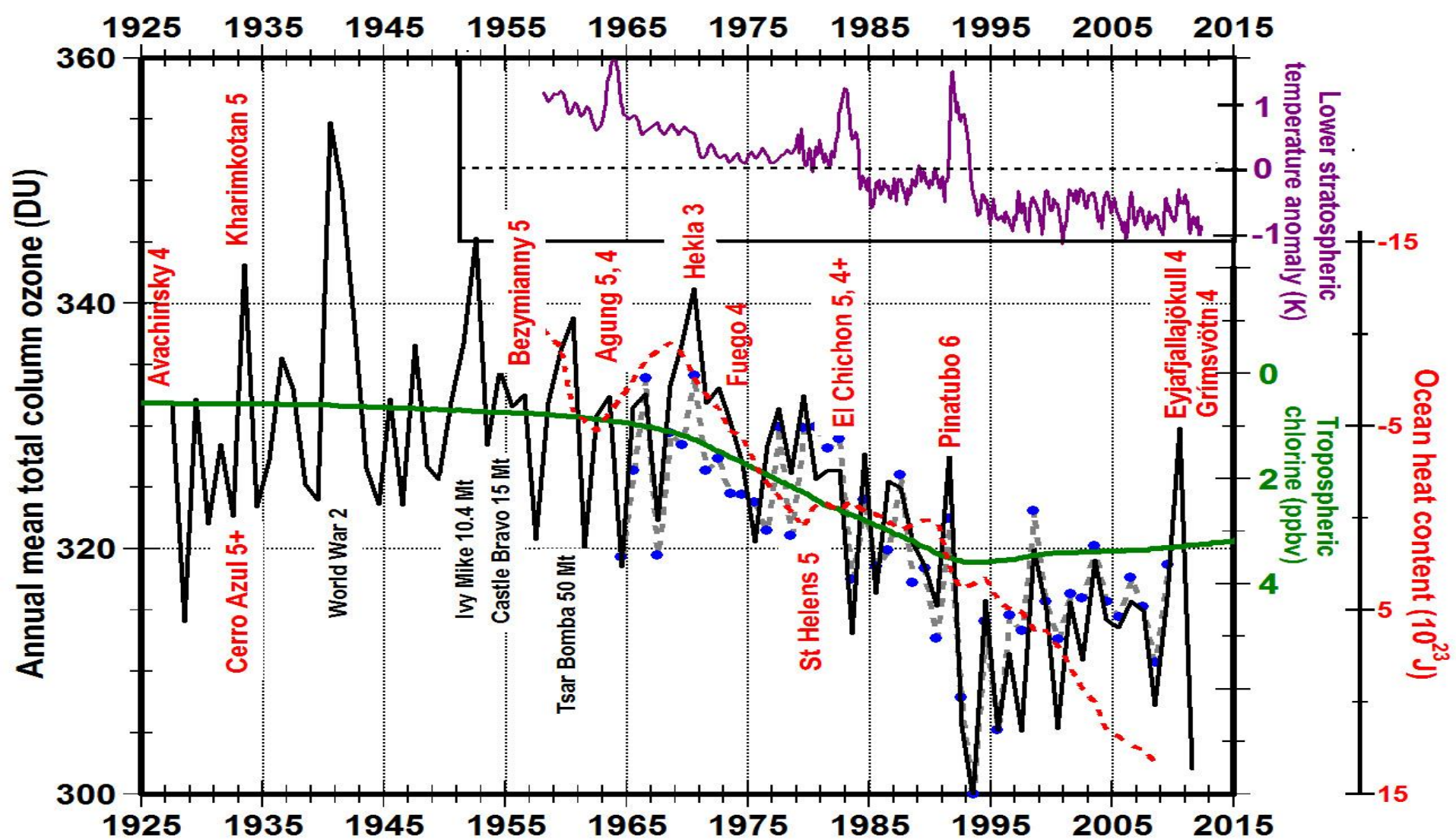


V43E-4749

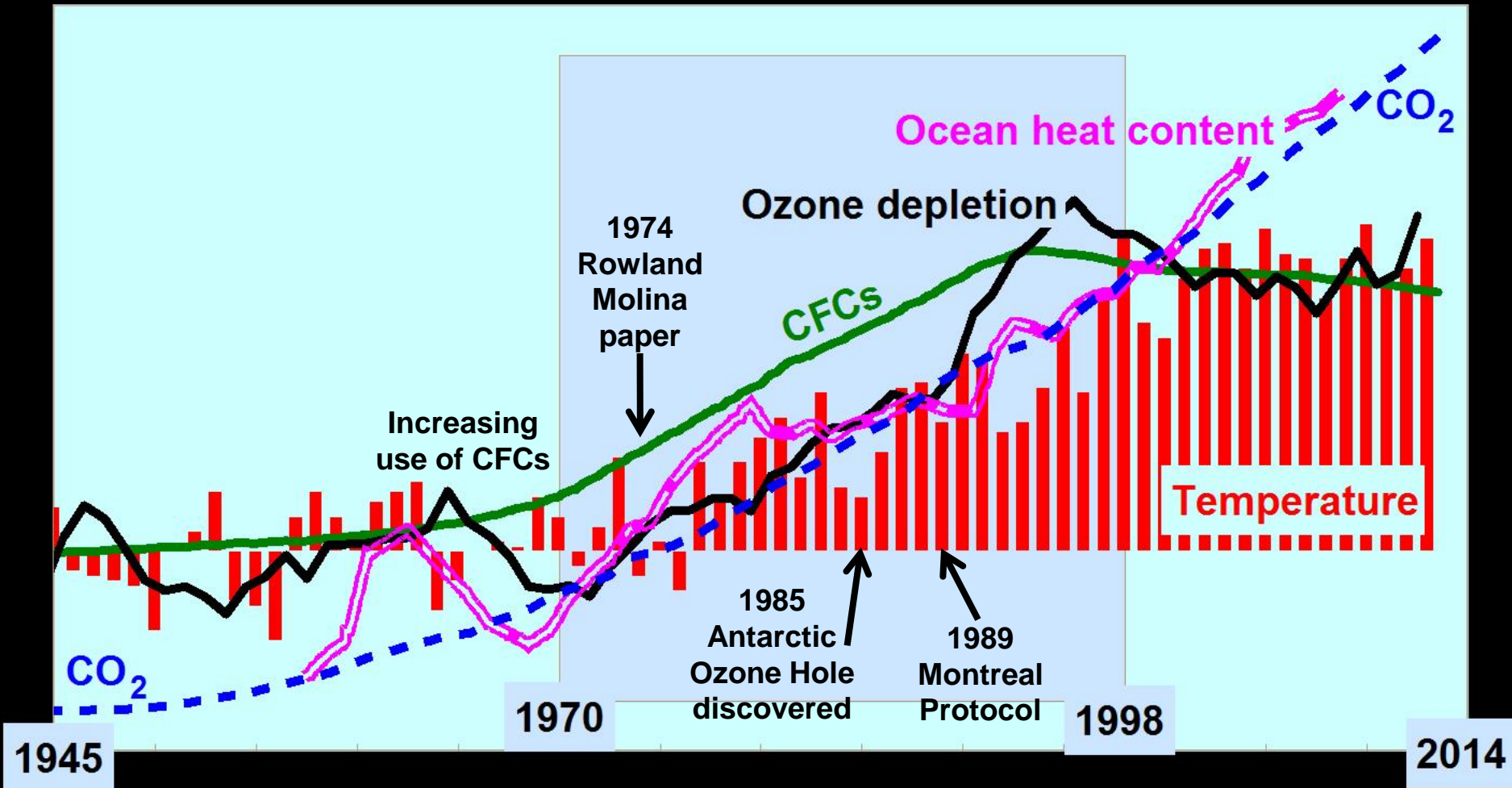
**Climate Throughout Geologic Time Has
Been Controlled Primarily by the Balance
Between Cooling Caused by Major
Explosive Eruptions of Evolved Magmas
Typical of Island Arcs and Warming
Caused by Voluminous Effusive Eruptions
of Basaltic Magma Typical of Subaerial
Ocean Ridges and Island Chains**

**Peter L Ward, USGS retired
Teton Tectonics, Jackson, WY
info@ozonedepletiontheory.info**



Annual mean total column ozone (black line) peaks during years with major volcanic eruptions and then drops precipitously by more than twice as much during the following year causing a cooling in the lower stratosphere (purple line) and warming of Earth. The green line shows annual mean tropospheric chlorine (y-axis inverted). The dashed red line shows increase in ocean heat content (y-axis inverted).

Why Did Global Warming Stop in 1998?



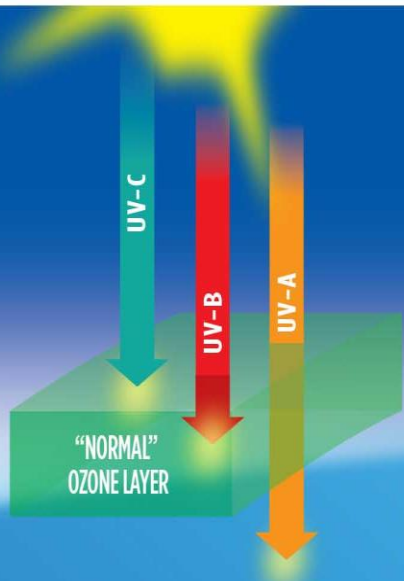
Because it was caused by ozone depletion due to CFCs, not greenhouse gases

