



ROYAL OBSERVATORY HELWAN

**SEISMOLOGICAL,
MAGNETIC AND METEOROLOGICAL REPORT
FOR THE YEAR 1942**

Published under the Direction of

M. R. MADWAR, PH.D., F.R.A.S., F.R.S.E.

Director of the Royal Observatory, Helwan

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INTRODUCTION

The seismological service in Egypt is carried out at Helwan Observatory, a section of the Physical Department, under the direction of the Ministry of Public Works.

A Milne-Shaw East West component seismograph had been in use since November 1921, replacing the two Milne instruments which had been previously in use. The room at the Observatory in which the Milne-Shaw was housed, is subject to considerable solar radiation and to wind currents. The seismograph records showed crowding in the lines, and sometimes considerable overlapping that made the records very difficult to read.

To remedy this defect, and to provide sufficient space for the two recently bought seismographs, a new building was constructed.

It consists essentially of a double-walled and double-ceiling room, $7 \times 7 \times 4$ metres; the floor of the inner room is about 3 metres below ground level. The outer surface of the rooms is covered with Selton blocks to minimise the variations in the temperature.

The diurnal variation in temperature is about 0.2°C . and the extreme seasonal change not more than 10°C .

A large massive concrete pillar at the centre supports the three seismographs, namely:—

- (1) N-S Component Milne-Shaw installed on May 19, 1938.
- (2) E-W " " re-installed on April 13, 1939.
- (3) Galitzin Wilip vertical seismograph installed on June 1938.

An improvement in the N-S and vertical Galitzin components is the time scale of the records, being 15 mm. = 1 minute.

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

Phases of the Seismogram :

- P (undae primae superiores) Direct P-type waves whose path lies wholly above the first major discontinuity.
- P (undae primae) Normal first preliminary tremor; condensation refraction or Longitudinal waves that have passed below the subcrustal or Mohorovicic discontinuity.
- PKP P waves that have traversed the earth's core.
- PP P wave reflected once at the earth's surface.
- PPP P wave reflected twice at the earth's surface.
- pP P wave from a deep focus reflected near the epicentre.
- S (undae secundae superiores) Direct S-type waves whose path lies wholly above the uppermost major discontinuity.
- S (undae secundae) Normal second preliminary tremors, traverse or shear waves which have below the Mohorovicic discontinuity.
- PS (undae transformatae) waves transformed from P to S on reflection at the earth's surface.
- sS S Type waves from a deep focus reflected near the epicentre.
- SS S Type waves reflected once at the earth's surface.
- SSS S Type waves reflected twice at the earth's surface.
- SKS S Waves transformed to P-waves on reflection into the core and back to S-waves when leaving the core.
- SKKS S Waves in the mantle reflected and internally reflected as P-waves in the core.
- L (undae longae) Long surface waves of irregular form at the beginning of the "principal phase".
- M (undae maximae) Shorter and more regular waves of large amplitude which follow the L-waves.
- F (finis) End of discernible movement.

Nature of the Motion :—

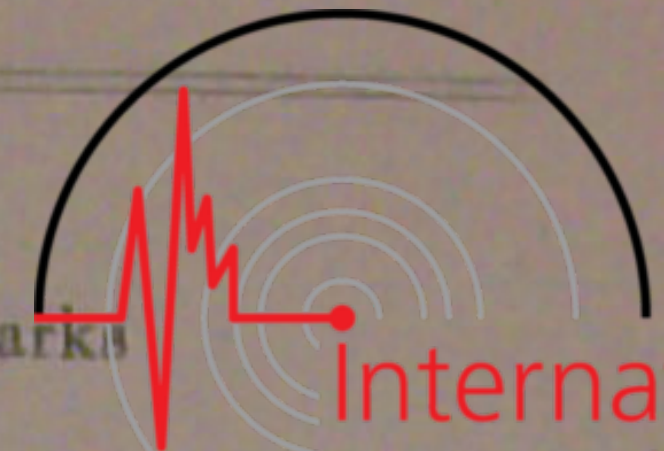
- i (impetus) Sudden beginning of the motion.
- e (emersio) Gradual beginning of the motion.
- T (period) Time of one complete oscillation.
- A -Amplitude of the earth motion, measured from the median line in microns.

$$(\mu = \frac{1}{1000} \text{ mm.})$$

ROYAL OBSERVATORY, HELWAN



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A_e	A_n		
	January							μ	μ	μ	Kms.	
1	14	Z Z	e e F	5 6.0	17 18	39 11						Very weak
2	18	Z Z Z	P e e F	16 17.5	43 44 49	18 03 57						
3	21	Z Z Z E	e i i M F	12 13.5	08 09 11 49	54 37 33						Preceded by microseisms
4	23	Z Z Z Z Z Z	iP e e PP (SKS) i i F	21 22.7	41 42 43 45 51 52 53	21 48 54 08 51 15 54						Dilatation
5	27	Z Z Z EZ E E	(eP) e e e e e F	15 16.8	43 46 47 49 53 56	21 36 36 39 51 48						Confused with microseisms
6	29	Z Z Z Z Z Z Z	ePKP pPKP PP SKP sSKP pSKS PS F	9 11.6	43 45 46 47 50 56	06 35 44 50 18 44 06				15000		Preceded by microseisms h = 100 km.
7	30	EZ	M F	11 11.6	04							
8	30	Z Z Z E E	P e e (S) M F	12 14.2	22 23 25 31 49	46 24 37 36 31	20	+103		7245		Preceded by microseisms h = 100 km.
9	31	Z Z Z EZ	eP e e e F	17 19.0	41 42 43 49	00 30 54 24						Preceded by microseisms h = 100 km.
10	February 2	Z Z Z Z Z E	Pn P* Pg Sn S* Sg F	17 17.6	06 07 08	40 49 57 31 45 52				477		Preceded by microseisms h = 100 km.
11	4	Z Z E	P e M F	17 18 18.5	39 07	10 36						Very weak
12	5	Z Z Z Z	Pn e Sn S* Sg F	1 1.7	18 19 20	09 30 54 25 51				1000		

