doubtless proved more advantageous than otherwise by filling the mountain canyons with the drifting snow. With the exception of the northeastern quarter of the Territory, which has been unusually dry throughout the past fall and winter, the prairie soil at the present writing is in very good condition for the early start of spring grass, and there is every prospect for a good water supply.

Utah.—The snowfall of the month was excessive over the Great Salt Lake and the Sevier Lake watersheds and deficient over the watersheds of the Green and Colorado rivers. The fall over the Great Salt Lake watershed was remarkably heavy and exceeds that for any January since 1890. The depth of snow in the mountains of the State is generally above average and greater than for several years. High winds during the month caused the snow to drift nicely and the temperature conditions were favorable for packing. The amount of snow now in the mountains and its drifted and solid condition assure all sections of the State an abundant supply of water for irrigation throughout the whole of the coming crop season.

Wyoming.—The January snowfall was very unevenly distributed throughout the State, the northern and extreme eastern portions receiving but small amounts, while the western and southern counties received good falls. The marked deficiency of snow over the eastern slope of the Big Horn Mountains, noted in the December bulletin, still continues and reports from that section show that probably less than one-half of the usual depth now exists. Reports from the Laramie, Platte, Green, and Snake River watersheds show that a good stock of snow has already accumulated in the sections named, and depths are reported to be up to the average or above; in many localities the depths are much above the normal and a good supply of water for irrigation seems assured.

SPECIAL CONTRIBUTIONS.

HAWAIIAN CLIMATOLOGICAL DATA.

By CURTIS J. LYONS, Territorial Meteorologist.

OBSERVATIONS AT HONOLULU.

The station is at 21° 18′ N., 157° 50′ W. 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.

The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.

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.

Meteorological Observations at Honolulu, January, 1903.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m. Greenwich time, or 1:30 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	29.94	64	63.3	77	69	60.5	68	ne.	3	2	30.04	29.94	0.01
2	29.95	62	61.3	77	63	63.3	80	ne-n.	1-0	4	30.09	29.90	0.00
3	29.96	64	63.3	77	62	59.7	78	w.	1-0	3-0	30.00	29.91	0.00
4	30.04	67	59	76	62	63.0	84	w-nne.	0-3	6	30.07	29.94	0.02
5	30.08	65	57	72	66	52.0	59	nne.	4	4	30.14	30.04	0.00
6	30.04	60	56.5	72	62	52.0	63	ne.	3	3	30.10	30.02	0.00
7	29.90	70	64	74	56	55.0	67	e.	1-0	5-10	30.07	29.90	0.02
8	29.73	72	69.3	77	62	62.7	70	ssw.	3-4	8-2	29.92	29.72	0.22
9	29.92	63	59	75	67	62.3	77	w-nw.	4-0	10-2	29.91	29.72	0.00
10	29.90	67	64	75	57	56.5	74	nw.	1-0	3-0	29.98	29.86	0.00
11	29.87	69	68.5	75	59	66.3	86	se.	1-0	10	29.98	29.85	1.65
12	29.97	67	61.5	76	69	68.3	91	sw-w.	1-0	10-4	29.98	29.85	0.16
13	29.97	68	60.5	73	64	55.3	63	nne.	3	1	30.02	29.94	0.00
14	29.97	67	63	74	66	57.0	67	nne.	3	4-1	30.02	29.94	0.00
15	29.96	68	64	73	63	60.7	78	ne-n.	2-5	9-3	30.02	29.92	0.02
16	30.00	68	64.3	74	66	63.3	80	ne.	3	4	30.03	29.93	0.02
17	30.00	65	64	77	65	63.3	78	ne-se.	3	3	30.06	29.97	0.00
18	30.04	66	65.5	78	64	65.5	85	s.	2-0	4-1	30.07	29.97	0.00
19	30.06	62	60.7	78	65	66.0	85	s.	1-0	3	30.10	30.01	0.00
20	30.08	69	65.3	79	60	61.5	79	s.	0	3	30.14	30.01	0.00
21	30.07	71	65.5	79	63	65.3	80	s-e.	0	4	30.16	30.04	0.00
22	30.10	69	64	79	66	62.3	68	se-e.	1-0	5	30.16	30.07	0.00
23	30.05	65	62	78	63	61.7	74	se.	1-0	3	30.13	30.03	0.00
24	30.04	69	64	77	62	62.7	80	s-ne.	2-0	8-2	30.14	30.02	0.00
25	30.02	66	62.5	76	64	60.7	70	ne.	2	2	30.11	30.00	0.00
26	29.99	69	62	78	66	60.3	70	ne.	2-0	2	30.08	29.98	0.00
27	29.99	67	65.3	76	65	60.0	67	nne.	3-0	5-2	30.06	29.95	1.27
28	30.10	69	61	72	65	61.7	82	nne.	1-5	2-6	30.13	29.99	0.42
29	30.14	69	60.5	73	66	57.5	68	ne.	5-6	10-6	30.18	30.07	0.12
30	30.15	69	61	73	65	54.0	58	ne.	6-7	7	30.19	30.12	0.12
31	30.15	70	62	74	65	56.5	62	ne.	6-5	7	30.22	30.10	0.00
Sums													4.05
Means	30.006	67.0	62.7	75.5	63.5	60.5	73.8		2.1	4.5	30.074	29.958	
Departure	+.055					—2.2	—3.0			+0.1			+0.95

