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A former paper on this subject[1] showed how the temperatures of Washington, St. Louis, and Helena seem to depend on the rise and fall of solar radiation. Table 1 of that publication gave a series of dates in all months of the year from the year 1924 to 1935 on which the solar radiation apparently began either to rise or to fall for a succession of several days. In figure 2 (here reproduced as figure 1) was shown the opposite average marches of temperature at Washington for 16 days after such opposite changes of solar radiation began.

On the basis of the evidence contained in this paper, Dr. R. A. Millikan composed, and others, including Dr. K. T. Compton, Dr. I. Bowman, and the Chief of the United States Weather Bureau, signed with him, the following memorandum:

The work on solar radiation that has been carried on for a considerable number of years under the leadership of Doctor Charles G. Abbot has apparently brought to light good evidence,

First, that the rate at which radiant energy comes to earth from the sun is not entirely constant but sometimes rises and other times falls through periods of a number of days; and

Second, that these rising or falling periods of solar radiation are followed through as much as sixteen days by measurable temperature variations in the atmosphere as determined by ordinary thermometer readings.

These effects are of so much scientific and practical interest for the problem of predicting at least some elements of the "weather" as much as two weeks ahead that it is our unanimous judgment that there should be not only a continuation of this research but considerable enlargement and refinement of the program, so as to subject these preliminary findings to exceedingly careful and dependable verification and extension.

The Smithsonian Institution has been for at least half a century the agent which has specialized most successfully on solar radiation problems. No other institution is in as good a position as is it to continue to lead in this field. The

[1] Smithsonian Misc. Coll., vol. 95, no. 12, May 1936.

undersigned therefore, after a most careful study of Dr. Abbot's program, endorse it unreservedly and express the earnest hope that he may receive the appropriations that he needs to make it effective.

An attempt was made to obtain a Federal appropriation of $200,000 to establish seven additional solar-radiation stations and to undertake

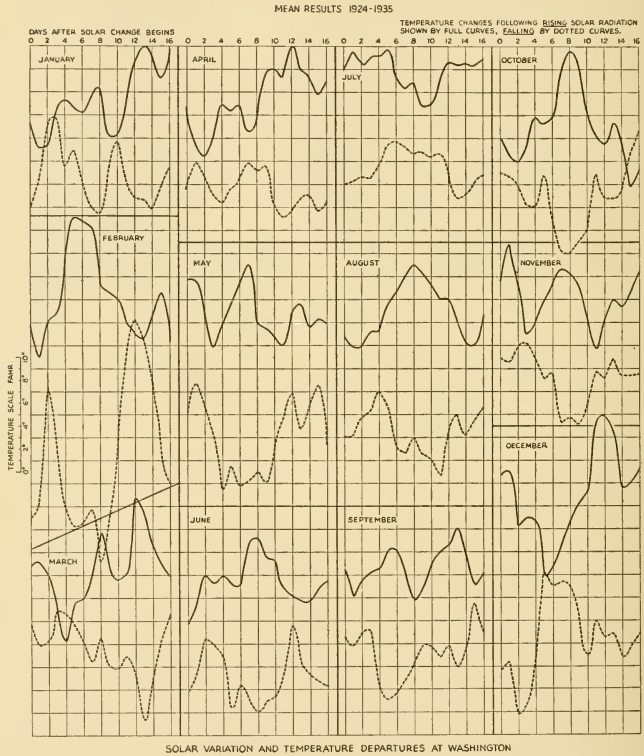

FIG. 1.—Oppositeness of temperature departures at Washington which follow average rising and falling sequences of solar variation.

automatic measures of ultraviolet rays at 100,000-feet altitude. The appropriation passed the Senate but was rejected by the conferees on the urgent deficiency bill. Fortunately, the Smithsonian Institution was able to make a grant of $5,000 to Dr. Brian O'Brien, of Rochester,

who with the cooperation of the University of Rochester, the Eastman Kodak Co., and other friends will undertake tests of the automatic measurement of ultraviolet solar rays at high altitudes.

In order to more thoroughly buttress the proposition that solar variation is a major factor in the temperature changes of terrestrial

FIG. 2.—Oppositeness of temperature departures at Potsdam which follow average rising and falling sequences of solar variation.

weather, I undertook, with the cooperation of the late C. F. Talman, meteorologist and librarian of the United States Weather Bureau, a study of the weather of Potsdam, Germany, similar to that I made for Washington and other stations. The year 1935 was not available,

but all other dates found in Table 1 of my former publication were used as dates of incipient solar changes.

To obtain departures from approximate daily normals at Potsdam, the values of the daily means of temperature at 7^h, 14^h, 21^h were employed. Monthly means of these daily means were available for the years 1921 to 1934, inclusive.[2] Average monthly values were computed for this interval and plotted on a sufficient scale. A smooth curve was drawn from these monthly averages, and the differences between it and the observed daily mean temperatures were used as temperature departures.

It is recognized that the normals thus obtained are only approximate. But this will not impair the value of the departures for the purpose proposed. For instance, if the normals thus obtained were a little low for a given month, the departures for all years during that month would be prevailingly positive, but the curve of their *fluctuation* over an interval of 16 days would be almost precisely the same as if the normals had been perfect.

Proceeding then in exactly the same way as described in my former publication, cited above, we arrive at the results shown in figure 2. Except for the months of May and June,[3] the results seem to be as emphatically favorable for Potsdam as for Washington to the former conclusions, as follows: Opposite changes of solar radiation are associated for at least 2 weeks after their commencement with opposite marches of temperature departures in weather. These average effects are of the order of several degrees Centigrade, although the solar changes on which they depend are only of the average range of about 0.7 percent. If daily excellent values of the solar constant of radiation, trustworthy to 0.2 percent, were available, certain weather features might probably be predicted for 2 weeks or more in advance. Since theory and observation indicate that the solar radiation changes fractionally perhaps ten times as much near 3,100 angstroms as in the solar constant, there is great hope that automatic records of ultraviolet solar radiation at great altitudes may be of first rate importance for weather forecasting.

[2] Beob. Obs. Potsdam, Deutsch. Meteorol. Jahrb., Teil 4, Heft 1.

[3] In these two months considerable temperature changes are found at Potsdam, but they run parallel for opposite variations of the sun.