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Monthly Weather Bulletin July 2010

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Monthly Weather Bulletin

No. 291
JULY 2010



Early morning rain and cloudy conditions for participants in the annual Naked Bike Ride from Cork to Blackrock on the 19th. (picture courtesy Irish Examiner)

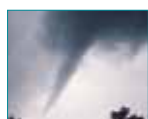
WARM AND DULL; VERY WET IN PLACES

July was the first month of 2010 which was dominated by weather patterns associated with Atlantic depressions. Slow-moving frontal systems brought significant falls of rain at times, while most days were cloudy but mild, with south to southwesterly winds. Rainfall totals for July were above normal everywhere and were more than twice the average at some

stations; it was the fourth successive July with rainfall totals much in excess of normal over most of the country. Unlike previous years, however, the relatively dry weather of the preceding months of 2010 and consequent high soil moisture deficits helped to prevent significant flooding during this month. Claremorris had its wettest July since records



INSIDE



Widespread heavy showers on several days - page 2

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Record monsoon floods in Pakistan

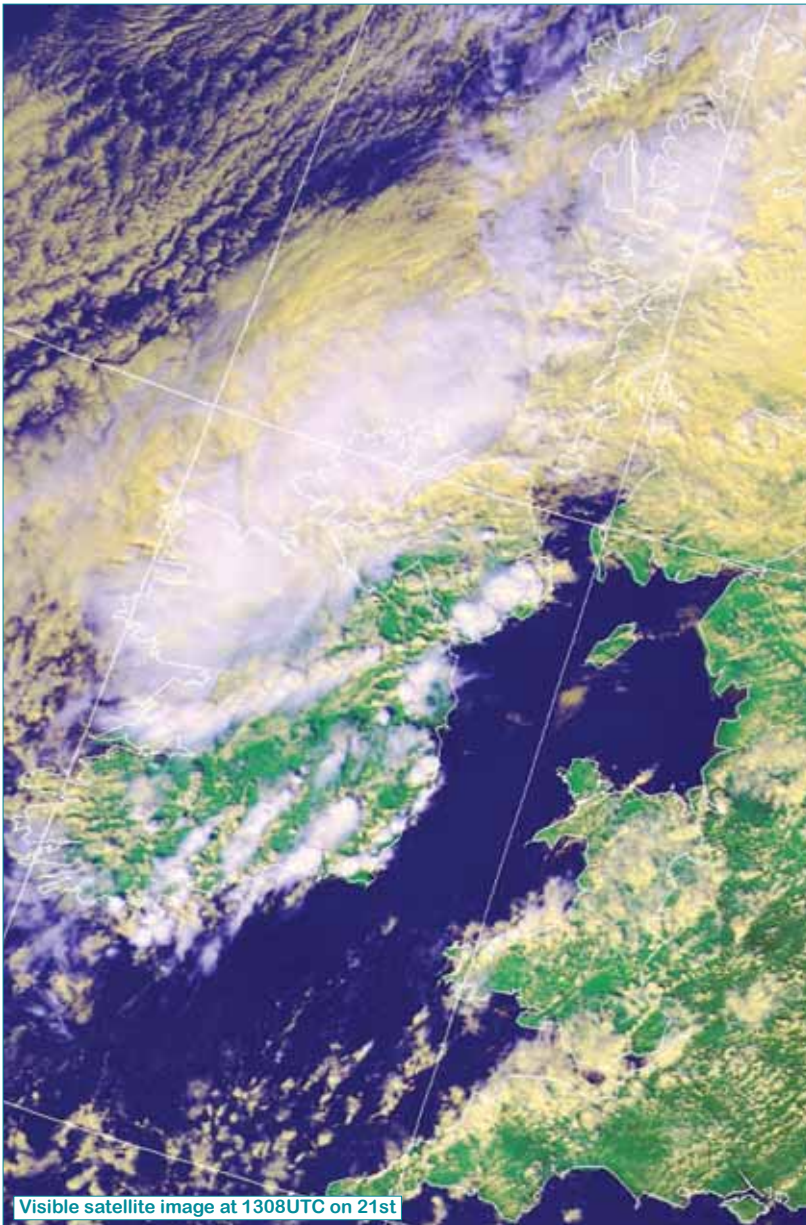


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Notes on the tables and map showing location of stations appear in January issue



Visible satellite image at 1308UTC on 21st

began there in 1950, while its daily fall of 56mm on the 10th was also a record for the month at the station.

Belmullet's total of 134mm also set a new record for July at the station. Heavy falls in the period around the middle of the month were often associated with thunderstorms. Most stations recorded between 13 and 19 wetdays during the month (days with 1mm or more rainfall), compared with the normal range for July of between nine and 15.

Mean monthly air temperatures were near normal in the south, but were around half a degree higher than normal at most stations. As shown by the accompanying temperature charts, there was little variation in either daily maximum or minimum values during the month, with few very warm days. Mean maximum temperatures were close to normal, but the generally cloudy conditions kept mean minimum values over a degree higher than normal generally. July sunshine totals were below normal everywhere, the first relatively dull month of 2010. Valentia Observatory's sunshine total of only 85 hours was among the five lowest for July in over a century of records at the station and was also its lowest of any month so far in 2010. The sunniest days of the month were

Above and right

There were a number of reports of funnel clouds (tornadoes not reaching ground level) during the month, usually associated with heavy thunderstorms. This funnel cloud was observed near Naas, Co. Kildare, during the afternoon of the 21st, when thunderstorms were widespread over the east and south of the country. (pictures courtesy Eamonn Dempsey, Wokingham Weather, www.woksat.info/wvp.html)



during the first week and on the 22nd.

1st to 21st: Rain was recorded during each day of this period and was very heavy at times. This rain was associated with frontal systems moving eastwards over Ireland, as unusually deep depressions for July tracked close to the west coast. The heaviest falls were on the 1st and in the periods 8th to 10th and 13th to 21st, with thunderstorms on several days; funnel clouds (tornadoes not reaching ground level) were observed at Adare, Co. Limerick, on the 12th and at Bettystown, Co. Meath, on the 21st. Gale gusts were recorded on several days, particularly on the 1st and 4th. Temperatures were close to normal throughout, with little diurnal variation. After relatively sunny weather during the first five days, the remainder of the period was dull.

22nd to 29th: A weak ridge of high pressure over Ireland during most of this period brought drier conditions, but the weather remained mostly cloudy and

humid with light rain at times.

Temperatures remained near normal, rising above normal in eastern areas on the 25th and 26th. Winds were generally light, southwest to westerly.

30th to 31st: Active fronts associated with a depression to the northwest brought a spell of rain in all areas, heaviest in western areas, clearing to showers. Warm and humid with little sunshine.

Wind and elements: Mean windspeeds for the month of between 7 and 14 knots (13 and 26km/h) were above normal everywhere and were the highest for July since 1998 at most stations. The strongest winds were recorded during the first half of the month, particularly on the 1st and 4th. Belmullet measured the highest gust, 62 knots (115km/h) on the 4th, its highest for July since 1988. Thunderstorms were most widespread in the periods 14th to 15th and 18th to 21st, but there were no reports of hail. Most fog was recorded between the 24th and 26th.

Below

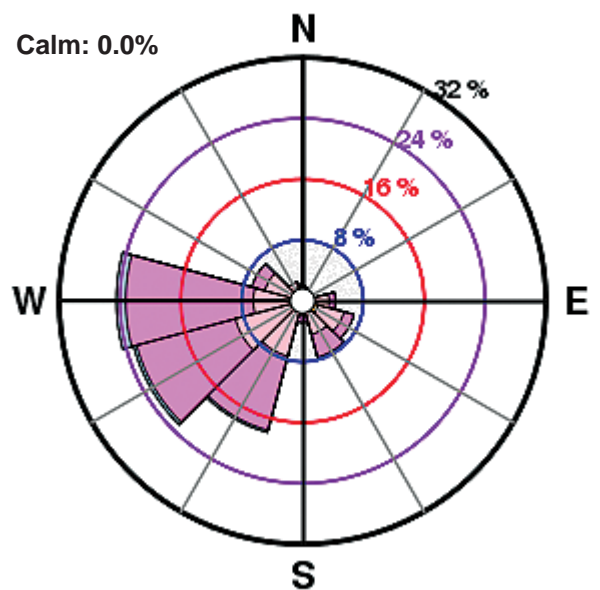
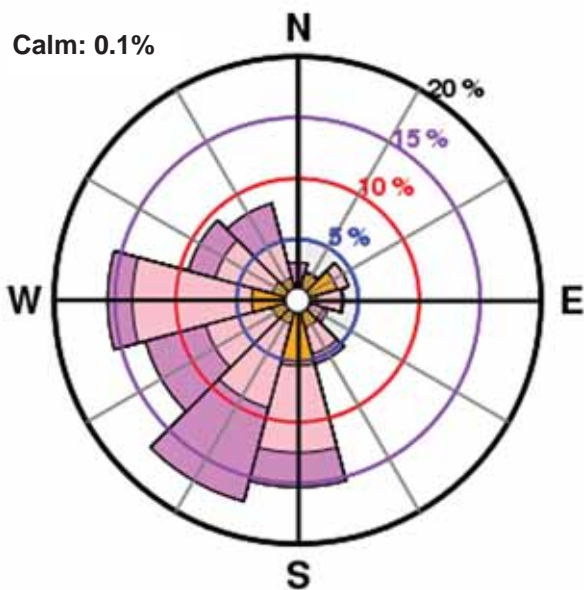
Unlike most of the month, there were dry and sunny conditions for the first day of the Irish Open in Killarney on the 29th. (picture courtesy Irish Examiner)



County / Station	WIND (KNOTS)										ELEMENTS				
	Mean speed	Max. dir.	10-min. speed	mean date/hour	Max. dir.	Gust speed	date/time	Days with gales	gale gusts	Hours with gale gusts	Snow	Snow Lying	Hail	Thunder	Fog
CO. CARLOW CARLOW (OAK PARK)	7.5	180°	20	1/13	250°	31	4/1237	0	0	0					
		190°	20	4/05											
CO. CAVAN BALLYHAISE	6.6	250°	22	4/12	240°	39	4/1325	0	1	6					
CO. CLARE SHANNON AIRPORT	9.1	240°	26	4/11	290°	37	10/2059	0	2	8	0	0	0	1	0
CO. CORK ROCHE'S POINT	10.9	160°	30	1/02	170°	38	1/0300	0	2	6					
CORK AIRPORT	9.1	220°	23	4/06	220°	35	4/0537	0	2	3	0	0	0	1	10
		330°	23	22/08											
CO. DONEGAL MALIN HEAD	14.3	230°	38	4/13	230°	58	4/1235	3	14	111	0	0	0	0	1
CO. DUBLIN DUBLIN AIRPORT	10.6	260°	36	4/13	270°	49	4/1400	1	3	14	0	0	0	1	3
CASEMENT AERODROME	10.0	250°	30	4/14	210°	44	4/0509	0	3	16	0	0	0	2	2
CO. KERRY VALENTIA OBSERVATORY	8.1	210°	22	4/05	180°	35	1/0054	0	1	1	0	0	0	1	3
CO. MAYO BELMULLET	12.1	200°	33	4/03	240°	62	4/1104	0	6	64	0	0	0	1	3
		200°	33	6/12											
KNOCK AIRPORT	9.5	250°	31	4/11	250°	46	4/1049	0	6	14	0	0	0	1	10
CO. TIPPERARY GURTEEN	8.2	270°	25	4/12	260°	37	4/1250	0	1	4					
CO. WESTMEATH MULLINGAR	5.8	230°	17	4/11	240°	32	4/1129	0	0	0					
CO. WEXFORD JOHNSTOWN CASTLE	7.0	220°	17	4/09	230°	33	4/1026	0	0	0					
		230°	17	15/11											

