



DEPARTMENT OF ENVIRONMENT, COMMUNITY & LOCAL GOVERNMENT

HISTORICAL NOTE NO. 7

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# **WEATHER EASTER 1916**

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Sunday 23 to Saturday 29 April 1916

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**Title:** Weather Easter 1916, Sunday 23 to Saturday 29 April 1916

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## Foreword

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The compilation of this Historical Note on Ireland's weather 1916 draws on the huge volume of past weather information that exists in archives. While nowadays we have sophisticated observational methods such as radar and satellite systems, our climate studies still rely to a great extent on traditional observations of rainfall and temperature such as those made one hundred years ago.

These long-term observations are extremely important from a climatological point of view and it is heartening to see that many of the sites reporting in 1916 are still recording weather information today. Indeed, some of the current stations have observation records dating to the mid-nineteenth century. Such long term records do not happen by accident; they require commitment, dedication and foresight. Even so it is hard to imagine that those who set up and operated observing sites in the nineteenth and early twentieth centuries could have foreseen that their observations would be of such use over 100 years later; the reanalysis plots in this publication are a direct product of these observations.

It is a tribute to the observers and the guardians of the records that so much information is available for a one week period 100 years ago. Special thanks is due to the many observers who painstakingly recorded weather observations for Ireland, the British Meteorological Office, now the United Kingdom Meteorological Office (UKMO), the volunteers in the British Rainfall Organisation (BRO) and staff of the Irish Meteorological Service, now Met Éireann. Of course the work continues and today we process over 1 million observations per day.

**Séamus Walsh**

Head of Climatology and Observations Division, Met Éireann

*Thursday 10 March 2016*

## Introduction

The Easter Rising occurred during the seventeenth week of 1916, that is between Sunday 23 to Saturday 29 April.

In 1965, for the 50-year Anniversary, the Irish Meteorological Service (now Met Éireann) produced a document entitled '**The Weather of Easter Week, 1916, in and near Dublin**' (see Figure 1) (Irish Meteorological Service, 1965). This focused on data gathered at the Dublin weather stations.

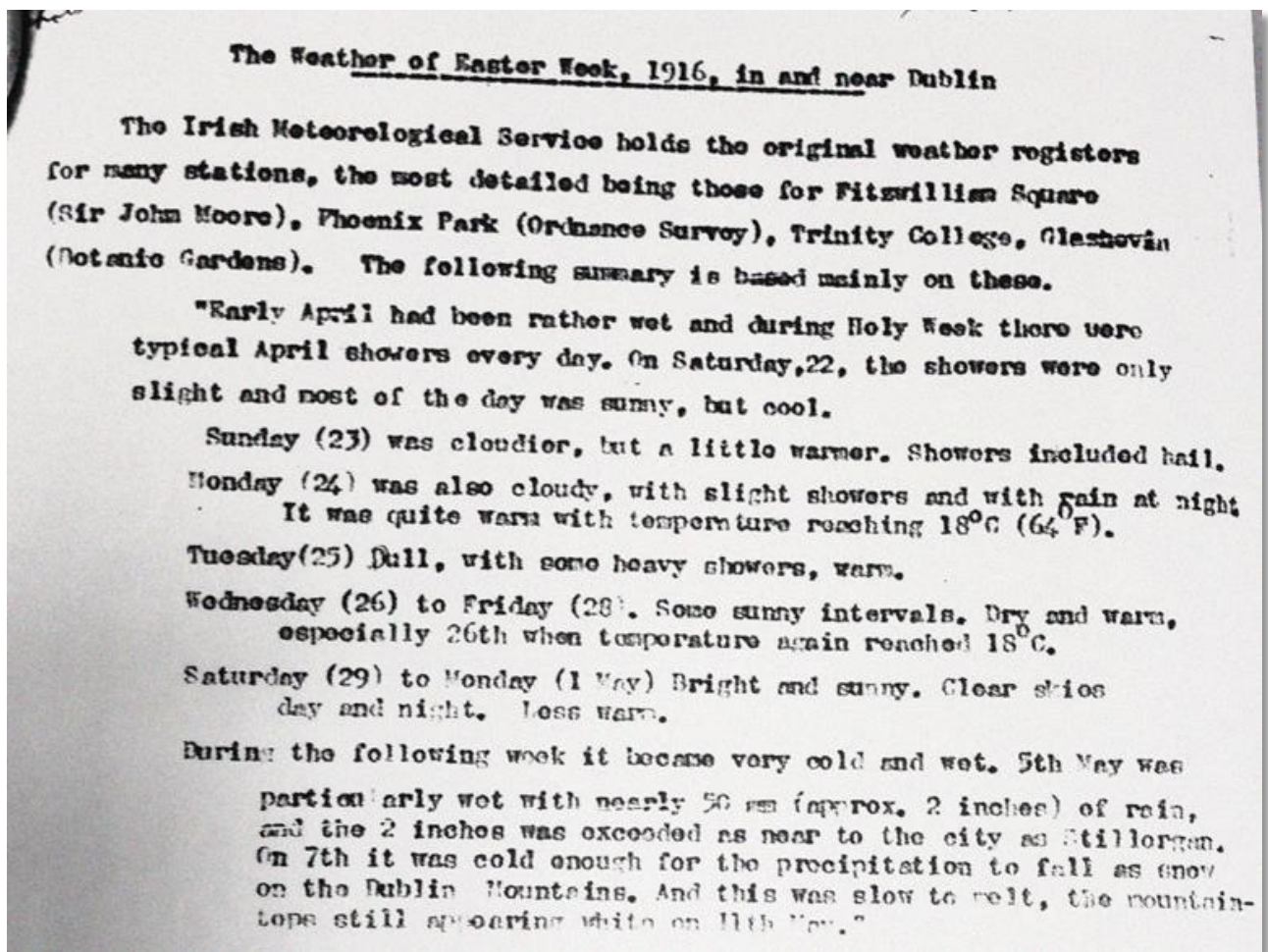


Figure 1. Dublin's Weather Easter 1916 (Irish Meteorological Service, 1965)

On this the 100-year anniversary, a search and analysis of the original records was undertaken. These records are kept in Met Éireann's library archive and others are available through the UKMO digital archive. The aim of this paper is to expand on the work in 1965 by presenting a day-by-day analysis for both Ireland's and Dublin's weather. Also included is a look at the climate of Ireland during that time.

Reanalysis plots were also generated (hereinafter referred to as ECMWF Reanalysis (ERA-20C)), where these plots reconstruct earlier weather patterns using the historical weather observations (Poli et al, 2013). An advantage of these reanalyses is that they provide both extra spatial coverage but also other weather parameters are available for areas in and around Ireland, thereby providing a source of additional information.

This note concludes with a short outline on the establishment of the Irish Meteorological Service, for more information (Keane, 2012).

Finally, as part of this work, special edition infographics were also produced entitled 'Ireland's Weather Easter 1916' and 'Dublin's Weather Easter 1916' (see Appendix A).

## Weather stations

The main weather stations reporting during 1916 were located as shown in Figure 2. Each of these stations were staffed by official meteorological personnel and included instrumentation to record observations of air temperature, wind, rain, atmospheric pressure, sunshine, etc. There were also over 200 rainfall stations, where volunteer observers recorded daily rainfall accumulations. These observations are still available for analysis today, more than 100 years later.

For meteorological reporting purposes, stations were grouped into different areas of Ireland such as:

- a District of the 'British Islands', that is: *Ireland, South* and *Ireland, North* and further broken down in eastern and western sections of same;
- for the purposes of rainfall observations, Ireland was divided into divisions, where division XX was Munster, Leinster was XXI, Connaught was XXII and Ulster was XXIII;
- forecast districts also existed, marked by bounded areas 9a, 9b, 10a and 10b (see Figure 15 for the mapped areas);
- a country (in the Annual Rainfall records of the BRO).

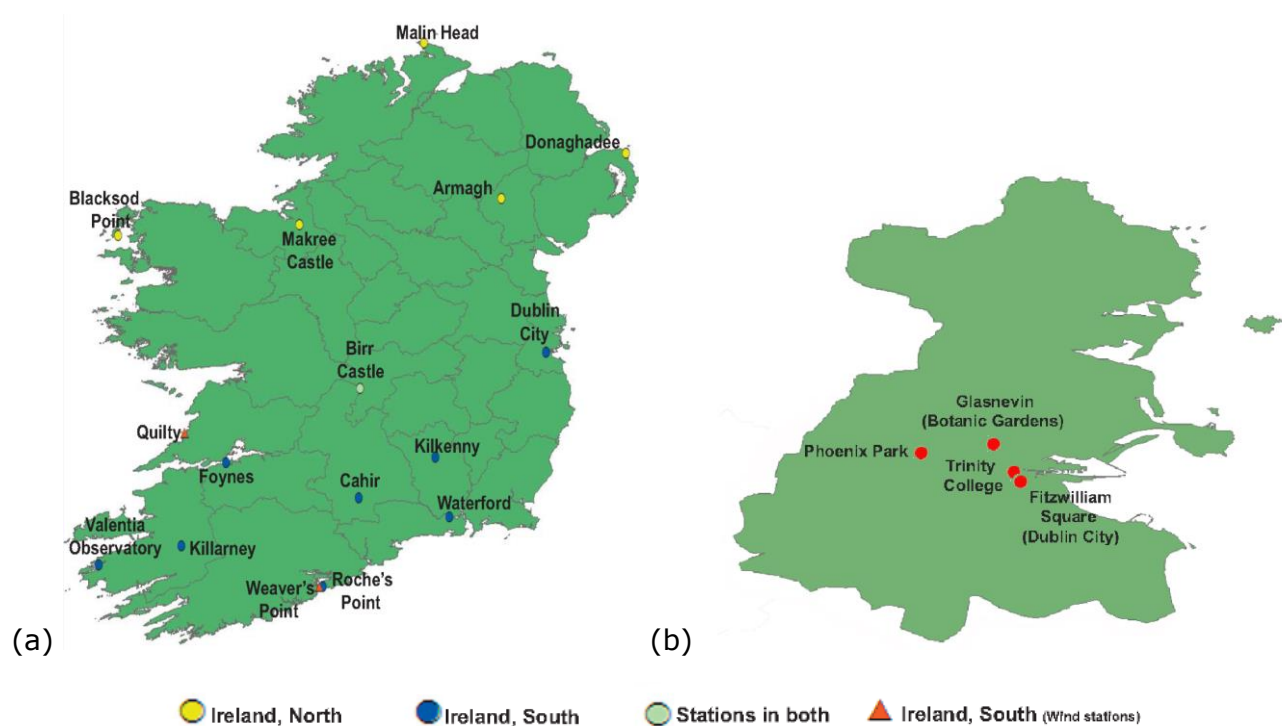


Figure 2. Meteorological Stations during 1916 for (a) Ireland (b) Dublin

Daily data from these stations (Table 1) have been transcribed from the paper copies of their daily, weekly and weather reports of the British Meteorological Office.

Stations	County	Opened	Closed	Latitude	Longitude
<b>Birr Castle</b>	Offaly	1-Jan-1862	1-Oct-1939	53.09375	-7.92591
<b>Valentia Observatory<sup>1</sup></b>	Kerry	1-Jan-1866	Open	51.93774	-10.24191
<b>Roche's Point</b>	Cork	1-Jan-1877	Open	51.79489	-8.25093
<b>Malin Head</b>	Donegal	1-Jan-1885	Open	55.37148	-7.33850
<b>Blacksod Point</b>	Mayo	1-Jan-1900	3-Oct-1956	54.10421	-10.07112
<b>Donaghadee</b>	Down	< 1885 <sup>2</sup>	unknown at time of note	54.6417	-5.5351

Table 1. Meteorological stations in Ireland during 1916

The network of rainfall gauges was managed by the BRO, a private, volunteer-led organisation. Some public bodies voluntarily forwarded copies of their observations to the BRO as did, to a lesser extent, the official observers of the British Meteorological Office.

Throughout Ireland, rainfall observations were recorded at a variety of places: including mills, asylums, abbeys, castles, hotels, rectories and private homes. The women and men who carried out their observing duties every day were titled Rev., Lt-Col, Mr, Mrs, Miss, Earl, Sir, MD, Dr, Major among others.

There were approximately 30 rainfall stations in the Dublin area recording rainfall observations to the BRO. Included among these were the four main weather stations run by the British Meteorological Office which were located at Fitzwilliam Square (also called Dublin City), Phoenix Park, Trinity College and Botanic Gardens in Glasnevin. Extra weather parameters were recorded at these stations, such as air/grass temperature, wind direction and force, mean sea level pressure. Phoenix Park also recorded sunshine.

<sup>1</sup> Valentia Observatory was called Valencia in reports during this time.

<sup>2</sup> Donaghadee station appears in the Symon's British Rainfall of 1885.





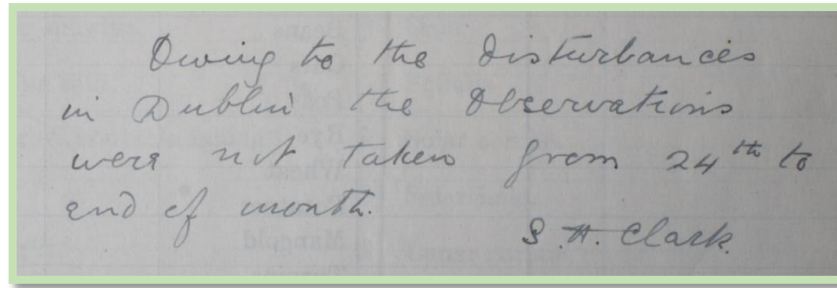


Figure 4. Trinity College register note by SA Clark (Met Éireann Library, MÉ/MO/16/4)

From these and other records collected around Ireland, the **Daily Weather Report** was produced which provides a summary of the daily observed weather at selected stations. Other meteorological reports available are:

- **Weekly Weather Report of the Meteorological Office**  
This report was a four-page document containing maps and data, published Thursday each week and priced at sixpence. It included general remarks, wind (frequency/mean values), temperature, rainfall, sunshine (comparison with average), mean sea temperatures and pressure; summary details included accumulated heat, ground frosts, etc., organised into the various forecast districts. Seasonal data was also presented.
- **Monthly Weather Report of the Meteorological Office**  
It was issued on the 27<sup>th</sup> day of each month, as a 12-page periodical with charts/maps/tables and an analysis of the month, unusual weather conditions, temperature max and min, distribution of rainfall and sunshine as percentages to normal. Forecasts were also included.
- **Annual Rainfall Report**  
The 1916 Annual Rainfall Report was analysed (Mill HR & Salter C, 1917). It was noted therein that "*Ireland retains its old character for steadiness in rainfall work, no less than 12 counties out of the 33 show neither a gain nor loss [of observations] as compared with last year, and in 2 more the gains balanced the losses*". Annual rainfall results for Ireland during 1916 included the fact that the number of rain days exceeded 225 days. An obituary was also included within this report, in acknowledgement of the number of years of service that the deceased observer recorded.

