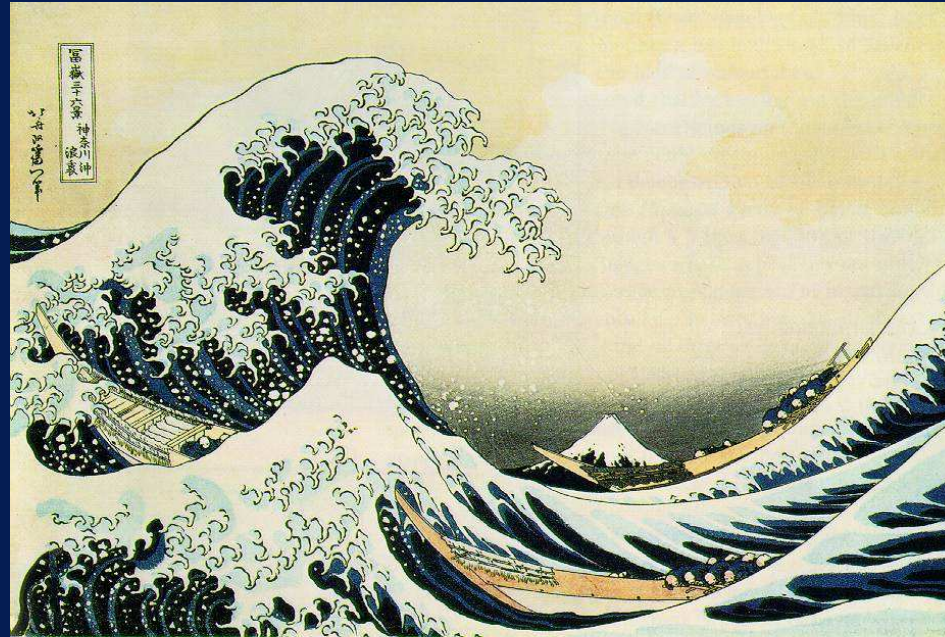


Indian Ocean Tsunami of 2004

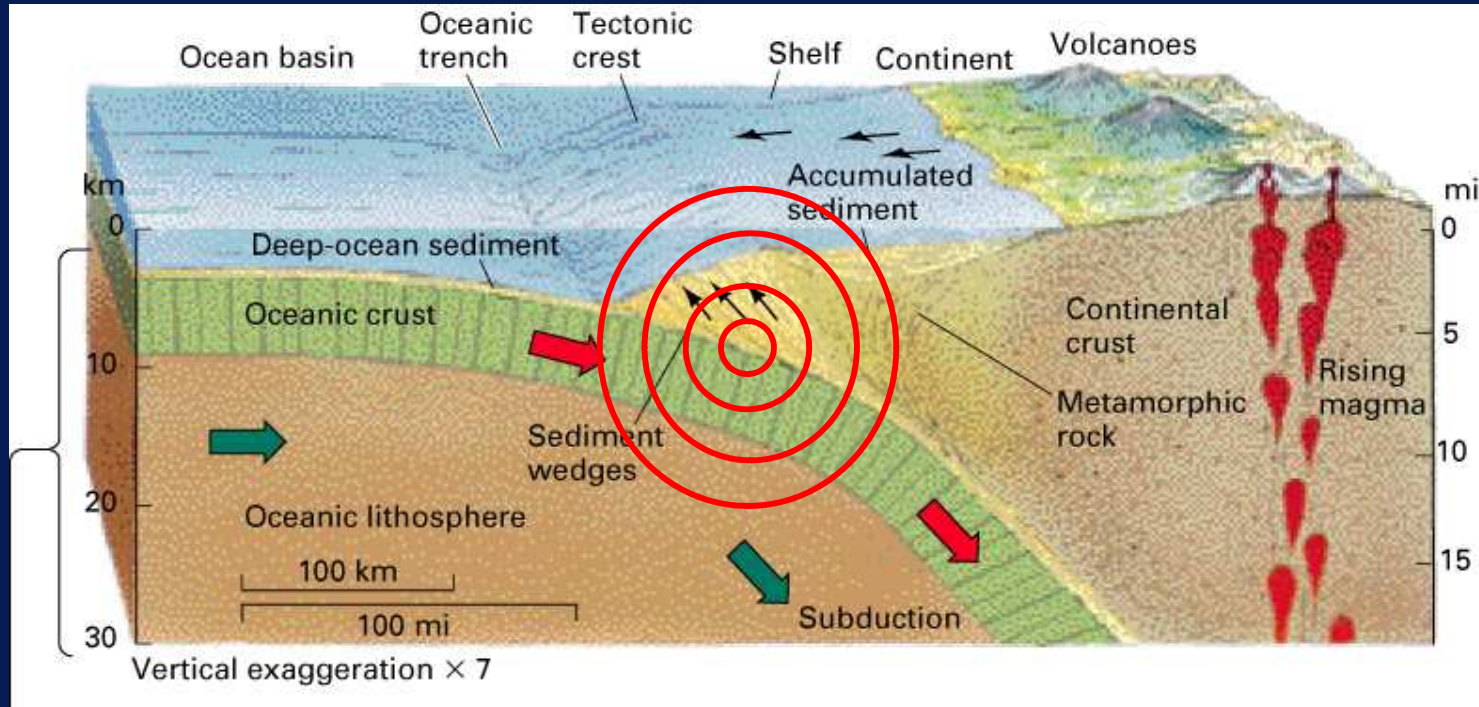
“The Great Wave” by Katsushika Hokusai (ca. 1823–1829)

