Earth

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Source: *Internet*

Tsunami Risk

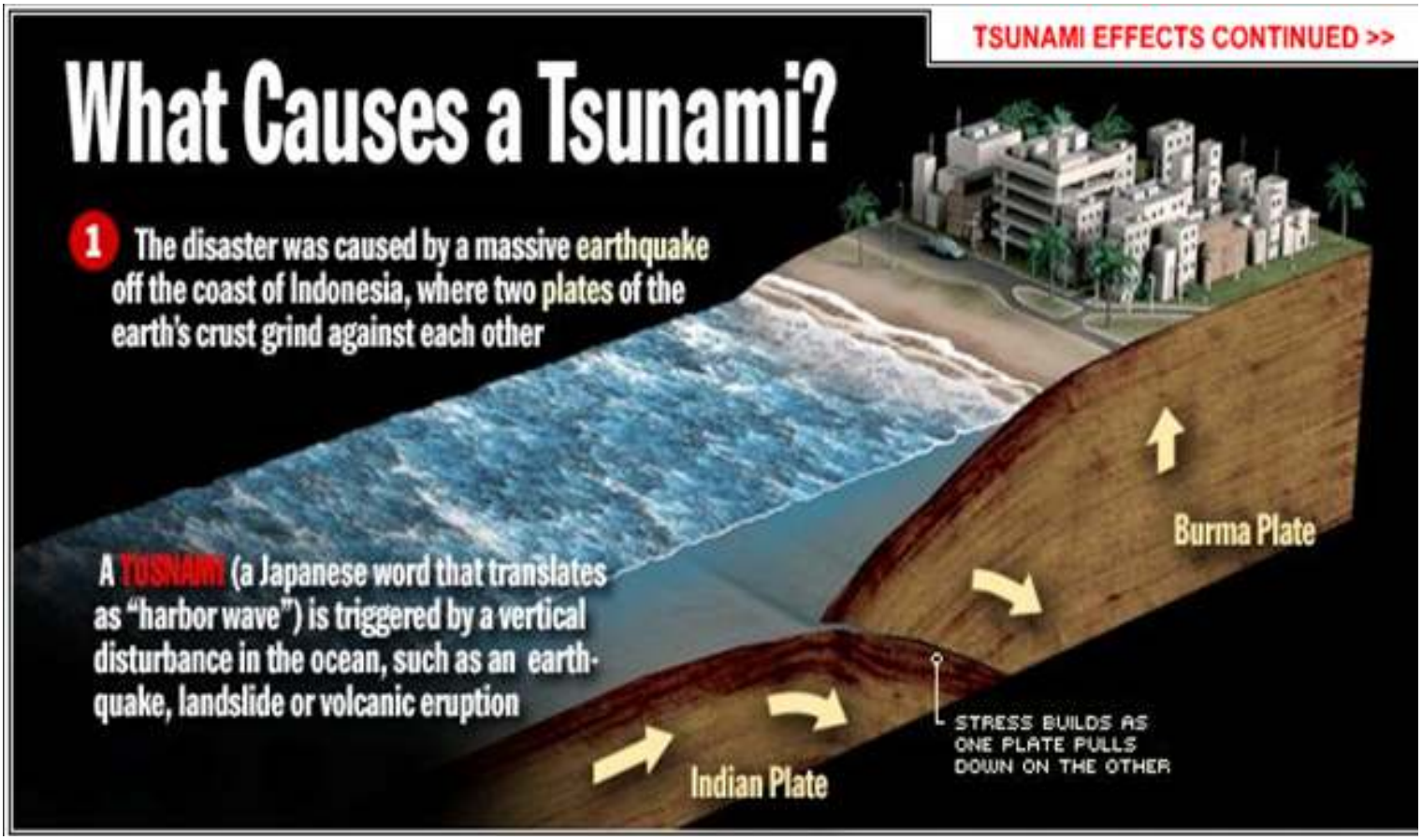
Tsunami is a Japanese word that means "Harbor Wave". Tsunami is series of waves that savagely attack coastlines causing property damage and loss of life.

Causes of Tsunami

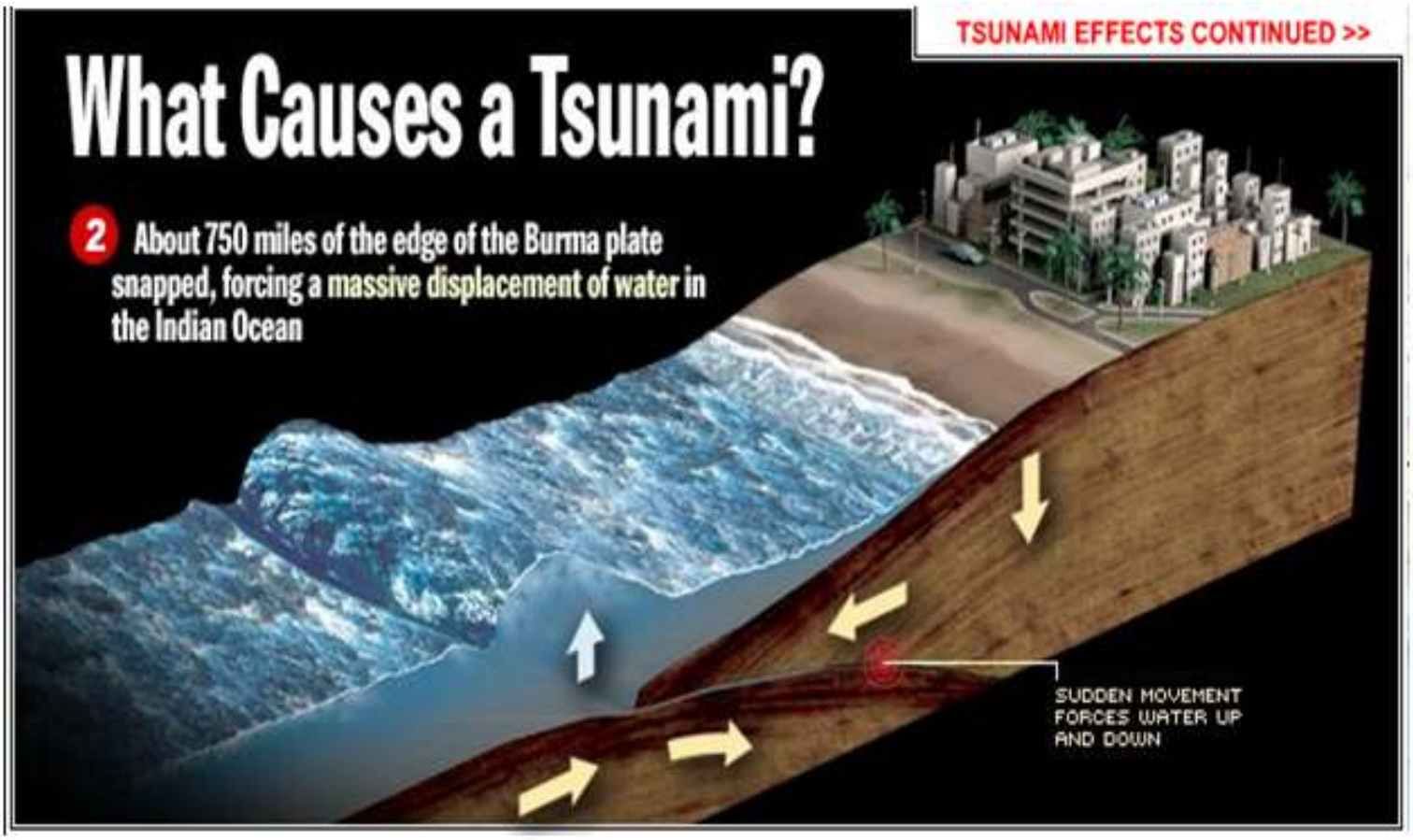
ANY disturbance, as stated below, that displaces a large water mass can generate a tsunami

- Earthquakes (Like 2011 Tohoku Earthquake tsunami, Indian Ocean tsunami)
- Earthquake induced submarine land slides
- Volcanic eruptions (1883Krakatoa, Indonesia tsunami)
- Explosions
- Impact of meteorites

