SEISMOMETRIC BULLETIN
OF THE
Hawaiian Volcano Observatory

Vol. I. HONOLULU, HAWAII, MARCH, 1915. No. 1

SYSTEMATIC REPORT OF THE WHITNEY LABORATORY OF SEISMOLOGY, 1 JANUARY TO 28 FEBRUARY, 1915

BY

HARRY O. WOOD

HONOLULU
THE HAWAIIAN GAZETTE CO., LTD.

INTERNATIONAL NOTATION

Symbols and Notation

1. Character of the Earthquake—

I. Perceptible. II. Moderately strong. III. Strong.

d	(terrae motus domesticus)	Local shock (origin nearby; when strong, perceptible at the station).
v	(terrae motus vicinus)	Near shock (origin less than 1,000 kilometers distant).
r	(terrae motus remotus)	Distant shock (origin from 1,000 to 5,000 kilometers distant).
u	(terrae motus ultimus)	Very distant shock (origin more than 5,000 kilometers distant).

2. Phases of the Seismogram—

P	(undae primae)	First phase (or first preliminary tremors).
PR_n		Waves n-times reflected at the earth's surface.
S	(undae secundae)	Second phase (or second preliminary tremors).
SR_n		Waves n-times reflected at the earth's surface.
PS		Waves changed from longitudinal to transverse oscillation, or vice versa, through reflection at the earth's surface.
L	(undae longae)	Long waves, chief phase, or principal part.
M	(undae maximae)	Greatest motion in the chief phase.
C	(coda)	Tail or end portion.
F	(finis)	End of discernible movement.

3. 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 motion, measured from the median line in microns ($\mu = 1 / 1000$ mm.)

A_E E-W component of A, positive to the E.

A_N N-S component of A, positive to the N.

A_V Vert. component of A, positive upward.

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4. Time—All determinations are reduced to Greenwich Mean Civil Time.

Δ Distance to the epicentrum, in kilometers.

V The indicator-magnification for very rapid vibration.

T The proper period of the pendulum, without damping.

ε The damping ratio.

r The maximal frictional displacement.

h The elevation above mean sea level.

No. 1 From 1 January to 28 February, 1915

Hawaiian Volcano Observatory

SEISMOMETRIC BULLETIN

from the Whitney Laboratory of Seismology

$\phi = 19° 25' 54.2''$ $\lambda = 155° 15' 39.2''$ h = 1214.6 m. Foundation : fissured, vesicular and cavernous basalt.

Apparatus: Bosch - Omori 100 - kg. Tromometers, two components.
Omori Heavy Horizontal Pendulum Tromometer, E - W Comp.

	V	T_o	ε	r/T_o^2
B—O A_N	100 +	15.2	7.8 : 1	0.009—
B—O A_E	100—	14.7	4.9 : 1	0.009—
Omori A_E	200	10.9	———	0.079
A_V	———	———	———	———

Omori ordinary Seismograph, three components

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
2 Jan.	eP	00	10	02					47	
	eS		10	07						
	iL		10	09						Max. a
	M		10	15	0.5	3.5	8—10			160 Milligals
	C		10	40						
	F		11	35						
4 Jan.	iP	4	45	37					10	
	iLM		45	38	0.2	5	9			Max. a
	C		45	47						900 Milligals
	F		46	33						
11 Jan.	iP	14	10	30					21	
	iS		10	32						
	iL		10	33						Max. a
	M		10	35	0.5	9	10			160 Milligals
	C		11	02						
	F		11	10						
13 Jan.	iP	5	26	05					21	
	iS		26	07						
	iL		26	08						Max. a
	M_{1E}		26	10	0.2—0.5	7	6			700 Milligals
	M_{2E}		26	18	0.5	—	13.5			
	C		26	58						
	F		27	53						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
13 Jan.	iP	6	48	45					22	
	iS		48	47						
	iL		48	48						Max. a
	M_1		48	50	0.5	42.5	50			800 Milligals
	M_{2E}		48	56	0.5		45			
	C		49	16						
	F		49	54						
14 Jan.	iP	6	08	09					32	
	iS		08	12						Not felt
	iL		08	14						Max. a
	M		08	21	0.5	60	90			1440 Milligals
	C		09	03						
	F		12	17						
15 Jan.	e	2	34	02					—	Max. a
	M		34	06	0.5	5	6—9			144 Milligals
	F		35	07						
16 Jan.	iPM_{NE}	11	36	19	0.5	—	7.5		21	
	iS		36	21						
	iL		36	22						Max. a
	M_{2N}		36	25	0.5	5.5				120 Milligals
	M_{3E}		36	29	0.5	—	6			
	C		36	37						
	F		37	24						

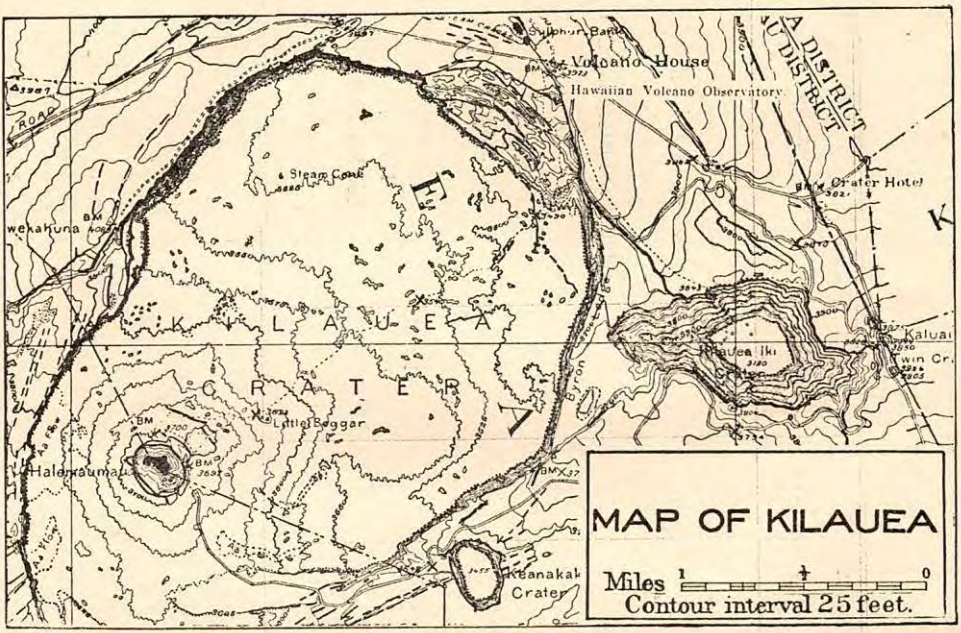
Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
17 Jan.	e	12	44	57					—	Max. a
	M		45	03	0.5	6	5—9.5			150 Milligals
	F		46	11						
17 Jan.	iP	17	46	13					31	
	iS		46	16						
	iL		46	18						Max. a
	M		46	27	0.5	12	15±			250 Milligals
	C		47	02						
	F		47	48						
18 Jan.	iP	13	23	28					21	
	iS		23	30						Not felt
	iL		23	32						Max. a
	M		23	44	0.5	72	45			1225 Milligals
	C		24	33			76.5			
	F		25	28						
21-22 Jan.	—	——	——	——					—	At some unknown time, during interruption of registration owing to absence, a small local shock. No measurements possible.
22 Jan.	iP	17	52	07					—	Not felt
	M		52	13	0.2-0.5	14	12			Max. a
	F		53	12			18			1200 Milligals

