



HELWAN OBSERVATORY



SEISMOLOGICAL REPORT

FOR THE YEAR 1950

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1950

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Seismological Bulletin

Constants of the Station:

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

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.

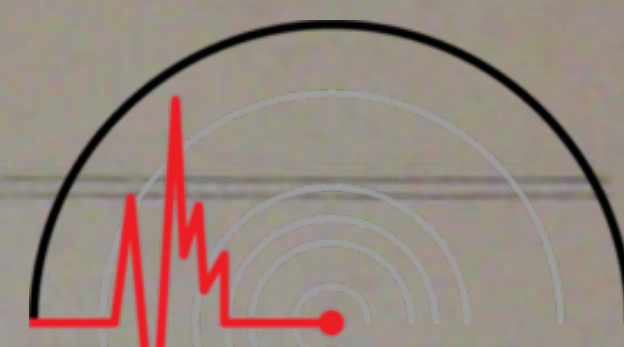
N.B. Compression should be taken dilatation
and dilatation compression.

No.	Date	Comp.	Phase	G.M.T			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _N	A _E		
								μ	μ	μ	Kms.	
1	January	Z	eP	1	26	04						Very weak
			Z	e	28	25						
			Z	F	30	12						
				2'3								
2	2	Z	ePn	13	45	13					833	" "
			N	(Sn)	46	40						
			Z	F	47	25						
				14'0								
3	2	Z	(PKP)	15	33	52					16110	h = 700 km.
			Z	(PPKP)	36	17						
			NEZ	(PP)	37	23						
			N	e	38	33						
			Z	F	46	28						
				17'5								
4	3	NZ	iP	3	04	09					9055	Dilatation
			Z	i		27						
			Z	i		42						
			Z	i	05	48						
			Z	e	06	29						
			Z	PP	07	20						
			E	iS	14	21						
			N	SKS		26						
			N	i	15	00						
			NE	PPS		27						
			F	5'0								
5	7/8	N	e	23	35	14						Very weak
			N	e		27						
			N	F	36	30						
				0'2								
6	9	N	e	13	13	18						" "
			N	e	14	06						
			F	13'5								
7	12	Z	iPKP	12	24	57					17110	Comperssion
			Z	PKKP	25	15						
			Z	i	26	14						
			Z	i	27	07						
			Z	e	28	09						
			Z	PP		39						
			Z	i	35	14						
			Z	PSKS	39	09						
			F	13'2								
8	12	Z	(eP)	23	34	29						Confused with microseisms.
			Z	e	36	09						
			Z	e		24						
			Z	e	37	36						
			N	e	39	21						
			Z	e	41	14						
			F	24'0								
9	14	Z	e	22	22	27						" weak "
			Z	i	23	12						
			Z	e	24	27						
			Z	e	27	26						
			N	e	29	08						
			F	22'7								
10	17	Z	eP	11	08	20						Confused with microseisms.
			Z	e	10	58						
			Z	F	17	24						
				12'1								
11	19	Z	iP	17	31	45					2155	Dilatation.
			Z	PPP	32	10						
			NE	iS	35	18						
			F**									
12	19	Z	(eP)	18	43	41						Very weak
			Z	e	40	56						
			NZ	i	50	30						
			Z	i		44						
			F	19'0								
13	19	Z	iP	23	15	23						Compression
			NE	e	19	00						
			NE	i	21	42						
			EZ	e	23	10						

