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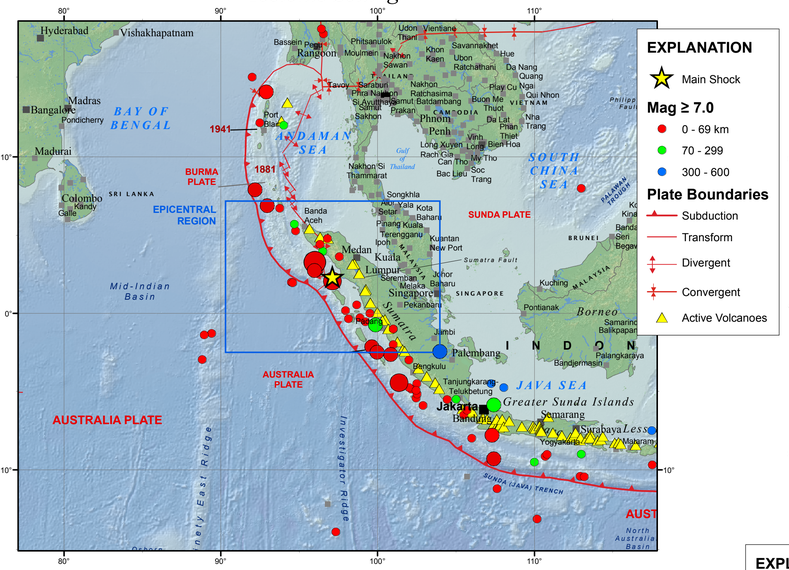
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

