

SUMMARY OF EARTHQUAKES

Occuring May-June 2006

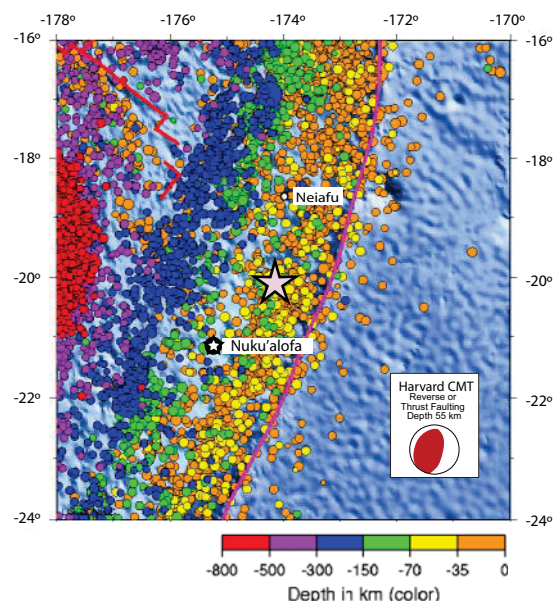
With surface wave or moment magnitude (M_w) greater than or equal to 6.5 and a depth no greater than 100 km, or an event for which a Tsunami Information Bulletin (TIB) or Regional Watch Warning (RWW) was issued. Epicenter, and M_w from USGS National Earthquake Information Center (NEIC, G); M_w , and centroid depth from Harvard (H); M_w from PTWC (P) at action time.

DATE	TIME (UTC)	LOCATION	EPICENTER	DEPTH (km)	M_w	PTWC ACTION	ACTION TIME	TSUNAMI? DAMAGING?	Maximum height and place
3 May	15:27	Tonga	20.130° S 174.164° W	55	8.1(P1) 7.9 (G) 7.8 (P2,P3)	001 RWW 002 RWW 003 Cancel	15:42 16:33 17:39	Yes No	0.54 m Pago Pago, American Samoa and Crescent City, California
10 May	02:43	Fox Islands, Aleutian Islands, Alaska	52.515 N 169.257 W	18	6.5 (P) 6.4 (H) 6.3 (G)	TIB	02:52	No	
16 May	10:39	Kermadec Islands	31.782° S 179.307° W	152	7.5 (P) 7.4 (G,H)	TIB	10:59	No	
16 May	15:28	Nias Region, Indonesia	0.103° N 97.049° E	16	6.9 (P) 6.8 (G,H)	TIB	15:42	No	
22 May	11:12	Near East Coast of Koryakia, Russia	60.776 N 165.712 E	17	6.7 (P) 6.6 (H) 6.5 (G)	TIB	11:22	No	
28 May	03:12	New Britain Region, Papua New Guinea	5.727 S 151.139 E	34	6.7 (P) 6.5 (G, H)	TIB	03:26	No	

TONGA 3 MAY 2006, 15:37 UTC, $M_w=7.9$

A major earthquake occurred in Tonga, about 160 km NE of Nuku'Alofa and equally far south of Neiafu. The earthquake, which happened at 4:26 AM (4 May) local time, measured 7.9 (M_w , USGS) and was felt throughout the surrounding islands. Although some damage was reported, few injuries and no deaths resulted. Steps were taken to escape a possible tsunami in Fiji and Gisborne, New Zealand.

A summary provided by the USGS National Earthquake Information Center (NEIC) lists recorded wave heights in meters (peak-to-trough) at the following selected tide stations: 0.54 m at Pago Pago, American Samoa; 0.10m at Tofino, British Columbia, Canada; 0.13 m at Raratonga, Cook Islands; 0.07 m at Suva, Fiji; 0.15 at Hanasaki, Japan; 0.48 m at Noumea, New Caledonia; 0.15 m at Jackson Bay, New Zealand; 0.42 m on Niue; 0.42 m at Apia, Samoa; 0.42 m at Nuku'alofa, Tonga; 0.13 m at King Cove, Alaska, 0.54 m at Crescent City, California, 0.35 m at Santa Barbara, California, 0.10 m at San Francisco, California, 0.49 m at Kahului, Hawaii,



Historical seismicity with Harvard Centroid Moment Tensor Solution (CMT). The recent earthquake location is marked by a star. Map courtesy of USGS National Earthquake Information Center (NEIC).

Tonga, continued

0.12 m at Portland, Oregon, 0.11 m at La Push, Washington, U.S.A; and 0.45 m at Port Vila, Vanuatu.

