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WORLD WEATHER AND SOLAR ACTIVITY

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INTRODUCTION

This paper is the sixth of a series by the author giving the results of investigations of the relation of solar activity to atmospheric changes. The earlier ones were published as Smithsonian Miscellaneous Collections, vol. 68, no. 3; vol. 71, no. 3; vol. 77, no. 6; vol. 78, no. 4; and vol. 82, no. 7. The author wishes to express his appreciation for the continuance of the encouragement in these researches by Dr. C. G. Abbot and Mr. John A. Roebling. He also wishes to acknowledge the help of Miss M. I. Robinson in the protracted statistical work that has been necessary.

The features especially stressed in this paper are:

1. The world-wide correlations of atmospheric changes, as indicated by a similarity in these changes in both the Northern and Southern Hemispheres and in widely separated continents and oceans. In some cases the changes are directly similar, and in others the changes are directly opposite—that is, when one increases the other decreases.

2. A relationship is found between atmospheric changes and sunspot activity, and an even closer relationship with changes in solar radiation.

3. Centers of action in the atmosphere are found to shift position under the influence of changes in the intensity of solar activity. This is a fact of great importance to be considered in correlating the weather between distant places, in studying the question of periodicity in the weather, and in tracing atmospheric movements of a wavelike nature.

WORLD-WIDE CORRELATION OF WEATHER CHANGES

In figure 1 a comparison is made between the mean annual rainfall in the interior of the United States and the height of the Parana River at Rosario, Argentina. By rainfall is meant the actual rainfall plus its equivalent in other forms of precipitation. The area used is the interior basin of the United States between the Allegheny and Rocky Mountains. The data were obtained from the Monthly Weather Review, and the mean annual values of the rainfall were computed for each year from 1900 to 1932 from the mean rainfall given for each of the following 10 sections:

Ohio Valley and Tennessee, Lower Lake Region, Upper Lake Region. Upper Mississippi Valley, West Gulf States, North Dakota, Missouri Valley, Northern Slope, Middle Slope, Southern Slope. The values are given in inches in column (1), table 1.

TABLE 1.—*Fundamental Data*

Year	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1889	....	....	..	0.5	0.1	0.0	—0.6
1890	....	....	..	0.1	—0.5	—0.1	—1.0
1891	....	....	..	—0.2	0.0	0.2	0.2
1892	....	....	..	—0.5	—0.6	—0.6	—0.7
1893	....	....	..	—0.3	—0.4	—0.3	—0.7
1894	....	....	..	—0.1	—0.4	—0.3	—0.6
1895	....	....	..	—0.1	—0.1	—0.3	—0.2
1896	....	....	..	—0.2	0.2	0.1	0.3
1897	....	....	..	0.1	—0.4	—0.2	—0.1
1898	....	....	..	—0.4	—0.6	—0.6	—0.9
1899	....	....	..	—0.1	0.1	0.2	0.4
1900	29.82	4.527	..	—0.1	0.3	0.2	0.5
1901	24.95	2.998	..	—0.2	0.2	0.1	0.4
1902	29.35	3.536	..	0.0	—0.4	0.2	1.0
1903	29.04	3.268	..	0.2	—0.5	—0.2	0.0
1904	26.21	3.807	..	0.1	0.0	0.3	0.2
1905	31.82	5.611	..	0.2	—0.3	0.4	1.0
1906	29.21	3.621	..	—0.2	0.0	0.0	0.0
1907	27.21	3.634	..	—0.4	—0.6	0.0	0.0
1908	28.58	4.249	33	—0.1	—0.4	0.0	0.1
1909	28.85	2.924	40	—0.2	—0.4	—0.2	—0.2
1910	22.73	2.837	75	—0.2	0.0	—0.4	—0.6
1911	28.33	3.128	25	0.3	0.4	0.4	0.5
1912	27.37	4.382	12	0.5	0.3	0.4	0.7
1913	28.20	3.664	27	0.4	0.2	0.5	0.7
1914	27.64	3.836	11	0.6	0.7	0.8	1.4
1915	31.62	3.717	26	—0.4	0.5	0.3	0.5
1916	26.81	2.397	60	—0.4	—0.3	—0.4	—0.6
1917	22.90	2.255	75	—0.1	—0.3	—0.3	—0.5
1918	26.68	3.018	28	—0.2	0.4	0.6	0.5
1919	29.69	4.189	13	0.0	0.6	0.5	0.9
1920	28.65	4.562	54	0.0	0.3	0.1	—0.2
1921	28.12	4.387	63	0.4	0.1	0.0	—0.2
1922	27.46	4.465	21	0.4	0.3	—0.1	—0.2
1923	30.17	4.458	22	0.7	0.5	0.1	0.1
1924	25.18	2.967	27	0.4	0.3	0.2	0.0
1925	25.15	2.396	24	0.5	0.1	0.3	0.0
1926	29.36	4.058	21	0.4	0.1	0.4	0.4
1927	30.38	3.141	34	0.1	0.0	0.2	0.1
1928	28.84	3.819	13	0.2	0.2	0.0	0.2
1929	29.01	4.494	15	0.1	0.0	0.2	0.0
1930	23.84	3.843	63	0.7	0.3	0.6	0.7
1931	26.50	4.974	41	..	..	..	..
1932	28.75	5.039	21	..	..	..	..

(1) Average rainfall in inches in interior basin of the United States between the Allegheny and Rocky Mountains.
(2) Average height in meters of the Parana River at Rosario, Argentina.
(3) Percentage of area of Australia above average rainfall.
(4) Departures of annual mean pressure from 42-year normal at Quixeramobim (values preceding 1897 were interpolated from Recife).
(5) Departures of annual mean pressure from 42-year normal at Antananarivo.
(6) Departures of annual mean pressure from 42-year normal at Colombo.
(7) Departures of annual mean pressure from 42-year normal at Darwin, Australia.

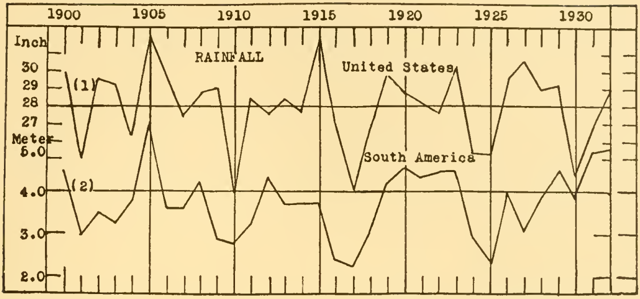


FIG. 1.—(1) Mean annual rainfall between the Allegheny and Rocky Mountains. (2) Mean annual height of the Parana River at Rosario, Argentina.

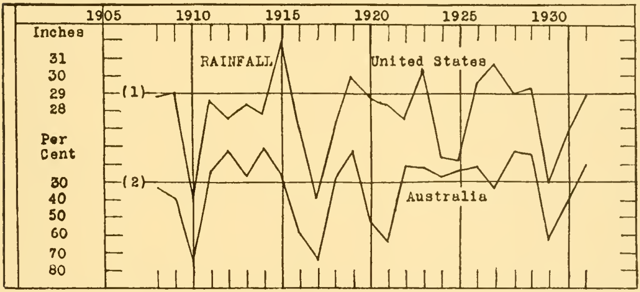


FIG. 2.—(1) Mean annual rainfall between the Allegheny and Rocky Mountains. (2) Percentage of Australia covered by excess of rainfall over normal.

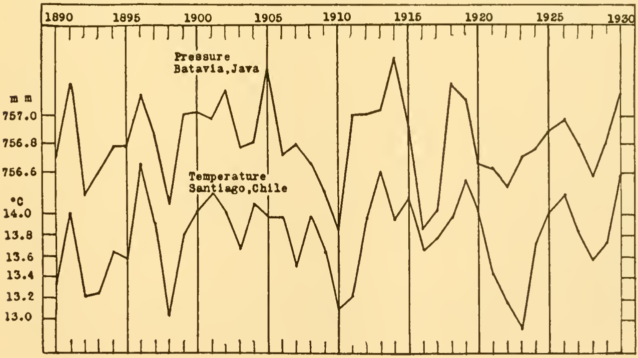


FIG. 3.—Comparison of pressure in the Indian Ocean with temperature in Chile.

The Parana River drains the interior of South America between about 15° S. and 30° S. The river heights used were those measured at Rosario, Argentina, near the mouth of the river. The mean annual height for each year from 1900 to 1932 is given in column (2) of table 1. The variations of height are believed to form a good index of the variations of rainfall over central South America, because there is no snowfall or ice to retard the flow of water into the river. The correlation between the rainfall of the interior of the United States and the variation in height of the Parana River is found to be $+.55 \pm .08$.

It was shown in a preceding paper[1] that the annual variations of pressure at San Diego are similar to those at Buenos Aires.

In figure 2 a comparison is made between the rainfall of the interior of the United States and the rainfall of Australia. The rainfall of the United States was obtained as previously described. The rainfall of Australia is expressed in percentages of Australia covered by areas of rainfall in excess of the normal. These data were obtained from the Rain Map of Australia, 1931 and 1932, published by the Commonwealth Meteorologist and are given in column (3) of table 1. In this case there is an inverse relationship—that is, when the rainfall in the United States is low, that in Australia is high, and vice versa. For this reason the curve of Australia is inverted, the higher values being plotted downward. The correlation value is $-.66 \pm .08$.

In comparing the two sets of curves, it is seen that every marked depression in the rainfall in the interior of the United States was accompanied by low water in the Parana River except in 1930 and was coincident with a marked excess of rainfall in Australia, except in 1924.

In figure 3 is shown a comparison of the annual mean pressures at Batavia in the Indian Ocean with the annual mean temperatures at Santiago, Chile. There is clearly a similarity between them, showing that they tend to oscillate in the same way. The correlation between the two for 64 years, 1866 to 1930, is $r = .43 \pm .03$. An even closer relation is found between the pressure in the Indian Ocean as observed at Colombo, Ceylon, and that at Santiago, Chile. The correlation for the 29 years, 1871 to 1902, is $r = -.68 \pm .08$, and for the 28 years, 1903 to 1930, it is $r = -.61 \pm .08$. In other words, the pressure oscillates oppositely in the two regions except for occasional breaks in the sequence.

Many similar instances have been pointed out by others. Blandford, Teisserenc de Bort, Hildebrandsson, Lockyer, Mossman, Arctowski,

[1] Smithsonian Misc. Coll., vol. 78, no. 4, p. 43, 1926.

Exner, Walker, Groissmayr, Nansen, Mémery, and others have given instances of correlation in weather in widely separated areas even in opposite hemispheres. De Geer finds these widespread correlations as far back as the glacial epoch, and White's researches suggest them even at an earlier period.

It is evident that there is something in common in the weather in widely separated parts of the earth, even in countries on opposite sides of the earth, as is shown in figure 2 in a comparison between the

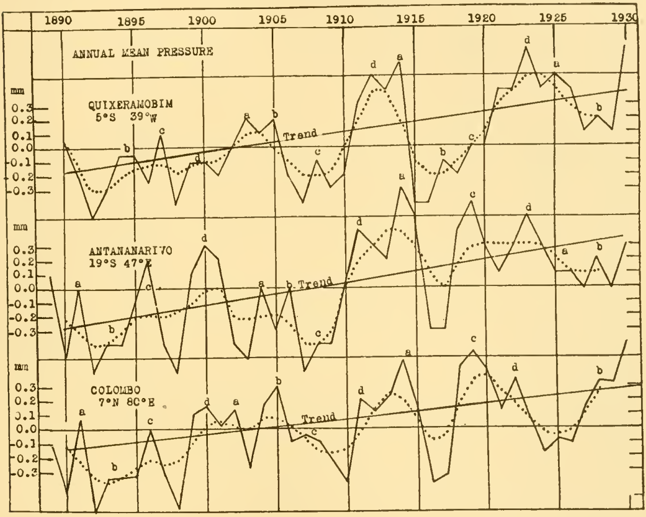


Fig. 4.—Annual means of pressure at widely separated tropical stations and smoothed means of several years, showing similarity of changes.

rainfall in the United States and in Australia. In fact, the weather changes are in some way related to each other over the entire world, as will be more fully seen from what follows.

In figure 4 the annual departures from normal pressure are plotted for three widely separated tropical stations, namely, Quixeramobim, Brazil; Antananarivo, Madagascar; and Colombo, Ceylon. The departures from 42-year normals are given in table 1, columns (4), (5), (6), and (7). The data for Quixeramobim were extended backward to 1889 by comparison with Recife. The oscillations of the annual pressures at these three stations show a similar pattern. More-over, the general trend of the pressure during the past 50 years has been upward. This is true throughout the equatorial region from northern Brazil to northern Australia. It will be noted that there are maxima every 2 to 4 years, which in the plot are marked a, b, c, d. There are also longer oscillations, which may be brought out by smoothing the curves. Consecutive or overlapping means of 3, 4, and 5 years were tried; then a second smoothing of the means of 3 was tried, so that the formula became $\frac{1}{9}\Sigma_1^3\Sigma_1^3$. A second smoothing of the means of 4 was also tried with the formula $\frac{1}{8}\Sigma_1^4\Sigma_1^2$. The results

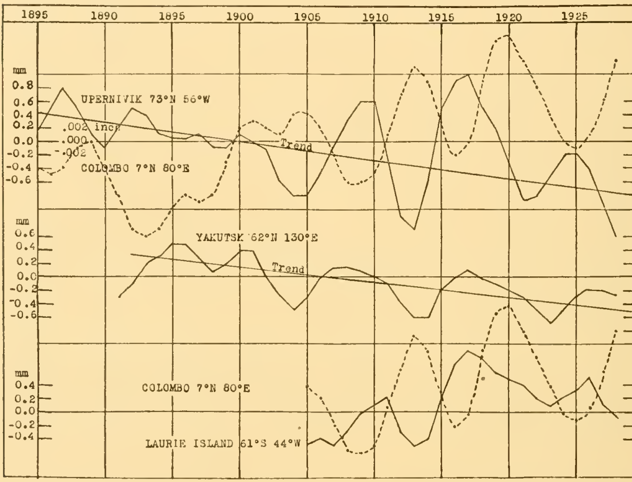


FIG. 5.—Smoothed means of pressure at stations in high latitudes (continuous lines) compared with smoothed means at a tropical station (dotted lines).

of this last formula gave the smoothest curves; but the second means of 3 were more easily obtained, so that the first formula was adopted for the smoothing, although in some cases the first means of 5 were used instead. The dotted curves given in figure 4 are from the second means of 3 (first formula). The data for these curves were obtained from World Weather Records, Smithsonian Miscellaneous Collections, vols. 79 and 90.

In figure 5 the smoothed means for Colombo are compared with similar smoothed annual means of pressure in high latitudes. The pressure oscillations are larger in high latitudes than in the Tropics, so that Colombo is plotted on a more open scale. It is seen that the longer oscillations of pressure at Colombo are exactly opposite to those at Upernivik in Iceland and at Yakutsk in Siberia, and the trend of the pressure for the past 42 years is opposed. The comparison of Colombo with Laurie Island, the most southern station in the Southern Hemisphere, in the lowest curve in figure 5 shows that the pressure oscillations of long period in high latitudes in the Southern Hemisphere are also opposed to those at Colombo and are similar to those in high latitudes in the Northern Hemisphere. It should be noted that Colombo is only about 7° of latitude from the Equator and is within the warmest and most humid area of the earth, whereas Upernivik and Yakutsk are in the coldest regions of the Northern Hemisphere where the vapor content of the atmosphere is small.

This comparison indicates that there are marked changes in the Pole to Equator pressure gradients in the atmosphere and, hence, marked oscillations in the intensity of the atmospheric circulation. To this cause may reasonably be attributed the similarities of rainfall and temperature between such widely separated areas as the United States and South America, the United States and Australia, and the similarity between the pressure in the Indian Ocean and the temperature on the coast of Chile.

The general diminution in the pressure gradient between high and low latitudes during the past 42 years, as shown by the trend of the pressures in high and low latitudes, is indicative of a world-wide amelioration of climate during the same period. It has been pointed out by various research workers that glaciers in high latitudes are slowly retreating, that the waters in the Great Lakes and in other lakes farther west in the United States are receding to lower levels, and that there is an upward trend of the temperature in high latitudes in both hemispheres. This change has probably been in progress during most of the past century. The latest publication on this subject is by Kincer in the Monthly Weather Review for September 1933. These various researches indicate that the climate of the earth is on the whole becoming warmer and drier in some long period of solar change, the length of which is not yet known. The change of climate corresponds in character with the long-period oscillations of past epochs pointed out by C. E. P. Brooks, of London, in his book "Climate Through The Ages."

When the departures from normal pressure are plotted on charts, they are seen to be larger in certain regions than in others. The regions of greatest departure have been called centers of action, but they are not fixed in position. This fact is evident from figure 6. This figure gives a comparison of the smoothed annual means of pressure at Upernivik, Iceland, and Gjesvaer, Norway. From 1885 to 1895 the pressure changes at Gjesvaer were opposed to those at Upernivik, from 1900 to 1924 they were similar, and from 1925 to 1930 they were

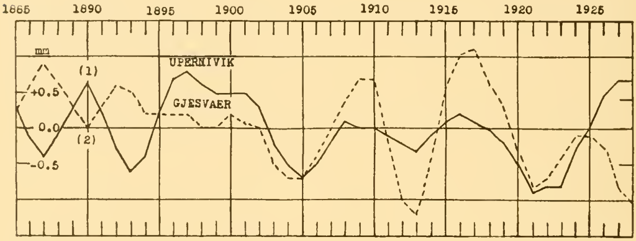


Fig. 6.—(1) Smoothed annual means of pressure at Upernivik, latitude 73° N., longitude 56° W. (2) Smoothed annual means of pressure at Gjesvaer, latitude 71° N., longitude 25° E.

again opposed. This difference indicates a shift in position of a center of action, which fact will be considered later in connection with its relation to solar activity.

SUN SPOTS AND WEATHER

The world-wide correlation of weather changes suggests some general cause, most probably a change in solar activity. The relation of weather to sun-spot changes has been a subject of investigation for many years by independent research workers. The most recent research is that of Schostakowitsch, a review of whose work appeared in the Bulletin of the American Meteorological Society for March 1933. These various investigations have brought out very clearly that when a mean of several years is taken in the Tropics, the pressure averages lower, the rainfall and cloudiness higher, and the surface temperatures lower near sun-spot maximum than near sun-spot minimum.

In order to illustrate this point, a mean is taken of the annual departures of pressure at Quixeramobim and Antananarivo given in table 1, columns (4) and (5). This mean was corrected for trend and plotted in figure 7 over the inverted sun-spot curve for the interval 1889 to 1930. The pressure curve is more variable than the sun-spot curve and usually shows about four maxima, a, b, c, d, in each sun-spot period. By smoothing out these secondary maxima by overlapping means of 5, the broken curve is obtained which is seen to run almost exactly parallel with the sun-spot curve. This similarity indicates clearly a relation between the two.

No such parallel relation prevails between the smoothed annual means of pressure in high latitudes and the sun-spot curve. In comparing plots of the two, decade by decade, it is evident that in high latitudes the centers of action in the atmosphere varied in position over wide distances with variations of intensity of solar activity.

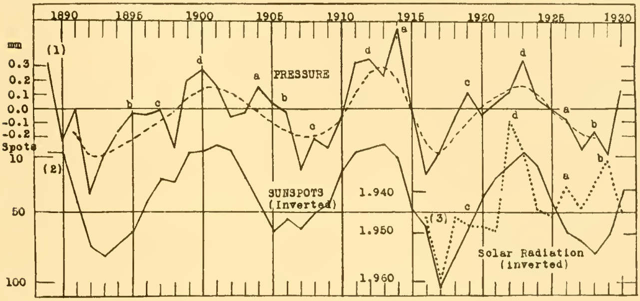


FIG. 7.—Comparison of mean pressures in Tropics with sun spots and solar radiation.

(1) Mean annual pressures at Quixeramobim and Antananarivo, corrected for trend. (2) Mean annual number of sun spots, inverted. (3) Mean annual values of solar radiation, in calories per minute, inverted.

This shifting of centers of action in high latitudes causes discontinuities and changes of phase in the sun-spot period and confuses relations that might otherwise appear.

The relative sun-spot numbers at successive sun-spot maxima differ greatly, as will be seen by the numbers in table 2.

