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ANNUAL AND DIURNAL VARIATION OF VISIBILITY  
AT SHANNON AND DUBLIN AIRPORTS

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COMPARISON OF VISIBILITY AT  
DUBLIN AND SHANNON AIRPORTS, 1951-55

INTRODUCTION:

An earlier paper (DIXON 1958) included a comparison of the visual range from O'Connell Street, Dublin, with that at Dublin Airport, using "median" and "quartile" visibilities. This paper applies the same criteria to comparing the visual range at Dublin and Shannon Airports, at all times of the day and in all seasons of the year.

The first section discusses the advantages of the "median" and "quartile" visibilities as climatological elements, and explains the method adopted in evaluating them. The other sections present the data for the two airports in tables and diagrams, including frequencies of extremes of visibility as well as the median and quartile values. The diagrams used are "isograms" depicting simultaneously the annual and diurnal variations.

MEDIAN AND QUARTILE VISIBILITY

Visibility summaries normally deal mainly with the frequency of extreme values, especially of fog. These are essential data for many problems, such as the effect of visibility on aircraft operations, but can be misleading for other applications. For example, the transparency of the air can be a useful index for the degree of atmospheric pollution, but the index must take into account all occasions of good and bad visibility. The average visibility, obtained as the arithmetic mean of the observed visual ranges, is inappropriate because it is unduly influenced by a few observations of long distances. It has the further disadvantage that it cannot be computed from published frequency summaries, which show no upper limit to the end class "over 25 miles".

It is therefore suggested that a more suitable index can be found in the median visibility, i.e. the distance at which suitably prominent objects can be recognised at half the observations. The median can be supplemented by quartiles, quintiles, or other similarly defined functions of the data. In this paper the median and a quartile are used, this quartile being the distance at which an object is visible at three quarters of the observations. Both median and quartile have been used by other writers: C.S. Durst (1949) quoted them for airfields in many parts of the world.

An advantage of this method is the convertibility from visibility to transparency. Clearly the median transparency is readily obtained from the median visibility. A further advantage, judging by the results for Irish rural stations, is that the median for observations at 09h. L.M.T. is a good approximation to that derived from observations at all hours, so that even the data for climatological stations observing only once per day can be of value.

A practical advantage is the ease with which the median and quartile may be extracted from visibility frequency summaries as normally published.

Example

The frequency distribution for visibilities observed at 10h G.M.T. during November 1951 at Dublin Airport were:-

Distance	<110y	110-220y	220-440y	440-1100y	1100-2200y	1 $\frac{1}{4}$ -2 $\frac{1}{2}$ m	2 $\frac{1}{2}$ -6 $\frac{1}{4}$ m	6 $\frac{1}{4}$ -12 $\frac{1}{2}$ m	12 $\frac{1}{2}$ -25m	>25m
Frequency	0	1	0	1	1	2	3	6	15	1

From this the cumulative frequencies are derived:

Distance(x)	110y	220y	440y	1100y	1 $\frac{1}{4}$ m	2 $\frac{1}{2}$ m	6 $\frac{1}{4}$ m	12 $\frac{1}{2}$ m	25m
No. of obs. < x	0	1	1	2	3	5	8	14	29

If these are plotted with linear scales it is found that the curve is almost straight for most of its length and it is easy to read off that the distance for which objects were visible at one-half and three-quarters of the observations are 1.3 and 5.1 miles respectively.

## RESULTS:

The first comment on any analysis of Irish visibility data must be to stress the transparency of the air compared with that of many other countries. Durst (DURST 1949) prepared a map showing what is here termed the quartile visibility at the midday observations, for a large part of western Europe. Over most of the area the distance is less than five miles and in the industrial regions of Great Britain it is under three miles. The corresponding figures for Dublin and Shannon Airports are  $8\frac{1}{2}$  and 10 miles respectively.

At most times of the day, in most months of the year, Shannon Airport has the better visibility. This is due chiefly to the absence of industrial and domestic pollution there. Dublin Airport is only three miles north from the edge of the Dublin city built-up area and smaller centres of population are at Swords (2 miles to NNE) and Malahide (4 miles ENE). Shannon Airport is much more distant from urban communities, the nearest being Ennis (10 miles NNW) Newcastle (6 miles NNE) and Limerick (13 miles E). A further factor is the proximity to the British industrial centres which naturally affect Dublin more than Shannon Airport and it is significant that the difference between the two places is enhanced in the months experiencing most winds with an east component. The situations favouring the spread of the British pollution across Ireland also favour the formation of advection fog along the east coast, but it is not likely that this occurs often enough to contribute largely to the figures.

That much of the pollution experienced in Ireland originates in Britain was proved long ago. Analyses of haze particles and the nuclei of raindrops and hailstones (HARTLEY 1902) showed that many of them had originated in England or Wales. A spectacular occurrence of black rain in October 1907 was proved to be caused by smoke from South Wales (BOEDDICKER 1908).

### Annual Variation

Considering the median and quartile values derived from the data for all hours of the day (Figure 1) there is a sharp midsummer maximum, and minima are reached in January and March. The trends are more regular at Shannon than at Dublin Airport; a secondary minimum in the quartile at Dublin in August has not been explained. The similar dip of the curves in May is consistent with that month's large proportion of easterly winds.

The summaries for selected extreme ranges of visibility show that the worst visibilities are commonest in March at both airports, but that the minimum frequency of excellent visibility is in January.

### Diurnal Variation

At Shannon Airport, throughout the year, visibility is worst during the night or near sunrise and maximum at about 15h G.M.T. The same is true at Dublin Airport for most of the year, although there is a tendency for the minimum to be delayed until about two hours after sunrise. Dublin Airport trends are quite different in the winter months. From November to February the maximum is reached about two hours before sunrise and the minimum between 16h and 18h GMT.

The contrast between the shapes of the diurnal variations leads to one surprising result, that there is normally a period in the morning when Dublin Airport has the better visibility.

The differences are largely the result of topographical features. Dublin Airport is over 200 feet above M.S.L. and when radiation conditions occur the coldest air, and the associated fog or mist, drifts to lower levels, leaving the airfield in clear air above the inversion. Shannon Airport is very near M.S.L. and is more liable to have radiation fog formed in situ. The Dublin pollution must also play an important part in modifying the diurnal variation. In the light-wind situations which favour fog and mist production it will take an appreciable time for the smoke and nuclei of newly lit fires to be carried from their sources to Dublin Airport, even

after the inversion trapping them has risen enough for the spread to be possible.

REFERENCES

- ROEDDICKER, O. Black Rain in Ireland. Symons' Met. Mag. Vol. 43  
1908, pp. 2-4.
- DIXON, F.E. Meteorology and the Community. J. Stat. & Soc. Inq. Sec. I. Vol. 19 (1956-57) Dublin 1958, pp. 81-103.
- DURST, C.S. Meteorology of Airfields (M.O.507) London 1949
- HARTLEY, W.N. Haze, dry fog, and hail. Sc. Proc. R.D.S. Vol. 9.,  
Dublin 1902, pp. 547-558.

