

# Tell Us a Special Climate Story!

Emission of CO<sub>2</sub> and Seismic Activity

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# Exploring the Relationship Between the Climate Emissions and Seismic Activity!!

# The Introduction

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# A Changing Climate, A Global Challenge

- Climate change is one of the biggest challenges of our time. Greenhouse gases (GHG), particularly CO<sub>2</sub> and methane, are the primary drivers of global warming.
  - While human activity is the main contributor, natural phenomena such as volcanic eruptions and earthquakes may also play a role
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# Hypothesis

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# Do Seismic Events Influence Emissions?

- As we face the global climate crisis, it's critical to understand how both natural and human-made activities affect the planet's atmosphere.
- Our analysis investigates whether earthquakes could cause spikes or drops in emissions.
- We explore this through data on seismic events and emissions from 2015 to 2020.

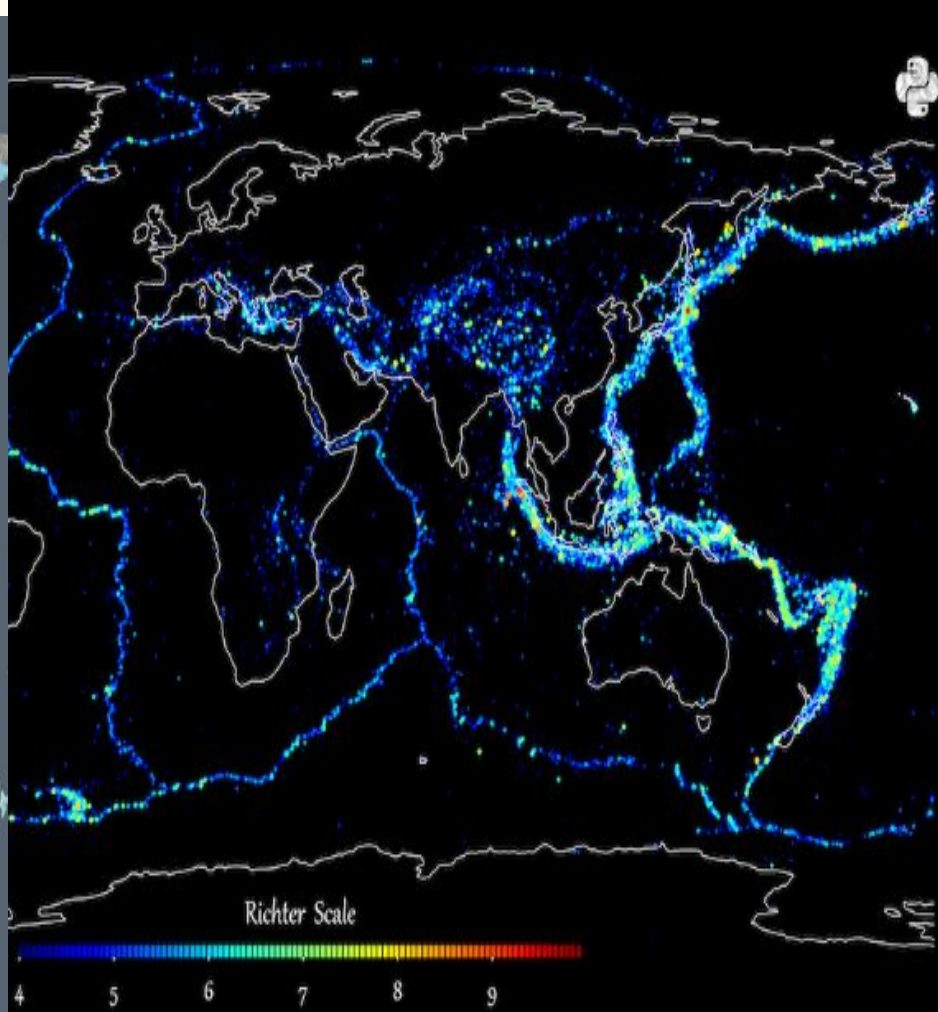
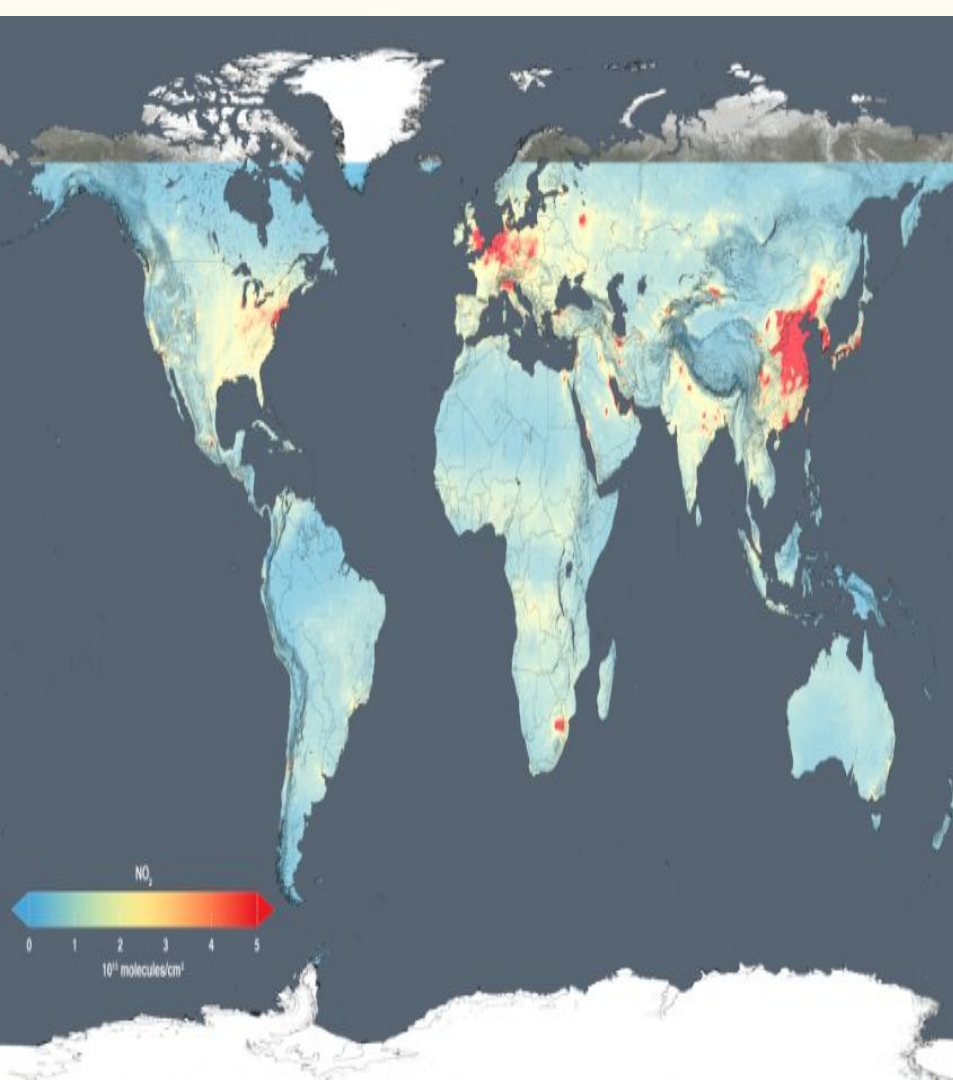