The Tsunami



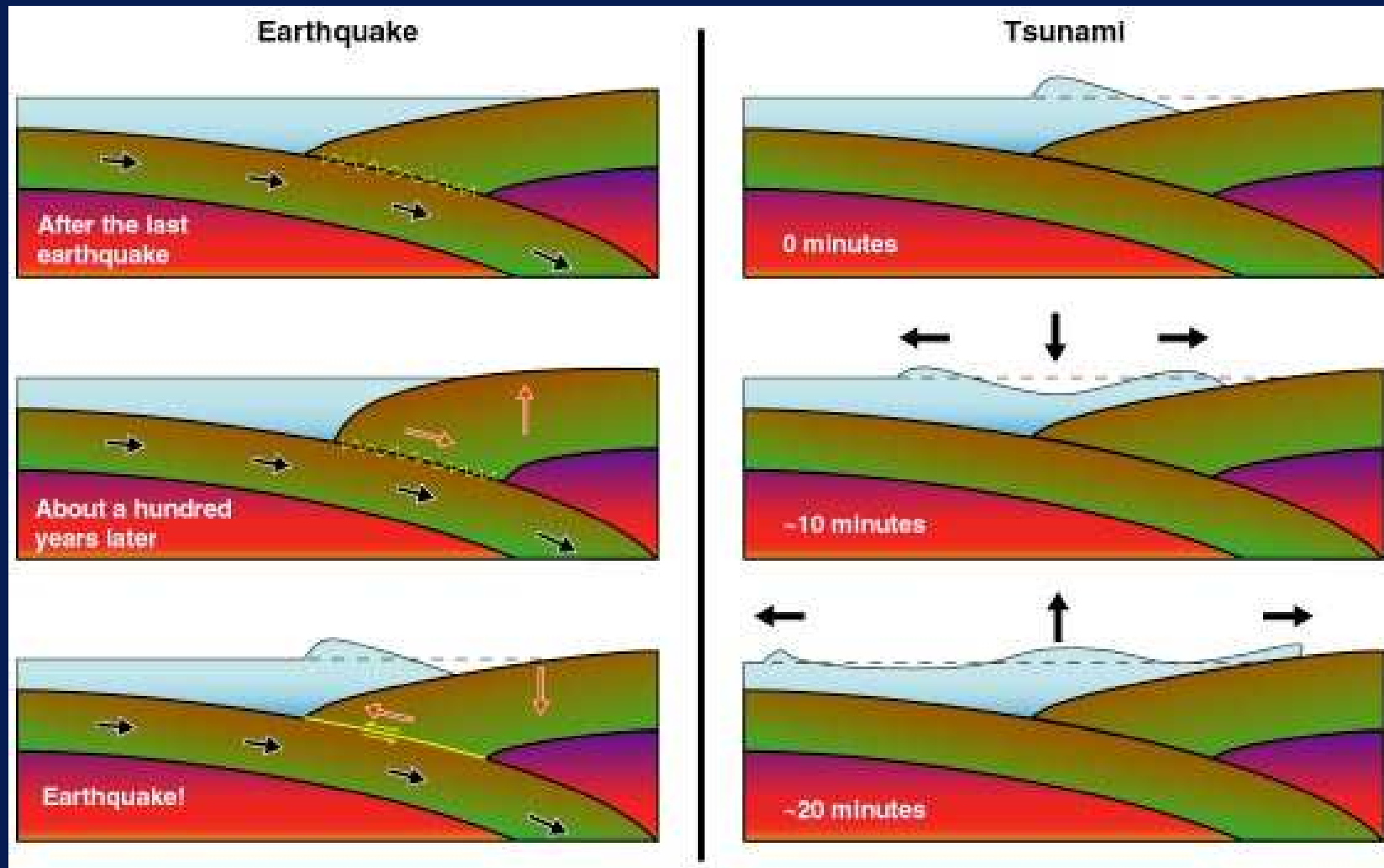
- Also called *seismic sea wave*
- Generated by an undersea geologic event, such as a great earthquake, volcanic explosion, or underwater landslide
- “Tsunami” in Japanese means “harbor wave”
- Tsunamis are *not* “tidal waves”