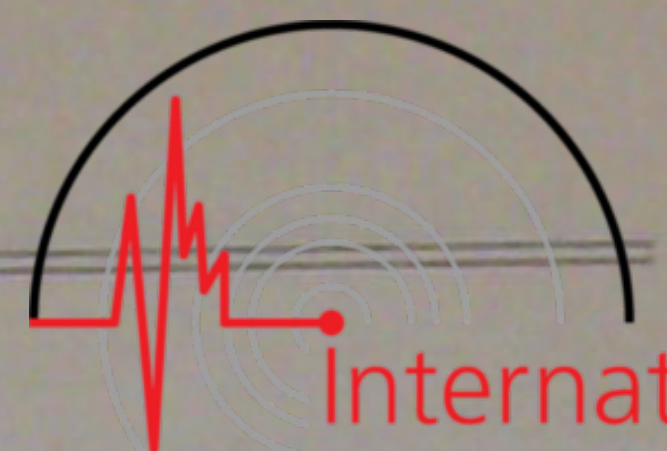
No.●	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
								A _N	A _E	A _Z		
				H.	M.	S.				Kms.		
				μ	μ	μ						
13	(Cont.)	Z	o F	23'6	24	20						Dilatation
14	22	Z Z NE	iP PPP iS F	4	11 12 15	40 08 15				2165		Very weak
15	22	Z Z Z Z	e e e e F	10	08 09 10	42 06 48 09						" "
16	22	Z Z	e e F	16	39 40	33 19						
17	23	Z Z Z Z Z N	iP e e PP PPP S F	10	12 13 14 6 18 23	44 02 30 15 15 26				9720		Dilatation
18	24	Z Z Z Z Z E Z Z	iPPP e e PP SP e i PSKS PPS F	17	06 07 08 09 17 15 19 21	24 04 30 10 45 58 42 00 25				15625		Dilatation
19	26	Z Z	i i	4	11	12 23						Very weak
20	27	Z Z Z Z	e e e e	19	38	08 27 17 43						" "
21	30	Z Z Z Z Z N	eP e PP e PPS M F	1	15 16 19 23 29 58	30 51 30 12 10				10890		Confused with microsoisms
22	30	Z Z Z	P i i F	10	09 11 12	39 06 26						Very weak
23	31	Z Z N	e e e F	4	23 26 27	48 45 02						" "
24	31	Z Z Z Z Z	eP e i i i F	11	32 34 43 45 46	18 02 12 45 20						Preceded by microsoisms
25	February 2	Z Z Z Z E	P e e e e M F	15	52 56 58	24 03 21 50						Confused with microseisms
26	2	Z Z Z N	iP e e e F	16	34 36 39	28 51 39 28						Compression

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _N	A _E		
								μ	μ	μ	Kms.	
27	2	Z NZ Z Z Z	eP e e e e F	20	09 15 16 17	24 18 27 45 38						Very weak
28	2	Z Z EZ Z Z	P e e e e F	22	49 50 53 54 55	52 40 30 39 30						Preceded by microseisms
29	3	Z Z Z Z Z NEZ Z Z	P e e e e S e e F	23	43 44 46 48 52 53	59 19 48 24 11 18 50 21				6780		" " "
30	3	Z Z Z Z NE Z N	P e e e PPP S e e F	3	02 03 04 10 11 12	06 29 18 06 57 30 21 24				6890		" " "
31	5	Z N	i e F	1	46 49	40 08						" " "
32	7	Z Z Z Z N	P i i e e F	10 11 11.8	50 51 00	13 24 33 42 36						Very weak
33	8	Z Z Z Z N	P e PcP PP S F	18	28 29 30 35	33 18 06 24 30				5335		Confused with microseisms
34	11	Z Z Z NE Z	P PP e eS PS F	1	33 36 39 43	42 27 51 08 42				8110		" " "
35	11	Z Z Z Z Z Z	PKP PKKP pPKP SPKKP PP e F	11	49 50 51 53 54	19 36 24 10 09 42				16665		h = 250 Km. "
36	12/13	Z Z Z Z N	P e e e i F	22	34 35 36 38 57	40 06 54 00 26						" " "
37	14	N N	e e F	00	14 19	48 00						Very weak
38	15	Z N N N	P e e e F	14 15 15.5	47 55 56 02	27 00 36 00						" "

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _N	A _E		
				H.	M.	S.	Sec.	μ	μ	μ	Kms	
39	16	Z	e	13	10	45						Confused with microseisms
40	16	Z	e F	14 15 5	41	15						
41	22	N N Z N	e e e M F	11 12 13 2	40 41 43 18	42 54 12						" " "
42	23	Z N	e e	5	01 11	07 48						" " "
43	23	Z Z Z Z E	P e e e e F	8	44 46 48 49 52	54 18 16 09 33						" " "
44	25	Z Z	P e F	5	56 57	32 30						" " "
45	25	Z Z Z Z N N	eP e e e e F	10	04 07 08 14 15	08 54 39 42 45 00						" " "
46	27	Z Z Z Z Z	e e e i e F	3 4	59 05 06 07	57 58 45 18 32						Very weak
47	28	Z Z N Z Z Z	eP e e e i i F**	10	13 17 20 22	03 11 50 56 12 45						" "
48	28	Z NE Z N Z NEZ NE N N NE N	iP PcP PP PP e PPP SKS i sS i i F	10	32 34 36 37 42 43 44 50	47 54 02 02 11 50 35 36 08 58 10				8890		Compression h = 300 km.
49	March 1	Z N	eP (S) F	8	37 48	36 00						Preceded by microseisms
50	2	Z Z Z	Pn Sn Sg F	10	20 21 27	20 56 09				322		Not felt
51	2	N N N N	e e e e F	18 19 21 2	58 05 06	12 42 15 12						
52	3	Z Z Z Z E	ePKP e e PP PPP SKKS	11	03 04 07 11 14	48 00 35 51 20 30				17335		Confused with microseisms

