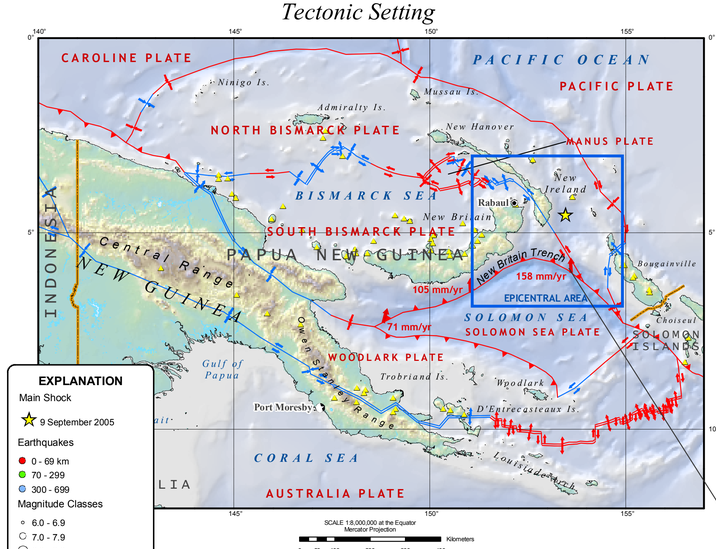
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

