

Eastern England: climate

The area comprises the counties of Bedfordshire, Cambridgeshire, Norfolk, Suffolk, Lincolnshire, the East Riding of Yorkshire and parts of Essex and Hertfordshire

The altitude of much of the area is below 60 metres and the Fens has the largest tract of low, flat land in the UK. The highest ground is in the south-west of the area where the north-eastwards extension of the Chiltern Hills reaches over 200 metres continuing as the East Anglian Heights. In the north of the area are the Lincolnshire Wolds and the Yorkshire Wolds.

Farming is an important activity in East Anglia and Lincolnshire and it is the chief cereal growing area of the UK, the main crops being barley, wheat and sugar beet. There is market gardening in the Fens, fruit growing in the Wisbech area, and the area around Spalding is noted for its spring bulbs. The industrial activities of the area include steel production and fishing. Fishing, which was once a major industry all along the east coast of England, has declined significantly in recent years.

The southern part of the area contains a number of satellite or dormitory towns around London such as Luton, Basildon, Stevenage and Southend. Other major centres of population include Peterborough, Norwich, Ipswich, Cambridge, Lincoln, Grimsby and Hull.

Temperature

The mean annual temperature over the region varies from around 9.5 °C to just over 10.5 °C. Variations in temperature depend on both altitude, with a decrease of about 0.5 °C for each 100 metres increase in altitude, and proximity to the coast. Over the UK the mean annual temperature ranges from about 7 °C in Shetland to over 11 °C in the extreme south-west of England and the Channel Islands.

Temperature shows both seasonal and diurnal variations. January and February are the coldest months with mean daily minimum temperatures across the region close to 1 °C. They range from just above 0 °C on the Wolds to 2 °C or a little higher near the coast. This compares with below -2.0 °C in parts of the Scottish Highlands and over 5.5 °C in the Isles of Scilly.

Mean daily maximum temperatures range from just over 6 °C to 8 °C during the winter months and from 20 °C to 23 °C in the summer. These are comparable with values found in the summer in the London area which tends to be the warmest part of the UK. A noteworthy feature is that many of the UK maximum temperature records are held by stations in Eastern England. The highest known temperature recorded in the area was 37.3 °C at Cavendish on 10 August 2003 and 36.9 °C was recorded that day at Cambridge Botanic Garden and 36.5 °C there on 3 August 1990. The highest UK temperature stands at 38.5 °C at Faversham in Kent on 10 August 2003.

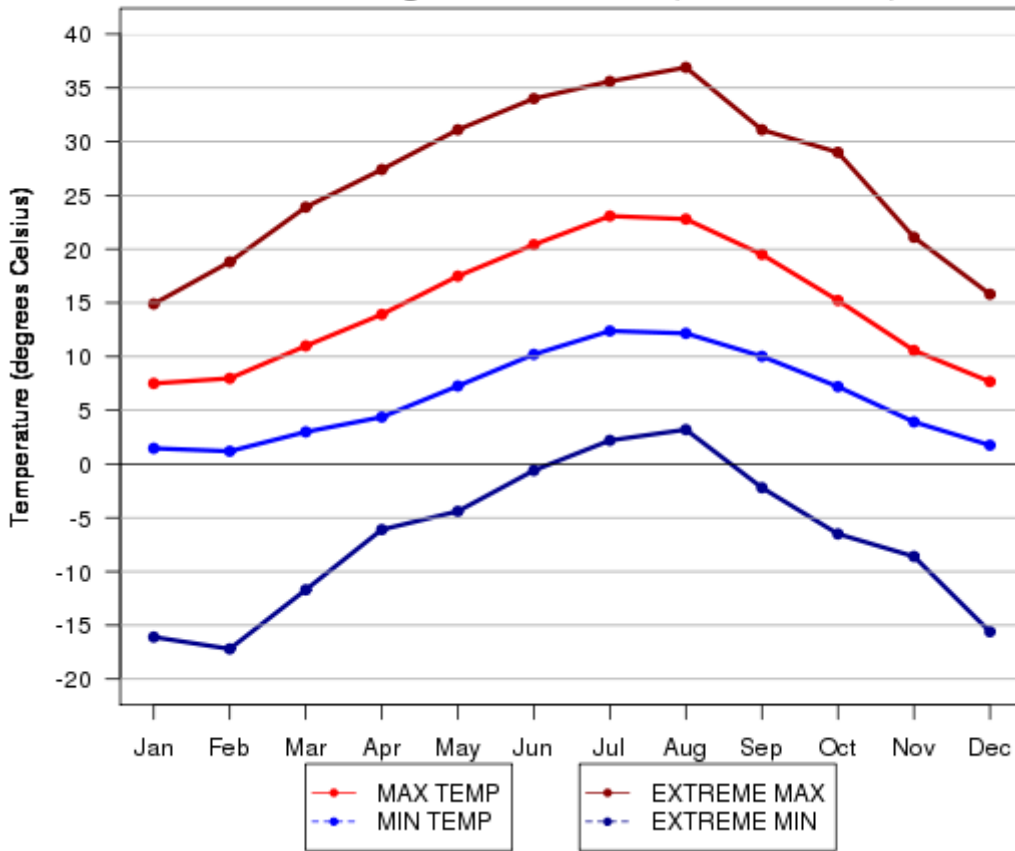
The variation of mean daily maximum and minimum temperatures month by month, together with the highest and lowest temperatures recorded, is shown for Cambridge Botanic Garden and Waddington, Lincolnshire.

Sea temperatures off the coast of eastern England vary from 5-6 °C in February and early March to 15-16 °C in August. The temperature is governed by the influx of warm water associated with the Gulf Stream.

