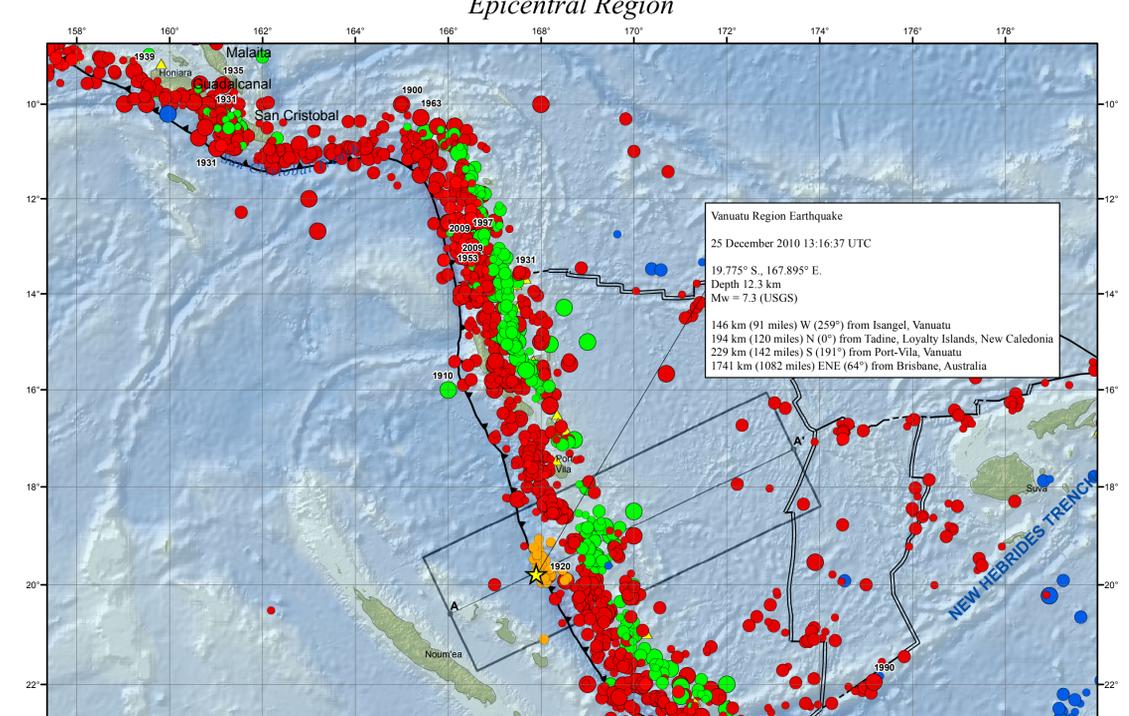
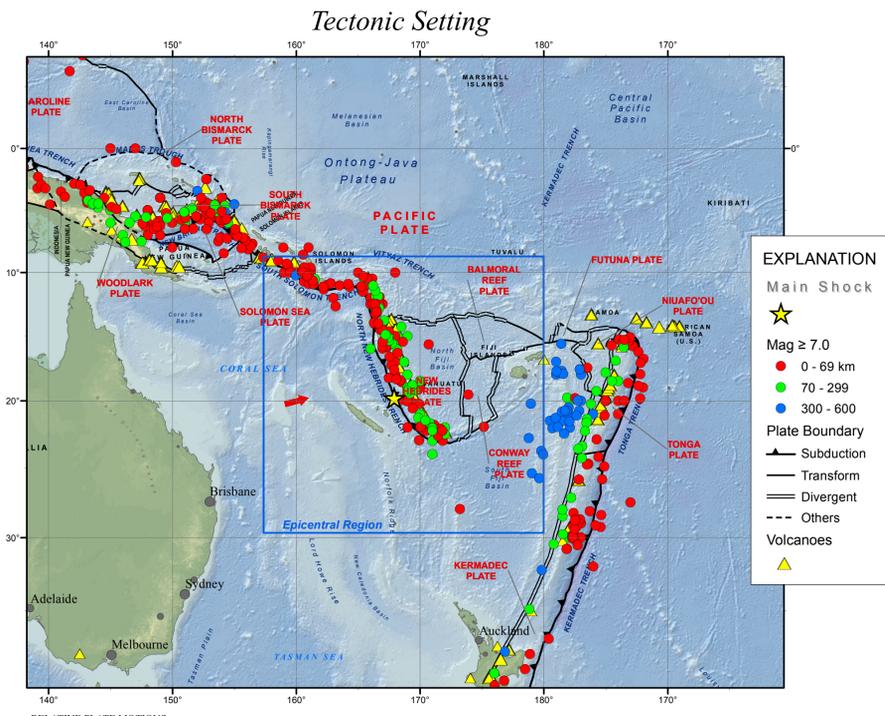