Subduction Zone Earthquake



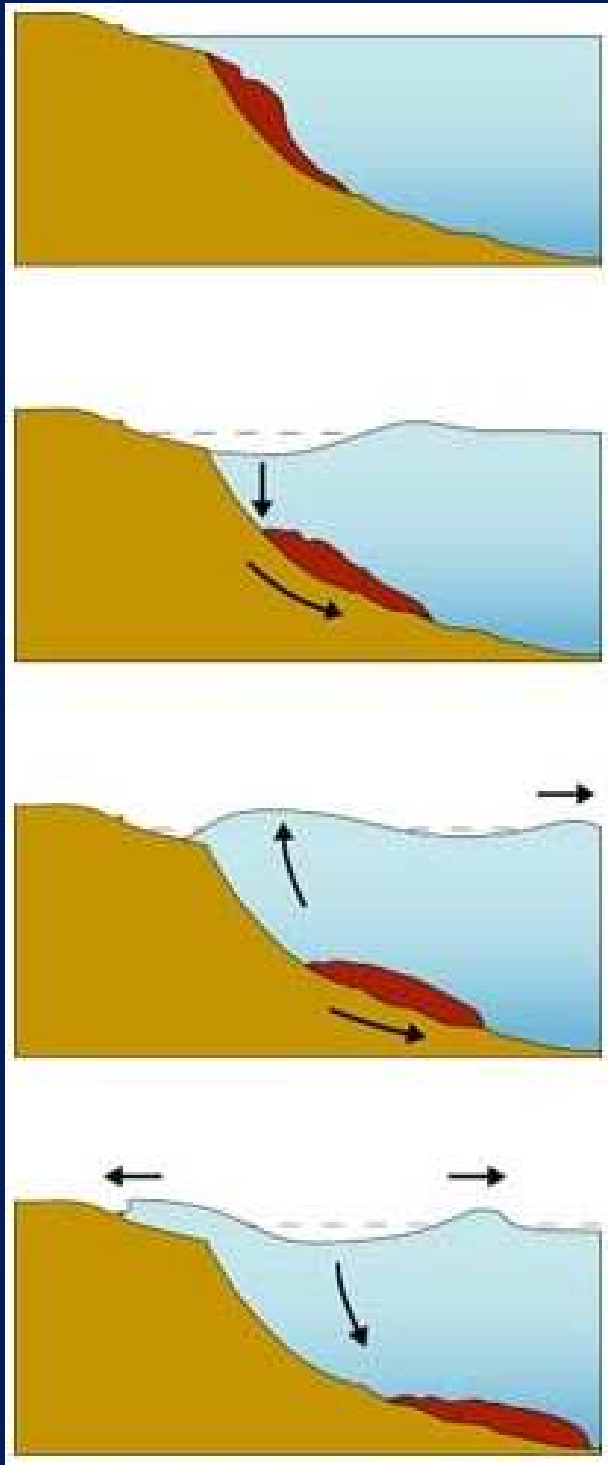
- Oceanic crust collides with continental crust and is forced downward
- Compression forces build until rock fractures and an earthquake occurs

