"Preliminary note on the seismographic observations of the San Francisco earthquake of April 18, 1906".

"Note on the transit velocities of the Guatemala earthquake of April 19, 1902".

"The Calabrian earthquake of September 8, 1905, observed in Tokyo".

"Preliminary note on the Formosa earthquake of March 17, 1906".

"Comparison of the faults in the three earthquakes of Mino-Owari, Formosa, and San Francisco".

"Note on the transit velocity of the Formosa earthquake of April 14, 1906".

"Notes on the Valparaiso and Aleutian earthquakes of August 17, 1906".

"On the distribution of recent Japan earthquakes".

In the several papers treating of the transit velocities of earthquake waves and formulas for computing times of earthquakes at the origin, etc., Doctor Omori to a certain extent revises results of earlier studies on similar topics already set forth in the Publications. The revision is based on new data and observations supplied by the recent great earthquakes in India, Calabria, Formosa, North America, and South America, and, naturally, the results differ appreciably from previous determinations.

We wish to call attention to a factor in connection with this question of speed of propagation that appears to have been generally disregarded, and is not recognized in Doctor Omori's studies.

The point in question is best illustrated by reference to the California earthquake, in respect to which certain definite facts bearing on the question are brought out from reports that have been rendered. It appears that fully thirty to thirty-five seconds elapsed after the first slight tremors were felt by careful observers located within a few miles of the fault line before the occurrence of the strong and destructive motion. Making all reasonable allowance for the existence of slight preliminary tremors for a short period corresponding to the short distance of the observers in question from the fault line, the writer is forced to the conclusion that the seismic action at the fault line during the first thirty or more seconds was of relatively inconsequential intensity. If the earthquake had ended at this phase no great records would ever have been made at distant stations, such as Tokyo, Washington, and those thruout Europe. In other words the distant records are to be correlated not with the feeble beginnings of the seismic action, as observed near the fault line, but with the strong and destructive motion. Upon this basis the waves which first reached distant stations like Washington and Tokyo originated at the fault line at the time of the beginning of *the destructive motion*, and not at the time of the motions felt first. According to the best information in the possession of the writer this time was 5 h., 12 m., 33 s., one hundred and twentieth meridian time.

Doctor Omori places the time of beginning of the earthquake at the fault line at 5 h., 12 m., 0 s. Evidence is not at hand to show that action was appreciably earlier at one part of the fault line than the other. It appears to have been nearly simultaneous at all points.

Different earthquakes must differ greatly in regard to the sequence of relative intensities thruout the entire duration of the tectonic action at the origin, and it seems that if the facts are carefully determined in each case and considered in accordance with the foregoing statements, some of the existing discordance in transit times and speeds might be harmonized.

TORNADO OF APRIL 5, 1907, IN ESCAMBIA COUNTY, FLA.

By WM. F. REED, jr., Observer. Dated Pensacola, Fla., May 8, 1907.

The morning weather map of April 5 showed an area of low barometric pressure over southern Arkansas, with a central depression of 29.65 inches; this storm moved eastward, with general rains, and past over northern Alabama during the afternoon of the 5th, reaching western North Carolina on the morning of the 6th.

The conditions at Pensacola on April 5 were stormy; the temperature ranged between 66° and 73°; the barometer (sea-level) fell from 29.96 at 12:01 a. m. to 29.68 at 7 p. m., and began to rise at 8:15 p. m.; winds were fresh to brisk southerly in the morning, high south to southwest between 12 noon and 9 p. m., and brisk southwest to west 9 p. m. to 12 midnight; at 3:33 p. m. the wind reached 43 miles from the south; at 5:28 p. m., 44 miles southwest; at 6:23 p. m., 45 miles southwest, and at 7:17 p. m., 40 miles southwest: clouds were of the lower types thruout the day and moved from the west and southwest; it became very threatening many times in the afternoon and evening, with passing light showers; cloudiness alternated rapidly from clear to cloudy between 7 and 9 p. m., becoming permanently clear by 9:30 p. m.; lightning was seen in the north at intervals from 6:30 to 7 p. m., then flashed from northwest around to southeast, continuing in the southeast after 11:30 p. m.; thunder was noted in the northwest at 9 p. m. The tide at Pensacola, caused by the high southerly winds, was 18 inches above normal high water. The estimated damage from this storm in Pensacola was $1000, viz, the amount that it cost the timber merchants to gather the timber that was cast ashore. Southwest storm warnings were displayed early in the afternoon.

