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

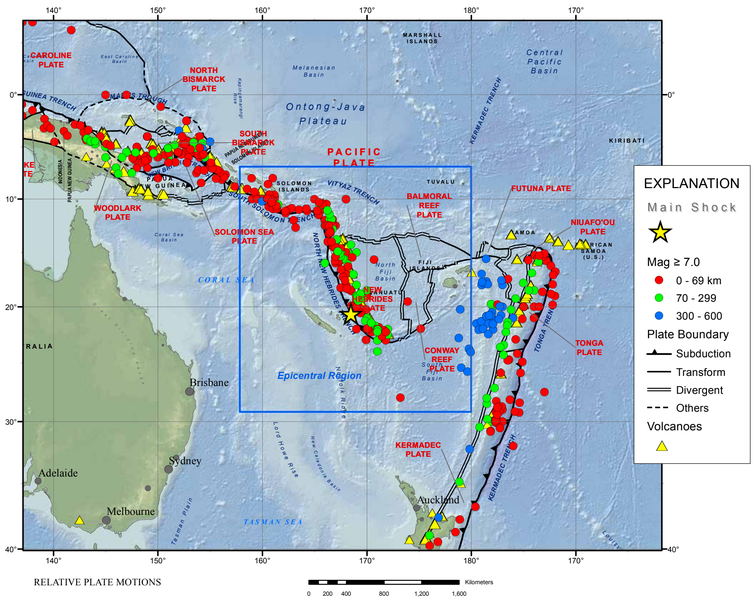
EARTHQUAKE SUMMARY MAP

Prepared in cooperation with the Global Seismographic Network

GSN

M7.0 Loyalty Islands Earthquake of 13 January 2011