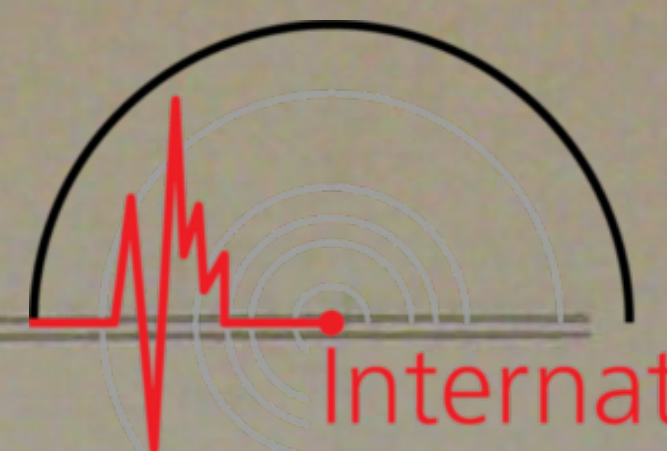


No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A_n	A_e		
								μ	μ	μ	Kms.	
53	3	Z	e		16	16						Very weak
		Z	e			24	43					
			F	13.3								
		Z	eP	15	59	33						
54	4	Z	e									" "
		Z	e									
		NE	e									
		Z	e									
		Z	e									
		NE	e									
55	7	NE	eP	2	20	32				9280		
		E	PP		23	46						
		NE	iS		30	53						
			F	5.0								
56	12	ENZ	M	2	28						" "	
			F	2.7								
57	14	E	e	3	34	36					" "	
		E	e		35	25						
		N	e		36	00						
		Z	e		37	50						
58	16	Z	PKP	19	43	36				16764	Preceded by microseisms Very weak	
		Z	PKKP			45						
		Z	i			54						
		Z	e			44	54					
		Z	e			45	21					
		Z	PP			47	15					
59	18	N	e	5	03	48					" "	
		N	e		05	00						
		Z	e		06	13						
		NE	M		35							
60	19	Z	e	7	01	00					" "	
		Z	e			32						
		Z	e			02	16					
		Z	e			03	16					
		Z	e				34					
61	23	ENZ	M	00	44						" "	
			F	1.0								
62	25/26	Z	PKP	22	47	00				17935	Very weak	
		Z	SKP		50	33						
		Z	e		52	23						
		Z	PKKS	23	01	54						
63	26	Z	iP	16	57	23				1980	Dilatation	
		Z	e		59	06						
		NE	iS	17	00	40						
		Z	PcP		02	02						
			F	18.6								
64	27	Z	iP	13	17	07				9780	" "	
		Z	e		20	08						
		Z	PP			36						
		ZN	PPP		22	36						
		N	iSKS		27	36						
		Z	S		28	00						
		N	PPS		29	21						
			F	16.1								
65	27	Z	eP	21	30	24				8500	Very weak	
		Z	e			31						
		Z	e			36	36					
		N	S		40	10						
		N	PS			44						
			F	23.5								



