



CAIRO UNIVERSITY

HELWAN OBSERVATORY



SEISMOLOGICAL REPORT

FOR THE YEAR 1946

Published under the Direction of

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Director of Helwan Observatory

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1954

SEISMOLOGICAL REPORT
1946

HELWAN OBSERVATORY

Sismcological Bulletin

Constants of the Station:

$\phi=29^{\circ} 51'N.$ $\lambda=31^{\circ} 20'E.$ $h=115$ m.

NATURE OF STRATA: Limestone rock.

INSTRUMENTS: Galitzin Wilip Aperiodic Seismograph, Photo Galvanometric Registration, Vertical Component.
Milne-Shaw Seismographs, Photographic Registration, two Horizontal Components.

Component	Date from which Constants apply	Pendulum Free Period T	Galvanometer Free Period T ₁	Damping Constant	Transmission Coefficient K	Static Magnification V
		sec.	sec.			
N	Monthly	12.0				250
E	"	12.0				250
Z	9-6-1938	11.16	11.13	+0.05	175	1000

The Seismological station at Helwan is superintended by Assis. Professor Azouz Ismail who carried out the measurements contained in this volume.

No.	Date	Comp	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H	M	S.		A_n	A_e	A_z		
	1946											
	January						Sec.	μ	μ	μ	Kms.	
1	5	Z Z Z	e i e F	1 2.5	30 33 34	28 50 52						Very weak
2	5	N N N E N E E E EN N N	ePKP e e PP e SKP SKKS PSKS PPS SS M F	20 21 24.0	16 17 19 20 26 29 31 37 20	50 12 24 33 14 20 20 42 57 42 42	18	+ 26			15445	
3	9	E E E	e e e F	11 12	58 02	03 15 30						Local (Not felt) Very weak
4	11	N N N N N N	eP PP PP S e sS F	1 3.0	44 46 47 53 56	18 15 18 06 24 42					8335	$\lambda = 600$ Kms
5	12	Z Z Z Z NZ N N N N N N N	iP i e e PP SKS SKKS S PS PPS SS F	20 23.5	38 39 40 42 49 50 51 55	39 50 33 30 15 00 27 42 39 00 52					10110	Dilatation
6	17	Z Z Z Z Z Z Z Z Z Z Z	ePKP pPKP PP pPP e e PPP PPP e e e SPP F	9 10 11.6	58 59 00 01 02 03 06 08 10 11	42 12 03 33 09 06 52 12 06 42 47 03					13335	Preceeded by microseisms $\lambda = 100$ Kms
7	20	Z Z ZE Z Z Z	PKP pPKP PP SKP e e F	17 19.5	13 14 16 17 19 22	50 21 37 12 54 54					15000	$\lambda = 100$ Kms
8	21	Z Z Z E Z	P e PPP S PeP F	11 12.0	28 30 32	07 12 24 52 23					1610	
9	21	Z Z EN	e e M F	15 16.0	16 17 30	45 03						

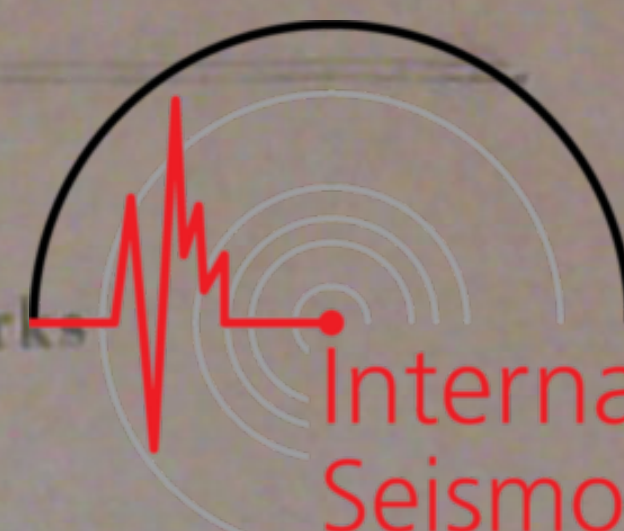
No.	Date	Comp.	Phase	G M T.			Period	Amplitude			Δ	Remarks
								A_n	A	A_z		
				H.	M.	S.	Sec.	μ	μ	μ	Kms.	
10	22	Z	e	3	27	17						Very weak
		Z	e		28	03						
		Z	e			38						
11	24	Z	e	6	29	02						Confused with microseisms
		Z	e		35	00						
		N	e		41	42						
		N	e		42	42						
			F***									
12	25	ENZ	iP	17	37	11					2780	Compression
		Z	PPP		38	00						
		Z	i		39	00						
		NZ	S		41	32						
		Z	i			57						
			F	18.5								
13	26	Z	P	6	47	11					6080	
		Z	e			41						
		Z	PcP		48	21						
		N	S		54	56						
		N	M	7	12							
			F***									
14	February 3	E	M	18	08							Very weak
			F	18.3								
15	4	E	M	3	27							" "
			F	3.5								
16	4	Z	P	3	57	53					10820	Preceded by microseisms
		Z	e		58	40						
		Z	e	4	01	22						
		Z	PP			45						
		Z	PPP		03	51						
		Z	S		09	26						
		ZN	e		10	00						
		ZN	PPS		11	09						
			F	4.4								
17	4	Z	e	22	07	56						Very weak
		Z	e		08	12						
18	5	Z	i	19	44	41						" "
		Z	i		51	27						
19	6	Z	e	14	32	00						Very weak
		Z	e		33	48						
		Z	e		34	51						
			F	14.7								
20	8	Z	e	1	19	27						" "
		E	M		29							
			F	1.6								
21	9	Z	e	13	23	15						" "
		Z	e			31						
		N	e		26	24						
			F	13.6								
22	10	Z	e	12	38	39						" "
		Z	e		29	20						
		Z	e		33	50						
			F	12.6								
23	10	Z	P	13	18	45						Preceded by microseisms
		Z	e		19	24						
		ZN	i		27	05						
		Z	i			32						
		E	M		31	00	10	+7				
			F	13.8								
24	12	ZE	iP	2	48	33					2555	Compression
		Z	e		49	40						
		Z	e		50	18						
		ZE	S		52	36						
		N	e		53	04						
		N	F	4.4		44						
25	12	Z	(ePKP)	13	30	29					17020	Very weak
		Z	(PKKP)			46						
		Z	(PP)		34	20						
			F	15.5								

