

Summary of Earthquakes and Tsunamis Affecting Fiji 1850-2004

The Republic of the Fiji Islands is comprised of 332 mountainous islands of volcanic origin, and is located between two major tectonic plates, the Pacific Plate, and the Indo-Australian Plate. Fiji’s island environment and proximity to the Pacific “Ring of Fire” makes it vulnerable to both earthquakes and tsunamis. While it should be assumed that earthquakes and tsunamis have affected Fiji throughout its history, the first written historical accounts begin around 1850. The following sections recount significant earthquakes and tsunami events that have affected Fiji from 1850 to 2004.

Earthquakes

Since 1918, when reliable recording of seismic events in Fiji began, a potentially dangerous earthquake of magnitude 6.0 or more has statistically occurred on an average of once every three years.¹ The largest earthquakes in Fiji during this time have occurred in the northeastern region of the country, considered to be the Islands’ most active earthquake zone. A list of some of the more strongly felt earthquakes between 1850 and 2001 are presented in Table 1, some of which are described in more detail below. It should be noted that all of these examples can be characterized as “Local Earthquake Events.”

Table 1 Strong Earthquakes Felt in Fiji – 1850 to 2001²

Date of Occurrence		Magnitude (MS)	Epicenter Location	Place Felt	Intensity (Modified Mercalli)	Deaths / Injuries
About 1850		6.5?	19.0S 178.0E	Kadavu	VIII	30-40 deaths
1869	Oct 2	5-6	17.8S 178.3E	Upper Rewa River	VII	None reported
1884	Jan (?)	6.8?	16S 179E	Naduri, (Macuata)	VII	None reported
1902	Aug 3	6.8?	16.7S 177.2E	Yasawas, Ba	VII	None reported
1919	Oct 3	6.9	16.4S 180.0	Rabi, Tunuloa	VIII	None reported
1921	Sep 30	6.7	17.0S 176.5E	Lautoka, Nadarivatu	V	None reported

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Date of Occurrence		Magnitude (MS)	Epicenter Location	Place Felt	Intensity (Modified Mercalli)	Deaths / Injuries
1928	Jun 21	7.0	17.0S 179.5W	Taveuni	VI	None reported
1932	Feb 17	6.6	16.2S 179.7W	Rabi, Tunuloa	VII	None reported
1932	Mar 9	6.5	17.5S 179.6E	Koro, Ovalau, Savusavu, Rabi, and northern Taveuni	VII	None reported
1950	Feb 13	6.5	18.9S 177.8E	Kadavu	VI	None reported
1953	Sep 14	6.8	18.25S 178.25E	Suva, Navua	VII	8 deaths (5 due to tsunami)
1957	Jan 3	5.0	16.7S 179.8E	Taveuni	VI	None reported
1979	Nov 17	6.9	16.5S 179.75W	Taveuni	VIII	None reported
1983	Jul 19	4.8	19.06S 177.77E	Kadavu	VI	None reported
1984	Oct 13	6.1	16.79S 177.3E	Yasawas	VI	None reported
1998	Nov 2	6.0	19.4S 177.5E	Kadavu	VII	None reported
2001	Feb 14	5.8	19.0S 177.4E	Kadavu	VI	None reported
2001	Sep 3	6.0	16.2S 178.3E	Bua, Labasa, Yasawa, Suva	VI	None reported

Local Earthquake Event (about 1850)

The first documented historical earthquake in Fiji occurred about 1850. The account describes an “earthquake that had been felt throughout the greater part of Feejee, but was so tremendous in Kantavu that the earth opened in several parts and destroyed a great number of people. In one part it shook down a large cave and buried thirty or forty women who had taken shelter for the night, having been on a fishing excursion. In another part of Buke-levu it shook down a part of the head bluff and did great damage.”³

Local Earthquake Event (1932)

On March 9, 1932 a 6.5 Magnitude earthquake centered just southeast of the island of Koro triggered a significant landslide that washed part of a village into the sea, and damaged a reef lighthouse. Many other buildings were severely damaged, including a stone church at Napuka. Mud volcanoes⁴ and changes to natural water supplies were also

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reported. The earthquake was felt in Koro, Ovalau, Savusavu, Rabi, and northern Taveuni.