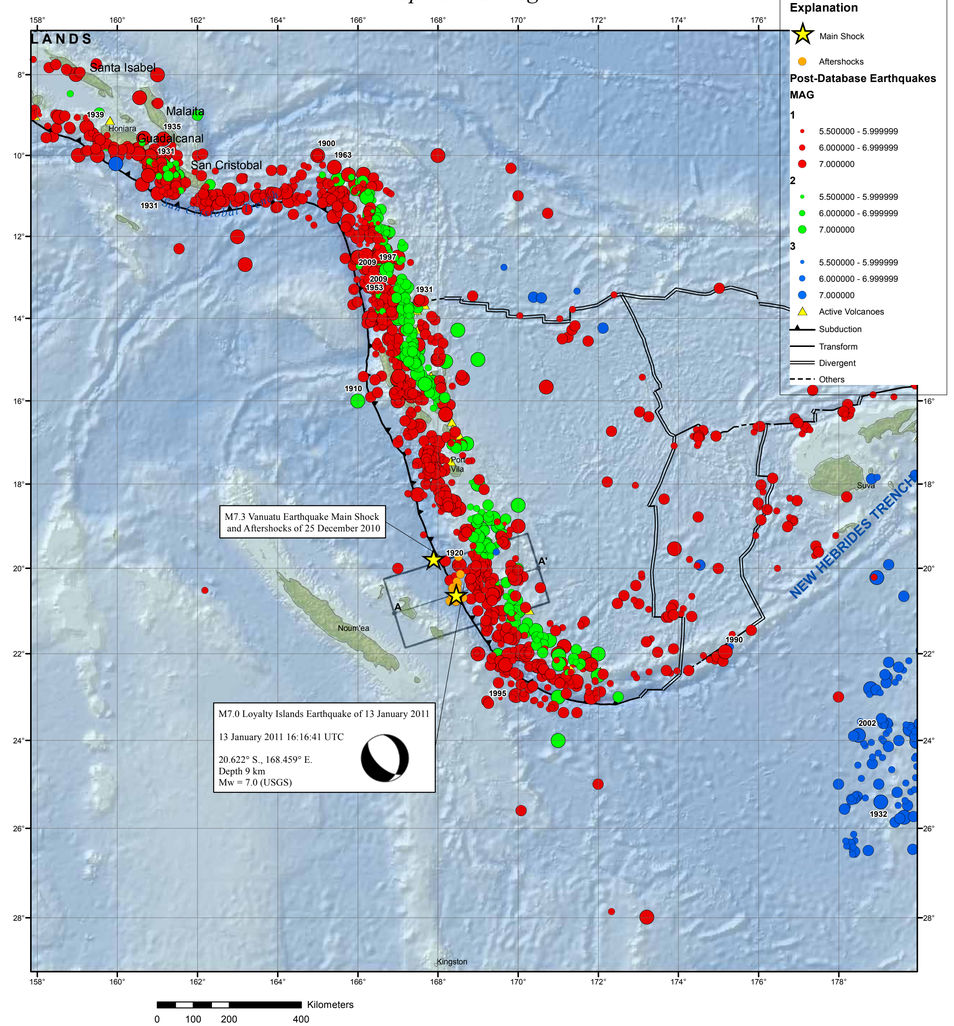
Tectonic Setting



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



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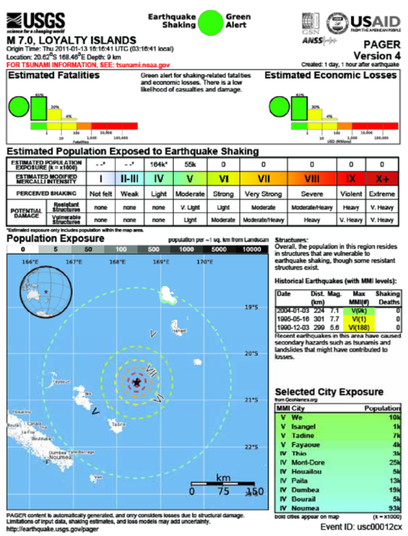
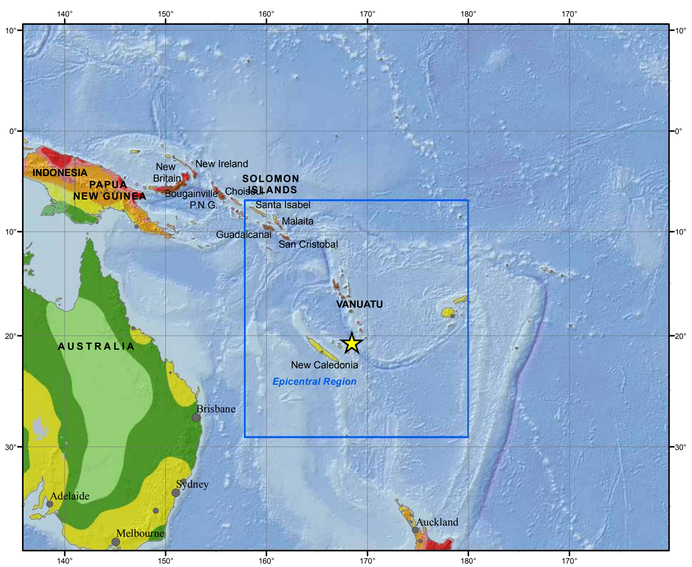


