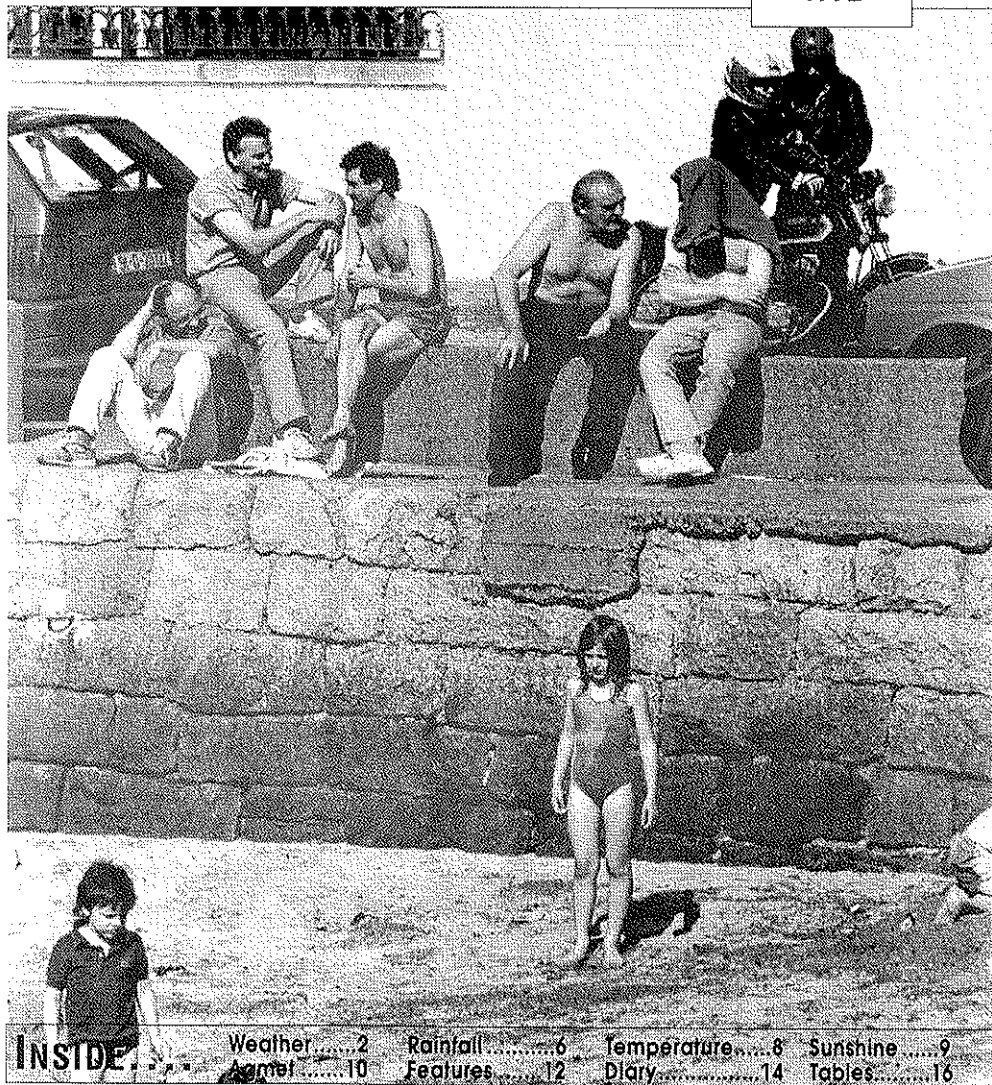


# Monthly Weather Bulletin

*published by the Meteorological Service, Glasnevin Hill, Dublin 9*

**JUNE  
1992**

*no. 74*



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# Dry and settled for much of the month - thundery rain early and late

Below

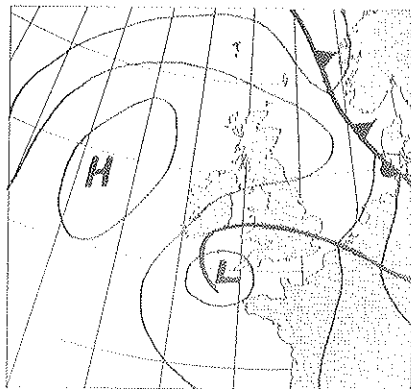
An Atlantic anticyclone kept northern and western areas largely free of cloud on the morning of Thursday the 4th, but the swirl of cloud to the south of the country indicates the centre of a depression that brought rain or showers with thunder at times to the south and east. (picture Dundee University)

(Cover photo Irish Times)



**T**he month got off to a misty start as a slack low pressure area moved eastwards across Ireland and another depression over England deepened and moved northwestwards bringing some rain mainly to the east and north. As the depression moved north of Ireland early on the 2nd an unstable northwesterly windflow developed; shower activity became heavy as a trough moved eastwards across the country during the afternoon and evening. As a shallow depression formed over the southeast of Ireland and slipped southeastwards towards the southwest of England on the 3rd, most of the rain was in Leinster and Munster, with Connaught and Ulster enjoying most of the sunshine.

On the 4th the flow turned northeasterly as there was an anticyclone to the northwest and a low to the east; again the north and west fared best and there was some shower activity in the south and east. A depression moved across the south of England on the 5th in a



This chart shows the synoptic situation at 7a.m. on the 4th, a couple of hours before the satellite picture to the left was taken.

southwesterly direction and a trough moving westwards in the north easterly windflow gave some rain mostly in the east and southeast. The northeasterly slackened on the 6th and it was dry as a low approached slowly from the Atlantic.

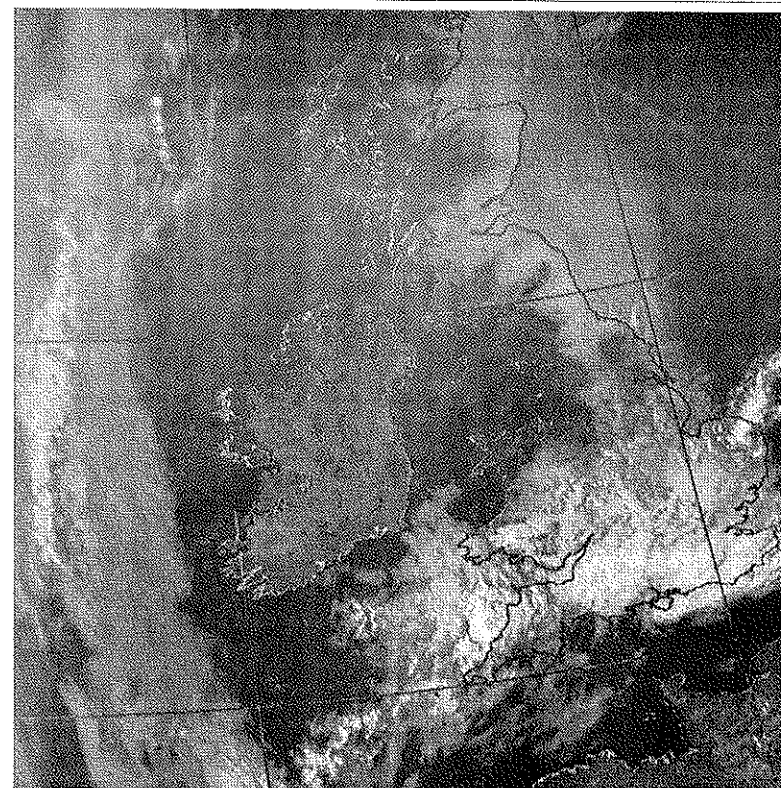
## Main weather patterns

**1st - 10th**  
*Hazy with occasional bursts of thundery rain*

**11th - 23rd**  
*Dry spell*

**24th - 27th**  
*Warm with isolated showers but mostly dry; cooler near northern and southwestern coasts with occasional rain*

**28th - 30th**  
*Very humid with a return of thundery activity from late on the 28th*



Ireland shows up completely free of cloud in this satellite picture taken on the morning of Sunday the 7th. The cloud to the south and to the west indicates areas of low pressure and their associated rainbelts. The cloud moved in over western areas later in the day bringing outbreaks of thundery rain.

(picture Dundee University)

This depression caused the winds to turn southeasterly during the 7th; it remained dry in many areas but there were some thundery showers in the western half of the country in the later part of the day as temperatures reached 24°C in places.

During the 8th and 9th we had a trough slow-moving over the west and a slack south or south-east windflow over Ireland. There was a good deal of fog especially overnight and also some thundery rain in the west and southwest with more scattered but thundery showers in other areas. On the 10th the flow became more easterly as there was a depression to the south of Ireland and there was enough instability and warmth for the development of thunderstorms in

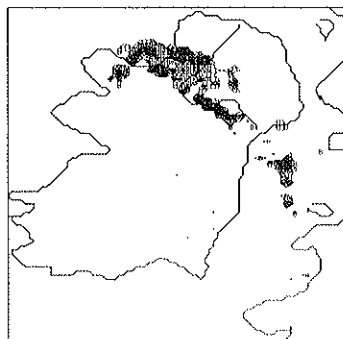
quite a number of places. As the depression filled on the 11th, shower activity died down and most areas had a warm dry day although isolated thunderstorms were reported.

A high pressure area over Scandinavia linked with another to the southwest on the 12th. Winds over Ireland were light and variable and after the clearance of early fog it was dry and warm and sunny. A southwesterly airflow developed on the 13th and there was more cloud and even a few spots of rain in the north and west, while the east and south had a fair share of sun. We remained in a cloudy but mostly dry southwesterly on the 14th but a weak front moved southwards on the 15th and

behind it winds turned northerly and temperature dropped. A high centre to the southwest of Ireland extended northeastwards and maintained northerly or northeasterly winds over Ireland until the 21st. As the anticyclone slipped southwards during the 22nd and 23rd winds backed northwesterly and then became variable as a ridge moved southwards across Ireland. During the 24th a slack southwesterly developed and a cold front coming in over northern and northwestern coastal areas in the evening gave the first spell of significant rain there for a fortnight. We remained in a slack southwesterly during the 25th and 26th with the front affecting the north and northwest from time to time; elsewhere it was mostly dry but isolated showers affected some areas.

By the 27th the main centre of high pressure had shifted from south to east of Ireland and we had a slack easterly windflow which held the front slow-

moving near the north coast, causing some rain in coastal areas of Ulster and north Connaught. Elsewhere it was mostly dry and warm but a few showers broke out in the midlands. During the 28th winds turned more southeasterly pushing the front away northwards and it was generally dry and warm. However, thundery rain affected the southwest late in the day and spread northwards overnight. There were scattered thunderstorms during the afternoon and evening of the 29th as a slack low-pressure area developed over the west. A more organised belt of

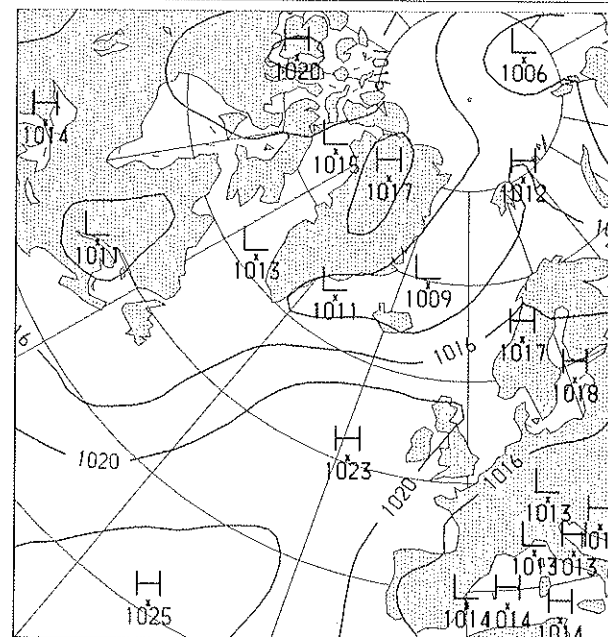
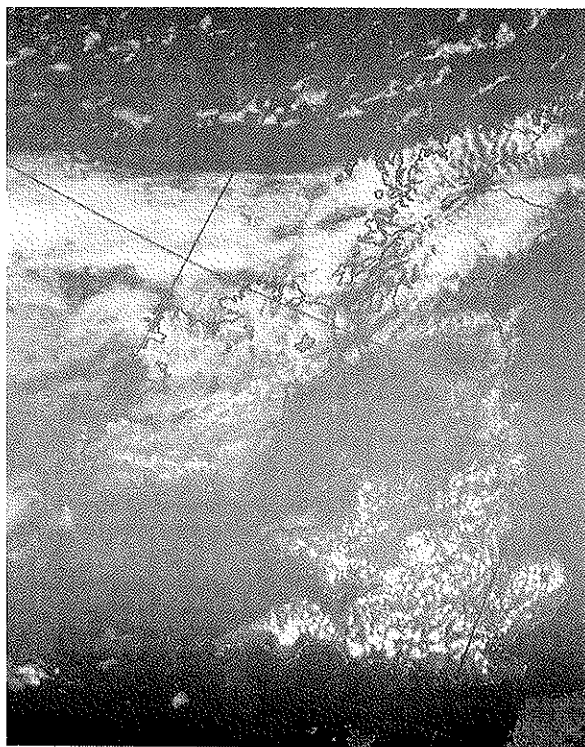


This radar image shows the rainfall pattern during the afternoon of the 29th.

thundery rain affected the south coast late on the 29th and moved northwards overnight to become slow-moving over the north and northwest early on the 30th as the low pressure centres over and near Ireland tended to move eastwards. After the early rain in the north and northwest, there were scattered but locally heavy or thundery showers during the later part of the 30th.

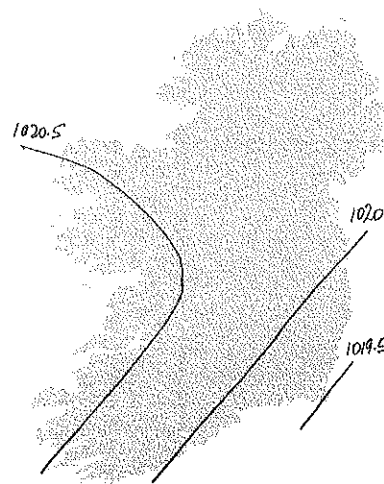
Overall, thunderstorms were reported between 1st and 11th and from late on 28th onwards. Fog was fairly widely reported between 8th and 13th. Winds were light for much of the time and the highest gust recorded was only 46 m.p.h. - this value was recorded at Rosslare on the 18th and at Malin Head on the 14th.

Below  
The band of cloud lying across the north and northwest of the country is part of the cold front that heralded the end of the dry spell there. Most of the rest of the country stayed dry until the 29th. (picture Dundee University)

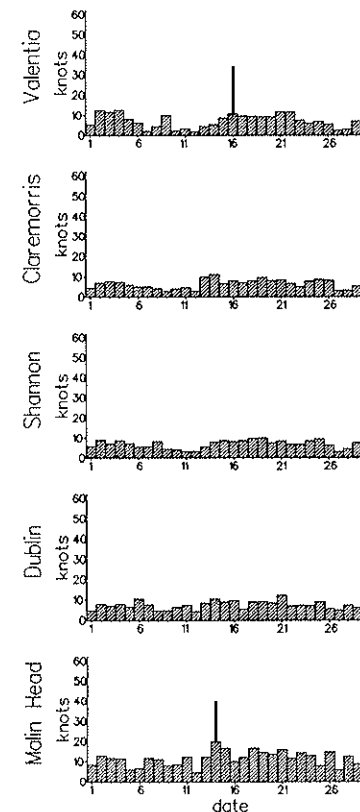


## MEAN ATMOSPHERIC PRESSURE

The mean pressure pattern during June was rather different from normal in that actual values were 4 to 5 hPa above normal and the orientation of the isobars indicates a mean northeasterly flow rather than the more westerly mean flow typical of June. (See also the wind roses on p19.) The chart above confirms that high pressure was the dominant influence on the month's weather, the mean location of the anticyclones being just to the west of Ireland.



Pressure values never dropped below 1000 hPa during June. The lowest value was exactly 1000 hPa, recorded at Malin Head on the 2nd. With the exception of the extreme westerly stations Belmullet and Valentia, all other stations recorded their lowest values that day also. Maximum pressure values were occurred on the 17th, the highest value of all being Belmullet's 1037.9 hPa.



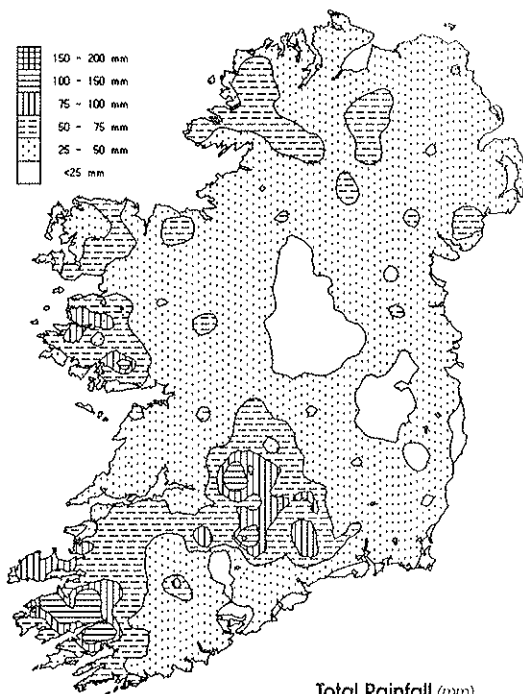
Daily mean wind speeds and maximum significant gusts (34 knots or more)

## SEA TEMPERATURES

Malin Head's sea temperature rose by a further couple of degrees during the month to 12.5°C, which is close to normal for the time of year. More generally, the temperature of the sea warmed from 12.5°C at the beginning of the month along eastern and northeastern coasts, to around 14°C by the end of the month. There was an even greater rise - from 13.5 to 16°C - off southern coasts.

## Mostly dry, but some heavy, thundery falls

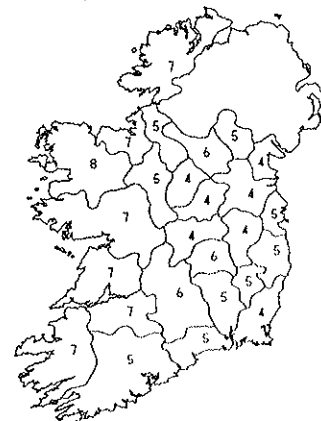
June was a dry month generally, and indeed much of the rain that did fall can be accounted for by a few heavy, often thundery falls on particular days. A striking example of this is provided by the returns from the climatological station at Cloosh in Connemara which show that 100mm of the month's total of 125mm fell on a single day, the 29th. Similarly of the 37mm recorded during June at Dublin Airport, 26mm fell on the 2nd (and more than 20mm of that in one hour), while there was practically no rain at all from the 6th to the 29th.



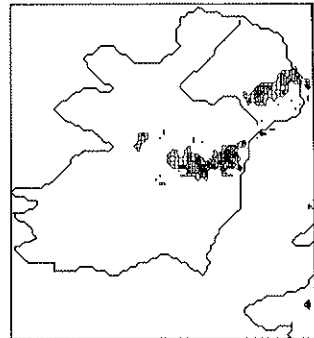
Total Rainfall (mm)

with totals that were significantly higher than normal: Clonmel's total was 61% above and Sherkin Island's 50% higher than normal for the month of June. However most stations had considerably less than normal rainfall, with some escaping the rain almost completely, such as Rosslare where a grand total of just 9mm was measured during the whole month. June hasn't been as dry at most stations since the mid-'70s.

Almost all of June's rain fell during the periods from the 1st to the 5th, the 8th to the 10th, and on the 29th and 30th. The period from the 11th to the 28th was almost completely dry everywhere, except in the northwest where the dry spell ended a little earlier with rain on the 24th. Drought conditions prevailed in much of the south



The number of wet days in each county during June 1992.