EARTHQUAKE SUMMARY MAP

*Prepared in cooperation with the Global Seismographic Network*
GSN

# M7.8 Northern Sumatra, Indonesia, Earthquake of 6 April 2010

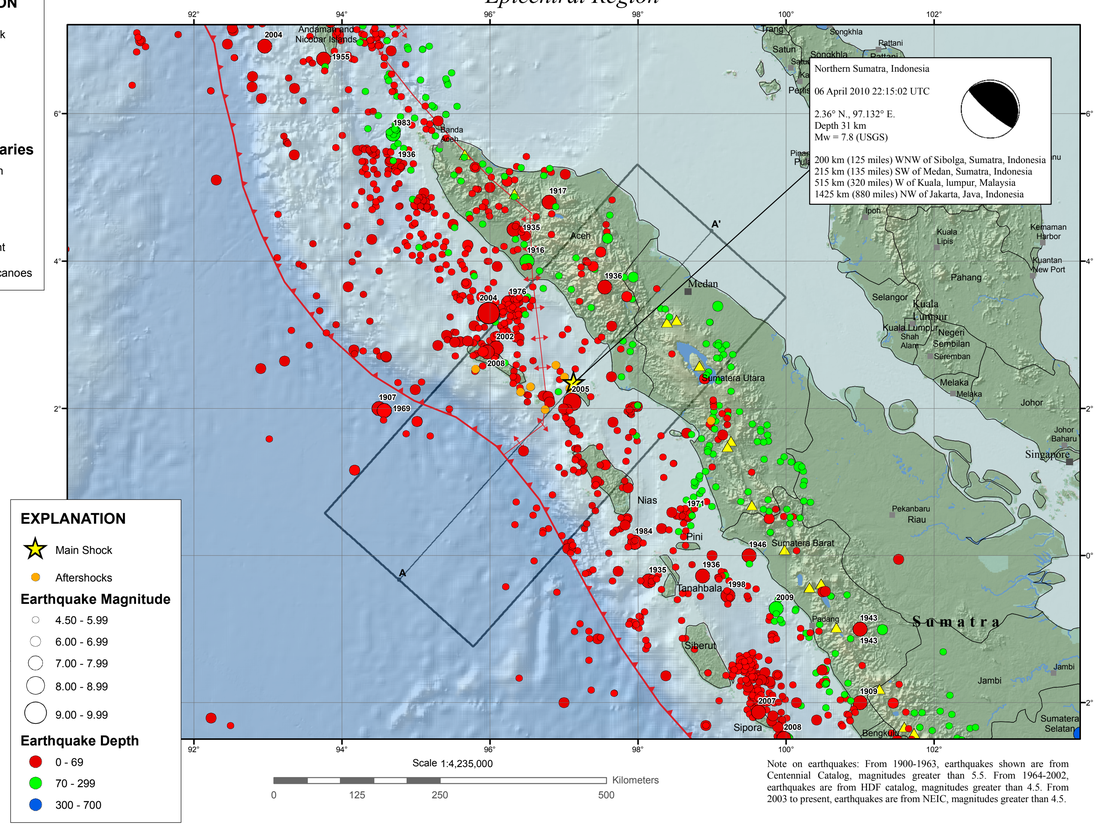
## *Tectonic Setting*




RELATIVE PLATE MOTIONS

In the region of this earthquake, the Australia Plate moves northeast with respect to the Sunda Plate at about 60-65 mm/yr.

## *Epicentral Region*




Note on earthquakes: From 1900-1963, earthquakes shown are from Centennial Catalog, magnitudes greater than 5.5. From 1964-2002, earthquakes are from HDF catalog, magnitudes greater than 4.5. From 2003 to present, earthquakes are from NEIC, magnitudes greater than 4.5.

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**M 7.7, NORTHERN SUMATRA, INDONESIA**
Origin Time: Tue 2010-04-06 22:15:02 UTC
Location: 2.36°N 97.13°E Depth: 31 km

USAID FROM THE AMERICAN PEOPLE
GSN
**PAGER**
**Version 3**
Created: 3 hours, 10 minutes after earthquake

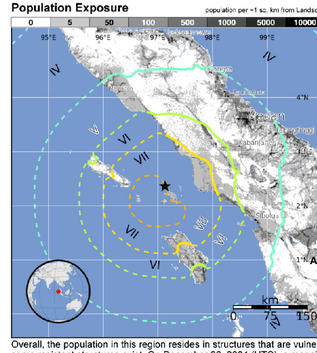
### Estimated Population Exposed to Earthquake Shaking

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ESTIMATED POPULATION EXPOSURE (k = x1000) | | - - * | 21k* | 6,671k* | 8,574k | 1,318k | 450k | 15k | 0 | 0 |
| ESTIMATED MODIFIED MERCALLI INTENSITY | | I | II-III | IV | V | VI | VII | VIII | IX | X+ |
| PERCEIVED SHAKING | | Not felt | Weak | Light | Moderate | Strong | Very Strong | Severe | Violent | Extreme |
| POTENTIAL DAMAGE | Resistant Structures | none | none | none | V. Light | Light | Moderate | Moderate/Heavy | Heavy | V. Heavy |
| | Vulnerable Structures | none | none | none | Light | Moderate | Moderate/Heavy | Heavy | V. Heavy | V. Heavy |

*Estimated exposure only includes population within the map area.

**Population Exposure**

population per ~1 sq. km from Landscan

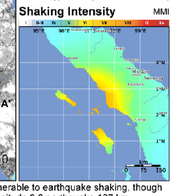



**Selected City Exposure**

| MMI | City | Population |
|---|---|---|
| V | Kabanjahe | 57k |
| IV | Binjai | 229k |
| IV | Sibolga | 80k |
| IV | Delitua | 28k |
| IV | Stabat | 27k |
| IV | Pematangsiantar | 210k |
| IV | Percut | 311k |
| IV | Medan | 1,751k |
| IV | Sunggal | 158k |
| IV | Perbaungan | 157k |
| IV | Tanjungpalai | 143k |

bold cities appear on map (k = x1000)

