U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE
SYSTEMS DEVELOPMENT OFFICE
TECHNIQUES DEVELOPMENT LABORATORY

TDL OFFICE NOTE 77-6

THUNDERSTORM PROBABILITY NOMOGRAM

Donald S. Foster and Ronald M. Reap

March 1977

Thunderstorm Probability Nomogram

by

Donald S. Foster and Ronald M. Reap

1. INTRODUCTION

Thunderstorm probability forecast equations have been developed and updated for each of the last several years to provide operational guidance for predicting thunderstorm activity 12-36 hours in advance (Reap and Foster, 1975, 1977). The major innovation for the 1977 thunderstorm equation was the development of an interactive predictor which takes into account the seasonal variation of thunderstorm occurrence but is properly responsive to the daily synoptic situation. This predictor was formed by multiplying the K stability index by the daily thunderstorm mean relative frequency. Local variations in thunderstorm occurrence were simulated by developing separate forecast equations, based on the interactive predictor, for each of the manually-digitized radar (MDR) grid blocks shown in figure 1. Although the interactive predictor is only one of several in the complete thunderstorm equation (National Weather Service, 1977), it tends to dominate the final probability forecast. By itself, it has a correlation coefficient of 0.54, corresponding to a reduction in variance of 0.29, as compared to 0.57 and 0.33, respectively, for the top eight predictors.

In a discussion with the Line Forecasters Technical Advisory Committee, it was agreed that these local forecast equations would be made available to field offices for guidance in preparing their own local thunderstorm probability forecasts. We have expanded on this idea by developing a nomogram that can be adapted locally to most MDR grid blocks.

2. THE INTERACTIVE PREDICTOR

The interactive predictor (KF) was formed by multiplying the K stability index (George, 1960) by the daily thunderstorm mean relative frequency. The K index is defined as:

$$K = (850\ \text{Temp} - 500\ \text{Temp}) + 850\ \text{Dew Pt} - (700\ \text{Temp} - 700\ \text{Dew Pt})$$

where the 850-mb and 700-mb temperatures and dew points are 24-hr forecasts obtained from TDL's trajectory model. The 500 mb-temperatures are 24-hr forecasts from NMC's six-layer primitive equation (PE) model. Thunderstorm mean relative frequencies were obtained from MDR data archived at TDL (Foster and Reap, 1973). An MDR code of 4 or greater was used to identify thunderstorms (Mogil, 1974).

Thunderstorm mean relative frequencies were used to simulate seasonal variations in thunderstorm occurrence. These variations are often related to subsynoptic-scale processes not adequately resolved by the large-scale model predictors, e.g., orographic, land-sea breeze, and diurnal heating effects.

The role of the K index is to force the climatology, as represented by the thunderstorm mean relative frequencies, to take into account the daily synoptic situation. For example, a cold frontal passage during summer in the southeastern United States will often sharply depress the K index. As a result, the contribution of the interactive predictor to the probability forecast will be minimized, even though the thunderstorm frequency may be quite high for that particular region and time of year.

To enhance the effect of the local variability in our thunderstorm probability forecasts, we developed statistical relationships between the interactive predictor (KF) and thunderstorm occurrence, as revealed by MDR data, for each of the grid blocks shown in figure 1. Probability estimates, $Y_{i,j}$, were obtained for each block by the linear regression equation

$$Y_{i,j} = A_{i,j} + B_{i,j} (KF)_{lin} \tag{1}$$

where i,j are the coordinates of the particular MDR block (see figure 1), $A_{i,j}$ and $B_{i,j}$ are regression constants for each block, and $(KF)_{lin}$ is a function of the interactive predictor (KF) and is linearly related to thunderstorm relative frequency. This function is more compatible with the linear regression relationships of equation 1 than the raw predictor (KF) which, as shown in figure 2, is highly nonlinear with respect to thunderstorm relative frequency. The linearization of KF was accomplished by a third order polynomial of the form

$$(KF)_{lin} = C_1 + C_2(KF) + C_3(KF)^2 + C_4(KF)^3 \tag{2}$$

where C_1, C_2, C_3, and C_4 are polynomial coefficients.

Only one term $(KF)_{lin}$ was used in the probability estimates given by equation 1 because of the relatively small sample (517 cases) for each MDR grid block. From experimentation, we found that two or more terms introduced small-sample instabilities in the regression analysis resulting in erratic probability forecasts for certain blocks. In any case, additional terms did not give a significant increase in the reduction of variance.

3. THE THUNDERSTORM PROBABILITY NOMOGRAM

We have constructed a basic nomogram (figure 3) for use with all MDR blocks. To complete the nomogram for a specific grid block, the user must plot from table 1:

(1) the specific location, i.e., MDR grid block coordinates or city name,

(2) the thunderstorm relative frequency data, and

(3) the labels for the forecast probability lines.

MDR grid row and column number refer to the grid shown in figure 1. If there is a city or Air Force Base with a weather station in a block, it is listed next.

The next 7 columns in table 1 list the mid-month values of thunderstorm mean relative frequencies from March through September averaged for the years 1974 through 1976. Plot these values on the left part of the nomogram as in figure 4. Daily values of the frequencies may be obtained by linear interpolation between the mid-month values.

The remaining 15 columns of figure 1 list the thunderstorm probabilities associated with KF values ranging from 125 to 3000. These KF values were used to construct the curves in figure 3, and were chosen to produce nomogram curves close enough together to permit reasonably accurate interpolation. In the construction, points were plotted representing the intersection of values of K and F whose products were equal to those chosen values. Thus, the 6 crosses on figure 3 are at the intersection of values of K and F whose product is 125. Similarly, the dots represent values of K and F whose product is 1000. The other curves were constructed in a similar manner.

The product curves may be relabeled in terms of thunderstorm probabilities for particular MDR blocks or locations by means of table 1. Thus, for Jacksonville, Fla. the KF values of 125, 250, ..., 3000 may be relabeled, respectively, as probability values of 15, 22, ..., 94 percent, as can be seen in figure 4. It should be noted that some probability values in table 1 have been truncated to 99.9 for convenience in listing.

To use the nomogram for any particular day, say June 1, start at the base of the frequency graph and move vertically upward until the frequency curve is intercepted, as shown in figure 4. From this point of interception move horizontally to the right until the vertical line along the forecast K index is intercepted. At this point read the forecast thunderstorm probability from the labels on the curves. Interpolation between lines by eye is perfectly acceptable and is within the accuracy of the final forecast value which is normally rounded to the nearest 5 or 10 percent.

A blank nomogram is attached at the end of this office note for your convenience in preparing a supply of blank forms.

4. LIMITATIONS

To insure good results with the nomogram there are certain limitations that must be considered. Since the probability forecast is for a thunderstorm (MDR code of 4 or greater) to occur anywhere within an MDR block area within the period $\pm$ 12 hours from the valid time of the K index, the user should be very careful about using the probabilities for a smaller area or different time period. A typical area might be a fairly large city and its suburbs, e.g., Washington, D. C. and vicinity. In addition, the probability

forecast is sensitive to thunderstorm relative frequency. In tabulating the frequencies, we averaged 3 years of data using a 9-point smoother. In spite of the smoothing, there were persistently low frequencies in blocks beyond an effective radar range of 140-150 km. Therefore, we limited the data in table 1 to those blocks whose centers were within 140-150 km of a WSR-57 radar site. These blocks are shown in figure 1. If there is a need to apply the nomogram to an MDR block that is beyond this range, we suggest experimenting with data from a nearby block that is within range. Finally, the derivation of the interactive predictor was based on 3 years of data for March 16 through September 15. Therefore, the nomogram should be used only during those months.

ACKNOWLEDGMENTS

We wish to express our appreciation to D. Sakelaris for the drafting and to B. Howerton for typing the note. Overall guidance was provided by Dr. M. A. Alaka and Dr. H. R. Glahn. The MOS systems programs, including the screening regression program, were developed by Dr. H. R. Glahn, Capt. F. T. Globokar, and G. W. Hollenbaugh.

REFERENCES

Foster, D. S. and R. M. Reap, 1973: Archiving of manually-digitized radar data. TDL Office Note 73-6, National Weather Service, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, 5 pp.

George, J. J., 1960: Weather forecasting for aeronautics. Academic Press, New York, New York, 673 pp.

Mogil, H. M., 1974: Evaluation of severe weather and thunderstorm forecasts using manually-digitized radar data and the SELS severe weather log. Preprints, Fifth Conference on Forecasting and Analysis., March 4-7, 1974, St. Louis, Mo., Am. Meteor. Soc., Boston, Mass., 270-275.

National Weather Service, 1977: Thunderstorm and severe weather probabilities based on model output statistics--No. 5. NWS Technical Procedures Bulletin No. 199, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, 14 pp.

Reap, R. M., and D. S. Foster, 1975: New operational thunderstorm and severe storm probability forecasts based on model output statistics (MOS). Preprints, Ninth Conference on Severe Local Storms, Oct 21-23, 1975, Norman, Oklahoma, Am. Meteor. Soc., Boston, Mass., 58-63.

_____, and _____, 1977: Automated prediction of thunderstorms and severe local storms. NOAA Technical Memorandum, NWS TDL-62, National Oceanic and Atmospheric Administration, U. S. Department of Commerce, 20 pp.

TABLE 1. THUNDERSTORM RELATIVE FREQUENCY AVERAGES FOR MARCH THROUGH SEPTEMBER FOR THE YEARS 1974-1976 AND 12-36 HOUR FORECAST PROBABILITY LABELS FOR SELECTED CURVES OF FREQUENCY-K-INDEX PRODUCTS. PROBABILITIES ARE BASED ON SINGLE BLOCK EQUATIONS DERIVED BY LINEAR REGRESSION FOR THE SAME TIME PERIOD USING AS A PREDICTOR THE LINEARIZED PRODUCT OF THE K INDEX AND THE RELATIVE FREQUENCY.

