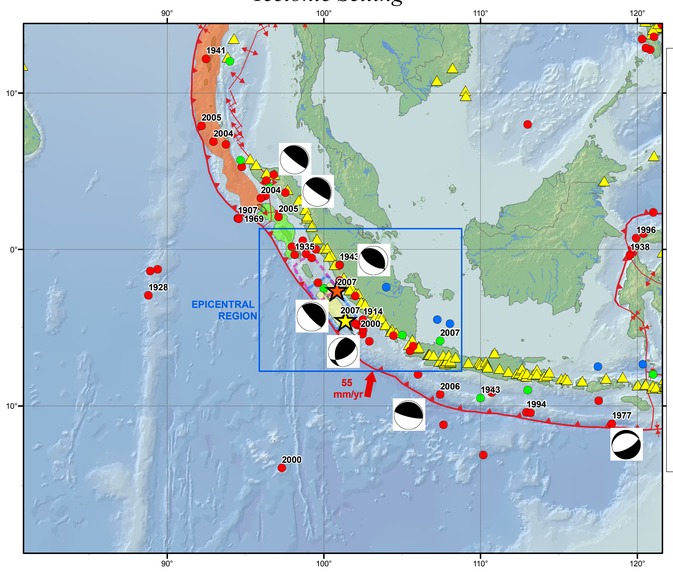
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

EARTHQUAKE SUMMARY MAP XXX

Prepared in cooperation with the Global Seismographic Network

M8.5 and 7.9 Southern Sumatra Earthquakes of 12 September 2007

Tectonic Setting



EXPLANATION

Mag ≥ 7.0
- 0 - 69 km
- 70 - 299
- 300 - 600
- 2007 Rupture
- 2005 Rupture
- 2004 Rupture
- 2002 Rupture
- 2000 Rupture
- 1833 Rupture
- 1797 Rupture

Plate Boundaries
- Subduction
- Transform
- Divergent
- Convergent
- Volcanoes

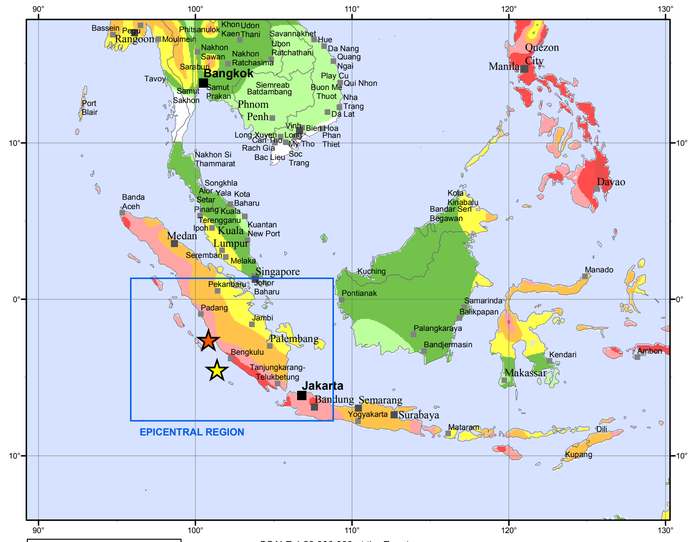
RELATIVE PLATE MOTIONS

The broad red vector represents the motion of the Australia Plate relative to the Sunda Plate in the region. The motion of the Australia Plate is generally 50 - 60 mm/yr north and slightly eastward with respect to the Sunda Plate.

SCALE 1:20,000,000 at the Equator

0 200 400 800 1,200 1,600 Kilometers

Seismic Hazard



Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec^2, expected to be exceeded in a 50-yr period with a probability of 10 percent.

