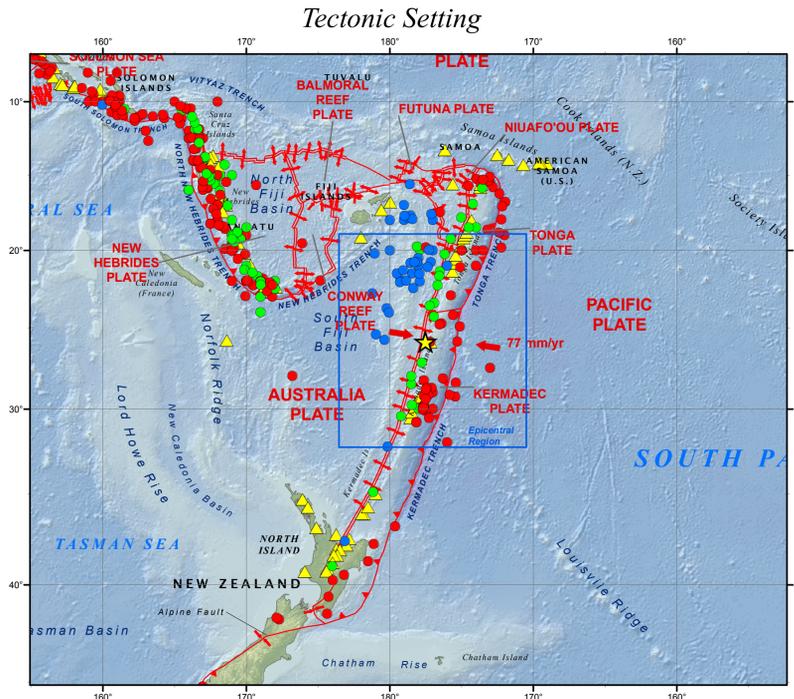
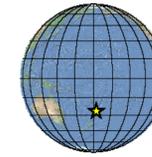


# M7.8 Kermadec- Tonga Trench Earthquake of 9 December 2007



RELATIVE PLATE MOTIONS

The broad red vectors represent the motion of the Pacific Plate relative to the Australia Plate. The motion of the Pacific Plate is westward with respect to the Australia Plate. The Tonga and Kermadec microplates are caught up in the

