



Evidence Relating Aerosolized Coal Fly Ash and Global Wildfire Increases to Stratospheric Ozone Loss

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Abstract: Nearly four decades of effort have failed to halt the problem of stratospheric ozone depletion, suggesting the possibility that the underlying cause of this depletion was misdiagnosed. Beginning in 2022, we proposed that aerosolized coal fly ash is an ice-nucleating and ozone-reactive particulate and serves as an alternative source and activation platform for chlorine, bromine and iodine. Coal fly ash is known to be able to destroy ozone by various other means. Recently, we showed that elemental analyses of coal fly ash are wholly consistent with arrayed and published stratospheric particle data which we have now extended to include global wildfire data. Global wildfire ash differs from ash produced in the laboratory from burning wood in that wildfire ash incorporates an iron-rich component. We demonstrate that both elemental-composition and water-leach data from coal fly ash and wildfire data-sets are consistent. For nearly 30 years, particulate matter consistent with coal fly ash has been jet-emplaced into the global upper troposphere and lower stratosphere and then settles to ground. In 2018, we explained how aerosolized coal fly ash widely deposited over land “sets the stage” for increasingly even more deadly forest fires. Wildfires are able to remobilize the fly ash particles deposited on trees and the underlying soil and vegetation. The wildfire ash components cool, attract, and adhere to one another from within this common ash-reservoir. Coal fly ash remobilized and incorporated into wildfire smoke can be uplifted into the stratosphere to destroy ozone. We show the striking parallel between the global loss of acreage due to fire and a proxy for jet-emplaced coal fly ash. This fundamentally new understanding of coal fly ash and its recombination into forest fire smoke with both particulate aerosols contributing to ongoing stratospheric ozone depletion is one profound reason that aerosolization of coal fly ash must cease and desist.

Keywords: aerosolized coal fly ash, stratospheric ozone depletion, stratospheric particles, Montreal Protocol, ozone hole, wildfires, forest fires, fire loss, ultraviolet radiation

INTRODUCTION

For nearly half a century, essentially one set of ideas has dominated scientific considerations related to stratospheric ozone destruction. Halogen radicals destroy stratospheric ozone through gas-phase catalytic reaction cycles. Aerosol and polar-stratospheric-cloud surfaces do not generally catalyze the ozone-destruction reactions themselves; instead, heterogeneous reactions on these surfaces convert relatively inactive halogen reservoir compounds into photolabile forms that release ozone-destroying radicals [1-3]. With respect to popular ideas about the cause of the Antarctic ozone hole [4], surface matter enables or accelerates the conversion of reservoir chlorine into reactive chlorine; it does not ordinarily serve as a surface on which ozone itself is destroyed.

Beginning in 2022, we [5-9] set forth a fundamentally different concept, namely, that aerosolized coal fly ash, uplifted into the stratosphere, destroys stratospheric ozone by a number of different means. Here we present new data that connects aerosolized coal fly ash not only to stratospheric ozone loss but to a broad spectrum of globally disastrous events including increasing global forest wildfires and as well connecting wildfire ash to stratospheric ozone loss.

CONNECTING AEROSOLIZED COAL FLY ASH TO STRATOSPHERIC OZONE LOSS

Initially, we proposed aerosolized coal fly ash as an ice-nucleating and ozone-reactive particulate, and as an alternative source and activation platform for chlorine, bromine and iodine [5-7]. Coal fly ash not only contains these halogens [10] (Table 1), but numerous other components that have been shown to destroy ozone, e.g., carbon particles, mineral oxides, and oxides of iron and manganese [5, 6, 11].

Table 1: Coal fly ash range of halogen element compositions [10].

Chlorine µg/g	Bromine µg/g	Fluorine µg/g	Iodine µg/g
13 – 25,000	0.3 – 670	0.4 – 624	0.1 – 200

Aerosolized coal fly ash is presumably transported into the stratosphere by deep convection storms [12], by large scale atmospheric mixing [13], by the Asian summer monsoon anti-cyclone [14], by direct injections from high-flying aircraft [15] and perhaps by other means. Aerosolized coal fly ash (by analogy with terrestrial observations) is concentrated in stratospheric clouds whereupon in spring the coal fly ash particles are released making them available for depleting ozone [7]. Acidic processing, irradiation, iron chemistry and reactions on particle or ice surfaces mobilize the particle-bound halogens. The resulting Cl, Br and possibly I radicals participate in catalytic ozone-destruction cycles. Iron-bearing ash can additionally destroy ozone directly, generate reactive oxygen species and promote polar-cloud formation.

Although we were able to show the similarity of coal fly ash particles with captured polar stratospheric particles, these were quite limited in number [5]. In 2023, Murphy et al. [16] arrayed vast amounts of stratospheric particle data in an attempt to make the case that these particles in large part consist of debris from meteors and reentry spacecraft, for example claiming that lithium came from batteries while niobium and hafnium came from rocket nose cones. In striking contrast, we found that same data to be wholly consistent with aerosolized coal fly ash. That identification, described below, profoundly supports our published association of aerosolized coal fly ash with stratospheric ozone depletion [5-7].

