Review Article
Further Evidence that Particulate Pollution is the Principal Cause of Global Warming: Humanitarian Considerations

ABSTRACT

Review of published data from the 1980 Mt. St. Helens volcanic eruption and diurnal temperature range data provide further new evidence that particulate pollution, not CO_2, is the main cause of global warming. A mechanism is reviewed that accounts for both local and global warming resulting from (1) aerosol particulate pollutants absorbing radiation and being heated in the troposphere, (2) the transfer of that heat to the surrounding atmosphere, (3) the lowering of the atmospheric adverse temperature gradient relative to the Earth's surface, (4) the consequent reduction of atmospheric convection, and (5) concomitant reduction of convection-driven surface heat loss. Graphic data shows global warming in lockstep with tropospheric aerosol particulate pollution, with both processes increasing in exponential fashion in recent decades. Particulate pollution health risks are reviewed, noting for example that fine pollution particles penetrate deep into lungs and systemic circulation and contribute to stroke, heart disease, lung cancer, COPD, respiratory infections, asthma and neurodegenerative disease. The good news is that global warming can be substantially and quickly reduced if particulate-trapping and particulate-reducing technologies are universally applied *and* the covert geoengineering aerial particulate jet-spraying ceases. The bad news is that dominant segments of academic and other significant institutional communities – government and government-contractors, intelligence agencies, environmental organizations, media, and military – are complicit and profit from poisoning the air we breathe. No one should derive benefit therefrom; something is fundamentally wrong.

Keywords: Global warming, aerosol particulates, geoengineering, climate change, World War II, coal fly ash, particulate pollution

1. INTRODUCTION

The United Nations' Intergovernmental Panel on Climate Change (IPCC) and the climate science community generally subscribe to the proposition that tropospheric aerosol particulates cool the climate [1-3], with the exception of black carbon aerosols [4]. IPCC scientists maintain that the consequence of aerosolized particulates is to block sunlight and cool the Earth [1,5-7].

Climate scientists undervalue the role of aerosols and clouds in trapping heat, contending that heat trapping occurs primarily by atmospheric greenhouse gases as is evident in the following statement [1]: *"Atmospheric aerosols counteract the warming effects of anthropogenic greenhouse gases by an uncertain, but potentially large, amount....Strong aerosol cooling in the past and present would then imply that future global warming [due to pollution reduction] may proceed at or even above the upper extreme of the range projected by the Intergovernmental Panel on Climate Change."* The perception of tropospheric aerosol particulates' cooling effect on Earth's climate has led to fundamental misconceptions in climate science.

Here we review the evidence for the behavior of tropospheric aerosol particulates, redress the fundamental climate science misconceptions, and discuss the consequences for humanity.

2. DIURNAL TEMPERATURE RANGE EVIDENCE

The diurnal temperature range (DTR), the daily high temperature minus nightly low temperature, ($T_{max} - T_{min}$), is a model-independent measure of climate change. DTR data are essentially independent of the direct radiative consequence of greenhouse gases [8,9]. During both daytime and nighttime, greenhouse gases' effects on long wave radiation are equivalent, thus equally affecting T_{max} and T_{min}. Moreover, greenhouse gases are transparent to solar radiation [10]. Whereas the reduction in T_{max} can be explained by sunlight being blocked by particulates or by clouds, the increase in T_{min} is inexplicable within the current IPCC understanding of climate science [9].

Usually DTR data are presented as averages over a large geographic area and averaged over suitable increments of time. Figure 1 from Qu et al. [11] presents yearly mean DTR values as well as the corresponding high temperature (T_{max}) and low temperature (T_{min}) mean values over the continental USA.

