1 E.				
							Tsinghai Province, China.				
							h: 33 km ca.				
							H= 21 10 28.5				USCGS
1.	P	Z	09	21	56.2	1.	iP	NEZ	21	26	49.8
	i	NE			57		S	N			27
	i	Z			22		P: S,E,D				
	i	NE			23						
	29.9 N., 141.3 E.										
	South of Honshu, Japan.										
	h: 75 km ca.										
	H= 09 20 12.5				USCGS						
1.	e	E	11	38	54	1.	iP Z, P NE		22	43	24.1
	e	N			42		i	Z			31
	e	E			29		i	E			32
1.	iP	NZ	14	02	15.4						
					(cont.)						(cont.)

July , 1963

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
	eS	N	22	45	54						
	e	E		46	52	2.	iP Z, P E		10	00	57.0
	eL	N		48	25		i	N		01	37
	eL	E			52	2.	P	Z	13	30	47
	P: D						i	Z			49
	46.5 N., 153.6 E.						i	Z		31	03
	Kurile Is.						e	E		36	40
	h: 69 km ca.					2.	sPKP 1	EZ	13	47	41.1
	H= 22 39 57.8						sPKP 1	N			42.5
2.	iP	EZ	00	12	22.1		sPKP 2	N		48	16
	i	N			22.5		sPKP 2	Z			19
	S	NE			44.6		14.7 S., 70.5 W.				
	P: W,C						Southern Peru.				
2.	eL	N	00	37	37		h: 159 km ca.				
	eL	N		41	06		H= 13 27 34.3				USCGS
	43.9 N., 85.2 E.					2.	iP Z, P NE		15	06	05.0
	Sinkiang Province , China.						i	Z			20
	h: 39 km ca.						eS?	E		09	08
	H= 00 15 22.4						eL	E		10	42
							eL	N			54
2.	eP	Z	01	42	50		P: D				
	i	EZ			58.5		45.7 N., 149.1 E.				
	eL	N		46	28		Kurile Is. region.				
	eL	N		48	24		h: 33 km ca.				
	46.3 N., 153.4 E.						H= 15 03 09.6				USCGS
	Kurile Is.					2.	P	Z	15	45	29.5
	h: 33 km ca.										
	H= 01 39 19.3										
2.	P	Z	02	48	35	2.	P	Z	20	21	23.5
2.	iP	NEZ	04	26	31.8		i	EZ			30
	S	E			57		i	N		22	12
	P: N,E,D						i	N			24
							i	Z			25
2.	iP	EZ	06	06	57.5	2.	P	Z	22	48	00
	i	N			58.1		i	Z			06.5
	S	E		11	03		i	E			07.5
	e	N			09		i	N			08
	eL	E		13	10		i	N			37
	eL	N			46		S	E			46.6
	P: W,C					3.	P	Z	00	32	49.6
	Mag. 4 $\frac{1}{4}$ (Mat.)						i	NE			57
	51.5 N., 159.1 E.						i	Z			58
	Off east coast of Kamchatka.					3.	iP	NEZ	00	35	55.6
	h: 33 km ca.						i	Z		36	07
	H= 06 02 13.7						P: N,E,C				
2.	iP	Z	09	55	34.1	3.	P	N	00	40	16.5
	PcP	Z		56	47.5		i	Z			17.3
	P: D						i	Z			23.5
	7.8 S., 109.0 E.					3.	eP	N	01	06	38
	Java.						e	E		10	20
	h: 117 km ca.						eL	E		12	26
	H= 09 46 35.8										

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	eL	E	18 01 17	7.	P	Z	10 25 19
	eL	N	42		i	NE	20
	P: D			7.	P	NZ	10 58 33
	Mag. no.				i	Z	59 10
	11.6 N., 142.7 E.				eS?	E	11 04 00
	Mariana Is. region.				eL	E	05 57
	h: 26 km ca.						
	H= 17 49 54.5	USCGS					
6.	iP NZ, P E		20 31 26.2				
	i	NEZ	32 05				
	P: N,C						
6.	iP	NZ	21 34 52.9	7.	iP NZ, P E		14 56 35.7
	i	Z	58.7		S	NE	57 09
	P: N,D				i	Z	10
					P: N,D		
6.	iP	EZ	22 23 08.9	7.	eP	NEZ	15 49 22
	i	N	11		S	NE	43
	i	E	12	7.	P	Z	17 40 42
	i	N	26		S	NEZ	41 08
	i	N	45	7.	P	Z	19 32 52.6
	i	N	24 12				
	P: E,D						
	37.7 N., 141.7 E.						
	Near east coast of Honshu,						
	Japan.						
	h: 34 km ca.						
	H= 22 22 22.9	USCGS					
7.	P	Z	00 07 04	7.	iP Z, P NE		19 46 47.8
	i	E	07		i	NEZ	51
	i	Z	34		P: D		
	i	Z	08 08	8.	iP	Z	00 21 34.4
	i	NE	09 49		i	E	35
7.	P	Z	04 05 14		i	E	54
	i	NEZ	19.5		S	N	55
					P: C		
7.	iP Z, P N		09 35 27.1	8.	eP	Z	00 45 58
	e	E	41 35		i	NE	46 14
	eL	E	44 29	8.	P	Z	01 13 44
	P: D				i	NE	47
	51.7 N., 156.4 E.				i	N	14 22
	Kamchatka region.				i	E	32
	h: 33 km ca.				i	N	35
	H= 09 30 56.2	USCGS		8.	P	Z	01 32 57
7.	iP	EZ	10 21 45.3		S	E	33 28
	i	N	47	8.	iP	Z	04 54 14.0
	eS	E	25 30		i	N	55 11.7
	P: E,D				P: D		
	17.9 N., 145.6 E.			8.	iF Z, P NE		09 27 43.8
	Mariana Is. region.				S	NE	28 11
	h: 137 km ca.				P: C		
	H= 10 17 24.4	USCGS					

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
8.	iPKP 1	EZ	11	24	19.3	9.	i	NE	03	03	17	
	iPKP 2	NZ			28.8		eS	N		11	07	
	iPKP 2	E			29		eL	N		12	05	
	i	E		25	12		46.3 N., 153.7 E.					
	eL	E		12	07 38		Kurile Is. region.					
PKP: D						h: 33 km ca.						
0.3 N., 17.3 W.						H= 03 04 37.4 USCGS						
Mid Atlantic Ocean,						9.	P	NZ	03	20	42	
h: 33 km ca.							i	E			43	
H= 11 05 07.5 USCGS						9.	iP	Z	04	13	14.1	
8.	P	Z	12	45	03.8		e	E			29	
	i	NE			04		e	E		13	53	
8.	iP	Z	13	31	53.4	P: D						
	i	E			53.6	22.0 N., 145.7 E.						
	P: D						Volcano Is. region.					
8.	P	Z	14	21	12	h: 33 km ca.						
	i	Z			22	H= 04 09 23.6 USCGS						
57.4 N., 154.0 W.						9.	P	Z	06	24	07	
Kodiak I., Alaska.							0.8 N., 121.5 E.					
h: 30 km ca.						Celebes.						
H= 14 12 30.5 USCGS						h: 142 km ca.						
8.	iP	Z	16	10	47.1	H= 06 16 53.0 USCGS						
	i	N			47.6	9.	PPP?	Z	09	47	36	
	S	E			11 07.7		e	E		54	36	
	P: D						eSS	E	10	01	40	
8.	iP Z, P NE		16	35	50.1		eSSS	E		06	32	
	i	Z			54.4	eL	E		20	52		
	S	E		36	11	Mag. 5 $\frac{1}{2}$ - 6 (Mat.)						
8.	i	NZ			12	8.5 N., 83.0 W.						
	P: C						Costa Rica-Panama border.					
8.	P	Z	17	10	59	h: 31 km ca.						
	i	Z			11 03	H= 09 24 33.3 USCGS						
8.	P	Z	17	53	10	9.	iP Z, P NE		10	25	33.3	
	eS	E	13	05	05		S	NEZ			42	
	eSS	E		09	00	9.	eP	Z	13	37	20 ca.	
	eL	E		11	00		i	Z			21	
	eL	N		13	00		i	Z		33	14	
	Mag. 5 $\frac{1}{2}$ - 5 $\frac{3}{4}$ (Mat.)						9.	eP	Z	17	33	37
65.8 N., 153.9 W.						eS		E		42	17	
Central Alaska.						e		NE			27	
h: 33 km ca.						eL		N		43	23	
H= 17 49 30.9 USCGS						eL		E			45	
9.	iP	NZ	01	04	23.0	24.2 N., 122.4 E.						
	i	E			29.1	Near east coast of Formosa.						
P: N,D						h: 33 km ca.						
9.	P	NZ	03	03	09.7	H= 17 34 33.2 USCGS						
	i	Z			12	9.	ePKP	Z	19	15	15	
(cont.)							29.1 S., 63.1 W.					
						La Rioja Province, Argentina.						
						(cont.)						

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
10.	iP i i S i ScP	NEZ NEZ NEZ NE EZ Z	19	56	22.3	12.	eP e e	Z E E	03	27	09
	P: S,E,D Mag. 5.3 (Mat.) 19.2 N., 145.2 E. Mariana Is. region. h: 171 km ca. H= 19 52 19.4										33.2 ca. 37.2 ca.
10.	P	Z	20	29	36	12.	e	E	04	01	7
	53.0 N., 171.4 W. Fox Is. region. h: 33 km ca. H= 20 21 49					12.	P i	Z Z	04	26	09
											10.5
11.	iP S P: D	Z Z	02	50	42.2	12.	P	Z	05	47	09
					44.3		i	Z		48	20
11.	iP iS P: D	Z NEZ	02	59	17.2						
					19.2						
11.	P eS	Z E	03	46	50	12.	P e	Z NEZ	07	39	06
					47 05			Z			43
11.	P e eL	Z E E	05	13	05	12.	P	Z	08	05	06.5
					17 25 ca.		P: C				
					18 48 ca.		17.9 S., 178.5 W. Fiji Is. h: 550 km ca. H= 07 55 02.3				
11.	iP P: W,C	EZ	05	55	59.7	12.	eP	Z	10	00	17
11.	eP eS	Z EZ	08	43	51	12.	eP i i	Z Z E	12	08	06
					44 35						12.6 13.0
11.	iP Z, P E P: W,C		17	58	27.8	12.	P iS	Z NZ	14	00	13
	12.0 S., 166.5 E. Santa Cruz Is. region. h: 144 km ca. H= 17 49 09.0										18.5
						12.	P	Z	14	14	08.7
11.	iP i S P: E,C	EZ N NZ	23	14	26.5						
					26.7						
					43						
12.	iP S P: S,W	NEZ EZ	01	29	38.4	12.	iP S i L L	NEZ NE E E N	14	48	47.0
					54						49 05
12.	P	Z	02	11	51	12.	P	Z	15	31	39
							i	NE			39.5
							S	E			34 36
							i	E			54
							L	E			36 54
							L	N			37 03
											(cont.)

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
13.	P	Z	16	29	00						
	i	E		30	42.4		i	Z	04	16	16.2
	i	N			44		eL	E		39	54
							e	N		46	33
13.	eP	Z	17	58	22						
	i	NZ			30.7						
	i	E			30.9						
13.	P	EZ	19	18	33	14.	e	E	05	16	33 ca.
		24.9 N., 70.3 E.				14.	eP	Z	05	42	17
		East Pakistan.					i	Z			27
		h: 33 km ca.					i	N			27.8
		H= 19 08 39.1			USCGS		i	E			28.1
13.	iP	NEZ	20	22	44.5		eL	E		48	54
	eS	N			52						
	P: C										
13.	iP	Z	22	04	19.0						
	iS	Z			22.1						
	P: C										
13.	P	Z	23	31	10	14.	PKP	Z	06	00	52
	S	NE			34		i	N		01	03.4
14.	iP	Z	00	14	21.8		e	E		12	46
	S	N			24 19		eL	E		34	48
	i	E			51		eL	E		39	45
	i	Z			25 23		eL	Z		46	15 ca.
	L	E			42 24						
	P: C										
		Mag. 5 $\frac{1}{2}$ - 6 (Mat.)									
		30.5 S., 177.2 W.									
		Kermadec Is. region.									
		h: 33 km ca.									
		H= 00 02 22.8			USCGS						
14.	eP	Z	00	26	41	14.	eP	Z	09	14	37
	S	E			27 31		i	Z			43
14.	eP	Z	01	34	39	14.	ePKP 2	Z	09	28	47
	e	E			35 17		i	Z			29 18
	i	Z			23						
		46.3 N., 153.2 E.									
		Kurile Is. region.									
		h: 33 km ca.									
		H= 01 31 10.0			USCGS						
14.	P	Z	02	06	53	14.	eP	Z	10	20	34
	e	E			10 57		iS	E		21	07.1
		21.1 N., 121.4 E.					i	Z			07.4
		Batan Is. region.									
		h: 58 km ca.									
		H= 02 02 09.6			USCGS						
14.	iP	Z	04	11	09.5	14.	P	Z	14	12	31
	i	Z			16.3		i	NE			42.0
	i	E			23		e	E		13	26
					(cont.)						

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
19.	P S	Z N	09 01 20 54	20.	P	Z	01 06 22
	P: S,E,D Mag. 5.0 (Mat.) 36.3 N., 141.0 E. Near east coast of Honshu, Japan. h: 70 km ca. H= 09 00 44.8				32.8 N., 129.9 E. Kyushu, Japan. h: 0 km ca. J.M.A.		
			USCGS	20.	e	E	01 38 33
19.	P	Z	11 53 51.7	20.	iP	N	02 17 12.3
	P: C 52.0 N., 172.5 W. Andreanof Is. h: 50 km ca. H= 11 46 39.1				i N 18.4 P: S 47.2 N., 152.2 E. Kurile Is. region. h: 108 km ca. H= 02 13 45.3		
			USCGS				USCGS
19.	P	Z	15 31 24.8	20.	iP	EZ	03 51 41.2
					iS Z 56 P: E,D		
19.	P	Z	18 33 09.5	20.	iP Z, P E		05 31 32.4
	i N 41.0 i E 42.8				i N 32.6 i E 33.2 P: W,C 14.4 N., 142.9 E. Mariana Is. h: 33 km ca. H= 05 26 19.1		
							USCGS
19.	iP	Z	18 52 50.1	20.	iP	Z	05 40 01.1
	i N 54.9 e E 56 54 e E 57 58 18.8 N., 145.7 E. Mariana Is. h: 102 km ca. H= 18 43 35.7				P: D 51.3 N., 157.9 E. Rat Is. h: 65 km ca. H= 05 35 33.6		
			USCGS				USCGS
19.	eP	Z	19 14 18	20.	iP	Z	06 49 38.3
	i Z 27.9 i N 28.4				ePP Z 53 49 S E 07 00 46 SS E 06 56 L E 14 10 L E 15 46 Lr Z 21 23 P: C Mag. 6 $\frac{1}{4}$ (Mat.) 57.6 S., 143.5 E. Macquarie I. region. h: 33 km ca. H= 06 36 10.8		
							USCGS
19.	iP NZ, P E		19 16 08.9				
	i E 17 51 e E 18 48 eL N 19 42 eL E 55 P: S,W,C 43.4 N., 146.3 E. Kurile Is. region. h: 43 km ca. H= 19 13 55.7						USCGS
			USCGS				
19.	iP EZ, iP N		23 37 06.7				
	P: S,E,D						
20.	P	E	00 20 39	20.	eP	Z	07 39 50
					i E 40 01. S N 56 32.4 N., 140.5 E. South of Honshu, Japan. h: 124 km ca. H= 07 38 50.9		
							USCGS
20.	P	Z	00 21 13	20.	P	NZ	07 55 22.6
	eL E 40 26 65.2 N., 133.7 W. Yukon. h: 33 km ca. H= 00 11 35.0				S E 38.6		
			USCGS				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
20.	eP e	Z NE	08 41 31 50	21.	iP e eS eL eL P: C	Z E E N E	06 13 33.9 22 30 23 05 33 14 42 03
20.	eP i	Z Z	11 09 30 40		Mag. no. 14.8 N., 56.1 E. Arabian Sea. h: 33 km ca. H= 06 01 57.3		USCGS
20.	eP 68.8 N., 4.6 W. Jan Mayen I. region. h: 49 km ca. H= 15 07 58.2	Z	15 19 16				
20.	iP P: N,W	NEZ	16 06 47.8	21.	eP e 17.8 N., 46.5 W. North Atlantic Ocean. h: 33 km ca. H= 06 47 32.2	Z E	07 03 10 04 06
20.	iP i i i i	Z N E E N	16 50 28.1 28.9 29.4 51 29 30	21.	eP i i	Z Z N	10 50 10 36 51 18
20.	eP i	Z Z	16 55 03 22.1	21.	eSSS 56.1 S., 27.4 W. Sandwich Is. region. h: 80 km ca. H= 11 03 20	E	11 54 43
20.	iP eS e P: N,E	NEZ E E	17 23 03.5 24 36 55	21.	iP i i S i P: E,D Mag. no. 37.2 N., 141.7 E. Near east coast of Honshu, Japan. h: 33 km ca. H= 12 45 07	EZ E Z N	12 45 52.2 52.5 58 46 28
20.	P	NEZ	20 13 35				USCGS
20.	P i S i	Z NEZ NE E	20 57 08 10.1 29 38	21.	P S P: C	Z E	13 54 13.1 31.3
20.	iP S i P: E,D	EZ N Z	21 43 36.8 54 57	21.	P eS L Lr Mag. 5-5 $\frac{1}{2}$ (Mat.) 9.7 N., 122.3 E. Negros, F.I. h: 54 km ca. H= 14 45 07.1	EZ N E Z	14 51 15 56 30 57 50 59 46
20.	P i S	Z N E	22 30 07.6 07.8 24				USCGS
20.	eP S	EZ E	23 22 31 55	21.	iP S P: S,E	NEZ NE	15 00 27.1 30.1
21.	P i eS?	EZ NEZ E	02 34 36 44 58				
21.	P i	Z NE	02 35 52 59.7				
21.	eP i i	EZ N E	02 52 13 22 25				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	eL P: C	E	21 00 14	24.	iP i iS	NEZ NEZ E	11 50 51.2 51.8 51 07.1
23.	eP 50.0 N., 176.3 W. Andreasof Is. region. h: 77 km ca. H= 21 51 15.5	Z	21 58 04		Mag. 5.0 (Mat.) 36.1 N., 135.8 E. Honshu, Japan. h: 33 km ca. H= 11 50 31.1		USCGS
23.	P i	Z E	23 18 18 31	24.	iP S P: C	Z Z	11 56 33.0 48.3
23.	eP i eS?	Z NZ E	23 48 59 49 05 28	24.	P S	Z N	11 58 59 59 16
24.	P i i eS	Z NE E N	06 17 27 27.7 34.5 21 37	24.	P S	Z NZ	12 11 01.9 16.6
24.	iP S i i P: S,W,D Mag. no. 32.4 N., 133.4 E. South of Honshu, Japan. h: 297 km ca. H= 08 50 20.7	NEZ E N Z	08 51 28.8 52 21 23 28	24.	P i eS L	Z Z E E	13 35 22.8 38 47
				24.	iP S P: S,W,D	NEZ NE	13 52 34.7 50
24.	P 27.2 S., 177.2 W. Kermadec Is. region. h: 33 km ca. H= 09 26 46.5	Z	09 38 30.1	24.	P	Z	15 00 50.7
				24.	P i eS L	Z Z E E	16 54 38 41.6 17 01 22 05 42
24.	eP i i	NEZ NEZ E	11 07 59 08 18 28		Mag. 5½ (Mat.) 6.4 S., 147.8 E. Near coast of eastern New Guinea. h: 55 km ca. H= 16 46 38.4		USCGS
24.	eP i i	Z NE Z	11 10 20 27 36	24.	P S	Z E	18 30 33 57
24.	P i S Lq Lr ScP? PcS?	Z EZ N E Z Z Z	11 36 30 35 40 08 41 14 42 09 44 33 38	24.	P i i eS	Z NZ E E	19 09 55 57.0 57.7 12 38
	Mag. 6 - 6½ (Mat.) 24.6 N., 122.0 E. Near east coast of Formosa. h: 33 km ca. H= 11 32 17.7		USCGS	24.	eP eS eSS e eL eL	Z E E N N Z	19 12 46 20 18 23 25 50 27 33 30 13

(cont.)

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
25.	eL	E	21	44	24	26.	iP	NEZ	22	52	20.2
	2.4 S., 77.8 W. Ecuador. h: 33 km ca. H= 20 31 18						S	NE			39
					USCGS		P: N,W,C				
26.	iP	EZ, P N	00	23	51.5	26.	iPKP	Z	23	37	53.3
	eS	E		24	23		PKP: C				
	P: W,C						23.4 S., 72.3 W. Off coast of northern Chile. h: 33 km ca. H= 23 18 04				USCGS
26.	P	NEZ	00	35	20	27.	iP	Z	00	08	01.0
	S	E			34		i	E			02.0
26.	P	Z	02	42	20.6		S	EZ			25.0
	eS	E		44	30		P: D				
	P: C					27.	L	E	00	51	45
26.	P	Z	04	29	39		Mag. 5 $\frac{1}{2}$ - 5 $\frac{3}{4}$ (Mat.)				
	S	E		40	03		9.7 S., 73.5 W.				
	eSS	E		45	42		Near coast of Peru.				
	SSS	E		50	41		h: 62 km ca.				
	Lq	E		54	48		H= 23 43 26.5				USCGS
	Lr	Z		59	22						
	P: D					27.	e	E	05	31	20
	Mag. 7 (Mat.)					27.	P	NEZ	06	33	37.1
	42.1 N., 21.5 E.						P: N,W,D				
	Southern Yugoslavia.					27.	P	Z	09	47	20
	h: 33 km ca.						i	N			25
	H= 04 17 16.7				USCGS		e	Z			27
26.	P	Z	04	31	29.6	27.	eP	Z	10	10	56
	S	E		32	14.6		e	E			15 36
	P: C						eL	E			20 55
26.	P	Z	05	36	26	27.	P	N	11	34	08
	15.0 S., 167.3 E.						S	N			52
	New Hebrides Is.					27.	iP	NEZ	12	47	14.8
	h: 124 km ca.						S	N			33
	H= 05 26 45.1				USCGS		P: E,D				
26.	P	Z	08	20	38.4	27.	P	NEZ	13	09	36
	S	E			51		S	NE			49
26.	P	Z	14	45	54.5		i	Z			50
	i	NE			55	27.	S?	NE	13	10	36
	S	NE		46	13	27.	iP	NZ	16	24	14.9
26.	iP	NEZ	16	18	03.3		i	N			31
	S	NE			10.1		P: S,D				
	P: E,C					27.	iP	NEZ	17	32	07.9
26.	P	Z	21	26	06.5		iS	N			24.9
	i	NE			07.7		P: S,W,D				
	S	NE			12.2						
	P: D										
26.	P	EZ	22	43	43						
	S	E			59						

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
27.	eP	Z	17 35 45		i	E	06 40 48
	e	E	56 40		S	Z	41 10.5
	e	E	18 02 30		i	E	15
27.	eP	Z	18 49 03	28.	e	E	06 47.0
	i	Z	52.4		eL	E	07 00.1
	e	E	54 53		e	E	13.5
27.	P	Z	19 43 24.1	28.	P	EZ	07 24 15
	i	E	25.5		i	NEZ	15.5
	iS	NE	30.9		eS	N	34 17
	P: C				e	E	28
27.	iP	Z	21 28 08.9		L	E	52 06
	i	NE	09.3		Mag. $5\frac{1}{2}$ - $5\frac{1}{2}$ (Mat.)		
	S	NEZ	29 17.9		29.8 S., 177.6 W.		
	P: D				Kermadec Is. region.		
	Mag. no.				h: 33 km ca.		
	31.0 N., 140.3 E.				H= 07 12 17.1 USCGS		
	South of Honshu, Japan.			28.	iP	NEZ	07 49 33.0
	h: 100 km ca.				S	NE	48.5
	H= 21 26 44.8 USCGS				P: N, E, C		
27.	P	Z	22 24 59.3	28.	iP	EZ, P N	08 04 41.5
	e	E	29 30		i	NEZ	42.0
	P: D				S	NEZ	12 10
	13.2 N., 144.5 E.				eSS	E	16 28
	Mariana Is.				L	E	21 23
	h: 87 km ca.				P: W		
	H= 22 19 52.0 USCGS				Mag. 5 - $5\frac{1}{2}$ (Mat.)		
27.	iP	NEZ	22 31 03.9		11.3 S., 112.1 E.		
	S	NE	21.9		Off coast of Java.		
	i	Z	23.9		h: 21 km ca.		
	P: N, W, D				H= 07 55 21.9 USCGS		
28.	P	Z	02 45 32.3	28.	iP	EZ	08 25 37.2
	i	N	32.8		S	E	43.5
	i	E	43.1		P: E		
	S	E	52.4	28.	P	NZ	09 31 45.6
28.	eP	Z	04 24 54		S	NZ	32 01
	i	Z	25 08		P: N, C		
	eL	E	33 16	28.	eP	Z	09 54 11
	51.7 N., 174.5 W.				e	E	56 45
	Andreanof Is.			28.	eP	Z	10 12 05
	h: 33 km ca.				i	Z	41
	H= 04 17 50.7 USCGS				eL	E	28 04
28.	P	Z	04 29 25.4		e	E	35 06
	i	E	26.2		1.5 N., 127.1 E.		
	S	E	41.2		Molucca Passage.		
	P: D				h: 33 km ca.		
28.	iP	Z	05 58 43.5		H= 10 05 28 USCGS		
28.	P	Z	06 40 47	28.	e	E	11 55 11
			(cont.)		eL	E	12 00 15

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
28.	iP eS P: S,W,C	NEZ E	12 16 17.7 20 15			H= 16 32 25.0	USCGS
				28.	iP iS P: E,C	NEZ NEZ	16 45 13.4 19.2
				28.	iP eS i Lr P: S,W,C	NEZ E E Z	13 55 04.2 57 55 58 11 59 25
28.	iP iS P: E,C	NEZ NEZ	12 41 11.0 17.0			Mag. 5 $\frac{1}{2}$ (Mat.) 46.6 N., 153.1 E. Kurile Is. region. h: 33 km ca. H= 18 51 36.7	USCGS
28.	P eL eL	Z E E	13 36 14 53 29 14 00 17				
				28.	eP i iS	Z NEZ E	21 32 18 26.5 33 09.0
				28.	iP i S P: S,E,D	NEZ N N	22 26 38.2 27 09.8 28
				29.	iP EZ, P N P: W,D		01 16 28.2
28.	P i eS eL 51.9 N., 174.3 W. Andreanof Is. h: 33 km ca. H= 14 42 42.7	EZ Z E E	14 49 47.4 52 55.5 15 01 15			1.2 N., 126.0 E. Molucca Sea. h: 85 km ca. H= 01 09 26	USCGS
				29.	P 30.4 S., 177.7 W. Kermadec Is. h: 33 km ca. H= 04 48 49.8	Z	05 00 44
28.	P i e	EZ Z Z	14 55 11 16.6 57 35			6.7 S., 107.1 E. Java. h: 85 km ca. H= 05 31 26.1	USCGS
				29.	P	Z	05 59 23
28.	iP iS P: D	Z NE	16 17 49.5 18 05.5			27.8 N., 55.6 E. Southern Iran. h: 37 km ca. H= 06 10 22.6	USCGS
28.	P i eS eL Lr Mag. 5 $\frac{1}{2}$ (Mat.) 4.9 S., 152.7 E. New Ireland region. h: 69 km ca.	Z NZ EZ E E NZ	16 29 48 53.7 40 11				
				29.	P S e ePKPPKP? Lr P: E,C	Z NE N Z Z	06 21 22.6 30 23 48 15 49 40 52 51

(cont.)

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
29.	P S P: C	Z E	12	05	38.6 54	30.	e	E	02	15	08
29.	iP i P: C	Z Z	16	56	43.2 57 58	30.	P e	Z Z	02	30	05 39
	5.7 S., 110.2 E. Java Sea. h: 530 km ca. H= 16 48 42.6				USCGS		30.0 S., 177.0 W. Kermadec Is. h: 41 km ca. H= 02 18 42.1				USCGS
29.	eP i i	Z N NZ	18	48	16 19 49 18	30.	iP NZ, P E eS eL	E E E	03	09	29.1 19 39 38 16
							P: S, E, D 30.0 S., 172.2 W. Kermadec Is. h: 40 km ca. H= 02 57 31.6				USCGS
29.	P i S ScS i PKPPKP P: N, W, C	NEZ NEZ N E Z NEZ	20	26	04.1 04.9 35 59 36 30 42 53 28	30.	iP i L Lr	Z E N Z	04	39	26.7 40 05 11 34 13 47
	Mag. $6\frac{1}{2}$ - $6\frac{3}{4}$ (Mat.) 30.2 S., 177.3 W. Kermadec Is. h: 39 km ca. H= 20 14 07.3				USCGS		30.2 S., 177.3 W. Kermadec Is. h: 17 km ca. H= 04 27 25.0				USCGS
29.	iP i S ScS? L Lr L P: C	NZ N N E E Z N	20	28	33.4 35.1 38 36 39 03 47 17 53 47 56 50	30.	P i S i ScS L L Lr P: C	Z NEZ E N E E N Z	05	57	49.1 50 06 07 35 40 03 17 13 32 19 09 21 22
	Mag. $6\frac{1}{2}$ - $6\frac{3}{4}$ (Mat.) 29.7 S., 177.0 W. Kermadec Is. h: 33 km ca. H= 20 16 36.9				USCGS		Mag. $6\frac{1}{2}$ - $6\frac{3}{4}$ (Mat.) 29.6 S., 177.3 W. Kermadec Is. region. h: 33 km ca. H= 05 45 53.3				USCGS
29.	iP L P: C	NEZ E	23	30	40.1 59 26	30.	iP S P: S, W, C	NEZ E	06	57	02.9 07 00 59
	30.1 S., 177.1 W. Kermadec Is. h: 48 km ca. H= 23 18 43.0				USCGS		51.7 N., 158.1 E. Kamchatka. h: 33 km ca. H= 06 52 22.7				USCGS
29.	iP P: D	NEZ	23	47	54.3	30.	P	Z	08	07	38
	5.4 S., 131.6 E. Banda Sea. h: 33 km ca. H= 23 40 03.4				USCGS		29.8 S., 176.9 W. Kermadec Is. region. h: 33 km ca. H= 07 55 42.3				USCGS
						30.	iP P: N, E, C	NEZ	08	28	48.6

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
31.	P	NZ	01	56	13.1	31.	iP Z, P N		15	11	09.8
	i	N			15.1		i	Z			11.3
	S	N	02	06	10		S	E			13 15
	e	E			37		P: C				
	L	E			17 05		Mag. no.				
	Lr	E			23 16		42.2 N., 142.4 E.				
	P: N,C						Off south coast of Hokkaido,				
	29.8 S., 177.2 W.						Japan.				
	Kermadec Is.						h: 33 km ca.				
	h: 65 km ca.						H= 15 09 37.6				USCGS
	H= 01 44 18.8										
	USCGS										
31.	P	Z	02	44	08.1	31.	P	Z	16	05	07.4
	i	NE			08.3		i	E			08.6
	i	Z			10		S?	NE			06 05
	i	Z			14		P: C				
	S	N			21						
	P: D										
31.	P	Z	08	27	25	31.	eP	Z	21	59	44
	i	E			26		e	E	22	00	19
	S	NE			28 37		e	Z			26
							43.1 N., 88.3 E.				
							Sinkiang Province, China.				
							h: 45 km ca.				
							H= 21 53 03.6				USCGS
31.	P	NEZ	11	30	52.9						
	i	E			54.6						
	eS	E			32 03						
	i	E			14						
	i	E			41						
	P: N,E,D										
	41.9 N., 142.4 E.										
	Near south coast of Hokkaido,										
	Japan.										
	h: 33 km ca.										
	H= 11 29 20.4										USCGS
31.	iP	N	11	53	27.1						
	S	NE			54 03.1						
	P: S										
31.	P	Z	13	31	53						
	eL	E			42 56						
	51.3 N., 175.0 W.										
	Andreanof Is.										
	h: 33 km ca.										
	H= 13 24 52.4										USCGS
31.	P	Z	14	52	24						
	i	N			25.6						
	eS	E			59 24						
	L	E	15	04	50						
	8.2 S., 116.4 E.										
	Sumbawa I. region.										
	h: 33 km ca.										
	H= 14 43 40.3										USCGS
31.	iP	NE	15	05	11.9						
	S	N			30.0						
	P: N,E										

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Date	Phase	Comp.	Time(GMT)		
			h	m	s
1.	P S	NEZ E	00	08	53.7 09 09
1.	e	E	01	22	30
1.	e	E	01	38	14
1.	e	E	01	55	.3
1.	e e	E E	03	39	14 43
1.	e	E	03	51	00
1.	iP i P: D	Z N	04	38	39.2 41.7
1.	P	NEZ	04	46	54
7.0 S., 146.1 E. Eastern New Guinea. h: 174 km ca. H= 04 39 02.7			USCGS		
1.	eP i S	Z EZ NE	09	03	46 53.6 04 26
1.	eP e e	Z Z N	10	13	54 14 02 31
1.	iP S	N N	10	44	30.8 43.9
1.	iP i eS L L L P: C	Z NEZ E N E Z	10	50	20.8 21.1 54 39 56 46 57 19 58 19
Mag. 5 - 5½ (Mat.) 55.3 N., 161.8 E. Near east coast of Kamchatka. h: 50 km ca. H= 10 45 02.7			USCGS		
1.	P i eL P: D	NEZ N E	12	50	16.8 53 56.7
1.	i i	NZ E	12	53	02.8 03.3
1.	P e	Z N	13	51	27 28

Date	Phase	Comp.	Time(GMT)		
			h	m	s
1.	eP	NZ	14	55	26
58.3 N., 151.9 W, Kodiak I. region. h: 40 km ca. H= 14 46 39.8			USCGS		
1.	P i	EZ N	15	32	50.9 51.1
P: E, D 29.8 S., 177.2 W. Kermadec Is. h: 59 km ca. H= 15 20 55.9			USCGS		
1.	e	E	15	43	15
1.	e e	E E	16	00	26 06 47
1.	e	E	16	36	18
1.	iP i i P: D	Z N E	17	08	24.8 25.0 25.2
1.	P e i	Z E N	17	31	52 53 53.4
1.	P i i e	NZ NEZ NEZ E	18	24	29.6 30.4 32 26 02
41.8 N., 142.8 E. Near south coast of Hokkaido, Japan. h: 60 km ca.			J.M.A.		
1.	P i S	Z E NE	21	00	53 53.7 01 43.6
1.	P	Z	21	04	02
17.6 S., 178.9 W. Fiji Is. h: 526 km ca. H= 20 53 58.3			USCGS		
1.	iP i eS P: W, C	EZ N N	21	16	46.1 46.6 17 25
1.	P i e	NZ E E	21	52	53 53 14.2 55 13

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Date	Phase	Comp.	Time(GMT)		
			h	m	s
2.	P	Z	01	09	49
2.	iP	NZ	05	21	04.6
	i	E			04.9
	S	Z			13
	P: S,D				
2.	iP	NEZ	05	46	26.0
	i	Z			35.6
	e	E			48.7
	e	E			50 16
	P: S,W,D				
	31.4 N., 131.6 E. Kyushu, Japan. h: 22 km ca. H= 05 44 36.5				
	USCGS				
2.	e	E	09	59.4	
	e	E	10	04	12
	56.2 N., 34.1 W. North Atlantic Ocean. h: 41 km ca. H= 09 07 18.0				
	USCGS				
2.	P	NEZ	10	23	04
	S	N			25 00
	i	E			03
	L	E			51
	26.8 N., 141.3 E. Mariana Is. region. h: 109 km ca. H= 10 20 39.7				
	USCGS				
2.	iP	NEZ	13	15	33.5
	S	NEZ			40.3
	P: S,C				
2.	iP	Z	13	57	05.0
	i	Z			15.0
	eS?	E			47
	e	N			48
	P: C				
2.	eP	NZ	17	19	37
	e	E			21 10
	e	N			13
2.	eP	Z	19	04	34
	i	E			35.0
	S	E			52
	i	N			53.5
2.	eP	Z	19	13	29
	S	N			14 10.5
2.	iP	EZ	19	32	50.5
	i	NE			51.0
	i	NE			33 01

(cont.)

Date	Phase	Comp.	Time(GMT)		
			h	m	s
	e	E	19	34	14
	eS	E			38 25
	L	E			40 16
	L	Z			42.2
	P: C				
	6.0 N., 125.1 E. Mindanao, P.I. h: 118 km ca. H= 19 26 26.0				
	USCGS				
3.	eP	Z	00	12	47
	i	N			48.0
	S	NE			13 13
3.	P	Z	01	23	36.8
	i	NE			37.0
	i	N			55.0
	i	E			58
	P: C				
3.	P	Z	01	41	42.3
	e	E			47 30
3.	e	E	02	10	13
3.	iP	NEZ	03	56	02.0
	ePcP	NEZ			57 25
	e	E	04	02	23
	eS	NEZ			24
	eL	E			07 57
	P: S,E,D				
	7.6 S., 156.8 E. Solomon Is. h: 402 km ca. H= 03 48 06.4				
	USCGS				
3.	iP	Z	04	28	29.0
	i	N			46.0
	P: D				
3.	eP	Z	05	13	50
	i	Z			53.0
3.	eP	NEZ	09	16	52
	S	E			17 08
	i	N			09.5
3.	ePKP	NEZ	10	40	49
	e	E			41 06
	iPP	Z			43 32
	eSKS	E			47 42
	e	E			51 56
	eSS	E	11	01	34
	eSSS	E			06 30
	e	E			13 30
	eL	E			16 42
	e	E			17 42

(cont.)