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
23 Jan.	e	9	56	17					—	
	M		56	22	0.5	7	9			Max. α
	F		57	18						150 Milligals
23 Jan.	i	23	55	02					—	
	M		55	06	0.2—0.5	3	3.5 6.5			Max. α
	F		55	44						650 Milligals
26 Jan.	i	2	05	06					—	
	M		05	13	0.5	3	4.5			Max. α
	F		06	03						70 Milligals
27 Jan.	i	8	05	50					—	
	M		05	55	0.5	4	4—8			Max. α
	F		06	53						130 Milligals
27 Jan.	iP	9	00	40					21	
	iSL		00	42						Max. α
	M		00	45	0.5	10	14			255 Milligals
	C		01	11						
	F		01	39						
27 Jan.	iP	17	26	05					34	
	eS		26	08						
	eL		26	10						Max. α
	M		26	14	0.2—0.5	3.5	4—4.5			400 Milligals
	C		26	23						
	F		26	50						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
30 Jan.	iP	15	07	30					16	
	iS?		07	31 ±						
	iL		07	36						Max. α
	M		07	43	0.5	37	20.5			590 Milligals
	C		08	05						
	F		09	10						
31 Jan.	eP	4	31	07					33	
	eS		31	10						
	eL		31	12						Max. α
	M		31	16	0.5	10.5	6			170 Milligals
	C		31	30						
	F		32	23						
31 Jan.	iP	8	17	37					32	
	iS		17	40						
	iL		17	42						Max. α
	M		17	46	0.5	25	22.5 26.7			425 Milligals
	C		18	14						
	F		19	37						
3 Feb.	e	2	52	20					—	
	M		52	25	0.2-0.5	2.5	2.5—3			Max. α
	F		53	00						300 Milligals
3 Feb.	i	3	53	15						
	M		53	18	0.2	—	3.5	—	—	Max. α
	F		53	39						350 Milligals

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
3 Feb.	iP	7	50	23					23	
	iS		50	25						
	iL		50	26						Max. a
	M		50	28	0.5	29	27			465 Milligals
	C		51	01						
	F		52	54						
4 Feb.	e	9	50	24					—	Max. a
	M		50	29	0.5	4	4.5			70 Milligals
	F		51	05						
4 Feb.	e	10	40	15					—	Max. a
	M		40	20	0.5	5.5	4-5			88 Milligals
	F		41	12						
14-23 Feb	—									During this interval service was interrupted owing to illness. At least one slight local shock occurred. No measurements possible.
25 Feb.	eL	9	10	46	11				—	
	M		19	44	6.5—7.5	73.5	17			$a = 6 - 7$ Milligals
	C		25	40						
	F		35.5*							*Indefinite later than this

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
26 Feb.	iP	20	43	44	3				2800	
	iS?		46	07	5					
	iLM_1		49	53	9	—	21—59			$a = 1$ to 3 Milligals
	M_{2N}		50	07	9—10	61	—			
	C	Indefinite								
	F	4	25.4*							*Indefinite later than this
27 Feb.	iP	20	51	41					21	
	iS		51	43						
	iL		51	44						Max. a
	M		51	46	0.5	10	12			190 Milligals
	C		52	08						
	F		53	30						
27 Feb.	iP	20	57	02					21	
	iS		57	04						Max. a
	iL		57	05						800 Milligals
	M		57	07	0.5	32.5	51			
	C		57	27						
	F		58	02						



HAWAIIAN VOLCANO RESEARCH ASSOCIATION.

This society is a voluntary one, made up of subscribers to scientific work which is being executed by the Massachusetts Institute of Technology.

In 1915 there are about 100 subscribers in Hawaii and elsewhere, firms and individuals. A group of firms and persons in Hilo built the main observatory building in the spring of 1912. Publications to date have been weekly reports since the summer of 1911, now reprinted in Honolulu in monthly form. The Massachusetts Institute of Technology will publish annual reports, of which the introductory number was printed in 1912.

The weekly bulletin as it appears in the Advertiser is reprinted as a leaflet and sent to regular annual subscribers to the work of the Association. L. A. Thurston is president of the Board of Directors of the Association, and R. W. Shingle is treasurer. New subscribers who are interested in volcanoes will be welcomed in the Association. The Association aims: (1) To record volcanic activity and earthquakes in Hawaii; (2) to attract scientific men hither for special studies; (3) to promote the establishment of volcano observatories all over the world. The annual dues of regular members are $5; patrons of the Assocaition subscribe larger amounts.

WHITNEY LABORATORY OF SEISMOLOGY.

The Whitney Laboratory of Seismology is equipped with two Bosch-Omori 100 kg tromometers registering N-S and E-W motion, a heavy Omori tromometer registering E-W motion, and an Omori "ordinary Seismograph" designed for registering strong earthquakes in all three components of motion. These are seated on concrete piers in a closed basement room having practically constant temperature, beneath the chief Observatory building near the hotel. Time is referred to a rated chronometer, checked at intervals by solar observations with a transit. Both instruments are loaned by the College of Hawaii. At the substation by the edge of the active pit an Omori two-component tromometer with light steady masses is mounted on a concrete pier placed directly on the fresh lava surface. Hawaiian standard time (H. S. T.) is 10 hrs. 30 min. slower than Greenwich time.

CANCANI SCALE OF SEISMIC INTENSITY.

Expressed by accelerations measured in millimeters per second per second.

I.	Instrumental	0.0	2.5
II.	Very slight	2.5	5.0
III.	Slight	5.0	10.0
IV.	Sensible, mediocre	10.0	25.0
V.	Rather strong	25.0	50.0
VI.	Strong	50.0	100.0
VII.	Very strong	100.0	250.0
VIII.	Ruinous	250.0	500.0
IX.	Disastrous	500.0	1000.0
X.	Very disastrous	1000.0	2500.0
XI.	Catastrophic	2500.0	5000.0
XII.	Great catastrophe	5000.0	10000.0

Grade IV. is ordinarily the minimum perceived by the senses; and in grade XII. the acceleration, or rate of change of motion (jerk) reaches that of terrestrial gravitation.

In the standard form of report the maximum intensity or acceleration, designated by the symbol a, or max. a, is given in the conventional unit, **the milligal.** The milligal is a measure of acceleration, such that 1 milligal = 1/100 mm. per sec. per sec. = 10 μ per sec. per sec. The Cancani scale, here defined in terms of millimeters per sec. per sec., can therefore be expressed in **milligals** by multiplying each of the numbers by 100.

SEISMOMETRIC BULLETIN
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Hawaiian Volcano Observatory

Vol. I. HONOLULU, HAWAII, MAY, 1915. No. 2

SYSTEMATIC REPORT OF THE WHITNEY LABORATORY OF SEISMOLOGY, 1 MARCH TO 30 APRIL, 1915

BY

HARRY O. WOOD.

HONOLULU
THE HAWAIIAN GAZETTE CO., LTD.

INTERNATIONAL NOTATION

Symbols and Notation

1. Character of the Earthquake—

I. Perceptible. II. Moderately strong. III. Strong.

d	(terrae motus domesticus)	Local shock (origin nearby; when strong, perceptible at the station).
v	(terrae motus vicinus)	Near shock (origin less than 1,000 kilometers distant).
r	(terrae motus remotus)	Distant shock (origin from 1,000 to 5,000 kilometers distant).
u	(terrae motus ultimus)	Very distant shock (origin more than 5,000 kilometers distant).

2. Phases of the Seismogram—

P	(undae primae)	First phase (or first preliminary tremors).
PR_n		Waves n-times reflected at the earth's surface.
S	(undae secundae)	Second phase (or second preliminary tremors).
SR_n		Waves n-times reflected at the earth's surface.
PS		Waves changed from longitudinal to transverse oscillation, or vice versa, through reflection at the earth's surface.
L	(undae longae)	Long waves, chief phase, or principal part.
M	(undae maximae)	Greatest motion in the chief phase.
C	(coda)	Tail or end portion.
F	(finis)	End of discernible movement.

