Climate Insights: Unveiling Ocean-Sea Dynamics, Pandemic Pollution, and Urban Air Trends

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Agenda

Intro

Our Oceans - Sea Level Rise

Our Oceans - Temperature Changes

Air Quality - Air Pollution

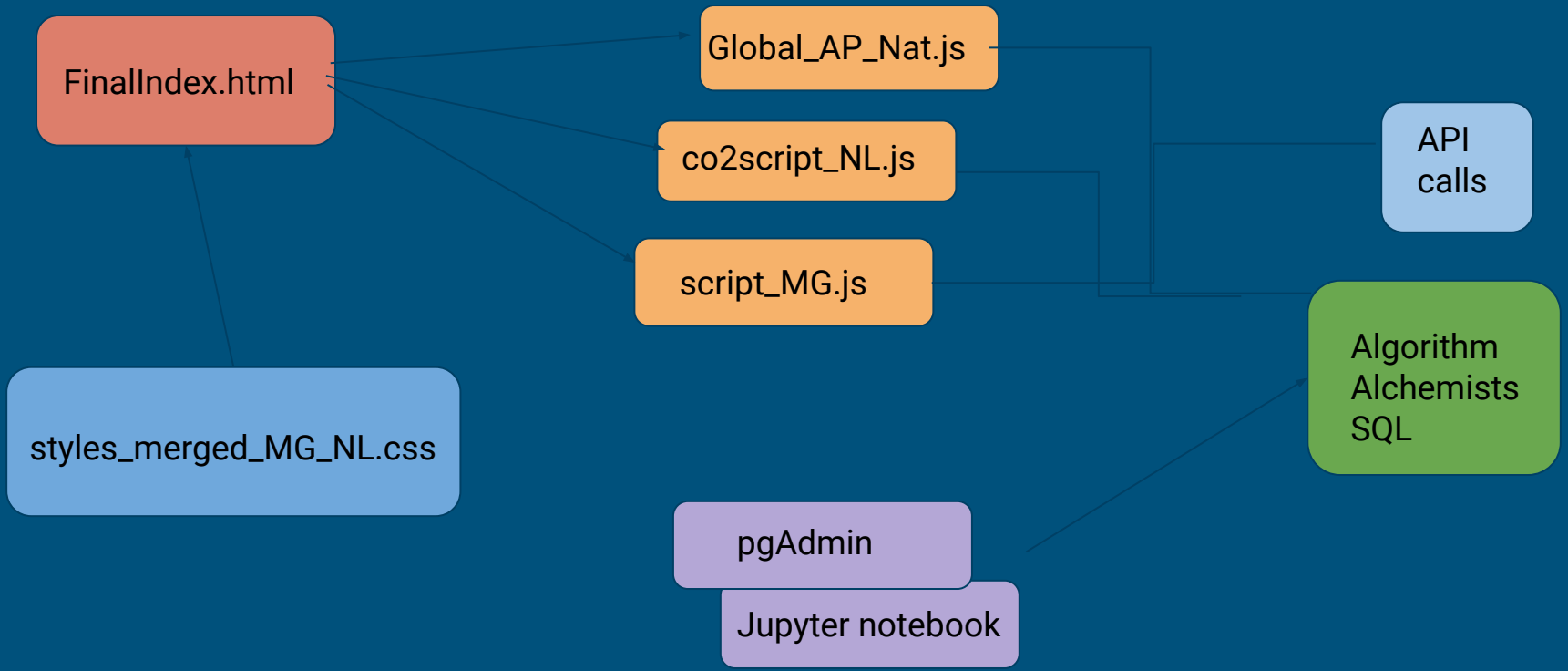
Dashboard

Introduction

- Analyzing the relationship between ocean temperatures and sea level rise throughout the past century.

- Investigating the impact of COVID-19 lockdowns on regional air pollution levels.