No.	Date 1946	Comp.	Phase	G.M.T.			Period Sec.	Amplitude			Δ Kms.	Remarks
				H.	M.	S.		A_n μ	A_e μ	A_z μ		
26	14	Z Z Z N	eP e e e F	12 12.2	05 06 07 08	24 54 26 24					Preceded by microseisms	
27	16/17	Z Z Z Z E E	ePKP (ePKKP) e i e (PSKS) F	22 0.5	16 19 20 30	18 33 50 22 18 30				16945	Confused with microseisms Very weak	
28	17	E	M F	14 14.5	21							Confused with microseisms
29	19	Z Z EN N	e e e e F	19 19.7	08 09 11 15	56 33 12 06						" " "
30	20	Z Z Z Z N ZE N E N	P i PP e S e sS SP i F	3 4 5.1	54 55 57 58 04 05 06	15 15 30 15 18 24 06 11 06				9165	" " " h = 100 kms.	
31	21	Z Z Z Z E	iPn e i Sn PeP F	15 16.5	45 46 52	09 20 13 45 48				932	Compression	
32	21	Z Z Z Z Z	e i i e e F	17 18.0	49 50 51	12 45 57 12 21						Very weak
33	22	Z Z Z N ZN Z	iP e e PP PPP S F	1 1.6	16 17 19 20 25	36 49 36 12 48 39				7665	Compression	
34	24	N N	e e F	3 3.7	02 24	48 18						Very weak
35	24	Z Z NE Z Z N	P pP S sS i SS F	9 10.9	41 42 52 53 54 58	57 24 42 30 40 40				10055	Confused with microseisms h = 100 kms.	
36	25	Z Z Z N EN	e e e e M F	2 3.1	02 03 04 30	15 00 24 06						Confused with microseisms
37	26	Z Z Z	e e e F	5 5.3	02 07	24 47 51						Very weak
38	27	Z E	(P) e F	6 7.3	24 29	03 51						" "



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No.	Date 1946	Comp.	Phase	G.M.T.			Period Sec.	Amplitude			Δ Kms.	Remarks
				H.	M.	S.		A_n μ	A_e μ	A_z μ		
39	28	Z Z Z Z Z NE NE	eP pP e e e S SS F	2	35 36 39 40 42 46 52	36 03 30 48 47 24 23					10110	h = 100 Kws.
				4.5								
40	2	Z Z Z Z Z Z E	eP e e e e e M F	2	41 42 43 45 52	45 00 24 42 12 33						Very weak
				3.2								
41	2	Z Z Z Z NZE NE	P PPP e e S PcP F	20	50 51 52 54 55	24 06 30 27 36 60					2665	
				21.2								
42	5	ZE Z ZNE EZ E	eP e PP S SS F	4	49 52 53	27 36 42 57 27					2110	Confused with microseisms
				5.2								
43	6	Z Z E E	eP e e e F	3	06 07 09	52 33 40 15						" " "
				3.4								
44	6	Z N N	iP e e e F	13	23 33	34 46 58						Dilatation Very weak
				13.6								
45	7	Z Z Z Z	P e e e F	16	39 40 41 42	41 20 49 27						" " "
				17.4								
46	9	Z Z	e e F	16	31	10 30						" " "
				16.8								
47	12	Z Z Z Z Z Z	iPKP e e PP e PPP F	00	21 24 25 27	33 47 06 43 37 54					16220	Dilation Very weak
				1.7								
48	12	Z Z Z Z Z EZ EZ E	iP PPP i i i S SS M F	2	26 27 27 29 34	05 27 56 27 50 27 51 33					2000	Dilation
				4.5			12		—154			
49	12	Z Z Z Z	eP e e e F	5	38 42 44	40 48 12 24						Very weak
				5.8								
50	12	Z Z Z	e e e F	19	49	00 21 48						" "
				20.1								
51	15	Z Z	eP PP	3	17 21	27 00					10045	Confused with microseisms



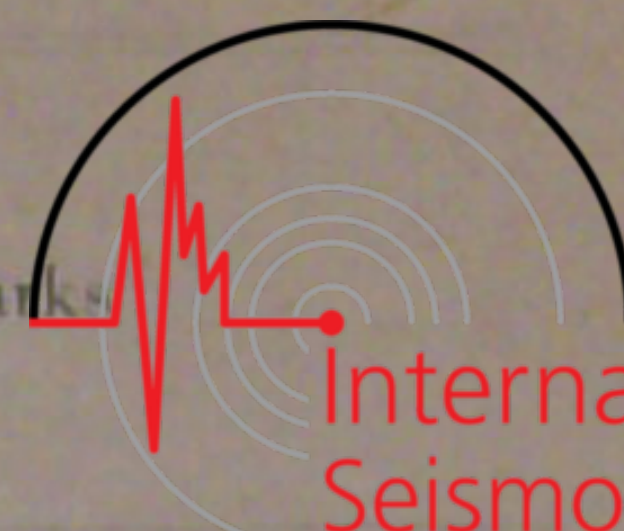
No.	Date	Comp.	Phase	G.M.T.			Period Sec.	Amplitude			Δ Kms	Remarks
				H.	M.	S.		A_n μ	A_e μ	A_z μ		
51	15 (contd.)	Z N N	PPP e eS F	4.5	23 27 28	05 28 24						
52	15	Z Z Z Z E	PKP e PP SKP M F	8 9 10.3	05 07 08 03	09 21 51 38					15335	Very weak
53	17	Z Z E	e e e F	12 13.3	44 48	03 27 06						" "
54	17	Z Z Z Z E E	eP e PPP PeP S M F	21 22.2	11 12 13 17 26	06 11 03 12 12 22	15		+29		4445	Confused with Microseisms
55	20	Z Z Z Z	e e e e F	4 5.0	49 50 51	52 23 43 21						Very weak
56	24	Z Z Z Z Z Z	PKP PKKP e e e PP F	15 17.6	52 53 55 56	27 28 06 11 30 06					16780	" "
57	25	Z Z	i i	4	49	30 36						" "
58	26	Z Z NE E E	P e S PS M F	17 20.4	20 26 30 31 52	48 54 27 06 05	18		-88		8280	
59	27	Z Z Z Z Z Z N	P e e PP e PPP S F	5 6 7.0	57 58 00 02 08	38 55 05 58 09 54 18					9665	
60	27/28	Z Z N E	eP PPP S M F	23 1.0	36 37 41 51	40 45 36 21	16		+36		3220	
61	29	Z Z Z Z Z Z E E E	e (PP) e e e e (PPP) (PPS) e M F	7 8 11.0	44 45 46 47 55 56 45	32 09 42 18 30 46 09 00 00 14	15		-29		(1220)	Preceded by Microseisms
62	31	Z	(P) F	11 12.2	40	05						Very weak
63	31	Z Z Z Z	e e e e F	21 22.0	49 50 51	54 27 40 10						" "

