

Midlands: climate

The Midlands area includes the Cotswold Hills to the south, the Northamptonshire uplands to the east, the Peak District to the north and is bounded by the Welsh border to the west.

It includes the Severn and Avon valleys, with their rivers flowing to the south, and the valley of the eastward-flowing Trent in the northern part of the area. Between these 3 valleys is a plateau of altitude 100 - 250 metres, with industrial Birmingham and the Black Country. The Avon and Severn valleys combine in the Vale of Evesham, noted for horticulture. To the west of the Severn are the foothills of the Welsh mountains, rising to about 540 metres in the Clee Hills. To the south of the Avon, the limestone uplands of the Cotswolds rise in a steep escarpment and extend north-eastwards with more gentle slopes into Northamptonshire and Leicestershire. To the north, the Peak District has extensive areas of upland, rising to over 400 metres in north Derbyshire.



The Midlands lies at the geographic heart of England. As such, it has a climate that is essentially transitional between northern and southern England in terms of temperature and between Wales and eastern England as regards rainfall.

Temperature

Mean annual temperatures over the region vary from around 8 °C to just over 10 °C. The highest values occur in the lower Severn valley, whilst the lowest occur at the higher altitudes such as the Peak District. 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. Minimum temperatures usually occur around sunrise and maximum temperatures are normally 2 or 3 hours after midday. Since the Midlands region is at some distance from the sea, with its moderating effects on temperature, the annual range is more pronounced than in most parts of the UK. Sharp winter frosts are common and there are occasional very hot summer days, particularly in the south and east of the region. These temperature extremes of both winter and summer are a key characteristic of the Midlands climate.

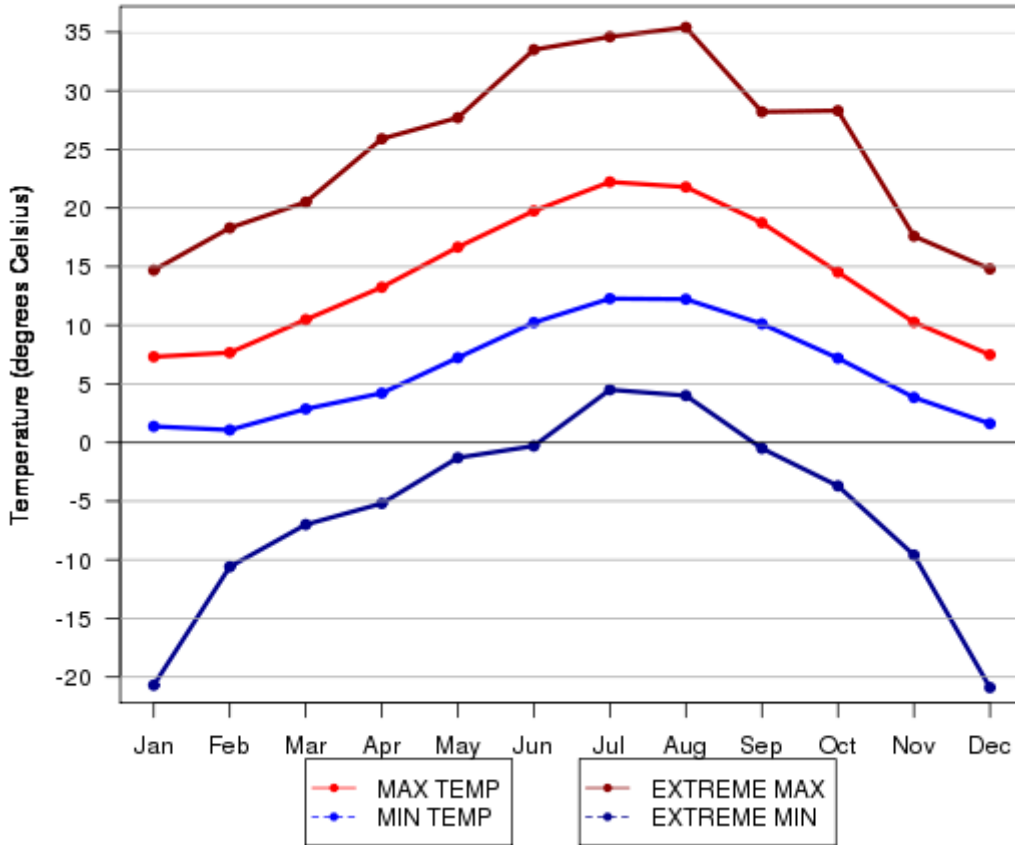
January is the coldest month, with mean daily minimum temperatures varying from just below 0 °C to about 1.5 °C. The higher values occur in the lower Severn valley and are due to the incursion of milder maritime air via the Bristol Channel. Cold air drainage into the river valleys results in large-scale frost hollows, with the Severn, Wye and Avon valleys enhancing the general frostiness of the western half of the Midlands. With snow cover, some remarkably low temperatures have been recorded, such as -25.2 °C at Shawbury, Shropshire on 13 December 1981 and -26.1 °C at Newport, Shropshire on 10 January 1982. This value at Newport is the lowest ever recorded in England.

