What's in Your Air?
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THE GLOBE PROGRAM
Global Learning and Observations to Benefit the Environment

REACH
RESEARCH EDUCATION ON AIR & CARDIOVASCULAR HEALTH
UNIVERSITY OF MONTANA, MISSOULA

Main Idea

- We are interested in how the air quality changes from being exposed to smoke over time.
- Our research question: Does smoke affect air quality throughout time?
- At the end of our research we concluded that smoke affects the air quality.
- We conducted a small scale experiment to help us with our research.

Question/Hypothesis
Asking Questions

- Our research question asks how the PM2.5 and AQI are affected by smoke and/or incense.
- Our hypothesis is that as the amount of smoke increases over time, the air quality will decrease.
- We are interested in researching this topic because air quality can immensely differ throughout the seasons and it dramatically affects our living environment.
- In class we conducted an experiment that helped us determine the relationship between PM2.5 and AQI

Introduction
Content Knowledge

- This topic is important because wildfire smoke affects billions of people around the world. Smoke can cause people to become ill under certain circumstances. It may also exasperate existing conditions.
- This topic is important to us specifically because our community is affected by wildfire smoke (mainly during the summer and fall seasons). During these times, we are not able to go outside for long periods of time because the air quality is unsafe.
- The Air Quality Index (AQI) is a guide for tracking and measuring air quality. The lower the numbers the better the air quality, the higher the numbers the worse the air quality.
- PM2.5 is the amount of particulate matter in the air. These particles are 2.5 microns or less in diameter, therefore the 2.5 in the name.
- In our small scale experiment we used incense instead of wildfire smoke. We used incense because it was the safest and most obtainable option.

Research Methods
Planning Investigations

- We created an experiment that shows a real life scenario of smoke/incense. The experiment will help us determine how smoke affects the air quality.
- We produced data to test the effects that smoke has on air quality.
- The GLOBE protocols that we looked at were Air Temperature Dailies, Aerosols, Barometric Pressures, Clouds, Precipitation, Relative Humidities, and Land Cover.
- We used the data from the experiment to show if the air quality is affected by smoke over time.

Carrying Out Investigations
Describes what *actually* happened

- As we collected data we found out that smoke does have an impact on air quality.
- We collected this data using a small scale experiment in which we burned incense as a replacement for smoke. This all took place in a small tote (16 quarts) with 5 small air holes.
- We took measurements of the air quality using Wynd (a small instrument used to measure PM2.5 and AQI).
- These methods helped us visualize that smoke does have an affect on air quality and can dramatically impact it too.
- We found a fairly strong correlation(r^2 = .8744) when we ran a linear regression ($y\sim.088858x+38.2174$) for the Heavy Sample, and a very strong correlation (r^2=.985) when ran the linear regression ($y\sim.980409x+16.5827$) for the Control Sample.
- For the Control Sample, when there are no PM2.5 particles detected, the AQI is expected to be 16.5827. For every 50 PM2.5 particles detected, the AQI increases by 49. This is basically a 1:1 with increase with about 98.5% reliability.
- For the Heavy Sample, when there are no PM2.5 particles detected, the AQI is expected to be 38.2174. For every 100 PM2.5 particles detected the AQI increases by 9. The reliability of this graph is 87.5 %.