A brief summary of the Climate of Ireland at the time now follows.

## Climate and weather prior to 1916

Weather parameters averaged over a time period can be presented as normals. The normal values for pressure, temperature, rainfall and bright sunshine were included as a supplement to the Daily Weather Report of Saturday 1 April (Meteorological Office, 1916, p. 3) given in the units<sup>3</sup> currently used:

Station name	1906–1915		1881–1915						
	Mean monthly MSLP 7am	Mean of Dry bulb 7am	Mean of Daily MAX temp	Mean of Daily MIN temp	Absolute Extremes MAX air temp (°C) (year)	Absolute Extremes MIN air temp (°C) (year)	Rain Total Fall (mm)	No. of days with rain	Bright Sunshine Daily mean (Month)
Malin Head	1012.6	6.3	9.8	4.9	20.6 (1914)	-3.3 (1908)	50	19	-
Blacksod Point	1013.9	7.6	10.8	5.5	21.7 (1893)	-1.7 (1897, 1911)	74	20	-
Valentia Observatory	1015.9	7.5	11.9	5.9	21.1 (1892)	-1.1 (1879, 92, 97, 98, 1900)	93	19	5 hr 33 min (39% possible)
Roche's Point	1016.1	7.2	11.6	5.7	22.2 (1893)	-1.7 (1908)	68	16	-
Birr Castle	1015.2	5.7	12.3	3.3	22.8 (1893)	-6.1 (1892)	55	16	5 hr 13 min (37% possible)
Donaghadee	1014.6	5.9	10.6	4.6	19.4 (1909)	-2.2 (1908)	51	16	-

Table 2. April normal pressure, temperature and rainfall

These normals indicate that the highest daily maximum air temperature recorded in April was 22.8°C at Birr Castle (Offaly) in 1893. The current highest daily maximum air temperature for April at an Irish weather station occurred at Glenties Hatchery (Donegal) with 25.8°C on Thursday 26 April 1984. The current available lowest daily minimum air temperature for April is -8.8°C, which occurred at Ballybrittas (Laois) on Wednesday 2 April 1969.

### Rainfall

The number of rain-days in Ireland during 1916 exceeded 225, except in the South and East, from Cape Clear Island (Cork) to Donaghadee (Down) (Mill HR & Salter C, 1917, p. 67), while the South-East of Ireland had less than 200 rain-days. See Figure 5 for more details on the year's rain-days. Between 1881 and 1926, the extreme number of rain days in Ireland ranged from a minimum of 181 days in 1887 to a maximum of 253 days in 1923 (Meteorological Office - Air Ministry, 1926, p. 68 (Table II)).

The greatest number of rain-days during April occurred in Donegal with 25 days and then Mayo with 24 days, while the least number of rain-days were half that in the East of the Country where Kildare had 12 rain-days. Dublin's stations do not appear in the records.

<sup>3</sup> See Appendix E for archive meteorological units and definitions.

Owing to World War I, the staff assigned to producing these reports were reduced in number and certain maps and data analysis had to be excluded, for example, the distribution of rain days in a year and in an average year were omitted along with average monthly values for rain-days.

STATION.	COUNTY.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Total.	Total Rain-fall.	Amount per Rain Day	
IRELAND.																	
Castletownshend, Seafield .....	Cork .....	6	24	21	18	21	20	10	6	12	10	24	28	25	219	45.96	21
Mallow, Longueville .....	" .....	9	22	21	14	17	20	16	7	14	13	29	23	18	214	42.31	20
Kenmare, Derreen .....	Kerry .....	4	29	22	18	21	19	19	9	16	13	29	27	24	246	75.51	31
Waterford, Brook Lodge .....	Waterford .....	3	21	24	18	18	19	16	9	10	10	22	20	14	201	39.88	20
Nenagh, Castle Lough .....	Tipperary .....	1	25	25	18	19	18	17	12	16	10	29	21	20	230	43.64	19
Cahir, Suirvale .....	" .....	3	26	24	19	19	18	18	11	15	13	27	20	20	230	36.76	16
Killadysert, Paradise Hill .....	Clare .....	3	28	23	22	24	22	14	13	16	13	31	25	21	252	47.90	19
Gorey, Courtown House .....	Wexford .....	4	19	22	20	16	17	15	10	14	8	25	21	15	202	38.56	19
Abbey Leix, Blandsfort .....	Queen's County .....	2	27	26	23	20	18	14	15	16	12	26	20	24	241	41.81	17
Straffan House .....	Kildare .....	2	22	22	20	17	12	9	13	14	10	26	18	23	206	38.96	19
Kells, Headfort .....	Meath .....	4	24	23	17	18	17	14	15	15	9	29	22	23	226	39.68	18
Moate, Coolatore .....	Westmeath .....	1	24	23	19	22	20	15	16	16	13	31	20	23	242	39.86	16
Ballynahinch Castle .....	Galway .....	3	31	22	15	25	20	15	17	18	20	31	29	24	267	70.96	27
Woodlawn .....	" .....	4	29	23	21	21	16	16	15	15	15	31	26	18	246	42.77	17
Crossmolina, Enniscoo .....	Mayo .....	2	28	23	21	20	24	15	13	21	20	30	28	28	271	62.50	23
Collooney, Markree Observatory .....	Sligo .....	2	29	20	19	23	23	17	21	20	20	31	28	23	274	55.31	20
Belturbet, Cloverhill .....	Cavan .....	1	26	21	13	19	20	18	13	17	12	29	26	20	234	39.59	17
Seaforde .....	Down .....	2	27	22	13	15	19	14	14	15	11	27	19	21	217	41.20	19
Ballymena, Harryville .....	Antrim .....	5	26	23	18	20	23	16	16	21	10	29	23	26	251	44.28	18
Myroe, Culmore House .....	Londonderry .....	5	22	23	15	19	17	16	11	17	12	24	20	19	215	42.58	20
Omagh, Edenfel .....	Tyrone .....	3	27	23	22	18	22	15	13	15	14	30	26	19	244	43.31	18
Dunfanaghy, Horn Head .....	Donegal .....	3	28	29	22	23	25	20	21	25	24	30	28	30	305	50.11	16
Killybegs, Rockmount .....	" .....	5	28	23	16	23	21	20	14	17	20	29	26	23	260	69.43	27
Ireland .....	(Mean of 23 stations) ..	26	23	18	20	19	16	13	16	14	28	24	22	239	47.51	20	

Figure 5. Rain days in Ireland during 1916 (Mill HR & Salter C, 1917, p. 71) ©Crown copyright 2016 Met Office

However, in 1926 an analysis of the **mean rainfall per rain-day** in the years prior to 1916 (that is from 1881-1915) was given for "the average annual rainfall divided by the average number of rain-days" (Meteorological Office - Air Ministry, 1926, p. 277) where 5.1mm is 0.20 inches. It was noted then that the map resembles the average annual rainfall. For the current average annual rainfall, see Figure 6(b), where areas in the South and West still typically record the highest rainfall amounts.

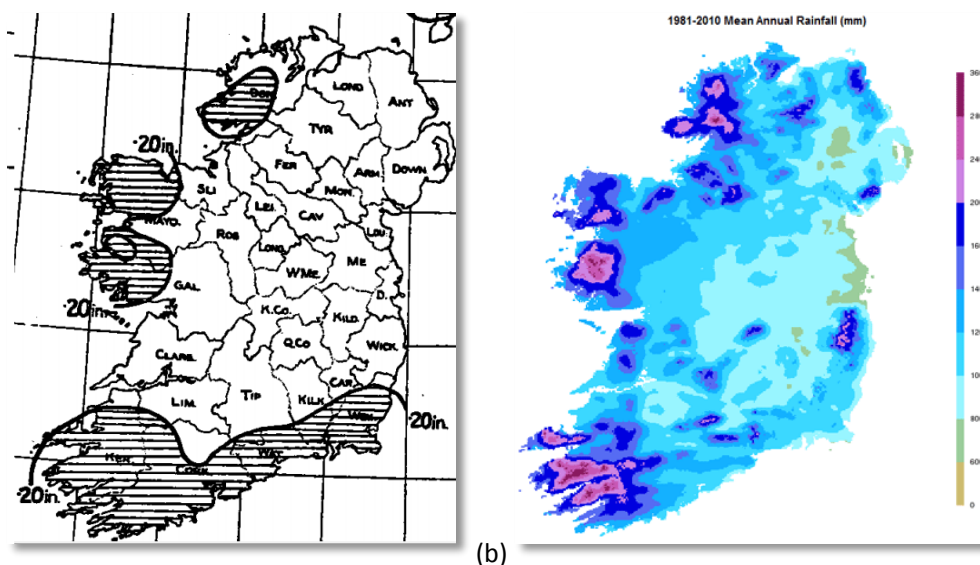


Figure 6. (a) Mean rainfall per rain-day 1881-1915 (Meteorological Office - Air Ministry, 1926, p. 278 (Fig. 5)) ©Crown copyright 2016 Met Office (b) 1981-2010 Mean Annual Rainfall (Walsh, 2012)

The month's observed monthly rainfall and percentage of average are illustrated below (Figure 7) and highlight that only parts of the East had a relatively dry month, while parts of the West observed significant falls of rain during April 1916. Indeed greater than 150% of normal rain fell over the West and North of Ireland during April (Mill HR & Salter C, 1917, p. [77]).

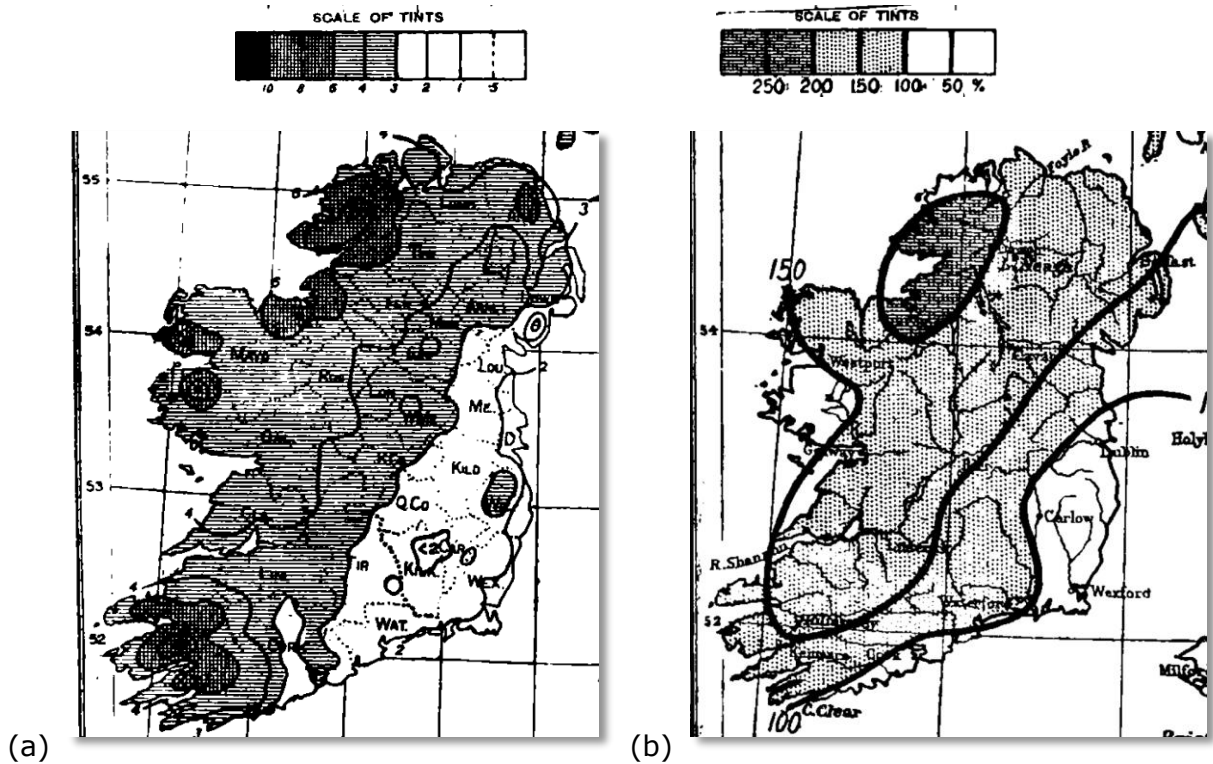


Figure 7. (a) April 1916 observed rainfall in inches (Mill HR & Salter C, 1917, p. [78]) (b) April 1916 percentage of average (Mill HR & Salter C, 1917, p. [79]) ©Crown copyright 2016 Met Office

During 1916, the monthly percentage of average (1881 to 1915) was 74% during March 1916, 153% during April and 186% during May 1916, the latter being the highest recorded monthly percentage of average between 1881 and 1924 (Meteorological Office - Air Ministry, 1924, p. [260]).

Figure 8 illustrates clearly that the months of April and May 1916 were unusual for rainfall during this 44 year period.



