

METEOROLOGICAL OFFICE, UNITED KINGDOM

SEISMOLOGICAL BULLETIN FOR JANUARY 19 66

1. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESSHIRE, SCOTLAND

Lat. 55° 19' 00" N., Long. 3° 12' 18" W. Height above M.S.L. 263m.

Foundation: Llandovery Shales, folded (late Silurian).  
Instruments: World-wide standardised seismograms (USCGS).

- (i) Long-Period SPRENGNETHER
- (ii) Short-Period BENIOFF

CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	v
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHER N E WWSS Z		15	100		} 750 at 15sec.
		15	100		
		15	100		
BENIOFF N' E' WWSS Z'		1.0	0.75		} 12500 at 1 sec.
		1.0	0.75		
		1.0	0.75		

2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

Lat. 51° 28' 6" N., Long. 0° 18' 47" W, Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.  
Instruments: Kew-type vertical seismograph, period 1.5 sec.  
Direct optical registration (ZV).

Notations: For phases the generally adopted notations are used.  
In addition the following symbols are in use:

- C = Compression
- D = Dilation
- Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.
- $\Delta$  = Epicentral distance
- h = Depth of hypocenter

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
2. ESK	Z'	eP	04	16	51.0				04 04 45.4; 31.3°N. 138.2°E h=394, South of Honshu, USCGS.	
2. ESK	Z'	iP	23	17	43.0	0.9	0.07		C. 23 12 18.8; 37.5°N., 23.4°E. h=22km. Greece. USCGS.	
	Z'	i		17	44.7					
3. ESK	Z'	ePKP	13	52	08.9				13 33 32.6; 20.3°S. 178.5°W h=537km. Fiji Is. USCGS.	
3. ESK	Z'	eP	18	27	45.3	0.9		0.03	C. 18 16 05.9; 4.7°N., 76.0°W. h=103km. Colombia. USCGS.	
KEW	ZV	iP	18	27	51				C.	
5. ESK	Z'N'E'	iP	11	18	56.2	0.5	0.024	0.027	0.019	Local. M <sub>L</sub> = 1.8(ESK)
	Z'N'E'	eS	19	12.7						
	Z'N'E'	M	19	15						
		F	19	40						
5. ESK	Z'N'E'	iP	11	21	14.2	0.4	0.029	0.033	0.023	Local M <sub>L</sub> = 2.0(ESK)
	E'	eS	21	30.6						
	Z'N'E'	M	21	32.5						
		F	22	00						

SEISMOLOGICAL BULLETIN

JANUARY 1966

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
5. ESK	Z'N'E E', Z'NE	iP <del>x</del> eS <del>x</del> M F	11	42	38.5 54.3 57.5 25	0.5	0.021	0.027	0.019	$\Delta = 135$ km. Local. $M_L = 1.7$ (ESK)
5. ESK	Z'NE E' Z'N'E'	iP <del>x</del> eS <del>x</del> M F	11	43	53.0 09.3 12 30	0.4	0.029	0.033	0.019	$\Delta = 140$ km. Local. $M_L = 2.0$ (ESK)
5. ESK	N'E'Z' E' Z'N'E'	iP <del>x</del> eS <del>x</del> M F	11	58	37.5 53.5 55 20	0.4	0.032	0.039	0.023	$\Delta = 137$ km. Local. $M_L = 2.0$ (ESK)
5. ESK	Z'N'E' Z' Z'E' Z'N'E' Z'N'E'	iP <del>x</del> iPg eS <del>x</del> eSg M F	13	27	03.1 05.9 19.9 22.6 28 10	0.4	0.070	0.059	0.043	$\Delta = 144$ km. Local. $M_L = 2.3$ (ESK)
5. ESK	Z' ZNE ZNE	e(P) eL M F	17	34	13.2 - 15 $\frac{1}{2}$ 40	20	2.3	4.5	4.5	17 21 28.4; 13.2 $^{\circ}$ N., 95.5 $^{\circ}$ E. h=37km. Andaman Is. USCGS. $M = 5\frac{3}{4}$ -6(ESK)
KEW	ZV	e(P)	17	34	08					
6. ESK	Z' Z' N' N'E' Z'N'E'	iP <del>x</del> i eS <del>x</del> eSg M F	12	37	34.1 37.3 45.6 47.3 48 $\frac{1}{2}$ 05	0.6	0.034	0.024	0.027	$\Delta = 96$ km. Local. $M_L = 1.5$ (ESK)
11. ESK	Z' NE NE NE E N Z	iP eS eL M M M M F	14	29	05.7 32 - - - - - - 40	20 16 16 16	2.3 4.0	3.6 3.4	5.4	C. $\Delta = 85.2^{\circ} = 9470$ km. 14 16 32.2; 33.7 $^{\circ}$ N. 137.2 $^{\circ}$ E. h=33km. Near coast of Honshu, Japan. USCGS. M = 5.8(ESK)
KEW	ZV	iP	14	29	17					
12. ESK	Z'	eP	08	14	15.3					08 02 09.6; 2.3 $^{\circ}$ S., 77.0 $^{\circ}$ W. h=182km. Peru-Ecuador border USCGS
12. ESK	Z'	eP	12	41	25.5	1			0.04	12 29 29.1; 15.3 $^{\circ}$ N., 94.4 $^{\circ}$ W. h=51km. Near Oaxaca, Mexico. USCGS.
13. ESK	Z'N'E' Z'N'E' Z'N'E'	eP <del>x</del> eS <del>x</del> M F	06	28	18.4 29.0 33 00	0.7	0.026	0.019	0.019	$\Delta = 89$ km. Local. $M_L = 1.2$ (ESK)
13. ESK	Z' ZN ZN E	eP eLR M M F	10 11	52 15 $\frac{1}{2}$	36.5 - - - 45	0.9 20 20	1.5	1.5	0.15 2.2	C. 10 41 11.0; 52.9 $^{\circ}$ N., 172.0 $^{\circ}$ E. h=14km. Near Is. Aleutian Islands. USCGS. M = 5.6(ESK)
KEW	ZV	eP	10	52	58					
14. ESK	Z'	eP	18	45	31.0					18 39 31.5; 34.7 $^{\circ}$ N. 27.0 $^{\circ}$ E. h=33km. Crete. USCGS.

SEISMOLOGICAL BULLETIN

JANUARY 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
15. ESK	Z'	eP	12	10	14.6					$\Delta = 62.7^\circ = 6970$ km. 11 59 58.6; 59.5°N. 144.6°W. h=33km. Gulf of Alaska. USCGS. M = 5.3(ESK)
	NE	eS		18	39	10	1.0	0.7		
	EN	M		34	$\frac{1}{2}$	20	1.3	1.1		
	ZN	M		37	-	18	1.7		2.0	
		F		13	00	-				
15. ESK	Z'	iP	18	13	15.4	0.8			0.06	C. 18 07 46.3; 36.7°N., 23.1°E. h=35km. Southern Greece. USCGS.
	Z'	i		13	17.5					
15. ESK	NE	eL	20	30	-					19 29 35; 33.5°S. 69.9°W. h=36km. Chile-Argentina Border. USCGS. M = 5 $\frac{1}{2}$ (ESK)
	ZNE	M		28	$\frac{1}{2}$	20	0.8	0.7	1.5	
		F		50	-					
16. ESK	E	e(SS)	00	55	10					$\Delta$ about 155°  Not in USCGS PDE.  M = 5 $\frac{1}{2}$ (ESK)
	E	e(SSS)	01	01	05					
	NE	eLQ		17	$\frac{1}{2}$					
	E	M		38	$\frac{1}{2}$	20		0.6		
	N	M		38	$\frac{1}{2}$	22	0.8			
	Z	M		39	$\frac{1}{2}$	22			1.7	
	E	M		51	$\frac{1}{2}$	18		0.8		
	NZ	M		51	$\frac{1}{2}$	19	0.9		1.4	
	F		02	10	-					
16. ESK	Z'	eP	07	20	38.1					07 07 56.9; 9.2°N., 93.8°E. h = 33km. Nicobar Is. USCGS
16. ESK	Z'	iP	09	23	13.8	0.9			0.08	C. 09 11 50.0; 52.9°N., 171.9°E. h=25km. Near Is. USCGS.
16. ESK	Z'	ePn	12	34	26.9					$\Delta = 6.4^\circ = 710$ km.  12 32 51; 50°27'N., 4°15'E. Belgium. Some damage to property. BCIS.  M <sub>L</sub> = 4.0 (ESK). $\Delta = 3.3^\circ = 365$ km.  Belgium.
	Z'	e(P $\bar{x}$ )		34	47.3					
	N'E'	eSn		35	39.2					
	E'	i		35	57.0					
	N'	e(S $\bar{x}$ )		36	07.9					
	Z',	e(Sg)		36	24.2					
	N',	e		36	29.9					
	ZNE	M		36	32	1	0.113	0.111	0.155	
		F		39.0	-					
	16. KEW	ZV	ePn	12	33	40.0				
ZV		iP $\bar{x}$		33	47.5					
ZV		i(Pg)		33	57.5					
ZV		i		34	08.5					
ZV		eSn		34	18.5					
ZV		iS $\bar{x}$		34	28.5					
ZV		i(Sg)		34	39.5					
ZV		M		34	50	1.5			0.77	
ZV		M		35	32	3			1.28	
	F		38.0	-						
16. ESK	Z'	eP	18	58	09.3					18 52 00.8; 32.2°N. 26.2°E. h=33km. Mediterranean Sea. USCGS.
16. ESK	Z'	eP	19	55	50.4	1			0.05	19 44 39.5; 54.9°N. 165.8°E. h=15km. Komandorsky Is. USCGS.
KEW	ZV	eP	19	56	12					
16. ESK	Z'	eP	20	21	17.3					20 15 27.4; 35.6°N. 26.0°E. h = 35km. Crete. USCGS.
	Z'	i		21	20.0					
17. ESK	Z'	eP	08	44	32.7					08 39 41.4; 40.2°N., 20.6°E. h=34km. Greece-Albania border. USCGS.

## SEISMOLOGICAL BULLETIN

JANUARY 1966

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS	
			h.	m.	s.		N	E	Z		
17. ESK	Z'	ePKP	18	08	35.9				17 49 59.3; 20.8°S., 178.5°W. h=543km. Fiji Is. USCGS.		
17. ESK	Z'	eP	19	07	39.8				18 56 15.6; 52.0°N., 171.2°W. h=46km. Fox Is. USCGS.		
17. ESK	Z'	eP	20	10	09.9				20 04 59.4; 38.2°N., 22.1°E. h=73km. Greece. USCGS.		
18. ESK	Z'	ePKP	06	46	02.9				06 27 12.7; 18.6°S., 177.8°W. h=364km. Fiji Is. USCGS.		
18. ESK	Z'E' N'E' N'E' Z'N'E'	iP <del>x</del> eS <del>x</del> eSg M F	11	01	38.8 50.0 51.9 53 20	0.6	0.026	0.020	0.022	$\Delta = 95$ km. Local. $M_L = 1.4$ (ESK)	
20. ESK	Z'	iP	14	57	28.3	1			0.07	14 46 06.2; 53.0°N., 171.8°E. h=29km. Near Is. USCGS.	
20. ESK	Z'	iP	16	43	44.5					16 32 19.9; 52.4°N., 169.6°W. h=19km. Fox Is. USCGS.	
21. ESK	Z'E' Z'N' Z'N'E'	iPg iSg M F	15	10	55.9 58.3 00.5 35	0.7	0.224	0.242	0.255	$\Delta = 17$ km. Local. $M_L = 0.8$ (ESK)	
22. ESK	Z'	iP	07	48	23.9					07 36 49.3; 17.4°N., 94.1°W. h = 139km. Chiapas, Mexico. USCGS.	
22. ESK	Z'	ePKP	11	19	28.2					11 01 05.3; 17.9°S., 178.5°W. h=598km. Fiji Is. USCGS.	
KEW	ZV	ePKP	11	19	41						
22. ESK	Z,Z' Z' NE E ZNE	iP ipP eS eLQ M F	14	37	55.7 38 05.2 46 48 54 $\frac{1}{2}$ - 15 11 - 16 30 -	10 1 16 18	2.5	4.5		2.3 0.07	C. $\Delta = 67.5^\circ = 7500$ km. 14 27 07.9; 56.0°N., 153.7°W. h=33km. South of Alaska. USCGS. $M = 6.2$ (ESK)
KEW	ZV	iP	14	38	22						
22. ESK	Z'	ePKP	19	56	07.0					19 36 32.4; 21.0°S., 174.2°W. h = 33km. Tonga Is. USCGS.	
22. ESK	Z'	eP	22	17	28.3					22 07 35; 62.1°N., 141.3°W. h=46km. Alaska. USCGS.	
23. ESK	Z' NE ZNE	eP eS M F	01	09	17.9 19 20 45 - 02 00 -	20	0.9	0.5	1.1	$\Delta = 80.4^\circ = 8930$ km. 00 57 22; 16.3°N., 94.9°W. h=32km. Oaxaca, Mexico. USCGS. Mag. M = 5 (ESK).	
23. ESK	Z ZNE	eP M F	02	07	36.2 36 - 45 -	16	0.5	0.4	1.0	01 56 38.0; 37.0°N., 106.9°W. h=10km. New Mexico. USCGS.	
24. ESK	ZNE	M F	02	53	- 03 05 -	16	0.3	0.7	0.7	02 15 27.7; 32.7°N., 67.6°E. h = 33km. Afganistan. USCGS.	
24. ESK	Z' E ZNE ZNE	eP eS M M F	07	32	49.8 40 40 56 $\frac{1}{2}$ - 08 03 - 30 -	25 16	4.3 2.2	2.5 3.7	1.6 5.1	$\Delta = 56.7^\circ = 6300$ km. 07 23 07.6; 29.9°N., 69.7°E. h=12km. West Pakistan. USCGS. $M = 5.4$ (ESK)	
KEW	ZV	eP	07	32	41						

SEISMOLOGICAL BULLETIN

JANUARY 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
24. ESK	Z'E'	iP*	15	12	18.7	0.5	0.018	0.019	0.013	$\Delta = 133\text{km.}$ Local.
	N'E'	eS*	12	34.3						
	N'E'	e	12	36.5						
	Z'N'E'	M	12	37						
		F	13	10						$M_L = 1.6(\text{ESK})$
24. ESK	ZNE	eL	16	03	-	16	0.4	0.6	0.9	15 32 48.1; 29.9°N., 69.8°E. h=4km. West Pakistan. USCGS
	ZNE	M	12 $\frac{1}{2}$	-						
		F	20	-						
25. ESK	Z'E'	iP*	16	13	14.0	0.5	0.029	0.024	0.019	$\Delta = 99\text{km.}$ Local.
	Z'N'	eS*	13	25.7						
	E'N'	eSg	13	27.5						
	ZNE	M	13	28.5						
		F	13	55						
$M_L = 1.5(\text{ESK})$										
28. ESK	Z'	ePKP	04	55	15.2					04 36 46.1; 17.5°S., 176.9°E. h=558km. Fiji Is. USCGS.
KEW	ZV	iPKP	04	55	23.5					
28. ESK	E	eLQ	06	41	-	22	5.6	5.2	6.5	05 42 16.4; 17.1°S., 168.4°E. h=24km. New Hebrides Is. USCGS.
	N	eLR	48 $\frac{1}{2}$	-						
	ZNE	M	07	04	-					
	Z	M	15 $\frac{1}{2}$	-						
	NE	M	16 $\frac{1}{2}$	-						
	F	08	20	-	19	3.0	4.3	5.3	Mag. M = 6.2(ESK)	
28. ESK	Z'	iP*	14	36	44.8	0.4	0.031	0.032	0.023	$\Delta = 110\text{km.}$ Local.
	Z'	eS*	36	57.7						
	E'	eSg	37	00.8						
	Z'N'E'	M	37	02 $\frac{1}{2}$						
		F	37	30						
$M_L = 1.8(\text{ESK})$										
28. ESK	Z'	eP*	14	51	00.9	0.3	0.062	0.059	0.045	$\Delta = 143 \text{ km.}$ Local.
	Z'	e	51	02.8						
	N'E'	eS*	51	17.7						
	ZNE	M	51	20						
		F	51	35						
$M_L = 2.4(\text{ESK})$										
28. ESK	Z'N'E'	iPg	15	02	16.0	0.9	0.052	0.067	0.035	Local. $M_L = 1.1 (\text{ESK})$
	Z'N'E'	eSg	02	22.3						
	Z'N'E'	M	02	27						
		F	03	00						
28. ESK	Z'	iP*	16	17	40.0	0.4	0.044	0.052	0.039	$\Delta = 151\text{km.}$ Local.
	Z'N'E'	eS*	17	57.5						
	Z'E'	iSg	18	00.3						
	N'E'	e	18	03.5						
	Z'N'E'	M	18	04 $\frac{1}{2}$						
		F	19	10						
$M_L = 2.2(\text{ESK})$										
28. ESK	Z'	eP	22	49	26.5	1.1			0.07	22 38 12.2; 51.6°N. 157.0°E. h=107km. Near Kamchatka. USCGS.
29. ESK	Z'	eP	14	52	13.5	1			0.08	14 40 26.5; 16.6°N., 91.2°W. h=7km. Mexico. Guatemala border. USCGS.
	Z'	i	52	17.6						
KEW	ZV	eP	14	52	25.5					
	ZV	e	52	29.5						

## METEOROLOGICAL OFFICE, UNITED KINGDOM

SEISMOLOGICAL BULLETIN FOR FEBRUARY 1966

## 1. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESSHIRE, SCOTLAND

Lat. 55° 19' 00" N., Long. 3° 12' 18" W. Height above M.S.L. 263m.

Foundation: Llandovery Shales, folded (late Silurian).

Instruments: World-wide standardised seismograms (USCGS).

- (i) Long-Period SPRENGNETHER  
(ii) Short-Period BENIOFF

## CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	V
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHER N E WWSS Z		15	100		} 750 at 15 sec.
		15	100		
		15	100		
BENIOFF N' E' WWSS Z'		1.0	0.75		} 12500 at 1 sec.
		1.0	0.75		
		1.0	0.75		

## 2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

Lat. 51° 28' 6" N., Long. 0° 18' 47" W. Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.

Instruments: Kew-type vertical seismograph, period 1.5 sec.  
Direct optical registration (ZV).Notations: For phases the generally adopted notations are used.  
In addition the following symbols are in use:

C = Compression

 $\Delta$  = Epicentral distance

D = Dilation

h = Depth of hypocenter

Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
1. ESK	Z'	eP	06	06	43.5				05 58 21.9; 42.1°N. 66.4°E. h=33km. Kazakh SSR. USCGS.	
1. ESK	Z'	iP	07	15	16.1	0.8		0.02	07 07 45.8; 35.1°N. 46.0°E. h=4km. Iran-Iraq border. USCGS.	
1. ESK	Z'E'	ePn	14	50	25.9	0.6	0.029	0.018	0.027	$M_L = 1.5$ (ESK)
	Z'E'	iPg	50	26.7						
	N'	eS*	50	38.8						
	E'N'	eSg	50	40.1						
	Z'N'E'	M	50	42						
		F	51	05					$\Delta = 112$ km. Local.	
2. KEW	ZV	ePKP <sub>2</sub>	05	53	43				05 34 01.8; 17.8°S, 173.2°W h=33km. Tonga Is. USCGS.	
3. ESK	Z'	eP	12	11	46.5				11 58 35.3; 16.6°N. 120.0°E. h=69km. Philippine Is. USCGS.	
4. ESK	Z'	eP	08	43	52.6				08 38 01.1; 34.3°N. 24.0°E. h=21km. Crete. USCGS.	

## SEISMOLOGICAL BULLETIN

FEBRUARY 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
4. ESK	Z'	ePKP	10	59	31.6					10 39 12.2; 15.9°S, 167.9°E.
	Z'	ePP	11	01	34.8					h=190km. New Hebrides. USCGS.
4. ESK	Z'	ePKP	21	04	31.0					20 44 55.7; 45.9°S, 123.0°E. h=33km. South of Astralia. USCGS.
5. ESK	Z'	eP	02	06	52.0	5			8.0	D. $\Delta = 24.4^\circ = 2700\text{km}$ .
	Z'	iP		06	52.6	1.1			1.1	02 01 48.3; 39.2°N., 22.0°E.
	Z'	i		07	00.2					h=38km. Greece. 1 killed,
	NE	eS		11	07	13	12	26		50 injured, 8500 homeless.
	NE	eL		13	-					USCGS.
	E	M		15	-	21		30		
	N	M		15	-	22	52			
	Z	M		16 $\frac{1}{2}$	-	21			40	M = 6.2 (ESK)
		F		55	-					
KEW	ZV	eP	02	06	16					D.
5. ESK	Z'	iP	02	16	14.7	0.7			0.05	02 11 10; 39.4°N., 22.2°E. h=33km. Greece. USCGS.
5. ESK	Z'	iP	03	03	05.3	1			0.11	02 58 00.6; 39.2°N., 22.2°E. h = 45km. Greece. USCGS.
KEW	ZV	iP	03	02	29					
5. ESK	Z'	eP	14	36	01.8					14 24 45; 52.8°N., 158.8°E. h=44km. Near Kamchatka. USCGS.
5. ESK	Z'	eP	15	24	28.2	1.7			0.39	15 12 29.1; 26.1°N., 103.1°E. h=15km. Yunnan Province, China. USCGS.
	Z'	i		24	29.7					
	NE	eL		47 $\frac{1}{2}$	-					
	E	M		57 $\frac{1}{2}$	-	20		16		
	N	M		59	-	23	19			
	ZNE	M		16 01 $\frac{1}{2}$	-	18	12	10	15	
		F		40	-					M = 6.2(ESK)
KEW	ZV	iP	15	24	30.5					
5. ESK	Z'	eP	16	27	24.3					16 16 01; 50.2°N., 155.1°E.
	Z'	iP		27	25.4	1			0.15	h=98km. Kurile Is. USCGS.
KEW	ZV	eP	16	27	43					
	ZV	iP		27	45					
6. ESK	Z'	eP	13	29	45.6					13 24 38.3; 39.0°N., 21.7°E. h = 36km. Greece. USCGS.
6. ESK	Z'	eP	23	38	19.7	0.9			0.03	C. Depth = 96km.
	Z'	epP		38	43.7					23 28 07.8; 60.4°N., 152.3°W. h=91km. Alaska. USCGS.
7. ESK	Z'	iP	04	35	54.0					C.
	Z'	i		35	56.6	1.7			0.27	
	Z'	i		36	00.0	1.1			0.30	04 26 13.9; 29.8°N., 69.7°E. h=33km. West Pakistan.
	ZN	eL		52	-					12 dead, extensive property damage.
	NE	M		58	-	26	50	22		
	NE	M	05	01	-	20	33	27		
	N	M		05	-	16	22			
	EZ	M		05	-	18		33	46	
		F	06	15	-					M = 6.3(ESK)
KEW	ZV	eP	04	35	45					
7. ESK	Z'	eP	05	31	27.3					05 21 44.6; 30.0°N., 69.9°E. h=10km. West Pakistan. USCGS.

## SEISMOLOGICAL BULLETIN

FEBRUARY 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
7. ESK	Z'	eP	05	39	59.1				05 30 19.2; 30.0°N. 69.6°E. h=48km. West Pakistan. USCGS.	
7. ESK	Z'	iP	23	16	16.0	1.3			0.15 C. $\Delta = 56.8^\circ = 6300$ km.	
	NE	eS		24	05				23 06 34.5; 30.2°N. 69.8°E.	
	EZ	eL		33	-				h=10km. West Pakistan.	
	EN	M		42	-	20	24	21	USCGS.	
	ZNE	M		47 $\frac{1}{2}$	-	14	14	24	28	
		F	24	30	-				Mag. M = 6.2(ESK)	
KEW	ZV	iP	23	16	07					
8. ESK	Z'	ePKP	10	20	47.8				10 02 09.0; 21.2°S, 178.5°W. h=525km. Fiji Is. USCGS.	
8. ESK	Z'	iP	20	13	11.3				20 08 06.3; 41.4°N. 25.1°E. h=33km. Greece-Bulgaria border. USCGS.	
9. ESK	ZE	eL	01	33	-				00 55 19.8; 14.3°N. 93.0°W.	
	ZE	M		42	-	20		2.2	2.9 h=50km. Mexico. USCGS.	
		F	02	00	-					
9. ESK	EN	eSS	05	15	35				04 40 28.4; 56.7°S., 25.7°W.	
	E	eL		28	-				h=27km. South Sandwich	
	ZE	M		51 $\frac{1}{2}$	-	18		4.9	7.8 Islands. USCGS.	
	N	M		52	-	18	6.0			
		F	06	50	-				M = 6 $\frac{1}{4}$ (ESK)	
9. ESK	Z'	iP	14	56	00.3				14 44 23.2; 37.2°N. 134.9°E. h=357km. Sea of Japan. USCGS.	
10. ESK	Z	eP	14	35	06	10			1.2 $\Delta = 99^\circ = 11000$ km.	
	Z	ePP		39	03	11			2.5 14 21 10.9; 20.8°N. 146.3°E.	
	NE	eSKS		45	40				h=43km. Mariana Islands	
	NE	eS		46	30	20	2.3	3.1	region. USCGS.	
	NE	ePS		48	04					
	NE	eSS		53	24					
	NE	eLQ	15	02 $\frac{1}{2}$	-					
	Z	eLR		08	-					
	NE	M		11 $\frac{1}{2}$	-	31	14	17	Mag. M = 6.4(ESK)	
	Z	M		15 $\frac{1}{2}$	-	24			3.2	
	NE	M		16	-	22	5.2	6.4		
		F	-	-	-					
10. ESK	EN	M	15	35 $\frac{1}{2}$	-	20	3.5	3.1	14 41 16; 20.7°N., 146.9°E.	
	Z	M		36 $\frac{1}{2}$	-	19			4.7 h=33km. Mariana Is. USCGS.	
		F	16	15	-				Mag. M = 6(ESK)	
10. ESK	Z'	eP	20	25	01.7				20 13 33.0; 47.2°N. 150.8°E. h=162 km. Kurile Is.	
KEW	ZV	iP	20	25	19				USCGS.	
11. ESK	Z'	eP	06	54	42.3				06 49 43; 39 $\frac{1}{2}$ °N., 21 $\frac{1}{2}$ °E. Greece. BCIS.	
11. ESK	Z'	ePn	11	49	25.5				$\Delta = 111$ km. Local.	
	Z'E'	iPg		49	26.3					
	N'	eS $\pi$		49	38.0					
	N'E'	eSg		49	39.7				M <sub>L</sub> = 1.6(ESK)	
	Z'N'E'	M		49	40 $\frac{1}{2}$	0.6	0.042	0.019	0.022	
		F		50	10					
13. ESK	Z'	iP	05	06	32.3	0.7	0.09	0.08	0.26 C. 04 57 57.7; 49.8°N.,	
	Z'	iPcP		08	04.8	1			0.10 78.1°E. h=0km. Kazakh SSR.	
									USCGS. Mag. M = 6.3(ESK).	
KEW	ZV	iP	05	06	36				C.	



