Mario Molina's Research Not Only Led to the Solution for the Antarctic Ozone Hole, It Also Led to the Solution for Global Warming Caused by Humans Since 1960

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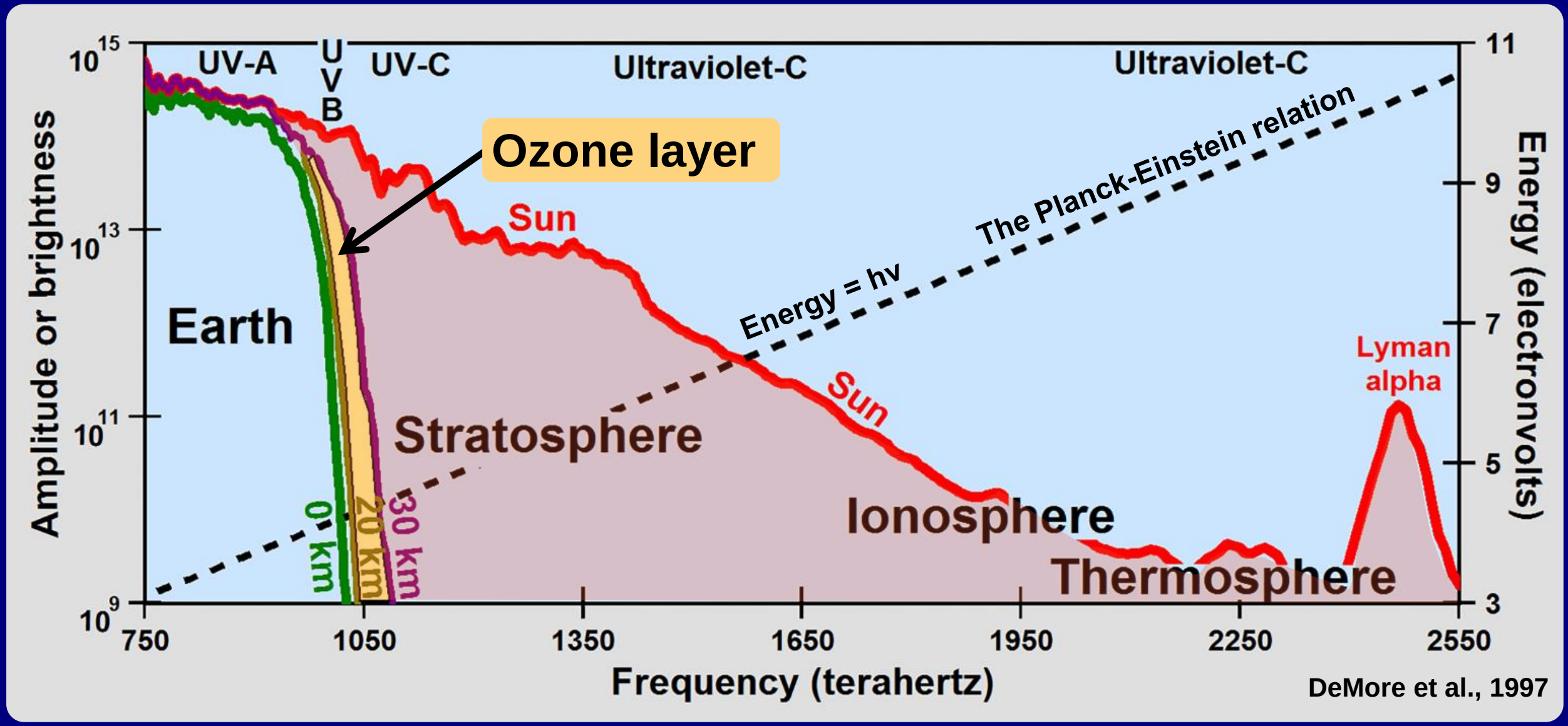
"The ozone layer acts as an atmospheric shield, which protects life on Earth against harmful ultraviolet radiation coming from the sun."

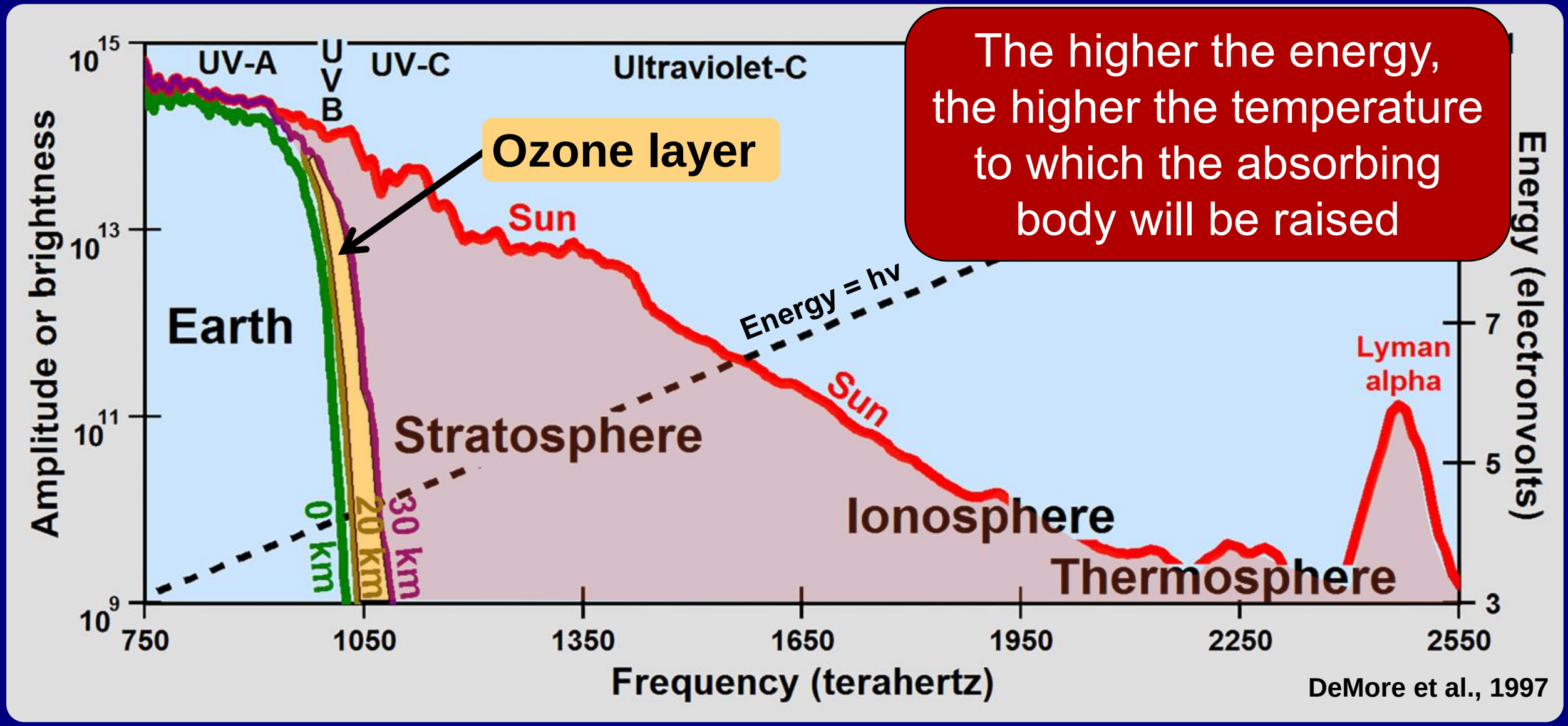
Mario T. Molina, Nobel Lecture, December 8, 1995

The ozone layer acts as an atmospheric blanket heated by absorbing the most energetic solar ultraviolet radiation reaching the lower stratosphere.

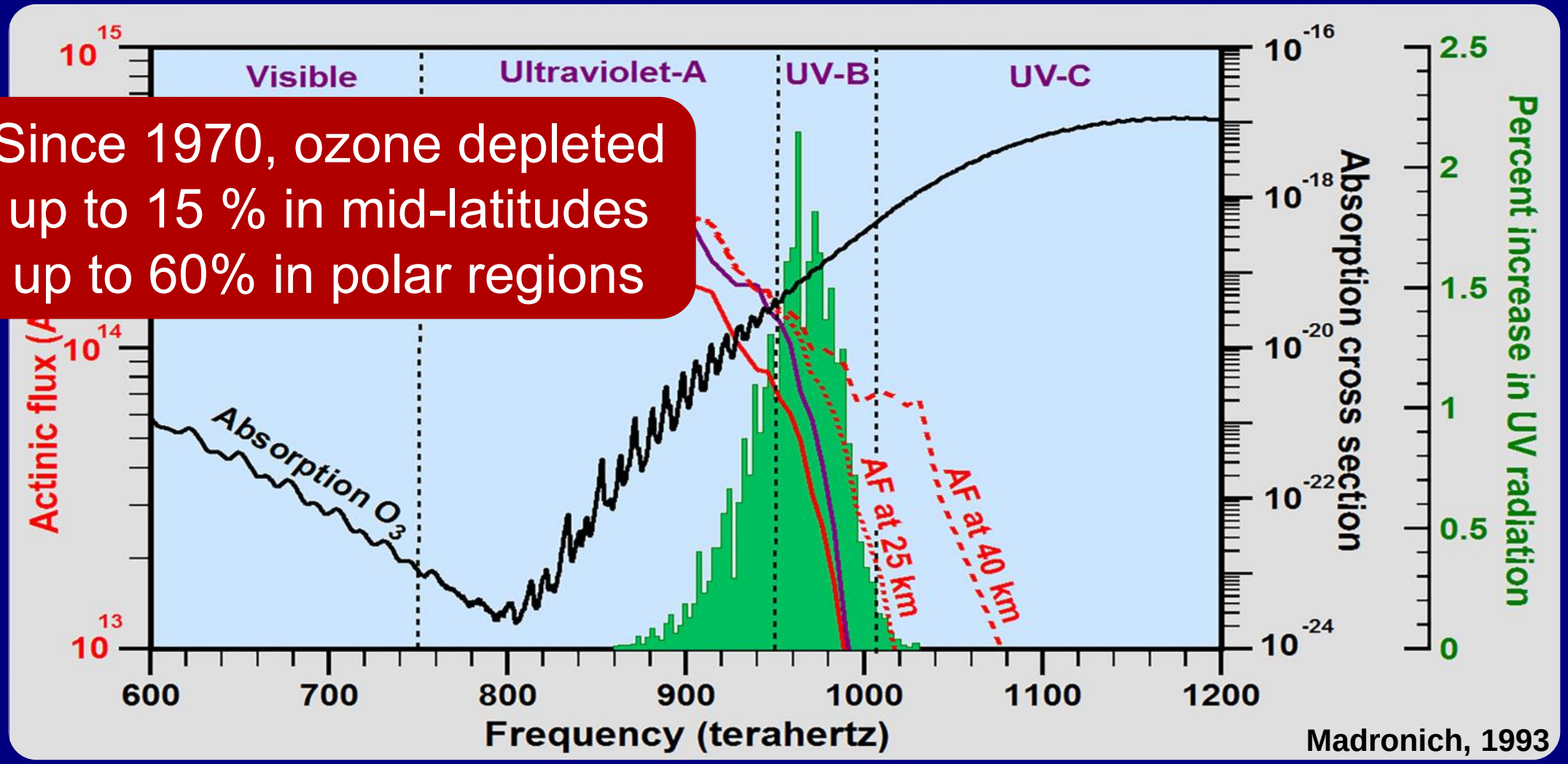
Most High Frequency, High-Energy, Ultraviolet-C Solar Radiation is Absorbed Above Earth