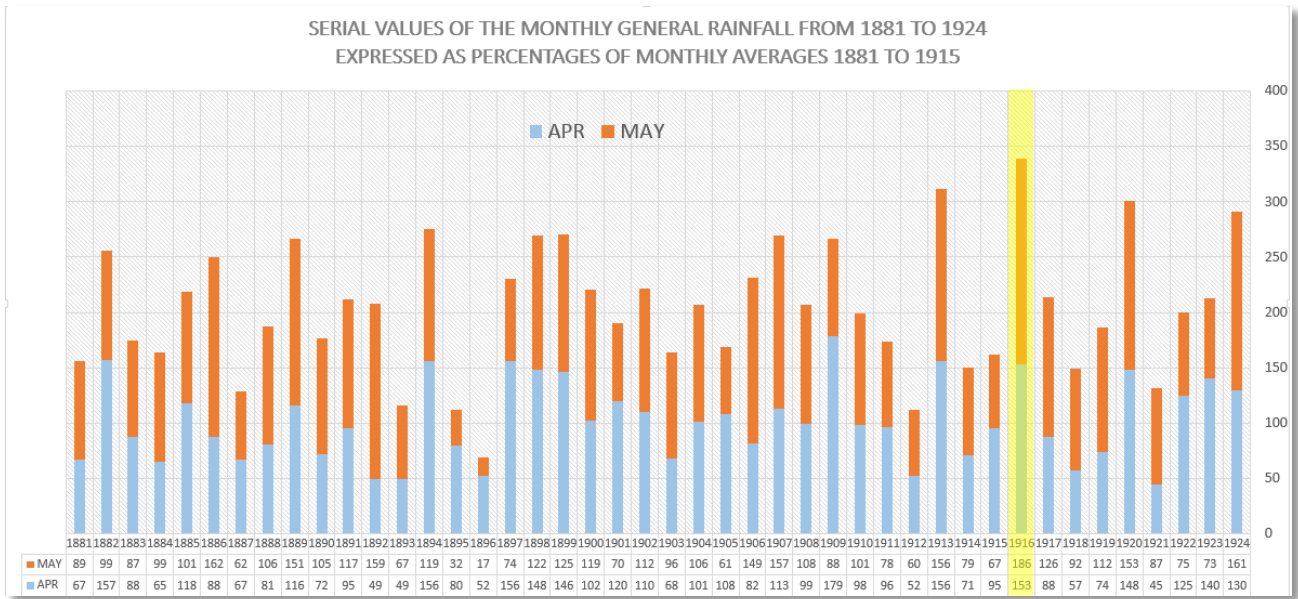


Figure 8. Monthly Averages (% of 1881-1915) for May and April from 1881 to 1924

No falls of 4 inches (101.6mm) or more were recorded in Ireland during 1915, however seven such falls were recorded in 1916 (Meteorological Office - Air Ministry, 1924, p. [48]). It is not easy to find when these falls occurred, however during 1916, there were two records for extremes of monthly rainfall in Ireland (see Figure 9) where May 1916 recorded 186% of average (the highest between 1881 to 1924) and again in Oct 1916 with 169% of average.

### EXTREMES OF MONTHLY RAINFALL, 1881 to 1924

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year
<i>Ireland.</i>													
Per cent. Date ..	173 1913	202 1923	195 1903	179 1909	186 1916	196 1912	177 1896	183 1917	222 1918	211 1916	169 1890	178 1914	124 1903
Per cent. Date ..	33 1881	11 1891	29 1900	45 1921	17 1896	18 1921	34 1913	37 1909	21 1894	44 1922	34 1896	41 1885	77 1887

Figure 9. Extremes of Monthly Rainfall between 1881 to 1924 (Meteorological Office - Air Ministry, 1924, p. [263]) ©Crown copyright 2016 Met Office

## Rain spells

Rain spells<sup>4</sup> occurred during Easter week (Table 3), where Killybegs (Donegal) recorded a total rainfall accumulation of 230.6mm from 6-25 April (20 days) including a maximum of 35.8mm in one day and mean of 11.4mm per day. Counties Tipperary, Clare, Laois, Kildare, Meath and Galway all had rain spells leading up to Easter.

*Table of Rain Spells, 1916—(continued).*

STATION & COUNTY.	Began.	Ended.	Last- ed.	Total Rain.	RAIN PER DAY		
					Max.	Min.	Mean
IRELAND.			Days	in.	in.	in.	n.
Nenagh (Castle-Lough) ..... 1915 <i>Tipperary—1.</i>	Apr. 10	Apr. 25	16	3.72	.77	.02	.23
Killadysert (Paradise Hill) .. 1915 <i>Clare—3.</i>	Apr. 2	Apr. 20	19	2.50	.43	.01	.13
Abbey Leix (Blandsfort) .... 1915 <i>Queen's County—2.</i>	Apr. 10	Apr. 25	16	2.37	.37	.01	.15
Straffan House..... 1915 <i>Kildare—2.</i>	Apr. 12	Apr. 26	15	2.53	.42	.05	.17
Kells (Headfort) ..... 1915 <i>Meath—4.</i>	Apr. 10	Apr. 25	16	2.59	.42	.01	.16
Ballynahinch Castle ..... 1915 <i>Galway—3.</i>	Dec. 20 Apr. 6	Feb. 19 Apr. 27	62 22	17.15 5.32	1.06 1.03	.01 .02	.28 .24

Table 3. Rain Spells (Mill HR & Salter C, 1917, p. [27]) ©Crown copyright 2016 Met Office

## Snowfalls before Easter week

Significant snowfalls affected Wales, Scotland and England during February and March, however it was noted that “*there is very little information about the depth of the snowfalls in Ireland, but there can be no doubt that the western isle suffered far less than Great Britain in February and March, 1916*” (Mill HR & Salter C, 1917, p. [31]).

• A rain spell is a period of more than 14 consecutive days every one of which is a rain day.

## Weather day-by-day 23-29 April 1916

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In order to provide a weather summary for each day of the week, the weather for Ireland and Dublin was determined using the following information:

- Observation and synoptic charts, which are subject to © Crown copyright 2016 Met Office, that is this paper contains public sector information licensed under the Open Government Licence v1.0.
- Weather data from the monthly reports (see Figure 2 for location) from
  - Malin Head (Donegal)
  - Blacksod Point (Mayo)
  - Valentia Observatory (Kerry)
  - Roche's Point (Cork)
  - Birr Castle (Offaly)
  - Donaghadee (Down)
- The Dublin area weather summary from the 50-year anniversary analysis (Figure 1).
- Weather data from the daily registers, where the data are an average of the three available Dublin stations:
  - Phoenix Park
  - Fitzwilliam Square
  - Glasnevin
- A transcription of the day's weather description is also included for all Dublin stations, excluding Trinity College (as there was none for the month of April).
- The ECMWF Reanalysis (ERA-20C) plots were generated by Dr Gleeson using a computer model of historical weather observations to reconstruct weather patterns (Poli et al, 2013). The ECMWF Reanalysis (ERA-20C) plots are used herein for illustrative purposes only for further information on use and limitations, visit [www.ecmwf.int](http://www.ecmwf.int). The parameters plotted for this paper are daily averages of the following:
  - Mean sea level pressure (hPa)
  - Air temperature (°C)
  - Wind speed (m/s)
- A storm warning was issued by the then Forecast Division of the British Meteorological Office on Sunday (for Monday) and the warning information is included on this day (See Appendix B for a copy of the entire forecast page).



## Sunday 23 April 1916

A high pressure ridge extended into Southern areas. Low pressure was located North-West with accompanying unsettled weather. This depression was forecast to pass north-westward, with secondaries causing further unsettled weather. See Figure 10 for a plot of the mean sea pressure (MSLP) (hPa) where high pressure is indicated by orange/red and low pressure by blue/green areas.

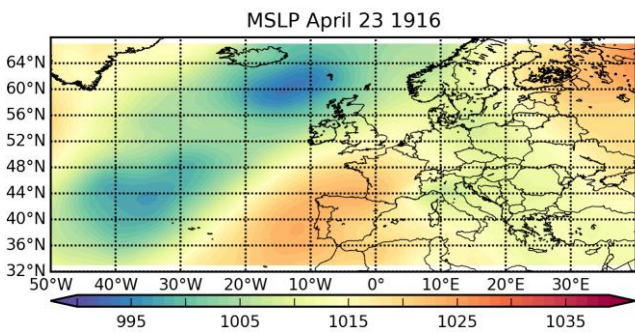


Figure 10. ECMWF Reanalysis (ERA-20C)

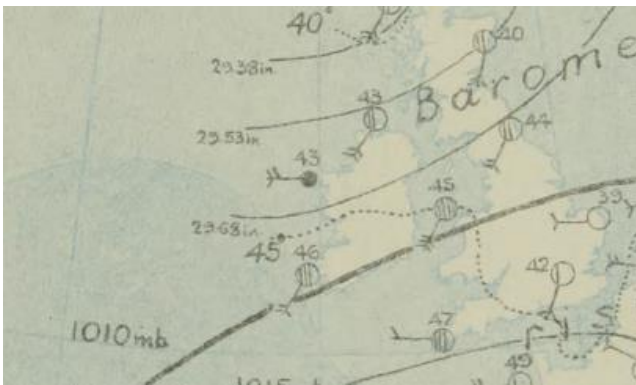


Figure 11. Synoptic chart 7am  
 (Meteorological Office, 1916, p. 94) ©Crown  
 copyright 2016 Met Office



Figure 13. Temperature (°F) at 7am  
 (Meteorological Office, 1916, p. 94) key for  
 symbols in Appendix E Figure 51(b) ©Crown  
 copyright 2016 Met Office

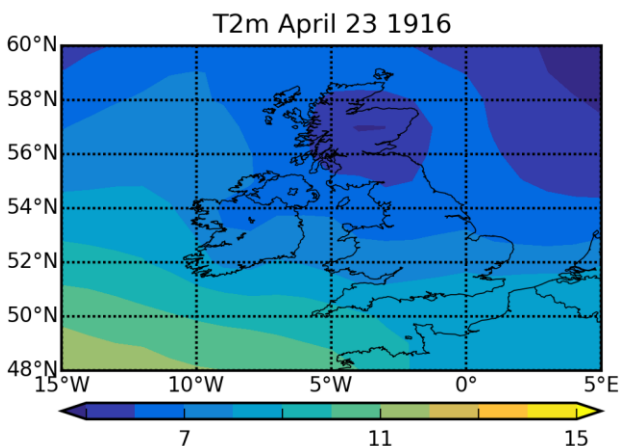


Figure 12. Air Temperature (°C) ECMWF  
 Reanalysis (ERA-20C)

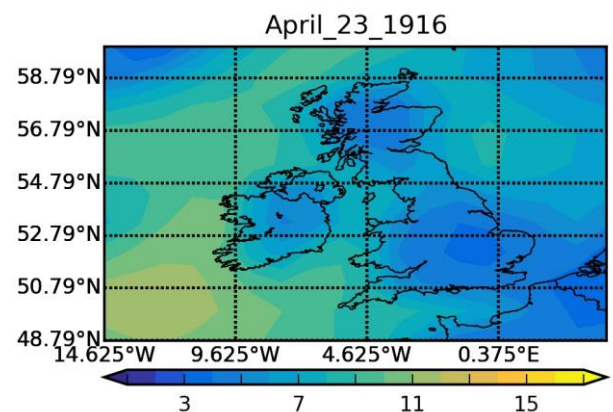


Figure 14. Wind Speed (m/s) ECMWF  
 Reanalysis (ERA-20C)

The North of the country was cooler than the South, note the 7°C (45°F) isotherm in Figure 10(b). Winds strongest in the Southwest.

Descriptions of the day's weather at Phoenix Park (MÉ/MO/1), Fitzwilliam Square (MÉ/MO/4) and Glasnevin (MÉ/MO/17), as transcribed from the above referenced Met Éireann Library manuscripts, follows:

Phoenix Park	Fitzwilliam Square	Glasnevin
Day bright and cloudy, night cloudy drizzle rain am.	Fresh WSW winds, clouds from West morn. Light shower midday, very fine PM. Cirrus and cirrus stratus overspreading 5pm, partial halo 545pm overcast and rainy.	Fine, breezy, intervals of sunshine, showers, fine at night.

Table 4. Sunday's Weather around Dublin

### Weather Summary

	Ireland	Dublin
Weather	Mild and cloudy, with light to moderate South-West breezes. Rain heaviest South of the country.	Sunday was cloudier than Saturday, but a little warmer. Showers included hail.
Average MSLP	1005.9hPa	1007.6hPa
Average air temperature	9.4°C (1.3°C above normal)	9.7°C (1.6°C above normal)
Max air temperature	14.4°C Glasnevin	14.4°C Glasnevin
Min air temperature	5.0°C Phoenix Park	5.0°C Phoenix Park
Wind force	Light to moderate	Light to moderate
Wind direction	South-West	South-West
Highest rainfall	27mm Valentia Observatory (29% of its monthly normal)	1.1mm Phoenix Park
Hours of sunshine	-	6.2 hours (~43% possible)

Table 5. Weather Summary for Ireland for Sunday 23 April 1916

#### Note:

Malin Head recorded an air temperature of -1.0°C, which is 5.9°C below normal for the time of year (see Climate of Ireland section for normals). Since this minimum was (1) left out of subsequent reports issued and (2) the other stations' observations ranged from 0.6 to 3.9°C above average, it appears unlikely that this reading is accurate. Therefore, the Malin Head maximum and minimum air temperatures have been excluded from this day's analysis.

### Weather Forecast for Monday

The forecast issued on Sunday 23 April 1916 was valid from noon Monday to noon Tuesday. See Appendix B for a copy of the entire forecast page.

It appears that storm warnings were issued by displaying Warning Signals (cones) at the coasts (see image inset below for locations) during the early morning.



