

Climate Throughout Geologic Time Has Been Controlled Primarily by the Balance Between

Cooling Caused by
Major Explosive
Eruptions of
Evolved Magmas
Typical of
Island Arcs

and

Warming Caused by
Voluminous Effusive
Eruptions of Basaltic Magma
Typical of Subaerial Ocean
Ridges, Island Chains, and
Continental Flood Basalts



1815 Mt. Tambora, Indonesia

Largest volcanic eruption in recorded history

Volcano Explosivity Index = 7

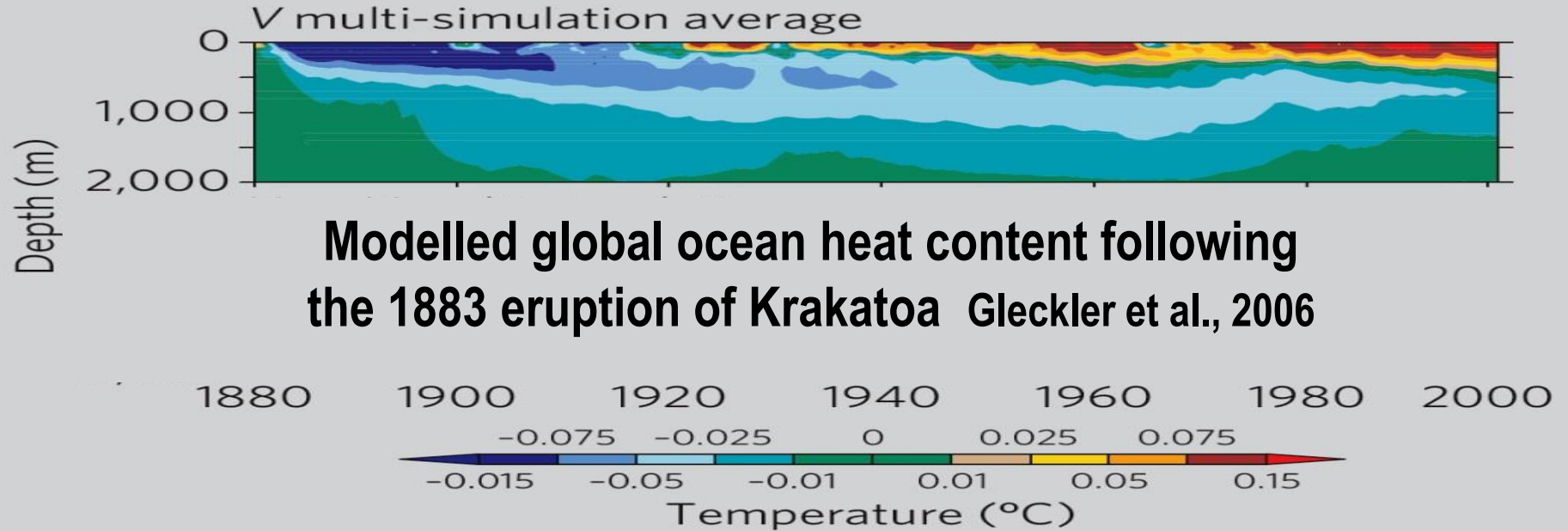


**Lowered world temperatures
0.4 to 0.7 °C**

**1816
Year There Was No Summer
The Poverty Year**

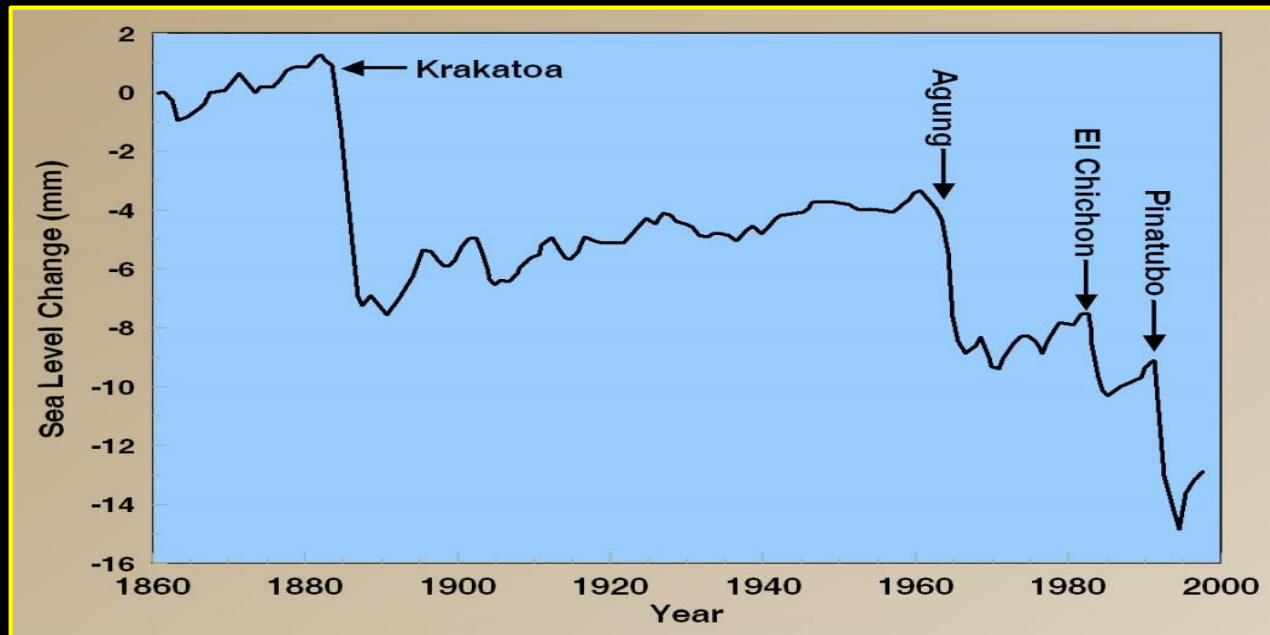
Krakatau	1883	(6)
Santa Maria	1902	(6?)
Novarupta	1912	(6)
Agung	1963	(5)
El Chichón	1982	(5)
Pinatubo	1991	(6)

