Talking about Tsunami

The word Tsunami comes from two Japanese words meaning “harbour (tsu)” and “wave (nami).” A tsunami is a series of waves triggered by ANY disturbance that displaces a large water mass from its equilibrium position. The cause may be underwater earthquakes, volcanic activities, landslides or sometimes meteorite impact. Although tsunamis are caused by underwater earthquakes, not all underwater earthquakes cause tsunamis. Most tsunamis are produced by tectonic movement of the ocean-floor, resulting from mega-thrust earthquakes. These earthquakes displace the water column leading to a tremendous rise/fall in the sea level. Earthquakes located near or directly under the ocean are considered to increase the probability of a tsunami.

Tsunamis are common in the Pacific Ocean, as there is significant movement of the Earth’s tectonic plates in the region. The undersea earthquake in the Indian Ocean (9.0 on the Richter Scale) near Sumatra that triggered the 2004 tsunami was so violent that it made the Earth wobble on its axis; shifted the mean North Pole, slightly altered the shape of the Earth and even decreased the length of each day. It also caused a massive vertical movement of the ocean floor. The fury of the resulting tsunami washed out the southernmost tip of India and permanently altered the map of Asia as some Indonesian islands moved by as much as 20 metres. It killed more than 280,000 people and rendered millions homeless.

Describing Tsunami

■ A tsunami is not a Tidal wave.
■ A tsunami wave is a shallow-water wave meaning that the ratio between the water-depth and its wavelength (distance between the crest or top of one wave and the crest of the next wave) is very small.
■ A tsunami wave has long wavelength (more than 100 km) and it loses little energy as it propagates. Hence in very deep water, a tsunami travels great transoceanic distances swiftly with limited energy loss.
■ The speed of these waves in the deep seas is more than 800 km per hour...more than a jet plane. Tsunami velocity depends on the depth of water through which it travels (velocity equals the square root of the product of the water depth times the acceleration of gravity).
■ Because the speed of a tsunami is a function of the water-depth, it slows as it nears the shore. Since its energy remains almost constant, the height of the wave grows when it enters shallow waters.
■ A tsunami arrives at the coast as a series of successive crests and troughs. Once a tsunami wave reaches the shore, successive waves stack up forming a pile of waves due to which the tsunami waves get compressed near the coast. This results in shortening of

Although the oldest record of ocean waves unleashing destruction and devastation following a massive earthquake, dates back to 326 BC when the Macedonian fleet of Alexander the Great was destroyed near the Indus delta/Kutch region, it would perhaps not be wrong to say that most Indians became aware of the terrifying consequences of a tsunami on 26 December 2004 when the Indian coastline was struck by another one. Since then, the word tsunami has entered the vocabulary of the common man, although perhaps the details of what “exactly” is a tsunami is not clear to all.
their wavelength and the direction of the wave energy upwards. This is called Shoaling Effect and is why these waves reach tremendous heights. For example, a tsunami wave one metre or less in deep ocean can transform to a 35m wave at landfall.

- The maximum height a tsunami reaches on shore is called a Run-up. It is the vertical distance between the maximum height reached by the water on the shore and the mean sea level.

Deadly Effects

- Tsunamis cause tremendous damage because the waves smash into the shore like a massive wall of water.
- The Run-up can cause tremendous damage inland and is much more common than huge, thundering tsunami waves.

Detecting Tsunamis

- Approaching tsunamis are sometimes heralded by noticeable rise or fall of coastal waters. A sudden sea level withdrawal may sometimes precede a tsunami.
- In the deep oceans, the amplitude of tsunami wave is normally less than 1m and cannot be detected from the air. Even boats cannot feel these long wavelength-low amplitude waves passing below them.
- Seismographs sensitive to wave movements, tide gauges connected to an instrument that records changes in water level, and bottom pressure recorders located on the ocean floor to measure the pressure of the waves passing overhead are pressed into service to give early warning.
- The information gathered is transmitted via satellites to monitoring stations. Communication of real-time data from seismic stations, tide gauges and BPRs to the early warning centre is very critical for generating timely tsunami warnings.
- The Japan Agency for Marine-Earth S&T has implemented DONET (Dense Oceanfloor Network Systems for Earthquakes and Tsunamis) – a programme involving submarine cable-based real-time seafloor observatory network for rapid detection and data processing of seismic motions immediately after the earthquake.
- Early Warning System for Tsunami has been established by MoES, India as the nodal Ministry, in collaboration with Department of Science and Technology (DST), Department of Space and the Council of Scientific and Industrial Research (CSIR). The National Tsunami Early Warning Centre has been set up at the Indian National Centre for Ocean Information Services (INCOIS), Hyderabad.

Most-Recent Tsunami

Two earthquakes (magnitudes 7.7 and 7.8 respectively) that occurred on 7 October 2009 near the Vanuatu Islands, southwest Pacific triggered tsunami.

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<th>Date</th>
<th>Cause</th>
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<tr>
<td>31 Dec 1881 (Source: Prof Roger Bilham)</td>
<td>7.9 Richter scale earthquake beneath Car Nicobar</td>
<td>Entire east coast of India and Andaman &amp; Nicobar Islands; 1m tsunami were recorded at Chennai.</td>
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<tr>
<td>August 1883 (Source: Dr. Arun Bapat)</td>
<td>Explosion of the Krakatoa Volcano in Indonesia</td>
<td>East coast of India was affected; 2m tsunami were recorded at Chennai.</td>
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<tr>
<td>26 June 1941 (Source: Dr. Arun Bapat)</td>
<td>8.1 Richter scale earthquake in the Andaman archipelago.</td>
<td>East coast of India was affected but no estimates of height of the tsunami is available</td>
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<tr>
<td>27 November 1945 (Source: Dr. Arun Bapat)</td>
<td>8.5 Richter scale earthquake at a distance of about 100km south of Karachi</td>
<td>West coast of India from north to Karwar was affected; 12m tsunami was felt at Kandla</td>
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Source: http://www.nio.org/sp/tsunami.jsp

Dr Sukanya Datta
Scientist, NISCAIR posted to Director General’s Technical Cell, CSIR HQ
Email: sukanya@csir.res.in

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