

# EARTHQUAKES VOLUNTEER GUIDE

General guidelines and information.

Volunteers are encouraged to tailor presentations based upon their knowledge, experience, and student interests.

You will have 5 groups for 20 minutes each.

## Key Concepts:

- Global seismicity in space and time
- Plate motions produce fault movement, fault movement produces earthquakes
- Elastic rebound/stick-slip fault movement
- Specific time, place, and size of earthquakes can't be predicted
- Seismic energy released in waves, waves cause ground shaking
- Extensional tectonics (basin and range faulting)
- Earthquake preparedness and safety
- Liquefaction

## Resources and Equipment:

- **tables for "Drop, Cover, and Hold On"**
- **UGS earthquake machine** (concrete block with winch)
- **slinky**
- **large fault blocks**
- **liquefaction table**
- **seismometer app** on phone, projected on large monitor
- computer and large monitor
- Utah earthquakes and faults map
- Wasatch fault block diagram
- Drop, Cover, Hold On poster
- liquefaction poster
- Energy/earthquake magnitude diagram
- Basin and Range extension GIF (can be downloaded here – [https://www.iris.edu/hq/inclass/animation/basin\\_\\_range\\_structural\\_evolution](https://www.iris.edu/hq/inclass/animation/basin__range_structural_evolution))
- USGS Latest Earthquakes web map – <https://earthquake.usgs.gov/earthquakes/map/?extent=-78.69911,-287.57813&extent=84.9901,162.42188&range=week&listOnlyShown=true&baseLayer=terrain&settings=true>
- YouTube liquefaction news piece (2011 Christchurch, NZ) -- [https://www.youtube.com/watch?v=j-hyOwsl\\_NY](https://www.youtube.com/watch?v=j-hyOwsl_NY)

## **Earthquakes Happen Where and When?** (USGS Latest Earthquakes)

The Earth's plates (jigsaw puzzle) move. Most (but not all) earthquakes happen on faults at plate boundaries (define fault). Earthquakes are happening all the time, you just can't feel most of them (< M2.5).

**Extensional Tectonics/Earthquakes in Utah** (Earthquakes and faults map, fault blocks, earthquake machine)

Utah isn't at a plate boundary, but it has faults that can move (e.g., Wasatch fault). Crust is being stretched (rocks deep in the crust are warm and "squishy"); each year **Utah and California get about ½ inch farther apart** (that's about the same rate that your fingernails grow). The stretching produces "normal" faulting. Energy gets stored in the hard/brittle crust, released suddenly when the fault moves.

The amount of movement on a fault, and the amount of time between the earthquakes produced, is never exactly the same. That's why we can't predict exactly when, where, or how big an earthquake will be.

**Earthquake Waves, Shaking, and Earthquake Magnitude** (Wasatch fault block diagram, slinky, energy/earthquake magnitude diagram)

When a fault moves, seismic energy is released underground and travels through the crust in waves (**P-waves and S-waves**). When the waves get to the ground surface you feel shaking. If the fault moves a little bit, the shaking is mild; you might not even feel it. If the fault moves a lot, the shaking is strong.

<use to show P-waves? [https://wiki.seg.org/images/c/c2/Slinky\\_waves.jpg](https://wiki.seg.org/images/c/c2/Slinky_waves.jpg) OR [https://www.youtube.com/watch?v=BxtiKodKq\\_E](https://www.youtube.com/watch?v=BxtiKodKq_E) OR <https://www.youtube.com/watch?v=KZal4MEWdc4>>

The largest earthquake ever recorded was M9.5 (Chile, 1960). The largest earthquake in modern time in Utah was M6.6 (Hansel Valley, 1934). The 2020 Magna earthquake was M5.7. The largest earthquake we would expect to occur in Utah is ~M7.6.

Kidquake! Jump and watch the "earthquake" appear on the "seismometer" (the phone app projected on the monitor is not a true seismometer).

**Earthquake Preparedness and Safety** (Drop, Cover, Hold On poster)

We live in earthquake country, and chances are good you'll feel a strong earthquake in your lifetime. In a strong earthquake, buildings can be damaged and people can be hurt. The best ways to stay safe during an earthquake are to have a plan and practice Drop, Cover, and Hold On. Talk to your parents about what you should do if an earthquake happens.

Drop, Cover, Hold On exercise

**Liquefaction** (liquefaction table, YouTube)

Earthquake ground shaking can cause saturated, sandy soils to liquefy (like along a stream channel or lake shore); the ground loses its strength. Liquefaction can cause buildings to settle, roads to crack, gentle slopes to move, and buried tanks to "float" up to the ground surface. Liquefaction hazard can be reduced through special engineering methods.