Earthquakes

Earthquakes are caused mostly by rupture of geological faults but also by other events such as volcanic activity, landslides, mine blasts, and nuclear test.

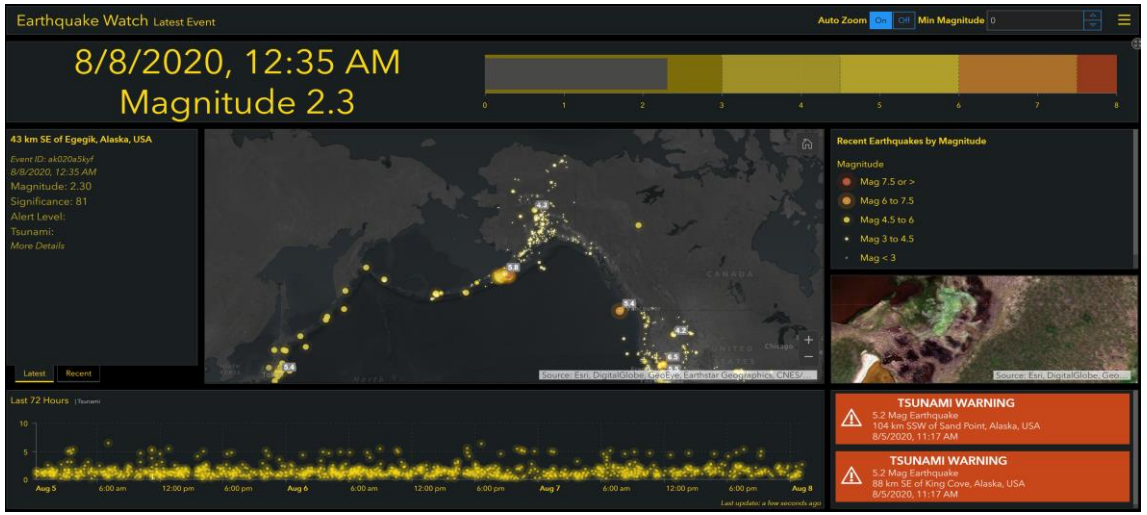
Earthquake Knowledge

An earthquake is any seismic event caused by nature or humans that generates seismic waves.

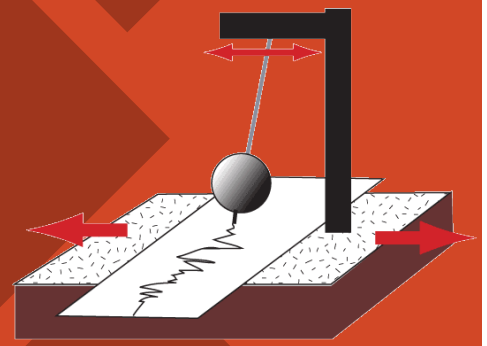
Energy radiates outward from the fault in all directions in the form of seismic waves.