Mean temperature for January, 1903, $(6+2+9)\div 3=69.8$; normal is 70.2. Mean pressure for January, 1903, $(9+3)\div 2=30.02$; normal is 29.965.

* 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 $(6+9+2+9)\div 4$. § Beaufort scale.

Maximum thermometer set at 9 p. m. and minimum at 2 p. m., local time.

GENERAL SUMMARY FOR JANUARY, 1903.

Honolulu.—Temperature mean for the month, 69.8°; normal, 70.2°; average daily maximum, 75.5°; average daily minimum, 63.5°; mean daily range, 12.0°; greatest daily range, 19.0°; least daily range, 5°; highest temperature, 79°; lowest, 56°.

Barometer average, 30.020; normal, 29.965; highest, 30.22, 30th; lowest, 29.72, 8th; greatest 24-hour change, that is, from any given hour on one day to the same hour on the next, 0.17; lows passed this point on the 7th and 26th; highs on the 4th, 21st, and 30th.

Relative humidity average, 73.8 per cent; normal, 76.8 per cent; mean dew-point, 60.5°; normal, 62.7°; mean absolute moisture, 5.89 grains per cubic foot; normal, 6.27 grains. There was again an unusual period of low dew-point at the end of the month. Dew on grass, 12 mornings.

Rainfall data for January, 1903.

Stations.	Elevation.	Amount.	Stations.	Elevation.	Amount.
HAWAII.			OAHU.		
HILO, e. and ne.	*Feet.*	*Inches.*		*Feet.*	*Inches.*
Waiakea	50	3.39	Punahou (W. B.), sw	47	4.05
Hilo (town)	100	4.46	Kulaokahua (Castle), sw	50	2.56
Kaumana	1,250	.....	Makiki Reservoir	120	3.36
Pepeekeo	100	7.14	U. S. Naval Station, sw	6	0.91
Hakalau	200	8.88	Kapiolani Park, sw	10	2.30
Honohina	300	10.87	College Hills	175	2.70
Puuohua	1,050	20.52	Manoa (Woodlawn Dairy), c.	285	5.75
Laupahoehoe	500	13.76	Manoa (Rhodes Gardens)	360	7.37
Ookala	400	11.34	School street (Bishop), sw	.....	.....
HAMAKUA, ne.			Insane Asylum, sw	30	2.93
Kukaiau	250	12.96	Kamehameha School	75	.....
Paauilo	300	11.42	Kalihi-Uka, sw	485	6.95
Paauhau (Mill)	300	8.42	Nuuanu (W. W. Hall), sw	50	2.86
Honokaa (Muir)	425	9.07	Nuuanu (Wyllie street)	250	3.86
Honokaa (Meinicke)	1,100	.....	Nuuanu (Elec. Station), sw	405	4.05
Kukuihaele	700	11.44	Nuuanu (Luakaha), c	850	9.64
KOHALA, n.			U. S. Experiment Station	350	3.21
Niulii	200	.....	Laniakea (Nahuina)	1,150	5.26
Kohala (Mission)	521	3.72	Tantalus Heights	1,360	3.71
Kohala (Sugar Co.)	270	2.50	Waimanalo, ne	300	4.00
Hawi, Mill	700	2.81	Kaneohe	100	3.90
Puakea Ranch	600	2.88	Maunawili, ne	300	6.73
Puuhue Ranch	1,847	10.10	Ahuimanu, ne	350	6.79
Waimea	2,720	6.23	Kahuku, n	25	1.54
KONA, w.			Waialua	37	1.96
Holualoa	1,350	.....	Wahiawa	900	.....
Kealakekua	1,580	4.92	Ewa Plantation, s	60	1.39
Napoopoo	25	3.62	U. S. Magnetic Station	45	1.28
Hoopuloa	1,650	2.74	Waipahu	200	0.42
KAU, se.			Moanalua	15	4.46
Kahuku Ranch	1,680	.....	KAUAI.		
Honuapo	15	0.82	Lihue (Grove Farm), e	200	1.85
Naalehu	650	2.40	Lihue (Molokoa), e	300	2.30
Hilea	310	1.40	Lihue (Kukaua), e	1,000	2.22
Pahala	850	3.20	Kealia, e	15	1.23
Moaula	.....	.....	Kilauea, ne	325	2.40
Volcano House	4,000	4.24	Hanalei, n	10	3.51
PUNA, e.			Waioli	10	3.66
Olaa, Mountain View (Russel)	1,690	6.38	Haena	15	.....
Kapoho	110	11.07	Waiawa	32	2.22
Pahoa	600	7.15	Eleele	150	1.87
MAUI.			Wahiawa (Mountain)	3,000	6.95
Lahaina	40	0.20	McBryde (Residence)	850	3.16
Waiopae Ranch	700	.....	Lawai (Gov. Road)	450	2.03
Kaupo (Mokulau), s	285	4.31	Lawai, w	225	1.20
Kipahulu, s	308	5.07	Lawai, e	800	1.50
Nahiku, ne	.....	18.99*	Kola	100	0.71
Nahiku	1,600	.....			
Haiku, n	700	12.20	*Delayed December reports.*		
Kula (Erehwon), n	4,500	3.04	Wahiawa (Oahu)	.....	10.15
Kula (Waiakoa), n	2,700	2.35	Hawi (Kohala)	.....	13.91
Puuomalei, n	1,400	16.05	Laupahoehoe	.....	27.20
Paia	180	12.32	Waiopae	.....	4.99
Haleakala Ranch	2,000	.....	Nahiku	1,600	44.31
Wailuku, ne	250	7.32			