We chose to submit that fundamental identification as a Brief Report to the *Proceedings of the National Academy of Sciences* (PNAS), which unwarrantedly rejected the submission without review, but was published in the *European Journal of Applied Sciences* [9], and is presented here along with additional related data providing crucial background for this investigation.

Vast amounts of money have been spent imaging and measuring stratospheric particles. Understanding their origins, however, has proved challenging. In 2023, Murphy et al. [16] arrayed stratospheric particle data in an attempt to make the case that these particles in large part consist of debris from meteors and reentry spacecraft. Within the framework of that arrayed data, we demonstrate an entirely different identification for these stratospheric particles, namely, aerosolized coal fly ash.

Evidence indicates that aerosolized coal fly ash particles can be uplifted into the stratosphere [12-15]. The ultrafine grain-size of coal fly ash [17] lends itself to aerosolization. Its massive annual production, which in 2019 was reported to be 4.61×10^8 tons/year [18], renders it a prime candidate for efficient transport into the stratosphere by various means.

Here we present elemental analyses of coal fly ash which explain within said arrayed data all the findings previously attributed to meteoric material and reentry spacecraft [16].

Rather than plotting atop the published graphs [16], which might be confusing, we reproduced the graphs of Murphy et al. [16]. Then we placed along their sides our graphs having identical ranges for plotting coal fly ash data, as presented by Figures 1, 2 and 3.

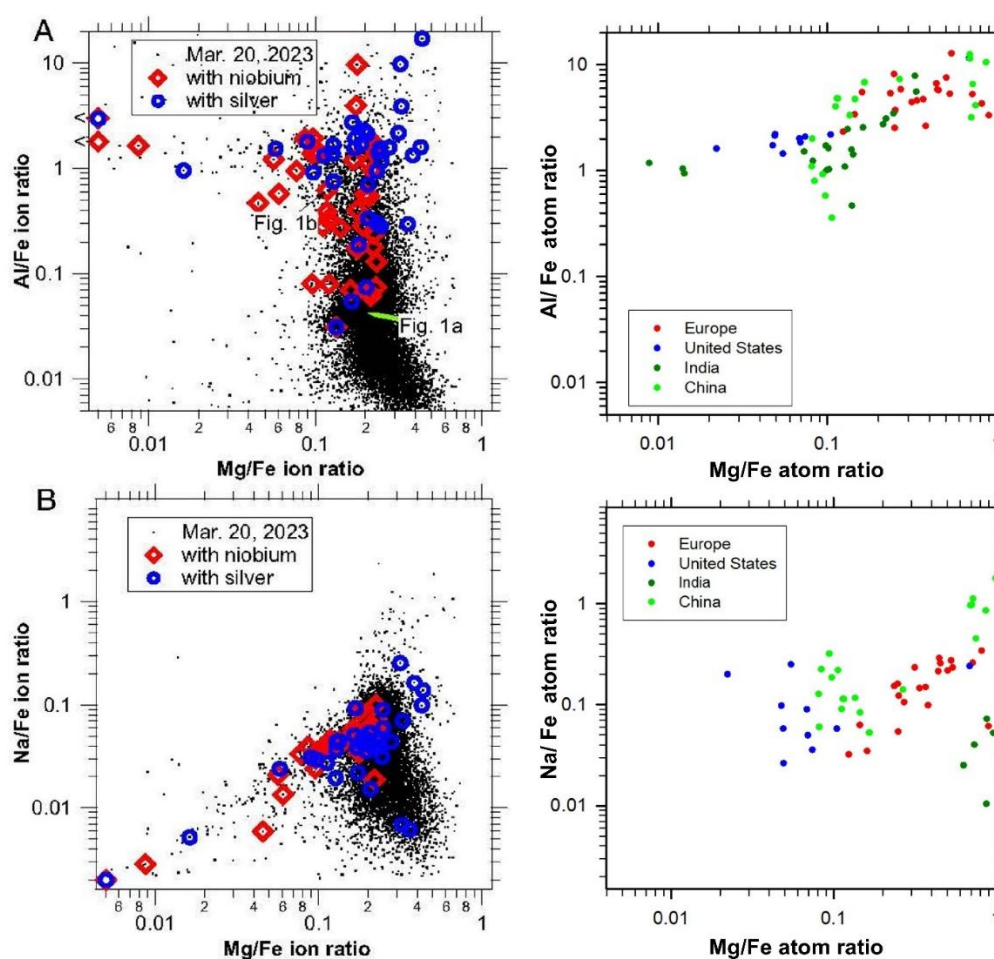


Figure 1: Left: Figure 2 of Murphy et al. [16] side by side with our plots of published coal fly ash data [19-25].