## SEISMOLOGICAL BULLETIN

FEBRUARY 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS	
			h.	m.	s.		N	E	Z		
13. ESK	Z'	eP	10	56	35.4	1			0.05	$\Delta = 78.5^\circ = 8700\text{km.}$ $1^\circ 44' 41.0''; 26.1^\circ \text{N. } 103.2^\circ \text{E.}$ $h=33\text{km. Yunnan Province,}$ $\text{China. USCGS.}$ $M = 5.8(\text{ESK})$	
	NE	eS	11	06	28						
	NE	eL		21	-						
	ZE	M		33	$\frac{1}{2}$	18		4.3	3.9		
	N	M		34	-	20	5.4				
		F	12	05	-						
KEW	ZV	eP	10	56	39						
13. ESK	Z'	eP	19	19	29.2					$19 09 47.4; 29.8^\circ \text{N. } 69.7^\circ \text{E.}$ $h=33\text{km. West Pakistan.}$ $\text{USCGS.}$ $M = 4\frac{3}{4}(\text{ESK})$	
	E	M		45	$\frac{1}{2}$	22		0.7			
	N	M		46	-	22	0.6				
		F	20	00	-						
14. ESK	Z'	iP	18	03	47.5	1			0.05	$17 57 50.0; 35.0^\circ \text{N. } 27.2^\circ \text{E.}$ $h=46\text{km. Mediterranean Sea.}$ $\text{USCGS.}$	
KEW	ZV	iP	18	03	17						
14. ESK	Z'	eP	20	22	03.8					$20 17 01; 39.0^\circ \text{N. }, 21.9^\circ \text{E.}$ $h=73\text{km. Greece. USCGS.}$	
16. ESK	N	eSKKS	03	47	50					$03 18 27.2; 17.7^\circ \text{S. } 167.9^\circ \text{E.}$ $h=31\text{km. New Hebrides Is.}$ $\text{USCGS.}$  $\text{Mag. } M = 6.4(\text{ESK})$	
	E	eSS		59	30						
	E	eLQ	04	17	-						
	ZN	eLR		25	$\frac{1}{2}$						
	ZNE	M		37	$\frac{1}{2}$	23	13	6	16		
	ZNE	M		39	$\frac{1}{2}$	22	9	7	17		
		F	05	50	-						
KEW	ZV	ePKP	03	38	02						
17. ESK	Z'	eP	10	46	31.8					$10 41 27; 39.1^\circ \text{N. } 22.2^\circ \text{E.}$ $h=33\text{km. Greece. USCGS.}$	
17. ESK	LENZ	ePS	12	16	46					$11 48 00.8; 32.2^\circ \text{S. }, 78.9^\circ \text{E.}$ $h=33\text{km. Mid-Indian Rise.}$ $\text{USCGS.}$  $M = 6.1(\text{ESK})$	
	E	eSS		22	45						
	N	eLQ		34	-						
	ZE	eLR		42	-						
	ZNE	M		13	00	20	3.8	5.1	5.1		
		F		40	-						
18. ESK	Z'	eP	00	40	13.2					$00 27 53.6; 36.7^\circ \text{N. } 140.4^\circ \text{E.}$ $h=65\text{km. Near Honshu, Japan.}$ $\text{USCGS.}$	
18. ESK	NE	M	08	00	$\frac{1}{2}$	20	1.5	1.6		$06 59 05.0; 6.9^\circ \text{N. } 124.0^\circ \text{E.}$ $h=57\text{km. Mindanao, Philippine}$ $\text{Islands. USCGS.}$	
		F	-	-	-						
18. ESK	Z'	ePn	12	24	52.8					$\Delta = 109\text{km.}$  Local. $M_L = 1.5(\text{ESK})$	
	N'	eS*		25	04.9						
	Z'N'E'	eSg		25	06.7						
	Z'N'E'	M		25	07	$\frac{1}{2}$	0.6	0.029	0.019		0.016
		F		25	35						
18. ESK	Z'	ePg	12	28	55.0					$\Delta = 105 \text{ km.}$ Local. $M_L = 1.5(\text{ESK})$	
	E'	eSg		29	07.4						
	E'N'	M		29	08	$\frac{1}{2}$	0.6	0.021	0.024		
		F		29	30						
18. ESK	N'E'Z'	iPg	14	50	48.4					$\Delta = 52\text{km.}$ Local.  $M_L = 2.0(\text{ESK})$	
	N'E'Z'	e		50	49.4						
	N'Z'	eSg		50	54.7						
	N'E'	i		50	57.1						
	N'E'Z'	i		50	58.6						
	N'E'Z'	M		51	01	0.7	0.39	0.37	0.27		
		F		52	10						
18. ESK	Z'	eP	19	14	19.9					$19 02 51.5; 44.3^\circ \text{N. } 143.1^\circ \text{E.}$ $h=225\text{km. Hokkaido, Japan.}$ $\text{USCGS.}$	

**SEISMOLOGICAL BULLETIN**

**FEBRUARY 1966**

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
21. ESK	Z'	iP	14	31	25.3				13 18 47.0; 26.3°N. 125.7°E. h=103km. Near Taiwan. USCGS.	
22. ESK	Z'	ePKP	05	21	38.3	1			0.09	
	Z	ePP		23	37	22	3.3	2.1	5.2	
	E	eLQ		56	-					
	NE	M	06	16	-	23	23	17		
	Z	M		16 $\frac{1}{2}$	-	22			13	
	E	M		19 $\frac{1}{2}$	-	21		16		
	Z	M		20 $\frac{1}{2}$	-	21			23	
	N	M		21 $\frac{1}{2}$	-	21	17			
	F		07	45	-				M = 6.7(ESK)	
KEW	ZV	ePKP	05	21	43					
	ZV	i		21	45					
23. ESK	Z'E'	ePg	15	39	07.9					
	Z'N'E'	eSg		39	21.0					
	Z'N'E'	M		39	22	0.5	0.039	0.024	0.024	
		F		39	50					
									$\Delta$ = 108km. Local. M <sub>L</sub> = 1.7(ESK)	
24. ESK	Z'	iP	05	51	27.7	0.7			0.04	
										C. 05 40 06.8; 52.6°N. 172.5°E. h=65km. Near Is. USCGS.
24. ESK	Z'	eP	20	03	31.4					
										19 53 15.4; 60.1°N. 147.7°W. h=25km. Alaska. USCGS.
26. ESK	Z'	iP	00	45	13.5	0.8				
										0.06
										C. 00 33 50.1; 52.4°N., 173.6°E. h = 51km. Near Islands. USCGS.
26. ESK	Z'E'	iPn	10	54	07.1					
	Z'E'	iPg		54	08.0	0.3		0.049	0.056	
	Z'N'	eS*		54	19.8					
	N'	eSg		54	21.3					
	E'N'Z'	M		54	22 $\frac{1}{2}$	0.6	0.055	0.029	0.027	
		F		55	00					
									$\Delta$ = 113km. Local. M <sub>L</sub> = 1.8(ESK)	
27. ESK	Z'	iP	16	41	43.2	0.8				
										0.03
										16 30 17.9; 52.1°N. 175.1°E. h=52km. Rat Is. USCGS.
28. ESK	Z'	iP	02	13	39.4	0.9				
										0.07
										02 02 13.6; 43.7°N. 139.6°E. h=225km. Sea of Japan. D. USCGS.
KEW	ZV	iP	02	13	54.5					
28. ESK	Z'	eP	13	48	21.0					
	E	M	14	27 $\frac{1}{2}$	-	22		0.8		
	N	M		28	-	22	1.2			
	ZN	M		33 $\frac{1}{2}$	-	16	2.2		1.4	
		F		45	-					
									13 35 39.0; 29.2°N., 130.1°E. h = 33km. Ryukyu Islands. USCGS. M = 5 $\frac{1}{4}$ (ESK).	

## METEOROLOGICAL OFFICE, UNITED KINGDOM

## SEISMOLOGICAL BULLETIN FOR MARCH 19 66

## 1. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESSHIRE, SCOTLAND

Lat. 55° 19' 00" N., Long. 3° 12' 18" W. Height above M.S.L. 263m.

Foundation: Llandovery Shales, folded (late Silurian).

Instruments: World-wide standardised seismograms (USCGS).

- (i) Long-Period SPRENGNETHER  
(ii) Short-Period BENIOFF

## CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	V
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHER N E WWSS Z		15	100		} 750 at 15 sec.
		15	100		
		15	100		
BENIOFF N' E' WWSS Z'		1.0	0.75		} 12500 at 1 sec.
		1.0	0.75		
		1.0	0.75		

## 2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

Lat. 51° 28' 6" N., Long. 0° 18' 47" W, Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.

Instruments: Kew-type vertical seismograph, period 1.5 sec.  
Direct optical registration (ZV).

Notations: For phases the generally adopted notations are used.  
In addition the following symbols are in use:

C = Compression

D = Dilation

Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.

$\Delta$  = Epicentral distance

h = Depth of hypocenter

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
2. ESK	Z'	eP	02	43	43.9	1.0			0.04	02 37 02.3; 43.0°N. 45.8°E. h = 24km. Caucasus. USCGS. M = 4 $\frac{3}{4}$ (ESK).
	NE	M		59	-	18	1.5	1.1		
	Z	M	03	01 $\frac{1}{2}$	-	13			2.1	
		F		10	-					
KEW	ZV	eP	02	43	30.5					
2. ESK	Z'	iP	12	02	45.6	0.8			0.04	C. 11 51 20.7; 52.4°N., 172.3°E. h=40km. Near Is. USCGS.
3. ESK	Z'	eP	03	37	06.4	0.7			0.12	C. 03 25 28.0; 48.3°N., 154.3°E. h=45km. Kurile Islands. USCGS. Mag. M = 5.5(ESK)
	Z'	i		37	07.1					
	E	eL		57	-					
	ZNE	M	04	11 $\frac{1}{2}$	-	20	1.4	1.5	1.8	
		F		35	-					
KEW	ZV	eP	03	37	25					
4. ESK	Z'	eP	13	22	48.8					$\Delta$ = 109km.
	Z'E'	iPg		22	49.7	0.3		0.04	0.04	Local (rock burst ?)
	N'	e		23	02.8					
	Z'N'E'	eSg		23	03.5					
	ZNE'	M		23	04	0.6	0.037	0.024	0.027	M <sub>L</sub> = 1.4
		F		23	30					

## SEISMOLOGICAL BULLETIN

MARCH 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
4. ESK	NE	eL	25	17	-					23 58 55.9; 38.8°S, 177.9°E.
	ZE	M		37	-	18		1.3	1.8	h=27km. New Zealand.
	N	M		37	-	20	1.3			USCGS.
		F	26	15	-					M = 5 $\frac{3}{4}$ (ESK)
5. KEW	ZV	ePKP	16	04	42					15 45 05; 17.6°S, 176.2°E.
										h=33km. Fiji Is. USCGS.
5. ESK	Z'	eP	21	04	27.1					$\Delta = 57.4^\circ = 6380\text{km.}$
	N	eS		12	20					20 54 45.7; 0.0, 18.0°W.
	E	eLQ		18	-					h=33km. North of Ascension
	ZNE	M		26	-	16	1.0	1.0	1.0	Is. USCGS.
		F		45	-					M=5(ESK).
6. ESK	Z'	eP	02	21	10.3					02 10 56.8; 31.6°N, 80.5°E.
										h=35km. Tibet. USCGS.
KEW	ZV	eP	02	21	06					
6. ESK	Z, Z'	eP	02	26	09.0	12			2.8	$\Delta = 63.0^\circ = 7000\text{km.}$
	Z'	ePcP		26	58.7	1.3			0.29	PZ' = 1.1sec. 0.10 $\mu$
	NE	eS		34	35	20	8.6	10.3		
	NE	eSS		38	25					
	N	eLQ		43	-					02 15 56.7; 31.6°N, 80.5°E.
	ZE	eLR		46	-					h=44km. Tibet. USCGS.
	N	M		50 $\frac{1}{2}$	-	21	185			
	E	M		50 $\frac{1}{2}$	-	20		65		M = 6.1 (body waves)
	Z	M		54 $\frac{1}{2}$	-	20			55	M = 7.1 (surface waves)
		F	04	25	-					
KEW	ZV	eP	02	26	04.5					
6. ESK	Z'	ePKP <sub>2</sub>	18	21	34.0					18 01 50.0; 24.1°S., 176.9°W
	ZNE	M		19	23 $\frac{1}{2}$	20	1.0	0.9	1.5	h=33km. South of Fiji Is.
		F		20	15	-				M = 5(ESK). USCGS.
7. ESK	Z'	iP	01	22	49.8	0.9			0.04	C. $\Delta = 33.9^\circ = 3770\text{km.}$
	NE	eS		28	14	20	1.1	2.3		01 16 05.8; 39.1°N., 41.7°E.
	N	eLQ		30 $\frac{1}{2}$	-					h=13km. Turkey. 15 dead,
	NE	M		37 $\frac{1}{2}$	-	21	10.6	7.0		many injured and major
	ZNE	M		40	-	18	5.5	7.4	11.3	property damage. USCGS.
		F	02	10	-					M = 5.3(ESK).
KEW	ZV	eP	01	22	30.5					
7. ESK	Z'	ePKP	02	53	58.5					02 35 28; 20.5°S., 178.4°W.
										h=601km. Fiji Is. USCGS.
7. ESK	Z, Z'	eP	21	40	49.4	1.6			0.16	$\Delta = 74.0^\circ = 8220\text{km.}$
	NZ	eS		50	18	22	6.7		3.7	
	NZ	eSS		55	11					21 29 17.0; 37.2°N, 114.8°E
	ZN	eLR	22	04	-					h=33km. Northeastern
	N	M		09 $\frac{1}{2}$	-	23	62			China. Moderate to heavy
	E	M		10 $\frac{1}{2}$	-	21		81		damage and injuries.
	N	M		14	-	16	80			USCGS.
	Z	M		17	-	15			55	
		F	24	20	-					M=7.0 (surface waves)
KEW	ZV	eP	21	40	57					
8. ESK	Z	ePP	01	35	50					
	Z'	ePKS		36	42.1					
	E	eLQ	02	12	-					01 13 42.3; 13.9°S, 166.6°E.
	NZ	eLR		19	-					h=37km. New Hebrides Is.
	N	M		32	-	22	2.0			USCGS.
	E	M		32 $\frac{1}{2}$	-	22		2.4		
	Z	M		33 $\frac{1}{2}$	-	22			3.7	
		F	03	30	-					Mag. M = 6(ESK)

SEISMOLOGICAL BULLETIN

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS	
			h.	m.	s.		N	E	Z		
8. ESK	ZE	ePS	06	09	24					05 41 04.5; 1.9°N. 126.4°E. h=33km. Molucca Passage. M=6.2(ESK)	
	N	M		43	-	26	10.0				
	E	M		43 $\frac{1}{2}$	-	26		8.4			
	Z	M		43 $\frac{1}{2}$	-	28			8.9		
	ZNE	M		52 $\frac{1}{2}$	-	20	4.5	3.9	7.2		
		F	07	20	-						
8. ESK	Z'	eP	18	56	51.7					18 51 47.2; 38.9°N. 21.3°E. h = 48km Greece. USCGS.	
8. ESK	Z'	eP	20	59	13.6					20 46 12.0; 20.0°S. 68.9°W. h=122km. Chile-Bolivia border. USCGS.	
KEW	ZV	eP	20	59	12						
10. ESK	Z'	eP	04	38	21.8					04 26 19.6; 32.2°N., 137.5°E. h=382km. South of Honshu. USCGS.	
10. ESK	Z'E'	ePg	16	29	01.9					$\Delta = 31$ km.	
	Z'	e		29	03.0						
	Z'N'E'	eSg		29	05.0					Local.	
	Z'N'E'	M		29	05 $\frac{1}{2}$	0.7	0.052	0.029	0.032	$M_L = 0.5$	
		F		29	20						
11. ESK	Z'	eP	20	07	37.0					20 01 43.8; 34.4°N. 24.4°E. h = 22km. Crete. USCGS.	
KEW	ZV	iP	20	07	04						
12. ESK	Z,Z'	iP	16	44	07.6	1.8	0.35	0.47	1.80	C. $\Delta = 90.5^\circ = 10050$ km.	
	Z'	i		44	08.6					pPZ = 17sec. 90 $\mu$	
	Z,Z'	ipP(?)		44	17.5	1.1	0.49	0.36	1.30	pPH = 17 " 30 $\mu$	
	ZE	iSKS		54	39					PPZ = 18 " 72 $\mu$	
	NE	iS		54	58	20	185	110		PPH = 18 " 51 $\mu$	
	ZNE	M		17	28	-	22	560	450	375	16 31 21.8; 24.1°N. 122.6°E.
		F		21	30	-					
KEW	ZV	iP	16	44	14.0					h=63km. Taiwan region.	
	ZV	ipP		44	23.0					7 killed, several injured and major property damage.	
	ZV	iPP		47	48					USCGS.	
	ZV	eSKS		54	51						
	ZV	eS		55	09						
	ZV	M		17	25 $\frac{1}{2}$	-	24		650	M = 8.3)	
	ZV	M			28 $\frac{1}{2}$	-	20		420	m = 7.7) (ESK)	
	M			30 $\frac{1}{2}$	-	16		320			
13. ESK	Z'	ePKP <sub>2</sub>	18	18	21.7					17 58 36; 55.0°S., 126.4°W. h=33km. Easter Island. USCGS.	
13. ESK	Z'	ePKP	19	00	11.2					18 40 40.7; 20.9°S. 175.4°W. h=65km. Tonga Islands. USCGS.	
13. ESK	Z'	eP	19	40	59.8					19 35 51.5; 38.9°N., 21.6°E. h=11km. Greece. USCGS.	
14. ESK	Z'	eP	04	53	57.3					04 42 50; 32.4°N., 97.4°E. h=33km. Tibet. USCGS.	
14. ESK	Z'E'	eP*	20	31	38.9					$\Delta = 150$ km.	
	Z'N'E'	ePn		31	39.4						
	Z'N'E'	iPg		31	40.2	0.4	0.029	0.075	0.076	Local. (Explosion ?)	
	Z'N'	e		31	56.3						
	N'E'	iSg		31	58.0	0.5	0.050	0.016	0.027		
	N'	e		31	59.5						
	Z'N'E'	M		32	03	0.6	0.061	0.049	0.049	$M_L = 1.9$	
	F		33	25							

SEISMOLOGICAL BULLETIN

MARCH, 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS	
			h.	m.	s.		N	E	Z		
14. ESK	Z'E'	eP <del>x</del>	20	34	04.0				$\Delta = 150\text{km.}$ Local. (Explosion?) $M_L = 1.9$		
	Z'N'E'	ePn		34	04.8						
	Z'E'	iPg <sup>2A</sup>		34	05.3	0.4	0.026	0.075		0.083	
	N'E'	eSg		34	23.0	0.4	0.061	0.023		0.033	
	ZNE	M		34	26 $\frac{1}{2}$	0.5	0.079	0.043		0.041	
		F		36	00						
15. ESK	Z'	eP	11	26	45.8				11 14 00.9; 24.2°N., 122.7°E. h=65km. Taiwan region. USCGS.		
15. ESK	NE	eL	24	15	-				23 31 46.1; 24.4°N., 122.7°E. h = 22km. Taiwan region. USCGS. $M = 5\frac{1}{4}$ (ESK)		
	E	M		28	-	19	1.0				
	NZ	M		29	-	18	1.3	0.9			
		F		45	-						
16. ESK	Z'	ePKP	12	32	32.8				12 13 02.4; 21.2°S.174.3°W h=66km. Tonga Islands.		
	KEW	ZV		12	32	44.5					
16. ESK	NE	eL	21	29	-				20 3823.5; 9.5°N.,121.9°E. h=24km. Sulu Sea. USCGS. $M = 5\frac{1}{4}$ (ESK).		
	ZNE	M		44 $\frac{1}{2}$	-	17	0.9	0.7		1.0	
		F		22	05	-					
17. ESK	Z'	iPKP <sub>1</sub>	16	09	00.5				D. Depth = 644km. 15 50 32.2;21.1°S.179.2°W. h=626km. Fiji Is. USCGS. $M = 6$ (ESK) Depth = 623km.		
	Z'	i		09	02.4						
	Z,Z'	iPKP <sub>2</sub>		09	03.4	1.0		1.8			
	Z	epPKP <sub>2</sub>		11	30						
	ZN	ePP		12	20	17	1.7	4.3			
	Z'	eSKP		12	26.5						
	Z'	esPKP		12	34.2						
	Z'	ePKS		12	42.7						
	ZN	eSKS		15	39						
	KEW	ZV	iPKP <sub>1</sub>	16	09	07.5					
	ZV	iPKP <sub>2</sub>		09	13						
	ZV	ipPKP <sub>2</sub>		11	37						
18. ESK	Z'	eP	18	21	22.1				18 11 09;60.3°N.146.6°W. h=34km. Alaska. USCGS.		
18. ESK	Z'	iP	21	05	46.5				20 46 19.4;20.7°S.169.7°E. h=78km.New Hebrides.USCGS.		
19. ESK	Z'	eP	08	23	42.9				08 11 40;43.3°N.145.8°E. h=11km. Hokkaido,Japan. USCGS.		
19. ESK	ZN	eL	18	09	-				17 16 40.9;52.7°S,19.9°E. h=33km.Southwest of Africa. $M=5\frac{3}{4}$ -6(ESK) USCGS.		
	ZNE	M		17	-	22	2.6	2.4		3.3	
		F		45	-						
20. ESK	ZV	eP <del>x</del>	00	09	10				00 08 14; 50.5°N,4.2°E. Belgium. BCIS.		
20. ESK	Z,Z'	iP	01	53	01.1	18	4.4	5.4	15.6	$\Delta = 60.9^\circ = 6770\text{km.}$ $PZ' = 1.3 \text{ sec. } 0.26\mu$ $PPZ = 24 \text{ sec. } 4.7\mu$ $PPH = 24 \text{ " } 4.6\mu$ 01 42 49.9;0.6°N.,30.2°E. h=36km. Uganda. More than 100 dead. Extensive damage. USCGS.	
	NE	eS		02	01	15	28	31	52		
	NE	eLQ		08	-						
	E	M		14	-	28		180			
	N	M		14 $\frac{1}{2}$	-	29	170				
	E	M		16 $\frac{1}{2}$	-	22		176			
	N	M		18	-	20	120				
	Z	M		21	-	15			177		
	KEW	ZV	iP	01	52	32.5					$M=6.8$ (ESK)
		ZV	ePcP		53	20					
	ZV	ePP		54	46						

## SEISMOLOGICAL BULLETIN

MARCH

19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
20. ESK	Z'	iP	05	58	32.5	0.7	0.06	0.06	0.22	C. 05 50 00; 50.0°N, 78.0°E. h=0km. Kazakh S.S.R. BCIS
KEW	ZV	iP	05	58	36.5	1			0.27	M = 6.2 (ESK); 6.2 (KEW).
20. KEW	ZV	iPKP	08	07	15.5					07 47 50.2; 17.0°S, 174.3°W. h=117km. Tonga Is. USCGS.
20. ESK	Z'	iPKP	09	23	59.8					09 04 31.8; 21.0°S., 174.5°W h=95km. Tonga Is. USCGS.
KEW	ZV	ePKP <sub>2</sub>	09	24	10					
20. ESK	Z'	eP	21	50	50.5	1			0.03	21 50 00; 71.8°N., 2.5°W. h=33km. Jan Mayen Island region. USCGS.
20. ESK	Z'	eP	22	32	34.3					22 28 49.9; 71.2°N, 5.8°W. h=33km. Jan Mayen Island region. USCGS.
22. ESK	Z'	eP	08	23	09.8					08 11 33.7; 37.5°N, 115.0°E h=11km. China. USCGS.
22. ESK	Z'	eP	08	31	07.1	16	1.4	1.9	5.5	C. $\Delta = 74.2^\circ = 8240\text{km}$ . PZ' = 1.1sec. 0.12 $\mu$
	NE	eS		40	37	19	21	11		
	NE	eSS		45	19					
	NE	eLQ		49 $\frac{1}{2}$	-					
	N	M	09	00	-	23	182			08 19 33.8; 37.5°N, 115.1°E. h=33km. Northeastern China USCGS.
	E	M		00 $\frac{1}{2}$	-	22		194		
	Z	M		05	-	16			110	
		F	11	40	-					M = 6.8 (ESK)
KEW	ZV	eP	08	31	15.5					
23. ESK	Z'	eP	00	17	23.7	10			2.4	$\Delta = 88.9^\circ = 9900\text{km}$ . PZ' = 1.0 sec. 0.16 $\mu$
	NE	eS		28	07	16	1.4	2.7		
	NE	eL		42	-					00 04 34.7; 23.8°N, 122.8°E. h=51km. Taiwan region. M=6.3 (ESK). USCGS.
	ZNE	M		53 $\frac{1}{2}$	-	23	16	19	6	
		F	01	40	-					
24. ESK	Z'	iP	04	24	12.3					04 04 55.5; 21.5°S., 176.4°W. h=191km. Fiji Islands. USCGS.
24. ESK	Z;N'	ePn	12	24	46.2					$\Delta = 146\text{km}$ .
	Z;N'	ePg		24	48.6					
	E'	eSn		25	03.7					
	Z;N'E'	eSg		05	05.7					Local. (Rockburst?)
	Z;N'E'	M		25	10 $\frac{1}{2}$	0.3	0.10	0.11	0.05	ML = 2.1
		F		25	35					
26. ESK	Z'	iP	15	30	35.0					C. $\Delta = 74.0^\circ = 8200\text{km}$ .
	N	eS		40	04					
	ZN	eL		54	-					15 18 03.2; 37.6°N, 115.2°E h=33km. China. USCGS.
	NE	M		59 $\frac{1}{2}$	-	24	13	13		
	NZ	M	16	03 $\frac{1}{2}$	-	16	14		12	M = 6.2 (ESK)
		F		40	-					
26. ESK	N	eL	18	50	-					18 14 23; 37.7°N, 114.9°E. h=33km. China. USCGS.
	NE	M		55	-	24	3.4	3.2		
	NZ	M		59	-	16	2.9		3.4	M = 5.7 (ESK)
		F	19	15	-					
27. ESK	Z'	iP	19	05	32.8					D. 18 53 41.3; 8.9°N, 83.4°W h=40km. Costa Rica. USCGS.
KEW	ZV	iP	19	05	41.5					D.
28. ESK	Z'	iP	15	42	00.2	1.6			0.23	15 29 18.4; 3.9°S, 80.9°W. h=19km. Peru-Ecuador border. USCGS.
KEW	ZV	eP	15	42	04.5					

## SEISMOLOGICAL BULLETIN

MARCH 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
28. ESK	Z'	iP	17	55	26.3	1.3			0.13	D. 17 42 47.6; 4.0°S. 80.8°W h=52km. Peru-Ecuador border. USCGS. D.
KEW	ZV	iP	17	55	31.0					
29. ESK	NE	eSKS	02	41	23					02 17 38.5; 23.7°N. 142.1°E.
	E	eL	03	01	-					h=79km. Volcano Islands.
	ZNE	M	03	10 $\frac{1}{2}$	-	30	3.0	2.0	3.0	region. USCGS.
		F	03	35	-					M = 5 $\frac{3}{4}$ (ESK)
29. ESK	NE	eL	06	47	-					06 12 00.4; 37.4°N. 114.9°E.
	NE	M		52 $\frac{1}{2}$	-	24	4.2	4.1		h=34km. China. USCGS.
	NZ	M		56 $\frac{1}{2}$	-	16	4.3		2.9	
		F	07	20	-					M = 5.8(ESK)
30. ESK	N	eL	04	45	-					04 18 38.1; 21.8°N. 62.2°E.
	ZNE	M		57	-	22	1.3	1.2	1.2	h=33km. Arabian Sea. USCGS.
		F	05	10	-					M=5-5 $\frac{1}{4}$ (ESK)
30. ESK	NE	eS	12	59	41	10	1.0	0.8		12 40 01.0; 49.8°N. 129.7°W.
	E	eL	13	09	-					h=33km. Vancouver Island
	ZNE	M		19	-	18	3.4	5.1	7.1	region. USCGS.
		F	14	00	-					M = 5.7(ESK).
31. ESK	Z'	iP	23	46	51.7	1.0			0.04	C. 23 38 00.5; 36.4°N., 70.8°E. h=200km.
KEW	ZV	iP	23	46	45					Hindu Kush region. USCGS.



METEOROLOGICAL OFFICE, UNITED KINGDOM

SEISMOLOGICAL BULLETIN FOR APRIL 19 66

I. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESSHIRE, SCOTLAND

Lat. 55° 19' 00" N., Long. 3° 12' 18" W. Height above M.S.L. 263m.

Foundation: Llandoverly Shales, folded (late Silurian).  
Instruments: World-wide standardised seismograms (USCGS).

- (i) Long-Period SPRENGNETHER
- (ii) Short-Period BENIOFF

CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	v
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHER N E WSS Z		15	100		} 750 at 15 sec.
		15	100		
		15	100		
BENIOFF N' E' WSS Z'		1.0	0.75		} 12500 at 1 sec.
		1.0	0.75		
		1.0	0.75		

2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

Lat. 51° 28' 6" N., Long. 0° 18' 47" W, Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.  
Instruments: Kew-type vertical seismograph, period 1.5 sec.  
Direct optical registration (ZV).

