



大津波
1945年

Tsunami!

Tsunami

Tsunami is Japanese for “harbor wave”

Caused by the vertical displacement of ocean water

Triggered by:

Large earthquakes that move the sea floor

Underwater landslides

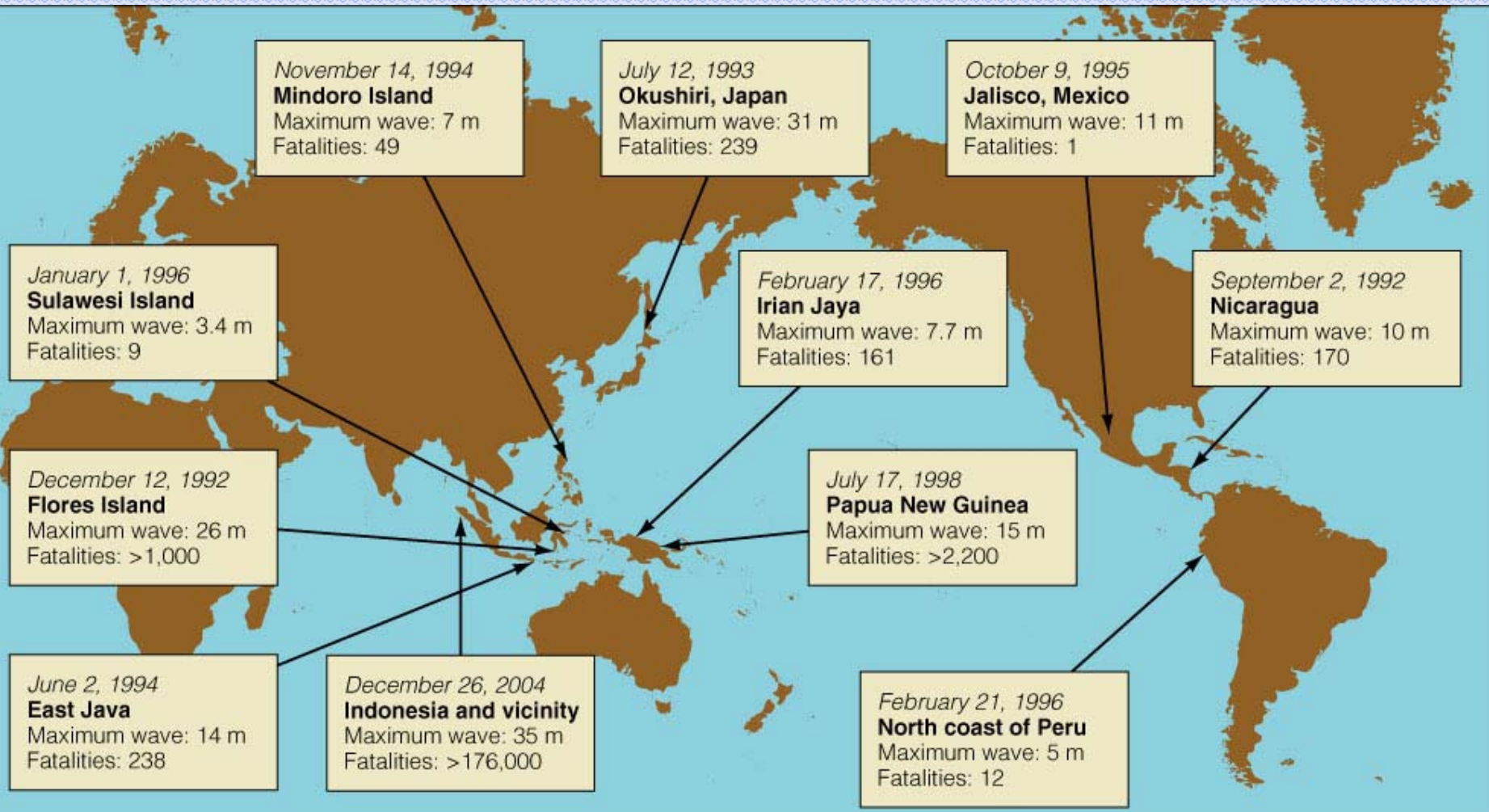
Volcano flank collapse

Submarine volcanic explosion

Asteroids

Another category: *Mega tsunami*

Tsunami