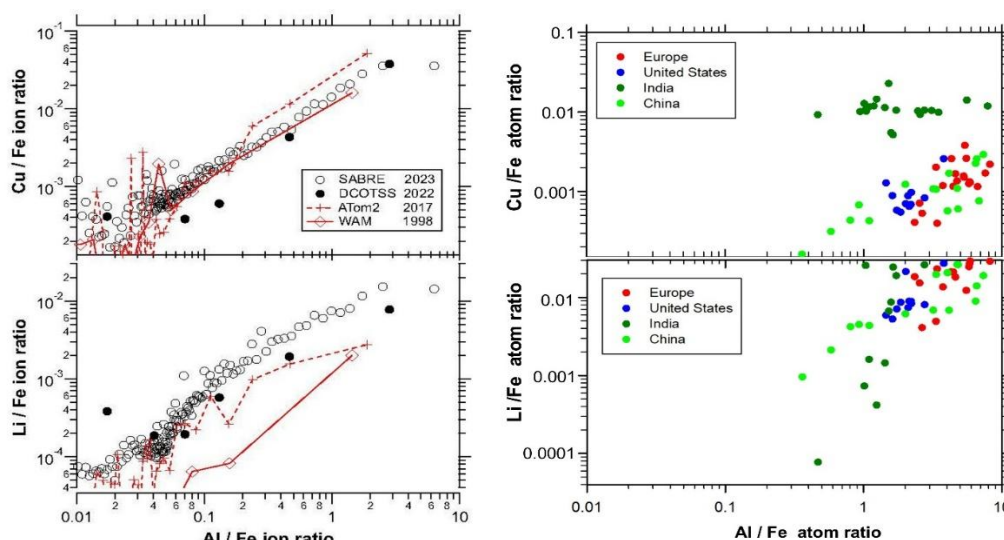


Figure 2: Left: Figure 3 of Murphy et al. [16] side by side with our plots of published coal fly ash data [19-25].

Our data, used in Figures 1 and 2, consist of 12 United States coal fly ash samples [19], 23 coal fly ash samples from Europe [20], 20 from India [21], and 24 coal fly ash samples from China [22-25]. Only those data that plot within the respective graph-ranges are shown.

Figure 3 is a comparison within the same respective graph-ranges of Supplemental Figure 3 from Murphy et al. [16] with the coal fly ash data from the same data-set shown in Figures 1 and 2.

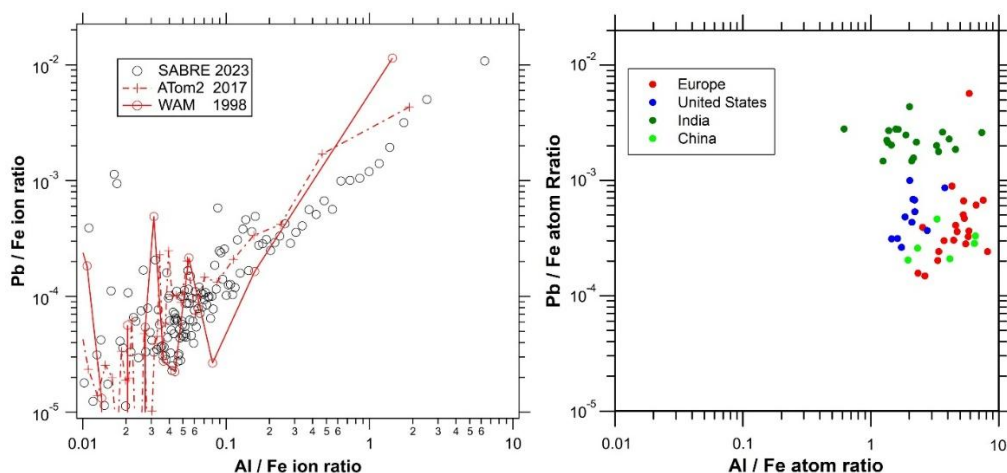


Figure 3: Left: Supplemental Figure 3 of Murphy et al. [16] side by side with our plot of published coal fly ash data [19-25].

Even though from a population of only 79 coal fly ash samples, Figures 1, 2 and 3 demonstrate quite clearly, without *ad hoc* assumptions, that aerosolized coal fly ash is entirely consistent with the multitude of stratospheric particles arrayed by Murphy et al. [16]. Moreover, the same document states: “*In addition to the very clear reentry signals from Li, Al, Cu, Nb, Ag, Hf, and Pb, other elements were detected.... These include Be, Mg,*

Ti, Cr, Fe, Ni, Zn, Ga, Mo, Cd, In, Sn, Sb, Ba, Ce, Pr, Nd, Ta, W, and Bi.” All of these elements are found in coal fly ash [19-25].

In the Supplemental Data, Murphy et al. [16] present a plot of numerous Hafnium Ion Signals (fraction of ions) versus Niobium Ion Signals and show a red linear fit. A Niobium value of 0.1 corresponds to Nb/Hf = 11.42 with unknown statistical error. Eleven Nb/Hf atom ratios from coal fly ash determinations [22, 24, 25] yield an average of 9.56 ± 7.74 .

Despite restrictions on chlorofluorocarbon production since the 1989 Montreal Protocol, the destruction of stratospheric ozone has not declined, but increased [26-28].

Unlike debris from meteors and reentry spacecraft, coal fly ash contains numerous substances that have been shown to destroy ozone [5, 11].

We have provided evidence that aerosolized coal fly ash is a significant destroyer of stratospheric ozone [5, 6]. The data shown in Figures 1, 2 and 3 provide additional compelling evidence that aerosolized coal fly ash can account for the multitude of stratospheric particles previously attributed to debris from meteors and reentry spacecraft.

