

North West England & Isle of Man: climate

This describes the main features of the climate of Cheshire, Merseyside, Greater Manchester, Lancashire, Cumbria, part of North Yorkshire and the Isle of Man. The eastern boundary of the region lies along the watershed of the Pennines.

There are several distinct geographical areas within the region. Much of the area west of the Pennines from Lancashire southwards forms part of a plain, mainly below 150 metres, with westward draining rivers such as the Mersey, Ribble and Lune. Liverpool and Manchester are the main centres of population. To the east, the Pennines are a chain of rolling gritstone moors rising to well over 600 metres and reaching their highest point at Cross Fell (893 metres). The Pennines form a natural barrier to east-west communications, but there are the Tyne gap linking Carlisle and Newcastle and the Aire gap linking Lancashire and Yorkshire. The Lake District in Cumbria includes Scafell Pike (978 metres), the highest mountain in England, and Windermere, the largest lake. To the north and NE, there is further low ground (below 60 metres) in the Vale of Eden and the Solway Plain, close to Carlisle. Most of the Isle of Man consists of a central mountain mass rising to 621 metres on Snaefell. Douglas is the main town and the centre of the island's tourist industry.

The range of topography and altitude found in both NW England and the Isle of Man provide a climate of great variety, and the region includes both the coldest place in England (Cross Fell in the Pennines) and the wettest place in England (the Lakeland fells around Seathwaite in Cumbria).

Temperature

Mean annual temperatures over the region depend very much on altitude and, to some extent, proximity to the coast. Over the lower lying areas inland the average varies from around 10.5 °C in Cheshire to 9 °C in the Solway Plain near Carlisle and there is an approximate decrease of 0.5 °C for each 100 metres increase in altitude. The highest values occur along the coasts of the Isle of Man, Merseyside and Lancashire, whilst the lowest occur at the higher altitudes such as the Lake District fells and Pennines. Over the UK, mean annual temperatures range from about 7 °C in the Shetlands to over 11 °C in Cornwall and the Channel Islands.

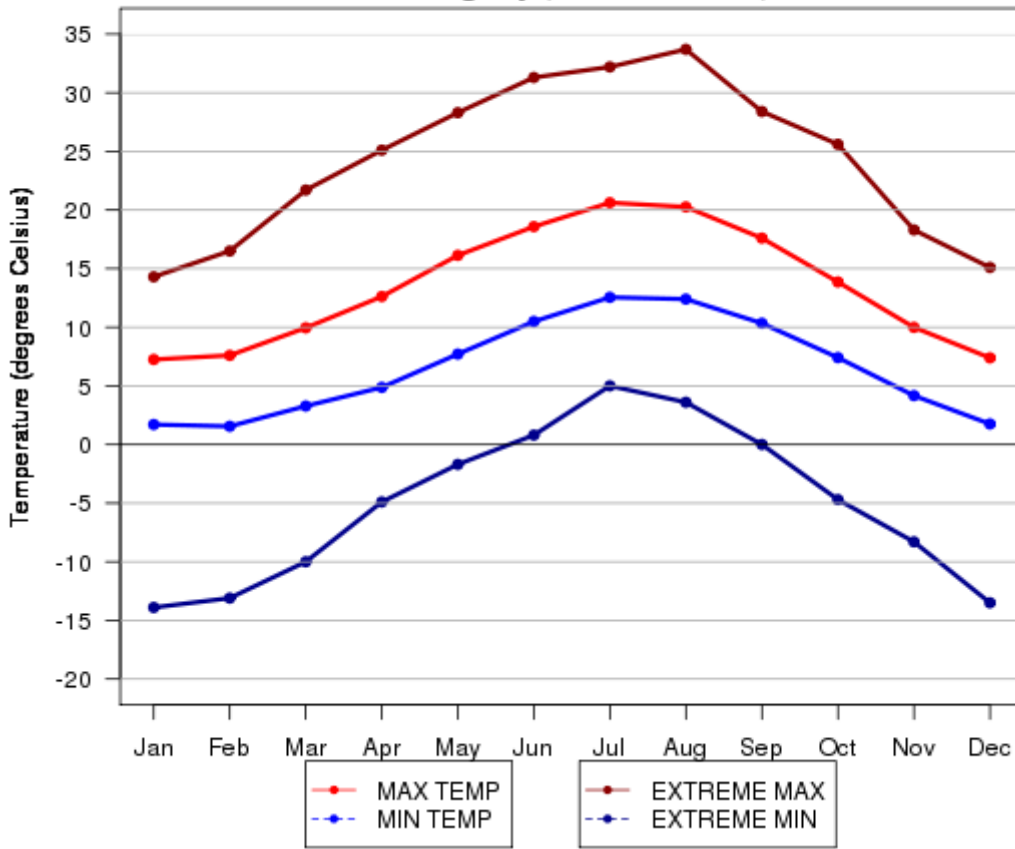
Temperature shows both a seasonal and a diurnal variation. January is usually the coldest month on the mainland, with mean daily minimum temperatures varying from below 0 °C over the highest ground to about 2 to 2.5 °C along the coasts and in Merseyside. However, on the Isle of Man the coldest month is February with a mean daily minimum temperature around 3 °C. This lag is due to the modifying effect of the Irish Sea, which is coldest in late February or early March. Minimum temperatures usually occur around sunrise and extreme minima have been recorded in winter, often in January or February. The lowest known temperature recorded in the region was -21.1 °C at Ambleside (Cumbria) in January 1940. On the Isle of Man the lowest recorded has been -11.7 °C at Douglas in February 1895.

July is the warmest month, with mean daily maximum temperatures of about 21 °C in Cheshire, but only 17 °C to 18 °C on the Isle of Man and in upland areas such as the Pennines and Lake District. The highest July mean daily maxima occur in the London area (23.5 °C) whilst the lowest occur in the Shetlands (15 °C). Maximum temperatures are normally 2 or 3 hours after midday. Extreme maximum temperatures can occur in July or August. For example, on 3 August 1990 a temperature of 34.5 °C was recorded at Knutsford, Cheshire, and in the heat wave in July 2006 34.3 °C was achieved at Crosby, Merseyside on the 19th.