11 major tsunamis since 1990 over 200,000 lives lost

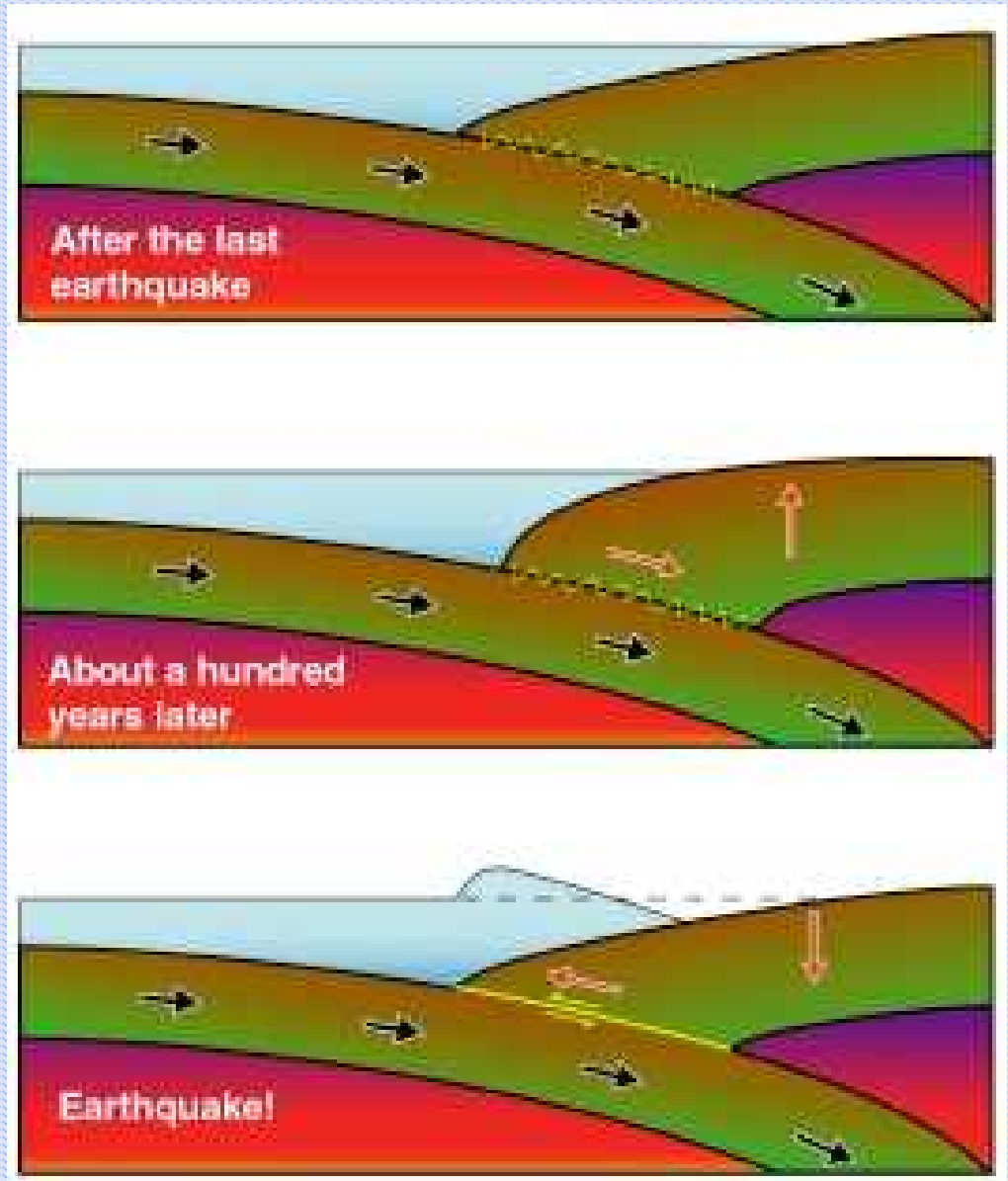
Ways to create a tsunami

Subduction-zone
earthquake

larger than
M 7-7.5

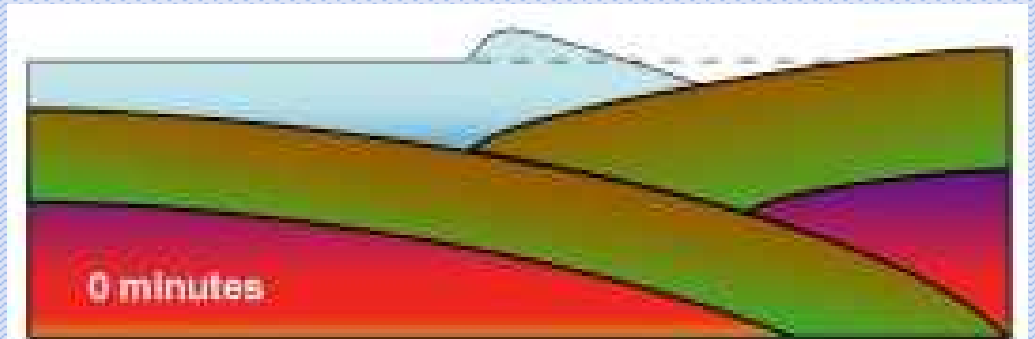
100 years later
stored tension

Fault rupture

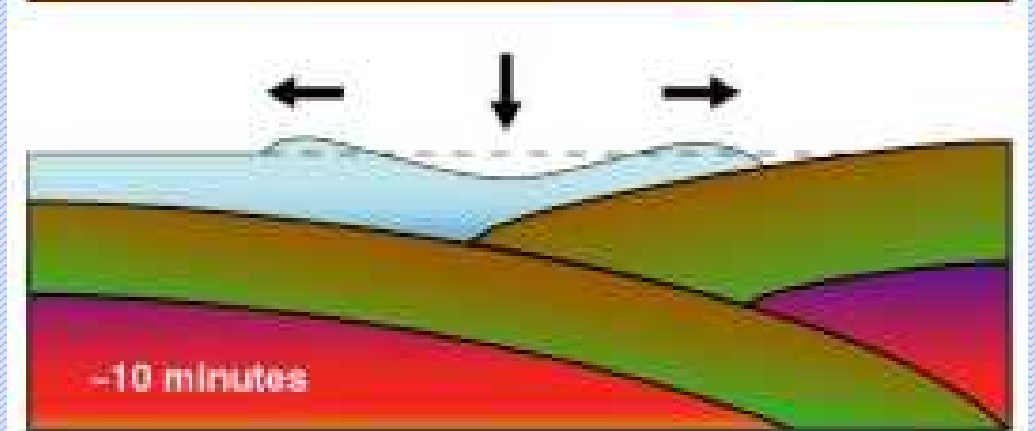


Response after earthquake

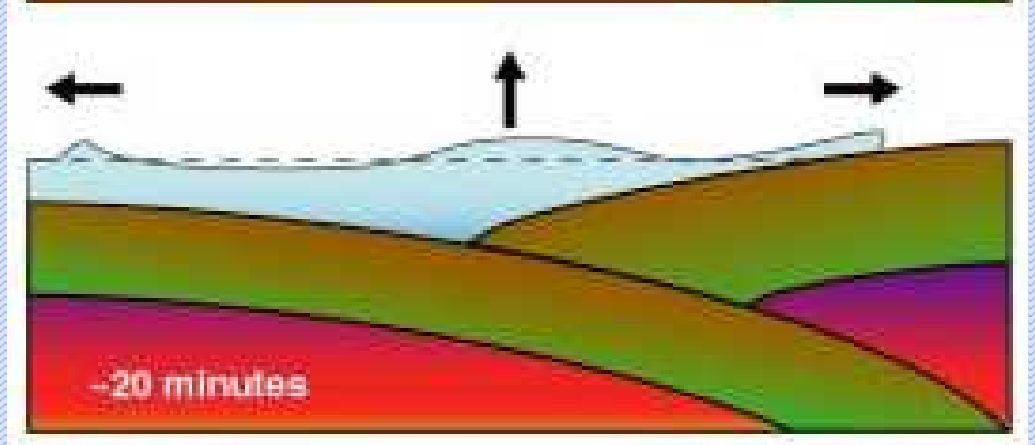
