Analysis of Aerosols and Cloud Coverage Using GLOBE Data and PurpleAir

7th grade
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Abstract

Our research question is analysis for aerosols and cloud coverage using GLOBE data and Purple Air. Our method were to use a data sheet and GLOBE protocols. We viewed the sky outside our class window everyday. Our results were almost everyday it was a milky color outside. A Lot of the days the cloud coverage was clear. We took all of our data in January and February. We learned Aerosols are a suspension of particles or droplets in the air and include airborne dusts, mists, fumes or smoke. Cloud coverage is the fraction of the sky obscured by clouds. Our findings were inconclusive.

Introduction/Background Research

We had questions on what aerosols, cloud droplets, cloud coverage,and what Purple Air were. Aerosols are a suspension of particles or droplets in the air and include airborne dusts, mists, fumes or smoke. Cloud coverage is the fraction of the sky obscured by clouds on average when observed from a particular location. Cloud droplets are a visible group (aggregate) of tiny droplets of water or particles of ice or a mixture of both floating in the free air. An aggregate is a whole particle formed by combining several elements. Purple Air is a community system of PM (10, 2.5, 1.0) low-cost sensors measuring particulate matter.

Research Question

Our research question is: Is there a correlation between aerosols and the amount of clouds? We are interested in this question because we didn't know that much about aerosols and cloud cover so we wanted to learn more. Our hypothesis is yes, because clouds usually form from tiny airborne particles called aerosols. The more aerosol particles can lead to more, but smaller, cloud droplets as a result, cloud droplets are constantly forming and dissipating. When more water condenses than evaporates clouds form and grow.

Introduction/Background Research (continued)

Also, the extent to which aerosol particles affect the climate depends on how much water the particles can hold in the atmosphere (Leibniz Institute for Tropospheric Research (TROPOS), November 21, 2023). Cloud properties in an effort to explain how two opposing effects of aerosols on clouds can influence cloud coverage and life cycle (NASA/Goddard Space Flight Center, August 19, 2008). The clouds in the dry regions may hold their water longer, contributing to droughts. Clouds drifting over moist areas may lose their water more quickly, leading to severe rains (Stephen Ornes, November 30, 2011 at 5:27 pm).

Experimental Methods

The materials we have used are purpleair.com, a paper that's on visibility and sky color data sheet. On the sheet it has cloud cover, the visibility of the sky, the color of the sky, and the weather conditions,wind direction. Our first step is looking out a window, or outside at the clouds. Then, write down your data of the cloud coverage. The third step is look if maybe there is hazy,or clear outside. Step four is looking at what the sky color, and some examples of this is milky, pale blue, light blue, ect. Then, your fifth step is to look at the weather conditions such as clear, rainy, snow, ect. Step six is look at the purple air where you are.

Experimental Methods (continued)

Our independent variable is cloud coverage. Our dependent variable is the amount of aerosols in the sky. We have been using purple air to fill out our data sheet. We have been graphing our data every school day. On our data chart we have to graph cloud coverage, purple air, color of the sky, visibility (fog), weather conditions, and the date.

