USGS Earthquake Data Analysis & Visualisation: The Americas vs. the world (Dates: 17 DEC 24 – 16 JAN 25)

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Agenda

- Dataset & Initial Investigation
- Method
- Results
- Conclusions

Dataset & Initial investigation

Dataset origin

- The USGS(U.S Geological Survey) monitors and reports on earthquakes, their impacts and hazards, and conducts targeted research on the causes and effects of earthquakes.
- They USGS provides real-time notifications, feeds and web services about earthquakes.
- F Rahman has set up a continuous data set on Kaggle containing details of all earthquakes that have happened in the last 30 days.
- Dataset downloaded for analysis covers 17 Dec 24 – 16 Jan 25

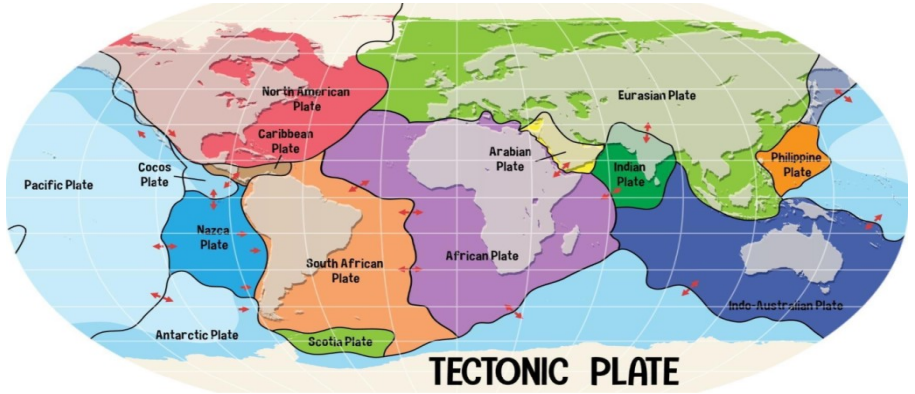
Initial investigation

- Broad picture analysis
  - Date, place (longitude, latitude), event type, magnitude and depth data most accessible to non-expert
  - Excluded error data and more technical data
- Sorted dataset for magnitude and depth
  - highest values contained non American data
  - lower values predominantly American data
  - Do we see differences in magnitude, depth and event types when we separate the Americas from the rest of the world?

