Engineering Seismology and Seismic Hazard – 2019

# Exercise #1

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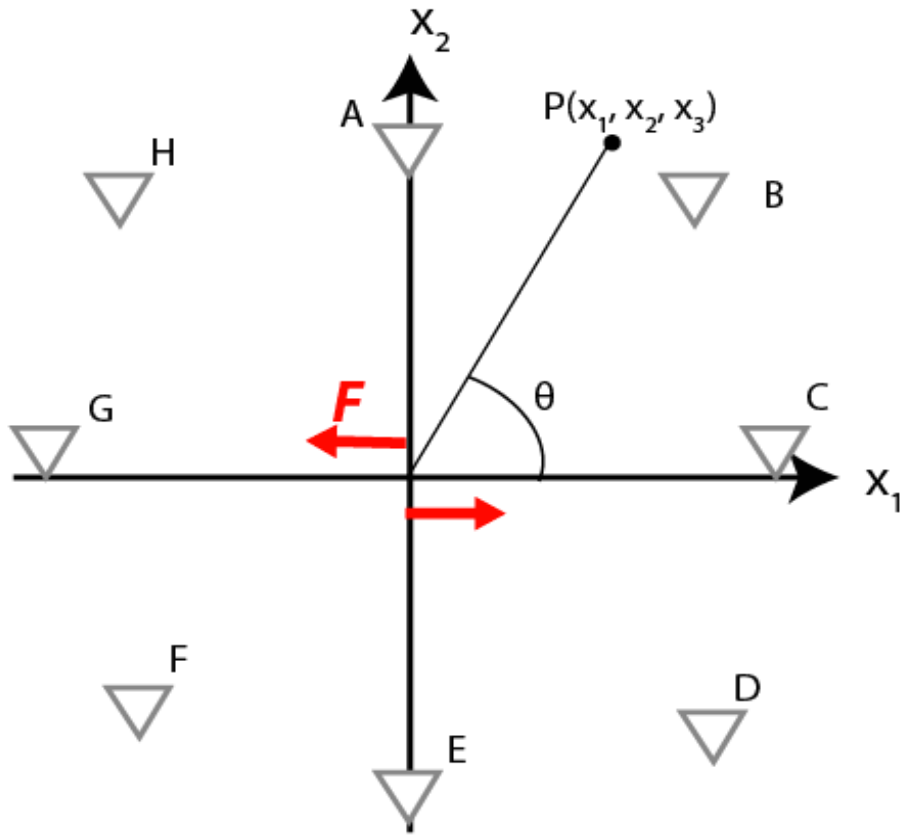
# Question 1

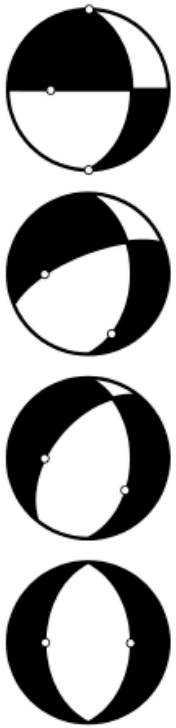



Green's function represents the wave propagation characteristics of a medium.

If we introduce a double couple source, we can discuss the propagation pattern of the generated waves by the source.

Imagine we have stations A-H positioned around the source. What might be the expected p – s wave patterns and directions.

