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Monthly Weather Bulletin March 1991

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Monthly Weather Bulletin

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no. 59

Generally Mild, Wet and Dull

After a cold winter, spring arrived in March. Mean temperatures jumped about 4°C up from last month's values. It was the first time since last October that temperatures were well above normal everywhere. However along with the mildness came the rain, and the cloud that gave the rain blocked the sun for much of the time, so that with the exception of the southwest, it was a pretty dull month.

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An anticyclone centred over the North Sea between Scotland and the south of Norway on Monday the 25th gave the sunniest day of the month, with more than 11 hours of sunshine in some favoured southern locations. However it also brought a cold sea fog to the east coast of Scotland and the north of England.

(picture Dundee University)

Quiet end to mainly unsettled month

Although March began with a ridge moving across the country early on the 1st, giving the sharpest frost of the month, the pattern for the next three weeks or so was set when an active Atlantic rainbelt moved eastwards on the 2nd, leaving a southwesterly flow in its wake.

Another active rainbelt moved eastwards on the 4th in a strong and gusty unstable airflow. The only report of thunder during March came from Shannon Airport that day, which also saw the strongest gust of the month, 60 knots, recorded at Malin Head.

During the next couple of days the south to southwest windflow backed easterly as the main low

1st - 20th:
Mild, dull and wet

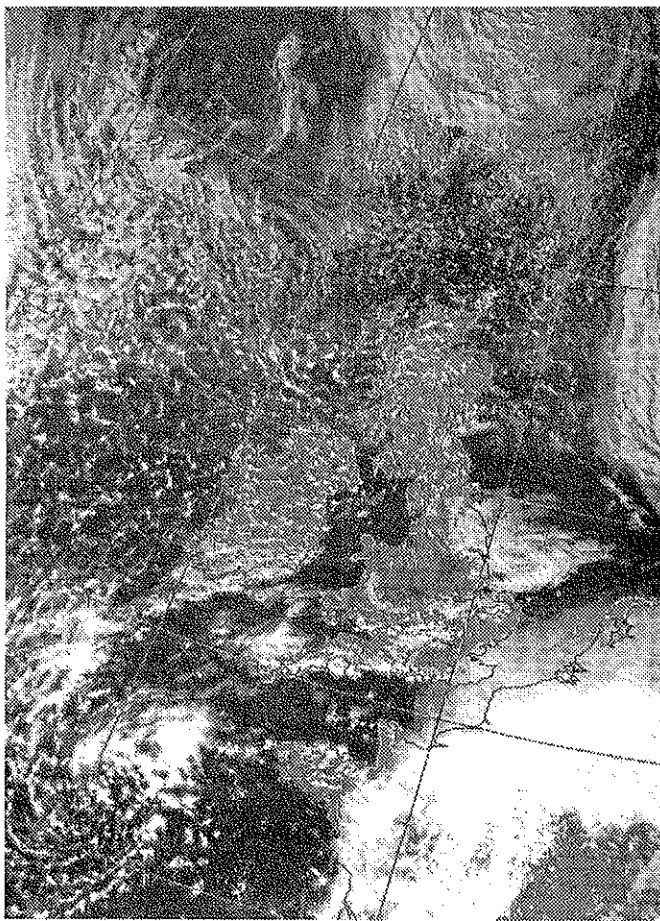
23rd - end:
High pressure dominant - mostly dry

pressure area shifted southeastwards towards the Bay of Biscay. A rainbelt moved up from the south during the 6th to become slow-moving over the country on the 7th, causing widely varying rainfall amounts. The low-pressure area in Biscay moved slowly north, to a position just east of Rosslare late on the 8th. This caused winds to become northeasterly and then northerly in direction. The depression continued its slow northward progress up the Irish Sea on the 9th. The wind turned southwesterly and the rain of the previous day gradually died out. By the 10th the wind had dropped off to light variable and there were just a few showers as a wave depression moved eastwards to the south of the country.

A further warm front, this time associated with a depression in mid-Atlantic, arrived on the 11th, causing rain to spread slowly northeastwards over Ireland.

This was the view from about 900 kilometres up at lunchtime on Thursday the 21st. The weak trough that had moved down across the country during the morning was lying over the south coast, causing the slight increase in cloud in that area. Further south, the cyclonic swirl of cloud indicates the position of the depression associated with the trough, as it headed towards the Bay of Biscay. A strengthening north to northwesterly flow of cool air behind the trough gave a day of sunny spells and scattered showers over Ireland.

(picture Dundee University)



Occasional rain the next day was due to the cold front that followed wobbling slowly eastwards; as on the 7th, amounts of rain varied widely. The slack and humid windflow continued on the 13th, although from a more westerly direction.

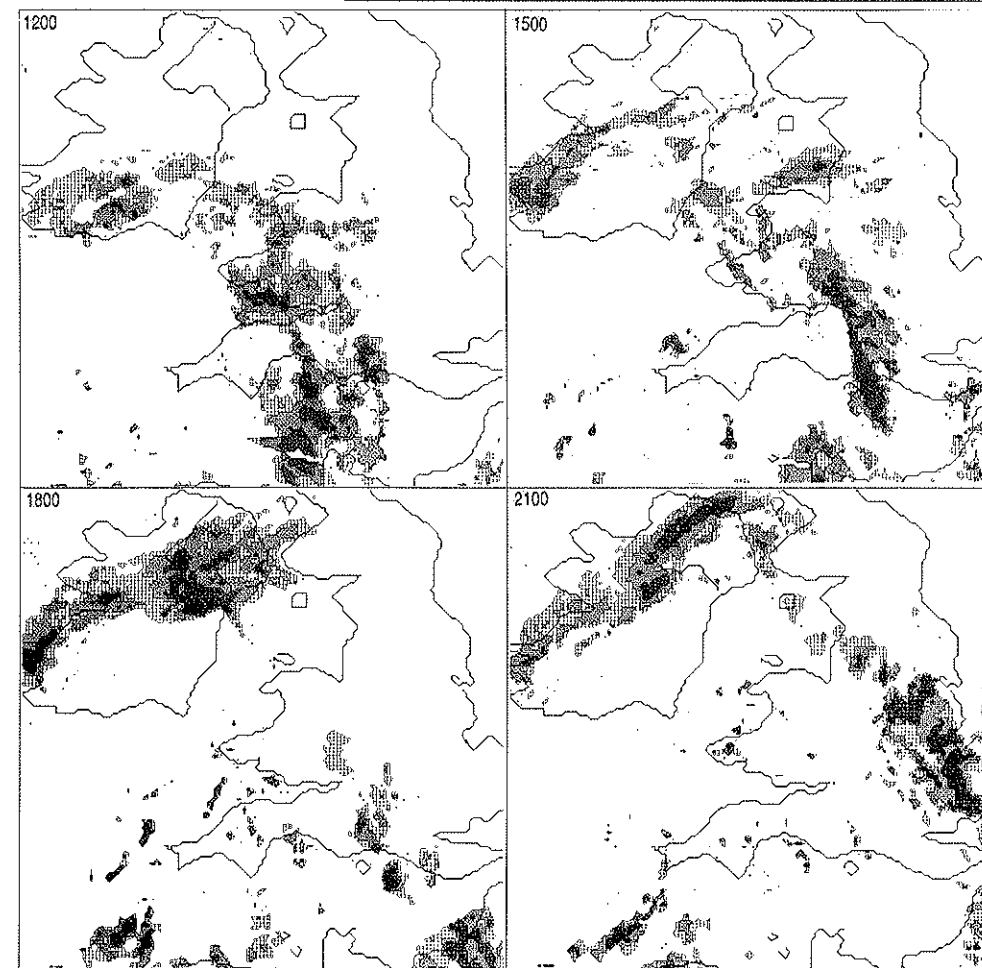
During the 14th however, winds became southerly again and gradually increased as an active warm front approached from the Atlantic late in the day. This front caused widespread rain the following day. A wave

depression developing on the cold front that followed moved in over the southwest on the 16th, to be over the midlands at the end of a day which was quite wet in most areas.

As the depression moved eastwards early on St. Patrick's Day, rain cleared to scattered showers. The most active warm front of the month affected the

country on the 18th, depositing an inch of rain or more on many western parts. Next day the winds were still strong and gusty as a cold front edged slowly south bringing more rain, except to the extreme north and south. There was rain again on the 20th, which was heavy in the south, east and midlands, as a depression moved eastwards

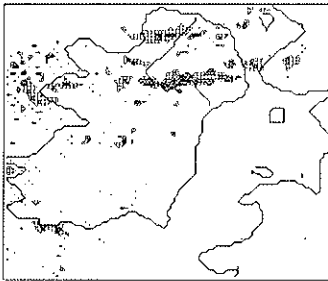
The period from the 15th to the 20th was wet. The sequence of radar pictures below shows the rainfall patterns on the afternoon and evening of the 16th, as a depression came in from the southwest pushing a curving rainbelt up from the south.



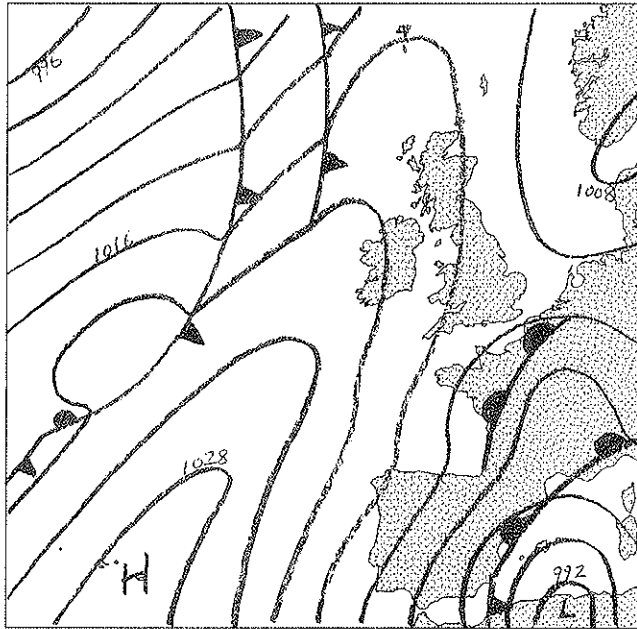
across the south of Ireland and then turned northeastwards up the Irish Sea.

Behind the depression winds turned northwesterly and the 21st and 22nd were days of sunshine and occasional showers. Then the weather settled down. After three frost-free weeks there was a slight air frost in places early on the 22nd. Pressure rose steadily on the 23rd. A ridge moved eastwards across Ireland on the 24th and an easterly airflow developed. The 25th was the sunniest day of the month but as winds turned more northeasterly on the 26th, it was only in parts of the west and north that the sun continued to shine.

There was a further slight air frost in places between the 24th and 26th. It stayed mainly dry over the next couple of days except for a few isolated showers. The 28th was dry and hazy in an easterly wind. Then the high-pressure area to the east slipped southwards and, as it amalgamated with a ridge to the west, a slack westerly windflow developed later on the 29th and on the 30th. As the flow backed slowly southwesterly and increased, it remained dry on the last two days of the month, apart from a few spots of rain near the north coast.



Showers and patches of rain affecting the country on the morning of Tuesday the 19th in a blustery west to southwest airflow.



