

In the southern portions of Georgia and Alabama and over the Florida Peninsula the temperature averaged slightly below normal, also over western Texas and the greater part of New Mexico, Arizona, and Utah.

The extremes of temperature for the year from all regular stations and from a limited number of cooperative stations in the United States and Canada are shown on Chart IX.

An examination of the chart shows that the extremes of temperature were, as a rule, well within the limits of former years.

Maximum temperatures of 100° or higher were recorded in the upper Missouri Valley, at scattered points in the Gulf States, in central and western Texas, over the southern portions of New Mexico and Arizona, and the central portions of California, Oregon, and Washington.

Minimum temperatures of 30° below zero or lower were confined to portions of northern New England, northern Minnesota, North Dakota, and to the elevated stations of the central Rocky Mountain district.

#### PRECIPITATION.

The annual precipitation for 1906 is shown on Chart IV. Over the districts east of the Rocky Mountains, lines have been drawn showing approximately the amounts of precipitation over the areas inclosed. Over the western Mountain and Pacific coast districts, on account of the diversified topography and the consequent variations in the annual fall, no attempt has been made to show the annual amounts by isohyets, and figures representing the actual amounts have been entered at the respective points of observation.

The enormous variations possible in the amounts of fall at points in close proximity are shown on the above-mentioned chart. Over the southern flanks of the Appalachian Mountains, in western North Carolina, and northern Georgia, the precipitation ranged from 75 to nearly 130 inches, while on the opposite slopes scarcely one-half of those amounts was recorded.

Also near the coast of northern Oregon amounts as high as 140 inches fell on the western slopes of the Coast Range, at elevations not above 2500 feet, which were twice the amounts measured at the level of the sea.

The departure of the annual precipitation for 1906 from the normal is shown on Chart XI.

Lines showing the amounts of departure have been drawn where sufficient uniformity existed in the signs, otherwise figures representing the actual departures were entered.

The total precipitation for 1906 was below the normal along the Atlantic coast from Virginia to central Florida, and over the Gulf coast from western Florida to Texas. The deficiency on the immediate coast line was very marked, ranging from more than 12 inches at Hatteras to nearly 20 inches at New Orleans. Precipitation was also deficient over New England, New York, Pennsylvania, the Lake region, central Mississippi, and lower Missouri valleys, and over the north Pacific coast districts.

In marked contrast with the deficiency along the Atlantic and Gulf coasts, the amount of fall over the Appalachian Mountain region from Pennsylvania southward to the central parts of the east Gulf States, and in a narrow strip westward over Alabama, northern Mississippi, central Arkansas, and northern Texas, ranged from 5 to as much as 25 inches above the average.

Precipitation was also in excess over practically all the Great Plains district from central Texas to North Dakota, over the entire Rocky Mountain and Plateau districts, and the Pacific coast from central Oregon to southern California.

The annual fall was especially heavy over central and northern Texas and the central and western portions of Oklahoma, Kansas, and Nebraska, where amounts from 10 to 12 inches above the normal were recorded.

In the central Rocky Mountain States, northern New Mexico, Arizona, Nevada, and central and southern California, the excesses were generally large, altho at isolated points the amounts were less than the average.

The year was one with rainfall in general sufficient for all ordinary requirements, and generally well distributed thru the growing season. An unusual amount of cloudy weather was the rule in nearly all districts, and the relative amount of moisture was generally in excess of the average.

#### DISTANT EARTHQUAKES RECORDED AT THE WEATHER BUREAU DURING THE YEAR 1906.

By C. F. MARVIN, Professor of Meteorology. Dated March 6, 1907.

This summary gives details of the records of all the earthquakes recorded by the Bosch-Omori seismograph in Washington, D. C., during 1906. In all cases the origin of these disturbances was at least hundreds and in most instances many thousands of miles distant from Washington; in fact, this type of seismograph is adapted to record only the so-called distant earthquakes.

Thus far the Weather Bureau has not maintained seismographs at any station except at Washington, D. C., and no organized effort is made to collect seismic observations. It therefore results that in many cases the origin of the earthquakes recorded is not known and can not be identified, except of course in the few instances where the earthquakes were accompanied by great calamities and are consequently reported in the public press.

The Weather Bureau has maintained some form of seismograph in operation in Washington almost continuously since 1886, but during the earlier years the record is quite incomplete, owing to the imperfect character of the instruments employed and to gaps in the records resulting from the removals of the office of the Weather Bureau, and other causes.

As stated in the MONTHLY WEATHER REVIEW, Vol. XXXI, p. 125, one pendulum of the Bosch-Omori seismograph was installed first during February, 1903. In the early part of 1906 this pendulum was moved to more spacious quarters, where, together with its companion pendulum, it could be installed in a much better and more permanent fashion, and both components of horizontal motion have been recorded continuously since April 22, 1906. The reader is referred to the MONTHLY WEATHER REVIEW, Vol. XXXI, p. 271, and Vol. XXXIV, p. 212, for further particulars in regard to the instruments themselves.

