HAWAIIAN CLIMATOLOGICAL DATA.

By R. C. LYDECKER, Territorial Meteorologist.

Meteorological Observations at Honolulu, July, 1904.

The station is at 21° 18′ north, 157° 50′ west. It is the Hawaiian Weather Bureau station Punahou. (See fig. 2, No. 1, in the MONTHLY WEATHER REVIEW for July, 1902, page 365.)

Hawaiian standard time is 10^h 30^m slow of Greenwich time. Honolulu local mean time is 10^h 31^m slow of Greenwich.

The pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

Rainfall for twenty-four hours is measured at 9 a. m. local, or 7:31 p. m., Greenwich time.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m. Greenwich time, or 2:30 a. m. Honolulu time.									Total rainfall at 9 a. m., local time.
				Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	29.98	72	66.5	82	71	62.3	67	ne.	1-0	3	30.00	29.96	0.02
2	30.01	73	66	83	71	63.3	66	ne.	1-0	2	30.02	29.96	0.05
3	29.99	73	66.5	82	70	61.3	62	ne.	0-2	3	30.03	29.96	0.09
4	29.99	73	68	82	70	63.3	64	ne.	1-3	3-6	30.03	29.96	0.06
5	29.99	74	68	83	72	66.3	74	ne.	1-3	4	30.03	29.96	0.24
6	30.00	75	67.5	82	72	66.3	72	ne.	2	4	30.08	29.96	0.05
7	29.99	74	69.5	82	72	65.7	70	ne.	2-1	4	30.02	29.96	0.03
8	29.98	73	68	83	72	65.7	71	ne.	1	6-4	30.04	29.96	0.05
9	29.96	73	68	83	72	63.7	71	ne.-nne.	2-0	4	30.01	29.94	0.04
10	29.95	73	66.5	83	70	64.0	68	ne.	0-2	2	29.98	29.91	0.02
11	29.98	74	66.5	82	73	61.3	61	ne.	3-2	2	29.98	29.91	0.01
12	29.96	75	68	84	74	63.3	64	ne.	3-2	2	30.00	29.94	0.04
13	29.98	74	66	83	75	64.3	64	ne.	4-2	3	30.00	29.95	0.00
14	30.01	75	68.5	84	74	62.7	61	ne.	3-4	2	30.03	29.96	0.00
15	30.05	75	67	84	75	64.0	65	ne.	1-3	3	30.07	30.01	0.01
16	30.01	74	67	83	74	63.0	63	ne.	3-5	3-3	30.07	29.99	T.
17	29.95	70	68.5	83	72	63.7	68	ne.	3-0	3-7-1	30.02	29.93	0.22
18	29.92	73	68	82	69	65.7	77	ene.-ne.	0-1	8-4	29.97	29.90	0.01
19	29.95	76	68.5	83	73	66.0	72	ne.	1-2	2-6	29.99	29.91	0.12
20	30.00	75	68	84	73	65.0	65	ne.	2-0	7-4	30.01	29.94	T.
21	29.97	76	70.5	84	74	64.3	64	ne.	2-0	3-7	30.02	29.96	0.01
22	29.97	77	69	83	75	67.7	72	ne.	0-1	3	30.01	29.94	T.
23	29.98	76	68	84	76	64.3	64	ne.	0-3	4	30.02	29.96	0.00
24	29.97	76	67	84	75	63.3	62	ne.	1-3	3	30.01	29.96	0.00
25	29.98	75	67	83	75	62.0	60	ne.	2-4	3	30.02	29.96	0.01
26	29.96	74	66	83	72	62.7	63	ne.	1-3	3	29.99	29.92	0.05
27	29.96	75	67	83	71	62.3	61	ne.	2-4	3	29.98	29.94	0.00
28	29.97	73	69	84	75	64.0	64	ne.	1-3	1-5	29.99	29.92	T.
29	30.00	76	69	85	71	67.3	73	ne.	0-1	3-5	30.02	29.94	T.
30	29.98	73	70	85	71	66.3	70	ne.	2-0	2-7	30.03	29.97	0.44
31	29.94	74	69	82	71	68.5	79	ne.	1-0	4-8	30.00	29.93	0.52
Sums													2.09
Means	29.978	74.2	67.8	83.2	72.6	64.3	67.0		1.7	3-6	30.013	29.948	
Departure.	—.015					—0.7	—1.5						+0.30

Mean temperature for the month of July, 1904 (9 + 2 + 9), ÷ 3 = 77.1°; normal is 77.3°.
Mean pressure for the month of July, 1904, (9 + 3) ÷ 2 = 29.980; normal is 29.995.
* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4:31 p. m., Greenwich time. ‡ These values are the means of (6 + 9 + 2 + 9) ÷ 4. § Beaufort scale.
Maximum thermometer set at 9 p. m. and minimum at 2 p. m., local time.

