For the comparison between the present calendar and the proposed 13-month calendar we will begin with the weekly values. The solid line in Figure 6 gives the total rainfall by weeks for the 27 years. Two sets of variations are seen at once. These are the great variations from week to week, and a longer period variation having two maxima and two minima per year. It is probably safe to assume that the long period variation is real, but just where the curve representing that variation should run depends largely on what we do with the weekly variations. Are they real or accidental? As one way of testing the matter a new set of weekly values was computed beginning on January 4, or three days later than in the first instance. These values are represented by the broken line in Figure 6. This shifting of the week made but little change in the curve although the phase was reversed in a few minor cases. An inspection of the data showed that in some cases at least the high points were due to one or more unusually heavy rains. Following this lead the total precipitation per week in rains of 1 inch or more was computed. These values are shown by curve C in Figure 7. Comparing this curve with the total rainfall curve A above, it is apparent that a very large portion of the weekly variation is due to these heavy rains. It was found that during the 27 years there had been rains of 1 inch or more on 299 days, which is 8.6 per cent of the total number of rainy days. The rainfall for these 299 days was 37 per cent of the total rainfall for the whole period. Even the most imaginative person would hardly assume that in another 27 years similar heavy rains would fall on exactly the same dates or even in the same weeks.

Under these circumstances it seemed proper to eliminate the weekly variations as much as possible without interfering with the general trend and this was done. The data were smoothed twice using first the formula $\frac{1+2+3+4+5}{5}=3$ and then the formula $\frac{1+2+3}{3}=2$. The curves B and D in Figure 7, represent the smoothed values. The standard deviation of the weekly values from the smoothed curve of total rainfall is 4.13 inches.

In Figure 8, Curve A represents the weekly rainfall, curve B the monthly rainfall by calendar months, and the broken line represents the rainfall for 13 periods of 4 weeks each.

The standard deviation of the weekly values from the curve for the calendar months is 4.25 inches, and the standard deviation from the curve of 13 months of 4 weeks each is 4.18 inches, as compared with a standard deviation of 4.13 inches from the smooth curve in Figure 7.

Conclusion. The method of computing data by weeks appears to have an advantage in point of accuracy of nearly 3 per cent over the usual method using calendar months.

TABLE 1.—*Rate per hour for 13 periods of 4 weeks beginning January 1, in thousandths of an inch*

Period	A. M.						P. M.					
	2	4	6	8	10	Noon	2	4	6	8	10	Midnight
1	0.062	0.064	0.063	0.062	0.059	0.057	0.054	0.053	0.052	0.054	0.056	0.059
2	.065	.065	.063	.061	.060	.058	.055	.058	.060	.064	.062	.064
3	.071	.070	.067	.064	.064	.064	.064	.065	.067	.068	.068	.069
4	.073	.076	.073	.069	.067	.069	.069	.072	.073	.074	.071	.070
5	.074	.076	.073	.069	.065	.072	.078	.087	.087	.080	.074	.073
6	.075	.080	.087	.085	.082	.089	.100	.110	.101	.091	.079	.074
7	.086	.087	.093	.090	.101	.110	.124	.131	.119	.101	.081	.078
8	.095	.094	.096	.101	.115	.121	.127	.132	.122	.104	.087	.086
9	.096	.093	.091	.091	.106	.109	.111	.113	.113	.098	.088	.083
10	.080	.077	.078	.079	.086	.086	.088	.091	.093	.083	.076	.073
11	.069	.069	.070	.068	.072	.070	.070	.072	.076	.070	.063	.061
12	.064	.062	.061	.062	.067	.064	.060	.059	.060	.059	.056	.060
13	.063	.060	.058	.057	.059	.057	.054	.051	.053	.055	.057	.061

CORRELATIONS FOR LONG-RANGE FORECASTING

By F. GROISSMAYR, Meteorologist

[Passau, Bavaria, Germany]

In Table 1 are listed 13 correlation coefficients, based on from 48 to 50 years' data. Of these, six are equal to or greater than 0.50, and may therefore be useful in long-range weather forecasting. Table 2 shows the actual and the computed deviations from the mean for those years in which the deviations of the disturbing element were especially pronounced. The coefficients are all equal to or greater than six times the probable error.

The North Atlantic circulation is measured by the deviation from normal of the pressure difference between Iceland and the Azores. The figures for the Nile flood are relative numbers, one relative unit being about 4.8 per cent; the mean of the Nile flood at Aswan, July to October, is 670.8×10^8 cubic meters. The temperatures of Germany are the means of 10 stations; those of the United States the means of 5 stations east of the Mississippi—Milwaukee, Cincinnati, New York, New Orleans, and St. Louis. The data were taken from Baur, Grundlagen einer Vierteljahrestemperaturvorhersage für Deutschland (1926); Bliss, The Nile Flood and World Weather (1926); and Groissmayr, Die Nilflut und der Folgewinter in Deutschland (Met. Zeit., 1927).

TABLE 1.—*Correlations for long-range forecasting*

Elements correlated	Charleston precipitation, 1872-1921	Charleston precipitation, 1872-1919	Argentine pressure, April-June, 1874-1923	Argentine pressure, May, 1874-1923	Nile flood at Aswan, July-October, 1874-1923
Nile flood at Aswan, July-October, 1874-1923	[1] 0.61		0.57		
Temperature in eastern United States, September-November, 1874-1923	−0.28			[1] −0.46	−0.40
Temperature in Germany, December-February, 1874-75 and 1923-24	−0.38		−0.47		[1] −0.50
Temperature in Germany, March-May, 1875-1924	[1] −0.55				
North Atlantic circulation (Azores-Iceland), December-February, 1874-75 and 1921-22		[1, 2] −0.66			
North Atlantic circulation, March-May, 1875-1922		−0.40			
Annual precipitation at Charleston, S. C., 1873-1920		[1] −0.64			
North Atlantic circulation, December-February, 1874-75 and 1923-24					−0.49

[1] The closest relations, so far as the author knows, ever found for these elements.
[2] Most important.

TABLE 2.—*Years of large departures of disturbing element*

Year	1874	1892	1894	1896	1902	1905	1909	1914	1915	1917	1919
Deviations ≧±1 mm. of Argentine pressure, April–June	1.3	2.4	1.5	1.5	−1.6	−1.0	1.3	−1.5	−1.4	1.2	−2.0
Deviations of the Nile flood, 3 months later:											
Actual	8	7	8	4	−6	−6	2	−3	−7	2	−3
Computed	4	7	5	5	−5	−3	4	−5	−4	4	−6

Regression on equation: $\Delta_{Nile}=3.1\ \Delta_{Press.}$

Contrast probability $=\frac{11}{11}=100$ per cent.

Year	1874	1878	1879	1887	1892	1894	1895	1899	1902	1905	1907	1913	1915
Deviations of the Nile flood ≧±6 or ≧±29 per cent	8	7	6	6	7	8	6	−6	−6	−6	−7	−12	−7
Deviations of German temperature following December–February° C.:													
Actual	−1.6	−1.0	−3.5	−1.8	−2.7	−3.1	−0.4	−0.5	0.6	1.2	0.2	0.9	2.8
Computed	−1.4	−1.3	−1.1	−1.1	−1.3	−1.4	−1.1	1.1	1.1	1.1	1.3	2.2	1.3

Regression equation: $\Delta_{Temp.}=-0.18\Delta_{Nile}$.
Contrast probability, $_{Nile}\geqq\pm6=12/13=92$ per cent.

Year	1874	1876	1877	1878	1885	1893	1901	1907	1908	1911	1917	1918
Deviations of the annual precipita- at Charleston ≧± 15 inches	15	30	30	29	20	23	−15	−16	−17	−16	−15	−17
Deviations of the North Atlantic circulation, 2½ years later, December–February:												
Actual	0	−10	−3	−17	−11	−2	6	8	2	3	10	1
Computed	−5	−10	−10	−10	−7	−8	5	5	6	5	5	6
Year	76/77	78/79	79/80	80/81	87/88	95/96	03/04	09/10	10/11	13/14	19/20	20/21

Regression equation: $\Delta_{circ.}=-0.34\Delta_{precip.}$
Contrast probability, $\Delta_{precip.}\geqq\pm15$, $=11/12=92$ per cent.

Year	1887	1892	1902	1906	1910	1915	1917	1919	1920
Deviations of May Argentine pressure ≧±2 mm.	2.3	2.8	−2.3	−21.1	2.0	−3.1	3.7	−3.1	−2.1
Temperatures in east United States following September–November:									
Actual	−1.9	−2.1	1.9	1.0	−0.1	2.2	−3.4	1.7	1.4
Computed	−1.2	−1.4	1.2	1.1	−1.0	1.6	−1.9	1.6	1.1

Regression equation: $\Delta_{temp.}=-0.51\Delta_{press.}$
Contrast probability, $\Delta_{press.}\geqq2$mm., 100 per cent.

Year	1874	1876	1877	1878	1885	1893	1901	1907	1908	1911	1917	1918
Deviations of the annual precipitation at Charleston ≧± 15 inches	15	30	30	29	20	23	−15	−16	−17	−16	−15	−17
Deviations of temperature in Germany, March–May, 2¾ years later:												
Actual	−1.7	−1.6	0.3	−1.3	−1.5	−0.2	0.4	0.6	0.9	1.1	2.6	1.9
Computed	−0.7	−1.4	−1.4	−1.3	−0.9	−1.0	0.7	0.7	0.8	0.7	0.7	0.8
Year	1877	1879	1880	1881	1888	1896	1904	1910	1911	1914	1920	1921

Regression equation: $\Delta_{temp.}=-0.046\Delta_{precip.}$
Contrast probability, $\Delta_{precip.}\geqq\pm15$, 92 per cent.

Year	1874	1876	1877	1878	1885	1893	1901	1907	1908	1911	1917	1918
Deviations of the annual precipitation at Charleston ≧±15 inches	15	30	30	29	20	23	−15	−16	−17	−16	−15	−17
Deviations of the Nile flood 2 years later:												
Actual	4	7	6	2	6	6	0	2	−1	−12	−3	−3
Computed	3	7	7	6	4	5	−3	−4	−4	−4	−3	−4
Year	1876	1878	1879	1880	1887	1895	1903	1909	1910	1913	1919	1920

Probability $=10/12=83$ per cent.
Regression of equation: $\Delta_{Nile}=0.22\Delta_{precip.}$

NOTES, ABSTRACTS, AND REVIEWS

LAPSE RATE IN NIMBUS CLOUDS

By W. PEPPLER

(Abstracted from Meteorologische Zeitschrift, May, 1928, by W. R. Stevens)

The observational material upon which the author has based this study was obtained from the numerous captive-balloon ascents made over Lake of Constance between the years 1910 to 1927. In order to eliminate pure stratus clouds, only ascents were used which showed a cloud thickness of at least 2 kilometers. Furthermore, all records were eliminated which indicated a possibility of error due to ice deposit on the meteorograph or which showed discontinuities of temperature or humidity within the cloud. In this way we are assured of temperature gradients in homogeneous clouds. The temperatures and pressures given in the tables represent mean values over a range of 500 meters.

Table 1 shows the mean lapse rates with respect to certain temperatures without taking into consideration either height or pressure. N indicates the number of observations.

Above 3° C. the lapse rate is about 0.57. Between +1° C. and −1° C. there is a depression to 0.51, and at lower temperatures there is an approximately linear decrease to 0.68 at −14° C.

Table 2 shows lapse rates in nimbus clouds with temperatures and pressures as arguments.

At pressures less than 620 mm. (about 1,500 meters) the gradient decreases from 0.58 at 6° C. to 0.52 at −2° C. and increases at lower temperatures. Much the same conditions prevail at the other pressures considered.

When the mean temperature gradient is computed with respect to pressure, as in Table 3, almost the same gradient prevails between 480–660 mm.

It is seen from Tables 1–3 that the computed gradients in nimbus clouds do not coincide with those which theoretically should prevail. The difference (observed minus theoretical) between observed and theoretical values are given in Table 4.

At temperatures of 3° C. the observed and theoretical gradients correspond; but at temperatures near zero to −10° C. there is a uniform difference of about −0.06.

Table 5 shows the difference at various temperatures divided into three intervals of pressure and indicates much the same as Table 4.

Table 6 gives the percentage frequency of various differences between observed and theoretical gradients.

Small negative deviations between zero and −0.08 are most frequent. The question which naturally arises is whether the differences between observed and com-