MONTHLY WEATHER REVIEW.

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The present summary for 1908 is based essentially upon data received from about 200 regular Weather Bureau stations, 33 regular Canadian stations, and from such climatological stations as have forwarded their annual summaries in time. The statistical tables and charts have been prepared under the supervision of Prof. F. H. Bigelow, in charge of the Climatological Division, and the summary of flood movements by Dr. H. C Frankenfield, Professor of Meteorology.

FORECAST DIVISION.

Prof. E. B. GARRIOTT, in charge.

WEEKLY WEATHER FORECASTS.

By Prof. E. B. GARRIOTT.

In reply to numerous inquiries regarding methods employed in the preparation of weekly weather forecasts, answer has been made that they are based upon a consideration of atmospheric pressure over the oceans and continents of the Northern Hemisphere. Details of the calculations, that rest largely upon knowledge acquired by study and experience, can not, of course, be readily furnished. In a general way, however, it may be stated that the dependence of local weather changes upon world-wide atmospheric conditions has long been recognized, and careful studies of the relation and association of the great oceanic and continental barometric areas with marked types of weather have been made. In previous years studies of this character have necessarily been made with reports received by mail. During the past year daily telegraphic reports from selected stations thruout the Northern Hemisphere have permitted an application of the knowledge derived from these studies.

In the balancing of air masses over the Northern Hemisphere is found a cause of normal and abnormal weather in various portions of the hemisphere. In winter the greater masses, which are represented by areas of high barometric pressure, occupy the continents, and in summer the oceans are the seats of the so-called permanent areas of high barometer. In the shifting of the areas is produced what may be termed an annual ebb and flow of atmospheric tides; the air currents, or prevailing winds that attend the tides, are important factors in climatic changes and conditions. Marked departures from a normal distribution of air pressure result in decided departures from seasonal weather. In the relation of normal and abnormal pressure distribution to seasonable and unseasonable weather is found the problem of forecasting for periods of one to two weeks in advance. Generally speaking the distribution of pressure that is peculiar to a certain season will produce in a modified degree the weather of that season irrespective of the time of year.

The character of the barometric distribution over the Pacific Ocean and the continent of Asia indicates the development or approach of storms and high-pressure areas that will appear on the western coasts of the North American Continent; and barometric conditions over the Atlantic Ocean and Europe indicate the direction and speed of the movements over the American Continent. Marked departures in the Asiatic area indicate the general character of the weather of the United States for a period of about two weeks in advance; and Pacific pressure conditions and changes furnish a key to weather changes that will occur on the Pacific coast of the United States three or four days in advance and indicate the character of those that will occur over the eastern portion of the United States six to seven days in advance. The strength or magnitude of the storms, cold and warm waves, and other meteorological phenomena bear a relation to the departures from the normal pressure that appear over the oceanic and continental areas referred to.

The next advance in the forecast period will be achieved when the cause of unseasonable and unusual barometric pressures over the oceans and continents is known. If, as has been suggested, such abnormalities are due to variations in the solar radiations, the fact may be discovered when appliances for measuring the variations, if any exist, are perfected. In the meantime observed conditions and changes in world-wide pressures must form a base of operation, and facts, not theories, must be employed by the forecaster.

RIVERS AND FLOODS.

By Prof. H. C. FRANKENFIELD.

The floods of the year have been described in the various monthly issues of the MONTHLY WEATHER REVIEW. In these it can be seen that the forecast work in connection with the floods maintained its previous high character, and no flood of consequence was unheralded.

The scheme of river-stage forecasting for the Ohio River has been completed as far Louisville, Ky., and it is hoped to complete the scheme for the entire river during the year 1909.

Changes in administrative work are shown in the following summary:

NEW RIVER DISTRICT CENTERS.

Bismarck, N. Dak., with territory comprising the watershed of the Missouri River at and above Bismarck, N. Dak.

Wichita, Kans., with territory comprising that portion of the watershed of the Arkansas River from the Kansas-Colorado line to Wichita, Kans.

The territory of the Bismarck district was formerly a portion of the Sioux City, Iowa, district.

SPECIAL RIVER STATIONS OPENED DURING THE YEAR.

Station.	*District.*
Beaver Falls, Pa	Pittsburg, Pa.
Bellota, Cal	Sacramento, Cal.
Brazos, Tex	Galveston, Tex.
Bridgeport, Texas	Galveston, Tex.
Chamberlain, S. Dak	Sioux City, Iowa.
Cochran, Ariz	Phoenix, Ariz.
Edinburg, Miss	Meridian, Miss.
Elliston, Ind	Cairo, Ill.
Emporia, Kans	Fort Smith, Ark.
Espanola, N. Mex	Denver, Colo.
Estacada, Oreg	Portland, Oreg.
Fort Lyons, Colo	Denver, Colo.
Glendive, Mont	Bismarck. N. Dak.
Grand Junction, Colo	Denver, Colo.
Grand Reservoir, Ohio	Columbus, Ohio.
Hawkinsville, Ga	Macon, Ga.
Le Roy, Kans	Fort Smith, Ark.
Lewis Ferry, Tex. (P. O., New Boston.)	Shreveport, La.
Lewiston Reservoir, Ohio	Columbus, Ohio.
Licking Reservoir, Ohio	Columbus, Ohio.

SPECIAL RIVER STATIONS OPENED—continued.