Picking a Topic

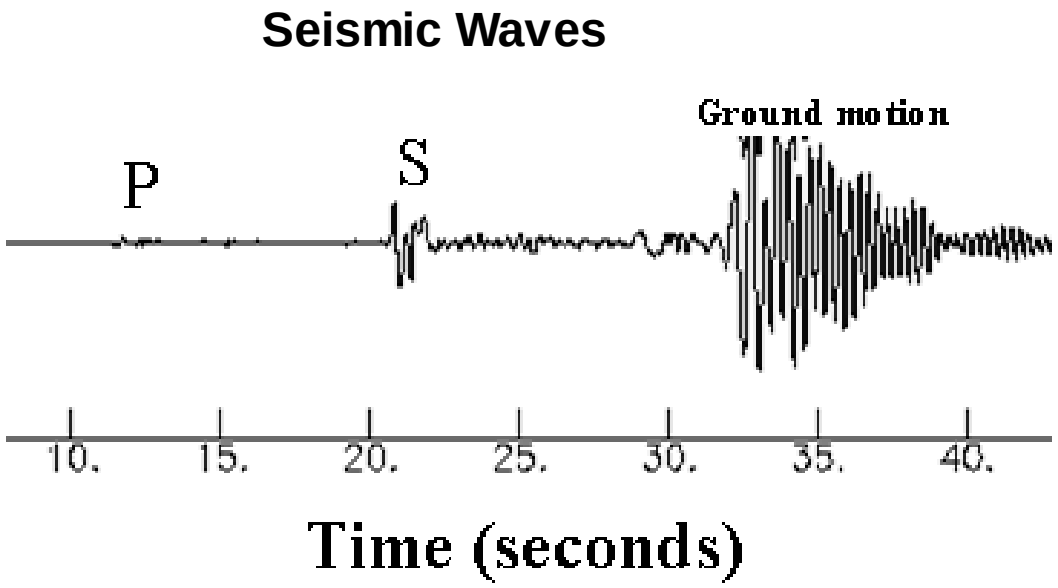
- We settled on focusing on earthquake data. We chose the earthquake USGS.gov catalog from the ProgrammableWeb.com Earthquakes APIs list. The data was used to analyze the significance of the earthquakes and to create a dashboard where users can filter the events based on time and type which then provides a web map to analyze the locations, magnitudes, frequencies and depths of the earthquakes. The dashboard also consists of a bar chart that provides the magnitude types count, a histogram showing the magnitude frequencies and a scatter plot of the magnitude vs depth.
- The inspiration was the following dashboard which provides the latest earthquake monitoring events.



Seismograph



Earthquakes are recorded by instruments called seismographs.



Seismic wave chart of an earthquake

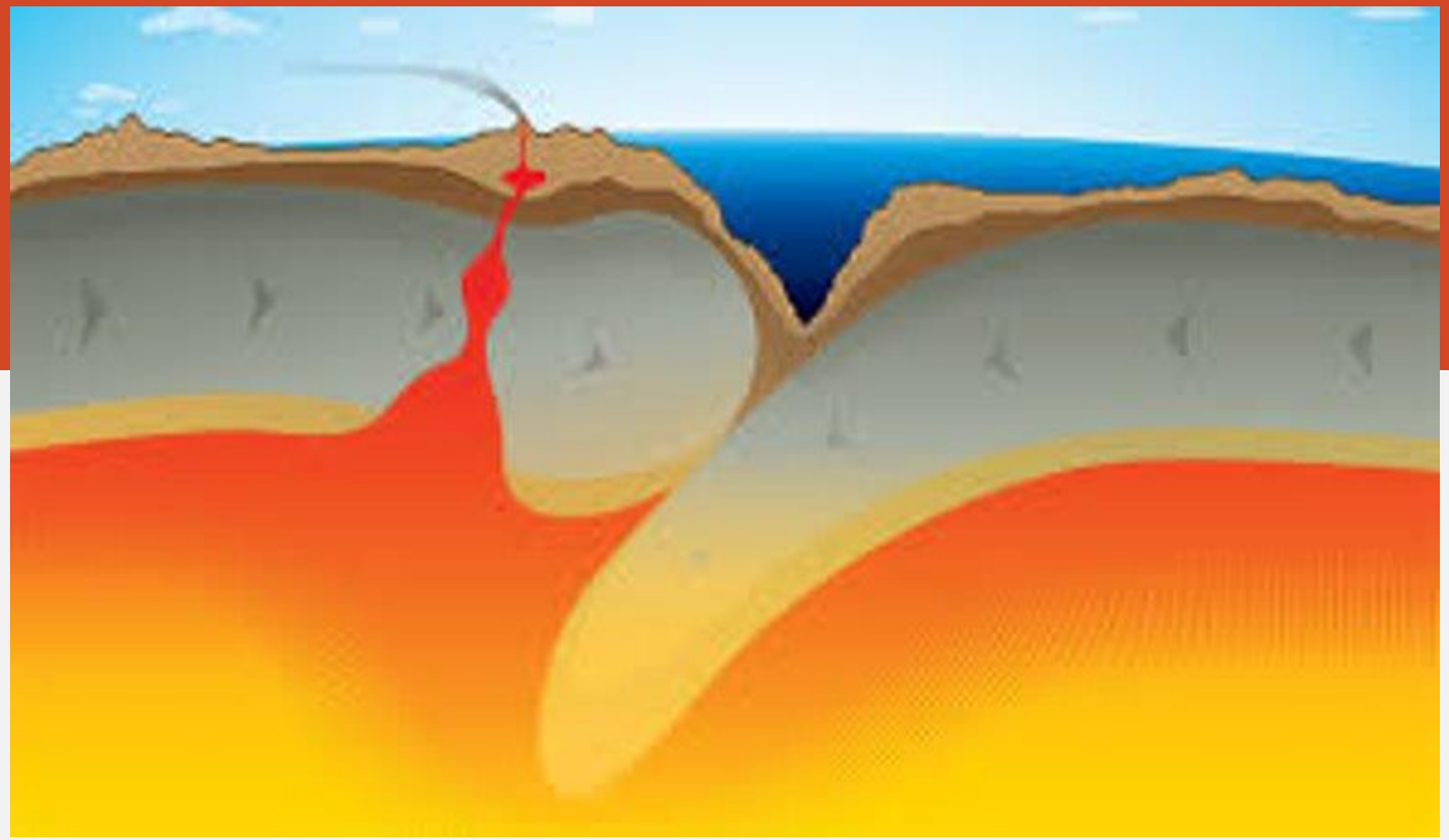
Shock waves from an earthquake that travel through the ground are called seismic waves. They are most powerful at the center of the earthquake, but they travel through much of the earth and back to the surface. They move quickly at 20 times the speed of sound.

