Namias has suggested cross-sections of potential temperature, which can be drawn very quickly. Since unsaturated air maintains a constant potential temperature during vertical motions, places in the cross-section where the potential temperature lines dip downward would probably represent subsidence (or a transition from a colder to a warmer air mass), and those where the potential temperature lines slope upward would represent zones of rising air (or a transition from a warm to a colder air mass).

To return to the question of time, it has been the experience in TWA that to construct the adiabatic chart and the Rossby diagram requires about 10 minutes with the data received in the present Weather Bureau code. W. H. Clover has developed a code which we use in transmitting the data to forecast centers that do not receive the data from the Government; with the use of this code, which has the same number of characters as the Weather Bureau code, the time for decoding and plotting is cut in half.

With the use of the above-mentioned methods of aerological analysis, it should be possible for the forecaster making general forecasts to use at least half a dozen free air soundings in the forecasting practice without an appreciable sacrifice of time. A routine man in the forecast center could plot the data in half an hour's time and have it ready for the forecaster's inspection when the latter finishes his weather map analysis.

The writer is certain that no organization in the United States has thus far treated free-air soundings with the routine thoroughness practiced in the TWA (Transcontinental Western Air) meteorological organization in the past year; he therefore hopes that these remarks will be taken as the result of the serious application of aerological material to practical forecasting, for both the short periods covered by individual air transport flights and the longer period forecasts similar to the daily Weather Bureau forecast period.

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(1) C.-G. Rossby, Thermodynamics Applied to Air Mass Analysis, Mass. Inst. Tech. Metl. Papers, vol. I, no. 3, 1932.
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# A REMARKABLE TEMPERATURE AGREEMENT AT A 33-YEAR INTERVAL

By J. B. KINCER and W. A. MATTICE

[Weather Bureau, Washington, November 1934]

In efforts to detect recurrences of a cyclic nature that possibly would serve as a basis for long-range forecasting a great deal of investigational work has been done and many papers published on the question of approximate repetitions in weather conditions at stated intervals of time. Many such cycles have either been claimed outright as more or less definitely established, or have been suggested as probably real and dependable in their recurring phases. However, it appears that when these are subjected to rigid tests they usually in the last analysis carry conviction of fortuity or chance combinations with no assurance of continued conformity in future years.

Most cases of recurrent agreements refer to conditions covering considerable periods of time, such as the average temperature for a month, a season, or a year. With numerous records we naturally would expect to find many cases of conformity when such periods are considered, but it would not be expected to find, except through the rarest of chance, a case in which the temperature distribution from day to day through a couple of months would be in close agreement with identical calendar days for the same period many years before.

However, a remarkable agreement of this character between maximum temperatures during the 1934 extremely hot summer in the interior States and the daily maxima in 1901 for the same period has come to light. The latter also was outstanding for abnormal heat in the area in question.

Attention was first called to this matter by a graph, prepared by the official in charge of the Weather Bureau station at Indianapolis, Ind., and published in the Indianapolis Star, July 25, 1934. The trend agreement from day to day between these summers, 33 years apart, was so striking that other station records were examined to determine how far this conformity extended geographically and for how long a period of time. This search disclosed marked agreement, considering the data in question, over the Ohio Valley, the lower Missouri Valley, and the northern Great Plains, the records, in general, over these regions being in agreement as to this tendency. The four graphs presented as figure 1 show these agreements. They represent the daily maximum temperatures at Cincinnati and Columbus, Ohio, St. Louis, Mo., and Springfield, Ill., covering the period from June 10 to August 17, or somewhat more than 2 months. A remarkable similarity is shown in view of the character of the data they represent—daily maximum temperatures for identical days for the summer of 1934 and for that 33 years earlier. An examination of the graphs shows a fairly uniform rise in temperature for both years from June 10 to around the 20th of July, with a more or less gradual recession of the curves thereafter to the middle of August. In both cases, of course, they ran far above normal.

Outside the central valleys and beyond the dates covered by these graphs, records for the summer show great divergences in this respect, with no conformity. Also, examination of other data during periods of abnormal temperature conditions, such as the 1934 cold February in the Northeastern States with other Februarys of past years disclosed no such day-to-day temperature agreement.

It appears that such remarkable and unexpected similarity in weather records, the very nature of which would seem to demand as explanation fortuitous combinations should serve to impress investigators of weather recurrences with the necessity for extreme caution in accepting concomitancy of records at time intervals, or apparent recurring phases, as definitely establishing progressions of a dependable cyclical nature. In other words, if agreements such as these can occur in daily maximum temperature data for a period of more than 2 months, the probability for chance combinations of various kinds would appear almost limitless when longer unit time periods are involved, such as a season or year.