System Architecture

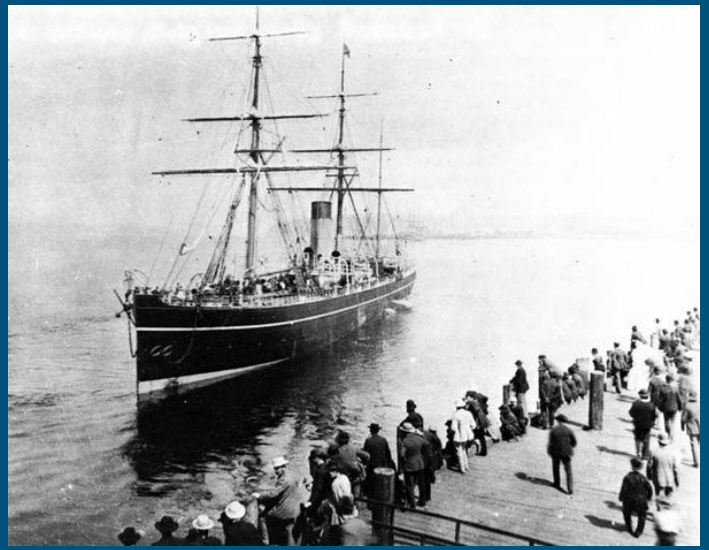


Our Oceans

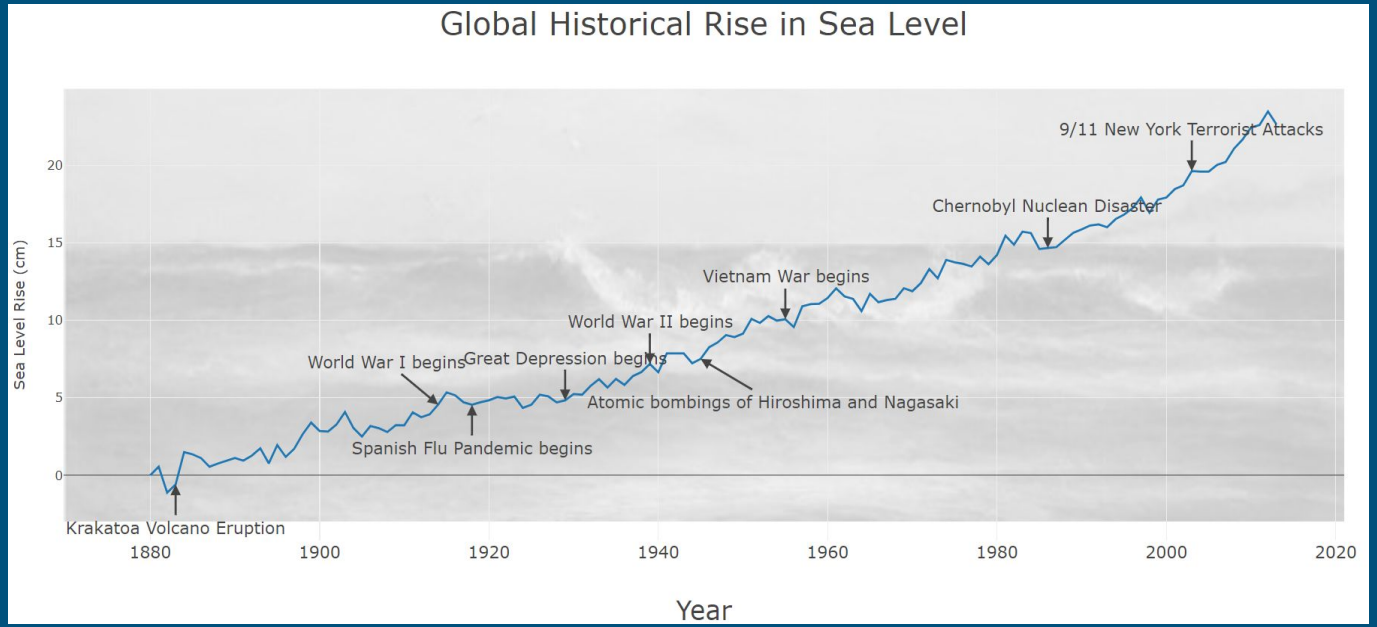
Historical Sea Level Rise

- Initial measurements were limited, but advancements in technology and monitoring have allowed for more accurate data collection.

- Contributing factors include:
  - Thermal expansion of seawater due to rising temperatures
  - Melting of glaciers and ice caps, particularly from the Greenland and Antarctic ice sheets.



Historical Sea Level Rise



- While the trend has been steady, sea level rise has accelerated in recent decades due to increased global warming.
- **Factors:** Growing population, industrialization & greater use of fossil fuels.