Figure 4.5, around the world between 1956 and 2022. Data Source - <https://www.usgs.gov/programs/earthquake-hazards/earthquakes>

# Gathering the Data



## DATA SOURCES

- **Emissions Data:** Sourced from NASA's CO<sub>2</sub> and methane emissions datasets, tracking concentrations and fluxes globally.
- **Earthquake Data:** Collected from the **IRIS Earthquake Browser** from 2015 to 2020, focusing on events with magnitude 5 and above.

**Goal:** Merge these datasets to explore any patterns between seismic activity and emissions changes.

# Emissions

	Longitude	Latitude	Value	Date
0	-179.5	89.5	-9999.0	2015-01-01
1	-178.5	89.5	-9999.0	2015-01-01
2	-177.5	89.5	-9999.0	2015-01-01
3	-176.5	89.5	-9999.0	2015-01-01
4	-175.5	89.5	-9999.0	2015-01-01

# earthquakes

	Longitude	Latitude	Value	Date
2260	-79.5	83.5	1.956606e-07	2015-01-01
2261	-78.5	83.5	6.236824e-08	2015-01-01
2262	-77.5	83.5	1.843677e-07	2015-01-01
2263	-76.5	83.5	6.893937e-07	2015-01-01
2264	-75.5	83.5	6.770272e-07	2015-01-01

