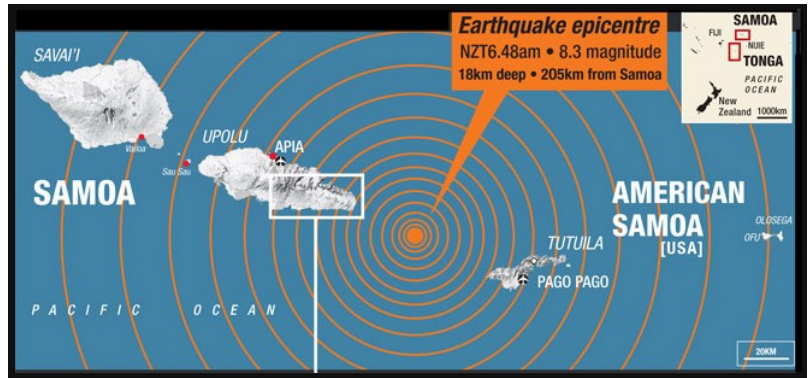


Samoa Earthquake

Sources: GNS, NZ Herald, TVNZ

At 6:48am NZT 30 Sep 2009 a large, shallow earthquake occurred in the Samoa Islands region. The earthquake generated a regional tsunami with wave heights of up to 6m reported in American Samoa. Estimates of earthquake magnitude and depth were released by the US Geological Survey (magnitude 8.0, depth 18km) and Pacific Tsunami Warning Centre (8.3, 33km).



The quake struck around dawn 190 kilometres from American Samoa, a US territory that is home to 65,000 people, and 200 km from Samoa. Residents in both Samoa and American Samoa reported being shaken awake by the quake, which lasted two to three minutes. The initial quake was followed by three aftershocks of at least 5.6 magnitude. Walls shook and objects smashed as tremors lasted for about a minute, soon followed by tsunami sirens and mobile phone text warnings in many places.

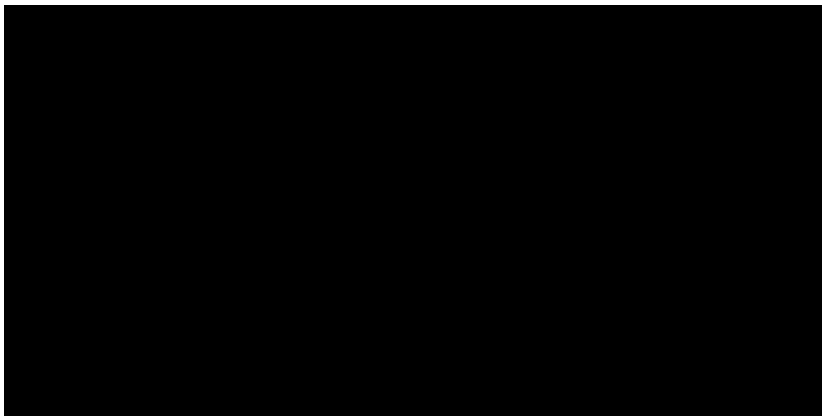
As tsunamis can travel at speeds of up to 600 km/h, this would have given Samoa about 20 minutes to ready itself for the disaster – although some reports suggested residents felt they only had about 5 minutes after the shaking stopped. As the tsunami approached locals reported watching the sea recede until the coral reef was visible. Then towering tsunami waves spawned by the powerful earthquake swept ashore on, flattening villages, killing at least 150 people, leaving dozens of people missing and over 2000 homeless. Residents described a wave as high as a single-storey house pushing everything before it, shifting debris about 100 m. Cars and people were swept out to sea by the fast-churning waters as survivors fled to high ground, where they remained huddled hours later. Hampered by power and communications outages, officials struggled to assess the casualties and damage.

Villages on the southern coast of the Samoan island of Upolu were the worst affected by the tsunami. Poutasi was "totally flattened" and the road was destroyed so people were accessing it by walking through a small stream. "It's just devastated, not even a cyclone has done this to us." The village school was totally destroyed as well as all the houses, barring the church minister's house, she said. "Cars have been thrown into the ocean and there are fish on the ground. I've never seen anything like this before in my life. It's sad." Other villages reportedly with many deaths include Vailoa and Aleipata; the beach village of Sau Sau Beach Fale was levelled; the tourist coast surrounding Lalomanu was flattened. Trucks from these coastal villages began delivering dozens of the dead to Apia morgue, including those who hesitated to leave right after the quake and the young and the elderly who could not move fast enough.



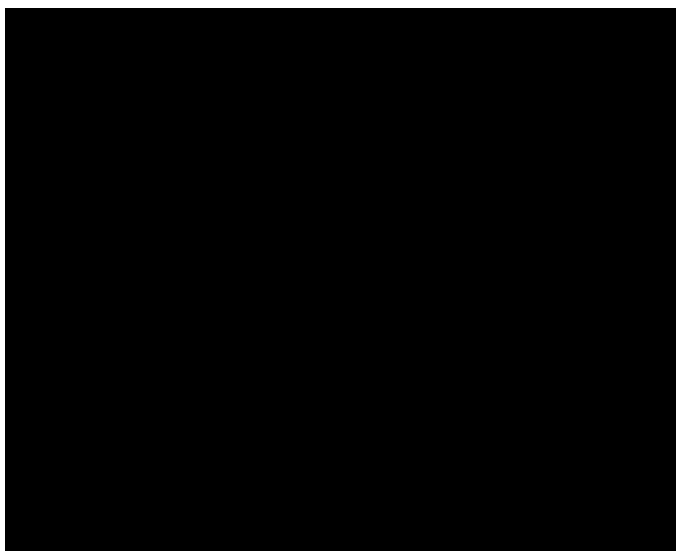
The owner of Apia's Ilili Resort, Daniela Brussani, says she and her partner fled by car to a hill, where they watched the destruction take place. "I look at the back, saw the big wave arrive - a big wave - 6 or 7m." Ms Brussani says her resort is now under 2m of water.