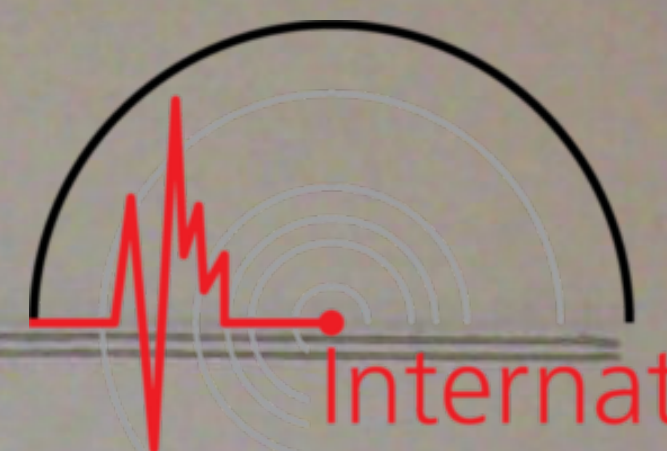
No.	Date	Comp.	Phase	G.M.T.			Period Sec.	Amplitude			Δ Kms.	Remarks
				H.	M.	S.		A _N μ	A _E μ	A _Z μ		
66	29	NE N	e e F	15	38 39 40	58 03 00					(Local tremor)	
67	29	Z Z Z E	e e e e F	17 18 19'3	58 59 06	57 18 50 42				6000	Very weak	
68	April 4	NE E N NE	eP PP iS PPS F	18 19 21'1	53 55 01	48 51 24 42						
69	5	Z Z Z N	e e e e F	9 10'5	36 38 44	18 28 30 30					Very weak	
70	6	Z Z Z E Z	P e e (S) e F	2 3'3	48 49 50 53 57	44 04 37 18 24				2955		
71	10	Z Z Z Z Z Z	PKP iPKKP e e PP e PPP F	6 8'0	36 37 38 40 42 43	27 36 21 12 04 23 32				16710	" "	
72	14	Z ZN Z Z Z Z Z N	ePKP pKKP pPKP e e e PP e e F	20 22'1	19 20 22 23 25 41	28 11 30 28 51 18 37 18 00				17390	h " = 230 Km.	
73	14	ZNE Z Z Z	iPn e e e	21	47 48	48 06 15 30					Dilatation (local tremor)	
74	20	Z Z ZN E N	iP e S e PPS F	10 11'1	03 14 15	34 51 06 18 30				9500	Dilatation	
75	20	Z Z ZNE Z Z	P e (S) e e F	17 18'3	24 29 33 39	42 51 52 45 57					Preceded by microseisms	
76	26	Z Z NZE	iP i S F	7	17 27	24 39 43				9220		
77	30	Z Z Z Z Z Z Z Z	ePKP e e c e e e e e	10	48 49 50 51 51 52 53	51 09 19 51 09 29 48 48 00						

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks		
				H.	M.	S.		A _N	A _E	A _Z				
				H.	M.	S.	Sec.	μ	μ	μ	Kms.			
78	May 1	Z	e		56	37						Very weak		
		Z	e		57	09								
		N	e	11	11	24								
			F	13.1										
79	1	Z	e	8	18	33						" "		
		Z	e			48								
		N	e		23	12								
		Z	e	8.6	24	43								
80	3	Z	e	13	33	00						" "		
		NE	e		43	12								
		Z	e	14.1		42								
			F											
81	9	Z	e	7	17	30						" "		
		Z	e		18	06								
		Z	e			21								
		Z	e	7.5		48								
82	9	Z	iP	6	15	39	20	-71				2755	Dilatation	
		Z	e			57								
		Z	PP		16	16								
		NE	S		19	58								
83	9	Z	e	9	22	33							Very weak	
		Z	e		24	09								
		Z	e		25	09								
		Z	e	10.0		30								
84	10	Z	iP	11	22	10							2755	Dilatation
		Z	PP			46								
		ZE	S		26	30								
			F	12.6										
85	10/11	Z	e	14	55	14							Very weak	
		Z	e		56	21								
		Z	e		59	30								
		Z	e	15.0		42								
86	17	Z	eP	23	47	57							5445	
		Z	i		48	04								
		Z	e		49	05								
		Z	PP			54								
87	17	Z	PPP		50	43							8720	
		E	S		54	48								
			F	2.0										
88	17	Z	iP	11	57	51							Compression	
		Z	e		58	30								
		Z	ipP		59	51								
		Z	e	12	00	48								
89	19	Z	e		01	56							h = 550 Kms.	
		Z	PPP		02	52								
		EZN	S		06	57								
			F	12.6										
87	17	Z	ePKP	18	32	38							Very weak	
		Z	e		34	17								
		ZE	e		35	48								
		Z	e		36	27								
88	19	Z	e		39	30							21.5	
		Z	e		46	02								
		E	e		50	20								
		E	e	21.5	56	00								
88	19	Z	ePKP	2	57	39							16220	
		Z	PP		3	00								
		Z	PPP			18								
		E	SKKS		07	39								
89	19	Z	e		19	02							15890	
		N	e		5.7	21								
		N	F			00								
89	19	Z	ePKP	7	25	04							15890	
		Z	e			51								