Notations: For phases the generally adopted notations are used.  
In addition the following symbols are in use:

- C = Compression
- D = Dilation
- Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.
- $\Delta$  = Epicentral distance
- h = Depth of hypocenter

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
1. ESK	Z'	iP	03	02	33.1				02 51 08.2; 51.7°N. 176.4°E h=73km. Rat Is. USCGS.	
1. ESK	E ZNE	eL	04	18	-	18	1.5	0.9	2.1	03 33 28.9; 53.5°S., 3.1°W h=33km. South Atlantic Ridge. USCGS. M = 5½(ESK)
		M F	05	38	-					
3. ESK	Z' ZNE	iP	04	56	02.3	1	0.8	0.5	0.04	C. 04 43 41.1; 36.7°N., 140.8°E. h=68km. Near coast of Honshu, Japan. USCGS.
		M F	05	36½	-					
KEW	ZV	iP	04	56	15.5					
3. ESK	E E	eL	05	21½	-	14		0.9		05 11 39; 36.2°N., 2.9°E. h = 33km. Algeria. USCGS.
		M F	05	22½	-					
3. ESK	Z' E E ZNE	eP	11	41	32.8	20	1.5	1.5	2.0	$\Delta$ = 23.4° = 2600km. 11 36 24.8; 39.0°N. 21.5°E. h=25km. Greece. USCGS. M=4½(ESK)
		eS	11	45	40					
		eL	11	48	-					
		M F	12	52	-					

## SEISMOLOGICAL BULLETIN

APRIL 1966

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
4. ESK	Z'	eP	06	54	41.0				$\Delta = 83.3^\circ = 9250\text{km.}$ 06 42 13.9; 12.1°N.92.7°E. h=33km. Andaman Islands. M=5 $\frac{1}{2}$ (ESK). USCGS.	
	N	eS	07	04	58	20	1.5			
	NE	M		30 $\frac{1}{2}$	-	21	2.7	2.0		
		F	08	00	-					
4. ESK	Z'	iP	20	01	47.7	0.8			0.03	C. 19 50 07.6; 13.8°N., 89.7°W. h=108km. El Salvador. USCGS.
5. ESK	Z'	iP	05	09	33.4	0.7			0.02	C. 04 57 37; 44.0°N.147.7°E h=33km. Kurile Is. USCGS.
5. ESK	Z'	ePg	14	11	57.9					$\Delta = 112\text{km.}$ Local (Rockburst?)  M <sub>L</sub> = 1.6
	Z'N'E'	eSg		12	11.1					
	Z'N'E'	M		12	12 $\frac{1}{2}$	0.7	0.038	0.027	0.030	
		F		12	35					
5. ESK	Z'	e(Pn)	15	16	54.3					$\Delta = 114\text{km.}$ Local. M <sub>L</sub> = 1.8
	Z'	iPg		16	55.2	0.4			0.027	
	E'N'	iSg		17	08.8					
	Z'N'E'	M		17	10	0.6	0.054	0.030	0.027	
		F		17	35					
6. ESK	N	eLQ	03	54 $\frac{1}{2}$	-					02 59 01.7; 45.8°S., 96.1°E. h=33km. Southeast Indian Rise. USCGS. M = 6-6 $\frac{1}{4}$ (ESK)
	ZNE	M	04	19 $\frac{1}{2}$	-	20	3.5	3.5	5.5	
		F	05	15	-					
6. ESK	Z'	e	13	40	51.4					$\Delta = 186\text{km.}$  Double explosion?  M <sub>L</sub> = 2.4
	Z'E'	iPg <sub>1</sub>		40	52.4	0.4		0.043	0.063	
	Z'N'E'	iPg <sub>2</sub>		40	55.7	0.4		0.095	0.123	
	N'	eS <del>x</del>		41	12.6					
	Z'	i		41	13.2					
	N'	iSg		41	14.3					
	ZNE'	M		41	16	0.5	0.059	0.046	0.055	
	NE'	M		41	20	0.5	0.075	0.051		
	F		42	30						
6. ESK	Z'	iP	22	39	23.6	0.9			0.03	22 28 38.7; 56.6°N.154.5°W. h=33km. Kodiak Island. USCGS.
7. ESK	Z'	eP	03	30	58.9	0.6			0.02	03 25 46.3; 37.8°N.21.1°E. h=36km. Greece. USCGS.
KEW	ZV	eP	03	30	23					
7. ESK	Z'	eP	09	55	21.7					09 42 32.1; 26.1°N.127.4°E. h=46km. Ryukyu Is. USCGS.
7. ESK	Z'	eP	18	42	05.1					19 38 59; 44.2°N., 7.4°E. Piemont, Italy. BCIS.
8. ESK	Z, Z'	iP	01	58	09.2	2.5			1.4	C. $\Delta = 72.2^\circ = 8020\text{km.}$
	Z, Z'	i		58	32.8					
	ZN	eS	02	07	26					01 46 44.9; 51.2°N.157.7°E. h=47km. Near coast of Kamchatka. USCGS.
	E	e		07	46					
	E	eLQ		17 $\frac{1}{2}$	-					
	ZN	eLR		21	-					
	ZNE	M		28	-	21	7.0	5.2	7.2	M = 6.1(ESK)
	F		03	35	-					
KEW	ZV	iP	01	58	28.5					C.
	ZV	i		58	35.0					
	ZV	i		58	52.5					
8. ESK	Z'	eP	05	36	08.9					05 24 44.6; 51.2°N.157.8°E. h=48km. Near Kamchatka. USCGS.
KEW	ZV	eP	05	36	28.5					

## SEISMOLOGICAL BULLETIN

APRIL 1966

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
8. ESK	Z'	iP	05	56	46.3	0.8			0.36	C. $\Delta = 17.8^\circ = 1980$ km. 05 52 40.4; 52.7°N., 33.2°W. h=33km. North Atlantic Ocean. USCGS. Mag. M = 4.8(ESK).
	N	eS	06	00	01	20	3.9			
	ZNE	M	02 $\frac{1}{2}$	-		14	4.4	2.1	2.2	
		F	35	-						
KEW	ZV	eP	05	57	13.5					
9. ESK	Z'	iP	02	46	13.8	0.8			0.06	C. 02 34 23.0; 9.4°N., 84.2°W. h=40km. Costa Rica C. USCGS.
	KEW	ZV	iP	02	46	24				
9. ESK	Z'	iP	02	54	00.2	0.9			0.20	02 42 08.7; 9.6°N., 84.1°W. h=30km. Costa Rica. USCGS. M=5.6(ESK)
	ZE	eLR	03	18	-					
	ZNE	M	28	-		20	0.8	1.5	2.3	
		F	55	-						
KEW	ZV	eP	02	54	10					
9. ESK	NE	eL	20	40	-					20 08 39; 56.7°N. 152.0°W. h=33km. Kodiak Island. M=5-5 $\frac{1}{4}$ (ESK). USCGS.
	NE	M	50	-		18	1.3	1.2		
		F	21	05	-					
10. ESK	Z'	iP	10	51	13.8	0.7			0.03	C. 10 39 51.0; 53.1°N., 171.0°E. h=20km. Aleutian Is. USCGS.
10. ESK	N	eL	17	20 $\frac{1}{2}$	-					16 36 14.6; 31.5°S. 71.2°W. h=64km. Near coast of Chile. USCGS. M = 5 $\frac{3}{4}$ (ESK)
	ZNE	M	34	-		22	2.0	1.7	2.7	
		F	50	-						
11. ESK	Z'	iP	16	17	07.5	0.9			0.03	16 05 41.6; 52.5°N. 173.0°E. h=29km. Aleutian Is. USCGS.
11. ESK	EN	M	17	15 $\frac{1}{2}$	-	17	0.7	1.2		16 42 53.5; 38.8°N. 70.6°E. h=29km. Afganistan-USSR M=4 $\frac{3}{4}$ (ESK). border.
	Z	M	16	-		15		1.4		
		F	25	-						
KEW	ZV	eP	16	51	45.5					
11. ESK	Z'	iP	17	29	39.3	1.3			0.26	17 17 33.8; 18.4°N. 102.3°W. h=72km. Mexico. USCGS. M = 5 $\frac{1}{4}$ (ESK).
	ZNE	M	18	08	-	18	0.5	1.0	1.5	
		F	25	-						
KEW	ZV	eP	17	29	54.0					
	ZV	e	30	05.5						
11. ESK	Z'	eP	23	11	06.2					$\Delta = 66.5^\circ = 7390$ km. 23 00 24.0; 56.6°N., 152.0°W. h=33km. Kodiak Island region. USCGS. M = 5 $\frac{1}{2}$ -5 $\frac{3}{4}$ (ESK).
	NE	eS	19	53						
	E	eL	31	-						
	ZNE	M	42	-	18	4.1	2.4	3.0		
		F	24	25	-					
12. KEW	ZV	iPKP	23	35	05					23 15 29.6; 17.9°S. 168.0°E h=30km. New Hebrides. USCGS.
12. ESK	Z	ePP	23	56	44	20	0.8	0.9	2.1	23 37 42.1; 38.1°S., 73.0°W h=44km. Central Chile. USCGS. M = 6.4(ESK)
	NE	ePS	24	06	16					
	Z	eLR	30	-						
	NE	M	41	-	20	12	14			
	ZNE	M	43 $\frac{1}{2}$	-	19	10	15	25		
		F	26	20	-					

SEISMOLOGICAL BULLETIN

APRIL 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
13. ESK	Z	ePP	03	54	22					03 35 16.3; 38.2°S. 73.2°W. h=40km. Near coast of Chile. USCGS.  Mag. M = 5.9(ESK)
	Z	eLR	04	27 $\frac{1}{2}$	-					
	NE	M		38 $\frac{1}{2}$	-	20	2.1	2.7		
	ZNE	M		41	-	19	1.8	3.0	4.6	
		F	05	25	-					
13. ESK	Z'	iPKP	04	46	38.6	1			0.07	04 27 54.8; 23.6°S. 179.9°W. h=550km. South of Fiji Is. USCGS.
14. ESK	Z'	eP	18	57	37.3					18 51 46; 34.5°N., 24.0°E. h=33km. Crete. USCGS.
14. ESK	Z'	eP	21	15	12.3					21 06 17.4; 38.9°N., 70.6°E. h=33km. Afganistan-USSR border. USCGS.
16. ESK	Z'	iP	01	37	57.1	1.3			0.12	C. $\Delta$ = 65.9° = 7320km.
	NE	eS		46	40	20	3.1	4.4		
	NE	eLR		58	-					
	E	M	02	03	-	26		8.5		01 27 15.3; 57.0°N. 153.6°W. h=33km. Kodiak Island region. USCGS.
	NZ	M		03 $\frac{1}{2}$	-	25	12.0		11.6	
	NZ	M		07	-	20	8.6		13.5	
	E	M		07 $\frac{1}{2}$	-			8.1		M = 5.9(ESK)
	F	03	10	-						
KEW	ZV	iP	01	37	23					
16. ESK	Z'E'	iP*	08	17	05.8					C. $\Delta$ = 161km.
	Z'E'	iPg		17	08.5					
	N'E'	eSg		17	26.1					Local. (Explosion?)
	ZNE	M		17	32	0.6	0.106	0.055	0.055	M <sub>L</sub> = 2.4
	F		18	40						
16. ESK	Z'	eP	11	25	15.8					11 32 01.1; 19.0°N. 70.4°W. h=46km. Dominican Republic. USCGS.
16. ESK	Z'	iPKP	15	42	10.7	0.9			0.08	15 23 29.3; 21.1°S. 178.6°W. h=511km. Fiji Islands region. USCGS.
	Z'	e		42	27.8					
KEW	ZV	iPKP <sub>2</sub>	15	42	21.5					
18. ESK	Z'	eP*	20	29	55.1					$\Delta$ = 144km.
	Z'E'	iPg		29	55.8	0.6	0.030	0.033		Local. (Explosion?)
	N'	iS*		30	11.8					
	Z'	iSg		30	12.6					
	F		30	45						
18. ESK	Z'	eP*	21	01	35.7					$\Delta$ = 145km.
	Z'E'	iPg		01	36.6	0.5	0.030	0.030		Local. (Explosion?)
	N'Z'	iS*		01	53.1					
	Z'N'E'	iSg		01	53.8					
	Z'N'E'	M		01	56	0.6	0.034	0.013	0.036	M <sub>L</sub> = 1.7
		F		02	40					
19. ESK	Z'E'	eP*	15	59	36.5					$\Delta$ = 110km.
	Z'E'	iPg		59	37.9	0.4	0.037	0.040		Local.
	Z'N'E'	eS*		59	49.3					
	Z'N'	iSg		59	51.0					
	Z'N'E'	M		59	52	0.6	0.080	0.044	0.055	M <sub>L</sub> = 1.9
	F		16	00	35					
20. ESK	NE	M	03	33	-	22	0.8	0.9		02 32 49.7; 18.8°N. 147.0°E. h=12km. Mariana Islands. M = 5 $\frac{1}{4}$ (ESK)
		F	04	00	-					
20. ESK	NE	M	07	00 $\frac{1}{2}$	-	22	0.8	0.9		06 00 39.4; 18.9°N. 146.8°E. h=33km. Mariana Is. USCGS.
	Z	M		03 $\frac{1}{2}$	-	21			0.8	
		F		35	-					M = 5 $\frac{1}{4}$ (ESK)

**SEISMOLOGICAL BULLETIN**

APRIL 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
20. ESK	Z'E'	iPg	11	19	29.2	0.7	0.19	0.18	0.20	$\Delta = 8\text{km.}$ Local. $M_L = 0.0$
	Z'E'	i	19	30.0						
	N'	iSg	19	31.5						
	N'E'	i	19	32.8						
	Z'N'E'	M F	19 20	33 $\frac{1}{2}$ 10 $\frac{1}{2}$						
20. ESK	NE	M	15	12	-	22	0.7	0.6		14 01 26.7; 18.8°N. 146.9°E. h=28km. Mariana Islands. M = 5(ESK). USCGS.
		F	30	-	-					
20. ESK	Z',Z	eP	16	46	02.5	23	7.0	6.9	7.1	16 42 03.7; 41.7°N. 48.2°E. h=19km. Caucasus. USCGS. $M = 5\frac{1}{2}$ (ESK)
	Z'	i	46	19.1						
	N	eL	58 $\frac{1}{2}$	-						
	ZNE	M F	17 18	05 00	-					
21. ESK	Z'	iP	04	06	32.2	0.8			0.04	03 57 58.0; 49.8°N. 78.0°E. h=0km. Eastern Kazakh SSR. USCGS.
	KEW	ZV	04	06	36					
21. ESK	Z'	eP	06	51	21.9					06 45 29; 34.8°N., 26.0°E. h=52km. Crete. USCGS.
21. ESK	N'Z'	iPg	15	55	45.5	0.4	0.048	0.042	0.055	$\Delta = 148\text{ km.}$ Local. (rockburst?) $M_L = 2.2$
	N'E'	eSg	56	02.8						
	Z'N'	e	56	03.8						
	Z'N'E'	M	56	04						
		F	56	45						
21. ESK	EN	eS	16	08	20	14	0.7	1.9		15 45 25.4; 36.1°N. 141.8°E h=30km. Near Honshu, Japan. $M = 5.7$ (ESK)
	E	eL	25	-						
	E	M	39	-						
	N	M	39 $\frac{1}{2}$	-						
	Z	M	39 $\frac{1}{2}$	-						
	ZNE	M	42	-						
		F	17	40	-					
21. ESK	EN	eS	17	59	47	14	0.4	0.9		17 36 50; 35.5°N., 142.0°E. h=46km. Near Honshu, Japan. USCGS. $M = 5.2$ (ESK)
	EN	M	18	29 $\frac{1}{2}$	-					
	Z	M F	18 19	30 $\frac{1}{2}$ 05	-					
22. ESK	Z'	eP	03	04	27.1					02 58 04; 47.9°N., 47.7°E. h=33km. Russia. USCGS.
22. ESK	NE	eL	03	53	-	18	1.9	2.5	2.8	03 06 32.3; 37.8°S. 73.4°W. h=18km. Near coast of Chile. $M = 5\frac{3}{4}$ -6(ESK) USCGS.
	ZNE	M F	04	12 $\frac{1}{2}$ 50	-					
22. ESK	Z'	eP	23	37	58.4	21	2.1	2.6	1.9	$\Delta = 65.6^\circ = 7300\text{km.}$ 23 27 20.5; 57.5°N. 152.1°W. h = 22km. Kodiak Island. USCGS. $M = 5.5$ (ESK)
	Z'	e	38	05.1						
	N	eS	46	40						
	NE	eL	57 $\frac{1}{2}$	-						
	ZNE	M	24	05	-					
	ZNE	M	10 $\frac{1}{2}$	-						
			16							
KEW	ZV	iP	23	38	25	16	3.6	3.6	7.0	D.
	ZV	e	38	32						

## SEISMOLOGICAL BULLETIN

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
23. ESK	Z, Z'	ePP	00	28	39	16	0.9	2.0	3.0	SH 22 sec. 3.2 $\mu$
	N	eLQ		54 $\frac{1}{2}$	-					
	NE	eLR	01	01	-					00 09 34.4; 0.9°S., 122.4°E
	E	M		09	-	27		47		h=45km. Northern Celebes.
	N	M		09 $\frac{1}{2}$	-	26	29			USCGS.
	ZNE	M		20 $\frac{1}{2}$	-	20	23	30	37	
		F	02	50	-					M = 6.8(ESK)
KEW	ZV	ePP	00	28	42					
23. ESK	N	eLQ	09	41 $\frac{1}{2}$	-					08 56 46; 0.5°S., 122.2°E.
	NE	M		56 $\frac{1}{2}$	-	27	4.6	7.0		h=79km. Northern Celebes
	ZNE	M	10	07	-	20	4.6	4.7	8.1	USCGS.
		F		50	-					M = 6.2(ESK)
23. ESK	Z'	eP	11	13	12.9					11 08 10; 39.1°N., 21.4°E.
										h=41km. Greece. USCGS.
24. ESK	Z'	iPKP	07	20	53.0					07 02 24.2; 21.1°S., 179.2°W.
										h=642km. Fiji Is. USCGS.
25. ESK	Z'	ePKP	11	00	34.6	1.0			0.04	10 41 58.2; 21.0°S., 178.7°W.
										h=561km. Fiji Is. USCGS.
27. ESK	Z'	eP	19	55	42.4					$\Delta = 35.1^\circ = 3900\text{km.}$
	N	eS	20	01	12					19 48 49.8; 38.2°N., 42.7°E.
	ZNE	eL		05	-					h=25km. Turkey. USCGS.
	NE	M		11	-	22	3.3	2.4		
	ZE	M		13 $\frac{1}{2}$	-	17		3.1	4.2	M = 5.1(ESK)
		F		35	-					
28. ESK	Z'	eP	11	52	35.7					11 47 34.1; 39.0°N., 21.4°E.
										h=54km. Greece. USCGS.
28. ESK	N	M	18	19	-	20	0.8			16 56 20; 19.1°S., 173.6°W.
	Z	M		19 $\frac{1}{2}$	-	20			1.1	h=27km. Tonga Islands.
	E	M		20	-	20		1.0		USCGS.
29. ESK	Z'	eP	01	57	47.3	0.9			0.04	D. 01 46 43; 53.8°N., 157.8°W
										h=33km. Alaska. USCGS.
KEW	ZV	eP	01	58	12					
30. ESK	N	eL	13	36	-					13 01 19; 18.8°N., 106.7°W.
	ZE	M		52	-	18		0.7	1.1	h=54km. Off coast of
		F	14	05	-					Mexico. USCGS.
30. ESK	Z	M	14	13	-	15			3.2	13 41 09.1; 41.0°N., 72.1°E.
	N	M		13	-	14	1.0			h=19km. Kirgiz SSR. USCGS.
	E	M		13	-	16		2.3		
		F		30	-					M = 5-5 $\frac{1}{4}$ (ESK)
Correction to the Bulletin for March 1967										
20. KEW	ZV	eP*	00	09	10					Not "Esk" as printed.

Met. O. 778

## METEOROLOGICAL OFFICE, UNITED KINGDOM

## SEISMOLOGICAL BULLETIN FOR MAY 19 66

## 1. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESSHIRE, SCOTLAND

Lat. 55° 19' 00" N., Long. 3° 12' 18" W. Height above M.S.L. 263m.

Foundation: Liandoverly Shales, folded (late Silurian).

Instruments: World-wide standardised seismograms (USCGS).

- (i) Long-Period SPRENGNETHER  
(ii) Short-Period BENIOFF

## CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	v
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHER N E WSS Z		15	100		} 750 at 15 sec.
		15	100		
		15	100		
BENIOFF N' E' WSS Z'		1.0	0.75		} 12500 at 1 sec.
		1.0	0.75		
		1.0	0.75		

## 2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

Lat. 51° 28' 6" N., Long. 0° 18' 47" W, Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.

 Instruments: Kew-type vertical seismograph, period 1.5 sec.  
Direct optical registration (ZV).

 Notations: For phases the generally adopted notations are used.  
In addition the following symbols are in use:

C = Compression

D = Dilation

Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.

 $\Delta$  = Epicentral distance

h = Depth of hypocenter

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
1. ESK	Z'	eP	16	35	20.7	1.7			0.16	$\Delta = 86.4^\circ = 9600\text{km.}$ 16 22 56.3; 8.5°S.74.3°W. h = 165km. Peru-Brazil border. USCGS. M = 6(ESK-SH)
	NE	eSKS		45	32					
	NE	eS		45	41	14	8.4	3.8		
	N	e		46	42					
	NE	eSS		51	25					
		F	17	35	-					
KEW	ZV	eP	16	35	22.5					
2. ESK	N	eL	10	52	-					09 52 48.5; 6.0°S., 149.7°E. h=52km. New Britain. USCGS. M = 5.6 (ESK)
	E	M	11	03 $\frac{1}{2}$	-	22		2.0		
	NZ	M		03 $\frac{1}{2}$	-	24	1.8		2.5	
		F		40	-					
2. KEW	ZV	ePKP <sub>2</sub>	11	12	10					10 53 28; 18.0°S.178.3°W. h=537km. Fiji Is. USCGS.
2. ESK	Z'	eP	23	19	13.1					23 12 23; 38.0°N., 42.6°E. h=41km. Turkey. USCGS. M = 4.6(ESK).
	NE	M		34 $\frac{1}{2}$	-	20	1.1	0.9		
	ZE	M		36 $\frac{1}{2}$	-	16		0.8	1.1	
		F		45	-					

Met. O. 778

SEISMOLOGICAL BULLETIN

MAY 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
4. ESK	Z'	eP	06	42	03.4					$\Delta = 24.1^\circ = 2680\text{km.}$ 06 36 59.8; 39.1°N., 21.8°E. h=41km. Greece. USCGS.
	ZE	eS		46	16	13	0.9	1.8	1.6	
	EZ	M		52 $\frac{1}{2}$	-	20		1.7	2.3	
	N	M		53	-	17	2.2			
		F		07	05	-				
4. ESK	Z'	eP	21	54	44.8					21 48 58; 37.7°N., 27.9°E. h=14km. Turkey. USCGS.
	E	eS		59	40	14	0.8	1.4		
	N	eL	22	00 $\frac{1}{2}$	-					
	EN	M		04 $\frac{1}{2}$	-	17	2.4	2.5		
		F		15	-					
5. ESK	Z'	eP	14	34	07.2					$\Delta = 88.8^\circ = 9870\text{km.}$ 14 21 22.7; 24.4°N. 122.6°E h=60km. Taiwan region. USCGS.
	Z'	e		34	10.3					
	NE	eSKS		44	35					
	NE	eS		44	46	12	3.6	1.7		
	NE	eL		58	-					
	NE	M	15	10	-	23	18	18		
	ZNE	M		18	-	18	12	10	17	
KEW	ZV	eP	14	34	15					
5. ESK	Z'	eP	15	19	51.0					15 16 31.9; 61.4°N., 27.5°W., h = 33km. Iceland. USCGS.
5. ESK	Z'	eP	15	28	30.0					15 25 12.4; 61.5°N. 27.4°W. h=33km. Iceland. USCGS.
	ZNE	M		32 $\frac{1}{2}$	-	20	1.6	2.4	3.1	
	ZNE	M		33 $\frac{1}{2}$	-	14	3.5	4.7	3.6	M = 4.4(ESK)
5. ESK	Z'	eP	15	56	00.6	1.8			0.2	15 52 41.1; 61.5°N. 27.5°W. h=33km. Iceland. USCGS.
	ZNE	eL		59	-					
	ZNE	M	16	00	-	20	2.5	3.3	4.6	
	ZNE	M		01	-	14	2.3	3.9	6.6	
		F		20	-					
6. ESK	Z'	ePKP	07	33	06.1					07 14 13.5; 25.0°S. 179.6°E h=488km. South of Fiji. USCGS.
7. ESK	Z'	eP	04	06	33.2	1.0			0.02	03 57 58.0; 49.7°N., 77.9°E. h=0km. Kazakh SSR. USCGS.
7. ESK	Z'	eP	13	14	02.3	1.5			0.14	$\Delta = 28.7^\circ = 3200\text{km.}$ 13 08 16.0; 37.8°N. 27.9°E. h=12km. Turkey. USCGS.
	Z'	e		14	07.0					
	NE	eS		18	50	16	1.2	1.7		
	N	eL		21	-					
	NE	M		24	-	17	5.2	4.0		
	Z	M		26	-	16			2.8	
	F		45	-						
7. ESK	Z'	eP	22	15	05.5					22 09 07; 42.1°N., 35.8°E. h = 13km. Black sea. USCGS.
8. ESK	Z'	eP	03	53	50.1					03 48 48; 39.0°N., 21.3°E. h=49km. Greece. USCGS.
9. ESK	Z'	eP	00	48	55.1	1.0			0.15	c. $\Delta = 28.9^\circ = 3200\text{km.}$ 00 42 55.6; 34.5°N. 26.5°E. h = 33km. Greece. USCGS.
	NE	eS		53	52	7	3.6	3.1		
	N	eL		56	-					
	ZNE	M	01	00	-	20	18	14	6	
		F		40	-					
KEW	ZV	eP	00	48	23.5					M = 5.4(ESK)



**SEISMOLOGICAL BULLETIN**

MAY 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
9. ESK	Z'	eP	03	57	02.3	1.2			0.06	D. 03 51 09.4; 37.2°N., 31.2°E. h=125km. Turkey. USCGS.
9. ESK	Z'	eP	06	14	29.8					06 08 28.5; 34.5°N.26.6°E. h=33km. Crete. USCGS.
10. ESK	Z'	eP	02	53	46.6					02 47 45.3; 34.5°N.26.6°E. h=33km. Crete. USCGS.
10. ESK	Z' NZ ZNE	eP eL M F	21	13	41.1 31½ - 39½ - 50 -	18	3.2	1.8	4.3	21 04 04.0; 51.8°N.99.0°E. h=2km. USSR-Mongolia border. USCGS. M=5¼(ESK).
	KEW	ZV	21	13	50.5					
11. ESK	Z' Z' NE E ZNE	iP ipP eS eLQ M	14	29	16.2 29 28.2 38 55 49 - 01½ -	1.7 16 20	0.9 4.6	1.6	0.45 5.0	C. $\Delta = 75.9^\circ = 8430\text{km}$ . 14 17 34.1; 48.9°N.156.2°E. h=13km. Kurile Islands. USCGS. M = 5.8(ESK)  Depth = 41km.(ESK,KEW)
	KEW	ZV ZV	14	29	35 47					
11. ESK	Z'	eP	14	38	19.9	1.2			0.06	14 26 41.6; 49.0°N.156.2°E. h=33km. Kurile Islands. USCGS.
11. ESK	Z'	eP	15	12	01.9					15 06 02; 34.4°N.26.5°E. h=34km. Crete. USCGS.
11. ESK	Z' E ZNE	eP eL M F	21	51	15.5 22 12 - 23½ - 23 00 -	20	1.7	2.8	1.3	21 39 35.3; 48.8°N.156.3°E. h=28km. Kurile Islands. USCGS. M=5½(ESK)  Depth = 41km(KEW)
	KEW	ZV ZV	21	51	34 46					
12. ESK	Z'	eP	11	06	41.1					11 01 36; 37.8°N.22.5°E. h=129km. Greece. USCGS.
12. ESK	Z'	eP	11	52	08.4					11 42 46; 40.2°N.,78.4°E. h=33km. Sinkiang Province, China. USCGS.
12. ESK	Z'	eP	12	28	40.5					12 16 59; 48.7°N.156.3°E. h=26km. Kurile Is.USCGS.
13. ESK	Z'	eP	13	17	51.7					13 11 51; 34.8°N.,27.0°E. h=31km. Crete. USCGS.
13. ESK	Z' Z'N'E' Z'N'E' Z'N'E'	eP* iPg iSg M F	14	29	25.4 29 26.0 29 41.2 29 42 30 30	0.4	0.042	0.053	Q117	$\Delta = 130\text{km}$ .  Local (Rockburst?)  ML = 2.1
14. ESK	Z'	eP	20	38	05.7					20 27 27.4; 10.5°N.63.0°W. h=16km. Near Venezuela. USCGS.

## SEISMOLOGICAL BULLETIN

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
14. ESK	Z'	eP	23	06	05.6					23 00 43; 36.8°N. 22.3°E. h=33km. Greece. USCGS.
	KEW ZV	eP	23	05	31					
15. ESK	Z'	eP	02	22	05.3					02 13 03; 39.6°N., 74.1°E. h=51km. Sinkiang Province, China. USCGS.
15. ESK	Z, Z'	eP	14	57	37.5	14			2.7	C. $\Delta = 73.8^\circ = 8200\text{km}$ .
	EN	eS	15	07	05	20	1.4	1.5		
	E	eL		17	-					14 46 06.5; 51.5°N. 178.4°W.
	ZNE	M		25 $\frac{1}{2}$	-	25	3.7	3.3	5.0	h=31km. Andreanof Islands.
	ZNE	M		29	-	20	3.3	2.6	4.4	USCGS.
		F	16	20	-					M=5.6(ESK)
	KEW ZV	eP	14	57	59					
15. ESK	Z'E'	iPg	14	59	31.0	0.3		0.050	0.051	C. $\Delta = 74\text{km}$ .
	N'E'	e		59	37.2					
	Z'N'E'	iSg		59	39.8					Local.
	Z'N'E'	M		52	42 $\frac{1}{2}$	0.6	0.108	0.060	0.090	
		F		60	35					ML = 1.7
15. ESK	Z'	eP	20	28	07.8					20 16 04; 1.5°S., 78.0°W. h=195km. Ecuador. USCGS.
16. ESK	Z'	ePKP	03	05	06.7					02 46 42.4; 6.9°S. 129.4°E. h=212km. Banda Sea. USCGS.
	KEW ZV	ePKP	03	05	07.5					
16. ESK	Z'	eP	13	19	10.2	0.7			0.03	13 06 38.1; 30.6°N. 130.2°E. h=68km. Japan. USCGS.
16. ESK	Z'	eP	17	36	56.8					17 30 53.5; 34.4°N. 26.6°E. h=32km. Crete. USCGS.
17. ESK	ZV	eP	01	11	43					00 59 06.3; 35.8°N. 140.5°E. h=68km. Near Japan. USCGS.
17. ESK	Z'	eP	07	13	43.2	1.0			0.04	07 03 29.4; 0.7°N. 30.1°E. h=12km. Uganda. 90 killed, 23 injured. Major property damage. USCGS.
	E	eL		30	-					
	NE	M		37	-	21	1.7	2.8		
		F	08	00	-					M = 5 $\frac{1}{2}$ (ESK). $\Delta = 114\text{km}$ .
17. ESK	Z'E'	e	19	22	42.1					
	Z'E'	iPg		22	43.0					
	N'	iSg		22	56.1					Local.
	N'E'	M		22	57 $\frac{1}{2}$	0.7	0.052	0.034		
		F		23	40					ML = 1.7
18. ESK	Z'N'E'	e	07	42	50.3					D. $\Delta = 174\text{km}$ .
	Z'N'E'	iPg		42	51.0	0.5		0.081	0.087	
	N'	iSg		43	11.1					Local.
	N'E'	M		43	13	0.6	0.078	0.058		
		F		44	30					ML = 2.3
18. ESK	Z'	eP	07	44	05.5					
	N	eL	08	04	-					07 32 07.3; 25.0°N. 109.0°W. h=33km. Gulf of California. USCGS.
	E	M		12 $\frac{1}{2}$	-	22		2.3		
	N	M		13	-	20	4.0			
	NE	M		16 $\frac{1}{2}$	-	17	2.4	2.8		
	Z	M		17	-	18			4.4	
		F		40	-					M = 5.7(ESK)
19. ESK	Z, Z'	iP	07	17	37.3	20			1.9	$\Delta = 70.2^\circ = 7800\text{km}$ .
	EN	eS		26	45	16	0.7	1.4		07 06 26.8; 54.1°N. 164.1°W.
	E	eLQ		36 $\frac{1}{2}$	-					h=28km. Unimak Island.
	ZNE	M		49 $\frac{1}{2}$	-	20	3.7	3.9	5.3	USCGS.
		F	08	40	-					M = 5.5(ESK)

## SEISMOLOGICAL BULLETIN

MAY, 1966

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
19. KEW	ZV	iP	07	18	02					
19. ESK	Z'	iP	14	07	50.1	0.8			0.04	C. 13 56 28; Nevada (underground explosion) Uppsala.
KEW	ZV	iP	14	08	14					
20. ESK	Z'	eP	00	55	55.0					00 53 00.0; 43.0°N. 0.3°W. h=33km. Pyrenees. USCGS.
20. ESK	Z'	ePP	09	33	15					
	NE	eSKS		39	40					09 14 49.2; 13.9°N. 146.1°E. h=66km. South of Mariana Islands. USCGS.
	E	eS		40	55					
	E	eL		59	-					
	ZNE	M	10	23 $\frac{1}{2}$	-	19	2.6	1.4	3.7	
		F	11	15	-					
20. ESK	NE	eL	18	46	-					18 02 41.4; 19.6°N. 122.0°E. h=96km. Philippine Is. USCGS.
	NE	M		53	-	25	1.8	1.5		
	NE	M		55 $\frac{1}{2}$	-	17	1.0	1.4		
		F	19	30	-					
21. ESK	Z'	ePKP	08	27	19.5					08 08 30.6; 24.3°S. 179.8°E. h=518km. Fiji Is. USCGS.
21. ESK	Z'	ePKP	11	10	29.0					10 50 59.8; 20.9°S. 175.3°W. h=75km. Tonga Is. USCGS.
21. ESK	Z'	eP	22	19	34.6					22 14 21; 38.1°N., 23.2°E. h=117km. Greece. USCGS.
22. ESK	ZNE	M	07	55 $\frac{1}{2}$	-	13	0.7	0.7	0.7	07 37 29.2; 38.7°N., 28.1°E. h=40km. Turkey. USCGS.
		F	08	05	-					
23. ESK	Z'	eP	01	30	07.1	1.2			0.06	01 25 58; 52.8°N. 33.6°W. h=33km. N. Atlantic. USCGS.
23. ESK	Z'	eP	01	33	04.9	1.2			0.09	C. 01 28 53; 52.6°N. 33.9°W. h=33km. N. Atlantic. USCGS.
24. ESK	Z'	iP	09	44	46.1	0.9			0.04	
	NE	M		53 $\frac{1}{2}$	-	20	1.7	1.6		09 39 26.0; 37.4°N. 22.1°E. h=34km. Greece. USCGS. M=4 $\frac{1}{2}$ (ESK)
		F	10	05	-					
24. ESK	Z'	eP	11	14	43.7	0.9			0.03	11 09 26; 37.5°N. 22.0°E. h=47km. Greece. USCGS.
24. ESK	Z'	eP	14	52	10.0					14 46 10; 34.1°N. 26.4°E. h = 53km. Crete. USCGS.
24. ESK	Z'	ePKP	15	48	48.9					15 29 12; 25.6°S. 177.4°W h=112km. Fiji Is. USCGS.
25. ESK	Z'	eP	09	11	44.4	1.0			0.05	09 06 59; 40.5°N. 19.9°E. h=33km. Albania. USCGS.
25. ESK	Z'	ePKP	12	26	40.0	1.3			0.15	12 07 04.8; 21.6°S. 169.9°E h=35km. Loyalty Is. USCGS.
KEW	ZV	iPKP <sub>2</sub>	12	66	50					

Met. O. 778

SEISMOLOGICAL BULLETIN

MAY, 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
25. ESK	Z'	ePKP2	13	42	16					13 20 56.2; 52.9°S. 160.0°E. h=33km. Macquarie Is. USCGS. M=6.1(ESK)
	NE	eLQ	14	33	-					
	Z	eLR		41 $\frac{1}{2}$	-					
	ZNE	M		57 $\frac{1}{2}$	-	22	3.3	2.7	2.9	
	ZNE	M		15 04 $\frac{1}{2}$	-	18	3.0	3.2	4.2	
		F		35	-					
26. ESK	Z'	eP	03	09	29.5					02 57 48; 48.0°N. 154.2°E. h=33km. Kurile Is. USCGS.
26. ESK	Z'	ePKP	18	49	18.9					18 30 07.4; 21.2°S. 176.9°W h=230km. Fiji Is. USCGS.
	KEW	ZV	18	49	30.5					
27. KEW	ZV	iP	22	24	12					22 14 14.1; 24.4°N. 68.7°E. h=5km. India-Pakistan border. USCGS.
28. ESK	Z'	eP	00	16	44.8					00 03 56.8; 24.4°N. 122.5°E h=33km. Taiwan region. USCGS. M = 6(ESK)
	NE	eL		41	-					
	NE	M		52 $\frac{1}{2}$	-	23	4.9	6.1		
		F	01	20	-					
29. ESK	Z'	iPKP	14	03	14.4	1.0			0.08	13 44 32.9; 21.6°S. 178.7°W. h = 516km. Fiji Is. USCGS.
	KEW	ZV	14	03	24.5					
30. ESK	Z'	eP	03	21	11.8					03 09 34.4; 7.6°N. 77.0°W. h=32km. N. Colombia. USCGS.
	KEW	ZV	03	21	18					
30. ESK	Z'	eP	14	56	43.2					14 53 01; 71.3°N. 07.1°W. h=33km. Jan. Mayen Is. USCGS.
31. ESK	Z'	eP	07	54	22.5					07 42 59.5; 52.3°N. 169.7°W h=33km. Fox Is. USCGS.