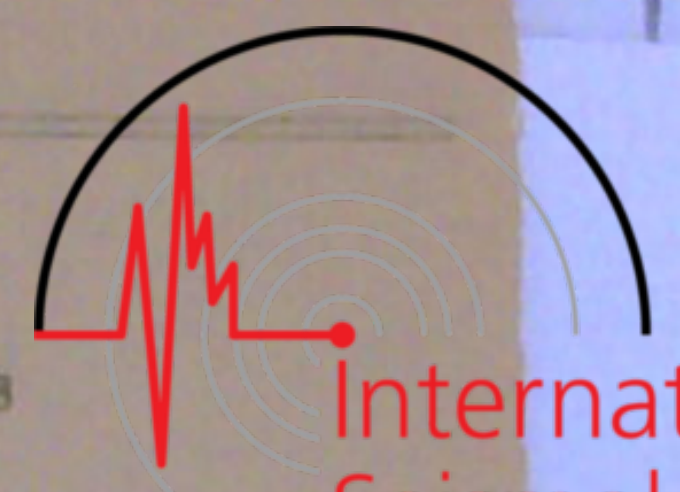


No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A_e	A_n		
								μ	μ	μ	Kms.	
13	7	Z Z Z	eP e e F	10 10'7	26 32 33	38 42 41						Very weak
14	13	Z Z Z Z	(PKP) (PKKP) i (PP) F	6 8'7	38 39 42	51 12 27 45						
15	14	Z Z E	eP e M F	10 11 11'3	51 53 11	51 00						
16	14	Z Z	iP i F	13 14'0	05	27 38						
17	16	Z Z Z Z EZ E	ePKP e e PP SKP SKKS F	18 20'4	27 28 29 30 36	24 54 21 57 55 42				15180	" "	
18	17	Z E EZ Z Z	(PKP) e (PP) e (PKP) F	4 5'1	31 33 34 36	13 24 39 12 45					" "	
19	20	Z Z Z E N	P i i SKS (S) F	00 01 2'0	56 00 07 08	42 24 48 15 06				10720	" "	
20	21	ENZ ENZ Z EN ENZ EN E	ip i PP SKS SKKS S PS F	7 9'0	20 23 30 31 32	21 45 54 45 10 15 15				9990	Dilatation	
21	21	Z Z Z N N	P PP e S M F	21 22 22'6	56 58 59 03 19	08 06 24 45				5890	Very weak	
22	23	Z Z NZ N	e e i e F	18 18'7	32 33 35	09 12 24 26						Preceded by microseisms
23	27	NZ Z Z	i e e F	8 8'6	15 16	30 00 51					" " "	
24	March 1	EN E	i e M F	10 11'6	17 20 57	18 39					" " "	
25	5	ENZ ENZ Z Z N EN EN	iP pP sP PP S SP sS	20	00 01 03 10 11	12 12 42 33 06 03 58				9220	Compression h=260 km.	



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A_e	A_n		
								μ	μ	μ	Kms.	
40	27	Z Z EN	P PP S F	18 19.1	42 43 46	45 09 36					2310	
41	30	Z Z N	eP e e (S) M F	9 10.2	18 19 26 45	18 45 04 30					6555	
42	30	Z Z E	e e M F	18 18.6	21 23 29	07 48						
43	April 8	Z ENZ ENZ N EN Z N E	iP PcP i PPP SKS S M M F	15 16 19.4	52 56 58 03 31 36	48 52 06 24 09 48 30 30	18 18	+411	+301		10055	Dilatation
44	8	Z Z Z Z N N N	iP e PP e SKS SKKS S F	19 21.1	42 43 45 46 52 53	15 14 45 36 30 00 09					9955	"
45	9	Z Z Z Z EN E	iP i e PP SKS eS F	00	08 09 12 18 19	27 51 30 00 45 21					10035	" Lost during light out
46	9	Z Z Z EN	iP e e (SKS) F	4 6.4	54 55 56 05	07 00 00 05						Dilatation
47	10	Z Z	i e F	11 13.3	52 53	00 18						Very weak
48	10	Z Z	i i	13	47	44 54						" "
49	11	Z E	e e F	1 2.5	43 53	56 28						
50	13	ENZ Z Z EN N N	P PP PPP S PS M F	7 8 10.5	55 57 58 03 04 15	50 50 48 28 08 12	18		-181		6000	
51	13	Z Z Z Z N	P e e e e F	10 12.0	44 48 50 54 55	03 21 05 06 08						
52	13	Z	e F	14 15.2	19	08						Very weak

