White Christmas

National Meteorological Library and Archive
Factsheet 5 — White Christmas

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What is a White Christmas?

For many people, a White Christmas means a complete covering of snow, ideally falling between midnight and midday on 25 December.

For the Met Office to declare a 'White Christmas' a single snowflake must be observed by either an official Met Office observer or by a Met Office automated weather station within the 24 hours of 25 December. If you have placed a bet on a White Christmas this is how the bookies decide on whether to pay out.

Whilst this is the official definition. For many the image of a White Christmas is a complete covering of snow, ideally falling on but certainly present on 25 December.

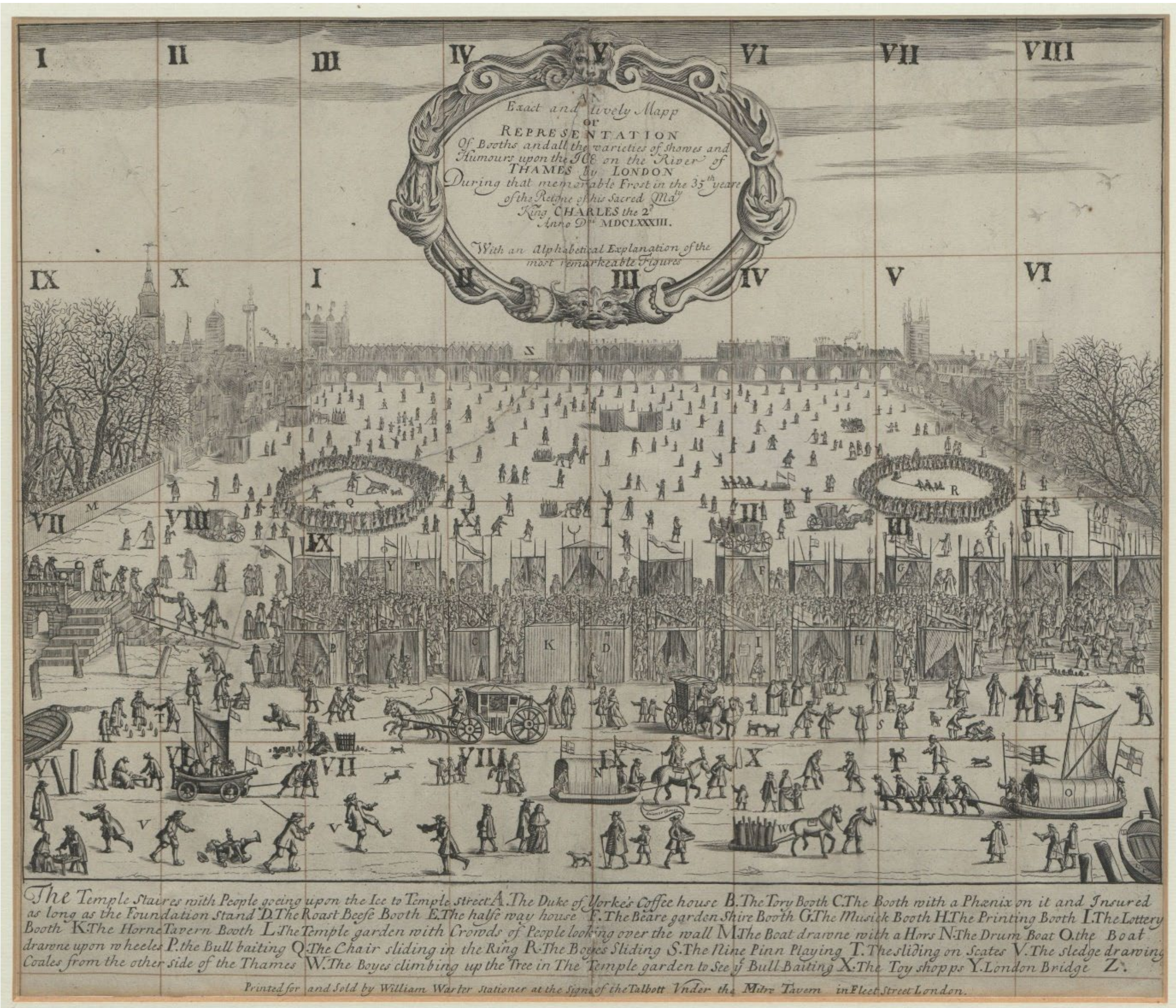
Historically and indeed even now many of us might think of snow at Christmas in different ways and not every particularly snowy winter includes snow at Christmas, which falls at the beginning of the season for snow in the UK. This factsheet explores some particularly snowy Christmases and winters of the past.