Year	Mon	Day	Time	Lat	Long	Dep	Mag
1900	07	29	0659	-10.000	165.000	0	7.6
1901	08	09	1301	-22.000	170.000	0	7.9
1910	06	16	0630	-19.000	169.500	100	7.9
1910	11	09	0602	-16.000	166.000	70	7.5
1913	10	14	0808	-19.500	169.000	230	7.6
1920	09	20	1439	-19.919	168.530	35	7.8
1928	03	16	0501	-22.281	170.476	35	7.5
1931	10	03	1913	-10.932	161.016	35	7.8
1931	10	10	0020	-9.968	161.194	50.2	7.7
1932	05	26	1609	-25.399	179.049	568	7.5
1934	07	18	1940	-11.907	166.731	35	7.8
1935	12	15	0707	-9.590	161.145	35	7.5
1939	04	30	0255	-9.295	159.234	35	7.9
1953	11	04	0349	-13.189	166.516	35	7.5
1963	09	15	0046	-10.472	165.770	35	7.5
1963	09	17	1920	-10.286	165.413	27.6	7.5
1965	05	20	0040	-14.642	167.504	9.7	7.6
1965	08	11	2231	-15.797	167.268	45.8	7.6
1966	06	15	0059	-10.344	160.887	3.3	7.5
1966	12	31	1823	-11.893	166.445	82.9	7.5
1969	01	05	1326	-7.991	158.968	63	7.5
1970	08	11	1022	-14.093	166.571	38.3	7.5
1970	08	11	1022	-14.095	166.570	39.1	7.5
1973	12	28	1341	-14.500	166.784	23.3	7.8
1980	07	08	2319	-12.487	166.482	56	7.5
1980	07	08	2319	-12.487	166.483	56.6	7.5
1980	07	17	1942	-12.504	166.011	31.6	7.8
1980	07	17	1942	-12.505	166.010	31.9	7.8
1980	10	25	1100	-21.941	170.056	39	7.5
1980	10	25	1100	-21.942	170.053	39.6	7.5
1981	07	06	0308	-22.251	171.814	30	7.6
1981	07	06	0308	-22.251	171.814	30	7.6
1984	02	07	2133	-9.957	160.522	17	7.6
1988	08	10	0438	-10.258	160.896	36.1	7.6
1990	03	03	1216	-21.956	175.171	35.5	7.6
1995	05	16	2012	-22.968	169.945	23.6	7.7
1997	04	21	1202	-12.560	166.738	29.8	7.7
1998	01	04	0611	-22.239	171.017	97.1	7.5
1998	01	04	0611	-22.242	171.019	97.2	7.5
2002	08	19	1108	-23.884	178.495	675	7.7
2009	10	07	2203	-13.006	166.510	45	7.7
2009	10	07	2218	-12.517	166.382	35	7.8

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

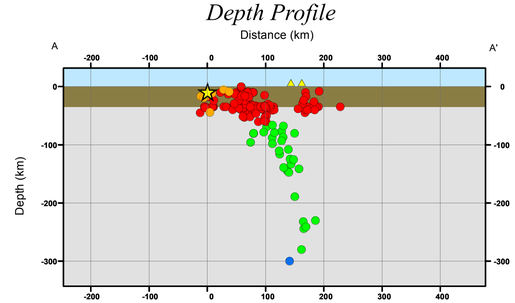
DISCUSSION

The Loyalty Islands (New Hebrides trench) earthquake of January 13, 2011, occurred as the result of normal-faulting within the Australia plate, in the region of the boundary between the Australia plate and the Pacific plate. In the epicentral region of the earthquake, the Australia plate moves east-northeast relative to the Pacific plate with a velocity of about 8 cm/yr. The Australia plate subducts beneath the Pacific plate at the New Hebrides trench and is seismically active northeast of the epicenter of the January 13 earthquake to a depth of 300 km. The stresses that generated the earthquake result from the bending of the Australia plate as it subducts beneath the Pacific plate.

The New Hebrides arc region of the Australia/New Hebrides plate-boundary experiences numerous strong earthquakes. In the past quarter century, the thousand kilometer section of the arc centered near the epicenter of the January 13 earthquake has produced 19 earthquakes of magnitude 7 or greater, the largest having magnitude 7.7.

The western margin of the Pacific plate that lies to the east of the New Hebrides trench is commonly viewed as being subdivided into several microplates that move with respect to each other at rates of a few cm/yr.

Depth Profile



Cross-section defined by profile boundaries shown on the Epicenter 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, 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.
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.

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 signifiance.

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