Valentia Observatory

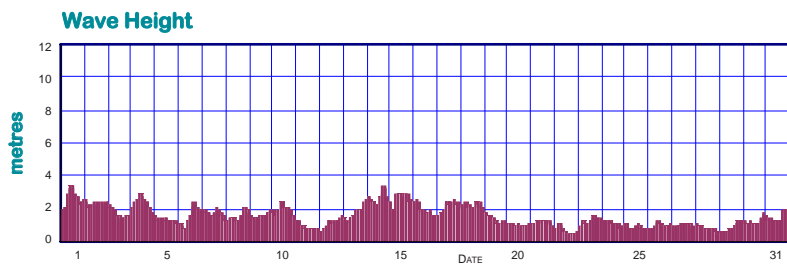
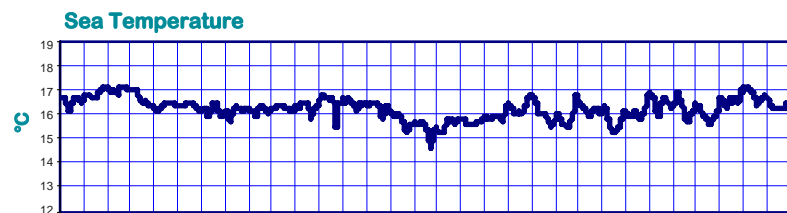
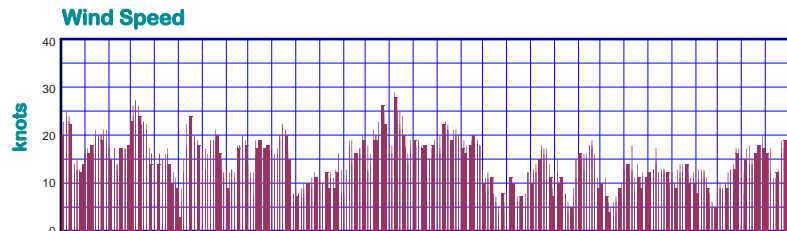
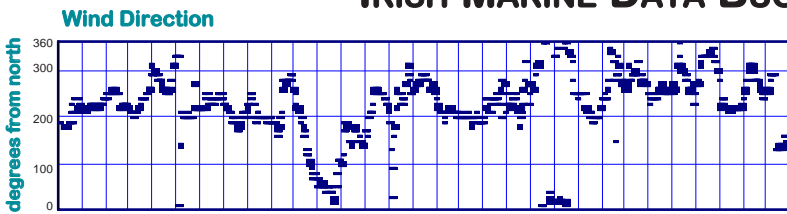
Dublin Airport



< 5
 5 - 10
 10 - 20
 20 - 35
 > 35
windspeed in knots

PERCENTAGE FREQUENCY OF WIND DIRECTION

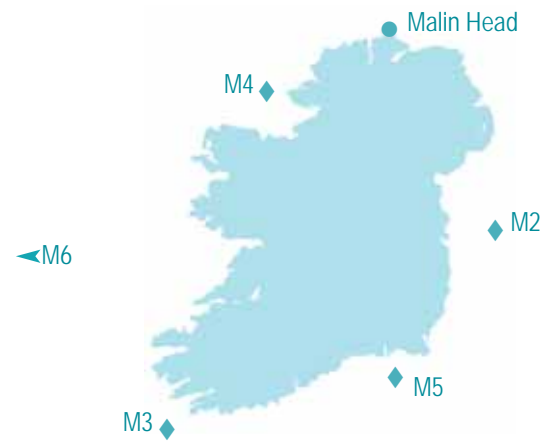
MARINE OBSERVATIONS FROM IRISH MARINE DATA BUOY NETWORK



Hourly wind and wave conditions at M5 (51.7°N, 6.7°W)

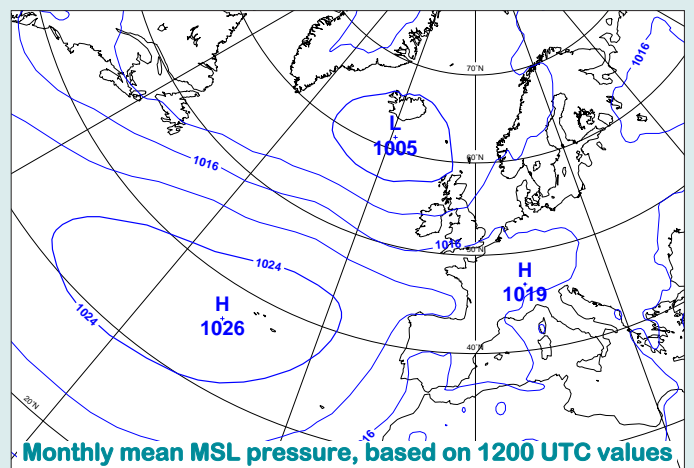
Buoy	Sea surface temp. (°C)	Mean wind speed (knots)	Max. 10-min wind (knots)	Mean wave height (m.)	Max. wave height (m.)
M2	n/a	13.4	31	0.9	2.9
M3	15.7	13.6	27	2.3	5.2
M4	14.5	16.7	32	3.8	4.8
M5	16.2	14.1	29	1.6	3.5
M6	14.8	n/a	n/a	2.5	6.4
Malin Head	14.7				

Summary of Mean Monthly Values

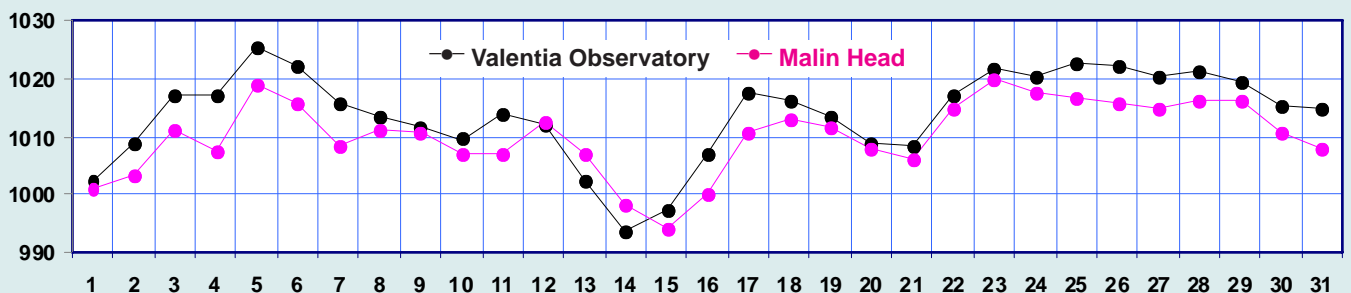


MEAN ATMOSPHERIC PRESSURE

Mean sea level pressure values for the month varied between 1011hPa in the north and 1014hPa in the south, between 3hPa and 4hPa lower than normal for July. The month's lowest pressure values were around mid-month, when an unusually deep depression for the middle of summer moved over Ireland; the lowest pressure of 990.6hPa was recorded at Shannon Airport on the 14th. Pressure was at its highest on the 5th, when the month's highest value of 1028.9hPa was measured at Valentia Observatory.



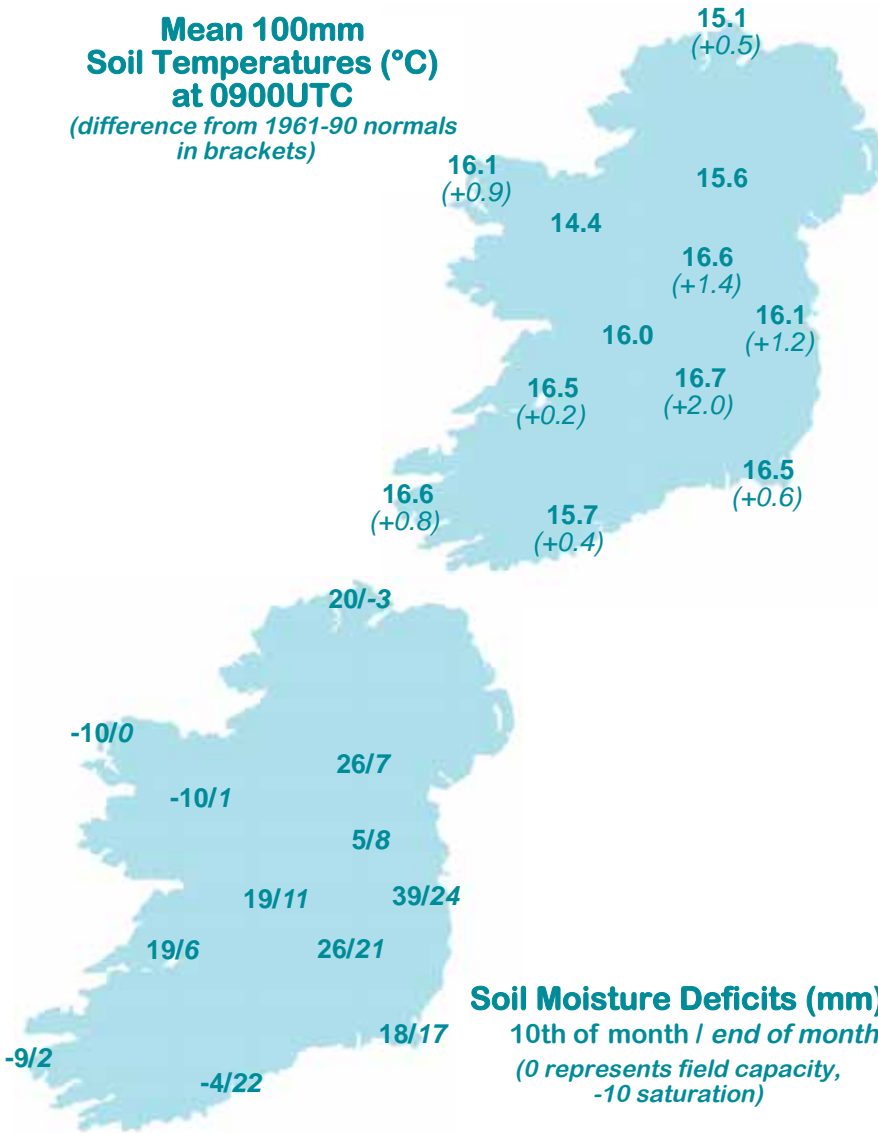
Monthly mean MSL pressure, based on 1200 UTC values



