Launch of first Marine Data Buoy from Galway
-see page 3
WEATHER

VERY UNSETTLED; COOL AND WET BUT SUNNY EVERYWHERE

Following mostly disturbed weather during September, October was another very unsettled month caused by a succession of Atlantic depressions close to or over Ireland. Rainfall totals were above normal everywhere, with some rainfall measured on all but two or three days at many stations. Despite the wet weather, it was sunnier than normal everywhere and totals were well above normal in the south and southeast. It was cool for much of the month, however, and mean temperatures were the lowest for October for seven years. Some of the low pressure systems near Ireland during the month were very deep and had strong winds associated with them; a number were former hurricanes or tropical storms. As a result mean windspeeds for the month were above normal almost everywhere and were well above the October normal in the northern half of the country.

Low pressure dominated the weather over Ireland from the beginning of the month. A deep depression moved close to the northwest coast on the 1st, spreading a band of rain eastwards in a strong southerly airstream. Winds veered westerly and reached gale force in the north on the 2nd, while showers became widespread and heavy here also. A complex depression - the former hurricane Ivan - introduced very mild air in a gale force southerly airstream on the 3rd as it brought a spell of generally light rain northwards, with heavier falls again in the north of the country. After a dry start on the 4th, a band of frontal rain crossed eastwards during the afternoon, bringing heaviest falls this time over the south and southwest. Pressure subsequently rose over the country and between the 5th and 7th of the month there was a welcome spell of settled weather. Although not completely dry, rainfall amounts during this period were small with sunny weather on the 5th; daytime temperatures were near normal but nights were cold where skies were clear. A cool, showery day on the 8th was followed by more widespread heavy rain on the 9th as a depression moved slowly northwesterwards over Ireland. This depression became centred over Scotland between the 10th and 13th, leaving Ireland in a cold northwesterly airstream with showers or longer spells of rain each day. Late on the 13th and early 14th a frontal system brought a spell of rain to all areas, heaviest in the southwest, and introduced much milder southwesterly winds. More frontal rain fell on the 15th and 16th, but this was generally recorded after dark, while both days were relatively mild and sunny.

LAUNCH OF IRISH MARINE BUOY NETWORK IN GALWAY

A report by a Fishing Vessel Safety Review Group in 1996 recommended that more observations from buoys at specific locations around Ireland would lead to better weather forecasts, which in turn would lead to improved safety at sea. The Irish Marine Data Buoy Network was formally launched on October 20th in Galway. This new network is a collaborative venture between Met Éireann, the Marine Institute and the UK Met Office (UKMO), who have many years of experience in deploying and operating ocean buoys.

The first buoy in the network (pictured on left) was supplied by the UKMO, for deployment by the Marine Institute's research vessel, Celtic Voyager (cover picture), at 53° 07.8'N, 11° 12'W, in 202m of water. It has dual sets of sensors to measure wind direction & speed, air temperature, atmospheric pressure, sea surface temperature, wave height and period, and also a dual transmission system. Power is provided by lead acid gel batteries which are charged by solar panels. Data from the sensors are transmitted hourly to Meteosat, hence to the ground station at Dunsfold and on to the UKMO who put the data into Ship Code format.

The first buoy in what will be a network of five around the Irish coast was positioned in position in early November. The rest in the series is planned for the Irish Sea, east of Dublin, in 2001. The UKMO and the Marine Institute will work with Irish and international companies to develop a new technologically advanced buoy that will have the added capability of collecting other data such as seawater temperature, salinity and currents. There are plans to include the data from the buoys with the coastal reports of the Sea Areas Forecast on Weatherfax, FAX, on the Marine Institute's website, and on the proposed Met Éireann website also.

Below and right: October was a month of persistent cyclonic activity over Ireland, with rain on almost every day. These pictures show a coast clearing rainstorm early on the 3rd; falls of between 10 and 25mm were widely recorded.