NORMAL CONDITIONS

UV-C keeps atmosphere warm

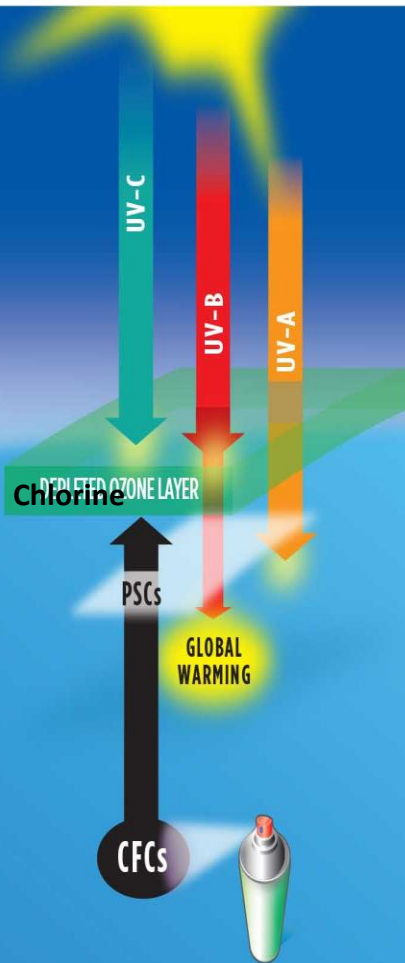
UV-B keeps ozone layer warm

UV-A & sunlight keeps Earth warm



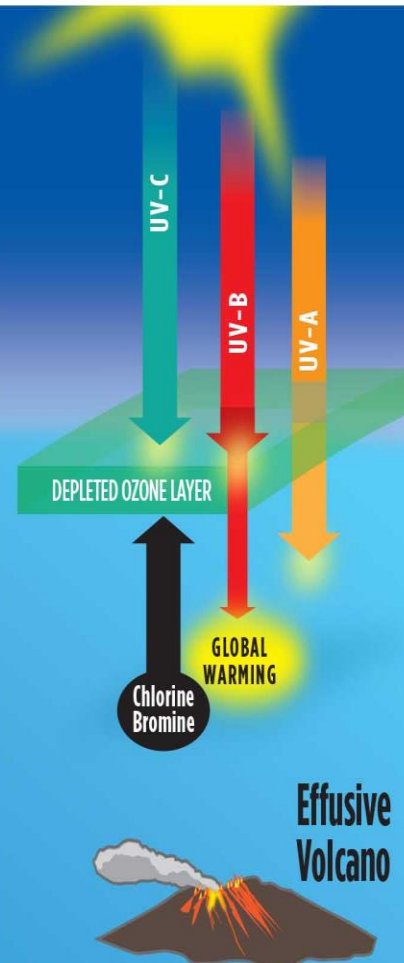
GLOBAL WARMING