0 minutes



10 minutes



20 minutes



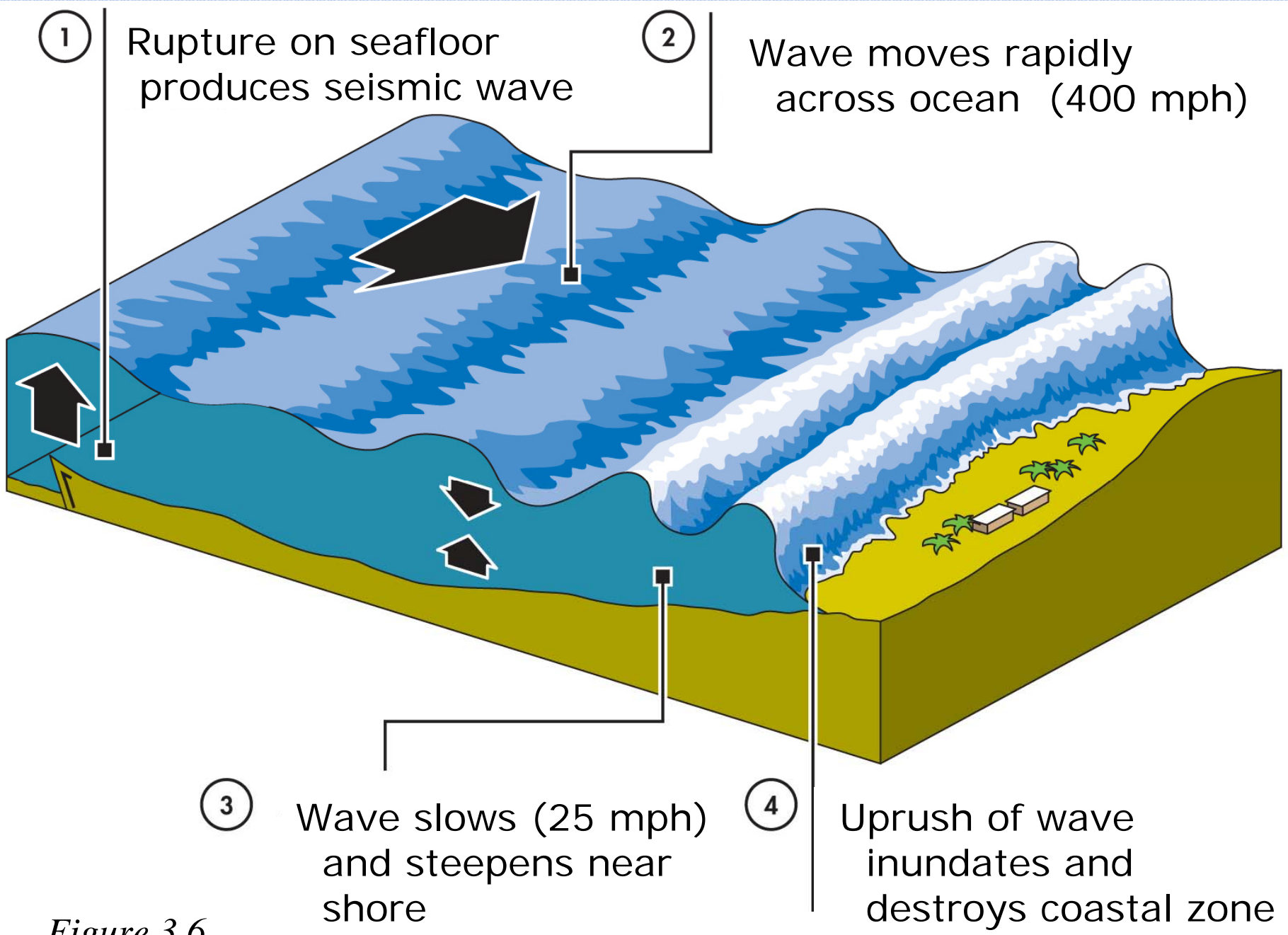
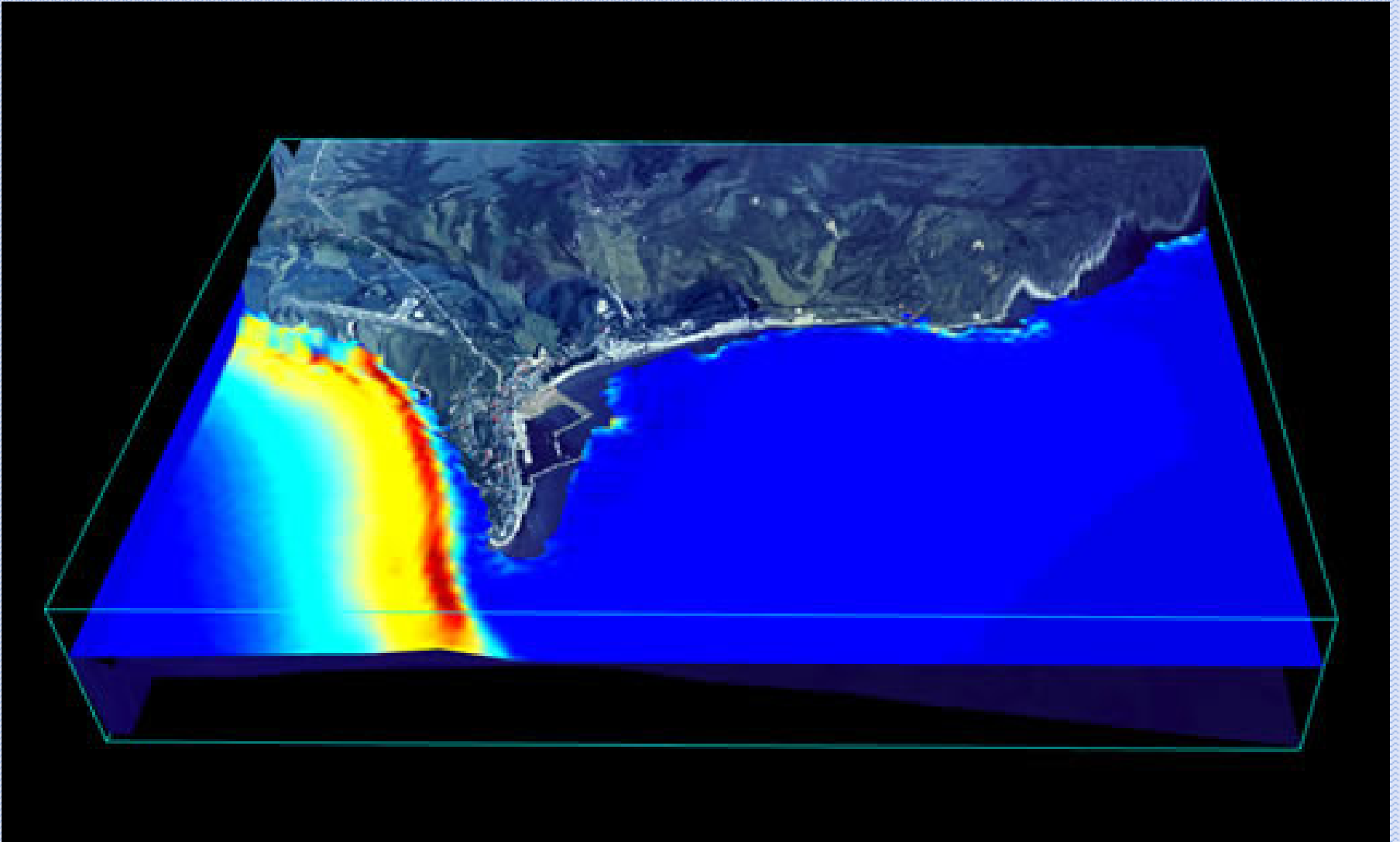
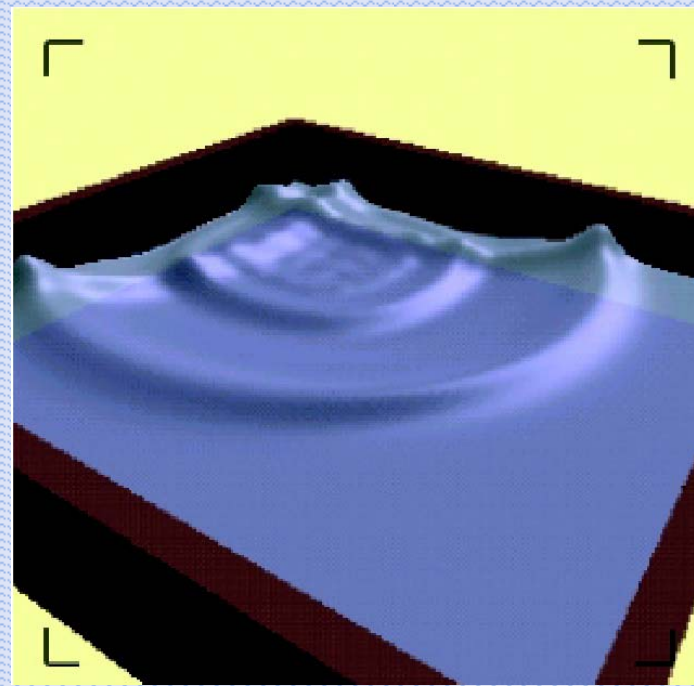
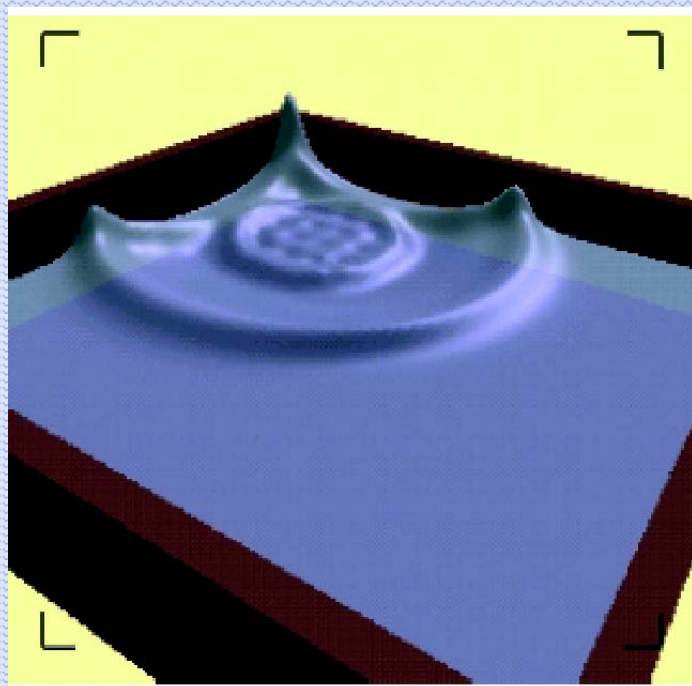
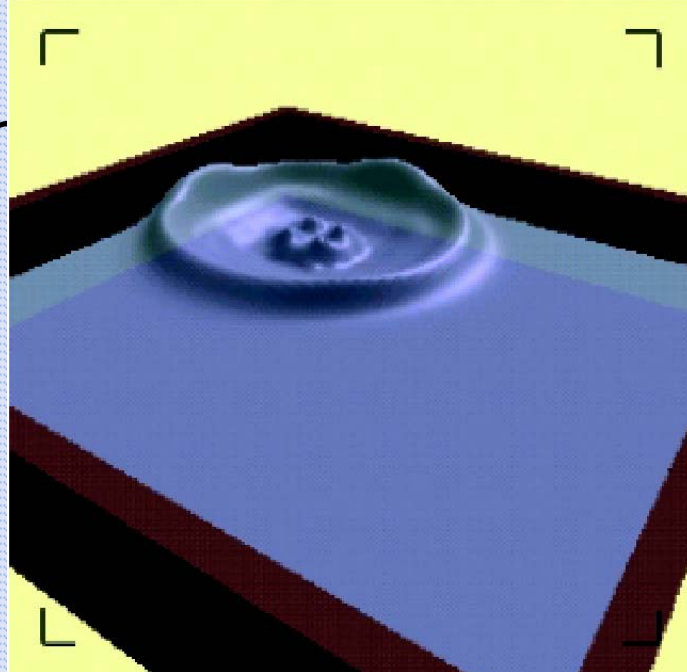
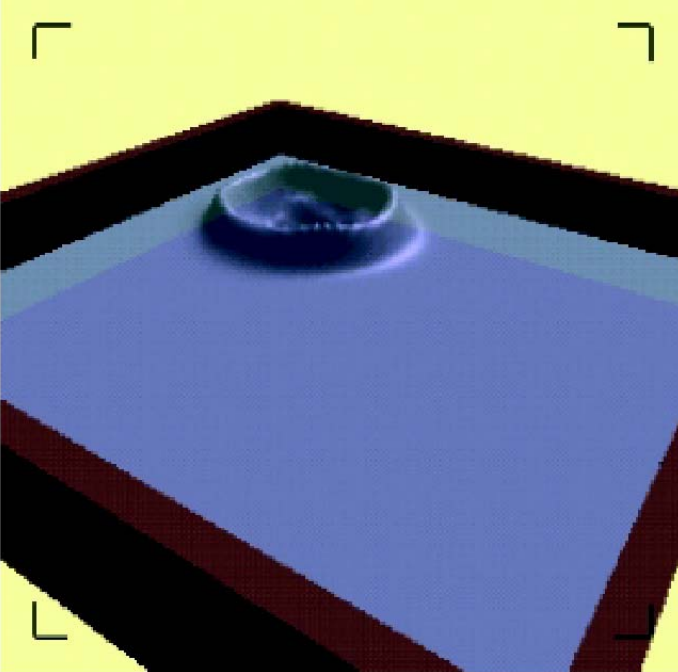
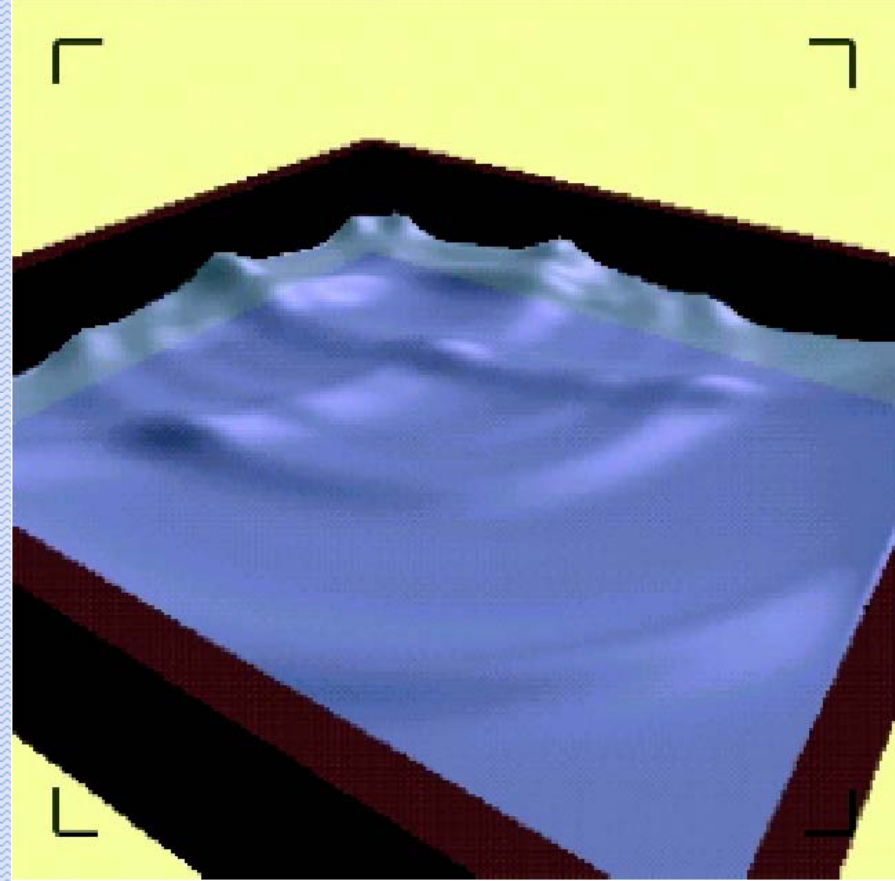
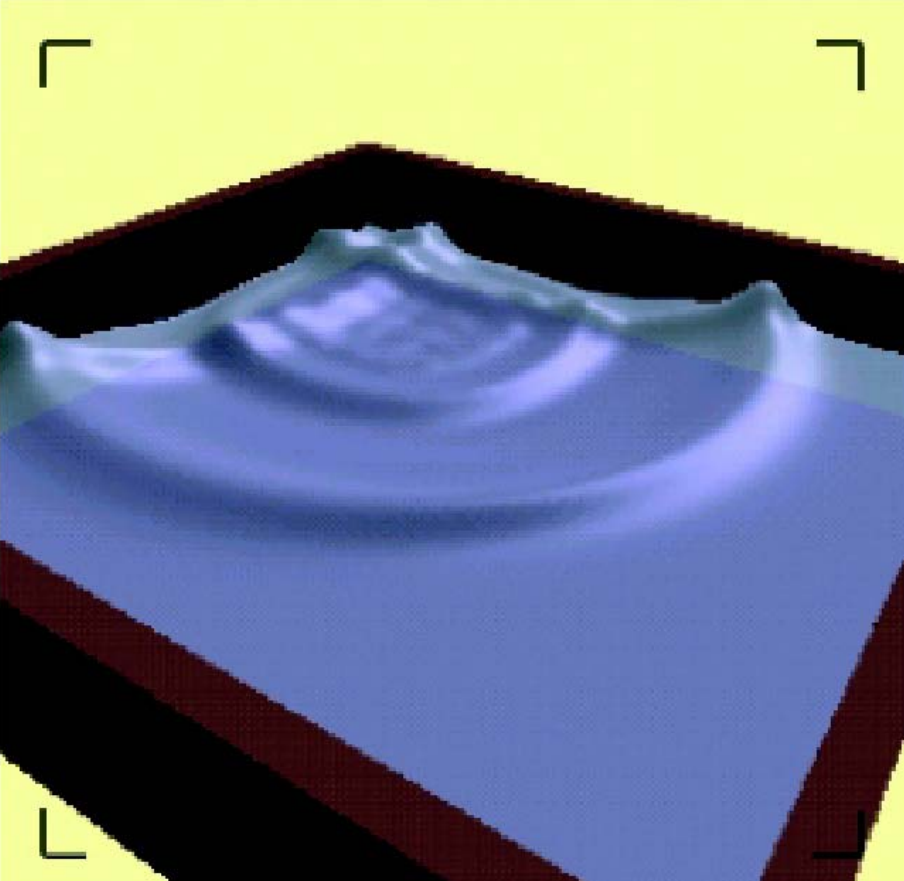