MOR ROW	GRD COL	WEATHER STATION	3-YR AVG TSTM RELATIVE FREQ MAR	APR	MAY	JUN	JUL	AUG	SEP	12-36 HR TSTM FCST PROBABILITY FOR SELECTED FREQUENCY-K-INDEX PRODUCTS 125	250	375	500	625	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
2	12		1	9	15	25	28	24	7	11.3	18.9	26.0	32.6	38.8	44.6	55.1	64.0	71.5	77.9	83.1	87.3	90.7	93.3	95.3
2	13	ABERDEEN, S DAK	1	9	15	26	28	24	8	11.7	19.2	26.2	32.8	38.9	44.7	55.0	63.9	71.3	77.6	82.8	87.0	90.3	92.9	94.9
2	14		1	8	13	24	25	22	7	10.3	18.4	26.1	33.2	39.9	46.2	57.4	67.0	75.2	82.0	87.6	92.2	95.8	98.6	99.9
2	17	ST CLOUD, MINN	1	10	13	26	27	27	12	12.4	21.6	30.2	38.2	45.7	52.8	65.4	76.2	85.3	93.0	99.3	99.9	99.9	99.9	99.9
2	18		1	7	11	22	25	23	10	12.2	23.7	34.5	44.7	54.1	63.0	78.8	92.4	99.9	99.9	99.9	99.9	99.9	99.9	99.9
3	11		0	8	15	23	27	23	8	9.4	16.8	23.8	30.3	36.4	42.1	52.4	61.2	68.6	74.8	79.9	84.1	87.4	90.0	91.9
3	12		1	11	17	26	27	26	10	9.9	15.8	21.3	26.4	31.2	35.7	43.7	50.6	56.4	61.3	65.3	68.6	71.2	73.2	74.7
3	13	HURON, S DAK	1	12	18	26	28	28	11	9.3	15.3	20.9	26.1	31.1	35.6	43.8	50.9	56.9	61.9	66.0	69.3	72.0	74.0	75.6
3	14		1	10	16	24	26	26	12	11.6	19.9	27.7	35.0	41.8	48.1	59.5	69.3	77.6	84.5	90.2	94.9	98.5	99.9	99.9
3	16		2	12	18	29	27	29	15	14.3	21.9	29.1	35.8	42.1	48.0	58.5	67.5	75.2	81.6	86.8	91.1	94.5	97.2	99.2
3	17	MINNEAPOLIS, MINN	3	15	19	32	30	31	17	13.5	20.5	27.1	33.3	39.0	44.4	54.0	62.3	69.3	75.2	80.0	83.9	87.0	89.4	91.3
3	18		3	12	16	28	29	28	14	13.7	20.6	27.2	33.3	39.0	44.4	53.9	62.1	69.1	74.9	79.7	83.6	86.7	89.1	91.0
4	12		1	11	18	24	27	27	12	9.6	16.3	22.6	28.4	33.9	39.0	48.2	56.1	62.8	68.4	72.9	76.7	79.6	81.9	83.7
4	13		1	12	18	22	25	28	12	10.8	17.9	24.6	30.9	36.7	42.2	52.0	60.4	67.5	73.5	78.4	82.4	85.5	88.0	89.9
4	16		4	12	20	27	27	28	14	14.7	22.2	29.3	35.9	42.1	47.9	58.2	67.1	74.7	81.0	86.2	90.4	93.7	96.3	98.3
4	17		5	16	23	31	29	30	16	16.1	24.1	31.6	38.6	45.1	51.2	62.2	71.5	79.5	86.2	91.6	96.1	99.6	99.9	99.9
4	18		5	12	19	28	27	28	14	17.3	25.6	33.4	40.8	47.6	54.0	65.5	75.3	83.6	90.6	96.3	99.9	99.9	99.9	99.9
4	20		2	7	10	20	19	26	8	11.3	20.1	28.4	36.2	43.4	50.2	62.3	72.7	81.6	88.9	95.0	99.9	99.9	99.9	99.9
4	21		2	7	9	20	19	27	8	13.0	23.0	32.4	41.2	49.4	57.1	70.8	82.6	92.6	99.9	99.9	99.9	99.9	99.9	99.9
4	22		1	5	8	18	16	24	9	12.7	23.8	34.2	44.0	53.1	61.7	77.0	90.1	99.9	99.9	99.9	99.9	99.9	99.9	99.9
4	38		1	1	6	17	29	19	8	10.3	19.9	29.0	37.5	45.4	52.8	66.0	77.4	87.1	95.1	99.9	99.9	99.9	99.9	99.9
4	39	BANGOR, ME	1	1	5	13	24	16	6	11.7	21.7	31.1	39.9	48.1	55.8	69.6	81.4	91.4	99.8	99.9	99.9	99.9	99.9	99.9
5	17		7	17	23	32	28	32	14	10.6	17.8	24.5	30.8	36.7	42.2	52.0	60.5	67.6	73.6	78.6	82.6	85.7	88.2	90.1
5	18	ROCHESTER, MINN	6	13	18	27	26	30	10	12.9	20.2	27.1	33.5	39.5	45.1	55.2	63.8	71.1	77.2	82.3	86.3	89.6	92.1	94.0
5	20		3	9	12	22	20	29	6	13.8	23.7	33.1	41.8	50.0	57.6	71.3	83.0	92.9	99.9	99.9	99.9	99.9	99.9	99.9
5	21		3	11	12	23	20	30	9	8.4	14.8	20.8	26.4	31.7	36.6	45.4	52.9	59.3	64.6	69.0	72.6	75.4	77.7	79.3
5	22	GREEN BAY, WIS	2	9	10	21	19	26	10	11.9	19.9	27.5	34.5	41.1	47.3	58.4	67.8	75.9	82.6	88.1	92.6	96.2	99.0	99.9
5	37		1	1	7	18	31	19	9	11.2	20.8	29.8	38.3	46.1	53.5	66.7	78.0	87.6	95.6	99.9	99.9	99.9	99.9	99.9
5	38		2	2	8	19	32	22	11	11.7	20.4	28.6	36.3	43.4	50.1	62.1	72.3	81.0	88.3	94.3	99.2	99.9	99.9	99.9
5	39		1	2	8	16	27	21	10	11.6	20.9	29.7	37.9	45.6	52.7	65.6	76.6	86.0	93.8	99.9	99.9	99.9	99.9	99.9
5	40		1	2	4	10	19	14	5	6.2	12.2	17.8	23.1	28.1	32.7	40.9	48.0	54.0	59.0	63.2	66.5	69.2	71.3	72.9
6	4	DENVER, COLO	0	2	11	20	35	23	10	12.0	21.6	30.7	39.2	47.2	54.6	67.9	79.3	89.0	97.0	99.9	99.9	99.9	99.9	99.9
6	5		1	4	16	22	36	26	10	12.7	21.0	28.8	36.1	42.9	49.3	60.8	70.6	78.9	85.8	91.6	96.2	99.9	99.9	99.9
6	6		1	4	17	19	31	23	9	13.1	20.8	28.0	34.7	41.0	46.9	57.4	66.5	74.1	80.6	85.8	90.1	93.5	96.2	98.2
6	10		2	18	25	32	33	28	15	18.2	24.1	29.7	34.9	39.8	44.4	52.6	59.6	65.6	70.5	74.6	78.0	80.6	82.7	84.2
6	11		3	22	27	34	32	30	19	17.6	23.2	28.4	33.3	37.9	42.2	49.9	56.5	62.0	66.7	70.5	73.7	76.1	78.1	79.5
6	12	NORFOLK, NEBR	3	21	26	32	29	30	19	15.9	21.7	27.1	32.2	36.9	41.3	49.3	56.1	61.9	66.7	70.7	73.9	76.5	78.4	80.0
6	15		7	17	25	33	26	34	15	12.5	21.8	30.6	38.8	46.5	53.7	66.5	77.5	86.9	94.7	99.9	99.9	99.9	99.9	99.9
6	16		8	18	26	34	28	34	14	15.2	23.7	31.6	39.1	46.0	52.5	64.2	74.2	82.6	89.7	95.5	99.9	99.9	99.9	99.9
6	20	MADISON, WIS	4	10	15	23	20	29	4	13.0	21.1	28.6	35.8	42.4	48.6	59.7	69.3	77.3	84.1	89.7	94.2	97.8	99.9	99.9
6	21		5	12	14	23	21	27	6	13.8	20.3	26.4	32.1	37.5	42.4	51.4	59.0	65.5	71.0	75.4	79.0	81.9	84.2	85.9
6	22		3	9	11	19	19	22	6	13.8	21.7	29.1	36.1	42.6	48.6	59.5	68.8	76.7	83.3	88.8	93.2	96.7	99.4	99.9
6	30		1	6	6	23	17	14	3	9.2	17.2	24.6	31.6	38.2	44.3	55.2	64.6	72.6	79.2	84.7	89.2	92.7	95.5	97.6
6	31		1	5	5	20	17	9	3	7.7	14.0	19.8	25.3	30.5	35.3	43.9	51.3	57.5	62.8	67.1	70.6	73.3	75.5	77.2
6	37	CONCORD, N H	2	3	8	17	28	19	10	12.2	21.8	30.8	39.2	47.1	54.4	67.6	78.9	88.5	96.5	99.9	99.9	99.9	99.9	99.9
6	38	PORTLAND, ME	3	4	9	16	29	23	13	11.6	21.3	30.3	38.8	46.8	54.2	67.5	78.9	88.5	96.6	99.9	99.9	99.9	99.9	99.9
7	4	COLORADO SPGS, COL	1	3	15	23	37	26	12	14.8	25.3	35.1	44.3	52.9	61.0	75.4	87.7	98.2	99.9	99.9	99.9	99.9	99.9	99.9

TABLE 1. CONTINUED

MOR ROW	GRD COL	WEATHER STATION	3-YR AVG TSTM RELATIVE FREQ MAR	APR	MAY	JUN	JUL	AUG	SEP	12-36 HR TSTM FCST PROBABILITY FOR SELECTED FREQUENCY-k-INDEX PRODUCTS 125	250	375	500	625	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
7	5		2	6	22	28	42	32	13	15.0	21.6	27.9	33.7	39.2	44.2	53.4	61.2	67.9	73.4	78.0	81.7	84.6	86.9	88.7
7	6		2	6	21	24	36	28	12	14.6	21.5	27.9	33.9	39.5	44.8	54.2	62.3	69.2	74.9	79.6	83.4	86.5	88.8	90.7
7	10		2	23	27	33	31	30	20	18.0	22.9	27.5	31.9	35.9	39.7	46.5	52.3	57.2	61.3	64.7	67.5	69.7	71.4	72.7
7	11	GRAND ISLAND, NEBR	4	29	31	36	31	31	22	15.6	20.1	24.4	28.4	32.2	35.7	41.9	47.3	51.9	55.7	58.8	61.4	63.4	65.0	66.2
7	12		5	29	32	35	28	31	21	18.8	24.2	29.2	33.9	38.3	42.4	49.8	56.1	61.5	66.0	69.7	72.7	75.1	76.9	78.3
7	15		10	22	31	40	27	38	20	14.7	22.4	29.7	36.5	42.8	48.7	59.4	68.5	76.2	82.6	88.0	92.3	95.7	98.4	99.9
7	16		11	23	30	40	28	37	18	11.3	19.7	27.6	35.0	41.9	48.4	60.0	69.9	78.3	85.4	91.2	95.9	99.6	99.9	99.9
7	17	WATERLOO, IOWA	11	22	27	37	27	36	13	15.7	23.6	31.1	38.1	44.7	50.8	61.8	71.2	79.2	85.9	91.4	95.8	99.4	99.9	99.9
7	25	FLINT, MICH	11	13	13	36	31	27	12	18.5	27.0	35.0	42.4	49.4	55.9	67.6	77.6	86.1	93.2	99.0	99.9	99.9	99.9	99.9
7	26		13	14	15	37	37	28	13	17.6	26.6	35.0	42.9	50.3	57.2	69.6	80.2	89.1	96.7	99.9	99.9	99.9	99.9	99.9
7	27		9	11	12	31	33	24	10	16.5	26.5	35.9	44.7	53.0	60.7	74.5	86.3	96.4	99.9	99.9	99.9	99.9	99.9	99.9
7	29		1	5	5	20	16	12	2	11.8	20.8	29.2	37.1	44.5	51.4	63.8	74.4	83.4	90.9	97.1	99.9	99.9	99.9	99.9
7	30	BUFFALO, N Y	1	5	5	21	16	12	3	12.1	21.5	30.3	38.5	46.2	53.4	66.3	77.3	86.7	94.5	99.9	99.9	99.9	99.9	99.9
7	31	ROCHESTER, N Y	1	4	4	19	15	10	3	15.8	29.3	42.0	53.9	65.1	75.4	94.1	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
7	38	BOSTON, MASS	4	5	11	13	26	23	14	9.9	19.2	27.9	36.1	43.7	50.8	63.6	74.6	83.9	91.6	98.0	99.9	99.9	99.9	99.9
8	4	PUEBLO, COLO	1	3	16	21	33	25	11	12.9	19.8	26.3	32.3	38.0	43.3	52.8	60.9	67.8	73.6	78.4	82.2	85.3	87.7	89.5
8	5		2	5	21	25	36	30	13	14.9	21.9	28.5	34.6	40.4	45.7	55.4	63.6	70.6	76.5	81.3	85.2	88.3	90.7	92.6
8	6		3	7	21	25	33	27	13	13.5	20.8	27.6	34.1	40.1	45.7	55.7	64.3	71.6	77.7	82.7	86.8	90.0	92.6	94.5
8	10		2	19	22	30	25	25	19	17.4	23.1	28.4	33.4	38.1	42.4	50.2	56.9	62.6	67.4	71.3	74.4	77.0	78.9	80.4
8	11		4	25	27	32	25	26	20	19.4	24.4	29.1	33.5	37.6	41.4	48.3	54.2	59.2	63.4	66.9	69.7	71.9	73.6	75.0
8	12		5	26	30	33	25	28	20	17.9	24.3	30.4	36.0	41.3	46.2	55.0	62.6	69.0	74.4	78.8	82.4	85.2	87.4	89.1
8	14		9	21	32	39	24	37	22	14.3	21.8	28.8	35.4	41.6	47.3	57.6	66.5	74.0	80.2	85.4	89.6	92.9	95.5	97.5
8	15		12	22	33	41	24	39	22	13.2	21.3	28.9	36.0	42.7	48.9	60.0	69.6	77.7	84.5	90.1	94.6	98.2	99.9	99.9
8	16	DES MOINES, IOWA	13	24	32	40	25	38	20	13.3	21.6	29.3	36.5	43.3	49.6	61.0	70.7	78.9	85.8	91.5	96.1	99.7	99.9	99.9
8	17		13	23	30	38	25	37	15	13.6	22.3	30.4	38.0	45.1	51.8	63.7	73.9	82.5	89.8	95.7	99.9	99.9	99.9	99.9
8	19	MOLINE, ILL	11	15	26	33	24	30	6	11.1	21.2	30.8	39.7	48.1	55.9	69.8	81.8	92.0	99.9	99.9	99.9	99.9	99.9	99.9
8	20	ROCKFORD, ILL	12	14	25	32	24	26	4	11.4	19.5	27.1	34.1	40.8	46.9	58.0	67.5	75.6	82.3	87.9	92.4	95.9	98.7	99.9
8	21	CHICAGO MIDWAY, IL	13	14	22	30	23	24	4	13.8	22.0	29.6	36.8	43.5	49.8	61.0	70.6	78.8	85.6	91.2	95.8	99.4	99.9	99.9
8	22		10	12	17	26	20	20	4	14.0	22.9	31.4	39.3	46.6	53.5	65.9	76.5	85.5	93.0	99.2	99.9	99.9	99.9	99.9
8	24		11	13	16	37	28	26	10	16.2	25.9	35.0	43.6	51.5	59.0	72.3	83.8	93.5	99.9	99.9	99.9	99.9	99.9	99.9
8	25		16	16	19	44	36	33	15	18.8	27.4	35.5	43.1	50.2	56.8	68.7	78.9	87.5	94.7	99.9	99.9	99.9	99.9	99.9
8	26	DETROIT, MICH	18	17	20	43	39	35	16	14.9	22.7	30.0	36.8	43.1	49.1	59.7	68.9	76.6	83.1	88.4	92.7	96.2	98.9	99.9
8	27		12	12	15	35	33	29	12	18.3	28.1	37.3	45.9	54.0	61.5	75.0	86.6	96.4	99.9	99.9	99.9	99.9	99.9	99.9
8	29	ERIE, PA	2	6	8	24	20	17	6	8.4	14.2	19.7	24.8	29.6	34.1	42.1	49.0	54.8	59.7	63.7	66.9	69.5	71.5	73.1
8	30		2	5	8	22	19	15	5	6.8	11.9	16.7	21.2	25.4	29.3	36.3	42.3	47.4	51.7	55.2	58.1	60.4	62.1	63.5
8	31		1	3	5	18	15	11	3	5.8	12.2	18.2	23.9	29.2	34.2	43.0	50.6	57.1	62.5	66.9	70.5	73.4	75.6	77.3
8	37	PROVIDENCE, R I	5	7	13	14	28	22	13	11.6	21.9	31.5	40.6	49.0	56.9	71.0	83.2	93.5	99.9	99.9	99.9	99.9	99.9	99.9
8	38		7	9	13	13	25	23	15	9.8	18.3	26.3	33.7	40.7	47.2	58.9	68.9	77.4	84.5	90.4	95.1	98.9	99.9	99.9
9	5		2	4	17	21	25	24	11	12.6	20.3	27.6	34.4	40.7	46.7	57.3	66.4	74.2	80.6	85.9	90.3	93.7	96.4	98.4
9	6		2	7	18	24	24	24	13	8.5	12.8	16.8	20.6	24.1	27.4	33.3	38.4	42.7	46.3	49.3	51.7	53.6	55.1	56.2
9	7		3	11	17	25	21	23	15	11.9	17.6	23.0	28.1	32.8	37.2	45.1	51.9	57.7	62.5	66.4	69.7	72.2	74.2	75.7
9	8		2	13	17	28	20	23	17	12.0	18.7	24.9	30.8	36.3	41.4	50.5	58.4	65.1	70.6	75.2	78.9	81.9	84.2	86.0
9	14		9	21	32	38	19	36	21	11.4	19.9	27.8	35.2	42.1	48.5	60.1	70.1	78.5	85.5	91.3	96.0	99.8	99.9	99.9
9	15		10	21	30	39	18	34	19	9.9	19.4	28.2	36.6	44.3	51.5	64.5	75.7	85.1	93.0	99.5	99.9	99.9	99.9	99.9
9	16		11	22	28	37	20	32	17	14.6	24.3	33.4	41.9	49.9	57.3	70.7	82.1	91.8	99.9	99.9	99.9	99.9	99.9	99.9
9	19		12	17	27	34	26	26	7	11.9	21.4	30.4	38.8	46.7	54.0	67.1	78.4	88.0	96.0	99.9	99.9	99.9	99.9	99.9
9	20		14	17	28	35	26	25	6	11.7	20.9	29.5	37.5	45.1	52.1	64.7	75.5	84.7	92.3	98.6	99.9	99.9	99.9	99.9
9	21		15	16	26	34	25	25	7	9.6	17.9	25.7	33.0	39.8	46.2	57.6	67.4	75.7	82.6	88.3	93.0	96.7	99.5	99.9
9	22		12	14	20	31	22	23	6	13.2	23.0	32.1	40.7	48.8	56.3	69.8	81.3	91.1	99.3	99.9	99.9	99.9	99.9	99.9
9	25	TOLEDO, OHIO	15	15	21	44	35	35	13	19.8	28.7	37.1	44.9	52.2	59.0	71.3	81.7	90.6	98.1	99.9	99.9	99.9	99.9	99.9

TABLE 1. CONTINUED

MDR ROW	GRD COL	WEATHER STATION	3-YR AVG TSTM RELATIVE FREQ MAR	APR	MAY	JUN	JUL	AUG	SEP	12-36 HR TSTM FCST PROBABILITY FOR SELECTED FREQUENCY-K-INDEX PRODUCTS 125	250	375	500	625	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
9	26		17	16	21	42	36	37	15	17.2	25.8	34.0	41.6	48.7	55.4	67.3	77.6	86.3	93.5	99.5	99.9	99.9	99.9	99.9
9	27	CLEVELAND, OHIO	13	13	16	36	32	33	13	12.1	28.0	37.3	46.0	54.2	61.8	75.4	87.0	96.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
9	28		8	9	13	33	29	28	11	12.4	22.2	31.5	40.2	48.3	55.9	69.5	81.1	91.0	99.2	99.9	99.9	99.9	99.9	99.9	99.9
9	29		5	7	12	30	25	22	11	14.7	25.5	35.7	45.2	54.0	62.3	77.2	89.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
9	30	BRADFORD, PA	3	5	10	24	21	16	8	14.4	25.8	36.5	46.5	55.9	64.7	80.4	93.8	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
9	34		6	7	17	28	31	26	14	10.9	21.9	32.2	41.9	50.9	59.3	74.4	87.4	98.4	99.9	99.9	99.9	99.9	99.9	99.9	99.9
9	35		6	8	18	26	34	27	15	11.9	21.4	30.4	38.7	46.6	53.9	67.0	78.2	87.7	95.7	99.9	99.9	99.9	99.9	99.9	99.9
9	36	BRIDGEPORT, CONN	6	8	16	20	31	24	15	10.0	19.6	28.7	37.1	45.0	52.4	65.6	77.0	86.6	94.7	99.9	99.9	99.9	99.9	98.6	99.9	99.9
9	38	BUZZARDS BAY L.SHI	8	9	13	15	25	21	15	12.4	20.7	28.4	35.6	42.3	48.6	60.0	69.6	77.9	84.7	90.4	95.0	98.6	99.9	99.9	99.9
10	6		2	8	17	24	19	22	12	8.5	13.8	18.9	23.6	27.9	32.0	39.4	45.2	51.0	55.5	59.2	62.2	64.5	66.4	67.8
10	7		3	12	18	26	18	22	13	8.9	15.3	21.3	26.9	32.1	37.0	45.8	53.3	59.1	65.0	69.4	72.9	75.8	78.0	79.6
10	8		4	15	19	29	19	23	15	13.9	18.8	23.5	27.9	32.0	35.8	42.7	48.6	53.5	57.7	61.1	63.9	66.1	67.9	69.2
10	9		4	15	19	30	19	23	15	11.5	16.7	21.6	26.1	30.4	34.4	41.6	47.7	53.1	57.3	60.9	63.8	66.1	67.9	69.3
10	10	RUSSELL, KANS	3	14	18	30	17	22	15	12.1	18.2	23.9	29.2	34.2	38.9	47.2	54.4	60.5	65.6	69.8	73.2	75.9	78.0	79.6
10	11		4	17	20	23	17	25	15	11.8	17.5	22.9	27.9	32.6	37.0	44.9	51.6	57.3	62.1	66.1	69.3	71.8	73.8	75.3
10	13	TOPEKA, KANS	8	22	28	32	17	34	19	14.2	21.0	27.4	33.4	39.0	44.3	53.6	61.7	68.5	74.2	78.9	82.7	85.8	88.1	89.9
10	14	KANSAS CITY, MO	10	22	31	38	17	37	20	8.3	17.1	25.2	32.9	40.1	46.8	58.7	69.0	77.7	85.0	91.0	95.9	99.8	99.9	99.9
10	15		9	20	27	36	15	32	16	11.3	21.8	31.6	40.8	49.4	57.4	71.8	84.1	94.5	99.9	99.9	99.9	99.9	99.9	99.9	99.9
10	18		12	21	24	30	26	24	9	9.2	18.3	26.8	34.7	42.1	49.1	61.5	72.1	81.2	88.7	95.0	99.9	99.9	99.9	99.9	99.9
10	20		12	16	26	30	27	23	7	12.6	22.8	32.3	41.2	49.5	57.3	71.2	83.2	93.3	99.9	99.9	99.9	99.9	99.9	99.9	99.9
10	21		11	13	23	29	24	24	7	14.2	24.5	34.2	43.2	51.7	59.6	73.8	86.0	96.3	99.9	99.9	99.9	99.9	99.9	99.9	99.9
10	25	YOUNGSTOWN, OHIO	9	9	16	35	31	32	14	11.7	21.6	30.8	39.5	47.7	55.2	68.8	80.5	90.4	98.6	99.9	99.9	99.9	99.9	99.9	99.9
10	29		7	8	16	35	31	29	15	11.7	21.2	30.2	38.5	46.3	53.6	66.6	77.8	87.3	95.3	99.9	99.9	99.9	99.9	99.9	99.9
10	30		5	5	13	28	26	21	12	14.7	25.3	35.3	44.7	53.5	61.7	76.3	88.9	99.6	99.9	99.9	99.9	99.9	99.9	99.9	99.9
10	34	ALLENTOWN, PA	11	10	21	32	35	31	18	14.5	24.7	34.3	43.2	51.6	59.4	73.5	85.5	95.7	99.9	99.9	99.9	99.9	99.9	99.9	99.9
10	35	NEW YORK, N Y	11	11	21	28	36	30	20	10.4	20.4	29.7	38.4	46.6	54.2	67.9	79.7	89.6	97.9	99.9	99.9	99.9	99.9	99.9	99.9
10	36	ISLIP, N Y	9	9	16	20	31	25	17	11.0	21.0	30.4	39.3	47.5	55.2	69.0	80.9	90.9	99.3	99.9	99.9	99.9	99.9	99.9	99.9
11	6		3	9	19	30	21	25	13	6.0	10.5	14.6	18.5	22.1	25.5	31.6	36.8	41.3	45.0	48.0	50.5	52.5	54.0	55.2
11	7		4	12	20	28	19	23	12	8.2	15.0	21.5	27.5	33.1	38.4	47.8	55.9	62.7	68.5	73.2	77.0	80.0	82.4	84.2
11	8	DODGE CITY, KANS	5	15	21	29	19	23	12	11.8	17.1	22.0	26.7	31.1	35.1	42.4	48.7	54.0	58.4	62.1	65.0	67.4	69.2	70.6
11	9		5	18	22	29	18	25	14	11.2	16.1	20.7	25.0	29.1	32.8	39.6	45.4	50.3	54.4	57.7	60.5	62.6	64.3	65.6
11	10		5	19	24	32	18	28	16	12.3	18.5	24.4	30.0	35.1	40.0	48.6	56.0	62.3	67.5	71.9	75.4	78.2	80.3	82.0
11	11		6	21	24	30	17	30	16	12.9	19.3	25.3	30.9	36.1	41.0	49.8	57.4	63.7	69.1	73.5	77.0	79.9	82.1	83.8
11	12		8	22	26	31	17	32	18	10.8	16.9	22.7	28.0	33.0	37.7	46.1	53.3	59.3	64.4	68.6	72.0	74.7	76.9	78.5
11	13		9	23	28	32	15	34	19	15.0	22.8	30.2	37.1	43.6	49.6	60.4	69.7	77.5	84.1	89.5	93.9	97.4	99.9	99.9
11	14	RICHARDS,GEBAUR AF	11	23	30	39	16	36	21	9.3	17.3	24.9	31.9	38.5	44.6	55.7	65.1	73.1	79.8	85.3	89.8	93.4	96.1	98.3
11	15	WHITEMAN AFB MO.	10	20	24	34	14	28	15	12.5	23.1	33.0	42.2	50.9	59.0	73.5	85.9	96.5	99.9	99.9	99.9	99.9	99.9	99.9	99.9
11	17		10	18	19	26	22	19	9	10.6	21.0	30.8	39.9	48.4	56.4	70.6	82.9	93.2	99.9	99.9	99.9	99.9	99.9	99.9	99.9
11	18		13	21	23	30	28	22	10	10.0	18.3	26.0	33.3	40.1	46.4	57.7	67.5	75.7	82.6	88.3	92.9	96.6	99.4	99.9
11	19	SPRINGFIELD, ILL	13	19	24	30	29	24	10	12.4	21.0	29.1	36.7	43.8	50.4	62.3	72.4	81.1	88.3	94.2	99.1	99.9	99.9	99.9
11	23	INDIANAPOLIS, IND	7	9	17	34	25	26	10	9.0	17.8	26.1	33.9	41.1	47.9	60.0	70.4	79.2	86.6	92.7	97.6	99.9	99.9	99.9
11	24		7	10	15	38	28	29	10	10.8	19.3	27.3	34.8	41.8	48.3	60.0	70.1	78.6	85.7	91.6	96.3	99.9	99.9	99.9
11	25	DAYTON, OHIO	7	10	15	37	30	31	9	10.7	19.8	28.4	36.5	44.0	51.0	63.6	74.3	83.5	91.1	97.4	99.9	99.9	99.9	99.9
11	28		7	7	15	32	30	29	12	13.1	22.8	31.8	40.2	48.1	55.5	68.7	80.1	89.7	97.7	99.9	99.9	99.9	99.9	99.9
11	29	PITTSBURGH, PA	7	7	15	33	32	27	14	11.5	20.3	28.7	36.4	43.7	50.5	62.7	73.2	82.0	89.4	95.5	99.9	99.9	99.9	99.9
11	30		5	5	14	28	29	24	12	12.0	21.3	30.1	38.2	45.9	53.0	65.8	76.8	86.1	93.8	99.9	99.9	99.9	99.9	99.9
11	33	WILMINGTON, DEL	10	10	22	31	34	31	20	11.7	21.4	30.5	39.1	47.0	54.5	67.9	79.3	89.1	97.2	99.9	99.9	99.9	99.9	99.9
11	34	PHILADELPHIA, PA	13	12	23	31	38	33	21	13.9	24.2	33.9	43.0	51.4	59.4	73.6	85.8	96.1	99.9	99.9	99.9	99.9	99.9	99.9
11	35		12	11	21	25	35	30	20	13.3	22.9	31.9	40.3	48.1	55.5	68.6	79.9	89.5	97.5	99.9	99.9	99.9	99.9	99.9
12	4		2	9	22	33	32	35	18	13.0	19.4	25.4	31.0	36.2	41.1	49.9	57.5	63.8	69.2	73.6	77.1	80.0	82.2	83.9

TABLE 1. CONTINUED

HDR ROW	HDR COL	WEATHER STATION	3-YR AVG TSTM RELATIVE FREQ MAR	APR	MAY	JUN	JUL	AUG	SEP	12-36 HR TSTM FCST PROBABILITY FOR SELECTED FREQUENCY-K-INDEX PRODUCTS 125	250	375	500	625	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
12	5		4	11	25	35	31	34	18	12.0	17.9	23.5	28.7	33.6	38.2	46.4	53.4	59.4	64.4	68.5	71.8	74.4	76.5	78.1
12	6		5	13	26	35	26	30	16	10.6	17.7	24.3	30.5	36.3	41.7	51.4	59.7	66.8	72.7	77.6	81.5	84.6	87.1	88.9
12	9		6	18	24	28	18	24	13	11.9	18.5	24.7	30.6	36.0	41.1	50.2	58.0	64.7	70.2	74.8	78.5	81.4	83.7	85.5
12	10		6	20	26	32	18	27	15	12.9	20.7	28.0	34.8	41.1	47.1	57.7	66.9	74 6	81.1	86.5	90.8	94.2	96.9	99.0
12	11	WICHITA, KANS	8	21	25	30	17	30	16	14.6	22.5	30.0	36.9	43.5	49.5	60.5	69.8	77 8	84.4	89.9	94.3	97.8	99.9	99.9
12	12		11	22	27	31	17	32	18	10.3	17.4	24.0	30.2	36.0	41.4	51.1	59.4	66.4	72.3	77.2	81.1	84.2	86.7	88.5
12	14		13	25	28	37	19	35	21	11.4	19.0	26.2	32.9	39.1	45.0	55.4	64.4	72.0	78.4	83.6	87.9	91.3	93.9	95.9
12	15		12	22	23	32	18	28	16	11.6	21.4	30.7	39.4	47.5	55.1	68.7	80.3	90.2	98.4	99.9	99.9	99.9	99.9	99.9
12	17		13	19	20	26	25	22	11	9.8	19.8	29.1	37.9	46.1	53.7	67.4	79.2	89.2	97.5	99.9	99.9	99.9	99.9	99.9
12	18	ST LOUIS, MO	16	22	23	30	30	25	12	9.6	18.6	27.0	34.9	42.3	49.2	61.5	72.1	81.1	88.6	94.8	99.8	99.9	99.9	99.9
12	19	SCOTT AFB IL.	15	20	23	30	29	27	12	12.6	22.1	31.0	39.3	47.2	54.5	67.5	78.7	88.3	96.2	99.9	99.9	99.9	99.9	99.9
12	20		14	18	23	30	29	29	14	10.2	19.8	28.7	37.1	44.9	52.2	65.3	76.5	86.0	94.0	99.9	99.9	99.9	99.9	99.9
12	21		12	13	22	28	27	30	14	14.0	24.1	33.5	42.4	50.7	58.4	72.3	84.2	94.2	99.9	99.9	99.9	99.9	99.9	99.9
12	22		11	11	22	33	27	29	14	10.3	19.2	27.6	35.4	42.7	49.6	61.9	72.4	81.3	88.8	94.9	99.9	99.9	99.9	99.9
12	23		9	10	21	35	28	29	14	12.5	21.7	30.3	38.4	46.0	53.0	65.6	76.5	85.6	93.3	99.7	99.9	99.9	99.9	99.9
12	24	CINCINNATI, OHIO	7	10	19	42	30	31	13	14.5	22.5	30.1	37.2	43.9	50.1	61.2	70.7	78.8	85.6	91.1	95.7	99.2	99.9	99.9
12	25		6	9	16	36	29	30	10	12.7	22.3	31.3	39.8	47.7	55.1	68.3	79.7	89.3	97.3	99.9	99.9	99.9	99.9	99.9
12	28		4	5	11	24	26	23	9	12.0	21.7	30.8	39.4	47.4	54.8	68.2	79.7	89.4	97.5	99.9	99.9	99.9	99.9	99.9
12	29		4	4	12	24	29	22	9	13.6	25.0	35.7	45.6	55.0	63.7	79.3	92.7	99.9	99.9	99.9	99.9	99.9	99.9	99.9
12	32	BALTIMORE, MD	11	11	23	30	34	32	21	13.8	22.8	31.3	39.3	46.7	53.7	66.1	76.8	85.9	93.4	99.7	99.9	99.9	99.9	99.9
12	33	MARTIN MARIETTA MD	14	15	26	32	40	35	25	15.1	24.3	32.9	41.0	48.6	55.7	68.4	79.2	88.4	96.1	99.9	99.9	99.9	99.9	99.9
12	34	DOVER AFB DE.	14	14	23	29	38	33	23	13.9	22.5	30.6	38.2	45.2	51.8	63.7	73.8	82.4	89.6	95.5	99.9	99.9	99.9	99.9
12	35	ATLANTIC CITY, N J	12	11	20	22	33	28	19	9.7	15.6	21.2	26.5	31.3	35.9	44.1	51.1	57.1	62.1	66.2	69.5	72.1	74.2	75.8
13	4		3	11	25	35	34	35	19	12.5	17.4	21.9	26.2	30.2	33.9	40.6	46.4	51.2	55.3	58.6	61.4	63.5	65.2	66.5
13	5	AMARILLO, TEX	5	15	30	38	33	35	19	11.0	16.7	22.0	26.9	31.6	35.9	43.7	50.3	56.0	60.7	64.6	67.7	70.2	72.2	73.7
13	6		6	17	31	37	29	31	17	12.3	18.2	23.8	28.9	33.5	38.3	46.4	53.4	59.3	64.2	68.3	71.6	74.2	76.2	77.8
13	9		7	18	27	25	20	24	11	12.2	18.6	24.7	30.4	35.7	40.6	49.5	57.1	63.6	69.0	73.4	77.0	79.9	82.1	83.8
13	10		8	20	28	30	21	26	13	9.4	16.8	23.6	30.1	36.1	41.8	51.9	60.5	67.9	74.0	79.1	83.2	86.4	89.0	90.9
13	11	VANCE AFB OK.	9	20	26	29	19	28	15	7.6	13.3	18.7	23.8	28.5	32.9	40.8	47.6	53.3	58.1	62.1	65.3	67.8	69.8	71.3
13	13		14	23	26	32	21	32	20	12.2	20.6	28.5	36.0	42.9	49.4	61.0	70.9	79.4	86.4	92.2	96.9	99.9	99.9	99.9
13	14		15	23	26	34	22	34	21	10.3	18.6	26.3	33.6	40.3	46.7	58.0	67.7	76.0	82.9	88.5	93.1	96.8	99.7	99.9
13	15	SPRINGFIELD, MO	13	20	21	29	21	29	16	11.2	20.1	28.5	36.4	43.7	50.6	62.9	73.4	82.3	89.8	96.0	99.9	99.9	99.9	99.9
13	17		12	16	19	24	25	23	10	12.1	20.8	29.0	36.7	43.9	50.6	62.7	73.0	81.7	89.0	95.1	99.9	99.9	99.9	99.9
13	18		14	19	22	27	29	25	11	10.3	19.7	28.5	36.8	44.5	51.7	64.6	75.7	85.1	93.0	99.4	99.9	99.9	99.9	99.9
13	19		15	19	22	30	30	29	13	10.6	20.1	29.1	37.5	45.3	52.6	65.7	77.0	86.5	94.5	99.9	99.9	99.9	99.9	99.9
13	20		17	19	24	31	31	33	16	11.8	20.0	27.6	34.8	41.6	47.9	59.1	68.8	77.0	83.8	89.5	94.1	97.7	99.9	99.9
13	21	EVANSVILLE, IND	19	17	24	32	32	35	19	12.5	20.2	27.4	34.2	40.5	46.4	57.0	66.1	73.8	80.2	85.5	89.8	93.2	95.9	97.9
13	22		15	14	23	35	31	34	18	14.2	23.2	31.7	39.7	47.1	54.1	66.5	77.2	86.3	93.8	99.9	99.9	99.9	99.9	99.9
13	23	LOUISVILLE, KY	11	11	21	39	30	33	16	11.2	19.3	26.9	33.9	40.6	46.7	57.8	67.3	75.4	82.1	87.6	92.1	95.7	98.5	99.9
13	24		7	9	19	40	30	31	13	15.0	23.7	31.9	39.6	46.8	53.5	65.6	75.9	84.6	91.9	98.0	99.9	99.9	99.9	99.9
13	25		8	8	17	36	32	31	11	13.8	21.8	29.3	36.2	42.8	48.9	59.8	69.2	77.1	83.8	89.2	93.7	97.2	99.9	99.9
13	32	WASHINGTON, D C	13	14	25	28	35	32	25	18.3	27.4	35.9	43.8	51.3	58.3	70.7	81.4	90.5	98.1	99.9	99.9	99.9	99.9	99.9
13	33		16	17	26	29	39	34	29	16.9	25.4	33.4	40.8	47.8	54.3	66.0	76.0	84.5	91.6	97.5	99.9	99.9	99.9	99.9
13	34	SALISBURY, MD	14	15	21	24	35	30	24	16.7	25.7	34.1	42.1	49.5	56.4	68.7	79.4	88.4	95.9	99.9	99.9	99.9	99.9	99.9
14	4		4	12	24	34	35	30	16	11.4	17.3	22.9	28.1	32.9	37.4	45.6	52.5	58.4	63.4	67.4	70.7	73.3	75.4	77.0
14	5		5	17	30	36	34	30	17	13.3	19.2	24.6	29.7	34.5	39.0	47.0	53.8	59.7	64.5	68.5	71.8	74.4	76.4	77.9
14	6		6	19	29	33	27	26	15	14.3	19.5	24.5	29.1	33.4	37.5	44.7	51.0	56.2	60.6	64.3	67.2	69.6	71.4	72.8
14	8	HOBART, OKLA	7	18	27	24	20	21	12	9.3	15.3	21.0	26.4	31.3	36.0	44.3	51.5	57.6	62.6	66.8	70.2	72.9	75.0	76.6
14	9		8	18	28	25	22	22	12	11.6	18.7	25.4	31.8	37.5	42.9	52.7	61.1	68.2	74.1	79.0	83.0	86.1	88.6	90.4
14	10	OKLAHOMA CITY, OKL	9	18	27	29	23	23	12	10.7	18.6	26.0	33.0	39.5	45.5	56.4	65.7	73.6	80.2	85.6	90.0	93.5	96.2	98.3

TABLE 1. CONTINUED

MDR ROW	GRD COL	WEATHER STATION	3-YR AVG TSTM RELATIVE FREQ MAR	APR	MAY	JUN	JUL	AUG	SEP	12-36 HR TSTM FCST PROBABILITY FOR SELECTED FREQUENCY-K-INDEX PRODUCTS 125	250	375	500	625	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
14	11		9	16	24	28	20	24	13	11.3	18.3	24.7	30.8	36.5	41.8	51.3	59.5	66.4	72.2	76.9	80.8	83.9	86.3	88.1
14	13		13	20	23	30	23	31	20	14.2	21.9	29.1	35.8	42.1	48.0	58.6	67.6	75.3	81.7	87.0	91.2	94.7	97.3	99.3
14	14		15	20	23	30	25	35	21	8.3	17.0	25.2	32.8	40.0	46.7	58.7	68.9	77.6	84.9	90.9	95.8	99.7	99.9	99.9
14	15		13	16	17	25	23	30	16	10.5	19.4	27.6	35.4	42.7	49.4	61.6	72.0	80.9	88.2	94.3	99.3	99.9	99.9	99.9
14	20		17	16	23	31	32	34	16	11.6	19.6	27.2	34.3	40.9	47.1	58.2	67.7	75.8	82.5	88.1	92.6	96.2	99.0	99.9
14	21		20	17	24	32	33	38	20	11.1	19.2	26.8	33.9	40.5	46.7	57.8	67.4	75.5	82.2	87.8	92.3	95.9	98.7	99.9
14	22		18	15	23	34	34	37	19	11.4	19.5	27.0	34.0	40.6	46.8	57.8	67.3	75.3	82.0	87.5	92.0	95.6	98.3	99.9
14	24	LEXINGTON, KY	8	9	18	35	30	30	13	8.5	16.2	23.5	30.3	36.6	42.5	53.1	62.2	69.9	76.3	81.6	85.9	89.4	92.0	94.1
14	32	RICHMOND, VA	12	12	20	22	29	26	20	14.5	22.5	30.1	37.2	43.8	50.0	61.1	70.6	78.6	85.4	90.9	95.4	99.0	99.9	99.9
14	33		15	15	23	24	35	30	25	12.9	20.7	28.1	34.9	41.4	47.4	58.2	67.4	75.2	81.8	87.2	91.6	95.0	97.8	99.8
14	34	WALLOPS ISLAND, VA	14	15	20	23	34	29	24	12.9	21.0	28.6	35.6	42.3	48.5	59.6	69.1	77.1	83.9	89.4	93.9	97.5	99.9	99.9
15	8	FT. SILL OK.	7	16	25	22	22	21	12	10.5	17.2	23.4	29.2	34.7	39.8	48.9	56.7	63.4	68.9	73.5	77.2	80.2	82.5	84.2
15	9		8	17	28	25	24	22	12	12.4	19.8	26.8	33.3	39.4	45.1	55.3	64.0	71.4	77.6	82.7	86.9	90.1	92.7	94.7
15	10		9	17	27	29	24	24	13	11.2	19.4	27.1	34.2	40.9	47.2	58.4	68.1	76.2	83.0	88.7	93.2	96.8	99.7	99.9
15	11		8	15	24	28	20	22	13	10.4	18.8	26.6	33.9	40.8	47.1	58.6	68.4	76.8	83.7	89.5	94.1	97.8	99.9	99.9
15	13		12	17	25	30	28	32	22	11.5	18.6	25.1	31.3	37.0	42.4	52.1	60.3	67.3	73.2	78.0	81.9	85.0	87.4	89.3
15	14		17	19	27	34	34	39	26	11.0	18.5	25.6	32.2	38.4	44.1	54.5	63.3	70.8	77.1	82.3	86.5	89.8	92.4	94.4
15	15		18	18	24	32	32	37	23	6.2	12.7	18.8	24.6	29.9	34.9	43.9	51.5	58.0	63.5	68.0	71.6	74.5	76.8	78.5
15	18		15	15	31	30	32	32	17	11.0	20.0	28.5	36.4	43.9	50.8	63.2	73.9	82.9	90.5	96.7	99.9	99.9	99.9	99.9
15	21	CAMPBELL AAF KY.	20	15	24	33	35	41	20	10.8	20.2	29.0	37.2	44.9	52.1	65.0	76.1	85.4	93.3	99.7	99.9	99.9	99.9	99.9
15	22		21	15	22	34	36	41	20	11.9	20.7	28.9	36.6	43.8	50.5	62.6	72.9	81.7	89.0	95.1	99.9	99.9	99.9	99.9
15	23		15	12	18	33	32	35	17	11.3	20.3	28.8	36.7	44.1	51.0	63.4	74.1	83.1	90.6	96.8	99.9	99.9	99.9	99.9
15	26		12	10	25	37	41	34	10	12.9	22.0	30.6	38.7	46.2	53.2	65.8	76.6	85.8	93.4	99.8	99.9	99.9	99.9	99.9
15	27		12	11	25	37	44	34	11	13.6	21.7	29.3	36.5	43.1	49.4	60.5	70.1	78.3	85.0	90.6	95.2	98.8	99.9	99.9
15	28		8	8	20	30	38	27	8	12.3	21.2	29.5	37.4	44.7	51.5	63.7	74.2	83.1	90.6	96.7	99.9	99.9	99.9	99.9
15	33	NORFOLK, VA	13	13	20	22	34	29	26	10.7	19.2	27.2	34.7	41.8	48.3	60.1	70.2	78.7	85.9	91.8	96.5	99.9	99.9	99.9
16	2		2	13	18	22	42	28	15	10.7	15.7	20.3	24.7	28.7	32.5	39.3	45.2	50.1	54.2	57.7	60.4	62.6	64.3	65.6
16	3		4	16	21	25	40	27	16	11.7	16.6	21.3	25.7	29.8	33.6	40.4	46.3	51.3	55.4	58.9	61.6	63.8	65.6	66.9
16	4		5	17	22	26	36	26	16	11.4	17.3	22.8	28.0	32.8	37.4	45.5	52.4	58.3	63.3	67.3	70.6	73.2	75.3	76.8
16	9		9	15	25	26	27	22	16	9.1	15.7	22.0	27.8	33.3	38.3	47.5	55.3	61.9	67.5	72.1	75.8	78.7	81.0	82.8
16	10		9	13	22	27	23	21	13	10.4	18.8	26.6	33.9	40.8	47.2	58.7	68.5	76.9	83.9	89.6	94.3	98.0	99.9	99.9
16	14		20	20	32	40	41	44	33	17.7	26.1	34.0	41.4	48.3	54.7	66.3	76.2	84.6	91.7	97.5	99.9	99.9	99.9	99.9
16	15		23	20	32	40	41	42	31	18.5	27.0	34.9	42.4	49.3	55.8	67.4	77.4	85.9	92.9	98.8	99.9	99.9	99.9	99.9
16	16		22	19	33	39	38	38	27	17.7	26.3	34.4	42.0	49.0	55.6	67.5	77.7	86.3	93.5	99.4	99.9	99.9	99.9	99.9
16	17	JONESBORO, ARK	22	18	37	38	39	36	27	14.5	22.1	29.1	35.8	42.0	47.7	58.1	67.0	74.6	80.9	86.1	90.3	93.6	96.2	98.2
16	18	BLYTHEVILLE AFB AR	20	17	40	37	39	38	27	13.1	22.2	30.7	38.7	46.1	53.1	65.6	76.3	85.4	92.9	99.2	99.9	99.9	99.9	99.9
16	19		18	15	36	34	38	38	24	11.2	19.9	28.0	35.7	42.8	49.4	61.4	71.6	80.3	87.6	93.6	98.4	99.9	99.9	99.9
16	20		18	14	30	34	37	41	21	8.3	15.9	22.9	29.5	35.7	41.5	51.8	60.7	68.2	74.5	79.7	83.9	87.2	89.8	91.8
16	21		19	14	25	35	37	41	20	11.8	20.3	28.2	35.7	42.6	49.1	60.7	70.7	79.1	86.2	92.0	96.7	99.9	99.9	99.9
16	22	NASHVILLE, TENN	21	16	22	37	39	45	21	10.7	18.1	25.0	31.5	37.5	43.2	53.3	62.0	69.4	75.5	80.6	84.7	88.0	90.5	92.5
16	23		15	14	18	33	35	36	18	13.0	21.5	29.5	36.9	43.9	50.4	62.1	72.2	80.6	87.8	93.6	98.3	99.9	99.9	99.9
16	25		9	9	20	33	34	31	10	9.2	18.5	27.3	35.5	43.2	50.3	63.2	74.2	83.5	91.3	97.7	99.9	99.9	99.9	99.9
16	26	BRISTOL, TENN	11	10	27	39	41	37	11	10.5	18.4	25.8	32.7	39.2	45.3	56.1	65.5	73.4	80.0	85.4	89.8	93.3	96.1	98.1
16	27		10	11	29	41	44	38	12	14.3	22.8	30.7	38.1	45.0	51.4	63.0	72.9	81.4	88.4	94.2	98.9	99.9	99.9	99.9
16	28		8	9	25	35	41	33	12	14.2	22.8	30.9	38.5	45.6	52.2	64.0	74.2	82.8	90.0	95.9	99.9	99.9	99.9	99.9
16	33		14	13	25	25	40	36	30	12.8	21.5	29.8	37.5	44.7	51.4	63.5	73.8	82.6	89.9	96.0	99.9	99.9	99.9	99.9
16	34		15	14	28	29	43	40	33	11.4	18.7	25.5	31.9	37.9	43.5	53.6	62.2	69.5	75.6	80.7	84.7	88.0	90.5	92.4
17	2		3	16	22	23	43	29	18	9.7	14.4	18.8	23.0	26.9	30.5	37.0	42.5	47.2	51.2	54.4	57.1	59.1	60.8	62.0
17	3	MIDLAND, TEX	4	18	24	24	39	27	19	9.1	13.7	18.1	22.2	26.0	29.6	35.9	41.4	46.1	50.0	53.2	55.7	57.8	59.4	60.6
17	4	WEBB AFB TX.	6	19	23	24	35	26	18	9.4	15.5	21.2	26.6	31.6	36.3	44.7	51.9	58.0	63.1	67.3	70.7	73.4	75.5	77.1

TABLE 1. CONTINUED

MDR ROW	GRD COL	WEATHER STATION	3-YR AVG TSTM RELATIVE FREQ MAR	APR	MAY	JUN	JUL	AUG	SEP	12-36 HR TSTM FCST PROBABILITY FOR SELECTED FREQUENCY-K-INDEX PRODUCTS 125	250	375	500	625	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
17	7		11	17	23	26	35	28	20	11.9	19.7	27.0	33.8	40.2	46.1	56.8	66.0	73.7	80.2	85.6	89.9	93.3	96.0	98.1
17	8		13	17	25	27	35	29	22	10.9	18.8	26.3	33.2	39.7	45.8	56.6	66.0	73.9	80.5	85.9	90.3	93.8	96.6	98.7
17	14		24	22	37	46	49	47	38	17.6	25.5	33.0	40.0	46.5	52.6	63.6	72.9	80.9	87.5	93.0	97.4	99.9	99.9	99.9
17	15	LITTLE ROCK, ARK	29	24	40	49	51	49	38	14.0	21.5	28.5	35.1	41.2	46.9	57.2	66.0	73.5	79.8	84.9	89.1	92.4	95.0	97.0
17	16		27	22	41	47	47	43	33	15.8	23.7	31.1	38.1	44.6	50.6	61.5	70.8	78.7	85.3	90.7	95.1	98.6	99.9	99.9
17	17		26	20	41	43	46	41	32	14.1	21.1	27.6	33.8	39.5	44.9	54.5	62.8	69.7	75.6	80.4	84.3	87.4	89.8	91.7
17	18	MEMPHIS, TENN	23	18	41	39	44	38	30	13.0	21.1	28.6	35.8	42.4	48.6	59.7	69.3	77.4	84.1	89.7	94.2	97.8	99.9	99.9
17	19		19	15	36	36	42	38	26	15.1	24.0	32.3	40.1	47.3	54.1	66.3	76.7	85.6	93.0	99.1	99.9	99.9	99.9	99.9
17	21		14	12	22	33	35	36	18	14.4	21.7	28.5	34.9	40.8	46.4	56.3	64.9	72.1	78.2	83.2	87.3	90.5	93.0	94.9
17	22		15	14	20	34	38	39	19	10.9	18.2	25.0	31.3	37.3	42.9	52.9	61.4	68.7	74.8	79.8	83.8	87.0	89.5	91.5
17	23		13	13	19	34	37	36	17	12.4	20.4	27.9	34.9	41.5	47.7	58.7	68.1	76.1	82.8	88.3	92.8	96.4	99.1	99.9
17	26	ASHEVILLE, N C	10	10	29	40	41	39	15	9.4	16.1	22.3	28.1	33.6	38.7	47.8	55.7	62.3	67.9	72.5	76.2	79.1	81.4	83.2
17	27		9	10	30	40	40	36	15	15.0	23.2	30.9	38.0	44.8	51.0	62.3	71.9	80.1	86.9	92.5	97.1	99.9	99.9	99.9
17	28		8	8	26	36	39	32	15	13.6	21.3	28.6	35.4	41.8	47.7	58.4	67.5	75.2	81.7	87.0	91.4	94.8	97.5	99.5
17	33	DARE AFR NC	18	14	32	33	47	48	40	16.6	24.8	32.4	39.6	46.3	52.5	63.7	73.3	81.4	88.2	93.8	98.4	99.9	99.9	99.9
17	34	CAPE HATTERAS, N C	20	15	33	34	44	47	40	13.8	20.1	25.9	31.4	36.6	41.4	50.0	57.4	63.6	68.8	73.1	76.6	79.4	81.6	83.2
18	2		3	14	23	21	40	28	20	11.4	15.7	19.7	23.5	27.1	30.3	36.3	41.3	45.6	49.2	52.2	54.6	56.5	58.0	59.1
18	3		4	17	23	21	36	25	20	11.0	16.2	21.0	25.5	29.8	33.7	40.8	46.9	52.0	56.3	59.9	62.8	65.0	66.8	68.2
18	4		5	18	23	21	33	25	18	8.7	14.4	19.7	24.7	29.4	33.7	41.5	48.2	53.9	58.6	62.5	65.7	68.2	70.2	71.7
18	6	ABILENE, TEX	11	19	24	26	38	30	23	12.3	18.2	23.7	28.9	33.7	38.3	46.4	53.3	59.2	64.2	68.2	71.5	74.1	76.2	77.7
18	7		15	20	27	28	42	32	27	11.3	17.5	23.3	28.8	33.9	38.7	47.2	54.6	60.8	66.0	70.2	73.7	76.5	78.6	80.3
18	8		18	20	29	29	40	32	28	12.3	18.5	24.3	29.8	34.9	39.6	48.2	55.5	61.7	66.9	71.1	74.6	77.3	79.5	81.1
18	9	DALLAS-FT WORTH, T	17	17	26	28	35	27	24	14.3	21.6	28.5	34.9	41.0	46.6	56.6	65.3	72.6	78.7	83.8	87.8	91.1	93.6	95.6
18	14		22	18	35	45	47	43	33	15.9	23.7	31.0	37.8	44.1	50.1	60.7	69.9	77.6	84.1	89.5	93.8	97.2	99.9	99.9
18	15		27	20	38	49	51	47	35	13.9	21.7	29.1	36.0	42.5	48.5	59.4	68.6	76.5	83.1	88.5	92.9	96.4	99.1	99.9
18	16		26	19	39	46	51	45	32	14.7	22.7	30.1	37.1	43.6	49.7	60.6	70.0	77.9	84.5	90.0	94.4	98.0	99.9	99.9
18	17		26	18	33	43	51	45	31	9.9	15.9	21.6	26.9	31.9	36.5	44.8	52.0	58.0	63.1	67.2	70.6	73.3	75.4	77.0
18	18		22	17	37	40	50	42	29	8.2	15.9	23.1	29.9	36.2	42.1	52.7	61.8	69.4	75.9	81.2	85.5	88.9	91.5	93.6
18	24		14	12	25	38	42	43	20	13.7	20.4	26.8	32.7	38.3	43.5	52.8	60.8	67.5	73.2	77.9	81.6	84.7	87.0	88.8
18	25		14	11	30	40	41	43	20	13.1	21.0	28.4	35.4	41.9	48.0	58.9	68.3	76.2	82.9	88.3	92.8	96.3	99.0	99.9
18	26	GREENVILLE, S C	13	11	32	41	41	42	21	15.2	23.1	30.4	37.3	43.7	49.7	60.5	69.7	77.6	84.1	89.5	93.9	97.3	99.9	99.9
18	30	POPE AFB NC.	14	11	35	41	53	50	38	15.7	23.0	29.9	36.3	42.3	47.9	58.0	66.6	73.9	80.0	85.0	89.1	92.3	94.9	96.8
18	31		18	15	39	44	56	57	46	17.7	24.8	31.4	37.7	43.5	49.0	58.7	67.1	74.2	80.1	85.0	89.0	92.1	94.6	96.5
18	32		22	16	42	46	57	62	49	15.0	22.5	29.6	36.2	42.4	48.2	58.5	67.4	74.9	81.2	86.4	90.5	93.9	96.5	98.5
18	33		23	16	39	42	51	57	47	15.3	23.1	30.4	37.3	43.7	49.7	60.4	69.6	77.4	84.0	89.3	93.7	97.2	99.9	99.9
19	6		13	20	29	27	39	32	28	10.5	16.8	22.8	28.4	33.7	38.6	47.4	54.9	61.3	66.6	71.0	74.6	77.4	79.6	81.3
19	7		18	21	31	30	41	33	30	10.3	17.8	24.7	31.3	37.4	43.1	53.4	62.1	69.6	75.8	80.9	85.1	88.4	91.0	92.9
19	8		20	22	32	30	42	32	30	14.5	20.0	25.1	29.8	34.3	38.5	45.9	52.4	57.8	62.3	66.1	69.1	71.5	73.4	74.8
19	9		19	19	28	28	37	28	25	17.0	22.6	27.9	32.9	37.5	41.8	49.6	56.2	61.9	66.6	70.5	73.6	76.1	78.1	79.6
19	17	GREENWOOD, MISS	27	18	35	43	56	50	29	13.3	21.0	28.1	34.8	41.0	46.9	57.3	66.3	73.9	80.3	85.5	89.8	93.2	95.8	97.8
19	20		20	14	32	40	56	41	24	12.4	20.4	27.9	34.9	41.5	47.6	58.6	68.0	76.0	82.6	88.1	92.6	96.1	98.9	99.9
19	21		19	14	32	39	55	41	21	16.0	24.0	31.5	38.5	45.0	51.2	62.2	71.6	79.6	86.3	91.8	96.2	99.8	99.9	99.9
19	24	DOBBINS AFB GA.	19	14	33	43	49	48	25	13.7	20.7	27.2	33.4	39.1	44.5	54.1	62.4	69.4	75.2	80.1	84.0	87.1	89.5	91.3
19	25	ATHENS, GA	20	14	38	45	50	48	28	11.8	18.3	24.3	30.0	35.3	40.2	49.1	56.7	63.1	68.5	72.9	76.5	79.4	81.6	83.3
19	26		16	12	36	43	46	43	27	12.3	19.1	25.6	31.6	37.2	42.4	51.8	59.9	66.7	72.5	77.2	81.0	84.0	86.4	88.2
19	30		19	13	42	49	61	58	47	15.5	22.7	29.4	35.7	41.6	47.1	57.0	65.5	72.7	78.7	83.6	87.6	90.8	93.3	95.2
19	31	WILMINGTON, N C	22	17	44	52	62	66	56	14.3	21.5	28.2	34.5	40.4	45.8	55.7	64.1	71.3	77.2	82.2	86.1	89.3	91.8	93.7
19	32		23	18	45	52	61	68	58	17.5	24.0	30.0	35.7	41.1	46.0	54.9	62.6	69.0	74.4	78.9	82.5	85.4	87.6	89.3
20	7	ROBERT-GRAY AAF TX	19	22	34	30	42	34	32	15.9	21.8	27.5	32.7	37.6	42.2	50.5	57.5	63.5	68.5	72.6	76.0	78.6	80.7	82.3
20	8	WACO, TEX	20	21	32	29	41	31	30	15.5	21.2	26.6	31.7	36.4	40.9	48.8	55.6	61.4	66.2	70.1	73.4	75.9	77.9	79.4

