

winter months, except in the east Gulf States, along the Atlantic coast generally, in the lower Lake region, upper Ohio Valley, and northern portion of the upper Lake region. That storms are less frequent in March in portions of the Great Lakes is not entirely borne out by the figures given in Professor Garriott's Bulletin K, Storms of the Great Lakes (of which he kindly permitted me to see the proof sheets), as for the 25-year period 1876-1900, December shows 35 storms, January 16, February 14, and March 22. In this Bulletin, however, only very severe storms, dangerous to shipping, were considered.

March windstorms, apparently, are not the ones most frequently attended with snow, for only at Boston and St. Paul were they so. No snow occurred with the March storms at Charleston. The December storms were most frequently attended with snow at Montgomery; the January, at Buffalo, Dodge, Galveston, Marquette, Nashville, and Omaha; and during February at the remaining stations.

It will, perhaps, surprise many persons to learn that the windstorms of the winter months and March, are generally attended with temperatures above the normal, and in numerous instances the proportion of temperatures above normal on windy days over those of below normal temperatures, is quite marked. In January the greater proportion of strong winds were attended with temperatures below normal at Montgomery and New York; in February at Boston, Chicago, Indianapolis, Montgomery, New York, Pittsburg, and St. Paul; in March at Boston, Montgomery, and New York; and during all the four months at Omaha and Galveston, the proportion at the latter city being quite marked.

The idea that if March comes in like a lion it will go out like a lamb, or vice versa, is not borne out by the figures, for on both the first and last days of the same month the wind did not reach the verifying velocity from 70 to 95 per cent of the time at the various stations. The greatest number of times March came in stormy was six at Marquette; and went out under like conditions the same number of times at Norfolk.

The number of times the wind reached the verifying velocity at the various stations, at the time of the vernal equinox, March 21, ranged from one to six, or from 5 to 30 per cent of the time.

A WATERSPOUT OFF HATTERAS.

By Mr. THOMAS B. HARPER.

Mr. T. F. Townsend, Local Forecast Official, forwards several photographs of waterspouts, taken by Mr. Thomas B. Harper of Philadelphia, and observed off the Hatteras Lightship, on the afternoon of April 26, 1903. Although the photographs, owing to the absence of any means for determining the true dimensions of the spouts, do not add to our knowledge any definite numerical details, yet the general description given by Mr. Harper is worthy of reproduction and reads as follows:

In reply to your request I take pleasure in inclosing you photographs of the waterspouts which occurred off Hatteras Lightship, about 3:15 p. m., April 26, 1903, on the north edge of the Gulf Stream, as seen from steamship *Watson*.

There were 5 distinct spouts in all; we were about 6 miles, a little south of east, of the lightship at the time, steaming about north; the wind had shifted in the early morning from about northeast to strong southwest; the rainstorm formed about noon, we were running into a light rain about 3 p. m.; it was, however, raining hard north and east of us. The storm was a well-defined line north and south, with a clear sky to west, with strong wind coming out of northwest. After the storm struck us we followed the storm for sometime, the spouts being on our port for over half an hour. The last one that formed finally worked so close to us that we were compelled to turn quickly to starboard and run due south; the spout worked so close to us that the steamer cleared it less than one-quarter of a mile. It was then so dark overhead that the negatives did not show the spout, although we were so close we could hear the roar of the wind, and see the swirl and suction of the column of water from the surface. As the spout passed us the temperature fell from 75° to 55° in a few minutes, with strong northwest wind.

The photos show views of two other spouts, the first one being too far off to photograph. We had in full view, at one time, three distinct spouts within one to one and one-half miles.

