

SEISMOLOGICAL BULLETIN

OF

MATSUSHIRO

NOVEMBER, DECEMBER

1964

Instrumental Constants

Instrument	Comp.	Period (sec)		Damping ratio		Magnification
Bentall Seismograph (Short Period)	N	T <sub>0</sub> = 1.0	T <sub>0</sub> = 0.23	h <sub>0</sub> = 0.68	h <sub>0</sub> = 1.7	100,000 (max)
	E	T <sub>0</sub> = 1.0	T <sub>0</sub> = 0.22	h <sub>0</sub> = 0.70	h <sub>0</sub> = 1.6	100,000 (max)
	Z	T <sub>0</sub> = 1.0	T <sub>0</sub> = 0.21	h <sub>0</sub> = 0.72	h <sub>0</sub> = 1.5	100,000 (max)
Bentall Seismograph (Long Period)	N	T <sub>0</sub> = 1.0	T <sub>0</sub> = 70	h <sub>0</sub> = 0.68	h <sub>0</sub> = 1.7	1,000 (max)
	E	T <sub>0</sub> = 1.0	T <sub>0</sub> = 67	h <sub>0</sub> = 0.70	h <sub>0</sub> = 1.6	1,000 (max)
	Z	T <sub>0</sub> = 1.0	T <sub>0</sub> = 64	h <sub>0</sub> = 0.72	h <sub>0</sub> = 1.5	1,000 (max)
Short Period Seismograph	Z	T <sub>0</sub> = 1.0	T <sub>0</sub> = 2.22	h <sub>0</sub> = 1.4	h <sub>0</sub> = 1.2	30,000 (max)
Gahita Seismograph	N	T <sub>0</sub> = 15	T <sub>0</sub> = 100	h <sub>0</sub> = 1	h <sub>0</sub> = 1.3	1,000 (max)
	E	T <sub>0</sub> = 15	T <sub>0</sub> = 100	h <sub>0</sub> = 1	h <sub>0</sub> = 1.3	1,000 (max)
	Z	T <sub>0</sub> = 7.5	T <sub>0</sub> = 100	h <sub>0</sub> = 0.70	h <sub>0</sub> = 1.3	1,000 (max)
Wood-Anderson Seismograph	N	Matsushiro Seismological Observatory Matsushiro-machi, Nagano-shi Nagano-ken, Japan				
1000 kg Long Period Seismograph	N					
	Z					

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Date	Phase	Comp.	Time(GMT)	Lat	Long	Depth	Mag
11-05-11.1	P	Z	05 06 11.1	33.8 N., 130.8 W., Queen Charlotte Is. region. h: 33 km ca. H= 04 55 47.4			
11-05-25 55	P	N	05 25 55	13.7 W., 120.6 E., Maduro, P. I. h: 94 km ca. H= 05 15 48.4			

Matsushiro Seismological Observatory, Japan

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Date	Phase	Comp.	Time(GMT)	Lat	Long	Depth	Mag
11-06-54.1	P	Z	06 53 56	51.7 N., 175.4 W., Andreanof Is., Aleutian Is. h: 20 km ca. H= 06 46 54.1			

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 <sub>1</sub> = 1.0 T <sub>2</sub> = 0.23	h <sub>1</sub> = 0.68 h <sub>2</sub> = 1.7	103,000 (max)
	E	T <sub>1</sub> = 1.0 T <sub>2</sub> = 0.22	h <sub>1</sub> = 0.70 h <sub>2</sub> = 1.6	106,000 (max)
	Z	T <sub>1</sub> = 1.0 T <sub>2</sub> = 0.21	h <sub>1</sub> = 0.72 h <sub>2</sub> = 1.2	131,000 (max)
Benioff Seismograph (Long Period)	N	T <sub>1</sub> = 1.0 T <sub>2</sub> = 70	h <sub>1</sub> = 0.68 h <sub>2</sub> = 5.9	7,330 (max)
	E	T <sub>1</sub> = 1.0 T <sub>2</sub> = 62	h <sub>1</sub> = 0.70 h <sub>2</sub> = 5.6	9,640 (max)
	Z	T <sub>1</sub> = 1.0 T <sub>2</sub> = 84	h <sub>1</sub> = 0.72 h <sub>2</sub> = 7.3	7,590 (max)
Short Period Seismograph	Z	T <sub>1</sub> = 1.0 T <sub>2</sub> = 2.82	h <sub>1</sub> = 1.4 h <sub>2</sub> = 1.2	32,000 (max)
Galitzin Seismograph	N	T <sub>1</sub> = 15 T <sub>2</sub> = 100	h <sub>1</sub> = 1 h <sub>2</sub> = 1.2	1,350 (max)
	E	T <sub>1</sub> = 15 T <sub>2</sub> = 100	h <sub>1</sub> = 1 h <sub>2</sub> = 1.1	1,640 (max)
	Z	T <sub>1</sub> = 7.5 T <sub>2</sub> = 100	h <sub>1</sub> = 0.76 h <sub>2</sub> = 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
2.	iP EZ, P N S NZ P: S, E, D		11	43	41.0 44 07		i N S NE P: S, E, D		02	06	43 52
2.	e N e N 44.5 N., 149.7 E. Kurile Is. h: 33 km ca. H= 11 50 58.1		11	57	43 59 25		Mag. 5.3 (Mat.) 34.5 N., 140.8 E. Off east coast of Honshu, Japan. h: 60 km ca.	JMA			
2.	iP NZ iS NEZ P: N, D		12	51	23.5 44.5	3.	e N 31.6 N., 66.4 E. Afghanistan. h: 38 km ca. H= 06 05 33.1	USCGS	06	42	27
2.	iP NEZ iS NEZ		13	23	12.8 13.6	3.	P NEZ iS E, S N		08	55	42 56 07.0
2.	iP EZ i Z S E i NZ P: W, D		15	53	24.5 39 54 00 09	3.	P NZ i E S E		10	22	08 09.0 23 08
2.	iP EZ S NEZ P: E, D		16	26	35.0 55.0	3.	iP NZ, P E S NE P: S, D		11	07	30.0 57
2.	iP NZ S NE i Z P: N, D		16	29	28.4 51 52	3.	iP NEZ S NE P: S, E, D Mag. 5.6 (Mat.) 34.5 N., 139.0 E. Off south coast of Honshu, Japan. h: 60 km ca.	JMA	11	10	09.2 34
2.	iP Z i N iS NE i Z P: D		16	43	08.5 08.7 29.5 30.0	3.	iP NEZ S NEZ P: S, E, D		11	48	47.0 49 13
2.	iP NZ, P E i EZ i Z i NE P: S, C		16	51	35.9 56.5 52 09.0 11.0	3.	iP EZ i N PcP Z eS NE L NE, eL Z P: E, C 0.1 N., 123.7 E. Northern Celebes. h: 149 km ca. H= 12 43 04.7	USCGS	12	50	15.0 15.4 52 25.5 55 56 58 48
2.	P NEZ iS NEZ		22	21	55.0 56.5	3.	iP Z i N i E S NE P: D		12	56	49.3 49.5 50.0 57 14.5
3.	iP NEZ P: W, D		00	18	02.0	3.	iP Z i N i E S NE P: D		13	12	31.6 32.0 32.4 56 57
3.	iP NEZ S N 47.1 N., 144.6 E. Sea of Okhotsk. h: 353 km ca. H= 00 29 41.8		00	32	19.8 34 29	3.	iP Z i N i E S NE P: D		13	12	31.6 32.0 32.4 56 57
3.	iP NEZ		02	06	22.5 (cont.)						

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
3.	eP eS? eL e	NEZ E E N	13 56 38 59 41 14 01 32 55	3.	L e eL	E N N	20 22 12 23.0 26 22
	50.3 N., 158.3 E. Kurile Is. region. h: 33 km ca. H= 13 53 35 USCGS			4.	iPKP1Z, PKP1E iPKP2 P: D	Z	02 31 07.5 36.0
3.	iP i eS P: S, D	NZ E NE	14 24 31.3 32.2 57	4.	P i i S E, eS N L eL	NZ NEZ E E N	03 42 55 56.5 43 06 47 17 43 28 50 00
	44.6 N., 149.0 E. Kurile Is. h: 20 km ca. H= 14 55 40.1 USCGS				Mag. 5-5½ (Mat.) 54.9 N., 162.6 E. Near east coast of Kamchatka. h: 49 km ca. H= 03 37 35.9 USCGS		
3.	P i i iS E, S N i	NZ E NZ	15 06 06 07.5 07.7 31.0 33.6	4.	iP Z, P N i iS N, S E i P: C	E Z	04 11 05.1 06.0 13.9 14.0
3.	P	Z	17 47 07.5	4.	iP i S P: C	Z E EZ	04 29 44.9 46.0 30 30
	36.0 N., 50.6 E. Iran. h: 33 km ca. H= 17 36 09.5 USCGS			4.	iP i i P: C	Z N Z	06 46 13.1 14 26.5
3.	iP i i S E, eS N i P: D	Z NE Z	18 25 25.0 25.5 59 26 00	4.	iP Z, P N i i iS Z, S E i P: D	E N E N	11 48 04.4 04.5 05.4 19.0 20
	55.0 N., 162.3 E. Near east coast of Kamchatka. h: 33 km ca. H= 06 40 51 USCGS			4.	iP i P: N, D	NZ E	13 09 35.5 35.8
3.	iP i i S i P: C	NZ E E N E	18 33 28.4 29 34 03.5 04	4.	e	N	13 5.2 22
	1.7 S., 149.8 E. New Ireland region.				(cont.)		

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
4.	eP	Z	14	12	36		i	E	04	27	19.1
	i	E			37		PcP	Z			29 06
	i	N			38		eS	N			33 29.
	S	EZ		13	17		P: N, C				
	i	N			17.5		5.5 S., 147.2 E.				
							East New Guinea region,				
							h: 197 km ca.				
							H= 04 19 39.5 USCGS				
4.	e	E	15	39	53	5.	P	Z	07	06	59
	L	N		40	20		i	N		07	04
	L	E			40		i	E			07
							S	N			11 49
							Lq	E			13 02
							L	N			14 10
							9.2 N., 142.0 E.				
							West Caroline Is.				
							h: 33 km ca.				
							H= 07 01 15.3 USCGS				
4.	iP Z, P N		20	04	09.0	5.	P	Z	10	02	12.4
	i	Z			11		i	NE			13.5
	S	NEZ			35		i	Z			54
							P: C				
							18.2 N., 68.4 W.				
							Mona Passage.				
							h: 183 km ca.				
							H= 08 47 06.0 USCGS				
4.	iP	Z	21	08	54.4	5.	P	Z	15	07	31
	i	NE			55		i	EZ			43.7
	i	Z			09 23		i	N			44
	S	E			13 55		i	Z			09 03
	Lq	E			15 31	5.	P	Z	15	12	08
	eLq	N			16 10	5.	iP	NEZ	20	29	15.5
	Lr	Z			17 38		P: E, D				
						5.	P	Z	21	01	37
							7.0 S., 129.4 E.				
							Banda Sea.				
							h: 95 km ca.				
							H= 00 45 30.9 USCGS				
5.	iP	Z	00	53	30.4	6.	iP	Z	02	50	51.3
	e	N			56 37		i	N			52.0
							iS	NE			51 06.5
							i	Z			09.0
							P: D				
						6.	iP	Z	03	02	37.1
							S	E			03 03
							P: D				
						6.	iP	N	03	55	18.0
							S	NE			42
							i	E			52
							P: N				
5.	P	N	02	02	47.2	6.	P	EZ	04	19	57.3
	i	Z			47.5		i	E			20 14
	i	E			47.7		P: E, D				
							5.1 S., 146.1 E.				
							East New Guinea region,				
							h: 137 km ca.				
							H= 01 47 42.1 USCGS				
5.	iP	NZ	04	27	18.5						



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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
	S	N	14 54 50	8.	iP	EZ	11 44 00.6
	L	E	56		i	N	12
	L	N	55 28		P:	W, D	
	L	Z	35	8.	iP	NEZ	12 18 03.0
	P: S, C				P:	N, W, D	
	Mag. 5-5½ (Mat.)			8.	P	Z	13 07 47.4
	45.5 N., 150.3 E.				iS	NEZ	50.0
	Kurile Is.			8.	P	Z	14 57 36.8
	h: 33 km ca.				iS	NZ, S E	38.1
	H= 14 49 13.4				P:	C	
	USCGS			8.	iP	Z	17 06 56.6
7.	iP	NEZ	15 13 25.8		i	E	56.8
	iS	NE	27.6		i	N	57.2
	P: W, D				S	NE	07 17
7.	iP	EZ, P N	17 08 21.0		P:	D	
	i	NEZ	42	8.	iP	Z	17 57 39.2
	P: N, E, C				i	NE	40
7.	iP	Z	18 46 33.5		i	EZ	46.0
	i	NE	36		i	Z	58 00
	S	NE	53 46		S	N	36
	L	E	58 43		i	E	41
	eL	N	19 00.0		L	E	53 00
	eL	Z	03 44		P: C		
	P: D				33.7 N., 133.3 E.		
	Mag. 6½-6½ (Mat.)				Shikoku, Japan.		
	0.4 N., 100.1 E.				h: 20 km ca. JMA		
	Northern Sumatra.			9.	iP	NZ	04 52 19.5
	h: 107 km ca.				i	E	19.8
	H= 18 37 43.7				pP	Z	38
	USCGS				S	E	58 45
7.	iP	Z	23 52 38.0		i	N	59 31
	P: D				eL	E	05 01 59
	19.9 S., 177.4 W.				eL	N	02 17
	Fiji Is. region.				P: N, C		
	h: 281 km ca.				Mag. 5-5½ (Mat.)		
	H= 23 41 55.1				7.2 S., 128.2 E.		
	USCGS				Banda Sea.		
3.	P	E	02 56 45		h: 129 km ca.		
	i	NZ	48		H= 04 44 19.9		
	PP	N	03 00 18		USCGS		
	S	E	07 14	9.	P	Z	08 16 40.0
	i	N	17		i	E	41
	e	E	16 00		eS	E	25 53
	Lq	E	21 50		L	E	39 41
	eL	N	24 26		39.8 N., 48.4 E.		
	Lr	Z	25 41		Northwestern Iran-USSR		
	Mag. 6½-6½ (Mat.)				border region.		
	49.0 S., 163.7 E.				h: 65 km ca.		
	Auckland Is. region.				H= 08 05 48.8		
	h: 33 km ca.				USCGS		
	H= 02 43 57			8.	P	Z	10 44 43
	USCGS				L	E	11 09 41
8.	P	Z	10 44 43		29.7 N., 51.0 E.		
	L	E	11 09 41		Southern Iran.		
	h: 40 km ca.				h: 40 km ca.		
	H= 10 33 27.5				H= 10 33 27.5		
	USCGS				USCGS		
				9.	iP	E	13 54 59.2
					i	NZ	59.4
					S	E	56 14
					P: W		