The Little Ice Age and Thames Frost Fairs

The Little Ice Age was a period of cooling which was particularly pronounced in the North Atlantic Region. It has conventionally been defined as extending from the 16th to the 19th centuries with particularly cold intervals beginning in about 1650, 1770 and 1850 with periods of slight warming in between. A number of factors may have contributed towards the cooling period including significant volcanic eruptions, cyclical lows in solar radiation, changes in ocean circulation and the natural variability of the global climate.

Whatever the cause of the cooling winters were generally more severe. The Thames froze on a number of occasions, sometimes for more than two months, and between 1607 and 1814 there were five or six occasions when the ice was thick enough to enable an entire fair to be held on the river. These 'frost fairs' were quite remarkable events with stalls selling food and drink, and a wide range of games. Sellers even kept warm by lighting fires inside their tents, all of which were pitched directly onto the ice.

The science historian James Burke has suggested that the period inspired changes in fashion with the development buttons and button holes to keep clothing tightly fastened and the invention of knitted close fitting undergarments. It is even thought that the colder climate of the period may have caused the wood used by Antonio Stradivarius in his famous violins to be denser than wood grown in warmer periods which may contribute to the unique tone of his instruments.



This image is of a Frost Fair on the Thames in 1683. Stalls included a roast beef booth, a music booth, at least one pub and a printers. Whilst activities included nine pin bowling, skating, chair sliding, sledges and both hors and human drawn boats. You can even see several coach and horses crossing the ice.

Despite extremely cold winters in 1881, 1895 and 1962-3 (when the upper Thames froze over) the Thames has not frozen over sufficiently to allow a Frost Fair since 1814. This is largely due to changes in the river and its built environment. The Thames of the past is very different from that of today. The wider and shallower footprint, without the modern stone embankments constructed in the Victorian era, made it much easier for the water to freeze and in addition Old London Bridge was demolished in 1832. The original medieval wooden bridge was supposed by 19 wooden piers with relatively narrow arches in between. These slowed the flow of the water and also trapped floating debris which further slowed the water, allowing it to freeze over. The new stone bridge has much wider arches allowing the river to flow more freely and also allowing salty water (which has a lower freezing temperature) to penetrate further upstream.

Charles Dicken's popularises the idea of Snow at Christmas

Typically in the UK snow is far more common in the deepening cold of early January and between January and early March than it is in December which lies at the beginning of the snow season. A good example of snow at this time of year is the 'Beast from the East' which struck the UK bringing heavy snow, particularly in the south of the country, at the end of February 2018. Snow in December is not overly common yet it is perhaps the most common running theme on Christmas Cards and will generally feature in shop decorations, Christmas stamps, wrapping paper and window displays.

Dickens, who was born in 1812, grew up during a particularly cold decade although snow falling on Christmas day was actually rarer in his lifetime than it was in the 30 years before his birth. The last Frost Fair on the Thames took place in 1814 and snow falling and lying during the Christmas period would have been relatively commonplace. Importantly we should remember that Christmas was generally celebrated for the full 12 days of Christmas period during 1800s and therefore 'snow at Christmas' could have been associated with any day from 24 December to 5 January, in some cases even through to the Candlemas feast on 2 February.

Dickens famously wrote about snow and ice at Christmas in his stories 'A Christmas Carol' and the 'Pickwick Papers'. He is also credited with making Christmas 'fashionable' again. With the Industrial Revolution as people began to move around the country traditions were weakened and both Sir Walter Scott and Washington Irving wrote with sadness of the loss of festivities. Dickens, writing in the 1840s, described Christmas festivities ranging from Christmas dinner to Christmas parties, family gatherings and snow covered frozen landscapes sought to conjour up all of the old traditional memories of his childhood and earlier and has been credited with essentially 'creating' the modern concept of Christmas. Added to this the introduction of Germanic traditions of the Christmas Tree and the Christmas Card by Prince Albert the Prince Consort and the new postal system established under Queen and Dicken's new image of Christmas could spread far and wide. It is this which we still imagine today, over two hundred years since the anomalous cold period that had such a memorable on Dickens. In fact generally only a few observing stations report snow lying at Christmas and often even fewer will report snow falling on Christmas day itself – the official requirement for a 'white christmas' even if it is not the image so often pictured.