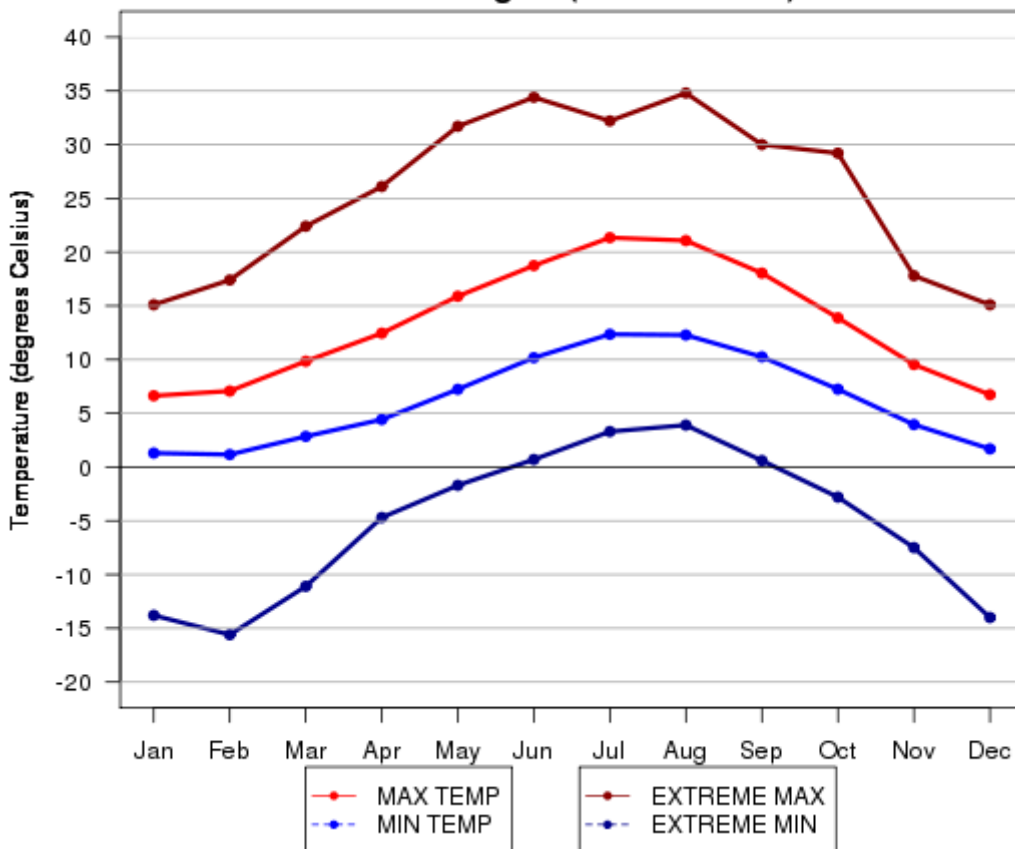


Temperatures tend to be lower in the south than the north in winter but heat up more rapidly and so the sea is warmer in the south during the summer months.

**Mean daily maximum and minimum temperature
(1981-2010) and extremes (1947-2014)
at Cambridge Botanic Garden (12 metres amsl)**



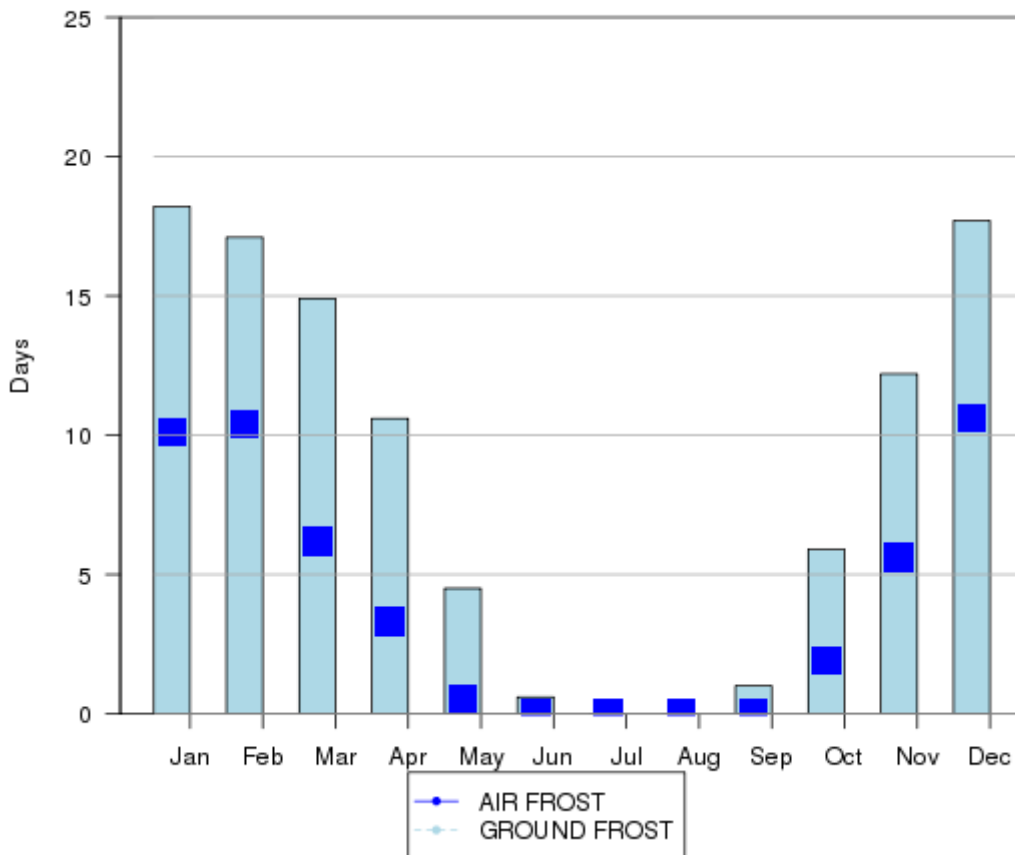
**Mean daily maximum and minimum temperature
(1981-2010) and extremes (1947-2014)
at Waddington (68 metres amsl)**