Mean daily Mean Sea Level pressure (hPa)

Mean 100mm Soil Temperatures (°C) at 0900UTC

(difference from 1961-90 normals in brackets)

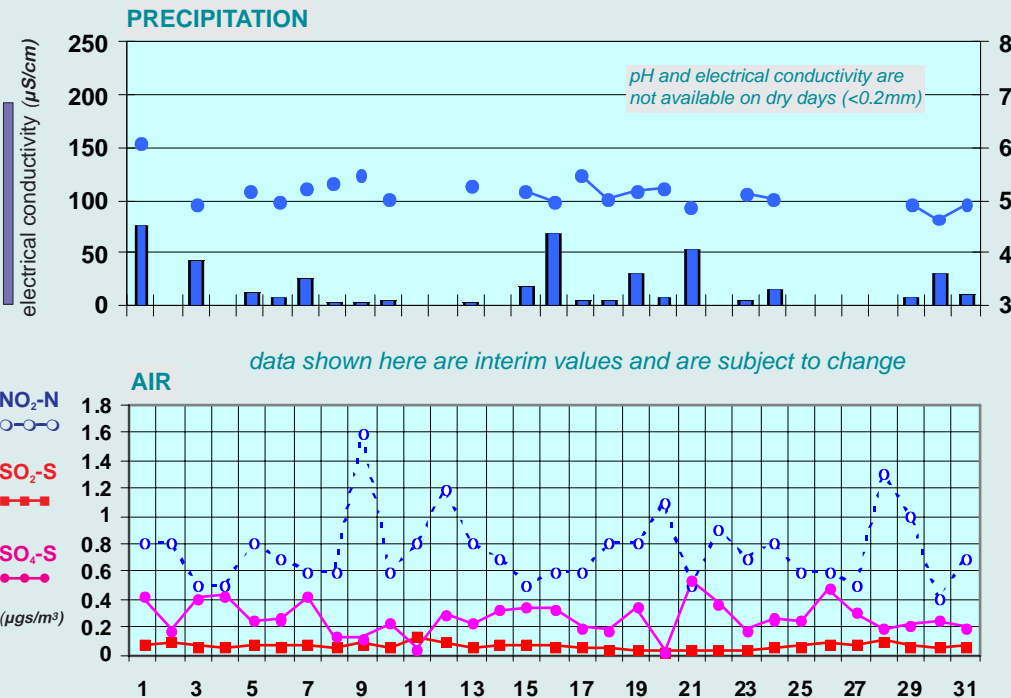


Soil Moisture Deficits (mm)
10th of month / end of month
(0 represents field capacity, -10 saturation)

Soil Temperatures at 0900UTC

County/ Station	°C		
	100mm	200mm	300mm
CO. CARLOW			
CARLOW (OAK PARK)	16.7	16.5	16.6
CO. CAVAN			
BALLYHAISE	15.6	15.8	16.1
CO. CLARE			
SHANNON AIRPORT	16.5	16.6	16.9
CARRON	16.8		17.0
CO. CORK			
ROCHE'S POINT	16.0	16.0	16.1
FERMOY (MOOREPARK)	17.2	17.0	17.3
CORK AIRPORT	15.7	15.5	15.9
SHERKIN ISLAND	16.2	16.2	16.2
BALLINCURRIG (PEAFIELD)	15.5	15.2	15.6
CO. DONEGAL			
MALIN HEAD	15.1	15.4	15.6
CO. DUBLIN			
DUBLIN (PHOENIX PARK)	18.0	18.1	17.6
DUBLIN AIRPORT	16.3	16.4	16.9
CASEMENT AERODROME	16.1	16.2	16.5
CO. KERRY			
VALENTIA OBSERVATORY	16.6	17.0	17.6
CO. LIMERICK			
MOUNT RUSSELL	15.1	15.8	
CO. MAYO			
BELMULLET	16.1	17.0	17.8
STRAIDE	16.0		
KNOCK AIRPORT	14.4	14.6	15.1
CO. MEATH			
WARRENSTOWN	16.5	17.0	17.9
CO. TIPPERARY			
GURTEEN	16.0	16.1	16.3
PETHARD (PARSONSHILL)	15.6	16.4	
CO. WATERFORD			
DUNGARVAN (CARRIGLEA)		17.0	16.9
CO. WESTMEATH			
MULLINGAR	16.6	16.7	17.5
CO. WEXFORD			
JOHNSTOWN CASTLE	16.5	16.5	16.8
JOHN F. KENNEDY PARK	17.1		17.8
CLONROCHE (KNOXTOWN)	16.6	16.9	17.0

Chemical Analysis of Precipitation and Air Samples at Valentia Observatory



Acid rain occurs when pollutants combine with moisture in the air to form sulphuric or nitric acid. pH is the simplest way of measuring the acidity of precipitation. Usually pH of 7.00 is considered neutral but this is not the case in rainfall samples. Pure water in the atmosphere has an equilibrium pH value of 5.65 at 20°C owing to carbon dioxide in the air dissolving to form carbonic acid. Any value below pH 5.65 is considered acid while any value above is considered alkaline.

Sulphur dioxide and sulphate in air contribute to the formation of sulphuric acid; nitrate in air contributes to the formation of nitric acid.

Conductivity measures the total ion activity in the rainfall, i.e. the higher the conductivity the greater the number of ions present.

10-DAY VALUES FOR SELECTED AGROMETEOROLOGICAL STATIONS		RAINFALL (mm)				TEMPERATURE (°C)										SUNSHINE (HOURS)					
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
Cavan (Loreto)	11-20	25.5	-	8	5	19.1	12.2	15.7	-	9.8	12	0	112	56	7.3	12	0	-	-	42.2	-
	21-end	28.5	-	6	3	19.3	12.6	16.0	-	6.2	23	0	127	66	3.5	23	0	-	-	28.8	-
	month	91.6	-	22	15	19.0	12.3	15.7	-	6.2	23	0	348	176	3.5	23	0	-	-	111.8	-
Co. Cork	1-10	75.0	-	7	6	18.7	11.7	15.2	-	7.5	6	0	108	53	7.4	6	0	15.6	15.6	46.9	-
Ballincurrag	11-20	74.9	-	9	6	18.7	10.8	14.8	-	6.6	17	0	103	49	6.4	17	0	15.2	15.1	38.8	-
	21-end	13.2	-	5	2	20.8	12.0	16.4	-	10.0	23	0	132	70	9.8	23	0	15.8	16.2	43.9	-
	month	163.1	-	21	14	19.4	11.5	15.5	-	6.6	17	0	343	172	6.4	17	0	15.5	15.6	129.6	-
Co. Donegal	1-10	107.7	-	9	8	18.0	12.0	15.0	-	10.9	6	0	106	50	7.5	7	0	-	-	-	-
Glenties	11-20	30.5	-	10	7	19.3	11.7	15.5	-	10.4	11	0	111	55	7.7	13	0	-	-	-	-
	21-end	61.3	-	9	8	17.8	11.9	14.9	-	5.1	23	0	115	54	2.6	23	0	-	-	-	-
	month	199.5	206	28	23	18.3	11.9	15.1	1.0	5.1	23	0	331	159	2.6	23	0	-	-	-	-
Co. Kerry	1-10	42.4	-	8	4	19.0	12.4	15.7	-	9.7	6	0	113	57	5.7	6	0	-	-	43.2	-
Ardfert	11-20	80.3	-	10	7	18.8	12.0	15.4	-	10.3	11	0	110	54	5.5	17	0	-	-	24.3	-
	21-end	12.2	-	8	6	19.2	13.0	16.1	-	10.1	23	0	129	68	5.6	23	0	-	-	30.9	-
	month	134.9	-	26	17	19.0	12.5	15.8	0.8	9.7	6	0	352	178	5.5	17	0	-	-	98.4	-
Co. Monaghan	1-10	58.2	-	8	6	19.2	11.3	15.3	-	7.7	6	0	108	53	0.3	1	0	-	-	-	-
Carrickmacross	11-20	45.6	-	9	6	19.1	11.9	15.5	-	9.1	12	0	111	55	0.3	11	0	-	-	-	-
	21-end	43.9	-	5	3	19.6	12.6	16.1	-	7.1	23	0	129	68	4.6	23	0	-	-	-	-
	month	147.7	264	22	15	19.3	12.0	15.7	-	7.1	23	0	348	176	0.3	1	0	-	-	-	-
Co. Waterford	1-10	50.0	-	5	4	19.6	12.6	16.1	-	7.0	6	0	117	62	4.6	6	0	-	17.1	53.2	-
Dungarvan	11-20	81.1	-	8	6	19.0	11.9	15.5	-	8.6	17	0	111	55	6.5	17	0	-	16.2	50.2	-
	21-end	11.4	-	4	2	21.1	13.5	17.3	-	9.6	29	0	142	80	7.1	29	0	-	17.3	51.6	-
	month	142.5	-	17	12	19.9	12.7	16.3	0.7	7.0	6	0	370	198	4.6	6	0	-	16.9	155.0	95
Co. Wexford	1-10	36.2	-	8	6	18.6	11.8	15.2	-	8.5	6	0	108	53	4.5	5	0	17.0	17.9	48.8	-
J.F.K. Park	11-20	85.7	-	7	6	17.9	11.4	14.7	-	8.1	17	0	103	47	6.8	11	0	16.7	17.4	39.5	-
	21-end	14.9	-	6	4	20.2	12.9	16.6	-	9.6	21	0	133	72	8.1	21	0	17.6	18.3	43.4	-
	month	136.8	240	21	16	18.9	12.1	15.5	0.4	8.1	17	0	344	172	4.5	5	0	17.1	17.8	131.7	87

MEASURED POTENTIAL EVAPOTRANSPIRATION (P.E.) AND SOIL MOISTURE					
Station	Period	P.E. (mm)		Soil Moisture (mm)	
		Amount	Deficit	Accum'ltd Deficit	Surplus
Co. Kerry	1-10	38.8	-	0	71
Valentia Obs.	11-20	18.4	-	0	49
	21-end	20.7	-	0	9
	month	77.9			

MONTHLY EVAPORATION (MM) FROM CLASS A PAN			
County	Station	Monthly Rainfall (mm)	Monthly Evaporation (mm)
Kerry	Valentia Observatory	154.8	69.8
Kerry	North Kerry Landfill	190.2	43.1
Mayo	Newport (Furnace)	129.3	56.3
Offaly	Derrygreenagh	123.7	68.6
Waterford	Dungarvan (Carriglea)	142.5	79.4
Wexford	J.F.K. Park	136.8	90.8

Station	P.E. (Penman) total(mm)	GLOBAL SOLAR RADIATION (MJ/sq.m.)			
		1st-10th	11th-20th	21st-end	Total
Co. Carlow					
Carlow (Oak Park)*	76	152.82	132.28	141.85	426.95
Co. Cavan					
Ballyhaise*	74	150.84	149.51	135.69	436.04
Co. Clare					
Shannon Airport	76	global solar radiation values for stations marked * are provisional			
Co. Cork					
Cork Airport	76				
Roche's Point*		163.62	167.63	172.51	503.76
Co. Donegal					
Malin Head	70	162.98	150.22	147.51	460.71
Co. Dublin					
Dublin Airport	83	164.80	173.77	150.43	489.00
Casement Aerodrome	79				
Co. Kerry					
Valentia Obs.	67	157.59	133.47	149.63	437.95
Co. Mayo					
Belmullet	66	169.76	142.09	140.32	452.17
Knock Airport	66				
Co. Tipperary					
Curteen*	72	155.16	149.33	137.49	441.98
Co. Westmeath					
Mullingar*	71	147.59	141.76	133.57	422.92
Co. Wexford					
Johnstown Castle*	73	165.27	143.45	154.17	462.89

Thursday 1st: There was widespread rain overnight, with some heavy spells over the western half of the country. A clearance moved into the west before dawn, reaching the east during the morning. The remainder of the day was mostly dry, with just isolated light showers and sunny spells. Winds were southwesterly, moderate to strong, easing later but remaining fresh in the west.