Skating image from the Pickwick Papers 'The Household Edition' Illustrated by Phiz 1873

Examples of Victorian Christmas cards depicting snowy scenes

During the 20th Century the UK experience two particularly extreme winters.

Winter of 1946 - 1947

The winter of 1946 – 1947 began with a cold period in December and snow falling just before and after Christmas but the particularly cold and extreme weather did not start until 23 January 1947. The first snow fell heavily over southern England. Blizzard conditions occurred across the south-west of England, leaving many villages in Devon isolated. Between January and March, snow fell every day somewhere in the country for 55 days straight. Much of this settled because temperatures stayed very low, just above freezing most days.

In February, the temperature at Kew Observatory did not go over 4.4 °C and the night minimum temperature only went above 0 °C twice, in many places it was the coldest February on record. The mean maximum temperature for the month was 0.5 °C (6.9 °C below average) and the mean minimum was -2.7 °C (4.6 °C below average). Mean minimum temperatures were more than 4 °C below average everywhere in southern England, and almost 6 °C below average in some places.

However the country was split into two during this period. Whilst the south experienced deep snow and freezing temperatures western Scotland was remarkably dry and sunny. Some areas that are normally very wet had no rain at all, which was unprecedented in February. Meanwhile from the midlands south conditions were exceptionally cloudy. At Kew, Nottingham and Edgbaston, there was no sun on 22 of the month's 28 days and most of the Midlands and southern England had sunshine totals about 40% of the average. Meanwhile when the skies did clear, night-time temperatures plunged. Woburn in Bedfordshire registered a low of -21 °C early on 25 February.

Snow continued into the start of March with strong gales and heavy snowstorms creating blizzard conditions. On 4 and 5 March heavy snow fell over most of England and Wales forming severe snow drifts. On 6 March, drifts were five metres deep in the Pennines and three metres deep in the Chilterns. On 10 and 11 March Scotland had its heaviest snowfall of the winter, with snow drifts up to seven metres deep reported by 12 March.

This was to be the last snowfall of the winter and temperatures rose to 10 °C creating a rapid and destructive thaw. With the ground still frozen from weeks of cold weather melt-water poured into the rivers. Many burst their banks and flooding spread across England from the south to the west, not helped by rain and severe gales which damaged buildings and created waves which pounded against and even broke some flood defences. As river levels continued to rise the Trent burst its banks at Nottingham on 18 March flooding hundreds of homes to first floor level. The Wharfe, Derwent, Aire and Ouse flooded a huge area of southern Yorkshire and in Selby seventy percent of houses were flooded - only the ancient abbey and a few streets around the market place stayed above water.

Coming so soon after the end of the war into a country with rationing and many buildings and areas severely bomb damaged the snow and ice and the extensive flooding resulting form the fast thaw had significant impacts for populations in the midlands and south of the UK.

Example of estuary ice, on the River Yar, Isle of Wight. This image was taken during another very cold spell in 1985

1962-1963 – the 'Big Freeze'

With temperatures so cold the sea froze in places, 1963 is one of the coldest winters on record. Bringing blizzards, snow drifts, blocks of ice, and temperatures lower than -20 °C, it was colder than the winter of 1947, and the coldest since 1740; more than 200 years.

On 22 December a high pressure system moved to the north-east of the British Isles, dragging bitterly cold winds across the country. This situation was to last much of the winter. A belt of rain over northern Scotland on 24 December turned to snow as it moved south, giving Glasgow its first white Christmas since 1938. The snow-belt reached southern England on Boxing Day, bringing snowfalls of up to 30 cm.

A blizzard followed on 29 and 30 December across Wales and south-west England, causing snowdrifts up to 6 m deep. Roads and railways were blocked, telephone lines brought down, and some villages were left cut off for several days. The snow was so deep farmers couldn't get to their livestock, and many animals starved to death. By the end of the month there were snow drifts 2.4m deep in Kent and about 4.6m deep in the west. On 31 December Big Ben was 10 minutes late chiming New Year due to the large amount of snow that had accumulated on the clock hands and slowed their progress.

