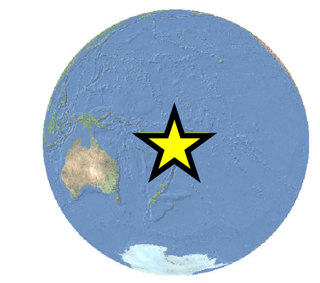
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

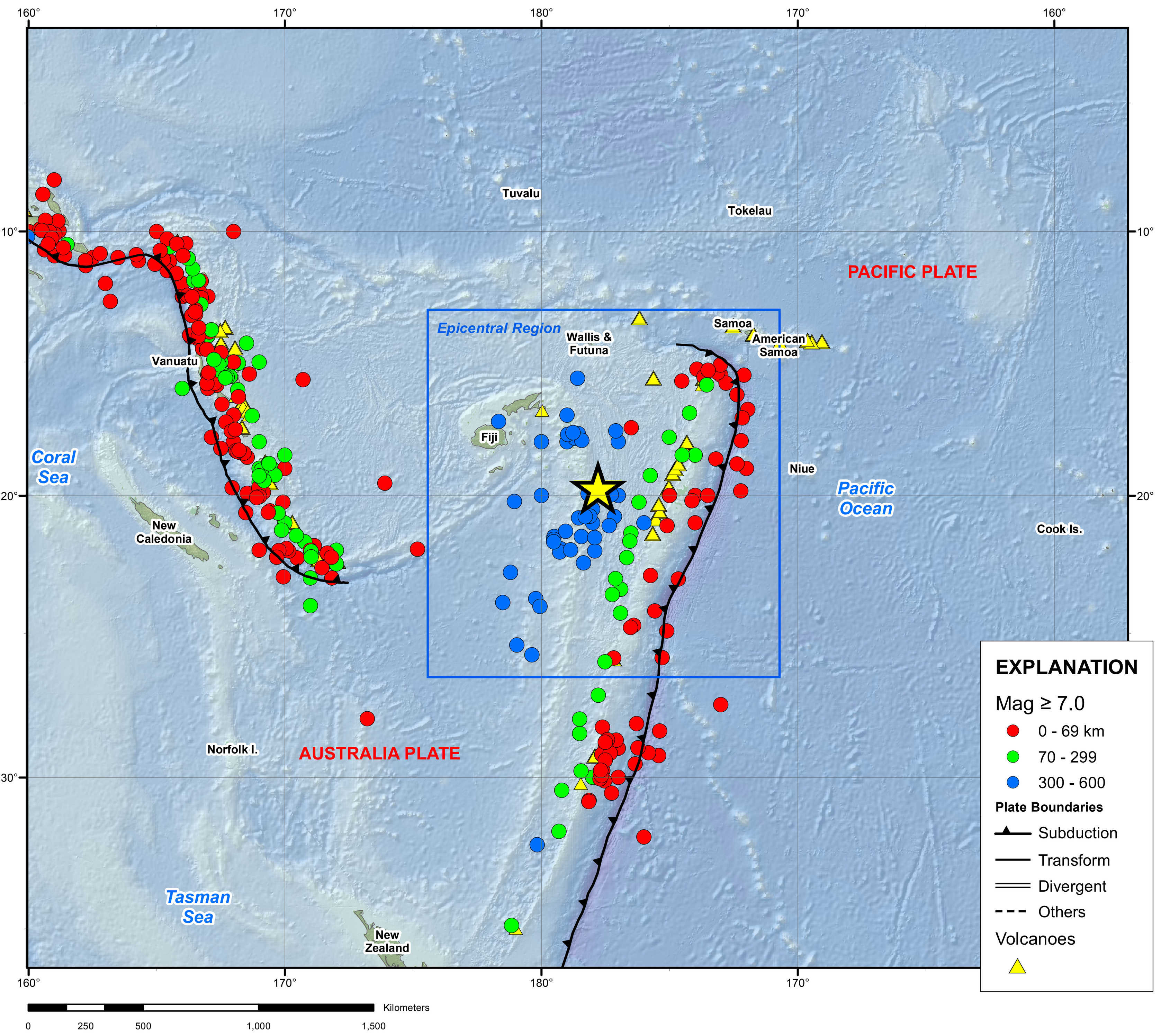
EARTHQUAKE SUMMARY MAP