* Record from 1st to 20th only.

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

Rainfall, 4.05 inches; normal, 3.10 inches; rain record days, 12; normal, 16; greatest rainfall in one day, 1.65 inches, on the 11th; total at Luakaha, 9.64 inches; normal, 9.15 inches; total at Kapiolani Park, 2.30 inches; normal, 2.00 inches.

The artesian well level rose during the month from 34.57 to 35.06 feet above mean sea level. January 31, 1902, it stood at 33.95. The average daily mean sea level for the month was 9.71 feet, the assumed annual mean being 10.00 feet above datum. For January, 1902, it was 9.90.

Trade wind days, 15 (5 of north-northeast); normal, 14. Average force of wind during daylight, Beaufort scale, 2.1. Average cloudiness, tenths of sky, 4.5; normal, 4.4.

Approximate percentages of district rainfall as compared with normal: Hilo, 65 per cent; Hamakua, 160 per cent; North Kohala, 70 per cent; Waimea (Hawaii), 170 per cent; Kona, 140 per cent; Kau, 50 per cent; Puna, 50 per cent; Maui, southeast exposures, 100 per cent; north exposure, 200 and over; Oahu, about 100 per cent; Kauai, 55 per cent.

The heaviest rainfall for the month was 20.52 inches; Puuohua (Nahiku, 1660 feet), not heard from; heaviest 24-hour rainfall, 6.94 inches, Nahiku, 850 feet, 13th.

Mean temperature table.

Stations.	Elevation.	Mean max.	Mean min.	Cor. av'ge.
	Feet.	°	°	°
Pepeekeo	100	75.4	66.3	70.1
Waimea	2,730	73.6	53.6	63.0
Kohala	521	75.1	62.9	68.3
Waiakoa	2,700	70.6	53.6	61.5
United States Magnetic Station	50	77.5	61.6	69.0
United States Experimental Station	350	76.3	64.5	69.8
Tantalus	1,725	71.1	59.3	64.5
Hilo	40	80.2	64.0	71.4

Kohala, Bond, dew point, 61°; relative humidity, 77 per cent; United States Magnetic Station, dew point, 61.0°; relative humidity, 75 per cent.

The month was characterized by two principal storms, the rains of the 11th from southeast and the rain of the 27th followed by a northerly gale. The coincidence of these, with corresponding storms in the previous month, is worth noting.

Heavy surf on Hawaii windward coast, 1st to 6th, 9th, and 27th to 31st.

Earthquake noted at Hilo, Waimea, and Kohala on the 3d between 7:20 and 7:25 a. m.

Solar haze and afterglow occasionally remarked.

No lightning noted.

The month of January was stormy throughout the Pacific judging from reports of vessels traveling here; northeasterly storms appeared to have extended even south of the equator.

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——.

Science. New York. Vol. 17.

Ward, R. DeC. Report of the Chief of the Weather Bureau. [Note.] Pp. 235-236.

Ward, R. DeC. Similar Barometric Variations over Large Areas. [Note on investigations of Norman Lockyer, W. S. Lockyer, and F. H. Bigelow.] P. 236.

Ward, R. DeC. Winter Aridity Indoors. [Note on article by Mark S. W. Jefferson.] P. 236.

Scientific American Supplement. New York. Vol. 55.

Walker, E. O. Atmospheric Electricity and Earth Currents. Pp. 22658-9.