(Photos: Aidan Holly)
shower, but more rain spread into Munster late on the 19th and moved northeastwards to all areas during the 20th. A ridge of high pressure on the 21st brought a rare dry and sunny day, but more familiar rain and stronger southerly winds returned on the 22nd ahead of an active occluded front, clearing to a showery westerly flow on the 23rd.

During the last week of the month, the pattern of cyclonic activity intensified as some very deep depressions brought a combination of heavy rain and strong winds. Between the 24th and 28th an area of low pressure became almost stationary near Iceland, deepening to 930 hPa on the 27th and influencing the weather over a huge area of the North Atlantic (see charts on left). Heavy rain or showers fell over Ireland on most days during this period, especially the 24th, 26th and between the 28th and 30th in the south. Rain on these latter days was associated with two depressions which deepened considerably near the south coast as they tracked eastwards late on the 29th and caused considerable damage over southern Britain. Showers continued in all areas on the 30th and 31st and temperatures fell as winds settled into a westerly direction.

Mean windspeeds for the month were between 9 and 13 knots (10 and 15 m.p.h.) at most stations, but ranged from 17 to 20 knots (20 and 23 m.p.h.) at coastal stations in the north and northwest. They were above normal everywhere except in the extreme southwest and were the highest for October for between 16 and 20 years at northern stations. Strong winds were recorded throughout most of the month, particularly at the beginning and end. The highest gust, 68 knots (78 m.p.h.), was measured at Malin Head on the 28th. Isolated hail showers were recorded, mainly in the periods 7th to 9th and 27th to 31st, while there was thunderstorm activity on the 2nd, 11th and 29th. Fog was fairly widespread in the periods 1st to 3rd, 14th to 17th and 25th to 26th.

A deep depression near Iceland on the 17th spread heavy rain across Ireland during the day, accompanied by strong southerly winds. This rain was particularly heavy in the southwest, where falls of close to 100 mm were measured in some upland areas. The 18th and most of the 19th were generally dry, sunny and breezy with just isolated

**Mean Atmospheric Pressure**

Like September, mean sea level pressure values were well below normal for the month everywhere, by between 8 hPa in the south of the country and 11 hPa in the north. These were the lowest mean values for any month since February 1995. Some very low pressure values were recorded as a deep depression moved across the country on the 11th, while another passed close to the north coast on the 30th. Malin Head recorded the lowest pressure of the month, 956.1 hPa on the 11th, the lowest October value at the station since 1986. The highest pressure of the month was measured at Cork Airport on the 6th, 1029.4 hPa.
Wetter than normal almost everywhere; very wet in western half

Rainfall totals for the month were above normal almost everywhere and were well above normal in the western half of the country. They ranged from 65mm at Dublin (Merrion Square) to 520mm at Maam Valley, Co. Galway, where it was the wettest October since records began in the area in 1968. Shannon Airport’s total of 182mm was also its highest on record for October (see chart below).

Percentage of normal values were between 100% at Merrion Square and 196% at Shannon Airport.

There were between 16 and 19 wet days during the month (days with 1.0mm or more of rainfall) over eastern counties, but 24 or more such days over much of the southwest, west and north. This compares with the normal range for October of between 11 and 19 wet days.

Although most days during October were wet, the heaviest rain fell at most stations towards the end of the month, especially in the period 22nd to 30th. Valentia Observatory measured falls of over 10mm on six days during this period, with over 25mm recorded on the 22nd, 26th and 29th. Some significantly higher falls were measured in monsoon areas of Cork and Kerry on both the 17th and 26th; the rainfall recording station at Gouganebarra, Co Cork, measured 95.8mm on the 17th.

Below:
The number of wet days - days with 1mm or more rainfall - in each county.