Current instrumentation shows that around 500,000 total earthquakes occur each year. Of those, around 100,000 are large enough to be felt by people.

Alaska is the most seismically active state and has more large earthquakes than California.

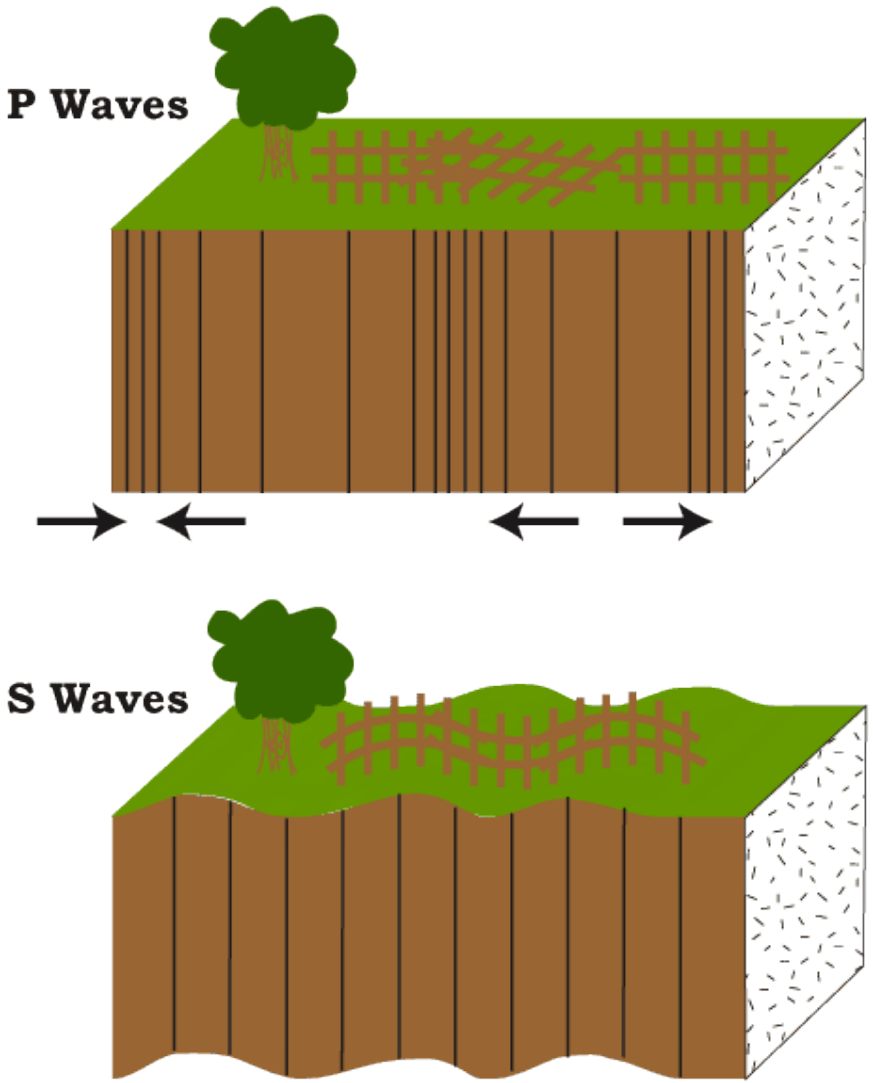
The largest earthquake ever recorded in the world was in Chile in 1960. It measured a 9.6 on the Richter Scale. The largest in the US was a 9.2 magnitude in Alaska in 1964.