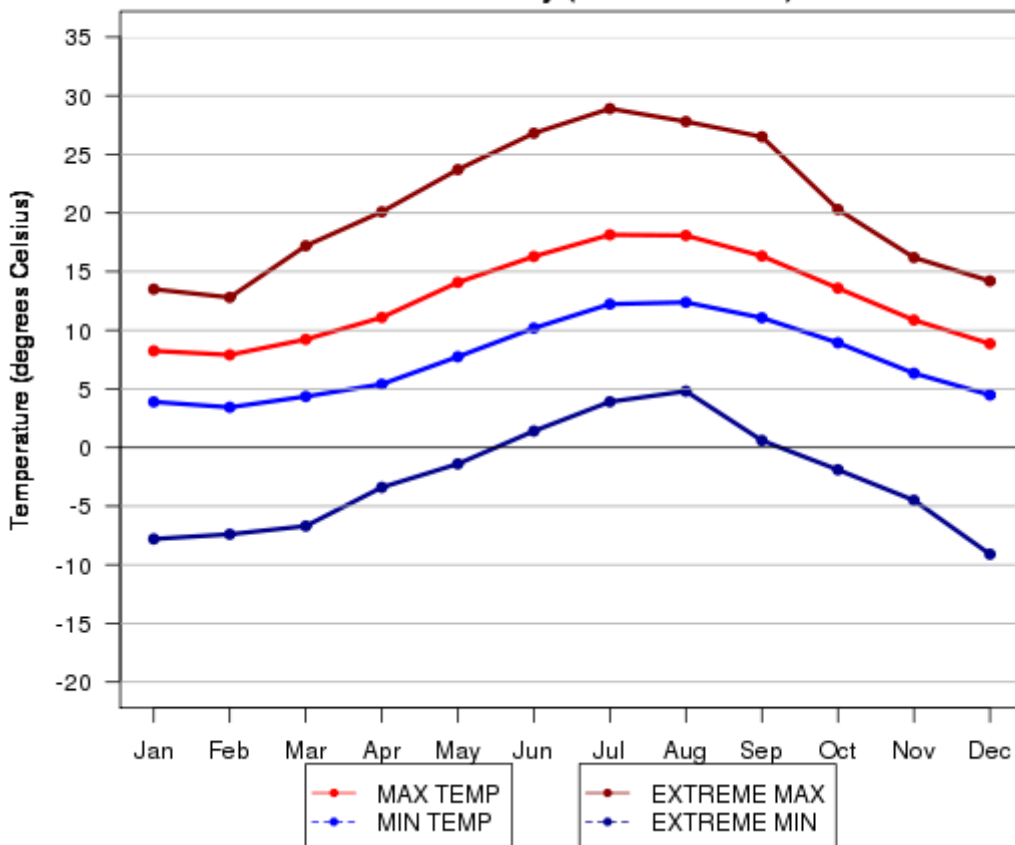


The variation of mean daily maximum and minimum temperatures month by month, together with the highest and lowest temperatures recorded, is shown for Ringway (Manchester Airport) and Ronaldsway.

**Mean daily maximum and minimum temperature
(1981-2010) and extremes (1942-2004)
at Ringway (69 metres amsl)**



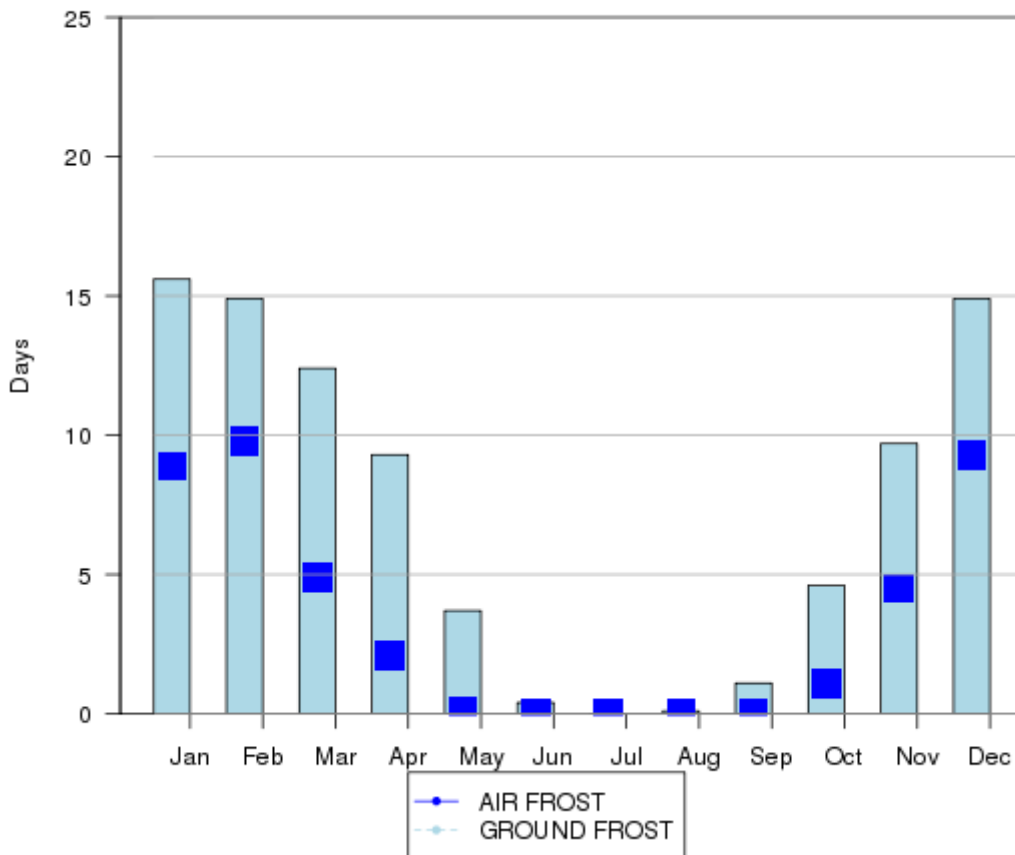
**Mean daily maximum and minimum temperature
(1981-2010) and extremes (1948-2014)
at Ronaldsway (16 metres amsl)**