Thermal Effects Last a Long Time and Cummmulate

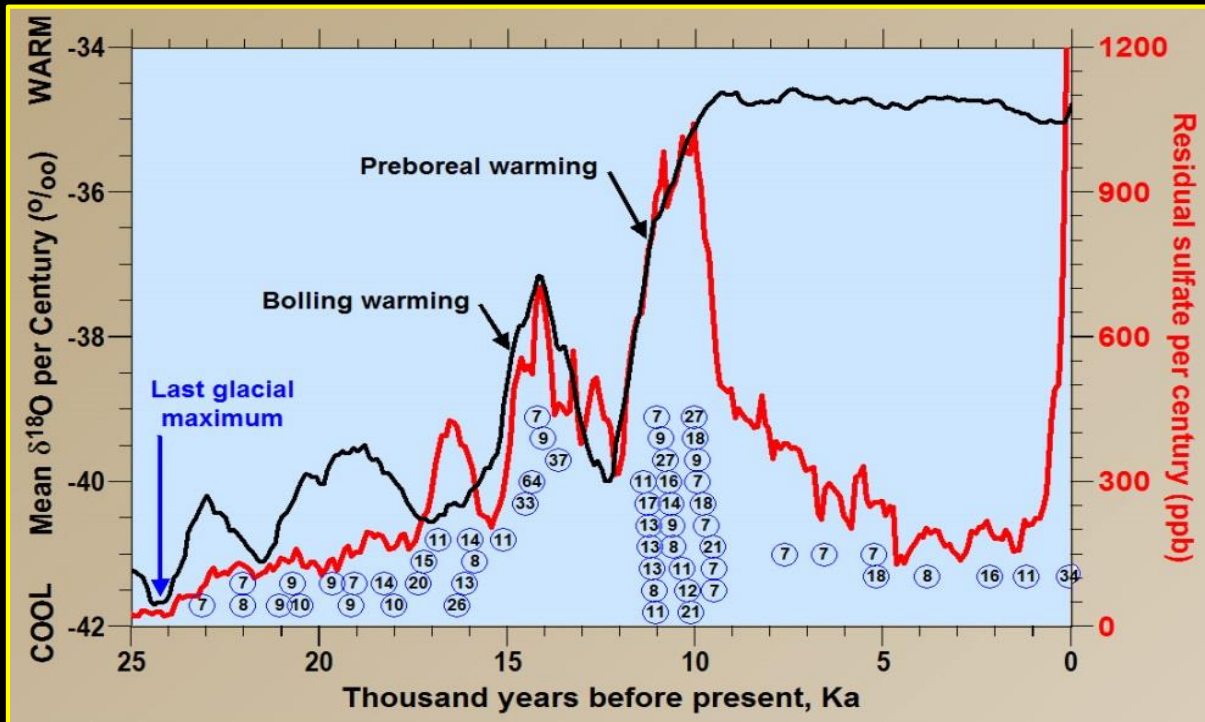


Modelled sea level change following the larger volcanic eruptions

Gregory et al., 2006



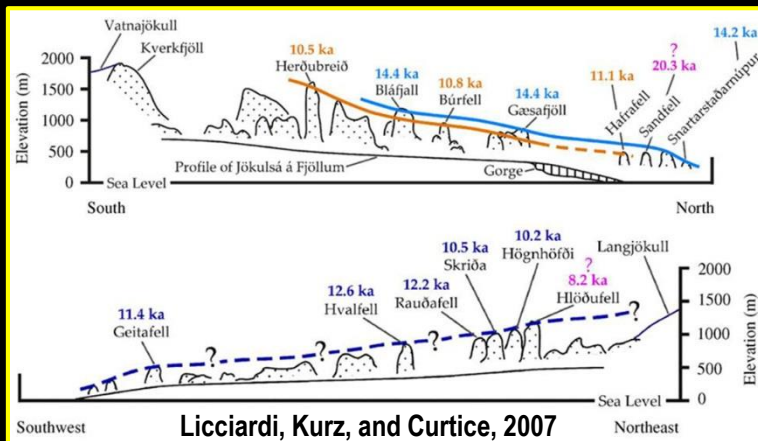
Last Ice Age Ended During Massive Volcanism in Iceland from 11,750 to 9,375 years BP



Basaltic, effusive volcanism was substantial and nearly continuous in Iceland during the Bolling and Preboreal warmings



A tuya or table mountain formed by eruption of basalt under ice



³He exposure ages and ice surface at end of last ice age

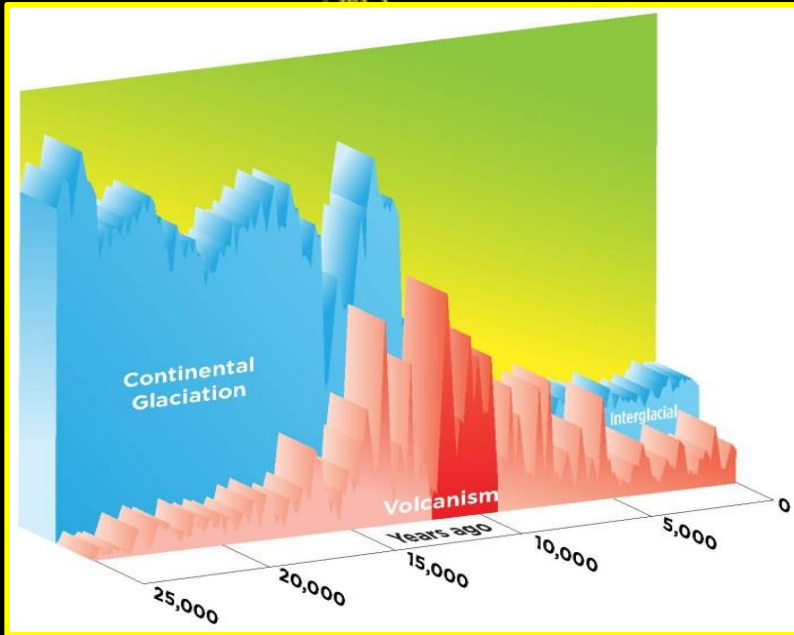
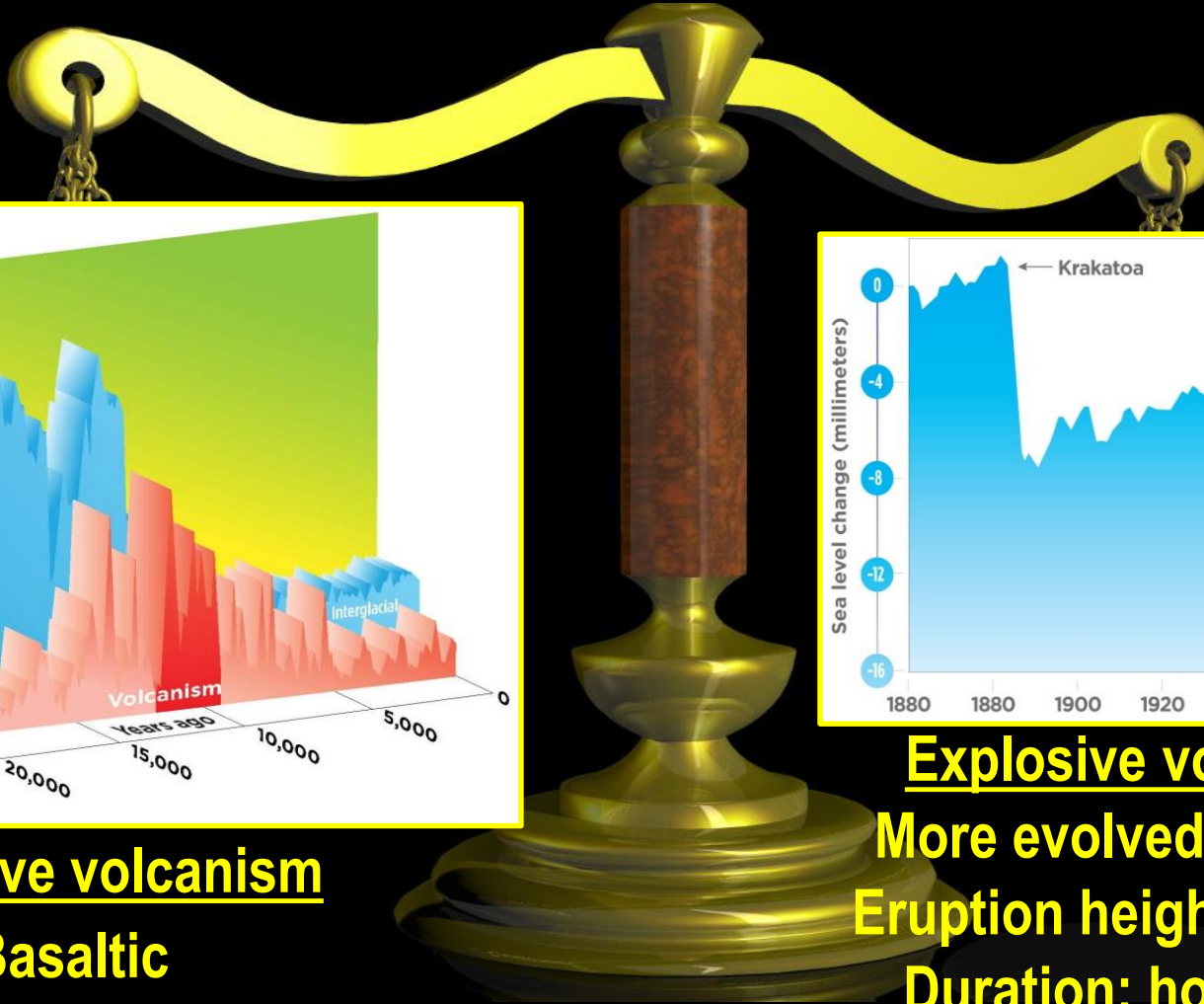
12 of the 13 dated tuyas in Iceland had their final eruptive phase during the Preboreal warming

