ISSN: 2634-9221
European Journal of Applied Sciences; Vol. 14 No. 04 (2026) (340-355)
https://doi.org/10.14738/aivp.1404.12101

CENTRAL ROLE OF AEROSOLIZED COAL FLY ASH IN THE GLOBAL *SARGASSUM* CRISIS

J. Marvin Herndon, Ph.D.
Transdyne Corporation, Dewees Island, SC 29451 USA

Mark Whiteside, M.D., M.P.H
Key West, FL 33040 USA

ABSTRACT

Currently, pelagic *Sargassum* seaweed blooms represent a near-global ecological disaster. The purpose of the present study is to point to evidence that aerosolized coal fly ash is the "smoking gun", a major, if not *the* major, causal-factor underlying the Global *Sargassum* Crisis. At least as far back as the 1990s, concerned citizens had started to notice white trails, often called "chemtrails" that stretched across the sky ultimately becoming a white haze. As time passed these became more frequent and were observed over wider geographic regions. Published elemental data of pelagic *Sargassum* samples, as ratios relative to barium, are largely consistent with the range of corresponding element ratios from European and American coal fly ash samples, providing evidence of *Sargassum* incorporation of matter from aerosolized coal fly ash. We obtained a proxy for the unavailable relative annual amount of geoengineering aerosolized coal fly ash by using the annual occurrence of the word "chemtrail" in Google Books. The striking increase in that proxy for relative annual change in chemtrail activity parallels the formation of the Great Atlantic *Sargassum* Belt beginning circa 2011. Moreover, cited experimental data provide direct evidence that coal fly ash acts as a nutrient and fertilizer for bacteria and cyanobacteria. Both symbiotic heterotrophic, diazotrophic (nitrogen-fixing) cyanobacteria and bacteria located within *Sargassum* biofilm require ample iron because the nitrogenase enzyme complex requires large amounts of this element to fix nitrogen. The solution for halting, or at least profoundly reducing, the current Global *Sargassum* Crisis is simple: End atmospheric contamination by aerosolized coal fly ash. Cease coal fly ash use for geoengineering, and sequester all coal fly ash from smokestack exhaust. Were this to be done, not only would the Global *Sargassum* Crisis subside, but global warming would subside and stratospheric ozone depletion would subside. Moreover, human and environmental health would markedly improve.

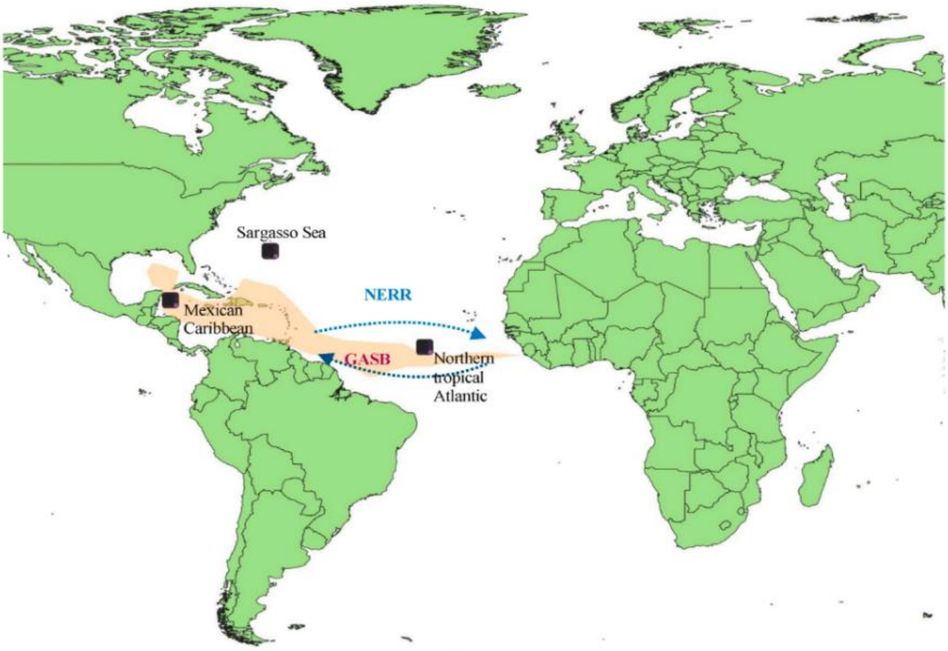
INTRODUCTION

Pelagic *Sargassum* seaweed blooms currently (2025-26) represent a near-global ecological disaster and pose immense challenges to coastal areas from West Africa across the Atlantic to the northern coasts of South America, the Caribbean, Gulf of Mexico, and the Southeast U.S. coast, especially Florida (Figure 1).

Since the formation of the Great Atlantic *Sargassum* Belt circa 2011, these blooms have been increasing in both size (tens of millions of tons) and duration (now up to 6-9 months per year, whereas previously 3-4 months per year mainly in the summer), devastating ecosystems, economies, flora and fauna, and threatening human health. These blooms carry toxic elements, pollutants (like pesticides), pathogens, and sometimes exotic species to coastal areas. On or near the beaches *Sargassum* begins to rot within 1-2 days, and then it begins releasing toxic gases like hydrogen sulfide and ammonia, leaching toxic elements into the water, and smothering and poisoning sea grass and corals. Large amounts of carbon and nutrients (phosphorus and nitrogen) are released, causing brownification of the nearshore water, the so-called "*Sargassum* brown tides." The beaches undergo erosion, sand contamination, and a transition from a sandy to a muddy bottom, and local hypoxic/anoxic conditions. The economic impact of the landings is severe, threatening tourism, fishing and other coastal industries, not to mention the well-being and mental health of residents. Much of the research to date on *Sargassum* has been conducted in Mexico and the Caribbean. Although progress has been made, major gaps remain in our knowledge of these blooms and how to prevent and combat them [1].

Figure 1: Left: *Sargassum* accumulation on the beach in Key West, Florida USA. Right: *Sargassum* rotting and brownifying the ocean water.

