

MONTHLY WEATHER REVIEW.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for April, 1902, is based on reports from about 3,100 stations furnished by employees and voluntary observers, classified as follows: Regular stations of the Weather Bureau, 162; West Indian service stations, 13; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Railway Company, 96; Hawaiian Government Survey, 200; Canadian Meteorological Service, 33; Jamaica Weather Office, 160; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3; Costa Rican Service, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander W. H. H. Southerland, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San Jose, Costa Rica; Capt. François S. Chaves, Director of

the Meteorological Observatory, Ponta Delgada, St. Michaels, Azores; W. M. Shaw, Esq. Secretary, Meteorological Office, London; and Rev. Josef Algué, S. J., Director, Philippine Weather Service.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is $157^{\circ} 30'$, or $10^{\text{h}} 30^{\text{m}}$ west of Greenwich. The Costa Rican standard of time is that of San Jose, $0^{\text{h}} 36^{\text{m}} 13^{\text{s}}$ slower than seventy-fifth meridian time, corresponding to $5^{\text{h}} 36^{\text{m}}$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

A remarkable succession of areas of low barometric pressure that appeared in the West and Northwest, swung south of east over the central valleys and moved thence north of east to the Atlantic coast, continued through February and March, and ended with an energetic storm that passed northeastward over the Atlantic States from April 7 to 10. This change in storm types inaugurated spring weather generally east of the Rocky Mountains. The first pronounced warm wave of the season appeared, however, during the third decade of the month, when an area of extensive heat advanced from the Rocky Mountains to the Atlantic coast. On the 22d, when the crest of this warm wave reached the Atlantic States, a cool wave with snow overspread the Northwest, and during the following two days the cooler weather advanced to the north Atlantic coast. Following this cool wave a storm of marked strength passed rapidly from the middle Plateau region to the Great Lakes, and moved thence with diminishing force over the Canadian Maritime Provinces, attended generally over the interior of the country east of the Rocky Mountains by rain and high winds.

On April 1 north Atlantic weather was controlled by two areas of low atmospheric pressure. One of these was central north of Scotland, with reported barometer 29.00 inches at Sumburg; the other covered the Canadian Maritime Provinces, with minimum barometer below 29.20 inches. The barometer

rose slowly over the eastern Atlantic until the 5th, when the area of low barometer noted on the 1st over the Canadian Maritime Provinces, crossed the British Isles. By the morning of the 6th this disturbance had reached the west coast of continental Europe between the fiftieth and fifty-fifth parallels.

From the 8th to the 12th the barometer fell steadily in the vicinity of the Azores, to 29.70 inches at Horta, Fayal, and on the latter date a well-defined disturbance was central between the Azores group and Portugal. During the 13th and 14th this disturbance apparently moved slowly south of east, and on the 14th its center passed south of Lisbon. From the 13th to the 15th the center of a low barometer area that crossed northern Scotland occupied longitudes that corresponded closely with those covered by this southern disturbance.

An area of low barometer, already referred to as having inaugurated a type of spring disturbances in the United States, advanced from Lake Superior to Newfoundland from the 11th to the 14th. From the 15th to the 17th it followed an easterly course over mid ocean. On the 18th its approach to Europe was indicated by reports from the west coast of Ireland, and from the 19th to the 22d it moved slowly northeastward off the west coast of Ireland and Scotland, with reported barometric pressure 29.28 inches on the 22d. A disturbance of slight intensity moved eastward from Florida on the 18th, passed near

Bermuda on the 20th, and north of the Azores on the 24th, with barometer 29.48 inches at Horta, Fayal; it advanced thence south of east to a position north of Lisbon by the 27th, with barometer 29.40 inches at Lisbon, after which it disappeared over southern Europe.

In the interest of eastward bound transatlantic steamers forecasts of weather and the direction and force of the wind from the American coast to the Banks of Newfoundland were issued twice daily from Washington. Ample and timely warnings were given of gales that visited the Atlantic, Pacific, and Gulf coasts, and the Great Lakes.

The following extract from the Portland, Oreg., Telegram, of April 30, comments on the storm that visited that section the night of the 28th and during the 29th, and the warnings that were issued in advance of its arrival:

The alertness of the Weather Bureau in anticipating a severe storm by sending out warnings and the good accomplished by these warnings was given a practical demonstration Monday, when the local office telegraphed its marine stations up and down the coast to be on the watch for a southwest gale, and in less than eight hours after the warnings were issued the storm swept over the coast in all its fury; but for the fact that fishermen and others were prepared for it, much damage and probably loss of life would have resulted.

In the central and northern districts vegetation was not sufficiently advanced to be seriously affected by the cold and frost of the month, and the occurrence of frost in the Southern States was anticipated by the forecasts and warnings.

The display of storm warnings on the Great Lakes and on Lake Pepin was resumed for the season April 1.

BOSTON FORECAST DISTRICT.

Severe northeast gales prevailed during the 8th and 9th, and high winds and gales from the 26th to the 30th, for which timely warnings were given. There were no gales without warnings.—*J. W. Smith, Forecast Official.*

NEW ORLEANS FORECAST DISTRICT.

No severe weather conditions occurred in any part of the district during the month.—*I. M. Cline, Forecast Official.*

CHICAGO FORECAST DISTRICT.

The severest storms occurred during the third decade of the month when a great deal of damage was done to vessels on the lakes, and to buildings and property in the upper Mississippi and lower Missouri valleys. Shipping on the Great Lakes was warned of the approach of these storms. Remarkably high temperatures, with high winds, prevailed in Nebraska, Kansas, and northwest Missouri on the 20th. Frost warnings were issued for parts of the middle-western States on the 16th, 22d, 23d, and 26th.—*F. J. Wals, Local Forecast Official.*

DENVER FORECAST DISTRICT.

Light frost occurred on a number of dates and was, as a rule, accurately forecast.—*F. H. Brandenburg, Forecast Official.*

SAN FRANCISCO FORECAST DISTRICT.

The month was one of frequent but not very heavy rainfall, and was unusually free from frost injurious to budding fruit.—*A. G. McAdie, Professor.*

PORTLAND, OREG., FORECAST DISTRICT.

Light to moderately heavy frost was of frequent occurrence, and was, as a rule, accurately forecast. Notable storms, for which timely warnings were issued, occurred in the first and third decades of the month.—*E. A. Beals, Forecast Official.*

HAVANA FORECAST DISTRICT.

No special forecasts or warnings were issued during the month.—*W. B. Stockman, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocity.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.										
I	*31, p. m.	50	107	3, p. m.	32	65	Miles.	Days.	Miles.	Miles.
II	3, a. m.	51	104	5, a. m.	36	87	2,975	3.0	992	41.3
III	6, a. m.	53	108	5, a. m.	46	60	1,550	2.0	775	32.3
IV	6, p. m.	34	118	8, a. m.	48	76	2,100	2.0	1,050	43.8
V	11, a. m.	37	122	16, a. m.	39	75	1,175	2.0	588	24.5
VI	21, a. m.	53	108	13, a. m.	46	118	3,825	9.5	403	16.8
VII	26, a. m.	37	100	26, p. m.	46	60	900	2.0	450	18.8
				30, a. m.	48	54	3,400	5.5	618	25.8
							2,725	4.0	681	28.4
Sums							18,650	30.0	5,557	231.7
Mean of 8 paths							2,331		695	29.0
Mean of 30 days									623	26.0
Low areas.										
I	1, a. m.	45	123	7, a. m.	47	54	4,250	6.0	708	29.5
II	3, p. m.	51	120	6, p. m.	45	83	1,975	3.0	658	27.4
III	5, p. m.	32	106	6, p. m.	38	75	2,425	3.0	808	33.3
IV	7, a. m.	51	120	11, a. m.	45	64	3,200	5.5	582	24.2
V	10, p. m.	47	97	8, p. m.	53	105	800	1.5	533	22.2
VI	17, a. m.	60	110	20, a. m.	47	71	1,400	2.0	700	29.2
VII	17, a. m.	60	110	20, a. m.	47	71	2,275	3.0	758	31.6
VIII	18, a. m.	48	124	24, a. m.	46	60	3,600	6.0	600	25.0
IX	23, p. m.	39	120	27, p. m.	48	68	2,725	4.0	681	28.4
X	26, p. m.	53	105	29, a. m.	48	89	1,250	2.5	500	20.8
	27, a. m.	38	114	30, a. m.	46	78	2,475	8.0	825	34.4
Sums							26,375	39.5	7,353	306.0
Mean of 11 paths							2,398		668	27.8
Mean of 39.5 days									668	27.8

*March.

For graphic presentation of the movements of these highs and lows see Charts I and II.—*Geo. E. Hunt, Chief Clerk, Forecast Division.*

RIVERS AND FLOODS.

In the Mississippi River, above the mouth of the Ohio, the average stages were somewhat lower than during the preceding month, while in the lower river, at least below Memphis, Tenn., they were 2 to 10 feet higher, the comparatively high stages of the preceding month having been prolonged by the moderate tides in the Ohio River that passed Cairo, Ill., on the 8th, and again on the 21st. The crest of this latter rise passed down the upper Ohio from the 10th to the 15th, reaching Cincinnati on the latter date. It afforded an opportunity for the issue of a few local flood warnings, and passed off without doing any damage.

Excellent navigable stages were the rule over nearly all the rivers, and the season on the upper Mississippi was opened throughout by the arrival on the 7th, at St. Paul, Minn., of the steamer *Cyclone*, the first boat through Lake Pepin from the south.

Nothing further of particular interest occurred except the flood of March 28–April 10 in the lower Tennessee River and its tributaries. The following report on this flood was made by Mr. P. H. Smyth, Official in charge of the United States Weather Bureau office at Cairo, Ill.:

The flood in the Duck and lower Tennessee rivers, although not extensive nor of long duration, was very destructive in its effects on account of its suddenness.

The rise was almost simultaneous with the falling of phenomenally heavy rains over southwestern Tennessee and northern Alabama. The heavy rainfalls over those sections for the twenty-four hours ending at 7 a. m., March 29, 1902, were as follows: Riverton, Ala., 7.15 inches; Columbia, Tenn., 4.40; Florence, Ala., 2.07; Johnsonville, Tenn., 1.59.