3. 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 motion, measured from the median line in microns ($\mu = 1 / 1000$ mm.)

A_E E-W component of A, positive to the E.

A_N N-S component of A, positive to the N.

A_V Vert. component of A, positive upward.

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4. Time—All determinations are reduced to Greenwich Mean Civil Time.

Δ Distance to the epicentrum, in kilometers.

V The indicator-magnification for very rapid vibration.

T The proper period of the pendulum, without damping.

ε The damping ratio.

r The maximal frictional displacement.

h The elevation above mean sea level.

No. 2 From 1 March to 30 April, 1915.

Hawaiian Volcano Observatory

SEISMOMETRIC BULLETIN

from the Whitney Laboratory of Seismology

$\phi = 19° 25' 54.2''$ $\lambda = 155° 15' 39.2''$ h = 1214.6 m. Foundation : fissured, vesicular and cavernous basalt.

Apparatus: Bosch - Omori 100 - kg. Tromometers, two components.
Omori Heavy Horizontal Pendulum Tromometer, E - W Comp.

	V	T_0	ε	r/T_0^2
B—O A_N	100 +	15.2	7.8 : 1	0.009—
B–O A_E	100—	14.7	4.9 : 1	0.009—
Omori A_E	200	10.9	———	0.079
A_V	———	———	———	———

Omori ordinary Seismograph, three components

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
6 Mar.	iP	8	29	03					21	
	iS			05						Max. a
	iL			07						
	M			08	0.5	8	9			145 Milligals
	C			29						
	F		30	29						
6 Mar.	i	8	43	26					—	Max. a
	M			31	0.5	4	5			80 Milligals
	F		44	12						
9 Mar.	i	4	28	47					—	Max. a
	M			52	0.5	6.5	6—8			130 Milligals
	F		30	14						
9 Mar.	iP	6	37	40					21	* 6h. 37m. 16s.,
	iS			42						motion appears
	iL			44						
	M			45	0.5	7	—			Max. a
	C		38	06						110 Milligals
	F			39						
12 Mar.	iP	22	48	27					20	
	iS			29						
	iL			30						Max. a
	M_1			31	0.5	14	18—20			350 Milligals
	M_2			35	0.5		11			
	C			42						
	F		49	48						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
14 Mar.	eP	1	41	41					21	
	iS			43						
	iL			44						Max. a
	M			46	0.3—0.5	—	3—3.5			130 Milligals
	C			56						
	F		42	26						
14 Mar.	eP	14	11	30					21	
	iS			32						Max. a
	iL			33						220 Milligals
	M			35	0.3	3	5—5.5			
	C			47						
	F		12	15						
14 Mar.	eP	17	36	56					20.5	
	iS			58						Max. a
	iL			59						800 Milligals
	M		37	01	0.2	—	8			
	C			15						
	F			21						
15 Mar.	iP	10	34	30					20	
	iS			32						
	iL			33						Max. a
	M_1			35	0.5	40	50			800 Milligals
	M_2			38	0.5	32	40			
	C		35	26						
	F		36	26						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
15 Mar.	eP	19	56	21					21	
	eS			23						
	iL			24						Max. a
	M			26	0.5	—	5.0			80 Milligals
	C			41						
	F		57	09						
16 Mar.	eP	21	44	37					20	
	iS			39						
	eL			40						Max. a
	M			43	0.5—0.6	—	3—3.5			55 Milligals
	C			54						
	F		45	32						
23 Mar.	e	1	11	35					—	
	M			40	0.2	5.0	3.5			Max. a
	F		12	09						500 Milligals
28 Mar.	iP	18	39	52					21	
	iS			54						
	iL			55						Max. a
	M			57	0.5	3	3—4.5			145 Milligals
	C		40	35						
	F		42	02						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
28 Mar.	iP	18	56	29					—	Felt shock; IV-V R.-F. scale. Styluses instantly flung off cylinders to N. and E. Replaced after some minutes. Slow waves of considerable amplitude like coda until F.
					—	—	—			
	F	20	30±							
29 Mar.	eP	12	08	29					21	
	iS			31						
	iL			32						Max. a
	M			34	0.5	4.5	5			80 Milligals
	C		09	02						
	F		10	07						
30 Mar.	eP	7	14	12					21	
	eS			14						
	eL			15						Max. a
	M			17	0.5	2.5	6			95 Milligals
	C			25						
	F			39						
30 Mar.	eP	8	32	14					21	
	eS			16						
	eL			17						
	M_1			19	0.5	17	41			Max. a
	M_{2E}			25	0.5	—	19			650 Milligals
	C		33	59						
	F		34	16						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
30 Mar.	eP	14	21	01					32	
	eS			04						Max. a
	eL			05						
	M			07	0.2	2.5	6.5			650 Milligals
	C			16						
	F			26						
30 Mar.	eP	20	31	03					31	
	eS			06						
	eL			07						Max. a
	M			11	0.5	2.5	5.0			80 Milligals
	C			29						
	F		32	09						
31 Mar.	eP	2	10	05					21	
	eS			07						
	eL			08						Max. a
	M			10	0.2—0.5	4.0	2.5—6.0			600 Milligals
	C			34						
	F		11	23						
31 Mar.	iP	12	14	19					21	
	iS			21						
	iL			22						Max. a
	M			25	0.5	5	4.5—7.0			110 Milligals
	C			52						
	F		15	50						

