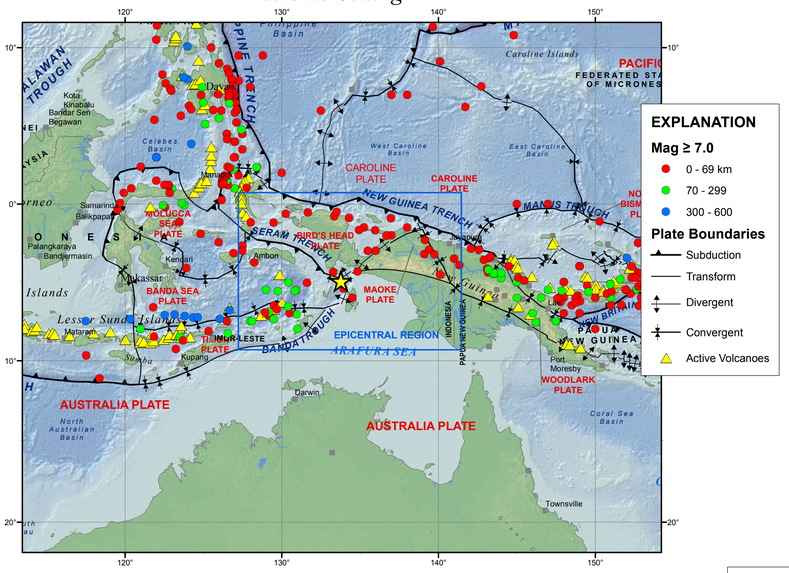
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the Global Seismographic Network
GSN

M7.2 Papua, Indonesia, Earthquake of 29 September 2010

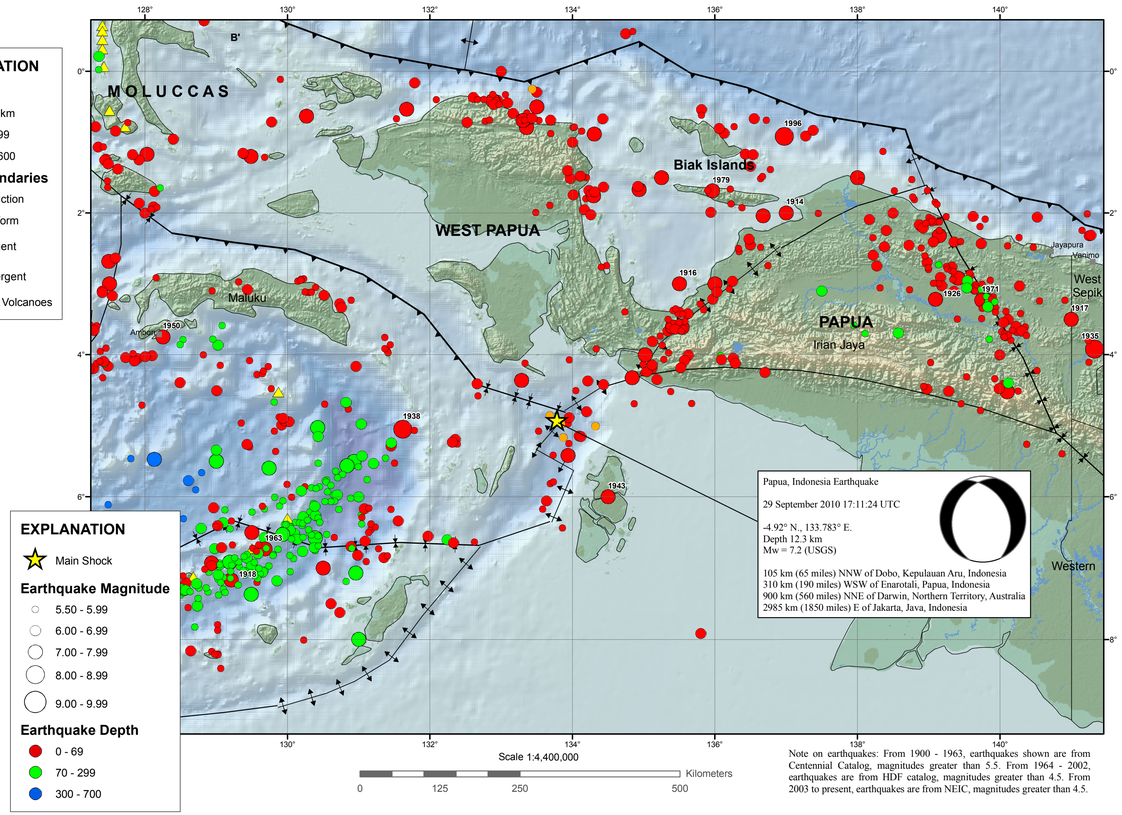
Tectonic Setting



RELATIVE PLATE MOTIONS

Eastern Indonesia is a region of complex plate interactions. From a global perspective, eastern Indonesia consists of microplates whose relative motions absorb the convergence of the Pacific, Australia, and Eurasia plates.(Pacific Plate boundary is east of this map).