Large floating mats of golden-brown seaweed in the center of the North Atlantic were allegedly reported by Christopher Columbus in the 15th Century. This area became known as the Sargasso Sea, and it has provided important habitat and breeding grounds for many species of fish, eels, crabs, shrimp, birds, and even sea turtles. Two species of *Sargassum*, *Sargassum fluitans* and *Sargassum natans* were always found in the traditional but now shrinking areas of the Sargasso Sea and Gulf of Mexico, and both species currently flourish in the Great Atlantic *Sargassum* Belt (Figure 2).



<u>Figure 2</u>: The Great Atlantic *Sargassum* Belt (GASB) extension in July 2018 [2] and the North Equatorial Recirculation Region (NERR). From [3].

The Great Atlantic *Sargassum* belt (GASB) extends over 5,000 miles from West Africa to the Gulf of Mexico and has been observed by satellite imagery since 2011. It was described in detail in 2019 [2]. This article suggested that the interannual variability of the GASB was likely caused by upwelling off the African coast during the boreal winter and discharge from the Amazon River in the spring and summer and concluded that the recurrent bloom in the tropical Atlantic and Caribbean would become the “new normal” [2].

Research confirms that an extreme, prolonged negative phase of the North Atlantic Oscillation during 2009-2010 acted as the tipping point seeding the Great Atlantic *Sargassum* Belt. This atmospheric anomaly altered winds and ocean currents, transporting seaweed patches into the tropical Atlantic, where it exploded in growth. This prolonged North Atlantic Oscillation shifted atmospheric pressure and southwardly shifted Westerlies. Stronger winds and surface water carried an initial seed population of *Sargassum* out of the northern Sargasso Sea and into the eastern and tropical Atlantic. Stronger winds disrupted the winter mixed layer, enhancing availability of nutrients presumably provided by vertical mixing. The macroalgae thrived in this new environment with very warm seas, abundant sunlight, and persistent nutrients from sources including vertical mixing and atmospheric sources [4].

Since 2011, *Sargassum* rafts have aggregated from March to September in massive windows along the Intertropical Convergence Zone under the action of converging winds. From May to September the Intertropical Convergence Zone shifts northward. This movement changes local wind conditions and pushes the aggregated rafts out of the equatorial path and directly into westward moving transit tracks. The North Equatorial Current and North Brazil Current/Guiana Current System push the floating biomass westward and northwestward into the eastern and central Caribbean Sea [5].

Primary drivers of the Great Atlantic *Sargassum* Belt are thought to include climate shifts, nutrient imbalances, vertical mixing, river discharges, iron deposition from Saharan dust, equatorial upwelling, and biomass burning (*e.g.*, in Central and Southern Africa). Lapointe et al. [6] concluded that the massive *Sargassum* bloom was driven by a major nutrient imbalance, specifically an escalating nitrogen to phosphorus (N/P) ratio caused by anthropogenic nutrient pollution from land-based run-off and agricultural fertilizer.

Researchers from the Max Planck Institute for Chemistry concluded that the massive Great Atlantic *Sargassum* Belt was primarily driven by wind-induced equatorial upwelling of phosphorus rich deep water combined with nitrogen-fixing from symbiotic cyanobacteria living in the *Sargassum*, giving the macroalgae a major competitive advantage in the tropical Atlantic [7].

Xing Zhou and colleagues provided evidence that an overlooked driver of the Great Atlantic *Sargassum* Belt shifted over time from physical forcing (*e.g.*, stronger winds/currents) to ecological control, *i.e.*, self-sustaining nutrient recycling by associated or symbiotic marine organisms. They argue that this type of internal control became dominant in recent years, allowing the massive blooms to persist despite fluctuating external nutrient sources and increasing ocean stratification [8].

Although there is some agreement regarding the multiple drivers of the Great Atlantic *Sargassum* Belt, there is ongoing debate regarding the source of nutrients for the massive accumulation of *Sargassum*.

We have previously suggested that aerosolized coal fly ash is a prime factor in the explosive growth of *Sargassum* [9]. The purpose of the present study is to point to evidence that aerosolized coal fly ash is the “smoking gun”, a major, if not *the* major, causal-factor underlying the Global *Sargassum* Crisis, which became apparent after 2003, and led to the formation of the Great Atlantic *Sargassum* Belt.

BACKGROUND

At least as far back as the 1990s, concerned citizens had started to notice white trails that stretched across and dimmed the sky, diffusing briefly to resemble cirrus clouds before becoming a white haze. As time passed, these jet-laid white trails became more frequent and were observed over wider geographic regions. By 2012 these trails had become a near-daily, near-global occurrence (Figure 3).

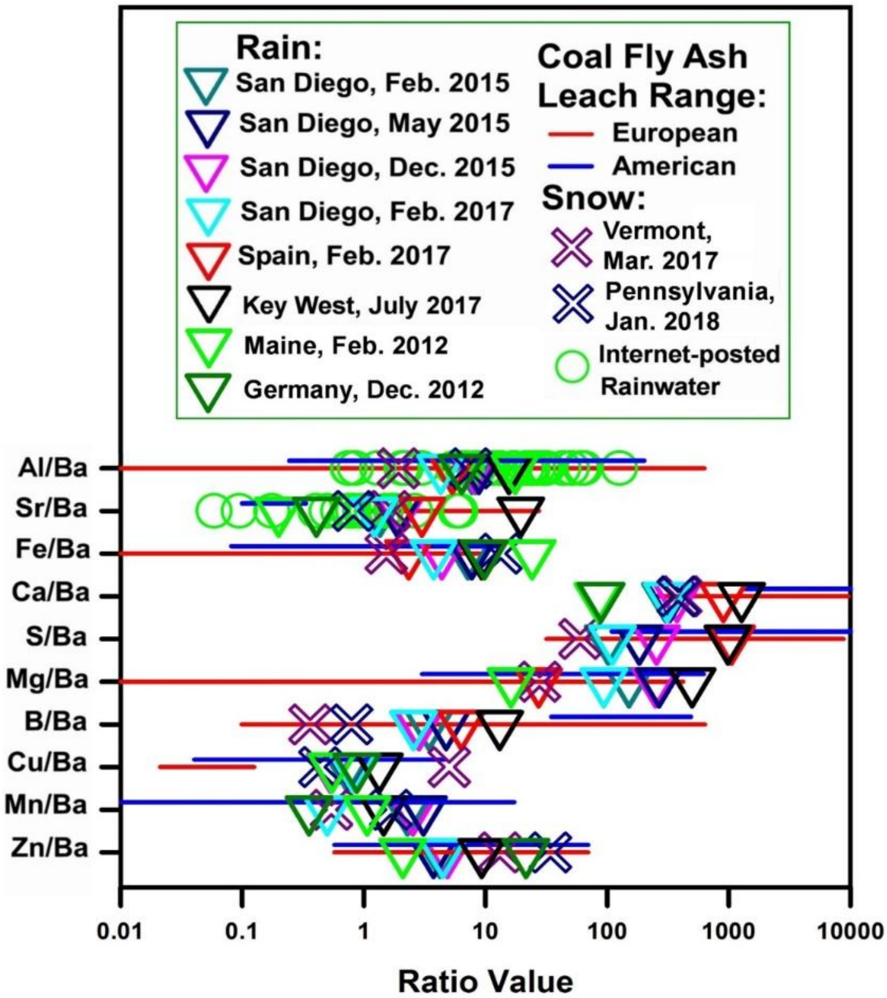
Figure 3: From [10]. Deliberate jet-emplaced particulate trails, sometimes referred to as "chemtrails", clockwise from top left San Diego, California (USA); Karnack (Egypt); London (England); Danby, Vermont (USA); Luxembourg (Luxembourg); Jaipur (India).

