

EARTHQUAKE BULLETIN OF THE METEOROLOGICAL OFFICE OBSERVATORIES.

A P R I L, 1915.

Observatory, Eskdalemuir, Langholm, Scotland.

Lat. $55^{\circ} 19' N.$

Long. $3^{\circ} 12' W.$

$h = 237$ metres.

Instruments. Two horizontal and one vertical Galitzin pendulums with galvanometric registration.

Date	Phase	h	G.M.T. _s		Period	Amplitude			△	Remarks
			G_m	T_s		A_n	A_e	A_z		
1	L	5	58							
	M	6	3	36	18	-4				Amplitude 3 on E near this time
	F	$6\frac{1}{4}$								
6	i	$6\frac{1}{2}$			15?				2?	Obscured by microseisms
22	i	19	17.1							
	e	19	$23\frac{1}{4}$							
	M	19	52	49	22	-3				
	F	$20\frac{1}{2}$								
23	P	15	40	40						$a = 236^{\circ}$
	i	15	42	56						
	PR?	15	45	56						
	i	15	47	4						
	S?	15	50	18						
	i	15	51	22	13	6		8360		If S = 15h.50m. 18s. then $\Delta = 8360$ km. thus epicentre is $6^{\circ} S. 56^{\circ} W.$
	i	15	54	17	12					
	i	15	55	5	15					
	SR?	15	$56\frac{1}{2}$		20					
	e	15	$59\frac{1}{2}$		15					
e	16	$3\frac{1}{2}$								
24		17	50	to	16 to 35					Waves
		18	52							
26		3	27	to	20					
		3	32							
28	M	3	58	52	17	+6				Small waves 3h.56m. to 4h.
29		20h. to 20h.				<2	<2			Faint disturbance
30	P?	1	55	20				7010		First movement
	S?	2	3	50						+S, +W, and up
	L?	2	16							$a = 50^{\circ}$ to 60° .
	M	2	25	1						Δ about 7010 km.
	F	$3\frac{1}{4}$			15	+12				

May, 1915.

Observatory, Eskdalemuir, Langholm, Scotland.

Lat. 55° 19' N.

Long. 3° 12' W.

h = 237 metres.



Instruments.

Two horizontal and one vertical Galitzin pendulums with galvanometric registration.

Date	Phase	G.M.T.			Period secs	Amplitude			△ km.	Remarks	
		h	m	s		A _n	A _e	A _z			
1	P	5	11	49	15	-	-	+	8420	Azimuth N. 16° E. Epicentre 47° N. 153 E. Violent quake Maxima con- fused by overlapping	
	PR ₁ ?	5	14	38	13						
	i ₁ ?	5	16	23							
	S	5	21	30	14						
	L	5	37								
	o	5 ³ / ₄									
	M	6									
C	9	37									
C?	11	20									
2	P	4	10	53	5				8650	Small	
	S	4	20	46							
	M	4	51 ¹ / ₄		17	4					
3	P	3	26	11					8380	Azimuth near- ly North? ? Long waves of second earthquake.	
	PR ₁ ?	3	29	22							
	S	3	35	50							
	SR ₁ ?	3	41	18							
	L	3	51								
	M	4	10		18	9					
		4 ¹ / ₂	disturbance subsided								
		4 ³ / ₄									
	M or L	4	58		60	20					
	M	5	3 ¹ / ₂		27	14	25				
F	8 ¹ / ₂										
5	F	11	29	32					8760?		
	i	11	32	04							
	i	11	35	00							
	i	11	37	22							
	S?	11	39	30							
	L	12	4		45						
	M	12	24 ¹ / ₄		20	8					
F	13	50									
5	P?	15	32	20							
	i	15	36	56							
	i	15	39	52							
	L	15	49								
	F	17	10								
6	P	12	20	38					8240		
	S	12	30	10							
	SR ₁	12	35	6							
	L	12	42								
	M	12	53		16	9					