Much of England remained covered in snow every day from late December until early March 1963. In between snow there was plenty of sunshine but temperature plunged during the clear nights. n Braemar in Scotland, the temperature got down to -22.2 °C on 18 January. Mean maximum temperatures in January were below 0 °C in several places in southern England and Wales, more than 5 °C below average. Mean minimum temperatures were well below freezing and remained little higher for most of February. The long bitterly cold spell caused lakes and rivers to freeze, even sea water in some of England's harbours turned to ice. The sea froze for one mile out from the shore at Herne Bay, Kent and for 4 miles out to sea at Dunkirk. It also froze widely inshore with ice patches forming at sea and on beaches. The upper Thames froze over and a car was even driven across the frozen river at Oxford. Meanwhile 283 civilians had to be airlifted from RAF Fylingdales where they had become blocked in by snow. It was the biggest ever helicopter rescue in British history involving four RAF Coastal Command Whirlwind helicopters which could only carry eight people and had to navigate 80mph winds and blowing snow.

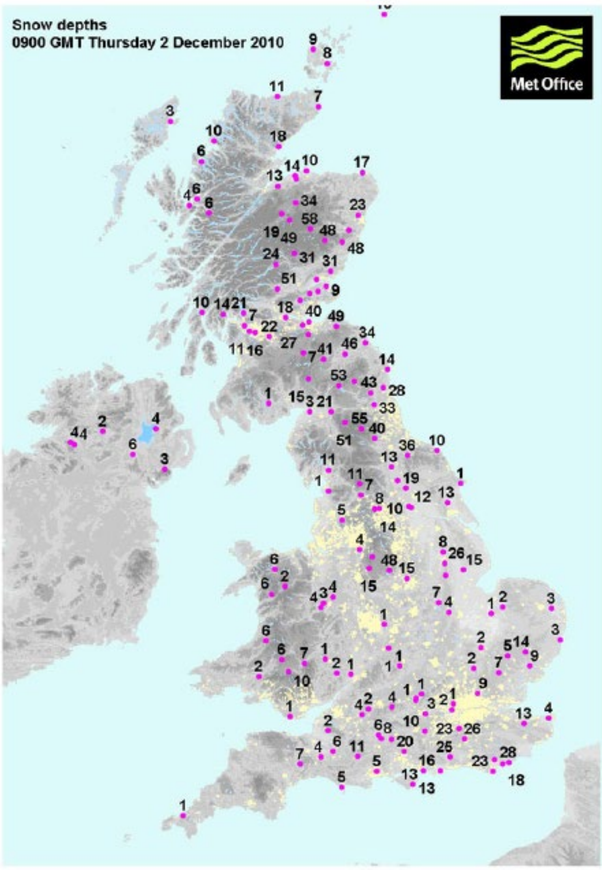
Snow continued to fall throughout February and temperatures remained cold until early March when a south-westerly air flow brought warmer temperatures. 6th March was the first morning of the year without a frost reported somewhere in Britain. The thaw inevitably brought flooding, but it was far more gradual and thus far less impactful than in 1947.

Christmas Day 1962 saw recorded snow falling in Scotland, England, Wales and Northern Ireland and was a widespread White Christmas. The highest snow depth recorded on the day was 15cm at Stirling.

