Q = The smallest of the following two terms:

$$\frac{MX-D}{6} \quad \text{or} \quad \frac{32-D}{6}$$

This term Q should only be used when there is no snow cover and the dewpoint is less than 32 degrees.

A = Temperature advection expected at the surface from the time of maximum to the time of minimum.

This formula is best used in the previous afternoon's forecast when both the maximum and dewpoint are known. The expected nighttime cloudiness should be averaged with the known daytime cloudiness. Also the nighttime wind speeds have to be forecast; the average of the 00, 06,12, GMT, forecast MOS surface wind speeds are usually quite good for this.

The advection term must also be forecast and it is perhaps the most difficult one. I have been using a relationship that seems to work, and that is that usually, the surface advection during the night equals 0.5 of any warm advection at 850 mbs or 0.7 of any cold advection at 850 mbs. Since the advection at 850 mb is usually expressed in degrees C, those two figures should be multiplied by 9/5 giving about 0.9 and 1.25, respectively. So, to determine the surface advection, take the forecast 850 mb temperature change from the time of maximum to the time of minimum and multiply by the 0.9 or the 1.25 depending on the sign of that advection. (Care must be used in that forecasts do not include the diurnal 850 mb temperature change that occurs during the summer months.)

Six months of data (January 1976-June 1976) at Midway airport, an urban site in Chicago, Ill., were used in deriving this formula.

The results are extremely encouraging. After 5 months (August 1976-December 1976) of testing the formula at a different urban site, National Airport in Washington, D.C., the average error was 2.8 degrees. This compares quite favorably with the 3.2 degree average error at the Washington Forecast Office and the 3.8 degree average error of the MOS equations during the same 5 months.

The formula does not work when there is a front expected within 100 miles of the station or when there is precipitation from the time of maximum to the time of minimum. Also, it does not work when local geography, like a sea breeze or a down-slope wind affects the temperature. Thus, at those times, it should not be used.

Otherwise the formula does quite well, and it takes only about five minutes to use it once one is familiar with it.

David A. Gustin
National Weather Service Forecast Office
Washington, D.C.

PROVIDING CLIMATOLOGICAL INFORMATION

The Weather Service Office in Tuscon, Arizona receives an average of 25-40 inquiries a week, from around the world, asking about their climate.

OIC, Richard A. Wood, notes that "we have found that the attached sheet can be produced more cheaply than the Local Climatological Data (LCD) Annual Summary which is always in short supply at Tuscon." He suggests that if other NWS stations receive numerous requests for local weather data, they might consider preparing similar climate data sheets. One side of the sheet can describe the local weather, topography, etc. and the other side can include thirty year normals as seen on the facing page.

Normals, Means, And Extremes

TUCSON, ARIZONA

Month	Temperatures °F: Normal: Daily maximum	Daily minimum	Monthly	Extremes: Record highest	Year	Record lowest	Year	Normal Degree days Base 65 °F: Heating	Cooling	Precipitation in inches: Water equivalent: Normal	Maximum monthly	Year	Minimum monthly	Year	Maximum in 24 hrs.	Year	Snow, Ice pellets: Maximum monthly	Year	Maximum in 24 hrs.	Year
(a)				34		34					34		34		34		34		33	
J	63.5	38.2	50.9	87	1953	16	1949	442	0	0.77	2.37	1957	T	1970	1.40	1946	4.7	1949	3.5	1949
F	67.0	39.9	53.5	92	1957	20	1955	333	11	0.70	2.27	1941	0.00	1972	1.49	1942	3.9	1965	3.9	1965
M	71.5	43.6	57.6	92	1950	20	1965	243	13	0.64	2.26	1952	0.00	1956	1.19	1952	5.7	1964	5.7	1964
A	80.7	50.3	65.5	102	1943	27	1945	81	96	0.35	1.66	1951	0.00	1972	0.75	1952	1.0	1956	1.0	1956
M	89.6	57.5	73.6	107	1958	38	1950	0	272	0.14	0.89	1943	0.00	1974	0.89	1943	0.0		0.0	
J	97.9	66.2	82.1	111	1970	47	1955	0	513	0.20	1.46	1954	0.00	1969	1.27	1954	0.0		0.0	
J	98.3	74.2	86.3	111	1958	63	1973	0	660	2.38	5.20	1958	0.27	1947	3.93	1958	0.0		0.0	
A	95.3	72.3	83.8	109	1944	61	1956	0	583	2.34	7.93	1955	0.46	1953	2.48	1961	0.0		0.0	
S	93.1	67.1	80.1	107	1950	44	1965	0	453	1.37	5.11	1964	0.00	1953	3.05	1964	0.0		0.0	
O	83.8	56.4	70.1	101	1955	26	1971	29	187	0.66	4.51	1972	0.00	1973	1.86	1972	T	1959	T	1959
N	72.2	44.8	58.5	90	1947	24	1958	221	26	0.56	1.90	1952	0.00	1970	1.86	1968	6.4	1958	6.4	1958
D	64.8	39.1	52.0	84	1954	16	1974	403	0	0.94	5.02	1965	0.00	1973	1.54	1967	6.8	1971	6.8	1971
YR	81.5	54.1	67.8	111	JUN 1970	16	DEC 1974	1752	2814	11.05	7.93	AUG 1955	0.00	MAY 1974	3.93	JUL 1958	6.8	DEC 1971	6.8	DEC 1971