Date	Phase	G.M.T.			Period	Amplitude			km.	Remarks.
		h	m	s		A _n	A _e	A _z		
8	M	6	6		25	$\frac{\mu}{3}$	$\frac{\mu}{-}$	$\frac{\mu}{+}$		
8	P PR ₁ S SR ₁ L M M	13 13 14 14 14 14 14	55 58 6 12 24 $\frac{1}{2}$ 28 37 $\frac{1}{2}$	35 51					circa 9300	Confused by wind.
12	P PR ₁ ? S SR ₁ ? M M	10 10 10 10 11 11	39 42 46 53 6 $\frac{1}{2}$ 8 $\frac{3}{4}$	07 21 56					6240	On N-South S consists of 2 $\frac{1}{2}$ complete oscillations occupying 1 $\frac{1}{2}$ minutes.
12		17 $\frac{1}{4}$ h. to 18h.			circa 15			circa 1 1		
14	eP i S? e M F	6 6 7 7 8	52 53 2 3 various	44 5 31 15					15 to 25	< 4 < 4
14		14 $\frac{1}{4}$ to 15 $\frac{3}{4}$								Small quake obscured by microseisms
16		14 $\frac{3}{4}$ to 15h.								Faint disturbance
16		17 $\frac{1}{2}$ to 18 $\frac{1}{2}$ h.								Faint disturbance
19	P eS L F	5 5 5 5	0 3 4 $\frac{1}{2}$ 33	18 33					40	1910 Small disturbance
21	P i S L M F	4 4 4 4 4 6	28 32 36 47 $\frac{1}{4}$ 53	50 30 45						6350
21		13 $\frac{1}{4}$								Faint quake
21		18 $\frac{3}{4}$								Faint quake
26		19 $\frac{1}{4}$ to 19 $\frac{1}{2}$ h.								Faint quake
26		21 $\frac{3}{4}$ to 22h.								Faint quake
27		15 to 15 $\frac{1}{4}$ h.								Faint quake
27		18 $\frac{1}{2}$								Faint quake
										Very faint

June, 1915.

Observatory, Eskdalemuir, Langholm, Scotland.

Lat. $55^{\circ}19'N$.Long. $3^{\circ}12'W$.

h = 237 metres.

Instruments. Two horizontal and one vertical Galitzin pendulums with galvanometric registration.

Date	Phase	G.M.T.			Period secs.	Amplitude			Δ Km.	Remarks
		h	m	s		A_n	A_e	A_z		
1	e	14	44						Azimuth nearly North or South	
	?P	14	49	7	4					
	?S	14	53	38				2800		
	M_1	15	1		14	31	27			
	F	18								
4	P	17	27	1					Azimuth $E31^{\circ}S$. Epicentre Greece	
	PR_1	17	28	41				2550		
	S	17	31	10	9					
	L	17	$33\frac{1}{2}$		33					
	M	17	35		22	18				
	M	17	37		17		12			
4	P	22	10	8					8770	
	S	22	20	7						
	SR_1	22	$25\frac{1}{2}$							
	M	22	45		19	9	11			
	F	$23\frac{1}{2}$								
6		$8\frac{1}{2}$						Small waves		
6	M	9	5		20	2				
	M	9	$5\frac{1}{2}$		20		4			
6	P	21	42	25					Azimuth $S 55^{\circ}W$. Epicentre Lat. $11^{\circ}S$. Long. $58^{\circ}W$.	
	PR_1	21	46	8				3970		
	S	21	52	34						
	i	21	$53\frac{1}{2}$			Large				
7	M	22	9							
	F	1								

