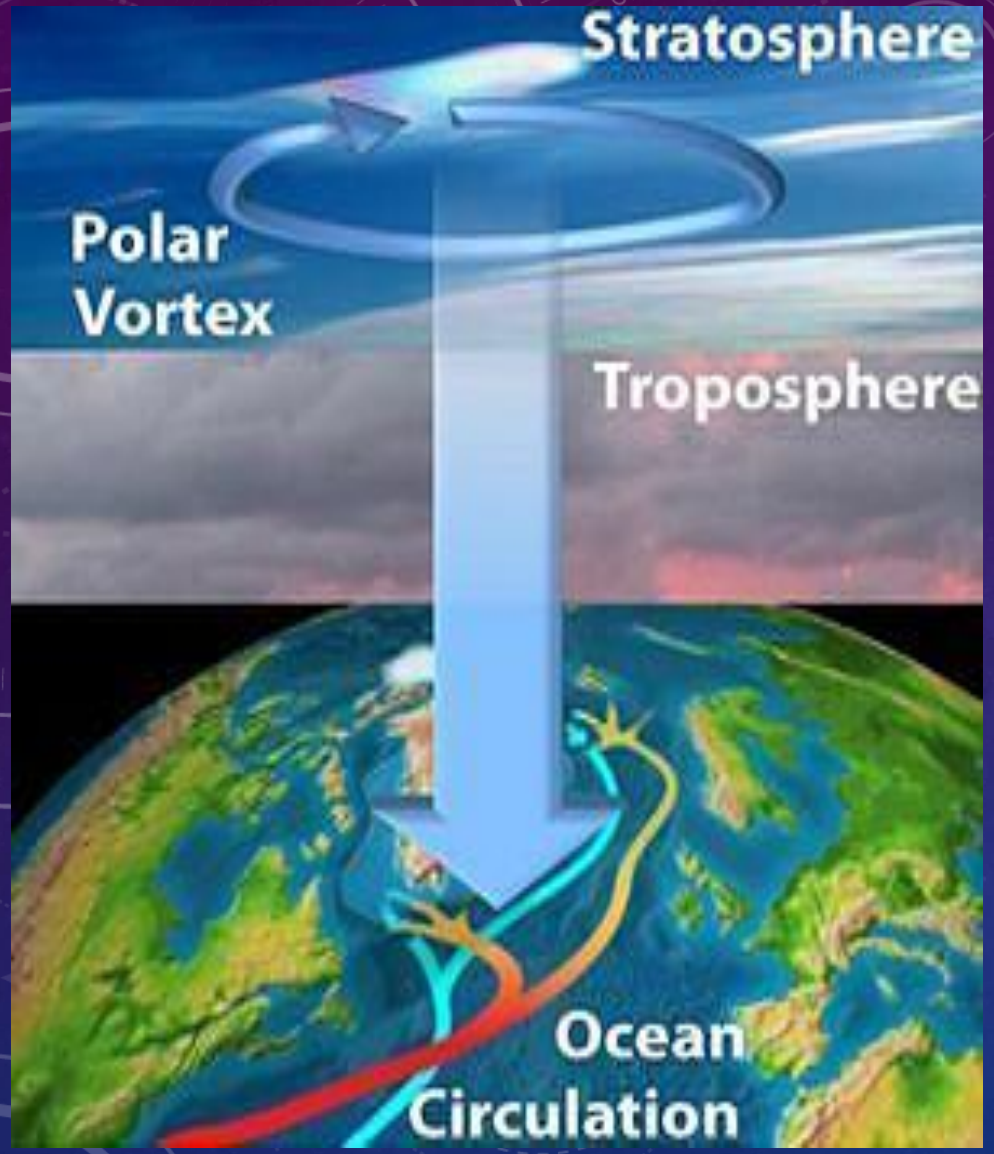