M7.7 New Ireland Earthquake of 9 September 2005

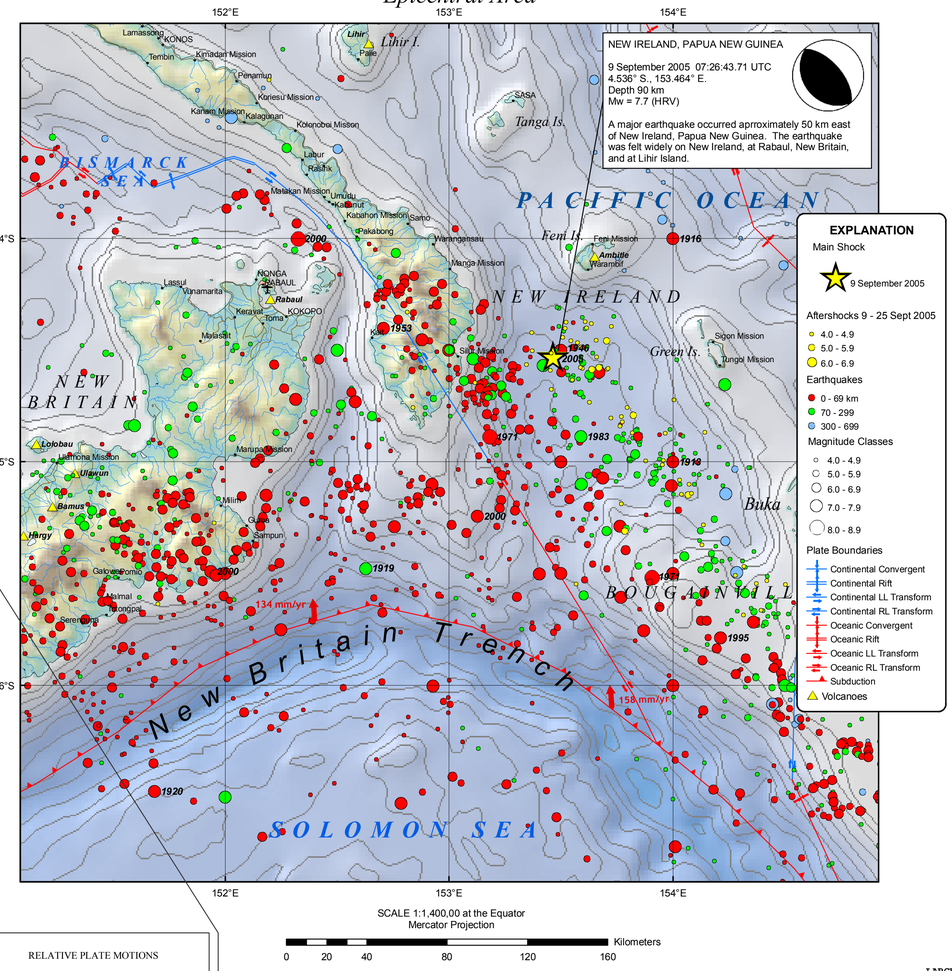
Tectonic Setting



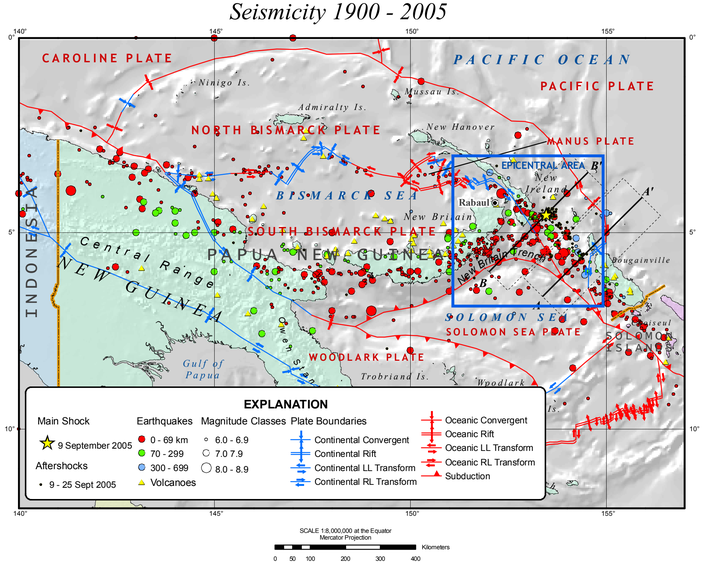
Generalized Seismic Hazard

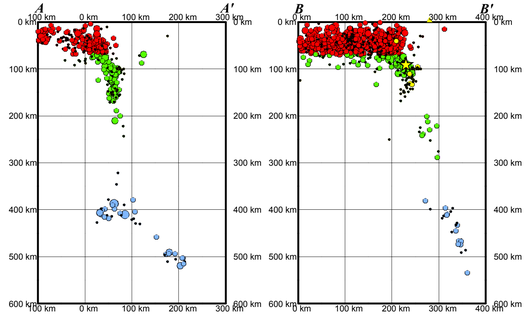
Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec², expected to be exceeded in a 50-yr period with a probability of 10 percent.

Epicentral Area



Seismicity 1900 - 2005





RELATIVE PLATE MOTIONS

The relative motion of adjacent tectonic plates is depicted on the map by short vectors shown at selected locations on the plate boundary. In this presentation, one of the plates is defined as the reference plate. The vector therefore represents the direction of motion of the adjacent plate relative to the reference plate. The rate of relative motion is labeled 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 dominant vector component is parallel to the plate margin.

If the South Bismarck plate is assumed to be the reference plate, the Solomon Sea plate is moving relative to it at a rate of about 70 - 160 mm/yr (Bird, 2003). The New Britain Trench is one surface expression of the rapid subduction of the Solomon Sea 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.

DISCUSSION

This intermediate-depth earthquake occurred within the lithosphere of the Solomon Sea plate, which is subducting generally to the north beneath the North Bismarck plate and the South Bismarck plate. The Solomon Sea, North Bismarck, and South Bismarck plates are all small plates within the broad region of convergence between the Australia plate and the Pacific plate. In this region, the Australia plate moves to the east-northeast with respect to the Pacific plate with a velocity of about 100 mm/yr. Earthquakes such as this one, that have focal-depths between 70 and 300 km, are commonly termed "intermediate-depth" earthquakes. Intermediate-depth earthquakes represent deformation within subducted plates, rather than deformation at plate boundaries. 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. The Solomon Sea plate in this region is seismically active to depths of over 500 km (see depth profiles at right).

LARGEST EARTHQUAKES 1900 - 2005
PAPUA NEW GUINEA AND VICINITY

YR	MO	DY	LAT	LON	DEPTH	MAG
1906	9	14	-7.000	149.000	0	8.0
1907	5	4	-7.500	153.700	60	7.7
1913	5	30	-5.000	154.000	0	7.7
1916	1	1	-4.000	154.000	0	7.7
1917	7	29	-3.500	141.000	0	7.6
1919	5	6	-5.477	152.629	233	7.6
1920	2	2	-6.474	151.685	35	7.6
1935	9	20	-3.920	141.330	35	8.1
1939	1	30	-7.080	155.386	35	7.7
1945	12	28	-6.000	150.000	0	7.6
1946	9	29	-4.500	153.500	0	7.6
1949	10	19	-5.500	154.000	60	7.5
1953	4	23	-4.402	152.708	35	7.6
1971	7	14	-5.519	153.906	45	8.0
1971	7	26	-4.889	153.183	37	8.1
1975	7	20	-6.612	155.097	60	7.7
1983	3	18	-4.887	153.589	89	7.7
1990	12	30	-5.118	150.962	177	7.5
1995	8	16	-5.788	154.213	30	7.7
2000	11	16	-4.001	152.327	17	8.0
2000	11	16	-5.243	153.127	33	7.8
2000	11	17	-5.491	151.936	26	7.8
2002	9	8	-3.302	142.945	13	7.8
2005	9	9	-4.539	153.474	90	7.7

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 Academic 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.

Environmental Systems Research Institute, Inc., 1992, 1993, Digital Chart of the World: ESRI, Data Dictionary and CD-ROM(4), Redlands, Calif., USA.

GLOBE Task Team and others, 1999, The Global Land One-Kilometer Base Elevation (GLOBE) Digital Elevation Model, Version 1.0: National Oceanic and Atmospheric Administration, Boulder, Colo., USA.

IOC, IHO, and BODC, 2003, Centenary Edition of the GEBCO Digital Atlas: CD-ROM(2), British Oceanographic Data Centre, Liverpool, UK.

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 (GSHAP, 1999)

PLATE TECTONICS
PB2002 (Bird, 2003)

VOLCANOES
Smithsonian Institution, Global Volcano Program

BASE MAP
ESRI (1992), Digital Chart of the World
GLOBE (1999)
IOC, IHO, and BODC (2003)
USGS, National Elevation Dataset (NED)

Map prepared by U.S. Geological Survey
National Earthquake Information Center
28 October 2005
Map not approved for release by Director USGS