## METEOROLOGICAL OFFICE, UNITED KINGDOM

SEISMOLOGICAL BULLETIN FOR JUNE 1966

## I. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESSHIRE, SCOTLAND

Lat. 55° 19' 00" N., Long. 3° 12' 18" W. Height above M.S.L. 263m.

Foundation: Llandoverly Shales, folded (late Silurian).

Instruments: World-wide standardised seismograms (USCGS).

- (i) Long-Period SPRENGNETHET  
(ii) Short-Period BENIOFF

## CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	V
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHET N E WSS Z		15	100		} 750 at 15 sec.
		15	100		
		15	100		
BENIOFF N' E' WSS Z'		1.0	0.75		} 12500 * at 1 sec.
		1.0	0.75		
		1.0	0.75		

\*) 25000 from 13th.

## 2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

Lat. 51° 28' 6" N., Long. 0° 18' 47" W, Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.

Instruments: Kew-type vertical seismograph, period 1.5 sec.  
Direct optical registration (ZV).Notations: For phases the generally adopted notations are used.  
In addition the following symbols are in use:

C = Compression

D = Dilation

 $\Delta$  = Epicentral distance

h = Depth of hypocenter

Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
1. ESK	Z'	eP	02	45	30.3				02 33 56; 51.5°N.176.2°E. h=15km. Rat Is. USCGS.	
1. ESK	Z, Z'	iPKP	12	07	16.0				11 47 33.1; 23.4°S.174.9°W. h=24km. Tonga Is. USCGS.	
KEW	ZV	ePKP	12	07	20					
2. ESK	Z, Z'	iP	03	39	26.6	7			1.9	D. PZ' 1.2 sec. 0.19u Depth = 45km. (ESK)
	Z'	epP		39	39.5					03 27 53.3; 51.1°N.176.0°E. h=41km. Rat Is. USCGS.
	NE	eS		48	58					M = 6 (ESK)
	ZNE	M	04	22	-	18	0.7	0.6	1.0	
		F	05	00	-					D. Depth = 44km (Kew)
KEW	ZV	iP	03	39	47.5					
	ZV	epP		40	00					
2. ESK	N'Z'	ePg	15	23	46.8					$\Delta$ = 107km. Local (rockburst?)
	N'E	eSg		23	59.2					
	Z'N'E'	M		24	01	0.7	0.027	0.033	0.027	M <sub>L</sub> = 1.5
		F		24	30					
2. ESK	Z'	iP	15	41	22.0	0.8			0.03	C. Nevada underground explosion.
KEW	ZV	iP	15	41	45.5					C.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
2. ESK	Z'E'	ePn	16	58	05.5				$\Delta = 111$ km.	
	Z'E'	ePg		58	06.3					
	N'	e		58	17.9				Local	
	Z'N'E'	eSg		58	19.5					
	Z'N'E'	M F		58 59	21 05	0.7	0.046	0.027	0.027	$M_L = 1.6$
2. ESK	Z'	eP	18	42	11.0				D. 18 37 48.3; 36.5°N. 7.4°W. h=28km. Straits of Gibraltar. USCGS.	
3. ESK	Z'	iP	14	11	22.7	0.9		0.03	C. Nevada underground explosion.	
KEW	ZV	iP	14	11	46.0				C.	
3. ESK	Z'E'	ePg	16	11	12.1				$\Delta = 17$ km.	
	N'	eSg		11	14.5				Local.	
	Z'N'E'	M F		11 11	16.5 30	0.6	0.024	0.032	0.030	$M_L = -0.1$
4. ESK	Z'	iP	05	20	45.0	1.0		0.08	C. 05 11 54.2; 36.3°N. 70.8°E h=207km. Hindu Kush. USCGS.	
KEW	ZV	iP	05	20	38.5				C.	
4. ESK	Z'	eP	06	22	13.8	1.0		0.04	06 16 57.4; 36.6°N. 21.0°E. h=80km. Mediterranean Sea. USCGS.	
5. ESK	Z'	eP	00	00	07.0	1.4		0.06	$\Delta = 76.2^\circ = 8470$ km.	
	Z'	epP		00	20.4				Depth = 47km. (ESK)	
	NE	eS		09	46	16	1.4	0.6	23 48 17.8; 46.5°N. 152.5°E.	
	ZN	eLR		25	-				h=27km. Kurile Islands. USCGS.	
	ZNE	M F		36 01	- 15	20	1.9	1.5	2.3	$M = 5.4$ (ESK)
KEW	ZV	eP	00	00	24.5				Depth = 47km. (KEW)	
	ZV	epP		00	38					
5. ESK	NE	M F	05	38	-	24	0.9	1.0	04 49 53; 24.7°N., 122.3°E. h=33km. Taiwan region. $M = 5\frac{1}{2}$ (ESK). USCGS.	
6. ESK	Z'	eP	05	10	49.1				05 03 20; 40.3°N., 53.0°E. h=27km. Turkmen SSR. USCGS.	
6. ESK	Z, Z'	iP	07	55	07.0	1.1	0.3	0.8	2.3	C. $\Delta = 52.1^\circ = 5790$ km.
	Z, Z'	ipP		55	56.4					PZ 10 sec. 13.5 $\mu$
	Z	iPcP		56	17					PH 10 " 6.2 $\mu$
	Z	ePP		57	07	10			5.6	
	Z	isPP		58	11					07 46 16.2; 36.3°N., 71.2°E.
	NE	eS	08	02	12	22	9.4	14.2		h=225km. Afghanistan-USSR border. USCGS.
	NE	esS		03	37					
	ZE	eLR		11	-					
	ZNE	M		16	-	25	26	20	23	$M = 6.3$ (ESK)
		F		09	30	-				Depth = 225km (ESK, KEW)
KEW	ZV	iP	07	55	00.5					C.
	ZV	ipP		55	50					
6. ESK	NE	eSKS	21	11	44					20 47 11.5; 9.6°N. 126.4°E.
	NE	eS		12	50					h=45km. Philippine Is. USCGS.
	ZNE	M		51	-	22	2.7	1.7	3.9	
	ZNE	M F		56 22	- 35	17	3.6	1.9	3.9	$M = 5.9$ (ESK)

SEISMOLOGICAL BULLETIN

JUNE 1966

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
7. ESK	Z,Z'	eP	01	12	54.3	14			1.9	C. $\Delta = 92.0^\circ = 10200\text{km}$ . 00 59 46.6; 15.0°S., 75.8°W. h=48km. Near coast of Peru. USCGS.
	Z	ePP		16	22					
	ZE	eSKS		23	28					
	N	eS		23	49	18	6.1			
	N	eLQ		39	-					
	Z	eLR		44	-					
	ZNE	M		54	-	18	4.3	7.1	11.2	
	F		03	40	-				M = 6.2(ESK)	
KEW	ZV	eP	01	12	56					
7. ESK	Z,Z'	eP	14	13	46.6	20			2.7	13 59 36.0; 11.3°N. 139.6°E. h=50km. West Caroline Islands. USCGS.
	Z	ePP		18	07	20	4.7	4.4	13.0	
	NE	eSKS		24	26					
	ZNE	ePS		27	26					
	NE	eSS		33	14					
	NE	eLQ		43 $\frac{1}{2}$	-					
	Z	eLR		52	-					
	ZNE	M		59	-	25	41	42	53	
	ZNE	M		15	04 $\frac{1}{2}$	-	20	28	44	
	F		17	00	-					
KEW	ZV	eP	14	13	55					
7. ESK	Z'E'	iPn	17	27	47.9					$\Delta = 115\text{km}$ .
	Z'E'	iPg		27	48.8	0.4		0.036	0.040	
	N'	eSg		28	02.3					Local.
	N'E'	M		28	03	0.7	0.045	0.022		$M_L = 1.6$
	F		28	50						
7. ESK	Z	ePKP	19	24	19.5					19 05 47.4; 21.4°S, 179.3°W. h=606km. Fiji Is. USCGS.
8. ESK	Z'	iP	20	07	44.3	0.9			0.09	19 56 21.3; 53.1°N. 171.1°E. h=20km. Near Is. USCGS.
	Z'	ipP		07	52.2					
KEW	ZV	iP	20	08	06					
9. ESK	Z'	eP	00	24	58.0					00 12 12.1; 7.6°N. 94.1°E. h=55km. Nicobar Is. USCGS.
9. ESK	Z'	iP	02	09	14.3					01 57 38.0; 45.0°N. 146.4°E h=160km. Kurile Is. USCGS.
9. ESK	Z'	eP	15	51	14.4					15 39 27.8; 44.3°N. 147.6°E. h=110km. Kurile Is. USCGS.
KEW	ZV	eP	15	51	31					
9. ESK	Z'N'	iPg	16	39	02.8					$\Delta = 61\text{km}$ .
	Z'N'E'	e		39	04.0					Local.
	Z'N'	e		39	09.0					
	Z'N'E'	eSg		39	09.9					
	Z'N'E'	i		39	12.5					
	ZNE'	M		39	15	0.7	0.133	0.182	0.090	$M_L = 0.8$
	F		40	00						
9. ESK	E	eS	22	40	16	14		0.6		22 16 22; 30.1°N. 142.2°E. h=12km. South of Honshu. USCGS.
	NE	M	23	07	-	22	0.5	0.8		
		F		35	-					
10. ESK	Z'	eP	04	36	43.0					04 25 14.3; 52.0°N. 175.0°E. h=33km. Near Is. USCGS.
10. ESK	Z'	eP	14	22	52.1					14 12 14.6; 57.4°N. 155.7°W. h=67km. Alaska. USCGS.
10. ESK	Z'	eP	19	22	41.2					19 11 17.1; 52.5°N. 173.6°E h=45km. Near Is. USCGS.

## SEISMOLOGICAL BULLETIN

JUNE 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
10. ESK	Z'	eP	22	21	22.7					22 14 37.3; 32.9°N. 39.8°W. h=8km. N. Atlantic Ridge. USCGS.
	ZE	eLR		31	-					
	N	M		31½	-	20	0.6			
	EZ	M		32	-	18		1.1	1.3	
		F		45	-					M = 4½(ESK)
10. ESK	Z'	eP	22	51	58.3					22 41 48.5; 45.1°N., 59.7°E. h=33km. Mongolia. USCGS.
11. ESK	Z'	eP	02	49	58.3					02 37 39; 19.2°N., 108.1°W. h=45km. Revilla-Gigedo Islands. USCGS.
11. ESK	Z'	eP	03	13	56.0					$\Delta = 87.9^\circ = 9770\text{km.}$
	NE	eS		24	35					03 01 08.7; 23.6°N. 119.9°E. h=33km. Taiwan. USCGS.
	NE	eL		41	-					
	NE	M		49½	-	22	3.3	3.8		
	Z	M		50½	-	18			1.5	
		F	04	20	-					M = 5½-6(ESK)
11. ESK	Z'	eP	10	27	00.2					10 21 55.9; 38.9°N., 21.4°E. h=43km. Greece. USCGS.
11. ESK	Z'	eP	12	10	17.2	0.9				12 05 03.2; 37.5°N., 21.2°E. h=51km. Greece. USCGS.
	NE	M		19½	-	22	0.4	0.5		
		F		25	-					
11. ESK	Z'	eP	18	25	08.0					18 13 40.6; 51.6°N. 178.4°W. h=60km. Andean of Is. USCGS.
12. ESK	Z'	iP	20	31	16.3					20 20 58.1; 3.0°S., 28.2°W. h=18km. S. Atlantic. USCGS.
13. ESK	Z'	ePKP	07	52	48.0					07 33 13.4; 21.2°S., 174.1°E
	E	eSS	08	15	09					h=49km. New Hebrides Is. USCGS.
	E	eLQ		34	-					
	ZN	eLR		41½	-					
	ZNE	M	09	00½	-	20	1.0	0.9	1.4	M = 5½(ESK)
		F	10	00	-					
13. ESK	Z'	eP	13	23	48.5					13 19 35; 73.1°N., 7.2°E. h=33km. Greenland Sea. USCGS.
13. ESK	Z'E'	ePg	15	06	48.0					$\Delta = 107\text{km.}$
	E'	iSg		07	00.8					Local.
	Z'E'	i		07	01.4					
	Z'N'E'	M		07	02.5	0.6	0.027	0.020	0.027	$M_L = 1.5$
		F		07	30					
13. ESK	Z'	e	18	27	16.7					
	Z',Z	iPKP	18	27	30.2	2.5			2.1	C. Depth = 235km. (ESK)
	Z',Z	epPKP		28	30					
	Z	ePP		30	08	10	1.8		4.4	18 08 38.4; 12.2°S., 167.1°E h=259km. Santa Cruz Is. USCGS.
	Z',Z	eSKP		30	43					
	N	ePKS		31	03					
	Z	eSKS		34	30					
	E	eSS		47	36					
	E	eLQ	19	05	-					
		F	20	25	-					M=6.1(ESK)
KEW	ZV	e	18	27	28					
	ZV	ePKP	18	27	35					C.
	ZV	ePP		30	49					
14. ESK	Z'	iP	02	52	48.2	1.0			0.02	02 45 57; 38.1°N., 42.8°E. h=38km. Turkey. USCGS.
14. ESK	Z'	ePKP	02	57	13.8					02 38 37; 20.8°S. 178.6°W. h=545km. Fiji Is. USCGS.



## SEISMOLOGICAL BULLETIN

JUNE 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
14. ESK	Z'	eP*	17	22	45.7					$\Delta = 113\text{km.}$
	E'Z'	iPn		22	46.5	0.3		0.021	0.027	
	E'Z'	iPg		22	47.5	0.4		0.033	0.041	Local.
	Z'N'	eS*		22	58.2					
	Z'N'E'	iSg		23	00.7					
	Z'N'E'	M F		23 24	01 $\frac{1}{2}$ 15	0.7	0.070	0.037	0.037	$M_L = 1.8$
14. ESK	Z'	eP	21	15	56.3					21 03 48.3; 30.7°N, 138.7°E. h=397km. South of Honshu. USCGS.
KEW	ZV	eP	21	16	07					
15. ESK	Z, Z'	ePKP	01	19	01					$\Delta = 132.3^\circ = 14700\text{km.}$
	ZN	ePP		21	28	12	3.9	1.5	9.2	
	ZNE	ePKS		22	30					00 59 45.8; 10.4°S, 160.8°E. h=31km. Solomon Is. USCGS.
	NE	eSS		39	15					
	E	eLQ		54	-					
	Z	eLR	02	03	-					
	ZNE	M		14	-	25	138	87	162	
	E	M		17	-	22		142		M = 6.8 (body waves) M = 7.5 (surface " )
	N	M		18 $\frac{1}{2}$	-	20	68			
	Z	M		21	-	21			151	
KEW	ZV	ePKP	01	19	06					
15. ESK	Z'	ePKP	01	52	10					01 32 55.5; 10.2°S, 161.1°E. h=33km. Solomon Is. USCGS.
	Z	M	02	52 $\frac{1}{2}$	-	21			57	
	N	M		54 $\frac{1}{2}$	-	20	49			
	E	M		55 $\frac{1}{2}$	-	20		25		M = 7(ESK)
KEW	ZV	ePKP	01	52	16					
15. ESK	Z'	iP	02	31	35.3					02 19 48; 17.2°N., 94.9°W. h=43km. Mexico. USCGS.
16. ESK	Z'	eP	17	09	14.2					$\Delta = 15.9^\circ = 1770\text{km.}$
	E	eS		12	09					
	ZN	eL		13	-					17 05 21; 71.6°N., 2.8°W. Jan Mayen Is. region. BCIS.
	E	M		14	-	15		1.4		
	NZ	M F		14 20	- -	18	0.7		0.8	M = 4-4 $\frac{1}{2}$ (ESK)
16. ESK	NE	eS	18	18	03					18 01 02; 12.9°N., 44.5°W. h=30km. N. Atlantic. USCGS.
	NE	eLQ		23	-					
	NE	M F		24 $\frac{1}{2}$ 35	- -	23	0.8	0.6		M=4 $\frac{3}{4}$ (ESK)
17. ESK	Z'	ePKP	10	22	42.3					10 04 02.2; 21.9°S, 178.9°W. h = 544km. Fiji Is. USCGS.
18. ESK	NE	eL	20	10	-					19 15 24.4; 3.3°S., 143.2°E h=17km. Near New Guinea. USCGS.
	ZNE	M F		31 45	- -	18	0.8	0.7	0.7	M=5 $\frac{1}{2}$ (ESK).
19. ESK	Z'	iP	18	01	07.9					17 55 32.3; 38.6°N., 27.4°E. h=31km. Turkey. USCGS.
	N	eLQ		07 $\frac{1}{2}$	-					
	NE	M F		10 $\frac{1}{2}$ 20	- -	18	0.9	0.8		M=4 $\frac{1}{2}$ (ESK)
19. ESK	Z'	eP	19	40	09.6	1.0			0.02	19 28 43.1; 51.7°N, 176.2°W. h=57km. Andeanof Is. USCGS.
20. ESK	Z'	iP	20	17	11.0	0.8			0.01	20 05 43; 50.7°N., 157.4°E. h=31km. Kurile Is. USCGS.

## SEISMOLOGICAL BULLETIN

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
21.ESK	E	eLQ	01	39	-	20	0.9	0.8	0.8	00 43 13.5; 10.9°S, 165, 3°E. h=25km. Santa Cruz Is. M = 5½(ESK)
	ZNE	M	02	10	-					
		F		50	-					
21.ESK	Z'	eP	18	23	33.8	1.3			0.10	D. 18 11 43.0; 16.3°N. 94.8°W h=62km. Mexico. USCGS.
KEW	ZV	eP	18	23	47.5					
21.ESK	Z'	iP	23	18	00.8	0.9			0.03	C. 23 06 25.9; 50.1°N., 157.8°E. h=14km. Kurile Islands. USCGS.
KEW	ZV	eP	23	18	20					
22.ESK	Z'	iP	07	22	46.1					07 11 00.8; 14.7°N. 92.1°W. h=87km. Near Mexico. USCGS.
22.ESK	Z'	iP	11	48	59.0	0.9			0.06	D. Depth = 29km. (ESK) 11 38 53.7; 61.4°N. 147.6°W. h=53km. Alaska. USCGS.
	Z'	epP	49	07.7						
22.ESK	Z'	eP	19	02	16.2					18 50 25.6; 45.4°N. 149.2°E. h=33km. Kurile Is. USCGS.
	Z'	i	02	17.2						
22.ESK	Z	epP	20	45	05	14	1.4	2.7	6.3	20 29 03.6; 7.2°S, 124.6°E. h=507km. Banda Sea. USCGS.
	Z'	iPKP	46	51.1						
	Z'	i	46	56.3						
	ZNE	epPP	49	59						
	NE	eSKS	52	59						
	NE	e	54	16						
	ZNE	eSP	56	56						
	Z'	e	57	23.5						
	N	esSS	21	06	52					
	N	M	36½	-	24					
ZE	M	37½	-	22	8.4		7.5	7.1	M = 6.7(ESK)	
	F	23	10	-						
KEW	ZV	ePKP	20	46	51					
	ZV	e	46	56						
	ZV	epPP	49	59						
23.ESK	Z'	iP	05	13	09.1	0.9			0.10	D. 05 01 42.4; 43.8°N., 139.9°E. h=218km. Sea of Japan. USCGS.
KEW	ZV	iP	05	13	23.5					D.
24.ESK	Z'	iPKP	08	37	20.0					08 17 49.1; 26.7°S. 177.3°W. h=146km. South of Fiji Is. USCGS.
24.ESK	Z'	eP	22	39	32.7					22 34 24.7; 38.8°N., 21.6°E. h=25km. Greece. USCGS.
25.ESK	Z'	iP	17	36	24.2	0.9			0.03	C. 17 24 38.9; 13.7°N., 91.2°W. h = 119km. Near Guatemala. USCGS.
25.ESK	Z'	iP	21	43	31.3					21 32 12; 53.3°N., 171.1°E. h=33km. Near Is. USCGS.
26.ESK	Z'N'	iPg	14	44	22.4	0.5	0.017	0.025	0.033	$\Delta$ = 100km. Local (rockburst)? M <sub>L</sub> = 1.4
	E'	eSg	44	34.2						
	Z'N'E'	iS <sub>x</sub>	44	35.1						
	Z'N'E'	M	44	36						
		F	44	15						

## SEISMOLOGICAL BULLETIN

JUNE

1966

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
27. ESK	Z,Z'	iP	10	51	32.5	10	0.5	1.5	3.2	C. $\Delta = 63.5^\circ = 7060$ km. PZ' 1.0 sec. 0.18 $\mu$ 10 41 08.6; 29.7°N.80.9°E. h=37km. Nepal-India border. USCGS. M=6.3(ESK) C.
	Z	ePP		53	52	10		1.0	1.7	
	N	eS	11	00	02	14	3.6	1.8		
	NE	M		17	-	20	17	9		
	ZNE	M		21 $\frac{1}{2}$	-	17	10	23	34	
KEW	ZV	iP	10	51	28.5					
27. ESK	Z'	eP	10	58	09.7					10 47 43; 29.5°N., 80.9°E. h=28km. Nepal-India border USCGS.
27. ESK	Z'	iP	11	00	13.0	0.9			0.07	10 49 50.0; 29.8°N.80.7°E. h=33km. Nepal-India border USCGS.
KEW	ZV	eP	11	00	08					
27. ESK	Z,Z'	iP	11	09	42.0	10			5.2	C. $\Delta = 63.6^\circ = 7070$ km. PZ' 1.0 sec. 0.22 $\mu$ 10 59 18.1; 29.7°N.81.0°E. h=40km. Nepal-India border M=6.6(ESK). USCGS. C.
	Z	ePP		12	00	10			3.1	
	N	eS		18	12	16	7.1			
	NE	M		35	-	20	34	18		
	ZNE	M		39 $\frac{1}{2}$	-	17	21	52	73	
KEW	ZV	iP	11	09	37					
27. ESK	Z'	eP	11	32	07.6					11 21 43.3; 29.7°N.80.8°E. h=33km. Nepal-India border USCGS.
27. ESK	Z'	eP	14	06	16.5	0.9			0.03	13 55 51.9; 29.6°N.80.8°E. h=35km. Nepal-India border USCGS.
KEW	ZV	eP	14	06	11					
27. ESK	Z'N'E	iPg	16	00	09.1	0.3		0.045	0.033	C. $\Delta = 16$ km. Local. M <sub>L</sub> = 0.8
	N'	i		00	10.5					
	N'Z'	iSg		00	11.4					
	Z'N'E'	M		00	13 $\frac{1}{2}$	0.7	0.24	0.26	0.27	
		F		00	45					
28. ESK	N	eS	04	47	30					04 26 12.4; 35.9°N.120.5°W. h=4km. California. USCGS. M=6.0(ESK)
	N	eLQ		57 $\frac{1}{2}$	-					
	Z	eLR	05	02	-					
	NE	M		07	-	20	6.9	4.5		
	EZ	M		14 $\frac{1}{2}$	-	16		6.7	10.9	
	F		06	10	-					
29. ESK	Z'	eP	00	54	18.0					00 49 34.2; 41.2°N.20.4°E. h=17km. Albania. USCGS.
29. ESK	Z'	iP	07	06	31.9	0.8			0.04	C. 06 57 58.1; 49.9°N.78.0°E. h=0km. Kazakh SSR. USCGS.
KEW	ZV	iP	07	06	35.5					
29. ESK	ZNE	M	23	10	-	20	0.8	0.6	0.8	21 46 54.5; 13.8°S.166.7°E. h=35km. New Hebrides Is. M=5 $\frac{1}{2}$ (ESK). USCGS.
		F	24	00	-					
30. ESK	Z'	iP	09	10	40.4	1.0			0.06	D. 08 59 48.3; 43.6°N., 132.2°E. h=454km. Near Vladivostok. USCGS.
30. ESK	Z'	iP	09	37	39.0					09 25 41; 43.6°N.147.2°E. h=33km. Kurile Is. USCGS.
30. ESK	N ZNE	eLR	13	16	-					12 27 41.9; 9.6°N.126.7°E. h=44km. Phillippine Is. M=5 $\frac{1}{2}$ (ESK). USCGS.
		M		31 $\frac{1}{2}$	-	20	1.1	0.8	0.9	
		F		55	-					
30. ESK	NE ZNE	eL	16	27	-					15 45 26.0; 24.4°N.122.2°E. h=47km. Taiwan region. USCGS.
		M		41 $\frac{1}{2}$	-	20	0.5	0.6	0.7	
		F		50	-					

## SEISMOLOGICAL BULLETIN

JUNE 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
30. ESK	Z'	eP	19	26	14.3					19 21 28; 41.2°N., 21.0°E. Yugoslavia. BCIS.
30. ESK	Z'	iP	22	26	22.0	1.3	0.06	0.05	0.16	C. Nevada underground explosion.
	ZNE	M		57	-	16	0.4	0.6	0.6	
		F	23	15	-					
KEW	ZV	iP	22	26	45.5					C.
Corrections to the Bulletin for May 1966										
17. KEW	ZV	eP	01	11	43					Not "ESK" as printed
25. KEW	ZV	ePKP <sub>2</sub>	12	26	50					Not 12 66 50 as printed.

## METEOROLOGICAL OFFICE, UNITED KINGDOM

## SEISMOLOGICAL BULLETIN FOR JULY 19 66

## 1. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESHIRE, SCOTLAND

 Lat.  $55^{\circ} 19' 00''$  N., Long.  $3^{\circ} 12' 18''$  W. Height above M.S.L. 263m.

Foundation: Llandoverly Shales, folded (late Silurian).

Instruments: World-wide standardised seismograms (USCGS).

- (i) Long-Period SPRENGNETHER  
(ii) Short-Period BENIOFF

## CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	V
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHER N E WSS Z		15	100		} 750 * at 15 sec
		15	100		
		15	100		
BENIOFF N' E' WSS Z'		1.0	0.75		} 25000 at 1 sec.
		1.0	0.75		
		1.0	0.75		

\*) 1500 from 24th.

## 2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

 Lat.  $51^{\circ} 28' 6''$  N., Long.  $0^{\circ} 18' 47''$  W, Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.

 Instruments: Kew-type vertical seismograph, period 1.5 sec.  
Direct optical registration (ZV).

 Notations: For phases the generally adopted notations are used.  
In addition the following symbols are in use:

C = Compression

 $\Delta$  = Epicentral distance

D = Dilation

h = Depth of hypocenter

Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
1. ESK	Z'	iP	06	03	15.1	8			3.7	C. $\Delta = 88.1^{\circ} = 9790$ km. PZ' 1.3 sec. 0.32 $\mu$  05 50 39.2; $24.8^{\circ}$ N. $122.5^{\circ}$ E h=117km. Taiwan region. USCGS.  M = 6.1 (ESK)  C.
	Z, Z'	i		03	16.3					
	Z, Z'	ePP		06	42	12			1.5	
	NE	eSKS		13	31					
	NE	eS		13	47	16	3.6	2.9		
	NE	esS		14	34					
	NE	eLR		32	-					
	ZNE	M		39 $\frac{1}{2}$	-	24	6.6	8.7	2.8	
KEW	ZV	iP	06	03	22.5					
	ZV	iPP		06	51					
1. ESK	Z'	iP	19	16	50.3	1.0			0.02	C. 19 05 26.5; $52.3^{\circ}$ N., $174.2^{\circ}$ E. h=56km. Near Is. USCGS.
1. ESK	Z'	iP	20	29	14.4	0.7			0.02	20 17 49.3; $13.7^{\circ}$ N., $88.4^{\circ}$ W. h=201km. El Salvador. USCGS.

