

# Earthquakes in Alaska

Alaska Division of Geological & Geophysical Surveys



## EARTHQUAKE:

A sudden and violent shaking of the ground as a result of movements within the earth's crust or volcanic action

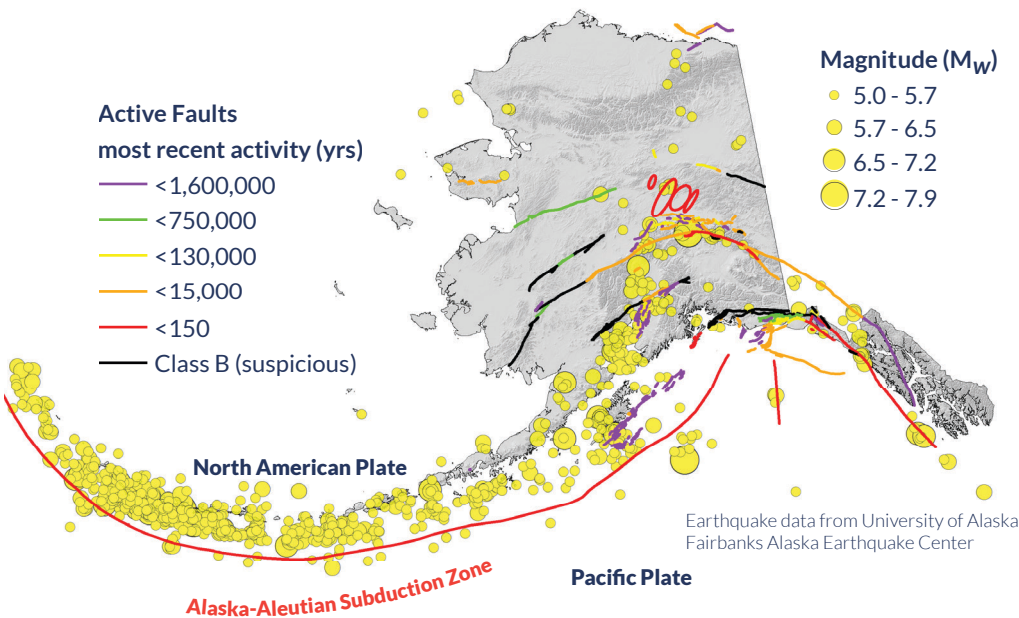
Alaska is one of the most seismically active regions in the world and earthquakes can occur in nearly any part of the state. Regardless of where you live, it's important to know what to do when an earthquake strikes. For more information, see DGGGS Information Circular 77, *Living with Earthquakes in Alaska*, [doi.org/10.14509/30144](https://doi.org/10.14509/30144).

## Can we predict earthquakes?

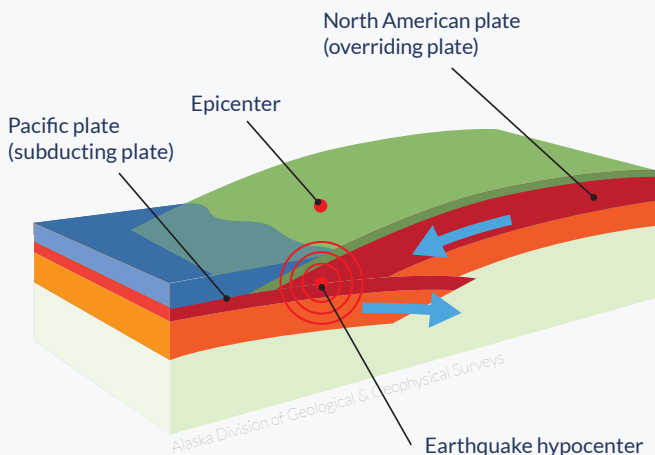
**No.** It is not possible to predict the time, location, or magnitude of an earthquake. However, by combining what we know about active faults with data from seismometers all over the state, scientists are able to evaluate the *likelihood* of future events in an area.

