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Short Communication

OBTAINING EVIDENCE OF COAL FLY ASH CONTENT IN WEATHER MODIFICATION (GEOENGINEERING) THROUGH ANALYSES OF POST-AEROSOL-SPRAYING RAINWATER AND SOLID SUBSTANCES

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ABSTRACT
Since the late 1990s tanker jets have been spraying particulate matter into the troposphere with no disclosure of the chemical compositions which mix with the air people breathe. Using forensic chemical methodologies, I discovered and published evidence that the main aerosolized component is coal combustion fly ash, a toxic nightmare. One of the methodologies used involves comparison of elements dissolved in rainwater, presumably leached from the aerosol particulates, with laboratory data on the water-leachate of European coal fly ash samples. Here I describe that methodology so that others can utilize and extend it. Another of the methodologies involves direct comparison of elements analyzed in solid substances with corresponding elements analyzed in coal fly ash samples. I also describe that methodology, indicate some potential materials of interest, and point out possible limitations.

Key Words: Weather Modification, Weather Warfare, Climate Modification, Geoengineering

INTRODUCTION
In the late 1990s concerned citizens began to report particulate trails being sprayed by jet aircraft into the troposphere (Thomas, 2004). Figures 1 and 2 show contemporary examples of the particulate trails observed. Government authorities have either denied their existence or falsely claimed they are harmless contrails made of ice crystals (USAF, 2013). Individuals from a number of countries took post-spraying rainwater samples and had them analyzed by commercial laboratories, usually requesting analyses for aluminum, sometimes for barium as well and rarely also for strontium.

As years passed, the frequency and duration of tropospheric particulate spraying increased so that by 2014 the spraying was a daily occurrence in San Diego where I live, and elsewhere throughout the United States, Canada, European Union countries, Australia, New Zealand and possibly other countries. As shown in Figure 1, the spray trails quickly diffuse, first forming cirrus-like artificial clouds, which further diffuse to leave a white haze in the sky, sometimes with a brownish cast. The air, in the region of the atmosphere where spraying occurs, mixes with the air people breathe. For particles to remain suspended for some period of time before settling, the particles must be micron (μm) or submicron in size. The persistent aerial spraying caused me concern as to adverse health consequences. As known from pollution studies, particles with diameters ≤ 2.5 μm have been found to be associated with increased hospital admissions (Bell et al., 2014), morbidity and premature mortality (Dai et al. 2014; Dockery et al., 1993; Pope et al., 2009), risk for cardiovascular disease (Haberzetti et al., 2012), lung inflammation and diabetes (Potera 2014), low birth weight (Ebisu and Bell, 2012), and reduced male fertility (Pires et al., 2011).

Early weather modification techniques, developed in public view for agricultural interests, involve seeding clouds with silver iodide or dry ice (frozen carbon dioxide) to cause rainfall. Cloud seeding to induce rain became a weapon of war during the Vietnam War (Fleming, 2012). The next weather modification step, developed in secret by the military, involved spraying some substance into the atmosphere to delay, inhibit, and retard the fall of rain, heat the atmosphere, and suppress loss of Earth's heat. As a weapon of war its use could lead to drought, crop failures, human and livestock suffering, and even to starvation. Historical evidence shows that military planners do not hesitate to expose their own citizens, and citizens of other friendly countries, to the consequences of testing weapons of mass destruction (Cole, 1988; Fradkin, 2004; Miller, 1991).

The scientific basis behind suppressing rainfall was inadvertently published by NASA (2010): "Normal rainfall droplet creation involves water vapor condensing on particles in clouds. The droplets eventually coalesce together to form drops large enough to fall to Earth. However, as more and more pollution particles (aerosols) enter a rain cloud, the same amount of water becomes spread out. These smaller water droplets float with the air and are prevented from coalescing and growing large enough for a raindrop. Thus, the cloud yields less rainfall over the course of its lifetime compared to a clean (non-polluted) cloud of the same size."

So I asked myself: "What substance is available to the military at low cost, in quantities of millions of tons per year worldwide in micron and submicron sized particles, and whose production facilities and transportation infrastructure are out of public view?" The answer that came to mind was coal combustion fly ash. When coal is burned by electric

power utilities, the heavy ash settles, and the very fine ash, called coal fly ash, used to go up the smokestack, but now in many countries it is electro statically trapped and sequestered because it contains concentrations of most of the toxins originally present in the coal (Carlson and Adriano, 1993). Others may have used that reasoning to come to the same conclusion, but I published the first scientific evidence (Herndon, 2015).