GENERAL SUMMARY FOR JULY, 1904.

Honolulu.—Temperature mean for the month, 77.1°; normal, 7.73°; average daily maximum, 83.2°; average daily minimum, 72.6°; mean daily range, 10.6°; greatest daily range, 14° (28th and 39th); least daily range, 8° (several); highest temperature, 85° (28th and 29th); lowest temperature, 69° (17th).

Barometer average, 29.980; normal, 29.995; highest, 30.07 (24th and 15th); lowest, 29.90 (17th); greatest 24-hour change, that is from any given hour of one day to the same hour of the next, .07; lows passed this point, 10th, 17th, 18th, 26th, and 31st; highs, 14th and 15th.

Relative humidity average, 67.0 per cent; normal, 68.5 per cent; mean dew-point, 64.3°; normal, 65.0°; mean absolute moisture, 6.64 grains per cubic foot; normal, 6.81 grains.

Rainfall, 2.09 inch; normal, 1.79 inches; greatest rainfall in twenty-four hours, 0.52 inch (from 9 a. m. 30th to 9 a. m. 31st); rain record days, 21; normal, 19.

Trade wind days, 31; normal, 29; average force of wind, Beaufort scale and during daylight only, 1.7; average cloudiness, tenths of sky, 3.6; normal, 4.0.

Rainfall data for July, 1904.

Stations.	Elevation.	Amount.
HAWAII.		
HILO, e. and ne.	*Feet.*	*Inches.*
Waiakea	50	11.42
Hilo (town)	.....	.....
Puueo	.....	.....
Kaumana	1,250	19.16
Pepeekeo	100	10.11
Puuohua	.....	.....
Hakalau	200	13.82
Honohina	300	17.49
Puuohua	.....	.....
Laupahoehoe	500	27.61
Ookala	400	16.75
HAMAKUA, ne.		
Kukaiau	250	15.52
Paauilo	300	14.58
Paauhau	300	8.33
Paapau	1,150	11.05
Honokaa (Mill)	425	10.00
Honokaa (Meinicke)	1,100	10.49
Kukuihaele	700	10.21
KOHALA, n.		
Awini Ranch	1,100	14.52
Niulii	200	5.95
Halawa	450	.....
Kohala (Mission)	521	5.93
Kohala (Sugar Co.)	270	6.18
Hawi Mill	700	6.05
Puakea Ranch	600	3.98
Puuhue Ranch	1,847	4.70
Waimea	2,720	3.82
KONA, w.		
Huehue	2,000	2.70
Holualoa	1,350	9.93
Kaukahoku Leheula	.....	.....
Kainaliu	.....	.....
Kealakekua	1,580	8.68
Napoopoo	25	1.80
Hoopuloa	.....	.....
Hoopuloa	.....	.....
Puuwaawaa Ranch	.....	.....
Huehue	.....	.....
KAU, se.		
Kahuku Ranch	1,680	4.42
Honuapo	15	1.09
Naalehu	650	2.53
Hilea	310	0.40
Pahala	850	0.66
Volcano House	4,000	6.68
PUNA, e.		
Olaa, Mountain View (Russel)	.....	.....
Olaa Plantation (Mill)	.....	.....
Olaa (20 miles)	.....	.....
Kapoho	110	.....
Pahoa	600	17.06
MAUI.		
Lahaina	.....	.....
Waiopae Ranch	.....	.....
Kaupo (Mokulau), s	285	4.16
Kipahulu, s	308	5.07
Hana	.....	.....
Nahiku, ne	850	11.41
Nahiku	1,600	.....
Haiku, n	700	4.32
Kula (Erehwon), n	4,500	0.99
Kula (Waiakoa), n	2,700	.....
Puuomalei, n	1,400	3.40
Wailuku, ne	.....	.....
Paia	180	1.46
MAUI—*Cont'd.*	*Feet.*	*Inches.*
Haleakala Ranch	.....	0.55
LANAI.		
Keomuku	2,000	.....
OAHU.		
Punahou (W. B.), sw	47	2.09
Kulaokahua (Castle), sw	50	1.54
Makiki Reservoir	.....	.....
U. S. Naval Station, sw	6	1.24
Kapiolani Park, sw	.....	.....
College Hills	175	3.36
Manoa (Woodlawn Dairy), c	285	9.22
Manoa (Rhodes Gardens)	360	11.06
Insane Asylum	30	2.00
School street (Bishop), sw	.....	.....
Kamehameha School	.....	.....
Kalihi-Uka, sw	485	8.42
Nuuanu (W. W. Hall), sw	50	2.65
Nuuanu (Wyllie street)	250	4.41
Nuuanu (Elec. Station), sw	405	5.20
Nuuanu (Luakaha), c	850	12.06
U. S. Experiment Station	350	3.51
Kaliiula	.....	.....
Laniakea (Nahuina)	.....	.....
Tantalus Heights (Frear)	1,360	10.26
Waimanalo, ne	300	1.51
Maunawili, ne	300	3.47
Kaneohe	100	3.50
Ahuimanu, ne	350	5.69
Kahuku, n	.....	.....
Waialua	.....	.....
Wahiawa	900	1.70
Ewa Plantation, s	60	0.55
U. S. Magnetic Station	.....	.....
Waipahu	200	0.00
Moanalua	15	1.56
Pacific Heights	.....	.....
KAUAI.		
Lihue (Grove Farm), e	200	2.09
Lihue (Molokoa), e	300	3.19
Lihue (Kukaua), e	1,000	6.23
Lihue (Kilohana)	400	3.59
Kealia, e	15	1.33
Kilauea (Plantation), ne	325	3.84
Hanalei, n	10	10.01
Waioli	.....	.....
Haena	.....	.....
Waiawa	.....	.....
Eleele	150	0.92
Wahiawa (Mountain)	.....	.....
McBryde (Residence)	850	3.63
Lawai (Gov. Road)	450	5.50
Lawai, w	215	1.52
Lawai, e	800	4.09
Koloa	100	0.81
Lawai Beach	.....	1.94
Delayed reports.		
Waiawa	.....	0.29
Hawi Mill	.....	1.57
Hakalau	.....	8.14
Honohina	.....	9.16
Olaa Mill	.....	8.20
Kahuku	.....	0.45
Haleakala Ranch	.....	0.09
Hilo	.....	8.25
Lawai, w	.....	1.11
Kula (Erehwon)	.....	1.09
U. S. Magnetic Station	.....	0.41