CONNECTING AEROSOLIZED COAL FLY ASH TO GLOBAL WILDFIRES

There is observational and experimental evidence that wildfires remobilize elemental contaminants deposited on trees, underlying soil and vegetation [29-33]. Here we examine global wildfire data [34, 35] to demonstrate (1) that it is indeed contaminated and (2) that said contamination appears consistent with remobilized coal fly ash.

Although elemental analyses of wildfire ash are quite limited in number and, notably, limited in the number of elements measured, that data is considerably more extensive than elemental data on laboratory-produced ash from burning wood. Nevertheless, the limited data shown in Table 2 are quite revealing.

Table 2

Comparison of Wildfire Ash with Non-Wildfire Burnt Wood Ash	Atom Ratio	Sam- ples	Average Value	Low Value	High Value
Neris et al. Global Wildfire Ash	B/Fe	59	0.0206	0.0002	0.2300
Singh et al. Non-Wildfire Ash	B/Fe	5	2.5372	0.5166	4.1179
Misra et al. Non-Wildfire Ash	B/Fe	6	1.6064	0.5344	3.6162
Plumlee et al. California Wildfire Ash	Li/Fe	2	0.0044	0.0022	0.0065
Singh et al. Non-Wildfire Ash	Li/Fe	5	4.9984	1.6422	9.9128
Ju YuanHua et al. Non-Wildfire Ash	Li/Fe	6	7.4514	0.3864	27.4787

Table 2 references: Neris et al. [34]; Singh et al. [36]; Misra et al. [37]; Plumlee et al. [35]; Ju YuanHua et al. [38].

Note from Table 2 that the atom ratio B/Fe is considerably greater in the Non-Wildfire Ash than the comparable ratio in the Global Wildfire Ash. Likewise, the atom ratio Li/Fe is considerably greater in the Non-Wildfire Ash than the comparable ratio in the California Wildfire Ash. Clearly, both the Global Wildfire Ash and the California Wildfire Ash were contaminated by an iron-rich component that had the effect of reducing the B/Fe and Li/Fe ratios in the Wildfire Ash data.

For nearly 30 years, particulate matter has been jet-emplaced into the upper troposphere and lower stratosphere on a near-daily, near-global basis. Government officials around the world neither acknowledge the existence of such a program nor acknowledge the chemical composition of said particulate matter. Individuals and institutions that concomitantly benefit financially likewise do not acknowledge that near-global aerial assault. However, for over 10 years, we have provided scientific data indicating that said particulate matter is consistent with aerosolized coal fly ash [39-44].

Although data limitations currently prevent a wholly unambiguous characterization, nevertheless the data we present below provides compelling evidence that the major contaminant of analyzed wildfire ash is coal fly ash.

In Figure 4 we compare the average value of the atom ratios of elements, relative to iron, in the following three data bases: European Coal Fly Ash [20]; American Fly Ash [19]; and, Global Wildfire Ash [34].

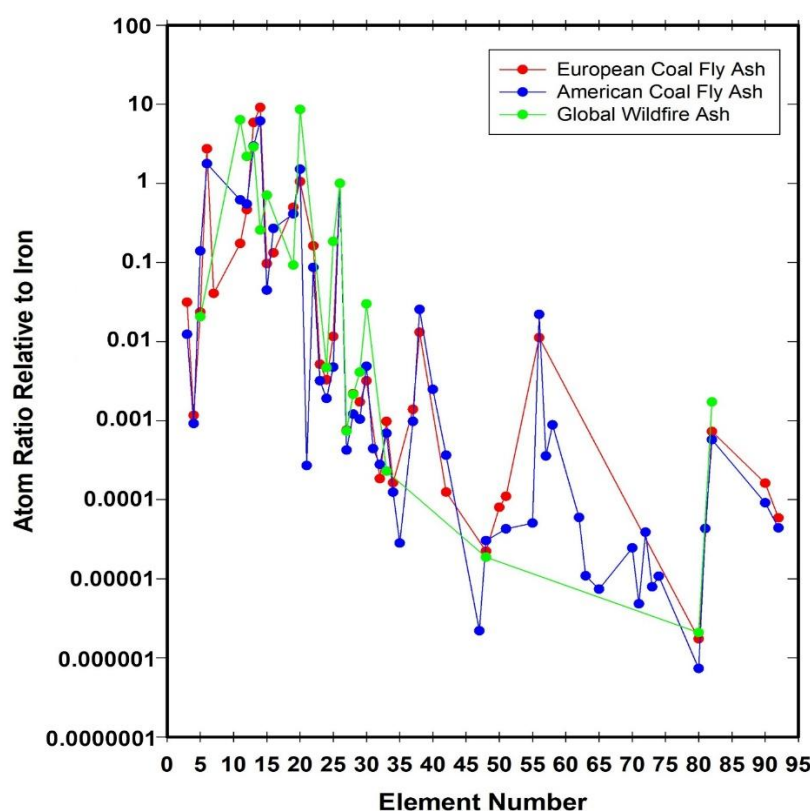


Figure 4: Comparison of average values of element atom ratios with respect to Iron in European Coal Fly Ash [20], American Coal Fly Ash [19] and Global Wildfire Ash [34] data bases.