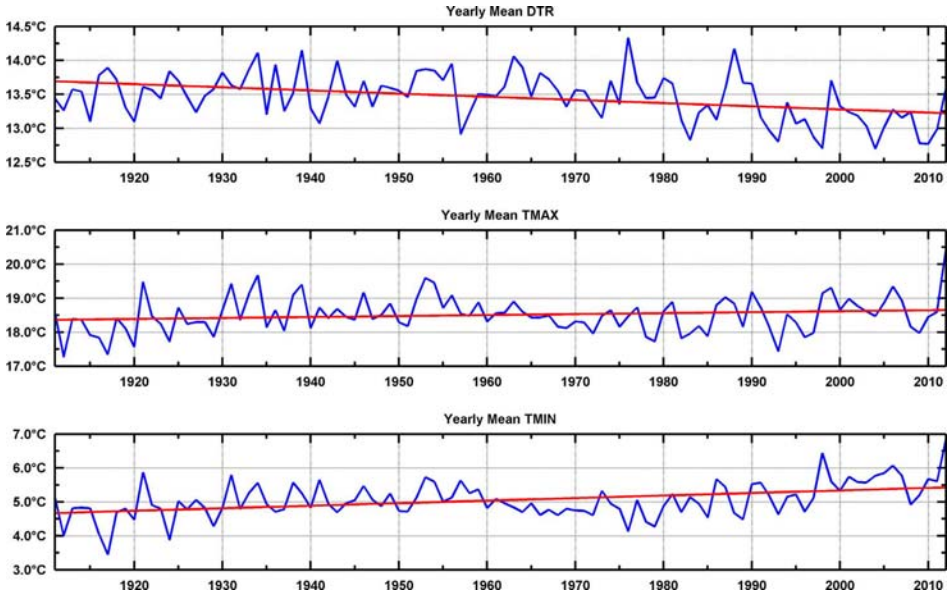

Figure 1. Yearly mean DTR, T_{max}, and T_{min} over the continental USA. The red lines are linear regressions. From [11], (http://creativecommons.org/licenses/by-nc-nd/3.0/).

Note in Figure 1 that the yearly mean DTR decreases, as indicated by the regression line. The reason is that, even though the yearly mean T_{max} increases, the yearly mean T_{min} increases at a faster rate so that the difference, i.e. DTR, decreases over time. The decrease in DTR over time is indicated in many [12-15], but not all investigations [16]. Whereas the reduction in T_{max} can be explained by sunlight being blocked by particulates or by clouds [14], however, the consistent increase in T_{min} is problematic for the climate science community's current understanding of climate science.

The eruption of Mt. St. Helens volcano in Washington State (USA) on May 18,1980 [17] provided an opportunity to assess the short-term influence of tropospheric injection of

volcanic particulates [18]. As the volcanic plume passed overhead in the troposphere, daytime temperatures dropped as the sunlight was absorbed and scattered by the particulates; nighttime temperatures, however, increased, and for a few days thereafter remained elevated presumably due to aerosol dust that persisted for a few days before falling to ground [18].

The diurnal temperature range was significantly lessened by the plume, but almost completely recovered within two days [18]. These observations are consistent with (1) the Mt. St. Helens aerosol particulates in the plume absorbing LW radiation and become heated in the atmosphere overhead, (2) the transfer of that heat to the surrounding atmosphere by molecular collisions, (3) the lowering of the atmospheric adverse temperature gradient relative to the Earth's surface, (4) the consequent reduction of atmospheric convection, and (5) concomitant reduction of convection-driven surface heat loss, which is evident by the increase in T_{min} [19-22].

Generally, the climate science community fails to understand the significant role atmospheric convection plays in heat removal from Earth's surface, instead relying on the role of radiation transport. It seems unaware of the role that convection-efficiency-reduction, caused by atmospheric heating via aerosol particulate heating, plays. For example, the explanation proffered for the Mount St. Helens volcanic plume nighttime heating is "*at night the plume suppressed infrared cooling or produced infrared warming*" [18] – which simply does not make sense.

Because aerosol particulates can serve as cloud condensation nuclei, an increase in aerosol particulates can increase cloud cover by as much as 5% [23]. Clouds, mainly consisting of water droplets or ice crystals, may be considered as assemblages of aerosol particulates [24].

