MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for December, 1903, is based on data from about 3300 stations, classified as follows:

Weather Bureau stations, regular, telegraph and mail, 166; West Indian Service, cable and mail, 15; River and Flood Service, 52, river and rainfall, 177, rainfall only, 62; voluntary observers, domestic and foreign, 2565; total Weather Bureau Service, 2962; Canadian Meteorological Service, by telegraph and mail, 20, by mail only, 13; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 75; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25; The New Panama Canal Company, 5; Central Meteorological Observatory of Mexico, 20 station summaries, also printed daily bulletins and charts, based on simultaneous observations at about 40 stations; Mexican Federal Telegraph Service, printed daily charts, based on about 30 stations.

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, Territorial Meteorologist, and Mr. R. C. Lydecker, Acting Territorial Meteorologist, Honolulu, H. I.; 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 José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; Rev. José Algué, S. J., Director, Philippine Weather Service; and H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; Señor Enrique A. Del Monte, Director of the Meteorological Service of the Republic of Cuba.

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° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard of time is that of San José, $0^h\ 36^m\ 13^s$ slower than seventy-fifth meridian time, corresponding to $5^h\ 36^m$ 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.

During the first and second decades of the month prevailing low barometric pressure over the British Isles was attended by a succession of severe gales over the eastern Atlantic. During a greater part of the third decade there was a reversal of the usual barometric pressures over western Europe, the barometer being high over northwestern and low over southwestern European countries. This abnormal distribution of pressure produced unusually low temperatures over central and southwestern Europe. During the period of low pressure over the British Isles the barometer continued relatively high in the vicinity of the Azores, and several depressions that crossed the eastern part of the United States with a moderate show of energy increased in intensity as they advanced over the Atlantic in high latitudes.

In the United States the storms of the first two decades of December lacked seasonal intensity, a fact that may, perhaps, be attributed to the peculiar barometric conditions, referred to, that existed to the eastward. During the third decade, however, two storms of marked severity advanced from the westward across the New England coast. The principal storms of the month on the Great Lakes occurred on the 12th and 19–20th. The storms of the Gulf of Mexico and Pacific coast were not attended by gales of marked severity.

Ample and timely warning was given United States ports of the high winds of the month.

The first cold wave of December appeared over the British Northwest Territory on the 11th; extended over the central valleys on the 12th, carrying the line of zero temperature to southern Illinois and southern Indiana; covered the Ohio Valley and the Lake region on the 13th, with freezing temperature in the interior of the west Gulf States, and extended over the interior of New England during the 14th. A cold wave that appeared over Manitoba on the 24th extended southward and southeastward carrying the line of zero temperature nearly to the Ohio River by the morning of the 26th, and reached the middle and east Gulf and Atlantic coasts on the morning of the 27th, with freezing temperature as far south as Tampa, Fla. During the 29th and 30th a cold wave advanced from the eastern part of the British Northwest Territory over the Ohio Valley and the Lake region.

Frequent frosts were reported on the middle and east Gulf coasts, in central and northern Florida, and parts of California. Killing frost occurred at Mobile, Ala., on the 3d, at New Orleans, La., and Pensacola, Fla., on the 27th, and at Red Bluff, Cal., on the 7th. Heavy frost occurred as far south as Tampa, Fla., on the 4th, 7th, 22d, 28th, and 30th, at San Francisco, Cal., on the 9th, at Los Angeles, Cal., on the 22d, and at Fresno, Cal., on the 8th, 10th, 15th, 18th, 26th, 28th, and 30th.

Timely warnings were issued to all interests affected by cold waves and frosts.

The Sugar Planters' Journal, New Orleans, La., January 2, 1904, remarks editorially, in part, as follows, regarding the frost warnings issued to sugar planters in Louisiana:

During the late sugar campaign we were again given an example of the inestimable value the local Weather Bureau is to the sugar planters of this State, which class of agriculturalists are more benefited than any other through the warnings issued by the Bureau in question.

BOSTON FORECAST DISTRICT.

The storm of the 20th–21st was severe, and the gales and heavy seas that attended it caused shipping to seek harbors of safety. The storm of the 26–27th was also severe, especially along the southern coast, where shipping was imperiled and several lives were lost. Timely warnings of the gales resulted in much benefit to shipping and other interests.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.

No severe gales occurred. Warnings were issued on the 12th for a general cold wave over the greater part of the district, and the warnings were fully justified. Ample warning was also given of other frosts and freezing temperatures that occurred in the sugar and trucking districts during the month.—*I. M. Cline, District Forecaster.*

CHICAGO FORECAST DISTRICT.

As a rule warnings were issued far in advance of the cold waves of the 11th to 13th, 21st–22d, 25–26th, and 29–30th, and advices were issued in advance of the snowstorms of the 12th, 25th, and 28th. Timely and ample warning was given shipping interests of the high winds and gales of the month. The month was unusually free from lake disasters, and it is probable that the storm warnings were, in many cases, a great benefit.—*H. J. Cox, Professor and District Forecaster.*

DENVER FORECAST DISTRICT.