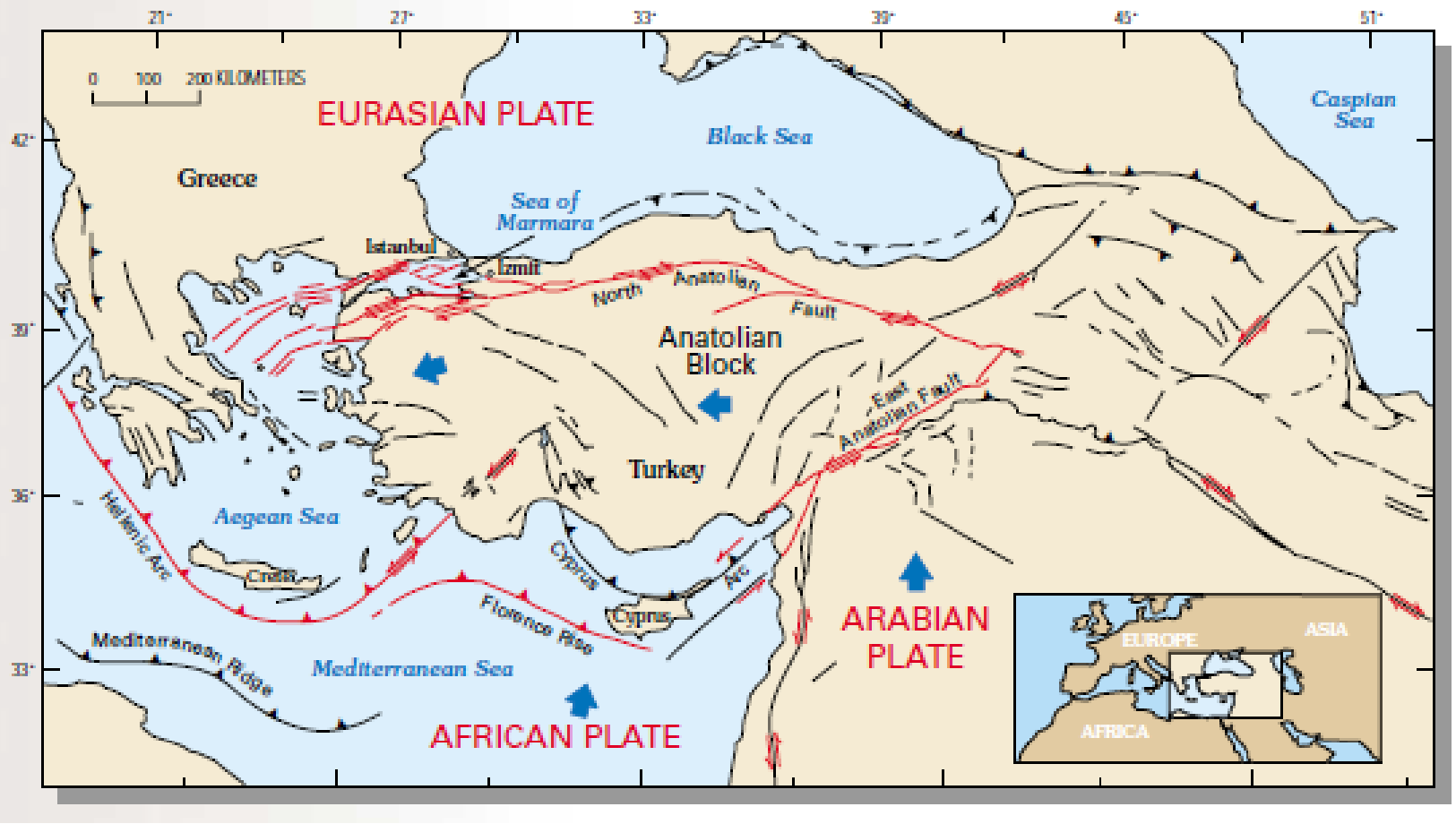
# Question 2



Guess which mechanism!

Beach balls are graphical representations of focal mechanisms associated with specific earthquakes.

# Question 3




Anatolian plate is one of the most studied tectonic regions in the world.

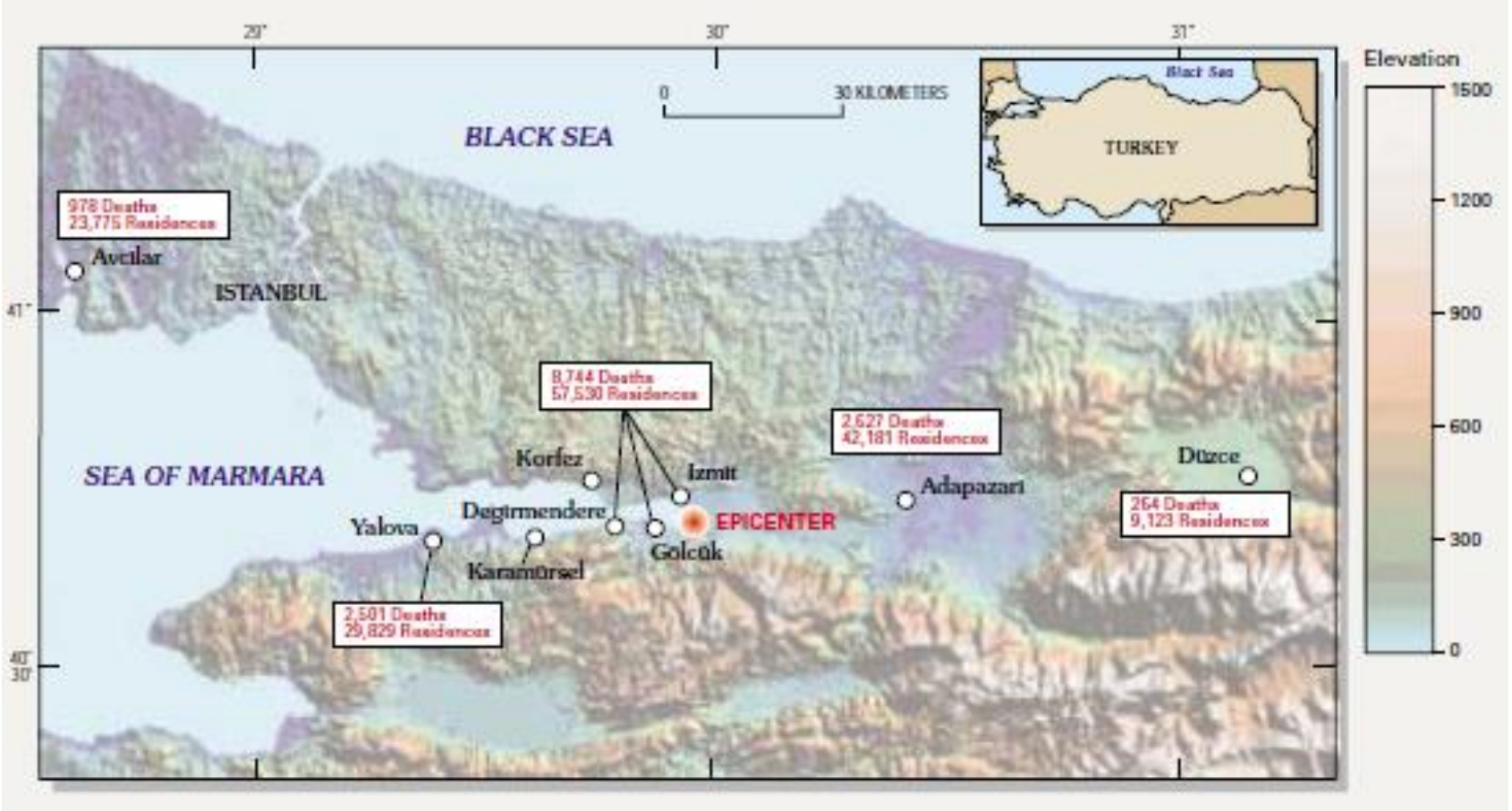
Anatolian plate is a minor tectonic plate under compression between the African, Arabian and Eurasian Plate.