Results

- Our results show that smoke does have an impact on air quality (PM2.5 and AQI).
- The investigation we conducted addressed the research question because our analysis used the air quality data to display and validate our data.
- As shown in the Heavy Sample and Control Sample, data was collected and made into a graph which helps the data be analyzed better.
- Based on our data, the more smoke in the air, the worse the PM2.5 and AQI and vice versa (the less smoke in the air, the better the PM2.5 and AQI).
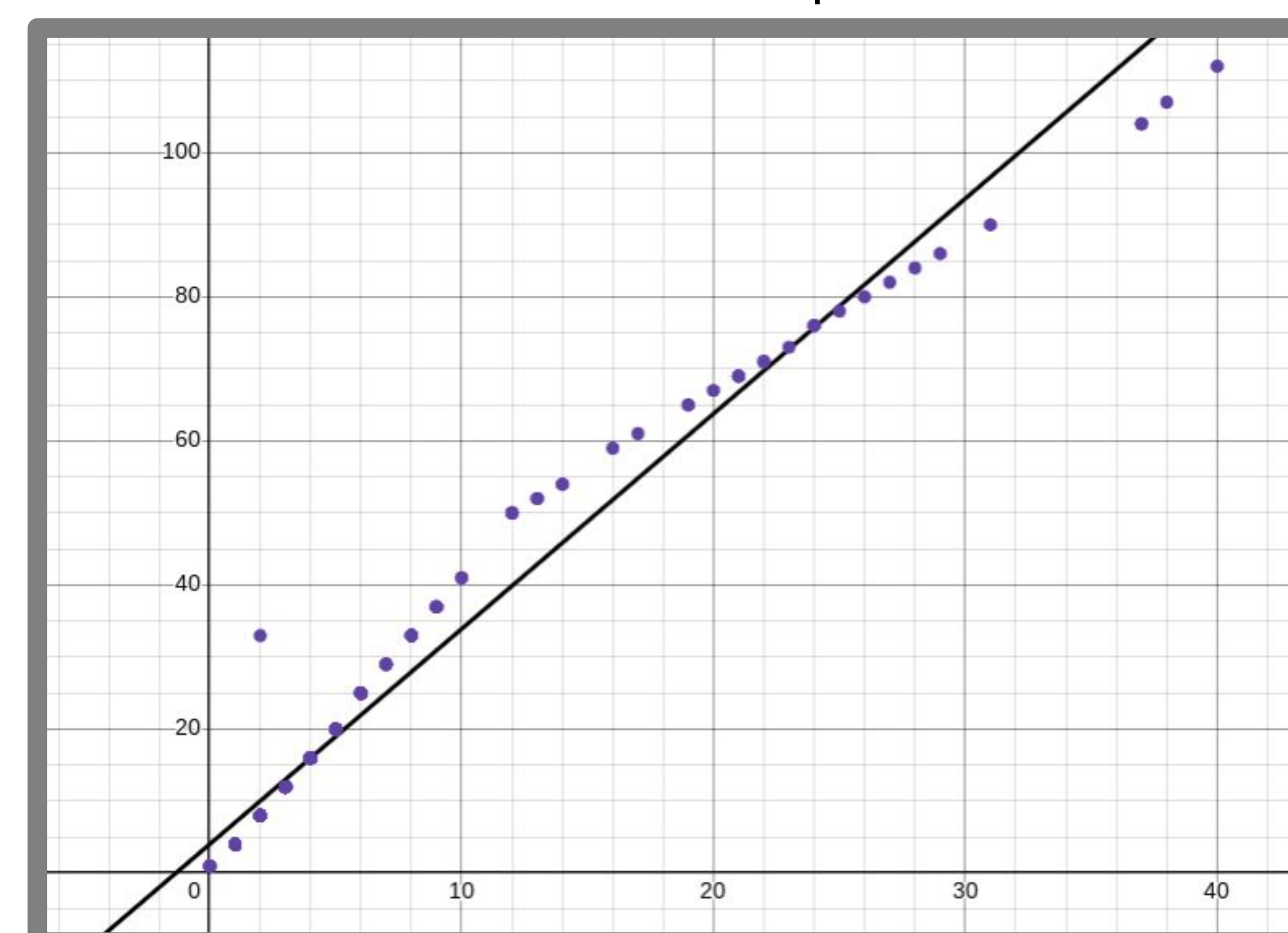
Heavy Sample: PM2.5 and AQI