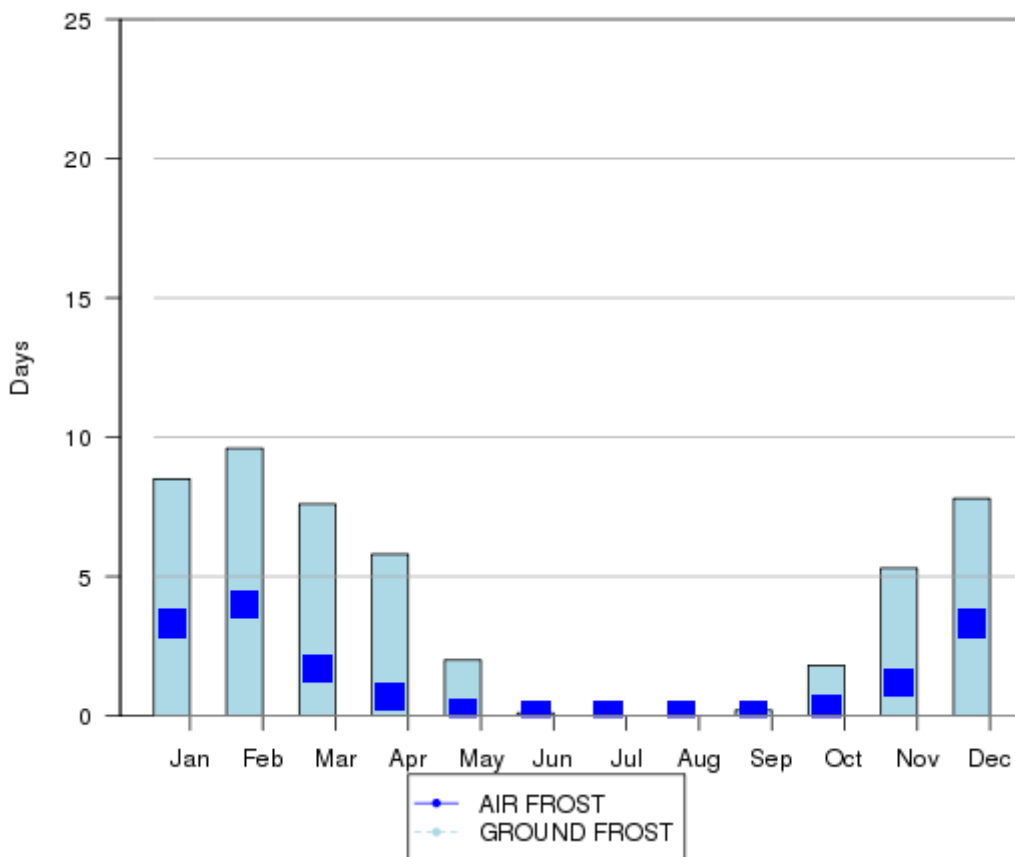
An 'air frost' occurs when the temperature at 1.25 metres above the ground falls below 0 °C, whereas incidence of a 'ground frost' refers to a temperature below 0 °C measured on a grass surface. The average number of days with air frost on the Isle of Man varies from about 15 to 40 a year and in NW England it varies from about 20 in Merseyside to over 75 a year in the higher Pennines and Lake District. Ground frost occurs on average on 50-100 days per year on the Isle of Man and from about 75 to over 130 days on the mainland, with a similar distribution to air frost.

The graphs show the average frequency of air and ground frost at Ringway and Ronaldsway. Although the summer months are usually free of air frost, ground frost may occur at any time of the year, especially at sites in inland valleys.

Average annual number of days of air and ground frost (1981-2010) at Ringway (69 metres amsl)



Average annual number of days of air and ground frost (1981-2010) at Ronaldsway (16 metres amsl)



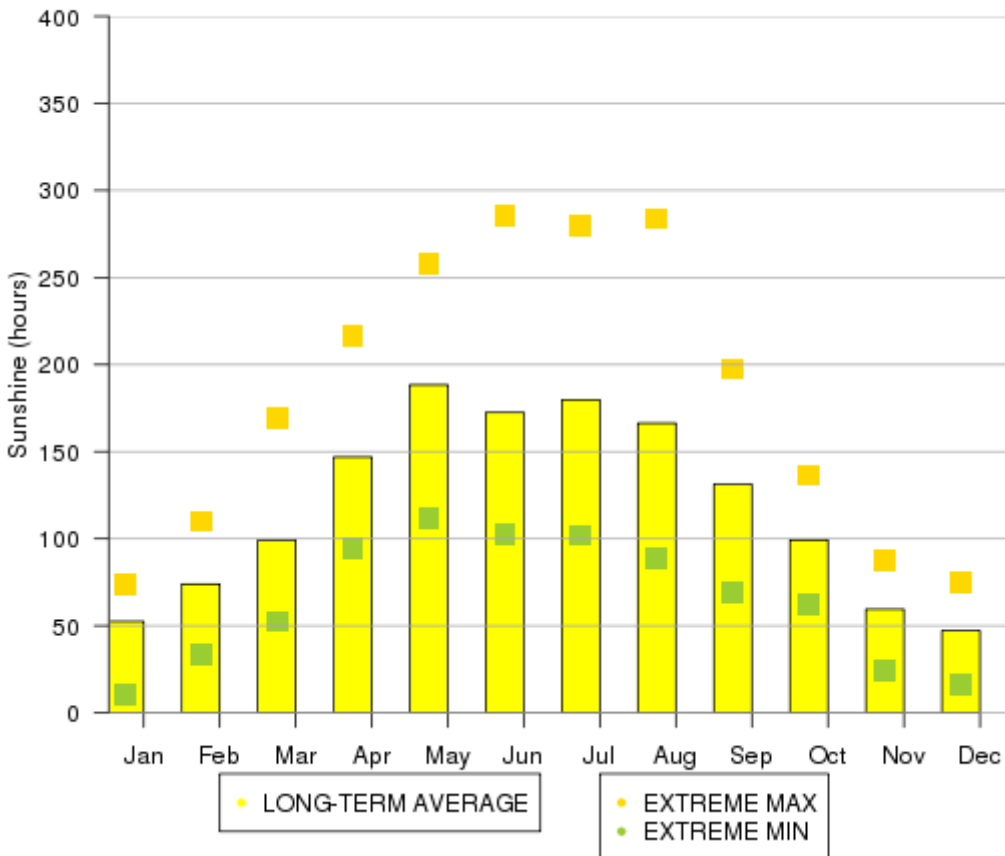
Sunshine

The number of hours of bright sunshine is controlled by the length of day and by cloudiness. The day is shortest in December and longest in June and in general December is the duller month and May the sunniest.