Figure 3.6

Okushiri, Japan



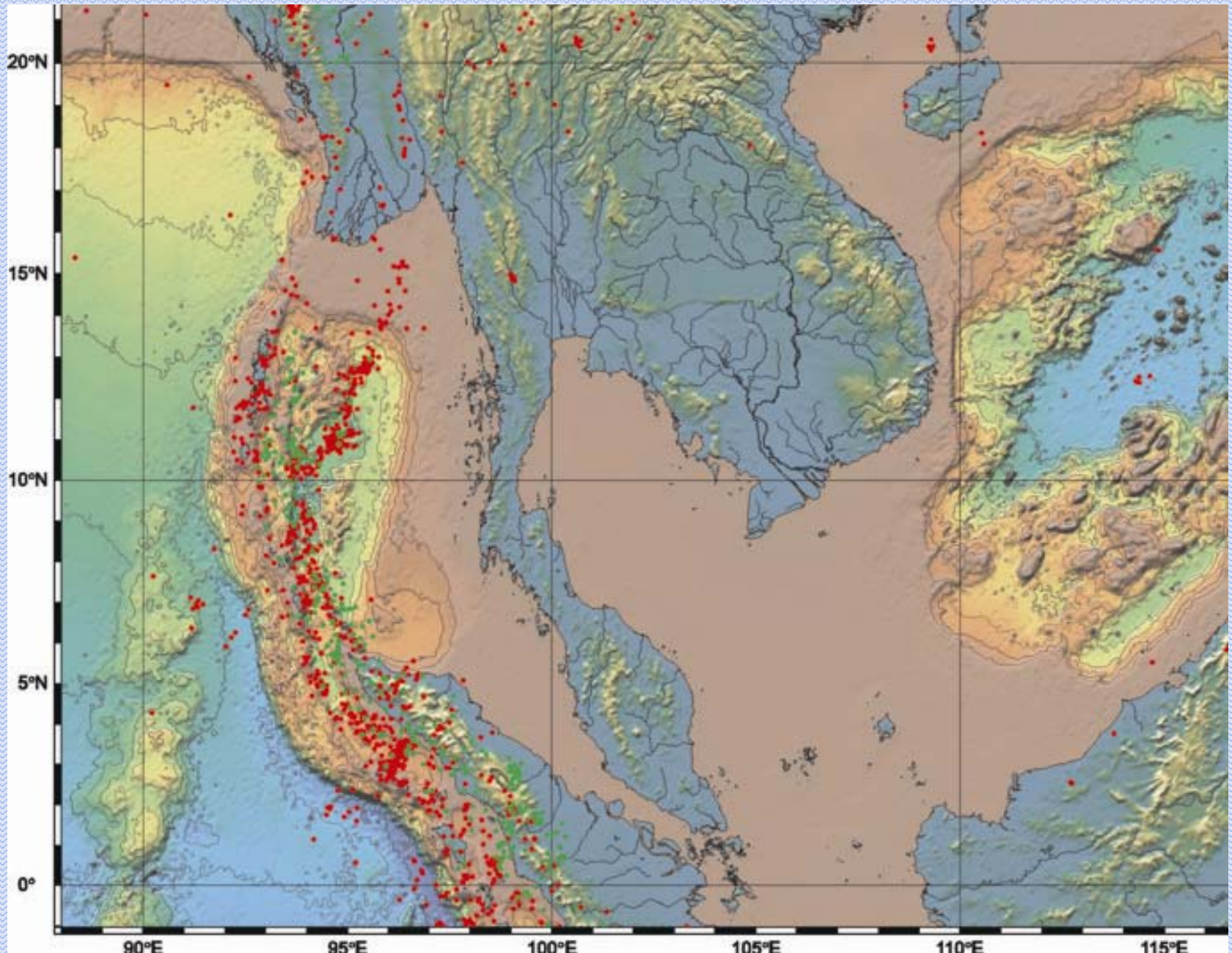




Okushiri, Japan



Sumatra & the Java Trench

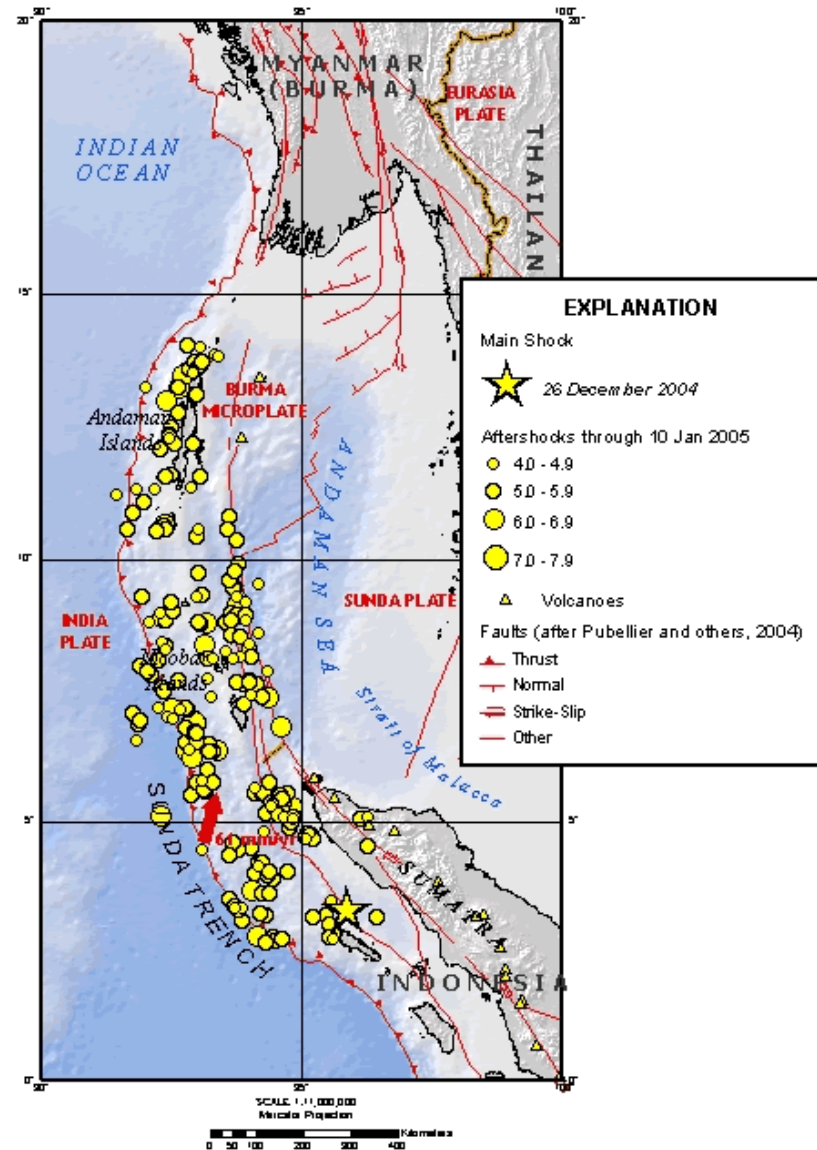


USGS

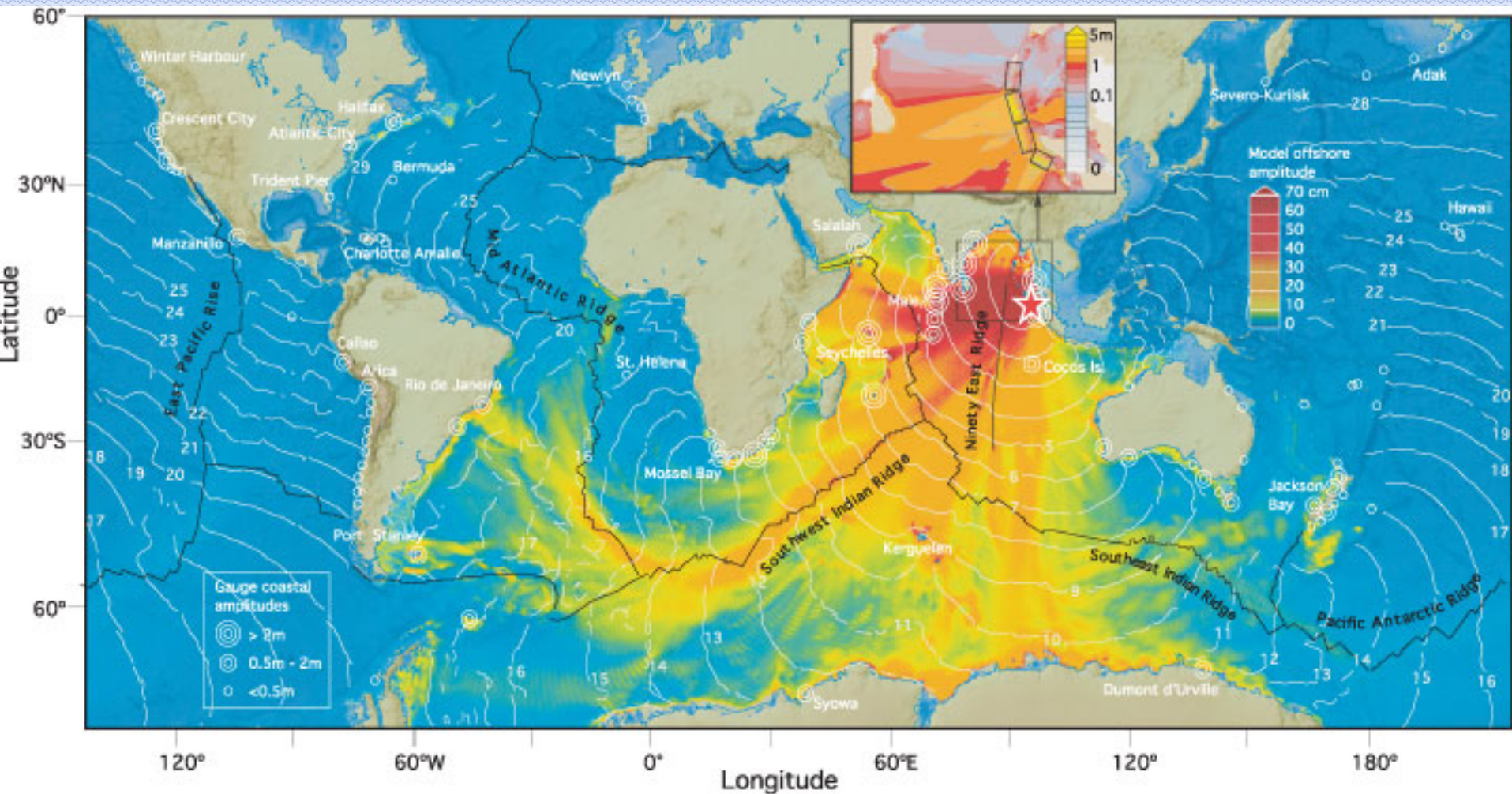
Indonesian tsunami 2004

Initial earthquake and after shocks

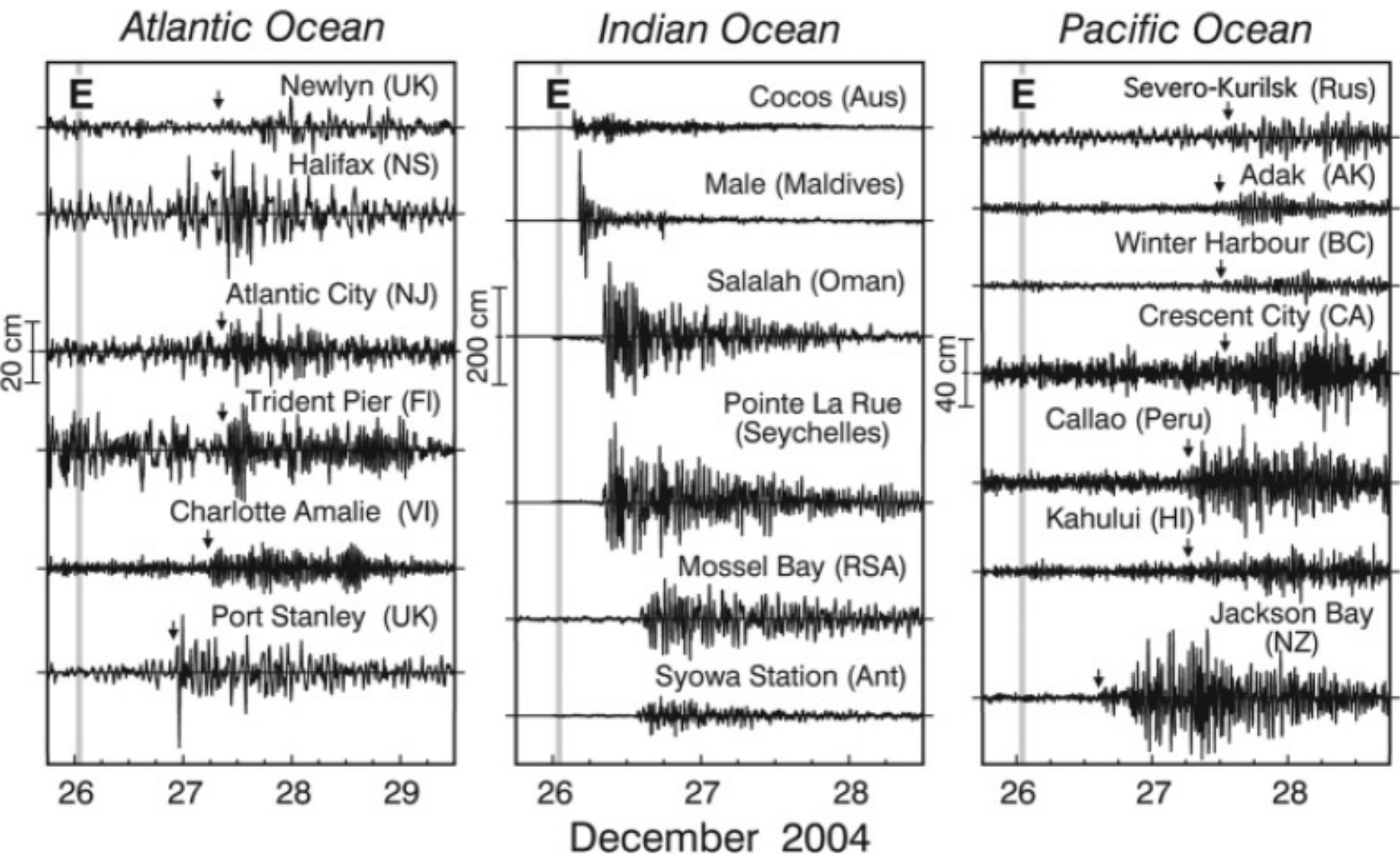
M9.0 Sumatra - Andaman Islands Earthquake of 26 December 2004



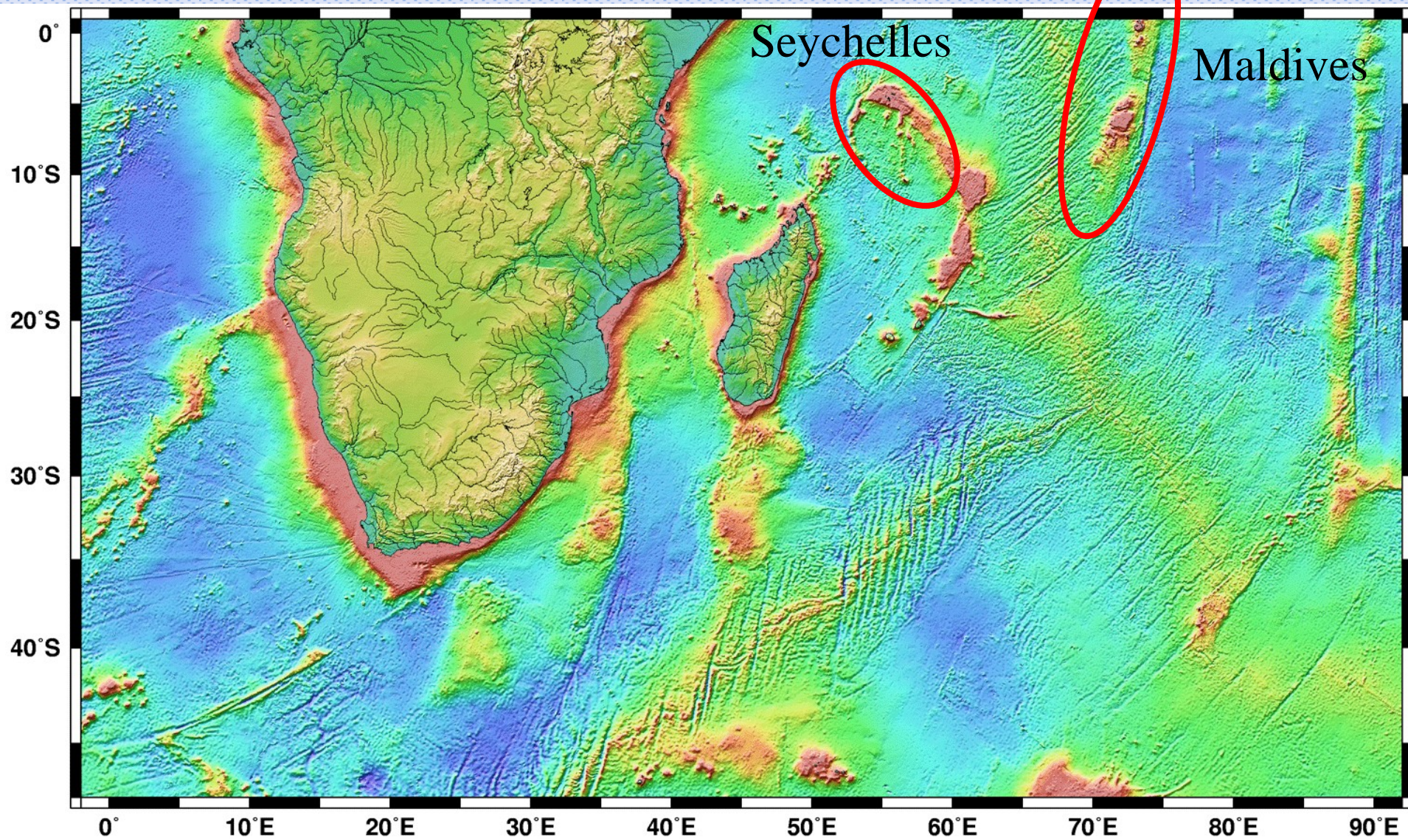
Tsunami path through the ocean



Detected by tide gauges



Southern Indian Ocean



Meulaboh,
Indonesia



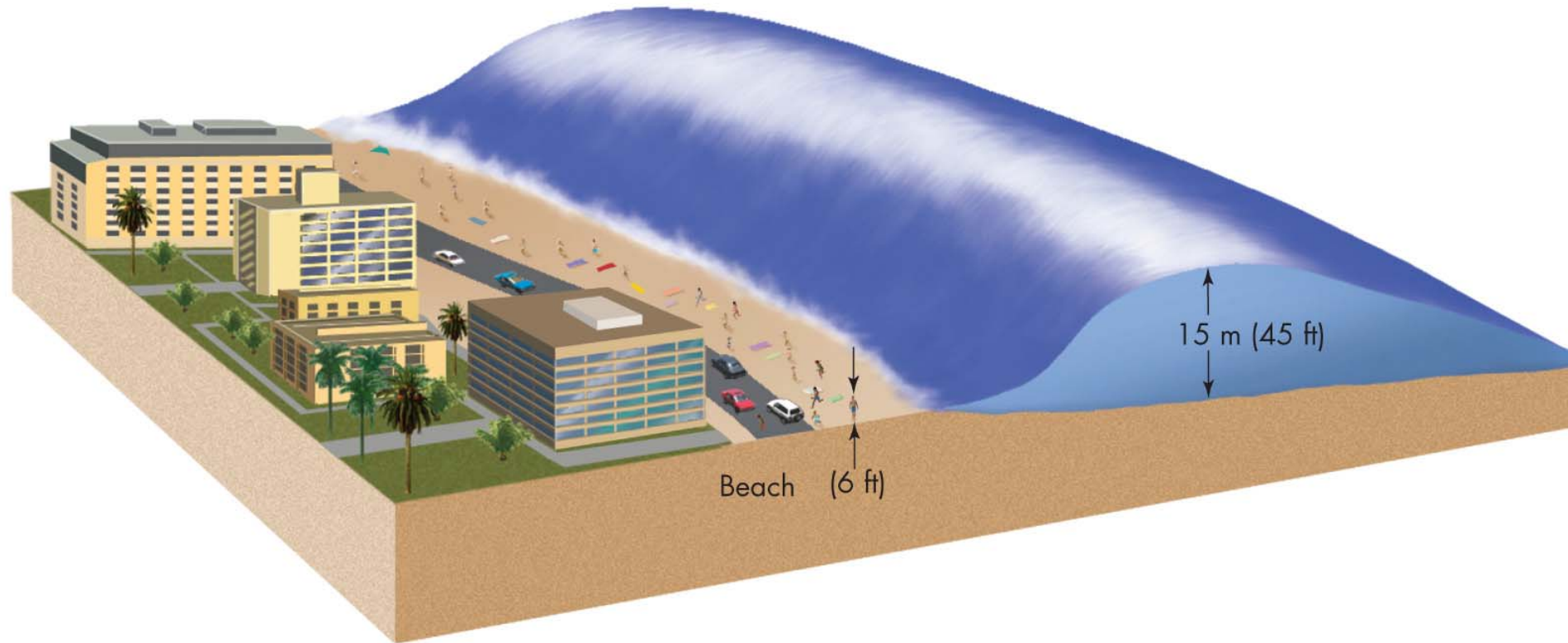
Meulaboh, Indonesia



Meulaboh, Indonesia



Scale of a tsunami



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Banda Aceh, Indonesia



Banda Aceh, Indonesia



Fig. 10-32b, p. 289

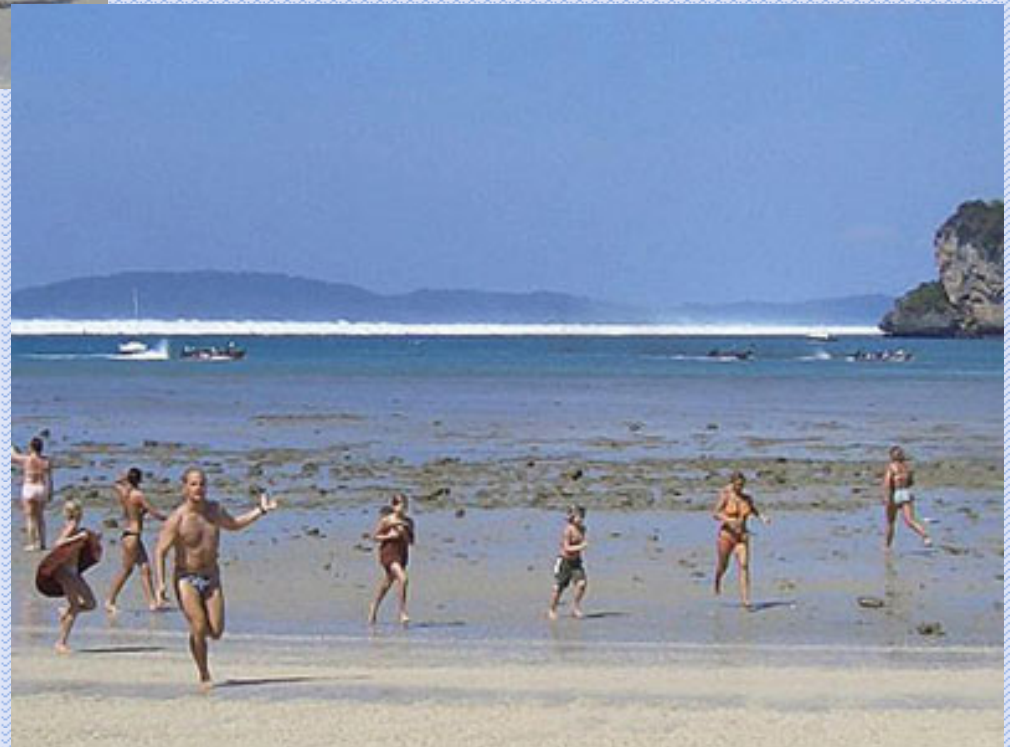


(b)