According to Ramanthan et al.[25]: "*Clouds are regulators of the radiative heating of the planet. They reflect a large part of the incoming solar radiation, causing the albedo of the entire earth to be about twice what it would be in the absence of clouds.... Clouds also absorb the longwave (LW) radiation (also known as infrared or thermal radiation) emitted by the warmer earth and emit energy to space at the colder temperatures of the cloud tops. Cloud LW absorption and emission are, in a sense, similar to the radiative effects of atmospheric gases. The combined effect of LW absorption and emission – that is, the greenhouse effect – is a reduction in the LW radiation emitted to space. The greenhouse effect of clouds may be larger than that resulting from a hundredfold increase in the CO_2 concentration of the atmosphere....*"

The explanation proffered by Ramanthan et al. [25] explains cloud-warming, but does not explain trapping heat at Earth's surface; something is missing. Consider instead that atmospheric water droplets, heated by LW radiation, behave in part at least similarly to pollution particles, i.e., they become heated and by molecular collisions *transfer* that heat to the surrounding ambient atmosphere and thereby reduce the adverse temperature gradient relative to Earth's surface. Concomitantly, the heated upper troposphere reduces the efficiency of atmospheric convection which in turn reduces convective heat loss from the surface, generally increasing nighttime T_{min} and abetting global warming.

Clouds and tropospheric particulate pollution thus are common factors that affect the diurnal temperature range, DTR. Hypothetically, one might imagine a more-or-less constant DTR if there were no human-caused particulate-pollution. But that is not the case. Instead one observes the consistent decrease in DTR over time, driven by the consistent increase in

nighttime T_{min} (Figure 1), which, in light of the evidence described above, points to particulate pollution as the principal cause of global warming.

3. WORLD WAR II EVIDENCE

The front page of the January 19, 2017 *New York Times* featured a global surface temperature image. Gottschalk [26,27] noticed a thermal peak coincident with World War II (WW2) and was inspired to further investigate. By applying sophisticated curve-fitting techniques to eight independent global temperature datasets from the U. S. National Oceanic and Atmospheric Administration (NOAA), Gottschalk [26,27] demonstrated that the WW2 peak is a robust feature and concluded that the thermal peak "is a consequence of human activity during WW2."

One of us (JMH) realized that wartime activities were potentially capable of causing abrupt global warming during WW2 by injecting massive amounts of particulate matter into the troposphere from extensive military mobilization and vast munition detonations, which included demolition of entire cities, and their resulting debris and smoke. The implication is that the aerosolized pollution particulates trapped heat that otherwise should have been returned to space, and thus caused global warming at Earth's surface [19].

Figure 2, from [26] is a copy of Gottschalk's figure to which were added three relative-value proxies representing major activities that produce particulate pollution [19]: Global coal production [28,29]; global crude oil production [29,30]; and, global aviation fuel consumption [29]. Each proxy dataset was normalized to its value at the date 1986 and each relative-value curve was then anchored at 1986 to Gottschalk's boldface, weighted average, relative global warming curve. The particulate-proxies track well with the eight NOAA global datasets used by Gottschalk [19].