Figure 15. Image of Storm Warnings Forecast issued on Sunday 23 April valid from noon Monday 24 April to noon Tuesday 25 April (Meterological Office, 1916, page 97) ©Crown copyright 2016 Met Office

## Monday 24 April 1916

The synoptic chart at 7am on the Monday indicated a depression (990hPa) was centred off the west of Scotland, which generated unsettled weather across Ireland. There was also a continental area of high pressure (anticyclone).

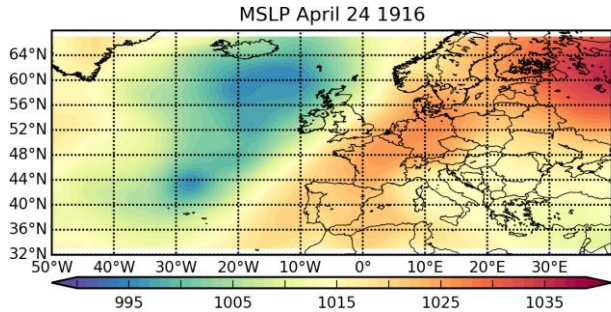


Figure 16. MSLP ECMWF Reanalysis (ERA-20C)

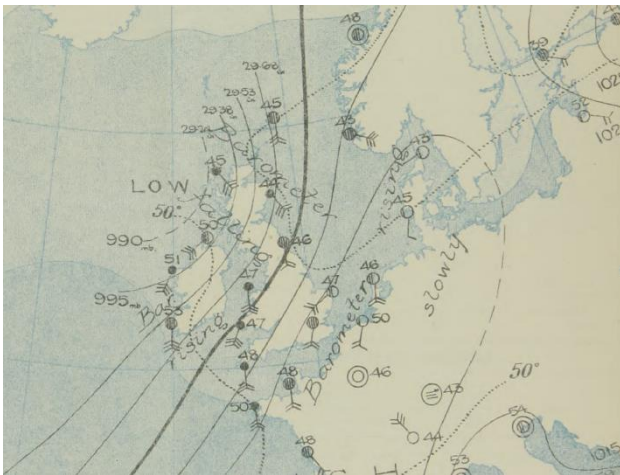


Figure 17. Synoptic chart 7am (Meteorological Office, 1916, p. 98) © Crown copyright 2016 Met Office

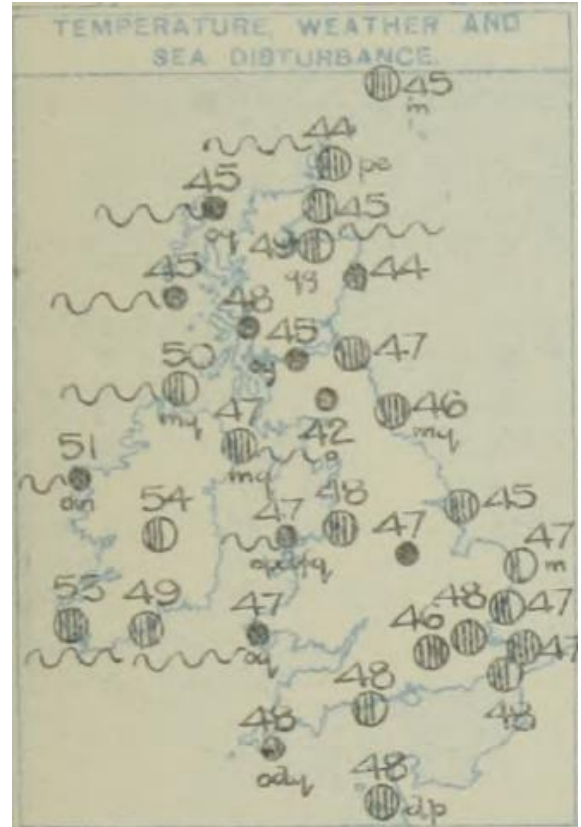


Figure 19. Temp (°F) 7am (Meteorological Office, 1916, p. 98) key for symbols in Appendix E Figure 51(b) © Crown copyright 2016 Met Office

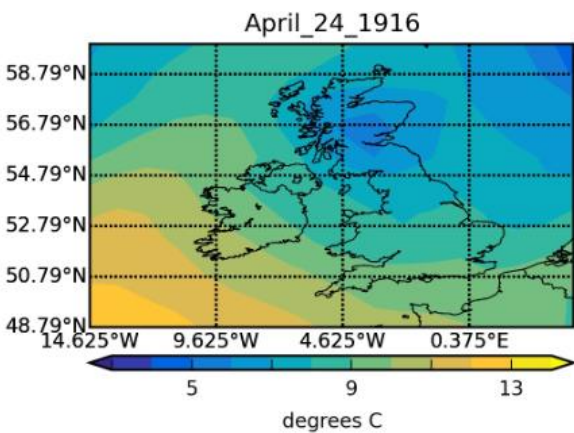


Figure 18. 2m Temp ECMWF Reanalysis (ERA-20C)

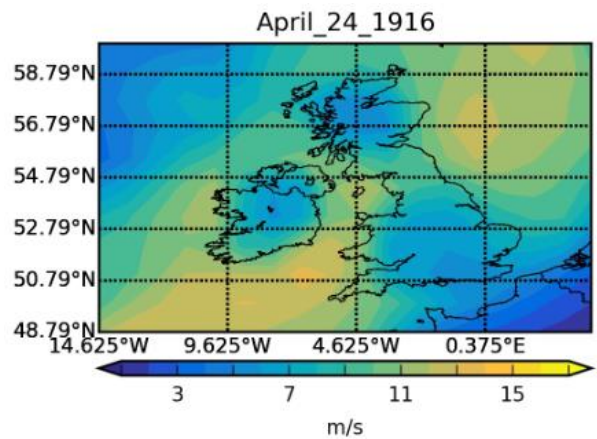


Figure 20. Wind Speed (m/s) ECMWF Reanalysis (ERA-20C)

The reanalysis mean sea level pressure (MSLP) shows a complex low situation to the west of Ireland – an area which would not have been available for analysis during 1916.

Reanalysis indicates that air temperatures across Ireland were between 8°C and 13°C, highest in the South-West. Observed air temperatures were also highest in the South-West at 11.7°C and lowest in the North-East at 8.3°C.

Sea temperatures were higher in the South, while seas were rough around Ireland. Mean winds observed were generally South-Westerly in direction, and speeds were approximately 30 knots (56km/h or 15m/s or Near Gale force).

Descriptions of the day's weather at Phoenix Park (MÉ/MO/1), Fitzwilliam Square (MÉ/MO/4) and Glasnevin (MÉ/MO/17), as transcribed from the above referenced Met Éireann Library manuscripts, follows:

<b>Phoenix Park</b>	<b>Fitzwilliam Square</b>	<b>Glasnevin</b>
Day cloudy passing showers pm, night cloudy.	Some rain last night, fresh southwesterly winds and much warmer. Slight rain even after fine, breezy day.	Fine, intervals of sunshine, showers, mist at night.

Table 6. Monday's Weather around Dublin

### Weather Summary

	<b>Ireland</b>	<b>Dublin</b>
Weather	Mild and windy generally, warm in the East. Cloudy with heavy rain in Southern and Western areas. Mist in places.	Monday was cloudy, with slight showers and rain at night. It was quite warm with temperature reaching 18°C.
Average MSLP	1001.1hPa	1005.6hPa
Average air temperature	10.1°C (2.0°C above normal)	13.1°C (5.1°C above normal)
Max air temperature	17.8°C Glasnevin	17.8°C Glasnevin
Min air temperature	2.8°C Malin Head	8.3°C Phoenix Park
Wind force	Moderate to Strong	Moderate to Strong
Wind direction	South-West	South-West
Highest rainfall total	33mm Valentia Observatory (35% of its monthly normal)	0.4mm Fitzwilliam Square
Hours of sunshine	-	3.7 hours (~25% possible)

Table 7. Weather Summary for Ireland for Monday 24 April 1916

### Wind records

- The week's highest observed sustained wind speed was recorded on this day with Gale Force 7 at midnight at Weaver's Point (Cork).
- The week's highest gust was recorded on this day with 49 knots (91 km/h) around 2am at Weaver's Point.



## Tuesday 25 April 1916

The depression moved further North-West, while the continental high-pressure extended westward. The reanalysis shows the depression (< 995hPa) had moved to the east of Iceland. The large continental high pressure had strengthened and was influencing weather in the Southwest of England.

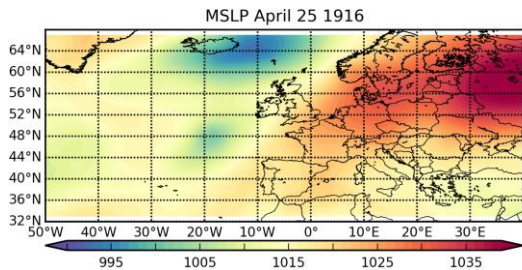


Figure 21. MSLP ECMWF Reanalysis (ERA-20C)



Figure 22. (b) Synoptic chart 7am (Meteorological Office, 1916, p. 102) ©Crown copyright 2016 Met Office

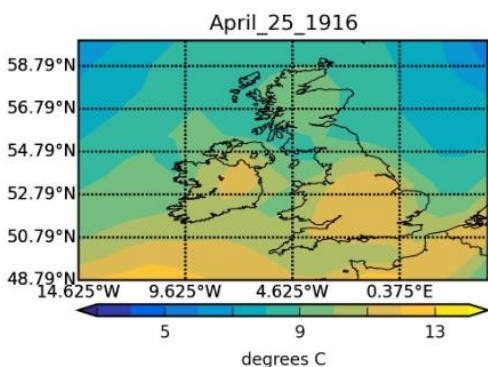


Figure 23. Air (2m) Temp ECMWF Reanalysis (ERA-20C)

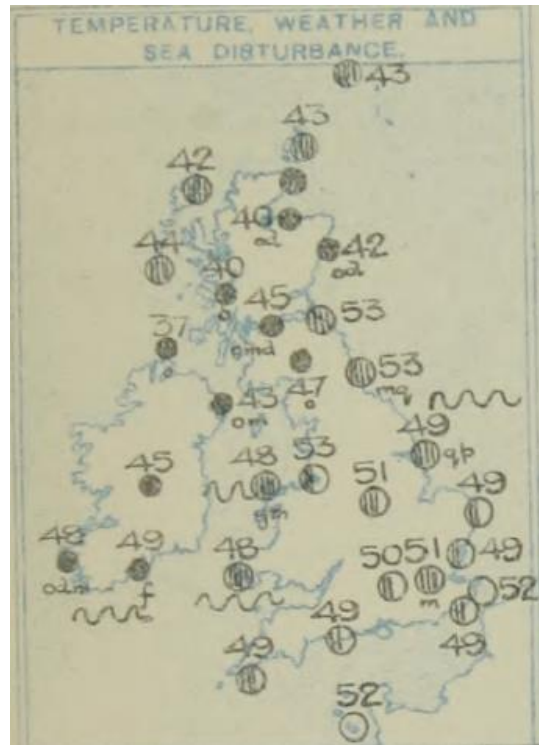


Figure 24. Temp (°F) 7am (Meteorological Office, 1916, p. 102) key for symbols in Appendix E Figure 51(b) ©Crown copyright 2016 Met Office

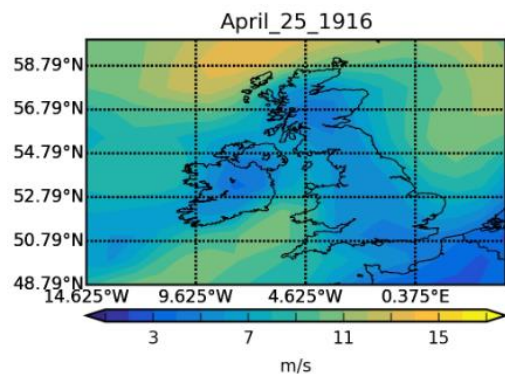


Figure 25. Wind Speed (m/s) ECMWF Reanalysis (ERA-20C)

Warmer weather in Southern areas, with air temperature up to 9.4°C. Malin Head experienced much colder weather; where a daily minimum of 2.8°C was recorded.

Variable winds continued generally light to moderate, while Southern seas continued rough.

Descriptions of the day's weather at Phoenix Park (MÉ/MO/1), Fitzwilliam Square (MÉ/MO/4) and Glasnevin (MÉ/MO/17), as transcribed from the above referenced Met Éireann Library manuscripts, follows:

<b>Phoenix Park</b>	<b>Fitzwilliam Square</b>	<b>Glasnevin</b>
Day cloudy heavy showers pm, night cloudy.	Slight showers last night. Cloudy, mild morn and AM. Overcast PM and heavy rain 4 to 6pm, fine at night.	Cloudy, dull, mild, heavy showers, damp at night.

Table 8. Dublin's Weather Tuesday 25 April 1916

### Weather Summary

	<b>Ireland</b>	<b>Dublin</b>
Weather	Cool and misty at start, becoming milder. Rain heaviest in the South. Cloudy generally.	Dull, with some heavy showers, warm.
Average MSLP	1012.4hPa	1015.4hPa
Average air temperature	8.7°C (0.7°C above normal)	12.3°C (4.2°C above normal)
Max air temperature	16.7°C Phoenix Park	16.7°C Phoenix Park
Min air temperature	2.8°C Malin Head	8.3°C Phoenix Park
Wind	Light to moderate	Light or gentle
Wind direction	Variable	Variable
Highest rainfall total	16mm Roche's Point	5.9mm Phoenix Park
Hours of sunshine	-	1.7 hours (~12% possible)

Table 9. Weather Summary for Ireland for Tuesday 25 April 1916

Note:

- "Aurora were seen at several northern stations." (Meteorological Office, 1916, p. 107)

## Wednesday 26 April 1916

The weakened Atlantic depression had moved into the South-West, which brought some light rain to Western and Southern coastal areas.