Some concerned citizens had taken samples of post-spray rainwater, and had the samples analyzed at commercial laboratories and posted the results on the Internet. Most individuals only requested aluminum analyses, some also requested barium, while a few requested analyses of aluminum, barium, and strontium [11]. The positive results from those water-analyses indicate the particulate matter being jet-emplaced in the atmosphere has the property of being partially soluble in water. The only widely available, cheap material which has that property is coal fly ash (CFA).

When coal is burned industrially, coal fly ash condenses and accumulates in the hot gases above the burner. Nearly all of the chemical elements, present in trace amounts in the coal, become concentrated in coal fly ash. Many, but not all, coal fly ash particles occur as spheres which owe their shape to the surface tension of the suspended melt. Coal fly ash particles range in size from a few nm to tens of µm across. These tend to be disequilibrium assemblages, having formed rapidly in an unnatural environment. Consequently, coal fly ash occurs in a multitude of elemental combinations and poses great risks to human and environmental health [12, 13].

Generally, relative concentrations of the trace elements in coal fly ash are typically higher than those found in the Earth's crust, soil, or even solid coal [14]. At least 38 elements can be partially extracted from coal fly ash by exposure to water [15]. Aerosolized coal fly ash makes atmospheric water more electrically conductive because many of its elements partially dissolve and ionize in water [16].

We published evidence that the coal fly ash is the main aerosolized particulate jet-sprayed into the troposphere [17-19] by comparing element ratios relative to barium in rainwater samples and melted snow samples with the range of corresponding ratios measured in the lixiviate of coal fly ash leaching experiments [15, 20] (Figure 4).



<u>Figure 4</u>: From [21], showing the similarity of element ratios measured in rainwater and snow-melt with the range of comparable element ratios measured in the laboratory lixiviate of water-leach experiments [15, 20].

We have presented evidence [22] that tropospheric post-chemtrail snowfalls can collect and bring down coal fly ash aerosol particulates in a manner similar to the physical-chemical technique called co-precipitation [18]. One phenomenon we observed pertains to snow mold which sometimes forms beneath snow in northern latitudes, for example in Wisconsin, USA and Canada (Figure 5). In springtime, as the snow begins to melt, it releases the trapped coal fly ash particles which descend and are re-trapped on the underlying snow mold.

Generalizing, one might expect any down-falling substance, such as volcanic ash or Saharan sand, to collect and bring down aerosolized coal fly ash.

Figure 5: Snow mold fibers observed and sampled as snow was beginning to melt. From [22].

Figure 6 shows analytical data, expressed as ratios relative to barium (Ba), for snow samples evaporated to near-dryness, samples of snow mold, and an air-drop material collected from the roof of a parked car. The solid lines shown represent the range of corresponding ratios for European [15] and American [20] coal fly ash measurements. These data, together with the rainwater data shown in Figure 4, provide compelling evidence that the main substance being jet-emplaced into the atmosphere is aerosolized coal fly ash.

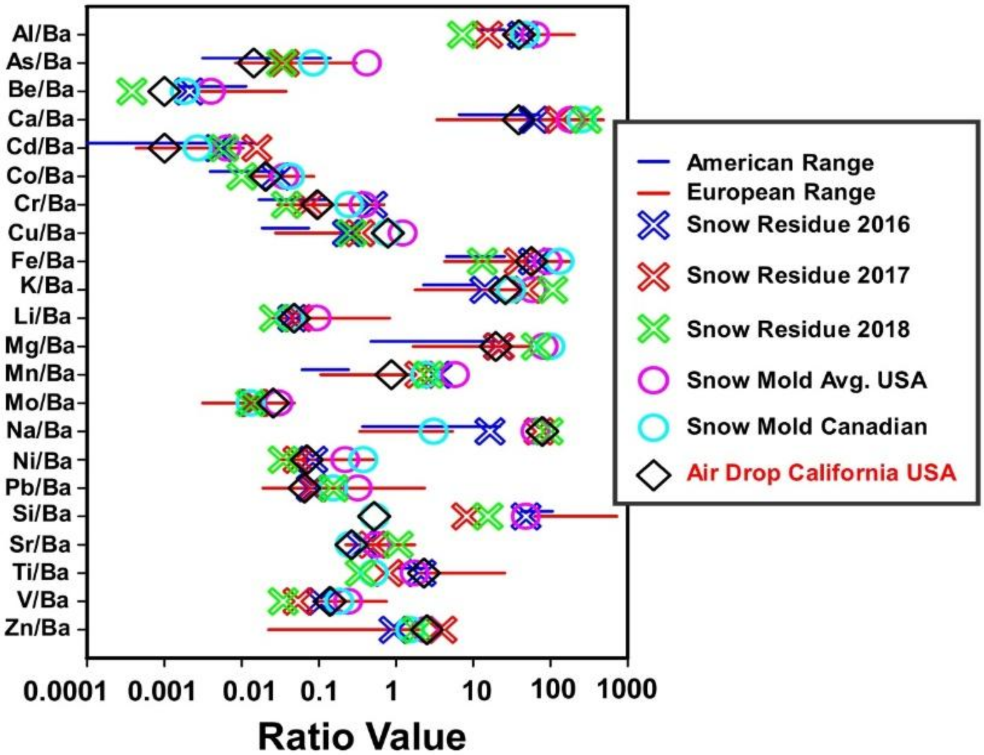


Figure 6: From [23], comparison of analytical results with the ranges of European [15] and American [20] coal fly ash samples.