SCALE 1:25,000,000  
0 200 400 800 1,200 1,600 Kilometers

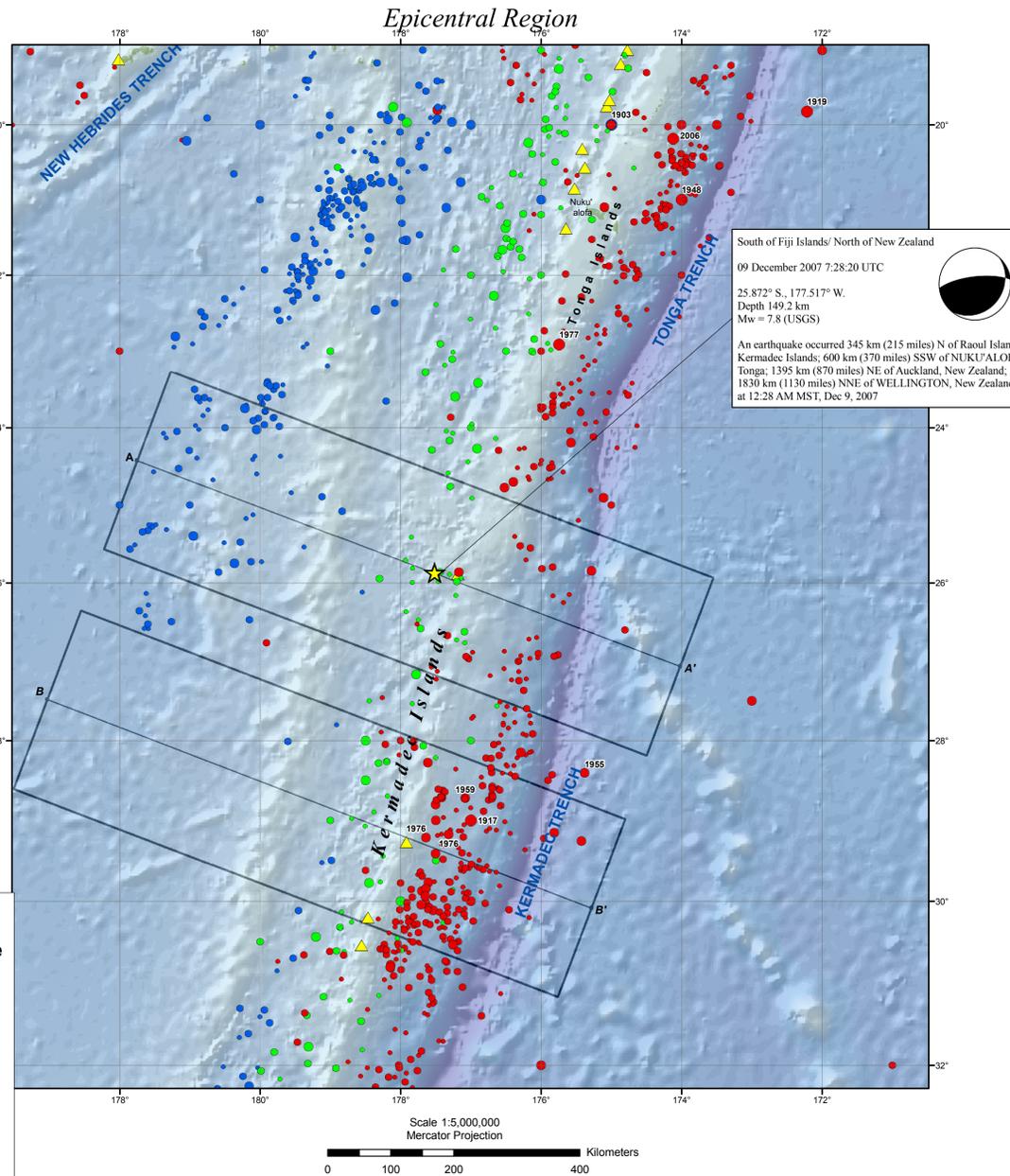
**EXPLANATION**

**Mag ≥ 7.0**

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

**Plate Boundary**

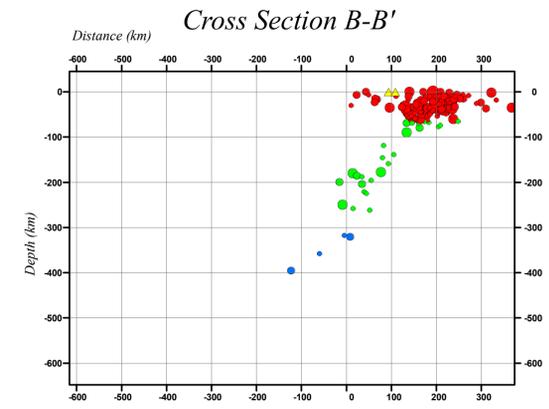
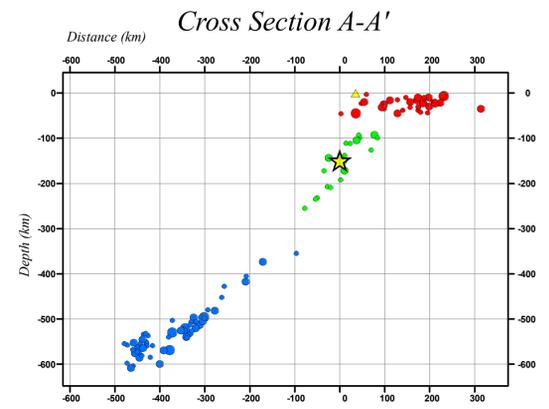
- Subduction
- Transform
- Divergent
- Convergent



South of Fiji Islands/ North of New Zealand  
09 December 2007 7:28:20 UTC  
25.872° S., 177.517° W.  
Depth 149.2 km  
Mw = 7.8 (USGS)

An earthquake occurred 345 km (215 miles) N of Raoul Island, Kermadec Islands; 600 km (370 miles) SSW of NUKU'ALOFA, Tonga; 1395 km (870 miles) NE of Auckland, New Zealand; 1830 km (1130 miles) NNE of WELLINGTON, New Zealand at 12:28 AM MST, Dec 9, 2007