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



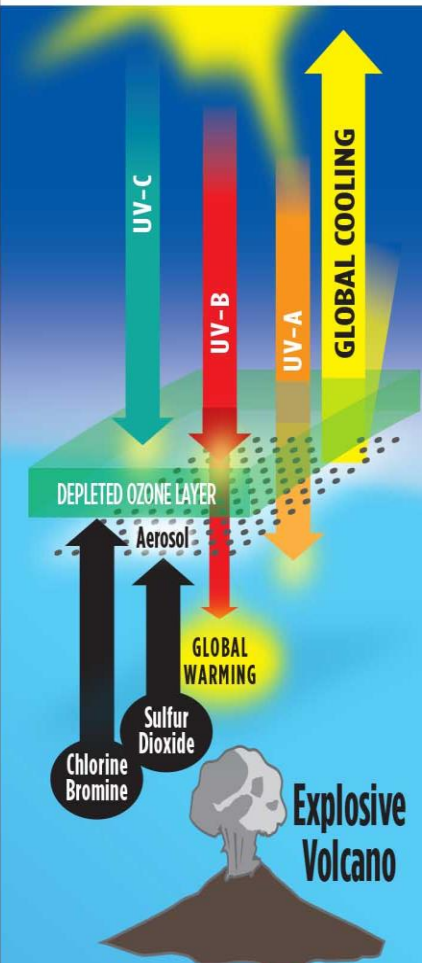
GLOBAL WARMING

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

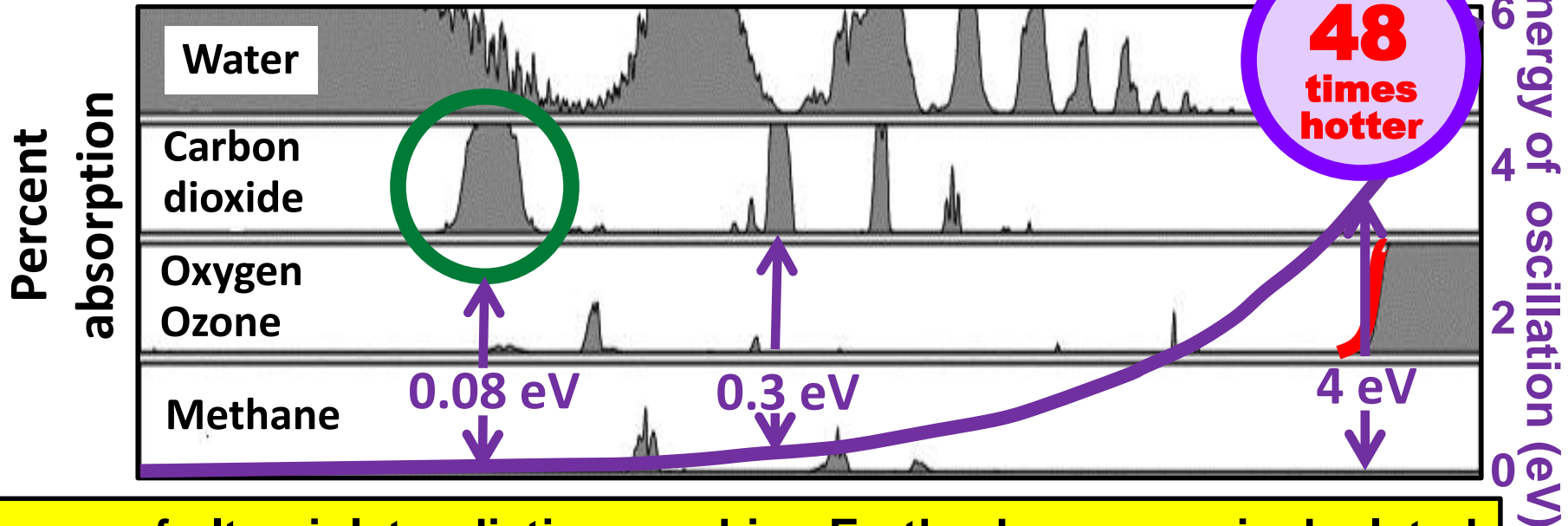
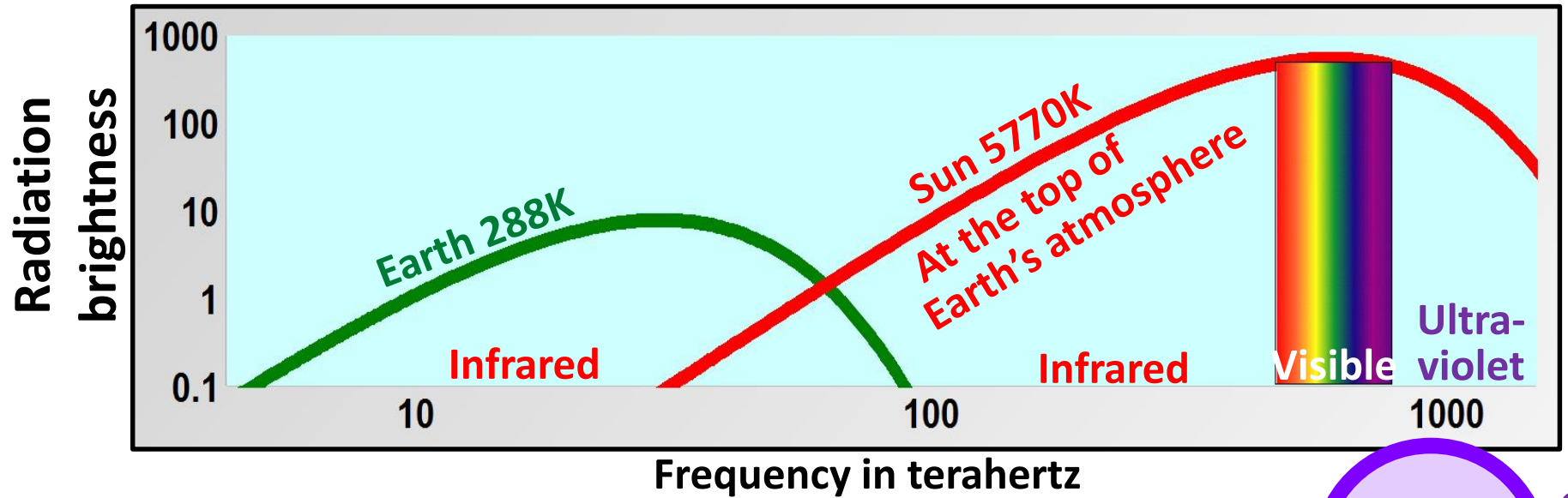


GLOBAL COOLING

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



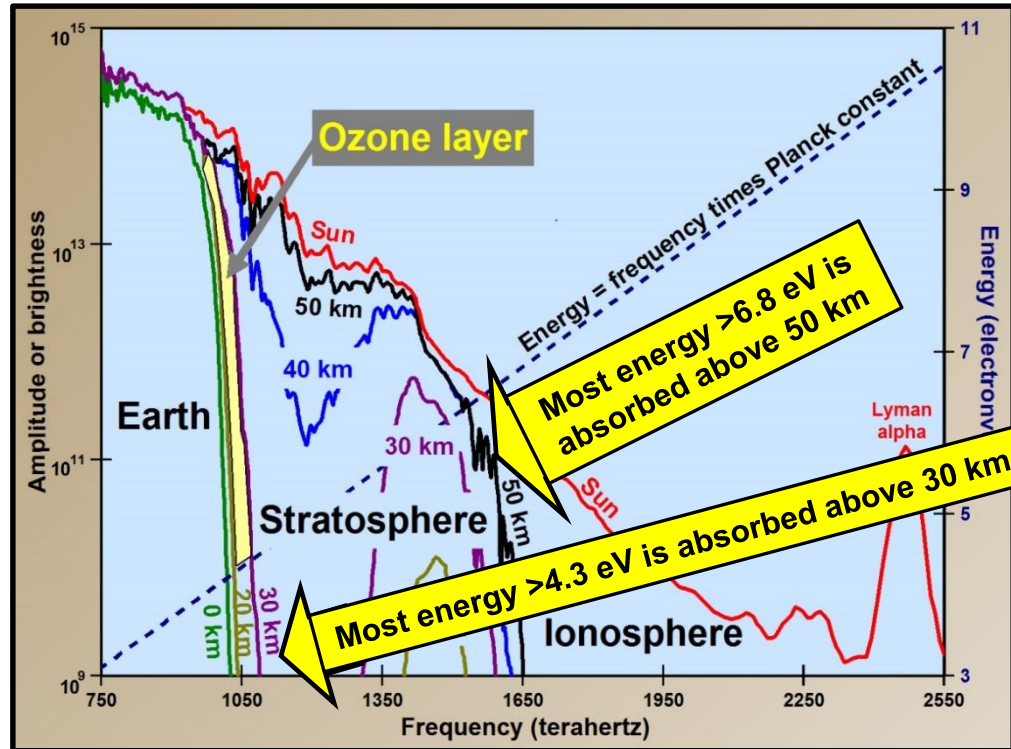
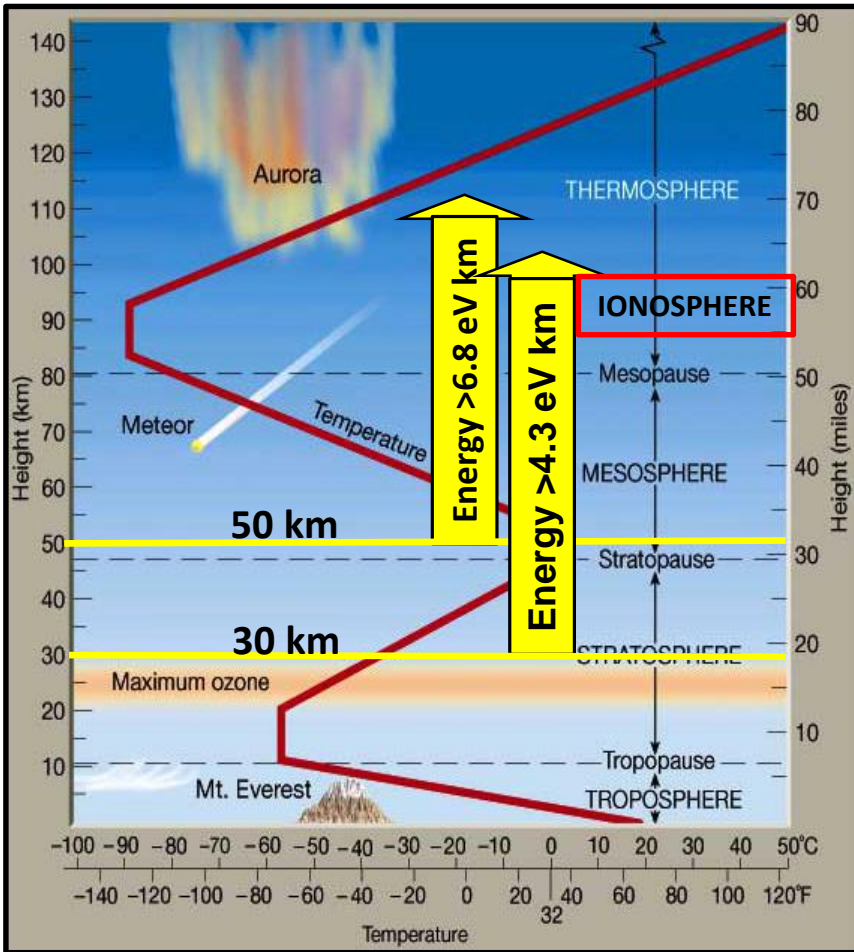
Energy Absorbed by Greenhouse Gases



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

The Highest Frequency Highest Energy Radiation is Absorbed in the Upper Atmosphere

Temperature in the atmosphere is set by the highest energy solar radiation to penetrate to a given level