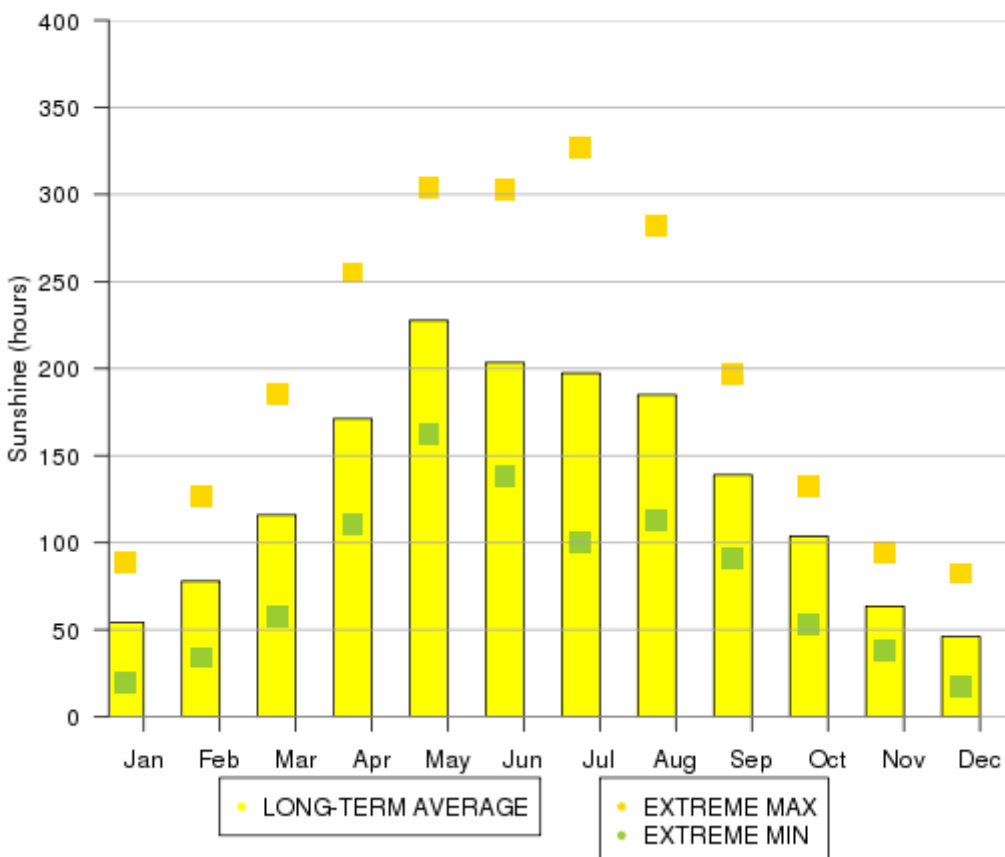
In general, sunshine duration decreases with increasing altitude, increasing latitude and distance from the coast. Industrial pollution and smoke haze can also reduce sunshine amounts but, since the Clean Air Act of 1956 and a decline in heavy industry, there has been an increase in sunshine duration over the industrial areas of Merseyside and Greater Manchester.

Average annual sunshine durations over NW England range from around 1200 hours in the higher Pennines to about 1500 hours on the coast. On the Isle of Man, the range is from about 1300 hours at high altitude to 1550 hours on the coast. These figures compare with values of less than 1100 hours a year in the Shetland Islands to over 1750 hours along the south coast of England and over 1900 hours in the Channel Islands. The tendency for convective cloud to develop over inland areas in summer leads to values that are lower than coastal sites. The graphs show the average monthly sunshine totals for Ringway and Ronaldsway, together with the highest and lowest totals recorded in the stated periods.

Mean monthly sunshine (1981-2010) and extremes (1942-2004) at Ringway (69 metres asl)



Mean monthly sunshine (1981-2010) and extremes (1949-2005) at Ronaldsway (16 metres asl)



The highest known monthly sunshine totals in the region are 336.1 hours at Blackpool and 327.0 hours at Ronaldsway, both in July 1955. The highest UK monthly total is 383.9 hours at Eastbourne in July 1911. In the

dullest winter months, less than 20 hours have been recorded - with none at all in December 1890 in central London.