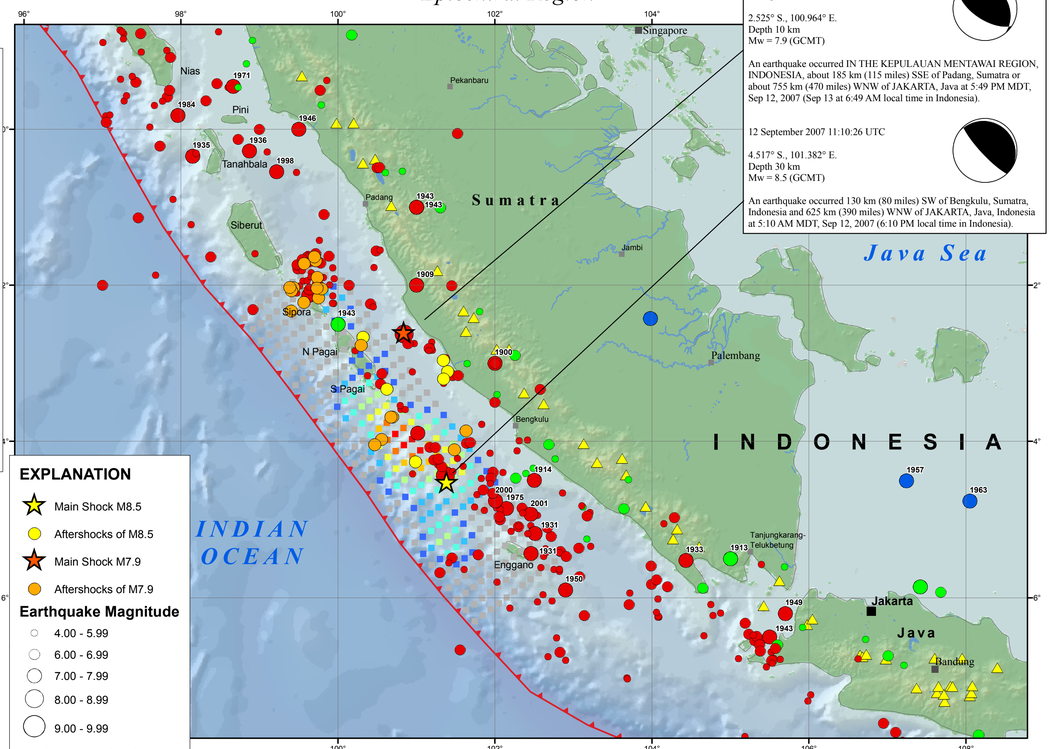
SCALE 1:20,000,000 at the Equator

0 200 400 800 1,200 1,600 Kilometers

Peak Ground Acceleration in m/sec**2

.2 .4 .8 1.6 2.4 3.2 4.0 4.8

Epicentral Region



EXPLANATION
- Main Shock M8.5
- Aftershocks of M8.5
- Main Shock M7.9
- Aftershocks of M7.9

Earthquake Magnitude
- 4.00 - 5.99
- 6.00 - 6.99
- 7.00 - 7.99
- 8.00 - 8.99
- 9.00 - 9.99

Earthquake Depth
- 0 - 69
- 70 - 299
- 300 - 700

Scale at the Equator 1:3,993,000
Mercator Projection

0 100 200 400 Kilometers

Southern Sumatra

12 September 2007 23:49:01 UTC

2.525° S., 100.964° E.
Depth 10 km
Mw = 7.9 (GCMT)

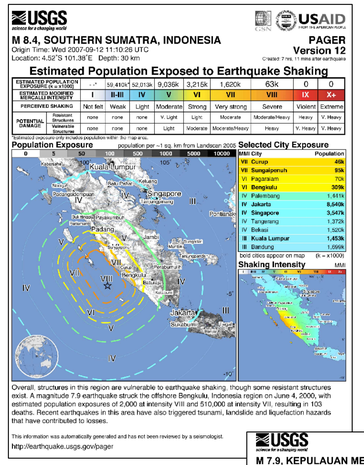
An earthquake occurred IN THE KEPULAUAN MENTAWAI REGION, INDONESIA, about 185 km (115 miles) SSE of Padang, Sumatra or about 755 km (470 miles) WNW of JAKARTA, Java at 5:49 PM MDT, Sep 12, 2007 (Sep 13 at 6:49 AM local time in Indonesia).

12 September 2007 11:10:26 UTC

4.517° S., 101.382° E.
Depth 30 km
Mw = 8.5 (GCMT)

An earthquake occurred 130 km (80 miles) SW of Bengkulu, Sumatra, Indonesia and 625 km (390 miles) WNW of JAKARTA, Java, Indonesia at 5:10 AM MDT, Sep 12, 2007 (6:10 PM local time in Indonesia).