No severe storms or cold waves occurred, and the month was generally mild and dry.—*F. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.

On the 7th a disturbance over lower California resulted in nearly one-third of an inch of rain at San Diego. With this exception the month was one of prolonged fair weather.—*A. G. McAdie, Professor and District Forecaster.*

PORTLAND, OREG., FORECAST DISTRICT.

The month was unusually quiet on the north Pacific coast, the only storms of consequence occurring on the 1st, 14th, 15th, and 19th. In each instance storm warnings were displayed well in advance of the storms. No severe cold weather occurred.—*A. B. Wollaber, Acting District Forecaster.*

RIVERS AND FLOODS.

At the end of December the Mississippi River was frozen from the headwaters to a short distance below the mouth of the Des Moines River. It remained open, however, during the first half of the month, except in the vicinity of Leclaire, Iowa, where it was closed during the entire month. From Hannibal to Cairo there was much heavy floating ice, and navigation between St. Louis and Cairo was suspended on the 9th. No ice was reported below Cairo.

The Missouri River was closed as far south as Sioux City, Iowa, and by the 7th of the month it had closed practically to Omaha. It did not close below, although floating ice was observed almost daily.

There were large quantities of ice in the Ohio River and its tributaries, necessitating the suspension of navigation at various points, particularly above Cincinnati. Many gorges were reported between Wheeling and Cincinnati, but they passed away without unusual incident.

The rivers of New England, except the Housatonic and the extreme southern Connecticut, were generally closed, except where kept open by artificial means. The Hudson River from Albany northward and the Mohawk River were frozen solid, and at the end of the month there were 10 inches of ice at Albany and the ice harvest was in progress.

The upper Susquehanna at Wilkesbarre closed on the 16th for the first time during the present season, and at Harrisburg on the 17th. The ice moved out five days later, but on the 28th the river at Wilkesbarre was again frozen over. At Lockhaven, Pa., the west branch of the Susquehanna was frozen during the entire month, and at Williamsport from the 15th to the 21st. The Juniata River was also icebound during the greater portion of the month.

There was considerable ice in the Potomac River and its tributaries, and by the end of the month the Shenandoah and upper Potomac were practically closed. A little ice was observed on the 18th and 19th in the upper Roanoke River, and this was about the southern limit of ice for the month.

In all the rivers the stages of water were about normal for the season and afforded no features of special interest.

The highest and lowest water, mean stage, and monthly range at 194 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, District Forecaster.*

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.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	2, p. m.	48	122	5, p. m. 8, a. m.	43 38	108 80	950 3,800	3.0 5.5	317 691	13.2 28.8
II	10, a. m.	28	97	13, a. m.	46	60	2,600	3.0	867	36.1
III	13, p. m.	50	107	16, a. m.	38	87	1,750	2.5	700	29.2
IV	15, a. m.	53	105	19, p. m.	42	70	2,200	4.5	489	20.4
V	18, a. m.	37	122	21, p. m.	28	83	2,850	3.5	814	33.9
VI	21, a. m.	53	105	23, p. m.	35	75	2,300	2.5	920	38.3
VII	25, a. m.	53	108	28, a. m.	27	80	2,700	3.0	900	37.5
VIII	27, a. m.	51	104	29, p. m.	46	60	2,900	2.5	1,160	48.3
IX	28, p. m.	53	105	*1, a. m.	30	82	2,550	3.5	728	30.0
Sums							24,600	33.5	7,586	316.0
Mean of 10 paths							2,460		758	31.6
Mean of 33.5 days									734	30.6
Low areas.										
I	1, a. m.	54	114	5, a. m.	48	68	2,650	4.5	589	24.5
II	5, p. m.	51	114	8, a. m.	45	64	2,550	2.5	1,020	42.5
III	7, p. m.	32	100	10, p. m.	48	68	2,425	3.0	808	33.7
IV	8, a. m.	53	105	9, p. m.	42	87	1,150	1.5	767	32.0
V	10, p. m.	47	112	13, p. m.	46	60	3,100	3.0	1,033	43.0
VI	17, a. m.	39	120	21, a. m.	47	65	3,250 3,625	4.0	812 906	33.8 37.8
VII	19, p. m.	50	120	23, a. m.	48	53	3,175	3.5	907	37.8
VIII	24, a. m. 24, p. m.	54 28	114 97	26, p. m.	46	60	3,050 2,500	2.5 2.0	1,220 1,250	50.8 52.1
IX	25, p. m.	54	114	28, a. m.	46	60	2,625	2.5	1,050	43.8
Sums							30,100	29.0	10,362	431.8
Mean of 11 paths							2,736		942	39.3
Mean of 29.0 days									1,038	43.2

*January.

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