Consider first the comparison of European and American Coal Fly Ash. Note that there are more element ratios shown in the American data than in the European data. Observe in Figure 4 that the American and European data are more-or-less consistent with one another. The European data skips across sections where its data points are missing and again joins up with the American data. A similar circumstance appears to exist for the Global Wildfire Ash data, throughout all the published data.

Within the limitations of the data used in Figure 4, it appears that wildfires remobilize and re-aerosolize coal fly ash contaminants deposited on trees, underlying soil and vegetation. Some of this wildfire ash likely get swept into the stratosphere bringing along associated coal fly ash components for reaction with and depletion of stratospheric ozone.

Consider another line of evidence connecting coal fly ash with global wildfire ash. Coal fly ash is unlike most geological materials in that water is capable of leaching portions of numerous elements, making them soluble in water. Both Morena et al. [20] and Sulaway et al. [19] report not just coal fly ash compositions, but compositions of the water leaching experiments. The Global Wildfire Ash [34] data also reports on aqueous leaching of wildfire ash. Figure 5 compares these sets of leach data.

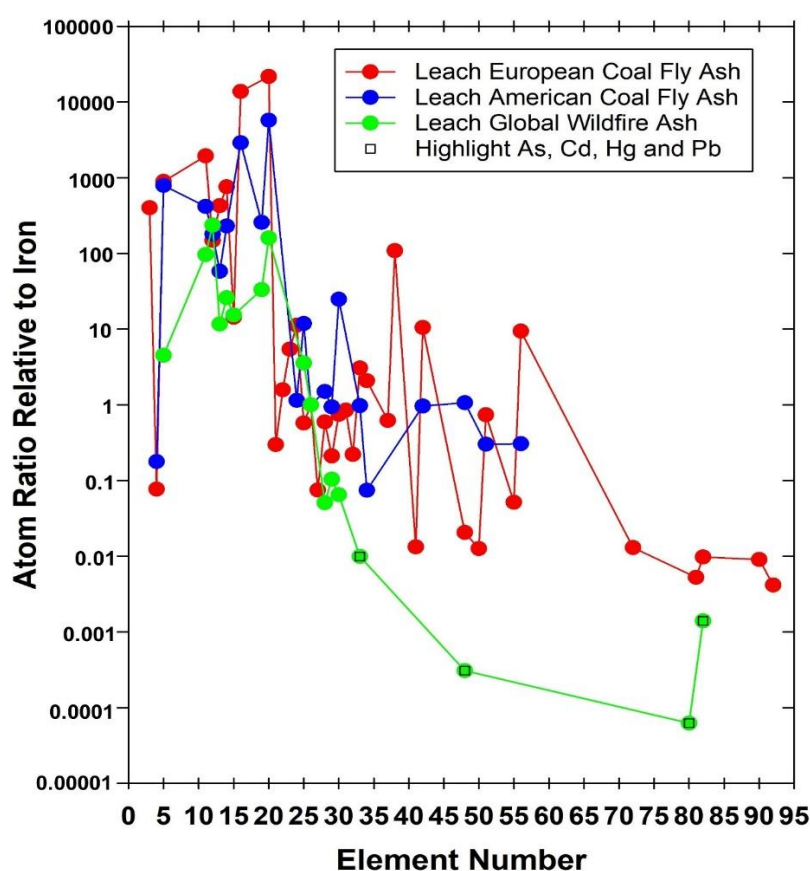


Figure 5: Comparison of average values of leachate-element atom ratios with respect to Iron in European Coal Fly Ash [20], American Coal Fly Ash [19] and Global Wildfire Ash [34] data bases.

Three highly volatile elements, arsenic, cadmium, and mercury seem underabundant in the wildfire leach data. Otherwise, these data provide further confirmation that wildfire ash is associated with coal fly ash. The association of wildfire ash with coal fly ash is reasonable and expected. Wildfires, as noted above, remobilize elemental contaminants deposited on trees, underlying soil and vegetation [29-33]. These ash components all cool, attract, and adhere to one another from within a common ash-reservoir.

CONNECTING GLOBAL WILDFIRES TO STRATOSPHERIC OZONE LOSS

In Figures 1, 2 and 3, we presented elemental analyses of coal fly ash which explain within said arrayed data all the findings previously attributed to meteoric material and reentry spacecraft [16]. Rather than plotting atop the graphs, which might be confusing, we reproduced the graphs of Murphy et al. [16]. Then we placed along their sides our graphs having identical ranges for plotting coal fly ash data, as presented by Figures 1, 2 and 3.

Figures 6, 7 and 8, reproduce Figures 1, 2 and 3, with the addition of global wildfire ash data added to each figure.