Scale 1:5,000,000  
Mercator Projection  
0 100 200 400 Kilometers



**EXPLANATION**

**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

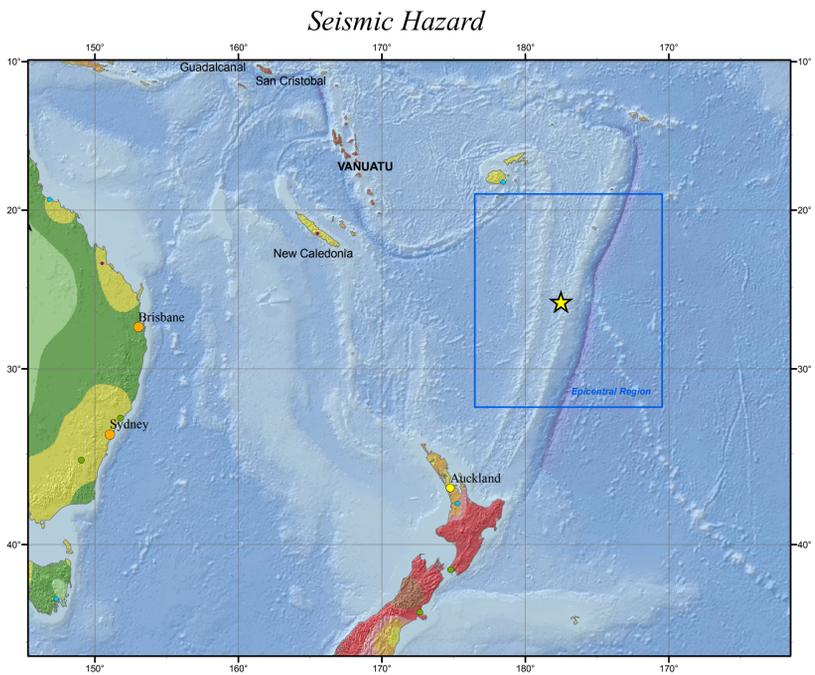
**DISCUSSION**

The December 9, 2007, M7.8 earthquake occurred in the Tonga - Kermadec subduction zone. The subduction zone, which is situated from the North Island of New Zealand to the north-northeast, is about 2500 km long. At a broad scale, tectonics of the subduction zone reflect the motion of the Pacific plate westward with respect to the interior of the Australia plate at a velocity of about 77 mm/y. The Pacific plate subducts beneath the Australia plate at the Tonga and Kermadec trenches, and dips to the west. In detail, the eastern edge of the broad Australia plate may itself be viewed as a collection of small plates or microplates that move with respect to each other and with respect to the Pacific plate and the Australia plate interior.

The interaction between the Pacific and Australia plate creates one of the most active tectonic environments in the world, with a high level of associated earthquake activity. Earthquakes occur on the thrust-fault interface between the Pacific and Australia plates, within the overriding Australia plate, and within the subducting Pacific plate. The December 9 earthquake occurred at depth of about 150 km within the Pacific plate and reflects stresses generated by the deformation of the Pacific plate as it is subducted. Earthquakes, such as this one, that have focal depths between 70 and 300 km are commonly termed "intermediate-depth" earthquakes. "Deep-focus" earthquakes, with focal depths greater than 300 km, also occur in the subducted Pacific plate in the Tonga - Kermadec subduction zone. Earthquakes have been reliably located to depths of nearly 700 km within the subduction zone.

**Significant Earthquakes Mag ≥ 7.8**

Year	Mon	Day	Time	Lat	Long	Dep	Mag
1903	01	04	0507	-20.000	-175.000	400	8.0
1917	05	01	1826	-29.000	-177.000	0	8.0
1919	04	30	0717	-19.823	-172.215	35	8.2
1948	09	08	1509	-21.000	-174.000	0	8.0
1955	02	27	2043	-28.406	-175.379	17.9	7.8
1959	09	14	1409	-28.722	-177.079	35	7.8
1976	01	14	1556	-29.213	-177.638	43.7	7.8
1976	01	14	1647	-29.172	-177.316	31.7	7.9
1977	06	22	1208	-22.912	-175.744	65.5	8.1
2006	05	03	1526	-20.187	-174.123	55	7.9



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

SCALE 1:25,000,000  
0 200 400 800 1,200 1,600 Kilometers

Peak Ground Acceleration in m/sec<sup>2</sup>

0.2 0.4 0.8 1.6 2.4 3.2 4.0 4.8

**DATA SOURCES AND REFERENCES**

**EARTHQUAKES AND SEISMIC HAZARD**  
USGS, National Earthquake Information Center  
NOAA, National Geophysical Data Center  
IASPEI, Centennial Catalog (1900 - 1999) and extensions Engdahl, E.R. and Villasehor, 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.  
HDF (unpublished earthquake catalog) (Engdahl, 2003)  
Global Seismic Hazard Assessment Program  
<http://www.seismo.ethz.ch/GSHAP/>

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

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

**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.

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