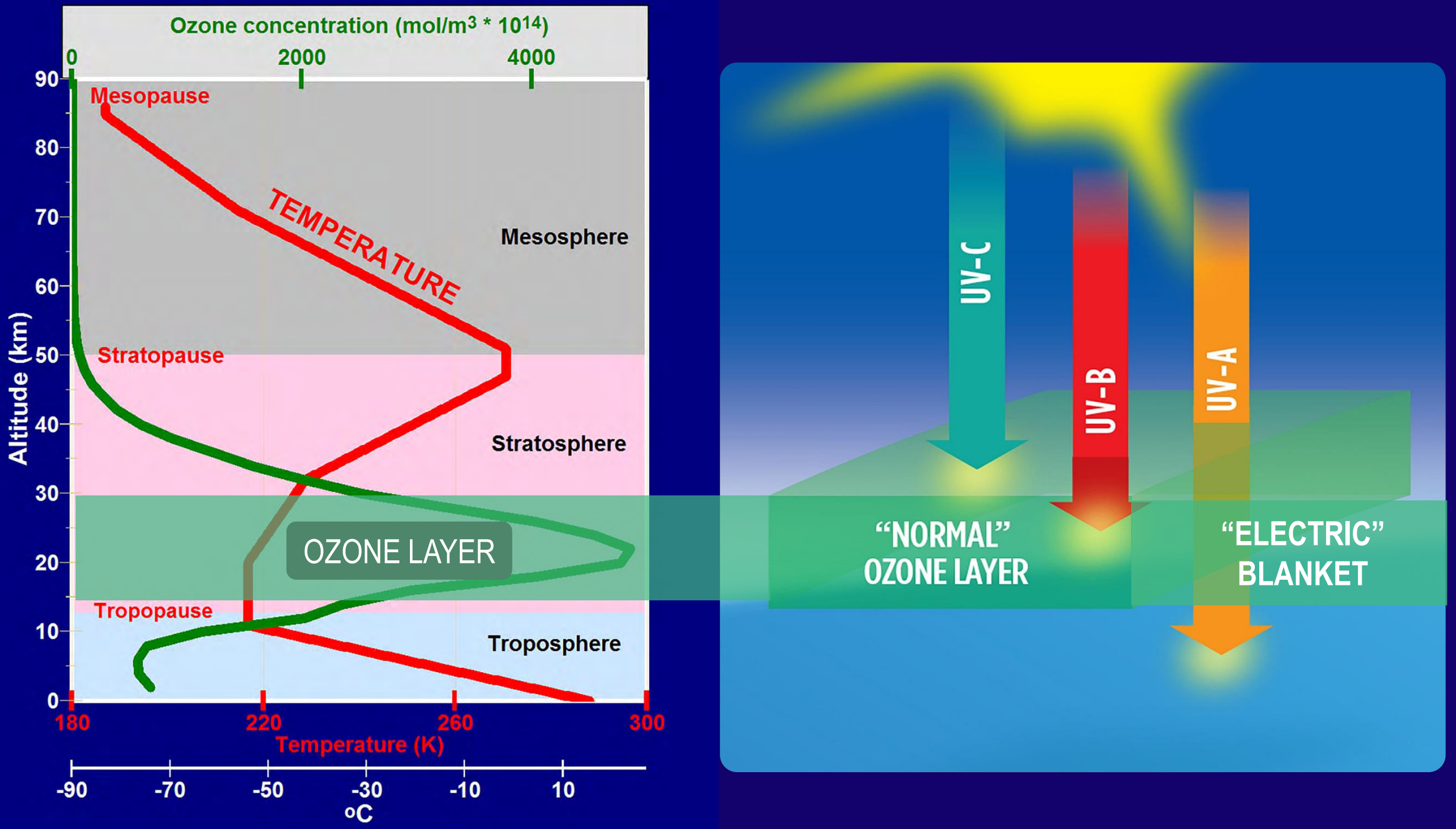


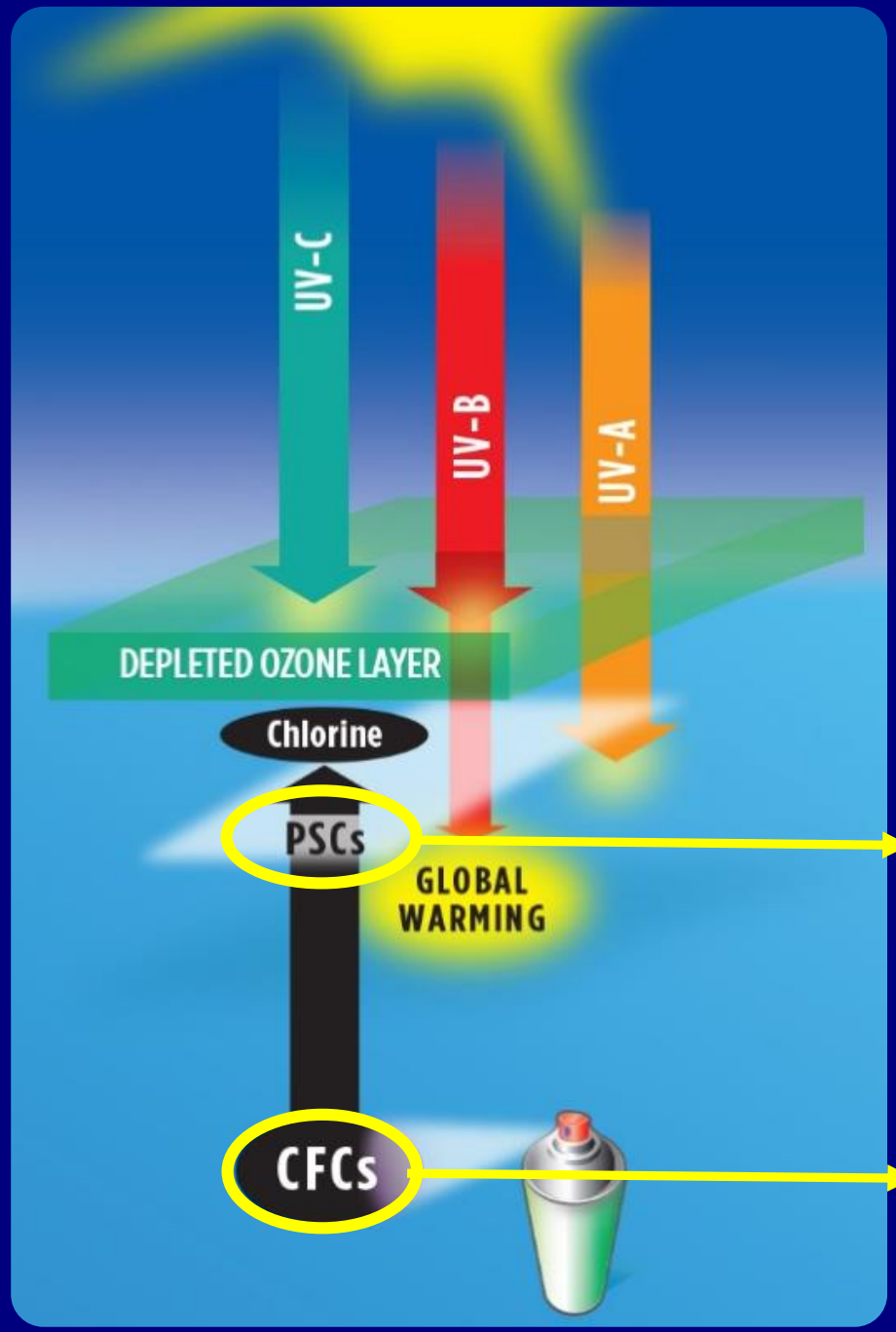
Most High Frequency, High-Energy, Ultraviolet-C Solar Radiation is Absorbed Above Earth



1% Less Ozone to Absorb Ultraviolet-B Radiation, Allows Up to 2% More Ultraviolet-B to Reach Earth, Cooling the Ozone Layer and Warming Earth