TABLE 1. CONTINUED

MOR ROW	GRD COL	WEATHER STATION	3-YR AVG TSTM RELATIVE FREQ MAR	APR	MAY	JUN	JUL	AUG	SEP	12-36 HR TSTM FCST PROBABILITY FOR SELECTED FREQUENCY-K-INDEX PRODUCTS 125	250	375	500	625	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
20	16		29	19	36	49	61	56	29	13.8	21.2	28.2	34.8	40.9	46.6	56.9	65.7	73.1	79.3	84.5	88.6	91.9	94.5	96.5
20	17		30	19	35	47	63	55	30	10.8	18.1	24.9	31.4	37.4	43.0	53.1	61.7	69.0	75.1	80.2	84.3	87.5	90.0	92.0
20	18		28	17	33	45	62	53	28	13.2	20.7	27.8	34.5	40.7	46.5	56.9	65.8	73.4	79.7	85.0	89.2	92.5	95.2	97.2
20	19		26	17	33	45	63	51	28	11.0	18.2	25.0	31.4	37.3	42.9	52.8	61.4	68.9	74.7	79.7	83.7	86.9	89.4	91.3
20	20		26	17	36	46	65	50	28	12.1	19.1	25.7	31.8	37.6	43.0	52.6	60.9	67.9	73.8	78.6	82.5	85.6	88.1	89.9
20	21	BIRMINGHAM, ALA	27	18	40	47	67	51	27	14.3	22.0	29.3	36.2	42.5	48.5	59.2	68.4	76.1	82.6	88.0	92.3	95.8	98.5	99.9
20	22		24	17	37	45	61	49	25	16.2	23.7	30.6	37.2	43.3	49.0	59.2	68.0	75.4	81.6	86.8	90.9	94.2	96.8	98.7
20	24	ATLANTA, GA	20	14	36	45	52	48	27	12.1	18.9	25.2	31.2	36.7	41.9	51.2	59.1	65.9	71.5	76.2	79.9	82.9	85.3	87.1
20	25		21	15	40	47	52	49	30	11.4	18.3	24.9	31.0	36.7	42.1	51.7	59.9	66.9	72.7	77.5	81.4	84.5	86.9	88.7
20	26		18	14	38	45	49	46	30	13.3	20.0	26.3	32.2	37.7	42.8	52.0	59.9	66.6	72.2	76.8	80.6	83.5	85.9	87.6
20	28	POINSETT AFR SC	15	10	37	46	52	45	32	11.8	18.7	25.2	31.3	37.0	42.3	51.8	59.9	66.3	72.6	77.4	81.2	84.3	86.7	88.5
20	29		17	11	39	49	57	53	40	12.1	18.8	25.1	31.0	36.6	41.7	50.9	58.9	65.6	71.2	75.8	79.6	82.6	84.9	86.7
20	30	MYRTLE BEACH SC.	17	11	38	49	57	57	49	17.7	25.6	33.0	39.9	46.4	52.5	63.3	72.6	80.5	87.1	92.6	97.0	99.9	99.9	99.9
20	31		20	15	39	50	58	64	58	12.8	20.2	27.1	33.6	39.7	45.3	55.4	64.1	71.5	77.7	82.7	86.8	90.1	92.7	94.6
21	4		7	24	32	24	39	31	37	13.4	19.9	25.9	31.6	37.0	41.9	50.8	58.5	64.9	70.3	74.8	78.4	81.3	83.5	85.2
21	5		12	26	35	28	43	38	39	11.2	18.4	25.1	31.4	37.3	42.9	52.7	61.2	68.4	74.4	79.4	83.4	86.6	89.1	91.0
21	6		15	25	36	30	43	38	38	11.3	18.2	24.7	30.8	36.4	41.7	51.2	59.4	66.3	72.1	76.9	80.7	83.8	86.2	88.0
21	16		29	20	37	53	69	61	30	13.3	20.8	27.8	34.4	40.6	46.3	56.7	65.5	73.0	79.3	84.5	88.7	92.0	94.6	96.6
21	17	JACKSON, MISS	31	21	36	51	70	59	31	12.1	19.7	26.8	33.4	39.6	45.4	55.8	64.7	72.3	78.6	83.8	88.0	91.4	94.0	96.0
21	18		28	19	34	50	67	58	32	11.4	18.9	26.0	32.5	38.7	44.4	54.7	63.6	71.0	77.3	82.5	86.6	90.0	92.6	94.5
21	19	MERIDIAN, MISS	27	19	34	51	67	57	33	9.3	16.6	23.3	29.7	35.6	41.2	51.1	59.6	66.9	72.9	77.9	81.9	85.1	87.6	89.5
21	20		27	20	36	52	67	57	34	14.3	21.2	27.6	33.7	39.3	44.6	54.0	62.1	69.0	74.8	79.5	83.3	86.4	88.7	90.6
21	21	MONTGOMERY, ALA	27	21	39	50	68	55	31	15.8	22.6	28.9	34.8	40.4	45.6	54.8	62.8	69.6	75.2	79.8	83.6	86.6	88.9	90.7
21	22		22	18	35	44	61	49	25	15.1	22.3	29.0	35.3	41.2	46.7	56.6	65.1	72.3	78.3	83.2	87.3	90.4	92.9	94.8
21	25	MACON, GA	21	16	40	52	59	54	38	12.3	18.4	24.1	29.4	34.5	39.1	47.5	54.7	60.8	65.9	70.1	73.5	76.2	78.3	79.9
21	28		15	10	36	48	56	50	39	11.2	18.1	24.6	30.7	36.4	41.8	51.3	59.5	66.4	72.2	77.0	80.8	83.9	86.3	88.1
21	29	CHARLESTON, S C	16	9	36	49	55	53	43	11.5	18.2	24.4	30.3	35.8	41.0	50.2	58.1	64.8	70.4	75.0	78.7	81.7	84.0	85.8
21	30		16	9	33	47	51	52	50	7.8	14.1	20.1	25.6	30.8	35.7	44.3	51.8	58.1	63.4	67.7	71.3	74.1	76.2	77.9
22	4		9	27	35	25	40	32	39	8.8	15.6	22.1	28.1	33.7	39.0	48.4	56.5	63.4	69.1	73.8	77.7	80.7	83.1	84.9
22	5		14	29	35	29	44	40	42	6.2	12.4	18.3	23.7	28.8	33.6	42.2	49.5	55.8	61.0	65.3	68.8	71.5	73.7	75.3
22	6	SAN ANTONIO, TEX	15	28	35	30	45	43	41	11.8	19.4	26.5	33.1	39.4	45.2	55.6	64.5	72.1	78.4	83.6	87.8	91.2	93.8	95.8
22	10		17	19	27	32	50	51	36	12.0	19.2	25.9	32.2	38.1	43.7	53.6	62.1	69.2	75.3	80.2	84.2	87.4	89.9	91.8
22	11		20	21	29	39	60	59	37	14.7	21.7	28.3	34.5	40.3	45.7	55.3	63.6	70.6	76.5	81.3	85.2	88.4	90.8	92.6
22	12		21	21	31	44	64	65	36	15.6	22.3	28.6	34.4	40.0	45.1	54.3	62.2	68.9	74.5	79.1	82.9	85.8	88.1	89.9
22	13		23	21	33	49	67	68	34	14.4	21.4	28.1	34.3	40.1	45.5	55.2	63.5	70.6	76.5	81.3	85.3	88.4	90.8	92.7
22	14	CLAIBORNE AFR LA	23	20	35	53	68	69	32	14.1	21.0	27.5	33.6	39.2	44.5	54.0	62.1	69.0	74.8	79.5	83.4	86.4	88.8	90.6
22	16	MCCOMB, MISS	29	22	38	58	75	69	34	13.6	21.3	28.6	35.4	41.7	47.7	58.3	67.4	75.1	81.6	86.9	91.2	94.7	97.3	99.4
22	17		30	23	38	55	77	68	36	13.1	20.4	27.3	33.8	39.9	45.5	55.7	64.4	71.7	77.9	83.0	87.1	90.4	92.9	94.9
22	18		28	23	36	56	75	67	38	11.5	18.9	25.9	32.4	38.3	44.2	54.4	63.2	70.6	76.8	82.0	86.1	89.4	92.0	93.9
22	20		25	23	38	61	71	65	42	14.3	21.2	27.7	33.8	39.5	44.8	54.3	62.5	69.4	75.2	79.9	83.8	86.9	89.3	91.1
22	21		26	22	40	57	70	63	39	15.0	21.6	27.7	33.5	38.9	43.9	52.9	60.6	67.2	72.7	77.2	80.8	83.7	86.0	87.7
22	25		21	17	40	56	60	60	45	20.5	27.1	33.2	39.0	44.4	49.4	58.4	66.2	72.7	78.2	82.7	86.4	89.3	91.6	93.3
22	26		23	19	42	58	66	64	51	15.0	21.9	28.5	34.6	40.3	45.6	55.2	63.4	70.3	76.2	80.9	84.8	87.9	90.3	92.2
22	27	WRIGHT AAF GA.	21	16	38	54	63	62	51	16.3	23.6	30.4	36.8	42.8	48.3	58.3	66.9	74.2	80.3	85.3	89.3	92.6	95.1	97.0
22	28	SAVANNAH, GA	17	12	32	49	57	55	48	8.9	15.6	21.8	27.7	33.1	38.2	47.4	55.2	61.9	67.5	72.0	75.8	78.7	81.0	82.8
22	29		14	8	28	44	49	50	47	9.7	15.8	21.5	26.9	31.9	36.6	44.9	52.1	58.2	63.3	67.5	70.9	73.6	75.7	77.3
23	4		9	24	32	23	34	32	36	6.9	14.9	22.4	29.4	35.9	42.1	53.0	62.4	70.4	77.1	82.6	87.0	90.6	93.3	95.4
23	5		12	27	32	27	40	41	43	10.7	17.6	24.1	30.2	35.8	41.1	50.7	58.8	65.8	71.5	76.3	80.2	83.2	85.6	87.5
23	6		12	26	31	28	41	46	43	8.7	16.6	24.0	31.0	37.5	43.6	54.5	63.8	71.7	78.4	83.8	88.2	91.8	94.5	96.6
23	9		13	18	26	27	38	48	37	10.6	18.4	25.8	32.7	39.1	45.1	55.8	65.1	72.9	79.4	84.8	89.2	92.7	95.4	97.4