# The Analytical Process

# Steps in Our Analysis

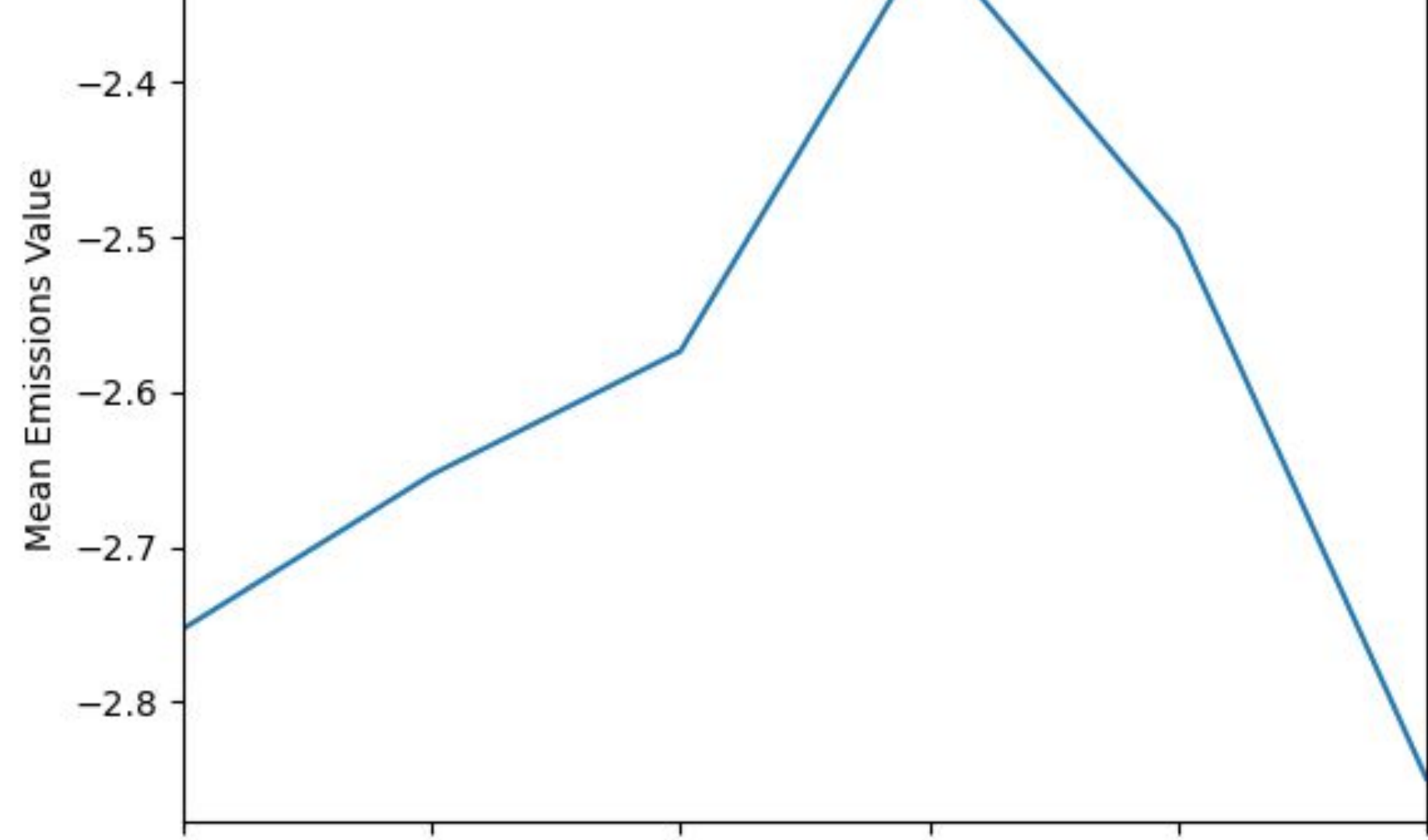
**Step 1:** Filtered earthquake data by magnitude ( $\geq 5$ ) and specific regions of interest.