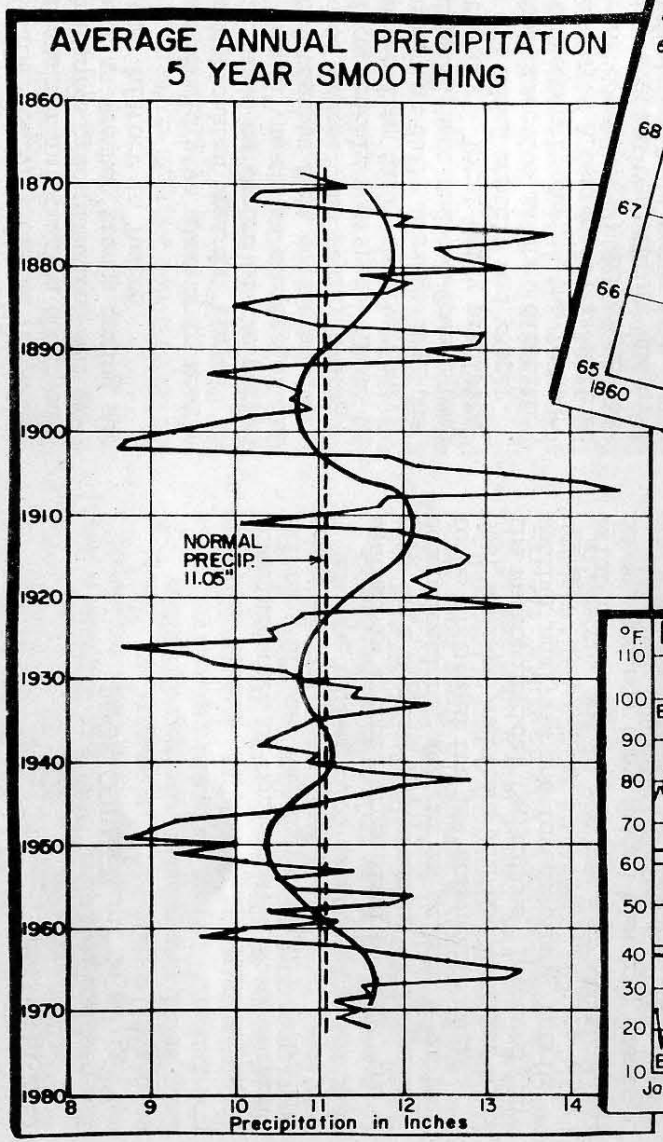
Month	Relative humidity pct. (Local time): Hour 05	Hour 11	Hour 17	Hour 23	Wind: Mean speed m.p.h.	Prevailing direction	Fastest mile: Speed m.p.h.	Direction	Year	Pct. of possible sunshine	Mean sky cover, tenths, sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, Ice pellets 1.0 inch or more	Thunderstorms	Heavy fog, visibility ¼ mile or less	Temperatures °F: Max. (b) 90 and above	32° and below	Min. 32° and below	0° and below	Average station pressure mb. Elev 2555 feet m.s.l.
(a)	34	34	34	34	29	15	27	27			27	34	34	34	34	34	34	34	34	34	34	34	2
J	62	39	32	56	7.8	SE	40	E	1962	81	4.6	14	7	10	4	*	*	*	0	0	7	0	927.1
F	58	34	26	49	8.1	SE	59	E	1952	83	4.4	13	6	9	3	*	*	*	0	0	5	0	927.4
M	52	28	22	42	8.5	SE	41	SE	1955	86	4.5	15	7	9	4	*	*	*	*	0	1	0	924.4
A	42	21	16	31	8.8	SE	46	SE	1952	91	3.3	17	7	6	2	*	1	0	4	0	*	0	923.8
M	33	16	12	23	8.6	SE	42	NE	1965	93	2.7	20	7	4	1	0	1	0	18	0	0	0	923.0
J	33	17	13	24	8.5	SSE	50	SE	1961	93	2.2	22	6	2	2	0	2	0	28	0	0	0	922.1
J	58	33	28	47	8.2	SE	71	SE	1971	77	5.3	10	12	9	10	0	14	0	29	0	0	0	924.4
A	66	39	34	55	7.6	SE	54	NE	1969	81	4.6	12	12	7	9	0	13	0	28	0	0	0	924.3
S	55	32	27	44	8.1	SE	54	SE	1960	87	2.8	20	6	4	4	0	5	0	23	0	0	0	924.0
O	52	30	25	43	8.2	SE	47	SE	1948	88	2.6	20	7	4	3	0	2	0	9	0	*	0	925.9
N	55	32	29	49	8.0	SE	55	E	1951	85	3.5	17	7	6	3	*	*	*	*	0	1	0	927.2
D	62	39	35	56	7.8	SE	44	*	1947	80	4.4	15	6	10	4	*	*	*	0	0	6	0	928.0
YR	52	30	25	43	8.2	SE	71	SE	JUL 1971	86	3.8	195	92	80	50	1	40	1	140	0	21	0	924.4

