

Fact sheet No. 9 - Weather extremes

Temperature

Temperature: the degree or intensity of heat present in a substance or object.

The Celsius scale of temperature was adopted by the World Meteorological Organization as the standard unit of temperature measurement and was formally adopted by the Met Office on 1 January 1961.

Note: throughout this fact sheet all values of temperature are given only in Celsius.



Figure 1. Recording the temperature.

United Kingdom

- In terms of annual average temperature, the warmest place in the UK is the Isles of Scilly with a mean temperature of 11.5 °C
- Braemar, Aberdeenshire is the coldest low-level place in the UK, in terms of annual average temperature, with a mean temperature of 6.5 °C
- At Heathrow Airport there were 14 consecutive days between 23 June and 8 July 1976 when the temperature was above 31 °C
- For the whole of the UK, 2006 was the warmest year on record with a mean temperature of 9.7 °C, 1.1 °C above the 30-year (1971 to 2000) long-term average.

England

Across England the mean annual temperature, at low altitudes, varies from about 8.5 °C to 11.0 °C, with the highest values occurring around or near to the coasts of Cornwall and the Isles of Scilly. The mean annual temperature decreases by approximately 0.5 °C for each 100 m increase in height so that, for example, Great Dun Fell in Cumbria, at 857 m, has an annual mean temperature of about 4.0 °C.

- **Highest recorded temperature:** 38.5 °C at Brogdale, Faversham (Kent), on 10 August 2003
- **Lowest recorded temperature:** –26.1 °C at Newport (Shropshire) on 10 January 1982

Scotland

Across Scotland the mean annual air temperature, at low altitude, ranges from about 7.0 °C on Shetland, in the far north, to 9.0 °C on the coast of Ayrshire and Dumfries and Galloway in the south-west. Normally temperature decreases by approximately 0.5 °C for each 100 m rise in height so that over the high ground temperatures are generally colder. For example, Braemar, at 339 m above mean sea level, has an annual mean temperature of 6.4 °C while the corresponding value on Ben Nevis, at an altitude of 1344 m, is –0.3 °C.

- **Highest recorded temperature:** 32.8 °C at Dumfries (Dumfries & Galloway) on 2 July 1908
- **Lowest recorded temperature:** –27.2 °C at Braemar (Aberdeenshire) on 11 February 1895 and again on 10 January 1982. Also at Altnaharra on 30 December 1995

Wales

Across Wales the mean annual temperature, at low altitudes, varies from about 9.5 °C to 10.5 °C, with the higher values occurring around or near to the coasts. The mean annual temperature decreases by approximately 0.5 °C for each 100 m increase in height so that, for example, Bwlchgwyn, Clwyd, at 386 m, has an annual mean temperature of 7.3 °C. On this basis, Snowdon, at 1085 m, would have an annual mean temperature of about 5.0 °C.

- **Highest recorded temperature:** 35.2 °C at Hawarden Bridge (Clwyd) on 2 August 1990
- **Lowest recorded temperature:** –23.3 °C at Rhayader (Powys) on 21 January 1940

Northern Ireland

Across Northern Ireland the mean annual temperature, at low altitudes, varies from about 8.5 °C to 9.5 °C, with the higher values occurring around or near to the coasts. The mean annual temperature decreases by approximately 0.5 °C for each 100 m increase in height so that, for example, Parkmore Forest, Co. Antrim, at 235 m, has an annual mean temperature of 7.4 °C. On this basis, Slieve Donard, the Province's highest mountain at 852 m, would have an annual mean temperature of about 4.5 °C.

- **Highest recorded temperature:** 30.8 °C at Knockarevan (near Belleek, Co. Fermanagh) on 30 June 1976 and at Shaw's Bridge, Belfast (Co. Antrim) on 12 July 1983
- **Lowest recorded temperature:** –17.5 °C at Magherally (near Banbridge, Co. Down) on 1 January 1979