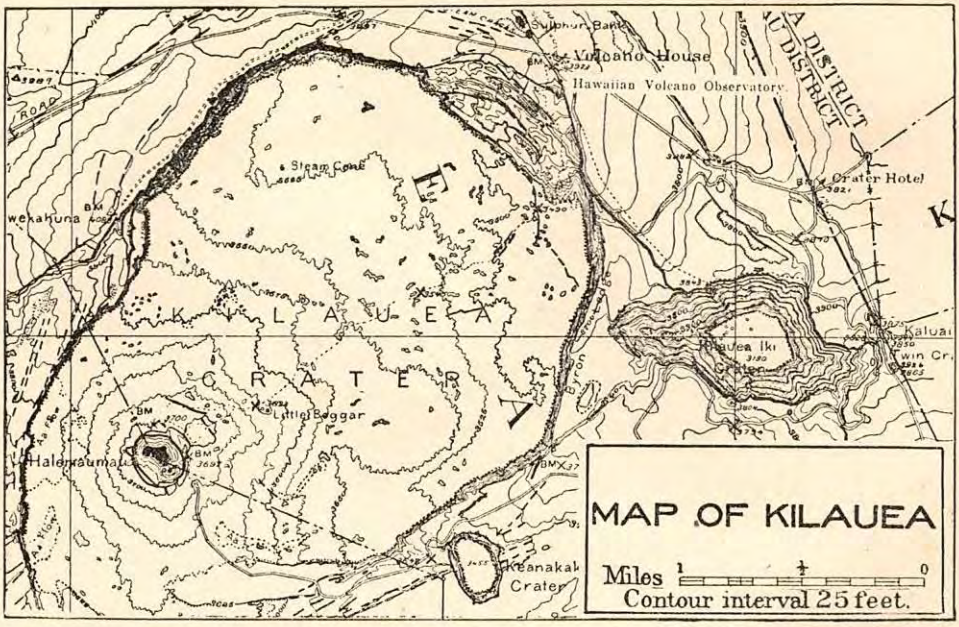
Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
31 Mar.	eP	17	17	58					31	
	iS		18	01						
	iL			03						Max. α
	M			07	0.5	8.0	14.5			230 Milligals
	C			25						
	F		19	41						
1 April	e	16	01	49					—	
	M			55	0.5	2.5	3.5—4.0			Max. α
	F		02	32						65 Milligals
3 April	eP	5	46	21					21	
	eS			23						
	iL			24						Max. α
	M			26	0.2	—	6.5			
	C			33						650 Milligals
	F	Indefinite								
8 April	iP	13	11	39					31	
	iS			42						
	iL			44						Max. α
	M_I			45	0.5	14	36.5—11.5			640 Milligals
	M_{2E}			49	0.5	—	40—22.5			
	C		12	06						
	F		13	31						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
8 April	eP	3	12	50					31	
	iS			53						Max. α
	iL			55						
	M			57	0.5	3.5	5.0			80 Milligals
	C		13	02						
	F			19						
9 April	iP	10	10	28					—	Max. α = 2400 Milligals,
	M			30	0.2	12.0	5—24.0			but the shock was not felt.
	F			49						Period very short ! !
11 April	iP	12	53	00					21	Felt shock II R.-F. scale.
	iS			02						Felt by one person lying
	iL			03						awake.
	M			06	0.5	53.0	34.5—91.0			Max. α
	C		54	30						1450 Milligals
	F		55	07						
13 April	iP	19	19	20					21	
	iS			22						
	iL			24						Max. α
	M			26	0.5	—	8—9			145 Milligals
	C			51						
	F		21	27						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
13 April	iP	21	50	18					21	
	iS			20						
	iL			21						Max. a
	M_1			23	0.5	—	32—35			560 Milligals
	M_2			26	0.5	—	22			
	C			55						
	F		51	54						
13 April	i	21	54	14					—	Max. a
	M			16	0.5	5.5	7			110 Milligals
	F		55	20						
18 April	eP	00	13	54					21	
	iS			57						Max. a
	iL			58						160 Milligals
	M		14	00	0.5	8.0	7.5—10.0			
	C			20						
	F		15	29						
18 April	iP	4	47	48					21	
	iS			50						
	iL			51						Max. a
	M_1			53	0.5	18	30			480 Milligals
	M_2			59	0.5	12	25			
	C		48	26						
	F		49	32						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
19 April	i	6	47	15					—	Max. a
	M			18	0.5	2	2—3			48 Milligals
	F		48	21						
19 April	iP	8	48	29					26	
	iS			32						
	iL			33						Max. a
	M			35	0.5	5	11			175 Milligals
	C			57						
	F		50	09						
26 April	eP	00	28	19					41	
	iS			23						
	iL			28						Max. a
	M			31	0.5	—	4—5			80 Milligals
	C			42						
	F		29	28						
26 April	eP	00	46	07					31	
	eS			10						
	eL			12						Max. a
	M			19	0.5	5.0	6—7.5			120 Milligals
	C			33						
	F		47	13						
28 April	iP	17	42	38					—	Max. a
	M			39	0.5	—	10			160 Milligals
	F		43	14						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
30 April	eP	4	00	09					31	
	eS			12						
	eL			14						Max. a
	M			24	0.5	—	5—6.5			105 Milligals
	C			32						
	F		01	04						



HAWAIIAN VOLCANO RESEARCH ASSOCIATION.

This society is a voluntary one, made up of subscribers to scientific work which is being executed by the Massachusetts Institute of Technology.

In 1915 there are about 100 subscribers in Hawaii and elsewhere, firms and individuals. A group of firms and persons in Hilo built the main observatory building in the spring of 1912. Publications to date have been weekly reports since the summer of 1911, now reprinted in Honolulu in monthly form. The Massachusetts Institute of Technology will publish annual reports, of which the introductory number was printed in 1912.

The weekly bulletin as it appears in the Advertiser is reprinted as a leaflet and sent to regular annual subscribers to the work of the Association. L. A. Thurston is president of the Board of Directors of the Association, and R. W. Shingle is treasurer. New subscribers who are interested in volcanoes will be welcomed in the Association. The Association aims: (1) To record volcanic activity and earthquakes in Hawaii; (2) to attract scientific men hither for special studies; (3) to promote the establishment of volcano observatories all over the world. The annual dues of regular members are $5; patrons of the Assocaition subscribe larger amounts.

WHITNEY LABORATORY OF SEISMOLOGY.

The Whitney Laboratory of Seismology is equipped with two Bosch-Omori 100 kg tromometers registering N-S and E-W motion, a heavy Omori tromometer registering E-W motion, and an Omori "ordinary Seismograph" designed for registering strong earthquakes in all three components of motion. These are seated on concrete piers in a closed basement room having practically constant temperature, beneath the chief Observatory building near the hotel. Time is referred to a rated chronometer, checked at intervals by solar observations with a transit. Both instruments are loaned by the College of Hawaii. At the substation by the edge of the active pit an Omori two-component tromometer with light steady masses is mounted on a concrete pier placed directly on the fresh lava surface. Hawaiian standard time (H. S. T.) is 10 hrs. 30 min. slower than Greenwich time.

CANCANI SCALE OF SEISMIC INTENSITY.

Expressed by accelerations measured in millimeters per second per second.

I.	Instrumental	0.0	2.5
II.	Very slight	2.5	5.0
III.	Slight	5.0	10.0
IV.	Sensible, mediocre	10.0	25.0
V.	Rather strong	25.0	50.0
VI.	Strong	50.0	100.0
VII.	Very strong	100.0	250.0
VIII.	Ruinous	250.0	500.0
IX.	Disastrous	500.0	1000.0
X.	Very disastrous	1000.0	2500.0
XI.	Catastrophic	2500.0	5000.0
XII.	Great catastrophe	5000.0	10000.0

Grade IV. is ordinarily the minimum perceived by the senses; and in grade XII. the acceleration, or rate of change of motion (jerk) reaches that of terrestrial gravitation.

In the standard form of report the maximum intensity or acceleration, designated by the symbol α, or max. α, is given in the conventional unit, **the milligal.** The milligal is a measure of acceleration, such that 1 milligal = 1/100 mm. per sec. per sec. = 10 μ per sec. per sec. The Cancani scale, here defined in terms of millimeters per sec. per sec., can therefore be expressed in **milligals** by multiplying each of the numbers by 100.

SEISMOMETRIC BULLETIN
OF THE
Hawaiian Volcano Observatory

Vol. 1 HONOLULU, HAWAII, JULY, 1915. No. 3

SYSTEMATIC REPORT OF THE WHITNEY LABORATORY OF SEISMOLOGY, 1 MAY TO 30 JUNE, 1915

BY

HARRY O. WOOD.

HONOLULU
THE HAWAIIAN GAZETTE CO., LTD.

INTERNATIONAL NOTATION

Symbols and Notation

1. Character of the Earthquake—

I. Perceptible. II. Moderately strong. III. Strong.

d	(terrae motus domesticus)	Local shock (origin nearby; when strong, perceptible at the station).
v	(terrae motus vicinus)	Near shock (origin less than 1,000 kilometers distant).
r	(terrae motus remotus)	Distant shock (origin from 1,000 to 5,000 kilometers distant).
u	(terrae motus ultimus)	Very distant shock (origin more than 5,000 kilometers distant).

2. Phases of the Seismogram—

P	(undae primae)	First phase (or first preliminary tremors).
PR_n		Waves n-times reflected at the earth's surface.
S	(undae secundae)	Second phase (or second preliminary tremors).
SR_n		Waves n-times reflected at the earth's surface.
PS		Waves changed from longitudinal to transverse oscillation, or vice versa, through reflection at the earth's surface.
L	(undae longae)	Long waves, chief phase, or principal part.
M	(undae maximae)	Greatest motion in the chief phase.
C	(coda)	Tail or end portion.
F	(finis)	End of discernible movement.

3. 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 motion, measured from the median line in microns ($\mu = 1 / 1000$ mm.)

A_E E-W component of A, positive to the E.

A_N N-S component of A, positive to the N.

A_V Vert. component of A, positive upward.

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4. Time—All determinations are reduced to Greenwich Mean Civil Time.

Δ Distance to the epicentrum, in kilometers.