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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
9.	e eL	E NE	16 13 58 16 00	10.	eS? e	N E	11 31 42 35 38
	56.8 N., 161.5 E. Near east coast of Kamchatka. h: 33 km ca. H= 16 01 03 USCGS				56.7 N., 161.3 E. Near east coast of Kamchatka. h: 33 km ca. H= 11 22 54 USCGS		
9.	L	E	16 36 00	10.	e	NE	12 27 45
	29.5 N., 86.0 E. Tibet. h: 33 km ca. H= 16 12 50.6 USCGS			10.	iP i i iS	Z NE Z NE, S Z	12 46 57.5 58.2 59.0 47 42.0
9.	iP PcP S i L	NEZ Z NZ E E	18 48 40.0 52 32 51 54 53 24		P: C		
	P: S, W, D Mag. 5-5½ (Mat.) 19.3 N., 121.0 E. Philippine Is. region. h: 33 km ca. H= 18 43 38.6 USCGS				31.6 N., 132.3 E. Southeast of Shikoku, Japan. h: 169 km ca. H= 12 45 16 USCGS		
10.	iP i	EZ N	01 23 19.0 19.7	10.	eP i i S i	Z E N N E	15 21 32 33 36 22 04 05.0
	P: E, D			10.	P	Z	15 59 04
10.	P i i S i	Z NE Z E N	04 10 56 57 11 27 12 37 42		32.6 N., 49.1 E. Westrn Iran. h: 28 km ca. H= 15 47 49.3 USCGS		
10.	eP i i e	Z E N N	05 19 21 23 24 38 30	10.	P i Lq e	Z N E N	16 41 53 55 50 04 56 40
					3.7 S., 136.5 E. West New Guinea. h: 14 km ca. H= 16 34 15.5 USCGS		
10.	e e	N N	06 01 20 10 50	10.	P iS i i	Z N E Z	18 47 59.6 48 24.5 25.5 27
					P: C		
10.	eP eS? eL	Z NE E	06 17 07 24 37 30.0	10.	iP iS	NEZ NEZ	23 08 09.6 25.5
	59.8 N., 144.3 E. Gulf of Alaska. h: 42 km ca. H= 06 07 49.6 USCGS				P: S, E, D		
10.	P i	EZ N	07 49 44 45	11.	iP iS	EZ, P N E	03 44 02.3 21.4
					P: E, C		
10.	P i i	Z N E	10 44 00 02 03	11.	eP?	Z	05 19 36
	6.1 S., 147.2 E. East New Guinea region. h: 80 km ca. H= 10 35 35 USCGS			11.	iP i e eL	Z Z E E	05 27 05.5 25 29 03 52

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
	P: C				S	E	13 27 42
	30.7 N., 131.3 E.				L	E	30 24
	Kyushu, Japan.				eLr	Z	31 25
	h: 33 km ca.				Mag. 5½-5½ (Mat.)		
	H= 05 25 07.6	USCGS			56.6 N., 161.4 E.		
					Near east coast of Kamchatka.		
11.	P	NEZ	06 04 28		h: 33 km ca.		
	53.8 N., 160.8 E.				H= 13 17 37.5		
	Near east coast of Kamchatka.				USCGS		
	h: 33 km ca.			11.	iP	EZ	14 02 27.3
	H= 05 59 32	USCGS			i	N	27.5
					iS E, S N		47.0
11.	iP	NZ	06 19 48.0		P: E, C		
	i	Z	59				
	e	E	22 02	11.	eP	Z	14 42 46
	P: S, C				eL	E	49 07
					56.8 N., 161.1 E.		
11.	e	E	08 07 58		Near east coast of Kamchatka.		
	57.1 N., 161.7 E.				h: 33 km ca.		
	Kamchatka.				H= 14 37 22.6		
	h: 33 km ca.				USCGS		
	H= 07 54 58	USCGS		11.	eP	Z	15 05 02
					PP	Z	54
11.	P	Z	08 10 45		e	E	15 52
	eS	E	18 19		56.9 N., 161.7 E.		
	e	N	25		Near east coast of Kamchatka.		
	eL	E	28 55		h: 33 km ca.		
	Mag. 5½ (Mat.)				H= 14 59 36		
	59.4 N., 144.6 W.				USCGS		
	Gulf of Alaska.			11.	eP	Z	15 26 11
	h: 10 km ca.				eL	E	32 42
	H= 08 01 26.1	USCGS					
11.	eL	E	10 28 40	11.	P	Z	15 45 43
	56.8 N., 161.2 E.				eL	E	52.5
	Near east coast of Kamchatka.				56.6 N., 161.4 E.		
	h: 33 km ca.				Near east coast of Kamchatka.		
	H= 10 16 18	USCGS			h: 33 km ca.		
					H= 15 40 18.0		
					USCGS		
11.	P	Z	11 45 42	11.	P	Z	16 30 15
	S	E	46 09				
11.	e	E	12 04 40ca.	11.	eP	Z	16 37 49
	e	E	08 58		e	E	46 14
					eL	E	47 06
11.	iP	NEZ	12 09 59.4		56.5 N., 161.2 E.		
	S	NE	10 45		Near east coast of Kamchatka.		
	P: N, E, C				h: 33 km ca.		
					H= 16 32 24.5		
					USCGS		
11.	P	EZ	12 22 51	11.	eP	Z	16 58 34
					20.0 N., 108.9 W.		
11.	eP	Z	13 16 50		Revilla Gigedo Is. region.		
	56.5 N., 161.5 E.				h: 33 km ca.		
	Near east coast of Kamchatka.				H= 16 45 09		
	h: 33 km ca.				USCGS		
	H= 13 11 23	USCGS		11.	eP	Z	17 02 49
					e	E	07 19
11.	P Z, eP N		13 23 04		eL	E	09.0
	e	E	26 54		Mag. 5½ (Mat.)		
			(cont.)		(cont.)		

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
			56.6 N., 161.4 E. Near east coast of Kamchatka. h: 33 km ca. H= 16 57 24.4 USCGS		eS	E	19 16 50
					eL	E	19 04
					Mag. 5 $\frac{1}{2}$ -6 (Mat.) 56.6 N., 161.3 E. Near east coast of Kamchatka. h: 33 km ca. H= 19 06 57.1 USCGS		
11.	P	Z	17 28 47 55.8 N., 161.0 E. Near east coast of Kamchatka. h: 33 km ca. H= 17 23 18 USCGS	11.	iP	NEZ	19 17 38.8
					S	NEZ	18 08
					P: S, W, C 38.7 N., 140.1 E. Honshu, Japan. h: 89 km ca. H= 19 16 57 USCGS		
11.	eP	Z	17 31 49 56.8 N., 161.8 E. Near east coast of Kamchatka. h: 33 km ca. H= 17 26 25 USCGS	11.	L	E	19 27 52
					L	E	29 20
					Mag. 5 $\frac{1}{2}$ (Mat.) 56.6 N., 161.3 E. Near east coast of Kamchatka. h: 33 km ca. H= 19 13 39.3 USCGS		
11.	eP	Z	17 34 16 56.6 N., 161.4 E. Near east coast of Kamchatka. h: 33 km ca. H= 17 28 50.5 USCGS	11.	e	E	20 14 40
	e	E	38 50	11.	P	Z	20 20 55
	eL	E	40 32		S E, eS N		21 15
				11.	P	NE	20 42 30
					i	Z	31
				11.	eP	Z	21 12 38
					e	N	13 37
11.	eP	Z	17 58 42 56.5 N., 161.3 E. Near east coast of Kamchatka. h: 33 km ca. H= 17 53 19.3 USCGS	11.	eP	Z	21 36 22
	i	Z	59 10	11.	P	Z	21 37 38
	e	E	18 01 41				13.7 S., 167.2 E. New Hebrides Is. h: 135 km ca. H= 21 28 03.0 USCGS
	eL	E	05.0	11.	P	Z	23 44 08
							11.9 N., 143.1 E. South of Mariana Is. h: 33 km ca. H= 23 38 47.2 USCGS
				11.	P Z, eP E		18 53 26
					S E, eS N		49
				11.	eP	Z	18 56 52
					e	E	19 02 34
					eL	E	04 21
11.	PKP	Z	19 08 15 13.4 S., 75.0 W. Peru. h: 99 km ca. H= 18 48 56.6 USCGS	12.	P	Z	00 50 18
				12:	P	Z	05 19 12
					S $\frac{4}{7}$ .	N	21 29
							47.1 N., 146.6 E. Northwest of Kurile Is. h: 328 km ca. H= 05 16 26.2 USCGS
11.	eP	Z	19 12 22 (cont.)	12.	P	Z	05 44 32
					e	E	56 33



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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
13.	P N, eP Z		06 03 13	14.	iP Z		05 57 16.0
13.	iP Z, P E		10 53 11.0		i E		29
	i Z		28		eS E		39
	i E		31		P: S, E, D 36.5 N., 140.6 E. Near east coast of Honshu, Japan. h: 50 km ca. JMA		
13.	iP Z, P N		13 35 48.0	14.	eP Z		09 04 12
	P: S, D			14.	iP EZ		11 04 02.0
	7.4 S., 125.4 E.				i N		02.2
	Banda Sea.				S E		12
	h: 368 km ca.				i N		13
	H= 13 28 03	USCGS			P: E, D		
13.	eP Z		13 39 21	14.	eP Z		16 21 04
	i N		41		10.3 S., 119.9 E. Sumba I. region. h: 33 km ca. H= 16 12 16 USCGS		
	i Z		46.1	14.	iP Z		17 02 25.2
13.	P Z		14 27 32		P: C 5.3 S., 146.8 E. East New Guinea region. h: 228 km ca. H= 16 54 50.7 USCGS		
13.	iP Z		15 25 30.5	14.	iP NZ, P E		19 33 40.9
	P: C				P: N, D		
	18.1 S., 178.4 W.			15.	iP Z		00 14 30.6
	Fiji Is. region.				S NE		15 11
	h: 574 km ca.				P: D		
	H= 15 15 27.4	USCGS		15.	iP Z, P E		00 43 18.0
13.	iP NZ, P E		17 17 58.3		P: D		
	S E, eS N		18 29	15.	iP EZ, P N		00 55 59.2
	P: S, D				i E		56 14
13.	P EZ		17 25 56		S Z		16
	S NE		26 08		i N		17
13.	P Z		19 50 48		P: S, E, D 36.2 N., 139.9 E. Honshu, Japan. h: 50 km ca. JMA		
13.	P Z		22 09 18	15.	iP Z		02 03 50.8
	e E		22 59		S E		04 16
	eL E		28.9		P: D		
	eL E		33 50	15.	eP Z		04 40 26
	Mag. 5½-5¼ (Mat.)				9.4 N., 126.3 E. Mindanao, P. I. h: 62 km ca. H= 04 34 30.3 USCGS		
	29.2 S., 178.1 W.			15.	e E		05 05.7
	Kermadec Is. region.						
	h: 77 km ca.						
	H= 21 57 30						
13.	P Z		22 36 18				
13.	P Z		23 59 49				
	S? NEZ		56				
14.	eP Z		03 01 02				
14.	iP NEZ		03 57 32.4				
	i E		43				
	eS E		58 56				
	P: N, E, C						
	Mag. 6.0 (Mat.)						
	33.6 N., 132.0 E.						
	Kyushu, Japan.						
	h: 70 km ca. JMA						

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
15.	iP S P: W, C	EZ E	05 54 06.4 24				49.5 S., 163.6 E. Auckland Is. region. h: 33 km ca. H= 16 45 44.8 USCGS
15.	iP S i	EZ N N	06 25 28.5 26 05 10	15.	eP	Z	19 00 17
15.	eP	Z	06 44 50	15.	P	EZ	19 31 11
			35.6 N., 45.7 E. Iran-Iraq border region. h: 33 km ca. H= 06 33 23.5 USCGS	15.	iP S P: C	Z NE	21 47 35.4 58
15.	iP	Z	07 32 08.2	15.	iP S	NEZ NE	23 28 22.0 33
			18.0 S., 178.3 W. Fiji Is. region. h: 608 km ca. H= 07 22 08.0 USCGS				P: S, E, D Mag. 5.1 (Mat.) 36.6 N., 139.2 E. Honshu, Japan. h: 20 km ca. JMA
15.	e eL	E E	10 09.6 12.3	15.	P i	Z EZ	23 31 58 32 11
			29.9 N., 51.0 E. Southern Iran. h: 33 km ca. H= 09 33 46.7 USCGS	16.	P i	Z E	00 00 12 12.7
15.	P Z, eP S	E N	10 14 21 48				47.2 N., 147.3 E. Northwest of Kurile Is. h: 297 km ca. H= 23 57 21 USCGS
15.	iP iS	EZ E, S N	11 02 00.3 10.4	16.	iP S i	NEZ NEZ E	01 01 47.8 02 11 25
15.	iP EZ, P iS P: N, W, C	N E	12 25 44.3 54.7	16.	eP	Z	02 58 29
15.	iP i	NEZ NE	15 25 24.6 35.0				36.9 N., 121.8 W. Central California. h: 33 km ca. H= 02 46 43 USCGS
15.	P i e S L	Z E E E E	15 56 34 59 33 16 00 06 13 01 18	16.	eP e i	Z Z Z	04 56 25 57 17 43
			Mag. 5 $\frac{1}{2}$ (Mat.) 24.0 N., 122.2 E. Taiwan region. h: 42 km ca. H= 15 52 21.5 USCGS				36.3 N., 70.4 E. Hindu Kush region. h: 225 km ca. H= 04 47 27.5 USCGS
15.	iP	Z	16 30 35.0	16.	P i	Z N	05 39 01 02
15.	P i i	Z E N	16 53 18 38 39				39.8 N., 39.9 E. Turkey. h: 39 km ca. H= 05 27 33.8 USCGS
15.	eP	Z	16 58 36 (cont.)	16.	P	Z	06 08 12

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
		Eastern Kazakh SSR. h: 0 km ca. H= 05 59 57.4				Kurile Is. h: 33 km ca. H= 18 21 14.5	
			USCGS				USCGS
16.	P i	Z Z	06 18 10 35	16.	eP	Z	20 25 07
16.	iP S P: C	Z NE	08 14 53.7 15 03	16.	iP 51.6 N., 178.5 E. Rat Is. h: 33 km ca. H= 20 35 06	Z	20 41 35.0
16.	eP	Z	10 01 45				USCGS
16.	P e eL	Z E E	12 19 59 24 49 25 18	16.	iP E, P Z i P: E, D	NE	21 14 54.6 15 05
		47.1 N., 154.1 E. Kurile Is. h: 33 km ca. H= 12 16 19.3		16.	P S	Z E	21 16 49 59
			USCGS	16.	P S	NZ E	22 23 29 56
16.	iP Z, P N P: C		12 25 45.5	16.	P	Z	22 42 54
16.	P eS e L	NEZ N E E	12 42 07 45 15 28 47 21	16.	P S L e eLr	Z E E Z	22 48 14 54 16 57 20 30 23 02 50
		Mag. 5-5½ (Mat.) 47.4 N., 154.2 E. Kurile Is. h: 33 km ca. H= 12 38 29.7				Mag. 5½-5¾ (Mat.) 1.0 N., 118.8 E. Borneo, h: 33 km ca. H= 22 40 44.0	
			USCGS				USCGS
16.	eP	Z	12 56 35	17.	e eL	E E	00 29.9 33.6
16.	iP N, P EZ e P: S	E E	13 54 53.2 14 00 27			Mag. 5½-5¾ (Mat.) 16.3 S., 173.7 W. Tonga Is. h: 33 km ca. H= 00 01 17.1	
			USCGS				USCGS
		48.3 N., 154.6 E. Kurile Is. h: 33 km ca. H= 13 50 58.5		17.	eP	Z	01 04 34
			USCGS	17.	iP S P: N, E, C	EZ NZ	05 57 38.0 48
16.	iP i P: D	Z E	14 26 07.5 40	17.	iP S i P: E, C	EZ N E	06 05 40.2 50 51
16.	iP Z, P N i i P: C	N E	16 36 49.5 37 08.4 08.6	17.	iP S P: W, C	Z NEZ	06 53 39.3 49
16.	iP e P: D	Z N	16 58 33.1 59 06				
16.	P	Z	18 25 39				
		50.0 N., 156.5 E.					