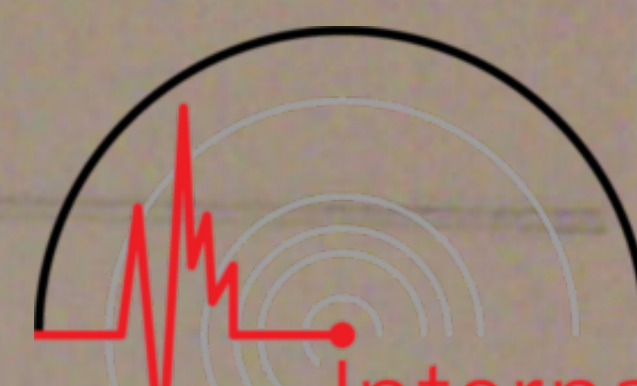
No.	Date	Comp.	Phase	G.M.T.			Period Sec.	Amplitude			Δ Kms.	Remarks
				H.	M.	S.		A_e μ	A_n μ	A_z μ		
53	15	Z N N N N	e i e e M F	21	53	26						Very weak
				22	00	48						
				22.4	04	18						
54	18	Z E	e e F	18	22	03						" "
				19.3	31	24						
55	19	Z Z Z Z Z E E	ep e e PP PPP eS M F	1	31	03					8680	" "
			2	07	00							
				3.1								
56	20	Z EZ Z	eP e e F	1	38	33						Preceded by microseisms
				2.0	40	24						
57	20	Z ENZ Z Z Z Z ENZ Z Z E EN	iP pP sP PP e PPP iS e SP PS sS F	8	52	30					9335	Compression h=350 km.
				03	24							
				0	04	09						
				10.0		42						
58	27	Z E N	eP (S) M F	9	25	33					5445	Very weak
				10.2	45							
59	27	Z Z Z Z N N	eP pP e PP S sS F	13	43	42					9780	h=100 km.
				14.7	55	10						
60	27	Z Z Z Z Z	e e e e e F	22	43	48						
				22.9	49	42						
61	28	Z Z Z Z Z Z EN	iP pP e e PP sPP i F	10	32	24					10000	Compression h=300 km. Very weak
				11.0	45	15						
62	29	Z Z Z Z	e e i i F	12	00	15						
				13.0	04	33						
63	May 5	N N Z Z E	e e e e M F	3	41	46						Preceded by microseisms
				4.3	52	10						
64	5	Z Z	e i F	16	13	42						Very weak
				17.1	15	40						



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A_e	A_n		
								μ	μ	μ	Kms.	
65	9	Z Z EZ Z	ipn pg Sn S* F	4 5.0	38 39 40	42 14 54 15					688	
66	14	Z Z Z Z Z Z E E E	iP i i PP PPP SKS PS L M F	2 3 8.0	27 28 31 32 34 38 41 06 15	52 09 24 15 45 18 48 09 22	24	+835			12110	Dilatation
67	15	Z N	e M F	12 13 14.8	10 00	13						
68	17	Z Z Z Z EN	e e e e e F	15 17.5	32 33 36 37	21 36 18 36 50 10						Preceded by microseisms
69	20	Z Z Z Z E	P PP i i S M F	16 16.3	02 03 05 09	15 30 36 09 48					2090	" " "
70	20	Z	e F	17 19.2	26	03						
71	21	Z N N N	Pn Sn e S* F	3 4.2	45 47	12 06 30 48					1120	" " "
72	23	Z Z	e e F	13 15.0	08 09	21 27						
73	23	Z Z N N N	P e eS SS M F	20 20.8	08 09 14 16 22	00 09 15 30 12	12	+19			4400	
74	24	Z Z Z Z N N N	iP i PcP PP PPP S PS M F	3 4 5.8	37 38 39 41 46 02 15	17 33 03 46 00 30 15	18	-48			7110	Dilatation
75	25	Z Z Z Z NZ	iP PcP e e S F	21 22.5	31 32 33 41	39 09 12 51 40					8720	"
76	26	Z NZ	e i F	6 7.2	57 59	45 00						
77	27	Z Z Z Z	ePKP PKKP SKP PPP F	6 9.1	51 52 55 59	37 09 15 27					17545	



No.	Date	Comp.	Phase	G. M. T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _e	A _n		
								μ	μ	μ	Kms.	
78	28	EZ Z EZ Z Z Z E E E E E E	iP e PP i sPP PPP SKS S PS sS SS i i F	1 3·6	14 15 18 19 20 24 25 27 31 40	51 33 36 00 06 38 45 15 00 15 11 21 36					10000	Dilatation h=300 km. Probably another chock confused with the preceding earthquake
79	28	Z Z EN N	e e e M F	15 16·0	26 31 32 43	49 00 15						Very weak
80	29	Z Z Z NZ N	iP i PPP S i F	5 6·4	39 41 46 49	57 30 57 17 35					4565	Compression
81	30	Z NZ	e e F	4 4·4	08 09	30 30						
82	30/31	Z Z N N	e e i i F	23 0·3	49 50 54 57	24 30 18 36						
83	31	Z Z	i e F	13 14·2	06	00 36						
84	31	Z NZ Z Z N N	P i e i e e F	21 22·1	47 49 50 51 52	36 00 30 05 18 12						
85	June 1	Z NZ Z	P i e F	3 3·4	08 09 11	18 46 06						Very weak
86	1	Z ENZ Z	e i i F	9	04 06 07	00 00 18						Confused with the succeeding earthquake
87	1	Z Z Z Z Z N N	iP PeP PP pPP PPP S sS F	9 10·1	20 21 22 23 27 29	19 33 21 18 27 00 06					5555	Compression h=300 km.
88	1	Z Z	e e F	11 11·2	04 05	45 12						Very weak
89	2	Z Z N N N N N N N	iP e e S PS PPS (SS) M F	00 1 3·0	43 44 54 55 56 00 24	33 36 15 36 37 14 42 12					10210	Dilatation
							21		+76			