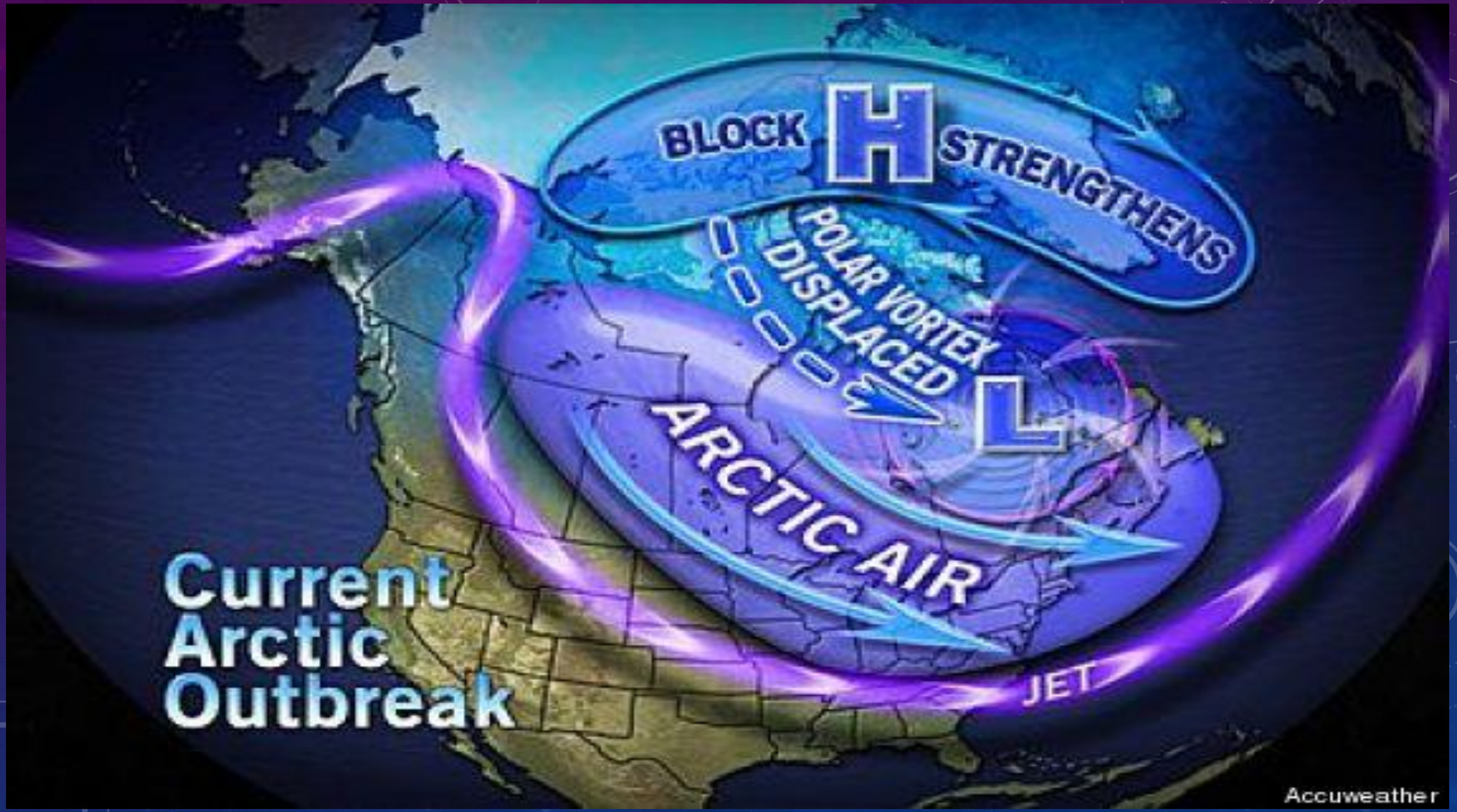