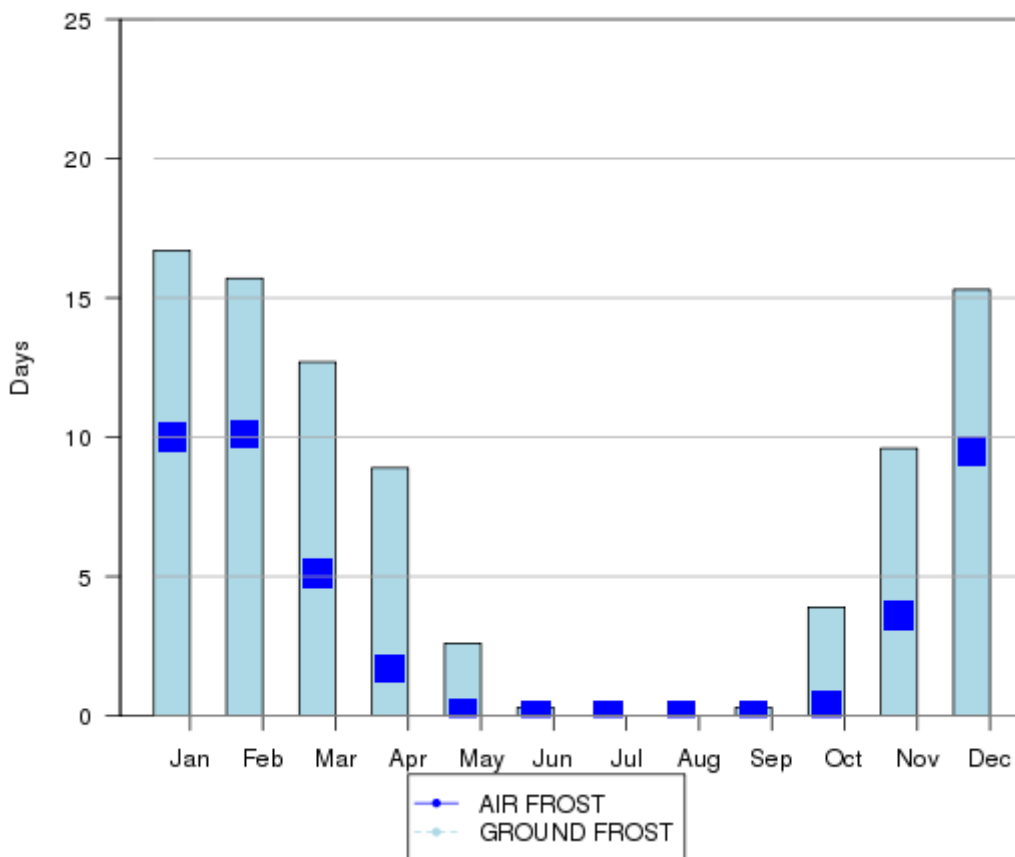
The number of days of frost is variable across the region although in East Anglia in particular, as the land is fairly flat, the main influence is proximity to the coast. An 'air frost' occurs when the temperature at 1.25 metres above the ground falls below 0 °C, whereas incidence of a 'ground frost' refers to a temperature below 0 °C measured on a grass surface. The average number of days a year with air frost ranges from less than 30 at the coast to about 55 well inland.

The graphs show the average frequency of air and ground frost at Cambridge Botanic Garden and Waddington. Although frost is obviously more prevalent in the winter, there are occasional records of ground frost in July and August at inland locations. The warming effect of the sea can delay the start of the frost season at coastal sites.

Average annual number of days of air and ground frost (1981-2010) at Cambridge Botanic Garden (12 metres amsl)



Average annual number of days of air and ground frost (1981-2010) at Waddington (68 metres amsl)