EVIDENCE COAL FLY ASH IS A MAJOR FACTOR IN THE GLOBAL *SARGASSUM* CRISIS

Tonon et al. [24] measured the elemental composition of pelagic *Sargassum* samples harvested in 2020 and 2021 from across the Caribbean, specifically Mexico, Jamaica, and the Dominican Republic. From 2018 to 2021, Hatt et al. [25] collected and analyzed the elemental composition of *Sargassum* samples mainly from two South Florida USA beach cities. Basilio et al. [26] measured trace element concentrations in beach-cast seaweeds collected from four beaches along the Espírito Santo coast in southeastern Brazil. Figure 7 connects the specific data sets from these analyses with the symbols used in Figure 8.

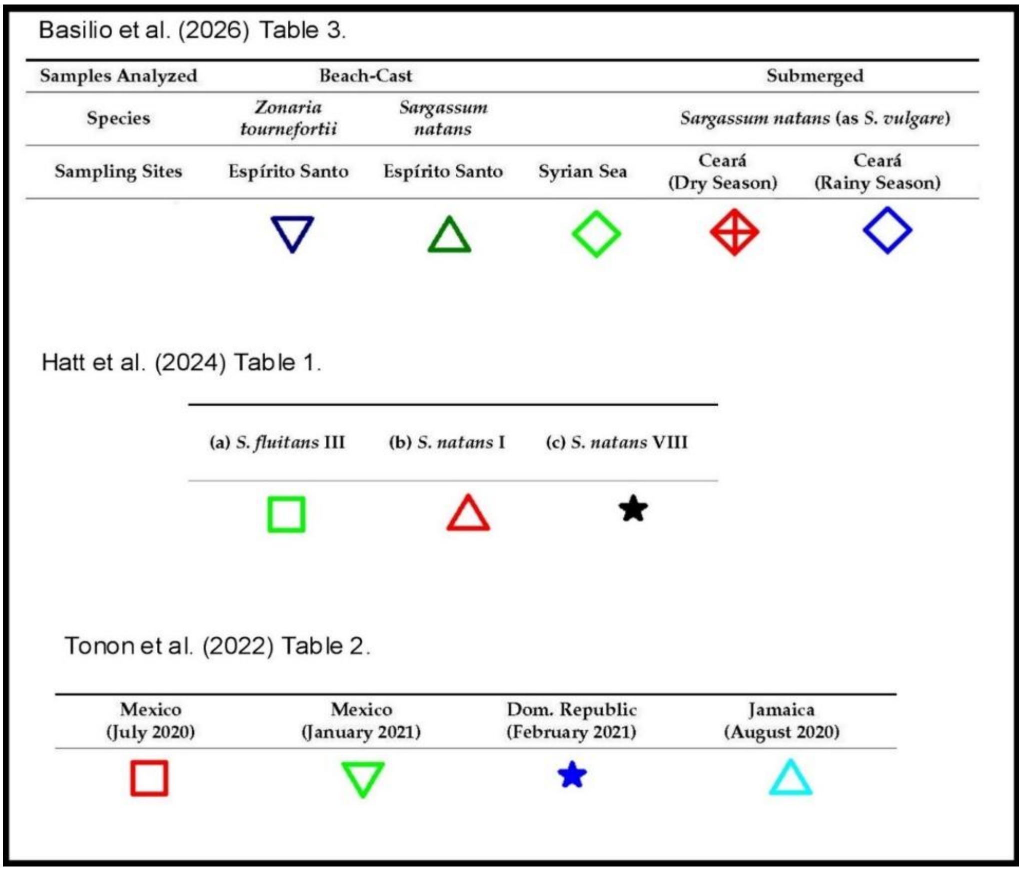
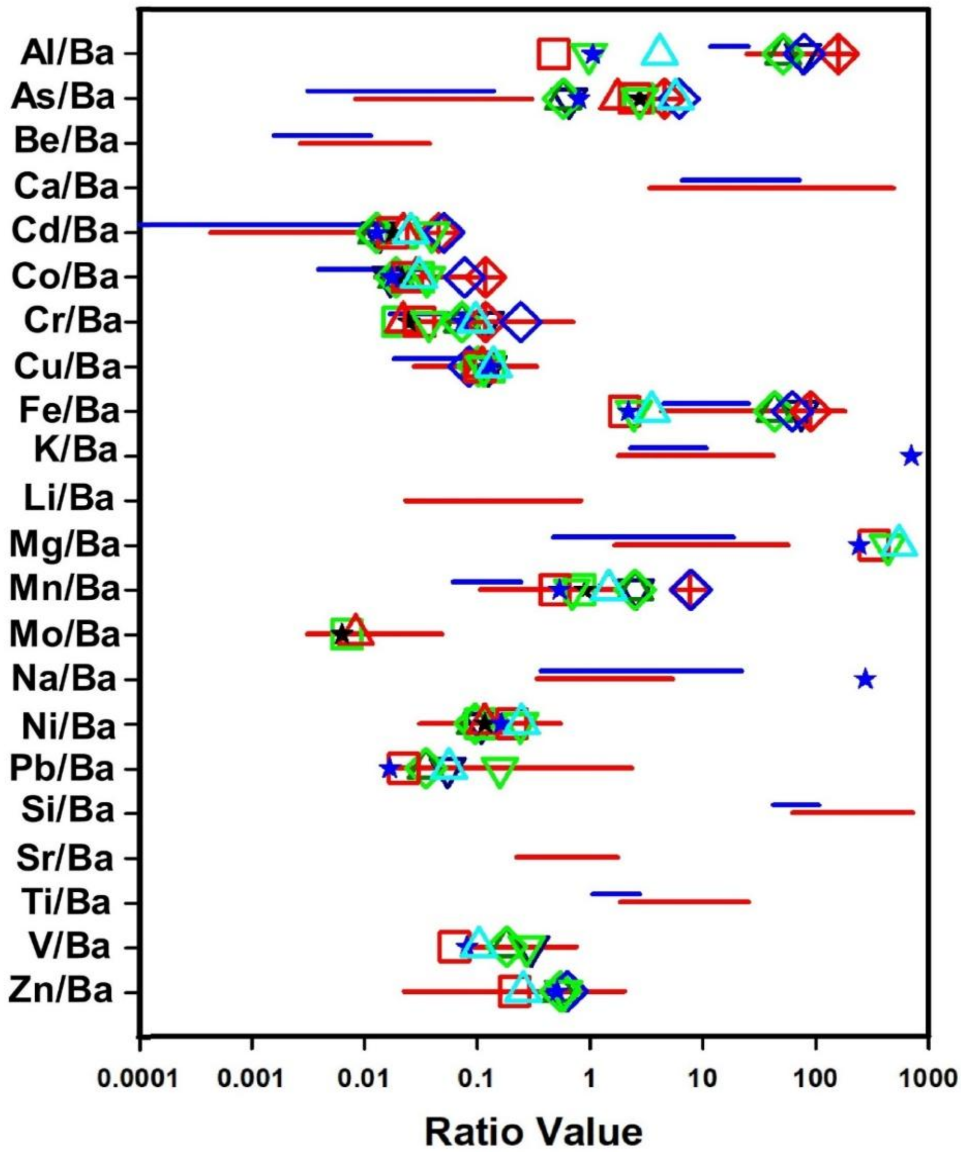