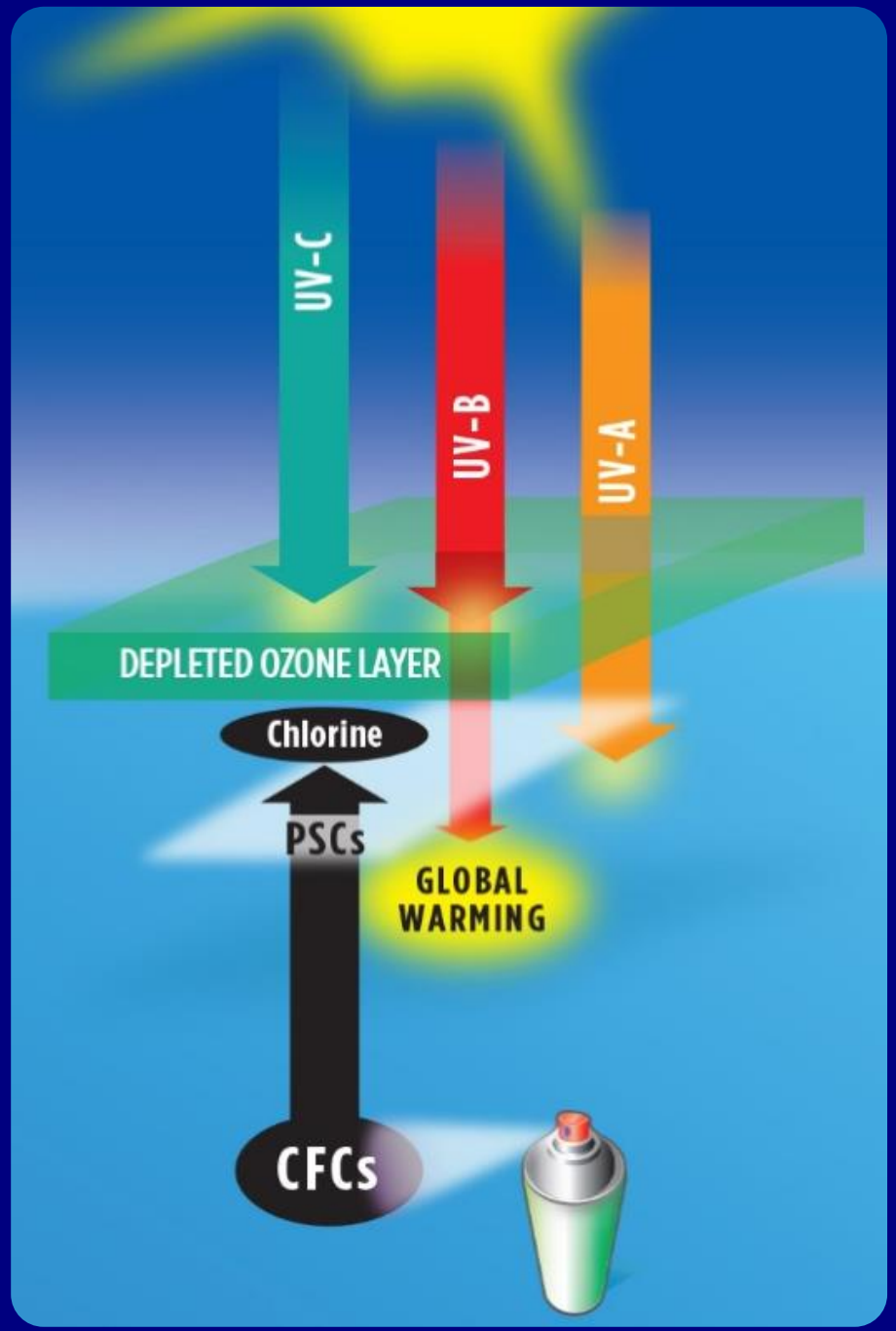


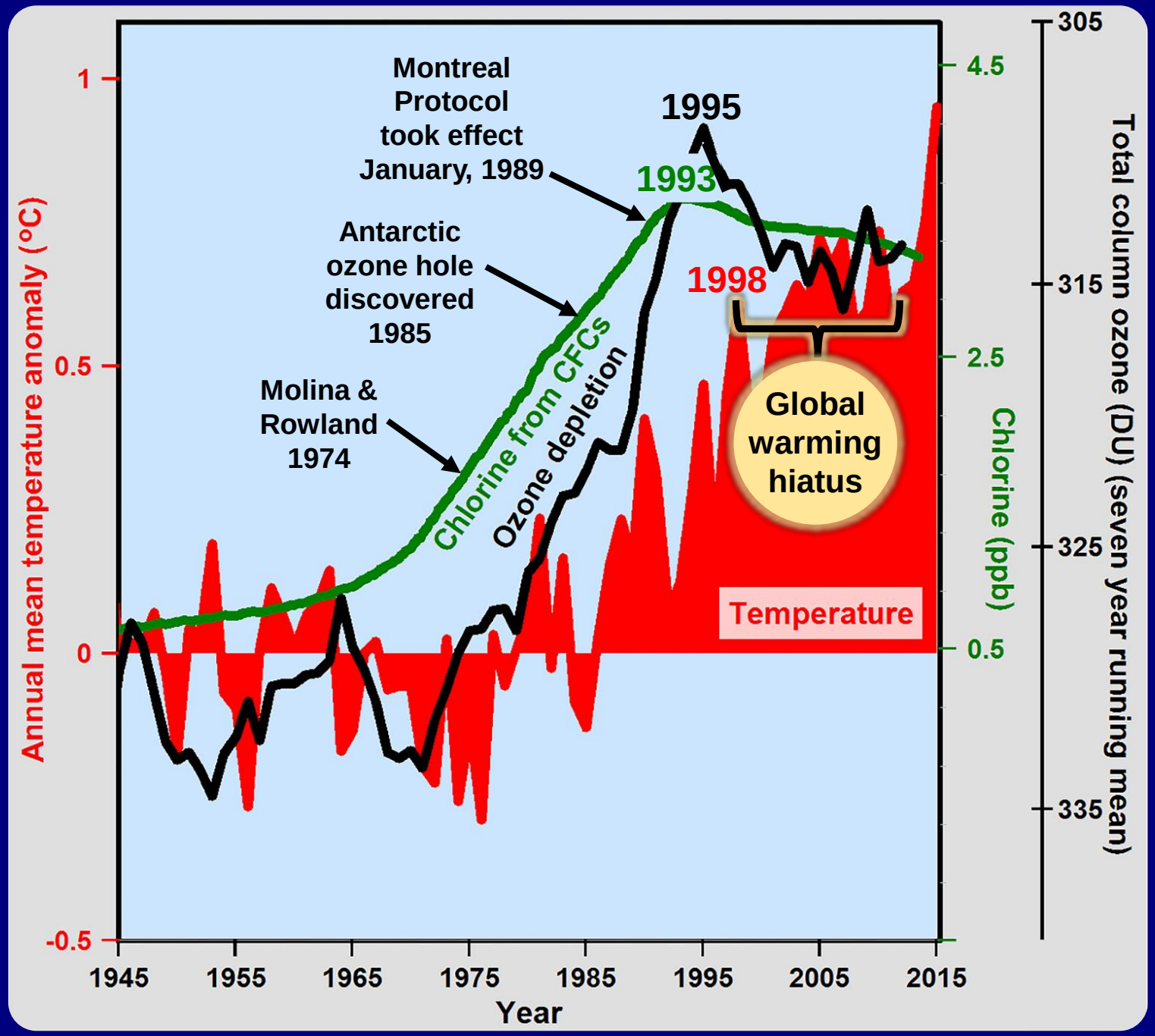

Ozone concentration (mol/m3 * 1014)
0
2000
4000
90
80
70
60
50
40
30
20
10
0
Altitude (km)
Mesopause
TEMPERATURE
Mesosphere
Stratopause
Stratosphere
OZONE LAYER
Tropopause
Troposphere
180
220
260
300
Temperature (K)
-90
-70
-50
-30
-10
10
oC
UV-C
UV-B
UV-A
"NORMAL"
OZONE LAYER
"ELECTRIC"
BLANKET



