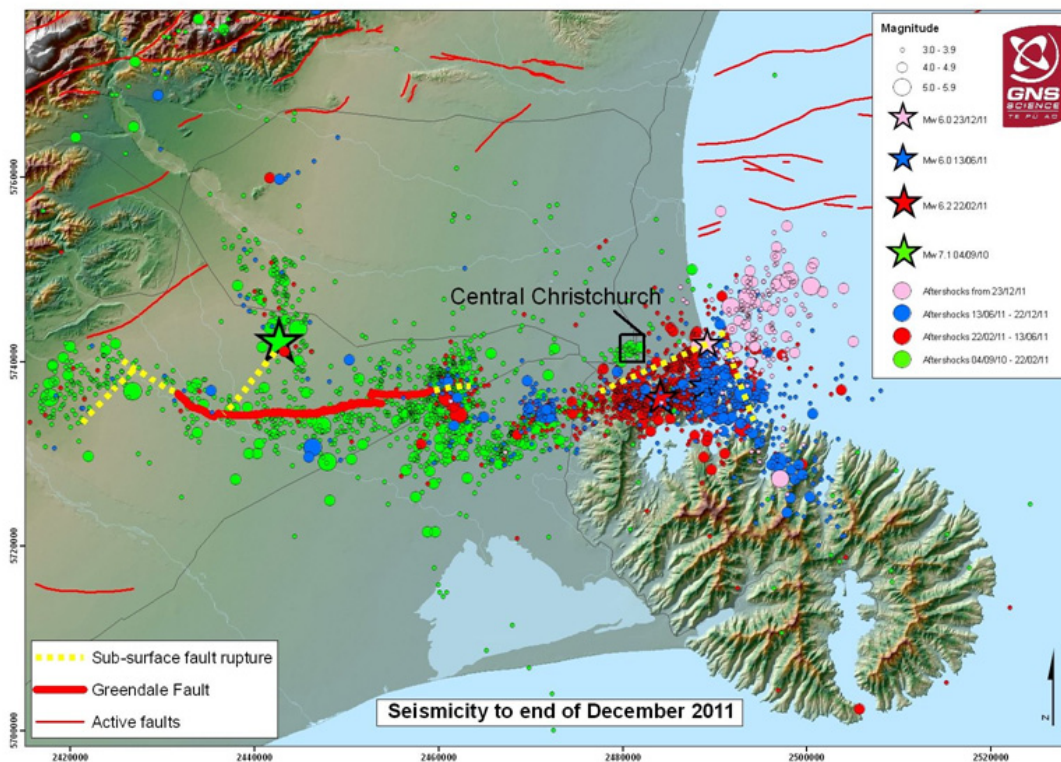


Earthquake activity since September 2010

The seismic activity has occurred across the Canterbury region and is not isolated to Christchurch city.

Refer to the '[most recent aftershock map](#)' which shows the distribution of earthquakes since 4 September 2010. See map below:



It is important to consider seismicity across the whole Canterbury region. As can be seen in the map above, the earthquakes have migrated since September 2010 across the region, generally from west to east (refer to map key for time sequence).

The initial earthquakes were located along the Greendale Fault and within Christchurch city, but since February 2011 the location of the earthquakes has moved southward (June events) and east December and January events. GNS Science advise that this migration pattern is expected and they predict that the location of the earthquakes may continue to move further east and out to sea.

The probability of a magnitude 5.0 – 5.9 earthquake is likely to have increased slightly after the earthquakes of December 2011 and January 2012. GNS Science will provide details of the updated modelling by the end of January and will release this information to the public. GNS Science predict that the probability of a magnitude 7.0 earthquake or above is low.

GNS Science predict that the likelihood of a tsunami as a result of an earthquake in the Canterbury region has not changed since modelling was completed in April 2011. A tsunami is unlikely unless an earthquake is located offshore, close to Canterbury and measures 7.0 magnitude or above. Any tsunami would result in the maximum of a one to two metre high wave, except in bays on Banks Peninsula where some increase can be expected, and where residents have been individually advised.

EARTHQUAKES

Why are the earthquakes located in different places in Canterbury?

Seismic activity has occurred across the Canterbury region and is not isolated to Christchurch city.

Refer to the '[most recent aftershock map](#)' which shows the distribution of earthquakes since 4 September 2010. It is important to consider seismicity across the whole Canterbury region.

The initial earthquakes were located along the Greendale Fault and within Christchurch city, but since February 2011 the location of the earthquakes has moved east. GNS Science advise that this migration pattern is expected and that the location of the earthquakes may move further east and will be located out to sea.