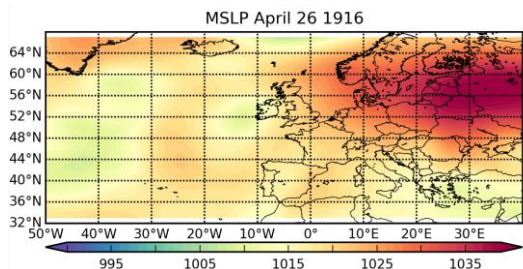


Figure 26. MSLP ECMWF Reanalysis (ERA-20C)

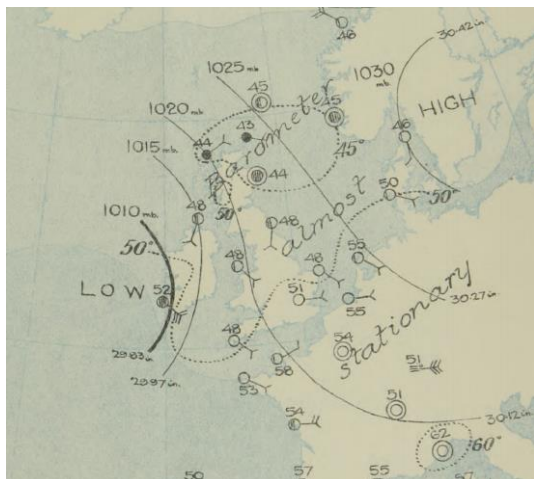


Figure 27. Synoptic chart 7am (Meteorological Office, 1916, p. 106)  
 ©Crown copyright 2016 Met Office

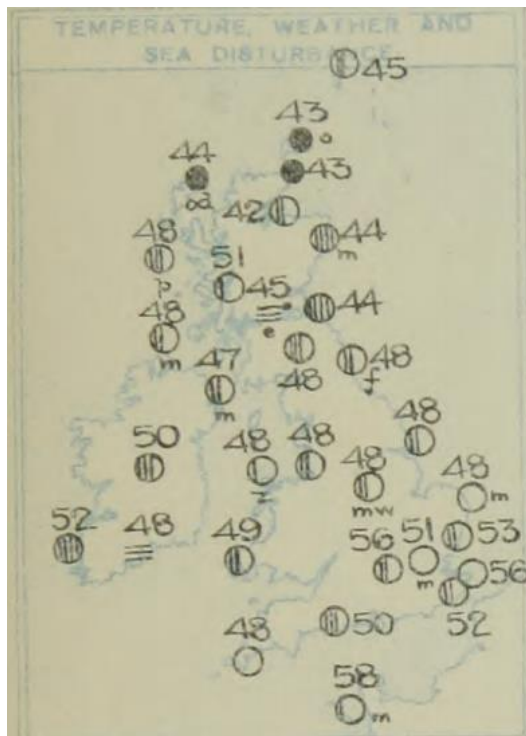


Figure 29. Temp (°F) 7am (Meteorological Office, 1916, p. 106) key for symbols in Appendix E Figure 51(b) ©Crown copyright 2016 Met Office

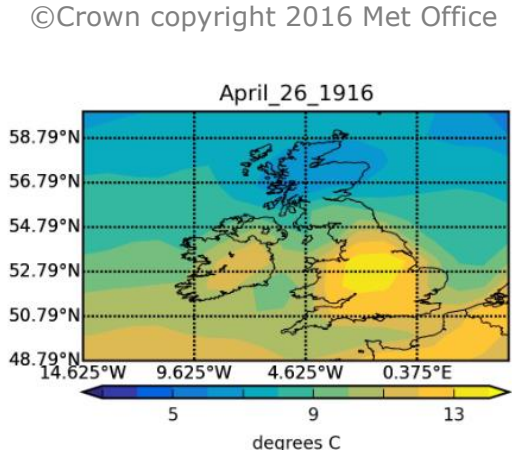


Figure 28. Air (2m) Temp ECMWF Reanalysis (ERA-20C)

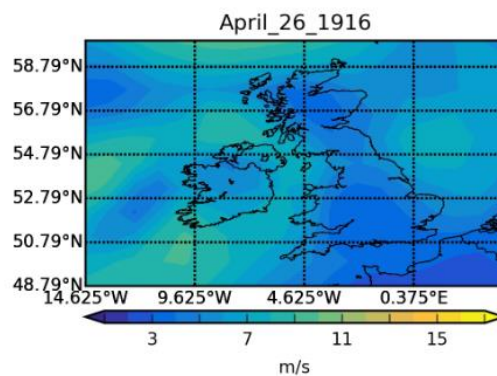


Figure 30. Wind Speed (m/s) ECMWF Reanalysis (ERA-20C)



Observed air temperatures ranged from 9-11°C. Reanalysis indicate that it was cooler along coasts in the West. A 10°C isotherm in the Synoptic chart (above) shows only two stations with temperature recorded, showing warmer weather in the West. The reanalysis adds more value - temperatures in the East, South and Midlands were highest. Dublin recorded a high of 17.2°C at Fitzwilliam Square and Phoenix Park. In this warm weather, coastal mist and fog were observed at Roche's Point.

Descriptions of the day's weather at Phoenix Park (MÉ/MO/1), Fitzwilliam Square (MÉ/MO/4) and Glasnevin (MÉ/MO/17), as transcribed from the above referenced Met Éireann Library manuscripts, follows:

<b>Phoenix Park</b>	<b>Fitzwilliam Square</b>	<b>Glasnevin</b>
Day cloudy night cloudy.	Fine and mild morn. Very fine, warm and sunny – cool Southeasterly breeze PM and evening.	Cloudy, breezy, intervals of sunshine, clear at night.

Table 10. Wednesday Weather around Dublin

### Weather Summary

	<b>Ireland</b>	<b>Dublin</b>
Weather	Warm, some sunny spells and coastal mist and fog.	Some sunny intervals. Dry and warm, especially 26 <sup>th</sup> when temperature again reached 18°C.
Average MSLP	1014.1hPa	1015.3hPa
Average air temperature	12.0°C (3.9°C above normal)	12.4°C (4.3°C above normal)
Max air temperature	17.2°C Fitzwilliam Square	17.2°C Fitzwilliam Square
Min air temperature	6.7°C Phoenix Park	6.7°C Phoenix Park
Wind force	Light to moderate	Light to moderate
Wind direction	Variable	Variable
Highest rainfall total	3mm Valentia Observatory (Kerry)	trace Phoenix Park
Hours of sunshine	-	4.3 hours (29% possible)

Table 11. Weather Summary for Ireland for Wednesday 26 April 1916

Note:

- Blacksod Point did not record temperature values for this day but were inserted as corrections later. However, it appears they may have been inserted incorrectly, so they are not used in this day's calculations (Meteorological Office, 1916, p. 125).

## Thursday 27 April 1916

A ridge of high pressure had built across most regions which brought fine weather conditions.

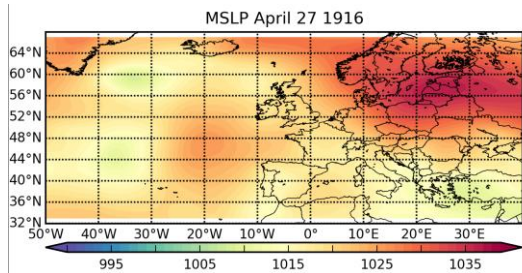


Figure 31. MSLP ECMWF Reanalysis (ERA-20C)

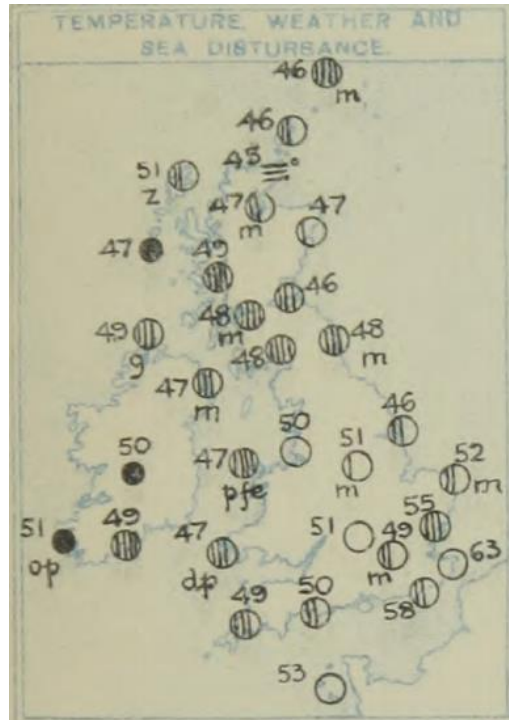


Figure 34. Temp (°F) 7am Monday (Meteorological Office, 1916, p. 110) key for symbols in Appendix E Figure 51(b) ©Crown copyright 2016 Met Office

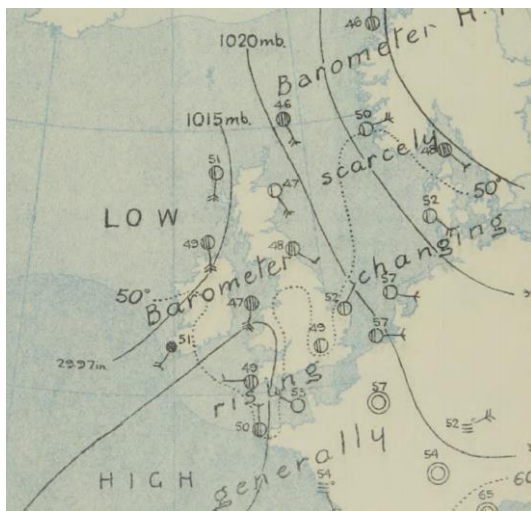


Figure 32. Synoptic 7am (Meteorological Office, 1916, p. 110) ©Crown copyright 2016 Met Office

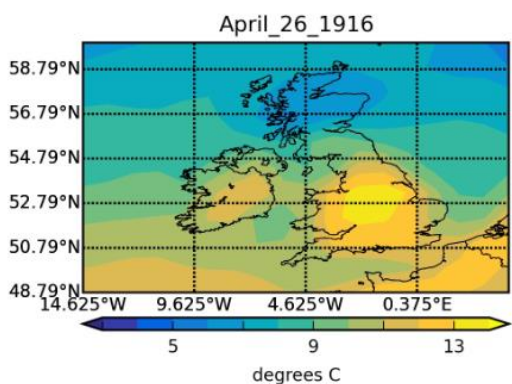


Figure 33. Air (2m) Temp ECMWF Reanalysis (ERA-20C)

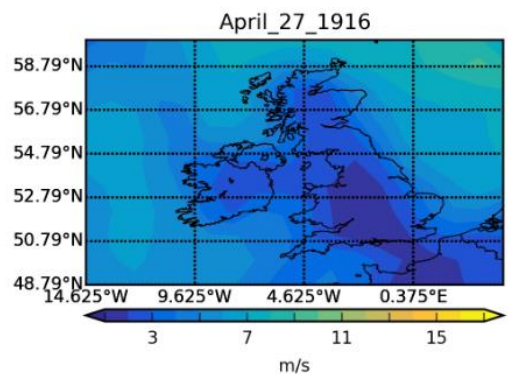


Figure 35. Wind Speed (m/s) ECMWF Reanalysis (ERA-20C)

There is however, a difference in the position in synoptic and reanalysis for the location of the Atlantic high pressure centre, the former being more to the south-west.

Generally it was a warm, cloudy day with the best of the bright weather to the North of the country. Winds were lightest in the East, but overall it was a calm day. A relatively-warm pool of air persisted over England, where air temperatures were 12.8°C during the early morning.

Descriptions of the day's weather at Phoenix Park (MÉ/MO/1), Fitzwilliam Square (MÉ/MO/4) and Glasnevin (MÉ/MO/17), as transcribed from the above referenced Met Éireann Library manuscripts, follows:

<b>Phoenix Park</b>	<b>Fitzwilliam Square</b>	<b>Glasnevin</b>
Day cloudy, night cloudy.	Increasing cloud from Southerly direction morn. Fine and warm. Much cloud PM and evening wind veering.	Fine, mild, bright sunshine, fine at night.

Table 12. Thursday's Weather around Dublin

### Weather Summary

	<b>Ireland</b>	<b>Dublin</b>
Weather	Warm, dry and cloudy generally.	Some sunny intervals. Dry and Warm.
Average MSLP	1016.2hPa	1019.0hPa
Average air temperature	10.5°C (2.4°C above normal)	11.9°C (3.9°C above normal)
Max air temperature	17.8°C Glasnevin	17.8°C Glasnevin
Min air temperature	6.1°C Blacksod Point (Mayo)	6.7°C Glasnevin
Wind force	Light to moderate	Light or gentle
Wind direction	Variable	Variable
Highest rainfall total	1mm Blacksod Point (Mayo)	0mm
Hours of sunshine	-	1.3 hours (~9% possible)

Table 13. Weather Summary for Ireland for Thursday 27 April 1916

## Friday 28 April 1916

High pressure weather dominated with a risk of thunder of lightning in southern areas.