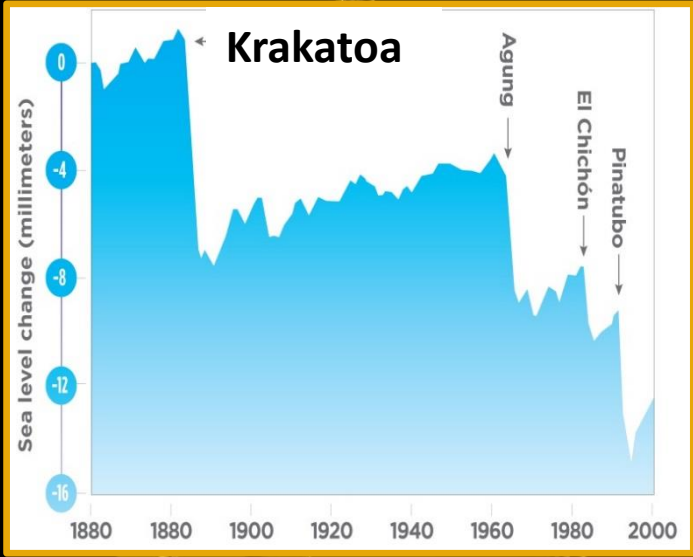
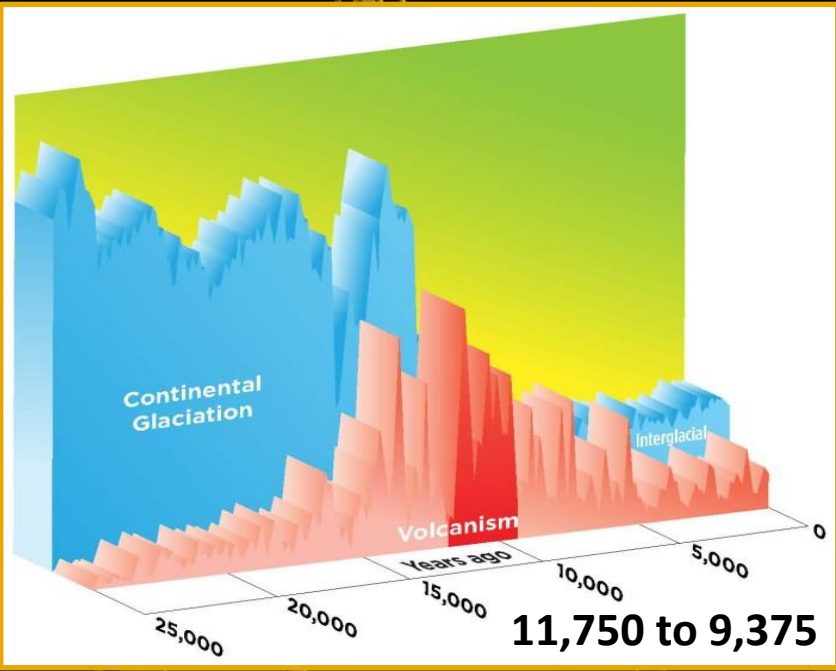


When ozone is depleted, more high-energy solar radiation reaches Earth

The temperature of Earth is determined primarily by how energetic the solar radiation is that reaches Earth

Global Warming

Global Cooling



Duration of effusive volcanism

Frequency of explosive volcanism

Effusive volcano

Explosive volcano



Bárðarbunga, Iceland, Current

Pinatubo, Philippines, 1991

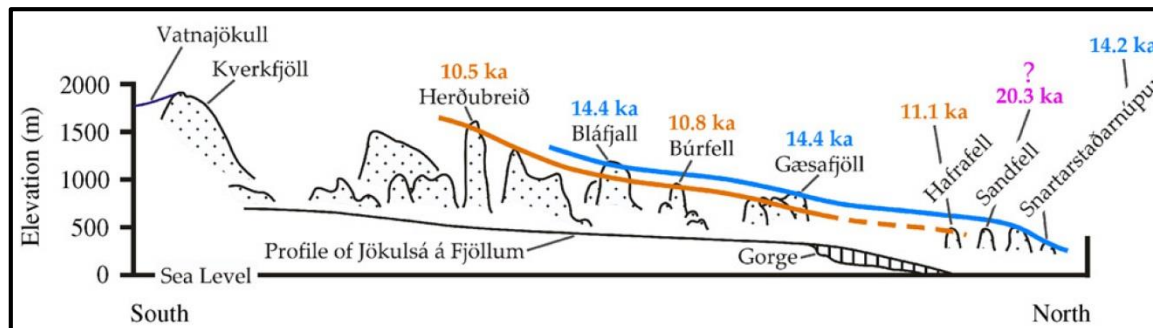
Eruption height: generally < 2 km

Eruption height: up to 36 km

Duration: years to millennia

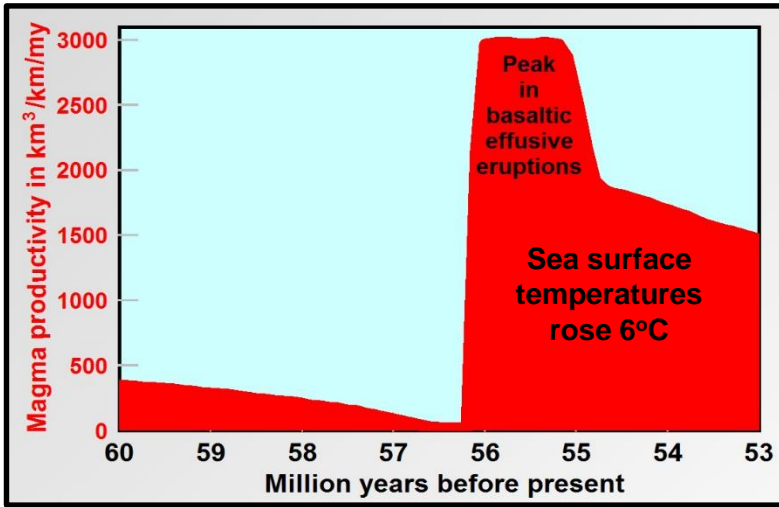
Duration: hours to days

Formed aerosol in the lower stratosphere



Glaciation in Iceland near end of last ice age (Licciardi et al., 2007)