The Delicate Balance Between

Global Warming

and

Global Cooling

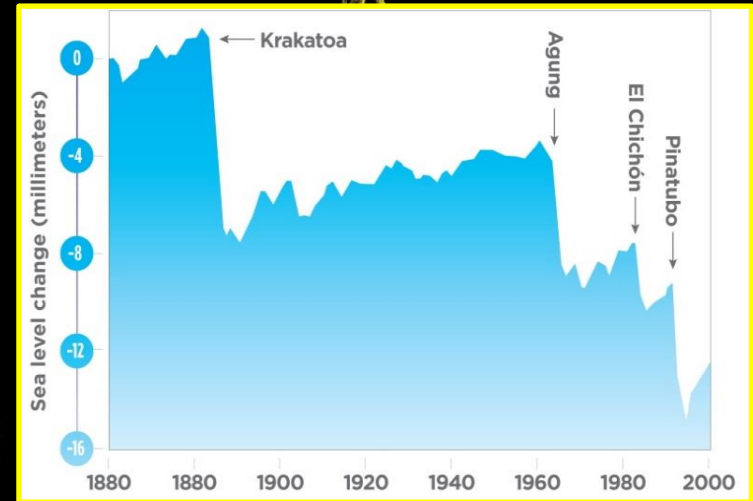


Effusive volcanism

Basaltic

Eruption height: generally < 2 km

Duration: years to millennia



Explosive volcanism

More evolved magmas

Eruption height: up to 36 km

Duration: hours to days

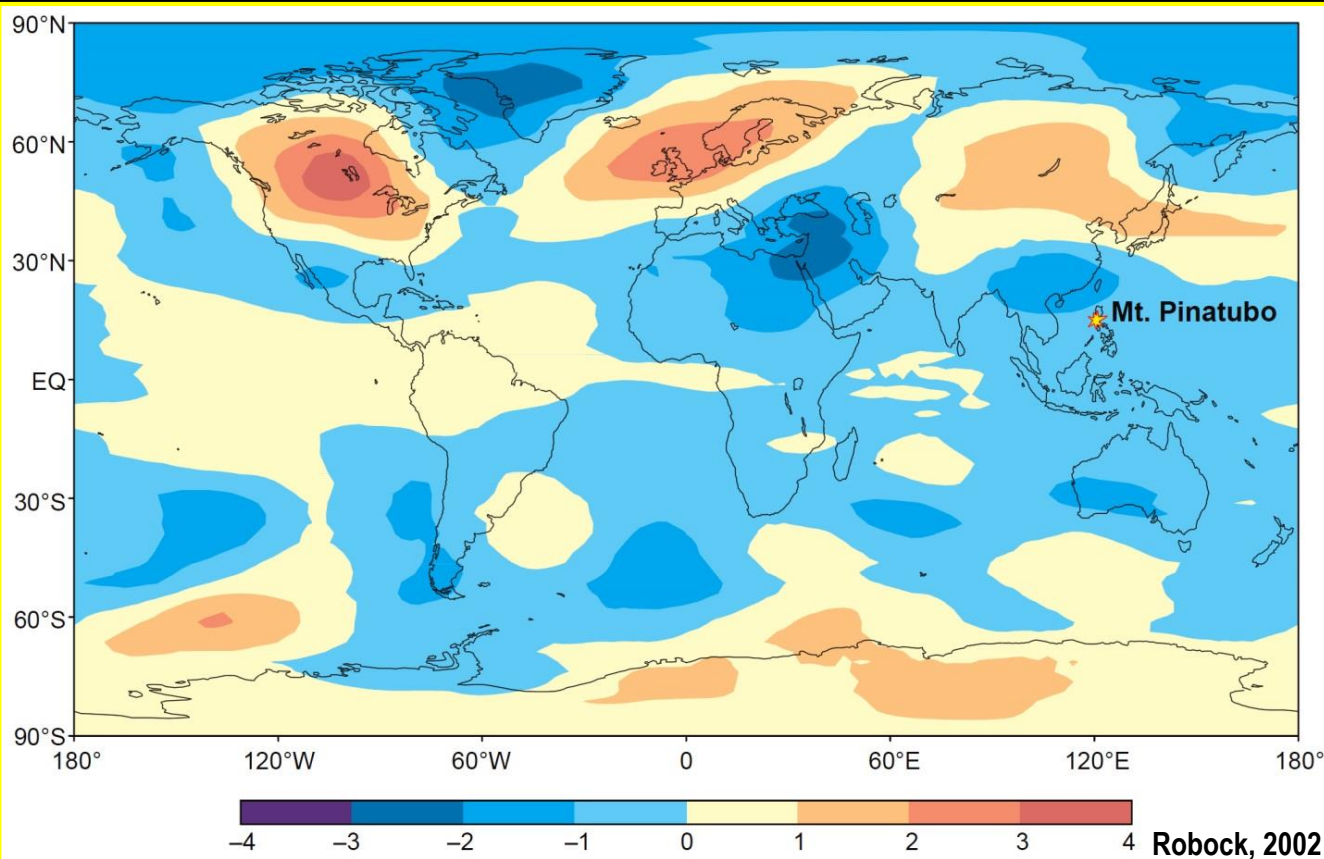
Forms an aerosol in the lower stratosphere

But Large Explosive Eruptions also Deplete Ozone Leading to Winter Warming

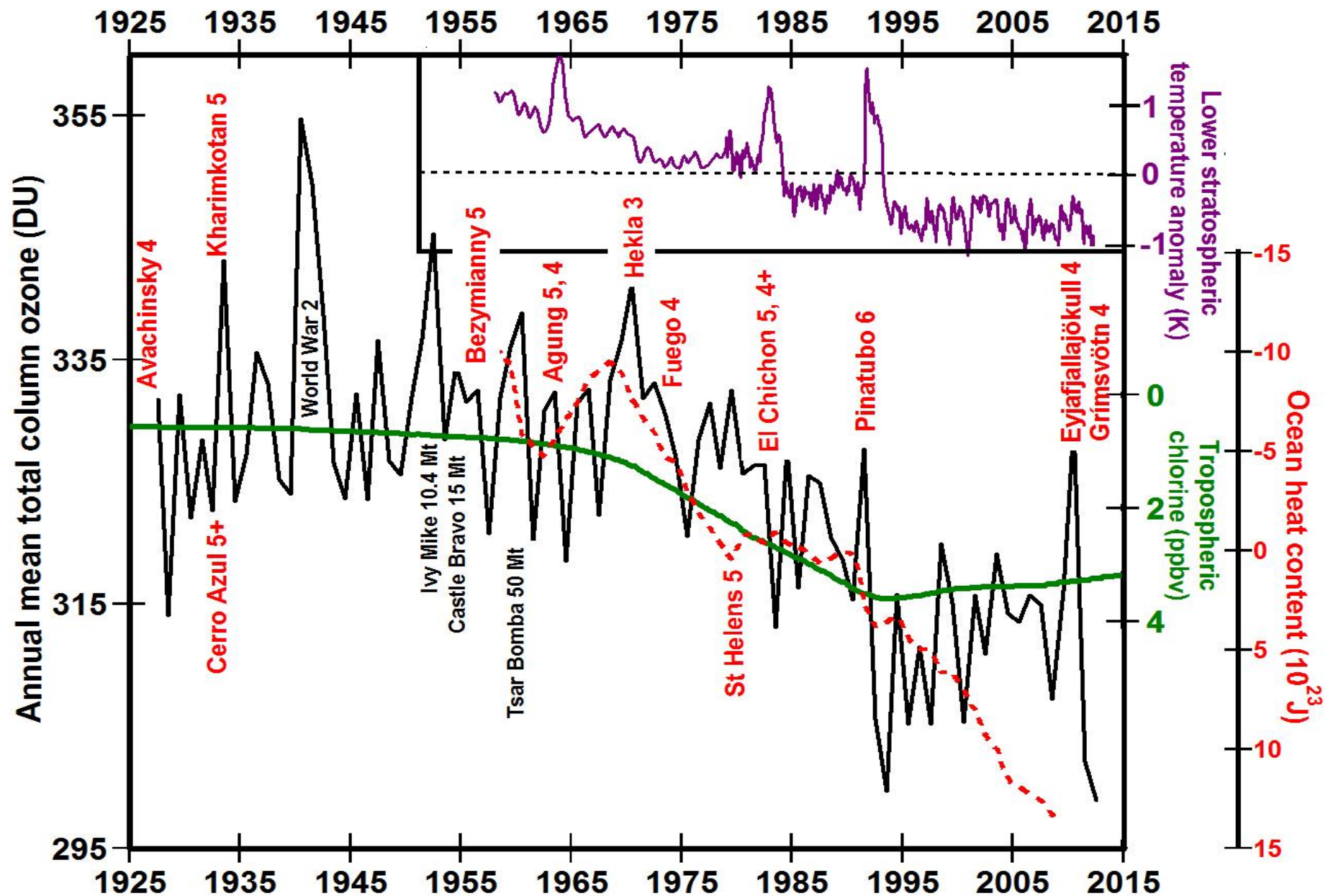


Pinatubo, 1991

**Lower tropospheric
temperature
anomalies
Dec. 1991
To
Feb 1992**



Average Annual Ozone Measured at Arosa, Switzerland



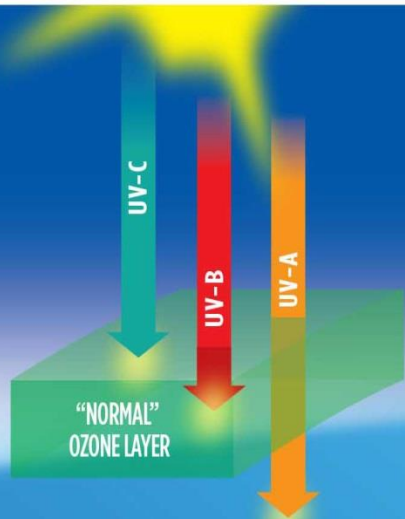
Effects of Ozone Depletion and Aerosols

NORMAL CONDITIONS

UV-C keeps atmosphere warm

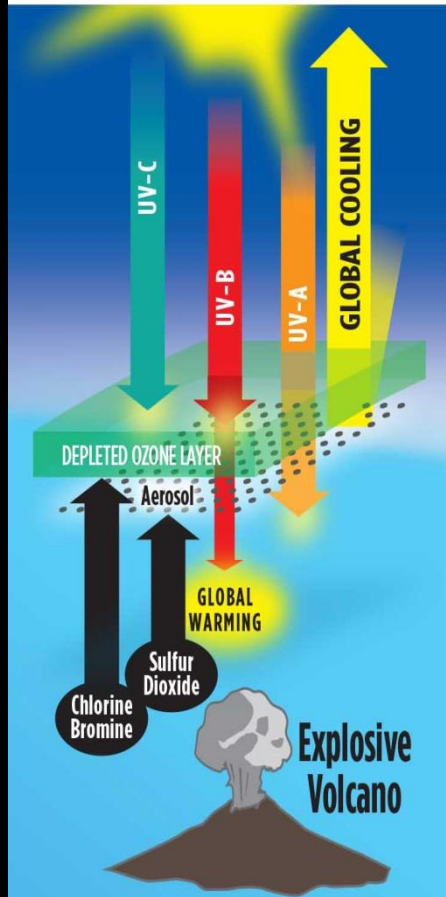
UV-B keeps ozone layer warm

UV-A & sunlight keeps Earth warm



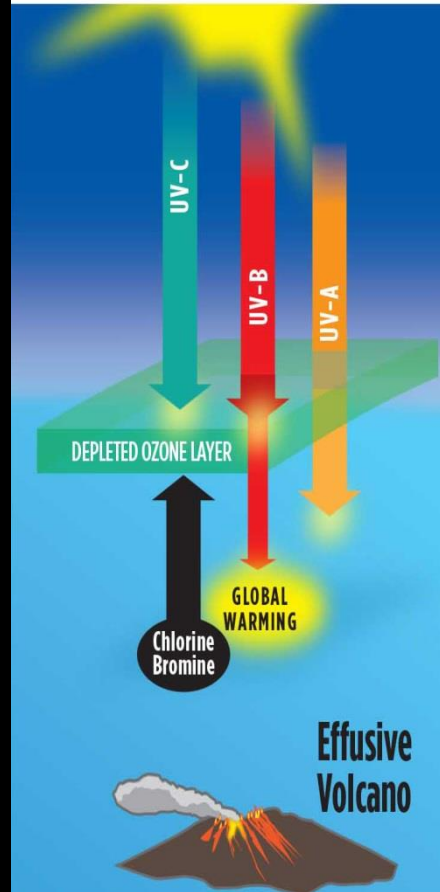
GLOBAL COOLING

Explosive volcanoes also eject **Sulfur Dioxide** into stratosphere forming aerosols that reflect & disperse sunlight causing net cooling of Earth



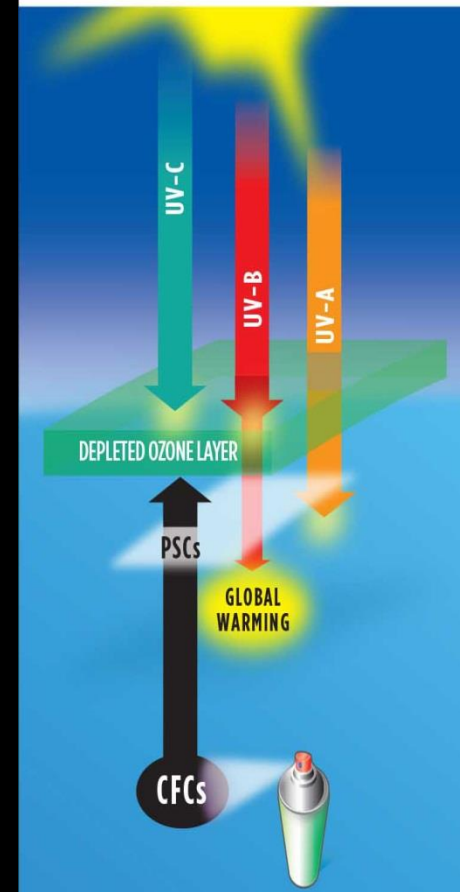
GLOBAL WARMING

Volcanoes release **Chlorine & Bromine** depleting ozone cooling ozone layer & warming Earth

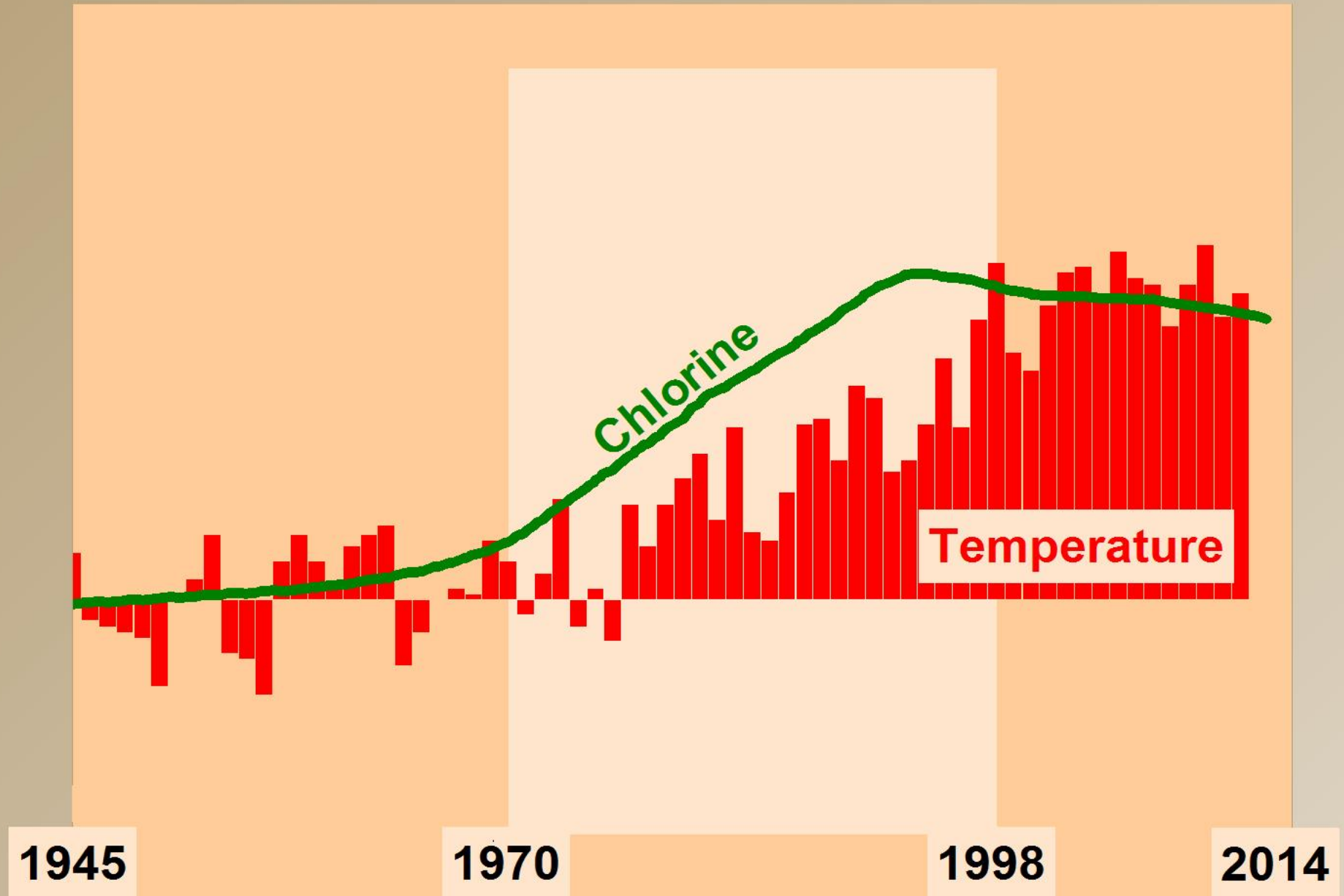


GLOBAL WARMING

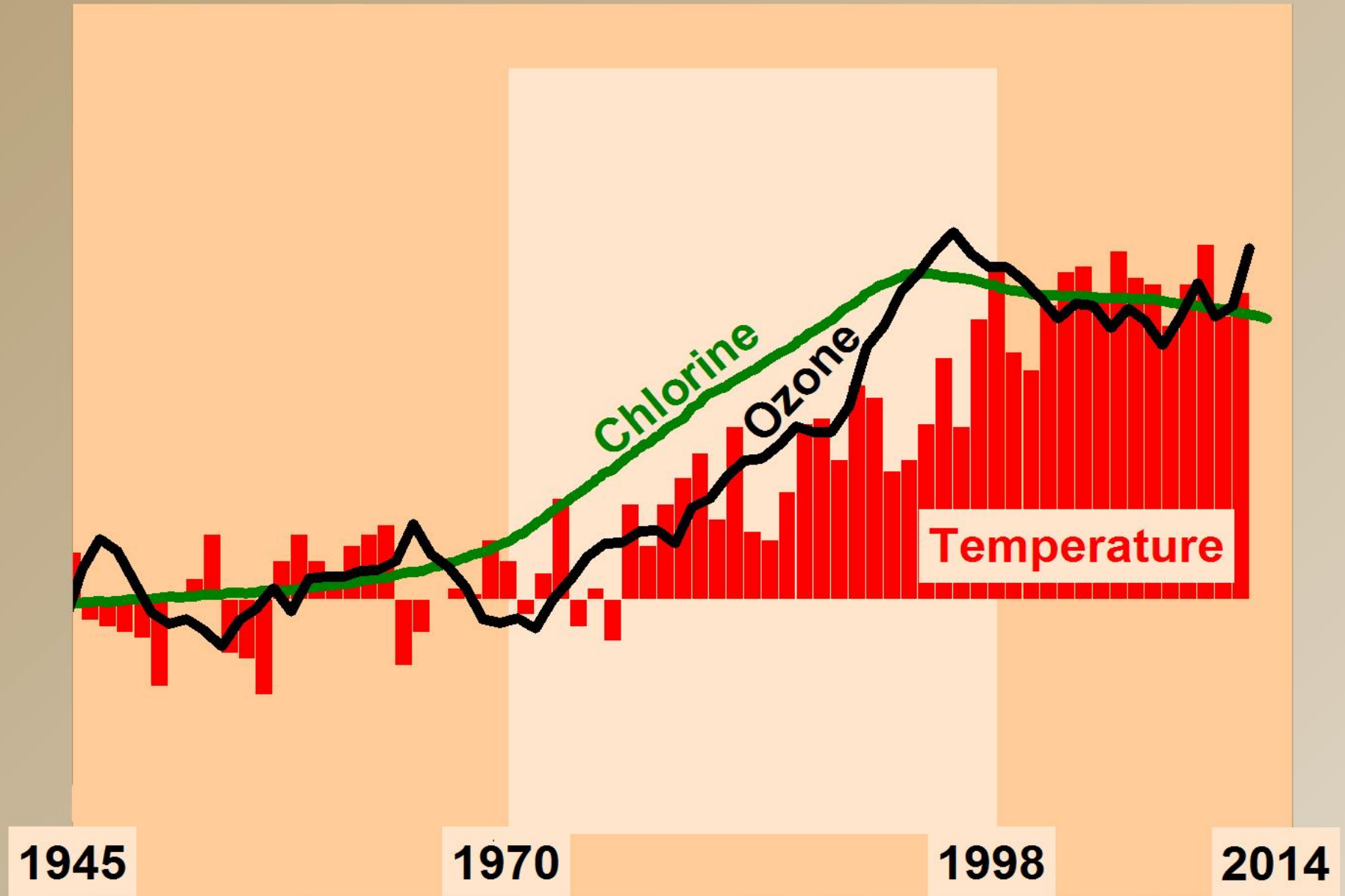
CFCs in polar stratospheric clouds (PSCs) release chlorine depleting ozone cooling ozone layer & warming Earth