Epicentral Region



EXPLANATION

Main Shock

Earthquake Magnitude

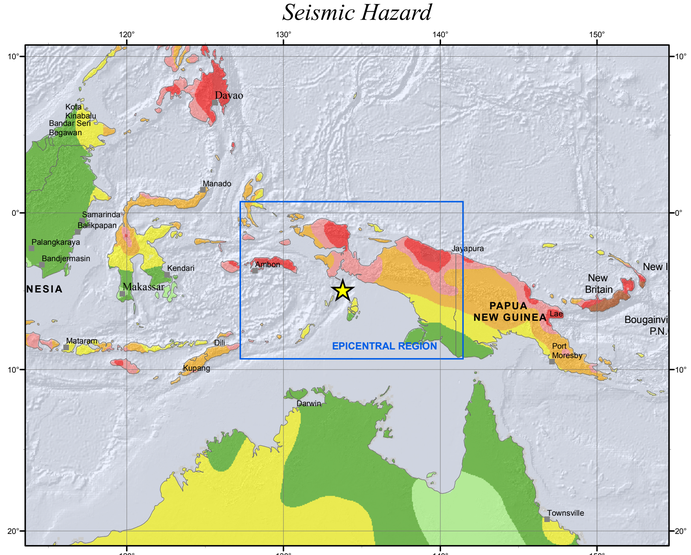
5.50 - 5.99
6.00 - 6.99
7.00 - 7.99
8.00 - 8.99
9.00 - 9.99

Earthquake Depth

0 - 69
70 - 299
300 - 700

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.

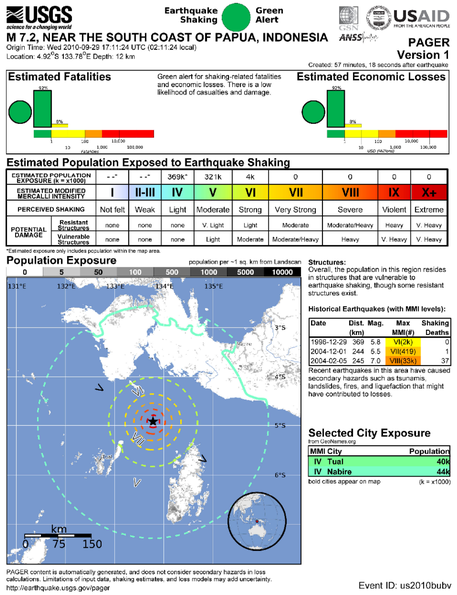
Seismic Hazard



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

.2 .4 .8 1.6 2.4 3.2 4.0 4.8



Significant Earthquakes Mag >= 7.5

Year	Mon	Day	Time	Lat	Long	Dep	Mag
1914	05	26	1422	-2.000	137.000	0	7.9
1916	01	13	0820	-3.000	135.500	0	7.6
1917	07	29	2152	-3.500	141.000	0	7.6
1918	11	18	1841	-7.168	129.210	35	7.5
1926	10	26	0344	-3.219	139.097	35	7.5
1935	09	20	0146	-3.920	141.330	35	8.1
1938	02	01	1904	-5.050	131.620	35	8.4
1943	11	06	0831	-6.000	134.500	0	7.6
1950	10	08	0323	-3.750	128.250	0	7.5
1963	11	04	0117	-6.733	129.684	35	7.8
1971	01	10	0717	-3.232	139.744	54.9	7.7
1979	09	12	0517	-1.688	135.966	18.9	7.5
1996	02	17	0559	-0.919	136.973	36.5	8.2
2002	10	10	1050	-1.757	134.297	10	7.6
2006	01	27	1658	-5.473	128.131	397	7.6
2009	01	03	1943	-0.414	132.885	17	7.6

TECTONIC SUMMARY

The Papua, Indonesia region earthquake of September 29, 2010 occurred as a result of normal faulting along a section of the broad plate boundary system in eastern Indonesia to the northwest of the Aru Islands.

Eastern Indonesia is characterized by complex tectonics in which motions of numerous small microplates are accommodating the large-scale convergence between the Australia, Sunda and Pacific plates. The September 29 earthquake lies near the boundary between the proposed Banda Sea microplate and the Australia plate proper, which is oriented approximately north-northeast and accommodates divergent motion between these plates. The focal mechanism of the earthquake is consistent with its occurrence on such a boundary, though due to the complexity of tectonics in this region any specific association with a causative fault structure must be regarded as speculative, pending further study. At a broad scale, the Australia plate moves northwards with respect to the Sunda plate at a velocity of approximately 77 mm/yr in the region of the earthquake. In more detail, it has been estimated that the Banda Sea microplate moves westward with respect to the Australia plate with a velocity of about 15 mm/yr.

Today's earthquake was preceded approximately 27 s earlier by a smaller, magnitude 6.2 event, from nearly the same epicenter. Eastern Indonesia is a tectonically active area with frequent moderate and large earthquakes. The region within 300 km of the September 29 event experienced over 30 earthquakes larger than M6 in the past half century.

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.

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

Map prepared by U.S. Geological Survey
National Earthquake Information Center
30 September 2010 (updated)
Map not approved for release by Director USGS