

States like Texas were caught off guard by the sudden cold, which led to waves of blackouts and lack of heat and water as pipes froze. North Texas experienced its coldest day in 72 years (minus 18C).

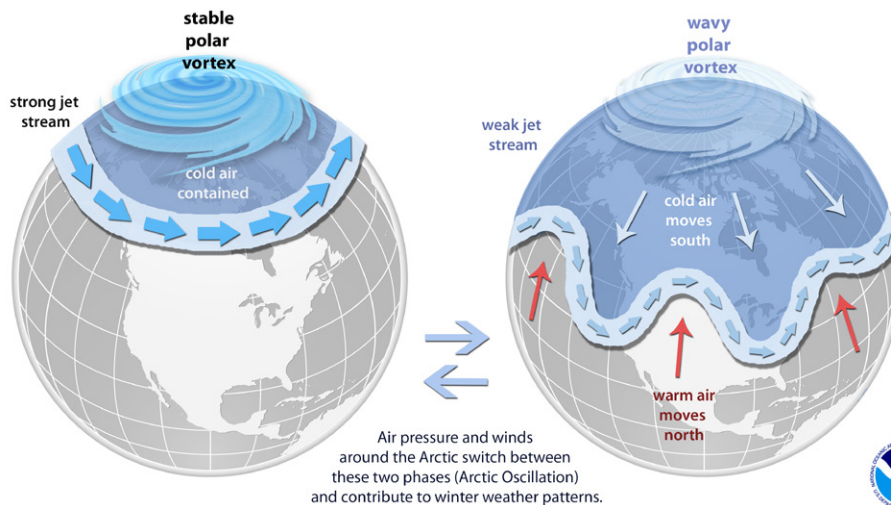
With average temperatures rising around the world due to greenhouse gas emissions, there is more heat in the global climate system. That's already having some predictable impacts, like an increase in the frequency and intensity of heat waves.

## Global Warming Can Have the Opposite Effect

- Some researchers are concerned that warming in the Arctic will increase the chances of frigid polar air spilling further south, leading to more periods of extreme cold in the near term.
- Ordinarily, the freezing air of the Arctic remains over the North Pole encircled by a fast-moving narrow band of winds called the **jet stream**. These winds, which can reach 400 kilometers per hour, are between 8 and 14 kilometers above the Earth's surface.
- The jet stream acts as a barrier between the spinning cold air in the north and the warmer air to the south. This trapped area of cold air is known as the **polar vortex**.
- The jet stream has been described as a rim around a bowl, keeping the cold air of the polar vortex in place. The cold air is heavier, so it stays in this "bowl" and is "stable".

## But what happens when the Arctic gets hit with warm weather?

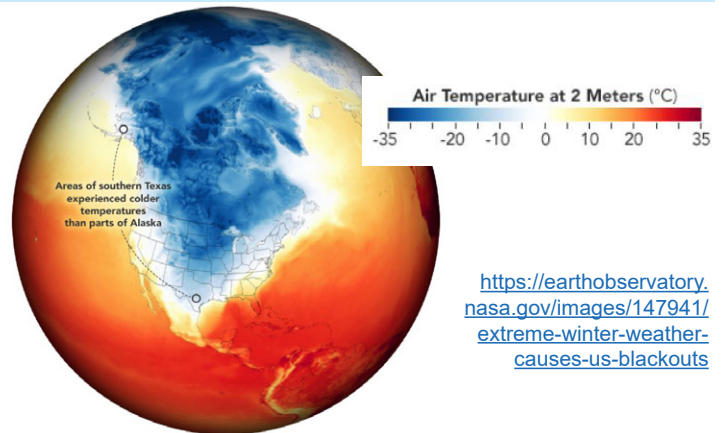
- As Arctic air warms, it becomes less dense and has more energy. It can more easily break out over the "bowl" and cause waves in the jet stream. The polar vortex ends up being less stable and cold air spills out to the south.
- These waves in the jet stream can appear anywhere and bring cold, severe weather southward.



[https://csl.noaa.gov/news/2021/301\\_0128.html](https://csl.noaa.gov/news/2021/301_0128.html)

The February 13–17, 2021 North American winter storm had widespread impacts across the United States, Northern Mexico, and parts of Canada.

The storm caused blackouts for over 9.9 million people in the U.S. and Mexico, most notably the 2021 Texas power crisis. By March 25, the death toll had risen to at least 137.



<https://earthobservatory.nasa.gov/images/147941/extreme-winter-weather-causes-us-blackouts>

## What does climate change mean for extreme cold events in the future?

- Scientists expect that winters will warm faster than summers across North America. More heat records will be broken in the coming years than cold records.
- It is possible winters can warm up over the long term while the polar vortex may spill over more frequently in the near term. Scientists do expect to get a better handle on what to expect with cold weather extremes as they gather more data.

## For More Information:

The polar vortex, explained - National Geographic (includes video) - *email sign-in required*  
<https://www.nationalgeographic.com/environment/article/polar-vortex>

The polar vortex is coming - National Geographic (video included)- *email sign-in required*  
<https://www.nationalgeographic.com/environment/article/the-polar-vortex-is-coming-raising-odds-for-intense-winter-weather>

On the sudden stratospheric warming and polar vortex of early 2021 - Climate.gov

<https://www.climate.gov/news-features/blogs/enso/sudden-stratospheric-warming-and-polar-vortex-early-2021>