Rainfall: 2mm to 16mm, heaviest at Cork Airport, 2mm at Casement Aerodrome

Temperature: max. 18°C to 23°C, min. 11°C to 15°C

Sunshine: 6 to 9 hours, sunniest at Valentia, 6 hours at Dublin Airport

Friday 2nd: Showers in the west overnight, some heavy. The showers continued through the day and became more widespread, although mostly light. Prolonged sunshine in the south and east, somewhat cloudier elsewhere. Warm. Winds were light southerly, veering southwesterly and increasing moderate to fresh before falling light again by evening.

Rainfall: nil to 6mm, heaviest at Belmullet, nil at Dublin Airport

Temperature: max. 17°C to 22°C, min. 10°C to 13°C

Sunshine: 6 to 12 hours, sunniest at Cork Airport, 6 hours at Belmullet

Saturday 3rd: Generally dry overnight except in the west, where there were a few isolated showers. The showers became more frequent in Ulster and north Connacht, merging into steady rain for a few hours in the northwest and north. This cleared by late evening, but further rain developed in the west. Cloudy in the north and west, sunny further east. Winds were light to moderate, southwesterly.

Rainfall: nil to 6mm, heaviest at Belmullet

Temperature: max. 16°C to 21°C, min. 10°C to 13°C

Sunshine: 1 to 7 hours, sunniest at Dublin Airport, 1 hour at Belmullet

Sunday 4th: Rain in the north and west moved southeastwards during the night and morning. The rain was heavy for a few hours in Ulster and north Connacht, but turned progressively light and patchy as it crossed the country. Generally dry for the remainder of the day with isolated showers. After a cloudy start, all areas had some sunshine. Winds were southwesterly, moderate to strong and very gusty, especially in the northwest, but easing by late evening.

Rainfall: 1 to 17mm, heaviest at Malin Head, 1mm at Dublin Airport

Temperature: max. 17°C to 21°C, min. 10°C to 13°C

Sunshine: 6 to 9 hours, sunniest at Dublin Airport, 6 hours at Knock Airport

Monday 5th: Scattered showers developed countrywide during the morning. These were mostly light, but some were heavier over Ulster. All areas had some spells of sunshine and showers died out during the evening. Winds were moderate, west or northwesterly generally, falling light during the evening and becoming variable in direction.

Rainfall: nil to 1mm, heaviest at Belmullet and Malin Head

Temperature: max. 16°C to 20°C, min. 8°C to 12°C

Sunshine: 7 to 11 hours, sunniest at Belmullet, 7 hours at Shannon Airport

Tuesday 6th: Generally dry at first apart from some drizzle in Ulster. A few sunny spells during the morning, though generally overcast. Patchy rain and drizzle spread from the west by mid-afternoon to affect much of the country. Winds were moderate to strong and gusty, south to southwesterly in direction.

Rainfall: nil to 7 mm, heaviest at Valentia, nil at Dublin Airport

Temperature: max. 16°C to 21°C, min. 8°C to 13°C

Sunshine: nil to 2 hours, sunniest at Casement Aerodrome

Wednesday 7th: Some showers overnight in the west, north and east, clearing by morning to give a mostly fine start to the day. Showers developed again during the afternoon, mainly in northern counties, with sunny periods elsewhere. These showers cleared eastwards by nightfall, leaving a mostly dry night countrywide. Winds were southwesterly, moderate to strong and gusty.

Rainfall: nil to 3mm, heaviest at Johnstown Castle, nil in the midlands

Temperature: max. 16°C to 22°C, min. 10°C to 14°C

Sunshine: 4 to 7 hours, sunniest at Belmullet, 4 hours at Dublin Airport

Thursday 8th: The day started mostly cloudy with some short sunny spells and scattered showers. Cloudier, wetter weather moved into the southwest in the morning, moving northeastwards across much of the country during the day. This rain was heavy at times, particularly in the south. Southwesterly winds were moderate, backing southeasterly during the evening before easing.

Rainfall: trace to 17mm, heaviest at Valentia, trace at Malin Head

Temperature: max. 16°C to 18°C, min. 9°C to 13°C

Sunshine: nil to 5 hours, sunniest at Belmullet, nil at Valentia

Friday 9th: Mild and humid overnight with rain in most areas, some heavy. The rain became more patchy during the morning with a few sunny spells, mainly in the northwest. Heavier and more persistent rain in the southwest during the afternoon moved quickly northeastwards, bringing heavy falls in some areas. The northwest and extreme southeast had only small amounts, however. A clearance followed into the southwest later in the evening. Winds were light to moderate and sometimes gusty, cyclonic variable.

Rainfall: 3 to 20mm, heaviest at Mullingar, 3mm at Belmullet

Temperature: max. 16°C to 19°C, min. 10°C to 14°C

Sunshine: nil to 6 hours, sunniest at Belmullet, nil in the southwest

Saturday 10th: Rain and drizzle over much of the country overnight died out during the early morning. Another band of persistent rain in the south during the morning spread northwards to affect all areas by afternoon, turning heavy over north Leinster and Ulster. Further heavy thundery pulses moved up from the south during the afternoon and evening, producing extremely heavy falls in the west. The rain cleared from the southwest by evening. Winds were light and variable in direction at first, becoming moderate cyclonic during the afternoon, strong during the evening in the west.

Rainfall: 7 to 56mm, heaviest at Claremorris, 7mm at Johnstown Castle

Temperature: max. 16°C to 20°C, min. 10°C to 15°C

Sunshine: nil to trace

Sunday 11th: Heavy rain in the north of the country overnight, otherwise generally dry. Sunny spells in all areas during the morning, especially in the east. During the late morning, the rain in the north turned to showers and became more widespread by the afternoon. Mostly dry in the east and parts of the south. Winds were west to northwesterly, moderate to strong and gusty.

Rainfall: nil to 1mm generally, 10mm at Malin Head

Temperature: max. 16°C to 19°C, min. 9°C to 12°C

Sunshine: 2 to 8 hours, sunniest at Dublin Airport, 2 hours at Valentia

Monday 12th: Light rain or drizzle near western and northern coasts overnight, mostly dry elsewhere. Persistent rain affected the south Cork coast for a few hours around dawn. The remainder of the day was generally dry with isolated light showers in the west and north. Sunny in the east, cloudier further west. Winds were light, southeasterly or variable in direction.

Rainfall: nil to 1mm, heaviest at Roche's Point

Temperature: max. 16°C to 20°C, min. 9°C to 13°C

Sunshine: nil to 10 hours, sunniest at Dublin Airport, nil at Valentia

Tuesday 13th: Showery rain in the northwest for a few hours in the early part of the night, dry elsewhere. A further area of showery rain developed in the southwest during the morning and spread to all parts by late afternoon. The showers were generally light but turned quite heavy during the afternoon in the southeast and also in the north during the evening. A few sunny spells also. Winds were light to moderate, east to southeasterly.

Rainfall: trace to 12mm, heaviest at Belmullet, trace at Malin Head

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

Sunshine: nil to 2 hours, sunniest at Knock Airport, nil at Belmullet

Wednesday 14th: Overnight rain, heaviest in the southwest and north. This moved gradually northwards and eased slightly by morning. Showers affected much of the country during the day, heaviest in Connacht and Munster. Some of the showers developed into heavy thunderstorms. Sunny spells also, mainly in the east. Winds were southeasterly in direction, light to moderate generally, strong and gusty in the north.

Rainfall: trace to 19mm, heaviest at Claremorris, trace at Valentia

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

Sunshine: 2 to 10 hours, sunniest at Casement Aerodrome, 2 hours at Belmullet

Thursday 15th: Some showers overnight, heaviest in east Connacht. Heavy showers moved into the west during the morning and crossed the country, leading to some intense thundery showers. Further heavy rain arrived in the southern half of the country and moved northwards during the early evening and night, bringing some intense thunderstorms to the southeast and east. Some sunny breaks in the east. Winds were light, northerly or variable in direction.

Rainfall: 1 to 31mm, heaviest at Johnstown Castle, 1mm at Belmullet

Temperature: max. 16°C to 20°C, min. 10°C to 13°C

Sunshine: <1 to 6 hours, sunniest at Casement Aerodrome, <1 hour at Belmullet

Friday 16th: Mild overnight with rain in most areas, heavy and thundery in places. The rain cleared eastwards during the early morning and it was a cool, breezy day with scattered showers and sunny spells. Moderate to fresh and gusty northwesterly winds backed southwesterly by evening and eased.

Rainfall: 2 to 16mm, heaviest at Casement Aerodrome, 2mm at Knock Airport

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

Sunshine: 2 to 7 hours, sunniest at Dublin Airport, 2 hours at Cork Airport

Saturday 17th: Rain in the north overnight, clearing. A mostly dry morning with some spells of sunshine and a few scattered showers. Another band of rain moved into the west during the afternoon and brought wet weather to most parts of the country during the evening and night. Winds were light to moderate, westerly.

Rainfall: trace to 17mm, heaviest at Valentia, trace at Dublin Airport

Temperature: max. 17°C to 20°C, min. 8°C to 12°C

Sunshine: 2 to 8 hours, sunniest at Cork Airport, 2 hours at Casement Aerodrome

Sunday 18th: Early rain in the south cleared by daybreak. A mainly fair start in most parts with isolated light showers. Rain spread from the south during the afternoon and affected most areas by evening, with some thunderstorm activity in the southwest. Winds were light, southwesterly in direction.