Mr. J. H. Patterson, of Muscogee, Fla., gives the following account and exact track of the tornado as it coursed thru the woodland, deviating somewhat to the right or left of a straight line:

The storm crost the line of Florida and Alabama in section 6, township 3 north, range 33 west, traveled southeast, past along the line between sections 6 and 31, in township 4 north, range 33 west, on thru the south half of 32 and north half of 33, southeast quarter of 28, center of section 27, north quarter of section 26; demolished house of Mr. George Locke in northeast quarter of section 26 about 5:45 p. m., past thru south half of section 24; in township 4, range 32, it went thru north half of section 19, on thru northwest quarter of section 20; in southwest quarter of section 17 it demolished a house belonging to Mr. James Lambert three or four minutes after it struck the Locke house; next it struck Mr. Steward's place and I can not give its track from there. The cloud was funnel shaped and lookt like smoke mixt with steam; no lightning; no rain. It sounded like a heavy freight train and traveled generally southwest to northeast. The presence of a whirl was evidenced by the position of fallen trees, those in the center of the path lying southwest to northeast; on the south side, northwest to southeast, and on the north side, southeast to northwest; width of path, 900 feet.

The following was obtained from an interview with Mr. J. R. Steward:

The day was cloudy and unusually windy; aside from this there was no marked indication of anything more than an ordinary rainstorm approaching until late in the afternoon, when conditions grew threatening; and a few minutes before 6 p. m. a sound like two or three passenger trains was heard roaring with increasing fury from the west. In the house with me there were seven other men whom I had employed to work about the place. We lookt to the westward and beheld the storm approaching; it seemed as tho a dense black smoke was rolling toward us over the ground; and as it came closer I saw in this dense mass dimly outlined the funnel-shaped cloud, the tail of which seemed to be thrashing, plowing, and upsetting everything in its pathway. Upon the impulse of the moment we all realized that we were in a dangerous position and ran for our lives, but while we were running the storm was upon us. I made for the open, knowing that not far away there was a pit where possibly I would escape injury by allowing the storm to pass over me. While in the act of climbing the fence a gust of wind picked me up and carried me about fifty feet; while I was being carried a piece of flying débris struck me on the top of the head, cutting a gash in my scalp three inches long and knocking me senseless; and when picked up I was told that I was raised ten feet or more from the ground. Two of the men got under a log wagon, which was carried along some distance, and escaped injury. The men that did not cling to trees or posts were carried about by the wind. One man was carried a distance of 200 yards, receiving only slight bruises. A carpenter clung to a mulberry tree at the corner of a two-story barn (indicated on accompanying map, fig. 1, at *b*); the barn with the exception of the sills was blown away; the carpenter, altho pinned to the ground by the tree and timbers, on top of

which was the horse, was taken out with only slight injuries; the horse was badly injured.

The eight-room cottage that we occupied before the storm (indicated on map at *a*) was partially wrecked and the roof was taken off. At *c* a one-story barn was blown away. At *d* another one-story barn was destroyed. At *e* a heavy log corncrib was blown down. At *f*, about one mile to the westward, a box car, remodeled to live in, was torn to pieces; Mr. Lambert and family left the car just before the storm struck. About three miles southwest of my place a four-room cottage occupied by Mr. George Locke (indicated on map at *g*) was partially destroyed; the family of seven left the house for the open at the beginning of the storm; one of the children was blown away from the party against a fence and severely injured. Fortunately my family were away. The average width of this storm's track was about 200 yards, being about one-third of a mile wide at point of greatest destruction. For half a mile to the east of my cottage and the same distance west, even the earth was torn up along a path averaging 30 feet in width; chunks of grass were wedged between the wreckage, and the path resembled the effects one would naturally expect from a huge stream of water more than 25 feet in diameter directed along the ground with great force, instead of from wind. The rainfall attending the storm was only moderate, starting with large scattered drops just before the storm struck. One mile or so to the northward there was some hail and roads were washt by excessive rains. The course of the storm was west-southwest to east-northeast; I traced it to the eastward and find that it past about one mile south of Bluff Springs. There was very little lightning and only moderate thunder.