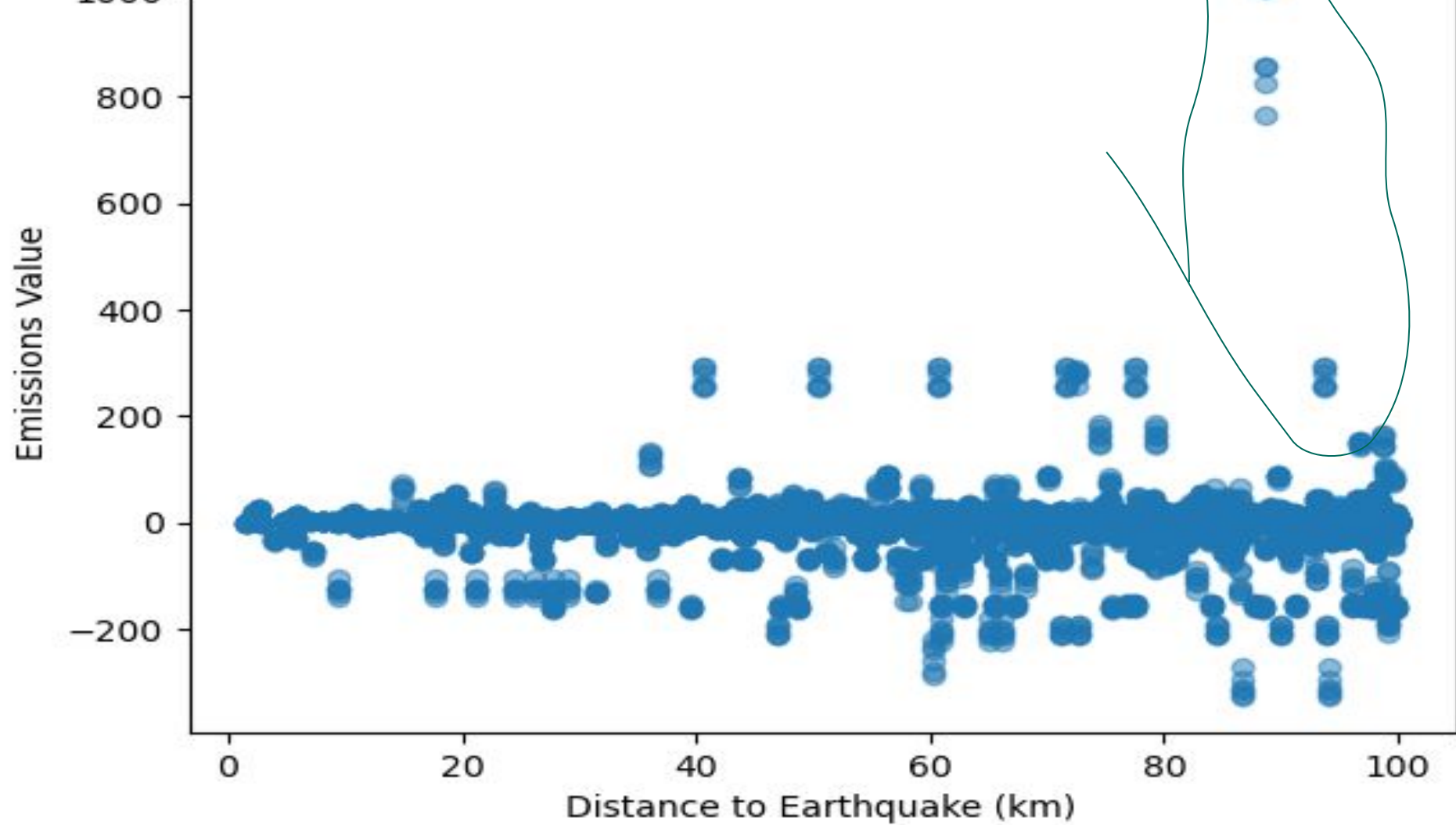
**Step 2:** Mapped emissions data close to seismic events.