**Shaking Intensity**



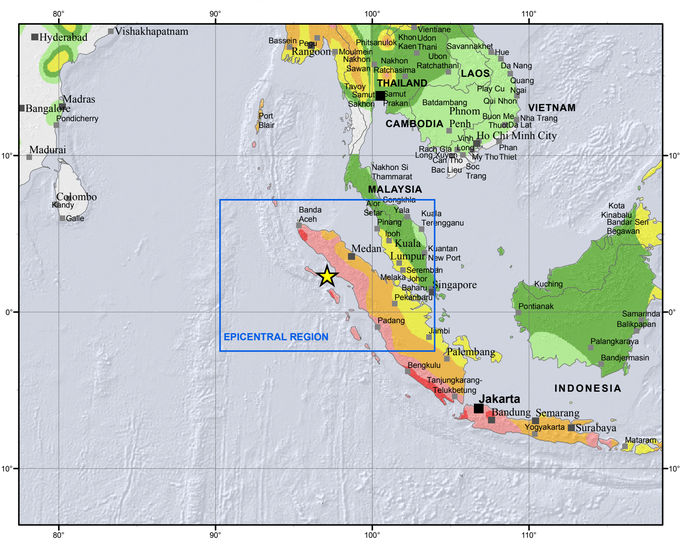

Overall, the population in this region resides in structures that are vulnerable to earthquake shaking, though some resistant structures exist. On December 26, 2004 (UTC), a magnitude 9.0 earthquake 167 km Northwest of this one struck Sumatra - Andaman Islands, Indonesia, with estimated population exposures of 232,000 at intensity IX or greater and 1,449,000 at intensity VIII, resulting in a reported 227,898 fatalities. Recent earthquakes in this area have caused tsunamis and landslides that may have contributed to losses.

This information was automatically generated and has not been reviewed by a seismologist.

http://earthquake.usgs.gov/pager

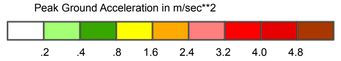
Event ID: us2010utc5

## *Seismic Hazard*

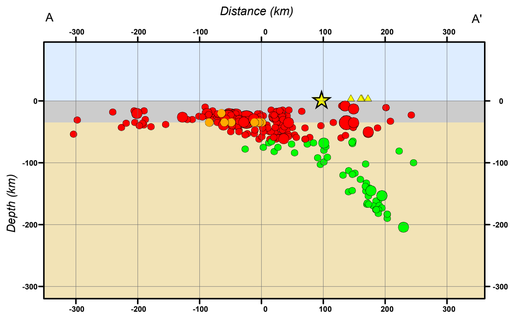



Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec², expected to be exceeded in a 50-yr period with a probability of 10 percent.

Peak Ground Acceleration in m/sec**2




## *Depth Profile*




TECTONIC SUMMARY

The Banyak Islands, Sumatra earthquake of April 6, 2010 occurred as a result of thrust faulting on or near the subduction interface plate boundary between the Australia-India and Sunda plates. At the location of this earthquake, the Australia and India Plates move north-northeast with respect to the Sunda plate at a velocity of approximately 60-65 mm/yr. On the basis of the currently available fault mechanism information and earthquake depth, it is likely that this earthquake occurred along the plate interface.

The subduction zone surrounding the immediate region of this event last slipped during the Mw 8.6 earthquake of March 2005, and today's event appears to have occurred within the rupture zone of that earthquake. Today's earthquake is the latest in a sequence of large ruptures along the Sunda megathrust, including two M 7.4 earthquakes beneath Simeulue 125 km to the north in 2002 and 2008; a M 9.1 earthquake that ruptured to within 125 km north of this earthquake in 2004; a M 8.5 375 km to the south in 2007; and a M 7.5 260 km to the south near Padang in 2009.