TABLE 1. CONTINUED

MDR ROW	GRD COL	WEATHER STATION	3-YR AVG TSTM RELATIVE FREQ MAR	APR	MAY	JUN	JUL	AUG	SEP	12-36 HR TSTM FCST PROBABILITY FOR SELECTED FREQUENCY-K-INDEX PRODUCTS 125	250	375	500	625	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
23	10	HOUSTON, TEX	16	20	28	33	48	55	41	10.0	17.1	23.8	30.1	35.9	41.4	51.2	59.6	66.7	72.6	77.5	81.5	84.6	87.1	89.0
23	11		19	21	30	38	57	63	41	10.9	18.2	25.0	31.4	37.4	43.0	53.0	61.6	68.9	74.9	80.0	84.0	87.3	89.8	91.7
23	12	PORT ARTHUR, TEX	20	22	32	43	64	70	40	11.5	19.1	26.3	33.1	39.4	45.2	55.8	64.8	72.5	78.9	84.2	88.4	91.8	94.5	96.5
23	13	LAKE CHARLES, LA	21	22	34	50	70	75	38	10.6	17.5	24.0	30.1	35.7	41.0	50.6	58.7	65.6	71.4	76.2	80.0	83.1	85.5	87.3
23	14		21	21	36	57	73	76	37	13.0	20.3	27.1	33.5	39.5	45.1	55.2	63.7	71.0	77.1	82.1	86.2	89.4	92.0	93.9
23	16		25	23	42	61	81	77	41	12.3	19.9	27.1	33.8	40.1	45.9	56.4	65.5	73.1	79.5	84.7	89.0	92.4	95.0	97.0
23	17		28	25	41	59	82	77	44	14.6	21.8	28.7	35.1	41.1	46.6	56.7	65.2	72.5	78.6	83.6	87.7	90.9	93.4	95.4
23	18		26	25	38	60	80	76	47	16.5	23.7	30.5	36.9	42.8	48.4	58.3	66.9	74.1	80.2	85.2	89.2	92.4	94.9	96.9
23	19	MOBILE, ALA	24	24	38	62	78	76	50	14.6	22.4	29.8	36.7	43.1	49.1	59.9	69.1	77.0	83.5	88.9	93.3	96.8	99.5	99.9
23	20		22	23	40	64	76	76	52	17.5	24.9	31.9	38.4	44.5	50.2	60.4	69.1	76.5	82.7	87.8	92.0	95.3	97.8	99.8
23	21		24	23	42	61	75	73	50	15.3	22.6	29.4	35.8	41.8	47.4	57.5	66.1	73.4	79.5	84.5	88.6	91.9	94.4	96.3
23	25		25	19	41	61	67	68	53	15.3	22.0	28.3	34.1	39.7	44.8	54.0	61.9	68.6	74.2	78.8	82.6	85.6	87.9	89.6
23	26		27	22	44	65	73	75	62	14.6	21.6	28.1	34.2	39.9	45.3	54.8	63.0	70.0	75.8	80.6	84.5	87.5	89.9	91.8
23	27		24	18	40	59	66	70	61	17.7	24.7	31.3	37.5	43.3	48.8	58.5	66.8	73.9	79.8	84.6	88.6	91.7	94.1	96.0
24	9		12	14	26	26	35	45	39	9.0	14.9	20.5	25.7	30.6	35.1	43.2	50.2	56.1	61.1	65.2	68.5	71.1	73.1	74.7
24	10	GALVESTON, TEX	14	16	27	30	44	52	42	6.3	12.4	18.2	23.6	28.6	33.3	41.8	49.0	55.1	60.2	64.5	67.9	70.6	72.7	74.4
24	11		15	16	29	33	53	61	43	10.5	16.2	21.7	26.7	31.5	35.9	43.9	50.7	56.5	61.3	65.3	68.5	71.1	73.1	74.6
24	12		15	17	29	38	60	68	42	10.7	17.4	23.7	29.6	35.1	40.2	49.5	57.4	64.1	69.7	74.3	78.1	81.1	83.4	85.2
24	13		15	17	31	45	68	74	42	12.0	18.7	25.1	31.0	36.5	41.7	50.9	58.9	65.6	71.2	75.9	79.6	82.6	85.0	86.7
24	14		16	18	34	53	73	76	43	11.7	19.5	26.9	33.7	40.2	46.2	57.0	66.2	74.0	80.5	85.9	90.3	93.8	96.5	98.6
24	16	NEW ORLEANS, LA	23	21	43	61	83	82	50	18.3	25.1	31.5	37.5	43.1	48.3	57.7	65.7	72.5	78.2	82.9	86.7	89.7	92.1	93.9
24	17		25	23	42	60	82	83	52	16.1	23.0	29.5	35.6	41.2	46.5	56.0	64.2	71.1	76.9	81.6	85.5	88.6	90.9	92.8
24	18	KEESLER AFB MS.	24	23	39	61	81	82	55	16.2	23.2	29.8	36.0	41.7	47.1	56.8	65.0	72.0	77.9	82.7	86.6	89.7	92.2	94.0
24	19		21	22	38	62	78	82	58	12.4	19.6	26.3	32.6	38.5	44.0	53.9	62.4	69.6	75.6	80.5	84.5	87.7	90.2	92.1
24	20	PENSACOLA, FLA	20	21	41	65	78	82	62	12.8	20.0	26.7	33.1	39.0	44.5	54.4	62.8	70.0	76.0	81.0	85.0	88.2	90.7	92.6
24	21	HURLBURT FLD FL.	22	22	43	63	78	82	62	18.1	25.3	32.0	38.3	44.2	49.7	59.6	68.0	75.2	81.2	86.1	90.1	93.3	95.8	97.7
24	22		24	22	43	64	78	82	61	20.4	27.0	33.2	39.1	44.5	49.6	58.8	66.6	73.3	78.8	83.4	87.1	90.1	92.4	94.1
24	23		24	21	40	60	75	78	58	19.0	25.9	32.4	38.5	44.2	49.5	59.0	67.2	74.1	79.9	84.6	88.5	91.6	94.0	95.8
24	25	MOODY AFB GA.	25	20	41	64	69	75	53	11.9	19.0	25.7	32.0	37.8	43.3	53.1	61.4	68.6	74.5	79.4	83.4	86.5	89.0	90.9
24	26		27	21	44	69	72	78	63	14.9	22.0	28.7	35.0	40.8	46.3	56.1	64.5	71.6	77.5	82.4	86.4	89.5	92.0	93.9
24	27	JACKSONVILLE, FLA	26	19	41	63	65	74	65	15.4	22.5	29.2	35.4	41.3	46.7	56.5	64.9	72.0	77.9	82.8	86.8	89.9	92.4	94.3
25	16		17	15	39	53	78	76	49	15.3	22.6	29.5	36.0	42.0	47.6	57.7	66.4	73.7	79.9	34.9	89.0	92.3	94.8	96.7
25	17	BOOTHVILLE, LA	20	17	39	55	79	77	52	15.6	22.6	29.1	35.3	41.0	46.4	56.0	64.3	71.3	77.1	81.9	85.8	88.9	91.3	93.2
25	22	TYNDALL AFB FL.	22	21	36	62	76	86	67	12.3	19.1	25.5	31.4	37.0	42.2	51.5	59.5	66.3	72.0	76.7	80.5	83.5	85.8	87.6
25	23	APALACHICOLA, FLA	24	22	36	62	77	85	67	17.9	24.6	30.9	36.8	42.4	47.5	56.8	64.7	71.5	77.1	81.7	85.5	88.5	90.8	92.6
25	24		24	21	37	65	76	84	66	14.6	21.6	28.1	34.1	39.8	45.1	54.6	62.8	69.7	75.5	80.3	84.1	87.2	89.6	91.4
25	27		26	19	46	68	68	75	67	12.5	19.7	26.4	32.8	38.7	44.2	54.1	62.6	69.7	75.8	80.7	84.7	87.9	90.4	92.3
25	28		24	17	43	61	60	69	69	14.0	19.5	24.7	29.6	34.1	38.3	45.9	52.5	58.0	62.6	66.4	69.5	72.0	73.9	75.3
26	5		7	10	22	27	32	30	46	3.9	12.1	19.8	27.0	33.7	40.0	51.2	60.9	69.0	75.9	81.5	86.1	89.7	92.5	94.7
26	6		6	8	23	26	35	35	51	5.8	12.7	19.2	25.3	30.9	36.2	45.7	53.8	60.7	66.5	71.2	75.1	78.2	80.5	82.4
26	26		26	18	49	77	80	83	73	17.8	24.8	31.4	37.5	43.3	48.6	58.3	66.5	73.5	79.3	84.2	88.1	91.2	93.6	95.4
26	27		27	19	52	76	76	80	73	13.9	20.9	27.6	33.8	39.5	45.0	54.7	63.0	70.0	75.9	80.8	84.7	87.8	90.3	92.1
26	28	DAYTONA BEACH, FLA	25	19	50	72	70	77	76	10.6	16.6	22.2	27.4	32.4	36.9	45.1	52.2	58.2	63.2	67.3	70.6	73.3	75.3	76.9
27	4		7	11	24	27	29	29	41	1.3	7.9	14.0	19.7	25.1	30.1	39.1	46.8	53.3	58.8	63.3	66.9	69.8	72.1	73.8
27	5		6	10	22	30	34	36	52	2.8	10.7	18.1	25.0	31.5	37.5	48.4	57.7	65.6	72.1	77.6	82.0	85.5	88.2	90.3
27	6		5	9	22	30	38	42	59	3.5	10.8	17.7	24.2	30.2	35.8	45.9	54.6	61.9	68.0	73.1	77.2	80.4	83.0	84.9
27	25		22	18	44	73	83	87	79	10.1	17.6	24.6	31.2	37.3	43.0	53.3	62.1	69.6	75.9	81.0	85.2	88.5	91.1	93.1
27	26		25	19	53	81	86	87	79	15.4	22.6	29.4	35.8	41.7	47.3	57.2	65.7	73.0	79.0	84.0	88.1	91.3	93.8	95.7
27	27	ORLANDO, FLA	27	19	58	82	83	84	79	16.1	23.3	30.0	36.3	42.2	47.7	57.6	66.0	73.2	79.2	84.1	88.1	91.3	93.8	95.7
27	28		25	19	55	77	76	82	80	12.9	20.3	27.1	33.6	39.6	45.2	55.2	63.9	71.2	77.3	82.3	86.4	89.7	92.2	94.1

TABLE 1. CONTINUED

MOR ROW	GRD COL	WEATHER STATION	3-YR AVG TSTM RELATIVE FREQ MAR	APR	MAY	JUN	JUL	AUG	SEP	12-36 HR TSTM FCST PROBABILITY FOR SELECTED FREQUENCY-K-INDEX PRODUCTS 125	250	375	500	625	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
25	4		6	13	24	29	31	30	42	1.8	8.6	14.9	20.9	26.4	31.6	40.9	48.8	55.6	61.2	65.9	69.7	72.7	75.0	76.8
26	5		5	11	20	31	37	38	54	2.1	9.3	16.0	22.4	28.2	33.7	43.6	52.1	59.2	65.2	70.2	74.2	77.4	79.8	81.7
27	6	BROWNSVILLE, TEX	4	11	17	31	39	45	61	3.8	11.0	17.8	24.2	30.1	35.6	45.6	54.1	61.3	67.4	72.4	76.4	79.6	82.1	84.0
28	25		20	18	46	75	84	88	83	7.7	15.2	22.3	28.9	35.0	40.8	51.1	59.9	67.4	73.7	78.9	83.1	86.4	89.0	91.0
28	26	TAMPA, FLA	25	20	55	84	89	88	83	11.0	18.4	25.4	31.9	38.0	43.7	54.0	62.8	70.2	76.4	81.5	85.7	89.0	91.6	93.5
28	27	AVON PARK AFR FL	25	21	60	87	89	87	83	16.5	23.7	30.4	36.8	42.7	48.2	58.1	66.6	73.8	79.8	84.8	88.8	92.0	94.5	96.4
28	28	PATRICK AFB FL.	23	20	57	80	84	83	83	8.0	15.6	22.8	29.6	35.8	41.7	52.2	61.3	68.9	75.3	80.6	84.9	88.3	90.9	92.9
29	5		4	12	17	33	39	37	54	2.6	9.4	15.9	21.9	27.5	32.8	42.2	50.3	57.2	62.9	67.7	71.5	74.5	76.9	78.7
29	25		17	17	46	78	84	90	84	8.1	15.5	22.4	28.9	35.0	40.7	50.9	59.6	67.0	73.2	78.3	82.4	85.7	88.3	90.2
29	26		22	21	55	87	89	90	86	12.0	19.4	26.3	32.8	38.9	44.6	54.7	63.5	70.9	77.0	82.1	86.3	89.5	92.1	94.1
29	27		22	22	61	90	91	88	86	13.8	21.1	28.0	34.4	40.4	46.0	56.1	64.7	72.0	78.1	83.1	87.2	90.5	93.0	94.9
30	26	FORT MYERS, FLA	17	18	53	85	84	88	85	11.4	19.4	26.9	34.0	40.5	46.7	57.7	67.1	75.1	81.8	87.3	91.8	95.3	98.1	99.9
30	28		18	22	60	86	89	84	89	10.7	18.2	25.2	31.8	38.0	43.7	54.1	62.9	70.4	76.7	81.9	86.1	89.4	92.0	94.0
30	29	WEST PALM BEACH, F	15	19	56	78	83	80	85	17.9	24.6	30.8	36.6	42.1	47.1	56.3	64.1	70.7	76.2	80.8	84.5	87.5	89.7	91.5
31	27		14	20	59	90	88	91	91	7.9	15.7	23.1	30.1	36.5	42.6	53.4	62.7	70.6	77.2	82.6	87.0	90.5	93.2	95.3
31	28		16	21	60	88	88	88	91	16.0	23.1	29.7	36.0	41.8	47.2	57.0	65.3	72.4	78.4	83.2	87.2	90.3	92.8	94.7
31	29	MIAMI, FLA	16	21	59	83	85	86	89	7.6	14.8	21.6	27.9	33.9	39.4	49.3	57.8	65.0	71.0	76.0	80.0	83.2	85.7	87.6
32	27		12	19	55	85	84	87	88	3.5	11.6	19.2	26.4	33.1	39.3	50.5	60.1	68.2	75.0	80.6	85.1	88.7	91.6	93.7
32	28	HOMESTEAD AFB FL.	15	19	56	83	84	85	89	13.5	21.1	28.1	34.8	41.0	46.8	57.1	66.1	73.6	79.9	85.1	89.3	92.7	95.3	97.3
32	29		13	18	56	80	83	84	89	9.9	16.7	23.1	29.1	34.7	39.9	49.3	57.4	64.2	69.9	74.6	78.4	81.4	83.8	85.6