Station.	District.
Lumber City, Ga	Macon, Ga.
Marble Falls, Tex	Galveston, Tex.
Medora, N. Dak	Bismarck, N. Dak.
Muscoda, Wis	Bubuque, Iowa.
New Martinsville, W. Va	Parkersburg, W. Va.
New River, Tenn	Nashville, Tenn.
Oxford Farmers Ditch, Colo	Denver, Colo.
Running Water, S. Dak	Sioux City, Iowa.
Shoals, Ind	Cairo, Ill.
Sistersville, W. Va	Parkersburg, W. Va.
Waterville, Pa	Harrisburg, Pa.
Williamsburg, Ky	Nashville, Tenn.

SPECIAL RIVER STATIONS CLOSED DURING THE YEAR.

Station.	District.
Barton, Oreg	Portland, Oreg.
Cedar Run, Pa	Harrisburg, Pa.
Edisto, S. C	Columbia, S. C.
Elko, Nev	Reno, Nev.
Ellwood Junction, Pa	Pittsburg, Pa.
Empire, Nev	Reno, Nev.
Floriston, Cal	Reno, Nev.
Gardnerville, Nev	Reno, Nev.
Halleck, Nev	Reno, Nev.
Ivanhoe, Va	Cincinnati, Ohio.
* Kiomache, Tex	Shreveport, La.
Las Animas, Colo	Denver, Colo.
Lovelocks, Nev	Reno, Nev.
Luxora, Ark	Memphis, Tenn.
Maricopa, P. and S. R., R. R. bridge, Ariz.	Phoenix, Ariz.
Rogers, Ind	Cairo, Ill.
Rousseau, S. Dak	Sioux City, Iowa.
Sinnemahoning, Pa	Harrisburg, Pa.
Tahoe City, Cal	Reno, Nev.
Woodford, Cal	Reno, Nev.
Yerrington, Nev	Reno, Nev.

RIVER STATION REOPENED.

Station.	District.
Riparia, Wash	Portland, Oreg.

CHANGED FROM RAINFALL TO RIVER STATION.

Station.	District.
Youngstown, Ohio	Pittsburg, Pa.

RAINFALL STATIONS OPENED DURING THE YEAR.

Station.	District.
Albany, Tex	Galveston, Tex.
* Ansonia, Pa	Harrisburg, Pa.
Big Springs, Tex	Galveston, Tex.
Bowie, Tex	Galveston, Tex.
Brownwood, Tex	Galveston, Tex.
Colorado, Tex	Galveston, Tex.
Dublin, Tex	Galveston, Tex.
* Elizabeth, W. Va	Parkersburg, W. Va.
Gainesville, Tex	Galveston, Tex.
Graham, Tex	Galveston, Tex.
Greenville, Tex	Galveston, Tex.
Kerrville, Tex	Galveston, Tex.
Longview, Tex	Galveston, Tex.
Luling, Tex	Galveston, Tex.
Oslo, Minn	Moorhead, Minn.
San Angelo, Tex	Galveston, Tex.
San Marcos, Tex	Galveston, Tex.
Seymour, Tex	Galveston, Tex.
Weatherford, Tex	Galveston, Tex.

RAINFALL STATIONS CLOSED DURING THE YEAR.

Station.	District.
Battleboro, N. C	Raleigh, N. C.
Corona, Colo	Denver, Colo.
* Letohatchie, Ala	Montgomery, Ala.
Rockfish, Va	Richmond, Va.
Summit, Cal	Sacramento, Cal.
Tupelo, Miss	Mobile, Ala.

* Cooperative.

The highest and lowest river stages during the year at selected stations are given in Table IV.

SPECIAL ARTICLES, NOTES, AND EXTRACTS.

ATMOSPHERIC INFLUENCES CAUSING MOVEMENTS OF THE SOIL.

The records made by seismographs show that in general the superficial layer of gravel, clay, sand, or other form of loose soil resulting from the disintegration of solid rock is subject to a variety of movements that have no connection with earthquakes properly so-called.

Among these microseismic movements many have a meteorological origin; such are the slow tiltings due to the infiltration of rain water, the freezing of the ground, the pressure of the wind against the walls of the buildings, the changes of atmospheric pressure and resulting changes in the weight of the superincumbent atmosphere, the added weight of a mass of freshly fallen rain or snow, the melting of glaciers and the diminished load on the continent, the changes in level and consequently in the weight and pressure of large interior lakes, the analogous changes in the level and pressure of the ocean water on the seacoasts due to winds and tides.

There are other movements due to strains in the solid rocky substratum or to the relief from strain; these belong to vulcanology and astronomy, and are traceable back to luni-solar tidal strains, to strains due to changes in the rotation of the globe, to volcanic heat and chemical changes, to the changes of aggregation that take place when amorphous strata slowly crystallize under pressure.

The slow tiltings or long tides that are so evident in every seismogram are frequently spoken of as due to the varying load of air, rain, or snow, acting on the solid rocky shell of our globe; but to me it seems more likely that these tiltings may be due to the influence of changes of load on our superficial soil, 5, 10, or 50 feet in depth, resting on a relatively rigid rocky soil. This soil is permeated with water and air. Like a sponge, it yields to every change of pressure. The water in deep wells, the water-tables, the flow of underground water, are usually found to vary with barometric pressure as plainly as they do with rainfall or melting snow, or freezing temperatures. The explanation of any local tilting phenomenon will not be satisfactory until we have thoroly studied the influence of atmospheric pressure on the soil and on the groundwater below the seismograph.

The study by Prof. Franklin H. King, of the Agricultural Experiment Station at Madison, Wis., on the behavior of groundwater shows how our seismographs are liable to be affected by changes of pressure and the reaction of the air below a wet soil.—*C. A.*