V The indicator-magnification for very rapid vibration.

T The proper period of the pendulum, without damping.

ε The damping ratio.

r The maximal frictional displacement.

h The elevation above mean sea level.

No. 3 From 1 May to 30 June, **1915.**

Hawaiian Volcano Observatory

SEISMOMETRIC BULLETIN

from the Whitney Laboratory of Seismology

$\phi = 19° 25' 54.2''$ $\lambda = 155° 15' 39.2''$ h = 1214.6 m. Foundation : fissured, vesicular and cavernous basalt.

Apparatus: Bosch - Omori 100 - kg. Tromometers, two components.
Omori Heavy Horizontal Pendulum Tromometer, E - W Comp.

	V	T_0	ε	r/T_0^2
B—O A_N	100 +	15.2	7.8 : 1	0.009—
B—O A_E	100—	14.7	4.9 : 1	0.009—
Omori A_E	200	10.9	———	0.079
A_V	———	———	———	———

Omori ordinary Seismograph, three components

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
1 May	eP	5	08	57	4—7				5360—5370	
	iS		15	57 +	15	54	32			S — P = 7 m +
	R_1S (?)		19	38	15	—	—			
	R_2S (?)		20	42	17.5	22	20			
	R_3S (?)		21	29	16	18	—			
	iL		22	19	25—30	30	24			Max. a
	M_1		24	02	20	1870	130			18 Milligals
	M_{2E}		25	29	18	—	140			
	M_{3E}		29	30	20	—	—			
	M_{4E}		31	55	17	—	—			
	M_{5N}		33	05	15	288	—			
	C	5	34	28	10					
	F	7	40+	—						
3 May	eP	22	15	59					41	
	eS		16	03						
	eL			05						Max. a
	M			08	0.5	7.5	7.5			120 Milligals
	C			15						
	F		17	33						
4 May	iP	12	31	22					21	
	iS			24						
	iL			25	0.2	4	16			Max. a
	M			27						1600 Milligals ;
	C			36						but not felt
	F		32	02						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
4 May	iP	12	39	33					21	
	iS			35						Max. a
	iL			36						1700 Milligals;
	M_1			37	0.2	7	17			but not felt
	M_{2E}			42	0.5	—	10			
	C			48						
	F		40	41						
5 May	iP	6	12	23					21	
	iS			25						Max. a
	iL			26						1040 Milligals;
	M			31	0.5	18	65			Shock not felt
	C			41						
	F		13	36						
6 May	e	11	23	20					?	Max. a
	M_E		25	59	8	—	90			7.6 Milligals
	M_N		26	11	8	120	--			
	F	13	40							
6 May	eP	22	25	46					41	
	eS			50						
	iL			52						Max. a
	M			57	0.2	5	6			600 Milligals
	C		26	19						
	F		27	29						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
9 May	iP	00	04	49					21	
	iS			51						
	iL			52						Max. a
	M			54	0.2	5	5			500 Milligals
	C		05	06						
	F			33						
10 May	eP	8	01	03					31	
	eS (?)			06 +						
	iL			08						Max. a
	M			12	0.5	8	12			190 Milligals
	C			22						
	F		02	06						
10 May	iP	10	52	48					24	
	iS			50						Max. a
	iL			51						1300 Milligals;
	M			56	0.2	7	8--10			but not felt
	C		53	08						
	F		54	18						
12 May	iP	3	38	40					21	
	iS			42						
	iL			43						Max. a
	M			46	0.5	—	3--5			80 Milligals
	C			52						
	F		39	40						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
12 May	iP	11	47	48					21	
	iS			50						
	iL			51						
	M			53	0.5	12.5	18.5			Max. a
	C		48	14						300 Milligals
	F		49	53						
12 May	iP	12	34	46					23	
	iS			48						
	iL			49						Max. a
	M			52	0.2—0.25	—	2.5—4			400 Milligals
	C		35	01						
	F			30						
13 May	eP	17	51	10					27	
	eS			13—						
	iL			14—						
	M_1			16	0.2	6	8			Max. a
	M_{2E}			19	0.2	—	7			800 Milligals
	C			22						
	F		52	16						
15 May	iP	21	06	52					23	
	iS			54						
	iL			55						Max. a
	M			57	0.5	37.5	50			800 Milligals
	C		07	07						
	F		08	31						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
15 May	e	21	16	04					—	Max. a
	M			09	0.5	—	3			48 Milligals
	F			32						
15 May	eP	23	09	01					31	
	iS			04						
	iL			06						Max. a
	M			07	0.5	—	10			160 Milligals
	C			21						
	F			50						
16 May	eP	3	49	52					30	
	iS			55						
	iL			57						Max. a
	M			58	0.2	2.5	3			300 Milligals
	C		50	06						
	F			20						
16 May	iP	9	13	55					21	
	iS			57						
	iL			58						Max. a
	M		14	00	0.2	4	6			600 Milligals
	C			09						
	F			20						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
16 May	iP	20	06	28					27	
	iS			31						
	iL			32						
	M			33	0.2	—	3			Max. a
	C			38						300 Milligals
	F			48						
17 May	iM_{1E}	17	06	47	0.2	—	5		—	
	i_N			52						
	M_N			54	0.2	3.5	—			Max. a
	C		07	02						500 Milligals
	F			09						
19 May	iP	4	43	16					21	
	eS			18						
	eL			19						Max. a
	M			21	0.2	3	3.5			350 Milligals
	C			32						
	F		44	04						
20 May	iP	3	33	11					31	
	iS			14						
	iL			16						Max. a
	M_I			17	0.5	13	35			560 Milligals
	M_{2E}			20	0.5	—	12.5			
	C			29						
	F		34	46						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
25 May	iP	15	29	14					31	
	iS			17						
	iL			19						Max. a
	M			25	0.2	5	10			1000 Milligals;
	C			37						but not felt
	F		30	56						
26 May	iP	00	11	20					—	Max. a
	M			24	0.2	—	4			400 Milligals
	C			28						
	F			46						
26 May	iP	16	08	10					32	
	iS			13						
	iL			15						
	M_I			17	0.3	14	17.5			Max. a
	M_{2E}			20	0.3	—	6.3			780 Milligals
	C			27						
	F		09	45						
26 May	iP	17	56	13					31	Origin S.E.; or N.W.?
	S			16						
	L			18						Max. a
	M			27	0.5	160	505			8000 Milligals
	C			53						
	F		58	28						Felt by several persons at the Volcano House as a slow swaying

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
26 May	iP	23	11	45					23	
	iS			47						
	iL			48						
	M			50	0.2	5	5			Max. a
	C			56						500 Milligals
	F		12	17						
27 May	eP	00	22	43					21	
	eS			45						
	iL			46						
	M			48	0.5	—	10.5			Max. a
	C		23	01						165 Milligals
	F			23						
27 May	eP	5	29	38					21	
	eS			40						
	iL			41						
	M			43	0.2	2	6			Max. a
	C			49						600 Milligals
	F		30	16						
27 May	iP	13	39	01					21	
	iS			03						
	iL			04						
	M			06	0.2	6	7			Max. a
	C			13						700 Milligals
	F		40	01						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
27 May	iP	15	50	11					21 +	
	iS			13						
	iL			14						
	M			16	0.2	9	9			Max. a
	C			25						900 Milligals
	F		51	21						
30 May	i	20	58	09					—	
	M			14	0.2	4	6			Max. a
	F			55						600 Milligals
1 June	iP	19	57	05					21 —	
	iS			07						
	iL			08						
	M_1			10	0.5	12	19			Max. a
	M_2			17	0.5	18	20.5			330 Milligals
	C			32						
	F		58	19						
2 June	eP	11	56	25					31	
	eS			28						
	iL			30						
	M			32	0.5	3	3			Max. a
	C			44						50 Milligals
	F		57	13						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
3 June	e	23	11	15					—	Max. a
	M			21	0.5	5	7			110 Milligals
	F			54						
5 June	i	13	14	40					—	Max. a
	M			45	0.2	5	4.5			500 Milligals
	F		15	01						
5 June	iP	18	38	16					—	Max. a
	M			20	0.5	—	90			1450 Milligals; but the shock was not felt!
	F			41						
5 June	e	20	10	33					—	Max. a
	M			39	0.5	—	5			80 Milligals
	F		11	33						
5 June	i	23	28	13					—	Max. a
	M			19	0.5	—	4			65 Milligals
	F		29	27						
6 June	e	21	42	56					Not less than 3850	
	el?		51	54						
	e		52	57						
	M_{1E}		54	24	12	—	35			Max. a
	M_{2E}		58	06	10	—	29			of the order of 1 Milligal
	C	indefinite								
	F	22	45 +							

