

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

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After a foggy start to November, the UK's weather is beginning to change.

The widespread low cloud, mist and dense fog of recent days will gradually give way to clearer skies, colder Arctic air and an increasing risk of frost and ice. But despite recent changes high above the North Pole, this colder spell is not being caused by the polar vortex.

Why was it so foggy?

High pressure dominated the UK during the first part of November, creating ideal conditions for fog. With light winds, clear spells and plenty of moisture close to the ground, temperatures fell towards the dew point overnight. This allowed water vapour to condense into tiny droplets, forming cloud at ground level.

Bonfire Night celebrations may also have contributed locally. Smoke from bonfires and fireworks added tiny particles, known as cloud condensation nuclei, to the atmosphere. Water vapour can condense onto these particles, helping fog droplets to form when the other ingredients are in place.

The resulting fog was sometimes dense and highly variable. One location could remain clear while another only a short distance away experienced very poor visibility. This patchiness illustrates why fog is one of the more challenging weather phenomena to forecast.

How do meteorologists forecast fog?

One tool available to meteorologists is a tephigram, a diagram showing how temperature and moisture change with height through the atmosphere.

Forecasters compare the air temperature with the dew point, which is the temperature to which air must cool to become saturated. When these two values are close together near the surface, the air contains plenty of moisture and only limited cooling may be needed for fog to develop.

A temperature inversion can provide another important clue. Normally, temperatures decrease with height, but during an inversion warmer air sits above cooler air near the surface. Under high pressure, this can act like a lid, trapping moisture in the lowest part of the atmosphere. As the ground cools overnight, fog can then form within this shallow layer.

Small differences can determine whether a location experiences dense fog, light mist or clear skies. Slightly drier air, a change in wind speed or temperatures remaining just above the fog point may be enough to prevent formation.

Colder and clearer conditions arrive

Although high pressure remains influential, its position is changing. As it builds to the west and northwest of the UK, winds will increasingly arrive from the north, drawing in colder Arctic maritime air.

This colder air is also drier than the relatively mild and moist air responsible for the recent fog. As a result, widespread dense fog becomes less likely, although some mist or isolated fog patches remain possible. Skies will often be clearer, allowing temperatures to fall more quickly

overnight.

Frost will therefore become a more widespread feature, with a risk of icy surfaces where showers occur. Wintry showers are possible around northern and eastern coasts, while some snow may fall over the higher ground of Scotland.

Is the polar vortex responsible?

The short answer is no.

The current colder weather is being driven by developments in the troposphere, the lowest part of the atmosphere where most of our weather occurs. In particular, the position of high pressure is changing the UK's wind direction and opening the door to colder air from the Arctic.

The polar vortex, by contrast, is a large circulation of winds around 30 kilometres above the Earth in the stratosphere. Changes at this height do not automatically produce an immediate change in the UK's weather. Any influence on conditions nearer the surface can take several weeks to develop and is never guaranteed.

There has recently been some stratospheric warming and a weakening of the winds around the vortex, with a brief reversal possible. However, forecasts indicate that this disruption may be short-lived, with the vortex returning closer to its average state as December approaches.

It will be monitored closely, but for now the UK's transition from foggy and relatively mild weather to clearer, colder conditions is about high pressure, wind direction and Arctic air, not the polar vortex.

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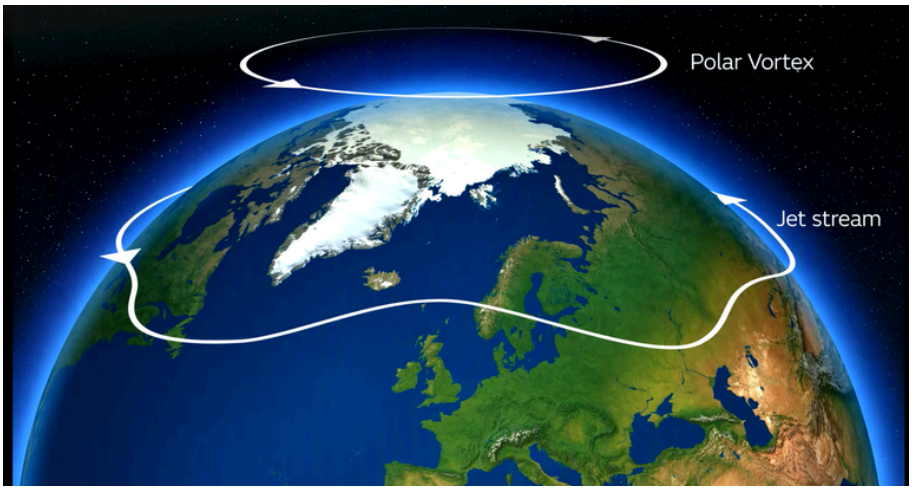
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