July is the warmest month, with mean daily maximum temperatures exceeding 22 °C in the south and east Midlands. The highest July mean daily maxima occur in the London area (23.5 °C) whilst the lowest occur in the Shetlands (15 °C). Extreme maximum temperatures can occur in July or August. For example, on 3 July 1976 35.9 °C was recorded at Cheltenham and on 9 August 1911 36.7 °C occurred at Raunds, Northamptonshire. On 3 August 1990, temperatures exceeded 34 °C widely over the Midlands, with 37.1 °C at

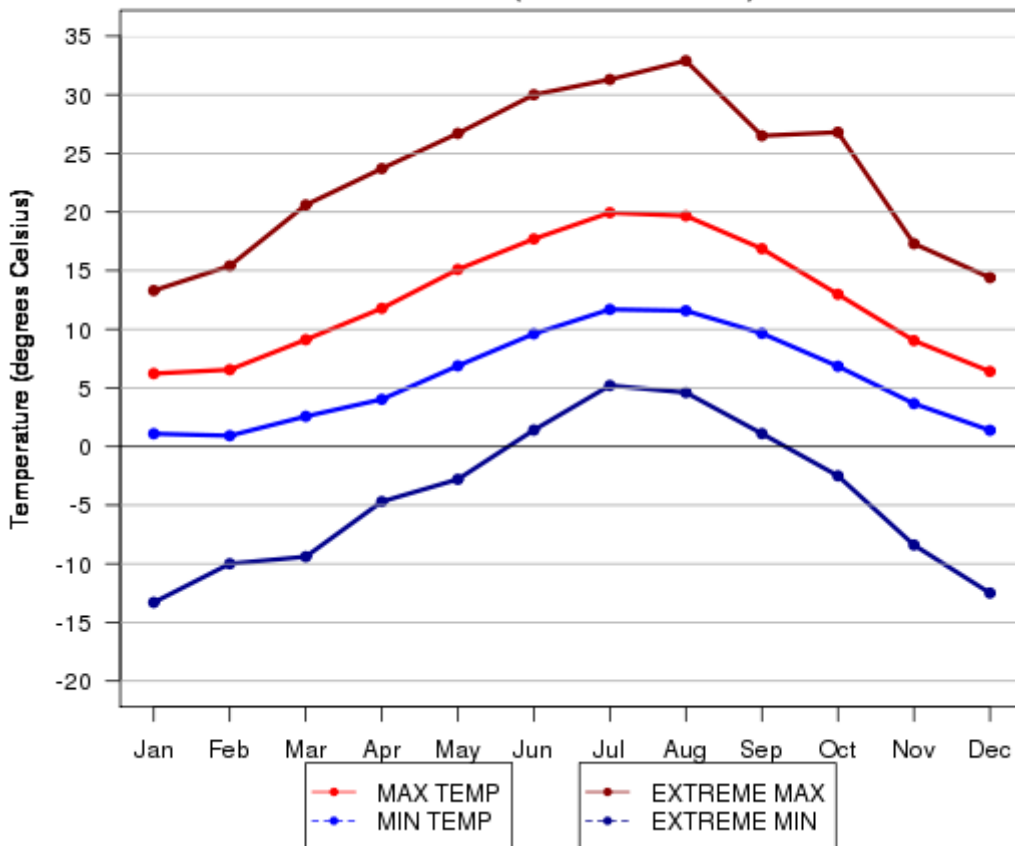
Cheltenham, a new national record. This stood until the heat wave of August 2003, when 38.5 °C was measured at Faversham, Kent.

The variation of mean daily maximum and minimum temperatures month by month, together with the highest and lowest temperatures recorded, is shown for Brize Norton (Oxfordshire) and Keele (Staffordshire). These graphs reflect the similarity in mean temperatures across the region, with only a gradual south to north gradient. However, extreme minima are dictated more by local topography.

**Mean daily maximum and minimum temperature
(1981-2010) and extremes (1968-2014)
at Brize Norton (81 metres amsl)**



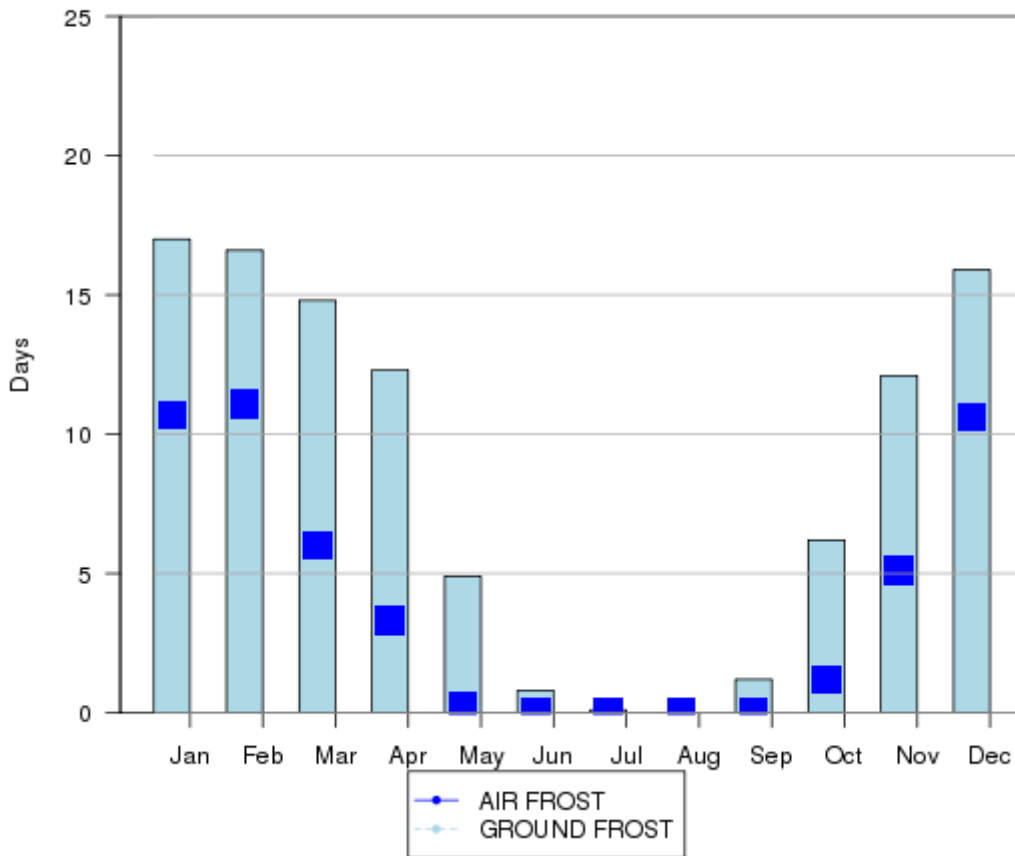
**Mean daily maximum and minimum temperature
(1981-2010) and extremes (1952-2014)
at Keele (179 metres amsl)**