The year 1906 has probably been as notable as any in history for the number and disastrous nature of the great earthquakes that occurred. It is certain that within recent years no similar loss of life and devastation of populous centers of civilization has been recorded. These facts do not in themselves, however, justify a conclusion that there has been a distinct increase in the annual number of earthquakes; it has simply happened that the origin of many of the great seismic disturbances has occurred within thickly populated districts. In this connection it is very important to bear in mind that the secondary effects of earthquakes, such as fire in the one case and great tidal waves in the other, are often immediate causes of vastly greater disasters than the earthquake itself.

On the morning of January 31, 1906, seventy-fifth meridian time, the greatest earthquake thus far recorded on the seismographs at the Weather Bureau occurred in Colombia, South America, and several of the submarine cables in the Caribbean Sea connecting Colombia with the West Indian Islands were severed. This disturbance appears to have been accompanied by a great tidal wave, as shown by some of the press dispatches.

At this date no great earthquake had occurred within the United States since the Charleston earthquake, and it would seem that the horrors of such great disasters were almost forgotten. At any rate, the press of the country contained only a few scanty notices of this severe South American disaster,

and the attention of the people of the United States was not aroused to the fact that a great earthquake had occurred just beyond the borders of their own territory.

A very considerable earthquake was also recorded during the afternoon of April 10 that has not yet been identified, and doubtless occurred far out at sea or remote from populous human habitations. Three days later another great earthquake occurred in the island of Formosa, attended by great losses of life and property, but receiving slight attention from the public generally.

Immediately following these severe seismic convulsions came the great Californian disturbance, namely, on April 18. According to the best information now available the first perceptible tremors occurred at the fault-line, a few miles to the west of

San Francisco at 5 h., 12 m., 0 sec., and the strong motion set in about thirty seconds later.

A very full report will be published in the near future by the Carnegie Institution, presenting the results of the investigation of the California earthquake, made by the commission appointed by Governor Pardee for that purpose.

The International Seismological Bureau at Strassburg has undertaken to collect all possible data relating to the Valparaiso earthquake of August 17, 1906, to lay before the delegates at the meeting in the fall of 1907.

It is not within our province, at the present time, to enter upon a discussion of the detailed features of any of these great earthquakes other than those set forth in the accompanying summary.

Summary of earthquakes recorded by the Bosch-Omori seismograph at Washington, D. C., during 1906.