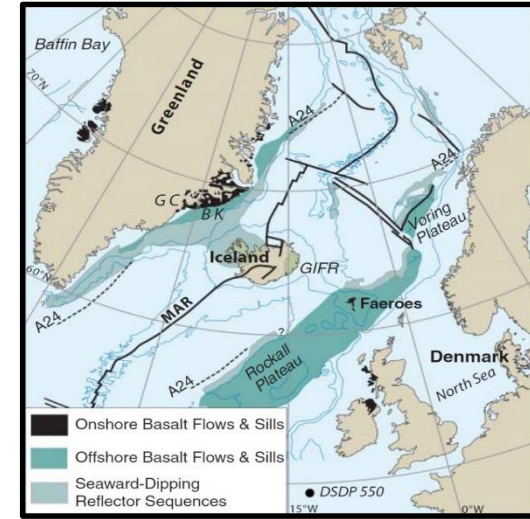
Examples of Major Temperature Change Contemporaneous with Major Volcanism



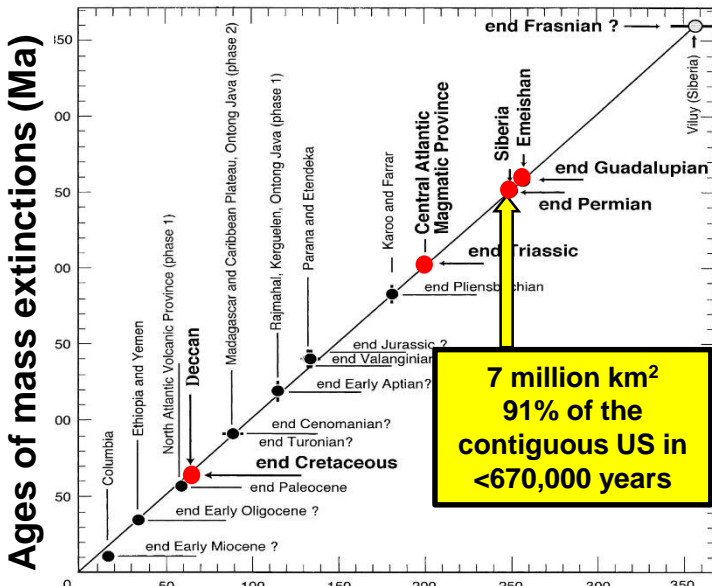
Paleocene Eocene Thermal Maximum

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)

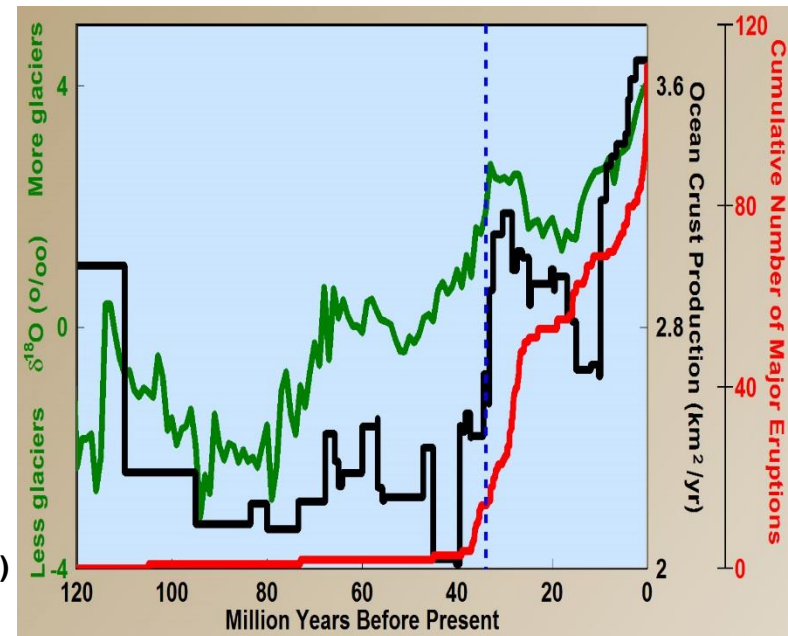


Flood Basalts and Mass Extinctions



Flood basalts
lead to:
 Ozone depletion
 Lethally hot climate
 Acidic oceans
 Land plant mutations
 Mass extinctions
 (Courtillot and Renne, 2003)

