

## IDENTIFIED RISK

The 2011 COMNAP report *Understanding Risk to National Antarctic Program Operations and Personnel in Coastal Antarctica from Tsunami Events* (2011) ran models based on ten historic earthquake events within the Pacific Rim. It revealed that major earthquakes as far away as Alaska could produce significant waves in Antarctica. Other potential sources of tsunami in Antarctica are the Java Trench in the Indian Ocean and the South Sandwich Trench in the South Atlantic. Submarine volcanoes and volcanic islands in the Peninsula region could also be threats.

In the last few years there has been an increase in earthquake activity in the Antarctic Peninsula region. The north of the Antarctic Peninsula has been experiencing unusual seismic activity in the Bransfield Strait, starting at the end of August 2020, with an earthquake of magnitude 4.9 (according to the United States Geological Survey, USGS) felt on 29 August at 12:47 (UTC) and the following day 30 August at 10:31 (UTC), with the occurrence of a 5.4 Mw earthquake (USGS). Since the end of August 2020, more than 30 thousand earthquakes have been detected on the white continent through seismic sensors and satellite technologies. There has also been a significant increase in the rate of deformation of the crust by more than one order of magnitude, from only a few millimetres per year to about 15 centimetres per year. Instruments located on King George Island managed to measure in just four months, from September to December 2020, a shift of about 5.5 cm in a northwest direction. In particular, on Saturday, 23 January, at 20:36:51 (local time) with a magnitude of 7.1 and its epicentre located near Bridgeman Island, about 250 km northeast of the Chilean O'Higgins, Escudero and Eduardo Frei bases.

## BE PREPARED

### Before a tsunami hits:

- Develop a clear line of communication whereby the station leader is made aware of tsunami threats and warnings.
- Inform all personnel on station of the plan and how to recognise the warning signs of an approaching tsunami.
- Identify at risk areas posed to the station and its immediate surrounds by coastal inundation, such as low lying buildings, cargo, and pier areas.
- Develop a response plan which includes evacuation routes and safe refuges located on higher ground.
- Identify which activities are at risk from tsunami such as diving, shipping operations, coastal research and sea ice traverses, and train personnel to mitigate or respond to that risk.

More information on tsunami can be found at:

**The International Tsunami Information Centre**

<http://itic.ioc-unesco.org>

**NOAA's National Data Buoy Centre**

[www.ndbc.noaa.gov](http://www.ndbc.noaa.gov)

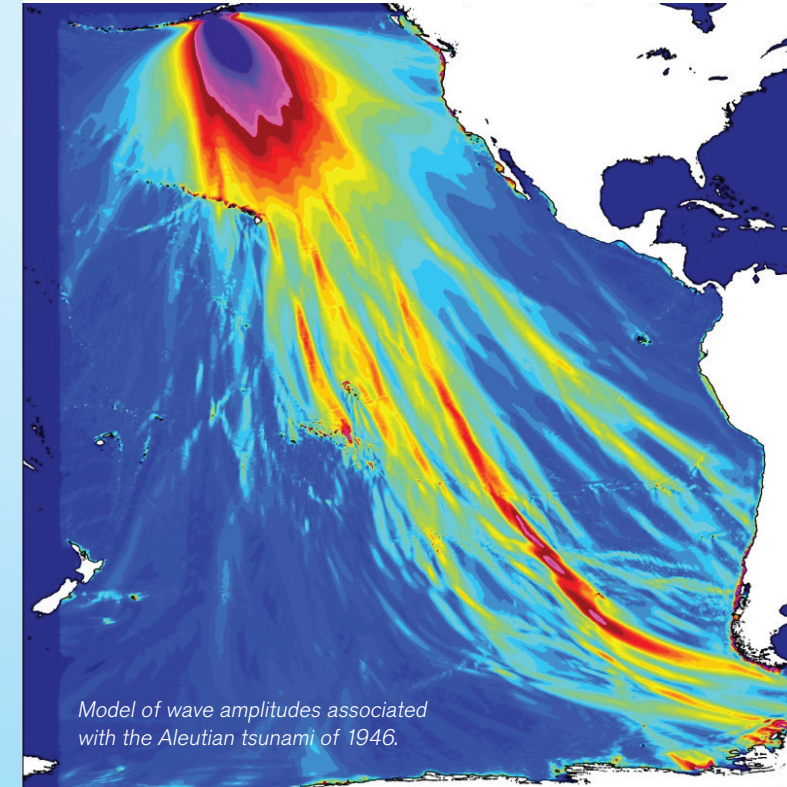
**Joint Australian Tsunami Warning Centre**

[www.bom.gov.au/tsunami](http://www.bom.gov.au/tsunami)



Photo: Amice/IPEV

# TSUNAMI Awareness in Antarctica



Model of wave amplitudes associated with the Aleutian tsunami of 1946.