Meulaboh, Indonesia













Kata Noi receding wave





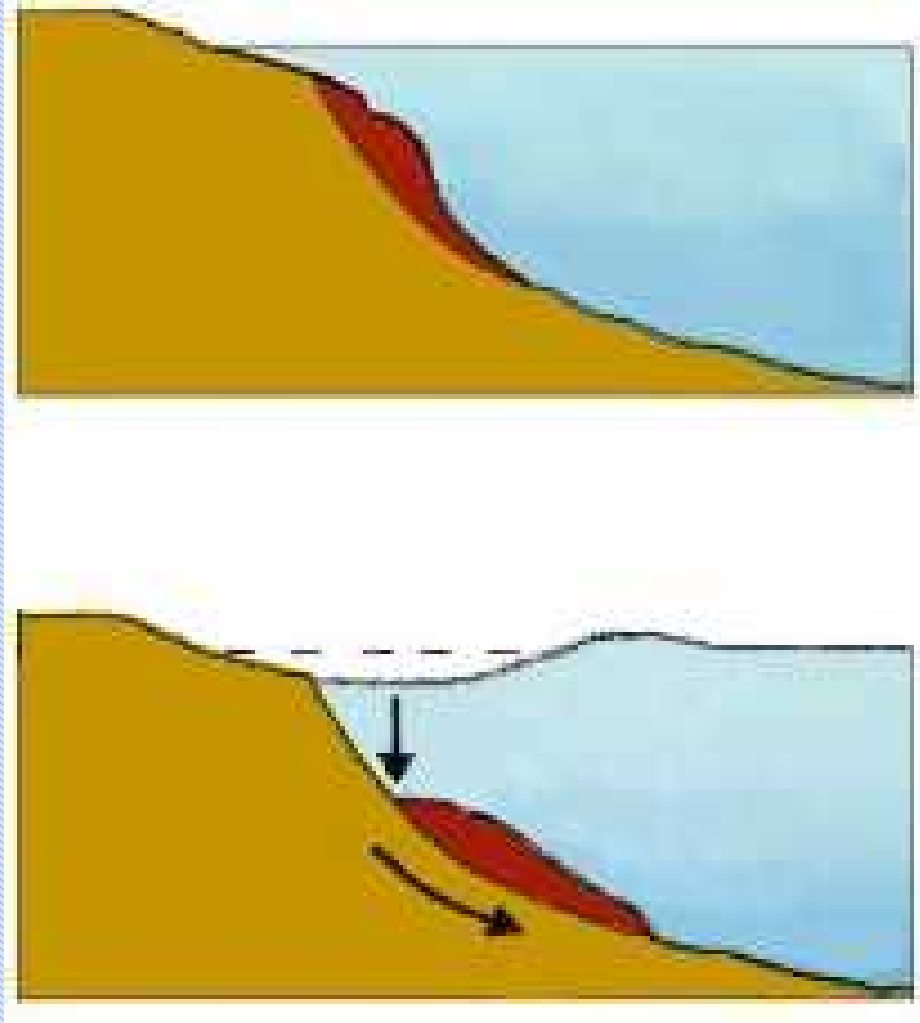
Water receding from shoreline



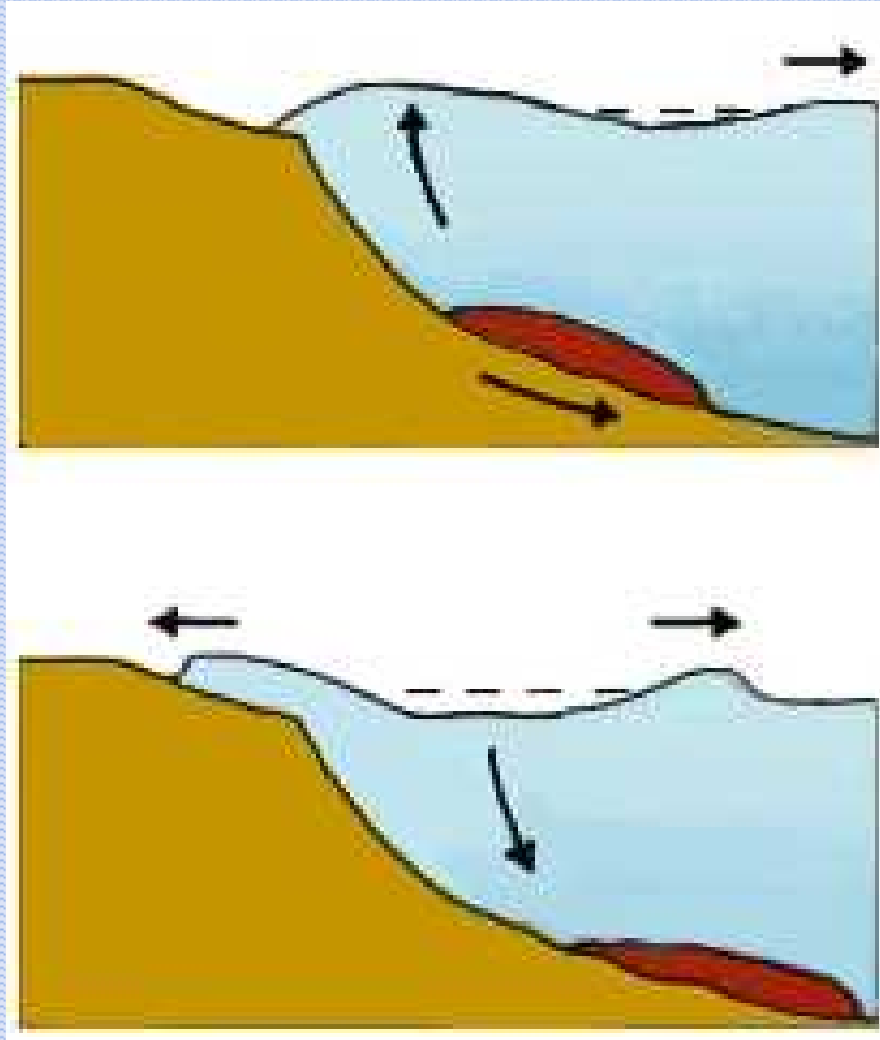
Water receding from shoreline

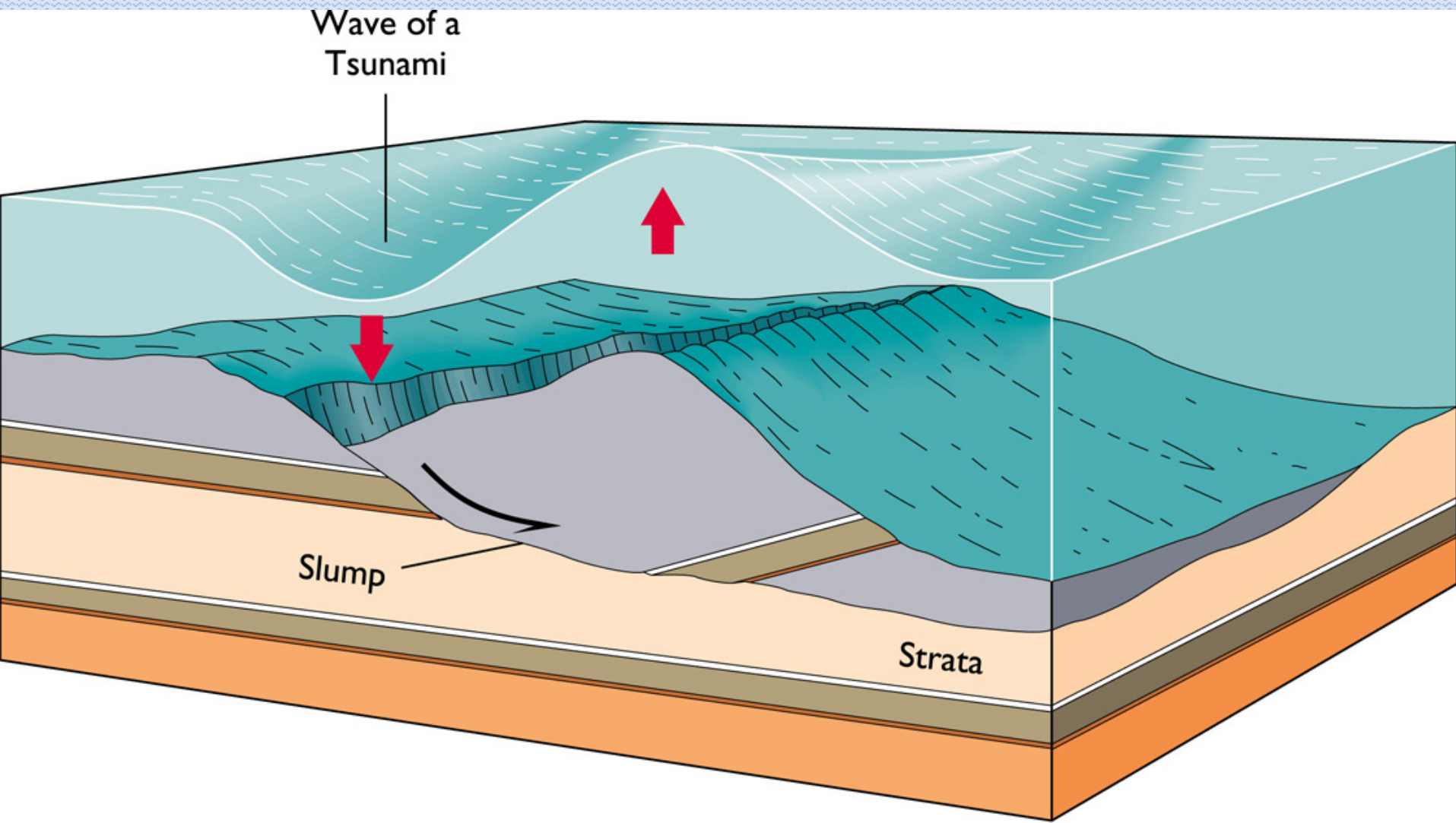
Ways to create a tsunami

Submarine
landslide
on edge of
