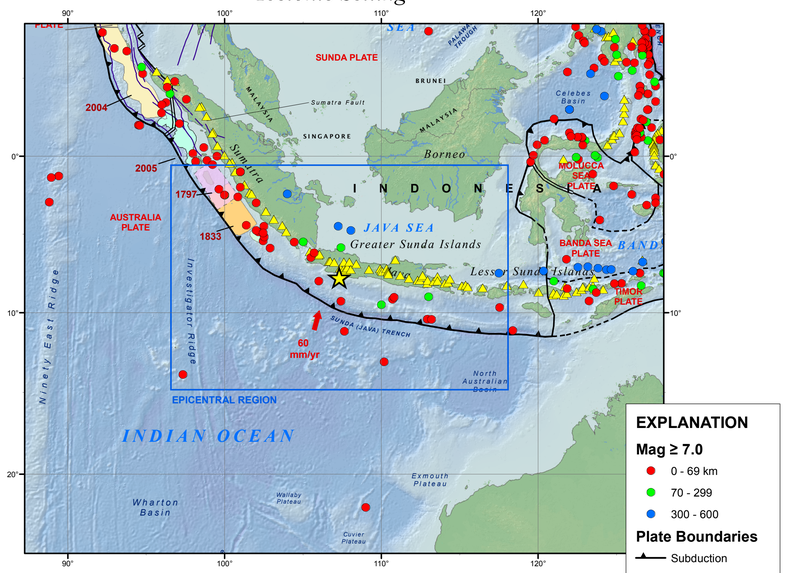
Prepared in cooperation with the Global Seismographic Network

GSN

M7.0 Java, Indonesia Earthquake of 2 September 2009

Tectonic Setting



RELATIVE PLATE MOTIONS

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

Scale 1:20,000,000

0 205 410 820 1,230 1,640 Kilometers

EXPLANATION

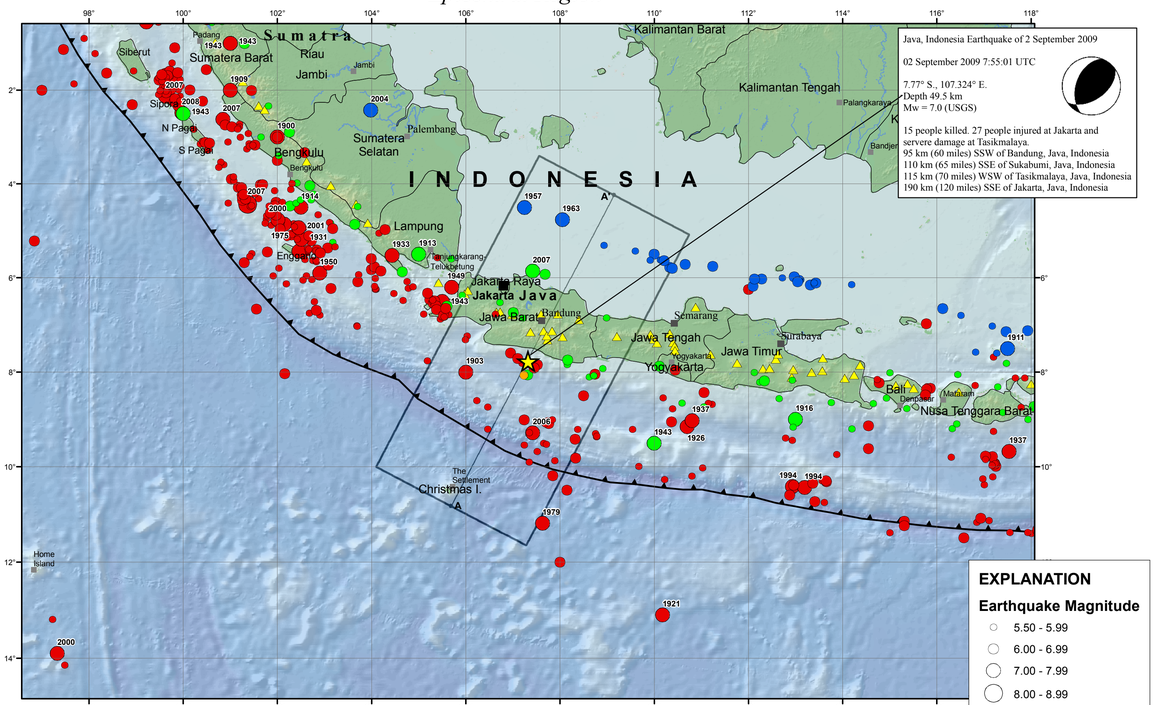
Mag ≥ 7.0

- 0 - 69 km
- 70 - 299
- 300 - 600

Plate Boundaries

- Subduction
- Transform
- Divergent
- Others
- Andaman Faults
- Rupture Area (Year)