Source: EPA.gov

Predicted Sea Level Rise

- Urban centers like **New York, Sydney, and Miami Beach** are particularly vulnerable to the impacts of sea level rise due to their coastal locations and dense populations.
- Cities built on low-lying coastal areas experience a higher risk of inundation.
- Urban development and the extraction of groundwater can cause land subsidence, exacerbating the effects of sea level rise.

View Chart: 'Cumulative Predicted rise in Sea Level over Time'

Predicted Sea Level Rise

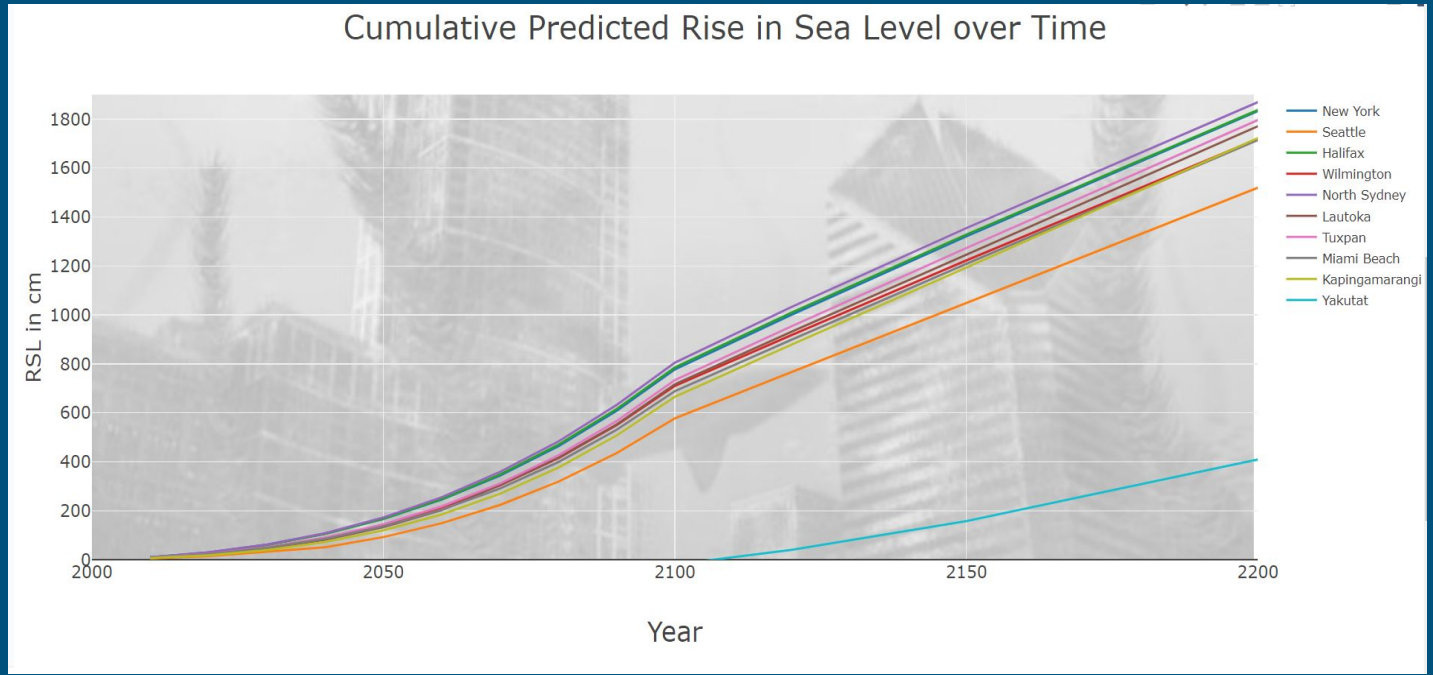
Predictions:

2050

- New York - 1.66 m
- Sydney - 1.72 m
- Miami Beach - 1.36 m

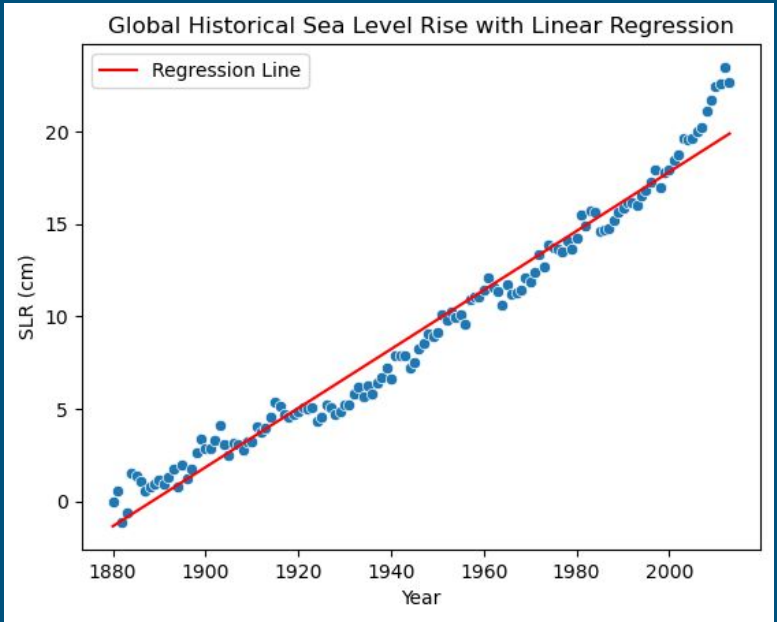
2100

- New York - 7.77 m
- Sydney - 8.05 m
- Miami Beach - 6.88 m



Source: NOAA.gov

Predicted SLR Based on Historical Data




```
1  # predicting 2050 global SLR
2  lri.predict([[2050]])
```

✓ 0.0s

```
array([36.11815582])
```

```
1  # predicting 2100 global SLR
2  lri.predict([[2100]])
```

✓ 0.0s

```
array([53.90646751])
```

- NASA Global SLR Predictions*:
  - 2050: 30 cm
  - 2010: 60 cm
- Global SLR Predictions using Linear Regression model:
  - 2050: 36.1 cm
  - 2010: 53.9 cm

Independent variable = Year
Dependent variable = SLR in cm

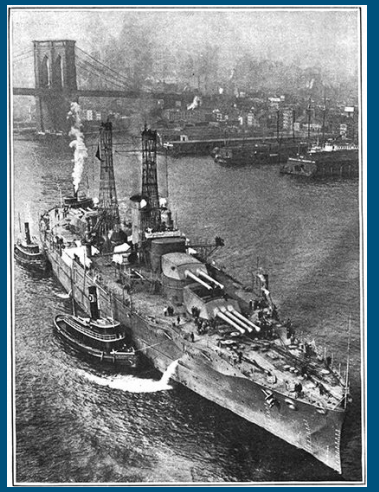
*Source: NASA

Global Ocean Temperatures

- On average, our oceans have warmed at a rate of about 0.8C since pre-industrial times.*
- Significant events in history have also contributed to these increased temperatures - events such as the COVID-19 pandemic and previous World Wars.
- Overall, the past 3 decades have been significantly warmer than expected, compared to 1880 when reliable records began. *