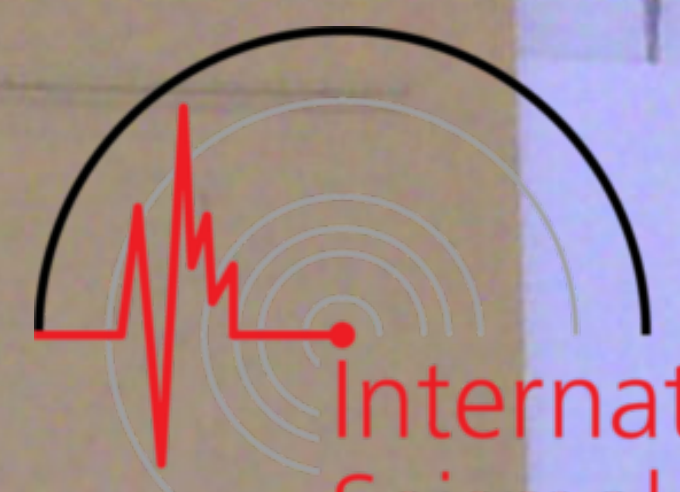
No.	Date	Comp.	Phase	G. M. T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _e	A _n		
								μ	μ	μ		
90	3	Z Z E E	P e (S) M F	4 5 6.1	48 50 57 17	06 34 24						
91	3	Z Z Z	iP i i F	16 17.4	50 51 53	30 00 17						Dilatation
92	4	Z Z E	e e e F	7 7.8	23 24 30	33 15 30						Preceded by microseisms
93	6	Z EN EN E	e i i M F	11 12 12.7	43 49 50 16	09 09 22						
94	6	Z EZ Z N	P i e e F	15 17.0	12 22 28	30 50 21 30						
95	8	Z Z	e e F	19 20.6	47	09 21						Very weak
96	10	Z Z Z EN E N N N	eP e PP SKS S PS PPS M F	10 11 12.1	34 35 37 44 45 46 47 15	03 18 51 (45) 25 33 20 24	24		+40		10655	
97	11	Z Z	e e	16	27 28	33 02						" "
98	11	Z EN	eP (S) F	17 18.3	19 29	15 44						" "
99	12	N	M F	11 12.9	21	30						
100	14	N EN EN	i i i F	3 6.0	28 34 35	32 33 15						
101	14	Z Z EN EN N	P e PP S PS F	14 16.0	42 45 53 54	27 45 53 14 07					9780	
102	15	Z Z Z Z	P i e e F	14 14.8	06 08 10	00 24 06 12						" "
103	16	ENZ Z Z N E N	Pn e e Sn S* Sg F	4 7.0	49 51 52 53	06 21 45 30 30 06					1440	
104	16	Z Z E ENZ	ePn (P*) e (Sg) F	9 9.6	16 17	09 22 45 84					666	



No.	Date	Comp.	Phase	G. M. T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _e	A _n		
								μ	μ	μ	Kms.	
105	16	Z Z N	eP e M F	21 23.5	24 27 44	10 25						Preceded by microseisms
106	18	Z Z Z N N Z N	eP e PP SKS e PS PPS F	9 12.5	45 49 55 56 58 59	00 51 18 38 19 35 32					11910	" " "
107	19	Z Z N	iP e (S) F	19 20 21.0	49 50 00	48 15 26						Dilatation
108	21	EZ Z EN EN	iPn P* Sn S* F	4 5.4	40 41	22 37 36 50					710	" (Felt in Cairo)
109	21	Z NZ Z	e i e F	22	01 04 05	31 00 00						Confused with the succeeding earthquake
110	21	NZ	e F	22 22.7	26	12						
111	22	EN	e	16	26	12						Local tremor
112	24	Z Z	eP e	8	34	09 24						
113	24	Z Z Z Z Z Z Z Z Z NZ Z E N N	e PKP PKKP SKP PP i SKS PPP SKKS i PSKS SS M F	11 13 15.0	36 39 40 43 46 50 59 02	12 18 32 49 02 27 16 33 42 06 18 25 00	15		+64		16910	
114	27	Z Z Z	i i i	1	31 33	22 30 15						Very weak
115	27	Z	eP	2	56	00						
116	27	Z N EN N	i i e i F	3 3.3	59 05 06 09	38 44 06 00						
117	29	Z EN Z EZ N N	e i i e e e F	6 7 8.4	49 53 55 56 57 00	50 54 42 15 36 36						
118	30	Z Z	P e	7	38	29 49						" "
119	July 3	Z Z Z Z	iP PP e e	2	56 57 58 59	42 45 33 50					3720	Compression