Figure 1: Photos of jet-laid particulate trails taken on days when there were no natural clouds in the San Diego sky. Note the formation of white haze that is characteristic of light scattering by micron and submicron size particles

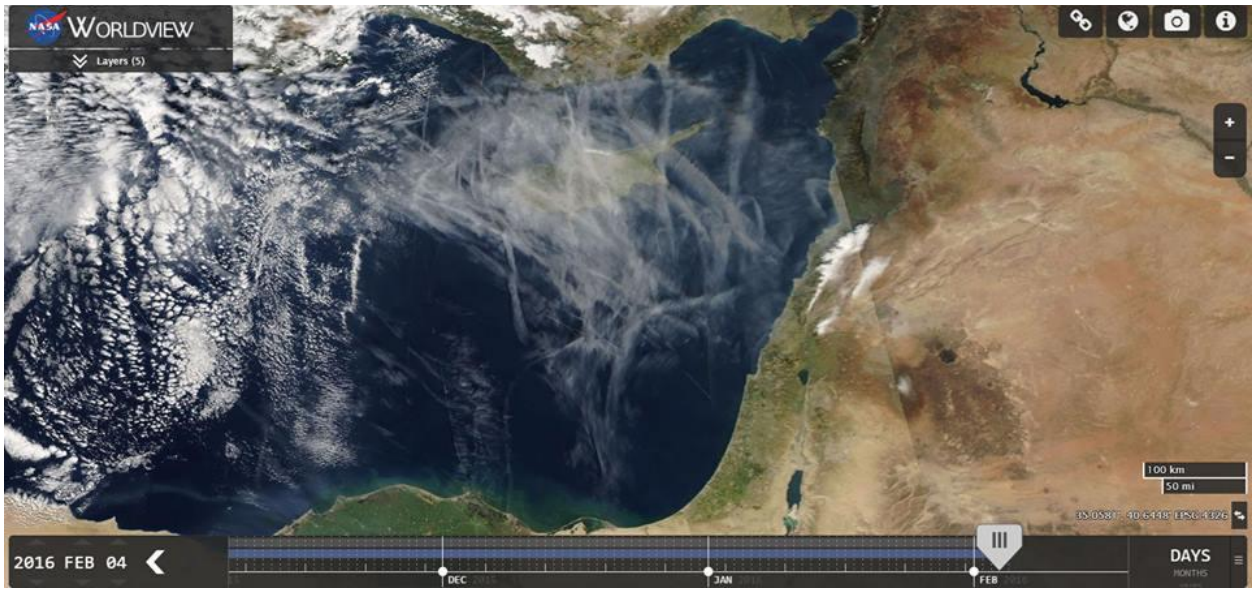

Figure 2: NASA Worldview satellite image from February 4, 2016 showing jet-laid trails blanketing the air above the Republic of Cyprus but nearly absent in surrounding regions

The purpose of this paper is to describe the methodologies I used for collection and measurement of rainwater and of solid substances so that others can have the understanding to conduct their own tests to provide evidence of what is happening to the air their citizens breathe. That is important to verify because coal fly ash is a toxic nightmare: Its tiny grain-size allows it to enter the body through the mouth, skin or eyes or by inhalation, where it settles deep in the lungs. Body moisture is all that is required to release a host of heavy metal toxins as well as aluminum in a soluble form; aluminum is implicated in neurological disorders, such as Autism, Alzheimer's, and Parkinson's, and is detrimental to most plants and animals (Herndon, 2015; Sparling and Lowe, 1996). Although there is good evidence that coal fly ash is the main substance being sprayed into the troposphere, other substances may at times be used and/or included.

RAINWATER ANALYSES

The idea behind obtaining evidence of aerosolized coal fly ash from rainwater analyses can be understood from the following hypothetical example: Suppose tea leaves were being sprayed into the atmosphere where clouds form. Water droplets in the atmosphere would "make tea"; evidence could then be obtained by comparing the chemicals in the rain "tea" with chemicals in cups of tea made in the laboratory. An analogous approach may be used to obtain evidence of aerosolized coal fly ash.