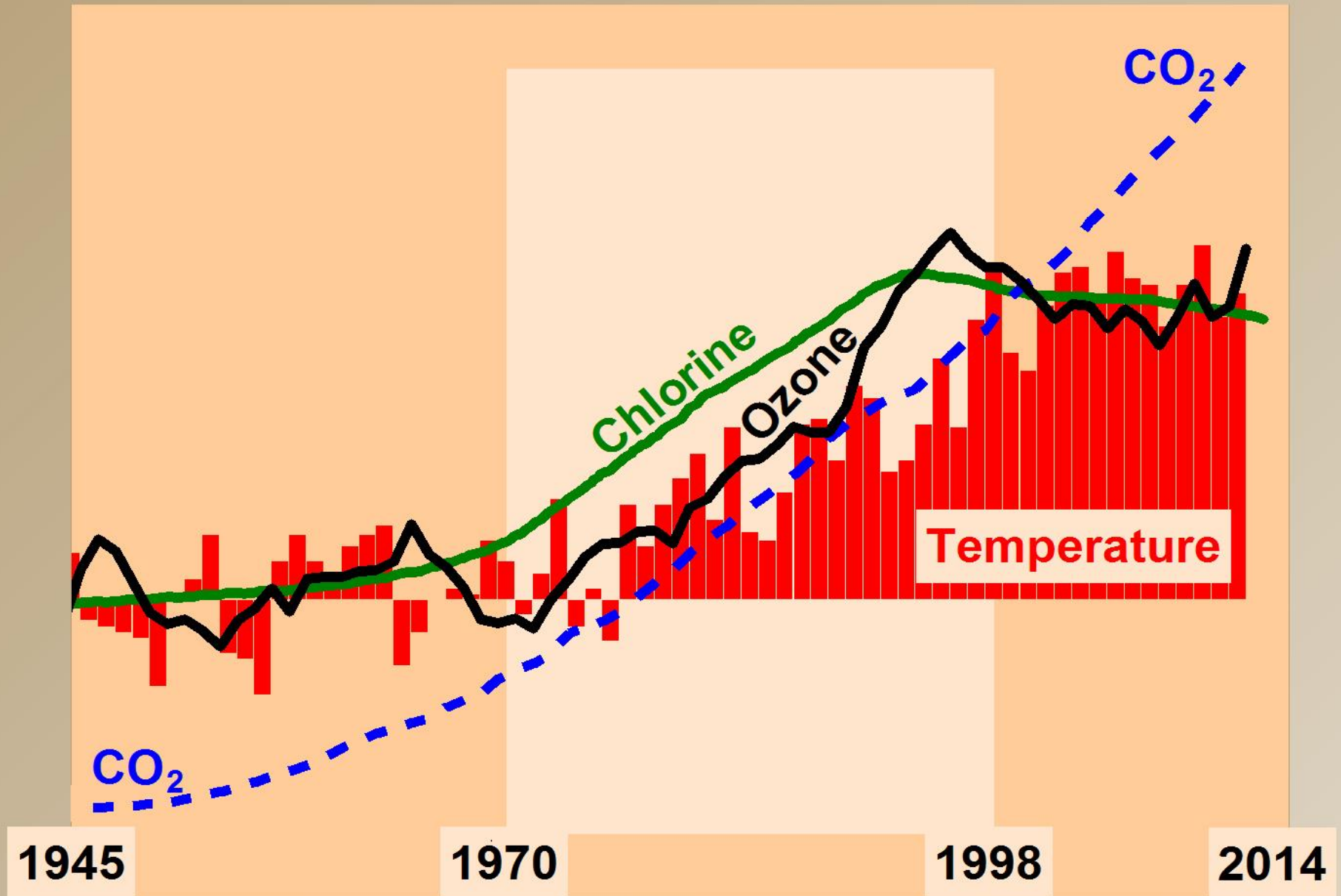
Global Warming 1970 to 1998



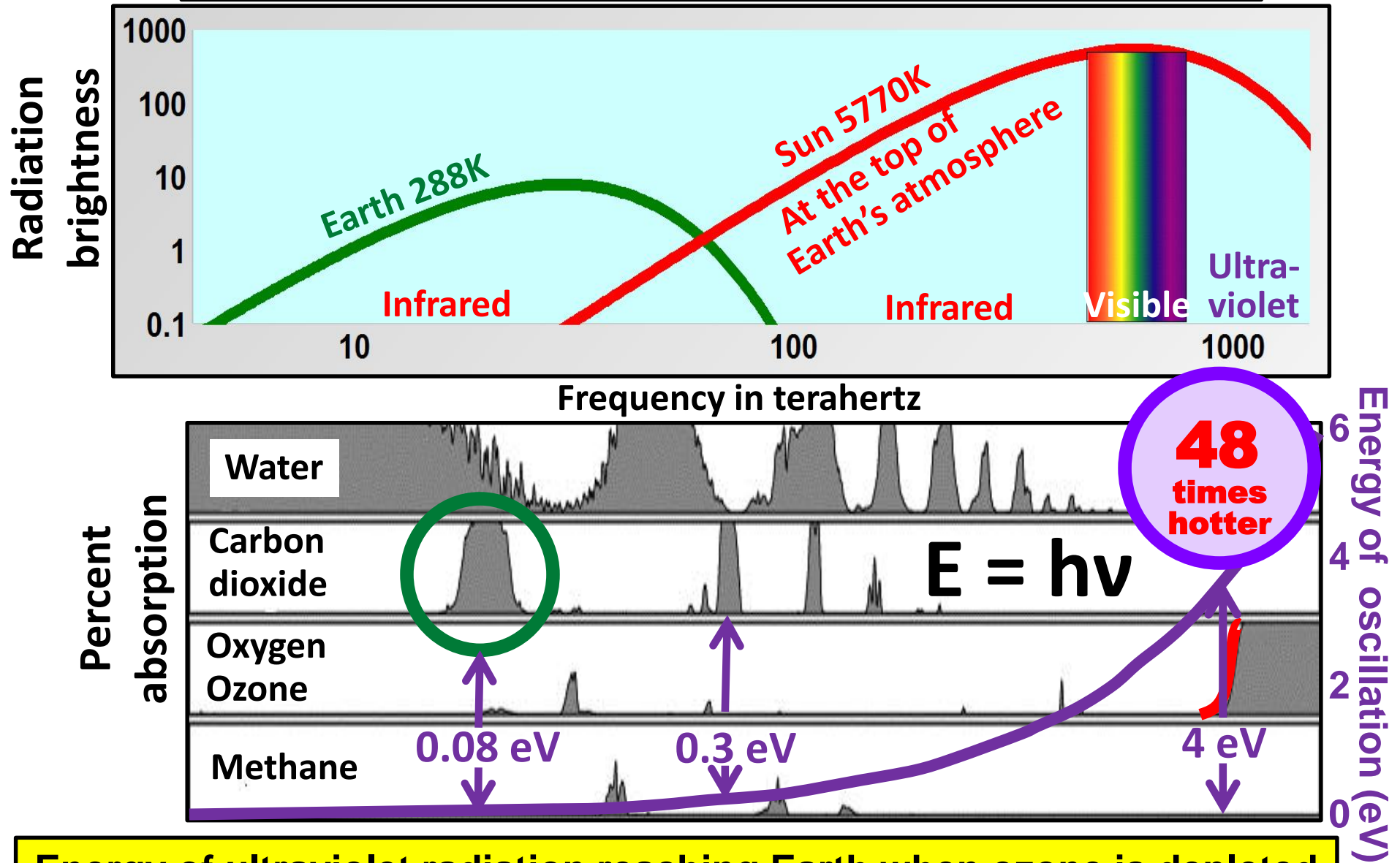
Global Warming 1970 to 1998



Global Warming 1970 to 1998



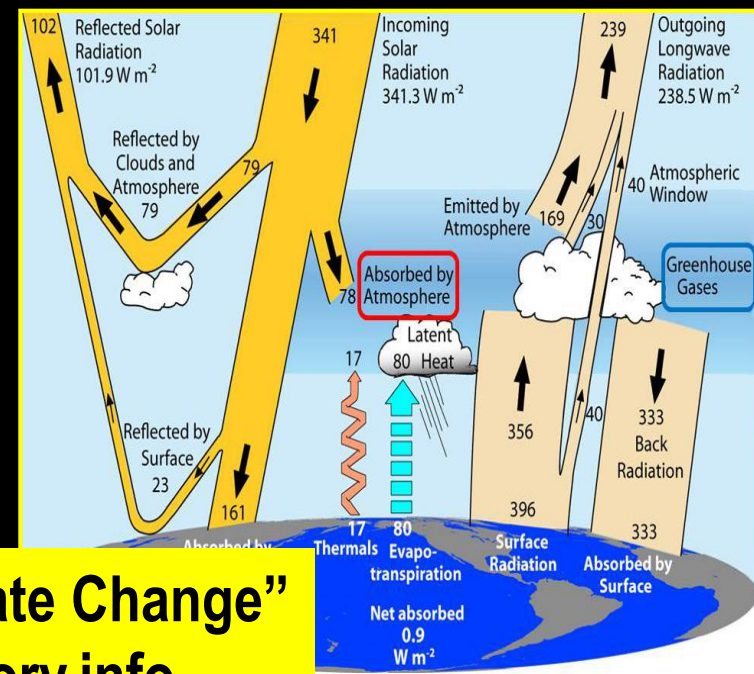
Energy Absorbed by Greenhouse Gases



Energy of ultraviolet radiation reaching Earth when ozone is depleted is at least 48 times hotter than energy absorbed by greenhouse gases