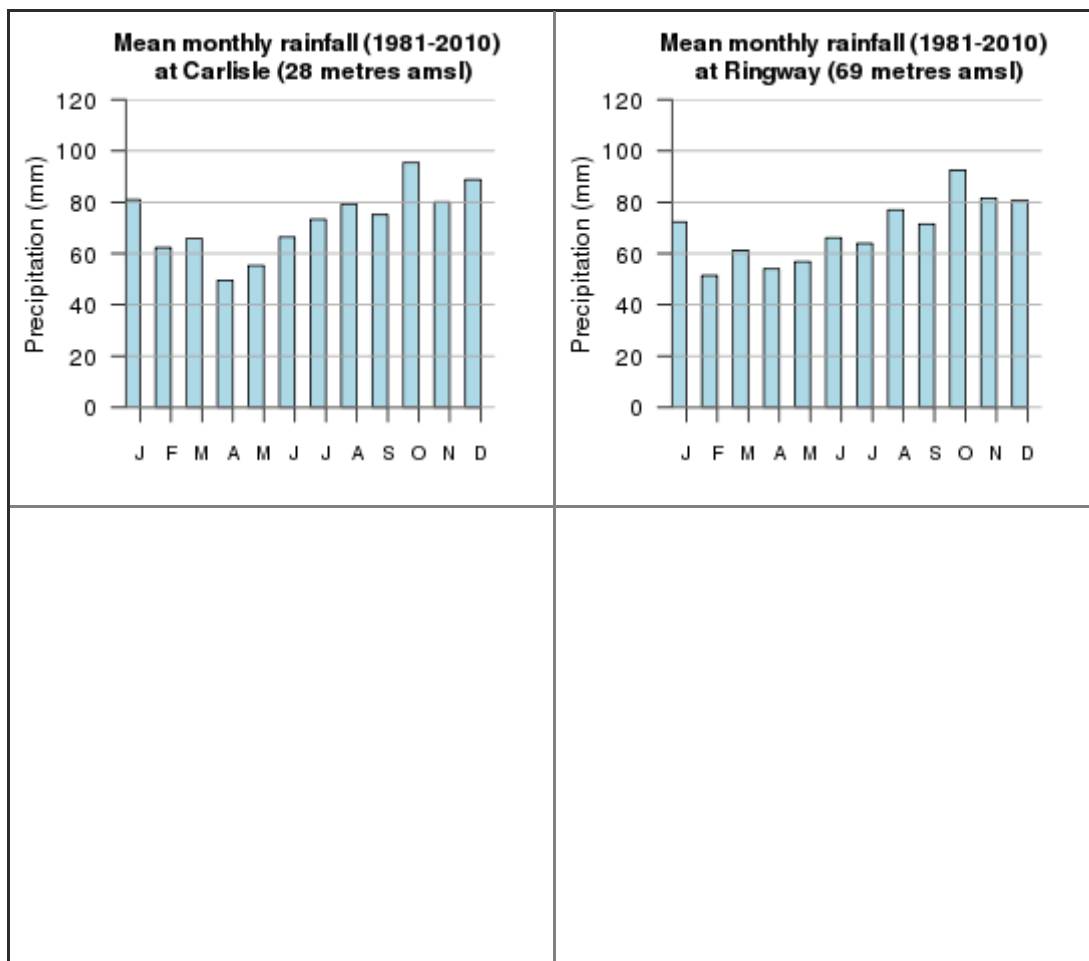
Rainfall

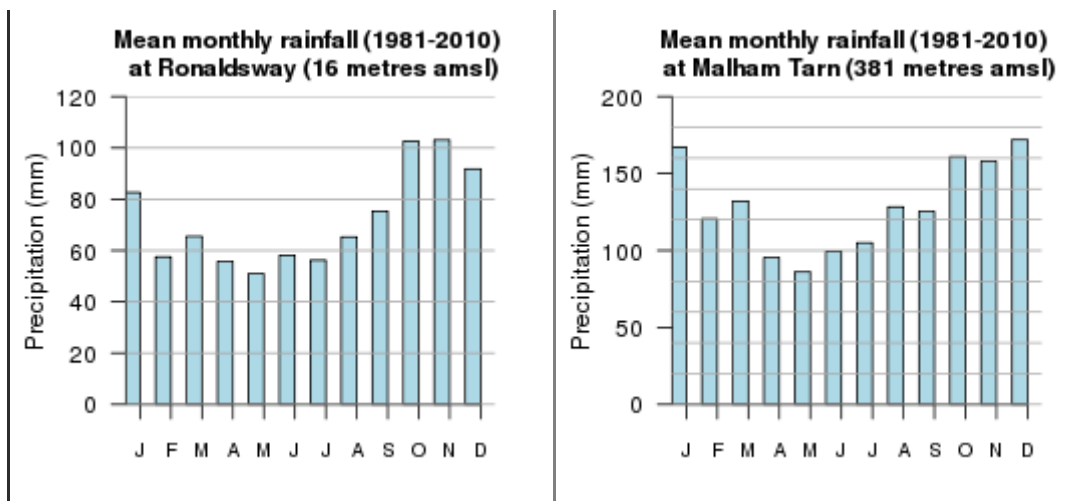
Rainfall is caused by the condensation of the water in air that is being lifted and cooled below its dew point. Rainfall tends to be associated with Atlantic depressions or with convection. The Atlantic Lows are more vigorous in autumn and winter and bring most of the rain that falls in these seasons. In summer, convection caused by solar surface heating sometimes forms shower clouds and a large proportion of rain falls from showers and thunderstorms then.

A further factor that greatly affects the rainfall distribution is altitude. Moist air that is forced to ascend hills may be cooled below the dew point to produce cloud and rain. A map of average annual rainfall therefore looks similar to a topographic map.

The exposure of NW England to westerly maritime air masses and the presence of extensive areas of high ground mean that the region has some of the wettest places in the UK. The higher parts of the Lake District are particularly wet, with an average of over 3200mm of rain each year. In contrast, the reputedly wet city of Manchester averages only 830mm and the more sheltered areas of Cheshire and the Eden valley in Cumbria are even drier with less than 800mm per year. These areas benefit from the 'rain shadow' effect of the high ground of N Wales and the Lake District respectively. The annual averages for the Isle of Man range from about 900mm on the coast to 1800mm around Snaefell. These values can be compared with annual totals of about 500mm in the drier parts of eastern England and over 4000mm in the western Scottish Highlands.

The course of mean monthly rainfall for 1981 - 2010 for 4 sites is shown below. Whilst rainfall is generally well-distributed through the year, there is a seasonal pattern. The driest season is spring whilst there is an autumn/winter maximum, when the Atlantic depressions are at their most vigorous. This contrast is most pronounced in the wetter upland areas.





Over much of the region, the number of days with rainfall totals of 1 mm or more ('wet days') tends to follow a pattern similar to the monthly rainfall totals. In the higher parts in winter (December-February), 50-60 days is the norm but this decreases to 40-45 days in summer (June-August). In the drier areas of Cheshire and Merseyside, 35-40 days in winter and about 30 days in summer are typical.