**Step 3:** Analyzed changes in emissions **30 days before and after** major earthquakes.

**Step 4:** Visualized patterns and relationships between seismic events and emissions.

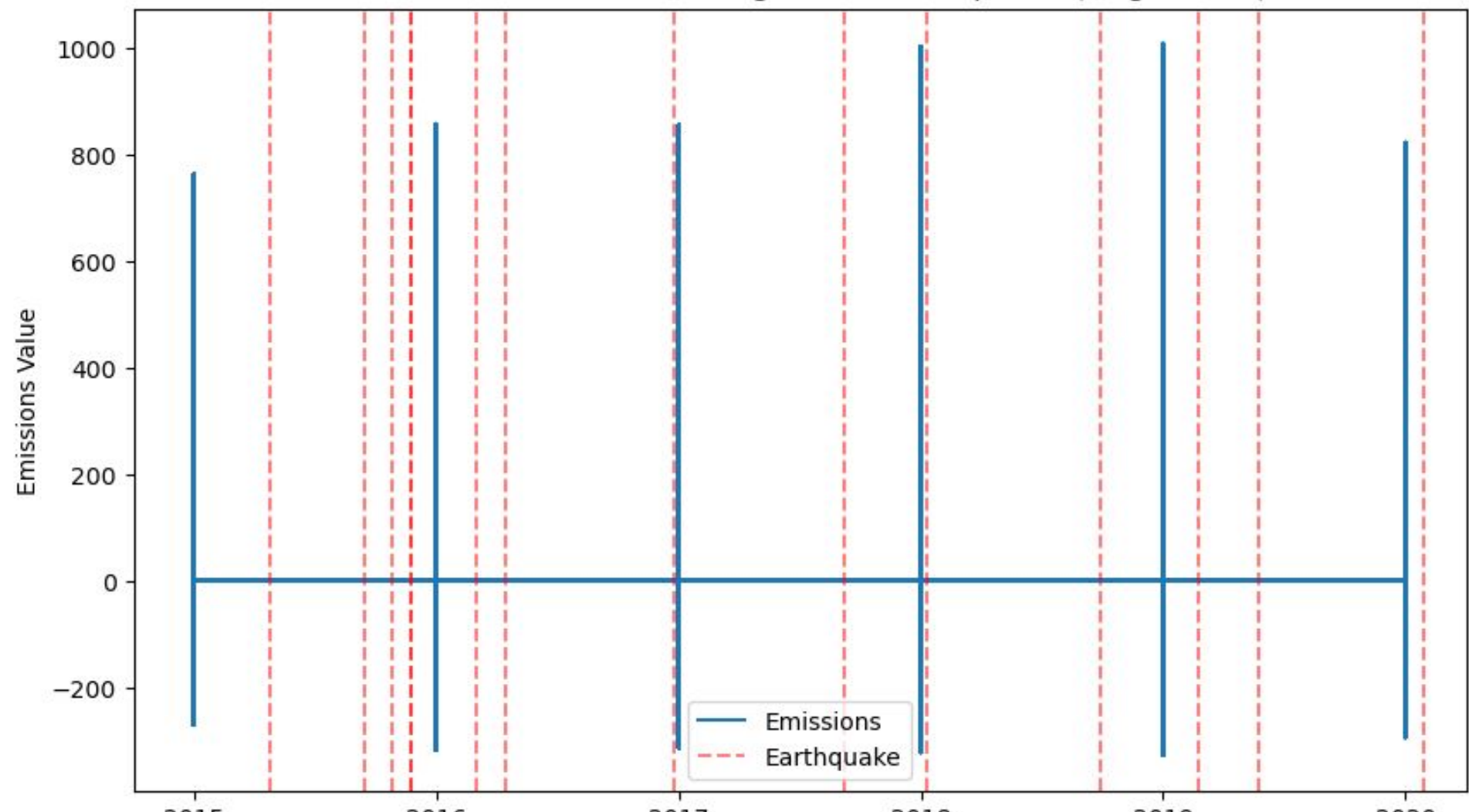
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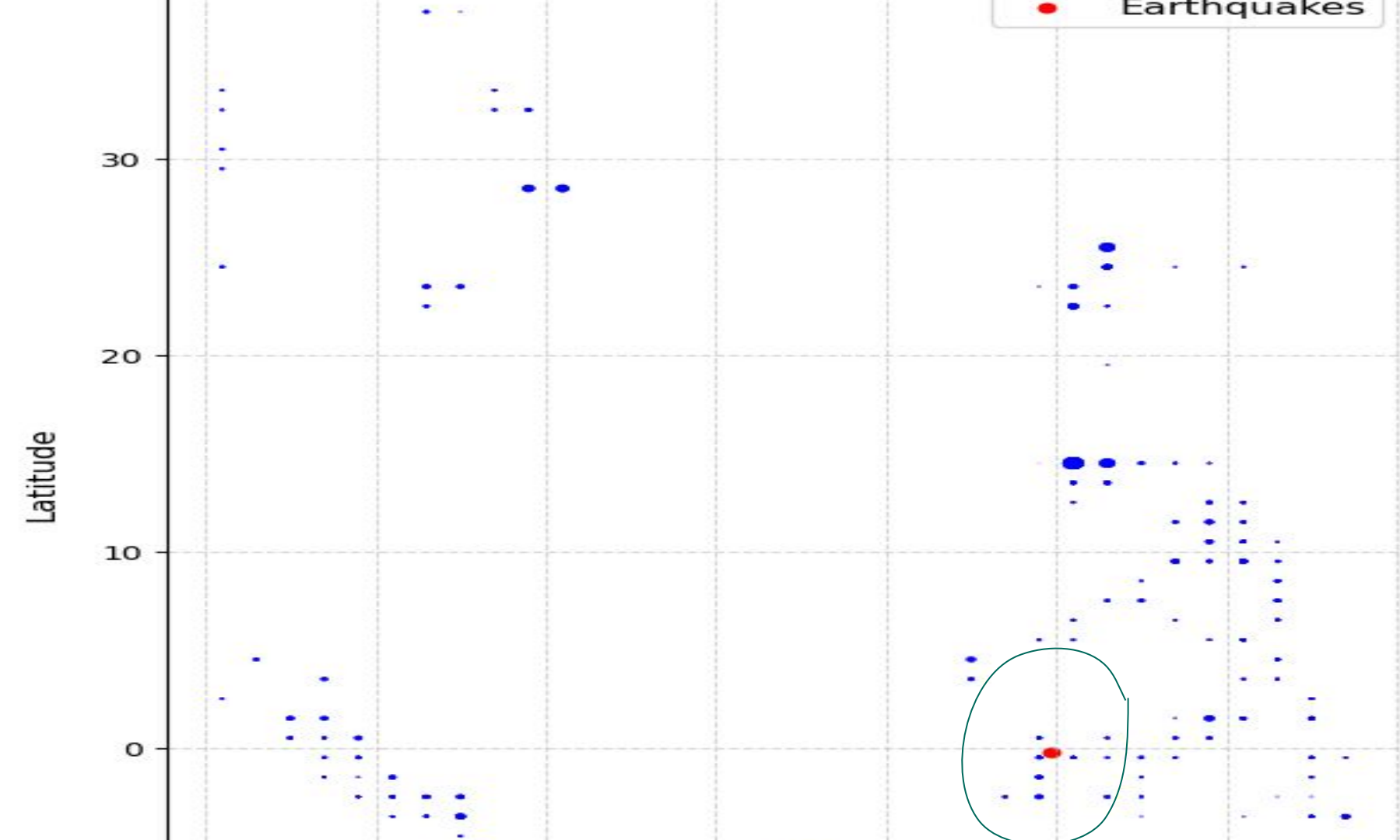
# Visualizing Earthquakes and Emissions