Local Earthquake Event (1953)

On 14 September 1953, a 6.8 Magnitude earthquake originating offshore from Suva, Viti Levu triggered a carbonate (coral reef) platform collapse, which in turn generated what is considered the most damaging local tsunami to affect Fiji in recorded history (see tsunami section below). Five people perished as a result of the tsunami waves. Three others died in the earthquake. Table 2 lists the estimated cost of repairs to government structures as summarized by the Public Works Department. Approximately ninety percent of the damage from this earthquake and tsunami event resulted from the earthquake itself.

Table 2: Cost of Repair to Government Buildings - 1953 British Pounds⁵

Infrastructure or Building Type	Estimated Cost of Repairs (£)
Water Supplies	2,000
Roads	3,000
Bridges	1,000
Suva wharf, including replacement of center shed	23,000
Mechanical and miscellaneous	5,000
Buildings, including replacements	14,000
Total	£ 48,000

Local Earthquake Event (1979)

On November 17, 1979, a 6.9 Magnitude earthquake felt strongly in Taveuni caused major damage to buildings on neighboring islands, and triggered a landslide on the island of Qamea. No deaths or injuries were reported.

Local Earthquake Event (1998)

In November of 1998, a 6.0 Magnitude earthquake caused major damage to concrete buildings, massive damage to plantations, and triggered a significant landslide on Mount Washington, Nabukelevu. No deaths or injuries were reported.

Tsunamis

Fiji experienced 17 tsunami events between 1877 and 2004. Of these, four had recorded wave heights ranging between 0.5 and 5.0 meters. The 1953 event triggered the largest wave heights, measuring 1.5 to 5.0 meters above Mean Sea Level (MSL). Three other significant events were caused by earthquakes that occurred off the island of Vanua Levu in 1881, and off of the coast of Chile in South America in both 1877 and 1960. A list of tsunami events between 1870 and 2004 are presented in Table 3, some of which are

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described in more detail below. It should be noted that these examples are categorized as either local, regional, or distant tsunamis, referring to Fiji’s proximity to the source region or point of origination. A "local" tsunami is defined as one originating from a source within 200 kilometers of a given location—where destructive effects are confined to coasts *within 100 kilometers of the source*. A “regional” tsunami is defined as one where destructive effects are confined *to within 1,000 kilometers from the source*. Finally, a "distant" tsunami (also referred to as a “Pacific-wide,” or “tele-tsunami”) *originates from a source greater than 1,000 kilometers away*.

Table 3: Tsunamis Recorded in Fiji – 1877 to 2004⁶

Date of Occurrence		Earthquake Epicenter			Tsunami Observed		
		Location	Lat/Long	Magnitude	Category	Location	Wave Ht. (m)
1877	May 10	Chile	21.5S 71.0W	MS 8.3	Distant (D)	Savusavu	2.0
(1881)	Jul 12	Fiji (Vanua Levu)	16.9S 179.0E	MS 6.8	Local (L)	Labasa Levuka	1.8 0.4
1953	Sep 14	Fiji – Suva	18.2S 178.3E	MS 6.8	L	Nakaseleka Makuluva Suva Beqa Koro	4.3 3.4 1.8 1.4 1.4
1960	May 23	Chile	41.0S 73.5W	MS 8.4	D	Suva	0.5
1967	Jan 01	Vanuatu	11.3S 166.0E	No magnitude listed	Regional (R)	Suva	<0.10
1968	Jul 25	Kermadec	30.8S 178.4W	MS 7.2	R	Suva	0.10
1975	Dec 17	Fiji (Kadavu)	18.5S 178.6E	MS 5.2	L	Suva Ono	(0.2) (0.2)
1975	Dec 27	Tonga	16.2S 172.5W	MS 7.8	R	Suva	0.08
1976	Jan 15	Kermadec	29.0S 177.4W	MS 8.0	R	Suva	0.22
1977	Jun 23	Tonga	16.8S 172.0W	MS 7.2	R	Suva	0.16
1977	Oct 10	Kermadec	26.1S 175.3W	MS 6.9	R	Suva	0.02
1995	May 16	Loyalty Islands	23.0S 169.9E	MS 7.7	R	Lautoka Suva	0.06 0.05
1995	Jul 30	Chile	23.3S 70.3W	MW 8.0	D	Lautoka	0.10
1997	Apr 21	Santa Cruz Islands	12.6S 166.7E	MW 7.7	R	Suva	<0.10