Fault Lines



The major fault lines of the world are located at the fringes of the huge tectonic plates that make up Earth's crust

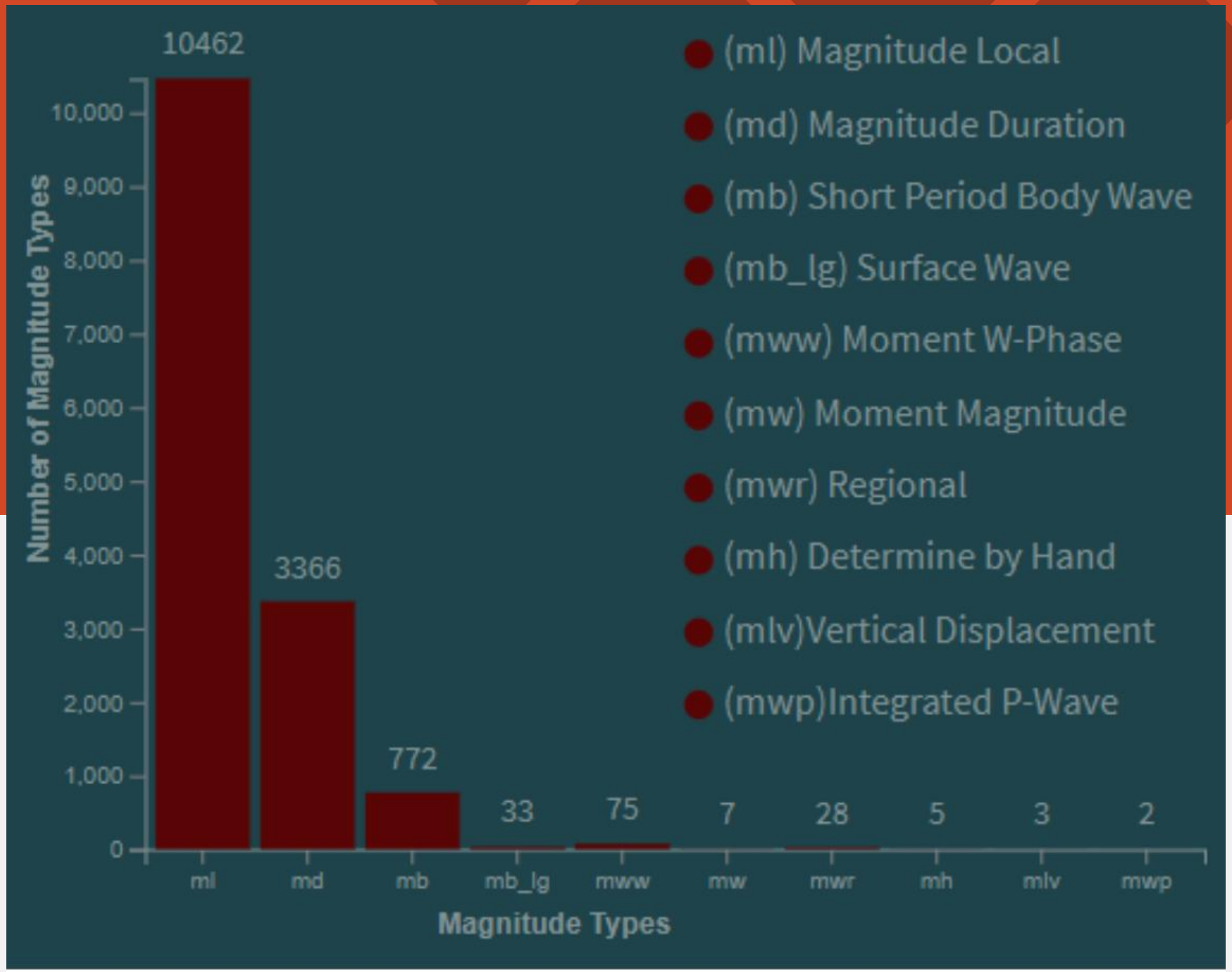
Seismic Waves



The P waves travel faster and shake the ground where you are first.

Then the S waves follow and shake the ground also.

If you are close to the earthquake, the P and S wave will come one right after the other, but if you are far away, there will be more time between the two.