# Question 3

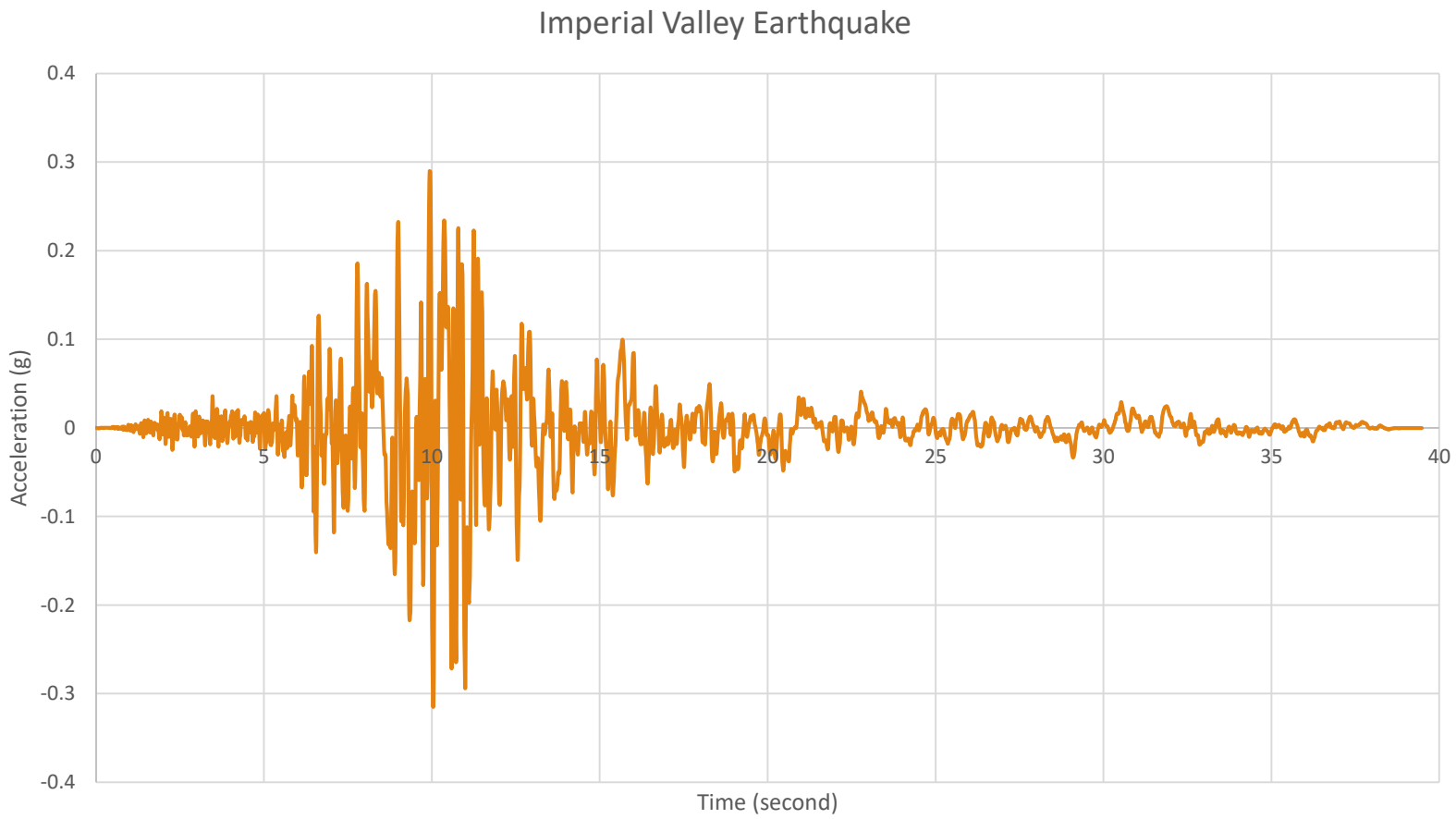
In 1999, a Mw 7.6 earthquake occurred on the western main branch of the North Anatolian Fault (NAF).

This event was quite close to numerous major cities in North-western Turkey.

We will be discussing some main characteristics of this event.