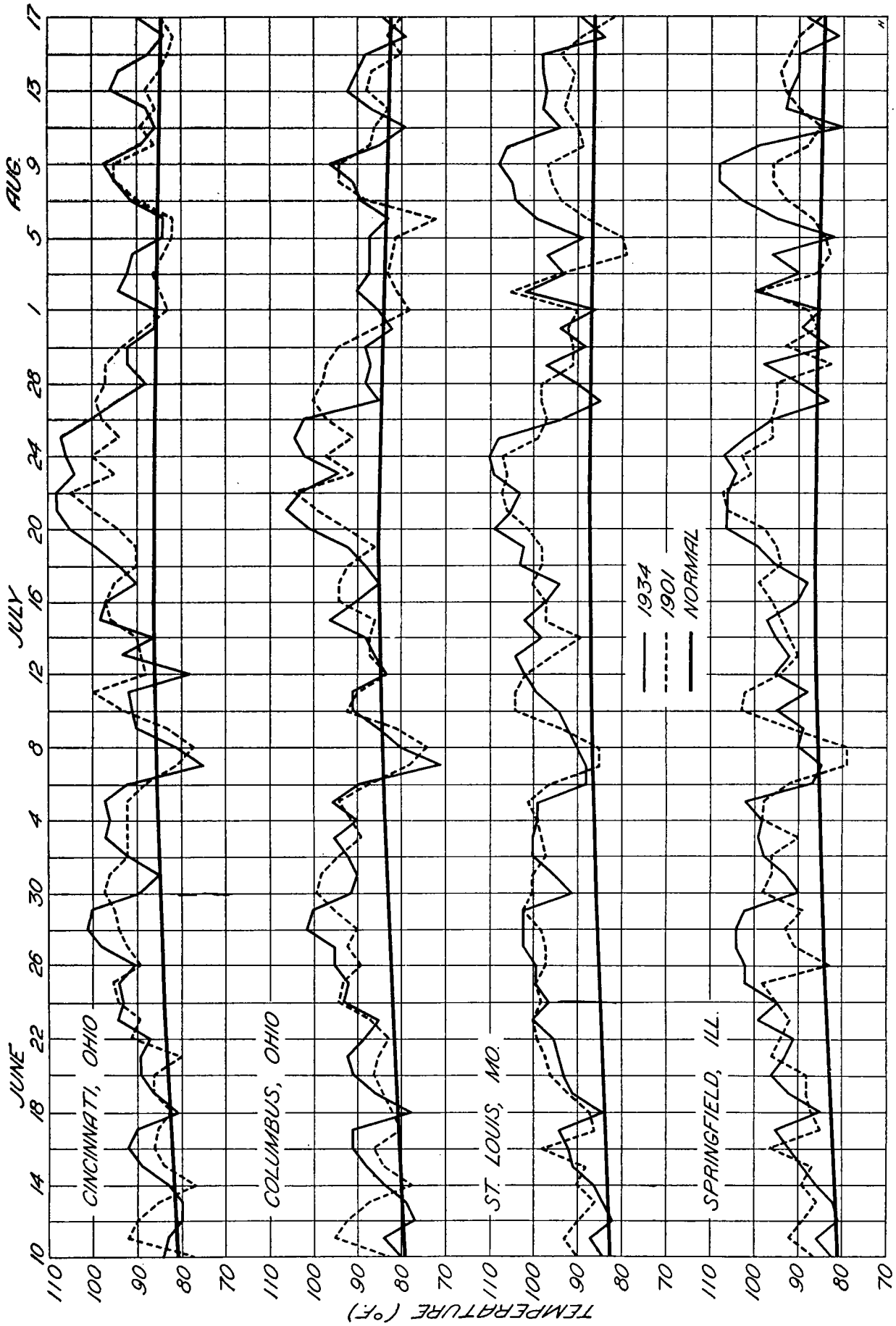


FIGURE 1.—Daily maximum temperatures, summers of 1901 and 1934.

### WATERSPOUTS, OCTOBER 29, 1934, BUFFALO, N. Y., HARBOR

A waterspout was seen over Lake Erie outside the outer break wall, from the Weather Bureau Office, at 11:30 a. m. It appeared to move rapidly from northwest to southeast, at a distance of approximately 2 miles from the Telephone Building. The funnel cloud was very distinct, being darker than the surrounding clouds, and merged above into the low cloud mass that covered the sky. It was of very small diameter, but extended upward from the water several hundred feet. From our point of observation at the Telephone Building, the violent agitation of the water by the funnel cloud was plainly seen. The white spray seemed to extend upward a number of feet. I doubt if the phenomenon lasted over 10 to 15 minutes, although we did not see it at the beginning. Three hours before the waterspout formed, the sky over a large part of Buffalo was inky black. I never saw a blacker sky, but the clouds passed along eastward, giving only moderate squalls of rain and snow.

During the hour between 11 a. m. and noon, the wind blew 49 minutes from the west and 11 from the southwest. The average velocity for the hour was 26 miles from west and the maximum wind for the hour was 28 miles from west at 11:37 a. m. The barometer was steady from 8 a. m. to 2 p. m. (29.76 inches reduced). Clouds were nearly 10/10 st. cu. from the west during the hour from 11 a. m. to noon. There was no line squall.

The lookout on duty at the Coast Guard reports that he saw 3 other waterspouts (4 in all) between 11 a. m. and 11:40 a. m., the one around 11:30 a. m. being the largest.

The last previous waterspout to be seen from our windows at Buffalo occurred on September 27, 1928.—*J. H. Spencer.*

## BIBLIOGRAPHY

C. FITZHUGH TALMAN, *in charge of Library*

### RECENT ADDITIONS

The following have been selected from among the titles of books recently received as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies:

**Ashworth, James Reginald**

Smoke and the atmosphere; studies from a factory town. (Manchester.) Manchester university press. 1933. xii, 131 p. incl. illus. (map), tables, diagrs. 22 cm. (Observations and experiments made in Rochdale, Lancashire.) "References": p. 125–126.

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Fog. New York, The Macmillan company. 1934. 23 p. front., 52 pl. on 37 l. 30½ cm. "Plates from 'Clouds', McAdie, Harvard university press, 1930."

**Stetson, Harlan True**

Earth, radio and the stars. New York, Whittlesey house, McGraw-Hill book company, inc. 1934. xvii, 336 p. col. front., illus., plates, map, diagrs. 21 cm. "First edition." Bibliography: p. 311–321.

**Theaman, John R.**

The Bahama islands. Mean monthly and annual precipitation tables. (International meteorological series.) Indianapolis. 1933. unp. frontis. map, tables, 22½ x 13½ cm.

Mean monthly and annual precipitation tables for stations in Siam. (International meteorological series.) Indianapolis. 1933. unp. frontis. map, tables. 18½cm. (Climatological paper no. 60.)