**US Tsunami Warning Centers Response Chronology
May 3, 2006
Tonga Earthquake and Tsunami**

A major earthquake occurred in the Tonga Islands (450 miles southwest of American Samoa) at 11:27 AM EDT (1527 UTC) on May 3rd, 2006. The quake was felt by the staff at the National Weather Service Office in Pago Pago and as far away as New Zealand, according to media reports. Initial magnitude was reported as 8.1, later revised to 7.8 moment, 7.7 Richter scale.

A non-destructive tsunami was detected by tide gauges in Fiji, Niue, Tonga, American Samoa, and Hawaii (including Midway). The maximum detected peak-to-peak height was 0.54 meters (21.26 inches) in American Samoa. There was no reported damage from the tsunami.

The Pacific Tsunami Warning Center (PTWC) issued Bulletin #1 for the Pacific within 15 minutes at 11:42 am EDT declaring a Tsunami Warning for New Zealand and Fiji. At 11:43 am EDT, PTWC issued Bulletin #1 for Hawaii declaring a Tsunami Watch for the State of Hawaii.

Bulletin #2 for the Pacific issued at 12:31 pm EDT included Tonga, Niue, American Samoa, Samoa, Wallis-Futuna in the Tsunami. Bulletin #2 for Hawaii issued at 12:34 pm EDT changed the watch to an advisory and estimated "a small sea level rise" in Hawaii.

Bulletins #3 canceling the warning for the Pacific and the advisory for Hawaii were issued at 1:36 pm EDT and 1:39 pm EDT, respectively.

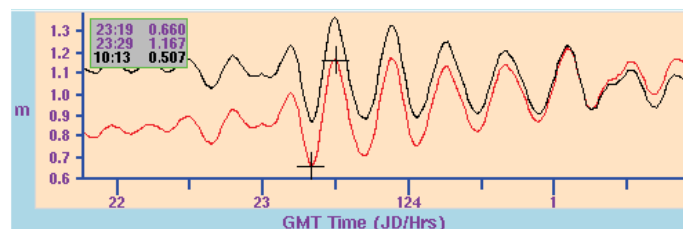
The West Coast/Alaska Tsunami Warning Center issued Tsunami Advisory Bulletins about the event at 11:43 am EDT, 12:48 pm EDT and 1:49 pm EDT. No watches or warnings were issued for their area of responsibility which included Alaska, Washington, Oregon, California and the west coast of Canada.

UTC	EDT*	Elapsed Time	Product/Event
15:27	11:27 am	0:00	Earthquake occurs
15:29	11:29 am	0:02	Samoa short period alarm alerted West Coast/Alaska Tsunami Warning Center (WC/ATWC) duty personnel
15:34	11:34 am	0:07	South Pacific regional alarm and autolocation of event in Tonga with initial magnitude 7.2 at the WC/ATWC in Alaska.
15:35	11:35 am	0:08	South Pacific regional alarm (stations CTAO and SNZO) and autolocation of event in Tonga with initial magnitude 8.2 at the Pacific Tsunami Warning Center (PTWC) in Hawaii

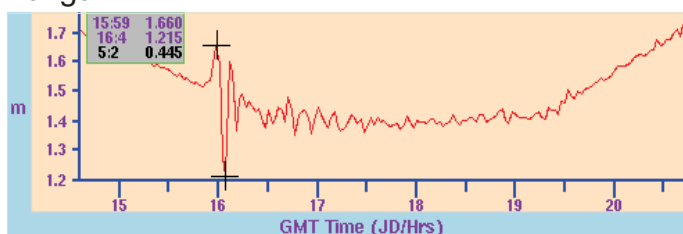
*Eastern Daylight Time

Water Level records from the Pacific Tsunami Warning Center (PTWC)