No.	Date	Comp.	Phase	G. M. T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _e	A _n		
								μ	μ	μ	Kms.	
119	3 contd.	N	S	3	02	12	12 12	+44	-71			
		N	e		03	15						
		N	SS		04	04						
		N	L		06	24						
		N	M		10	54						
		E	M		11	18						
			F	4.6								
120	4	EN	M	7	48							
			F	8.2								
121	4	Z	e	8	39	48						
			F	9.5								
122	7	Z	iP	3	12	52	15000				15000	Compression h = 500 km.
		Z	i		13	13						
		Z	pP		14	45						
		Z	PKP		15	45						
		Z	e		16	42						
		Z	pPKP		17	49						
		Z	sPKP									
			PP		18	35						
	SKP											
	Z	PKS		19	15							
			F	5.0								
123	7	Z	e	12	56	47						
		Z	e	13	06	15						
			F	14.5								
124	8	Z	iP	7	10	18	15 18	+95	+82	12445	Dilatation	
		Z	e		14	33						
		Z	PP			51						
		Z	i		15	33						
		Z	PPP		17	15						
		NZ	SKS		20	48						
		Z	PS		24	21						
		EZ	PPS		25	21						
		Z	SS		30	33						
		N	M		58	52						
		E	M		8.05	29						
			F	10.0								
125	8/9	Z	e	22	49	45						
		Z	e		52	06						
			F	0.8								
126	10	N	e	3	35	54						Very weak
		Z	e		38	21						
			F	4.0								
127	12	Z	P	5	19	42	12235					
		Z	i			56						
		Z	i		23	28						
		Z	PP		24	08						
		E	SKS		30	24						
		Z	PS		33	36						
		Z	PPS		34	36						
			F	8.0								
128	13	Z	eP	00	20	16	11480				11480	Preceded by microseisms
		Z	e			34						
		Z	e		21	04						
		N	SKKS		31	38						
		N	PS		33	30						
			F	1.3								
129	24	Z	eP	5	09	42						" " "
			e		11	06						
		EN	i		17	44						
		EN	e		24	12						
			F	6.3								
130	25	EZ	iP	6	35	15	10665				10665	Compression
		Z	i			36						
		Z	i		36	07						
		Z	PP		39	05						
		Z	PPP		41	15						
		EN	SKS		45	51						
		EN	SKKS		46	24						
		N	S			36						
		N	PS		47	48						
					F	8.1						

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _e	A _n		
				μ	μ	μ				Kms.		
131	26	NZ Z N	e e e F	1 1.7	32 33	12 55 06						Near earthquake
132	27	Z E	i e F	11 11.6	17 28	55 21						Very weak
133	29	Z Z Z EZ N	iP PP PPP S M F	20 21.1	27 31 36	12 42 52 24 42	12		-49		2600	Compression
134	29/30	Z Z Z Z Z N Z Z	iP i PKP i SKP SKKS S PPS F	23 2.1	02 03 06 07 09 14 15 18	45 15 21 13 00 25 27 22					13045	"
135	August 1	Z Z Z Z	(PKP) (PKKP) (SKP) e F	5 6.9	07 11 12	30 48 03 15					16965	Very weak
136	1	Z E EZ EZ E Z EZ Z N	iPKP PKKP e e e SKP SKKS PSKS M F	12 13 14	53 54 55 57 04 07 15	45 54 37 20 00 15 09 21 51	20		-46		16720	Compression (New Zealand) Confused with the succeeding earthquake
137	1	Z Z Z EN N	e e e e e F	14 17.5	44 48 51 54 56	00 06 07 48 50						Very weak
138	3	Z Z Z	eP i i	20	28 29	36 00 39						
139	4	N	M F	20 20.4	15	00						
140	5	Z Z Z	e i e F	15 15.4	13 15	12 35 18						
141	6/7	Z Z ENZ Z EN EN N N N E	eP e e PPP SKS S PS PPS M M F	23 00 4.5	51 54 56 57 02 03 04 05 34 41	30 36 00 45 03 12 27 12 24 42	24 24		+302 +333		11165	Dilatation
142	8	Z Z EN	iP e i F	00 0.9	32 33 43	49 10 06						Very weak
143	8	Z Z	i i F	14 14.4	08	12 32						



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A_e	A_n		
								μ	μ	μ	Kms.	
144	8/9	EN	e F	23 00.2	01	42						Very weak
145	9	Z	i F	3 3.7	30	28						
146	10	Z Z	e e F	6 7.0	49	16 33						
147	10	N Z	e i F	16 16.3	12 13	42 15						
148	12	Z Z EZ Z	e e i i F	20 21.2	41 42 43 46	00 20 22 21						
149	12	Z Z Z Z	e e e e F	21 22.3	55 57 58	03 30 06 06						
150	13	Z Z NZ Z	P e e i F	8 8.6	31 32 36 37	46 21 36 21						
151	13	Z Z EZ Z Z N	P i i i e e F	16 18.2	03 05 06 07 22	51 35 48 28 28 54						
152	15	Z Z Z	eP i e F	15 17.2	21 22 23	57 30 25						
153	16	Z Z Z	i e i F	11 12.5	34 35 38	09 54 02						
154	19	Z Z Z ENZ NZ E	eP PP e eS SS M F	2 3.1	33 34 37 38 40	22 47 09 21 09 16				2410		
155	19	Z Z	e e F	4 4.8	34 40	27 45						Very weak
156	19	Z Z N	e i ee F	18 19.5	39 40 41	48 00 00						" "
157	20	Z EZ Z	e e e F	18 18.7	30 31 32	57 06 12						
158	22	Z N	e M F	9 10.5	13 50	12						" "
159	23	Z Z Z EZ Z	iP e PP S PS F	6 10.0	48 51 58 59	06 25 37 54 48				9855		Compression