Coal fly ash that is stored in lined ponds sometimes spills out into the environment and may contaminate groundwater. For that reason, studies were made on the leach characteristics of that material, and show that water readily leaches a host of elements from coal fly ash; many of those elements are toxic (Suloway et al., 1983). The most thorough leach-study I found is that of Moreno et al., (2005). They obtained 23 samples of coal fly ash from European sources and leached 100g of each sample in 1 liter of distilled water for 24 hours. Then they measured 38 elements in the water-leachate.

If, as I thought, rainwater leaches elements from the aerosolized coal fly ash, then the leached elements should appear in rainwater in similar proportions as in the water-leachate from the leaching experiments. In each case, the concentrations may be expressed in µg/liter, or in some equivalent units. But the concentrations of elements in rainwater may depend on exposure time and/or dilution. So how does one make a comparison with the laboratory results? The answer is to normalize all measurements, both rainwater and lab-leach, to a single element in each data set; in other words, make ratios to a single element concentration for each datum in the data set; I chose barium because it is reasonable abundant in the leach data, and it is unlikely to be found in rainwater for any other reason.

Figure 3 shows published rainwater data compared to published coal fly ash laboratory leach data. From this figure several features are evident and serve to illustrate various aspects of the methodology. The solid black lines show the range of leachate compositions from the European leach-study of 23 samples of coal fly ash. The composition of coal fly ash from different sources varies somewhat as do the concomitant compositions of the water-leachate. Note

though the similarity between the rainwater samples and the laboratory values even for the early Internet-posted 3-element analyses. This similarity indicates that the aerosolized particulate matter has essentially the same water-leach characteristics as coal fly ash. The 8-element data (7 ratios) are consistent with the 3-element data (2 ratios) shown. It is expected that additional element ratios will further confirm the coal fly ash identification, so what are the potential limitations?

The amount of a particular element in rainwater leached in the clouds from aerosolized coal fly ash depends on the degree and/or duration of exposure and on the abundance of the particular element in coal fly ash and its leachability; some elements may be more readily leached than others. Table 1 shows the average concentrations of elements in the water-leachate of the European coal fly ash leach experiments (Moreno et al., 2005) as ratios relative to barium. These are ordered by relative abundance for the following reason: Not all laboratories have the capability to measure elements that are in low abundance, i.e., they are below their detection limits. Because commercial laboratories typically charge about US$ 20 per element, it is prudent first to measure those elements that are expected to be relatively abundant in coal fly ash contaminated rainwater. Academic research laboratories often have more sensitive analytical capabilities, which would be useful to extend the 8-element fingerprint shown in Figure 3.

Table 1: The average laboratory water-leachate elemental compositions, normalized to barium, from 23 European coal fly ash samples measured by (Moreno et al. 2005).

Element Ratio	European Average	Element Ratio	European Average	Element Ratio	European Average
Ca/Ba	1753.4	V/Ba	1.986	Cs/Ba	0.0170
S/Ba	1323.4	Cr/Ba	1.790	Co/Ba	0.0143
Na/Ba	121.0	Se/Ba	0.8841	Pb/Ba	0.0134
Al/Ba	70.99	Fe/Ba	0.7230	Hf/Ba	0.0125
Si/Ba	69.34	Ge/Ba	0.6780	Cd/Ba	0.0121
B/Ba	44.54	Zn/Ba	0.3591	Th/Ba	0.0112
Mg/Ba	43.21	Ti/Ba	0.3169	Sn/Ba	0.0083
Li/Ba	11.29	Rb/Ba	0.2669	U/Ba	0.0065
Sr/Ba	10.06	Ga/Ba	0.2622	Nb/Ba	0.0064
As/Ba	8.281	Ni/Ba	0.1005	Tl/Ba	0.0060
P/Ba	5.418	Cu/Ba	0.0759	Be/Ba	0.0043
Mo/Ba	5.109	Sc/Ba	0.0420		
Sb/Ba	3.862	Mn/Ba	0.0364		