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT)Z h m s
17.	iP NZ, P E		08 23 40.5		e	N	19 09 48
	i	Z	29 17		L	E	11 02
	i	Z	26		Lr	Z	12.4
	S	E	30 13		Mag. 6-6½ (Mat.)		
	L	E	34 05		12.7 N., 144.9 E.		
	Lr	Z	36 43		South of Mariana Is.		
	P: N, W, C				h: 43 km ca.		
	Mag. 7½-7½ (Mat.)				H= 19 00 10.4 USCGS		
	5.7 S., 150.7 E.						
	New Britain region.			17.	iP	Z	19 41 29.2
	h: 45 km ca.				i	NE	29.5
	H= 08 15 39.3 USCGS				S	Z	57
					P: C		
17.	eP	Z	08 54 50	17.	eP	Z	19 43 32
17.	iP	Z	11 03 08.0		eS	E	57
	P: D			17.	eP	Z	20 59 59
17.	iP	Z	11 13 32.6		i	E	21 00 01
	i	NE	32.8	17.	eP	Z	21 28 17
	P: D				iS?	E	45
	23.4 S., 179.9 W.			17.	P	Z	21 31 17
	South of Fiji Is.				S	E	45
	h: 549 km ca.			17.	iP	NZ	21 46 54.5
	H= 11 03 06.8 USCGS				i	E	55.0
17.	eP	Z	11 15 24		S	NE	47 22
17.	P	EZ	14 41 49.6		P: N, C		
	i	E	42 15	17.	P	Z	21 49 00
	i	Z	18		S	NE	28
17.	eP	Z	14 45 33		P: N, C		
	e	E	51 58	17.	eP	Z	21 55 26
	e	E	55 22	17.	eP	Z	21 57 29
	eLr	Z	57 34		i	E	33
	Mag. 5½ (Mat.)				S?	NE	58
	3.5 S., 150.1 E.			17.	P	EZ	22 09 09
	New Ireland region.				i	Z	33
	h: 33 km ca.				i	E	35
	H= 14 37 53 USCGS			17.	iP	NEZ	22 17 28.3
17.	iP Z, P E		15 08 39.1		S	NE	50
	P: D			17.	iP Z, P NE		17 48 08.8
17.	P	Z	15 33 45		e	E	57 16
17.	iP Z, P NE		17 48 08.8		P: S, W, D		
	e	E	57 16		0.1 S., 122.9 E.		
	P: S, W, D				Northern Celebes.		
	0.1 S., 122.9 E.				h: 160 km ca.		
	Northern Celebes.				H= 17 40 57.4 USCGS		
	h: 160 km ca.			17.	iP	Z	22 57 50.4
	H= 17 40 57.4 USCGS				i	E	54
17.	iP	Z	17 53 51.0		S	E	58 18
	P: C				P: D		
17.	P	Z	19 05 26	18.	eP	Z	00 24 52
	S	E	09 40		e	Z	25 08
	(cont.)				e	N	26



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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
18.	P i S	Z E E	01 18 24 27 51				
							New Britain region. h: 49 km ca. H= 14 34 54.5 USCGS
18.	P	Z	03 33 44	18.	P	Z	14 48 27
			9.6 S., 116.8 E. Sumbawa I. region. h: 82 km ca. H= 03 24 53.9 USCGS	18.	iP S	Z E	16 44 14.0 40
							P: D
18.	P	Z	04 07 27	18.	e eL	E E	17 19.0 21.4
18.	eP i S	Z E E	04 54 25 27.3 51	18.	P Z, eP i	N EZ	21 15 25 53
18.	iPKP2 P: D	Z	05 22 13.2	18.	P	Z	21 33 11
			31.2 S., 67.6 W. San Juan Province, Argentina. h: 8 km ca. H= 05 01 41.4 USCGS	18.	iP Z, P i eS eL	E N N E	22 32 28.0 23.5 41 51 55 20
							P: W, C Mag. 6 (Mat.) 20.2 S., 174.1 W. Tonga Is. h: 33 km ca. H= 22 21 01.9 USCGS
18.	iP eS P: D	Z E	05 23 30.8 57	18.	P e	Z E	23 46 28 31.3
18.	e e	E E	06 25.4 31.3	18.	P Z, eP i eS?	E E N	11 51 46 52 01 12
18.	P Z, eP i eS?	E E N	11 51 46 52 01 12	18.	P e e	Z E E	13 28 57 34.8 37.6
							51.7 N., 174.2 W. Andreanof Is., Aleutian Is. h: 12 km ca. H= 13 21 47.2 USCGS
18.	P e e	Z E E	13 28 57 34.8 37.6	18.	eP S i	Z NZ E	23 48 47 48 15 16
18.	P Z, eP i eS?	E E N	11 51 46 52 01 12	19.	iP Z, P P: C	N N	00 14 51.7
18.	P e e	Z E E	13 28 57 34.8 37.6	19.	eP	Z	00 56 05
18.	iP N, P i i i P: S	Z E N Z	14 07 14.0 36 37 38	19.	eP	Z	04 58 24
18.	iP e e S i eSS eLr eLr P: N, W, C Mag. 6½-6¾ (Mat.) 6.0 S., 148.2 E.	NEZ N E E N E Z E	14 42 54.1 49 15 18 47 49 52 50 56 12 16	19.	eP i S	EZ E NE	07 01 48 58 02 11
				19.	iPNZ, P i eS e	E E E	14 12 44.5 56.0 N., 161.3 E. Near east coast of Kamchatka. h: 33 km ca. H= 14 07 21.5 USCGS
				19.	P Z, eP eS e	N E E	15 53 11.5 59 35 16 02 36

(cont.) -15-

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	eL	E	16 04 26				
	eLr	Z	05 13				
	P: C						
	Mag. 5½ (Mat.)						
	3.4 S., 150.1 E.						
	New Ireland region.						
	h: 33 km ca.						
	H= 15 45 31.2						USCGS
19.	P	Z	16 24 34	20.	eP	Z	01 31 44
	10.8 S., 166.3 E.				6.2 S., 150.4 E.		
	Santa Cruz Is.				New Britain region.		
	h: 166 km ca.				h: 61 km ca.		
	H= 16 15 26.2				H= 01 23 40.6		
							USCGS
19.	iP	Z	17 29 29.2	20.	eP?	Z	02 33 57
	i	N	29.7				
	i	Z	45	20.	eP	Z	03 03 58
	P: D				6.2 S., 150.5 E.		
					New Britain region.		
					h: 44 km ca.		
					H= 03 01 52.3		
							USCGS
19.	iP	Z	19 21 17.2	20.	P	Z	04 53 57
	i	N	49		59.6 N., 148.2 W.		
	P: C				Kenai Peninsula, Alaska.		
					h: 33 km ca.		
					H= 04 50 55.3		
							USCGS
19.	P	Z	21 17 35	20.	eP	Z	05 43 04
	i	Z	46		i	E	28
19.	P	Z	22 01 13	20.	iP	Z	05 53 30.1
	e	Z	48		S	NE	56
	i	N	02 03		i	N	57
19.	P	Z	22 42 24	20.	eL	E	06 52.6
	i	E	26.6				
	i	E	42	20.	iP	Z	07 23 46.2
	S	E	52		iS	E	24 08.5
					P: D		
19.	iP	Z	23 21 16.3	20.	eL	E	10 53 20
	i	E	16.7		eL	E	11 02 03
	P: D				0.2 S., 18.2 W.		
					Central Mid-Atlantic Ridge.		
					h: 33 km ca.		
					H= 09 50 13.5		
							USCGS
19.	P	NEZ	23 43 14	20.	P	Z	13 03 13
	S	Z	50 04		i	E	31
	L	E	53 38		S?	NE	43
	Lr	Z	56 21	20.	eP	Z	13 26 33
	P: N, W, C						
	Mag. 7½ (Mat.)						
	6.0 S., 150.8 E.						
	New Britain region.						
	h: 3 km ca.						
	H= 23 35 06.0						USCGS
19.	P	Z	23 48 53	20.	P	NZ	16 26 20
19.	iP	Z	23 58 15.7		i	E	21
	i	E	16.7		i	NE	29
	S	E	45	20.	eP	Z	16 23 34
	P: C				8.9 S., 123.6 E.		
					Flores I. region.		
					h: 33 km ca.		
					H= 16 20 04		
							USCGS
20.	eP	Z	00 03 19				
	i	Z	08 54				

(cont.)

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
20.	P S?	NZ E	16 34 26 55		sP e S e G	Z N NE E E	02 24 51 28 47 29 07 09 32 00
20.	iP S	NEZ E	16 35 01 15		P: N, E, C		
			Mag. 5.0 (Mat.) 36.2 N., 139.2 E. Honshu, Japan. h: 50 km ca. JMA		1.0 N., 124.0 E. Northern Celebes. h: 248 km ca. H= 02 16 44.5 USCGS		
20.	iP S	NEZ E	16 40 55.0 41 23	21.	iP P: C	Z	02 29 16.0
			P: N, E, D				
20.	iP Z, P N e S	E E	17 51 18.0 52 04 16	21.	iP S	Z NE E	03 11 31.0 31.5 53
			P: D				P: D
20.	iP P: S, E, D	NZ E	19 13 05.7	21.	P i S	NZ E E	03 25 33 35 54
			6.9 S., 129.7 E. Banda Sea. h: 126 km ca. H= 19 05 09.7 USCGS				
20.	iP eL P: S, D	NZ E	19 28 45.7 38.8	21.	P i eL eL eL	Z E E E N	04 10 04 05 21 27 28 50 52
			4.9 S., 145.4 E. Near north coast of New Guinea. h: 152 km ca. H= 19 21 10.0 USCGS				Mag. 5½-5½ (Mat.) 1.9 N., 96.8 E. Off west coast of northern Sumatra. h: 33 km ca. H= 04 01 02.0 USCGS
20.	iP i S L P: D	Z NE E E	23 35 56.3 57.0 38 16 40 07	21.	P pP	NEZ Z	06 29 00 22
			Mag. 6 (Mat.) 44.0 N., 150.0 E. Kurile Is. h: 50 km ca. JMA				14.9 S., 167.2 E. New Hebrides Is. h: 97 km ca. H= 06 19 16.0 USCGS
20.	iP eS P: D	Z E	23 54 23.2 56 38	21.	iP i S	NEZ Z NE	07 59 06.3 27 39
			44.6 N., 149.5 E. Kurile Is. h: 33 km ca. H= 23 51 35.4 USCGS				P: N, E, D 38.1 N., 140.8 E. Honshu, Japan. h: 75 km ca. JMA
21.	P i P: E, D	EZ N	01 52 38.0 39	21.	iP S i	NEZ EZ E	12 41 26.6 49 42 00
							P: S, E, C
21.	iP pP	NEZ Z	02 23 37.5 24 24 (cont.)	21.	eP e e	Z N E	12 43 41 45 55 46 31 (cont.)