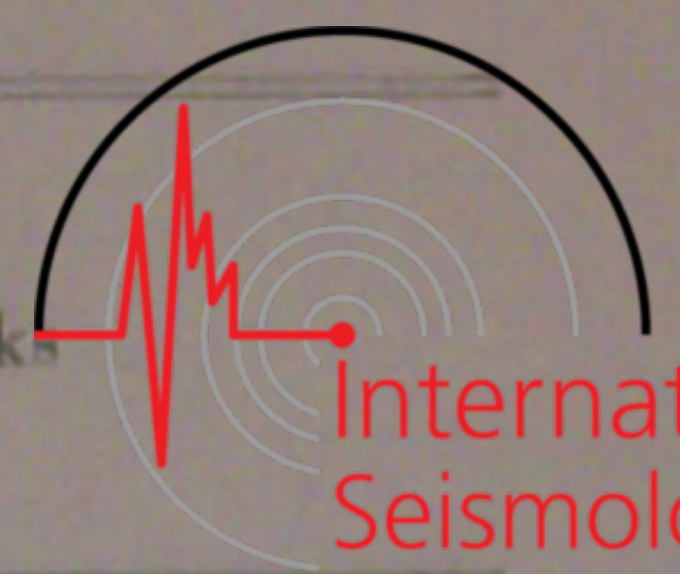


No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		A _e	A _n	A _z		
							Sec.	μ	μ	μ	Kms.	
160	24/25	Z Z Z EN EN EN N N	P PP PPP SKS SKKS PS G M F	23 5·0	05 08 11 15 16 17 44 59	03 54 03 32 08 36 00	(12)		-960		10780	
161	25	N N	e M F	20 21 22·8	43 20	00						
162	26	Z E	e M F	12 13 13·8	27 14	18						
163	27	Z Z Z Z	e i i e F	6 7·3	17 18 19 20	33 37 9 15						
164	28	Z Z Z Z Z N	e e e i i M F	19 19·8	28 29 30 32	05 48 17 55 06						
165	29	Z Z Z	iP i i	1	10 13 14	06 25 12						Compression
166	29	Z Z Z	e i i	1 2	58 00	08 15 18						
167	September 1	ENZ Z N N	iPn Pg iSn Sg F	9 11·0	45 44 46	47 18 59 38					688	Dilatation
168	1	Z	i F	19 20·1	11	07						Very weak
169	1	Z Z Z	e i i F	20 21·5	40 43	00 26 51						" "
170	3	Z N N	(P) (S) M F	7 8 8·7	54 01 16	00 47						" "
171	4	Z Z Z N Z	iP PPP e S SS F	17	33 34 35 38 39	50 22 07 00 05					2555	Dilatation
172	6	Z Z	e e F	16 17·6	12 13	51 09						Confused with the succeed- in 6 tremors Very weak
173	7	N Z Z	e e e F	1 2·0	50 51	18 40 09						" "
174	8	EN EN N	(PP) (S) (SP) F	16 17·2	23 30 31	34 24 18						
175	9	N E	(S) (PS)	1	49 50	18 48						

No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A_e	A_n		
				μ	μ	μ				Kms.		
175	9 <i>contd.</i>	E N	(SS) M F		56 22	32						
				2 4.4								
176	10	EZ EN	e e F	5 6.2	05 11	00 21						Very weak
177	13	NZ Z Z	e e e	00	43	21 27 33						"Local tremor"
178	14	EZ Z E N	eP e e e F	11 12 13.6	50 53 00 12	20 33 21 14						
179	17	Z EN EN	i e i F	11 12 13.6	53 02 04	39 30 36						
180	19	Z	e F	7 7.8	30	27						
181	20	Z	e F	18 19.4	45	24						Very weak
182	21	Z Z Z Z	i e e e F	00	01 02 03 04	51 27 18 26						
				0.3								
183	21	EZ NZ E	P S RiP F	21	29	08 15 20 00				60		Felt at Helwan
												Very weak
184	22	Z Z Z N	e e e L F	1 3.0	06 09 14 46	15 30 21						
185	24	E EZ E E	eP PP S e F	3 4 5.2	51 54 01	04 09 06 18				8700		
186	26	Z E	e L F	4 5 5.3	38 00	10						
187	27	Z Z Z N	eP e e (S) F	9 9.8	13 15 17	33 53 18 48						
188	30	Z Z ENZ	ePn Pg Sn F	22 23.1	32 33	40 13 57				730		
189	October 5	Z NZ NZ N N	P S e SS e F	1 1.5	18 21 22	18 15 30 45 18				1600		
												Very weak
190	5	Z Z	e e F	7 7.8	31 33	26 24						
191	6	Z Z N	e e e F	12 14.0	10 11 28	39 09 00						