Magnitude Types of Scales

Magnitude is based on measurement of the maximum motion recorded by a seismograph.

Several scales have been defined but the most commonly used are:

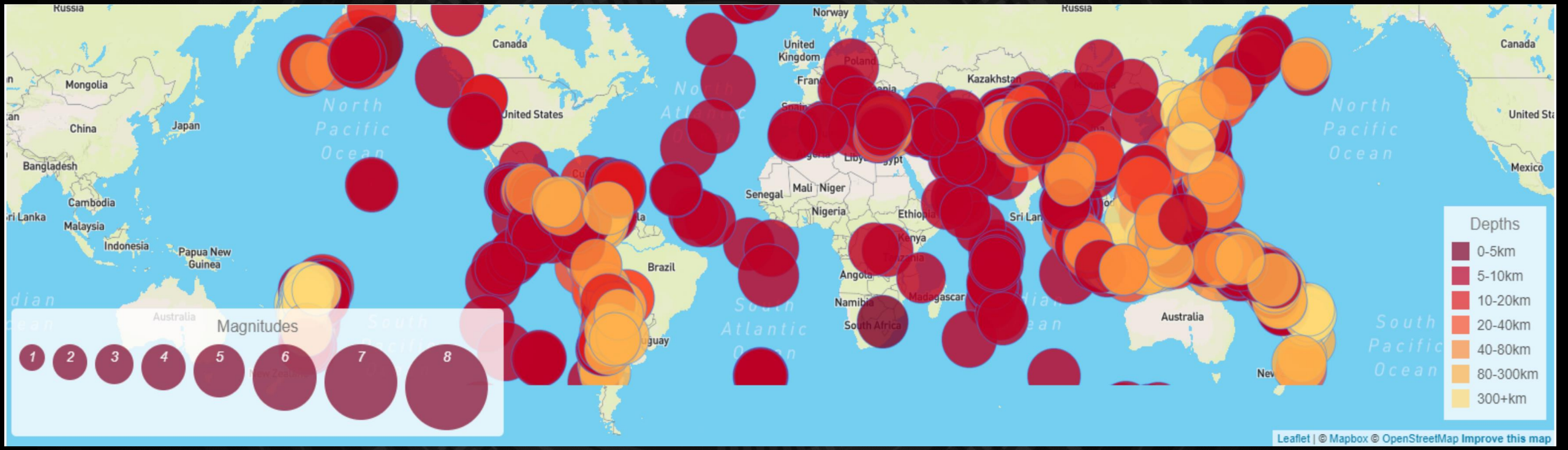
Magnitude Local (ml)– commonly referred to as Richter scale. **Measures the maximum amplitude of the ground shaking**

Magnitude Duration (md)- measures the total duration instead of the duration of surface waves

