

ASIA EARTHQUAKE & TSUNAMI

December 26, 2004

OVERVIEW AND COMPARISON TO THE
CASCADIA SUBDUCTION ZONE

Contributed by ASCE/TCLEE Reconnaissance Team members
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**material is compiled from publicly available sources*

World's Worst Subduction Zone Quake Disaster

What was it?

- Magnitude 9.0 Subduction Zone Earthquake

What Happened?

- Strong Ground Shaking for 3-7 Minutes
- Local and Distant Tsunamis
- Extensive human losses



Hotel That Survived

- Nicest Hotel in Banda Aceh, Sumatra
- 5-Story Concrete Hotel performed well



Two Mosques That Withstood The Tsunami Forces Banda Aceh, Sumatra



Banda Aceh Shore, Indonesia BEFORE



Banda Aceh Shore, Indonesia AFTER

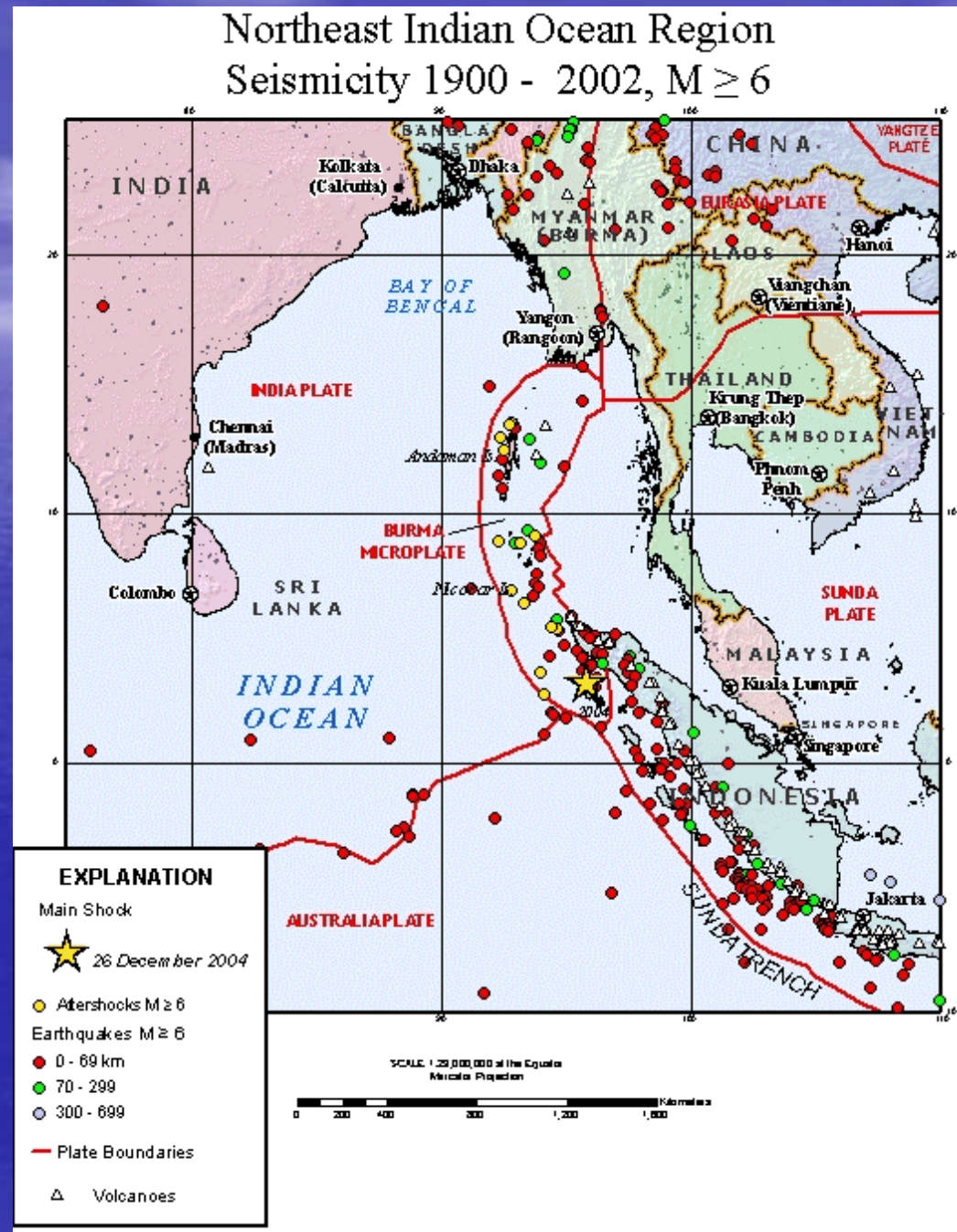


Slope Failures & Tsunami Flooding

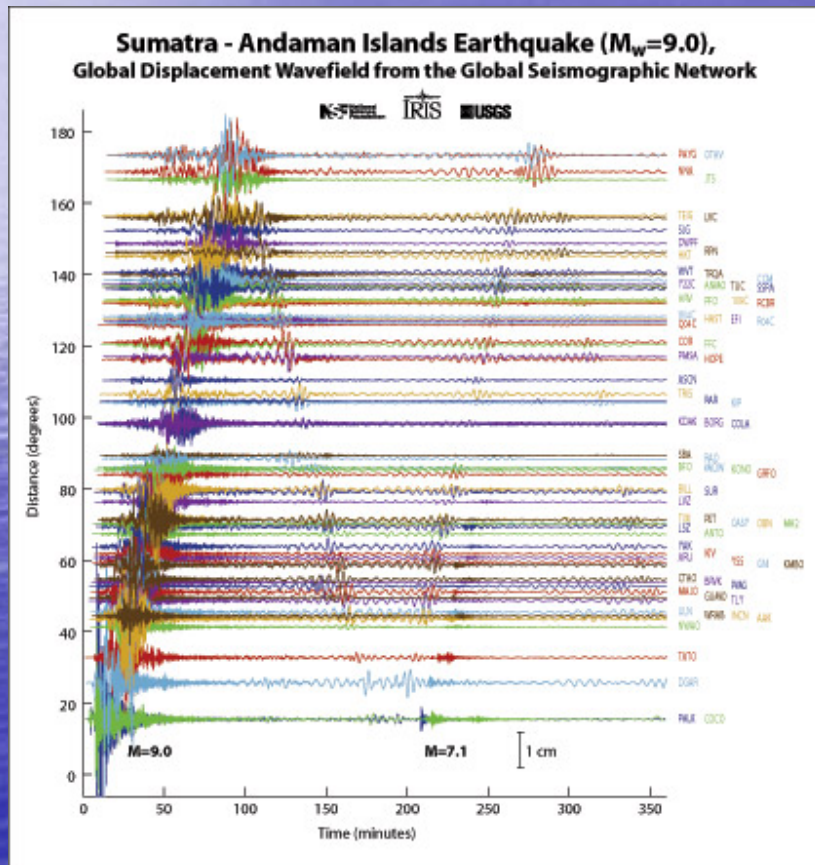


Slope failures along the bases of the hills

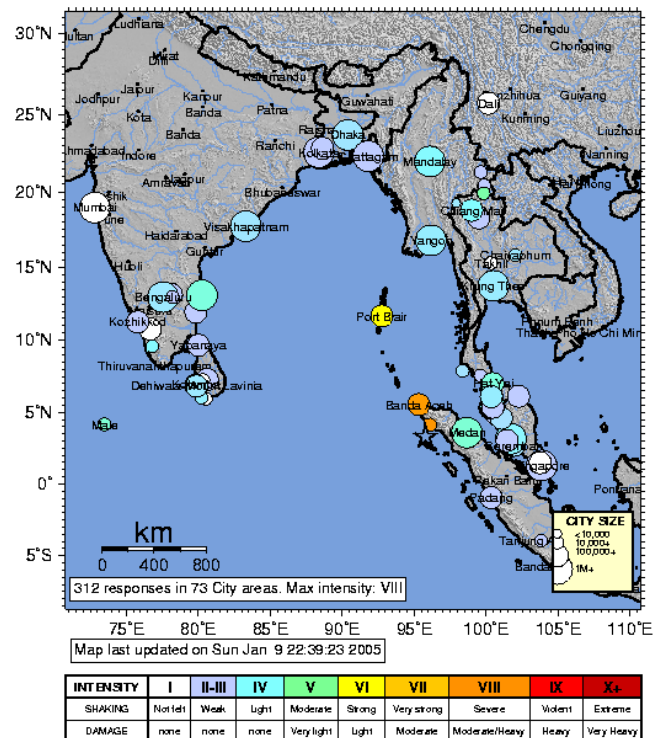
Tectonic Setting and Historic Seismicity (Indian plate under Burma plate)