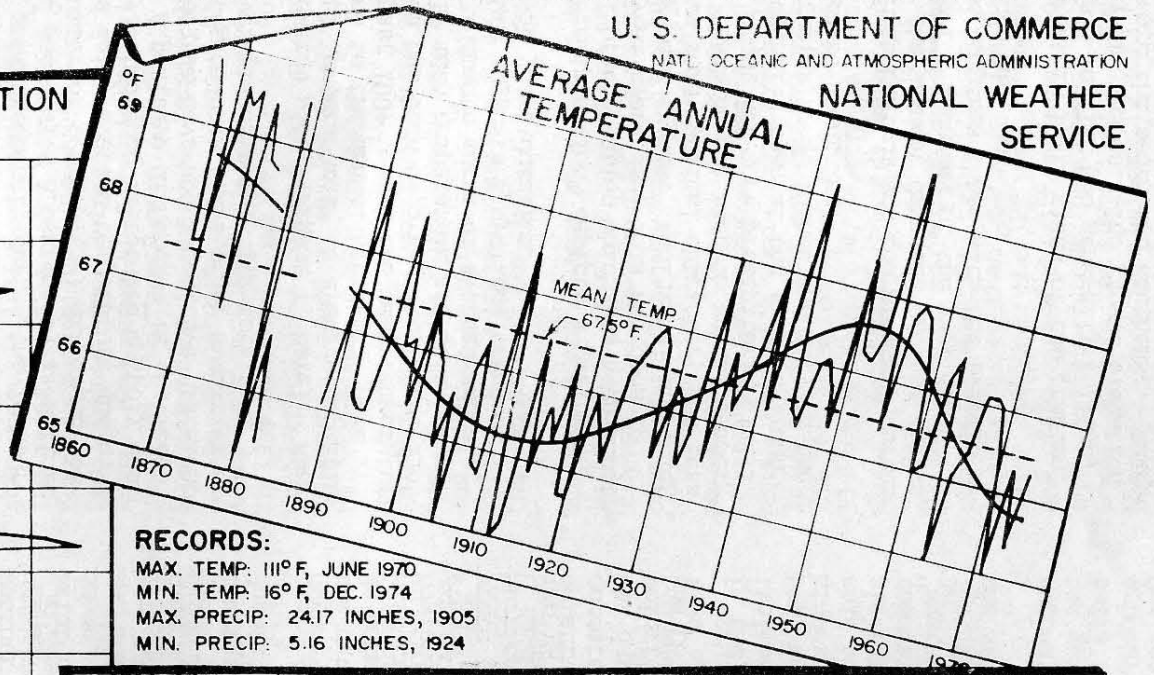
Means and extremes above are from existing and comparable exposures. Annual extremes have been exceeded at other sites in the locality as follows: Highest temperature 111 in June 1970 lowest temperature 16 in December 1974.