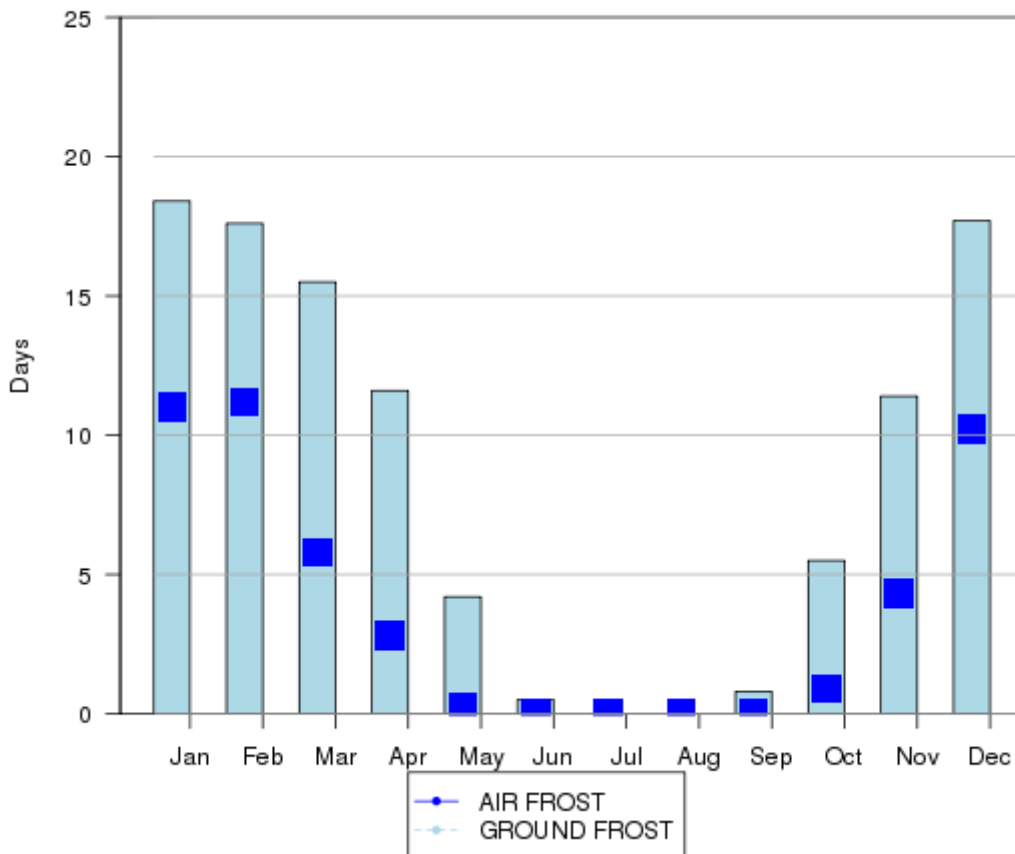
Frost is a widespread, occasionally marked, characteristic of the Midlands. An 'air frost' occurs when the temperature at 1.25 metres above the ground falls below 0 °C, whereas incidence of a 'ground frost' refers to a temperature below 0 °C measured on a grass surface. The average number of days with air frost in the Midlands varies from about 40 a year in the lower Severn valley to over 60 a year in the Peak District and sheltered areas of the Welsh Marches. Ground frost occurs on average on about 100 to 125 days per year, with a similar distribution to air frost.

The graphs show the average frequency of air and ground frost at Brize Norton and Keele. These show that, although the summer months are usually free of air frost, ground frost may occur at any time of the year, especially at sites in valleys.

Average annual number of days of air and ground frost (1981-2010) at Brize Norton (81 metres amsl)



Average annual number of days of air and ground frost (1981-2010) at Keele (179 metres amsl)



Sunshine

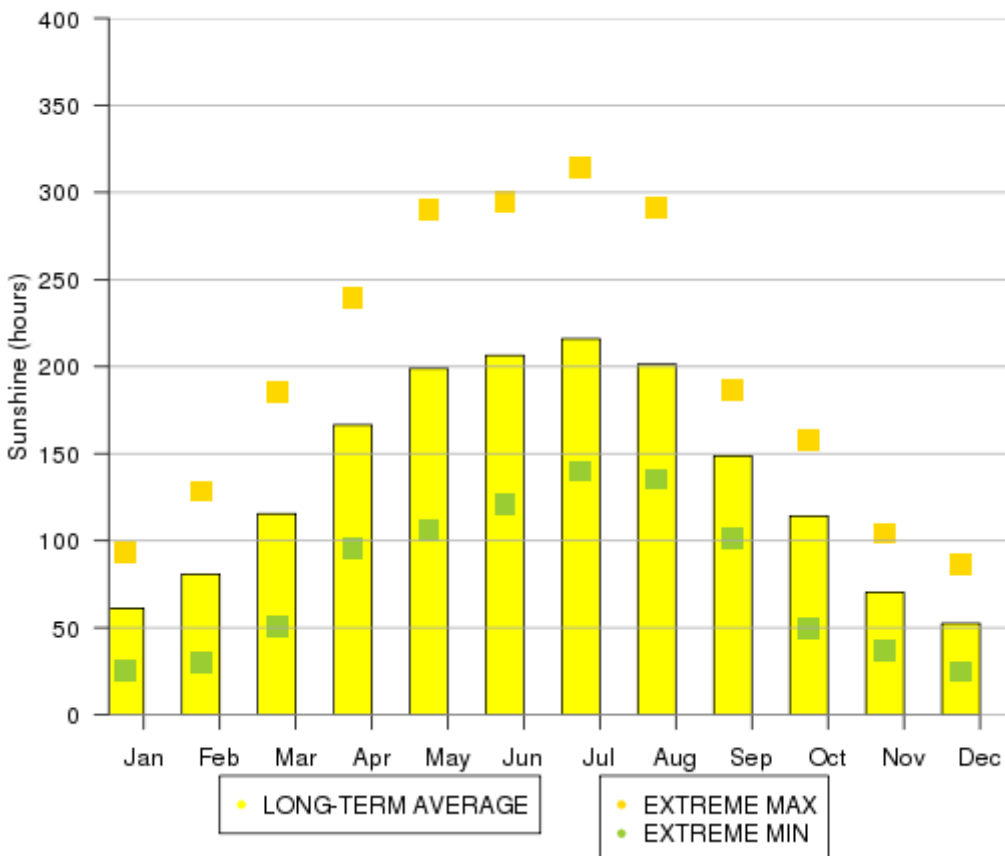
The number of hours of bright sunshine is controlled by the length of day and by cloudiness. The day is shortest in December and longest in June and so in general December is the dulllest month and June or July the sunniest.

