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Urgent multi-disciplinary survey for the effects of tsunami from the Mentawai, Indonesia, earthquake on 25 October 2010

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We carried out field survey of tsunami from the 25 October Mentawai, Indonesia, earthquake in North and South Pagai Island. It was a multi-disciplinary survey supported by ongoing collaboration project between Indonesia and Japan, titled as Multi-disciplinary Natural Hazard Reduction from Earthquakes and Volcanoes in Indonesia. The main objectives of the survey were to measure physical aspects of tsunami, such as tsunami heights, inundation distances and characteristics of tsunami deposits, summarize human and property damage, and interview human and social reaction to the tsunami, i.e., if the tsunami warning messages reached to coastal community and how people reacted. The main findings of the survey was summarize as follows.

1. The tsunami heights were measured at eight localities on the west coast of North and South Pagai Islands. Thirty-eight measurements range from 2.5 to 9.3 m, but mostly 4 to 7 m. The tsunami inundation was more than 300 m at three locations.

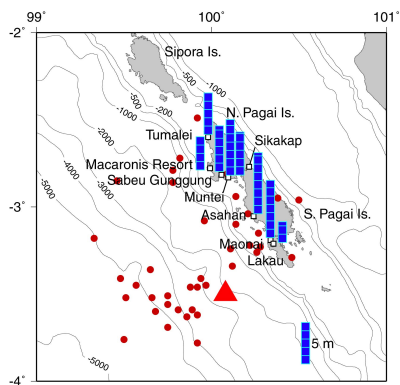
2. This earthquake was a tsunami earthquake, which produced weak shaking but large tsunamis. While initial magnitude was 7.2, analysis of long period seismic wave indicated the long duration and larger seismic moment (M_w 7.8), hence a possibility of large tsunamis. Such broadband seismic analysis of should be included in the tsunami warning system.

3. The tsunami deposits sampled at 4 to 6 sites along transects at three locations are described. The deposits are mostly coarse to medium sand, 5 to 26 cm thick, and composed of 2 to 5 units. Many units show normal grading and moderate sorting. The thickness is variable along profiles affected by local topography, but grain size generally shows finer landward.

4. Residents felt and many were awoken by earthquake, but they reported that the ground shaking was weaker than the 2007 Bengkulu or 2009 Padang earthquake. Because these earthquakes did not cause tsunami damage, many residents did not expect tsunami. Many people heard loud sound of tsunami, and escaped to inland.

5. The official tsunami warning from BMKG reached the Mentawai regency office, but did not reach coastal communities because of lack of communication tools. However, some coastal residents were watching TV and saw running text of tsunami warning (5 to 18 min after the earthquake, according to BMKG summary). Therefore, early warning message through television should be enhanced.

6. Numbers of casualties dramatically vary from place to place. Nearly a half of villagers lost their lives at some communities, but a few at other communities. Tsunami education, repeated drills, proximity to high ground, and a three-story tower seem to make the dramatic difference.



Keywords: Tsunami, field survey, Mentawai, tsunami earthquake, tsunami deposit, Indonesia