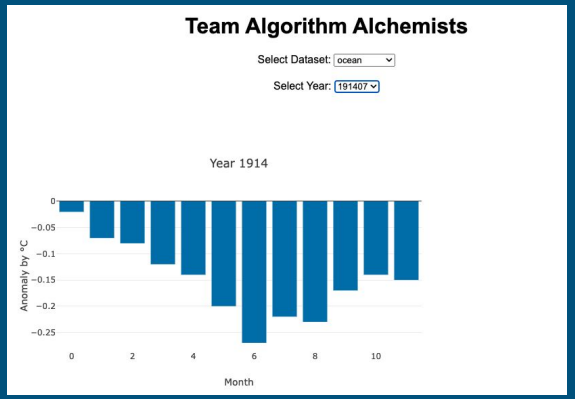
*Source: https://www.carbonbrief.org

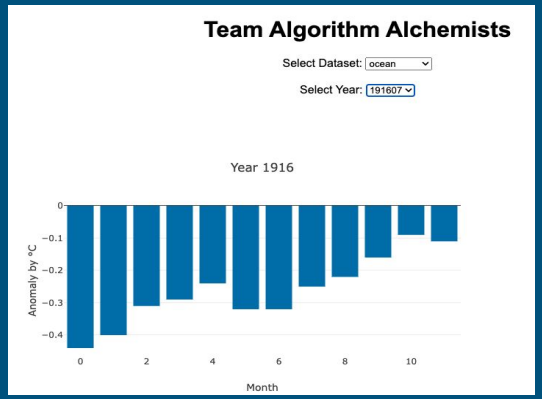
World War 1 - Visualized

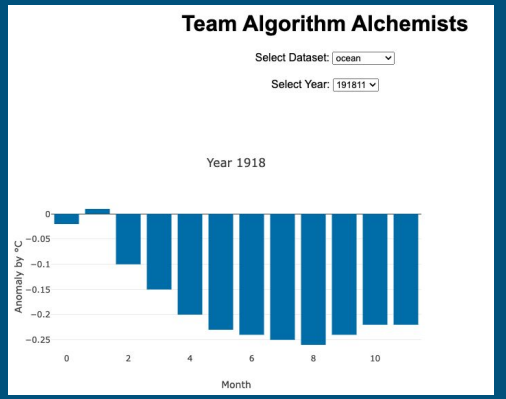


World War 1: July 28, 1914 - November 11, 1918

- While temperatures did rise slightly during the height of the war, the overall change was not drastic.



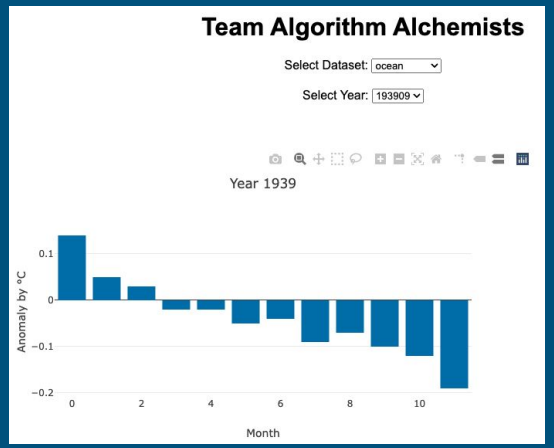


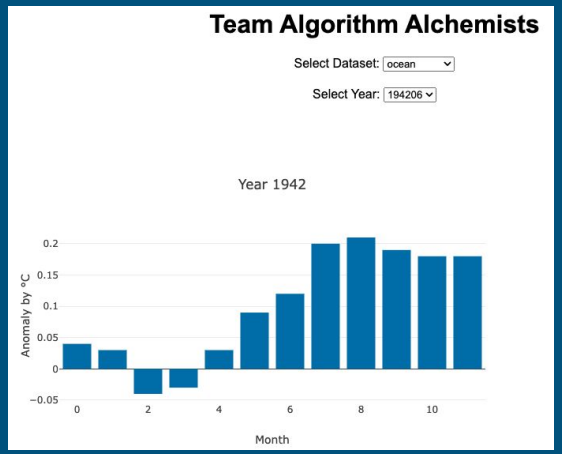


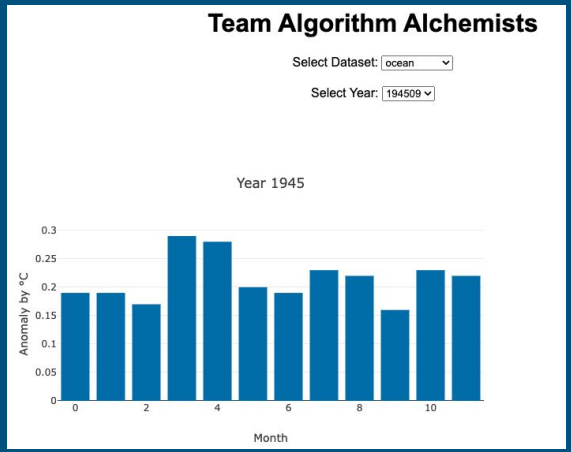
World War 2 - Visualized

World War 2: September 1, 1939 - September 2, 1945

- The second World War, however, did see significant temperature increases.