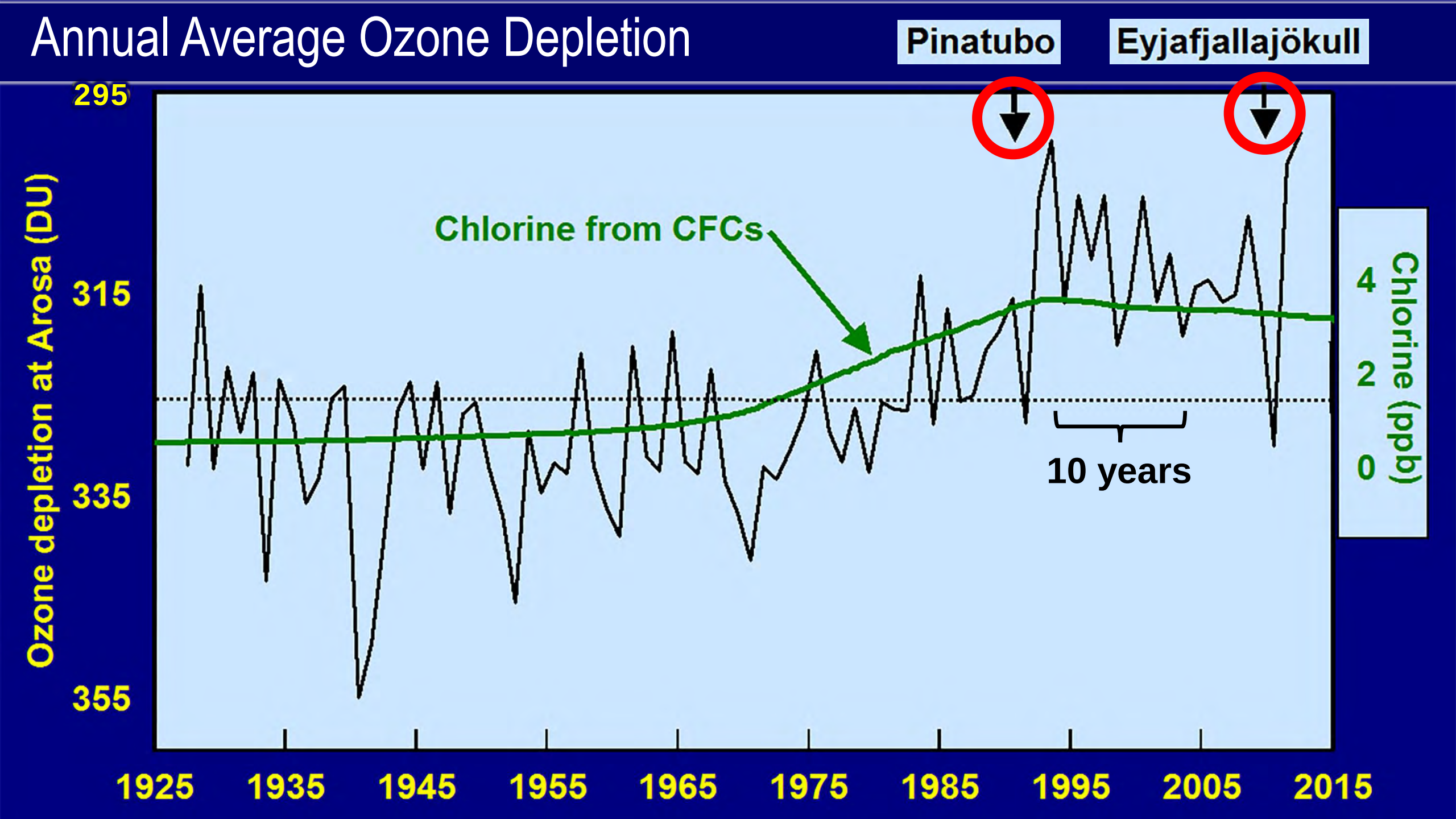
PSCs = Polar Stratospheric Clouds

CFCs = ChloroFluoroCarbon gases

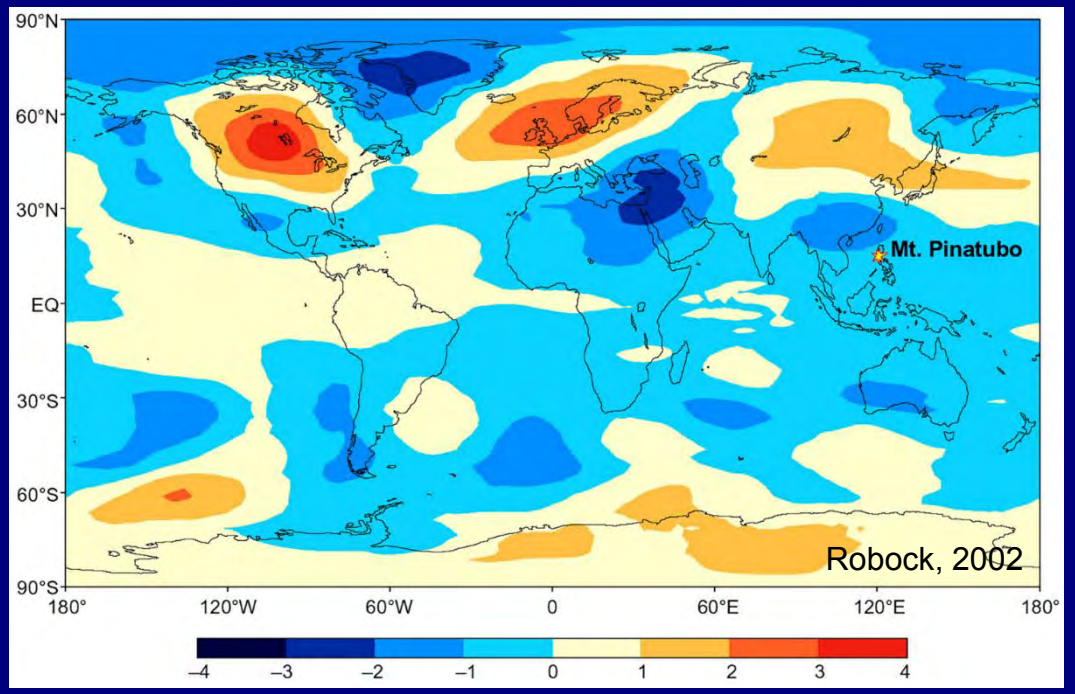

UV-C
UV-B
UV-A
DEPLETED OZONE LAYER
Chlorine
PSCs
GLOBAL WARMING
CFCs


Montreal Protocol took effect January, 1989
1995
1993
1998
Antarctic ozone hole discovered 1985
Molina & Rowland 1974
Chlorine from CFCs
Ozone depletion
Global warming hiatus
Temperature
Annual mean temperature anomaly (°C)
Chlorine (ppb)
Total column ozone (DU) (seven year running mean)
Year
1
0.5
0
-0.5
4.5
2.5
0.5
305
315
325
335
1945
1955
1965
1975
1985
1995
2005
2015

