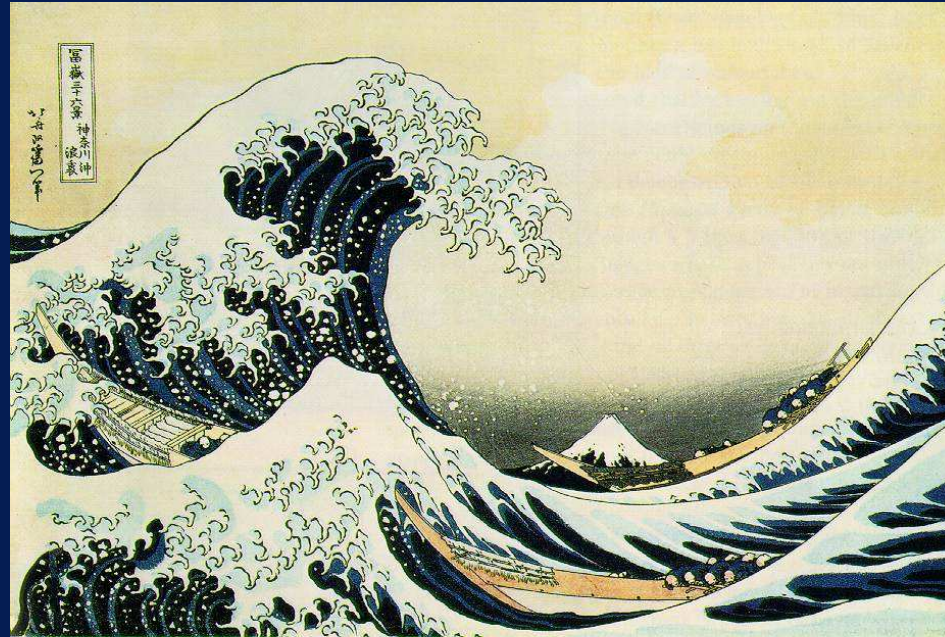


# Indian Ocean Tsunami of 2004

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

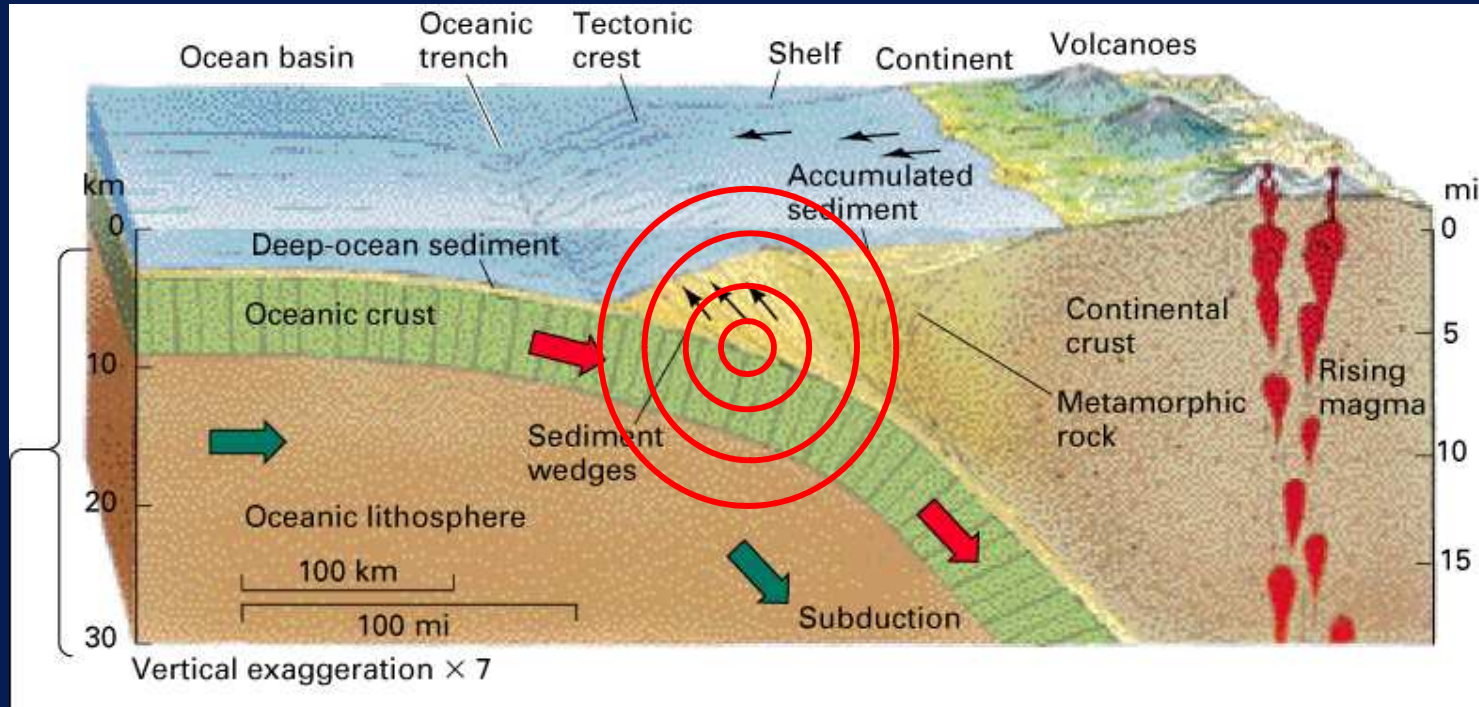


# The Tsunami



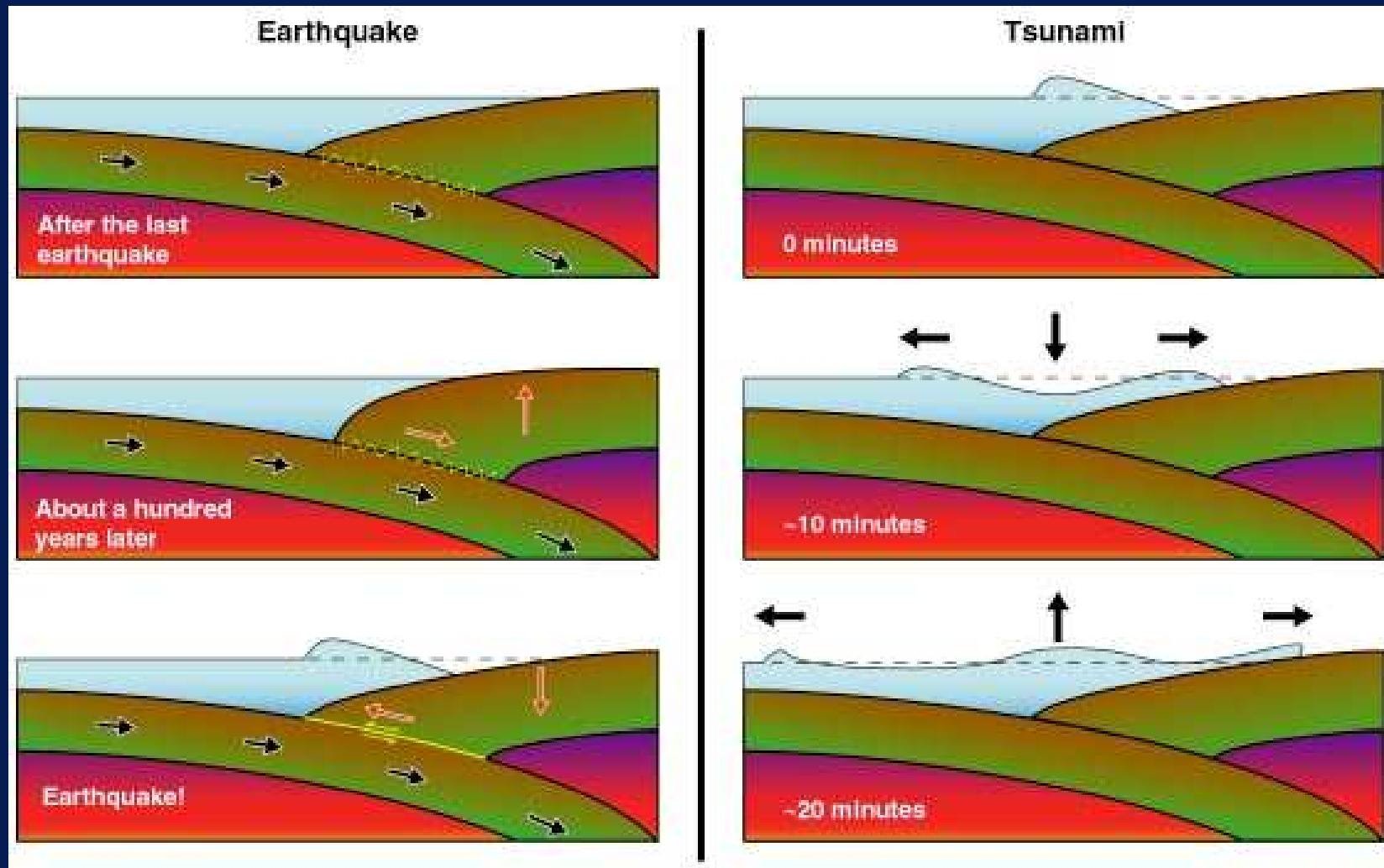
- Also called *seismic sea wave*
- Generated by an undersea geologic event, such as a great earthquake, volcanic explosion, or underwater landslide
- “Tsunami” in Japanese means “harbor wave”
- Tsunamis are *not* “tidal waves”