Generation of the Tsunami



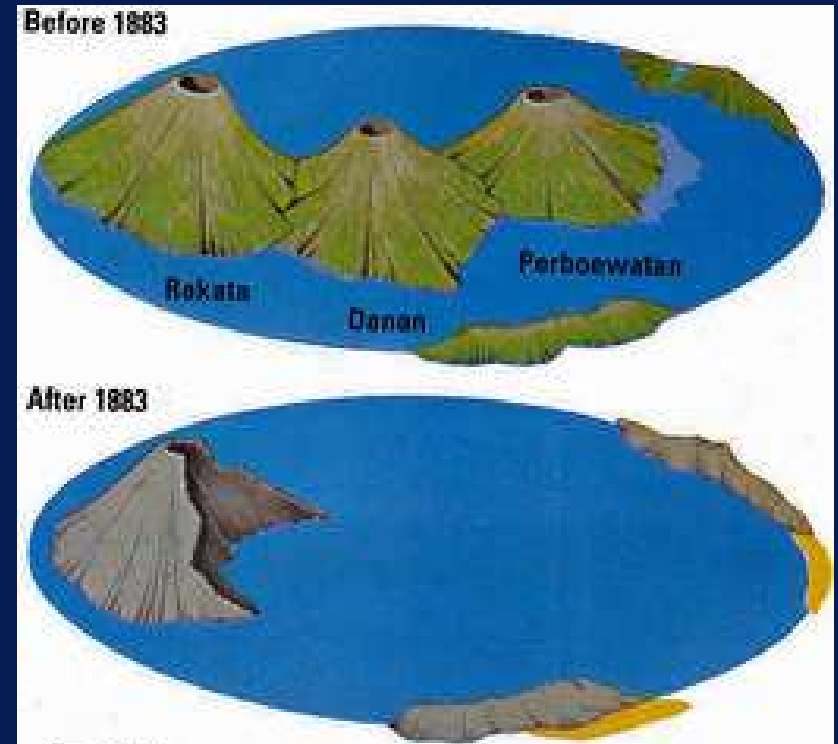
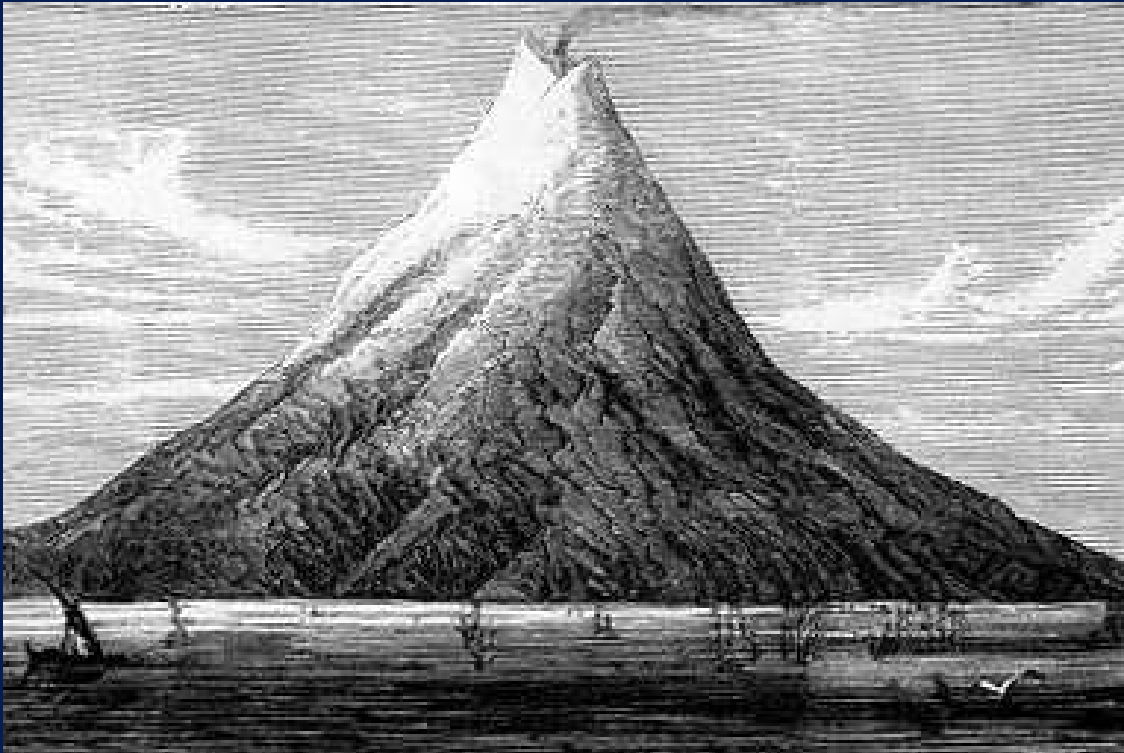
- During the earthquake, the seafloor moves upward, creating a water wave that spreads outward.