Prepared in cooperation with the  
Global Seismographic Network

# M7.3 Vanuatu Region Earthquake of 25 December 2010



**USGS Earthquake Shaking Green Alert**

**M 7.3, VANUATU REGION**  
Origin Time: Sat 2010-12-25 13:16:37 UTC (00:16:37 local)  
Location: 19.775°S 167.895°E Depth: 12.3 km  
FOR TSUNAMI INFORMATION, SEE: [tsunami.noaa.gov](http://tsunami.noaa.gov)

**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 (N x 1000)	I	II-III	IV	V	VI	VII	VIII	IX	X+
ESTIMATED MODIFIED MACALELINTENSITY	Not felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
PERCEIVED SHAKING	none	none	none	Light	Moderate	Moderate/Strong	Moderate/Heavy	Heavy	V. Heavy
POTENTIAL DAMAGE	none	none	none	Light	Moderate	Moderate/Heavy	Heavy	V. Heavy	V. Heavy

**Population Exposure**

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):**

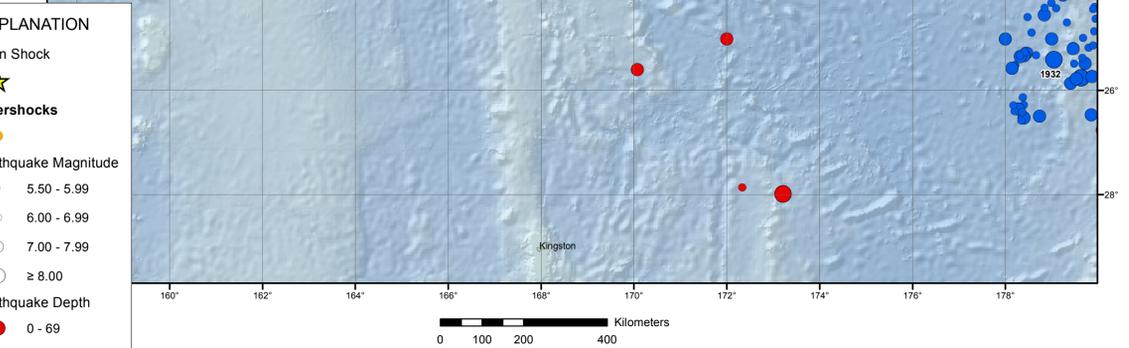
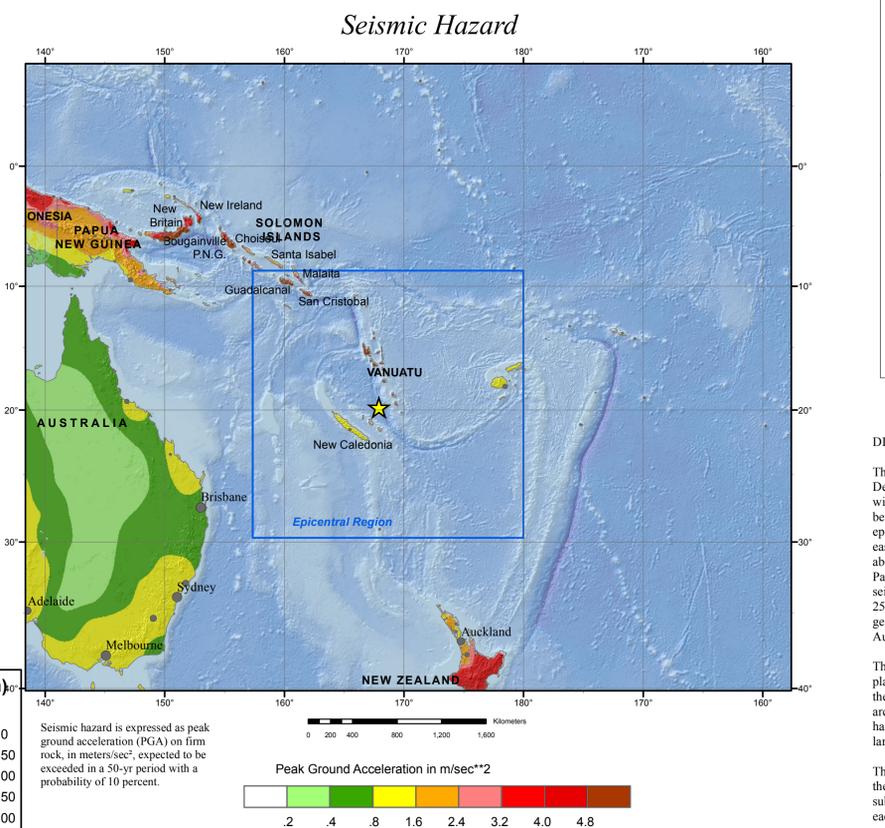
Date	Dist. (km)	Mag.	Max. Shaking (MMI)	Deaths
1981-02-17	229	6.7	VIII	0
2004-01-03	334	7.1	VIII	0
1996-12-03	350	5.8	VI	0