Prepared in cooperation with the Global Seismographic Network

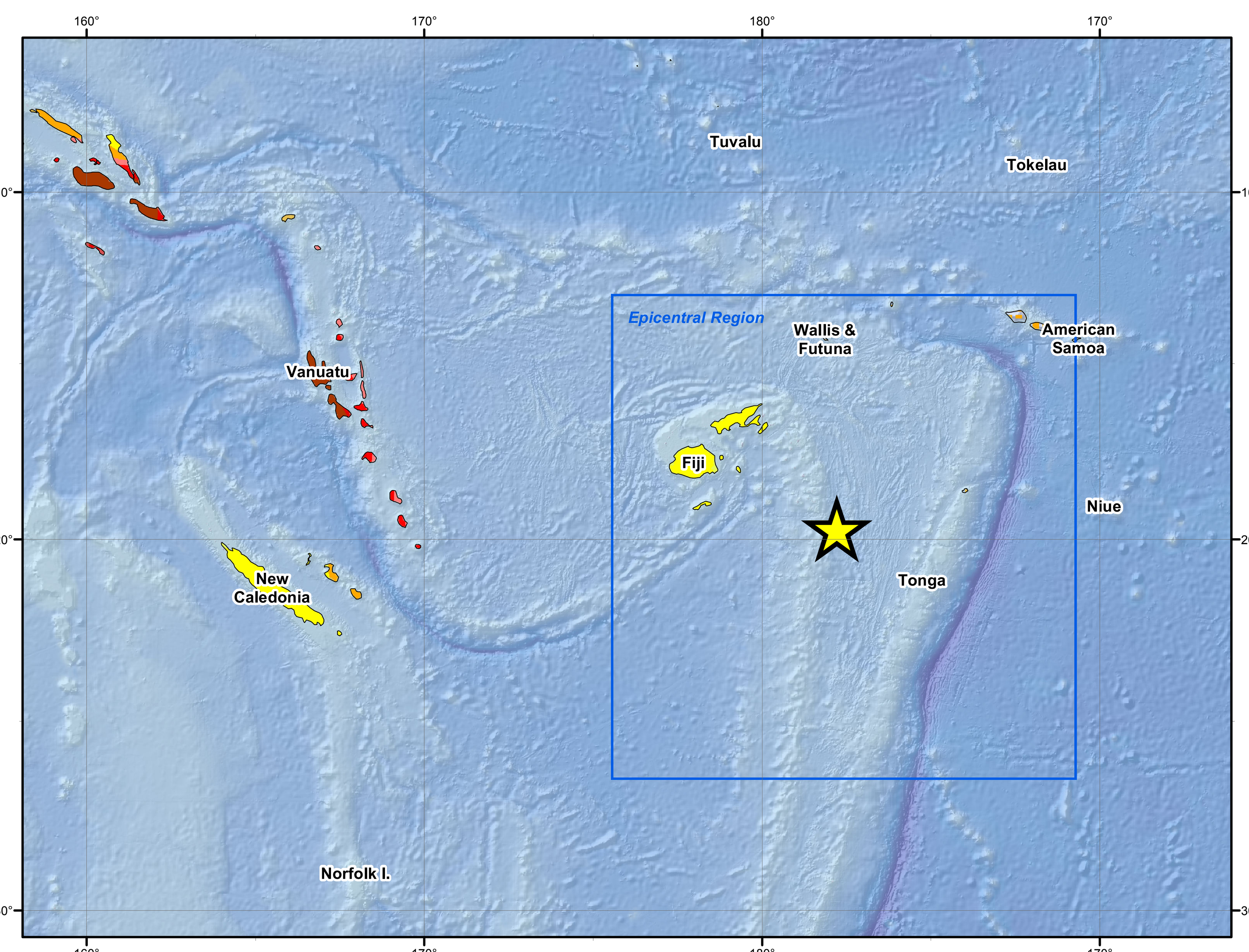
M7.1 Offshore Fiji Earthquake of 01 November 2014