Undersea Landslide or Slump



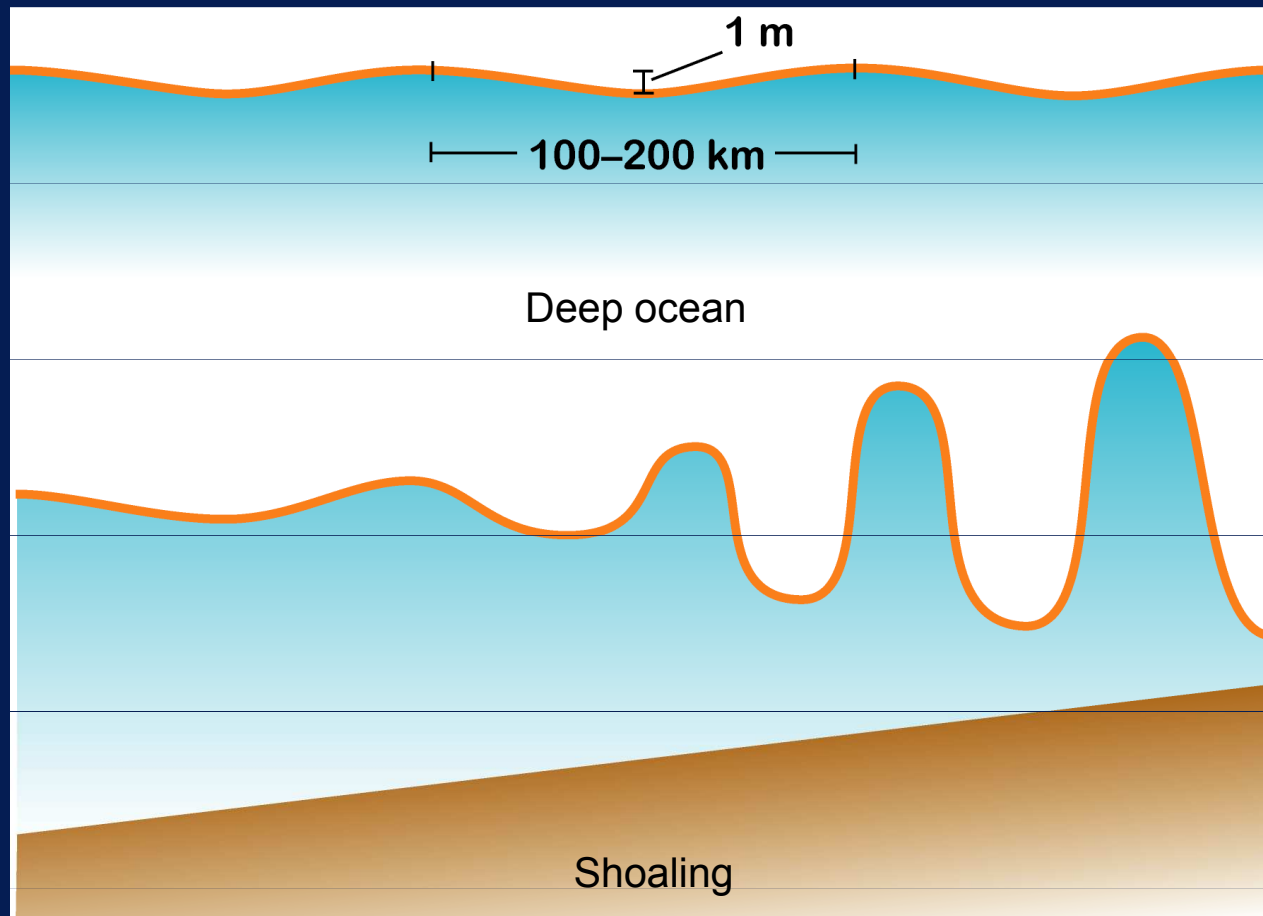
- Body of sediment slumps downward along a continental shelf
- Can be triggered by an earthquake
- Water drops at head of slump, rises at toe to create a wave
- Wave moves outward as a tsunami

