

Tsunami- Causes and Impacts

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In this module we will be learning about the causes and impacts of tsunami.
This is the outline of the presentation.

Learning outcomes- At the end of this module, you will be able to understand the causes of tsunami and to analyse the various effects of tsunami.

Tsunami-Introduction

Tsunami is a Japanese word; Tsu means Harbour and Nami means wave. Hence together it is called as the harbour waves. Tsunamis are the giant waves caused by submarine earthquake or volcanic eruption that occurs under the sea. They are also referred as seismic sea waves because this tsunami waves are mostly caused by the submarine earthquakes. They are also referred as high energy tidal waves.

Characteristics

Let's look at some of the characteristics of the tsunamis.

First of all, tsunamis are the high energy sea waves caused by various factors. But the submarine earthquake is one of the major factors for the formation of tsunamis.

Second, tsunami are the long waves and they have wavelength more than 100 kilometres in the deep sea. And their wavelength decreases as they approach towards the coast. The speed of the tsunami increases with increasing water depth and as they approach towards the coast the speed of the tsunami waves decreases.

There are two types of tsunami waves- deep sea and local tsunami.

When the tsunami is formed in the mid ocean after the occurrence of the earthquake or any other tectonic movement, it gets split into two types; distant or the deep-sea tsunami moves out to the deep ocean and the local tsunami

approaches towards the coast. Hence it is the local tsunami which causes much of the destruction on the coastal areas. The height of the tsunami wave in the deep ocean is very low and as it approaches towards the coast the height increases. It sometimes attains the height of more than 25 meters. The gap between successive tsunami waves ranges between 20 to 40 minutes. Once the first tsunami waves hit the coastal area, the people shouldn't go back on the beach immediately because there are chances that successive tsunami waves may come with a time gap of 20 to 40 minutes. Hence tsunami is not a single wave phenomenon, it is a multiple wave phenomenon.

Causes

Let's look at some of the causes which are responsible for the formation of tsunamis.

First one is the submarine earthquake. Earthquake or the submarine earthquake or the undersea earthquake is one of the major factors for the formation of tsunami. There are various factors which are responsible for the tsunami origin. But then submarine earthquake or the undersea earthquake is one of the important factors.

Not all the earthquakes that occurs under the sea is responsible for the tsunami. Only those earthquakes having more than 7.0 magnitude on the Richter scale are responsible for the tsunami waves. Here we can see that the Indian ocean tsunami that occurred in 2004, was caused due to the undersea earthquake of having a magnitude of around 9.3 on the Richter scale. Similarly, the Japan tsunami that occurred in 2011 was caused due to the scale of 8.9 magnitude. Hence severe earthquakes having more magnitude are responsible for the formation of the tsunami waves.

Second one is the undersea massive landslides. Undersea massive landslides caused by sudden tectonic movement displaces the seawater upward, and then it leads to the formation of tsunami.

Next one is the collision of convergent destructive plates. The convergent plates lead to the subduction and that basically leads to up thrusting of plate margins,

causing the sudden upward movement of the seawater that give rise to tsunami waves. We can take the example of Sumatra tsunami which took place in 2004, where in the Indo Australian plate subducted below the Burmese plate and later on it was followed by major earthquake of 9.3 magnitude which give rise to this massive tsunami.

Last one is the explosive volcanic eruption on the sea floor or on the islands also leads to the tsunamis. We can take the example of Krakatoa volcano that occurred in 1883 which was responsible for rise in tsunami in that particular year. Java and Sumatra islands were badly affected by that.

Effects

Now let's look at some of the effects, which are caused due to the tsunami.

Tsunami disturbs the entire life of the human being. It creates a damage to the structures wherein the houses, buildings, roads, the rail networks and the communication systems are disrupted or affected very badly by the tsunami. We can take the example of Japan tsunami that occurred in 2011 where in the bridges, railway lines and road networks were badly disrupted. Second one is the loss of human lives. Yes, tsunami takes the human life and we have seen instances, where in the tsunami's have taken human lives. Sumatra tsunami that occurred in 2004 had basically affected more than 12 countries surrounding the Indian Ocean. It has led to deaths of more than 2.5 lakhs people. Similarly, Japan tsunami that occurred in 2011 has killed more than 10,000 people, Java and Sumatra tsunami that occurred in 1883 has killed more than 36,000 people. Hence tsunami's basically kills a lot of human being, at the same time a lot of people goes missing when such massive waves hit the coastal areas.

Third one is the loss of property. Yes, of course when the massive waves hit the coastal areas, and when the water intrudes into the settlement areas it basically destroys the property of the human being right from cattle's, crops, food stocks,

farms and the fishing boats on the coastal areas and many other things. Human beings lost their property or lose their property when such tsunami occurs. Other effects that we can see is the destruction of beaches, which occurs due to the washing of sand by the water, then the shifting of islands also take place.

In 2004, when the Sumatra tsunami occurred, that led to the shifting of Andaman and Nicobar Islands. Then deposition of salt on the coastal lines and also in the interior areas. Basically, what happens is that if such salt is deposited on the fertile land, then it decreases the soil fertility.

Now since it leads to the destruction of beaches, obviously it leads to the destruction of marine ecology and also fish and the water get badly affected. There is a scarcity of drinking water because the saline water gets mix up with the fresh drinking water sources and it also leads to the contamination of the freshwater source. It also creates a damage to the ports and harbours and also damages the naval and Air Force Base. This had happened with Andaman and Nicobar in 2004 when Sumatra tsunami occurred. There is also an outbreak of disease wherein it gives rise to epidemics or restlessness and fear psychosis among the people. It also generates a lot of mental stress and mostly people undergo psychological disorders. Hence these are some of the effects of tsunamis.

Conclusion

As I said, tsunami is caused by various factors, but then earthquake heaving more than 7.0 magnitude on a Richter scale is the principal factor. Tsunami also creates a lot of negative impacts on the human life. Right from killing the human beings, destroying the properties and creating some other effects by affecting the marine ecology. That's why we need to have tsunami prediction system so that we can reduce the level of damage incurred by the tsunami.

These are the references.

Thank you.