

## FAQ: ShakeAlert<sup>®</sup> Basics

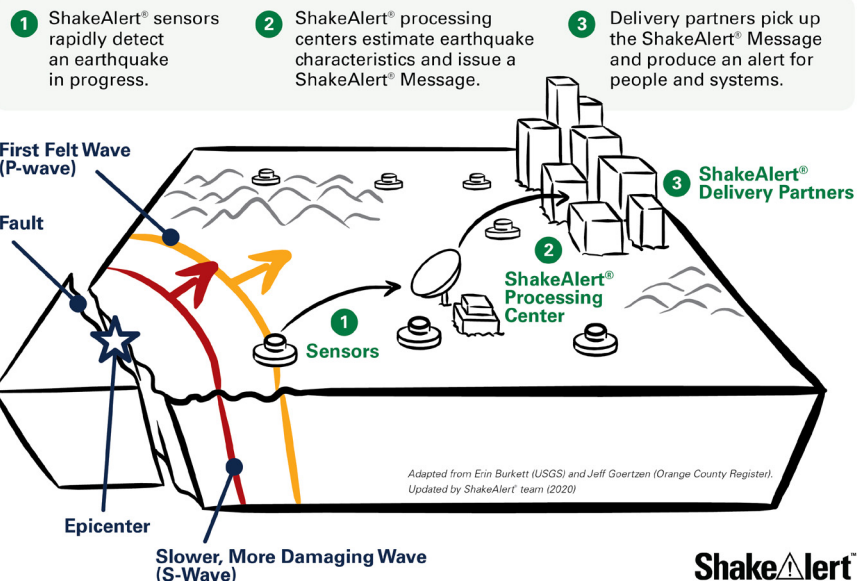
The **ShakeAlert<sup>®</sup> Earthquake Early Warning system**<sup>1</sup>, operated by the U.S. Geological Survey (USGS), quickly detects significant earthquakes, estimates shaking, and issues ShakeAlert Messages to Technical Partners. Then, Technical Partners, which have entered into a license agreement with the USGS, use this information to deliver alerts that rapidly reach people and trigger automated actions to protect vital systems and infrastructure, potentially seconds before shaking arrives at their location.

### • Can ShakeAlert predict when an earthquake will occur?

In a word – NO. The ShakeAlert<sup>®</sup> System **is not earthquake prediction**. ShakeAlert detects ground movement **after** an earthquake has already begun. USGS issues data Messages that are used by ShakeAlert Technical Partners to rapidly alert people so they can immediately take protective action before shaking arrives.

**It is not possible to predict exactly when, where, and how big an earthquake will be.** Check out [Part 1](#) and [Part 2](#) of this video that explains why earthquakes cannot be predicted.

### ShakeAlert<sup>®</sup> Is Not Earthquake Prediction



### • How does ShakeAlert detect an earthquake?

During an earthquake, a rupturing fault sends out several different kinds of waves that send energy away from the epicenter, like ripples on a pond. The fastest-moving seismic waves (primary or P-waves) travel about 3.7 miles per second in rock and generally do not produce strong shaking. P-waves are followed by slower moving, more damaging waves (secondary or S-waves) and surface waves that travel about 2.5 miles per second.

The ShakeAlert seismic network detects the P-wave (first felt wave) and immediately transmits data to a ShakeAlert processing center, where the estimated location, size, and expected shaking of the quake are determined. The goal of earthquake early warning is to send out a ShakeAlert-powered alert before damaging shaking arrives.

<sup>1</sup> When referring to “system” vs “System,” lowercase “s” refers to the USGS part of the operation (sensors and processing centers), and uppercase “S” refers to the USGS part and the alert delivery Technical Partners (i.e., the entire System).

Earthquake early warning works because:

- ✓ P-waves travel almost twice as fast as the damaging S-waves and surface waves; and
- ✓ The speeds of today's data telecommunications systems are many times faster than seismic waves. Both of these factors make it possible for alerts to reach people before strong shaking arrives. Because of the speed difference between P-waves, S-waves, and surface waves, someone who is farther from the earthquake's origin has more time to potentially receive an alert before shaking arrives.

Although the objective is for alerts to be received before the more damaging S-waves and surface waves arrive, there is a region near the epicenter of most earthquakes called the late-alert zone, where alerts may not arrive before shaking begins.

Those who are directly above or very near the earthquake origin are not likely to receive an alert before shaking is felt. This is because there may not be enough time to detect, confirm, and send an alert to those close to the epicenter before the S-waves and surface waves arrive.

## • How do alerts get to people and trigger automated actions?

If the earthquake becomes large enough to meet USGS alerting thresholds, a **ShakeAlert Message** is issued by the USGS. It is then picked up by **Technical Partners** who deliver an alert that prompts people to take a protective action, such as **DROP, COVER, AND HOLD ON**, and/or to trigger an automated action that can protect vital systems, equipment, facilities, and infrastructure. These automated actions could include slowing a train, closing valves, issuing a public announcement, and many others. (See [FAQ: Magnitude, Intensity, and ShakeAlert®](#) for a more detailed explanation of alert threshold levels.)

## • What is the value of getting an alert before shaking arrives?

Earthquake shaking can cause significant damage to buildings and infrastructure, and can threaten people's safety. Even though the alert may be received only seconds before shaking arrives, those seconds matter, because they can provide enough time for people to take a protective action, such as **DROP-COVER-HOLD ON**, to stay safe during shaking. Other protective actions may be required for individuals to adapt to their situation and environment. (See [FAQ: ShakeAlert® Earthquake Early Warning System and Warning Times](#) for a more detailed discussion about alert times.)

### Things To Know About ShakeAlert®



**You may feel shaking and not get an alert.**



**You may get an alert after you feel shaking.**



**You may get an alert and not feel strong shaking or any shaking at all.**

## REFERENCES AND RESOURCES

About SeismicWaves- Incorporated Research Institutions for Seismology (IRIS)  
<http://ds.iris.edu/aed2/c/aboutWaves.phtml>

SeismicWave Motions- Incorporated Research Institutions for Seismology (IRIS)  
[https://www.iris.edu/hq/inclass/animation/seismic\\_wave\\_motions4\\_waves\\_animated](https://www.iris.edu/hq/inclass/animation/seismic_wave_motions4_waves_animated)

Take 2: Can Earthquakes be Predicted (Part 1)- Incorporated Research Institutions for Seismology (IRIS)  
[https://www.iris.edu/hq/inclass/animation/take\\_2\\_can\\_earthquakes\\_be\\_predicted\\_part\\_1](https://www.iris.edu/hq/inclass/animation/take_2_can_earthquakes_be_predicted_part_1)

Take 2: Can Earthquakes be Predicted (Part 2)- Incorporated Research Institutions for Seismology (IRIS)  
[https://www.iris.edu/hq/inclass/animation/take\\_2\\_can\\_earthquakes\\_be\\_predicted\\_part\\_2](https://www.iris.edu/hq/inclass/animation/take_2_can_earthquakes_be_predicted_part_2)