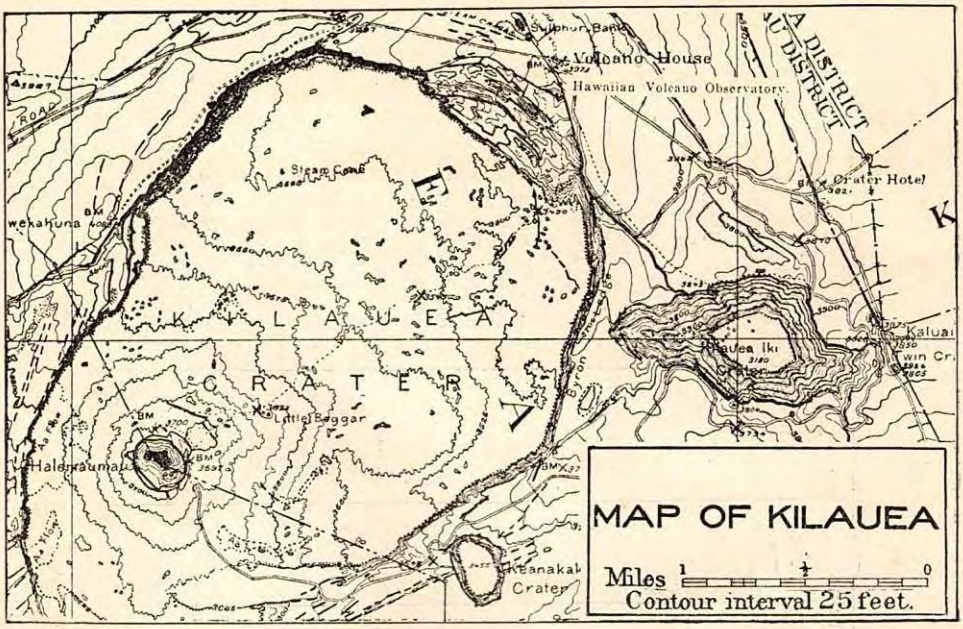
Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
7 June	e	4	25	30					—	Max. a
	M			51	0.5	—	2			32 Milligals
	F		26	47						
9 June	iP	16	30	29					47	
	iS			34						
	iL			36						
	M			38	0.2	—	5			Max. a
	C			49						500 Milligals
	F		31	20						
11 June	iP	1	44	04					21	
	iS			06						
	iL			07						
	M			09	0.2	—	14			Max. a
	C			23						220 Milligals
	F		45	21						
11 June	eP	2	02	51					21—	
	eS			53						
	eL			54						
	M			55	0.5	—	3.5			Max. a
	C		03	08						56 Milligals
	F			37						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
12 June	iP	15	20	13					31	
	iS			16						
	iL			18						
	M_1			20	0.5	14	20			Max. a
	M_{2E}			25	0.5		21			330 Milligals
	C			35						
	F		21	49						
13 June	iP	12	56	06					21—	
	iS			08						
	iL			09						Max. a
	M			11	0.2	5	10			1000 Milligals;
	C			24						but not felt
	F		57	05						
14 June	eP	9	37	32					21—	
	iS			34						
	iL			35						Max. a
	M			37	0.5	12	20.5			
	C			56						330 Milligals
	F		39	06						
16 June	iP	12	55	36					22	
	iS			38						Max. a
	iL			39						
	M			41	0.2	10	12			1200 Milligals;
	C		56	04						but not felt
	F			54						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
16 June	e	18	51	08					—	Max. a
	M			13	0.2	3	3			300 Milligals
	F			53						
18 June	iP	10	17	26					31	
	iS			29						Max. a
	iL			31						9000 Milligals;
	M			37	0.5	30	56			but there was no report that
	C		18	01						the shock was felt!
	F		19	47						
20 June	eP	15	03	42					31	
	eS			45						Max. a
	iL			47						2100 Milligals;
	M			49	0.2	—	21			but there was no report that
	C		04	02						the shock was felt!
	F			44						
21 June	e	6	26	44					—	Max. a
	M			49	0.2	—	8			800 Milligals
	F		27	14						
21 June	iP	6	27	50					—	
	iS			52						Max. a
	iL			55						
	M		28	05	0.2	—	13			1300 Milligals;
	C			12						but not felt
	F			30						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
23 June	e	4	15	38					—	
	M		19	21	12	120	—			Max. a;
	F	indefinite								of the order of 3 Milligals
23 June	e	5	11	46					—	
	M		14	38	8	225	—			Max. a;
	F	indefinite								of the order of 14 Milligals
23 June	iP	9	24	00					21	
	iS			02						
	iL			03						
	M			05	0.5	7	13			Max. a
	C			22						210 Milligals
	F		25	08						
24 June	eP	7	20	55					32—	
	iS			58						
	iL		21	00						
	M			06	0.5	—	7.5			Max. a
	C			14						120 Milligals
	F		22	29						
25 June	eP	11	34	26					21	
	eS			28						
	iL			29						
	M			31	0.2	—	4			Max. a
	C			40						400 Milligals
	F		35	28						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
25 June	e	7	49	46					—	
	M			51	0.2	—	3.5			Max. a
	F		50	00						350 Milligals
25 June	e	19	24	10					—	
	M			15	0.2	—	1			Max. a
	F		25	22						100 Milligals
26 June	*								—	* A very slight local earthquake in the early morning hours; through over-scoring, the exact time cannot be made out.
29 June	iP	7	59	49					21—	
	iS			51						
	iL			52						Max. a
	M			54	0.5	51	60+			980 Milligals;
	C	8	00	14						not felt
	F	8	01	07						
30 June	iP	23	31	35					21—	
	iS			37						
	iL			38						Max. a
	M			40	0.2	—	19			1900 Milligals;
	C			56						but the shock was not felt?
	F		32	49						



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CANCANI SCALE OF SEISMIC INTENSITY.

Expressed by accelerations measured in millimeters per second per second.

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II.	Very slight	2.5	5.0
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VII.	Very strong	100.0	250.0
VIII.	Ruinous	250.0	500.0
IX.	Disastrous	500.0	1000.0
X.	Very disastrous	1000.0	2500.0
XI.	Catastrophic	2500.0	5000.0
XII.	Great catastrophe	5000.0	10000.0

Grade IV. is ordinarily the minimum perceived by the senses; and in grade XII. the acceleration, or rate of change of motion (jerk) reaches that of terrestrial gravitation.

In the standard form of report the maximum intensity or acceleration, designated by the symbol α, or max. α, is given in the conventional unit, the milligal. The milligal is a measure of acceleration, such that 1 milligal = 1/100 mm. per sec. per sec. = 10 μ per sec. per sec. The Cancani scale, here defined in terms of millimeters per sec. per sec., can therefore be expressed in milligals by multiplying each of the numbers by 100.

