Is There a Correlation with Aerosols and Sky Color?

Reuben Dove and Landon Jones

Abstract

In this project I will be exploring the correlation between aerosols and sky color. Will aerosols affect sky color? Will they affect it but only by a bit? My hypothesis is this: The higher the amount of aerosols, the darker the color of the sky is. This is because the aerosols would block the sun, thus making the sky darker. I will test this by looking at the PurpleAir value of a certain place, And then I would look at the sky color of that exact same place, and compare them. It turns out that the aerosols have a higher effect on the haziness rather than the sky color. This makes sense because the aerosols would hang out near the surface and boy affect the sky color as much.

Background Research

Normally the sky is blue because the oxygen in the air refracts the light so we see blue. And while loose aerosols barely affect the visible color of the sky, even a thin sheet of aerosols can make a big difference. All the studies I have in the sources tab showed a comparison between a place with higher aerosol levels, and somewhere nearby with less. It turned out that the photo with higher aerosol levels were way more hazy than the suburb with less. Surprisingly, the aerosols had a greater effect on the evening sky than it did in midday. This is because with thinner layers of aerosols are overpowered by the sunlight. But when the sun goes down, the the moon doesn’t have a strong enough twilight to break through the aerosols. Blood moons and harvest moons are practically invisible due to aerosols if there are enough.

Background Research (continued)

Meanwhile, a thicker layer of aerosols found in major metropolises can majorly impact even the midnoon sky. Take Shanghai, China, it is a major port and industrial center, and thus has a high amount of aerosols. The sky color in Shanghai is grey and smoggy and covered in smoke. While the nearby town of Huzhou, is remarkably clear for its size. This is because of the lack of aerosols in the city.

Experimental Methods

For this experiment, I chose a few cities around the world and compared their purpleair score to the globe sky color reports. The cities go as followed. LA, Chicago, NYC, Mexico City, and Rio de Janeiro for the americas. London, Paris, Milan, Bucharest, and Riga were chosen for Europe. Algiers, Cape Town, and Lagos for Africa. And Delhi, Shanghai, Seoul, and Tokyo for asia. I used Purpleair, Globe sky color index, and globe haziness index.

Procedure

-Check purpleair status of city
-Check sky color of city
-Check haziness Index of city
-Graph your results