slope



Submarine landslide

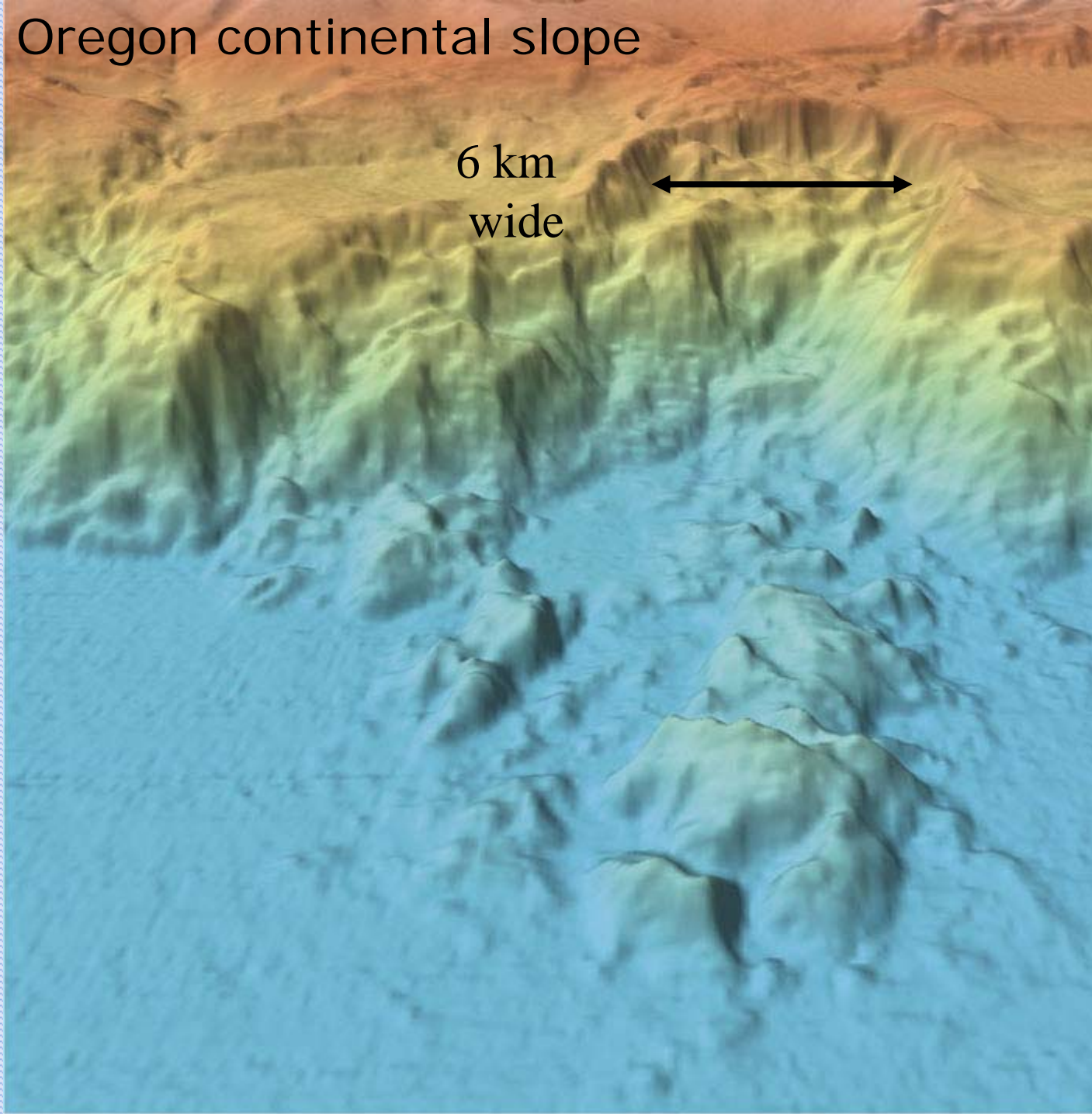




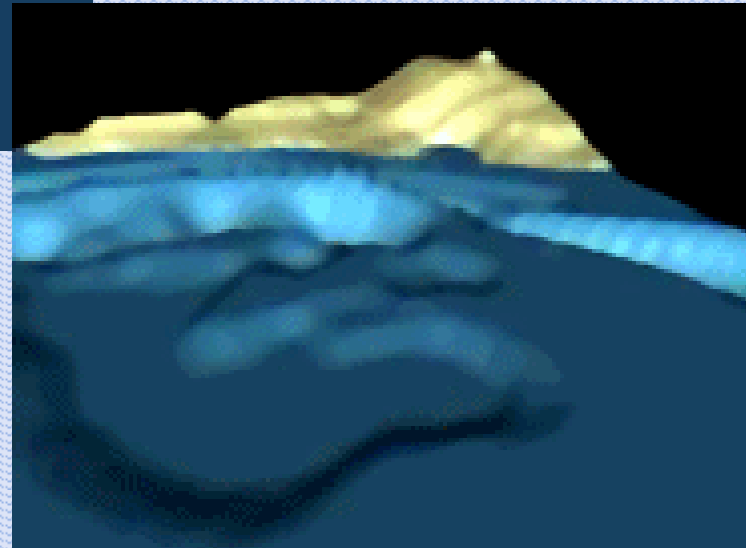
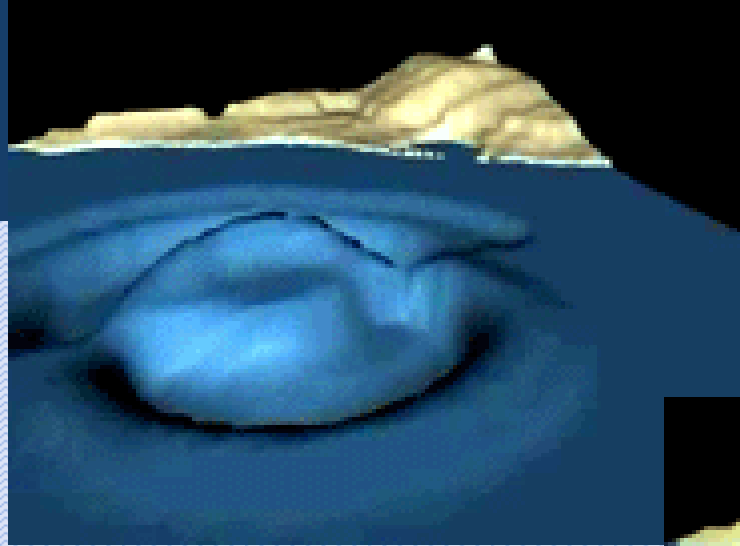
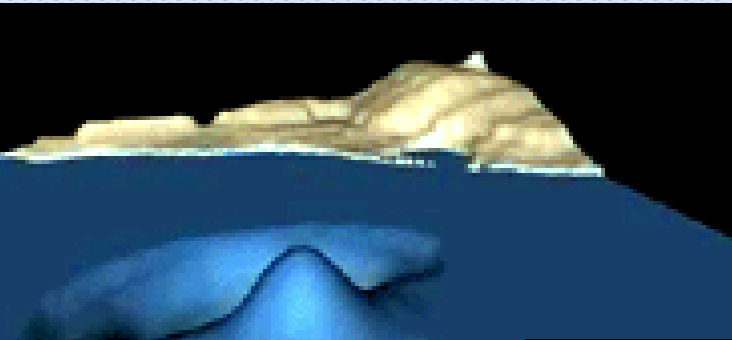
(a) GENERATION OF A TSUNAMI

Oregon continental slope

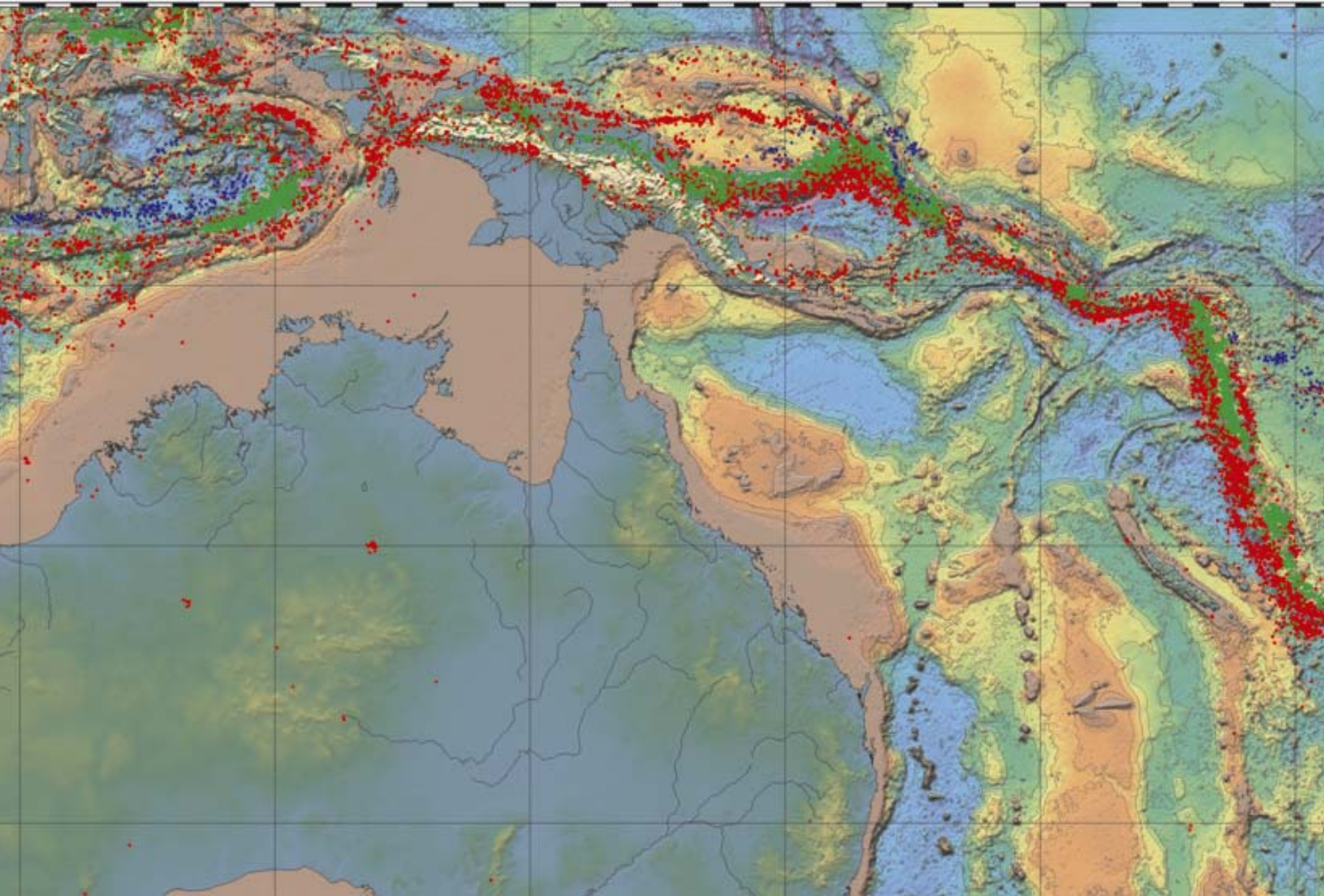
6 km