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 Midlands.

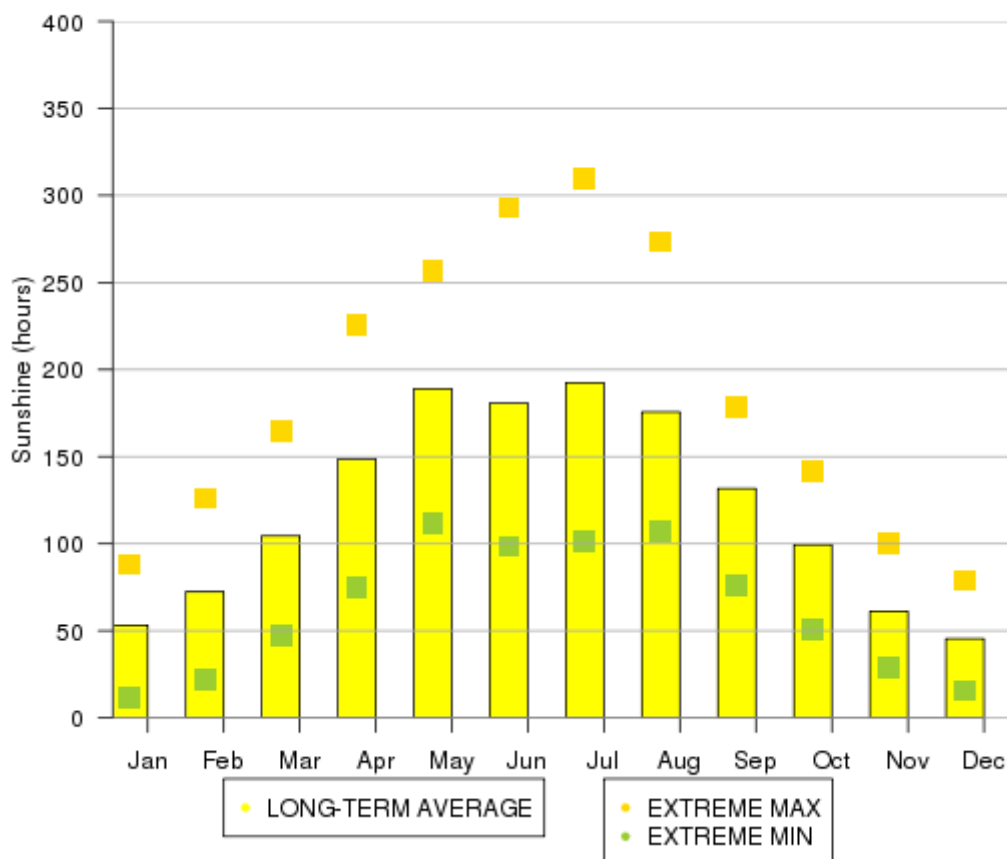
Average annual sunshine durations over the Midlands range from less than 1400 hours in the higher northern and western fringes to about 1600 hours near the southern boundary. These figures compare with values of less than 1100 hours a year in the Shetland Islands to over 1750 hours along the south coast of England and over 1900 hours in the Channel Islands. The tendency for convective cloud to develop over inland areas in summer leads to sunshine averages that are lower than coastal sites.

The graphs show the average monthly sunshine totals for Brize Norton and Shawbury, together with the highest and lowest totals recorded in the stated periods.

Mean monthly sunshine (1981-2010) and extremes (1973-2014) at Brize Norton (81 metres asl)



Mean monthly sunshine (1981-2010) and extremes (1946-2014) at Shawbury (72 metres asl)



The highest known monthly sunshine totals in the region are 314.7 hrs at Brize Norton and 309.6 hours at Ross-On-Wye in July 2006 and 308.5 hours at Cheltenham in June 1957. The highest UK monthly total is 383.9 hours at Eastbourne (East Sussex) in July 1911. In the dullest winter months, less than 20 hours have been recorded, with only 4.1 hours at Buxton in January 1996, but there was none at all in December 1890 in central London.