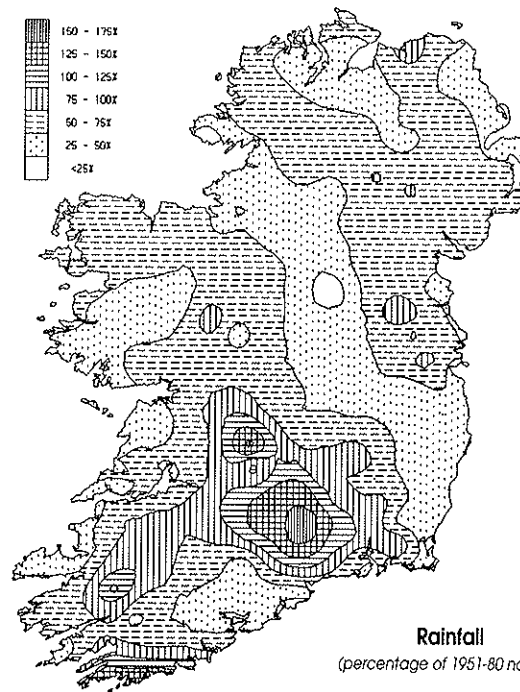
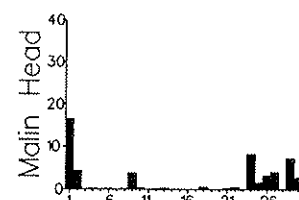
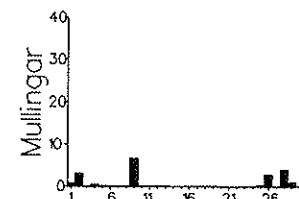
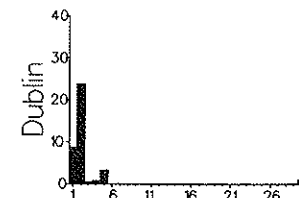
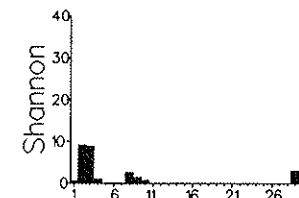
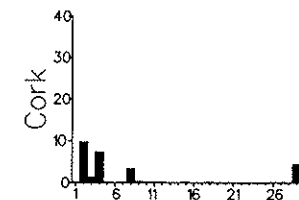
The band of showers that caused that fall of 26mm at Dublin Airport on the 2nd can be seen on this radar image for 7pm.

The number of days with significant rain was quite low, ranging from between three and five at most southern and eastern stations, up to between seven and nine days along northern and western coasts. But since most of that rain fell in thundery bursts, percentages of normal rainfall varied widely across the country. A few stations ended up

## DAILY RAINFALL EXPRESSED AS % OF MONTHLY NORMAL (1951-80)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL		
COUNTY																																	
Carlow	3	12	14	6	4	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	59		
Cavan	13	4	-	1	-	-	-	6	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7	1	41		
Clare	1	11	10	1	-	-	-	4	5	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	49		
Cork	2	12	2	4	-	-	-	2	13	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	8	55	
Donegal	18	1	-	-	-	-	-	3	3	1	-	1	-	-	-	-	-	-	-	-	-	-	-	9	1	2	3	-	4	3	49		
Dublin	11	23	4	2	5	-	-	10	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	59		
Galway	5	2	2	-	-	-	-	4	3	7	2	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	3	25	62		
Kerry	9	17	1	1	-	-	-	1	24	5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	8	80	
Kildare	4	16	10	1	5	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37		
Kilkenny	12	30	16	1	3	-	-	-	2	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	10	80
Laois	5	14	17	2	-	-	-	-	2	6	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	4	55	
Leitrim	11	1	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	6	9	32	
Limerick	4	43	8	1	-	-	-	-	5	3	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	8	84
Longford	7	4	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	5	1	1	21	
Louth	28	17	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	2	-	52	
Mayo	3	1	-	-	-	-	-	-	4	7	5	3	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	1	13	9	47
Meath	16	14	-	1	1	-	-	-	27	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	67	
Monaghan	25	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	4	1	56
Offaly	-	29	4	1	-	-	-	-	-	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	9	50
Roseconnon	22	4	-	-	-	-	-	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	7	55
Sligo	5	1	-	-	-	-	-	-	1	15	5	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	1	15	6	52
Tipperary	2	48	17	1	2	-	-	-	3	21	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	5	132
Waterford	2	15	33	1	4	-	3	4	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	70
Westmeath	1	5	-	1	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5	-	-	7	2	-	33	
Wexford	2	23	22	2	3	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	58
Wicklow	8	3	9	7	4	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	37
IRISH	6	15	7	1	1	-	-	1	5	6	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	5	58

NOTE: In the above table, each value represents the percentage of the monthly normal that fell on each day. Stations within each county are averaged together. For example, 3% of the average monthly rainfall in Co. Carlow fell on the 1st.

Rainfall  
(percentage of 1951-80 normals)

Daily rainfall amounts (millimetres)



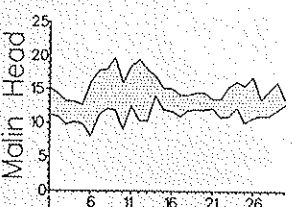
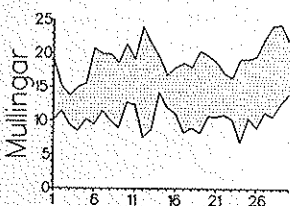
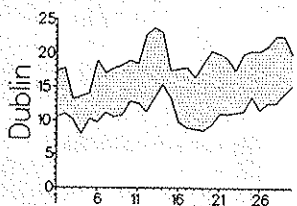
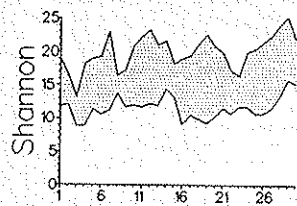
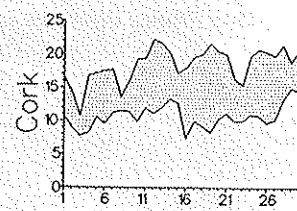
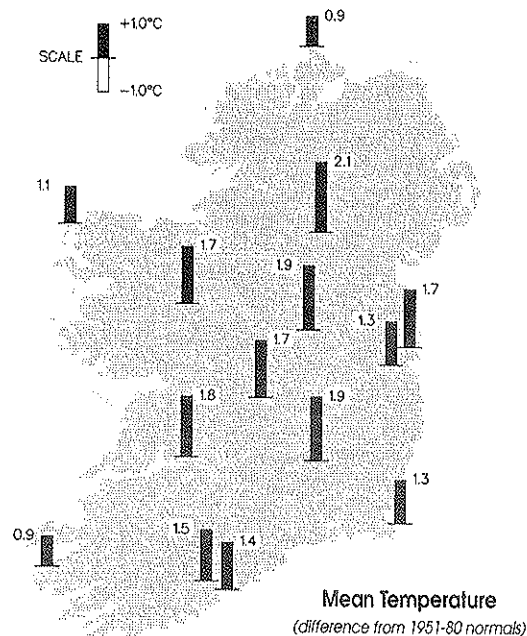
## Warmest since '76 in eastern half

June was warm with mean air temperatures ranging from a degree above normal in some northern and western coastal areas, to more than two degrees above in parts of the north midlands. Rosslare's mean value of 14.6°C equalled the station's June record. It was the warmest June at both Clones and Roche's Point since 1970, and the warmest since 1976 in the eastern half of the country generally.

Daytime and nighttime temperatures contributed about equally to the excess. Mean maxima were more than 2°C above normal at some inland stations but were less than 1°C above normal in some coastal districts; at Malin Head they were

only 0.2°C above normal. Highest mean maximum was 20.6°C at Dungarvan and both Shannon Airport and Kilkenny equalled their values of June 1976. Clones had its highest mean maximum since 1970. Highest daytime temperatures were recorded between the 7th and 14th and from the 24th to the 30th, the highest values occurring on the 29th, when the temperature rose to 26.5°C at Derrygreenagh in Co. Offaly.

June's mean minima were generally the highest for between 10 and 22 years but at Rosslare were the highest on record. The lowest temperatures mostly occurred on the nights of the 3rd and 4th and during the period from the 16th to the 19th. The air temperature fell to just 3°C at Markree Castle in Sligo on the 17th, while at Derrygreenagh the temperature at ground level reached -2.6°C that night.



Daily maximum and minimum temperatures (°C)

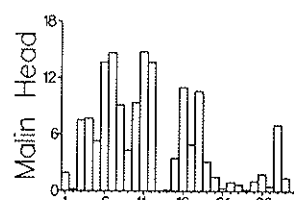
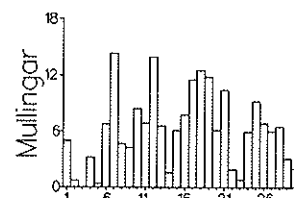
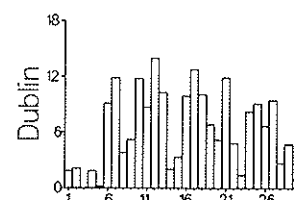
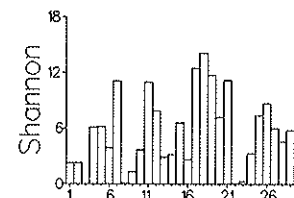
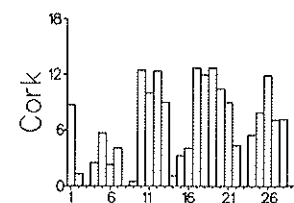
## Dull in the northwest

Although much of the month was warm and dry, sunshine amounts varied quite a bit across the country. Whereas Newport in Co. Mayo received an average of 3.8 hours of sunshine a day, Rosslare enjoyed 6.9 hours. Generally it was the east and south that fared best, with up to 118% of normal sunshine measured at Clonroche, Co. Wexford. Northwestern areas were considerably duller: it was the duller June since 1984 along the Mayo coast, with just two-thirds of normal sunshine recorded.

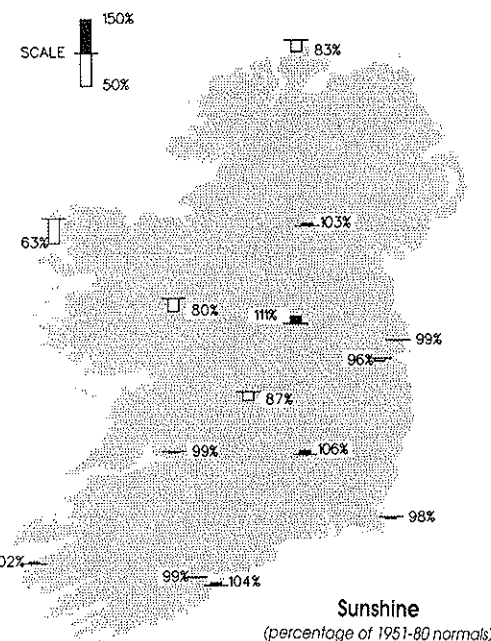
The sunniest days were the 7th, 11th, 12th, from the 17th to the

19th, and the 26th in the south. Malin Head's total of 14.8 hours on the 11th was the highest of the month. The duller days generally were the 2nd, except in the southeast, the 3rd, except in the northwest, and the 23rd, but the variations in the month's sunshine meant that for example while southern stations were enjoying between 10 and 14 hours of sunshine on the 26th, the sun barely peeped through the clouds at Belmullet.

Most stations had no sunshine at all on just one or two days during the month but there were five such days at Valentia in Co. Kerry and a total of nine completely dull days at Belmullet.



Daily sunshine amounts (hours)



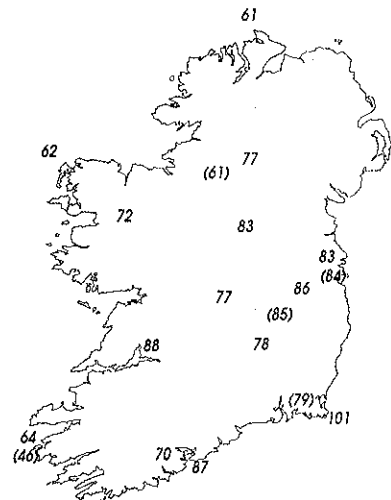
# Drought slows grass growth

**1st - 10th:** Unsettled - troughs with frontal rainbelts were slow-moving.

**11th - 26th:** Settled - extensive area of high pressure extended over the country giving settled weather conditions for the most part. Initially troughs advanced towards the country from Europe giving conditions favouring the spread of potato blight in southern areas during the first days of this period and a blight warning was issued on the 13th. Subsequently the high became dominant.

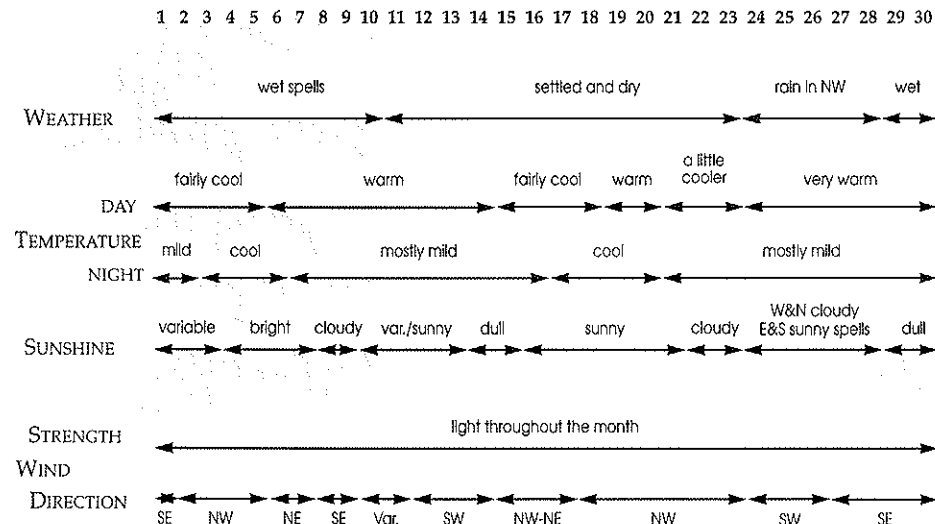
**27th - 30th:** Unsettled - high recedes and country comes under the influence of thundery Atlantic troughs. The second blight warning of the season was issued.

Soil moisture deficits increased after the first ten days and drought caused much-reduced grass growth in the southeast especially. Thundery rain brought relief towards the end of the month.



Soil moisture deficits (mm) on the 30th as estimated by formula of the synoptic stations. Values calculated from the Thornthwaite lysimeters are given in brackets for those stations where measured. The large differences at Ballinamore and Valentia are due to differences occurring in May carried over into June.

## TIME-LINE SEQUENCES OF WEATHER IN JUNE



10-DAY VALUES FOR SELECTED AGROMETEOROLOGICAL STATIONS		RAINFALL		TEMPERATURE										SUNSHINE		mean wind speed (m/s) 2m agl. P.E. (Penman) (mm)					
Station	period	amount	% of average	rain days	wet days	mean max.	mean min.	mean daily	diff. from average	lowest min.	date	days with air frost	degree days > 4.4°C	degree days > 10.0°C	lowest "grass-min."	date	days with ground frost	mean 10cm at 0900h	mean 30cm at 0900h	total no. of hours	% of average
Co. Cork	1-10	16.4	-	5	3	17.4	10.0	13.7	-	8.5	3	0	93	38	4.6	1	0	14.8	14.5	23.6	-
Fermoy	11-20	0.0	-	0	0	20.8	9.8	15.3	-	5.5	19	0	109	56	-2.4	19	2	17.0	16.2	83.8	-
	21-end	5.5	-	2	1	20.7	10.5	15.6	-	6.0	26	0	112	58	-2.4	26	2	17.3	16.0	57.0	-
	month	21.9	40	7	4	19.6	10.1	14.9	1.4	5.5	19	0	314	151	-2.4	19	4	16.4	15.6	164.4	99
Co. Donegal	1-10	14.2	-	4	2	19.7	9.5	14.6	-	6.1	4	0	102	49	-	-	-	-	-	-	-
Letterkenny	11-20	0.0	-	0	0	19.3	10.3	14.8	-	4.6	17	0	104	51	-	-	-	-	-	-	-
	21-end	16.7	-	6	4	18.3	11.4	14.9	-	7.2	23	0	104	49	-	-	-	-	-	-	-
	month	30.9	-	10	6	19.1	10.4	14.8	-	4.6	17	0	310	149	-	-	-	-	-	-	-
Co. Kerry	1-10	100.5	-	7	5	16.8	9.6	13.2	-	7.5	7	0	88	34	4.5	6	0	-	-	33.7	-
Ardfert	11-20	0.0	-	0	0	18.1	10.1	14.1	-	6.5	18	0	97	43	2.0	19	0	-	-	74.5	-
	21-end	8.2	-	3	2	19.7	11.1	15.4	-	8.2	25	0	110	54	4.1	25	0	-	-	39.4	-
	month	108.7	-	10	7	18.2	10.3	14.3	-	6.5	18	0	295	131	2.0	19	0	-	-	147.6	-
Co. Leitrim	1-10	10.9	-	3	3	19.1	10.5	14.8	-	6.9	4	0	104	49	N/A	NA	-	14.6	15.0	46.8	-
Ballinamore	11-20	0.0	-	0	0	19.5	9.5	14.5	-	5.4	12	0	101	48	N/A	NA	-	15.8	16.2	70.7	-
	21-end	8.9	-	4	1	19.7	10.8	15.3	-	8.0	24	0	109	53	N/A	NA	-	15.9	15.9	25.7	-
	month	19.8	26	7	4	19.4	10.3	14.9	2.0	5.4	12	0	313	150	N/A	NA	-	15.5	15.7	143.2	96
Co. Louth	1-10	29.2	-	5	3	17.8	9.3	13.6	-	8.1	8	0	92	38	2.2	1	0	14.8	15.5	-	-
Ardee	11-20	0.0	-	0	0	20.9	9.0	15.0	-	5.0	12	0	105	54	-0.5	17	1	16.9	18.0	-	-
	21-end	2.8	-	3	1	20.4	10.6	15.5	-	8.4	24	0	111	56	0.9	24	0	17.8	18.0	-	-
	month	32.0	53	8	4	19.7	9.6	14.7	-	5.0	12	0	308	148	-0.5	17	1	16.5	17.2	-	-
Co. Waterford	1-10	14.7	-	6	3	18.2	10.6	14.4	-	9.1	4	0	100	45	6.3	7	0	-	15.3	34.9	-
Dungarvan	11-20	0.0	-	0	0	21.9	10.6	16.3	-	8.1	12	0	119	64	5.2	19	0	-	17.3	75.5	-
	21-end	2.3	-	1	1	21.7	11.2	16.5	-	6.9	26	0	120	66	2.9	26	0	-	17.7	58.0	-
	month	17.0	-	7	4	20.6	10.8	15.7	-	6.9	26	0	339	174	2.9	26	0	-	16.7	168.4	-
Co. Wexford	1-10	23.9	-	6	5	17.2	10.5	13.9	-	8.9	1	0	95	39	-0.7	9	1	14.8	14.4	49.2	-
Johnstown Castle	11-20	0.0	-	0	0	20.4	11.0	15.7	-	9.2	19	0	113	57	0.4	11	0	15.8	15.1	80.5	-
	21-end	0.5	-	1	0	20.4	11.9	16.2	-	9.0	27	0	117	62	2.8	27	0	16.8	15.7	68.2	-
	month	24.4	42	7	5	19.3	11.1	15.2	2.0	8.9	1	0	325	158	-0.7	9	1	15.8	15.0	197.9	100

## MEASURED POTENTIAL EVAPOTRANSPIRATION (P.E.) AND SOIL MOISTURE

County/ Station	Period	P.E. (mm)		Soil Moisture (mm)	
		Amount	Deficit	Accumulated Deficit	Surplus
Co. Carlow	1-10	19.2	—	33	12
Carlow (Oak Park)	11-20	30.6	30	63	—
	21-end	38.7	22	85	—
	month	88.5	—	—	—
Co. Dublin	1-10	18.6	—	33	1
Kinsealy	11-20	35.5	34	67	—
	21-end	32.7	17	84	—
	month	86.8	—	—	—
Co. Kerry	1-10	31.4	1	1	—
Valentia Obs.	11-20	21.5	21	22	—
	21-end	36.1	24	46	—
	month	89.0	—	—	—
Co. Leitrim	1-10	23.2	12	12	—
Ballinamore	11-20	40.6	41	53	—
	20-end	22.5	8	61	—
	month	86.3	—	—	—
Co. Wexford	1-10	25.8	2	25	—
	11-20	29.0	29	54	—
	21-end	34.4	25	79	—
	month	89.2	—	—	—

See  
back  
page  
for  
notes  
on the  
data

## GLOBAL SOLAR RADIATION (MJ/sq.m.) P.E. (Penman)

County/ Station	10-day totals			total for month	total for month (mm)
	1-10	11-20	21-end		
Co. Donegal					
Malin Head	210.85	202.95	127.82	541.60	85
Co. Dublin					
Dublin Airport	162.06	218.11	190.41	570.58	103
Co. Kerry					
Valentia Obs.	158.94	235.89	179.46	574.29	87
Co. Kilkenny					
Kilkenny	167.63	227.48	195.79	590.90	96
Co. Mayo					
Belmullet	171.20	179.77	120.83	471.80	75
Co. Monaghan					
Clones	173.22	226.30	161.83	561.35	83
Co. Offaly					
Birr	147.11	214.95	180.73	542.79	80

## Summary of significant weather worldwide during June 1992

## Heavy rain affects Mediterranean resorts

The Eurasian landmass suffered large variations from normal temperature values in the first half of the month. In the first week, Trondheim (Norway) reported 27.4°C, and Gothenburg (Sweden) reported 28.9°C. By contrast the mountainous plateau of Mongolia felt the effects of a cold front as it plunged southwards. Bayan Ovoo saw the temperature fall from 22°C to 2°C in one day, and was typical of many parts of Mongolia where normal temperatures for June are around 25°C. However, the heatwave over Arctic Europe and Russia ended on Monday the 15th: cool northwesterly winds brought unsettled weather with temperatures some 15 degrees cooler.

Even more marked temperature contrasts occurred over Canada: eastern parts had temperatures in the low thirties celsius - Goose Bay in Labrador reaching 32°C on Friday the 19th, while a hundred miles further north behind a cold front, temperatures were close to freezing. The cold front moved south during Saturday over the Great Lakes region bringing summer snow to parts of Michigan.

Holiday destinations in southern Europe and the Mediterranean have also had rather changeable weather. In particular thunderstorms with heavy rain in southwest France and Spain caused flooding on some roads on the 15th. In Almería and Murcia, where rain is rare in June, almost an inch fell. Naples had over two and a half inches of rain in 12 hours on Thursday the 18th, while Piacenda, about 40 miles south of Milan, measured 177mm (almost seven inches) mainly from storms in the early hours of Friday morning. The storms also spread north over France and

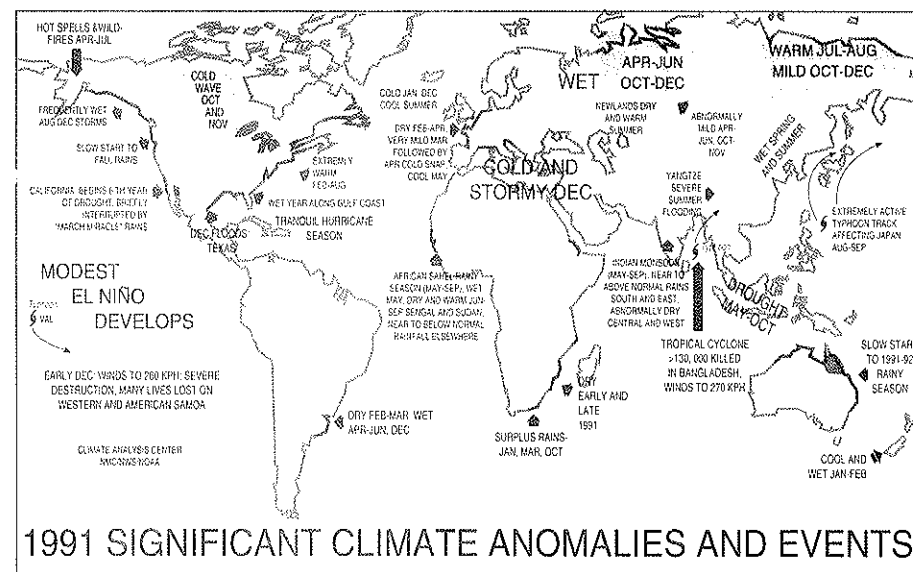
Belgium and on Friday afternoon the edge of the storm belt passed over parts of south-east England. 15mm hail was reported at Great Yarmouth, but this was nothing compared to the four-and-a-half inch diameter hail that fell at Wichita, Kansas, on the same day.

The western Mediterranean continued changeable into the early part of the fourth week with many places again having spells of torrential rain and thunderstorms: Gibraltar, where a normal June produces very little rain (0.2 inches on average) was drenched on Sunday the 21st by nearly 4 inches, giving them their wettest June day since 1930. Next day, the southern Spanish province of Andalusía bore the brunt of the storms: and on Tuesday and Wednesday they ravaged northern Spain and the south of France. In northern Spain 3 people died and some Basque towns were reported to be submerged under 10ft of water. A violent two-hour storm caused floods that destroyed houses and cars in San Sebastian. In the

south of France one person died and hundreds were made homeless by the storms.

The usual pre-monsoon heat built up over India with many places having temperatures in excess of 40°C (104°F) early in the first week. Raipur in Orissa state reported 45°C. The temperature crept ever higher to reach 46.1°C (115°F) at Hissar just west of New Delhi on the 6th. But the hottest place was Dera Ismail to the northwest of Delhi in Lahore, which reached a searing 49.2°C (120°F) on Thursday the 18th. So far this year the southwest monsoon over India has been rather weak and its progress northwards slower than usual. The rains eventually reached Bombay giving a modest 44mm on Friday the 19th, but 140 miles to the south, the monsoon was much more active, drenching Ratnagiri with 385mm (over 15 inches). It is also the rainy season in Hongkong: 15 inches can be expected in June on average. On the 7th, nearly 3 inches fell while a further 5 inches were recorded during the course of the 19th and 20th. Torrential rain also occurred over Yucatan, Cuba, Florida and the Bahamas. Englewood in Florida had a staggering 24 inches (approximately 600mm) during the period from the 24th to the 26th.

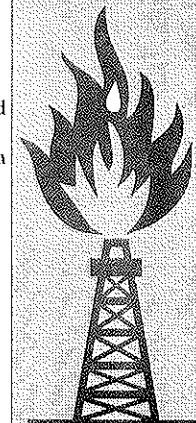
Rain - or rather the lack of it - has also been making headlines in New Zealand, still in the grip of drought. The lack of water to drive hydro-electric turbines was highlighted by a spell of cold frosty weather on South Island during the second part of the month.



In March 1991 at the end of the Gulf war, over 700 Kuwaiti oil wells had been destroyed or damaged, 600 of which were burning out of control. From March through until the Summer of 1991, the fires consumed more than 5 million barrels of oil and over 70 million cubic metres of gas per day and caused a pall of thick black smoke to cover a large part of the region. Massive amounts of carbon particles, sulphur dioxide and other pollutants were injected into the atmosphere with the potential to cause unknown effects of both regional and possibly global consequence on the environment.

A multinational research project was mounted to study the severity, extent and consequences of the resulting air pollution, under the overall co-ordination of the United Nations Environment Programme (UNEP). By November 1991, at a much faster rate than had been expected, all fires had been extinguished. During this eight-month period, a large-scale atmospheric measurement and modelling effort was mounted under the aegis of the World Meteorological Organisation (WMO). Preliminary results suggest that the atmospheric effects of the fires were mainly local or regional. The smoke plume never rose high enough to be transported long

# Atmospheric impact of Kuwaiti oil fires



distances and the particles turned out to be efficient as cloud condensation nuclei and were readily scavenged out of the atmosphere.

Although the smoke had significant effects on the air quality and weather of the Gulf region, the scientific studies showed that the fires were unlikely to have affected the weather or climate on a global basis, because the smoke was never observed to rise above 6 kilometres and generally stayed at about 3 kilometres, forming a horizontally spread cloud confined largely to the Arabian Peninsula. Post event analysis shows that the amount of sulphur dioxide emissions was about 57% of that emitted from electric utilities in the United States of America and carbon dioxide emissions were about 2% of the annual global amount. Emissions of soot particles (smoke) from the fires, though regionally significant, were found to be about ten times less than smoke released globally by deliberate or wild biomass burning. The effects of meteorological and geographic conditions in the area were such that materials in the plume were largely confined to this horizontal cloud, without much mixing down to the surface.

Hence, pollution levels experienced at population centres in the region, though at times high, were much lower than expected.

(adapted from material issued by the WMO)

**Monday 1st:** Some mist and drizzle early but mostly dry. Rain moving north in the evening was heavy in places. Light variable winds.

*Rainfall:* nil to 8mm generally, 9 to 21mm in the northwest and northeast, up to 39mm in the southwest

*Temperature:* max. 15°C to 20°C, min. 9°C to 13°C

*Sunshine:* trace to 6 hours generally, 9 to 10 hours in the south

**Tuesday 2nd:** Some overnight rain, especially in the north. Thundery showers in many places. Variable winds becoming northwesterly.

*Rainfall:* up to 16mm in the west, 15 to 30mm generally

*Temperature:* max. 11°C to 19°C, min. 9°C to 12°C

*Sunshine:* nil to 3 hours generally, 10 hours in the southeast

**Wednesday 3rd:** A low just southeast of Ireland maintained a north to northeast flow. Rain in the southern half of country. Winds light to moderate generally northerly.

*Rainfall:* nil or trace in the northern half, 2 to 19mm in the southern half

*Temperature:* max. 10°C to 15°C, min. 7°C to 11°C

*Sunshine:* nil generally, 4 to 11 hours in the southwest, northwest and north

**Thursday 4th:** Winds north to northeast, light to moderate. Rain or showers in Leinster and Munster with thunder in the south and southeast. Largely dry in Ulster and Connaught.

*Rainfall:* nil to 3mm generally, up to 7mm in the south

*Temperature:* max. 13°C to 18°C, min. 5°C to 11°C

*Sunshine:* 2 to 9 hours generally, 13 hours in the northwest

**Friday 5th:** Northerly to northeasterly airflow as a depression over southwest England moved steadily southwest into Biscay; its associated troughs crossed Ireland bringing occasional rain to the east and parts of the south.