Figure 7: Legend for Figure 8 that connects specific data sets to the symbols used in Figure 8.

Figure 8 presents the trace element data from Basilio et al. [26], Hatt et al. [25], and Tonon et al. [24], expressed as ratios with respect to barium (Ba) for comparison with the ranges of corresponding element ratios in European [15] and American [20] coal fly ash samples.



<u>Figure 8</u>: Comparison of trace element ratios relative to barium measured in *Sargassum* samples [24-26] are shown for comparison with the ranges of corresponding element ratios in European [15] and American [20] coal fly ash samples.

The similarity in trace element ratios with corresponding ranges of coal fly ash ratios provide evidence of *Sargassum* incorporation of matter from aerosolized coal fly ash, although some elements such as calcium (slightly off scale), sodium and arsenic may partially be collected from the seawater environment.

In an article appropriately entitled "Global Floating Algae Blooms are Expanding", Qi et al. [27] present compelling graphical evidence that supports their titular assertion, illustrated in Figure 9.

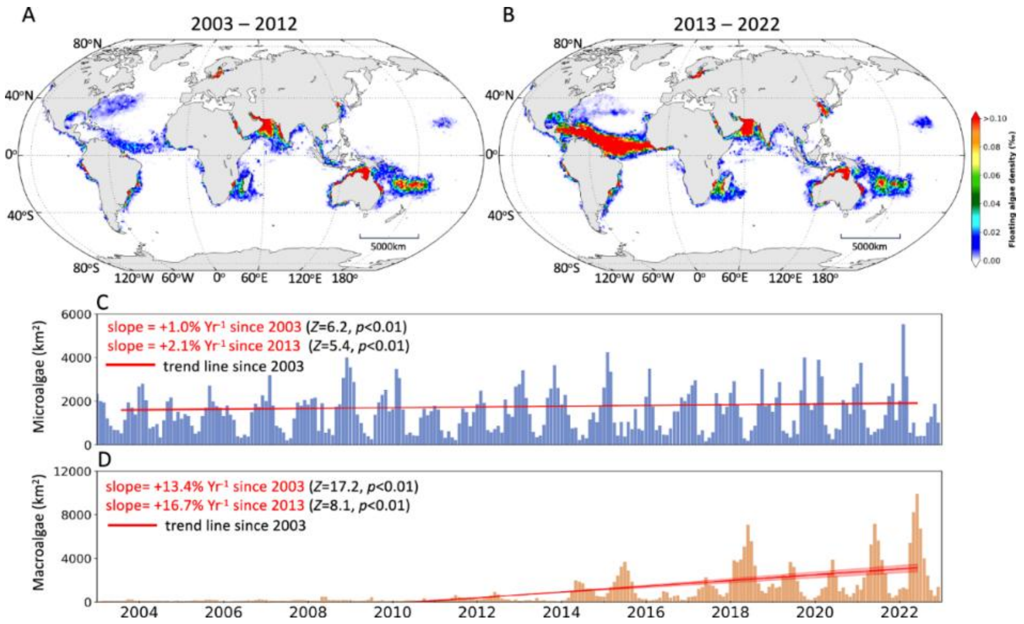


Figure 9: From [27], compelling evidence of the algae blooms worldwide in the years 2013-2022 relative to the years 2003-2012.

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 [28]. 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” in Google Books [29], as shown in Figure 9.

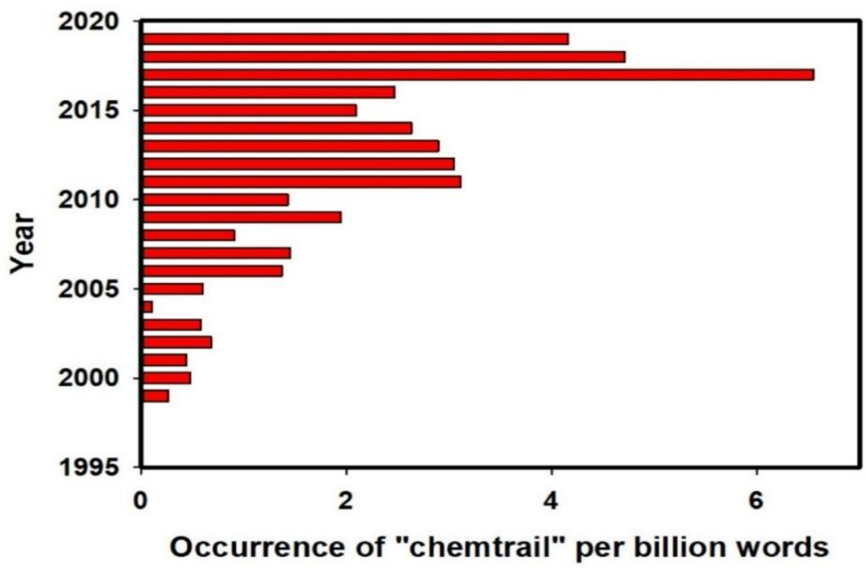


Figure 9: The annual number of occurrences of the word “chemtrail” per billion words in Google Books [29] as a proxy for the relative annual quantity of coal fly ash chemtrails, a.k.a. aerial particulate trails, sky striping.