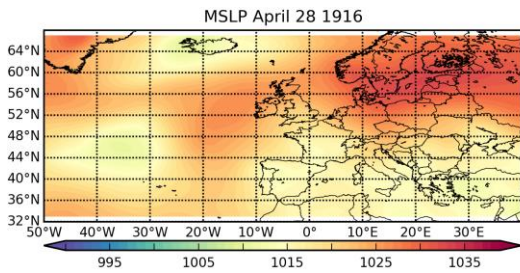


Figure 36. MSLP ECMWF Reanalysis (ERA-20C)

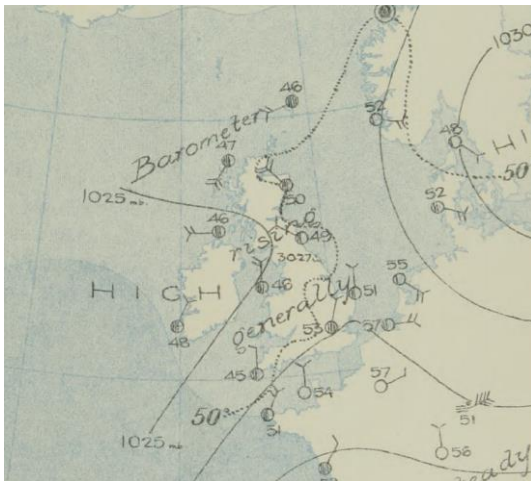


Figure 37. Synoptic 7am (Meteorological Office, 1916, p. 114) ©Crown copyright 2016 Met Office

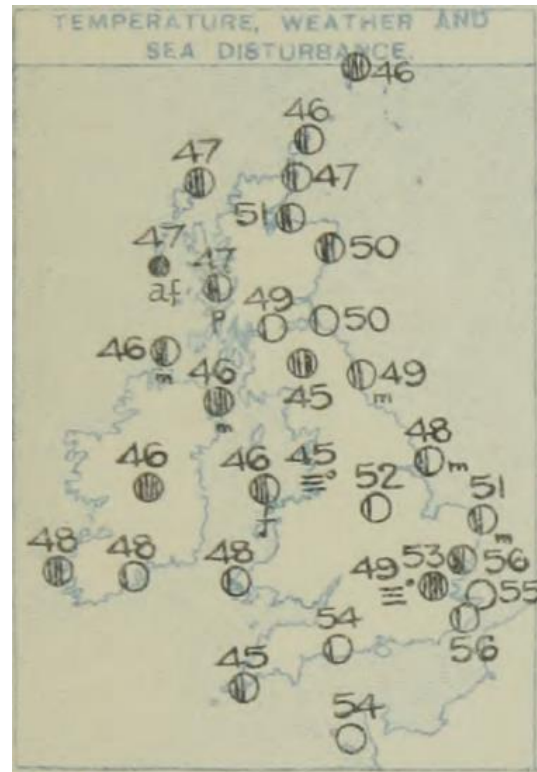


Figure 39. Temp (°F) 7am Monday (Meteorological Office, 1916, p. 114) key for symbols in Appendix E Figure 51(b) ©Crown copyright 2016 Met Office

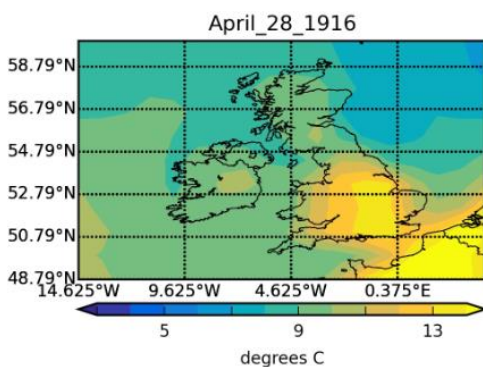


Figure 38. Air (2m) Temp ECMWF Reanalysis (ERA-20C)

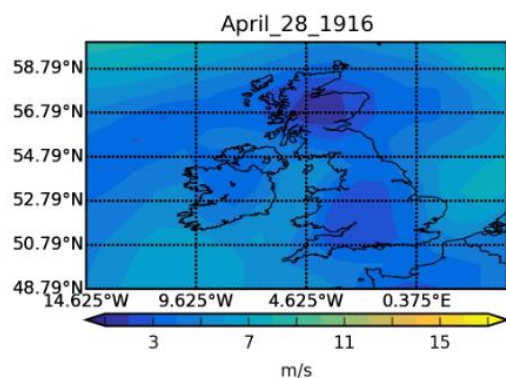


Figure 40. Wind Speed (m/s) ECMWF Reanalysis (ERA-20C)

The relatively warm pool of air over England had moved South-Eastward, with temperatures at 7am up to 13.3°C. According to the reanalysis, winds increased a little along coasts in the South-West of Ireland but still light to moderate generally, elsewhere relatively calm.

Descriptions of the day's weather at Phoenix Park (MÉ/MO/1), Fitzwilliam Square (MÉ/MO/4) and Glasnevin (MÉ/MO/17), as transcribed from the above referenced Met Éireann Library manuscripts, follows:

<b>Phoenix Park</b>	<b>Fitzwilliam Square</b>	<b>Glasnevin</b>
Day bright and cloudy, night cloudy.	Cloudy from Northeasterly direction to overcast morn. AM – fair, sunny and cool PM and evening.	Fine, dull in the forenoon, bright sunshine, clear at night.

Table 14. Friday's Weather around Dublin

### Weather Summary

	<b>Ireland</b>	<b>Dublin</b>
Weather	Some mist, but a generally dry, mild day. Some sunny spells.	Some sunny intervals. Dry and Warm
Average MSLP	1025.7hPa	1024.8hPa
Average air temperature	9.8°C (1.7°C above normal)	9.9°C (1.8°C above normal)
Max air temperature	15.6°C Birr Castle (Offaly)	13.3°C Fitzwilliam Square
Min air temperature	3.9°C Phoenix Park	3.9°C Phoenix Park
Wind force	Calm or light	Light or calm
Wind direction	Variable	Northerly or calm
Highest rainfall total	0.2mm Donaghadee	Nil
Hours of sunshine	-	6.6 hours (~44% possible)

Table 15. Weather Summary for Ireland for Friday 28 April 1916



## Saturday 29 April 1916

High pressure continued to dominate the weather. During this good, sunny weather, a high of 21°C occurred in Waterford. This was the week's highest daily maximum air temperature.

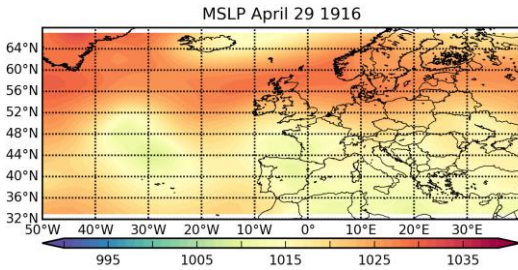
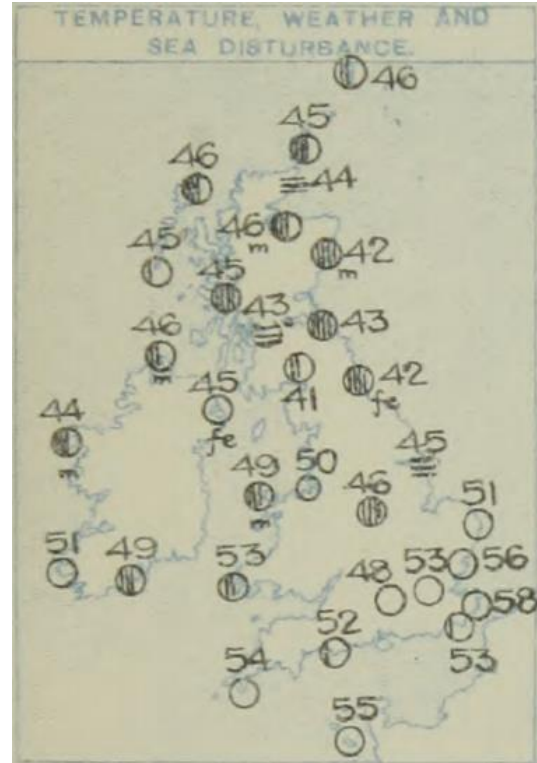


Figure 41. MSLP ECMWF Reanalysis (ERA-20C)



Figures 44 Temp (°F) 7am Monday (Meteorological Office, 1916, p. 118) key for symbols in Appendix E Figure 51(b) ©Crown copyright 2016 Met Office

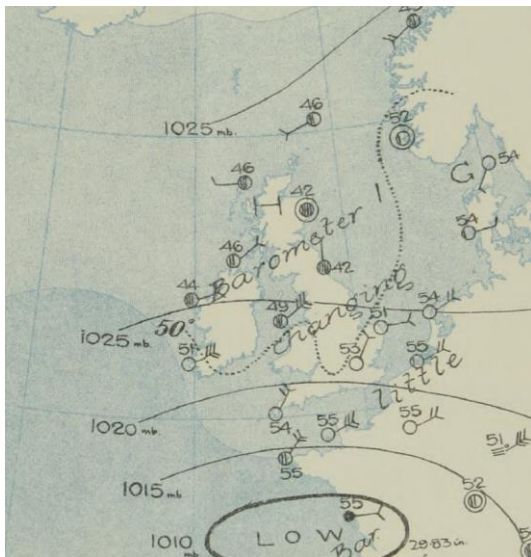
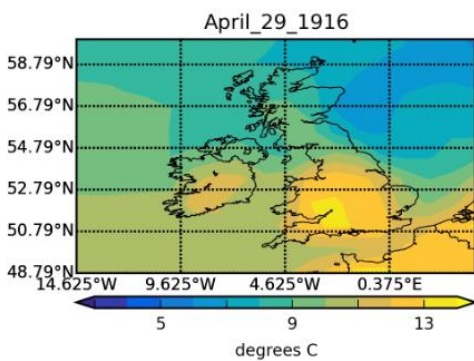
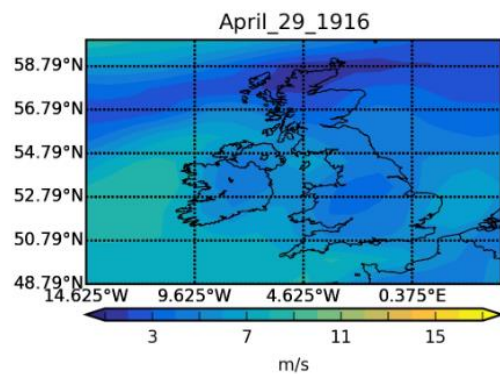


Figure 42. Synoptic chart 7am (Meteorological Office, 1916, p. 118) ©Crown copyright 2016 Met Office



Figures 43 Air (2m) Temp ECMWF Reanalysis (ERA-20C)



Figures 45 Wind Speed (m/s) ECMWF Reanalysis (ERA-20C)

A review of the digital climate database<sup>5</sup> shows that only one station has ever recorded this value or more on a 29th April, that is Roche's Point (Cork) which reached 21.3°C in 1993. In the climate database, only fifteen years have recorded air temperatures  $\geq 21.0^\circ\text{C}$  during an April.

Descriptions of the day's weather at Phoenix Park (MÉ/MO/1), Fitzwilliam Square (MÉ/MO/4) and Glasnevin (MÉ/MO/17), as transcribed from the above referenced Met Éireann Library manuscripts, follows:

<b>Phoenix Park</b>	<b>Fitzwilliam Square</b>	<b>Glasnevin</b>
Beautiful bright day, night clear.	Fine, hazy morn. Beautiful weather. Quite, bright and genial.	Fine, breezy, bright sunshine, fine at night.

Table 16. Saturday's Weather around Dublin

### Weather Summary

	<b>Ireland</b>	<b>Dublin</b>
Weather	Remaining mild, dry. Some good sunshine. Coast mist or drizzle.	Bright and sunny. Clear skies.
Average MSLP	1024.3hPa	1022.8hPa
Average air temperature	11.1°C (3.0°C above normal)	10.1°C (2.0°C above normal)
Max air temperature	21°C Waterford	15.6°C Fitzwilliam Square
Min air temperature	2.2°C Phoenix Park	2.2°C Phoenix Park
Wind force	Light to moderate, fresher in the South	Light or gentle
Wind direction	Northerly	Northerly
Highest rainfall total	trace Roche's Point, Donaghadee	Nil
Hours of sunshine	-	11.7 hours (~78% possible)

Table 17. Weather Summary for Ireland for Saturday 29 April 1916

Note: As the analysis ends on this date, the forecast is not included.

The highest **weekly** total rainfall was recorded at Killarney with 91 mm (479% of its weekly normal).

<sup>5</sup> Possible 77 years digital archive (since 1940).

## The weather after Easter week

The rain in the week to follow brought falls amounting to three times the normal across the whole of Ireland.

Daily totals for Friday 5 May 1916 recorded 44mm at Birr Castle (Offaly) and over 35mm at several other places in Ireland. The heaviest of the rain on that day was in the Dublin area where rainfall stations recorded rainfall amounts as follows: Greystones (Coolagad) 66.3mm, Bray (Fassaroe) 66.3mm and Shankhill 63.8mm (Meteorological Office, 1916, p. [46]). As already mentioned, the rainfall in Ireland during May 1916 was still not exceeded by 1924.

Following the heavy rains in April and May, the following droughts occurred in Ireland:

STATION & COUNTY.	ABSOLUTE DROUGHTS.			PARTIAL DROUGHTS.			
	Began.	Ended.	Last-ed. Days	Began.	Ended.	Last-ed. Days	Rain in.
<b>IRELAND.</b>							
Castletownshend (Seafield) .... <i>Cork—6.</i>	July 16	July 31	16	July 12	Aug. 10	30	·16
Mallow (Longueville) ..... <i>Cork—9.</i>	July 12	Aug. 8	28	July 7	Aug. 10	35	·34
Kenmare (Derreen) ..... <i>Kerry—4.</i>	July 16	July 31	16	July 12	Aug. 10	30	·12
Waterford (Brook Lodge) ..... <i>Waterford—3.</i>	July 13	Aug. 10	29	July 6	Aug. 10	36	·29
Nenagh (Castle Lough) ..... <i>Tipperary—1.</i>	None			July 12	Aug. 10	30	·19
Cahir (Suirvale) ..... <i>Tipperary—3.</i>	None			July 7	Aug. 10	35	·31
Killadysert (Paradise Hill) .... <i>Clare—3.</i>	None			July 14	Aug. 11	29	·27
Gorey (Courtown House) ..... <i>Wexford—4.</i>	July 17	Aug. 10	25	July 7	Aug. 13	38	·28
Straffan House ..... <i>Kildare—2.</i>	June 9	June 25	17	July 14	Aug. 13	31	·27

Figure 46. Droughts in 1916 (Meteorological Office, 1916, p. [20]) ©Crown copyright 2016 Met Office

See Appendix E for meteorological definitions.