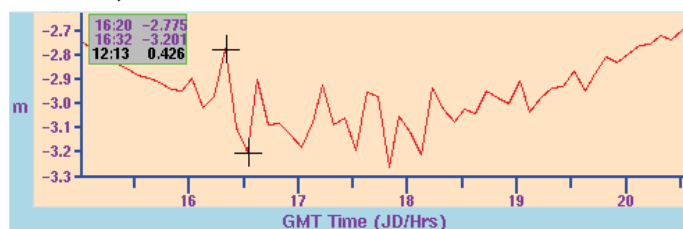
Niue



Tonga



Kahului, Maui

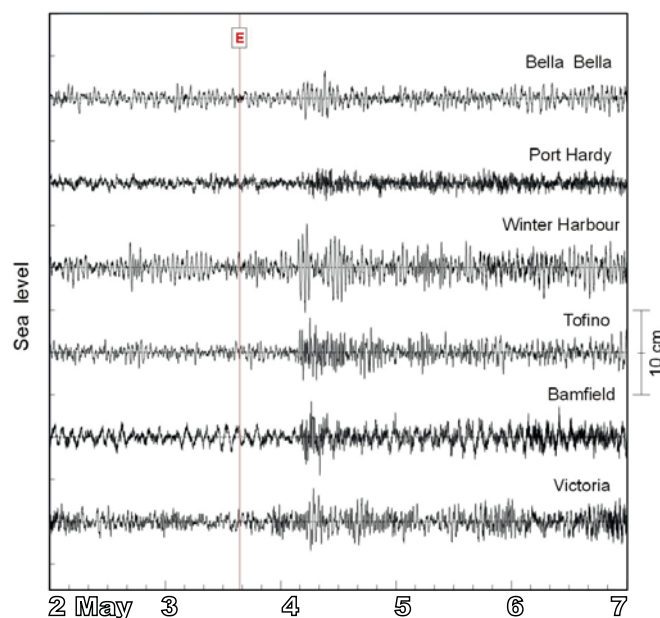


Above, Water level records provided by PTWC from Niue, Tonga, and Kahului, Maui, (Hawaii). Graphs indicate maximum peak-to-trough wave height (in metres) with elapsed time depicted.

Water Level records from Canada

The Tonga tsunami of May 3, 2006 was clearly recorded near the coast of British Columbia as seen by the plot of the records to the right. These record the water level after high-pass filtering with 3-hour Kaiser-Bessel window and the red line indicates the time the earthquake occurred.

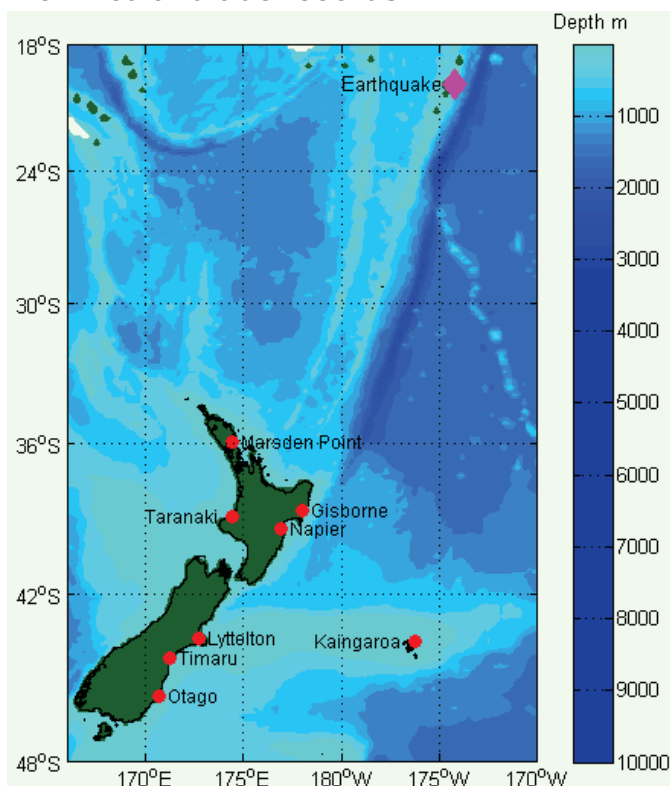
Stations (in British Columbia)	Arrival time UTC	Travel time	Max wave height
Bella Bella	04:16	12h 49m	5.7 cm
Port Hardy	04:15	12h 48m	3.7 cm
Winter Harbour	03:31	12h 04m	10.8 cm
Tofino	03:49	12h 22m	6.9 cm
Bamfield	04:00	12h 33m	5.6 cm
Victoria	05:17 UTC (4/05)	13h 50m	9.0 cm



Tsunami travel time, maximum wave heights and sea level records courtesy of A. Rabinovich, Canada.

