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*
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

1. Rupture on seafloor produces seismic wave
2. Wave moves rapidly across ocean (400 mph)
3. Wave slows (25 mph) and steepens near shore
4. Uprush of wave inundates and destroys coastal zone
Okushiri, Japan
Okushiri, Japan
Sumatra & the Java Trench
USGS

Indonesian tsunami 2004

Initial earthquake and after shocks
Tsunami path through the ocean
Detected by tide gauges
Southern Indian Ocean

Seychelles

Maldives
Meulaboh, Indonesia
Meulaboh, Indonesia
Meulaboh, Indonesia
Scale of a tsunami

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Banda Aceh, Indonesia
Banda Aceh, Indonesia
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
Oregon continental slope

6 km wide
Simulation of landslide-induced wave
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: