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No. 68

WIND AT BALLYKELLY

by S D Glassey and W G Durbin B Sc

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1. Introduction

in 1962 Woodley⁽²⁾ carried out an analysis of wind data for Belfast (Aldergrove) Airport, the only place in Northern Ireland for which a comparatively long-term (31 years, 1928-1946 plus 1949-1960) anemograph record was then available. Short-term records are available for a few other places, however, and of these the longest is from Ballykelly in Co Londonderry.

The wind instrument used at Ballykelly is a direct recording pressure-tube anemograph. It was installed in May 1957 and in the ten-year period to April 1967 with which this analysis is concerned it remained unchanged in type and position. It is located at 55°04'N 07°01'W, the Irish grid reference being Ic(24)624235 (Fig 1). The altitude of the site is six feet above mean sea level (Belfast datum) and the vane is fifty five feet above the ground. The effective height of the instrument is thirty five feet.

A simplified map of topographical features influencing winds at Ballykelly is shown in Fig 1. The location is naturally sheltered by the Sperrin Mountains to the south and east and to a lesser degree by the Mountains of Inishowen to the north-west. The valley of the River Roe, running south/north, provides a natural path for southerly winds. The River Foyle valley, orientated south-west/north-east, provides a natural path for south-westerly winds.

2. Data available and method of analysis

In the period May 1957 to April 1967 the full 87,648 observations of hourly mean wind were evaluated to the nearest knot for speed and to the nearest ten degrees for direction. They were examined statistically on a monthly basis, firstly in relation to the frequency of occurrence in various ranges of both speed and direction and secondly by obtaining monthly means and extremes of wind speed. The results are given in the form of a Wind Rose and Tables.

/(a)

(a) Wind Rose

A Wind Rose, indicating the distribution over the various speed ranges for each of the twelve direction ranges, is given at Fig 2.

It will be seen from Fig 2 that the direction range of the most frequent winds is 230 to 250 degrees. However, this range cannot be called the prevailing wind direction, since winds from the ranges 260 to 280 degrees, 110 to 130 degrees and 200 to 220 degrees are almost equally frequent. Other features apparent from Fig 2 are

- (a) about 33 per cent of all winds of 17 kt and above come from directions between 220 and 280 degrees
- (b) the low frequency of observations with wind directions between north and east.

(b) Tables of frequencies and means

The following ten Tables are given:-

Percentage frequency of wind speed with direction	TABLE 1
Statistics of mean wind speeds	TABLE 2
Statistics of gust speeds	TABLE 3
Statistics of gust frequencies	TABLE 4
Frequencies of gusts exceeding 33 kt	TABLE 5
Frequencies of gusts exceeding 47 kt	TABLE 6
Number of days when gust speeds exceeded 33 kt, their duration and maximum duration in any one day, for each month and for the year	TABLE 7
Number of days when gust speeds exceeded 47 kt, their duration and maximum duration in any one day, for each month and for the year	TABLE 8
Days of gale	TABLE 9
Extreme value analysis (after Gumbel)	TABLE 10

TABLE 1 - Percentage frequency of wind speed with direction

Table 1 has thirteen sections - one for each month of the year and one for the year as a whole. Wind directions are divided into twelve thirty-degree

/ranges

ranges (e.g. 350-010 degrees covers the range 346-014 degrees) and wind speeds are given in knots. The entry 0+ is used when the frequency is less than 0.05 per cent. At the foot of each column are given total percentages of winds within a given range of wind direction, taking all speeds except calm into account and, at the end of each row are given total percentages within various speed ranges whatever the direction. It will be seen that in some cases there are small differences between the given totals and the sums of the figures in the rows or columns. This is because the figures in the Table have been rounded to one place of decimals. The equivalence between the ranges of wind speed in knots, mph, metres per second and Beaufort Force is given in the following Table.

Knots	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	48-55
Miles per hour	1-3	4-7	8-12	13-18	19-24	25-31	32-38	39-46	47-54	55-63
Metres per second	0.3 to 1.5	1.6 to 3.3	3.4 to 5.4	5.5 to 7.9	8.0 to 10.7	10.8 to 13.8	13.9 to 17.1	17.2 to 20.7	20.8 to 24.4	24.5 to 28.4
Beau- fort Force	1	2	3	4	5	6	7	8	9	10

/TABLE 1

TABLE 1 - PERCENTAGE FREQUENCIES OF MEAN WIND
SPEED WITH DIRECTION

JANUARY

Speed range kt	350- 010°	020- 040°	050- 070°	080- 100°	110- 130°	140- 160°	170- 190°	200- 220°	230- 250°	260- 280°	290- 310°	320- 340°	TOTAL
1- 3	0.2	0.3	0.7	1.5	2.4	1.4	1.2	0.7	1.4	1.6	0.4	0.3	15.9
4- 6	0.3	0.4	0.5	1.1	1.2	1.0	1.1	1.1	1.7	1.5	0.8	0.5	12.1
7-10	0.5	0.6	0.8	2.0	1.9	2.2	2.2	2.0	3.2	2.3	1.5	0.9	11.4
11-16	0.4	0.4	1.2	2.1	3.1	2.9	3.0	4.6	4.5	2.7	0.8	0.4	20.1
17-21	0.2	0.1	0.1	0.6	1.3	1.5	1.0	1.4	1.1	0.8	0.2	0.1	26.1
22-27	0+	0.1		0.2	0.6	0.8	1.0	0.6	0.3	0.5	0.1	0.1	8.5
28-33			0+	0.2	0.1	0.2	0+	0+	0.1	0.1	0.2		4.5
34-40				0+				0+	0.1	0.1	0+		1.0
41-47										0.1			0.2
48-55											0+		0.1
TOTAL	1.7	1.9	3.5	7.8	10.6	10.0	9.6	10.5	12.5	9.7	4.0	2.3	99.9

FEBRUARY

Speed range kt	350- 010°	020- 040°	050- 070°	080- 100°	110- 130°	140- 160°	170- 190°	200- 220°	230- 250°	260- 280°	290- 310°	320- 340°	TOTAL
1- 3	0.8	0.5	0.5	0.9	1.6	1.5	1.2	0.8	0.9	1.4	0.6	0.6	11.2
4- 6	0.4	0.5	0.6	1.0	2.0	1.4	1.4	1.0	1.3	1.3	0.4	0.4	11.4
7-10	0.5	0.6	0.9	1.3	2.6	2.5	2.1	2.8	3.1	1.7	0.8	0.4	11.7
11-16	0.6	0.7	0.9	2.0	5.0	3.0	2.5	3.7	4.3	2.5	1.0	0.7	19.3
17-21	0.1	0+	0.6	0.4	2.8	1.0	1.0	1.9	1.6	1.7	0.8	0.1	27.2
22-27	0.1		0.1	0.1	1.3	0.6	0.5	0.6	0.8	0.8	0.4	0.1	12.0
28-33	0+		0+	0+	0.3	0.2	0+	0.1	0.2	0.4	0.1		5.4
34-40					0.1	0+	0+		0.2	0.1			1.2
41-47					0+			0+					0.4
48-55					0+								0.1
TOTAL	2.6	2.3	3.6	5.7	15.8	10.2	8.9	10.8	12.5	9.9	4.2	2.2	99.9

MARCH

Speed range kt	350- 010°	020- 040°	050- 070°	080- 100°	110- 130°	140- 160°	170- 190°	200- 220°	230- 250°	260- 280°	290- 310°	320- 340°	TOTAL
1- 3	0.5	0.7	0.5	1.2	1.7	1.1	0.7	0.6	0.9	0.7	0.6	0.6	8.5
4- 6	0.6	0.5	0.6	1.4	2.0	1.1	1.1	1.1	1.1	0.6	0.4	0.5	9.7
7-10	1.0	0.7	0.7	2.4	3.0	2.5	1.9	2.2	2.7	1.9	1.3	0.8	10.9
11-16	0.7	0.7	0.4	1.5	5.2	4.2	1.7	3.4	5.0	2.7	1.7	1.0	21.1
17-21	0.1	0.1	0.1	0.6	2.9	2.2	0.4	1.6	2.0	1.9	0.9	0.6	28.5
22-27			0+		2.1	1.1	0.3	0.5	1.0	1.0	0.6	0.2	13.3
28-33					0.5	0.2	0+	0.1	0.1	0.2	0.1		6.7
34-40						0.1				0+	0+		1.1
41-47													0.1
48-55													0.0
TOTAL	2.9	2.7	2.4	7.1	17.4	12.6	6.1	9.3	12.7	9.0	5.6	3.7	99.9

TABLE 1 CONTD - PERCENTAGE FREQUENCIES OF MEAN
WIND SPEED WITH DIRECTION

APRIL

Speed range kt	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	TOTAL
									calm or light/variable				10.4
1- 3	0.6	1.2	0.5	1.0	1.4	0.9	0.9	0.8	1.3	1.0	0.8	0.9	11.3
4- 6	1.4	1.3	0.5	0.8	1.4	0.9	1.1	1.2	2.0	1.3	1.0	1.3	14.2
7-10	2.1	1.8	0.9	1.5	2.3	2.0	1.8	2.1	4.1	2.6	1.9	1.3	24.2
11-16	1.2	1.2	0.8	1.7	3.1	1.9	1.9	2.5	4.7	3.5	2.2	1.3	26.0
17-21	0.3	0.3	0.2	0.9	1.4	0.8	0.3	0.7	1.4	1.5	1.1	0.4	9.2
22-27	0+		0.1	0.4	0.9	0.5	0.1	0.1	0.5	0.8	0.4	0.2	4.1
28-33				0+		0.2		0+	0+	0.2	0.1		0.6
34-40									0+				0+
41-47													0.0
48-55													0.0
TOTAL	5.7	5.7	2.9	6.3	10.4	7.2	6.0	7.4	14.1	10.8	7.5	5.4	100.0

MAY

Speed range kt	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	TOTAL
									calm or light/variable				15.3
1- 3	1.3	1.5	0.6	1.1	1.7	1.2	1.4	0.7	1.3	0.7	0.9	1.2	13.6
4- 6	2.3	2.2	0.6	0.9	1.7	1.4	1.7	1.5	2.2	0.7	0.7	1.0	17.0
7-10	2.9	2.3	0.5	1.0	2.4	2.1	2.2	2.1	2.7	1.9	1.7	2.2	23.9
11-16	2.3	0.8	0.2	0.8	2.5	1.9	1.1	1.8	2.5	2.8	2.5	2.1	21.4
17-21	0.3	0+	0+	0.2	0.5	0.3	0.5	0.7	1.2	1.4	0.8	0.3	6.3
22-27			0.1	0.1	0.1	0.1	0+	0.2	0.7	0.6	0.3	0+	2.2
28-33				0+					0.1	0.1	0.1		0.4
34-40													0.0
41-47													0.0
48-55													0.0
TOTAL	9.0	6.8	1.9	4.2	8.9	7.0	6.9	7.0	10.8	8.2	7.0	6.8	100.1

JUNE

Speed range kt	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	TOTAL
									calm or light/variable				13.0
1- 3	1.3	1.4	0.6	0.9	2.0	1.9	1.1	1.2	2.2	1.5	0.8	1.2	16.1
4- 6	1.4	1.5	0.3	0.6	2.2	2.1	1.7	1.8	3.0	2.0	1.1	1.0	18.8
7-10	2.3	1.5	0.3	0.5	2.1	2.1	2.1	2.6	4.4	2.6	2.5	2.5	25.5
11-16	1.9	1.0	0.3	0.4	1.1	2.3	1.4	1.5	4.3	3.2	2.2	1.2	20.7
17-21	0.2				0.4	0.3	0.3	0.4	1.3	1.0	0.7	0.1	4.7
22-27					0+	0.1	0.1	0.1	0.3	0.4	0.2		1.1
28-33									0+	0+			0+
34-40													0.0
41-47													0.0
48-55													0.0
TOTAL	7.1	5.4	1.6	2.4	7.8	8.7	6.8	7.4	15.5	10.7	7.5	6.0	99.9

TABLE 1 CONTD - PERCENTAGE FREQUENCIES OF MEAN
WIND SPEED WITH DIRECTION

JULY

Speed range kt	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	TOTAL
									calm or light/variable				11.2
1- 3	1.1	1.5	0.6	1.2	1.6	1.2	0.9	0.9	2.4	1.7	1.2	1.3	15.3
4- 6	2.5	1.7	0.7	0.8	0.9	1.1	1.2	1.4	3.7	2.7	1.7	2.3	20.8
7-16	3.1	1.8	0.5	0.9	1.0	1.5	1.7	1.9	4.1	3.9	4.4	3.6	28.3
11-16	2.1	0.7	0.1	0.3	0.4	0.7	0.6	1.4	3.2	3.9	4.1	2.3	19.8
17-21	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.2	0.4	0.9	0.8	0.4	3.4
22-27					0.1	0.1	0+	0+	0.2	0.6	0.1		1.2
28-33										0.1			0.1
34-40													0.0
41-47													0.0
48-55													0.0
TOTAL	8.9	5.6	2.0	3.2	4.1	4.8	4.4	5.9	14.0	13.6	12.3	10.0	100.1

AUGUST

Speed range kt	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	TOTAL
									calm or light/variable				13.4
1- 3	1.5	1.4	0.6	0.8	1.3	1.1	0.7	0.9	1.7	1.2	0.9	1.5	13.8
4- 6	1.9	2.0	0.5	0.6	1.3	1.3	1.3	1.6	3.6	1.9	1.3	1.6	18.8
7-10	2.8	1.6	0.3	0.6	1.9	1.6	1.5	2.0	4.8	3.2	2.6	2.6	25.4
11-16	0.8	0.4	0.1	0.3	1.6	2.1	1.7	2.2	3.6	4.0	2.2	1.5	20.6
17-21	0.4	0.1			0.3	0.4	0.3	0.6	1.6	1.3	0.6	0.2	5.9
22-27	0.1				0.1	0.1	0.1	0.2	0.5	0.6	0.1	0.2	1.9
28-33					0+	0+		0+	0.1	0+	0+	0.1	0.3
34-40											0+		0+
41-47													0.0
48-55													0.0
TOTAL	7.5	5.5	1.5	2.2	6.5	6.7	5.6	7.5	15.8	12.2	7.8	7.7	100.1

SEPTEMBER

Speed range kt	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	TOTAL
									calm or light/variable				14.2
1- 3	0.8	0.6	0.7	1.2	2.1	2.2	1.9	1.2	1.8	1.3	0.9	0.9	15.6
4- 6	0.7	1.0	0.3	0.6	1.9	2.6	2.0	1.9	2.8	1.4	0.9	1.0	17.3
7-10	0.7	0.9	0.3	0.7	1.8	2.8	3.1	3.8	3.6	2.3	1.7	1.6	23.5
11-16	1.1	0.6	0.2	0.8	1.6	2.0	1.9	3.3	3.0	2.7	2.2	1.8	21.2
17-21	0.2	0+	0.1	0.3	0.4	0.7	0.4	0.6	0.7	1.2	0.6	0.6	5.8
22-27	0.1			0.1	0.2	0.2	0.1	0.3	0.3	0.5	0.2	0.1	2.1
28-33					0+	0+	0+	0+	0+	0.1	0+		0.2
34-40					0+		0+	0+		0+	0+		0.1
41-47							0+	0+					0+
48-55							0+						0+
TOTAL	3.7	3.2	1.5	3.8	8.0	10.6	9.3	11.2	12.3	9.6	6.6	6.0	100.0

TABLE 1 CONTD - PERCENTAGE FREQUENCIES OF MEAN
WIND SPEED WITH DIRECTION

OCTOBER

Speed range kt	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	TOTAL
									calm or light/variable				11.5
1- 3	0.3	0.6	0.7	0.9	2.2	1.8	1.6	1.0	1.7	1.2	0.5	0.4	12.8
4- 6	0.3	0.4	0.5	1.0	2.4	2.1	2.6	2.2	3.2	1.8	0.7	0.6	17.7
7-10	0.7	0.3	0.6	1.1	2.5	2.8	3.0	3.9	4.8	2.2	0.9	0.9	23.7
11-16	0.9	0.3	0.5	0.6	2.6	3.0	2.2	3.7	4.2	2.6	1.2	1.2	23.1
17-21	0.5	0.1	0+	0.4	0.8	0.6	0.5	1.5	1.5	0.9	0.6	0.5	7.9
22-27	0.1			0.1	0.2	0+	0.2	0.5	0.6	0.3	0.3	0.3	2.7
28-33	0+					0.1		0.1	0+	0+	0+	0.2	0.4
34-40	0+							0+		0+			0.1
41-47	0+								0+				0.1
48-55													0.0
TOTAL	2.9	1.8	2.2	4.2	10.7	10.5	10.1	12.7	16.0	9.1	4.2	4.2	100.0

NOVEMBER

Speed range kt	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	TOTAL
									calm or light/variable				18.1
1- 3	0.3	0.7	1.0	1.9	2.7	2.0	1.4	1.1	1.5	1.1	0.4	0.2	14.1
4- 6	0.3	0.7	0.5	1.4	2.1	1.7	1.2	1.4	2.5	1.6	0.5	0.2	14.0
7-10	0.8	0.9	0.7	1.6	1.6	1.8	2.5	3.0	3.9	2.3	1.2	0.6	20.8
11-16	0.9	0.9	0.6	1.2	1.4	1.4	2.5	3.7	4.1	2.0	1.3	1.2	21.3
17-21	0.4	0.3	0.2	0.8	0.2	0.9	0.7	0.7	0.9	0.6	0.5	0.6	6.8
22-27	0.5	0.2	0.1	0.4	0.4	0.3	0.2	0.2	0.4	0.4	0.2	0.4	3.7
28-33	0.1	0+		0+	0.2	0.1	0.1	0+	0.1	0.1	0+	0.1	0.9
34-40					0+				0+	0.1	0.1		0.2
41-47										0.1			0.1
48-55													0.0
TOTAL	3.4	3.6	3.1	7.3	8.6	8.1	8.5	10.0	13.5	8.3	4.2	3.4	100.0

DECEMBER

Speed range kt	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	TOTAL
									calm or light/variable				15.2
1- 3	0.4	0.4	0.6	1.7	2.2	1.7	0.8	0.9	1.5	1.1	0.3	0.2	11.9
4- 6	0.4	0.4	0.5	1.0	1.4	1.5	1.3	1.0	2.5	1.2	0.3	0.4	12.0
7-10	0.6	0.4	0.5	1.2	1.5	2.0	2.3	2.6	4.9	2.1	0.7	0.6	19.3
11-16	0.3	0.2	0.5	1.1	1.1	2.1	2.8	5.6	5.6	3.0	1.3	1.2	24.9
17-21	0.2	0+	0.1	0.7	0.6	1.0	1.0	2.3	2.2	1.5	0.9	0.3	10.9
22-27	0.2	0+		0.3	0.3	0.4	0.5	0.6	0.8	0.8	0.5	0.3	4.7
28-33		0+			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.8
34-40	0+						0+		0+	0.1	0+	0.1	0.2
41-47	0+									0+	0+	0+	0.1
48-55													0.0
TOTAL	2.1	1.6	2.3	6.0	7.3	8.7	8.9	13.0	17.7	9.9	4.2	3.2	100.0

TABLE 1 CONTD - PERCENTAGE FREQUENCIES OF MEAN
WIND SPEED WITH DIRECTION

YEAR

Speed range kt	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	TOTAL
									calm or light/variable				13.2
1- 3	0.8	0.9	0.6	1.2	1.9	1.5	1.1	0.9	1.6	1.2	0.7	0.8	13.2
4- 6	1.1	1.1	0.5	0.9	1.7	1.5	1.5	1.4	2.5	1.5	0.8	0.9	15.4
7-10	1.5	1.1	0.6	1.2	2.0	2.1	2.2	2.6	3.9	2.4	1.8	1.5	22.9
11-16	1.1	0.7	0.5	1.1	2.4	2.3	1.9	3.1	4.1	3.0	1.9	1.3	23.4
17-21	0.3	0.1	0.1	0.4	1.0	0.8	0.5	1.0	1.3	1.2	0.7	0.4	7.8
22-27	0.1	0+	0+	0.1	0.5	0.4	0.2	0.3	0.5	0.6	0.3	0.2	3.3
28-33	0+	0+	0+	0+	0.1	0.1	0+	0+	0.1	0.1	0.1	0+	0.6
34-40	0+			0+	0+	0+	0+	0+	0+	0+	0+	0+	0.1
41-47	0+				0+		0+				0+		0+
48-55					0+		0+				0+		0+
TOTAL	4.8	3.9	2.4	5.0	9.6	8.7	7.6	9.4	13.9	10.1	6.3	5.1	100.0

Table 2 Statistics of mean wind speed

This Table gives the following statistics:

(a) average mean hourly wind speed (knots) for each month of the year and for the year as a whole. The figures were obtained by calculating mean hourly wind speeds for each month and year separately and then averaging them over the ten year period, May 1957 - April 1967.

(b) standard deviations of mean hourly wind speed (knots), May 1957 - April 1967.

(c) highest hourly mean wind speed (knots) in the period May 1957 - April 1967.

(d) year(s) of occurrence of highest hourly mean wind speed.

(e) lowest monthly maximum hourly mean wind speed (knots) in the period

(f) year(s) of occurrence of lowest monthly maximum hourly mean wind speed.

*(a) Aldergrove average hourly mean wind speeds (knots). May 1957 - April 1967.

*(b) Standard deviations of Aldergrove average hourly mean wind speed (knots). May 1957 - April 1967.

* The figures for Aldergrove have been included for purposes of comparison.

TABLE 2 - STATISTICS OF MEAN WIND SPEED

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
(a)	9.1	10.2	10.8	9.3	7.8	7.3	7.3	7.7	7.7	8.5	8.1	9.4	8.6
(b)	1.65	2.66	1.81	1.64	1.19	1.29	1.11	1.79	1.59	1.68	1.93	1.82	
(c)	50	53	38	34	32	37	29	35	51	45	45	46	
(d)	1965	1963	1966	1960	1962 1963 1965 1966	1960	1961	1957	1961	1959	1965	1962	
(e)	28	25	26	22	22	20	17	18	17	23	22	24	
(f)	1958	1965	1961	1964	1957 1959	1957	1965	1958 1960	1959	1964	1958	1960	
ALDERGROVE, for comparison													
(a)	10.6	11.2	11.8	10.4	9.7	9.4	9.2	9.3	9.7	10.0	9.7	10.7	10.1
(b)	1.88	2.39	1.61	1.61	2.02	1.41	1.32	1.35	1.71	1.71	1.78	1.27	

Table 3 Statistics of gust speeds

Table 3 which also includes some comparative figures for Aldergrove, is in eight parts giving the following statistics on gust speeds in knots:

- (a) average monthly maximum gust
- (b) highest maximum gust recorded for each month
- (c) year(s) of occurrence of highest monthly maximum gust
- (d) lowest monthly maximum gust
- (e) year(s) of occurrence of lowest monthly maximum gust

The following are comparative figures for Aldergrove based on the same period, May 1957 to April 1967:

- (a) average monthly maximum gust
- (b) highest gust recorded for each month
- (c) year(s) of occurrence of highest gust for each month

TABLE 3 - Gust speeds

BALLYKELLY (May 1957 to April 1967)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(a)	60	59	54	52	49	46	40	47	53	53	57	59
(b)	77	75	64	66	57	67	48	57	92*	71	76	76
(c)	1965	1961	1966 1967	1960	1962	1962	1961	1962	1961	1959	1963	1962
(d)	50	50	47	46	37	35	32	37	36	42	43	48
(e)	1966	1964	1959	1962	1957	1957	1965	1960	1959	1966	1958	1961
				1964	1959	1958						

* A gust of 92 knots from 200° at 1525 GMT on 16 September 1961 is the highest gust recorded to date at Ballykelly

ALDERGROVE, for comparison

(a)	55	49	49	49	49	44	39	46	48	52	53	55
(b)	69	63	56	57	60	65	47	56	76	68	72	69
(c)	1961 1965	1961	1963	1959 1963	1964	1960	1964	1957	1961	1961	1959	1966

Table 4. Statistics of gust frequencies

This Table gives the percentage frequency of maximum gust speeds within ten knot ranges for each of the twelve 30-degree direction bands. The Table is based on the maximum gust recorded in 3,652 observations - ie one for each day of the ten-year period.

TABLE 4 - Gust frequencies

BALLYKELLY (May 1957 to April 1967)

Speed range kt	350- 010	020- 040	050- 070	080- 100	110- 130	140- 160	170- 190	200- 220	230- 250	260- 280	290- 310	320- 340	TOTAL
1- 9	0.3	0.5	0.2	0.3	0.4	0.3	0.1	0.1	0.3	0.5	0.1	0.1	3.2
10-19	2.8	4.1	1.0	0.9	2.3	2.3	1.4	1.2	1.8	1.9	1.5	1.8	23.0
20-29	2.3	1.4	0.8	1.7	3.6	3.5	3.1	3.7	3.9	3.4	3.0	2.1	32.5
30-39	1.2	0.3	0.3	0.9	2.1	2.8	2.3	3.5	3.5	3.2	2.9	1.1	24.1
40-49	0.4	0.2	0.1	0.4	1.4	1.6	1.2	1.5	1.9	1.9	1.2	0.6	12.4
50-59	0.1			0.1	0.3	0.3	0.3	0.3	0.7	0.8	0.6	0.2	3.7
60-69					0+		0.1	0+	0.2	0.2	0.1	0.1	0.7
70-79	0+							0+	0+	0+	0+		0.2
80-89													0.0
90-99								0+					0+
Calm													0.1
TOTAL	7.1	6.5	2.4	4.3	10.1	10.8	8.5	10.3	12.3	11.9	9.4	6.0	99.9

The entry 0+ is used when the frequency is less than 0.05 per cent.

Table 5 Number of hours with gusts exceeding 33 kt

Tables 5 and 6 have been prepared from the number of hours in which gust speeds have been recorded to exceed 33 kt and 47 kt respectively.

- (a) average number of hours per month
- (b) highest number of hours per month
- (c) year(s) of occurrence of (b)
- (d) lowest number of hours per month
- (e) year(s) of occurrence of (d)
- (f) Aldergrove; average number of hours per month, for comparison.

TABLE 5 - Hours with gusts exceeding 33 kt

BALLYKELLY (May 1957 to April 1967)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
(a)	80	85	101	59	38	22	18	27	37	55	66	90	56.5
(b)	159	161	234	108	77	88	54	73	69	119	125	141	
(c)	1962	1962	1967	1966	1963	1962	1961	1957	1957	1961	1966	1966	
(d)	22	32	47	21	2	2	0	4	1	18	7	44	
(e)	1959	1965	1959	1961	1957	1957	1965	1960	1959	1960	1958	1960	

ALDERGROVE, for comparison

(f)	45	36	54	36	28	22	14	26	26	34	43	52	34.7
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TABLE 6 - Hours with gusts exceeding 47 kt

((a) to (f) as for Table 5)

BALLYKELLY (May 1957 to April 1967)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
(a)	9.8	12.7	8.0	4.5	3.3	1.4	0.1	2.1	2.8	5.5	9.5	14.2	61.6
(b)	26	49	29	18	12	10	1	8	9	22	31	40	
(c)	1958	1962	1957	1960	1962	1962	1961	1962	1961	1959	1966	1958	
(d)	2	2	0	0	0	0	0	0	0	0	0	1	
(e)	1967	1959 1960	1959	1961 1962 1964	1957 1959 1960	1957 1958 1959 1961	ALL ex- cept 1961	1958 1960 1961 1963 1964 1965	1957 1959 1960 1965	1957 1960 1966	1958	1960	

ALDERGROVE, for comparison

(f)	7.1	4.7	1.7	1.0	1.5	1.5	0.0	3.3	2.0	3.4	4.4	4.9	35.5
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Table 7 Frequency of days when gusts exceeded 33 kt

Tables 7(a) and 8(a) give the average number of days for each month of the year and for the year as a whole when gusts exceeded 33 kt and 47 kt respectively. The Tables are subdivided, according to the time for which the gusty conditions persisted, into eight three-hour periods.

TABLE 7a - Average number of days

Time of day GMT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
0100-0300	4.4	5.3	5.6	3.9	2.8	1.6	1.6	2.5	3.1	3.2	3.5	6.3	43.8
0400-0600	2.5	2.5	3.5	1.7	1.2	0.9	0.8	1.5	1.4	2.4	1.8	2.8	23.0
0700-0900	2.1	2.2	1.0	1.3	0.7	0.4	0.4	0.5	1.1	1.4	1.6	2.0	14.7
1000-1200	1.4	1.2	1.5	1.0	1.0	0.3	0.3	0.6	0.6	0.6	0.8	1.1	10.4
1300-1500	0.9	0.5	1.3	0.7	0.3	0.2	0.3	0.4	0.3	0.5	0.8	1.0	7.2
1600-1800	0.3	1.0	0.7	0.3	0.3	0.2	0.1	0.3	0.2	0.3	0.3	0.7	4.7
1900-2100	0.3	0.1	0.2	0.3		0.1		0.2	0.1	0.1	0.4	0.1	1.9
2200-2400	0.2	0.2	0.5	0.1	0.1					0.3	0.3	0.4	2.1
TOTAL	12.1	13.0	14.3	9.3	6.4	3.7	3.5	6.0	6.8	8.8	9.5	14.4	107.8

Tables 7(b) and 8(b) give the maximum number of hours in each month for which these gusty conditions persisted, together with the appropriate year(s).

TABLE 7b - Maximum number of hours

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
No of hours	24	24	24	24	22	19	17	20	19	23	24	24
Years	1964	1962	1960 1963 1964 1967	1960	1962	1962	1961	1959	1963	1959	1965 1966	1962

Table 8 Frequency of days when gusts exceeded 47 kt

TABLE 8a - Average number of days

Time of day GMT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
0100-0300	2.8	1.8	2.7	1.1	1.0	0.4	0.1	0.4	0.9	1.4	1.4	2.4	16.4
0400-0600	0.9	0.8	0.5	0.3	0.2	0.1		0.1	0.1	0.1	0.6	0.7	4.4
0700-0900	0.1	0.3			0.1			0.1	0.1	0.1	0.1	0.1	1.0
1000-1200		0.2	0.1								0.2	0.1	0.6
1300-1500				0.1							0.1	0.1	0.3
1600-1800		0.1											0.1
1900-2100										0.1			0.1
2200-2400													0.0
TOTAL	3.8	3.2	3.3	1.5	1.3	0.5	0.1	0.6	1.1	1.7	2.4	3.4	22.9

TABLE 8b - Maximum number of hours

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
No of hours	9	16	12	14	9	5	1	8	9	19	15	15
Years	1958	1962	1967	1960	1962	1962	1961	1962	1961	1959	1965	1966

Table 9 Days of gale

This table gives the total number of days of gale in the ten-year period for each month separately and for the whole ten years.

A "day of gale" is one during which the mean wind speed exceeded 33 kt for a period of at least ten consecutive minutes at a standard height of 33 ft above ground. (Days during which only gusts exceeded 33 kt are not classified as days of gale, because the Beaufort Wind Scale gives names to mean wind speed ranges only).

TABLE 9 - Total number of days in the ten years

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
Total no of days	15	24	13	6	3	3	3	3	5	5	11	11	99

Table 10 Extreme value analysis

This table gives the figures obtained from an extreme value analysis (Shellard (2)) in respect of wind speeds (at 33 ft, 100 ft, and 200 ft above the ground) likely to be exceeded only once in 10, 20, 50 and 100 years.

	Speeds likely to be exceeded only once in			
	10 years	20 years	50 years	100 years
<u>At Standard Height of</u> <u>33 ft above ground</u>				
Maximum mean hourly speed	54 (62)	59 (68)	65 (75)	69 (79)
Maximum mean 1-minute speed	66 (76)	73 (84)	80 (92)	85 (98)
Maximum gust speed	87(100)	94(108)	103(119)	110(127)
<u>At Height of</u> <u>100 ft above ground</u>				
Maximum mean hourly speed	66 (76)	72 (83)	80 (92)	84 (97)
Maximum mean 1-minute speed	81 (93)	89(103)	98(113)	104(120)
Maximum gust speed	96(111)	103(119)	113(130)	121(139)
<u>At Height of</u> <u>200 ft above ground</u>				
Maximum mean hourly speed	73 (84)	80 (92)	88(101)	94(108)
Maximum mean 1-minute speed	90(104)	99(114)	109(125)	116(134)
Maximum gust speed	101(116)	110(127)	120(138)	128(147)

All speeds are given in knots, followed by their equivalents, in miles per hour, in brackets.

3. Discussion

From the "Total" figures given in the bottom row of the Year Table of Table 1, the distribution of wind direction throughout the year is clearly seen. On 13.2 per cent of occasions winds were either calm or too light and variable for it to be possible to assign a realistic direction to them and of the remaining occasions 27.5 per cent were from directions between 280 degrees and 100 degrees (through North). The percentage of occasions when directions were between 100 degrees and 280 degrees (through South) was much higher at 59.3 per cent. There was a maximum of 13.9 per cent in the range 230-250 degrees (to some extent this could be due to funnelling along the valley of the River Foyle).

The wind at Ballykelly is affected by local topography. The surrounding hills provide shelter from all directions. The monthly wind speeds are lower than at Aldergrove, a station further inland but less sheltered by topographical features. The winds at Ballykelly are not, therefore, truly representative of the wind regime on the exposed northern coast of Ireland.

Tables 3, 4 and 5 provide comparative figures for Ballykelly and Aldergrove in relation to gusts. Table 3 gives an indication that average maximum gust speeds at Ballykelly are greater than at Aldergrove but the differences, which vary from 1 kt in July to 5 kt in January, (the months of lowest and highest average gust values respectively) are not marked. Much more significant are the differences in the duration of gusts reaching or exceeding gale force and seen in Table 4. For almost 150 hours per year more gusts exceeding 33 kt were recorded at Ballykelly. The percentage frequency of gusts is higher and the actual maximum gust values are higher at Ballykelly than at Aldergrove.

References

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ending 1963.
Climatological Memorandum No 50, Met Office, Bracknell

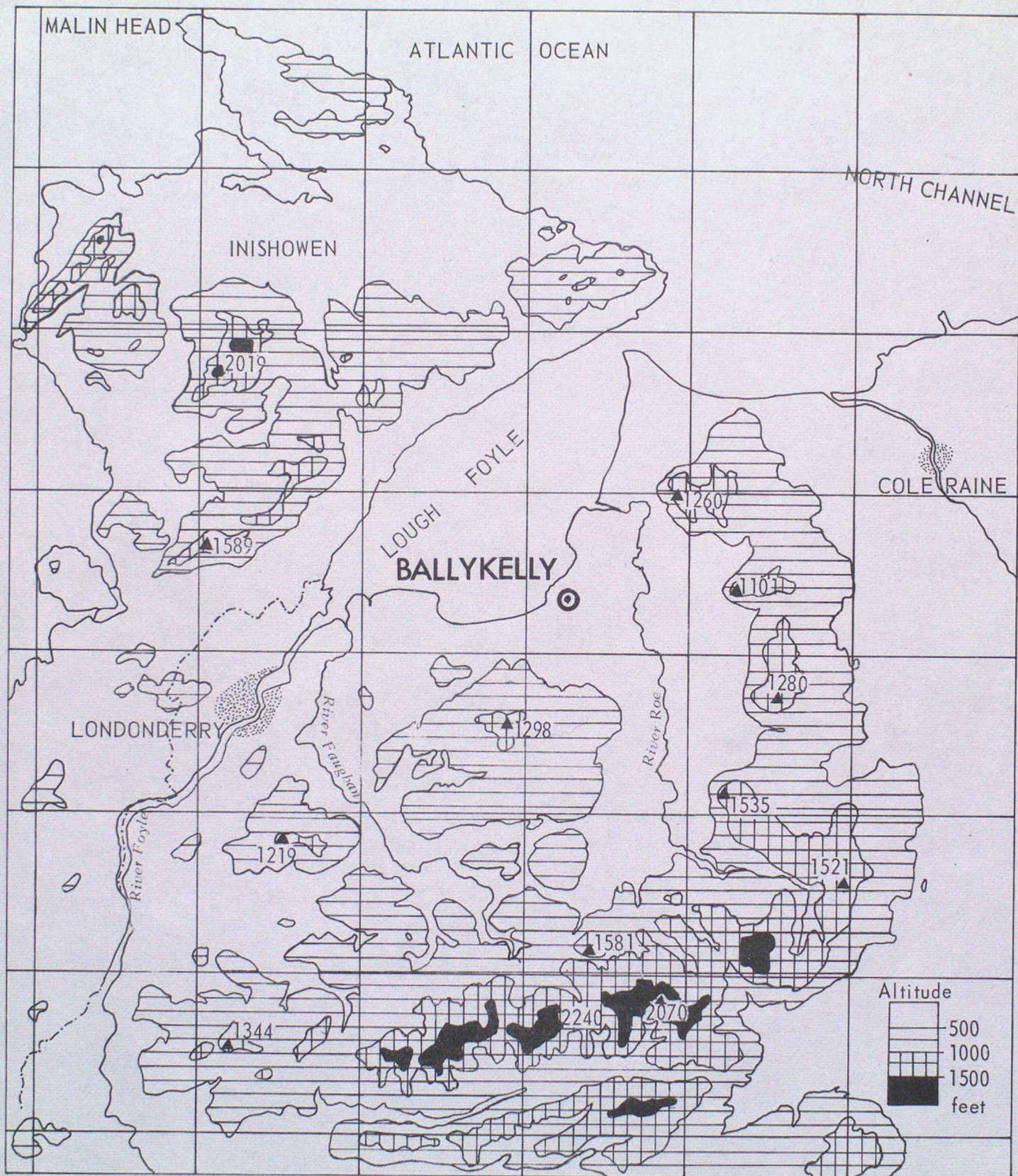
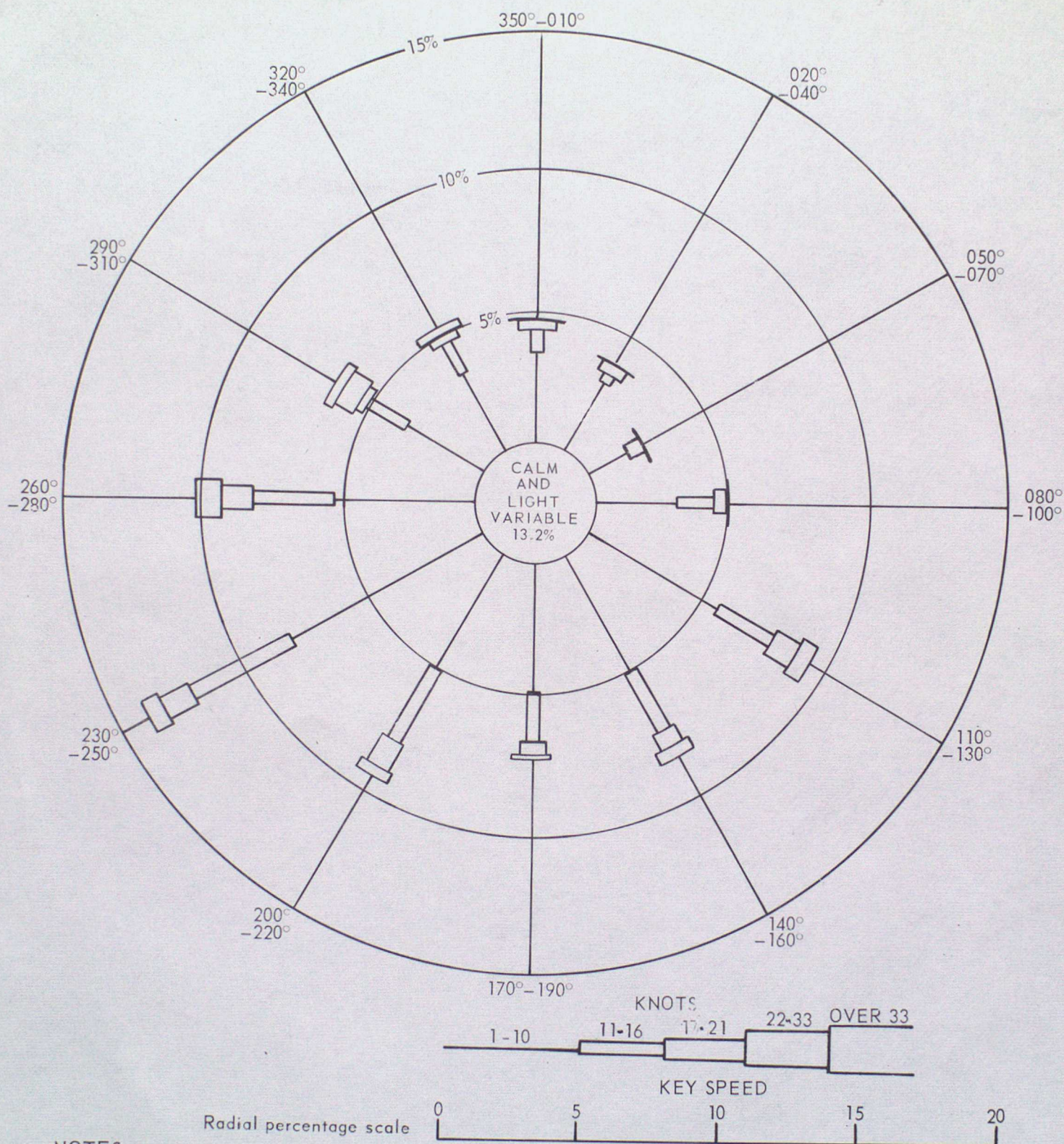


Figure 1.

BALLYKELLY: Period MAY, 1957 to APRIL, 1967
Based on 87,648 observations of hourly mean wind speed and direction.

PERCENTAGE FREQUENCY OF DIRECTION ALL SPEEDS



NOTES

1. Total hours recorded for each direction/speed range are expressed as a percentage of total hours actually recorded during the period.
2. Percentages are plotted radially from inner circle edge and are cumulative, exclusive of total periods of calm and light, variable winds, which are shown by figure in centre circle.

Figure 2.