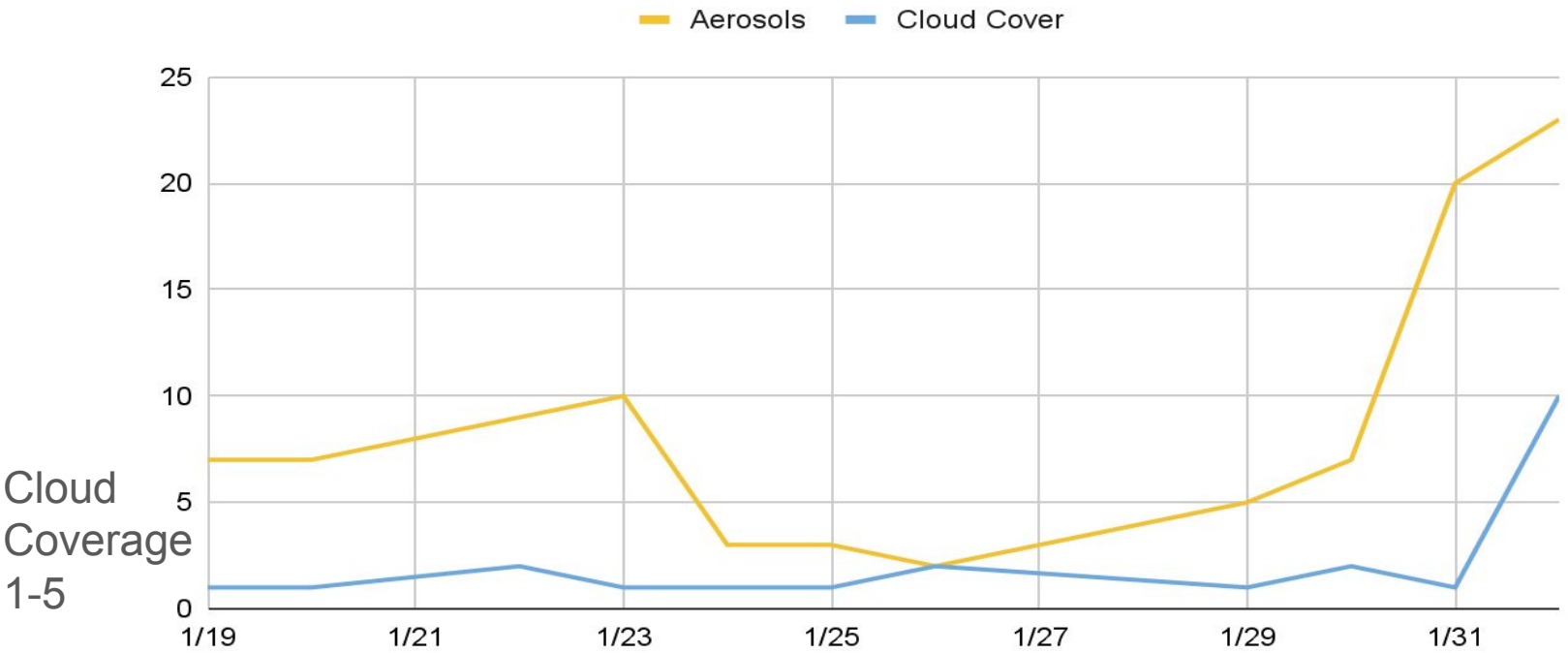
January 2024

Date	Time	Cloud Cover	Sky Color	Purple Air
1/19	1:10pm	Very hazy	milky	7
1/20	12:09am	Somewhat hazy	Pale blue	7
1/22	2:10pm	clear	Pale blue	9
1/23	1:45pm	Somewhat hazy	milky	10
1/24	1:15pm	clear	milky	3
1/25	1:20pm	clear	milky	3
1/26	1:05pm	Somewhat hazy	milky	2
1/29	1:10pm	clear	milky	5
1/30	1:00pm	clear	Pale blue	7
1/31	1:59pm	clear	Pale blue	20