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.	
90	25	Z	PP		28	08					12110	h = 100 km.
		Z	e		29	11						
		Z	e		30	57						
		Z	e		33	15						
		N	e		46	30						
		N	PSKS		48	18						
			F	10'4								
		Z	eP		18	49	16					
		Z	e			50	54					
		Z	e			52	05					
Z	ePKP			53	09							
Z	PP				55							
NE	i			59	21							
N	S		19	01	06							
N	e			07	00							
N	e			08	24							
	F	21'3										
91	26	Z	iPKP	1	36	33					15780	Compression h = 100 km.
		Z	pPKP		37	06						
		Z	e		39	04						
		Z	PP			54						
		E	PKS			40	24					
		Z	e			41	20					
		Z	e			46	48					
		E	e			50	14					
		E	e			52	26					
		N	e			57	36					
N	e		2	00	00							
	F	5'0										
92	27	Z	ePKP	12	58	27					13890	h = 200 Km.
		Z	e		59	00						
		Z	PP	13	00	21						
		Z	e		01	55						
		Z	PPP		03	06						
	F**											
93	27	Z	PKP	14	45	51						Very Weak
		Z	i			59						
		Z	i			46	09					
		Z	(PP)			49	42					
	F	15'0										
94	28	Z	ePKP	1	56	15						" "
		Z	(PP)		59	20						
		Z	e	2	00	24						
		Z	e		01	42						
		E	e		06	15						
		N	e		17	42						
		N	e		19	36						
	F	4'1										
95	Juin 4	Z	ePn	14	12	50					610	Preceded by microseisms
		ZE	Sn		18	54						
		ZE	i			59						
		Z	(S*)			14	10					
	F	14'4										
96	4	Z	PKP	15	37	40					16110	Very Weak
		Z	PP		40	53						
	F	15'8										
97	7	Z	eP	17	06	48					11780	h = 100 Km.
		Z	e		10	39						
		Z	PP			11	15					
		Z	e				46					
		E	e			18	08					
		Z	PS			20	30					
	F	18'6										
98	8	Z	iP	16	20	17					9445	Dilatation
		Z	PP		23	39						
		N	S		30	45						
		NZ	PP _s		32	06						
		N	SS		36	22						
		N	M		56	42						
	F	19'2										
99	11/12	Z	ePKP	22	30	23					14335	Very weak
		Z	PP		32	27						
		Z	SKP		33	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.	
	Cont.	ZN Z Z	e e e F		35 36 37	03 30 12						Very weak
100	14	Z Z Z	e e e F	4	04	04 15 27						" "
101	16	Z Z Z	i i i	00	06 08	11 21 27						" "
102	17	Z Z Z N	eP e PP eS F	22 23 24'0	50 51 53 00	12 29 38 54				9665		" "
103	18	Z Z Z Z	eP i i e F	3	03 12	34 06 21 51						" "
104	19	Z Z Z Z NE	iP e e PP S F	12 13 16'2	49 50 51 53 00	36 06 39 12 12				9665		Compression
105	20	Z Z Z Z	i e i i	1	22 23 25	34 13 36 51						Very weak
106	21	Z Z Z E N	PKP e PP e i F**	7	15 16 18 28 36	08 45 17 42 42				16000		
107	21	Z Z	e e F	10 13'0	15 16	32 25						Confused with the preceding choc
108	23	Z Z Z	i e e F	11 12 12'2	53 01	36 18 42						Very weak
109	24/25	Z ZE Z Z E E Z N N	iPKP PP SKP e e e PPS i i F	22 23 2'3	44 48 50 57 58 00 06 08	57 05 36 14 21 03 54 03 24				15980		Compression
110	25	Z E N	eP SKS S F	11 12'9	19 29 30	03 30 00				10110		
111	25	Z Z Z	e e e F	18 18'6	26 27	42 12 36						Very weak
112	27	Z Z Z N	iP e PP S F	15 16 17'4	54 57 04	03 33 13 18				9110		Dilatation



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		
123	10	Z Z	e e	14	10	08 15					Very weak	
124	10	Z Z Z Z	PKKP pPKP pPKKP PP	14	10	27 22 37 00				16665	h = 600 km.	
125	12	Z Z N N	eP PP SKS e F	11	22	42 39 18 33				10720	Very weak	
126	13	Z Z Z Z Z NE N N N	P PP sP PP PPP SKS S sS SS F	4	15	59 59 48 48 54 46 15 18 36				10220	h = 530 km.	
127	14	Z Z Z	e i i	11	32	18 24 51					Very weak	
128	14	Z Z Z	e i i	16	54	39 46 15					" "	
129	17	Z Z Z Z	iPKP e e (PP)	20	37	21 47 38 36				16143	Dilatation	
130	18	Z Z	i e	00	42	50 27					Very weak	
131	18	Z	i	1	46	39					" "	
132	18	Z	i F	16 17.4	88	42					" "	
133	20	Z Z Z Z Z	iPKP e PP e SKS e F	9	50	18 00 24 54 21 06				15920	Dilatation	
134	21	Z Z Z N Z	iPKP (PP) e e e F	20	51	29 20 12 02 45				15555	Dilatation	
135	23	Z Z	e e	16	09	45 24					Very weak	
136	25	Z Z	P e F	18	25	25 21					" "	
137	28	Z Z Z Z	eP e (PP) (PPP) F	5	14	39 21 14 00				10000	" "	
138	29	Z Z Z Z E N N	iP e e P SKS S PS F	16 17	59	14 12 28 00 42 20 24				10355	Dilatation	