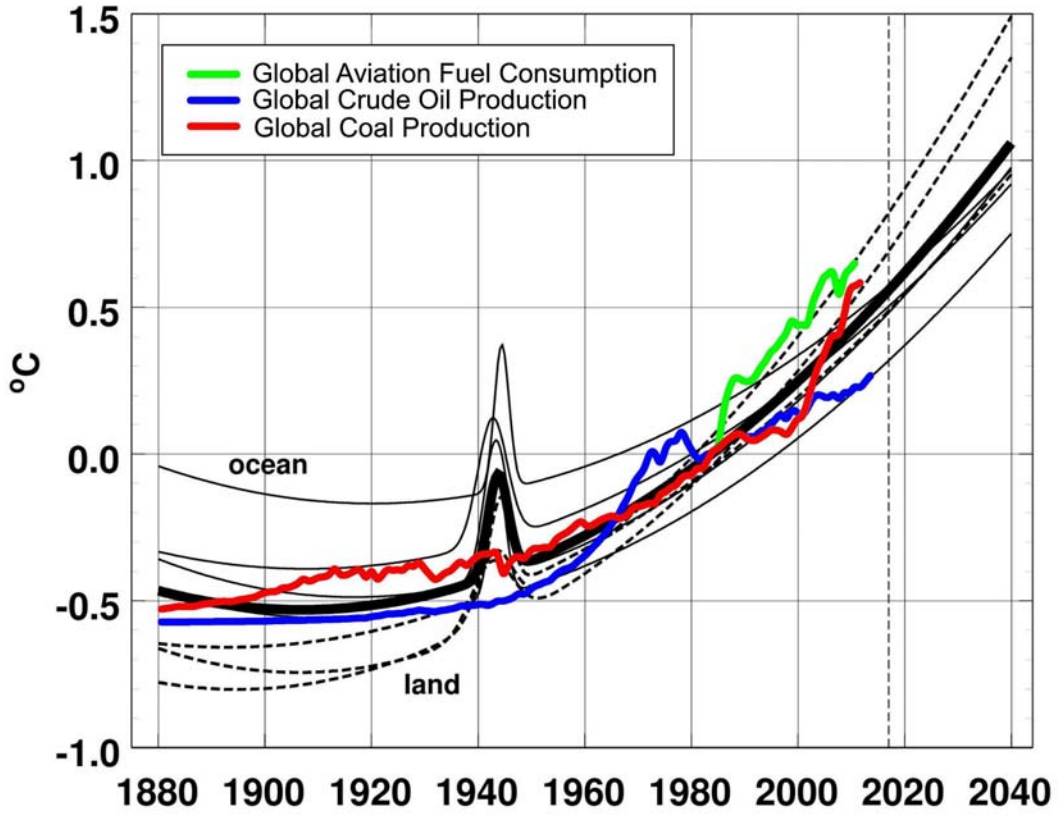

Figure 2. Copy of Gottschalk's fitted curves for eight NOAA data sets showing relative temperature profiles over time [26] to which are added proxies for particulate pollution. Dashed line: land; light line: ocean; bold line: weighted average. From [19].

Atmospheric carbon dioxide (CO_2) can be ruled out as the cause of the thermal peak coincident with WW2: Antarctic Law Dome Ice core data during the period 1936-1952 show no significant increase in CO_2 during the war years, 1939-1945 [31]. Moreover, rapid cessation of WW2 global warming is understandable as tropospheric pollution-particulates typically fall to ground in days to weeks [32], while CO_2 remains in the atmosphere for decades [9].

Following the surrender of Germany and Japan, the wartime aerosol particulates settled to ground, Earth radiated its excess trapped energy, and global warming abruptly subsided for a brief time. Accelerated post-WW2 industrial growth, initially in Europe and Japan, and later in China, India, and the rest of Asia dramatically increased worldwide aerosol particulate pollution and concomitant global warming [33].

4. MECHANISM OF AEROSOL-CAUSED GLOBAL WARMING

Atmospheric convection is dynamically complex; computational models, though simplistic, are generally mathematically complex [34,35], typically based upon parameterized [36] solution of hydrodynamic equations of motion [37,38], which may obscure critical details of the actual physical process of convection.

Chandrasekhar described convection in the following, easy-to-understand way [39]: *The simplest example of thermally induced convection arises when a horizontal layer of fluid is heated from below and an adverse temperature gradient is maintained. The adjective 'adverse' is used to qualify the prevailing temperature gradient, since, on account of thermal expansion, the fluid at the bottom becomes lighter than the fluid at the top; and this is a top-heavy arrangement which is potentially unstable. Under these circumstances the fluid will try to redistribute itself to redress this weakness in its arrangement. This is how thermal convection originates: It represents the efforts of the fluid to restore to itself some degree of stability.*

The adverse temperature gradient and its consequences are rarely, if ever, explicitly considered in geophysical convection calculations [9]. A simple classroom-demonstration experiment, however, can provide critical insight for understanding how convection works [22].

The convection classroom-demonstration experiment was conducted using a 4 liter beaked-beaker, nearly filled with distilled water to which celery seeds were added, and heated on a regulated hot plate. The celery seeds, dragged along by convective motions in the water, served as an indicator of convection. When stable convection was attained, a ceramic tile was placed atop the beaker to retard heat loss, thereby increasing the temperature at the top relative to that at the bottom, thus decreasing the adverse temperature gradient.