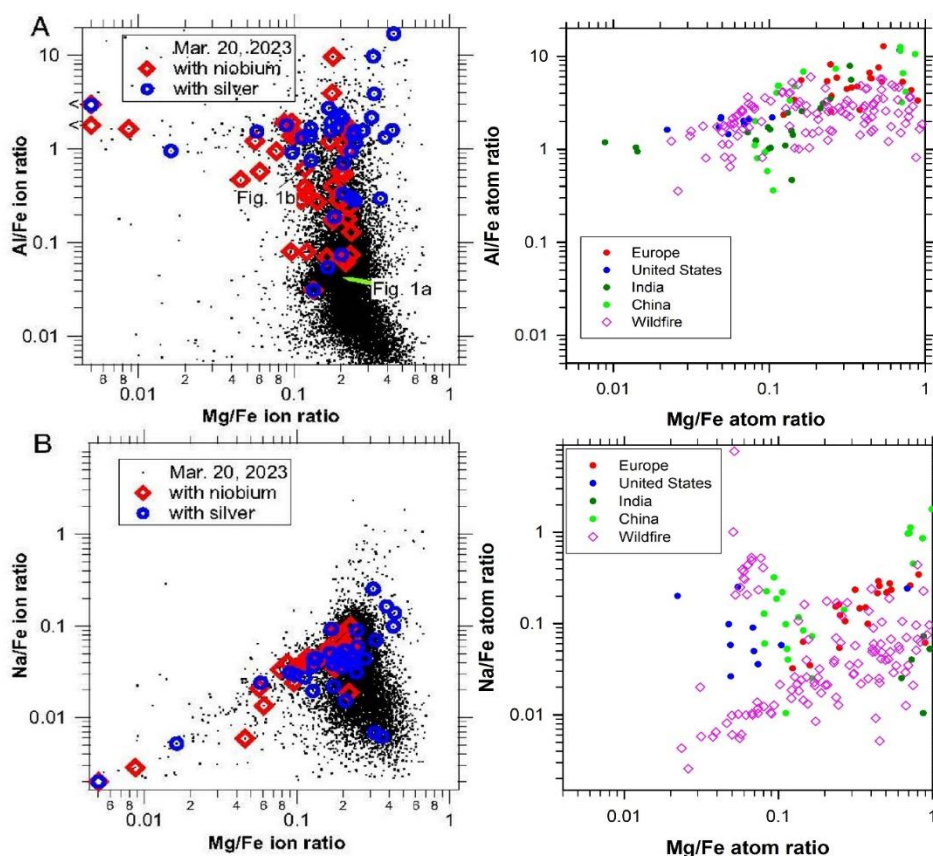


Figure 6: Left: Figure 2 of Murphy et al. [16] side by side with our plots of published coal fly ash data [19-25] and global wildfire ash data [34].

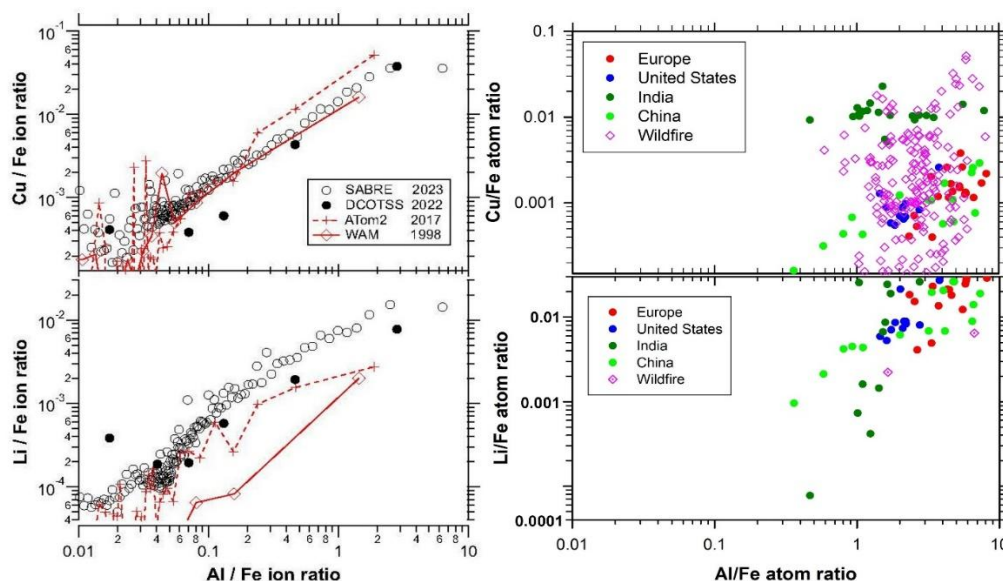


Figure 7: Left: Figure 3 of Murphy et al. [16] side by side with our plots of published coal fly ash data [19-25] and global wildfire ash data [34, 35].

Note that wildfire ash data for Li/Fe was extremely limited, yet each ratio plotted consistently with the coal fly ash data.