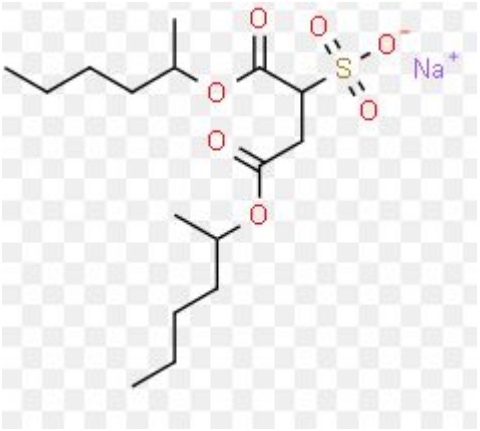
Resources

-PurpleAir
-Globe sky color
-Globe haziness

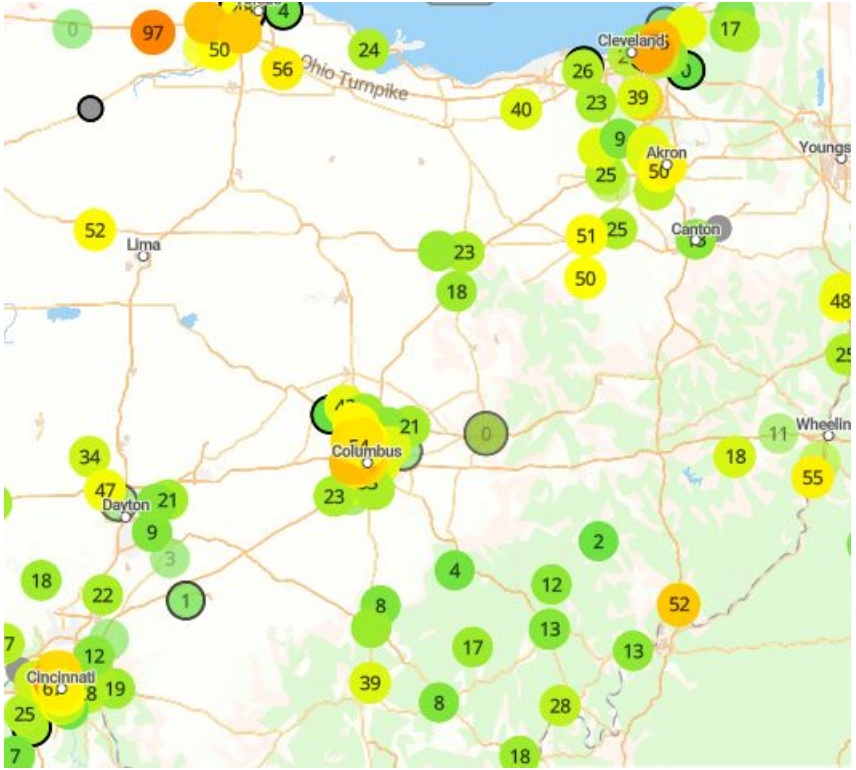
Variables

-City
-Sky color

Maps, Tables, Graphs, and other Data



An amazing aerosol structure graph made by ChemSpider

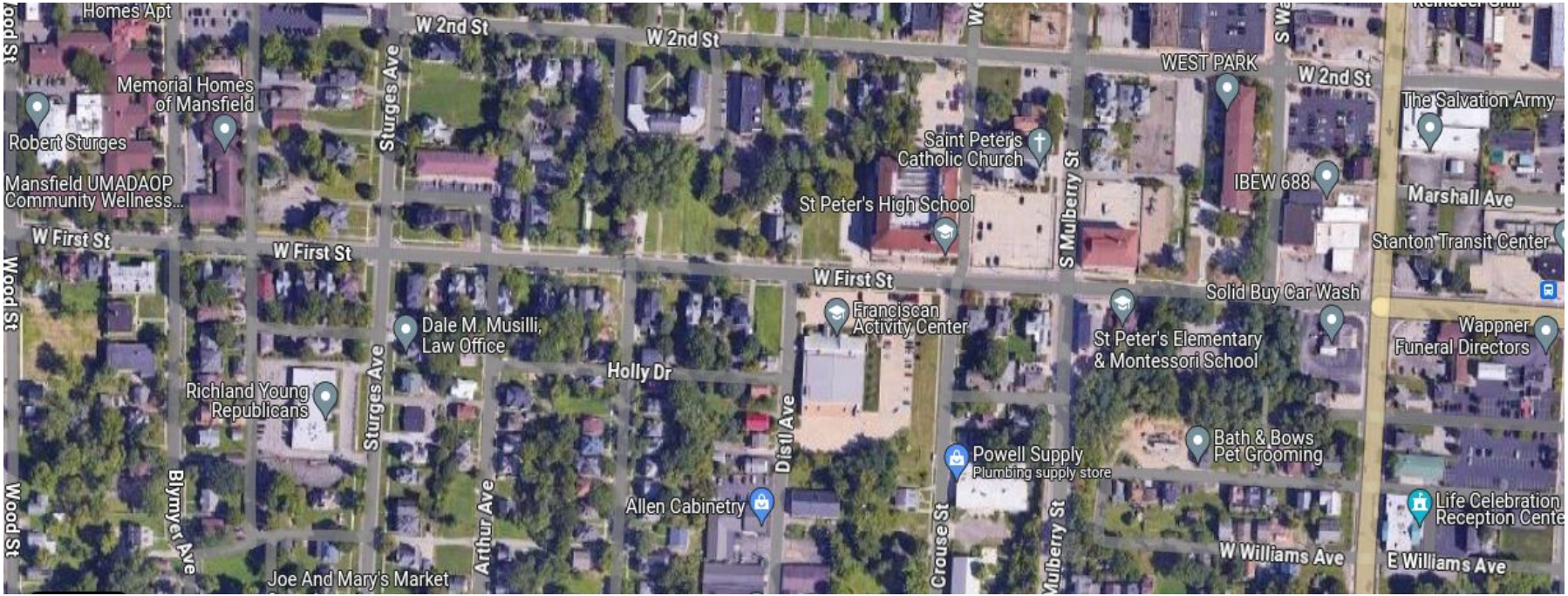


Map of Purpleir devices in Ohio

Aerosols and Sky Conditions at St. Peter’s

Date	Time	Visibility	Sky color	Extra	Purpleair	Cloud cover
1/22	2:10	Clear	Pale blue	Cold	9	Broken
1/24	2:10	Clear	Overcast	Raining	3	Overcast
1/25	2:10	Clear	Overcast	Wet	23	Overcast
1/26	2:15	S.Hazy	Overcast	Warm	19	Overcast
1/29	2:10	Hazy	Overcast	Freezing	5	Overcast

Location of science project: St. Peter's School



From Google maps

City	Aerosol Level	Sky color	Hazyness
LA	115	Pale blue	Very Hazy
New York	95	Pale blue	Extremely hazy
London	89	Milky	Very Hazy
Paris	107	Pale blue	Extremely hazy
Cairo	227	Light blue	“Smoky”
Riyadh	157	Milky	Hazy
Delhi	288	Pale blue	“Smoky”
Bangkok	134	Blue	Very Hazy
Shanghai	153	Pale blue	Extremely Hazy
Tokyo	17	Blue	Somewhat Hazy