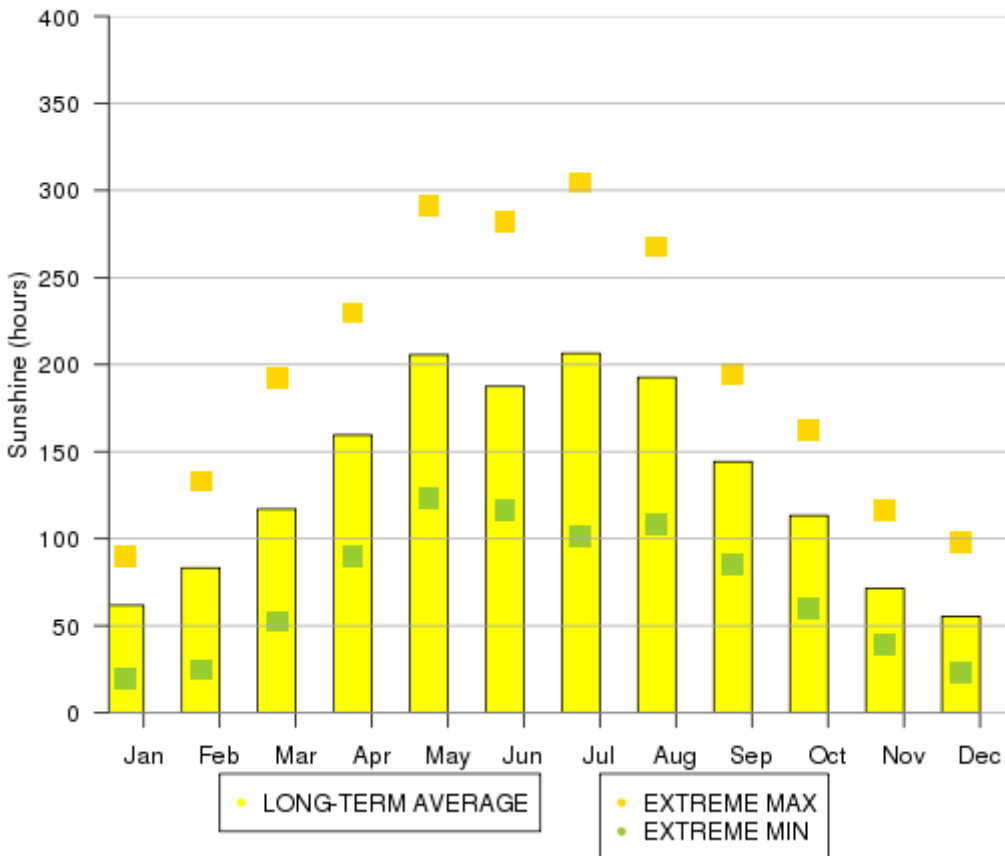


Sunshine

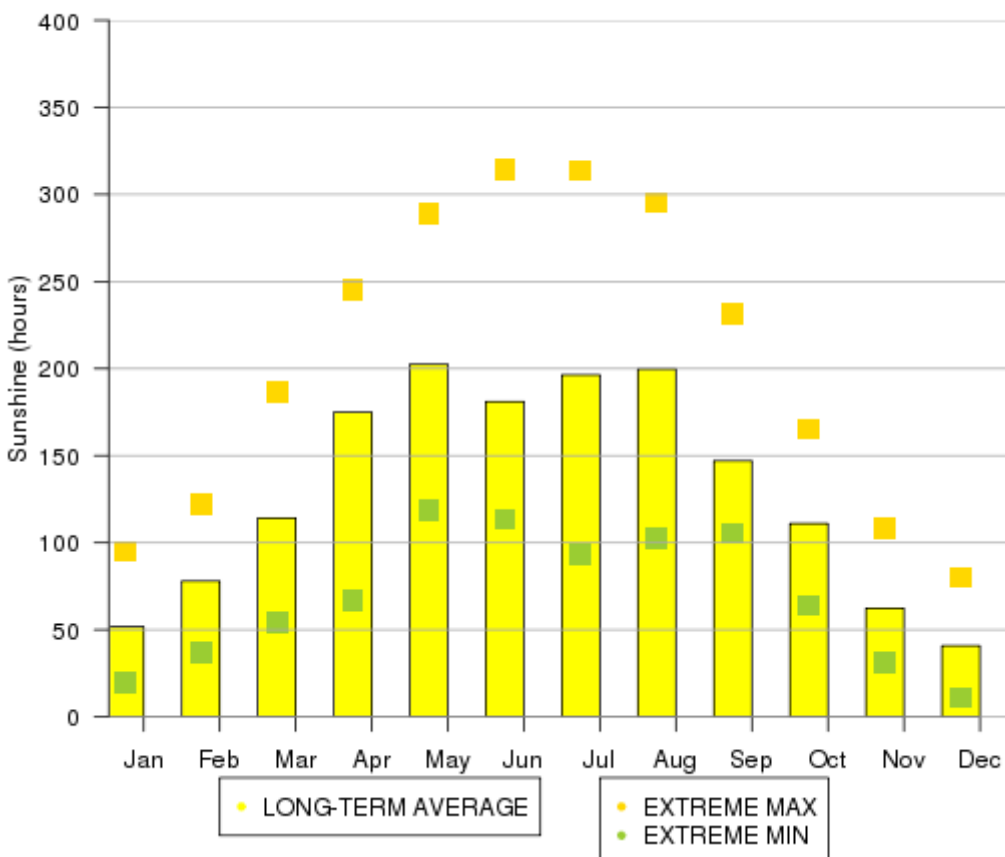
The variation in length of day throughout the year means that the duration of sunshine shows a marked annual variation. On average, December is the month with the least sunshine and July is the sunniest. In general sunshine duration decreases with increasing latitude although proximity to the coast also plays an important role. Subsidence associated with high pressure reduces cloud cover and in spring and summer, when the sea is cool relative to the land, there is little convective cloud over the sea. Coastal areas are then favoured by high sunshine amounts, whereas convective cloud often forms inland.

The graphs show the average monthly sunshine totals for Waddington and Lowestoft, together with the highest and lowest totals recorded in the stated periods. Compared to coastal resorts in SW England, the Norfolk coast has about 10% less sunshine hours throughout the year. Low cloud from the North Sea can affect the coast especially in spring and summer. Across the region, annual averages range from about 1450 hours over much of Lincolnshire and East Yorkshire to over 1600 hours in east Norfolk, Suffolk and Essex. For comparison, the Channel Islands are the sunniest place in the UK with some locations exceeding 1900 hours per year and the Shetland Islands the least sunny with an average of only 1100 hours per year.

**Mean monthly sunshine (1981-2010) and extremes (1947-2014)
at Waddington (68 metres asl)**



**Mean monthly sunshine (1981-2010) and extremes (1921-2007)
at Lowestoft (25 metres asl)**



The highest known monthly sunshine totals in the region are 334.8 hours at Levington and 331 hours at Wattisham in May 1989. 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 9 hours at Writtle in December 1956, but there was none at all in December 1890 in central London.