Slip (mm)
- 0.07 - 50.00
- 50.01 - 100.00
- 100.01 - 150.00
- 150.01 - 200.00
- 200.01 - 250.00
- 250.01 - 300.00
- 300.01 - 350.00
- 350.01 - 400.00
- 400.01 - 450.00



USGS science for a changing world — USAID from the American people

M 8.4, SOUTHERN SUMATRA, INDONESIA
Origin Time: Wed 2007-09-12 11:10:26 UTC
Location: 4.52°S 101.38°E Depth: 30 km

PAGER
Version 12
Created: 7 hrs, 11 mins after earthquake

Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (k = x1000)	~0	59 480k	52,013k	9,036k	3,215k	1,620k	63k	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
POTENTIAL DAMAGE: 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 2005

Selected City Exposure

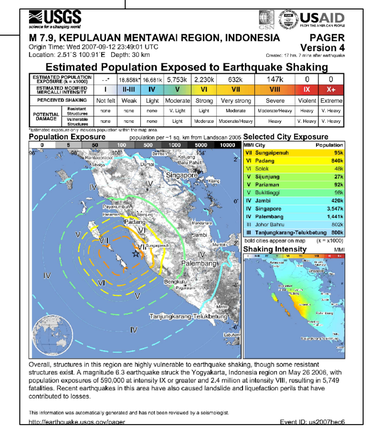
MMI	City	Population
VII	Dumai	46k
VII	Sungaipenuh	93k
VI	Pagaralam	76k
VI	Bengkulu	309k
IV	Palembang	1,441k
IV	Jakarta	8,540k
IV	Singapore	3,547k
IV	Tanjungkarang	1,372k
IV	Bekasi	1,520k
III	Kuala Lumpur	1,453k
III	Bandung	1,556k

bold cities appear on map (k = x1000)

Shaking Intensity MMI

Overall, structures in this region are vulnerable to earthquake shaking, though some resistant structures exist. A magnitude 7.9 earthquake struck the offshore Bengkulu, Indonesia region on June 4, 2000, with estimated population exposures of 2,000 at intensity VIII and 510,000 at intensity VII, resulting in 103 deaths. Recent earthquakes in this area have also triggered tsunami, landslide and liquefaction hazards that have contributed to losses.

This information was automatically generated and has not been reviewed by a seismologist.
http://earthquake.usgs.gov/pager



USGS science for a changing world — USAID from the American people

M 7.9, KEPULAUAN MENTAWAI REGION, INDONESIA
Origin Time: Wed 2007-09-12 23:49:01 UTC
Location: 2.51°S 100.91°E Depth: 30 km

PAGER
Version 4
Created: 17 hrs, 7 mins after earthquake

Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (k = x1000)	~0	19,606k	16,661k	5,753k	2,230k	632k	147k	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
POTENTIAL DAMAGE: 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 2005

Selected City Exposure

MMI	City	Population
VII	Sungaipenuh	93k
VI	Padang	845k
VI	Solok	49k
V	Sijunjung	27k
V	Pariaman	82k
V	Bukittinggi	59k
IV	Jambi	428k
IV	Singapore	3,547k
IV	Palembang	1,441k
III	Johor Bahru	810k
III	Tanjungkarang-Telukbetung	880k

bold cities appear on map (k = x1000)

Shaking Intensity MMI

Overall, structures in this region are highly vulnerable to earthquake shaking, though some resistant structures exist. A magnitude 6.3 earthquake struck the Yogyakarta, Indonesia region on May 26 2006, with population exposures of 590,000 at intensity IX or greater and 2.4 million at intensity VIII, resulting in 5,749 fatalities. Recent earthquakes in this area have also caused landslide and liquefaction perils that have contributed to losses.