No.	Date	Comp.	Phase	G. M. T.			Period	Amplitude			Δ	Remarks			
				H.	M.	S.		Sec.	A_e	A_n			A_z	Kms.	
				μ	μ	μ									
218	6	Z Z	e e F	21	37	17 33						Very weak			
219	7	Z Z Z EN Z	(eP) e (PP) (S) (PS) F	7	45 48 49 55 56	29 12 41 58 47						9.0	Preceded by microseisms		
220	7	Z Z	eP e F	12	08	42 54						13.0	Very weak		
221	8	Z Z Z	e e e F	00	03 04	45 06 44						0.3	" "		
222	9	Z Z Z N N	P i e i i F	4	02 04 05 12	49 51 46 22 34							" "		
223	10	Z N N N N N	iP PP PPP S L M F	11	53 56 57	33 15 48						12	7890	Compression very strong	
						48 15						17.2			
224	12	Z Z Z Z Z	P PP PPP PPPP S F	5	14 15 19 20 23	28 18 22 05 54						7.0	8665	h = 200 km.	
225	12	Z Z N N	eP e e M	15	44 45 53	37 21 12									
		Z N	(eP) (M) F	15 17	55 08	07						18.0		Probably another earthquake	
226	14	Z Z Z Z Z	e e e e i F	5	41 42 43 44 50	00 06 23 07 27						7.0			
227	15	NZ N N EN EN E E	P PP i PcP S L M F	17	03 04 05 06 07 09 12	45 18 06 36 51 54 28						15	-86	2510	Confused with the succeeding earthquake Dilatation
228	15	Z Z N Z Z E N	iP i e PP e S M F	17	24 25 28 29 35 06	45 57 16 08 04 30 36						18	-48	9780	
						06 36						20.6			
229	16	Z Z Z	P e e F	1	04 09	45 06 47						1.3		Very weak	
230	16	Z Z Z	P PP e	21	32 33	39 12 55							6220	h = 150 km.	



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remark
				H.	M.	S.		Sec.	A_e	A_n		
								μ	μ	μ	Kms.	
230	16 contd.	Z Z Z N N N	e PP e e S i F		34 35 37 40	30 45 52 50 12 30						
				22.1								
231	17	Z Z Z Z Z	(i PKP) (PKKP) (PP) i i F	10	22 26	18 42 15 26 48						Dilatation
				12.5								
232	17/18	E	M F	00 1.3	24							
233	18	Z Z Z Z EN Z E	P e e e iS e L F	12	05 06 07 08 09 10 11	48 34 17 12 36 21 15				2280		Confused with the succeeding earthquake Confused with the preceding earthquake Probably a replica
234	18	Z Z Z N EN E	i i i i i i	12	26 28 29	28 45 00 52 30 45						
				14.0								
235	19	Z Z Z Z Z	F eP e e e e F	9	10 11 13 20	54 20 51 18 45						Confused with the succeeding earthquake Confused with the preceding earthquake
236	19	Z Z Z	i i i F	9	57	00 13 26						
				11.8								
237	21	Z Z EZ Z E Z	Pn e Sn i S* PcP F	14	04 06 07 10	26 45 36 12 26 28				1290		Preceded by microseisms
				15.0								
238	22	Z Z E E	e e e M F	16	25 27 28 20	30 24 27						Very weak
				17 18.3								
239	25	Z Z Z Z Z	(PKP) i e e i e F	1	37 39 55	20 31 59 16 36 12						
				2.6								
240	26	Z Z Z NZ Z E EN -E EN N	P pP e e PP S sS SP i i F	14	40 41 42 43 50 51 52 53	04 30 18 40 28 18 03 15 18 30				9445		h = 100 km.
				16.3								
241	27	Z N E	e e M	00	05 09 13	00 34						Very weak



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A_e	A_n		
								μ	μ	μ	Kms.	
241	27 <i>contd.</i>		F	0	8							
242	27	Z	(eP)	2	40	54						
		Z	e		41	57						
		Z	e		42	14						
		NZ	e		48	58						
		E	e		50	45						
		N	e		51	03						
		EN	i			54						
		Z	i		53	17						
		E	i			36						
		E	i		54	30						
			F	3	8							
243	27	E	eP	23	34	26						Local tremor
		Z	e			30						
		Z	e			36						
244	28	EZ	iP	10	49	36					7190	Dilatation
		E	e			42						
		E	e		51	28						
		E	PP		52	02						
		EN	iS		58	24						
		N	PS			54						
		N	i		59	12						
		N	M	11	15	39	18		+648			
			F	15	0							
245	30	Z	P	1	01	21						
		Z	e		05	33						
		Z	(PP)			48						
		Z	e		07	41						
		Z	(PPP)		08	15						
		NE	e		11	00						
		E	e		15	00						
		N	(PPS)		16	18						
			F	2	3							
246	December 1	Z	i	21	50	10						
		N	M	22	16							
			F	23	0							
247	2	Z	(iPKP)	00	33	42						Dilatation
		Z	(PKKP)			54						
		Z	i		34	06						
		Z	(PP)		37	21						
		E	M	1	40							
			F	2	5							
248	2	Z	iP	19	07	05					1255	"
		N	e		08	27						(Felt in Turkey)
		NZ	(S)		09	22						
		Z	(SS)			42						
			F	20	2							
249	3	Z	P	1	25	52						
		Z	e		29	03						
		Z	(PP)			24						
		E	(S)		36	36						
			F	2	5							
250	4	Z	e	15	45	31						
		Z	e		47	03						
			F	18	1							
251	5	Z	iP	14	41	34					9990	Compression
		Z	e		42	03						
		Z	e			33						
		Z	i		43	21						
		Z	PP		45	12						
		N	SKS		51	55						
		ENZ	S		52	28						
		Z	PS		53	30						
			F	15	8							
252	9	Z	eP	22	32	27					11335	Very weak
		Z	i			36						
		N	PP		36	30						
		Z	PPP		38	51						
		N	SKS		43	00						
			F	23	8							



