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CLIMATOLOGY OF BROOKHAVEN NATIONAL LABORATORY 1949 THROUGH 1973

CONSTANCE M. NAGLE

November 1975

BROOKHAVEN NATIONAL LABORATORY
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ABSTRACT

The climatology of Brookhaven National Laboratory was prepared from data collected by the Brookhaven Meteorology Group formed in August 1948. At that time the principal function of the Group was to meet the atomic energy industry's requirement of collecting meteorological data for the evaluation of hazards. This involved the development of an objective method of calculating ground-level concentrations from the effluent of a 350-ft nuclear reactor stack. Over the years meteorological data collection has been expanded and is now applicable to many areas of environmental and scientific research.

Temperature and precipitation data in this report cover the period from January 1, 1949, to December 31, 1973. Other meteorological parameters have been studied for shorter periods.

When possible the results are presented in tabular form to facilitate usage. Data are given in the form of frequency distributions, percentage frequency distributions, joint frequency distributions, extremes, ranges, averages, and persistence studies as being most adaptable for further research.

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INTRODUCTION

Brookhaven National Laboratory (BNL) presents an interesting cross between a maritime and a continental exposure. In the broad sense, the area is greatly influenced by the Atlantic Ocean, Long Island Sound, and the various associated bays (Figure 1). The presence of this very large body of water in the immediate vicinity moderates both summer and winter temperatures. It also has a pronounced influence on wind and humidity patterns and greatly reduces the snowfall from what would be expected at a nearby inland station.

On a smaller scale, the site exhibits one feature that is characteristic of continental exposures. This is the pronounced tendency for excessive radiative heat loss during the nocturnal hours, which results in minimum temperatures markedly lower than those found in many nearby locations.

From a diffusion standpoint the site is nearly uniform, since there is generally an even distribution of wind directions and a rapid, fairly consistent alternation among various stability types.

In the following tables several meteorological features are examined in considerable detail over various time intervals. The main emphasis is on temperature and precipitation, since these two factors influence a large percentage of Laboratory functions. Because of the Laboratory's interest in low-level atmospheric diffusion, analyses of stability and wind velocity are included.

GENERAL CLIMATOLOGY

In August 1948 the Meteorology Group set up its first complete observation station. Most of the material reported in the following sections has been derived from observations made with stan-

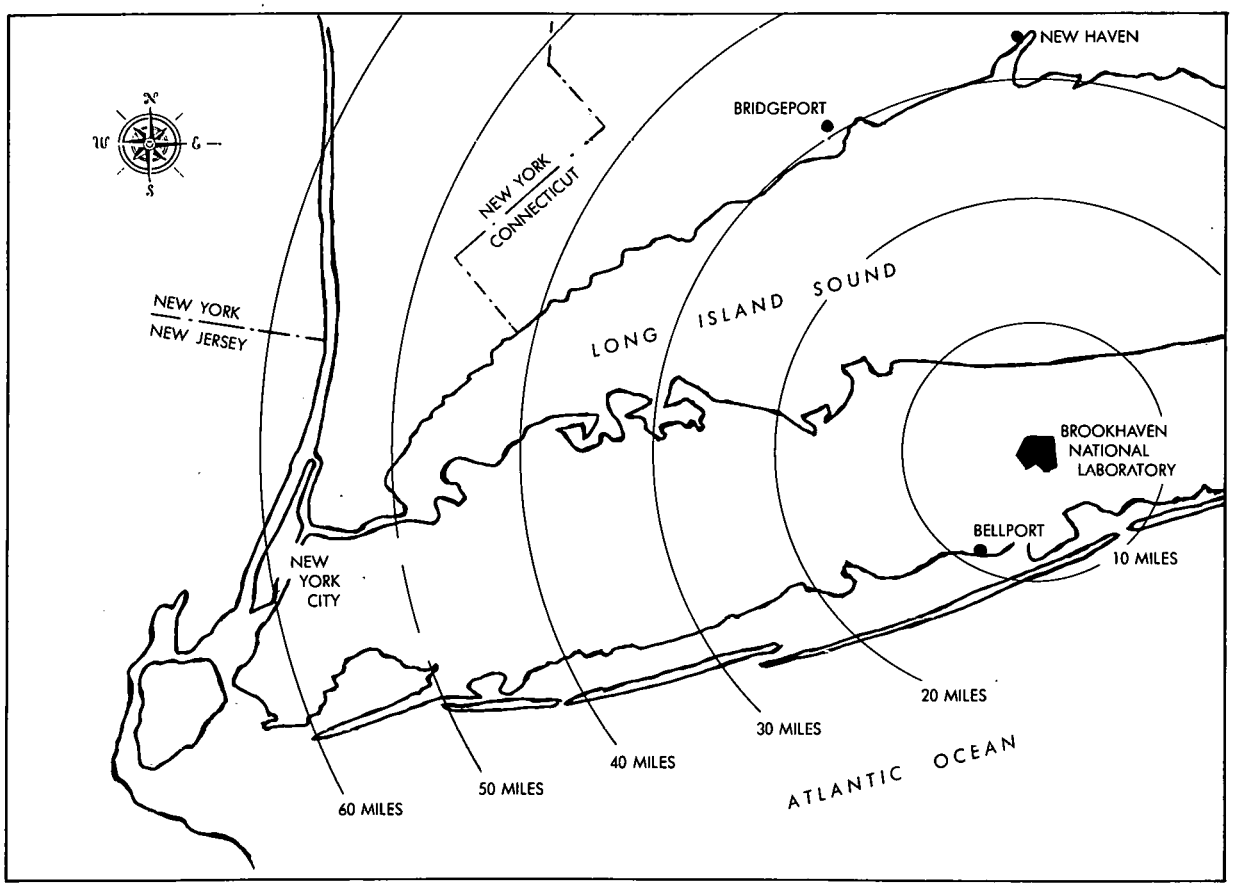

Figure 1. Location of Brookhaven National Laboratory.

Table 1

Meteorological Instrumentation

Meteorological parameter	Type of instrument	Elevation with respect to ground	Period of record covered
Temperature	Friez hygrothermograph, Model No. 594	5 ft	Jan 1949 – Dec 1973
Soil temperature	Leeds & Northrup 100-ohm copper thermohms and Micromax recorder	3 in. 2½ ft 5 ft 10 ft 20 ft	1960–1962 1954–1956 1954–1956; 1960–1962 1954–1956; 1960–1962 1954–1956
Precipitation	Friez weighing-type rain gage, Model No. 755 B	3 ft	Jan 1949 – Dec 1973; Dec 1947 – Apr 1973 (snow)
Direct and diffuse solar radiation	Eppley 50-junction Pyranometer and Leeds & Northrup Micromax recorder	35 ft	Jan 1950 – Dec 1958
Relative humidity	Friez hygrothermograph, Model No. 594	5 ft	Jan 1960 – Dec 1969
Pressure	Friez microbarograph, Model No. 790-1	Ivory point of mercurial barometer, 89.5 ft above mean sea level. Microbarograph checked against mercurial barometer.	Apr 1950 – Mar 1952
Wind speed	Friez Aerovane, Model No. 120	37 ft 355 ft	Aug 1948 – Jul 1951 Feb 1960 – Dec 1968; Jan 1971 – Dec 1973
Wind direction	Friez Aerovane, Model No. 120	37 ft 355 ft	Aug 1948 – Jul 1951 Feb 1960 – Dec 1968; Jan 1971 – Dec 1973
Peak speeds and related directions	Friez Aerovane, Model No. 120	37 ft; 355 ft	Jan 1949 – Dec 1973

dard meteorological observing equipment (see Table 1), maintained in accordance with standard U.S. Weather Bureau* procedures. However, it has not been possible to complete all observations on a 24-hr/day basis, since the Group were on a round-the-clock schedule for only a relatively brief portion of the record. Wherever possible, automatic equipment that would permit a 24-hr recording day was substituted.

Temperature

The average annual temperature is 49°F, which is generally higher than at most places of the same latitude within the United States, except along the Pacific Coast. Winter temperatures are milder because of the modifying influence of the surrounding warmer water surfaces. During the summer, afternoon temperatures are moderated by local sea breezes blowing onshore from the cool water surfaces. However, temperatures of 100.5°F in July and −23°F in January have been recorded at the Laboratory. The data on temperature are given in Tables 2 to 20.

Precipitation

The average annual precipitation is 48 in., with little variation in the average for each month (Tables 21 and 22). Warm-season precipitation is primarily convective in nature, whereas most of the late fall and winter precipitation results from storms that move northeastward along or in close proximity to the east coast. An hourly rainfall rate

(Text continued on page 13)

*Now the National Weather Service.

Table 2

Mean Temperature (°F), 1949–1973

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1949	36.1	35.6	38.4	49.1	57.8	68.1	73.9	71.4	61.2	57.4	42.0	34.2	52.1
1950	38.0	28.9	33.1	43.3	53.4	64.2	70.0	67.4	59.8	53.8	43.4	32.0	48.9
1951	32.2	31.8	37.7	47.4	57.0	63.7	70.7	68.6	62.4	53.4	40.0	45.0	50.8
1952	32.4	31.9	36.8	48.6	55.1	67.7	74.3	70.1	62.0	49.6	42.6	34.9	50.5
1953	34.1	34.8	38.9	47.1	58.3	65.0	70.7	68.3	63.3	65.0	43.2	37.5	52.2
1954	26.5	34.6	37.0	47.5	53.5	66.0	69.5	67.0	61.0	55.5	40.5	32.0	49.2
1955	27.6	30.0	37.5	48.6	58.5	63.2	74.9	71.8	60.5	54.4	40.1	24.7	49.3
1956	28.0	32.6	33.2	42.1	52.6	65.1	68.5	68.7	59.3	59.0	41.8	36.1	48.9
1957	23.7	32.9	38.3	48.2	56.6	69.3	71.5	66.6	63.4	51.6	45.3	36.8	50.4
1958	29.8	25.5	37.0	47.0	53.0	61.3	72.1	68.7	61.2	50.2	42.4	24.3	47.7
1959	27.7	27.6	35.7	47.2	58.2	64.0	70.4	71.8	65.0	54.0	42.7	34.8	49.9
1960	30.5	34.2	31.0	47.5	57.6	66.1	68.7	68.9	60.1	50.1	44.3	27.3	48.9
1961	23.3	29.5	36.5	44.7	54.2	66.0	70.9	70.3	69.0	54.5	42.9	32.5	49.5
1962	29.9	29.9	37.2	45.7	56.0	65.4	66.8	67.0	58.6	50.6	39.2	28.1	47.9
1963	28.0	25.9	39.3	47.1	55.2	66.4	69.9	67.3	59.3	55.8	46.4	26.7	48.9
1964	30.2	27.4	37.4	43.8	59.2	64.5	71.3	65.9	61.6	50.7	42.8	35.0	49.2
1965	25.5	29.1	35.7	43.8	59.5	64.8	68.5	68.5	62.8	50.9	40.7	34.2	48.7
1966	27.8	30.1	37.7	42.5	52.8	66.0	72.4	70.0	60.8	48.6	43.4	31.2	48.6
1967	32.9	24.7	32.1	44.2	50.2	65.3	70.8	69.1	59.8	49.9	38.3	32.8	47.5
1968	24.3	24.8	37.6	46.7	53.3	64.0	71.4	69.0	64.1	50.2	42.4	29.8	48.1
1969	27.9	29.6	34.0	47.1	55.5	63.7	68.4	71.6	62.2	51.2	40.9	30.9	48.6
1970	21.7	28.4	34.5	46.3	57.5	66.3	72.3	71.4	64.6	52.8	44.2	32.3	49.4
1971	24.0	30.8	37.0	42.7	54.0	65.5	69.2	68.5	66.1	58.0	41.0	37.1	49.5
1972	31.2	28.5	36.0	43.0	56.8	64.5	72.9	69.0	64.7	47.3	39.2	35.5	49.0
1973	31.4	30.5	42.9	49.2	55.4	69.5	72.4	71.9	62.1	52.3	43.9	36.9	51.5
Mean	29.0	30.0	36.5	46.0	55.6	65.4	70.9	69.2	62.2	53.1	42.1	32.9	49.4

Table 3

Mean Daily Maximum Temperature (°F), 1949–1973

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1949	43.8	44.8	47.2	59.0	68.8	78.8	83.7	82.3	71.1	67.9	52.7	44.4	62.0
1950	47.0	37.6	43.4	53.6	64.2	75.9	80.8	77.5	70.0	66.0	55.0	41.5	59.4
1951	42.5	43.0	47.0	60.5	70.5	74.5	81.5	79.2	74.9	63.9	50.8	45.2	61.1
1952	41.7	40.8	44.7	59.8	67.1	79.3	86.9	80.9	84.3	62.2	53.6	43.3	62.1
1953	43.1	44.6	47.7	57.3	68.3	78.9	83.4	80.6	76.4	65.8	56.1	47.5	62.5
1954	36.6	45.8	48.1	59.4	65.2	77.4	82.0	78.5	71.8	67.1	50.9	40.1	60.2
1955	35.1	39.5	46.8	58.9	72.4	75.1	85.2	82.2	71.7	65.2	49.6	33.8	59.6
1956	35.5	40.9	42.5	54.0	64.6	78.2	77.8	79.7	70.0	63.9	52.3	45.7	58.8
1957	32.7	42.0	48.5	59.9	69.0	80.9	83.5	78.5	74.2	62.5	55.4	46.3	61.1
1958	37.5	33.2	44.8	58.1	63.2	72.2	81.2	78.7	71.7	60.5	52.8	34.4	57.4
1959	37.0	37.5	44.8	58.1	70.3	74.3	79.1	81.3	76.3	63.9	52.2	43.9	59.9
1960	38.2	42.9	39.3	59.3	69.3	77.4	79.9	78.9	70.4	63.3	55.8	38.7	59.4
1961	33.9	40.4	45.8	54.3	64.9	77.2	80.8	80.1	78.7	65.6	52.3	40.5	59.5
1962	38.8	37.0	47.8	57.3	69.1	76.4	78.7	77.6	70.0	62.4	49.2	38.0	58.5
1963	37.7	35.9	48.2	59.9	68.1	78.4	81.3	78.0	69.1	69.0	55.2	34.9	59.6
1964	39.9	36.7	46.7	53.9	72.8	75.8	79.1	77.9	73.0	63.1	55.8	42.8	59.8
1965	34.7	37.8	44.5	55.1	72.6	76.7	79.8	78.8	72.3	61.4	51.1	43.7	59.0
1966	36.0	39.4	47.8	53.7	63.9	77.6	84.8	81.7	71.4	62.7	54.6	40.9	59.5
1967	42.2	35.7	42.3	55.1	61.4	76.7	79.8	77.4	72.0	62.6	48.1	43.1	58.0
1968	33.2	35.4	48.6	61.8	65.8	73.8	82.4	80.2	77.0	65.5	50.8	38.5	59.4
1969	35.8	35.9	43.4	58.3	67.8	74.9	76.8	81.7	73.2	63.5	50.6	38.5	58.4
1970	30.7	39.0	43.3	57.4	67.9	75.9	81.3	82.6	75.4	64.5	53.4	40.1	59.3
1971	32.8	39.4	45.4	54.7	65.0	77.7	80.0	80.4	74.8	69.0	50.0	46.0	59.6
1972	41.5	38.4	44.9	54.4	68.8	73.2	82.0	80.4	75.8	59.3	46.8	41.8	58.9
1973	41.0	38.3	52.0	59.1	64.6	78.6	82.6	84.0	74.4	65.5	52.8	45.8	61.6
Mean	38.0	39.3	45.8	57.3	67.4	76.6	81.4	80.0	73.6	64.2	52.3	41.6	59.8

Table 4

Mean Daily Minimum Temperature (°F), 1949–1973

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1949	28.9	26.4	30.5	39.8	46.2	57.3	64.2	60.4	51.2	47.0	31.3	24.1	42.3
1950	29.0	20.1	22.9	33.3	42.6	52.6	59.3	57.0	50.0	41.0	32.0	24.5	38.7
1951	22.0	23.0	27.5	34.5	44.0	54.0	60.5	58.0	49.8	42.7	29.7	24.5	39.2
1952	23.0	22.8	28.2	38.1	44.2	55.7	61.6	59.7	48.6	36.9	32.2	26.3	39.8
1953	26.1	25.1	30.1	37.2	48.3	52.9	57.8	55.4	50.2	39.3	29.9	27.4	40.0
1954	17.5	24.7	26.4	35.5	41.0	54.6	57.1	55.7	50.8	43.3	29.5	23.7	38.3
1955	20.0	20.5	27.5	38.3	44.6	51.3	64.6	61.2	49.7	43.6	30.9	15.4	39.0
1956	20.6	24.4	23.7	30.1	40.6	51.6	59.1	57.8	48.5	37.5	31.4	26.7	37.7
1957	14.6	23.6	20.0	36.6	41.2	57.8	59.5	54.7	52.6	40.7	35.2	27.8	39.6
1958	22.1	18.0	29.9	35.8	43.0	50.5	63.1	58.4	50.8	39.8	32.2	14.1	38.1
1959	18.4	18.2	26.7	36.1	46.1	54.0	61.7	62.3	53.7	44.1	33.1	25.6	40.0
1960	22.8	26.5	22.8	35.6	45.5	54.7	57.9	59.0	49.8	37.1	32.8	16.3	38.4
1961	12.8	19.4	27.2	35.2	44.1	54.3	60.9	60.5	59.3	43.5	33.5	23.5	39.5
1962	18.5	19.9	27.3	34.1	42.9	54.2	54.1	56.2	47.5	39.1	29.3	18.3	36.8
1963	18.1	15.8	30.0	34.6	42.7	54.4	59.4	56.4	49.8	42.7	37.7	19.7	38.4
1964	20.5	17.7	28.1	33.7	45.6	53.7	63.4	53.9	50.2	38.5	30.1	27.3	38.6
1965	15.9	21.0	27.0	32.6	46.5	52.0	57.1	50.1	53.3	40.0	30.4	24.8	38.3
1966	19.8	20.4	27.6	31.2	41.9	54.6	60.0	58.2	50.4	34.5	32.8	21.7	37.8
1967	23.9	14.0	22.1	33.4	39.3	54.1	63.2	61.1	48.0	37.6	28.8	22.3	37.3
1968	15.7	14.4	27.0	31.8	41.5	54.7	60.5	58.0	51.1	44.5	33.9	21.1	37.8
1969	19.9	23.2	24.6	36.0	43.1	52.5	60.1	60.9	51.2	40.1	31.2	23.2	38.8
1970	12.7	17.7	25.6	35.5	47.1	56.4	63.1	60.0	53.8	41.7	35.0	24.6	39.4
1971	14.9	22.2	28.6	30.7	42.9	54.0	58.7	56.4	57.5	47.5	32.0	28.3	39.5
1972	20.8	18.5	27.4	31.5	44.5	55.8	63.8	57.0	53.6	35.3	31.6	29.1	39.1
1973	21.2	22.6	33.7	39.4	46.2	60.5	62.1	63.5	50.0	39.1	34.9	28.0	41.8
Mean	20.0	20.8	27.2	34.8	43.9	54.4	60.5	58.4	51.3	40.7	32.0	23.5	39.0

Table 5

Absolute Maximum Temperature (°F), 1949–1973

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1949	59	60	67	76	84	93	95	99	81	85	73	58	99
1950	61	50	62	73	80	90	90	85	83	82	81	61	90
1951	62	62	58	79	87	89	92	87	85	80	66	63	92
1952	58	51	64	81	77	98	96	88	88	79	71	59	98
1953	62	58	66	70	86	93	98	99	100	78	70	62	100
1954	52	64	69	76.5	83	87.5	93.5	89	84	84.5	61	54.5	93.5
1955	46.5	57.5	65.5	83	88	88	98	97	81	81	64.5	49	98
1956	44.5	54.5	60	80.5	88.5	97	91	91	85	83	66	61.5	97
1957	52.5	60.5	72	86.5	85	95	100.5	90	86	76.5	68	61	100.5
1958	52.5	48.5	56.5	74	78.5	86	91	88	85	78.5	64.5	53	91
1959	55.5	47.5	69	78.5	87	94.5	86	90.5	88	86	71	59	94.5
1960	49	58	73	84	82	87.5	88.5	88.5	80.5	78	64	58	88.5
1961	54	60.5	67	82	79.5	93	90	88.5	91.5	78.5	72	53.5	93
1962	54.0	54.0	63	77	86	89	88	87	81	84	63.5	66	89
1963	53.5	51.5	70	80	86	93	94	84.5	80	80	67	54	94
1964	51	46	62	85.5	91	94	95	88	88	77	70	61	95
1965	62	58	62	74	93	91	91	87	84.5	78	71	63	91
1966	62	55	62	70	79	90.5	99	90	88.5	74	67	67	99
1967	66	60.5	66	78.5	78	89	88	84	83.5	85.5	67	57	89
1968	51	52	66	76	78	91	95.5	89.5	83	79.5	73	58.5	95.5
1969	49	42	63	74	93.5	85	91.5	90	90	78	70.5	57.5	91.5
1970	49	55.5	55	78.5	91	87	90	90	92	75.5	65	61.5	92
1971	50.5	56	62	68	79	89	90	90	85	77	68.5	68	91
1972	55	60	62	73.5	80.5	84	93.5	88.5	88	74	64.5	57	93.5
1973	62.5	54.5	68.5	83.5	83	94.5	92	97	93	78.5	66	62.5	97

Table 6

Absolute Minimum Temperature (°F), 1949–1973

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1949	16.0	7.0	12.0	28.0	32.0	39.0	47.0	45.0	33.0	26.0	10.0	7.0	7.0
1950	2.0	2.0	2.0	12.0	28.0	37.0	45.0	44.0	31.0	21.0	15.0	−14.0	−14.0
1951	3.0	2.0	9.0	22.0	27.0	38.0	46.0	43.0	27.0	25.0	14.0	5.0	2.0
1952	−9.0	9.0	11.0	22.0	28.0	45.0	40.0	41.0	34.0	18.0	14.0	7.0	−9.0
1953	10.0	4.0	12.0	26.0	38.0	33.0	41.0	42.0	25.0	21.0	20.0	4.0	4.0
1954	−12.0	−6.0	11.5	9.5	28.0	33.5	45.0	45.0	35.0	21.5	14.0	7.5	−12.0
1955	5.5	−0.5	11.0	25.0	29.0	36.0	48.0	40.0	33.0	21.5	18.0	0.0	−0.5
1956	−5.0	5.5	1.0	14.5	25.0	30.0	45.5	41.0	30.0	23.0	9.0	7.0	−5.0
1957	−10.5	4.5	13.0	18.0	30.5	35.0	39.5	37.0	29.5	28.5	18.0	8.0	−10.5
1958	−3.0	0.0	17.5	19.0	30.0	34.5	48.5	45.0	32.0	21.0	13.5	−8.0	−8.0
1959	−2.0	6.0	15.0	19.0	29.0	39.0	45.0	42.0	29.0	23.5	20.0	−3.0	−3.0
1960	6.0	16.0	8.0	18.0	29.5	37.0	48.0	40.0	32.0	22.0	16.0	0.0	0.0
1961	−23.0	−6.0	10.0	24.0	24.5	36.5	46.0	44.0	32.0	22.0	16.5	5.0	−23.0
1962	1.0	−3.0	12.0	17.0	26.0	38.0	40.0	42.0	28.0	18.0	19.0	1.5	−3.0
1963	−1.5	−1.0	8.0	23.0	29.5	39.0	43.0	40.5	29.5	30.0	23.0	−8.5	−8.5
1964	4.0	1.5	15.5	8.0	29.0	38.0	50.0	39.0	31.5	23.0	12.0	6.0	1.5
1965	−11.0	−2.5	15.0	23.0	32.0	40.0	42.0	37.0	30.0	24.0	16.0	10.0	−11.0
1966	6.0	−5.5	12.0	21.5	25.0	38.0	43.0	45.0	32.0	13.0	15.0	−5.0	−5.5
1967	−1.0	−15.5	−7.5	20.0	29.0	31.0	48.5	50.0	34.5	25.5	13.5	−0.5	−15.5
1968	−8.0	0.0	10.0	16.0	24.0	42.0	43.5	41.0	39.0	26.0	23.0	2.0	−8.0
1969	1.0	7.5	9.5	10.0	28.0	39.0	44.0	44.5	31.0	20.5	13.0	6.0	1.0
1970	−8.5	−3.5	16.5	17.5	30.5	38.0	52.0	47.0	39.5	21.0	14.0	8.0	−8.5
1971	−5.0	−2.0	13.0	20.5	29.0	34.0	45.5	38.5	38.0	31.5	21.0	8.5	−5.0
1972	−1.0	−1.0	5.0	20.5	31.0	35.0	50.0	39.0	37.5	17.0	15.5	16.0	−1.0
1973	3.0	7.0	21.0	24.0	31.0	41.0	47.0	53.0	31.0	29.0	18.5	12.0	3.0

Table 7

Distribution of Daily Mean Temperature (°F), 1949–1973

(Percent of days on which mean temperatures were observed in the class interval shown.)

	Class interval								
Month	0 to 9.9	10 to 19.9	20 to 29.9	30 to 39.9	40 to 49.9	50 to 59.9	60 to 69.9	70 to 79.9	80 to 89.9
Jan	2.5	14.3	37.2	32.2	12.4	1.4			
Feb	1.0	12.6	31.6	41.9	12.1	0.8			
Mar	0.1	1.4	15.2	52.1	26.5	4.7			
Apr			0.8	17.5	53.2	23.0	5.5		
May				0.1	21.7	50.2	23.7	4.3	
Jun					0.5	19.5	51.5	27.5	1.0
Jul						2.2	39.9	51.5	6.4
Aug						7.8	43.6	46.8	1.8
Sep					5.1	34.3	41.6	17.9	1.1
Oct			0.1	6.5	33.5	39.0	18.9	2.0	
Nov			4.8	35.8	41.4	15.9	2.1		
Dec	0.9	8.2	29.4	40.0	17.9	3.6			
Annual	0.4	3.0	9.9	18.8	18.7	16.9	18.9	12.5	0.9

Table 8

Distribution of Daily Maximum Temperatures (°F), 1949–1973

(Percent of days on which maximum temperatures were observed in the class intervals shown.)

	Class interval									
Month	10 to 19.9	20 to 29.9	30 to 39.9	40 to 49.9	50 to 59.9	60 to 69.9	70 to 79.9	80 to 89.9	90 to 99.9	100 to 105
Jan	2.5	18.5	36.8	30.1	10.7	1.4				
Feb	2.1	11.1	40.0	34.4	11.1	1.3				
Mar	0.3	2.1	23.0	42.2	24.9	7.0	0.5			
Apr			1.2	10.5	41.1	21.7	0.5	1.7		
May				1.0	15.6	43.0	31.0	8.1	0.5	
Jun					1.1	15.6	50.3	28.9	4.1	
Jul						1.8	37.0	51.5	9.6	0.1
Aug					0.1	3.6	43.9	48.9	3.5	
Sep					3.2	29.5	47.5	18.4	1.3	0.1
Oct			0.1	4.5	22.2	47.0	23.7	2.5		
Nov		0.4	7.6	30.2	41.5	18.3	1.9	0.1		
Dec	0.6	8.6	35.2	33.5	19.0	3.1				
Annual	0.4	3.4	12.0	16.4	16.1	16.4	20.4	13.3	1.6	<0.1

Table 9

Distribution of Daily Minimum Temperatures (°F), 1949–1973

(Percent of days on which minimum temperatures were observed in the class intervals shown.)

	Class interval										
Month	−30 to −20.1	−20 to −10.1	−10 to −0.1	0 to 9.9	10 to 19.9	20 to 29.9	30 to 39.9	40 to 49.9	50 to 59.9	60 to 69.9	70 to 79.9
Jan	0.1	0.4	3.3	14.0	31.3	30.1	18.0	2.8			
Feb		0.1	2.5	13.7	25.4	36.1	20.5	1.7			
Mar			0.2	1.8	13.5	45.7	32.5	6.2	0.1		
Apr				0.3	2.5	25.3	42.3	26.5	3.1		
May						4.4	28.6	39.8	24.1	3.1	
Jun							4.5	23.5	41.5	29.2	1.3
Jul							0.1	8.4	32.4	49.9	9.2
Aug							0.8	16.4	36.0	38.5	8.3
Sep						0.9	14.8	27.6	32.6	21.3	2.8
Oct					0.6	17.5	30.3	29.8	17.6	4.1	0.1
Nov				0.3	10.1	32.7	35.4	16.1	5.3	0.1	
Dec		0.3	1.1	9.8	24.3	35.6	22.1	6.3	0.5		
Annual	<0.1	0.1	0.6	3.3	9.0	19.0	20.8	17.1	16.1	12.2	1.8

Table 10

Mean Temperature Ranges (°F), 1949–1973

J	F	M	A	M	J	J	A	S	O	N	D	Annual
18	18	18	22	24	23	21	22	22	24	21	19	21

Table 11

Monthly Extremes of Daily Temperature Ranges (°F), 1949–1973

	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Highest	47.0	42.5	45.0	50.0	52.0	43.0	42.0	40.0	41.0	46.0	46.0	48.0	52.0
Lowest	2.0	1.5	2.0	1.0	1.5	2.0	2.5	3.0	3.0	2.0	2.0	1.0	1.0

Table 12

Distribution of Daily Temperature Ranges (°F), 1949–1973

(Percent of days on which a given temperature range was observed in each class interval.)

	Temperature interval, °F					
Month	0 to 9.9	10 to 19.9	20 to 29.9	30 to 39.9	40 to 49.9	50 to 59.9
Jan	16.1	44.4	30.8	7.4	1.3	
Feb	13.4	45.7	29.3	11.1	0.5	
Mar	14.2	44.2	31.1	9.9	0.6	
Apr	8.7	30.9	37.8	19.3	3.2	0.1
May	7.9	27.1	38.3	23.1	3.4	0.2
Jun	8.0	32.0	40.9	17.5	1.6	
Jul	6.3	38.6	41.1	13.9	0.1	
Aug	6.7	33.2	44.5	15.5	0.1	
Sep	7.3	32.0	41.0	18.8	0.9	
Oct	6.9	27.3	37.2	26.0	2.6	
Nov	10.5	38.4	35.0	14.2	1.9	
Dec	14.8	45.4	30.8	8.1	0.9	
Annual	10.1	36.6	36.5	15.4	1.4	<0.1

Table 13

Temperature Extremes (°F), 1949–1973

	Highest			Lowest		
Month	Day	Year	Temp.	Day	Year	Temp.
Jan	24	1967	66.0	22	1961	−23.0
Feb	15	1954	64.0	13	1967	−15.5
Mar	28	1960	73.0	19	1967	−7.5
Apr	21	1957	86.5	1	1964	8.0
May	29	1969	93.5	1	1961	24.5
Jun	26	1952	98.0	19	1956	30.0
Jul	22	1957	100.5	3	1957	39.5
Aug	11, 31	1949	99.0	24	1957	37.0
	31	1953	99.0	31	1965	37.0
Sep	2	1953	100.0	24	1953	25.0
Oct	4	1959	86.0	31	1966	13.0
Nov	2	1950	81.0	25	1956	9.0
Dec	11	1971	68.0	28	1950	−14.0

Table 14

Date of Maximum Temperature 90°F or Above,* 1949–1973

Year	First	Last
1949	Jun 26	Aug 11
1950	Jun 25	Jul 31
1951	Jul 27	Jul 27
1952	Jun 25	Jul 29
1953	Jun 20	Sep 3
1954	Jul 14	Jul 31
1955	Jul 2	Aug 21
1956	Jun 13	Aug 18
1957	Jun 16	Aug 3
1958	Jul 2	Jul 3
1959	Jun 9	Aug 28
1960	None	None
1961	Jun 13	Sep 12
1962	None	None
1963	Jun 25	Jul 28
1964	May 23	Jul 1
1965	May 26	Jul 25
1966	Jun 24	Aug 19
1967	None	None
1968	Jun 6	Jul 17
1969	May 29	Sep 1
1970	May 10	Sep 23
1971	Jul 8	Aug 9
1972	Jul 28	Jul 24
1973	Jun 11	Sep 4

*For one or more hours.

Table 15

Date of Minimum Temperature 32°F or Below,* 1949–1973

Year	Last	First
1949	May 26	Oct 27
1950	May 21	Sep 18
1951	May 14	Sep 30
1952	May 4	Oct 9
1953	Apr 30	Sep 23
1954	May 14	Oct 7
1955	May 20	Oct 22
1956	Jun 19	Sep 19
1957	May 17	Sep 28
1958	May 1	Sep 30
1959	May 17	Sep 18
1960	May 4	Sep 23
1961	May 31	Sep 30
1962	May 29	Sep 21
1963	May 26	Sep 24
1964	May 4	Sep 16
1965	May 24	Sep 27
1966	May 16	Sep 27
1967	Jun 1	Oct 12
1968	May 27	Oct 5
1969	May 15	Sep 22
1970	May 30	Oct 6
1971	May 15	Oct 13
1972	May 27	Oct 10
1973	May 8	Sep 22

*For one or more hours.

Table 16

Threshold Temperature, 1949–1973

(Percent of days on which certain threshold temperatures occurred for the period of record.)

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Annual
					Ice days (max temp. <32°F)							
24.5	16.6	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	14.3	4.9
					Frost days (min temp. <32°F)							
83.9	84.5	71.0	36.9	8.4	0.3	0.0	0.0	2.0	22.3	51.9	76.5	36.4
					Growth rate days (mean daily temp. ≥45°F)							
9.6	4.8	15.2	57.5	95.7	100	100	100	99.9	84.0	39.9	12.5	59.9

Table 17

Total Heating Degree Days, 1949–1973

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual total
1949	862	820	823	472	246	62	4	13	148	263	697	953	5363
1950	839	1012	988	648	358	95	11	29	195	349	647	1024	6195
1951	1014	929	845	524	259	99	6	27	129	370	726	927	5855
1952	1012	959	875	486	310	33	4	25	144	480	662	933	5923
1953	985	840	804	537	219	111	24	52	152	383	654	854	5615
1954	1194	850	859	526	351	61	16	23	149	348	738	1024	6139
1955	1148	979	863	492	230	98	2	37	160	332	748	1250	6339
1956	1146	940	985	688	398	92	30	44	221	438	695	894	6571
1957	1282	880	828	504	284	54	10	54	136	414	592	873	5911
1958	1092	1106	858	548	366	148	16	26	132	461	678	1263	6694
1959	1156	1046	907	536	258	120	6	18	130	371	670	938	6156
1960	1060	876	1056	527	239	60	4	22	176	464	620	1168	6280
1961	1292	995	884	608	338	60	7	26	68	236	668	1006	6188
1962	1091	981	862	578	307	62	44	44	218	448	773	1142	6550
1963	1147	1096	808	538	314	56	27	34	190	292	557	1168	6227
1964	1079	1090	840	636	222	77	10	74	158	442	666	930	6224
1965	1224	1006	907	636	216	98	20	40	142	439	729	954	6411
1966	1152	977	846	696	378	64	6	8	152	509	652	1048	6488
1967	994	1118	1020	624	460	60	7	18	174	478	800	1000	6753
1968	1264	1166	848	550	356	84	13	50	80	318	688	1092	6509
1969	1150	992	960	536	316	97	24	15	164	419	722	1058	6453
1970	1342	1016	944	560	250	49	0	4	115	360	616	1013	6269
1971	1260	956	868	660	342	68	15	36	74	214	714	866	6073
1972	1004	1058	899	661	262	68	8	43	89	549	775	916	6332
1973	1042	967	686	478	312	30	7	2	168	396	634	870	5592
Mean	1114	986	882	570	304	76	13	30	146	391	685	1007	6204

Table 18

Total Cooling Degree Days, 1949–1973

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1949	0	0	0	0	14	154	281	216	32	30	0	0	727
1950	0	0	0	0	0	72	165	103	39	1	1	0	381
1951	0	0	0	0	12	60	184	140	50	7	0	0	453
1952	0	0	0	4	2	112	293	183	54	2	0	0	650
1953	0	0	0	0	10	110	206	154	100	0	0	0	580
1954	0	0	0	0	2	92	158	91	31	57	0	0	431
1955	0	0	0	0	28	43	315	246	24	4	0	0	660
1956	0	0	0	0	14	94	136	160	51	0	0	0	455
1957	0	0	0	4	24	184	211	103	87	0	0	0	613
1958	0	0	0	0	0	36	232	130	37	0	0	0	435
1959	0	0	0	0	42	76	174	234	128	30	0	0	684
1960	0	0	0	0	9	84	120	144	30	3	0	0	390
1961	0	0	0	0	2	91	188	192	188	0	0	0	661
1962	0	0	0	0	28	72	100	106	26	3	0	0	335
1963	0	0	0	0	11	96	180	104	18	6	0	0	415
1964	0	0	0	0	41	70	204	101	55	0	0	0	471
1965	0	0	0	0	44	90	127	146	77	0	0	0	484
1966	0	0	0	0	0	94	236	162	26	0	0	0	518
1967	0	0	0	0	0	64	199	145	19	10	0	0	437
1968	0	0	0	0	0	55	212	176	52	8	0	0	503
1969	0	0	0	0	21	58	130	210	80	6	0	0	505
1970	0	0	0	0	18	89	226	202	104	9	0	0	648
1971	0	0	0	0	0	96	145	146	116	6	0	0	509
1972	0	0	0	0	7	53	254	156	80	0	0	0	550
1973	0	0	0	4	14	164	236	276	82	2	0	0	778
Mean	0	0	0	1	14	88	196	161	63	7	<1	0	531

Table 19

Daily Temperature Readings (°F), 1949–1973

Day	Maximum		Minimum			Maximum		Minimum		
	Av	High	Av	Low	Mean	Av	High	Av	Low	Mean
	January					February				
1	39.0	62.0	20.0	7.5	29.6	35.0	55.0	17.8	−2.0	26.7
2	38.5	52.0	19.7	−5.0	29.1	37.8	54.5	20.2	−4.5	29.2
3	40.4	53.0	24.3	4.5	32.8	34.2	55.0	17.6	−6.0	27.1
4	40.3	55.0	24.3	6.5	32.2	37.7	51.0	22.0	−1.0	29.6
5	38.6	60.0	21.5	4.5	29.8	40.3	54.1	20.6	−3.5	30.4
6	39.0	56.0	19.8	1.0	29.4	40.5	52.0	18.7	1.0	29.0
7	37.7	54.0	21.9	5.0	29.8	39.5	53.0	20.6	−5.5	30.3
8	35.1	59.0	19.4	0.5	27.7	37.6	58.0	16.7	−1.0	27.1
9	36.2	62.0	16.9	−1.5	26.5	39.6	60.0	18.4	−1.0	30.1
10	37.4	55.0	21.1	2.5	29.2	37.9	54.0	22.6	2.0	30.3
11	32.6	57.0	19.4	2.5	27.8	38.7	58.0	19.6	−2.0	28.9
12	34.4	50.0	15.6	3.5	25.5	37.3	55.0	17.5	3.0	28.1
13	36.9	54.0	16.2	−10.0	26.6	37.1	61.0	19.0	−15.5	26.8
14	38.8	61.0	18.4	−12.0	28.8	39.2	55.0	20.1	−0.5	29.7
15	38.6	56.0	20.8	−11.0	29.8	41.4	64.0	23.5	3.5	32.4
16	36.4	54.0	19.6	5.5	28.0	39.5	58.0	18.4	1.0	29.0
17	37.5	55.0	16.6	−2.5	26.6	36.4	47.0	19.7	−1.0	28.0
18	37.9	62.5	18.2	−10.5	28.1	39.2	54.0	23.1	3.0	31.1
19	37.6	62.0	18.5	−5.0	28.4	41.8	56.0	23.7	−4.0	32.7
20	38.8	56.0	22.5	2.5	30.2	39.1	58.0	21.3	5.0	30.2
21	39.8	53.0	21.0	−15.0	30.6	37.9	57.0	21.8	4.0	29.4
22	43.4	55.0	21.3	−23.0	32.4	39.1	60.0	22.0	6.0	29.9
23	42.8	56.0	22.2	−8.5	32.5	38.8	50.0	21.2	6.0	29.8
24	37.2	66.0	23.3	0.0	30.4	41.0	60.5	20.8	0.0	30.9
25	39.3	56.5	23.6	−1.5	31.6	43.3	58.0	24.4	9.0	33.9
26	39.5	60.0	22.8	1.0	30.6	41.6	57.0	22.3	1.5	31.9
27	38.3	60.0	20.8	3.5	29.6	41.8	62.0	22.9	0.0	32.4
28	34.2	51.0	18.1	3.5	29.4	42.4	57.5	24.5	4.0	33.4
29	35.2	52.0	18.6	−2.0	26.9	42.7	–	24.5	–	33.5
30	36.5	55.5	19.0	−6.0	27.8	–	–	–	–	–
31	34.7	52.0	14.1	−9.0	24.4	–	–	–	–	–
	March					April				
1	41.2	60.0	26.2	8.0	33.6	51.0	70.5	28.1	8.0	39.9
2	43.0	62.0	25.6	2.5	34.4	54.8	76.0	33.4	12.0	44.0
3	41.9	62.5	25.0	10.0	33.7	52.6	78.5	33.3	14.0	42.9
4	42.1	62.0	24.6	2.0	33.4	52.5	68.0	31.6	9.5	42.1
5	43.8	60.0	28.2	10.0	35.9	54.7	66.0	31.1	16.0	42.8
6	42.5	57.0	26.7	12.0	34.9	53.2	67.5	31.7	17.5	42.4
7	42.6	58.0	26.5	9.0	34.3	53.3	71.0	34.2	16.0	43.7
8	42.7	57.0	25.3	10.0	33.6	53.4	78.5	33.3	24.0	43.4
9	43.9	60.0	24.0	9.5	33.7	55.2	75.5	31.3	20.0	43.3
10	44.4	65.5	25.9	5.0	35.1	55.8	79.0	33.1	20.5	44.4
11	44.2	66.0	26.0	8.5	34.7	54.0	64.0	32.0	18.0	42.8
12	45.5	68.5	27.3	16.5	36.3	55.8	67.0	30.7	19.5	43.2
13	44.7	60.0	27.7	18.0	35.9	53.2	76.0	32.1	16.0	42.6
14	45.6	72.0	28.1	15.0	36.8	57.6	76.0	33.5	19.0	45.1
15	45.1	58.0	27.3	12.5	36.5	58.6	83.0	34.9	20.0	46.7
16	46.3	67.0	27.5	12.0	37.2	58.4	66.5	35.3	18.0	46.8
17	45.4	61.0	26.8	8.5	36.0	59.0	77.0	34.7	20.5	46.8
18	43.2	63.0	25.4	1.0	34.2	60.9	85.5	36.5	20.5	48.7
19	43.9	62.0	25.5	−7.5	34.6	60.6	80.0	36.0	23.0	48.3
20	44.8	66.5	25.2	−2.0	36.1	58.8	81.0	35.6	20.5	47.2
21	46.1	64.0	25.8	5.5	35.9	60.2	86.5	34.7	22.0	47.4
22	45.8	58.0	27.6	11.0	36.5	61.8	79.0	39.3	26.0	50.5
23	49.7	66.0	29.8	17.0	39.8	61.9	83.5	38.6	25.0	50.2
24	50.3	62.0	28.4	17.5	39.4	57.6	79.0	37.5	24.0	47.3
25	50.0	70.0	28.9	14.5	39.5	61.0	84.0	37.3	26.0	49.2
26	49.2	69.0	31.0	8.0	40.3	60.9	79.0	39.2	24.0	50.1
27	49.0	66.0	29.2	9.0	38.9	58.8	77.0	39.6	25.0	49.4
28	52.0	73.0	29.5	12.0	40.5	59.4	81.5	40.0	21.5	49.7
29	51.4	66.0	30.6	17.0	40.5	61.5	77.5	39.3	24.5	50.4
30	49.7	67.0	31.2	20.0	40.5	61.7	80.5	36.6	25.0	49.2
31	49.2	62.0	30.0	18.0	39.7	–	–	–	–	–

Table 19 (cont'd.)

Daily Temperature Readings (°F), 1949–1973

Day	Maximum		Minimum			Maximum		Minimum		
	Av	High	Av	Low	Mean	Av	High	Av	Low	Mean
	May					June				
1	62.3	82.0	37.4	24.5	49.6	73.7	89.0	50.5	31.0	62.1
2	62.0	83.0	39.9	25.0	50.9	75.2	89.0	52.3	34.0	63.4
3	62.5	73.0	40.9	25.0	51.6	74.3	83.0	50.6	33.0	62.6
4	66.5	89.0	38.7	28.0	52.5	75.3	85.0	49.7	35.0	62.5
5	64.5	88.0	39.1	25.0	51.8	75.6	88.0	52.3	34.5	63.7
6	65.6	84.0	38.1	28.0	51.9	77.7	91.0	52.4	37.5	65.0
7	64.9	82.0	38.1	29.5	51.6	76.5	88.5	53.6	39.0	65.0
8	63.5	85.5	43.4	24.0	53.6	77.0	89.0	51.6	36.0	64.1
9	66.7	86.0	45.5	29.0	56.2	76.6	91.0	54.2	35.0	65.6
10	67.4	91.0	44.1	29.0	55.8	74.4	91.0	53.1	36.0	63.8
11	66.7	86.0	44.2	28.5	55.4	74.5	94.5	52.7	40.0	63.6
12	67.6	82.5	44.7	31.5	56.2	76.2	89.0	52.2	35.0	64.3
13	67.9	87.0	42.4	26.0	54.9	75.3	93.0	54.9	38.0	65.1
14	66.1	74.0	42.5	28.0	54.2	72.8	97.0	53.5	38.0	63.1
15	67.0	84.0	43.8	29.0	55.5	74.2	93.5	53.0	38.0	63.4
16	67.5	87.0	45.2	30.5	56.3	76.6	95.0	53.6	36.5	65.1
17	68.0	82.0	44.3	29.0	56.1	75.9	94.5	53.0	38.0	64.2
18	66.3	82.0	46.0	30.0	56.3	76.6	90.5	51.0	33.5	63.9
19	68.5	86.0	47.2	32.5	57.8	75.0	86.0	53.2	30.0	64.1
20	68.1	85.0	48.1	32.0	58.3	76.6	92.0	54.7	34.0	64.5
21	69.5	85.0	46.6	28.0	58.3	76.7	93.0	57.9	42.0	67.5
22	69.5	84.5	45.8	33.0	57.6	76.1	88.0	57.6	46.0	66.8
23	71.2	91.0	45.8	33.0	58.5	77.9	90.0	55.3	42.0	66.6
24	68.7	88.5	46.5	25.0	57.1	78.6	90.5	59.1	50.0	68.9
25	67.7	81.0	45.8	25.0	56.7	80.0	92.0	58.8	48.0	69.4
26	69.3	93.0	45.1	31.0	57.2	80.2	98.0	58.4	44.0	66.8
27	68.8	88.0	45.5	29.0	57.1	80.3	92.0	57.9	40.0	69.2
28	70.3	87.0	45.3	33.0	57.8	78.4	93.0	56.2	45.0	66.6
29	70.3	93.5	46.9	31.0	57.7	79.3	94.5	56.9	44.5	68.1
30	70.8	84.5	48.4	30.5	59.5	81.8	94.0	60.9	46.0	71.2
31	74.2	88.5	48.4	31.0	61.5	–	–	–	–	–
	July					August				
1	82.6	95.0	60.3	40.0	71.4	82.5	92.0	60.8	46.0	71.7
2	84.1	95.0	59.5	44.0	71.8	79.0	97.0	60.1	48.0	69.4
3	81.7	99.0	60.6	39.5	71.0	79.7	90.0	59.0	42.0	69.4
4	80.6	95.0	58.2	43.5	69.2	79.5	87.5	58.9	42.0	69.5
5	78.9	98.0	56.7	43.5	67.8	79.4	96.0	58.8	45.0	69.2
6	78.5	90.0	56.0	40.0	66.5	79.5	94.0	57.1	39.0	68.3
7	80.0	88.0	55.9	42.0	68.0	81.4	90.0	59.3	43.0	70.4
8	81.4	91.0	57.9	45.0	69.6	81.9	90.0	60.5	44.0	71.2
9	80.4	92.0	58.8	44.0	69.4	81.1	96.0	61.1	44.0	71.1
10	79.4	90.0	60.4	45.0	70.0	81.1	96.0	62.6	39.0	71.8
11	80.6	91.5	60.0	45.0	70.2	80.0	99.0	61.1	43.0	70.5
12	81.7	93.0	60.0	46.0	70.6	80.1	88.0	58.3	42.0	69.6
13	80.1	94.0	60.7	46.0	70.6	79.0	87.5	58.3	43.0	68.6
14	81.4	93.5	62.4	53.0	71.9	80.0	90.0	57.5	44.0	68.6
15	80.6	88.0	61.1	51.0	70.9	80.7	88.0	58.6	43.0	69.9
16	81.1	93.0	61.8	46.0	71.5	80.1	88.5	59.1	40.0	69.2
17	82.8	95.5	60.9	45.0	71.9	79.3	86.5	59.1	46.0	69.1
18	83.6	98.0	61.3	48.5	72.5	79.4	91.0	56.5	44.5	68.3
19	82.4	94.0	64.1	51.5	72.8	79.6	90.0	56.9	42.0	68.2
20	79.9	94.5	62.4	49.0	71.1	79.7	92.5	57.7	44.5	68.1
21	80.9	94.5	60.4	43.0	70.7	79.1	93.0	56.4	44.0	67.9
22	82.4	100.5	61.7	48.0	72.1	79.1	86.5	56.4	42.0	67.8
23	82.5	95.0	62.4	48.0	72.4	77.6	85.0	54.1	39.0	66.0
24	81.1	90.0	60.5	45.0	70.8	77.5	88.5	53.7	37.0	66.2
25	81.4	91.0	59.8	46.0	70.6	78.4	90.0	55.0	38.5	66.4
26	81.1	90.0	59.6	41.0	70.0	79.3	88.0	56.1	40.0	67.4
27	82.0	93.0	62.7	54.0	72.4	81.1	89.5	59.1	46.0	70.1
28	82.0	94.0	62.8	50.0	73.5	80.7	96.0	58.0	41.0	69.3
29	82.9	94.0	63.4	49.0	73.2	81.6	96.0	59.3	40.0	70.7
30	81.5	92.0	62.6	51.0	72.0	84.5	97.0	59.8	41.0	70.6
31	82.4	92.0	61.3	45.5	71.8	80.7	99.0	60.9	37.0	70.6

Table 19 (cont'd.)