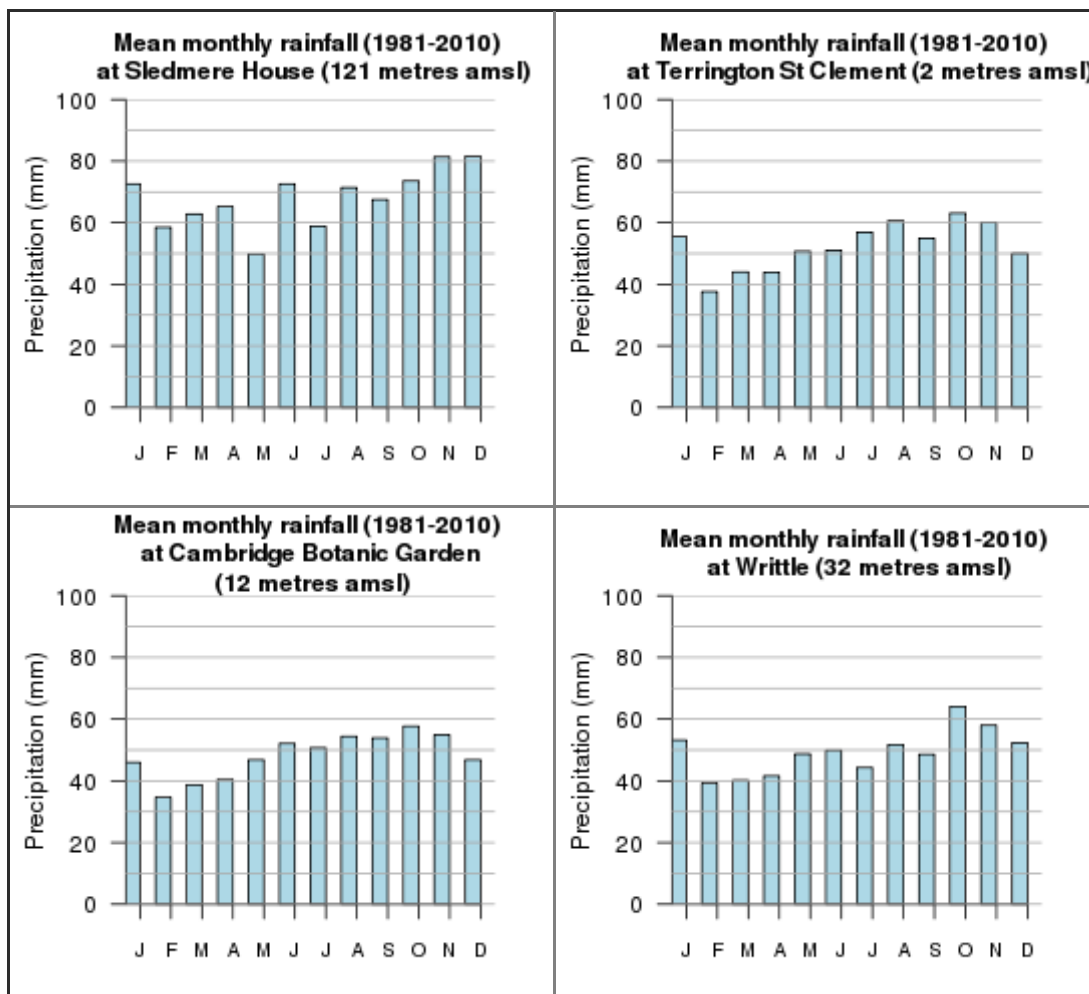
Rainfall

Rainfall is caused by the condensation of the water in air that is being lifted and cooled to its dew point. Rainfall tends to be associated with Atlantic depressions or with convection. The Atlantic lows are more vigorous in autumn and winter. In summer, convection caused by solar surface heating sometimes forms shower clouds and a large proportion of rain falls from showers and thunderstorms at this time of year. Rainfall caused this way is normally more intense than winter rainfall which tends to be more frontal with falls occurring over longer periods.

Atmospheric humidity is an important factor determining rainfall and the sea temperature largely controls this. A final factor which greatly affects the rainfall distribution is altitude. Moist air which is forced to ascend hills may be cooled to the dewpoint to produce cloud and rain. A map of rainfall therefore looks very like a topographic map.

In England and Wales the wettest places are in the Lake District, receiving an average of over 3000 mm of rain a year, whilst in the western Scottish mountains averages of over 4000 mm occur. Much of eastern England receives less than 700 mm per year and includes some of the driest areas in the country.

The course of mean monthly rainfall for 1981 - 2010 for 4 sites is shown below. There is a much more even distribution of rainfall throughout the year than in most other parts of the UK. This is mainly due to a combination of the 'rain-shadow' effect for winter Atlantic depressions produced by the high ground to the west and a higher frequency of convective rainfall in summer.



Across most of the region there are, on average, about 30 rain days (rainfall greater than 1 mm) in winter (December to February) and less than 25 days in summer (June to August) with the highest averages being at the higher altitude of the Wolds.

Although rainfall is generally low, there have been some noteworthy severe storms. These include 25 to 26 August 1912 when over 100 mm was recorded in Norfolk causing damage to roads and bridges, with a maximum of 205 mm at Brundall, east of Norwich. On 1 September 1994, 147 mm was recorded in only a few hours at Ditchingham near Bungay in Suffolk, causing transport disruption and significant flooding. The highest recorded daily rainfall total in the UK was 279mm at Martinstown in Dorset on 18 July 1955.

The number of thunderstorms in a year can make a significant contribution to the total annual rainfall. They can occur at any time of year but are more frequent during the summer months. Over East Anglia, Lincolnshire and Humberside the average number of days of thunder per year is about 15 although there is considerable variability from year to year. For example, Cambridge recorded 2 days of thunder in 1997, 7 in 1998 and 22 in 1999.

In thunderstorms or heavy showers at any time of year the precipitation may be in the form of hail. The occurrence of hail tends to have a spring maximum, as in summer hail tends to melt before reaching the ground, although damaging hail is usually associated with summer thunderstorms. There are 6-8 days each year with hail over much of East Anglia, less elsewhere. In Lincolnshire on 25 August 2001 there were reports of hail the size of golf balls at Sleaford, Coningsby and Spilsby in the south of the county causing damage to aircraft, cars and greenhouses.