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Date of Occurrence		Earthquake Epicenter			Tsunami Observed		
		Location	Lat/Long	Magnitude	Category	Location	Wave Ht. (m)
1999	Nov 26	Vanuatu	16.4S 168.4E	MS 7.5	R	Lautoka	0.13
2001	Jun 23	Peru	16.1S 73.4W	MW 8.4	D	Suva Lautoka	0.10 0.10
2004	Dec 26	Sumatra	3.29N 95.98E	MW 9.0	D	Suva	0.11

Pacific-wide Tsunamigenic Event (1877)

On May 10, 1877, an earthquake in Chile caused a tsunami which reached all coastlines in the Pacific with disastrous consequences in Chile, Hawaii, and Japan.” Thousands of lives were lost across the Pacific as a result, although no deaths were reported in Fiji. The Fiji Times reported one observer’s account, “Whilst at breakfast... a sudden upheaval [of water] was observed and, three times in succession, the waves, rolling in with great force, encroached far above high water mark.”⁷ The travel time to Suva for a tsunami generated near Chile is approximately 17.5 hours after a massive earthquake occurs, putting the arrival time of the first wave at 6:30 a.m., and consistent with the “breakfast time” report. A wave height of 2 meters was recorded in Savusavu.

Local Tsunamigenic Event (1881)

On July 12, 1881 an observer witnessed the sea level rise at least 0.4 meters (18 inches) above the high water mark in Levuka Creek. Another observer recounted a rise in sea level of about 1.8 meters (6 feet) along the coast of central northern Vanua Levu. The tsunami is believed to have been generated by an earthquake originating to the north of Vanua Levu, in Fiji’s most active seismic zone.⁸ No deaths or injuries were reported in Fiji.

Local Tsunamigenic Event (1953)

Just after midday on September 14, 1953, a 6.8 Magnitude earthquake originating 25 kilometers offshore from Suva, Viti Levu triggered a carbonate (coral reef) platform collapse, which in turn generated what is considered the most damaging local tsunami to affect Fiji in recorded history. Reported wave heights in Suva ranged from 0.7 to 5.0 meters above MSL, causing major damage to the wharf and other buildings in Suva City, as shown in Figure 1. Wave heights in Nakasaleka in Kadavu measured 4.3 meters above MSL. The tsunami occurred at low tide. Had it struck during high tide, damage would have been more severe.

Eyewitness accounts indicated the tsunami with “palm tree-high waves” took only 3 minutes to reach Suva. Five people perished as a result of the tsunami waves. Three others died in the earthquake. As indicated in the previous section, approximately ten

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percent of total damages from the earthquake and tsunami event were in fact caused by the tsunami itself.

