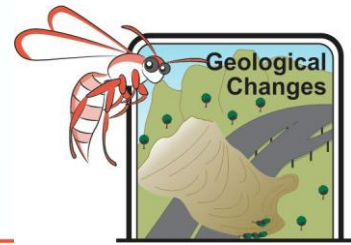


Tsunami - Teacher Background



Japan lies on the Pacific Rim where the Pacific Plate is pushing up against the Eurasian Plate. This explains why the country has so many earthquakes, volcanoes and resultant tsunamis.

Japanese sailors noticed that some earthquakes generated unusual waves from the ocean. Although this wave was only noticeable as a slight rise out at sea, it increased in height as it approached land and was catastrophic on arrival. They named them Tsunami, which is Japanese "harbour wave". (The plural of tsunami is tsunamis). The recent catastrophic tsunami of 2011 devastated the eastern coast and damaged the atomic power station at Fukushima. Water inundated the coastal areas knocking down buildings, trees and living things drowned. Although the waves retreated, infrastructure was disrupted, disease was rife, drainage was diverted or blocked and soil was contaminated by salt.



Earthquakes release energy that will travel through solid earth as seismic waves but not through liquids. As a result of stress from earthquakes, blocks of undersea floor can break or fault and can be moved upwards or downwards. The ocean floor lifted 10m during the Aceh earthquake displacing an enormous volume of water. They can also be caused by landslides on the sea floor, land slumping into the ocean, large volcanic eruptions or meteorite impact in the ocean. Volcanic tsunamis such as Krakatoa in 1883 are not caused by lava outpourings but rather by the collapse of the empty magma chamber below a volcano. Seawater rushes in, expands due to heat and is violently expelled.

Causes of tsunami

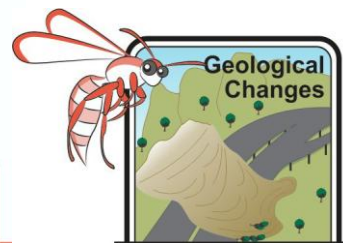
Earthquake	75%
Landslides (mostly undersea)	8%
Volcanism	5%
Weather	2%
Unknown	10%

The change in seafloor level generates a bulge or "swell" at the surface that is not particularly obvious to sailors on ships. Energy transfer between water columns is similar to Newton's swing where most of the movement is only noticeable in the first and last ball. Satellites sensors can however detect the wave and alert inhabitants of low lying coastal areas towards which it approaches. The destructive crashing wave height builds up as the water depth shallows. It is created by the building up of a series of waves as they approach land due to the forwards pressure of those following and the backwards pressure of decreasing water depth.

Tsunamis can travel at the speed of a passenger jet. Their height and direction can be estimated by readings from a network of floating buoys that have been placed in tsunami prone oceans. Lasers in weather satellites monitor the change of height of ocean surface. The Bureau of Meteorology provides information on natural disasters. Information about the possibilities of tsunami strike may be found at The Joint Tsunami Warning Centre <http://www.bom.gov.au/tsunami/>

On average, Australia is struck by one tsunami every two years. Most recent ones are small and have presented little threat to our coastal communities. The threat is moderately increased on the northwest coast of W.A. due to its closeness to the Indonesian earthquake zone. Along the Kimberly and Pilbara coasts large boulders brought kilometres inland from their coastal outcrops are indicators of fairly recent (in the last 2,900 to 5,000 years) tsunami that must have had a terrible effect on the living things of the coastal savannahs. Aboriginal communities must have been affected but we have no oral record.

Tsunami – Teacher background



On Dirk Hartog Island off the Gascoyne coast of Western Australia Dr P Playford, a famous geologist found large boulders, which appear to have been swept up inland over a 5m cliff by wave action. Some boulders weighed over 700 tonnes. Dr Playford suggested that an undersea landslide might have caused this localised tsunami in an area not known for tectonic movement.

<https://au.news.yahoo.com/thewest/a/17798666/tsunami-finding-rocks-research/>

Our awareness of tsunami's destructive power was heightened by the ten metre high tsunami that swept through the Indian Ocean at speeds of more than 500 km/hr on Sunday 26th December in 2004. It was caused by a series of powerful earthquakes whose epicentre was 30 km below the seabed approximately 250 km south-southwest of Banda Aceh, an island in the volcanic Indonesian Archipelago. This is the interface between two major tectonic plates. It caused death and destruction along the coasts of India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and the Seychelles. Thailand, Bangladesh, Kenya and Australia were less affected. By March of that year it was known that 273,636 people had died, 7,253 were missing and more than 1 million had been made homeless.

Tsunami and tidal waves

A common student misconception is that tsunamis and tidal waves are the same thing.

Tidal waves are caused by gravitational pull between the Sun, Moon and Earth. This pull can cause a rise in sea level.

Tsunamis are not caused by gravitational pull. They are caused by rapid geological events that change the floor of the sea displacing large masses of water.

This can be:

1. Faulting of rock uplifting or dropping seafloor.
2. Collapsing of a magma chamber under a volcano.
3. The rise of the volcano from the seafloor.
4. The collapse of sediments down the continental shelf.
5. The collapse of glacier ice into a fjord.
6. Meteorite impact at sea.