Worldwide

- The lowest screen temperature recorded in the world is $-89.2\text{ }^{\circ}\text{C}$ at Vostok, Antarctica on 21 July 1983
- In terms of annual average temperature, the coldest place in the world is Plateau Station, Antarctica with a mean temperature of $-56.6\text{ }^{\circ}\text{C}$
- The highest screen temperature recorded in the world is $57.7\text{ }^{\circ}\text{C}$ at Al'Aziziyah, Libya, on 13 September 1922
- In terms of annual average temperature, the hottest place in the world is Dallol, Ethiopia with a mean temperature of $34.4\text{ }^{\circ}\text{C}$
- At Browning, Montana, the temperature fell $55.6\text{ }^{\circ}\text{C}$ in the 24 hours between 23 and 24 January 1916 from $6.7\text{ }^{\circ}\text{C}$ to $-48.9\text{ }^{\circ}\text{C}$. This occurred during the passage of a cold front.
- At Rapid City, South Dakota on 10 January 1911, the temperature fell from $12.8\text{ }^{\circ}\text{C}$ at 0700 to $-13.3\text{ }^{\circ}\text{C}$ at 0715
- At Rapid City, South Dakota on 22 January 1943, the temperature rose from $-20\text{ }^{\circ}\text{C}$ at 0732 to $7.2\text{ }^{\circ}\text{C}$ two minutes later. This was caused by the onset of warm Chinook winds.

Africa

Highest recorded temperature: $57.7\text{ }^{\circ}\text{C}$ at Al'Aziziyah, Libya on 13 September 1922

Lowest recorded temperature: $-23.9\text{ }^{\circ}\text{C}$ at Ifrane, Morocco on 11 February 1935

Antarctica

Highest recorded temperature: $14.6\text{ }^{\circ}\text{C}$ at Hope Bay on 5 January 1974

Lowest recorded temperature: $-89.2\text{ }^{\circ}\text{C}$ at Vostok on 21 July 1983

Asia

Highest recorded temperature: $53.9\text{ }^{\circ}\text{C}$ at Tirat Tsvi, Israel on 21 June 1942

Lowest recorded temperature: $-69.8\text{ }^{\circ}\text{C}$ at Verkhoyansk, Siberia on 7 February 1892

Europe

Highest recorded temperature: $50.0\text{ }^{\circ}\text{C}$ at Seville, Spain on 4 August 1881

Lowest recorded temperature: $-55.0\text{ }^{\circ}\text{C}$ at Ust'Shchugor, Russia (no date available)

Australia

Highest recorded temperature: $50.7\text{ }^{\circ}\text{C}$ at Oodnadatta, South Australia on 2 January 1960

Lowest recorded temperature: $-23.0\text{ }^{\circ}\text{C}$ at Charlotte Pass, New South Wales on 29 June 1994

North America

Highest recorded temperature: $56.7\text{ }^{\circ}\text{C}$ at Death Valley, USA on 10 July 1913

Lowest recorded temperature: $-63.0\text{ }^{\circ}\text{C}$ at Snag, Canada on 3 February 1947

South America

Highest recorded temperature: $48.9\text{ }^{\circ}\text{C}$ at Rivadavia, Argentina on 11 December 1905

Lowest recorded temperature: $-33.0\text{ }^{\circ}\text{C}$ at Sarmiento, Argentina on 1 June 1907

Bright sunshine



Figure 2. Sunrise over Langdon Bay (Kent).

United Kingdom

- St. Helier, Jersey is the sunniest town in the British Isles with an average 1915 hours of sunshine per year.

Mean daily sunshine figures reach a maximum in May or June, and are at their lowest in December. The key factor is, of course, the variation in the length of the day through the year, but wind and cloud play their part as well.

England

On sunny days in summer, largely because the formation of convective (cumulus) cloud takes place over land and skies over the sea remain cloud-free, the sunniest parts of the whole United Kingdom are along the south coast of England. Many places along the south coast achieve annual average figures of around 1750 hours. The duller parts of England are the mountainous areas, with annual average totals of less than 1000 hours.

Highest recorded sunshine: 383.9 hours at Eastbourne (East Sussex) in July 1911

Lowest recorded sunshine: 0.0 hours at Westminster (London) in December 1890

Scotland

Generally, Scotland is more cloudy than England, due mainly to the hilly nature of the terrain and the proximity of low-pressure systems from the Atlantic. Even so, parts of Angus, Fife, the Lothians, Ayrshire, and Dumfries and Galloway average over 1400 hours of sunshine per year, comparing favourably with the coastal areas of Northern Ireland and the north of

England, though not perhaps with the annual totals of over 1700 hours achieved along the south coast of England. The dullest parts of Scotland are the more mountainous areas, with an annual average of less than 1100 hours over the mountains of Highland Region.