# Subduction Zone Earthquake



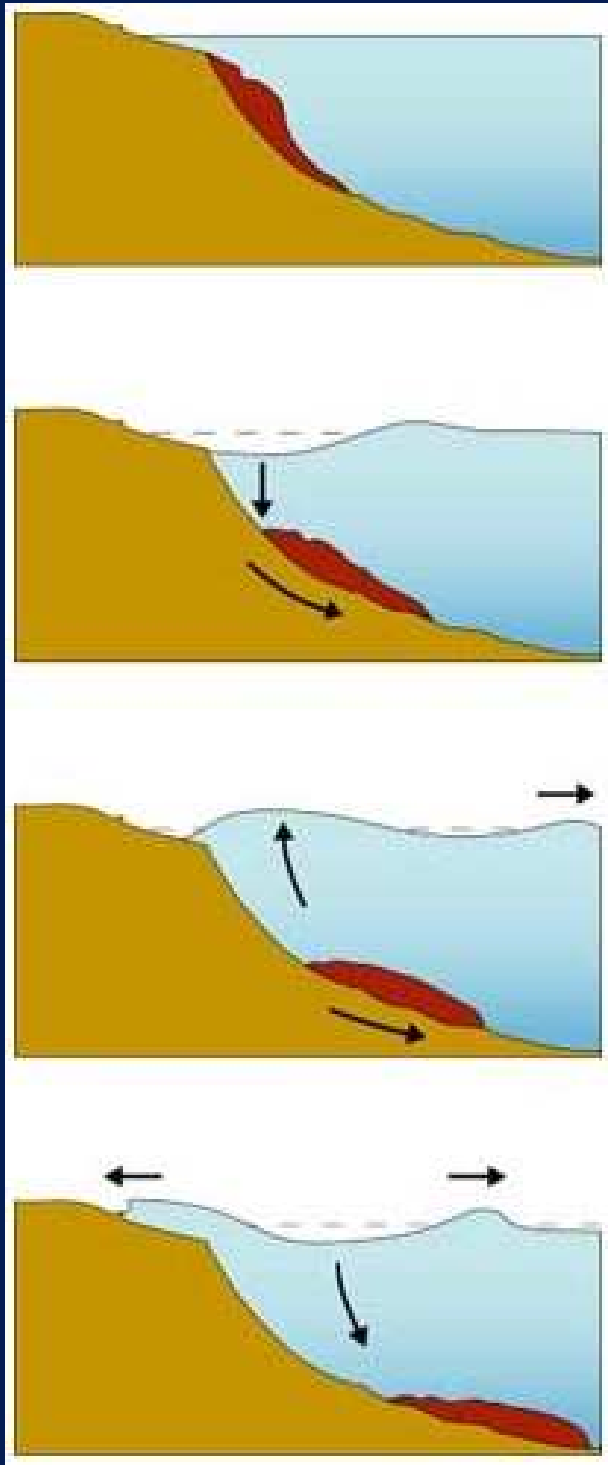
- Oceanic crust collides with continental crust and is forced downward
- Compression forces build until rock fractures and an earthquake occurs