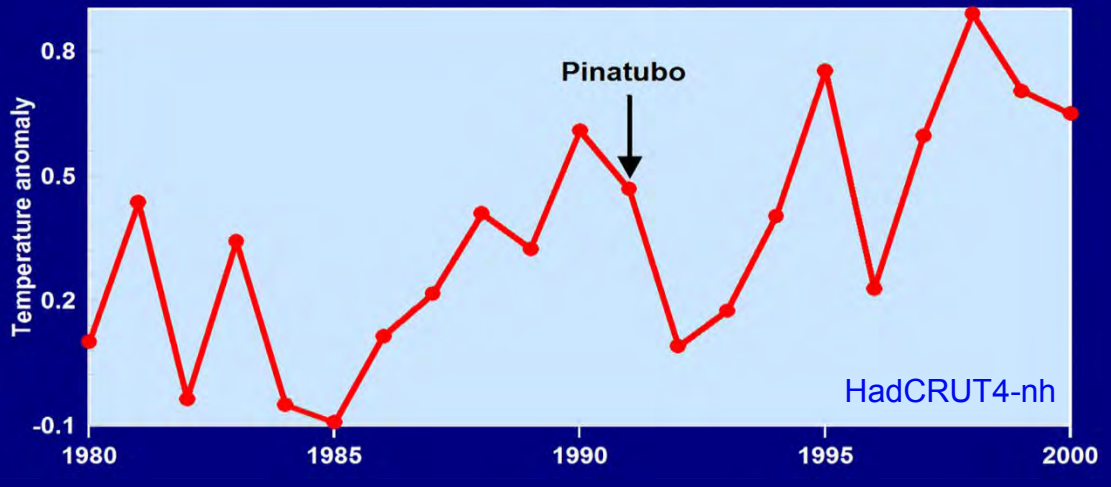
Annual Average Ozone Depletion

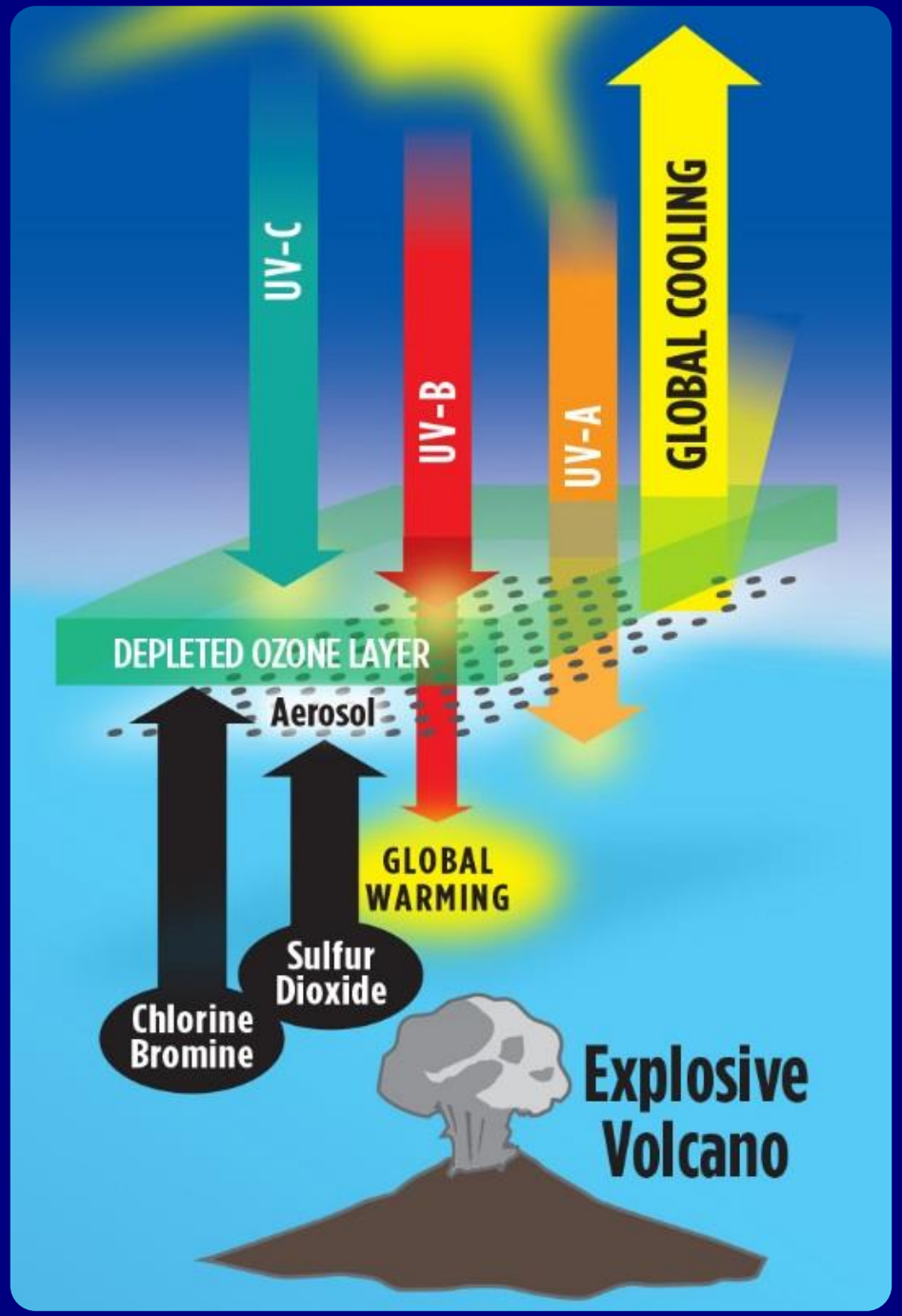


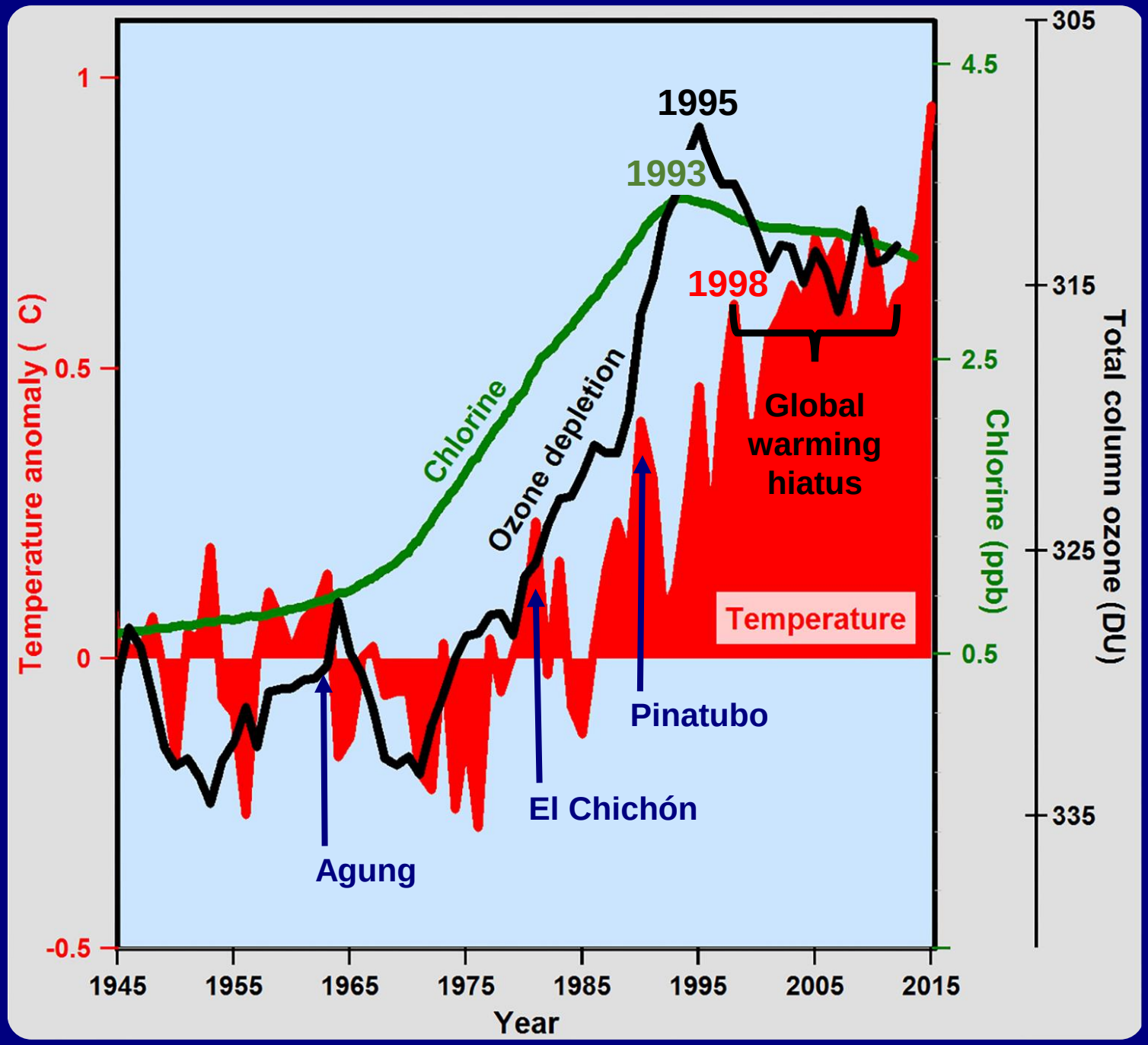
Regional warming (4°C) Dec to Feb

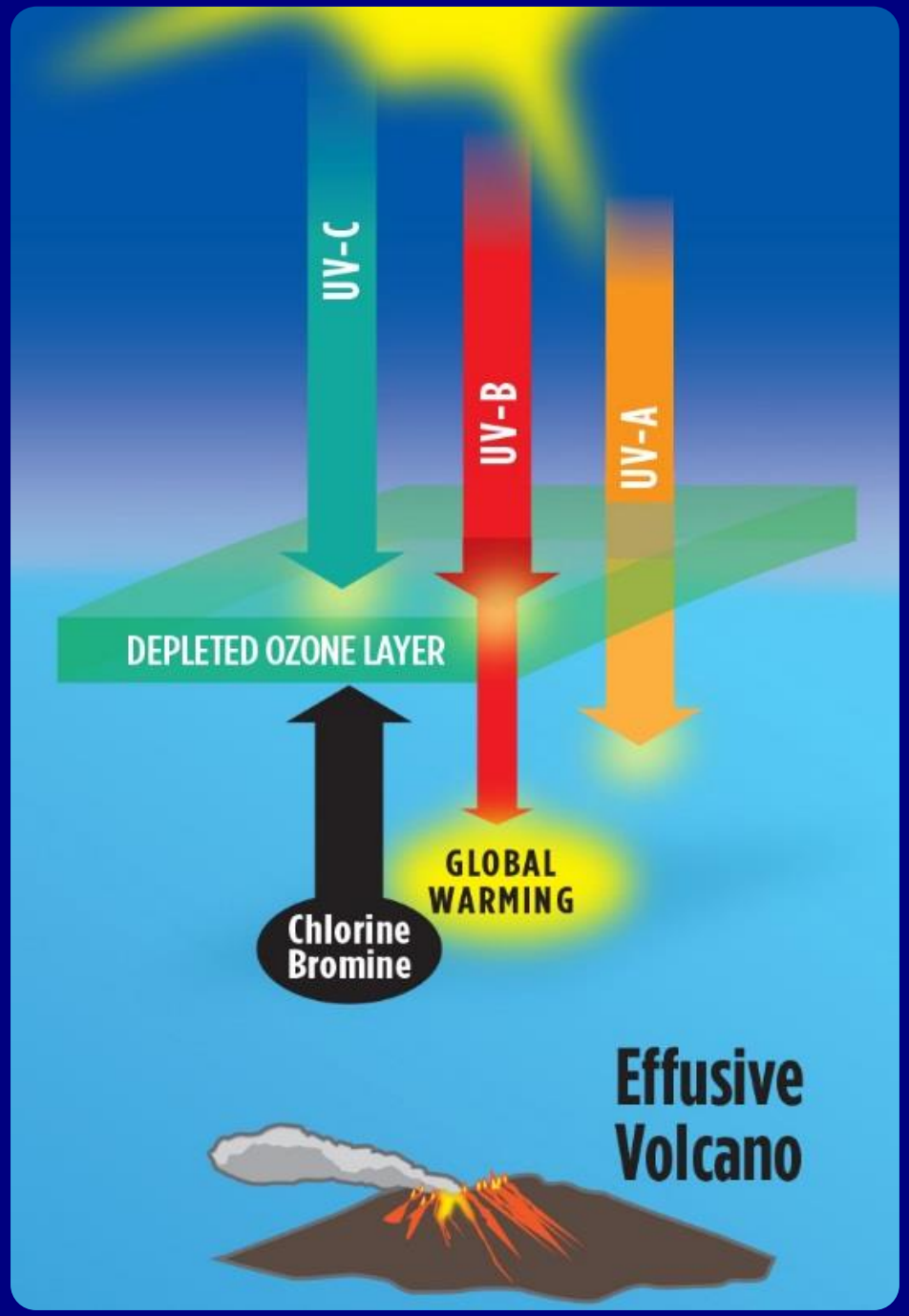


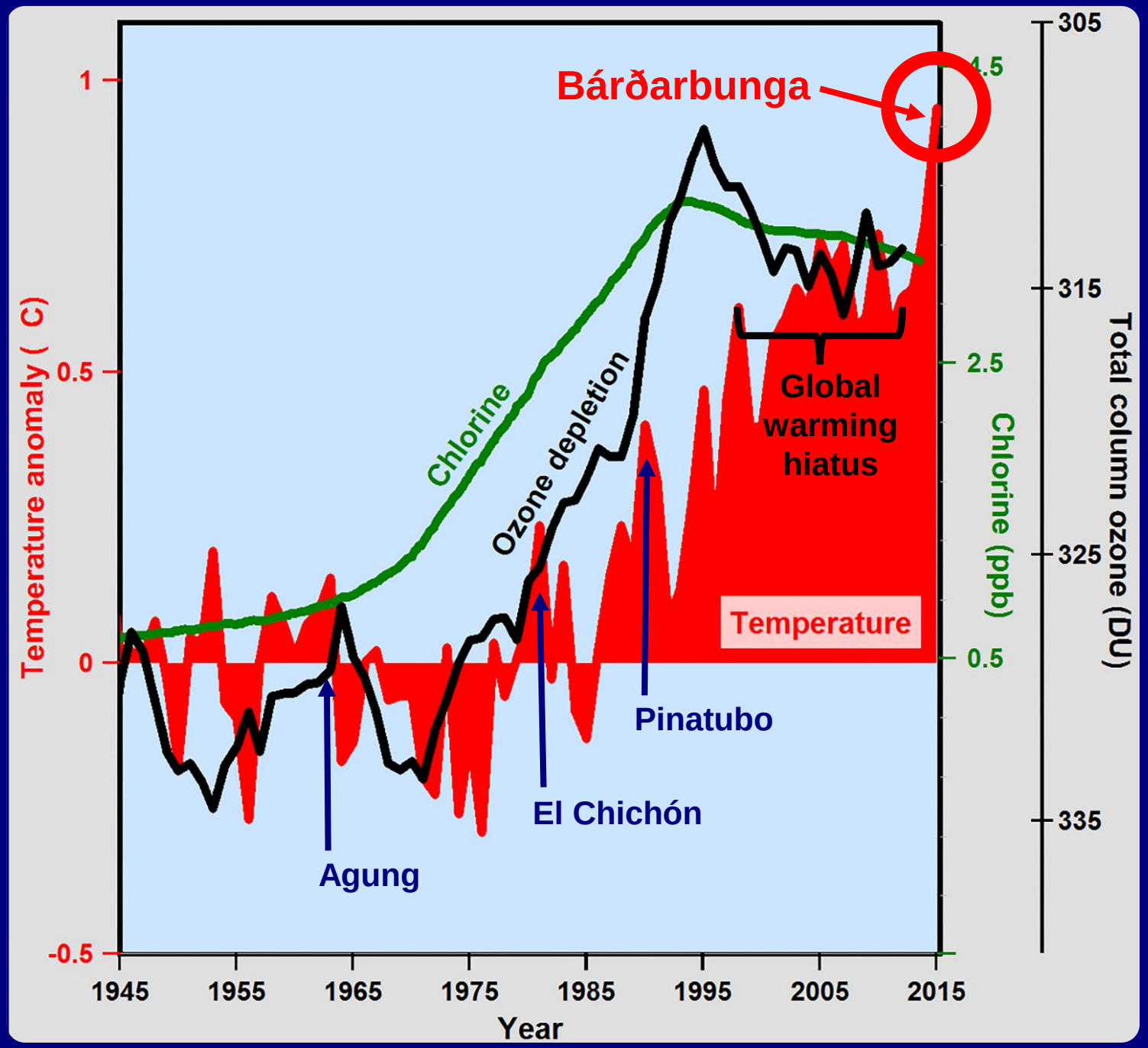
Global cooling (0.5°C) for next 3 years



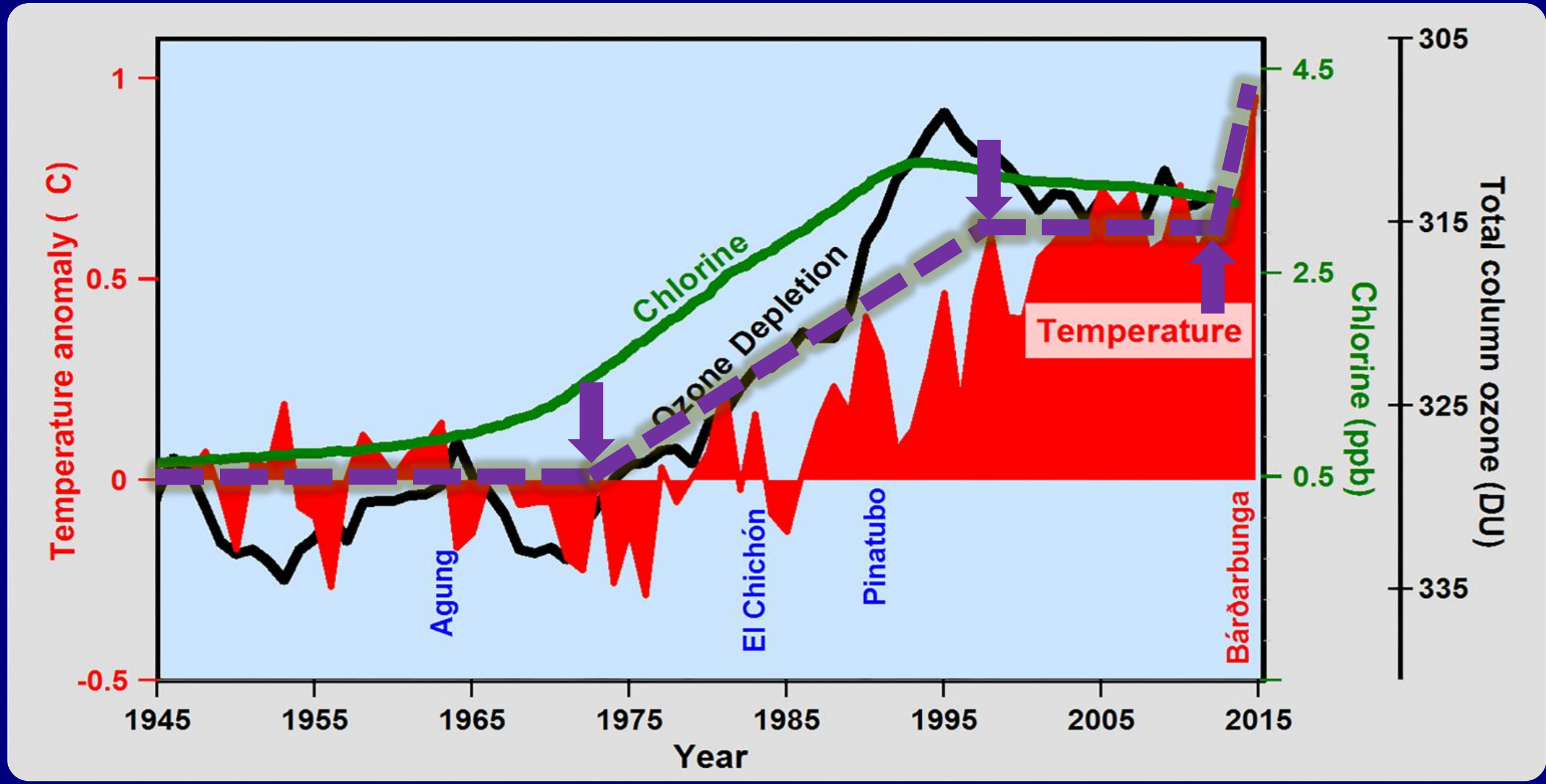

UV-C
UV-B
UV-A
GLOBAL COOLING
DEPLETED OZONE LAYER
Aerosol
GLOBAL WARMING
Sulfur Dioxide
Chlorine Bromine
Explosive Volcano