## How are earthquakes measured?

Scientists often use the **moment magnitude scale ( $M_W$ )** to describe the size of earthquakes. This logarithmic scale is based on the amount of physical energy released in an earthquake. Each step up on the scale corresponds to ~32 times greater energy released. For example, a  $M_W$  8 earthquake releases 32 times more energy than a  $M_W$  7, and 1,000 times more energy than a  $M_W$  6!



Above: All  $M$  5+ earthquakes from 1990 to mid-2018 and known active faults in Alaska. The Pacific plate is forced beneath the North American plate (in a process known as subduction) at a rate of several inches per year.



**Hypocenter:** location within the earth where the earthquake rupture begins

**Epicenter:** the spot on earth's surface directly above the hypocenter

## What causes earthquakes?

An earthquake is the release of accumulated energy from within the earth's crust, caused by sudden movement on a geologic fault. Tectonic plates are constantly in motion, but are stuck together at their edges because of friction. When the friction is overcome, parts of the crust slip past one another and the energy that is released is the shaking we feel in an earthquake.

**Why do some earthquakes in Alaska occur very far from the plate boundary?** Plate collision along the Alaska-Aleutian subduction zone causes deformation on a network of faults extending more than 700 km (435 mi) into Interior Alaska.

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## What to do during an earthquake If you are...

### Inside

Stay there and “**drop, cover, and hold on.**”  
**Do not** run outside.

### Outside

**Move away from buildings**, then drop and cover.

### Near the Ocean

If shaking lasts longer than 20 seconds, **go to high ground immediately after the shaking stops.** Do not wait for an official tsunami warning. **Strong earthquakes may trigger tsunamis.**



For more information, see DGGS IC 77, [doi.org/10.14509/30144](https://doi.org/10.14509/30144).

## Earthquakes can cause many hazards, including:

Strong ground motion (shaking)  
Surface rupture  
Regional subsidence and uplift  
Tsunami  
Earthquake-related ground failure (landslides & liquefaction)  
Seiche (oscillation in water levels)

## Notable historical earthquakes

**In 1964 the second-largest instrumentally recorded earthquake ( $M_W$  9.2) ruptured in the Gulf of Alaska.** The earthquake, and the tsunamis it triggered, took 128 lives and cost \$311 million in damage.

**In 2002 the Denali fault ruptured with the largest ( $M_W$  7.9) intra-plate earthquake in North America in over 100 years.**

The ground surface ruptured for ~210 miles along several fault strands and triggered hundreds of landslides.

**On November 30, 2018, a magnitude 7.1 earthquake struck just north of Anchorage.** Strong shaking and ground failures throughout the Matanuska-Susitna Valley caused severe damage to roadways and significant damage to more than 750 homes and buildings, totaling over \$75 million in costs.

## What to do after an earthquake

**Check for injuries**—Do not move a seriously injured person unless necessary.

**Check for gas leaks**—If the area is safe, check tank supports and connecting pipes. Shut off the main valve if you smell gas or suspect a broken pipe. Call your gas company for further instructions.

**Damaged structures**—Approach all structures with caution. Do not enter damaged buildings or structures. Stay away from downed power lines (even if the power appears to be off) and contact your electric company.

## Preparing for an earthquake

**Assess** potential hazards in your home, work, or school

**Identify** safe places to take cover

**Plan** what to do in the event of an earthquake or tsunami

**Evaluate** your tsunami evacuation routes

**Practice** “drop, cover, and hold” drills

**Prepare** an emergency kit

## Earthquake studies at DGGS

DGGS studies active faulting and seismic sources in the state to understand earthquake, tsunami, and associated hazards. In addition to characterizing fault rupture parameters, earthquake timing, recurrence, and slip rates, our ongoing efforts include post-earthquake and tsunami documentation, response, and investigations. DGGS administers and participates in the Alaska Seismic Hazards Safety Commission, and participates in the Western States Seismic Policy Council.



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*This circular includes information from the following agencies: Alaska Seismic Hazards Safety Commission, Alaska Earthquake Center, and Alaska Division of Homeland Security & Emergency Management.*