# Generation of the Tsunami



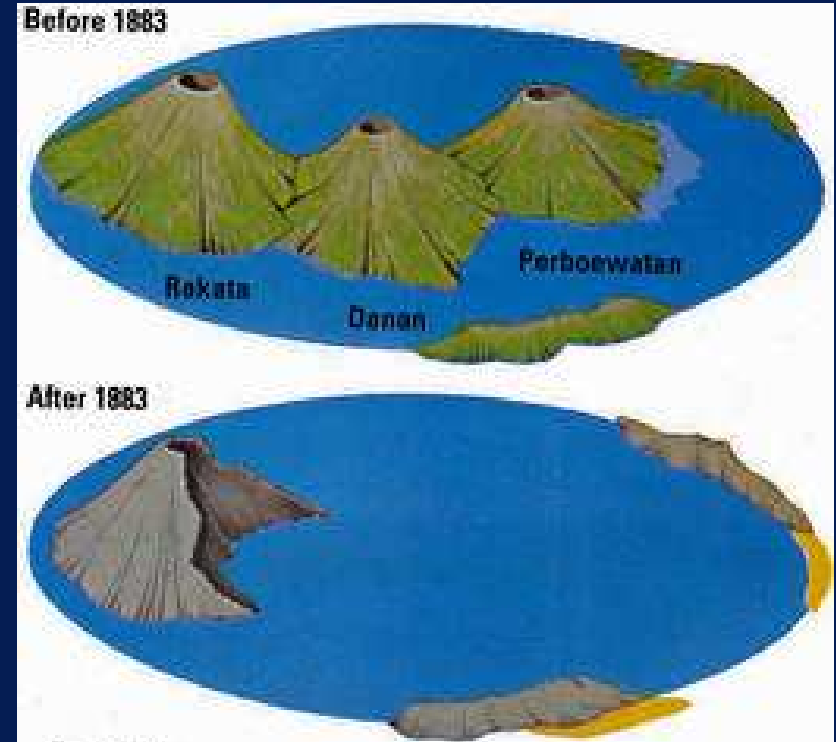
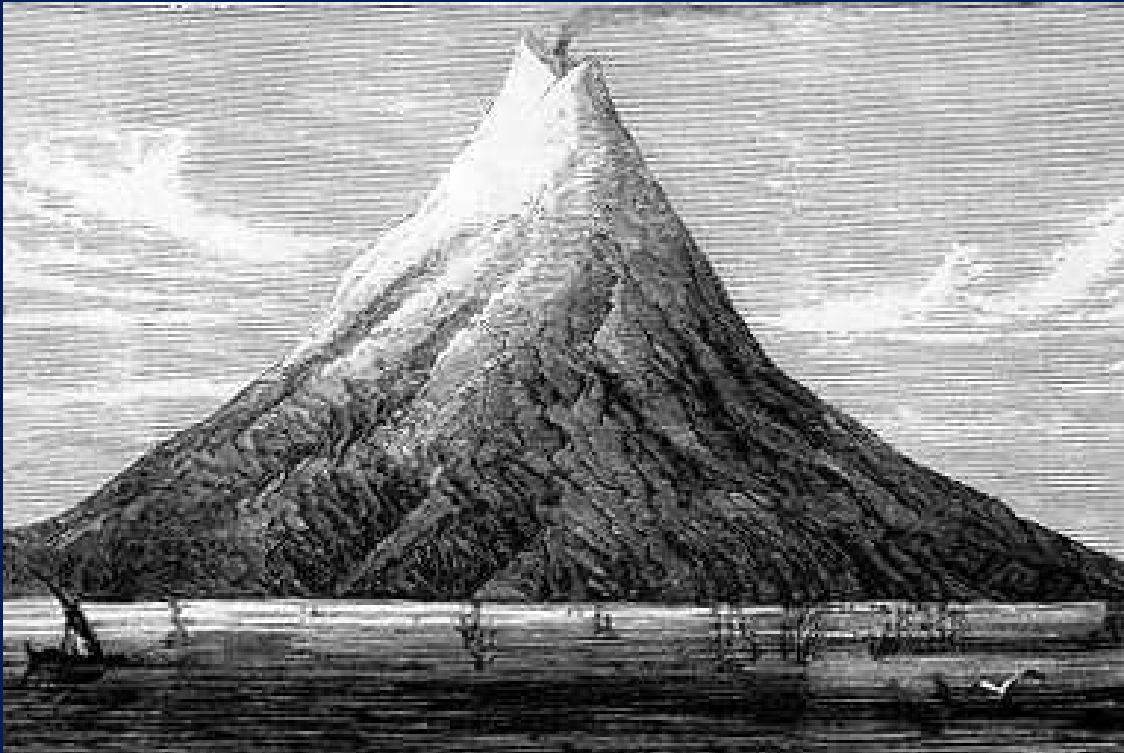
- During the earthquake, the seafloor moves upward, creating a water wave that spreads outward.

# 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

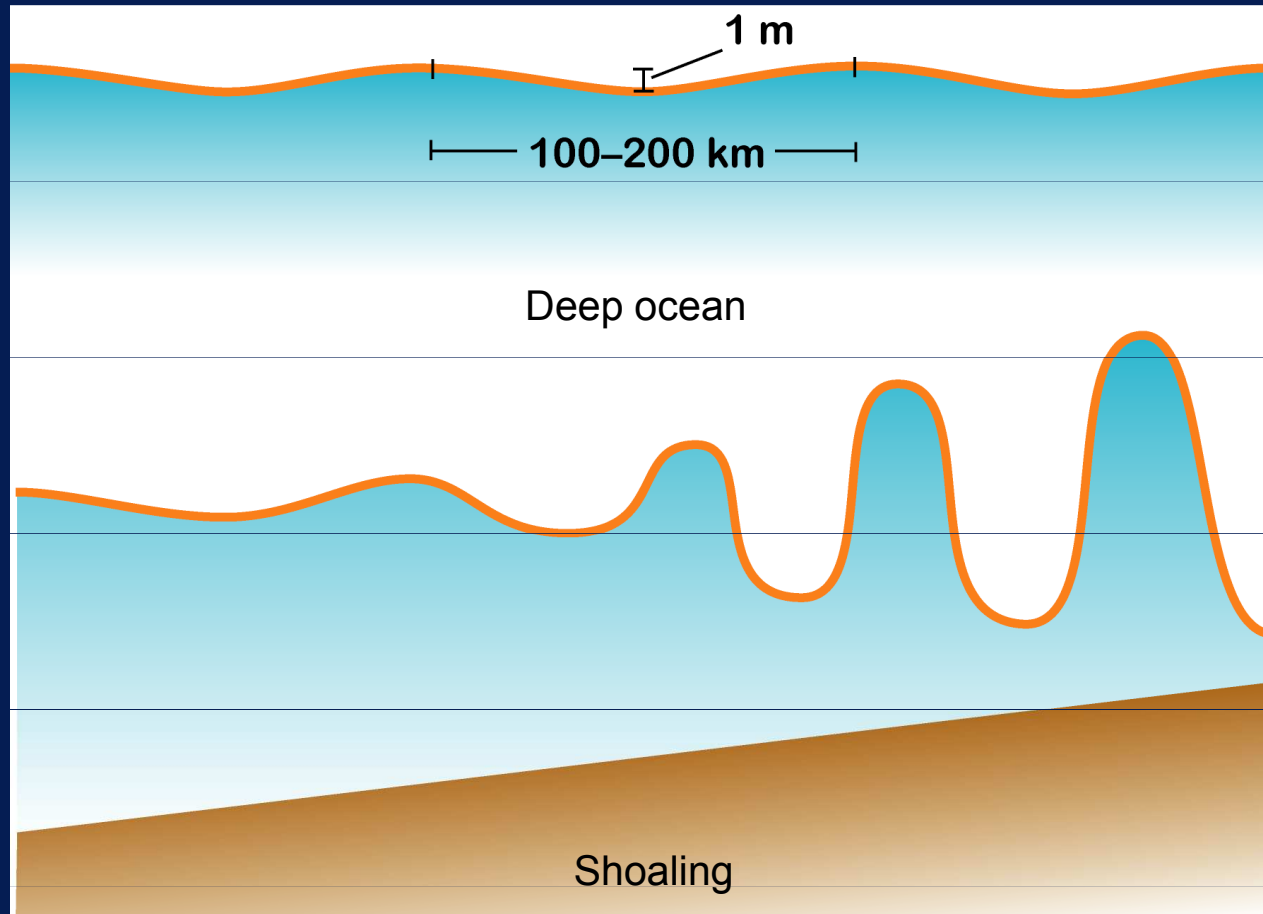
# Volcanic Explosion



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