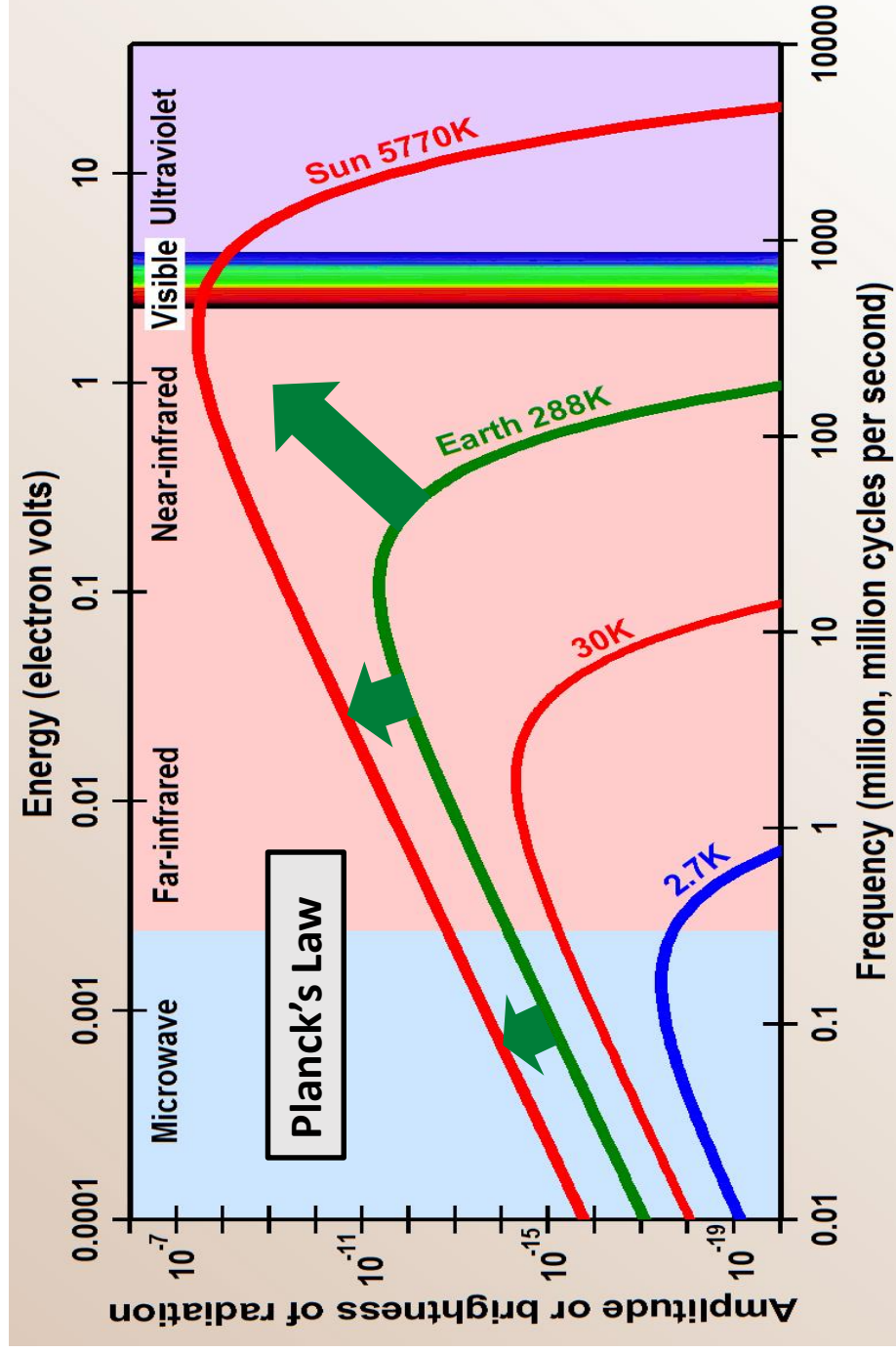
Massive Expansion of Ice in Antarctica at 34 Ma



Ages of continental flood basalts (Ma)

Global Warming Is Caused by Less O₃ – Not More CO₂

1. The microscopic bonds holding matter together oscillate between attractive and repulsive electrostatic forces, giving rise to macroscopic temperature.
2. The heat capacity of matter is dependent primarily on the number of degrees of freedom of these oscillations.
3. Heating matter increases the amplitude of these oscillations at each frequency and increases the frequency with the peak amplitude.
4. When matter reaches thermal equilibrium, the spectrum of frequencies and associated amplitudes on its surface are described by Planck's Law.
5. These oscillations on the surface of matter induce an electromagnetic field in space containing the same frequencies (colors) and amplitudes (brightness) flowing away from the matter in much the same manner as a radio station transmits its frequency and amplitude.



6. Frequencies in the electromagnetic field do not interact with each other and do not change as they propagate over galactic distances. Amplitudes, on the other hand, decrease by one over the square of the distance travelled as they spread out over the surface of an expanding sphere.
7. Oscillations in matter and in space constitute thermal energy which, in space, is quantized by invariant frequency. Thermal energy is also quantized because it is equal at each frequency to the frequency times the Planck constant. Energies of radiation over a range of frequencies are not additive.
8. The solar, ultraviolet thermal energy that reaches Earth when ozone is depleted is at least 48 times hotter, at least 48 times more energetic, than infrared energy absorbed by greenhouse gases. There simply is not enough thermal energy absorbed by greenhouse gases to have a major effect on global warming.
9. Computer programs used to quantify greenhouse-gas theory overestimate infrared energies because they assume that thermal energy travels in space as waves where energy is a function of amplitude squared, that energies are additive over bandwidth, and that frequencies interact and change over distance – all properties very different from the observed behavior of radiation in space described above.
10. Heat flows from hot to cold. According to Planck's Law, radiation from a body of mass does not have high enough frequencies or amplitudes to warm itself as assumed by greenhouse-gas theory. Warming radiation must come from a warmer body.

More details at ozonedepletiontheory.info

YouTube Video at tinyurl.com/ozone-depletion-theory

Dr. Peter L. Ward, U.S. Geological Survey, retired

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