1995
1993
1998
Chlorine
Ozone depletion
Global warming hiatus
Temperature
Pinatubo
El Chichón
Agung
Temperature anomaly (C)
Chlorine (ppb)
Total column ozone (DU)
Year
1
0.5
0
-0.5
4.5
2.5
0.5
305
315
325
335
1945
1955
1965
1975
1985
1995
2005
2015


UV-C
UV-B
UV-A
DEPLETED OZONE LAYER
GLOBAL WARMING
Chlorine
Bromine
Effusive Volcano


Bárðarbunga
Global warming hiatus
Chlorine
Ozone depletion
Temperature
Pinatubo
El Chichón
Agung
Temperature anomaly (C)
Chlorine (ppb)
Total column ozone (DU)
Year
1
0.5
0
-0.5
4.5
2.5
0.5
305
315
325
335
1945
1955
1965
1975
1985
1995
2005
2015

Inflection Points in Temperature Trends



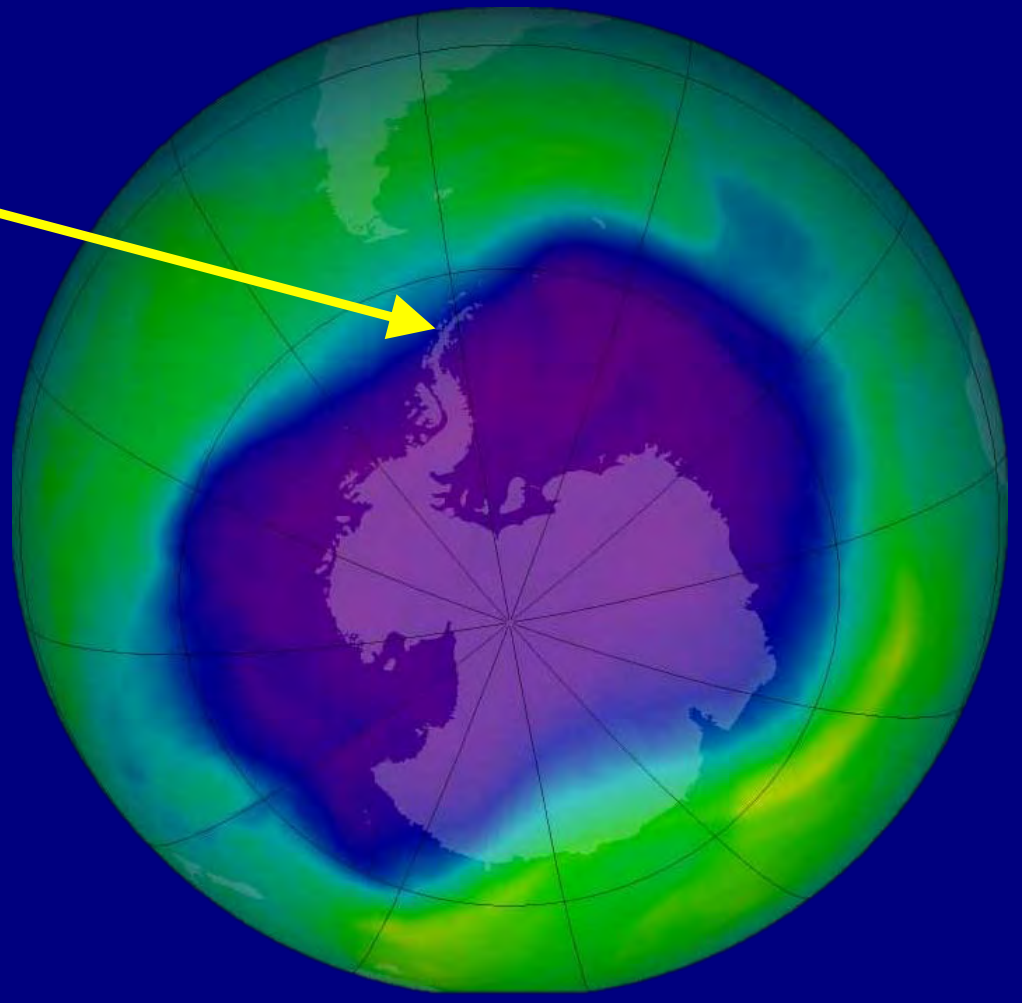
The Greatest Ozone Depletion is Associated with the Greatest Regional Warming

Antarctic Peninsula

Minimum monthly temperatures rose 6.7°C from 1976 to 2000

Greatest warming in 1800 years

Winter sea ice decreased 10% per decade



September 24, 2006

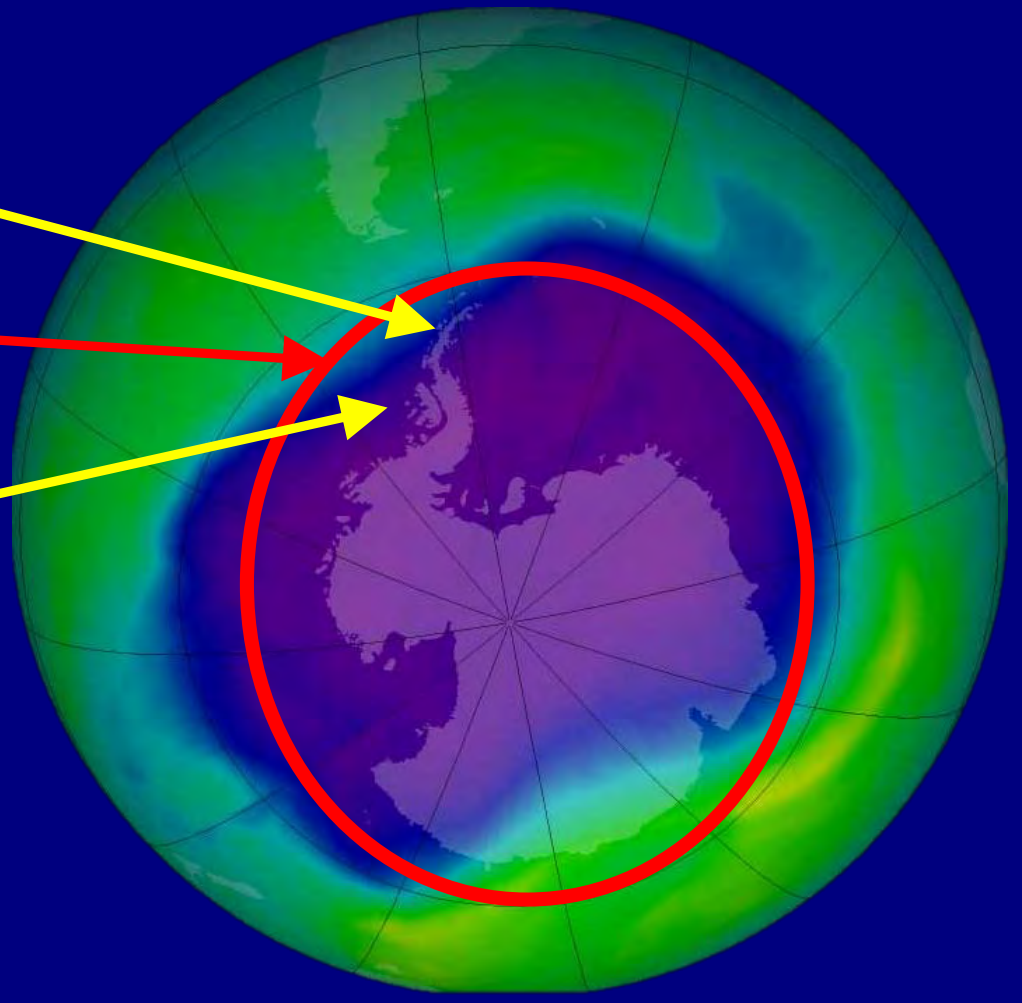
The Greatest Ozone Depletion is Associated with the Greatest Regional Warming