Nature. London. Vol. 67.

MacDowall, Alex. Sun-spots and Summer Heat. P. 247.

Jensen, H. I. Remarkable Meteorological Phenomena in Australia. Pp. 344-345.

Engineering News. New York. Vol. 49.

—— The Movement of Sand on Beaches by winds of different velocities. [Note on observations by Mr. James H. Bacon.] P. 117.

Aeronautical Journal. London. Vol. 7.

Shaw, William Napier. Contributions of Balloon Investigations to Meteorology. Pp. 8-13,

National Geographical Magazine. Washington. Vol. 14.

Murdoch, L. H. Why Great Salt Lake has fallen. Pp. 75-77.

American Journal of Science. New Haven. 4th series. Vol. 15.

Barus, C. Ionization of Water Nuclei. Pp. 105-121.

La Nature. Paris. 31me Année.

Gall, J. F. Installation météorologique de l'hôpital de Pau. P. 128.

Ciel et Terre. Bruxelles. 23me Année.

Rocquigny-Adanson, G. de. Époque de la floraison du "Camellia japonica L." dans le centre de la France. Pp. 537-546.

Rocquigny-Adanson, G. de. Sur l'origine des "Mistpoeffers." P. 581.

Geographische Zeitschrift. Leipzig. 9 Jahrgang.

Maurer, Hans. Deutsch-Ostafrika. Pp. 1-20.

Gaea. Leipzig. 39 Jahrg.

—— Das Klima der geologischen Vergangenheit. Pp. 123-124.

—— Bericht über die internationale Experten-Konferenz für Wetterschiessen in Graz. Pp. 151-166.

—— Der Drachenaufstieg am 6 Dezember 1902 von aëronautischen Observatorium bei Berlin. Pp. 183-184.

Laska, W. Das Wetter und die Telegraphendrahte. Pp. 184-185.

Das Wetter. Berlin. 20 Jahrgang.

Frenbe, —. Ein landwirtschaftlicher Wetterdienst. Pp. 2-8.

Assmann, Richard. Der Gang der Isotherme 0° im Verlaufe des diesjährigen Winters. Pp. 8-19.

Meteorologische Zeitschrift. Wien. Band 19.

Liznar, J. Ueber die Aenderungen des Grundwasserstandes nach den vom Prälaten Gregor Mendel in den Jahren 1865-1880 in Brünn ausgeführten Messungen. Pp. 537-543.

Maurer, H. Das Klima von Deutsch-Ostafrika. Pp. 543-548.

Stolberg, A. Verhalten der Rheintemperaturen in den Jahren 1895-1900. Pp. 548-552.

Draenert, F. M. Zum Klima des Staates Ceará, Brasilien. Pp. 522-560.

—— Resultate der meteorologischen Beobachtungen zu Carmen (Patagonien) im Jahre 1900. P. 560.

Exner, F. M. Versuch einer Berechnung der Luftdruckänderungen von einem Tage zum nächsten. P. 560.

—— Meteorologische Beobachtungen auf der Insel Martinique im Jahre 1899. P. 561.

—— Temperatur der Lena bei Golowskaja. Pp. 561-562.

Steiner, L. Zum "Flächensatz." Pp. 562-564.

—— Giusseppe Zettwuch über die blaue Farbe des Himmels. Pp. 564-565.

Woeikof, A. Intensität und Dauer der Platzregen. Pp. 565-566.

—— Deformationen der Sonnenscheibe und grüner Strahl beim Sonnenuntergang. P. 566.

—— Auffallende Abenddämmerung. P. 566.

Shaw, W. N. La lune mange les nuages. Pp. 566-570.

Richter, C. M. Das Klima von Santa Barbara. Pp. 570-574.

—— Ueber die Beziehung des Luftdruckes an Stationen der Ostseite des Atlantischen Oceans. Pp. 574-575.

—— Partielle Regenmessung. P. 575-576.

—— Sonnenfinsterniss-Meteorologie. Pp. 576-577.

—— Die Anticyklone Sibirien. P. 577.

Duffek, —. Bemerkungen zur Frage über Vorgänge bei Gewittern. Pp. 577-578.

—— Die effektive Temperatur der Sonne. Pp. 578-580.

Rörig, Adolf. Waldungen und Hagelfälle. Pp. 580-581.

H[ann], J[ulius]. Magnetische Beobachtungen in Aegypten 1893-1901. P. 581.

—— Meteorologische Beobachtungen in Kete-Kratyi, Togo. Pp. 581-583.

Mouromtzoff, Peter von. Merkwürdige Hagelform. P. 583.

Memorias y Revista de la Sociedad Cientifica "Antonio Alzate." Mexico. Tome 13.

Guzman, José. Utilidad de las variaciones barométricas en el pronostico del tiempo. Pp, 215-230.