Highest recorded sunshine: 329.0 hours at Tiree (Argyll & Bute) in May 1946 and May 1975

Lowest recorded sunshine: 0.6 hours at Cape Wrath (Highland) in January 1983

Wales

On the whole, Wales is cloudier than England, because of the hilly nature of the terrain and the proximity to the Atlantic. Even so, the south-western coastal strip of Dyfed manages an annual average total of over 1700 hours, comparing not unfavourably with figures of around 1750 hours achieved by many places along the south coast of England. The dullest parts of Wales are the mountainous areas, with annual average totals of less than 1100 hours.

Highest recorded sunshine: 354.3 hours at Dale Fort (Dyfed) in July 1955

Lowest recorded sunshine: 2.7 hours at Llwynon (Powys) in January 1962

Northern Ireland

On the whole, Northern Ireland is cloudier than England, because of the hilly nature of the terrain and the proximity to the Atlantic. Even so, the coastal strip of Co. Down manages an annual average total of over 1400 hours, comparing not unfavourably with many coastal areas of England and Wales, though not perhaps with the figures of around 1750 hours achieved by many places along the south coast of England. The dullest parts of Northern Ireland are the more mountainous areas, with annual average totals of less than 1100 hours.

Highest recorded sunshine: 298.0 hours at Mount Stewart (Co. Down) in June 1940

Lowest recorded sunshine: 8.3 hours at Silent Valley (Co. Down) in January 1996

Worldwide

- In terms of annual average sunshine, the sunniest recorded place on Earth is Yuma, Arizona, USA with 4300 hours per year
- St Petersburg, in Florida, USA recorded 768 consecutive sunny days from 9 February 1967 to 17 March 1969
- The South Pole has no sun for 182 days per year

Rainfall

Rain: the total liquid product of precipitation and condensation from the atmosphere, as received and measured in a rain-gauge.

Snow, sleet and hail, in addition to rain, make up much the greater part of the total 'rainfall', as defined above. There are also small additions due to the deposition of dew, hoar-frost and rime on to the collecting surface on the rain-gauge.

One inch of rainfall is equivalent to about 100 tons of water per acre (1 mm is equivalent to about 1 kilogram per square metre).

Rainfall is classified into three general types:

- **Orographic Rain** – rain which is caused, or enhanced, by the presence of high ground.
- **Cyclonic Rain** – rain that is caused by the large-scale vertical motion associated with synoptic features such as depressions and fronts.
- **Convective Rain** – rain that is caused by the vertical motion of an ascending mass of air which is warmer than its environment, the horizontal dimension of such an air mass is generally of the order of 15 km or less and forms a typical cumulonimbus cloud.

Convective rain is typically of greater intensity than either of the other two main classes (cyclonic and orographic) and is sometimes accompanied by thunder.



Figure 3. Girl with umbrella.

United Kingdom

- The heaviest rainfall in one year in the United Kingdom is 6528 mm recorded at Sprinkling Tarn, Cumbria, in 1954
- The longest drought in the United Kingdom occurred in Sussex and lasted 60 days between 17 March and 15 May 1893
- In terms of annual average rainfall, the driest recorded place in the United Kingdom is St Osyth, Essex, with just 513 mm per year

Extreme rainfall events in the United Kingdom

Highest 24-hour total: 279 mm at Martinstown, near Dorchester, Dorset, on 18 July 1955

Highest 5-minute total: 32 mm at Preston, Lancashire, on 10 August 1893

Highest 30-minute total: 80 mm at Eskdalemuir, Dumfries and Galloway, on 26 June 1953

Highest 60-minute total: 92 mm at Maidenhead, Berkshire, on 12 July 1901

Highest 90-minute total: 117 mm at Dunsop Valley, Lancashire, on 8 August 1967

Highest 120-minute total: 193 mm at Walsaw Dean Lodge, West Yorkshire, on 19 May 1989

Highest 180-minute total: 178 mm at Horncastle, Lincolnshire, on 7 October 1960

England

Rainfall in England varies widely, with the highest average annual totals being recorded in the Lake District, where the yearly fall is comparable with that in the western Highlands of Scotland. The Lake District is the wettest part of England with average annual totals exceeding 2000 mm, with the Pennines and the moors of south-west England being almost as wet. However, all of East Anglia, much of the Midlands, eastern and north-eastern England, and parts of the south-east, receive less than 700 mm a year.

