

Learning from Earthquakes Indonesia Earthquake and Tsunami

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On Monday, October 25, 2010, at 9:42 p.m. local time, an M7.7 earthquake struck west of South Pagai, a small island that forms the southern chain of the Mentawai Islands off western Sumatra. The epicenter was 175 miles south of Padang, West Sumatra, Indonesia. The earthquake occurred along the Sunda megathrust, the subduction zone off the coast of Sumatra, which marks the boundary between the Sunda and Australian plates. The event's epicenter was 12.8 miles deep and caused a tsunami affecting the islands in the southern part of Mentawai Islands. According to the USGS, it is likely that this earthquake occurred along the plate interface and was part of a sequence of large earthquakes that have recently occurred along the Sunda megathrust, including the 2004 Indian Ocean earthquake and tsunami and the 2009 Padang earthquake.

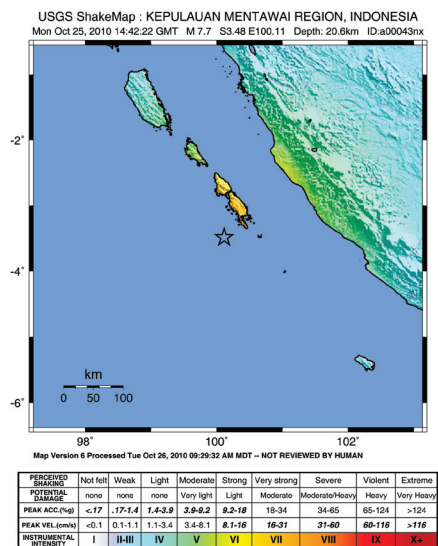
Reports indicate that the tsunami wave was up to seven meters in height and arrived as quickly as five minutes after the earthquake. Although a tsunami early warning system installed after the 2004 Indian Ocean tsunami runs along this subduction zone, the warning was not disseminated quickly enough to save villagers on these remote islands. Such warning systems are most effective for people who live hours away from the tsunami source. Since the 2004 tsunami, many organizations have focused on raising awareness and training people in at-risk areas in Sumatra to evacuate once they feel a strong earthquake. Unfortunately, these efforts, although a good start, have not reached all at-risk areas, and many villagers,

although aware, lack access to adequate evacuation routes that would have led them to safety in time.

The earthquake was also felt in Padang, but did not cause any significant damage or generate a tsunami in that area. The shaking did cause some people in Padang to leave their homes, and some even evacuated inland. Around 15,000 villagers along other parts of the Mentawai Islands — which also felt the earthquake but were not affected by a tsunami — were moving to high ground at night even weeks after the earthquake for fear of another disaster.

The remoteness of the islands has made the response efforts challenging. Numerous boats with medical supplies and food were unable to leave the main ports in Padang for days because of bad weather. It takes over 12 hours to go from Padang to the Mentawai Islands by boat. Most of the aid immediately following the disaster could only come in by helicopter. The inability to communicate with many of the remote villages and limited road access further aggravated the situation. According to estimates from the West Sumatra Disaster Management Agency, more than 445 people were killed, 58 people are missing, and 173 people sustained severe injuries. Hundreds of homes, mostly wooden structures, were completely destroyed in 20 villages.

Based on studies by Kerry Sieh at Earth Observatory in Singapore, this event has not released the built-up stress between the plates at this segment of the subduction zone. This indicates that the Mentawai Islands (population 80,000) and Padang (population 900,000) are still under a high risk of a larger tsunami. Similar to the conclusion drawn from the 2009 Padang earthquake, this event underscores the need to continue the concerted effort to prepare the community through the well-developed use of warning systems and evacuation routes and procedures. It also shows the importance of establishing access for aid and relief during such events.



Location of epicenter and shaking intensity (source: USGS)

GEER Report on New Zealand Earthquake

The preliminary report by the Geo-Engineering Extreme Events Reconnaissance Association (GEER) on the geotechnical effects of the September 4, 2010, M_w 7.1 Darfield (New Zealand) earthquake is now available at [http://www.geerassociation.org/GEER_Post EQ Reports/Darfield New Zealand 2010/Cover_Darfield_2010.html](http://www.geerassociation.org/GEER_Post_EQ_Reports/Darfield_New_Zealand_2010/Cover_Darfield_2010.html). The most significant aspects of the earthquake were geotechnical in nature, with liquefaction and lateral spreading being the principal causes for the extensive damage inflicted on lifelines, residential houses, and unreinforced masonry buildings. The main funding for the US contingent for the reconnaissance effort came from NSF (via GEER), with partial support coming from PEER and EERI. The team was led by Russell Green (Virginia Tech) and Misko Cubrinovski (University of Canterbury). GEER contributed to the EERI report on this event published in the November 2010 *Newsletter*, available at http://www.eeri.org/site/images/eeri_newsletter/2010_pdf/EERI_NewZealand_EQRpt-web.pdf.