## SEISMOLOGICAL BULLETIN

JULY 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
2. ESK	N'Z' N'Z' Z'N'E' Z'N'E'	eP <del>x</del> ePg iSg M F	14	43	51.3 52.3 07.0 08 00	0.6	0.015	0.016	0.029	$\Delta = 127\text{km.}$ Local (rockburst) $M_L = 1.1$
3. ESK	Z'	eP	04	06	33.3	1.0			0.02	03 55 15.7; 52.5°N. 170.2°W. h=69km. Fox Is. USCGS.
3. ESK	Z'	ePKP	04	29	05					04 09 30; 21.1°S. 174.2°W. h = 33km. Tonga Is. USCGS.
3. ESK	Z'E' Z'E' E'N' E'N' E'N'	eP <del>x</del> iPg e iSg M F	13	42	53.1 54.0 05.0 07.8 08½ 00	0.4 0.7		0.018	0.022	$\Delta = 119\text{km.}$ Local (rockburst) $M_L = 1.1$
4. ESK	Z'	iP	03	07	06.1	0.9			0.04	C. 02 55 35.9; 51.8°N., 176.4°E. h=28km. Rat Is. USCGS.
4. ESK	Z'	iPKP	07	41	01.0					07 22 26; 22.1°S., 179.6°W. h=600km. Fiji Is. USCGS.
4. ESK	Z, 'Z ZNE NE ZNE	iP eS eLQ M F	12	20	31.4 40 25.8 26½ 40	12 12 25	1.5 5.2 6.1	1.5 5.3 7.6	3.4 9.7	C. $\Delta = 23.6^\circ = 2600\text{km.}$ 12 15 28.1; 37.5°N. 24.8°W. h=33km. Azores Is. USCGS. M = 5.2(ESK)
4. ESK	Z', Z Z' Z' E N E E NZ ZNE	eP i i eS ePS eSS eLQ eLR M	18	45	09.1 13.0 23.7 37 18 08 04½ 08½ 23	2.5 23 19	0.8 10 46		2.7 32 67	$\Delta = 73.5^\circ = 8170\text{km.}$ 18 33 35.7; 51.7°N. 179.9°E. h=13km. Rat Island, Aleutian Is. USCGS. M = 6.9(ESK)
4. ESK	Z'	eP	19	01	54.2					18 50 25; 51.7°N., 179.0°W. h=33km. Andreanof Is. USCGS.
5. ESK	Z'	eP	02	27	28.3	1.0			0.02	02 22 24 37.5°N., 24.6°W. h=27km. Azores Is. USCGS.
5. ESK	Z' Z' Z' E E EN	eP e i eS eLQ M F	02	33	09.4 20.3 23.2 43 - 11½ 45	1.3 18		0.16		$\Delta = 72.9^\circ = 8100\text{km.}$ 02 21 43.8; 52.2°N. 178.4°W h=66km. Andreanof Is. USCGS. M = 5.1(ESK)
5. ESK	Z' Z' NE ZNE	eP e eS M F	05	14	09.0 14.8 18 20½ 05	6 24			1.0 1.6	$\Delta = 23.4^\circ = 2600\text{km.}$ 05 09 03.6; 37.6°N. 24.6°W. h=12km. Azores Is. USCGS. M = 4½(ESK)

## SEISMOLOGICAL BULLETIN

JULY 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
5. ESK.	Z'	eP	10	12	32.8				10 01 22; 27.5°N., 92.4°E. h=77km. India-China border. USCGS.	
6. ESK	Z' ZNE	eP M F	14	08 30 45	34.3 - -	17	1.3	0.7	0.7	13 59 14.8; 43.9°N., 83.2°E. h=33km. Sinkiang, China. USCGS. M=5(ESK).
9. ESK	Z'	eP	03	33	41.0				03 28 24.4; 37.9°N. 22.0°E. h=43km. Greece. USCGS.	
9. ESK	E'Z' E' Z'N'E'	ePg iSg M F	12	26 26 26 27	38.5 53.0 54 45	0.7	0.028	0.051	0.032	$\Delta = 122\text{km.}$ Local (rockburst) M <sub>L</sub> = 1.5
10. KEW	ZV	ePKP <sub>2</sub>	10	21	09					10 00 39.1; 30.5°S. 177.8°W. h=40km. Kermadec Is. USCGS.
10. ESK	Z, 'Z Z' Z NE NE ZNE	iP ipP ePP eSKS eS M F	16	25 25 29 36 36 17	37.4 47.1 08 04 15 09 50	10 14 20	1.6 11		1.4 16	$\Delta = 89^\circ = 9900\text{km.}$ 16 12 41.5; 24.2°N. 125.2°E. h=28km. Ryukyu Is. USCG. M = 6½(ESK)
KEW	ZV ZV	eP epP	16	25	43 52					
10. ESK	Z'	iP	22	17	14.6					22 04 24.4; 24.8°N. 125.3°E. h=58km. Ryukyu Is. USCGS.
11. ESK	E ZNE	eSS M F	23	27 24 25	20 06 10	20	0.5	0.7	0.8	22 46 05.7; 19.2°S. 173.6°W. h=120km. Tonga Is. USCGS.
12. ESK	Z' Z' Z' EN	eP e i M F	03	02 02 02 41½ 55	01.2 04.7 14.7 - -	1.1 22	1.4	1.0	0.10	02 56 23.5; 35.5°N. 22.4°E. h=15km. Mediterranean Sea. USCGS. M = 4.5(ESK)
KEW	ZV	eP	03	01	26.5					
12. ESK	Z'	iPKP	17	56	52.6	1.5			0.10	C. 17 37 27.3; 21.5°S., 170.5°E. h=134km. Loyalty Is. USCGS.
12. ESK	Z' Z, Z'E' NE, E' ZE ZNE ZNE	iP iPa eS eLR M M F	18	58 59 19 07½ 10½ 12 40	57.0 15.8 35.4 - - - -	1.0 1.1 10 23 19	0.7 5.8 4.6	0.39 1.5	0.04 0.57 7.6 10.4	D. $\Delta = 27.7^\circ = 3080\text{km.}$ 18 53 08.5; 44.6°N. 37.4°E. h=26km. Caucasus. USCGS. M=5.2 (ESK) Pa has very large amplitude on S.P. (8.43 km/sec).
KEW	ZV	eP	18	58	40					
13. ESK	Z'	epP	08	33	02.8					08 20 59.4; 12.6°N. 87.7°W. h=61km. Near Nicaragua. USCGS.
KEW	ZV	epP	08	33	14					
13. ESK	Z' N	eP eS	10	38 41	04.8 29					10 34 02.8; 56.8°N. 34.1°W. h=24km. Atlantic Ocean. USCGS.

## SEISMOLOGICAL BULLETIN

JULY 1966

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
14. ESK	Z'	eP	12	28	58.4				12 18 17.0; 56.2°N. 149.8°W. h=33km. Gulf of Alaska. USCGS.	
14. ESK	Z'	iP	18	18	25.7	0.9		0.05	18 07 04.1; 53.1°N. 171.1°E. h=29km. Near Is. USCGS.	
15. ESK	Z'	eP	08	09	49.2				08 00 00.7; 16.9°N. 61.5°W. h=89km. Leeward Is. USCGS.	
15. ESK	Z'	eP	23	55	16.6				23 50 13.1; 39.0°N. 21.8°E. h=44km. Greece. USCGS.	
17. ESK	Z'	iPKP	02	43	40.0	0.8		0.11	C. 02 24 06.9; 21.6°S., 169.9°E. h=63km. Loyalty Is. USCGS.	
	KEW	ZV	02	43	49.5					
18. ESK	Z'	iP	10	09	33.3				09 59 10.0; 13.1°N. 57.6°E. h=33km. Arabian Sea. USCGS.	
	KEW	ZV	10	09	15					
19. ESK	ZE	eP	00	24	19	9		0.4	0.6	00 20 11; 55.5°N., 35.4°W. h=33km. Atlantic Ocean. USCGS.
	ZE	eL		28 $\frac{1}{2}$	-					
	ZNE	M		29 $\frac{1}{2}$	-	20	0.2	0.9	0.9	M = 3.6(ESK)
		F		50	-					
19. ESK	Z'	eP	01	51	55.7	1.1			0.04	$\Delta = 67.8^\circ = 7530\text{km.}$
	Z'	i		51	57.8					
	NE	eS	02	00	50	14	1.0	1.2		01 40 53.9; 56.2°N. 164.9°E. h=18km. Komandorsky Islands region. USCGS.
	E	eLQ		09	-					
	ZN	eLR		13 $\frac{1}{2}$	-					
	ZNE	M		27	-	19	5.1	4.0	4.4	M = 5.7(ESK)
		F		40	-					
19. ESK	Z'	eP	19	32	00.0	10			0.4	$\Delta = 74^\circ = 8220\text{km.}$ 19 20 33.4; 51.7°N. 173.3°W. h=47km. Andreanof Is. USCGS.
	E	eS		41	29					
	E	eLQ		51 $\frac{1}{2}$	-					
	ZNE	M	20	06 $\frac{1}{2}$	-	18	0.8	0.8	1.1	
		F		40	-					
20. ESK	Z'	eP	10	21	11.5					10 16 07.2; 38.9°N. 21.4°E. h=32km. Greece. USCGS.
21. ESK	Z'	iP	04	06	32.6	0.8	0.015	0.012	0.035	C. 03 57 57.8; 49.7°N., 77.9°E. h = 0km. Eastern Kazakh S.S.R. USCGS.
21. ESK	Z'	iPKP	18	48	37.9					18 30 14.9; 17.8°S. 178.6°W h=591km. Fiji Is. USCGS.
21. ESK	Z'	ePn	20	32	28.3					
	Z'N'E'	iP <del>n</del>		32	28.9					
	Z'N'E'	iPg		32	30.6	0.3		0.08	0.08	Large explosion at the distance of about 180km.
21. ESK	Z'	ePn	20	33	54.5	54.5				" " "
	Z'	iP <del>n</del>		33	55.1					
	Z'	iPg		33	57.6					
22. ESK	Z'	iP	03	49	28.9	1.0			0.03	03 39 59.7; 42.8°N. 84.5°E. h=33km. Sinkiang, China. USCGS.



SEISMOLOGICAL BULLETIN

JULY 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
24. ESK	ZNE	M F	10	20	-	18	0.5	0.5	0.6	08 52 13; 16.3°S. 172.8°W. h=49km. Samoa Is. USCGS.
24. ESK	Z'	iPKP	17	37	39.6	1.0			0.08	17 18 17.6; 20.4°S. 175.8°W. h=112km. Tonga Is. USCGS.
26. ESK	Z'	iPKP	22	59	25.9					22 39 47.8; 27.5°S. 177.9°W. h=143km. Kermadec Is. USCGS.
	Z'	i		59	36.1					
27. ESK	Z	eP	05	02	31					
	Z	ePP		06	28					
	NE	eSKS		13	08					
	NE	ePS		15	20					
	NE	eL		29 $\frac{1}{2}$	-					
	ZNE	M		43	-	20	1.1	0.7	1.4	M = 5 $\frac{1}{4}$ (ESK).
		F	06	15	-					
27. ESK	Z, 'Z	eP	14	56	55.2	1.0			0.02	$\Delta$ = 43.6° = 4850km.
	N	eS	15	03	22					14 49 02.0; 32.6°N. 48.8°E.
	ZNE	M		16 $\frac{1}{2}$	-	19	1.4	0.5	0.6	h = 36km. Iran. USCGS.
		F		40	-					M = 4 $\frac{3}{4}$ (ESK).
28. ESK	ZNE	M	02	41 $\frac{1}{2}$	-	20	0.3	0.3	0.5	01 18 27.4; 17.2°S. 167.7°E.
		F	03	30	-					h=17km. N. Hebrides. USCGS.
28. ESK	Z'	iPKP	07	31	49.2					07 13 18; 21.0°S., 179.1°W. h = 604km. Fiji Is. USCGS.
29. ESK	Z'	iP	06	38	18.7					06 25 35.2; 29.0°N. 129.4°E. h=21km. Ryukyu Is. USCGS.
29. ESK	Z'	ePg	18	02	21.3					$\Delta$ = 115km.
	Z'N'	iSg		02	35.0					
	Z'N'E'	M		02	38	0.6	0.027	0.027	0.038	Local (rockburst)
		F		02	55					ML = 1.2
30. ESK	Z'E'	ePx	10	25	12.8					$\Delta$ = 117km.
	Z'E'	iPg		25	13.6	0.3		0.042	0.047	
	E'N'	iSg		25	27.3					Local (rockburst)
	Z'N'E'	M		25	28	0.6	0.044	0.026	0.030	
		F		25	55					ML = 1.5
31. ESK	Z'	eP	23	37	46.6					23 26 24; 52.9°N., 170.8°E. h = 33km. Near Is. USCGS.

Kew seismograph did not operate from 1-5 and 19-28 due to waterproofing of the vault.

Esk did not operate on 22-23 and 25-26 due to annual inspection and standardisation.

Cornwall earthquake of 23 July: 01 50 02, 50°7' N., 05° 09' W (Kew) was missed by both stations.

Met. O. 778

13 OCT 1967

## METEOROLOGICAL OFFICE, UNITED KINGDOM

 SEISMOLOGICAL BULLETIN FOR AUGUST 1966

## I. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESSHIRE, SCOTLAND

 Lat.  $55^{\circ} 19' 00''$  N., Long.  $3^{\circ} 12' 18''$  W. Height above M.S.L. 263m.

Foundation: Llandovery Shales, folded (late Silurian).

Instruments: World-wide standardised seismograms (USCGS).

(i) Long-Period SPRENGNETHER

(ii) Short-Period BENIOFF

## CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	V
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHER N E WWSS Z		15	100		} 1500 at } 15 sec.
		15	100		
		15	100		
BENIOFF N' E' WWSS Z'		1.0	0.75		} 25000 at } 1 sec.
		1.0	0.75		
		1.0	0.75		

## 2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

 Lat.  $51^{\circ} 28' 6''$  N., Long.  $0^{\circ} 18' 47''$  W, Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.

Instruments: Kew-type vertical seismograph, period 1.5 sec.

Direct optical registration (ZV).

 Notations: For phases the generally adopted notations are used.  
 In addition the following symbols are in use:

C = Compression

 $\Delta$  = Epicentral distance

D = Dilation

h = Depth of hypocenter

Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
1. ESK	Z', Z	iP	19	19	31.1	10				$\Delta = 56.6^{\circ} = 6290$ km. PZ' = 1.3 sec. $0.073 \mu$ 19 09 55.1; $29.9^{\circ}$ N. $68.8^{\circ}$ E h = 33km. West Pakistan. USC GS. M = 4.9 (body waves) (ESK) M = 6.2 (surface waves) C.
	NE	eS		27	19	16	1.1	0.33	0.72	
	N	eLQ			33.0	-		0.9		
	E	eLR			37.0	-				
	N	M			43	-	25	23		
	E	M			45	-	20	9		
	ZE	M			$48\frac{1}{2}$	-	17	18	22	
KEW	ZV	iP	19	19	21.5					
1. ESK	Z'	iP	20	40	32.0	10			0.4	$\Delta = 56.1^{\circ} = 6230$ km. PZ' = 1.3 sec. $0.06 \mu$ 20 30 57.0; $29.9^{\circ}$ N. $68.6^{\circ}$ E. h = 33km. West Pakistan. USC GS. M = 4.6 (body waves) (ESK) M = 5.9 (surface waves)
	N	eS		48	17	18	0.9			
	N	M		21	$04\frac{1}{2}$	-	25	13		
	E	M			$06\frac{1}{2}$	-	20	4.4		
	ZE	M			$09\frac{1}{2}$	-	17	7.1	7.9	
KEW	ZV	eP	20	40	22.0					
1. KEW	ZV	ePKP	20	43	53.0					20 24 18; $15.3^{\circ}$ S. $173.0^{\circ}$ W. h = 7km. Samoa Is. USC GS.

Met. O. 778

## SEISMOLOGICAL BULLETIN

AUGUST 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
1. ESK	Z'	iP	20	43	58.5	1.4			0.09	C. 20 32 01.3; 44.6°N., 150.4°E. h = 24km. Kurile Islands. USCGS.
KEW	ZV	iP	20	44	15					
1. ESK	Z'	iP	21	12	34.2	1.2			0.32	C. $\Delta = 56.6^\circ = 6290\text{km}$ .  21 02 59.6; 30.0°N. 68.7°E. h=33km. West Pakistan. 2 killed, 15 injured, about 45 villages destroyed. USCGS.  M=6.1 (body waves) (ESK) M=6.7 (surface " ) (ESK)
	Z'	i		12	37.3					
	Z'	i		12	41.1					
	Z'	iPcP		13	23					
	N	eS		20	22	22	9.3	8.5		
	E	eLR		29	-					
	N	M		34	-	32	74			
	NE	M		38 $\frac{1}{2}$	-	20	49	29		
	ZNE	M		42	-	16	55	79	70	
		F	25	15	-					
KEW	ZV	iP	21	12	24.5					
1. ESK	Z'	iP	22	40	31.6					22 30 54.8; 30.0°N. 68.9°E. h=33km. West Pakistan. USCGS.
2. ESK	NE	eL	06	09	-					05 41 37.4; 30.0°N. 68.8°E. h=32km. West Pakistan. USCGS.
	N	M		14 $\frac{1}{2}$	-	27	0.4			
	E	M		16 $\frac{1}{2}$	-	20		0.2		
		F		30	-					
2. ESK	Z'E'	ePn	06	55	17.4					$\Delta = 6.4^\circ = 710\text{km}$ . 06 53 34; 58.3°N., 8.5°E. South of Norway (Uppsala)
	N'E'	eSn		56	30.8					
2. ESK	Z'	eP	09	28	31.3	1.3			0.04	09 18 57.6; 29.9°N. 69.2°E. h=21km. West Pakistan. USCGS.
2. ESK	Z'E'	e	13	31	05.9					$\Delta = 113\text{km}$ .  Local (rockburst)  ML = 1.5
	Z'E'	iPg		31	06.7	0.5		0.015	0.015	
	Z'N'	e		31	18.0					
	N'	iSg		31	20.0					
	Z'N'E'	M		31	21	0.6	0.027	0.014	0.013	
		F		31	40					
2. ESK	ZNE	M	19	35 $\frac{1}{2}$	-	20	0.4	0.4	0.4	18 48 33.8; 36.5°N. 138.1°E. h = 2km. Honshu, Japan. USCGS.
		F	20	00	-					
5. ESK	Z'	iP	01	13	07.5	0.9			0.034	C. 01 03 04.4; 32.6°N., 79.6°E. h=55km. Kashmir- Tibet border. USCGS. M = 4.8(ESK)
	N	eL		31	-					
	NE	M		39 $\frac{1}{2}$	-	22	0.8	0.4		
		F		55	-					
KEW	ZV	iP	01	13	03					
5. ESK	Z'	iP	04	06	32.0	0.9	0.02	0.02	0.05	C. 03 57 58.1; 49.9°N., 78.0°E. h=0km. Eastern Kazakh SSR USCGS.
KEW	ZV	iP	04	06	35.5					C.
5. ESK	E	eL	05	29	-					04 33 07.4; 10.9°S., 162.3°E. h = 93km. Solomon Is. USCGS.
	NE	M	06	00	-	18	0.4	0.4		
		F		50	-					

Met. O. 778

## SEISMOLOGICAL BULLETIN

AUGUST 1966

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS	
			h.	m.	s.		N	E	Z		
5. ESK	Z'N'E'	i	07	29	34.8	0.4	0.033	0.081	0.081	$\Delta = 133\text{km.}$ Local (rockburst) $M_L = 2.0$	
	Z'N'E'	iPg		29	35.4						
	N'	iSg		29	51.1						
	E'	i		29	54.1	0.6	0.068	0.041	0.041		
	Z'N'E'	M		29	58						
		F		30	55						
6. ESK	Z'	iP	02	35	33.3	1.1			0.04	02 31 08; 42.2°N., 18.8°E. h=33km. Yugoslavia. USCGS.	
	NE	eL		41	-	20	0.4	0.4			
	NE	M		42 $\frac{1}{2}$	-						
		F	03	05	-						
KEW	ZV	iP	02	34	53						
6. ESK	Z'	iP	14	51	05.9	1.0			0.02	14 38 41.4; 7.8°S., 75.1°W. h=149km. Peru. USCGS.	
6. ESK	Z'	eP	18	37	48.3	0.8			0.02	18 32 34.2; 37.9°N., 22.3°E. h=55km. Greece. USCGS.	
6. ESK	Z'	eP	19	45	16.5	1.5			0.06	19 33 22.3; 44.9°N. 150.2°E h=36km. Kurile Is. USCGS.	
6. ESK	Z'	eP	20	16	49.1	19	0.3	0.2		20 12 32; 73.5°N., 7.6°E. h=33km. Greenland Sea. USCGS.	
	NE	M		20	-						
		F		45	-						
6. ESK	Z'	iP	20	31	24.2					20 19 30.1; 44.8°N. 150.2°E h=41km. Kurile Is. USCGS.	
6. ESK	Z'	eP	21	16	02.0	0.9			0.01	21 04 32.5; 51.9°N. 175.3°E h=30km. Rat Is. USCGS.	
7. ESK	Z'	iP	02	24	38.2	13	9.6	1.8	21	D. $\Delta = 74.4^\circ = 8260\text{km.}$ PZ' = 3.3 sec. 8.8 u 02 13 05.1; 50.6°N. 171.3°W h=39km. Aleutian Is. USCGS.	
	NE	eS		34	09	15	14.6	7.6			
	N	eSS		39	24						
	E	eLQ		44 $\frac{1}{2}$	-						
	N	eLR		48 $\frac{1}{2}$	-						
	ZNE	M		03	00 $\frac{1}{2}$	-	20	27	17		37
		F	06	35	-					M = 7.0 (ESK)	
7. ESK	Z'	eP	10	38	03.7					10 28 29.6; 42.3°N. 85.0°E. h=37km. Sinkiang Province, China. USCGS.	
7. ESK	Z'	iPKP	14	00	53.9					13 42 07.8; 24.0°S. 179.9°W h=537km. Fiji Is. USCGS.	
7. ESK	Z'	iP	14	22	09.3	12	0.4	0.2		$\Delta = 61.3^\circ = 6800\text{km.}$ 14 11 51.2; 59.6°N. 144.4°W h=4km. Gulf of Alaska. USCGS. M = 4.6(ESK).	
	NE	eS		30	28						
	E	eL		37 $\frac{1}{2}$	-	20	0.5	0.6			
	NE	M		46	-						
		F	15	15	-						
7. ESK	Z'	iP	14	36	12.3	1.0			0.02	14 30 47; 36.4°N., 22.2°E. h=54km. Greece. USCGS.	
7. ESK	Z', Z	eP	17	48	09.5	20	5.1	2.6		$\Delta = 76.0^\circ = 8440\text{km.}$ 17 36 26.7; 31.8°N. 114.5°W h=33km. Gulf of California USCGS. M = 6.2(ESK).	
	NE	eS		57	49						
	N	eLQ		18	08	-	17	29	28		27
	ZNE	M		20	-						
		F	21	00	-						

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
7. ESK	Z'	iP	20	30	36.9					C. 20 18 41.5; 42.3°N., 143.0°E. h=66km. Hokkaido, Japan. USCGS.
8. ESK	Z'	eP	08	15	07.1	2.0			0.23	$\Delta = 83.7^\circ = 9300\text{km}$ . 08 02 45.8; 19.3°N. 108.1°W. h=33km. Revilla Gigedo Islands. USCGS.
	NE	eS	25	26		13	1.1	1.5		
	Z	ePS	26	14						
	ZE	eLR	41 $\frac{1}{2}$	-						
	ZNE	M	52	-		18	2.2	3.2	4.6	
		F	10	00	-					M = 5.7(ESK)
8. ESK	Z'E'	e	13	35	14.2					$\Delta = 117\text{km}$ . Local (rockburst)
	Z'E'	i	35	14.8						
	Z'E'	iPg	35	15.2	0.4		0.023	0.023		
	Z'N'	e	35	27.0						
	Z'N'	iSg	35	28.7						
	Z'N'E'	M	35	30	0.6	0.044	0.017	0.028		
		F	36	00						
8. ESK	Z'	e	14	05	58.3					$\Delta = 122\text{km}$ . Local (rockburst)
	Z'	i	05	59.0						
	Z'E'	iPg	05	59.4						
	E'N'	iSg	06	13.9						
	Z'N'E'	M	06	14	0.6	0.043	0.017	0.023		
		F	06	45						
9. ESK	Z'	iP	03	39	01.1	1.0			0.05	C. 03 34 14.3; 40.3°N. 19.9°E. h=33km. Albania. USCGS.
	Z'	i	39	05.2						
	NE	M	46 $\frac{1}{2}$	-	22	0.6	0.4			
	Z	M	49 $\frac{1}{2}$	-	18			0.3		
		F	04	00	-					M = 4.0(ESK)
9. ESK	Z'	iP	11	24	29.7	1.3			0.04	11 12 39.4; 9.3°N. 83.8°W. h=35km. Costa Rica. USCGS.
9. ESK	Z'N'E'	iPg	16	28	53.7					$\Delta = 74\text{km}$ . Local. ML = 1.8
	N'E'	iSg	29	02.5						
	Z'N'E'	M	29	06 $\frac{1}{2}$	0.7	0.107	0.114	0.060		
		F	29	35						
10. ESK	Z', Z	iPKP	05	20	33.7	1.0			0.08	05 01 09.4; 20.1°S. 175.3°W h=96km. Tonga Islands. USCGS.
	KEW	ZV	05	20	40.5					
	ZV	i	20	46.5						
10. ESK	N	eL	13	33	-					12 33 42.2; 5.5°S. 151.8°E. h=40km. New Britain. USCGS.
	ZNE	M	47	-	23	1.4	0.9	0.9		
		F	14	50	-					
10. ESK	Z'	iP	15	28	09.2					15 22 34.8; 36.2°N. 22.2°E. h=7km. Greece. USCGS.
10. ESK	Z'	iP	22	14	32.7	1.0			0.04	22 05 35.0; 38.4°N. 69.6°E. h=4km. Tadzhik SSR. USCGS. M=4 $\frac{3}{4}$ (ESK).
	ZNE	M	37	-	22	0.6	0.8	1.2		
		F	50	-						
11. ESK	Z'	eP	00	28	51.4	0.8			0.02	00 23 40.4; 37.8°N. 20.9°E. h=43km. Ionian Sea. USCGS.
11. ESK	Z'	eP	04	39	23.8	1.0			0.05	$\Delta = 24.0^\circ = 2660\text{km}$ . 04 34 17.2; 38.9°N. 21.8°E. h=33km. Greece. USCGS.
	Z'	i	39	28.9						
	NE	eS	43	36	11	0.7	0.6			
	NE	M	47 $\frac{1}{2}$	-	22	0.8	0.6			
		F	05	00	-					
11. ESK	Z'	iPKP	05	32	12.9					05 12 42.2; 19.3°S. 173.9°W h=33km. Tonga Is. USCGS.
	E	eSS	53	57						



DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
15. ESK	Z	ePPS	03	12	34					02 45 32.3; 13.3°N. 121.3°E. h=14km. Philippine Is. USCGS.  <b>M = 6.2(ESK)</b>
	ZN	eL		32	-					
	NE	M		38 $\frac{1}{2}$	-	27	18	20		
	ZNE	M		43 $\frac{1}{2}$	-	20	5.2	9.8	5.0	
	ZNE	M		49	-	18	4.8	7.4	8.5	
		F	05	00	-					
15. ESK	Z'	eP	10	32	15.5					10 20 42.2; 3.8°N. 64.0°E. h=37km. Carlsberg Ridge. M=5 $\frac{1}{2}$ (ESK). USCGS.
	ZNE	M	11	08	-	20	1.5	1.1	1.1	
		F		45	-					
15. ESK	Z'	eP	13	46	38.0	1.3			0.06	$\Delta = 61.3^\circ = 6800\text{km}$ . 13 36 23.7; 60.4°N. 146.0°W. h=9km. Alaska. USCGS.  M = 5.1(ESK)
	NE	eS		54	53	12	0.8	0.6		
	E	eL	14	03	-					
	ZNE	M		13 $\frac{1}{2}$	-	19	1.5	1.4	2.1	
		F		14	35	-				
16. ESK	Z'	iP	02	25	11.3	1.3	0.06	0.12	0.32	C. Depth = 202km. (ESK) 02 16 19.7; 36.4°N. 70.8°E. h=199km. Hindu Kush. M=5.1(ESK) USCGS.
	Z'	iP		25	56.5					
	Z'	ePcP		26	19.6					
	Z'	iPP		27	09.3					
16. ESK	Z'	eP	02	51	27.7	1.0			0.02	02 47 45.0; 71.2°N. 6.3°W. h=33km. Jan Mayen Is.
16. ESK	Z'	eP	03	33	37.8	1.0			0.02	03 28 40; 40.0°N. 20.0°E. Albania. BCIS.
16. ESK	Z'	iP	03	58	30.7	1.0			0.06	C. $\Delta = 22.0^\circ = 2450\text{km}$ . 03 53 42.9; 40.3°N. 19.9°E. h=33km. Albania. USCGS.  M = 4.1(ESK)
	NE	eS	04	02	27					
	NE	eL		04 $\frac{1}{2}$	-					
	NE	M		06	-	22	1.2	0.8		
		F		50	-					
16. ESK	Z'	eP	05	14	04					
16. ESK	Z'	eP	18	13	50.6					$\Delta = 71.4^\circ = 7930\text{km}$ . 18 02 36.1; 37.4°N. 114.2°W. h=33km. Nevada. USCGS.  M = 5.6(ESK)
	NE	eS		23	05	12	0.3	0.4		
	N	eLQ		31 $\frac{1}{2}$	-					
	ZNE	M		43 $\frac{1}{2}$	-	17	1.8	4.1	4.8	
		F		19	35	-				
16. ESK	Z', Z	ePKP	20	05	14.9	8			1.0	19 45 38.7; 21.4°S. 171.3°E. h=36km. Loyalty Is. region. USCGS.  M = 5.9(ESK)
	Z'Z	e		05	20.9					
	E	eLQ		46	-					
	ZN	eLR		54.0	-					
	ZNE	M	21	06 $\frac{1}{2}$	-	22	2.5	1.4	3.0	
		F	22	30	-					
16. ESK	Z'	eP	22	21	47.9					22 18 00; 71.4°N. 2.8°W. h=33km. Jan Mayen Is. USCGS.
17. ESK	Z'	ePKP	20	11	50.1					19 54 10.2; 5.0°S. 125.2°E. h=538km. Banda Sea. USCGS.
17. ESK	Z'	eP	20	10	02.6	0.8			0.05	$\Delta = 73.2^\circ = 8130\text{km}$ . 20 58 35.9; 52.3°N. 174.9°E. h=32km. Near Islands. USCGS.  M=4.8(ESK)
	Z'	iP		10	03.4					
	E	eS		19	27	14		0.4		
	Z	eL	20	33	-					
	ZNE	M		44	-	17	0.5	0.5	0.6	
	F		22	30	-					