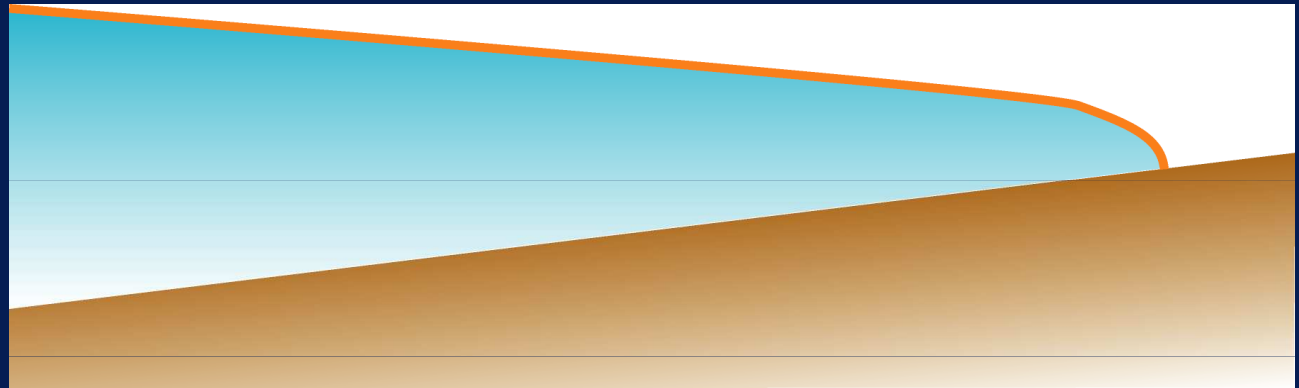
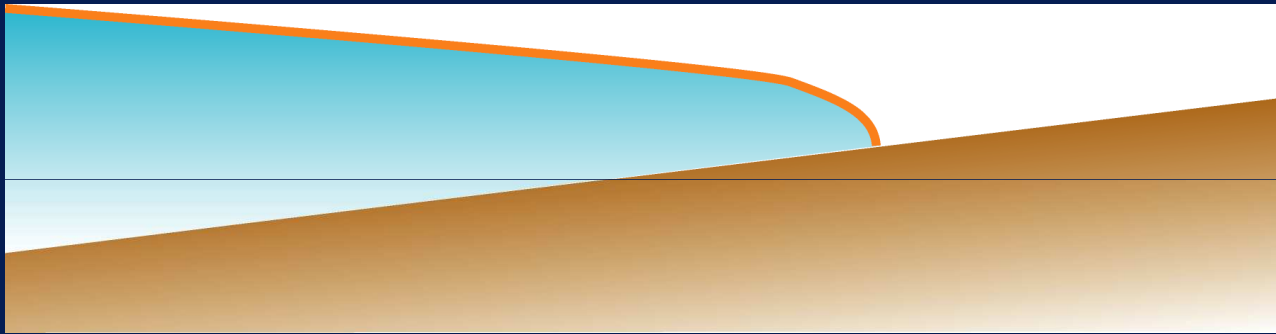
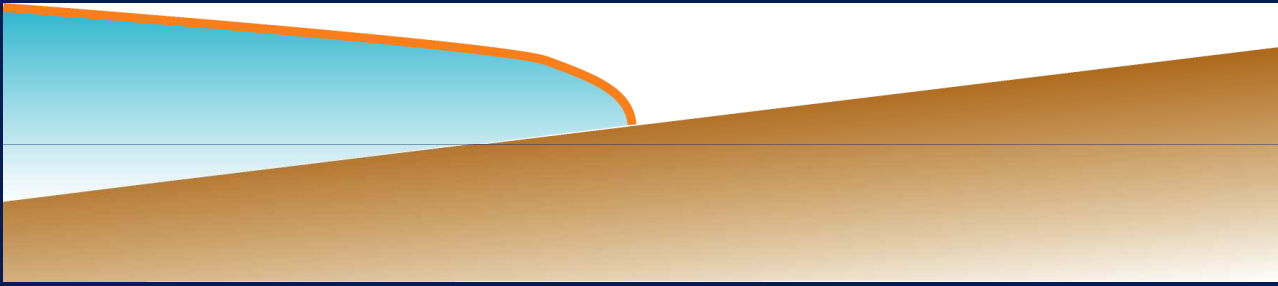


