Antarctica’s Deep-winter Heatwave

Why in news?

For the second time in two years, a record-breaking heatwave is sweeping through Antarctica at the height of its winter season.

What are the characteristics of Antarctica?

- **Geography** – It is *one among the seven continents* of the Earth and contains the geographic South Pole.
- **Size** – It is the *5^{th} largest continent*.
- **Atmospheric parameters** – It is, on average, the *coldest, driest, and windiest* of the continents.
- It is mainly a *polar desert*, with annual precipitation of over 200 mm.
- **Temperatures** – It holds the record for the lowest measured temperature on Earth, *−89.2 °C* (−128.6 °F).
    - **Near the coast** – The temperature can exceed 10 °C in summer and fall to below −40 °C in winter.
    - **Over the elevated inland** – It can rise to about −30 °C in summer but fall below −80 °C in winter.
- **Source of water** – About 70% of the world's freshwater reserves are frozen in Antarctica.



What is Antarctica's deep-winter heatwave?

- **Normal Deep-winter temperatures** – It usually vary between ***minus 50 degrees and minus 60 degrees*** Celsius.
- **Antarctica's Deep-winter heat wave** – For the second time in two years, a heatwave is sweeping through Antarctica at the height of its winter season.
- Heat wave is a *period of abnormally high temperatures*, more than the normal maximum temperature that occurs.
    - *Ground temperatures have been 10 degrees Celsius higher* than normal on average since mid-July and up to 28 degrees higher on certain days.
    - In *East Antarctica*, the temperatures are currently in the range of *minus 25 degrees to minus 30 degrees* Celsius.

East Antarctica is the relatively higher-elevation swathe that makes up two-thirds of the world's coldest continent

- **Reasons –** It is mainly due to *changes in atmospheric and Oceanic variables* in the southern hemisphere especially Antarctica and in Southern Ocean.
- **Weakening of the polar vortex** - It a rare event that is only *expected to occur once every two decades* on average.

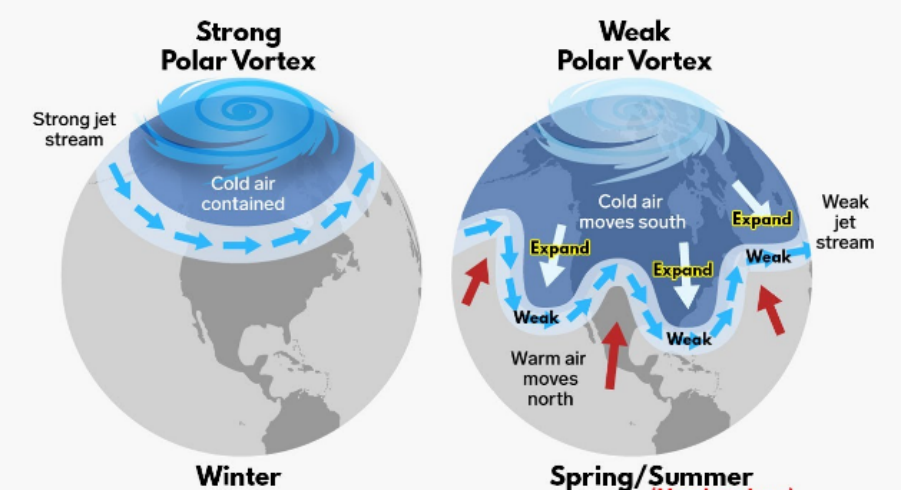
Polar vortex *is the band of cold air and low pressure systems that spins around the poles of the Earth in the stratosphere. The vortex that usually remains strong*

and stable during winter in the southern hemisphere keeps the cold air trapped over Antarctica and not letting hot air come in.

- This year, the stability of vortex has been *disturbed by large-scale atmospheric waves* (periodic disturbances in the fields of atmospheric variables).

***Atmospheric wave** is a periodic disturbance in the fields of atmospheric variables like surface pressure or geopotential height, temperature, or wind velocity.*

- Due to this, the *vortex released trapped cold air*, and *opened the door for warmer air* to enter the region.
- As this warmer air travelled downwards from the upper atmosphere, it *caused an increase in temperatures*.



- **Reduction of Antarctic sea ice** – This June the extent of Antarctic *sea ice was the second-lowest ever* for that time of year.
- Generally, sea ice plays a crucial role in keeping temperatures down in the Polar Regions.
    - It ensures that the air remains cool by acting as a barrier between the cold air and the relatively warmer water below.
    - White surface of Sea ice reflects more sunlight (solar energy) back to space than liquid water.
- **Warmer Southern Ocean** – Heat travels to Antarctica from the warmer southern ocean surrounding it.
- **Global warming** – Antarctica is warming at a rate of 0.22 degrees Celsius to 0.32 degrees Celsius per decade — almost twice as fast as the rest of the world.

IPCC has estimated that the Earth as a whole is warming at the rate of 0.14-0.18 degrees Celsius per decade.

To know about Arctic Polar Vortex, click here

What are the effects of winter heat wave?

- **Ice sheet reduction** - Antarctica's hot winter will lead to further reduction in Antarctic Ice Sheet.
    - The Antarctic Ice Sheet, covering 98% of the Antarctic continent holds more than 60% of the world's total freshwater.
- **Sea level rise** - It can potentially raise global sea levels by hundreds of feet.
    - Antarctica has already lost 280% more ice mass in the 2000s and 2010s than it lost in the 1980s and 1990s.
- **Displacement of people** – Sea level rise will cause coastal cities and population to move away from coastal line.
    - A sea level rise by a few feet will displace the roughly 230 million people who live within 3 feet of the high tide line today.
- **Affects global ocean circulation system** - Melting ice in Antarctica slows down this circulation.
    - Global ocean circulation system regulates climate by storing and transporting heat, carbon, nutrients, and freshwater around the world.
- A slower global ocean circulation system will lead to oceans absorbing less heat and CO_2 further intensifying global warming.
- **Reduction in ocean salinity** - Freshwater from melting ice reduces the salinity and density of the surface water.

References

[Indian Express | Antarctica winter heatwave]

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