Typically, it rains on about one day in three in England, perhaps somewhat more often in winter, though long dry spells occur in most years.

Maximum in a day (09-09 UTC): 279 mm at Martinstown (Dorset) on 18 July 1955

Scotland

There is a general misconception that the whole of Scotland experiences high rainfall. In fact, rainfall in Scotland varies widely, with a distribution closely related to the topography, raging from over 3000 mm per year in the western Highlands (comparable with rainfall over the mountains of the English Lake District and Snowdonia in Wales) to under 800 mm per year near the east coast (comparable with the English Midlands).

Typically, measurable rainfall (an amount of 0.2 mm or more) occurs on over 250 days per year over much of the Highlands, decreasing to around 175 days per year on the Angus, Fife and East Lothian coasts. In comparison, the driest part of Britain, along the Thames Estuary in south-east England, averages around 150 days per year with measurable rainfall.

Maximum in a day (09-09 UTC): 238 mm at Sloy Main Adit, Loch Lomond on 17 January 1974

Wales

Rainfall in Wales varies widely with the highest average annual totals being recorded in the mountainous areas of Snowdonia and the Brecon Beacons, where the yearly fall is comparable with that in the English Lake District or the western Highlands of Scotland. In the east, close to the border with England, annual totals are similar to those over much of the English Midlands. Snowdonia is the wettest part of Wales with average annual totals exceeding 3000 mm, but coastal areas and the east receive less than 1000 mm a year.

Maximum in a day (09-09 UTC): 211 mm at Rhondda (Gwent) on 11 November 1929

Northern Ireland

Rainfall in Northern Ireland varies widely, with the highest average totals being recorded in the Sperrin, Antrim and Mourne Mountains, where the yearly fall of around 1600 mm is about half that in the English Lake District or the western Highlands of Scotland. In the east close to the coast, and near to the southern and eastern shores of Lough Neagh, the annual totals of just under 800 mm are similar to those near the Firth of Forth in Scotland, but rather more than those over much of the English Midlands.

Maximum in a day (09-09 UTC): 158.9 mm at Tollymore Forest (Co. Down) on 31 October 1968

Worldwide

Highest average annual total: 11680 mm (460 inches) at Mount Wai-ale-ale, Hawaii

Highest in one year: 26461 mm (1042 inches) at Cherrapunji, India from 1 August 1860 to 31 July 1861

Highest in one calendar month: 9300 mm (366 inches) at Cherrapunji, India in July 1861

Highest in 24 hours: 1825 mm (72 inches) at Fac Fac, La Reunion Island, Indian Ocean

Highest in 12 hours: 1350 mm (53 inches) at Belouve, La Reunion Island, Indian Ocean

Other rainfall facts and figures

- **Driest place:** for the period between 1964 and 2001, the average annual rainfall at the meteorological station in Quillagua, in the Atacama Desert, Chile, was just 0.5 mm
- 500 million litres of rain can fall from a single thunderstorm

Wind

Wind: the (horizontal) movement of air relative to the rotating surface of the earth.

Wind speed, in the Met Office, is normally measured in knots. The knot is defined as a speed of one nautical mile per hour.

$$1 \text{ knot} = 0.514 \text{ m s}^{-1} = 1.152 \text{ mile h}^{-1} = 1.853 \text{ km h}^{-1} = 1.689 \text{ ft s}^{-1}$$

United Kingdom

There is a close relationship between surface isobars (line joining points of equal pressure) and wind speed and direction over open level terrain. However, in mountain and moorland areas such as the Pennines, local topography also has a very significant effect with winds tending to be aligned along well-defined valleys. The most common direction from which the wind blows in the United Kingdom is the south-west, but in a climate which is extremely variable from day to day winds from other directions are quite frequent, and long spells of easterly or north-easterly winds are not unusual.

Over land, the roughness of the ground causes a decrease in the mean wind speed compared with that which occurs over the sea, with the size of the decrease depending on the nature of the terrain. In major town and cities the overall mean speed is considerably reduced by the buildings but local funnelling may occur, and the wind can gust to about the

same speed as in open country. It is this gustiness which causes much of the damage to buildings and trees on really wind days, though such days are comparatively rare.



Figure 4. Wind farm at Port of Blyth, Northumberland.

England

In England, because of the protection afforded by the island of Ireland, the windiest place is the coastal regions of Devon and Cornwall. Here there are about 15 days of gale a year. Inland, the number of days decreases to fewer than five days a year.