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	L	N	11 31.8	4.	P	E	00 39 19.0
	L	E	40.6		i	NE	22.2
	Mag. 7 $\frac{1}{4}$ (Mat.)				S	NE	48
	7.7 N., 35.3 W.			4.	iPKP	Z	02 33 32.0
	Mid-Atlantic Ocean.				P; D		
	h: 33 km ca.				42.6 S., 83.4 W.		
	H= 10 21 36.6				Off coast of southern Chile.		
	USCGS				h: 33 km ca.		
3.	iP	NEZ	14 40 17.8		H= 02 13 50.6		
	i	NEZ	30.4		USCGS		
	S:	NE	35	4.	e	E	03 24.7
	P: S,W,C			4.	P	NE	03 25 47.2
3.	iP	Z	12 05 38.7		P: S,E		
	i	NE	39.2	4.	eP	N	05 43 40
	P: C				i	NE	46
3.	P	Z	15 53 45.5		e	E	49.2
	e	Z	50		46.4 N., 153.4 E.		
	i	Z	52.3		Kurile Is.		
	i	N	54 38.5		h: 33 km ca.		
3.	eP	Z	16 22 36		H= 05 40 08.2		
	i	N	52.5		USCGS		
3.	iP	NEZ	16 36 39.6	4.	P	N	07 17 38.5
	eS	E	42 20		e	E	24.8
	e	E	45 15		e	E	27.3 ca.
	P: N,E,D				9.4 S., 114.2 E.		
	52.0 N., 174.3 W.				South of Java.		
	Andreanof Is.				h: 117 km ca.		
	h: 33 km ca.				H= 07 08 47.1		
	H= 16 29 35.8				USCGS		
	USCGS			4.	iP	NE	07 37 52
3.	iP	Z	20 20 01.5		S	NE	38 28
	i	N	01.9	4.	eP	E	08 26 08
	eS	NE	21 23		i	N	12.0
	P: C			4.	P	NE	09 24 08
3.	P	Z	20 34 05.0		22.6 S., 173.4 E.		
	e	N	06		Loyalty Is. region.		
	S	N	48.5		h: 72 km ca.		
	i	E	49		H= 09 13 17.8		
	USCGS				USCGS		
3.	iP	EZ	20 38 01.2	4.	eP	NE	09 44 14
	i	NE	01.7		i	N	45 09.5
	eS?	E	48.7	4.	P	N	10 00 06
	L	E	59.0		7.7 S., 129.5 E.		
	P: W,C				Tanimbar Is. region.		
	Mag. 5 $\frac{1}{2}$ (Mat.)				h: 195 km ca.		
	30.7 S., 178.3 W.				H= 09 54 12.0		
	Kermadec Is.				USCGS		
	h: 37 km ca.			4.	P	NE	10 53 27
	H= 20 26 04.1				S	NE	45
	USCGS			4.	P	E	11 16 05.5
4.	P	Z	00 23 48.5		i	NE	10.4
					P: E		

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
7.	eP eS e	Z N E	12 36 02 57 58	8.	P S	NZ NE	04 06 28.4 45
7.	P i e	NEZ NZ N	12 59 28 28.6 13 01 00	8.	eP	Z	07 44 44 ca.
7.	iP P: N,W,C 18.2 S., 177.9 W. Fiji Is. region. h: 508 km ca. H= 13 56 50	NEZ	14 07 02.4 USCGS	8.	eP	Z	08 43 15 ca.
7.	P i	EZ NEZ	15 11 38.8 53.8	8.	iP S P: C	Z N	10 36 54.4 37 13
7.	PKP	Z	17 32 46	8.	P e S L L	Z Z E E NZ	11 24 13 29 51 30 56 34 33 37 33
	56.1 S., 27.0 W. Sandwich Is. h: 33 km ca. H= 17 13 18.4		USCGS		Mag. 6 $\frac{1}{4}$ (Mat.) 5.8 S., 151.0 E. New Britain. h: 48 km ca. H= 11 16 11.2		USCGS
7.	ePKP	Z	18 55 26	8.	eP	Z	11 39 29 ca.
	13.6 N., 90.9 W. Near south coast of Guatemala. h: 67 km ca. H= 18 36 46.6		USCGS	8.	eP	Z	11 44 19 ca.
7.	P S i	Z E NZ	19 49 12 31 32		27.3 N., 129.2 E. Ryukyu Is. h: 92 km ca. H= 11 41 30.5		USCGS
8.	eP	NEZ	01 47 59	8.	eP S	Z NEZ	12 23 55 ca. 24 10
8.	iP i S i eL eL e	NEZ Z E N N E Z	02 20 37.4 48.4 25 16 26 43 50 30 05	8.	P S	Z NZ	12 27 13 27
	P: S,W,C 54.2 N., 168.1 E. Fox Is. h: 33 km ca. H= 02 14 54.4		USCGS	8.	P S	Z NZ	13 01 58.4 02 25
8.	iP eS i	NZ E NZ	03 11 35.3 12 58 13 00	8.	iP i S iScP P: S,D	NZ E NEZ Z	13 57 37.7 37.9 14 00 54 04 32.4
	P: N,C 29.8 N., 138.8 E. South of Honshu, Japan. h: 458 km ca. H= 03 09 51.7		USCGS		18.3 N., 145.3 E. Mariana Is. region. h: 423 km ca. H= 13 53 42.2		USCGS
8.	P i S	Z N	15 32 45 53.4	8.	P i S	Z NEZ NE	19 12 23.4 24.4 13 27
					32.2 N., 140.9 E. South of Honshu, Japan. h: 77 km ca. H= 19 11 11.2		USCGS

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
9.	eP S	Z NEZ	02 39 04 30	10.	P	Z	03 46 13 ca.
9.	eP e	Z N	07 42 16 43 00				27.3 S., 176.6 W. Kermadec Is. region. h: 140 km ca. H= 03 34 44 USC GS
9.	eP	Z	08 46 51	10.	P	Z	04 38 43
			50.6 N., 157.2 E. Southern Kamchatka. h: 33 km ca. H= 03 42 21.1 USC GS				28.1 N., 53.3 E. Southern Iran h: 46 km ca. H= 04 27 33.5 USC GS
9.	iP P: D	Z	10 20 47.6	10.	P	NEZ	13 20 44
			21.6 S., 171.1 E. Loyalty Is. region. h: 153 km ca. H= 10 10 18.2 USC GS				i Z 21 02 S Z 22 56 eL E 23 30 24.7 N., 142.7 E. Volcano Is. region. h: 33 km ca. H= 13 17 47.1 USC GS
9.	eP eS	Z N	12 07 54 27 ca.	10.	iP	NE	14 47 35.1
9.	P	Z	12 26 34				i Z 43 S E 48 27 P: N, W
			51.6 N., 173.8 W. Andreanof Is. h: 33 km ca. H= 12 20 02.2 USC GS	10.	P	Z	16 16 03
9.	P	NEZ	14 21 08.0				15.0 S., 179.0 W. Fiji Is. region. h: 389 km ca. H= 16 05 59.7 USC GS
			1.2 N., 125.6 E. Molucca Passage. h: 33 km ca. H= 14 13 58.9 USC GS	10.	iP iS	NZ NE	16 58 03.0 31.6
9.	P i S eL e e eL P: C	Z N E E N E NE	14 47 33.5 39.5 56 53 15 04 10 05 12 07 00 40				P: N, C
			Mag. 6 $\frac{1}{2}$ (Mat.) 15.3 S., 175.7 W. Fiji Is. region. h: 33 km ca. H= 14 36 45.9 USC GS	10.	eP S	Z NE	17 54 31 47
9.	P eS	NEZ N	16 52 09 48	10.	PKP	Z	18 56 30
9.	P S	NEZ N	20 16 34 13 10				8.3 N., 82.9 W. Panama-Costa Rica border. h: 33 km ca. H= 18 37 45.3 USC GS
10.	e	Z	00 01 53	10.	iP P: D	Z	20 39 24.2
10.	eP S	Z NE	01 30 07 28	11.	eP	Z	01 27 00
			Mag. 5 $\frac{3}{4}$ (Mat.) 60.5 S., 154.9 E.	11.	eS e e L eL	E E E E Z	01 59 31 02 04 17 12 21 14 52 21 20

(cont.)

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
		Balleny Is. region, h: 33 km ca. H= 01 34 22.2				h: 100 km ca., H= 17 42 46.0	
			USCGS				USCGS
11.	eP eS	Z NEZ	02 28 14 29 02	12.	eP eSS eL	Z E E	18 40 19 53 37 19 02 27
11.	iP i S e P: E,D	EZ N N E	04 26 28.6 28.9 27 10 16		Mag. 5 $\frac{1}{2}$ - 5 $\frac{1}{2}$ (Mat.) 25.3 N., 62.7 E. Near coast of west Pakistan. h: 33 km ca. H= 18 29 38.8		
11.	iP i i S i i	NEZ E Z N E Z	07 33 08.3 11.7 45 48 59 39 14	13.	iP e iS P: N,D	NZ Z E	00 20 32.6 21 23 58.3
	P: S,W,C			13.	iP Z, FN iS i P: C	E N	02 47 33.1 54.6 55.9
	Mag. 5.1 (Mat.) 38.7 N., 141.2 E. Northern Honshu, Japan, h: 20 km ca.		J.M.A.	13.	eP i i eL	Z NZ E E	03 35 16 20.4 20.7 46 19
11.	P eS	NEZ EZ	07 51 54 52 03		55.0 N., 156.4 W. Kodiak I. region. h: 33 km ca. H= 03 26 45.4		
11.	P i	Z N	10 10 12.7 13.0				USCGS
11.	P	NEZ	12 16 30	13.	eP i i ePcP eS e	Z N E Z E N	05 01 30 30.5 30.7 02 57 07 25 ca. 35 ca.
11.	iP iS P: S,E,D	NEZ NZ	14 18 22.9 34.8		7.2 S., 124.5 E. Banda Sea, h: 542 km ca. H= 04 53 58.8		
12.	iP i ipP P: C	Z NE Z	10 17 55.8 56.2 18 23.2				USCGS
	5.7 S., 131.1 E. Banda Sea, h: 92 km ca. H= 10 10 08.0		USCGS	13.	iP i P: E,D	EZ N	06 39 35.0 35.4
12.	eL	E	14 02 44		20.6 S., 178.5 W. Fiji Is. h: 562 km ca. H= 06 29 19.1		
	2.1 N., 90.4 W. Galapagos Is. h: 33 km ca. H= 13 06 46.1		USCGS				USCGS
12.	P S	Z N	15 03 45 04 23	13.	iP i e S i	NEZ Z N E N	06 56 42.0 48.6 57 07 21 29
12.	P	Z	17 50 36		P: S,E,D		
	5.9 S., 146.5 E. Near east coast of New Guinea.						

(cont.)

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Date	Phase	Comp.	Time(GMT)
			h m s
13.	iP e eL	NEZ E E	07 03 27.9 13 22 21 42
	P: N,W,C 19.1 S., 173.9 W. Tonga Is. h: 23 km ca. H= 06 52 06.1 USCGS		
13.	iP EZ, P N		07 12 41.2
	P: W,D 36.6 N., 70.9 E. Hindu Kush. h: 244 km ca. H= 07 03 49.6 USCGS		
13.	P S e	Z N E	07 18 48 19 20 26
13.	eL	E	14 03 23
	76.2 N., 6.4 E. Svalbard region. h: 33 km ca. H= 13 28 02.2 USCGS		
13.	P i S	Z E N	17 18 17 18.6 19 05
13.	iP eS eL eL eL	NEZ E E N Z	22 03 58.7 13 19 21 12 22 23 26.0
	P: N,W,C Mag. $5\frac{1}{4}$ - $5\frac{1}{2}$ (Mat.) 19.3 S., 173.7 W. Tonga Is. h: 33 km ca. H= 21 52 37.4 USCGS		
13.	iP i S	NZ E NE	23 02 37.6 38.2 04 20
	P: S,D Mag. 5.5 (Mat.) 27.2 N., 140.1 E. Bonin Is. region. h: 443 km ca. H= 23 00 24.3 USCGS		
13.	iP i	N Z	23 34 03.2 03.5
	P: N		
14.	P	Z	02 06 49.8

Date	Phase	Comp.	Time(GMT)
			h m s
14.	iP eS i eL eL	Z E E E E	02 53 10.3 03 07 23 03 36 16 04 26 15
	P: C 21.4 S., 175.2 W. Fiji Is. region. h: 33 km ca. H= 02 46 44.1 USCGS		
14.	P esP ePcS ePcS eS eLq eLr	Z Z Z N N E N	03 40 30 41 12 46 06 07 47 07 50 12 52 50 ca.
	Mag. $5\frac{1}{4}$ - $5\frac{1}{2}$ (Mat.) 4.9 S., 152.3 E. New Britain. h: 62 km ca. H= 03 32 33.5 USCGS		
14.	eP eS i	EZ N E	04 13 16 32 34.1
14.	eP e	Z N	05 16 02 10
14.	iP S i i	Z E N N	07 01 50.5 02 17.3 20.4
	P: C		
14.	e	E	07 27 40 ca.
14.	iP i iS i	EZ N NE Z	03 19 49.3 50.1 20 00.2 01.3
	P: S,E,D		
14.	iP eL	Z E	03 36 02.0 40 10
	P: C 9.3 S., 153.3 E. Solomon Is. h: 33 km ca. H= 08 27 14.9 USCGS		
14.	iP iS	EZ NEZ	10 03 13.6 34.8
	P: E,C		
14.	iP S	Z N	10 46 08.1 29.1

(cont.)

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	i	Z	10 46 29.8	14.	iP	Z	21 39 19.5
	P: C				i	E	19.9
14.	iP	Z	11 45 37.7		i	N	20.7
	iS	N	46 28.7		e	N	57
	i	E	29.0		i	N	40 04
	P: D				e	Z	05
					P: D		
14.	iPKP 1	Z	14 52 21.3	14.	iP	Z	23 46 50.2
	i	E	21.6		i	E	51.4
	i	Z	33.1		iS	E	47 45.1
	ePKP 2	Z	52		i	N	45.8
	epPKP 2	Z	53 16		P: D		
	esPKP 2	Z	33				
	22.3 S., 68.7 W.			15.	iP	NZ	02 19 21.8
	Northern Chile.				eS	N	20 51
	h: 120 km ca.				i	NE	21 01.9
	H= 14 32 36.7		USCGS		ScS	N	31 14
					P: N,C		
14.	eP	Z	16 22 32		Mag. 5.6 (Mat.)		
	eS	N	25 56		27.9 N., 139.6 E.		
	e	E	26 13		Bonin Is.		
	24.1 N., 122.4 E.				h: 476 km ca.		
	Off coast of Formosa.				H= 02 17 16.9		USCGS
	h: 28 km ca.						
	H= 16 18 18.0		USCGS	15.	e	Z	05 45 40
					e	Z	49
14.	iP	Z	18 51 26.3		i	N	49.7
	i	N	26.9		i	E	50.2
	i	E	28.0		i	N	46 09.0
	i	NZ	39.9	15.	iP	NEZ	06 12 21.3
	epPP?	Z	53 16		S	N	58
	iPcP	Z	33.2		e	E	13 02
	iPcP	E	34.2		i	N	10
	iPPP	Z	46.1		P: N,E,D		
	eS	N	57 16		Mag. 6.3 (Mat.)		
	eL	N	19 00 25		37.7 N., 141.9 E.		
	eL	E	00 5		Near east coast of Honshu,		
	eL	Z	37		Japan.		
	eL	Z	01, 16		h: 60 km ca.		J.M.A.
	P: C						
	Mag. 5 $\frac{1}{4}$ - 5 $\frac{1}{2}$ (Mat.)			15.	iP	NEZ	08 09 55.4
	3.4 S., 135.4 E.				iS	NE	10 11.2
	West Irian.				P: S,W,C		
	h: 33 km ca.						
	H= 13 43 55.5		USCGS	15.	iP	EZ	10 48 42.6
					i	N	43.1
14.	iP	NZ	21 21 24.6		iS	NE	54.4
	i	E	24.9		P: E,D		
	eS	N	22 08	15.	e	Z	10 49 34
	i	EZ	09		e	N	42
	e	E	24	15.	P	Z	12 09 22
	P: S,C			15.	P	Z	12 09 22
	40.6 N., 143.6 E.			15.	P	NEZ	15 36 55.7
	Off east coast of northern				iS	NE	37 06.7
	Honshu, Japan.						
	h: 33 km ca.						
	H= 21 20 4		USCGS				

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
15.	iP iS P: N,E	NZ, P E NEZ	16	10	48.4 51.7						
							H= 03 00	24.3			USCGS
15.	iP S i P: W,C	EZ N E	17	30	44.0 31.06 09	16.	iP iS i P: N,E,D	NEZ E N	04	57	57.7 53 15.3 16.0
15.	eP i	Z Z	17	42	25 43 16.2	16.	eP i e	Z EZ N	05	57	58 58 02.6 39
15.	iPKP 1 i i i iPKP 2 iPKP 2 SKK9? SKSP SS SS sSS i e i i G G	NZ E NEZ E N E N N N E N E Z N E	17	43	45 45.8 48 49.6 50.1 44 02.9 06.5 53 23 56 46 18 05 33 40 09 16 32 13 40 15 12 14 25 18 30	16.	P i e	Z E N	07	09	24 26.5 48
											48.8 N., 155.0 E. Kurile Is. h: 33 km ca. H= 07 05 26.1 USCGS
						16.	P	Z	14	38	18
						16.	P	NZ	20	56	50.6
											2.1 N., 126.1 E. Molucca Passage. h: 35 km ca. H= 20 49 52.1 USCGS
						16.	P e e i	Z Z N N	22	30	40 31 57 59 32 05
											43.9 N., 142.1 E. Hokkaido, Japan. h: 81 km ca. H= 22 28 45.0 USCGS
15.	eP i	Z NE	18	20	20 29.1	16.	P	Z	22	44	41
15.	iP e i P: D	Z Z N	19	04	23.3 32 32.6	16.	ePKP	Z	23	26	01
											12.8 S., 14.5 W. South Atlantic Ocean. h: 33 km ca. H= 23 06 24.6 USCGS
15.	iP i P: E,C	EZ NEZ	20	36	30.9 37 16.9	16.	iP i eS c eLq eLr P: C	Z N E E E E	23	32	09.7 11.1 42 40 50 22 55 05 58 26
16.	P eL	Z E	02	45	39 55 20						
											3.1 S., 129.3 E. Ceram Sea. h: 94 km ca. H= 02 38 10.9 USCGS
15.	iP P: C	Z	03	03	00.3						
											6.3 S., 129.0 E. Banda Sea. h: 263 km ca.
						17.	i	Z	09	17	50

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
17.	iP P: C 20.0 S., 174.0 W. Tonga Is. h: 33 km ca. H= 05 33 40.1	Z	05 45 05.3	18.	iP i e e P: E,D	EZ N N N	03 20 34.2 34.8 55 21 10
17.	eP eL 52.4 N., 163.7 W. Fox Is. h: 33 km ca. H= 06 17 36.4	Z E	06 25 10 39.8	18.	iP Z, P S e P: D	NE N E	05 06 51.2 07 41 44
17.	iP S P: N,C	NZ NE	07 02 32.0 52	18.	iP i S Mag. 5.3 (Mat.) 35.7 N., 139.6 E. Near Tokyo, Japan. h: 130 km ca.	Z NE NEZ	07 10 17.0 17.3 38 J.M.A.
17.	iP i eS i i L L L P: S,W,D Mag. 6.0 (Mat.) 30.4 N., 130.7 E. Off south coast of Kyushu, Japan. h: 60 km ca.	NEZ NE N E Z E Z N	11 14 42.8 15 03.4 16 26 28 45 17 00 18 28	18.	P i S	NZ E NE	09 37 39.8 41.0 38 04
17.	P S	NEZ N	14 47 04 22	18.	eP e i e	EZ Z N Z	15 20 01 11 11.6 21 00
17.	iP i S i P: C	Z N E N	18 50 05.9 06.0 51 05.2 06.6	18.	iP i iS i P: C	Z E E N	15 36 15.7 15.9 32.2 32.6
17.	iP iS i P: S,W,D	NEZ E N	20 09 40.8 10 00.0 01.0	18.	iP eS i P: N,E	NEZ E NZ	16 42 00.2 17 19
17.	iPKP 1 PKP 2 P: C 20.3 S., 67.4 W. Southern Bolivia. h: 33 km ca. H= 20 56 42	Z Z	21 16 35.9 17 05.3	18.	iP i P: N,E,C	NEZ Z	18 45 03.0 47 00.3
18.	eP i	EZ N	00 11 26 27.4	18.	iP EZ, P iPcP e S eL eL eL P: E,D Mag. 5 $\frac{1}{2}$ -6 (Mat.) 50.3 N., 176.9 W. Andreanof Is. h: 33 km ca. H= 18 43.16.1	N Z Z E E N Z	18 50 05.2 52 37.9 53 55 35 57 32 58 03 08 USCGS

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
18.	iP i i	Z E N	20	30	01.3 02.4 03.4	19.	ePKP e	Z Z	10	11	27 33	
	P: C 22.5 S., 175.2 W. Tonga Is. h: 33 km ca. H= 20 18 29.9			USCGS			59.8 S., 25.9 W. Sandwich Is. region. h: 33 km ca. H= 09 51 25.2			USCGS		
18.	eP eS eSS eL eL	Z E E E Z	20	39	45 49 49 54 46 01 08 07 22	19.	eP eS e	E E E	15	00	22 01 26 55	
	Mag. 5½ - 5¾ (Mat.) 32.1 S., 178.1 W. Kermadec Is. region. h: 33 km ca. H= 20 27 41.9			USCGS			41.5 N., 141.8 E. Off east coast of Honshu, Japan. h: 117 km ca. H= 14 53 59.5			USCGS		
18.	iPKP P: C	Z	23	27	26.7	19.	iP S P: E	E NEZ	20	42	31.0 49	
	14.2 S., 71.9 W. Southern Peru. h: 31 km ca. H= 23 07 54.2			USCGS			19.			P	E	20 48 03 20.2
19.	P i S	Z NE E	00	52	56.9 57.3 53 12.4	19.	eL	E	23	30	17	
19.	eP S	E E	04	03	59 04 40	20.	eP	Z	06	47	40	
19.	eP eS eSS eLq eLr	Z E E E E	04	36	05 46 08 51 11 57 12 05 03 15		5.5 S., 145.8 E. Near coast of northeast New Guinea. h: 90 km ca. H= 06 39 57			USCGS		
	32.0 S., 177.9 W. Kermadec Is. region. h: 33 km ca. H= 04 24 00.4			USCGS			20.	e	E	07	02	25
19.	P i eS eL	EZ Z E E	06	25	54 26 14 27 04 27	20.	eP	Z	07	02	51	
	41.0 N., 143.5 E. Off east coast of northern Honshu, Japan. h: 25 km ca. H= 06 24 23.9			USCGS			6.9 S., 103.0 E. Off coast of Sumatra. h: 61 km ca. H= 06 53 28			USCGS		
19.	e e e	Z Z E	06	44	54 45 54 46 03	20.	e	E	07	26	47 ca.	
							20.	P	NEZ	09	32	17
							27.3 S., 176.5 W. Kermadec Is. h: 37 km ca. H= 09 20 26.7			USCGS		
							20.	eP	Z	12	38	36
							20.	iP S i i	NEZ NE Z N	12	59	47.6 06 07 08
							P: N, E, D Mag. 5.0 (Mat.) 37.2 N., 139.7 E. Central Honshu, Japan. h: 20 km ca.			J.M.A.		

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
20.	iP eS i P: C	Z E N	13 40 02.6 19 20.6	21.	iP i P: S,C	NZ E	03 38 56.1 56.2
20.	iP S i e L L P: S,W,C Mag. 5.5 (Mat.) 41.3 N., 142.8 E. Off east coast of Honshu, Japan. h: 100 km ca.	NEZ NE Z NE N E	15 49 38.3 50 49 52 55 51 17 18	21.	P e	EZ N	10 05 51.7 52
				21.	iP P: D 8.3 S., 108.8 E. Near south coast of Java. h: 225 km ca. H= 10 17 01	Z	10 25 50.1
20.	iP iS P: D	Z NZ	18 47 35.3 41.6	21.	iP S i P: E,D	EZ, P N NE Z	16 50 21.0 38 39
20.	eP i	Z E	19 14 20 23.4	21.	P i i S NE, eS eL L eL P: N,E,D 49.0 N., 158.2 E. Kurile Is. region. h: 33 km ca. H= 18 02 44.4	NEZ Z EZ Z E E N	18 07 06.2 07.7 08 29 10 45 11 45 13 21 31
20.	eP e	Z Z	19 55 08 53				
20.	eP? eL	Z E	20 17 01 24 09	21.	P i i S NE, eS eL L eL P: N,E,D 51.8 N., 176.5 W. Andreanof Is. h: 17 km ca. H= 18 20 52.8	Z NE Z NEZ	18 27 48 49
20.	eP e e eS? i	N E E Z N	22 31 57 32 30 37 43 52.6				
21.	P i i i S i i P: W,C	EZ N Z N N E NEZ	02 24 29.5 29.7 37 41 49 50 52	21.	iP i i P: C	Z, P E N NEZ	19 47 49.9 50.1 48 06.6
21.	iP S i P: N,D	NEZ NE Z	03 09 59.1 10 02 08.6	21.	P eS i	NEZ N E	20 42 20 43 03 05
21.	PKP eL 14.3 N., 72.5 W. Caribbean Sea; h: 33 km ca. H= 03 39 22.6	Z E	03 58 26 04 31 25	21.	iP i S N, eS P: D	Z N E	21 17 53.0 53.2 18 23
				21.	eP i S N, eS i	Z NE E Z	21 41 42 44 42 30 35

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
22.	P	Z	20	56	50	23.	iP Z, P E		13	01	02.2	
	i	N			50.6		i	N			02.4	
	i	E			52		i	N			15	
	eS?	NE	58	25			S	N			53	
23.	eL	E	02	39	50		P: W,C					
23.	iP NZ, P E		03	47	40.1	23.	P	Z	21	35	41	
	S	NEZ		49	32		i	N			44	
	P: N						4.4 S., 134.9 E.					
	44.7 N., 146.1 E.						Irian.					
	Kurile Is.						h: 95 km ca.					
	h: 135 km ca.						H= 21 28 12				USCGS	
	H= 03 45 17.6											
23.	iP	NEZ	06	07	26.1	23.	iP	NEZ	23	24	16.6	
	S	NE			44		S	NEZ			25 55	
	i	Z			45		L	E			26 30	
	P: N,E,D						P: S,E,D					
							28.6 N., 142.5 E.					
							Bonin Is.					
							h: 45 km ca.					
							H= 23 22 10.1				USCGS	
23.	P	NZ	13	14	16.7	24.	P	Z	00	31	53.7	
	i	E			17.6		i	NE			54.4	
	S	E			18 13		S	NE			32 11	
	i	N			26		i	Z			13	
	Lq	E			19 16							
	Lr	E			20 10		24.	iPKP 1	Z	01	01	30.2
	Lr	Z			18		PKP 2	Z			56	
	L	N			22 43		22.4 S., 168.5 W.					
	P: S,C						Northern Chile.					
	Mag. 5 $\frac{1}{2}$ - 5 $\frac{3}{4}$ (Mat.)						h: 66 km ca.					
	52.4 N., 159.6 E.						H= 01 41 40.5				USCGS	
	Off east coast of Kamchatka.											
	h: 33 km ca.											
	H= 13 09 25.3											
23.	iP Z, P N		13	32	28.2	24.	P	Z	02	29	29.7	
	i	E			29.6		i	E			30.2	
	S	E			33 27		i	N			30.5	
	i	N			32		i	Z			30 15	
	P: D						S?	E			28	
							i	N			33	
23.	iP	Z	15	30	16	24.	P	N	03	06	43.9	
	i	E			21		i	Z			44.1	
	4.9 N., 128.1 E.						P: S					
	Talaud Is. region.						55.9 N., 162.1 E.					
	h: 268 km ca.						Near east coast of Kamchatka.					
	H= 15 24 06						h: 110 km ca.					
							H= 03 01 30				USCGS	
23.	iP NZ, P E		16	47	22.5	24.	P	NZ	03	17	05.5	
	e	E			51 09		i	E			08	
	eL	E			54 14		P: S,D					
	P: N											
	Mag. 4 $\frac{3}{4}$ (Mat.)											
	52.5 N., 159.5 E.						24.	eP	Z	06	48	31
	Near east coast of Kamchatka.						eL	E			51 12	
	h: 67 km ca.						L	N			52 35	
	H= 16 42 34.2											

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
24.	eP i e i	EZ N N Z	07 54 24 25.9 55 09 24				
					45.2 N., 151.3 E. Kurile Is. region. h: 33 km ca. H= 05 21 19.4		USCGS
24.	P i	Z N	09 11 01.7 02.7	25.	P i i eSS eSSS eSSS L L Lr	Z NE E E E N E N Z	06 23 21 22 33 37 57 40 57 41 27 47 30 49 37 57 41
24.	P i	Z N	10 49 32 35		Mag. 5½ (Mat.) 38.9 N., 38.4 E. Central Turkey. h: 33 km ca. H= 06 11 43.3		USCGS
24.	P? 51.0 N., 179.4 E. Rat Is. h: 33 km ca. H= 10 58 28.2	Z	11 05 10				USCGS
24.	P i S?	EZ N NE	11 12 43 45 13 21	25.	iP S i i P: S,E,D	NEZ N E Z	07 30 28.6 43 47 53
24.	P i i S i	Z N E E N	12 29 50.7 51.0 51.2 30 01 01.5	25.	iP ipP iPP isP isPP i iS E, S N i iScS? isS isS iSS iSS isSS isSS L PKPPKP PKPPKP i i W 2 P: S,E,D Mag. 6½ (Mat.) 17.5 S., 178.8 W. Fiji Is. region. h: 565 km ca. H= 12 18 12.5	NEZ NEZ N NEZ Z E Z NE NE Z E N Z NE E E E NE N E E	12 28 13.5 30 09.4 39 31 09 33 23 35 41 36 25.4 26.2 37 24 39 55 58 41 19 27 44 00 12 15 50 26 56 25 32 13 31 38 34.0 14 05.0
24.	eL	E	21 17 45				
24.	eP i eL	Z NEZ E	21 45 06 19.6 48 37				
					45.0 N., 151.7 E. Kurile Is. region. h: 33 km ca. H= 21 41 57.8		USCGS
24.	L	E	23 36 24	25.	P i i i eS e L eL	Z N E E E N E N	02 23 32 33 34 47 26 38 43 27 30 40
					48.7 N., 146.3 E. Sea of Okhotsk. h: 134 km ca. H= 02 20 12.7		USCGS
25.	iP i i eS i L L P: N,D	NZ E NEZ E N N E	05 24 25.7 25.8 38.7 26 43 57 27 35 29.0	25.	P i i i	Z E N Z	12 58 45.6 46.2 49 50

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Date Phase Comp. Time(GMT)				Date Phase Comp. Time(GMT)			
h m s				h m s			
25.	iP Z, P N ipP Z P: N,D 52.5 N., 172.5 W. Andreanof Is. h: 80 km ca. H= 18 44 15.5		18 51 25.2 42	26.	P Z i N i Z i N i EZ P: D		11 06 52.1 53 08 21 28 30
26.	iP Z, P E e N P: D		00 39 46.2 40 00	26.	P NEZ P Z i E		11 11 25 11 56 31.7 33
26.	P Z 26.3 S., 173.3 E. Fiji Is. region. h: 546 km ca. H= 02 28 12.3		02 38 48.0	26.	iP Z P: D 22.7 S., 171.7 E. Loyalty Is. region. h: 43 km ca. H= 12 19 27.6		12 30 15.2
26.	eL E		03 10 29	26.	iP NZ i E S NEZ P: S,D Mag. 4.7 (Mat.) 32.7 N., 137.7 E. South of Honshu, Japan. h: 349 km ca. H= 12 45 30.3		12 46 37.5 37.7 47 29
26.	P NEZ P: D 19.3 S., 175.4 W. Tonga Is. h: 83 km ca. H= 02 59 46.9		03 10 56.9	26.	eP Z 19.8 N., 155.6 W. Hawaii. h: 5 km ca. H= 13 49 19		13 59 28
26.	P Z i NE 17.7 S., 173.8 W. Fiji Is. h: 575 km ca. H= 04 49 43.8		04 59 43.8 45.3	26.	eP EZ eS? N i NE		22 29 37 30 21 37
26.	eP Z i N S E i NEZ		05 00 30 31 01 12 15	26.	iP NE, P Z iS NE, S Z P: S,W		22 55 36.8 39.6
26.	eP NZ i NZ eS? E i N		05 25 03 16 26 03 10	26.	iP NE, P Z iS NE i Z P: S,W		22 56 43.1 45.9 46.5
26.	eP Z eL E L N Mag. 5 $\frac{1}{4}$ (Mat.) 6.8 S., 105.6 E. Java. h: 33 km ca. H= 05 42 40.3		05 51 57 06 09 00 25	26.	P Z i NE i NEZ 7.7 S., 127.3 E. Banda Sea. h: 151 km ca. H= 23 32 33.3		23 40 38.4 38.5 45
7 26.	P NZ i E 51.6 N., 157.0 E. Near east coast of Kamchatka. h: 105 km ca. H= 08 45 32.4		08 49 00.3 00.6	26.	eP Z S NE		23 45 51 46 59

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
26.	P	Z	23 56 23.6				
	i	N	24.0		Solomon Is.		
	i	N	57 06		h: 92 km ca.		
	S	E	18		H= 18 08 12.7		USCGS
	i	N	19	27.	P	Z	20 45 01 ca.
	i	Z	21		i	Z	05
	L	E	58 29		i	E	05.5
27.	P	Z	03 42 33		i	N	06
			11.2 S., 165.7 E.		eS?	N	48 41
			Santa Cruz Is.		i	E	55
			h: 33 km ca.				18.3 N., 146.4 E.
			H= 03 32 56.5				Mariana Is.
			USCGS				h: 78 km ca.
27.	PKP	Z	03 43 28				H= 20 40 37.0
	i	E	35				USCGS
	e	E	58 54	27.	iP	EZ	21 37 26.0
	Lq	E	04 26 10		i	N	29
	Lq	N	11		i	N	32.3
	Lr	Z	33 30		i	E	33
	Lr	N	33		S?	N	38 07
	Lr	E	35		i	E	14
			Mag. 6 - 6½ (Mat.)		i	N	20
			45.9 S., 75.3 W.				P: E,D
			Near coast of southern Chile.	27.	iP	NEZ	22 04 32.5
			h: 33 km ca.		i	EZ	37.5
			H= 03 23 32.6		S	NEZ	05 46
			USCGS		L	N	06 07
27.	P?	NZ	05 15 02		L	E	26
	i	E	04		eL	Z	54
	i	EZ	19				P: N,E,D
	i	N	20				Mag. 4.5 (Mat.)
	i	NZ	25				40.3 N., 145.4 E.
27.	P	NZ	07 14 43.6				Off east coast of Honshu,
	i	E	44.3				Japan.
			5.5 S., 149.3 E.				h: 60 km ca.
			New Britain region.				J.M.A.
			h: 162 km ca.	28.	iP Z, P E		00 32 39.7
			H= 07 06 57.4		i	N	40.0
			USCGS				P: D
27.	iP	E	10 30 32.5	28.	P	Z	02 06 48
	i	Z	32.7		i	N	55
	i	N	33.7		i	E	58
	i	Z	58		S	N	07 28
			P: W	28.	iP	NZ	03 44 52.1
27.	PKP 1	Z	13 16 15		iS N, S EZ		46 06.5
	iPKP 2	Z	45.2				P: S,D
			17.7 S., 70.1 W.	28.	iP Z, P NE		05 53 07.0
			Southern Peru.		i	Z	34
			h: 188 km ca.		iS N, S E		42.0
			H= 12 56 55.2		i	Z	43
			USCGS				P: D
27.	iP	Z	18 17 07.7	28.	iP Z, P E		06 35 43.5
	i	N	08.0		i	N	50.0
	i	E	09.0				(cont.)
			P: D				
			10.0 S., 161.3 E. (cont.)				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	S E, eS N		06 36 28				
						h: 31 km ca. H= 08 53 43.4	USCGS
28.	iP	NEZ	07 24 59 ca.	29.	iP	NEZ	10 30 34.1
	S	N	26 27 ca.		i	NE	51.0
	i	Z	31 ca.		i	Z	54
	P: N,E,D				F: N,D		
28.	P	N	15 53 07.9	29.	iP	EZ	15 25 14.4
	i	Z	09		i	N	14.9
	i	E	10		S	NEZ	27.5
	i	N	10.9		P: E,D		
	S	E	54 43	29.	PKP	NZ	15 49 34
	i	NZ	44		i	E	38
	28.3 N., 141.0 E.				i	Z	48
	Bonin Is. region.				FP	Z	52 15
	h: 96 km ca.				PKS	NE	53 13
	H= 15 51 06.3	USCGS			SKSP	NE	16 02 24
29.	iP	Z	01 29 13.9		SKSP	Z	30
	i	Z	30		iPPS	E	04 04
	P: C				i	N	05 40
	2.0 N., 123.4 E.				SS	N	10 07
	Northern Celebes.				SS	E	13
	h: 43 km ca.				SS	Z	11 16
	H= 01 22 06.4	USCGS			iSSS	N	14 50
29.	P	Z	06 12 25.9		SSS	E	15 17
	i	E	26.9		iLq	N	26 10
	i	N	27		Lr	E	32 00
	i	E	13 09		Lr	Z	44
	i	Z	16		Lr	N	33 10
	S	NE	15 28		W 2	NEZ	28 00
	i	Z	30		Mag. 6 $\frac{3}{4}$ - 7 (Mat.)		
	21.9 N., 145.5 E.				7.1 S., 81.6 W.		
	Mariana Is.				Off coast of Peru.		
	h: 130 km ca.				h: 23 km ca.		
	H= 06 08 48.0	USCGS			H= 15 30 31.4	USCGS	
29.	iP	NEZ	09 02 36.7	29.	P	Z	21 08 37.9
	i	N	03 59		i	E	46
	iPP	Z	04 33		e	N	09 46
	iPP	E	46		i	Z	10 41
	i	E	09 24		S	N	17 43
	S	E	54		i	E	48
	i	Z	53		Lq	E	25 24
	SS	N	13 28		Lq	N	56
	SS	E	52		Lr	Z	28 53
	i	NE	16 24		Lr	E	29 10
	Lq	NE	13 10		Lr	N	12
	eLq	Z	19 07		Mag. 6 (Mat.)		
	Lr	E	23 10		15.5 S., 172.9 W.		
	Lr	Z	12		Tonga Is. region.		
	Lr	N	14		h: 33 km ca.		
	P: S,E,C				H= 20 57 31.5	USCGS	
	Mag. 6 $\frac{1}{2}$ (Mat.)			29.	eP	Z	23 28 26
	39.6 N., 74.2 E.				i	E	27.4
	Sinkiang Province , China.						
	(cont.)						