SEISMOLOGICAL BULLETIN

AUGUST 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
17. ESK	Z	eP	23	18	32	1.1			0.02	23 14 42; 50.9°N. 30.0°W. h=33km. N. Atlantic Ridge. USCGS. M=3.8(ESK).
	Z'	i		18	36.6					
	ZE	eL		22 $\frac{1}{2}$	-					
	ZNE	M F		23 $\frac{1}{2}$ 35	-	20	0.4	0.8	0.8	
17. ESK	ZNE	M	23	49	-	18	0.2	0.3	0.4	23 07 58.9; 37.3°N. 114.1°W. h=33km. Nevada. USCGS.
		F	24	00	-					
18. ESK	Z'	eP	06	49	34.5					06 38 04; 51.5°N. 177.8°E. h=44km. Rat Is. USCGS.
18. ESK	Z', Z	iP	10	45	03.0	14		1.0	2.0	PZ' = 1.0 sec. 0.23 $\mu$ Depth = 67km. (ESK) 10 33 16.5; 14.6°N. 91.7°W. h=76km. Guatemala. USCGS. M=6.1(ESK)
	Z'	ipP		45	21.2	0.9			0.13	
	ZN	e		55	12					
	ZE	ePS		55	43					
	ZE	eLR	11	09 $\frac{1}{2}$	-					
	ZNE	M		14 $\frac{1}{2}$	-	25	4.2	8.3	10.4	
	ZE	M F		17 13	- 30	22		7.0	10.0	
18. ESK	Z'	iPn	11	23	25.6					C. $\Delta$ = 567km. 51.0°N., 1.2°E. U.K. (explosion) BCIS.
	E'	e(Sn)		24	21.3					
18. ESK	Z', Z	eP	14	48	30					14 33 59.8°; 0.2°S. 125.1°E. h=56km. Molucca Sea. M = 6.1 (ESK). USCGS.
	Z'	ePP		53	08					
	ZNE	M	15	46 $\frac{1}{2}$	-	22	4.7	4.1	5.6	
18. ESK	Z	ePP	14	57	03					14 37 53; 0.1°S. 125.1°E. h=33km. Molucca Sea. USCGS.
18. ESK	Z'	ePKP	15	21	56.3					15 02 17.1; 21.7°S. 167.8°E. h=20km. Loyalty Is. USCGS.
19. ESK	Z'	eP	03	20	19.0					03 10 04.2; 59.5°N. 144.6°W. h=33km. Gulf of Alaska. USCGS.
19. ESK	Z'	eP	04	01	02.0					03 53 01.0; 50.4°N. 77.9°E. h=0km. Kazakh SSR. USCGS.
19. ESK	Z'	eP	11	34	24.2					$\Delta$ = 72.3° = 8030km. 11 23 13.5; 53.6°N. 167.6°W. h=54km. Fox Islands. M = 5 (ESK)
	N	eS		43	42					
	NZ	eLR		57	-					
	ZNE	M F	12	06 $\frac{1}{2}$ 25	- -	18	0.8	0.4	0.9	
19. ESK	Z'	iP	12	28	50.2	12	1.3	5.8	9.5	C. $\Delta$ = 34.7° = 3860km. PZ' = 1.0sec. 0.3 $\mu$ 12 22 09.6; 39.2°N. 41.7°E. h=26km. Turkey. More than 3000 dead many injured and major property damage. M=6.7(ESK). USCGS.
	NE	eS		34	18	20	26	49		
	NE	M		46	-	19	203	150		
		F	16	45	-					
19. ESK	Z'	iP	12	51	30.7					12 46 23.7; 36.4°N. 141.7°E. h=28km. Near Japan. USCGS.
19. ESK	Z'	eP	12	58	51.0					12 15 10.1; 39.2°N. 41.1°E. h=33km. Turkey. USCGS.
19. ESK	Z'	iP	13	21	47.6					13 54 24.9; 38.9°N. 41.7°E. h=33km. Turkey. USCGS.
	Z'	i	14	01	09.9	1.0			0.06	



DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
19. ESK	Z'	eP	14	10	35.1				14 03 57.8; 39.2°N.41.3°E. h=33km. Turkey. USCGS.	
19. ESK	Z'	eP	14	24	33.3	1.0		0.02	14 17 57.5; 39.2°N.41.1°E. h=47km. Turkey. USCGS.	
19. ESK	Z'	eP	18	47	54.3				18 41 16.0; 39.1°N.41.4°E. h=33km. Turkey. USCGS.	
	ZNE	M F	19	04 $\frac{1}{2}$ 20	- -	18	0.4	0.4		0.3
20. ESK	Z'	iP	07	55	44.0	1.1			$\Delta = 83.7^\circ = 9300\text{km.}$ 07 43 27.6; 3.2°S.77.2°W. h=116km. Peru-Ecuador USCGS. border. M = 4.5 (ESK).	
	NE	eS	08	05	55	16	0.2	0.4		0.05
20. ESK	Z',Z	iP	09	44	09.1	1.0			$\Delta = 77.1^\circ = 8670\text{km.}$ Depth = 144km. (ESK) 09 32 31.7; 43.1°N.140.6°E. h=161km. Hokkaido, Japan. USCGS. M = 5 $\frac{1}{2}$ (ESK).	
	Z'	epP		44	45					
	NE	eS		53	43	12	0.9	0.6		
	ZNE	e		54	18					
	ZNE	eLR F	10	09 35	- -					
20. ESK	Z'	iP	12	05	46.8	6		0.5	$\Delta = 33.6^\circ = 3730\text{km.}$ 11 59 12.1; 39.3°N.40.9°E. h = 37km. Turkey. 25 killed. USCGS. M = 6.1(ESK)	
	Z'	i		05	47.4					
	NE	eS		11	06	20	2.8	8.0		
	N	eLQ		13 $\frac{1}{2}$	-					
	ZE	eLR		15 $\frac{1}{2}$	-					
	ZNE	M		22	-	19	40	21		26
20. ESK	Z'	iP	12	08	19.4	1.0			0.06 C. 12 01 43; 39.0°N.40.9°E. h=33km. Turkey. USCGS.	
20. ESK	Z'	iP	12	09	44.2	1.3			0.11 D. 12 05 19.0; 42.3°N., 18.6°E. h=22km. Yugoslavia. USCGS. M = 5.6(ESK).	
	NE	M		20 $\frac{1}{2}$	-	19	32	27		
20. ESK	Z'	eP	19	12	47.3				19 08 21.4; 42.3°N.18.9°E. h=20km. Yugoslavia.	
	NE	M F		19 $\frac{1}{2}$ 30	- -	19	0.3	0.3		
20. ESK	Z',Z	iPKP	23	14	42.4	12			2.4 C. 22 55 03.0; 23.4°S.176.0°W. h=57km. Fiji Is. USCGS. M=5.8(ESK)	
	Z	iPP		18	06					
	E	eSS		37	10					
	ZNE	M	24	18	-	20	2.0	1.3		2.4
	ZNE	M F	25	31 40	- -	17	1.7	2.3		2.7
20. ESK	Z'	ePKP	12	33	03.6					
21. ESK	Z'	iP	01	36	09.4	0.9			0.03 C. $\Delta = 26.1^\circ = 2900\text{km.}$ 01 30 45.2; 40.3°N.27.4°E. h=33km. Turkey. USCGS. M = 4.8(ESK).	
	NE	eS		40	36	14	1.4	1.1		
	N	eL		42 $\frac{1}{2}$	-					
	NE	M F		45 02 20	- -	20	5.0	3.4		
21. ESK	Z'	ePKP	02	33	43.4				02 14 01.3; 23.6°S.175.9°W. h=33km. Tonga Is. USCGS.	
21. ESK	Z',Z	eP	05	14	23.5	1.7			0.09 C. $\Delta = 104.9^\circ = 11650\text{km.}$ 05 00 26.8; 08.5°N.126.7°E. h=67km. Philippine Is. USCGS. M = 6.0(ESK).	
	NE	eSKS		24	58					
	NE	eS		26	07					
	ZNE	M F	06	05 07 30	- -	22	2.0	2.8		4.5
21. ESK	Z'N'E'	iPg	13	04	48.8				$\Delta = 70\text{km.}$ Local.	
	Z'	i		04	54.3					
	N'E'	i		04	55.3					
	Z'N'E'	iSg		04	57.3					

**SEISMOLOGICAL BULLETIN**

**AUGUST 19 66**

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
contd.										
21. ESK	Z'N'E'	M F	13 05 00 05 25			0.9	0.049	0.065	0.086	ML = 1.4
22. ESK	Z'	iP	14 31 36.3			1.0			0.02	D. 14 21 13.7; 50.3°N., 147.6°E. h=628km. Sea of Okhotsk. USCGS.
22. ESK	ZNE ZNE	ePS M	17 31 34 18 14 $\frac{1}{2}$ -				1.5	0.9	1.8	17 02 03.5; 1.8°S. 134.2°E. h=13km. New Guinea. M=5.6(ESK).
22. ESK	Z', Z Z' Z E ZN ZNE ZNE	iPKP i ePP eLQ eLR M M F	18 01 47.5 01 49.0 05 12 43 - 51 - 19 08 - 24 - 21 10 -			17 17 17 20 19			10.2 2.0 4.9 4.6 8.2 5.9 4.7 5.9	C. 17 42 10.6; 22.4°S. 170.6°E. h=39km. Loyalty Islands region. USCGS. M = 6.2(ESK)
22. KEW	ZV ZV	ePKP i	18 01 57 02 05							
22. ESK	Z', Z	iPKP	20 51 35.6							C. 20 31 58.2; 22.5°S., 170.5°E. h=33km. (R) Loyalty Is. USCGS.
22. ESK	Z', Z Z' ZNE ZNE	eP i eL M F	21 53 10 53 13.5 57 - 58 - 22 35 -			18	1.6	0.9	1.6	21 49 17.4; 71.9°N. 11.4°W. h=33km. Jan Mayen Is. region. USCGS. M = 4.1 (ESK).
23. ESK	Z'	iPKP	00 13 13.7			0.9			0.03	C. 23 53 36.4; 22.3°S., 170.5°E. h=45km. Loyalty Is. USCGS.
23. ESK	Z' NZ NE ZNE	eP eS eL M F	18 35 08.2 45 52 19 03 - 12 $\frac{1}{2}$ - 40 -			20	0.9	1.5	0.5	$\Delta = 89.0^\circ = 9890\text{km.}$ 18 22 16.7; 23.8°N. 123.2°E. h=37km. Ryukyu Islands. M = 5.3(ESK)
23. ESK	Z'	eP	19 17 21.7							19 14 24; 44.5°N. 6.3°E. France. BCIS.
23. ESK	Z'	ePKP	22 18 44.7							21 59 04.2; 22.2°S. 169.6°E. h=33km. Loyalty Is. USCGS.
24. ESK	ZNE	M	07 29 -			18	0.3	0.3	0.3	06 51 15.8; 29.9°N. 68.6°E. h=33km. West Pakistan. USCGS.
25. ESK	ZNE	M F	01 28 $\frac{1}{2}$ - 40 -			18	0.2	0.2	0.4	00 32 49.5; 32.1°N. 132.3°E. h=34km. Japan. USCGS.
26. ESK	Z'	iPKP	01 11 38.9							00 51 51.3; 27.5°S. 177.3°W. h=59km. Kermadec Is. USCGS.
26. ESK	Z' ZNE	eP M F	06 00 35.6 06 - 20 -			18	0.8	1.5	0.3	05 56 24.3; 38.1°N. 8.4°W. h=33km. Portugal. USCGS. M = 4.1(ESK).
26. ESK	Z' Z' E ZNE	iPKP i eLQ M F	09 26 28.5 26 37.0 10 08 - 28 - 11 30 -			1.7 1.7 22			0.27 0.27 1.1 0.5 1.5	09 06 50.4; 22.1°S. 170.0°E. h=33km. Loyalty Islands. USCGS. M=5.4(ESK).

Met. O. 778

SEISMOLOGICAL BULLETIN

AUGUST 1966

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
KEW	ZV	ePKP <sub>2</sub>	09	26	41					
	ZV	e		26	46					
27. ESK	NE	eLR	17	57 $\frac{1}{2}$	-				17 10 44.2; 13.9°N. 123.6°E.	
	ZNE	M	18	10	-	20	0.7	0.5	0.6	h=13km. Philippine Is.
		F		30	-					M=5.1(ESK) USCGS.
28. ESK	Z'	eP	04	22	39.9					04 18 13.3; 42.2°N. 18.7°E.
	ZNE	M		31 $\frac{1}{2}$	-	15	0.3	0.2	0.4	h=39km. Yugoslavia. USCGS.
		F		45	-					
28. ESK	N	eL	04	49	-					04 09 24.3; 36.6°N. 138.1°E.
	NE	M		56	-	20	0.7	0.7		h=24km. Japan. USCGS.
		F	05	25	-					M = 5.1(ESK).
28. ESK	Z'	iPKP <sub>1</sub>	07	49	20.9					Depth = 107km. (ESK)
	Z'	iPKP <sub>2</sub>		50	02.8	1.0			0.04	07 29 34.7; 35.8°S. 178.5°E.
	Z'	ipPKP <sub>2</sub>		50	32.3					h=94km. Near New Zealand. USCGS.
KEW	ZV	ePKP <sub>1</sub>	07	49	24					
	ZV	ePKP <sub>2</sub>		50	18					
28. ESK	Z'	ePKP	10	21	08.9					10 03 03.0; 4.6°S. 155.2°E.
										h=509km. Solomon Is. USCGS.
KEW	ZV	ePP	10	23	48					
28. ESK	Z'	iP	11	51	56.1					Depth = 180km. (ESK)
	Z'	ipP		52	36.2	1.2			0.05	10 43 01.0; 36.3°N. 70.9°E.
										h = 173km. Hindu Kush. USCGS.
KEW	ZV	epP	11	52	30					
28. ESK	NE	eL	23	22	-					22 30 55.1; 2.3°N. 128.4°E.
	ZNE	M		37	-	23	0.5	0.5	0.7	h=75km. Halmahera.
		F	24	05	-					USCGS.
29. ESK	E	eLQ	14	21	-					13 10 27.0; 65.2°S. 176.9°E.
	ZN	eLR		30 $\frac{1}{2}$	-					h=33km. Balleny Is. USCGS.
	ZNE	M		47	-	22	0.8	0.6	1.5	
		F	15	15	-					M = 5.3(ESK)
30. ESK	Z'	iP	06	20	23.1	1.0			0.03	D. Depth = 2.6km. (ESK)
	Z'	ipP		20	31.1					06 10 33.4; 51.7°N. 104.4°E.
	ZNE	M		27 $\frac{1}{2}$	-	16	1.0	0.3	1.3	h=33km. Lake Baikal. USCGS.
		F	07	10	-					M = 4.8(ESK)
30. ESK	N	eL	13	27	-					12 40 27.5; 13.4°N. 120.7°E.
	NE	M		35 $\frac{1}{2}$	-	23	0.5	0.4		h=81km. Philippine Is.
		F	14	10	-					USCGS.
30. ESK	Z'E'	e	15	12	42.8					$\Delta$ = 114km.
	Z'E'	iPg		12	43.5	0.5		0.025	0.023	
	N'	e		12	55.0					Local (rockburst)
	Z'N'E'	iSg		12	56.8					
	ZNE'	M		12	58	0.6	0.029	0.041	0.025	ML = 1.7
		F		13	40					
30. ESK	Z'	iP	20	31	01.2	1.0			0.14	D. $\Delta$ = 60.8° = 6760km.
	Z'	ipP		31	09.6					Depth = 28km. (ESK)
	NE	eS		39	14	12	0.8	0.7		20 20 54.0; 61.3°N. 147.5°W.
	E	eLQ		47 $\frac{1}{2}$	-					h = 36km. Alaska. USCGS.
	N	eLR		50	-					
	ZNE	M		58	-	20	1.5	1.4	2.1	
		F	21	55	-					M = 5.2(ESK)
KEW	ZV	iP	20	31	28.5					D.
30. ESK	Z'	iP	20	33	26.2	1.0			0.04	20 23 18.2; 61.5°N. 147.5°W
										h=33km. Alaska. USCGS.

Met. O. 778

## SEISMOLOGICAL BULLETIN

AUGUST 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
30. ESK	NE	eS	23	59	56				23 37 19.4; 18.7°N. 107.0°W. h = 54km. Off coast of Mexico. USCGS. M = 5.3(ESK)	
	N	eLQ	24	11.1	-					
	NE	M	18 $\frac{1}{2}$	-		25	2.2	0.7		
	NE	M	20	-		20	1.3	0.5		
		F	45	-						
31. ESK	Z', Z	iP	18	19	26.0	1.2			$\Delta = 15.6^\circ = 1740\text{km.}$ 18 15 39.5; 71.6°N. 2.7°W. h=33km. Jan Mayen Is. region. USCGS. M = 4.6(ESK).	
	Z'	i	19	29.6				0.11		
	E	eS	22	18		16		1.4		
	NE	eL	23.2	-						
	ZNE	M	24	-		20	1.9	4.4		2.5
		F	19	00	-					
KEW	ZV	eP	18	20	12.0					
Kew seismograph did not operate for 15 days due to waterproofing of the vault.										

## METEOROLOGICAL OFFICE, UNITED KINGDOM

SEISMOLOGICAL BULLETIN FOR SEPTEMBER 19 66

## 1. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESSHIRE, SCOTLAND

Lat. 55° 19' 00" N., Long. 3° 12' 18" W. Height above M.S.L. 263m.

Foundation: Llandoverly Shales, folded (late Silurian).

Instruments: World-wide standardised seismograms (USCGS).

- (i) Long-Period SPRENGNETHER  
(ii) Short-Period BENIOFF

## CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	V
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHER N E WSS Z		15	100		} 1500 at 15 sec.
		15	100		
		15	100		
BENIOFF N' E' WSS Z'		1.0	0.75		} 25000 at 1 sec.
		1.0	0.75		
		1.0	0.75		

## 2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

Lat. 51° 28' 6" N., Long. 0° 18' 47" W, Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.

Instruments: Kew-type vertical seismograph, period 1.5 sec.  
Direct optical registration (ZV).Notations: For phases the generally adopted notations are used.  
In addition the following symbols are in use:

C = Compression

D = Dilation

 $\Delta$  = Epicentral distance

h = Depth of hypocenter

Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS	
			h.	m.	s.		N	E	Z		
1. ESK	Z;Z	eP	01	42	18.7	1.0			0.04	$\Delta = 15.9^\circ = 1770\text{km.}$ 01 38 29.9; 71.8°N. 2.8°W. h=17km. Jan Mayen Is. USCGS. M = 4.1(ESK)	
	Z'	i	42	23.7							
	E	eS	45	14	16		0.6				
	Z	M	47	-	20			1.4			
	E	M	47	-	15		2.2				
1. ESK	Z'	eP	12	40	50.8	1.2			0.05	$\Delta = 25.1^\circ = 2800\text{km.}$ 12 35 32.7; 38.1°N. 22.8°E. h=36km. Greece. USCGS. M=4.0(ESK).	
	E	eS	45	10							
	ZNE	M	52	-	18		0.3	0.2			0.4
		F	58	-	7						
1. ESK	Z,Z'	iP	14	28	19.1	7			1.1	D. $\Delta = 25.0^\circ = 2780\text{km.}$ PZ' = 1.1sec. 0.15 $\mu$	
	Z'	i	28	19.9							
	Z,Z'	i	28	27.1							
	E	eS	32	38.2	16		2.7	3.1			
	ZN	e	32	47							
	Z	eL	34	-							
	ZNE	M	40	-	19		7.2	4.4			6.0
	F	15	10	-							
KEW	ZV	eP	14	27	42						

## SEISMOLOGICAL BULLETIN

SEPTEMBER 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
1. ESK	Z'	iP	19	21	47.4	1.0			0.14	$\Delta = 15.8^\circ = 1760\text{km.}$ 19 18 00.6; 71.6°N., 2.9°W. h=33km. Jan Mayen Is. region. USCGS.
	Z'	i		21	51.1					
	E	eS		24	41					
	ZN	eL		25 $\frac{1}{2}$	-					
	ZNE	M		26 $\frac{1}{2}$	-	20	0.9	2.4	0.9	
		F	19	45	-					M = 4.2(ESK)
KEW	ZV	eP	19	22	34					
1. ESK	Z'	eP	21	31	25.1					21 27 38.6; 58.3°N. 32.6°W. h=33km. N. Atlantic Ocean. USCGS.
	Z	e		31	27.5					
	ZE	eL		34.7	-					
	ZNE	M		35 $\frac{1}{2}$	-	21	0.6	1.0	1.4	
		F	22	00	-					
1. ESK	Z'	eP	23	29	02.5	0.8			0.03	Depth = 85km. (ESK) 23 19 09.8; 61.8°N. 149.6°W. h = 77km. Alaska. USCGS. M = 4.8(ESK).
	Z'	ipP		29	24.8	0.9			0.04	
2. ESK	Z'	eP	01	06	17.7					00 54 40.7; 51.0°N. 177.9°E. h=14km. Rat Is. USCGS.
2. ESK	E	eSKS	08	23	34					07 59 05.7; 4.5°S. 105.9°W. h=33km. Easter Island Rise USCGS.
	N	eS		24	31					
	E	ePS		26	04					
	N	eLQ		41	-					
	ZNE	M		54 $\frac{1}{2}$	-	20	0.7	1.8	2.1	
		F	09	45	-					M = 5.5(ESK)
2. ESK	Z'	e	11	27	45.5					$\Delta = 118\text{km.}$ Local (rockburst)
	Z'E'	iPg		27	46.9	0.5		0.017	0.019	
	N'	iSg		28	00.4					
	Z'N'E'	M		28	01	0.7	0.051	0.028	0.025	
		F		28	25					
2. ESK	Z'	iP	22	56	53.0	1.0			0.02	22 46 39.5; 60.2°N. 146.9°W. h=31km. Alaska. USCGS.
3. ESK	E	eSKS	16	47	41					16 24 20.7; 10.2°N. 104.2°W. h=47km. Off coast of Mexico. USCGS.
	E	eSS		53	49					
	ZE	eLR	17	06	-					
	ZNE	M		17	-	20	0.4	0.7	1.1	
		F		35	-					
4. ESK	Z'	iP	04	49	30.9	1.0			0.02	04 37 04.5; 12.2°N. 93.1°E. h=33km. Andaman Is. USCGS.
4. ESK	NE	eL	10	31	-					09 41 23.8; 2.5°S. 138.8°E. h=39km. New Guinea. USCGS. M = 5.5(ESK).
	ZNE	M		56 $\frac{1}{2}$	-	20	1.2	0.9	1.8	
		F	11	10	-					
5. ESK	Z'	iPKP	00	27	19.9					00 08 05.1; 21.7°S. 176.4°W h=212km. Fiji Is. USCGS.
5. ESK	Z'	eP	22	39	27.5					22 34 14.1; 38.5°N. 21.9°E. h=33km. Greece. USCGS.
8. ESK	Z'	iP	12	19	45.5	1.3			0.06	12 07 49.7; 22.5°S. 10.7°W. h=33km. S. Atlantic Ridge. USCGS.
8. ESK	Z'	iP	12	27	02.2					12 18 14.8; 36.4°N. 70.2°E. h=223km. Hindu Kush. USCGS.

## SEISMOLOGICAL BULLETIN

SEPTEMBER 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
8. ESK	Z'E'	e	15	58	41.2	0.5		0.017	0.024	$\Delta = 120$ km. Local (rockburst) $M_L = 1.6$
	Z'E'	iPg		58	42.1					
	N'E'	iSg		58	55.9					
	Z'N'E'	M		58	56.5					
		F		59	40	0.6	0.053	0.028	0.036	
8. ESK	Z'E'	e	16	31	18.7	0.4		0.017	0.017	$\Delta = 105$ km. Local (rockburst) $M_L = 1.4$
	Z'E'	iPg		31	19.8					
	N'	iSg		31	32.2					
	Z'N'E'	M		31	34					
						0.6	0.044	0.028	0.017	
8. ESK	Z,Z'	eP	21	30	13.8	18			2.4	C. $\Delta = 108.5^\circ = 12500$ km. 21 15 52.8; 2.4°N. 128.4°E. h=96 km. Halmahera. USCGS. $M = 7.1$ (ESK)
	Z'	ePP		34	48	10	2.2	3.1	6.7	
	NE	eSKS		41	12	18	3.1	4.2		
	NE	eS		42	10	18	2.3	3.3		
	NE	eLR	22	09	-					
	ZNE	M		19 $\frac{1}{2}$	-	27	52	44	47	
	ZNE	M		20 $\frac{1}{2}$	-	24	43	40	40	
		F		24	20	-				
8. ESK	Z'	iPKP	21	36	51.0	1.0			0.1	21 17 21.4; 21.7°S. 176.3°W. h=80 km. Fiji Is. USCGS.
8. ESK	Z'	iP	22	07	31.7	0.9			0.05	21 55 40.1; 45.4°N. 150.5°E. h=32 km. Kurile Is. USCGS.
8. ESK	Z'	iP	22	43	11.6	0.7			0.01	22 31 50.9; 52.7°N. 173.4°E. h=58 km. Near Is. USCGS.
9. ESK	Z'E'	iPg	14	38	57.4	0.4	0.008	0.028	0.020	$\Delta = 17$ km. Local. $M_L = 0.5$
	Z'N'	iSg		38	59.7					
	Z'N'E'	M		39	02					
		F		39	35					
9. ESK	Z'	iP	20	52	02.0					20 42 06.3; 14.7°N. 52.3°E. h=28 km. Gulf of Aden. USCGS.
10. ESK	Z'	iP	02	38	53.3	0.6			0.02	02 27 47.7; 46.6°N. 144.1°E. h=335 km. Sea of Okhotsk. USCGS.
	KEW	ZV	02	39	09.5					
10. ESK	Z'	iPKP	17	50	46.2					17 32 03.0; 23.3°S., 179.8°E. h=550 km. Fiji Is. USCGS.
	Z'	i		50	51.9					
10. ESK	Z'	eP	22	08	53.3					21 58 46.8; 19.3°N. 67.9°W. h=28 km. Mona Passage. USCGS.
11. ESK	Z'	iP	17	49	15.9	0.8			0.05	Depth = 166 km. (ESK) 17 38 04.2; 6.8°N. 72.9°W. h=167 km. N. Colombia. USCGS.
	Z'	i		49	17.7					
	Z'	i		49	22.8					
	Z'	ipP		49	56.3					
KEW	ZV	eP	17	49	21.5					
12. ESK	Z, 'Z	ePKP	11	49	18.4	10			16.0	D. 11 29 40.3; 23.1°S. 170.6°E. h=49 km. Loyalty Islands region. USCGS. $M=6.3$ (ESK).
	Z'	i		49	33.0					
	Z	ePP		52	44					
	E	eSS	12	11	46					
	E	eLQ		30 $\frac{1}{2}$	-					
	N	eLR		39	-					
	ZNE	M		55 $\frac{1}{2}$	-					
	ZNE	M		13	06	-				
	F		14	25	-	20	3.9	4.5	3.1	
						18	4.2	3.8	5.6	

## SEISMOLOGICAL BULLETIN

SEPTEMBER 1956

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS	
			h.	m.	s.		N	E	Z		
12. ESK	Z'	iP	16	52	23.6				$\Delta = 72.0^\circ = 8000\text{km.}$ 16 41 01.7; 39.4°N. 120.1°W. h=8km. California. USCGS.		
	NE	eS	17	01	42						
	NE	eL		12	-						
	ZNE	M		20	-	20	6.7	7.5		7.1	
	ZNE	M		22 $\frac{1}{2}$	-	16	7.5	4.8		9.7	
		F	18	10	-				M = 6.0(ESK)		
13. ESK	Z'	ePKP	01	10	25.3				00 50 42.8; 23.0°S. 170.6°E. h=28km. Loyalty Is. USCGS.		
14. ESK	Z'	ePKP	00	40	39.0				00 21 01.3; 23.2°S. 170.6°E. h=51km. Loyalty Is. USCGS.		
14. ESK	Z	eP	23	33	41				23 18 41.6; 60.1°S. 27.0°W. h=33km. Sandwich Is. region. USCGS.		
	Z', Z	iPKP		37	25.0	18	1.9	2.7			
	Z	ePP		38	30						
	N	eSKKS		45	30						
	E	eS		46	31	19	2.1	6.7			
	E	eLQ		24	09 $\frac{1}{2}$	-					
	NZ	eLR		14 $\frac{1}{2}$	-					M = 6.8(ESK)	
	ZNE	M		21 $\frac{1}{2}$	-	20	41	31		49	
		F	26	30	-						
15. ESK	Z'	ePKP	04	26	41.6				04 07 04.8; 23.6°S. 175.8°W. h=67km. Tonga Is. USCGS. M=5 $\frac{3}{4}$ (ESK)		
	ZNE	M	05	33	-	20	1.3	1.2		2.1	
15. ESK	E	eS	12	19	45	16		1.5	11 51 55.7; 60.3°S. 26.7°W. h=33km. Sandwich Is. USCGS. M = 6.1(ESK).		
	N	ePS		21	35						
	E	eLQ		41	-						
	ZNE	M		53	-	20	6.9	4.2		7.8	
15. ESK	ZNE	M	13	03	-	18	3.8	3.3	7.5	11 59 57.2; 60.2°S. 26.4°W. h=33km. Sandwich Is. USCGS. M = 6.0(ESK).	
15. ESK	Z'	iPKP	14	34	01.9	1.0			0.03	14 14 19.4; 23.1°S. 170.8°E. h=26km. Loyalty Is. USCGS.	
15. ESK	Z'	eP	17	23	38.2				$\Delta = 91^\circ = 10100\text{km.}$ 17 10 46.8; 22.8°N. 121.4°E. h=47km. Taiwan region. USCGS.		
	E	eSKS		34	10						
	NE	eS		34	32	13	0.6	1.0			
	NE	M		59 $\frac{1}{2}$	-	25	9.5	7.8			
	ZNE	M		18	08	-	16	18		6.5	22
		F	19	10	-				M=6.0(ESK)		
16. ESK	Z'	iP	02	59	29.3	0.9			0.03	D. 02 48 21.8; 54.1°N., 163.5°W. h=39km. Unimak Is. USCGS.	
	KEW	ZV		59	54						
16. ESK	N'	e	13	31	00.7				$\Delta = 148\text{km.}$ Local (rockburst)		
	Z'N'	iPg		31	01.4	0.3	0.044	0.018		0.026	
	Z'N'E'	iSg		31	18.7						
	Z'N'E'	M		31	20	0.4	0.068	0.068		0.068	
	Z'N'E'	F		32	05						M <sub>L</sub> = 1.9
16. ESK	Z'	eP	15	04	36.8				14 52 52.1; 14.2°N. 91.2°W. h=81km. Guatemala. USCGS.		
17. ESK	Z'	ePKP <sub>2</sub>	20	37	27.2				20 17 26.0; 27.7°S. 176.6°W. h=37km. Kermadec Is. USCGS.		
	ZNE	M		21	53 $\frac{1}{2}$	-	17	0.4		0.5	0.7
	ZNE	F		22	40	-					
KEW	ZV	ePKP <sub>2</sub>	20	37	44.5				M=5 $\frac{1}{4}$ (ESK).		



SEISMOLOGICAL BULLETIN

SEPTEMBER 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
17. ESK	Z'	iPKP	21	24	37.8	0.9			0.04	21 05 26.8; 20.7°S, 176.3°W. h=220km. Fiji Is. USCGS.
18. ESK	Z'	iP	05	34	26.1	0.7			0.01	05 22 31.2; 42.3°N, 142.8°E. h=73km. Hokkaido. USCGS.
18. ESK	Z'	eP	12	08	52.3					11 58 28.5; 13.0°N, 57.6°E. h=33km. Arabian Sea. USCGS.
	KEW	ZV	12	08	34.0					
18. ESK	Z'	eP	14	28	06.0					14 15 57.2; 22.6°N, 102.1°E. h=33km. China. USCGS.
	N	eL		54	-					
	ZNE	M	15	01½	-	20	1.4	0.8	0.6	M = 5.2(ESK)
		F		55	-					
18. ESK	E	eLQ	16	03	-					15 14 24.9; 60.4°S, 27.0°W. h=33km. Sandwich Is. USCGS.
	ZN	eLR		10½	-					
	ZNE	M		15½	-	22	1.4	0.8	1.5	M = 5.5(ESK)
		F	17	00	-					
18. ESK	Z', Z	iP	20	52	41.8	1.0			0.2	C. $\Delta$ = 49.2° = 5470km. 20 43 53.3; 27.8°N, 54.3°E. h=16km. Southern Iran. USCGS.
	NE	eS		59	46					
	N	eL	21	08	-					
	ZNE	M		17	-	19	2.3	2.2	3.2	
	ZNE	M		20	-	16	2.0	1.8	2.7	
		F		55	-					M = 5.5(ESK).
	KEW	ZV	20	52	24.5					
19. ESK	Z'	iP	04	35	43.0	0.7			0.02	04 24 05.1; 47.6°N, 153.8°E. h=80km. Kurile Is. USCGS.
19. ESK	Z'	eP	05	15	40.0					05 03 46.6; 23.9°N, 97.6°E. h=15km. Burma-China border USCGS.
	N	eL		41	-					
	ZNE	M		48	-	20	1.4	0.9	0.6	M=5.2(ESK)
		F	06	10	-					
19. ESK	Z'	iPKP	07	20	45.6	1.0			0.06	07 02 12.8; 20.7°S, 178.4°W. h=580km. Fiji Is. USCGS.
20. ESK	Z'	iP	06	25	17.2	0.7			0.01	06 13 48.0; 52.2°N, 173.1°E. h=21km. Near Is. USCGS.
20. ESK	Z'	iP	20	44	36.3					20 32 41.8; 44.7°N, 150.4°E. h=45km. Kurile Is.
20. ESK	Z'	iP	23	49	10.4					23 37 21.8; 24.1°N, 97.6°E. h=28km. Burma-China border USCGS.
	ZNE	M	24	21	-	20	1.1	0.8	0.6	M=5.1(ESK).
		F		40	-					
21. ESK	Z'N'E'	e	16	33	04.6					$\Delta$ = 64km. Local.
	Z'E'	iPg		33	05.5					
	Z'N'E'	iSg		33	13.1					
	Z'N'E'	M		33	17	0.9	0.107	0.098	0.138	ML = 1.5
		F		33	55					
22. ESK	Z'	eP	00	15	42.6					00 04 28.0; 52.6°N, 159.5°E. h=61km. Off coast of Kamchatka. USCGS.
22. ESK	Z'	eP	19	08	50.0					18 57 36.5; 37.4°N, 114.2°W. h=33km. Nevada. USCGS.
	ZNE	eL		31	-					
	ZNE	M		36½	-	18	0.8	0.8	0.9	
	ZNE	M		38½	-	16	0.7	1.3	1.4	
		F	20	05	-					M=5.0(ESK)

SEPTEMBER 1966

## SEISMOLOGICAL BULLETIN

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS	
			h.	m.	s.		N	E	Z		
22. ESK	Z' E	eP eS	22	06	14.3 16 16					$\Delta = 79.8^\circ = 8870\text{km.}$ 21 54 12.1; 26.2°N. 104.4°E. h=9km. China. USCGS.	
23. ESK	Z' Z' NE ZNE	iP i eS M F	01	41	43.3 41 57.3 51 33 15 $\frac{1}{2}$ - 50 -	7 12 20			0.6 0.6	0.6 0.5 1.0 0.9	C. $\Delta = 78.0^\circ = 8670\text{km.}$ 01 29 47.2; 44.7°N. 150.3°E. h=34km. Kurile Is. USCGS. M=5.1(ESK)
KEW	ZV	eP	01	42	00						
23. ESK	Z'	iP	02	18	14.8	0.8				0.02	02 07 02.4; 52.9°N. 159.7°E. h=68km. Off Kamchatka. USCGS.
23. ESK	NZ NZ ZNE	ePS eL M F	18	55	28 19 20 - 26 $\frac{1}{2}$ - 55 -	24	0.5	0.3	0.7		18 25 53.0; 59.5°S. 26.3°W. h=33km. Sandwich Is. USCGS. M = 5 (ESK)
23. ESK	Z'	eP	20	46	53.2						20 40 59.0; 34.2°N. 27.2°E. h=178km. Mediterranean Sea USCGS.
23. ESK	Z'	eP	23	53	03.0						23 48 03.0; 38.6°N. 22.1°E. h=88km. Greece. USCGS.
24. ESK	Z' Z' E ZNE	iP ipP eS M F	10	09	35.9 09 45.5 16 40 34 - 55 -	1.0 20	1.0	0.9	1.1	0.03	$\Delta = 49.5^\circ = 5500\text{km.}$ 10 00 46.4; 27.4°N. 54.5°E. h=33km. S. Iran. USCGS. M=4.8(ESK)
KEW	ZV	iP	10	09	18.5						
24. ESK	Z'	iPKP	17	07	59.0						16 48 31.7; 22.4°S. 171.6°E. h=127km. Loyalty Is. USCGS.
24. ESK	Z'	eP	20	26	29.0	0.7				0.02	20 21 19.7; 38.1°N. 22.5°E. h=102km. Greece. USCGS.
25. ESK	Z', Z NE N EZ ZNE ZNE	iP eS eLQ eLR M M F	06	14	27.6 24 24 36 - 41 - 46 $\frac{1}{2}$ - 50 - 07 10 -	1.6 14 26 20	0.6	0.8	1.3 1.1	0.24	D. $\Delta = 79.8^\circ = 8870\text{km.}$ 06 02 26.4; 18.3°N. 100.8°W. h=60km. Mexico. USCGS. M = 5.2(ESK)
KEW	ZV	iP	06	14	43.5						D.
25. ESK	Z'	ePKP	08	55	59.2						08 36 19.4; 22.9°S. 170.5°E. h=33km. Loyalty Is. USCGS.
25. ESK	Z'	iP	20	30	57.3	0.9				0.04	C. 20 19 42.5; 53.0°N., 159.7°E. h=48km. Off Kamchatka. USCGS.
KEW	ZV	iP	20	31	17.5						C.
26. ESK	Z' Z' N NE ZNE	iP i eS M M F	05	22	13.7 22 19.7 31 29 52 - 56 $\frac{1}{2}$ - 06 30 -	1.0 12 22 16	0.7 1.8 1.7	0.2 0.9 1.5	2.3	0.08	C. $\Delta = 71.5^\circ = 8050\text{km.}$ 05 10 58.1; 27.5°N. 92.6°E. h=33km. India-China border USCGS. M = 5.2(ESK)

SEISMOLOGICAL BULLETIN

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
26. KEW	ZV	iP	05	22	12.5				C.	
26. ESK	ZN	eLR	07	16	-				06 10 08.2; 16.0°S. 175.7°W. h=145km. Tonga Is. USCGS.	
	ZNE	M		26 $\frac{1}{2}$	-	20	0.6	0.4		0.9
		F		50	-					
26. ESK	Z'E'	e	17	54	09.0				$\Delta$ = 115km.	
	Z'E'	iPg		54	10.1	0.5		0.017		0.017
	N'E'	iSg		54	23.4					
	Z'N'E'	M		54	24.5	0.6	0.045	0.027		0.031
		F		55	20				Local (rockburst) ML = 1.5	
27. ESK	Z'	ePKP	09	25	04.5				09 06 31.1; 20.7°S. 178.7°W. h=568km. Fiji Is. USCGS.	
27. ESK	Z'	eP	11	00	24.9				10 54 50.0; 36.9°N., 24.1°E. h=22km. Greece. USCGS.	
28. ESK	Z'	eP	14	12	02.0	1.0			0.10	$\Delta$ = 76° = 8450km.
	Z'	iP		12	04.9					14 00 22.9; 27.4°N. 100.1°E. h=33km. Yunnan Province, China. USCGS.
	Z'	i		12	13.5					
	NE	eS		21	42	13	2.6	2.4		
	NE	M		48 $\frac{1}{2}$	-	22	11.6	8.4		
	NE	M		52 $\frac{1}{2}$	-	20	11.6	6.9		
	F		16	50	-				M = 6.1(ESK)	
KEW	ZV	eP	14	12	03.5					
29. ESK	Z'	iPKP	03	03	24.9	1.1			0.05	02 44 19.0; 19.9°S. 176.2°W. h=246km. Fiji Is. USCGS.
30. ESK	Z'	iP	06	08	21.7	0.8			0.02	05 59 48; 38.9°N., 64.5°E. Uzbek S.S.R. BCIS
30. ESK	Z'	eP	07	15	17.0					07 03 22.4; 15.4°N. 94.0°W. h=46km. Near Mexico. USCGS.
30. ESK	Z'	iP	09	42	07.0					09 29 11.6; 18.3°S. 69.7°W. h=122km. N. Chile. USCGS.
Correction to Bulletin for August 1966										
26. ESK	Z'	ePKP	23	33	03.6					not 12 33 03.6 as printed.

## METEOROLOGICAL OFFICE, UNITED KINGDOM

## SEISMOLOGICAL BULLETIN FOR OCTOBER 19 66

## 1. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESSHIRE, SCOTLAND

Lat. 55° 19' 00" N., Long. 3° 12' 18" W. Height above M.S.L. 263m.

Foundation: Llandovery Shales, folded (late Silurian).

Instruments: World-wide standardised seismograms (USCGS).

- (i) Long-Period SPRENGNETHET  
(ii) Short-Period BENIOFF

## CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	V
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHET WWSS	N	15	100		} 1500 } at 15 sec.
	E	15	100		
	Z	15	100		
BENIOFF WWSS	N'	1.0	0.75		} 25000 } at 1 sec.
	E'	1.0	0.75		
	Z'	1.0	0.75		

## 2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

Lat. 51° 28' 6" N., Long. 0° 18' 47" W, Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.

Instruments: Kew-type vertical seismograph, period 1.5 sec.  
Direct optical registration (ZV).Notations: For phases the generally adopted notations are used.  
In addition the following symbols are in use:

C = Compression

 $\Delta$  = Epicentral distance

D = Dilation

h = Depth of hypocenter

Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
1. ESK	ZNE	M F	08	14	-	17	0.3	0.3	0.3	07 38 29.0; 34.8°N. 71.0°E. h=25km. Pakistan. USCGS. M = 4.3(ESK).
2. ESK	NE	eLR	02	59 $\frac{1}{2}$	-					02 24 57.1; 43.7°N. 125.2°E. h=33km. China. USCGS. M=4.8(ESK).
	NE	M	03	04 $\frac{1}{2}$	-	24	0.5	0.9		
	NE	M F	08 $\frac{1}{2}$ 25	- -	16	0.4	0.4			
2. ESK	Z'	iP	07	35	03.5	14			0.7	$\Delta = 74^\circ = 6200\text{km.}$ 07 23 35.3; 51.6°N. 174.5°E. h=34km. Andraonof Is. USCGS. M = 5.1(ESK).
	WE	eS		44	32	16	0.3	0.7		
	N	eSS		49	12					
	ZN	eLR		58 $\frac{1}{2}$	-					
	ZNE	M F	08 09	06 10	- -	22	1.8	1.5	1.5	
2. ESK	Z'	iP	11	26	18.4	1.4			0.19	$\Delta = 21.0^\circ = 2340\text{km.}$ 11 21 44.9; 45.7°N. 26.5°E. h=140km. Rumania. USCGS. M = 5.0(ESK).
	Z'	i		26	22.9					
	Z'	ipP		26	43.6					
	ZNE	eS F		30 43	04 -	13	0.5	1.8	1.0	

## SEISMOLOGICAL BULLETIN

OCTOBER 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
KEW	ZV	eP	11	25	53.0					
	ZV	epP		26	18.0					
2. ESK	Z'	eP	12	19	27.1				12 08 00.6; 51.6°N, 174.6°W. h=56km. Andreanof Is. USCGS.	
2. ESK	Z'	eP	12	34	23.4				12 22 25.2; 13.4°N, 92.2°W. h=46km. Off coast of Mexico. USCGS.	
5. ESK	Z'	iP	08	44	55.3	1.2			08 34 40.6; 0.1°N, 30.0°E. h=33km. Republic of Congo. USCGS.	
	Z'	e		45	02.3					
	ZNE	M	09	11 $\frac{1}{2}$	-	18	0.7	0.8	0.7	
	ZNE	M		15 $\frac{1}{2}$	-	14	1.5	1.1	1.7	
		F		30	-				M = 5.0(ESK)	
7. ESK	Z, Z'	ePKP	16	14	30.4	12			12.4	
	Z'	iPKP		14	31.4					
	Z	ipPKP		15	30					
	Z	eSKP		17	44					
	Z', Z	iPP		17	54.5	14	2.1		4.9	
	N	e		28	00					
	E	eSS		36	30					
	E	eLQ		56	20					
	ZN	eLR	17	04	-					
	ZNE	M		17 $\frac{1}{2}$	-	21	6.4	4.0	5.6	
		F		18	30				M = 6.3(ESK).	
KEW	ZV	iPKP	16	14	35.5				C.	
7. ESK	Z'	iP	21	06	01.7	1.0			0.11	
									D. 20 55 56.0; 61.6°N, 150.1°W. h=56km. Alaska. USCGS.	
KEW	ZV	iP	21	06	29.5					
8. ESK	E	eLQ	01	11 $\frac{1}{2}$	-					
	NZ	eLR		18	-					
	ZNE	M		34	-	18	2.1	2.4	3.7	
		F		02	30				M = 5.8(ESK)	
KEW	ZV	iPKP	00	31	54.0					
	ZV	i		31	56.5					
8. ESK	Z'	iPKP	02	41	01.1					
									C. 02 21 56.4; 19.4°S., 175.4°W. h = 241km. Tonga Islands. USCGS.	
8. ESK	E	eLQ	03	33	-					
	ZN	eLR		40	-					
	ZNE	M		54 $\frac{1}{2}$	-	18	2.3	2.1	3.7	
		F		05	00				M = 5.8(ESK).	
KEW	ZV	iPKP	02	53	50.0					
	ZV	i		53	52.5					
8. ESK	Z'	iP	03	17	21.1					
									C. 03 06 46.4; 57.7°N., 151.6°W. h = 32km. Kodiak Is. USCGS.	
8. KEW	ZV	iPKP	15	02	39.0					
									14 43 53.9; 15.6°S, 177.8°W. h=420km. Fiji Is. USCGS.	
8. ESK	Z'	eP	19	50	06.0	0.8			0.02	
									19 39 40.5; 10.8°N, 62.6°W. h=90km. Near Venezuela. USCGS.	
8. ESK	Z'	eP	21	09	22.8					
									20 57 33.4; 46.4°N, 153.1°E. h=33km. Kurile Is. USCGS.	

## SEISMOLOGICAL BULLETIN

OCTOBER 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
9. ESK	Z'	ePKP	02	24	53.6				02 06 35.3; 17.8°S. 178.2°W. h=639km. Fiji Is. USCGS.	
9. ESK	Z'	iP	06	57	36.8	1.1			$\Delta = 50.3^\circ = 5590\text{km.}$	
	NE	eS	07	04	48	17	3.4	2.1	06 48 40.3; 12.6°N. 30.8°E. h=11km. Sudan. USCGS.	
	NE	eSS	08	31						
	NE	eLQ	10	-						
	ZNE	M	18	-		23	6.3	4.0	3.3	
	NE	M	22	-		14	5.5	8.0		
		F	08	25	-				M = 5.5(ESK)	
KEW	ZV	eP	06	57	06.5					
9. ESK	ZNE	M	08	52 $\frac{1}{2}$	-	18	0.8	0.5	0.9	08 10 28.0; 31.3°N. 114.3°W. h=33km. Gulf of California. M=4.9(ESK). USCGS.
		F	09	20	-					
9. ESK	Z'	eP	10	37	19.1					10 28 27.8; 12.6°N. 31.1°E. h=44km. Sudan. USCGS.
		M	11	57 $\frac{1}{2}$	-	22	0.9	0.7		M = 4.7(ESK).
		F	11	15	-					
9. ESK	Z'	ePKP	12	26	21.0				12 06 42.6; 54.9°S. 124.2°W. h=33km. Easter Is. Rise. USCGS.	
10. ESK	Z'	iP	07	05	06.5				06 53 11.6; 44.3°N. 149.3°E. h=33km. Kurile Is. USCGS.	
10. ESK	Z'	eP	10	13	57.2				10 03 31.0; 10.8°N. 62.5°W. h=95km. Near Venezuela. USCGS.	
11. ESK	E	eS	06	53	45					06 25 55.1; 60.3°S. 26.0°W. h=37km. South Sandwich Is. USCGS.
		ePPS	07	55	38					
	N	eSS	07	02	12					
	ZN	eLR	20 $\frac{1}{2}$	-						
	ZNE	M	27 $\frac{1}{2}$	-	22	4.2	2.1	4.4	M = 5.9(ESK).	
		F	08	55	-					
11. ESK	Z'E'	eP*	10	02	23.9					$\Delta = 92\text{km.}$
	Z'E'	iPn			24.6					Local (rockburst)
	N'Z'	eS*			36.4					
	N'	eSn			38.2					
	Z'N'E'	M			39	0.6	0.056	0.037	0.048	ML = 1.6
		F		03 20						
11. ESK	Z'	eP	10	18	08.1	1.0			0.02	10 06 19.9; 28.0°N. 103.8°E. h=31km. China. USCGS.
11. ESK	Z	eL	21	56	-					20 40 39.8; 32.6°S. 178.7°W. h=33km. Kermadec Is. M=5.3(ESK).
		M	22	11 $\frac{1}{2}$	-	18	0.6	0.5	0.9	
		F		50	-					
12. ESK	Z'	ePP	00	26	50	16				00 06 37.8; 11.9°S. 121.8°E. h=33km. South of Timor. USCGS.
		eSKKS		33	46					
	Z	ePS		36	30					
	Z	eLR	01	04	-					
	ZNE	M		25	-	20	2.3	1.5	1.8	M = 5.7(ESK).
		F	02	35	-					
12. ESK	ZNE	M	05	51	-	20	0.6	0.8	0.9	04 22 14.0; 31.2°S. 177.8°W. h=14km. Kermadec Is. USCGS. M=5.3(ESK).
		F	06	40	-					

## SEISMOLOGICAL BULLETIN

OCTOBER 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
12. ESK	Z' ZE ZNE	iP eLR M F	20	31	54.9					20 20 06.8; 11.2°N. 86.2°W. h=43km. Near coast of Nicaragua. USCGS. M = 4.9(ESK).
13. ESK	Z'	iP	02	26	04.4	1.0			0.05	C. 02 15 45.2; 59.5°N., 145.2°W. h=10km. Gulf of Alaska. USCGS.
13. ESK	Z'	iP	15	57	42.0					15 45 15.6; 8.8°S. 74.3°W. h=155km. Peru-Brazil border. USCGS.
13. ESK	Z NE ZNE	iPP e(PPS) M F	18 19 20	56 05 39	07 45	8 17			0.8 3.0	Not in USCGS PDE M = 5.7(ESK)
14. ESK	Z', Z Z' NE NE NE ZNE	eP i eS eL M M F	01	14	58.7	8			0.9	$\Delta = 62^\circ = 6900\text{km}$ . 01 04 43.3; 36.4°N. 87.5°E. h=24km. China. USCGS.
	KEW	ZV	01	15	57.5					
14. ESK	Z'	iP	01	21	23.4					01 11 51.6; 39.4°N. 80.2°E. h=33km. China. USCGS.
14. ESK	Z'N'E' N'E' Z'N'E'	iPg iSg M F	14	00	39.9	0.8	0.047	0.048	0.033	$\Delta = 49\text{km}$ . Local (rockburst) ML = 1.0
15. ESK	Z' Z' ZE	eP i eS	07	03	53.1	1.0			0.04	$\Delta = 21.6^\circ = 2400\text{km}$ . 06 59 16.9; 45.7°N. 26.3°E. h=120km. Rumania. USCGS. M = 4.8(ESK).
16. ESK	N NE NE	eL M M F	09 10	56 00	-	24	1.3 0.8	1.0 0.8		09 13 31.0; 29.6°N. 142.4°E. h=56km. South of Honshu, Japan. USCGS. M = 5.2(ESK).
16. ESK	Z'E' Z'N'E'	iPg iSg F	19	10	37.9	0.4	0.060	0.054	0.037	$\Delta = 19\text{km}$ . Local (rockburst?) ML = 0.5
17. ESK	E ZN ZNE	eLQ eLR M F	11	11	-	23	1.4	1.6	2.8	10 15 40.6; 11.0°S. 166.7°E. h=55km. Santa Cruz Is. USCGS. M = 5.6(ESK).
17. ESK	Z'	iPKP	18	38	41.1	0.9			0.07	18 20 07.8; 22.3°S. 179.1°E. h = 635km. Fiji Is. USCGS.

SEISMOLOGICAL BULLETIN

OCTOBER 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
17. ESK	Z',Z	iP	21	54	55.7	20	10	27	80	C. $\Delta = 89.6^\circ = 9960\text{km}$ . PZ' 2.0 sec. 2.7 $\mu$ 21 41 56.3; 10.7°S. 78.7°W. h=38km. Near coast of Peru. About 125 killed, over 3000 injured and major property damage. USCGS.
	ZE	iPP		58	20	22	16	28	47	
	ZE	iSKS	22	05	16	16			36	
	EN	eS		05	42	28	166	143		
	NE	M		32	-	20	180	300		
		F	08	00	-					
KEW	ZV	iP	21	54	58.5					m = 7.5) (ESK) M = 8.0)
	ZV	M	22	32 $\frac{1}{2}$	-	20			540	
17. ESK	Z'	iP	22	06	11.6	1.0			0.05	Not in USCGS P.D.E.
17. ESK	Z'	eP	23	17	20.9					23 04 22.1; 10.5°S. 78.6°W. h=39km. Off coast of Peru. USCGS.
18. ESK	Z'	iPKP	04	21	53.8					04 03 09.0; 23.2°S. 179.3°E. h=520km. Fiji Is. USCGS.
19. ESK	Z'	iP	04	06	32.1	0.7	0.04	0.03	0.11	C. 03 57 57.7; 49.7°N. 78.0°E. h=0km. Kazakh SSR. M=5.6(ESK). USCGS.
KEW	ZV	iP	04	06	36.0					
19. ESK	Z',Z	iP	08	11	21.2	12	1.5	0.4	2.7	$\Delta = 57.1^\circ = 6350\text{km}$ . PZ' = 1.3 sec. 0.26 $\mu$ P1Z' = 1.1 sec. 0.41 $\mu$ PPZ = 12 sec. 4.4 $\mu$ PPH = 12 " 3.2 $\mu$ Multiple shock. 08 01 33.8; 1.6°S. 15.5°W. h=33km. North of Ascension Island. USCGS. M = 6.5(ESK)
	Z',Z	iP1		11	40.0	14	3.1	0.8	6.4	
	Z	iPa		14	55	16	10.0	2.7	10.0	
	NE	eS		19	12	13	4.6	3.3		
	NE	eS1		19	30	14	15	17		
	ZN	ePS		19	40					
	E	eLQ		25.2	-					
	Z	eLR		28.0	-					
	ZNE	M		38	-	21	83	76	92	
		F		12	20	-				
	KEW	ZV	iP	08	10	58				
19. ESK	Z'	eP	19	47	52.2					19 36 24.9; 51.2°N. 159.1°E. h=34km. Near Kamchatka. USCGS.
20. ESK	N	eL	01	22	-					00 53 38.7; 33.6°N. 78.5°E. h=27km. Kashmir-Tibet border. USCGS. M=5.1(ESK) $\Delta = 15\text{km}$ .
	NE	M		26 $\frac{1}{2}$	-	21	2.0	0.9		
		F		40	-					
20. ESK	Z'E'	iPg	15	47	16.5					Local. ML = 0.8
	E'N'	iSg		47	18.8					
	Z'N'E'	M		47	21 $\frac{1}{2}$	0.7	0.33	0.24	0.20	
		F		47	50					
21. ESK	Z'	eP	16	22	02.6	0.9			0.02	16 17 02.0; 39.6°N. 22.1°E. h=33km. Greece. USCGS.
22. ESK	Z'	eP	03	15	01.5					03 03 23.5; 23.1°N. 94.4°E. h=68km. Burma-India border. USCGS.
	Z'	i		15	28.5					
22. ESK	Z'	iP	12	58	20.4	0.9			0.04	C. 12 47 18.2; 55.2°N., 162.0°E. h=59km. Near Kamchatka. USCGS.
23. ESK	Z'	iP	07	20	48.2	0.8			0.02	C. $\Delta = 75^\circ = 8300\text{km}$ . 07 09 20.9; 51.0°N. 159.2°E. h=38km. Near Kamchatka. M=5.1(ESK). USCGS.
	N	eS		30	22					
	ZNE	M	08	01	-	16	1.3	0.7	2.0	
		F		35	-					
24. ESK	Z'	eP	14	04	54.0					13 53 44.5; 54.9°N. 165.8°E. h=33km. Komandorsky Is. USCGS.