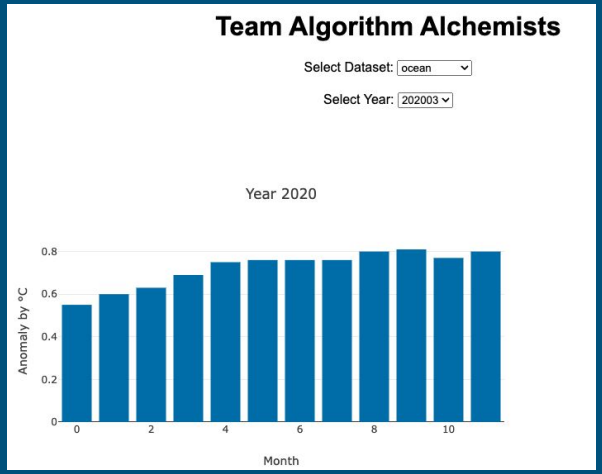


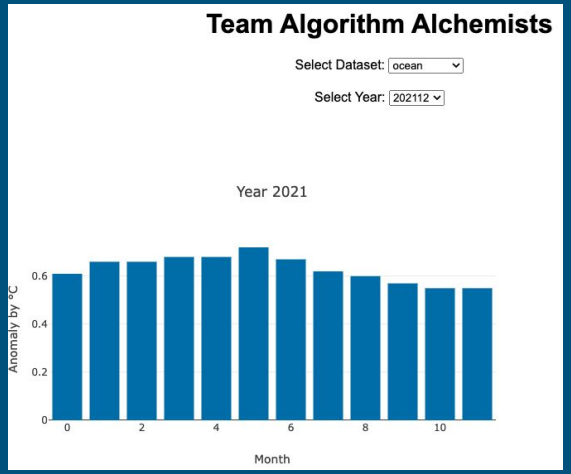


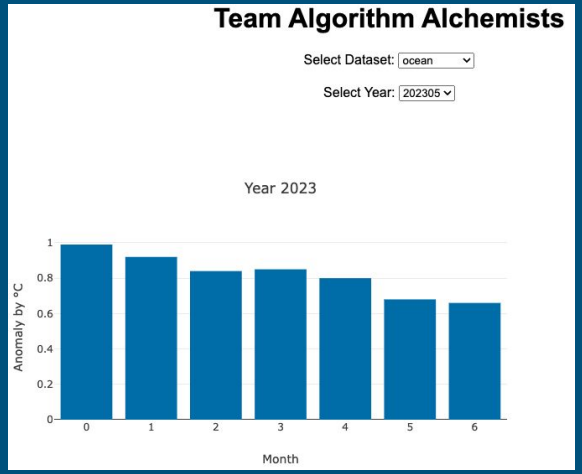
The COVID-19 Pandemic - Visualized

COVID-19 Pandemic: March 11, 2020 - May 5, 2023

- Lasting impacts from the global shutdown significantly affected our ocean's temperatures.







Air Quality

Air Quality

AQI Category + Value

- General
- CO
- Ozone
- NO2
- pm2.5

Map Global Air Quality Data 2023

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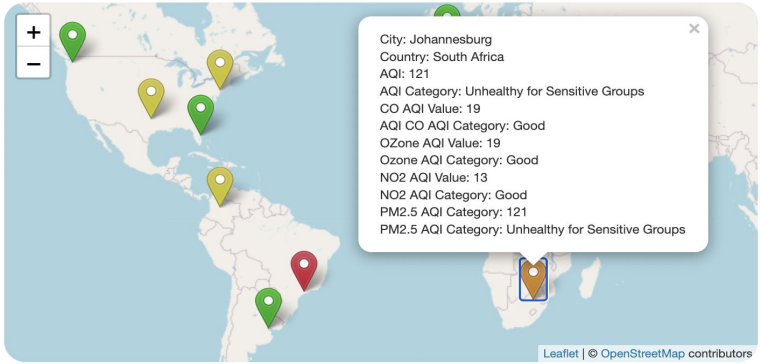
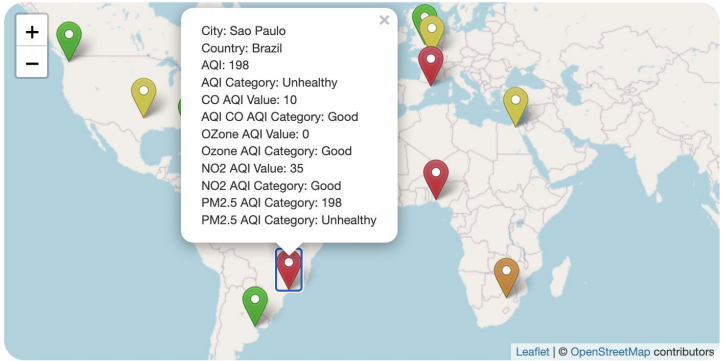