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
31.	iP S P: N,E,C	NEZ E	12	25	54.0 55.6						
31.	eP i 28.2 N., 129.3 E. Ryukyu Is. h: 33 km ca. H= 12 47 11	Z E	12	49	54 50 06						USCGS
31.	iP iS P: N,E	NEZ NZ	14	00	37.8 39.4						
31.	P i P: N,D	NZ E	16	34	20.6 20.9						
31.	iP P: D 2.0 N., 127.5 E. Halmahera region. h: 70 km ca. H= 16 53 44.7	Z	17	00	41.3						USCGS
31.	iP S? P: N,C	NEZ N	20	17	51.8 53.8						
31.	iP iS P: N	NZ NE	20	51	24.7 26.1						
31.	P i i S i	Z E N E N	21	03	19.3 19.6 20.8 36.2 38						Mineo Takehana Director
31.	P i i 21.5 S., 179.2 W. Fiji Is. h: 543 km ca. H= 21 26 09.3	Z N E	21	36	29.8 30.3 30.5						USCGS

12 MAY 1969

SEISMOLOGICAL BULLETIN
OF
MATSUSHIRO

SEPTEMBER , OCTOBER
1963

Matsushiro Seismological Observatory
Matsushiro-machi, Nagano-shi,
Nagano-ken , Japan

Matsushiro Seismological Observatory , Japan

Seismological Bulletin

Latitude 36° 32' 30"N.

Longitude 138° 12' 32"E.

Elevation 440 M.

Instrumental Constants

Instruments	Comp.	Period (sec)		Damping ratio		Magnification
Benioff Seismograph (Short Period)	N	T ₁ = 1.0	T ₂ = 0.23	h ₁ = 0.68	h ₂ = 1.7	103,000 (max)
	E	T ₁ = 1.0	T ₂ = 0.22	h ₁ = 0.70	h ₂ = 1.6	106,000 (max)
	Z	T ₁ = 1.0	T ₂ = 0.21	h ₁ = 0.72	h ₂ = 1.2	131,000 (max)
Benioff Seismograph (Long Period)	N	T ₁ = 1.0	T ₂ = 70	h ₁ = 0.68	h ₂ = 5.9	7,330 (max)
	E	T ₁ = 1.0	T ₂ = 62	h ₁ = 0.70	h ₂ = 5.6	9,640 (max)
	Z	T ₁ = 1.0	T ₂ = 84	h ₁ = 0.72	h ₂ = 7.3	7,590 (max)
Short Period Seismograph	Z	T ₁ = 1.0	T ₂ = 2.32	h ₁ = 1.4	h ₂ = 1.2	32,000 (max)
Galitzin Seismograph	N	T ₁ = 15	T ₂ = 100	h ₁ = 1	h ₂ = 1.2	1,350 (max)
	E	T ₁ = 15	T ₂ = 100	h ₁ = 1	h ₂ = 1.1	1,640 (max)
	Z	T ₁ = 7.5	T ₂ = 100	h ₁ = 0.76	h ₂ = 0.37	860 (max)
Wood-Anderson Seismograph	N	0.3		0.3		1,050
	E	0.3		0.8		1,200
1000 kg Long Period Seismograph	N	33.0		0.60		100
	E	30.0		0.62		100

September, 1963

Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
1.	iP i S P: W,C	EZ N N	01	12	24.9 25.2 45		L L Mag. 5½ - 5½ (Mat.) 33.9 N., 74.7 E. Northern India. h: 44 km ca. H= 01 34 31.6	NE E	02	01	54 40	USCGS
1.	iP i S P: C	Z E N	05	03	02.1 02.3 25	2.	eP e	EZ E	02	04	40 20	
1.	iP eS P: C	Z N	06	22	06.4 38	2.	iP iS P: E	E E	05	20	24.9 26.9	
1.	iP i S E, eS P: D 31.7 N., 141.0 E. South of Honshu, Japan. h: 33 km ca. H= 06 47 23.5	Z E N	06	48	43.1 54 49 43	2.	iP eS eL P: E 40.3 N., 145.3 E. Off east coast of Honshu, Japan. h: 33 km ca. H= 06 52 10.9	EZ NE NE	06	53	49.4 55 04 50	USCGS
1.	P i i i i P: D	Z Z N N Z	09	05	30.1 31.4 32.0 06 16.3 21	20	iP i iS P: W,C	Z Z N	07	00	54.6 01 12.0 15.2	
1.	iP i S P: N,C	NZ E NE	12	58	49.4 49.8 59 46	2.	eP 52.5 N., 169.2 W. Fox Is. h: 33 km ca. H= 08 03 21.7	Z	08	10	55	USCGS
1.	eP i L	Z NZ Z	17	18	47 54.4 20 19.9	2.	iP Z, P E i e eS L P: C 45.4 N., 150.9 E. Kurile Is. h: 33 km ca. H= 11 44 00.2	Z Z E NE	11	47	03.0 08 16 49 36 50 08	USCGS
1.	iP S P: S,E,D	EZ N	19	29	22.7 52	1.	P i S	Z N NE	21	14	47 49.7 15 19	
1.	P i S	EZ N N	23	56	28 29.1 57 06	2.	eP e eLq Lr Mag. 5½ - 5½ (Mat.) 25.7 N., 109.5 W. Gulf of California. h: 33 km ca. H= 14 10 44.7	Z NE N E	14	23	47 34 50 48 04 52 49	USCGS
2.	eP eS SS	EZ E E	01	43	31 50 48 54 18							

(cont.)

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
2.	eP i	EZ E	15 11 31 32.3	3.	iP e e i iS	EZ E N Z NEZ	05 03 51.2 04 05 06 08 21
2.	iP Z, P e	E E	15 46 30.7 57	P: E, D 36.0 N., 140.7 E. Near east coast of Honshu, Japan. h: 33 km ca. H= 05 03 17.9 USCGS			
2.	iP i i	Z Z E	19 35 57.7 58.3 37 21	3.	iP NZ, P i S Lq Lr	E Z N NE EZ	05 32 41.8 55 35 09 48 37 00
P: D 41.0 N., 141.9 E. Near coast of Honshu, Japan. h: 33 km ca. H= 19 34 40.1 USCGS				P: N, E, D 45.4 N., 150.9 E. Kurile Is. h: 33 km ca. H= 05 29 39.5 USCGS			
2.	iP i iS P: E, D	Z NE NE	19 59 50.0 52.0 20 00 25.4	3.	iP iS i	NEZ N E	05 43 17.5 36.7 37.1
2.	iP i i S P: C	Z E Z NZ	20 19 15.2 15.5 16.7 52	P: N, W			
2.	eP eS	Z E	20 57 50 58 38	3.	eP i Lr eLr	Z N E Z	06 19 16 36.7 29 31 30 03
2.	iP i eS Lq Lr P: C	Z E E N Z	23 48 01.8 05.3 50 18 46 52 10	51.9 N., 173.5 W. Andreanof Is. h: 50 km ca. H= 06 12 06.9 USCGS			
Mag. 5 $\frac{1}{2}$ (Mat.) 45.4 N., 150.8 E. Kurile Is. h: 33 km ca. H= 23 45 00.1 USCGS				3.	P	Z	07 04 34
3.	eP	Z	01 56 22	3.	iP NZ, eP S i i i	E N E Z N	07 04 42.4 05 01.2 02.0 04.0 04.4
44.8 N., 150.9 E. Kurile Is. region. h: 59 km ca. H= 01 53 21 USCGS				P: N, C			
3.	P S	NEZ N	02 42 59 43 27	3.	L	E	08 26 46
3.	eP e e	Z E Z	05 01 00 13 14	3.	eP	Z	09 25 41
45.0 N., 151.0 E. Kurile Is. h: 33 km ca. H= 04 57 56.7 USCGS				62.8 N., 25.2 W. Iceland region. h: 33 km ca. H= 09 13 33.1 USCGS			
3.	P i i	Z N Z	10 07 34.3 36.1 36.6	(cont.)			

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	i eS P: C	N E	10 07 47.7 58				H= 05 06 47.0 USCGS
3.	iP i S P: S,W,D Mag. 4.0 (Mat.) 34.9 N., 136.9 E. Aichi Pref., Honshu, Japan. h: 0 km ca.	NEZ E EZ	18 22 16.6 17.1 42	4.	P iS i	NEZ E N	05 41 35 56.8 57.8
3.	iP e P: C	Z E	21 30 26.7 34 47	4.	iP S e P: N,E	NE NE Z	05 45 17.8 31 36
3.	iP i eS i P: S,E,D	NEZ Z E Z	22 35 36.3 36 09 22 25	4.	iP i i	Z Z Z	07 52 30.5 32.5 55.7
3.	P i i S i P: C	Z NE Z E N	23 32 07.5 07.9 03.1 39.2 43.7	4.	eP iS e	Z N E	03 22 13 45.3 47
4.	eP e i i 29.3 N., 127.5 E. East China Sea. h: 253 km ca. H= 03 00 51	Z N EZ N	03 03 29 32 33.4 37.2	4.	iP P: C	Z	09 04 52.0
4.	iP i i iS P: W,C	EZ N N NE	05 03 13.1 13.3 13.7 23.2	4.	P iS	Z N	12 49 23.7 50 13.2
4.	eP e e eSS eSSS eLq Lr eLr Lr eLr Mag. 6½ (Mat.) 36.1 N., 5.3 E. Near coast of Algeria. h: 33 km ca.	Z Z N NE NE NE E N E Z	05 20 01 06 29 02 37 43 41 18 45 36 52 43 53 36 55 10 58 06	4.	P i i PP i PPP S SS N, eSS eLq Lr PKPPK e P: N,E,D Mag. 6½ (Mat.) 71.4 N., 73.3 W. Near east coast of Baffin I. h: 33 km ca. H= 13 32 12.3	NEZ N NEZ NE Z NZ NE E NEZ Z Z	13 43 22.2 23.7 24.1 45 54 56 47 44 52 36 56 56 14 00 17 02 51 11 22 25
4.	iP i i iS P: W,C	EZ N N NE	05 03 13.1 13.3 13.7 23.2	4.	iP iS P: S,E,D	NEZ NE	17 04 13.2 35.3
4.	eP e e eSS eSSS eLq Lr eLr Lr eLr Mag. 6½ (Mat.) 36.1 N., 5.3 E. Near coast of Algeria. h: 33 km ca.	Z Z N NE NE NE E N E Z	05 20 01 06 29 02 37 43 41 18 45 36 52 43 53 36 55 10 58 06	4.	eP S i	Z E N	17 43 39 56 56.7

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
4.	P i i iS i P: C	Z E N EZ N	18 43 34.8 35.2 35.4 43.1 43.6	5.	iP? i e i i P: C	NEZ Z Z E N	16 09 16.9 22.9 36 38.0 41
4.	P iS	E E	21 05 57 06 12.8	5.	P	NEZ	16 31 50.7
4.	eP? 71.5 N., 72.8 W. Baffin I. h: 33 km ca. H= 21 20 18.5	Z	21 31 33 USCGS	5.	iP i i i iS i P: S,D	NZ E N E NE Z	16 38 43.2 44 44.5 45.5 39 17.2 20.3
4.	eP 71.6 N., 73.5 W. Near east coast of Baffin I. h: 33 km ca. H= 21 41 00.6	Z	21 52 10 USCGS	5.	P i iS i	Z N E Z	17 50 11.9 12.2 46.6 47.0
5.	P e 17.8 S., 173.5 W. Fiji Is. h: 553 km ca. H= 00 55 59.1	NEZ E	01 06 02 18 36 USCGS	5.	iP Z, P i S P: C	NE EZ N	21 06 33.9 42.2 07 09
5.	P e S	E Z N	01 20 32 35 59	5.	P iS i	NZ NZ E	21 27 57 28 05.7 06.2
5.	iP iS P: N,E,D	NEZ N	08 01 08.7 30.2	5.	P i i i S i	EZ EZ N N NE	21 32 41 43.1 43.5 33 27 34
5.	P S	Z Z	08 46 18 37	5.	eP i i	Z NZ Z	23 14 11 12.5 13.4
5.	P i 18.0 S., 163.1 E. New Hebrides Is. h: 33 km ca. H= 10 42 42.5	Z Z	10 52 54.7 53 05 USCGS	6.	iP i i i S i L L P: W,D Mag. 5.7 (Mat.) 36.4 N., 130.6 E. Sea of Japan. h: 33 km ca. H= 06 03 52.1	EZ N N N N N E N	06 05 13.2 19.0 57 06 30 36 59 07 00 USCGS
5.	P i i e	EZ N N Z	14 56 26 45.5 57 09 25	6.	P 6.1 N., 126.2 E. Near southeast coast of Mindanao , P.I. (cont.)	Z	08 16 52
5.	eP i i i	Z NZ Z N	15 14 29 35.8 54 15 03.7				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
					eS	E	01 19 36
					i	N	41
					i	NE	20 03
					P: E,C		
					Mag. 5.4 (Mat.)		
					36.4 N., 130.6 E.		
					Off east coast of South Korea,		
					h: 33 km ca.		
					H= 01 16 55.1 USCGS		
6.	iP NZ, P E		10 27 11.9	7.	eP	Z	01 45 39
	e Z		29 02	7.	P	Z	02 41 06
	S N		35 53		i	N	07
	P: S,D				21.5 S., 174.6 W.		
	24.0 S., 179.9 E.				Tonga Is.		
	Kermadec Is. region.				h: 33 km ca.		
	h: 500 km ca.				H= 02 29 38.3 USCGS		
	H= 10 16 33.9 USCGS						
6.	iP	NEZ	10 47 05.9	7.	iP	Z	04 17 13.4
	e	Z	57		i	NE	13.6
	P: W,C				pP	Z	48
6.	eP	N	12 30 24		P: C		
	e	Z	26		5.9 S., 129.8 E.		
	i	NE	29.2		Banda Sea.		
6.	iP	NEZ	14 36 00		h: 169 km ca.		
	P: N				H= 04 09 29.8 USCGS		
6.	iP	Z	15 42 21.3	7.	iP	NZ	07 16 43.3
	i	N	27		i	E	43.7
	S	NE	43 03		i	Z	53
	P: R,C				eS	E	19 09
6.	iP	NZ	17 54 30.9		e	N	11
	15.2 S., 167.9 E.				eLq	N	40
	New Hebrides Is.				Lr	Z	20 54
	h: 231 km ca.				P: N,D		
	H= 17 44 56 USCGS				Mag. 5½ - 5½ (Mat.)		
6.	P	NZ	20 08 43		45.4 N., 150.3 E.		
	e	E	13 11		Kurile Is.		
	e	N	35		h: 33 km ca.		
	Lq	E	46		H= 07 13 39.9 USCGS		
	Lr	N	15 46	7.	iP	Z	03 52 08.1
	Lr	Z	16 07		P: C		
	L	E	17 10		8.3 S., 117.5 E.		
	Mag. 4½ - 5 (Mat.)				Sumbawa.		
	11.2 N., 138.5 E.				h: 81 km ca.		
	Mariana Is. region.				H= 08 43 26 USCGS		
	h: 33 km ca.			7.	PKP	Z	09 10 29.7
	H= 20 03 23.3 USCGS				i	Z	40.6
6.	iP	NZ	21 04 49.7		e	E	54 34
	eL	E	13 35		eLr	N	59 00
	eL	N	14 19		eLr	E	20
	P: C				eL	E	10 05 39
	53.9 N., 165.6 W.				eL	N	46
	Fox Is.				P: C		
	h: 33 km ca.				Mag. 5½ - 6 (Mat.)		
	H= 20 56 59.9 USCGS				11.7 S., 13.6 W. (cont.)		
7.	iP	EZ	01 13 21.5				
	i	NEZ	22				
			(cont.)				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	Ascension I, region. h: 33 km ca. H= 08 50 57.5 USC GS				eLr	Z	19 45 31
					P: C		
					Mag. $5\frac{1}{2}$ - $5\frac{1}{2}$ (Mat.) 3.0 S., 130.4 E. Ceram Sea h: 33 km ca. H= 19 26 29.3 USC GS		
7.	iP	NEZ	12 48 59.1	7.	P	Z	22 03 13.3
	iPcP	Z	52 45.1		i	Z	14.6
	S	E	53 04		i	NE	14.8
	i	N	08		i	N	15.5
	Lq	NE	54 18		i	E	16.1
	Lr Z, eLr	NE	55 45		eS	N	04 56
	P: S,W,C 54.0 N., 160.3 E. Kamchatka. h: 110 km ca. H= 12 44 01.1 USC GS				L	E	05 08
					P: C		
7.	iP	NZ	13 52 57.4		27.8 N., 141.5 E. Bonin Is. region. h: 50 km ca. H= 22 00 58.9 USC GS		
	i	E	58.0	7.	iP	NEZ	22 52 45.2
	i	E	53 10		iS	N	46.5
	P: N,C 7.1 S., 148.1 E. Near east coast of New Guinea. h: 64 km ca. H= 13 44 51.9 USC GS				P: N,E,D		
7.	iP Z, P N		15 27 15.0	8.	iP	NZ	00 59 15.8
	i	E	15.7		ScS	E	01 09 40
	P: D 22.0 S., 179.6 W. Fiji Is. h: 558 km ca. H= 15 16 55.4 USC GS				eSS	E	14 10
					eLq	E	19 33
7.	iP	NZ	16 20 58.9		i	E	22 38
	iS	E	21 19.1		Lr	NZ	24 08
	i	N	19.6		P: N,C Mag. $5\frac{1}{2}$ (Mat.) 28.1 S., 176.8 W. Kermadec Is. region. h: 57 km ca. H= 00 47 27.7 USC GS		
	P: N				H= 00 47 27.7 USC GS		
7.	P	Z	16 28 59.2	8.	iP	EZ	01 46 55.0
	i	Z	29 19.9		i	N	47 24.3
	P: C				P: E,D		
7.	iP	NEZ	16 34 26.1	8.	P	Z	08 03 34
	iS	E	46		i	NE	34.8
	i	N	47		iS	Z	04 05.8
	P: N,E,C				35.1 N., 135.8 E. Honshu, Japan. h: shallow. J.M.A.		
7.	iP	NEZ	18 18 32.7	8.	e	E	10 21.8
	iS	NE	34.0	8.	iP	Z	11 00 43.0
	P: N,E,D				iS E, S N		01 23
7.	iP	NZ	19 34 00.6		i	Z	31
	i	N	01.1		P: N,D		
	PP	N	35 31				
	PPP	N	36 12				
	eS	NE	40 02				
	Lq	N	43 03				
	Lq	E	11				

(cont.) -7-

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
8.	P	EZ	11 34 56		i	N	02 53 42.8
	iS	N	35 02		i	N	49.8
	P: D				i	Z	55 30
8.	e	N	12 32 04		i	Z	59 26
8.	iP	NEZ	15 51 28.7		e	E	28
	S	N	30.6		Lq	E	03 03 15
	P: N				Lr	Z	07 10
8.	P	NZ	19 41 20.5		P: S,E		
	i	E	22.1		Mag. $6\frac{1}{4}$ - $6\frac{1}{2}$ (Mat.)		
	i	N	22.5		4.4 S., 152.7 E.		
	i	Z	34		New Britain.		
	P: S,D				h: 34 km ca.		
	21.9 S., 174.6 W.				H= 02 45 45.5		USCGS
	Tonga Is.			9.	iP	NEZ	04 12 10.5
	h: 33 km ca.				iS	NE	12.1
	H= 19 27 47.6		USCGS		P: N,E,C		
8.	iP	NEZ	20 00 56.8	9.	iP	NEZ	04 12 47.7
	ipP	Z	02 52.3		iS	NEZ	49.8
	PP	Z	03 47		P: N,E,C		
	iS N, S EZ		09 33	9.	iP	NEZ	04 47 26.0
	i	N	34		P: N,E,C		
	SP or SCS E		10 02	9.	iP	NEZ	05 08 54.0
	i	Z	20 28		iS	NE	55.6
	PKPPKP Z		28 34		P: N,E		
	P: S,E,D			9.	iP	EZ	06 18 00.7
	23.6 S., 179.8 E.				i	N	01.0
	Fiji Is. region.				S	N	19
	h: 550 km ca.				i	Z	25
	H= 19 50 29.8		USCGS		P: E,D		
8.	iP	NEZ	21 46 01.3	9.	iP	EZ	12 05 17.8
	iS	N	08.3		i	E	54
	P: N,E				iS	E	59.8
8.	eP	NZ	23 55 51		i	N	06 00
	iS	NE	52.0		P: E		
9.	iP	NEZ	00 23 20.8	9.	iP	Z	12 26 33.0
	P: N,E				i	E	36.5
9.	P	Z	00 29 26		i	N	27 06.5
	22.6 S., 179.5 W.				P: D		
	Fiji Is.				12.3 N., 141.3 E.		
	h: 550 km ca.				Mariana Is. region.		
	H= 00 19 02.7		USCGS		h: 76 km ca.		
9.	iP	NEZ	02 13 51.0		H= 12 21 19.5		USCGS
	iS	EZ	52.7	9.	P	Z	13 01 49
	i	N	54.4		pP	NZ	02 27
	P: N,E,C				14.7 S., 167.4 E.		
9.	iP	NE	02 53 41.6		New Hebrides Is.		
	i	Z	42.5		h: 182 km ca.		
			(cont.)		H= 12 52 15.4		USCGS

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
10.	P e i eS eL	NZ N Z E E	01 19 25.9 31 31.7 27 34 33 00	10.	eP e S	Z NEZ NEZ	16 56 43 59 57 24
	14.0 S., 166.2 E. New Hebrides Is. h: 64 km ca. H= 01 09 47.0				53.3 N., 159.9 W. Alaska Peninsula region. h: 33 km ca. H= 17 01 07.3		
	USCGS				USCGS		
10.	iP i S P: E	EZ N N	02 42 18.4 18.7 40	10.	eP	Z	17 48 10
10.	eP	Z	03 49 59	10.	P iS P: N	NZ N	17 53 00.1 01.8
10.	iP P: S,D	NZ	06 35 42.2	10.	P	Z	13 12 09
	23.0 S., 179.3 E. Fiji Is. region. h: 520 km ca. H= 06 25 14.5				55.2 N., 157.1 W. Alaska Peninsula region. h: 33 km ca. H= 13 03 30.7		
	USCGS				USCGS		
10.	iP iS P: N,E,C	NEZ NZ	08 16 26.6 33.2	10.	P iS P: C	NEZ E	19 01 58.0 02 14.3
10.	P eL	Z E	10 57 20 13.4	10.	iP Z, P N PP S Lq Lq Lr E, eLr Z Lr P: D	Z N E N N N	19 25 09.5 28 08 34 02 41 24 40 44 45 45 00
10.	P	Z	11 48 03.4		Mag. 5 $\frac{1}{2}$ - 6 (Mat.) 19.0 S., 175.8 E. Tonga Is. region. h: 33 km ca. H= 19 14 26.8		
10.	P i iS	EZ N N	12 01 17 24.4 47.3		USCGS		
10.	iP i i P: N,E	NEZ N E	14 06 51.0 07 10.8 11.5	10.	iP iS P: N,E,D	Z N	20 08 44.9 09 09.2
10.	iP i ipP P: N,C	NEZ E Z	14 20 23.6 23.8 21 11.3	11.	P eL Lr	NZ E E	00 03 58 13 32 16 16
	0.1 N., 123.2 E. Northern Celebes. h: 160 km ca. H= 14 13 12				Mag. 5 $\frac{1}{2}$ - 5 $\frac{3}{4}$ (Mat.) 3.4 S., 131.4 E. Ceram region. h: 64 km ca. H= 23 56 26.2		
	USCGS				USCGS		
10.	iP iS P: S,E,D	NEZ N	16 40 40.2 41 04.2	11.	P i i	EZ N Z	01 00 47 47.8 56
					4.1 S., 151.8 E. New Britain. (cont.)		

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
		h: 205 km ca. H= 00 53 12.7	USCGS	11.	eP i	Z Z	17 46 19 21.9
11.	iP i i P: D	Z Z N	02 16 50.7 17 04.6 09.7	11.	eP	Z	22 32 37
							33.1 S., 178.2 W. South of Kermadec Is. h: 21 km ca. H= 22 20 26.6 USCGS
11.	P i S	NZ E N	04 38 15 31 32	11.	iP	Z	22 46 36.0
11.	iP NE , P S P: N,E	Z NE	06 48 20.1 29	12.	ePKP	Z	02 48 34
11.	eP	Z	08 24 54				22.0 S., 67.6 W. Chile-Bolivia border. h: 160 km ca. H= 02 23 53.2 USCGS
11.	P i eL eLr eLr	Z E E N Z	09 07 12 23 16 48 19 50 20.0	12.	P i eS e eL	Z NZ E E E	03 22 37 38.6 31 26 38 51 45 42
		Mag. 5½ (Mat.) 3.5 S., 131.2 E. Ceram. h: 33 km ca. H= 03 59 37.6 USCGS					Mag. 5½ - 5½ (Mat.) 22.5 S., 170.7 E. Loyalty Is. region. h: 54 km ca. H= 03 11 53.9 USCGS
11.	iP N, P iS P: N	E N	09 08 05.0 06.5	12.	eP	Z	03 35 58
							13.5 S., 166.5 E. Santa Cruz Is. h: 68 km ca. H= 03 26 19.4 USCGS
11.	P eS i	NZ N N	11 19 36 20 09 15.0	12.	eP	E	07 31 16
11.	eP	Z	11 55 44				51.6 N., 177.4 E. Rat Is. h: 40 km ca. H= 07 25 02 USCGS
		18.5 S., 177.8 W. Fiji Is. h: 611 km ca. H= 11 45 38.3 USCGS		12.	iP i eL P: C	Z N E	08 31 08.5 09.0 09 02 26
11.	P	NZ	12 42 52				Mag. 5¼ - 5½ (Mat.) 34.9 N., 32.2 E. Cyprus. h: 55 km ca. H= 09 18 57.9 USCGS
11.	iP i S P: E,D	EZ N N	15 06 33.9 34.7 50	12.	iP i i P: N	N Z E	10 03 13.1 13.4 20.9
11.	P	Z	15 13 42				47.0 N., 152.6 E. Kurile Is. h: 60 km ca. H= 09 59 44.9 USCGS
		3.6 S., 127.4 E. Ceram Sea. h: 209 km ca. H= 15 11 16 USCGS					
11.	iP iS i P: N,E,C	NEZ N N	16 42 04.8 47.9 52.4				

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
12.	iP P: N,D	NZ	11	03	15.2	13.	iP e eL P: S,W,C	NEZ Z E	17	12	03.7 15 03 40.0
12.	ePKP 7.7 N., 35.9 W. North Atlantic Ocean. h: 33 km ca. H= 13 10 17.9	Z	13	29	39	13.	iP e i P: N,W	NEZ E N	22	04	01.9 21 22
12.	eP i iS?	NZ Z N	13	51	36 46.9 53.3	13.	eP eS	Z E	22	58	12 52
12.	eP 19.0 S., 175.9 E. Fiji Is. region. h: 33 km ca. H= 14 10 58	Z	14	21	47	13.	S P	NE Z	23	04	22 23 08 51
12.	P i iS?	NEZ Z NE	16	53	21 29.2 37.5	13.	eP i	Z Z	23	18	40 19 09
12.	P	Z	13	34	57	13.	eP eL eL Mag. 5½ (Mat.) 31.3 S., 179.3 W. Kermadec Is. h: 16 km ca. H= 23 33 32.9	Z E E	23	45	37 00 06 35 ca. 10.0
12.	eP i i i	Z N E N	23	03	26 41.9 43.9 44.9	13.	P S	NZ NE	00	21	46 51
13.	P S	NZ NE	00	21	46 51	13.	P i S	Z N NE	00	35	32 32.5 36
13.	iP iS E, S N P: E,D	EZ	01	12	51.3 13 06	13.	iP i i i P: W,C	EZ N E N	12	16	10.4 12.9 21.7 22.2
13.	eP S i	Z Z N	01	16	39 43 44	14.	P eS Lr Lr Mag. 5½ - 5¾ (Mat.) 3.6 S., 131.2 E. Ceram region. h: 33 km ca. H= 00 18 33.4	Z E Z E	00	26	13 32 23 35 59 36 00
13.	iP iS i i P: W,D	EZ N E N	15	16	13.7 23.9 25.0 25.4	14.	eP eL eL 31.3 S., 179.1 W. Kermadec Is. h: 33 km ca. H= 00 38 07.5	Z E E	00	50	09 01 14 30 18.0

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
14.	P	Z	02	13	15.9		P: N,W,C				
	i	N			17.4		35.3 N., 139.2 E.				
	e	E		23	23		Honshu, Japan.				
	e	Z		24	30		h: 10 km ca.	J.M.A.			
	P: C										
14.	iP	Z	03	02	59.7	14.	iP	Z	10	57	29.3
	S	NZ		03	10		i	N			30.2
							S	N			52
							P: D				
14.	P	Z	04	04	19	14.	iP	Z	11	00	44.2
	eS	E		14	14		i	N			44.7
	eScS	E			43		S	NZ			53
	eSS	N		13	56		P: D				
	e	E		20	40	14.	iP N, P E		11	21	05.2
	Lq	E		23	39		i	N			18.2
	Lq	N		29	00		P: N				
	eLr	Z		31.0		14.	iP N, P Z		11	22	55.6
	Mag. 6 $\frac{1}{2}$ - 6 $\frac{1}{2}$ (Mat.)						i	N		23	03.4
	31.4 S., 179.0 W.						P: N				
	Kermadec Is.										
	h: 33 km ca.										
	H= 03 52 16.9	USCGS									
14.	P	NZ	06	46	43	14.	ePKP	Z	12	03	13
	S	E		48	09		20.1 S., 68.2 W.				
							Bolivia-Chile border.				
	42.4 N., 142.3 E.						h: 33 km ca.				
	Near south coast of Hokkaido,						H= 11 48 13	USCGS			
	Japan.										
	h: 50 km ca.					14.	P	Z	12	11	45.3
	H= 06 45 08.3	USCGS					i	N			45.6
							i	N			46.7
14.	iP	NEZ	07	20	53.8	14.	eP	Z	15	35	17
	S	NEZ		24	04		13.7 S., 166.3 E.				
	i	Z		26	18		New Hebrides Is.				
	P: S,W,D						h: 20 km ca.				
	19.0 N., 145.0 E.						H= 15 25 33.3	USCGS			
	Mariana Is. region.										
	h: 610 km ca.										
	H= 07 17 18.5	USCGS									
14.	P	Z	07	27	31	14.	iP	NZ	16	13	23.2
	i	NZ			34		S	E		14	01
	P: C						i	Z			07
							i	Z			14
							P: S,C				
14.	iP	Z	09	23	44.7	14.	iP	Z	18	56	43.2
	i	N			45.0		i	N			43.4
	e	Z		29	35		i	N			57 07.7
	i	N			51.4	14.	P	Z	19	53	09
	eL	E		32	14		36.7 N., 121.8 W.				
	eL	N		33	35		Monterey County , California.				
	P: C						h: 15 km ca.				
	Mag. 4 $\frac{3}{4}$ (Mat.)						H= 19 46 15.8	USCGS			
	25.5 N., 142.6 E.										
	Volcano Is. region.										
	h: 43 km ca.										
	H= 09 26 46.9	USCGS				14.	e	E	21	31	44
							e	N			34.9
14.	iP	NEZ	10	06	34.9		eL	E			37 25
	S	N			49		eL	N			38 03

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
15.	iP	Z	00	56	09.7	15.	eP	Z	11	10	10
	i	N		59	00						
	S	E	01	03	47						
	i	N			52						
	L	E		09	00						
	Lr	Z		11	38						USCGS
	P: S,E,D										
	Mag. 7 $\frac{3}{4}$ (Mat.)										
	10.3 S., 165.6 E.										
	Santa Cruz Is.										
	h: 43 km ca.										
	H= 00 46 54.1										
15.	P	Z	02	06	54	15.	iP	NZ	11	18	03.8
	i	N			57		i	E			04.5
	9.4 S., 167.0 E.										
	Santa Cruz Is.										
	h: 33 km ca.										
	H= 01 57 24										USCGS
15.	iP NZ, P E	EZ	04	09	38.9	15.	eP	Z	11	54	26
	S	EZ		10	06						
	P: N,E,D										
15.	iP	Z	05	34	35.0	15.	P	Z	12	12	18
	i	Z		35	06.7		S	EZ			19.1
	i	Z			19		i	N			19.6
	P: D					15.	P	Z	12	58	45
15.	P	NEZ	06	24	38	15.	eP	Z	13	06	44
	10.2 S., 165.4 E.										
	Santa Cruz Is.										
	h: 28 km ca.										
	H= 06 15 21.7										USCGS
15.	iP	Z	08	30	16.5	15.	iP Z, P E	N	15	29	15.6
	i	N			16.8		i				31
	i	E			17.1	15.	iP	NZ	20	32	45.7
	i	E			45						
	P: D										
15.	eP	Z	08	34	03						
	5.9 S., 146.7 E.										
	North-East New Guinea.										
	h: 89 km ca.										
	H= 08 26 08.7										USCGS
15.	eP	Z	08	43	05	15.	P	Z	22	12	31
	30.4 S., 179.3 W.										
	Kermadec Is. region.										
	h: 33 km ca.										
	H= 08 31 10										USCGS
15.	P	Z	09	17	52	15.	iP	Z	22	23	07.2
	e	E		34	56		S	NZ			39
	13.3 S., 166.4 E.										
	Santa Cruz Is.										
	h: 36 km ca.										
	H= 09 08 09.1										USCGS
15.	iP Z, P E		00	11	31.9	15.	eP	Z	23	30	28
					(cont.)		i	EZ			31 17
							i	N			17.9
16.	iP Z, P E		00	11	31.9	16.	iP Z, P E		00	11	31.9

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	i	NZ	00 11 33.5		i	Z	09 49 43.0
	e	E	15 56		i	E	44
	eL	E	16 41		i	N	47.5
	eL	N	17.3				55.0 N., 166.0 E.
	P: D						Komandorsky Is. region.
	Mag. 4 $\frac{1}{2}$ - 5 (Mat.)						h: 33 km ca.
	22.4 N., 120.5 E.						H= 09 43 55.3 USCGS
	Southern Formosa.						
	h: 33 km ca.						
	H= 00 06 50.3		USCGS	16.	P	NZ	10 26 21
					S	NEZ	33
16.	iP	NZ	00 29 20.4	16.	P	Z	11 54 33
	iS	Z	24.6	16.	iP	NEZ	12 21 55.5
	i	N	25.5		i	NE	22 20
	i	E	26.0				P: N,E,D
	P: N,E,C			16.	iP	EZ	12 23 16.6
16.	iP	Z	01 13 03.3		S	N	33
	i	Z	25				P: S,E,D
	i	N	41	16.	iP	Z	12 55 51.0
	i	E	42		i	NE	51.5
	P: C				i	E	56 09
16.	P	Z	01 43 58		S	N	12
	i	N	44 44				P: D
16.	eP	Z	01 58 26	16.	iP	NZ	13 46 11.3
	i	N	29		i	N	47 10
	e	E	02 06 07		i	E	11
	e	E	08 54		i	N	12.5
	eL	E	14 13				P: S,D
	Mag. 5 (Mat.)			16.	P	EZ	13 52 09
	10.2 S., 165.3 E.				iS	N	43
	Santa Cruz Is.			16.	P	EZ	15 19 04
	h: 33 km ca.				i	Z	31
	H= 01 49 13.7		USCGS		eL	E	29 16
16.	P	Z	06 00 16				Mag. 4 $\frac{1}{2}$ - 5 (Mat.)
	i	NEZ	13				52.3 N., 171.0 W.
	i	N	01 42				Andreanof Is.
	i	N	57				h: 140 km ca.
16.	P	Z	06 40 31				H= 15 11 52 USCGS
	i	N	32	16.	iP	NEZ	15 23 04.4
					S	N	29
	49.6 N., 149.9 E.						P: S,W,D
	Sea of Okhotsk.			16.	iP	NZ	16 33 02.0
	h: 430 km ca.				iS	E	04.6
	H= 06 36 56		USCGS		i	N	05.0
16.	iP	Z	07 42 16.4				P: S,D
	i	N	17.7	16.	P	Z	16 46 13
	i	N	55.0				13.4 S., 166.6 E.
	i	E	56.2				New Hebrides Is.
16.	iP	Z	09 49 29.5				h: 23 km ca.
	i	Z	34.7				H= 16 36 32.0 USCGS
	i	Z	39.7				
	i	N	40.0				

(cont.)

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
16.	P S	Z N	16 46 37 47 01		i P: N,D	Z	17 07 45.4
16.	iP i	Z Z	17 04 51.3 58.5	17.	iP i	Z Z	17 23 50.4 24 11.7
16.	iP i P: W,C 43.2 N., 126.8 W. Off coast of Oregon. h: 33 km ca. H= 17 15 34.5	NEZ E	17 26 40.6 55.4	17.	iP i P: D	Z N	17 46 56.0 59.4
16.	P	Z	19 55 25	17.	P i	Z Z	18 28 09 34
16.	iP i i eC e eL eL P: C Mag. 5 $\frac{1}{2}$ - 5 $\frac{1}{2}$ (Mat.) 13.4 S., 166.5 E. Santa Cruz Is. h: 28 km ca. H= 20 05 21.9	Z N E N E E E	20 15 03.5 03.7 03.9 22 51 23 20 27 58 31 28	17.	iP NZ, P S	E NEZ	18 38 07.9 14.4
16.	P i	EZ E	21 02 18 03 41	17.	eP i	Z NZ	19 01 22 40
17.	ePKP i i e e eL eLr Mag. 5 $\frac{3}{4}$ - 6 (Mat.) 10.6 S., 78.2 E. Central Peru. h: 61 km ca. H= 05 54 33.7	Z Z Z E E E E	06 13 43 54 14 13.5 36 36 58 59 07 00.7 01 44	17.	iP i i P: C 10.1 S., 165.0 E. Santa Cruz Is. h: 36 km ca. H= 19 57 40.3	Z N E	19 29 24.9 26.4 26.9 32 31 37 07 44 41 45 05
17.	P i i	Z NZ N	11 53 17 19.3 32.7	17.	P iP i i P: C 10.1 S., 165.0 E. Santa Cruz Is. h: 36 km ca. H= 19 57 40.3	Z Z N E	19 34 51 20 06 52.5 53.1 53.4
17.	iP iS i i P: N,W,C	Z E N Z	16 20 00.1 44.2 44.5 45	17.	iP i P: D 9.9 S., 164.7 E. Santa Cruz Is. h: 33 km ca. H= 20 00 56.6	Z Z	20 10 11.4 20 38 05.2 57
17.	iP i	Z NE	17 07 19.0 45.1 (cont.)	17.	ePKP i	Z Z	20 52 52 53 06 (cont.)

