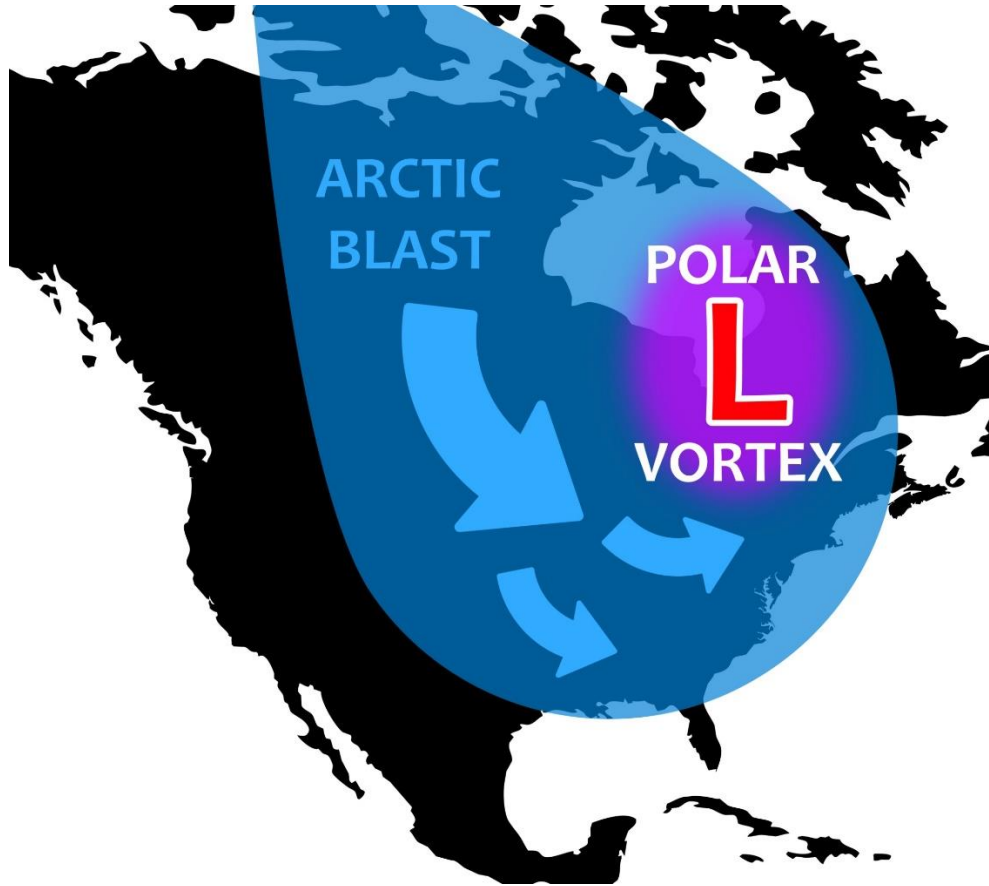


## Climate at a Glance: The Polar Vortex



### **Key Takeaways:**

- The phrase “**polar vortex**” is often erroneously used by the media to link climate change and severe winter weather events.
- The polar vortex was first identified as a cause for some instances of severe winter weather events in **1853**.
- **Claims that climate change** is creating new and more severe polar vortex events are **not supported by either observational evidence or computer climate models**.

### **Short Summary:**

Extreme winter weather is often attributed to an atmospheric weather event known as a “polar vortex outbreak” or an “Arctic outbreak.” The Polar Vortex is nothing new: The term first appeared in an 1853 issue of *E. Littell's Living Age*.<sup>1</sup>

According to the National Oceanic and Atmospheric Administration (NOAA):<sup>2</sup>

The polar vortex is a large circulation of low pressure and cold air that forms every winter in the [stratosphere](#) above the North and South poles. The term vortex refers to the counter-

clockwise flow of air that helps keep colder air close to the poles (left globe in Figure 1).

Sometimes during winter in the Northern Hemisphere, the polar vortex will become less stable and disrupt the polar jet stream circulating in the same direction miles below the vortex — thus sending cold Arctic air southward over the United States (right globe in Figure 1).

# Understanding the polar vortex

The Arctic polar vortex is a strong band of winds in the stratosphere, surrounding the North Pole 10–30 miles above the surface.