Highest Monthly Totals at Shannon Airport (mm) (records since 1945)

<table>
<thead>
<tr>
<th>Month</th>
<th>Total Rainfall (mm)</th>
</tr>
</thead>
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<td>175</td>
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</tr>
<tr>
<td>December 1999</td>
<td>175</td>
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</table>

Daily rainfall amounts (mm)

Daily rainfall amounts (hours)
Cooler than normal everywhere

Mean air temperatures for the month ranged from 8.6°C at Connaught Airport to 11.2°C at Sherkin Island, Co. Cork, around half a degree below normal generally. It was the first time since 1993 that October was cooler than normal. Mean minima were over a degree below normal at several stations, reflecting the number of cold nights around the middle of the month in particular; ground frost was measured inland on most nights between the 4th and 22nd.

Sunnier than normal everywhere, especially in south and southeast

Sunshine totals for the month ranged from 79 hours at Malin Head to 136 hours at Rosslare, with percentage of normal values between 104% at both Malin and Valentia Observatory and 142% at both Mullingar and Kilkenny. It was the sunniest October at most stations for 5 or 6 years and the sunniest in the south and southeast for between 34 and 41 years. Totals in some cases were higher than those normally expected for September. This is in spite of the rain which fell on most days during the month, as much of the sunshine recorded was between showers.

Sunshine was distributed fairly evenly across the month, but the 5th and 21st were particularly sunny. Rosslare measured the highest daily sunshine, 10.2 hours on the 5th, while Cork Airport's value of 10.1 hours on the 16th was its highest October value since records began there in 1962.

Values of global solar radiation were close to normal generally, ranging from 92% of normal at Valentia Observatory to 113% at Dublin Airport.
**SEA TEMPERATURES**

Sea temperatures fell by three degrees during October, but were still around half a degree above normal by the end of the month. They ranged from a little below 13°C off the west and northwest coasts to around 14°C in the Irish Sea at mid-month. At Malin Head the mean sea temperature for the month was 13.1°C, half a degree above the October normal.

### Mean 10cm Soil Temperatures (°C) at 0900Z

<table>
<thead>
<tr>
<th>Station</th>
<th>Period</th>
<th>Temperature (°C)</th>
<th>Mean (°C)</th>
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</thead>
<tbody>
<tr>
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<td>1-10</td>
<td>3.8</td>
<td>-0.9</td>
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<tr>
<td>Fermoy</td>
<td>11-20</td>
<td>3.9</td>
<td>0.2</td>
</tr>
<tr>
<td>January</td>
<td>1-10</td>
<td>4.0</td>
<td>0.6</td>
</tr>
<tr>
<td>February</td>
<td>11-20</td>
<td>4.1</td>
<td>0.7</td>
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<tr>
<td>March</td>
<td>1-10</td>
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<td>5.1</td>
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### Soil Moisture Deficits (mm)

10th of month / End of month

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<th>Soil Moisture Deficit (mm)</th>
<th>0 represents field capacity, -10 saturation</th>
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### Measured Potential Evapotranspiration (P.E.) and Soil Moisture

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<tr>
<th>Station</th>
<th>Period</th>
<th>P.E. (mm)</th>
<th>Soil Moisture Deficit (mm)</th>
<th>Accumulated Deficit (mm)</th>
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### See back page for notes on the data
Stormy end to the month over northwest Europe

After a wet and windy October over much of England, the Low Countries and northwestern France, a severe storm affected much of the area during the 29th and 30th. The complex storm system, with central pressures as low as 980hPa early on the 30th (sea levels below) tracked over Wales and central England, bringing some torrential rain, with snow on its northern edge and storm force winds south of the low center.

In the 24 hours up to 0900 UTC on the 30th, over 50mm of rain fell over parts of Wales and the south and southwest of England, with severe flooding along several rivers in the area, already affected by earlier heavy rain during the month. Damage was also caused by winds gusting as high as 94 knots (87 m.p.h.), while a tornado caused considerable damage at Welwyn on the English south coast, the second tornado to hit the area in the same month. Gusts of over 50 knots (60m.p.h.) were measured at coastal stations in western France, with 60 knots (106 m.p.h.) measured in a gale at Brest early on the 30th. Falls of over 20mm in a 6-hour spell were recorded over much of northern and western France at the same time. Rainfall totals for the month were over twice the October normal in most parts of England, while parts of the southeast had up to 350% of normal. Such a wet October would be expected here once every 203 years.