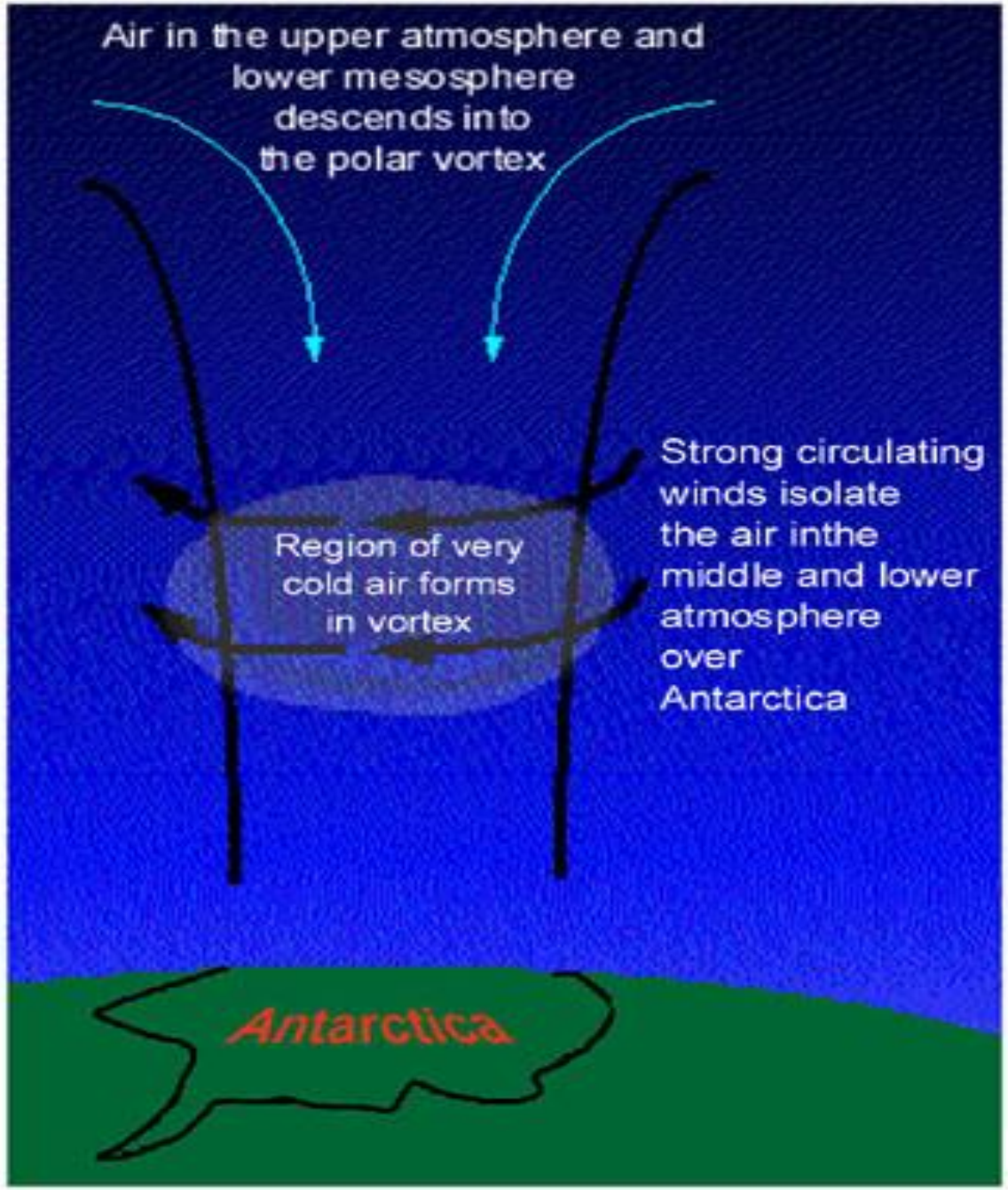


