

Deep dive: Could changes high above the Arctic influence the UK's weather?

Author: Met Office

Wed 4 Nov 2026

The stratospheric polar vortex high above the North Pole is currently being disturbed, with signs that a sudden stratospheric warming (SSW) is developing.

It is an exceptional development for this early in the season and there is an intriguing connection with the current exceptional El Niño in the tropical Pacific. But could events thousands of kilometres away, and tens of kilometres above our heads, eventually influence the UK's weather?

The answer involves a fascinating chain of interactions across the atmosphere.

What is happening to the polar vortex?

During autumn, the stratosphere above the North Pole becomes increasingly cold as the Northern Hemisphere receives less sunlight. The growing temperature contrast between the Arctic and lower latitudes helps strengthen a ring of westerly winds around the pole, known as the stratospheric polar vortex.

Usually, this vortex is relatively circular. However, large atmospheric waves developing lower down in the troposphere can propagate upwards and disturb it. These disturbances can stretch the vortex, push it away from the pole or, in some circumstances, split it.

That is important because sufficiently strong disturbances can result in a sudden stratospheric warming. In a major SSW, the westerly winds around the polar vortex can reverse and become easterly.

The stratospheric polar vortex is already unusually stretched, with the disturbance associated with so-called "wave two" activity, when two large atmospheric waves push into it from opposite directions

This wave two activity is considerably stronger than average for the time of year. Forecasts suggest the vortex will subsequently become increasingly displaced from the North Pole.

Where does El Niño come in?

El Niño is characterised by unusually warm sea-surface temperatures in the tropical Pacific. The current event is exceptional, with temperatures in the Niño 3.4 region - a key area of the central tropical Pacific used to monitor El Niño and La Niña, with unusually warm sea-surface temperatures over several months indicating El Niño conditions - having already reached record-breaking levels.

This warmth can influence weather patterns far beyond the tropical Pacific.

During El Niño, increased thunderstorm activity over the central Pacific releases large amounts of heat into the atmosphere. This can alter atmospheric circulation and strengthen the large-scale waves that travel through the troposphere.

This helps explain why El Niño winters are associated with an increased likelihood of sudden stratospheric warmings.

Met Office presenter and meteorologist, Aidan McGivern, said: "El Niño is basically enhancing the waves that go on in the troposphere, the wriggly jet stream. Those waves can then propagate upwards into the stratosphere, knocking, bumping and disturbing that circle of winds

around the polar stratosphere, causing it to be displaced, pushed off the pole, deformed or even split."

It is a good example of a "teleconnection", where atmospheric changes in one part of the world influence weather patterns thousands of kilometres away.

Could a major sudden stratospheric warming happen?

The current disturbance is already producing warming in the stratosphere above the North Pole.

Forecasts from the ECMWF model show temperatures continuing to rise, while the normally westerly winds surrounding the vortex weaken. Many ensemble members suggest those winds could briefly reverse during the coming week, potentially meeting the definition of a major SSW.

However, the expected reversal is relatively weak and short-lived, and there remains uncertainty over whether a major SSW will occur.

If it does, its timing would be particularly notable. It would be exceptionally early in the season compared with the events meteorologists are more accustomed to analysing later in winter.

Aidan explained: "We know that El Niños increase the chances, through this chain of events, of sudden stratospheric warmings happening, and we know sudden stratospheric warmings increase the chance of colder weather for the UK. So we've got this chain of events that we can start to flag well in advance."

What could this mean for the UK?

A major SSW does not automatically mean snow or severe cold for the UK.

When an SSW occurs, its effects can sometimes propagate downwards into the troposphere over the following two to six weeks. This can weaken the Atlantic jet stream and increase the likelihood of blocking areas of high pressure developing.

Where those areas of high-pressure form is crucial.

High pressure over the UK could bring quieter, drier conditions with an increased likelihood of frost and fog. Blocking farther north could encourage easterly winds, while high pressure to the west could make northerly winds more likely. Historically, an SSW increases the chance of colder UK weather, but the outcome is far from guaranteed.

That uncertainty is particularly important with such an early-season event because there is generally less cold air available across the Northern Hemisphere than later in winter.

For now, therefore, this is not a forecast of an impending UK cold spell. Instead, meteorologists will be closely monitoring the polar vortex and whether changes in the stratosphere eventually work their way down into the part of the atmosphere where our day-to-day weather takes place.

READ MORE:

Met Office completes world-first cloud supercomputing transformation

October 2026 weather stats: A regional breakdown

Why the UK sees fewer warnings for fog than wind or rain

How long will high pressure keep the UK dry?

Keep up to date with weather warnings, and you can find the latest forecast on our website, on YouTube, by following us on X and Facebook, as well as on our mobile app which is available for iPhone from the App store and for Android from the Google Play store.



More by Met Office

[Deep Dive: From fog to frost: Is the polar vortex responsible?]

[November weather records: the UK's warmest, coldest, wettest and windiest extremes]

[Week ahead: Cold, fog and wintry showers for some in the week ahead]

[Weekly weather quiz November 6: Test your knowledge!]

[Weekend weather: A grey and chilly forecast, but will the sunshine break through?]

["Big freeze"? "Snow flurries"? Weather headline review]

[What is the stratospheric polar vortex and how does it affect UK weather?]

[10-day trend: A change on the way as high-pressure retreats?]

[October 2026 weather stats: A county breakdown]

[Week ahead: High pressure continues to dominate]

About this blog

This is the official blog of the Met Office news team, intended to provide journalists and bloggers with the latest weather, climate science and business news, and information from the Met Office.

Subscribe to this blog

Enter your email address to receive notifications of new posts from the Met Office news team.

The form will open in a new tab.

Email Address

Sub