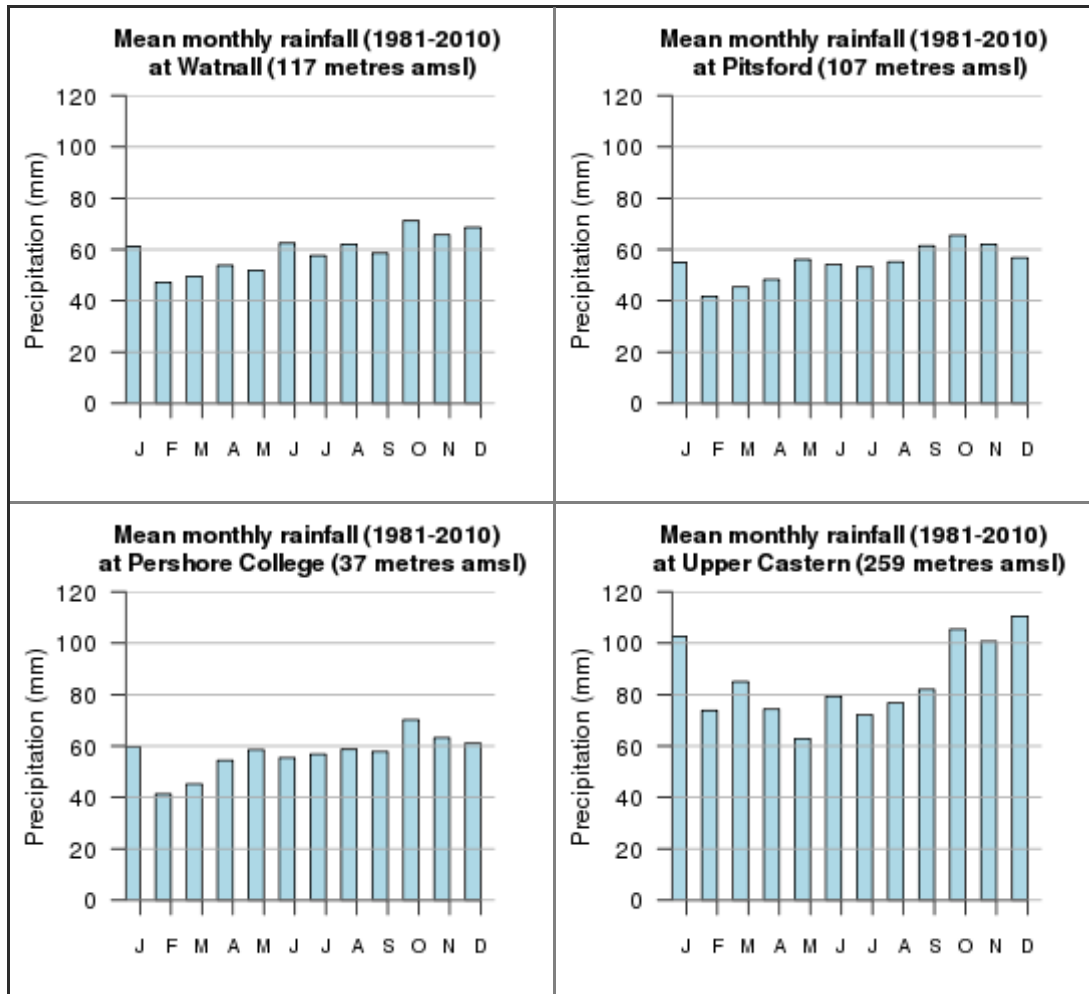
Rainfall

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 looks similar to a topographic map. However, because most rainfall arrives from the west with Atlantic depressions, much of the West Midlands lies in the 'rain shadow' of the Welsh mountains. This makes the region relatively dry, with the effect enhanced locally by the Severn and Wye valleys.

The wettest areas in the Midlands, with an average of over 800 mm per year, are along the Welsh border, in the Cotswolds and, especially, in the Peak District; the highest altitudes exceed 1000 mm. In contrast, the more sheltered areas of the South and East Midlands are the driest with less than 600 mm per year in parts of Northamptonshire, the lower Trent valley and the Avon valley. These values can be compared with annual totals around 500 mm in the drier parts of eastern England and over 4000 mm in the western Scottish Highlands.

Rainfall is generally well-distributed through the year, but the wettest month varies across the region. In the wetter upland areas of the north and west, there is a pronounced winter maximum when the Atlantic depressions are at their most vigorous. In contrast, the East and South Midlands tend to have a more even distribution through the year, with summer amounts there associated with showery, convective rainfall. The course of mean monthly rainfall for 1981 - 2010 for 4 sites is shown below.



Over much of the Midlands, 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 of the west and north in winter (December - February), 40 to 45 days is the norm but this decreases to near 30 days in summer (June - August). In the drier east and south, 30 to 35 days in winter and 20 to 25 days in summer are typical. This seasonal change reflects the tendency for summer rainfall to occur over shorter periods because of more convective activity and less frontal rainfall.

Periods of prolonged rainfall can lead to widespread flooding, especially in winter and early spring when soils are usually near saturation. The Severn valley is particularly prone, since it drains extensive upland areas in mid-Wales. At Easter 1998 a stationary band of heavy rain that stretched across the Midlands from Worcester to Peterborough resulted in floods in which 5 people died and 1000's were evacuated from their homes. Late October and early November 2000 also saw severe flooding, particularly in areas bordering the Rivers Severn and Trent, following an exceptionally wet autumn with over twice the normal rainfall. On 20 July 2007, up to 18 hours of rainfall resulted in many places in the south Midlands receiving their highest daily rainfall on record. Many rivers burst their banks, including the lower Severn, upper Thames and their tributaries. Thousands of homes and businesses were flooded and there was severe road and rail transport disruption across a wide area.

Thunderstorms are most likely to occur from May to September, reaching their peak in July and August, with eastern areas among the most prone in the UK. High intensity rainfall is often associated with summer showers and thunderstorms, rates of 100 mm/hr or more being possible for short periods. A notable example that affected Birmingham was the storm of 14 July 1982, with about 35 mm falling in 20 minutes and peak

intensities of over 250 mm/hour at Edgbaston, causing extensive flooding. In another storm on 24 July 1994, also in Birmingham, about 21 mm fell in less than 1 hour and 15 mm diameter hailstones fell.