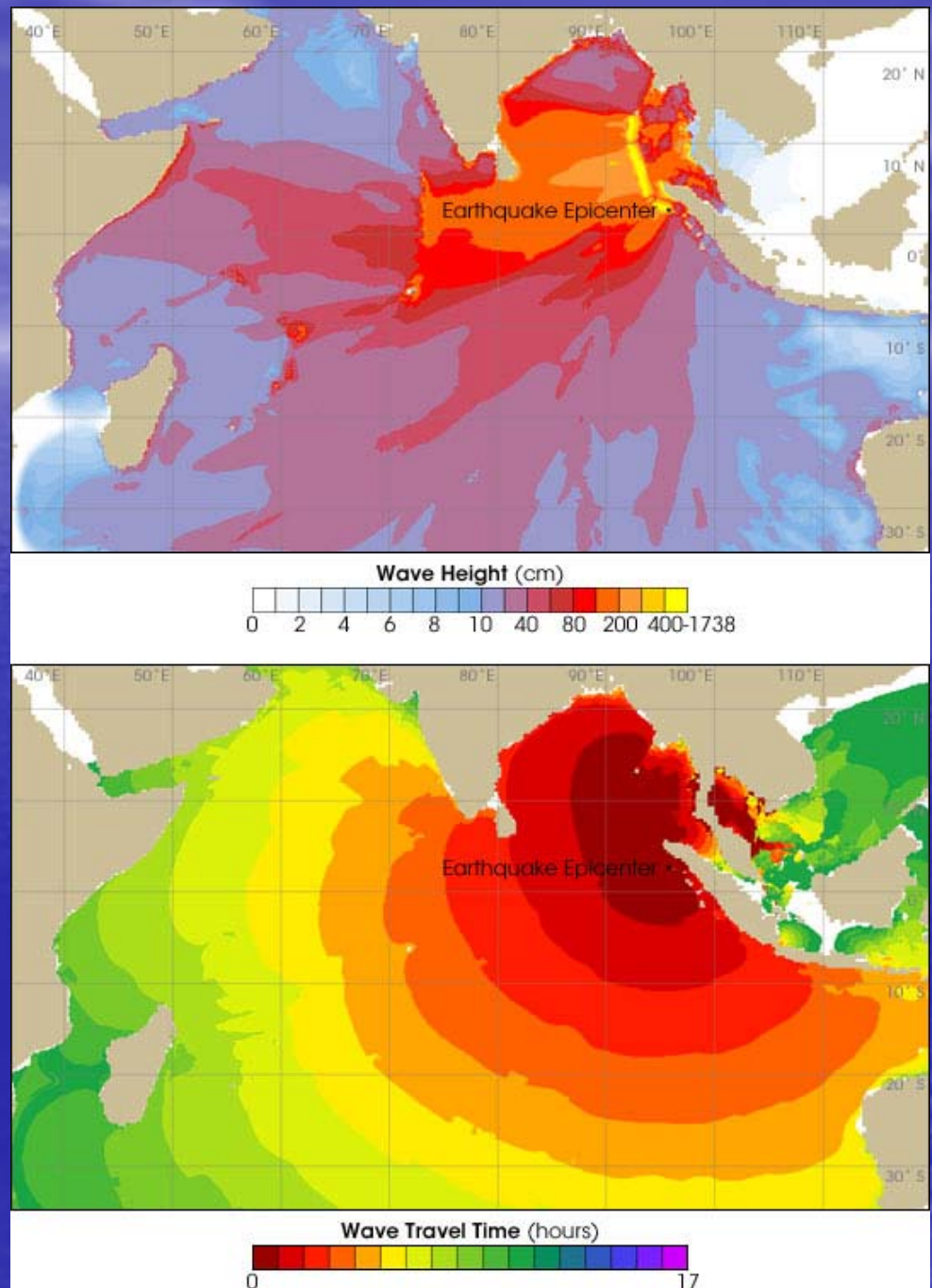
Magnitude 9.0 Earthquake Shaking Felt Across the Indian Ocean