Date	Phase	G.M.T.			Period secs.	Amplitude			Δ Km.	Remarks
		h	m	s		A_n	A_e	A_z		
7	P	22	11	22					8420 or 9580	Azimuth N 17° E?
	?S	22	21	3						
	?S	22	22	1						
	SR ₁	22	26	49						
	L	22	38 $\frac{1}{2}$		23	6				
	M	22	47 $\frac{1}{2}$		21		6			
	F	23 $\frac{1}{2}$								
18	M	0	27		26	8	6			
	F	1								
22	P	3	37	29				9280	"Principal Phase" inconspicuous	
	PR ₁	3	41	12						
	S	3	47	53						
	i	3	49	46						
	SR ₁	3	54	44						
	?L	4	7							
	F	5								
23		4	40 to		14				Small waves	
		4	50							
23		5	37 to		14				Small waves	
		6	0							
24	e	5	31	10						
	e	5	31	36						
	L	5	34 $\frac{1}{2}$		19	6	4			
	M	5	37		17	1	$\frac{1}{2}$			
	C	6	34							
27	P	15	37	31					Azimuth N 16° E?	
	PR ₁	15	40	27						
	e	15	43	37						
	?S	15	47	15		on N - S				
	?S	15	47	42		on E - W				
	?S	15	48	7		on N - S				
	SR ₁	15	52	57						
	L	16	5		35					
	M	16	14		21	9				
	F	17			21		6			

Note:-- A few faint disturbances have been omitted.

EARTHQUAKE BULLETIN OF THE METEOROLOGICAL OFFICE OBSERVATORIES.

July 1915

Observatory, Eskdalemuir, Langholm, Scotland.

Lat. 55° 19' N. Long. 3° 12' W. h = 237 metres.

 Instruments. Two horizontal and one vertical Galitzin
pendulums with galvanometric registration.
Milne - Shaw E - W

Date	Phase	G.M.T.			Period secs.	Amplitude			△	Remarks.
		h	m	s		A _n	A _e	A _z		
2	M	14	16		18	<i>12</i>	<i>12</i>	<i>12</i>		
	M	14	22		15	3	3			
3	M	21	40		12		1			
7		17								Small distur- bance confused by wind.
√ 8	P	22	32	29					9220	Azimuth rough- ly NLE or SSW
	S	22	42	50						
	SR ₁	22	48	27						
	M	23	2½		35		6			
	M	23	5½		26		4			
	M	23	14		18	4				
	F	24								
√ 11	P	11	32	49					2210	Azimuth SSW Near max. the displacement was alter- nately E 32°S and W 32°N.
	S	11	36	30						
	M	11	39		19	16	26			
12	M	3				1 or 2	1 or 2			faint disturbance
13	M	0				1	1			faint disturbance
13	M	20¼				1	1			"
22	M	4	49		17		2			Small distu- bance more E-W than N-S

 23 to 24 interruptions in record owing to the Milne-Shaw
instrument being fitted up.

L. F. Richardson.

Date	Phase	G.M.T.			Period Secs.	Amplitude			△	Remarks.
		h	m	s		A _n	A _e	A _z		
24	P	19	21	15	} on vertical component				12610 or 15500	if S why on vertical? Y refers to British Association Report 1915
	i	19	21	51						
	i	19	22	43						
	PR ₁ ?	19	25	30						
	e S?	19	33	58						
	S? or Y?	19	35	35		on N - S				
	SR ₁ ?	19	45	33		on E - W				
M	20	27		25	1½	Oscillation in principal phase mostly NW to SE				
M	20	28		24	1½					
F	21									
26		8½ to 9¾				<3	<3		Small waves	
31	P	1	42	42				7900	Large quake Azimuth near- ly N or S	
	S	1	51	57						
	F	5½								

L. F. Richardson.

EARTHQUAKE BULLETIN OF THE METEOROLOGICAL OFFICE OBSERVATORY

August, 1915.

Observatory, Eskdalemuir, Langholm, Scotland.

Lat. 55° 19' N.

Long. 3° 12' W.

h = 237 metres.

Instruments. Two horizontal and one vertical Galitzin pendulums with galvanometric registration.

Milne-Shaw East - West. Omori North-South.