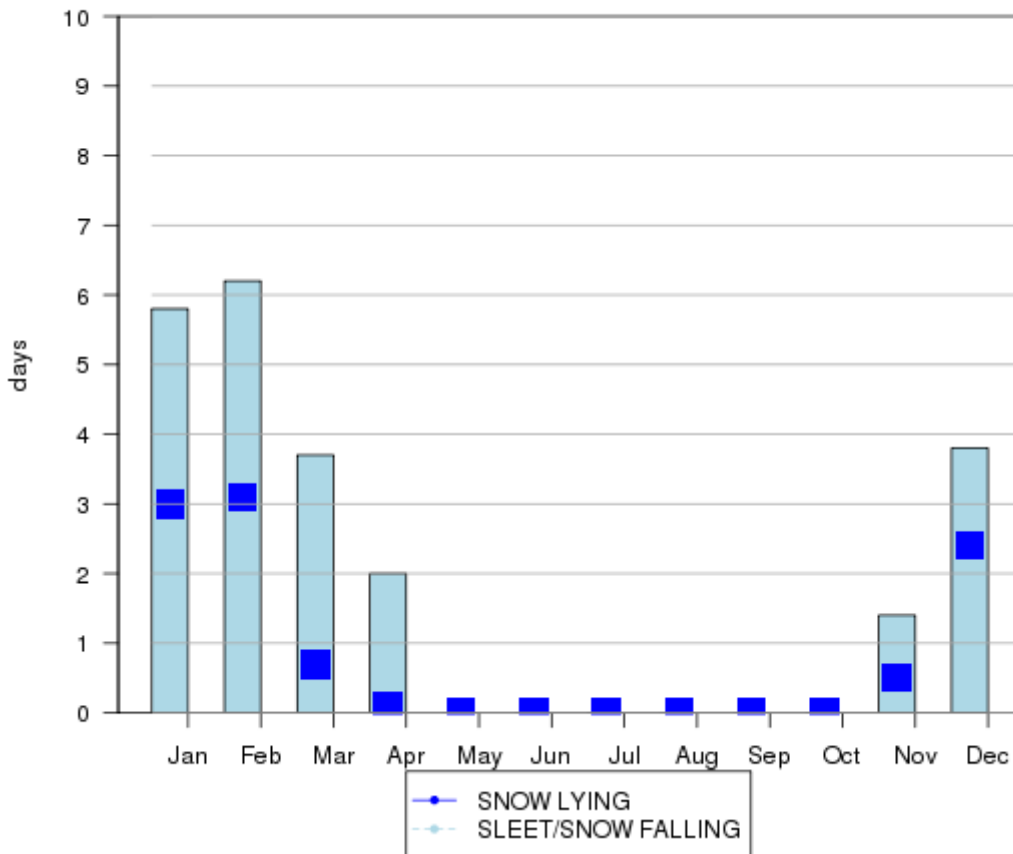
Snowfall

The occurrence of snowfall is linked closely to temperature, with snow rarely falling if it is higher than 4 °C. For snow to lie for any length of time, the temperature normally has to be less than this. The number of falls also increases with altitude and latitude.

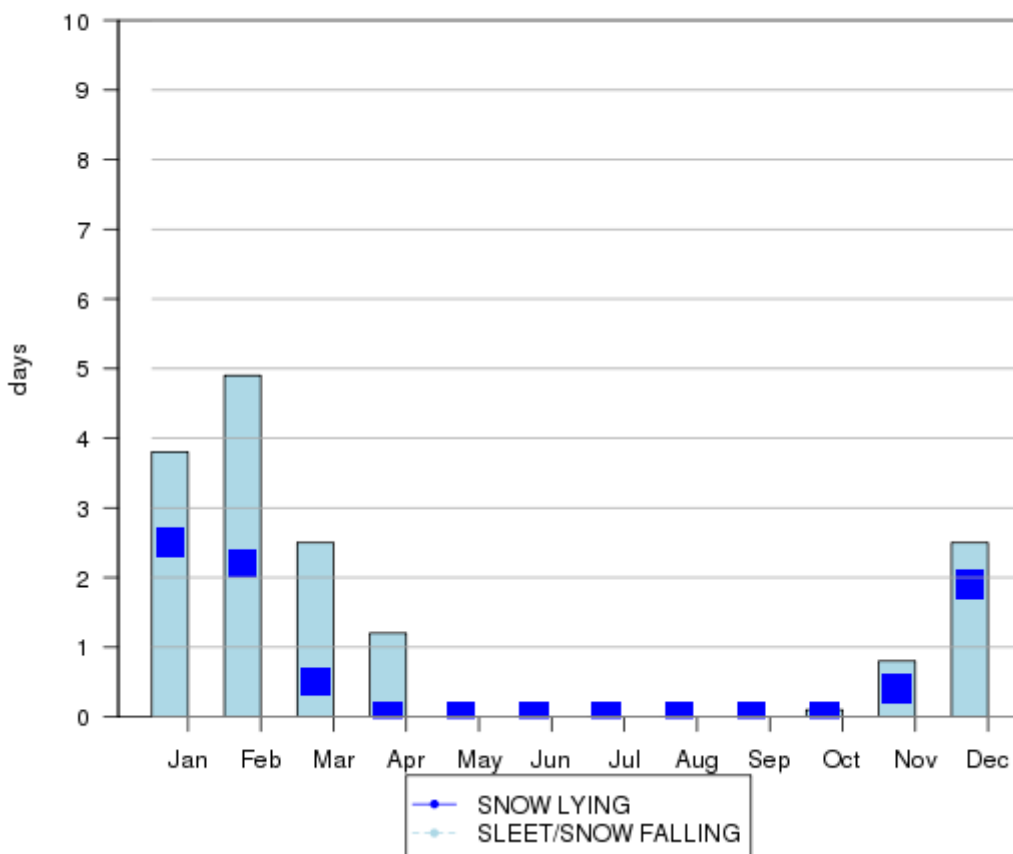
The average number of days with snow falling each year ranges from under 20 in the south-east of the area to over 30 on higher ground. The average number of days with snow lying is less, varying from about 6 to 15. As a comparison, Balmoral in Grampian averages 60 days each winter with snow lying. It is unusual to get accumulations of more than 15 cm of snow and places on the Wolds tend to be the most prone.

The monthly averages of days with sleet/snow falling and lying at Waddington and Marham 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 Waddington (68 metres amsl)



Average number of days per year of sleet/snow falling and snow lying (1981-2010) at Marham (21 metres amsl)



One of the worst winters was that of 1947 when snow fell somewhere in the UK every day between 22 January and 17 March. Frequent snowfalls and low temperatures (a minimum of -21°C was recorded at

Woburn in Bedfordshire) meant that when the thaw did occur, accompanied by rain and severe gales, the effects were significant. In East Anglia, where the major rivers flow north-eastwards, the south-westerly wind drove water before it and waves pounded the dykes which eventually gave way. Most of the Fenland area was flooded and the army were called in to assist.