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.

Approximate percentages of district rainfall as compared with normal: Hawaii, South Hilo, 134 per cent; North Hilo, 231; Hamakua, variable, from 186 at Paauhau to 384 at Kukaiau; Kohala, 150; Waimea, 153; Kona, 112; Kau, variable, from 23 at Hilea to 141 at Naalehu. Island of Maui, variable, from 59 at Haleakala Ranch to 130 at Paia Oahu: Honolulu district, 135; Nuuanu, 112; Koolau, 128; Ewa, 134. Kauai: Lihue, 128; Hanalei, variable, from 97 at Kilauea to 193 at Hanalei. As will be seen from the above, the rainfall throughout the group was, with but few exceptions, in excess of the normal, especially so in the North Hilo and Hamakua districts of Hawaii.

The heaviest monthly rainfall reported was at Laupahoehoe, Hawaii, 27.61 inches. The heaviest 24-hour rainfalls were at Ookala and Paauilo, Hawaii, 5.90 and 5.17 inches, respectively, on the 12th.

Kohala, dew-point, 67.0; relative humidity, 79.0 per ceut.

Ewa Mill, dew-point, 59.0°; relative humidity, 54.0 per cent; barometer average, 29.98 inches.

Temperature table for July, 1904.

Stations.	Elevation.	Mean max.	Mean min.	Cor. av'ge.	Highest.	Lowest.
	Feet.	°	°	°	°	°
Hilo	50	.....	.....	.....	.....	.....
Pepeekeo	100	78.2	69.2	73.0	81	67
Olaa Mill	210	.....	.....	.....	.....	.....
Kohala	521	78.7	67.8	72.5	80	65
Waimea	2,730	70.0	61.3	65.0	73	69
Volcano House	4,000	72.4	52.7	61.0	79	48
Waiakoa	2,700	.....	.....	.....	.....	.....
Keomuku	10	.....	.....	.....	.....	.....
Kinau Street (Castle)	50	83.9	72.8	77.1	86	68
United States Magnetic Station	50	.....	.....	.....	.....	.....
Ewa Mill	60	84.5	67.6	75.4	87	65
United States Experiment Station	350	84.9	70.9	77.5	88	69

Honolulu.—Lightning in ssw. on the evenings of the 6th and 7th; slight earthquake on 23d.