**Significant Earthquakes Mag ≥ 7.0**

| Year | Mon | Day | Time | Lat | Long | Dep | Mag |
|---|---|---|---|---|---|---|---|
| 1907 | 01 | 04 | 0519 | 2.000 | 94.500 | 50 | 7.5 |
| 1909 | 06 | 03 | 1840 | -2.000 | 101.000 | 0 | 7.2 |
| 1916 | 07 | 27 | 1152 | 4.000 | 96.500 | 100 | 7.0 |
| 1917 | 11 | 04 | 1203 | 4.800 | 96.800 | 0 | 7.1 |
| 1935 | 08 | 03 | 0110 | 4.430 | 96.326 | 35 | 7.0 |
| 1935 | 12 | 28 | 0235 | -0.345 | 98.147 | 35 | 7.8 |
| 1936 | 01 | 02 | 2234 | -0.279 | 98.872 | 35 | 7.0 |
| 1936 | 08 | 23 | 2112 | 5.296 | 94.759 | 35 | 7.1 |
| 1936 | 09 | 19 | 0101 | 3.648 | 97.551 | 35 | 7.1 |
| 1943 | 06 | 08 | 2042 | -1.000 | 101.000 | 50 | 7.2 |
| 1943 | 06 | 09 | 0306 | -1.000 | 101.000 | 50 | 7.5 |
| 1946 | 05 | 08 | 0520 | 0.000 | 99.500 | 0 | 7.1 |
| 1955 | 05 | 17 | 1449 | 6.738 | 93.754 | 29.1 | 7.2 |
| 1969 | 11 | 21 | 0205 | 1.973 | 94.574 | 11 | 7.6 |
| 1971 | 02 | 04 | 1533 | 0.552 | 98.665 | 60 | 7.1 |
| 1976 | 06 | 20 | 2053 | 3.437 | 96.254 | 16.2 | 7.0 |
| 1983 | 04 | 04 | 0251 | 5.724 | 94.694 | 94.5 | 7.0 |
| 1984 | 11 | 17 | 0649 | 0.179 | 97.959 | 28.7 | 7.1 |
| 1998 | 04 | 01 | 1756 | -0.544 | 99.217 | 32 | 7.0 |
| 2002 | 11 | 02 | 0126 | 2.824 | 96.085 | 30 | 7.4 |
| 2004 | 12 | 26 | 0058 | 3.295 | 95.982 | 30 | 9.0 |
| 2004 | 12 | 26 | 0421 | 6.910 | 92.958 | 39 | 7.2 |
| 2005 | 03 | 28 | 1609 | 2.085 | 97.108 | 30 | 8.6 |
| 2007 | 09 | 13 | 0335 | -2.130 | 99.627 | 22 | 7.0 |
| 2008 | 02 | 20 | 0808 | 2.768 | 95.964 | 26 | 7.4 |
| 2008 | 02 | 25 | 0836 | -2.486 | 99.972 | 25 | 7.2 |
| 2009 | 09 | 30 | 1016 | -0.720 | 99.867 | 81 | 7.5 |
| 2010 | 04 | 06 | 2215 | 2.360 | 97.132 | 31 | 7.8 |

DISCLAIMER

Base map data, such as place names and political boundaries, are the best available but may not be current or may contain inaccuracies and therefore should not be regarded as having official significance.

DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD
USGS, National Earthquake Information Center
NOAA, National Geophysical Data Center
IASPEI, Centennial Catalog (1900 - 1999) and extensions (Engdahl and Villaseñor, 2002)
HDF (unpublished earthquake catalog) (Engdahl, 2003)
Global Seismic Hazard Assessment Program

PLATE TECTONICS AND FAULT MODEL
PB2002 (Bird, 2003)
Finite Fault Model, Chen Ji, UC Santa Barbara (2007)

BASE MAP
NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center
NOAA GEBCO and GLOBE Elevation Models
ESRI Online

REFERENCES

Bird, P., 2003, An updated digital model of plate boundaries: Geochem. Geophys. Geosyst., v. 4, no. 3, pp. 1027- 80.

Engdahl, E.R. and Villaseñor, A., 2002, Global Seismicity: 1900 - 1999, chap. 41 of Lee, W.H.K., and others,eds., International Earthquake and Engineering Seismology, Part A: New York, N.Y., Elsevier Academeic Press, 932 p.

Engdahl, E.R., Van der Hilst, R.D., and Buland, R.P., 1998, Global teleseismic earthquake relocation with improved travel times and procedures for depth determination: Bull. Seism. Soc. Amer., v. 88, p. 722-743.

Map prepared by U.S. Geological Survey
National Earthquake Information Center
20 April 2010
Map not approved for release by Director USGS