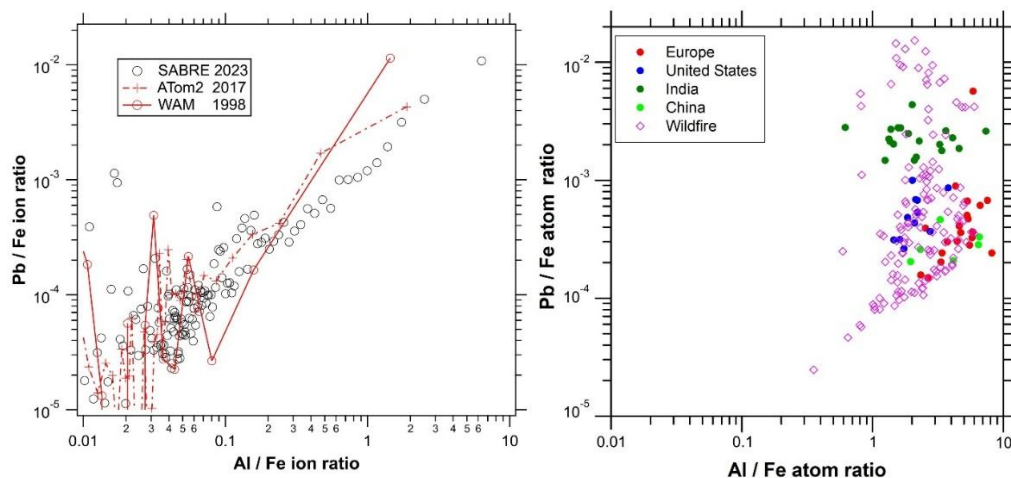


Figure 8: Left: Supplemental Figure 3 of Murphy et al. [16] side by side with our plot of published coal fly ash data [19-25] and global wildfire ash data [34].

ANTHROPOGENIC BASIS OF GLOBAL WILDFIRE INCREASES

In 2018, we published a scientific article entitled California Wildfires: Role of Undisclosed Atmospheric Manipulation and Geoengineering [45].

In that article we described some of the consequences of jet-emplaced coal fly ash into the upper troposphere and lower stratosphere, including: inhibiting rainfall, heating the atmosphere, heating the surface regions, making atmospheric water more electrically conducting, causing drought, causing deluges, poisoning soil, disrupting agriculture, and causing tree deaths. Moreover, we also pointed out that jet-emplaced coal fly ash

exacerbates wildfires [45]. Subsequently, we demonstrated the manner by which rare Torrey Pines and Giant Sequoias are being killed as a consequence of jet-emplaced coal fly ash, a process also applicable to global forests in general [46, 47] (Figure 9).



Figure 9: Dead Torrey Pines against chemtrail filled sky, consistent with aerosolized coal fly ash [46].

What we discovered and described here is of gravely more serious concern with respect to global forest fire causation. The near daily, near-global deliberate jet-assisted aerosolization of coal fly ash not only produces circumstances favorable for wildfires, but the wildfires themselves re-aerosolize coal fly ash which adds directly to the anthropogenic coal fly ash aerosolization. Even if jet-emplaced coal fly ash were constant (which there is no reason to believe) the feed-back mechanism of wildfire re-aerosolization might cause increasing loss of timber due to forest fires as well as harbor significant consequences for stratospheric ozone loss. There is a striking parallel between annual area of forest fire disturbance and the relative annual chemtrail activity (Figure 10).

The near-daily, near-global deliberate emplacement of coal fly ash into the upper troposphere and lower stratosphere is a highly-secret, covert activity combined with a fully orchestrated disinformation program to deceive the public. Consequently, the most important data, such as the annual amount of coal fly ash used for clandestine geoengineering purposes, are unavailable. However, there is a way to obtain an estimate of the annual relative change in coal fly ash that is deliberately added to the atmosphere in the form of chemtrails based upon cultural responses [49]. The more aerosol trails in the sky, the more people are apt to notice, be concerned, and express their concerns in writing. One relative measure is to plot annual counts of the usage of the word “chemtrail”, including capitalizations and plurals, in Google Books [50], as shown in the lower portion of Figure 10.

The most significant consequence of stratospheric ozone loss is the allowance of increased levels of harmful solar ultraviolet radiation reaching Earth’s surface. Solar ultraviolet radiation has adversely affected mixed conifer forests in the U.S. most of the

last century, and presumably throughout the world. Foliar injury, premature needle abscission, crown thinning, and reduced growth due to this type of oxidant pollution injury has been well documented in ponderosa pines and Jeffrey pines in Southern California [51]. Industrial pollution (including products of coal combustion) contributes to the reduced growth and reproduction of vascular plants, effects which may be accentuated by a warming climate [52]. Tree leaves and needles effectively collect and concentrate a significant percentage of the particulate matter in air pollution [53] and dissolve from aerosolized coal fly ash, including highly toxic [54] aluminum in a chemically mobile form from the reaction of atmospheric water with aerosolized coal fly ash [45-47]. The deposition of heavy metals from particulate air pollution is implicated in forest decline in many parts of the world including North America and Europe [55].