Tectonic Setting



Seismic Hazard

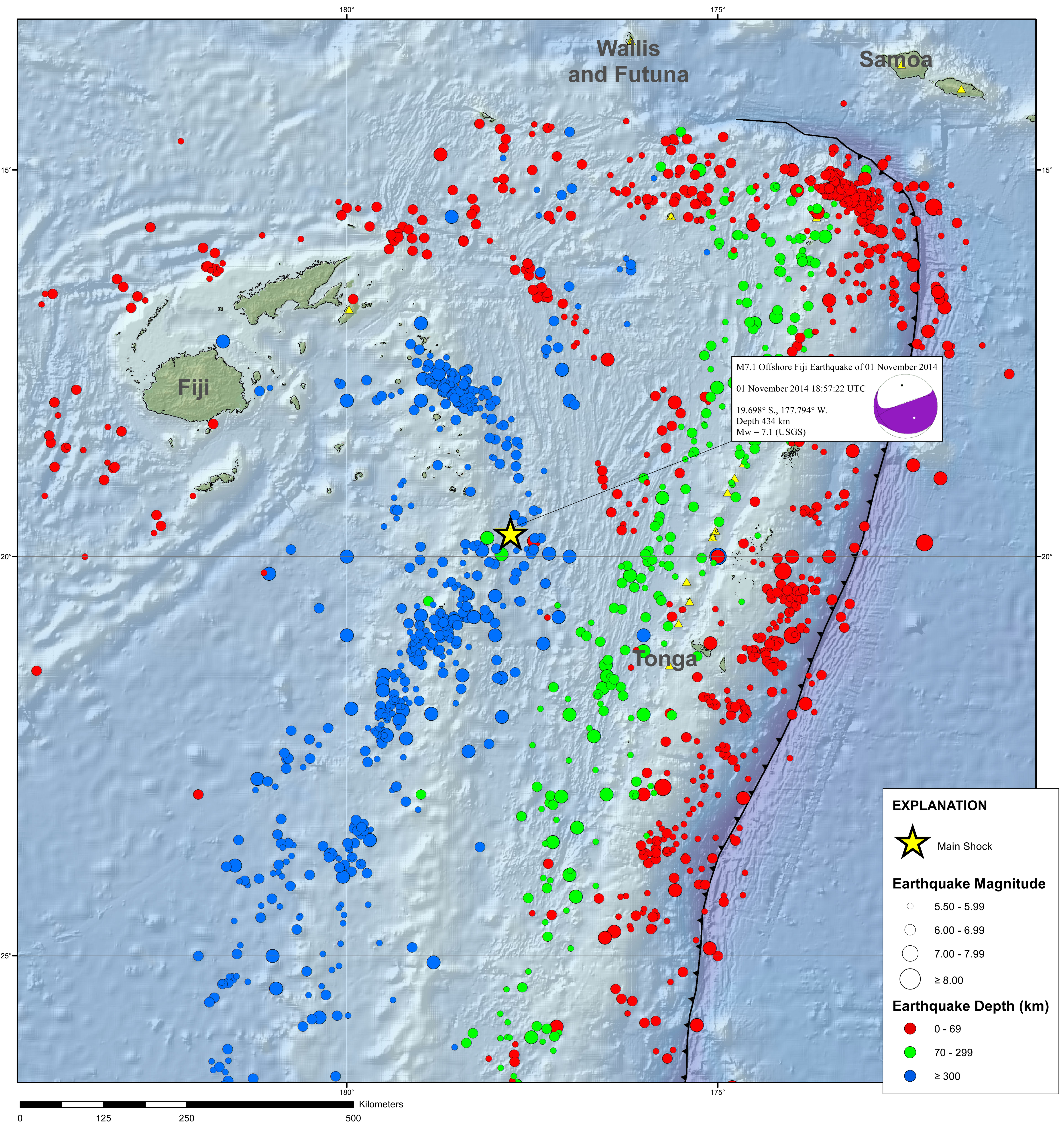


Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec², expected to be exceeded in a 50-yr period with a probability of 10 percent.

Peak Ground Acceleration in m/sec**2

.2 .4 .8 1.6 2.4 3.2 4.0 4.8

Epicentral Region



TECTONIC SUMMARY

The eastern margin of the Australia plate is one of the most seismically active areas of the world due to high rates of convergence between the Australia and Pacific plates. In the region of New Zealand, the 3000 km long Australia-Pacific plate boundary extends from south of Macquarie Island to the southern Kermadec Island chain. It includes an oceanic transform (the Macquarie Ridge), two oppositely verging subduction zones (Puysegur and Hikurangi), and a transpressive continental transform, the Alpine Fault through South Island, New Zealand.

North of New Zealand, the Australia-Pacific boundary stretches east of Tonga and Fiji to 250 km south of Samoa. For 2,200 km the trench is approximately linear, and includes two segments where old (>120 Myr) Pacific oceanic lithosphere rapidly subducts westward (Kermadec and Tonga). At the northern end of the Tonga trench, the boundary curves sharply westward and changes along a 700 km-long segment from trench-normal subduction, to oblique subduction, to a left lateral transform-like structure.

Australia-Pacific convergence rates increase northward from 60 mm/yr at the southern Kermadec trench to 90 mm/yr at the northern Tonga trench; however, significant back arc extension (or equivalently, slab rollback) causes the consumption rate of subducting Pacific lithosphere to be much faster. The spreading rate in the Havre trough, west of the Kermadec trench, increases northward from 8 to 20 mm/yr. The southern tip of this spreading center is propagating into the North Island of New Zealand, rifting it apart. In the southern Lau Basin, west of the Tonga trench, the spreading rate increases northward from 60 to 90 mm/yr, and in the northern Lau Basin, multiple spreading centers result in an extension rate as high as 160 mm/yr. The overall subduction velocity of the Pacific plate is the vector sum of Australia-Pacific velocity and back arc spreading velocity: thus it increases northward along the Kermadec trench from 70 to 100 mm/yr, and along the Tonga trench from 150 to 240 mm/yr.