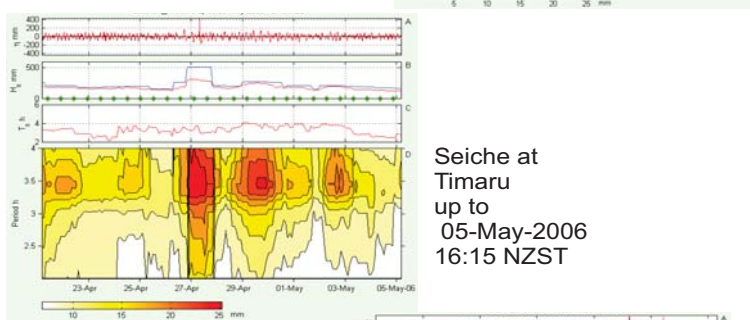
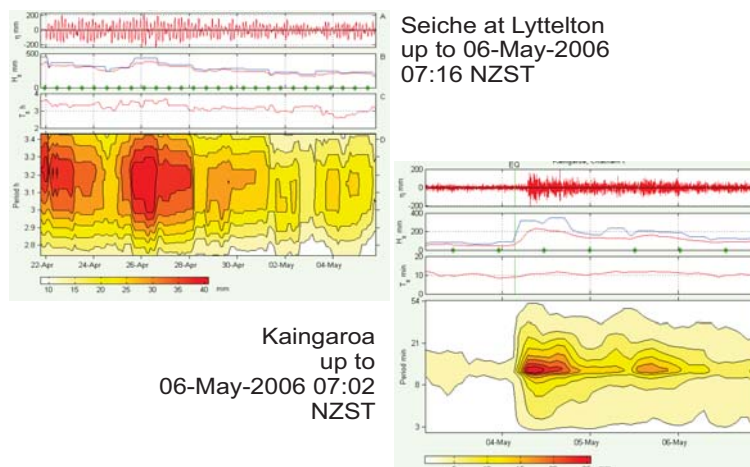
Tonga, continued

New Zealand tide records



From 'Tsunami records in New Zealand' by Derek Goring, Mulgor Consulting Ltd., 24 Brockworth Place, Christchurch, New Zealand at <http://www.mulgor.co.nz>: "The direct path from the earthquake to the nearest port (Marsden Point) is only 2090 km, so we would expect the waves to arrive about 4 hours after the earthquake (07:30 NZST). In fact, the waves that arrived at Marsden Point were so small, they can hardly be distinguished from the background meteorologically generated waves (called Far Infra Gravity or FIG waves). However, the tsunami was felt at other east coast ports, though the main waves did not arrive until 12 or more hours after the earthquake, so they must have taken a roundabout route.

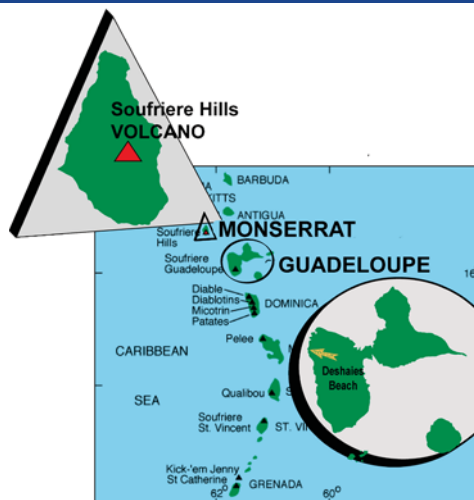
Subsequently, NIWA has kindly supplied data from their sea-level recorder at Kaingaroa, on the northeast tip of Chatham Island, almost due south from the earthquake location, and 900 km east of mainland New Zealand. Unlike the NZ coast sites, there is almost no continental shelf off Kaingaroa, so it receives waves from the Pacific first. In the deep ocean, the waves are travelling at up to 800 kph, but on the continental shelf, they slow to less than 250 kph."



DESHAIES, GUADELOUPE TSUNAMI, 20 MAY 2006, MONTSERRAT, LESSER ANTILLES, SOUFRIERE VOLCANO TSUNAMI

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A major lava dome collapse took place at the Soufriere Hills Volcano on the morning of 20 May 2006. A helicopter flight in the afternoon confirmed that most of the lava dome has gone, together with some remnants of the 2003 lava dome, leaving a broad, deep, eastward sloping crater at the summit of the volcano. The volume of the lava dome was believed to be about 90 million cubic meters and most of this collapsed over a period of less than three hours. Views of the western part of the crater where ash venting is continuing were not possible but it is unlikely that there is significant dome



Maps showing partial arc of the Caribbean Island chain, with enlargement of Montserrat (left) and Guadeloupe (right) where survey was made. (Base map courtesy of University of Texas Austin, Perry-Castaneda Digital Map Collection; <http://www.lib.utexas.edu/maps/>).