

Sliding direction of the landslide that caused the 1998 Papua New Guinea tsunami

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On 17 July 1998, a tsunami caused serious damage on the northern coast of Papua New Guinea about 20 min after an Mw 7.0 earthquake. The tsunami has been attributed to a submarine landslide that occurred about 13 min after the mainshock because its arrival at the coast was too late and its height too great to be the direct result of the fault slip of the earthquake. We found long-period (pass-band 50-100s) seismic phases possibly corresponding to the landslide event at JAY (about 150 km from the epicenter) and PMG (about 920 km from the epicenter). We investigated seismic records at nearby six stations. However, no possible phases were found except for JAY and PMG.

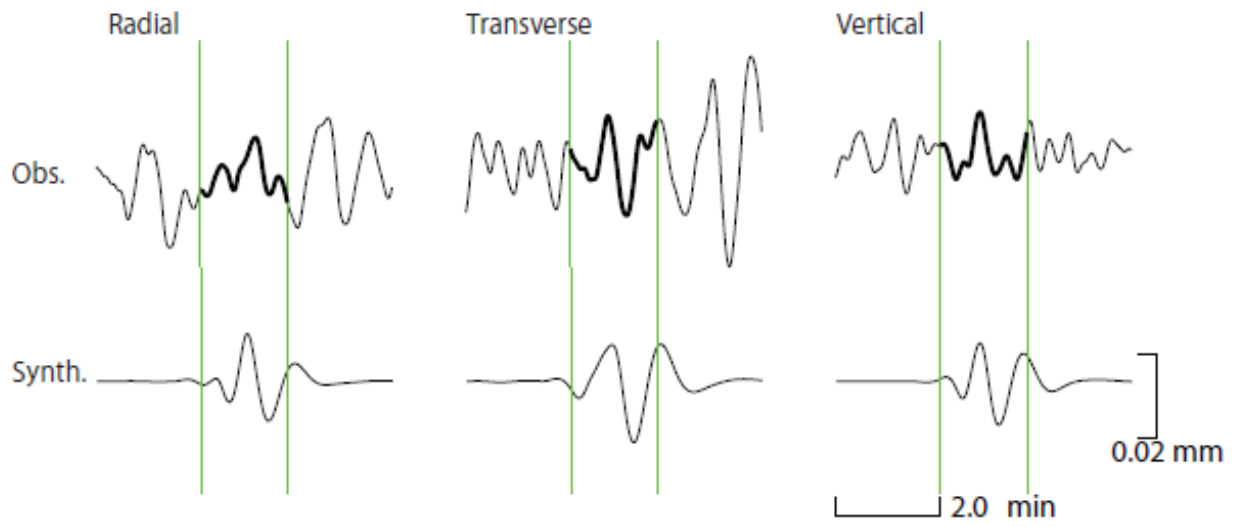
We tried to construct synthetic records for the observed records at JAY and PMG by the method of Takeo (1985). To fit the synthetic records to the observed ones, various horizontal force directions were assumed, and checked cross-correlation functions between them. The landslide start time was adjusted to fit the synthetic waves to the waveform at JAY, and it was 12 min and 29 s after the mainshock origin time. The peak amplitudes of synthetic records were adjusted to the observed ones. The figure shows the comparison between the observed and synthetic records. The force size was estimated at $2-6 \times 10^{12}$ N, and a landslide duration of 40 s showed the best fit. This force value was of the same order of magnitude estimated based on tsunami simulations in previous studies. The volume and the acceleration assumed for the tsunami simulations were confirmed with the observed seismic waves. The force of 6×10^{12} N is comparable to the force estimated by Kanamori and Given (1982) for the debris avalanche associated with the 1980 Mt St. Helens eruption (10^{13} N). The seismic waveform comparisons indicated that the force direction was oriented northeastward for both JAY (N72E) and PMG (N55E). A northward landslide was assumed in many previous tsunami simulations. There would be a possibility that the slump motion may have been oriented northeastward, which is along the downward direction of the topography.

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Keywords: The 1998 Papua New Guinea tsunami, submarine landslide tsunami, seismic waves from landslides

(a) JAY



(b) PMG

