

OZONE!

Good up high
Bad nearby













Stratospheric

Tropospheric



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- Beneficial uses:
 - Purify water
 - Sterilize air
 - Bleaching certain foods (flour)

Reminder about formation



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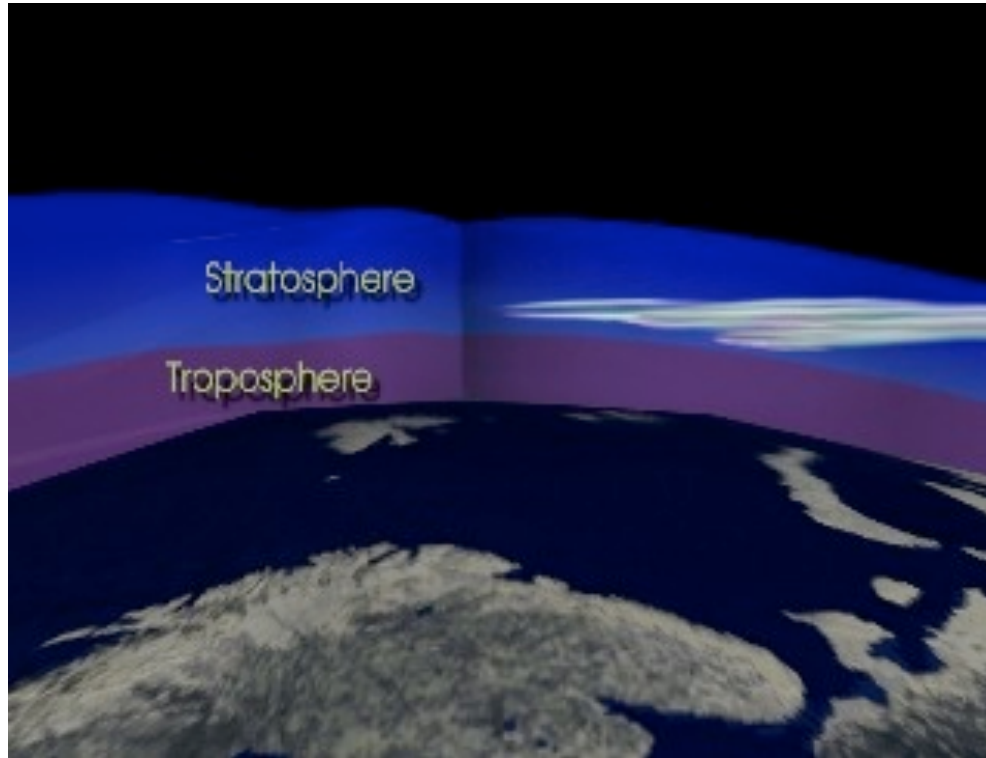
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- What's causing the damage to the layer?

Amazing CFC's

- Easily liquified!
- Relatively inert!
- Non-toxic!
- Non-combustible!

- Coolants, propellants, used in making styrofoam, industrial solvents
- Because of inertness, diffuse slowly, unchanged into stratosphere



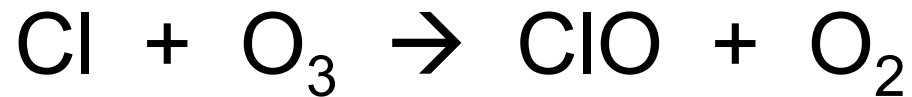
- Troposphere:
 - Thinnest layer, 80% mass, almost all H₂O
 - .04 ppm O₃
- Stratosphere: 10 ppm O₃

Why is ozone *thinning* seasonal?

During sunless winter, polar stratospheric clouds (PSC's) form within vortex

This special cloud surface is ideal for
“chlorine reserve compounds”
(CFC's, HCl, ClONO₂)

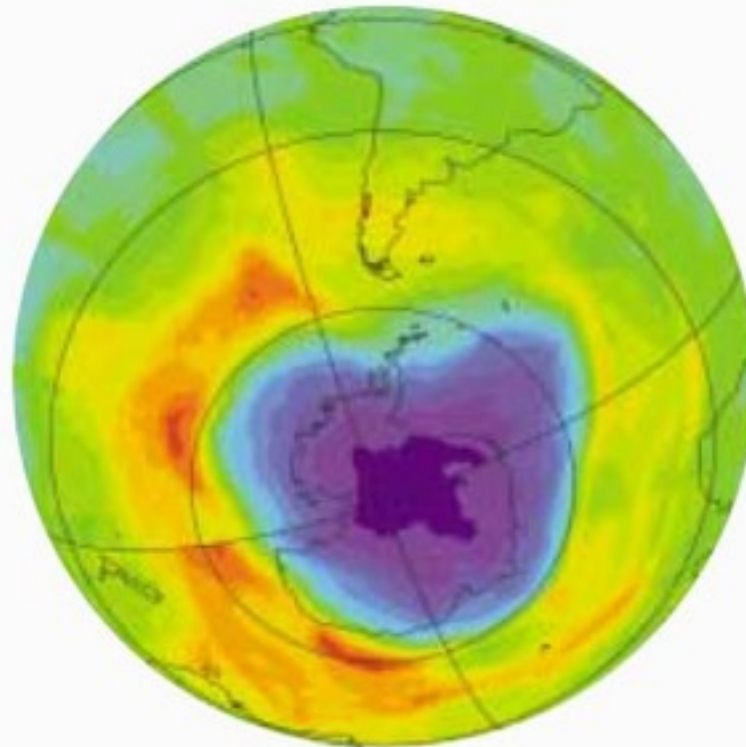
Main Reactions



- Catalyst - alters the rate of a reaction without permanently being altered by that reaction, and so can react over and over again.
- One molecule of chlorine can potentially degrade over 100,000 molecules of ozone before it is removed from the stratosphere or becomes part of an inactive compound.



Antarctic Ozone Hole



4 October 2001



Total Ozone (Dobson units)

Timeline

- Mid-70's recognized problem
- 1978 U.S. banned use of CFC's
- 1987 Montreal Protocol banned product internationally
- But CFC's are stable, insoluble in H₂O, so may be 2070 before ozone completely restored IF no additional threats are introduced.