In general, wind speed increases with height, with the strongest winds being observed over the summits of hills and mountains, Great Dun Fell, in Cumbria, at 857 metres averaged 114 days of gale a year during the period 1963 to 1976.

Highest gust recorded at a low-level site: 103 knots (118 mph) at Gwennap Head (Cornwall) on 15 December 1979

Scotland

Since many of the major Atlantic depressions pass close to or over Scotland, the frequency of strong winds and gales is higher than in other parts of the United Kingdom. Over low ground, the windiest areas are the Western Isles, the north-west coast and Orkney and Shetland with over 30 days with gales per year in some places.

Highest gust recorded at a low-level site: 123 knots (142 mph) at Fraserburgh (Aberdeenshire) on 13 February 1989

Highest gust recorded at a high-level site: 150 knots (173 mph) at Cairngorm Automatic Weather Station (on the border of Highland and Moray at an altitude of 1245 metres AMSL) on 20 March 1986

Wales

In Wales, gales occur most frequently in the extreme south-west of Dyfed with about 30 days of gale on average. Other coastal areas have 15 days or more of gale with the number of days decreasing inland to 5 days or fewer.

At Snaefell (altitude 615 metres AMSL), on the Isle of Man, the average number of days of gale a year is 200.

Highest gust recorded at a low-level site: 108 knots (124 mph) at Rhoose (South Glamorgan) on 28 October 1989

Northern Ireland

The coastal fringes of counties Antrim and Down have about 15 days of gale a year, while the number of days decreases inland to five days or fewer.

Highest gust recorded at a low-level site: 108 knots (124 mph) at Kilkeel (Co. Down) on 12 January 1974

Worldwide

- The highest surface wind speed recorded at a high altitude station is 372 kilometres per hour (200 knots) on top of Mount Washington, New Hampshire, USA on 12 April 1934
- The highest surface wind speed recorded at a low altitude station is 333 kilometres per hour (180 knots) measured at Thule, Greenland on 8 March 1972
- The Antarctic continent is a continent of extremes. It is the windiest and least windiest place on Earth:
 - The windiest place on Earth is Port Martin, Antarctica. Here winds average more than forty miles per hour on at least one hundred days each year
 - The least windiest place on Earth is at Dome A, Antarctica, where typical wind speeds are less than a few kilometres per hour, making it the calmest place on Earth

Snow

Snow: solid precipitation which occurs in a variety of minute ice crystals at temperatures well below 0 °C but as larger snowflakes at temperatures near 0 °C.

Snowflakes are aggregates of ice crystals which occur in an infinite variety of shapes and forms. At very low temperatures the flakes are small and their individual structure is simple. At temperatures which are close to freezing-point the individual flakes may be composed of a very large number of ice crystals (predominantly star-shaped) and the flakes may then have a diameter up to several inches.

- 12% of the Earth's land surface is permanently covered by ice and snow
- The deepest snowfall ever measured in the USA was 11.43 metres in March 1911 at Tamarac, California
- The greatest snowfall recorded in one day occurred at Silver Lake, Colorado on 14 April 1921 when 1.93 metres were measured
- The earliest snow to fall in London was on 25 September 1885

- The snowiest winter of the twentieth century in the United Kingdom was 1947. Between 22 January and 17 March snow fell every day somewhere in the country
- The most disastrous avalanche in the United Kingdom occurred in Lewes, East Sussex on 27 December 1836. Eight people were killed and several houses were destroyed



Figure 5. Snow scene at Yangdroke Lake, Tibet

Atmospheric Pressure

Pressure: is the force per unit area exerted on a surface by the liquid or gas in contact with it.

Atmospheric pressure of the atmosphere at any point is the weight of the air which lies vertically above a unit area centred at the point.