Rainfall: trace to 19mm, heaviest at Cork Airport, trace at Belmullet

Temperature: max. 16°C to 21°C, min. 12°C to 15°C

Sunshine: nil to >1 hour, sunniest at Knock Airport

Monday 19th: Heavy rain overnight, particularly in southern and eastern counties. Some thunderstorm activity during the early morning in Munster and east Ulster as the band of heavy rain moved northwards. The afternoon was mainly dry but humid, with a few scattered showers. Winds were light, southwesterly in direction.

Rainfall: trace to 20mm, heaviest at Johnstown Castle, trace at Belmullet

Temperature: max. 17°C to 22°C, min. 12°C to 16°C

Sunshine: 1 to 5 hours, sunniest at Cork Airport, 1 hour at Dublin Airport

Tuesday 20th: After a mainly dry start to the day with just a few scattered light showers, heavier showers developed in the west towards noon and became widespread during the afternoon and evening, especially over Connacht and north Leinster. Sunny spells early in the day and between the showers later. Winds were light, south or southwesterly, becoming variable by evening.

Rainfall: nil to 8mm, heaviest at Knock Airport, nil at Johnstown Castle

Temperature: max. 17°C to 21°C, min. 10°C to 14°C

Sunshine: 3 to 6 hours, sunniest at Cork Airport, 3 hours at Valentia

Wednesday 21st: Heavy, showery rain in Connacht overnight drifted southwards, becoming light by morning. Further heavy rain moved into Donegal and north Connacht during the morning and continued there during the afternoon, before dying out in the late evening. Showers developed elsewhere during the late morning, some very heavy and thundery. Sunshine in the south. Winds were moderate, northerly on northern and western coasts, light inland.

Rainfall: trace to 23mm, heaviest at Claremorris, trace at Dublin Airport

Temperature: max. 14°C to 19°C, min. 11°C to 13°C

Sunshine: trace to 7 hours, sunniest at Cork Airport, trace at Belmullet

Thursday 22nd: Rain and drizzle in some parts overnight. The morning was cloudy with some scattered showers and sunny spells. Becoming mostly dry by afternoon with some sunshine in places, especially in the west and north. Generally dry by evening. Winds were north to northeasterly, strong and gusty early in the night, easing later.

Rainfall: nil to 8mm, heaviest at Johnstown Castle, nil at Valentia

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

Sunshine: <1 to 12 hours, sunniest at Knock Airport, <1 hour in the east

Friday 23rd: Dry weather in almost all areas overnight and during the day with sunny spells developing, especially in eastern areas. The afternoon continued dry over much of the country, but with some rain along the southwest coast. The evening and night saw rain and drizzle over parts of south and southwest, while continuing dry over the rest of the country. Winds were light, southerly or variable in direction.

Rainfall: nil to 6mm, heaviest at Valentia

Temperature: max. 16°C to 20°C, min. 6°C to 13°C

Sunshine: trace to 6 hours, sunniest at Casement Aerodrome, trace at Valentia

Saturday 24th: Some outbreaks of light rain or drizzle overnight. Rain or showers continued throughout the day, although rainfall amounts were generally small. Sunny spells in the east and northwest, generally overcast elsewhere. Winds were light southerly, veering westerly in the afternoon.

Rainfall: trace to 2mm, heaviest at Belmullet, trace at Mullingar

Temperature: max. 16°C to 23°C, min. 12°C to 15°C

Sunshine: trace to 5 hours, sunniest at Dublin Airport, trace at Belmullet

Sunday 25th: Patchy light rain or drizzle overnight and during the morning. The rain and drizzle was most persistent near western and northern coasts and became heavy for a while in the north during the evening. Sunshine in the south, generally cloudy elsewhere. Warm and humid. Winds were west to southwesterly, generally light, moderate in the north.

Rainfall: nil to 1mm generally, 7mm at Malin Head

Temperature: max. 17°C to 24°C, min. 12°C to 15°C

Sunshine: nil to trace generally, 7 hours at Cork Airport

Monday 26th: Very mild and humid overnight with outbreaks of light rain or drizzle, mostly in the west and north. Generally dry during the morning. Damp, drizzly conditions returned during the afternoon. Sunshine in the south and east, cloudy further north. Winds were light southwesterly.

Rainfall: nil to 4mm, heaviest at Malin Head, nil in the south and east

Temperature: max. 18°C to 24°C, min. 13°C to 17°C

Sunshine: nil to 7 hours, sunniest at Cork Airport, nil at Belmullet

Tuesday 27th: Damp and drizzly weather overnight, clearing the southeast by morning. The remainder of the day was generally dry but there were a few light showers near Atlantic coasts. Prolonged sunshine in the east, cloudier elsewhere. Mild. Winds were light to moderate, southwest to westerly in direction.

Rainfall: nil to 2mm, heaviest at Belmullet, nil at Johnstown Castle

Temperature: max. 17°C to 21°C, min. 12°C to 15°C

Sunshine: 1 to 10 hours, sunniest at Dublin Airport, 1 hour at Shannon Airport

Wednesday 28th: Some showers during the morning in the north and northwest, dry elsewhere with sunny spells at times. Continuing mainly fair during the remainder of the day, with most sunshine in the south. A few showers also during the afternoon, but generally dry by evening. Winds were light, westerly.

Rainfall: nil to 3mm, heaviest at Malin Head, nil in the south and east

Temperature: max. 16°C to 20°C, min. 9°C to 14°C

Sunshine: 2 to 10 hours, sunniest at Cork Airport, 2 hours at Knock Airport

Thursday 29th: Generally dry overnight. Some rain and drizzle in the west during the day, dry with some sunny spells further east. The evening and night were generally cloudy with some rain and drizzle along western coastal districts. Winds were light, west or southwesterly in direction.

Rainfall: nil to trace generally, 4mm at Belmullet

Temperature: max. 15°C to 21°C, min. 11°C to 14°C

Sunshine: nil to 7 hours, sunniest at Cork Airport, nil at Knock Airport

Friday 30th: Rain in western areas, heavy in places, spreading eastwards overnight. A wet morning generally with some heavy falls of rain. During the afternoon, rain and drizzle cleared and some sunny spells developed. A few showers during the evening. Winds were light, westerly in direction.

Rainfall: nil to 15mm, heaviest at Belmullet, nil at Roche's Point

Temperature: max. 17°C to 21°C, min. 12°C to 15°C

Sunshine: trace to 3 hours, sunniest at Cork Airport, trace at Casement Aerodrome

Saturday 31st: Showers in the north and west became more frequent and heavier during the early hours and merged into a longer spell of rain in the south. Showers continued during the day but became confined to the north by evening. Sunny spells in most parts, especially in the northwest. Winds were light, westerly in direction.

Rainfall: trace to 6mm, heaviest at Malin Head, trace at Roche's Point

Temperature: max. 16°C to 20°C, min. 11°C to 14°C

Sunshine: <1 to 6 hours, heaviest at Belmullet, <1 hour at Valentia

Very wet in most places

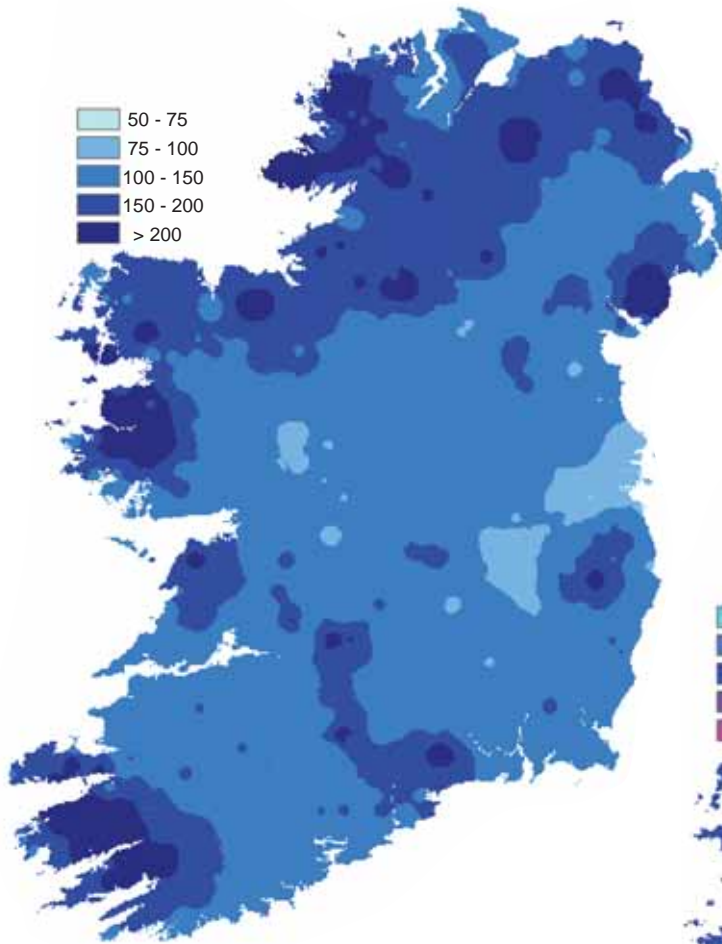
July rainfall totals were above normal everywhere and were more than twice the monthly normal over much of the country. Totals ranged from 75mm at Dublin Airport to 278mm at Delphi Lodge, Co. Mayo, with percentage of normal values between 155% of normal at Ballyhaise and 264% at Carrickmacross (Dunoge), Co. Monaghan. Despite the very high totals, however, it was not as wet a month as July of last year in most areas, but it was the wettest for between 15 and 22 years in parts of the west.

There were several very wet days during the month, but most stations recorded their highest daily falls on the 10th, 15th or 18th. The highest daily value of the month, 57.9mm, was measured at Glenties, Co. Donegal, on the 10th; this was the highest daily fall for July at the station since it opened in 1941 and the highest for any month there since September 1992.