Emissions Before and After Significant Earthquakes (Mag  $\geq 7.5$ )





Insights



# More steps in Our Analysis

In some regions, emissions values fluctuate after large seismic events.

Analysis focused on emissions within a 100 km radius of earthquake epicenters, examining 30 days before and after major quakes.

Key Insight: Emissions spikes were observed after some major seismic events, particularly in areas with industrial activity.

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# Case Study

- `coordinates (120.1775, -1.7144)`
- At the beginning we detected :The approximate region is: Southeast Asia
- Exactly Indonesia: The coordinates (120.1775, -1.7144) are located in Indonesia (likely in the Sulawesi)
- Indonesia, situated along the Pacific Ring of Fire, is prone to both seismic activity and emissions from industrial processes and deforestation.
- We analyzed earthquakes and emissions in Indonesia and found correlations between large earthquakes and emission changes.

# Climate Story: Emissions and Earthquakes

# What We Found

- Seismic events, especially in regions like **Indonesia**, seem to have an impact on emissions.
  - Natural factors, like volcanic eruptions, and human factors, such as industrial disruptions, might both contribute to these emissions spikes.
  - These findings suggest that monitoring seismic zones could offer **early warning signs** of potential emission spikes.
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# Challenges Faced

- **Data Sparsity:** Some regions had insufficient emissions data, making it difficult to draw broad conclusions.
  - **Time Lag:** It was challenging to align seismic and emissions data accurately in time for some regions.
  - **Complexity of Relationships:** Emissions changes may result from a mix of natural and industrial factors, making causation hard to prove.
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# Conclusion



# What Does This Mean for the Climate?

- **Key Finding:** Seismic events can potentially influence emissions, particularly in regions with active industries or natural carbon sources.
  - These findings underline the importance of monitoring seismic zones not only for their physical impact but also for their environmental impact.
  - More research is needed to further explore how seismic activity might be linked to long-term climate change trends.
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# The Next Steps

- **Future Work:** More granular research is required to understand how natural events like earthquakes, and volcanic eruptions affect emissions.
  - Improved monitoring of both emissions and seismic activity could help predict and mitigate some of the environmental effects.
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THANKS