Note the striking increase in the Figure 9 proxy for relative annual change in chemtrail activity that parallels the formation of the Great Atlantic *Sargassum* Belt beginning circa 2011.

We have previously reviewed the effects of the multifold components of aerosolized coal fly ash as they relate to the increasing global occurrences of harmful algal blooms. Aerosolized coal fly ash (CFA) from non-sequestered coal-fired power plant emissions and especially from undisclosed, although "hidden in plain sight" tropospheric aerosol geoengineering operations inflict irreparable damage to the world's water bodies and exert profound effects on human and environmental health [12, 13]. Atmospheric deposition of CFA particles provides a source of water-soluble, bioavailable iron which drastically shifts the global phytoplankton balance in favor of harmful algae and cyanobacterial blooms in both fresh and salt water [9].

Despite the traditional view that iron from Saharan dust supported the macroalgae in the Sargasso Sea, recent studies confirm that anthropogenic CFA particles are the most significant sources of the soluble, bioavailable iron in the open ocean [30]. The primary source of bioavailable iron in CFA is the glassy aluminosilicate phase provided by aluminosilicates, the most abundant material in CFA. Formed during high temperature coal combustion and rapid cooling, the aluminosilicate matrix traps ferric iron in a form made soluble by acidic processing in the atmosphere [31]. Acidic processing by sulfates doubles or triples the amount of soluble, bioavailable CFA iron deposition in the sea. This soluble reactive iron has major impacts on ocean productivity, carbon export, and oxygen depletion [32].

Anthropogenic iron containing aerosols, we submit, helped spawn the Great Atlantic *Sargassum* Belt, not only by providing a great nutrient resource, especially iron, but as well by potentially influencing wind patterns, precipitation, particle deposition, and changes in the North Atlantic Oscillation. A multi-variant analysis in three zones of the Great Atlantic *Sargassum* Belt showed a close association of *Sargassum* density, dust deposition, and surface iron concentrations in the sea from 2002-2010 before the emergence of the Great Atlantic *Sargassum* Belt circa 2011 [3]. Many more toxic metals and soluble trace elements leach from coal fly ash into water as compared to African or desert dust. It is notable that soluble phosphorus is 4-6 times higher and aluminum at least as high or higher in coal fly ash leachate vs. desert dust [33].

The elemental ratios of coal fly ash and *Sargassum* are remarkably similar (Figure 8). Coal fly ash contains more than 20 potentially toxic heavy metals and metalloids as well as organics like polycyclic aromatic hydrocarbons (PAH's) and polychlorobiphenyls (PCB's) and several radionuclides. Iron and aluminum (in the form of aluminosilicate) are major components of coal fly ash, and arsenic is an important toxic metalloid [34].

While *Sargassum* offers economic opportunities for its use, its many toxic micropollutants limit its use. Iron and aluminum are two of the most abundant elements in *Sargassum*. Among the many contaminants in *Sargassum*, arsenic is the most salient and worrisome. Arsenic is bioaccumulated in *Sargassum* due to confusion in the phosphate transporter system between arsenic and phosphate. At least 15-20 heavy metals and metalloids are found in *Sargassum* with metal uptake often mediated by cationic uptake.

Organic pollutants in *Sargassum*, as in coal fly ash, include both PAH's and PCB's [35]. Polonium-210 and Lead-210 are natural decay products of Uranium-238. These radioactive elements concentrate in CFA as products of combustion, and both are scavenged by pelagic macroalgae like *Sargassum* [36].

Soluble iron is a vital nutrient for *Sargassum* in the open ocean because iron is necessary for both photosynthesis and nitrogen fixation. *Sargassum* growth responses to macronutrients like nitrogen and phosphorus are driven by iron bioavailability. In laboratory experiments, adding nitrogen and/or phosphorus to cultured *Sargassum* does not cause increased growth, but combining them with iron causes unprecedentedly high growth rates, doubling the biomass in just over 5 days. This indicates that soluble iron acts as the crucial micronutrient co-limiting *Sargassum* growth [37]. The cited study claiming that upwelled phosphorus and not iron is the key driver of Sargassum blooms was based on nitrogen isotopes in coral growth rings and historical data showing that heavy African dust periods did not correlate with *Sargassum* biomass. However, since the coral growth ring data did not include iron, and most of the soluble iron in the ocean derives from atmospheric sources like CFA (not African dust) their conclusion that this phosphate availability explains massive *Sargassum* blooms in the Atlantic is not valid [7]. Both symbiotic heterotrophic, diazotrophic (nitrogen-fixing) cyanobacteria and bacteria located within *Sargassum* biofilm require ample iron because the nitrogenase enzyme complex requires large amounts of this element to fix nitrogen [38]. Larson et al. [39] showed that iron operating on phosphorus-iron co-limitation plays a critical role in governing the abundance, biomass, and community structure of nitrogen-fixing organisms. They showed that high levels of both phosphorus and iron yielded the greatest number of heterotrophic, nitrogen fixing cyanobacteria.

Experiments provide direct evidence that coal fly ash acts as a nutrient and fertilizer for bacteria and cyanobacteria in both soil and aquatic systems. Coal fly ash stimulates soil microbial activity. It provides essential nutrients, alters pH, and supplies surfaces that support the growth of nitrogen-fixing microorganisms. At the same time, larger amounts of CFA added to soil can impair these organisms and other beneficial bacteria [40]. Heavy metals including cadmium, copper, zinc, and lead can be adsorbed by cyanobacterial fertilizers [41]. Matsumoto and colleagues demonstrated that floating coal fly ash blocks were an effective, low-cost medium for bulk cultivation and cell adhesion of marine cyanobacteria in open ocean environments [42]. Cyanobacteria, a photosynthesizing organism that accumulates to form algal blooms, has evolved strategies to thrive in iron-limited environments where they can outcompete other micro-organisms for iron acquisition. Cyanobacteria have a high tolerance for multiple toxic metals and metalloids (like those found in coal fly ash) and this characteristic may help enable them to maintain their dominance in mixed algae settings like *Sargassum* blooms [43].