SEISMOMETRIC BULLETIN
OF THE
Hawaiian Volcano Observatory

Vol. 1 HONOLULU, HAWAII, SEPTEMBER, 1915. No. 4

SYSTEMATIC REPORT OF THE WHITNEY LABORATORY OF SEISMOLOGY, 1 JULY TO 31 AUGUST, 1915

BY

HARRY O. WOOD.

HONOLULU
THE HAWAIIAN GAZETTE CO., LTD.

INTERNATIONAL NOTATION

Symbols and Notation

1. Character of the Earthquake—

I. Perceptible. II. Moderately strong. III. Strong.

d	(terrae motus domesticus)	Local shock (origin nearby; when strong, perceptible at the station).
v	(terrae motus vicinus)	Near shock (origin less than 1,000 kilometers distant).
r	(terrae motus remotus)	Distant shock (origin from 1,000 to 5,000 kilometers distant).
u	(terrae motus ultimus)	Very distant shock (origin more than 5,000 kilometers distant).

2. Phases of the Seismogram—

P	(undae primae)	First phase (or first preliminary tremors).
PR_n		Waves n-times reflected at the earth's surface.
S	(undae secundae)	Second phase (or second preliminary tremors).
SR_n		Waves n-times reflected at the earth's surface.
PS		Waves changed from longitudinal to transverse oscillation, or vice versa, through reflection at the earth's surface.
L	(undae longae)	Long waves, chief phase, or principal part.
M	(undae maximae)	Greatest motion in the chief phase.
C	(coda)	Tail or end portion.
F	(finis)	End of discernible movement.

3. 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 motion, measured from the median line in microns ($\mu = 1 / 1000$ mm.)

A_E E-W component of A, positive to the E.

A_N N-S component of A, positive to the N.

A_V Vert. component of A, positive upward.

4. Time—All determinations are reduced to Greenwich Mean Civil Time.

Δ Distance to the epicentrum, in kilometers.

V The indicator-magnification for very rapid vibration.

T The proper period of the pendulum, without damping.

ε The damping ratio.

r The maximal frictional displacement.

h The elevation above mean sea level.

No. 4 From 1 July to 31 August, **1915.**

Hawaiian Volcano Observatory

SEISMOMETRIC BULLETIN

from the Whitney Laboratory of Seismology

$\phi = 19° 25' 54.2''$ $\lambda = 155° 15' 39.2''$ h = 1214.6 m. Foundation : fissured, vesicular and cavernous basalt.

Apparatus: Bosch - Omori 100 - kg. Tromometers, two components.
Omori Heavy Horizontal Pendulum Tromometer, E - W Comp.

	V	T_0	ε	r/T_0^2
B—O A_N	100 +	15.2	7.8 : 1	0.009—
B—O A_E	100—	14.7	4.9 : 1	0.009—
Omori A_E	200	10.9	———	0.079
A_V	———	———	———	———

Omori ordinary Seismograph, three components

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
1 July	eP	2	05	58					21—	
	eS		06	00						
	iL			01						Max. a
	M			04	0.5	—	36 ±			575 Milligals
	C			13						
	F			55						
1 July	iP	9	55	55					31	
	iS			58						
	iL		56	00						Max. a
	M			03	0.5	—	12			193 Milligals
	C			14						
	F			52						
2 July	e	7	37	19					—	Max. a
	M			25	0.5	—	3			48 Milligals
	F		38	11						
2 July	iP	7	38	30					31	
	iS			33						
	iL			35						Max. a
	M			38	0.5	—	13			208 Milligals
	C		39	08						
	F			59						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
5 July	eP	11	53	45					21—	
	iS			47						Max. a
	iL			48						1750 Milligals;
	M			50	0.2—0.5	10	14—9			no report that the shock
	C		54	15						was felt ! !
	F		55	07						
6 July	iP	17	42	13					—	
	M			17	0.5	7	12			Max. a
	F		44	03						190 Milligals
8 July	iP	8	45	10					22—	
	eS			12						
	eL			13						
	M			15	0.5	16	16			Max. a
	C			31						250 Milligals
	F		46	26						
9 July	eP	23	04	57					34	
	eS		05	00						
	eL			02						
	M			04	0.2	—	8			Max. a
	C			44						800 Milligals
	F		06	17						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
10 July	iP	12	52	08					21—	
	iS			10						
	iL			11						Max. a
	M			14	0.5	16	35.5			570 Milligals
	C			33						
	F		54	17						
13 July	e	13	32	33					—	Max. a
	M			38	0.2	2.5	5			500 Milligals
	F		33	31						
15 July	iP	1	13	36					21	
	iS			38						
	iL			39						Max. a
	M			40	0.2	—	8			800 Milligals
	C			45						
	F		14	05						
15 July	iP	13	18	22					21 +	
	iS			24						
	iL			25						Max. a
	M			27	0.2	6	5			600 Milligals
	C			48						
	F		19	52						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
16 July	iP_{1*}	15	30	17					(1) 21—	* A definite double-shock
	iS_1			19					(2) 15—	
	iP_2			22						
	iS_2			23						
	$iL_{(2?)}$			24 +						Max. a
	M			28	0.5	—	4.5			70± Milligals
	C		indefinite							
	F		31	03						
20 July	iP	8	47	07					21 +	
	iS			09						
	iL			10						Max. a
	M			11	0.2	3	5			1000 Milligals;
	C			19						but not felt
	F			37						
20 July	iP	8	49	00					21 +	
	iS			02						
	iL			03						Max. a
	M			05	0.2	5	4			1000 Milligals;
	C			12						but not felt
	F			30						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
21 July	eP	2	00	01					45	
	eS			06						
	eL			10						
	M_{1N}			12	0.5	12	—			Max. a
	M_{2E}			20	0.5	—	22			350 Milligals
	C			34						
	F		01	37						
22 July	iP	11	10	16					21—	
	iS			18						
	iL			19						
	M_1			21	0.5	7	10			Max. a
	M_2			30	0.5	9.5	13			210 Milligals
	C			45						
	F		11	42						
23 Jluy	i	15	57	14					—	Max. a
	M			17	0.2	—	6.5			1300 Milligals;
	F			32						but not felt
23 July	iP	16	01	11					51	
	iS			17						
	iL			20						Max. a
	M			23	0.5	—	9			145 Milligals
	C			34						
	F		02	28						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
27 July	iP	6	19	00					27	
	iS			03						
	iL			04						
	M			07	0.5	—	19.5			Max. α 230 Milligals
	C			35						
	F		20	33						
29 July	eP	22	21	17					24	
	eS			19						
	iL			21						
	M			23	—	—	—			———
	C	indefinite								
	F	"								
31 July	iP	1	40	18					5000 ±*	* 4280—5120, the latter the better value
	iS		47	04	4— 7	390	75			α of S-phase; of the order of 25 to 40 Milligals
	iL		51	08	17—19	113	33			
	M_{1E}		54	00	13	—	200			α of M-phase; of the order of 1—5 Milligals
	M_{2N}			31	11	380	—			
	M_{3N}			54	20	300	—			
	M_{4E}		56	04	13	—	174			
	C		58	31	8—13	—	—			
	F	2	45 ±							