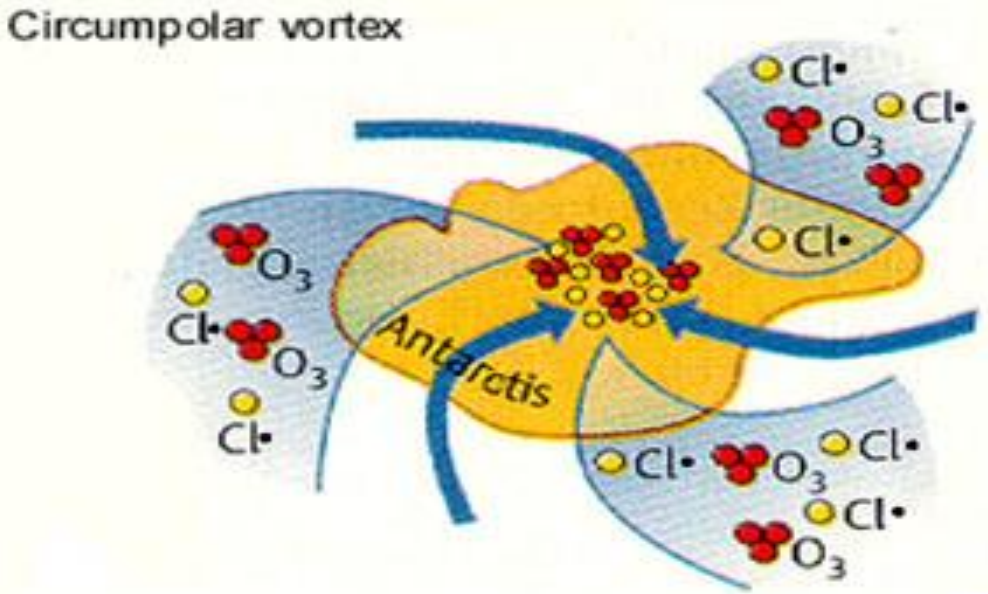
POLAR VORTEX

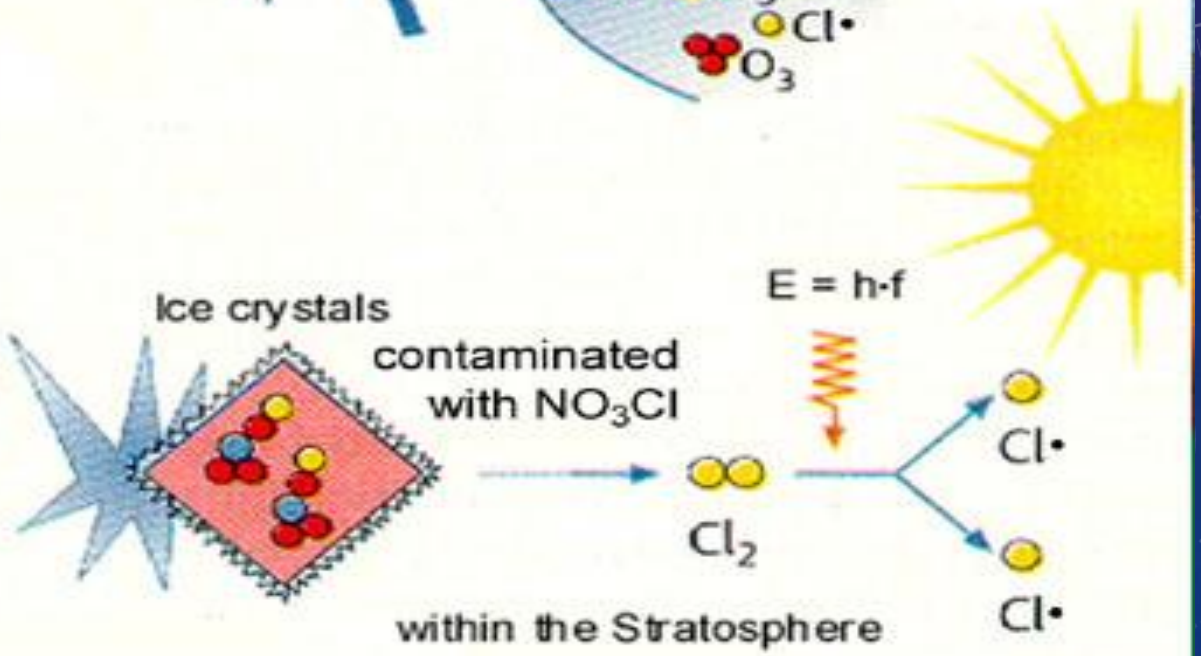
Dr T.R.Trivedi Physics Department Bhavan's College, Dakor