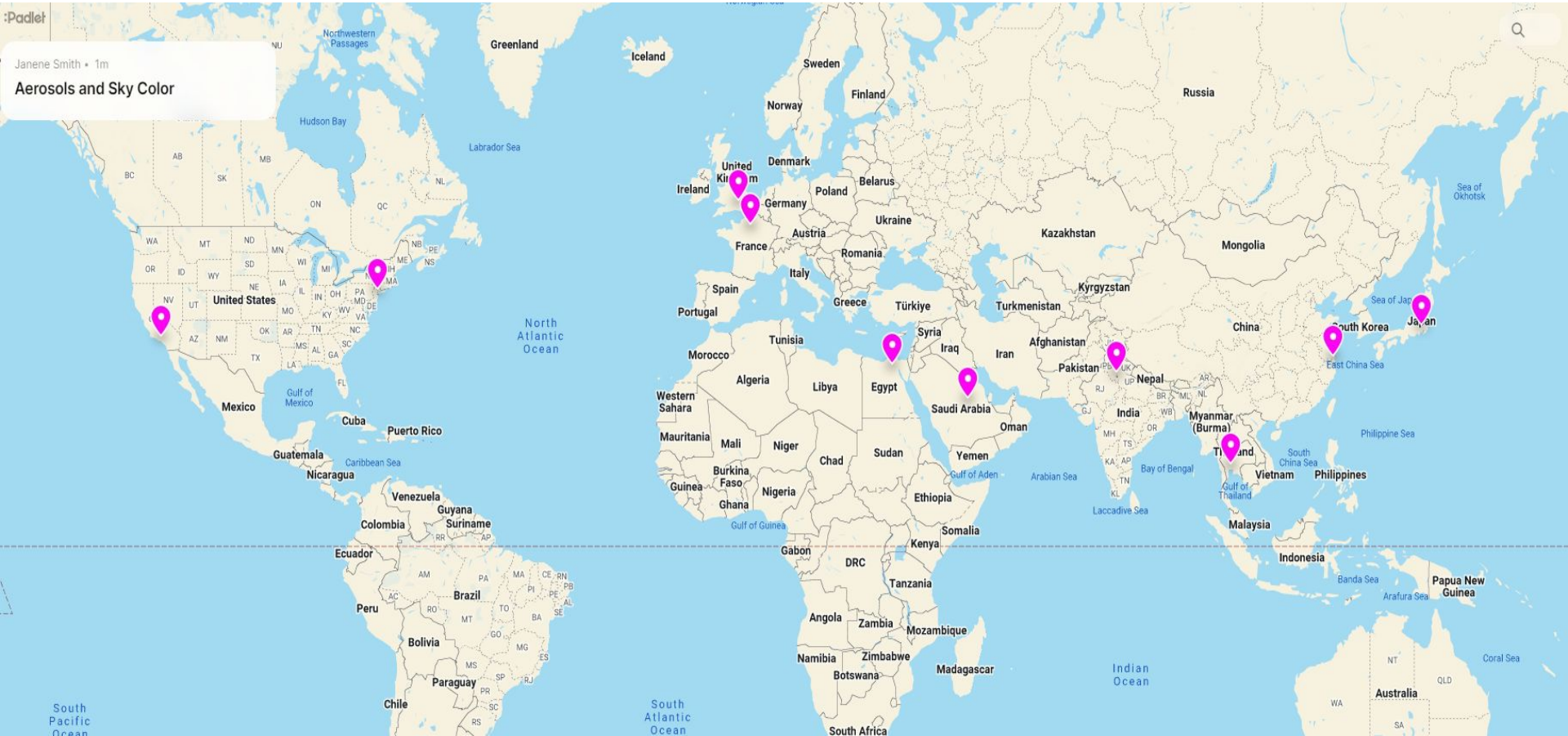
Discussion of Results

As expected, many of these cities had a very high amount of aerosols, Delhi and Bucharest scoring the highest at 288 and 270 respectively. Although one was a shocker, Tokyo, the biggest city in the world, scored a 17 due to just how clean Japan is. Most European cities lay around 60-125, Africa at 150-225, Americas at 100-175, and Asia at 175-250. It is true that the aerosols affected the sky color a bit, most cities having milky or light blue skies (besides Tokyo who had blue) and rather dark clouds. But what surprised me the most was visibility. Most cities had very and extremely hazy, with some even saying “smoky”. This would make sense because the aerosols would lay over the city like a sheet, barely affecting the sky but majorly affecting the visibility.

Conclusions

In conclusion, aerosols do have some effect on sky color, which is what I was going for. But interestingly, they had a larger effect on the haziness of the area. This surprised me because I wasn’t expecting to have to track another variable, and technically I didn’t have to, but it was so interesting that I just had to put it down. I am proud to say that aerosols do have a correlation with sky color and haziness.

Cities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Janene Smith • 1m
Aerosols and Sky Color
Northwestern Passages
Greenland
Iceland
Sweden
Finland
Russia
Norway
Hudson Bay
Labrador Sea
United Kingdom
Ireland
Denmark
Poland
Belarus
Germany
Ukraine
France
Austria
Kazakhstan
Mongolia
Romania
Italy
Spain
Portugal
Greece
Türkiye
Kyrgyzstan
Turkmenistan
China
North Atlantic Ocean
United States
Syria
Iraq
Iran
Afghanistan
Pakistan
Nepal
India
Morocco
Tunisia
Algeria
Libya
Egypt
Saudi Arabia
Oman
Western Sahara
Mauritania
Mali
Niger
Chad
Sudan
Yemen
Gulf of Aden
Arabian Sea
Bay of Bengal
Myanmar (Burma)
Vietnam
Philippines
Gulf of Mexico
Mexico
Cuba
Puerto Rico
Guatemala
Caribbean Sea
Nicaragua
Burkina Faso
Guinea
Nigeria
Ghana
Gulf of Guinea
Ethiopia
Somalia
Kenya
Gabon
DRC
Tanzania
Laccadive Sea
Malaysia
Indonesia
Venezuela
Guyana
Suriname
Colombia
Ecuador
Peru
Brazil
Bolivia
Paraguay
Chile
Angola
Zambia
Mozambique
Namibia
Zimbabwe
Botswana
Madagascar
South Africa
South Pacific Ocean
South Atlantic Ocean
Indian Ocean
Philippine Sea
South China Sea
East China Sea
Sea of Okhotsk
Banda Sea
Arafura Sea
Papua New Guinea
Coral Sea
Australia

Sources:

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