# The Tsunami Wave



- 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

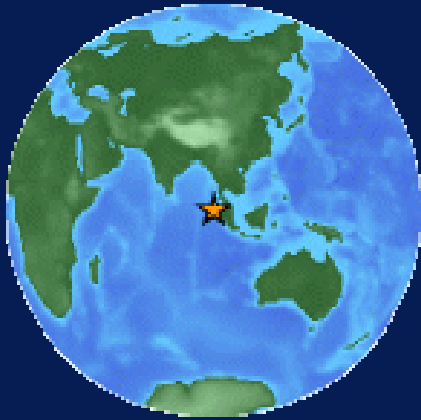
# The Wave Keeps Coming



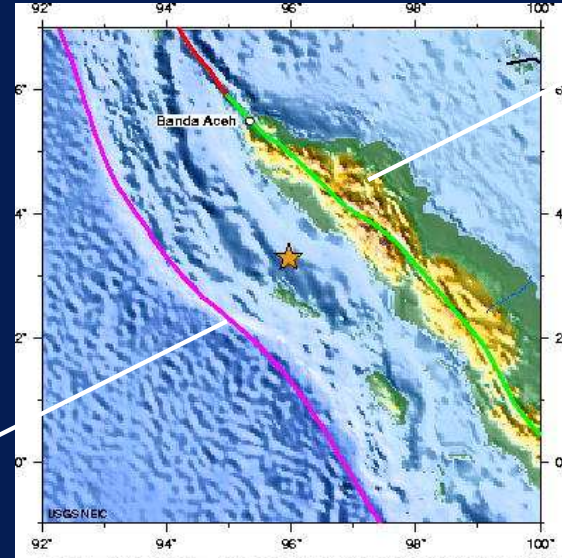
- The wave acts like a temporary rise in sea level, pushing water far inland before it retreats



