



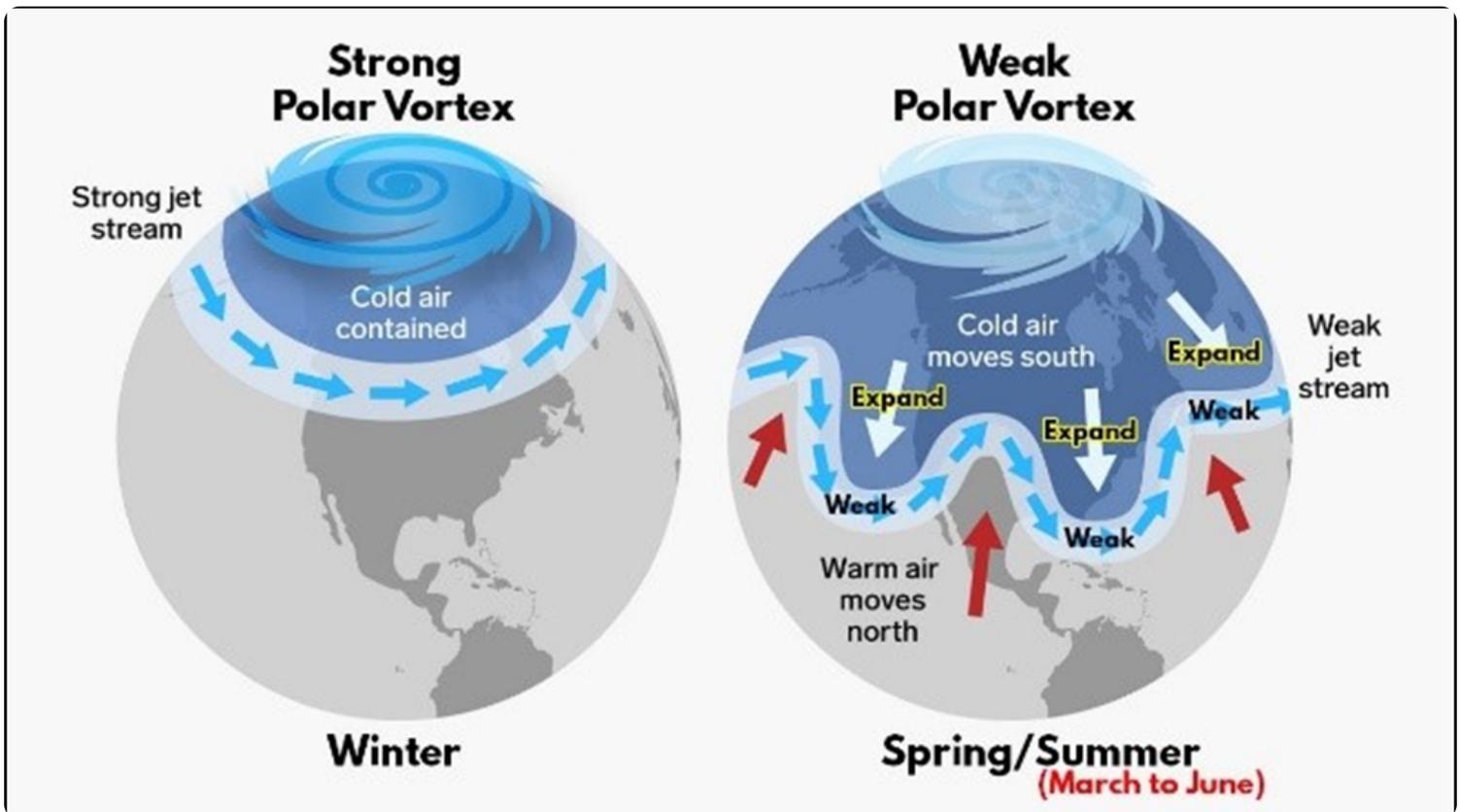
Polar Vortex

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In News: A southward expansion of the polar vortex has triggered extreme cold conditions in parts of the United States, due to weakening and distortion of the jet stream.

What is the Polar Vortex?

- The polar vortex is a large, persistent low-pressure system containing extremely cold air over the Polar Regions.
- It is normally confined by the polar-front jet stream, which acts as a boundary between cold polar air and warmer mid-latitude air.



Role of the Polar-Front Jet Stream

- An eastward-flowing belt of strong winds in the upper atmosphere.
- Separates cold polar air from warm tropical air.
- Its strength and path determine whether cold air remains confined or spills southward.

Direction of Rotation

- **Northern Hemisphere:** Counter-clockwise
- **Southern Hemisphere:** Clockwise (due to the Coriolis force)

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Factors Responsible for Formation

- **Strong temperature gradient** between poles and tropics
- **Earth's rotation (Coriolis force)**
- **Pressure gradient force**
- **Jet stream interaction**

Stability & Weather Impact

Strong Polar Vortex

- Jet stream flows in a **tight, circular path**
- Cold air remains **locked near the poles**
- Mid-latitudes experience **milder winters**

Weak / Disturbed Polar Vortex

- Jet stream becomes **wavy or meandering**
- Cold polar air **plunges southward**
- Causes **extreme cold spells**, snowstorms, and temperature anomalies

Types of Polar Vortex

1 Tropospheric Polar Vortex

oAltitude: **~10–15 km**

oDirectly affects **day-to-day weather**

2 Stratospheric Polar Vortex

oAltitude: **~15–50 km**

o**Strongest during winter**

oSudden weakening can trigger **Sudden Stratospheric Warming (SSW)** events