HAWAIIAN OLIMATOLOGICAL 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, May, 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.			
	Dry bulb.	Wet bulb.	Temperature.		Means.	Wind.		Average cloudiness.	Sea-level pressures.					
			Maximum.	Minimum.		Prevaling direction.	Force.		Maximum.	Minimum.				
1	30.00	†	†	82	67	66.7	82	se-ne.	2	†	30.06	29.99	0.03	
2	30.01	73	67.5	81	67	66.0	77	s-ne.	2	†	30.06	29.96	0.00	
3	30.04	68	65.5	82	70	63.7	67	ne.	3	4	30.09	29.99	0.00	
4	30.03	68	64	82	67	62.3	70	w-ne.	1-3	6-1	30.08	30.00	0.00	
5	30.04	72	65.3	80	66	60.3	65	nne.	3	4-1	30.08	29.99	0.03	
6	30.02	72	65	80	67	60.3	64	ne.	4-5	4-1	30.10	29.99	0.02	
7	30.04	71	64	80	71	61.3	66	ne.	4-5	3-7	30.09	30.01	0.04	
8	30.05	70	64.5	79	67	60.0	63	ne.	4-5	4	30.11	30.01	0.05	
9	30.05	71	65	78	68	61.7	68	ne.	4	4	30.11	30.02	0.05	
10	30.07	67	63	80	69	62.0	67	ne.	3	3-5	30.12	30.03	0.02	
11	30.04	70	65	80	66	60.5	67	ne.	3-1	3-3	30.12	30.04	0.02	
12	30.01	72	65	78	69	61.3	70	ne.	2-0	5-3	30.06	30.00	0.00	
13	30.04	72	67	81	68	60.5	62	ne.	3	4	30.09	30.00	0.05	
14	30.03	72	67.5	80	70	64.3	72	ne.	3-5	5	30.10	30.02	0.01	
15	29.99	73	67	81	71	63.5	67	ne.	4	3	30.06	29.97	0.00	
16	30.01	67	65	81	69	64.7	72	se-ne.	1-0	7-3	30.06	29.97	0.00	
17	30.02	68	66.5	81	66	65.7	80	sw-n.	1-0	6	30.08	30.00	0.04	
18	29.99	72	70	82	68	65.5	72	s-ne.	1-0	5-2	30.05	29.97	0.20	
19	29.98	72	67	81	67	67.0	76	s-ne.	1	6-2	30.05	29.98	0.05	
20	29.95	70	68	78	71	67.0	80	s-ne.	1-0	3-0	30.03	29.96	0.36	
21	29.99	74	67.5	83	68	67.0	78	se-ne.	2-0	3-4	30.02	29.94	0.02	
22	30.04	74	69	82	72	65.0	70	ne.	3-0	5	30.09	29.99	0.05	
23	30.06	73	65	81	71	64.0	68	ne.	4	5	30.14	30.04	0.02	
24	30.06	72	67	80	72	60.5	62	ne.	5	3	30.12	30.04	0.04	
25	30.05	73	66	80	70	63.3	67	ne.	5	5-3	30.12	30.04	0.03	
26	30.04	73	66	79	72	63.0	68	ne.	5	4	30.09	30.02	0.06	
27	30.03	73	66	80	69	63.3	71	ne.	5	4	30.14	30.04	0.17	
28	30.07	72	67	77	70	64.3	74	ne.	5	3	30.13	30.06	0.11	
29	30.04	72	65	79	69	63.3	69	ne.	4	7	30.08	30.02	0.11	
30	30.05	73	64.5	80	70	61.5	64	ne.	3-4	4	30.09	30.00	0.06	
31	30.10	72	67.5	79	70	61.5	65	ne.	4	4	30.15	30.06	0.22	
Sums..														1.86
Means	30.032	71.3	66.1	80.0	69.0	63.2	69.7		3.0		30.089	30.005		
Departure..	+0.015					-0.7	-2.8							-0.82

Mean temperature for the month of May, 1903, (6 + 2 + 9) ÷ 3 = 74.2°; normal is 74.2°. Mean pressure for the month of May, 1903, (9 + 3) ÷ 2 = 30.044; normal is 30.029.

* 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 MAY, 1903.

Honolulu.—Temperature mean for the month, 74.2°; normal, 74.2°; average daily maximum, 80.0°; average daily minimum, 69.0°; mean daily range, 11.0°; greatest daily range, 15°; least daily range, 6°; highest temperature, 83°; lowest, 66°.