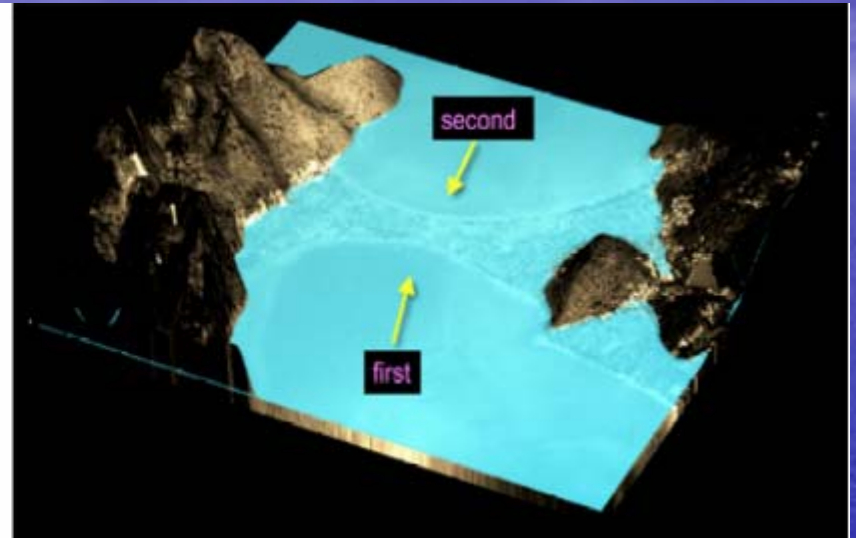
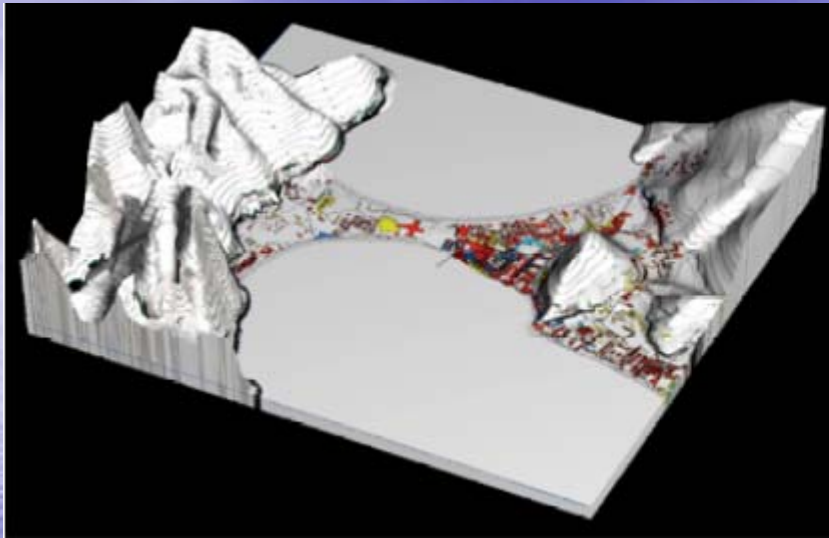
USGS Community Internet Intensity Map (154 miles S of Banda Aceh, Sumatera, Indonesia)
ID:slav_04 00:58:51 GMT DEC 26 2004 Mag=9.0 Latitude=N3.30 Longitude=E95.78