Snowfall

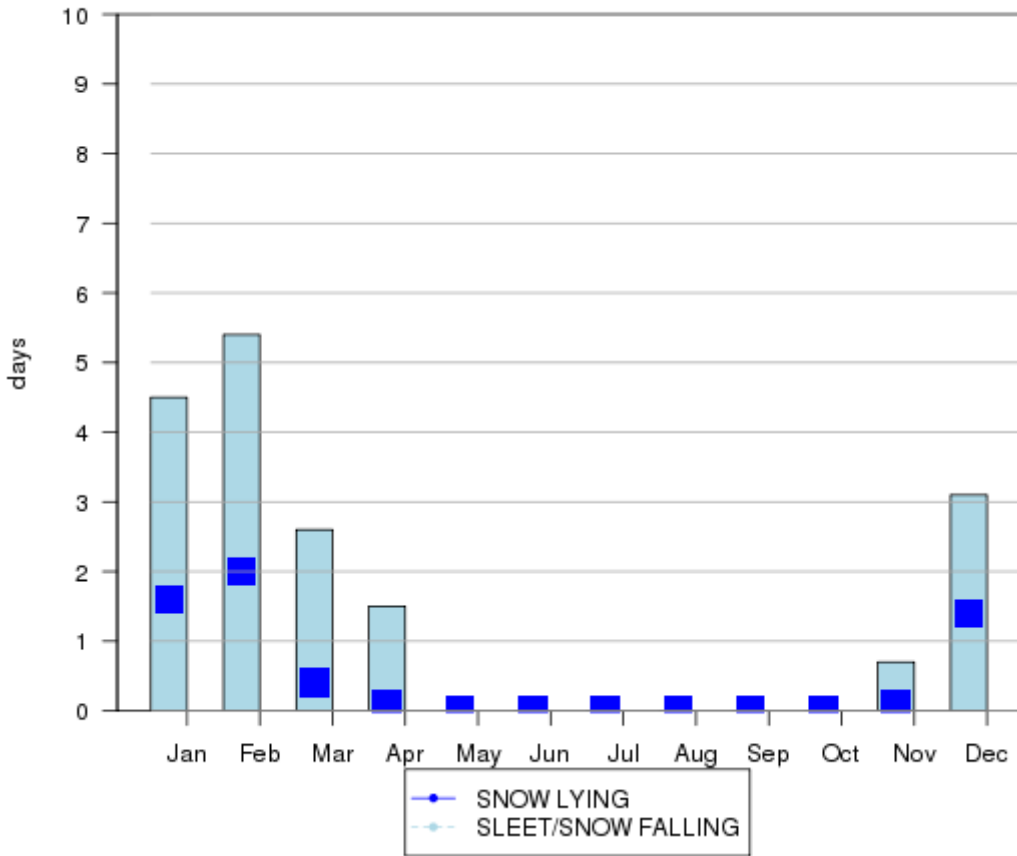
The occurrence of snow is linked closely with temperature, with falls rarely occurring if the temperature is higher than 4 °C. For snow to lay for any length of time, the temperature normally has to be lower than this. Over most of the area, snowfall is normally confined to the months from November to April, but upland areas may have brief falls in October and May. Snow rarely lies outside the period from December to March.

On average, the number of days with snow falling is about 20 per winter in the lower lying areas, particularly the lower Severn valley. An average of about 35 days is typical of upland areas in the north and near the Welsh border. An average increase of about 5 days of snow falling per year per 100 metres increase in altitude has been found typical.

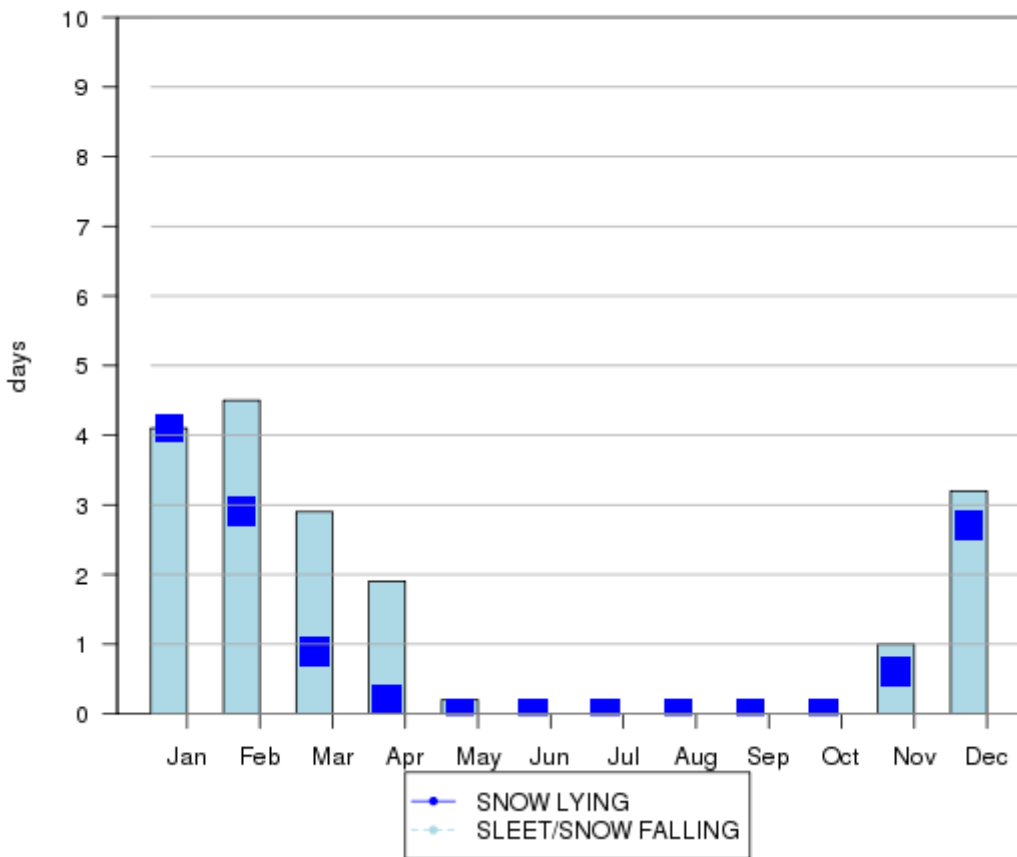
The number of days with snow lying is also mainly dependent upon altitude but partly upon proximity to cold (easterly) and warm (south-westerly) air masses. The number therefore varies from about 6 days per year in the lower Severn valley to over 20 days in upland areas such as the Peak District. These 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.