Periods of prolonged rainfall can lead to widespread flooding, especially in winter and early spring when soils are usually near saturation. The autumn of 2000 was particularly wet, with over twice the normal rainfall in much of the Pennines, Greater Manchester and Cheshire. Widespread and severe flooding affected Cumbria in January 2005 and November 2009. The January 2005 floods in Carlisle were considered to be the worst to affect the city since 1822. On 19 November 2009, Seathwaite (Cumbria) reported 253 mm in 24 hours.

Thunderstorms are most likely to occur from May to September, reaching their peak in July and August. In the Isle of Man thunder occurs on about 5 days per year, on average, while on the mainland the number is 8 to 12 days. The heaviest falls of rain in the UK are often associated with summer thunderstorms. An example was the 95.9 mm that fell at Manchester-Ringway in 11 hours on 5/6 August 1981.

Snowfall

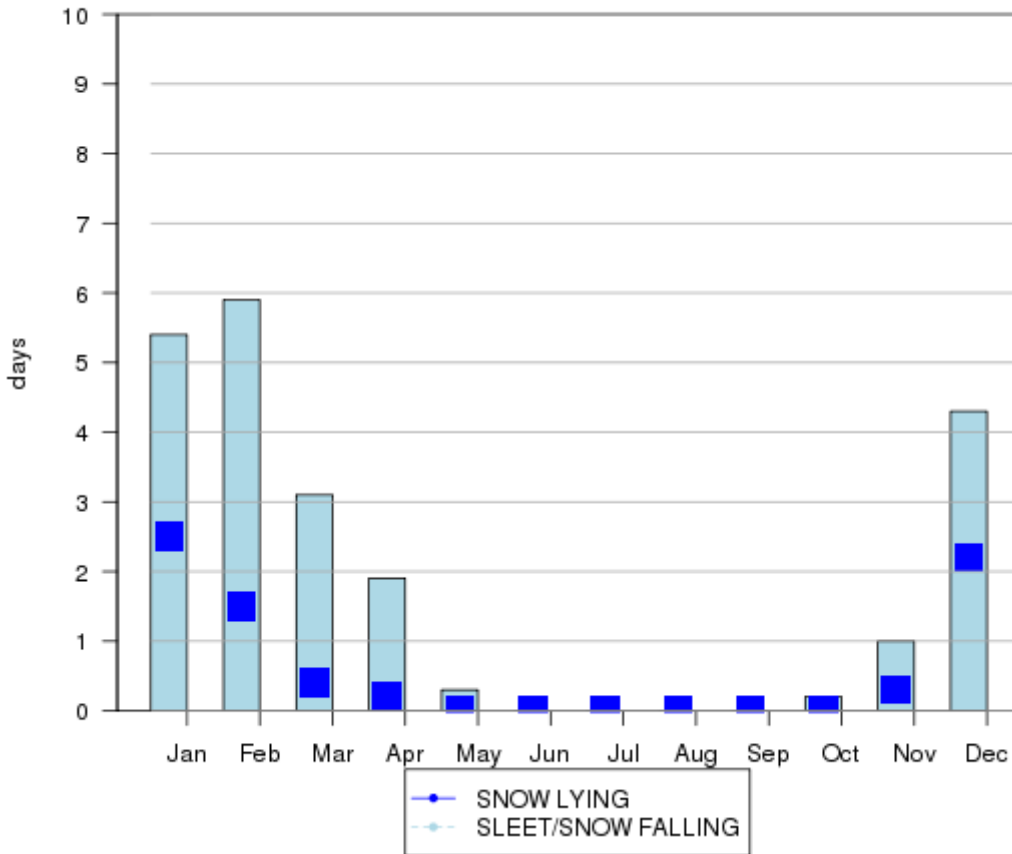
The occurrence of snow is linked closely with temperature, with falls rarely occurring if the temperature is higher than 4 °C. For snow to lie for any length of time, the temperature normally has to be lower than this. Over most of the area, snowfall is normally confined to the months from November to April, but upland areas may have occasional falls in October and May. Snow rarely lies on low ground outside the period from November to March but over higher ground lying snow can also occur in October and as late as May.

On average, the number of days with snow falling is about 10-15 per year on the Isle of Man and about 20 days in lower-lying parts of the mainland but as much as 50 days over the highest ground. An average increase of about 5 days of snow falling per year per 100 m increase in altitude has been found typical.

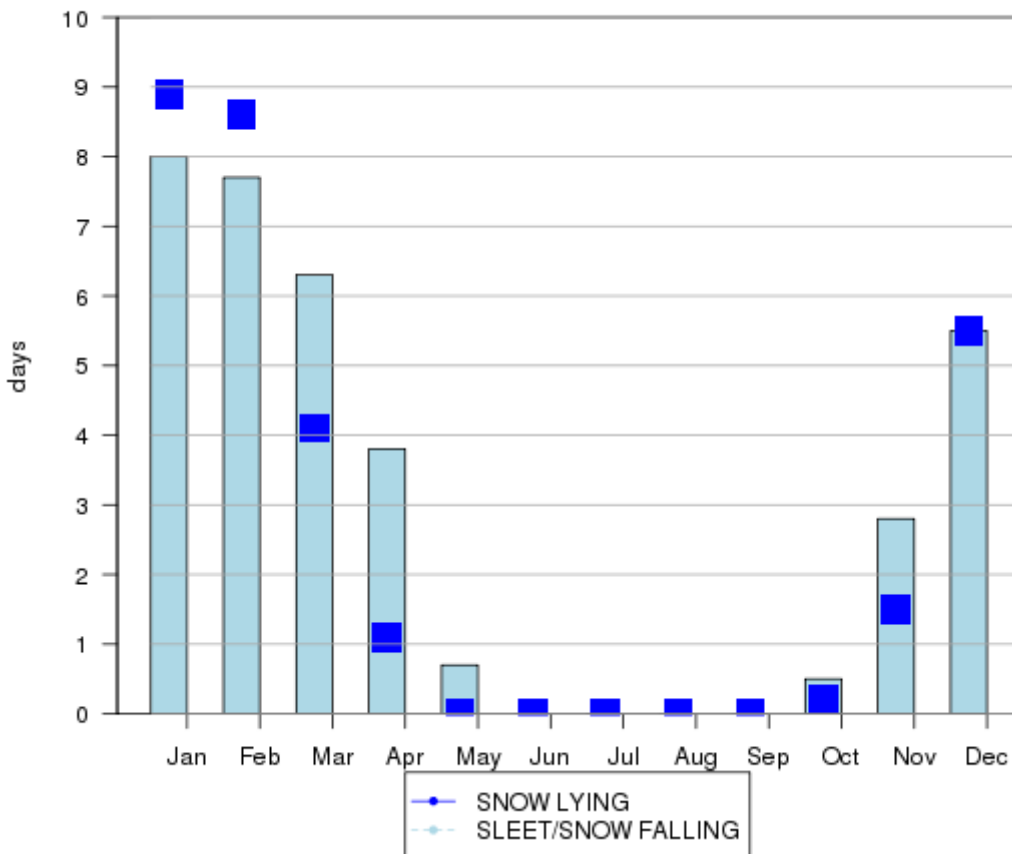
The number of days with snow lying is also mainly dependent upon altitude but partly upon proximity to the sea. The number therefore varies from less than 5 days per year on the Isle of Man to around 3-7 days on the Cumbrian and Lancashire coasts and over 30 days in upland areas such as the Pennines and Lake District. These averages can be compared with parts of the Scottish Highlands, which have about 60 days with snow lying on average and with the coasts of SW England, with less than 3 days per year. In most places, January is the month with most days of both snow lying and snow falling closely followed by February.