Figure 3, from [22], extracted from the video record [40], shows dramatic reduction in convection after placing the tile atop the beaker. In only 60 seconds the number of celery seeds in motion, driven by convection, decreased markedly, demonstrating the principle that reducing the adverse temperature gradient decreases convection. That result is reasonable as zero adverse temperature gradient by definition is zero thermal convection. The implications from this simple classroom demonstration should be quite clear with respect to global warming.

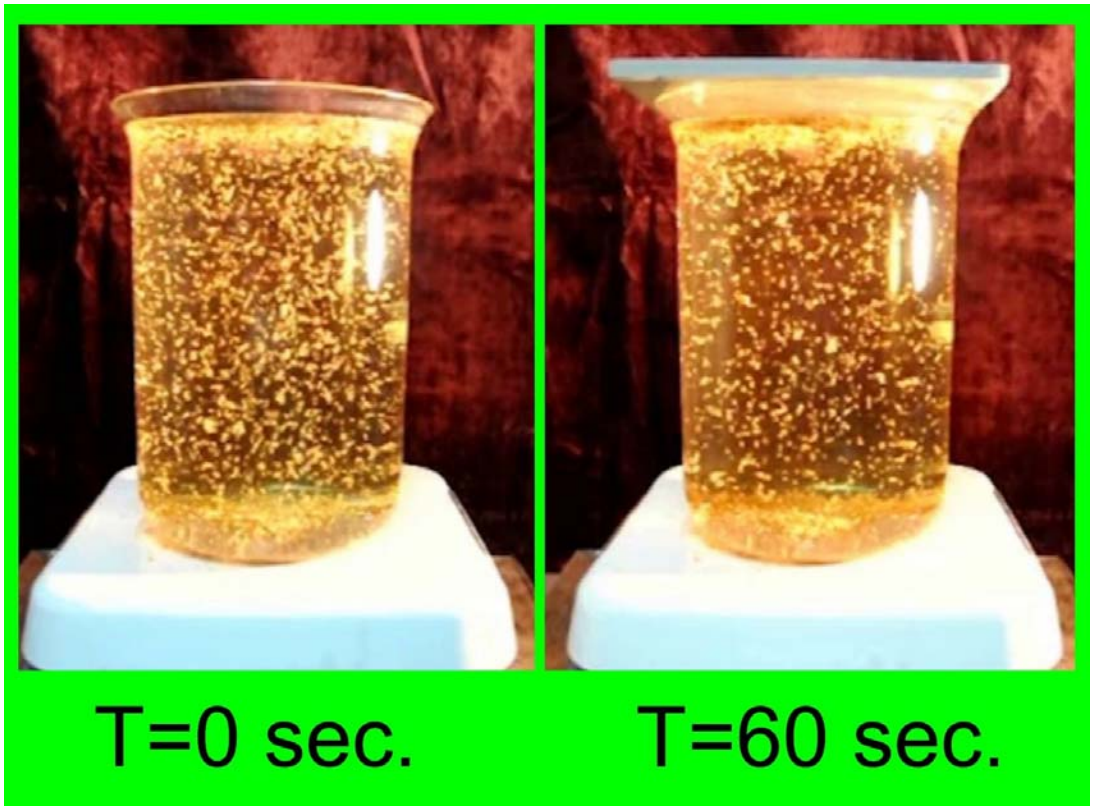

Figure 3. From [22]. A beaker of water on a regulated hot plate with celery seeds pulled along by the fluid convection motions. Placing a ceramic tile atop the beaker a moment after T=0 reduced heat-loss, effectively warming the upper solution's temperature, thus lowering the adverse temperature gradient, and reducing convection, indicated by the decreased number of celery seeds in motion at T=60 sec.

Complex atmospheric convection takes place *throughout the troposphere*, with differing scale-lengths and with various distortions caused by lateral flow. In all instances, however, the relative convection-efficiency is a function of the prevailing adverse temperature gradient. Particulates, heated by radiation, transfer that heat to the surrounding atmosphere, which reduces the adverse temperature gradient relative to the surface and, concomitantly, reduces surface heat loss and thereby causes increased surface warming [22] both locally, as in the case of urban heat islands [41], and globally. *Particulate pollution, not anthropogenic carbon dioxide, is the principal cause of global warming* [19-22].