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
			Near coast of southern Chile. h: 33 km ca. H= 20 32 58.1	18.	iP P: D	Z	10 37 24.5
17.	eP	Z	21 22 41	18.	eP i	Z N	13 05 01 21
			6.7 S., 105.3 E. Java. h: 33 km ca. H= 21 13 23	18.	P i	Z Z	14 20 59 21 32
17.	eP S	Z N	22 34 48 35 05	18.	P	Z	15 48 42
17.	P	NEZ	22 37 44	18.	iP eS e eSS e eL eLr P: C	Z E N E E E Z	17 10 16.3 20 18 23 25 22 31 22 32 33 42 55
			10.2 S., 165.1 E. Santa Cruz Is. h: 33 km ca. H= 22 23 29.6				Mag. 6½ (Mat.) 40.9 N., 29.2 E. Turkey. h: 33 km ca. H= 16 58 12.5
17.	eP	Z	22 43 04				USCGS
			10.0 S., 164.9 E. Santa Cruz Is. h: 33 km ca. H= 22 33 49.8	18.	P i	Z	17 25 26
17.	eP iS i	Z Z NE	22 47 22 23.5 28.8				3.3 S., 139.9 E. Western New Guinea. h: 90 km ca. H= 17 18 00.3
17.	iP S i i P: S,W,C	NEZ E Z N	22 59 51.8 23 00 02.6 03.1 03.3	18.	iP P: W,C	EZ	17 34 59.0
18.	iP S i P: S,W,C	NEZ EZ N	02 03 27.0 44 46	18.	P i i	EZ NE Z	18 47 34 48 25.7 27
18.	eL	E	02 17 38	18.	P S	Z NEZ	23 25 39 41 42
			10.7 S., 165.1 E. Santa Cruz Is. h: 23 km ca. H= 01 55 46.2	18.	P S	EZ NEZ	23 53 08 37
18.	iP EZ, P N i S P: S,W,D	N N N	03 45 38.1 33.5 46 06	19.	P i i	Z Z N	00 55 04 12.9 37
18.	eL	E	04 22 17	19.	iP P: C	Z	09 10 00.3
			10.2 S., 165.2 E. Santa Cruz Is. h: 33 km ca. H= 04 00 24.1				22.0 S., 179.6 W. Fiji Is. region. h: 563 km ca. H= 08 59 40.6
18.	P i	Z NE	08 09 14 47	19.	P S i	EZ E N	09 40 27 43 48

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
19.	P i	Z NE	11 05 10 26	20.	P i	Z 76.5 N., 7.9 E. Svalbard region. h:33km ca. H=03 03 32.9	03 13 53 USCGS
19.	iP S i i P:N,E,C	NEZ NE Z	15 54 30.5 55 11 12	20.	P i	Z N	06 46 23 24
19.	iP S P:W,D	NEZ N	18 51 17.3 22	20.	iPKP P:C	Z 21.5 S., 68.3 W. Bolivia - Chile border. h:125km ca. H=07 25 11.8	07 44 54.7 USCGS
19.	iP i P:C 15.2 S., 167.6 E. New Hebrides Is. h: 161 km ca. H= 19 29 17.0	Z NE	19 38 57.6 57.9	20	P i i i i	Z E N Z N	08 57 53 54 55.4 58 06.2 59 09.7
19.	P	Z	20 13 02	20.	iP iS P:N,W,D	NEZ NE	11 21 07.0 08.7
19.	iP i i i P:S,E	NE E NZ E	20 25 48.9 49.1 26 09 09.4	20.	iPKP iP S i i P:N,C	NE E E Z	12 49 27.3 27.5 33 39
19.	iP i P:N,W,D	NEZ Z	21 04 26.3 08 24	20.	iPKP i i i i	Z Z Z NZ E	15 01 02.6 14.7 38 46.5 50.5
19.	P S i	Z E N	21 14 13 37 39	20.	iPKP i i i i P:N,C	Z Z Z NZ E	15 01 02.6 14.7 38 46.5 50.5
19.	ePKP 18.1 S., 69.3 W. Chile-Bolivia-Peru border. h; 174 km ca. H= 21 10 18*	Z	21 29 49 USCGS	20.	iPKP i i i i P:N,C	Z Z Z NZ E	15 01 02.6 14.7 38 46.5 50.5
19.	iP i i S P:D	Z E N Z	22 35 04.4 04.6 04.9 43	20.	P iP i i	Z NZ Z N	17 09 08.7 17 33 24.3 52.7 54
20.	iPNZPE i i P:S,D 0.2 N., 124.0 E. Northern Celebes. h: 122 km ca. H=23 57 58.*	Z N	00 05 04.9 08.8 11.5 USCGS	20.	iP i i	Z N Z	19 09 10.9 19.0 50.7
20.	P i	Z E	00 52 17 32	20.	iP	Z	19 48 09.9 (cont.)

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Date	Phase	Comp.	Time(GMT)
			h m s
20.	i	E	19 48 11.4
	iS	NZ	44.4
	i	Z	48
20.	iPKP1	EZ	22 31 04.9
	iPKP2	Z	46
	i	N	49
	P:W,D		
	17.8 S., 68.8 W.		
	Peru - Bolivia border.		
	h: 171 km ca.		
	H= 22 11 32.2 USCGR		
20.	P	EZ	23 49 23
	S	EZ	40
	i	N	42
21.	eP	Z	00 52 18
	e	E	01 00 17
	eL	E	03 47
21.	P	Z	04 03 02
	eL	E	12 05
	O.C., 119.7 E.		
	Northern Celebes.		
	h: 47 km ca.		
	H= 03 55 26.6 USCGR		
21.	iP	NEZ	03 00 12.8
	S	NE	23
	P:S,E,D		
21.	P	Z	08 46 18
	i	E	33.3
21.	iP	NEZ	09 18 28.8
	S	EZ	19 16.8
	P:S,E,C		
	40.4 N., 140.0 E.		
	Near east coast of Honshu, Japan.		
	h: 179 km ca.		
	H= 09 17 25.3 USCGR		
21.	P	Z	11 11 42
	i	NEZ	44.3
	i	E	45.5
21.	iP	Z	11 26 03.3
	iS	E	25.3
	P:S,E,D		
	35.9 N., 140.1 E.		
	Ibaragi Pref, Japan.		
	h: 80 km ca. J.M.A		
21.	iPEZPPN		12 33 15.3
	i	NE	44.4
	i	Z	53.8
	P:W,D		

Date	Phase	Comp.	Time(GMT)
			h m s
21.	F ⁺	Z	16 34 55
	i	Z	38.3
21.	iP	Z	16 53 43.9
	i	E	53.4
	P:D		
	54.9 N., 161.5 E.		
	Near east coast of Kamchatka.		
	h: 33 km ca.		
	H= 16 53 28.2		
21.	P	Z	18 27 24
	i	NZ	33.5
	i	E	35.7
	i	NZ	29 08
	i	E	09.9
	e	E	30 50
	eL	E	32 23
	Mag. 4½ (Mat)		
	24.2 N., 125.1 E.		
	Ryukyu Is.		
	h: 33 km ca.		
	H= 18 23 32.2 USCGR		
21.	P	Z	21 25 30
	i	EZ	33.4
	iS	NE	52.5
21.	iP	Z	23 05 52.3
	iS	EZ	06 40.3
	P:C		
22.	iP	NEZ	02 55 57.3
	PcP	Z	58 20.3
	P:N,E,D		
	52.5 N., 174.9 W.		
	Andreanof Is, Aleutian Is.		
	h: 105 km ca.		
	H= 02 49 03.4 USCGR		
22.	iP	NEZ	03 07 09.0
	S	N	16 06
	SSS	E	23 12
	Lr	NE	27 09
	P:S,D		
	Mag. 6¼ - 6½ (Mat)		
	19.3 S., 175.9 E.		
	Fiji Is. region.		
	h: 23 km ca.		
	H= 02 56 24.3 USCGR		
22.	iP	NEZ	04 00 26.6
	iS	N	49.8
	i	Z	53
	P:S,W,C		
22.	iPZPNE		08 34 36.6
	S	NEZ	56
	P:C		

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp	Time(GMT)
			h m s				h m s
22.	P	NZ	09 30 21	23.	iP	NEZ	15 07 24.1
					iS	NE	33.5
22.	iP	NEZ	12 24 58.0		P:N,E,C		
	i	Z	25 33.5	23.	iP	NEZ	17 09 14.9
	P:N,E,C				i	Z	29.4
22.	iP	Z	14 31 33.4		PKP	Z	11 54.4
	P:C				S	E	14 37
22.	iPNZPE		19 32 42.0		L	E	15 57
	i	E	42.6		P:S,W,C		
	S	E	41 36		Mag. 5 $\frac{1}{2}$ -5 $\frac{1}{4}$ (Mat)		
	SSS	E	48 49		51.3 N., 179.2 W.		
	eLr	E	52 22		Andreanof Is., Aleutian Is.		
	Lr	E	35		h: 33 km ca.		
	P:S,I				H= 17 02 36.6	USCGS	
	Mag. 5 $\frac{1}{2}$ -6(Mat)			23.	iP	NEZ	21 39 45.8
	19.2 S., 175.9 E.				P:S,W,C		
	Tonga Is. region.			24.	P	NEZ	03 00 47
	h: 24 km ca.				i	Z	48.6
	H=19 21 57.1	USCGS			iS	NEZ	01 06.6
22.	iP	NEZ	23 32 09.8	24.	iP	NEZ	03 09 41.4
	iS	NEZ	15.0		i	Z	44.6
	P:N,E,C				i	N	56.9
23.	iPZPNE		05 45 23.3		P:N,E,D		
	P:D			24.	iP	Z	08 07 40.0
	7.3 S., 122.1 E.				i	Z	08 30.8
	Flores Sea,				S	E	31
	h: 543 km ca.				i	Z	15 22
	H= 05 37 46.5	USCGS			P:C		
23.	P	Z	05 57 42	24.	PKP1	EZ	08 15 22
	i	Z	43.3		e	N	28
	i	Z	59.6		PKP2	Z	43
23.	iPZPNE		06 45 15.0		15.8 S., 13.3 W.		
	i	E	20.7		Atlantic Ocean, South of		
	i	Z	46		Ascension I.		
	P:D				h: 33 km ca.		
23.	e	E	07 42 00		H= 07 55 41.4	USCGS	
	eL	E	45 13	24.	iPNZPE		03 16 04.0
	16.6 S., 28.6 E.				P:N,C		
	Northern Rhodesia.			24.	iPNZPE		14 10 39.2
	h: 33 km ca.				P:S,D		
	H= 06 40 36.5	USCGS		24.	P	NZ	15 14 02.6
23.	PS	E	09 31 06		i	Z	04.0
	SS	F	37 37		i	E	06.5
	Lr	E	48 58	24.	eP	Z	15 54 35
	Lr	E	54 42		10.5 S., 164.6 E.		
	Mag. 5 $\frac{1}{2}$ - 6(Mat)				Santa Cruz Is. region.		
	16.6 S., 28.8 E.				h: 33 km ca.		
	Northern Rhodesia.				H= 15 45 24.7	USCGS	
	h: 33 km ca.						
	H= 09 01 56.8	USCGS					

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Date	Phase	Comp.	Time(GMT) h m s.	Date	Phase	Comp.	Time(GMT) h m s.
24.	PKP	NZ	16 49 24	25.	P	Z	14 59 31
	i	Z	31.5		i	N	35.0
	i	N	33.0		i	N	55
	i	E	37.0		S	E	15 07 05
	pPKP	Z	50 03		L	E	14 42
	ePP	Z	15 52 21		Mag. $5\frac{1}{2}$ - $5\frac{3}{4}$ (Mat)		
	e	NZ	25		10.1 S., 164.5 E.		
	SKKS	E	59 13		Solomon Is. region.		
	SKSP	Z	17 02 10		h: 33 km ca.		
	SP	E	56		H= 14 50 13.2 USC GS		
	SPSor			25.	eP	Z	20 09 22
	SSP	Z	04 54		i	NE	27.0
	SS	E	10 45		i	Z	23.0
	SSS?	E	16 00	25.	P	Z	21 06 27
	L	N	26 25		10.5 S., 164.7 E.		
	L	N	33 30		Santa Cruz Is. region.		
	Mag. $6\frac{1}{2}$ (Mat)				h: 36 km ca.		
	10.6 S., 73.0 W.				H= 20 57 15.2 USC GS		
	Near coast of Freu.			26.	eP	Z	00 37 37
	h: 80 km ca.			26.	iP	NZ	00 50 55.0
	H= 16 30 16.0 USC GS				iS	NE	51 16.5
24.	eP	Z	22 17 42		P:S,E,D		
	10.3 S., 164.6 E.			26.	iP	EZ	01 37 25.3
	Santa Cruz Is.				i	N	26.5
	h: 33 km ca.				iS	NE	51.0
	H= 22 03 32.1 USC GS				P:E,C		
25.	iP	Z	03 04 04.3	26.	P	Z	03 23 34.5
	eS	Z	11		i	Z	29 03.5
	P:C			26.	P	Z	04 29 04
25.	P	EZ	06 58 49.6		e	E	38 17
	S	NE	59 08		L	E	40 10
25.	eP	Z	11 39 52		L	E	42 43
	eS	Z	40 29		56.5 N., 153.4 E.		
25.	P	Z	12 40 25		Kodiak I. region.		
	eS	E	40		h: 33 km ca.		
25.	P	Z	12 56 25.4		H= 04 20 21.5 USC GS		
	i	Z	27.2	26.	iP Z, P NE		05 34 56.5
	15.2 S., 167.4 E.				PP	Z	36 11
	New Hebrides Is.				PcP	Z	37 28.3
	h: 122 km ca.				i	Z	43.0
	H= 12 46 42.0 USC GS				i	Z	50.5
25.	eP	Z	13 09 03		S	E	40 27
25.	P	Z	13 17 44		i	E	42 06
25.	P	Z	14 10 06.5		L	E	43 00
	S	E	17 40		L	E	40
	L	E	25 16		P:D		
	Mag. $5\frac{1}{2}$ (Mat)				Mag. $5\frac{1}{2}$ (Mat)		
	10.2 S., 164.6 E.				50.4 N., 176.9 W.		
	Solomon Is. region.				Andreevof Is.		
	h: 33 km ca.				h: 33 km ca.		
	H= 14 00 54.6 USC GS				H= 05 23 07.3 USC GS		

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
26.	iP	NZ	06 02 55.0		i	E	04 04 57.0
	pP	Z	03 32.5		iS	NE	05 37.0
	PF	Z	04 41.5		P:C		
	P:N,W						
	5.6 S., 143.0 E.						
	New Britain region.						
	h: 156 km ca.						
	H= 05 55 09.7						
	USCGS						
26.	iP	Z	06 49 25.7	27.	eP	Z	09 17 22
	P:D				eS	Z	13 24
	56.6 N., 153.2 W.						
	Kodiak I. region.			27.	eP	Z	10 33 30
	h: 33 km ca.				S	E	47 09
	H= 06 40 43.5				L	E	56 53
	USCGS				L	Z	57 00
					Mag. 5 $\frac{3}{4}$ -6 (Mat)		
					17.1 S., 174.6 E.		
					Fiji Is. region.		
					h: 33 km ca.		
					H= 10 23 04.1		
					USCGS		
26.	eP	Z	07 36 17	27.	P	Z	11 07 12
26.	P	NZ	03 05 20		i	Z	23.2
	S	NE	47				
26.	iF	Z	10 25 34.6	27.	eP	Z	11 10 05
	i	Z	44.0		S	E	15 04
	eS	N	26 19		e	E	40
	P:C				L	E	16 03
					Mag. 5 $\frac{3}{4}$ -6 (Mat)		
					11.3 N., 126.0 E.		
					Off east coast of Leyte,		
					P.I.		
					h: 17 km ca.		
					H= 11 04 17.3		
					USCGS		
26.	iP	NEZ	12 27 43.5	27.	P	Z	11 12 43
	P:S,E,D				eS	Z	13 04
26.	iP	NEZ	14 30 06.0	27.	P	EZ	11 17 12
	iS	E	07.7		i	N	29.5
	P:N,E,C						
26.	iP	NZ, P E	20 43 25.0	27.	P	Z	11 36 15
	PPP	Z	45 32		i	EZ	30.3
	L	E	52 42		i	N	35.3
	Lr	E	54 33		e	E	43 17
	P:N,C				ScS	E	45 12
	Mag. 5-5 $\frac{1}{4}$ (Mat)				L	E	54 53
	3.3 S., 141.9 E.				L	Z	55
	Near east coast of New Guinea.				Mag. 6 $\frac{1}{4}$ -6 $\frac{1}{2}$ (Mat)		
	h: 33 km ca.				17.2 S., 174.7 E.		
	H= 20 35 54.3				Fiji Is. region.		
	USCGS				h: 33 km ca.		
					H= 11 25 53.6		
					USCGS		
26.	P	NZ	22 49 40	27.	iP	Z	11 53 21.9
	i	N	43.5		i	Z	12 00 13.4
	eS	E	51 07		i	N	21.4
	e	N	10		P:C		
	eL	N	17	27.	P	Z	13 31 14.4
27.	iP	Z	04 04 53.7	27.	iP	NEZ	14 38 05.3
	i	NE	55.5				
	i	Z	56.3				

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Date	Phase	Comp.	Time(GMT)		
			h	m	s
23.	iP Z, P NE P:D 13.1 S., 177.9 W. Fiji Is. h: 604 km ca. H= 11 06 00.4		11	16	03.4
		USCGS			
23.	iP Z i N i Z P:D		11	24	45.6 25 06.9 07.9
23.	iP NEZ i Z P:S, W, C		13	34	00.6 22
23.	iP Z, P E i E eS N P:C		13	43	06.9 17.9 44 06
23.	P Z PcP N PP N 3.5 S., 102.0 E. Near coast of Sumatra. h: 29 km ca. H= 13 42 25.2		13	51	35 52 49 53 54
		USCGS			
23.	P Z eS Z		19	10	36 11 11
23.	iP Z i NE i N iS NE P:D		19	17	09.5 10.0 11.0 44.2
23.	iP NZ, P E S NE P:N, D		19	19	13.2 52
23.	P NZ S E		19	23	22 54
23.	iP Z i NEZ eS E P:C		22	30	55.6 56.2 32 13
23.	iP Z P:D		22	54	52.5
23.	eP Z S Z		23	23	05 47
29.	SS E L E 62.0 S., 163.5 E.		03	27	00 47 07

(cont.)

Date	Phase	Comp.	Time(GMT)		
			h	m	s
		Balleny Is. region. h: 33 km ca. H= 02 55 05*			
		USCGS			
29.	iP Z i E eS E i N P:C		05	32	42.3 42.7 33 29 32
29.	iP Z iS NEZ P:C		07	16	10.3 15.2
29.	P Z i Z eS E i N		03	37	27.3 28.5 40 46
29.	iP Z iS EZ P:C		09	56	32.4 33.5
29.	iP Z iS Z P:C		09	56	56.7 58.7
29.	P Z 28.3 S., 177.3 W. Kermadec Is. h: 116 km ca. H= 10 06 43.4		10	13	22.5
		USCGS			
29.	P Z 36.6 N., 29.2 E. Near north coast of Turkey. h: 33 km ca. H= 13 35 45.3		13	43	03
		USCGS			
29.	iP Z P:D		15	40	30.5
29.	iP Z iS NEZ P:C		16	20	06.3 33.3
29.	iP EZ, P N i Z P:W, D		17	17	45.0 13 05.7
29.	P Z 0.1 S., 130.4 E. Spice Is. region. h: 33 km ca. H= 13 16 21*		13	23	30
		USCGS			
29.	P Z i Z i E		19	23	31 44.6 24 43.3

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
29.	iP PcP S L L P:C	Z Z NE E Z	19 41 23.1 44 09 46 30 48 37 48	30.	F S	Z NE	16 29 39 30 27
	Mag. $5\frac{1}{2}$ - $5\frac{1}{2}$ (Mat.) 6.0 N., 125.3 E. Mindanao, P.I. h: 117 km ca. H= 19 35 01.6 USC GS			30.	iF i iS P:E,D	EZ N NE	18 12 20.3 20.7 33.3
29.	iP P:C	Z	19 47 44.6	30.	P i PP S L	Z Z Z E E	23 05 40 49.0 06 08.5 10 13 11 27
29.	iP i S i P:C	Z Z E N	20 34 31.3 32.1 37 15 19		Mag. $5\frac{1}{2}$ (Mat) 9.4 N., 142.3 E. Mariana Is region. h: 33 km ca. H= 22 59 52.3 USC GS		
	21.6 N., 142.9 E. Volcano Is. region. h: 325 km ca. H= 20 31 10.1 USC GS			29.	iP eS P:D	Z E	22 01 27.9 57
29.	P	Z	22 29 26	29.	iP eS P:D	Z E	22 01 27.9 57
	36.1 N., 19.0 E. Ionian Sea. h: 47 km ca. H= 22 16 38.4 USC GS			30.	iP Z, P E		09 01 19.2
	1.3 S., 128.5 E. Ceram Sea. h: 30 km ca. H= 08 54 15.0 USC GS			30.	iF i e eL P:C	Z N Z E	09 01 35.5 36.5 50 10 07
30.	eP	Z	12 43 50	30.	eP	Z	12 43 50
	52.6 N., 169.5 E. Fox Is. Aleutian Is. h: 33 km ca. H= 12 36 28.4 USC GS			30.	P i	Z Z	14 10 02.3 05.6
30.	iP iS P:E,C	EZ, F N NE	15 19 38.3 51.2				

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
1.	iP S P;D	Z E	00 50 36.2 51 08	2.	iP S P:N,E,C	NEZ NE	05 53 43.0 56
1.	P i i eS	Z Z N NE	05 04 28 30 44 07 53	2.	iP eS e eL P:C	Z E N E	05 53 32.5 06 07 54 08 04 20 34
			18.5 N., 145.2 E. Mariana Is. h: 225 km ca. H= 05 00 21.8				Mag. 5½(Mat) 20.8 S., 174.1 W. Tonga Is. h: 33 km ca. H= 05 47 05.5
1.	iP P:N.,W.D	NEZ	07 36 49.5	2.	iP i P:E,D	EZ NEZ	06 07 04.2 17.3
1.	eP i i	Z Z N	12 41 57 42 07 10	2.	iP i iS i P:N,D	NZ E Z NEZ	07 12 01.4 01.9 16.9 17.3
1.	iP Z, P N i e e P:C	E E E	12 43 04.5 05.0 44 26 46 30	2.	iP iS S P:W,C	EZ N NE	09 52 32.7 32.9 53 50
1.	iP iS P:W.,D	EZ NEZ	16 06 11.0 13.4				36.3 N., 142.4 E. Off east coast of Honshu, Japan h: 43 km ca. H= 09 51 41.1
1.	iP i i P:W,C	EZ NEZ Z	19 48 39.2 39.6 49 17	2.	iP NZ, PE S? i P:N,C	NE NE Z	10 28 50.1 29 47.6 48.2
2.	iP i P:D	Z Z	00 12 05.5 27	2.	eP eL	Z E	12 21 33 27 00
2.	P i	Z EZ	01 17 14 27.2	2.	iP NZ, P E P:N,D		14 16 25.9
2.	iP Z, P N i PPP? e eL eLr	E Z E E E	03 39 24.0 25 41 13.4 22 49 07 51 36	2.	iP S P:N,W,D	NZ NEZ NEZ	14 25 50.5 18 17 54.0 13 15
			Mag. 5½(Mat) 5.4 S., 52.0 E. New Britain. h: 65 km ca. H= 03 31 27.0				USCGS
2.	iP Z, P NE i i i P:C	Z Z NE Z	04 46 59.6 47 10 50 48 18	3.	P S	NEZ N	00 13 46 14 25
2.	iP S	NEZ N	05 44 07.7 09	3.	P i i P:S	NZ NE E	03 28 22.3 26 37
2.	iP S	NEZ N	05 44 07.7 09	3.	iP	NEZ	04 22 29.9 (cont)

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
5.	iP S P:C	Z NEZ	09 15 28.6 35.2	6.	iP S P:E,D	NEZ NE	10 14 49.2 15 02.6
5.	iP i P:S,C	NZ E	11 03 44.7 45.0	6.	iP Z, P N S P:C	N	10 38 48.0 39 27
5.	iP Z, P E i S P:C	N EZ	12 20 44.0 45.6 21 02	6.	P i S i	Z E N EZ	11 47 40 41.4 48 21.6 22.6
5.	iP i S P:S,D	NZ E NE	14 02 08.2 09 24	6.	P S	E NE	11 49 36 50 15
5.	eP eS eL eL eL	Z E E E E	15 10 36 21 20 34 13 43.5 46 00	6.	iP i P:E,D	EZ N	12 43 12.3 41
	Mag. 5 $\frac{1}{2}$ (Mat) 11.6 N, 42.8 E./ French Somaliland. h: 33 km ca. H= 14 57 47.4 USCGS			6.	iP i P:C	Z Z	15 21 35.6 44.6
					22.0 S., 69.4 W. Northern Chile. h: 33 km ca/ H= 15 01 42.1 USCGS		
5.	P i	Z N	18 15 12 49	6.	ePKP1 PKF 2	Z Z	17 35 28 48
5.	iP P:E,D	EZ	20 26 17.7		33.9 S., 70.0 W. Central Chile. h: 101 km ca. H= 17 15 33.9 USCGS		
	52.1 N, 178.1 E. Rat Is. h: 140 km ca. H= 20 20 02.7 USCGS			6.	iP P:C	Z	21 35 07.1
5.	P i S P:C	Z NEZ N	23 53 41.2 41.7 55 50	6.	iP i S i P:D	Z NZ NEZ NE	22 02 29.5 40.1 03 19 24
	45.3 N., 150.0 E. Kuriho Is. h: 50 km ca. H= 23 50 46.3 USCGS			7.	iP i P:D	Z E	02 35 33.2 33.6
6.	P S	Z NEZ	02 56 00 37	7.	iP i S P:D	Z Z E	05 47 19.3 56 48 34
6.	iP S P:W,D	EZ NEZ	05 11 09.4 21.7	7.	iP S i P:S,E,C	NEZ NE E	07 13 08.6 22 31
6.	P S	Z NEZ	05 26 53 54	7.	iP	NEZ	07 52 09.9 (cont.)
6.	iP S P:D	Z NE	05 42 36.3 43				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	S	NEZ	07 52 15		Lr	E	00 48 00
	P:S,E,C				Lr	Z	48
7.	eP	Z	12 14 35		P:E		
	S	Z	15 26		Mag. 5½(Mat)		
7.	iPKP	Z	13 03 10.5		15.1 S., 173.2 W.		
	PKP,C				Samoa Is. region.		
					h: 33 km ca.		
					H= 00 17 01.1		USCGS
				8.	P	Z	01 51 35
				8.	P	Z	02 10 11.7
					S	N	47
7.	iP Z, P NE	NE	13 10 22.8		P:CC		
	i	EZ	45	8.	iP	Z	02 13 32.0
	P:C				P:D		
7.	iP	NEZ	13 24 52.0		21.2 S., 177.9 W.		
	i	EZ	53.1		Fiji Is. region.		
	pP	Z	26 42		h: 380 km ca.		
	ePP?	E	28 00		H= 02 02 53.4		USCGS
	S	NE	33 31				
	eSS	E	33 24	8.	eL	E	06 38 14
	eG	E	44 04		eL	E	41 40
	P:S,E,D				11.3 N., 125.9 E.		
					Samoa region. P.I.		
					h: 39 km ca.		
					H= 06 26 17.6		USCGS
				8.	P	NZ	07 50 32
7.	iP	EZ	16 36 24.1	8.	iP	Z	03 07 46.2
	i	NE	40		S	NEZ	48
	P:W,D			8.	P	Z	10 48 36
7.	iP	NEZ	16 38 16.1		i	Z	42
	S	NE	17		i	Z	49 27.5
	P: N				i	Z	50 27
7.	e	E	21 56 56		28.7 S., 69.8 W.		
					Central Chile.		
					h: 71 km ca.		
					H= 10 29 04		USCGS
				8.	iP	NEZ	14 57 38.2
7.	e	E	23 18 00		i	NE	55
					P:N,E,D		
7.	P	Z	23 39 19	8.	iP	NEZ	17 42 26.0
	eS	E	43 16		iS	NE	27.7
	eL	E	45 24		P:N,E		
				8.	P	NEZ	18 50 14
					S	NEZ	20
				8.	iP	Z	20 36 17.8
					P:D		
8.	iP	E	00 28 04.1		2.6 N., 128.4 E.		
	i	NZ	04.7		Halmahera.		
	S	E	37 11		h: 156 km ca.		
	eLq	E	44 56		H= 20 29 40.1		USCGS
			(cont.)				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
8.	iP i P:C	Z NE	23 12 12.8 22	9.	eP 44.0 N, 147.5 E. Kurile Is. h: 33 km ca. H= 21 20 30	Z	21 23 00 USCGS
	19.4 S, 175.8 W Tonga Is. region. h: 182 km ca. H= 23 01 16.0		USCGS	9.	iP S P:N,E,C	NZ NEZ	23 38 16.8 55
9.	iP Z, P N S P:C	E	02 49 48.2 50 51	9.	eP 8.4 S, 126.1 E Timor. h: 229 km ca. H=23 40 57	Z	23 49 22 USCGS
9.	e 18.6 S, 173.7 W. Tonga Is. h: 33 km ca. H= 05 12 26.9	E	05 47 46 USCGS	10.	P 5.6 S, 145.6 E. New Britain h: 102 km ca. H=00 50 35.4	Z	00 58 22.2 region. USCGS
9.	P i i	Z Z N	07 00 40 50 51	10.	iP P:E,D	EZ	05 30 21.0
9.	iP S P:S,D	NZ NE	07 31 40.6 56	10.	eP i	Z N	07 55 03 36
9.	P S?	Z N	08 28 01 10	10.	iP i P:N,E,C	NEZ Z	08 16 27.4 17 09
9.	iP P:N,C	NZ	10 14 27.5	10.	eP 46.0 N, 153.7 E. Kurile Is. region. h: 45 km ca. H= 10 15 17.4	Z	10 13 48 USCGS
9.	iP S	NZ NE	10 16 12.7 14	10.	iP P:C 12.6 S, 167.0 E. Santa Cruz Is. h: 223 km ca. H= 14 16 31.1	Z	14 25 46.1 USCGS
9.	eP eL	Z E	10 38 04 44 58	10.	P 12.4 N, 144.0 E. Mariana Is. h: 35 km ca. H= 16 49 52.0	Z	16 55 10 USCGS
9.	P 20.3 S, 174.4W. Tonga Is. h: 33 km ca. H= 10 36 53.4	Z	10 48 20.8 USCGS	10.	iP i i i P:E,C	Z N NE Z E	21 05 14.3 16.4 30 37 40
9.	iP S P:N,C 27.7 N, 138.5 E. South Honshu, Japan. h: 556 km ca. H= 14 36 32.2	NZ N	14 33 38.0 40 17 USCGS				
9.	P S	Z NZ	14 48 28 33				
9.	iP S P:S,C	NZ NZ	20 44 40.6 45 04				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
10.	eP S i	NZ NE Z	22 01 33 54 55				
						44.8 N., 149.0 E. Kurile Is. h: 40 km ca. H= 11 26 57.9	USCGS
11.	F	Z	00 11 39	12.	P	Z	11 55 39
	24.1 S, 179.6 W. Fiji Is. region. h: 437 km ca. H= 00 01 13.0		USCGS		46.0 N, 143.8 E. Kurile Is. h: 33 km ca. H= 11 53 05		USCGS
11.	P S P:W,D	EZ N	03 58 40.4 59 13	12.	P i i	Z Z E	12 05 05 13 27
11.	P i	Z Z	05 56 20 54			44.4 N, 149.6 E. Kurile Is. h: 40 km ca. H= 12 02 18.3	USCGS
11.	P i	NZ Z	11 16 28.4 39	12.	P i	Z Z	12 35 21 33
	P:N,D 46.0 N, 151.9 E. Kurile Is. h: 30 km ca. H= 11 13 11.0		USCGS		44.7 N, 149.6 E. Kurile Is. h: 40 km ca. H= 12 32 35.3		USCGS
11.	iP e S P:S,W,D	NEZ N NE	12 14 50.5 15 14 39	12.	iP i	NEZ Z	13 09 48.6 10 09
	Mag. 4.9(Mat) 35.0 N, 135.2 E. Southern Honshu, Japan. h: 379 km ca. H= 12 13 49		USCGS		P:N,E,D 44.5 N, 149.4 E. Kurile Is. h: 50 km ca. H= 13 07 07.9		USCGS
11.	P i S	NZ E E	14 12 53 55 13 36	12.	P	NZ	13 32 17
					44.5 N, 149.3 E. Kurile Is. h: 50 km ca. H= 13 29 36.4		USCGS
12.	iP S P:C	Z NE	01 35 58.6 36 40	12.	iP i	Z Z	13 57 39.2 51.3
12.	iP Z, P E S P:D	NE	02 52 28.5 43.3		P:D 43.5 N, 151.1 E. Kurile Is. h: 40 km ca. H= 13 54 58.3		USCGS
12.	iP i P:D	Z Z	05 27 28.3 37.8	12.	P	NEZ	14 17 52
					44.7 N, 149.5 E. Kurile Is. h: 45 km ca. H= 14 15 08-		USCGS
12.	iP Z, P NE i i S L L P:S,W,C Mag. 6.3 (Mat)	NEZ NEZ E E N Z	11 29 39.5 43.8 31 11 58 32 22 40	12.	P i i eS	Z NEZ Z E	16 14 36.5 37.3 49 16 46

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	eL	E	16 17 30				
	P:D				17;9 N, 145;2 E.		
					Mariana Is. region.		
					ht 639 km ca.		
					H= 21 17 37		USCGS
12.	P	Z	16 30 53.4	12.	P	Z	21 23 43
	i	NEZ	31 07		i	Z	54
	eL	E	34 19	12.	P	EZ	22 04 46.2
					S	N	07 02
					eL	E	59
					P:W,C		
					44.5 N, 149.5 E.		
					Kurile Is.		
					h: 45 km ca.		
					H= 22 02 01.2		USCGS
12.	iP	NZ	18 03 33.7	12.	P	Z	22 10 12.2
	eL	E	12 54		i	Z	20
	P:N,D				i	E	29
					P:D		
					44.4 N, 149.2 E. Kurile Is.		
					h: 40 km ca.		
					H= 22 07 29.3		USCGS
12.	P	NZ	18 51 17.7	12.	eP	Z	23 04 52
	i	N	31.4				
	eS	E	53 26				
	eL	E	54 38				
	P:S,C						
					50.3 N, 149.0 E.		
					Sea of Okhotsk.		
					h: 33 km ca.		
					H= 23 02 41		USCGS
12.	P	NZ	19 49 39	12.	P	Z	23 42 57
					44.3 N, 149.2 E. Kurile Is.		
					h: 40 km ca.		
					H= 23 40 11.1		USCGS
12.	P	Z	19 59 45	13.	P	Z	01 29 16.9
	i	Z	48.1		i	Z	23
	i	Z	53		S	N	31 33
	eS	E	20 01 54		L	E	37
	e	E	02 16		P:D		
					44.4 N, 149.3 E.		
					Kurile Is.		
					h: 33 km ca.		
					H= 01 26 34.3		USCGS
12.	P	NZ	20 23 46	13.	iP	NEZ	01 37 37.2
					eS	N	39 57
					P:S,W,C		
					44.4 N, 149.2 E.		
					Kurile Is.		
					h: 33 km ca.		
					H= 01 34 54.3		USCGS
12.	iP	Z	21 21 20.2	13.	eP	Z	02 14 58
	i	Z	35		eS	NE	17 02
	e	E	25 43		eL	E	37
	P:C						
					44.0 N., 149.4 E.		
					Kurile Is.		