The polar vortex is far above and typically does not interact with the polar jet stream, the flow of winds in the troposphere 5–9 miles above the surface. But when the polar vortex is especially strong and stable, the jet stream stays farther north and has fewer “kinks.” This keeps cold air contained over the Arctic and the mid-latitudes warmer than usual.

Every other year or so, the Arctic polar vortex dramatically weakens. The vortex can be pushed off the pole or split into two. Sometimes the polar jet stream mirrors this stratospheric upheaval, becoming weaker or wavy. At the surface, cold air is pushed southward to the mid-latitudes, and warm air is drawn up into the Arctic.

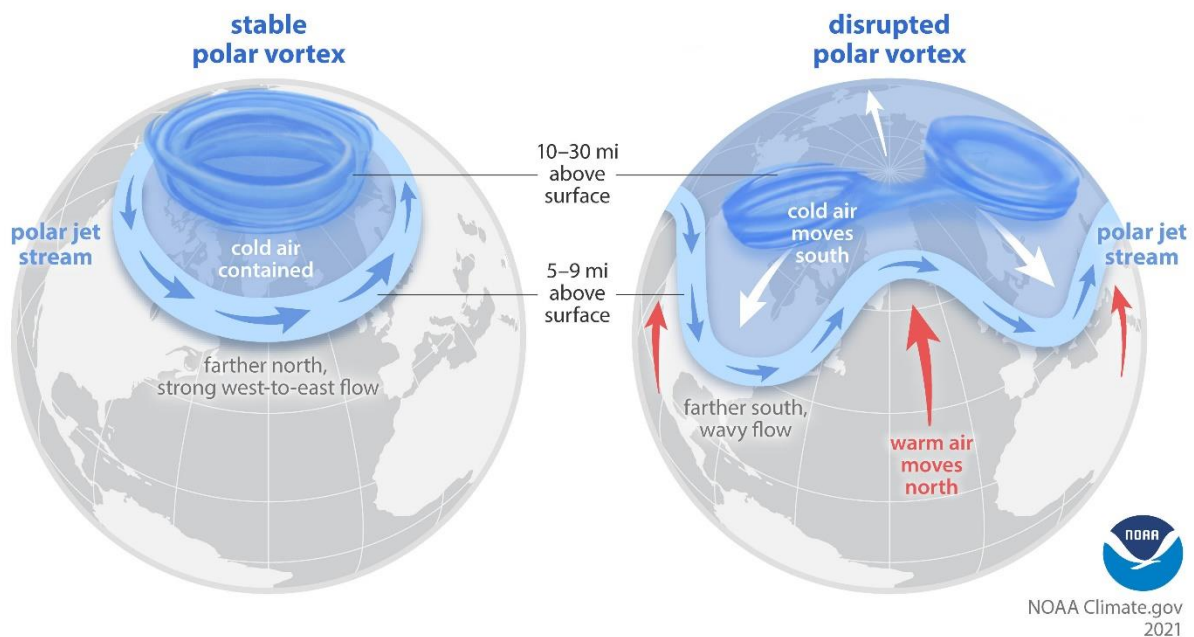


Figure 1: When the Arctic polar vortex is especially strong and stable (left globe), it encourages the polar jet stream, down in the troposphere, to shift northward. The coldest polar air stays in the Arctic. When the vortex weakens, shifts, or splits (right globe), the polar jet stream often becomes extremely wavy, allowing warm air to flood into the Arctic and polar air to sink down into the mid-latitudes. NOAA Climate.gov graphic, adapted from original by NOAA.gov.

In the past decade, those concerned about climate change have regularly linked polar vortex events to [climate change](#).<sup>3,4</sup>

Recently, some climate researchers have cited computer models to attribute specific polar vortex events to climate change. However, there no evidence contained in the long-term observational records that

polar vortex events have become more frequent or severe during the recent period of modest warming. In its discussion of the polar vortex, NOAA says computer models fail to produce consistent projections linking climate change and the polar vortex. "Computer models don't agree on how global warming will affect the polar vortex," reports NOAA.<sup>5,6</sup>

Claims that climate change is creating new and more severe polar vortex events are not supported by either observational evidence or computer climate models.

Each polar vortex outbreak is an individual weather event spanning days to a week at any given location, no single one of which can be honestly attributed to climate change, which is a trend measured over [thirty years at the minimum](#).<sup>7</sup> Science has observed no increasing trend in polar vortex weather events.

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