5. DANGER TO EARTH'S SELF-REGULATION AND BIOTA SURVIVAL

For more than three billion years, our planet, in its own highly complex and inter-related manner, has self-regulated itself thereby producing an environment favorable for the existence of life. From time to time we may discover some interesting fragmentary knowledge, for example, the possibility that oceanic planktonic algae might influence cloud formation through production of dimethylsulphide [42]. However, those who understand science will maintain a sense of humility for the vast number of unknowns related to the workings of Earth. Less humble scientists, on the other hand, heedless of the unknowns involved, willingly promote efforts to *geoengineer* our planet, efforts which can only lead to disaster.

By one count recently [43] there were 2,543 scientific articles on solar radiation management geoengineering that have been published. Scientific papers about geoengineering studiously ignore the fact that tropospheric aerial spraying, done by the military and its various commercial contractors, has been ongoing for at least two decades [44-50]. They also presume future solar radiation "management" will take place in the stratosphere, not in the troposphere where our weather mostly occurs. More grievously, the complicity of silence among climate scientists and engineers cloaks the covert activity of deliberately poisoning the air we all breathe [44,47,50], and deceiving the public about the health risks [51-53], which many allege to be crimes against humanity [54].

Figure 4. From [55]. Photographs of tropospheric aerial particulate geoengineering trails. Rows top to bottom: 1) LaCrosse, Wisconsin (USA), Courtesy of John Brinsko; 2) Bettendorf, Iowa (USA), Courtesy of Amy Fordham; 3) Sussex, UK, Courtesy of Vicky McCarthy; 4) Portland, Oregon (USA), Courtesy of Linda Pope.

Particulate pollution, systematically emplaced in the troposphere, traps heat that should otherwise be removed from the surface by atmospheric convection [19-22]. It also alters natural weather patterns and causes climate chaos [49], including droughts and deluges [49,50], poisons the environment [48], damages the ozone layer that protects us from the solar ultraviolet radiation [56], and is toxic to virtually all biota [57-59], including humans [47,60-62].

6. POISONING THE AIR WE ALL BREATHE

Poor quality air is the greatest environmental threat to human health [63]. On a global basis, diseases related to ambient air pollution accounted for 65% of all life-years lost to environmentally-related disability and death in 2016 [64]. Over 95% of the world's population now breathes polluted air [65]. Particulate matter (PM) pollution is a major cause of non-communicable diseases (NCD's). Fine pollution particles penetrate deep into lungs and systemic circulation and contribute to stroke, heart disease, lung cancer, COPD, respiratory infections, and asthma [66]. While most air pollution deaths occur in low- to medium-income countries in Africa and Asia, cumulative exposure to PM pollution in the U.S. is associated with all-cause lung cancer and cardiopulmonary mortality [67]. Excessive or insufficient combustion of fossil fuels is the dominant source of particulate air pollution on a world-wide basis [68].

Particulate air pollution has known detrimental effects on the human brain and central nervous system. Data now show that air pollution is a major contributor to both stroke and neurodegenerative disease [69]. Both epidemiological and animal studies suggest that air pollution is a risk factor for cognitive decline at all ages and for Alzheimer's Dementia later in life [70].

The recent finding of exogenous magnetite pollution particles in brain tissue of persons with advanced dementia is like a "smoking gun," indicating the relationship between particulate air pollution from coal combustion and neurodegenerative disease [71]. We have shown that the size and morphology of these pollution particles is most consistent with their origin in coal fly ash [61] and we have shown that coal fly ash is consistent with the main particulate being jet-sprayed into the troposphere to geoengineer our planet [44-50].

Virtually everyone in the world is now exposed to air pollution. Adverse consequences of air pollution in children include not only impairment of cognitive and behavioral development, but increased respiratory and other chronic diseases. Studies suggest that humans are "seeded" by air pollutants in utero and this exposure continues throughout life [72,73].