The monthly averages of days with sleet/snow falling and lying at Ringway and Malham Tarn are shown below (a day of lying snow is counted if the ground is more than 50 % covered at 0900).

Average number of days per year of sleet/snow falling and snow lying (1981-2010) at Ringway (69 metres amsl)



Average number of days per year of sleet/snow falling and snow lying (1981-2010) at Malham Tarn (381 metres amsl)



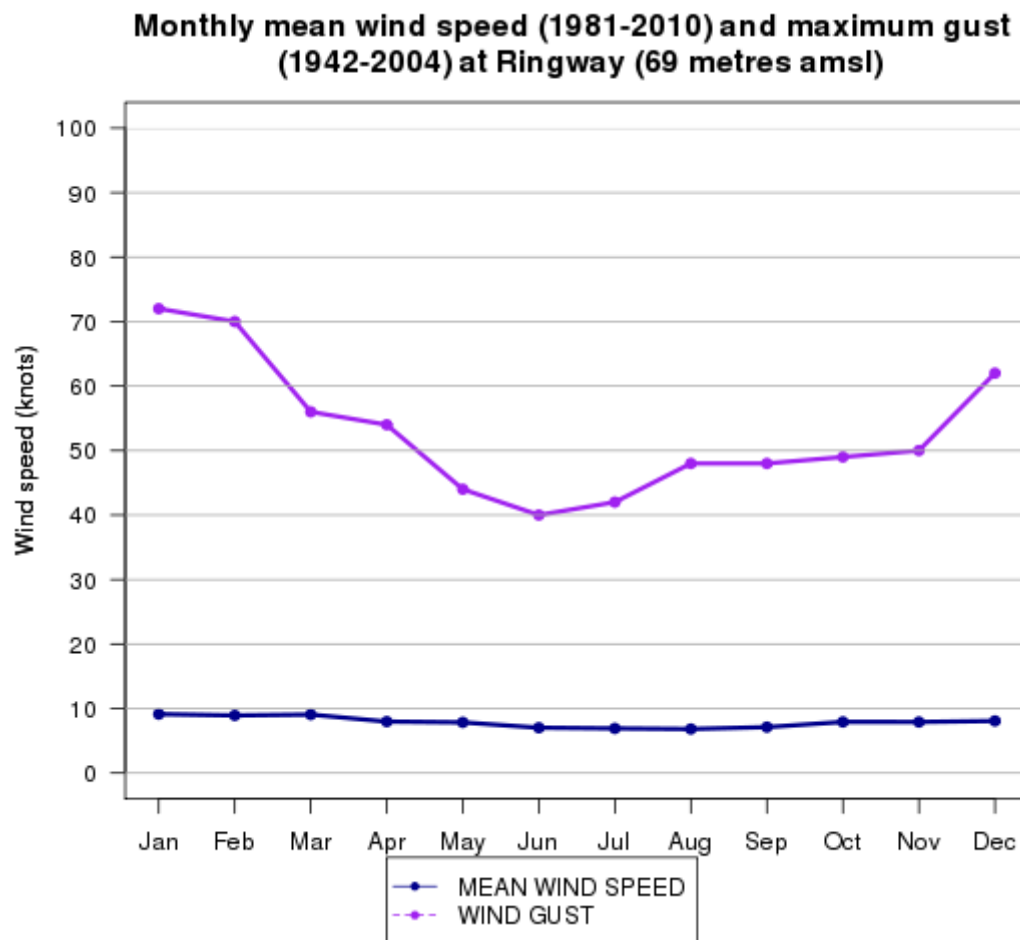
Snowfall is, however, highly variable from year to year. For example, at Carlisle there were 26 days with snow lying in the unusually cold winter of 1962/63 but none in winter 1963/64.

The depth of undrifted snow does not often exceed 15 cm at low altitudes but on occasions depths of 30 to 60 cm may occur over a wide area. When depths exceed 15 cm in association with strong winds, serious drifting may occur, especially in hilly areas, leading to widespread travel disruption. A notable example was the blizzard of 5-6 February 1996 when more than 15 cm of snow fell in low-lying parts of Lancashire and drifts were up to 2 metres deep.

Wind

NW England and the Isle of Man are among the more exposed parts of the UK, being relatively close to the Atlantic and containing large upland areas. The strongest winds are associated with the passage of deep areas of low pressure close to or across the UK. The frequency and strength of these depressions is greatest in the winter half of the year, especially from December to February, and this is when mean speeds and gusts (short duration peak values) are strongest.