No	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _N	A _E		
								μ	μ	μ	Kms.	
150	15	Z	iP F**	14	19	13						Dilatation violent
151	15	Z Z N	iP e iS F**	18	48 49 56	23 00 06					6335	Dilatation
152	15	Z Z	eP (PcP) F**	21	11 12	13 12						
153	15	Z Z Z N	iP c e eS F**	21	51 52 54 59	44 49 22 30					6390	Dilatation
154	15/16	Z Z ZN Z	iP e (S) e F	23 00 0 8	54 55 01 02	13 17 54 09						Dilatation
155	16	Z N N	eP iS i F	5 6 8	42 50	51 36 48					6345	
156	16	Z Z Z ENZ	iP PP i S F	6 8 0	51 53 54 59	36 42 38 22					6390	Dilatation
157	16	Z N	(eP) iS F	15 16 5	39 46	04 32						
158	16	N	e F	16 17 5	53	12						Very weak
159	16	Z Z N	P e S F	18 19 0	00 01 08	52 00 24						
160	16/17	Z	P F	23 0 2	31	11						" "
161	17	Z NZ	iP (S) F	2 3 0	03 11	45 24						Dilatation
162	17	Z Z Z Z Z Z Z	iPKP PKKP pPKP PP e SKS e F	16 18 0	34 36 37 38 40 48	03 24 29 52 27 09 03					16665	Compression h = 630 Km.
163	18	Z Z Z NZ N	eP e e S i F	1 3 0	17 18 19 25 27	30 22 47 08 13					6280	
164	18	Z Z Z Z Z EN	eP e e PP PPP S F	17 18 3	08 09 10 11 16	28 30 00 39 52 18					6280	Preceded by microseisms
165	20	Z E	P eS F	9 10 2	13 20	09 50					6220	" " "

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _N	A _E		
				H.	M.	S.	Sec.	μ	μ	μ	Kms.	
66	21	Z Z	e e F	6 6.7	00 01	20 17						Preceded by microseisms
67	21	Z N N	eP (S) e F	8 9.6	38 46 48	46 03 42						Very weak
68	21	N	e F	23 23.6	12	40						" "
69	22	N N	e e F	2 3.4	39 42	54 06						" "
70	22	Z N	eP (S) F	6 7.8	13 22	22 24						
71	22	Z Z	iP e F	7 9.0	52 53	51 19						Dilatation
72	22	Z Z E	P PcP eS F	13 14.5	32 33 40	09 05 06					6390	
73	23	Z NE N	eP iS e F	3 4.3	18 26 28	52 33 38					6110	
74	23	Z Z NE	iP PP S F	18 19 19.8	56 58 04	40 52 26					6390	Dilatation
75	26	Z	e F	4 6.3	52	05						Very weak
76	26	N ZE E N	e e e M F	6 7 8.2	52 07	22 30 39 45	15	+18				Preceded by microseisms
77	27	Z Z Z Z	P PP S i F	22 22.5	06 08 12	06 17 45 21					1555	Very weak
78	29	N	e F	18 18.9	02	40						" "
79	29	N	e F	22 23.7	47	42						" "
80	30	E	e F	7 8.5	25	26						" "
81	31	E EN EN N	e e e F	7 9.1	22 29 31	45 06 33 06						" "
82	Sep. 1	N N	e e F	3 4.4	06 07	12 30						
83	2	N	e F	3 5.6	11	18						
84	2	N N	e e F	13 15.7	41 43	42 30						
85	2	N	ePg F**	13	59	18						Local (not felt)