Antarctic Peninsula

Southern oceans warmed at twice the global rate

Bellingshausen Sea warmed 1°C

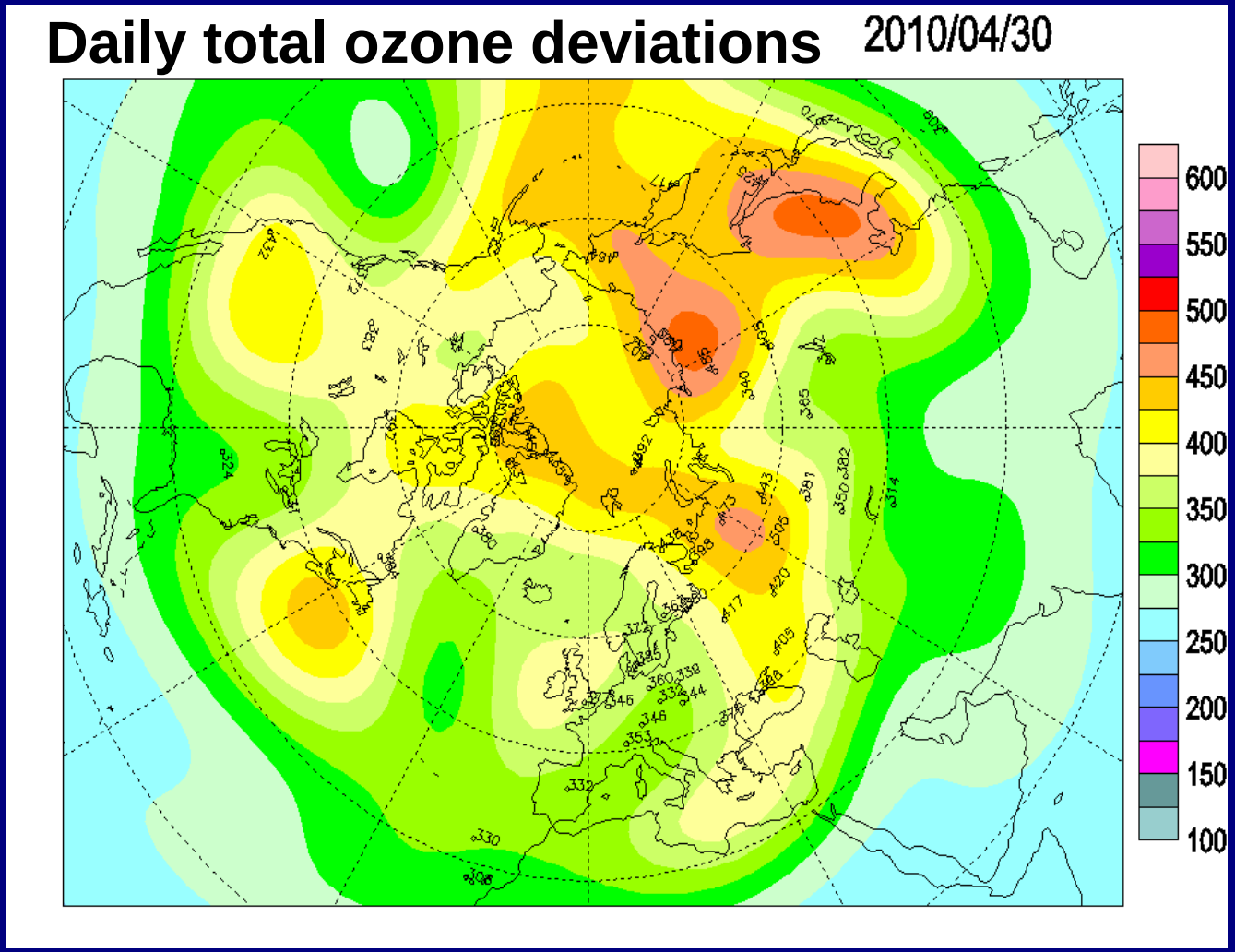
Formation of cold Antarctic bottom water decreased



September 24, 2006

Ozone Depletion is Closely Related to Weather

In the 1920s, Gordon Dobson noted a close relationship between ozone concentrations and weather

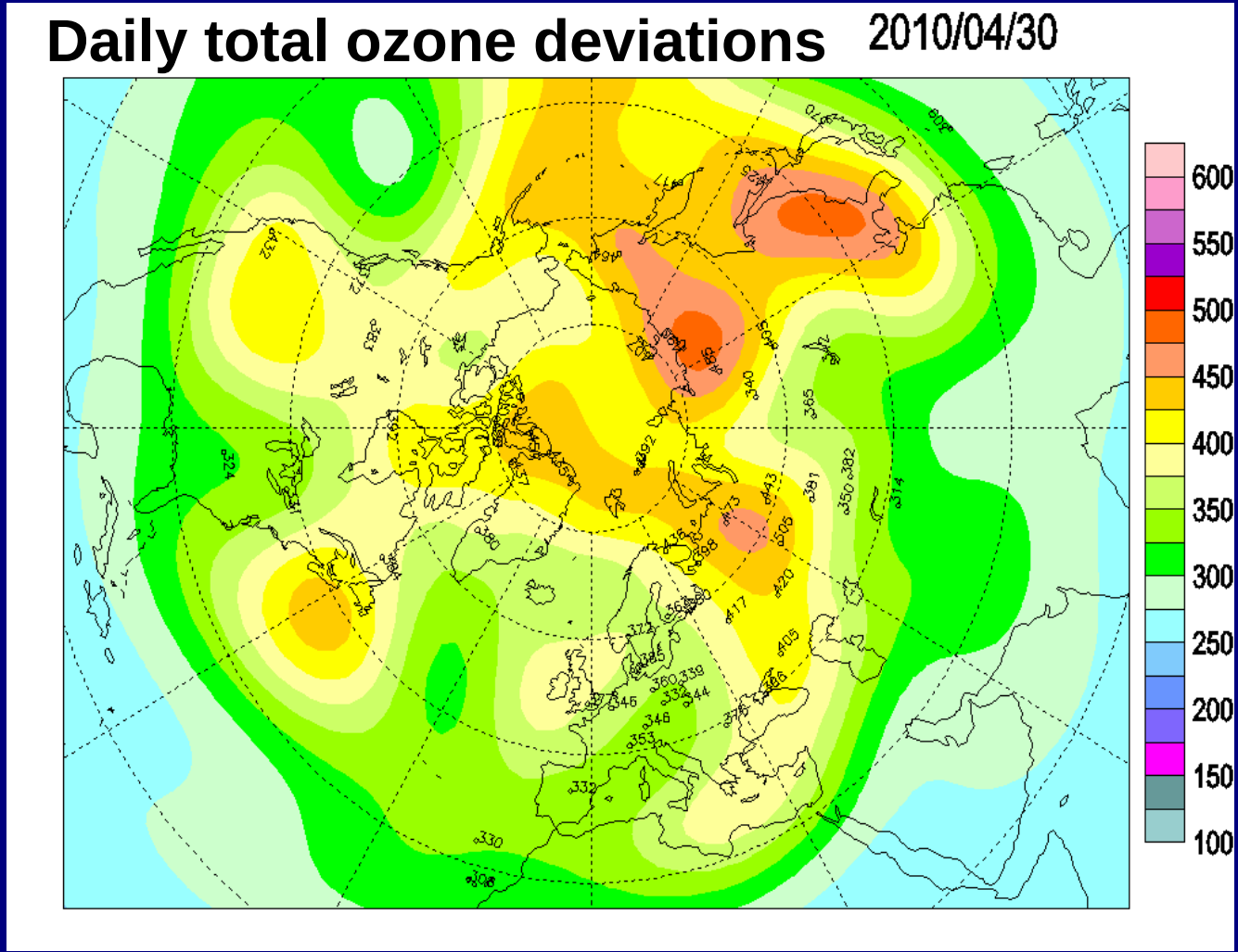


Ozone Depletion is Closely Related to Weather

1. The higher the concentration of ozone in the ozone layer, the more heat is generated in the ozone layer and the less heat reaches Earth

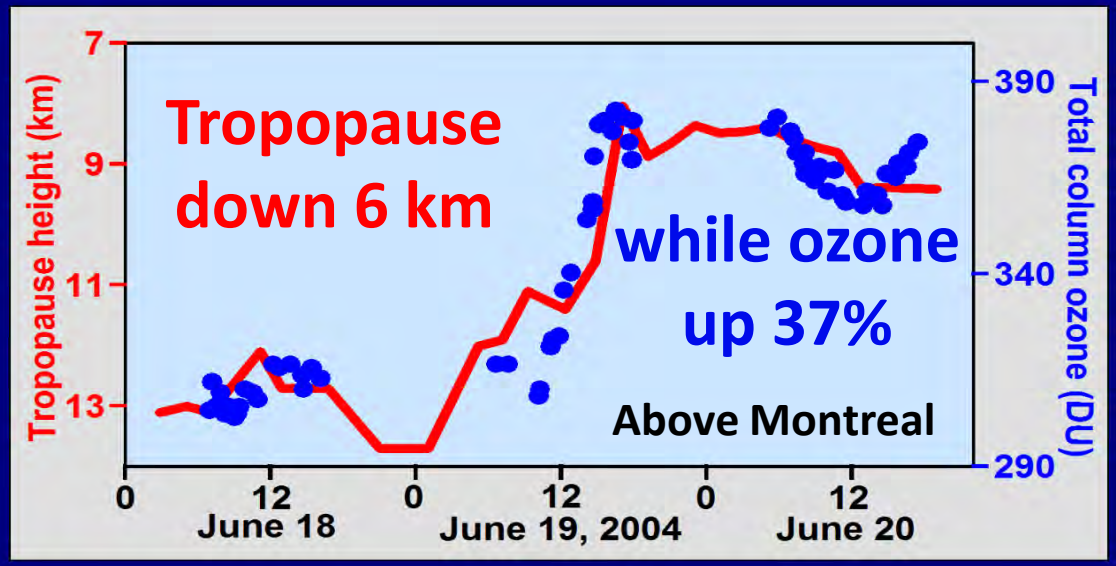
More ozone in ozone layer associated with surface low pressure areas