Details from UK Met Office and Météo France

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**Summary of Significant Weather Worldwide during October**

A low pressure system, Michael, moved quickly northwards in the western Atlantic around the middle of the month, causing gales and rain over much of Newfoundland, with gales of 60 knots (70 m.p.h.), reaching there on the 25th.

The month saw an extremely wet spell to the north over the central Mediterranean. On the 1st, the northern Italian city of Milan received 115mm, while Milan recorded 120mm, both within an 8-hour spell.

The middle of October saw unusually cool weather over much of Australia, with maximum temperatures as low as eight degrees below normal. Alice Springs equaled the previous lowest October temperature of 37°C, while its monthly average value of 20.9°C was four degrees below normal.

Information supplied by NOAA Climate Prediction Center, U.S. Department of Commerce

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**20th Century annual means of rainfall, temperature & sunshine at Malin Head**

**Mean Annual Temperature**

**Annual Rainfall Totals**

**Mean Annual Sunshine per day**

---
<table>
<thead>
<tr>
<th>County / Station</th>
<th>TEMPERATURE (°C)</th>
<th>RAINFALL (MM)</th>
<th>SUNSHINE (HOURS)</th>
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<tr>
<td></td>
<td>Mean max min Mean deviation</td>
<td>Highest max date</td>
<td>Lowest min date</td>
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<tr>
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<td>13.0 7.6 10.3 17.3 3 3.5 21</td>
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<td>ABERDEEN</td>
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<tr>
<td>CO. TIPPERARY</td>
<td>12.7 6.6 10.4 -0.4</td>
<td>17.0 3 2.7 21</td>
<td>-0.0 21</td>
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<tr>
<td>FEDHAR (MACKENZIE)</td>
<td>12.7 5.3 9.0 15.7 3 1.3 21</td>
<td>-3.8 21</td>
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<td>CO. WATERFORD</td>
<td>14.1 6.6 10.4 -0.4</td>
<td>17.0 3 2.7 21</td>
<td>-0.0 21</td>
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<tr>
<td>WATERFORD (TIPPERARY)</td>
<td>14.1 6.3 10.2 -0.7</td>
<td>17.5 3 2.8 21</td>
<td>-0.0 21</td>
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<tr>
<td>CO. WESTMEATH</td>
<td>13.8 5.6 9.2 -0.6</td>
<td>17.3 3 -1.3 21</td>
<td>-5.4 21</td>
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<tr>
<td>BALLINGAUN 17</td>
<td>14.3 6.4 10.4 -0.4</td>
<td>18.3 3 1.4 30</td>
<td>0.2 22</td>
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<tr>
<td>CO. WEXFORD</td>
<td>13.8 6.4 9.8 -0.5</td>
<td>17.0 3 1.7 26</td>
<td>-0.4 21</td>
</tr>
<tr>
<td>JOHNSON CASTLE</td>
<td>14.3 6.4 9.8 -0.5</td>
<td>17.0 3 1.7 26</td>
<td>-0.4 21</td>
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<tr>
<td>akisarriard</td>
<td>14.6 8.1 11.1 -0.4</td>
<td>17.6 4 2.9 30</td>
<td>2.6 21</td>
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<td>CLOONROE</td>
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<td>John F. Kennedy Park</td>
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<td>17.5 3 2.8 30</td>
<td>-1.0 21</td>
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</tbody>
</table>
## Tables

### Weather — No. of Days with

<table>
<thead>
<tr>
<th>County / Station</th>
<th>Rain days</th>
<th>Wet days</th>
<th>Air frost</th>
<th>Ground snow</th>
<th>Snow fall</th>
<th>Hail</th>
<th>Thunder</th>
<th>Fog</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO. CLARE SHANNON AIRPORT</td>
<td>27</td>
<td>26</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CO. CORK WATERFORD</td>
<td>19</td>
<td>19</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>CO. DUBLIN DUBLIN AIRPORT</td>
<td>16</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>CO. KERRY KILLARNEY</td>
<td>20</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Wind (Knots)