We have previously suggested that aerosolized coal fly ash is a prime factor in the explosive growth of *Sargassum* [9]. Here we have provided evidence that the increase in coal fly ash tropospheric emplacement for geoengineering, along with non-trapped coal fly ash exhausting smokestacks in Asia, is a major, if not *the* major cause, of the current *Sargassum* crisis.

The solution for halting, or at least profoundly reducing, the current global Sargassum crisis is simple: End atmospheric contamination by aerosolized coal fly ash. Cease coal fly ash use for geoengineering, and sequester all coal fly ash from smokestack exhaust. Were this to be done, not only would the current *Sargassum* crisis subside, but global warming would subside

[44-46] and stratospheric ozone depletion would subside [47-49]. Moreover, human and environmental health would markedly improve [13, 19].

CONCLUSIONS

Currently, pelagic *Sargassum* seaweed blooms represent a near-global ecological disaster. At least as far back as the 1990s, concerned citizens had started to notice white trails, often called “chemtrails” that stretched across the sky ultimately becoming a white haze. As time passed these became more frequent and were observed over wider geographic regions. Published elemental data of pelagic *Sargassum* samples, as ratios relative to barium, are largely consistent with the range of corresponding element ratios from European and American coal fly ash samples, providing evidence of *Sargassum* incorporation of matter from aerosolized coal fly ash. We obtained a proxy for the unavailable relative annual amount of geoengineering aerosolized coal fly ash by using the annual occurrence of the word “chemtrail” in Google Books. The striking increase in that proxy for relative annual change in chemtrail activity parallels the formation of the Great Atlantic *Sargassum* Belt beginning circa 2011. Moreover, cited experimental data provide direct evidence that coal fly ash acts as a nutrient and fertilizer for bacteria and cyanobacteria. Both symbiotic heterotrophic, diazotrophic (nitrogen-fixing) cyanobacteria and bacteria located within *Sargassum* biofilm require ample iron because the nitrogenase enzyme complex requires large amounts of this element to fix nitrogen. The solution for halting, or at least profoundly reducing, the current Global *Sargassum* Crisis is simple: End atmospheric contamination by aerosolized coal fly ash. Cease coal fly ash use for geoengineering, and sequester all coal fly ash from smokestack exhaust. Were this to be done, not only would the Global *Sargassum* Crisis subside, but global warming would subside and stratospheric ozone depletion would subside. Moreover, human and environmental health would markedly improve.

REFERENCES

1. Rodríguez-Martínez, R., et al., The great Atlantic sargassum belt: impacts on the Central and Western Caribbean–a review. Harmful Algae, 2025. **144**: p. 102838.
2. Wang, M., et al., The great Atlantic sargassum belt. Science, 2019. **365**(6448): p. 83-87.
3. Haneji, H., Haneji, S, Managaki, S and van Tussenbroek, B. , Possible relationship between atmospheric conditions and the Great Atlantic Sargassum Belt. Phycology, 2026. **6**(3): p. 86.
4. Jouanno, J., et al., An extreme North Atlantic Oscillation event drove the pelagic Sargassum tipping point. Communications Earth & Environment, 2025. **6**(1): p. 95.
5. Johns, E.M., et al., The establishment of a pelagic Sargassum population in the tropical Atlantic: biological consequences of a basin-scale long distance dispersal event. Progress in Oceanography, 2020. **182**: p. 102269.
6. Lapointe, B.E., D.F. Webber, and R.A. Brewton, Productivity, growth, and biogeochemistry of pelagic Sargassum in a changing world. Harmful Algae, 2025: p. 102940.
7. Jung, J., et al., Equatorial upwelling of phosphorus drives Atlantic N2 fixation and Sargassum blooms. Nature Geoscience, 2025. **18**(12): p. 1259-1265.
8. Zhou, X., et al., Changing drivers of the Great Atlantic Sargassum Belt from physical forcing to ecological control. Nature Communications, 2026.

9. Whiteside, M. and J.M. Herndon, Role of aerosolized coal fly ash in the global plankton imbalance: Case of Florida's toxic algae crisi. Asian Journal of Biology, 2019. **8**(2): p. 1-24.

10. Herndon, J.M. and M. Whiteside, Aerosol particulates, SARS-CoV-2, and the broader potential for global devastation. Open Access Journal of Internal Medicine, 2020. **3**(1): p. 14-21.

11. Herndon, J.M., Aluminum poisoning of humanity and Earth's biota by clandestine geoengineering activity: implications for India. Curr. Sci., 2015. **108**(12): p. 2173-2177.

12. Herndon, J.M. and M. Whiteside, Intentional destruction of life on Earth. Advances in Social Sciences Research Journal, 2021. **8**(7): p. 295-309.

13. Herndon, J.M. and M. Whiteside, Chemtrails are not Contrails: The Face of Evil. 2022: Amazon Kindle Direct Publishing https://www.amazon.com/dp/B09X49TGWB

14. Fisher, G.L., Biomedically relevant chemical and physical properties of coal combustion products. Environ. Health Persp., 1983. **47**: p. 189-199.

15. Moreno, N., et al., Physico-chemical characteristics of European pulverized coal combustion fly ashes. Fuel, 2005. **84**: p. 1351-1363.

16. Herndon, J.M., M. Whiteside, and I. Baldwin, Fifty Years after "How to Wreck the Environment": Anthropogenic Extinction of Life on Earth. J. Geog. Environ. Earth Sci. Intn., 2018. **16**(3): p. 1-15.

17. Herndon, J.M., Evidence of coal-fly-ash toxic chemical geoengineering in the troposphere: Consequences for public health Int. J. Environ. Res. Public Health 2015. **12**(8).

18. Herndon, J.M. and M. Whiteside, Further evidence of coal fly ash utilization in tropospheric geoengineering: Implications on human and environmental health. J. Geog. Environ. Earth Sci. Intn., 2017. **9**(1): p. 1-8.

