



RELATION OF SUMMER TEMPERATURE AND RAINFALL
DEPARTURES IN OKLAHOMA TO THE VAPOR
CONTENT OF THE AIR

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(Abstract)

The existence, during the period 1920-1930, of a positive .52 correlation between July rainfall departures in Oklahoma and June temperature anomalies in the Western Gulf of Mexico suggest, since evaporation is greater from warm than from cool water surfaces, that varying vapor content of the atmosphere may be an important factor controlling the character of summer weather in the Southwest. Depression of the temperature of the dew-point and variations in daily range in temperature, both indicators of the vapor content of the atmosphere, support this hypothesis. Daily range in temperature, which is increased by low atmospheric humidity, was shown to have at Oklahoma City in August negative $.56 \pm 0.7$ coefficient of correlation with August rainfall departures at that station during the period 1891-1931, while August departures in depression of the dew-point had a negative $.53 \pm .076$ correlation with August rainfall departures at that station during the same period. Depression of dew-point temperatures at Oklahoma City also had during the period 1920-1930 negative correlations of .53, .48 and .31 with May and June sea temperatures. It thus appears that high vapor content of the atmosphere, induced by abnormally high sea temperatures, causes abnormally wet weather in Oklahoma in August; whereas low humidity caused apparently by abnormally low sea temperatures results in dry August weather. Dry Augusts are abnormally hot while wet Augusts are abnormally cool, there being a negative $.64 \pm .054$ correlation during the period 1891-1933. During this period 17 of the Augusts in Oklahoma were classed as dry-hot, 12 as wet-cool, whereas only 3 were dry-cool and none were wet-hot. Thus, paradoxically, abnormally hot Augusts result from low sea temperatures while cool Augusts result from abnormally warm seas.

The frequency and degree of temperature and rainfall departures for the state of Oklahoma for the four summer months is shown in Tables 1 and 2.

TABLE 1. *Frequency and degree of Oklahoma monthly temperature departures from normal of four summer months during a 42-year period.*

Monthly temp. departure, ° F.	Number of months			
	May	June	July	August
+7—7.9	1	0	0	0
6—6.9	0	1	0	0
5—5.9	0	1	0	0
4—4.9	0	2	1	3
3—3.9	5	2	1	2
2—2.9	3	2	5	7
1—1.9	6	2	9	5
under .9	12	17	12	8
—1—1.9	4	5	7	8
—2—2.9	6	7	3	4
—3—3.9	2	2	3	3
—4—4.9	1	0	1	1
—5—5.9	1	0	0	0
—6—6.9	1	1	0	1
Normal temp.	66.2	77.1	81.4	81.0

TABLE 2. *Rainfall departures.*

Rainfall departure	Number of months			
	May	June	July	August
+5—5.9	1	1	0	0
4—4.9	1	2	0	0
3—3.9	2	2	0	1
2—2.9	3	2	6	7
1—1.9	5	5	4	3
under .9	14	14	21	17
—1—1.9	7	10	8	11
—2—2.9	9	5	3	3
—3—3.9	0	1	0	0
Normal rainfall	4.72	3.8	3.1	3.02

The frequency of occurrence of dry-hot, wet-cool, dry-cool and wet-hot months in Oklahoma classified according to average states rainfall departures of more than 0.25 in. and temperatures of more than 0.5°F is shown* in Table 3.

TABLE 3. *Frequency of occurrence of type months, 1891-1933*

Month	Dry-hot	Wet-cool	Dry-cool	Wet-hot
May	13	6	5	6
June	12	13	5	1
July	13	12	2	2
Aug.	17	12	3	0
Total	55	43	15	9

It appears from Table 3 that the frequency of occurrence of the exceptional types, dry-cool and wet-hot, decreases as the season advances; they rarely occur in July and August when cyclonic storms are infrequent and the weather is dominated by the monsoonal indraft of tropical Gulf air masses.

*Climatological Data, Okla. Sec., U. S. Weather Bureau (1933).