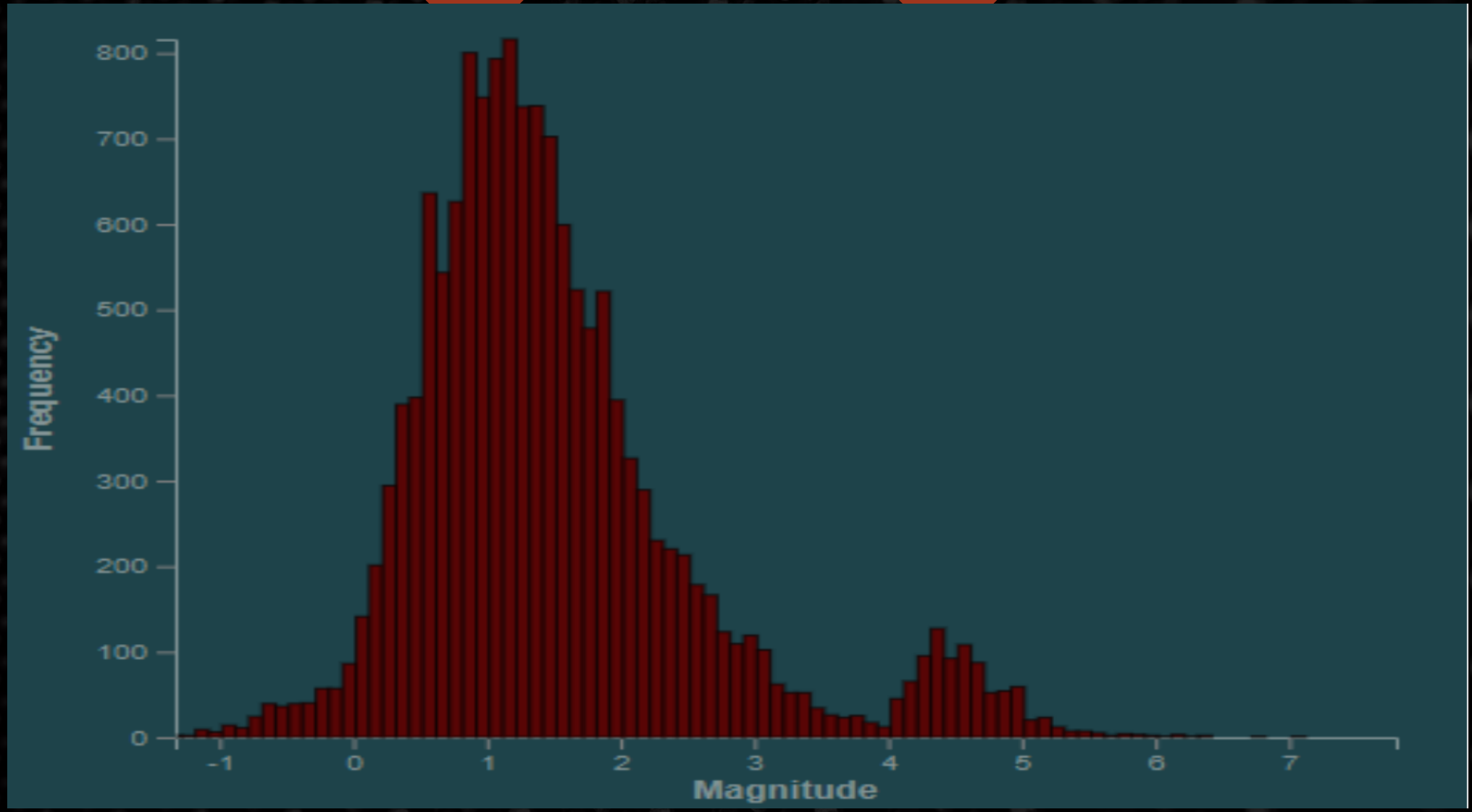
Magnitude Body-Wave(mb) - uses only P-waves measured in the first few seconds