*Rainfall:* nil to 3mm

*Temperature:* max. 13°C to 19°C, min. 9°C to 12°C

*Sunshine:* nil to 5 hours in the eastern half, 5 to 7 hours in the western half

**Saturday 6th:** A northeast airflow over the country with a low over southeast England filled slowly and another low was west of Ireland with associated fronts approaching. Dry.

*Rainfall:* nil or trace

*Temperature:* max. 15°C to 21°C, min. 8°C to 12°C

*Sunshine:* 1 hour in the southeast, 2 to 10 hours generally, 14 hours in the north

**Sunday 7th:** A slack northeasterly windflow turned gradually southeasterly. Some sea fog near south coast but sunny elsewhere. Warm inland with thunderstorms late in the day in parts of the west and midlands.

*Rainfall:* nil to 2mm generally, up to 14mm in the north and west

*Temperature:* max. 15°C to 25°C, min. 8°C to 13°C

*Sunshine:* 3 to 4 hours in the south and southeast, 10 to 15 hours generally

**Monday 8th:** Fog in many areas early. Slack southerly flow with a trough slow-moving over the west, giving dull conditions and spells of thundery rain in these areas.

Elsewhere there were sunny intervals and thundery showers broke out here and there during the afternoon and evening.

*Rainfall:* nil to 4mm generally, 12mm in the southwest, 16mm in the northeast

*Temperature:* max. 13°C to 21°C, min. 9°C to 13°C

*Sunshine:* nil to 4 hours generally, 9 hours in the north

**Tuesday 9th:** West of a line Sligo/Cork, cloudy with rain, thundery in places. East of line, sunny spells but some thundery showers. Fog on east coast. Light variable winds.

*Rainfall:* nil to 4mm generally, 6 to 8mm in the north midlands, 18 to 13mm in the southwest and northwest

*Temperature:* max. 12°C to 20°C, min. 8°C to 12°C

*Sunshine:* nil in the northwest and southwest, 1 to 5 hours generally, 7 hours in the east

**Wednesday 10th:** A low south of the country maintained an unstable easterly airflow. Generally dry with long sunny spells, especially in the east and south. Some thundery showers during the afternoon and evening. Light variable winds everywhere. Some coastal fog patches in the north and east.

*Rainfall:* nil to 4mm

*Temperature:* max. 16°C to 23°C, min. 9°C to 13°C

*Sunshine:* 4 to 9 hours generally, 11 to 13 hours in the east, southeast and south

**Thursday 11th:** Mist and fog in many areas clearing slowly to give a mostly dry sunny day. An isolated thunderstorm reported at Belmullet but otherwise dry. Light southeasterly winds becoming light variable during the day.

*Rainfall:* nil or trace

*Temperature:* max. 16°C to 22°C, min. 7°C to 13°C

*Sunshine:* 2 to 7 hours in the midlands, 7 to 13 hours generally, 15 hours in north

**Friday 12th:** A ridge of high pressure over the country. Some mist and fog at first, clearing during the morning. Warm. Light variable winds.

*Rainfall:* nil or trace

*Temperature:* max. 18°C to 25°C, min. 5°C to 13°C

*Sunshine:* 8 to 14 hours

**Saturday 13th:** The ridge of high pressure extending from an Azores anticyclone over the southern half of the country drifted southwards, allowing a light to moderate southwest flow to become established. A warm front crossed the country in the evening bringing light rain or drizzle to all areas except south Leinster. Fog in western areas.

*Rainfall:* nil or trace

*Temperature:* max. 18°C to 25°C, min. 8°C to 14°C

*Sunshine:* nil to 4 hours in the north, northwest and southwest, 6 to 10 hours generally

**Sunday 14th:** Ireland lay in a warm humid moderate southwest flow for much of the day. A cold front, approaching from the northwest, had cleared much of Ulster and Connacht by midnight but gave little or no rain.

*Rainfall:* nil or trace

*Temperature:* max. 18°C to 24°C, min. 13°C to 15°C

*Sunshine:* trace to 3 hours

**Monday 15th:** A weak cold front moved southeastwards during the night hours giving only slight drizzle. Winds veered from southwest to northwest, light to moderate generally, moderate to fresh in the north.

*Rainfall:* nil to trace

*Temperature:* max. 15°C to 19°C, min. 10°C to 14°C

*Sunshine:* 1 to 7 hours

**Tuesday 16th:** A north to northeasterly airflow. Cooler than of late but dry. Good sunshine in the eastern half of the countr but cloudier in the western half. Winds light generally but moderate in some coastal areas.

*Rainfall:* nil to trace

*Temperature:* max. 15°C to 19°C, min. 7°C to 12°C

*Sunshine:* 2 to 8 hours generally, 10 hours in the east, 11 hours in the north

**Wednesday 17th:** An anticyclone to the west of the country was slow moving. An associated ridge of high pressure drifted southwards and allowed a cold front to gradually cross Ulster from midday. Winds light north-northwesterly.

*Rainfall:* nil to trace

*Temperature:* max. 14°C to 20°C, min. 3°C to 9°C inland, 7°C to 12°C coastal

*Sunshine:* 5 to 15 hours

**Thursday 18th:** The anticyclone to the west of the country was slow moving and its associated ridge persisted as a weak embedded front tracked southwards. Winds light to moderate northerly. Dry and sunny in most areas though some drizzle affected the north.

*Rainfall:* nil to 1mm

*Temperature:* max. 14°C to 21°C, min. 7°C to 12°C

*Sunshine:* 8 to 14 hours

**Friday 19th:** The anticyclone to the west dominated. Moderate northerly airflow. Warm and sunny generally.

*Rainfall:* nil

*Temperature:* max. 15°C to 23°C, min. 6°C to 12°C

*Sunshine:* from 3 hours up to 15 hours in the southwest

**Saturday 20th:** The ridge from the Atlantic high still over Ireland. Cloud and drizzle over the north and west. Dry elsewhere with good sunshine in southern areas. Light winds between northwest and northeast in direction.

*Rainfall:* nil to trace

*Temperature:* max. 15°C to 21°C, min. 8°C to 13°C

*Sunshine:* trace to 8 hours generally, 11 to 12 hours in the south

**Sunday 21st:** The Atlantic ridge continued to cause northwest to north winds, light generally but moderate to fresh on exposed coasts. Dry and sunny mostly but Ulster and Connaught were cloudy with odd spots of drizzle.

*Rainfall:* nil to trace

*Temperature:* max. 14°C to 21°C, min. 9°C to 13°C

*Sunshine:* trace to 1 hour in the north and northwest, 4 to 12 hours generally

**Monday 22nd:** Anticyclonic conditions persisting. Light mainly northwesterly winds. Some drizzle in northern areas, but generally dry although less sunny than of late.

*Rainfall:* nil to trace with 1mm in the north

*Temperature:* max. 14°C to 19°C, min. 10°C to 12°C

*Sunshine:* nil to 5 hours generally, 8 hours in the southeast

**Tuesday 23rd:** The anticyclone to the southwest of Ireland slowly declined leaving a ridge over Ireland. Winds light to moderate, mainly between southwesterly and northwesterly in direction. Some light rain near northern coasts.

*Rainfall:* nil to trace

*Temperature:* max. 15°C to 18°C, min. 9°C to 12°C

*Sunshine:* nil to 4 hours

**Wednesday 24th:** The anticyclone slipped further south allowing a weak front to pass eastwards across Ireland. Some rain and drizzle in northern areas. The best of the sunshine was in the eastern half of the country. Light south to southwest winds, moderate in the north for a while, turning northeasterly there as a cold front moved in during the evening.

*Rainfall:* nil or trace generally, 3mm in the northwest, 7mm in the north

*Temperature:* max. 16°C to 20°C, min. 7°C to 13°C

*Sunshine:* nil in the north and northwest, 2 to 6 hours in the western half, 6 to 8 hours in the eastern half

**Thursday 25th:** The shallow anticyclone to the south of the country remained stationary as did a weak cold front with waves over the northwest. A light to moderate southwest flow persisted. Light showers.

*Rainfall:* nil to 1mm generally, 3mm in the north

*Temperature:* max. 15°C to 22°C, min. 9°C to 14°C

*Sunshine:* trace to 3 hours in the north and northwest, 4 to 10 hours generally

**Friday 26th:** The shallow anticyclone persists, as does the cold front off the northwest coast. Winds remain light southwesterly generally, moderate in the northwest. A few showers here and there.

*Rainfall:* nil to 1mm

*Temperature:* max. 17°C to 23°C, min. 6°C to 12°C inland, 10°C to 14°C coastal

*Sunshine:* trace to 2 hours in the north and northwest, 2 to 10 hours generally, 12 to 14 hours in the south and southeast

**Saturday 27th:** A weak frontal zone over northern areas gave some rain. A very slack east to southeast airflow generally. A few showers. Misty night.

*Rainfall:* nil to 3mm generally, 6mm in the north

*Temperature:* max. 15°C to 23°C, min. 9°C to 13°C

*Sunshine:* nil to 2 hours in the north and northwest, 3 to 9 hours generally, 12 hours in the southeast

**Sunday 28th:** A slack southeasterly flow. A weak front off the north coast, giving some rain early on. Generally hazy with fog in a few places.

*Rainfall:* nil or trace generally, 1mm in the north

*Temperature:* max. 14°C in the north, 19°C to 25°C generally, min. 9°C to 14°C

*Sunshine:* 3 to 10 hours

**Monday 29th:** Troughs associated with a depression off the southwest coast crossed the country from the south during the day in a light south to southeast flow. Showers were widespread with thunder reported. It remained humid with widespread mist and haze.

*Rainfall:* trace to 5mm generally, 11mm in the southwest, 23mm in the west

*Temperature:* max. 16°C to 27°C, min. 11°C to 16°C

*Sunshine:* trace in the south and southwest, 1 to 6 hours generally

**Tuesday 30th:** A trough associated with a slack area of low pressure over and near Ireland affected the northern half of the country where prolonged moderate to heavy rain was reported. Showers were reported elsewhere. Winds light variable generally, but moderate in the east and north.