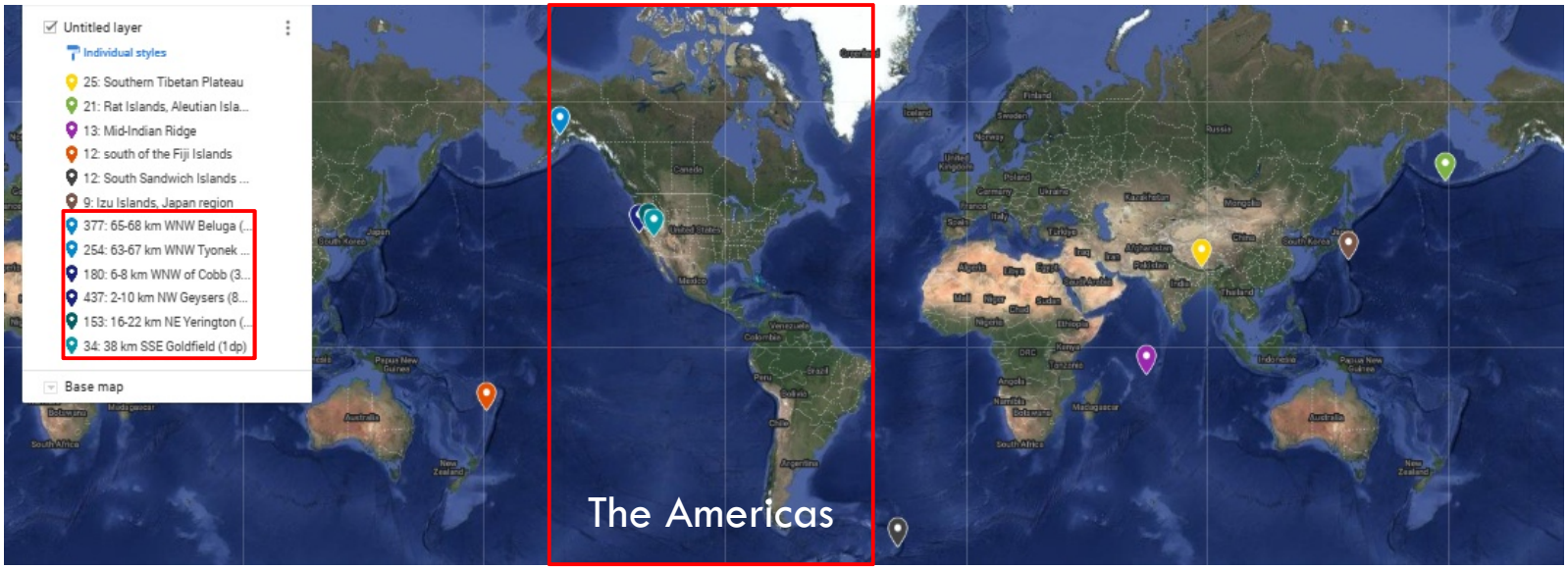
➢ *Reference – Kaggle page: Earthquake*

Method

- Do we see differences in magnitude, depth and event types when we separate the Americas from the rest of the world?
- Created 2 new datasets using longitudes:
  - North and South America (Americas)
  - Rest of the world (non-Americas)



Tectonic map, reference: world-map-showing-tectonic-plates-boundaries-free-vector.jpg (1920×980)

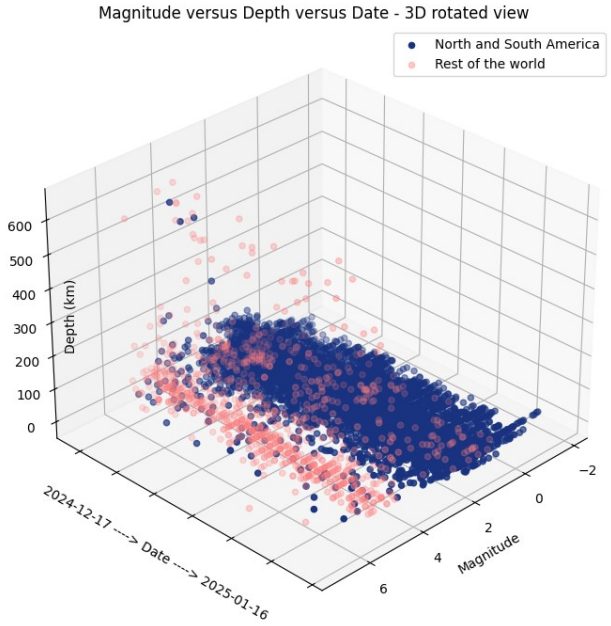


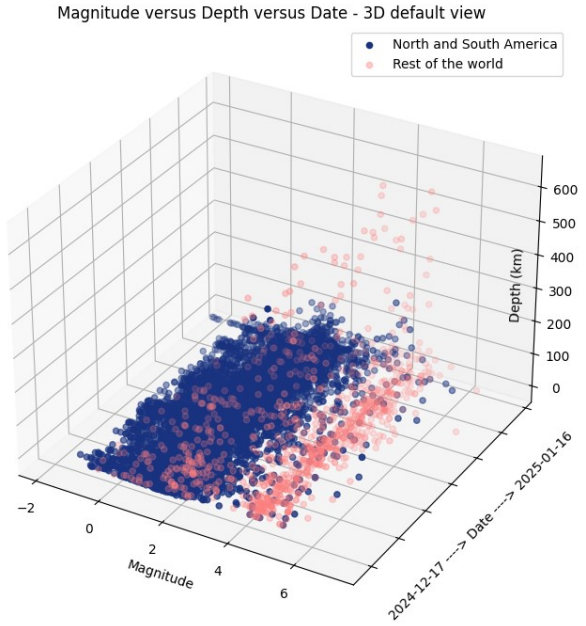
Custom map showing approximate longitude separation of the 2 datasets: the Americas and the rest of the world: Custom map view link

*place references the closest known populated place in relation to the seismic event (Americas) in Geonames population dataset or a different seismic and geographical scheme is used (rest of work. ANSS Comprehensive Earthquake Catalog (ComCat) Event Terms Documentation

Results – Magnitude vs. Depth vs. Time

- More data for Americas (8030) versus rest of the world (1034)
- One 3D plot shown at different rotations: higher depth and magnitude data values harder to see on default visualisation (right) versus rotated visualisation (left)
- Rest of world data predominantly higher magnitudes and depths versus the Americas
- Data relatively consistent day to day - some higher than usual depth/magnitude readings in the Americas mid- late December

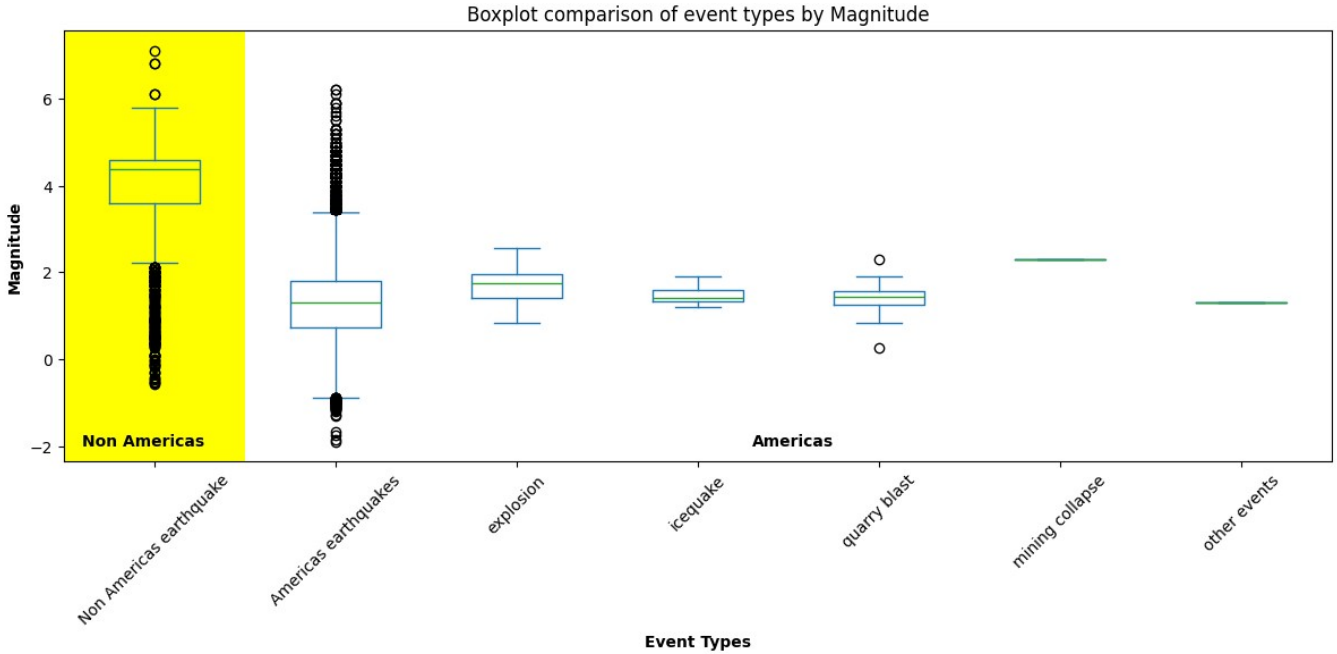




**Date axis values converted to float to be plotted and not human readable. Labelled with axis label for readability*

Results – Magnitude of event types

- non Americas/rest of the world data only had earthquake event types recorded with predominantly higher magnitudes versus Americas earthquake magnitudes
- non Americas/rest of the world earthquake outliers mainly lower magnitude and opposite for Americas
- Magnitudes of non earthquake event types for Americas have tighter data spread but similar range of magnitude for the majority of datapoints



Conclusions

- USGS captures much more data local to the Americas
- USGS data captured from the rest of the world predominantly of greater magnitude

Potential Future work

- Review and update code for future proofing with further data sets
- Pull and pool more data for longer timeline comparison
- More in-depth analysis of places and event types

Q & A