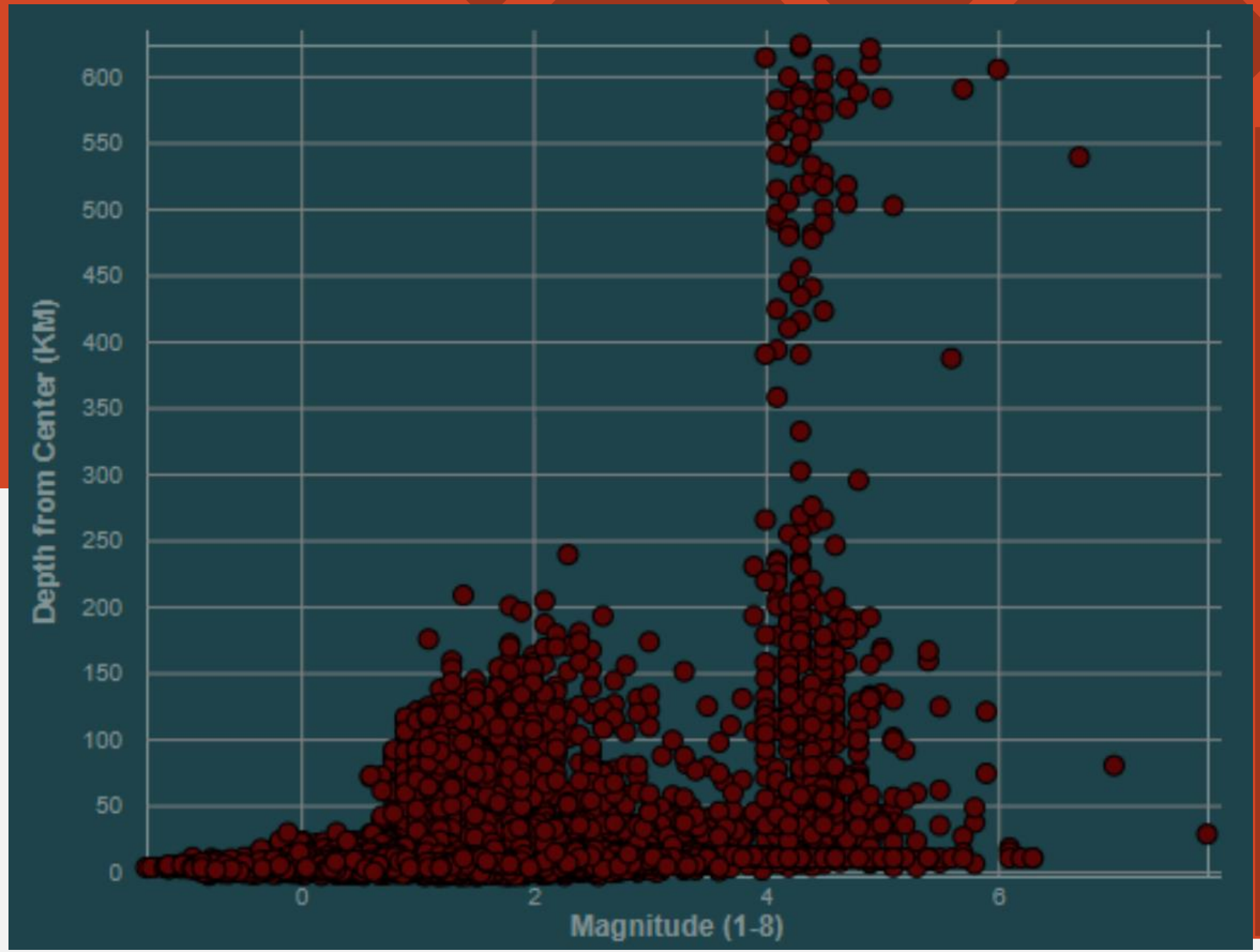
Map of Earthquakes

Our map shows that, unsurprisingly, earthquakes generally occur along the tectonic plates.



The magnitude is distributed mostly around a 1 on the Richter Scale. However, there is a spike of earthquakes between 4 and 5.





When looking at a scatter plot of magnitude vs depth, there is a large increase of intermediate and deep earthquakes at the 4-5 range of magnitude.

Conclusions

In conclusion, we learned several things from this 30-day sample of earthquake data. It was interesting to see an uptick in earthquakes with a magnitude of 4-5, particularly at great depths (200+ km).

While the great majority of earthquakes were in the vicinity of tectonic plates, it was interesting to see many earthquakes were around the state of Oklahoma. For future work, we may look into the correlation of quantity and size of earthquakes with the amount of fracking, oil and gas, etc. going on in the area.

The source of our data was from the United States Geological Survey and it appears that the United States had a disproportionate number of low-magnitude earthquakes.

The "Ring of Fire" (see right) contains 400+ volcanoes and 81% of the world's largest earthquakes occur along this area.