

Earthquake terms: A glossary

Acceleration

The change in velocity (speed in a certain direction) in one unit of time. Acceleration occurs when something moves from a slower to faster speed. The ground experiences acceleration during an earthquake when the ground is shaking.

Core

This is the innermost centre of the earth, made of metal and starts 4000 km below the earth's surface. It has a central solid core and a liquid outer.

Crust

This is the outer layer of the earth and can range from 10 to 65km thick. Within the crust there is an upper brittle layer (about 15-35km thick) which can produce earthquakes.

Deaggregation/disaggregation (deag/disag)

The process of splitting up the probabilistic seismic hazard results by a set of specified criteria. This is done to help understand which earthquake sources may impact, and are important for, a particular region. The criteria can be combinations of many factors, such as magnitude, distance, location, and type of tectonic region (i.e. active shallow crust, volcanic, subduction interface, subduction slab).

Deformation

When a material is deformed it is changed from its original shape. Earthquakes can cause deformation due to stress and strain.

Directivity

The variability in earthquake shaking depending on the direction a fault ruptures. Ground motion in the direction of the rupture propagation (the

direction the energy of the earthquake is released) is more severe than in other directions.

Epicentre

The epicentre is the point on the earth's surface vertically above the focus point where a seismic rupture begins.

Fault

A fault is a fracture along the Earth's crust where the blocks on either side have moved relative to one another.

Frequency

The frequency is the number of times something happens in a certain period of time, such as the ground shaking up and down or back and forth during an earthquake.

Geodesy

Geodesy is the science of determining the size and shape of the earth and the precise location of points on its surface.

Geodetic

Geodetic refers to the use of geodesy for measurements.

Ground motion

The movement of the earth's surface caused by earthquakes. Earthquakes produce seismic waves that travel through and along the surface of the earth.

Hazard

A source or situation with the potential for harm in terms of human injury, or damage to property, to the environment, or a combination of these.

Hazard curve

A set of values (usually looking like a curve, when plotted) representing the probabilities of exceedance (PoE, PE; vertical axis) of given acceleration values (horizontal axis). In short, the values of this curve represent the probability of exceeding a specific acceleration value. These plots are for a single spectra period (i.e. PGA, 0.5, 1.0).

Impact

A significant or major effect.

Intensity

The intensity is a number (written as a Roman

numeral) describing the severity of an earthquake in terms of its effects on the earth's surface and on humans and their structures.

Lifelines

Lifelines are structures that are important or critical for a community to function, such as roadways, pipelines, powerlines, sewers, communications, and port facilities.

Liquefaction

A process by which water-saturated sediment temporarily loses strength and acts as a fluid, like when you wiggle your toes in the wet sand near the water at the beach. This effect can be caused by earthquake shaking.

Magnitude

The relative size of the earthquake, based on the maximum motion recorded by a seismograph. Usually a number of seismograph recordings at different locations are used to calculate the magnitude, using either the local magnitude scale (ML; also known as Richter magnitude), the surface-wave magnitude (M_s), body-wave magnitude (M_b) or the moment magnitude (M_w).

New Zealand Site Class

Used to convey an understanding of soil conditions at a site and is currently used in New Zealand building standards and guidelines (e.g. New Zealand Standard 1170). Site classes range from A to E and are defined by a range of soil conditions including, but not limited to, shear wave velocities, measurement of other geotechnical properties, and evaluation of the period of the site. Most sites in New Zealand correspond to site class B, C, or D. The quick descriptions of the site classes are:

- A: Strong Rock
- B: Rock
- C: Shallow Soil
- D: Deep or Soft Soil
- E: Very Soft Soil

P wave

The P-wave, or compressional wave, is the first seismic wave recorded at a location when an earthquake occurs. The shaking occurs in both the same and the opposite direction to the way the wave itself is travelling. So, imagine the P-wave is travelling from the left to the right of this page,

the shaking it causes would be moving both left and right.

Peak ground acceleration (PGA)

The largest increase in velocity recorded in an earthquake by a particle on the ground, or that can be expected based on the estimated ground motion at a specific site (i.e. as shown in a site-specific spectrum). In PSHA, PGA is usually represented at spectral period of zero.

Probability of exceedance (PoE, PE)

The PoE for a ground motion provides the probability that a specified ground motion will be exceeded in a time-window of interest.

Recurrence interval

Used to describe behaviour of earthquakes on a particular fault. (However, the regularity of earthquake occurrence is highly debated topic. For example, we do not necessarily model individual earthquakes to occur on a regular interval and therefore the use of Return Period for ground shaking can be misleading. Ground motions with a particular probability of exceedance (PoE) is the correct term).

Risk

The likely range of impact; the degree of possible loss or damage or harm that is likely.

Rupture

Rupture describes the actual movement of a fault as it slips. (The rupture front is thus the boundary between the slipping and locked parts of an earthquake, and can occur in just one direction or radiate outward in many directions).

S wave

An S-wave, or shear wave, describes the type of seismic wave that shakes the ground back and forth perpendicular to the direction the wave is travel. So, imagine the S-wave is travelling from the left to the right of this page, the shaking would be moving up and down the page.

Seismograph

A seismograph is what we use to record an earthquake, also called a seismometer. It uses a mass and pen suspended over a base fixed to the ground surface. When the ground moves, the pen does not and it marks out the ground motion onto

a rotating drum of paper or magnetic recording tape. These days electronic recordings occur.

Slip

After an earthquake two points on either side of a fault can end up further apart. This change in location, or relative displacement is known as the slip.

Source

The earthquake source is the point which releases the forces that go on to generate the acoustic and seismic waves that travel out from the source. The latter causes earthquake shaking at the ground surface.

Spectrum/Spectra

A curve showing amplitude (in the case of hazard analyses, this would be acceleration) on the y axis, versus period on the x axis. So, a spectrum overall should show the amount of shaking there is at each period (how much of each type of shaking there is). This is produced for horizontal ground motions.

Stress

This is the force acting on a surface over a unit area. For earthquakes, understanding the stress direction and rate can help us understand how an earthquake occurred and moved.

Strain

When a material is deformed due to tectonic stress or due to seismic waves passing through it, the way it has changed in length or volume is described as the strain. It can be brittle (break), ductile (bend), or elastic (deform and return).

Subduction Zone

The subduction zone is the place where two plates come together, one riding over the other. Most volcanoes on land occur parallel to and inland from the boundary between the two plates.

Tectonic plates

The tectonic plates are the large, thin, relatively rigid plates that move relative to one another on the outer surface of the Earth.

Tsunamigenic

Tsunamigenic is referring to those earthquakes, commonly along major subduction zone plate boundaries such as those bordering the Pacific Ocean, that can generate tsunamis.

Vs30

A measure of the behaviour of the ground soils at the near surface, which can impact shaking.