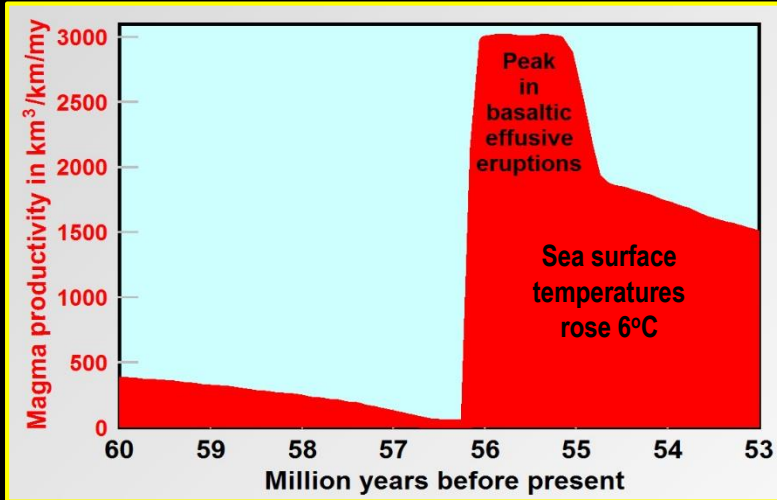
Greenhouse Gas Theory is Simply Wrong

1. There simply is not enough energy absorbed by greenhouse gases
2. The bonds holding greenhouse gases together are clearly observed to absorb radiation, but not to raise temperature
3. The assumption that greenhouse gases slow cooling of Earth ignores the fact that heat is transferred through the troposphere primarily by convection
4. The assumption that greenhouse gases radiate heat back to Earth breaks the Second Law of Thermodynamics
5. You do not stand next to a cold stove to warm up
6. A thermal body cannot warm itself



Paper on “The Thermodynamics of Climate Change”
is available at OzoneDepletionTheory.info

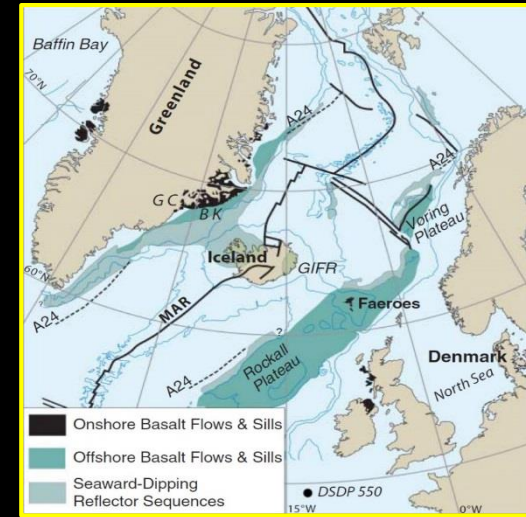
Major Temperature Change During Major Volcanism



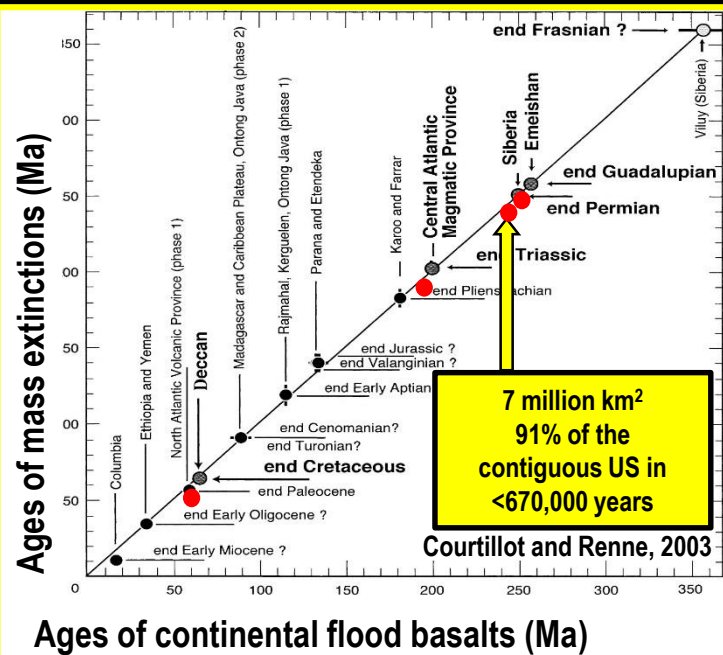
Paleocene Eocene Thermal Maximum

Extrusion of basaltic magma reached a peak 55 to 60 million years ago during the opening of the Greenland-Norwegian Sea. Temperature also reaches a peak.