Tsunami Travel Times and Estimated Wave Heights



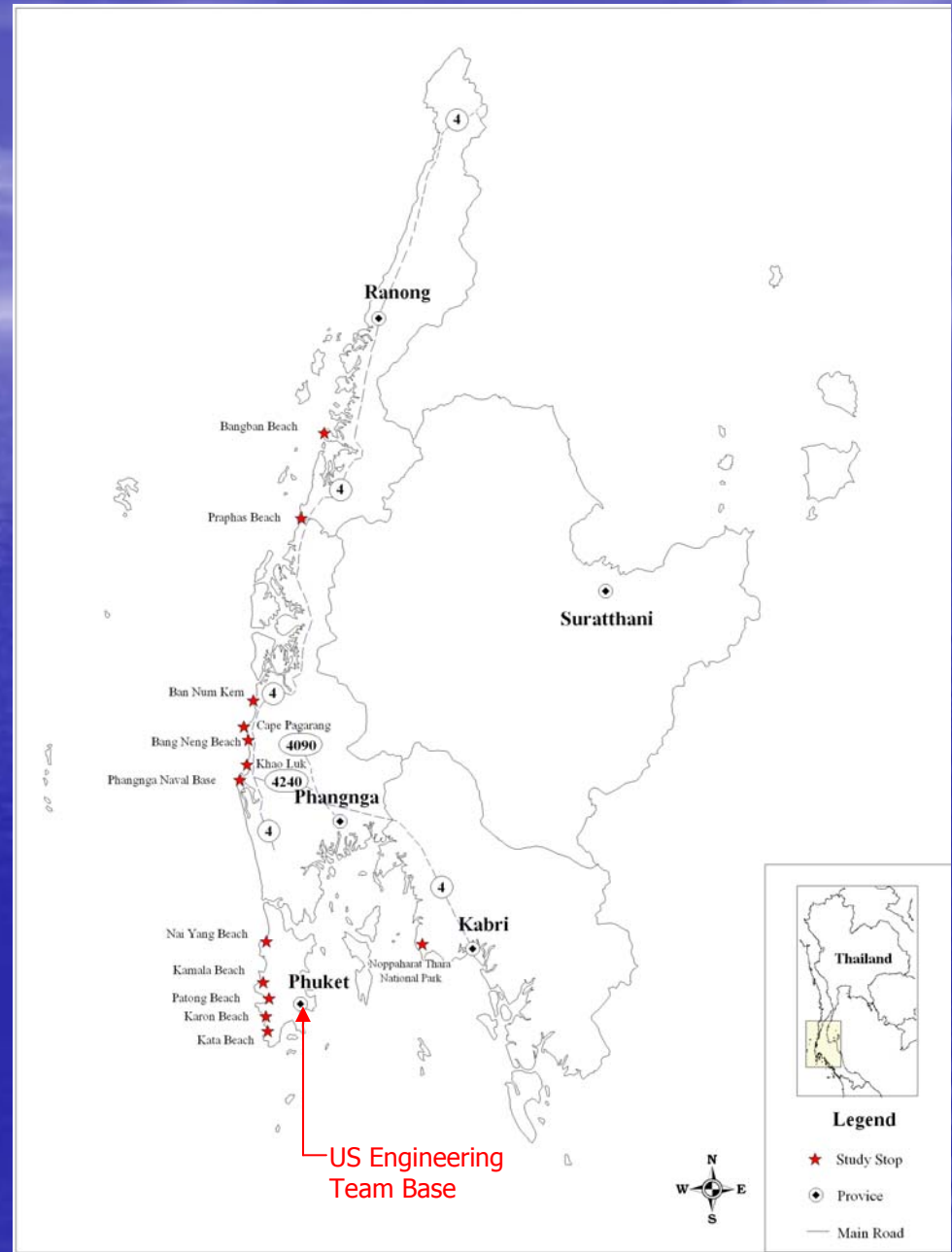
Total Destruction at Phi Phi Island, Thailand



Film location for
“The Beach” starring
Leonardo DiCaprio



Sites to be investigated by U.S. engineering team from ASCE and EERI



(Source: Thailand DMR and AIT seminar)