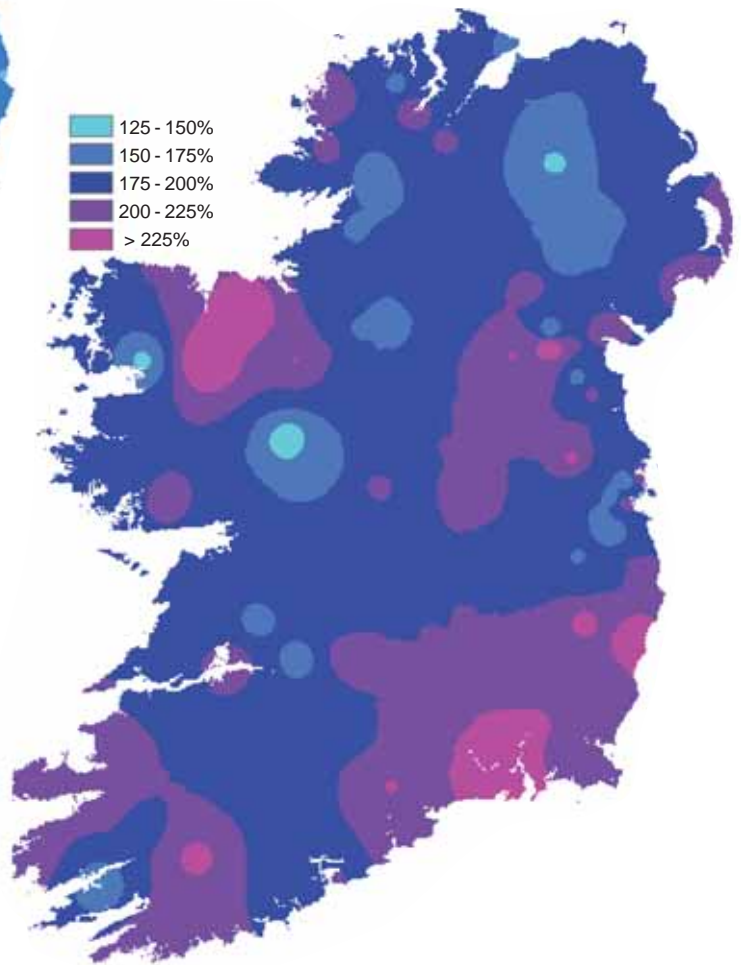
Claremorris's daily fall of 55.5mm up to midnight on the 10th was also its highest ever July value since records began there in 1950. There was a total of between 13 and 19 wetdays at the majority of stations (*days with 1mm or more of rainfall*), but more than 20 wetdays in many western areas. This compares with the normal range for July of between nine and 15 wetdays.

County/ Station	Total Amount (mm)	% of 1961-90 average	Most in a day / date		Number of Raindays (>0.2mm)	Wetdays (≥1mm)
CO. CARLOW						
CARLOW (OAK PARK)	82.1	168	16.0	10	21	11
CO. CAVAN						
BALLYHAISE	93.0	155	15.9	15	23	15
CAVAN (LORETO COLLEGE)	91.6		15.8	15	22	15
CO. CLARE						
SHANNON AIRPORT	121.3	213	16.9	9	25	17
CARRON	186.0	192	21.5	17	29	24
CO. CORK						
ROCHE'S POINT	144.4	241	26.6	18	19	14
FERMOY (MOOREPARK)			not available			
CORK AIRPORT	119.5	184	25.2	18	22	13
SHERKIN ISLAND	127.9	221	23.7	17	19	15
BALLINCURRIG (PEAFIELD)	163.1		40.4	10	21	14
CO. DONEGAL						
MALIN HEAD	128.6	179	19.8	21	27	11
GLENTIES HATCHERY	199.5	206	57.9	10	28	23
BALLYSHANNON (CATHLEEN'S FALL)	137.0	188	24.3	10	27	22
CO. DUBLIN						
DUBLIN (PHOENIX PARK)	81.5	163	22.3	15	19	13
DUBLIN AIRPORT	74.7		19.5	15	18	10
CASEMENT AERODROME	79.4	169	21.5	15	20	14
DUBLIN (MERRION SQUARE)	92.2	214	28.1	15	19	12
CO. GALWAY						
GALWAY (UNIV. COLL.)	125.6	185	15.6	20	24	19
MAAM VALLEY	246.3		36.2	3	28	25
BALLYGAR	101.6	164	13.7	20	24	16
CO. KERRY						
VALENTIA OBSERVATORY	154.8	212	23.6	17	29	22
ARDFERT (LISCAHANE)	134.9		28.8	14	26	17
CO. LIMERICK						
MOUNT RUSSELL	135.1		24.0	10	29	18
CO. MAYO						
BELMULLET	134.4	198	33.2	10	29	19
STRAIDE	165.1	262	29.5	15	24	19
CONNACHT AIRPORT	173.9		45.8	10	30	21
DELPHI LODGE II	278.1		55.2	15	30	25
CO. MEATH						
WARRENTOWN	128.3	229	21.9	9	20	15
CO. MONAGHAN						
CARRICKMACROSS (DUNOGE)	147.7	264	34.1	21	22	15
CO. OFFALY						
DERRYGREENAGH	123.7	213	26.2	15	19	13
CO. SLIGO						
ARDTARMON	154.1		45.2	10	28	20
CO. TIPPERARY						
GURTEEN	110.6		27.5	15	24	18
FETHARD (PARSONSHILL)	106.7		17.8	18	18	16
CO. WATERFORD						
WATERFORD (TYCOR)	138.7	248	42.6	18	19	14
DUNGARVAN (CARRIGLEA)	142.5		33.4	18	17	12
CO. WESTMEATH						
MULLINGAR	139.2	225	38.1	15	25	17
CO. WEXFORD						
JOHNSTOWN CASTLE	132.5	232	35.0	15	23	13
JOHN F. KENNEDY PARK	136.8	240	37.8	18	21	16
CLONROCHE (KNOXTOWN)	161.2		50.8	18	21	14

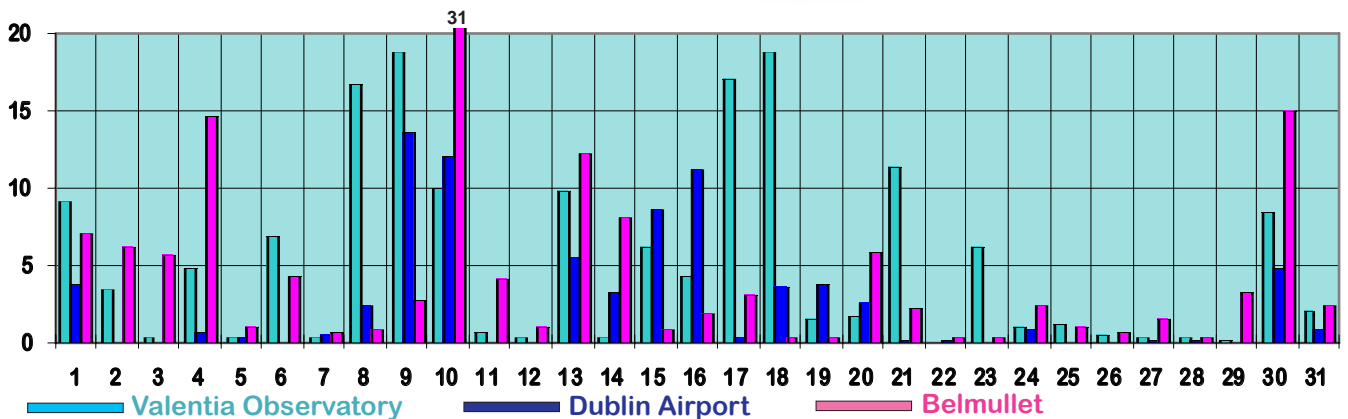
Total rainfall (mm)



Percentage of normal rainfall



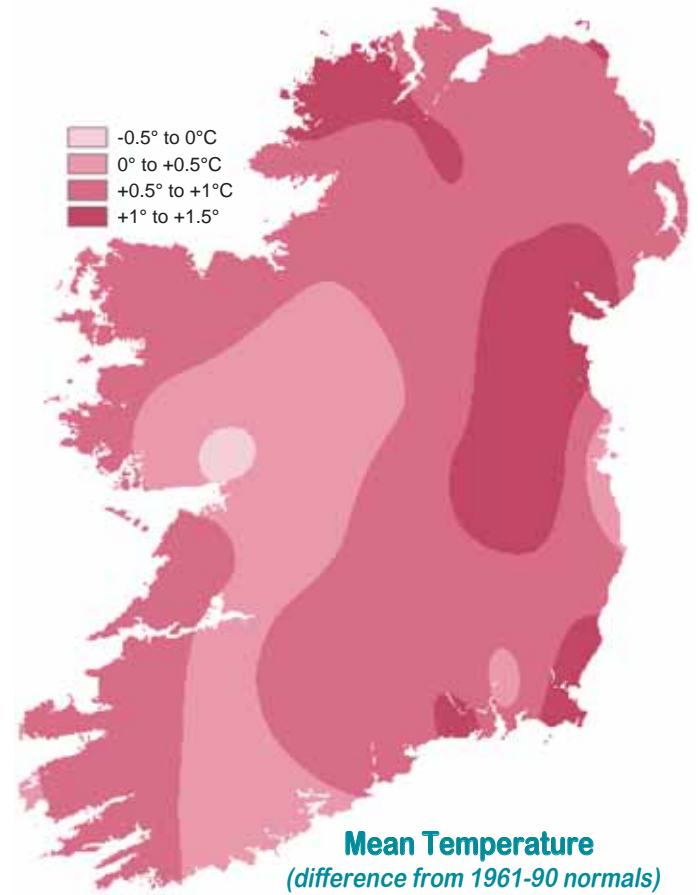
Daily 0-24h rainfall values (mm)



A little warmer than normal throughout

Temperatures were close or a little higher than normal throughout almost all of July, with few very warm days. Mean monthly air temperatures varied between 14.0°C at Knock Airport and 16.7°C at Dublin (Merrion Square), around half a degree higher than normal generally but over a degree above normal in parts of the east and southeast.

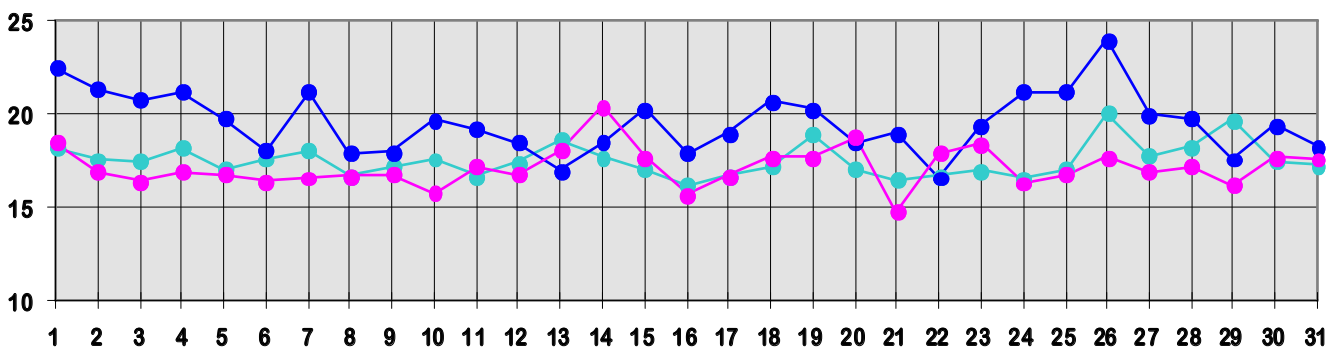
The month's highest temperatures were associated with the only spell of relatively settled weather, between the 22nd and 29th. Almost all stations recorded their highest temperatures on either the 25th or 26th, with the highest value of 25.3°C measured at Ballygar, Co. Galway, on the 26th. In an average July there are between four and 12 days with maximum values of over 20°C; while many midland and eastern stations recorded this number this month, there were only one or two such days in most Atlantic coastal areas. The month's lowest temperatures were recorded in the period 5th/6th, on the 17th and 23rd. Glenties, Co. Donegal, recorded the lowest air temperature of the month, 5.1°C on the 23rd, while the lowest grass minimum



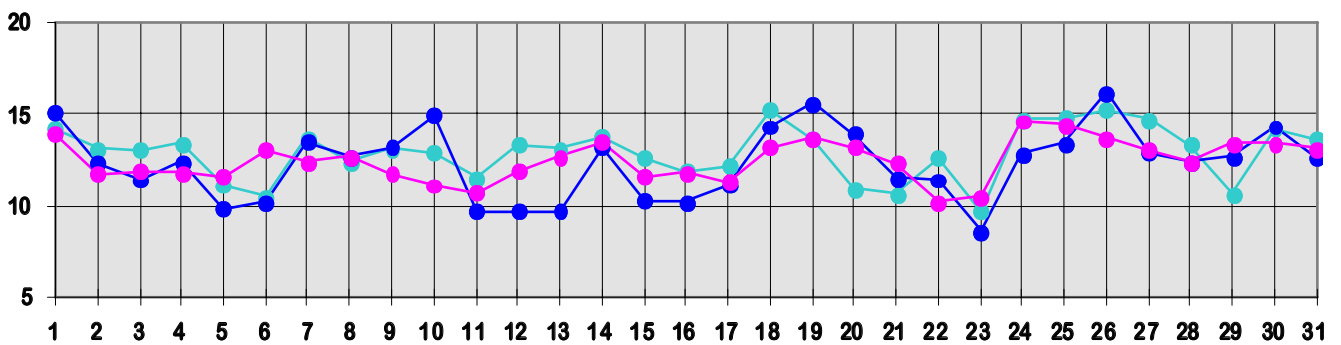
Mean Temperature
(difference from 1961-90 normals)

value of 0.1°C was recorded at Straide, Co. Mayo, on the same day.

Daily 0-24h maximum temperatures (°C)



Daily 0-24h minimum temperatures (°C)



● Valentia Observatory ● Dublin Airport ● Belmullet

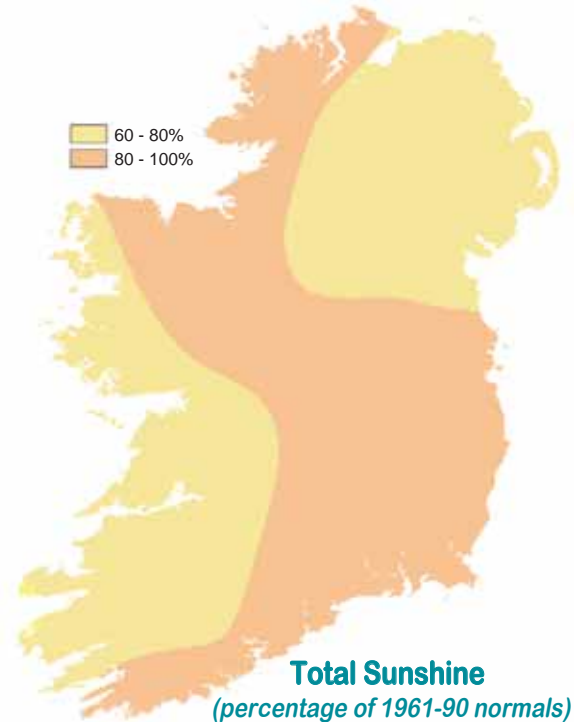
County/ Station	°C											
	Mean max.	Mean min.	Mean/ deviation from 1961-90 average		Highest max./date		Lowest min./date		Lowest grass min./date		Days with air frost ground frost	
CO. CARLOW												
CARLOW (OAK PARK)	20.0	12.4	16.2	0.9	24.2	26	8.5	6	6.0	12	0	0
CO. CAVAN												
BALLYHAISE	18.6	12.1	15.4		22.0	26	6.7	23	2.4	23	0	0
CAVAN LORETO COLLEGE	19.0	12.3	15.7		22.1	26	6.2	23	3.5	23	0	0
CO. CLARE												
SHANNON AIRPORT	19.0	13.4	16.2	0.4	21.9	26	10.6	6	7.4	5	0	0
CARRON	17.7	12.1	14.9	0.7	19.8	26	9.5	6	4.0	6	0	0
CO. CORK												
ROCHE'S POINT	18.2	12.8	15.5	0.3	22.7	26	9.8	17	4.1	6	0	0
FERMOY (MOOREPARK)			not available									
CORK AIRPORT	18.3	11.8	15.1	0.2	23.1	26	7.8	17	5.0	6	0	0
SHERKIN ISLAND	18.2	12.8	15.5	0.6	20.0	21 30	10.3	11	7.6	11	0	0
BALLINCURRIG (PEAFIELD)	19.4	11.5	15.5		23.5	25 26	6.6	17	6.4	17	0	0
CO. DONEGAL												
MALIN HEAD	16.9	12.6	14.8	0.9	21.6	1	7.9	23	5.0	23	0	0
GLENTIES HATCHERY	18.3	11.9	15.1	1.0	21.1	14	5.1	23	2.6	23	0	0
BALLYSHANNON (CATHLEEN'S FALL)	18.3	12.3	15.3	0.7	21.4	1	7.5	23			0	
CO. DUBLIN												
DUBLIN (PHOENIX PARK)	20.3	12.8	16.6	1.5	24.7	26	9.5	6	7.7	5	0	0
DUBLIN AIRPORT	19.6	12.4	16.0		24.0	26	8.6	23	6.4	23	0	0
CASEMENT AERODROME	19.6	12.5	16.1	1.0	23.6	26	9.4	6	5.9	12	0	0
DUBLIN (MERRION SQUARE)	19.4	13.9	16.7	0.4	24.8	26	10.0	11 16			0	
CO. GALWAY												
GALWAY (UNIV. COLL.)	19.4	11.1	15.3	0.0	21.9	14	8.3	23	7.3	23	0	0
MAAM VALLEY	18.4	12.5	15.5		21.0	14	9.9	23	7.0	23	0	0
BALLYGAR	19.6	12.1	15.9		25.3	26	6.0	23	4.0	23	0	0
CO. KERRY												
VALENTIA OBSERVATORY	17.6	13.2	15.4	0.5	20.1	26	9.7	23	5.1	23	0	0
ARDFERT (LISCAHANE)	19.0	12.5	15.8	0.8	23.1	26	9.7	6	5.5	17	0	0
CO. LIMERICK												
MOUNT RUSSELL	18.6	12.1	15.4		21.8	26	9.3	6	6.1	6	0	0
CO. MAYO												
BELMULLET	17.1	12.8	15.0	0.9	20.4	14	10.2	23	7.2	23	0	0
STRAIDE	18.5	12.1	15.3	0.7	20.5	14 26	5.5	23	0.1	23	0	0
KNOCK AIRPORT	17.0	11.0	14.0		20.2	26	8.6	8	4.5	23	0	0
DELPHI LODGE II	17.7	12.8	15.3		21.4	14	9.5	23	6.5	23	0	0
CO. MEATH												
WARRENTOWN	19.9	12.7	16.3	1.4	23.6	26	7.8	12	5.0	6 12	0	0
CO. MONAGHAN												
CARRICKMACROSS (DUNOGE)	19.3	12.0	15.7		22.7	1	7.1	23	4.6	23	0	0
CO. OFFALY												
DERRYGREENAGH	20.0	11.4	15.7	1.0	23.4	1 26	7.7	5	4.3	5	0	0
CO. SLIGO												
ARDTARMON	19.3	12.5	15.9		23.3	14	8.3	23	3.7	23	0	0
CO. TIPPERARY												
GURTEEN	18.9	12.0	15.5		21.8	26	6.6	23	3.1	23	0	0
FETHARD (PARSONSHILL)	18.9	11.8	15.4		21.3	25	6.7	6	4.2	6	0	0
CO. WATERFORD												
WATERFORD (TYCOR)	19.9	13.0	16.5	1.0	24.3	25	9.9	6			0	
DUNGARVAN (CARRIGLEA)	19.9	12.7	16.3	0.7	24.1	25	7.0	6	4.6	6	0	0
CO. WESTMEATH												
MULLINGAR	18.9	11.8	15.4	0.7	22.1	26	7.2	23	4.0	6	0	0
CO. WEXFORD												
JOHNSTOWN CASTLE	19.2	13.0	16.1	1.3	23.9	26	9.4	6	6.3	5	0	0
JOHN F. KENNEDY PARK	18.9	12.1	15.5	0.4	23.0	26	8.1	17	4.5	5	0	0
CLONROCHE (KNOXTOWN)	19.1	11.9	15.5		23.3	25	5.9	6	3.0	6		

County/ Station	Daily mean (hours/day)	% of average	% of possible	Most in a day/date	
CO. CAVAN					
CAVAN LORETO COLLEGE	3.61		22	11.0	2
CO. CLARE					
SHANNON AIRPORT	3.21	70	20	10.1	22
CO. CORK					
CORK AIRPORT	4.45	82	27	12.1	2
SHERKIN ISLAND	5.26	91	33	11.4	25
BALLINCURRIG (PEAFIELD)	4.18			9.5	4
CO. DONEGAL					
MALIN HEAD	3.80	89	23	12.8	22
BALLYSHANNON (CATHLEEN'S FALL)	3.40	85	20	13.0	22
CO. DUBLIN					
DUBLIN AIRPORT	4.59	86	28	10.7	2 5
CASEMENT AERODROME	4.08	83	25	9.8	14
CO. GALWAY					
GALWAY (UNIV. COLL.)	3.55	77	22	12.3	22
CO. KERRY					
VALENTIA OBSERVATORY	2.73	60	17	9.3	22
ARDFERT (LISCAHANE)	3.17		19	10.9	22
CO. MAYO					
BELMULLET	3.33	78	20	11.3	5
STRAIDE	3.43			12.2	22
KNOCK AIRPORT	3.13			12.4	22
CO. WATERFORD					
DUNGARVAN (CARRIGLEA)	5.00	95	31	12.2	2
CO. WEXFORD					
JOHN F. KENNEDY PARK	4.25	87	26	12.4	2
CLONROCHE (KNOXTOWN)	4.75			12.0	2

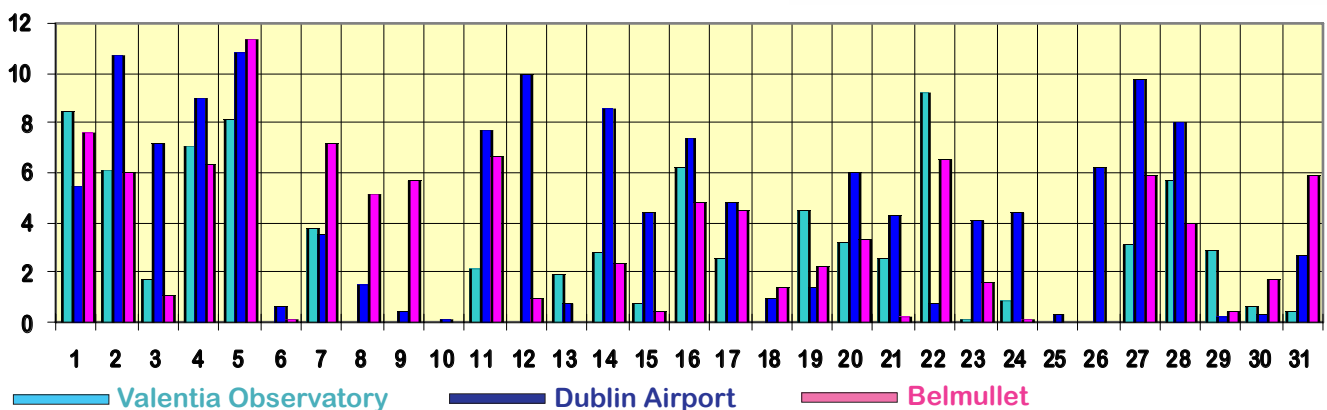
Duller than normal everywhere

For the first time during 2010, sunshine totals for the month were below normal everywhere. Totals ranged from 85 hours at Valentia Observatory to 163 hours at Sherkin Island, Co. Cork, with percentage of normal values between 60% of normal at Valentia and 95% at Dungarvan (Carriglea), Co. Waterford. At many stations it was the duller July for between seven and 12 years.

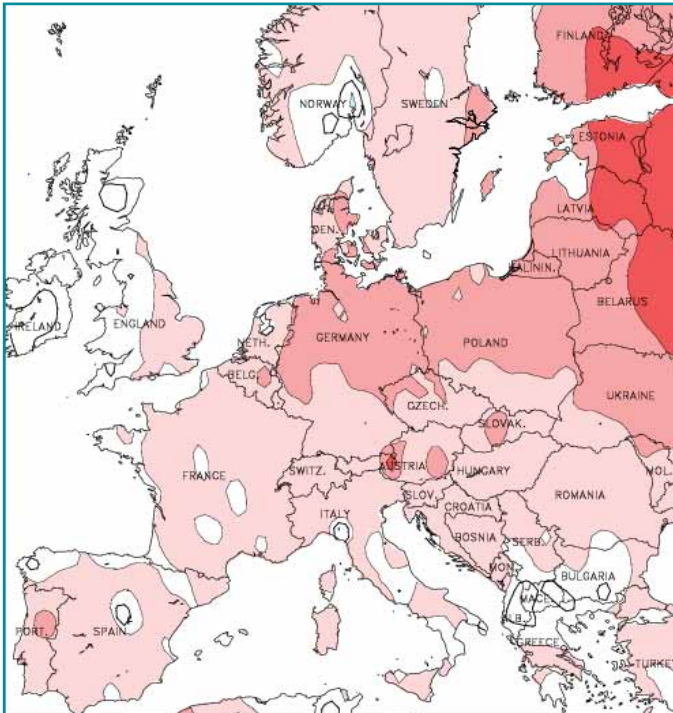
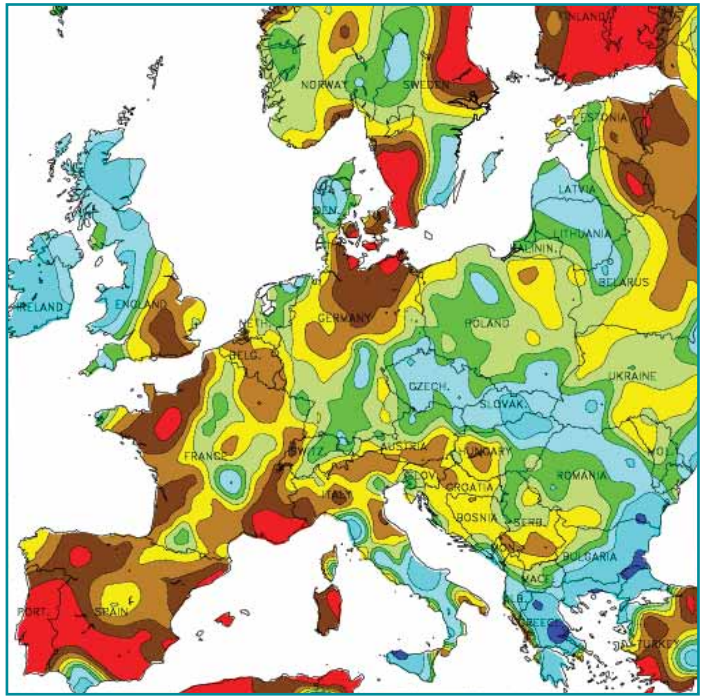
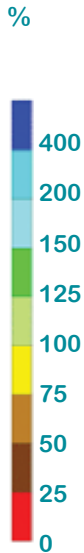
After a sunny start, generally dull conditions persisted from the 6th onwards. The 22nd was sunny in the west and north, however, and the month's highest daily value of 13.0 hours was measured at Ballyshannon (Cathleen's Fall) on this day. Global solar radiation totals were also below normal everywhere, ranging from 84% of normal at Valentia to 99% at Dublin Airport.



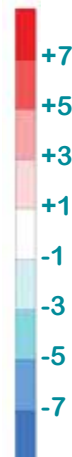
Daily sunshine values(hours)



JULY RAINFALL
(percentage of 1961-1990 normal)



°C



JULY MEAN TEMPERATURE
(difference from 1961-1990 normal)

Data supplied by NOAA
Climate Prediction Centre,
US Department of Commerce

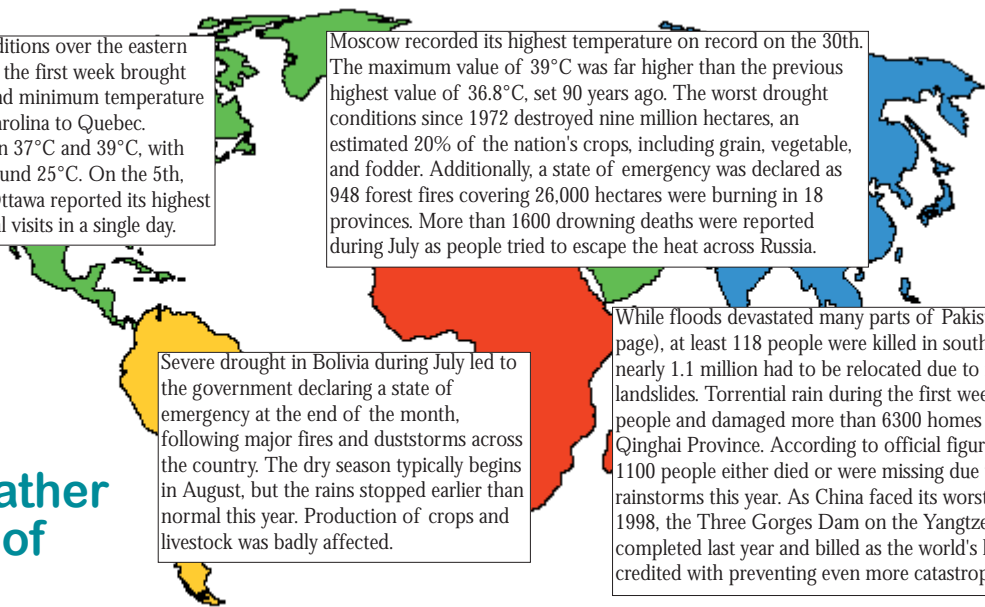
Extreme heatwave conditions over the eastern U.S. and Canada during the first week brought many new maximum and minimum temperature records, from North Carolina to Quebec. Maxima rose to between 37°C and 39°C, with minimum values of around 25°C. On the 5th, Montfort Hospital in Ottawa reported its highest ever number of hospital visits in a single day.

Moscow recorded its highest temperature on record on the 30th. The maximum value of 39°C was far higher than the previous highest value of 36.8°C, set 90 years ago. The worst drought conditions since 1972 destroyed nine million hectares, an estimated 20% of the nation's crops, including grain, vegetable, and fodder. Additionally, a state of emergency was declared as 948 forest fires covering 26,000 hectares were burning in 18 provinces. More than 1600 drowning deaths were reported during July as people tried to escape the heat across Russia.

Severe drought in Bolivia during July led to the government declaring a state of emergency at the end of the month, following major fires and duststorms across the country. The dry season typically begins in August, but the rains stopped earlier than normal this year. Production of crops and livestock was badly affected.

While floods devastated many parts of Pakistan (see back page), at least 118 people were killed in southern China and nearly 1.1 million had to be relocated due to flooding and landslides. Torrential rain during the first week also killed 29 people and damaged more than 6300 homes in parts of Qinghai Province. According to official figures, more than 1100 people either died or were missing due to the numerous rainstorms this year. As China faced its worst flooding since 1998, the Three Gorges Dam on the Yangtze River, completed last year and billed as the world's largest, was credited with preventing even more catastrophic flooding.

Global weather highlights of the month



MONSOON RAINFALL BRINGS WORST FLOODS IN PAKISTAN'S HISTORY

Every summer brings monsoon rain to Pakistan, but the rain which fell during this July led to the worst flooding in the country's 63-year history. Over 500mm of rain was recorded over parts of Peshawar and Punjab provinces during the second half of the month, representing around half of the normal total monsoon fall over the three-month season. More than 300mm fell in some places in the two-day period between the 29th and 30th, triggering extensive flooding along the upper reaches of the River Indus and threatening densely-populated areas further south. According to media sources, at least 1500 people were killed in the flooding and landslides in Pakistan and another 64 in Afghanistan. A plane crash near Islamabad that killed 152 people was also blamed on the severe weather. By August 1st, entire villages in northern Pakistan had been washed away, while an estimated 2.5 million people were affected by flooding of buildings and agricultural land, together with a lack of drinking water.



Below are satellite images of northern Pakistan taken on August 1st 2009 (*left*) and July 31st 2010 (*right*), captured by NASA's Terra satellite; both images use a combination of infrared and visible light to increase the contrast between water and land. Water varies in colour from electric blue to navy, vegetation is green and bare ground is pinkish brown. Clouds range in colour from nearly white to pale blue-green. Acquired at the same time of year, the images show the dramatic difference caused by torrential monsoon rains. Flowing roughly north-south, the Indus River appears as a braided stream in 2009, with patches of dry or nearly dry ground in the river valley. In 2010, the water level is high enough to cover areas that were dry the previous year. West of the river, long tendrils of standing water extend toward the northwest. Water levels are also significantly higher in tributaries east of the Indus River. The floods this year followed record-breaking heat in Pakistan during June, while the development of a severe heatwave over Russia at the same time has led to speculation that the extreme events may be connected, although no link has been proven.

(text and images courtesy NASA Earth Observatory, Pakistan Meteorological Department)