The monthly averages of days with sleet/snow falling and lying at Brize Norton and Keele 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 Brize Norton (81 metres amsl)



Average number of days per year of sleet/snow falling and snow lying (1981-2010) at Keele (179 metres amsl)



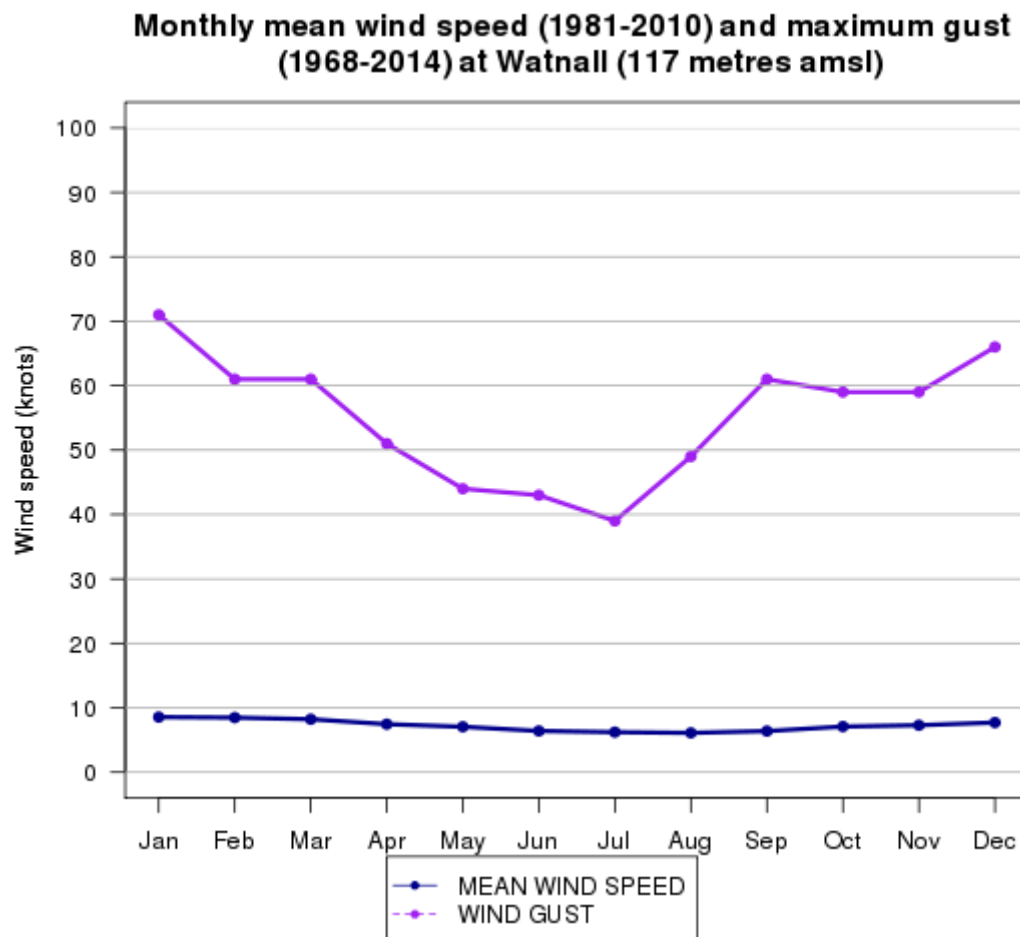
Snowfall is, however, highly variable from year to year. For example, at Birmingham there were 75 days with snow lying in the unusually cold winter of 1962/63 but only 2 days in winter 1960/61.

The depth of undrifted snow does not often exceed 15cm 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 8/9 January 1982 when 36 hours of snow accompanied by easterly gales gave 30 to 50 cm of level snow and drifts that were locally over 1metre deep. Another example was 7/8 December 1990 when much of the Midlands had snow 20 cm deep, with over 40 cm in the Birmingham area. Strong NE winds whipped the snow into drifts 2 metres deep, resulting in considerable transport disruption.

Wind

The Midlands area is one of the more sheltered parts of the UK, the windiest areas being in western and northern Britain, closer to the Atlantic. 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 graph shows a typical variation of the monthly mean speeds and highest gusts.

The variation in monthly mean speeds (average of a continuous record) and highest gusts ('instantaneous' speed averaged over about 3 seconds) at Watnall 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. Over the Midlands generally, the average is around 2 days per year but exposed areas, especially in the west and north, usually experience about 5 gales per year. Wind speed is sensitive to local topographic effects and land use. Places sheltered by hills, or in extensively wooded or urban areas will have lower wind speeds and fewer days of gale.

There have been several noteworthy gales affecting the Midlands, 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 gusts of 70-80 knots, the 'Burns Day storm' of 25 January 1990 when gusts of 60-70 knots were recorded widely and 27 October 2002 which again saw gusts of around 60 knots.