19. Herndon, J.M. and M. Whiteside, Nature as a Weapon of Global War: The Deliberate Destruction of Life on Earth. 2021, Worldwide: Amazon Kindle Direct Publishing https://www.amazon.com/dp/B09KN2LFXL

20. Suloway, J.J., et al., Chemical and toxicological properties of coal fly ash, in Environmental Geology Notes 105. 1983, Illinois Department of Energy and Natural Resources: Illinois.

21. Herndon, J.M., D.D. Williams, and M. Whiteside, Previously unrecognized primary factors in the demise of endangered torrey pines:A microcosm of global forest die-offs. J. Geog. Environ. Earth Sci. Intn. , 2018. **16**(4): p. 1-14.

22. Herndon, J.M. and M. Whiteside, Contamination of the biosphere with mercury: Another potential consequence of on-going climate manipulation using aerosolized coal fly ash J. Geog. Environ. Earth Sci. Intn., 2017. **13**(1): p. 1-11.

23. Whiteside, M. and J.M. Herndon, Aerosolized coal fly ash: A previously unrecognized primary factor in the catastrophic global demise of bird populations and species. Asian J. Biol., 2018. **6**(4): p. 1-13.

24. Tonon, T., et al., Biochemical and elemental composition of pelagic sargassum biomass harvested across the Caribbean. Phycology, 2022. **2**(1): p. 204-215.

25. Hatt, D.C., et al., Comprehensive analysis of biomass, nutrient, and heavy metal contributions of pelagic Sargassum species (Phaeophyceae) inundations in South Florida. Phycology, 2024. **4**(2): p. 235-255.

26. Basilio, T.H., et al., Trace Metal Concentration in Beach-Cast Seaweeds from Southeastern Brazil Indicates the Legacy of the Mining Industry. Phycology, 2026. **6**(2): p. 44.

27. Qi, L., et al., Global floating algae blooms are expanding. Nature Communications, 2025. **17**(1): p. 612.

28. Michel, J.-B., et al., Quantitative analysis of culture using millions of digitized books. science, 2011. **331**(6014): p. 176-182.

29. Google, Google Books Ngram Viewer: English Version 3 1-gram dataset. Available at: https://storage.googleapis.com/books/ngrams/books/20200217/eng/eng-1-ngrams_exports.html. 2020.

30. Chen, H., et al., Coal fly ash as a source of iron in atmospheric dust. Environmental Science & Technology, 2012. **46**(4): p. 2112-2120.

31. Veranth, J.M., et al., Mössbauer spectroscopy indicates that iron in an aluminosilicate glass phase is the source of the bioavailable iron from coal fly ash. Chemical Research in Toxicology, 2000. **13**(3): p. 161-164.

32. Li, W., et al., Air pollution–aerosol interactions produce more bioavailable iron for ocean ecosystems. Science advances, 2017. **3**(3): p. e1601749.

33. Li, R., et al., Abundance and fractional solubility of phosphorus and trace metals in combustion ash and desert dust: Implications for bioavailability and reactivity. Science of the Total Environment, 2022. **816**: p. 151495.

34. Chen, Y., et al., A comprehensive review of toxicity of coal fly ash and its leachate in the ecosystem. Ecotoxicology and environmental safety, 2024. **269**: p. 115905.

35. Devault, D.A., et al., Sargassum contamination and consequences for downstream uses: a review. Journal of Applied Phycology, 2021. **33**(1): p. 567-602.

36. Bam, W., et al., Scavenging of select radionuclides and trace elements by pelagic Sargassum in the Caribbean Sea. Marine pollution bulletin, 2022. **179**: p. 113658.

37. Leemans, L., et al., Iron co-limitation of Sargassum fluitans. Aquatic Botany, 2025. **196**: p. 103807.

38. Cox, D., et al., Sailing together: A review of the pelagic Sargassum microbiome. Harmful algae, 2025. **148**: p. 102904.

39. Larson, C.A., et al., Iron limitation effects on nitrogen-fixing organisms with possible implications for cyanobacterial blooms. FEMS microbiology ecology, 2018. **94**(5): p. fiy046.

40. Upadhyay, N. and A. Dubey, Effect of coal fly ash and cyanobacteria on different crops. International Journal of Research in Engineering and Science (IJRES), 2024. **12**(7): p. 80-84.

41. Kaur, R. and D. Goyal, Heavy metal accumulation from coal fly ash by cyanobacterial biofertilizers. Particulate Science and Technology, 2018. **36**(4): p. 513-516.

42. Matsumoto, M., et al., Floating cultivation of marine cyanobacteria using coal fly ash. Applied biochemistry and biotechnology, 2000. **84**(1): p. 51-57.

43. Ghio, A.J. and E.D. Hilborn, Cyanobacterial blooms, iron, and environmental pollutants: AJ Ghio and ED Hilborn. Biometals, 2024. **37**(3): p. 577-586.

44. Herndon, J.M., Air pollution, not greenhouse gases: The principal cause of global warming. J. Geog. Environ. Earth Sci. Intn., 2018. **17**(2): p. 1-8.

45. Herndon, J.M., Role of atmospheric convection in global warming. J. Geog. Environ. Earth Sci. Intn., 2019. **19**(4): p. 1-8.

46. Herndon, J.M. and M. Whiteside, Geophysical consequences of tropospheric particulate heating: Further evidence that anthropogenic global warming is principally caused by

particulate pollution. Journal of Geography, Environment and Earth Science International, 2019. **22**(4): p. 1-23.

47. Herndon, J.M. and M. Whiteside, Aerosolized coal fly ash particles, the main cause of stratospheric ozone depletion, not chlorofluorocarbon gases. European Journal of Applied Sciences, 2022. **10**(3): p. 586-603.

48. Whiteside, M. and J.M. Herndon, Destruction of stratospheric ozone: Role of aerosolized coal fly ash iron. European Journal of Applied Sciences, 2022. **10**(4): p. 143-153.

49. Whiteside, M. and J.M. Herndon, New paradigm: Coal fly ash as the main cause of stratospheric ozone depletion. European Journal of Applied Sciences, 2022. **10**(5): p. 207-221.