## Establishment the Irish Meteorological Service

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The Irish Meteorological Service was set up in December 1936, taking over the commitments of the British Meteorological Office. The transfer took place on Thursday 1 April 1937. The network of stations included Valentia Observatory, 4 telegraphing reporting stations (operated by part-time observers at Malin Head, Blacksod Point, Birr and Roche's Point), 18 climatological stations and 172 rainfall stations.

The headquarters of the Irish Meteorological Service was located at 14/15 St Andrew Street, Dublin together with an office at Foynes Airport, which was set up to prepare for the first trans-Atlantic flight in the summer of 1939.

The staff at Foynes Airport were on loan from the British Meteorological Office, among them were Mr S P Peters and Mr J Harding (later Assistant Director of the British Meteorological Office) and Mr DA Davies (later Secretary-General of the World Meteorological Organisation).

The last of the British staff on loan left in March 1941, when the first groups of the Irish Meteorological Officer Cadets and Assistants had been recruited.

## Acknowledgements

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A special thank you is extended to all observers, past and present, who have recorded (and continue to record) the weather of Ireland. The nation is indebted to you for your diligent and thorough work.

The authors are also grateful to Séamus Walsh for his thoughtful foreword and review of the document at various stages. This Note would not have been completed without the help and knowledge of our colleagues: Mairéad Treanor (Librarian) and Aidan Murphy.

During the summer of 2015, two interns from the Dublin City University course - MSc in Science Communication - were invaluable in photographing, transcribing and analysing details from the library archive. The authors would like to thank Lucia Carmen Herman and Maria Jacob.

We extend our appreciation to all organisations who collected, recorded and provided copies of their original records of the daily data in Ireland at the time, namely the United Kingdom Met Office (UKMO) and the British Rainfall Organisation<sup>6</sup> (BRO).

The digital library and archive of the UKMO can be accessed here:

<https://digital.nmla.metoffice.gov.uk/>

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<sup>6</sup> For more on this organisation, visit [www.metoffice.gov.uk/learning/library/archive-hidden-treasures/british-rainfall](http://www.metoffice.gov.uk/learning/library/archive-hidden-treasures/british-rainfall).

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Irish Meteorological Service, 1965. The Weather of Easter Week, 1916, in and near Dublin.

Keane, T., 2012. *Establishment of the Meteorological Service in Ireland. The Foynes Years, 1936-1945*. s.l.:s.n.

Meteorological Office - Air Ministry, 1924. Report on the the Distribution of Rain in Space and Time over the British Isles during th eyear 1924. *British Rainfall 1924*.

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Meteorological Office, 1916. 1st January to 30th June, 1916. *Daily Weather Reports*, p. 3.

Mill HR & Salter C, 1917. *Birtish Rainfall, 1916. On the Distribution of Rain in Space and Time over the British Isles during the year 1916*. London: s.n.

Poli et al, 2013. The data assimilation system and initial performance evaluation of the ECMWF pilot reanalysis of the 20th-century assimilating surface observations only (ERA-20C), ERA Report Series 14.

Walsh, S., 2012. A summary of climate averages for Ireland, 1981-2010. *Climatological Note*.

Daily meteorological registers held in the Met Éireann library for the Dublin Stations are:

Dublin (Fitzwilliam Square) Meteorological Observations, 1916. Manuscript. Ref: MÉ/MO/4

Dublin (Phoenix Park) Meteorological Observations, 1916. Manuscript. Ref: MÉ/MO/1

Dublin (Glasnevin) Meteorological Observations, 1916. Manuscript. Ref: MÉ/MO/17

Dublin (Trinity College) Meteorological Observations, 1916. Manuscript. Ref: MÉ/MO/16/4

*The following Finding Aid for Meteorological Observations may prove useful for some readers:*

Keane, A. 2011. Registers of meteorological observations in Ireland 1855 - 1976. Historical Note No. 6. *Dublin: Met Éireann*. Available at: <http://hdl.handle.net/2262/74613>

## Appendix A. Infographics

The following were published online on 17 February and 15 March 2016 respectively.

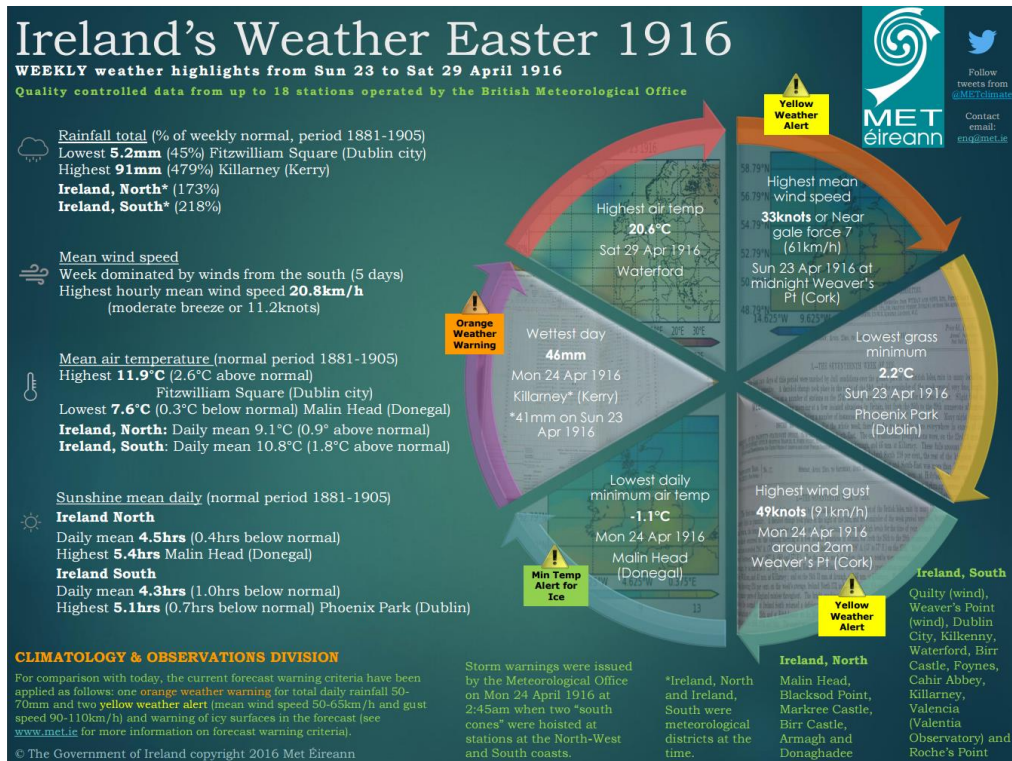


Figure 47. Ireland's Weather Easter 1916 ([tweet](#))

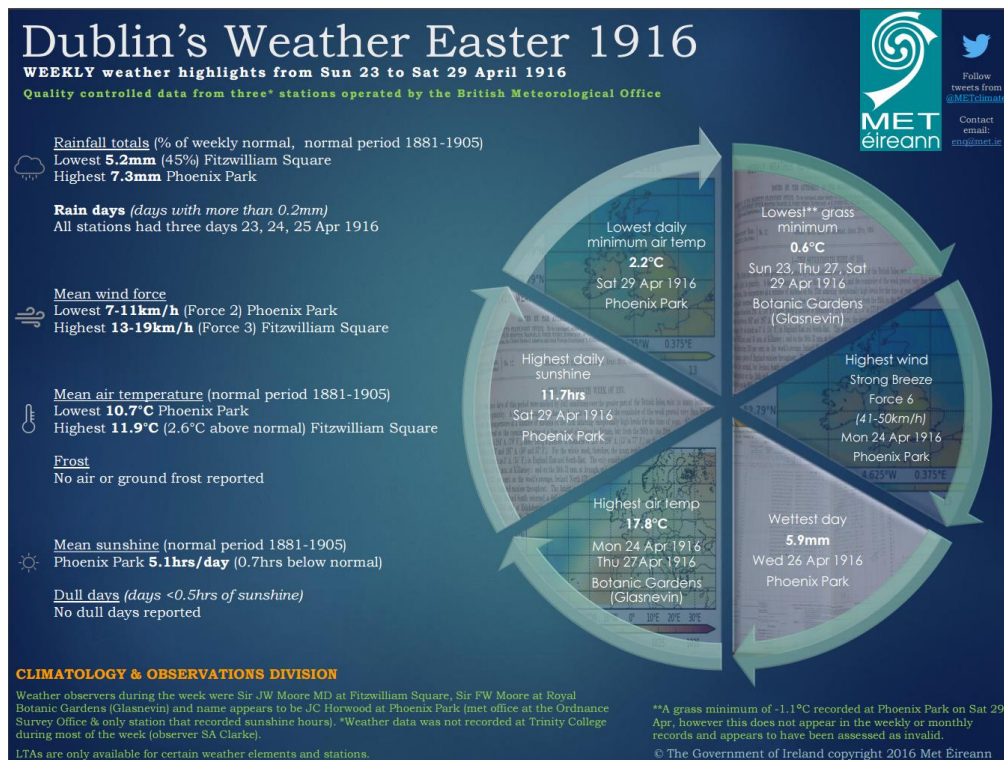


Figure 48. Dublin's Weather Easter 1916 ([tweet](#))

Request the digital copy by emailing [enq@met.ie](mailto:enq@met.ie) (available in A3 or A4 pdf format).

Notes on infographics:

- Figure 47: *Normal for the Week* is the mean daily temperature in the corresponding week, derived from 25 years of observations (1881-1905). The daily mean temperature is obtained from the maximum and minimum and applying a suitable correction (see Appendix D. Dublin's weather data for details on this correction). Original readings were in degrees Fahrenheit (and converted into degrees Celsius for use in this report). Pressure values are taken at 7am and 6pm (the Daily Weather Report).
- Normals for temperature, rainfall and sunshine quoted in the infographics for 'Ireland's Weather Easter 1916' and 'Dublin's Weather Easter 1916' included data from the daily, weekly and monthly reports. Calculated weekly means are taken from these reports and not from data collected for this Historical Note.
- Figure 48: A grass minimum temperature of -1.1°C was reported at Phoenix Park on Sunday 29 April 1916. However, subsequent meteorological reports do not include this value as a record, and perhaps was deemed inaccurate.
- The observed data in the daily register, converted into today's units, are given in Appendix C. Ireland's weather data and Appendix D. Dublin's weather data.
- The name of the station with the Ireland's wettest day (see Figure 47) was not given, only the county, however, it is thought to be one of the stations in Table 18.

STATIONS.	AUTHORITIES.	Rain Gauge.				Depth of Rain		Days with .01 in. or more
		Diam.	Height Above Ground		1916			
			ft.	in.	feet.	mm.	inches.	
<b>KERRY.</b> (Area, 1851 sq. mi.)		in.	ft.	in.	feet.	mm.	inches.	
Killarney (Flesk Mills) .....	D. E. McDonnell, Esq., C.E.	...	...	...	...	1624	63.92	220
„ (District Asylum) ...	E. W. Griffin, Esq., M.D.	5	0	10	178	1777	69.97	275

Table 18. Killarney Stations 1916 (Mill HR & Salter C, 1917, p. 305) ©Crown copyright 2016 Met Office



## Appendix B. Storm Forecast Monday 23 April 1916

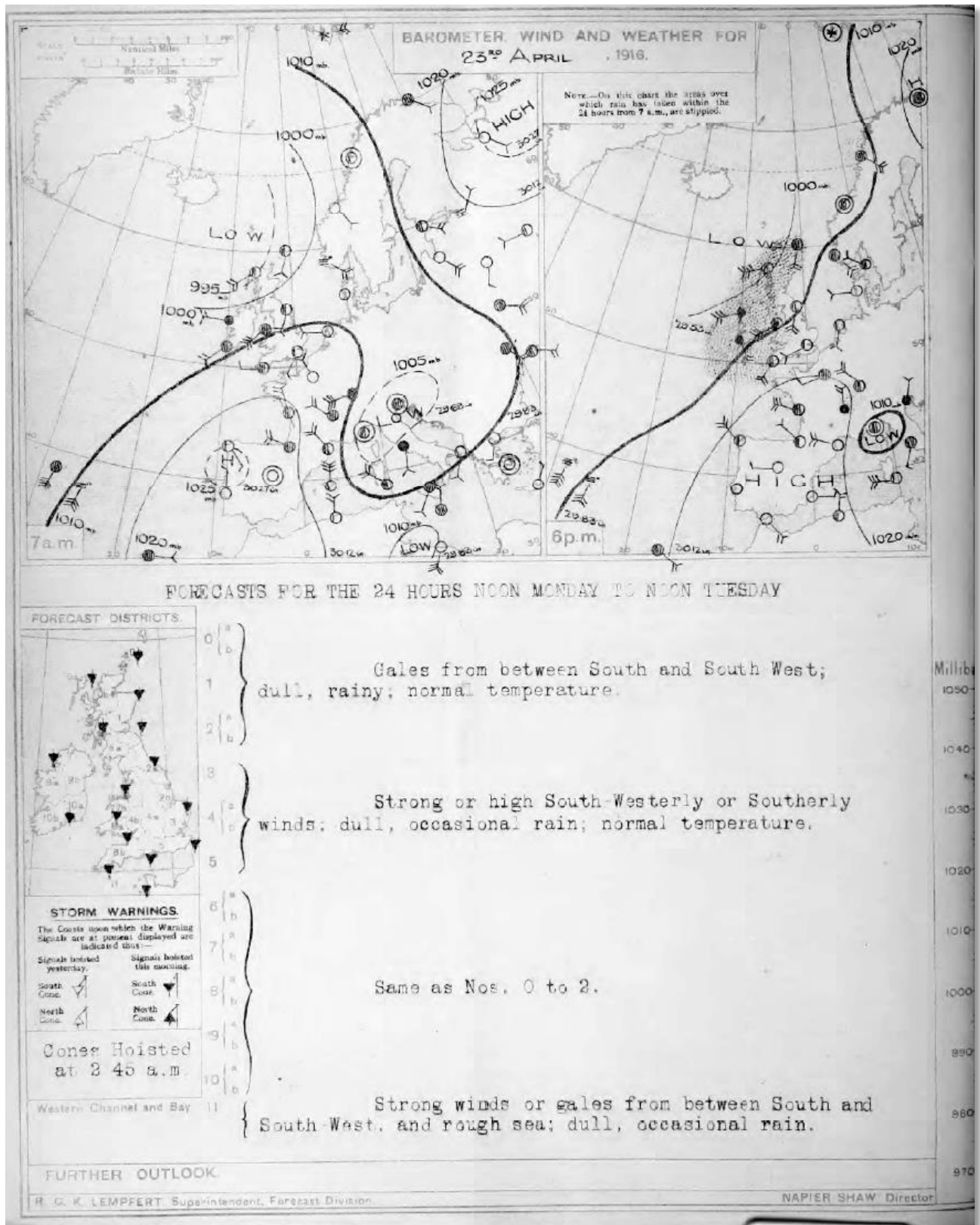


Figure 49. Storm Forecast (Meteorological Office, 1916, p. 97) ©Crown copyright 2016 Met Office

## Appendix C. Ireland's weather data

Averages of the data are given as follows, where Dublin data are an average in most instances at the three available stations: Fitzwilliam Square, Glasnevin and Phoenix Park.

