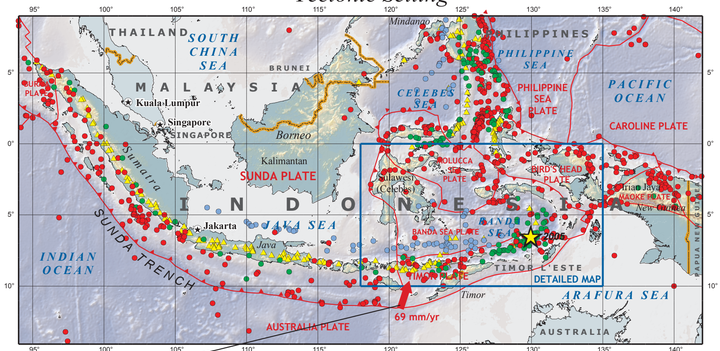
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

M7.1 Banda Sea Earthquake of 2 March 2005

Tectonic Setting



RELATIVE PLATE MOTIONS

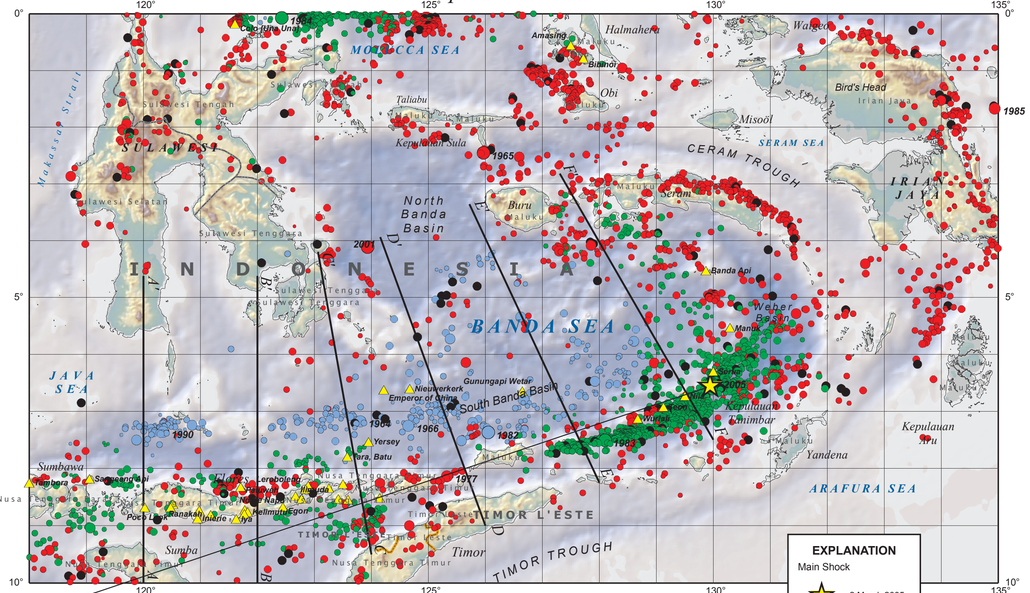
The relative motion of adjacent tectonic plates is depicted on the map by short vectors located at selected points on the plate boundary. In this presentation, the vector therefore represents the direction of the moving plate relative to the adjacent reference plate. The rate of relative motion is labelled next to the vector.

The components of the vector perpendicular and parallel to the plate margin approximate convergent/divergent and transverse direction of motion between the plates, respectively. As viewed from the reference plate, an inward directed component suggests convergence at and near the plate boundary that may be expressed as crustal folding, uplift, thrust faulting, or plate subduction. Similarly, an outward directed component suggests plate divergence such as would be expected at a zone of crustal spreading. Transcurrent or transform faulting would be expected when the predominant vector component is parallel to the plate margin.

In the example shown on the map, the Australian plate is moving N 8° E relative to the Sunda reference plate.

EXPLANATION
Main Shock
2 March 2005
Earthquakes M ≥ 6 1900 - 2004
0 - 69 km
70 - 299
300 - 700
Plate Boundaries
Subduction
All Other Types
Volcanoes

Epicentral Area



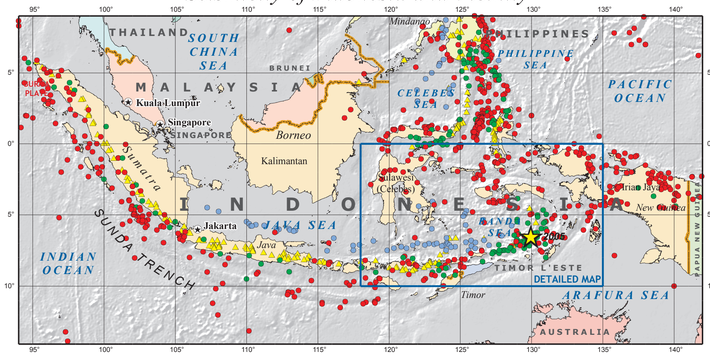
BANDA SEA, INDONESIA

2 March 2005 10:42:12.15 UTC
6.533° S., 129.945° E.
Depth 201 km
Mw = 7.1 (USGS)

Felt (V) on Ambon and at Waingapu, Sumba; (III) at Jayapura and Merauke, Irian Jaya. Felt at Manakwari and Sorong, Irian Jaya. Felt at Amlapura, Karangasem and Klungkung, Bali. Also felt at Brisbane, Darwin, Howard Springs, Jabiru, Katherine and Kununurra, Australia.