**TABLE I**  
**MEDIAN VISIBILITY 1951-55**

Month	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	All Hours	
<b>DUBLIN AIRPORT</b>																										
Jan.	12.3	11.8	11.4	11.1	12.0	12.4	13.3	14.6	15.4	13.6	11.4	11.2	10.7	11.6	11.8	11.6	10.0	9.2	8.7	8.8	9.1	9.2	10.3	11.5	10.5	
Feb.	11.6	11.7	11.4	10.9	11.2	11.5	12.0	14.0	14.9	11.5	10.6	11.7	12.6	12.0	13.2	14.0	12.5	11.6	10.1	9.7	10.0	10.4	10.3	10.5	11.4	
Mar.	9.7	9.6	9.6	9.8	9.3	9.7	10.3	10.3	10.2	9.2	9.8	10.3	11.5	11.3	12.3	12.6	12.3	12.0	10.9	9.2	8.9	9.3	8.8	9.8	9.9	
Apr.	13.7	13.0	12.8	12.9	13.1	14.5	15.5	17.0	15.5	13.9	17	19	18	20	17	17	18	16	16	12.5	11.2	11.1	11.9	12.5	14.4	
May	14.1	12.9	11.9	12.5	12.5	12.7	12.2	12.1	11.7	12.6	14.0	15	16	17	17	17	18	18	17	18	15	12.4	12.3	13.0	13.9	
June	18	17	16	17	18	18	19	19	19	22	27	29	29	28	31	32	30	28	29	30	25	24	18	18	21	
July	21	19	19	18	23	25	27	24	27	28	30	31	32	34	32	33	33	36	38	36	33	30	25	23	27	
Aug.	20	20	19	19	19	20	21	18	25	28	28	30	32	32	33	36	36	37	38	35	26	22	24	21	24	
Sept.	17	17	17	16	16	17	19	20	19	20	23	27	27	28	28	27	31	30	27	22	19	18	18	18	20	
Oct.	15	15	14.8	14.5	14.0	14.5	15	17	18	16	16	17	18	20	21	22	18	15	13.5	12.0	11.9	11.8	12.7	13.8	15	
Nov.	12.2	13.9	12.6	12.1	12.6	13.5	13.7	14.4	14.5	13.1	11.6	11.0	12.1	11.5	12.7	12.0	11.0	9.7	9.5	8.8	9.8	9.8	10.5	12.1	12.1	
Dec.	14.5	15	14.4	15	14.9	15	16	16	16	13.2	12.2	11.0	10.7	10.7	11.6	12.4	10.2	9.4	9.7	10.3	10.7	10.5	11.2	12.0	12.6	
Spring	12.4	11.5	11.3	11.6	11.5	12.1	12.3	12.8	12.3	11.8	12.9	13.8	14.5	15.5	14.5	15.5	15.5	14.6	13.9	12.1	11.1	10.8	10.8	11.8	12.2	
Summer	20	19	17	18	20	20	21	21	22	27	28	31	33	32	33	34	31	31	33	31	27	23	21	20	24	
Autumn	16	15	14.2	14.2	14.0	14.9	15	17	16	16	16	16	18	19	20	19	18	15	14.0	13.0	12.5	12.4	13.1	14.7	15	
Winter	12.7	12.7	12.3	12.1	12.6	13.2	14.0	14.7	14.8	12.6	11.5	11.3	11.2	11.3	12.0	12.4	10.5	9.7	9.2	9.7	10.0	10.2	11.0	11.7	11.2	
Year	14.7	14.5	13.7	13.7	13.7	14.7	15.1	16.3	16.0	15.2	15.4	16.0	16.5	16.8	17.1	17.1	16.0	14.6	13.6	13.1	12.6	12.2	12.7	13.7	14.7	
<b>SHANNON AIRPORT</b>																										
Jan.	11.6	10.4	10.4	10.7	11.5	11.9	10.8	10.8	13.3	15	16	13.4	14.6	12.7	14.3	12.9	12.6	14.4	12.8	11.8	11.6	12.2	12.8	12.6	12.5	
Feb.	14.2	13.7	13.6	14.1	15.2	12.3	13.0	13.4	16	16	15	18	18	19	22	23	23	20	17	15	15	12.9	13.2	14.0	14.9	
Mar.	12.4	11.7	12.2	11.3	10.8	10.9	12.4	12.3	11.9	10.8	11.0	12.3	13.5	16	15	18	17	17	16	16	13.4	13.0	12.5	13.0	13.1	
Apr.	16	15.0	16	14.8	14.2	16	15	16	17	20	20	23	24	22	25	25	23	25	20	19	16	15	15	15	18	
May	18	17	17	15	15	15	14.8	14.7	16	20	24	25	27	27	29	28	31	29	27	27	26	21	18	17	20	
June	19	18	18	19	16	15	15	16	19	24	27	28	29	30	32	32	31	32	31	30	31	27	21	18	24	
July	20	19	20	19	18	18	17	17	18	21	26	32	33	34	33	33	36	34	35	33	31	26	23	21	27	
Aug.	20	19	19	18	19	18	20	20	22	23	26	30	32	33	33	33	37	34	36	33	31	26	24	22	25	
Sept.	17	18	19	19	20	19	19	20	20	22	24	26	25	30	29	33	33	33	28	25	22	21	20	19	22	
Oct.	16	15	14.2	13.0	14.1	14.1	14.5	16	16	16	16	19	21	21	24	27	27	22	20	18	18	17	16	15	17	
Nov.	14.5	13.4	13.3	13.4	12.4	12.8	12.7	12.0	13.0	14.9	14.5	14.5	13.4	14.5	14.0	14.7	17	14.9	12.3	12.4	12.9	12.9	12.8	14.2	13.9	
Dec.	13.0	13.0	12.5	12.7	13.0	13.9	13.1	12.8	14.6	13.6	14.3	14.6	13.5	14.1	14.5	14.4	14.6	12.3	11.6	11.8	12.8	12.6	13.0	11.8	13.2	
Spring	16	14.9	14.7	14.0	13.2	14.0	14.1	14.3	14.9	15	18	20	20	20	23	24	23	23	22	20	17	16	16	14.6	17	
Summer	20	19	19	19	18	18	17	18	19	22	26	30	31	32	33	33	35	34	34	32	31	26	23	21	25	
Autumn	16	16	16	16	15	15	15	16	17	18	19	20	21	22	24	25	25	22	21	18	18	17	17	16	18	
Winter	13.0	13.1	12.6	12.4	11.9	12.6	12.5	12.5	14.2	14.3	15	15	15	16	16	16	15	14.4	13.2	13.0	12.9	12.5	13.0	12.7	13.8	
Year	15.2	14.9	14.9	14.7	15.3	14.8	14.4	15.2	16.1	17.5	18.5	19.6	21	22	24	24	24	23	21	20	19	17	16	16	17.5	

TABLE 2  
QUARTILE VISIBILITY 1951-55

Month	GMT.	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	All Hours	
<b>DUBLIN AIRPORT</b>																											
Jan.		7.8	7.7	7.4	7.4	8.0	8.1	8.6	8.9	8.7	6.5	5.5	5.9	5.8	6.2	6.8	6.0	5.5	5.0	4.7	5.0	5.2	4.9	6.6	7.4	7.4	6.3
Feb.		6.7	6.3	6.6	5.8	5.9	6.7	7.0	7.3	5.9	6.8	6.0	7.1	6.8	6.8	6.5	7.2	6.9	6.2	5.5	5.6	5.6	5.8	6.0	5.7	5.7	5.9
Mar.		4.1	4.1	4.2	4.6	4.0	4.0	4.0	2.9	3.5	3.6	4.3	4.6	5.0	5.4	6.2	6.7	6.2	5.6	5.5	4.8	4.5	4.5	4.7	4.5	4.5	5.5
Apr.		8.0	8.1	8.0	8.1	8.0	8.0	6.7	9.4	8.0	7.5	8.9	9.6	8.7	9.2	8.5	8.5	9.0	8.8	7.9	7.7	7.0	7.0	6.9	8.1	8.0	
May		6.4	6.9	6.8	6.7	6.2	6.3	6.1	5.8	5.7	6.5	7.4	7.4	7.1	7.1	7.5	7.8	8.0	7.5	8.1	8.2	7.4	6.5	6.8	7.0	6.9	
June		10.3	9.4	8.5	8.6	8.4	9.5	8.9	9.0	7.6	8.2	8.9	9.5	9.7	10.2	10.9	10.2	10.0	9.9	9.9	9.6	9.8	9.3	9.0	9.7	9.4	
July		11.7	11.2	10.6	11.3	13.8	13.2	13.0	11.7	12.6	14.9	17	17	18	17	17	17	17	19	19	17	17	13.9	12.6	12.6	14.0	
Aug.		11.5	11.0	10.4	10.9	10.2	9.5	7.0	6.7	9.0	11.5	12.3	12.6	14.0	12.4	12.6	12.4	16	15	14.0	14.0	13.4	10.8	11.0	11.3	11.0	
Sept.		11.4	10.3	10.8	10.5	10.5	10.6	10.8	11.9	10.5	11.2	12.6	15	16	18	15	15	15	15	16	12.3	10.9	10.6	10.5	11.5	12.0	
Oct.		8.3	8.4	8.4	8.1	7.2	8.1	7.6	6.8	7.0	5.5	6.1	7.5	8.4	9.6	9.4	8.5	8.2	8.0	6.0	5.5	6.0	6.0	6.3	6.9	7.5	
Nov.		7.6	8.2	8.0	7.9	8.0	8.8	9.3	8.5	8.7	7.5	7.3	7.0	7.3	7.2	7.4	7.4	7.0	6.0	5.6	4.9	5.5	5.5	6.7	7.6	6.9	
Dec.		9.1	9.1	9.4	9.7	9.9	10.0	10.4	10.4	9.7	7.8	7.7	6.5	6.4	6.7	6.9	6.2	6.5	6.8	6.8	6.5	7.0	7.6	7.7	8.1	7.1	
Spring		6.2	6.2	6.4	6.5	6.2	6.1	5.7	5.6	5.7	6.0	6.7	7.0	7.1	6.8	7.3	7.5	7.6	7.6	7.3	6.4	6.1	6.1	6.0	6.5	6.4	
Summer		11.5	10.7	10.6	10.1	11.1	10.8	9.9	9.4	10.0	11.4	12.0	12.6	12.8	13.0	14.5	13.1	14.0	14.5	13.6	12.5	12.4	10.9	11.1	11.4	11.7	
Autumn		8.7	8.8	8.4	8.4	8.3	9.1	9.1	8.3	8.5	7.7	8.0	8.6	9.0	9.4	9.5	8.6	8.7	7.8	7.0	6.8	6.7	6.8	7.2	8.9	8.0	
Winter		7.8	7.6	7.6	7.5	7.8	8.1	8.6	8.5	8.4	7.9	6.3	6.4	6.3	6.6	6.8	6.3	6.3	5.7	5.4	5.8	5.9	6.2	7.1	7.3	6.9	
Year		7.5	7.4	7.6	7.7	7.9	8.2	8.1	7.9	8.0	7.5	7.8	8.3	8.4	8.6	8.8	8.6	8.4	8.4	7.8	7.0	7.1	7.0	7.2	8.0	7.8	
<b>SHANNON AIRPORT</b>																											
Jan.		6.0	5.9	5.0	5.0	5.3	5.0	4.9	5.2	5.5	6.8	7.0	7.3	6.9	7.7	8.4	6.9	6.8	6.7	6.6	6.3	5.5	5.7	6.7	6.3	6.3	
Feb.		7.8	7.8	7.3	7.4	6.4	6.0	6.1	6.7	7.8	7.9	6.6	7.6	8.5	8.9	10.5	10.3	10.0	9.8	8.2	8.5	8.3	7.7	7.7	7.9	7.8	
Mar.		4.7	4.6	4.2	4.2	4.2	4.3	4.0	4.4	4.0	4.1	4.3	5.0	6.0	5.9	6.6	7.4	7.5	8.0	6.9	6.2	5.3	5.6	5.5	5.3	5.7	
Apr.		7.2	6.5	6.9	6.2	4.9	5.3	7.0	7.9	7.1	7.4	8.3	9.8	10.7	10.9	11.0	10.7	10.2	10.9	9.8	9.7	8.6	7.8	8.2	7.8	9.1	
May		8.9	8.7	8.6	7.5	7.7	7.6	7.5	8.0	8.3	9.8	10.9	13.7	11.7	12.9	13.0	13.7	13.9	12.3	12.6	13.4	10.9	9.5	9.1	8.7	10.2	
June		10.3	9.9	9.2	9.5	7.6	7.0	7.4	7.3	8.3	9.9	12.3	12.3	14.6	15	15	16	15	18	16	15	16	13.5	11.0	10.2	11.0	
July		10.7	8.9	9.8	9.6	8.5	9.0	7.9	7.8	8.7	9.9	12.0	14.5	13.8	18	20	19	22	19	17	15	13.7	12.6	10.0	10.2	12.1	
Aug.		12.6	12.6	11.0	11.1	11.1	9.2	8.7	8.9	11.2	11.1	13.7	17	16	18	17	16	22	20	20	18	16	14.0	13.9	14.6	13.3	
Sept.		9.1	9.0	9.9	9.9	13.0	11.2	10.2	10.7	9.7	10.8	13.1	13.2	12.8	17	16	14.1	14.1	16	13.9	13.6	12.4	12.0	11.2	10.5	12.3	
Oct.		6.3	6.9	6.6	6.8	6.8	7.0	7.1	5.7	5.9	6.8	7.4	9.0	9.2	9.2	12.4	12.2	11.3	10.8	10.2	9.1	9.0	7.8	7.5	6.3	8.7	
Nov.		7.2	7.6	6.6	6.8	6.7	6.8	6.8	6.0	7.2	7.9	7.6	7.9	7.6	8.4	8.1	8.6	9.1	8.0	7.5	7.6	7.1	7.2	7.3	8.0	8.0	
Dec.		7.8	7.7	7.0	7.0	7.1	7.6	7.8	7.4	8.4	7.9	8.4	8.6	7.5	8.3	7.6	7.9	7.9	7.4	7.3	7.3	6.8	7.4	7.5	7.4	7.6	
Spring		7.0	6.3	5.8	5.7	5.3	5.6	6.3	6.7	6.6	7.1	7.9	8.8	9.2	10.1	10.9	10.6	10.5	10.4	9.7	9.5	8.6	7.9	7.7	7.1	8.0	
Summer		11.3	10.6	10.6	10.6	8.8	8.4	8.1	7.8	9.0	10.8	13.0	14.5	15	17	18	17	19	18	18	16	15	13.8	11.9	11.7	12.3	
Autumn		7.4	7.7	7.5	7.8	8.2	7.8	8.0	7.2	8.0	8.9	9.3	9.5	10.1	11.1	11.1	11.1	11.7	10.4	10.4	9.4	9.9	8.6	8.8	8.5	8.9	
Winter		7.5	7.1	6.5	6.5	6.4	6.3	6.3	6.4	7.3	7.5	7.4	7.5	7.6	7.9	8.1	8.0	7.6	7.6	7.2	7.2	6.9	6.8	7.3	7.4	7.2	
Year		7.9	7.8	7.3	7.3	7.2	7.2	7.0	7.4	7.5	8.3	8.8	9.4	9.5	10.0	10.5	10.5	10.4	10.4	9.1	9.7	8.9	8.6	8.2	8.1	8.5	

TABLE 3

PERCENTAGE FREQUENCY OF FOG (VISIBILITY &lt; 1100 yds.) 1951-55

Month	GMT	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	All Hours	
<b>DUBLIN AIRPORT</b>																											
Jan.		2	3	3	3	3	3	3	4	3	5	6	1	1	1	1	0	1	5	4	2	4	3	2	2	2	2.6
Feb.		2	1	2	2	4	7	7	3	5	3	2	1	2	1	1	1	1	1	1	3	2	3	3	3	4	2.6
Mar.	10	11	12	13	14	14	13	15	12	9	8	6	5	5	2	2	2	2	3	3	5	6	5	6	7	7.9	
Apr.		1	1	2	1	1	3	3	3	1	1	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	1.1
May		3	3	4	3	6	6	5	3	3	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	2	1.9
June		2	2	3	5	3	1	1	1	0	1	0	1	0	0	0	0	0	1	1	1	1	1	1	1	2	1.2
July		1	0	0	2	2	2	1	2	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0.5
Aug.		2	3	3	3	4	5	5	5	3	1	1	0	0	0	0	0	0	1	1	1	1	2	2	2	1.7	
Sept.		4	2	1	3	3	3	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1.1	
Oct.		1	2	3	4	6	6	5	6	5	3	2	1	1	0	0	1	1	1	1	1	2	2	3	3	2.5	
Nov.		6	3	4	3	2	3	3	2	2	3	3	3	3	1	2	3	3	3	3	3	1	3	4	5	2.9	
Dec.		1	1	2	3	2	1	1	2	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1.1	
Spring		4.8	5.2	5.9	5.9	7.2	7.6	7.0	7.4	5.4	3.7	3.3	2.6	2.0	1.5	0.7	0.7	0.7	1.1	1.5	2.0	2.4	2.4	3.0	3.3	3.6	
Summer		1.7	1.5	2.4	3.3	2.8	2.8	2.4	2.6	1.1	0.7	0.2	0.2	0.0	0.0	0.0	0.2	0.2	0.4	0.7	0.4	0.4	1.1	1.1	1.3	1.1	
Autumn		3.7	2.4	2.6	3.3	3.7	3.7	3.7	3.5	2.9	2.2	1.5	1.3	1.3	0.4	0.7	1.1	1.1	1.3	1.3	1.3	1.1	1.5	2.6	3.3	2.1	
Winter		1.8	1.8	2.2	2.7	2.9	3.8	3.8	3.1	2.4	2.4	2.9	1.1	1.3	0.4	1.1	0.7	0.9	2.4	2.0	2.0	2.2	1.8	1.8	2.2	2.1	
Year		3.0	2.7	3.3	3.8	4.2	4.5	4.2	4.1	3.0	2.1	2.0	1.3	1.1	0.7	0.6	0.7	0.7	1.3	1.3	1.4	1.5	1.6	2.1	2.5	2.2	
<b>SHANNON AIRPORT</b>																											
Jan.		5	5	6	6	8	9	7	5	7	7	3	3	1	1	1	2	1	1	2	1	3	3	3	3	3	3.9
Feb.		2	2	2	2	3	4	5	6	3	3	2	1	1	1	0	1	1	0	0	0	1	1	1	1	1	1.9
Mar.		4	5	5	6	8	6	10	12	10	7	6	3	2	1	0	0	0	0	0	0	1	1	1	2	2	3.7
Apr.		0	0	1	1	1	1	3	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
May		1	0	2	1	1	1	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4
June		0	0	0	1	2	2	3	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4
July		0	1	1	0	2	2	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Aug.		0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Sept.		1	1	1	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.4	
Oct.		1	2	4	4	5	8	7	8	5	3	3	1	0	0	0	0	0	0	0	0	0	1	2	2	2	2.4
Nov.		4	5	3	4	3	5	5	5	5	5	3	2	3	3	1	1	1	1	1	1	1	2	3	4	2.9	
Dec.		1	1	2	1	1	1	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0.5
Spring		1.5	1.5	2.6	2.6	3.0	2.8	5.0	5.2	4.1	3.0	2.2	0.9	0.7	0.2	0	0	0	0	0	0	0.2	0.2	0.4	0.7	1.5	
Summer		0	0.2	0.2	0.2	1.5	1.5	2.2	1.5	0.7	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3
Autumn		2.0	2.4	2.6	2.9	3.1	4.8	4.4	4.8	3.3	2.6	2.0	1.1	1.1	0.9	0.4	0.2	0.2	0.2	0.2	0.2	0.4	1.1	1.8	2.2	1.9	
Winter		2.9	2.9	3.3	3.1	4.2	4.7	4.0	3.3	3.8	3.8	1.8	1.6	0.7	0.7	0.4	0.9	0.9	0.2	0.7	0.4	1.1	1.3	1.6	1.8	2.1	
Year		1.6	1.8	2.2	2.2	3.0	3.5	3.9	3.7	3.0	2.4	1.5	0.9	0.6	0.4	0.2	0.3	0.3	0.1	0.2	0.2	0.4	0.7	0.9	1.2	1.5	

TABLE 4

## PERCENTAGES OF VISIBILITIES OVER 25 miles 1951-55

Month	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	All Hours	
<b>DUBLIN AIRPORT</b>																										
Jan.	7	7	6	5	4	6	6	7	15	14	10	10	7	6	6	6	3	3	3	3	3	3	2	5	6	6
Feb.	7	6	7	7	6	7	7	9	19	18	13	16	17	19	20	22	20	18	9	4	4	5	5	6	11	
Mar.	10	9	9	8	5	6	6	12	11	14	15	17	20	24	26	26	24	19	13	7	6	5	6	10	13	
Apr.	12	11	9	9	10	14	25	29	29	29	32	39	43	43	42	40	37	33	33	23	16	13	13	13	25	
May	23	21	18	17	21	28	28	28	32	31	34	39	37	37	35	39	41	43	41	41	33	28	26	26	31	
June	24	23	21	23	32	31	33	34	37	46	52	55	55	54	57	56	55	54	55	55	51	42	33	31	42	
July	39	34	35	34	44	50	53	48	52	57	61	63	64	67	64	66	65	68	69	67	64	57	50	46	55	
Aug.	35	34	28	25	29	35	45	47	50	55	55	57	63	61	63	66	64	65	65	63	51	41	37	38	49	
Sept.	17	15	14	13	12	19	33	35	31	36	45	51	55	57	57	55	59	59	53	39	27	20	20	19	35	
Oct.	12	11	10	11	10	9	14	29	34	31	29	30	34	40	41	43	38	30	18	10	8	10	10	12	22	
Nov.	11	9	9	8	9	11	10	15	23	19	13	14	17	16	22	20	13	5	5	3	5	5	6	6	11	
Dec.	8	8	8	10	10	10	12	19	19	17	9	8	11	8	11	10	7	4	3	3	4	4	5	5	9	
Spring	15	13	12	11	12	16	20	23	24	25	27	32	33	35	34	35	34	31	29	24	18	16	15	16	23	
Summer	33	30	28	27	35	39	43	43	46	53	56	58	61	60	61	62	61	62	63	61	55	46	40	38	48	
Autumn	13	12	11	11	10	13	19	27	29	29	29	32	35	38	40	40	37	31	25	17	13	12	12	12	23	
Winter	7	7	7	8	6	8	9	10	18	16	11	11	12	11	12	12	11	8	5	3	4	4	4	5	9	
Year	17	16	15	14	16	19	23	26	29	31	31	33	35	36	37	37	35	33	31	27	23	19	18	18	26	
<b>SHANNON AIRPORT</b>																										
Jan.	8	6	6	6	5	5	7	6	14	25	26	26	30	31	30	30	28	24	18	14	12	10	9	10	16	
Feb.	18	16	18	13	13	11	12	13	27	30	30	31	34	38	44	45	45	38	31	25	23	19	21	21	25	
Mar.	15	12	12	14	11	10	12	21	24	24	26	29	32	34	37	42	39	39	38	34	28	23	19	17	25	
Apr.	26	23	22	21	23	27	31	35	35	39	45	47	48	46	49	50	47	50	45	43	37	34	31	27	37	
May	26	26	23	21	23	25	29	32	34	42	49	51	54	54	57	56	61	57	54	53	52	40	35	28	41	
June	33	32	31	31	31	37	37	38	41	49	54	55	58	59	63	63	62	63	62	60	61	53	41	35	48	
July	36	35	35	34	35	37	35	35	36	43	51	63	65	68	70	68	70	68	68	66	62	56	46	41	50	
Aug.	35	30	30	28	26	35	39	41	43	47	51	60	64	66	66	66	72	68	70	66	62	51	46	42	50	
Sept.	28	25	25	25	23	26	33	39	39	43	45	51	49	59	58	61	61	61	55	49	40	39	37	34	42	
Oct.	17	14	14	15	14	17	15	26	30	33	35	39	42	45	48	53	53	45	41	33	30	28	25	19	30	
Nov.	13	12	12	12	9	10	11	13	21	25	28	25	23	30	34	33	35	27	24	20	15	13	16	13	20	
Dec.	10	6	6	6	5	7	9	10	17	28	24	26	25	25	27	23	23	15	10	9	8	10	10	12	15	
Spring	23	20	19	19	19	21	24	29	31	35	40	42	44	45	48	49	48	48	46	43	39	32	28	24	34	
Summer	35	32	32	31	31	36	37	38	40	46	52	59	62	64	67	66	68	67	67	64	62	53	45	39	50	
Autumn	19	17	17	18	16	18	20	26	30	33	36	38	38	45	47	49	49	44	40	34	28	27	26	22	31	
Winter	12	10	10	8	7	8	9	10	19	28	26	28	29	31	33	32	31	25	19	16	14	13	13	14	19	
Year	22	20	20	19	18	21	23	26	30	36	39	42	44	46	49	49	49	46	43	39	36	31	28	25	33	



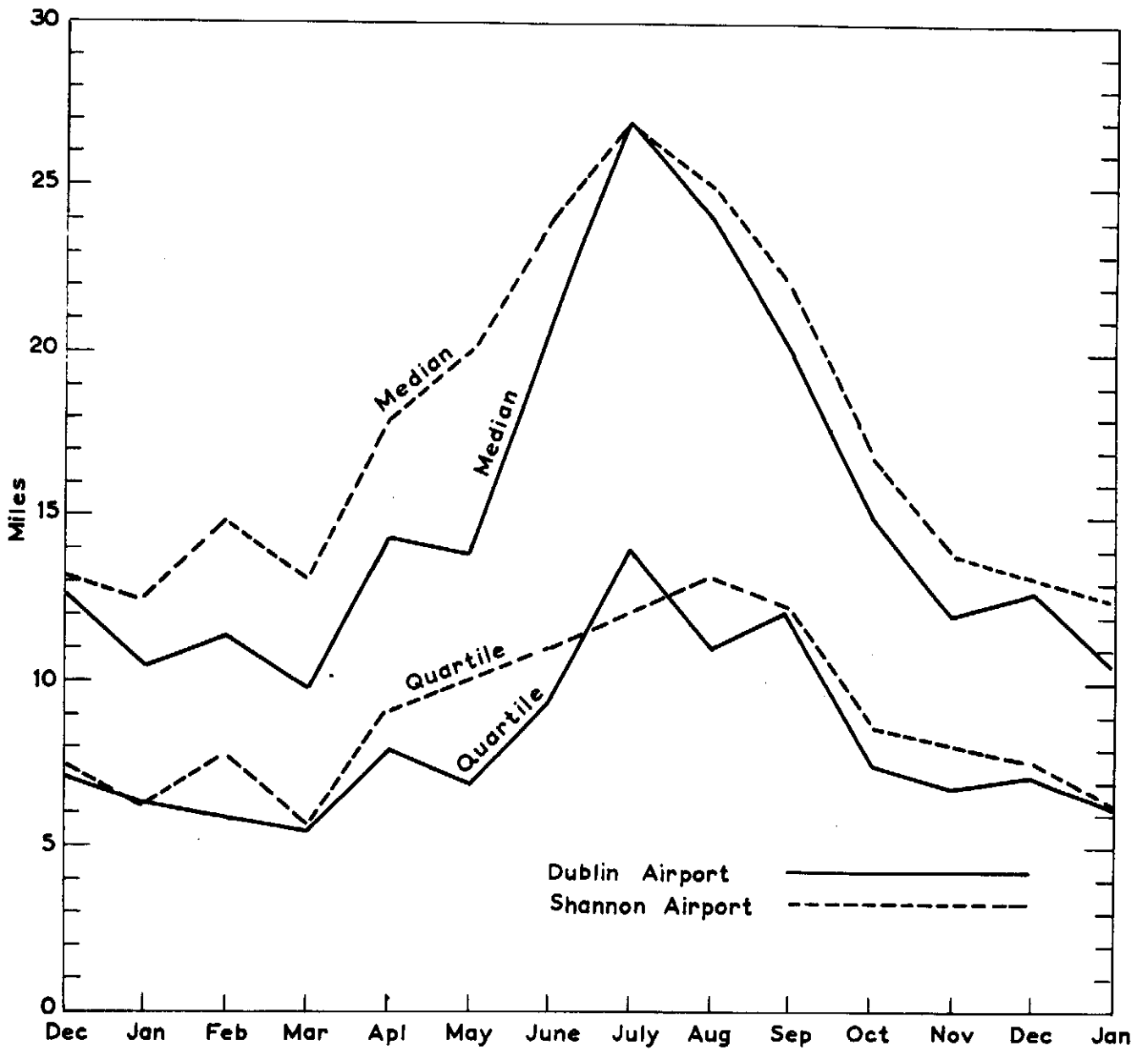
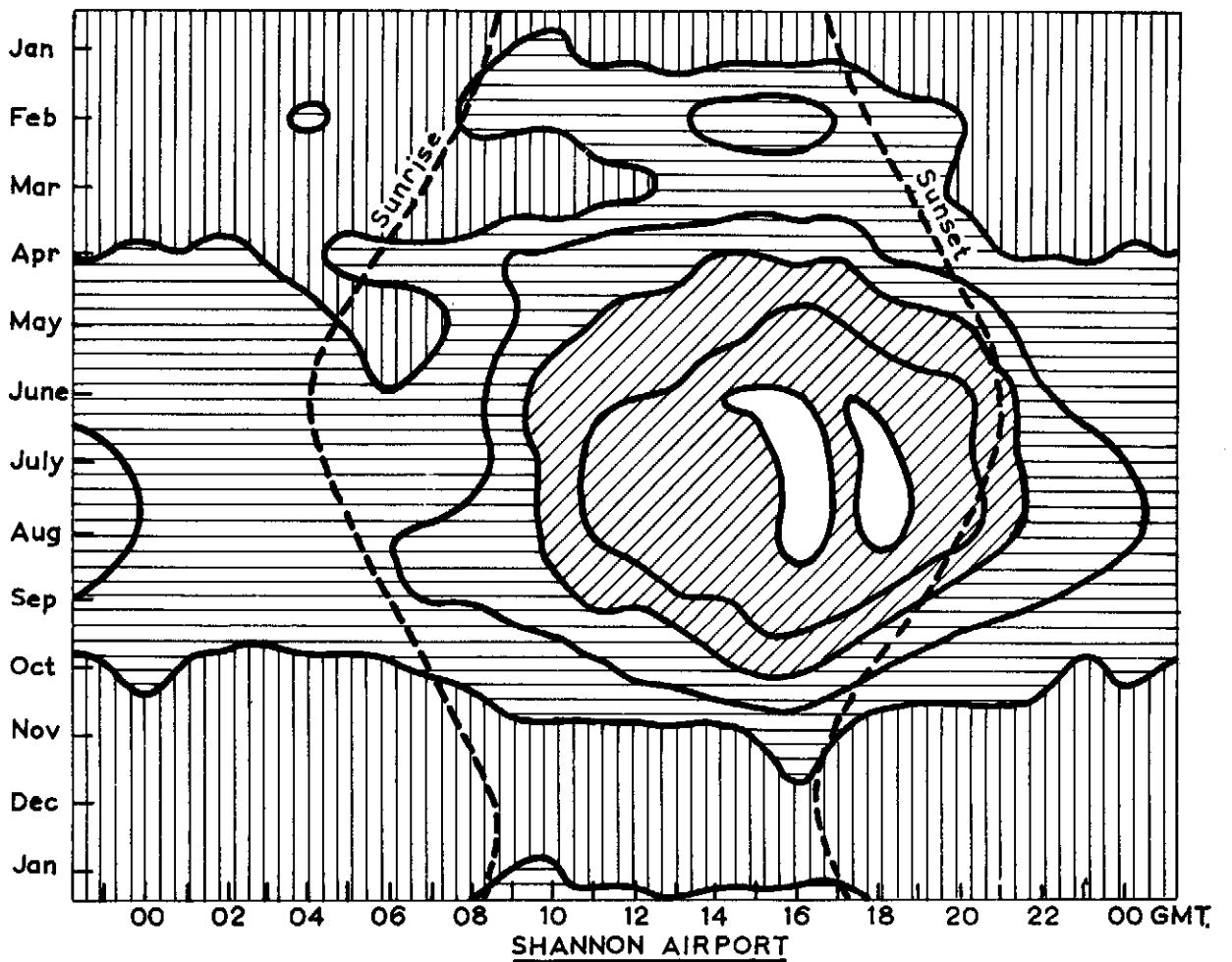
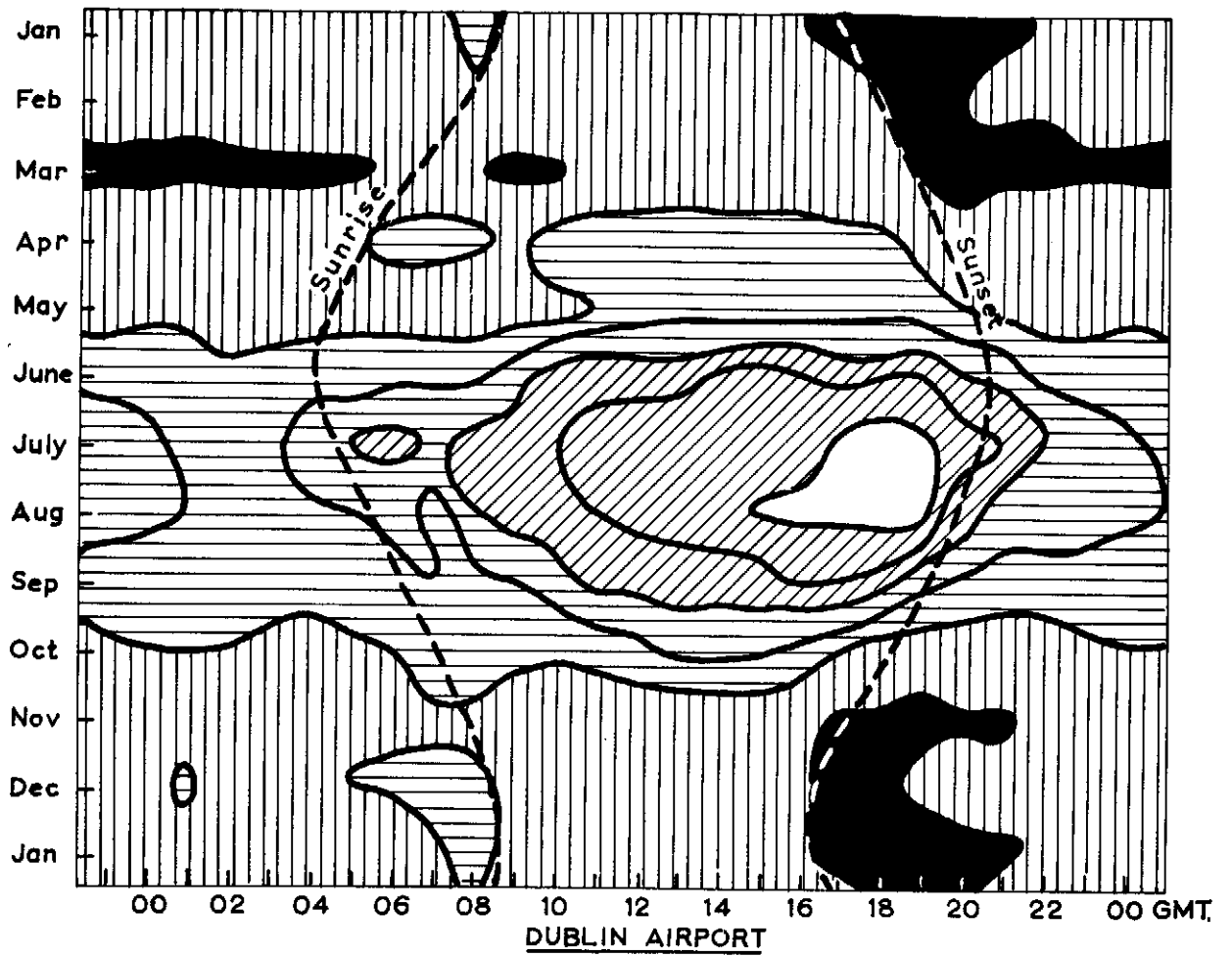


Fig. 1. Median and Quartile visibility at Dublin and Shannon Airports, 1951-55 (All hours)



Key 5 10 15 20 25 30 35 40 Miles

MEDIAN VISIBILITY 1951 - 55

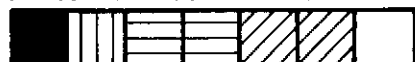


Fig. 2. Isograms of median visibility at Dublin and Shannon Airports.

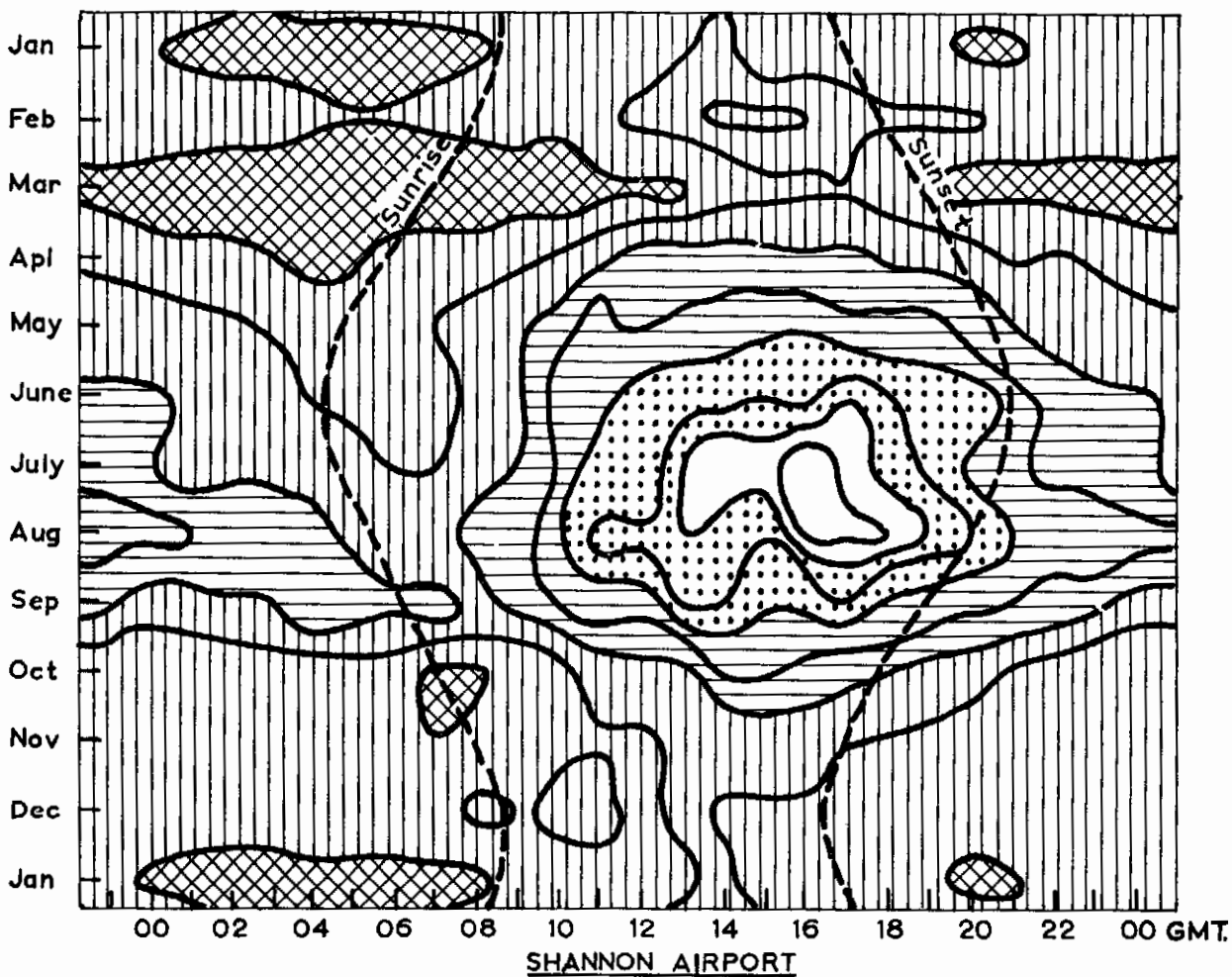
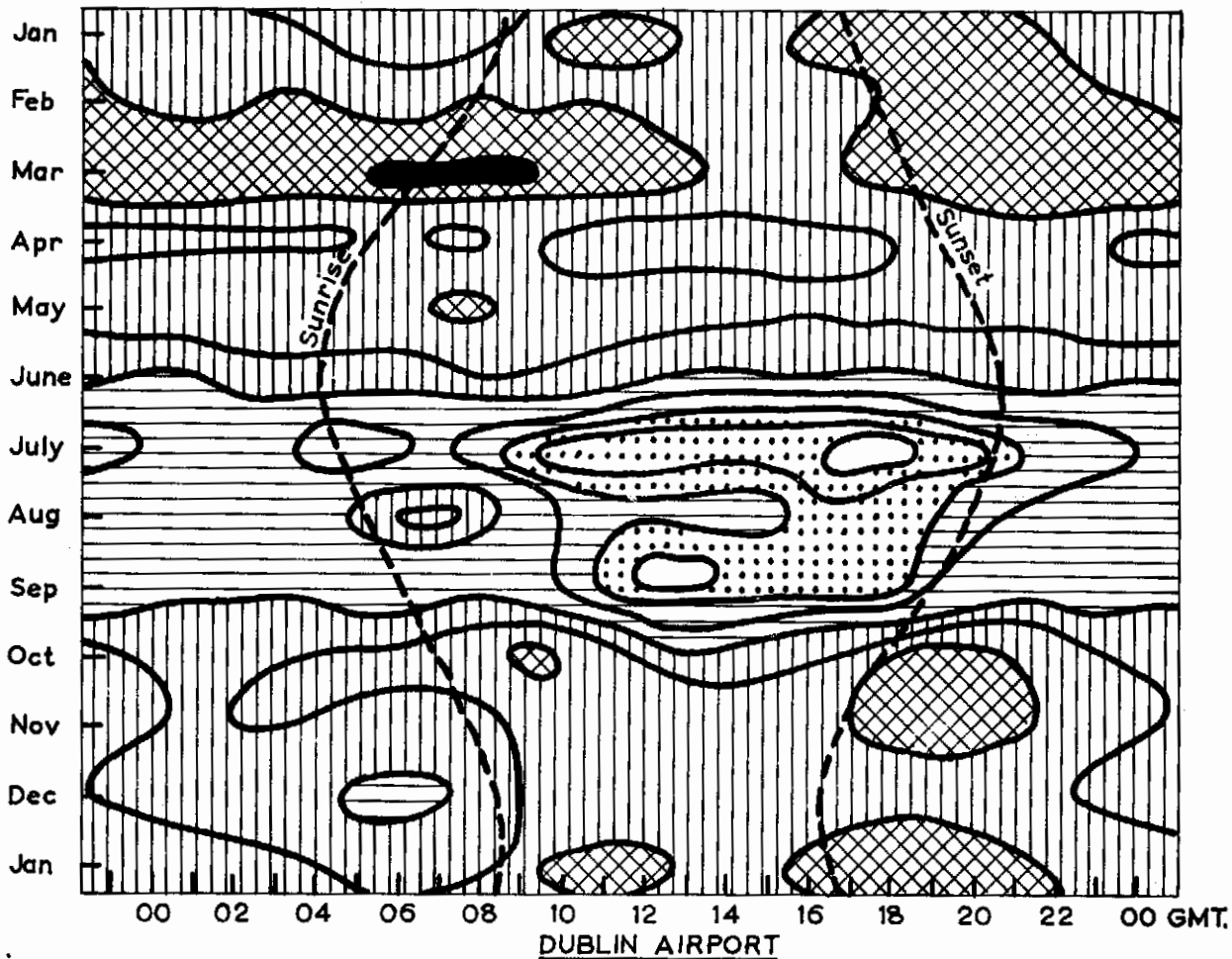


Fig. 3. Isograms of quartile visibility at Dublin and Shannon Airports.