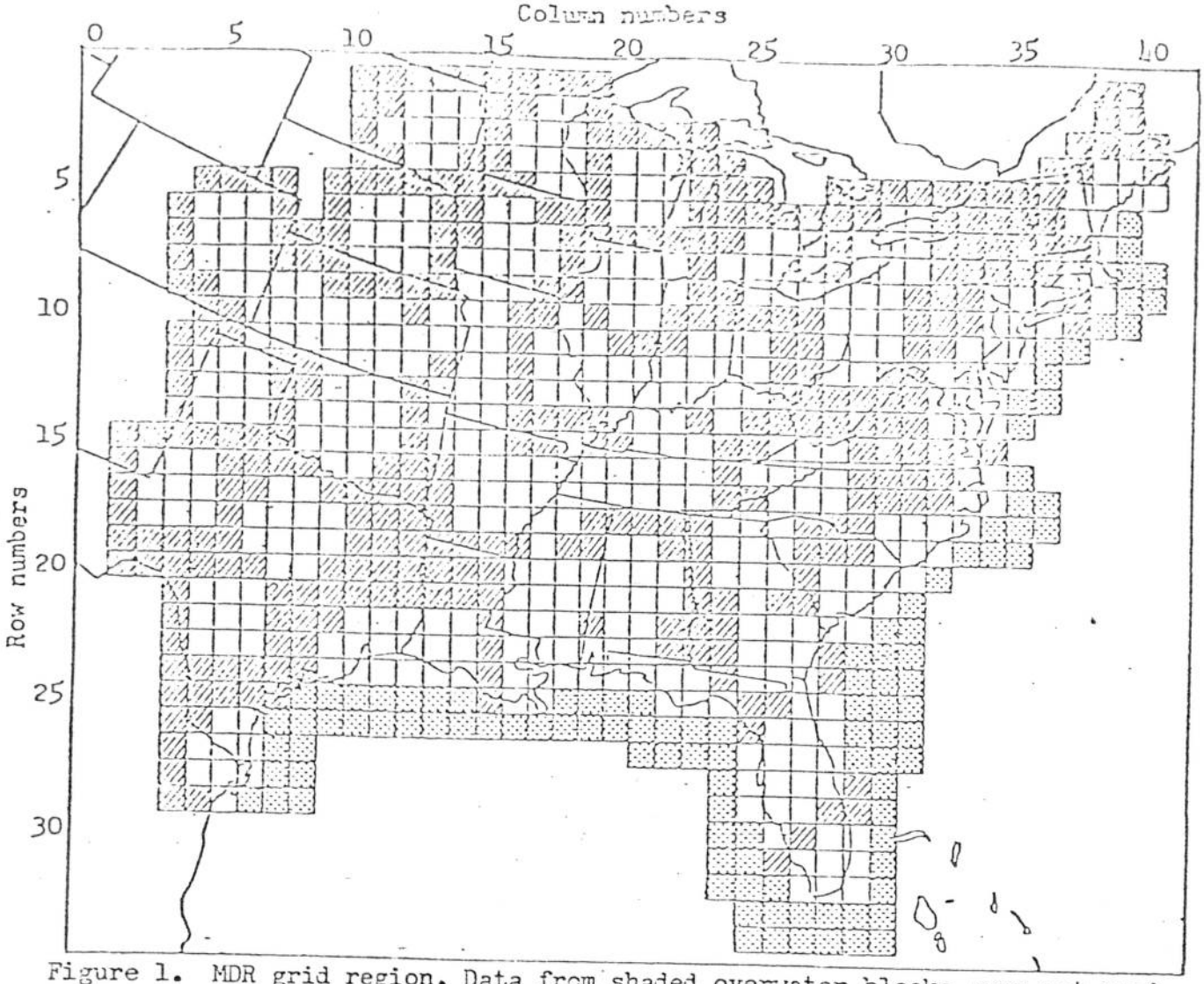

Figure 1. MDR grid region. Data from shaded overwater blocks were not used in the screening regression procedure. Hatched blocks have centers beyond 140-150 km from a radar site. Average thunderstorm relative frequencies from these blocks are not as dependable as those from the closer open blocks. To insure optimum results with the nomogram, data are given for the open blocks only in table 1.

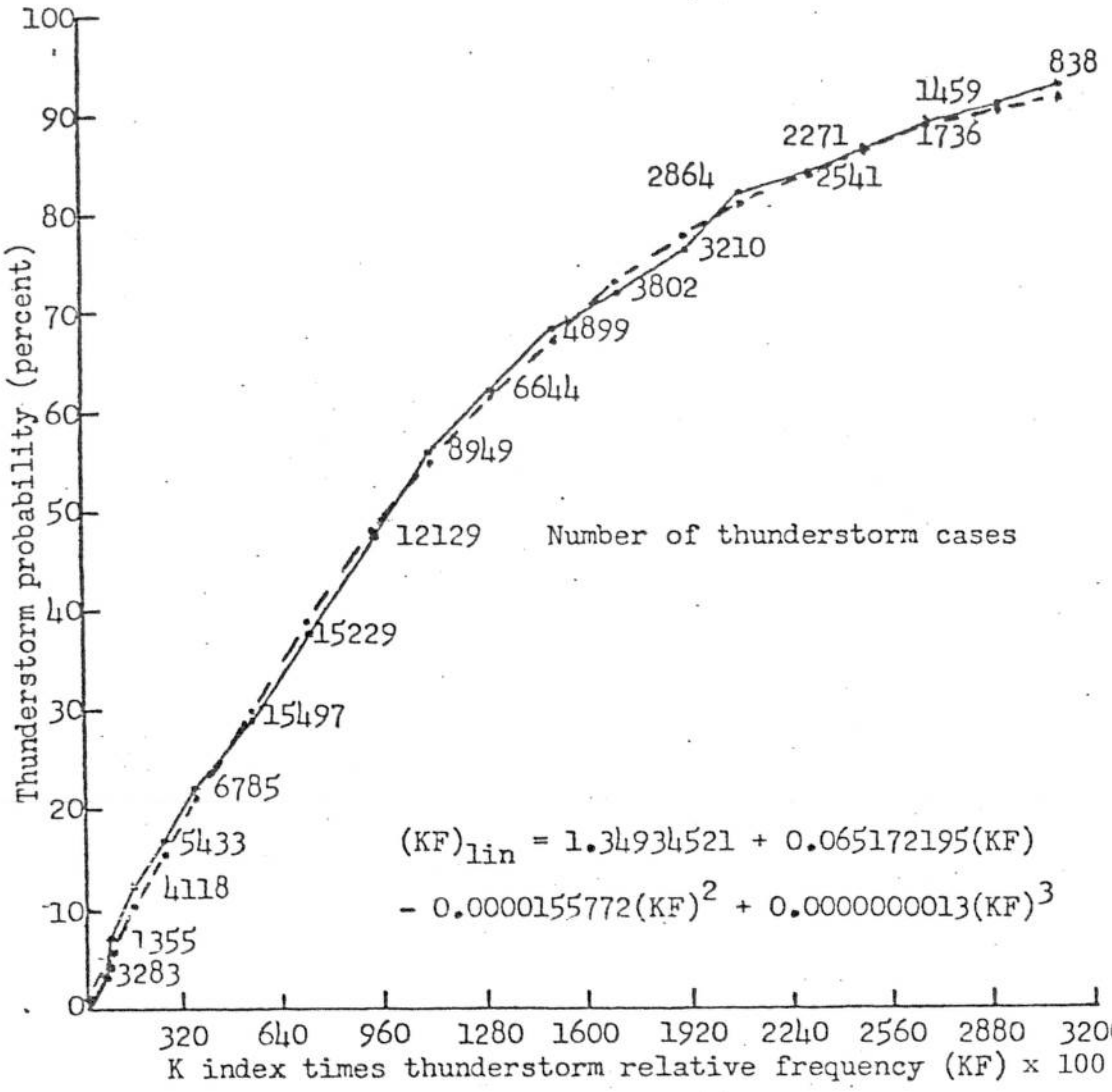

Figure 2. Solid curve shows the product of the K index and thunderstorm relative frequency plotted against thunderstorm probability. Data were for March 16 through September 15 for the years 1974, 1975, and 1976. Area included 761 overland MDR grid blocks. The dashed curve shows a third order polynomial fit to the basic data. The polynomial was used to linearize the frequency-K index product.

THUNDERSTORM PROBABILITY NOMOGRAM

from TDL Office Note 77-6 by Foster and Reap

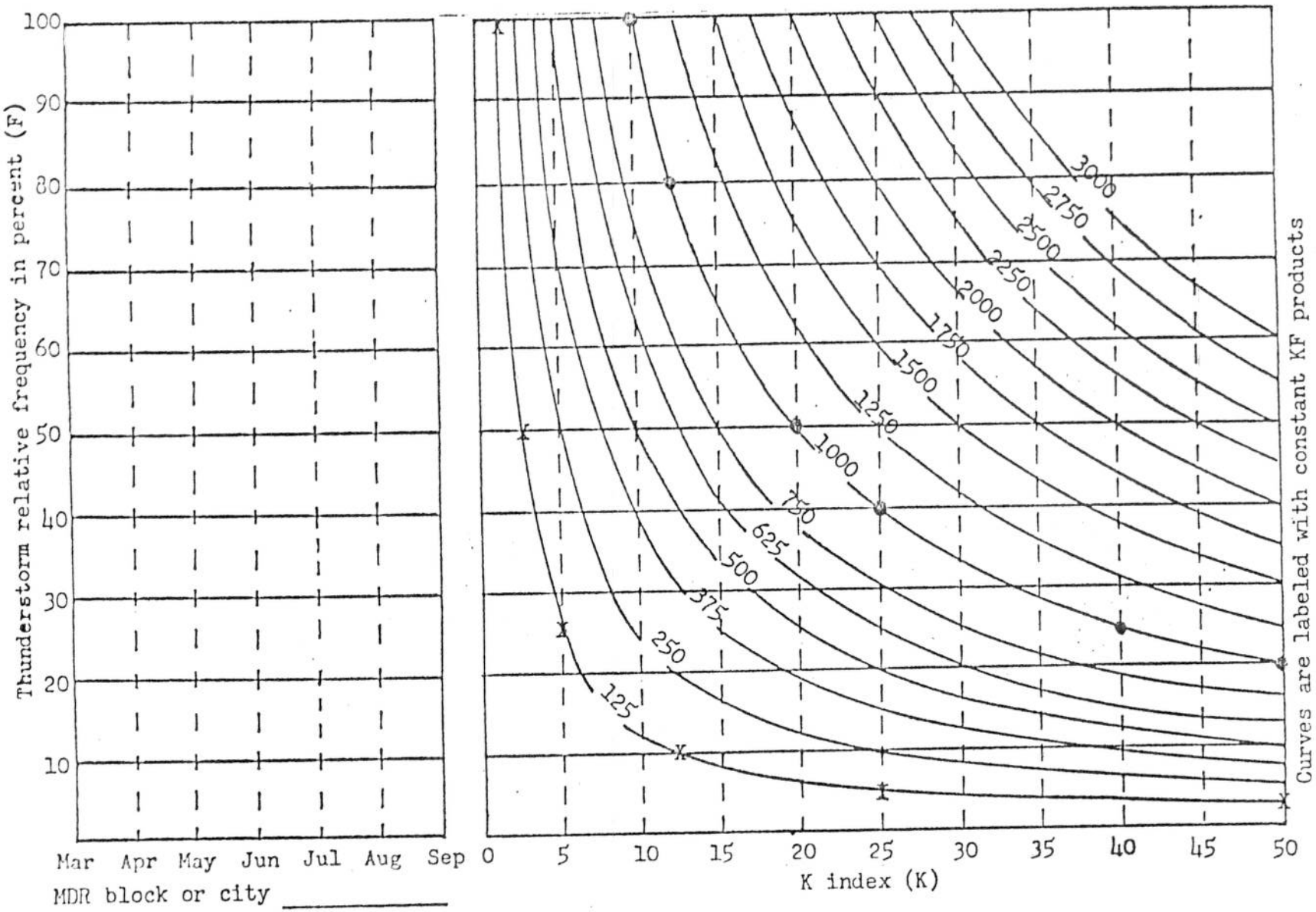

Figure 3. Basic thunderstorm probability nomogram.