No.	Date	Comp.	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A _e	A _n		
				μ	μ	μ	Kms.					
253	11	NZ	iP	2	41	52				1220	Dilatation	
		Z	e		42	12						
		ENZ	S		44	06						
		EN	i			36						
		NZ	PcP		47	52						
				4.0								
254	13	Z	e	00	09	45						
		Z	e		10	12						
		Z	e		13	18						
		Z	e		15	00						
255	13	Z	(P)	8	54	17					Confused by microseisms	
		Z	(PKP)		57	39						
		Z	(PP)		59	16						
		E	e	9	03	53						
						9.3						
256	13	Z	e	12	49	32					" " "	
		Z	e		50	06						
		Z	e			36						
				13.0								
257	13	Z	eP	19	26	03				11110		
		Z	e		29	43						
		Z	PP		30	06						
		E	SKS		36	39						
		E	SKKS		37	14						
		Z	PS		38	57						
				20.4								
258	15	Z	eP	10	42	15				2520	Preceded by tremors	
		Z	e		43	27						
		Z	PP			42						
		Z	PPP			53						
		Z	S		46	22						
		Z	SS		47	18						
				11.3								
259	15	Z	(eP)	23	19	11					Very weak	
		Z	e		20	08						
		Z	e		21	03						
		Z	(M)		23	00						
				23.6								
260	19/20	Z	eP	23	23	43				11000	h = 100 km.	
		Z	sP		24	13						
		Z	e		25	12						
		Z	e		27	15						
		Z	pPP		28	15						
		EN	SKS		34	06						
		N	S		35	06						
		N	sS			52						
				2.9								
261	20	Z	P	14	05	50				1380	Anatolia	
		ENZ	PP			57						
		N	e		06	54						
		N	e		07	56						
		N	i		08	08						
		N	S			18						
				18.0								
262	21	Z	e	13	11	09					Very weak	
		Z	i		12	45						
		EN	e		20	46						
				15.5								
263	21	Z	P	21	26	45				2555		
		Z	PP		27	12						
		Z	(S)		31	00						
		N	M		35	30						
		E	M			36						
				22.5								
264	22	Z	(P)	4	34	38				14665	h = 100 km.	
		Z	(pP)		35	06						
		Z	i			38						
		Z	(PKP)		37	44						
		Z	i		39	13						
				7.0								
265	23	Z	i	14	19	12					Very weak	
		Z	e		21	33						

+33
-33

No.	Date	Comp	Phase	G.M.T.			Period	Amplitude			Δ	Remarks
				H.	M.	S.		Sec.	A_e	A_n		
								μ	μ	μ	Kms.	
265	23 <i>contd.</i>		F	16.1								
266	24/25	Z Z	i e F	23 0.1	51 55	15 02						Very weak
267	26	Z Z Z Z N	e e i e e F	12 13 14.0	49 50 51 52 03	51 15 44 21 54						Preceded by microseisms
268	27	Z Z Z EN	P e (PP) SKS F	16 17 18.1	52 56 57 03	58 30 28 30					12390	" " "
269	29	Z Z Z Z Z	P PPP e S e F	3	46	21 39 48 51 12					2090	Confused with the succeeding earthquake Very weak
270	29	Z N	i e	4	48 58	30 42						Beginning lost in changing the paper (near earthquake)
271	29	ENZ ENZ ENZ	i i i F	7 8.0	45	30 36 56						
272	29/30	Z Z Z Z	e e e e F	23 1.0	32 33 35 36	09 43 18 15						
273	31	EZ Z Z N N N	iP PP i S PS M F	12 15.0	15 17 19 24 48	06 42 26 18 50 38	15		+25		7720	Compression
274	31	Z Z Z EN	e i e M F	10 20.5	25 27 54	28 36 56						Very weak
275	31	Z Z	e e F	21 21.7	36 38	27 12						" "

Tremors were also recorded at:

Month	D	H	D	H	D	H	D	H	D	H
Jan	22	16	30	17	31	10				
Feb.	4	3	8	13	14	9	23	11	28	5
Mar.	4	5	8	12	12	10	24	21	30	1.22
Apr.	14	15.21	16	1	30	3				
May	6	19.20	23		24	10	31	6		
June	1	22	5	17	10	15.23	11	11	13	21
July	4	3.20	5	11	8	22	21	10	25	13
Aug.	26	19								
Sept.	14	18	16	19	26	14	28	13	31	8.10
Oct.	4	18	10	14	12	7	18	23	27	14
Nov.	30	17								
Dec.	5	2	8	4	9	2	12	2	13	3
	18	20	27	23	30	23				
	14	19	16	11	22	22	24	1	27	19
	1	11	5	1	10	1	15	9	17	2
	18	22	21	9						