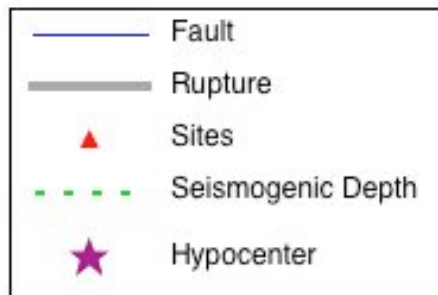
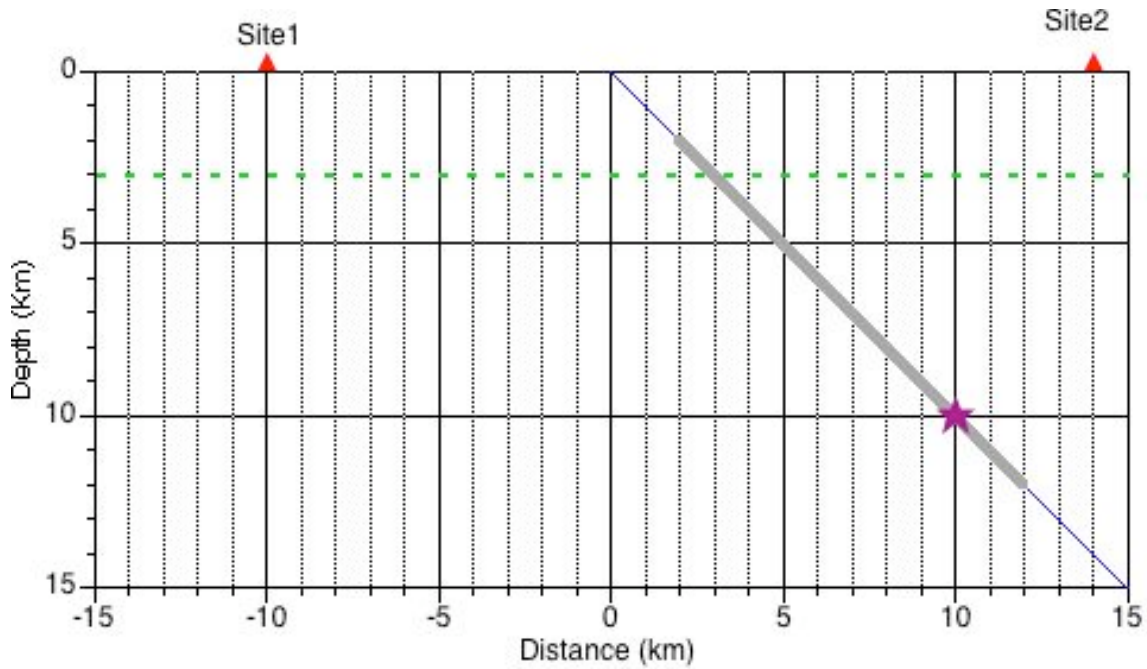


Problem Set #3

Ground Motion Models

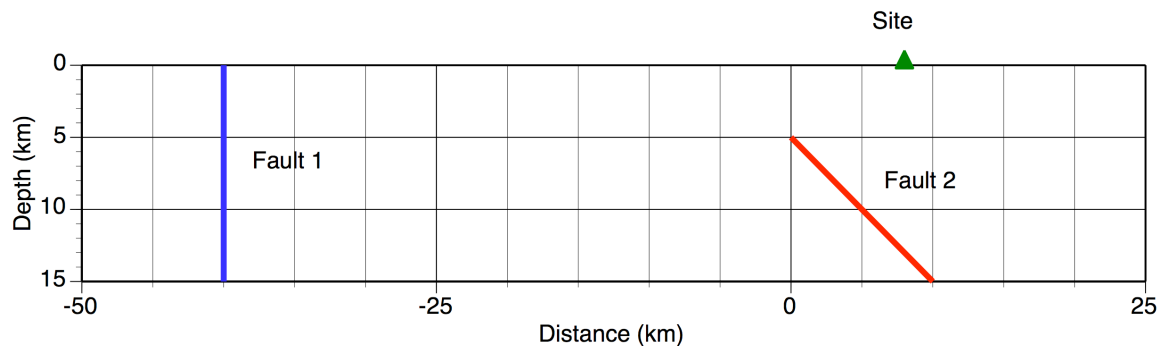
1. For the scenarios shown in Figure1, compute the six distance measures for each site: R_{epi} , R_{hypo} , R_{rup} , R_{seis} , R_{JB} , and R_x . Assume that the rupture goes past the site (e.g the distance into the page is zero). Specify which site is on the hanging wall and which is on the footwall.



For problems 2, 3, 4, use the following source characterization:

	Fault 1	Fault 2
Length (km)	100	30
Width (km)	15	14
Dip	90	45
Top of fault (km)	0	5
Slip-Rate (mm/yr)	5	1
Magnitude pdf	delta function	delta function
Style-of-Faulting	Strike-slip	Reverse
Mag-Area model:	mean $M=\log(A)+4$ pdf = delta func	mean $M=\log(A)+4$ pdf = delta func

The site is located at $X=8$ km



2. For each fault, compute the mean characteristic magnitude and the median and standard deviation of the $T=0.2$ sec spectral acceleration (5% damping) using the Abrahamson and Silva (2007) and the Boore & Atkinson (2007) NGA models. Use two site conditions:

Rock: $VS_{30}=760$ m/s (measured), $Z_{1.0} = 50$ m, $Z_{2.5}=500$ m

Soil: $VS_{30}=270$ m/s (measured), $Z_{1.0} = 500$ m, $Z_{2.5} = 2000$ m

3. Compute the median amplification factor (ratio of the median soil/ median rock ground motion) from each earthquake (fault) and each attenuation relation. Explain why the amplification factors for $T=1.0$ sec are similar for the two earthquakes, but the amplification factors for $T=0.2$ sec are different for the two earthquakes.

4. Explain why the standard deviation for the soil and rock sites based on the Abrahamson & Silva model are similar for fault 1, but different for fault 2. Why are they the same for the Boore & Atkinson model for both faults?

5. Classify the following as either epistemic uncertainty or aleatory variability in the context of seismic hazard analysis.

	Aleatory	Epistemic
The spectral acceleration given a magnitude, distance, style-of-faulting, and site condition		
Value of the standard deviation of the spectral acceleration given a magnitude, distance, style-of-faulting, and site condition		
Value for the median spectral acceleration given a magnitude, distance, style-of-faulting, and site condition		
Dominant style-of-faulting of a fault		
Location of the hypocenter given the rupture plane		
Seismogenic depth of a fault		