PAGER

M 7.1, FIJI REGION

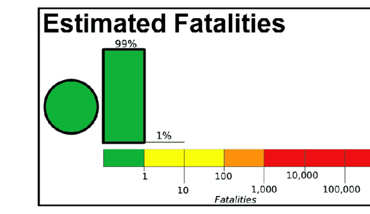
Origin Time: Sat 2014-11-01 18:57:22 UTC (06:57:22 local)
Location: 19.70°S 177.79°W Depth: 434 km

Earthquake Shaking Green Alert

PAGER Version 3

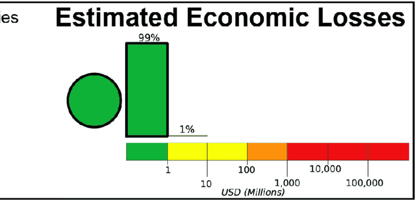
Created: 2 hours, 3 minutes after earthquake

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

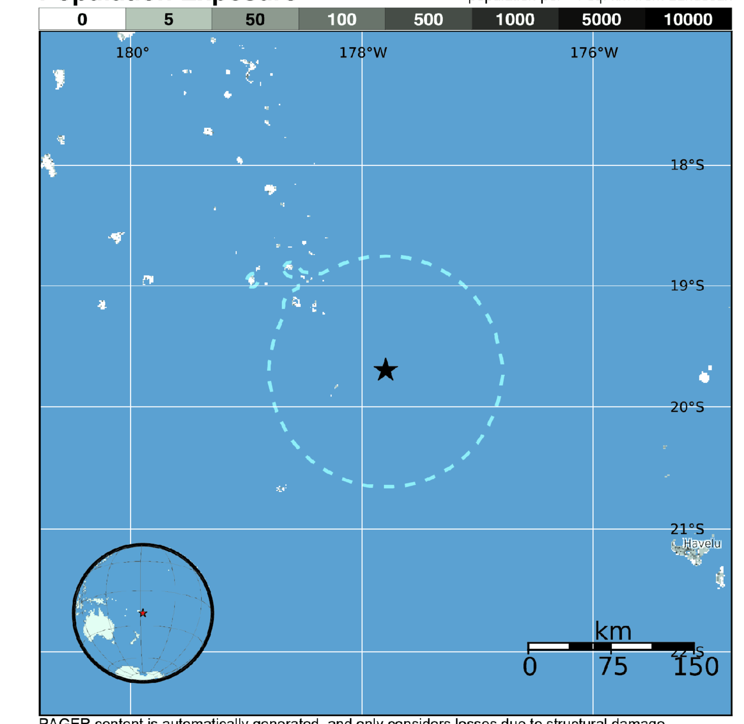
ESTIMATED POPULATION EXPOSURE (k = x1000)		- -*	72k*	32k	0	0	0	0	0	0
ESTIMATED MODIFIED MERCALLI INTENSITY		I	II-III	IV	V	VI	VII	VIII	IX	X+
PERCEIVED SHAKING		Not felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	Resistant Structures	none	none	none	V. Light	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy
	Vulnerable Structures	none	none	none	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy	V. Heavy

*Estimated exposure only includes 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
1983-05-15	255	6.6	V(6k)	0
1983-03-21	333	6.7	VII(53k)	0
2006-05-03	390	8.0	VIII(9k)	0

Selected City Exposure

from GeoNames.org

MMI	City	Population
IV	Vaini	3k
III	Havelu	3k
III	'Ohonua	1k
III	Nuku'alofa	22k

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: usc000stdc

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)
EHB catalog (Engdahl et al., 1998)
HDF (unpublished earthquake catalog, Engdahl, 2003)
Global Seismic Hazard Assessment Program

PLATE TECTONICS AND FAULT MODEL
PB2002 (Bird, 2003)
Ji, C., D.J. Wald, and D.V. Helmberger, Source description of the 1999 Hector Mine, California earthquake; Part I: Wavelet domain inversion theory and resolution analysis, Bull. Seism. Soc. Am., Vol 92, No. 4. pp. 1192-1207, 2002.
DeMets, C., Gordon, R.G., Argus, D.F., 2010. Geologically current plate motions, Geophys. J. Int. 181, 1-80.

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

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 Villasenor, 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.

DISCLAIMER

Map updated by U.S. Geological Survey National Earthquake Information Center
03 November 2014
http://earthquake.usgs.gov/
Map not approved for release by Director USGS