*Rainfall:* nil to 4mm generally, 6 to 17mm in the north and northwest, 15mm in Kilkenny, 27 to 52mm in the south and south midlands

*Temperature:* max. 14°C to 23°C, min. 13°C to 15°C

*Sunshine:* nil to 2 hours in the north and northwest, 1 to 3 hours generally, 6 to 8 hours in the south and southeast



## TABLES

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County / Station	TEMPERATURE (°C)						
	Mean max.	Mean min.	Mean/ deviation from average		Highest max./date	Lowest min./date	Lowest grass min./date
CO. CARLOW							
CARLOW (OAK PARK)	20.5	10.3e	15.4	1.6	25.0 28	6.4 04	3.6 12 19
CO. CLARE							
CARRON	18.1	10.4	14.3		24.0 29	7.6 03	5.6 12 25
SHANNON AIRPORT	20.1	11.6	15.9	1.8	25.3 29	8.9 03 04	3.9 16
CO. CORK							
CORK AIRPORT	18.4	10.7	14.6	1.5	22.2 12	7.4 16	5.0 16
FERMOY (MOORE PARK)	19.6	10.1	14.9	1.4	23.5 12	5.5 19	-2.4 19 26
ROCHE'S POINT	18.2	11.8	15.0	1.4	21.5 19	9.0 03	5.0 19 26
SHERKIN ISLAND	17.8	11.5e	14.7	1.4	21.8 19	8.9 19	
CO. DONEGAL							
CATHALEEN'S FALL	18.7	9.5e	14.1	0.9	23.4 07 28	3.2 17	
LETTERKENNY (MAGHERENAN)	19.1	10.4	14.8		24.9 12	4.6 17	
MALIN HEAD	15.5	11.2	13.4	0.9	19.7 09	8.0 06	3.9 06
CO. DUBLIN							
CASEMENT AERODROME	19.0	10.1	14.6	1.3	24.7 28	5.6 19	3.8 04
DUBLIN AIRPORT	18.9	11.4	15.2	1.7	23.8 13	8.0 04	5.2 19
DUBLIN (MERRION SQUARE)	19.2	12.5	15.9	1.2	25.3 13	9.7 04	
CO. GALWAY							
GALWAY (UNIV. COLLEGE)	19.3	11.9	15.6	2.0	25.5 29	9.0 04	
MAAM VALLEY	18.4	11.5	15.0		23.2 12	8.1 03	3.9 17
CO. KERRY							
ARDFERT (LISCAHANE)	18.2	10.3e	14.3		24.0 29	6.5 18	2.0 19
VALENTIA OBSERVATORY	17.6	11.1	14.4	0.9	22.2 29	8.1 07	5.0 19
CO. KILDARE							
NAAS (GOWRAN GRANGE)	19.3	9.7	14.5		25.6 29	4.9 04	-0.8 19
CO. KILKENNY							
KILKENNY	20.5	10.3	15.4	1.9	24.8 29	6.3 26	1.4 19
MOONCOIN (SILVERSPRING)	19.8	10.2	15.0	1.5	23.4 12	5.9 26	-0.9 19 26
CO. LETTRIM							
BALLINAMORE	19.4	10.3	14.9	2.0	24.6 28	5.4 12	
CO. LIMERICK							
MOUNT RUSSELL	18.5	10.0	14.3		22.8 12 28	7.0 03	2.2 19
CO. LOUTH							
ARDEE (BOHARNAMOE)	19.7	9.6e	14.7		25.2 12	5.0 12	-0.5 17
CO. MAYO							
BELMULLET	17.1	11.1	14.1	1.1	24.0 07	6.6 03	2.7 03
CLAREMORRIS	18.6	10.3	14.5	1.7	23.6 28	6.1 04	2.1 12
KNOCK AIRPORT	17.6	9.7	13.7		23.1 28	5.4 04	
NEWPORT (FURNACE)	18.5	11.7	15.1	1.5	24.5 07 12	7.5 04	3.6 05
CO. MEATH							
WARRENTOWN (AGR. COLL.)	19.2	10.7	15.0	1.7	24.0 12	7.9 09	2.6 17
CO. MONAGHAN							
CLONES	19.4	10.8	15.1	2.1	24.3 29	6.3 17	-1.0 17
CO. OFFALY							
BIRR	19.7	10.4	15.1	1.7	25.6 29	6.0 12	1.1 19
DERRYGREENAGH	19.9	10.1	15.0	1.9	26.5 29	6.0 17	-2.6 17
CO. SLIGO							
MARKREE CASTLE	19.3	9.8e	14.6	1.7	24.5 12	3.0 17	
CO. TIPPERARY							
FETHARD (PARSONSHILL)	19.3	10.3	14.8		23.0 28	6.4 19	4.4 26
CO. WATERFORD							
DUNGARVAN (CARRIGLEA)	20.6e	10.8	15.7		24.0 12	6.9 26	2.9 26
CO. WESTMEATH							
MULLINGAR II	19.2	10.4	14.8	1.9	24.3 29	6.9 24	3.5 24
CO. WEXFORD							
CLONROCHE	19.6e	10.6	15.1	1.9	23.3 27	7.6 19	1.4 11
JOHN F. KENNEDY PARK	19.2	11.1	15.2	1.8	22.5 13	8.0 04 19	1.2 27
ROSSLARE	16.9	12.3	14.6	1.3	21.5 13	10.4 19	6.2 11

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## TABLES

County / Station	RAINFALL (MM)			SUNSHINE (HRS)			
	Total amount	% of average	Most in a day/date	Daily mean (hrs./day)	% of average	% of possible	Most in a day/date
CO. CARLOW							
CARLOW (OAK PARK)	30.7	63	11.8 03	5.46	96	33	14.5 17
CO. CLARE							
CARRON	39.7	42	10.9 29				
SHANNON AIRPORT	28.5	48	9.1 02	5.55	99	33	14.1 18
CO. CORK							
CORK AIRPORT	26.4	41	9.6 02	6.14	99	37	12.7 17 19
FERMOY (MOORE PARK)	21.9	40	10.2 02	5.48	99	33	13.9 17
ROCHE'S POINT	23.8	48	14.6 02	6.62	104	40	14.1 26
SHERKIN ISLAND	83.9	150	27.2 30	6.50	102	39	13.7 11
CO. DONEGAL							
CATHALEEN'S FALL	32.6	43	20.8 01	4.27	79	25	14.4 19
LETTERKENNY (MAGHERENAN)	30.9		8.1 01				
MALIN HEAD	53.5	75	16.5 01	5.02	83	29	14.8 11
CO. DUBLIN							
CASEMENT AERODROME	29.3	60	11.5 02	5.99	96	35	12.8 12
DUBLIN AIRPORT	38.4	72	23.8 02	6.35	99	38	14.0 12
DUBLIN (MERRION SQUARE)	20.5	40	6.3 01				
CO. GALWAY							
GALWAY (UNIV. COLLEGE)	46.1	63	23.3 29	4.20	74	25	12.0 12
MAAM VALLEY	44.7		13.5 07				
CO. KERRY							
ARDFERT (LISCAHANE)	108.7		38.6 01	4.92		29	13.0 17
VALENTIA OBSERVATORY	41.9	55	12.4 08	5.61	102	34	14.6 17 19
CO. KILDARE							
NAAS (GOWRAN GRANGE)	22.1		9.5 02				
CO. KILKENNY							
KILKENNY	35.9	76	14.7 30	6.05	106	36	14.3 17
MOONCOIN (SILVERSPRING)	56.0	106	30.0 02	5.43	96	33	13.0 17
CO. LETTRIM							
BALLINAMORE	19.8	26	8.0 01	4.77	96	28	13.5 07
CO. LIMERICK							
MOUNT RUSSELL	100.1		52.3 30				
CO. LOUTH							
ARDEE (BOHARNAMOE)	32.0	53	14.3 01				
CO. MAYO							
BELMULLET	38.2	55	15.2 30	3.79	63	22	12.7 04
CLAREMORRIS	22.8	31	8.1 09	4.10	80	24	13.3 07
KNOCK AIRPORT	28.4		8.8 01				
NEWPORT (FURNACE)	51.3	53	11.6 07	3.65	68	21	14.4 18
CO. MEATH							
WARRENTOWN (AGR. COLL.)	29.3	48	15.9 08				
CO. MONAGHAN							
CLONES	43.2	63	19.7 08	5.39	103	32	14.4 07
CO. OFFALY							
BIRR	32.5	63	23.2 02	4.70	87	28	13.3 17
DERRYGREENAGH	22.7	41	10.2 30				
CO. SLIGO							
MARKREE CASTLE	35.4	44	11.2 09				
CO. TIPPERARY							
FETHARD (PARSONSHILL)	53.0		22.5 02				
CO. WATERFORD							
DUNGARVAN (CARRIGLEA)	17.0		8.9 02	5.61		34	11.1 17
CO. WESTMEATH							
MULLINGAR II	19.7	31	6.7 09	6.18	111	36	14.3 07
CO. WEXFORD							
CLONROCHE	29.9	47	16.3 02	6.74	118	40	13.1 12
JOHN F. KENNEDY PARK	46.4	83	18.8 03	6.24	108	37	12.6 12
ROSSLARE	9.1	19	2.4 03	6.92	98	41	14.4 12

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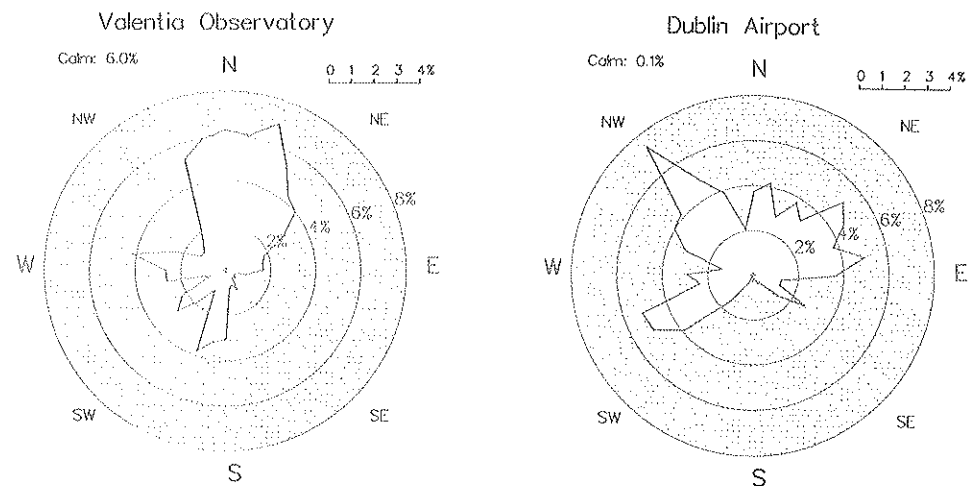
County / Station	WEATHER — NO. OF DAYS WITH									MEAN 0900 SOIL TEMPERATURES (°C)		
	Rain days	Wet days	Air frost	Ground frost	Snow lying	Hail	Thunder	Fog		10cm	20cm	30cm
CO. CARLOW												
CARLOW (OAK PARK)	6	6	0	0						16.9	16.5	16.9
CO. CLARE												
CARRON	11	8	0	0						14.6		15.2
SHANNON AIRPORT	9	7	0	0	0	0	1	3		16.4	16.8	16.9
CO. CORK												
CORK AIRPORT	6	5	0	0	0	0	1	6		15.4	15.6	16.7
FERMOY (MOORE PARK)	7	4	0	4						16.4		15.6
ROCHE'S POINT	8	4	0	0						15.8	15.5	15.5
SHERKIN ISLAND	9	8	0									
CO. DONEGAL												
CATHALEEN'S FALL	9	5	0									
LETTERKENNY (MAGHERENAN)	10	6	0									
MALIN HEAD	14	9	0	0	0	0	3	4		15.2	15.2	14.4
CO. DUBLIN												
CASEMENT AERODROME	9	7	0	0	0	0	1	3		16.1	16.2	16.7
DUBLIN AIRPORT	7	4	0	0	0	0	1	5		16.5	16.6	16.4
DUBLIN (MERRION SQUARE)	8	6	0									
CO. GALWAY												
GALWAY (UNIV. COLLEGE)	11	8	0									
MAAM VALLEY	14	8	0	0								
CO. KERRY												
ARDFERT (LISCAHANE)	10	7	0	0								
VALENTIA OBSERVATORY	11	8	0	0	0	0	2	4		15.3	15.5	16.2
CO. KILDARE												
NAAS (GOWRAN GRANGE)	7	4	0	1								
CO. KILKENNY												
KILKENNY	8	5	0	0	0	0	0	0		16.5	16.8	17.0
MOONCOIN (SILVERSPRING)	6	5	0	2								
CO. LEITRIM												
BALLINAMORE	7	4	0							15.5	15.6	15.7
CO. LIMERICK												
MOUNT RUSSELL	12	8	0	0						14.3	14.6	
CO. LOUTH												
ARDEE (BOHARNAMOE)	8	4	0	1						16.5	16.8	17.2
CO. MAYO												
BELMULLET	13	7	0	0	0	0	3	2		15.7	16.1	16.3
CLAREMORRIS	9	8	0	0	0	0	4	1		15.4	15.9	16.3
KNOCK AIRPORT	11	6	0									
NEWPORT (FURNACE)	10	10	0	0								
CO. MEATH												
WARRENTOWN (AGR. COLL.)	7	5	0	0						17.0	16.6	16.7
CO. MONAGHAN												
CLONES	6	5	0	1	0	0	3	1		16.0	16.0	16.4
CO. OFFALY												
BIRR	8	5	0	0	0	0	3	3		16.5	16.7	16.9
DERRYGREENAGH	9	3	0	4								
CO. SLIGO												
MARKREE CASTLE	8	5	0									
CO. TIPPERARY												
FETHARD (PARSONSHILL)	8	6	0	0						15.1	15.8	
CO. WATERFORD												
DUNGARVAN (CARRIGLEA)	7	4	0	0								16.7
CO. WESTMEATH												
MULLINGAR II	9	5	0	0	0	0	3	3		15.6	15.7	16.9
CO. WEXFORD												
CLONROCHE	8	4	0	0						15.7		15.6
JOHN F. KENNEDY PARK	7	5	0	0							16.4	16.2
ROSSLARE	7	5	0	0	0	0	2	6		17.0	16.9	16.5

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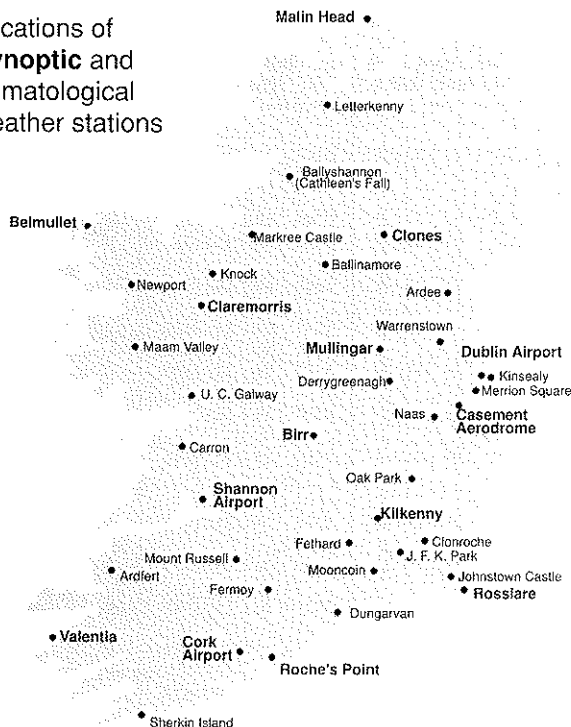
# TABLES

County / Station	WIND (KTS)										Days with gales	Hours with gale gusts
	Mean speed	Max. 10-min. dir. speed	mean date/hour	Max. Gust dir. speed	date/time							
CO. CLARE												
SHANNON APT.	6.5	350°	18 19/16	160°	29 10/1505	0	0	0				
CO. CORK												
CORK APT.	7.8	330°	22 21/17	330°	32 21/2224	0	0	0				
ROCHES POINT	6.0	320°	26 21/17	340°	35 21/1652	0	1	2				
CO. DONEGAL												
MALIN HEAD	11.1	260°	31 14/08	260°	40 14/1940	0	1	7				
CO. DUBLIN												
CASEMENT AERO.	6.0	220°	17 14/15	220°	23 14/1117	0	0	0				
DUBLIN APT.	7.0	20°	19 18/24	320°	28 21/1308	0	0	0				
CO. KERRY												
VALENTIA OBSY.	6.7	340°	19 02/17	020°	34 16/1359	0	1	1				
CO. KILKENNY												
KILKENNY	5.2	20°	17 18/18	360°	29 22/0145	0	0	0				
CO. MAYO												
BELMULLET (Not Available)												
CLAREMORRIS	6.0	230°	19 14/05	230°	28 14/1455	0	0	0				
CO. MONAGHAN												
CLONES	2.6	360°	16 18/17	360°	30 18/1035	0	0	0				
CO. OFFALY												
BIRR	3.5	330°	13 21/18	360°	26 19/1232	0	0	0				
CO. WESTMEATH												
MULLINGAR II	4.7	340°	13 21/16	340°	26 21/1056	0	0	0				
CO. WEXFORD												
ROSSLARE	10.2	50°	32 18/16	050°	40 18/1529	0	4	13				

## FREQUENCY OF WIND DIRECTION



## Locations of Synoptic and Climatological weather stations



The MONTHLY WEATHER BULLETIN is produced by the Climatology and Applications Division of the Meteorological Service. An annual subscription to the bulletin costs £25. Further climatological information is available from the Climate Enquiries Office, Glasnevin Hill, Dublin 9, telephone 01-375436, fax 01-369115.

## Notes on the tables

### A. General

1. Rainfall amounts are given in millimetres, temperature in degrees Celsius, sunshine duration in hours and wind speed in knots. (1 knot = 1.15 m.p.h.)
2. Rainfall amounts are measured at climatological stations at 0800GMT and credited to the previous day. At synoptic stations daily totals refer to the 24-hour period ending at 0600GMT the following day. The term rainfall includes all forms of precipitation, such as snow and hail, and deposition from dew or frost, measured as equivalent rain.
3. 'Raindays' and 'wetdays' are days during which the total rainfall is not less than 0.2mm and 1.0mm respectively.
4. A 'day' for the purposes of this publication refers to the period from 0900GMT on a particular day to 0900GMT on the following day. (This is because climatological stations make their daily observations at 0900GMT.)
5. The mean daily air temperature over a period is taken as the mean of the daily maxima and daily minima (averaged separately over the period).
6. Days with air frost are those during which the minimum air temperature was below 0°C. Similarly days with ground frost indicate days when the grass minimum temperature was below 0°C. (Grass minimum temperatures are measured by a thermometer placed horizontally on pegs just above the tips of short grass.)
7. Mean soil and earth temperatures are based on readings taken at 0900GMT.
8. A gale is a mean wind over a 10 minute period of 34 knots or more. A gale gust is a gust of 34 knots or more. All wind speeds refer to the wind at an effective height of 10 metres above the ground.
9. 'e' denotes that the value is calculated using one or more estimated readings.
10. Data from Northern Ireland is kindly provided by the Belfast Weather Centre.

### B. Agmet

11. Calculated Potential Evapotranspiration (P.E.) values are based on values of temperature, sunshine, wind speed and vapour pressure using the Penman formula. Because of formula limitations, negative values can occur in winter; these are replaced in the table by zero. Measured P.E. values are those measured by means of soil-filled tanks sunk into the ground with their upper grass-covered ends at surface level.
12. Soil moisture deficits and surpluses are computed from the differences between rainfall and actual evapotranspiration (A.E.). Estimates of A.E. are derived from measured values of P.E. (See Agmet Memo No. 1, 1969). Soil moisture surpluses are assumed to be removed by drainage and surface run-off and are not therefore carried forward from one period to the next. Soil moisture deficits are regarded as being cumulative. Where heavy rain occurs near the end of the fixed period, the date of cut-off may be adjusted to avoid error due to insufficient run-off time.
13. Degree day totals are calculated using the method set out by McVicker in the Journal of Heating and Ventilating Engineers (Vol. 14 No. 18, Nov-Dec 1946).
14. Global solar radiation values are given in MJ/sq.m. correct to two decimal places (3.6MJ = 1kWh).