



The 2009 South Pacific tsunami - implications for tsunami hazard in the South Pacific

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On 29 September 2009 a Mw8.0 earthquake at the northern end of the Tonga Trench created a tsunami with a devastating impact on the islands of Tutuila (American Samoa), Upolu (Samoa) and Niuatoputapu (Tonga). The intensity of the tsunami impact on islands close to the source was surprising for an earthquake of this magnitude, which is presumably a consequence of an unusual earthquake source. Moment tensor solutions suggest a mechanism of normal faulting in the outer-rise though this is not fully consistent with the polarity of waves observed at DART buoys within the Pacific. The written history of tsunami in the southwest Pacific is relatively short, especially for the Tonga-Kermadec-Hikurangi trench, and includes few events; consequently the question 'How typical is this event of tsunami from this subduction zone?' is critical for understanding the tsunami hazard of the region.

An important source of information on the tsunami comes from post-event surveys. Researchers from GNS Science participated in survey teams on each of the three strongly affected islands. Information collected by these surveys is very varied, and includes: estimates of physical parameters such as the distribution of run-up heights, flow depths, and inundation distances; engineering observations regarding the damage to, and relative fragility of, different types of buildings and infrastructure; observations of environmental impact and the role of the environmental factors, such as coral reefs, forests, and sand dunes, on influencing the tsunami impact; and observations of the response to the events by the local communities. This presentation will include a summary of the main findings from these surveys.

The earthquake source for this event appears to have an unusual mechanism for a tsunamigenic earthquake, and to be relatively complex. Attempts to invert for the source using any one of the various collected datasets - the survey data described above, DART buoy sea level records, geodetic observations of the movement of survey points, and seismic records - in isolation have been limited by the available coverage and have not produced a confident interpretation. We have therefore attempted to use the different sources of data collectively to try and achieve an integrated interpretation of the tsunami source, and our work towards this goal will be summarised in the presentation.