

After an earthquake, how does a tsunami happen?

11 September 2017, by Jane Cunneen

Friday's earthquake off Mexico was the largest in that region in [over a century](#), and will add pressure to a region already being battered by [several other natural disasters](#).

The earthquake occurred off the west coast of southern Mexico 69 km below the surface, with a [magnitude of 8.1](#), making it the largest earthquake worldwide since 2015, when a [magnitude 8.4 generated a tsunami off the coast of Chile](#).

It will be some time before we know the full extent of the [earthquake damage](#) in Mexico. Recent assessments recorded more than [60 deaths and significant damage](#).

The earthquake also generated a [tsunami](#) with a series of waves over one metre high striking the Mexico coast over a period of [more than six hours](#).

The wave travelled west across the Pacific Ocean towards New Zealand, but initial warnings triggered for that country have [now been cancelled](#).

Why do some earthquakes create tsunamis?

Most earthquakes occur along the edges of tectonic plates, known as [plate boundaries](#). The Mexico earthquake occurred where the Cocos plate is [colliding with the North American plate](#).

An area of about 200 by 50 km was pushed up by the earthquake, moving the water overlying it. The sea floor was uplifted by [only a few metres](#), but this is enough to displace several cubic kilometres of water and send a series of waves outwards from the earthquake epicentre.

The tsunami waves travel away from the earthquake epicentre in [all directions](#). The height of the tsunami waves on shore depends on several factors, such as the distance and direction from the earthquake epicentre, the depth and shape of the [sea floor](#), and shape of the coast line.

About 75% of tsunamis occur at [subduction zones](#), including some of the largest in recent history such as the 2004 Indian Ocean (Boxing Day) tsunami which [claimed more than 250,000 lives](#).

The remainder are caused by underwater landslides, volcanic eruptions, and (rarely) [meteorite impacts](#).

Only the largest earthquakes (more than 7.5 magnitude) are capable of generating a tsunami that will travel more than 100 km. About [two tsunamis occur every year](#) which cause damage near their source, and about two per decade cause damages or deaths on distant shores (more than 1000 km from the source).

How do we know when a tsunami is on the way?

The earthquake in Mexico was detected by international seismic networks within minutes, immediately activating regional and national tsunami warning systems. Mexico is a member of the Pacific Tsunami Warning System, which has two regional centres – one in [Hawaii](#) and one in [Japan](#).

These centres monitor the seismic networks 24/7 so that they can react immediately when an event is detected. Many countries have 24/7 national tsunami warning centres as well. Each country and local government area then decides how to respond to the information and whether to evacuate coastal areas in case of a tsunami.

Following an earthquake, a warning message is immediately broadcast to national and local government agencies and disaster management offices. Over the next few hours, tsunami warning centre staff will monitor the [global network of sea level stations](#) including [offshore tsunameter buoys](#) which will tell them if a [tsunami wave](#) was generated.

Estimates of the earthquake magnitude and location are revised hourly or as more information becomes available, and this updated information is [broadcast to authorities and the media](#). The information continues to be reviewed as the first waves reach the shoreline, helping to provide better wave height estimates for countries further from the earthquake epicentre.

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At the local level, responses differ from country to country but the [warning](#) messages are usually broadcast through media channels including television, radio and internet. Many people will also receive information through social media.

Some countries send alerts directly to cell phones, and tourist areas may have tsunami sirens on popular beaches.

Responding quickly and appropriately to these alerts can save lives.

Fortunately on this occasion the tsunami triggered was only small. But the human impact of the [earthquake](#) itself is high, and the death toll will probably get worse.

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