Map Global Air Quality Data 2023



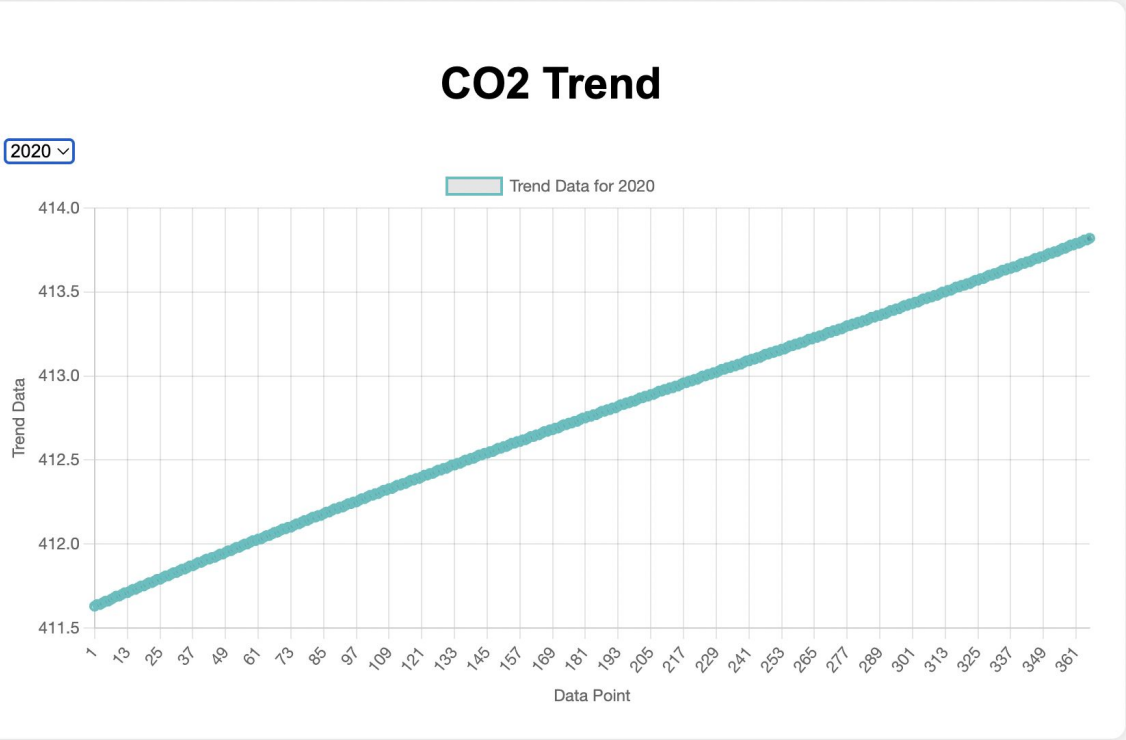
CO2 levels

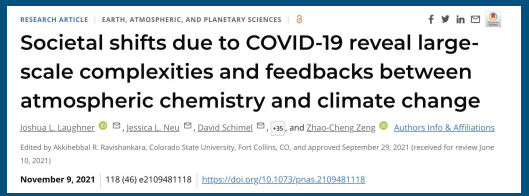
Reference:

- Pre-industrial levels 280 ppm
- Today 420 ppm

Global Warming API
CO2 levels
2013-2023

Trend: 3 points per year
COVID did not slow down CO2 rising levels





RESEARCH ARTICLE | EARTH, ATMOSPHERIC, AND PLANETARY SCIENCES

Societal shifts due to COVID-19 reveal large-scale complexities and feedbacks between atmospheric chemistry and climate change

Joshua L. Laughner, Jessica L. Neu, David Schimel, +35, and Zhao-Cheng Zeng Authors Info & Affiliations

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However, while carbon dioxide (CO_2) emissions fell by 5.4 percent in 2020 compared to the previous year, the amount of carbon dioxide in the atmosphere continued to grow at about the same rate as in preceding years. “This suggests that reducing activity in these industrial and residential sectors is not practical in the short term”.

Thank You