Reported from other stations: Pepeekeo, Hawaii: Hard earthquake shock at 1:55 p. m. on the 17th; snow still visible on mountain tops; bright morning glows at intervals; heavy surf 10th to 12th and 21st to 27th, inclusive; easterly winds throughout, force, 1.2; average cloudiness, 6.1. Kohala, trade winds all the month. Hilo, heavy earthquake on 17th.

COSTA RICAN CLIMATOLOGICAL DATA.

Communicated by Mr. H. PITTIER, Director, Physico-Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San José de Costa Rica, during June, 1904.*

Hours.	Pressure.		Temperature.		Relative humidity.		Rainfall.		
	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Duration, 1904.
	Inches.	*Inches.*	° *F.*	° *F.*	%	%	*Ins.*	*Ins.*	*Hrs.*
1 a. m	26.15	26.14	64.6	64.0	90	93	0.02	0.08	1.67
2 a. m	26.13	26.12	63.3	63.9	93	93	0.06	0.08	1.67
3 a. m	26.12	26.11	63.3	63.3	89	93	0.04	0.05	1.33
4 a. m	26.11	26.10	62.8	63.0	90	93	0.10	0.05	2.00
5 a. m	26.11	26.10	61.7	62.8	93	93	0.09	0.04	2.00
6 a. m	26.12	26.11	61.3	62.4	94	93	0.04	0.04	1.35
7 a. m	26.13	26.12	62.1	62.8	90	84	0.00	0.02	.....
8 a. m	26.14	26.13	66.0	66.9	79	84	0.00	0.02	.....
9 a. m	26.15	26.14	71.1	70.3	69	77	.....	0.03	.....
10 a. m	26.15	26.15	73.8	73.7	68	70	.....	0.06	.....
11 a. m	26.15	26.14	76.8	75.7	60	62	.....	0.06	.....
Noon	26.14	26.13	78.8	82.6	58	67	.....	0.15	.....
1 p. m	26.12	26.12	77.7	75.9	65	68	0.11	0.36	0.75
2 p. m	26.11	26.10	77.6	76.0	64	71	0.39	0.96	2.75
3 p. m	26.09	26.09	74.8	73.8	73	70	1.25	1.19	5.00
4 p. m	26.09	26.08	77.6	71.4	78	81	1.08	1.96	6.79
5 p. m	26.09	26.09	69.8	69.6	85	85	3.26	1.57	9.55
6 p. m	26.11	26.10	68.2	68.4	88	88	4.23	1.82	13.73
7 p. m	26.12	26.11	66.7	67.1	91	90	0.91	1.02	11.09
8 p. m	26.13	26.13	66.0	66.4	92	92	0.78	0.77	10.50
9 p. m	26.15	26.14	65.7	65.8	91	92	0.90	0.43	8.15
10 p. m	26.16	26.15	65.3	65.3	92	93	0.41	0.23	7.86
11 p. m	26.16	26.15	64.8	64.9	93	93	0.11	0.18	4.67
Midnight	26.16	26.15	64.4	64.6	93	93	0.10	0.09	3.42
Mean	26.13	26.12	68.5	68.2	82	85	.....	.....	.....
Minimum	26.05	26.01	58.3	55.8	36	.....	.....	.....	.....
Maximum	26.21	26.22	86.0	85.1	100	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....	13.98	11.26	94.28

REMARKS.—At San José the barometer is 3,835 feet above sea level. Readings are corrected for gravity, temperature, and instrumental error. The hourly readings for pressure, and wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The thermometers are 5 feet above ground and are corrected for instrumental errors. The total hourly rainfall is as given by Hottinger's self-register, checked once a day. Under maximum, the greatest hourly rainfall for the month is given. The standard rain gage is 5 feet above ground. Since January 1, 1902, observations at San José have been made on seventy-fifth meridian time, which is 0 hours, 36 minutes, 13.3 seconds *in advance* of San José local time. The normals for pressure, temperature, and relative humidity have been adjusted to this time; the normal for rainfall in Table 1 and the sunshine observations and normal in Table 2 refer to local time. At Port Limon the hours of direct observation are 8 a. m., 2 and 8 p. m., San José local time; the barometer is 14 feet above sea level. The means for temperature and relative humidity in Table 4 are obtained from two-hourly readings given by a Richard self-registering thermometer.