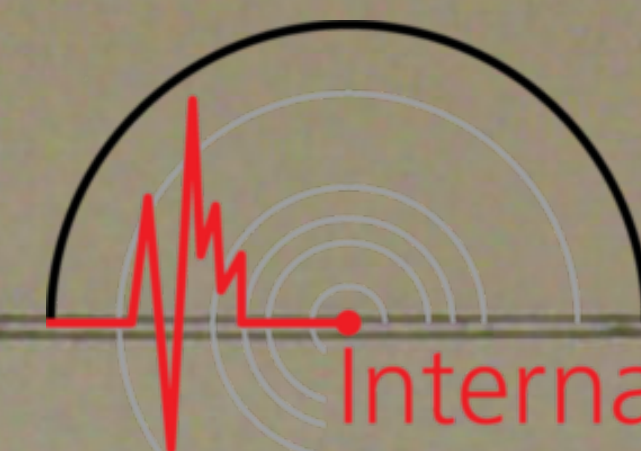
No.	Date	Comp.	Phase	G M.T.			Period	Amplitude			Δ	Remarks		
				H.	M.	S.		A _N	A _E	A _Z				
										μ	μ	μ	Kms.	
186	2	NE E E	eP PPP eS F	16 17.2	24 27 32	20 42 09							6280	
187	4	N N	e e F	6 7.1	36	28 42								
188	4	N N	e e F	12 12.9	19 30	56 06								
189	5	NE N N	i i i F	4 4.8	13 16 17	24 58 22								
190	5	N	e F	8 9.5	46	12								
191	8	NE E E N	(Sn) e (S*) (Sg) F	11 11	13 18	14 20 27 36							466	Local (not felt)
192	9	N	e F	10 13.1	58	12								
193	10	N N	e e F	3 4.8	37 54	40 42								
194	10	E N E NE E N	eP pP PP PPP e e F	15 18.5	35 36 38 39 44 46	26 20 45 24 50 30							9110	h = 220 Km.
195	11	N	e F	9 10.5	56	52								
196	13	N N	e M F	11 12.6	24 51	52								
197	14	E E E EN	e e e M F	9 10 10.8	29 31 32 00	36 36 18								
198	16	N N	i e F	22 22.6	21 22	46 34								
199	19	E E E	i e e F	20 23.6	54 55 56	39 00 27								
200	21/22	N N	eP (iS) F	23 0.9	00 07	12 30								
201	23	NE E	eP e F	00 2.4	12 16	40 20								
202	23	NE NE	Pn Sn F	6 7.2	25 26	21 36							722	
203	24	E EN N E	eP iS e e F	23 24.2	02 06 07 08	10 42 06 21							2945	
204	27	Z Z	iPKP e	8	43 44	38 06								Compression Very weak

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		A _N	A _E	A _Z		
				H.	M.	S.	Sec.	μ	μ	μ	Kms.	
04	Cont.	Z	e F	9.0	47	32						
05	28	Z Z E	iP e eS F	3	41 45 51	43 05 39						Dilatation Very weak
06	29	Z Z N N N	e e e e F	6	51 57 58 01	09 51 00 12 00						
07	30	Z Z Z ENZ	iP pP PP iS F	7	38 39 40 46	24 15 45 00				6445		Dilatation h = 250 Km.
08	Oct. 1	Z Z Z Z	e i i i F	22	38 39	03 13 11 39						Very weak
09	3	Z N N	eP iS e F	23	11 19 21	44 36 34				6335		" "
10	5	Z Z Z	PKP e PP F	1	00 03	46 54 51				15900		" "
11	5	Z Z N N	iP PP SKS PS F	16	23 28 34 37	51 08 30 30				11855		Dilatation
12	6	Z N NE	e e M F	18	02 03 09	54 46						Very weak
13	8	Z Z N E	eP PP iS PS F	3	36 40 48 49	45 50 18 30				10965		Preceded by microseisms
14	8	Z Z	P e F	16	50 51	24 37						Very weak
15	10	Z Z Z ZN	(eP) i i e F	8	48 53 54	24 03 34 18						Confused with microseisms
16	14	Z Z Z	e e e F	8	35 36	48 04 45						" " "
17	15	Z Z Z	ePKP e e F	16	21 22	03 17 13						Very weak
18	19	Z Z Z	e e e F	10	11 12	12 20 42						" "
19	21	Z Z Z Z	iPKP i i PP F	4	32 33 34 36	45 08 53 47				17220		Dilatation h = 100 Km.