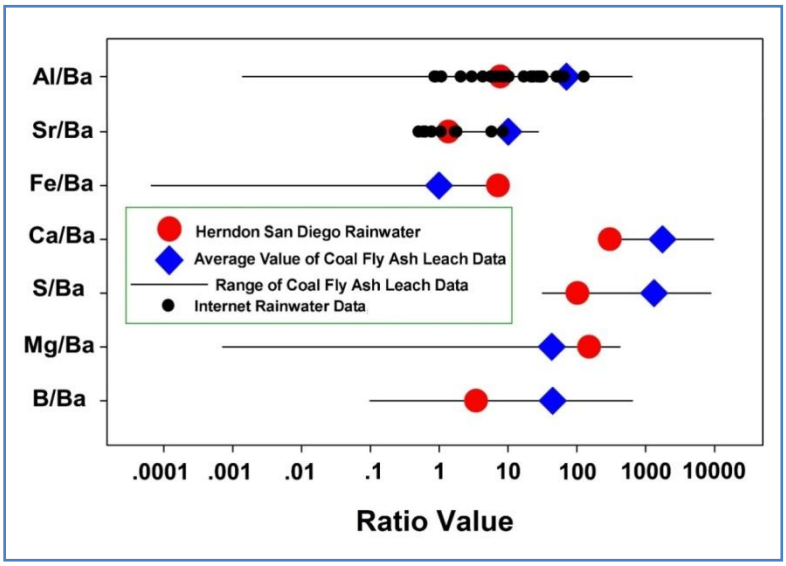

Figure 3: Comparison of measured rainwater elemental ratios with corresponding ratios from coal fly ash leach experiments (Herndon 2015)

The following comments may be helpful for those inexperienced in rainwater sample collection and analysis. Rainwater samples should not be collected in a metal container. It is a good idea to line the collecting vessel with an unused plastic bag, for example, like those used to line trash cans. Place the collection vessel with its liner in an open area where it is less likely to collect foreign debris such as might fall from trees. Laboratories usually prefer one liter of water for tests, although they will accept less if that amount is unavailable. Check with the laboratory; often they will provide acid-washed containers for sample submission. Laboratories that frequently test drinking water will sometimes only report element concentrations that exceed the government safe drinking water standards; insist instead that *all* element compositions requested be reported unless they are less than the *actual* detection limit. To my knowledge there are no studies showing whether it is better to collect the first post-spraying rain or wait until after it has rained a bit. I usually collect the first rain that falls mainly because rainfall in San Diego is often inhibited by the aerosol spraying.

SOLID SUBSTANCE ANALYSES

There are several possibilities for direct sampling of aerosolized coal fly ash, but samples must be obtained from regions without heavy, polluting industries or electrical utilities that burn coal, especially where electrostatic precipitators are not routinely used. ● Ideally one might desire to capture a sample of the spray as it exits the spray-jet and have it analyzed. Done properly, that would provide irrefutable evidence of the chemical composition of the substance being sprayed. This has not yet been done as there are numerous technological obstacles to overcome for such sampling. Nevertheless, some individuals are making plans for just such an attempt. ● One might sample the air being drawn into the cabin of airliners, capturing particulates on a high-efficiency filter for subsequent chemical analysis or passing the air through a portable spectrometer to measure the grain-size distribution. However, make sure that the airstream is not impeded by a filter system and do not sample during takeoff and landing to avoid extreme dust contamination. ● Dust collected from used aircraft air filters may be analyzed, but flight log documentation is important to establish that at no time during the air-filter use did the plane venture into or near airspace where electrostatic precipitators are not required for coal burning utilities. ● Running a high-efficiency (HEPA) filter outdoors for a period of time, perhaps three months, may collect dust from aerial spraying that has mixed with the air we breathe. As those filters are usually large, it is helpful to vacuum transfer the dust to a smaller filter to reduce the digestion volume produced during analysis. ● Dispersion of particulates sometimes inadvertently leads to fibrous, web-like material that is occasionally seen to float down from the sky and should be collected and analyzed both for metallic elements and for organic compounds. ● On rare occasion a mistake is made or equipment fails and some of the undispersed feed-stock falls to the ground. This material should be recovered and analyzed.