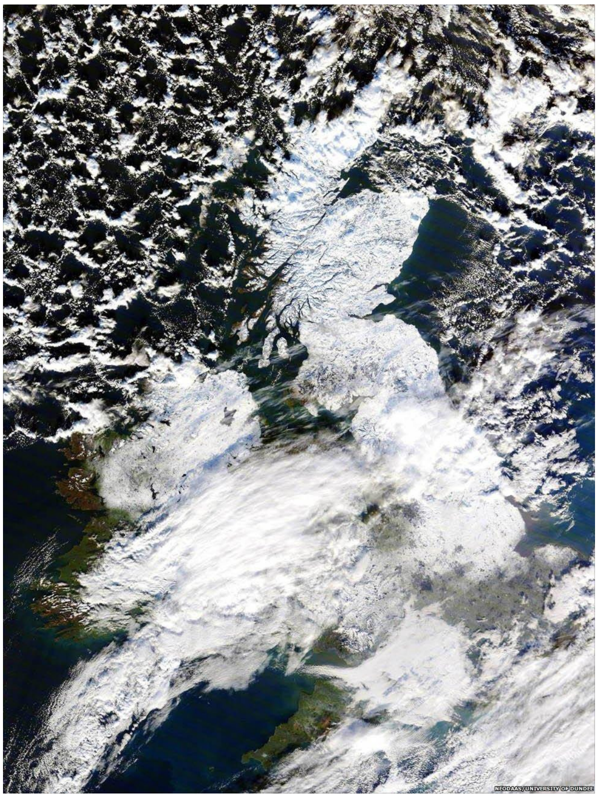
Christmas 2010 – the last UK wide White Christmas

In 2010 snow was reported falling across all the nations of the United Kingdom. Although it did not necessarily fall widely on the day many people clearly remember the snow of December 2010.
From late November to Boxing Day 2010 the UK experienced two spells of severe winter weather with very low temperatures and significant snowfalls. The first of these spells lasted for two weeks from Thursday 25 November to Thursday 9 December and saw persistent easterly or north-easterly winds bringing bitterly cold air from northern Europe and Siberia, accompanied by snow. Eastern Scotland and north-east England saw the most persistent and heaviest snow, which accumulated to depths of 50 cm or more across the higher ground by the end of the spell. However, lower lying areas were also affected and the snow increasingly spread to other parts of the UK, so that by early December many areas of the UK were under lying snow. Temperatures struggled to rise above freezing during the day and there were very severe frosts at night. Temperatures widely fell below -10 °C on several nights and on occasion below

-20 °C in northern Scotland. This spell of snow and freezing temperatures occurred unusually early in the winter, with the snowfalls judged as the most significant and widespread in late November and early December since late November 1965.

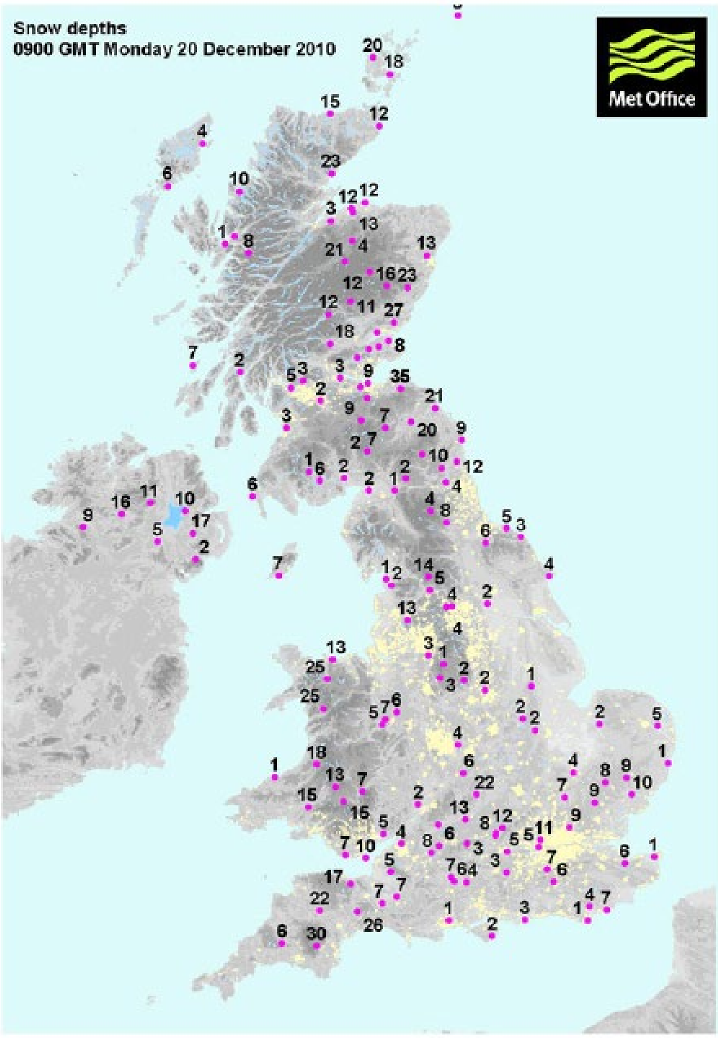


Map showing show depths at 0900 on 2 December 2010 with snow lying across much of the country.