Barometer average, 30.044; normal, 30.029; highest, 30.15, lowest, 29.94; greatest 24-hour change, that is, from any given hour on one day to the same hour on the next, 0.06; lows passed this point 15th to 22d; highs, 10th, 23d, and 31st.

Relative humidity average, 69.7 per cent; normal, 72.5 per cent; mean dew-point, 63.2°; normal, 63.9°; mean absolute moisture, 6.39 grains per cubic foot; normal, 6.53 grains.

Rainfall, 1.86 inches; normal, 2.68 inches; rain record days, 25; normal, 19; greatest rainfall in one day, 0.36, on the 20th; total at Luakaha, 6.94; normal, 9.25; at Kapiolani Park, 0.27; normal, 1.17.

The artesian well water level fell during the month from 34.75 to 34.65 feet above mean sea level. May 31, 1902, it

stood at 33.85. The average daily mean sea level for the month was 9.65 feet, the assumed annual mean being 10.00 feet above datum. For May, 1902, it was 9.66.

Trade wind days, 26, (1 NNE.); normal, 24; average force of wind during daylight, Beaufort scale, 3.0. Average cloudiness, tenths of sky, 4.8; normal, 4.4.

Rainfall data for May, 1903.

Table with columns: Stations, Elevation, Amount. Includes sub-sections for HAWAII, MAUI-Cont'd, OAHU, HAMAKUA, KOHALA, KONA, KAU, KAUAI, and MAUI.

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: Hilo, 63 per cent; Hamakua, 26; Kohala, 43; Waimea, 57; Kona, 77; Kau, 62; Puna, 83; Maui, 66; Oahu, 57; Kauai, 38. The heaviest 24-hour rainfalls for the month were at Kaumana, 1.94; Puuhua, 1.90, on the 22d; and at Rhodes Gardens, Manoa, 1.80, 20th. Heaviest monthly rainfall, Mountain View, Olaa, 11.70 inches.

Kohala dew-point average, 63.9°; humidity, 76.1 per cent; Magnetic Station, 63.6° and 67.0 per cent.

The unusually large meteor mentioned in April report as having been seen at Hilo on the 30th of that month is reported from Pepeekeo as having burst high in air over the latter place,

Hawaiian rainfall for the year 1902.

Table with columns: Stations, Elevation, Rain, Normal. Includes sub-sections for HAWAII, MAUI-Cont'd, HAMAKUA, KOHALA, KONA, KAU, KAUAI, and MAUI.

* January and February interpolated from Nahiku 900. NOTE.—Maui stations are many of them comparatively new, consequently no normals.

Summary for the year 1902, Honolulu, H. I.

Table with columns: Months, Pressure at sea level, Temperature, Humidity, Wind. Includes sub-sections for Direction and Force.

Normal pressure, 9 a. m. + 3 p. m. ÷ 2 = 29.988. Normal temperature, 6 a. m. + 2 p. m. + 9 p. m. ÷ 3 = 74.0. Mean maximum + mean minimum ÷ 2 = 74.2. The mean pressure at Greenwich 0° is the same as the mean of 9 a. m. + 3 p. m. ÷ 2. * Under winds: NE. includes E; SE. includes S; SW. includes W. and NW. includes N. The force is on the Beaufort scale. † 6 a. m. + 2 p. m. + 9 p. m. ÷ 3. ‡ 6 a. m. + 9 a. m. + 2 p. m. + 9 p. m. ÷ 4.

leaving a trail like a narrow cloud for some length of time. Thunder at Pepeekeo, May 1. Snow on Mauna Loa 21st. Heavy surf 15-19, 23-28.

The rainfall of 1902 was extraordinary in amount in all districts, Naalehu and Hilea in Kau and Waiawa in Kauai being the only exceptional stations, while at some points the rainfall was more than twice the normal.

Figures in black type indicate that one or two months are missing from the year's record, but are interpolated from adjacent stations. Where three or more months are lacking the station is omitted from this list.