Most of the recent earthquakes seem to be located at a depth of eight to 10 km. What does that mean?

In the Canterbury region, Greywacke rock is located at a depth of eight to 10 km and is over 100 million years old. This rock is very old and fractured and this is where most of the earthquakes are located.

The earthquake on 23 December felt different to the earthquakes in February and June 2011. Why is this?

There are a number of factors which affect how an earthquake feels, but one key change was the decrease in ground shaking levels. This decrease is expected because they were deeper than earlier events, were smaller in magnitude than February in particular, and were at greater distance from populated places. There are also some preliminary indications that the recent earthquakes have contained less energy at their source. GNS Science expect that the levels of ground shaking will continue to decrease, especially if the earthquakes are more distant and have similar 8-12 km depth..

Are we likely to have another 'big one' – an earthquake over 6.0 magnitude?

GNS Science predict that we are most likely to experience further earthquakes of 5.0 to 5.9 magnitude, but there is a low probability that we will experience further earthquakes of magnitude 6.0 and above.

GNS Science advise that the energy which has been released to date is now in line with what would be expected at this time so that 'we have caught up' on the level of energy which was expected to be released following the Darfield earthquake of September 2010.

However GNS Science predicts that we will have an ongoing but slowly decreasing level of seismicity for several decades. While the earthquakes will not suddenly stop, the events felt by residents will reduce in frequency progressively from the levels experienced over the last 12 months. They will become undetectable over time.

GNS Science predict that events will continue for some years and if there is a magnitude 6.0 earthquake, then it is unlikely to be located within Christchurch city due to the trends to date.

For further information regarding seismicity in the Canterbury region since September 2010 visit <http://www.geonet.org.nz/canterbury-quakes/>

TSUNAMI

What is the local tsunami risk in Christchurch and Pegasus Bay?

The risk is low in Christchurch and Pegasus Bay and has not changed as a result of the recent earthquakes.

From the information that GNS Science has, a hazardous local source tsunami from an earthquake fault in Pegasus Bay is thought to be unlikely.

However it cannot be ruled out completely. If you are near the coast and feel strong ground shaking that lasts for a minute or more and it is hard to stand up, then an excellent precaution is to move inland or to higher ground as quickly as you can, using the safest route that you can.

If there is strong long term ground shaking and I am near the coast, what is the safest way to move to higher ground?

You will need to use common sense to work out the best route to use from where you are. Be aware that if the ground shaking is strong, there may be unstable cliffs and rockfalls in hillside suburbs. Think about weather conditions.

There will not be time to give an official warning or to sound any warning sirens for a local source tsunami. Do not wait for an official warning, or for any sirens to sound, to evacuate.

If there is a regional source tsunami, where will they come from and what size wave would we expect to see?

Regional source tsunamis may come from the east and north of the North Island and off the Fiordland coast.

The most likely regional tsunami source is the Hikurangi subduction zone fault, off the Wairarapa/Hawkes Bay coast. Earthquakes are thought to happen here roughly every few thousand years but the timing of the last earthquake is not known.

An earthquake on this fault will be felt in Christchurch as a moderate, rolling earthquake that lasts for more than a minute.

A tsunami from this fault would take around 1-2 hours to reach Christchurch. It is unlikely to be large here, but it may flood very low lying areas. Sea heights above normal tide height at the coast here would probably be around 1-2 metres, but there

may be localised areas where they would be more than that because of the way tsunamis slosh around in Pegasus Bay.

It is likely that there will be time to sound warning sirens, when installed, for a Hikurangi subduction zone tsunami.

However, the most important warning will be the long ground shaking from the earthquake. Do not wait for an official warning, or for the sirens to sound, to evacuate.

Why didn't the September 2010 and February 2011 earthquakes cause tsunamis?

The September 2010, February 2011 and June 2011 earthquakes did not cause tsunamis because they happened on land and/or they did not move the sea floor enough to generate the tsunami. The aftershocks out to sea from these earthquakes are too small to cause a tsunami. An earthquake at sea usually needs to be greater than magnitude 6.5 to cause even a small tsunami.

Are the warning sirens for Christchurch still coming?

Christchurch City Council has confirmed a budget for the installation of tsunami warning sirens. The sirens will not be used for a local tsunami. Sirens will only be used in the event of a distant source tsunami from across the Pacific Ocean, and possibly for a regional source tsunami from the Hikurangi subduction zone. There will not be time to sound the warning sirens if there is a local source tsunami in Pegasus Bay – earthquake shaking will be your only warning.

For further information visit

<http://www.ccc.govt.nz/homeliving/civildefence/informationondisastershazards/tsunami.aspx> or www.ecan.govt.nz