This information was automatically generated and has not been reviewed by a seismologist.
http://earthquake.usgs.gov/pager Event ID: us2007hec6

TECTONIC SUMMARY

The magnitude 8.5 and 7.9 southern Sumatra earthquakes of September 12, 2007 occurred as the result of thrust faulting on the boundary between the Australia and Sunda plates. At the location of these earthquakes, the Australia plate moves northeast with respect to the Sunda plate at a velocity of about 60 mm/year. The direction of relative plate motion is oblique to the orientation of the plate boundary offshore of the west coast of Sumatra. The component of plate-motion perpendicular to the boundary is accommodated by thrust faulting on the offshore plate-boundary. Much of the component of plate motion parallel to the plate boundary is accommodated by strike-skip faulting on the Sumatra fault, which is inland on Sumatra proper.

The magnitude 8.5 earthquake of September 12, 2007 is the fourth earthquake of magnitude greater than 7.9 to have occurred in the past decade on or near the plate boundaries offshore of western Sumatra. This earthquake occurred just north of the source region of the magnitude 7.9 earthquake on June 4, 2000. The September 12, 2007 magnitude 7.9 earthquake occurred about 225 km northwest of the magnitude 8.5 earthquake at the northern end of the aftershock zone. These two earthquakes and their aftershocks overlay the southern portion of the estimated 1833 rupture zone, which extends from approximately Eggano Island to the northern portion of Siberut Island. The great magnitude 9.1 earthquake of December 26, 2004, which produced the devastating Indian Ocean tsunami of that date, ruptured much of the boundary separating the India plate and the Burma plate.

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.

Significant Earthquakes Mag ≥ 7.5

Year	Mon	Day	Time	Lat	Long	Dep	Mag
1914	06	25	1907	-4.500	102.500	0	7.6
1935	12	28	0235	-0.345	98.147	35	7.8
1943	06	09	0306	-1.000	101.000	50	7.5
2000	06	04	1628	-4.762	102.007	35	7.9
2002	11	02	0126	2.82	96.08	30	7.6
2004	12	26	0058	3.30	95.98	30	9.1
2005	03	28	1609	2.09	97.11	30	8.6
2006	07	17	0819	-9.25	107.41	34	7.7
2007	08	08	1704	-5.91	107.67	280	7.5
2007	09	12	1110	-4.438	101.367	30	8.5
2007	09	12	2349	-2.625	100.841	35	7.9

DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD
USGS, National Earthquake Information Center
NOAA, National Geophysical Data Center
ISAPEI, 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)
Rupture Zones, Briggs et al (2007)

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

REFERENCES

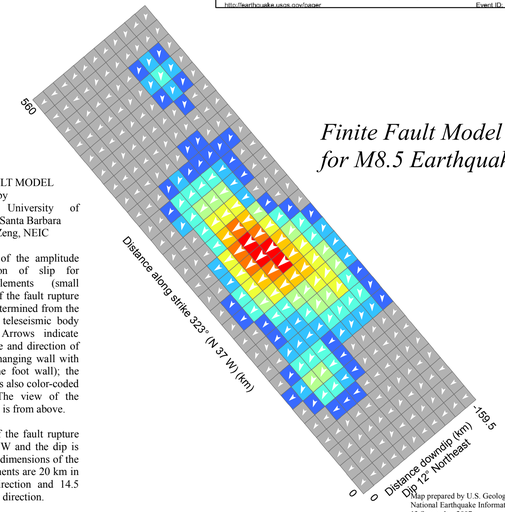
Bird, P., 2003, An updated digital model of plate boundaries: Geochem. Geophys. Geosyst., v. 4, no. 3, pp. 1027- 80.

Briggs, Rich, 2007, 2007 Sumatra, Indonesia, Earthquakes, EERI Newsletter, Oct 2007, V41, N10.

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.

Finite Fault Model for M8.5 Earthquake



FINITE FAULT MODEL
Contributed by
Chen Ji, University of California at Santa Barbara and Yuehua Zeng, NEIC

Distribution of the amplitude and direction of slip for subfault elements (small rectangles) of the fault rupture model are determined from the inversion of teleseismic body waveforms. Arrows indicate the amplitude and direction of slip (of the hanging wall with respect to the foot wall); the slip amount is also color-coded as shown. The view of the rupture plane is from above.

The strike of the fault rupture plane is N37W and the dip is 12 NE. The dimensions of the subfault elements are 20 km in the strike direction and 14.5 km in the dip direction.

Map prepared by U.S. Geological Survey
National Earthquake Information Center
13 September 2007
Map not approved for release by Director USGS