Epicentral Region



Scale 1:6,655,000

0 105 210 420 630 840 Kilometers

EXPLANATION

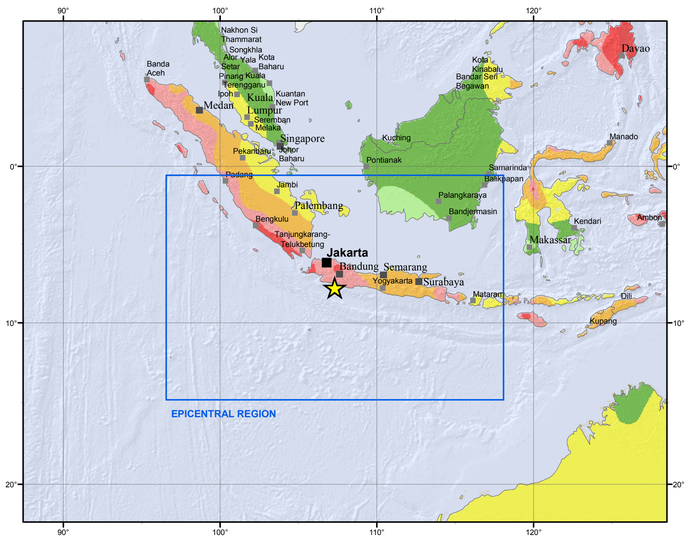
Earthquake Magnitude

- 5.50 - 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

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.

Scale 1:20,000,000

0 205 410 820 1,230 1,640 Kilometers

Peak Ground Acceleration in m/sec**2

.2 .4 .8 1.6 2.4 3.2 4.0 4.8

USGS science for a changing world

USAID FROM THE AMERICAN PEOPLE

M 7.0, JAVA, INDONESIA
Origin Time: Wed 2009-09-02 07:55:01 UTC
Location: 7.77° S 107.32° E Depth: 49 km

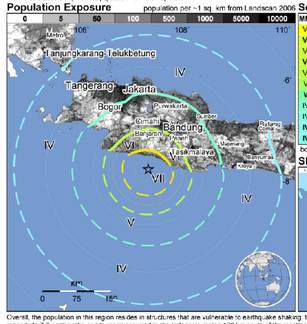
PAGER Version 1
Created: 48 mins, 24 secs after earthquake

Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (k = x1000)		-.*	8,589k*	42,127k	24,897k	4,358k	871k	0	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 2006

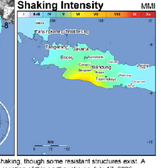


Selected City Exposure

MMI	City	Population
VI	Barjar	37k
VI	Paseh	126k
VI	Pamenungpeuk	48k
VI	Banjaran	164k
VI	Soreang	150k
V	Ciranjang-hilir	77k
V	Bandung	1,699k
IV	Bekasi	1,520k
IV	Depok	1,198k
IV	Tangerang	1,372k
IV	Jakarta	8,540k

bold cities appear on map (k = x1000)

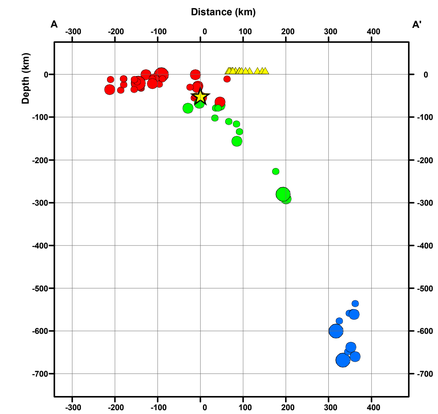
Shaking Intensity



Overall, the population in this region resides in structures that are vulnerable to earthquake shaking, though some resistant structures exist. A magnitude 7.7 earthquake and tsunami occurred in the Indonesia region 172 km south of the location of this earthquake on July 17, 2006 (UTC), with estimated population exposures of 10,838,000 at intensity V and 44,151,000 at intensity IV, resulting in an estimated 665 fatalities. On May 26, 2006 (UTC), a magnitude 6.4 earthquake occurred near the Yogyakarta, Indonesia, region 333 km east of the location of this earthquake, with estimated population exposures of 966,000 at intensity IX or greater and 2,026,000 at intensity VIII, resulting in an estimated 5,749 fatalities. Recent earthquakes in this area have caused tsunamis 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: us2009ilbat