# Question 3




Lets compute the epicentre to the strong motion station distance

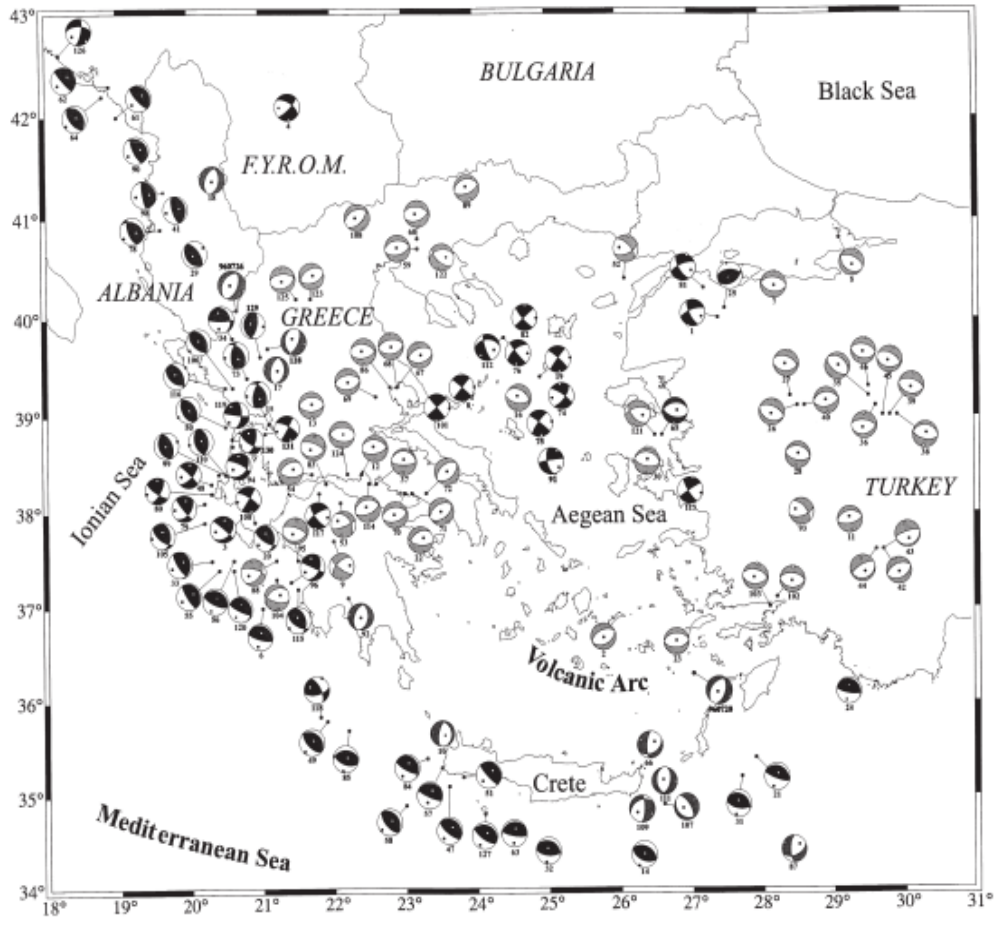
Assume Vp = 7 km/sec and Vs = 4 km/sec

We have two equaitons;