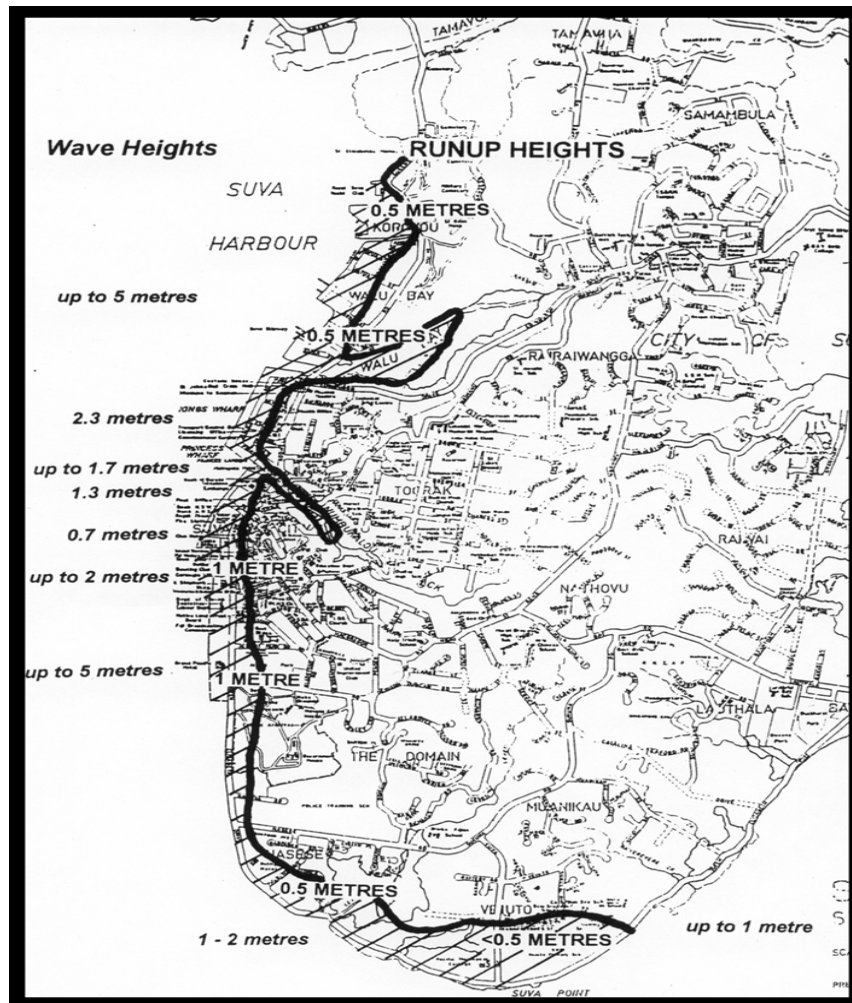


Figure 1: Observed Wave Heights and Run-up Heights for Suva, Fiji from the 1953 Tsunami⁹

Pacific-wide Tsunamigenic Event (1960)

On May 22, 1960 an 8.2 Magnitude earthquake originating in Chile caused the most destructive Pacific-wide tsunami of recent history. About 2,000 people were killed in Chile by the joint action of earthquake and the tsunami, another 3,000 were injured, and about 2,000,000 were made homeless. The waves were estimated to be about 20 meters above MSL. The tsunami traveled across the Pacific, causing extensive damage. Wave heights were estimated to be about 11 meters above MSL at Hilo, Hawaii, and 6 meters above MSL at various locations in Japan.

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The tsunami arrived at Suva approximately 13 hours after the earthquake struck, and damaged several ships anchored at Walu Bay. Run-up heights of 0.5 meters above MSL were recorded in Suva. While the tsunami caused 61 deaths in Hawaii, 20 in the Philippines and 100 more in Japan, no deaths or injuries were reported in Fiji.

¹ Vuetibau, Lasarusu. Fiji Earthquakes. Fiji Ministry of Lands and Mineral Resources, Mineral Resources Department. Suva, revised 2004.

² Everingham, Ian B. Reports of Earthquakes Felt in Fiji, 1850-1940. Fiji Ministry of Energy and Mineral Resources, Mineral Resources Department. Suva, 1983. (Internal document – Report 48).

³ Everingham: 1983. (Extract from page 473 of Jackson's Narrative published as *Appendix A* of the Journal of a Cruise Among the Islands of the Western Pacific by John Elphinstone Erskine, Captain R.N. of M.H.S. Havannah; London 1853. Reprinted from Dawsons of Pall Mall in 1967.)

⁴ Small volcano-shaped cones of mud and clay caused by volcanic gases and heat escaping from magma deep below the earth's surface, that either (1) pours gently from a vent in the ground like a fluid lava flow; or (2) is ejected into the air like a lava fountain by escaping volcanic gas and boiling water. (U.S. Geological Survey).

⁵ Houtz, R.E. "The 1953 Suva Earthquake and Tsunami." Bulletin of the Seismological Society of America. 52.1 (1962): 1-12.

⁶ Everingham, Ian B. Tsunamis in Fiji. Fiji Ministry of Energy and Mineral Resources, Mineral Resources Department. Suva, 1984. (Internal document).

⁷ Everingham: 1984.

⁸ Everingham: 1984.

⁹ Prasad, G. and Rynn, J. "Tsunami Mitigation for the City of Suva, Fiji." Science of Tsunami Hazards. 18.1 (2000): 35-54.