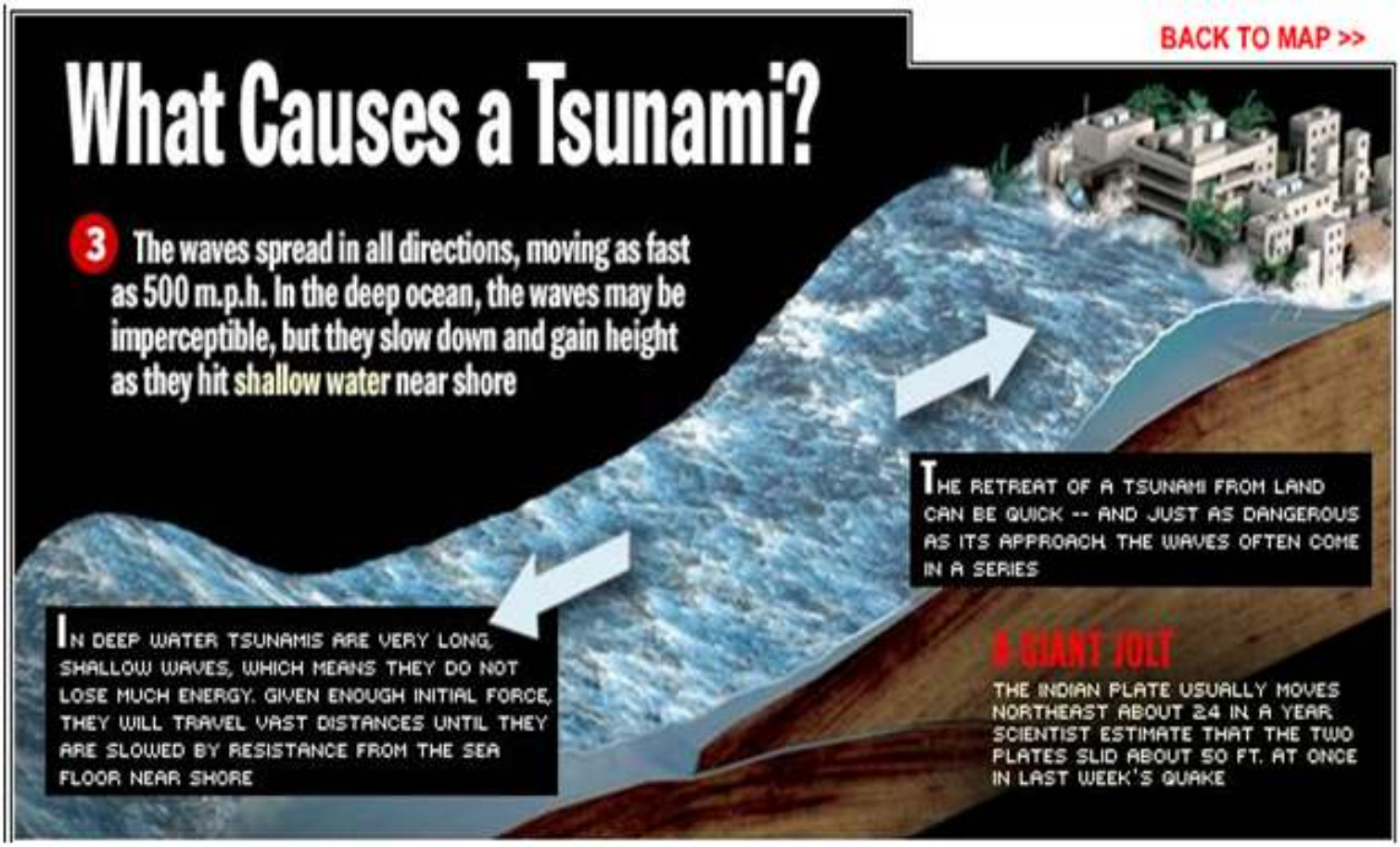
Figures below shows reason of Indian Ocean Tsunami 2004 which was caused by a sub-marine earthquake.



Source: *Internet*



Source: *Internet*

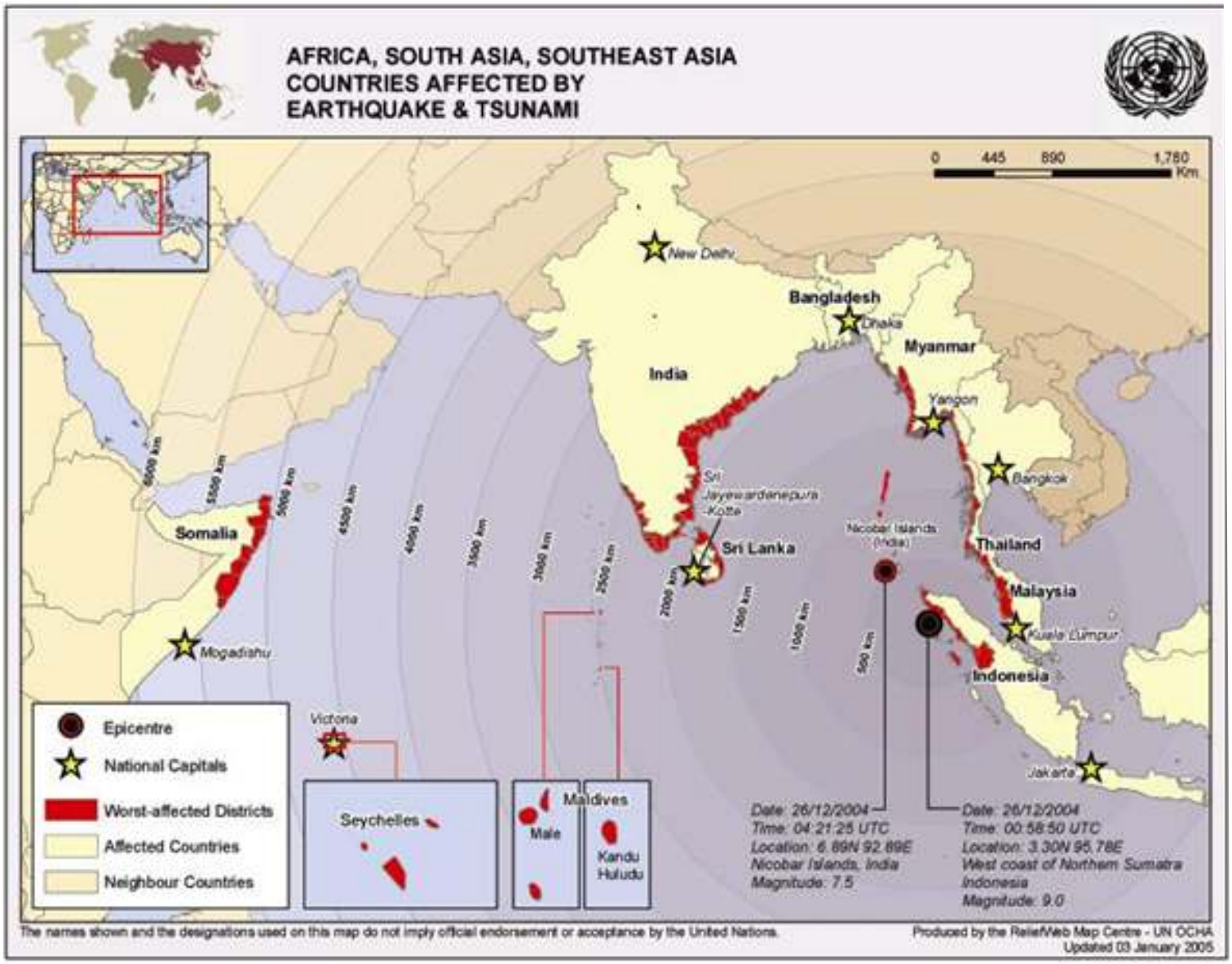


Source: *Internet*

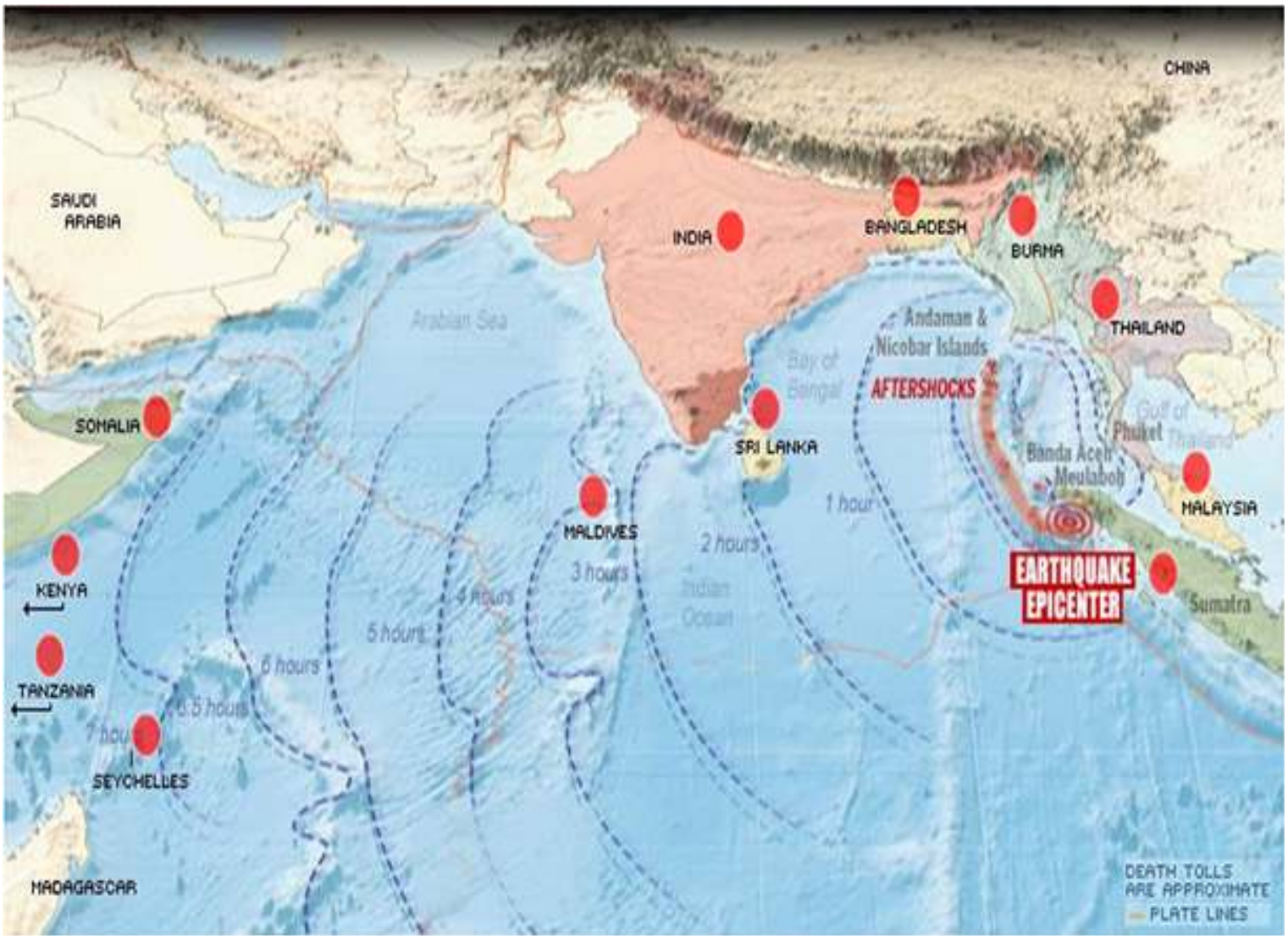
Characteristics of tsunami waves

- Speed depends on the depth of water. In the deep and open ocean, it may be 450-650 miles per hour (725- 1050 kilometers per hour)
- Distance between successive crests may be 300 to 400 miles (480-650 kilometers)
- In open ocean, the height of the waves may 1 or 2 feet
- Generally there are 3 to 5 distinct waves, the second or third may be the largest

Figures below show geographical spread of Indian Ocean Tsunami 2004 and time taken to hit various countries



Source: *UN OCHA*

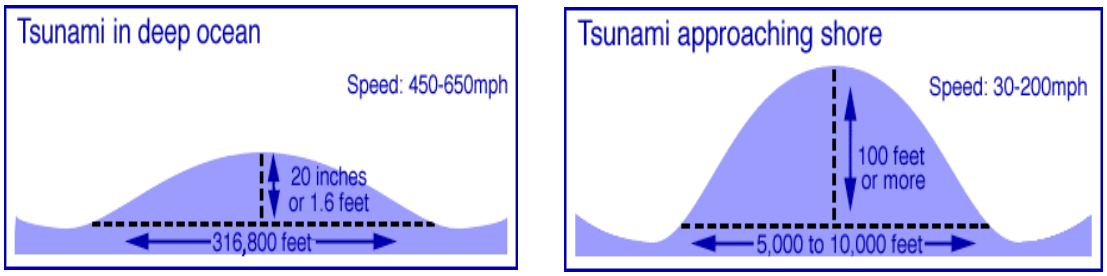


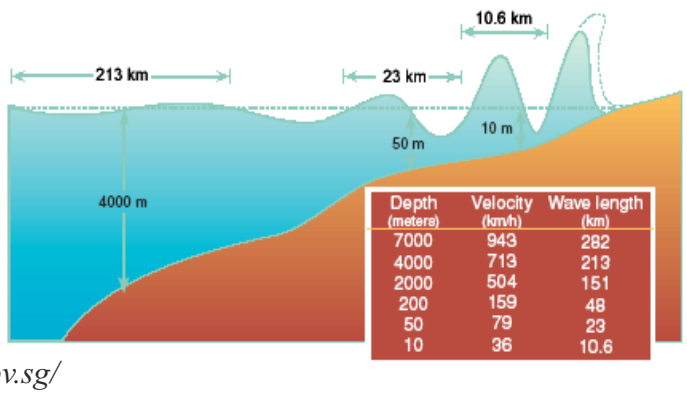
Source: *UN OCHA*

Tsunami Shoaling

In deep water, a tsunami moves very fast and has a long wavelength and a small amplitude. As it enters shallower water, it slows down and the wavelength decreases. This causes the wave to become much taller.

Shoaling amplification depends on ratio of group velocity at nucleation site and coast site. If the bathymetry #is steep, amplification will be low and vice-versa. Figure below shows tsunami shoaling.





Source: *http://www.nea.gov.sg/*

Damage Done by Tsunami

Tsunamis can cause damage of houses, contents, infrastructure damage, and environment besides killing people.

A catamaran sightseeing boat washed by the 2011 tsunami onto a two-story home in Otsuchi, Iwate prefecture, Japan
Source: *The Atlantis.com*

Rail tracks, twisted by tsunami, are seen near Paiyagala train station, some 50 km south of Colombo, on December 29, 2004 | Source: *Jean-Philippe Ksiazek*

Dead mango tree in Maldives after exposure to salt water during 2004 tsunami. Coconut trees survived
Source: *Personal collection, SAS*

Table below shows economic and insured loss caused by recent tsunamis

Location	Primary Cause	Date	Economic Loss (US$)	Insured Loss (US$)
Indonesia & neighbouring countries	Earthquake	26/12/2004	13.4 billion	2.1 billion
South of Java Island, Indonesia	Earthquake	17/07/2006	55 million	1 million
Samoa	Earthquake	29/09/2009	147 m	NA
Chile	Earthquake	27/02/2010	30 billion	8 billion
Sumatra, Indonesia	Earthquake	25/10/2010	NA	NA
Pacific coast of Japan	Earthquake	11/03/2011	210 billion	35 billion
Solomon Islands	Earthquake	06/02/2013	36 million	NA
Chile	Earthquake	16/09/2015	1 billion	350 million
New Zealand	Earthquake	14/11/2016	3.9 billion	1.7-2.4 billion

Source: *Swiss Re*

Bathymetry is the study of underwater depth of lake or ocean floors.

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