TABLE 2.—*Relative Sun-spot Numbers at Different Epochs*

Yearly means				5-year means			
Maxima		Minima		Maxima		Minima	
Year	Number	Year	Number	Years	Number	Years	Number
1870.....	**139.1**	1867.....	7.3	1868-72...	**92.6**	1865-69...	33.1
1883.....	63.7	1878.....	3.4	1881-85...	58.7	1876-80...	13.1
1893.....	**84.9**	1889.....	6.3	1891-95...	**67.1**	1887-91...	11.9
1905.....	63.5	1901.....	2.7	1904-8 ...	54.0	1899-1903.	10.7
1917.....	**103.9**	1913.....	1.4	1915-19...	**70.2**	1911-15...	13.5
1928.....	77.8	1923.....	5.8	1926-30...	62.5	1921-25...	21.0

The highest sun-spot numbers were in 1870, 1893, and 1917, and lesser maxima were observed in 1883, 1905, and 1928. The first group of maxima are here called periods of high solar activity and the second group, periods of moderate activity. It will be noticed that periods of higher and lesser activity have occurred alternately,

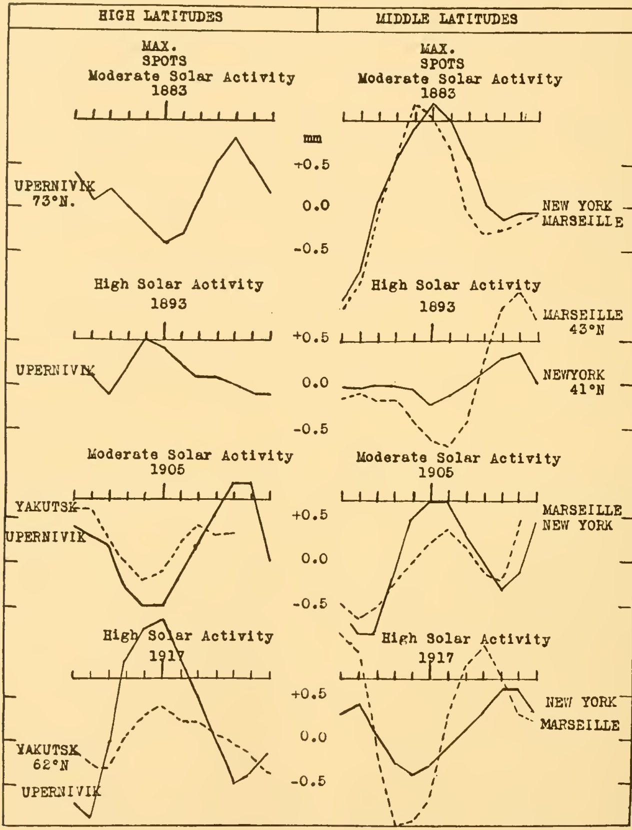


FIG. 8.—Smoothed annual means of pressure during the sun-spot period, Northern Hemisphere.

thus giving rise to a period of 22 to 24 years between similar states of activity. This alternation is found in the records since 1848 but not earlier.

In figure 8 the smoothed annual means of pressure at Upernivik and at Yakutsk have been plotted for successive periods of sun-spot activity, in so far as observations permit, and are compared with the values observed simultaneously at New York and Marseille. The plots show that in 1883 with moderate solar activity the pressure was low at Upernivik and high at New York and Marseille. In 1893 with increased solar activity the pressure was high at Upernivik and low at New York and Marseille. In 1905 with moderate solar activity the pressure was low at Upernivik and also at Yakutsk and high at New York and Marseille. With greatly increased solar activity in

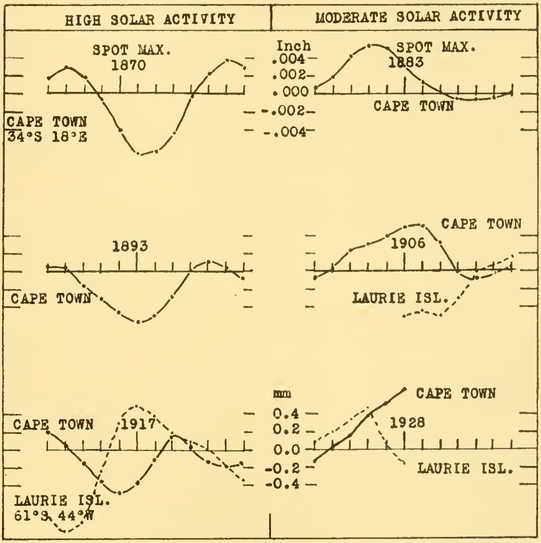


FIG. 9.—Smoothed annual means of pressure during the sun-spot period, Southern Hemisphere.

1917 the pressure was very high at Upernivik and low at New York and Marseille. These diagrams indicate that with high solar activity the centers of increased atmospheric pressure move northward to near 70° latitude, whereas with moderate solar activity they are found near 40° latitude. The same poleward oscillation of a center of increased pressure in the Southern Hemisphere with increased solar activity is indicated in figure 9. In this diagram the smoothed annual means of pressure at Cape Town are shown with high solar activity on one side of the diagram and with moderate solar activity on the other side. During periods of high maxima of solar activity the pressure is low at Cape Town, whereas with moderate maxima of solar activity the pressure is high at Cape Town, just as it is at New York and Marseille in the Northern Hemisphere. At Laurie Island, 61° S. shown by the broken line, the pressure was high with high solar activity in 1917 and low with moderate solar activity in 1905-6 and 1928, just as it was at Upernivik and Yakutsk in high latitudes in the Northern Hemisphere. The observations at Laurie Island now cover two sun-spot periods, and great credit is due the Argentine Government for maintaining this station with great difficulty and with much expense in this high southern latitude. It is hoped that in the coming years other nations may find it possible to maintain a net of stations in high southern latitudes.

An effort was made to map the positions of the centers of action at different sun-spot epochs. For this purpose the data published in World Weather Records (Smithsonian Misc. Coll., vols. 79 and 90) were used. These volumes contain the most complete set of data available, but for vast areas of the world there are still no observations, and for this reason any map of world conditions must be incomplete.

Five-year means of pressure, with the central year the epoch of maximum sun spots, were obtained for all available stations and plotted on a world chart. Lines of equal departure from normal were drawn for each 0.3 mm in the Tropics and for larger intervals in higher latitudes. The areas where the pressure was above normal are shaded. These areas for three epochs of maximum sun spots are shown in figure 10. The epochs are arranged in the order of intensity of solar activity as indicated by the number of spots, 1915-19, 1891-95, 1904-8. (See table 2.) The data were insufficient for earlier epochs.

During the marked maximum of spots 1915-19 the pressures are shown very high in high latitudes in both the Northern and Southern Hemispheres, with centers of greatest departure over Greenland and northern Siberia in the Northern Hemisphere and secondary centers over the cold waters off the coast of Africa and of Lower California. In the equatorial belt and over the warm waters of the Gulf Stream and the Kuro Siva the pressures were generally below normal, with centers of low pressure over the North Atlantic and North Pacific between 40° and 50° N. Corresponding centers of low pressure are shown in the Southern Hemisphere between 30° and 40° S. With a lessened intensity of solar activity in 1891-95 the centers in high latitudes appear displaced toward the Equator, with the exception of a low-pressure area over northern Europe. The center of high pressure over Greenland has moved southward toward Hudson Bay, and

Sun-spot maximum 1915-1919. Mean number of spots 70.2.

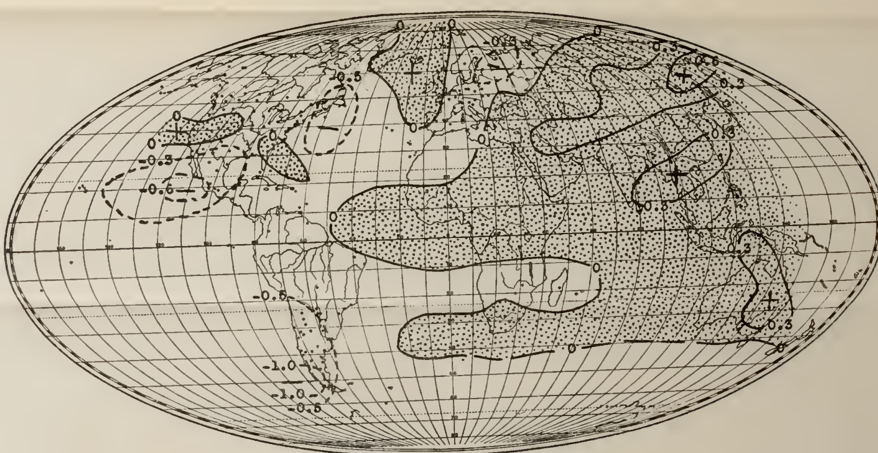
Sun-spot maximum 1891-1895. Mean number of spots 67.1.

Sun-spot maximum 1904-1908. Mean number of spots 54.0.

Fig. 10.—Departures of 5-year means of pressure from normal.

Sun-spot minimum 1910-1914. Mean number of spots 7.9.

Sun-spot minimum 1899-1903. Mean number of spots 10.7.



Sun-spot minimum 1887-1891. Mean number of spots 13.8.

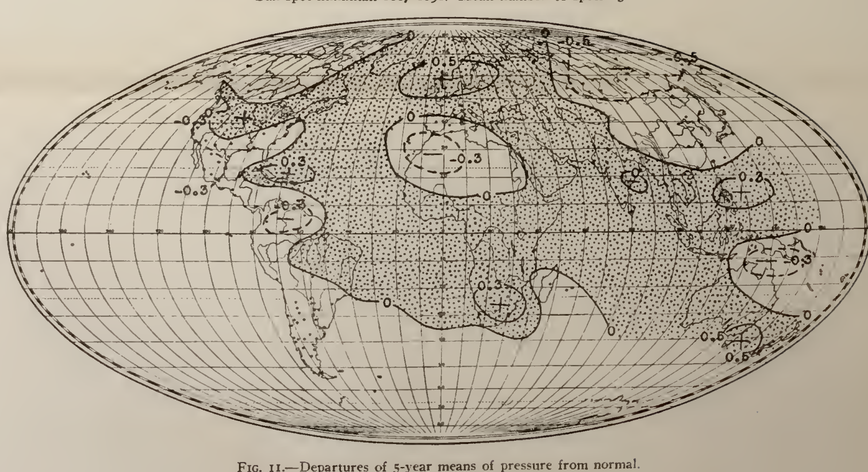


FIG. 11.—Departures of 5-year means of pressure from normal.

the center over northern Siberia has moved to a lower latitude. The center of decreased pressure over the North Atlantic has moved about 10° of latitude toward the Equator, and the decreased pressure over the North Pacific extends southeastward over the United States. Still referring to figure 10, with an even lower solar activity in 1904-8 the centers of excess pressure have moved southward to central North America and to Southern Siberia, respectively, and the centers off Lower California and northern Africa have increased in intensity; but the pressure continues low over the equatorial belt between the East Indies and northern South America. The centers of excess pressure in southern latitudes have been displaced to latitudes between 30° and 40° S., and areas of deficient pressure have appeared in latitudes between 60° and 70° in both hemispheres.

In figure 11 the departures of the 5-year means of pressure during epochs of minimum sun spots are arranged in reverse order to those shown in figure 10 for maxima of spots. During the period of very low sun-spot numbers in 1910-14 the distribution of the areas of excess and defect of pressure is almost the reverse of the distribution during the period of high solar activity in 1915-19. During the less marked solar minima of 1899-1903 and 1887-91 the reversal is less evident, but it should be noted that in each case there was an excess of pressure along the equatorial belt between the East Indies and South America.

CORRELATIONS BETWEEN VARIATIONS IN SOLAR RADIATION AND WEATHER

The dotted curve in figure 7 shows the annual mean values of the solar constant of radiation as measured by the Smithsonian astrophysical observatories. These data are plotted inverted—that is, with the higher values downward, as was the case with the sun spots. The curve formed in this way resembles the mean pressure curve for the two selected tropical stations much more nearly than does the sun-spot curve. The very low pressures in 1916-17 correspond with high values of solar radiation, and the high mean values of pressure in 1922-23 correspond with low values of solar radiation. It should be noted also that during the sun-spot period 1917-28 there were four maxima of solar radiation just as there were of pressure, although the extremes do not coincide exactly in time. From this we may infer that the pressure changes are caused by changes in solar radiation and follow changes in sun-spot numbers only in a general way.

Figure 12 shows the annual means of sun spots and solar radiation during two sun-spot periods. The continuous curve is plotted from the relative sun-spot numbers and the dotted curve from the mean values of solar radiation. During the period 1912-23 the long period oscillation of radiation is the same as that of the sun spots, but during the period 1923-33 this relation is not apparent.

At times the month to month variations of solar radiation and of atmospheric pressure are strikingly similar. In figure 13 the continuous curves are plotted from the departures from the 10-year averages of the monthly means of solar radiation observed in the same month

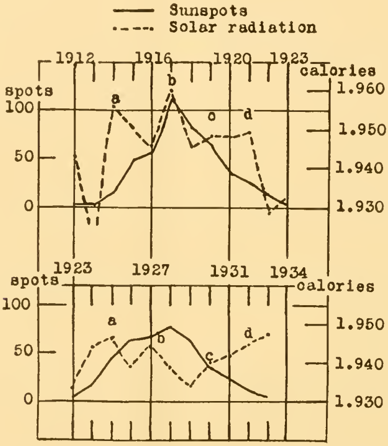


FIG. 12.—Sun spots and solar radiation annual means.

of succeeding years. The broken curves are plotted in the same way from monthly departures of atmospheric pressure in the centers of action in the atmosphere. The values of solar radiation are taken from table 45 of the Annals of the Astrophysical Observatory of the Smithsonian Institution, vol. V, p. 278, and the pressures are taken from World Weather Records, 1921-1930, Smithsonian Miscellaneous Collections, vol. 90.

It is seen in figure 13 that in the high-pressure center off the coast of Lower California in winter the solar radiation during the decade 1921-1930 varied in a general way in the same sense as the pressure, whereas in the Tropics during the interval from April to September it varied in an opposite way—that is, the pressure fell when the solar radiation increased. For this reason the two lower plots of pressure departures from normal are inverted in figure 13. The correlation values vary between 0.60 and 0.70 for the 30 months covered by

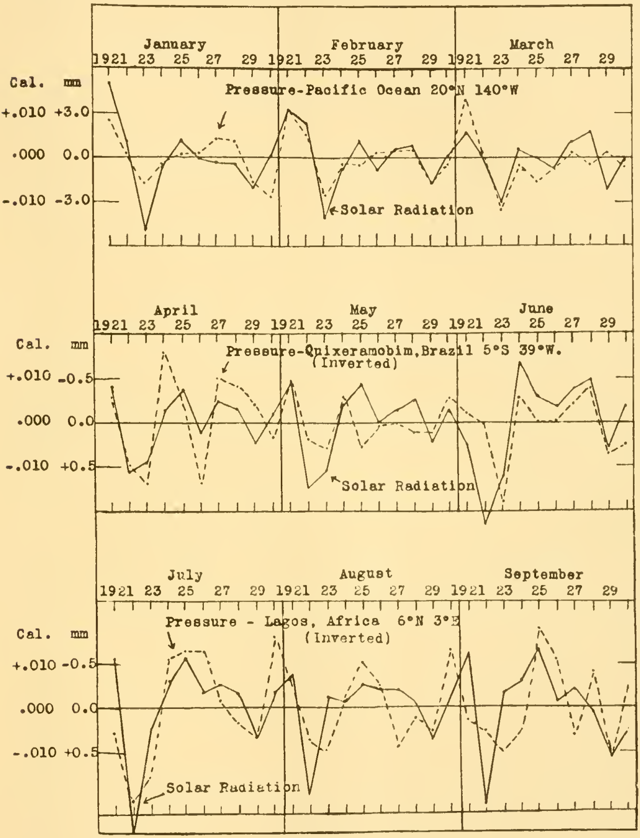


FIG. 13.—Monthly mean departures of solar radiation and of atmospheric pressure from 10-year normals (1).

each plot. The variations of atmospheric pressure are much larger in high latitudes than near the Equator. For that reason the variation of pressure for a given change in solar radiation is much greater in high latitudes than at the Equator. This fact is illustrated by the upper plot in figure 13, where the pressure change for the same interval on the scale is six times as great as for the tropical stations; it is also shown in figure 14, where the centers of action are near 50° N. In this region the oscillations of pressure are 10 times greater than they are near the Equator.

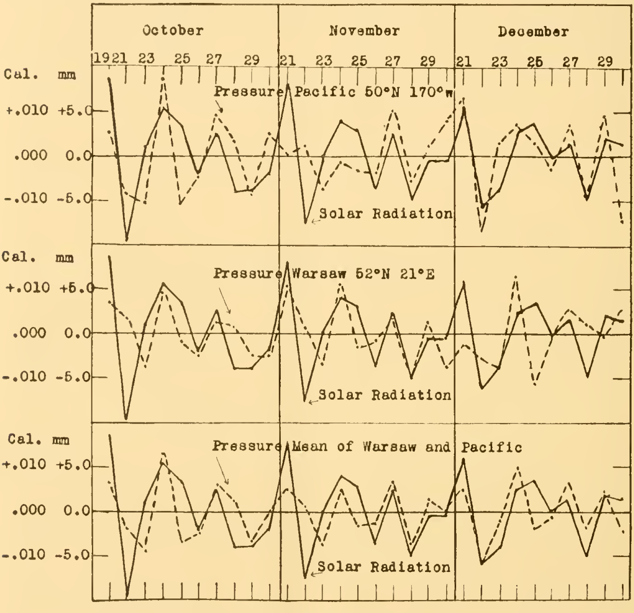


FIG. 14.—Monthly mean departures of solar radiation and of atmospheric pressure from 10-year normals (2).

Owing to the fact that the centers of action in the atmosphere show marked changes of position with variations of solar activity, as pointed out in the case of sun spots, it is not to be expected that any high degree of correlation between solar radiation and pressure can be expected for long intervals. It seemed worth while, however, to compute the correlation between the monthly values of solar radiation and of pressure for all parts of the world, using with the monthly values of solar radiation the pressure at selected stations taken from World Weather Records, Smithsonian Miscellaneous Collections, vol. 90. The computed correlation coefficients and the amount of change in pressure for each change of 1 per cent in solar radiation are given in table 3 on page 36. The data all relate to the 10 years 1921-1930.

The correlation coefficients are plotted on maps, one for the whole period of 120 months in figure 15, and others for the seasons separately in figures 16, 17, 18, and 19. The correlations for the entire period of 120 months are not large, but the charted results show that minus correlations prevail over the Indian Ocean, equatorial Africa, the equatorial Atlantic, and along the Gulf Stream up to Iceland. The minus correlation signifies that with increased solar radiation the pressure falls within those areas where the pressure is normally low, and the plus correlation shows that it tends to rise within belts between 20° and 40° both north and south of the Equator. In other words, with increased solar radiation the normal areas of high and low pressure in the atmosphere are accentuated and the normal atmospheric circulation speeded up.

It is also to be noted that there are well-defined centers of plus and minus correlation. The center of plus correlation over Siberia may be called the Gobi Desert center; the one over northern Africa and the adjacent Atlantic, the Sahara center; the one over the Pacific west of lower California, the Pacific center; and the one over Labrador, the Labrador-Greenland center. It is significant that the areas of minus correlation, as pointed out in the case of sun-spot maxima, are in regions where the water temperatures and vapor pressures are high, and the centers of plus correlations are in regions where the vapor pressures are low. This fact suggests very strongly, if it does not prove, that the fall of pressure with increased solar radiation is due to the absorption of the increased radiation by the water vapor in the air, the heating of the air, a consequent lowering of the pressure, and an overflow of air to the colder and drier regions of the earth.

With the four seasonal charts the maximum correlation coefficients are large. Figures 16 to 19 show that although the areas of minus correlation vary in area and position with the seasons, the centers of greatest minus correlation are always found in regions of high vapor pressure. It is of especial significance that in June to August, when the sun is north of the Equator and the highest vapor pressures are also north of the Equator, the greatest minus correlations are found between the Gold Coast of Africa and the mouth of the Amazon River in South America; whereas in December to February, when the sun is in the Southern Hemisphere and the highest vapor pressures

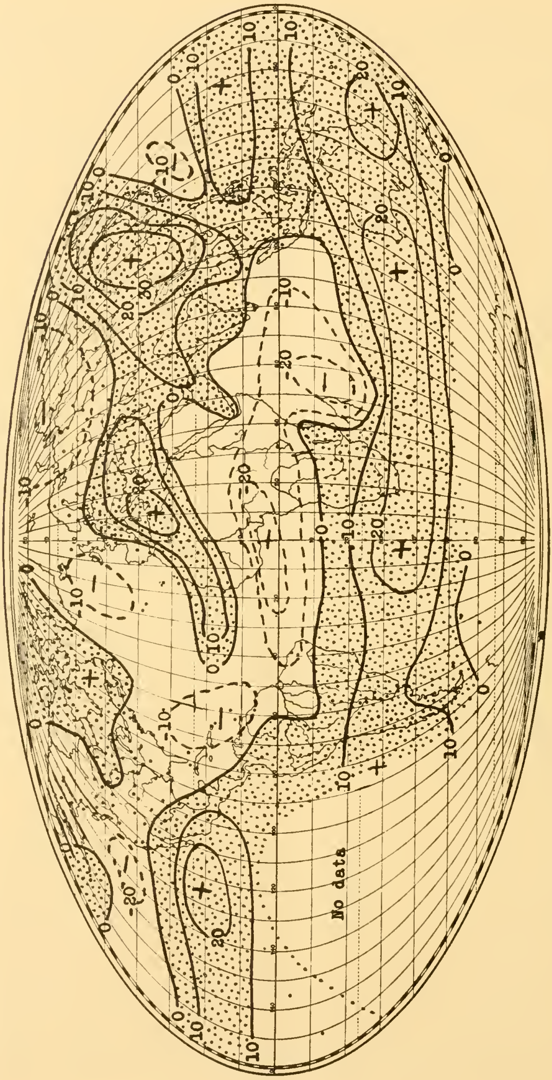


Fig. 15.—Correlations of monthly means of pressure and solar radiation. 1921-1930, 120 months.

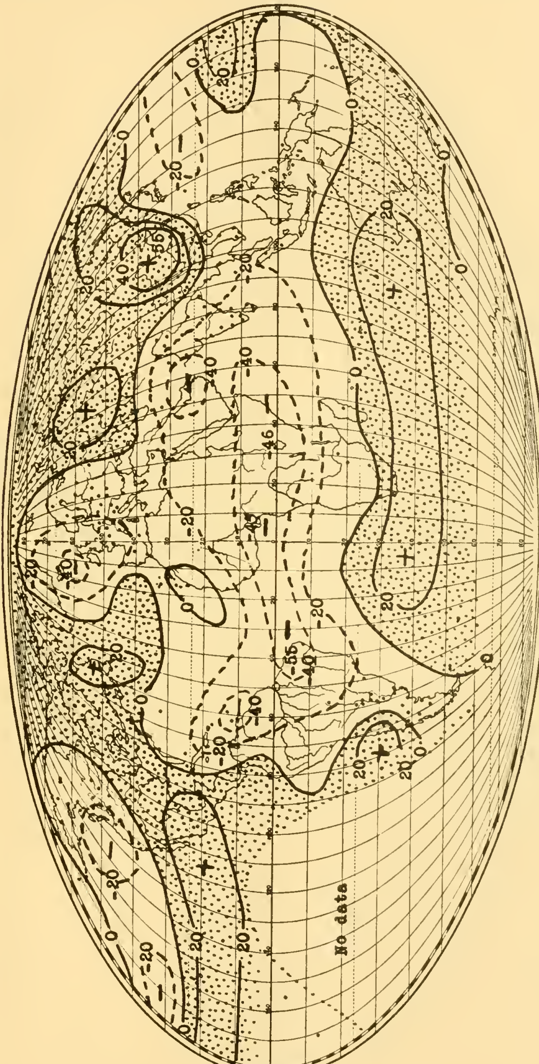


Fig. 16.—Correlations of monthly means of pressure and solar radiation. March to May, 1921-1930, 30 months.

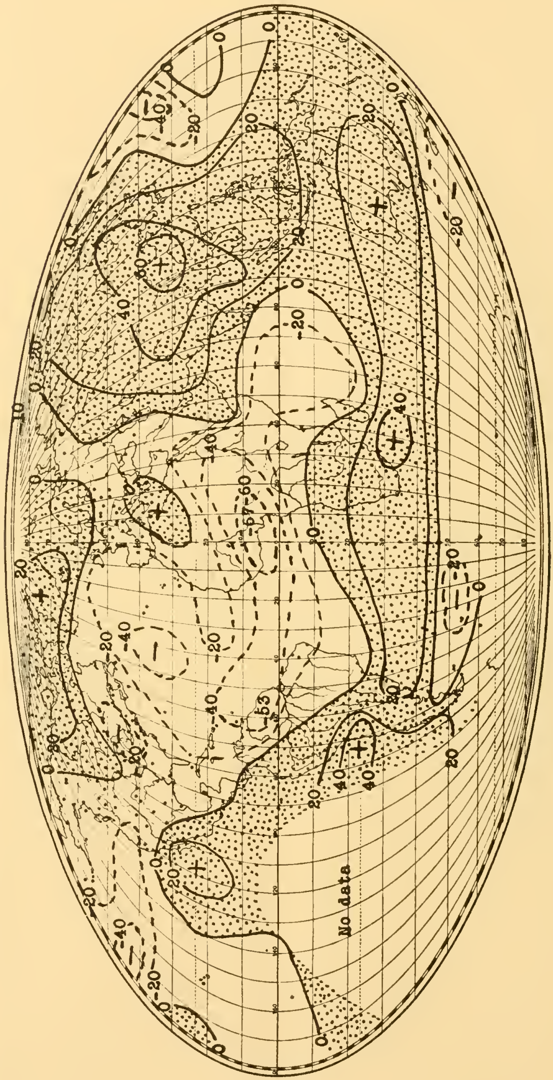


FIG. 17.—Correlation of monthly means of pressure and solar radiation. June to August, 1921-1930, 30 months.

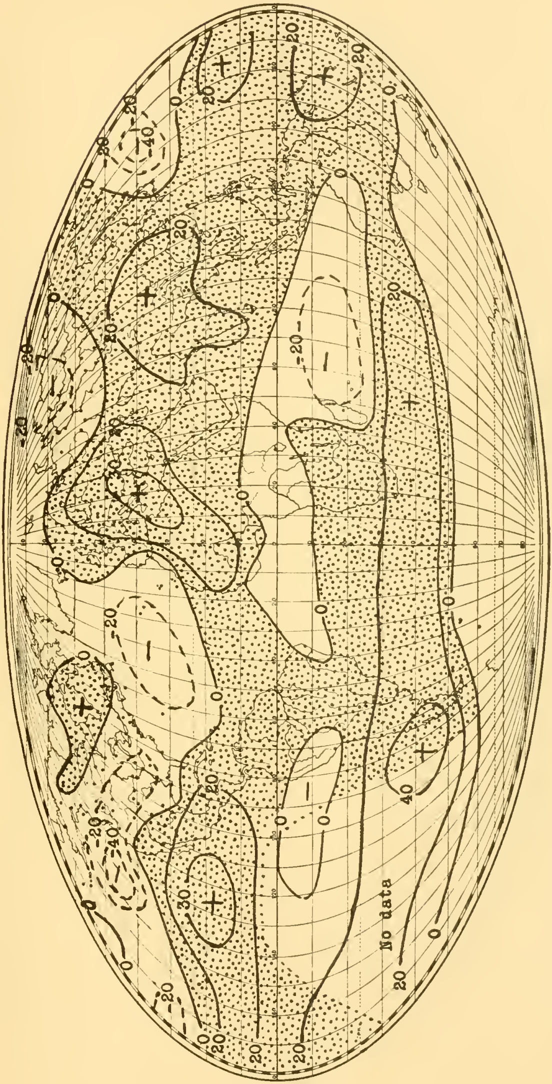


Fig. 18.—Correlation of monthly means of pressure and solar radiation. September to November, 1921-1930, 30 months.

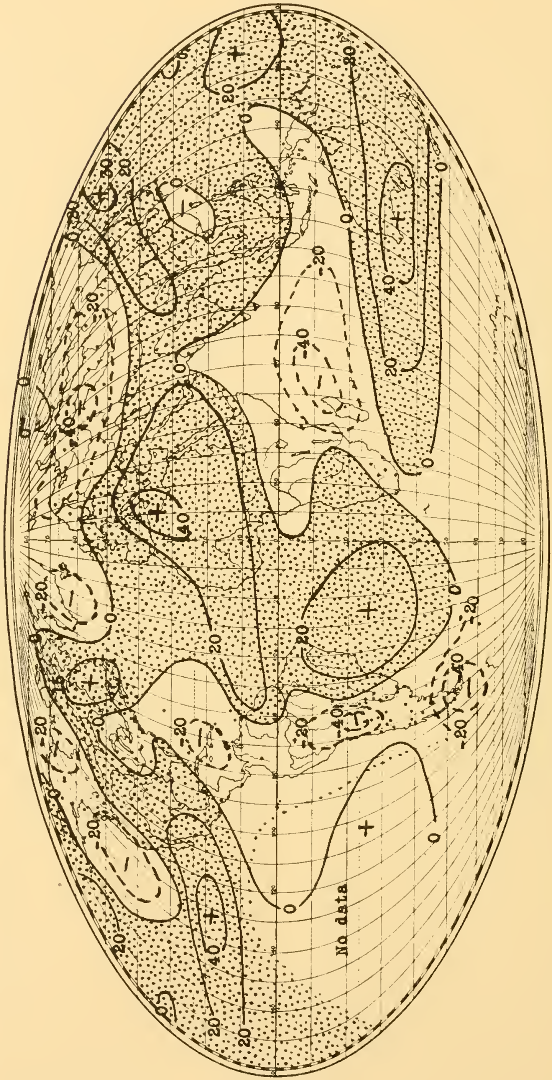


Fig. 19.—Correlations of monthly means of pressure and solar radiation. December to February, 1921-1930, 30 months.

are south of the Equator, the greatest minus correlations are found south of the Equator in the Indian Ocean near Madagascar and in central South America.

In Dr. G. C. Simpson's excellent paper on "Further Studies in Terrestrial Radiation,"[2] he considers what should be the effect of 1 percent change in solar radiation. He finds that such an increase might be balanced (1) by an increase of 2° C. in surface temperatures, or, (2) by an increase of 1°.5 in the temperature of the stratosphere, or, (3) by an increase of .01 percent in cloudiness. However, what should not be overlooked in this connection is that an increase in cloudiness involves a coincident increase in temperature and a resulting decrease in pressure in order to produce the increase in cloudiness. This is particularly true in the equatorial belt. The calculations given in table 3, coefficient *b*, show that in the centers of action in that region the change of pressure for 1 percent change of solar radiation does not exceed −1.2 mm. To produce this fall would require a rise in the mean temperature of the air column of about 0°.4 C.[3] If there were no errors in the solar measurements, the correlation coefficients *r* and *b* would probably be larger, but in no case would the resulting temperatures exceed the amounts calculated by Simpson.

In high latitudes the coefficient *b* becomes larger and in the centers of action rises to 5 mm for 1 percent change in solar radiation; but in this region the air is approaching the axis of rotation of the earth, and the deflecting effect of the rotation plays a part in lowering the pressure within normal centers of low pressure which are intensified by the increased solar radiation. The height above the surface at which the greatest absorption of solar radiation by water vapor takes place is yet to be determined, but certainly in some cases it is within or above the cloud level.

In order to study the variation of position of the centers of action with varying intensity of solar radiation, the monthly departure from 10-year normals of solar radiation were arranged according to intensity in the following six classes: (1) over +.010 calories, (2) +.006 to +.010, (3) +.001 to +.005, (4) −.000 to −.005, (5) −.006 to −.010, (6) under −.010. The normal was taken as 1.940 calories per square centimeter per minute, and the absolute values may be obtained by adding this value to the departures given. The mean pressures for the 10 years 1921-1930 were then determined for each station in a world-wide net of stations for each class of solar radiation

[2] Mem. Roy. Meteorol. Soc., vol. 3, no. 21, pp. 19-22, 1928.

[3] See World Weather, p. 275, Macmillan and Co., 1923.

intensities. The data were taken from World Weather Records, 1921-1930. The results are given in table 4 on page 42 for each season and in table 5 on page 49 for the mean for the four seasons—that is, for the year.

Referring to table 5, the first step in investigating the relationships was to determine the correlation between the means of departures of pressures corresponding respectively to equal departures of solar radiation above and below normal. The results are as follows:

Correlation between the Mean Departures of Pressure Corresponding Respectively to Equal Departures of Solar Radiation Above and Below Normal

	Correlation coefficients	
Departures of solar radiation	Northern Hemisphere	Southern Hemisphere
+.001 to +.005 and −.000 to −.005	$r = -0.35$	$r = -0.51$
+.006 to +.010 and −.006 to −.010	$r = -.38$	$r = -.72$
Over +.010 and under −.010	$r = .27$	$r = -.23$
Number of stations used	$N = 119$ stations	$N = 46$ stations

The meaning of this table is that for equal departures of solar radiation above and below normal the departures of pressure from normal in all parts of the world tend to have opposite signs. This relation holds for stations all over the world, not only in the means for the year, taken from table 5 as here given, but also in general with a few exceptions for the separate seasons given in table 4. This fact seems to leave no escape from the conclusion that this is a real and not an accidental relationship. In short, these extensive data, covering all parts of the world, prove that solar variation is an important weather factor, even the dominating one, as also appears from Figs. 13 and 14 and 23-26.

Figure 20 shows the areas of excess and of defect of pressure for three different values of solar radiation above normal, and figure 21 shows the areas for the different values of solar radiation below normal. The departures of radiation above and below normal were taken as nearly equal as possible. These charts show numerous centers of plus and of minus departures of pressure which appear to be related in the successive charts. For example, in figure 20 the upper chart (1), for solar radiation above +.010 calories, shows an area of excess pressure over Greenland and Labrador. In the next chart (2), for +.006 to +.010 calories, this area has extended southward with the center of greatest departure near Nova Scotia; and in the third chart (3), for +.001 to +.005 calories, the center of excess pressure is over the ocean to the south of Nova Scotia. In figure 21, with solar

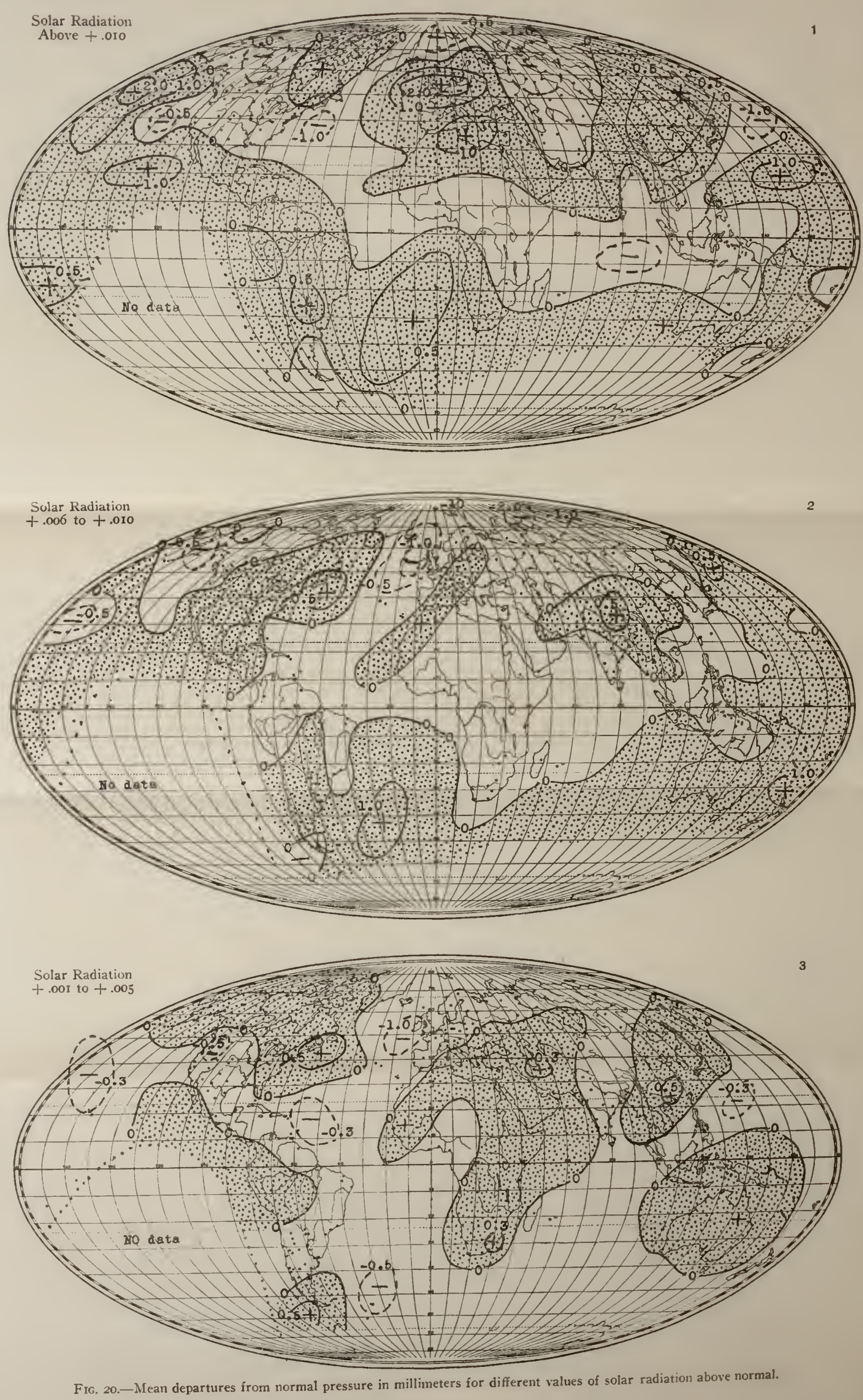


Fig. 20.—Mean departures from normal pressure in millimeters for different values of solar radiation above normal.

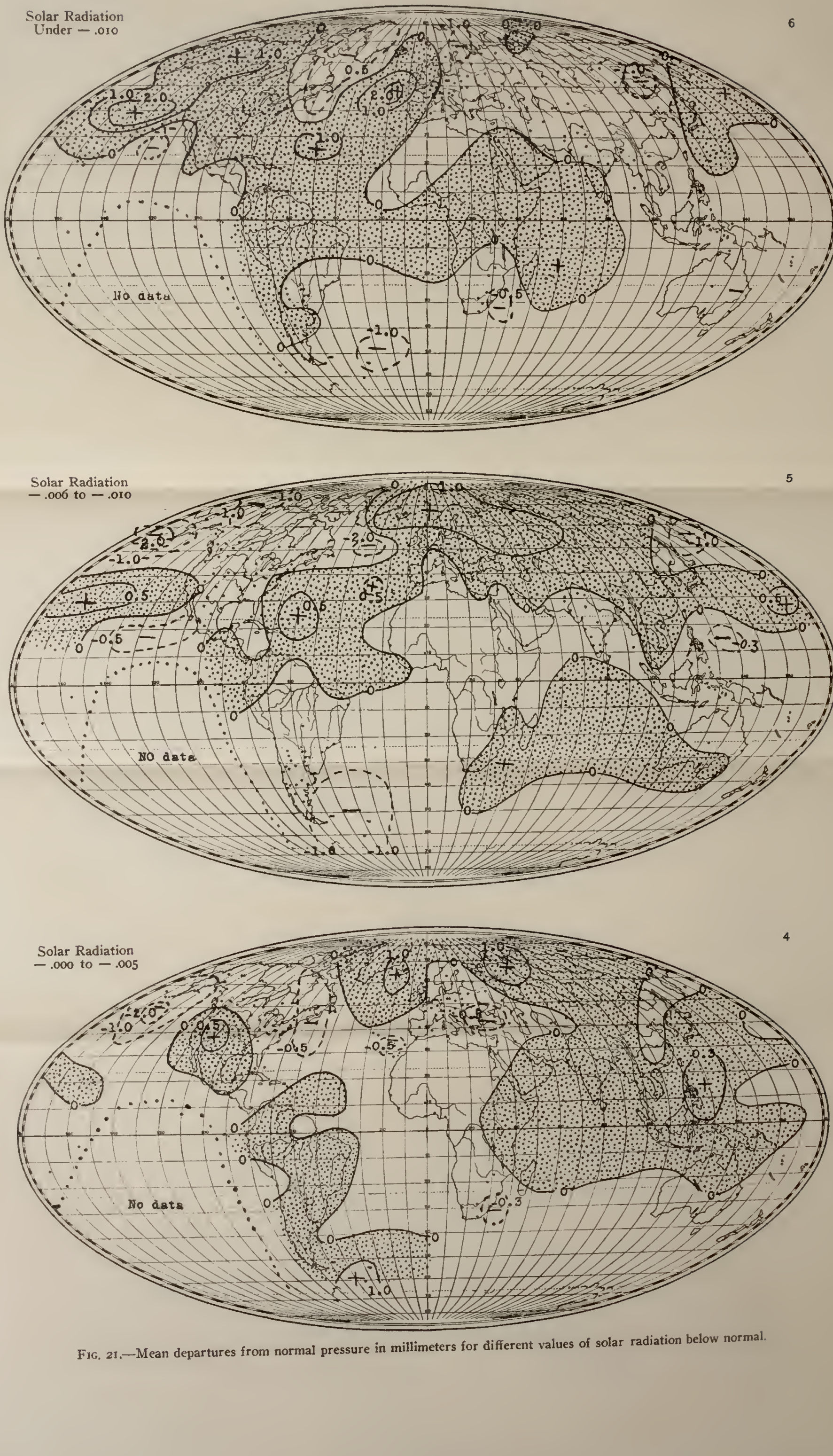


FIG. 21.—Mean departures from normal pressure in millimeters for different values of solar radiation below normal.

departures of $-.000$ to $-.005$ calories, chart (4), this area shows a defect of pressure with the minimum near Nova Scotia. Chart (5), for $-.006$ to $-.010$ calories, shows the center of defect northeast of Newfoundland, and chart (6), for values under $-.010$ calories, shows the center of defect over Greenland and Labrador.

In the same way an area of excess pressure over Europe in chart 1 moves southward to the coast of Africa in chart 3, changes sign, and then moves northward over Europe with numerically increasing minus values of solar radiation. In chart 1 a center of minus pressures is found over the central Pacific west of California. This center shifts southwestward to latitude 30° in chart 3, changes sign with the change in radiation from plus to minus values, and then shifts northeastward with increasing minus values of solar radiation. The shift of centers does not appear quite so regular over the Atlantic. However, an area of defective pressure near Spitsbergen in chart 1 is found farther south in the two succeeding charts 2 and 3. With minus values of solar radiation it becomes an area of excess pressure covering the area between Greenland and Norway in charts 4 to 6. An area of excess pressure moves southward from northeastern Siberia to southern Siberia with decreasing positive values of radiation in charts 1 to 3, but the return northward of the minus area is not so evident in charts 4 to 6. A center of defective pressure near Bermuda in chart 1 shifts southward and is found near the West Indies in chart 3. It then changes sign with the change in solar radiation, and moves northward to the vicinity of Bermuda in chart 6.

In figure 22 an effort was made to plot the shift of the different centers of action. The position of the centers for different intensities are indicated by letters of the alphabet.

In general, when a center of action, either plus or minus, is found in a high latitude with high values of solar radiation, a center with an opposite sign is found about 30° farther south near the same longitude. Both these centers of action shift southward with decreasing plus values of solar radiation, change sign with the change in solar radiation from plus to minus, and then shift northward with increasing minus values of radiation. The only exception to this rule appears to be in the center of action in the Pacific, about 20° N. and 140° W., which apparently drifts eastward, changes sign, and then drifts westward again.

In the Southern Hemisphere the number of stations is too few to permit one to follow the shift in the centers of action, but the similarity of the changes north and south of the Equator, shown in the study of the sun-spot relations, no doubt holds in the case of solar radiation changes of shorter period.

In order to study the seasonal shift in the centers of action, the data given in table 3 were plotted in a series of charts. It is not feasible to reproduce all of these charts, but they indicate that the centers of action for each intensity of solar radiation oscillate around their mean position as a result of seasonal changes. Hence, in order to determine the effect of any solar radiation change, both the solar intensity and the seasonal change must be considered.

In figures 23, 24, 25, and 26 the differences between the mean pressures for solar intensities of +.006 to +.010 and −.006 to −.010 are given for each season. The mean change in solar radiation is about .015 calorie or 0.8 percent of the normal value, 1.940 calories. These charts show the direct effect of this change of solar radiation on the pressure as nearly as is possible with any arrangement of the data at present available. The changes shown by these charts are not small. They are sufficiently large to dominate the weather and to make their consideration imperative to anyone who would understand the weather and its causes.

The points of interest to be noted in these charts are: (1) With increased solar radiation there is a fall of pressure between Australia and Africa in December to February, when the sun is south of the Equator, and a fall of pressure between Malaysia and the West Indies in June to August, when the sun is north of the Equator; (2) with increased solar radiation there is a marked fall of pressure at all seasons in the North Atlantic, more marked and farther north in winter and spring and less marked and farther south in summer and autumn; (3) there is also a fall of pressure in the North Pacific west of North America; this area of fall is farther north and more marked in winter, but less pronounced than in the North Atlantic; (4) there is an increase of pressure over the Arctic region of North America at all seasons, although the center of greatest increase appears to oscillate back and forth across the continent; (5) there are two centers of increased pressure in northern Eurasia, one of the centers being found over eastern Asia and one between western Siberia and northern Europe, both showing large seasonal oscillations; (6) there are centers of increased pressure about 10° to 30° N.; one of these is found at all seasons between Hawaii and Mexico, another is in the Pacific about 140° E., and other more transient areas are near the west coast of Africa and near India. The stations in the Southern Hemisphere are too few to enable one to follow the shifting of the centers of action.

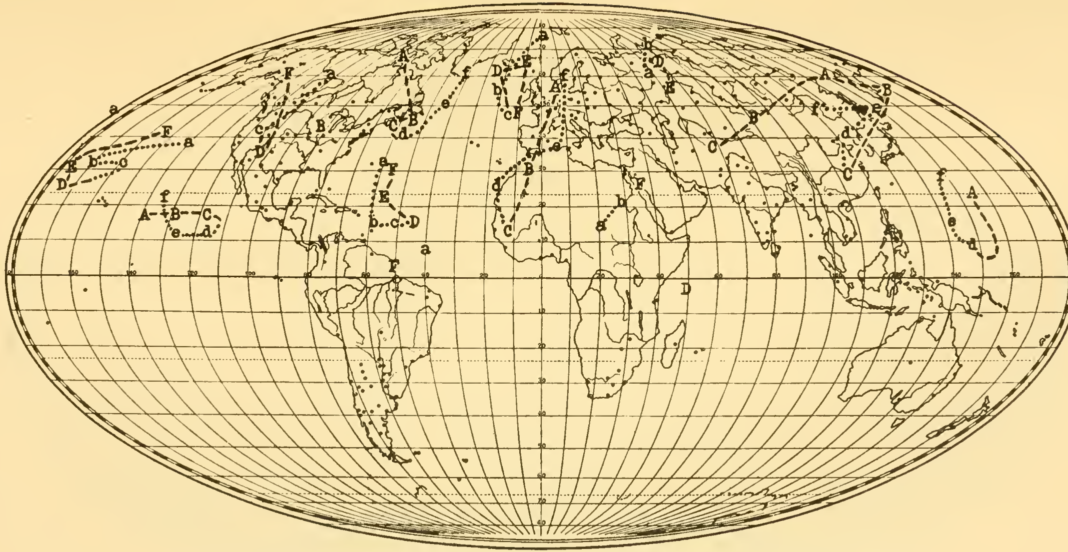


FIG. 22.—Movement of centers of action in the atmosphere with varying intensities of solar radiation.

A = center of excess of pressure and	a = center of defect of pressure when solar radiation is	over + .010
B = " " " " " "	b = " " " " " " " " "	+ .006 to + .010
C = " " " " " "	c = " " " " " " " " "	+ .001 to + .005
D = " " " " " "	d = " " " " " " " " "	− .000 to − .005
E = " " " " " "	e = " " " " " " " " "	− .006 to − .010
F = " " " " " "	f = " " " " " " " " "	under − .010

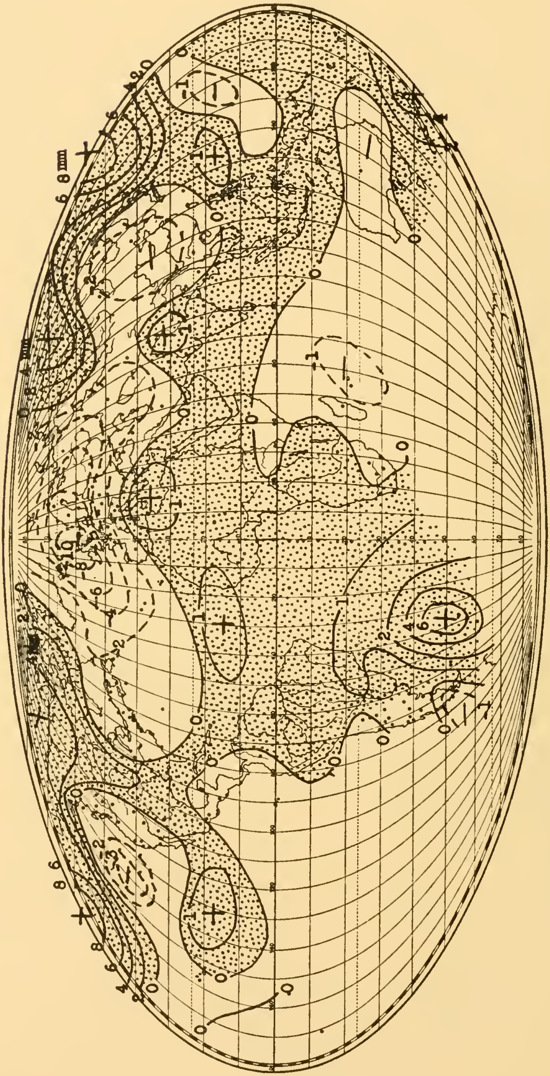


Fig. 23.—Differences between mean pressures with departures of solar radiation + .006 to + .010 and − .006 to − .010, December to February.

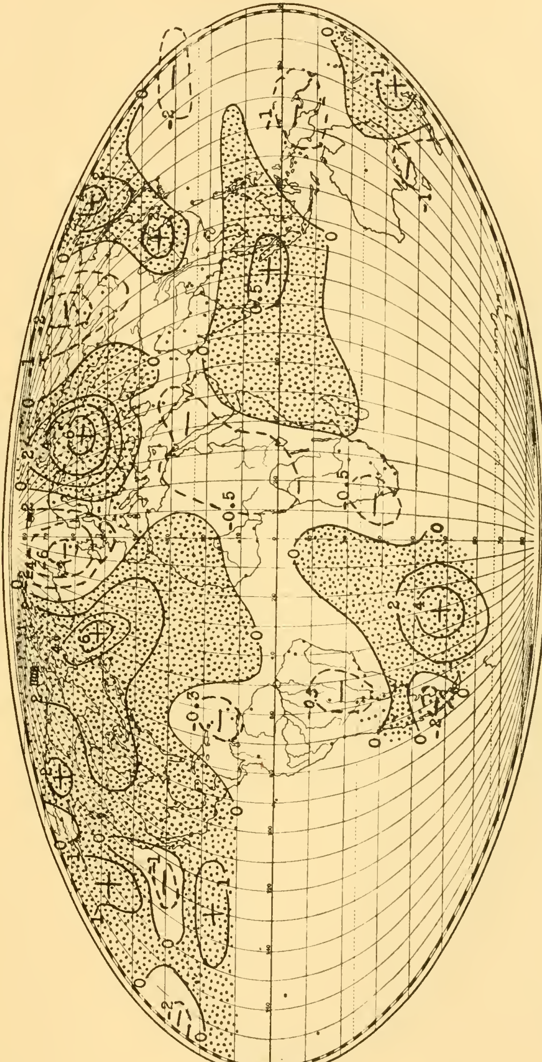


FIG. 24.—Differences between mean pressures with departures of solar radiation + .006 to + .010 and − .006 to − .010. March to May

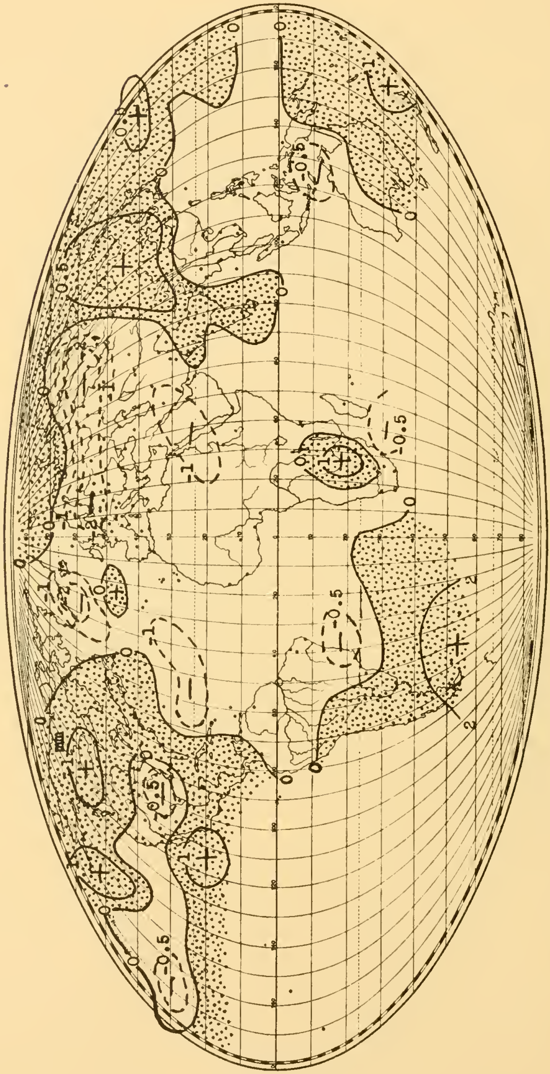


Fig. 25.—Differences between mean pressures with departures of solar radiation + .006 to + .010 and − .006 to − .010. June to August.

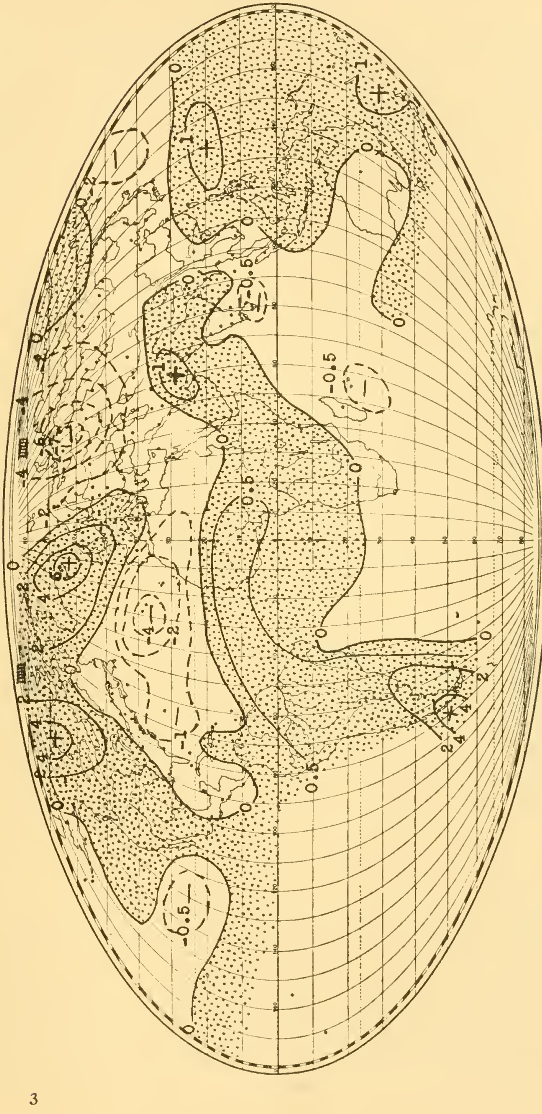


FIG. 26.—Differences between mean pressures with departures of solar radiation + .006 to + .010 and − .006 to − .010. September to November.

Similar charts for other intensities show that in general the northern centers of action are farther north with increased intensity of solar action and farther south with decreased intensity at all seasons. These charts show, as did the preceding charts, that with increase of solar radiation the pressure falls in those regions where the vapor pressure and the temperature are abnormally high for the latitudes in which they are found, whereas increases of pressure are found where the vapor pressure and temperature are below the normals for the latitude.

PROGRESSIVELY MOVING WEATHER WAVES

Numerous examples have been given in preceding papers of this series and in other publications of the progressive wavelike movements of weather areas in different parts of the world. These progressive movements can probably be explained in large part, at least, as due to the movements of the centers of action in the atmosphere with varying intensity of solar radiation. During each cycle of change in solar radiation the centers of excess pressure move from high latitudes to low latitudes and back again. These changes in position can be interpreted as waves that progress with a velocity inversely proportional to the length of the period of oscillation. In the shorter waves the west to east drift of the atmosphere in middle latitudes also plays an important part in the progressive motion.

SUMMARY

1. There is something in common in the weather in widely separated parts of the earth, even in countries on opposite sides of the earth, as for example the central United States and Australia. Changes in rainfall in central North America show a similarity to changes in central South America. Changes in pressure in the Indian Ocean show similarities to changes of temperature on the coast of Chile. Annual pressure means in San Diego vary in the same way as in Buenos Aires, and pressures in Ceylon vary inversely to those in Santiago, Chile. Many such relationships have been shown by other investigators.

It is suggested that these common features are brought about by changes in the intensity of the circulation of the earth's atmosphere. In confirmation of this view it is shown that there are periods lasting for several years when the pressure gradient between the equatorial region and the colder regions in high latitudes become greater than normal, and succeeding years when it becomes less than normal. This simultaneous change in the pressure gradient north and south of the

Equator indicates widespread oscillations in the circulation of the earth's atmosphere. In addition, for the past 42 years covered by the observations, there has been an upward trend of pressure in the equatorial belt and a downward trend in the cold areas of high latitudes, indicating a generally decreasing pressure gradient between high latitudes and the Equator, and an amelioration of the earth's climate.

2. In all latitudes, changes in pressure, temperature, and rainfall are most intense in certain areas, which have been called centers of action. In the equatorial region the centers of action are over the Indian Ocean and over the equatorial Atlantic between the Gold Coast of Africa and the Amazon River. In higher latitudes there are centers of action in the North Atlantic and North Pacific in which the pressure and rainfall change in the same way as in the equatorial centers of action.

Oppositely behaving centers of action are found over the cold lands of high latitudes such as Iceland, northern Canada, and northwestern Siberia, and over the cool waters of the middle latitudes such as the Pacific Ocean west of lower California and west of Chile and in the Atlantic ocean west of northern Africa. When the pressure and rainfall are in excess in this latter group of centers of action they are in defect in the equatorial and oceanic centers.

3. These centers of action are related in a general way to such major features of the earth's surface as the polar regions and the equatorial region and the distribution of land and water. Within regions of warm water and of high vapor content in the equatorial region, and over the oceans in high latitudes, the weather conditions in general oscillate oppositely to those over the cold land areas in high latitudes and the cool water areas of lower latitudes. These latter regions are also regions of low vapor pressure.

4. The centers of action are not stationary but tend to shift position, oscillating to and fro over wide areas, so that any given place on the earth's surface may be at one time within the influence of a field of action of one kind, and at another time under the influence of a field of action of an opposite kind.

This shifting of the centers of action in the atmosphere has been one of the most disconcerting and discouraging facts confronting research workers in meteorology. Relations have been found between distant regions which for a while gave high correlation coefficients, either plus or minus, and then suddenly the relationship reversed in sign. Cycles have been found in the weather and have excited hope for a while that a key to weather changes had been discovered, but only to lead to disappointment by disappearing or by changing in phase. Wavelike movements in the atmosphere have been disclosed which continued for a short time and disappeared. A reason for these changes is now offered for the first time in the systematic changes of position in the centers of action in the atmosphere, under the influence of changing solar activity. With the removal of this outstanding difficulty, meteorology should show a marked advance, both in theory and in practical weather forecasting, more especially in forecasting for long periods in advance.

5. The changes in intensity and position of the centers of action in the atmosphere are intimately related to changes in solar activity, more especially to changes in solar heat radiation. The annual means of pressure in these centers of activity, when smoothed, follow in a general way the changes in annual values of sun spots, but there is no relation evident between the two in the changes of short period. Monthly and even shorter periods of change in the intensity of solar radiation show, however, an unmistakable relation to weather changes.

6. The picture presented in this paper is that of an atmosphere in which the regions of high vapor content in the tropical regions of the earth are strongly affected by changes of solar radiation (presumably by the absorption of the incoming heat rays by the water vapor in the air). The air therein becomes warmer, increases in volume per unit mass, and its pressure falls, attended by an increase in rainfall. Simultaneously, there are centers of action in high latitudes where opposite relationships are evident. These centers of action all sway back and forth under the influence of changing intensity of solar radiation and changing position of the sun with the season.

7. When solar radiation increases, the centers of action in high latitudes move farther north and increase in intensity. That is, the pressure over cold regions in these latitudes becomes abnormally high and the temperature falls, while simultaneously the belts of low pressure in equatorial regions widen and develop centers of low pressure in middle latitudes. These changes in pressure are attended by winds which markedly influence the temperatures in high latitudes.

8. The matter of especial importance considered in this paper is the shifting of the centers of action in the atmosphere under the influence of varying intensity of solar activity. If this is a fact, then no research worker in meteorology can afford to overlook it.

9. When the earliest investigations of the relations of solar activity and weather began, it was assumed that if the sun became warmer the temperature all over the earth would rise. Some confirmation of this view appeared to result from Köppen's finding that the mean temperature over all the regions from which he was able to obtain observations was higher when sun spots were at a minimum. But more recent investigations have disclosed that solar radiation is on the whole lower at sun-spot minimum and that with the increase of solar radiation there are regions of the earth which show opposite changes toward each other. Now it is shown that these regions of opposite change shift position on the earth's surface. This view adds complications, but brings us nearer the actual facts. In the meantime there has been a marked development in theory from the physical and mathematical viewpoint, as shown by the papers of Dr. G. C. Simpson on the heat balance in the atmosphere, and the studies of Brunt and Fowle on the absorptive powers of water vapor on solar radiation.

TABLE 3.—*Correlation of Monthly Means of Solar Radiation and Atmospheric Pressure*

Station	Lat.	Long.	Year, 120 months		Mar.-May, 30 months		June-Aug., 30 months		Sept.-Nov., 30 months		Dec.-Feb., 30 months	
			r	b mb	r	b mb	r	b mb	r	b mb	r	b mb
PACIFIC OCEAN:												
Open Ocean	50° N.	170° E.	—.05	—0.5	.14	2.1	—.24	—1.9	—.34	—3.0	.20	2.8
Open Ocean	50° N.	170° W.	.12	1.4	.14	3.0	—.12	0.9	.10	1.8	.29	5.4
Open Ocean	50° N.	150° W.	.02	0.2	.05	0.6	—.15	—1.2	.24	2.0	—.03	—0.5
Open Ocean	40° N.	160° E.	—.08	—0.6	—.07	—0.8	.12	0.4	—.41	—2.7	.11	1.3
Open Ocean	40° N.	180°	—.04	—0.3	.07	0.9	—.50	—2.4	—.01	—0.1	.15	1.8
Open Ocean	40° N.	160° W.	—.05	—0.6	—.11	—1.3	—.29	—1.4	—.18	—1.5	.10	1.7
Open Ocean	40° N.	140° W.	—.24	—2.1	—.04	—0.5	—.21	—3.1	—.40	—3.3	—.27	—3.0
Open Ocean	30° N.	150° E.	.08	0.3	—.02	—0.1	.18	0.4	—.08	—0.3	.17	1.1
Open Ocean	30° N.	170° E.	—.07	—0.4	—.32	—0.2	.00	0.0	—.26	—0.8	.12	1.2
Open Ocean	30° N.	170° W.	—.04	—0.2	—.28	—2.2	—.10	—0.3	—.05	—0.2	.12	1.4
Open Ocean	30° N.	150° W.	.04	0.3	—.08	—0.8	.12	0.6	.10	0.5	.04	0.4
Open Ocean	30° N.	130° W.	.01	0.2	—.10	—0.8	.16	0.5	.26	1.0	—.16	—1.0
Midway Island	28° N.	177° W.	—.08	—0.4	—.28	—1.9	.23	0.7	—.25	—0.8	—.08	—0.6
Omura	27° N.	142° E.	—.12	—0.4	—.24	—0.8	—.23	—0.8	—.08	—0.2	.08	0.3
Open Ocean	20° N.	140° E.	.01	0.1	—.10	—0.6	—.22	—0.8	.19	0.8	.18	0.7
Open Ocean	20° N.	160° E.	.15	0.5	.13	0.5	.04	0.1	.25	0.5	.22	0.9
Open Ocean	20° N.	180°	.10	0.3	.26	1.0	.05	0.4	.00	0.0	.16	0.6
Honolulu	21° N.	158° W.	.03	0.1	.16	0.4	—.10	—0.1	.09	0.2	.00	0.0
Open Ocean	20° N.	140° W.	.24	1.1	.26	1.8	.04	0.1	.31	0.9	.41	2.4
Ladrone Island	13° N.	145° E.	.12	0.9	.13	1.2	.10	0.5	.19	1.1	.07	0.6
Yap Island	9° N.	138° E.	.09	0.2	.05	0.1	.24	0.3	.06	0.1	.00	0.0
Ocean Island	1° S.	169° E.	.06	0.2	—.08	—0.5	.02	0.1	.05	0.2	.24	1.3
Port Moresby	9° S.	147° E.	.13	0.2	—.03	—0.1	.17	0.3	.24	0.5	.08	0.2
Samoa	14° S.	172° W.	.13	0.1	.05	0.1	.02	0.0	.27	0.4	.11	0.3
NORTH AMERICA:												
Barrow	71° N.	156° W.	—.22	—3.3	.19	1.7	.25	1.0	—.08	—0.6	—.22	—3.3
Fort Goodhope	66° N.	129° W.	—.12	—1.0	—.25	—1.8	.13	0.6	—.10	—1.1	—.25	—3.3
Eagle	65° N.	141° W.	—.05	—0.6	—.19	—1.3	—.18	—0.9	.01	0.2	—.03	—0.6
Nome	64° N.	165° W.	—.05	—0.3	—.06	—0.6	—.11	—1.1	—.01	—0.0	—.04	—0.6

NOTE.—*r*=correlation coefficient; *b*=amount of change in pressure for 1 percent change in solar radiation. *b* is in millibars but may be changed to percentages by moving the decimal point one place to left.

TABLE 3.—*Correlation of Monthly Means of Solar Radiation and Atmospheric Pressure* (continued)

Station	Lat.	Long.	Year, 120 months		Mar.-May, 30 months		June-Aug., 30 months		Sept.-Nov., 30 months		Dec.-Feb., 30 months	
			r	*b* *mb*	*r*	*b* *mb*	*r*	*b* *mb*	*r*	*b* *mb*	*r*	*b* *mb*
NORTH AMERICA (*continued*):												
Kodiak	58° N.	152° W.	—.04	—0.2	—.10	—1.0	—.12	—0.6	.07	0.7	—.01	—0.2
Juneau	58° N.	134° W.	—.06	—0.5	—.04	—0.4	—.08	—0.3	—.06	—0.4	—.08	—1.3
Dutch Harbor	54° N.	166° W.	.02	0.2	.11	1.5	—.23	—1.6	—.04	—0.3	.20	3.7
Anticosti	49° N.	63° W.	.05	0.4	.17	1.9	—.18	—0.6	.09	0.6	.15	2.1
Seattle	48° N.	122° W.	—.15	—0.8	—.29	—1.7	.10	0.2	—.21	—1.0	—.16	—1.3
Bismarck	47° N.	101° W.	.01	0.0	.05	0.4	.02	0.2	—.09	—0.3	.01	0.1
Cape Race	46° N.	53° W.	.05	...	.24	...	—.23	...	—.33	...	.05	...
Alpena	45° N.	83° W.	—.08	—0.4	.06	0.4	—.36	—1.0	—.03	—0.2	—.05	—0.3
New York	41° N.	74° W.	—.02	—0.1	.04	0.3	—.03	—0.1	—.06	—0.2	—.02	—0.2
Red Bluff	40° N.	122° W.	—.13	—0.4	—.28	—1.0	—.34	—0.4	.26	0.5	—.22	—1.0
Denver	40° N.	105° W.	—.10	—0.4	.01	0.1	—.07	—0.2	—.35	—1.3	.04	0.2
St. Louis	39° N.	90° W.	—.07	—0.2	.12	0.6	—.19	—0.4	—.21	—0.7	—.02	—0.1
Charleston	33° N.	80° W.	—.07	—0.2	—.08	—0.5	—.13	—0.3	—.11	—0.3	.02	0.1
San Diego	33° N.	117° W.	.15	0.3	.01	0.0	.37	0.5	.17	0.3	.08	0.2
Abilene	32° N.	100° W.	—.07	—0.2	.09	0.4	—.28	—0.6	—.18	—0.4	.06	0.3
Key Kest	25° N.	82° W.	—.05	—0.1	.01	0.1	—.21	—0.3	.07	0.1	—.10	—0.2
Mazatlan, Mex.	23° N.	106° W.	.19	0.3	.20	0.3	.06	0.1	.30	0.6	.23	0.5
Merida	21° N.	90° W.	.13	0.3	.27	0.8	—.18	—0.2	.30	0.6	.12	0.4
Colon	9° N.	79° W.	.07	0.1	.14	0.2	.07	0.1	.14	0.2	—.01	—0.0
SOUTH AMERICA:												
Georgetown	7° N.	58° W.	—.09	—0.2	—.36	—1.0	—.53	—0.4	.28	0.5	.21	0.7
Taperinka	2° S.	54° W.	—.01	—0.0	—.21	—0.3	—.17	—0.2	.14	0.2	.18	0.2
Quixeramobim	5° S.	39° W.	—.17	—0.2	—.55	—0.8	—.35	—0.5	.08	0.1	.02	0.0
Ondina	13° S.	38° W.	.05	0.1	—.23	—0.2	—.02	0.0	—.02	0.0	.27	0.6
Cuyaba	16° S.	56° W.	.05	0.1	—.32	—0.6	.03	0.0	.22	0.3	.16	0.3
La Paz	16° S.	68° W.	.00	0.0	—.03	—0.2	.12	0.5	—.12	—0.3	—.02	—0.1
Rio de Janiero	23° S.	43° W.	.01	0.0	—.23	—0.6	—.10	—0.3	.18	0.3	.22	0.7
Salta	25° S.	65° W.	.15	0.5	.21	0.7	.45	1.5	.18	0.5	—.40	—1.4
Asunción	25° S.	58° W.	.11	0.3	—.08	—0.3	.12	0.3	.18	0.5	.16	0.4
Curitiba	25° S.	49° W.	.15	0.3	—.01	—0.0	.16	0.4	.06	0.1	.33	0.8
Goya	29° S.	59° W.	.15	0.5	—.13	—0.5	.19	0.8	.33	0.9	.06	0.2

TABLE 3.—*Correlation of Monthly Means of Solar Radiation and Atmospheric Pressure* (continued)

Station	Lat.	Long.	Year, 120 months *r*	Year, 120 months *b* *mb*	Mar.-May, 30 months *r*	Mar.-May, 30 months *b* *mb*	June-Aug., 30 months *r*	June-Aug., 30 months *b* *mb*	Sept.-Nov., 30 months *r*	Sept.-Nov., 30 months *b* *mb*	Dec.-Feb., 30 months *r*	Dec.-Feb., 30 months *b* *mb*
SOUTH AMERICA (*continued*):												
Córdoba	31° S.	64° W.	.12	0.4	.04	0.2	.18	0.6	.25	0.7	.12	0.3
Santiago	33° S.	71° W.	.09	0.2	—.03	—0.1	.23	0.5	.02	0.1	.06	0.1
Buenos Aires	35° S.	58° W.	.14	0.5	—.07	—0.3	.24	0.9	.25	0.9	—.06	—0.2
Bahia Blanca	39° S.	62° W.	.08	0.4	—.04	—0.2	.00	0.0	.33	1.5	—.15	—0.5
Puerto Madryn	43° S.	65° W.	.07	0.4	—.09	—0.7	—.01	—0.1	.33	1.8	—.06	0.4
Sarmiento	45° S.	69° W.	.04	0.2	—.14	—1.1	.20	1.3	.19	1.1	—.23	—1.7
Islota de los Evangelistos	52° S.	75° W.	.11	1.0	—.08	—1.1	.23	2.1	.51	3.7	—.39	—3.8
Santa Cruz	50° S.	68° W.	.05	0.4	—.05	—0.6	.12	1.0	.38	2.3	—.42	—3.0
Punta Arenas	53° S.	71° W.	.06	0.2	—.01	—0.2	.10	0.9	.44	3.0	—.47	—3.8
ATLANTIC OCEAN AND GREENLAND:												
Upernivik	73° N.	56° W.	.05	0.4	.08	0.9	.25	1.4	—.05	—0.4	—.02	—0.3
Angmagsalik	66° N.	37° W.	—.04	—0.4	—.04	—0.6	.25	1.9	—.07	—0.6	—.23	—4.0
Stykkishólm	65° N.	23° W.	—.10	—1.4	—.26	—4.1	.22	1.3	—.06	—0.7	—.23	—5.3
Berufjordur	64° N.	14° W.	—.07	—1.0	—.31	—4.7	.29	1.6	.02	0.2	—.19	—4.4
Open Ocean	60° N.	30° W.	—.09	—0.6	—.13	—3.5	—.11	—0.8	.19	2.5	—.35	13.3
Open Ocean	60° N.	15° W.	—.19	—3.4	—.46	—8.8	—.46	—4.5	.03	0.4	—.10	—3.0
Open Ocean	50° N.	40° W.	—.05	—0.4	.17	1.9	—.38	—1.8	—.02	—0.1	—.01	—0.2
Open Ocean	50° N.	30° W.	—.10	—1.2	—.03	—0.5	—.31	—2.2	—.10	—0.9	—.01	—0.2
Open Ocean	50° N.	20° W.	—.12	—1.2	—.15	—2.7	—.26	—1.8	—.02	—0.2	—.02	—0.4
Open Ocean	40° N.	60° W.	.00	0.0	.17	1.9	—.11	—1.4	—.19	—0.9	.09	0.7
Open Ocean	40° N.	50° W.	—.01	—0.1	.22	3.1	—.21	—1.0	—.20	—0.8	.11	0.9
Open Ocean	40° N.	40° W.	—.06	—0.5	.11	1.4	—.40	—1.7	—.26	—1.4	.12	1.7
Open Ocean	40° N.	20° W.	—.07	—0.6	.08	0.9	—.29	—1.0	—.19	—1.2	.02	0.0
Ponta Delgada	38° N.	26° W.	—.10	—0.8	.03	0.4	—.37	—1.3	—.30	—1.7	.06	0.8
Open Ocean	35° N.	70° W.	—.02	—0.3	—.03	—0.6	—.14	—0.6	.01	0.1	—.01	—0.1
Madeira	33° N.	17° W.	—.10	—0.8	—.06	—0.5	—.46	—1.1	—.14	—0.4	.01	0.1

TABLE 3.—*Correlation of Monthly Means of Solar Radiation and Atmospheric Pressure* (continued)

Station	Lat.	Long.	Year, 120 months r	Year, 120 months b mb	Mar.-May, 30 months r	Mar.-May, 30 months b mb	June-Aug., 30 months r	June-Aug., 30 months b mb	Sept.-Nov., 30 months r	Sept.-Nov., 30 months b mb	Dec.-Feb., 30 months r	Dec.-Feb., 30 months b mb
ATLANTIC OCEAN AND GREENLAND (*continued*):												
Open Ocean	30° N.	50° W.	—.09	—0.5	—.04	—0.4	—.30	—0.9	—.08	—0.2	—.09	—0.6
Open Ocean	30° N.	40° W.	—.10	—0.6	—.04	—0.3	—.49	—1.0	—.30	—0.9	.11	0.9
La Laguna	28° N.	16° W.	—.05	—0.2	—.01	—0.1	—.32	—0.4	—.20	—0.5	.09	0.5
Open Ocean	25° N.	65° W.	—.19	—0.6	—.17	—0.9	—.34	—1.0	—.15	—0.4	—.14	—0.5
Port-au-Prince	19° N.	72° W.	—.14	—0.2	—.21	—0.5	—.34	—0.5	.16	0.2	—.26	—0.5
São Vicente	17° N.	25° W.	.11	0.2	.14	0.3	—.05	—0.1	.18	0.4	.21	0.6
Richmond Hill	12° N.	62° W.	—.13	—0.2	—.52	—1.0	—.18	—0.2	.07	0.1	—.07	—0.2
St. Helena	16° S.	6° W.	.05	0.4	—.01	—0.1	.02	0.2	.07	0.7	.12	0.8
Cape Pembroke	52° S.	58° W.	.07	0.8	.13	2.0	.09	1.1	.27	0.5	—.37	—4.1
South Georgia	54° S.	37° W.	—.07	—0.7	.14	1.8	—.22	—1.9	—.08	—0.6	—.03	—0.5
South Orkneys	61° S.	45° W.	.01	0.1	.18	2.6	.13	1.0	—.05	—0.4	—.20	—2.6
EUROPE:												
Spitsbergen	78° N.	14° E.	—.09	—0.9	—.09	—1.1	.04	0.2	—.06	—0.5	—.21	—3.6
Malye Karmakouly ..	72° N.	53° E.	—.04	—0.5	—.03	—0.5	—.06	—0.4	—.17	—1.2	.07	1.2
Mehavn-Stetnes	71° N.	28° E.	—.02	—0.2	—.06	—0.9	.24	1.6	.07	0.7	—.24	—4.3
Bodö	67° N.	14° E.	—.05	—0.6	—.09	—1.5	.16	0.9	.07	0.8	—.26	—5.1
Leningrad	60° N.	30° E.	.00	0.0	.05	0.9	.12	0.7	.15	1.4	—.27	—4.7
Perm	58° N.	56° E.	—.12	—0.9	.33	3.9	.04	0.2	—.24	—2.1	—.41	—6.4
Aberdeen	57° N.	2° W.	—.04	—0.5	—.23	—3.1	.04	0.2	.06	0.8	—.14	—1.7
Moscow	56° N.	37° E.	—.02	—0.1	.22	2.7	—.02	0.1	.07	0.5	—.28	—4.0
Utrecht	52° N.	5° E.	.02	0.2	—.23	—2.6	—.08	—0.4	.21	1.8	.05	0.8
Warsaw	52° N.	21° E.	.10	0.8	—.10	—1.0	—.05	—0.2	.37	2.6	.04	0.5
Valentia	52° N.	10° W.	—.07	—1.0	—.21	—3.7	—.22	—2.4	.05	0.4	—.02	—0.4
Marseille	43° N.	5° E.	.14	0.9	—.21	—1.6	.02	0.0	.33	1.6	.30	3.2
Rome	42° N.	12° E.	.24	1.7	—.06	—0.6	.12	0.4	.36	2.3	.46	4.7
Tiflis	42° N.	45° E.	.12	0.5	.01	0.1	—.01	—0.0	.27	1.0	.16	1.2
Krasnovodsk	40° N.	53° E.	.06	0.3	.02	0.1	—.02	—0.1	.02	0.4	.11	1.9
Lisbon	39° N.	9° W.	—.08	—0.4	—.07	—0.5	—.30	—0.5	—.15	—0.6	.02	0.2
Beirut	34° N.	35° E.	.10	0.2	—.17	—0.6	—.01	—0.0	.26	0.4	.26	1.2

TABLE 3.—*Correlation of Monthly Means of Solar Radiation and Atmospheric Pressure* (continued)

Station	Lat.	Long.	Year, 120 months		Mar.-May, 30 months		June-Aug., 30 months		Sept.-Nov., 30 months		Dec.-Feb., 30 months	
			r	b mb	r	b mb	r	b mb	r	b mb	r	b mb
AFRICA:												
Helwan	30° N.	31° E.	—.05	—0.1	—.29	—0.9	—.28	—0.3	.05	0.1	.16	0.6
Khartoum	16° N.	33° E.	—.06	—0.1	—.18	—0.5	—.41	—0.5	.06	0.1	.24	0.7
Freetown	8° N.	13° W.	—.06	—0.1	—.10	—0.2	—.33	—0.4	—.05	—0.1	.24	0.4
Lagos	6° N.	3° E.	—.20	—0.3	—.48	—0.9	—.67	—1.0	.20	0.3	.11	0.2
Entebbe	0° N.	32° E.	—.16	—0.2	—.46	—1.0	—.11	—0.1	—.13	—0.1	—.06	—0.2
Zanzibar	6° S.	39° E.	.03	0.0	—.04	—0.1	—.09	—0.1	.19	0.2	.07	0.1
Salisbury	18° S.	31° E.	.08	0.0	—.09	—0.1	.23	0.1	.08	0.0	.05	0.0
Bulawayo	20° S.	29° E.	.10	0.2	—.07	—0.1	.19	0.4	.20	0.2	.02	0.1
Kimberley	29° S.	25° E.	.10	0.1	.07	0.1	.28	0.2	.18	0.1	—.26	—0.1
O'Okiep	30° S.	18° E.	.15	0.3	—.07	—0.2	.34	0.6	.19	0.2	.03	0.0
Durban	30° S.	31° E.	.25	0.2	.16	0.2	.42	0.4	.26	0.1	—.04	—0.1
Port Elizabeth	34° S.	26° E.	.23	0.8	.23	1.0	.32	1.2	.32	0.7	—.04	—0.1
ASIA:												
Dickson	73° N.	80° E.	—.13	—1.5	.01	0.2	—.38	—2.7	—.34	—2.8	.14	2.7
Yakutsk	62° N.	129° E.	—.04	...	.02	...	.05	...	.05	...	—.17	...
Yenisseysk	58° N.	92° E.	—.10	—0.7	.11	0.8	.14	0.4	—.21	—0.9	—.35	—3.7
Tomsk	56° N.	85° E.	—.11	—0.7	.18	1.4	.23	0.8	—.23	—1.2	—.39	—3.9
Barnaul	53° N.	84° E.	—.07	—0.3	.21	1.2	.27	0.6	—.15	—0.6	—.34	—2.7
Irkutsk	52° N.	104° E.	—.04	—0.1	.05	0.2	.27	0.7	.07	0.3	—.31	—1.9
Petropavlovsk	53° N.	159° E.	.25	2.8	.27	4.5	—.18	—1.3	.38	2.7	.35	4.3
Blagovyeshtchensk	50° N.	127° E.	.34	0.8	.17	0.8	.47	1.4	.22	0.8	—.02	—0.1
Nemuro	43° N.	145° E.	.06	0.3	—.01	—0.1	.20	0.6	—.14	—0.6	.22	1.6
Vladivostok	43° N.	132° E.	.19	0.3	.05	0.3	.41	1.0	—.11	—0.8	.10	0.8
Tashkent	41° N.	69° E.	.02	0.0	.05	0.2	.00	0.0	.05	0.1	.00	0.0
Joshin	41° N.	129° E.	.10	0.4	.06	0.3	.45	0.9	—.06	—0.2	.01	0.0
Leh	34° N.	78° E.	.13	1.2	—.12	—0.5	.53	0.6	.22	0.3	.18	1.0
Nagasaki	33° N.	130° E.	—.05	—0.1	—.04	—0.1	.09	0.4	—.20	—0.5	—.07	—0.2
Nanking	32° N.	119° E.	.39	1.8	.55	4.0	.60	2.0	.32	1.3	.13	0.7
Bushire	29° N.	51° E.	—.09	—0.2	—.41	—1.3	.01	0.0	—.07	—0.1	.13	0.3

TABLE 3.—*Correlation of Monthly Means of Solar Radiation and Atmospheric Pressure* (continued)

Station	Lat.	Long.	Year, 120 months		Mar.-May, 30 months		June-Aug., 30 months		Sept.-Nov., 30 months		Dec.-Feb., 30 months	
			r	*b* *mb*	*r*	*b* *mb*	*r*	*b* *mb*	*r*	*b* *mb*	*r*	*b* *mb*
ASIA (*continued*):												
Hyderabad	25° N.	68° E.	.08	0.2	—.37	—1.1	.38	0.8	.17	0.3	—.08	—0.2
Jask	26° N.	58° E.	.19	0.5	—.47	—1.3	.45	1.1	.20	0.5	.28	0.8
Calcutta	23° N.	88° E.	.07	0.1	—.35	—1.2	.34	0.6	.16	0.3	—.05	0.1
Hongkong	22° N.	114° E.	.07	0.2	—.12	—0.5	.20	0.5	.15	0.3	—.01	—0.1
Bombay	19° N.	73° E.	.06	0.1	—.31	—0.4	.07	0.0	.35	0.3	.00	0.0
Manila	15° N.	121° E.	.13	0.3	—.15	—0.3	.26	0.4	.25	0.5	.02	0.1
Aden	13° N.	45° E.	.04	0.1	—.34	—0.4	.11	0.1	.10	0.1	.09	0.2
Port Blair	12° N.	93° E.	.16	0.3	—.10	—0.3	.44	0.5	.26	0.4	.04	0.1
Amini Divi	11° N.	73° E.	.08	0.3	—.24	—1.4	.05	0.2	.34	1.4	.06	0.3
Saigon	11° N.	107° E.	.01	0.0	—.11	—0.3	.34	0.4	—.11	—0.3	—.05	—0.1
Iloilo	11° N.	123° E.	.14	0.3	—.08	—0.1	.28	0.4	.17	0.3	.16	0.5
Colombo	7° N.	80° E.	—.08	—0.1	—.22	—0.5	—.16	—0.2	.06	0.1	—.07	—0.1
INDIAN OCEAN, AUSTRALIA, AND NEW ZEALAND:												
Batavia	6° S.	107° E.	.15	0.2	—.09	—0.2	.30	0.3	.30	0.3	.10	0.2
Christmas Island	10° S.	106° E.	—.01	0.0	.10	0.2	.17	0.2	—.15	—0.3	—.13	—0.2
Darwin	12° S.	131° E.	.12	0.1	—.03	—0.1	.19	0.2	.03	0.1	—.01	—0.1
Antananarivo	19° S.	48° E.	—.14	—0.3	—.09	—0.2	.11	0.2	—.16	—0.2	—.40	—1.2
Mauritius	20° S.	57° E.	—.22	—0.6	—.05	0.0	—.29	—0.5	—.30	—0.3	—.29	—1.2
Alice Springs	24° S.	134° E.	.12	0.4	.16	0.6	.29	0.7	—.05	—0.1	.13	0.5
Brisbane	27° S.	153° E.	.23	1.0	.19	1.1	.34	1.1	.10	0.4	.34	1.7
Sydney	34° S.	151° E.	.21	0.5	.18	1.4	.28	1.4	.06	0.4	.39	2.5
Adelaide	35° S.	139° E.	.18	1.0	.19	1.3	.33	1.8	—.10	—0.6	.43	1.8
Aukland	37° S.	175° E.	.06	0.5	.24	2.5	—.02	—0.2	—.06	—0.5	.23	1.8
Wellington	41° S.	175° E.	.05	0.4	.10	1.1	—.10	—0.8	—.08	—0.8	.38	3.7
Dunedin	46° S.	170° E.	.02	0.2	.05	0.6	—.19	—1.0	—.07	—0.8	.36	4.0

TABLE 4.—*Mean Departures of Pressure from Normal in Millimeters for Different Departures of Solar Radiation from Normal in Calories*

Station	Latitude	Longitude	March-May						June-August						September-November						December-February					
			Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010
	N.	W.	Latitude 70° N. to 79° N.																							
Barrow	71°	156°	.....	.2	1.0	−1.0	−1.5	1.0	.4	−.4	.1	.6	1.6	−1.6	−1.0	.6	.4	1.1	−4.0	2.1	−4.1	1.9	.8	−2.3	−1.7	3.1
Upernivik	73°	56°	.....	−1.9	2.2	.6	−4.3	−.3	1.2	−.1	.1	.3	.6	−1.8	−.9	.5	.3	1.4	−2.4	.1	.3	2.2	−.6	−.9	1.0	.8
	N.	E.																								
Spitsbergen	78°	14°	.....	−1.9	.4	.8	.3	−.8	1.1	.4	.1	−2.4	−.9	.1	−.3	−1.9	−.1	2.3	.4	−1.7	−2.8	4.9	−.8	−.6	5.3	−.5
Mehavn-Stetnes	71°	28°	.....	−1.0	.4	.3	−.3	.2	.4	−.3	.3	−2.3	−1.5	−1.2	1.9	−2.3	−.2	.3	.2	−.5	−4.4	−2.5	−.3	1.3	5.6	−2.8
Malye Karmakouly	72°	53°	.....	−.1	−.4	1.0	−2.7	1.0	2.2	.1	−.3	.3	−1.1	.6	.8	−4.1	.4	.9	.5	.4	−1.5	−1.1	−.1	.3	3.4	−3.9
Waigatz	70°	58°	.....	−.1	−.2	1.2	−3.7	.6	.3	−.1	−.1	−.4	−.4	.4	.6	−5.3	.4	1.2	1.2	.7	−6.8	4.6	−.8	1.3	3.8	−3.6
Dickson	73°	80°	.....	−3.2	.7	1.4	−4.2	.3	−1.7	−.1	−3.9	−4.8	1.3	1.5	−.2	−4.8	1.0	.7	.9	3.1	.4	.1	.3	−.3	2.3	−3.4
	N.	W.	Latitude 60° N. to 69° N.																							
Nome	64°	165°	.....	−.5	.8	−1.4	−.1	.8	.8	−1.6	.3	1.4	−.5	.5	0	−2.2	1.1	.7	−1.1	.2	−1.5	3.8	.7	−2.4	.6	3.4
Eagle	65°	141°	.....	.1	.2	−.7	−1.9	1.6	.9	−.5	−.2	−.2	−1.1	1.2	.6	−1.0	1.0	.3	−1.6	1.3	−1.4	3.3	2.2	−2.7	−1.0	3.7
Ft. Good Hope	66°	129°	.....	−1.2	.6	−.9	−1.2	.6	.3	−.2	.1	−.6	−.4	−.3	−1.1	−.1	.8	−.2	−2.3	1.8	−4.5	1.6	.5	−1.2	.4	2.7
Angmagsalik	66°	37°	.....	−2.8	1.6	1.6	−2.0	−.9	1.1	.5	−.1	−.9	1.7	−2.3	−.7	.7	−.4	1.8	−2.4	.3	−2.3	5.8	−2.0	−.4	6.6	.5
Atlantic	60°	30°	.....	−2.3	0	.8	.7	0	1.7	−1.5	−.4	0	1.7	0	−1.1	.8	1.2	1.2	−2.7	−2.4	0	5.1	−2.2	.6	5.6	0
Stykkishólm	65°	23°	.....	−3.4	.4	1.9	1.2	.5	1.8	.3	−.5	.2	1.8	−1.4	−.4	1.2	−.8	1.0	−3.2	1.7	−1.2	−.7	−1.8	.4	6.6	−1.0
Berufjördur	64°	14°	.....	−3.3	.1	1.5	2.6	.6	1.7	.2	−.1	−.7	.9	−1.4	1.0	1.6	−1.3	0	−3.6	2.3	−.3	−2.2	−1.7	.2	7.1	−1.6
	N.	E.																								
Bodö	67°	14°	.....	−.2	−.2	−.3	2.4	.1	1.6	−1.3	.6	−.8	−.2	−1.4	1.2	−.2	−1.1	−.4	−1.8	1.4	−4.2	1.1	−.3	.7	6.8	−2.8
	N.	W.	Latitude 50° N. to 59° N.																							
Pacific	50°	170°	.....	.3	.9	−1.9	−.1	.3	.6	0	−.1	−.9	.2	.3	2.3	−2.6	0	1.2	−1.8	−.6	5.5	6.4	−1.1	−3.9	−1.8	.8
Dutch Harbor	54°	166°	.....	.5	.8	−1.9	−1.1	.8	.8	−1.0	0	.1	−2.9	1.6	1.7	−3.5	0	2.0	−2.4	.5	2.9	6.4	.5	−4.4	−2.7	3.2
Kodiak	58°	152°	.....	−1.2	−.2	−.3	−1.4	1.2	1.7	−.9	0	2.5	−1.8	1.3	1.3	−2.1	.5	−.1	−1.9	.9	−.1	3.4	1.0	−5.7	.6	4.2
Pacific	50°	150°	.....	.1	.1	−1.1	−1.3	2.1	1.4	0	0	−5.3	−1.8	3.0	1.7	−.7	.5	.1	−2.8	.3	2.5	0	.5	−4.6	1.9	2.2
Juneau	58°	134°	.....	−1.3	−.3	−.3	−1.6	1.0	.8	.1	−.1	−1.5	−1.7	1.2	−.7	−.1	.2	.4	−.6	.6	−1.2	1.1	1.4	−3.2	1.2	2.2
Atlantic	50°	40°	.....	2.2	−.6	0	−5.2	−.7	−.8	−.9	−.3	1.9	.3	2.4	−.6	−1.3	1.0	1.0	−1.1	−.2	1.7	−2.2	−.2	−.5	.7	−.6
Atlantic	50°	30°	.....	.9	−1.2	.7	−2.5	2.0	−.3	−.5	−.7	3.1	−.8	2.2	.1	−1.2	.7	.1	−3.1	3.2	3.3	−4.8	−.5	.7	.7	−1.1
Atlantic	50°	20°	.....	.3	−1.8	1.3	−.8	2.6	.1	−.5	−.6	2.6	−1.0	2.5	1.1	−1.2	.2	−.7	−1.8	2.6	6.5	−4.3	−2.1	.6	2.5	−.1
Valentia	52°	10°	.....	−.8	−1.3	1.5	1.5	1.4	−.1	−.9	−.6	3.1	.5	1.0	1.3	−.2	−.4	−1.1	−2.7	4.0	5.2	−4.0	−2.0	.9	3.9	−1.6
Aberdeen	57°	2°	.....	−.9	−.7	.8	4.4	.2	1.0	−.5	−.3	2.5	.4	−.3	3.1	1.1	−1.8	−1.4	−5.0	4.9	2.4	−4.5	−1.4	.7	6.0	−3.4

TABLE 4.—*Mean Departures of Pressure from Normal in Millimeters for Different Departures of Solar Radiation from Normal in Calories* (continued)

Station	Latitude	Longitude	March-May						June-August						September-November						December-February					
			Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010
	N.	E.	Latitude 50° N. to 59° N.																							
Utrecht	52°	5°	....	.6	−1.3	.2	3.7	.6	2.3	−1.1	−.4	1.8	1.2	−.1	2.5	.6	−.6	−1.5	−3.1	2.7	2.5	−3.1	−.7	.1	3.1	−2.3
Warsaw	52°	21°	....	2.2	−1.4	−.9	2.0	1.2	.6	−.5	−.5	1.1	1.5	−.2	2.8	.5	−.4	1.4	1.6	.5	−.7	−3.1	1.1	−.7	1.9	−3.0
Moscow	56°	37°	....	2.8	−.4	−1.3	−2.6	.3	1.6	−.9	−.2	−.5	1.3	.2	1.7	−1.9	−.8	.3	1.2	−.5	−4.5	−3.5	1.2	.9	2.8	−2.1
Leningrad	60°	30°	....	2.7	−1.0	−1.3	−.7	1.2	1.7	−.8	.2	−.1	.5	−.7	2.4	−1.4	−.6	−.8	0	−.2	−4.9	−2.7	.5	1.2	4.3	−2.3
Perm	58°	56°	....	2.1	0	−1.0	−4.0	−.4	1.8	−1.3	−.3	.6	1.1	−.1	0	−3.9	−.8	1.6	3.1	.2	−6.7	−1.9	.4	2.7	3.4	−.7
Barnaul	53°	84°	....	.7	−.1	.2	.1	−.5	.6	−.5	0	−.2	1.0	−.7	.3	−1.6	−.8	1.3	.4	0	−2.8	−1.8	.4	1.0	.6	0
Tomsk	56°	85°	....	.5	0	.1	.5	−.9	.1	−.7	.1	−.1	1.5	−1.1	.1	−2.9	−.4	1.0	.7	.2	−3.6	2.6	.2	.8	2.3	.2
Yenisseysk	58°	92°	....	.1	.2	.1	.3	−.8	.1	−.6	.1	.4	.9	−.5	.9	−3.1	−.6	1.3	.5	.1	−3.0	3.2	.1	.6	−.8	.7
Irkutsk	52°	104°	....	−.4	.2	0	1.1	−.7	.2	−.2	0	.1	−.8	−.3	.9	−1.0	−.8	1.4	.1	−.5	−.9	−.7	.2	.1	1.1	.9
Blagovyeshtchensk	50°	127°	....	−.3	.3	.2	.3	−.9	2.0	−.4	.2	−.1	−1.1	−1.1	.8	.2	−.8	−.1	1.4	−1.2	−1.1	−1.9	.9	−.1	.5	−.6
Petropavlovsk	53°	159°	....	2.1	.4	−.6	−4.1	1.7	−.7	−1.0	.2	1.6	−.4	.9	1.9	0	0	−.4	−2.1	−2.7	5.1	0	−.3	−.6	−4.1	.8
Pacific	50°	170°	....	−.1	.6	−.3	−1.5	−.2	0	−.2	−.1	−.2	−.4	1.0	−1.0	−1.8	−1.1	1.2	1.1	1.3	.5	6.9	−.2	−.2	−3.0	.2
	N.	W.	Latitude 40° N. to 49° N.																							
Pacific	40°	180°	....	.7	.4	−2.0	1.2	.7	−1.2	.5	−.7	2.2	−.1	2.0	.6	−.8	−1.4	1.4	−.5	0	2.5	3.7	−.9	−.7	−.7	1.2
Pacific	40°	160°	....	.5	.1	−2.0	.1	2.4	−.6	.2	−.2	−2.0	.5	1.6	1.2	−1.4	−.8	−.4	−1.3	3.3	3.3	2.4	−.5	−3.0	1.2	1.6
Pacific	40°	140°	....	.5	−.1	−1.1	−1.0	2.0	.7	−.2	0	−2.0	−.5	1.6	−.7	−.7	−.6	0	−1.8	3.2	−2.3	−.5	.1	−1.4	2.8	1.4
Seattle	48°	122°	....	−.6	−.2	−.1	−.8	1.8	1.1	.1	−.1	−.5	−.4	0	−.7	.2	−.8	1.2	−.6	.8	−.4	−.8	−.4	.5	.8	.1
Red Bluff	40°	122°	....	.1	−.1	−.4	0	1.1	.2	−.3	−.4	.3	.4	.4	.4	.5	0	−.1	−.3	−.3	−.6	.6	−.3	1.1	.1	.1
Bismarck	47°	101°	....	.2	−.1	.3	−2.4	.4	9	−.1	.1	.1	−.6	.4	−.5	.8	.1	−.7	.3	.4	−.8	2.2	.1	−.5	−.1	.7
Alpena	45°	83°	....	.9	0	−.4	−1.8	.7	−.4	−.1	−.5	1.6	.3	.5	.1	−.4	.6	−.5	−.6	.6	−.2	−1.0	.5	−1.0	−.2	1.0
New York	41°	74°	....	.9	.7	.5	−.9	1.0	−.3	.3	−.2	.4	.1	−.1	0	0	.3	−.5	.7	.6	0	−1.2	.7	−.6	.2	.7
Father Point	48°	68°	....	1.0	−.1	−1.2	−1.2	1.1	−.1	−.1	−.2	1.2	−.8	.6	.4	−1.2	.9	0	−.2	0	.6	−2.2	1.1	−1.9	−.8	1.7
Anticosti	49°	63°	....	1.1	.2	−1.1	−1.3	−.1	.2	−.4	.3	−.1	−.6	.4	−.3	−.8	1.2	.5	−.4	−1.0	.2	−2.2	1.3	−2.2	−.5	.4
Atlantic	40°	60°	....	1.2	−.2	.2	.1	−1.6	0	.3	0	−.9	−.2	.2	−1.6	.6	.9	−.6	.7	1.3	−1.8	−.2	1.5	−1.4	.1	−1.1
Cape Race	46°	53°	....	2.1	−.7	.4	−1.1	−1.4	−.1	0	0	−.7	−.5	.1	−1.4	.1	1.6	.5	.5	−1.9	−.4	−1.7	1.8	−2.4	−.1	−.4
Atlantic	40°	50°	....	3.2	−.9	.5	−.1	−1.4	−.7	−.1	.1	−.5	−.3	.7	−.8	−.6	.7	−.4	.8	1.2	−.5	−.4	1.2	−1.4	−.7	−.8
Atlantic	40°	40°	....	2.2	−1.0	−.1	.7	−.8	0	−.3	.2	.9	−.1	2.3	−.9	−1.6	.3	−.1	1.9	1.2	1.3	−2.5	1.1	−.8	−1.6	−.3
Atlantic	40°	20°	....	1.8	−1.0	0	−1.8	1.0	1.0	−.3	−.6	.5	.2	1.8	−.4	−1.2	−.5	−.1	2.2	−.4	2.7	−3.8	.1	−.6	−.3	1.1
	N.	E.																								
Marseille	43°	5°	....	.1	−.6	−.4	1.5	1.1	.1	−.2	−.1	.6	.4	−.2	.9	.1	.6	−.5	−.9	−.3	1.8	.2	.4	−.9	−.4	−1.6
Rome	42°	12°	....	.5	−.3	−.7	1.3	.5	.8	−.4	−.1	1.5	−.3	−.4	1.7	.3	−.6	−.1	−.9	−.8	3.0	−2.7	.9	−1.0	−2.0	−1.9
Tiflis	42°	45°	....	.8	−.2	−.6	.5	0	.1	0	−.1	−.7	.8	−.1	.6	−.6	.1	.1	1.0	−1.5	−.4	−1.4	1.1	−.6	.1	−1.8

TABLE 4.—*Mean Departures of Pressure from Normal in Millimeters for Different Departures of Solar Radiation from Normal in Calories* (continued)

Station	Latitude	Longitude	March-May						June-August						September-November						December-February					
			Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010
	N.	E.	Latitude 40° N. to 49° N.																							
Krasnovodsk	40°	53°	.....	.4	.1	−.5	.5	0	−.4	0	0	−.7	.7	−.1	.1	−.6	−.1	.6	1.1	−1.5	−2.2	−1.8	1.1	−.7	.4	−1.7
Tashkent	41°	69°	.....	.4	0	−.3	−.2	0	.2	−.3	.1	.2	0	0	0	0	−.2	.3	1.2	−1.0	−.5	−1.6	.7	−.4	1.1	−1.0
Joshin	41°	129°	.....	.2	−.1	−.4	−.5	.4	1.5	.1	−.1	.6	−.6	−.7	.6	−.1	−1.1	−.4	1.1	0	−.7	−1.1	.7	−.7	−.5	−.4
Vladivostok	43°	132°	.....	.2	.2	−.5	−.6	.4	1.5	−.1	0	.7	−.9	−.6	−.4	−.9	−1.7	2.4	.1	−.6	−.9	−.8	1.3	−.9	−.7	−.9
Nemuro	43°	145°	.....	.3	0	−.8	−1.7	1.7	1.2	−.5	.2	−.7	−.5	−.4	.4	−.6	−.9	.3	.9	.1	−.2	1.4	.7	−.8	−.9	−.9
Pacific	40°	160°	.....	−.9	.5	−.6	.5	.9	.8	.6	−.1	−1.7	0	0	−1.9	−.7	−1.0	1.6	1.6	.2	−1.9	5.4	.2	−.1	−1.2	−.6
	N.	W.	Latitude 30° N. to 39° N.																							
Pacific	30°	170°	.....	−.9	.3	−.5	.6	1.2	0	0	−.1	−1.1	.6	.3	1.4	−.6	−1.0	−.5	−.2	1.5	2.5	−.4	−.6	−.3	.5	−.2
Pacific	30°	150°	.....	−.3	.4	−1.0	−.3	1.2	−.6	.1	−.1	1.9	.4	−.7	1.1	−.1	−.4	−.7	.3	.3	1.0	.5	−.6	−.2	1.3	0
Pacific	30°	130°	.....	−.5	.4	−.6	.9	.3	−.7	.1	.2	.8	.4	−.9	1.0	−.7	−.2	.2	.2	−.8	−2.2	−.9	.4	.2	.3	−.5
San Diego	33°	117°	.....	.3	−.1	−.1	.2	.1	.2	.1	.1	0	.1	−.4	.7	.2	−.2	−.3	.1	−.2	.3	−.5	−.1	.2	−.2	−.1
Denver	40°	105°	.....	−.3	0	.8	−2.0	.1	.1	−.3	.1	.2	.2	.3	−1.1	.2	−.4	.4	.2	.6	−.1	.1	−.1	.4	.1	−.9
Abilene	32°	100°	.....	.2	−.3	.9	−1.2	−.1	−.5	−.4	.1	−.1	.2	.4	−.3	.3	−.3	0	.1	.2	−.2	.1	.1	.2	−.6	−.3
St. Louis	39°	90°	.....	.5	−.2	.5	−1.2	−.2	−.4	−.1	−.1	−.1	.6	.1	−.6	.2	.2	0	−.1	.4	−.6	0	.3	.5	−.3	.8
Charleston	33°	80°	.....	.1	−.1	−.1	−.3	.3	−.5	.5	−.6	−.3	.2	.3	.1	−.2	.3	−.3	.6	−.1	.1	−.6	.4	−.6	−.3	.4
Atlantic	35°	70°	.....	.4	−.2	−.3	−.3	.5	.2	.3	−.3	−.4	.3	.2	.2	−.3	.4	0	1.3	−.5	−.5	−.4	.6	−1.2	0	.8
Atlantic	30°	50°	.....	.7	−.5	−.3	.2	.7	−.3	0	−.1	−2.2	.4	1.1	.2	−.6	−.2	−.4	.8	1.0	−.5	−1.1	.5	−.4	−.8	1.4
Atlantic	30°	40°	.....	.8	−.5	−.2	−.2	.5	−.9	−.5	−.2	−.3	1.1	1.4	−.3	−.5	−.8	−.2	1.5	.7	.1	−1.8	1.0	−.6	−1.3	−1.1
Ponta Delgada	38°	26°	.....	1.6	−.9	−.2	−.7	.6	.8	−.3	−.6	.4	−.1	2.0	−.7	−1.1	−.6	−.2	3.6	−.4	2.4	−4.1	.7	−.8	−1.5	1.2
Madeira	33°	17°	.....	.7	−.2	−.8	−1.0	1.4	.2	−.7	−.2	1.0	−.2	1.0	.2	−.6	−.2	−.3	1.9	−.5	1.6	−1.0	.1	−1.3	−.5	2.4
Lisbon	39°	9°	.....	.3	−.3	−.1	−1.0	1.2	0	−.7	0	.3	.3	.1	−.3	−.8	.1	.1	1.2	−.3	1.5	−1.0	−.1	−1.0	.2	1.3
	N.	E.																								
Beirut	34°	35°	.....	−.2	.1	−.2	−.1	.3	.5	−.4	0	.3	.3	.1	.4	−.3	−.1	.1	.1	−.3	.4	.5	.4	−.7	−.8	0
Leh	34°	78°	.....	.3	−.3	−.2	.9	.3	.4	−.2	.2	−.3	−.1	−.6	.1	.3	−.2	0	−.5	−.1	.3	1.8	−.2	.5	−.3	−.3
Nanking	32°	119°	.....	1.5	.8	−.5	−1.0	−2.1	.4	.8	.5	−1.9	.1	−2.1	.6	.1	−.2	.5	1.0	−1.8	.....	−2.4	.1	.2	.3	−1.8
Nagasaki	33°	130°	.....	−.3	.1	.2	.1	.1	−.1	.3	0	−1.0	.3	−.1	.1	−.1	−.8	.3	.4	.3	0	−.8	−.2	.1	.6	0
Pacific	30°	150°	.....	−.5	.1	.1	1.2	−.4	.1	.8	−.4	0	.6	−.4	.5	−.2	−.6	−.2	.4	.4	1.3	1.3	−.6	.6	−.5	−1.0
Pacific	30°	170°	.....	−1.3	.2	.1	1.2	.7	−1.2	.8	0	−1.0	.8	−.2	−.2	−.1	−.6	.2	.2	.9	−.1	.4	.1	.5	.5	−2.1

TABLE 4.—*Mean Departures of Pressure from Normal in Millimeters for Different Departures of Solar Radiation from Normal in Calories* (continued)

Station	Latitude	Longitude	March-May						June-August						September-November						December-February					
			Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010
	N.	W.	Latitude 20° N. to 29° N.																							
Pacific	20°	180°	.....	0	.2	.1	.3	−1.1	.1	1.0	−.4	−.8	.3	.1	.8	.2	−.3	−.7	−.4	.6	.9	1.3	−.1	.5	0	−.7
Midway Island	28°	177°	.....	−1.6	.4	.6	.9	−.1	−.1	.3	.1	−.7	.8	−.9	0	.4	−.8	−.2	.5	.6	.6	−1.7	−.4	.6	1.3	−.6
Honolulu	21°	158°	.....	.1	.2	.2	−.3	−.3	.1	.1	−.1	−.1	−.2	.3	.4	.5	−.1	−.9	.4	.2	.2	−.8	−.2	.8	−.1	−.4
Pacific	20°	140°	.....	1.9	−.4	−.6	0	−.7	−.1	−.1	0	2.3	−.5	−.5	1.3	.1	−.4	−.6	.2	−.1	2.4	−.1	−.2	.2	−1.4	0
Mazatlan	23°	106°	.....	.2	.1	−.1	−.7	−.2	.5	.3	−.1	−.9	−.7	.1	.5	.3	.1	−.6	0	.1	.5	−.6	.1	0	−.8	.2
Merida	21°	90°	.....	.3	0	.2	−.8	−.2	.2	0	−.1	−.1	−.1	.3	.4	.1	.1	−.4	.5	−.7	.7	−.4	−.1	.2	−.1	.3
Atlantic	25°	65°	.....	.1	−.2	−.3	.3	.6	−.5	−.2	−.1	−.9	1.4	.8	.3	−.2	.2	−.3	1.1	0	−.5	−.1	0	−.1	0	.5
Key West	25°	82°	.....	.1	0	.1	−.6	0	0	.3	0	−.5	−.2	.3	0	0	−.1	0	.5	−.6	.2	−.3	−.1	0	−.5	.7
La Laguna	28°	16°	.....	.2	.1	−.4	−.4	.3	−.1	−.5	.1	.5	−.1	.3	−.4	−.3	.2	−.2	1.5	−.6	.7	−.3	.2	−.8	−.7	1.1
	N.	E.																								
Helwan	30°	31°	.....	−.3	.2	−.3	.4	.6	0	−.5	0	.2	.2	.2	.4	−.5	−.1	0	−.1	−.1	.4	.5	.1	−.4	−.4	.1
Bushire	29°	51°	.....	−.5	−.2	.4	.2	.5	.1	−.5	.1	−.1	.6	−.2	−.2	−.1	−.2	.3	−.2	0	.2	−.1	.2	−.3	.1	−.3
Jask	26°	58°	.....	−.6	0	.5	−.3	.6	.4	−.2	.2	.1	−.1	−.9	−.2	.3	.2	.2	−.8	−.1	−.3	.3	.3	0	0	−1.1
Hyderabad	25°	68°	.....	−.8	.1	.4	−.6	.4	.4	−.1	.1	−.7	−.4	−.5	.2	.2	−.1	0	−.3	.1	−.6	.6	0	.1	.2	−.3
Calcutta	23°	88°	.....	−.5	−.1	.4	−.4	.5	.4	−.1	0	−.1	−.4	−.5	0	.4	.1	−.3	−.1	−.1	−.2	5.	−.1	.3	−.1	−.3
Yunnanfu	25°	102°	.....	−.4	−.3	.5	.6	.1	−.2	−.3	.5	−1.2	.7	−.9	.4	−.2	−.4	0	.7	.6	.7	−1.2	0	−.2	.6	−.6
Hongkong	22°	114°	.....	−.3	.1	.1	.1	.2	.6	−.2	.2	−.6	0	−.5	.1	.5	−.1	−.1	.1	0	.3	−.3	−.2	.2	.1	0
Pacific	20°	140°	.....	0	−.4	.5	.1	.2	.3	−.5	−.4	2.0	.4	.4	1.5	.3	−.3	−.7	−.9	.7	1.0	.8	−.5	.4	−.3	0
Omura	27°	142°	.....	−.7	0	.4	.8	−.2	−.3	−.1	−.2	.4	.6	.8	.3	.4	−.4	−.1	−.2	.6	−.1	.8	−.4	.7	.1	−.6
Pacific	20°	160°	.....	−.4	.2	.3	.9	−1.0	.6	.7	−.4	−.3	.2	.1	.7	.5	−.2	−.6	−.2	.1	1.8	−1.1	0	.6	−.2	−.8
	N.	W.	Latitude 10° N. to 19° N.																							
Port au Prince	19°	72°	.....	−.1	−.1	0	.1	.1	.1	.1	−.1	−.3	−.1	.5	.4	.2	−.5	0	−.1	.1	−.2	0	0	−.1	−.2	.7
Richmond Hill	12°	62°	.....	−.3	−.1	.1	.1	.5	.2	−.1	0	.4	0	.3	0	.3	−.6	.4	.8	−.3	0	.2	−.1	.2	−.3	.5
São Vicente	17°	25°	.....	.5	−.3	0	.1	−.3	.5	−.7	.1	.3	−.1	.1	.3	.8	−.7	0	.1	−.4	.3	.6	.3	−.7	−.6	.5
	N.	E.																								
Khartoum	16°	33°	.....	−.6	.2	.2	.1	.1	−.3	−.3	0	−.2	.7	.3	0	.1	−.1	0	.1	−.1	.3	−.2	0	−.1	−.5	−.2
Aden	13°	45°	.....	−.3	0	.1	−.4	.3	.2	−.3	.1	−.6	0	.1	.1	.2	0	0	−.1	−.1	0	.3	.1	0	0	−.2
Bombay	19°	73°	.....	−.3	−.2	.2	−.4	.2	.4	−.4	.1	.5	−.1	.1	.6	−.2	−.1	−.1	−.1	−.1	−.2	−.1	.1	.2	−.3	.1
Amini Divi	11°	73°	.....	−.1	−.1	.3	−.3	.2	.3	0	0	−.2	−.1	.1	.4	−.3	0	−.1	−.4	−.3	−.1	−.1	.1	.2	−.5	−.1
Port Blair	12°	93°	.....	−.1	−.1	.5	−.4	0	.3	.1	.1	−.1	.1	−.6	.1	.2	.1	0	.2	−.5	−.6	0	.2	.4	−.3	−.6
Saigon	11°	107°	.....	−.1	−.2	.4	−.2	−.1	.2	−.1	.1	−.4	.7	−.5	−.6	.1	.1	.2	.3	−.3	−.3	.1	.2	.1	−.1	−.4
Manila	15°	121°	.....	−.1	−.2	.4	−.1	0	.3	−.1	0	.1	0	−.4	.1	.5	.1	.1	−.5	−.4	−.4	.6	−.1	.7	−.1	−.6
Iloilo	11°	123°	.....	−.1	−.1	.4	−.3	−.2	.2	0	0	−.2	.2	−.5	0	.2	0	.5	−.4	−.4	−.6	.3	.2	.5	−.2	−1.0
Guam	13°	144°	.....	−.4	.1	.8	−.6	−.3	.2	0	−.1	−.2	.3	−.2	.1	.3	.3	−.2	−.5	−.1	−.6	0	.1	.8	−.4	−.8

TABLE 4.—*Mean Departures of Pressure from Normal in Millimeters for Different Departures of Solar Radiation from Normal in Calories* (continued)

Station	Latitude	Longitude	March-May						June-August						September-November						December-February					
			Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010
	N.	W.	Latitude 0° to 9° N.																							
Colon	9°	79°	.....	0	−.1	.1	.1	−.2	0	0	0	−.3	−.2	.1	0	0	−.2	−.3	.1	.1	.1	−.5	.1	0	−.3	.3
Georgetown	7°	58°	.....	.1	−.2	−.2	.2	.9	−.2	−.5	−.3	.6	−.2	1.0	.7	.4	−.4	−.4	−.5	.3	1.5	.4	−.4	−.2	−.5	.9
Freetown	8°	13°	.....	−.4	.2	−.3	−.1	0	−.2	−.3	.1	−.5	.2	.3	−.2	.5	−.5	.2	.4	−.2	−.1	.2	.2	−.2	0	.4
	N.	E.																								
Lagos	6°	3°	.....	−.2	−.2	.1	.2	.3	−.3	−.3	−.2	.1	.4	.8	0	.3	.4	−.4	−.5	.3	.7	0	−.1	.4	−.1	.6
Entebbe	0°	32°	.....	−.7	.2	.3	0	.2	−.3	−.2	.2	−.5	.2	.1	−.2	.2	−.2	0	.1	0	−.2	.2	.1	.1	.4	.3
Colombo	7°	80°	.....	0	−.2	.1	−.5	.4	.1	−.1	0	−.3	.3	.1	.3	−.4	0	0	.1	0	−.4	.1	.1	0	−.1	.1
Yap Island	9°	138°	.....	−.3	−.1	.7	−.2	−.5	.1	0	0	−.6	.6	−.5	0	.2	.1	−.4	0	0	−1.0	−.3	0	.6	0	−.6
	S.	W.	Latitude 0° to 9° S.																							
Taperinha	2°	54°	.....	−.2	0	.2	0	0	.1	−.2	0	−.1	.2	.1	.1	.5	−.2	0	−.1	−.1	.2	0	.1	0	−.2	.1
Quixeramobim	5°	39°	.....	−.1	−.2	.1	.3	.5	−.1	−.4	0	.4	−.2	.5	0	.5	−.4	.1	.2	−.2	.1	.1	0	0	−.3	.4
	S.	E.																								
Zanzibar	6°	39°	.....	−.1	0	.2	−.5	0	−.1	−.3	.1	−.3	−.1	.2	.1	.1	0	−.1	0	−.2	−.1	.1	0	.1	−.2	0
Batavia	6°	107°	.....	0	−.1	.3	−.5	0	.2	−.1	.1	.1	.3	−.3	.1	.1	.1	.1	−.1	−.3	−.3	.3	.1	.3	−.3	−.4
Port Moresby	9°	147°	.....	0	−.2	.4	.8	−.5	.3	.1	0	.3	−.5	−.2	−.1	.1	.3	.2	−.3	−.5	.2	−.1	−.1	.6	−.4	−.2
Ocean Island	0°	169°	.....	−.2	.1	.2	−.2	−.2	.8	0	−.1	.1	0	.1	.3	.4	−.1	−.2	−.3	.2	.5	0	0	.3	−.6	.1
	S.	W.	Latitude 10° S. to 19° S.																							
Apia	13°	171°	.....	0	.1	0	.4	−.3	.3	0	−.1	.5	.2	−.2	.4	.5	−.2	−.3	−.2	0	.9	−.4	−.1	−.4	.2	.2
La Paz	16°	68°	.....	−.3	.1	.1	−.3	0	.2	−.1	.2	−.8	−.4	.1	0	.3	0	0	−.2	.2	−.2	.1	.1	.2	−.6	.3
Cuiabá	16°	56°	.....	−.3	−.1	.2	.2	.1	.6	0	0	.3	0	−.2	.3	.5	−.4	0	−.1	−.1	.1	.3	.2	−.3	−.3	.1
Ondina	13°	38°	.....	−.2	0	.2	.2	−.1	−.1	−.3	0	−.1	.4	−.1	−.2	.4	−.3	.1	.4	−.2	.2	.1	.3	−.5	−.4	0
St. Helena	16°	6°	.....	.1	0	0	−.3	.2	.2	.1	.1	−1.5	.3	−.1	.5	.1	−.2	0	−.2	−.2	1.4	0	−.1	−.3	−.4	.3
	S.	E.																								
Salisbury	18°	31°	.....	−.3	.1	.3	−.2	−.2	−.1	0	.2	−1.1	.4	−.4	−.1	.1	2.0	0	.1	−.1	−.3	.4	.3	−.5	−.1	0
Antananarivo	19°	48°	.....	.1	−.1	.2	−.1	0	0	−.2	−.1	−.3	−.1	−.1	−.1	−.2	.1	0	0	.2	−.1	−.4	−.4	.5	.1	.9
Christmas Island	10°	106°	.....	0	0	0	−.1	0	0	0	0	−.1	.1	0	0	0	0	0	0	0	−1.1	.1	0	0	0	0
Darwin	12°	131°	.....	−.4	.1	.4	−.3	−.3	0	0	.1	−.3	.5	−.4	−.2	.1	.2	.1	−.4	−.2	−.2	.2	−.2	1.0	−.4	−.2

TABLE 4.—*Mean Departures of Pressure from Normal in Millimeters for Different Departures of Solar Radiation from Normal in Calories* (continued)