February 2024

2/1	10:20am	clear	lightblue	23
2/2	11:14am	clear	milky	3

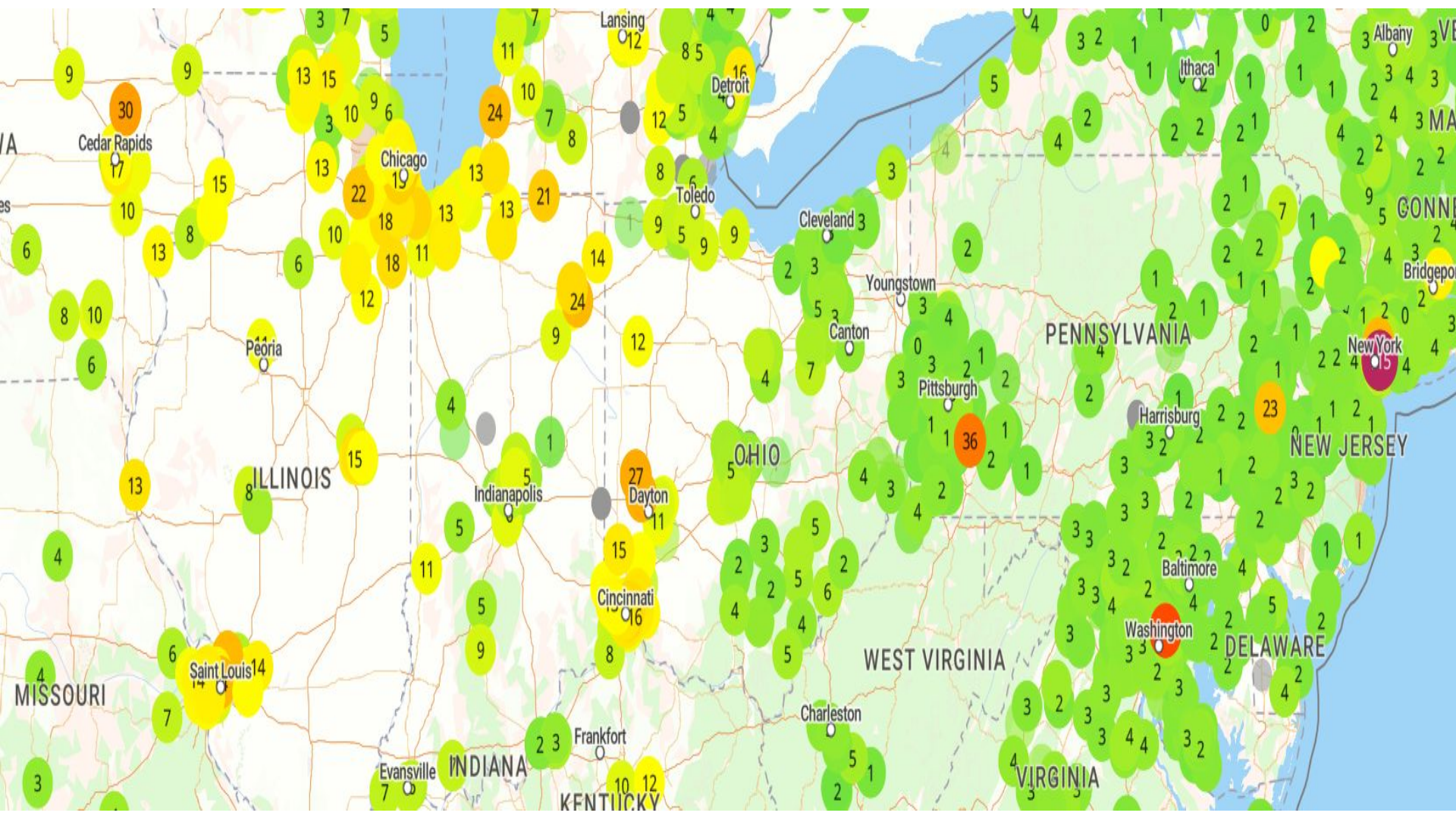
Correlation Between Aerosols and Cloud Coverage



Amount of cloud coverage was assigned the following numbers: 1=overcast 2=broken 3=scattered 4=isolated 5=few