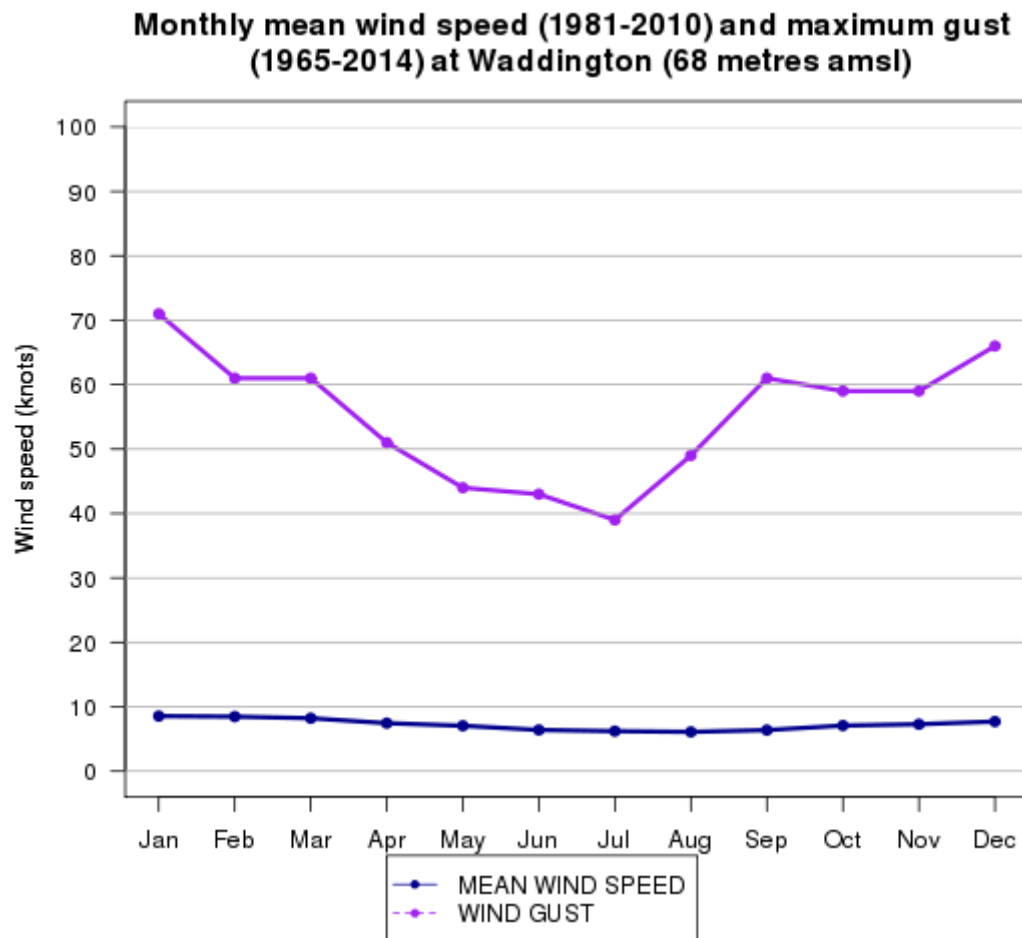
More recently, heavy snow and freezing temperatures were experienced in January 1987 when bitter weather arrived from Russia and Scandinavia, resulting in snow depths over 30 cm in Lincolnshire (36 cm at Cranwell on 14th), blocked roads and ice along parts of the coast.

Wind

Eastern England is one of the more sheltered parts of the UK, since the windiest areas are to the north and west, closer to the track of Atlantic storms. The strongest winds are associated with the passage of deep depressions across or close to the UK. The frequency of depressions is greatest during the winter months so this is when the strongest winds normally occur. The graph shows a typical variation of the monthly mean speeds and highest gusts.

Winds are usually stronger by day than by night due to increased turbulence caused by temperature rise, resulting in higher average speeds and more gusty winds. Periods of very light or calm winds are more prevalent inland, with coastal areas having similar wind directions to inland locations but higher wind speeds.

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



Wind direction is defined as the direction from which the wind is blowing. As Atlantic depressions pass by 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. Directions between south and north-west account for the majority of

occasions and the strongest winds nearly always blow from this range of directions. Spring time also tends to have a maximum of winds from the north east.

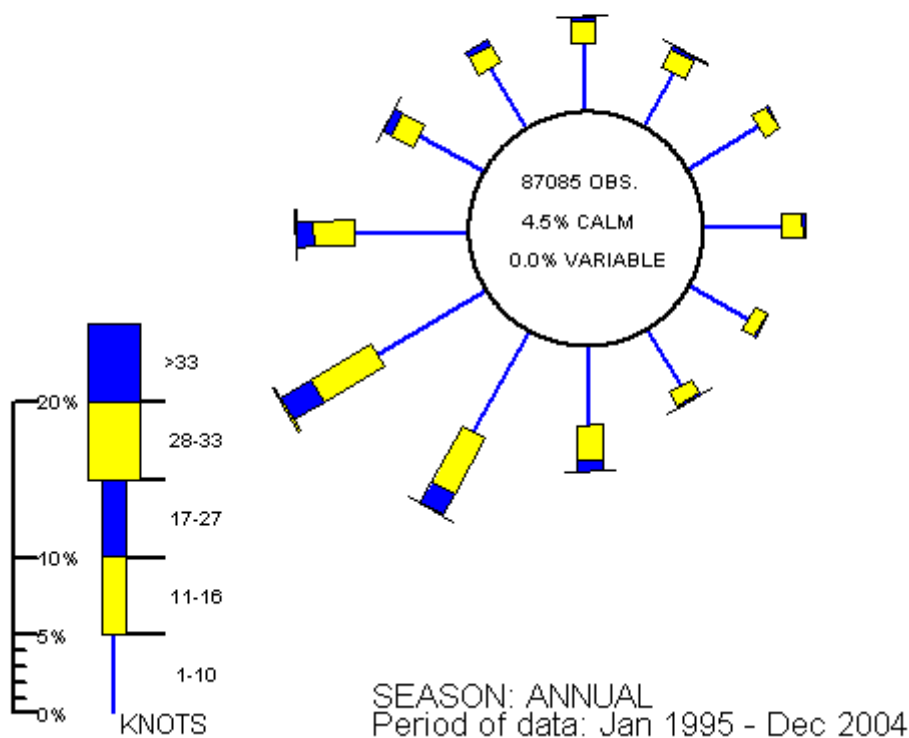
In coastal areas sea breezes are an important feature of the weather in late spring and summer when the land is warming up and the sea still relatively cool. These start at the coast and then progress inland bringing a drop in temperature. The inland penetration is dependent on the temperature difference land to sea and the strength of convective activity.

