Aerosols can occur naturally (dust from a desert, sea salt from an ocean, gases blasting out of volcanoes or from a forest fire) and anthropogenically (fossil fuel combustion, fertilizer production and wastewater disposal).

On the other hand, Aerosols contribute to climate by reflecting light space, thus cooling the planet.

During the Covid 19 period, there was a huge reduction in fossil fuel combustion due to slow down of industrial production and lesser need of vehicle emissions and the effect on Aerosol Optical deaths (AOD) due to the Covid 19 pandemic.

To investigate the emissions of aerosols during Covid-19, data from the following Aeronet website was used with the following criteria:

1) Data had to be collected in January of 2019 or earlier
2) Data collection had to end in September 2020 or later
3) Data had to be at least 30% of the days over this range.

Google mobility data was used to estimate the impact of lockdown on aerosol production since Google mobility measures transportation patterns when people use their phone to drive. For this study, driving to the workplace was analyzed due to being a predictable and common occurrence.

A linear regression was used to estimate the amount of AOD variability that can be explained by changes in driving patterns.

### Results

**Urban Sites**

<table>
<thead>
<tr>
<th>Site</th>
<th>Change in AOD</th>
<th>Delta AOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSFC/Greenbelt</td>
<td>15.1%</td>
<td>12.5%</td>
</tr>
<tr>
<td>Washington, DC</td>
<td>16.8%</td>
<td>13.8%</td>
</tr>
<tr>
<td>II 20 Km</td>
<td>5.9%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Coefs is 0.34495063</td>
<td></td>
<td>R² is 9.3%</td>
</tr>
</tbody>
</table>

**Rural Sites**

<table>
<thead>
<tr>
<th>Site</th>
<th>Change in AOD</th>
<th>Delta AOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mauna Loa/volcano located in Hawaii Island Rural</td>
<td>16.8%</td>
<td>13.8%</td>
</tr>
<tr>
<td>II 312.213 Km</td>
<td>5.9%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Coefs is 0.68812501</td>
<td></td>
<td>R² is 0.5%</td>
</tr>
</tbody>
</table>

The drop of aerosol emission has been attributed to the reduction in fuel combustion. A regression test was carried to analyze how much aerosol signal was due to transportation. Mobility data supported that some urban centers experienced reduction in aerosols according to the Aeronet results, which can be attributed to lockdown.

When Coefs are positive, it signifies that there is a change due to driving. The data analysis shows that the Coefs in the cities are higher than in rural areas.

**Discussion**

There was a change in the AOD at GSFC in Maryland during the lockdown period, showing that vehicle emissions explain 9.3% of the reduction in aerosols. In Mauna Loa which is more remote, the AOD did not decrease during the covid pandemic despite changes in driving. Thus, we conclude that vehicle emissions do not contribute substantially to AOD at Mauna Loa.

### Conclusion/Future Work

- We found evidence of decreased AOD at 22 sites out of 39 analyzed. This suggests AOD has not been significantly affected by decrease in transportation could have decreased due to changes in anthropogenic activity during the pandemic.

- The hypothesis seems to be partially supported due to some countries experiencing a reduction in AOD. However, due to having limited data availability, the increase in AOD experienced by the countries highlighted in red cannot be explained.

- To develop the hypothesis, additional data is needed.

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