## SEISMOLOGICAL BULLETIN

OCTOBER 19

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
24. ESK	Z'	iP	14	39	32.6	0.9			0.02	14 31 21.3; 37.7°N. 59.0°E. h=33km. Iran-USSR border. USCGS.
25. ESK	Z'	iP	10	16	38.7	1.1			0.03	10 06 58.1; 29.9°N. 68.9°E. h=6km. Pakistan. USCGS.
25. ESK	Z'	iP	18	16	32.9	1.2			0.03	C. 18 04 11.8; 36.8°N., 138.2°E. h=28km. Japan. USCGS.
KEW	ZV	eP	18	16	45.0					
26. ESK	Z'	iPKP	18	48	20.9					18 28 54.1; 18.4°S. 167.6°E. h=36km. New Hebrides Is. USCGS.
Z'	i			48	22.3					
KEW	ZV	iPKP	18	48	30.0					C.
27. ESK	Z'	iP	06	04	02.5	0.9	0.40	0.22	0.83	C. $\Delta = 29.0^\circ = 3220\text{km.}$ 05 57 58.0; 73.4°N. 54.8°E. h=0km. Novaya Zemlya. USCGS.
Z'	iPcP			07	08.7					
E'	iS			08	53.0	1.4			0.09	
ZNE	M			16	-	20	1.7	1.8	1.4	
ZN	M			19 $\frac{1}{2}$	-	15	2.3		2.8	m = 6.5 } (ESK) M = 6.3 }
F	F			50	-					
KEW	ZV	iP	06	04	25.5					C.
ZV	iPcP			07	16					
27. ESK	Z', Z	eP	14	34	40.3	1.3			0.06	$\Delta = 98.8^\circ = 10980\text{km.}$ PZ = 12 sec. 0.7 $\mu$
Z'	ePP			38	42	1.9			0.19	
ZN	eSKS			45	18					
EN	eS			46	04	16	1.0	0.8		14 21 04.8; 22.2°N. 145.9°E. h=29km. North Pacific Ocean. USCGS.
N	ePS			47	28					
EN	eSS			52	50					
E	eLQ		15	01 $\frac{1}{2}$	-					
N	eLR			08 $\frac{1}{2}$	-					
ZNE	M			22 $\frac{1}{2}$	-	20	2.1	3.9	4.2	M = 5.9 (ESK)
F	F		16	10	-					
27. ESK	Z'	iP	23	58	45.4	0.8			0.02	C. 23 46 47.7; 41.7°N., 141.9°E. h=71km. Hokkaido, Japan. USCGS.
28. ESK	Z	eL	02	50	-					01 41 19.1; 9.6°S. 159.8°E. h=32km. Solomon Is. M=5.3 (ESK) USCGS.
NE	M			58 $\frac{1}{2}$	-	22	0.7	0.7		
F	F		03	15	-					
28. ESK	Z'	eP	17	46	35.9					17 35 07.4; 51.1°N. 159.1°E. h=33km. Off coast of Kamchatka. USCGS.
28. ESK	Z'	iPKP	22	31	21.3					22 11 47.6; 20.1°S. 168.8°E. h=19km. Loyalty Is. USCGS. M=5.1 (ESK)
ZNE	M		23	34 $\frac{1}{2}$	-	20	0.5	0.4	0.7	
KEW	ZV	iPKP	22	31	30.0					
28. ESK	Z'	iPKP	23	43	54.2					23 24 14.5; 22.5°S. 170.9°E. h=25km. Loyalty Is. USCGS.
29. ESK	Z'	iP	00	57	09.7	0.9			0.02	00 45 39.7; 51.1°N. 159.1°E. h=33km. Near Kamchatka. USCGS.
29. ESK	ZN	eL	01	51 $\frac{1}{2}$	-					Not in USCGS P.D.E.
ZNE	M		02	01	-	22	0.5	0.6	0.9	
F	F			25	-					

## SEISMOLOGICAL BULLETIN

OCTOBER 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
29. ESK	Z'	iP	02	44	33.3	4	1.6	2.8	4.2	D. $\Delta = 23.1^\circ = 2570\text{km}$ . PZ' = 1.1sec. 0.81 $\mu$ PH' = 1.1 " 0.27 $\mu$ 02 39 29.4; 39.2°N. 21.2°E. h=20km. Greece. One killed, 23 injured and major property damage. USCGS. M = 5.6(ESK). D.
	NE	eS		48	38	12	5.8	9.8		
	N	eL		50 $\frac{1}{2}$	-					
	Z'	iPcS		51	58.7					
	NE	M		53	-	22	10.0	6.9		
	ZNE	M		56	-	16	10.0	9.2	17.0	
	F		03	40	-					
KEW	ZV	iP	02	43	56.0					
29. ESK	Z	iP	14	44	45.0					14 32 41.2; 41.8°N. 144.1°E. h=41km. Hokkaido, Japan. M=4.9(ESK). USCGS.
	ZNE	M	15	20	-	20	0.5	0.7	0.4	
	F			50	-					
29. ESK	Z	eP	15	45	22					$\Delta = 91.1^\circ = 10120\text{ km}$ . 15 32 18.9; 10.7°S. 79.0°W. h=22km. Off coast of Peru. USCGS. M=5.1(ESK).
	E	eSKS		55	53					
	N	eS		56	15	16	1.3			
	ZNE	M	16	22 $\frac{1}{2}$	-	20	0.3	0.7	0.7	
	ZNE	M		27	-	18	0.4	0.7	1.2	
	F		17	15	-					
29. ESK	Z'	eP	17	56	05.8					17 51 01.8; 38.9°N. 20.8°E. h=33km. Greece. USCGS.
30. ESK	Z'	iP	02	15	22.0	0.9			0.02	C. 02 10 15.3; 39.0°N., 21.8°E. h = 33km. Greece. USCGS.
30. ESK	NE	eLR	05	36	-					05 05 31.5; 3.5°S. 30.0°E. h=6km. Lake Tanganyika region. USCGS. M = 4.7(ESK).
	ZNE	M		48	-	14	0.6	0.4	0.9	
	F		06	10	-					

## METEOROLOGICAL OFFICE, UNITED KINGDOM

## SEISMOLOGICAL BULLETIN FOR NOVEMBER 1966

## I. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESSHIRE, SCOTLAND

Lat. 55° 19' 00" N., Long. 3° 12' 18" W. Height above M.S.L. 263m.

Foundation: Llandoverly Shales, folded (late Silurian).

Instruments: World-wide standardised seismograms (USCGS).

- (i) Long-Period SPRENGNETHER  
(ii) Short-Period BENIOFF

## CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	V
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHER N E WSS		15	100		} 1500 * at 15 sec.
		15	100		
		15	100		
BENIOFF N' E' WSS		1.0	0.75		} 25000 ** at 1 sec.
		1.0	0.75		
		1.0	0.75		

## 2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

Lat. 51° 28' 6" N., Long. 0° 18' 47" W, Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.

Instruments: Kew-type vertical seismograph, period 1.5 sec.  
Direct optical registration (ZV).Notations: For phases the generally adopted notations are used.  
In addition the following symbols are in use:

C = Compression

D = Dilation

Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.

 $\Delta$  = Epicentral distance

h = Depth of hypocenter

\*) 750 from 17th  
\*\*) 12500 " "

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
1. ESK	Z'	iP	07	12	45.6	0.6			0.06	07 01 00.4; 43.2°N, 143.4°E. h=127km. Hokkaido, Japan. USCGS.
	KEW	ZV	07	12	59.5					
3. ESK	Z'	iP	11	47	27.2					0. 11 37 22.7; 19.1°N., 67.9°W. h=47km. Mona Passage. USCGS.
3. ESK	Z'	eP	16	34	37.2	10		0.8	2.1	$\Delta = 60.2^\circ = 6690\text{km.}$
	NE	eS		42	47	14	4.0	3.3		
	E	eSS		46	37					
	N	eLQ		49 $\frac{1}{2}$	-					
	ZE	eLR		53 $\frac{1}{2}$	-					
	ZNE	M		56	-	21	3.4	8.3	9.4	
	ZNE	M	17	05	-	17	5.4	6.3	6.1	
		F	18	30	-					M=5.7(ESK).
	KEW	ZV	16	34	45.5					
4. ESK	Z'	iPKP	16	01	52.0					15 43 09.0; 25.9°S, 178.3°E. h=620km. Fiji Is. USCGS.

NOVEMBER 1966

## SEISMOLOGICAL BULLETIN

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
5. ESK	E	eS	13	25	49				12 45 13.9; 15.3°S. 175.2°W.	
	E	eLQ		43 $\frac{1}{2}$	-				h=38km. Tonga Is. USCGS.	
	ZNE	M	14	11 $\frac{1}{2}$	-	18	3.5	3.4	5.1	M = 6.0(ESK)
		F	15	15	-					
6. ESK	Z'	iP	08	32	46.4	1.2			0.08	08 29 14.3; 59.8°N. 30.0°W.
	ZNE	eL		36	-					h=33km. N. Atlantic. USCGS.
	ZNE	M		37	-	18	2.7	3.4	3.7	M=4.4(ESK)
		F		50	-					
7. ESK	ZN	eL	18	43	-					17 37 41.2; 15.1°S., 173.6°W.
	ZN	M		54	-	20	0.7		1.0	h=45km. Tonga Is. USCGS.
		F		19	20	-				M = 5.3(ESK).
8. ESK	Z'	eP	03	21	53.0					03 14 10.1; 36.1°N. 50.9°E.
										h=23km. Iran. USCGS.
8. ESK	Z'E'	iPn	09	19	25.5					$\Delta = 145$ km.
	Z'E'	iP*		19	26.4					Explosion.
	Z'N'	iSg		19	44.4					
	EN'	iS*		19	45.5					
		F		20	40					
8. ESK	Z'	iP	11	47	22.0					11 35 57.0; 52.4°N. 173.0°E.
	Z'	i		47	30.8					h=41km. Near Islands. USCGS.
9. ESK	Z'	i(PKP)	04	32	57.3					Not in USCGS P.D.E.
9. ESK	Z'	iP	15	17	24.2	1.0			0.04	15 12 27.0; 39.2°N. 20.6°E.
	Z'	ipP		17	32.9					h=30km. Greece-Albania border. USCGS.
	NE	M		25 $\frac{1}{2}$	-	22	0.7	0.6		M=4.0(ESK)
		F		35	-					
11. ESK	Z'N'E'	iPg	10	42	09.5					$\Delta = 109$ km.
	Z'	iP*		42	10.3					Local (rockburst)
	Z'N'E'	iPn		42	11.2					
	Z'E'	iSg		42	23.1					
	N'	iS*		42	25.0					ML = 1.5
	EN'	M		42	29	0.5	0.045	0.039		
		F		43	10					
11. ESK	Z'	iP	15	42	26.7	1.2			0.06	Depth = 37km. (ESK)
	Z'	ipP		42	38.2	1.2			0.08	15 31 04.2; 52.3°N. 169.1°W.
	ZNE	M	16	16 $\frac{1}{2}$	-	18	0.9	0.8	1.5	h=38km. Fox Islands. USCGS.
		F		45	-					M = 5.0(ESK)
KEV	ZV	eP	15	42	50					
	ZV	e		42	59					
11. ESK	Z'	iP	16	14	54.6	0.7			0.02	C. 16 03 38.1; 50.3°N. 155.5°E.
										h=145km. Kurile Is. USCGS.
12. ESK	Z'	iP	13	01	47.8	1.1			0.09	C. $\Delta = 79.8^\circ = 8870$ km.
	Z'	ipP		01	58.2					12 49 43.6; 41.8°N. 144.1°E.
	E	eS		11	47	19		2.6		h=33km. Hokkaido, Japan.
	NE	M		38 $\frac{1}{2}$	-	21	6.3	7.7		USCGS.
		F		14	30	-				M = 6.0(ESK)
12. ESK	ZV	iP	13	02	01					C.
	Z'	ePKP	19	04	22.6					
	Z'	e		04	48.3					18 45 01; 15.6°S. 167.3°E.
	Z'	ePKS		08	03					h=40km. New Hebrides Is. USCGS.
	E	eLQ		43.2	-					
	NE	M	20	02	-	22	7.0	5.9		
		F		07	-	22	5.5	7.7		
		F	21	20	-					M = 6.3(ESK)

## SEISMOLOGICAL BULLETIN

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
KEW	ZV	ePKP	19	04	28					
	ZV	e		04	34					
	ZV	ePKS		08	12					
13.ESK	Z'	iP	03	01	40.6	0.9			0.04	C. 02 51 50.6; 17.1°N. 61.9°W h=65km. Leeward Islands. USCGS.
KEW	ZV	iP	03	01	45.5					
15.ESK	Z'	iP	00	19	38.0	0.8			0.02	00 08 07.1; 51.4°N. 179.9°W. h=43km. Andeanof Islands. USCGS.
16.ESK	Z'	eP	23	27	30.2	0.9			0.02	23 16 09.1; 52.6°N. 169.5°W. h=33km. Fox Is. USCGS.
18.ESK	Z', Z	eP	18	52	55.3					
	Z'	e		52	59.8					
	E	eL		56	-					
	ZNE	M		58	-	20	1.1	0.7	1.4	18 48 43.9; 73.4°N. 06.8°E. h=33km. Greenland Sea. USCGS.
		F	19	10	-					M=4.1(ESK).
18.ESK	E	eS	19	58	30					19 43 35.2; 24.0°N. 46.3°N. h=33km. N. Atlantic Ridge. USCGS.
	E	eL	20	02 $\frac{1}{2}$	-					
	ZNE	M		05 $\frac{1}{2}$	-	20	1.2	2.1	2.5	M=4.9(ESK).
		F		15	-					
19.ESK	Z'	eP	05	32	14.0					05 19 56.1; 37.6°N. 141.3°E. h=67km. Near Japan. USCGS.
19.ESK	Z'	eP	07	18	22.8	1.1			0.11	$\Delta = 29^\circ = 3200\text{km.}$
	ZNE	eS		23	10	20	1.4	1.6	1.4	07 12 39.7; 35.0°N. 23.5°E. h=33km. Crete. USCGS.
	N	eL		26	-					
	ZNE	M		29 $\frac{1}{2}$	-	20	3.5	2.8	2.0	M = 4.9(ESK)
		F		45	-					
KEW	ZV	eP	07	17	49.0					
19.ESK	Z'	iP	07	54	33.0	0.7			0.04	07 42 28.2; 18.4°N. 95.3°E. h=56km. Burma. USCGS.
19.ESK	ZNE	eL	18	02	-					17 40 58.2; 24.2°N. 46.4°W. h=33km. N. Atlantic Ridge. USCGS.
	ZNE	M		03 $\frac{1}{2}$	-	20	0.5	0.7	0.9	M=4.5(ESK)
		F		10	-					
19.ESK	N	eS	18	44	27	16	0.9			18 20 30.0; 10.7°S. 79.1°W. h=34km. Near Peru. USCGS.
	ZNE	M	19	13	-	16	0.3	0.7	0.7	M=5.0(ESK).
		F		30	-					
20.ESK	Z'	eP	09	41	27.7					09 29 59.1; 51.4°N. 176.6°W. h=54km. Andeanof Is. USCGS.
20.ESK	Z'	ePKP	17	07	20.2					16 47 33.0; 55.1°S. 129.4°W. h=33km. South Pacific. USCGS.
	Z'	i		07	29.1					
	NE	eL		50	-					
	ZNE	M	18	09 $\frac{1}{2}$	-	20	1.2	0.9	1.8	M=5.5(ESK).
		F		45	-					
20.ESK	Z'	ePKP	19	13	19.3					18 53 31.8; 55.3°S. 128.7°W. h=33km. South Pacific. USCGS.
21.ESK	ZV	eP	12	31	30					12 19 27.3; 46.7°N. 152.5°E. h=40km. Kurile Is. USCGS.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
22. ESK	Z' E	iP eS	06	40	41.9	1.1			0.10	C. $\Delta = 74.2^\circ = 8240\text{km}$ . 06 29 53.5; 48.2°N. 146.7°E. h=453km. Sea of Okhotsk. USCGS.
KEV	ZV	iP	06	40	58.5					
22. ESK	N ZN ZNE	ePS eL M F	07	30	37					07 01 11.1; 57.9°S. 25.3°E. h=38km. Sandwich Is. USCGS. M=5.4(ESK).
			08	01	-	22	1.3	0.8	1.5	
22. ESK	Z'	iP	09	03	43.2					08 52 18.2; 52.1°N. 172.7°E. h=55km. Near Islands. USCGS.
22. ESK	Z' Z'	eP e	16	06	25.5					15 54 58.6; 52.1°N. 172.7°E. h=33km. Near Is. USCGS.
23. ESK	E N ZNE	eLQ eLR M F	03	16 $\frac{1}{2}$	-					02 19 13.8; 14.9°S. 166.9°E. h = 48km. New Hebrides Islands. USCGS. M=5.5(ESK).
			04	25	-	22	1.1	1.5	0.9	
24. ESK	Z'	iP	07	04	20.6					06 53 37.1; 56.5°N. 152.9°E. h=33km. Kodiak Is. USCGS.
26. ESK	NE Z ZNE	eS eL M F	03	33	05					03 23 44.3; 78.4°N. 5.2°E. h=33km. Svalbard region. USCGS. M=4.4(ESK).
				35 $\frac{1}{2}$	-	17	1.4	1.3	2.0	
27. ESK	Z'	iP	12	59	43.1					12 48 01.5; 48.1°N. 155.0°E. h=28km. Kurile Is. USCGS.
27. ESK	Z' NE ENZ	eP eS M F	20	18	16.6	1.1			0.05	$\Delta = 23.4^\circ = 2580\text{km}$ . 20 13 01.5; 78.5°N. 06.4°E. h=33km. Svalbard region. M=4.9(ESK). USCGS.
				22	24	17	4.7	4.4	5.8	
28. ESK	Z'	iP	07	44	53.3					D. 07 32 53.4; 06.6°N., 82.7°W. h=33km. South of Panama. USCGS.

## METEOROLOGICAL OFFICE, UNITED KINGDOM

SEISMOLOGICAL BULLETIN FOR DECEMBER 19 66

## 1. ESKDALEMUIR OBSERVATORY, LANGHOLM, DUMFRIESSHIRE, SCOTLAND

Lat. 55° 19' 00" N., Long. 3° 12' 18" W. Height above M.S.L. 263m.

Foundation: Llandoverly Shales, folded (late Silurian).

Instruments: World-wide standardised seismograms (USCGS).

- (i) Long-Period SPRENGNETHER  
(ii) Short-Period BENIOFF

## CONSTANTS:

INSTRUMENT	DATE FROM WHICH CONSTANTS APPLY	FREE PERIODS		DAMPING	V
		PENDULUM Tp sec.	GALVANOMETER Tg sec.		
SPRENGNETHER N E WSS		15	100		} 750 at 15sec.
		15	100		
		15	100		
BENIOFF N' E' WSS		1.0	0.75		} 12500 at 1 sec.
		1.0	0.75		
		1.0	0.75		

## 2. KEW OBSERVATORY, RICHMOND, SURREY, ENGLAND

Lat. 51° 28' 6" N., Long. 0° 18' 47" W, Height above M.S.L. 4m.

Foundation: River gravel resting on London clay.

Instruments: Kew-type vertical seismograph, period 1.5 sec.  
Direct optical registration (ZV).Notations: For phases the generally adopted notations are used.  
In addition the following symbols are in use:

C = Compression

D = Dilation

Mag. = Earthquake magnitude, determined in the old Gutenberg-Richter scale (M). The mean value for body and surface waves is given, if agreement is good, otherwise the values for body and surface waves are quoted separately.

 $\Delta$  = Epicentral distance

h = Depth of hypocenter

The bulletin is prepared at Kew Observatory and all enquiries concerning the seismograms for both Kew and Eskdalemuir should be addressed to Kew.

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
1. ESK	Z'	iP	04	39	37.1	1.0			0.05	C. 04 29 23.3; 60.1°N., 146.4°W. h=38km. Alaska. USCGS.
1. ESK	Z'	ePKP	05	16	00.5					04 56 58.2; 14.0°S. 167.1°E h=132km. New Hebrides Islands. USCGS.  M=6.0(ESK)
	Z'	i		16	12.3					
	Z	ePP		18	54	14			3.7	
	Z'	iSKP		19	35.0					
	Z'	iPKS		19	37.7	1.1			0.4	
	E	eLQ			54½	-				
ZNE	M		06	19	-	20	3.5	3.1	5.0	
	F		07	20	-					
KEW	ZV	ePKP	05	16	08					
	ZV	i		16	14					
	ZV	eSKP		19	43					
1. ESK	Z'	iP	19	08	05.9					18 56 23.1; 41.6°N. 139.6°E h=173km. Hokkaido, Japan. USCGS.

## SEISMOLOGICAL BULLETIN

DECEMBER 1966

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
2. ESK	Z'	eP	03	16	35.2				03 07 54.0; 28.2°N. 53.2°E. h=40km. Iran. USCGS.	
3. ESK	Z'	ePKP	14	32	16.7				14 13 25.2; 24.7°S. 179.9°E. h=492km. Fiji Is. USCGS.	
5. ESK	Z'N'E'	ePg	15	54	59.7				$\Delta$ = 123km. Local (rockburst) $M_L$ = 2.2	
	Z'N'E'	eSg		55	15.3					
	Z'N'E'	M		55	18	0.4	0.079	0.062		0.092
		F		56	00					
6. ESK	Z'	eP	07	30	14.8				07 18 39.9; 50.1°N. 159.8°E. h=27km. Kurile Is. USCGS.	
7. ESK	Z'N'E'	iPg	14	30	05.5				$\Delta$ = 50km. Local. $M_L$ = 1.8	
	Z'N'E'	iSg		30	11.7					
	Z'N'E'	iS*		30	13.9					
	Z'N'E'	M		30	18	0.7	0.24	0.24		0.17
		F		31	25					
7. ESK	Z'	iP	17	29	42.9	1.2			0.07	17 17 42.0; 44.3°N. 151.7°E. h=26km. Kurile Is. USCGS. Multiple shock.
	Z'	i		29	49.6					
	Z'	i		30	00.9	1.0			0.05	
	Z'	i(pP)		30	05.1	1.1			0.15	
7. KEW	ZV	iP	17	29	59					
	ZV	i(pP)		30	22					
8. ESK	Z'	eP	00	04	36.6					23 54 35.9; 18.3°N. 68.5°W. h=141km. Mona Passage. USCGS.
	Z'	ePcP		05	10.3					
8. ESK	Z'	eP	11	35	46.9					11 31 18.0; 42.2°N. 18.9°E. h=24km. Yugoslavia. USCGS.
9. ESK	Z'	eP	16	55	30.3					16 43 57.7; 51.7°N. 174.6°E. h=21km. Near Islands. USCGS.
10. ESK	Z'	iP	13	18	22.5	16			4.9	C. $\Delta$ = 78.1° = 8680km. PPZ 18 sec. 2.0 $\mu$ 13 06 32.6; 14.3°N. 92.0°W. h=70km. Guatemala. USCGS. $M$ =6.3(ESK).
	Z'	i		18	26.9					
	ZN	eS		28	10	20	1.8		3.2	
	N	eLQ		39	-					
	ZN	M		55 $\frac{1}{2}$	-	18	13		21	
		F		15	20	-				
10. KEW	ZV	iP	13	18	35					
10. ESK	Z'	iP	17	14	23.3	1.0			0.05	$\Delta$ = 29.0° = 3200km. 17 08 32.2; 41.0°N. 33.5°E. h=13km. Turkey. USCGS. $M$ = 4.8(ESK)
	N	eS		19	11					
	ZN	M		28	-	17	2.7		3.4	
		F		50	-					
10. KEW	ZV	iP	17	14	00					
10. ESK	N	eLQ	18	58 $\frac{1}{2}$	-					18 08 14.4; 3.6°S. 145.4°E. h=33km. New Guinea region. USCGS. $M$ =6.2(ESK).
	ZN	eLR		19	07	-				
	ZN	M		25 $\frac{1}{2}$	-	18	5.4		5.8	
		F		20	30	-				
11. ESK	Z'	iP	07	11	28.0					06 59 26.4; 13.9°N. 92.1°W. h=9km. Near Mexico. USCGS.
11. ESK	N	M	21	13 $\frac{1}{2}$	-	19	1.0			20 08 22.3; 13.4°N. 146.0°E. h=50km. Mariana Is. USCGS. $M$ =5.4(ESK)
	E	M		14 $\frac{1}{2}$	-	18		1.4		
	Z	M		15	-	18			1.0	
		F		35	-					



SEISMOLOGICAL BULLETIN

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
13. ESK	Z'	iP	12	30	00.5	1.1			0.06	12 21 02.3; 37.3°N. 71.9°E. h=126km. Afghanistan-USSR border. USCGS.
KEW	ZV	iP	12	29	55.0					
14. ESK	Z'	iP	03	55	00.3					03 44 01.9; 52.9°N. 177.6°W. h=243km. Andreanof Is.
	Z'	ipP		56	04.9					
14. ESK	Z'	eP	13	54	32.4					14 49 59.8; 45.6°N. 26.4°E. h=158km. Rumania. USCGS.
14. ESK	Z'	iPKP	21	26	41.8					$\Delta = 123^\circ = 13600\text{km.}$
	Z	iPP		28	30	7			1.9	
	NE	ePS		38	26					21 07 52.1; 4.8°S. 143.9°E. h=74km. New Guinea. USCGS.
	NE	eLQ		58 $\frac{1}{2}$	-					
	ZNE	eLR	22	08	-					
	E	M		11 $\frac{1}{2}$	-	35		12		
	N	M		12	-	32	15			
	Z	M		12	-	33			18	
	ZNE	M		25	-	21	5.6	5.6	5.3	M = 6.2(ESK)
		F	23	30	-					
KEW	ZV	ePKP	21	26	45.0					
	ZV	e		27	12.0					
15. ESK	Z'	iP	02	19	46.9	0.9			0.07	02 08 03.0; 21.7°N. 94.5°E. h=81km. Burma. USCGS.
KEW	ZV	iP	02	19	45					
16. ESK	Z'	iP	21	02	42.7	0.9			0.07	$\Delta = 64^\circ = 7100\text{km.}$
	Z'	i		02	46.0					
	N	eS		11	17					20 52 13.5; 29.6°N. 81.0°E. h=9km. Nepal. USCGS.
	NE	M		28	-	21	9.3	5.6		
	ZNE	M		32	-	17	6.1	13	18	M=5.9(ESK)
		F	21	50	-					
17. ESK	Z'	iP	06	02	56.9	1.1			0.09	05 59 10.2; 70.7°N. 14.0°W. h=27km. Jan Mayen Is.
	N	M		08	-	17	4.7			
	E	M		08	-	15		3.9		
	Z	M		08 $\frac{1}{2}$	-	18			4.7	M = 4.6(ESK)
		F		15	-					
18. ESK	Z'	iP	05	06	29.9	1.1			0.10	04 57 57.8; 49.9°N. 77.7°E. h=0km. Kazakh SSR. USCGS.
20. ESK	Z'	iP	00	36	02.5					C. 00 26 27.8; 66.7°N., 148.7°W. h = 33km. Alaska. USCGS.
20. ESK	Z'	iP	01	07	27.4	0.8			0.03	D. 00 57 53.1; 66.7°N., 148.7°W. h=33km. Alaska. USCGS.
20. ESK	Z'	iP	12	39	18.9	0.8			0.09	D. 12 26 55.0; 26.1°S. 63.2°W. h=589km. Argentine. USCGS.
KEW	ZV	iP	12	39	14.5					D.
20. ESK	Z'	iP	15	41	21.8	1.6			0.35	C. 15 30 00 Nevada nuclear explosion.
	ZNE	eL		16	09	-				
	ZE	M		12 $\frac{1}{2}$	-	16		2.7	2.3	
	ZN	M		14	-	16	1.7		4.0	m=6.1; M=5.6(ESK)
		F		35	-					
KEW	ZV	iP	15	41	45.5					
20. ESK	NE	eL	19	25	-					18 39 40.3; 14.3°N. 122.1°E. h=37km. Philippine Is. USCGS.
	EN	M		33	-	23	4.9	7.6		
	E	M		41 $\frac{1}{2}$	-	20		4.3		
	NZ	M		42 $\frac{1}{2}$	-	18	6.5		6.1	M = 6.0(ESK).
		F	20	00	-					

## SEISMOLOGICAL BULLETIN

DECEMBER 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
21. ESK  KEW	Z'	iPKP1	09	11	05.4	1.3			0.5	08 52 00.2; 20.0°S. 169.7°E. h=245km. New Hebrides Is. USCGS.
	Z'	iPKP2		11	06.6					
	ZV	ePKP1	09	11	12					
	ZV	iPKP2		11	17					
21. ESK	Z'E'	iPg	15	19	10.6	0.7	0.18	0.17	0.20	C. $\Delta$ = 18km. Local. M <sub>L</sub> = 0.7
	Z'N'	iSg		19	13.0					
	Z'N'E'	M		19	15.5					
		F		19	43					
21. ESK	Z'	iP	22	21	25.8				22 10 58.8; 29.4°N. 81.0°E. h=31km. Nepal-India border. USCGS.	
23. ESK	Z'	ePKP	16	09	20.9	27	25	22	32	15 50 20.4; 7.1°S. 148.3°E. h=43km. New Guinea region. USCGS.
	Z'	i		09	22.8					
	N	ePKS		12	38					
	E	eLQ		44	-					
	ZNE	eLR		51	-					
	ZNE	M		58 $\frac{1}{2}$	-					
	ZNE	M	17	08	-					
	ZNE	F	18	30	-					
23. KEW	ZV	ePKP	16	09	23					
	ZV	i		09	26					
	ZV	ipPKP		09	45					
24. ESK	Z'	iP	22	39	13.5				22 28 59.6; 59.9°N. 153.4°W. h=113km. Alaska. USCGS.	
25. ESK	Z'	eP	23	14	51.0				23 03 22.8; 51.8°N. 176.1°E. h=47km. Rat Is. USCGS.	
27. ESK  KEW	Z'	eP	01	34	37.6	1.1			0.05	01 22 17.3; 37.1°N. 141.0°E. h=60km. Japan. USCGS.
	ZV	eP	01	34	50					
27. ESK	Z'	iP	21	34	00.8					21 22 14.8; 13.2°N. 88.8°W. h=66km. El Salvador. USCGS.
28. ESK        KEW	Z', Z	iP	08	31	44.3	24	10	14	47	C. $\Delta$ = 99° = 11000km.
	Z'	i		31	48.8					
	Z	iPP		35	41	26	22	27	50	08 18 07.4; 25.5°S. 70.7°W. h=47km. Near coast of
	ZNE	iSKS		42	20	19	49	39		Chile. Three killed, sixty
	EN	eS		43	10	25	62	55		injured and extensive
	N	eLQ		59	-					property damage. USCGS.
	NE	M	09	12	-	22	370	370		
		F	13	30	-					
	ZV	eP	08	31	42					m = 7.6; M = 8.0 (ESK)
	ZV	i		31	46					
29. ESK	ZV	ePP		35	39					
	ZV	M	09	13	-	20			390	
	N	eSS	22	54	25					22 16 22.7; 32.8°S. 111.7°W. h=33km. Easter Island
	N	M	23	32 $\frac{1}{2}$	-	20	1.4			Cordillera. USCGS.
	E	M		33	-	18		1.4		
	Z	M		33	-	20			1.6	
		F	24	05	-					M = 5.6 (ESK).
30. ESK	Z'	ePMP	01	18	43.8					01 00 25.4; 17.8°S. 178.9°E. h=658km. Fiji Is. USCGS.

SEISMOLOGICAL BULLETIN

DECEMBER 19 66

DATE (STN)	COMPT.	PHASE	TIME (GMT)			T s.	AMPLITUDE ( $\mu$ )			REMARKS
			h.	m.	s.		N	E	Z	
31. ESK	Z', Z	ePKP	18	42	23.6					18 23 03.9; 11.8°S. 166.5°E. h=30km. Santa Cruz Islands. USCGS.  M = 7.3 (ESK)
	Z	eX		42	42					
	ZN	ePP		45	20	30	18	6	30	
	N	ePS		55	40					
	E	eLQ	19	19 $\frac{1}{2}$	-				200	
	Z	M		41 $\frac{1}{2}$	-	22		260		
	E N	M M		42 42 $\frac{1}{2}$	- -	23 23	155			
KEW	ZV	ePKP	18	42	31					
31. ESK	Z'	ePKP	19	12	32.4					18 53 12.5; 11.6°S. 165.9°E. h=33km. Santa Cruz Islands. USCGS.
	ZV	ePKP	19	12	37					
31. ESK	Z'	ePKP	22	34	31.1					22 15 14.0; 11.3°S. 164.8°E. h=33km. Santa Cruz Islands. USCGS.  M = 6.7(ESK).
	Z	ePP		37	05	25	7.2	2.4	12.0	
	E	M	23	36 $\frac{1}{2}$	-	21		45		
	Z	M		37	-	20			63	
	N	M F		38 40	- -	20	44			
KEW	ZV	ePKP	22	34	37					