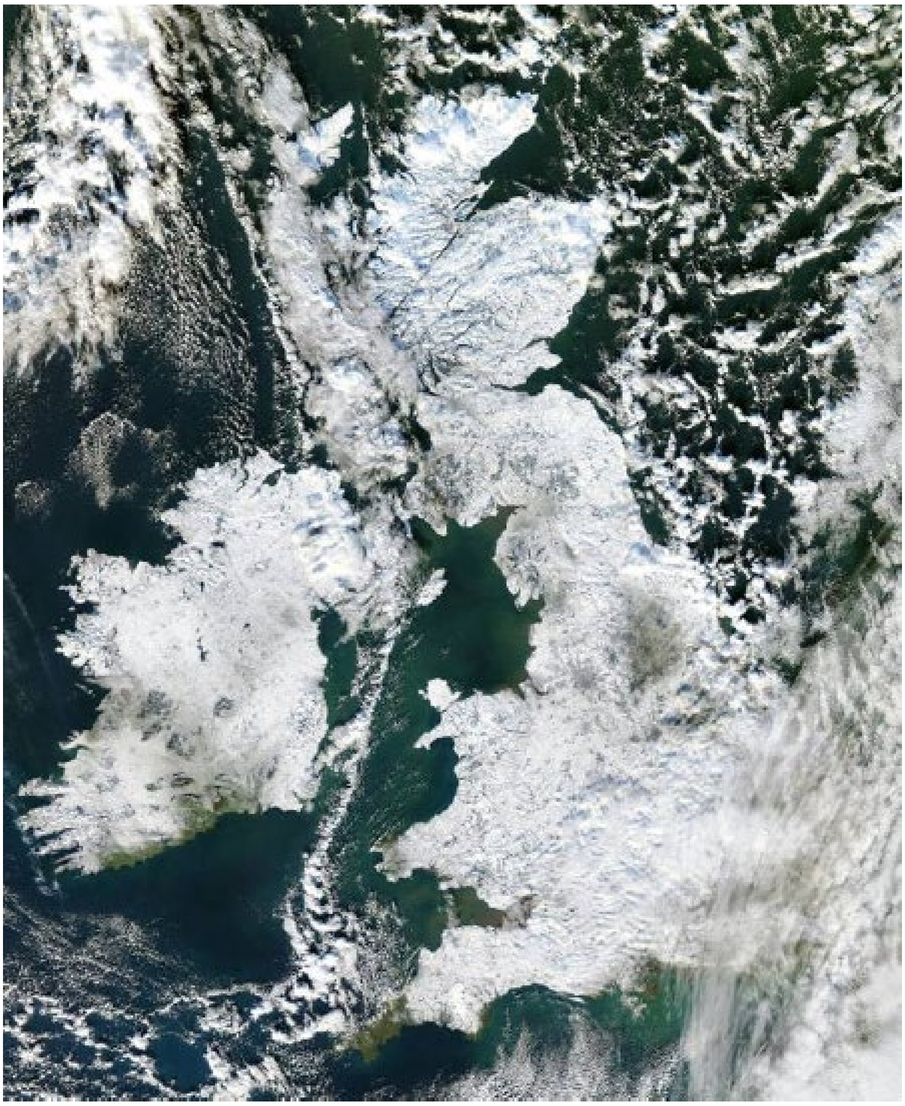


This satellite image of the UK received at 1203 GMT on Tuesday 7 December 2010 shows snow lying across most of the country. Image from the NERC Dundee Satellite Receiving Station, Dundee University, Scotland.