TABLE 2.—*San José, June, 1904.*

Time.	Sunshine.		Cloudiness.		Temperature of the soil at depth of—				
	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	6 inches.	12 inches.	24 inches.	48 inches.	120 inches.
	Hours.	*Hours.*	%	%	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*
7 a. m	10.41	9.76	50	60	70.2	71.1	71.8	71.4	70.7
8 a. m	19.48	17.55	.....	.....	.....	.....	.....	.....	.....
9 a. m	22.56	20.05	.....	.....	.....	.....	.....	.....	.....
10 a. m	22.49	20.14	70	67	70.3	70.7	70.3	71.2	.....
11 a. m	19.52	18.36	.....	.....	.....	.....	.....	.....	.....
Noon	16.40	14.14	.....	.....	.....	.....	.....	.....	.....
1 p. m	12.48	11.14	78	84	71.2	71.1	71.6	72.5	.....
2 p. m	8.69	10.39	.....	.....	.....	.....	.....	.....	.....
3 p. m	8.10	6.89	.....	.....	.....	.....	.....	.....	.....
4 p. m	6.22	4.22	97	94	71.6	71.4	71.8	71.2	.....
5 p. m	2.50	1.70	.....	.....	.....	.....	.....	.....	.....
6 p. m	0.84	0.56	.....	.....	.....	.....	.....	.....	.....
7 p. m	.....	.....	88	92	71.4	71.4	70.5	71.2	.....
8 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
9 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
10 p. m	.....	.....	84	81	71.2	71.4	71.8	71.2	.....
11 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
Midnight	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mean	.....	.....	71	80	71.1	71.2	71.8	71.2	70.7
Total	149.68	135.04	.....	.....	.....	.....	.....	.....	.....

TABLE 3.—*Rainfall at stations in Costa Rica, June, 1904.*

Stations.	Height above sea level.	Observed, 1904.		Averages.		
		Amount.	Number of days.	Number of years.	Amount.	Number of days.
	Feet.	*Inches.*			*Inches.*	
Sipurio (Talamanca)	197	8.74	15	4	8.94	19
Boca Banano	10	5.63	19	8	5.98	15
Port Limon	10	.....	.....	10	5.67	12
Swamp Mouth	10	.71	15	6	5.08	10
Zent	66	7.36	17	3	3.70	16
Siquirres	197	1.02	10	6	9.33	16
Dos Novillos	400	.....	.....	.....	.....	.....
Guapiles	984	9.45	16	4	10.95	16
Cariblanco (Sarapiqui)	2,740	.....	.....	6	20.79	27
San Carlos	528	19.33	24	6	13.11	21
Las Lomas	873	13.23	17	4	7.60	12
Peralta	1,089	1.18	22	6	13.11	20
Turrialba	2,034	.....	.....	9	10.39	17
Juan Viñas	3,412	1.73	23	8	7.48	17
Santiago	3,609	10.75	20	3	8.31	19
Paraiso	4,383	9.92	20	3	19.45	18
Cachi	3,346	.....	.....	3	10.20	21
Las Concavas	4,386	10.51	28	3	10.47	24
Cartago	4,761	6.50	11	3	12.40	24
Tres Rios	4,265	11.61	22	15	11.14	18
San Francisco Guadalupe	3,894	13.78	23	8	13.39	22
San José	3,806	13.98	22	15	11.26	23
La Verbena	3,740	13.35	23	8	12.48	25
Nuestro Amo	2,595	7.52	18	8	10.20	17
Alajuela	3,117	.....	.....	4	11.97	18
San Isidro Alajuela	4,416	11.77	20	3	16.61	25
Las Cañas	2,559	.....	.....	.....	.....	.....
Puntarenas	.....	5.47	18	.....	.....	.....

Notes on earthquakes.—June 9, 9^h 10^m a. m., slight shock NNE.-SSW., intensity IV, duration 3 seconds. June 12, 1^h a. m., very light shock NW.—SE., intensity I, duration 2 seconds; 5^h 20^m p. m., very brief shock N.-S., intensity II, duration 2 seconds.