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A_n	A_c		
1946												
				H.	M.	S.	Sec.	μ	μ	μ	Kms.	
77	4 (contd.)	Z	e F	13.8		39						
78	4	N	e F	21 22.0	49	44						Very weak
79	5	ZE ZE ZE E	iP* P* Pg Sn F	20 21.6	56 57	04 22 42 29					821	Compression
80	5	Z Z Z Z Z N ZN Z	eP PcP e e PP e pS sS F	21 22 22.5	59 00 02 09	18 27 36 09 12 00 12 39					8220	Preceded by Microseisms h = 200 Kms.
81	6	Z Z Z Z Z N	eP e e e e e F	3 4.6	16 17 18 19 21 25	27 36 48 30 00 18						Preceded by Microseisms
82	6	Z Z Z Z	e e e e F	5 7.5	06 08 18 19	09 39 00 26						Very weak
83	6	Z Z Z Z N N N	e e e (PP) (SKS) (S) (PS) F	14 16.2	00 01 03 04 10 11 13	39 34 33 00 26 42 06				11555		
84	9	Z Z Z N	iP i i e F	10 11.8	43 44 54	51 03 08 24						Compression
85	11	Z NE E N	P S PS M F	2 7.0	01 09 21	42 22 54 20	20	—230			6000	Preceded by Microseisms
86	12	Z Z Z Z Z Z	Pn P* i i i Sn F	7 8.4	38 39 40	47 06 08 13 18 09					800	
87	13	Z Z E	P i e F	20 20.9	17 27	21 35 35						Very weak
88	14	Z Z Z	e e e F	1 1.3	10 11 13	50 14 00						" "
89	17	Z Z Z	e e e	16	09 10 17	54 24 57						Very weak
90	18	Z Z Z	(ePKP) (PKKP) e	7 23	22 47	15 51 47					17780	Preceded by Microseisms

N	Date	Comp.	Phase	G.M.T.			Period Sec.	Amplitude			Δ Kms.	ReaMrks
				H.	M.	S.		A _n μ	A _e μ	A _z μ		
90	18 (contd).	Z	o		24	44						
		Z	SKS		29	00						
			F	9.1								
91	18	Z	P	11	36	31						
		NE	e		44	12						
		N	i		56	12						
		N	M		59							
			F	12.5								
92	23	Z	e	1	11	08						Very weak
		Z	e			15						
		Z	e		15	12						
93	23	Z	ePKP	5	15	07					13755	Preceded by microseisms
		Z	PP		16	45						
		Z	e		17	45						
		Z	SKP		18	09						
		Z	e		19	15						
		Z	e		22	30						
		Z	SKKS		23	38						
		N	es		24	48						
		N	M	6	08	32	18		+14			
			F	8.3								
94	23	Z	PKP	10	59	45					16665	h — " 100 Kms. "
		Z	o			54						
		Z	PKKP	11	00	04						
		Z	pPKP			15						
		Z	PP		03	27						
		Z	pPP			52						
		Z	SKS		06	40						
		Z	pPS		14	47						
			F	18.0								
95	24	Z	(ep)	11	11	58						Very weak
		N	M		41							
96	24	Z	P	11	25	39						" " "
		Z	i			27						
		N	M		54							
			F	12.2								
97	26	Z	iP	8	20	46					6280	Copression
		Z	PP		22	56						
		Z	PPP		24	08						
		Z	e		25	51						
		NE	e		30	08						
			F	8.9								
98	30	Z	e	3	51	18						Very weak
		Z	e		52	12						
			F	4.0								
99	May 3	Z	e	22	21	10						Preceded by microseisms
		Z	e			19						
		Z	e		22	02						
		Z	e		23	12						
		Z	e			51						
		Z	e		24	12						
		Z	e		25	44						
		Z	e		29	08						
			F**									
100	3/4	Z	ePKP	22	42	36					13345	
		Z	PP		43	57						
		E	e		45	06						
		E	e		49	40						
		E	e		50	07						
		E	e		51	33						
		N	M	23	23	42	24		+17			
			F	3.0								
101	7	Z	e	14	57	29						" " "
			F	15.4								
102	8	Z	iP	5	31	42					7820	Dilatation
		Z	PeP		32	03						
		N	iS	8	40	54						
		N	PPS		41	33						
		N	i		42	06						
		N	i			48						
		N	SS		45	30						