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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
	i	E	09 32 55		i	E	18 24 27
	eL	E	42 32		S?	NE	51
	3.4 S., 130.7 E. Ceram. h: 33 km ca. H= 09 25 15.8 USCGS			23.	iP	NEZ	18 33 38.6
					S	NZ	48
	P: N, C				P: N, E, C		
22.	iP	E	15 48 41.0	23.	iP	NEZ	18 56 07.7
	i	E	46		S	Z	38
	S	EZ	49 04		P: N, E, C		
	i	EZ	14		36.4 N., 141.0 E. Near east coast of Honshu, Japan. h: 40 km ca. JMA		
	P: E				P: N, D		
22.	iP	E	19 08 29.0	23.	iP	NZ	19 05 47.5
	iS	E	31.4		i	Z	06 09.5
	P: E				S	NEZ	15
22.	eP	E	19 53 03		P: N, D		
	S	E	25	23.	iP	Z	19 11 10.0
22.	eP	E	20 52 21		i	E	12
	eS?	E	58		P: D		
22.	iP	E	21 48 02.5		19.1 N., 145.0 E. Mariana Is. h: 220 km ca. H= 19 07 10 USCGS		
	S?	E	49 19	23.	P	NZ	19 48 25
	P: E				S	E	53
	30.8 N., 140.7 E. South of Honshu, Japan. h: 82 km ca. H= 21 46 32.0 USCGS			23.	iP Z, P N		22 23 05.5
22.	iP	E	21 53 33.0		i	E	06
	i	E	56		i	Z	15
	i	E	54 55		P: C		
	P: E				0.1 S., 124.5 E. Molucca Sea. h: 66 km ca. H= 22 15 47.0 USCGS		
	33.9 N., 132.9 E. Honshu, Japan. h: 10 km ca. JMA			23.	P	EZ	23 09 43
23.	iP	EZ	02 46 59.5		i	N	44
	i	N	47 00		i	N	10 03
	S	E	12	23.	P	Z	00 07 34
	i	E	13		P: C		
	P: E, D			24.	P	Z	01 46 57
23.	P	Z	04 26 22.5		6.3 S., 150.7 E. New Britain region. h: 33 km ca. H= 01 38 49.6 USCGS		
	P: C			24.	P	Z	02 36 19
	8.1 S., 108.4 E. Java. h: 33 km ca. H= 04 17 13 USCGS				25.0 N., 125.0 E. Southwestern Ryukyu Is. h: 33 km ca. H= 02 32 28 USCGS		
23.	P	Z	04 49 00	24.	P	Z	02 36 19
	45.4 N., 150.8 E. Kurile Is. h: 45 km ca. H= 04 45 58 USCGS				P: C		
23.	iP	NZ	18 24 23.6		P: C		
	(cont.)				P: C		

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
24.	P S	NZ NE	06 20 33 21 00	25.	eP S?	NZ E	08 12 23 55
24.	P	Z	06 45 19 20.2 S., 179.2 W. Fiji Is. region. h: 660 km ca. H= 06 35 14.5	25.	P i	Z E	08 40 02 02.5 26.6 N., 96.3 E. Burma. h: 80 km ca. H= 08 32 59.0
24.	iP	NEZ	09 23 20.0 P: S <sub>0</sub> W, C 51.9 N., 157.5 E. Near east coast of Kamchatka. h: 87 km ca. H= 09 18 46	25.	iP	NEZ	08 42 04 16.1 S., 175.1 W. Tonga Is. h: 302 km ca. H= 08 31 32.9
24.	eP i	Z NE	10 33 05 38	25.	iP i S	Z NE NE	08 49 08.7 09 50
24.	iP Z, P E pP eS e	Z E E	10 50 30.0 55 57 46 11 03 00	25.	iP PcP ScP S ScS e	NEZ Z Z NE NE E	09 31 20.2 33 04 35 49 37 02 40 12 42 37
			6.8 S., 107.4 E. Java. h: 125 km ca. H= 10 41 33.5				P: N, E, C 4.3 S., 122.2 E. Celebes. h: 610 km ca. H= 09 24 08.9
24.	P i eS e e eL Lr eScS	Z NE E N E Z Z E	12 46 28 35 50 48 51 08 10 13 52 10 53 42 57 24	25.	P	Z	11 54 56 38.3 N., 71.0 E. Afghanistan-USSR border region. h: 85 km ca. H= 11 45 54.1
			Mag. 6 $\frac{1}{2}$ -7 (Mat.) 13.1 N., 124.7 E. Luzon, P.I. h: 5 km ca. H= 12 40 51.4	25.	P i	Z N	12 11 03 48
24.	eP	Z	12 49 55	25.	P eL?	NZ E	12 50 37 58 24 55.1 N., 162.6 E. Near east coast of Kamchatka. h: 79 km ca. H= 12 45 20
24.	eP	Z	12 56 04 13.2 N., 124.9 E. Luzon, P. I. h: 97 km ca. H= 12 50 40.2	25.	eP	Z	13 11 39 9.5 S., 153.8 E. Solomon Is. h: 38 km ca. H= 13 02 41.7
24.	P	Z	12 59 33	25.	iP i i	Z Z NE	14 42 13.3 27 24 02
25.	P iS	NEZ E	03 26 38.5 27 03.5				

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
25.	iP S P: S, C	NZ NE	19 12 59.5 13 22	26.	eP? e eL	Z E NE	14 24 08 28 26 30 47
25.	iP P: C	Z	19 42 32.1				24.9 N., 122.0 E. Taiwan region. h: 33 km ca. H= 14 19 47.6 USCGS
25.	P S	Z NE	22 33 25 32	26.	P i	NZ NE	16 28 13 24
26.	eP S i	Z E E	00 20 19 46 47.6	26.	P i	Z E	16 45 39 43
							53.7 N., 152.0 W. Kodiak I. region. h: 33 km ca. H= 16 36 50.6 USCGS
26.	iP i i S P: C	Z N E NE	01 30 21.6 22.0 22.6 54	26.	P i i	Z E E	17 03 42 43 04 23
26.	eL	E	03 41 38	26.	eP? eL	Z E	19 29 33 35 48
26.	eP S i	Z E Z	04 37 04 28 31	26.	P i	EZ NE	23 04 45 53
26.	eP	Z	07 07 12	27.	iP i i P: D	Z NE E	03 19 09.8 10.5 15
			28.0 S., 177.0 W. Kermadec Is. h: 33 km ca. H= 06 55 25 USCGS				
26.	P eS e e L L L L	EZ N E E E Z N E	10 25 18 28 48 50 29 09 24 30 34 40 31 00 42	27.	iP EZ, P N i eS e eL eL P: E, D	Z Z E N E Z	05 39 04.2 16.3 41 26 40 42 54 43 14
			Mag. 6 $\frac{1}{2}$ -6 $\frac{1}{2}$ (Mat.) 24.9 N., 122.0 E. Taiwan region. h: 33 km ca. H= 10 21 07.2 USCGS				45.2 N., 150.9 E. Kurile Is. h: 33 km ca. H= 05 36 01.5 USCGS
26.	iP S P: N, D	NZ NE	11 30 20.7 25	27.	iP S P: S, W, D	NEZ NEZ	10 27 00.7 11.0
26.	iP S P: N, W	NEZ N	12 57 43.1 46	27.	iP Z, P N i S i i P: S, C	Z E E NE NE	10 44 40.7 41.1 45 04 04.3 13

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
27.	eP pP	Z Z	11 12 43 13 35	27.	iP S P: C	Z E	14 32 46.7 33 05
	36.3 N., 70.7 E. Hindu Kush region. h: 219 km ca. H= 11 03 48.0 USCGS			27.	iP S P: C	Z E	14 35 49.8 36 08
27.	iP S	NEZ E	13 48 05.0 22.5	27.	P S	EZ E	14 42 12 31
	P: N, E, D Mag. 5.9 ca. (Mat.) 37.8 N., 133.4 E. Near west coast of Honshu, Japan. h: 40 km ca. JMA			27.	P S	Z E	14 46 11 28
27.	P eS	NEZ E	13 55 31 48	27.	iP S P: C	Z E	15 47 34.7 52
27.	P S	NEZ E	13 56 44 57 02	27.	P i S	Z NEZ NEZ	15 52 37 37.7 54
27.	P S	Z E	13 57 51 58 07	27.	iP S P: S, C	NZ E	16 18 44.5 19 02
27.	eP S	Z E	13 58 37 54	27.	iP S P: D	Z E	17 05 38.9 56
27.	iP S P: N, D	NZ E	13 59 33.8 50	27.	iP iS P: S, C	NZ E	17 20 43.5 21 01
27.	iP iS P: C	Z E	14 06 00.2 17.3	27.	P iS	Z NE	17 28 26 43.4
27.	P S	Z E	14 08 29 46.4	27.	iP S P: N, E, D	NEZ NE	17 33 29.3 47
27.	iP S P: D	Z E	14 10 33.3 50	27.	iPKP1 Z, PKP1E PKP2 E P: C		19 02 50.3 03 08
27.	iP S P: C	Z E	14 13 11.1 29		29.7 N., 42.0 W. North Atlantic Ridge. h: 33 km ca. H= 18 44 27.1 USCGS		
27.	iP S P: D	Z E	14 24 42.3 25 00	27.	iP i P: N, E, C	NEZ E	19 22 08.4 19
27.	iP S P: D	Z E	14 26 12.3 29	27.	iP S P: E	EZ NEZ	19 37 16.5 23
27.	iP iS P: D	Z E	14 31 42.2 59.2	27.	P S	Z E	22 11 50 12 08



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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
28.	eP S	Z E	02 23 34 51	28.	P e	Z N	18 13 16.6 14 19
28.	iP S	NZ NE	05 37 25.0 42	28.	P S	Z E	18 15 26 43.5
		P: N, D		28.	iP S	NZ NE	19 59 35.0 59
28.	eP S	Z E	05 48 25 42	28.	iP S	NZ NE	20 13 43.4 14 27
						P: S, C	
28.	eP i	Z NE	06 42 54 55.5	28.	iP S	NZ NE	20 13 43.4 14 27
						P: N, D	
28.	iP i S	Z NE E	07 30 02.0 02.5 13	28.	P	Z	22 17 23.5
28.	iP i eS P: D	Z N E	11 08 30.1 31.0 09 06	28.	eP S	Z E	23 14 16 20.8
28.	P S	NZ NE	12 24 56 25 24	29.	P i eS	Z N E	04 14 58 15 06 10
				29.	iP	Z	06 30 02.5
28.	iP i S i	NEZ Z Z N	12 51 43.6 57 52 20 23		P: C		
						19.4 S., 169.2 E. New Hebrides Is. h: 324 km ca. H= 06 20 10	USCGS
				29.	P S	Z E	09 56 40.5 56
						P: D	
28.	iP S i P: D	NZ E NE	14 42 03.3 20 21	29.	iP i S	EZ N NE	12 10 07.2 07.5 17.5
						P: E, D	
28.	iPKP i i epPKP P: N, D	NZ E E Z	16 59 48.0 50 54 17 02 10	29.	P S	NEZ NZ	13 10 05 52
				29.	iP S i	NEZ NEZ E	13 30 13.0 35.0 45.5
						P: N, W, C	
				29.	P i S	Z NEZ NE	15 30 42.5 44.5 31 09.5
28.	PKP e e esSS P: C	Z E E E	17 07 43.4 11 50 20 47 24 28	29.	P	Z	16 00 12
						5.5 S., 146.2 E. East New Guinea region. h: 48 km ca. H= 15 52 18.4	USCGS
				29.	ePKP	Z	17 14 49
						55.5 S., 26.0 W.	(cont.)

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
				30.	P	Z	12 36 28
					i	EZ	31.5
					i	Z	36
					i	EZ	50
29.	eP	Z	18 25 02		S	N	43 36
	i	NZ	03.6		i	N	43
	S	NE	23		i	EZ	53
					SS	N	47 20
29.	iP	NZ	19 10 01.3		Lq	N	49 35
	S	NE	19		L	N	52 15
					L	Z	54 05
					L	E	07
							Mag. $7\frac{1}{2}$ - $7\frac{3}{4}$ (Mat.)
							6.8 N., 94.8 E.
							Nicobar Is. region.
							h: 33 km ca.
							H= 12 27 38.6 USCGS
				30.	eP	Z	16 18 00
							23.8 S., 179.3 E.
							South of Fiji Is.
							h: 481 km ca.
							H= 16 07 30 USCGS
29.	iP	Z	22 58 19.7				
29.	iP	Z	23 00 21.6	30.	P	Z	19 03 40
	i	E	24				24.0 S., 179.9 E.
	S	NE	49				South of Fiji Is.
							h: 550 km ca.
							H= 18 53 11.4 USCGS
29.	P	Z	23 03 33				
	S	E	59	30.	eP	Z	22 48 24
	i	N	04 00				53.7 N., 167.7 W.
							Fox Is., Aleutian Is.
							h: 69 km ca.
							H= 22 47 46.0 USCGS
30.	P	Z	01 21 37				
	S	E	54				
30.	eP	Z	01 33 40				
	S	E	52				
	i	E	57				
30.	e	E	06 37 06				
							13.8 N., 120.7 E.
							Mindoro, P. I.
							h: 203 km ca.
							H= 06 25 15.7 USCGS
30.	eP	Z	10 17 08				
	eL	E	24 22				
	eL	E	28 36				
							4.7 N., 126.8 E.
							Talau Is.
							h: 52 km ca.
							H= 10 10 06.1 USCGS
30.	P	Z	10 34 54.5				
	S	NE	35 18				
30.	eL	E	10 50 50				

Mineo Takehana  
Director

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
1.	P eS P: D	Z N	00 17 35.0 18 17	2.	iP Z, P N i P: D	E	13 18 21.4 22
1.	iP i i P: C	Z E E	03 32 00.6 01.2 48	2.	iP Z, P NE ePP eLq eLr P: S, W, C	Z E E	13 26 20.0 28 14 36 10 38 51
1.	iP i i e eG P: D	Z E NZ E E	05 04 13.9 14.2 15.1 14 02 22 12				53.8 N., 165.4 W. Fox Is., Aleutian Is. h: 35 km ca. H= 13 18 29.0 USCGS
			18.9 S., 175.8 W. Tonga Is. h: 232 km ca. H= 04 53 23.9 USCGS	2.	iP i e P: C	Z E NZ	17 26 58.5 59.5 28 30
1.	P S P: N, C	Z E NE	11 59 00	2.	iP i	NZ E	23 42 54 54.5
			30.9 S., 177.9 W. Kermadec Is. region. h: 33 km ca. H= 11 47 02.4 USCGS	3.	iP iS i	EZ E N	00 43 09.3 19.4 20.0
1.	iP i S P: N, C	NZ E NE	12 19 16.1 16.5 20 03	3.	iP i i S eSS eLq Lr Lr P: D	Z E N E E E Z	04 02 30.5 37.0 40.0 12 56 18 35 26 38 30 51 32 04
1.	P S	NZ N	15 13 17 55				Mag. 6 $\frac{1}{4}$ -6 $\frac{1}{2}$ (Mat.) 15.0 S., 66.8 E. Mid-Indian Rise. h: 46 km ca. H= 03 50 01.2 USCGS
1.	iP NZ, P i eS P: S, E, D	E E E	15 39 23.0 25 40 26	1.	eP iS	Z E	19 50 34 56.7
1.	eP iS	Z E	19 50 34 56.7	1.	P P: C	Z	20 19 04.5
1.	e	E	23 23 03	1.	e	E	23 23 03
2.	P i S	NEZ E Z	00 50 35 48 51 03	3.	iP NZ, P S i P: S, W, C	E E NE	04 12 16.0 39 41
2.	iP Z, P i S P: C	E N N	05 25 14.0 19 45	3.	iP i iS P: C	Z N N E	09 23 53.2 53.7 24 10.6 11.3
2.	P S P: C	Z N	10 17 23	3.	iP i iS P: C	Z E E	09 38 21.5 23.3 36.1
			9.1 S., 158.0 E. Solomon Is. h: 42 km ca. H= 10 08 39.6 USCGS	3.	iP P: C	Z	09 52 24.7