Date.	Component, N.-S. or E.-W.	Seventy-fifth meridian time.					Duration of--				Period of pendulum.	Magnification of record.	Maximum double amplitude of actual displacement of pier.	Remarks.
		First preliminary tremors began.	Second preliminary tremors began.	Principal portion began.	Principal portion ended.	End of earthquake.	First preliminary tremors.	Second preliminary tremors.	Principal portion.	Earthquake.				
1906.		<i>h. m. s.</i>	<i>h. m. s.</i>	<i>h. m. s.</i>	<i>h. m. s.</i>	<i>h. m. s.</i>	<i>m. s.</i>	<i>h. m. s.</i>	<i>m. s.</i>	<i>h. m. s.</i>	<i>Sec.</i>	<i>Times.</i>	<i>mm.</i>	
January 2, p. m.	E.-W.	9 11 1		9 55 56	10 01 06	10 10 06			5 10	1 * *	21	10		Not recorded on N.-S. component.
January 21, a. m.	E.-W.	9 12 40		9 38 40		10 10 10					28	10		Too small to measure.
	E.-W.	9 12 50	9 21 15	9 35 00	9 48 00	10 54 00	8 25	0 13 45	13 00	1 41 10	23.5	10	0.12	Primary disturbance.
	E.-W.	1 55 27		2 01 32	2 09 13	*		0 06 05	7 41	*	28	10	0.19	Do.
	E.-W.	1 55 30		2 02 48	2 07 48	*		0 07 18	5 00	*	26	10	0.30	Second disturbance, too indefinite to make out.
January 24, a. m.	E.-W.			2 25 32	2 29 22*				3 50		28	10	0.10	Do.
	E.-W.	2 34 22		2 41 45	2 49 47	3 03 27		0 07 23	8 02	0 29 05	28	10	0.12	Third disturbance.
	E.-W.	2 35 17		2 43 23	2 50 13	3 07 20		0 08 06	6 50	0 32 03	26	10	0.20	Do.
	E.-W.	4 56 37		4 59 17	5 01 43	5 33 25		0 02 40	2 26	0 36 48	28	10	0.08	Fourth disturbance.
	E.-W.	4 55 30		4 59 47	5 01 32	5 31 43		0 04 17	1 45	0 36 13	26	10	0.13	Do.
January 25, p. m.	E.-W.	*		3 46 40	3 50 00*	3 56 45*			3 20		28	10	0.09	This record very ill-defined.
	E.-W.	3 41 30		3 49 05	3 51 10	3 55 00		0 07 35	2 05	0 13 30	26	10	0.18	
January 27, a. m.	E.-W.	5 06 42	5 10 30	5 13 27	5 29 32	6 16 37	3 48	0 02 57	16 05	1 09 55	28	10	0.13	
	E.-W.	5 06 28	5 10 03	5 12 00	5 29 30	6 11 30	3 40	0 01 52	17 30	1 05 02	26	10	0.19	
January 31, a. m.	E.-W.	10 43 28		10 50 06	11 29 36	2 48 30		0 06 38	39 30	4 05 02	30	10	+	Pen left sheet.
	E.-W.	10 43 12		10 49 22	11 20 00	2 40 25		0 06 10	30 38	3 57 13	25	10	+	Do.
February 18, p. m.	E.-W.	9 26 05	9 37 00	9 59 28	10 13 38	11 21 30	10 55	0 22 23	14 10	1 55 25	51	10	0.40	In room No. 26.
	E.-W.	9 26 22		9 59 26	10 14 17	11 15 52		0 33 04	14 51	1 49 30	10.6	30	0.10	In room No. 45.
March 3, a. m.	E.-W.	3 47 03	3 51 05	3 50 59	3 54 58	5 05 02		0 03 56	3 59	1 17 50	51	10	1.55	In room No. 26.
	E.-W.	3 47 01		3 53 42	3 57 14	4 53 32	4 04	0 02 37	3 32	1 06 31	10.6	30	1.80	In room No. 45.
March 10, a. m.	E.-W.	2 34 00		2 37 00	2 43 00	3 1 10		0 03 00	6 00		51	10	0.10	In room No. 26.
	E.-W.	2 34 00		2 39 00	2 42 00			0 05 00	3 00		11	30		New instrument, room No. 45.
March 29, a. m.	E.-W.	4 58 27		5 02 17	5 10 00	5 15 00		0 03 50	7 43	0 16 33	33	10	0.05	In room No. 26.
April 18, a. m.	E.-W.	8 19 20	8 25 00	8 29 38	8 41 00	12 35 20	5 40	0 04 38	11 22	4 16 00	32	10	40.00*	In room No. 26, San Francisco quake.
April 18, p. m.	E.-W.	7 39 55		7 44 45	7 46 10	8 40 10		0 01 50	1 25	1 00 10	35	15	7.00	After shock of San Francisco quake.
April 19, a. m.	E.-W.	2 54 00		2 59 00	3 05 00	4 04 00		0 05 00	6 00	1 10 00	35	15	0.06	
April 23, a. m.	E.-W.	4 22 30		4 28 30	4 31 36	5 1 10		0 06 00	3 06	0 40 *	30	15	0.13	
	E.-W.	4 22 30		4 28 16	4 33 00	5 1 10		0 05 46	4 44	0 40 *	31	10	0.21	
May 4, p. m.	E.-W.	7 38 43		7 46 13	7 56 00	8 30 00		0 07 30	9 47	0 51 17	30	15	0.05	
	E.-W.	7 38 43		7 46 03	7 54 00	8 39 00		0 07 20	7 57	1 00 17	31	10	0.10	
May 31, p. m.	E.-W.	11 59 29	0 10 08	0 33 28	0 45 58	2 15 30	16 39	0 23 20	12 30	2 22 01	30	15	0.71	
June 1, a. m.	E.-W.	11 53 28		0 34 35	0 47 33	2 03 28		0 41 07	12 58	2 10 00	33	10	0.48	
June 6, p. m.	E.-W.	9 58 21		10 01 48	10 07 51	10 58 21		0 03 27	6 03	1 1 10	30	15	0.07	