TECTONIC SUMMARY

The Java earthquake of September 02, 2009, occurred at a depth of about 50 km as a result of reverse faulting. The tectonics of Java are dominated by the subduction of the Australia plate north-northeastward beneath the Sunda plate, with a relative velocity of 59 mm/year at the longitude of the earthquake. Although the September 02 shock's hypocenter would place it near the subduction interface between the Australia and Sunda plate, the orientation of the causative fault that is inferred from the seismic wave radiation-pattern is inconsistent with the shock occurring as interplate faulting on that interface. Instead, the earthquake likely occurred as the result of faulting within the subducting Australia plate.

The region of the plate boundary between the Australia plate and Sunda plate is seismically highly active, with past strong earthquakes having occurred within each of the Australia and Sunda plates as well as on the plate interface. The magnitude 7.8 earthquake of June 2, 1994 and the magnitude 7.7 earthquake of July 17, 2006, both of which occurred south of Java and both of which produced destructive tsunamis, occurred as the result of thrust faulting on the shallow plate interface near the Java trench. The devastating Yogyakarta earthquake of May 26, 2006, magnitude 6.3, occurred at shallow depth within the overriding Sunda plate. The magnitude 7.5 Java earthquake of August 28, 2007, occurred at a depth of about 290 km within the subducted Australia 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 >= 7.0

Year	Mon	Day	Time	Lat	Long	Dep	Mag
1900	01	05	1900	-3.000	102.000	0	7.0
1903	02	27	0043	-8.000	106.000	0	7.3
1909	06	03	1840	-2.000	101.000	0	7.2
1911	07	05	1840	-7.500	117.500	370	7.0
1913	08	13	0425	-5.500	105.000	75	7.3
1914	06	25	1907	-4.500	102.500	0	7.6
1916	09	11	0630	-9.000	113.000	100	7.1
1921	09	11	0401	-13.095	110.177	25	7.3
1926	09	10	1034	-9.152	110.701	35	7.0
1931	02	10	0634	-5.433	102.458	35	7.1
1931	09	25	0559	-5.178	102.511	35	7.3
1933	06	24	2154	-5.522	104.434	35	7.3
1937	08	11	0055	-9.675	117.533	35	7.2
1937	09	27	0855	-9.027	110.802	35	7.0
1943	04	01	1418	-6.500	105.500	0	7.1
1943	06	08	2042	-1.000	101.000	50	7.2
1943	06	09	0306	-1.000	101.000	50	7.5
1943	07	23	1453	-9.500	110.000	90	7.6
1943	11	26	2125	-2.500	100.000	130	7.1
1949	06	24	2238	-6.200	105.700	65	7.0
1950	03	27	2118	-5.900	102.900	0	7.0
1957	04	16	0404	-4.504	107.244	600	7.2
1963	12	15	1934	-4.764	108.050	668	7.1
1975	10	01	0330	-4.859	102.145	37.2	7.0
1979	07	24	1931	-11.185	107.628	12.1	7.0
1994	06	02	1817	-10.411	112.935	34.5	7.8
1994	06	02	1817	-10.432	113.191	35	7.1
2000	06	04	1628	-4.762	102.007	34.6	7.9
2000	06	18	1444	-13.896	97.328	7.1	7.9
2001	02	13	1928	-4.933	102.454	34	7.3
2004	07	25	1435	-2.427	103.981	582	7.3
2006	07	17	0819	-9.284	107.419	20	7.7
2007	08	08	1705	-5.859	107.419	280	7.5
2007	09	12	1110	-4.438	101.367	34	8.5
2007	09	12	2349	-2.625	100.841	35	7.9
2007	09	13	0335	-2.130	99.627	22	7.0
2008	02	25	0836	-2.486	99.972	25	7.2

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

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.

The GEBCO_08 Grid, version 20090202, http://www.gebco.net

Map prepared by U.S. Geological Survey
National Earthquake Information Center
2 September 2009
Map not approved for release by Director USGS