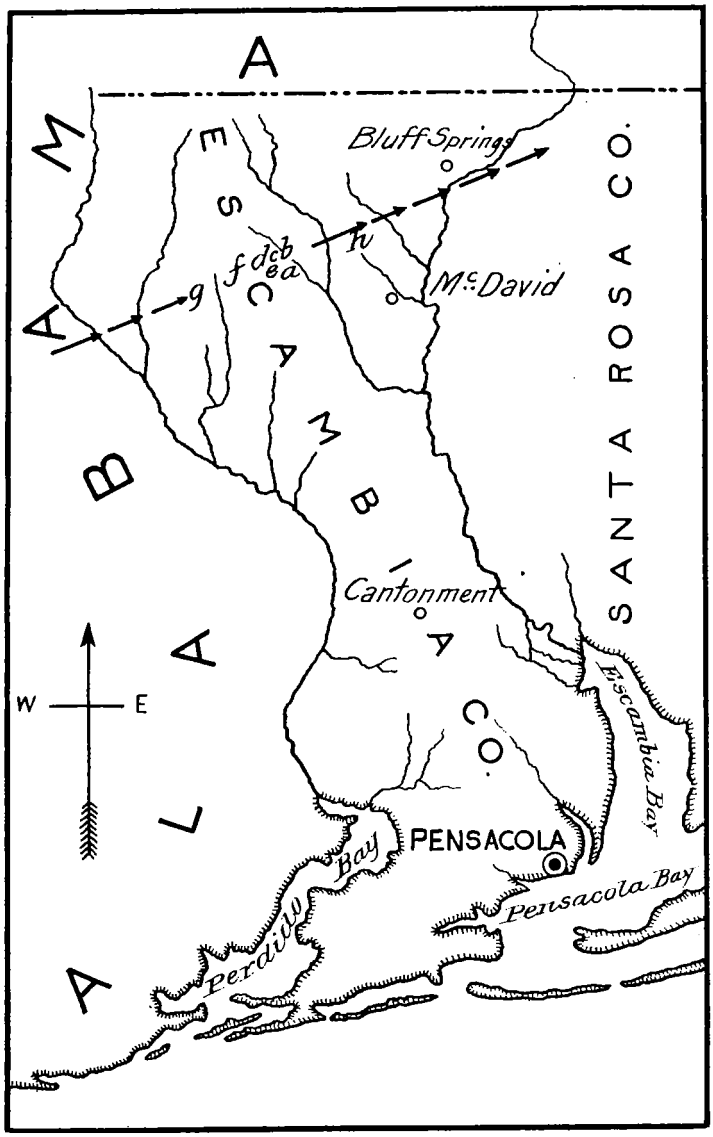

FIG. 1.—Map of Escambia County, in western Florida, showing track of tornado of April 5, 1907.

A report from Mr. J. P. Harrison, McDavid, Fla., states that the tornado late in the afternoon of the 5th past mostly thru the timber region northwest of McDavid, destroying a house belonging to Mrs. Mollie Evans and Mrs. Margarette Williams (indicated on map at *h*).

Cloud very bright, followed by heavy black cloud resembling heavy black smoke, continually mixing and rolling together. Very little lightning. Heavy rain. No hail. Previous to the storm there was a roaring, deadening sound.

Escambia County, Fla., has been visited by three tornadoes since March 1, 1905, not to mention the hurricane of September 26–27, 1906. A tornado occurred March 20, 1905, near Bluff Springs; a smaller one near Cantonment April 14, 1905, and the one of this April (1907) also past near Bluff Springs.

A PROPOSED NEW METHOD OF WEATHER FORECASTING BY ANALYSIS OF ATMOSPHERIC CONDITIONS INTO WAVES OF DIFFERENT LENGTHS.

By HENRY HELM CLAYTON. Dated Hyde Park, Mass., May 4, 1907.

It has been known for a long time that when an average of the temperature, pressure, or any weather condition is obtained for a week, month, or other period, the resulting mean will differ for successive intervals, even after allowance has been made for the known annual and diurnal variations. By many meteorologists it is still considered debatable whether these variations are merely unbalanced, accidental variations, subject to no law, or whether they represent variations under the rule of forces which may be ascertained, and predictions of the variations may be made. I believe that such laws can be found, and I have spent many years in a laborious search for them.

In the American Meteorological Journal of July, 1885, and again in the same journal of June, 1891, I quoted data which seem to me to show clearly that, in the oscillations of pressure and temperature in the United States, there may be detected at least two sets of waves, one of which travels rapidly from west to east and the other much more slowly. Chambers and Sherman had also pointed to evidence of a similar nature.[1] But, so far as known, the drift of atmospheric conditions, other than that apparent on the ordinary weather map, was sporadic and irregular, sometimes being relatively rapid and at other times very slow, and therefore furnished no basis for accurate forecasting. Moreover, such movements are so disguised that they are not readily recognized, and have received but little attention.

Meteorologists have turned their attention to other aspects of the subject, such as (1) periodic changes; (2) the shifting of the centers of action of the atmosphere, as, for example, the shifting of the center of high pressure near the Azores, or the shifting of the center of low pressure near Iceland; (3) seesaw oscillations of pressure and other weather conditions between widely separated areas, as between India and Russia, or India and South America, or between Iceland and the Azores.

After considerable research along these lines,[2] I have arrived at the conclusion that, for purposes of forecasting, the study of the laws underlying the drift of weather conditions is the most promising line of research, and that the conditions of high and low pressure, temperature departures, etc., shown on the weather map, should not be regarded as individual units, each having a drift of its own, but rather as a complex, kaleidoscopic effect, produced by atmospheric conditions progressing from place to place at different speeds and, perhaps, from different directions. When one turns a kaleidoscope, the bits of glass, moving different distances, fall into a new arrangement; so, in the course of a day, the different atmospheric conditions, changing or moving with different speeds, assume the momentary relations which are shown by successive daily weather maps. Figs. 1, 2, 3, and 4 are given here

[1] Nature, vol. 23, Nos. 4 and 5, and Amer. Meteor. Journal, vol. 1, No. 7.

[2] See paper showing oscillation about certain centers in Amer. Meteor. Journal, Jan., 1884, and April, 1885, and also various papers on periodic changes in same journal.