# 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



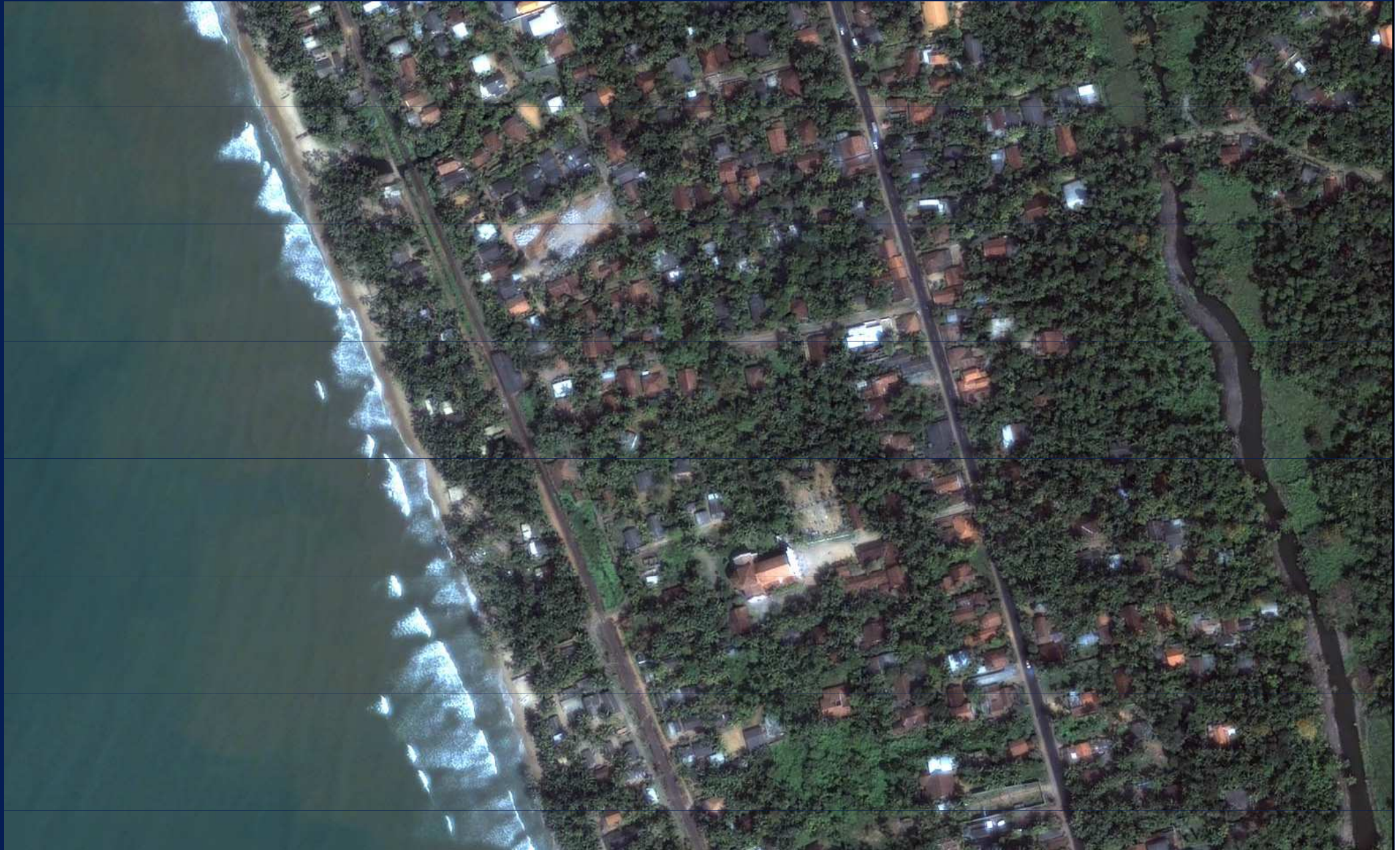


# Banda Aceh, Sumatra, Indonesia





# 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