The period from 9 to 15 December saw milder and quieter conditions with a gradual thaw of lying snow. However, a second spell of severe weather began on Thursday 16 December as very cold Arctic air pushed down across the UK from the north. Snow showers affected the north and west on Friday 17 December, while there was heavier snow across southern England and Wales on Saturday 18 December. Further heavy snow affected south-west England on Monday 20 December. The UK remained under bitterly cold Arctic air until Boxing Day, with daytime temperatures again failing to rise above freezing and very severe frosts. While there was little further snowfall, lying snow remained until 26 to 27 December. The second spell of snow and freezing temperatures has been judged the most significant such spell in December since 1981, although late December 2009 to mid-January 2010 (the previous winter) were also broadly comparable to both these spells. Overall, the prolonged freezing conditions resulted in an exceptionally cold December across the UK: the coldest December in the last 100 years and the coldest across central England since 1890. Indeed, this was the coldest month in the UK since February 1986, and in Northern Ireland, the coldest individual month of the last 100 years.



Map showing show depths at 0900 on 20 December 2010 with snow still lying across much of the country although depths had decreased in some areas.



Satellite image of lying snow covering Great Britain and Ireland on Friday 24 December 2010, Christmas Eve, showing lying snow almost completely covering the UK, with the exception of a few areas (e.g. Isle of Wight and the far south-west of Cornwall). Even these areas experienced lying snow at the start of December. Image from the NERC Dundee Satellite Receiving Station , Dundee University, Scotland.

The emergency services, transport organisations and utilities were all put under great pressure by the snow. The freezing temperatures caused water supply problems due to burst pipes. Schools and airports were closed and sadly four people lost their lives due to the severe weather. Although the event was well forecast the rate of snowfall resulted in many blocked roads initially in Scotland with the A9 blocked for a time and on 2 December the Forth Bridge was closed for over 10 hours - the first time it had ever been closed due to snow. On 1 December the wind shifted from a north-easterly to a more easterly direction bringing heavy snowfalls across south-east England. The M25 was badly affected with 400 lorries stranded overnight, and Gatwick Airport was closed. There were also delays and cancellations on the rail network. The difficulties continued into the 2nd December but eased on the 3rd.

The second spell saw a belt of snow across southern England and South Wales on Saturday 18 December again resulting in widespread disruption. Airline passengers were particularly badly affected with Heathrow Airport closed at the busiest time of year in the run-up to Christmas. Further heavy snow early on Monday 20 December brought significant problems to both Devon and Somerset with the A38 closed near Exeter and widespread problems on the roads: the AA reported the busiest day in its 105 year history. The East Coast main line was shut on Tuesday 21 December after overhead power lines came down. It remained quieter, but bitterly cold with a gradual improvement in travelling conditions until Boxing Day which saw the start of a slow thaw.

Although falling snow was not reported widely on Christmas Day snow was still lying across much of the country. The deepest snow depth recorded on 25 December day was 43cm at Cae Poeth (Gwynedd).

A detailed report on the snow and low temperatures of late November and December 2010 is available in the Historic Weather Events section of the NMLA Digital Library and Archive.

Christmas weather – will it or won't it snow?

The likelihood of snow depends on many factors, mainly latitude and height above sea level. Not all of us live in the Scottish Highlands and falls of sleet or snow over low-lying areas are usually confined to between November and April. However, there have been isolated falls as late as June.

Even if snow falls in December, there is no guarantee that snow will 'stick'. On days when snow is falling, the temperature of the air above the ground sometimes remains above freezing — so the snow does not settle for long.

Climate change has brought higher average temperatures over land and sea and this generally reduces the chances of a White Christmas. However, the natural variability of the weather will not stop cold, snowy winters happening in the future.

Snow near Honiton, Devon 2018

How the definition of a White Christmas has changed

Officially a white Christmas has always required snow to fall on Christmas day itself and has always disregarded lying snow because this need not have fallen on the day, as was the case in so many places in 2010, but observing methods have changed over time.

Before automatic weather stations were invented observations were taken by humans who could look out for flakes of snow even when they were falling amid sleet and rain. Now that the vast majority of the network is automated our instruments are very good at accurately identifying falling snow, but less accurate at spotting snow falling within rain or sleet. For this reason the definition has been updated so that snow, rather than sleet, must be observed on Christmas Day.

Of course at all manned Met Office stations (either observatories or military locations) Met Office staff keep a keen eye out throughout Christmas day if the forecast indicates snow is a possibility and teams also keep a close eye on data reported from automated weather stations.

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Met Office FitzRoy Road, Exeter, Devon, EX1 3PB, United Kingdom. enquiries@metoffice.gov.uk
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