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
		h: 45 km ca. H= 02 12 20.0	USCGS	13.	eP	Z	06 49 25ca.
13.	eP eL	Z E	03 39 02 43 14			45.3 N., 147.5 E. Kurile Is. h: 55 km ca. H= 06 46 54.0	USCGS
13.	P i	EZ E	03 55 52 59	13.	eP	Z	06 51 33ca.
13.	P i L	Z E E	04 08 33.6 51 11 18			45.5 N., 151.8 E. Kurile Is. h: 55 km ca. H= 06 49 26.3	USCGS
		P:C 44.4 N., 149.2 E. Kurile Is. h: 30 km ca. H= 04 05 50.1	USCGS	13.	eP	Z	07 06 25
13.	iP i i i S i iL iL	EZ, P N NEZ NE N N NE N E	05 20 39.9 45.7 21 47 05 22 12 56 23 08 29 24 02			45.5 N., 150.6 E. Kurile Is. h: 50 km ca. H= 07 03 23.8	USCGS
		P:S,W,C Mag. 7.4(Mat) 44.8 N., 149.5 E. Kurile Is. h: 60 km ca. H= 05 17 57.1	USCGS	13.	P	Z	07 19 43
13.	P	Z	05 26 38			45.5 N., 151.5 E. Kurile Is. h: 55 km ca. H= 07 16 42.9	
13.	eP	N	05 45 36ca.	13.	P	Z	07 22 11
		Mag. 5.6(Mat) 46.5 N., 151.6 E. Kurile Is. h: 55 km ca. H= 05 42 14.2	USCGS			45.0 N., 151.5 E. Kurile Is. h: 40 km ca. H= 07 19 11.1	USCGS
13.	eP	E	06 12 05ca.	13.	P	Z	07 34 52
		Mag. 5.6 (Mat) 45.3 N., 151.3 E. Kurile Is. h: 60 km ca. H= 06 09 02.2	USCGS			45.0 N., 151.4 E. Kurile Is. h: 40 km ca. H= 07 31 50.6	USCGS
13.	P	Z	06 15 55	13.	P	Z	07 38 40
		45.1 N., 149.7 E. Kurile Is. h: 40 km ca. H= 06 12 21.7	USCGS			46.5 N., 151.8 E. Kurile Is. h: 45 km ca. H= 07 35 44.7	USCGS
13.	P	Z	06 26 37	13.	P	Z	08 09 46
		45.4 N., 150.8 E. Kurile Is. h: 40 km ca. H= 06 23 36.2	USCGS	13.	P	Z	03 14 34
						44.5 N., 151.6 E. Kurile Is. h: 60 km ca. H= 08 11 32.0	USCGS
				13.	eP	Z	03 37 38
						44.5 N., 150.9 E. Kurile Is. h: 33 km ca. H= 08 34 40	USCGS
				13.	P	NEZ	09 13 02
						44.2 N., 149.5 E. Kurile Is. h: 40 km ca. H= 09 10 15.4	USCGS

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
		Kurile Is. h: 30 km ca. H= 20 35 53.3	USCGS			Kurile Is. h: 45 km ca. H= 22 25 37.0	USCGS
13.	P i	Z Z	21 20 51 21 04	13.	iP i	NZ Z	22 32 30.0 42.1
		45.4 N., 151.5 E. Kurile Is. h: 45 km ca. H= 21 17 45	USCGS			P:S,C 44.3 N., 149.5 E. Kurile Is. h: 40 km ca. H= 22 29 48.6	USCGS
13.	P i eS	Z Z E	21 38 45 58 41 23	13.	eP i i eS	Z Z Z N	23 03 47 59 09 34 11 18
		45.3 N., 151.7 E. Kurile Is. h: 45 km ca. H= 21 35 37.3	USCGS			45.5 N., 151.9 E. Kurile Is. h: 30 km ca. H= 23 05 33.5	USCGS
13.	P S	Z N	21 50 46.6 53 10	13.	P i	Z Z	23 11 55 12 08
		P:C 44.3 N., 149.5 E. Kurile Is. h: 50 km ca. H= 21 48 01.5	USCGS			45.2 N., 151.4 E. Kurile Is. h: 45 km ca. H= 23 03 49	USCGS
13.	P	Z	21 53 20	13.	eP i i	Z E Z	23 28 11 23 38
		46.1 N., 151.8 E. Kurile Is. h: 45 km ca. H= 21 50 02,4	USCGS			44.4 N., 183.0 E. Kurile Is. h: 50 km ca. H= 23 25 00.8	USCGS
13.	eP i	Z N	21 55 54 56 15	13.	P i i eS i L	Z E Z E N N	23 55 10 12 26 57 28 35 55
		P:N,E,D Mag. 5.3 (Mat) 44.7 N., 152.1 E. Kurile Is. h: 50 km ca. H= 21 55 00.8	USCGS			Mag. 5.3 (Mat) 44.5 N., 150.1 E. Kurile Is. h: 50 km ca. H= 23 52 22.8	USCGS
13.	iP eS	Z E	22 05 59.1 08 18	14.	eP	Z	00 06 03
		P:D 45.1 N., 150.9 E. Kurile Is. h: 45 km ca. H= 22 02 58.1	USCGS			45.0 N., 150.9 E. Kurile Is. h: 60 km ca. H= 00 03 04.1	USCGS
13.	P i i	EZ NEZ Z	22 28 19.1 20.0 33	14.	eP	Z	00 07 58
		P:E,D 44.2 N., 149.3 E.	(cont.)			46.1 N., 151.4 E. Kurile Is. h: 60 km ca. H= 00 04 48	USCGS

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
14.	eP i i eS	Z E Z N	00	22	10 16 36 35		i	Z	03	25	15.0	
	44.5 N., 150.5 E. Kurile Is. h: 45 km ca. H= 00 19 17.9			USCGS			P:C 44.9 N., 151.3 E. Kurile Is. h: 50 km ca. H= 03 21 56.1			USCGS		
14.	iP S P:D	Z Z	00	50	00.4 17.7	14.	iP S P:D	Z N	03	34	24.0 36 33	
	45.9 N., 151.8 E. Kurile Is. h: 25 km ca. H= 03 31 07.8			USCGS			45.9 N., 151.8 E. Kurile Is. h: 25 km ca. H= 03 31 07.8			USCGS		
14.	P i	Z Z	00	55	17 36	14.	eP i	Z Z	03	55	36 52	
	45.6 N., 150.6 E. Kurile Is. h: 35 km ca. H= 00 52 04.0			USCGS			44.7 N., 149.8 E. Kurile Is. h: 50 km ca. H= 03 52 56.3			USCGS		
14.	iP i i S P:D	Z Z Z N	01	22	13.4 29.2 42.3 32	14.	iP S eL P:N, E, D	NEZ NZ NE	04	03	52.7 57 43	
	44.3 N., 151.2 E. Kurile Is. h: 55 km ca. H= 01 19 17.1			USCGS			Mag. 5.3 (Mat) 44.9 N., 150.2 E. Kurile Is. h: 50 km ca. H= 04 06 01.7			USCGS		
14.	P i	Z Z	01	38	35 49	14.	P S	Z N	04	14	03.5 15 29	
	44.4 N., 149.8 E. Kurile Is. h: 50 km ca. H= 01 35 50.8			USCGS			Mag. 5.6 (Mat) 44.7 N., 150.6 E. Kurile Is. h: 45 km ca. H= 04 11 14.0			USCGS		
14.	eP	Z	01	53	47	14.	P	NZ	04	16	05	
	44.5 N., 151.4 E. Kurile Is. h: 50 km ca. H= 01 50 47.2			USCGS			Mag. 5.6 (Mat) 44.9 N., 150.7 E. Kurile Is. h: 40 km ca. H= 04 13 03.1			USCGS		
14.	P i	Z Z	02	13	42 53	14.	P i	Z Z	04	37	39 54	
	47.9 N., 150.0 E. Kurile Is. h: 45 km ca. H= 02 15 50			USCGS			44.4 N., 151.5 E. Kurile Is. h: 25 km ca. H= 04 34 30.6			USCGS		
14.	P	Z	02	21	22	14.	P	Z	04	42	29	
	44.4 N., 150.3 E. Kurile Is. h: 45 km ca. H= 02 18 38.9			USCGS			44.9 N., 150.7 E. Kurile Is. h: 40 km ca. H= 04 13 03.1			USCGS		
14.	iP i	Z N	03	25	03.1 14.4	14.	eP S	Z N	04	59	55 02 24	
	(cont.)			-38-								

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
14.	P S	NEZ NEZ	05	27	09.4	14.	eP eS	Z E	09	12	44
	P:S,W,C 44.5 N., 151.0 E. Kurile Is. h: 55 km ca. H= 05 24 12.3 USC GS						14.				
14.	eP	Z	05	45	49	14.	P	Z	09	32	12
	44.8 N., 150.6 E. Kurile Is. h: 50 km ca. H= 05 42 55.3 USC GS						i i S L				
14.	iP	Z	06	31	45.3			Z			
	i S P:C 44.1 N., 149.4 E. Kurile Is. h: 35 km ca. H= 06 29 01.5 USC GS						45.5 N., 151.7 E. Kurile Is. h: 40 km ca. H= 09 29 07.1 USC GS				
14.	iP	Z	07	09	55.0	14.	P	Z	10	02	22.3
	P:C 18.8 S., 169.3 E. New Hebrides Is. h: 250 km ca. H= 06 59 56.6 USC GS						i eS eL				
14.	P	Z	07	13	49	14.	iP	EZ	10	16	13.6
	i 44.6 N., 150.3 E. Kurile Is. h: 45 km ca. H= 07 15 53.0 USC GS						iS P:E,C				
14.	eP	Z	07	56	44	14.	iP	Z	10	27	39.3
	45.3 N., 151.0 E. Kurile Is. h: 35 km ca. H= 07 53 42.7 USC GS						i i e P:D				
14.	P	NEZ	07	57	31			EZ			
	S L 44.3 N., 151.2 E. h: 55 km ca. H= 07 54 33.9 USC GS						45.7 N., 150.2 E. Kurile Is. h: 40 km ca. H= 10 24 36.5 USC GS				
14.	iP	Z	08	46	53.2	14.	P	Z	11	16	20.3
	i eS P:C 44.7 N., 150.7 E. Kurile Is. h: 50 km ca. H= 08 43 56.6 USC GS-39-						eL N 45.0 N., 150.9 E. Kurile Is. h: 45 km ca. H= 11 13 19.4 USC GS				
							14.				
							eP eL				
							Z N				
							11				
							26				
							21				
							29				
							45				
							45.5 N., 151.7 E. Kurile Is. h: 50 km ca. H= 11 23 13.5 USC GS				
							14.				
							P				
							i				
							Z				
							Z				
							11				
							47				
							23.0				
							37.4				
							14.				
							P				
							i				
							Z				
							Z				
							E				
							11				
							59				
							32				
							46				
							12				
							04				
							15				
							45.4 N., 150.9 E. Kurile Is. h: 45 km ca. H= 11 56 31.0 USC GS				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
14.	P	Z	12 14 59.3		L	N	17 55 54
	S	N	17 33		L	E	56 10
	eL	N	48		P:N,E,D		
	45.6 N., 152.4 E.				45.2 N., 151.3 E.		
	Kurile Is.				Kurile Is.		
	h: 40 km ca.				h: 60 km ca.		
	H= 12 11 42.5		USCGS		H= 17 50 15.3		USCGS
14.	eP	Z	12 47 42	14.	iP	Z	17 59 23.3
	i	N	43 07		i	NE	24.4
	i	E	56		i	N	36
	44.7 N., 150.2 E.				eS	N	18 01 46
	Kurile Is.				45.0 N., 151.3 E.		
	h: 50 km ca.				Kurile Is.		
	H= 12 44 54.1		USCGS		h: 30 km ca.		
					H= 17 56 17.8		USCGS
14.	P	Z	13 03 53	14.	eP	Z	18 05 32
14.	iP	Z	13 24 39.2		i	Z	55
	i	Z	44.3		44.3 N., 152.2 E.		
	S	E	26 54		Kurile Is.		
	L	NE	27 11		h: 40 km ca.		
	P:N,E,D				H= 18 02 56		USCGS
	Mag. 5.9(Mat)			14.	iP	Z	19 49 08.6
	44.3 N., 151.0 E.				P:D		
	Kurile Is.			14.	P	Z	20 49 33.4
	h: 60 km ca.				44.9 N., 152.3 E.		
	H= 13 21 45.3		USCGS		Kurile Is.		
					h: 40 km ca.		
14.	eP	Z	13 56 20		H= 20 46 16.8		USCGS
	i	N	32	14.	iP	NEZ	21 09 17.2
	eS	E	53 39		S	NE	20.7
	45.0 N., 151.1 E.				i	Z	20.9
	Kurile Is.				P:N,W,C		
	h: 30 km ca.			14.	P	Z	21 10 57.6
	H= 13 53 17.4		USCGS		i	N	58.0
					i	N	11 07
14.	eP	Z	14 54 53		S	N	13 26
	i	Z	55 14		eL	E	36
	3.3S., 126.7 E.				P:D		
	Ceram Sea.				45.0 N., 150.5 E.		
	h: 33 km ca.				Kurile Is.		
	H= 14 47 30.9		USCGS		h: 45 km ca.		
					H= 21 08 00.1		USCGS
14.	P	Z	15 25 03	14.	P	Z	21 16 39
	i	N	03		i	Z	51
14.	P	Z	15 38 27	14.	eP	Z	21 22 25
	e	Z	41 05		44.3 N., 149.3 E.		
	1.6N., 127.6 E.				Kurile Is.		
	Timor region.				h: 45 km ca.		
	h: 231 km ca.				H= 21 19 54.7		USCGS
	H= 15 31 39		USCGS				
14.	iP	NEZ	17 53 17.6				
	i	Z	29.4				
	i	N	29.7				
	S	E	55 40				

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
15.	iP i eS P:C	Z Z N	09	17	21.7 33.6 38	15.	P P i	Z EZ Z	12	26	47.5 09.8 17	
	44.3 N., 149.5 E. Kurile Is. h: 33 km ca. H= 09 14 34.3			USCGS			15.	P P:C	Z	14	06	43.1
15.	iP i S L P:N,E,D	NEZ NE N E	09	35	03.8 13 23 47	15.	P i	Z Z	14	38	19 32	
	45.2 N., 150.2 E. Kurile Is. h: 40 km ca. H= 09 32 08.7			USCGS			15.	iP i eS P:S,E,D	NEZ E E	15	26	47.1 27 02 15
15.	P eS eSS L P:C	Z NE N E	10	11	12.6 20 52 25 09 30 49	15.	eP L?	Z E	15	02	30 05 09	
	Mag. 5½ (Mat) 67.2 N., 18.4 W. North of Iceland. h: 33 km ca. H= 09 59 30.1			USCGS			15.	P i S L	Z Z N N	16	19	13 26
15.	P i S L	NZ NEZ N NE	10	49	53 53.6 20 47	15.	P i S L	Z NEZ N N	17	18	31.8 46.6 20 41 21 03	
	44.6 N., 149.0 E. Kurile Is. h: 50 km ca. H= 10 47 12.6			USCGS			15.	P i S L	Z NEZ N N	17	18	31.8 46.6 20 41 21 03
15.	eP	Z	11	17	13	15.	P i S L	Z NEZ N N	17	18	31.8 46.6 20 41 21 03	
15.	iP i eS? L L P:N,D	NZ NZ E N N	11	56	53.4 57 06 59 30 44 18	15.	eP i	Z Z	17	37	54 38 03	
	45.1 N., 151.9 E. Kurile Is. h: 55 km ca. H= 11 53 45.5			USCGS			15.	eP i	Z Z	17	37	54 38 03
15.	P i eS P:C	Z Z N	12	06	57.5 07 10 09 26	15.	P eS L	Z E E	17	57	11 59 44 00 12	
	45.1 N., 151.8 E. Kurile Is. h: 45 km ca. H= 12 03 48.7			USCGS			15.	P i eS P:C	Z Z N	12	06	57.5 07 10 09 26
15.	P i eS P:C	Z Z N	12	06	57.5 07 10 09 26	15.	P i eS P:C	Z Z N	12	06	57.5 07 10 09 26	
	45.1 N., 151.8 E. Kurile Is. h: 45 km ca. H= 12 03 48.7			USCGS			15.	P i eS P:C	Z Z N	12	06	57.5 07 10 09 26

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	S	NE	13 29 24	16.	iP EZ, P N		02 42 36.5
	L	E	30		S	NE	52.2
	L	N	40		P:E,D		
	P:S,C			16.	P	Z	03 17 58
	Mag. 5.4 (Mat)			15.	P	Z	03 50 33
	45.3 N., 151.0 E.				i	Z	36
	Kurile Is.				i	Z	44.8
	h: 35 km ca.			16.	P	Z	05 18 32.2
	H= 18 23 57.8				i	Z	46
	USCGS				i	E	47
15.	P	NEZ	20 44 33.2		S	E	20 37
	S	E	46 56		L	E	56
	P:N,E,D				P:C		
	Mag. 5.4 (Mat)				44.8 N., 150.4 E.		
	45.4 N., 151.1 E.				Kurile Is.		
	Kurile Is.				h: 33 km ca.		
	h: 50 km ca.				H= 05 15 36.1		
	H= 20 41 30.2				USCGS		
	USCGS			16.	P	Z	07 03 13
15.	eP	Z	21 50 28	16.	iP	NEZ	08 36 54.4
	i	Z	38		i	Z	37 05.3
15.	P	Z	21 52 31.6		eS	E	08 39 30
	i	N	53 21		L	N	46 03
	S	E	53 32		P:N,E,D		
	L	E	22 01 36		45.6 N., 151.9 E.		
	Lr	Z	04 35		Kurile Is.		
	P:D				h: 45 km ca.		
	Mag. 6-6½ (Mat)				H= 09 33 42.0		
	3.0 S., 129.9 E.				USCGS		
	Ceram.			16.	eP	Z	09 33 15
	h: 27 km ca.				i	Z	17.7
	H= 21 44 58.0				i	N	25
	USCGS				eL	E	39 13
15.	P	Z	22 09 20		45.2 N., 153.8 E.		
15.	P	Z	22 45 10		Kurile Is.		
	i	Z	19		h: 40 km ca.		
	46.3 N., 152.4 E.				H= 09 29 56.7		
	Kurile Is.				USCGS		
	h: 35 km ca.			16.	P	Z	10 03 30
	H= 22 41 44.7				i	E	04 34
	USCGS			16.	P	Z	10 33 52.2
15.	P	EZ	23 11 58.7		i	NEZ	52.7
	P:C				eS?	E	36 15
	45.9 N., 149.9 E.				L	E	56
	Kurile Is.				P:C		
	h: 40 km ca.				45.2 N., 150.4 E.		
	H= 23 09 00.5				Kurile Is.		
	USCGS				h: 45 km ca.		
16.	iP	NZ	01 28 22.8		H= 10 30 55.2		
	i	NZ	33.6		USCGS		
	P:N,E,D			16.	eP	Z	11 49 18
	46.1 N., 151.8 E.				i	Z	30
	Kurile Is.			16.	iP	Z	12 55 11.4
	h: 45 km ca.				(cont.)		
	H= 01 25 06.7						
	USCGS						
16.	P	Z	01 50 50				
	e	Z	52 15				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	eS?	N	13 01 04	16.	iP	NEZ	20 09 00.7
	Lq	E	04 06		S	N	18
	Lr	N	06 33		P:N,E,D		
	P:C			16,	P	Z	20 10 09
	1.8°S., 127.9 E.				S	N	27
	Hannera region.			16.	eP	Z	20 40 04
	h: 33 km ca.				eSS	E	51 10
	H= 12 47 44.2				L	N	52 33
16.	iP NZ, P E		14 24 00.4		Mag. 5½-5¾ (Mat)		
	eS	E	26 37		38.6 N., 73.1 E.		
	eL	N	27 45		Tadzhik S.S.R.		
	P:S,W,C				h: 70 km ca.		
	45.8 N., 151.8 E.				H= 20 31 15		USCGS
	Kurile Is.			16.	eP	Z	20 45 13
	h: 40 km ca.				2.8 N., 137.9 E.		
	H= 14 20 45.3		USCGS		Palau Is. region.		
16.	P	Z	15 02 43.		h: 23 km ca.		
	i	Z	50		H= 20 39 30.5		USCGS
	i	EZ	53	16.	P	NEZ	21 33 46.4
	S	N	05 18		i	NEZ	46.7
	45.6 N., 150.4 E.				i	E	35 41
	Kurile Is.				i	E	55
	h: 40 km ca.				S	NE	36 03
	H= 14 59 43.3		USCGS		L	E	34
16.	iP	Z	15 51 55.7		P:N,E,D		
	i	NE	56.4		44.4 N., 150.9 E.		
	S	N	59 01		Kurile Is.		
	i	E	12		h: 80 km ca.		
	SS	N	16 02 39		H= 21 30 52.7		USCGS
	Lq	E	06 02	17.	iP	NEZ	00 38 27.6
	Lr	E	08 30		eS?	NE	41 00
	P:D				P:N,E,D		
	Mag. 5½ (Mat)				45.1 N., 149.6 E.		
	38.6 N., 73.4 E.				Kurile Is.		
	Tadzhik S.S.R.				h: 33 km ca.		
	h: 33 km ca.				H= 00 35 20		USCGS
	H= 15 43 00.8		USCGS	17.	eP	Z	01 11 42
16.	iP	NEZ	17 00 27.2	17.	P	Z	03 11 03
	i	Z	36		i	Z	20
	S	E	01 19		eL	E	15 29
	P:N,E,C				11.6 N., 140.6 E.		
16.	iP	Z	17 12 08.2		Mariana Is. region.		
	i	NE	08.6		h: 70 km ca.		
	i	N	17.8		H= 03 05 50.2		USCGS
	P:C			17.	P	Z	03 43 15
16.	eP	Z	19 13 10		S	N	50 49
	e	Z	14 18		45.1 N., 151.4 E.		
	23.8 N., 58.0 E.				Kurile Is.		
	Southern Iran.				h: 45 km ca.		
	h: 32 km ca.				H= 03 45 03.6		USCGS
	H= 19 02 25.0		USCGS				

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
17.	P i eS eL P:C	Z Z N E	04 22 57.2 23 11 25 32 04 25 42				
						45.0 N., 150.8 E. Kurile Is. h: 33 km ca. H= 10 41 26.6	USCGS
17.	eP	Z	11 53 51	17.	eP	Z	11 53 51
						45.0 N., 151.4 E. Kurile Is. h: 45 km ca. H= 11 50 50	USCGS
17.	P eS	Z N	05 16 06 13 11	17.	eP	Z	12 21 04
						49.2 N., 149.8 E. Kurile Is. h: 45 km ca. H= 12 18 23.0	USCGS
17.	eP e	Z E	07 15 29 20 13	17.	P eS eL	Z N E	13 01 32 03 34 50
						45.1 N., 150.3 E. Kurile Is. h: 50 km ca. H= 12 58 33.6	USCGS
17.	P i eS L P:S,C	NZ E E NE	08 13 36.6 46 15 40 50	17.	iP Z, P E i S L P:W,C		14 09 13.9 14.2 11 29 12 19
						44.2 N., 149.2 E. Kurile Is. h: 40 km ca. H= 14 06 32.2	USCGS
17.	eP i	Z Z	08 26 34 58	17.	eP	Z	14 19 53
						9.8 N., 126.5 E. Near east coast of Mindanao, P.I. h: 33 km ca. H= 14 13 59.8	USCGS
17.	eP i	Z Z	08 34 26 35	17.	P e L	EZ N NZ	14 25 26.7 27 30 47
						46.2 N., 152.0 E. Kurile Is. h: 45 km ca. H= 14 22 14.6	USCGS
17.	P i eS L P:C	Z NEZ	09 33 51.7 34 05.2	17.	iP Z, P NE i e eL P:D		15 05 53.2 06 05 07 55 09 03
						44.1 N., 149.2 E. Kurile Is. h: 55 km ca. H= 15 03 12.7	USCGS
17.	P	Z	09 42 18				
						38.8 N., 73.4 E. Tadzhik S.S.R. h: 40 km ca. H= 09 33 24.0	USCGS
17.	P i eS eL	Z EZ E E	10 19 41 20 03 22 11 29				
						43.8 N., 151.0 E. Kurile Is. h: 50 km ca. H= 10 16 48.9	USCGS
17.	eP e	Z Z	10 31 15 26				
17.	P	Z	10 44 30				

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
		h: 51 km ca. H= 08 05 22.1	USCGS			h: 40 km ca. H= 17 55 00.2	USCGS
18.	eP eS	NZ N	08 13 13 20 29	18.	iP i eL P:C	Z Z E	18 48 41.8 52.9 53 52
		44.5 N., 151.1 E. Kurile Is. h: 55 km ca. H= 08 15 17.0	USCGS			43.7 N., 149.6 E. Kurile Is. h: 45 km ca. H= 18 45 57.2	USCGS
18.	eP i i LE L	Z Z NZ Z	08 56 20 24 31 53 46 08 58 52	18.	P	Z	19 53 51
		44.8 N., 150.2 E. Kurile Is. h: 60 km ca. H= 08 53 33.9	USCGS	18.	P eS eL	Z E E	20 09 01 11 56 12 23
18.	P i	Z Z	10 07 32 45			47.6 N., 154.3 E. Kurile Is. h: 40 km ca. H= 20 05 14.4	USCGS
		48.2 N., 151.4 E. Kurile Is. h: 33 km ca. H= 10 04 31	USCGS	18.	P i	Z Z	21 05 32 45
18.	eP eS eL	Z N E	10 21 04 23 24 44	18.	iP S i L P:S,W,C	NEZ E N E	21 25 54.5 28 15.2 16.9 21 28 49
		44.9 N., 152.8 E. Kurile Is. h: 55 km ca. H= 10 18 18.3	USCGS			45.2 N., 151.1 E. Kurile Is. h: 45 km ca. H= 21 22 52.7	USCGS
18.	iP i i P:N,D	NZ N Z	10 39 15.9 40 06 09	18.	P i i P:C	Z Z Z	21 46 09.6 09.6
						5.3 S., 108.5 E. Sumatra. h: 33 km ca. H= 21 36 55.0	USCGS
18.	P i P:C	Z Z	11 49 37.0 39.2	18.	eP	Z	22 05 52
18.	iP S i P:S,E,D	NEZ E NZ	15 53 19.2 43.7 44.2	18.	eP i i	Z Z Z	22 56 08 13 20
						46.1 N., 152.5 E. Kurile Is. h: 40 km ca. H= 22 52 50.6	USCGS
18.	P i P:C	Z E	17 40 17.7 19.4	18.	P	NZ	23 46 19
18.	iP Z, P eS L P:S,W,C	NE N N	17 58 00.9 18 00 36 53			44.7 N., 149.2 E. Kurile Is. h: 45 km ca. H= 23 43 35.9	USCGS
		45.6 N., 150.6 E. Kurile Is.	(cont.)	19.	iP iS P:S,C	NZ NEZ	00 00 08.4 33:7

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
		Kurile Is. h: 40 km ca. H= 15 42 32.9		19.	iP S P:C	Z N	23 20 31.7 21 55
19.	P	Z	15 13 12	19.	eP i	Z Z	23 47 28 40
		44.4 N., 150.9 E. Kurile Is. h: 120 km ca. H= 16 15 21.4					45.1 N., 151.4 E. Kurile Is. h: 40 km ca. H= 23 44 31.6
19.	iP S	NE EZ	16 13 19.1 30	20.	eP	Z	00 45 31
19.	iP i i P:C	Z NZ E	16 23 09.4 09.9 47				44.3 N., 149.7 E. Kurile Is. h: 40 km ca. H= 00 42 41.9
		45.0 N., 149.4 E. Kurile Is. h: 45 km ca. H= 16 20 53.8		20.	P i i i S L	Z Z N EZ N N	00 56 02 07 17 19 53 16 32
19.	P i S P:S	NZ N Z	16 41 35.1 37 46.7				Mag. 6.4 (Mat) 44.7 N., 150.7 E. Kurile Is. h: 25 km ca. H= 00 53 07.2
19.	iP P:C	Z	13 05 20.1	20.	eP	N	01 26 12
		46.5 N., 152.7 E. Kurile Is. h: 40 km ca. H= 13 01 58					45.9 N., 153.6 E. Kurile Is. h: 40 km ca. H= 01 22 35.1
19.	P	Z	19 13 20	20.	eP	Z	01 43 27
		45.2 N., 151.2 E. Kurile Is. h: 45 km ca. H= 19 10 15.4					43.9 N., 149.3 E. Kurile Is. h: 40 km ca. H= 01 40 39.5
19.	P i	Z Z	20 56 25 56	20.	P	Z	02 12 19
		42.6 N., 152.0 E. Kurile Is. h: 40 km ca. H= 20 53 37					Mag. 5.3 (Mat) 44.7 N., 150.0 E. Kurile Is. h: 45 km ca. H= 02 09 29.4
19.	iP S P:D	Z N	22 37 09.5 34.2	20.	eP	Z	02 54 49ca.
19.	P i i	Z N N	23 14 45 46 56				46.5 N., 148.1 E. Kurile Is. h: 40 km ca. H= 02 52 00
		45.2 N., 151.1 E. Kurile Is. h: 33 km ca. H= 23 11 40.9		20.	eP	Z	03 01 35
							44.4 N., 149.6 E. Kurile Is. h: 60 km ca. H= 02 58 54.2

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
	P:N,D				P:C		
	Mag. 5.2 (Mat)				Mag. 5.3 (Mat)		
	44.3 N., 149.4 E.				45.1 N., 150.5 E.		
	Kurile Is.				Kurile Is.		
	h: 33 km ca.				h: 45 km ca.		
	H= 08 26 12.3		USCGS		H= 13 21 14.1		USCGS
20.	P	Z	09 13 29	20.	iP	Z	13 41 16.7
	S	E	15 36				31.1 N., 115.6 W.
	eL	Z	16 43				Baja, California.
	Mag. 5.6 (Mat)				h: 14 km ca.		
	44.4 N., 150.0 E.				H= 13 29 26.6		USCGS
	Kurile Is.			20.	iP	Z	15 08 21.3
	h: 40 km ca.				i	Z	38.3
	H= 09 10 43.9		USCGS		P:C		
20.	P	Z	11 11 42	20.	iP Z, P N		15 14 17.9
	i	Z	57		i	Z	32
	44.4 N., 149.7 E.				eS	E	16 32
	Kurile Is.				P:C		
	h: 40 km ca.				44.1 N., 151.1 E.		
	H= 11 08 57.9		USCGS		Kurile Is.		
20.	P	Z	11 13 36		h: 50 km ca.		
	44.9 N., 151.2 E.				H= 15 11 23.5		USCGS
	Kurile Is.			20.	iP	NZ	15 31 52.3
	h: 40 km ca.				P:S,C		
	H= 11 15 32.3		USCGS		43.7 N., 150.3 E.		
20.	P	Z	11 33 33		Kurile Is.		
	44.2 N., 150.6 E.				h: 50 km ca.		
	Kurile Is.				H= 15 29 06.5		USCGS
	h: 45 km ca.			20.	P	Z	15 47 22
	H= 11 35 46.6		USCGS		45.7 N., 149.7 E.		
20.	P	NZ	11 55 10.7		Kurile Is.		
	i	NZ	11.2		h: 45 km ca.		
	i	N	17		H= 15 44 34.2		USCGS
	eS	Z	57 34	20.	eP	Z	15 56 15
	L	Z	58 22		47.4 N., 149.0 E.		
	P:N,D				Kurile Is.		
	Mag. 5.6 (Mat)				h: 45 km ca.		
	44.7 N., 150.2 E.				H= 15 53 43.1		USCGS
	Kurile Is.			20.	P	NZ	16 03 01
	h: 45 km ca.				eS	N	05 20
	H= 11 52 20.7		USCGS		44.3 N., 149.7 E.		
20.	P	Z	12 06 23		Kurile Is.		
	i	Z	36		h: 45 km ca.		
					H= 16 00 15.1		USCGS
20.	P	Z	12 12 15	20.	iP	Z	17 44 10.5
	i	Z	28		i	Z	20
	eS	N	14 33		i	Z	32
	45.0 N., 149.6 E.				S	N	46 24
	Kurile Is.				i	NZ	31
	h: 45 km ca.				eL	Z	48 18
	H= 12 09 31.1		USCGS		Mag. 5.3 (Mat)		
20.	iP	Z	13 24 11.9		44.2 N., 149.6 E.		
	S	E	26 42				
			(cont.)				(cont.)

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
	P:S,W,C						
	44.2 N., 151.0 E.				44.3 N., 151.2 E.		
	Kurile Is.				Kurile Is.		
	h: 50 km ca.				h: 45 km ca.		
	H= 20 39 39.3	USCGS			H= 02 29 06.9	USCGS	
21.	P	Z	21 18 53.3	22.	P	NZ	03 20 08
	P:C				S	N	22 23
	43.3 N., 152.5 E.				e	E	26
	Kurile Is.				P:N		
	h: 20 km ca.				45.0 N., 150.2 E.		
	H= 21 15 48.8	USCGS			Kurile Is.		
21.	eP	Z	23 06 02		h: 45 km ca.		
					H= 03 17 15.2	USCGS	
21.	iP	NEZ	23 21 25.8	22.	iP	NEZ	03 23 26.4
	eS	N	23 42		e	E	30 23
	P:N,E,D				e	Z	03 30 35
	44.0 N., 150.3 E.				P:S,W,C		
	Kurile Is.				43.9 N., 150.3 E.		
	h: 50 km ca.				Kurile Is.		
	H= 23 13 41.3	USCGS			h: 50 km ca.		
21.	iP	EZ	23 32 05.7		H= 03 25 38.8	USCGS	
	i	N	05.9	22.	eP	Z	04 35 36
	i	Z	07.1		i	Z	45.1
	S	N	34 31		51.0 N., 179.4 E.		
	P:W,C				Rat Is.		
	44.0 N., 150.1 E.				h: 55 km ca.		
	Kurile Is.				H= 04 29 11.7	USCGS	
	h: 55 km ca.			22.	P	Z	04 52 00
	H= 23 29 20.7	USCGS			e	Z	53 34
21.	P	EZ	23 35 56		44.5 N., 149.1 E.		
	eS	N	38 00		Kurile Is.		
	44.2 N., 149.0 E.				h: 33 km ca.		
	Kurile Is.				H= 04 49 17.0	USCGS	
	h: 55 km ca.			22.	eP	Z	06 40 48
	H= 23 33 16.1	USCGS			44.8 N., 152.1 E.		
22.	iP	Z	00 02 30.6		Kurile Is.		
	44.9 N., 150.8 E.				h: 50 km ca.		
	Kurile Is.				H= 06 37 44	USCGS	
	h: 33 km ca.			22.	iP	Z	10 21 01.4
	H= 23 59 25	USCGS			eS	E	23 12
22.	SP	Z	01 06 58.6		eL	N	40
	i	NE	53.8		P:C		
	S	NZ	07 13		44.2 N., 150.3 E.		
	P:D				Kurile Is.		
	36.2 N., 139.3 E.				h: 50 km ca.		
	Honshu, Japan.				H= 10 18 14.5	USCGS	
	h: 50 km ca.	J.M.A.		22.	eP	Z	10 29 29
22.	P	NEZ	01 13 19		43.6 N., 143.1 E.		
22.	iP	NEZ	02 32 04.9		Kurile Is.		
	i	NEZ	17.4		h: 50 km ca.		
	P:N,E,D				H= 10 26 28.5	USCGS	
				22.	eP	Z	10 43 14
							(cont)

(cont)

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 Date Phase Comp, Time(GMT)
 h m s

 44.1 N., 150.5 E.
 Kurile Is.
 h: 33 km ca.
 H= 10 45 32

USCGS

 22. F Z 12 00 40.0
 i Z 52.6
 e E 12 00

P:D

 45.3 N., 151.7 E.
 Kurile Is.
 h: 33 km ca.
 H= 12 05 30.3

USCGS

 22. P EZ, eP N 12 22 29
 i NZ 44.7

 45.1 N., 151.3 E.
 Kurile Is.
 h: 20 km ca.
 H= 12 19 17.5

USCGS

22. eP Z 12 39 27

22. eP Z 12 52 22

 45.6 N., 151.7 E.
 Kurile Is.
 h: 50 km ca.
 H= 12 49 32.6

USCGS

 22. P Z 13 23 01
 e Z 12
 S NEZ 24 01

 22. F Z 13 29 50.5
 e NE 51

P:D

 44.5 N., 149.8 E.
 Kurile Is.
 h: 33 km ca.
 H= 13 27 05.2

USCGS

 22. P NZ 13 56 21
 e Z 57 30
 e E 14 02.2

 22. P Z 15 44 48
 e E 45 04

 11.6 S., 166.3 E.
 Santa Cruz Is.
 h: 30 km ca.
 H= 15 35 26.1

USCGS

 22. eP EZ 15 50 04
 e E 52 26
 e E 16 00 43

 22. iP EZ 16 03 26.2
 i NEZ 27.2
 eS E 05 46
 e N 55

(cont)

 Date Phase Comp, Time(GMT)
 h m s

P:W,C

 43.5 N., 150.4 E.
 Kurile Is.
 h: 105 km ca.
 H= 16 00 43.3

USCGS

22. e E 13 36.5

 22. iP NEZ 19 17 15.8
 i Z 24

P:N,E,D

 45.3 N., 149.4 E.
 Kurile Is.
 h: 33 km ca.
 H= 19 14 14

USCGS

22. iP NEZ 19 29 21.4

P:N,E,D

 44.3 N., 152.3 E.
 Kurile Is.
 h: 33 km ca.
 H= 19 26 14

USCGS

22. e E 19 40.1

 22. eP Z 23 06 48
 e E 09 39

 44.0 N., 152.4 E.
 Kurile Is.
 h: 20 km ca.
 H= 23 03 39.5

USCGS

 23. iP Z, P NE 00 09 22.0
 i N 22.4
 eS E 12 03
 e N 40

P:S,W,C

 45.7 N., 151.6 E.
 Kurile Is.
 h: 20 km ca.
 H= 00 06 09.0

USCGS

 23. P Z 01 04 38.5
 P 44.2 N., 152.0 E.
 Kurile Is.
 h: 33 km ca.
 H= 01 01 31

USCGS

 23. P Z 01 53 04.3
 i EZ 05.3
 S NZ 59
 P:C

23. iP Z 02 36 01

 23. P N 02 41 19
 i E 19.7
 eS N 43 37

 45.6 N., 150.1 E.
 Kurile Is.

(cont)

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
	i	N	18	33	08.7	24.	iP Z, P N		02	59	31.3	
	i	Z			16.1		S	NE			48.6	
	eS?	N		40	32		P;S,C					
	L	N		41	30							
			45.4 N., 152.3 E. Kurile Is. h: 50 km ca. H= 13 34 33.0 USCGS			24.	P	Z		06	53	33
23.	iP	Z	18	57	12.1	24.	P	Z		07	02	20
	iS	NEZ			14.4		i	E			23.0	
	P:D						S	N		06	31	
23.	P	EZ	20	34	15.5		i	E			37	
	i	N			19.3		L	N		09	09.9	
			P:E,D 19.4 N., 155.5W. Hawaii I., Hawaii. h: 5 km ca. H= 20 24 05.5 USCGS			24.	iP	Z		07	35	35.5
23.	e	N	20	49	42		i	NE			36.0	
23.	P	Z	21	21	10		i	Z			49.6	
	i	N			11.0		S?	N		42	54	
	eS	N		23	27		i	NE		43	47	
	P:C						eSS	N		47	1	
			44.3 N., 150.7 E. Kurile Is. h: 40 km ca. H= 21 18 14 USCGS				eL	N		52	3	
23.	iP	N	22	14	12.1		P:C					
	i	EZ			12.3		Mag.6-6½ (Mat) 4.9 S., 102.9 E. Off south coast of Sumatra. h: 50 km ca. H= 07 26 23.9 USCGS					
	eS	N		16	29	24.	eP	Z		08	06	56
	L	N		17	15							45.1 N., 150.0 E. Kurile Is. h: 55 km ca. H= 08 03 55 USCGS
	P:S											
			44.0 N., 151.3 E. Kurile Is. h: 20 km ca. H= 22 11 13.1 USCGS			24.	P	Z		09	23	45
24.	P	Z	00	50	56		i	Z			53.0	
	i	E		51	28.4	24.	P	Z		09	34	32.7
24.	P	NE	01	09	18		i	Z			34.1	
	i	Z			18.4		i	NEZ			55.7	
	S	N		11	18	24.	P	Z		11	07	01
	L	E			30		i	NEZ			12.3	
			Mag.4.9 (Mat) 44.5 N., 150.3 E. h: 45 km ca. H= 01 06 25.9 USCGS									
24.	iP	NEZ	01	52	23.9	24.	iP	Z		13	23	29.6
	S	E		53	09.3		P:C					
	i	Z			11	24.	iP	Z		13	43	03.3
	P:N,E,C						i	NE			03.5	
							i	N		50	33.1	
							e	NE		51	0	
											(cont)	