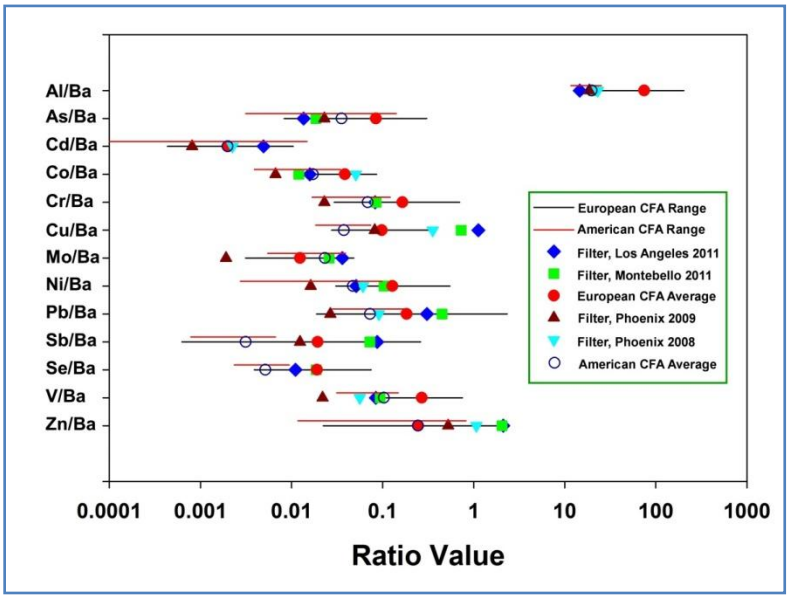

Figure 4 shows analytical data, normalized to barium, of dust collected by high-efficiency air filters, run outdoors for three months in Southern California (USA) and in Arizona (USA), compared to corresponding data-average from samples of 23 European and 12 American coal fly ash samples. The range of compositions of European and American coal fly ash samples are shown as well (Moreno et al. 2005; Suloway et al. 1983).

Figure 4 shows four sets of air-filter analytical data, normalized to barium, compared to corresponding analytical data averages (Table 2) and ranges of 23 European and 12 American coal fly ash samples (Moreno et al., 2005; Suloway et al., 1983). The composition of coal fly ash from different sources varies somewhat as do the concomitant compositions of the air-filter dust. Note though the similarity between the dust samples and the coal fly ash averages and ranges. This similarity is good evidence that the aerosolized particulate matter is coal fly ash. A similar data presentation may be used to display other types of data, such as analyses of the fibrous, web-like material. The solid substance matter has one advantage over the rainwater samples, although each approach is desirable and complimentary: The elements are much more concentrated in the solid substance matter, thus many more elements (as many as 27) can be measured above the limits of detection by commercial laboratories.

Table 2: The average elemental compositions, normalized to barium, from 23 European coal fly ash samples measured by (Moreno et al. 2005). These data are tabulated in the same order as those of Table 1. Fewer elements were measured in the coal fly ash samples than in the laboratory leachate shown in Table 1.

Element Ratio	European Average	Element Ratio	European Average	Element Ratio	European Average
Ca/Ba	29.18	V/Ba	0.1834	Cs/Ba	
S/Ba	3.048	Cr/Ba	0.1119	Co/Ba	0.0299
Na/Ba	2.173	Se/Ba	0.0163	Pb/Ba	0.0938
Al/Ba	101.5	Fe/Ba	41.89	Hf/Ba	
Si/Ba	164.5	Ge/Ba	0.0085	Cd/Ba	0.0014
B/Ba	0.1723	Zn/Ba	0.1379	Th/Ba	0.0235
Mg/Ba	7.405	Ti/Ba	5.081	Sn/Ba	.0061
Li/Ba	0.1414	Rb/Ba	0.0750	U/Ba	.00097
Sr/Ba	0.7899	Ga/Ba		Nb/Ba	
As/Ba	0.0511	Ni/Ba	0.0882	Tl/Ba	
P/Ba	1.771	Cu/Ba	0.0720	Be/Ba	0.0070
Mo/Ba	0.0080	Sc/Ba			
Sb/Ba	0.0087	Mn/Ba	0.3508		

The above described tests are relatively straight-forward provided the samples are reasonably free of contamination. Other tests one might like to make, such as soil samples, are much more complicated to interpret as they have their own incorporated elements in addition to elements that might be added from covert aerial spraying. For such samples ideally one would like to have a sample of identical basic composition taken before atmospheric spraying began years ago to serve as a reference standard. Usually, that is impossible to obtain, so the best one can hope to do is to take a series of samples of the same material over time to ascertain which, if any elements, have been increasingly added over that time period.

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