**Selected City Exposure**

MMI City	Population
V Isangel	14
V We	104
V Fayouou	44
V Tadiue	71
V Port-Vila	364
V Thio	34
IV Poidimlie	34
IV Mont-Dore	254
IV Dumbéa	194
IV Pailia	134
IV Noumea	934

**RELATIVE PLATE MOTIONS**

The broad red vector represents the motion of the Australia plate with respect to the Pacific plate to the east of the North New Hebrides trench. The western margin of the Pacific plate that lies to the east of the North 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. The microplate model and nomenclature of Bird (2003) are represented in this poster.



### Significant Earthquakes Mag $\geq 7.5$

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	-22.251	171.814	30	7.6
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
1965	05	20	0040	-14.642	167.504	9.7	7.6
1965	08	11	2231	-15.797	167.268	45.8	7.6
1970	08	11	1022	-14.095	166.570	39.1	7.5
1980	07	08	2319	-12.487	166.482	56	7.5
1980	07	17	1942	-12.504	166.011	31.6	7.8
1980	10	25	1100	-21.941	170.056	39	7.5
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
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

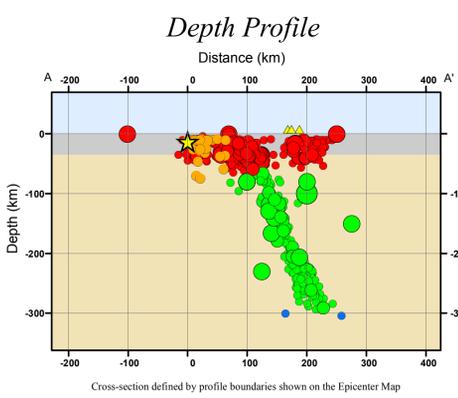
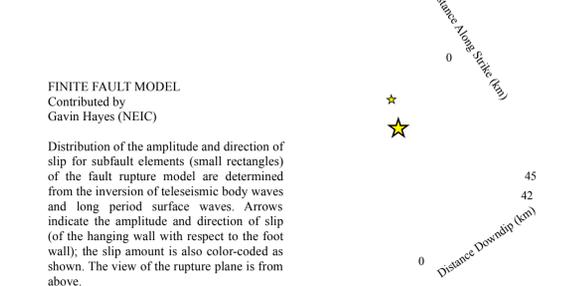
### DISCUSSION

The Vanuatu (North New Hebrides trench) earthquake of December 25, 2010, 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 North New Hebrides trench and is seismically active northeast of the epicenter of the December 25 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 on the epicenter of the December 25 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.

### Finite Fault Model for M7.3 Earthquake



**DATA SOURCES and REFERENCES**

**EARTHQUAKES**  
USGS, National Earthquake Information Center  
NOAA, National Geophysical Data Center  
IASPEI, Centennial Catalog (1900 - 1999) and Engdahl, E.R. and Villaseñor, A., 2002, Global Seismicity 1900 - 1999, chap. 4 of Lee, W.H.K., and others, eds., International Earthquake and Engineering Seismology, Part A: New York, N.Y., Elsevier Academic Press, 932 p.  
EHB catalog (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.)  
HDF (unpublished earthquake catalog, Engdahl, 2003)

**SEISMIC HAZARD**  
Global Seismic Hazard Assessment Program, <http://www.seismo.ethz.ch/GSHAP/>

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

**BASE MAP**  
NIMA and ESRI, Digital Chart of the World  
USGS, EROS Data Center  
<http://earthquake.usgs.gov/>  
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  
28 December 2010  
<http://earthquake.usgs.gov/>  
Map not approved for release by Director USGS