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		
237	8	Z Z Z Z E	eP e e e e F	10	10	32 41 12 13 14 23	10.7					Preceded by microseisms
238	9	Z Z Z N	iP e e e F	12	07	21 46 11 17 30	13.0					Compression Very weak
239	12	Z Z Z	eP e e F	16	50	27 51 43 52 56	17.0					Very weak
240	14	Z Z	e e	4	45	11 53 30						" "
241	14	Z Z N N N N Z E	eP e e e (S) e e M F	22	10	44 11 21 15 36 48 16 06 20 06 25	22.9			3445		" "
242	17	Z Z N	eP e e F	19	47	50 09 53 42	21.4					" "
243	17	Z Z Z N	e e e e F	22	07	49 15 37 13 12	22.7					" "
244	22	Z N Z	eP (S) i F	10	29	53 40 27 43 09	12.1					Very weak
245	24	Z Z Z Z Z	PKP e PKKP e PP F	13	23	36 45 57 24 48 27 13	15.6			17220		
246	24	Z Z Z Z Z	ePKP Je (PKKP) e PP F	20	38	50 09 48 42 36 43 45	23.0			18445		
247	25	Z Z	e e	5	41	13 03 45						" "
248	25	Z Z E EN EN	iP PPP e oS SS F	17	21	41 03 22 23 22 24 45 25 12	18.0			1890		Compression
249	28	Z Z ZE Z Z	e e i i i F	17	55	34 53 57 23 48 58 12	18.2					Confused with microseism.
250	Dec. 1	Z NE	iP (S)	15	02	29 58 11				8135		Dilatation
251	2	E E	F e e	17.4 15	42	03 51						Very weak

No.	Date	Comp.	Phase	G.M.T			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _N	A _E		
								μ	μ	μ	Kms.	
	(Cont.) 2	N	e F	16.5	43	28						
252	2	E E E E N E N	ePKP e e PP SKS PSKS PS F	20	11	16 51 18 12 44 20 51					15745	
253	3	Z Z Z	PKP PP (SKP)	8	07	04 55 28					15555	
254	4	Z Z Z	ePKP e PP F	7	57	31 10 04					15745	" "
255	4	Z Z EN E EN E E	eP PKP PP SKS i PS PPS F	16	43	37 48 36 39 06 39 02					13890	h = 100 Km.
256	9/10	Z Z Z Z N N	P pP e PP (iSKS) SKKS F	21	53	06 03 22 33 33 02					12220	h = 225 Km.
257	10	Z Z ZE Z Z	ie PP PS (PPS) e F	3	05	34 53 27 20 48					12220	
258	10	Z Z Z ZE E E Z	iPKP PKKP pPKP PP e e SKSP F	13	42	28 55 45 24 18 45 53					16945	Compression h = 300 Km.
259	14	Z Z	eP e F	00	51	24 39						Very weak
260	14	Z N Z N N N N	iPKP PKKP pKKP PP i i i F	2	12	18 42 15 12 54 06 50					16890	Compression h = 200 Km.
261	14	Z Z Z Z Z Z N N N NE	eP e PP e PPP e e e i F	14	30	30 12 06 06 35 46 20 24 00					12620	
262	18	Z Z N	eP PP S F	15	58	15 22 42					11220	



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				h.	M.	S.		Sec.	A _N	A _E		
								μ	η	η	Kms.	
263	22	Z N	eP (S) F	9 10.8	21 29	00 18						Very weak
264	23	Z Z	e e F	1 1.7	32 35	20 19						" "
265	24	Z Z N	P i e F	16 17.6	44 51	09 13 42						" "
266	28	Z E Z Z Z	(eP) e i i i F	22 23.0	33 34 36 37	08 56 00 13 36						Confused with microseisms
267	29	N N E	e e M F	12 13.0	11 14 28	54 36						" " "
268	29	E E E	e e M F	22 23 23.7	53 57 12	00 13						" " "
269	30	Z Z Z	(PKP) (iPKKP) (PP)	21	34 38	18 31 06						Very weak "

Tremors were also recorded at:

	D	H	D	H	D	H
January	3	12	22	15	29	2
February	5 15 23	10 0,9 12	11 17 28	10 22 8	12 22	4 17
March	1 9	1 11	3 14	7 17	5 29	1 15
April	5 15	2 16	6 20	21 3,22	13 23	15 9
May	2 10	17 23	3 21	2 14	7 23	8 9,13
June	4 13 28	9 0 17	5 15	5 8	11 18	4,21 11,13
July	8 22	7 22	17 23	0,19 0,2	21 31	8 19
August	12 17 21 26	4 6 19 14	13 18 23 31	17 23 16 20	16 19 24	20,21, 22 21 2
September	1 11 16 26	8 1 3 0,6	4 13 18	9 1 20	5 14 22	21 22 4,9
October	6 16 31	1,4 10 0	13 19	0 12	14 23	1 20
November	2 16 19 26	21 10 21 3	6 17 20	23 17 14	12 18 21	22 1 21
December	12	2,3	18	4	21	13

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