Locals on the island of Savai'i, west of Upolu earlier reported that the sea had receded and no water was visible. As there were fears the water would return as a tsunami, everyone in the area was moved to higher ground, However some locals believed the island had in fact been pushed up by the earthquake - the inter-island ferry could reportedly no longer dock at the port so was moored off-shore.



Rescue workers found a scene of destruction and debris with cars overturned or stuck in mud, and rockslides over some roads. Several students were seen ransacking a convenience store. One of the runways at Pago Pago International Airport needed to be cleared of widespread debris for emergency use. Signs of devastation were everywhere, including a giant boat that had been washed ashore and came to rest on the edge of a highway. Power poles came down and the main ring road around the island fell away in places, rocks instead of orange safety cones marking wash-outs. American Samoa's eastern power plant was swamped, cutting electricity to that part of the territory and hampering efforts to assess casualties and damage.

Mike Reynolds, superintendent of the National Park of American Samoa, was quoted as saying 4 tsunami waves 4.5 - 6 m high roared ashore soon after the earthquake, reaching up to 1.6 km inland. The National Park of American Samoa is a scenic expanse of reefs, picturesque beaches, tropical forests and wildlife that include sea turtles and flying foxes, a type of fruit bat. A spokesperson for the National Park reported that the park's visitor centre and offices had been destroyed and only a fifth of the park's 15 employees and 50 volunteers had been located. Tonga also suffered coastal damage from 6m high waves – 90% of the housing was destroyed on the Tongan island of Toputapu



The earthquake and tsunami were big, but not on the same large scale of the Indonesian tsunami that killed more than 150,000 across Asia 26 Dec 2004, said tsunami expert Brian Atwater of the USGS in Seattle. The 2004 earthquake was at least 10 times stronger than the 8.0 to 8.3 measurements being reported for today's quake, Atwater said. It's also a different style of earthquake than the one that hit in 2004. The tsunami hit American Samoa about 25 minutes after the quake, which is similar to the travel time in 2004, Atwater said. The big difference is there were more people in Indonesia at risk than in Samoa.

Based on the location, magnitude and depth estimates, a 'National Warning Tsunami Threat to NZ' was issued at 7:15am. The public were advised to stay away from the sea and beaches along the north-eastern coast of the North Island, and on the Chatham Islands with run-ups predicted to reach up to one metre at the coast and strong currents likely in these areas. While there was, in the end, little noticeable affect on the open coast, some harbours reported extremely strong currents. Data from the GNS Science tsunami gauges on Raoul Island showed that the largest waves were not the first, but those arriving about an hour later.

What is a Tsunami?

- A tsunami - from the Japanese "tsu" (harbour) and "nami" (wave) - is a fast travelling wave typically generated by vertical movements from seismic activity such as a powerful, shallow sub-sea earthquake.
- Normal ocean waves are caused by the wind, weather, tides, and currents. They have periods of 5-20 seconds, wavelengths of 100-200 meters, and travel at speeds of 8-100 km per hour. Tsunami waves have much longer periods of 10 minutes to 2 hours, wavelengths of 100-500 km, and travel at speeds of 600-800 km per hour.
- The speed of tsunami waves varies depending on the depth of the water. The height of normal waves and tsunami waves is similar in deep ocean water, but near shore, tsunami waves slow and swell, reaching heights of up to 10 metres or more.
- Normal ocean waves only involve motion of the uppermost layer of the water, but tsunami waves involve movement of the entire water column from surface to sea floor. This means a normal wave is like a small ripple on top of the ocean, but tsunamis are like the entire ocean getting deeper all at once.
- A tsunami is not actually a tidal wave. Although a tsunami's impact can be influenced by tidal levels, tsunamis are unrelated to tides.
- Data used to predict tsunami are recorded by buoys such as the one here. They are anchored by a pressure-detector on the seafloor. Data from the detector is transmitted to the buoy and then relayed via satellite links to ground stations. A United Nations organisation co-ordinates these warning systems in the Pacific, Indian & Atlantic Oceans.
- The Pacific Tsunami Warning Centre recorded a wave height of around 1.5 m greater than sea level in American Samoa, around 70 cm in Samoa, and 50 cm in Tonga for this event.
- Major tsunamis occur about once a decade. Based on historical data, about 59% of the world's tsunamis have occurred in the Pacific Ocean, 25% in the Mediterranean Sea, 12% in the Atlantic Ocean and 4% in the Indian Ocean.
- The largest recorded earthquake, of 9.5 magnitude in Chile in May 1960, generated a tsunami that swept across the Pacific, killing scores of people in Hawaii, Japan and elsewhere.
- The quake that triggered the 2004 Indian Ocean tsunami was magnitude 9.15. That quake and tsunami killed around 230,000 people in Indonesia, Sri Lanka, Thailand, Malaysia and other countries as far a field as Somalia.
- "This quake's magnitude suggests a fault rupture of 200 - 300 km, with one side of the fault moving up to 7 m relative to the other", says Gary Gibson, an Australian seismologist.



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