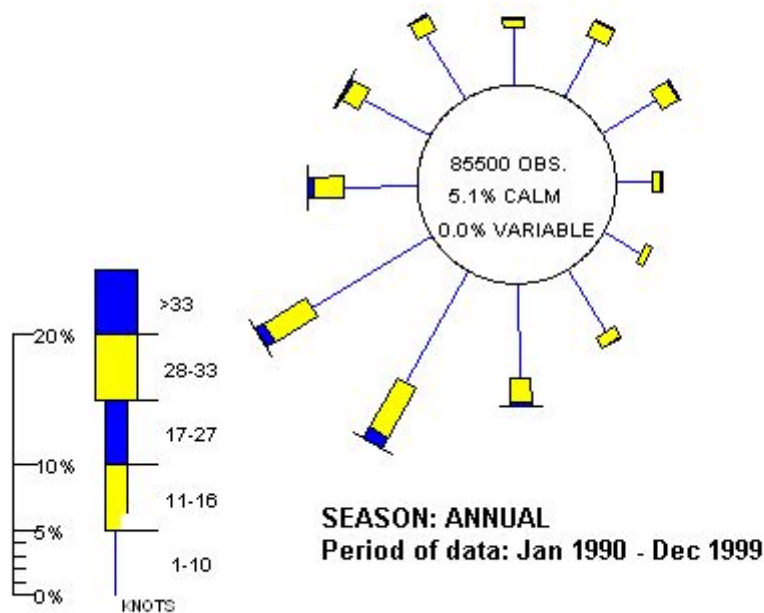
The direction of the wind is defined as the direction from which the wind is blowing. As Atlantic depressions pass the UK the wind typically starts to blow from the south or south west, but later comes from the west or

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. In the Midlands, periods of very light or calm winds with no preferred direction usually occur for around 5% of the year.

The annual wind rose for Birmingham airport (Elmdon) is typical of open, level locations across the region, with a prevailing south-westerly wind direction through the year.

WIND ROSE FOR ELMDON
N.G.R: 4167E 2841N

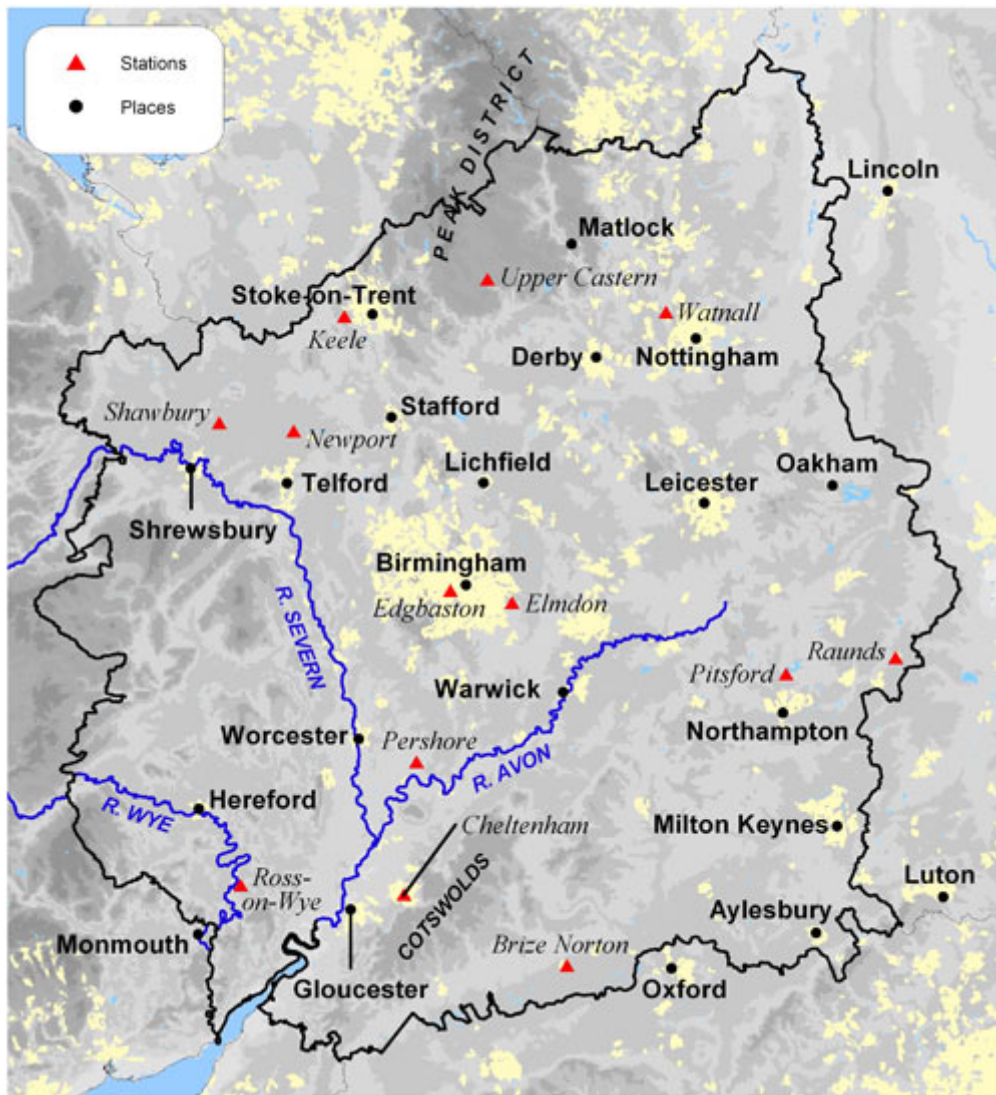
ALTITUDE: 98 metres a.m.s.l.



A tornado is a violently-rotating column of air, caused by the rapid displacement of warm moist air by cold dense air often associated with the occurrence of active cold fronts. It will typically last for a few minutes, track across the land for 2 to 5 km and have a diameter of 20 to 100 metres. On average, 33 tornadoes are reported each year in the UK although the number can vary significantly from year to year. The UK has the highest frequency of reported tornadoes per unit area in the world, although they are nowhere near as intense as those reported in the USA.

One of the strongest tornadoes to affect the UK in 30 years struck Birmingham on the afternoon of 28 July 2005. Over 420 homes were damaged with about 122 sustaining serious roof damage when a tornado with estimated 110 knot winds ripped through the Kings Heath, Moseley, Sparkbrook and Balsall Heath areas of the city. Fortunately there were no fatalities, but 3 people were seriously injured, and about 1000 trees were uprooted some of which blocked roads.

Location map



Last updated: 11 October 2016