Daily Temperature Readings (°F), 1949–1973

Day	Maximum Av	Maximum High	Minimum Av	Minimum Low	Mean	Maximum Av	Maximum High	Minimum Av	Minimum Low	Mean
			September					October		
1	79.9	92.0	58.5	41.0	69.0	69.2	84.5	45.2	32.0	57.2
2	78.7	100.0	57.2	41.5	67.6	69.1	81.5	43.0	30.5	56.2
3	76.9	93.0	56.6	37.5	66.1	69.5	78.0	46.5	31.5	58.0
4	78.8	90.0	57.6	44.5	67.8	67.2	86.0	45.9	33.0	57.0
5	78.2	88.5	56.6	40.0	66.7	67.9	85.5	43.8	29.0	55.9
6	77.2	86.0	52.8	37.0	64.4	66.3	82.5	42.4	25.0	54.4
7	76.3	84.5	51.5	37.0	63.2	65.7	78.5	45.5	27.0	55.2
8	75.3	84.0	51.9	36.0	63.0	66.2	76.0	45.6	21.5	55.9
9	75.2	88.0	52.0	33.0	63.1	67.6	80.0	43.9	26.0	55.8
10	75.8	89.0	53.5	37.0	64.4	68.1	85.0	43.6	26.5	55.8
11	74.7	00.0	53.0	37.5	63.4	65.5	81.0	41.9	24.0	53.7
12	74.0	91.5	52.2	34.0	62.9	65.7	84.0	42.3	20.0	54.0
13	73.7	88.0	51.3	35.0	62.4	64.0	80.5	39.0	24.0	51.2
14	73.5	88.0	53.9	36.0	63.0	66.8	77.5	39.2	21.0	53.0
15	73.1	81.0	52.8	37.5	62.1	67.1	83.0	43.2	25.0	55.1
16	73.2	84.5	53.2	31.5	62.5	68.0	80.0	41.8	28.0	54.9
17	71.1	82.0	50.0	34.0	59.9	66.1	78.0	39.7	28.0	52.9
18	72.9	84.5	49.7	29.0	60.7	64.5	76.0	40.1	24.0	52.3
19	71.6	83.5	50.4	30.0	60.0	63.3	79.5	39.1	25.0	51.1
20	69.7	81.0	50.4	37.0	59.6	62.0	76.0	36.6	20.5	49.3
21	70.0	82.0	50.2	30.0	59.3	61.7	77.0	37.6	17.0	49.6
22	71.7	87.5	49.7	28.0	60.1	60.7	73.0	37.0	22.0	48.8
23	71.7	92.0	48.2	28.0	60.4	62.6	72.0	41.4	21.5	51.5
24	69.3	86.5	45.4	25.0	56.8	63.0	76.0	42.1	20.5	52.2
25	68.6	82.5	44.9	29.5	56.8	58.6	75.5	38.4	21.0	48.5
26	70.6	85.5	46.0	32.0	57.2	59.9	76.5	37.5	18.0	48.7
27	69.0	83.5	44.6	32.0	56.2	59.7	78.0	36.5	21.0	48.1
28	68.2	80.0	49.4	30.0	58.4	58.7	77.0	35.7	21.0	47.1
29	68.0	80.5	47.5	29.5	57.5	58.9	76.0	36.3	21.0	47.8
30	69.4	80.0	45.7	27.0	57.2	58.4	78.5	35.0	17.0	46.7
31	–	–	–	–	–	59.7	73.0	36.7	13.0	48.8
			November					December		
1	60.2	79.0	38.8	21.0	49.5	41.9	66.0	22.7	11.0	32.6
2	59.5	81.0	39.0	22.0	49.1	43.3	61.5	22.1	−0.5	32.7
3	58.7	70.5	38.3	19.0	48.2	46.7	61.0	25.8	8.0	36.2
4	56.4	71.0	37.2	18.0	46.7	46.7	61.0	26.8	3.5	36.7
5	53.0	72.0	34.2	19.0	43.6	46.3	62.0	29.2	3.0	36.1
6	52.0	71.0	33.2	19.5	42.4	45.7	62.0	27.5	8.0	36.5
7	54.4	66.0	32.8	16.0	43.5	44.5	63.0	26.1	9.5	35.4
8	54.2	67.0	31.6	16.0	42.9	45.8	63.0	27.2	6.0	35.9
9	52.7	68.0	32.1	14.0	42.5	45.1	67.0	28.2	8.0	35.9
10	51.0	65.5	32.7	14.5	41.9	42.9	60.0	27.8	7.0	35.6
11	52.4	73.0	30.8	9.5	41.6	43.9	68.0	24.1	−8.0	34.8
12	54.8	67.5	32.6	18.0	43.8	42.4	59.0	26.3	4.0	34.4
13	52.6	70.0	30.9	15.0	41.4	42.2	56.5	25.1	−0.5	33.0
14	54.9	66.0	33.6	18.5	44.3	40.4	55.0	22.4	−7.5	32.2
15	53.7	66.0	33.1	15.0	43.4	39.4	57.0	21.2	0.0	31.4
16	53.7	65.5	33.9	15.5	43.8	38.3	65.0	21.5	4.8	30.5
17	52.9	68.0	33.7	15.5	43.2	39.1	55.5	19.6	5.0	29.8
18	50.7	69.0	32.1	22.0	41.4	40.8	58.0	21.1	4.0	31.7
19	51.2	68.0	30.6	18.0	41.0	39.1	57.0	20.6	1.5	28.6
20	50.8	70.0	29.3	15.0	40.0	39.9	60.0	21.6	4.0	28.9
21	50.7	66.0	30.2	16.0	40.7	39.0	61.0	23.1	3.0	31.6
22	48.7	70.0	29.0	13.0	38.9	38.7	55.0	22.1	−3.0	30.7
23	49.6	64.0	28.0	12.0	38.8	38.9	56.0	21.6	2.0	31.4
24	50.4	63.5	30.7	13.5	40.5	39.2	53.0	23.8	−3.0	31.8
25	48.6	64.0	27.5	9.0	37.8	39.8	61.0	22.5	6.0	31.7
26	49.4	60.0	30.0	14.0	39.7	41.9	58.0	25.8	7.0	30.8
27	50.0	61.0	28.8	10.0	39.4	38.3	62.5	21.1	−13.0	29.9
28	50.2	62.0	31.2	13.5	40.7	39.9	54.0	19.1	−14.0	29.5
29	48.3	65.5	30.7	17.0	39.5	41.2	51.0	21.4	4.5	31.4
30	44.4	63.5	26.0	13.5	35.4	39.2	54.5	21.1	−4.0	33.6
31	–	–	–	–	–	38.2	63.0	18.8	−8.5	28.4

Table 20

Mean Monthly Soil Temperatures (°F)

Month	Location of sensor below ground				
	3 in.[a]	2½ ft[b]	5 ft[c]	10 ft[c]	20 ft[b]
Jan	34.5	35.8	40.6	47.2	54.7
Feb	35.5	34.6	38.5	44.2	52.4
Mar	40.0	38.2	39.3	42.8	49.7
Apr	53.0	44.0	44.0	43.6	48.1
May	62.5	54.4	51.6	47.8	48.2
Jun	74.0	65.0	59.3	53.0	49.2
Jul	78.0	70.8	66.2	58.9	51.2
Aug	77.5	71.4	68.9	62.6	54.0
Sep	73.0	67.0	68.6	64.4	56.2
Oct	59.5	61.2	63.4	63.1	57.8
Nov	47.5	49.4	54.7	58.3	58.0
Dec	37.0	39.4	46.2	52.4	57.0
Annual	56.0	52.6	53.4	53.2	53.0

[a] 1960–1962 data.
[b] 1954–1956 data.
[c] 1960–1962 and 1954–1956 data.

(Table 23) of >2 in. and a 24-hr rainfall rate of >8 in. are exceptional but not unknown.

Thundershowers (Tables 24 and 25) are basically caused by (1) *convection* resulting from solar heating of the ground or radiative cooling of cloud tops, and (2) *mechanical lifting* of the air in the vicinity of fronts or in regions of strong wind convergence. Convection showers therefore show a marked diurnal variation, while frontal showers have a random distribution. Both types have occurred at BNL during every month but are most prevalent during the summer months. Because of the proximity of the ocean, which prevents sufficient heating for local generation of thundershowers, convective showers reaching this area are normally generated over inland areas around midday and are carried to eastern Long Island by upper-level wind flow occurring usually during the evening hours.

Snow occurs between October and April, with an average seasonal amount of 31 in. The total snowfall varies greatly from one year to the next. For example, 21 in. were recorded during 1965-66 and 75 in. during 1966-67. The data on snowfall are contained in Tables 26 to 29.

The mean annual number of days with freezing rain and/or freezing drizzle is 6. Heavy ice storms are relatively infrequent and generally occur during the month of January in the local area.[1]

Humidity

Data were obtained from a hygrothermograph housed in an instrument shelter (standard U.S. Weather Bureau type) located at 19 West Brookhaven Avenue, BNL. The data presented cover the years 1948-1969. However, since the humidity data are not continuous, they were analyzed for the following periods: dew point, Aug 1948 – Jul 1951; wet bulb, May 1954 – Oct 1958 and Jan 1960 – Dec 1969; relative humidity, Jan 1960 – Dec 1969. The expressions used to characterize the atmospheric humidity are defined below.

Relative humidity. The ratio of the actual water vapor pressure to the saturation vapor pressure of a given parcel of air (e/e_s). Relative humidity varies with the temperature, pressure, and moisture content of the air sample and is not a particularly useful quantity when given by itself.

Dew point. The temperature to which a given air sample must be reduced to reach saturation. Dew point depends only on pressure and moisture content and is primarily a function of the latter in these circumstances.

Mixing ratio. The ratio of the mass of water vapor in a volume of moist air to the mass of the dry air alone (M_v/M_a).

Specific humidity. The ratio of the mass of water vapor in a volume of moist air to the mass of the dry air plus the mass of the water vapor [$M_v/(M_a+M_v)$].

Dew Point. In solving air-conditioning problems it is important to know how much water vapor is present in the air, and in most studies the dew point, or the corresponding mixing ratio for standard pressure, is desired rather than relative humidity. (See Tables 30 to 32).

Wet Bulb. Data on the wet bulb temperature have been arranged in two summaries (Tables 33 and 34). The data presented in the first summary are for May–Oct only, since virtually all the humidity problems that have reached the Meteorology Group have been connected with the high humidity of the summer season. The second summary consists of a distribution of hourly wet bulb temperatures for the period 1960–1969. Table 35 shows the diurnal variation in average wet bulb temperature for each month and annually.

Relative Humidity. Hourly data on relative humidity for the period 1960–1969 are summarized in Tables 36 and 37.

(Text continued on page 20)

Table 21

Monthly and Annual Precipitation (in.), 1949–1973

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total annual
1949	5.55	4.71	2.88	3.63	3.32	T*	3.07	5.21	3.49	1.74	2.96	3.36	39.92
1950	2.80	4.28	3.98	2.41	5.23	2.72	3.22	4.26	1.38	1.69	4.34	4.36	40.67
1951	3.75	4.99	5.02	3.42	3.68	2.64	2.08	4.50	1.06	5.48	6.01	6.17	48.80
1952	7.10	3.54	5.44	3.61	7.64	2.78	1.00	7.61	1.35	0.31	3.56	4.45	48.39
1953	6.73	4.16	10.36	5.59	3.34	1.66	2.76	2.40	0.90	3.17	5.03	6.43	52.53
1954	2.74	2.18	4.21	5.36	4.08	1.69	0.94	11.98	10.47	2.44	5.42	6.39	57.90
1955	0.62	3.26	4.79	4.28	0.95	2.53	1.65	9.04	3.96	11.43	7.19	0.82	50.52
1956	3.52	6.32	5.47	2.97	2.63	3.00	5.79	1.50	3.64	2.95	4.63	6.03	48.45
1957	2.36	2.33	3.20	4.44	1.40	0.42	2.01	1.25	3.57	3.86	4.41	8.45	41.79
1958	7.96	4.58	6.65	6.34	5.81	2.28	3.42	5.37	4.24	7.39	2.00	2.66	59.60
1959	2.60	2.06	6.71	3.93	1.75	5.35	6.85	3.72	1.36	3.13	4.46	5.12	47.04
1960	3.59	5.48	3.38	3.27	2.54	2.13	6.03	1.79	7.49	3.94	2.62	4.31	46.57
1961	3.56	4.10	4.60	5.70	6.17	2.30	5.61	4.23	6.23	3.06	2.89	3.70	52.15
1962	4.38	5.77	3.63	3.31	1.12	3.55	1.64	7.64	4.07	4.62	5.04	2.83	47.60
1963	3.27	3.88	4.27	2.56	3.08	5.51	2.65	2.10	3.66	0.18	6.89	2.78	40.83
1964	5.89	4.76	3.56	8.37	0.63	1.41	4.40	1.16	3.02	4.29	3.07	6.03	47.19
1965	4.88	3.03	2.74	4.20	1.83	1.09	3.43	5.15	1.51	2.16	1.83	2.11	34.35
1966	4.57	5.18	1.73	2.13	6.55	1.40	1.12	3.23	6.53	4.45	2.89	4.15	43.93
1967	1.65	3.98	8.18	4.14	7.98	5.30	6.01	5.43	2.24	2.11	4.00	7.60	58.62
1968	3.00	2.21	7.54	2.00	4.95	4.24	0.50	3.10	2.08	3.01	8.09	8.22	48.94
1969	1.04	4.03	3.62	5.15	2.44	2.06	8.62	5.51	3.60	3.69	4.48	7.83	52.07
1970	0.81	43.7	5.44	4.57	3.44	1.77	3.10	6.08	2.42	1.41	6.52	3.73	43.66
1971	2.95	6.45	3.55	3.30	3.80	0.92	5.03	3.86	2.12	3.41	6.86	2.57	44.82
1972	2.41	6.12	5.40	4.53	6.10	7.30	1.03	1.29	3.08	7.64	7.51	6.22	58.63
1973	4.44	4.36	4.38	7.77	5.46	3.25	4.45	3.11	2.51	2.79	2.22	8.00	52.74
Mean	3.69	4.25	4.83	4.28	3.83	2.72	3.49	4.54	3.44	3.61	4.63	5.00	48.31

*T = trace (<0.01 in.).

Table 22

Pecentage Frequency of Daily Precipitation (in. of water), 1949–1973

(Percent of days having measurable precipitation in the indicated ranges. Precipitation occurred on 45% of all days; 27% of the days received <0.01 in. and 53% received < 0.10 in.)

Precipitation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<0.01	18.2	23.0	25.1	20.4	30.0	35.3	35.8	29.7	31.0	34.4	22.6	19.0	26.8
0.01–0.09	30.9	23.7	23.0	33.3	29.2	23.3	26.8	23.1	22.5	22.8	28.5	26.1	26.3
0.10–0.24	18.3	17.9	16.8	14.8	13.9	15.6	11.1	15.6	14.4	10.9	13.7	16.8	15.0
0.25–0.49	14.1	13.0	10.9	13.0	10.1	12.9	9.9	11.9	13.4	11.9	13.7	16.5	12.6
0.50–0.99	12.6	13.6	17.0	10.5	9.3	9.5	8.5	10.9	11.6	12.3	13.4	11.6	11.8
1.00–2.49	5.6	8.2	7.0	7.7	7.5	3.4	7.6	6.3	6.0	7.0	7.3	9.1	6.9
2.50–4.99	0.3	0.6	0.2	0.3			0.3	2.5	0.7	0.0	0.8	0.9	0.5
5.00–9.99									0.4	0.7			0.1
≥10.0													0.0
	% of days with precipitation												
	43.9	46.7	49.9	50.4	51.2	43.5	42.8	41.3	37.9	36.8	47.7	45.4	44.8

Table 23

Percentage Frequency of Hourly Precipitation (in. of water), 1949–1973

Precipitation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
<0.01	47.3	41.4	46.8	48.6	54.3	56.5	59.0	51.6	50.9	47.8	45.6	41.7	48.5
0.01–0.09	44.3	47.3	43.2	40.6	35.0	33.7	29.4	34.2	35.9	40.4	41.2	47.4	40.4
0.10–0.19	6.8	8.0	7.3	7.4	7.0	6.2	4.8	6.2	7.2	6.5	8.6	7.7	7.1
0.20–0.39	1.5	3.0	2.4	2.8	3.0	2.4	4.0	5.0	4.1	3.9	3.8	2.7	3.1
0.40–0.59	0.1	0.3	0.2	0.5	0.6	0.8	1.4	1.7	1.0	0.7	0.5	0.5	0.6
0.60–0.79		<0.1	0.1	0.1	<0.1	0.3	0.7	0.5	0.4	0.4	0.1	<0.1	0.2
0.80–0.99					0.1	0.1	0.3	0.3	0.2	0.2	<0.1	0.0	0.1
1.00–1.19						<0.1	0.2	0.3	0.0	0.1	0.0	0.0	<0.1
1.20–1.39							0.1	0.1	0.0	0.0	<0.1	0.0	<0.1
1.40–1.59								0.1	0.1	0.0	<0.1	0.0	<0.1
1.60–1.79							0.1						<0.1
1.80–1.99						<0.1			0.1				<0.1
2.00–2.19									0.1				<0.1

Table 24

Monthly Distribution of Thundershowers, Aug 1948 – Jul 1951

(Hours in which thunder and lightning were observed at the BNL station.)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Av No. of hours	1	0	1	4	13	4	16	9	2	2	1	1	4.5
% of all hours with thundershowers	1	0	1	8	24	8	30	18	4	4	1	2	100

Table 25

Diurnal Distribution of Thundershowers, Aug 1948 – Jul 1951

(The data show a distinct peak of thundershower activity in early evening rather than in afternoon hours, as is usually the case with inland stations.)

	Time of day (EST)							
	00–03	03–06	06–09	09–12	12–15	15–18	18–21	21–24
% of occurrence	13	7	6	7	10	17	24	16

Table 26

Total Monthly and Seasonal Snowfall (in.)

Season	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
1947–48	0.0	0.0	19.0	26.0	18.5	3.0	0.0	66.5
1948–49	0.0	0.0	23.6	6.3	14.2	10.8	0.0	54.9
1949–50	0.0	0.5	3.0	T*	10.5	6.3	3.5	23.8
1950–51	0.0	T	2.5	5.6	4.0	3.2	0.0	15.3
1951–52	0.0	T	T	1.6	7.2	10.0	0.0	18.8
1952–53	T	1.4	4.5	1.4	T	4.5	T	11.8
1953–54	0.0	T	T	12.2	1.0	T	0.2	13.4
1954–55	0.0	0.0	4.5	0.9	7.5	2.2	0.7	15.8
1955–56	0.0	2.2	6.7	9.5	2.5	20.5	1.5	42.9
1956–57	0.0	T	1.8	5.7	6.0	1.0	1.2	15.7
1957–58	0.0	0.0	6.0	14.0	18.6	22.5	0.0	61.1
1958–59	0.0	0.0	5.0	1.3	0.8	8.1	0.0	15.2
1959–60	0.0	T	15.2	4.1	3.7	18.9	0.0	41.9
1960–61	T	T	13.7	24.3	18.5	1.0	T	57.5
1961–62	0.0	T	7.0	1.0	13.0	1.8	T	22.8
1962–63	1.0	1.0	4.8	7.4	6.0	3.2	T	23.4
1963–64	0.0	T	13.5	12.2	20.4	1.5	T	47.6
1964–65	0.0	0.0	3.6	23.0	6.0	4.0	T	36.6
1965–66	T	0.0	T	12.1	8.5	T	T	20.6
1966–67	0.0	0.0	9.3	1.6	32.5	31.5	T	74.9
1967–68	0.0	3.8	9.2	8.4	6.0	3.0	T	30.4
1968–69	0.0	T	3.2	0.2	19.0	9.0	0.0	31.4
1969–70	T	T	12.2	5.2	4.5	4.5	0.0	26.4
1970–71	T	0.0	6.4	12.2	1.0	0.5	2.0	22.1
1971–72	0.0	T	T	3.2	10.5	3.0	T	16.7
1972–73	0.0	T	T	3.0	2.5	0.2	T	5.7
Mean	T	0.3	6.7	7.8	9.3	6.7	0.4	31.2

Table 27

Date and Amount of First and Last Snowfall (in.), Dec 1947 – Apr 1973

Snow season	First snowfall		First measurable		Last snowfall		Last measurable	
	Date	Amount	Date	Amount	Date	Amount	Date	Amount
1947–48	N.A.*	N.A.	N.A.	N.A.	Mar 3	0.6	Mar 3	0.6
1948–49	Dec 9	T**	Dec 15	6.7	Mar 18	4.8	Mar 18	4.8
1949–50	Nov 25	T	Nov 27	0.5	Apr 14	3.5	Apr 14	3.5
1950–51	Nov 21	T	Dec 26	2.5	Mar 22	1.7	Mar 22	1.7
1951–52	Nov 10	T	Jan 10	1.5	Mar 19	1.5	Mar 19	1.5
1952–53	Oct 20	T	Nov 30	1.4	Apr 20	T	Mar 8	1.5
1953–54	Nov 6	T	Jan 11	5.0	Apr 5	0.1	Apr 5	0.1
1954–55	Dec 6	T	Dec 21	4.0	Apr 3	0.7	Apr 3	0.7
1955–56	Nov 20	2.0	Nov 20	2.0	Apr 8	1.5	Apr 8	1.5
1956–57	Nov 22	T	Dec 30	1.8	Apr 4	1.2	Apr 4	1.2
1957–58	Dec 4	6.0	Dec 4	6.0	Mar 27	T	Mar 22	1.0
1958–59	Dec 6	T	Dec 9	2.0	Mar 27	1.0	Mar 27	1.0
1959–60	Nov 29	T	Dec 7	0.1	Mar 26	T	Mar 22	1.1
1960–61	Oct 24	T	Dec 11	3.0	Mar 24	T	Mar 23	0.5
1961–62	Nov 9	T	Dec 10	2.0	Apr 16	T	Mar 22	0.3
1962–63	Oct 26	1.0	Oct 26	1.0	Apr 10	T	Mar 21	0.8
1963–64	Nov 30	T	Dec 12	1.5	Apr 9	T	Mar 22	1.0
1964–65	Dec 6	T	Dec 9	0.1	Apr 18	T	Mar 20	2.5
1965–66	Oct 28	T	Jan 13	0.1	Apr 13	T	Feb 25	2.0
1966–67	Dec 3	T	Dec 20	0.3	Apr 27	T	Mar 22	15.0
1967–68	Nov 15	T	Nov 30	3.8	Mar 13	1.5	Mar 13	1.5
1968–69	Nov 12	T	Dec 15	2.8	Mar 11	T	Mar 7	3.3
1969–70	Oct 22	T	Dec 1	1.0	Mar 31	2.0	Mar 31	2.0
1970–71	Oct 17	T	Dec 15	0.1	Apr 7	0.5	Apr 7	0.5
1971–72	Nov 10	T	Jan 5	1.0	Apr 7	T	Mar 14	0.3
1972–73	Nov 22	T	Jan 29	3.0	Apr 8	T	Mar 22	0.3

*N.A. = not available.
**T = trace (a visible but not measurable snowfall).

Table 28

Distribution of Daily Snowfall (Days), Dec 1947 – Dec 1973

(Number of days on which snowfalls were observed in the class interval shown, and total days of snowfall. The last column gives (in inches) the greatest snowfall within each snow month since meteorological observations have been recorded at BNL.)

	Snowfall (in.)							
Month	<1.0	1.0 to 3.9	4.0 to 5.9	6.0 to 7.9	8.0 to 9.9	⩾10.0	Total days	Greatest snowfall, in.
Oct	7	1					8	1.00
Nov	35	4					39	3.80
Dec	96	46	5	3	2	2	154	15.00
Jan	103	62	7	5	1	2	180	14.00
Feb	103	66	10	2	0	6	187	15.30
Mar	96	46	5	5	1	2	155	15.00
Apr	18	5					23	3.50
Seasonal total							746	74.45

Table 29

Distribution of Daily Snowfall (%), Dec 1947 – Dec 1973

(Percent of snowfalls observed in the class interval shown.)

	Snowfall (in).					
Month	<1.0	1.0 to 3.9	4.0 to 5.9	6.0 to 7.9	8.0 to 9.9	⩾10.0
Oct	87.5	12.5				
Nov	89.7	10.3				
Dec	62.4	29.9	3.2	1.9	1.3	1.3
Jan	57.2	34.4	3.9	2.8	0.6	1.1
Feb	55.1	35.3	5.3	1.1	0.0	3.2
Mar	62.0	29.7	3.2	3.2	0.6	1.3
Apr	78.3	21.7				
Season	61.5	30.8	3.6	2.0	0.5	1.6

Table 30

Percentage Frequency of Daily Dew-Point Temperatures, Jun – Sep

[Percentage of days on which the indicated dew-point (saturation mixing ratio in g water vapor per kg dry air) values were observed.]

	Dew point, °F											
	30 to 34.9	35 to 39.9	40 to 44.9	45 to 49.9	50 to 54.9	55 to 59.9	60 to 64.9	65 to 69.9	70 to 74.9	75 to 79.9	80 to 84.9	85 to 89.9
Max			1	1	6	13	18	30	24	7	0	<1
Min	1	5	10	14	19	15	20	13	3			
	Saturation mixing ratio											
	3.5 to 4.3	4.3 to 5.3	5.3 to 6.4	6.4 to 7.8	7.8 to 9.3	9.3 to 11.2	11.2 to 13.3	13.3 to 16.0	16.0 to 19.0	19.0 to 22.5	22.5 to 27.0	27.0 to 31.8

Table 31

Average No. of Days With Dew-Point Temperatures ⩾60°F and ⩾71°F for 18 to 24 hr

	Jun	Jul	Aug	Sep	Season
⩾60°F	12	22	18	7	59
⩾71°F	1	3	2	<1	6

Table 32

Percent of Hours Per Month With Dew-Point Temperatures ⩾60°F and ⩾71°F

	Jun	Jul	Aug	Sep	Season
⩾60°F	49	79	69	34	58
⩾71°F	0	21	10	3	10

Table 33

Percent of Hours Wet Bulb Temperature Was ⩾67°F, May 1 – Oct 31,* 1954–1969

Year	May	Jun	Jul	Aug	Sep	Oct	Seasonal
1954	1	17	29	18	8	7	13
1955	<1	5	54	55	7	1	20
1956	2	18	37	19	9	0	14
1957	4	40	38	28	29	0	23
1958	0	7	61	43	13	<1	21
1959	–	–	–	–	–	–	–
1960	1	28	46	52	13	2	24
1961	<1	22	59	59	53	3	32
1962	6	20	30	42	16	1	19
1963	1	15	45	33	4	<1	16
1964	2	16	46	29	15	0	17
1965	11	22	37	52	39	1	27
1966	1	26	49	55	15	2	25
1967	1	44	68	57	15	3	31
1968	0	12	50	50	19	–	26
1969	4	21	43	62	32	4	28
16-yr av	2	21	46	44	18	2	21

*Air-conditioning season.

Table 34

Wet Bulb Temperatures (°F), 1960 –1969

(Percent of hours that the wet bulb temperature occurred within the interval shown.)

Month	1 to 5	6 to 10	11 to 15	16 to 20	21 to 25	26 to 30	31 to 35	36 to 40	41 to 45	46 to 50	51 to 55	56 to 60	61 to 65	66 to 70	71 to 75	76 to 80	81 to 85	⩾86
Jan	2.0	4.6	8.9	14.4	16.9	17.9	16.3	11.0	5.3	2.2	0.5	<0.1						
Feb	2.0	4.6	6.7	13.5	16.1	20.2	21.2	9.6	3.9	1.7	0.4	0.1	<0.1					
Mar	0.2	0.7	2.3	5.7	12.3	18.0	27.1	18.0	9.6	4.1	1.9	0.1						
Apr			0.2	0.5	1.9	6.1	11.5	24.7	22.1	12.7	7.5	3.3	4.0	2.5	2.3	0.6	0.1	
May					0.1	0.8	3.2	8.0	16.1	21.7	21.3	18.2	7.2	2.6	0.7	0.1	<0.1	
Jun								0.4	2.2	6.0	14.0	23.7	27.6	19.7	5.9	0.8	<0.1	
Jul								<0.1	0.4	1.5	6.9	13.9	23.8	29.1	19.2	4.9	0.3	
Aug						<0.1	<0.1	0.1	1.2	3.0	7.9	12.9	20.8	27.1	21.7	4.9	0.4	
Sep						0.1	1.0	2.5	5.3	10.4	15.5	19.5	20.3	16.3	7.3	1.7	0.1	
Oct			0.1	0.2	1.0	3.6	7.6	11.7	14.8	17.2	17.3	13.3	10.4	2.5	0.3	<0.1		
Nov			0.5	1.9	5.5	13.0	16.5	15.9	15.3	13.9	10.0	6.1	1.3	0.1				
Dec	1.0	1.9	6.1	11.2	17.9	20.8	16.4	11.1	6.5	5.3	1.4	0.4						
Annual	0.4	1.0	2.1	3.9	6.0	8.3	10.0	9.4	8.5	8.3	8.7	9.3	9.6	8.4	4.9	1.1	0.1	

Table 35

Diurnal Variation of Average Wet Bulb Temperature (°F), 1960 1969

	Hour of day																							
Month	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Av
Jan	22	22	22	21	22	22	21	21	23	25	26	26	28	28	28	27	26	25	24	24	24	23	23	23	24
Feb	23	23	22	22	22	21	22	22	25	26	27	28	29	29	29	29	28	27	26	25	25	24	24	23	25
Mar	28	27	26	26	26	26	26	28	30	32	33	33	34	34	35	34	34	33	31	31	30	29	29	28	30
Apr	37	37	36	36	36	36	38	40	42	43	44	44	44	45	44	44	44	43	42	42	41	40	39	38	41
May	46	46	45	44	44	44	48	49	50	52	52	53	53	53	54	53	53	53	52	51	50	49	48	48	50
Jun	58	57	56	56	56	58	60	61	62	62	63	63	63	63	63	63	63	63	62	62	60	60	59	58	60
Jul	62	62	61	60	60	62	64	65	66	65	66	67	67	67	67	67	67	68	68	67	66	65	64	63	65
Aug	61	61	60	60	60	61	63	64	65	66	66	66	66	66	67	68	68	68	67	66	64	64	63	62	64
Sep	55	55	54	54	54	54	56	59	60	61	60	60	61	61	62	61	62	62	60	59	58	57	56	56	58
Oct	43	42	42	41	41	41	42	46	49	50	50	51	51	51	51	51	50	49	47	47	45	44	44	43	46
Nov	37	37	36	36	36	35	35	37	40	42	42	43	43	43	42	42	41	40	39	38	38	37	37	37	39
Dec	25	25	25	24	24	23	24	24	27	29	30	30	31	31	30	30	29	27	27	27	26	26	25	24	27
Annual	41	41	40	40	40	40	42	43	45	46	46	47	48	48	48	47	47	46	45	45	44	43	42	42	44

Table 36

Relative Humidity (%), 1960–1969

(Percent of hours that the relative humidity was within the intervals shown.)

Month	1 to 5	6 to 10	11 to 15	16 to 20	21 to 25	26 to 30	31 to 35	36 to 40	41 to 45	46 to 50	51 to 55	56 to 60	61 to 65	66 to 70	71 to 75	76 to 80	81 to 85	86 to 90	91 to 95	96 to 100
Jan		<0.1	0.2	0.4	1.3	3.0	4.5	5.6	5.6	6.6	6.6	5.5	4.7	5.1	4.3	3.5	3.5	3.0	3.3	3.3
Feb			0.1	0.9	2.7	4.2	4.9	5.6	7.0	6.9	6.2	5.3	4.4	4.3	3.8	3.2	3.4	3.0	3.5	3.0
Mar	0.1	0.3	1.3	2.1	3.1	3.7	4.7	5.2	5.7	5.6	6.1	4.8	4.6	3.8	3.1	3.2	2.9	2.4	2.5	3.4
Apr	<0.1	0.3	0.8	2.7	3.0	3.8	4.5	4.2	5.4	5.2	4.4	4.0	4.0	3.4	3.7	2.4	3.8	3.2	3.2	3.8
May	<0.1	0.2	0.7	1.7	2.3	3.2	4.7	4.5	4.7	4.9	4.6	4.0	3.9	3.9	3.4	3.7	3.1	4.2	3.0	3.9
Jun			0.1	0.6	1.3	2.0	2.1	2.9	3.6	4.1	3.7	3.6	3.3	4.0	3.7	3.1	3.5	3.8	4.1	5.0
Jul			<0.1	0.4	1.1	1.9	2.2	2.3	2.3	3.2	3.6	3.6	3.5	4.2	4.1	3.3	3.7	4.4	3.4	5.2
Aug				0.1	0.5	1.4	1.6	2.4	2.5	3.2	3.8	3.4	3.9	3.5	4.0	3.4	3.4	3.6	3.6	5.5
Sep		<0.1	<0.1	0.2	0.5	1.1	1.9	2.5	3.3	3.6	3.5	4.0	3.3	3.6	3.6	2.9	3.2	3.2	3.2	5.6
Oct			0.1	0.5	1.2	1.7	2.9	4.4	5.0	4.8	4.6	4.1	4.3	3.3	3.7	3.3	2.9	2.4	2.5	4.8
Nov	<0.1	0.0	0.2	0.4	0.8	1.7	3.0	4.7	5.5	5.7	5.4	4.4	4.0	3.1	3.2	2.6	2.9	3.2	3.2	4.6
Dec		0.1	0.1	0.2	0.8	1.5	2.5	4.3	5.5	6.7	6.6	5.4	4.9	4.4	4.2	3.5	3.2	2.8	2.7	4.0
Annual	<0.1	0.1	0.3	0.8	1.6	2.4	3.3	4.0	4.7	5.0	4.9	4.3	4.1	3.9	3.7	3.2	3.3	3.3	3.2	4.3

Table 37

Diurnal Variation of Average Relative Humidity (%), 1960–1969

	Hour of day																							
Month	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Av
Jan	78	78	78	78	79	79	80	78	72	65	58	55	54	53	53	57	61	66	69	71	73	74	75	77	69
Feb	77	78	78	79	80	80	80	77	70	64	59	56	54	53	52	54	57	62	66	70	72	73	74	75	68
Mar	78	79	80	81	82	81	80	72	62	57	53	51	48	47	47	49	52	57	64	68	71	73	76	78	66
Apr	85	86	86	87	88	86	78	68	60	62	52	49	49	48	49	51	54	61	68	73	78	80	82	83	69
May	89	90	91	92	92	87	74	64	58	54	51	49	48	49	49	52	56	62	72	78	82	84	86	88	71
Jun	96	97	97	98	98	93	82	73	66	62	59	57	57	57	58	62	66	73	82	90	93	95	95	96	79
Jul	97	97	97	98	98	96	87	76	68	64	60	58	58	59	60	64	68	76	86	91	94	96	96	97	81
Aug	96	97	97	98	97	96	90	81	71	66	61	60	60	59	61	66	71	81	90	94	95	95	96	96	82
Sep	95	96	96	96	96	96	90	82	72	64	61	59	58	59	61	65	74	85	91	94	94	94	94	94	82
Oct	90	91	91	92	92	92	90	80	68	59	54	52	50	50	51	58	68	78	83	85	86	87	88	89	76
Nov	85	86	86	86	86	87	86	82	75	66	60	57	56	56	58	63	69	74	77	80	81	83	85	86	75
Dec	82	83	83	84	85	85	86	85	77	69	63	59	58	58	59	63	67	72	76	77	79	79	80	82	75
Annual	87	88	88	89	89	88	84	76	68	63	58	55	54	54	55	59	64	70	77	81	83	84	86	87	74

Table 38

Percentage Frequency of Daily Insolation, 1950–1958

	Insolation in Langleys (g-cal/cm²)																		
Month	0 to 50	51 to 100	101 to 150	151 to 200	201 to 250	251 to 300	301 to 350	351 to 400	401 to 450	451 to 500	501 to 550	551 to 600	601 to 650	651 to 700	701 to 750	751 to 800	801 to 850	851 to 900
Jan	18	18	13	14	23	12	2											
Feb	11	9	8	9	11	13	15	17	7									
Mar	6	10	8	5	4	5	6	10	11	13	13	7	2	<1				
Apr	3	5	8	3	7	4	4	6	7	8	7	12	13	10	3	<1		
May	1	4	4	3	3	4	4	6	6	6	9	6	10	12	14	7	1	
Jun	0	2	2	3	4	4	3	3	4	4	6	8	10	14	15	15	2	1
Jul	0	2	2	2	2	2	4	3	3	5	8	11	11	11	20	13	3	<1
Aug	0	3	5	3	2	5	4	7	7	9	10	16	16	9	4	<1		
Sep	1	4	5	3	7	6	7	6	14	17	12	10	6	1	1			
Oct	3	5	7	7	10	14	13	17	15	8	1							
Nov	11	9	14	17	24	19	6	<1										
Dec	13	12	21	32	21	1												
Annual	6	7	8	8	11	7	5	6	6	6	6	6	6	6	4	2	<1	<1

Table 39

Averages and Extremes of Daily Insolation, 1950–1958

(Amounts received at the surface of the earth.)

Month	Av daily total	Highest daily total		Lowest daily total	
	Langleys	Langleys	Year	Langleys	Year
Jan	149	300	1954	<1	1958
Feb	233	448	1955	10	1958
Mar	333	660	1957	10	1958
Apr	427	754	1957	8	1958
May	501	829	1957	37	1954
Jun	575	807	1957	50	1950
Jul	557	840	1957	65	1956
Aug	478	768	1951	49	1950
Sep	396	728	1954	16	1950
Oct	300	512	1955	31	1956
Nov	184	367	1951	10	1950
Dec	146	285	1956	2	1955
Annual	357	867	1957	<1	1950

Solar Radiation

Insolation measurements (Tables 38 and 39) were made with an Eppley thermoelectric pyrheliometer located on top of the Meteorology building at an elevation of 35 ft. The pyrheliometer was connected to a Leeds & Northrup Micromax recorder in the building. The data cover the period Jan 1950 through Dec 1958. At the location of the instrument there were no major obstructions that might affect the recording of insolation.

The Langley, the standard unit of measurement of insolation, is used to denote one gram-calorie per square centimeter.

Average sunshine recorded in the New York City area is 59% annually, with a high of 66% in the summer and a low of 50% in the winter[2] (Table 40).

Barometric Pressure

Station pressure is recorded on a microbarograph corrected at regular intervals to a mercurial barometer.

The data in Figures 2 to 9 cover the period Apr 1950 through Mar 1952 and show the diurnal features of station pressure by solar hour for each solar season (see Table 41).[3]

Wind Data

Wind direction and wind speed measurements are made at the 37, 150, and 355-ft levels of the BNL meteorological tower. Only data from the 37 and 355-ft levels are used in this report.

Hourly averages of wind direction and wind speed were obtained from Esterline Angus recorder charts. Since the installation of an automatic recording system in 1960, some of the wind data have consisted of hourly averages of 6-min instantaneous readings.[4]

The wind rose is a graphical illustration of the frequency of wind direction. Monthly and annual wind roses for the wind direction at the 37-ft level during all observed hours between Aug 1948 and Jul 1951 are presented in Figures 10 through 22.

(Text continued on page 27)

Table 40

Average Percentage of Possible Sunshine Received at Cities Near Long Island as Compared With Two Western Cities

Month	Boston	Providence	Hartford	New Haven	Albany	New York	Phoenix	Seattle
Jan	52	50	47	52	44	50	77	28
Feb	56	56	54	60	51	55	79	34
Mar	58	58	56	60	54	57	83	42
Apr	55	57	54	58	52	59	88	48
May	57	60	57	61	56	62	93	52
Jun	63	63	59	64	61	65	94	49
Jul	66	63	62	66	65	66	84	63
Aug	66	62	60	65	62	64	85	56
Sep	64	60	57	64	59	63	89	53
Oct	61	60	55	62	56	61	88	36
Nov	52	51	46	53	39	53	84	28
Dec	54	51	46	54	40	50	77	23
Annual	59	58	55	60	54	59	85	45

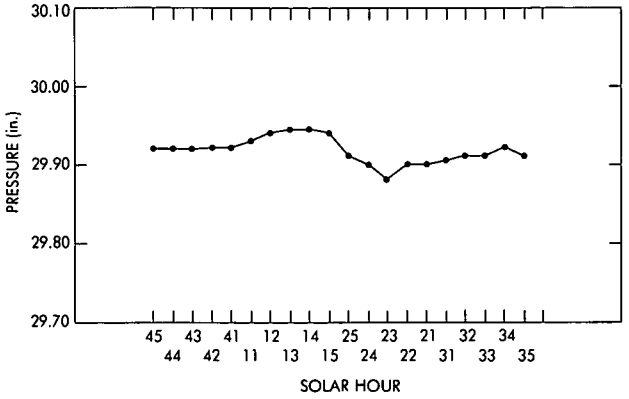

Figure 2. Annual station pressure by solar hour, Apr 1950 – Mar 1952.

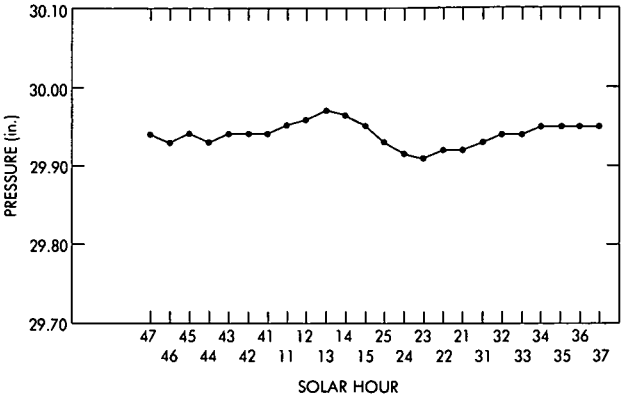

Figure 3. Winter station pressure by solar hour, solar season V (Nov 16–30, Dec–Feb).

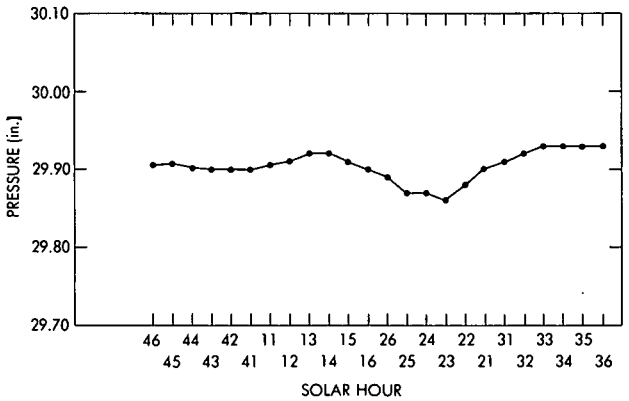

Figure 4. Spring station pressure by solar hour, solar season W_s (Mar 1–31).

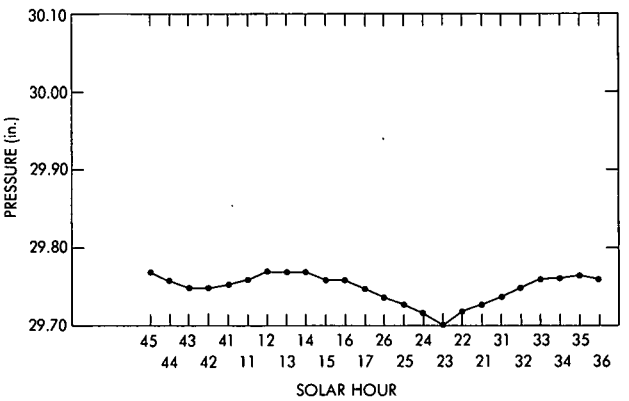

Figure 5. Spring station pressure by solar hour, solar season X_s (Apr 1–15).

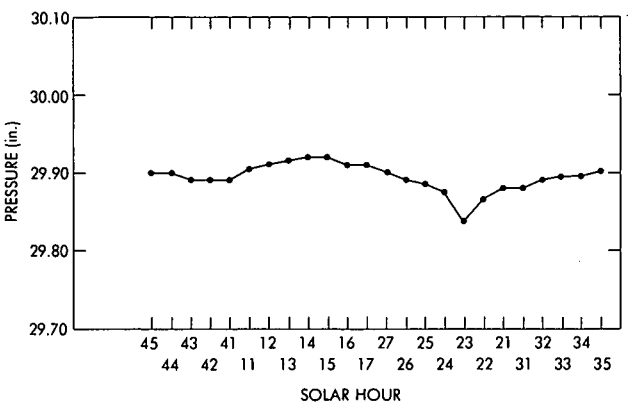

Figure 6. Summer station pressure by solar hour, solar season Y (Apr 16–30, May–Aug).

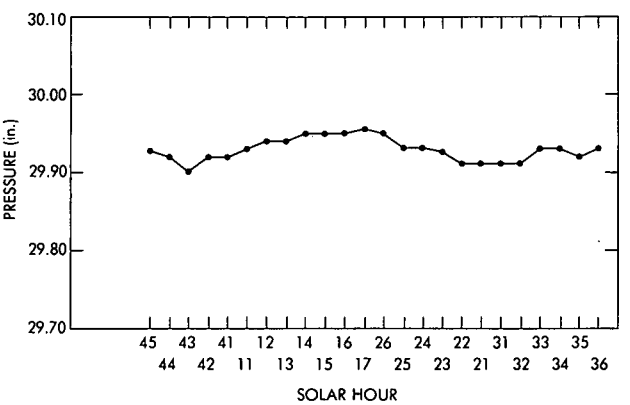

Figure 7. Fall station pressure by solar hour, solar season X_f (Sep 1–15).

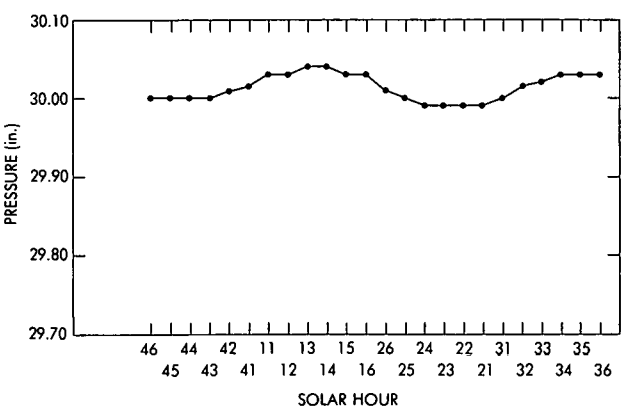

Figure 8. Fall station pressure by solar hour, solar season W_f (Sep 16–30).

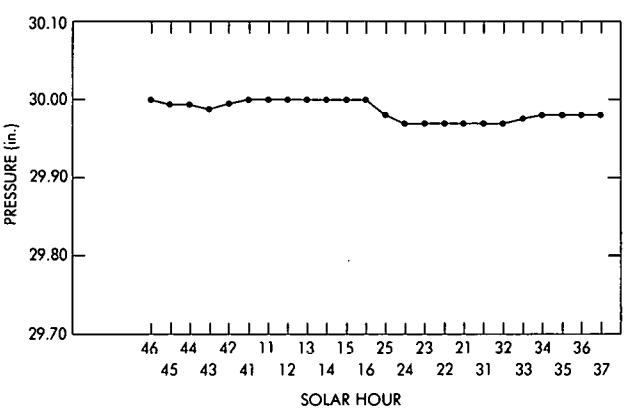

Figure 9. Fall station pressure by solar hour, solar season Z (Oct, Nov 1–15).

Table 41

Annual Solar Time Index

The first digit of the index indicates the period (period 4, midnight to sunrise; period 1, sunrise to midday; period 2, midday to sunset; period 3, sunset to midnight). The second digit gives the hour number within the period.

Standard time	Jan		Feb		Mar		Apr		May		June	
	1–15	16–31	1–15	16–28	1–15	16–31	1–15	16–30	1–15	16–31	1–15	16–30
0100	47	47	47	47	46	46	45	45	45	45	44	44
0200	46	46	46	46	45	45	44	44	44	44	43	43
0300	45	45	45	45	44	44	43	43	43	43	42	42
0400	44	44	44	44	43	43	42	42	42	42	41	41
0500	43	43	43	43	42	42	41	41	41	41	11	11
0600	42	42	42	42	41	41	11	11	11	11	12	12
0700	41	41	41	41	11	11	12	12	12	12	13	13
0800	11	11	11	11	12	12	13	13	13	13	14	14
0900	12	12	12	12	13	13	14	14	14	14	15	15
1000	13	13	13	13	14	14	15	15	15	15	16	16
1100	14	14	14	14	15	15	16	16	16	16	17	17
1200	15	15	15	15	16	16	17	17	17	17	18	18
1300	25	25	25	26	26	26	26	27	27	27	27	27
1400	24	24	24	25	25	25	25	26	26	26	26	26
1500	23	23	23	24	24	24	24	25	25	25	25	25
1600	22	22	22	23	23	23	23	24	24	24	24	24
1700	21	21	21	22	22	22	22	23	23	23	23	23
1800	31	31	31	21	21	21	21	22	22	22	22	22
1900	32	32	32	31	31	31	31	21	21	21	21	21
2000	33	33	33	32	32	32	32	31	31	31	31	31
2100	34	34	34	33	33	33	33	32	32	32	32	32
2200	35	35	35	34	34	34	34	33	33	33	33	33
2300	36	36	36	35	35	35	35	34	34	34	34	34
2400	37	37	37	36	36	36	36	35	35	35	35	35

	Jul		Aug		Sep		Oct		Nov		Dec	
	1–15	16–31	1–15	16–31	1–15	16–30	1–15	16–31	1–15	16–30	1–15	16–31
0100	45	45	45	45	45	46	46	46	46	47	47	47
0200	44	44	44	44	44	45	45	45	45	46	46	46
0300	43	43	43	43	43	44	44	44	44	45	45	45
0400	42	42	42	42	42	43	43	43	43	44	44	44
0500	41	41	41	41	41	42	42	42	42	43	43	43
0600	11	11	11	11	11	41	41	41	41	42	42	42
0700	12	12	12	12	12	11	11	11	11	41	41	41
0800	13	13	13	13	13	12	12	12	12	11	11	11
0900	14	14	14	14	14	13	13	13	13	12	12	12
1000	15	15	15	15	15	14	14	14	14	13	13	13
1100	16	16	16	16	16	15	15	15	15	14	14	14
1200	17	17	17	17	17	16	16	16	16	15	15	15
1300	27	27	27	27	26	26	25	25	25	25	24	25
1400	26	26	26	26	25	25	24	24	24	24	23	24
1500	25	25	25	25	24	24	23	23	23	23	22	23
1600	24	24	24	24	23	23	22	22	22	22	21	22
1700	23	23	23	23	22	22	21	21	21	21	31	21
1800	22	22	22	22	21	21	31	31	31	31	32	31
1900	21	21	21	21	31	31	32	32	32	32	33	32
2000	31	31	31	31	32	32	33	33	33	33	34	33
2100	32	32	32	32	33	33	34	34	34	34	35	34
2200	33	33	33	33	34	34	35	35	35	35	36	35
2300	34	34	34	34	35	35	36	36	36	36	37	36
2400	35	35	35	35	36	36	37	37	37	37	38	37

Solar Seasons

V	W	X	Y	X	W	Z	V
Winter		Spring		Summer		Fall	
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

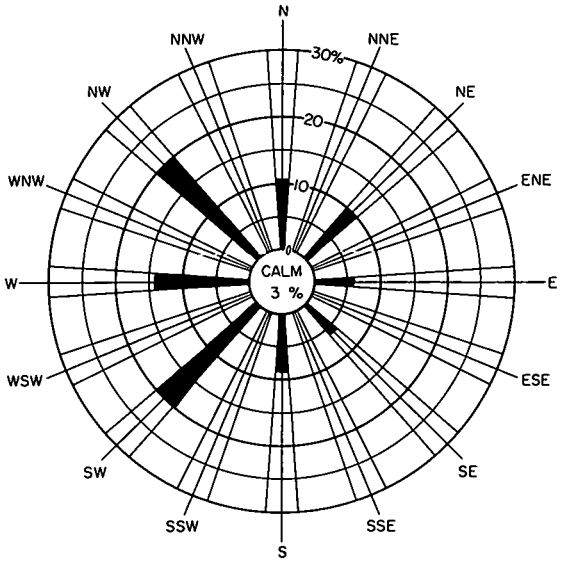

Figure 10. Wind direction rose, 37-ft level, Jan.

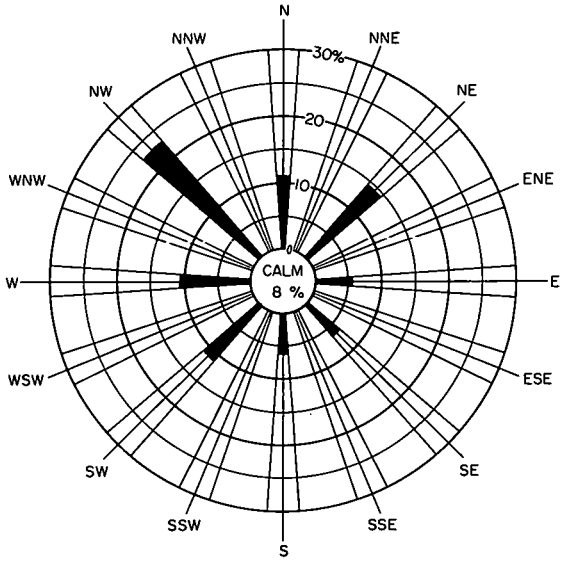

Figure 11. Wind direction rose, 37-ft level, Feb.

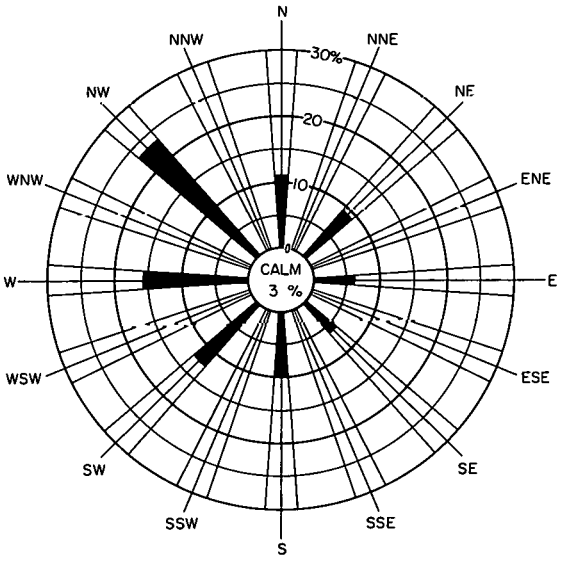

Figure 12. Wind direction rose, 37-ft level, Mar.

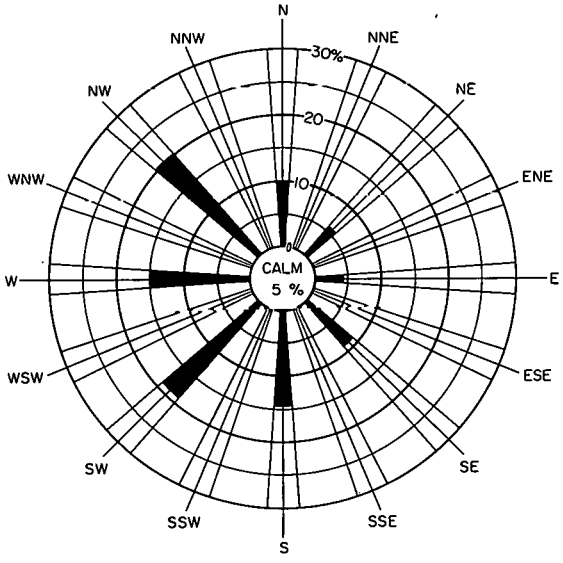

Figure 13. Wind direction rose, 37-ft level, Apr.

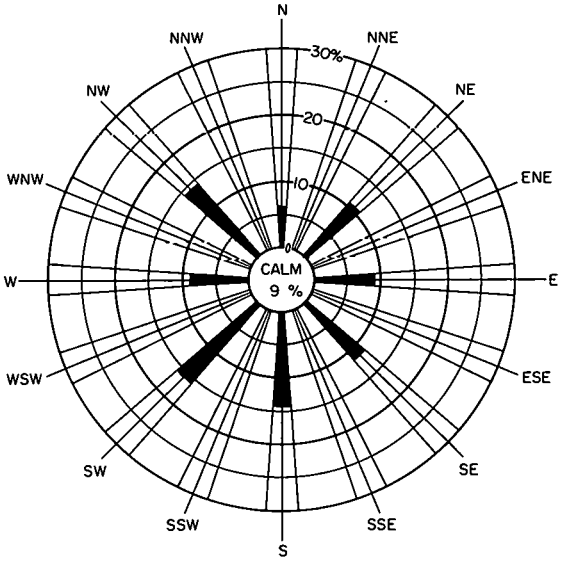

Figure 14. Wind direction rose, 37-ft level, May.

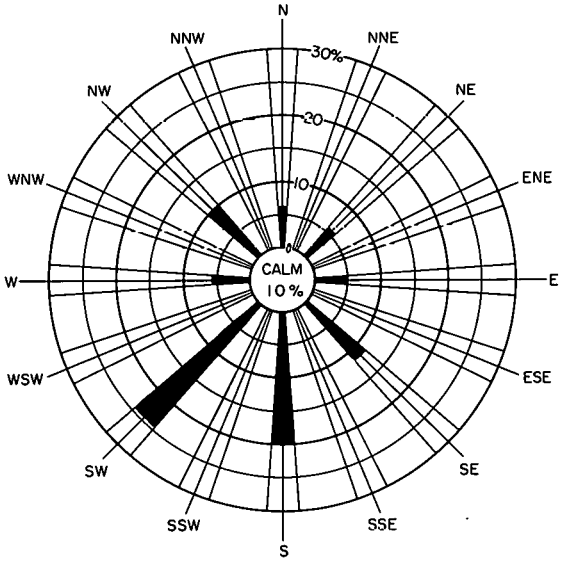

Figure 15. Wind direction rose, 37-ft level, Jun.

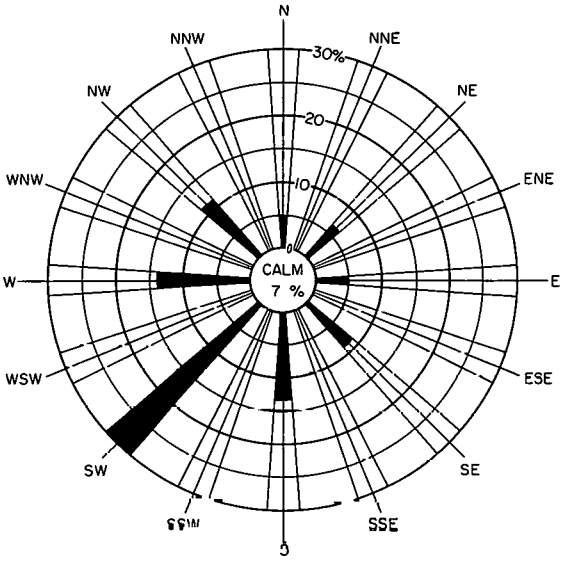

Figure 16. Wind direction rose, 37-ft level, Jul.

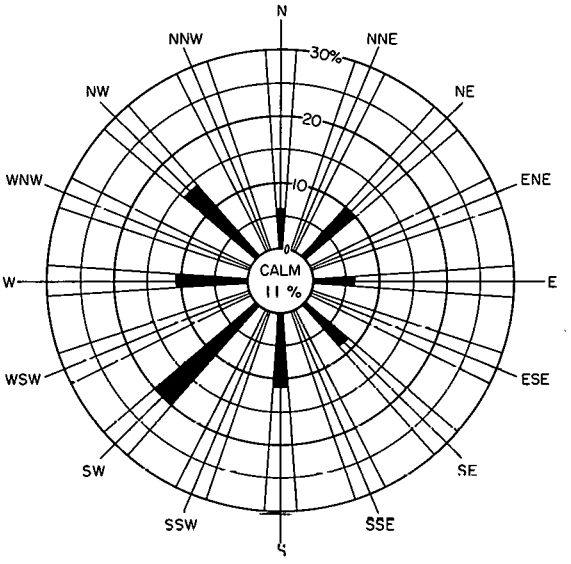

Figure 17. Wind direction rose, 37-ft level, Aug.

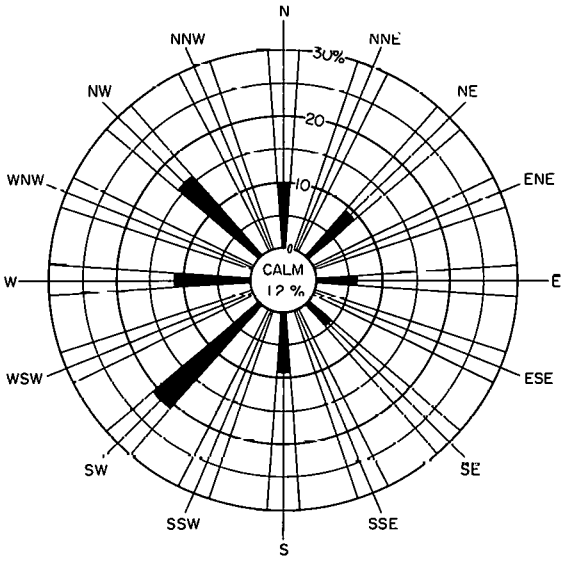

Figure 18. Wind direction rose, 37-ft level, Sep.

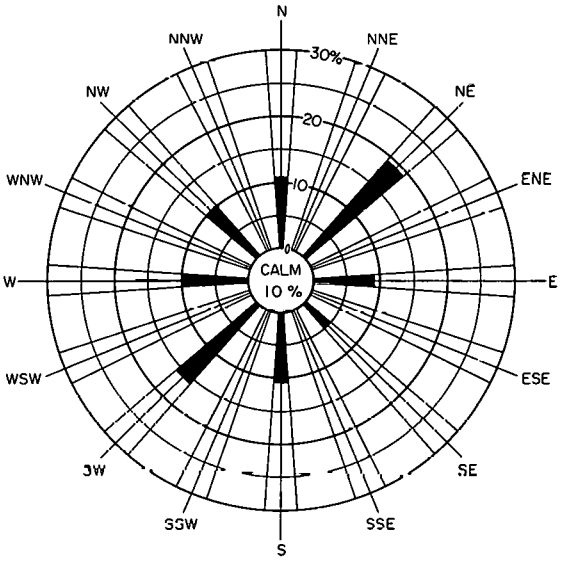

Figure 19. Wind direction rose, 37-ft level, Oct.

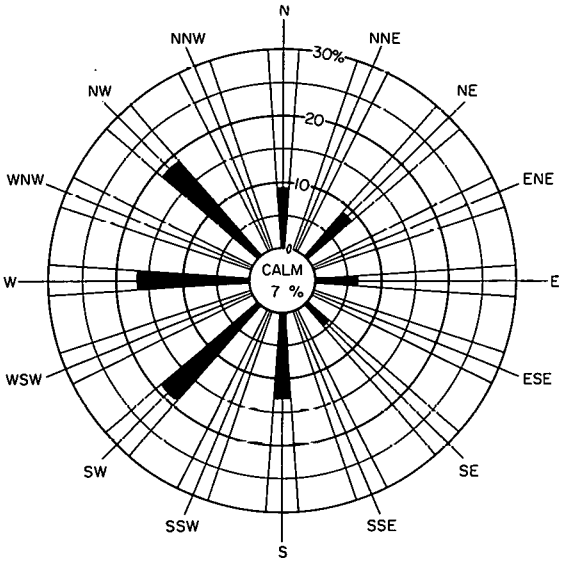

Figure 20. Wind direction rose, 37-ft level, Nov.

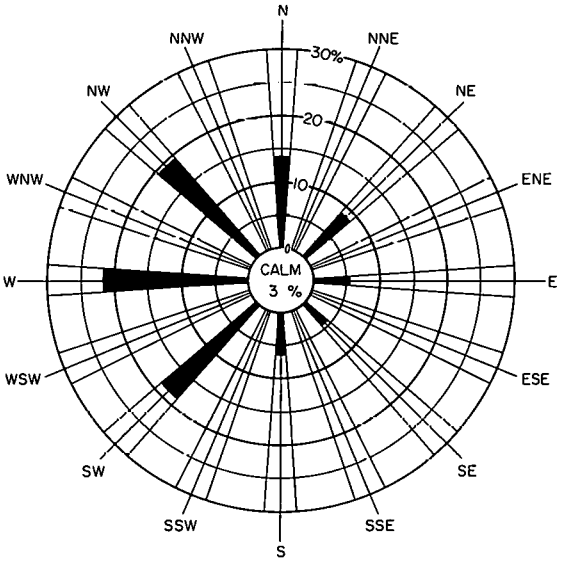

Figure 21. Wind direction rose, 37-ft level, Dec.

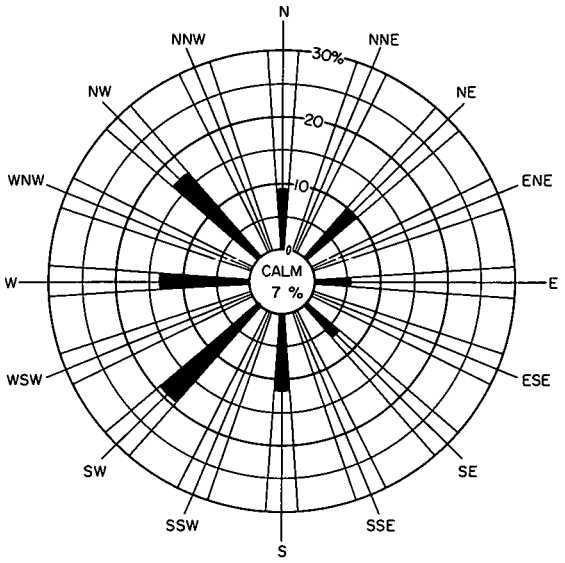

Figure 22. Wind direction rose, 37-ft level, Annual, Aug 1948 – Jul 1951.

Table 42

Peak Wind Speeds (meters/sec) at BNL, 1949–1973

Northwest (293–337.5°)

Tower level (ft)	Peak wind (Sep 11, 1954, Hurricane Edna, hr ending 1200 EST) Hourly mean	Peak
355	27.0	49.5
150	20.0	29.3
37	14.5	28.2
Gustiness		C
Air temp.		63°F
Temp. diff., 410 to 37 ft		−0.5°F
Relative humidity		96%
Station pressure		28.940 in.
Sky condition		Overcast
Precipitation		Heavy rainfall; max rate occurred at this time

Table 43

Peak Wind Speeds (meters/sec) at BNL, 1949–1973

West (248–292.5°)

Tower level (ft)	Peak wind (Sep 12, 1960, Hurricane Donna, hr ending 1700 EST) Hourly mean	Peak
355	21.0	35.9
150	18.3	32.8
37	12.5	29.2
Gustiness		C
Air temp.		61°F
Temp. diff., 410 to 37 ft		0°
Station pressure		28.760 in.
Relative humidity		100%
Sky condition		Overcast
Precipitation		None

Table 44

Peak Wind Speeds (meters/sec) at BNL, 1949–1973

Southwest (203–247.5°)

Tower level (ft)	Peak wind (Jan 15, 1962, hr ending 1800 EST) Hourly mean	Peak
355	20.0	32.5
150	16.2	29.4
37	7.6	19.1
Gustiness		C
Air temp.		52.2°F
Temp. diff., 410 to 37 ft		0°
Relative humidity		96%
Station pressure		29.480 in.
Sky condition		Overcast
Precipitation		Heavy rain

Table 45

Peak Wind Speeds (meters/sec) at BNL, 1949–1973

South (158–202.5°)

Tower level (ft)	Peak wind (Nov 28, 1958, hr ending 2100 EST) Hourly mean	Peak	2nd Highest wind (Apr 1, 1962, hr ending 0600 EST) Hourly mean	Peak
355	20.5	32.5	21.3	29.5
150	N.A.*	N.A.	N.A.	N.A.
37	N.A.	N.A.	9.5	19.0
Gustiness		C		C
Air temp.		60°F		53.0°F
Temp. diff., 410 to 37 ft		−0.4°		−0.1°
Relative humidity		88%		96%
Station pressure		29.460 in.		29.485 in.
Sky condition		Overcast		Overcast
Precipitation		Heavy rain		Light rain

*N.A. = not available.

Table 46

Peak Wind Speeds (meters/sec) at BNL, 1949–1973

Southeast (113–157.5°)

Tower level (ft)	Peak wind (Sep 12, 1960, Hurricane Donna, hr ending 1400 EST) Hourly mean	Peak
355	23.0	40.2
150	21.0	36.7
37	16.0	29.0
Gustiness		C
Air temp.		70°F
Temp. diff., 410 to 37 ft		0°
Relative humidity		100%
Station pressure		28.730 in.
Sky condition		Overcast
Precipitation		Heavy rain and fog

Table 48

Peak Wind Speeds (meters/sec) at BNL, 1949–1973

Northeast (023–067.5°)

Tower level (ft)	Peak wind (Aug 31, 1954, Hurricane Carol, hr ending 0900 EST) Hourly mean	Peak
355	30.0	50.0*
150	24.0	49.1
37	16.0	36.2
Gustiness		C
Air temp.		62°F
Temp. diff., 410 to 37 ft		−0.5°
Relative humidity		94%
Station pressure		28.640 in.
Sky condition		Overcast
Precipitation		Heavy rainfall, max hourly rate occurred at this time.

*Estimated at 125 miles/hr at the 410-ft level.

Table 47

Peak Wind Speeds (meters/sec) at BNL, 1949–1973

East (068–112.5°)

Tower level (ft)	Peak wind (Nov 25, 1950, hr ending 1900 EST[a]) Hourly mean	Peak	2nd Highest wind (Aug 13, 1955, hr ending 0900 EST[b]) Hourly mean	Peak
355	27.0	45.0	21.5	30.2
150	N.A.[c]	N.A.	18.5	29.5
37	15.0	N.A.	11.0	22.0
Gustiness		C		C
Air temp.		55°F		75°F
Temp. diff., 410 to 37 ft		0°		−0.3°
Relative humidity		100%		83%
Station pressure		29.180 in.		29.730 in.
Sky condition		Overcast (500-ft ceiling)		Overcast
Precipitation		Heavy rain		Moderate rain

[a]During an intense Atlantic Coastal storm. [b]During Hurricane Connie. [c]N.A. = not available.

Table 49

Peak Wind Speeds (meters/sec) at BNL, 1949–1973

North (338–022.5°)

Tower level (ft)	Peak wind (Sep 21, 1961, Hurricane Esther, 0600–0800 EST) Hourly mean	Peak
355	27.0	41.8
150	19.5	35.9
37	12.0	27.6
Gustiness		C
Air temp.		61.5°F
Temp. diff., 410 to 37 ft		−0.2°
Relative humidity		100%
Station pressure		29.255 in.
Sky condition		Overcast (<1500-ft ceiling)
Precipitation		Heavy rain

Table 50

Percentage Frequency of 37-ft Wind Speed, Aug 1948 – July 1951

(Percent of hours during which wind speeds in the designated classes occurred.)

Month	Miles/hr 0–5	5.1–12	12.1–25	≥25.1
Jan	44	42	14	0
Feb	32	50	17	1
Mar	29	45	26	0
Apr	26	51	22	1
May	37	51	12	0
Jun	34	54	12	0
Jul	53	45	2	0
Aug	55	42	3	0
Sep	53	40	7	0
Oct	47	47	6	0
Nov	38	47	14	1
Dec	52	38	10	0
Annual	42	46	12	<1

The wind direction represents the direction from which the wind blows, with data plotted to 8 points of the compass (Tables 42 to 49). Wind speeds for the same level and period are given in Table 50.

In a later section (Diffusion Climatology), wind direction roses for 355 ft during the period 1960–1973 are presented with data plotted to 16 points of the compass.

Storms and Hurricanes

The highest wind speeds at BNL have been associated with hurricanes. A speed of 125 miles/hr was estimated during Hurricane Carol on August 31, 1954. Hurricanes generally occur from June through October, with a few weak or declining storms in May and November. In September there is a 92% chance that there will be at least one tropical cyclone somewhere in the North Atlantic and a 42% chance that there will be three or more storms. Between 1901 and 1931 hurricanes of more than minor intensity rarely affected the northeastern states (Table 51). Since 1932, sections of the coast have been severely affected, with several hurricanes moving inland or passing close enough offshore to bring storms or hurricane winds, heavy rainfall, or high storm tides.[5]

Intense Atlantic Coastal storms are common in the area. The lowest pressures recorded at the Laboratory, together with total storm precipitation, are given in Table 52.

Tornadoes and hail storms are extremely rare occurrences on Long Island; the average annual frequency of tornadoes is <1.[6]

Meteorological Extremes

The meteorological extremes of temperature, degree days, precipitation, wind speed, and barometric pressure at BNL from 1949 to 1973 are given in Table 53.

DIFFUSION CLIMATOLOGY

The climatic data included in this section were compiled from data recorded at the Laboratory between Feb 1960 and Dec 1973.

The frequency distributions of wind speed, wind direction, and stability presented in the following sections were based on the BNL Gustiness Classification (Figure 23). The classification is a visual interpretation of the wind direction trace; A and B_2 represent the very unstable case; B_1, the typical daytime unstable case; C, the strong wind-speed neutral stability case; and D, the nighttime stable case.[8]

Stability Classes

The tables presented in this and the following section cover the seasonal and annual frequency distribution of BNL gustiness classes (Tables 54 to 56) and the joint distribution of wind speed and wind direction by BNL gustiness classes (Tables 57 to 92). All analyses were prepared from data recorded at the 355-ft level of the meteorological tower at Brookhaven National Laboratory.

Table 55 shows that during very unstable and neutral hours (gustiness classes A, B_2, and C), the prevailing direction is west-northwest; it becomes more southerly, with a peak from the southwest, during stable hours (gustiness D). During the typical daytime stability condition (gustiness B_1) the prevailing directions are south-southwest and west-northwest.

Wind Velocity by Stability Classes

Tables 57 through 62 present a joint frequency distribution of wind speed and wind direction by Brookhaven gustiness types. During unstable atmospheric conditions wind speeds are shown to decrease with increasing instability; the prevailing wind direction is generally from west to northwest during very unstable conditions and from the southwest and northwest during the typical daytime instability condition. Neutral wind speeds are most frequently observed between 8 and 10 meters/sec from the southwest. Stable wind speeds are observed between 4 and 8 meters/sec, also from the southwest.

Tables 63 through 92 present seasonal and annual joint frequency distributions of wind speed and wind direction by Brookhaven gustiness types. In some of the tables the columns do not add up because of rounding.

Wind Direction Roses

The seasonal and annual wind direction roses in Figures 24 to 38 were developed for gustiness types B_1 and D and for all stability hours combined for the period 1960–1973. Hours included in the B_1 and D wind roses constitute 82.3% of all observed hours.

(Text continued on page 52)

Table 51

Hurricanes Affecting Long Island Since 1743
(From Dunn and Miller[7])

Date	Year	Intensity*
Sep ?	1743	Minor
Aug 19	1700	Minimal
Sep 22	1815	Major
Sep 2–3	1821	Major
Sep 17–18	1876	Minor
Oct 23	1878	Major
Aug 18–19	1879	High tides
Sep 9–12	1889	Minimal
Aug 23–24	1893	Minor
Aug 28–29	1893	Minor
Oct 13	1893	Minimal
Oct 9–10	1894	Minor
Sep 29–30	1896	Major
Oct 31	1899	High tides
Sep 15–16	1903	Minor
Oct 2	1929	Minor
Aug 23–24	1933	Major
Sep 8	1934	Minimal
Sep 21	1938	Minimal
Sep 14–15	1944	Major
Aug 30–31	1954	Minor
Sep 10–11	1954	Minor
Oct 15	1954	Major
Aug 12–13	1955	Minor
Aug 17–18	1955	Major
Sep 12	1960	Minor
Sep 21	1961	Minor

*Intensity classification:

	Maximum winds (mph)	Minimum central pressure (in.)
Minor	<74	>29.40
Minimal	74–100	29.03–29.40
Major	101–135	28.01–29.00

Table 52

Lowest Pressures of Intense Storms Affecting BNL,
Jan 1949 – Dec 1973

Date	Lowest pressure (in.)	Total storm precipitation (in)
Nov 2, 1949	29.130	0.78
Nov 25, 1950	29.180	3.93 (Atlantic Coastal low)
Jan 15, 1951	28.985	2.30
Feb 7, 1951	29.055	1.58
Mar 11, 1952	29.040	1.42
Jan 20, 1953	29.015	0.94
Feb 15, 1953	28.865	1.77
Aug 31, 1954	28.620	4.07 (Hurricane Carol)
Sep 11, 1954	28.940	9.02 (Hurricane Edna)
Dec 14/15, 1954	29.035	2.14
Feb 11, 1955	29.100	0.47
Feb 25, 1956	29.020	0.61
Mar 16, 1956	29.120	0.71 (5.5 in. snow)
Apr 8, 1956	28.885	1.34 (1.5 in. snow)
Dec 29, 1956	28.965	0.26
Mar 9, 1957	28.980	0.36
Jan 7/8, 1958	28.930	2.09 (14 in. snow)
Feb 16/17, 1958	28.870	1.73 (17 in. snow)
Jan 16, 1959	28.780	0.43
Mar 6, 1959	29.000	1.63
Mar 12, 1959	28.980	1.68 (5.5 in. snow)
Feb 19, 1960	28.885	1.32
Sep 12, 1960	28.375	4.64 (Hurricane Donna)
Mar 6, 1963	28.930	1.31
Nov 30, 1963	28.770	1.25
Jan 16, 1964	29.000	0.77
Jan 30, 1966	28.780	0.98
Mar 1, 1968	28.740	1.65 (1.0 in. snow)
Mar 13, 1968	29.320	4.27 (2.0 in. snow)
Nov 12, 1968	28.950	2.11
Dec 22, 1969	28.990	1.17
Apr 2, 1970	28.890	2.63
Nov 5, 1970	29.120	0.67
Jan 26, 1971	28.970	0.24
Feb 8/9, 1971	29.160	2.07
Feb 23, 1971	29.220	1.49
Mar 3/4, 1971	28.520	1.41
Nov 29/30, 1971	29.220	2.16
Feb 3/4, 1972	28.980	1.43 (trace snow)
Feb 19/20, 1972	28.830	2.28 (3.0 in. snow)
Mar 17/18, 1972	29.060	0.98
Jun 22, 1972	28.920	1.59 (Hurricane Agnes)
Oct 7, 1972	29.060	5.65 (Atlantic Coastal low)
Nov 8/9, 1972	29.015	1.84
Nov 26, 1972	29.080	1.18
Jan 29, 1973	28.980	1.14 (3.0 in. snow)
Mar 17, 1973	28.900	1.01
Dec 17, 1973	29.140	1.28
Dec 21, 1973	29.040	2.07

Table 53

Meteorological Extremes at BNL, 1949–1973

Observation	Record
Absolute highest temperature	100.5°F, Jul 22, 1957
Absolute lowest temperature	−23.0°F, Jan 22, 1961
Greatest daily temperature range	52°
Least daily temperature range	2°
Max annual degree days (total)	6753 for 1967
Max monthly degree days	1342 for Jan 1970
Max annual precipitation	59.60 in. for 1958
Min annual precipitation	34.35 in. for 1965
Max monthly precipitation	11.98 in., Aug 1954
Min monthly precipitation	Trace for Jun 1949
Max daily precipitation	8.63 in. Sep 11, 1954*
Max total rainfall, single storm	9.02 in., Hurricane Edna, Sep 10-11, 1954*
Max hourly rainfall	2.10 in., Hurricane Edna, Sep 11, 1954*
Max seasonal snowfall**	74.9 in. 1966–67
Max monthly snowfall**	32.0 in., Feb 1967
Max daily snowfall**	15.3 in., Feb 1958
Max snowfall, single storm**	19.0 in., Dec 1947
Longest period of continuous snow cover**	55 days (Dec 26, 1947 – Feb 18, 1948)
Absolute first day of snowfall	Oct 17
Absolute last day of snowfall	Apr 27
Peak wind speed	125 miles/hr (estimated at 410 ft), 0900 EST, Aug 31, 1954, during Hurricane Carol
Lowest barometric pressure	28.375 in., 1450 EST, Sep 12, 1960, during Hurricane Donna

*Precipitation reading may be high since shielding became disarranged. One-half mile WNW of official rain gage, 7.72 in. were recorded.

**Snowfall data cover the period 1947–1973.

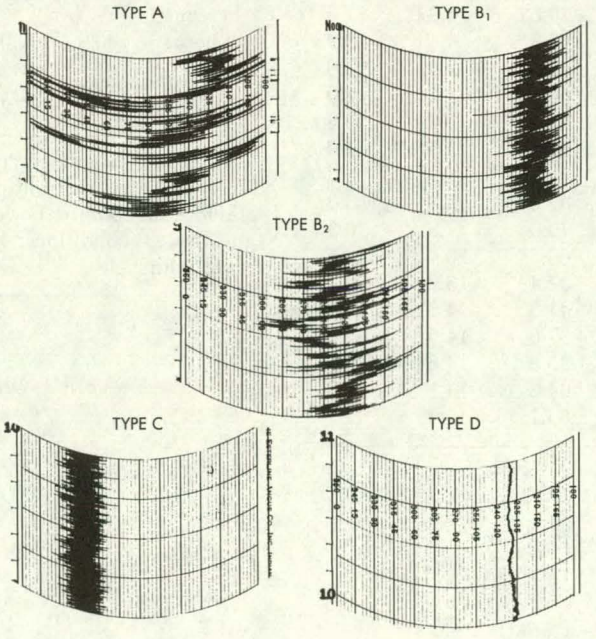

Figure 23. BNL gustiness classes.

Table 54

Distribution of Gustiness Hours (%), 1960–1973

Season	Gustiness class				
	A	B_2	B_1	C	D
Winter	0.7	5.5	53.5	11.9	28.4
Spring	1.6	9.9	52.0	11.6	24.9
Summer	1.5	7.4	52.8	4.3	34.0
Fall	1.1	6.0	49.2	8.7	35.0
Annual	1.2	7.2	51.8	9.3	30.5

Table 55

Percent of Gustiness Hours by Wind Direction, 1960–1973

Direction	Gustiness class					All hours
	A	B_2	B_1	C	D	
N	1.3	3.1	5.2	3.1	6.2	5.2
NNE	5.5	4.5	4.8	4.5	5.7	4.9
NE	4.6	5.9	4.8	5.9	4.5	4.9
ENE	6.0	4.0	4.4	4.0	3.8	4.6
E	5.1	2.1	3.6	2.1	2.8	3.4
ESE	6.1	1.8	3.4	1.8	3.2	3.1
SE	2.8	2.5	3.3	2.5	3.5	3.2
SSE	3.4	2.5	3.4	2.5	4.0	3.5
S	1.8	1.6	4.6	1.6	4.0	4.3
SSW	5.0	6.0	13.6	6.0	8.2	11.4
SW	6.7	5.1	9.7	5.1	11.8	10.4
WSW	7.7	5.8	5.0	5.8	9.3	6.5
W	12.0	10.0	5.7	10.0	8.2	6.8
WNW	16.3	19.8	10.6	19.8	8.4	10.3
NW	8.8	14.5	8.7	14.5	8.5	8.8
NNW	6.9	10.8	9.2	10.8	7.9	8.7
Percent of hours	100.0	100.0	100.0	100.0	100.0	100.0
Percent of total hours	1.2	7.2	51.8	9.3	30.5	

NOTE: To obtain percent of total observed hours for any single category, multiply percent shown by percent of total for that column. For example, south winds and stable (gustiness D) conditions: 4.0% × 30.5% = 1.2% of total observed hours.

Table 56

Diurnal Variation of Gustiness Classes (% of Hours), 1960–1973

Hour ending (EST)	Gustiness class				
	A	B_2	B_1	C	D
0100		0.1	33.9	12.7	53.3
0200		0.1	33.7	12.5	53.7
0300		*	33.3	11.9	54.8
0400		0.1	33.5	11.5	54.9
0500		*	33.8	10.8	55.4
0600		*	35.7	10.9	53.4
0700	0.1	0.3	46.7	10.0	42.9
0800	0.6	3.0	63.5	7.9	25.0
0900	1.9	10.0	70.6	5.9	11.6
1000	4.1	18.8	68.8	4.4	3.9
1100	5.6	26.6	62.4	3.8	1.6
1200	5.7	29.6	60.1	3.6	1.0
1300	5.0	28.7	61.9	3.6	0.8
1400	2.9	25.1	67.4	3.6	1.0
1500	1.8	17.9	74.9	4.1	1.3
1600	0.8	8.8	82.0	5.1	3.3
1700	0.1	3.3	79.0	7.3	10.3
1800		0.5	66.5	10.4	22.6
1900		0.2	52.4	13.2	34.2
2000		0.2	41.5	14.3	44.0
2100		0.1	37.6	14.5	47.8
2200		0.1	35.8	14.6	49.5
2300		0.1	34.8	14.1	51.0
2400		*	34.7	13.1	52.2

*>0 but <0.05%.

Table 57

Joint Frequency Distribution of Wind Speed and Wind Direction
for Gustiness A (Extremely Unstable), 1960–1973

Wind direction	Wind speed (meters/sec)								
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+
N	0.2	0.6	0.5						
NNE	0.4	2.7	2.4						
NE	0.3	2.0	2.2	0.1					
ENE	0.5	4.5	0.9						
E	0.8	2.9	1.1	0.1					
ESE	0.6	4.0	1.5						
SE	0.6	1.4	0.8		0.1				
SSE	0.4	2.1	0.9						
S	0.3	0.7	0.7						
SSW		2.0	2.7	0.1	0.3				
SW	0.3	3.1	3.1	0.1	0.1	0.1			
WSW	0.3	3.8	2.7	0.6	0.3	0.1			
W	1.1	5.3	4.8	0.5	0.1	0.1			
WNW	0.6	6.4	5.9	1.9	1.0	0.3			
NW	0.3	3.7	4.0	0.7	0.2	0.1			
NNW	0.2	3.3	3.2	0.2	0.1				
Total	6.9	48.5	37.4	4.3	2.2	0.7	0.0	0.0	0.0

Total cases, 1164 (1.2% of total observations).

Table 58

Joint Frequency Distribution of Wind Speed and Wind Direction
for Gustiness B_2 (Very Unstable), 1960–1973

Wind direction	Wind speed (meters/sec)								
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+
N	*	0.4	1.7	0.6	0.3	*	0.1		
NNE	*	0.8	2.5	1.0	0.2	0.1	*		
NE	*	0.7	3.2	1.4	0.4	0.1		*	
ENE	*	0.8	1.7	0.9	0.4	0.1	*		
E	*	0.5	1.0	0.4	0.1		*		
ESE	*	0.6	0.7	0.4	0.1	*			
SE	*	0.6	1.2	0.6	0.1				
SSE	0.1	0.6	1.1	0.6	0.1				
S	*	0.4	0.7	0.3	*	0.1			
SSW	*	0.7	2.9	1.6	0.6	0.1			
SW	*	0.5	2.1	1.3	0.8	0.1	0.1		
WSW		0.9	2.4	1.2	0.7	0.5	0.1		
W	0.1	1.0	2.6	2.6	1.6	1.2	0.8	*	
WNW	*	1.2	4.2	5.5	4.8	2.2	1.9	0.2	*
NW	*	0.6	3.8	3.8	3.6	1.9	0.9	0.1	
NNW	*	1.2	4.3	2.6	1.7	0.7	0.2		
Total	0.6	11.5	36.1	24.8	15.5	7.1	4.1	0.3	*

*>0 but <0.05%.
Total cases, 6957 (7.2% of total observations).

Table 59

Joint Frequency Distribution of Wind Speed and Wind Direction for Gustiness B_1 (Typical Daytime Instability), 1960–1973

Wind direction	Wind speed (meters/sec)								
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+
N	*	0.1	0.7	1.5	1.9	0.7	0.2	*	
NNE		0.1	0.9	1.4	1.3	0.7	0.3	*	*
NE	*	0.2	0.8	1.6	1.5	0.5	0.2	0.1	
ENE	*	0.3	1.6	1.5	0.7	0.1	*	*	
E	*	0.2	1.1	1.2	0.6	0.3	0.1	*	*
ESE	*	0.2	0.8	1.2	0.9	0.2	0.1	*	*
SE	*	0.1	0.9	1.1	0.8	0.3	0.1	*	
SSE	*	0.1	1.0	1.1	0.9	0.3	0.2	*	
S	*	0.1	1.0	1.8	1.1	0.5	0.2	*	
SSW	*	0.2	1.7	4.3	4.6	2.2	0.6	*	
SW	*	0.1	1.1	2.8	3.6	1.6	0.5	*	
WSW	*	0.1	0.7	1.3	1.7	0.8	0.3	0.1	*
W	*	0.1	0.6	1.3	1.8	1.1	0.6	0.1	*
WNW		0.1	0.6	1.0	3.1	2.3	2.1	0.1	*
NW		0.1	0.7	1.6	2.8	2.1	1.3	0.1	*
NNW		0.1	0.9	1.8	3.3	2.0	1.0	0.1	
Total	0.2	2.2	15.3	27.3	30.7	15.7	7.8	0.8	*

*>0 but <0.05%.
Total cases, 50,004 (51.8% of total observations).

Table 60

Joint Frequency Distribution of Wind Speed and Wind Direction for Gustiness C (Neutral Stability), 1960–1973

Wind direction	Wind speed (meters/sec)								
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+
N		*	*	0.1	0.9	1.4	1.4	0.3	0.1
NNE		0.1	*	0.1	0.3	0.9	1.6	0.2	0.1
NE	*		*	0.3	1.6	1.6	2.0	0.5	0.1
ENE	*		0.8	2.7	3.5	1.1	0.8	0.2	0.1
E		*	0.2	0.8	1.1	0.9	0.7	0.1	0.1
ESE				0.1	0.3	0.5	0.6	0.2	*
SE			*	0.1	0.4	0.4	0.9	0.4	*
SSE				*	0.5	0.9	1.3	0.5	*
S				0.2	1.1	1.8	2.1	0.8	0.1
SSW			0.1	0.3	2.7	5.3	6.0	0.9	*
SW			0.1	0.4	4.2	6.1	3.2	0.3	
WSW			0.1	0.2	2.2	2.8	1.0	0.1	
W			0.1	0.2	1.5	1.8	0.8	0.2	*
WNW			0.1	0.2	1.9	2.3	1.8	0.3	0.1
NW	*		*	0.1	0.9	2.0	2.4	0.5	0.1
NNW		0.1	*	0.1	1.2	2.6	2.1	0.5	0.1
Total	0.1	0.2	1.5	5.9	24.3	32.4	28.7	6.0	0.9

*>0 but <0.05%.
Total cases, 8954 (9.3% of total observations).

Table 61

Joint Frequency Distribution of Wind Speed and Wind Direction,
Gustiness D (Stable), 1960–1973

Wind direction	Wind speed (meters/sec)								
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+
N	0.1	0.3	1.2	2.3	2.0	0.3	*		
NNE	0.1	0.3	1.2	2.1	1.5	0.3	*	*	
NE	0.1	0.5	1.3	1.5	0.9	0.2			
ENE	0.1	0.7	1.7	0.7	0.3	0.1			
E	0.1	0.8	1.0	0.8	0.3	*	*		
ESE	0.1	0.5	1.0	1.2	0.3	0.1	*		
SE	0.1	0.5	1.2	1.2	0.5	0.1	*		
SSE	0.1	0.5	1.2	1.4	0.7	0.1	*		
S	0.1	0.3	1.0	1.5	0.9	0.2	0.1		
SSW	0.1	0.5	1.5	2.5	2.4	1.0	0.1	*	
SW	0.1	0.5	1.5	3.0	4.6	2.0	0.2	*	
WSW	0.1	0.5	1.4	2.3	3.1	1.7	0.2	*	
W	0.1	0.4	1.4	2.1	2.8	1.2	0.2		
WNW	0.1	0.5	1.5	2.5	2.8	0.9	0.1		
NW	0.1	0.5	1.5	2.9	2.7	0.7	0.1		
NNW	0.1	0.5	1.4	2.7	2.6	0.5	0.1		
Total	1.6	7.8	21.0	30.7	28.4	9.4	1.1	*	0.0

*>0 but <0.05%.
Total cases, 29,408 (30.5% of total observations).

Table 62

Joint Frequency Distribution of Wind Speed and Wind Direction,
All Gustiness Hours, Annual, 1960–1973

(Percentages obtained by using all observed hours, Jan–Dec.)

Wind direction	Wind speed (meters/sec)									
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N	*	0.2	0.9	1.5	1.7	0.6	0.3	*	*	5.2
NNE	0.1	0.3	1.0	1.4	1.2	0.5	0.3	*	*	4.9
NE	*	0.2	1.1	1.4	1.3	0.5	0.3	0.1	*	4.9
ENE	*	0.5	1.5	1.4	0.9	0.2	0.1	*	*	4.6
E	0.1	0.4	1.0	1.0	0.6	0.2	0.1	*		3.4
ESE	0.1	0.3	0.8	1.0	0.6	0.2	0.1	*	*	3.1
SE	*	0.3	0.9	1.0	0.6	0.2	0.2	*		3.2
SSE	*	0.3	0.9	1.1	0.6	0.3	0.2	0.1		3.5
S	*	0.2	0.9	1.4	0.9	0.5	0.3	0.1	*	4.3
SSW	0.1	0.3	1.6	3.1	3.4	1.9	0.9	0.1		11.4
SW	*	0.3	1.2	2.5	3.7	2.0	0.6	0.1		10.4
WSW	0.1	0.3	1.0	1.5	2.1	1.2	0.3	*		6.5
W	0.1	0.3	1.0	1.5	2.0	1.2	0.5	0.1	*	6.8
WNW	0.1	0.4	1.2	2.1	3.1	1.9	1.4	0.1	*	10.3
NW	*	0.3	1.2	2.0	2.6	1.6	1.0	0.1	*	8.8
NNW	*	0.4	1.3	2.0	2.7	1.5	0.7	0.1	*	8.7
Total	0.7	5.0	17.5	25.9	28.0	14.5	7.3	1.0	0.1	100.0

*>0 but <0.05%.

Table 63

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness A (Extremely Unstable), Winter Season, 1960–1973

(Percentages obtained by using all observed hours, Dec–Feb.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.0–14.0	14.1–18.0	18+	Total
N										
NNE	*	*								*
NE		*								*
ENE		*	*							*
E	*									*
ESE		*	*							0.1
SE		*	*							*
SSE										
S		*								*
SSW		*	*							*
SW		*	*							*
WSW		*	*							0.1
W	*	*	*	*						0.1
WNW	*	0.1	*	*	*	*				0.2
NW		*	*	*						0.1
NNW		*	*							*
Total	*	0.3	0.2	0.1	*	*				0.7

*>0 but <0.05%.

Table 64

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness B_2 (Very Unstable), Winter Season, 1960–1973

(Percentages obtained by using all observed hours, Dec–Feb.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N		*	0.1	*	*					0.1
NNE		*	0.1	*						0.1
NE		*	0.1	*						0.2
ENE		*	0.1	*	*					0.1
E		*	*	*	*					0.1
ESE		*	*	*						0.1
SE		0.1	*							0.1
SSE		0.1	*	*						0.1
S		*	*							*
SSW		*	0.1	0.1	0.1	*				0.2
SW		*	0.1	0.1	*	*				0.2
WSW		*	0.1	0.1	0.1	0.1	*			0.4
W	*	0.1	0.2	0.2	0.2	0.1	0.1			0.9
WNW		0.1	0.2	0.4	0.4	0.2	0.2	*		1.5
NW		*	0.2	0.2	0.2	0.1	0.1	*		0.8
NNW		0.1	0.2	0.2	0.1	*				0.6
Total	*	0.6	1.5	1.3	1.1	0.5	0.4	*		5.5

*>0 but <0.05%.

Table 65

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness B_1 (Typical Daytime Instability), Winter Season, 1960–1973

(Percentages obtained by using all observed hours, Dec–Feb.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N	*	0.1	0.3	0.8	1.4	0.4	0.2	*		3.3
NNE		0.1	0.3	0.7	0.9	0.4	0.2	*		2.6
NE		0.1	0.4	0.8	0.8	0.3	0.1			2.5
ENE		0.1	0.7	0.7	0.4	0.1	*			2.1
E	*	0.1	0.4	0.4	0.4	0.2	0.1			1.5
ESE		*	0.3	0.3	0.3	0.1	*	0.1		1.1
SE		*	0.2	0.3	0.2	0.1	0.2			1.0
SSE		*	0.2	0.2	0.2	0.1	0.1	*		0.9
S		*	0.2	0.2	0.3	0.1	0.1	*		0.9
SSW		0.1	0.4	0.6	0.8	0.5	0.2	*		2.6
SW		0.1	0.3	1.0	1.2	0.7	0.4	*		3.7
WSW		*	0.3	0.9	1.5	0.7	0.3	0.1		3.8
W		0.1	0.3	1.0	1.7	1.2	0.7	0.2		5.2
WNW		0.1	0.4	1.2	2.9	2.2	1.8	0.2		8.6
NW		*	0.5	1.1	2.3	1.9	1.4	0.2		7.4
NNW		0.1	0.5	1.1	2.4	1.3	0.8	0.1		6.3
Total	*	1.0	5.7	11.3	17.7	10.3	6.6	0.9	*	53.5

*>0 but <0.05%.

Table 66

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness C (Neutral Stability), Winter Season, 1960–1973

(Percentages obtained by using all observed hours, Dec–Feb.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N					0.1	0.1	0.2	0.1	*	0.4
NNE					*	0.2	0.2	0.1		0.4
NE				0.1	0.2	0.3	0.3	*		0.9
ENE	*		0.1	0.4	0.5	0.1	0.1	*		1.3
E			*	*	0.1	0.1	0.1	*		0.4
ESE				*	*	0.1	0.1	*		0.2
SE					*	*	0.2	0.1		0.3
SSE					0.1	0.1	0.2	0.1	*	0.5
S					0.1	0.2	0.2	0.1	*	0.6
SSW					0.2	0.4	0.6	0.1		1.2
SW				*	0.3	0.5	0.3	*		1.1
WSW				*	0.4	0.5	0.1	*		1.1
W				*	0.3	0.2	0.2	*		0.8
WNW			*	0.1	0.3	0.3	0.3	*	*	1.1
NW				*	0.1	0.3	0.4	0.2	*	1.0
NNW				*	0.1	0.1	0.3	0.1		0.6
Total	*		0.1	0.7	2.8	3.5	3.8	0.9	0.1	11.9

*>0 but <0.05%.

Table 67

Joint Frequency Distribution of Wind Speed and Wind Direction,
Gustiness D (Stable), Winter Season, 1960–1973

(Percentages obtained by using all observed hours, Dec–Feb.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N	*	0.1	0.4	0.7	0.5	*				1.7
NNE	*	0.2	0.4	0.7	0.4	*				1.7
NE	0.1	0.1	0.4	0.5	0.1	*				1.2
ENE	0.1	0.2	0.5	0.2	*	*				1.0
E	*	0.2	0.3	0.1	0.1					0.7
ESE	*	0.2	0.1	0.2	0.1	*	*			0.7
SE	*	0.1	0.2	0.3	0.1	*				0.8
SSE	*	0.1	0.2	0.4	0.3	0.1				1.1
S	*	0.1	0.1	0.3	0.2	0.1	*			0.8
SSW	*	0.2	0.4	0.4	0.5	0.2	*			1.7
SW	*	0.1	0.1	0.7	0.0	0.5	0.1			2.6
WSW	*	0.1	0.5	0.7	1.0	0.4	*			2.8
W	*	0.1	0.6	0.8	1.1	0.4	*			3.0
WNW	*	0.1	0.6	1.0	1.0	0.2				2.9
NW	*	0.2	0.6	1.3	0.9	0.1	*			3.1
NNW	*	0.2	0.5	1.0	0.7	0.1	*			2.6
Total	0.5	2.3	6.2	9.3	7.8	2.1	0.2			28.4

*>0 but <0.05%.

Table 68

Joint Frequency Distribution of Wind Speed and Wind Direction,
All Gustiness Hours, Winter Season, 1960–1973

(Percentages obtained by using all observed hours, Dec–Feb.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.0–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N	*	0.2	0.8	1.5	1.9	0.6	0.4	0.1	*	5.5
NNE	0.1	0.3	0.8	1.4	1.3	0.5	0.4	0.1		4.9
NE	0.1	0.2	0.9	1.3	1.2	0.7	0.4	*		4.8
ENE	0.1	0.4	1.4	1.3	1.0	0.2	0.1	*		4.5
E	0.1	0.3	0.7	0.7	0.5	0.2	0.2	*		2.7
ESE	0.1	0.2	0.4	0.6	0.4	0.2	0.1	0.1		2.1
SE	*	0.2	0.5	0.5	0.4	0.2	0.3	0.1		2.3
SSE	*	0.2	0.5	0.6	0.5	0.3	0.3	0.1	*	2.5
S	*	0.1	0.4	0.5	0.6	0.4	0.3	0.1	*	2.4
SSW	*	0.3	0.8	1.1	1.5	1.1	0.9	0.1		5.8
SW	*	0.2	0.8	1.8	2.4	1.6	0.7	0.1		7.6
WSW	*	0.3	0.9	1.7	3.0	1.6	0.5	0.1		8.1
W	0.1	0.3	1.1	2.1	3.3	1.9	1.0	0.1		10.0
WNW	*	0.4	1.2	2.6	4.6	2.9	2.3	0.2	*	14.2
NW	*	0.3	1.2	2.7	3.5	2.4	1.9	0.4	*	12.4
NNW	*	0.3	1.3	2.3	3.3	1.6	1.2	0.2		10.2
Total	0.6	4.2	13.7	22.7	29.4	16.5	11.0	1.8	0.1	100.0

*>0 but <0.05%.

Table 69

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness A (Extremely Unstable), Spring Season, 1960–1973

(Percentages obtained by using all observed hours, Mar–May.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N			*							*
NNE		*	0.1							0.1
NE		*	0.1							0.1
ENE	*	0.1	*							0.1
E		0.1	*							0.1
ESE	*	0.1	*							0.1
SE	*	*	*							0.1
SSE	*	*	*							0.1
S		*								*
SSW		*	*							*
SW		*	0.1							0.1
WSW		*	*	*	*					0.1
W	*	0.1	0.1	*						0.2
WNW		0.1	0.1	0.1	*					0.2
NW		0.1	0.1	*						0.2
NNW		*	0.1	*						0.1
Total	0.1	0.6	0.7	0.1	*					1.6

*>0 but <0.05%.

Table 70

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness B_2 (Very Unstable), Spring Season, 1960–1973

(Percentages obtained by using all observed hours, Mar–May.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N		*	0.1	0.1	0.1					0.3
NNE		*	0.2	0.1	*					0.4
NE		0.1	0.2	0.1	0.1					0.5
ENE	*	0.1	0.2	0.1	*					0.4
E		*	0.1	*	*					0.2
ESE		*	0.1	0.1	*	*				0.2
SE		*	0.1	0.1	*					0.2
SSE	*	*	0.1	0.1	*					0.2
S	*	*	0.1	*	*					0.1
SSW		*	0.2	0.2	0.1	*				0.6
SW		*	0.2	0.1	0.1	*	*			0.4
WSW		0.1	0.2	0.1	0.1	*	*			0.5
W	*	*	0.2	0.2	0.2	0.1	0.1			0.9
WNW		0.1	0.2	0.4	0.6	0.3	0.3	*		2.0
NW		0.1	0.3	0.4	0.6	0.3	0.2	*		1.9
NNW		0.1	0.3	0.3	0.2	0.1	*			1.1
Total	0.1	0.8	2.8	2.5	2.1	1.0	0.6	*		9.9

*>0 but <0.05%.

Table 71

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness B_1 (Typical Daytime Instability), Spring Season, 1960–1973

(Percentages obtained by using all observed hours, Mar–May.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N		*	0.4	0.8	1.0	0.4	0.1			2.7
NNE		0.1	0.4	0.7	0.7	0.2	0.2	*		2.3
NE		0.1	0.4	0.7	0.7	0.1	0.1	*		2.1
ENE	*	0.2	0.9	0.8	0.5	0.1				2.5
E	0.1	0.2	0.7	0.8	0.4	0.3	0.2	*		2.7
ESE	*	0.2	0.7	0.9	0.9	0.3	0.1	*	*	3.1
SE	*	0.1	0.6	0.9	0.4	0.2	0.1	*		2.3
SSE	*	0.1	0.4	0.8	0.6	0.2	0.1			2.2
S		0.1	0.5	1.1	0.6	0.3	0.1			2.7
SSW	*	0.1	0.6	1.9	2.3	1.4	0.5	*		6.8
SW		*	0.5	0.9	1.4	0.7	0.2	*		3.7
WSW	*	*	0.3	0.5	0.5	0.3	0.2	*		1.9
W		*	0.2	0.4	0.7	0.5	0.4	0.1	*	2.3
WNW		0.1	0.3	0.8	1.7	1.2	1.0	0.1		5.2
NW		*	0.3	0.7	1.7	1.2	0.5	*		4.4
NNW		*	0.5	1.1	1.9	1.1	0.5	*		5.1
Total	0.2	1.2	7.7	13.8	16.0	8.5	4.3	0.3	*	52.0

*>0 but <0.05%.

Table 72

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness C (Neutral Stability), Spring Season, 1960–1973

(Percentages obtained by using all observed hours, Mar–May.)

Wind direction	Wind speed (meters/sec) ⩽0.05	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N		*		*	0.1	0.2	0.2	*		0.5
NNE		*		*	*	0.1	0.3	*		0.4
NE			*	*	0.1	0.1	0.3	0.1	*	0.7
ENE			0.1	0.3	0.5	0.2	0.1	*	*	1.2
E			*	0.1	0.2	0.1	0.1	*		0.5
ESE					*	*	0.1	*		0.2
SE					*	*	*	*		0.1
SSE					0.1	0.1	0.2	0.1	*	0.4
S				*	0.1	0.1	0.3	0.2	*	0.7
SSW					0.2	0.5	0.8	0.2	*	1.8
SW				*	0.3	0.6	0.7	0.1		1.7
WSW				*	0.1	0.2	0.2			0.5
W				*	0.1	0.2	0.1	*	*	0.5
WNW			*	*	0.2	0.3	0.2	*	*	0.8
NW				*	0.1	0.3	0.3	*		0.7
NNW		*		*	0.2	0.5	0.2	*		0.9
Total		*	0.1	0.6	2.4	3.7	3.9	0.8	0.1	11.6

*>0 but <0.05%.

Table 73

Joint Frequency Distribution of Wind Speed and Wind Direction,
Gustiness D (Stable) Spring Season, 1960–1973

(Percentages obtained by using all observed hours, Mar–May.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N	*	0.1	0.3	0.5	0.7	0.1	*			1.7
NNE	*	0.1	0.3	0.5	0.4	0.1				1.4
NE	0.1	0.1	0.3	0.3	0.3	*				1.1
ENE	0.1	0.2	0.4	0.2	0.1	*				1.0
E	*	0.2	0.2	0.2	0.1	*				0.7
ESE	*	0.1	0.3	0.4	0.1	*				1.0
SE	*	0.1	0.3	0.3	0.2	*				0.9
SSE	0.1	0.2	0.3	0.3	0.2	*				1.1
S	*	0.1	0.3	0.3	0.3	*	*			1.0
SSW	*	0.1	0.3	0.5	0.5	0.3	0.1			1.8
SW	*	0.1	0.3	0.7	1.0	0.7	0.1			2.9
WSW	*	0.1	0.3	0.4	0.6	0.4	0.1			1.9
W	*	0.1	0.3	0.4	0.4	0.3	0.1			1.6
WNW	*	0.1	0.4	0.5	0.9	0.4	*			2.3
NW	*	0.1	0.3	0.6	0.9	0.3	0.1			2.3
NNW	*	0.1	0.3	0.7	0.8	0.3	*			2.2
Total	0.3	2.0	4.9	6.8	7.5	2.9	0.5	*		24.9

*>0 but <0.05%.

Table 74

Joint Frequency Distribution of Wind Speed and Wind Direction,
All Gustiness Hours, Spring Season, 1960–1973

(Percentages obtained by using all observed hours, Mar–May.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N	*	0.2	0.8	1.4	1.8	0.7	0.3	0.1		5.3
NNE	*	0.3	1.0	1.3	1.1	0.5	0.4	*		4.6
NE	0.1	0.1	1.0	1.2	1.2	0.4	0.4	0.1	*	4.5
ENE	0.1	0.6	1.3	1.4	1.1	0.3	0.4	*	*	5.2
E	0.1	0.4	1.0	1.1	0.8	0.4	0.2	*		4.2
ESE	0.1	0.4	1.0	1.4	1.1	0.3	0.1	*	*	4.4
SE	0.1	0.3	1.0	1.3	0.7	0.2	0.1	*		3.7
SSE	0.1	0.3	0.9	1.2	0.8	0.3	0.2	0.1	*	3.9
S	*	0.2	0.8	1.5	0.9	0.5	0.5	0.2	*	4.6
SSW	*	0.2	1.4	2.6	3.1	2.2	1.3	0.2	*	11.0
SW	*	0.2	1.0	1.8	2.8	1.9	1.0	0.1		8.8
WSW	*	0.3	0.8	1.0	1.3	1.0	0.5	*		4.9
W	0.1	0.2	0.8	1.0	1.5	1.1	0.6	0.1	*	5.4
WNW	*	0.3	1.1	1.8	3.3	2.1	1.7	0.2	*	10.5
NW	*	0.3	1.0	1.7	3.2	2.2	1.0	0.1		9.5
NNW	*	0.3	1.2	2.1	3.2	2.0	0.7	*		9.5
Total	0.8	4.6	16.1	23.8	27.9	16.1	9.4	1.2	0.1	100.0

*>0 but <0.05%.

Table 75

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness A (Extremely Unstable), Summer Season, 1960–1973

(Percentages obtained by using all observed hours, Jun–Aug.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N		*								*
NNE	*	*	*							0.1
NE	*	*	*							0.1
ENE	*	0.1	*							0.1
E		*	*							0.1
ESE		*	*							0.1
SE	*	*								*
SSE	*	*								*
S		*	*							*
SSW		0.1	0.1		*					0.1
SW	*	0.1	0.1							0.1
WSW	*	0.1	*							0.1
W	*	0.1	0.1	*						0.2
WNW	*	0.1	0.1	*						0.3
NW		0.1	0.1							0.1
NNW		0.1	*							0.1
Total	0.1	0.7	0.6	*	*					1.5

*>0 but <0.05%.

Table 76

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness B_0 (Very Unstable), Summer Season, 1960–1973

(Percentages obtained by using all observed hours, Jun–Aug.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N		0.1	0.2	*						0.3
NNE		0.1	0.3	0.1	*					0.5
NE		0.1	0.3	0.1	*					0.5
ENE		0.1	0.1	*	*					0.2
E	*	*	0.1	*						0.1
ESE		0.1	*	*						0.1
SE		0.1	0.1	0.1						0.3
SSE		0.1	0.2	0.1						0.3
S		0.1	0.1	*						0.2
SSW	*	0.1	0.3	0.1	*					0.5
SW		0.1	0.2	0.1	*					0.5
WSW		0.1	0.3	0.1	*	*				0.5
W		*	0.2	0.2	0.1	*				0.5
WNW		*	0.5	0.5	0.2	0.1	*			1.3
NW		0.1	0.3	0.2	0.1	*	*			0.8
NNW		0.1	0.4	0.2	0.1	*				0.8
Total	*	1.3	3.6	1.8	0.5	0.1	*			7.4

*>0 but <0.05%.

Table 77

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness B_1 (Typical Daytime Instability), Summer Season, 1960–1973

(Percentages obtained by using all observed hours, Jun–Aug.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N		0.1	0.4	0.7	0.5	0.2				1.8
NNE		0.1	0.6	0.7	0.5	0.2	*			2.1
NE		0.1	0.4	0.9	0.7	0.2	*			2.3
ENE		0.2	0.8	0.5	0.2					1.7
E		0.1	0.5	0.5	0.2	*				1.4
ESE	*	0.1	0.5	0.5	0.2	0.1	*			1.4
SE	*	0.1	0.6	0.7	0.2	0.1	*			1.7
SSE		0.1	1.0	0.9	0.4	0.3	0.1			2.8
S		0.1	1.1	1.9	1.1	0.2	0.1			4.5
SSW		0.2	1.7	5.0	5.2	2.0	0.3			14.5
SW		*	1.0	2.8	3.2	1.0	0.2			8.2
WSW		0.1	0.6	0.8	0.6	0.2	*			2.3
W	*	*	0.4	0.5	0.3	0.2	*			1.4
WNW		0.1	0.5	0.8	0.6	0.2	0.1			2.3
NW		0.1	0.4	0.7	0.6	0.2	0.1			2.1
NNW		*	0.6	0.7	0.6	0.3	0.1			2.3
Total	0.1	1.5	11.1	18.6	15.1	5.4	1.0	*		52.8

*>0 but <0.05%.

Table 78

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness C (Neutral Stability), Summer Season, 1960–1973

(Percentages obtained by using all observed hours, Jun–Aug.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N					0.1	0.1	*	*		0.2
NNE				*	*	0.1	0.1			0.1
NE				*	*	*				0.1
ENE			*	*	*	*				0.1
E				*	*	*	*			0.1
ESE				*		*	*			0.1
SE			*	*	*		*			0.1
SSE				*	0.1	*	*			0.1
S				*	0.1	0.1	*			0.2
SSW				0.1	0.3	0.5	0.3			1.2
SW				0.1	0.7	0.6	0.1	*		1.4
WSW				*	0.1	0.1				0.2
W			*	*	*	*				0.1
WNW					0.1	0.1				0.1
NW					*	*	*			0.1
NNW					*	0.1	*			0.1
Total			0.1	0.3	1.5	1.8	0.6	*		4.3

*>0 but <0.05%.

Table 79

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness D (Stable), Summer Season, 1960–1973

(Percentages obtained by using all observed hours, Jun–Aug.)

Wind direction	Wind speed (meters/sec)									Total
	≤0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N	*	0.1	0.4	0.8	0.6	0.1				2.0
NNE	*	0.1	0.4	0.6	0.4	0.1				1.7
NE	*	0.2	0.4	0.5	0.2	*				1.3
ENE	*	0.2	0.5	0.2	*	*				1.0
E	*	0.2	0.3	0.2	0.1					0.8
ESE	*	0.2	0.4	0.2	0.1					0.9
SE	*	0.1	0.5	0.3	0.1	*				1.0
SSE	*	0.2	0.6	0.5	0.2	*				1.5
S	*	0.1	0.5	0.7	0.3	*				1.7
SSW	*	0.2	0.7	1.3	1.2	0.5				3.9
SW	*	0.2	0.6	1.4	2.4	0.7	*			5.3
WSW	0.1	0.2	0.6	0.9	1.1	0.6	0.1			3.6
W	0.1	0.1	0.4	0.6	0.8	0.5	0			2.5
WNW	*	0.2	0.4	0.6	0.8	0.3	*			2.3
NW	*	0.1	0.4	0.7	0.6	0.2	*			2.0
NNW	*	0.2	0.4	0.8	0.9	0.2	*			2.5
Total	0.5	2.6	7.5	10.2	9.8	3.2	0.2			34.0

*>0 but <0.05%.

Table 80

Joint Frequency Distribution of Wind Speed and Wind Direction, All Gustiness Hours, Summer Season, 1960–1973

(Percentages obtained by using all observed hours, Jun–Aug.)

Wind direction	Wind speed (meters/sec)									Total
	≤0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N	*	0.3	1.0	1.4	1.1	0.3	*	*		4.2
NNE	*	0.3	1.3	1.3	1.0	0.3	0.1			4.5
NE	*	0.4	1.2	1.5	1.0	0.2	*			4.3
ENE	*	0.5	1.5	0.8	0.3	*				3.1
E	0.1	0.4	0.9	0.8	0.3	0.1	*			2.6
ESE	0.1	0.4	0.8	0.8	0.3	0.1	*			2.5
SE	*	0.3	1.2	1.1	0.3	0.1	0.1			3.1
SSE	*	0.4	1.8	1.4	0.6	0.4	0.1			4.8
S	*	0.3	1.6	2.7	1.5	0.4	0.1			6.6
SSW	*	0.5	2.8	6.5	6.8	3.0	0.6			20.3
SW	*	0.4	1.9	4.4	6.3	2.3	0.3	*		15.6
WSW	0.1	0.4	1.5	1.8	1.8	0.9	0.1			6.6
W	0.1	0.5	1.1	1.3	1.2	0.6	0.1			4.7
WNW	0.1	0.4	1.5	1.9	1.4	0.7	0.2			6.2
NW	*	0.2	1.3	1.6	1.4	0.5	0.1			5.1
NNW	*	0.4	1.4	1.7	1.6	0.6	0.1			5.8
Total	0.7	6.1	22.8	31.0	26.9	10.5	1.9	0.1		100.0

*>0 but <0.05%.

Table 81

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness A (Extremely Unstable), Fall Season, 1960–1973

(Percentages obtained by using all observed hours, Sep–Nov.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N		*	*							*
NNE		*	*							0.1
NE		*	*							*
ENE		0.1	*							0.1
E	*	*	*							0.1
ESE		0.1	*							0.1
SE	*	*	*							*
SSE		*	*							0.1
S	*	*								*
SSW		*	*							*
SW		*	*							0.1
WSW		0.1	*							0.1
W	*	0.1	*							0.1
WNW	*	0.1	*							0.1
NW		*	*							0.1
NNW		0.1	*							0.1
Total	0.1	0.7	0.3	*	*					1.1

*>0 but <0.05%.

Table 82

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness B_2 (Very Unstable), Fall Season, 1960–1973

(Percentages obtained by using all observed hours, Sep–Nov.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N		*	*	*	*		*			0.2
NNE		0.1	0.2	0.1	*					0.3
NE		0.1	0.3	0.2	*	*				0.6
ENE		*	0.1	0.1	*	*				0.3
E		0.1	0.1	*						0.1
ESE		*	0.1	*						0.1
SE		*	0.1	*	*					0.2
SSE	*	*	*	*	*					0.1
S		*	0.1	*						0.1
SSW		*	0.2	*	*	*				0.4
SW		*	0.1	0.1	0.1					0.4
WSW		0.1	0.2	0.1	*	*				0.3
W		0.1	0.2	0.1	0.1	0.1	*	*		0.5
WNW		*	0.3	0.3	0.2	0.1	*			1.0
NW		*	0.3	0.3	0.1	0.1	*			0.8
NNW		0.1	0.3	0.1	0.1	*	*			0.6
Total	*	0.7	2.6	1.5	0.7	0.4	0.1	*		6.0

*>0 but <0.05%.

Table 83

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness B_1 (Typical Daytime Instability), Fall Season, 1960–1973

(Percentages obtained by using all observed hours, Sep–Nov.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N		0.1	0.4	0.7	1.1	0.5	0.2	*		3.0
NNE		0.1	0.5	0.8	0.7	0.6	0.2			2.9
NE		0.1	0.5	0.9	0.9	0.3	0.3	0.1		3.1
ENE		0.1	1.0	1.1	0.6	0.1	*			2.9
E		0.1	0.6	0.7	0.3	0.1	*			1.0
ESE		*	0.4	0.7	0.3	0.1	*			1.5
SE		0.1	0.3	0.5	0.5	0.2	0.1	*		1.7
SSE		*	0.4	0.5	0.3	0.1	0.1	*		1.3
S		*	0.3	0.5	0.4	0.2	0.1	*		1.6
SSW	*	0.1	0.8	1.6	1.4	0.7	0.2			4.8
SW		0.1	0.5	1.2	1.8	0.9	0.2	*		4.7
WSW		0.1	0.3	0.6	0.9	0.4	0.1	*		2.3
W		*	0.3	0.8	1.0	0.5	0.2	*		2.9
WNW		0.1	0.4	0.9	1.7	1.3	1.1	0.1		5.6
NW		*	0.4	0.7	1.2	1.0	0.6	*		4.0
NNW		0.1	0.5	0.8	1.8	1.2	0.6	0.1		5.1
Total	*	1.1	7.6	13.0	14.9	8.2	4.0	0.4		49.2

*>0 but <0.05%.

Table 84

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness C (Neutral Stability), Fall Season, 1960–1973

(Percentages obtained by using all observed hours, Sep–Nov.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N				0.1	0.1	0.1	0.2	*	*	0.5
NNE					*	0.1	0.1	*	*	0.2
NE				*	0.2	0.1	0.2	0.1		0.5
ENE			*	0.2	0.3	0.1	0.1	*		0.8
E			0.1	0.1	0.1	0.1	*	*		0.4
ESE			0.1	*	*	0.1	*	*	*	0.2
SE				*	0.1	0.1	0.1	*	*	0.3
SSE					0.1	0.1	0.1	*		0.3
S				0.1	0.1	0.2	0.2	*		0.6
SSW			*	0.1	0.3	0.5	0.5	*		1.4
SW			*	*	0.3	0.6	0.2	*		1.1
WSW				*	0.2	0.3	0.1	*		0.6
W			*	*	0.1	0.2	*	*		0.3
WNW			*	*	0.2	*	0.1	0.1		0.4
NW				*	0.1	0.1	0.1	0.1		0.4
NNW			*		0.1	0.3	0.2	0.1	*	0.7
Total			0.2	0.6	2.3	3.0	2.1	0.4	0.1	8.7

*>0 but <0.05%.

Table 85

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness D (Stable), Fall Season, 1960–1973

(Percentages obtained by using all observed hours, Sep–Nov.)

Wind direction	Wind speed (meters/sec) ⩾0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N	*	0.1	0.4	0.8	0.7	0.1	*			2.1
NNE	*	0.1	0.4	0.8	0.6	0.2	*			2.1
NE	*	0.2	0.4	0.6	0.4	0.2				1.8
ENE	*	0.2	0.7	0.4	0.2	0.1				1.6
E	0.1	0.2	0.5	0.4	0.1	*	*			1.3
ESE	*	0.2	0.4	0.6	0.2	*				1.4
SE	*	0.2	0.5	0.5	0.3	*				1.5
SSE	*	0.2	0.3	0.5	0.2	*				1.3
S	*	0.1	0.3	0.5	0.3	0.1				1.4
SSW	*	0.2	0.5	0.8	0.8	0.4	*			2.7
SW	0.1	0.1	0.5	1.0	1.4	0.6	*			3.8
WSW	*	0.2	0.4	0.8	1.0	0.6	0.1			3.1
W	*	0.2	0.5	0.8	1.0	0.4	0.1			3.0
WNW	0.1	0.1	0.5	0.9	0.9	0.2	*			2.7
NW	*	0.2	0.5	1.0	0.9	0.2	*			2.8
NNW	0.1	0.2	0.4	0.8	0.8	0.1	*			2.4
Total	0.5	2.7	7.2	11.2	9.8	3.2	0.4			35.0

*>0 but <0.05%.

Table 86

Joint Frequency Distribution of Wind Speed and Wind Direction, All Gustiness Hours, Fall Season, 1960–1973

(Percentages obtained by using all observed hours, Sep–Nov.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N	*	0.2	1.0	1.6	1.9	0.7	0.3	*	*	5.8
NNE	0.1	0.3	1.0	1.6	1.3	0.8	0.3	*	*	5.6
NE	0.1	0.3	1.2	1.7	1.6	0.6	0.4	0.1		6.0
ENE	*	0.5	2.0	1.8	1.0	0.2	0.1	*		5.7
E	0.1	0.4	1.2	1.4	0.6	0.2	0.1	*		3.8
ESE	*	0.4	0.9	1.2	0.5	0.2	0.1	*	*	3.3
SE	0.1	0.3	1.1	1.1	0.8	0.2	0.2	*	*	3.7
SSE	0.1	0.2	0.7	1.0	0.6	0.2	0.3	*		3.1
S	*	0.2	0.7	1.0	0.9	0.5	0.4	*		3.7
SSW	*	0.2	1.5	2.6	2.6	1.6	0.7	0.1		9.3
SW	*	0.3	1.2	2.4	3.6	2.0	0.5	*		10.0
WSW	*	0.4	0.9	1.5	2.0	1.3	0.3	*		6.4
W	*	0.4	1.0	1.7	2.2	1.2	0.3	0.1		6.9
WNW	0.1	0.3	1.3	2.1	2.9	1.7	1.3	0.1		9.8
NW	*	0.3	1.2	1.9	2.3	1.5	0.7	0.1		8.0
NNW	*	0.4	1.2	1.7	2.8	1.8	0.8	0.2	*	8.9
Total	0.6	5.1	18.1	26.3	27.6	14.7	6.6	0.9	0.1	100.0

*>0 but <0.05%.

Table 87

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness A (Extremely Unstable), Annual, 1960–1973

(Percentages obtained by using all observed hours, Jan–Dec.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N		*	*							*
NNE	*	*	*							0.1
NE		*	*							0.1
ENE	*	0.1	*							0.1
E	*	*	*							0.1
ESE	*	0.1	*							0.1
SE	*	*	*							*
SSE	*	*	*							*
S		*	*							*
SSW		*	*							*
SW		*	*							0.1
WSW		0.1	*	*						0.1
W	*	0.1	0.1	*						0.1
WNW	*	0.1	0.1	*	*					0.2
NW		*	0.1	*						0.1
NNW		*	*							0.1
Total	0.1	0.6	0.5	*	*	*				1.2

*>0 but <0.05%.

Table 88

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness B_2 (Very Unstable), Annual, 1960–1973

(Percentages obtained by using all observed hours, Jan–Feb.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N		*	0.1	0.1	*					0.2
NNE		0.1	0.2	*	*					0.3
NE		0.1	0.1	0.1	*	*				0.4
ENE		0.1	0.1	0.1	*	*				0.3
E		*	0.1	*	*					0.2
ESE		*	0.1	*	*					0.1
SE		*	0.1	0.1	*					0.2
SSE	*	*	0.1	0.1	*					0.2
S		*	0.1	*	*					0.1
SSW		0.1	0.2	0.1	0.1	*				0.4
SW		*	0.2	0.1	0.1	*	*			0.4
WSW		0.1	0.2	*	0.1	*	*			0.4
W	*	0.1	0.2	0.2	0.1	0.1	0.1			0.7
WNW		0.1	0.3	0.4	0.3	0.2	0.1	*		1.4
NW		*	0.3	0.3	0.3	0.1	0.1	*		1.1
NNW		0.1	0.3	0.2	0.1	0.1	*			0.8
Total	*	0.8	2.7	1.8	1.1	0.5	0.3	*		7.2

*>0 but <0.05%.

Table 89

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness B_1 (Typical Daytime Instability), Annual, 1960–1973

(Percentages obtained by using all observed hours, Jan–Dec.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N		0.1	0.4	0.8	1.0	0.4	0.1	*		2.7
NNE		0.1	0.4	0.7	0.7	0.4	0.2	*		2.5
NE		0.1	0.4	0.8	0.8	0.3	0.1	*		2.5
ENE	*	0.2	0.9	0.8	0.3	0.1	*			2.3
E	*	*	0.6	0.6	0.4	0.2	*	*		1.9
ESE	*	0.1	0.4	0.6	0.5	0.1	*	*		1.7
SE	*	0.1	0.5	0.6	0.3	0.1	0.1	*		1.7
SSE	*	*	0.5	0.6	0.4	0.2	0.1	*		1.7
S		0.1	0.5	0.9	0.6	0.2	0.1	*		2.4
SSW		0.1	0.9	2.2	2.4	1.1	0.3	*		7.0
SW		*	0.6	1.5	1.8	0.8	0.3	*		5.0
WSW		0.1	0.3	0.7	0.9	0.4	0.2	*		2.6
W		*	0.3	0.7	0.9	0.6	0.3	0.1		2.9
WNW		0.1	0.4	0.9	1.7	1.2	1.1	0.1		5.5
NW		*	0.3	0.8	1.5	1.1	0.6	0.1		4.5
NNW		0.1	0.5	0.9	1.7	1.0	0.5	0.1		4.9
Total	0.1	1.2	7.9	14.1	15.9	8.2	4.0	0.4	*	51.8

*>0 but <0.05%.

Table 90

Joint Frequency Distribution of Wind Speed and Wind Direction, Gustiness C (Neutral Stability), Annual, 1960–1973

(Percentages obtained by using all observed hours, Jan–Dec.)

Wind direction	Wind speed (meters/sec) ⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	Total
N				*	0.1	0.1	0.1	*	*	0.4
NNE		*		*	*	0.1	0.2	*	*	0.3
NE				*	0.2	0.1	0.2	0.1	*	0.6
ENE			0.1	0.3	0.3	0.1	0.1	*	*	0.9
E			*	0.1	0.1	0.1	0.1	*		0.4
ESE				*	*	0.1	0.1	*		0.2
SE				*	*	*	0.1	*		0.2
SSE					0.1	*	0.1	0.1		0.3
S				*	0.1	0.2	0.1	0.1	*	0.5
SSW			*	*	0.3	0.5	0.5	0.1		1.4
SW			*	*	0.4	0.6	0.3	*		1.3
WSW				*	0.2	0.3	0.1			0.6
W			*	*	0.1	0.2	0.1	*		0.4
WNW			*	*	0.2	0.2	0.2	*	*	0.6
NW				*	0.1	0.2	0.2	0.1	*	0.6
NNW		*		*	0.1	0.2	0.2	0.1	*	0.6
Total	*	*	0.1	0.5	2.3	3.0	2.7	0.6	0.1	9.3

*>0 but <0.05%.

Table 91

Joint Frequency Distribution of Wind Speed and Wind Direction,
Gustiness D (Stable), Annual, 1960–1973

(Percentages obtained by using all observed hours, Jan–Dec.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N	*	0.1	0.4	0.7	0.6	0.1	*			1.9
NNE	*	0.1	0.4	0.6	0.5	0.1	*			1.7
NE	*	0.1	0.4	0.5	0.2	0.1				1.4
ENE	*	0.1	0.5	0.2	0.1	*				1.1
E	*	0.2	0.3	0.3	0.1	*				0.9
ESE	*	0.2	0.3	0.4	0.1	*				1.0
SE	*	0.1	0.4	0.4	0.1	*				1.1
SSE	*	0.2	0.4	0.4	0.2	*				1.2
S	*	0.1	0.3	0.4	0.3	0.1	*			1.2
SSW	*	0.2	0.4	0.8	0.8	0.3	*			2.5
SW	*	0.2	0.5	0.8	1.4	0.6	0.1			3.6
WSW	*	0.1	0.4	0.7	0.9	0.5	0.1			2.8
W	*	0.1	0.4	0.6	0.9	0.4	0.1			2.5
WNW	*	0.2	0.4	0.8	0.9	0.3	*			2.6
NW	*	0.2	0.5	0.9	0.8	0.2	*			2.6
NNW	*	0.2	0.4	0.8	0.8	0.2	*			2.4
Total	0.5	2.4	6.4	9.3	8.7	2.9	0.3			30.5

*>0 but <0.05%.

Table 92

Joint Frequency Distribution of Wind Speed and Wind Direction,
All Gustiness Hours, Annual, 1960-1973

(Percentages obtained by using all observed hours, Jan–Dec.)

Wind direction	Wind speed (meters/sec)									Total
	⩽0.5	0.6–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–14.0	14.1–18.0	18+	
N	*	0.2	0.9	1.5	1.7	0.6	0.3	*	*	5.2
NNE	0.1	0.3	1.0	1.4	1.2	0.5	0.3	0.1	*	4.9
NE	*	0.2	1.1	1.4	1.3	0.5	0.3	0.1	*	4.9
ENE	*	0.5	1.5	1.4	0.9	0.2	0.1	*	*	4.6
E	0.1	0.4	1.0	1.0	0.6	0.2	0.1	*		3.4
ESE	0.1	0.3	0.8	1.0	0.6	0.2	0.1	*	*	3.1
SE	*	0.3	0.9	1.0	0.6	0.2	0.2	*		3.2
SSE	*	0.3	0.9	1.1	0.6	0.3	0.2	0.1		3.5
S	*	0.2	0.9	1.4	0.9	0.5	0.3	0.1	*	4.3
SSW	0.1	0.3	1.6	3.1	3.4	1.9	0.9	0.1		11.4
SW	*	0.3	1.2	2.5	3.7	2.0	0.6	0.1		10.4
WSW	0.1	0.3	1.0	1.5	2.1	1.2	0.3	*		6.5
W	0.1	0.3	1.0	1.5	2.0	1.2	0.5	0.1	*	6.8
WNW	0.1	0.4	1.2	2.1	3.1	1.9	1.4	0.1	*	10.3
NW	*	0.3	1.2	2.0	2.6	1.6	1.0	0.1	*	8.8
NNW	*	0.4	1.3	2.0	2.7	1.5	0.7	0.1	*	8.7
Total	0.7	5.0	17.5	25.9	28.0	14.5	7.3	1.0	0.1	100.0

*>0 but <0.05%.

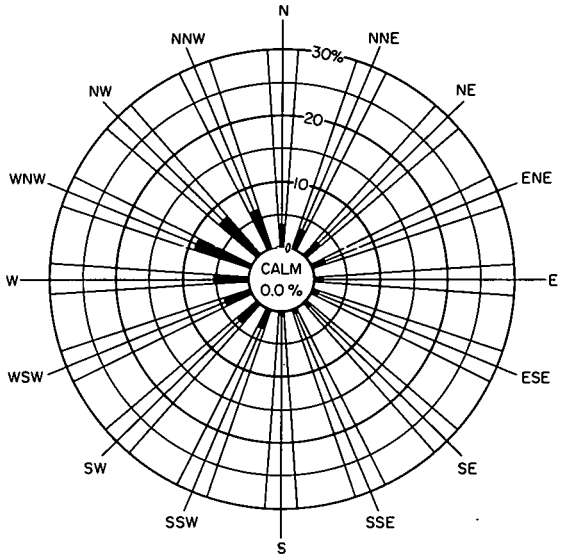

Figure 24. Winter wind direction rose, 355-ft level, B_1 gustiness (unstable), Dec–Feb, 1960–1973.

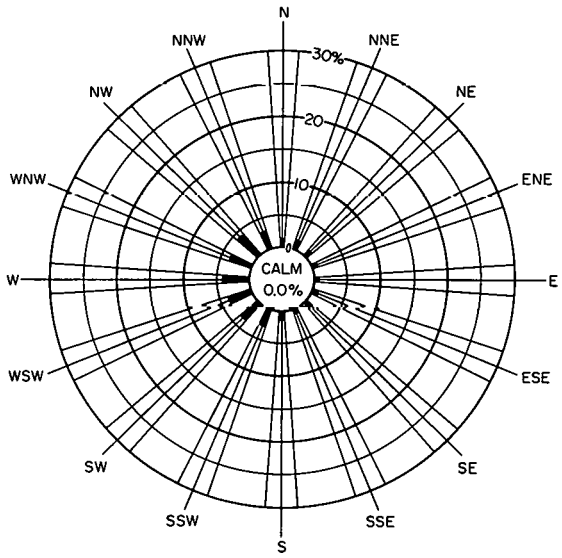

Figure 25. Winter wind direction rose, 355-ft level, D gustiness (stable), Dec–Feb, 1960–1973.

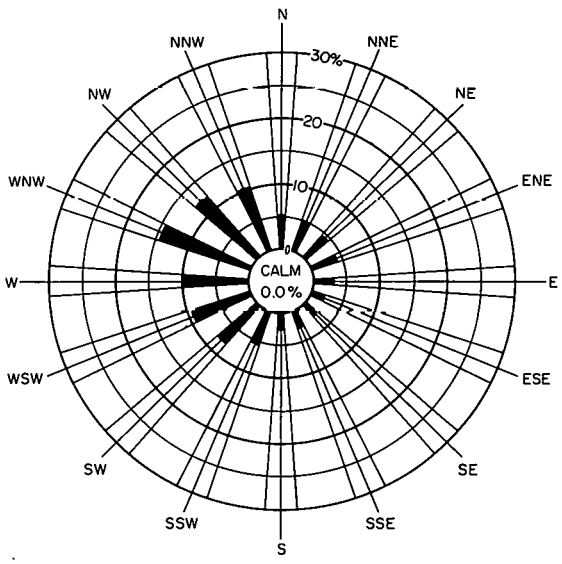

Figure 26. Winter wind direction rose, 355-ft level, all gustiness classes, Dec–Feb, 1960–1973.

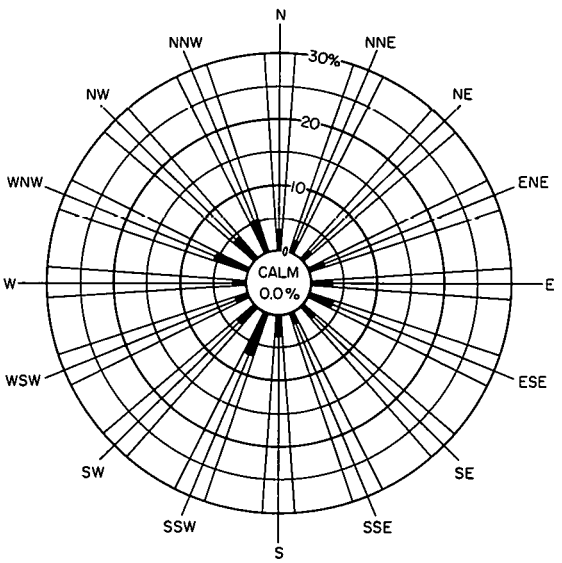

Figure 27. Spring wind direction rose, 355-ft level, B_1 gustiness (unstable), Mar–May, 1960–1973.

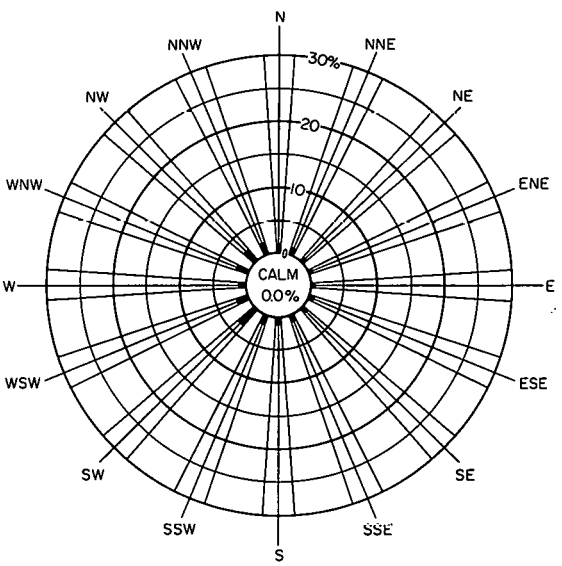

Figure 28. Spring wind direction rose, 355-ft level, D gustiness (stable), Mar–May, 1960–1973.

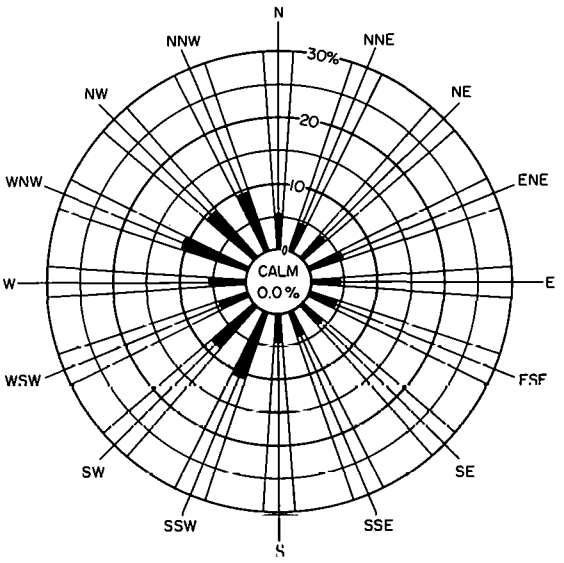

Figure 29. Spring wind direction rose, 355-ft level, all gustiness classes, Mar–May, 1960–1973.

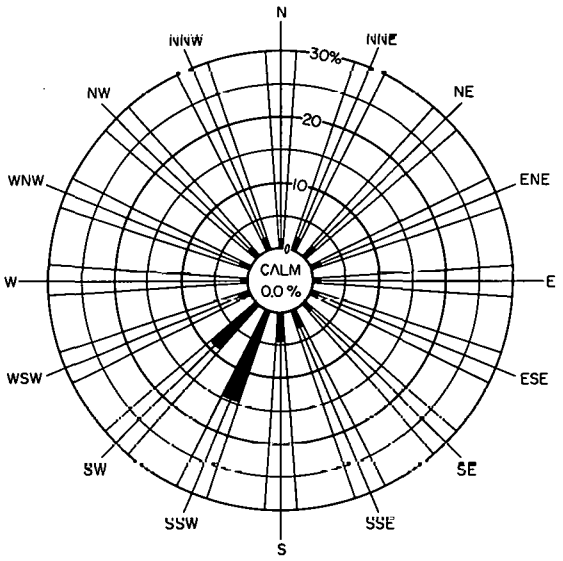

Figure 30. Summer wind direction rose, 355-ft level, B_1 gustiness (unstable), Jun–Aug, 1960–1973.

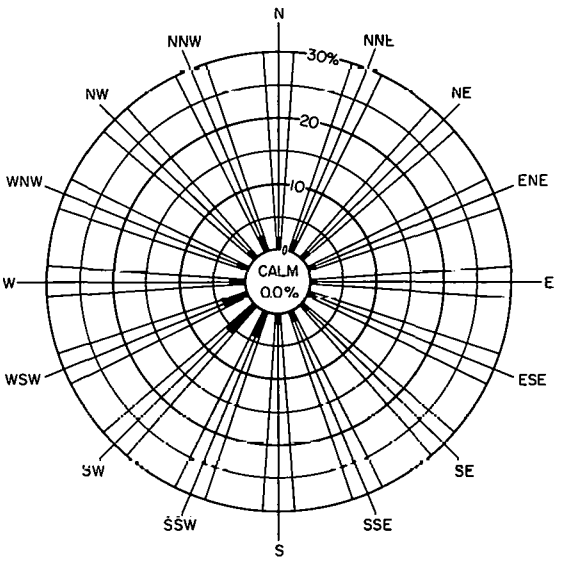

Figure 31. Summer wind direction rose, 355-ft level, D gustiness (stable), Jun–Aug, 1960–1973.

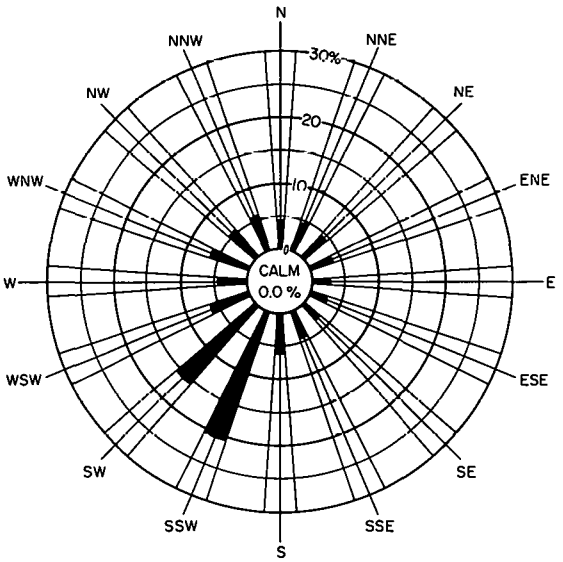

Figure 32. Summer wind direction rose, 355-ft level, all gustiness classes, Jun–Aug, 1960–1973.

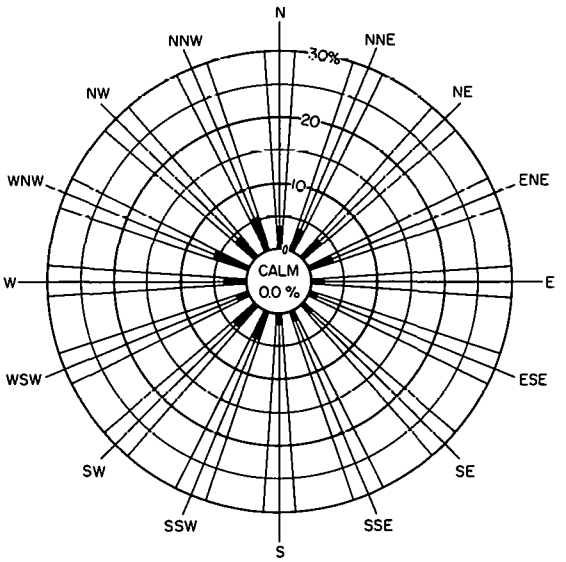

Figure 33. Fall wind direction rose, 355-ft level, B_1 gustiness (unstable), Sep–Nov, 1960–1973.

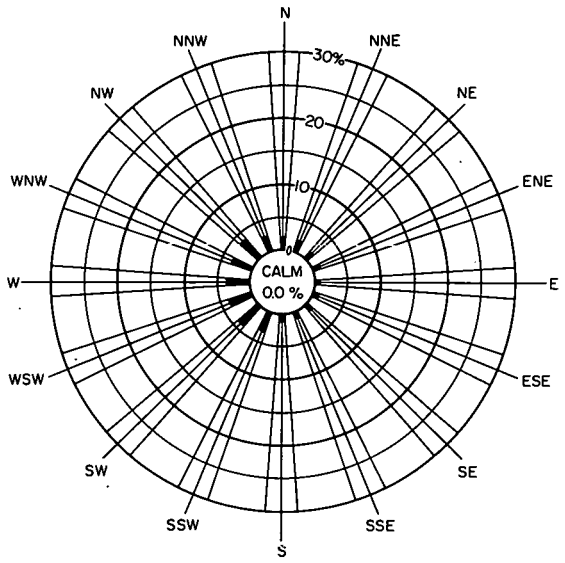

Figure 34. Fall wind direction rose, 355-ft level, D gustiness (stable), Sep–Nov, 1960–1973.

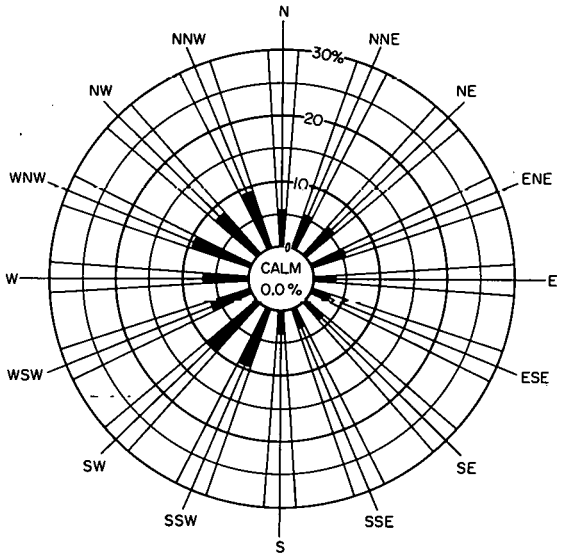

Figure 35. Fall wind direction rose, 355-ft level, all gustiness classes, Sep–Nov, 1960–1973.

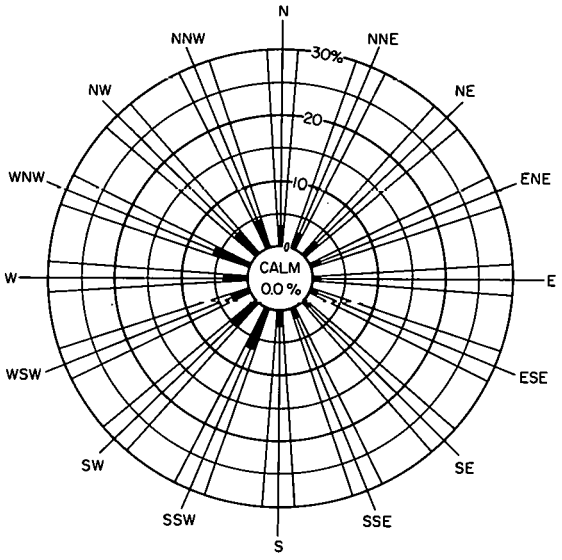

Figure 36. Annual wind direction rose, 355-ft level, B_1 gustiness (unstable), Jan–Dec, 1960–1973.

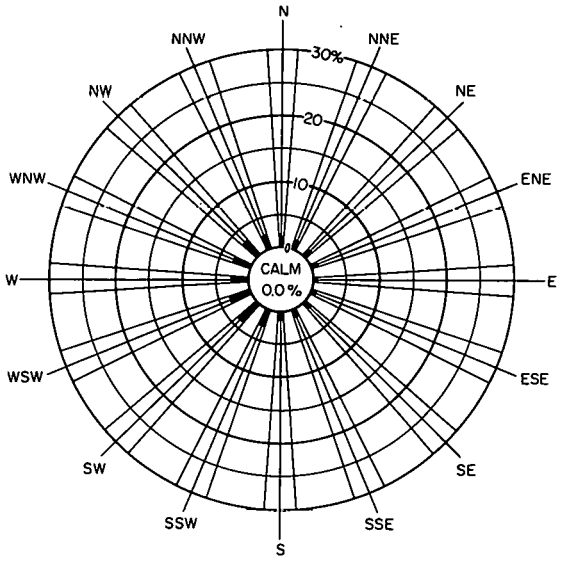

Figure 37. Annual wind direction rose, 355-ft level, D gustiness (stable), Jan–Dec, 1960–1973.

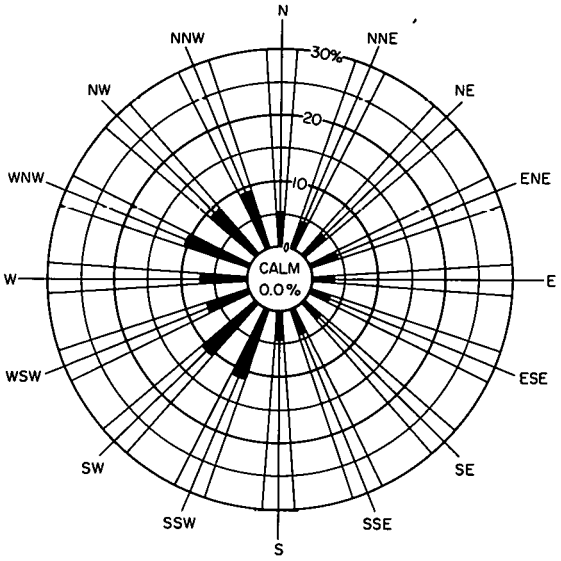

Figure 38. Annual wind direction rose, 355-ft level, all gustiness classes, Jan–Dec, 1960–1973.

The direction roses show that winds from the westerly quadrants, particularly west-northwest and northwest winds, are favored during the winter season and winds from the south-southwest and southwest, during the summer season. During the spring and fall there are fairly strong peaks from the south-southwest and west-northwest, reflecting the oscillation between summer and winter conditions. The same double peak in direction appears on the annual rose.

Wind Persistence

Prediction of dose rates as a function of averaging time must take into account the variability of atmospheric diffusion which usually is determined by persistence, as measured by the number of consecutive hours in which the wind remains in an angular sector. This method does not adequately indicate the maximum concentration, since a short-term deviation of the wind from the reference sector ends a period of persistence even though the wind can resume the same direction immediately thereafter. A more realistic approach is found in a simple technique known as "steadiness" (S), which shows the fluctuations of wind direction as a function of time with the associated probability of occurrence.[9]

Figure 39 presents an extreme value graph of ten years (1960–1969) of Brookhaven National Laboratory hourly wind data utilizing all gusti-

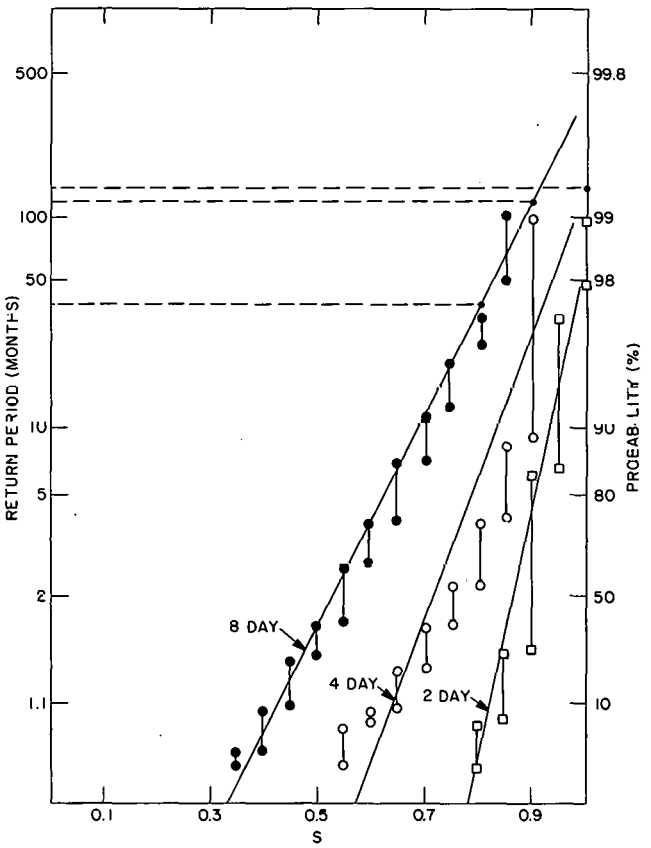

Figure 39. Extreme probability and return periods of "steadiness."

Table 93

Wind Persistence at BNL, 1960–1969
Extreme Probability and Return Periods of "Steadiness" (S)

Duration (hr)	S → 1.0	S = 0.9	S = 0.8	Preferred direction	Min mean wind speed (miles/hr)
		Lower Level (37 ft)			
4	7*	<1	<1	NW-SW-SE	½
12	60	5	1	NW-SW-SE	½
24	140	40	13	NW-SW-SE	1
48	>1000 (>80 yr)	580	240	NW-SW-SE	2
		Upper Level (355 ft)			
4	8	<1	<1	NW-SW-SE	1
12	60	4	<1	NW-SW-SE	3
24	200	45	9	NW-SW-SE	5
48	>1000 (>80 yr)	600	225	NW-SW-SE	5

*Recurrence interval, months.

ness hours; the computed rates of probabilities and associated recurrence intervals are in months. The figure shows that the data readily fit the Fisher-Tippet Type I distribution of 2, 4, and 8-day intervals. The dashed lines show that the wind direction will remain approximately the same (S approaching 1.0) for 4 days once every 140 months, within 18 degrees (S = 0.9) for 8 days once every 125 months, and within 36 degrees (S = 0.8) for 8 days once every 38 months.

Mean hourly wind data for two heights (37 and 355 ft) were used for steadiness analyses during stable conditions. Recurrence intervals are shown in Table 93. A considerable number of stable hours (36%) occurred in this sample. There is no change of recurrence intervals with height, and the wind can be expected to remain in the same direction for 12 hr once every 60 months and for 48 hr once in $\approx$80 years. Minimum mean wind speeds of $<$1 mile/hr occur for short periods only at the low level and increase at the upper level. The preferred wind directions are associated with the prevailing wind regimes of the area.

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