Sunday 23 April 1916

Station	MSLP (hPa) 7am	Wind direction 7am	Wind Force (1-12)	MAX Daily Temp (°C)	MIN Daily Temp (°C)	Daily Rain Total (mm)
Dublin Stations	1007.6	WSW	4	14.4	5.0	1.1
Malin Head	1000.8	SW	4	10	-1* Day note	3
Blacksod Point	1003.0	W	3	11	6	11
Valentia Observatory	1009.0	SW	3	12	7	27
Roche's Point	1010.3	W	2	11	7	16
Birr Castle	1007.2	SW	2	12	7	10
Donaghadee	1003.6	WSW	4	13	7	3

*\*excluded as unlikely this occurred.*

Monday 24 April 1916

Station	MSLP (hPa) 7am	Wind direction 7am	Wind Force (1-12)	MAX Daily Temp (°C)	MIN Daily Temp (°C)	Daily Rain Total (mm)
Dublin Stations	1005.6	SW	4	17.8	8.3	0.4
Malin Head	993.5	SW	6	10	3	17
Blacksod Point	994.3	SSW	6	17	3	12
Valentia Observatory	1006.8	S	6	13	8	33
Roche's Point	1005.4	SSW	5	11	9	19
Birr Castle	1000.9	S	5	15	7	12
Donaghadee	1001.1	SSW	6	14	5	12

Tuesday 25 April 1916

Station	MSLP (hPa) 7am	Wind direction 7am	Wind Force (1-12)	MAX Daily Temp (°C)	MIN Daily Temp (°C)	Daily Rain Total (mm)
Dublin Stations	1015.4	SSE	4	16.7	8.3	5.9
Malin Head	1012.6	NE	2	9	3	1
Blacksod Point	1012.5	ESE	3	10	4	2
Valentia Observatory	1010.1	W	1	12	9	5
Roche's Point	1012.9	SSW	4	9	9	16
Birr Castle	1011.9	NW	1	12	7	2
Donaghadee	1011.4	SSW	3	8	5	3

Wednesday 26 April 1916

Station	MSLP (hPa) 7am	Wind direction 7am	Wind Force (1-12)	MAX Daily Temp (°C)	MIN Daily Temp (°C)	Daily Rain Total (mm)
Dublin Stations	1015.3	SSE	2	17.2	6.7	0.0
Malin Head	1014.9	SW	2	16	8	-
Blacksod Point	1010.7	SE	3	Day note	Day note	1.0
Valentia Observatory	1009.3	SE	5	12	9	3.0
Roche's Point	1015.5	SE	4	11	9	1.0
Birr Castle	1014.6	SSE	2	14	9	1.0
Donaghadee	1018.5	SE	3	17	7	-

Thursday 27 April 1916

Station	MSLP (hPa) 7am	Wind direction 7am	Wind Force (1-12)	MAX Daily Temp (°C)	MIN Daily Temp (°C)	Daily Rain Total (mm)
Dublin Stations	1019.0	W	1	12.8	0.0	0.0
Malin Head	1013.3	S	4	12	7	0.2
Blacksod Point	1012.4	WSW	4	10	6	1.0
Valentia Observatory	1017.4	SW	3	12	8	0.1
Roche's Point	1018.6	SW	1	13	"?"	-
Birr Castle	1016.0	S	1	14	7	1.0
Donaghadee	1016.7	S	4	14	7	-

Friday 28 April 1916

Station	MSLP (hPa) 7am	Wind direction 7am	Wind Force (1-12)	MAX Daily Temp (°C)	MIN Daily Temp (°C)	Daily Rain Total (mm)
Dublin Stations	1024.8	NE	1	12.8	0.0	0.0
Malin Head	1025.3	W	3	11	6	-
Blacksod Point	1026.6	W	1	11	6	-
Valentia Observatory	1026.5	NNE	2	13	9	-
Roche's Point	1025.2	NNW	2	15	8	-
Birr Castle	1026.4	N	1	16	7	-
Donaghadee	1025.4	N	3	11	6	0.2

Saturday 29 April 1916

Station	MSLP (hPa) 7am	Wind direction 7am	Wind Force (1-12)	MAX Daily Temp (°C)	MIN Daily Temp (°C)	Daily Rain Total (mm)
Dublin Stations	1022.8	NE	2	0.0	0.0	0.0
Malin Head	1027.0	NE	2	13	7	-
Blacksod Point	1025.6	ENE	3	12	7	-
Valentia Observatory	1021.8	ENE	5	18	9	-
Roche's Point	1022.6	NW	2	18	9	trace
Birr Castle*	1024.4	N	1	17	7	-
Donaghadee	1025.6	N	3	12	6	trace



## Appendix D. Dublin's weather data

Table below shows the observed data as input in the daily register, and converted into today's units:

	Average MSLP (hPa)	Wind direction	Wind	MAX Daily Temp (°C)	MIN Daily Temp (°C)	Daily Rain Total (mm)	Sunshine duration (hours)
<b>Sun, 23-Apr-1916</b>							
Fitzwilliam Square	1008.2	WSW, SW	force 4 to 4	13.9	5.6	1.0	NA
Glasnevin	1006.6	WSW	force 2 to 4	14.4	5.6	0.8	NA
Phoenix Park	1008.1	SW, SW	force 3 to 4	13.9	5.0	1.1	6.2
<b>Mon, 24-Apr-1916</b>							
Fitzwilliam Square	1006.0	SW	force 3 to 5	17.2	9.4	0.4	NA
Glasnevin	1004.8	WSW , SE	force 3 to 5	17.8	9.4	0.3	NA
Phoenix Park	1006.1	S, SW	force 4 to 6	16.7	8.3	0.3	3.7
<b>Tue, 25-Apr-1916</b>							
Fitzwilliam Square	1016.0	S, SSE	force 1 to 2	15.0	10.0	3.8	NA
Glasnevin	1014.4	WSW , SE	force 1 to 2	14.4	9.4	4.4	NA
Phoenix Park	1015.7	S, calm	force 3	16.7	8.3	5.9	1.7
<b>Wed, 26-Apr-1916</b>							
Fitzwilliam Square	1016.2	SE, SE	force 2 to 3	17.2	9.4	0.0	NA
Glasnevin	1014.1	WNW, SSE	force 3 to 4	15.0	8.9	0.0	NA
Phoenix Park	1015.6	S, calm	force 2	17.2	6.7	TRACE	4.3
<b>Thu, 27-Apr-1916</b>							
Fitzwilliam Square	1019.6	WSW, NW	force 1 to 3	16.1	8.3	0.0	NA
Glasnevin	1017.8	NW, Calm	force 0 to 2	17.8	6.7	0.0	NA
Phoenix Park	1019.6	SW, calm	force 2	16.1	6.7	0.0	1.3
<b>Fri, 28-Apr-1916</b>							
Fitzwilliam Square	1025.6	NE, N	force 1 to 3	13.3	9.4	0.0	NA
Glasnevin	1023.3	NE	force 1 to 1	13.3	6.7	0.0	NA

	Average MSLP (hPa)	Wind direction	Wind	MAX Daily Temp (°C)	MIN Daily Temp (°C)	Daily Rain Total (mm)	Sunshine duration (hours)
Phoenix Park	1025.6	calm, calm	calm	12.8	3.9	0.0	6.6
<b>Sat, 29-Apr-1916</b>							
Fitzwilliam Square	1023.2	NNE, N	force 2 to 2	15.6	8.3	0.0	NA
Glasnevin	1022.2	NE, Calm	force 0 to 3	15.6	3.9	0.0	NA
Phoenix Park	1023.2	NE, calm	force 2	15.0	2.2	0.0	11.7

The average weekly temperature for Phoenix Park is reported in the records as 11.9°C. However, a quick calculation from above yields 12.1°C. This difference occurs due to a 'Correction for Temperature' which was applied when calculating means for maximum and minimum at each station. These corrections were:

Phoenix Park :                    -0.067 and -0.067  
 Glasnevin:                        none given in register  
 Fitzwilliam Square:            -0.074 and -0.081

When calculating weekly means for the Dublin stations, the corrections above were applied.

## Appendix E. Meteorological units and definitions

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### Units

The units of measurement used the various meteorological reports during 1916 were:

- Temperature reported in degrees absolute (°A) or Fahrenheit (°F)
- Rainfall reported inches (in.) or millimetres (mm)
- Pressure reported millibars (mb)
- Wind force as defined by Beaufort 1-12
- Sunshine in hours and minutes together with percentages of possible

The following give more details on these and other parameters:

**Pressure** is given in “millibars” (1000 millibars = one megadyne per square centimetre). One millibar is approximately equivalent to the pressure of 0.75008 mm. of mercury under standard conditions (273a, lat. 45°). The name is used in the Year-Book, following the example of Professor Bjerknes of Christiania in his work for the Carnegie Institution of Washington. The expression of atmospheric pressure in millibars shows that any necessary reduction of the readings of the barometer to standard temperature and latitude has already been made.

**Temperatures** are given in units on the Kelvin Absolute Scale, *i.e.* in centigrade degrees measured from a zero 273° below the normal Freezing Point of water. Temperatures at or below 273a (0° C.) are printed in small type.

**Vapour-Pressure**, deduced from the readings of the dry and wet bulb thermometers by Glaisher's Tables, is given in millibars.

**Wind-Speed** is expressed in metres per second. The values are estimated for periods of 60 minutes centering at the hours named.

**Wind-Direction** is given in points of the Compass, from N by E (1) through East (8), to True North (32). The directions refer to the exact hour, and are not mean values. No direction is given when the anemometer shows a smaller velocity than 1.6 metres per second.

**Precipitation** is given in millimetres of equivalent rainfall. Values of rainfall are for the 24 hours beginning at 9 h.; previous to May 1st, 1914, they were for the 24 hours beginning at 10.30 a.m.

Figure 50. Measurements and units during 1916 (Great Britain. Meteorological Office, 1917, p. [iii] 5) ©Crown copyright 2016 Met Office

## Definitions

The meteorological definitions in place during 1916 were:

- A rain-day is a period of 24 hours commencing normally at 9am in which 0.01 inches of rain or 0.2mm or more of rain is recorded. This definition was in place for rainfall from 1865<sup>7</sup>. Current rainfall definitions also include a wet-day but this was not adopted until 1919 (a period of 24 hours, commencing normally at 9am, during which 0.04 inch or 1.0mm or more of rain is recorded).
- A rain spell is a period of more than 14 consecutive days every one of which is a rain day.
- The absolute drought is a period of more than 14 consecutive days no one of which is a rain day.
- The partial drought is a period of more than 28 consecutive days, the main rainfall of which does not exceed 0.01 inches per day.
- Temperature on the grass 30.4°F or below.
- Temperature range: Mean Max. – Mean Min.
- Mean temperature for the month  $\frac{1}{2}$  (Max. + Min.)

However, results and analysis presented in the following pages have been converted into the units now used, e.g. Fahrenheit to Celsius, inches to mm.

Symbols were also written in the meteorological records, the meanings of which are:

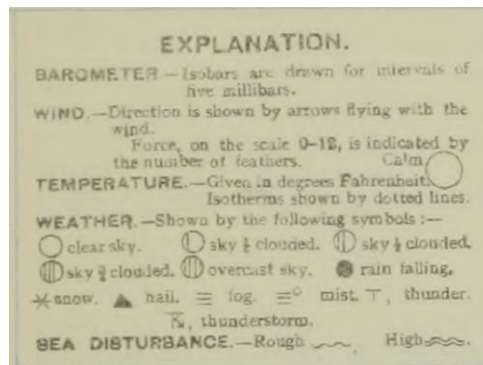


Figure 51. (b) Explanation of symbols for "Temperature, Weather and Sea Disturbances" (Meteorological Office, 1916, p. [94]) ©Crown copyright 2016 Met Office

## Climatology

The normals for the period are given within this note, however, in general they are:

The normals for Pressure, Temperature, and Precipitation are from the 45 years 1871 to 1915; those for Humidity from the 30 years 1886 to 1915; and those for Wind from the 35 years 1881 to 1915. Except in the case of Pressure, no allowance has been made for the removal of the observatory from Valencia Island to Cahirciveen in 1891.

Figure 52. Climatological Normals during 1916 (Great Britain. Meteorological Office, 1917) ©Crown copyright 2016 Met Office

<sup>7</sup> [www.metoffice.gov.uk/media/pdf/k/6/British\\_Rainfall\\_1953.pdf](http://www.metoffice.gov.uk/media/pdf/k/6/British_Rainfall_1953.pdf)