

A post-tsunami field survey of the 2009 South Pacific tsunami in Niuatoputapu Island, Tonga

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A post-tsunami field survey of the 30th September 2009 South Pacific earthquake tsunami was carried out on Niuatoputapu Island, Tonga, during 11-16 November, 2009. The island was severely affected by the tsunami and about half of the houses in the three villages were destroyed. The survey team interviewed local people to get information about the earthquake intensity and the tsunami behaviour. Based on these eyewitness accounts and ground traces such as water marks left on house walls, broken trees, and tsunami deposits, we measured inundation distance, tsunami run-up height and flow depth around the island. The tsunami was shown to be most destructive on the northern peninsula and the north to eastern coast of the Niuatoputapu island, which directly faces the source area. The maximum measured inundation distance was 910 m on the southeastern coast of the island. The maximum tsunami height was 16.9 m above mean sea level at Toma, also on the south western coast. The heights were 8 - 15 m along the northern peninsula and eastern coast of the island, and 4 - 6 m above mean sea level along the western coast where the three villages are located. Inundation distances in the villages were 200 - 500 m. Some areas of forest were completely destroyed by the tsunami, especially on the northern peninsula and the northeastern coast of the Niuatoputapu Island. Strong currents were present during the tsunami, and particularly affected the northeast to southwest coast. In these affected areas trees were all swept away along with part of the surface soil, and after the tsunami the land surface was covered by white sand and boulders consisting of coral fossils. Piles of such sand and boulders were typical also along the eastern to southern coastline. According to eyewitnesses, three tsunami waves attacked the villages and the last one was the most destructive. Most of the people there did not expect tsunami after they felt the strong shaking, but did evacuate after watching the first small tsunami or hearing some unusual noises from the sea. It was the first reported tsunami that caused significant damage to Tonga. The disaster in Niuatoputapu will provide an opportunity to start basic public education programs about tsunami.

Keywords: tsunami, Samoa earthquake, run-up height, inundation, tsunami deposit, post tsunami survey