Sumatra-Andaman Islands Earthquake & Tsunami Statistics

- Date: Sunday, December 26, 2004
- Region: Off W Coast of N. Sumatra, Indonesia
- Magnitude: 9.0, Type: Subduction Zone
- Depth: about 30 km (18.6 miles)
- Rupture Length: >700-mile section plate shifted
- Tsunamis: Caused massive tsunamis
- Direct Fatalities from shaking and tsunami:
Over 225,000
- Indirect Losses: Infrastructure continuity, fire,
disease, looting, food-water-fuel-medical shortages

Fires



Flames spread on the debris-strewn
coast of Aceh Province

Hazardous Fuels

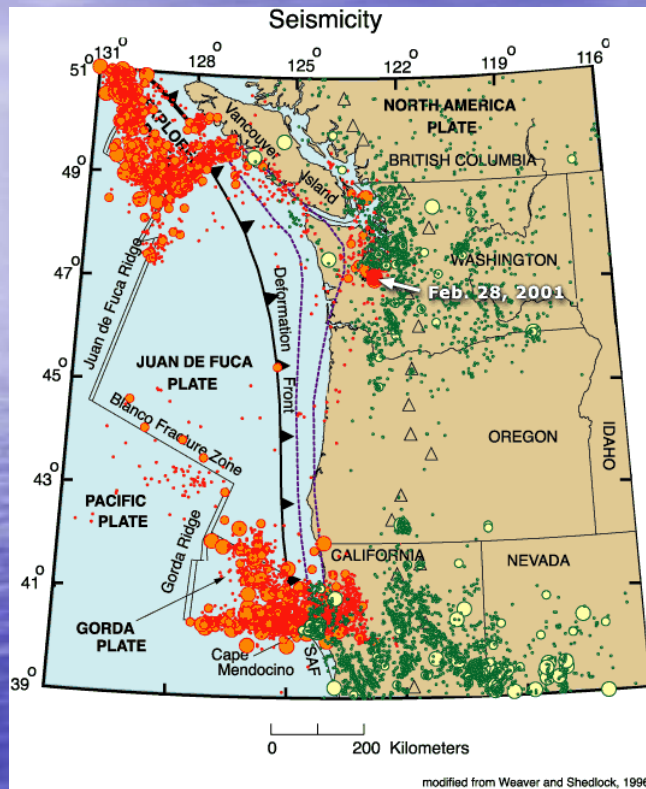


Scattered Drums from
Government-owned Pertamina Oil
company

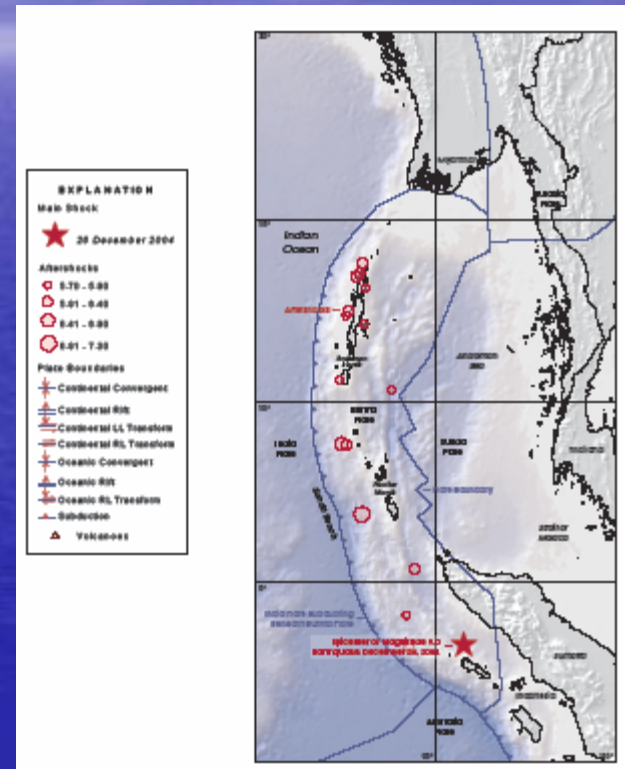


Unsafe distribution of fuel,
Aceh Province, Indonesia

Comparison of Plate Tectonic Settings

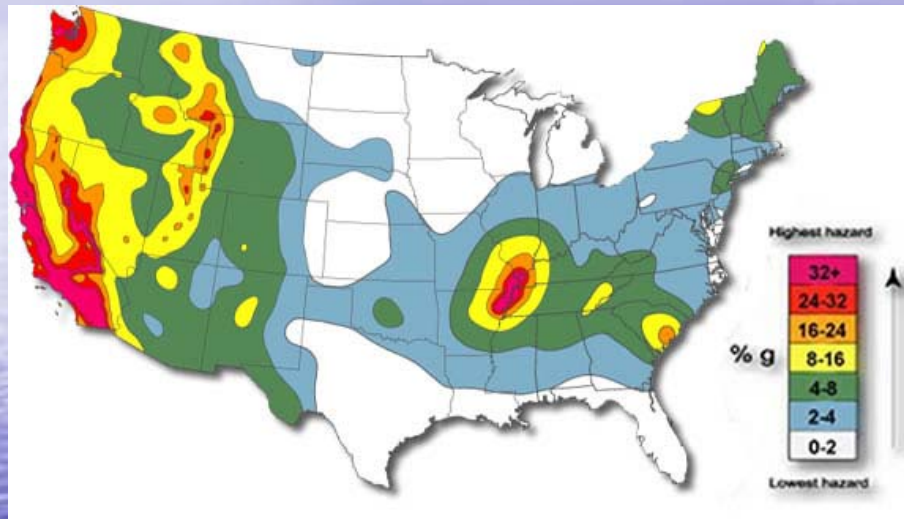