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
	P:C			25.	eP	Z	01 41 01
	44.0 N., 150.3 E.			25..	iP	NEZ	01 42 30.3
	Kurile Is.				F:S,E,C		
	h: 45 km ca.			25.	P	Z	02 36 37
	H= 13 45 09.9	USCGS			i	NEZ	33.1
24.	F	Z	15 26 49		S	E	52
	i	N	49.3		i	N	54.6
	i	EZ	49.5	25.	F	Z	02 41 27.1
	i	Z	27 03.9		S	NE	43
	eL	N	29.3	25.	eP	NEZ	04 03 23
	P:D				51.6 N., 156.4 E.		
	44.8 N., 149.9 E.				Kamchatka.		
	Kurile Is.				h: 110 km ca.		
	h: 45 km ca.				H= 03 53 59	USCGS	
	H= 15 24 06.0	USCGS		25..	eP	Z	04 34 00
24.	iP	Z	19 21 53.0	25.	eP	NZ	05 03 14
	i	N	22 12.3		i	Z	43.3
	i	E	24 23		e	N	14 20
	i	N	30.6		52.0 N., 174.3 E.		
	i	E	36		Near Is., Aleutian Is.		
	P:D				h: 70 km ca.		
	28.3 N., 123.5 E.				H= 06 02 06.6	USCGS	
	Ryukyu Is.			25.	eP	NZ	06 30 43
	h: 33 km ca.				e	NZ	31 11
	H= 19 19 10.2	USCGS			e	N	33.6
24.	F	Z	19 35 17		44.3 N., 150.4 E.		
	i	NEZ	17.4		Kurile Is.		
	i	Z	24.6		h: 50 km ca.		
	e	Z	29		H= 06 27 53	USCGS	
24.	F	Z	20 20 59.4	25.	eP	EZ	07 32 12
	i	N	59.9		i	Z	25.1
	eS	E	23 13		i	NEZ	34.5
	L	E	46		e	E	36 26
	P:C				45.7 N., 151.3 E.		
	44.4 N., 149.7 E.				Kurile Is.		
	Kurile Is.				h: 33 km ca.		
	h: 40 km ca.				H= 07 29 02.0	USCGS	
	H= 20 13 12.7	USCGS		25.	iP	NZ	08 11 02.9
24.	eP	EZ	21 56 30		i	Z	27.0
	e	N	59 50		P:S,C		
	45.3 N., 151.5 E.				43.7 N., 150.3 E.		
	Kurile Is.				Kurile Is.		
	h: 40 km ca.				h: 45 km ca.		
	H= 21 53 25.0	USCGS			H= 08 03 12.1	USCGS	
25.	P	NZ	01 11 17.6	25.	P	EZ	10 20 54
	i	Z	29.1		i	Z	21 08.6
	i	E	13 20		e	NE	23 53
	e	E	15 40ca.		45.3 N., 150.2 E.		
	44.7 N., 149.5 E.				Kurile Is.		
	Kurile Is.						
	h: 50 km ca.						
	H= 01 03 35.5	USCGS					

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
		h: 40 km ca, H= 10 17 57.1	USCGS			h: 20 kn ca. H= 16 41 46.0	USCGS
25.	iP i P:C	Z N	11 15 49.2 50.2	25.	P 45.5 N., 150.6 E. Kurile Is. h: 33 km ca. H= 19 01 56.9	Z	19 04 58 USCGS
		44.0 N., 151.1 E. Kurile Is. h: 45 km ca. H= 11 12 57.3	USCGS	25.	iP i i PcP iS i iL L i L L P:S,D Mag. 6½ - 6½ (Mat) 12.3 N., 144.5 E. Mariana Is. h: 29 km ca. H= 19 53 53.3	NZ E N Z N E N Z N Z N S,D	20 04 16.3 17.1 25.0 07 34.0 08 39.3 46.0 09 52 10 39 11 33.2 12.9 13.0 USCGS
25.	iP i i S i L P:D	Z NE Z N E NE	12 00 29.7 45.1 N., 149.3 E. Kurile Is. h: 70 km ca. H= 11 57 55.3				USCGS
25.	iP i i S i L P:D	Z NE Z N E NE	12 35 57.6 57.8 36 10.6 33 14 20 33.9				USCGS
		44.5 N., 150.2 E. Kurile Is. h: 45 km ca. H= 12 33 05.8	USCGS	25.	eP e 36.9 N., 95.2 E. Tsinghai Province, China. h: 33 km ca. H= 22 49 42	Z N	22 56 20 23 07.3 USCGS
25.	iP i e P:D	Z N N	13 12 11.5 20.7 14 52				USCGS
25.	iP S P:S,C	NZ NZ	13 13 23.3 29.1	25.	eP eS L 13.4 N., 144.1 E. Mariana Is. h: 57 km ca. H; 23 21 42.7	Z N N	23 26 54 31 23 35 40 USCGS
25.	iP P:W,C	EZ	15 10 11.4				USCGS
		45.2 N., 150.6 E. Kurile Is. h: 33 km ca. H= 15 07 10	USCGS	26.	iP S i P:S,E,D	NEZ E N	00 33 23.3 43 44
25.	iP i i e P:N,D	NZ E Z E	16 06 16.6 17.2 08 52.5 13 32				USCGS
25.	iP i eS e e P:S,C	NZ E E N E	16 44 34.3 34.5 46 45 53 48.5	26.	iP S i P:S,W,D	NEZ E N	02 56 20.9
		44.3 N., 149.7 E. Kurile Is.	(cont.)	26.	P i S L1 L1 L2 Mag. 5½ (Mat) 44.5 N., 150.1 E. Kurile Is. h: 55 km ca. H= 03 55 39.7	Z Z N E N NE	03 53 23.3 31.4 04 00 45 01 20 21 03 00 USCGS

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
26.	iP eS P:C	NZ, FE N	05 04 19.7 06 30	26.	iP i L P:W,C	EZ N NE	11 24 41.6 41.3 27 25
		43.7 N., 150.5 E. Kurile Is. h: 40 km ca. H= 05 01 31.5	USCGS			Mag. 5 $\frac{1}{2}$ - 5 $\frac{1}{2}$ (Mat) 44.7 N., 149.7 E. Kurile Is. h: 55 km ca. H= 11 21 47.6	USCGS
26.	P S i e	NEZ N N E	06 02 32 04 40 05 00 56	26.	P i i i eS P:C	Z N N E N	11 34 41.4 42.3 48.0 55.2 36 50
		44.5 N., 149.8 E. Kurile Is. h: 60 km ca. H= 05 59 44.2	USCGS			44.6 N., 149.8 E. Kurile Is. h: 55 km ca. H= 11 31 53.0	USCGS
26.	P	Z	06 27 53	26.	eP	Z	12 44 11
		44.6 N., 154.2 E. Kurile Is. h: 60 km ca. H= 06 25 19	USCGS			15.3 S., 174.0 W. Tonga Is. h: 115 km ca. H= 12 33 50.1	USCGS
26.	eP	EZ	06 30 41	26.	P i iS P:W	E NEZ E	14 42 08.5 09.0 09.3
		44.3 N., 149.6 E. Kurile Is. h: 55 km ca. H= 06 27 53.3	USCGS			26. P P:C	Z 14 46 22.5
26.	iP i eS e P:C	Z E N E	06 46 26.3 27.0 41 42	26.	eP	Z	14 47 43
		26. iP i i S P:D	10 13 43.3 43.8 51.0 14 06			44.6 N., 149.7 E. Kurile Is. h: 60 km ca. H= 14 44 49.2	USCGS
26.	eP	Z	10 35 39ca.	26.	iP i i e P:D	Z NEZ Z E	15 31 29.9 32.1 56 32 33
		44.4 N., 149.5 E. Kurile Is. h: 55 km ca. H= 10 32 37	USCGS			26. P 26. iP i P:D	Z 17 11 54 19 03 35.4 35.8
26.	iP iS P:N,E,D	NEZ NEZ	10 43 40.4 44.9			7.0 S., 129.7 E. Banda Sea. h: 125 km ca. H= 13 55 39.1	USCGS
26.	P eS e	Z N E	10 54 17 40 41	26.	eP	Z	19 03 40
26.	eP i e i	Z N E NZ	11 24 35 36.5 38 38.7			(cont.)	

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	eL	E	20 01 15		L	N	08 27 00
	44.5 N., 149.4 E. Kurile Is. h: 65 km ca. H= 19 53 50				P:C Mag. 5 $\frac{1}{2}$ (Mat) 24.3 S., 176.0 W. Tonga Is. region. h: 33 km ca. H= 07 55 12.3		
27.	P	NZ	20 03 26.2	28.	eP	Z	03 54 00
	i	E	26.5	28.	eP	Z	10 06 35
	L	N	11 10		i	N	33.5
	L	E	49		i	N	09 12.3
	P:N,D 44.5 N., 150.1 E. Kurile Is. h: 50 km ca. H= 20 05 33.1				e	E	10 33
23.	P	Z	00 44 06.5	23.	P	Z	10 21 04
	i	N	06.7		e	E	25 42
	i	E	06.8		44.6 N., 149.6 E. Kurile Is. h: 50 km ca. H= 10 18 10.3		
	e	E	43 16		USCGS		
	1.9 N., 124.8 E. Northern Celebes. h: 232 km ca. H= 00 37 21			28.	iP	NEZ	12 08 16.0
	USCGS				i	Z	12 10.4
28.	iP	NZ, ZE	01 01 40.0		S	N	19
	i	Z	59		i	E	20.0
	iS	E	02 13.5		L	E	13 40
	i	NZ	14.5		L	EZ	14 36
	P:S,E,D				P:S,W,C Mag. 5 $\frac{1}{2}$ - 6 (Mat) 52.8 N., 159.8 E. Off east coast of Kamchatka. h: 33 km ca. H= 12 03 19.8		
28.	e	Z	01 12 29		USCGS		
23.	P	Z	05 01 47.6	28.	iP	EZ	13 05 19.4
	e	NEZ	53		i	N	19.8
	e	N	04 30		i	N	31
	L	E	05 07		i	E	32
	P:C 45.4 N., 151.3 E. Kurile Is. h: 45 km ca. H= 04 58 42.9				P:E,D		
	USCGS			23.	P	Z	14 16 37
28.	eP	Z	06 18 50		e	N	33
	46.5 N., 154.2 E. Kurile Is. h: 33 km ca. H= 06 15 33.7				i	Z	50
	USCGS				i	E	50.5
					45.3 N., 151.3 E. Kurile Is. h: 45 km ca. H= 14 13 31.6		
28.	iP	Z	07 24 59.1		USCGS		
	i	NE	59.4	28.	P	NZ	14 39 13
	e	NE	25 20		i	NZ	31.2
	P:D				i	E	32.0
28.	P	Z	08 06 43.3		45.7 N., 150.3 E. Kurile Is. h: 55 km ca. H= 14 36 20.0		
	i	N	50.5		USCGS		
	eS	N	16 57	28.	P	Z	13 08 01
	e	E	17 00ca.		i	NE	01.4
	e	E	21 32		(cont.)		
	L	E	26.2				
	(cont.)						

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	S	Z	13 10 18.0	29.	iP	EZ	02 26 47.2
	P:D				P:E,D		
			45.0 N., 151.7 E.				44.6 N., 151.2 E.
			Kurile Is.				Kurile Is.
			h: 60 km ca.				h: 45 km ca.
			H= 13 05 09.7				H= 02 23 53.6
			USCGS				USCGS
28.	P	NZ	13 12 29	29.	eP	Z	03 00 36
			43.9 N., 150.9 E.		e	Z	56
			Kurile Is.				45.6 N., 151.2 E.
			h: 33 km ca.				Kurile Is.
			H= 13 09 38				h: 25 km ca.
			USCGS				H= 02 57 33
							USCGS
28.	iP	Z	18 23 14.5	29.	eP	Z	04 01 43
	i	NE	15.0				
	S	NE	34	29.	iP	Z	05 42 33.2
	P:D				e	EZ	41
28.	iPKP	Z	19 35 24.5		i	Z	48.2
	i	Z	32.7	29.	P	Z	07 11 50
	PKP:D						45.3 N., 150.7 E.
			42.8 S., 73.7 W.				Kurile Is.
			Southern Chile.				h: 55 km ca.
			h: 30 km ca.				H= 07 09 00
			H= 19 15 12.5				USCGS
			USCGS				
28.	iP	NEZ	20 09 47.5	29.	iP Z, P E		10 04 14.6
	i	Z	13 04.6		P:W,C		
	i	Z	13.5	29.	iP	Z	15 12 16.5
	P:N,W,C				i	Z	20
			24.5 S., 179.9 E.		S	NEZ	28
			Fiji Is. region.				P:N,E,C
			h: 532 km ca.	29.	P	Z	16 08 55.5
			H= 19 59 15.0		e	Z	09 34
			USCGS		P:C		
				29.	iP	Z	16 55 01.9
28.	iP	NEZ	20 39 45.7		i	N	02.5
	e	N	41 22		iS	Z	35.5
	eS	E	56		e	E	36
	L	N	42 32		P:C		
	L	Z	44	29.	iP	EZ	19 13 04.9
	P:N,E,D				i	Z	05.6
			44.8 N., 149.6 E.		i	Z	16.1
			Kurile Is.		P:E,D		
			h: 45 km ca.	29.	e	E	20 57 20
			H= 20 36 56.0				
			USCGS	29.	iP	Z	22 09 43.1
					i	Z	10 17.9
					P:D		
28.	iP	Z	21 52 27.8	29.	iP	NZ	22 11 11.6
	i	N	28.3		i	Z	14.1
	i	E	30.2		S	Z	22
	P:D				P:D		
			49.9 N., 154.7 E.				
			Kurile Is.				
			h: 105 km ca.				
			H= 21 43 24.1				
			USCGS				
28.	eP	Z	21 56 20				
29.	P	Z	02 22 45				
	S?	N	23 10				

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
29.	eP	Z	22	30	45	30.	i	Z	04	43	28.3
	eL	E		40	27		i	E			29.1
	eL	Z		44	15		e	Z			45
29.	eP	Z	22	34	14	30.	eP	Z	05	11	33
	24.4 S., 176.1 W. Tonga Is. region. h: 33 km ca. H= 22 22 37.7						i	N			35.0
					USCGS		e	N			12 03
30.	iP	Z	00	03	45.3	30.	iP	Z	05	23	36
	44.2 N., 150.6 E. Kurile Is. h: 50 km ca. H= 00 00 58						F:D				
					USCGS	30.	e	E	06	07.5	
30.	eP	Z	00	38	29	30.	iP	NZ	09	31	10.6
	44.7 N., 150.0 E. Kurile Is. h: 55 km ca. H= 00 35 40.4						i	E			10.7
					USCGS		P:S,C 44.9 N., 149.1 E. Kurile Is. h: 45 km ca. H= 09 28 29.9				
30.	eP	Z	00	41	16	30.	P	Z	10	54	37.6
	e	E		43	51		e	E			57.7
30.	iP	EZ	00	53	42.0		44.6 N., 150.2 E. Kurile Is. h: 55 km ca. H= 10 51 45.9				
	i	N			42.1						USCGS
	i	Z			49.6	30.	P	Z	15	24	01
	S	N			59		e	E			27 05
	P:E,C						L	E			28 37
30.	eP	Z	01	03	34		44.3 N., 150.2 E. Kurile Is. h: 45 km ca. H= 15 21 07.2				
	43.4 N., 151.2 E. Kurile Is. h: 45 km ca. H= 01 05 37										USCGS
30.	P	NEZ	02	31	14	30.	iP	Z	16	16	52.2
	i	E			17.1		iS	EZ			54.5
	iS	Z, S NE			46	30.	iP	Z, P NE	19	04	10.2
	35.1 N., 135.9 E. Honshu, Japan. h: 0 km ca.						S	NZ			12.3
					JMA		i	E			12.5
							P:N,W,D				
30.	iP	Z	02	34	47.6	30.	iP	NEZ	19	10	37.7
30.	eP	Z	03	02	19		iS	Z			40.2
	43.6 N., 151.4 E. Kurile Is. h: 44 km ca. H= 02 59 24						P:S,D				
					USCGS	30.	iP	EZ	19	12	26.3
							S	NEZ			29.0
							P:W				
30.	eP	Z	03	41	43	30.	P	Z	22	45	14
	i	NZ		42	12.6		e	E			43 25
30.	eP	Z	04	13	15		L	E			50 16
	i	NZ			48		43.5 N., 150.5 E. Kurile Is. h: 33 km ca. H= 22 42 27				
30.	eP?	Z	04	14	40ca.						USCGS
	i	NEZ		15	10.6						

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Date	Phase	Comp.	Time(GMT)		
			h	m	s
31.	iP	NZ	03	29	11.5
	i	E			12.0
	i	N			14
	e	E			26
	S	N	38	46	
	ScS	E	39	38	
	L	N	50	26	
	L	E	57	12	
	L	E	04	04	47
	P:N,C Mag. 6 - 6 $\frac{1}{2}$ (Mat) 21.8 S., 175.0 W. Tonga Is. h: 33 km ca. H= 03 17 42.0 USC GS				
31.	iP	Z	04	36	13.3
	P:D 23.9 S., 179.3 W. Fiji Is. region. h: 464 km ca. H= 04 25 38.0 USC GS				
31.	iP	NEZ	07	23	49.0
	S	NE			24 06
P:N,W,C					
31.	iP	Z	09	01	39.4
	i	NE			39.6
P:D 17.9 S., 178.3 W. Fiji Is. region. h: 637 km ca. H= 08 51 42 USC GS					
31.	F	Z	09	45	37.6
	i	N			38.6
	e	Z			43
	eS?	NE	47	52	
L	E	48	53		
31.	eP	Z	10	56	44
	10.5 S., 162.0 E. Solomon, Is. region. h: 33 km ca. H= 10 47 25.3 USC GS				
31.	iP	Z	13	28	05.1
	i	NZ			06.8
	i	E			09.4
	iS?	E			12.6
	P:D				
31.	iP	EZ	17	51	34.0
	i	N			39.1
	S	N	53	53.6	
	L	E	56	11	
P:E,D 44.2 N., 150.0 E. (cont.)					

Date	Phase	Comp.	Time(GMT)		
			h	m	s
Kurile Is. h: 70 km ca. H= 17 48 45.6 USC GS					
31.	P	Z	20	20	06.1
	37.2 N., 70.0 E. Hindu Kush region. h: 105 km ca. H= 20 10 54.2 USC GS				
31.	iP	EZ	20	30	44.5
	i	N			44.8
	e	E	40	21	
P:W,C					
31.	e	Z	23	57	07
	43.7 N., 151.2 E. Kurile Is. h: 33 km ca. H= 23 54 03 USC GS				

Mineo Takehana

Director

SEISMOLOGICAL BULLETIN
OF
MATSUSHIRO

NOVEMBER , DECEMBER
1963

Matsushiro Seismological Observatory
Matsushiro - machi, Nagano - shi,
Nagano - Ken, Japan

Matsushiro Seismological Observatory , Japan

Seismological Bulletin

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

Instrumental Constants

Instruments	Comp.	Period (sec)		Damping ratio		Magnification
Benioff Seismograph (Short Period)	N	T ₁ = 1.0	T ₂ = 0.23	h ₁ = 0.68	h ₂ = 1.7	103,000 (max)
	E	T ₁ = 1.0	T ₂ = 0.22	h ₁ = 0.70	h ₂ = 1.6	106,000 (max)
	Z	T ₁ = 1.0	T ₂ = 0.21	h ₁ = 0.72	h ₂ = 1.2	131,000 (max)
Benioff Seismograph (Long Period)	N	T ₁ = 1.0	T ₂ = 70	h ₁ = 0.68	h ₂ = 5.9	7,330 (max)
	E	T ₁ = 1.0	T ₂ = 62	h ₁ = 0.70	h ₂ = 5.6	9,640 (max)
	Z	T ₁ = 1.0	T ₂ = 84	h ₁ = 0.72	h ₂ = 7.3	7,590 (max)
Short Period Seismograph	Z	T ₁ = 1.0	T ₂ = 2.82	h ₁ = 1.4	h ₂ = 1.2	32,000 (max)
Galitzin Seismograph	N	T ₁ = 15	T ₂ = 100	h ₁ = 1	h ₂ = 1.2	1,350 (max)
	E	T ₁ = 15	T ₂ = 100	h ₁ = 1	h ₂ = 1.1	1,640 (max)
	Z	T ₁ = 7.5	T ₂ = 100	h ₁ = 0.76	h ₂ = 0.87	860 (max)
Wood-Anderson Seismograph	N	0.8		0.8		1,050
	E	0.8		0.8		1,200
1000 kg Long Period Seismograph	N	33.0		0.60		100
	E	30.0		0.62		100

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
1.	P iS Z, S E	EZ	02 27 32 51.4		e i e	NE Z N	31 32.2 20 14
1.	P 45.2 N., 152.2 E. Kurile Is. h: 40 km ca. H= 02 51 35.1	Z	02 54 49 USCGS	1.	eP i e S i	Z NEZ N Z E	22 44 05 06.0 46 17 29 30
1.	iP i	Z NZ	03 22 17.8 26				Mag. 5 $\frac{1}{2}$ (Mat) 44.3 N., 149.0 E. Kurile Is. h: 40 km ca. JMA
1.	iP Z, P E iS P:D	NE	03 28 46.7 29 05.4	2.	iP i i P:S,C	NZ Z E	06 11 11.2 13.0 13.9
1.	P e P:S,W,C 51.7 N., 159.8 E. Near east coast of Kamchatka. h: 33 km ca. H= 03 52 25.9	NEZ E	03 57 13 04 06 40 USCGS	2.	P L L	EZ E N	09 20 20 23 27 31
1.	eP? e L	Z N N	07 42 50ca. 46 06 51 05				44.6 N., 151.2 E. Kurile Is. h: 50 km ca. H= 09 17 18.2 USCGS
1.	eP	Z	07 49 45	2.	iP Z, P E e P:D	EZ	11 43 40.3 50
1.	P i P:C	Z NE	14 23 55 55.8	2.	iP S P:W,C	EZ E	15 40 26.3 42
1.	iP i S i i P:N	NZ E N Z E	13 34 17.6 17.9 36.1 36.4 37	2.	iP i i eS i L P:S,W,C 44.0 N., 150.5 E. Kurile Is. h: 50 km ca. H= 17 53 27.2	NEZ Z Z E N N	17 56 15.9 28 41 58 21 35 59 16 USCGS
1.	iP i iS P:S,W,D	NEZ Z EZ	20 44 00.7 06.3 16.0	2.	iP S P:N,E,C	NEZ E	19 44 51.1 59
1.	iP i eS eL P:C 22.5 S., 176.8 W. Tonga Is. h: 71 km ca. H= 20 59 28.1	Z Z N N	21 10 43.0 50.9 19 50 30 51 USCGS	2.	ePKP1 PKP2 eL 24.3 S., 63.1 W. Chile - Argentina border. h: 106 km ca. H= 21 35 29.8	Z Z NE	21 55 13 33 22 36 50 USCGS
1.	iP i	Z NEZ	22 14 53.9 15 06.4 (cont)				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
2.	eL	NE	23 42	3.	iP Z, P E	N	04 41 33.5
2.	eP?	Z	23 47 53ca.		i		33.8
	i	Z	55		P:W,C		
	i	N	48 02		49.5 N., 155.6 E.		
	e	E	04		Southern tip of Kamchatka.		
	i	E	07		h: 50 km ca.		
	i	Z	21		H= 04 37 25.2	USCGS	
2.	PN., eP E Z		01 18 32	3.	eP?	Z	06 24 53
	i	Z	44.4		i	NEZ	54.5
	i	N	45.5		S	E	25 17
	i	Z	59	3.	iPKP	Z	07 57 35.5
	L	N	21 51		i	NE	36.0
	L	E	22 00		P:D		
			45.2 N., 151.4 E.		15.6 S., 73.3 W.		
			Kurile Is.		Southern Peru.		
			h: 45 km ca.		h: 112 km ca.		
			H= 01 15 24.9		H= 07 38 10.7	USCGS	
3.	iP	Z	01 40 09.3	3.	iP	Z	14 24 41.3
	P:C				i	NE	51.0
			45.4 N., 151.0 E.		eS	E	25 34
			Kurile Is.		P:C		
			h: 33 km ca.	3.	iP Z, P N		14 41 36.5
			H= 01 37 04.0		P:D		
			USCGS		14.0 S., 165.9 E.		
3.	eP	NZ	02 18 43		New Hebrides Is.		
	e	Z	49		h: 50 km ca.		
	L	N	22 02		H= 14 31 57.2	USCGS	
	L	E	11	3.	P	Z	14 48 32
			Mag. 5 (Mat)		39.2 N., 21.1 E.		
			23.9 N., 122.6 E.		Near west coast of Greece.		
			Off east coast of Taiwan.		h: 29 km ca.		
			h: 33 km ca.		H= 14 35 59.4	USCGS	
			H= 02 14 24				
			USCGS	3.	P	NEZ	15 23 16
3.	PKP1	Z	03 29 13.4	3.	eP?	Z	16 58 29ca.
	PKP2	Z	27.6		i	NEZ	36
	i	EZ	28.8		S	NE	59 30
	PP	Z	31 53	3.	F	EZ	17 57 02.5
	i	Z	32 56.2		i	NE	05.3
	i	N	59		i	Z	06.0
	eSS?	E	48 48		S	NE	35
	eSS	N	49 42		P:E,C		
	PSPS	E	50 34	3.	iP	Z	19 25 51.0
	Lr	E	04 14 23		i	NE	51.3
	Lr	Z	30		S	E	28 10
	L	N	17 10		e	N	20
	P:C				L	N	40
			Mag. 6 $\frac{1}{4}$ -7 (Mat)		P:C		
			3.5 S., 77.3 W.		45.3 N., 150.1 E.		
			Peru-Ecuador border.		Kurile Is.		
			h: 33 km ca.		h: 45 km ca.		
			H= 03 10 12.7		H= 19 22 53.6	USCGS	
			USCGS				
3.	iP	EZ	03 55 18.3				
	i	NEZ	32.0				
	P:E,D						

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
3.	iP i iS i i P:N,C	NZ E N E Z	21 45 18.0 13.5 43.5 43.8 49.0				
							Banda Sea. h: 30 km ca. H= 01 17 08.9 USCGS
3.	eP i eS eL	Z Z E E	22 04 59 05 15 08 47 09 32	4.	iP Z, P NE P:N,E,C 6.9 S., 129.5 E. Banda Sea. h: 76 km ca. H= 02 14 04.2		02 22 06.5 USCGS
3.	iP i i eL L L P:C 44.3 N., 149.2 E. Kurile Is. h: 45 km ca. H= 22 54 36.6	Z NZ NZ N N E	22 57 16.0 19.7 30 23 00 26 01 45 50	4.	P NEZ isP Z sP E 7.0 S., 129.5 E. Banda Sea. h: 129 km ca. H= 02 36 41.1		02 44 36 45 19.5 21 USCGS
3.	P Z, eP E i i	E E N	23 44 43 54.5 45 03.3	4.	iP Z P:D		03 39 47.5
3.	iP i i e P:E	E NZ N N	23 47 49.0 49.5 52.1 43 08	4.	iP NZ, P,E i E PcPorPP Z P:S,D 6.9 S., 129.8 E. Bansa Sea. h: 100 km ca. H= 03 43 15.9		03 51 12.9 13.1 52 59 USCGS
4.	P 45.2 N., 150.0 E. Kurile Is. h: 66 km ca. H= 00 52 53.0	Z	00 55 48 USCGS	4.	eP Z 7.0 S., 129.5 E. Banda Sea. h: 115 km ca. H= 05 00 29.1		05 08 26 USCGS
4.	iP P:N,W,C 15.1 S., 167.3 E. New Hebrid s Is. h: 154 km ca. H= 01 14 32.8	NEZ	01 24 12.0 USCGS	4.	iP Z i N epP Z sP E sP Z P:C 6.8 S., 129.8 E. Banda Sea. h: 80 km ca. H= 05 22 59.0		05 30 58.3 58.5 31 19 28 29 USCGS
4.	P i PPP S iSSor sSSZ SSorsSS iL L P:N,E,C Mag. 7 $\frac{1}{2}$ -7 $\frac{1}{2}$ (Mat.) 6.8 S., 129.6 E.	NEZ E E E E E E	01 25 10 12 27 35 31 31 35 05 07 36 25 32	4.	P Z e E e N e Z i E i N eS NE 44.5 N., 150.6 E.		06 12 13 16 22 28 30 35 14 25 USCGS

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November , 1963

Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
		Kurile Is. h: 40 km ca. H= 06 09 19.8	USCGS			7.0 S., 129.4 E. Banda Sea. h: 132 km ca. H= 15 13 35.1	USCGS
4.	P	Z	08 09 00.5	4.	e	N	16 08 08
	L	E	13 51		e	N	10 34
	eL	N	14 00			44.5 N., 11.0 E. Emilia Romagna, Italy. h: 16 km ca. H= 15 45 46.8	USCGS
		44.0 N., 149.9 E. Kurile Is. h: 33 km ca. H= 08 06 15.1	USCGS	4.	P	Z	16 20 46
4.	P	Z	08 12 39	4.	iP Z, P NE		17 00 14.9
	S	N	56		e	Z	27
4.	P?	N	08 38 45		i	E	32
	e	E	47		i	N	33
	i	Z	48		P:D		
	e	Z	39 01	4.	P	Z	18 34 15
		44.8 N., 149.3 E. Kueile Is. h: 33 km ca. H= 08 35 51.5	USCGS		i	N	17
4.	iP	Z	08 49 23.3		eL	N	19 00 46
	P:C					23.5 S., 176.1 W. Toga Is. h: 33 km ca. H= 18 22 43	USCGS
4.	P	Z	09 58 16	4.	P	Z	19 21 49
	S	N	52	4.	iP	NZ	20 00 03.2
	i	E	54		P:S,D		
	i	Z	53			6.9 S., 129.5 E. Banda Sea. h: 104 km ca. H= 19 52 04.0	USCGS
	eL	NE	59 26	4.	P	Z	21 21 12
	L	E	10 01 20			36.3 N., 71.3 E. Hindu Kush. h: 143 km ca. H= 21 12 11.5	USCGS
4.	P	Z	10 13 24	4.	iF NZ, PE		22 25 02.0
4.	eP	NZ	10 49 34		S	N	31 13
	i	Z	45		sS	E	32 12
4.	iP	Z	11 44 32.7		e	N	34 16
	iS	N	56.2		Lr	N	35 45
	i	E	57.1		Lr	Z	58
	P:C				P:S,W,D		
4.	i	E	13 16 14			Mag. 5 $\frac{1}{2}$ -5 $\frac{3}{4}$ (Mat) 6.8 S., 129.9 E. Banda Sea. h: 136 km ca. H= 22 17 09.0	USCGS
	e	N	15	4.	iP Z, P N		22 33 41.6
	e	Z	19		P:C		
	i	NEZ	31				
	e	N	19 26				
4.	P	NZ	14 34 34				
	i	Z	45				
	i	N	46				
4.	P	Z	14 54 20				
4.	P	Z	15 21 33				
	i	N	33.6				
	SP	Z	22 11				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
4.	iP P:S,E	NEZ	22 48 18.8	5.	P 27.6 S., 176.2 W. Kermadec Is. region. h: 92 km ca. H= 09 33 36	Z	09 45 19
4.	P i	Z N	23 49 38 47				USCGS
5.	P i	Z N	03 01 56.5 02 13.5	5.	iP NZ, P E i E P:N		11 27 58.6 59.5
			55.5 N., 157.9 E. Kamchatka. h: 33 km ca. H= 02 56 50.6				USCGS
5.	P	NEZ	06 14 18	5.	P i S P:E,D	EZ N E	12 54 06.1 06.5 36
			6.9 S., 129.4 E. Banda Sea. h: 94 km ca. H= 06 06 19				USCGS
5.	P i	Z Z	06 19 06 18	5.	P P:D	Z	13 44 58
5.	P i iS	Z NE NE	06 57 01 01.7 42.0	5.	P i i i e e i P:D	Z N E Z N Z N	14 13 19.4 26.7 51.0 53.3 14 06 11 21
5.	iP P:C	Z	08 28 31.5				
			24.8 S., 179.7 E. Fiji Is. h: 606 km ca. H= 08 18 05	5.	P? e i i i	Z Z NE Z N	14 15 45 52 52.5 16 21 24
			USCGS				
5.	iP i i P:C	Z NE E	08 46 13.0 13.5 38.2	5.	iP Z, P E i N i N i N P:C		14 22 35.3 43.0 23 02 09
5.	P Z, eP E i epP esP pPP?	Z N Z E E	08 51 31 31.5 53 52 11 53 37	5.	P i	Z N	14 38 07 14
			7.2 S., 129.0 E. Banda Sea. h: 112 km ca. H= 08 43 33.8				USCGS
5.	P i S L P:S,C	NZ E E NE	09 21 33.2 33.8 23 45 24 14	5.	eP i i i e	Z N NZ E N	14 41 01 03.5 09 13 32
			43.5 N., 150.9 E. Kurile Is. h: 40 km ca. H= 09 18 42.6				USCGS
			USCGS	5.	eP e	Z N	16 14 04 07
							26.1 S., 178.9 E. Fiji Is. region. h: 56 km ca. H= 16 02 05.4
							USCGS

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
5.	iP i	EZ N	17	43	32.3 32.7	6.	P i i	Z E N	02	13	22.3 39 47
5.	F Z, eP	NE	21	02	07	6.	P i i PP PPP S eLq L Lr i i	NZ NZ E Z N NE NE E Z N Z	02	20	33 40 46 22 11 38 26 32 28 10 29 36 30 33 31 41 33 42
		44.6 N., 149.3 E. Kurile Is. h: 33 km ca. M= 20 59 26.3			USCGS						
5.	iP i i S P:S	N Z E E	21	10	34.0 34.2 35 57						
5.	iP P:C	Z	21	48	47.0						
		47.4 N., 147.1 E. Kurile Is. h: 44 km ca. H= 21 46 23.6			USCGS						
5.	iP S P:C	Z NE	23	49	23.5 46						
5.	iP P:D	Z	23	59	59.5						
		1.7 N., 126.4 E. Molucca Passage. h: 23 km ca. H= 23 52 56.3			USCGS						
6.	P i P:N	N EZ	00	16	49.1 49.5						
6.	iP Z, P S P:D	N Z	00	41	40.5 42 04						
6.	iP i S P:C	Z E NEZ	01	02	02.6 04.1 26						
6.	iP i S P:S,D	NZ Z NEZ	01	26	47.0 47.5 27 10.5						
6.	P i S i	Z Z E NEZ	01	28	13 14.5 36 37.8						
6.	P Z, eP S E, eS N	NE	01	45	51 46 13						
		Mag. 6 $\frac{1}{2}$ -7 (Mat) 2.6 S., 138.4 E. Western New Guinea. h: 33 km ca. H= 02 13 16.8			USCGS						
6.	P	Z	03	07	32						
		2.2 S., 133.7 E. Western New Guinea. h: 43 km ca. H= 03 00 12.2			USCGS						
6.	P?	Z	03	15	17						
6.	P i S i	NZ E E E	03	43	34 34.3 56 57						
6.	iP eS i P:C	NZ NEZ E	03	44	30 53 54						
6.	iP i i eS S i P:C	Z N E E Z NE	03	53	08.3 09.3 10.5 31 32 33						
6.	iP S i P:N,C	NZ NZ EZ	04	33	11.0 35 36						
6.	eL eL	N Z	04	51	28 50						
6.	iP P:N,W,C	NEZ	06	40	07.5						
		30.8 S., 179.9 E.									

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
		Kermadec Is. region. h: 411 km ca. H= 06 28 55.3					
6.	P e e L	Z N N NE	07 47 40 48 49 51 09 53 57	6.	P i ipP	EZ N Z	17 16 06.7 07.5 29.7
						0.8 S., 113.6 E. Near south coast of Java. h: 230 km ca. H= 17 07 22	
6.	P i	Z NE	09 09 14 16	6.	iPKP i i ipPKP pPKP P:D	Z E N Z NE	18 52 54.0 54.7 55.1 53 40.7 43
		7.1 S., 129.2 E. Banda Sea. h: 90 km ca. H= 09 01 12.0				16.7 S., 69.7 W. Peru-Bolivia border. h: 174 km ca. H= 18 33 25.9	
6.	iP i i eS i i eL L L	NEZ Z NEZ E N E N N E	09 28 29.9 32.2 38.0 31 16 22 40 32 04 34 04 15	6.	eP i e e e	Z NE E N NE	23 55 00 12 57 13 16 40
		P:S,W,C Mag. 5-5½ (Mat) 46.3 N., 154.9 E. Near west coast of Kamchatka. h: 33 km ca. H= 09 24 49.2		7.	P e	Z Z	00 02 55 03 21
6.	eP e eL?	Z N N	13 51 05 14 02 44 22.0	7.	P eS eLq Lr	Z N N N	02 50 21 56 06 53 13 03 01 26
						Mag. 5½ (Mat) 2.5 S., 138.7 E. Western New Guinea. h: 69 km ca. H= 02 42 57.9	
6.	iP i iS E, S N P:N,E,C	NEZ E E E	14 42 53.6 58.1 43 16.0	7.	eP e eL	Z N Z	03 27 55 30 43 32 00
						Mag. 5ca.(Mat) 44.9 N., 150.1 E. Kurile Is. h: 40 km ca. H= 03 24 59.3	
6.	iP i i eS i P:D	Z N E E N	16 20 23.5 24.5 25.0 21 32 33.5	7.	iP iS i i P:W	EZ E N E	05 59 29.5 51.0 51.3 55.3
6.	eP	Z	16 42 02	7.	iP i i iS i	Z E NZ Z N	06 13 06.1 06.5 06.9 42.2 45
6.	P S? i i i P:S,W	NEZ E N Z E	16 51 16 41 42 43.0 43.5				(cont)

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
	P:C 36.3 N., 142.4 E. Off east coast of Honshu, Japan. h: 60 km ca.		JMA				
7.	iP eS i P:E	EZ N E	06 23 32.5 29 11 13.5	7.	iP EZ, P N i i P:E,D	N E N	15 51 09.5 27.3 28.1
7.	P i i i i	Z E Z N Z	09 05 39 39.5 39.9 51 07 17.7	7.	iP i P:C 24.2 S., 176.4 W. Tonga Is. region. h: 33 km ca. H= 15 53 41.9	Z N	15 05 15.1 15.4
	44.2 N., 149.7 E. Kurile Is. h: 45 km ca. H= 09 03 53.4		USCGS	7.	iP i e P:S,D 11.3 S., 166.1 E. Santa Cruz Is. h: 89 km ca. H= 16 26 37.8	NZ E E	16 35 57.0 57.2 52.0
7.	iP Z, P NE S L L P:S,C 44.2 N., 151.1 E. Kurile Is. h: 50 km ca. H= 09 22 53.3	NE NE E N	09 25 49.5 23 06 35 58				USCGS
7.	P i	Z N	10 03 16 33	7.	P 24.4 S., 176.0 W. Tonga Is. region. h: 33 km ca. H= 17 34 53.0	Z	17 46 33
7.	iP NZ, P E e e P:N,E,C	N N E	11 56 52.5 57 44 45	7.	eP i i i S L i	EZ E NZ E N E E	18 02 06ca. 22.5 24 03 05 15 56 06 17
7.	iP i S eLq eLq iLr P:N,C 14.1 N., 146.2 E. Mariana Is. region. h: 48 km ca. H= 12 55 25.6	NZ E NE N E E	13 00 30.0 30.7 04 41 05 46 54 06 20	7.	iP Z, P N i iS E, S N P:C	E E N	18 46 21.3 23.7 45.5
	H= 12 55 25.6		USCGS	7.	P i i eL Lr Mag. 5 $\frac{1}{4}$ (Mat) 44.9 N., 151.9 E. Kurile Is. h: 29 km ca. H= 20 37 53.6	Z E N NE EZ	20 41 03 03.5 05.9 44 13 46 34
7.	iP Z, P NE iS iS P:S,W,D	NE Z NE	13 01 40.0 03 26.0 26.4				USCGS
7.	P 45.5 N., 150.0 E. Kurile Is. h: 40 km ca. H= 15 12 34.5	NEZ	15 15 32	7.	iP i e P:C	Z NE Z	22 48 53.5 54.5 49 09
	H= 15 12 34.5		USCGS	8.	iP Z, P NE S	NE Z	00 24 43.3 25 13

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
3.	iP S S P:W,C	EZ N E	02 45 09.5 44 45				
					44.4 N., 149.4 E. Kurile Is. h: 33 km ca. H= 14 35 26*		USCGS
3.	i	E	02 46 59	8.	iP i P:C	Z Z	16 20 07.8 47.6
8.	P e	Z E	04 23 13 52	8.	P	Z	21 26 43.5
8.	iP S i P:D	Z E N	04 33 08.5 34 22 24	9.	P i	EZ Z	01 25 50 26 03
8.	P 21.5 S., 179.7 W. Fiji Is. h: 659 km ca. H= 05 05 03.0	Z	05 15 14	9.	P	Z	07 55 43
				9.	iP i P:C	Z Z	08 38 21.6 35
8.	eP	Z	06 09 04				45.6 N., 150.0 E. Kurile Is. h: 45 km ca. H= 08 35 25.3
8.	P i i	Z E Z	06 12 26 26.9 13 16	9.	iP i eL P:E,D	EZ Z NE	08 54 21 34 57 34
8.	P i i	EZ N N	07 26 01 01.5 22				45.3 N., 150.8 E. Kurile Is. h: 33 km ca. H= 08 51 18.6
8.	iP NZ, P i i eS L L P:N,D Mag. 5 - 5½ (Mat) 45.0 N., 150.9 E. Kurile Is. h: 40 km ca. H= 03 08 09.2	E Z Z E N E	08 11 10.3 15 25 13 54 14 06 14	9.	eP	Z	11 16 34
							45.6 N., 150.9 E. Kurile Is. h: 40 km ca. H= 11 13 30.6
8.	iP i P:C 44.0 N., 150.4 E. Kurile Is. h: 40 km ca. H= 11 22 28.5	Z NE	11 25 15.0 15.3	9.	iP i i S i P:D	Z N E N E	14 32 31.7 31.9 32.5 33 28 29.6
				9.	iP iS P:S,E,D	NEZ N	19 07 55.0 08 07.1
8.	iP i i P:E,C	EZ N Z	13 03 11.2 11.7 39	9.	iPKP i i i i iSKP i iPP PKS	Z, PKP E N E Z Z N NE E	21 33 51.1 51.6 53.3 53.7 54.0 36 45 56.6 37 12 44
8.	iP e P:C	Z NE	14 38 10.1 41 14 (cont.)				(cont.)

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
	L	E	13	05	21							
	L	N			35	13.	P	NZ	01	34	30.0	
	L	Z		07	15		i	E			30.5	
	P:N,E,D						i	NE		35	07	
	44.2 N., 149.4 E.					13.	iP	Z	01	35	20.3	
	Kurile Is.						iS	NE			50.0	
	h: 50 km ca.						L	E			53.6	
	H= 13 00 00.7			USCGS			P:D					
12.	eP	NZ	14	43	25		Mag. 4.3 (Mat)					
	S?	N		50	35		34.6 N., 137.1 E.					
							Near south coast of					
							Honshu, Japan.					
							h: 105 km ca.					
							H= 01 34 46			USCGS		
12.	iP	Z	15	37	30.7		P	Z	01	41	07.6	
	P:D						i	E			03	
	31.7 N., 78.5 E.						i	N			08.5	
	Northern India.						S	NE			39	
	h: 33 km ca.						i	Z			44	
	H= 15 23 43.9			USCGS			L	E			52	
							P:C					
12.	P	Z	17	30	27		13.	iP	NEZ	05	02	16.1
	i	N			28.2			i	Z			16.3
	i	E			29.6		S	N				38
	S	E		31	49		L	NEZ				48
	i	Z			52.6		P:N,E,					
							Mag. 5.1 (Mat)					
12.	iP	NEZ	17	44	32.6		34.4 N., 138.3 E.					
	iS	Z			37.7		Near south coast of					
	F:N,E						Honshu, Japan.					
							h: 80 km ca.					
							H= 05 01 41.8			USCGS		
12.	iP	EZ	18	28	24.3		13.	P	NZ	05	13	52
	i	N			25.2			i	E			53
	S	NE			48		S	N		14	20	
	P:W,C						i	EZ				22
12.	P	Z	20	43	04.5		13.	P	Z	05	35	24
	i	E			04.7			i	NE			27
	i	N			05.1		S	NE				53
	S	N			48		13.	P	EZ	05	36	23
	i	E			49			i	N			27
	L	E		44	23		S	E				56
	L	N			50		13.	iP	EZ	05	53	45.5
	P:D							i	N			45.7
12.	iP	Z	21	02	53.9			i	E			59
	P:D						P:E,D					
	7.1 S., 129.5 E.					13.	P	NZ	06	46	26	
	Banda Sea.						e	E			27	
	h: 131 km ca.						S?	E			59	
	H= 20 54 03.5			USCGS		13.	P	Z	07	35	24.5	
13.	P	N	00	29	06.0			i	E			25
	i	Z			06.3		(cont.)					
	i	E			08.7							
	P:S											
13.	P	Z	01	13	20							
	44.5 N., 149.2 E.											
	Kurile Is.											
	h: 50 km ca.											
	H= 01 15 38.5			USCGS								

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
	i	N	07	35	30							
	i	NE			40	13.	P	NEZ	15	53	33	
	i	N			37 21		S	E			55 30	
	L	E			38 09							
	L	N			17							
			44.2 N., 149.6 E.						44.3 N., 143.2 E.			
			Kurile Is.						Kurile Is.			
			b: 40 km ca.						h: 33 km ca.			
			H= 07 32 42.0						H= 15 50 48*			
			USCGS						USCGS			
13.	iP	Z	09	51	09.8	13.	P	N	16	28	14.4	
	i	N			11.6		i	N			15.0	
	i	E			12.4							
	S	E			52 11							
	P:D											
			45.5 N., 150.0 E.						45.5 N., 150.0 E.			
			Kurile Is.						Kurile Is.			
			h: 50 km ca.						h: 50 km ca.			
			H= 16 25 17						H= 16 25 17			
			USCGS						USCGS			
13.	iP	NE	10	29	11.0	13.	P	Z	17	30	22	
	i	Z			11.4		i	Z			40	
	i	Z			19		i	E			40 46	
	i	NE			20		e	E			50 44	
	P:N,W						eL	E			56 12	
			22.9 S., 175.3 W.								59 30	
			Tonga Is.						22.9 S., 175.3 W.			
			h: 33 km ca.						Tonga Is.			
			H= 17 18 50.1						h: 33 km ca.			
			USCGS						H= 17 18 50.1			
			USCGS						USCGS			
13.	P	N	11	11	42.0	13.	P	Z	17	48	19.5	
	i	Z			42.1		i	Z			27.5	
	i	E			42.4							
	S	NEZ			12 12							
	i	Z			19							
13.	P	Z	11	28	58	13.	P	Z	17	54	04.5ca.	
	i	N			59.5		i	NE			05	
	i	E			29 00		i	E			06.5ca.	
			23.8 S., 179.9 W.									
			Fiji Is. region.									
			h: 520 km ca.									
			H= 11 18 28.6									
			USCGS									
13.	P	Z	12	41	49.7	13.	iP	NZ	18	39	02.0	
	i	E			50.0		i	E			03.0	
			51.9 N., 177.6 W.					i	E			47
			Andreanof Is. Aleutian Is.					i	N			52
			h: 33 km ca.									
			H= 12.34 52									
			USCGS									
			USCGS									
13.	P	Z	13	11	47	13.	P	Z	21	59	48	
	i	NE			48		e	E			22 05 32	
	S	N			14 20							
	i	E			23							
			44.9 N., 148.8 E.									
			Kurile Is.									
			h: 40 km ca.									
			H= 13 09 00.7									
			USCGS									
			USCGS									
13.	P	Z	15	19	21	14.	P	Z	00	31	59	
	i	NEZ			22.0		i	NE			32 00	
	iS	E			39.0		i	Z			12	
	i	N			39.5		i	E			14	
			30.1 S., 177.4 W.									
			Kermadec Is.									
			h: 42 km ca.									
			H= 00 20 03.0									
			USCGS									
			USCGS									
13.	P	Z	15	22	54	14.	iP	NEZ	01	35	21.5	
	i	NE			55.0		P:N					
	S	NE			23 11							
			14. 04 02 05.1									
			14. 04 02 05.6									
			14. 04 02 10.0									
			14. 04 38									
			14. 04 41									
			14. 04 43									
			14. (cont.)									

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
Northern Burma, h: 33 km ca., H= 11 07 53.7 USCGS				17.	P	NZ	05 03 23
	i	E	23.7		iS	E, S N	43.6
16.	iP	Z	22 54 56.0	17.	eP	Z	07 56 57
	i	E	56.3		S	E	03 04 26
	i	N	56.5		eL	E	11 52
	i	Z	23 04 04	17.	eP	Z	03 02 40
	iS	N	31		i	EZ	03 14
	i	E	41		i	N	15
	iScS	E	05 06		i	Z	30
	iScS	N	14.5		i	E	04 26
	i	E	32.0	17.	iP	Z	10 33 46.1
	iSS	E	09 21		i	Z	57.5
	iLq	N	12 37	20.9 S., 174.3 W. Tonga Is. h: 33 km ca. H= 10 27 10 USCGS			
	i	N	15 42	17.	iP NZ, PE		10 45 52.0
	Lr	Z	13 23		iS NE, SZ		46 09.0
	Lr	N	19 00		P: N, E, C		
P:C Mag. 6 - 6½ (Mat) 22.3 S., 175.0 W, Tonga Is. h: 33 km ca., H= 22 43 26.4 USCGS				17.	iP	Z	13 23 54.0
16.	eP	NEZ	23 46 33	P:D 17.4 S., 173.5 W. Fiji Is. region. h: 509 km ca. H= 13 13 49.3 USCGS			
16.	P E, eP NZ		23 51 27	17.	P	Z	17 43 35.9
22.1 S., 175.3 W. Tonga Is. h: 33 km ca. H= 23 39 53.3 USCGS					i	NZ	46
17.	eP	Z	01 00 26	44.9 N., 149.5 E. Kurile Is. h: 50 km ca. H= 17 40 59.1 USCGS			
	i	NE	29	17.	P	NEZ	13 44 36
22.2 S., 175.0 W, Tonga Is. h: 33 km ca., H= 00 48 57 USCGS					i	NEZ	46
17.	ePKT	Z	01 07 21		eL	E	53 03
	i	N	24	17.	eP	Z	22 53 58
	i	E	32		e	Z	54 14
	iPP	Z	10 13		i	Z	25
	iPP	E	19	45.2 N., 150.1 E. Kurile Is. h: 40 km ca. H= 22 51 14 USCGS			
	i	Z	37	18.	P	Z	00 13 29
	Lq	E	45 30	44.1 N., 151.1 E. Kurile Is. h: 40 km ca. H= 00 15 34 USCGS			
	Lr	Z	53 34	18.	iP	NZ	01 43 24.5
	eLr	N	56.0		i	E	25.0
Mag. 7½ - 7½ (Mat) 7.6 N., 37.4 W, North Atlantic Ocean, h: 33 km ca., H= 00 48 02.6 USCGS					S N, eS E		50 50
17.	P	Z	01 43 39.5	(cont.)			
	i	E	40.0				
	i	E	45.7				
	S?	E	53.0				

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
	P;S,C			18.	iP NZ, F E	E	16 31 26.1
	47.2 N., 148.5 E.				iS	N	32 07.1
	Sea of Okhotsk.				i	EZ	07.6
	h: 319 km ca.				P;S,D		
	H= 01 45 27.6	USCGS		18.	iF	EZ	16 59 15.8
18.	i	NEZ	01 59 22		i	N	15.9
	i	Z	02 00 06		P;W,D		
	i	NEZ	11	18.	iP	Z	17 30 56.6
18.	eP	Z	05 25 30		i	EZ	31 00
	8.4 S., 113.5 E.				i	N	01
	South of Java.				S	N	25
	h: 104 km ca.				i	EZ	29
	H= 05 16 42	USCGS			F:D		
18.	P	NEZ	05 39 34	18.	iP	NZ	18 20 16.7
	i	NEZ	41		i	E	17
18.	P	Z	06 14 56		P:N,D		
	22.4 S., 170.5 E.			18.	eP	NEZ	19 29 12
	Loyalty Is.				i	Z	13.2
	h: 33 km ca.				i	E	30
	H= 06 04 12.7	USCGS			i	N	32
18.	iP	Z	07 40 57.1	18.	P	Z	21 20 47.5
	i	N	43 18		i	N	48.1
	i	NE	44 30		i	E	48.4
	F:D				eS	E	28 48
	43.9 N., 150.8 E.				eL	E	37 36
	Kurile Is.				P:C		
	h: 33 km ca.				13.4 S., 166.6 E.		
	H= 07 38 05	USCGS			Santa Cruz Is.		
18.	P	Z	11 05 49.7		h: 51 km ca.		
	i	N	50		H= 21 11 10.2	USCGS	
	i	E	50.5	19.	iP	NEZ	02 03 58.6
18.	P	Z	14 51 05.7		S?	E	06 04
	i	E	06		i	N	09
	i	N	09.9		P;S,W,C		
	i	Z	39		44.1 N., 150.2 E.		
	i	Z	54 29		Kurile Is.		
	i	Z	15 01 27		h: 50 km ca.		
	SorSKS	NE	37		H= 02 01 16	USCGS	
	Lq	NE	13 54	19.	iP	NEZ	04 39 50.7
	Lr	Z	17 20		S	NE	41 21
	Lr	E	41		P:N,W,D		
	Mag. 6½-6¾ (Mat)				39.7 N., 129.5 E.		
	29.9 N., 113.6 W.				Off east coast of Korea.		
	Gulf of Mexico.				h: 537 km ca.		
	h: 14 km ca.				H= 04 37 56.8	USCGS	
	H= 14 38 23.9	USCGS		19.	eL	E	09 01 52
18.	P	Z	16 14 58		30.9 N., 113.8 W.		
	29.7 N., 113.8 W.				Gulf of California.		
	Gulf of California.				h: 14 km ca.		
	h: 14 km ca.				H= 08 23 11.6	USCGS	
	H= 16 02 19.9	USCGS					

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)	
			h m s				h m s	
20.	iP Z, P S i P:S,D	NE NE Z	05 23 55.1 24 45 50		i S i L P: D	N E N N	22 36 21 33 10 19 41	
20.	iP P:N,E,D	NEZ	10 41 51.0		44.1 N., 149.1 E. Kurile Is. h: 45 km ca. H= 22 33 30.3		USCGS	
20.	P i eS Lq eLr Mag. 5½ (Mat) 22.2 S., 175.2 W. Tonga Is. h: 33 km ca. H= 11 59 58.5	NZ E N N Z	12 11 28 29 20 49 29 09 33.0				USCGS	
20.	P i i i	EZ N E N	13 24 00 08 34 39					
20.	P i S i	Z N E N	13 54 43 50 55 15 16.5					
20.	P i i eS i i 31.5 N., 131.6 E. Kyushu, Japan. h: 33 km ca. H= 16 57 13.5	EZ NZ Z N E N	16 59 00 05 13 17 00 14 01 23 40		41.2 N., 141.1 E. Near north coast of Honshu, Japan. h: 57 km ca. H= 09 53 38.9		USCGS	
20.	P i P:D 48.0 N., 154.8 E. Kurile Is. h: 33 km ca. H= 19 48 43	NZ E	19 52 35.9 36.1		44.9 N., 151.9 E. Kurile Is. h: 40 km ca. H= 13 06 41.6		USCGS	
20.	eP L	Z N	20 44 38 47 10					
20.	P i iS i i	EZ N E N Z	22 30 04.2 05 21.6 22 22.5					
20.	iP Z, P N i	E	22 36 09.5 10,0 (cont)		47.6 N., 153.3 E. Kurile Is. h: 60 km ca. H= 14 22 56.1		USCGS	
				21.	F i eS e	Z E N E	03 13 35 19 22.8 30 33	
				21.	P	Z	06 04 55 17.9 S., 178.6 W. Fiji Is. h: 595 km ca. H= 05 54 54.9	USCGS
				21.	eL eL	N Z	08 24 05 25 17	
				21.	iP i eS P: S,C 41.2 N., 141.1 E. Near north coast of Honshu, Japan. h: 57 km ca. H= 09 53 38.9	NZ EZ E	09 54 56.2 56.7 56 21	USCGS
				21.	eP i i i e eL	Z N E N Z N	13 09 49 50.3 54.1 10 03.0 11 29 13 11	
				21.	iP N, P Z P: N 47.6 N., 153.3 E. Kurile Is. h: 60 km ca. H= 14 22 56.1		14 26 35	USCGS
				21.	eP i e eL	Z Z N N	16 27 55 59.7 28 14 34 10	
					13.0 N., 144.9 E. Mariana Is. h: 33 km ca. H= 16 22 42.4		USCGS	

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
21.	iP	NEZ	13 32 51.6	22.	P	NEZ	14 43 34
	P:S,W,C				i	E	42.5
21.	ePKP	Z	19 02 24		i	E	51
	13.3 S., 14.5 W.				eS	N	50 49
	Ascension Is. region.				e	N	51
	h: 33 km ca.				L	N	51 15
	H= 13 42 44.3	USCGS			L	Z	47
21.	P NZ, eP E		20 01 03		i	NZ	53 56
	e	N	21		Mag. 5½ (Mat)		
	i	Z	23.1		44.4 N., 149.0 E.		
	eS	E	03 19		Kurile Is.		
	eL	N	33		h: 33 km ca.		
	eL	Z	04 36		H= 14 45 51.7		
	44.2 N., 149.6 E.			22.	P	NZ	14 59 55
	Kurile Is.			22.	iP	NE	15 24 51.2
	h: 40 km ca.				i	Z	51.6
	H= 19 53 23.3	USCGS			eS	E	26 53
21.	P	NZ	21 05 52.1		e	N	27 01
	i	NZ	53.5		P:N,E		
	i	Z	03 44.7		44.5 N., 149.2 E.		
	eS	N	09 25		Kurile Is.		
	i	NEZ	39		h: 40 km ca.		
	eL	NZ	11 31		H= 15 22 10.9		
	50.3 N., 156.4 E.			22.	P	Z	17 14 56
	Southern Kamchatka.				i	N	57.1
	h: 80 km ca.				i	E	15 00.6
	H= 21 01 35.3	USCGS			eS	N	24 23
21.	eP?	Z	22 23 45		eL	N	33 33
	e	Z	56		17.9 S., 172.3 W.		
	i	Z	24 07.1		Tonga Is. region.		
	e	N	26 51		h: 33 km ca.		
					H= 17 03 32.9		
					USCGS		
22.	iP	NEZ	00 27 05.0	22.	P	Z	13 15 38.1
	eS	N	33 52		i	N	33.4
	e	N	35 53	22.	PKP	Z	19 16 49
	P:N,E,C				e	Z	59
	5.9 S., 107.9 E.				21.0 S., 67.9 W.		
	Near north coast of Java.				Western Bolivia.		
	h: 323 km ca.				h: 87 km ca.		
	H= 00 18 35.9	USCGS			H= 18 57 02.5		
					USCGS		
22.	P	NEZ	06 10 07	22.	iP	Z	20 04 23.3
	e	E	11 09		e	Z	41
	e	N	17		P:C		
22.	eP	Z	08 39 16	22.	P	EZ	23 04 39
22.	iPKP	Z	12 53 47.1		i	Z	55
	i	Z	52.6		e	N	05 25
	P:C			22.	iP Z, P NE		23 27 22.9
	18.3 S., 69.6 W.				eS	E	46
	Chile-Bolivia border.				i	N	46.3
	h: 120 km ca.				P:C		
	H= 12 40 10.0	USCGS					

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
24.	iP i eS i i P:N,C	NZ E N E Z	01 34 53.0 53.5 36 17 19.0 21.1		P:S,E,D 6.1 S., 147.6 E. Near coast of North-East New Guinea, h: 75 km ca. H= 15 31 29.4		USCGS
24.	iP e e e P:S,W,C	NEZ E N N	02 36 13.3 35 37 50 33 30	24.	P e	EZ E	15 45 07 42
24.	eP 22.1 S., 175.6 W. Tonga Is. h: 33 km ca. H= 05 08 42.8	Z	05 20 12	24.	iP i i eS i e eL eL eL P:S,W,C 44.3 N., 149.3 E. Kurile Is. h: 50 km ca. H= 17 56 02.2	NEZ N E E Z N E Z	17 58 43.5 53.5 56.1 18 00 49 50 58 01 27 31 03 00
24.	P 21.9 S., 175.8 W. Tonga Is. h: 33 km ca. H= 05 13 23.5	Z	05 24 53				USCGS
24.	eP?	NZ	10 47 44	24.	iP i i i i S i i Mag. 5.5 (Mat) 28.2 N., 140.1 E. South of Honshu, Japan. h: 260 km ca. H= 11 05 56,8	NZ E N E Z NE E Z	11 07 58.0 59.3 08 00.0 02.9 09 10.5 25 31 33
24.	iP iS i P:S,C	NEZ NE Z	11 43 23.6 40.0 40.6	24.	iP i eS i i eL eL eL P:N,D 46.4 N., 150.0 E. Kurile Is. h: 40 km ca. H= 18 09 08.7	NZ E N E Z N E Z	18 12 03.7 03.9 14 29 40 41 15 12 38 41
24.	iP e e i eL 48.1 N., 148.0 E. Kurile Is. h: 40 km ca. H= 11 53 56	NEZ NE Z E Z NE	11 56 15.5 58 16 22 34.6 59 04	24.	eP i i e eL 45.6 N., 151.6 E. Kurile Is. h: 33 km ca. H= 19 23 13.8	Z N EZ E N	19 26 22 35 36 29 12 40
24.	iP iPP? eL eL	NZ, P E Z E N	15 39 24.9 41 14.2 53 45 50	25.	P e	Z N	01 30 34 31 54
			(cont.)	25.	eP eL eL	Z E E	03 52 01 55 47 56 27
							44.8 N., 149.4 E. (cont.)

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
		Kurile Is. h: 40 km ca. H= 03 49 13.3	USCGS	25.	iP	Z	16 51 07.7
					i	NE	10.1
					i	Z	11.0
25.	P	Z	05 49 00		eS	N	54 45
	e	E	50 48		e	E	55.0
					i	N	59 51
25.	P	EZ, eP N	06 46 29		P:C		
	i	NEZ	42			22.6 N., 121.3 E.	
	eL	N	49 42			Near east coast of Taiwan.	
		45.4 N., 151.4 E.				h: 33 km ca.	
		Kurile Is.				H= 16 46 36.2	USCGS
		h: 50 km ca.		25.	iP	NZ	19 58 16.9
		H= 06 43 23.5	USCGS		S	NZ	25
25.	P	Z	08 08 57.4		P:C		
25.	eP	Z	08 56 46	25.	iP	EZ	21 55 18.1
	i	Z	55		S	Z	33
		45.0 N., 149.2 E.			e	N	34
		Kurile Is.			P:W,C		
		h: 33 km ca.		26.	P	Z	03 10 20
		H= 08 54 06.1	USCGS			26.9 S., 176.5 W.	
25.	P	NEZ	10 05 05			Kermadec Is. region.	
	i	NZ	13			h: 46 km ca.	
	i	N	24			H= 02 53 34.7	USCGS
	i	Z	06 38	26.	iP	Z	07 00 05.6
	eS	Z	07 17		i	Z	01 15
	eL	N	46		e	Z	03 35
	eL	E	54		P:D		
		Mag. 5 $\frac{1}{2}$ - 5 $\frac{1}{2}$ (Mat)				6.8 S., 129.6 E.	
		44.3 N., 149.5 E.				Banda Sea.	
		Kurile Is.				h: 111 km ca.	
		h: 55 km ca.				H= 06 52 08.2	USCGS
		H= 10 02 23.8	USCGS	26.	e	Z	10 47 45
25.	P	NEZ	10 13 49	26.	iP	Z	12 46 37.3
	S	N	15 54		i	NE	37.3
	eL	N	16 40		S	N	55
		44.1 N., 149.9 E.			P:C		
		Kurile Is.		26.	iP	Z	13 19 15.2
		h: 45 km ca.			i	E	15.4
		H= 10 11 04.8	USCGS		i	N	16.4
25.	P	Z	11 33 43		eS	N	56
	i	NEZ	53.0		i	Z	58
	e	N	34 30		i	E	59
	e	Z	32		P:C		
	eL	N	37.3	26.	eP	Z	14 12 20
		45.4 N., 151.7 E.			i	E	24.3
		Kurile Is.			i	EZ	45
		h: 50 km ca.			i	NEZ	49
		H= 11 30 33.0	USCGS		i	EZ	13 15
25.	P	Z	12 05 47	26.	eP?	Z	14 35 20
	S	NEZ	06 37		i	EZ	36
25.	P	NEZ	13 40 01		i	E	56
	S	N	19				
	i	Z	21				

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
28.	iP S	NEZ NE	10	26	50.5 51.5	28.	eP e	NZ N	23	21	08 24
23.	iP S P:N,E	NEZ E	11	05	20.8 21.6				43.6 N., 150.6 E. Kurile Is. h: 33 km ca. H= 23 18 19.8 USC GS		
28.	iP eS P:N	NEZ N	12	02	22.8 23.7	29.	ePKP	Z	02	13	05
28.	P e eS e eL eL	Z Z N Z N E	13	08	12 09 51 10 38 44 11 27 12.0				15.1 S., 73.7 W. Southern Peru. h: 124 km ca. H= 01 53 45 USC GS		
						29.	P i i	Z NZ Z	03	58	47 59 03 24
									44.7 N., 147.0 E. Kurile Is. h: 133 km ca. H= 03 56 20.1 USC GS		
28.	iP i i iS i P:E	E Z N Z N	13	13	51.2 51.6 52.9 14 05.7 07.2	29.	eP? i	Z Z	04	08	27 09 05.8
23.	eP	Z	15	17	19	29.	iP iS	EZ, P N EZ	05	17	33.2 40.0
									12.1 S., 166.1 E. Santa Cruz Is. h: 33 km ca. H= 15 07 50.8 USC GS		
23.	iP i i eL eL P:W,C	EZ N N E N	15	19	16.2 16.8 34 25 26 34	29.	iP S i	E NEZ	05	45	58.0 46 05
									09 47 46 48 00.6 57 58		
						29.	e	E	10	47	43
						29.	iP S i P:E,C	EZ N EZ	11	15	47.7 54 54.4
									Mag. $5\frac{1}{4}$ - $5\frac{1}{2}$ (Mat) 52.2 N., 174.2 E. Near Is. Aleutian Is. h: 33 km ca. H= 15 13 11.0 USC GS		
28.	eL	E	19	54	05	29.	iP iS i P:C	Z, P E EZ N	11	30	14.8 21.9 22.8
									12.2 S., 165.9 E. Santa Cruz Is. h: 25 km ca. H= 19 26 25.5 USC GS		
23.	P pP	Z Z	20	05	54 06 19	29.	eP e	Z Z	11	41	11 32
									12 38 52.7 39 03 16.0 16.4		
						29.	iP e i P:W,C	EZ E N	13	14	47.2 15 03 07.0
									7.1 S., 129.4 E. Banda Sea. h: 113 km ca. H= 19 57 56.7 USC GS		

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Date	Phase	Comp.	Time(GMT)		
			h	m	s
1.	eP eS L L	Z N E N	04	31	43
				36	20
				39	13
					40
			56.1 N., 111.8 E. Lake Baikal region, h: 33 km ca. H= 04 26 12.8 USCGS		
1.	eP	Z	07	55	01
			3.9 S., 146.3 E. Bismarck Sea. h: 33 km ca. H= 07 46 55.3 USCGS		
1.	iP iS	NEZ NEZ	09	13	19.6
					29.1
			P:N,E,D		
1.	P i	Z Z	09	43	49.6
				45	09.1
			7.4 N., 93.5 E. Nicobar Is. h: 27 km ca. H= 09 34 56* USCGS		
1.	iP iS	EZ, P N NE	11	11	29.1
					31.3
			P:W		
1.	iP P:D	Z	12	00	15.1
			4.6 S., 154.8 E. Solomon Is. region, h: 479 km ca. H= 11 52 52.9 USCGS		
1.	iP P:N,D	NZ, P E	13	36	57.9
1.	P	Z	15	28	50.6
1.	eP i i	Z Z Z	15	53	50
				54	01.3
					17.5
			45.9 N., 152.5 E. Kurile Is. h: 33 km ca. H= 15 50 31.1 USCGS		
1.	eP	Z	16	00	09
			44.5 N., 150.7 E. Kurile Is. h: 40 km ca. H= 15 57 12.0 USCGS		
1.	iP iS	Z Z	16	16	03.6
					10.3
			P:N,E,C		

Date	Phase	Comp.	Time(GMT)		
			h	m	s
1.	P	Z	16	17	28
			28.9 N., 130.0 E., Ryukyu Is., h: 31 km ca., H= 16 15 01* USCGS		
1.	P i i i	NEZ E N E	16	22	42
					44.4
				23	06
					08
1.	P	Z	16	26	05
			21.2 S., 68.4 W. Northern Chile. h: 61 km ca. H= 16 06 14.8 USCGS		
1.	P S	NEZ N	16	37	58.1
				38	19
			P:N,W		
1.	P iS	Z NE	17	22	22.6
					29.4
1.	P e	Z E	17	37	55
				43	09
			44.6 N., 150.7 E. Kurile Is. h: 40 km ca. H= 17 34 58* USCGS		
1.	P e	EZ E	17	47	29
				51	34
			44.9 N., 150.3 E. Kurile Is. h: 40 km ca. H= 17 44 33* USCGS		
1.	iP S i	NEZ N E	19	29	26.1
				30	33.1
					37.1
			P:N,W,C		
1.	iP i i	EZ EZ	21	34	32.7
					52.9
			P:E		
2.	eP i	E NZ	00	11	42
					50
2.	iP iS	EZ NZ	02	34	05.4
					07.6
			P:W,C		
2.	eP eS L	Z E EZ	03	12	23
				13	09
				15	42
2.	iP	NEZ	05	21	40.3
			P:N,E,D (cont.)		

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Date	Phase	Comp.	Time(GMT)
			h m s
3.	iP eL	Z E	07 26 26.7 31 47
	12.6 N., 144.3 E. Mariana Is. h: 45 km ca. H= 07 21 00* USCGS		
3.	iP i eS L Lr P:C	Z NEZ E E E	08 42 31.1 41.1 45 33 48 13 50 57
	46.1 N., 152.9 E. Kurile Is. h: 45 km ca. H= 08 39 07.4 USCGS		
3.	iP EZ, P N iS i P:E	N N EZ	12 36 07.3 12.9 13.9
3.	iP Z, P NE S i	E E N	12 44 09.1 26.6 27.6
3.	P e	Z E	13 30 56 34 40
	45.7 N., 153.3 E. Kurile Is. h: 45 km ca. H= 13 27 31* USCGS		
3.	iP EZ, P N P:W,D	N N	16 07 12.5
3.	iP i S P:C	Z N EZ	18 30 25.1 25.6 40.1
3.	iP S P:N,E	NEZ EZ	20 18 18.6 25.7
3.	P S SS e L L	NEZ NE N E E N	21 24 40 32 22 36 09 43 38 00 39 23
	Mag. 5 $\frac{1}{2}$ - 6 (Mat) 12.2 S., 166.0 E. Santa Cruz Is. h: 32 km ca. H= 21 15 10.4 USCGS		
3.	iP L	NZ E	21 39 34.6 55 52 (cont.)

Date	Phase	Comp.	Time(GMT)
			h m s
	P:S,C 12.0 S., 166.0 E. Santa Cruz Is. h: 40 km ca. H= 21 30 05.7 USCGS		
3.	iP iS P:C	Z NEZ	21 40 28.5 30.6
3.	iP i i i L P:E,D	EZ N EZ N E	21 59 16.6 17.3 23.1 49.1 22 05 29
3.	eP i	Z Z	23 21 10 13.9
3.	iPKP1 i i i iPKP2 PP i i SKSP PPS i i L L P:D	Z Z NEZ Z Z Z E E E E E E E E Z	23 23 32.7 36.1 38 47.1 59.4 27 20 37 23 42 35 47 35 52 10 57 15 00 03 50 13 48 15 00
	Mag. 6 $\frac{1}{2}$ - 6 $\frac{1}{2}$ (Mat) 22.4 S., 69.3 W. Northern Chile. h: 18 km ca. H= 23 03 41.6 USCGS		
4.	P	Z	01 20 43
4.	iP EZ, P N i i S i L L L P:E,D	Z Z E E E N Z	01 31 01.6 05.1 12.1 33 46 34 02 24 33 35 15
	Mag. 6 - 6 $\frac{1}{2}$ (Mat) 46.2 N., 153.3 E. Kurile Is. h: 20 km ca. H= 01 27 34.1 USCGS		
4.	eP	Z	01 38 50
	45.3 N., 153.4 E. (cont.)		

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
		Kurile Is. h: 60 km ca. H= 01 35 24.5				46.0 N., 153.2 E. Kurile Is. h: 40 km ca. H= 15 44 52.9	
		USCGS				USCGS	
4.	P	NEZ	02 46 54				
	i	E	47 03.7	4.	eP	Z	15 53 10
	i	Z	05		i	NEZ	20
	eS	E	49 40			46.6 N., 153.3 E. Kurile Is. h: 33 km ca. H= 15 49 47.1	
	L	E	50 10			USCGS	
		45.9 N., 153.2 E. Kurile Is. h: 50 km ca. H= 02 43 30.4		4.	SS	E	16 38 53
		USCGS			SSS	E	43 55
4.	iP Z, P E		03 01 31.1		e	E	47 25
	i	Z	38.8		G	E	53 42
	P:D				L	E	56 39
		4.8 S., 130.1 E. Ceram region. h: 33 km ca. H= 02 53 42*			L	E	17 11 10ca.
		USCGS				Mag. 6 (Mat) 35.5 S., 102.8 W. Easter I. region. h: 33 km ca. H= 15 59 42.1	
4.	iP	Z	05 33 39.6			USCGS	
	i	EZ	48.1	4.	iP	NEZ	19 19 39.9
	P:C				eS	NE	20 22
4.	iP	EZ	05 35 16.9			P:S,W,D	
	iS	NEZ	19.1	4.	iP	NEZ	19 44 20.1
	P:E,D					P:N,E,D	
4.	iP	NEZ	06 49 23.1	4.	P	Z	20 50 42
	P:N,E,D				S	NE	51 06.6
		45.9 N., 152.2 E. Kurile Is. h: 45 km ca. H= 06 45 44.7		4.	P	EZ	22 52 52
		USCGS			i	N	53.6
4.	iP	NEZ	08 27 40.7		S	N	53 30
	i	Z	44.1		i	NZ	40
	i	Z	51.1	5.	eP	Z	05 58 13
	S	E	30 26	5.	P	NZ	09 46 34
	L	E	59		S	NZ	47 09.5
	L	N	31 11	5.	iP Z, P NE		09 57 37.8
	Lr	E	33 26		S	E	53 14
		P:S,W,C Mag. 5 $\frac{1}{2}$ - 5 $\frac{1}{2}$ (Mat) 46.1 N., 152.9 E. Kurile Is. h: 33 km ca. H= 08 24 17.1				P:D	
		USCGS		5.	eL	E	12 24 00ca.
4.	iP EZ, P N		10 50 10.3			7.4 N., 77.3 E. Colombia. h: 33 km ca. H= 11 29 49.4	
	P:E,C					USCGS	
4.	iP	NEZ	15 48 18.6	5.	eP	Z	13 09 50ca.
	i	NEZ	27.6			12.2 N., 143.9 E. Mariana Is region. h: 33 km ca. H= 13 04 27.4	
	S	E	51 23			USCGS	
	L	E	52 00				
	Lr	E	54 03				
		P:N,E,D					

(cont.)

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
7.	eP	Z	06 56 15		P:D		
	45.1 N., 149.3 E.				29.3 S., 173.5 W.		
	Kurile Is.				Kermadec Is.		
	h: 40 km ca.				h: 209 km ca.		
	H= 06 53 18.1		USCGS		H= 17 37 25.6		USCGS
7.	P	Z	07 31 01	7.	eP	Z	20 17 34
					i	Z	44.6
7.	iP Z, P NE		07 56 56.6		i	N	20 18 01
	iS	NEZ	57 22		i	N	19 07
7.	iP	EZ	10 25 46.5	7.	iP	Z	20 51 26.9
	i	E	48.7		iS	E	39.6
	i	N	49.0		P:D		
	i	Z	53.5				
	i	N	26 38	8.	iP	EZ	07 56 44.0
	P:W,D				S	E	59 33
7.	eP	Z	10 43 23		L	E	08 00 24
	i	Z	28.0		L	N	26
	eS	E	52 25		P:E,D		
	L	E	11 01 25		Mag. 5 $\frac{1}{2}$ (Mat)		
	20.8 S., 174.0 E.				46.4 N., 153.0 E.		
	Fiji Is. region.				Kurile Is.		
	h: 33 km ca.				h: 20 km ca.		
	H= 10 32 39.5		USCGS		H= 07 53 15.1		USCGS
7.	P	Z	11 29 16	8.	iP	NEZ	12 09 53.5
	45.8 N., 153.0 E.				iS	NE	10 43
	Kurile Is. region.				P:S,W,C		
	h: 55 km ca.				35.5 N., 143.3 E.		
	H= 11 25 54.1		USCGS		Off east coast of		
					Honshu, Japan.		
					h: 33 km ca.		
7.	iP Z, P N		15 23 15.0		H= 12 08 49.3		USCGS
	i	N	18.5	8.	iP	Z	12 57 14.3
	PcP	Z	26 59		i	EZ	15.6
	S	NE	27 30		eS	E	30
	L	E	29 00		P:C		
	P:C			8.	iP EZ, P N		13 16 26.7
	12.3 N., 143.9 E.				P:W		
	Mariana Is. region.			8.	P	NEZ	13 20 27
	h: 33 km ca.			8.	iP	Z	14 47 48.3
	H= 15 17 57.3		USCGS		eS	E	48 03
7.	iP	NEZ	15 59 49		P:C		
	i	N	55	8.	iP EZ, P N		13 16 26.7
	iS	NE	16 00 13.8		P:W		
	P:N,W,C			8.	P	NEZ	13 20 27
7.	P	Z	16 20 25	8.	P	Z	20 18 08
	S	Z	49		S	Z	32
7.	P	Z	16 21 17	8.	P	NZ	20 34 51.5
	S	Z	41		eS	N	37 21
7.	iP	NEZ	17 31 26.5		45.3 N., 151.3 E.		
	i	N	34.4		Kurile Is.		
	P:S,W,D				h: 40 km ca.		
					H= 20 31 45.7		USCGS
7.	iP Z, P NE		17 48 56.5	8.	iP	Z	20 42 43.8
	(cont.)				(cont.)		

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
			Near coast of Fukushima Pref, Honshu, Japan. h: 0 km ca. JMA			10.	P	Z	14	03	05.7
							i	Z			07.2
							i	NE			03.3
							eS	N			30
10.	iP	EZ	00	57	48.0	10.	P	NZ	14	17	25
	i	Z		59	00.5	10.	PKP	Z	15	09	26.0
	eS	Z			50		i	Z		10	02.3
	i	N			54		P:D				
			P:E,D 34.8 N., 134.7 E. Honshu, Japan. h: 249 km ca. H= 00 56 51.6						18.1 S., 63.5 W. Western Bolibia. h: 79 km ca. H= 14 49 42.6		
			USCGS						USCGS		
10.	iP	NEZ	03	38	51.4	10.	P	NEZ	15	46	55
	i	Z		39	24.7		S	NEZ		47	11
	PcP	NEZ		40	38.0	10.	P	EZ	15	49	21
	sP	NEZ			54		S	NZ			37
	PPP	N		41	39	10.	P	Z	15	51	17
	i	N		43	38		i	Z		52	13
	ScP	NEZ			48.0		P:D				
	PcS	NEZ		44	49				21.3 S., 174.4 W. Loyalty Is. region. h: 33 km ca. H= 15 39 49.2		
	S	N		45	11				USCGS		
	ScS	E		48	10.0	10.	iP	NEZ	17	27	36.9
	eL	E		49	52		iS	NEZ		28	04
	eL	N			55		P:N,E,C				
	L	Z		50	00	10.	iP	EZ	20	20	40.3
			P:S,W,D Mag. 5 $\frac{1}{2}$ - 5 $\frac{1}{2}$ (Mat) 6.2 S., 128.1 E. Banda Sea. h: 366 km ca. H= 03 31 21.1				S	N		21	09.3
			USCGS				P:W,C				
10.	iPKP1	Z	06	50	35.7	11.	P	Z	00	53	51
	PKP2 or	Z			45.7		S	E	01	07	55
	pPKP	Z			52.6		Lq	E		15	23
	i	Z			51 04.6		Lr	Z		19	10
	sPKP	E							Mag. 6-6 $\frac{1}{2}$ (Mat) 15.1 S., 173.6 W. Tonga Is. region. h: 33 km ca. H= 00 47 43.3		
	P:C		58.1 S., 26.4 W. Sandwich Is. h: 110 km ca. H= 06 30 54.8						USCGS		
			USCGS						USCGS		
10.	P	Z	07	40	48	11.	iP	NEZ	02	41	24.0
10.	P	Z	09	31	44		P:N,W,C				
	i	Z			57.4				17.3 S., 178.6 W. Fiji Is. h: 537 km ca. H= 02 31 19.4		
			45.8 N., 151.7 E. Kurile Is. h: 50 km ca. H= 09 28 38.6						USCGS		
			USCGS						USCGS		
10.	P	NZ	13	24	11	11.	iP	NEZ	04	02	42.6
	i	Z			34.5		i	N		03	27
10.	eL	E	13	21	10		PP	Z		04	15.2
10.	P	EZ	14	01	23		P:S,D		7.2 S., 125.5 E. Banda Sea. h: 145 km ca.		
	i	Z			38.4				(cont)		

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Date	Phase	Comp.	Time(GMT)		
			h	m	s
			H= 03 54 39.5		USCGS
11.	P i eL	Z E E	06 10 45 53 14 40		USCGS
			19.6 N., 145.7 E. Mariana Is. region. h: 110 km ca. H= 06 06 45		USCGS
11.	eP	Z	09 15 14		USCGS
			45.3 N., 150.1 E. Kurile Is. h: 43 km ca. H= 09 12 15.5		USCGS
11.	P iS	Z NE	09 24 30 25 59.3		USCGS
			32.1 N., 130.2 E. Near west coast of Kyushu, Japan. h: 170 km ca. H= 09 22 36		USCGS
11.	P	Z	11 23 00		USCGS
			24.2 S., 179.3 E. Fiji Is. h: 540 km ca. H= 11 12 30.3		USCGS
11.	P i S	NZ E NE	12 28 06 07 25		USCGS
11.	iP iS P:N,E,D	NEZ E	14 51 31.6 34.1		USCGS
11.	P S L P:C	Z E E	17 14 50.5 20 13 22 25		USCGS
			Mag. 5 $\frac{1}{2}$ -6 (Mat) 51.2 N., 179.3 W. Andreanof Is., Aleutian Is. h: 32 km ca. H= 17 08 12.3		USCGS
11.	eP e	Z Z	17 17 30 19 23		USCGS
11.	iP P:C	Z	17 31 49.3		USCGS
			51.3 N., 179.5 W. Andreanof Is., Aleutian Is. h: 33 km ca. H= 17 25 12.5		USCGS
11.	P S	Z E	19 15 04.7 26.1		USCGS

Date	Phase	Comp.	Time(GMT)		
			h	m	s
11.	eP e	Z E	19 19 34 27 44		USCGS
			51.3 N., 179.5 W. Andreanof Is., Aleutian Is. h: 54 km ca. H= 19 12 59.6		USCGS
11.	iP i P:D	Z NE	20 32 43.9 44.2		USCGS
			51.3 N., 179.3 W. Andreanof Is., Aleutian Is. h: 33 km ca. H= 20 25 13.5		USCGS
12.	P S	Z NEZ	10 20 03 21		USCGS
12.	P eL P:C	NZ E	14 07 06.4 11 53		USCGS
			46.0 N., 149.9 E. Kurile Is. h: 33 km ca. H= 14 04 03.2		USCGS
12.	P S	EZ NE	14 29 17 53		USCGS
12.	L	E	15 25 14		USCGS
			4.5 N., 97.2 E. Northern Sumatra. h: 33 km ca. H= 15 02 48		USCGS
12.	iP i P:N,W,D	NZ, P E E	16 39 35.4 40 18		USCGS
12.	iP P:D	Z	22 38 05.9		USCGS
			19.3 S., 174.1 W. Tonga Is. h: 33 km ca. H= 22 26 42.2		USCGS
12.	iP S i i P:D	Z, P NE N E E	23 27 44.7 30 16.3 32 31 04		USCGS
			46.3 N., 150.5 E. Kurile Is. h: 90 km ca. H= 23 24 36.6		USCGS
13.	P i eS	Z Z E	02 50 35 52 53 16		(cont)

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
			25.9 N., 126.1 E. Ryukyu Is. h: 109 km ca. H= 02 47 14				44.5 N., 151.7 E. Kurile Is. h: 45 km ca. H= 06 49 34.6
13.	iP eS P:W,C	EZ E	04 23 16.8 31	14.	iP EZ, P N i NZ e E P:N,E,D		07 59 55.9 08 00 13.5 06.8
13.	P i S	Z N NE	17 52 36.1 37.0 57				62.7 N., 149.5 W. Central Alaska. h: 95 km ca. H= 07 51 07.9
13.	iP eS P:N,D	NEZ N	19 29 04.2 24	14.	eP eL	Z E	12 24 09 28 00
13.	P e	NEZ E	22 23 02 25.0	14.	P eL	Z E	15 14 21 55.7
			44.3 N., 149.1 E. Kurile Is. h: 40 km ca. H= 22 20 19.4				7.1 S., 155.7 E. Solomon Is. h: 95 km ca. H= 15 06 05
13.	iP S P:E,C	EZ E	23 20 06.7 17	14.	P eS	Z N	16 08 56 09 14
14.	ePKP	Z	00 25 02	14.	iP eS eL P:C	Z N E	17 35 19.7 36 45 37 26
			2.3 S., 61.2 W. Northern Brazil. h: 36 km ca. H= 00 05 39.8				41.7 N., 139.4 E. Near south coast of Hokkaido. h: 33 km ca. H= 17 34 01
14.	iP NZ, P E i Z P:N,W,D		01 55 17.7 39.7	14.	PKP1 PKP2 i	Z Z NE	19 33 24 42 46
			17.9 S., 178.3 W. Fiji Is. region. h: 550 km ca. H= 01 45 13.8				22.8 S., 70.5 W. Near coast of northern Chile. h: 48 km ca. H= 19 13 53.3
14.	P i eS P:C	Z EZ N	03 47 00.7 10 49 18	14.	P S P:E,D	EZ NZ	20 17 44.0 18 07.8
			45.4 N., 150.1 E. Kurile Is. h: 33 km ca. H= 13 44 01.1	15.	P	NZ	01 14 15
14.	iP Z, P E i N S NE P:C		05 43 10.4 10.9 43.7	15.	eP eL	Z E	03 23 06 26.5
							44.3 N., 149.5 E. Kurile Is. h: 15 km ca. H= 03 20 18.1
14.	iP e P:C	Z E	06 52 38.0 58 41	15.	eP	Z	05 41 53

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
15.	P eS P:D	Z N	06 48 47.3 49 00	15.	iP PcP iPP sP iPcS S ScS sS ePKP1PKP1 i PKP2PKP2 eSKPPKPZ P:S,W,D Mag: 7 (Mat) 4.8 S., 103.0 E. Java Sea. h: 650 km ca. H= 19 34 45.5	NEZ Z NEZ NEZ E N NE E Z Z Z Z Z	19 42 42.0 43 49 44 41.3 45 53 47 52.3 49 02.3 51 26 52 48 20 12 48 13 07 14 14 15 20
15.	P L	Z E	07 05 08 07 42				
	28.6 N., 129.9 E. Ryukyu Is. region. h: 33 km ca. H= 07 02 36.5 USCGS						
15.	P L	Z E	07 41 12 54 30				
	34.3 N., 88.8 E. Tibet. h: 33 km ca. H= 07 33 20.2 USCGS						
15.	P eL	NZ E	10 25 35 29 35	15.	eP	Z	20 44 46
	44.1 N., 149.2 E. Kurile Is. h: 45 km ca. H= 10 22 53.7 USCGS			15.	P i P:C	Z NE	21 08 30.8 35.8
15.	iP iS P:N,W,D	NEZ NEZ	11 24 55.0 58.4	15.	P P:S,W,C	NEZ	21 37 49.9
15.	eP e	Z E	13 15 07 20 56	16.	eP	Z	02 00 28 2.2 S., 105.9 E. Near east coast of Sumatra. h: 33 km ca. H= 01 51 44.6 USCGS
	44.3 N., 150.3 E. Kurile Is. h: 45 km ca. H= 13 12 15.1 USCGS			16.	P i i S L L	Z Z Z E E E	02 00 38 01 50 05 45 08 24 14 07 15 20
15.	P i	Z Z	15 14 27 40.1		Mag. 6½ - 6¼ (Mat) 6.1 S., 104.9 E. Near west coast of Sumatra. h: 36 km ca. H= 01 51 23.2 USCGS		
	4.7 S., 102.9 E. Near coast of Sumatra. h: 72 km ca. H= 15 05 18.4 USCGS			16.	eP	Z	02 15 59 6.3 S., 105.5 E. Near west coast of Sumatra. h: 33 km ca. H= 02 06 38.2 USCGS
15.	eL	E	16 10.8				
	51.0N., 128.8 W. Vancouver Is. region. h: 33 km ca. H= 15 44 22.3 USCGS			16.	eP	Z	04 25 18 6.3 S., 105.5 E. Near west coast of Sumatra. h: 63 km ca. H= 04 16 43.0 USCGS
15.	P i e P:C	Z E N	17 05 28.7 29.0 06 46	16.	iP	NZ, P E	05 21 54.8 (cont.)
15.	P eL	Z E	17 41 13 52 46				
	9.4 S., 124.1 E. Timor region. h: 33 km ca. H= 17 32 37.2 USCGS						

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	S	N	19 26 39.7	18.	P	EZ	08 01 30.6
	i	E	41.9		S	NEZ	39.6
	P:S,D			18.	P	Z	11 01 50
17.	iP	Z	22 23 05.1	18.	P	Z	11 40 57
	i	N	06.8		i	N	41 02
	i	E	08.7		i	Z	04
	iS	N	57.6	18.	eP	Z	12 33 35
	P:C				29.9 S., 177.2 W.		
17.	P	Z	23 30 00		Kermadec Is.		
	52.9 N., 165.4 W.				h: 130 km ca.		
	Fox Is. Aleutian Is.				H= 12 21 50.1		USCGS
	h: 33 km ca.						
	H= 23 22 11.2		USCGS	18.	iP	EZ	18 13 50.0
18.	iP	Z	00 41 34.9		i	N	50.6
	i	NE	35.6		eS	N	14 21
	S	NE	51 03.1		P:E,D		
	ScS	N	56		37.2 N., 140.7 E.		
	SS	N	55 49		Near east coast of		
	Lq	N	01 01 00		Honshu, Japan.		
	Lr	Z	03 50		h: 59 km ca.		
	PKPKP	Z	09 00		H= 18 13 15.8		USCGS
	SKPKP	N	12 45	18.	P	Z	19 16 01
	ePKPKPKPKPZ		29 30		eS	N	38
	P:C			18.	eP	Z	19 33 15
	Mag. 7½ (Mat)				i	Z	26
	24.8 S., 176.6 W.				46.2 N., 151.5 E.		
	Tonga Is.				Kurile Is.		
	h: 46 km ca.				h: 33 km ca.		
	H= 00 30 02.6		USCGS		H= 19 30 06.1		USCGS
13.	P	Z	02 53 40.3	18.	P	Z	21 30 13
	i	N	51.1	19.	iP	Z, P NE	00 53 37.3
	i	Z	54		S	NEZ	54 36
	eS	N	56 25		P:S,D		
	P:C			19.	P	NZ	03 39 51.5
	45.5 N., 151.3 E.				i	E	52
	Kurile Is.				S	NE	40 17
	h: 33 km ca.				P:S,D		
	H= 02 50 31.0		USCGS	19.	iP	NZ	08 52 19.3
13.	P	Z	03 12 12		P:N,E,D		
	i	Z	25	19.	P	Z	10 04 34
	45.8 N., 151.7 E.				i	Z	05 08
	Kurile Is.			19.	P	Z	11 18 19
	h: 45 km ca.				eS	NE	20 09
	H= 03 09 05.5		USCGS	19.	P	Z	12 29 28
13.	P	Z	06 48 01		i	Z	39
	41.7N., 82.5 E.			19.	P	Z	13 52 13.0
	Sinkiang Province, China.				iS	EZ	27.5
	h: 33 km ca.				P:S,E,D		
	H= 06 40 05.9		USCGS				
18.	P	Z	06 58 16.1				
	i	Z	18				
	S	NZ	58				
	P:D						

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
19.	iP i S P:S,D	Z N NE	16	25	52.0 08 15	20.	iF Z, P E i i iS P:D	NE N NEZ	06	00	51.5 52.0 06 07.5
19.	ePKP1 PKP2 i i eL 9.7 S., 79.1 W. Near coast of central Peru. h: 56 km ca. H= 17 04 07.8	Z Z E Z E	17	23	14 26 28 33 07.5	20.	iF P:C	Z	08	58	50.4
19.	iP i S P:D	Z E E	19	54	29.5 35 05	20.	iP i pP eS sS SS P:N,C 7.0 S., 129.3 E. Banda Sea. h: 103 km ca. H= 08 57 17.8	NZ E Z E N E	09	05	17.7 18.0 51 11 37 12 30 14 58
19.	P i i i	Z E Z E	22	42	21 23 31 38	20.	iP i i i i eS L i P:D 31.0 N., 131.6 E. Near Yakushima, Japan. h: 40 km ca	Z NZ N E E N N Z	12	57	02.3 10.5 19.5 27.4 40.5 58 42 59 11 41
20.	P i	Z N	00	32	35 35.5	20.	iP i i S P:C	Z N E NEZ	13	50	19.0 19.8 58 51 03.5
20.	P i	Z Z	00	50	35 39	20.	eP e e i e S L Mag. 5 $\frac{1}{2}$ (Mat) 12.3 S., 66.0 E. Indian Ocean. h: 33 km ca. H= 15 49 44.9	Z E N Z E N E	16	02	11 13 16 43 06 32 12 22 30 16
20.	P i i i S i P:N 45.0 N., 147.4 E. Kurile Is. h: 50 km ca. H= 04 09 15.1	N NZ NE N NE Z	04	11	50.6 51.1 52.7 12 47 13 44 14 10	20.	iP i	N EZ	16	36	17.5 31
20.	iP i P:N,E,D	NEZ N	05	57	15.0 39	20.	iP i	N EZ	16	24	05.1

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
20.	eP e	Z E	16	58	37	21.	iP i i	Z E N	13	27	53.6
	12.6 S., 66.4 E. Indian Ocean. h: 33 km ca. H= 16 46 14.4			17	05	19	P:D				53.9
											54.7
		USCGS				21.	iP S P:W,C	Z NE	14	30	46.4
20.	iP i S P:C	Z N N	17	20	06.2						31 00
					09.5	21.	P	Z	14	48	24
				21	20						
20.	P i S	Z N N	21	50	12	21.	eP	Z	15	28	31
					17						
				51	23	21.	iP i i	Z NE Z	16	13	28.4
21.	iP i P:D	Z E	02	14	15.7		P:D				40.7
					47		45.7 N., 151.1 E. Kurile Is. h: 40 km ca. H= 16 10 21*				
		USCGS				21.	iP i i S i P:C	Z EZ N E Z	16	24	22.7
21.	F i	Z Z	03	41	16						30
					42						32.5
21.	P i	Z E	08	38	01						25 26
					31						33
21.	iP i	Z Z	08	41	10.3		32.5 N., 141.0 E. South of Honshu, Japan. h: 33 km ca. H= 16 23 17.9				
					17.7						
		USCGS				22.	e	E	02	26	50
21.	F 7.1 S., 129.2 E. Banda Sea. h: 143 km ca. H= 08 34 36.7	Z	08	42	33	22.	P i i	Z Z NE	04	37	08
											30.6
		USCGS									31.7
21.	iP i eS eSS eL P:S,D	NZ E E E E	12	45	37.3	22.	P i i i	Z Z N Z E	05	55	18
	21.2 S., 175.8 W. Tonga Is. h: 90 km ca. H= 12 34 22.7				37.7						19.3
					55 25						20.2
				13	00.2						21.0
					04 46	22.	PKP	Z	06	16	41
		USCGS					35.1 S., 67.9 W. Mendoza Province, Argentina. h: 33 km ca. H= 05 56 29.5				
21.	P i i eS i eL L	Z E N Z E N E	13	14	40						
					45.7	22.	iP i S i i	NZ Z N E N	09	07	19.1
					48						21.3
				19	18						08 52
					29						55
				20	51						57
					55		P:N,C				
	Mag. 5 $\frac{3}{4}$ - 6 (Mat) 16.1 N., 119.7 E. Near west coast of Luzon, P.I. h: 49 km ca. H= 13 09 09.6					22.	eP	Z	10	01	23
		USCGS				22.	iP P:C	Z	10	44	59.6
21.	P	Z	13	18	08.7						

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
22.	iP Z, PN		12	05	18.6		i	Z	13	45	17.2
	i	E			19.6		S	E		47	26
	eS	E		11	34		i	N			32
	e	E		14	49		eL	E		48	20
	eL	E		15	56		eL	N		49	12
	P:N,C 6.1 S., 146.9 E. North east New Guinea, h: 102 km ca. H= 11 57 27.4						43.8 N., 150.5 E. Kurile Is. h: 33 km ca. H= 13 42 23.3				
					USCGS						USCGS
22.	eP	Z	12	27	06	23.	eP	Z	14	00	21
	5.3 S., 144.9 E. North east New Guinea, h: 65 km ca. H= 13 52 34.8						5.3 S., 144.9 E. North east New Guinea, h: 65 km ca. H= 13 52 34.8				
					USCGS						USCGS
22.	iP	E	14	11	19.3						
	i	Z			19.6						
	P:W										
22.	iP NZ, PE		18	03	18.7	23.	eP	Z	16	28	50
	i	Z			33		eL	E		33	54
	P:N,D 44.6 N., 149.4 E. Kurile Is. h: 65 km ca. H= 18 00 32*						24.5 N., 121.8 E. Near east coast of Taiwan, h: 130 km ca. H= 16 24 46.2				
					USCGS						USCGS
22.	eP	Z	20	13	36	23.	P	Z	16	50	05.
	i	N			52		e	E		51	26
	i	Z		14	05.2		eS	N			35
	45.3 N., 151.2 E. Kurile Is. h: 45 km ca. H= 20 10 30*						P:C				
					USCGS	23.	P	Z	18	10	10
							25.8 S., 177.8 W. Tonga Is. region. h: 140 km ca. H= 17 58 40.8				
											USCGS
22.	P	NZ	21	19	05.0	23.	eP	Z	18	24	41
	i	E			25.1						
22.	P	NEZ	23	25	01	23.	iP NZ, PE		13	42	27.9
	S	NE			18		S	N		44	30
	i	Z			19		eL	N		45	12
22.	P	Z	23	32	43		eL	E			19
23.	eP	Z	00	15	30		P:S,W,C Mag. 5 - 5 $\frac{1}{4}$ (Mat) 44.1 N., 149.1 E. Kurile Is. h: 65 km ca. H= 18 39 46.6				
	eS	NZ			54						USCGS
	i	E			55						
23.	P	Z	08	46	20	23.	P	Z	18	50	52
	i	Z			22.6		i	E		51	27
	i	N			23.2	23.	P	Z	19	25	00
23.	iP	Z	13	24	50.0						
	i	E			50.2						
	i	N			50.7						
	i	N	25	08							
	i	Z			11						
	i	N			29						
	P:D					23.	iP	NZ	21	57	59.0
23.	P	Z	13	45	13.		i	Z		59	10
	i	NEZ			13.2		S	NE			37
					(cont.)		P:S,D				
						23.	eP	Z	22	55	54

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Date	Phase	Comp.	Time(GMT)
			h m s
24.	P i	Z EZ	01 17 34 42
		46.4 N., 152.2 E., Kurile Is. h: 40 km ca. H= 01 14 06*	USCGS
24.	P i i eS e L	Z N NE E N E	02 29 06 19 20 31 26 50 32 16
		45.2 N., 151.4 E. Kurile Is. h: 50 km ca. H= 02 26 01.4	USCGS
24.	eP	Z	02 45 33
		45.1 N., 151.2 E. Kurile Is. h: 45 km ca. H= 02 42 31*	USCGS
24.	P i eS eL	Z Z N E	03 04 02 15 06 35 07 13
		45.4 N., 151.3 E. Kurile Is. h: 50 km ca. H= 03 00 57.3	USCGS
24.	eP S	Z N	03 22 37 23 20
24.	iP eS L	NZ E E	03 30 27.4 32 49 33 28
		P:N,D 45.5 N., 151.5 E. Kurile Is. h: 45 km ca. H= 03 27 23.9	USCGS
24.	eP	Z	05 04 03
24.	P S	Z NE	07 17 07 27
24.	eP S	Z NE	07 43 04 07
24.	eP i i	Z Z N	09 19 08 10 53
24.	iP i eS P:S,D	NZ E Z	10 12 14.7 15.5 32.7 15.5 32.7

Date	Phase	Comp.	Time(GMT)
			h m s
24.	iP i P:D	Z N	10 43 35.9 36.5
		55.9 N., 161.0 E. Near east coast of Kamchatka. h: 110 km ca. H= 10 38 23.3	USCGS
24.	iP eS e eL eL	EZ E E E E	11 27 50.7 35 38 37 58 42 09 44 08
		P:N,W,C Mag. 5 $\frac{1}{2}$ (Mat) 13.1 S., 166.7 E. Santa Cruz Is. region. h: 61 km ca. H= 11 18 15.2	USCGS
24.	iP EZ, P S	N NE	12 56 09.5 31
		P:S,E,D Mag. 5.0 (Mat) 36.2 N., 139.7 E. Honshu, Japan. h: 70 km ca. H= 12 55 46.4	USCGS
24.	iP i S P:D	Z N NE	16 06 51.1 51.5 07 08
24.	P e e	Z E N	17 42 54 43 51 53
24.	P	Z	19 09 23
		6.6 S., 146.3 E. North east New Guinea. h: 53 km ca. H= 19 01 11.7	USCGS
24.	iP P:S,E,C	Z	20 00 55.3
24.	e	E	20 13 36
24.	P e eL	Z E E	21 18 56 51 26 54 54
		53.0 S., 159.5 E. Macquarie I. region. h: 33 km ca. H= 21 05 54.6	USCGS
24.	iP Z, P i i P:C	NE N NEZ	22 34 26.5 30 47

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Date	Phase	Comp	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
		Kurile Is. h: 50 km ca. H= 08 09 09*					
						USCGS	
26.	iP eL P:C	Z E	10 48 57.5 51 34	26.	iP Z, P E i N eL E eL Z		16 30 53.9 54.1 40 52 42 06
		43.6 N., 148.3 E. Kurile Is. h: 33 km ca. H= 10 46 26.9				P:W,D Mag. 5½ (Mat) 1.4 N., 126.7 E. Molucca Sea. h: 65 km ca. H= 16 23 54.2	
						USCGS	
26.	eP i i	Z Z N	11 07 15 46 47	26.	P S	Z NE	16 40 52 41 16
26.	iP S P:E,D	NEZ EZ	12 06 52.4 07 03	26.	iP Z, P E iS NE P:D		17 28 54.2 29 04.7
26.	P iS P:D	Z EZ	12 07 20 31	26.	iP EZ, P N S NZ P:N,E,C		18 41 33.6 58
26.	P	Z	13 34 33.1	26.	iP iS P:C	Z NEZ	19 02 21.5 26.1
26.	iP P:W,D	EZ	14 04 02.9	26.	iP iS P:N,C	NZ NZ	19 03 34.2 38.8
26.	eP iS	Z NEZ	14 18 25 30.4	26.	iP S P:D	Z NE	20 01 28.2 38
26.	iP iS	Z NEZ	14 21 21.8 27.6	26.	iP S P:N	NZ Z	20 09 46.0 51
26.	eP iS	Z NEZ	14 21 52 58.3	26.	iP S P:C	Z NZ	20 20 20.0 22.5
26.	iP iS P:C	Z EZ	14 22 28.0 34.2	26.	eP	Z	20 33 03
26.	P iS	Z NEZ	15 27 09 15.2	26.	eP	Z	20 59 24
26.	eP iS	Z NEZ	15 27 52 57.4			36.4 N., 71.3 E. Hindu Kush. h: 140 km ca. H= 20 50 21.2	
26.	iP iS P:D	Z EZ	15 28 51.1 57.4			USCGS	
26.	P iS i	Z N Z	15 30 17 23.2 23.4	26.	eP	Z	21 18 36
26.	iP Z, P NE iS NZ		15 33 47.0 52.8			51.2 N., 169.8 W. Fox Is. Aleutian Is. h: 33 km ca. H= 21 11 11.9	
26.	eP i	Z Z	16 09 15 20			USCGS	
26.	P	Z	22 49 19	26.	P	NEZ	22 59 53
27.	P	Z	01 44 15	27.	P	Z	01 44 15

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	eLr	Z	03 40.4	20.	iP Z, F	NE	10 44 34.1
	eLr	E	41.1		S	NEZ	40
	P:D				P:C		
	Mag. 6½ (Mat)						
	32.7 S., 173.9 W.						
	Kermadec Is.						
	h: 33 km ca.						
	H= 03 03 52.0						
	USCGS						
28.	iP	Z	11 04 02.3	20.	iP	Z	11 12 23.5
					iS	Z	23.6
23.	P	NE	11 04 12.1	20.	iP	EZ	11 12 59.7
	S	NEZ	13.4		S	E	13 01.5
					P:D		
23.	iP	NZ	11 26 40.1	20.	iP	Z	11 13 34.0
	P:N,W,C				i	E	34.2
					i	N	34.4
					i	Z	53.3
					i	N	59
					i	Z	10 02.5
					P:C		
23.	iP	Z	12 37 59.7	20.	P	Z	11 21 31
	S	N	33 13		S	NEZ	37
	P:C				P:D		
28.	P	Z	14 17 23.1	20.	P	Z	11 47 52
	S	NEZ	33		iS E, S Z		57.4
	P:D						
23.	iP Z, F E		15 41 37.2	29.	eP	Z	12 00 36
	i	N	37.3		i	E	01 09
	i	Z	39				
	S	N	57	20.	iP	Z	12 24 16.6
	P:W,C				i	Z	43
					P:C		
28.	ePKP	Z	13 13 27	29.	iP	Z	12 35 56.3
	i	Z	43		S	NE	36 03
	eSKS	E	25 51		P:C		
	eSS	E	42 10	20.	iP	EZ	12 52 43.6
	e	E	52 20		i	N	44.0
	eL	E	13 04 53		i	Z	59
	Mag 6 (Mat)				S?	N	53 02
	60.4 S., 51.3 W.				P:W,D		
	South Shetland Is. region.						
	h: 49 km ca.						
	H= 17 53 33.1						
	USCGS						
28.	iP	EZ	10 34 11.0	20.	P	Z	15 10 43
	i	Z	36.5		i	N	45
	P:W,C				20.7 S., 173.4 W.		
					Fiji Is. region.		
					h: 534 km ca.		
					H= 15 00 24.0		
					USCGS		
23.	iP	EZ	04 32 34.2	20.	P	Z	15 37 43
	i	NEZ	47	20.	eP	Z	17 33 40
	P:W,C						
29.	iP	EZ	04 33 20.0	29.	ePKP	Z	17 35 14
	i	NEZ	33		i	Z	17.3
					i	E	13
29.	eP	Z	07 43 42		i	N	13
					ePP	E	39 12
20.	P	Z	00 11 01				(cont.)
	i	N	33				
	i	Z	34.0				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	eSS	E	17 58 28	30.	iP	Z	04 43 37.3
	eL	E	18 26.5		P:C		
	18.5 S., 69.7 W.			30.	iP N, P E		06 16 21.3
	Northern Chile.				P:N		
	h: 113 km ca.			30.	P?	Z	06 35 32
	H= 17 15 39.2		USCGS		29.3 S., 176.9 W.		
29.	iP	NEZ	17 33 43.7		Kermadec Is.		
	iS	NEZ	53.5		h: 34 km ca.		
	P:E,C				H= 06 23 35.2		USCGS
29.	iP	NZ	20 03 51.2	30.	iP	NZ	09 03 57.2
	S	NE	09 09		iS	NEZ	53.3
	P:N,C				P:N,C		
29.	eP	Z	20 19 16	30.	iP	NEZ	12 23 49.4
29.	iP E, P Z		20 44 34.1		S	N	29 15
	i	Z	55		P:S,W,D		
	i	N	45 21	30.	iP	NEZ	13 32 26.1
	P:W,C				eS	E	34 52
29.	P	Z	21 19 43		L	Z	35 38
	i	Z	20 14		L	E	36 09
30.	eP	Z	01 05 39		ScP	E	41 51
	i	E	47.7		ScS	E	45 06
	3.4 S., 122.3 E.				i	E	23
	Banda Sea.				P:S,V,C		
	h: 82 km ca.				Mag. 5 $\frac{1}{2}$ - 5 $\frac{1}{2}$ (Mat)		
	H= 00 53 13.3		USCGS		45.5 N., 150.6 E.		
30.	P	Z	01 19 02		Kurile Is.		
	i	E	05		h: 40 km ca.		
	S	N	22 02		H= 13 29 25.3		USCGS
	e	E	24	30.	PKP	Z	14 06 14
	eL	E	49		i	Z	17
	e	E	25 30		38.3 N., 122.3 W.		
	ScS	E	30 52		Mendocino County, California.		
	i	N	54		h: 33 km ca.		
	Mag. 5 - 5 $\frac{1}{2}$ (Mat)				H= 13 47 03.1		USCGS
	21.6 N., 144.5 E.			30.	eP	Z	14 21 04
	Mariana Is. region.				i	N	23
	h: 120 km ca.			30.	iP	Z	15 10 07.7
	H= 01 15 24.5		USCGS		PcP	Z	13 13
30.	P	Z	01 27 14		eS	E	14 50
30.	eP	Z	03 23 09		eL	E	16 32
	19.9 S., 177.8 W.				iScP	Z	45
	Fiji Is. region.				P:C		
	h: 522 km ca.				9.4 N., 126.0 E.		
	H= 03 12 52*		USCGS		Near east coast of Mindanao, P.I.		
30.	P	NZ	04 02 12		h: 102 km ca.		
	54.4 N., 160.6 E.				H= 15 04 14.2		USCGS
	Near east coast of Kamchatka.			30.	P	Z	16 33 07
	h: 33 km ca.			30.	iP	NEZ	16 33 19.1
	H= 03 57 09.2		USCGS		P:S		

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
30.	ePKP	Z	16 40 15		i	Z	10 31 53.7
	18.3 S., 70.1 W.				i	E	50.5
	Northern Chile.				i	Z	32 00.7
	h: 150 km ca.						
	H= 16 20 48*	USCGS					
30.	iP	Z	20 34 00.1				
	i	NE	00.9				
	eS	E	35 22	31.	P	Z	10 42 20
	i	NZ	44		i	N	36.6
	P:C				i	Z	43 23.3
	42.4 N., 142.3 E.				eL	E	44 43
	Hokkaido, Japan.			31.	P	Z	10 48 25
	h: 50 km ca.				i	EZ	37.3
	H= 20 32 10.5	USCGS			eL	E	54 03
30.	P	EZ	20 48 32				
	i	Z	46				
	S	N	49 16				
30.	eP	Z	21 12 47				
30.	eP	Z	22 00 57	31.	P	Z	11 15 10
	i	Z	10 29		e	E	45
					e	N	54 49
30.	P	EZ	22 14 54	31.	iP	NZ	12 10 59.6
	i	N	15 34		P:N,D		
	i	Z	21 16 13				
	P:E,C			31.	P	Z	12 12 55
	6.9 N., 94.7 E.				iS?	NZ	13 21.5
	Nicobar Is.				i	E	22.1
	h: 64 km ca.						
	H= 22 06 07.1	USCGS		31.	P	Z	12 47 31
31.	P	Z	01 13 46	31.	iP Z, P N		14 15 45.2
					i	E	45.7
31.	eP	Z	02 12 56		S	NE	16 16
	i	Z	59.7		i	N	20
	i	N	13 25		P:S,C		
	i	N	29				
				31.	P	Z	16 47 44
31.	P	Z	02 59 19		S?	NE	43 14
	S	EZ	26				
				31.	P	Z	17 15 50
31.	P	Z	03 15 43		i	NE	16 03
	i	NZ	16 23		i	NZ	10
31.	eP	Z	04 31 03	31.	PKP	Z	17 57 24
	i	Z	21		i	Z	57.7
	45.0 N., 151.3 E.				PP	Z	13 01 31
	Kurile Is.				i	E	41
	h: 33 km ca.				eSKS	E	04 20
	H= 04 23 04*	USCGS			SKKS	E	07 45
					i	Z	46
					i	E	08 25
31.	iP	EZ	04 32 52.6		i	Z	10 13
	i	N	53.9		eSS	E	21 20
	S	NE	33 06		eSSS	E	13 29 16
	P:W,C				eL	E	55.5
					eL	Z	59.5
31.	P	Z	10 31 58		P:C		
			(cont.)				(cont.)