7. TWILIGHT OF HUMANITY

The 1962 publication of *Silent Spring* by Rachel Carson [74] gave rise to a new, grassroots movement dedicated to protecting the environment from the onslaught of industrial toxins. But as time progressed the organizations thus-spawned lost their environmental conscience. Like the academic community, the conservation and environmental communities are silent about the near-daily, near-global aerial tropospheric particulate spraying. The corporate giants that fund all these communities also control the mainstream media that also deceive the public with their silence. Even more grievously, government institutions have been corrupted to aid and abet a treasonous assault on their own as well as the populations of other "sovereign nations."

In the United States, for example, the Environmental Protection Agency in January 2014 ruled coal fly ash to be a solid waste, not a toxic waste, so that it could be dumped in landfills

and rivers, potentially contaminating groundwater [75]. Why? Presumably so that the government or the Pentagon could not be charged with jet-spraying a toxic waste into the troposphere on a near-daily, near-global basis.

One of the U. S. National Institutes of Health, the U.S. National Institute of Environmental Health Sciences, twice rejected without review manuscripts warning of the health risks of the covert aerial spraying [76]. The U.S. Air Force [51], intelligence agencies [77], and NASA [78], work ceaselessly to deceive the public into believing that the aerial particulate spraying is simply harmless ice crystals from jet exhaust, thus preventing the public from understanding the health risks such activity involves. The situation is not substantially different in the European Union or the British Commonwealth [79].

The devastating effects of a rapidly overheating planet combined with the gross pollution of air, water, and soil threatens all forms of life on earth. While global particulate emissions of coal and other fossil fuels can be controlled and reduced, there can be no slowing down or reversing global warming without first recognizing and halting the near-daily, near-global, undisclosed tropospheric aerosol particulate *geoengineering* that is currently devastating the natural processes of planet Earth.

8. CONCLUSIONS

Published data from the 1980 Mt. St. Helens volcanic eruption and diurnal temperature range data provide further new evidence that particulate pollution, not CO_2, is the main cause of global warming. As the plume of Mt. St. Helens erupted volcanic particulates passed overhead, it led to cooler days and, notably, to warmer nights. Heat loss from the surface was reduced at night. The daytime cooling that results from sunlight blocking by aerosolized particulates is more than offset by heat retention during nighttime.

A mechanism is reviewed that accounts for both local and global warming resulting from (1) aerosol particulate pollutants absorbing radiation and being heated in the troposphere, (2) the transfer of that heat to the surrounding atmosphere, (3) the lowering of the atmospheric adverse temperature gradient relative to the Earth's surface, (4) the consequent reduction of atmospheric convection, and (5) concomitant reduction of convection-driven surface heat loss.

Graphic data shows global warming in lockstep with tropospheric aerosol particulate pollution, with both processes increasing in exponential fashion in recent decades. Particulate pollution health risks are reviewed, noting for example that fine pollution particles penetrate deep into lungs and systemic circulation and contribute to stroke, heart disease, lung cancer, COPD, respiratory infections, asthma, and neurodegenerative disease.

The good news is that global warming can be substantially and quickly reduced if particulate-trapping and particulate-reducing technologies are universally applied *and* the aerial particulate jet-spraying ceases. The bad news is that dominant segments of academic and other significant institutional communities – government and government-contractors, intelligence agencies, environmental organizations, media, and military – are complicit and profit from poisoning the air we breathe. No one should derive benefit therefrom; something is fundamentally wrong.

Climate change and global air pollution are now environmental and public health emergencies. Particulate pollution, including particulate combustion-products of fossil fuels, is a primary cause for both of these modern disasters. Responsible science is all about correcting mistakes, and a new paradigm is desperately needed to better understand and

confront these closely intertwined crises. The causes of air pollution and associated runaway warming are modifiable but corrective actions necessarily hinge on international cooperation at all levels of authority.

Ongoing, near-global, and "hidden in plain sight," programs of tropospheric aerosol geoengineering are making a bad situation unimaginably worse: These operations must be recognized and halted. There is no time for complacency – these are the greatest challenges mankind may ever face.

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