THANK YOU


BLOCK
H
STRENGTHENS
POLAR VORTEX
DISPLACED
L
ARCTIC AIR
JET
Current
Arctic
Outbreak
Accuweather







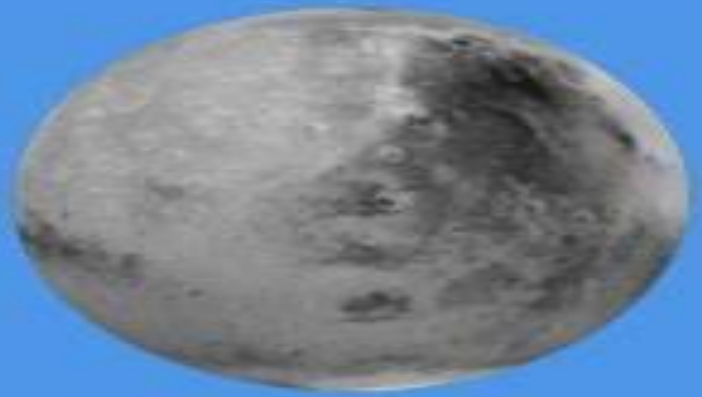
Ozone depletion facilitated by the polar vortex

On January 1, 2014

it was colder in Canada than it was on Mars

Winnipeg, Manitoba
Canada

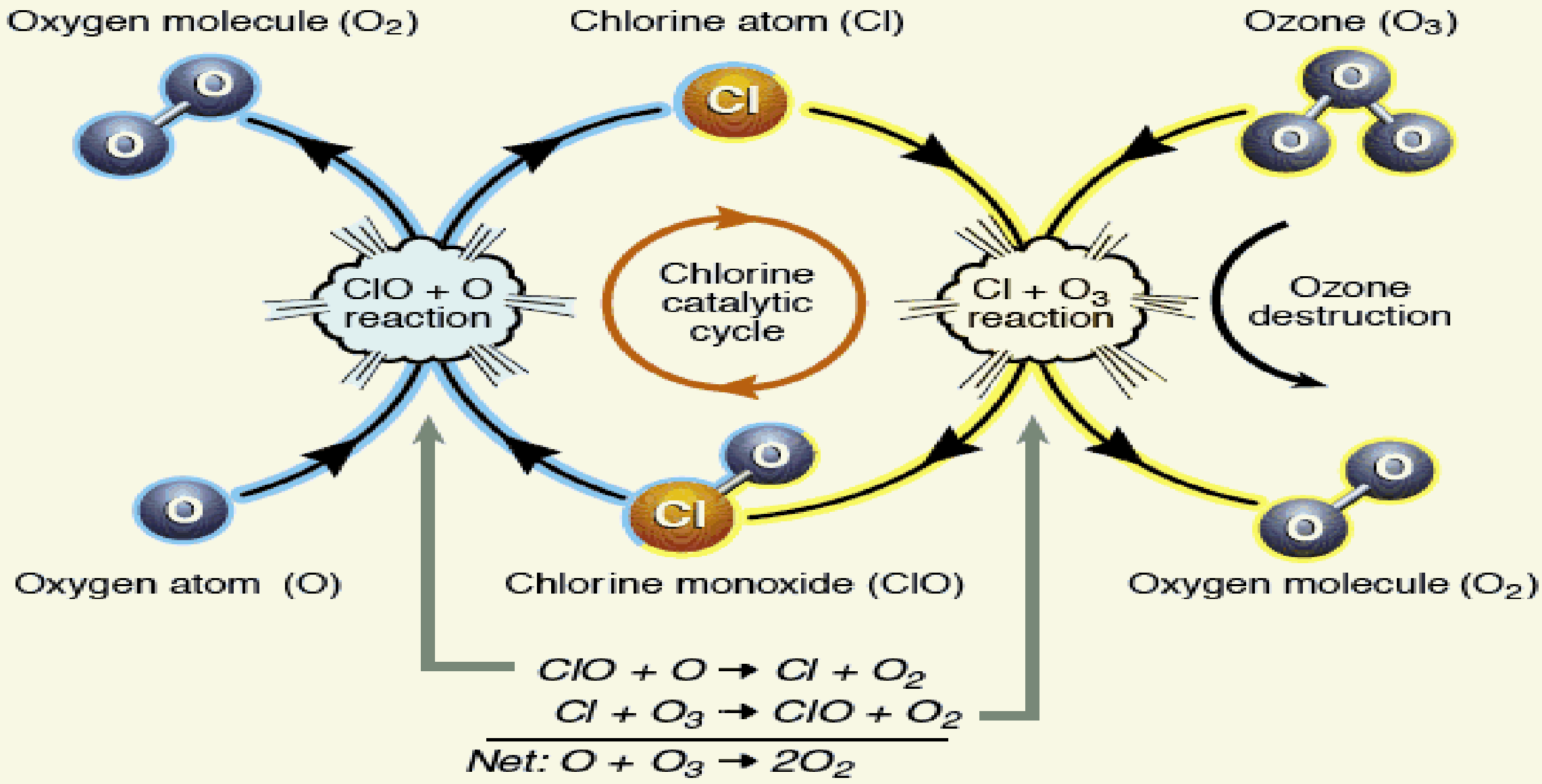
-31°C



Mars, Our Solar System
The Milky Way

-29°C

Ozone Destruction Cycle 1



$$ClO + O \rightarrow Cl + O_2$$

$$Cl + O_3 \rightarrow ClO + O_2$$

$$\text{Net: } O + O_3 \rightarrow 2O_2$$

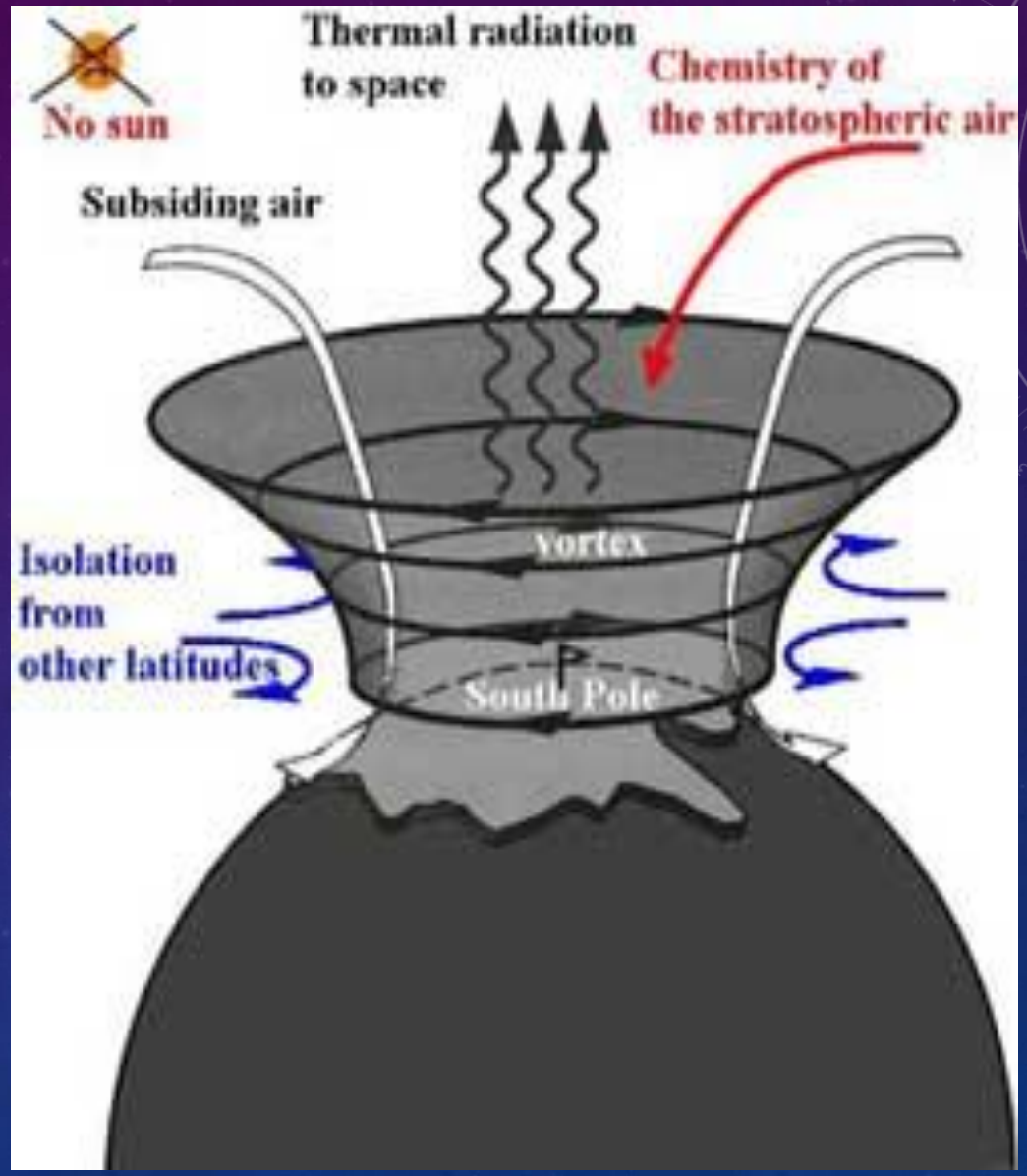
Stratospheric ozone is important in the earth system because it absorbs ultraviolet radiation from the sun, protecting life on earth. Ozone is a relatively rare and unstable molecule composed of three oxygen atoms O3. The normal oxygen molecule has two oxygen atoms O2. It is the second most common gas in the atmosphere, and it is relatively stable.

Ozone is found in two regions of the atmosphere:

In the stratosphere at heights around 20–30 km, where it is produced by sunlight. This is good ozone. It is critical for life because it protects all life on earth from dangerous solar ultraviolet radiation, especially UVB, a band of ultraviolet radiation with wavelengths from 280–320 nanometers produced by the sun. Ultraviolet radiation with wavelengths from 320–400 nanometers, UVA, is not absorbed, and it is much less dangerous to life.
Close to the surface, where it is produced by sunlight acting on atmospheric pollutants. It is produced from nitrogen oxides and volatile carbon-based compounds when there is intense sunshine, above all in the spring and summer. This is bad ozone. It causes respiratory illness; it damages plants; and it attacks rubber.

The ozone hole is the result of a series of processes:

1.During the winter, the very cold air over Antarctica is surrounded by warmer air at lower latitudes. This creates a low pressure region with strong winds blowing around the region at the boundary between warm and cold air. The rotating air, a strong polar vortex, isolates the the stratosphere above Antarctica from rest of the stratosphere.



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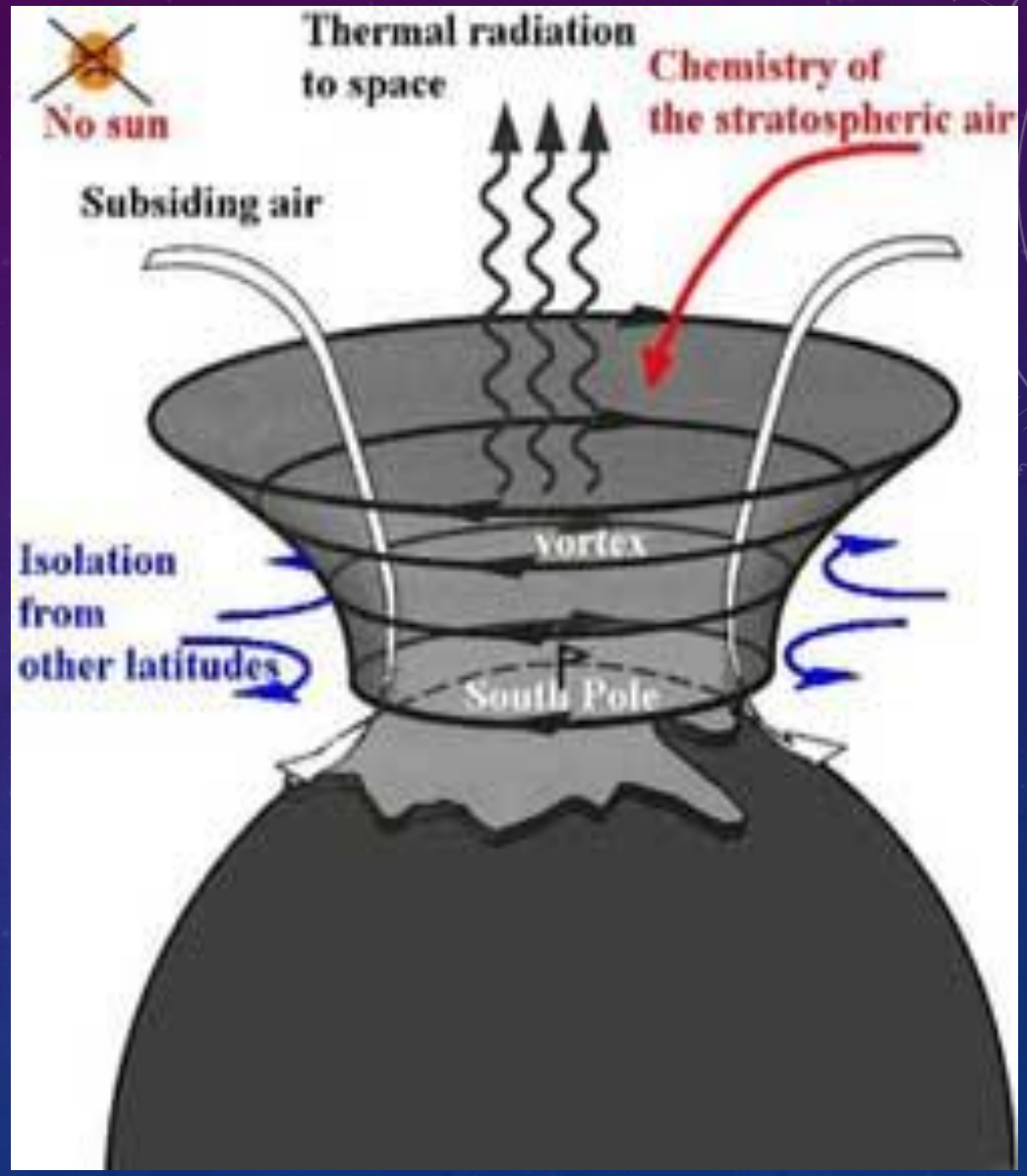
As the air cools, Polar stratospheric Clouds form inside the vortex. When temperatures drop to 195 K, nitric acid, sulfuric acid and water condense to form Type I Polar Stratospheric Clouds. Then, as temperatures drop to 188 K, H_2O molecules condense on the Type I cloud particles to form Type II Polar Stratospheric Clouds. Type II particles are large enough (10 microns in diameter) that they fall out of the stratosphere, removing nitric acid and water from the stratosphere. Type I cloud particles are so small (1 micron in diameter) that they remain in the stratosphere.



http://oceanworld.tamu.edu/resources/environment-book/stratosphericozone.html