PRECIPITATION & TEMPERATURE SUMMARIES

WSO, TUCSON, ARIZONA

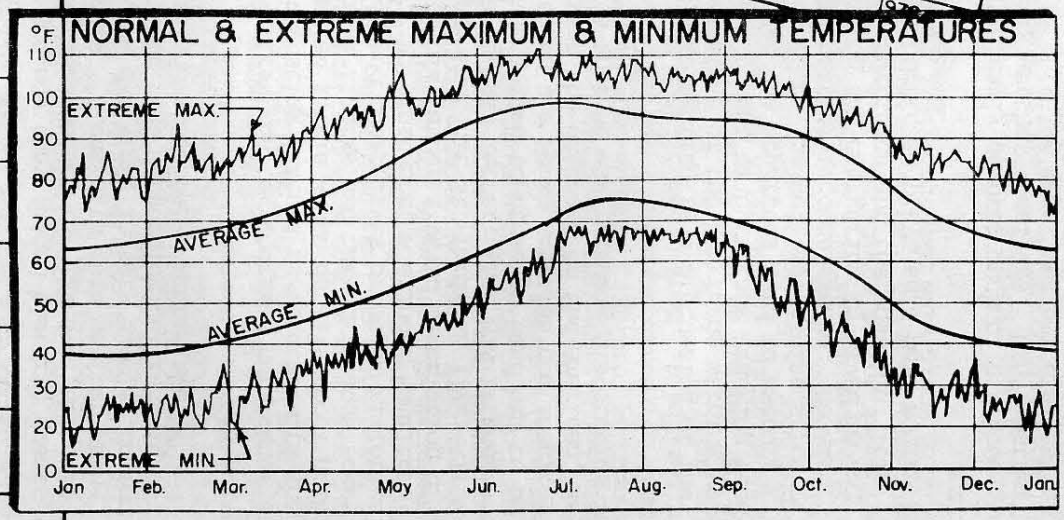
U. S. DEPARTMENT OF COMMERCE
NATL. OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE





RECORDS:

MAX. TEMP: 111° F, JUNE 1970
MIN. TEMP: 16° F, DEC. 1974
MAX. PRECIP: 24.17 INCHES, 1905
MIN. PRECIP: 5.16 INCHES, 1924



Temperature and Precipitation Summaries
Tuscon, Arizona
Richard A. Wood, National Weather Service
Tuscon, Arizona

The following is the text and format of this sheet.

"The Tuscon Weather Service Office receives numerous requests for information about our normal temperatures, precipitation, and extremes, as well as weather trends during our 108 year weather history in Tuscon.

The data below should give answers to most often asked questions on what is "normal" in Tuscon. It is based on record of the period 1941-1970. "Normal" means an average of different kinds of weather data collected over a long period of years. The yearly average is computed from monthly averages. These in turn are computed from daily observations. For temperature, the daily average is the mean between the highest and the lowest temperature for the day. Total daily precipitation amounts are added monthly and yearly. Prevailing wind direction is the direction observed most frequently during the 24-hour period of each day. A degree-day is defined as the number of degrees (°F) difference between the daily average temperature and 65°F. The daily difference is totaled monthly and yearly. A positive difference is called cooling degree-days and a negative difference, heating degree-days. All other summaries are simple averages or cumulative totals.

On the reverse side, (Figure 1, here), "Average Annual Temperatures" is a curve depicting variations in the annual averages. Note , for the past 100+ years, the mean temperature for Tuscon has been 67.5°F. But, since 1965, the yearly mean temperature has been below 67.5°F. A smooth curve of average annual temperature suggests a cyclical trend of about 40-50 years duration.

"Annual Precipication" depicts a variation of annual precipitation which has been smoothed in 5-year averages. This was done to show long-term trends. Additional smoothing also shows some cyclical character, but less distinct than the one seen in annual temperatures. About 20% more precipitation falls in the foothills than at the airport and almost triples to 30 inches annually in the higher nearby mountains.

"Record High Maximum and Low Minimum" curves indicate the warmest days and coolest nights on record for each day of the year since 1941, and compares these with the average maximum and minimum.

Terrain: Within 10-15 miles of the station, the terrain is flat and generally rolling, with many dry washes. The ground elevation rises toward the south and southeast. Rugged mountain ranges reaching 5,000 ft. or higher are a distance of 25-40 miles and encircle the valley floor"