The variation in monthly mean speeds (average of a continuous record) and highest gusts ('instantaneous' speed averaged over about 3 seconds) at Ringway is shown below.



Another measure of wind exposure is the number of days when gale force is reached. If the wind reaches a mean speed of 34 knots or more over any ten consecutive minutes, then that day is classed as having a gale. Wind speed is sensitive to altitude and local topographic effects. Over the Isle of Man, the average is around 10-15 days of gale per year while on the mainland gales occur on 5-10 days along the coast but low-lying places inland experience less than 5 gales per year.

There have been several noteworthy gales affecting NW England, accompanied by property damage and disruption to travel and power supplies. Examples include 2 January 1976 when a depression moving eastwards across Scotland to the North Sea brought storm force winds with a gust of 79 knots at Fleetwood

(Lancs), the 'Burns Day storm' of 25 January 1990 when gusts of 60-70 knots were recorded widely and 8 January 2005 when a deep depression resulted in a gust of 88 knots at St Bees Head, Cumbria.

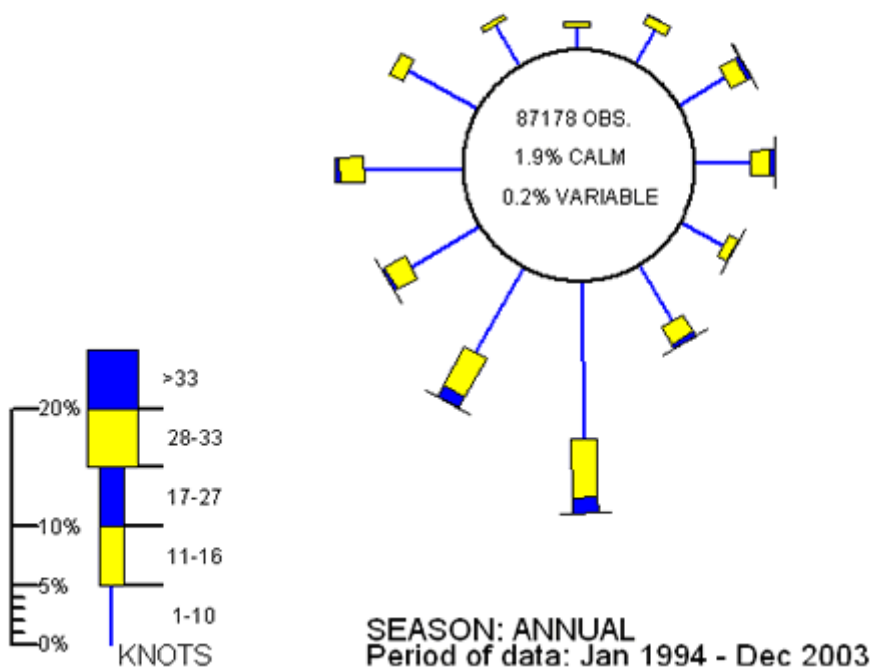
The direction of the wind is defined as the direction from which the wind is blowing. As Atlantic depressions pass the UK the wind typically starts to blow from the south or south west, but later comes from the west or north-west as the depression moves away. The range of directions between south and north-west accounts for the majority of occasions and the strongest winds nearly always blow from this range of directions. Spring time tends to have a maximum frequency of winds from the north east. Summer can have a greater incidence of north-west or west winds associated with sea breezes.

The annual wind roses for Ringway and for Ronaldsway are typical of open, level locations across the region. There is a prevailing south-westerly wind direction through the year, but a high frequency of north to north-east winds in spring. Topography again plays a part in modifying the climate with channelling of winds between areas of high ground. For example, the Pennines and N Wales give a southerly bias to winds over Cheshire and Greater Manchester and the Eden valley gives a SE bias to winds at Carlisle. Easterly winds blowing across the Pennines can result in mountain wave effects when strong winds are brought down to low levels in the lee of upland; a well-known example is the 'Helm wind' associated with Cross Fell (893 metres) in the northern Pennines.

WIND ROSE FOR RINGWAY

N.G.R: 3814E 3844N

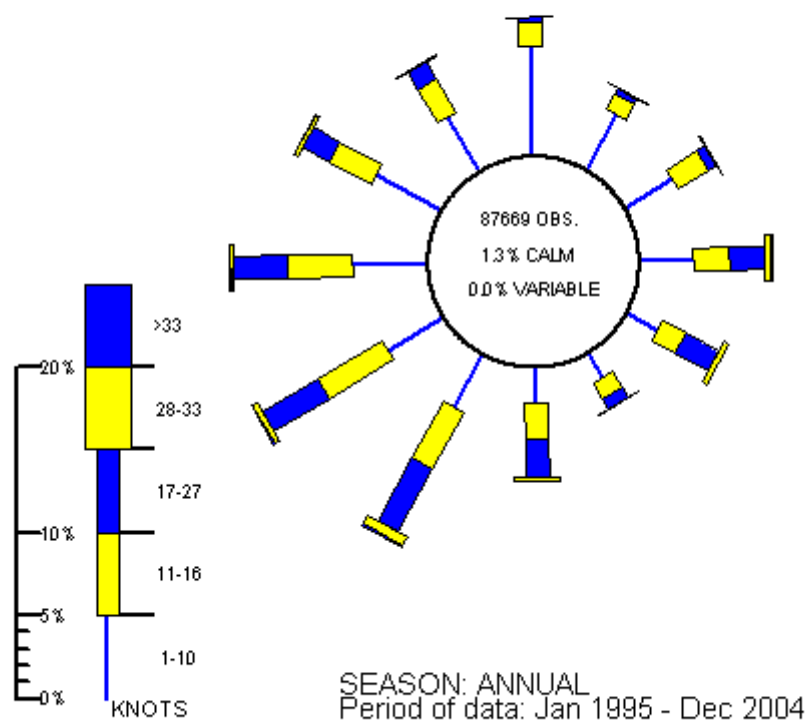
ALTITUDE: 69 metres a.m.s.l.



WIND ROSE FOR RONALDSWAY

N.G.R: 2279E 4687N

ALTITUDE: 16 metres a.m.s.l.



Location map