Mean temperature table for May, 1903.

Stations.	Elevation.	Mean max.	Mean min.	Cor. av'ge.
	<i>Feet.</i>	o	o	o
Pepeekeo	100	76.8	68.3	71.9
Hilo	40	84.3	66.5	74.7
Kohala	521	77.5	65.6	70.9
Waimea	2,730	70.4	58.3	63.7
Waialoa	2,700	83.6	55.9	69.0
United States Magnetic Station	50	83.8	67.1	74.8
United States Experimental Station	350	80.6	68.5	74.2
Waikiki	15	80.8	70.5	75.0

HIGH WINDS AT POINT REYES LIGHT, CAL.

By Mr. W. W. THOMAS and Prof. A. G. McADIE.

Mr. W. W. Thomas, Observer, Point Reyes Light, Cal., through Prof. Alexander G. McAdie, communicates tables and charts comparing together the wind velocities during two memorable gales at the former station in May, 1902, and 1903. He adds: "It is believed that the record of an average hourly movement of the air, exceeding 50 miles per hour, for a period of nine consecutive days (May 13-23, 1903) is unparalleled in the records of the Weather Bureau." Professor McAdie says: "I have added a few notes giving the air movement at Point Lobos, Cal., San Francisco, Mount Tamalpais, and Southeast Farallon, as the grouping of the stations makes it possible to discuss the air movement at sea level, on the ocean, a little above sea level on headlands, and at a height of half a mile on Tamalpais."

Two memorable northwest gales at Point Reyes Light, Cal.

Date.	Average velocity, miles per hour.				Daily movement.		Maximum velocity.	Extreme velocity.	Time of maximum velocity.
	0 to 6 a. m.	6 a. m. to 12 noon.	12 noon to 6 p. m.	6 p. m. to 12 midnight.	Total.	Average hourly.			
1902.									
May 13.....	7	4	11	10	Miles. 188	Miles. 8	Miles. 16	16
14.....	11	14	12	22	347	14	23	30
15.....	29	31	31	36	756	31.5	45	50
16.....	39	38	46	58	1,086	45	75	80	10:30 p. m.
17.....	64	54	67	78	1,580	66	90	96	7:00 p. m.
18.....	75	70	79	88	1,876	78	110	120	8:50 p. m.
19.....	59	45	59	64	1,360	57	75	80	7:00 p. m.
20.....	40	27	31	52	905	38	57	62	10:45 a. m.
21.....	34	12	11	22	474	20	48	50	12:50 a. m.
22.....	21	7	9	12	291	12	27	29
23.....	17	7	10	15	287	12	26	30
1903.									
May 13.....	13	9	11	35	410	17	48	50	10:15 p. m.
14.....	51	39	47	55	1,153	48	64	66	9:00 p. m.
15.....	43	44	63	78	1,371	57	89	93	7:55 p. m.
16.....	72	60	65	82	1,673	70	94	98	9:55 p. m.
17.....	62	42	51	67	1,339	56	89	92	12:05 a. m.
18.....	58	52	48	59	1,247	52	68	70	12:10 a. m.
19.....	45	45	47	50	1,124	47	60	62	12:15 a. m.
20.....	42	42	50	50	1,103	46	58	60	3:50 a. m.
21.....	47	47	53	57	1,227	51	64	66	8:45 a. m.
22.....	42	39	39	45	986	41	59	61	11:30 a. m.
23.....	47	19	18	30	679	28	52	54	12:45 a. m.

As the diagram accompanying Mr. Thomas's communication is but little more instructive than the tabular data, we refrain from publishing it; the proper fractions given by Mr. Thomas have been omitted as the nearest whole figure is sufficient; the maximum hourly velocities are the averages for five minutes;

the extreme hourly velocities are deduced from the records for single miles. The table referred to by Professor McAdie will be found on page 220.—C. A.

LANTERN SLIDES.