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
31 July	iP	21	50	18					57	
	iS			25						
	iL			28						
	M			33	0.5	7	10			Max. α 160 Milligals
	C		51	07						
	F			37						
2 Aug.	eP	18	50	44					21 —	
	iS			46						
	iL			47						
	M			50	0.3—0.4	5	6.5			Max. α 220 Milligals
	C		51	11						
	F			37						
3 Aug.	iP	14	07	37					21—	
	iS			39						
	iL			40						
	M			43	0.5	—	9			Max. α 145 Milligals
	C		08	08						
	F			43						
4 Aug.	iP	7	39	52					46	
	iS			57						
	iL			59						
	M		40	03	0.5	9	12			Max. α 270 Milligals
	M_{2E}			10	0.5	—	17			
	C			36						
	F		41	27						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
4 Aug.	eP	7	44	24					31	
	iS			27						
	iL			29						
	M			31	0.5	—	4			Max. a
	C			37						65 Milligals
	F		45	52						
6 Aug.	iP	11	10	31					20.5	
	iS			33						
	iL			34						Max. a
	M			36	0.5	56	95			1500 Milligals;
	C		11	06						but not felt
	F		12	00						
6 Aug.	e	13	32	47	—	—	—			Teleseism; chief phase only,
	F		45±							feebly registered
6 Aug.	iP	14	00	49					20.7	
	iS			51						
	iL			52						Max. a
	M			54	0.5	7	11.5			185 Milligals
	C		01	32						
	F		02	27						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
6 Aug.	iP	22	37	35					52	
	iS			41						
	iL			45						
	M			54	0.5	6	5			Max. a
	C		38	18						96 Milligals
	F		39	01						
8 Aug.	iP	14	24	00					22	
	iS			02						
	iL			03						
	M			06	0.5	—	8			Max. a
	F			25						130 Milligals
	F		25	44						
9 Aug.	*									* A slight local shock, probably in the early morning hours; the time-marking mechanism out of order.
13 Aug.	eP	22	37	56					23	
	eS			58						
	iL			59						
	M		38	01	0.3	—	9			Max. a
	C			37						140 Milligals
	F		39	16						

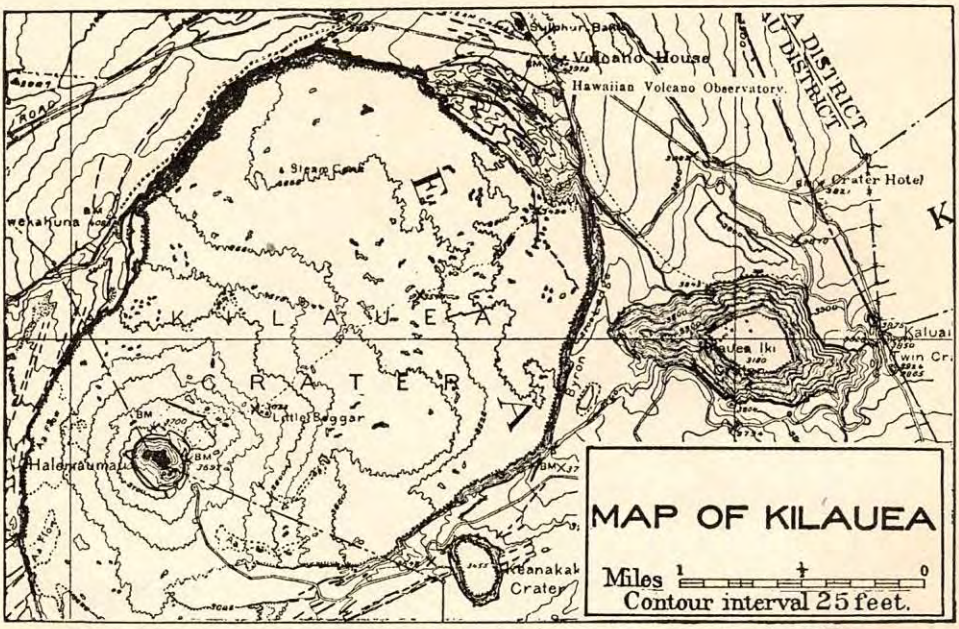
Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
14 Aug.	e	3	21	59					31	
	iS		22	02						
	iL			04						Max. a
	M			06	0.5	—	4			65± Milligals
	C			19						
	F		23	59						
14 Aug.	iP	11	27	29					26	
	eS			32						
	iL			34						
	M			35	0.5	—	10			Max. a
	C			49						160 Milligals
	F		28	30						
15 Aug.	iP	15	45	27					22	
	iS		15	29 +						Max. a
	iL			30 +						5600+ Milligals;
	M			33	0.5	350 +	350 +			felt generally in vicinity of
	C		46	12						Observatory
	F		47	37						
17 Aug.	iP	00	24	38					—	Max. a
	M			43	0.2	1	2			20 Milligals
	F			56						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
17 Aug.	iP	00	26	49					21	
	iS			51						
	iL			52						Max. a
	M			54	0.5	—	115			1800 Milligals;
	C		27	19						but not felt
	F		28	21						
17 Aug.	eP	5	04	15					21	
	iS			17						
	iL			18						
	M			20	0.2	5.5	5			Max. a
	C			27						550 Milligals
	F			43						
21 Aug.	i	13	10	47					—	
	M			50	0.2	5	5			Max. a
	F		11	10						500 Milligals
21–22 Aug.	*	*00	15 ±						45 +	* A small local shock; time lost through instrumental defect. Max. a 240 Milligals
	M				0.5	15	15			
24 Aug.	i	13	49	57					—	
	M		50	02	0.5	—	5			Max. a
	F			47						80 Milligals

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
27 Aug.	eP	12	37	59					21	
	eS		38	01						
	iL			02						
	M			04	0.5	—	4.5			Max. a
	C			14						70 Milligals
	F		39	04						
27 Aug.	iP	19	27	44					21	
	iS			46						
	iL			47						
	M			49	0.5	12	19			Max. a
	C		28	14						300 Milligals
	F		29	01						
27 Aug.	iP	20	32	23					—	
	M			29	0.2	3	4			Max. a
	F		33	17						400 Milligals
27 Aug.	i	20	34	55					—	
	M			58	0.2	2.5	2.5			Max. a
	F		36	15						250 Milligals;
27 Aug.	eP	23	43	57					37	
	S		44	01						
	iL			04						
	M_1			07	0.5	3.5	5			Max. a
	M_{2E}			11	0.5	—	3.5			80 Milligals
	C			27						
	F		45	17						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	△ Km	Remarks
29 Aug.	iP	23	04	57					21	
	iS			59						
	iL		05	00						Max. a
	M			03	0.3	7.5	7			335 Milligals
	C			28						
	F		06	05						
30 Aug.	iP	9	43	49					32	
	iS			52						
	iL			54						
	M			56	0.2	7	8			Max. a
	C		44	16						800 Milligals
	F			54						
31 Aug.	iP	1	45	34					24	
	iS			36						
	iL			37						
	M			40	0.5	8	10			Max. a
	C		46	11						160 Milligals
	F			59						
31 Aug.	iP	8	08	57					20	
	iS			59						
	iL		09	00						Max. a
	M			01	0.5	26	34			500 Milligals;
	C			17						felt at Hilo
	F		18	41						

Date 1915	Phase	Hour h.	m.	s.	Period s.	Amplitude A_N μ	A_E μ	A_Z μ	Δ Km	Remarks
31 Aug.	iP	15	28	35					21	
	iS			37						Max. a
	iL			38						7500 Milligals;
	M			40	0.5	—	465			felt generally in the vicinity
	C‘		29	39						of the Observatory
	F		31	33						



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X.	Very disastrous	1000.0	2500.0
XI.	Catastrophic	2500.0	5000.0
XII.	Great catastrophe	5000.0	10000.0

Grade IV. is ordinarily the minimum perceived by the senses; and in grade XII. the acceleration, or rate of change of motion (jerk) reaches that of terrestrial gravitation.

In the standard form of report the maximum intensity or acceleration, designated by the symbol a, or max. a, is given in the conventional unit, the milligal. The milligal is a measure of acceleration, such that 1 milligal = 1/100 mm. per sec. per sec. = 10 μ per sec. per sec. The Cancani scale, here defined in terms of millimeters per sec. per sec., can therefore be expressed in milligals by multiplying each of the numbers by 100.