Station	Latitude	Longitude	March-May						June-August						September-November						December-February					
			Over +.010	+.006 to +.010	+.001 to +.005	000 to -.005	-.006 to -.010	Under -.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to -.005	-.006 to -.010	Under -.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to -.005	-.006 to -.010	Under -.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to -.005	-.006 to -.010	Under -.010
	S.	W.	Latitude 20° S. to 29° S.																							
Catamarca	28°	65°	.....	-.3	.4	-.2	-.6	0	1.3	.6	.2	.5	-.1	-.6	.4	.4	-1.3	.6	-.2	.2	.4	-.4	.2	.1	-.7	.8
Goya	29°	59°	.....	-.3	.1	.1	.2	.2	1.1	.8	-.4	.7	.2	-.7	.8	1.0	-.9	.1	-.8	-.1	0	0	0	.5	-.6	-.1
Asunción	25°	58°	.....	-.2	-.1	.3	.3	-.2	.9	.5	-.4	.9	.1	-.6	.8	.8	-.9	0	-.6	.1	.4	0	.2	.1	-1.0	.3
Curitiba	25°	49°	.....	-.3	.1	.3	.1	-.3	.5	-.3	.2	-.4	0	-.4	-.1	.4	-.3	.2	.3	-.3	.3	-.5	.3	.2	-.5	-.7
Rio de Janeiro	23°	43°	.....	-.3	-.1	.3	.1	.1	.6	-.5	0	.1	0	0	.1	.6	-.4	-.2	-.6	-.2	.5	.1	.2	.1	-.9	0
Salta	25°	65°	.....	.1	0	0	.5	-.4	1.4	.6	-.2	.8	-.4	-1.1	.7	.6	-.7	.1	-.9	.3	-.5	-1.1	-.1	.5	-.3	.1
	S.	E.																								
O'Okiep	30°	18°	.....	-.4	.3	-.1	.3	.1	.2	.1	.3	-1.2	-.3	-.5	.2	.1	-.1	-.1	.4	.4	-.3	.3	.1	0	-.3	0
Kimberley	29°	25°	.....	-.2	.2	0	.3	-.4	.5	.1	.5	-1.5	-.1	-.3	.2	.1	.1	-.2	.4	-.5	-.4	-.5	-.1	-.2	.4	0
Bulawayo	20°	29°	.....	-.4	.2	.1	-.3	-.1	.2	.1	.2	-.8	-1.2	0	.1	.1	.1	-.3	0	-.1	-.3	.1	.1	.2	-.2	-.3
Durban	30°	31°	.....	-.5	.4	-.1	-.7	-.5	.4	0	.8	-2.2	.9	-1.6	.4	.3	.1	-.5	0	-.1	-.6	-.2	.3	-.1	.3	-.5
Mauritius	20°	57°	.....	.1	-.1	.3	-.1	.2	0	-.2	-.1	-.4	.1	.6	-.4	-.2	0	0	.5	.1	-.1	-1.0	-.3	.5	.2	1.0
Alice Springs	24°	134°	.....	-.3	.3	.4	-.1	-1.0	.3	.7	-.1	.4	.5	-1.1	-.4	.1	.2	-.2	.2	.1	.3	-.7	0	.9	-.6	-.7
Brisbane	27°	153°	.....	.4	.2	-.3	-.1	-.6	-.2	1.2	0	.1	.4	-1.6	.1	.2	.2	-.9	-.1	-.2	1.5	-.9	.1	.2	-.5	-1.7
	S.	W.	Latitude 30° S. to 39° S.																							
Santiago	33°	71°	.....	-.1	0	0	-.1	-.1	.9	.2	-.3	.8	-.2	-.2	0	.2	.1	-.3	.2	.1	.3	-.4	-.1	.3	-.5	.1
Córdoba	31°	64°	.....	-.3	.1	-.1	.1	-.5	1.4	.7	-.5	.6	-.2	-.3	.6	.8	-.8	0	-.7	.1	-.1	-.2	-.1	.3	-.3	.5
Bahia Blanca	39°	62°	.....	-.3	.2	0	-.5	.1	1.1	.4	-.4	.2	-.6	.2	1.1	1.5	-.9	-.2	-1.4	.1	-.6	.1	-.1	.1	-.4	.7
Buenos Aires	35°	58°	.....	-.3	.1	.1	-.4	.1	1.1	.8	-.3	-.1	.1	-.7	1.5	1.0	-.3	.3	-1.0	.8	.1	-.1	-.2	.2	-.4	.4
	S.	E.																								
Port Elizabeth	34°	26°	.....	0	0	0	0	0	0	0	.1	-.4	.1	-.1	.1	0	0	.1	0	0	-.1	.1	0	0	0	0
Adelaide	35°	139°	.....	0	.1	0	.1	-.2	0	.2	0	0	0	-.2	-.1	0	.1	-.1	.1	.1	.1	0	0	0	-.1	-.1
Sydney	34°	151°	.....	0	0	0	.2	0	0	.2	0	0	0	-.2	0	0	.1	-.1	0	0	.3	0	0	0	0	-.1
Auckland	37°	175°	.....	2.0	-.8	.2	.2	-1.2	.6	.2	.1	.5	-1.3	-.2	-.8	2.0	-.2	-.6	-.5	1.4	1.2	1.4	-.4	.5	.8	-2.7

TABLE 4.—*Mean Departures of Pressure from Normal in Millimeters for Different Departures of Solar Radiation from Normal in Calories* (continued)

Station	Latitude	Longitude	March-May						June-August						September-November						December-February					
			Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010	Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010
	S.	W.	Latitude 40° S. to 49° S.																							
Sarmiento	45°	69°	.....	−1.5	.5	.6	− .1	− .4	.6	.6	.1	.1	− .9	−1.0	.5	1.9	−1.2	.1	−1.0	− .1	−2.1	.3	.2	.2	− .1	.8
Puerto Madryn	43°	65°	.....	− .9	.5	.2	−1.0	.2	.7	.4	0	.4	−2.0	.4	1.8	1.3	−1.0	− .2	−1.4	.2	− .6	.7	.1	− .1	− .9	.8
	S.	E.																								
Dunedin	46°	170°	.....	.2	− .1	.1	.3	− .2	− .2	.1	0	.1	− .2	0	− .1	.2	.2	− .3	0	.1	.2	.2	0	0	0	− .3
Wellington	41°	175°	.....	.2	− .1	0	.2	− .1	− .1	.1	0	.1	− .2	0	− .1	.2	.1	− .3	0	.2	.2	.2	0	0	0	− .3
	S.	W.	Latitude 50° S. to 59° S.																							
Islota de los Evangelistos	52°	75°	.....	−2.0	.8	.8	.4	−1.0	− .7	.5	1.0	.4	−1.8	−2.1	1.9	2.5	.4	− .9	−2.7	−1.2	−2.8	− .9	− .1	.5	.7	1.8
Punta Arenas	53°	71°	.....	−1.7	.9	1.0	−1.1	−1.1	−1.7	.7	.8	− .1	−1.8	−1.1	1.9	1.8	.5	− .7	−1.6	− .5	−2.9	− .1	− .2	.6	.4	2.3
Santa Cruz	50°	68°	.....	−1.7	.8	.9	− .7	− .9	−1.0	.5	.8	− .2	−1.5	−1.1	1.7	1.6	− .4	− .6	−2.0	− .5	−2.5	− .1	0	.4	.4	1.8
Cape Pembroke	52°	58°	.....	.3	.6	.5	−2.2	− .6	− .8	0	.4	4.4	−2.5	1.2	2.1	.9	.1	−1.1	−1.4	− .5	−2.3	1.5	− .6	1.2	−1.4	− .6
South Georgia	54°	37°	.....	3.1	− .8	.9	−1.5	.2	1.4	− .5	− .5	3.0	−3.4	2.5	.3	− .6	−1.0	.8	− .4	1.6	.5	4.6	−1.0	1.8	−2.4	4.8
	S.	W.	Latitude 60° S. to 69° S.																							
South Orkneys	61°	45°	.....	1.6	− .3	.5	−2.3	−1.3	− .6	.7	.4	3.0	−2.4	−1.3	− .7	−1.3	.6	1.5	−1.0	− .3	− .2	3.0	−1.0	2.3	− .9	2.9

TABLE 5.—*Mean Departures of Pressure from Normal in Millimeters for Different Departures of Solar Radiation from Normal in Calories*

Station	Lat. °	Long. °	Year Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010
	N.	W.	Latitude 70° N. to 79° N.					
Barrow	71	156	—1.4	.3	.6	—.5	—1.6	1.0
Upernivik	73	56	0	—.3	.4	.4	—.9	—.3
Spitsbergen	78	E. 14	—.6	—.4	—.1	.8	1.6	—.7
Mehavn-Stetnes	71	28	0	—1.2	.1	.3	1.4	—1.0
Malye Karmakouly	72	53	.9	—1.4	—.2	.7	.5	—.2
Waigatz	70	58	—1.5	—.8	—.2	1.1	.8	—.3
Dickson	73	80	—.6	—2.1	.3	.6	.1	.6
	N.	W.	Latitude 60° N. to 69° N.					
Nome	64	165	—.2	—.7	.7	—.8	—.3	1.1
Eagle	65	141	.1	.1	.8	—.1	—1.3	1.9
Ft. Good Hope	66	129	—1.6	—.3	.2	—.7	—.8	1.4
Angmagsalik	66	37	—.6	0	—.4	.9	1.4	—.7
Atlantic	60	30	.3	—.2	—.7	.9	1.1	—2.4
Stykkishólm	65	23	0	—.9	—.7	1.1	1.6	0
Berufjördur	64	14	.8	—1.0	—.6	.5	1.7	.1
Bodö	67	E. 14	—.2	—.4	—.1	—.1	1.9	—.5
	N.	W.	Latitude 50° N. to 59° N.					
Pacific	50	170	2.7	.3	—.1	—1.4	—1.1	.2
Dutch Harbor	54	166	1.7	—.2	.3	—1.3	—2.4	1.4
Kodiak	58	152	1.0	—.8	.3	—1.6	—1.0	1.8
Pacific	50	150	1.8	—.1	.2	—2.0	—.9	.9
Juneau	58	134	—.4	—.3	.3	—1.0	—.5	1.2
Atlantic	50	40	0	0	—.1	.3	—.5	.4
Atlantic	50	30	.9	—.7	—.6	.7	—1.3	1.7
Atlantic	50	20	2.3	—.8	—1.2	.6	—.1	2.0
Valentia	52	10	2.3	—1.1	—1.2	.6	.7	1.4
Aberdeen	57	2	2.4	—.7	—.9	.3	1.1	.6
Utrecht	52	E. 5	2.5	—.3	—.7	—.2	.8	.4
Warsaw	52	21	1.2	.4	—.2	0	.7	—.2
Moscow	56	37	0	—.1	0	—.1	1.1	—.4
Leningrad	60	30	.2	.1	—.2	—.3	1.3	—.4
Perm	58	56	—1.2	—.8	—.1	1.0	1.5	—.2
Barnaul	53	84	—.4	—.5	0	.7	.6	—.3
Tomsk	56	85	—.9	—.4	0	.6	1.3	—.4
Yenisseysk	58	92	—.4	—.5	0	.6	.1	—.2
Irkutsk	52	104	.2	—.5	—.1	.5	.3	—.2
Blagovyeshtchensk	50	127	.6	—.4	.3	0	.4	—1.0
Petropavlovsk	53	159	1.6	.8	.1	—.3	—2.6	.5
Pacific	50	170	—.3	.3	—.1	.2	—.9	.6
	N.	W.	Latitude 40° N. to 49° N.					
Pacific	40	180	.6	.6	—.5	—.2	—.2	1.0
Pacific	40	160	1.3	.2	—.3	—1.8	.1	2.3
Pacific	40	140	—.7	—.1	—.1	—.9	.1	2.1
Seattle	48	122	—.1	—.2	—.3	.4	—.2	.7
Red Bluff	40	122	0	0	—.2	.1	0	.3
Bismarck	47	101	—.2	.5	0	—.5	—.5	.4
Alpena	45	83	—.1	.1	.2	—.4	—.4	.7
New York	41	74	—.1	.3	.4	—.1	.2	.5
Father Point	48	68	.3	—.2	.3	—.8	—.6	1.3
Anticosti	49	63	0	—.2	.7	—.8	—.6	—.1
Atlantic	40	60	—1.2	.6	.5	—.6	.2	—.7
Cape Race	46	53	—.8	.5	.6	—.4	—.2	—.9

TABLE 5.—*Mean Departures of Pressure from Normal in Millimeters for Different Departures of Solar Radiation from Normal in Calories* (continued)

Station	Lat. °	Long. °	Over +.010	Year +.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010
	N.	W.		Latitude 40° N. to 49° N.				
Atlantic	40	50	—.7	.9	.2	—.4	0	—.4
Atlantic	40	40	0	0	.2	—.2	.2	.4
Atlantic	40	20	.8	—.2	—.5	—.2	.3	.7
Marseille	43	E. 5	.9	0	0	—.5	—.1	—.2
Rome	42	12	1.8	—.2	.2	—.4	—.7	—.6
Tiflis	42	45	.2	0	.2	—.4	.6	—.8
Krasnovodsk	40	53	—.3	—.2	.3	—.2	.7	—.8
Tashkent	41	69	—.1	—.1	.2	—.1	.7	—.5
Joshin	41	129	.5	0	0	—.4	0	—.2
Vladivostok	43	132	0	—.3	.1	.4	—.5	—.3
Nemuro	43	145	.5	0	.1	.5	—.3	.2
Pacific	40	160	—1.2	.3	0	.1	.2	.2
	N.	W.		Latitude 30° N. to 39° N.				
Pacific	30	170	1.3	—.5	—.3	—.5	.3	.8
Pacific	30	150	.6	0	—.2	—.4	.5	1.2
Pacific	30	130	—.3	—.4	.2	0	.4	—.5
San Diego	33	117	.5	.1	0	—.1	0	—.1
Denver	40	105	—.5	—.1	—.1	.5	—.2	.1
Abilene	32	100	—.3	0	—.2	.3	—.3	.1
St. Louis	39	90	—.5	.2	0	0	—.2	.2
Charleston	33	80	—.2	0	0	—.3	.1	.2
Atlantic	35	70	—.1	.1	.1	—.5	.4	.2
Atlantic	30	50	—.1	0	—.1	—.4	.2	1.0
Atlantic	30	40	—.3	—.1	.1	—.3	.4	.6
Ponta Delgada	38	26	.6	—.3	—.3	—.3	.5	.7
Madeira	33	17	.5	—.2	—.1	—.6	.2	1.0
Lisbon	39	9	.3	—.4	—.1	—.2	.3	.5
Beirut	34	E. 35	.4	—.2	.1	—.2	—.2	0
Leh	34	78	.3	.3	—.1	0	0	—.2
Nanking	32	119	.5	.3	.4	0	.3	—1.9
Nagasaki	33	130	0	—.1	—.1	.1	.4	0
Pacific	30	150	.6	.2	—.3	.2	.3	—.3
Pacific	30	170	—.4	—.2	0	.1	.6	—.1
	N.	W.		Latitude 20° N. to 29° N.				
Pacific	20	180	.6	.2	—.1	—.1	0	—.2
Midway Island	28	177	.1	—.6	—.1	.4	.9	—.2
Honolulu	21	158	.2	.1	—.1	0	0	0
Pacific	20	140	1.2	.6	—.2	—.1	—.5	—.3
Mazatlan	23	106	.5	.1	0	—.3	—.5	.1
Merida	21	90	.4	.1	—.1	0	0	—.1
Atlantic	25	65	—.1	—.1	—.3	—.3	.7	.6
Key West	25	82	.1	.1	0	0	—.1	.1
La Laguna	28	16	0	—.2	.1	—.4	.2	.2
Helwan	30	E. 31	.3	—.3	.1	—.1	0	.2
Bushire	29	51	0	—.4	0	.1	.1	0
Jask	26	58	0	—.2	.2	.2	—.3	—.3
Hyderabad	25	68	0	—.1	0	.1	—.2	—.1
Calcutta	23	88	.1	—.1	0	.1	—.2	—.1
Yunnanfu	25	102	.3	—.4	0	0	.6	—.2
Hongkong	22	114	.3	—.1	.6	0	.1	—.1
Pacific	20	140	1.0	0	—.4	.2	—.3	.3
Omura	27	142	0	—.1	—.2	.3	.2	.2
Pacific	20	160	1.0	.1	—.1	0	.1	—.4

TABLE 5.—*Mean Departures of Pressure from Normal in Millimeters for Different Departures of Solar Radiation from Normal in Calories* (continued)

Station	Lat. °	Long. °	Year: Over +.010	+.006 to +.010	+.001 to +.005	000 to −.005	−.006 to −.010	Under −.010
	N.	W.	Latitude 10° N. to 19° N.					
Port-au-Prince	19	72	.2	0	—.1	—.1	—.1	.3
Richmond Hill	12	62	0	—.1	—.1	.3	.1	.2
São Vicente	17	25	.3	.2	—.1	—.2	—.1	0
Khartoum	16	E. 33	0	—.3	.1	0	.1	0
Aden	13	45	.1	—.1	.1	0	—.2	.1
Bombay	19	73	.3	—.3	0	.1	—.2	.1
Amini Divi	11	73	.3	—.2	0	.1	—.3	0
Port Blair	12	93	0	0	.1	.2	—.1	—.4
Saigon	11	107	—.3	0	0	.2	.2	—.3
Manila	15	121	0	.1	—.1	.3	—.2	—.3
Iloilo	11	123	—.1	0	0	.4	—.2	—.5
Guam	13	144	—.1	—.1	.1	.4	—.3	—.3
	N.	W.	Latitude 0° to 9° N.					
Colon	9	79	.3	0	0	—.1	—.1	0
Georgetown	7	58	.7	.1	—.3	—.2	—.3	.7
Freetown	8	13	—.2	—.1	.1	—.1	.2	—.1
Lagos	6	E. 3	.1	—.1	—.1	—.2	—.1	.5
Entebbe	0	32	—.2	—.2	.1	.1	—.1	.1
Colombo	7	80	.1	—.1	0	0	0	.1
Yap Island	9	138	—.1	0	0	.3	.1	—.4
	S.	W.	Latitude 0° to 9° S.					
Taperinha	2	54	.1	0	0	0	0	0
Quixeramobim	5	39	0	0	—.1	.1	0	.3
Zanzibar	6	E. 39	0	—.1	.1	.1	—.2	0
Batavia	6	107	0	.1	0	.2	—.1	—.2
Port Moresby	9	147	.1	0	0	.4	—.2	—.3
Ocean Island	0	169	.5	.1	0	.1	—.3	0
	S.	W.	Latitude 10° S. to 19° S.					
Apia	13	171	.5	.1	—.1	—.2	.1	—.1
La Paz	16	68	0	0	.1	0	—.4	.1
Cuiabá	16	56	.3	0	0	0	—.1	0
Ondina	13	38	0	0	.1	0	.1	—.1
St. Helena	16	6	.8	.1	0	—.2	—.2	0
Salisbury	18	E. 31	—.2	—.1	.2	—.2	0	.2
Antananarivo	19	48	—.1	—.1	—.1	.2	0	.2
Christmas Island	10	106	—.1	0	0	0	0	0
Darwin	12	131	—.2	—.1	0	.4	—.3	—.3
	S.	W.	Latitude 20° S. to 29° S.					
Catamarca	28	65	.6	.1	0	.2	—.4	.1
Goya	29	59	.7	.3	—.2	.3	—.4	—.2
Asunción	25	58	.7	.3	—.2	.2	—.4	—.1
Curitiba	25	49	.2	—.2	.1	.2	—.1	—.4
Rio de Janeiro	23	43	.4	—.1	0	.1	—.5	0
Salta	25	65	.6	.2	—.2	.2	—.4	—.1
O'Okiep	30	E. 18	.1	—.1	.2	—.2	—.1	—.2
Kimberley	29	25	.1	—.1	.2	—.3	.3	—.3

Table 5.—*Mean Departures of Pressure from Normal in Millimeters for Different Departures of Solar Radiation from Normal in Calories* (continued)

Station	Lat. °	Long. °	Year: Over +.010	Year: +.006 to +.010	Year: +.001 to +.005	Year: 000 to −.005	Year: −.006 to −.010	Year: Under −.010
	S.	E.		Latitude 20° S. to 29° S.				
Bulawayo	20	29	0	—.1	.2	—.1	—.3	—.1
Durban	30	31	.1	—.1	.4	—.4	.2	—.7
Mauritius	20	57	—.2	—.2	—.1	.2	.2	.4
Alice Springs	24	134	0	0	.1	.3	0	—.7
Brisbane	27	153	.4	.4	.1	—.3	—.1	—.8
	S.	W.		Latitude 30° S. to 39° S.				
Santiago	33	71	.3	0	—.1	.1	—.1	0
Córdoba	31	64	.6	.3	—.3	.1	—.4	—.1
Bahia Blanca	39	62	.7	.4	—.2	0	—.8	.2
Buenos Aires	35	58	1.0	.3	—.1	.2	—.5	.1
Port Elizabeth	34	E. 26	0	0	0	—.1	0	—.1
Adelaide	35	139	0	.1	0	0	0	—.1
Sydney	34	151	.1	.1	0	.1	0	—.1
Auckland	37	175	.1	1.5	—.3	.1	—.2	—.6
	S.	W.		Latitude 40° S. to 49° S.				
Sarmiento	45	69	—.2	.2	.1	.3	—.5	—.2
Puerto Madryn	43	65	.8	.2	0	0	—1.3	.6
Dunedin	46	E. 170	—.1	.2	0	—.1	0	—.1
Wellington	41	175	0	.2	0	—.1	0	—.1
	S.	W.		Latitude 50° S. to 59° S.				
Islota de los Evagelistos	52	75	—.1	—.1	.5	.2	—1.0	—.8
Punta Arenas	53	71	—.4	0	.5	.2	—1.0	—.3
Santa Cruz	50	68	—.2	—.1	.4	.3	—1.0	—.3
Cape Pembroke	52	58	.1	.5	.1	.4	—1.9	—.1
South Georgia	54	37	.7	1.2	—.8	1.3	—1.9	2.0
	S.	W.		Latitude 60° S. to 69° S.				
South Orkneys	61	45	—.5	1.0	—.1	2.5	—1.5	—.2