TSUNAMI

Definition

↳ Tsunamis are very large catastrophic oceanic waves which are formed due to disturbance in sea-water.

Tsunami

- Tsu [Harbour]
- Nami [Wave]

↳ It is a series of waves which are created from the source of origin due to geological changes near or below the ocean floor.

Causes of Tsunami

- Undersea EQs
- Landslides
- Sub-Marine Volcanic Eruptions
- other Causes

(1) Undersea EQ's

↳ Most destructive Tsunamis are generated by massive undersea earthquakes, occurring at depth less than 50 km with the epi focus on fault line near or on the ocean floor.

- For generation of Tsunamis, there should be vertical movement in plates due to plate tectonics.
- At transform faults → No Tsunamis → No Vertical movement of plate.

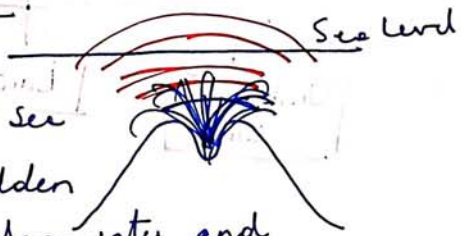
(2) Landslides

- Rock materials from mountains plunges into the ocean leading to formation of Tsunamis.

- Underwater Landslides also create Tsunamis.

(3) Volcanic Eruptions

- Violent volcanic eruptions under the sea level causes sudden displacement of seawater and Tsunamis are generated.



- Example = 1883 = Explosion and collapse of Krakatao in Indonesia.
  - Waves of 40m height were created.

(4) Other Causes

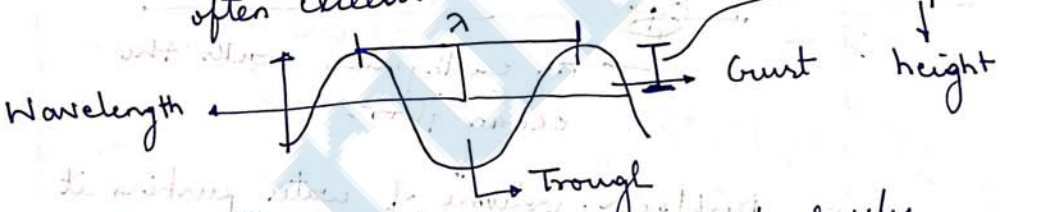
a) Fall of Meteorites and Asteroids

b) Nuclear Submarine explosion

Propagation of Tsunami Waves

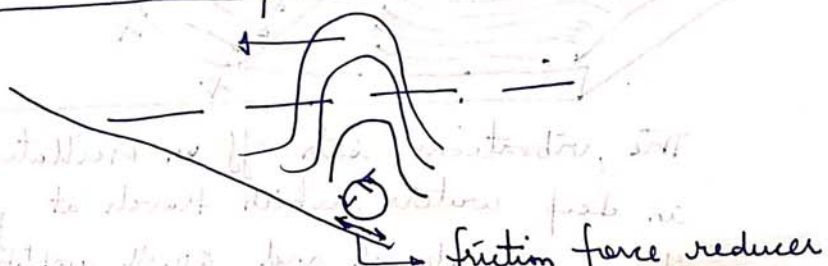
Deep Ocean

- They travel at very high speed as Sea floor does not offer any obstruction.
- Their wavelength is very long which often exceeds 500 - 700 Kms.



- Amplitude is very low and rarely exceed 1 meter
  - Thus difficult to detect in Deep Sea.
    - So not felt by passengers on boats

Shallow Waters / Coasts



(2)

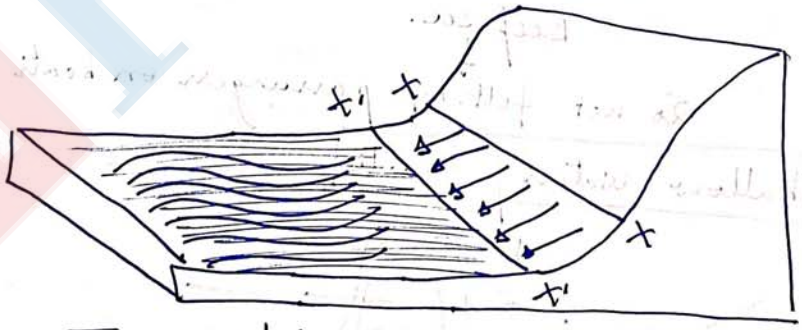
- speed is reduced enormously as sea floor friction obstructs.
- They attain enormous height often exceeding 10 meter
  - Conversion of Kinetic Energy into Potential energy.

How a Tsunami Occurs

Phase 1

- An earthquake rocks the ocean floor.
  - ↓
  - Displaces volume of water pushing it in upward direction

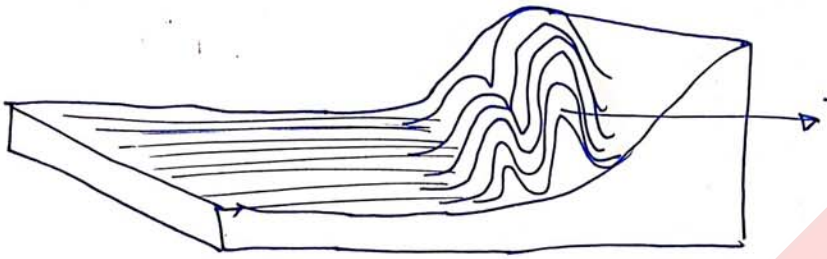
Phase 2



The vibrations sets off an oscillation in deep water; which travels at great speed, large wavelength and small amplitude

↳ Sea water receeds from the shore

Phase 3



↳ Waves become greater in amplitude as water gets shallower

↳ Energy is released at the coast.

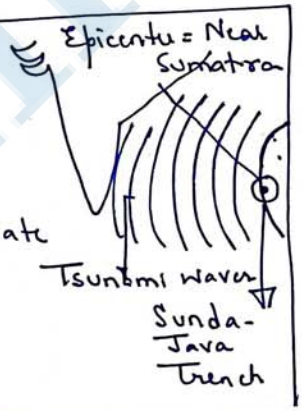
Case study: 2004 Tsunami = 26th Dec

↳ Most catastrophic

↳ Cause = Severe EQ [8.9 on Richter scale]

↳ 15 meter slip in Vertical direction when Indian plate Subducted under Burmese plate.

↳ Amplitude = 30 mt



↳ Killed an estimated 227,898 people in 14 Countries.