American Meteorological Society 2018 Abstract

Climate Sensitivity Has Never Been Demonstrated by Experiment in the Laboratory or in the Field

Surprisingly, increases in greenhouse gas concentrations have never been shown by experiment to cause observed global warming. Experimental proof of theory is a cornerstone of the scientific method. As Steven Chu put it, "the final arbitrator of any point of view are experiments that seek the unbiased truth." Don't you think it would be wise to do such a basic experiment before spending trillions of dollars to reduce CO_2 emissions?

There are many good reasons to wonder. Knut Ångström (1900), an expert in radiation physics, concluded from experiments that "under no circumstances should carbon dioxide absorb more than 16% of terrestrial radiation, and the amount of this absorption varies quantitatively very little, as long as there is not less than 20% of the existing value."

Climate sensitivity is not measured directly. It is estimated assuming that observed increases in greenhouse gases are the primary cause of observed increases in temperature. The IPCC (2013) estimated "with high confidence" that the increase "in annual global mean surface temperature following a doubling of the atmospheric equivalent carbon dioxide concentration" is in the range of 1.5 to 4.5 °C. While annual average concentrations of CO_2 rose from 280 ppm in the 1850s to 403 ppm in 2016 (a factor of 1.4), annual average global temperatures rose 1.1 °C (HadCRUT4). From 1998 through 2013, however, CO_2 rose at ever increasing rates while temperature increased very little. More than 100 peer-reviewed papers have searched unsuccessfully for a clear explanation of this "global warming hiatus." What if greenhouse gases are not the primary cause of global warming?

Scientists have proposed five different mechanisms for how increasing concentrations of greenhouse-gases could cause global warming: 1) direct heating of air by absorbing terrestrial infrared radiation, 2) direct heating of air that slows the rate of heat loss from Earth, 3) re-radiation of absorbed energy that slows the rate of heat loss from Earth, 4) re-radiation of absorbed energy back to Earth where it is absorbed and causes warming of Earth, and 5) climate feedbacks.

1) Direct heating of air by absorbing infrared radiation does not appear significant. I placed air in two Styrofoam boxes (45 liters each) with identical boundary conditions. The only difference was that one box contained normal air with 425

ppm CO_2, the other with more than 9999 ppm CO_2 (>23 times normal). When heated at the same time through a thin plastic membrane by the same infrared radiation from a black pot of water at 325K, the CO_2-rich air warmed only 0.1K more than regular air. CO_2 is observed to absorb infrared terrestrial radiation, but only along spectral lines making up less than 16% of the frequencies radiated by Earth. This radiant energy is absorbed into the bonds holding the molecule together, while temperature of a gas is proportional to the average translational velocity of the 2500 other molecules making up air. Greenhouse gases simply do not absorb enough thermal energy to warm Earth significantly.

2) Earth loses heat through the troposphere primarily by weather systems driven by convection due to temperature decreasing with height and temperature decreasing from the tropics to the poles. Loss of heat by radiation affected by greenhouse gases is at least an order of magnitude less.

3) It is widely assumed that gas molecules radiate significant energy in all directions. A CO_2 molecule can only re-radiate the energy it absorbs, which is <16% of the frequencies radiated by Earth while temperature of matter is a function of a very broad continuum of frequencies described by Planck's law. A layer of air is not a black body, has minimal thermal mass, and thus can only radiate thermal energy that is continuously convected from below as observed in the solar photosphere.

4) Planck's law shows that radiation from a warmer body of matter contains higher frequencies of oscillation and higher amplitudes of oscillation at every frequency. Radiation from a colder body of matter, therefore, cannot physically warm a warmer body of matter as enshrined in the second law of thermodynamics—it does not contain high enough frequencies and amplitudes of oscillation. Temperature of tropospheric air decreases with increasing altitude. Even if a layer of gas could radiate, radiation from a colder layer cannot make Earth warmer.

5) Feedbacks, including snow and ice albedo, water vapor and lapse rate, clouds, aerosols, carbon sinks, and wetland methane emissions, must be reevaluated recognizing that thermal energy is a function of frequency of oscillation of the bonds holding matter together, not amount.

According to the Planck-Einstein relation, thermal energy (E) in matter is equal to the frequency of oscillation (ν) of each degree of freedom, of each bond holding matter together times the Planck constant (h) where $E=h\nu$— the energy of a frictionless atomic oscillator. Radiant thermal energy (E) in air and space is

induced by a broad continuum of such frequencies of oscillation on the surface of the radiating body. Atmospheric chemists use $E=h\nu$ in their chemical equations to specify the energy needed, for example, to dissociate molecular oxygen.

Climate scientists currently assume that radiation has the same physical properties no matter the temperature of the radiating body, that hotter bodies emit more of this generic radiation, and that a body absorbing more of this generic radiation, more watts per square meter, gets hotter. Planck's law, however, shows that radiant thermal energy is a function of frequency of oscillation ($E=h\nu$), which is a function of how hot the radiating body is, not a function of amount of some generic radiation. Ultraviolet-B solar radiation reaching Earth when the ozone layer is depleted, has a peak frequency content that is 48 times higher, 48 times "hotter" than the frequencies of terrestrial infrared radiation absorbed most strongly by CO_2.

Ozone depletion, caused by man since 1970 and caused by major extrusive, basaltic volcanic eruptions throughout Earth history, allows more than normal of this very "hot" solar ultraviolet-B radiation to reach Earth, explaining observed details of global warming far more clearly and much more precisely than greenhouse-warming theory.