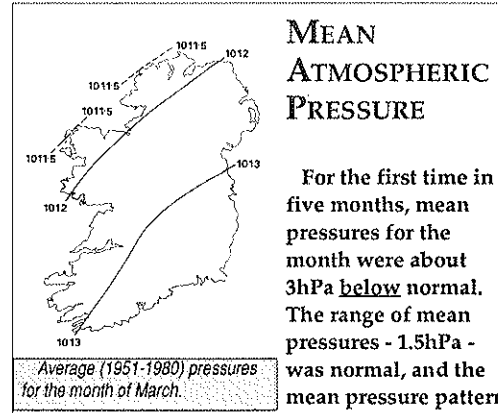
The end of the rain: the situation at midday on Saturday the 23rd as the ridge of high pressure extending up over the country from the southwest blocked the progress of the rainbelts to the west. The weather stayed mainly dry for the rest of the month.

Wind speeds during March were unexceptional. The strongest winds of the month occurred between the 2nd and the 5th, and between the 18th and 20th. There were between 10 and 12 days with gale gusts along northern, southern and southwestern coasts. Elsewhere gusts of gale force or over occurred on between 3 and 7 days.

Much of the month's fog occurred as a result of the slack, moist airflow that persisted from the 6th to the 13th. Cork Airport had 14 days with fog; there were 9 or 10 such days along the east coast, while elsewhere there was fog on between 1 and 7 days, the exception being Belmullet where no fog at all was reported during March. Hail was mostly confined to coastal areas in the west and

northwest, falling on the 2nd and 3rd and in the period from the 20th to the 22nd. Some snow also fell on the 2nd and 3rd, this time only at a few inland stations.

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

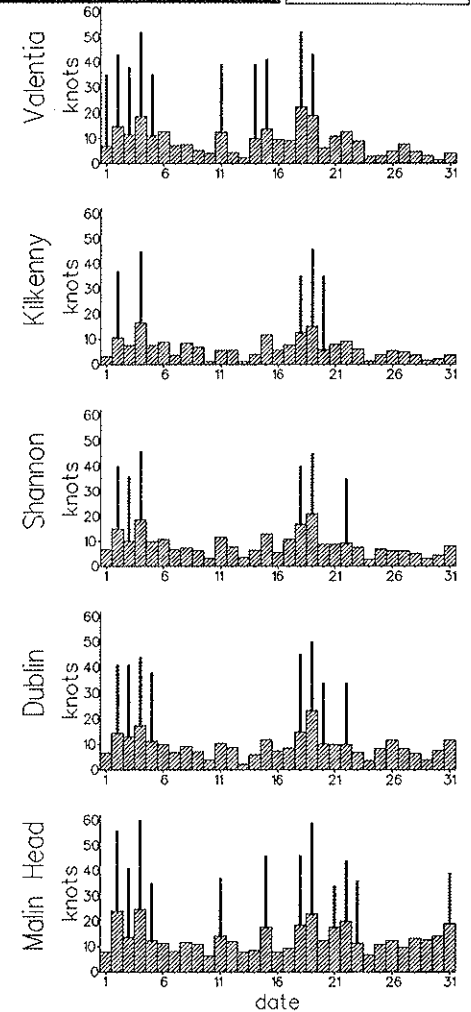
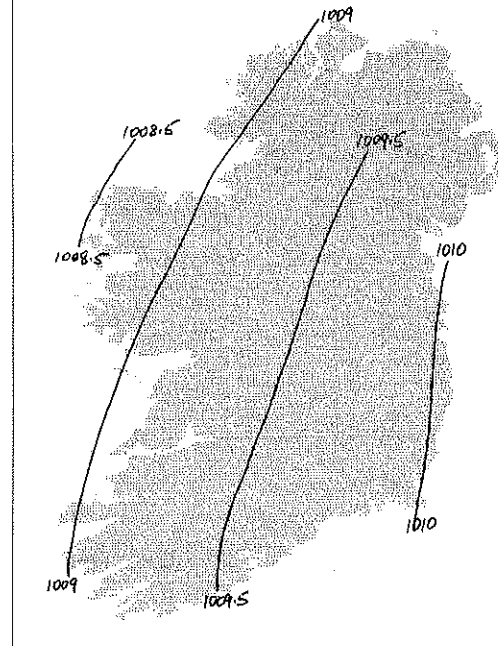


Average (1951-1980) pressures for the month of March.

MEAN ATMOSPHERIC PRESSURE

For the first time in five months, mean pressures for the month were about 3hPa below normal. The range of mean pressures - 1.5hPa - was normal, and the mean pressure pattern

was also similar to the usual March distribution, although there was a bit more of a southerly component. All of which ties in with the fact that March was a mainly unsettled month, generally wet, mild and dull.



SEA TEMPERATURES

The temperature of the seas off our coasts followed the normal pattern and began to slowly warm again during March. Malin Head reported a mean sea surface temperature for the month of 7.3°C, which is about normal for the time of year and a degree above last month's value. Whereas last month's value was almost two degrees higher than the station's mean air temperature, in March the two values were almost the same.

Over 200% in north and north midlands

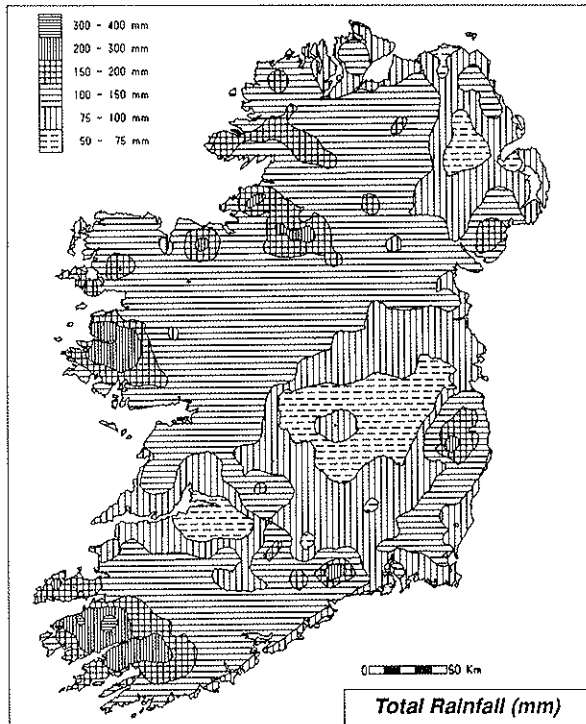
March was a wet month everywhere. Totals varied quite a bit across the country: while Dublin Airport had its wettest March for 10 years, in the extreme north and northwest it was the driest March since 1984.

Totals for the month ranged from just over 50mm at some stations in the south midlands, to more than five times that amount in mountain areas of the west and southwest. Only in parts of the south midlands were amounts close to normal; elsewhere rainfall was well above normal, exceeding 200% in some areas in the north and north midlands.

Almost all of March's rain fell during the first three weeks of the month - the last 9 days were mainly dry everywhere, although as the month ended there was some significant rain in the northwest on the night of the 31st/1st April. The heaviest rain

fell on the 18th and 20th, and to a lesser extent on the 11th and 16th. The greatest daily fall of the month occurred on the 18th when a total of 62.5mm was measured

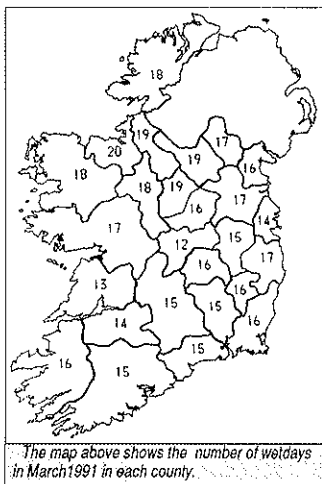
at Maam Valley in Connemara. A fall of 30mm was recorded at Claremorris on the 18th, the greatest daily fall there during the month of March for 37 years.



The Effects of Altitude on Rainfall

"Annual amounts of precipitation increase by between 100mm on eastern slopes and 200mm on exposed western slopes for every 100m rise in altitude, the higher values occurring in the uplands of the west. At an elevation of 300m, the annual rainfall may be as much as 50% greater than in the adjoining lowlands. Some summits in the southwest receive over 3000mm annually. The increase in rainfall is accounted for by the general uplift of air over raised ground, which enhances both the intensity and duration of the rain and showers. There is also a consequential increase in the number of rain-days and wet-days in upland areas. Many areas in the lee of mountains and hill ranges enjoy relatively lighter rainfalls because of protection from the prevailing westerly winds. The situation becomes complex in ranges such as the Wicklow and Donegal mountains where local peaks and valleys occur over relatively short distances."

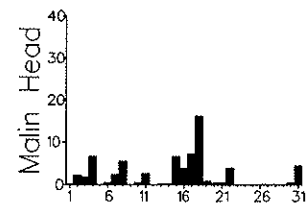
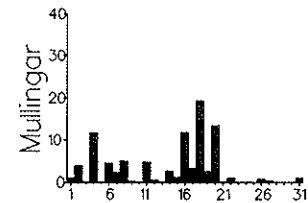
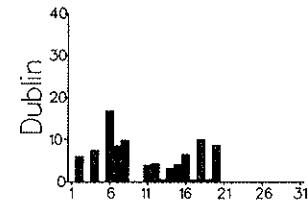
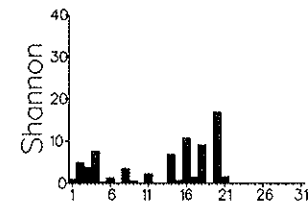
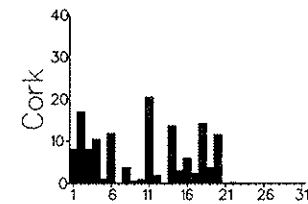
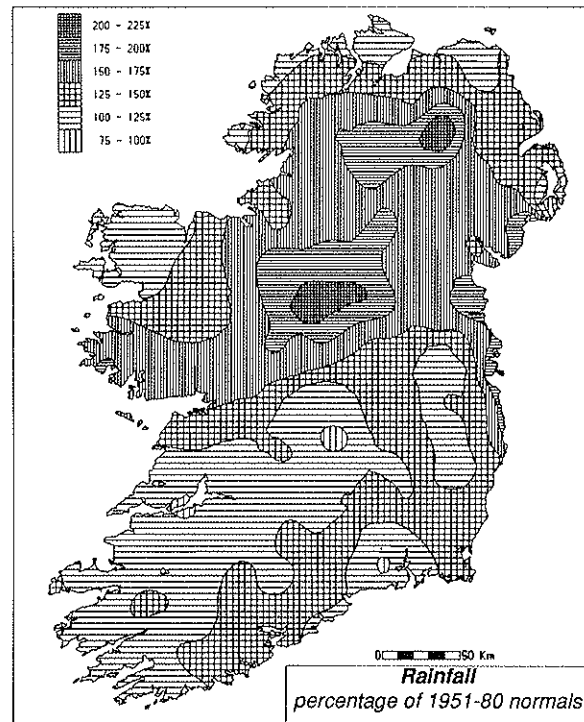
(from 'Climate, Weather and Irish Agriculture', ed. T. Keane)



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

| COUNTY | DAY | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | TOTAL | | | | | | |
|-----------|-----|----|---|----|----|----|----|----|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|-------|-------|-------|-------|-------|-----|
| | 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 | 31 | | | | | | | |
| Carlow | 7 | 19 | 5 | 10 | 1 | 11 | 3 | 4 | - | 9 | - | 9 | - | 7 | 2 | 9 | 5 | 7 | 12 | - | 1 | - | - | - | - | - | - | - | - | - | - | 1 | ..... | 129 | | | | |
| Cavan | 3 | 6 | 3 | 10 | - | 4 | 9 | 9 | 1 | - | 11 | 1 | - | 8 | 11 | 16 | 12 | 27 | 8 | 10 | 1 | 2 | - | - | - | - | - | - | - | - | - | 6 | ..... | 163 | | | | |
| Clare | 4 | 10 | 3 | 8 | 2 | 3 | - | 6 | - | 6 | - | 6 | - | 2 | 7 | 3 | 17 | 6 | 14 | 1 | 23 | 1 | 1 | - | - | - | - | - | - | - | - | 4 | ..... | 121 | | | | |
| Cork | 11 | 8 | 9 | 7 | 11 | - | 3 | 1 | 2 | 14 | 1 | - | 10 | 3 | 7 | 10 | 9 | 6 | 8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 121 | | | | |
| Donegal | 1 | 7 | 3 | 9 | - | 2 | 6 | 7 | - | - | 4 | 2 | 1 | 3 | 9 | 14 | 6 | 24 | 3 | 3 | 4 | 4 | - | - | - | - | - | - | - | - | - | 3 | ..... | 127 | | | | |
| Dublin | 1 | 13 | 3 | 9 | 2 | 0 | 16 | 16 | 1 | - | 5 | 8 | 1 | 7 | 2 | 11 | 2 | 11 | 3 | 22 | 1 | 2 | - | - | - | - | - | - | - | - | - | - | 1 | ..... | 157 | | | |
| Galway | 5 | 8 | 5 | 8 | 2 | 4 | 2 | 6 | - | - | 10 | 1 | 1 | 5 | 13 | 30 | 4 | 27 | 4 | 13 | - | 1 | - | - | - | - | - | - | - | - | - | - | 1 | ..... | 164 | | | |
| Kerry | 9 | 8 | 6 | 11 | - | 8 | - | 2 | 1 | 7 | 1 | - | 5 | 3 | 16 | 8 | 12 | 3 | 12 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | 1 | ..... | 116 | | | |
| Kildare | 1 | 15 | - | 6 | 1 | 3 | 4 | 5 | - | - | 2 | 9 | 1 | 4 | - | 10 | 2 | 18 | 6 | 30 | 1 | 2 | - | - | - | - | - | - | - | - | - | - | 1 | ..... | 125 | | | |
| Kilkenny | 7 | 14 | 5 | 10 | 2 | 8 | 2 | 3 | - | - | 8 | 5 | - | 5 | 1 | 9 | 7 | 10 | 5 | 16 | - | 1 | - | - | - | - | - | - | - | - | - | - | - | 1 | ..... | 119 | | |
| Leaoli | 2 | 4 | 2 | 9 | 3 | 9 | 6 | 2 | - | - | 3 | 2 | 4 | 2 | 19 | - | 4 | 2 | 19 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | ..... | 97 | | |
| Leitrim | 2 | 10 | 2 | 11 | - | 3 | 9 | 6 | 1 | - | 9 | 1 | 1 | 3 | 18 | 17 | 10 | 24 | 6 | 8 | 1 | 4 | - | - | - | - | - | - | - | - | - | - | - | 2 | ..... | 158 | | |
| Limerick | 9 | 5 | 2 | 14 | 3 | 5 | - | 6 | 1 | - | 1 | - | 4 | 2 | 17 | 4 | 2 | 9 | 22 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 107 | | | |
| Longford | 7 | 2 | 2 | 10 | 1 | 2 | 6 | 14 | 1 | - | 8 | 1 | - | 6 | 9 | 35 | 10 | 24 | 27 | 19 | - | 2 | - | - | - | - | - | - | - | - | - | - | - | 5 | ..... | 200 | | |
| Louth | 3 | 5 | 1 | 4 | 1 | 6 | 13 | 15 | 1 | - | 15 | 5 | - | 8 | 3 | 17 | 3 | 29 | 17 | 20 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | 2 | ..... | 170 | |
| Maye | 3 | 12 | 3 | 7 | - | 1 | 4 | 2 | - | - | 7 | 1 | 1 | 4 | 6 | 8 | 6 | 30 | 6 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | 11 | ..... | 122 | |
| Meath | 3 | 5 | - | 2 | 2 | 9 | 14 | 11 | 1 | - | 4 | 4 | - | 9 | 1 | 19 | 2 | 19 | 4 | 21 | 1 | 4 | - | - | - | - | - | - | - | - | - | - | - | - | 4 | ..... | 140 | |
| Monaghan | 4 | 5 | 3 | 10 | - | 4 | 12 | 9 | 2 | - | 5 | 4 | 1 | 8 | 17 | 17 | 5 | 23 | 9 | 21 | 5 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | 2 | ..... | 171 | |
| Offaly | 2 | 5 | 4 | 7 | 1 | 7 | 1 | 9 | - | 6 | 1 | - | 9 | - | 17 | 3 | 21 | 2 | 21 | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | ..... | 120 | |
| Roscommon | 7 | 6 | 1 | 15 | - | 3 | 4 | 10 | - | 10 | 1 | - | 6 | 15 | 37 | 6 | 26 | 5 | 19 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 | ..... | 186 | |
| Sligo | 6 | 8 | 3 | 10 | - | 2 | 13 | 5 | 1 | - | 8 | 3 | 1 | 3 | 18 | 15 | 5 | 34 | 2 | 13 | 5 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | 3 | ..... | 171 | |
| Tipperary | 7 | 12 | 9 | 10 | 4 | 13 | 1 | 7 | - | 1 | 4 | - | 1 | 3 | 3 | 8 | 11 | 8 | 7 | 16 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | 127 | | |
| Waterford | 8 | 13 | 7 | 3 | - | 12 | - | 8 | 4 | 1 | 22 | - | 1 | 17 | 5 | 7 | 10 | 8 | 5 | 10 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 141 | | |
| Westmeath | 2 | 6 | - | 19 | - | 7 | 4 | 8 | - | 8 | 1 | - | 4 | 2 | 19 | 5 | 31 | 4 | 22 | - | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 | ..... | 148 | |
| Wexford | 6 | 11 | 2 | 7 | 5 | 9 | 2 | 6 | - | - | 12 | 14 | - | 11 | 5 | 7 | 5 | 12 | 4 | 15 | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | 134 | | |
| Wicklow | 5 | 15 | 7 | 12 | 2 | 11 | 7 | 8 | - | - | 9 | 6 | - | 6 | 3 | 9 | 3 | 12 | 1 | 15 | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | | 133 |
| MEAN | 5 | 9 | 3 | 9 | 1 | 7 | 5 | 7 | 1 | - | 8 | 3 | 1 | 6 | 6 | 16 | 6 | 18 | 6 | 16 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | 4 | | 141 |

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, 7% of the average monthly rainfall in Co. Carlow fell on 1st.



Daily rainfall amounts (millimetres)

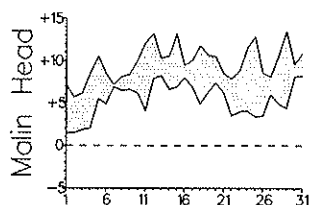
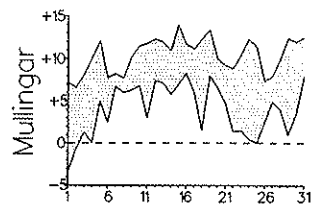
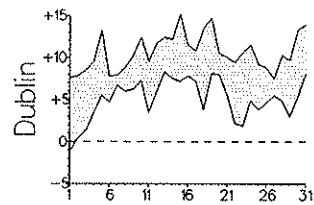
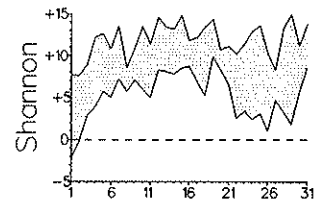
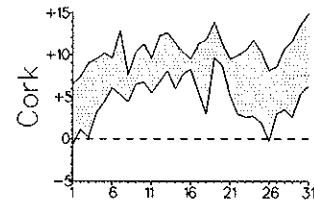
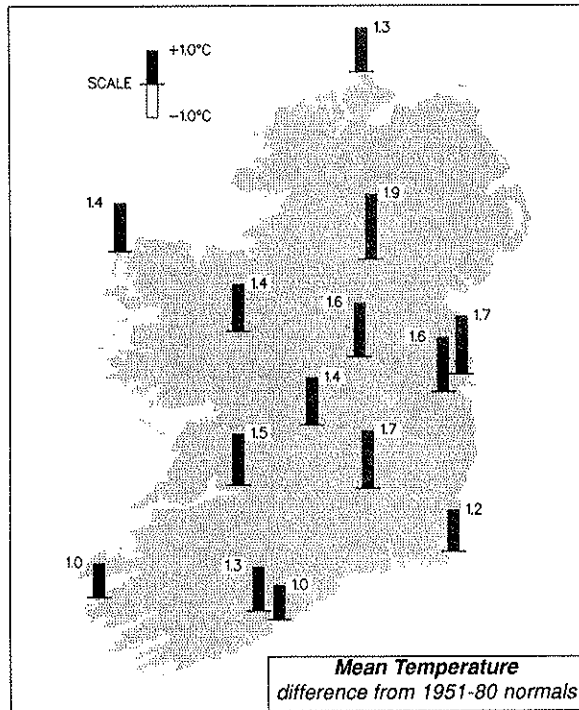
Mild overall, after cold start

Although it didn't set any records, March was a mild month overall. Mean temperatures ranged from 7.2°C in parts of the midlands and northwest, up to 8.8°C at Valentia Observatory. That's about 4°C higher than last month's mean temperatures, and a degree or two above normal for the month of March.

While air temperatures stayed above freezing throughout at a number of coastal locations and at Merrion Square in the centre of Dublin, there were 7 days with air frost at Ardee. All stations had some ground frost however, ranging from 3 such days along

the south coast up to 17 days with frost on the ground at Clonroche in Co. Wexford. The 1st was the coldest day of the month everywhere, with sub-zero air temperatures at most stations, down to -4.7°C at Markree Castle in Co. Sligo. Ground temperatures dropped to below -10.0°C at a number of inland stations that night. It warmed up over the following couple of days however.

Although many stations had their warmest days during the last few days of the month, notably the 29th and 31st, the highest temperature was 16.8°C, recorded at Mooncoin on the 19th, the warmest day of the month at many southern and eastern stations.



Daily maximum and minimum temperatures (degrees Celsius)

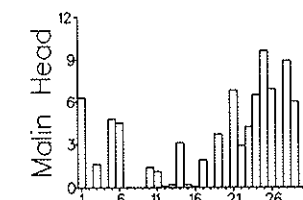
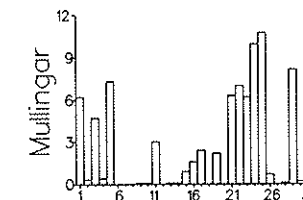
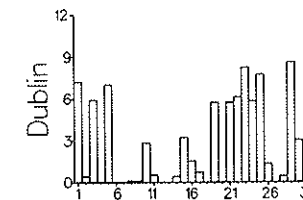
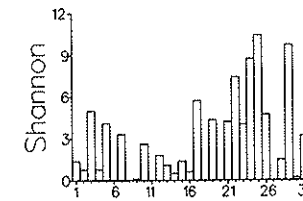
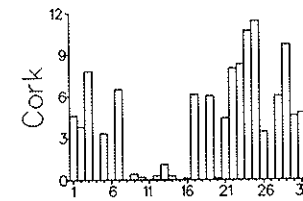
Dull, except in the southwest

Cork and Kerry got the best of the sunshine. Although it was the sunniest March for 5 years in Cork and the sunniest since 1975 at Valentia Observatory in Cahirciveen, it was the dulllest for 7 or 8 years in North Leinster.

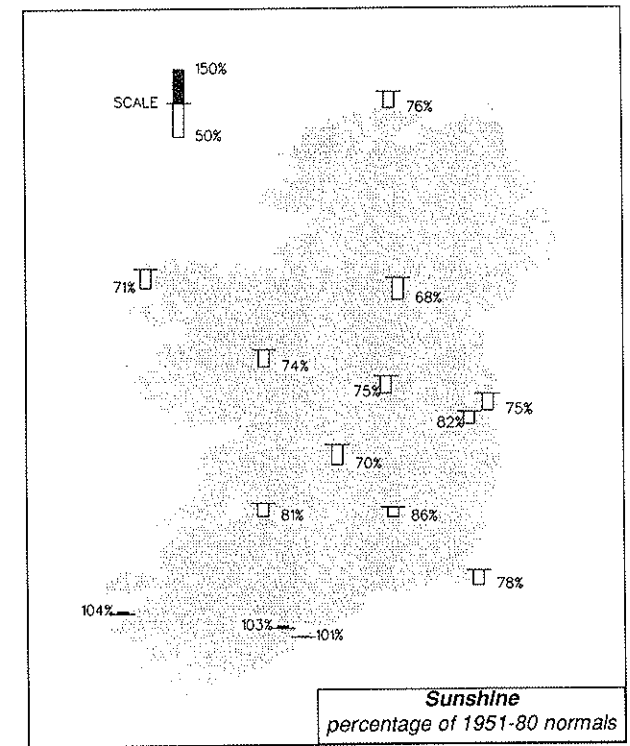
The sun shone for around 3.5 hours each day on average in the south and southwest, slightly above normal for the time of year. However at Clones there was an average just over 2 hours a day, and generally in the north midlands and northwest sunshine amounts were down to around 70% of normal.

There was good sunshine on the 1st, 3rd, 5th, and on St. Patrick's Day in the south and west. Otherwise the best of the sunshine occurred in the period from 21st to the 25th and on the 29th. Most stations had their sunniest day of the month on Monday the 25th, when the sun shone for 11.4 hours at Cork Airport, making it the sunniest March day there for 10 years.

There were between 6 and 10 days with no sunshine at all during March. Comparing the mean daily sunshine durations to length of day, at Clones there was just 18% of possible sunshine, whereas at Sherkin Island, off the southwest tip of Co. Cork, there was almost a third of possible sunshine during the month.



Daily sunshine amounts (hours)



Spring farming held up by wet weather

The wet conditions of February continued until March 22nd. Rainfall for the first three weeks of March exceeded 250 per cent of average (for the three-week period) in the north-midlands and east. Elsewhere it was about 200 per cent but less than 150 per cent of average in the west-midlands and northwest. After this there was a dramatic turnaround and a dry, settled spell began which lasted until the end of the month.

1st - 22nd: Atlantic troughs to the south and west of Ireland brought a series of rainbelts to the country throughout this period. The wettest spell occurred from 15th to 20th. Work on spring tillage and putting fertilizer on winter crops and on grass was possible only on a few occasions (either on free-draining soils or in some instances through the use of special tractor tyres). While the soil temperature was high - about 1.5°C above average - many farmers could not take advantage of the potential for growth, which was very good for the time of year.

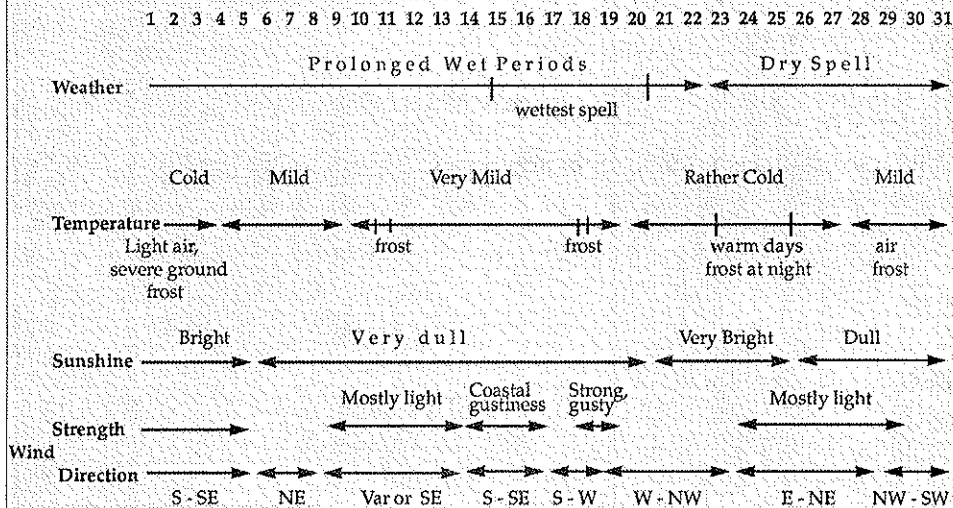
23rd - 31st: In complete contrast this period was dry and generally colder. There was no rainfall except on one or two days in the west or north-midlands. Soil temperature was still above average, by about 0.5°C. The much delayed spring work was undertaken as field conditions improved. Soil moisture deficits at the end of the month were about 7 to 9mm in the midlands and east, and about 1 or 2mm in the west.

SOLAR RADIATION

Solar radiation is the ultimate source of energy in the world. "The total amount of solar radiation is the sum of the direct beam radiation which comes straight from the region of the sun, and diffuse radiation which has undergone scattering during its passage through the atmosphere.... Crop growth depends on solar radiation since roughly half the total radiation received is active in promoting the vital process of photosynthesis of organic matter from carbon dioxide and water. However the efficiency with which solar energy is used depends on crop temperature and on the availability of water and nutrients."

- Rohan, 'The Climate of Ireland'

Time-line sequences of weather in March



| Station | period | RAINFALL | | TEMPERATURE | | | | | | | | | | SUNSHINE | | mean wind speed (ms) (m.s.g.l.) P.E. (Penman) (mm) | | | | | | | |
|------------------------------|--------------|----------|--------------|-------------|----------|-----------|-----------|------------|--------------------|-------------|------|---------------------|-------------------|----------------------|---------------------|--|------|------------------------|--------------------|--------------------|--------------------|--------------|----|
| | | 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°C | degree days > 10.0°C | lowest "grass-min." | | date | days with ground frost | mean 10cm at 0900h | mean 20cm at 0900h | total no. of hours | % of average | |
| Co. Cork Fermoy | 1-10 | 60.5 | - | 10 | 7 | 10.7 | 3.5 | 7.1 | - | -4.1 | 1 | 2 | 33 | 3 | -9.5 | 1 | 6 | 5.9 | 6.4 | 29.2 | - | 3.2 | - |
| | 11-20 | 31.9 | - | 8 | 7 | 12.6 | 7.2 | 9.9 | - | 1.7 | 18 | 0 | 56 | 9 | 0.5 | 11 | 0 | 8.7 | 8.7 | 11.9 | - | 3.1 | - |
| | 21-end month | 0.1 | - | 0 | 0 | 11.9 | 1.9 | 6.9 | - | -2.5 | 25 | 4 | 35 | 6 | -6.5 | 25 | 9 | 7.0 | 8.2 | 59.7 | - | 2.6 | - |
| | month | 92.5 | 119 | 18 | 14 | 11.7 | 4.1 | 7.9 | 1.4 | -4.1 | 1 | 6 | 124 | 18 | -9.5 | 1 | 15 | 7.2 | 7.8 | 100.8 | 101 | 3.0 | 23 |
| Co. Donegal Letterkenny | 1-10 | 34.2 | - | 8 | 5 | 9.3 | 3.1 | 6.2 | - | -2.9 | 1 | 1 | 23 | 1 | - | - | - | - | - | - | - | - | - |
| | 11-20 | 51.3 | - | 10 | 9 | 12.1 | 5.9 | 9.0 | - | 0.9 | 11 | 0 | 47 | 6 | - | - | - | - | - | - | - | - | - |
| | 21-end month | 18.7 | - | 6 | 4 | 11.9 | 3.3 | 7.6 | - | 0.1 | 26 | 0 | 40 | 6 | - | - | - | - | - | - | - | - | - |
| | month | 104.2 | - | 24 | 18 | 11.1 | 4.1 | 7.6 | - | -2.9 | 1 | 1 | 110 | 13 | - | - | - | - | - | - | - | - | - |
| Co. Kerry Ardferf | 1-10 | 31.0 | - | 8 | 7 | 10.8 | 3.5 | 7.2 | - | -1.9 | 1 | 1 | 31 | 3 | -7.2 | 1 | 6 | - | - | 28.3 | - | - | - |
| | 11-20 | 62.2 | - | 8 | 8 | 12.9 | 7.5 | 10.2 | - | 4.0 | 11 | 0 | 58 | 11 | -0.9 | 11 | 3 | - | - | 10.8 | - | - | - |
| | 21-end month | 4.1 | - | 4 | 2 | 12.2 | 2.8 | 7.5 | - | -1.1 | 26 | 1 | 40 | 8 | -4.6 | 26 | 7 | - | - | 66.0 | - | - | - |
| | month | 97.3 | - | 20 | 17 | 11.9 | 4.6 | 8.3 | - | -1.9 | 1 | 2 | 129 | 21 | -7.2 | 1 | 16 | - | - | 105.1 | - | - | - |
| Co. Leitrim Ballinamore | 1-10 | 38.3 | - | 9 | 7 | 9.6 | 2.0 | 6.2 | - | -3.1 | 1 | 2 | 25 | 2 | -8.1 | 1 | 4 | 4.7 | 5.3 | 12.9 | - | 2.4 | - |
| | 11-20 | 100.8 | - | 8 | 8 | 11.9 | 5.5 | 8.7 | - | 0.2 | 11 | 0 | 45 | 5 | -3.9 | 11 | 2 | 8.0 | 8.1 | 5.7 | - | 2.7 | - |
| | 21-end month | 13.9 | - | 4 | 4 | 11.4 | 2.7 | 7.1 | - | -1.0 | 29 | 1 | 35 | 5 | -5.3 | 29 | 6 | 5.8 | 7.6 | 53.4 | - | 2.1 | - |
| | month | 153.0 | 182 | 21 | 19 | 11.0 | 3.6 | 7.3 | 1.7 | -3.1 | 1 | 3 | 105 | 12 | -8.1 | 1 | 12 | 6.2 | 7.0 | 70.0 | 70 | 2.4 | 21 |
| Co. Louth Ardee | 1-10 | 36.1 | - | 7 | 6 | 9.6 | 3.3 | 6.5 | - | -3.7 | 1 | 3 | 27 | 1 | -10.1 | 1 | 2 | 4.9 | 5.3 | - | - | - | - |
| | 11-20 | 58.2 | - | 9 | 8 | 13.5 | 5.7 | 9.6 | - | 1.0 | 11 | 0 | 53 | 10 | -2.0 | 18 | 2 | 8.5 | 8.2 | - | - | - | - |
| | 21-end month | 5.4 | - | 3 | 2 | 11.0 | 1.9 | 6.5 | - | -2.2 | 27 | 4 | 32 | 4 | -7.9 | 27 | 9 | 6.0 | 7.2 | - | - | - | - |
| | month | 99.7 | 175 | 19 | 16 | 11.4 | 3.6 | 7.5 | - | -3.7 | 1 | 7 | 112 | 15 | -10.1 | 1 | 13 | 6.5 | 6.9 | - | - | - | - |
| Co. Waterford Dungarvan | 1-10 | 48.9 | - | 9 | 8 | 10.6 | 3.4 | 7.0 | - | -2.4 | 1 | 1 | 31 | 2 | -4.5 | 1 | 3 | - | 6.8 | 27.3 | - | 2.8 | - |
| | 11-20 | 70.6 | - | 10 | 9 | 12.7 | 7.1 | 9.9 | - | 1.3 | 18 | 0 | 56 | 9 | 1.3 | 18 | 0 | - | 9.1 | 13.8 | - | 3.2 | - |
| | 21-end month | 0.9 | - | 2 | 0 | 12.6 | 3.1 | 7.9 | - | -0.4 | 29 | 1 | 43 | 8 | -2.6 | 25 | 3 | - | 8.1 | 58.1 | - | 1.8 | - |
| | month | 120.4 | - | 21 | 17 | 12.0 | 4.5 | 8.3 | - | -2.4 | 1 | 2 | 130 | 19 | -4.5 | 1 | 6 | - | 8.0 | 99.2 | - | 2.6 | 13 |
| Co. Wexford Johnstown Castle | 1-10 | 35.2 | - | 8 | 7 | 10.4 | 4.5 | 7.5 | - | -1.3 | 1 | 1 | 33 | 2 | -3.4 | 4 | 5 | 6.0 | 6.6 | 25.5 | - | 1.9 | - |
| | 11-20 | 69.6 | - | 10 | 9 | 11.1 | 6.8 | 9.0 | - | 3.7 | 11 | 0 | 46 | 3 | -2.6 | 18 | 2 | 8.4 | 8.6 | 14.9 | - | 1.9 | - |
| | 21-end month | 0.6 | - | 2 | 0 | 10.7 | 4.1 | 7.4 | - | 1.7 | 25 | 0 | 35 | 3 | -3.7 | 24 | 7 | 6.8 | 8.1 | 61.8 | - | 1.3 | - |
| | month | 105.4 | 141 | 20 | 16 | 10.7 | 5.1 | 7.9 | 1.7 | -1.3 | 1 | 1 | 114 | 8 | -3.7 | 24 | 14 | 7.0 | 7.8 | 102.2 | 93 | 1.7 | 23 |

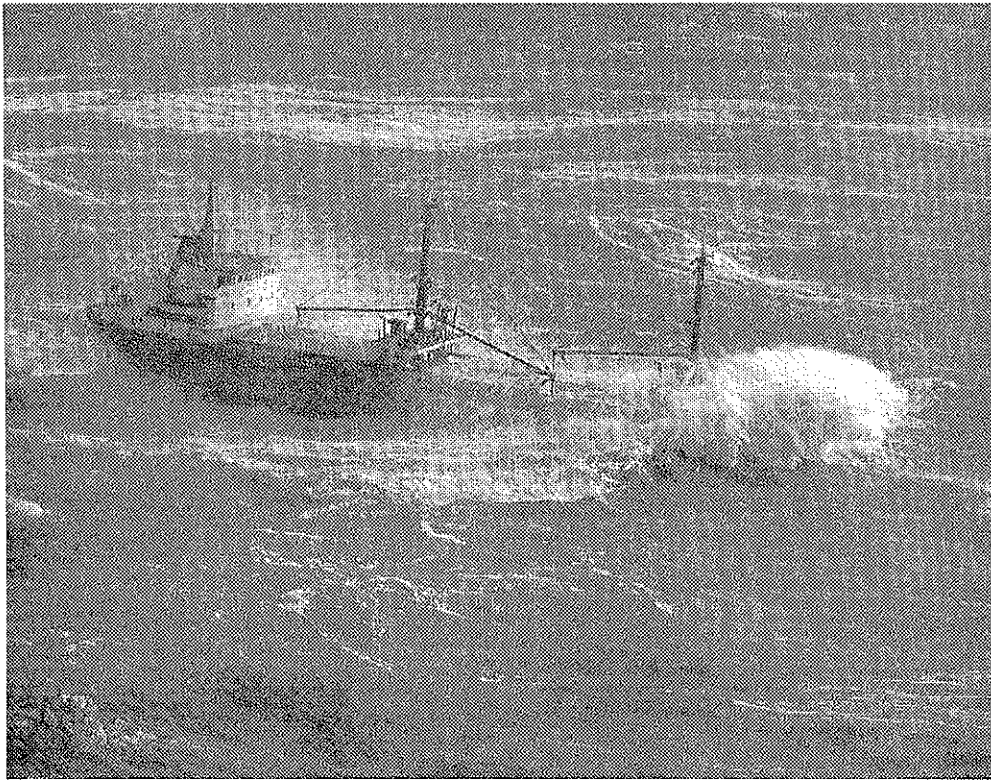
MEASURED POTENTIAL EVAPOTRANSPIRATION (P.E.) AND SOIL MOISTURE

| County/Station | Period | P.E. (mm) | | Soil Moisture (mm) | |
|------------------------------|--------------|-----------|---------|---------------------|---------|
| | | Amount | Deficit | Accumulated Deficit | Surplus |
| Co. Carlow Carlow (Oak Park) | 1-10 | 2.6 | - | 0 | 30 |
| | 11-22 | 16.2 | - | 0 | 24 |
| | 23-end month | 10.5 | 9 | 9 | - |
| | month | 29.3 | - | - | - |
| Co. Dublin Kinsealy | 1-10 | 1.1 | - | 0 | 47 |
| | 11-21 | 3.8 | - | 0 | 44 |
| | 22-end month | 8.1 | 7 | 7 | - |
| | month | 13.0 | - | - | - |
| Co. Kerry Cahirciveen | 1-10 | 4.8 | - | 0 | 37 |
| | 11-21 | (-2.7) | - | 0 | 98 |
| | 22-end month | 6.3 | 2 | 2 | - |
| | month | 8.4 | - | - | - |
| Co. Leitrim Ballinamore | 1-10 | NA | - | 0 | - |
| | 11-21 | NA | - | 0 | - |
| | 22-end month | 7.1 | 7 | 7 | - |
| | month | NA | - | - | - |
| Co. Wexford Johnstown Castle | 1-10 | 6.9 | - | 0 | 28 |
| | 11-21 | 9.6 | - | 0 | 60 |
| | 22-end month | 8.0 | 8 | 8 | - |
| | month | 24.5 | - | - | - |

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 | 47.61 | 60.51 | 121.93 | 230.05 | 32 |
| Co. Dublin Dublin Airport | 52.54 | 55.13 | 129.05 | 236.72 | 32 |
| Co. Kerry Cahirciveen | 73.67 | 66.75 | 135.30 | 275.72 | 32 |
| Co. Kilkenny Kilkenny | 60.36 | 53.60 | 126.33 | 240.29 | 27 |
| Co. Mayo Belmullet | 55.08 | 59.39 | 134.12 | 248.59 | 31 |
| Co. Monaghan Clones | 48.29 | 49.68 | 120.47 | 218.44 | 28 |
| Co. Offaly Birr | 52.71 | 55.07 | 120.27 | 228.05 | 23 |



OCEAN WAVES

Ocean waves are generated by the wind. As the wind blows over the surface of the sea, waves develop. At first they grow in both height and length, but even after they reach their maximum height they may continue to grow in length. Wave height is a function of the mean speed of the wind, but it is also influenced by the duration of the wind and by the 'fetch' or distance over which the wind blows. Waves under the influence of wind are called 'sea'. The sea often seems to be a confused and constantly changing collection of waves. This is due to variations in the shape and direction of the waves.

Once the waves have escaped from the winds that made them they are called 'swell'. These waves can run for days with very little loss of energy. Strong winds from an opposing direction can destroy them in a matter of hours however. The life of a wave depends on the smoothness of its shape. Storm waves tend not to last very long but smooth streamlined swell waves with definite crests and troughs and a more rhythmic rise and fall can persist for a very long time, travelling hundreds, even thousands of miles. Waves interact with each other, with

faster waves overtaking slower ones, reinforcing or cancelling each other out.

WAVE HEIGHT (H)

The height of a wave is the vertical distance between the crest and the preceding or following trough. The table on the next page gives a description of the wave systems associated with a range of significant wave heights. The significant height is defined as the average height of the highest one-third of the waves. It is very close to visual estimates of wave height by experienced seamen. Individual waves in the wave train will exceed the significant height. The highest wave of all will be about twice the significant height.

| State of Sea | Wave height (metres) |
|--------------|----------------------|
| Calm | 0 - 0.1 |
| Wavelets | 0.1 - 0.5 |
| Slight | 0.5 - 1.25 |
| Moderate | 1.25 - 2.5 |
| Rough | 2.5 - 4 |
| Very rough | 4 - 6 |
| High | 6 - 9 |
| Very high | 9 - 14 |
| Phenomenal | Over 14 |

However the height of a wave is not as important as its steepness, i.e. the ratio between wave height and wave length. A boat can easily ride a high wave if the wave is also very long. It climbs up one side and slides down the other. However even a rather small wave can cause problems if it is steep. The stern gets hung on one crest while the bow is driven under the next. Waves are choppier (steeper) during the early part of a blow than later when the sea is more fully developed. Observations of wave steepness indicate ratios of height over length of between 0.1 and 0.008. The theoretical maximum steepness of a wave is 0.143.

WAVE LENGTH (L)

Wave length is the horizontal distance between successive crests. Storm 'sea' waves in the North Atlantic are usually about 500 feet long. 'Swell' waves are much longer: lengths of over 2,500 feet have been observed along the south coast of England.

WAVE PERIOD (T)

The wave period is the time for two successive crests to pass a given point. 'Sea' and 'swell' waves can have periods of between 1 and 30 seconds, but 2 to 10 second periods are more typical.

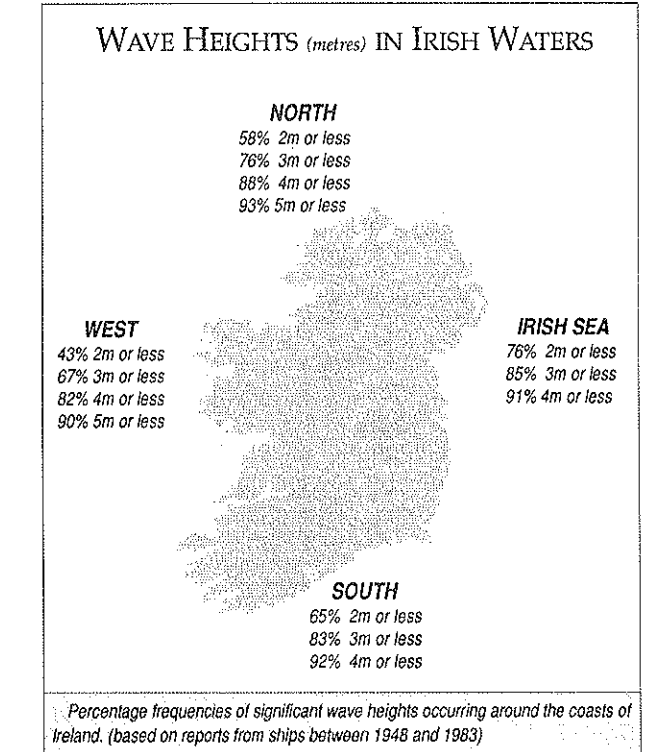
WAVES AND COASTS

Waves finally run ashore and break up in surf. Waves running into shallow water first decrease with height and then increase quite markedly. On most coasts breakers are higher than the deepwater waves from which they come. Shallow water also has the effect of slowing down incoming waves. This causes the crests to bunch up and the wave lengths to shorten, so that a wave is much steeper just before it breaks. The increase in steepness can happen very quickly. The only feature of a wave that remains unchanged from its deep water state is its period.

Like light waves, sea waves can be refracted, diffracted and reflected. Waves are refracted by

moving into shallower water because that part of the wave in deeper water is moving faster than that in shallower water. This causes the wave crest to bend in alignment with the bottom contours, and hence in general waves tend to be oriented parallel to the shoreline. Wind waves can affect beaches in two major ways. Short steep waves which usually occur during a storm near the coast, tend to tear the beach down. Long swells, which originate from distant storms, tend to rebuild the beaches.

This article draws mainly on Blair Kinsman's classic 'Wind Waves - their generation and propagation on the ocean surface', and on Volume 1 of the US Army's 'Shore Protection Manual'.



Friday 1st: Frosty with a ridge over the country early. A moderate to fresh south to southeast airflow then developed. Rain in West Munster in the evening.

Rainfall: nil to 15mm

Temperature: max. 7°C to 9°C, min. -5°C to 3°C

Sunshine: 2 to 7 hours

Saturday 2nd: A south to southeasterly airflow as frontal systems moved in from the southwest bringing rain to all areas followed by showers. Winds southeasterly moderate to fresh and gusty. Winds veered southwest to west with frontal passage and decreased light to moderate except in the north where they remained fresh to strong and gusty.

Rainfall: 2 to 12mm generally, 20 to 26mm in the south and southwest

Temperature: max. 6°C to 9°C, min. -1°C to 4°C, ground frost -2°C in the midlands and east

Sunshine: nil to 4 hours

Sunday 3rd: A fresh to strong southwest flow early in the day gave way to a strengthening southeast airflow as a depression approached.

Rainfall: nil to 5mm

Temperature: max. 6°C to 11°C, min. zero to 4°C, ground frost -1°C

Sunshine: 1 to 5 hours in the northern half, 8 to 10 hours in the southern half

Monday 4th: As a depression moved northwards just to the west of the country a strong gale force southeast developed. Winds veered southwesterly. Rain gave way during the afternoon to showers, some thundery.

Rainfall: 2 to 18mm

Temperature: max. 8°C to 13°C, min. zero to 5°C, ground frost -4°C inland

Sunshine: nil to 1 hour, 3 hours in the northwest

Tuesday 5th: Winds south or southwest moderate to fresh at first later south or southeast light to moderate. Light showers. Fog in the south.

Rainfall: nil to 1mm

Temperature: max. 10°C to 13°C, min. 5°C to 7°C

Sunshine: 2 to 7 hours

Wednesday 6th: A frontal trough moved northwest over the country followed by a very moist easterly airflow. Winds light to moderate easterly later moderate to fresh with some gale gusts in the south. Misty rain and fog at night, slight ground frost in places.

Rainfall: trace to 17mm

Temperature: max. 8°C to 12°C, min. 2°C to 7°C

Sunshine: nil to 2 hours generally, 5 hours in the north

Thursday 7th: A trough which gave some rain over Munster as it moved northwards in a slack mainly easterly airflow became slow moving over the east and midlands. There were sunny spells in Munster but it was overcast elsewhere with rain heaviest in the east and northeast.

Rainfall: nil to 17mm

Temperature: max. 8°C to 16°C, min. 5°C to 8°C

Sunshine: trace generally, 3 to 8 hours in the southern half

Friday 8th: A depression over southwest England moved slowly northwards as a moist and mild northeasterly airflow continued near Ireland. Mist was widespread together with overnight fog. Some areas had outbreaks of rain. Winds were light throughout.

Rainfall: nil to 9mm

Temperature: max. 8°C to 11°C, min. 4°C to 7°C

Sunshine: nil to 2 hours

Saturday 9th: A small depression in the Irish sea filled as it drifted north. A moderate westerly airflow became established over the country.

Rainfall: nil to 2mm

Temperature: max. 8°C to 12°C, min. 6°C to 8°C

Sunshine: nil to 1 hour

Sunday 10th: A weak ridge covered the country as a trough off the southwest coast moved eastwards. Mild with a little rain in places.

Rainfall: nil to 2mm

Temperature: max. 9°C to 14°C, min. 3°C to 8°C

Sunshine: trace to 5 hours

Monday 11th: Moderate, moist southeast winds, fresh at times, brought rain to all areas especially the south and southwest. Mild with fog in the evening.

Rainfall: nil to 5mm generally, 14 to 21mm in the south and southwest

Temperature: max. 8°C to 13°C, min. zero to 6°C

Sunshine: nil to 3 hours

Tuesday 12th: Cloudy with spells of rain in most places. Foggy. Light southeast winds. Mild.

Rainfall: 1-6mm generally, 18mm in the southeast

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

Sunshine: zero to 2 hours

Wednesday 13th: A weak front over the east coast gave some rain and drizzle for much of the day in eastern areas. Mist and fog in the rest of the country clearing slowly in the morning to give a cloudy but mostly dry day. Winds light south-southwesterly. Mild and humid.

Rainfall: nil to 1mm generally, 4mm in the east

Temperature: max. 10°C to 13°C, min. 7°C to 9°C

Sunshine: nil to 1 hour generally, 6 hours in the southwest

Thursday 14th: A front crossed the country during the early morning to be followed by a weak ridge and later a south to southeast flow as a further front approached the southwest.

Rainfall: nil to 5mm generally, 15mm in the southeast

Temperature: max. 11°C to 13°C, min. 6°C to 8°C

Sunshine: trace to 3 hours generally, 7 hours in the southeast

Friday 15th: A fresh to strong south to southeast flow covered the country during the first half of the day giving way during the afternoon to a moderate, mild and moist south to southwest flow as a warm front moved northeastwards over the country.

Rainfall: 2 to 16mm

Temperature: max. 10°C to 16°C, min. 7°C to 9°C

Sunshine: nil to 6 hours

Saturday 16th: A shallow depression moved northeastwards across the country bringing widespread rain.

Rainfall: trace to 25mm

Temperature: max. 10°C to 13°C, min. 7°C to 9°C

Sunshine: nil to 2 hours

Sunday 17th: A slack, shallow depression covering much of the country filled and drifted slowly northwards leaving a light to moderate northwest flow backing south and southeast by midnight. Rain cleared the east coast around noon and was followed by isolated showers.

Rainfall: trace to 14mm

Temperature: max. 10°C to 12°C, min. 5°C to 7°C

Sunshine: 1 to 7 hours

Monday 18th: An active frontal system moved eastwards bringing rain to all areas, heavy in places. Winds light to moderate southeast or south at first, later veered southwest and increased fresh to strong with gale gusts. Cold early with ground frost in the midlands and east.

Rainfall: 3 to 18mm generally, 23 to 63mm over most of the west and southwest

Temperature: max. 11°C to 14°C, min. 2°C to 7°C

Sunshine: nil

Tuesday 19th: A strong blustery west to southwest airflow gave showers or outbreaks of rain in most places, heaviest in the west and south. Winds slackened and showers became more scattered during the evening.

Rainfall: nil to 5mm generally, 10mm in the northwest

Temperature: max. 12°C to 17°C, min. 7°C to 11°C

Sunshine: nil to 6 hours

Wednesday 20th: A frontal wave depression over Mizen Head just before noon, deepened as it moved east northeast to be just west of the Kish lighthouse in Dublin Bay by nightfall. This gave widespread rain, heaviest in Munster, Leinster and East Ulster. Moderate to fresh winds from the southwest, later backed southeast and then east-northeast along the east coast before becoming mostly westerly with the clearance.

Rainfall: nil to 18mm

Temperature: max. 10°C to 12°C, min. 6°C to 9°C

Sunshine: nil or trace

Thursday 21st: Weak trough moved southwest early. A cool northwest to north airflow intensified. Scattered showers.

Rainfall: nil to 5mm

Temperature: max. 9°C to 11°C, min. 3°C to 6°C

Sunshine: 3 to 9 hours

Friday 22nd: Moderate to fresh northwesterly airflow covered the country. Blustery showers. Cool.

Rainfall: nil to 4mm

Temperature: max. 8°C to 11°C, min. zero to 6°C

Sunshine: 3 to 8 hours

Saturday 23rd: A moderate north to northwest airstream over the country gave mainly dry but cool weather with just isolated showers largely confined to the west and north.

Ground frost was widespread overnight.

Rainfall: nil or trace

Temperature: max. 8°C to 11°C, min. zero to 5°C

Sunshine: 1 to 8 hours

Sunday 24th: Clear and frosty during hours of darkness otherwise dry and mainly sunny with light variable winds as a ridge moved across the country.

Rainfall: nil

Temperature: max. 10°C to 14°C, min. -1°C to 6°C

Sunshine: 5 to 11 hours

Monday 25th: High pressure dominant. Dry, cool and sunny with light easterly winds.

Rainfall: nil

Temperature: max. 8°C to 14°C, min. -3°C to 6°C

Sunshine: 8 to 11 hours

Tuesday 26th: An east to northeast airflow. Mainly fair, some scattered showers. Dull in the east, sunny in the west.

Rainfall: nil or trace

Temperature: max. 8°C to 12°C, min. -1°C to 6°C

Sunshine: nil to 10 hours

Wednesday 27th: Light to moderate northeast winds. Cool and dry generally but some rain or drizzle in the midlands and west. Cloudy in western areas.

Rainfall: nil to 2mm

Temperature: max. 7°C to 10°C, min. 4°C to 7°C

Sunshine: nil or trace

Thursday 28th: An anticyclone over Scotland maintained a light east to northeast flow over the country. Mist and haze.

Rainfall: nil

Temperature: max. 10°C to 16°C, min. 3°C to 7°C, ground frost -2°C

Sunshine: nil to 9 hours

Friday 29th: The anticyclone slipping slowly south. Generally light variable winds, moderate southwesterly in the north. Mist and haze with fog patches.

Rainfall: nil

Temperature: max. 9°C to 15°C, min. -2°C to 5°C, ground frost -6°C

Sunshine: 5 to 10 hours

Saturday 30th: A slack westerly airflow covered the country as a weak front approached the northwest bringing drizzle in the evening. Generally cloudy and misty with light southwesterly winds, but moderate in the north.

Rainfall: nil to 1mm

Temperature: max. 10°C to 15°C, min. 2°C to 8°C

Sunshine: nil to 6 hours

Sunday 31st: The mild west-southwest airflow freshened late in the day as a ridge over the country declined, allowing a weak trough to cross.

Rainfall: nil or trace

Temperature: max. 11°C to 16°C, min. 6°C to 9°C

Sunshine: trace to 5 hours

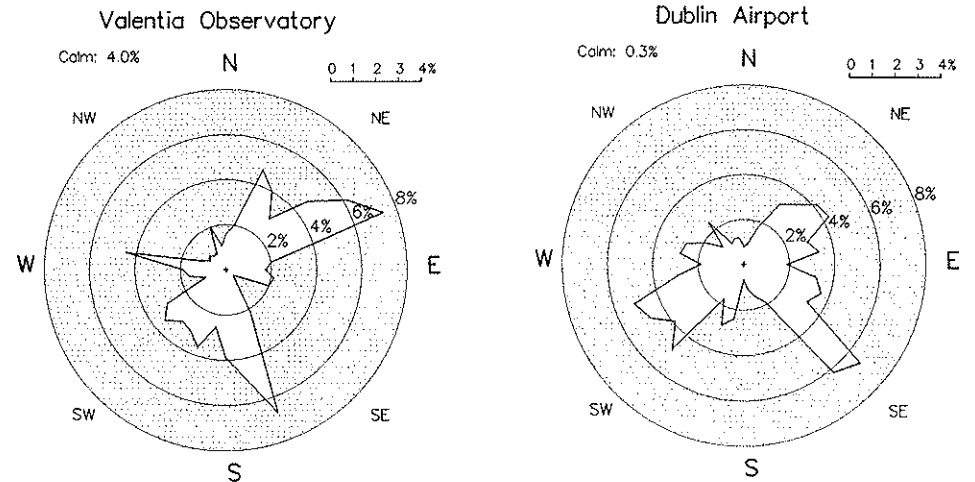
| County / Station | TEMPERATURE (°C) | | | | | | |
|--------------------------|------------------|-----------|------------------------------|-------------------|------------------|------------------------|--|
| | Mean max. | Mean min. | Mean/ deviation from average | Highest max./date | Lowest min./date | Lowest grass min./date | |
| CO. CARLOW | | | | | | | |
| CARLOW (OAK PARK) | 11.7 | 4.1e | 7.9 1.7 | 15.3 19 | -2.8 01 | -7.0 01 | |
| CO. CLARE | | | | | | | |
| CARRON | 10.0 | 4.7 | 7.4 | 14.0 29 | -0.4 01 | -4.1 01 | |
| SHANNON AIRPORT | 11.8 | 5.2 | 8.5 1.5 | 15.0 29 | -2.2 01 | -9.6 01 | |
| CO. CORK | | | | | | | |
| CORK AIRPORT | 10.6 | 4.6 | 7.6 1.3 | 14.9 31 | -0.7 01 | -3.1 01 | |
| FERMOY (MOORE PARK) | 11.7 | 4.1e | 7.9 1.4 | 16.2 19 | -4.1 01 | -9.5 01 | |
| ROCHE'S POINT | 10.6 | 5.7 | 8.2 1.0 | 13.9 19 | 1.0 01 | -2.1 01 | |
| SHERKIN ISLAND | 10.9 | 5.9 | 8.4 0.9 | 12.8 07 30 | -0.8 01 | | |
| CO. DONEGAL | | | | | | | |
| CATHALEEN'S FALL | 10.3 | 4.0 | 7.2 1.1 | 14.0 15 | -2.5 01 | | |
| LETTERKENNY (MAGHERENAN) | 11.1 | 4.1e | 7.6 | 15.2 29 | -2.9 01 | | |
| MALIN HEAD | 9.8 | 5.4 | 7.6 1.3 | 13.5 29 | 1.4 01 | -2.5 26 | |
| CO. DUBLIN | | | | | | | |
| CASEMENT AERODROME | 10.7 | 4.4 | 7.6 1.6 | 14.5 12 | -3.2 01 | -5.2 01 | |
| DUBLIN AIRPORT | 10.7 | 5.1 | 7.9 1.7 | 15.2 15 | -1.2 01 | -3.7 04 | |
| DUBLIN (MERRION SQUARE) | 11.2 | 5.9 | 8.6 1.5 | 15.9 15 | 0.9 01 | | |
| CO. GALWAY | | | | | | | |
| GALWAY (UNIV. COLLEGE) | 11.3 | 5.6 | 8.5 1.7 | 15.0 29 | -1.4 01 | | |
| MAAM VALLEY | 10.9 | 5.5 | 8.2 | 14.7 29 | -1.2 01 | -5.5 01 | |
| CO. KERRY | | | | | | | |
| ARDFERT (LISCAHANE) | 11.9 | 4.6 | 8.3 | 15.6 31 | -1.9 01 | -7.2 01 | |
| VALENTIA OBSERVATORY | 11.9 | 5.6 | 8.8 1.0 | 15.8 07 | -1.7 01 | -4.9 01 | |
| CO. KILDARE | | | | | | | |
| NAAS (GOWRAN GRANGE) | 10.8 | 4.2 | 7.5 | 14.4 28 | -2.3 01 | -6.4 01 | |
| CO. KILKENNY | | | | | | | |
| KILKENNY | 11.5 | 4.3 | 7.9 1.7 | 15.4 31 | -3.1 01 | -10.1 01 | |
| MOONCOIN (SILVERSPRING) | 11.8 | 4.2 | 8.0 1.4 | 16.8 19 | -2.9 25 | -10.2 01 | |
| CO. LEITRIM | | | | | | | |
| BALLINAMORE | 11.0 | 3.6 | 7.3 1.7 | 14.2 31 | -3.1 01 | -8.1 01 | |
| CO. LIMERICK | | | | | | | |
| MOUNT RUSSELL | 10.5 | 4.5e | 7.5 | 14.5 31 | -0.8 26 | -6.7 01 | |
| CO. LOUTH | | | | | | | |
| ARDEE (BOHARNAMOE) | 11.4 | 3.6e | 7.5 | 15.7 18 | -3.7 01 | -10.1 01 | |
| CO. MAYO | | | | | | | |
| BELMULLET | 11.0 | 5.7 | 8.4 1.4 | 14.6 28 | -0.2 01 | -4.5 01 | |
| CLAREMORRIS | 10.8 | 3.9 | 7.4 1.4 | 15.1 29 | -4.4 01 | -8.9 01 | |
| NEWPORT (FURNACE) | 10.5 | 5.2 | 7.9 1.1 | 13.8 29 | -1.2 01 | -5.4 01 | |
| CO. MEATH | | | | | | | |
| WARRENSTOWN (AGR. COLL.) | 10.4 | 4.3 | 7.4 1.6 | 13.8 19 | -2.0 01 | -4.4 01 | |
| CO. MONAGHAN | | | | | | | |
| CLONES | 10.7 | 4.3 | 7.5 1.9 | 14.7 31 | -2.3 01 | -6.9 01 | |
| CO. OFFALY | | | | | | | |
| BIRR | 11.2 | 4.2 | 7.7 1.4 | 15.1 15 | -3.9 01 | -10.1 01 | |
| DERRYGREENAGH | 10.7 | 3.7 | 7.2 1.7 | 14.0 15 | -3.5 01 | -9.6 01 | |
| CO. SLIGO | | | | | | | |
| MARKREE CASTLE | 10.8 | 3.6e | 7.2 1.2 | 14.6 29 | -4.7 01 | | |
| CO. TIPPERARY | | | | | | | |
| DUNDRUM (KNOCKAVILLA) | 11.5 | 3.4 | 7.5 | 14.9 30 | -4.0 01 | -5.3 01 | |
| FETHARD (PARSONSHILL) | 10.8 | 4.0 | 7.4 | 14.4 19 | -2.6 01 | -4.5 01 | |
| CO. WATERFORD | | | | | | | |
| DUNGARVAN (CARRIGLEA) | 12.0 | 4.5 | 8.3 | 16.3 31 | -2.4 01 | -4.5 01 | |
| CO. WESTMEATH | | | | | | | |
| MULLINGAR II | 10.4 | 4.0 | 7.2 1.6 | 14.0 15 | -3.5 01 | -6.6 01 | |
| CO. WEXFORD | | | | | | | |
| CLONROCHE | 10.8 | 4.5 | 7.7 1.8 | 15.5 19 | -1.4 01 | -7.4 01 | |
| JOHN F. KENNEDY PARK | 10.7 | 5.2 | 8.0 1.6 | 16.1 19 | 0.3 01 | -3.9 01 | |
| ROSSLARE | 9.9 | 6.1 | 8.0 1.2 | 14.5 30 | 2.5 01 | -0.9 11 | |

| 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) | 73.7 | 139 | 13.5 02 | | 2.64 | 80 | 22 | 10.7 25 |
| CO. CLARE | | | | | | | | |
| CARRON | 140.0 | 137 | 22.9 18 | | | | | |
| SHANNON AIRPORT | 72.0 | 116 | 16.8 20 | | 2.82 | 81 | 24 | 10.4 25 |
| CO. CORK | | | | | | | | |
| CORK AIRPORT | 139.0 | 135 | 20.5 11 | | 3.61 | 103 | 30 | 11.4 25 |
| FERMOY (MOORE PARK) | 92.5 | 119 | 14.9 01 | | 3.25 | 101 | 27 | 9.7 29 |
| ROCHE'S POINT | 110.6 | 147 | 17.2 02 | | 3.59 | 101 | 30 | 9.8 25 29 |
| SHERKIN ISLAND | 104.5 | 112 | 13.6 11 17 | | 3.86 | 104 | 32 | 11.2 25 |
| CO. DONEGAL | | | | | | | | |
| CATHALEEN'S FALL | 110.7 | 160 | 15.8 16 | | 2.50 | 78 | 21 | 10.3 25 |
| LETTERKENNY (MAGHERENAN) | 104.2 | | 17.8 18 | | | | | |
| MALIN HEAD | 67.1 | 95 | 16.2 18 | | 2.61 | 76 | 22 | 9.6 25 |
| CO. DUBLIN | | | | | | | | |
| CASEMENT AERODROME | 63.5 | 130 | 15.5 20 | | 2.79 | 82 | 23 | 10.1 29 |
| DUBLIN AIRPORT | 91.1 | 182 | 16.8 06 | | 2.67 | 75 | 22 | 8.6 29 |
| DUBLIN (MERRION SQUARE) | 88.4 | 184 | 14.3 06 | | | | | |
| CO. GALWAY | | | | | | | | |
| GALWAY (UNIV. COLLEGE) | 127.5 | 168 | 21.6 18 | | | | | |
| MAAM VALLEY | 241.4 | | 62.5 18 | | 2.29 | | 19 | 9.2 25 |
| CO. KERRY | | | | | | | | |
| ARDFERT (LISCAHANE) | 97.3 | | 24.3 16 | | 3.39 | | 28 | 10.2 25 |
| VALENTIA OBSERVATORY | 143.2 | 125 | 19.6 16 | | 3.52 | 104 | 30 | 10.2 25 29 |
| CO. KILDARE | | | | | | | | |
| NAAS (GOWRAN GRANGE) | 67.9 | | 16.2 20 | | | | | |
| CO. KILKENNY | | | | | | | | |
| KILKENNY | 77.6 | 136 | 14.8 20 | | 2.87 | 86 | 24 | 10.1 25 29 |
| MOONCOIN (SILVERSPRING) | 98.9 | 125 | 12.7 11 | | 3.07 | 89 | 26 | 9.7 29 |
| CO. LEITRIM | | | | | | | | |
| BALLINAMORE | 153.0 | 182 | 24.5 16 | | 2.26 | 70 | 19 | 10.4 25 |
| CO. LIMERICK | | | | | | | | |
| MOUNT RUSSELL | 124.7 | | 17.5 20 | | | | | |
| CO. LOUTH | | | | | | | | |
| ARDEE (BOHARNAMOE) | 99.7 | 175 | 16.2 07 | | | | | |
| CO. MAYO | | | | | | | | |
| BELMULLET | 87.9 | 106 | 20.1 18 | | 2.60 | 71 | 22 | 11.0 25 |
| CLAREMORRIS | 110.9 | 137 | 28.5 18 | | 2.34 | 74 | 20 | 8.9 25 29 |
| NEWPORT (FURNACE) | 124.7 | 104 | 43.5 18 | | 2.30 | 71 | 19 | 9.4 25 |
| CO. MEATH | | | | | | | | |
| WARRENSTOWN (AGR. COLL.) | 77.6 | 127 | 11.3 20 | | | | | |
| CO. MONAGHAN | | | | | | | | |
| CLONES | 119.7 | 193 | 20.6 16 | | 2.13 | 68 | 18 | 9.2 25 |
| CO. OFFALY | | | | | | | | |
| BIRR | 54.7 | 103 | 10.9 20 | | 2.42 | 70 | 20 | 10.1 25 |
| DERRYGREENAGH | 81.1 | 137 | 12.8 20 | | 2.50 | 77 | 21 | 9.5 25 |
| CO. SLIGO | | | | | | | | |
| MARKREE CASTLE | 132.7 | 172 | 25.8 18 | | | | | |
| CO. TIPPERARY | | | | | | | | |
| DUNDRUM (KNOCKAVILLA) | 77.3 | | 17.8 20 | | | | | |
| FETHARD (PARSONSHILL) | 79.7 | | 11.4 20 | | | | | |
| CO. WATERFORD | | | | | | | | |
| DUNGARVAN (CARRIGLEA) | 120.4 | | 14.8 14 | | 3.20 | | 27 | 9.3 25 |
| CO. WESTMEATH | | | | | | | | |
| MULLINGAR II | 92.5 | 149 | 19.3 18 | | 2.56 | 75 | 22 | 10.7 25 |
| CO. WEXFORD | | | | | | | | |
| CLONROCHE | 115.5 | 133 | 13.1 11 | | 3.31 | 95 | 28 | 11.0 29 |
| JOHN F. KENNEDY PARK | 91.8 | 119 | 10.4 11 19 | | 2.57 | 75 | 22 | 8.2 25 |
| ROSSLARE | 88.7 | 141 | 17.1 12 | | 3.08 | 78 | 26 | 11.0 25 |

| 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) | 17 | 16 | 5 | 10 | | | | | 6.4 | 6.7 | 7.3 | |
| CO. CLARE | | | | | | | | | | | | |
| CARRON | 23 | 18 | 1 | 5 | | | | | 6.1 | | 7.1 | |
| SHANNON AIRPORT | 16 | 12 | 2 | 13 | 1 | 0 | 2 | 1 | 5 | 7.0 | 7.7 | 8.2 |
| CO. CORK | | | | | | | | | | | | |
| CORK AIRPORT | 19 | 16 | 2 | 8 | 2 | 0 | 0 | 0 | 15 | 6.9 | 7.3 | 8.1 |
| FERMOY (MOORE PARK) | 18 | 14 | 6 | 15 | | | | | | 7.2 | | 7.8 |
| ROCHE'S POINT | 17 | 15 | 0 | 3 | | | | | | 7.1 | 7.6 | 8.0 |
| SHERKIN ISLAND | 19 | 15 | 1 | | | | | | | | | |
| CO. DONEGAL | | | | | | | | | | | | |
| CATHALEEN'S FALL | 21 | 18 | 2 | | | | | | | | | |
| LETTERKENNY (MAGHERENAN) | 24 | 18 | 1 | | | | | | | | | |
| MALIN HEAD | 21 | 12 | 0 | 5 | 0 | 0 | 1 | 0 | 3 | 6.4 | 6.8 | 7.4 |
| CO. DUBLIN | | | | | | | | | | | | |
| CASEMENT AERODROME | 18 | 13 | 3 | 12 | 0 | 0 | 2 | 0 | 5 | 6.1 | 6.6 | 7.1 |
| DUBLIN AIRPORT | 15 | 12 | 1 | 12 | 1 | 0 | 0 | 0 | 11 | 6.3 | 6.8 | 7.7 |
| DUBLIN (MERRION SQUARE) | 20 | 16 | 0 | | | | | | | | | |
| CO. GALWAY | | | | | | | | | | | | |
| GALWAY (UNIV. COLLEGE) | 22 | 16 | 1 | | | | | | | | | |
| MAAM VALLEY | 21 | 18 | 1 | 8 | | | | | | | | |
| CO. KERRY | | | | | | | | | | | | |
| ARDFERT (LISCAHANE) | 20 | 17 | 2 | 16 | | | | | | | | |
| VALENTIA OBSERVATORY | 18 | 15 | 2 | 5 | 0 | 0 | 1 | 0 | 1 | 7.5 | 8.0 | 9.0 |
| CO. KILDARE | | | | | | | | | | | | |
| NAAS (GOWRAN GRANGE) | 21 | 15 | 3 | 14 | | | | | | | | |
| CO. KILKENNY | | | | | | | | | | | | |
| KILKENNY | 17 | 12 | 3 | 15 | 2 | 0 | 0 | 0 | 3 | 6.6 | 7.2 | 7.7 |
| MOONCOIN (SILVERSPRING) | 18 | 16 | 4 | 16 | | | | | | | | |
| CO. LEITRIM | | | | | | | | | | | | |
| BALLINAMORE | 21 | 19 | 3 | 12 | | | | | | 6.2 | 6.3 | 7.0 |
| CO. LIMERICK | | | | | | | | | | | | |
| MOUNT RUSSELL | 18 | 15 | 2 | 11 | | | | | | | | |
| CO. LOUTH | | | | | | | | | | | | |
| ARDEE (BOHARNAMOE) | 19 | 16 | 7 | 14 | | | | | | 6.5 | 6.6 | 6.9 |
| CO. MAYO | | | | | | | | | | | | |
| BELMULLET | 17 | 15 | 1 | 5 | 0 | 0 | 3 | 0 | 1 | 7.3 | 7.7 | 8.1 |
| CLAREMORRIS | 22 | 17 | 2 | 12 | 1 | 0 | 3 | 0 | 5 | 6.3 | 7.0 | 7.5 |
| NEWPORT (FURNACE) | 23 | 19 | 1 | 10 | | | | | | | | |
| CO. MEATH | | | | | | | | | | | | |
| WARRENTOWN (AGR. COLL.) | 19 | 14 | 1 | 9 | | | | | | 6.0 | 6.1 | 6.7 |
| CO. MONAGHAN | | | | | | | | | | | | |
| CLONES | 21 | 18 | 2 | 10 | 0 | 0 | 1 | 0 | 3 | 6.3 | 6.8 | 7.3 |
| CO. OFFALY | | | | | | | | | | | | |
| BIRR | 14 | 11 | 4 | 14 | 1 | 0 | 0 | 0 | 2 | 6.5 | 7.1 | 7.6 |
| DERRYGREENAGH | 23 | 14 | 3 | 14 | | | | | | | | |
| CO. SLIGO | | | | | | | | | | | | |
| MARKREE CASTLE | 23 | 21 | 5 | | | | | | | | | |
| CO. TIPPERARY | | | | | | | | | | | | |
| DUNDRUM (KNOCKAVILLA) | 18 | 14 | 5 | 14 | | | | | | 6.8 | 7.3 | |
| FETHARD (PARSONSHILL) | 18 | 15 | 2 | 11 | | | | | | 6.3 | 6.6 | |
| CO. WATERFORD | | | | | | | | | | | | |
| DUNGARVAN (CARRIGLEA) | 21 | 17 | 2 | 6 | | | | | | | | 8.0 |
| CO. WESTMEATH | | | | | | | | | | | | |
| MULLINGAR II | 21 | 16 | 2 | 12 | 0 | 0 | 0 | 0 | 7 | 6.0 | 6.4 | 7.1 |
| CO. WEXFORD | | | | | | | | | | | | |
| CLONROCHE | 18 | 17 | 1 | 17 | | | | | | 7.0 | 7.0 | 7.4 |
| JOHN F. KENNEDY PARK | 17 | 16 | 0 | 9 | | | | | | 6.8 | 7.2 | 7.9 |
| ROSSLARE | 16 | 13 | 0 | 3 | 0 | 0 | 1 | 0 | 11 | 7.2 | 7.8 | 8.2 |

| County / Station | WIND (KTS) | | | | | | | | | |
|----------------------|------------|--|----|-------|--------------------------------|----|---------|-----------------|----|-----------------------|
| | Mean speed | Max. 10-min. mean dir. speed date/hour | | | Max. Gust dir. speed date/time | | | Days with gales | | Hours with gale gusts |
| CO. CLARE | | | | | | | | | | |
| SHANNON APT. | 8.5 | 170° | 32 | 04/14 | 170° | 46 | 04/1552 | 0 | 6 | 23 |
| CO. CORK | | | | | | | | | | |
| CORK APT. | 9.4 | 160° | 33 | 04/24 | 150° | 44 | 04/1545 | 0 | 6 | 45 |
| ROCHES POINT | 9.5 | 210° | 37 | 04/19 | 160° | 53 | 04/1608 | 2 | 10 | 74 |
| CO. DONEGAL | | | | | | | | | | |
| MALIN HEAD | 13.1 | 230° | 42 | 19/21 | 120° | 60 | 04/1133 | 4 | 12 | 90 |
| CO. DUBLIN | | | | | | | | | | |
| CASEMENT AERO. | 10.6 | 250° | 36 | 19/24 | 190° | 50 | 04/2243 | 3 | 8 | 80 |
| DUBLIN APT. | 9.4 | 110° | 36 | 04/24 | 240° | 50 | 19/1215 | 3 | 8 | 42 |
| CO. KERRY | | | | | | | | | | |
| VALENTIA OBSY. | 8.6 | 210° | 32 | 18/23 | 100° | 52 | 04/0536 | 0 | 10 | 74 |
| | | | | | 230° | 52 | 18/1712 | | | |
| CO. KILKENNY | | | | | | | | | | |
| KILKENNY | 6.3 | 170° | 27 | 04/17 | 250° | 46 | 19/0955 | 0 | 5 | 26 |
| CO. MAYO | | | | | | | | | | |
| BELMULLET | 10.6 | 220° | 31 | 19/24 | 120° | 43 | 04/0915 | 0 | 5 | 28 |
| | | | | | 230° | 43 | 19/0537 | | | |
| CLAREMORRIS | 7.8 | 280° | 26 | 19/24 | 170° | 46 | 04/1701 | 0 | 4 | 18 |
| CO. MONAGHAN | | | | | | | | | | |
| CLONES | 9.0 | 140° | 32 | 04/24 | 140° | 53 | 04/1138 | 0 | 6 | 39 |
| CO. OFFALY | | | | | | | | | | |
| BIRR | 4.5 | 130° | 26 | 02/17 | 130° | 43 | 04/0954 | 0 | 5 | 22 |
| CO. WESTMEATH | | | | | | | | | | |
| MULLINGAR II | 7.0 | 250° | 26 | 18/20 | 250° | 45 | 19/1205 | 0 | 4 | 25 |
| CO. WEXFORD | | | | | | | | | | |
| ROSSLARE | 10.4 | 220° | 28 | 18/17 | 240° | 48 | 03/0034 | 0 | 10 | 75 |

FREQUENCY OF WIND DIRECTION



Notes on the tables

Locations of Synoptic and Climatological weather stations



A. General

- 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.)
- Rainfall amounts are measured at climatological stations at 0900GMT 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.
- 'Raindays' and 'wetdays' are days during which the total rainfall is not less than 0.2mm and 1.0mm respectively.
- A 'day' for the purposes of this publication refers to the period from a particular day to 0900GMT on the following day. (This is because climatological stations make their daily observations at 0900GMT.)
- 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).
- 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.)
- Mean soil and earth temperatures are based on readings taken at 0900GMT.
- 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.
- 'e' denotes that the value is calculated using one or more estimated readings.
- Data from Northern Ireland is kindly provided by the Belfast Weather Centre.

B. Agmet

- 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.
- 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, 1968). 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; dates of the end/beginning of such adjusted periods are circled.
- 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).
- Global solar radiation values are given in MJ/sq.m. correct to two decimal places (3.6MJ=1kWh).

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