Date	Phase	G.M.T.			Period	Amplitude			Δ	Remarks.
		h	m	s		A_r	A_e	A_z		
2	e F	7 8½	9	29		<i>m</i>	<i>m</i>	<i>m</i>		
3	eP e e S M	13 13 13 13 14	24 30 31 34 20	56 28 57 43	19	24		8540	Azimuth NE or SW.	
4	eP? eS? M F	12 13 13 13½	57 0 2½	6 26	20	2		1970?	Azimuth N or S	
6	P PR ₁ S SR ₁ L M M F	13 13 13 13 13 13 14 16	24 27 34 39½ 52½ 59 4 10	27 31 27	40 21 18		15	8790	Azimuth N 26° E. Epicentre lat. 42° N. long. 143° E Japan	
7	e M F	4 5½	54	10		< 2	< 2			
7	P S ? L M	15 15 15 15 15	9 13 13 17½ 18	15 23 54	on both on E-W 19	N-S & E-W mainly		2540	Azimuth E 33° S. Epicentre: lat. 59° N long. 32° E Greece.	
8		1½ 2	to			< 2	< 2		Small waves.	
8	e	3	30	36						
9	i	6	8	58					Followed by very small disturbance	

L. F. Richardson.

EARTHQUAKE BULLETIN OF THE METEOROLOGICAL OFFICE OBSERVATORY.

Eskdalemuir.

August 1915. (continued)



Date	Phase	G.M.T.			Period	Amplitude			△	Remarks.
		h	m	s		A _n	A _e	A _z		
10	P S F	0 0 1 1/2	53 57	9 18					2550	Azimuth SE approx.
10	P S F	2 2 3 1/4	7 11	50 59					2550	Azimuth E 40° S ± 10° Epicentre 19° E 38° N? Adriatic? Larger than the preceding.
11	eP S? e	9 9 9	15 19	37 42 21 1/2					2500	
11	P S L F	10 10 10 10	3 7 10 40	26 26 49					2440	
12	P e ₁ e ₂ e ₃ e ₄ e ₅ e ₆ L M	7 7 8 8 8 8 8 8 8	55 57 3 4 4 5 8 11	36 56 4 49 56 54 1 32 40 41			horizontal and vertical horizontal only horizontal and vertical		1050?	Azimuth N 60° E ± 20° parallel to P Do. perpendicular to P Do. parallel to P Do. Do. Do. Do. Do. perpendicular to P East Indies.
12	M	10 10	12 1/2 13		23 20	8 7				First part lost in changing sheets.
12	eP e ₃ e ₄ e ₆ M C	13 13 13 14 14 14 3/4	46 55 56 1 30	12 20 29 36			vertical only horizontal and vertical		25	2.5 1.7 Phases similar in shape to those, having same sub- script, near 8h.
12	e	22	13	6						
16 A	P L	0 0	7 11	55						see B, C, D next page in date column

L. F. Richardson.

EARTHQUAKE BULLETIN OF THE METEOROLOGICAL OFFICE OBSERVATORIES.

Eskdalemuir. August, 1915. (continued)



Date	Phase	G.M.T.			Period	Amplitude			Δ	Remarks.	
		h	m	s		A_n	A_e	A_z			
16	P	1	8	16		N N N		8220	Azimuth North Epicentre: lat. 51°N. long. 177°E. Aleutian Islands.		
	S	1	17	47							
	SR ₁ F	1 2 $\frac{3}{4}$	23								
16 B	P	2	50	20					Mean azimuth of quakes A, B, C, D, is W 37°N		
	L	2	53 $\frac{1}{2}$								
16 C	P	3	28	50				1740	Mean epicentre lat 62°N. long. 30°W.		
	eS?	3	31	50							
	L	3	32								
16 D	P	5	21	45				1690			
	eS?	5	24	35							
	L	5	25								
18	M	23	30 $\frac{1}{2}$		10	0.7 1.3					
19	P	0	17	19							
	i	0	24	9							
	i	0	28	37							
	F	2 $\frac{1}{2}$									
19	P	6	47	30				2510	Azimuth E 27°S Epicentre 24°E 41°N. Macedonia.		
	S	6	51	36							
	M	6	55 $\frac{1}{2}$							19	15
26	M	9	16 $\frac{1}{2}$		11	0.9 1.1					
27		6 $\frac{3}{4}$ 7 $\frac{3}{4}$	to			<3 <3			Small irregular waves.		
31	P	21	4	54				7500?	Azimuth approx. NE - SW Azimuth of M phase NW - SE		
	e	21	5	50							
	L	21	30								
	M	21	33							30	10 11
	F	22 $\frac{1}{2}$									

Some of the smallest disturbances in the month
have been omitted.

L. F. Richardson.

EARTHQUAKE BULLETIN OF THE METEOROLOGICAL OFFICE OBSERVATORIES.

September, 1915.

Observatory, Eskdalemuir, Langholm, Scotland.

Lat. $55^{\circ} 19' N$.Long. $3^{\circ} 12' W$.

h = 237 metres.

Instruments. Two horizontal and one vertical Galitzin pendulums with galvanometric registration.
Milne-Shaw East - West. Omori North-South.



Date	Phase	G.M.T.			Period	Amplitude			Remarks
		h	m	s		A_n	A_e	A_z	
1	P? L M	1	25 40 44	7	32	4			
1	M M	20	23 49		10 9	<1 <1	<1 <1		
3	M	0	9					Small irregular waves	
3			12 to $12\frac{1}{2}$					Small irregular waves	
3			$23\frac{3}{4}$					Small irregular waves	
4			$0\frac{1}{4}$						
5	M? M	13	7 15		45 30		4		
6	P M F	17	45 42 20	0	21	4	4		
7	P ₁ P ₂ PR ₁ S ₁ S ₂ M F	1	32 33 35 42 42 58 $6\frac{1}{2}$	35 56 7 37	 29	 250		From Azimuth $W \pm 5^{\circ}$ S ₁ - P ₁ Computed epi- and centre $84^{\circ} W$. S ₂ - P ₂ $13^{\circ} N$. 8270 Destruction in long. 89° to $90^{\circ} W$. lat. $13\frac{1}{2}^{\circ}$ to $14^{\circ} N$.	
7			13 to 14					Small waves.	

L. F. Richardson.

Date	Phase	G.M.T.			Period	Amplitude			△	Remarks.
		h	m	s		A _n	A _e	A _z		
7		21	to	22						Small irregular waves, mainly E - W
10	M	22	43		13	0.7	0.2			
12	P i i i i F	0 0 0 0 0 1½	17 20 22 23 29	12 6 25 46 14						Azimuth S 60°W
12	P i S	20 20 21	53 56 1	22 26 4						Azimuth S 40°W Epicentre lat. 6110 6°N long 35°W
16	i?	10	31	48						
21	P? eS L M	18 19 19 19	59 2 3 5½	56 46	15		5			
23	P S? F	8 8 10¼	23 31	58 16					5660	Azimuth NW or SE
25		21 21½								Small distur- -bance

L. F. Richardson.

EARTHQUAKE BULLETIN OF THE METEOROLOGICAL OFFICE OBSERVATORY



October 1915.

Observatory, Eskdalemuir, Langholm, Scotland.

Lat. 55° 19' N.

Long. 3° 12' W. h = 237 metres.

Instruments.

Two horizontal and one vertical Galitzin pendulums with galvanometric registration.

Milne-Shaw East-West Omori North-South.

Date	Phase	G.M.T.			Period	Amplitude			Δ	Remarks.
		h	m	s		A _n	A _e	A _z		
2	M	3	9	46	< 3	<i>u</i>	8.5	<i>u</i>		Felt locally
3	i M	0 0	5 20	26	20		1			
3	P? i M	1 2 2	59 8 28½	18	18		3			
3	P PR ₁ S? PRS? SR ₁ M F	7 7 7 7 7 7 11½	4 7 13 14 18 35	25	15		180		8000	Azimuth definitely N 53°W Distance doubtful Western U.S.A. From Milne-Shaw
5	iP i i e e S? e e i i F	14 14 14 14 14 14 14 14 14 14 17	5 8 9 12 12 19 22 26 27 31 31	59 19 15 27 57 22 44 14 31 2						Steep emergence azimuth N 8° to 14°W. Epicentre in 13,700? middle of Pacific Ocean
8	i i i M	15 15 16 16	58 58 4 20	9 25 9	30		4	4½		mainly E - W

L.F. Richardson



EARTHQUAKE BULLETIN OF THE METEOROLOGICAL OFFICE OBSERVATORIES

Iskdalemuir, October 1915 (continued).

Date	Phase	G.M.T.			Period	Amplitude			△	Remarks.
		h	m	s		A _n	A _e	A _z		
9	eP? L M F	4 4 4 4	8 15 24 40							
10		7 to 8 8								Very small
10		10 ¹ / ₂ to 11 ¹ / ₂								Very small
11	P S L e e i	2 2 3 3 3 3	47 54 0 2 6 7	24 55				5900		Multiple Earthquake?
11		17								Small irregular waves
11	P Y? S M ₁ M ₂	19 19 19 20 20	43 51 53 4 7	9 26 1	20 19	4 irreg.	12 12	8640		
12	L?	22	13							Confused by microseisms
17	L	23	48							
20	M	0	11			< 5	< 5			Confused by microseisms
23	L	2	57							Do.
26	M	13	39			< 3	< 3			
31	M	10	1		21	4				

L. F. Richardson.

EARTHQUAKE BULLETIN OF THE METEOROLOGICAL OFFICE OBSERVATORIES.

November, 1915.

Observatory, Eskdalemuir, Langholm, Scotland.

Lat. 55° 19' N. Long. 3° 12' W. h = 237 metres.

Instruments. Two horizontal and one vertical Galitzin pendulums with galvanometric registration.

Milne-Shaw East West, Omori North South.



Date	Phase	G.M.T.			Period	Amplitude			△	Remarks.
		h	m	s		A _n	A _e	A _z		
1	P	7	36	12					9000	Epicentre from Ottawa and Eskdalemuir 149°E. 41°N.
	PR ₁	7	39½							
	S	7	46	22	on east-west					
	S?	7	47	8	on vertical					
	M	8	13		20		146			From Milne-Shaw
4		2½ to 5								Small disturbance
18	e	4	25	6						
	e	4	30	31						
	M	4	48		23		15			
	M	4	52		18		10			
18	P ₁	20	43	3						Double P
	P ₂	20	43	33						
	S	20	50	6						
	L	21	2							
	M	21	9	57	26	+13	-18			
20		16¼ to 17								Small disturbance
21	i	0	35	10						Subsequent maxima with shorter periods.
	e	0	45							
	L	0	46							
	M ₁	0	52½		21					
21	P	22	56	35						Epicentre 35°W 30°N. by combining with Ottawa.
	S	23	0							
	M	23	3		18		4 3			
22		5 8 to 5 30								Small disturbance
26	i	19	33	48						Small
	F	20	¾							

L. F. Richardson.

EARTHQUAKE BULLETIN OF THE METEOROLOGICAL OFFICE OBSERVATORIES



December, 1915.

Observatory, Eskdalemuir, Langholm, Scotland.

Lat. $55^{\circ} 19' N$.Long. $3^{\circ} 12' W$.

h = 237 metres.

Instruments. Two horizontal and one vertical Galitzin pendulums with galvanometric registration.
 Milne-Shaw East-West Omori North-South.

Date	Phase	G.M.T.			Period	Amplitude			△	Remarks.
		h	m	s		A_n	A_e	A_z		
✓ 3	P	2	50	40	30 21	32	28			
	i	2	59	50						
	e	3	7	30						
	L	3	13							
	M	3	16 $\frac{1}{2}$							
	F	3	20							
6		21 $\frac{1}{2}$ to 22 $\frac{1}{4}$							Small disturbance.	
	7	11 to 11 10							Disturbance masked by microseisms.	
9		14 $\frac{1}{2}$ to 15							Small disturbance.	
17	P	7	14	18						
	i	7	21	46						
	e	7	24	10						
	L	7	26	8						
	M	7	31							
	F	8 $\frac{3}{4}$								
18	P	18	36	33						
	e	18	45	3						
	F	20								
19	P?	20	37	46	30	3				
	e	20	44	2						
	e	20	56	36						
	L	20	59							
	M	21	6							
	F	22								
26	e	9	41	20						
29	i	0	2	16						
	e	0	17	52						
	L	0	24							
	M	0	28							
	F	1								
31		12 $\frac{3}{4}$ 13 $\frac{1}{2}$							Disturbance mask- ed by wind	