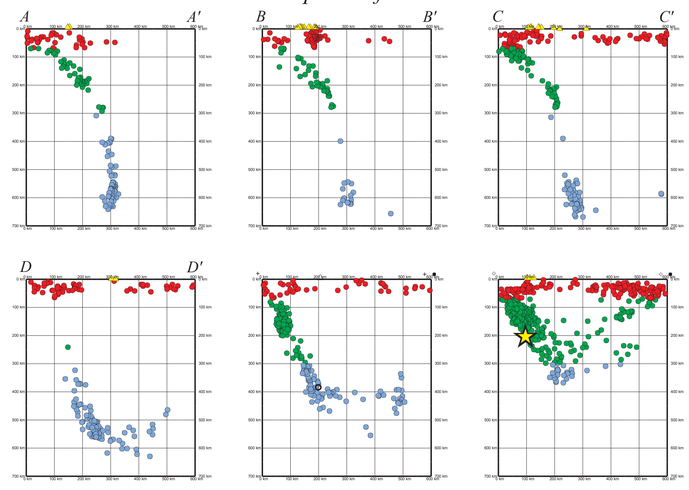
EXPLANATION
Main Shock
2 March 2005
Earthquakes 1964 - 2002
0 - 69 km
70 - 299
300 - 700
Magnitude Classes
3.5 - 3.9
4.0 - 4.4
4.5 - 4.9
5.0 - 5.4
5.5 - 5.9
6.0 - 6.4
6.5 - 6.9
7.0 - 7.4
7.5 - 7.9
Volcanoes

Seismicity of Indonesia and Vicinity

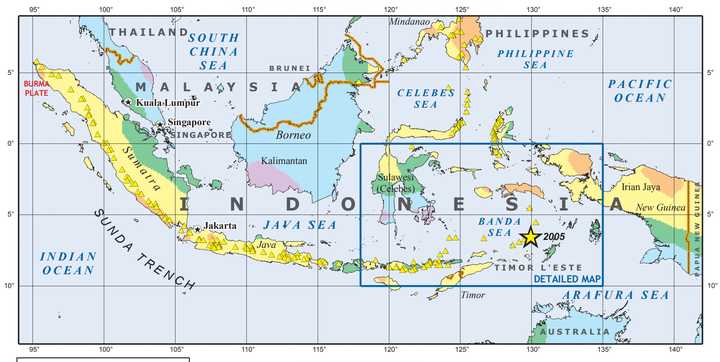


EXPLANATION
Main Shock
2 March 2005
Earthquakes M ≥ 6 1900 - 2004
0 - 69 km
70 - 299
300 - 700
Volcanoes

Depth Profiles



Generalized 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.

EXPLANATION
Main Shock
2 March 2005
Earthquakes 1900 - 2004
0 - 69 km
70 - 299
300 - 700
Seismic Hazard
0.0 - 0.2 m/sec²
0.2 - 0.4
0.4 - 0.8
0.8 - 1.6
1.6 - 3.2
3.2 - 4.3
Plate Boundaries
Subduction
All Other Types
Volcanoes

DISCUSSION

The tectonics of the earthquake region are determined by the northward motion of the Australia plate relative to the Sunda plate at about 70 mm/yr. The relative motion of Australia toward the interior of the Sunda plate drives the motion of small plates that are situated between the Australia plate and the interior of the Sunda plate. The earthquake occurred in the inclined seismic zone that dips northward from the Timor trough and that marks the position of the subducted Australia plate. Until recently in geologic time, the Australia plate subducted beneath the Timor plate at the Timor trough. Within geologically recent time, northward subduction of Australia beneath the Timor plate has largely ceased, and the northward motion of the Australia plate relative to the Sunda plate is now accommodated substantially by the southward subduction of the Banda Sea plate beneath the Timor plate on the northern boundary of the Timor plate. The subducted Australia plate nonetheless remains intensely seismic, probably because of high stresses that are generated by the distortion of the plate.

Earthquakes, such as this one, that have focal-depths between 70 and 300 km are commonly termed "intermediate-depth" earthquakes. Intermediate-depth earthquakes typically cause less damage on the ground surface above their foci than is the case with similar magnitude shallow-focus earthquakes, but large intermediate-depth earthquakes may be felt at great distance from their epicenters.

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.

LARGEST EARTHQUAKES M ≥ 7 1964 - 2005
EPICENTRAL AREA

YR	MO	DY	LAT	LON	DEPTH	MAG
1964	10	18	-7.173	123.809	577.9	7.0
1965	1	24	-2.454	125.966	30.1	7.7
1966	6	22	-7.254	124.650	527.2	7.0
1969	2	11	-6.791	126.672	425.4	7.2
1977	8	27	-8.137	125.326	44.0	7.1
1982	6	22	-7.368	126.049	451.6	7.5
1983	11	24	-7.507	128.100	184.3	7.4
1984	8	6	-0.071	122.426	244.9	7.4
1985	11	17	-1.671	134.937	11.8	7.3
1987	6	17	-5.599	130.835	67.0	7.1
1990	5	24	-7.356	120.348	587.6	7.1
1992	12	12	-8.497	121.835	28.0	7.8
1992	12	20	-6.595	130.401	78.0	7.3
1995	12	25	-6.927	129.192	142.0	7.1
1996	6	17	-7.141	122.511	587.0	7.9
1998	11	9	-6.966	128.941	20.0	7.0
1998	11	29	-1.938	124.818	16.0	7.7
2000	5	4	-1.140	123.523	26.0	7.6
2001	10	19	-4.114	123.933	28.3	7.5
2002	10	10	-1.711	134.311	16.0	7.7
2004	11	11	-8.152	124.868	10.0	7.5
2005	3	2	-6.533	129.945	201.0	7.1

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
PB2003 (Bird, 2003)

VOLCANOES
Smithsonian Institution, Global Volcano Program

BASE MAP
NIMA and ESRI, Digital Chart of the World
USGS, EROS Data Center

NEWS SOURCES

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
19 April 2005 @ 1600 MDT
Map not approved for release by Director USGS