wide



Simulation of landslide-induced wave

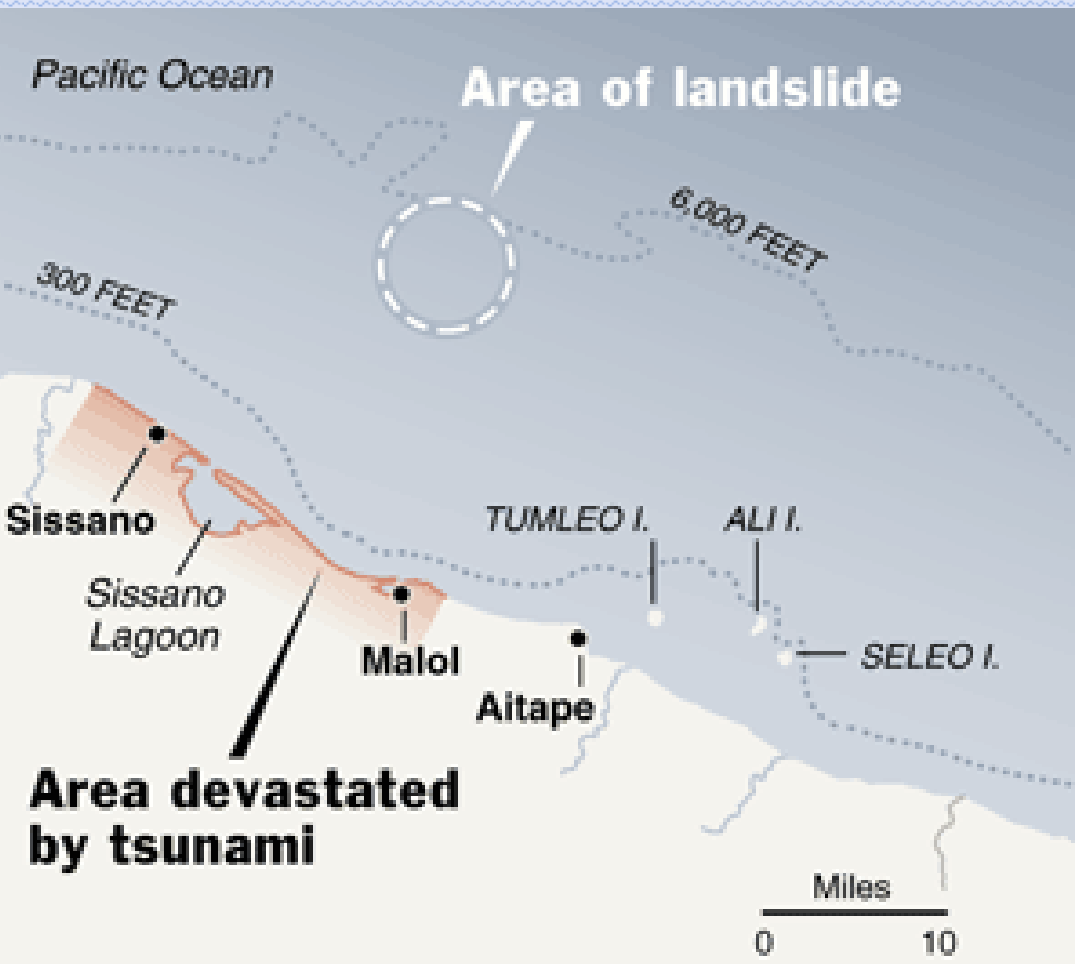


Papua New Guinea



Papua New Guinea

July 17, 1998
2100 deaths



tsunami waves
30 feet high

landslide of
1 cubic mile
of sediment

triggered by a
magnitude 7.0
earthquake

Coastal village

Before:



After:

