USGS science for a changing world

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

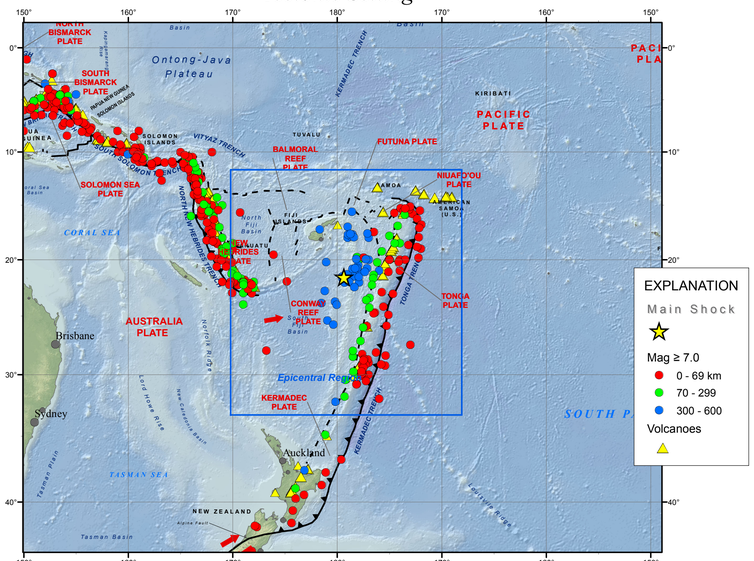
EARTHQUAKE SUMMARY MAP

Prepared in cooperation with the Global Seismographic Network

GSN

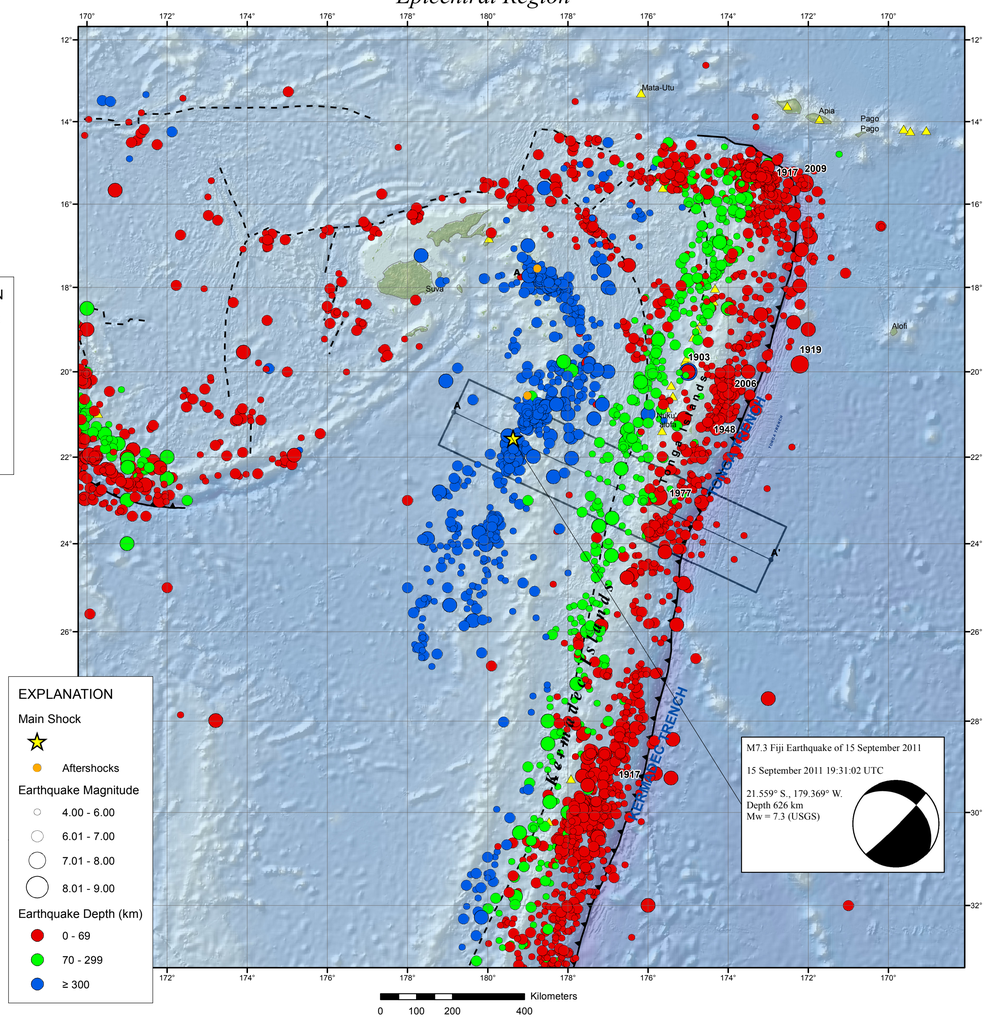
M7.3 Fiji Earthquake of 15 September 2011

Tectonic Setting

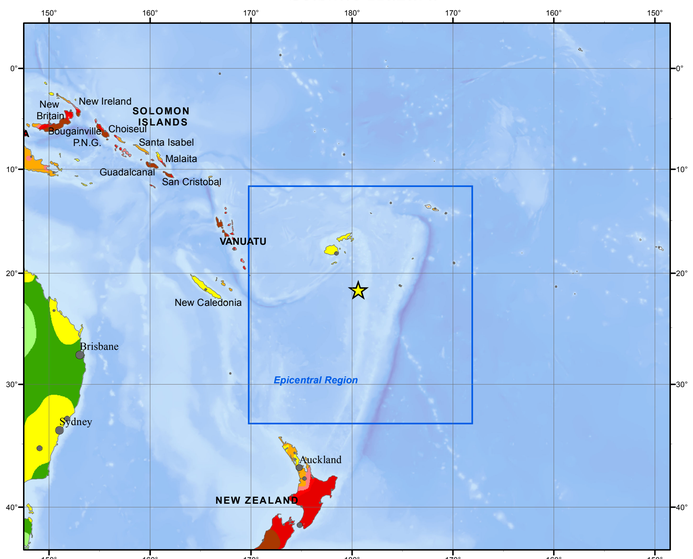


RELATIVE PLATE MOTIONS:
The broad red vector represents the motion of the Australia plate with respect to the Pacific plate in the epicentral region.

Epicentral Region



Seismic Hazard



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

PAGER

USGS science for a changing world — Earthquake Shaking: Green Alert — ANSS — USAID FROM THE AMERICAN PEOPLE

M 7.3, FIJI REGION
Origin Time: Thu 2011-09-15 19:31:02 UTC (07:31:02 local)
Location: 21.56°S 179.37°W Depth: 626 km

PAGER Version 2
Created: 47 minutes, 33 seconds after earthquake

Estimated Fatalities
Green alert for shaking-related fatalities and economic losses. There is a low likelihood of casualties and damage.

Estimated Economic Losses

Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (k = x1000)		- -*	18k	0	0	0	0	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 to population within the map area.

Population Exposure
population per ~1 sq. km from Landscan
0 | 5 | 50 | 100 | 500 | 1000 | 5000 | 10000

Structures:
Overall, the population in this region resides in structures that are vulnerable to earthquake shaking, though some resistant structures exist.

Historical Earthquakes (with MMI levels):

Date (UTC)	Dist. (km)	Mag.	Max MMI(#)	Shaking Deaths
1979-10-01	383	5.6	V(92k)	0
1983-12-23	398	5.5	VI(26k)	0
1977-06-22	390	8.0	VII(47k)	0

Recent earthquakes in this area have caused secondary hazards such as tsunamis that might have contributed to losses.

Selected City Exposure
from GeoNames.org

MMI	City	Population

bold cities appear on map (k = x1000)

PAGER content is automatically generated, and only considers losses due to structural damage. Limitations of input data, shaking estimates, and loss models may add uncertainty.
http://earthquake.usgs.gov/pager

Event ID: usc0005vcv

Significant Earthquakes Mag >= 8.0

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
1917	06	26	0549	-15.500	-173.000	0	8.5
1919	04	30	0717	-19.823	-172.215	35	8.2
1948	09	08	1509	-21.000	-174.000	0	8.0
1977	06	22	1208	-22.912	-175.744	65.5	8.1
2006	05	03	1526	-20.187	-174.123	55	8.0
2009	09	29	1748	-15.489	-172.095	18	8.1

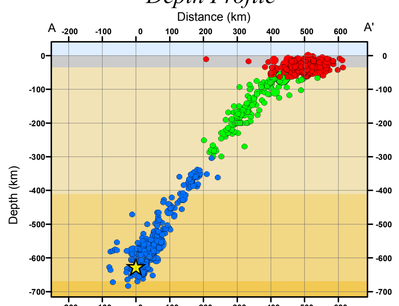
TECTONIC SUMMARY

The Fiji region earthquake of September 15, 2011 occurred at a depth of approximately 630 km beneath the Earth's surface as a result of oblique-reverse faulting within the subducting Pacific slab. At the latitude of this earthquake, the Pacific plate moves approximately due west with respect to the interior of the Australia plate at a rate of 75 mm/yr. The Pacific plate is seismically active west of the September 15 epicenter to depths of over 650 km. The geometry of the Pacific plate at depth is known to be quite complex, and may involve interactions between the Pacific plate proper and one or more relict slab fragments. The stresses generating the September 15 earthquake likely result from the slow deformation within the interior of one of these slabs, near the base of the mantle transition zone.

Earthquakes that have focal-depths greater than 300 km are commonly termed "deep-focus" earthquakes, as distinguished from "shallow-focus" earthquakes, having depths less than 70 km, and "intermediate-depth" earthquakes, having depths between 70 and 300 km. Intermediate-depth and deep-focus earthquakes represent deformation within subducted plates, rather than deformation at plate boundaries. Intermediate-depth and deep-focus 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 and deep-focus earthquakes may be felt at great distances from their epicenters.

The subducting Pacific plate beneath Fiji, which initiates its westward decent beneath the eastern edge of the Australia plate at the Tonga Trench, is one of the most seismically active regions in the world. Over the past 37 years, there have been well over 3000 deep-focus earthquakes within 200 km of the September 15 event. Of these, 14 had magnitudes of M 6.5 or greater. The largest was an M 7.7 earthquake 15 km to the southwest and 50 km shallower in August of 2002.

Depth Profile



Cross-section defined by profile boundaries shown on the Epicenter Map

Earthquake locations are labeled by year on the Epicentral Region map.

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 and Villaseñor, 2002)
EHB catalog (Engdahl et al., 1998)
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.
Engdahl, E.R., van der Hilst, R., and Buland, R., 1998, Global teleseismic earthquake relocation with improved travel times and procedures for depth determination: Bull. Seism. Soc. Am., v. 88, no. 3, p. 722-743.)
Engdahl, E.R. and Villaseñor, A., 2002, Global Seismicity: 900 - 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.

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 regraded as having official significance.

Map prepared by U.S. Geological Survey National Earthquake Information Center
16 September 2011
http://earthquake.usgs.gov/
Map not approved for release by Director USGS