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s	
3.	P P: C	Z	19 48 06.3	5.	iP P: D	Z	09 33 53.5	
4.	eL	Z	02 45 10	5.	P	Z	10 42 52	
4.	iP S P: D	Z NE	04 05 55.7 06 10				17.8 S., 167.8 E. New Hebrides Is. h: 33 km ca. H= 10 32 39.2 USCGS	
4.	P iS N, S E	NZ	10 20 00.3 22.2	5.	iP iS i	NZ NZ E	17 46 26.3 53.1 53.5	
4.	P i S i eLq eLr Lr eLr P: N	N Z N E E N E Z	15 56 50 51 16 03 23 27 06 25 09 00 26 16 09 43	5.	iP Z, P E P: C		18 25 13.0	
			Mag. 6-6½ (Mat.) 6.4 S., 150.7 E. New Britain region. h: 19 km ca. H= 15 48 43.4 USCGS	5.	iP i e e	Z N Z NZ	19 59 14.8 15.1 27 31	
					P: C		59.4 N., 144.8 W. Gulf of Alaska. h: 33 km ca. H= 19 50 01.6 USCGS	
4.	eP iPcP eL L L	Z Z E N E	21 19 32 21 21.7 29.2 32 32 57	5.	P	Z	21 27 09	
			Mag. 5-5½ (Mat.) 5.5 S., 151.2 E. New Britain region. h: 101 km ca. H= 21 11 40 USCGS	5.	iP i S S	NZ E NE E	22 36 54.6 54.9 41 07	
					P: N, D		54.0 N., 161.5 E. Near east coast of Kamchatka. h: 38 km ca. H= 22 31 44.3 USCGS	
5.	iP EZ, P N P: N, E		02 59 47.4	5.	iP i S L	NZ E NE E	23 56 48.7 49.6 00 01 03 03 43	
5.	e	Z	05 58 45		P: S, C		53.9 N., 161.5 E. Off east coast of Kamchatka. h: 38 km ca. H= 23 51 38.8 USCGS	
5.	iP NZ, P E iS i P: S, D		06 20 58.0 21 07.3 07.8	5.	iP iS Z, S NE P: C	NZ	08 10 54.4 11 14.0	
5.	eP e e eS	Z Z Z E	08 33 59 34 05 20 38 02	6.	iP i S L	NZ E N E	00 01 08.9 10.0 05 30 07 34	
			15.9 N., 147.1 E. Mariana Is. region. h: 42 km ca. H= 08 29 06.6 USCGS		P: S, C		Mag. 5½-5½ (Mat.) 54.0 N., 161.5 E. Near east coast of Kamchatka. h: 39 km ca. H= 23 55 59.2 USCGS	
				-26-	6.	eP?	Z	03 35 48

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)			
			h	m	s				h	m	s	
6.	iP	NEZ	04	17	29.1	6.	P	NZ	09	05	15.8	
	iS	E			57.1		i	E			16.5	
	i	N			58.1		S	E			43.5	
			P: N, W, C						P: S, D			
6.	iP	NZ	04	20	57.1	6.	iP	NZ	12	09	04.8	
	i	E			58.1		i	E			06.0	
	S	E			21 25		iS	E			32.7	
			P: N, C						P: N, C			
6.	P	Z	04	34	37	6.	iP	NEZ	12	41	35.7	
	S	E			40 30		iS	E			52.5	
	L	E			43 26		P: N, E					
	L	N			39							
			Mag. 5 $\frac{3}{4}$ -6 (Mat.)						6.			
			2.3 S., 138.3 E.						iP			
			West New Guinea.						iS			
			h: 33 km ca.						E			
			H= 04 27 16						P: N, C			
			USCGS						6.			
6.	iP	Z	04	37	10.3	6.	iP	NZ	19	37	10.0	
	i	E			11.5		i	E			10.4	
			P: C						eS			
									E			
									P: S			
6.	P	NZ	04	38	26	6.	P	Z	22	53	35.5	
							S	NE			51	
6.	iP	EZ	04	39	35.6	7.	P	Z	00	28	18	
	iS	EZ			43.8		S	NE			29 09	
	P: E											
6.	iP	N	04	56	43.3	7.	iP	Z	01	39	19.0	
	i	Z			43.6		i	E			19.8	
	iS	NE			57 11.4		S	EZ			42	
	P: N						P: C					
6.	eP	Z	05	08	24	7.	P	NZ	01	53	04	
	17.9 N., 143.5 E.						i	E			04.4	
	Mariana Is. region.						S	NE			26	
			h: 13 km ca.						7.			
			H= 05 03 57.5						P			
			USCGS						EZ			
6.	iP	Z	07	00	49.4	7.	iP	Z	07	36	16.5	
	S	EZ			01 17		i	E			17.0	
	i	N			18		i	Z			22.0	
									S			
									NEZ			
									Z			
									40			
									42.8			
									54			
									55.5			
6.	iP	Z	07	56	21.8	7.	iP	Z	09	06	41.5	
	i	E			23		i	NE			42.0	
	i	Z			57 20		PP	Z			08 28	
	i	EZ			24		PP	NE			30	
P: C						S			N			
						Lq			E			
						Lq			N			
						Lr			E			
						Lr			Z			
						Lr			N			
						P: C						
6.	iP	Z	08	28	38.5	6.	e	E	08	57	00	
	S	NE			29 07							
P: C												

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
Mag. 6-6½ (Mat.) 5.4 S., 151.3 E. New Britain region. h: 54 km ca. H= 08 58 43.8 USC GS				7.	iP NZ, eP E iS NE P: S, D		22 10 27.8 45.8
7.	iP i i	NEZ Z Z	11 16 08.6 22 34	8.	P L	EZ E	04 39 04 41 03
7.	iP P: N, E, D	NEZ	11 22 00.5	8.	iP iS E S N i N P: S, E, D	NEZ	17 50 19.0 50 52.0
42.8 N., 143.2 E. South of Hokkaido, Japan. h: 115 km ca. JMA				8.	iP iS E S N i N P: S, E, D	NEZ	17 50 19.0 50 52.0
Mag. 6 (Mat.) 34.7 N., 139.2 E. Near south coast of Honshu, Japan. h: 31 km ca. H= 17 49 46.3 USC GS				7.	iP i i i	EZ N E N	15 20 22.6 23.0 41 54
P: W, C				8.	P P: D	Z	18 03 18
7.	iP i i pP S SS N eSS E G G	Z N E Z NE E E N	15 51 00.8 02.0 02.2 15 51 51 57 03 16 00 13 01 15 29	8.	iP S	NEZ E	18 03 40 04 11
P: C 5.1 S., 145.9 E. East New Guinea region. h: 219 km ca. H= 15 43 29.7 USC GS				8.	eP eS	Z NE	18 05 59 07 28
7.	iP i	NZ E	18 34 55.0 55.5	8.	iP S	Z E	18 13 36 14 04
P: S, C 51.7 N., 158.0 E. Near east coast of Kamchatka. h: 50 km ca. H= 18 30 17 USC GS				8.	iP S	Z E	18 16 51.0 17 19
7.	eL eL	N N	19 54 31 20 08 48	8.	iP iS P: C	Z E	18 18 35.0 19 03
6.7 N., 82.2 W. South of Panama. h: 30 km ca. H= 18 52 47.6 USC GS				8.	P iS	Z E	18 24 09 37
7.	P	Z	20 07 29.5	8.	iP iS P: D	Z E	18 29 44.2 30 13
7.	iPKP1 iPKP2 P: C	Z Z	21 01 19.0 48.4	8.	iP iS P: C	Z E	18 33 04.0 34 31.5
18.9 S., 69.6 W. Northern Chile. h: 127 km ca. H= 20 41 42.0 USC GS				8.	iS	Z	18 34 43.0
7.	iPKP1 iPKP2 P: C	Z Z	21 01 19.0 48.4	8.	P S	Z E	18 35 03 31
18.9 S., 69.6 W. Northern Chile. h: 127 km ca. H= 20 41 42.0 USC GS				8.	iP iS P: C	Z E	18 35 53.8 36 21.5

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
8.	iP S P: C	Z E	18 37 39.5 38 07	3.	iP iS P: C	Z E	20 20 19.9 47.8
8.	iP S P: C	Z E	18 39 01.0 29	8.	iP S P: D	Z EZ	20 55 21.3 49
3.	iP iS i P: D	Z NEZ EZ N	18 59 14.5 15.0 44 46	3.	iP S P: D	Z EZ	20 55 21.3 49
8.	P	Z	19 06 07	8.	P S P: D	Z EZ	21 02 07.9 35
3.	S	Z	19 06 45	8.	iP iS P: S, D	NZ E Z	21 04 18.6 19 47.6
3.	iP iS iS P: S, D	NZ E EZ	19 08 22.6 23.1 51	3.	eP S	Z Z	21 06 16 45
3.	iP S P: D	Z Z	19 17 04.9 33	3.	P S	Z Z	21 08 37 09 04
8.	P S	Z E	19 21 32 59	8.	iP S P: C	Z EZ	21 09 56.8 10 25
8.	iP S	Z E	19 22 57 23 25	8.	P S	Z EZ	22 08 09 37
8.	iP iS P: C	Z E	19 26 23.7 51.7	8.	iP iS P: C	Z E	23 52 44.5 53 12
8.	iP iS P: D	Z E	19 33 33.1 34 00.9	9.	iP NZ, P iS P: C	E E	01 30 14.1 41.9
3.	P S	Z E	19 39 18 45	9.	iP iS P: D	Z E	01 43 05.0 32.8
8.	iP S	Z EZ	19 44 04.6 32	9.	P S P: C	Z E	02 27 20 48
8.	iP S P: D	Z EZ	19 45 25.4 46 17	9.	iP iS	Z E	02 49 15.6 44.8
8.	iP iS P: D	Z E	19 50 58.4 51 26.6	9.	iP S P: C	Z E	03 31 30.8 32 00
3.	iP S	Z E	20 05 50.8 06 20	9.	eP S	E E	05 50 51 51 19

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
9.	P eS	Z E	06 16 55 17 24				41.1 N., 21.0 E. Albania-Yugoslavia border region. h: 30 km ca. H= 18 28 38.2 USCGS
9.	eS	Z	06 18 12				
9.	iP iS P: N, C	NZ E	06 38 27.6 55.6	9.	iP P: C	Z	19 18 46.4
9.	iP i e i eS L eL P: C	Z NE E Z E E N	06 44 28.1 28.6 36 37 46 06 47 47 06	9.	iP eS P: D	Z E	19 24 32.0 25 00
				9.	P eS	Z E	20 40 37 41 07
				9.	eP S	Z E	21 00 34 01 00
9.	iP iS P: C	Z E	08 10 09.5 37.2	10.	iP EZ, P i i P: W	N Z N	04 28 31.5 32.0 29 18.5
9.	iP NZ, P i iS P: S	E E NE	11 43 16.9 23.2 48	10.	P S	Z E	05 23 29 58
9.	eL	E	12 20 34	10.	iP i i S i i P: C	Z N E NE Z NEZ	09 13 56.7 57.1 57.7 14 19 21 34
9.	iPKP1 iPKP2 pPKP2 pPPP SS SSS P: D	Z NEZ NZ N N N	13 54 35.5 55 18.8 57 29 14 04 49 18 23 24 45	10.	iP i i i i i i P: N, D	NZ E E Z E Z N	10 43 15.8 16.1 26 27.0 38.9 40.6 51 52
							27.5 S., 63.2 W. Santiago del Estero Province, Argentina. h: 586 km ca. H= 13 35 42.4 USCGS
9.	P S	Z E	15 36 01 28	9.	PKP1 i PKP2	Z Z Z	17 03 49 58 04 20
							20.4 S., 63.0 W. Southern Bolivia. h: 83 km ca. H= 16 44 02.2 USCGS
9.	iP P: C	Z	18 41 06.1	10.	P	Z	12 03 55
							19.5 N., 155.3 W. Hawaii region. h: 10 km ca. H= 11 53 45.2 USCGS

(cont.) -30-



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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
10.	iP S P: S, W, C Mag. 6-6½ (Mat.) 40.4 N., 138.9 E. Eastern Sea of Japan. h: 33 km ca. H= 15 11 05.5	NEZ NE	15 12 03.8 50	10.	P N, eP Z i iS	8.4 S., 127.1 E. Timor. h: 33 km ca. H= 20 25 40	22 00 58 01 02 21.4
10.	iP S P: N, D	NZ E	15 40 33.6 41 16	10.	iP i i S iL	NZ E E N Z E	23 31 47.7 48.0 32 23 33 40 45
10.	iP i S i P: D	Z NEZ Z E	17 04 38.3 38.6 55 56	10.	iP i iS P: S, C Mag. 5.4 (Mat.) 40.2 N., 139.0 E. Eastern Sea of Japan. h: 39 km ca. H= 23 30 51.4	NZ E NE	23 31 47.7 48.0 32 23 33 40 45
10.	iP i iS P: N, C	NZ E NE	17 09 23.6 24.1 10 08.1	11.	iP NZ, P E e eS e P: S, C	E E N E	03 16 56.5 17 31 55 57 18 04
10.	P i S	NEZ Z NE	17 13 15 15.9 32	11.	P e	EZ N	07 26 25 54
10.	P iS	NZ NEZ	17 37 29.6 57.1	11.	P i	Z NZ	13 56 25.0 33.5
10.	iP i i iS P: C	Z N E E	17 43 17.1 17.5 17.7 59.2	11.	iP i e i P: E, D	EZ N N E	15 34 42.8 43.8 35 15 23
10.	iP i iS P: C	Z N NE	17 48 54.2 55.1 49 14.8	11.	iP S S P: N, W, D Mag. 5.8 (Mat.) 38.9 N., 130.0 E. Sea of Japan. h: 550 km ca. H= 16 04 58.2	NEZ N EZ	16 06 43.8 08 09 10
10.	iP Z, P E S P: D	NE NE	18 25 34.9 26 03	10.	P iS	Z NE	18 58 45 59 19.5
10.	iP e eS e P: S, W 44.7 N., 149.2 E. Kurile Is. h: 22 km ca. H= 19 43 27	NE E E N	19 46 14.1 32 48 41 54	11.	iP i i S eL P: D	Z E N N N	17 20 13.3 14.1 15.0 55 21 31
10.	P Z (cont.)	Z	20 34 04 (cont.)	11.	P i	NZ N	22 50 57 51 23 (cont.)

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	pP	Z	22 51 25.2	12.	P	EZ	13 15 26
					i	N	36.3
					S	N	16 21
	6.3 S., 131.2 E. Tanimbar Is. region. h: 47 km ca. H= 22 42 59.4 USCGS			12.	iP	Z	18 56 00.0
					e	Z	34
					P: C		
11.	P	NZ	23 21 34	12.	P	Z	19 56 34
	eS	E	22 02				26.1 N., 175.9 W. South of Tonga Is. h: 85 km ca. H= 19 14 55.7 USCGS
	i	N	03				
12.	iP	NZ	04 33 13.3	12.	iP	Z	22 27 17.0
	i	E	14.0		i	Z	30
	S	EZ	43		P: C 20.2 S., 174.0 W. Tonga Is. h: 33 km ca. H= 22 15 51 USCGS		
	P: N, C			12.	P	Z	23 15 40
12.	eP	N	07 28 10		i	E	43
	i	Z	11.0		i	N	54
	i	N	15.5		eS	NE	22 02
	PP	NZ	29 56		eL	E	25 40
	PP	E	59		eL	N	23 26 32
	eS	E	34 27		eL	N	28 28
	i	N	41		eL	Z	55
	e	E	37 44	12.	P	Z	23 15 40
	e	N	46		i	E	43
	L	E	39 10		i	N	54
	L	Z	41 49		eS	NE	22 02
	Mag. 5 $\frac{1}{2}$ -5 $\frac{3}{4}$ (Mat.) 6.9 S., 150.6 E. New Britain region. h: 33 km ca. H= 07 20 00.0 USCGS				eL	E	25 40
					eL	N	23 26 32
					eL	N	28 28
					eL	Z	55
					5.8 S., 147.1 E. East New Guinea region. h: 68 km ca. H= 23 07 46.1 USCGS		
12.	P	Z	08 05 56	12.	P	NZ	23 31 47
				12.	P	NZ	23 36 54
					S	NE	37 19
				13.	P	Z	00 40 08
							65.2 N., 164.9 W. Alaska. h: 33 km ca. H= 00 32 09.4 USCGS
12.	iP	Z	10 17 47.4	13.	iP NZ, P E		00 41 28.2
	i	NE	47.9		i	Z	33.8
	i	N	18 08.2		eS	E	48 00
	eS	E	24 14		e	N	08
	eL	NE	27.9		eL	E	51 22
	P: C 52.6 N., 169.3 W. Fox Is. h: 33 km ca. H= 10 10 17.0 USCGS				eL	N	54 05ca.
					eL	E	21
					eL	Z	57 15
					P: N, E, D Mag. 5 $\frac{1}{2}$ -6 (Mat.) 64.9 N., 165.7 W. Alaska: h: 15 km ca. H= 00 33 24.7 USCGS		
12.	iP	EZ	10 30 07.3				
	i	N	07.7				
	S	N	35				
	i	E	37				
	P: W						
12.	iP	NZ	12 01 19.6				
	i	E	20.4				
	S	NEZ	46				
	P: S, D						

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
13.	eP S	Z NEZ	03 28 38 53	13.	P P: S, W	NE	16 10 43.5
13.	P S i	NEZ EZ N	05 03 11.7 15.5 15.7	13.	eP	Z	16 50 17
13.	iP iS i P: E, C	EZ EZ N	05 10 26.6 36.8 37.1	13.	P eL eL	Z E N	16 57 31.8 17 03 32 06 07
							7.9 N., 137.0 E. West Caroline Is. h: 33 km ca. H= 16 51 39.2 USCGS
13.	iP i i e P: S, E	NE Z Z NE	07 29 49.4 49.8 55.2 30 01	13.	iP Z, P eS P: C	NE NEZ	17 42 45.0 43 09
13.	iP P: D	Z	09 39 09.4	13.	iP e P: C	Z Z	19 22 12.7 35
							10.7 S., 165.0 E. Santa Cruz Is. h: 33 km ca. H= 19 12 57.1 USCGS
13.	eP i i i S	NE Z N E NEZ	11 45 34 38 38.5 39.3 46 06	13.	e eP eS i	Z Z Z NE	22 22 15 23 18 58 19 30 32
13.	eP eS	EZ NEZ	12 06 30 57	14.	ePKP i e i e SS eSS eLq Lr Lr eLr	Z Z N E N N E E N Z E	02 18 44 52 54 19 00 30 25 41 39 51 03 00 02ca. 09 07 16 11 06
							Mag. 5 $\frac{1}{2}$ (Mat.) 20.1 N., 122.0 E. Philippine Is region. h: 33 km ca. H= 13 15 49.8 USCGS
13.	iP P: W, C	EZ, P N	13 55 05.0	14.	P	Z	03 33 22
							Mag. 6 $\frac{1}{2}$ -6 $\frac{1}{2}$ (Mat.) 54.3 S., 2.4 W. South Atlantic Ridge. h: 33 km ca. H= 01 59 05.6 USCGS
							46.2 N., 151.9 E. Kurile Is. h: 33 km ca. H= 13 51 50 USCGS
13.	P	Z	14 27 23	14.	P	NE	03 33 31
13.	P	NZ	14 29 14	14.	P S E, eS N	NZ NE N E	04 46 57 47 38 48 54 57
							45.2 N., 150.4 E. Kurile Is. h: 33 km ca. H= 14 26 15 USCGS
13.	P i	Z NZ	15 58 30 59 08	14.	eP e	Z EZ	06 13 45 58



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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
14.	P e S e	Z NE E N	06 43 26 32 44 59 45 03		PcP eL P: E, C	N E	05 15 46.9 21 32
							2.3 N., 126.6 E. Molucca Passage. h: 45 km ca. H= 05 06 22.8 USCGS
14.	P e	EZ N	12 43 53 48.0	15.	P	NZ	05 19 32
14.	iP Z, P N i S i e	E NZ E E	15 53 41.3 41.6 54 33 34 50	15.	eS eSS eL	E E E	12 40 04 47 51 13 07 22
							14.7 N., 91.7 W. Guatemala. h: 118 km ca. H= 12 13 25.8 USCGS
				15.	P i i e eL	NEZ E NZ N E	15 06 45 56 59 10 12 53
							45.4 N., 150.9 E. Kurile Is. h: 33 km ca. H= 15 03 40 USCGS
14.	P	Z	17 08 30	15.	iP eS i	NZ N E	19 56 43.1 57 13 16
14.	iP i S eL	NZ E NE E	18 50 41.5 41.7 51 27 51				P: S, C
							40.5 N., 138.3 E. Eastern Sea of Japan. h: 26 km ca. H= 18 49 41 USCGS
14.	P S	Z NEZ	21 05 26 36	15.	iP i iS i	N EZ E N	20 31 36.0 36.2 59.0 59.5
							P: S
15.	eP	Z	03 53 43	15.	eP	Z	22 34 42
				15.	P	Z	22 41 36
							51.0 N., 169.6 W. Fox Is., Aleutian Is. h: 33 km ca. H= 22 34 07.7 USCGS
15.	P i i	Z EZ N	03 55 43 45.0 45.6	15.	eP i	Z N	23 05 08 36
				16.	P S	Z NE	00 07 38.5 51
				16.	P i	Z Z	00 28 31.4 49.7
15.	iP S P: D	Z NEZ	04 22 46.2 23 09	16.	P eS e	Z N E	02 29 06.8 35 18 22
							(cont.)

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
	L	E	02 39 07		i	E	18 31 38.4
	eL	N	09		eS	E	35 36
					eL	E	37 36
					L	N	39 56
					P: C		
						20.1 N., 121.9 E.	
						Philippine Is region.	
						h: 19 km ca.	
						H= 18 26 39.0	USCGS
16.	eP	Z	03 15 48	16.	iP	NZ	18 43 14.6
	eS	E	22 01		iS	NEZ	37.0
	e	N	03		i	Z	48.9
	L	E	25 49		P: S, C		
	eL	N	27 29	16.	eP	Z	19 31 52
						21.8 S., 175.3 W.	
						Tonga Is.	
						h: 33 km ca.	
						H= 19 20 26.3	USCGS
				16.	P	Z	19 32 59
					i	E	33 05.0
					e	N	36 49
					eL	E	37 37
						24.8 N., 122.4 E.	
						Taiwan region.	
						h: 61 km ca.	
						H= 19 28 50.0	USCGS
16.	iP	Z	04 01 39.4	16.	eP	Z	04 07 54
	i	E	40			21.6 S., 169.6 E.	
	e	Z	47			Loyalty Is. region.	
	PcP	EZ	04 24			h: 44 km ca.	
	eS	N	06 32			H= 03 57 17.2	USCGS
	eL	E	08 46	16.	P	EZ	04 15 02
	eL	N	09 19		i	N	02.5
				16.	P	NEZ	04 34 49
					i	Z	58
					i	N	35 00
				16.	iP	NEZ	05 26 58.2
					iS	N	27 07.3
					i	E	07.5
					P: N, E, C		
				16.	P	EZ	07 57 25
					S	NEZ	58 08
				16.	P	NZ	08 15 39
					S	NEZ	52
				16.	P	Z	12 31 23
						21.7 S., 169.6 E.	
						Loyalty Is region.	
						h: 21 km ca.	
						H= 12 20 44.2	USCGS
16.	iP	Z	18 31 33.0	17.	P	EZ	01 38 30
					i	N	31.9
					S	N	53
					i	E	55.5
				17.	iP	NEZ	02 34 13.9
					i	NZ	30
					S	E	48
					i	N	50
					P: S, E, D		
						Mag. 5.0 (Mat.)	
						35.5 N., 141.8 E.	
						Near east coast of Honshu,	
						Japan.	
						h: 81 km ca.	
						H= 02 33 26.5	USCGS

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
17.	P iS i	NEZ E N	02 45 22 45.0 45.7	17.	eP i eS i	NZ E E N	16 12 10 11.0 44 47
17.	iP i S P: N	NZ E E	04 05 54.7 56.2 07 41	17.	iP i iS i	Z NE NE Z	18 49 23.8 24.0 50 27.8 29.0
		27.6 N., 140.0 E. Bonin Is. region. h: 468 km ca. H= 04 03 45.7	USCGS			31.6 N., 138.0 E. South of Honshu, Japan. h: 376 km ca. H= 18 48 02.4	USCGS
17.	iP i eS e	NEZ NZ E N	05 21 35.5 50 24 01 27	17.	P eS i	NZ N E	20 13 39 14 30 30.9
		P: S, C Mag. 5.6 (Mat.) 45.4 N., 150.1 E. Kurile Is. h: 17 km ca. H= 05 18 34.8	USCGS	17.	P i S	NEZ NE NE	21 46 45 51 47 11
17.	iP iS P: S	NEZ NEZ	06 27 31.7 36.0	17.	P eP e i	Z Z N E	21 55 36 58 56 10
17.	iP iS P: S, W	NEZ NEZ	06 29 41.1 45.7	17.	P i eL eL	Z NE E N	23 51 29.5 30.2 59 13 35
		51.4 N., 177.9 W. Andreanof Is., Aleutian Is. h: 57 km ca. H= 23 44 46.2	USCGS	18.	P Z	Z	00 21 13
17.	eP eS i	Z E N	08 23 19 43 46			18.8 S., 168.9 E. New Hebrides Is. h: 69 km ca. H= 00 10 59.6	USCGS
17.	P e	Z N	09 42 21 25	18.	iP S P: N	N NE	01 35 58.4 36 26
17.	P i eS	Z Z NE	13 33 55.1 57.8 34 23	18.	P S	NE NE	04 38 43 53
17.	eP i S e	NEZ N Z E	14 13 15	18.	P i i S e	EZ Z N N E	06 06 07 08.2 42 47 07 03
		16.0 N., 96.9 W. Oaxaca, Mexico. h: 36 km ca. H= 13 59 25.3	USCGS			37.3 N., 142.0 E. Off east coast of Honshu, Japan. h: 33 km ca. H= 06 05 18.8	USCGS
17.	P e e	NZ NE NZ	14 21 39 22 12 23 28				

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
18.	iP S P: E, D	EZ, P N N	06 12 56.5 13 38	19.	iP P: W, C	EZ	07 58 22.1
18.	iP i S i P: E, D	EZ N Z N	06 51 04.1 04.5 42 47	19.	iP i i P: N	N Z E	11 23 12.3 12.6 13.3
		37.3 N., 141.8 E. Near east coast of Honshu, Japan. h: 62 km ca. H= 06 50 18.2	USCGS	19.	iP S P: N, E, C	NEZ NEZ	12 08 58.3 09 54
18.	P P: N, C	Z NEZ	09 13 00	19.	iP i i S P: C	Z N E NEZ	15 11 30.5 30.7 31.0 12 05
		44.1 N., 149.4 E. Kurile Is. h: 33 km ca. H= 09 10 19	USCGS	19.	iP N, P S P: S	E NEZ	16 18 27.0 55
18.	iP S P: N, C	NZ NEZ	11 11 17.9 49	19.	iP i P: D	Z E	18 27 04.3 06,4
18.	iP i i P: E, D	EZ NE Z	13 55 54.5 56 24.5 25.0			8.9 S., 112.8 E. Java. h: 336 km ca. H= 18 18 31	USCGS
18.	iP i S i P: E	EZ N N N	14 30 57.7 59.0 31 28 34	19.	iP iS P: N, W, C	NEZ E	19 02 38.9 54.4
18.	P i i S i	Z NZ E NZ E	15 54 44 45.0 46.0 55 16 17	19.	iP i S i P: S, E, D	NEZ Z NE Z	21 38 04.1 16.0 29 30
18.	iP i S P: D	Z NE NEZ	20 23 42.9 43.1 24 01	19.	eP P P e	Z Z Z	22 51 38 22 54 37 23 47 00 48 15
19.	P S	Z Z	00 53 44 54 09	20.	P iS i	NZ E NEZ	00 52 51 53 15.7 19
19.	iP i S P: W	EZ N NEZ	01 58 53.2 53.4 59 15	20.	eP S	Z NEZ	04 01 44 02 01
19.	eP P: D	Z	04 20 19	20.	iP Z, P P: D	NE NE	11 36 58.0
		29.8 N., 114.1 W. Baja California. h: 33 km ca. H= 04 07 38	USCGS			20.1 S., 177.7 W. Fiji Is. region. h: 463 km ca. H= 11 26 32.6	USCGS

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
20.	iP S e i	NEZ NE N E	13 32 39.1 33 13 17 25	21.	e	E	07 50 20
	P: N, E, D Mag. 5 (Mat.) 37.5 N., 141.6 E. Near east coast of Honshu, Japan. h: 40 km ca. H= 13 31 54,7 USCGS			21.	iP	Z	08 09 26.8
					P: D		
20.	iP S i i	NEZ Z E N	13 51 10.7 23 25 29	21.	iP	NZ	08 20 42.7
	P: N, E, D				E 43.0 EZ 22 01 P: N, D		
20.	PKP epP	Z Z	16 05 08 40	21.	eP	EZ	09 00 17
	22.2 S., 69.1 W. Northern Chile. h: 100 km ca. H= 15 45 25.3 USCGS			21.	eP	N	10 25 22
					i Z 22.6 S NE 58		
20.	P i eS	EZ EZ NE	21 36 22.1 22.8 37 05	21.	iP?	Z	10 27 23
	P: E, D				S N 45		
20.	eP i i eS	Z E N N	22 08 00 00.8 01.7 41	21.	iP	Z	15 41 26.9
					i NE 42 24 P: D		
20.	iPKP	Z	23 03 10.4	21.	P	Z	17 27 19
	P: C 18.6 S., 69.5 W. Northern Chile. h: 129 km ca. H= 22 43 35 USCGS				i Z 51.5 i E 52		
20.	iP i S	Z NE NEZ	23 15 14.9 15.3 30	21.	iP	Z	17 45 29.3
	P: D 36.6 N., 140.3 E. Near east coast of Honshu, Japan. h: 83 km ca. H= 23 14 45.9 USCGS				i NZ 34.5 P: C 60.5 N., 146.8 W. Southern Alaska. h: 43 km ca. H= 17 36 29.0 USCGS		
21.	P i S	EZ N N	00 14 26 29.2 15 06	21.	iP	Z	18 01 20.8
					S NE 39.5 P: D		
21.	P S i	Z N E	02 09 49 10 27 28	21.	iP	NEZ	18 40 44.5
					P: W, C 63.1 N., 150.3 W. Central Alaska. h: 111 km ca. H= 18 32 03.0 USCGS		
				21.	P	E	18 42 41
					S E 49		
				21.	eL	E	19 34 27
					13.0 N., 124.5 E. Luzon, P. I. h: 33 km ca. H= 19 23 21 USCGS		
				22.	iP	NEZ	00 00 20.2
					S EZ 28 P: S, E, C		



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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
22.	iP i S P: N, C	NZ E EZ	00 40 16.9 17.1 26	22.	P e P: C	Z NZ	09 40 01.3 10
22.	P i P: C	Z N	00 43 10.6 11.6	22.	iP i i S P: C	Z E Z N	12 02 45.0 45.3 51 03 21.8
			9.5 S., 71.3 W. Peru-Brazil border region. h: 614 km ca. H= 00 24 48.7	22.	iP P: S, E, D	NEZ	12 03 27.3
22.	iP P: D	Z	00 56 42.6				22.2 S., 179.7 W. South of Fiji Is. h: 600 km ca. H= 11 58 10.1
			21.3 S., 179.3 W. Fiji Is. region. h: 663 km ca. H= 00 46 33	22.	iP Z, P N i P: C	NEZ	12 16 21.9 50
22.	iP NZ, P E i P: N, C	E	01 23 10.0 30	22.	iP i P: W, C	EZ N	12 34 38.4 35 06.0
22.	iP i P: D	Z N	02 41 12.0 14.6	22.	P i i iS? i P: N	NZ N E NE E	13 34 51.7 58.3 58.7 35 17.5 21.0
			20.7 S., 178.2 W. Fiji Is. region. h: 85 km ca. H= 02 30 08.7	22.	iP i P: N, E, D	NEZ N	17 30 25.5 49
22.	P e	Z NE	04 05 33 49	22.	P P: W, D	EZ	18 19 42.4
22.	P i i S e Lq Lr	Z E N E E E Z	04 47 26 26.5 27 56 10 05 01 06 10 23 18 13	22.	iP i P: D	Z Z	18 31 40.7 43.7
			Mag. 6 $\frac{1}{4}$ (Mat.) 28.2 N., 57.0 E. Southern Iran. h: 42 km ca. H= 04 36 34.7	22.	P P: NEZ	NEZ	18 33 55
22.	iPKP ePP eG eL P: C	Z Z E E	08 19 50.2 21 41 51 21 58.3				7.2 N., 126.8 E. Mindanao, P.I. h: 384 km ca. H= 18 28 18.3
			Mag. 5 $\frac{1}{2}$ -5 $\frac{3}{4}$ (Mat.) 18.4 N., 68.8 W. Mona Passage. h: 115 km ca. H= 08 01 12.6	22.	P S P: C	NZ N	19 19 58 20 25
22.	P P: D	Z	08 30 01.4	22.	iP P: N, D	NZ	19 43 22.3
				22.	P S eSS	Z E E	21 06 56 17 10 22 55

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
22.	eLq	E	21 28.6		i	Z	21 45 54
	eLr	E	32.6		eS	E	46 27
	Mag. 5 $\frac{1}{2}$ -6 (Mat.)				P: S, C		
	31.9 N., 117.1 W.						
	Off west coast of Baja California.			24.	eP	NZ	00 02 34
	h: 14 km ca.				i	Z	40.2
	H= 20 54 35.3 USCGS			24.	iP	EZ, P N	01 14 50.4
22.	P	NEZ	21 41 03		eS	N	15 09
	51.4 N., 177.9 W.				P: W, D		
	Andreanof Is.			24.	eP	Z	01 17 39
	h: 65 km ca.				i	Z	01 17 42.5
	H= 21 34 21.1 USCGS				i	Z	18 36
					36.2 N., 70.9 E.		
					Hindu Kush region.		
					h: 158 km ca.		
					H= 01 08 37.7 USCGS		
22.	P	NZ	22 38 18				
	S	E	46.3				
	i	N	46.5	24.	iP	Z	03 23 23.7
23.	P	Z	03 57 17		i	N	25.0
	51.8 N., 175.8 W.				i	E	25.5
	Andreanof Is.				P: D		
	h: 33 km ca.						
	H= 03 50 14 USCGS			24.	iP	NEZ	05 09 43.3
					S	NE	10 06
					P: S, E, D		
23.	iP	NZ	07 44 02.7	24.	P	Z	06 13 36
	i	E	03.7	24.	iP	Z	07 59 43.0
	eG	E	54 41		e	Z	08 01 22
	P: N, C				P: C		
	7.1 S., 129.4 E.						
	Banda Sea.						
	h: 111 km ca.						
	H= 07 36 02.9 USCGS						
23.	P	Z	08 39 16	24.	iP	EZ	09 38 45.8
	i	NE	17.0		i	NEZ	47.0
	S	N	44.4		S	E	39 05
	i	E	45.4		P: E, D		
					36.2 N., 139.7 E.		
					Ibaragi Pref., Japan.		
					h: 50 km ca. JMA		
23.	iP	EZ	12 29 23.5	24.	iP	NEZ	11 14 06.7
	S	E	27.0		S?	NE	08
	P: W, D				P: W		
23.	iP	Z	19 50 03.0	24.	iP	NEZ	14 24 53.9
	iS	NE	51 48		S	NEZ	25 20
	e	Z	51		i	Z	21
	e	N	52 33		P: S, E, D		
	i	Z	48.5	24.	iP	NZ	14 45 32.0
	e	E	57 56		i	E	32.5
	P: C				S	E	59
	30.3 N., 131.1 E.				P: S, D		
	Kyushu, Japan.						
	h: 33 km ca.						
	H= 19 47 59.3 USCGS			24.	iP	Z	16 15 37.3
23.	e	Z	19 57 49		S	E	16 03
23.	iP	NZ	21 45 29.3		P: C		
	i	E	29.5				
	(cont.)						

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
24.	P S P: D	Z NE	16	23	00 26		e	E	19	36	38
							3.9 N., 96.9 E. Northern Sumatra. h: 141 km ca. H= 19 25 52.5 USCGS				
24.	iP i P: S, E, D	NZ, P E EZ	16	44	13.5 45 04	24.	iP S i P: D	Z NZ E	19	47	56.7 48 23 23.4
24.	iP S P: C	Z E	16	54	37.4 55 03	24.	iP S P: C	Z NEZ	19	54	21.0 46
24.	P e	Z N	16	56	25 57 00	24.	iP S P: C	Z NEZ	19	55	29.5 56
24.	P S	Z E	17	00	40 01 06.4	24.	iP S P: N, W, C	NEZ E	19	55	29.5 56
24.	P S	Z NE	17	18	32 58		Mag. 5.7 (Mat.) 34.6 N., 139.2 E. Near south coast of Honshu, Japan. h: 10 km ca. JMA				
24.	iP i S P: S, D	NZ E NE	17	40	37.4 40.4 41 05	24.	iP S	NEZ NEZ	20	01	45 02 11
24.	P S	Z E	17	47	33.5 46	24.	iP i S P: S, D	NZ E E	20	04	49.5 50.0 05 17
24.	iP i S P: D	Z NE NE	17	53	42.7 54 09	24.	P S	NZ E	20	10	45 11 11.1
24.	iP i S P: S, D	NZ NE NE	18	09	11.5 14.5 39.5	24.	iP iS E, S N P: D	Z	20	14	48.7 15 15.5
24.	iP S P: C	NZ NE	18	10	40.5 11 06.5	24.	iP eS P: D	Z NE	20	16	08.3 34
24.	iP i i PP PcS eS L L P: C	Z N E Z Z E Z	18	53	37.0 37.4 37.7 55 28.5 59 15 51 19 03 23 06.8	24.	iP S P: S	NZ E	20	18	23.9 50
						24.	P S	Z NE	20	19	56 20 22
						24.	iP S P: D	Z NEZ	20	36	14.0 40
						24.	eP S	Z NE	20	42	18 42
24.	eP i	Z Z	19	34	34 35 53.6 (cont.)	24.	iP i	Z NE	20	43	23.8 24.0 (cont.)

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
	S i P: D	NZ E	20 43 48 50	25.	eP e	NEZ EZ	00 06 42 03 08
24.	S	Z	20 45 26.5	25.	eP eS	Z NE	00 35 47 36 12
24.	iP i S P: N, C	NZ E N	20 52 25.8 26.0 50.5	25.	iP S P: S, D	NZ NE	00 44 41.6 57
24.	eP eS	Z NE	21 01 47 02 48	25.	e	E	01 25 38
24.	e	Z	21 03 27	8.2 N., 126.0 E. Mindanao, P. I. h: 62 km ca. H= 01 08 26.8 USCGS			
24.	iP i S P: N	NZ E E	21 07 30.0 30.4 57	25.	iP S P: N, C	NZ N	01 39 33.3 58
24.	iP S	NEZ E	21 09 05 30	25.	iP i S P: N, C	NZ E Z	02 17 09.4 10.0 35
24.	P S	NZ NE	21 16 15 41.5	25.	P S	Z Z	02 17 55 18 22
24.	iP i S P: C	Z N E	21 21 42.5 43.3 22 10	25.	S	NE	02 19 45
24.	P S	Z E	21 35 02 28.5	25.	iP eS P: S, D	NZ NE	02 35 30.9 57
24.	eP eS	Z E	21 55 52 56 18	25.	P S	Z NE	03 00 16 41
24.	P S	Z N	22 26 11 37	25.	eP S	N N	03 42 58 43 21
24.	iP S P: N, C	NZ E	22 29 21.3 48	25.	P eS	N E	03 45 50 47 03
24.	P S	NE NE	23 31 01 26	25.	P S	Z NE	04 07 54 03 21
24.	P S	Z N	23 45 44 46 09	25.	P S i	Z E N	05 17 22 48 49
24.	P eS	Z E	23 47 30 56	25.	P S	Z E	05 25 17 44.5
24.	P P: C	Z	23 59 13	25.	eP S	Z NEZ	05 31 53 32 15
23.9 S., 179.9 W. South of Fiji Is. h: 473 km ca. H= 23 48 37.2 USCGS				25.	eP eS	Z E	06 53 38 54 05

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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
25.	eP	NEZ	08 11 02	25.	P	Z	14 03 19
					S	N	44
	9.9 S., 159.8 E. Solomon Is. h: 35 km ca. H= 08 02 08.5			25.	eP	NZ	14 06 23
					S	N	48
				25.	iP	NZ	14 09 13.9
25.	iP	Z	08 19 03.7		i	E	14.8
	S	EZ	30		S	N	39
	P: S, D			25.	iP	Z	14 09 40
25.	iPKP1	EZ	09 08 17.0		S	EZ	10 05
	ePKP2	EZ	51		P: E, D		
	P: S, D 18.8 S., 69.0 W. Northern Chile. h: 117 km ca. H= 08 48 37.7			25.	P	Z	14 12 18
					S	NE	44
25.	P	Z	09 17 46	25.	iP	NZ	14 14 56.9
	iS	E	18 12.4		S	E	15 22
25.	iP	EZ	09 29 42.0		P: N, C		
	S	Z	30 07	25.	iP	NZ	14 16 52.9
	i	E	10		S	N	17 18.2
	P: C				P: N, C		
25.	eP	Z	09 42 55	25.	iP	NZ	14 19 32.7
	S	E	43 22		eS	E	59
25.	P	Z	10 29 00		P: N, C		
	S	E	26.2	25.	iP	NZ	14 29 52.4
25.	eP	Z	10 39 53		S	NE	30 21
25.	P	Z	13 49 36		P: N, C		
	S	NEZ	50 02	25.	P	EZ	14 40 12
25.	P	NZ	13 51 02.2		eS	E	37
	P: S, D			25.	iP	Z	14 52 22.7
25.	iP	NEZ	13 51 13.4		eS	N	51
	S	NE	39		P: C		
	P: N, W, C Mag. 5.6 (Mat.) 34.7 N., 139.2 E. Near south coast of Honshu, Japan. h: 0 km ca.			25.	eP	Z	14 54 27
					i	E	50
				25.	P	Z	14 57 46
					S	N	58 13
				25.	eP	Z	15 07 33
					S	NE	59
25.	eP	Z	13 55 39	25.	eP	Z	15 12 00
	e	Z	56 03		eS	NE	25
25.	e	Z	13 58 22	25.	iP	NEZ	15 18 10.3
25.	e	Z	13 59 35		iS	Z	35.9
25.	eP	Z	14 00 20		P: N, W, C		
	e	Z	44	25.	iP	N	15 19 26.1
25.	e	Z	14 01 44		i	E	26.4
	e	N	02 11		S	Z	52
					P: N		

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Date	Phase	Comp.	Time(GMT)			Date	Phase	Comp.	Time(GMT)		
			h	m	s				h	m	s
25.	eP S	NZ E	15	26	28 54	25.	iP NZ, P E eS Z P: S, E, D		16	51	10.4 38
25.	P S	NZ E	15	36	33 56.4	25.	eP S	Z Z	16	54	13 41
25.	iP S P: S, C	NZ Z	15	39	28.4 54	25.	eP eS	Z NE	16	55	51 56 18
25.	P eS	NZ N	15	41	40.3 42 04	25.	P S	Z NE	16	57	08.2 35
25.	P eS	Z NE	15	43	11 35	25.	eP S	Z NE	16	58	16 41
25.	P S	E E	15	47	50 48 15	25.	S	NE	16	59	28
25.	iP i S i P: N, C	NZ E Z E	16	05	41.7 42.6 06 09 11	25.	P S	Z E	17	00	18 44
25.	e	Z	16	07	22	25.	iP i iS P: S, D	NZ E E	17	02	04.8 05.1 33
25.	P eS	Z NE	16	17	53 18 20	Mag. 5.7 (Mat.) 34.8 N., 139.3 E. Near south coast of Honshu, Japan. h: 33 km ca. H= 17 01 32.2 USCGS					
25.	P eS	NEZ NE	16	20	30 58	25.	eS	Z	17	07	34
25.	P S P: C	Z Z	16	23	13.1 38	25.	eS	Z	17	10	27
25.	iP i P: N	N Z	16	25	53.4 53.5	25.	iP S P: D	Z Z	17	11	13.9 41
25.	eP S	Z Z	16	26	08 35	25.	iP S P: D	Z Z	17	13	36.4 14 03.4
25.	iP i eS P: N, C	NZ E NE	16	29	34.7 35.9 30 00	25.	eP eS	Z E	17	18	19 48
25.	iP S P: N, W, C	NEZ Z	16	35	01.9 28	25.	eP eS	Z NE	17	20	57 21 35
25.	iP S P: C	Z NE	16	37	15.0 40	25.	i	Z	17	22	49.4
25.	iP NZ, P E S P: S, E, D	Z Z	16	39	36.9 40 04	25.	iP i i S P: D	Z N E Z	17	23	11.1 38 04.9 05.2 06.2 33

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
25.	iP eS P: S, D	NZ Z	17 40 26.4 53	25.	P S	Z N	18 54 41 55 06
25.	iP i S P: S, D	NZ E Z	17 43 20.7 21.4 48	25.	P S	NEZ NE	18 56 15 40
25.	P S	E NE	17 49 37 50 09	25.	iP S P: D	Z N	19 13 36.7 14 02
25.	eP S	Z Z	17 52 45 53 11	25.	iP S P: D	Z NEZ	19 26 31.7 59
25.	S	Z	17 53 47	25.	eP S	Z N	19 27 30 58
25.	e	Z	17 54 27	25.	iP i S P: N, C	NZ E NE	19 35 10.3 11.1 38
25.	P S	Z Z	17 54 40 55 07	25.	P S	Z N	20 17 08 32.4
25.	eP eS	Z NE	17 56 51 57 17	25.	iP Z, P N i S P: D	E NE	20 59 29.1 30.2 55
25.	e i	Z Z	17 58 19	25.	P S	Z NE	21 08 22 48
25.	ePKP i	Z Z	18 16 23 46.4	25.	iP S P: D	Z NE	21 14 21.4 47
			25.3 S., 68.1 W. Chile-Argentina border region. h: 101 km ca. H= 17 56 40.1				USCGS
25.	iP eS P: D	Z E	18 19 49.2 20 17	25.	P S	Z NE	21 20 04 29
25.	P S	Z E	18 22 34 23 00	25.	iP S P: N, C	NZ N	21 22 42.4 23 07
25.	P S	Z E	18 24 34 59	25.	eP S	NE NE	21 36 57 37 20
25.	eP S	Z NE	18 44 00 26	25.	P i S P: N, C	NZ E NEZ	21 41 30.0 30.5 57
25.	iP S P: D	Z E	18 48 46.2 49 12	25.	P S	Z NE	22 03 57 04 23
25.	S	E	18 49 50.4	25.	P	NEZ	23 02 49
25.	P S P: S	NZ NE	18 51 20.9 47	25.	eP eS	Z NE	23 12 37 13 03

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
25.	P S	Z NE	23 35 23.3 48		i eS i	NE N N	10 59 23.2 11 01 05 22.7
25.	iP S P: D	Z NEZ	23 37 20 46		P: D		43.1 N., 145.2 E. Hokkaido, Japan. h: 12 km ca. H= 10 57 17.2 USCGS
26.	iP S P: S	NZ NE	01 39 39.1 40 05.4	26.	iP e P: C	Z E	12 17 01.2 30
26.	eP S	Z E	01 42 56 43 21.4	26.	iP S P: S, W, C	NEZ NE	13 59 38.7 57
26.	P S	NZ NE	01 58 05 32	26.	P e	Z N	14 26 09 37
26.	eP S	Z N	02 11 26 52	26.	iP S PcP iScP ScS P: N, E, D	NEZ E EZ Z E	14 34 55.2 38 33 39 31 42 26.6 46 08
26.	P S P: S, D	NZ E	02 39 26.4 52				51.8 N., 156.8 E. Kamchatka. h: 136 km ca. H= 14 30 29.1 USCGS
26.	P eS P: C	Z Z	02 49 53.4 50 20	26.	iP S P: D	Z N	14 55 31.9 58
26.	iP S P: S, E, D	NEZ NE	03 04 17.9 36	26.	eP S	E E	16 08 37 59
26.	iP i S P: N, C	NZ E E	03 49 04.4 04.8 31	26.	eP e	Z Z	18 39 50 42 09
26.	iP 19.7 S., 178.3 W. Fiji Is region. h: 510 km ca. H= 04 57 14	NZ	05 07 34.4	26.	P i	E E	21 07 39 59
26.	iP S P: N, E, C	NEZ NEZ	07 01 48.4 02 15	26.	eP eS	Z NE	22 45 33 46 00
26.	P S P: D	Z NZ	07 11 08.9 35.4	26.	iP S P: W, D	EZ, P NE	23 43 04.5 21.5
26.	P S P: D	Z NEZ	08 23 24.9 48.4	27.	P S	Z E	00 44 34.6 45 00
26.	eP S	Z N	09 52 49 53 16	27.	P S	Z E	02 45 42 46 06
26.	iP	Z	10 59 22.8 (cont.)	27.	P S	Z N	04 03 15 41



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Date	Phase	Comp.	Time(GMT)	Date	Phase	Comp.	Time(GMT)
			h m s				h m s
27.	eP S	Z EZ	04 41 53 42 17	28.	P eS	Z E	10 49 06 32
27.	iP Z, P N S P: N, C	E	05 01 26.8 53.5	28.	P S	Z NE	12 00 35 01 06
27.	P S P: D	Z E	07 08 43.4 09 10	28.	P S P: N, D	NZ NE	12 06 38.8 07 09
27.	eP S	Z E	07 41 10 33	28.	iP pP S ScS sS sSS G P: S, E, D Mag. 6 (Mat.) 22.1 S., 179.6 W. South of Fiji Is. h: 611 km ca. H= 16 16 11.0	NEZ Z N E N E NEZ	16 26 28.4 28 30 34 55 35 44 38 38 42 45 46 00
27.	iP S P: W, D	EZ E	07 44 05.7 17				USCGS
27.	iP S	Z N	07 48 24.0 30	28.	P P: C	Z	17 14 08.5
27.	eP e e	NZ E E	15 19 01 32 20 30				86.7 N., 68.7 E. North of Frauz Josef Land. h: 33 km ca. H= 17 04 57.0
27.	P P: D	EZ	16 51 48.5				USCGS
27.	iP i S P: D	Z NZ NE	17 01 05.3 06.1 30	28.	iP S P: S, E, D	NEZ NEZ	17 18 33.3 19 00
27.	P PcP S L L	Z Z N E N	17 48 52 52 42 53 30 53 34 58 04	28.	eS?	Z	17 20 25
			Mag. 6-6½ (Mat.) 12.9 N., 125.4 E. Samar, P. I. h: 33 km ca. H= 17 43 21.4	28.	iP S P: N, C	NZ NE	17 41 36.0 42 03
			USCGS	28.	P eS i i P: C	NZ E N Z	21 06 04.0 27 28 31
27.	P S P: S, C	NZ E	19 34 41.5 35 06	28.	eP	Z	21 17 18
28.	eP eS	Z E	02 35 18 50	28.	iP S P: C	Z Z	22 40 12.5 38.5
28.	P S	Z E	09 36 19 46.5	28.	iP i i S P: D	Z E N Z	22 46 07.0 07.3 08.0 41
28.	P	Z	10 15 50.5				
28.	eP e	Z N	10 16 58 17 09				



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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
28.	P	Z	23 57 43	29.	iP	NZ	06 50 33.0
	51.5 N., 175.0 W. Andreanof Is., Aleutian Is. h: 33 km ca. H= 23 50 41				i	E	33.3
					S	EZ	52
					P: S, D		
29.	eP	Z	00 22 51	29.	eP	N	07 07 02
	S	E	23 15		e	N	07
29.	eP	Z	00 51 21		i	E	08 32
	51.5 N., 175.0 W. Andreanof Is., Aleutian Is. h: 35 km ca. H= 00 44 20.1				e	N	43
					P: N, W		
29.	eP	Z	01 33 15	29.	P	NE	09 41 19
29.	P	E	01 44 26.3		S	NE	25
29.	iP	EZ	01 47 09.8	29.	iP E, P N		10 15 39.0
	eL	E	55 10		P: N, E		
	eL	E	59.2		51.8 N., 175.1 W. Andreanof Is., Aleutian Is. h: 76 km ca. H= 10 09 42.4		
	P: C				USCGS		
	51.5 N., 175.0 W. Andreanof Is., Aleutian Is. h: 33 km ca. H= 01 40 08.4			29.	iP	NEZ	12 51 45.5
					eS	NE	52 28
					P: N, E, D		
29.	iP	EZ	03 31 56.5		40.5 N., 139.0 E. Eastern Sea of Japan. h: 16 km ca. H= 12 50 43.5		
	S	E	32 49		USCGS		
	P: E, D			29.	P	NZ	15 35 41.4
	38.1 N., 144.0 E. Off east coast Honshu, Japan. h: 40 km ca. H= 03 30 44.3				eS	N	36 23
					P: N, D		
29.	iP	NZ	04 18 04.8	29.	iP	NEZ	16 36 04.7
	i	E	05.0		iS?	E	30.0
	S	NE	25		i	NEZ	33
	P: S, D				P: S, E, C		
29.	eP	Z	05 03 05	29.	iP Z, P N		17 10 49.3
29.	eP	Z	05 03 55		i	NE	50.0
	e	NE	04 20		S	NE	11 18
	P: D				P: D		
29.	iP	Z	06 42 05.5	29.	eP	Z	17 12 07
	eS	E	47 57		S	NEZ	35
	L	E	50 39	29.	P	Z	17 13 35
	P: C				S	Z	14 03
	51.4 N., 174.9 W. Andreanof Is., Aleutian Is. h: 22 km ca. H= 06 35 02.2			29.	eP	Z	17 15 44
					S	E	16 11.5
					USCGS		
29.	iP	Z	06 46 09.5	29.	iP	Z	17 52 38.2
	51.5 N., 174.8 W. Andreanof Is., Aleutian Is. h: 33 km ca. H= 06 39 08.0				S	E	53 06
					USCGS		
				29.	P	NZ	19 48 20.6
					S	NEZ	41

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Date	Phase	Comp.	Time(GMT) h m s	Date	Phase	Comp.	Time(GMT) h m s
29.	P i e	Z N E	20 59 50 58 21 00 12		i e P: D	Z E	13 48 41.5 14 01.6
29.	iP P: D	Z	23 09 28.0	30.	P i	Z E	13 56 37 58 08.5
				17.2 S., 178.7 W. Fiji Is. region. h: 493 km ca. H= 22 59 22.0 USCGS			
29.	P iPP	Z Z	23 30 57 32 37.0	30.	iP i P: C	Z N	14 21 28.8 22 13.5
				6.2 S., 155.5 E. Solomon Is. h: 50 km ca. H= 23 22 42.1 USCGS			
30.	eP S	Z NE	00 32 11 39	30.	P i S	NZ E NEZ	15 28 45.3 46.0 29 45
				P: S, D Mag. 5.4 (Mat.) 31.3 N., 138.8 E. South of Honshu, Japan. h: 261 km ca. H= 15 27 25.8 USCGS			
30.	iP i	Z NE	01 08 45.0 09 01.7	30.	iP i eS e P: C	Z NE E N	16 51 10.9 11.3 52 14 31
				41.6 N., 141.7 E. Hokkaido, Japan. h: 42 km ca. H= 16 49 46.4 USCGS			
30.	eP eS	Z N	07 03 06 26	30.	iP i eS e P: C	Z NE E N	19 28 32.8 59.9
30.	e S	E	11 11 44	30.	iP S P: C	NEZ E	20 55 25.0 52
30.	iP e i	Z N E	11 35 09.0 51 52.5	30.	P S	Z E	21 01 01 27.5
30.	P S	Z N	12 43 00 29	30.	P S	Z E	21 41 25
				12.4 N., 142.0 E. South of Mariana Is. h: 100 km ca. H= 13 08 50.2 USCGS			
30.	iP i S P: S, D	NZ E NEZ	13 17 58.0 58.5 18 30	30.	P S	Z NE	21 44 29 55
30.	iP Z, P N e P: C	Z E	13 23 36.0 24 07	31.	eP S	Z Z	00 32 50 33 17
30.	iP S P: C	Z E	13 26 34.9 27 06.5	31.	iP i eS P: C	Z N NE	01 49 08.5 08.9 50 38
30.	iP Z, P N		13 48 11.5 (cont.)	28.7 N., 139.4 E. (cont.)			

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h m s

Bonin Is. region.  
h: 426 km ca.  
H= 01 47 13

USCGS

31. P Z 07 19 48  
eS NZ 20 20

31. P Z 07 20 40  
eS NE 21 12

31. P Z 07 31 43  
i E 32 15

31. P Z 08 34 22  
S NE 49

31. iP Z, P E 12 54 47.2  
ePcP Z 56 21  
P: D

7.4 S., 156.0 E.  
Solomon Is.  
h: 48 km ca.  
H= 12 46 22.4

USCGS

31. iP Z 16 30 27.5  
i NE 28.0  
P: C

35.8 N., 25.6 E.  
Crete.  
h: 86 km ca.  
H= 16 18 01.7

USCGS

31. P NZ 17 00 17  
eS E 49

31. P NZ 17 01 58  
eS NE 02 29

31. P Z 17 16 17

31. iP NZ 21 15 02.0  
i E 02.5  
S Z 30.5  
P: N, C

31. iP Z 23 21 26.0  
ePcP Z 23 15  
L E 31 45  
L Z 35 00

4.6 S., 153.0 E.  
New Britain region.  
h: 77 km ca.  
H= 23 13 30.9

USCGS

Date Phase Comp. Time(GMT)  
h m s

Mineo Takehana

Director