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ
				H.	M.	S.		A _n	A _e	A _z	
							Sec.	μ	μ	μ	Kms.
102	8 (conid.)	N N	SSS M F	6 9.7	48 05	32 48	24	+175			
103	8	Z Z Z Z Z Z	eP e e PP PS PPS F	9 10 12.8	59 03 04 14 15	51 24 10 30 06 12					12780
104	9	Z Z Z	e e e F	19 20.2	53 56	03 26 44					Very weak
105	9	Z Z Z Z Z Z Z	iP PeP e PP eS PS e F	22 23.8	40 43 50 51 53	06 17 38 27 37 24 51				9445	Dilatation
106	9/10	Z Z Z	e e e F	23 1.2	43 54 55	16 33 23					Very weak
107	10	Z Z Z	e e e F	10 10.5	09 13 14	03 34 18					" "
108	11	Z Z Z N	P e e M F	16 16.7	04 80 11 18	47 00 15 00					" "
109	11	Z Z Z Z	eP e e e F**	17 	37 38 39	12 33 24 42					" "
110	11	Z Z Z Z Z Z Z Z	iP i e i e e e e F	18 19.8	47 48 49 50 57 58	12 40 15 31 52 18 23 31 18					Dilatation
111	12	Z Z Z Z Z N	P e PeP e PPP es F	13 14.5	29 30 31 36	07 37 24 14 54 24					5665
112	15	Z Z Z	P e e	22 	29 30	57 12 31					Very weak
113	15/16	Z Z Z Z N	e e e e M F	22 23 1.0	43 44 46 12	40 54 24 40					" "
114	16	Z Z Z	P i e F	5 7.2	44 46 47	29 39 21					" "

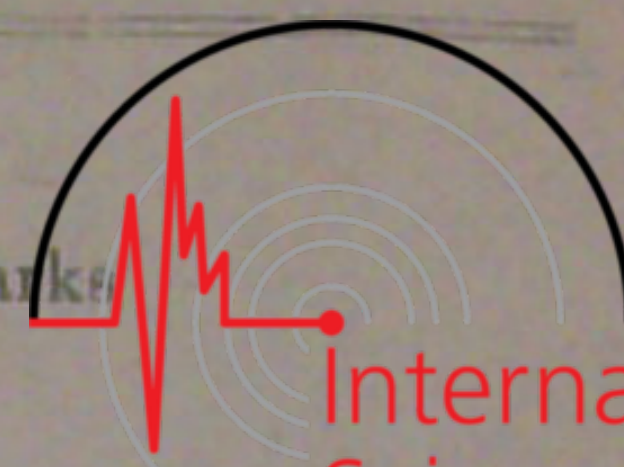
No	Date	Comp	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
								A_n	A_c	A_z		
				H.	M.	S.	Sec.	μ	μ	μ	Kms.	
115	19	Z	P	00	04	00					9500	
		Z	e			12						
		Z	e			27						
		Z	e		46	15						
		Z	PP		47	21						
		N	S		54	36						
		Z	i		55	35						
		Z	i			49						
			F	2.1								
116	19	NE	M	15	51							Very weak
			F	16.1								
117	21	Z	iP	9	29	15					9335	Compression
		Z	i			42						
		Z	e		30	03						
		Z	PP		32	30						
		Z	e		35	18						
		Z	e			27						
		Z	e			57						
		ZNE	e		39	30						
		NE	iS			38						
		N	e			54						
		Z	e		40	18						
		Z	PPS			57						
		Z	e		42	00						
		E	M	10	02	30	24		-32			
			F	11.4								
118	22	Z	P	9	53	14						Very weak
		Z	e			33						
		Z	e			54						
		Z	e		54	22						
		Z	e		55	15						
		Z	e		57	05						
			F	10.1								
119	29	ZE	ePg	9	11	45						Local (Not felt)
		E	e			48						
		E	e			51						
			F	9.3								
120	30	Z	iP	3	46	42					2780	Dilatation
		Z	PP		47	21						
		ENZ	eS		51	06						
		Z	e			27						
		Z	e		52	30						
			F	4.3								
121	31	ENZ	iP	3	15	41					1390	Compression
		Z	e		16	05						
		Z	e			45						
		Z	e		17	07						
		Z	e			20						
		Z	S		18	03						
		Z	e		19	14						
		Z	e			39						
		E	M		22	55	11		+44			
	June		F	5.0								
122	1	Z	P	16	24	03					9220	Very weak
		Z	(PeP)			09						
		Z	pP			30						
		N	(S)		34	06						h = 100 Kms.
		N	(SKS)			14						
			M		58							
			F	17.2								
123	2	Z	iP	1	21	06					9220	Dilatation
		Z	(pP)			35						
		Z	e			44						
		Z	(sP)			51						h = 120 Kms
		Z	e		23	47						
		Z	e		24	09						
		NE	(S)		31	06						
		N	e			22						
		N	e			48						
		N	(sS)			56						
			F	2.5								
124	2	Z	P	6	44	11						
		N	(S)		47	33						
			F	7.0								



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No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
								A_n	A_e	A_z		
				H.	M.	S.	Sec.	μ	μ	μ	Kms.	
125	4	Z	P	5	03	39						Very weak
		Z	e			45						
		Z	e		06	18						
		Z	e		07	36						
126	5	N	M	2	00							" "
			F	3.5								
127	5	Z	eP	10	23	15						Very weak
		Z	e		24	39						
			F	11.2								
128	6	Z	eP	10	47	42						" "
		Z	e		50	08						
		N	M	11	13	12	12	+ 5				
			F	12.5								
129	7	N	e	4	32	50					12220	" "
		NE	SKS		38	13						
		NE	SKKS		39	12						
		NE	PS		41	32						
		E	M	5	07							
			F	6.7								
130	12	ZN	eP	16	22	20					11335	" "
		E	PP		26	39						
		EN	SKS		32	58						
		N	M	17	10							
			F	18.0								
131	15	Z	eP	18	42	51					10980	
		Z	e		46	36						
		ZE	PP			47						
		E	e		53	33						
		E	SKKS		54	05						
		E	e			19						
		E	PS		55	36						
		N	i	19	00	36						
			F	20.5								
132	18	ENZ	i	12	44	08						Near earthquake
		E	i			10						
		E	i			21						
			F	12.8								
133	19	Z	e	00	26	39						Very week
			F	1.6								
134	20	Z	e	00	41	00						" "
		N	e		46	26						
		N	e		48	36						
		N	e			48						
			F	1.7								
135	23	ZE	e	7	15	03						Very week
		N	i		18	06						
		N	e		19	00						
			F	7.6								
136	23	Z	eP	17	27	03					10110	h = 100 Kms.
		ZN	e			12						
		ZN	pP			30						
		Z	sP			39						
		ZN	PP		30	48						
		ZN	pPP		31	06						
		Z	sPP			24						
		Z	e		33	21						
		N	SKS		37	24						
		N	S			50						
		N	S		38	38						
		N	e		39	54						
			F**									
137	23	N	e	18	31	38						
		N	e		33	30						
		N	e		39	00						
			F	20.4								
138	26	ENZ	P	12	54	14						Very week
		EZ	e			36						
			F	15.2								
139	July 1/2	E	e	2/3	01	12						" "
			F	1.7								