Dr. O. L. Fassig communicates the following list of lantern slides that he has had made for his lectures on meteorology at Baltimore, Md. Duplicates of the slides marked "n" (negatives) can be furnished those who desire them at the rate of 25 cents each; a negative and slide will cost 50 cents. If any item includes many slides the corresponding number is given.

1. Whirling alto-stratus.
- 1 n. Umbrella cloud. MONTHLY WEATHER REVIEW. 1902.
- 1 n. Diurnal barometric wave, North America and South America.
- 1 n. Diurnal barometric wave, path of center.
1. Solar halo, Columbus, Ohio.
- 1 n. Cluster of snow crystals.
2. The "Umbria" after a snowstorm.
- 2 n. Effect of heavy snow on trees.
- 1 n. Effect of hailstorm on corn field.
1. Distant view of tornado.
- 1 n. Fake tornado.
- 2 n. New Richmond tornado.
- 1 n. Louisville tornado, March 27, 1890.
- 3 n. West Indian hurricane, 8 a. m., August 7, 8, and 13, 1899.
- 1 n. Galveston hurricane, September 8, 1900. (Isobars.)
- 1 n. Typical storm area, February 28, 1902, 8 a. m.
- 3 n. Typical Gulf storm, February 20, 21, and 22, 1902.
- 3 n. Typical Lake storm, December 24, 25, and 26, 1902.
- 1 n. Storm tracks and storm frequency.
- 2 n. Storm tracks, January and February, 1903, United States.
- 1 n. Daily weather map, United States. Typical low area in Mississippi Valley.
- 1 n. Paths of highs and lows across the United States with rate of progress.
- 1 n. Flat map, June 15, 1896, 8 a. m.
- 1 n. Normal temperatures in United States, January.
- 1 n. Normal temperatures in United States, July.
- 3 n. Baltimore daily weather, 1871-1902; February 22, March 4, and July 4.
- 1 n. Baltimore normal daily temperature; average maximum, minimum, and barometer.
- 1 n. Baltimore temperatures; daily ranges and extremes.
- 1 n. Baltimore monthly temperature departures, 1817-1902.
- 1 n. Diurnal variation of temperature at Baltimore on clear, cloudy, and rainy days.
- 1 n. Relation between temperature and wind direction January, April, July, and October, at Baltimore.
- 1 n. Diurnal and annual changes of wind velocity at Baltimore.
- 1 n. Diurnal variation of temperatures at Baltimore as affected by wind velocity.
- 1 n. Baltimore rainfall probability; 5-day means, daily and average amounts.
- 1 n. Normal daily temperatures at Baltimore, April 20-June 28.
- 1 n. Sun-spot frequency and temperatures at Baltimore.
- 1 n. Unusual succession of rainy Sundays, Baltimore, September, 1902, to February, 1903.
6. Fog billows, San Francisco, Cal.
- 1 n. The moon and the weather.
- 1 n. The coronal period and meteorological and magnetic phenomena.
- 1 n. Sun-spot frequency and temperature, rainfall, hail, and vintages.
- 1 n. Sun-spot frequency and magnetic declination.
1. Marvin's kite meteorograph.
22. Typical cloud forms.
- 1 n. Typical cumulus. Hann.
- 1 n. Thunderhead, Java.
- 1 n. Typical cloud forms arranged in order of occurrence. (Inward.)
- 4 n. Hail clouds.
- 1 n. Ideal cross section of hail cloud.
- 4 n. Hail stones.
- 1 n. Hail shooting in Italy.
- 1 n. An aurora, Germany, eighteenth century.
- 1 n. Solar halo and mock suns.
- 1 n. Solar halo, seventeenth century.
25. Snow crystals.
1. Snow under the equator.
1. Lightning flashes.
1. Tree struck by lightning.
- 1 n. Approaching tornado. Frank Leslie's Weekly.
- 1 n. Tornado, Germany, sixteenth century.
- 1 n. Waterspouts, Florida coast.
- 1 n. Sun-spot frequency and June temperature at Bremen.
- 1 n. Rynmann's Wetterbuechlein. Edition of 1510, Augsburg.