This graph shows how the air quality is changing over the course time. This is the sample with 3 incense.
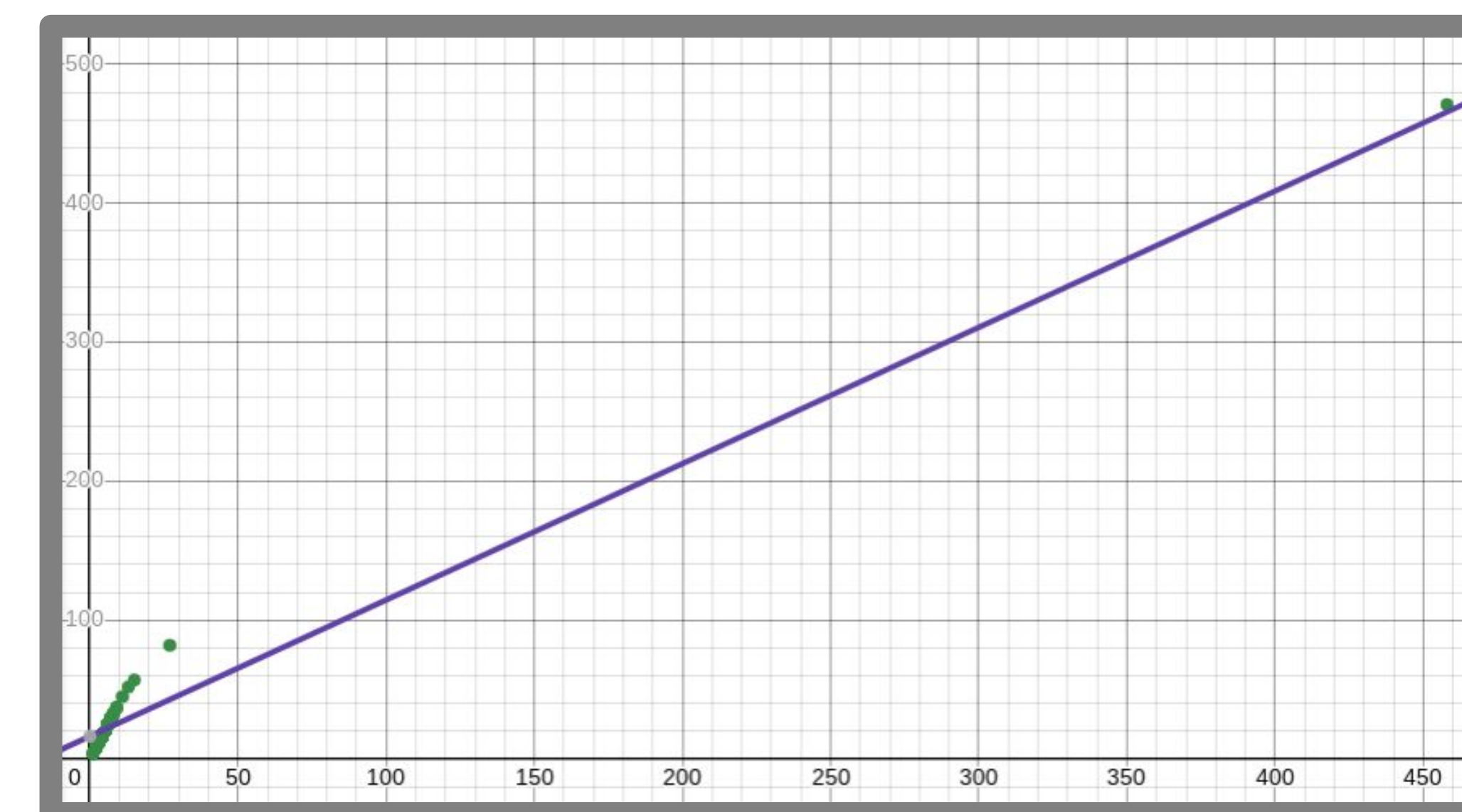
The linear regression is $y\sim.980409x+16.5827$ r^2=.985 or a 98.5% correlation

Control Sample: PM2.5 and AQI

This graph shows how the air quality is changing over the course time. This is the sample with 0 incense.

The linear regression is $y\sim.088858x+38.2174$ r^2=.8744 or a 87.4% correlation

Discussion
Interpreting Data

- The results appear to show that smoke has a big influence on the air quality over time.
- This data is important to science, and our community because people depend on air quality in their day to day lives.
- The results support our hypothesis because we were trying to determine how air quality is affected by smoke.
- Collecting Globe Data presented a challenge because there was a limited amount of research done on our topic, especially in our area.
- We had difficulties with the Wynd Air Tracker consisting of incorrect readings by the tracker. We also had trouble with the trackers staying connected to one device.
- If we have the chance to further continue our research, we would like to like to look at different factors that might affect our results. These factors include soil ph, air temperature, humidity, ect.

Conclusions

- Our hypothesis is supported by our results because we predicted that the air quality would be affected by smoke over time.
- Improvements to our result could be made by doing the experiment in one day. We could also have taken more precautions when doing the experiment.
- We appreciated doing this research for GLOBE and NASA because it gave us a new outlook on the air that we breathe.

Bibliography
References

GLOBE Home Page - GLOBE.gov, https://www.globe.gov/. Accessed March 28 2024
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