	E.-W.	9 53 52		10 01 45	10 05 30	10 29 00		0 07 53	3 45	0 35 08	30	10	0.10	
June 9, a. m.	E.-W.	7 06 20		7 25 05	7 37 00	8 25 00		0 18 45	11 55	1 18 40	30	15	0.09	
	E.-W.	7 03 50	7 16 10	7 26 57	7 35 00	8 00 00	12 20	0 10 47	8 03	0 56 10	30	10	0.07	
June 19, p. m.	E.-W.	9 00 00*	9 32 44	9 36 46	9 43 25	10 20 10		0 04 02	6 39	1 1 10	30	15	0.30	
	E.-W.	9 18 30	9 32 36	9 36 46	9 42 36	10 19 51	4 06	0 04 10	5 50	1 01 21	33	10	0.12	
June 21, p. m.	E.-W.	10 21 40		10 27 13	10 33 00*	10 50 50		0 05 33	5 47	0 28 20	30	15	0.07	
	E.-W.	10 20 50		10 27 00	10 32 40	10 50 00		0 06 10	5 40	0 29 10	32	10	0.05	
	E.-W.	2 00 08		2 03 35	2 07 00	2 20 10			3 25		30	15	0.06	
	E.-W.			2 03 25	2 06 00	2 15 00		0 03 22	2 35	0 14 57	32	10	0.07	
June 22, a. m.	E.-W.			2 31 10	2 33 10						32	10		Very slight wave movement.
	E.-W.			2 30 10	2 31 10						30	15		
	E.-W.	2 59 10				3 13 10					32	15		Too small to define.
	E.-W.	2 57 10*				3 02 50*					30	10		
June 24, a. m.	E.-W.	6 51 49		7 29 14	7 47 20	8 53 14		0 37 25	18 06	2 01 25	32	15	0.17	
	E.-W.	6 51 49		7 29 34	7 39 14	8 43 36		0 37 45	9 40	1 51 47	35	10	0.08	
June 26, a. m.	E.-W.	7 28 54		7 32 04	7 34 42	7 52 34		0 03 10	2 38	0 23 40	30	15	0.07	
	E.-W.	7 28 50		7 31 14	7 33 44	7 52 29		0 02 24	2 30	0 23 39	35	10	0.09	
June 27, a. m.	E.-W.	4 00 00												Details can not be made out.
	E.-W.	4 03 00												Do.
	E.-W.	4 00 00									32	15		Lines crowded by tilting, record undecipherable.
July 1, p. m.	E.-W.	4 02 12				4 14 12				0 12 00	35	10		Slight disturbance of doubtful character.
	E.-W.	9 50 12				10 20 12				0 30 00	32	15		Record not clear, second disturbance.
	E.-W.	10 02 27				10 11 12				0 08 45	35	10		Record doubtful, second disturbance.
July 2, a. m.	E.-W.	0 00 47	0 20 32	0 23 12	0 33 00			0 19 45	2 40	0 32 13	35	10		Very small, doubtful; no record on N.-S. component.
	E.-W.	6 54 47		6 08 55	6 21 10	6 35 40				0 23 13	35	10		Do.
July 8, p. m.	E.-W.	6 00 18		6 13 15	6 45 30			0 08 37	12 15	0 35 22	32	15	0.05	
	E.-W.	5 59 10		6 10 20	6 13 15	6 45 30		0 11 10	2 55	0 46 20	35	10	0.05	
July 13, p. m.	E.-W.	6 58 58		7 03 07	7 05 58	7 36 00		0 04 09	2 51	0 37 02	30	15	0.07	
	E.-W.	6 58 05		7 03 12	7 05 27	7 35 37		0 05 07	2 15	0 37 32	35	10	0.30	
July 16, p. m.	E.-W.	4 01 10		4 26 10	4 32 30	4 56 10			7 25		30	15	0.07	
	E.-W.	4 01 10		4 26 10	4 32 30	4 56 10		0 25 00	6 30*	0 55 10	35	10	0.12	
July 20, a. m.	E.-W.	6 11 55		6 39 00	6 42 00	6 59 00		0 28 05	3 00	0 47 05	30	15	0.10	Instrument in imperfect order.
	E.-W.	6 11 55		6 40 45	6 44 50	6 59 00		0 28 50	4 05	0 47 05	35	10	0.10	
July 22, p. m.	E.-W.	2 42 06		2 47 26	2 54 24	3 27 35		0 05 20	6 58	0 35 29	35	10	0.08	Record on N.-S. component lost by superposed record trace.
August 1, p. m.	E.-W.			6 56 12	7 09 14				13 02		30	15	0.05	
	E.-W.			6 56 12	7 05 52				9 40		35	10	0.04	
August 14, p. m.	E.-W.			9 02 10	9 13 10				11 10		35	10	0.03	Imperfectly recorded on N.-S. component.

Summary of earthquakes recorded by the Bosch-Omori seismograph at Washington, D. C.—Continued.

Table with columns: Date, Component, N.-S. or E.-W., Time (h. m. s.), Duration of—, Magnification of record, Maximum double amplitude of actual displacement of pier, Remarks. Rows include dates from August 16 to December 23, 1906, with detailed seismic data and notes.

\* Doubtful. † Very great. ‡ October 2, a. m., indefinite. § In this and similar cases, when the beginning of the second preliminary tremors was not sharply defined, then the total duration of the preliminary tremors is given in the column for the second preliminary tremors. ¶ In this table 0 is used for midnight and 12 for noon.