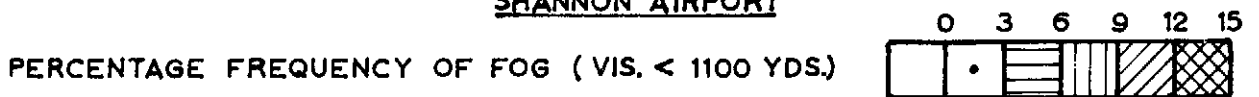
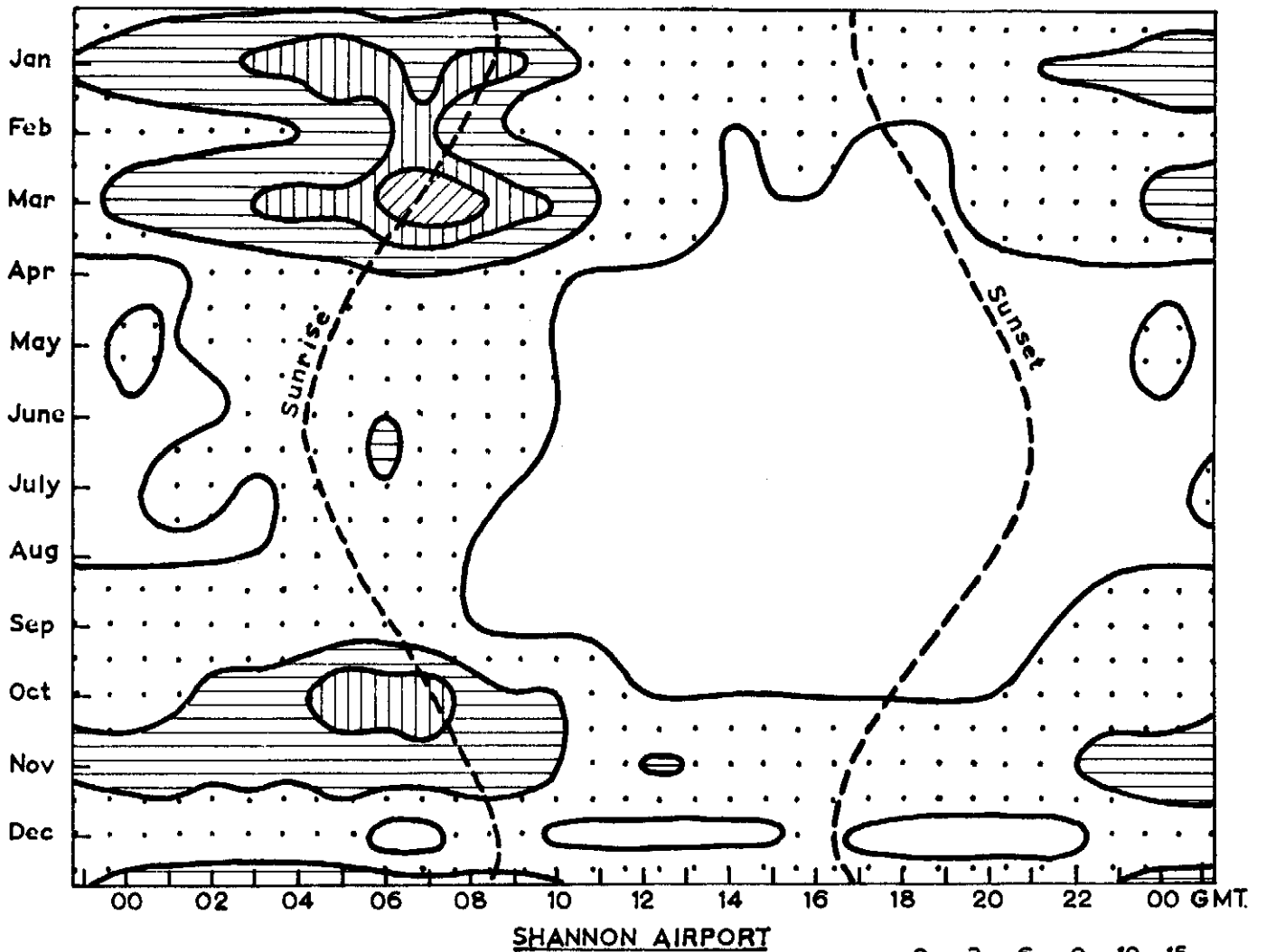
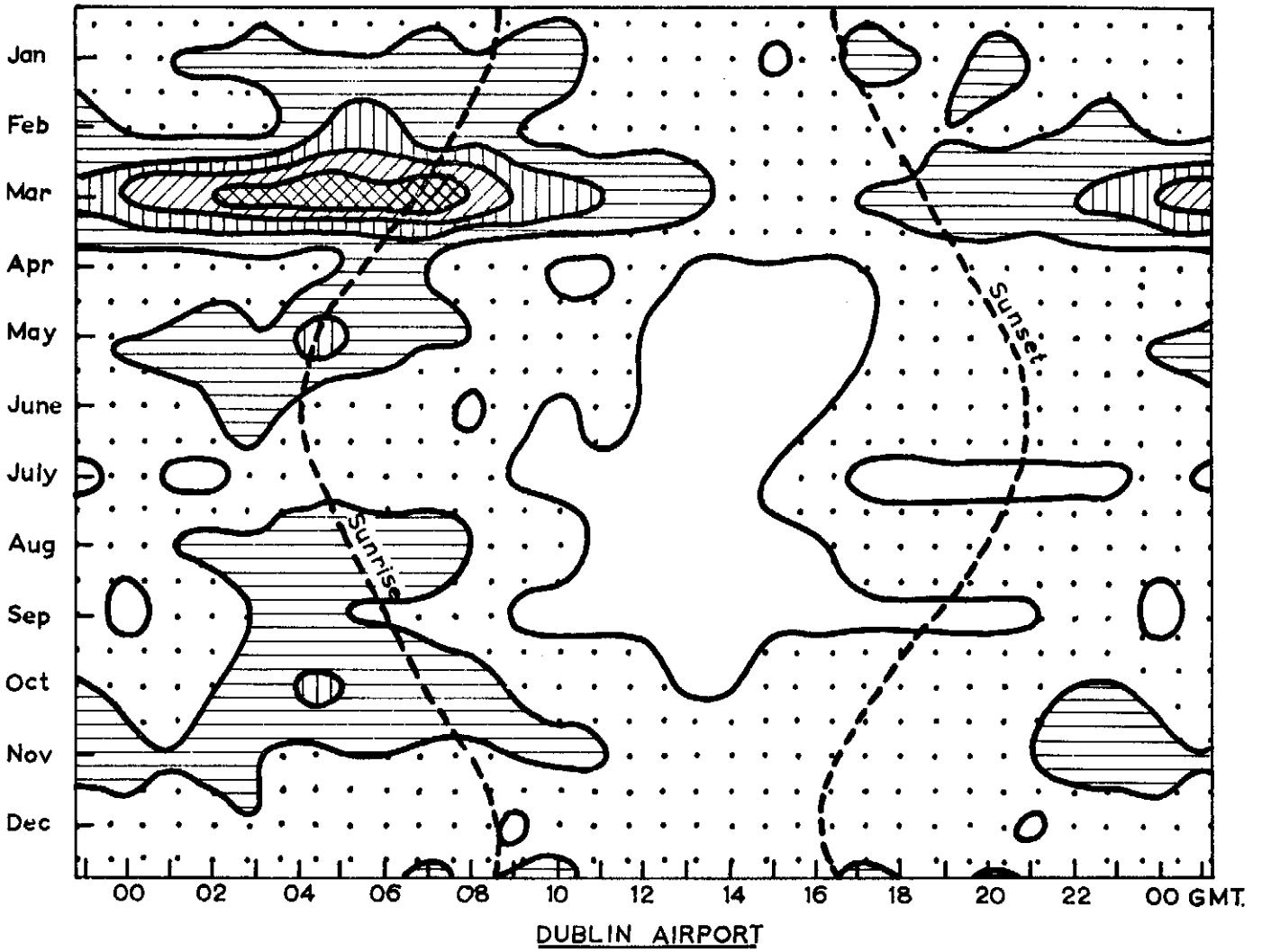


Fig. 4. Isograms of fog frequencies at Dublin and Shannon Airports.