Averaged across the year, the wind rose for Coltishall shows that the prevailing wind direction is from the south-west.

WIND ROSE FOR COLTISHALL

N.G.R: 6262E 3229N

ALTITUDE: 17 metres a.m.s.l.



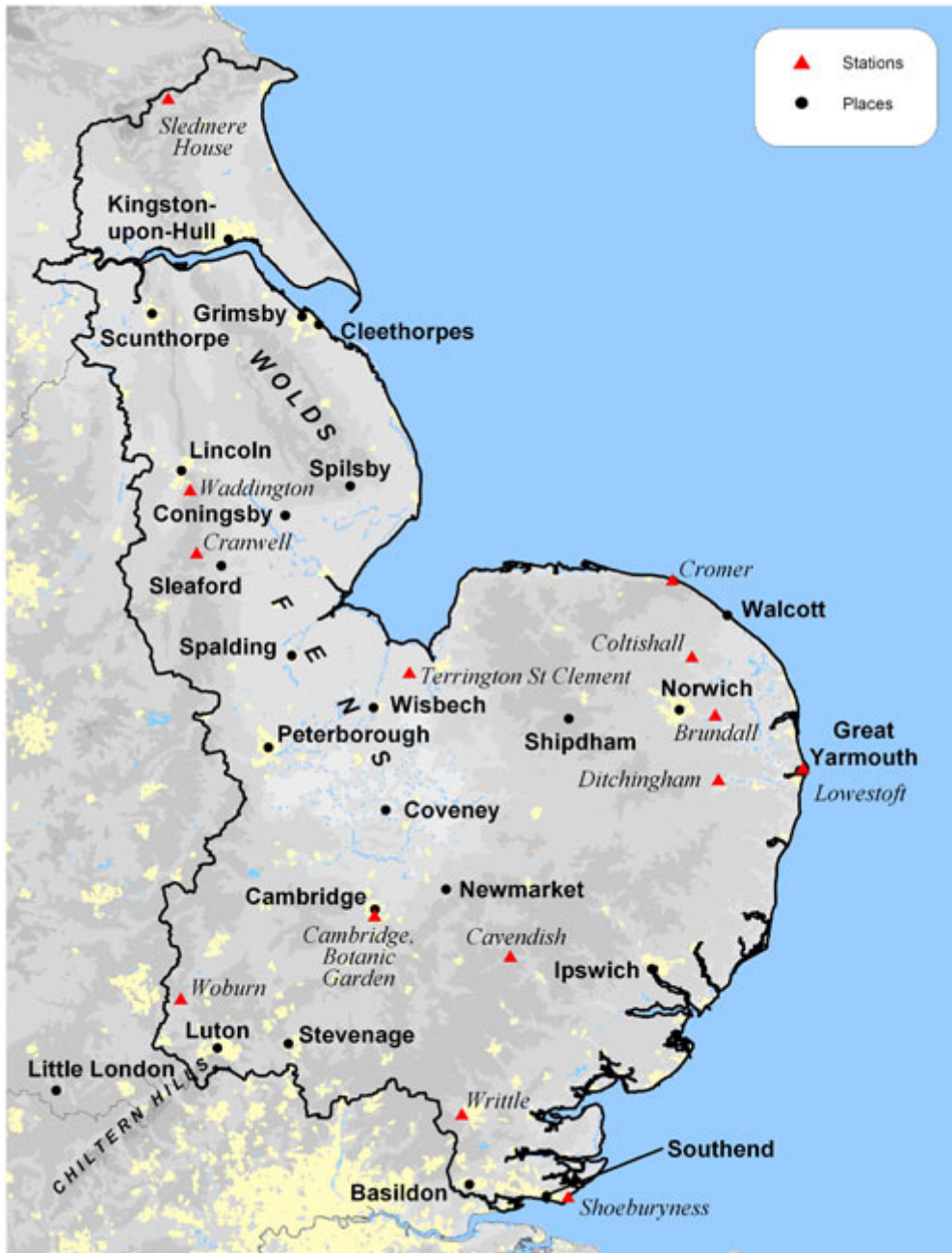
A day of gale is defined as a day on which the wind speed attains a mean value of 34 knots or more over any period of 10 minutes. Much of East Anglia and Lincolnshire has no more than 2 days of gale each year, but exposed coasts average about 5 gales each year. Coastal areas of east Yorkshire and Humberside average about 10 days of gale a year. Two particularly noteworthy gale events occurred in January 1976 and October 1987. On 2 January 1976 a depression moved across Scotland to the North Sea causing storm force winds that particularly affected the north, east and Midland areas of England. Gusts exceeding 90 knots were reported in East Anglia and sea walls were breached at Walcott in Norfolk and Cleethorpes on Humberside causing extensive damage. The 'Great Storm' of 15-16 October 1987 caused widespread damage across south-east England. The strongest gust recorded in Eastern England was 87 knots at Shoeburyness (Landwick) in Essex.

Eastern England has the greatest frequency of tornadoes in the UK. 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.

Both the longest track tornado and the largest outbreak of tornadoes in the UK occurred in Eastern England. On 21 May 1950, a tornado which touched-down at Little London (Buckinghamshire) tracked 107 km to Coveney (Cambridgeshire). From there it travelled another 53 km to Shipdham (Norfolk) before disappearing out into the North Sea. The largest tornado outbreak in the UK occurred on 21 November 1981 when tornadoes were formed as an active cold front swept across East Anglia. 105 tornadoes were reported across the Midlands and Eastern England with Norfolk being hit by at least 13. This was also the largest outbreak recorded in Europe.

Location map



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