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
								A_n	A_e	A_z		
				H.	M.	S.	Sec.	μ	μ	μ	Kms.	
140	8	Z Z	e e F	11 12.0	38 39	32 33						Very weak
141	8	Z	e F	18 19.9	08	10						" "
142	9	Z Z ZE Z Z Z Z NE	iPKP i pPKP PKKP pPKKP e PP pPP e F	1 4.0	28 29 32 33 39	11 23 38 03 33 12 39 08 06					17780	Dilatation h = 100 Kms.
143	9	Z Z Z Z Z Z E E E E	iPKP e e pPKP PP pPP e e e e F	13 14.6	32 33 33 35 36 37 42 54 56	55 02 13 45 12 03 24 40 12 05					14445	Compression h = 200 Kms.
144	16	Z Z Z EN	iPn P* Pg Sn F	5 7.5	28 29	06 18 33 12					622	Compression
145	16	N Z	e e F	10 10.6	20	12 52						Very weak
146	16	Z N N	e e e F	17 17.6	16 17	18 28 42						" "
147	16	Z N Z Z N Z N	P e PPP e e S e F	19 20.5	47 48 49	33 36 45 15 18 09 12					932	Preceded by microseisms
148	17	Z N	e e F	1 2.4	30 38	48 30						Very weak
149	17/18	N Z NE NE E E	e e e e e e F	23 3.0	23 35 37 38 39 40	09 23 18 00 09 18						" "
150	18	Z Z N N NE	PP e S e M F	6 7 10.0	25 27 33 06	15 42 00 54					11465	" "
151	19	Z Z Z Z Z Z NE NE ZNE Z	iP pPP sP e PP sPP S e e sS F	21 22.7	28 29 32 33 39 40	32 07 28 46 10 00 12 26 42 12					10000	Dilatation h = 150 Kms.



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
								A_n	A_e	A_z		
				H.	M.	S.	Sec.	μ	μ	μ	Kms.	
152	20	Z Z Z Z N	e e e i e F	2	46 47 48	42 15 50 03 24						Preceded by Microseisms
				3.2								
153	25	Z Z Z Z Z	e e i i i F	00	34 35 36	12 43 11 39 12						" " "
				0.7								
154	25	Z Z Z Z NE NE Z	iP e i i e S e F	14	21 23 24 25 31 34	45 57 09 23 13 40 51					8665	Compression
				14.7								
155	25	Z Z Z N N N N	eP e PP SKS e PS SSS F	16 17	55 56 59 06 06 08 13	35 00 21 06 24 12 30					11000	Preceded by microseisms
				19.9								
156	26	Z Z Z Z Z NE E N N Z Z N	ePP PPP e e e SKS SKKS S e e e M F	7	03 06 07 09 10 11 13 14 50	39 02 30 09 21 50 45 24 44 24 12					12220	
				8.6								
157	26	Z Z Z Z Z	PKP PKKP e e PP	22	51 54 55	06 36 18 38 05					17000	$h = 100$ Kms.
158	27	Z N E	e e M F	00	02 11 33	20 54						Very weak
				1.2								
159	27	N N N N N	P S e SS e F	16	29 31 32	00 32 42 08 48					1500	
				17.9								
160	31	Z N	P e F	00	41 51	33 54						Very weak
				1.0								
161	August 2	Z Z Z Z Z Z N N Z Z E E E E	eP e e e e e e e e PPP e PS e SS M F	19	33 34 35 37 39 40 45 47 48 54 23	47 33 09 09 27 39 18 18 30 51 08 48 30 00 00					12445	
				20 22.1			24		+ 56			

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		A _n	A _e	A _z		
							Sec.	μ	μ	μ	Kms.	
162	3	Z Z ZN Z N N N	iP e i PP SKS e S F	13	18 19 22 29 30	55 09 19 33 18 42 12					10580	Dilatation Very weak
163	4	Z E E E E N NE E	P e e e PPP e e S M F	18	04 09 10 14 42	06 21 56 24 26 12 42 09	20		+253		9555	
164	6	Z Z Z	e e e F	3	08 09	40 52 18						Very weak
165	7	Z Z Z NE	eP e PPP S F	22	53 54 58	06 51 18 08					3364	Preceded by microseisms
166	8	Z Z E N N NE N	P PP SKS S PS (PPS) M F	13 14 13.7	41 44 51 52 53 70	32 54 45 12 06 36 36	20	+75			9665	
167	9	Z Z NE	P e e F	20	19 30	36 54 30						Very weak
168	11	Z Z Z Z N	PKP pPKP PP pPP SS F	2	13 15 32	22 48 12 36 00					13890	h = 100 Kms.
169	15	Z Z Z Z Z N	PKP e PP SKP e SS F	15	43 46 47 48 50	36 57 53 10 28 36					16110	
170	15	Z Z Z N N E	eP e PPP iS SS M F	19	31 32 33 36 38 46	45 30 03 54 43					3555	Preceded by microseisms
171	17	Z Z NE E	iP PPP S SS F	9	51 53 55	18 36 56 10					1555	Dilatation
172	17/18	Z Z NE E	iP PPP S SS F	23	40 41 43 44	53 13 33 56					1565	" "
173	20	Z Z ZE	eP e e F	17	29 32 33	54 45 11						Very weak