<table>
<thead>
<tr>
<th>County / Station</th>
<th>Mean speed (knots)</th>
<th>Max speed (knots)</th>
<th>Min speed (knots)</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO. CLARE SHANNON AIRPORT</td>
<td>11.5</td>
<td>30.0</td>
<td>1.0</td>
<td>NE</td>
</tr>
<tr>
<td>CO. KERRY KILLARNEY</td>
<td>11.4</td>
<td>28.0</td>
<td>1.0</td>
<td>NW</td>
</tr>
<tr>
<td>CO. LOUTH DUBLIN AIRPORT</td>
<td>11.0</td>
<td>28.0</td>
<td>1.0</td>
<td>SW</td>
</tr>
</tbody>
</table>

### Frequency of Wind Direction

<table>
<thead>
<tr>
<th>Wind Direction</th>
<th>Frequency</th>
</tr>
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<tbody>
<tr>
<td>NE</td>
<td>12.0</td>
</tr>
<tr>
<td>NW</td>
<td>11.0</td>
</tr>
<tr>
<td>SW</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Daily mean wind speeds and maximum significant gusts (24 knots or more).
Notes on the Tables

A. General
1. Rainfall amounts are given in millimetres, temperature in degrees Celsius, sunshine duration in hours and wind speed in knots.
(1 knot = 1.15 m.p.h.)

2. All stations daily rainfall totals refer to the 24-hour period ending at 0900UTC the following day. The term "rainfall" includes all forms of precipitation, such as snow and hail, and deposition from dew or frost, measured as equivalent rain.

3. "Blowdays" and "dredge days" are days during which the total rainfall is not less than 0.2mm and 1.0mm respectively.

4. A "day" for the purposes of this publication refers to the period from 0600UTC on a particular day to 0600UTC on the following day. (This is because climatological stations make their daily observations at 0600UTC.)

5. The mean daily air temperature over a period is taken as the mean of the daily maximum and daily minimum (averaged separately over the period).

6. Days with air frost are those during which the minimum air temperature was below 0°C. Similarly, days with ground frost indicate days when the grass minimum temperature was below 0°C. (Grass minimum temperature are measured by a thermometer placed horizontally on the grass just above the tips of short grass.)

7. Mean soil and earth temperatures are based on readings taken at 0900UTC.

8. A gale is a mean wind of over 10 minutes period of 34 knots or more. A gale gust is a gust of 34 knots or more. All wind speeds refer to the wind at an effective height of 10 metres above the ground.

9. "W" denotes that the value is calculated using one or more estimated readings.

10. Data from Northern Ireland is kindly provided by the Belfast Weather Centre.

B. Agmet
11. Calculated Potential Evapotranspiration (P.E.) values are based on values of temperature, sunshine, wind speed and vapour pressure using the Penman formula. Because of formula limitations, negative values can occur in winter; these are replaced in the table by zero. Measured P.E. values are those measured by means of a infilled hydrometer sunk into the ground with its upper grass-covered end at surface level.

12. Soil moisture deficits and supplies 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, 1988). Soil moisture deficits are assumed to be removed by drainage and surface runoff and not Penman cattle forward from one period to the next. Soil moisture deficits are regarded as being cumulative. Where heavy rain occurs near the end of the period, the date of cut-off may be adjusted to avoid error due to insufficient runoff time.


14. Global solar radiation values are given in MJh m-2, corrected to two decimal places (MJh-2 x 1000).

C. Laboratory
15. Daily samples of air and precipitation are taken at Valentia Observatory at 1000UTC each day. Monthly precipitation samples at other stations are taken at 1200UTC on the 1st of each month.

16. Air sample data are given in micrograms per cubic metre, electrical conductivity in micro-Siemens per centimetre and pH in pH units.