Less ozone in ozone layer associated with surface high pressure areas

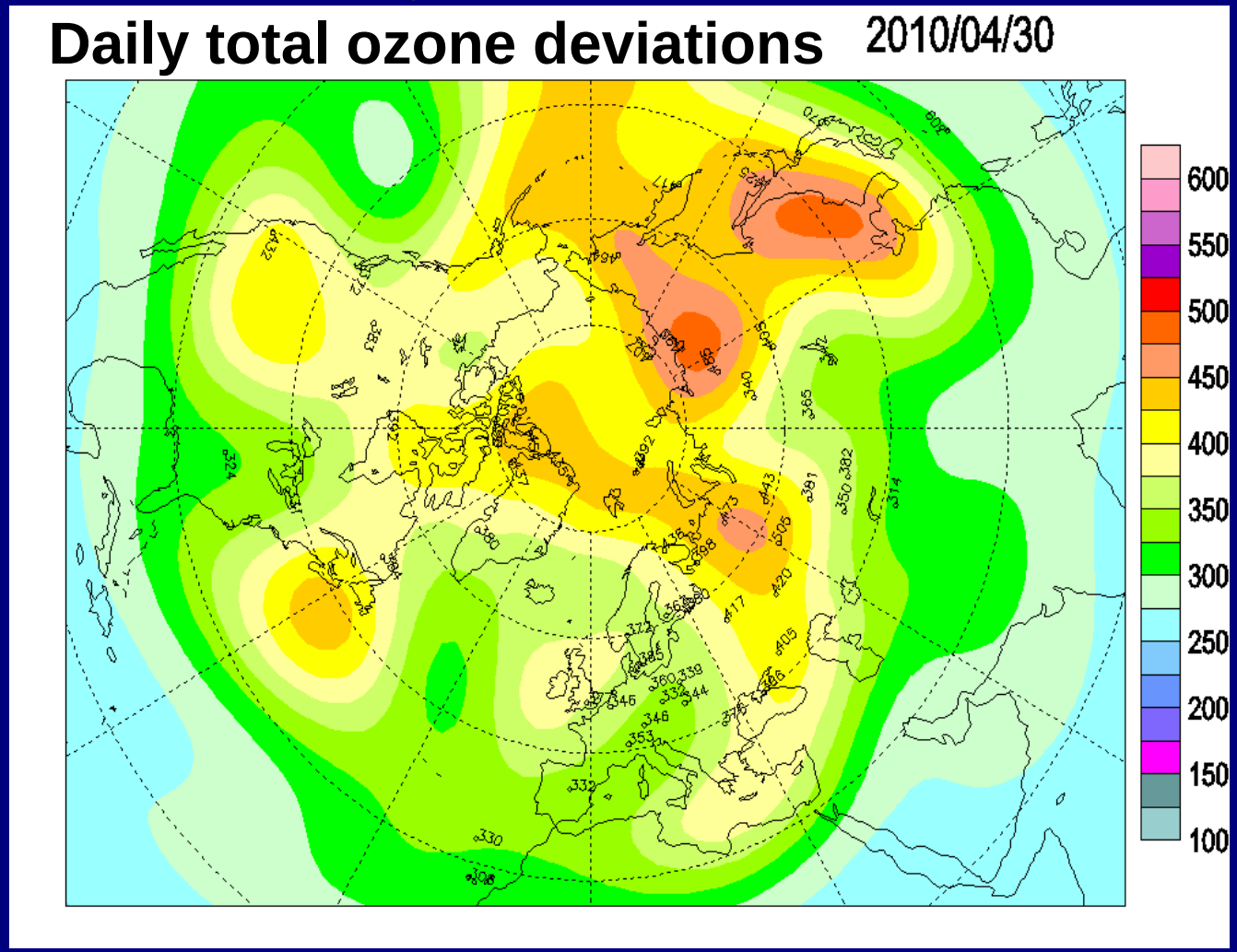


Ozone Depletion is Closely Related to Weather

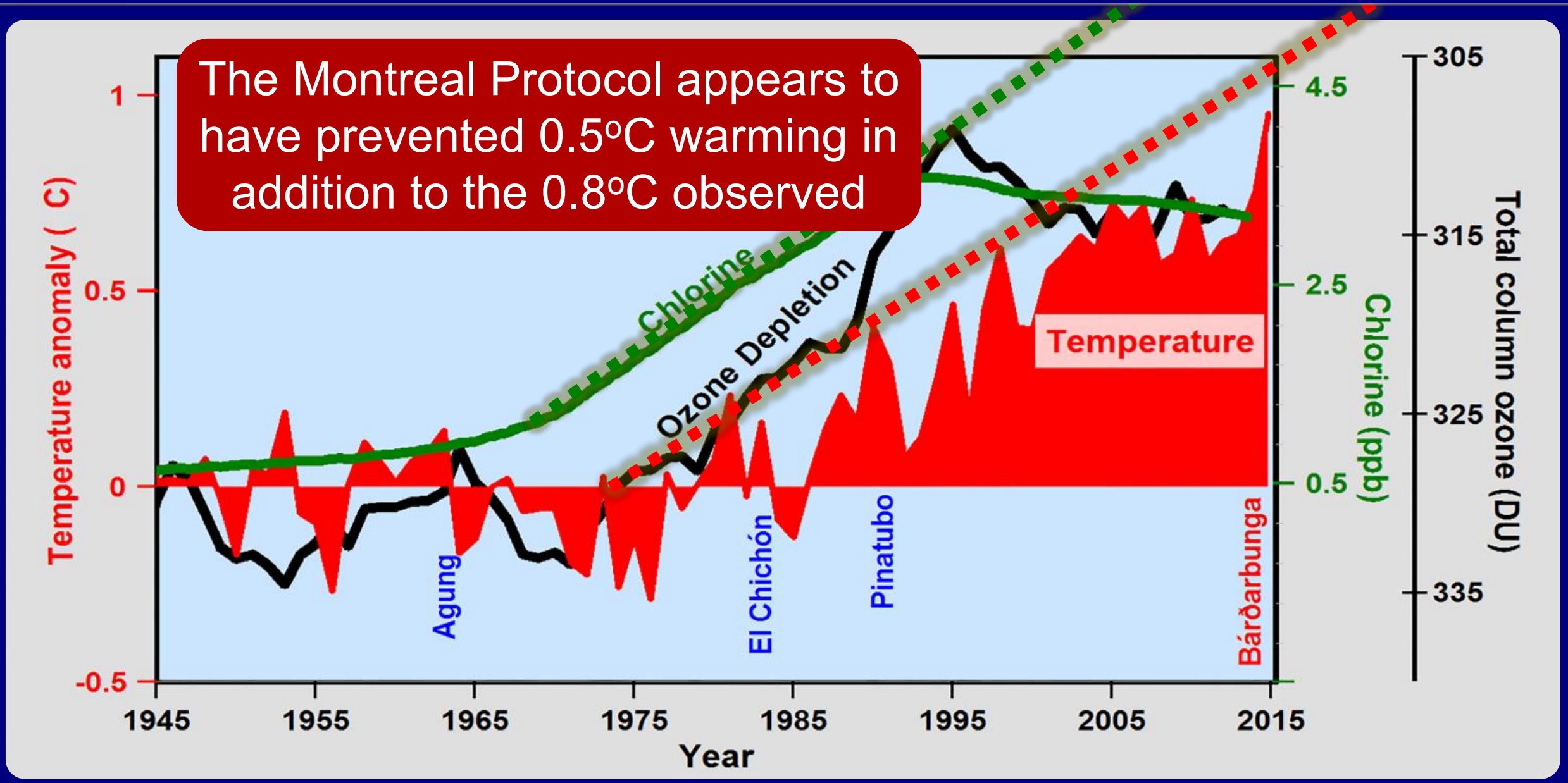
1. The higher the concentration of ozone in the ozone layer, the more heat is generated in the ozone layer and the less heat reaches Earth
2. Pressure highs/lows
3. Tropopause height



4. Polar vortex
5. Jet stream



What If There Were No Montreal Protocol?



How Sure Are We About Greenhouse Gases?

1. If E=hv, ultraviolet-B is 48 times more energetic, than infrared absorbed by greenhouse gases
2. Radiation from a body of matter cannot heat that same body of matter
3. There are major inflection points in temperature trends
4. There are widespread observations throughout the geologic record of sudden warming
5. Surprisingly: increases in greenhouse gases have never actually been shown experimentally to warm the atmosphere enough to cause global warming

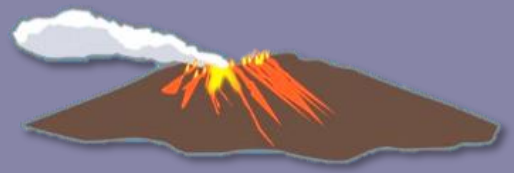
The Climate Change Challenge

I hereby agree to give $10,000 of my children's inheritance to the first person or team of people who can demonstrate through direct measurements in the laboratory and/or in the field that a 15% increase in carbon dioxide, such as that observed from 1970 to 1998, can actually cause more warming of Earth than caused by observed contemporaneous depletion of the ozone layer by up to 60%

Issued publicly and to more than 2000 climate scientists on November 12, 2015

Conclusions

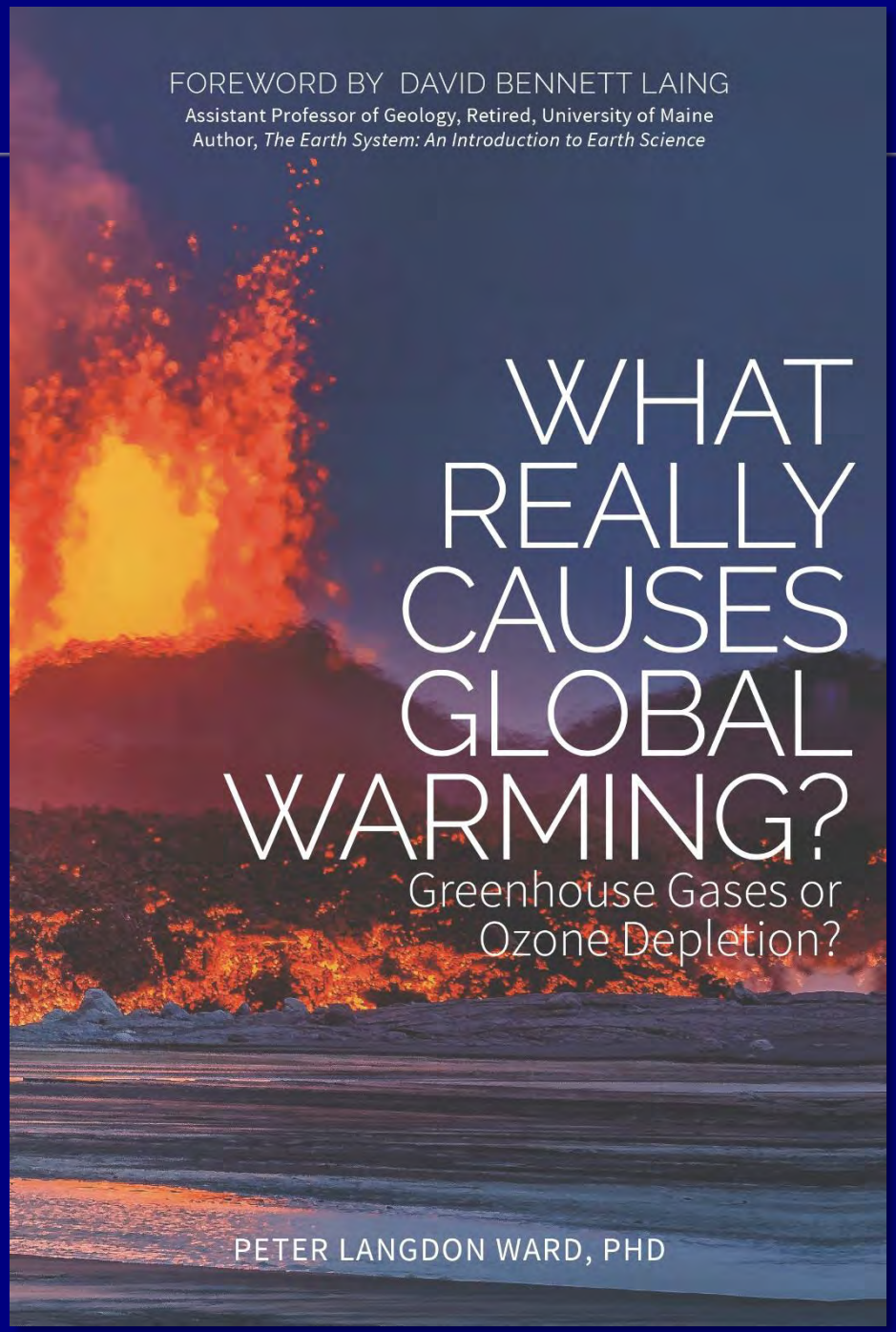
Aerosols formed by explosive volcanism provide a clear, direct, and sufficient explanation for global cooling over the past 100 years and throughout the history of planet Earth



Ozone Depletion caused by effusive volcanism or CFCs provides a clear, direct, and sufficient explanation for each of the major changes in global warming over the past 100 years and throughout the history of planet Earth

It is very, very important for <u>all</u> life on Earth that we get this right!

More Information



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