

Earthquakes

Today we will explore the structure of the earth and think about earthquake prediction.

Open the IRIS Earthquake Browser (www.iris.washington.edu/ieb/). Play around with it and familiarize yourself with its features.

Project One: Zoom into South America and select a region over South America that spans from Santiago to Rio de Janeiro (Fig. 1).



Fig. 1.

- A) plot 1000 events with all magnitudes (prioritize larger events). Is there a pattern to the distribution of earthquakes across South America?
- B) Download the data as a netcdf file and import the file into IDV (as a netcdf data point file). Create a display of the data (make sure to select declutter and show multiple occurrences). Rotate the display and look at the pattern of the earthquakes with depth and distance from the western margin of the continent. What pattern do you see? Make a sketch of the earthquake pattern. Can you explain this pattern?

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Project Two: Zoom into Central America and the west coast of the United States.

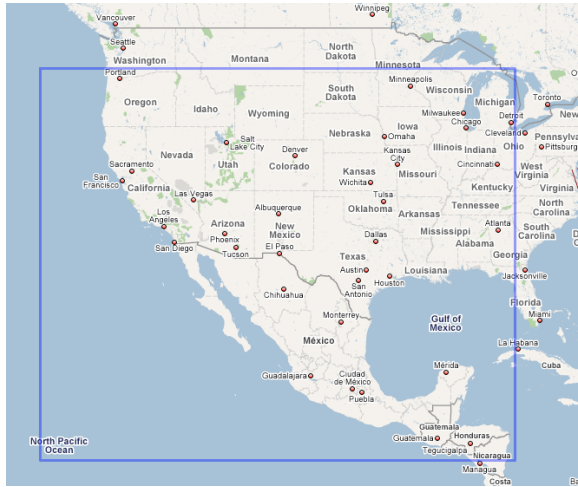


Fig. 2

Compare the earthquake pattern of the west coast of the US, Mexico, and Central America. Are there differences? Is there anything special about the location of earthquakes in Baja California and Southern California compared to Central America and Oregon?

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Project Three: Zoom into the north Atlantic and select a slice between Labrador and Ireland.

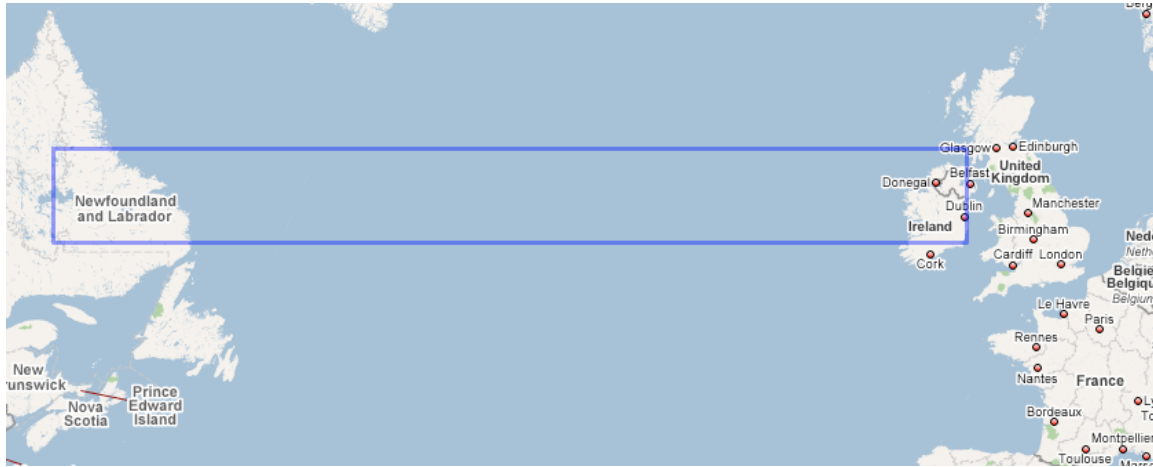


Fig. 3

Describe the earthquake pattern. Download the netcdf file and import into IDV. Visualize the earthquake locations in IDV and compare the earthquake structure of the Mid Atlantic to South America. Is there a difference in depth distribution and strength?

Project Four: Zoom into Mount St. Helens National Park explore the location and depth distribution of earthquakes in IDV. Make a sketch and speculate what causes the pattern.

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Project Five: Earthquake predictions. Zoom into the Sumatra region and select all earthquakes larger than 7.0.

- a) What is the distribution of these earthquakes?

- b) Create a table of the earthquakes and calculate the recurrence interval of a major earthquake in this area ($T = N/n$). N = years on record, n = number of events.

- c) The probability (P) of an event with recurrence interval T is $P = 1/T$. What is the probability of an earthquake with a magnitude larger than 7 to hit Sumatra next year?