To check the latest tsunami warnings visit the Pacific Tsunami Warning Center and the Indian Ocean Tsunami Warning and Mitigation System websites:

<https://www.tsunami.gov>

<https://bom.gov.au/tsunami/iotwms>



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Photo: Han/KOPRI

## WHAT IS A TSUNAMI?

A tsunami forms when a large volume of water is displaced within a relatively short time frame, causing large, rapid wave action. Tsunami can be generated by volcanic eruptions, glacier calvings and landslides, but are most commonly triggered by earthquakes, which cause deformation of the sea floor.

While everyday waves generated by wind have a wavelength of 100 m from crest to crest, tsunami wavelengths are much longer, measuring up to 200 km. Although tsunami can reach speeds of over 800 km/hr in deep water, they may have an amplitude of only one metre. As a tsunami approaches the shoreline, wave momentum decelerates and wave heights can increase by several metres. A tsunami may appear as a series of breaking waves or a rapidly rising tide, although their formation is unrelated to tides. The arrival of waves at the coastline can be staggered over a long period, with surges of waves minutes to hours apart. The second or third wave is generally the largest and most dangerous to people and infrastructure in a tsunami.

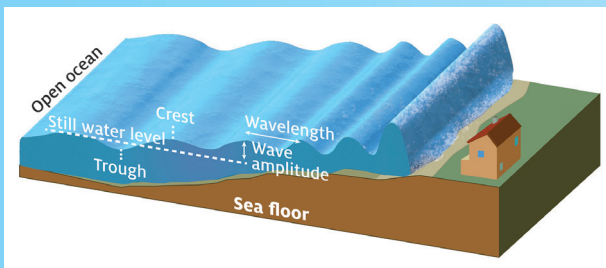


Image: Waikato Regional Council

A diagram illustrating wavelength and wave amplitude change as a tsunami approaches shore



Photo: Troyanov

## WHAT ARE THE WARNING SIGNS OF A TSUNAMI?

The fact is there is a lack of tsunami early warning detection buoys surrounding the Antarctic continent. So, for personnel working near the Antarctic coast, it is extremely important to know the natural warning signs of an approaching tsunami.

As natural warning signs prior to a tsunami, you may:

**Feel an earthquake:** Depending on your proximity to the epicentre, you may feel the earth shake.

**Watch sea level recede dramatically from the shoreline:**

Coastal water is drawn out to the ocean extremely swiftly before returning as a tsunami. Experts believe a receding coastline may give a maximum of five minutes to evacuate the area, move away from the coast or to high areas.

**Hear a loud sound:** Sometimes, people report hearing a loud roaring sound resembling a freight train prior to the arrival of a tsunami.



Photo: Australian Government Bureau of Meteorology

A Deep-ocean Assessment and Reporting of Tsunamis (DART) buoy



Photo: PROANTAR

## WHAT TO DO IN THE EVENT OF A TSUNAMI IN ANTARCTICA

**If you are on land, grounded ice or inside a station or other building:**

After dropping, covering and holding if you feel an earthquake, follow the instructions of your station leader, and:

- If you hear an official tsunami warning or detect the natural signs of a tsunami, activate the tsunami response plan.
- Take your emergency preparedness kit. Having supplies will make you more comfortable during the evacuation.
- Get to higher ground as far inland as is safely possible. Watching a tsunami could put you in grave danger. If you can see the wave, you are too close to escape it.

**If you are at sea or on sea ice:**

- Since tsunami wave activity is imperceptible in the open ocean, do not return to port if you are at sea and a tsunami warning has been issued for your area. Tsunamis can cause rapid changes in water level and unpredictable dangerous currents in harbours and ports.
- Remember that the tsunami danger period can last several hours following a strong earthquake.
- Even if a tsunami does not inundate the coastline, it can produce unusual, strong currents, posing a risk to ships and divers. Large waves may also cause calving events from ice shelves. Do not dive during a tsunami warning or after you feel a strong earthquake.

Personnel based at coastal Antarctic locations should discuss tsunami evacuation plans and have procedures in place in the event of a tsunami. Discuss safety issues with your manager or station leader on a regular basis.