Cascadia

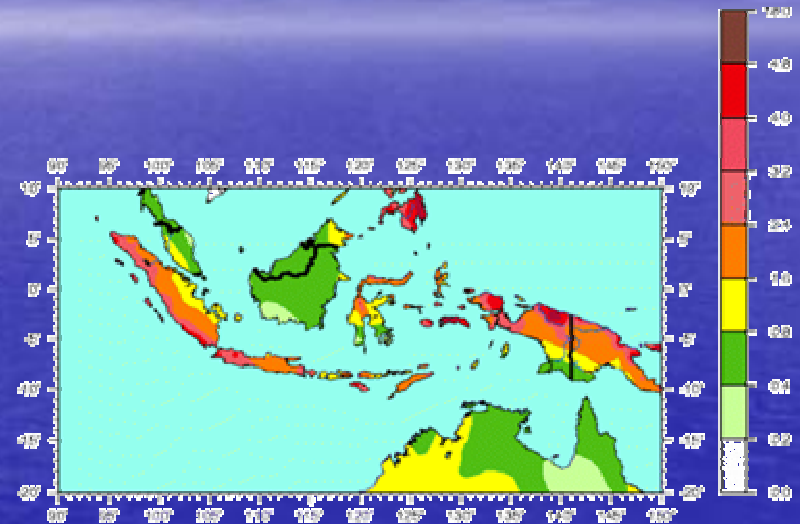


Sunda Trench

Comparison of U.S. & Indonesia Shaking Maps



PGA 10 % probability of being exceeded in the next 50 years on rock site



Peak Ground Acceleration (m/s²) with 10% Probability of Exceedance in 50 Years

PGA 10 % probability of being exceeded in the next 50 yrs on rock site

Comparison of Statistics

Sumatra Earthquake

- Magnitude 9.0
- Shaking for 3-7 minutes
- Generated Tsunami
- High Consequence event
- Long term recovery
- About 225k fatalities
- Cost unknown
- Tsunami Hit 11 countries

Cascadia Model Quake

- Magnitude 8.5
- Minutes of Shaking
- Generates Tsunami
- High Consequence event
- Long term recovery
- Est. >5k fatalities (in OR)
- Est. building damage \$12 billion

Sumatra-quake Rupture Length (arrow) Compared to Cascadia Subduction Zone