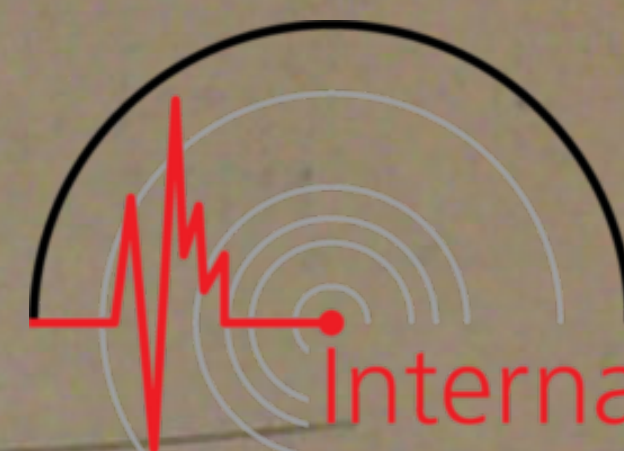


Remarks

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No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
								A_u	A_e	A_z		
				H.	M.	S.	Sec.	μ	μ	μ	Kms.	
174	21	Z Z Z	eP e e F**	18	20 22	03 26 15						Very weak
175	21	Z Z Z Z E NE E	iP e e e SKS S PS F	19	30 34 35 41 42	42 03 45 27 12 36 33					10000	Compression
176	22	Z Z Z Z N	e e e e M F	16	51 54 59 00 55	09 24 51 36						Very weak
177	23	Z Z	e e F	11	30 31	18 30						" "
178	24	Z Z N E	eP e eS M F	00	34 36 39 45	57 00 36 40	10		+7		2955	
179	24	Z EN EN	P (SKS) (S) F	14	31 41 42	22 48 12					9945	" "
180	28	Z Z Z Z	ePKP PKKP PP e F	20	26 30 31	25 52 28 31					17435	" "
181	28/29	Z Z Z Z Z Z Z Z NEZ Z E E	eP pP e sP e e PPP e i SKKS e e F	22	41 43 44 46 47 48 51 18 54 52 55	36 42 15 39 05 54 50 07 18 54 11 18					1220	h = 580 Kms,
182	29	Z Z	e e	23	15	00 14						Very weak
183	1	Z N N	eP e e F	18	31 32	54 40 54						" "
184	4	N E	e M F	19	03 37	12						Very weak
185	5	N N E	e e M F	12 13 14.1	57 58 32	00 12						" "
186	9	Z N	e e F	9	34 36	48 30						" "
187	9	ZE NE E	iP (S) M F	10 11 12.0	48 58 28	41 34					8590	Dilatation

September



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		A_n	A_e	A_z		
							Sec.	μ	μ	μ	Kms.	
188	9	Z Z Z	P e e F	17 18.0	31 32	38 03 18						Very weak
189	11	ZN Z Z E	iP PP PPP S F	10 12.0	01 02 03 06	54 51 06 55					3380	Dilatation
190	12	ZEN N N N N E N	iP e PS i ScS M M F	15 20.5	27 35 36 38 50	09 06 38 10 00 42	24 (30)	-1500	+778		6735	Compression
191	13	Z Z	e e F	16 18.0	06 10	50 06						Very weak
192	13	Z Z Z N NZ	iP e e SKS PPS F	19 20.6	11 12 14 22 23	49 12 24 06 38					9445	Dilatation
193	14	Z Z Z	e e e	3	04 05 09	46 21 11						Very weak
194	14	Z Z	iPKP PP F	20 22.0	07 10	56 03					14445	Dilatation Very weak
195	15	Z Z Z NF	(eP) e e e F	16 17.0	00 01 03 08	20 50 22 26 20						
196	19	Z Z N E	eP PP S M F	00 1.0	16 17 20 27	31 09 38 40	18		+ 19		2555	
197	23	Z Z Z Z Z	ePKP PP SKP e PPP F***	22	12 15 16 17 18	58 39 30 52 45					15335	Preceded by microseisms
198	23/24	Z Z Z E E E E E E E	eP e PKP PP e e SKS PS e e i F	23 3.0	44 45 48 49 50 51 56 59 00 05	39 12 18 24 05 48 04 10 42 11 12					13045	" " "
199	25	Z Z Z N N N	iP e PP e SKKS S F	10 11.2	18 22 29 30	43 12 32 36 48 06					10665	Compression
200	26	Z Z Z Z	iPKP e pPKP PKKP	11	12 14	03 12 15 25					16665	Dilatation h = 550 Kms.

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		A_n	A_e	A_z		
							Sec.	μ	μ	μ	Kms.	
200	26 (Contd)	Z	e			42						
		Z	sPKP		15	10						
		Z	e			45						
		Z	e		16	25						
		Z	e		18	47						
		E	e		21	38						
		N	(PPS)		28	52						
		N	e		34	18						
			F	12	3							
201	27	Z	e	16	15	27						Very weak
		Z	e		16	09						
		N	e		17	06						
			F	16	6							
202	27	Z	P	19	56	00						" "
		Z	e		58	33						
			F	20	7							
203	28	Z	e	13	36	45						" "
		N	e		46	42						
			F	14	8							
204	28	Z	e	19	42	51						" "
		Z	i		46	33						
		Z	e		49	14						
			F	20	1							
205	29	Z	eP	3	17	21					13355	
		Z	e		20	18						
		Z	PKP			48						
		Z	e		21	03						
		Z	PP		22	18						
		NE	SKS		28	00						
		NE	e		29	27						
		E	S		30	08						
		N	e		31	27						
		N	PS		32	06						
		N	M	4	00	39	30	-563				
			F	7	5							
206	29	Z	P	20	27	16					2680	
		Z	PP			45						
		Z	e		28	27						
		Z	e		29	46						
		Z	e		30	30						
		NE	eS		31	33						
		NEZ	e		34	50						
		NE	e		35	30						
		E	ScS		38	28						
		Z	e		39	27						
			F**									
207	29	Z	eP	21	28	30						Very weak
		Z	e			47						
			F	22	1							
208	30	Z	e	1	18	33						
		Z	e			45						
		Z	e		19	18						
		E	M	2	00							
			F	2	8							
209	30	Z	iP	11	41	39					9055	Compression
		Z	e		42	15						
		Z	PP		44	48						
		Z	e		45	15						
		N	S		51	50						
		N	e		52	24						
		N	ePS			42						
			F	13	8							
210	October 2	Z	iP	4	58	51					10110	Dilatation
		Z	e		59	39						
		Z	PP	5	02	33						
		Z	e		05	33						
		NE	SKS		09	09						
		NE	S			38						
		N	sS		10	(24)						
			F	6	8							
211	2	EN	eP	6	55	58						
		N	i		56	36						

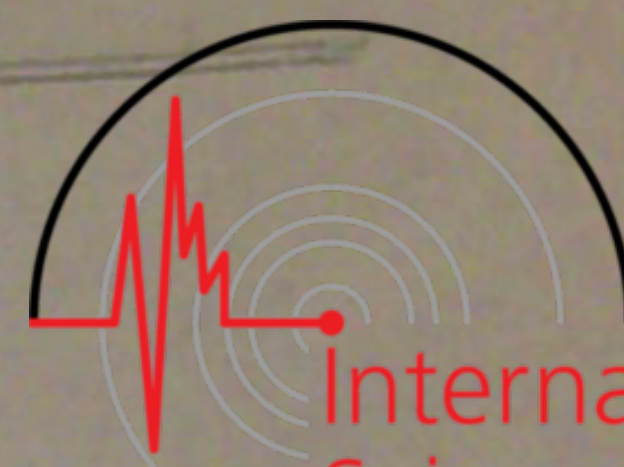
No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
								A_n	A_e	A_z		
				H.	M.	S.	Sec.	μ	μ	μ	Kms.	
211	2 (Contd)	N N N	e i i F	07	59 06 07	38 24 48						
212	3	Z Z Z EN	eP PPP e S F**	15	41 42 43	06 24 02 48					1610	
213	4	Z Z Z NE ZNE N	iP i PP SKS i S F	14 15	58 02 08 09	24 33 00 48 10 28					10220	Dilatation
214	5	Z Z Z Z	e e e e F	11	51 52	30 42 14 36						Very weak
215	8	Z Z Z Z Z Z N	PKP i (PKKP) i i (PP) i F	14	15 17 17 18 37	00 07 17 23 39 47 18					17020	
216	9	ENZ	M F	21 22.3	30							Very weak
217	13	Z N EZ E E	iPn P* Sn S* Sg F	21	26 27	12 24 19 40 55					644	Compression
218	13/14	Z Z E E	e e e e F	23	31 32 37 38	39 21 26 17						Very weak
219	14	Z Z EN	e e M F	5 6 7.5	04 06 10	40 12						" "
220	15	Z Z N	e e e F***	6 7	56 01 20	50 54 28						" "
221	15	Z Z Z	P e e F	8	05 06 08	52 12 00						" "
222	17	Z Z Z N N	eP e e e i F	17	01 02 03 04 08	45 33 45 42 52						Near earthquake
223	18	N NE E N N	ePn iSn S* i i F	4	35 36 38 39	24 32 53 20 54					655	
224	18	Z Z Z	eP e e F	20	55 56 57	18 06 12						



Remarks

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No.	Date 1946	Comp.	Phase	G.M.T.			Period Sec.	Amplitude			Δ Kms.	Remarks
								A_n μ	A_e μ	A_z μ		
225	22	Z Z Z Z Z ZE Z	iPKP e pPKP e PP e PPP F	10	19	18 45 20 09 26 39 54 22 03 24 03					13555	Dilatation
226	22	Z NZ	eP i F	16	01	03 48						Very weak (Near earthquake)
227	22	Z Z Z Z	e e i e	17	46	30 45 24 39						Very weak
228	23	Z Z N NZ	e e e i F	8	08	09 39 10 06 12 00						" "
229	24	Z Z	e e F	1	26	38 00						" "
230	24	Z Z Z	e e e	8	57	10 19 24						" "
231	25	NE N N N	P i e e F	22	02	42 00 13 03 54						" "
232	26	N N NE	e e M F	00	39	26 18						" "
233	26	Z Z Z Z N	e e e e M F	11	57	54 29						Very weak
234	26	Z N Z	e e e F	21	48	21 42 50 05						" "
235	30	Z Z Z EZ Z Z Z E E	iP PP i e S e PS PPS M F***	8	00	59 50 08 43 11 52 12 14 13 03 33 14 14					10500	Dilatation
236	30	Z Z	(P) e F	8	26	14 40						
237	30	Z Z	iP i	14	25	57 21						Dilatation Very weak
238	November 1	ZN Z ZN Z N E Z EN N	iP i PP e SKS eS i ePS SS	11	27	51 10 42 30 21 16 18 26 48					10720	Dilatation



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
								A_n	A_e	A_z		
				H.	M.	S.	Sec.	μ	μ	μ	Kms	
238	1 (contd.)	E	M F	12 15.0	20	36	21		+51			
239	2	Z Z Z Z Z Z E	P e e e e e F	14	17 20 27	00 21 00 30 45 57 33						Very weak
240	2	EZ E E	iP S M F	18 20.5	35 40 55	21 47 00	12		247		3790	Dilatation
241	3	Z Z E	e e M F	13 14 14.2	42 49 01	18 37						Very weak
242	3	Z Z Z Z Z E	P PP i i iS e F	18 19.0	50 51 53	39 53 15 29 39 49					1780	" "
243	3	Z Z Z E E	iP PcP PPP S M F	19 20 22.3	42 43 45 49 04	02 06 15 42 39	12		-36		6055	Dilatation
244	4/5	Z E	iP iS F	21 2.0	52 56	35 27					2390	" "
245	6	Z Z E E	ePn P* Sn S* F	14 14.8	25 26 27	52 06 54 12					577	Preceded by Microseisms
246	6	Z EZ	e e F	16 17.3	57 59	00 18						Very weak
247	6	Z Z Z E EZ E	iP i PP e S SS F	20 21.1	04 05 10 13	09 18 48 18 27 33					4635	Dilatation
248	7	Z Z Z E	iP i e M F	16 16.7	00 01 02 21	57 03 42						" " Very weak
249	10	Z Z E E	iP e e M F	00 01 1.6	54 56 00 16	16 03 40						Compression Very weak
250	10	Z Z Z Z E	e e e e M F	13 14 14.3	14 24 25 05	12 52 43 38						" "
251	10	Z Z Z Z EZ Z	eP i i i PP PPP	17 18	57 01 02 04	30 06 24 45 06 27					12445	