$X\ (km) = Vp * t1$

$X(\ km) = Vs * (t1 + \Delta t)$

# Question 4



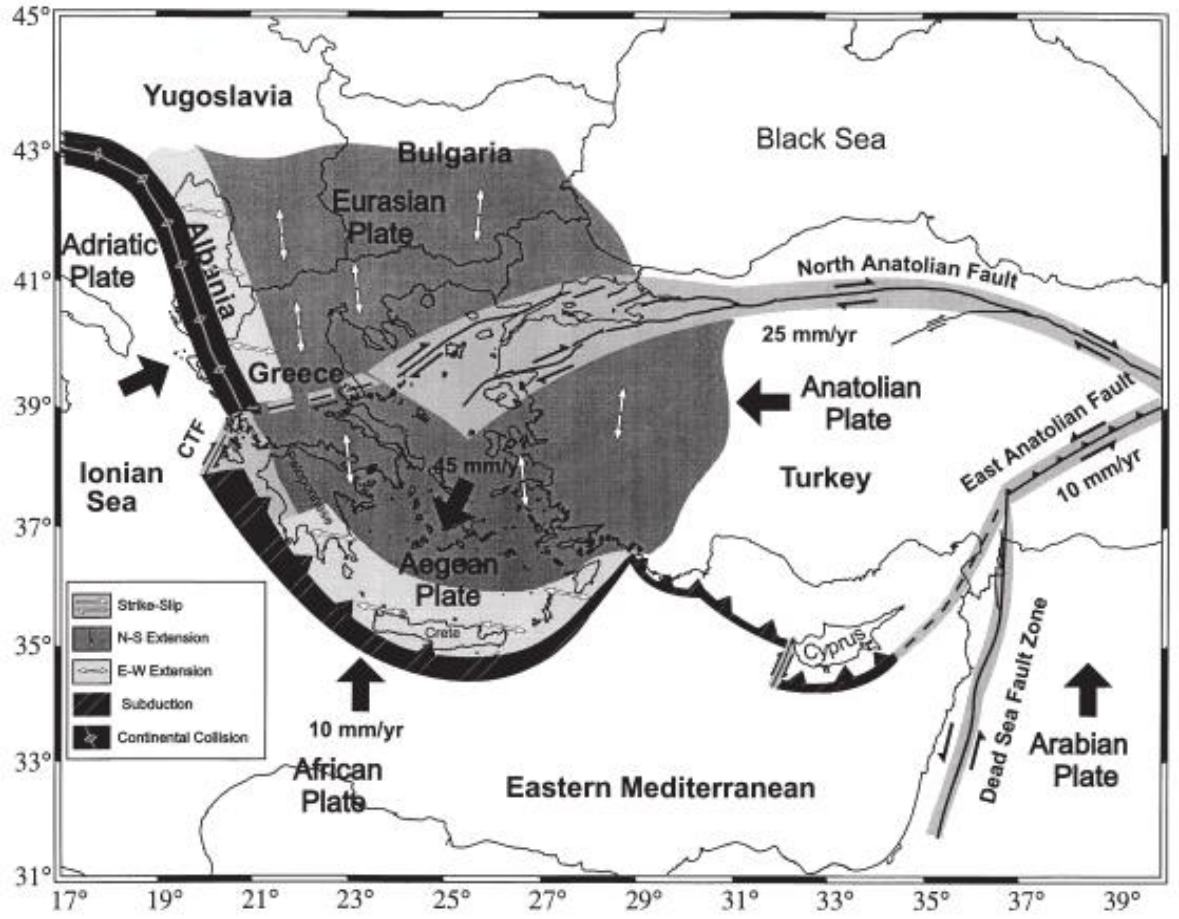

Here, all the earthquakes occurred between 1953 and 1995 having a magnitude higher that M>5.5

What does such a database might tell us?

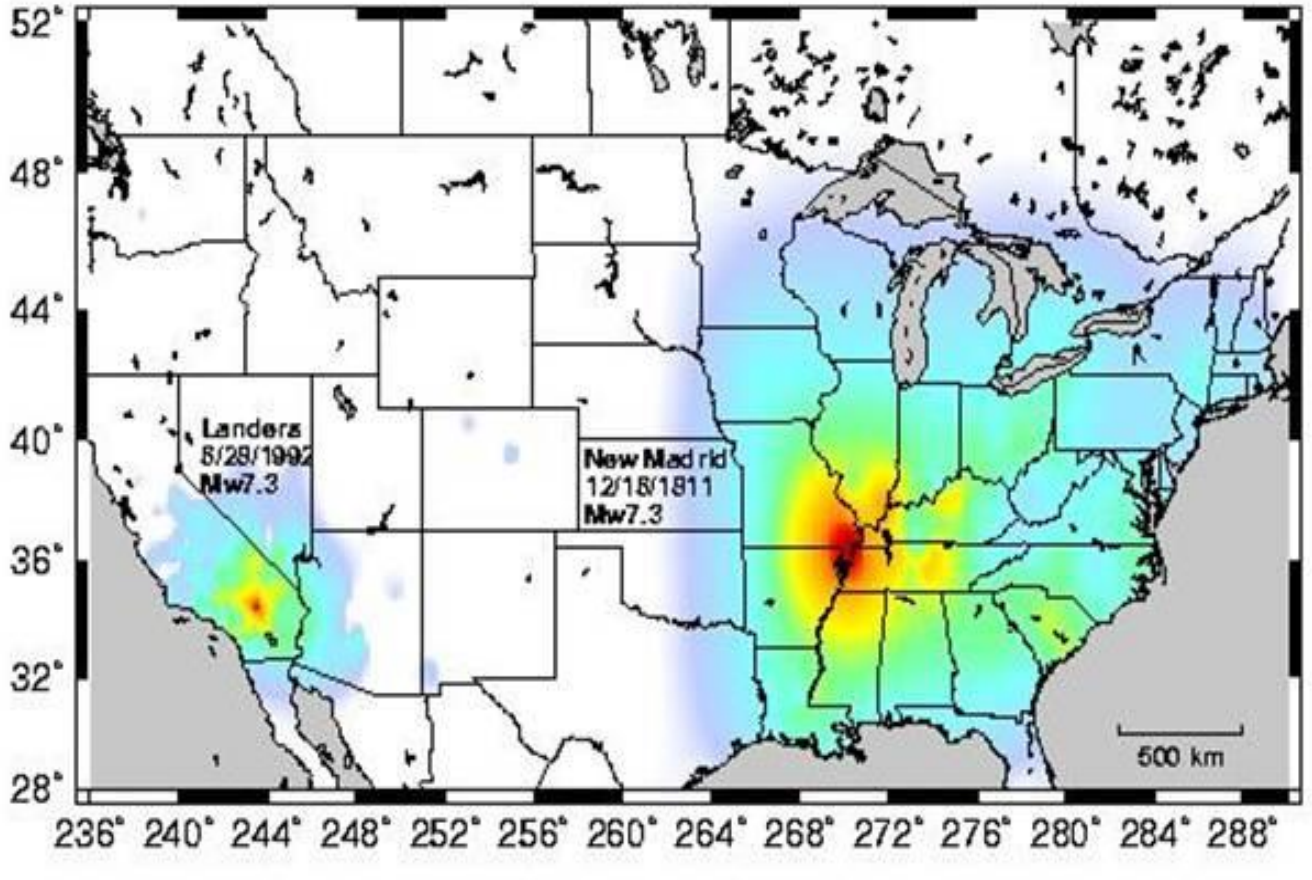
# Question 4

Here, is the tectonic setting of the same region.

Do you think that the previous plot and this one is compatible?



# Question 5




| PERCEIVED SHAKING | Not felt | Weak | Light | Moderate | Strong | Very strong | Severe | Violent | Extreme |
|---|---|---|---|---|---|---|---|---|---|
| POTENTIAL DAMAGE | none | none | none | Very light | Light | Moderate | Moderate/Heavy | Heavy | Very Heavy |
| PEAK ACC.(%g) | *<.17* | *.17-1.4* | *1.4-3.9* | *3.9-9.2* | *9.2-18* | 18-34 | 34-65 | 65-124 | >124 |
| PEAK VEL.(cm/s) | <0.1 | 0.1-1.1 | 1.1-3.4 | 3.4-8.1 | 8.1-16 | *16-31* | *31-60* | *60-116* | *>116* |
| INSTRUMENTAL INTENSITY | I | I-III | IV | V | VI | VII | VIII | IX | X+ |

In 1811, a sequence of three high magnitude earthquakes occurred in New Madrid, Ohio.

Peculiarly, these events had an enormous area of influence and the shaking was even felt from the cities as far as New York, Boston and Montreal.

Compared with the similar magnitude event in Landers, California, what controls the felt area of these earthquakes? If you were the scientist to model the ground motion in these two earthquakes, how would you consider this difference in your model?