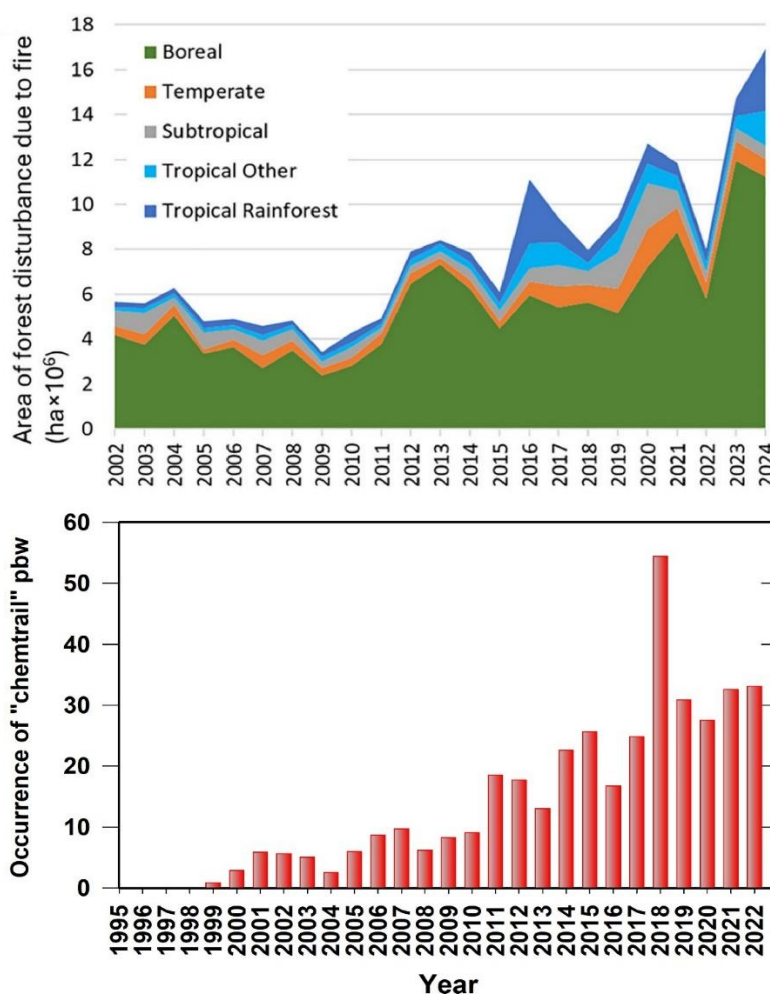


Figure 10: Upper: Annual global forest disturbance due to fire, 2002-2024, by climate domain. Reproduced from Potapov et al. [48], Figure 1A, CC BY 4.0. Lower: Proxy for relative chemtrail activity.

The waxy surfaces on plants confer protection against pathogens, environmental extremes, and air pollution. One of the main barriers to the harmful effects of air pollution in conifers is the epidermal wax covering of the needles. Cuticular waxes regulate diffusion of water and gas, and their biochemistry has been widely studied [56]. The main factors

affecting the adsorptive capacities of tree leaves/needles in coniferous trees are the number of stomata, the amount of epicuticular wax, and the properties of the cuticle in different seasons [57]. Particulate pollutants are able to degrade epicuticular waxes and decrease the drought tolerance of Scots pine (*Pinus sylvestris* L) [58]. Air pollution produces an amorphous appearance of epicuticular waxes in conifers, called wax erosion, which correlates with visible tree damage [59]. Cuticular wax erosion caused by air pollution destroys surface wax 2-5 times as rapidly as natural aging [56]. Increases in solar ultraviolet radiation [60-62] damage and weaken trees making them more susceptible to hostile pathogens. The addition of particulate matter to the upper troposphere reduces atmospheric convection, causing regional and global warming, and, notably, keeps night-time temperatures elevated [40, 63, 64]. All of these thermal consequences enhance the likely hood of forest wildfires.

CONCLUSIONS

Nearly four decades of effort have failed to halt the problem of stratospheric ozone depletion. Meanwhile, the biosphere is suffering. Wildfires around the globe are markedly increasing. Beginning in 2022, we proposed that aerosolized coal fly ash is an ice-nucleating and ozone-reactive particulate and serves as an alternative source and activation platform for chlorine, bromine and iodine. Coal fly ash is known to be able to destroy ozone by various other means. Recently, we showed that elemental analyses of coal fly ash are wholly consistent with a vast quantity of arrayed and published stratospheric particle data which we have now extended to include global wildfire data.

Global wildfire ash differs from ash produced in the laboratory from burning wood in that wildfire ash incorporates an iron-rich component. We demonstrated that both elemental-composition and water-leach data from coal fly ash and wildfire data-sets are consistent. For nearly 30 years, particulate matter consistent with coal fly ash has been jet-emplaced into the global upper troposphere and lower stratosphere and then settles to ground. In 2018, we explained how aerosolized coal fly ash widely deposited over land “sets the stage” for increasingly even more deadly forest fires.

Wildfires are able to remobilize the fly ash particles deposited on trees and the underlying soil and vegetation. The wildfire ash components cool, attract, and adhere to one another from within this common ash-reservoir. Coal fly ash remobilized and incorporated into wildfire smoke can be uplifted into the stratosphere to destroy ozone. We show the striking parallel between the global loss of acreage due to fire and a proxy for jet-emplaced coal fly ash. This fundamentally new understanding of coal fly ash and its recombination into forest fire smoke with both particulate aerosols contributing to ongoing stratospheric ozone depletion is one profound reason that aerosolization of coal fly ash must cease and desist.

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