Volcanic Explosion



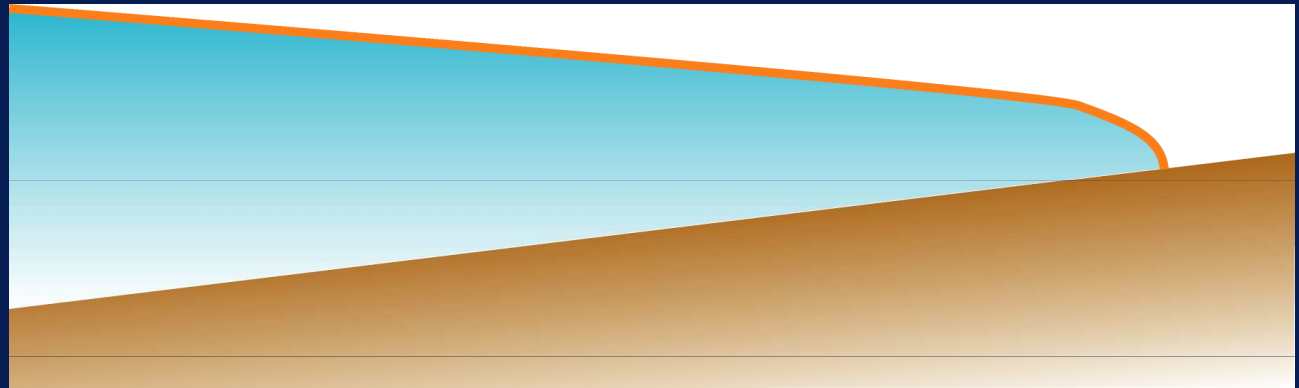
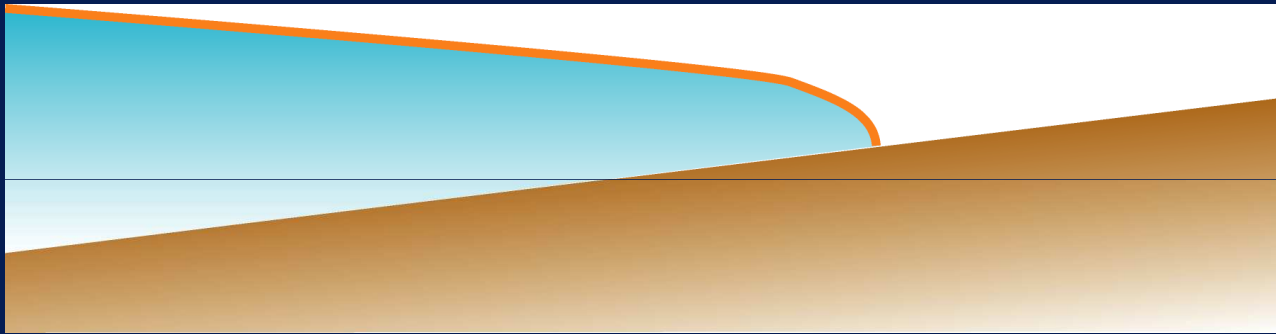
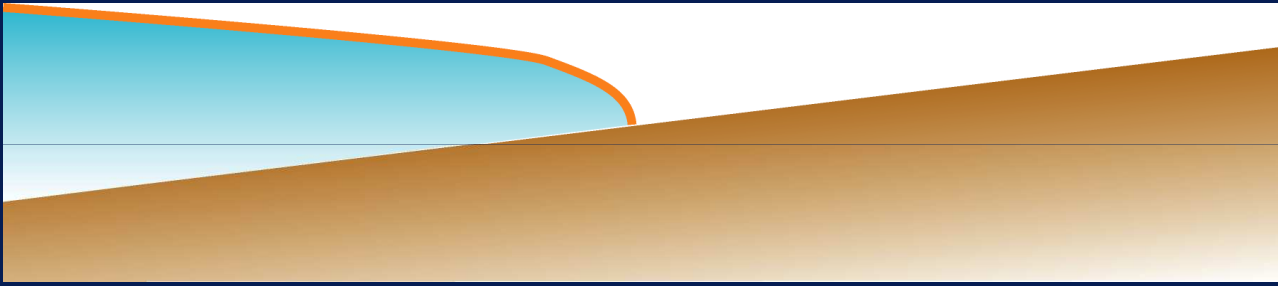
- The explosive eruption of Krakatau in August 1883 created a tsunami that claimed more than 36,000 lives