Storey et al., 2007



Flood Basalts and Mass Extinctions

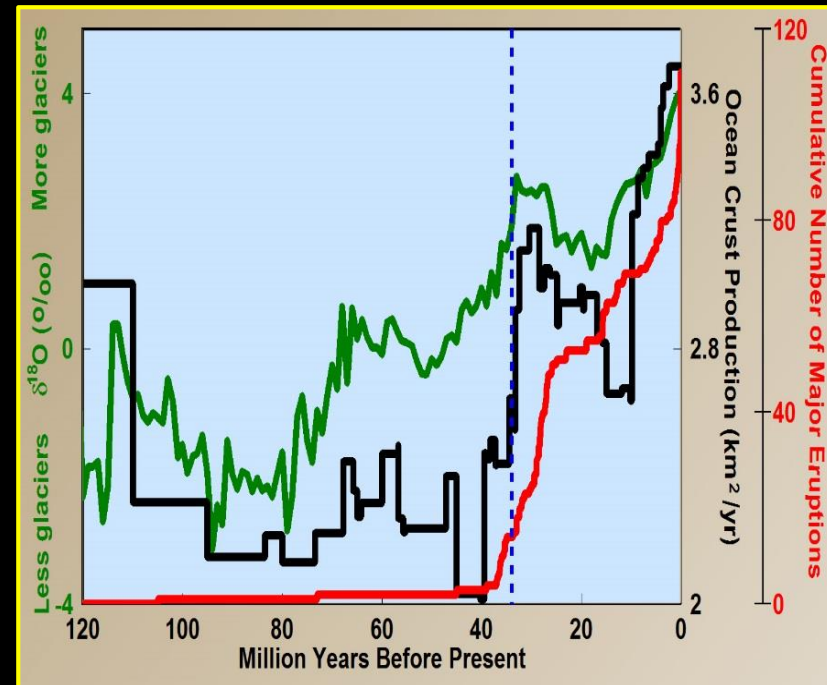


Flood basalts

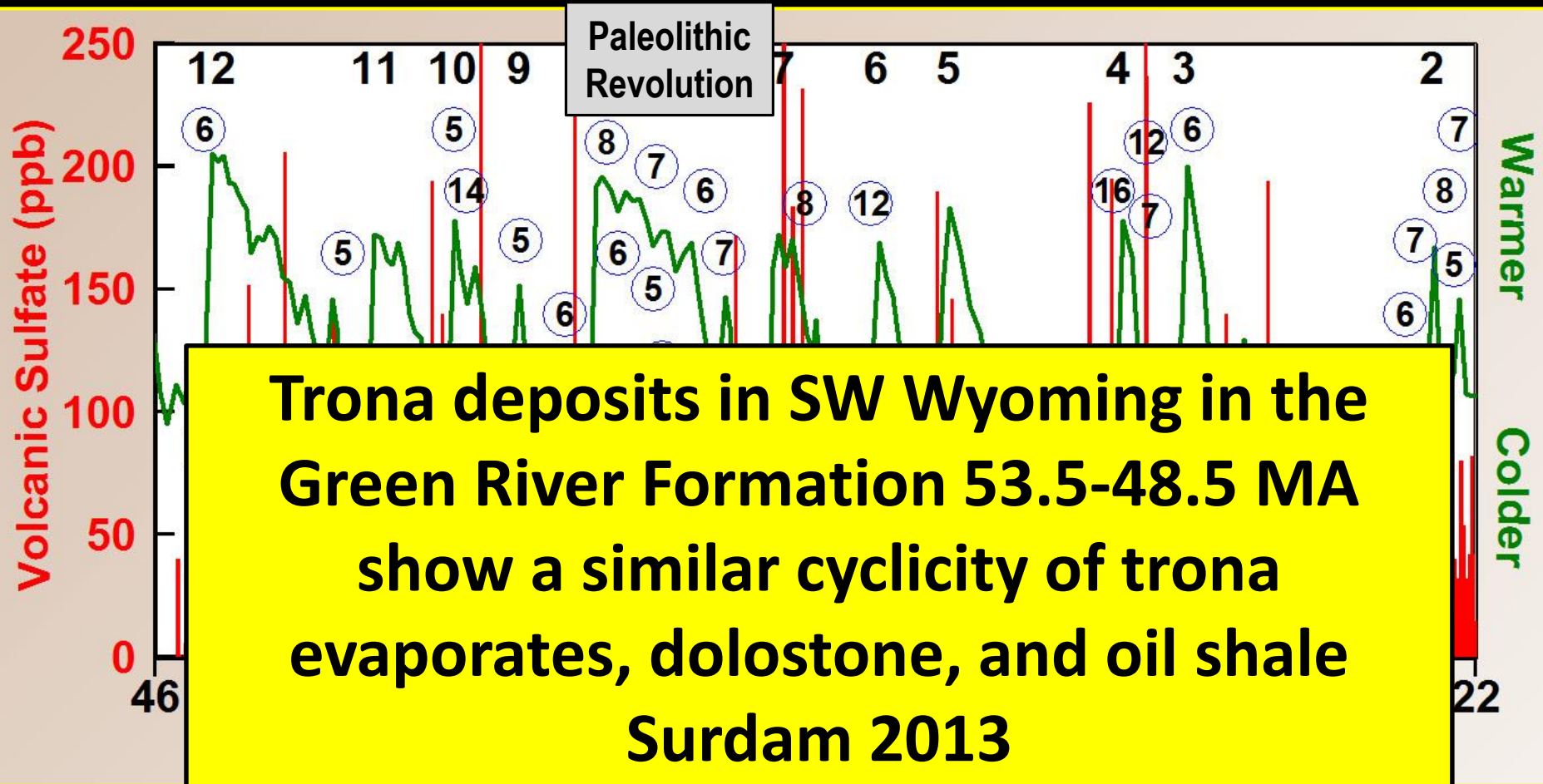
lead to:

Lethally hot climate
Acidic oceans
Ozone depletion
Plant mutations
Mass extinctions

Massive Expansion of Ice in Antarctica at 34 Ma



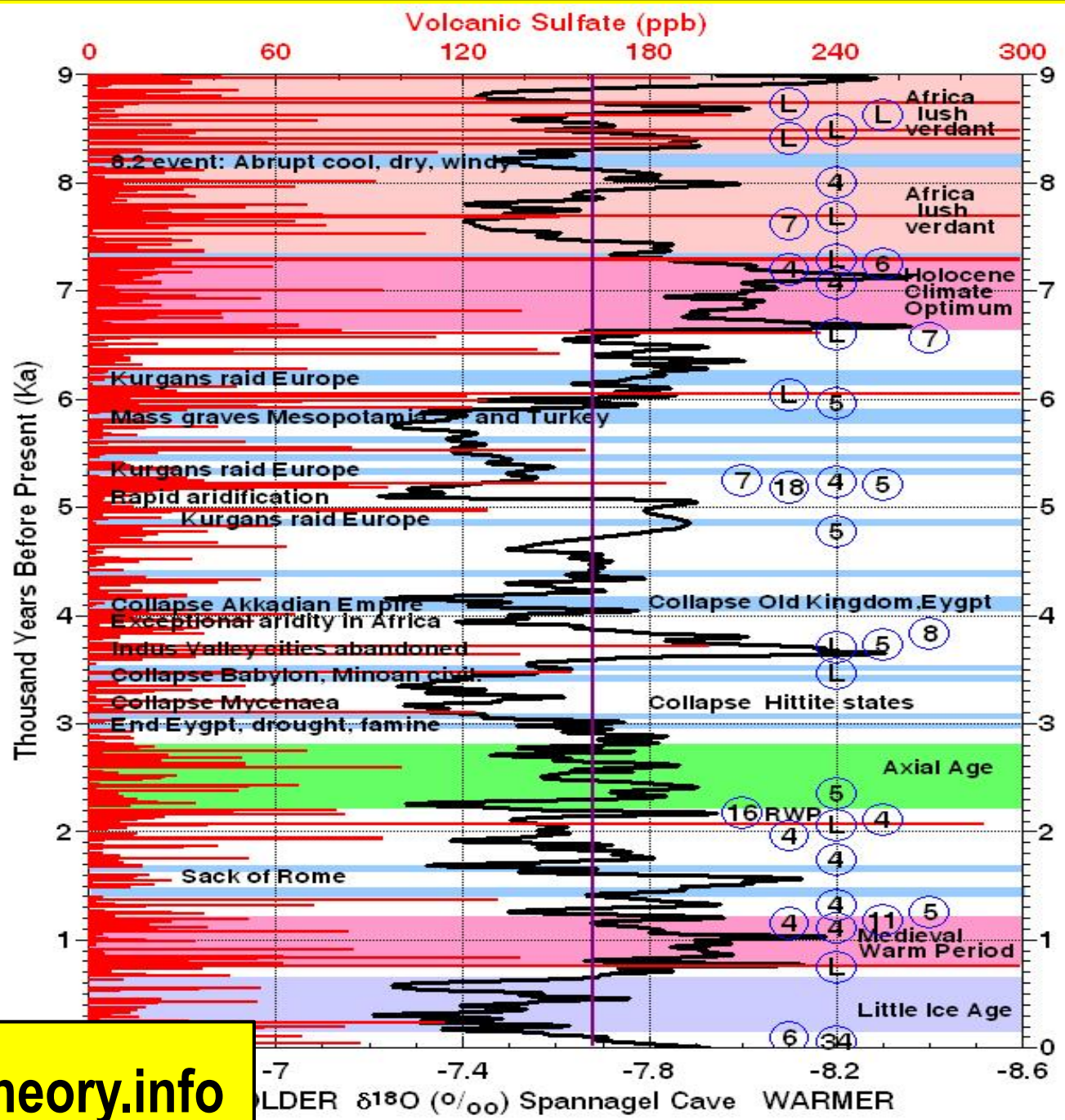
Dansgaard-Oeschger Sudden Warmings Caused by Effusive Volcanism Primarily in Iceland?



**Brachiopod Habitat Temperatures
in the Paleozoic Giles 2012**

In the last 9000 years
volcanism (red)
shows a close
relationship to
temperature (black)
and to
human history

Ward 2009



OzoneDepletionTheory.info

Stalagmite temperatures from Vollweiler et al., 2006

Conclusions

1. Explosive volcanoes form aerosols in the lower stratosphere, reflecting sunlight, cooling Earth
2. Effusive, basaltic volcanoes deplete ozone, warming Earth
3. The balance between cooling and warming is controlled by plate tectonics
4. Sudden changes in volcanism show a close relationship to sudden changes in geologic epochs, ages, and evolution of life on Earth

Volcanoes rule!

OzoneDepletionTheory.info