Discussion of Results

Our data table shows the date, time, cloud coverage, sky color, and the purple air count. All of the results we took were in January and February. On january 19th the cloud coverage was very hazy and the purple air was 7. Then, on january 23rd was somewhat hazy the purple air was 10. On january 31st the cloud coverage was clear and the purple air was 20. The lowest the purple air ever got was on january 26th the purple air was 2. It was kind of hard to collect data because of all of the snow days we had.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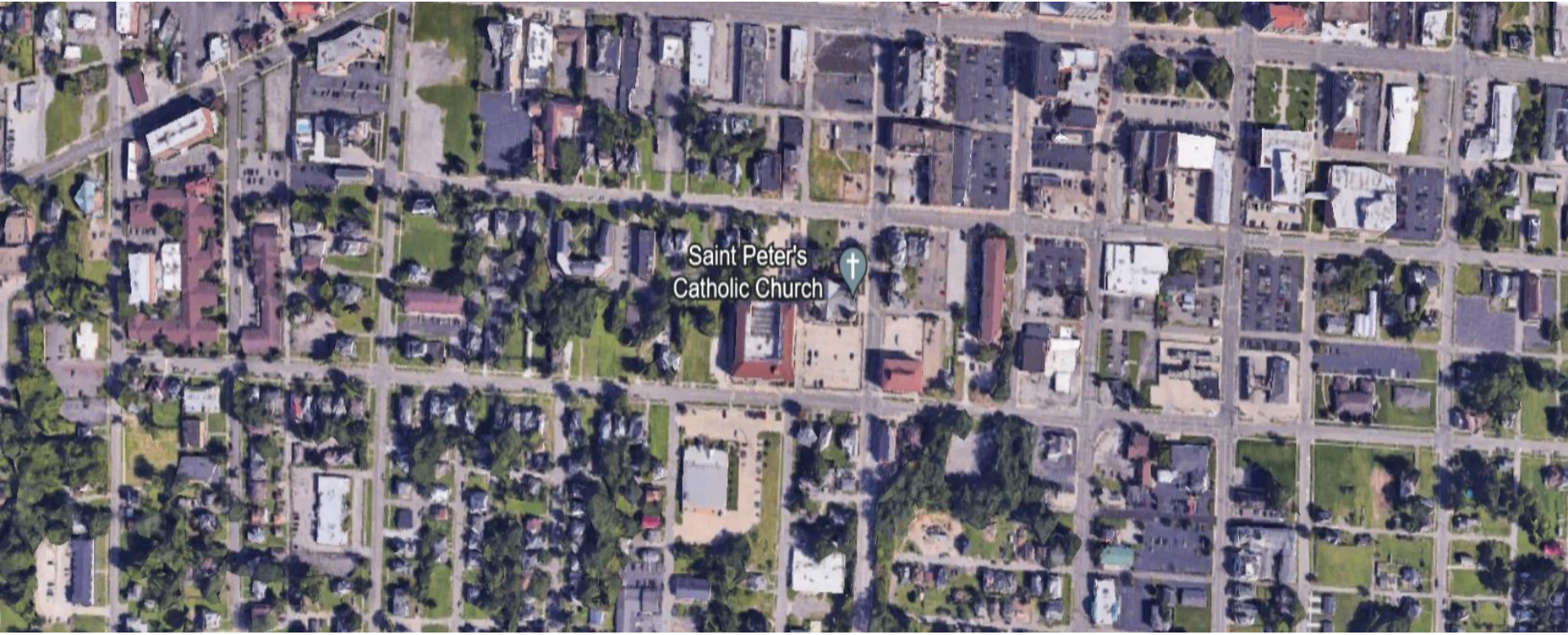
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Conclusions

Based on the data collected there was no connection only in cloud coverage, a lot of the days it was clear. There was no connection with the purple air on a lot of the days because they were all different numbers. If we would've collected more data over a longer period of time we might've seen different results such as possibly a correlation.

CLOUD COVER

AEROSOL

Credits

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Sources:

Ornes, Stephen. “Dirty Clouds Change Rainfall.” Science News Explores, 3 Dec. 2019,

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“NASA Study Improves Ability to Predict Aerosols’ Effect on Cloud Cover.” ScienceDaily, ScienceDaily, 19 Aug. 2008, www.sciencedaily.com/releases/2008/08/080814163554.htm.