The Tsunami Wave



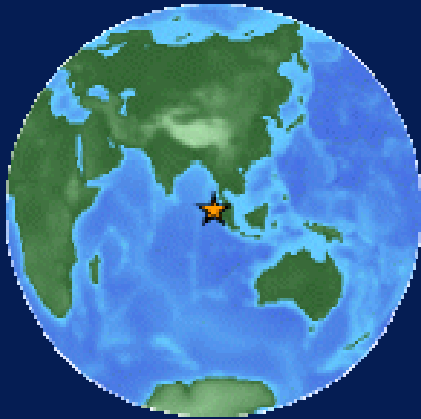
- The tsunami wave has a wavelength of 100–200 km with a deep water height of 1 m or less
- Travels as fast as 200 m/s (440 mi/hr) in open ocean
- As it approaches the shore, it slows, steepens, and rises in height

The Wave Keeps Coming

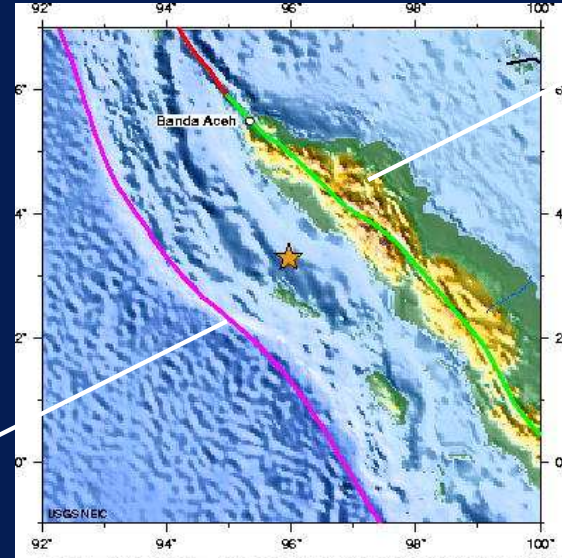


- The wave acts like a temporary rise in sea level, pushing water far inland before it retreats

Indian Ocean Tsunami of December 26, 2004



Java Trench



Sumatra

- Caused by 9.0 earthquake beneath Java Trench, west of Sumatra, Indonesia
- Fourth largest earthquake since 1900
- 1000 km of fault ruptured and sea floor moved upward by about 5 m (16 ft)

Propagation of the Tsunami Wave

QuickTime™ and a
Photo decompressor
are needed to see this picture.

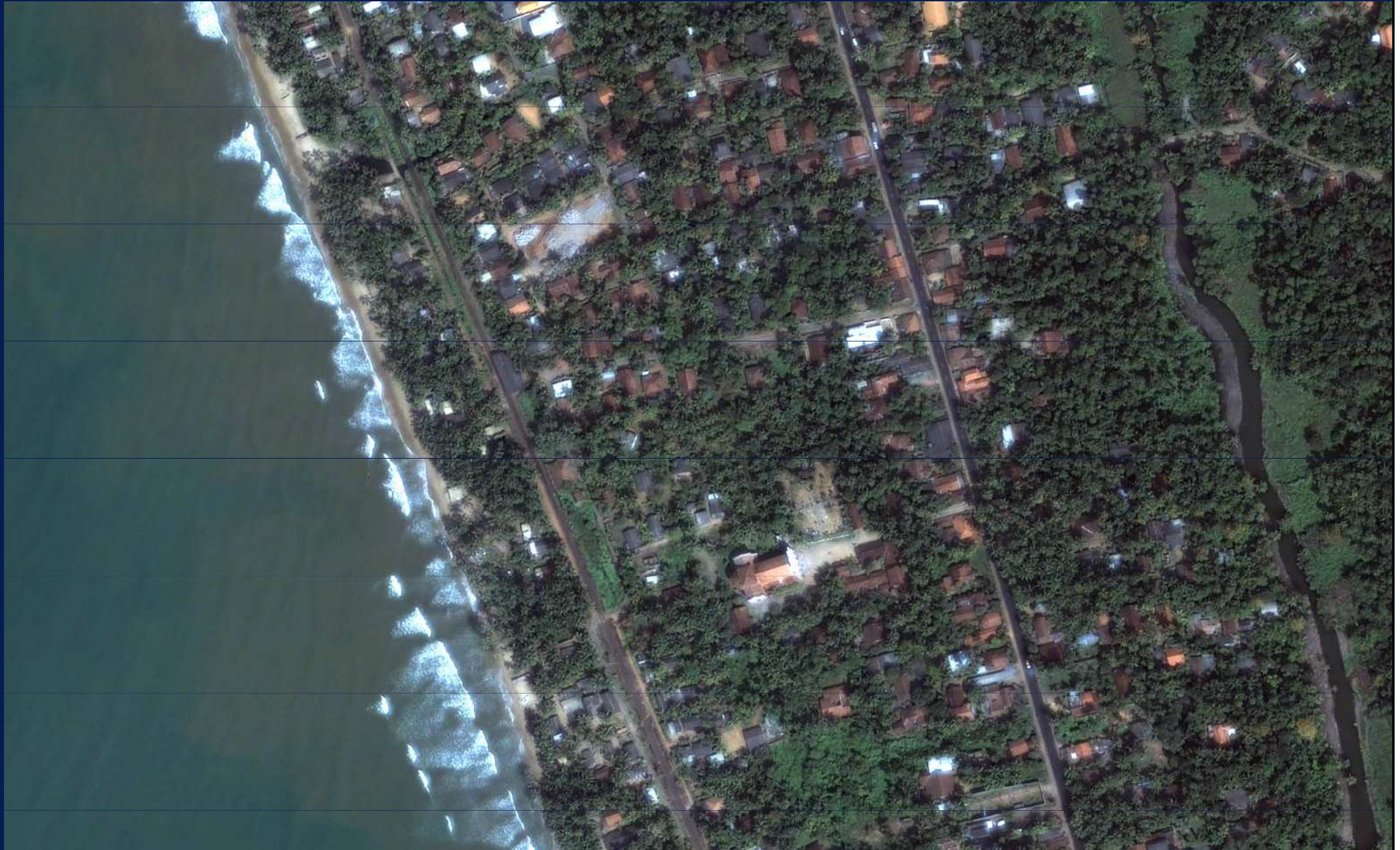
Banda Aceh, Sumatra, Indonesia



Banda Aceh, Sumatra, Indonesia



Kalutara Beach, Sri Lanka



Kalutara Beach, Sri Lanka



Kalutara Beach, Sri Lanka



Kalutara Beach, Sri Lanka



The Tsunami's Toll

- Deaths: >210,000
 - Indonesia: 166,000
 - Thailand: 5,000
 - Sri Lanka: 30,000
 - India: 10,000
- Damage: >\$7 billion
 - Indonesia: \$4.4 billion
 - India: \$1.5 billion
 - Sri Lanka: \$900 million
- Aid Donations: >\$6.5 billion
 - Government pledges: \$5.3 billion
 - Private donors: \$1–2 billion