No.	Date 1946	Comp.	Phase	G.M.T.			Period Sec.	Amplitude			Δ Kms.	Remarks
								A_n μ	A_c μ	A_z μ		
	10 (contd.)	E E E E	PS e SS M F		11 12 17 46	30 00 48 27	22		+171			
252	11	Z Z Z	e e e	21.5	22	07 08 14						Very weak
253	12	Z N N	e i M F	6 7 8.9	13 20 00	40 26						" "
254	12	Z Z Z E N	iPKP PKKP PP PSKS (SS) F	17 18 21.0	48 49 52 03 12	34 03 40 06 24					17480	Dilatation
255	14	Z N	i e F	11 12.6	47 59	45 36						Very weak
256	16	Z Z Z	e e e F	12 13.0	10	36 48 57						" "
257	17	Z Z Z Z E	eP PP e e SKS F	3 4.0	02 06 07 09 13	44 42 33 44 15					11035	" "
258	17	Z Z Z Z NE	e e e e M F	13 14 14.6	56 10	06 27 45 54						" "
259	17/18	Z ZN Z Z Z NZ NZ N N N E E E N E	iP e e e PP e PcP S i i i i SS M M F	22 0.3	30 31 32 33 35 36 37 42 55	30 47 52 24 33 54 30 30 48 58 05 27 09 06 55	12 12	+45	-36		3365	Compression
260	18	Z Z Z Z	ePKP PKKP i PP	2 3	59 01 03	15 33 33 08					16665	Very weak
261	18	Z Z Z NE	(eP) i i (S) F**	13	26 36 38 46	24 37 09 36						
262	18	Z Z Z Z Z Z NE	(eP) e e e e e (S) F	13 15.7	49 50 54 59	20 30 42 58 58 40 30						
263	20	EN	M F	2 2.8	22							Very weak

No.	Date 1946	Comp.	Phase	G.M.T.			Period	Amplitude			Δ Kms.	Remarks
								A_n μ	A_e μ	A_z μ		
264	21	Z Z NE NE	eP PPP S i F	1 2.5	46 48	24 39 36 54					1290	Preceded by microseisms
265	21	Z Z Z Z Z NE	eP PKP e PP SKP M F	3 4 5.5	35 38 40 41 30	08 24 35 12 42					14000	Very weak
266	21	Z Z Z NE	e e e e F	19 19.8	34 35	27 42 36 42						" "
267	22	N N	e M F	16 17.3	31 52	30						Very weak
268	23	Z Z Z Z	e e e e F	11 11.9	41 42	37 46 06 40						" "
269	26	Z	e F	8 8.8	32	27						" "
270	28	Z Z Z Z Z Z Z Z Z ZE Z Z EN N EN N	iPKP i PKKP i sPKKP i e PP i i SKKS e PSKS e F	16 17.5	10 11 12 13 14 15 16 21 25 33	51 57 28 45 03 27 03 48 51 24 09 50 00 54					17220	Compression h = 100 kms.
271	30	N	i	12	02	40						Very weak
272	December 4/5	Z Z N N	e e i i F	22 23 0.7	58 59 07 08	46 21 45 24						Confused with microseisms
273	7	Z Z Z Z	i i i i F	10 11	57 58	42 53 10 27						Local tremor
274	8	Z	i F	12 13.7	34	50						Very weak
275	10	Z Z	i e	7	35 38	00 06						" "
276	10	Z Z	e i	16	52 54	10 15						" "
277	19	E E	eP (S) F	3 4.0	09 19	17 09						Preceded by microseisms
278	20	E E E	iP PP eS F	19 24.0	31 35 42	42 09 24					9710	Very violent
279	21	E E	eP e	10	31 42	33 06					9710	



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
								A_n	A_e	A_z		
				H.	M.	S.	Sec,	μ	μ	μ	Kms.	
279	21 (Contd)	E	PS		43	08						
			F	14.1								
280	24	E	e	2	16	42						Very weak
281	24	E	e	2	45	57						" "
		E	e		46	30						
		E	M		50							
			F	2.9								
282	24	E	eP	3	48	26						" "
			F	4.0								
283	26	E	e	17	14	18						" "
		E	e			50						
		E	M		48							
			F	18.5								
284	28	Z	P	10	22	06						Preceded by microseisms
		Z	e			39						
		Z	e			51						
		Z	e		23	00						
		Z	e		27	42						
		E	e		32	30						
		E	eS			45						
			F	11.6								
285	30	Z	P	4	19	57						" " "
		Z	e		20	05						
		Z	e		22	21						
		Z	e		23	50						
			F	5.2								

Tremors were also recorded at:

	D	H	D	H	D	H	D	H
Jan.	2	5	4	20	13	11.5		
Feb.	2	9	11	4	16	7.5	18	1.2
	24	8						
Mar.	12	11	13	10	16	12	20	16
	21	18						
Apr.	2	14,15,16	4	17	5	17	6	11
	11	10	18	4	24	13,14		
May	10	14	26	9				
June	3	15	28	9				
July	2	12	10	15	13	20	17	00
	23	19						
Aug.	3	00	5	13				
Sept.	4	2	6	5,8	10	1	13	21
	17	6	21	2				
Oct.	1	7	2	9	3	17	7	8
	10	5	19	8	23	7		
Nov.	3	2	4	11	5	7,8	7	10,22
	10	22	15	3	19	11	22	4
	25	15						
Dec.	4	22	11	17	13	14	19	1
	21	4	24	17				