Units of Atmospheric Pressure

The unit of pressure in the International System (SI) is the Newton per metre squared (Nm^{-2}) to which has been given the name Pascal and the symbol Pa. The unit for measuring atmospheric pressure for international meteorological purposes, however, remains the millibar (mb).

$$1 \text{ mb} = 100 \text{ Pa} = 1 \text{ hPa}.$$

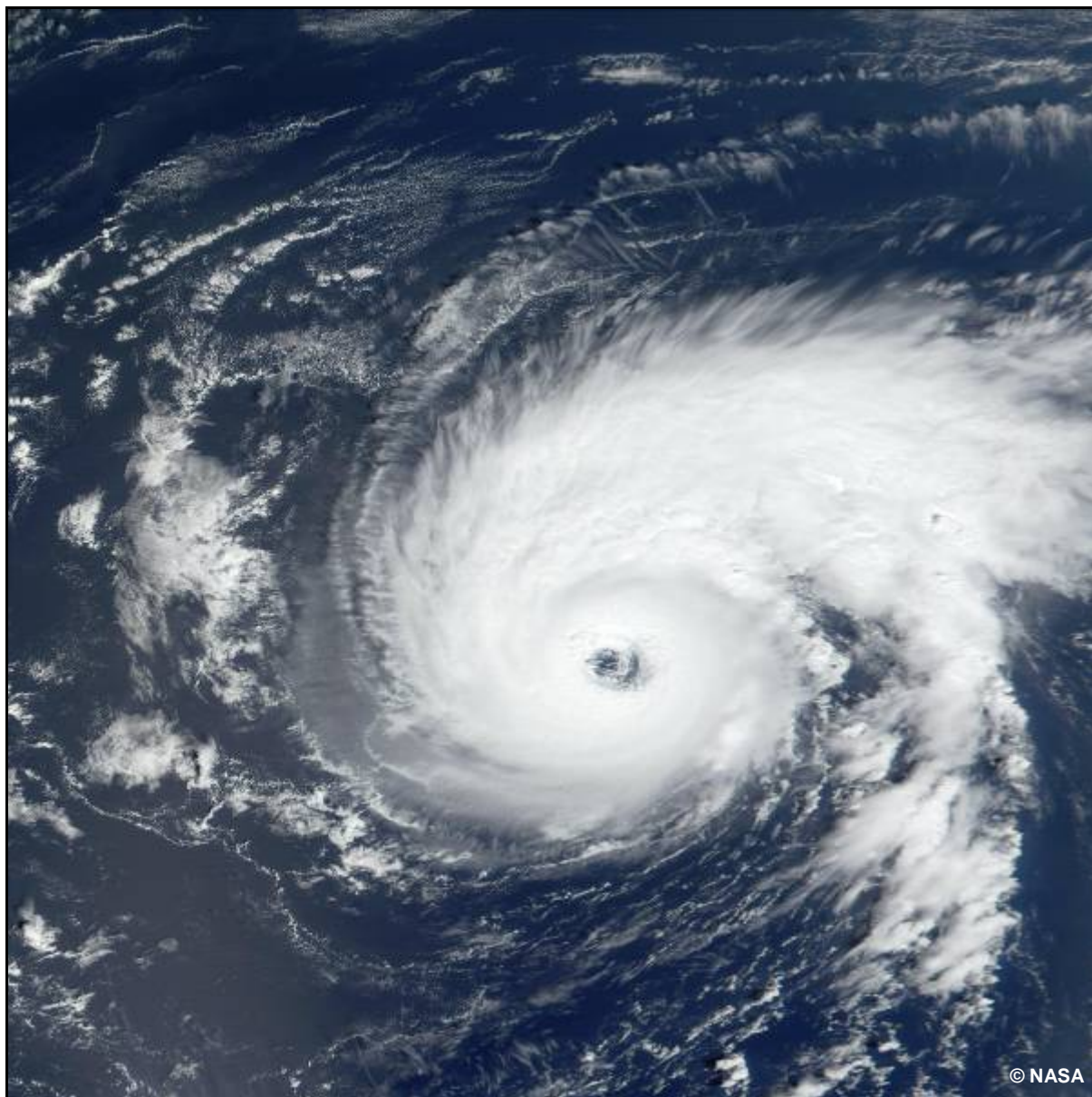


Figure 6. Hurricane Erin viewed from space

United Kingdom

- The highest barometric pressure reading ever made in the United Kingdom is 1053.6 mb at Aberdeen on 31 January 1902
- The lowest barometric pressure reading in the United Kingdom is 925.6 mb at Ochtertyre, Perthshire on 26 January 1884

Worldwide

- The highest barometric pressure reading recorded in the world is 1083 mb at Agata, Siberia on 31 December 1968
- The lowest barometric pressure reading in the world occurred in the eye of Typhoon Tip as it moved across the Pacific Ocean to the east of the Philippines on 12 October 1979. The pressure fell to 870 mb

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