The 2018/09/24 Sulawesi Earthquake and Tsunami

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• District in Palu, was completely damaged by the soil liquefaction and tsunami that followed immediately after the earthquake.
• The first place that was hit by the tsunami was the beach where a festival named Festival Pesona Palu Nomoni was ongoing.
• The majority of the partygoers (participants) were later recovered dead from the beach and the sea. Several others were injured.
• Many bodies were lined and laid on the side of the street and many were also found on the shoreline.
• Total 2,245 dead 4,488 Injured 1,075 Missing as at 22 Oct. 2018
Tsunami triggered by earthquake as well as others on 28 Sept. 2018 at Palu, Indonesia

• An unpredicted tsunami following a M7.5 strike-slip faulting occurred on 28 September 2018, swept the coast of Palu Bay, Sulawesi, Indonesia.

• The relatively short period of tsunami devastated area along the coast up to the distance of about 100 to 300 m inland at Palu bay. Tsunami watermarks are observed up to about 8 m near the coast and decreased to a maximum of 3.5 m inland ward. (Muhari et al, 2018, JDR)

• Most possible mechanism inside the bay such as underwater and coastal landslide that should be the responsible in generating destructive tsunami in Palu Bay. (Muhari et al, 2018, JDR)

• For recovery and reconstruction, the available data and information of tsunami, and its analysis are required to give the idea of tsunami resilient city for the future.
Past activity of earthquakes followed by tsunamis, Sulawesi

M7.5
震源は内陸
右横滑り断層
パル市直下で破壊
地震動, 津波, 液状化, 地滑り

M ≥ 6 (Periods: 1900-2018)
Source: USGS
Earthquake | Sept 28, 2018  (BMKG, 2018)

The earthquake and tsunami in Indonesia caused widespread destruction and killed more than 1,400 people, according to the latest figures. Most deaths occurred in the small city of Palu, where tsunami waves as high as six metres smashed into the beachfront. Satellite data shows over 3,000 buildings were destroyed in the Palu city area along with bridges and roads.

October 4, 2018
Tsunami water mark: inundation flow depth

No water mark at house facing sea front

Water marks of several layers on the wall in the back of 1-200m

Tsunami water mark: inundation flow depth
Sliding/subsiding
Destruction in Palu (Reuters)

Masjid Apung (Floating mosque)
Talise Beach
Talise Beach Pavilio
Popular local hangout
Nusantara Monument
Palu landmark

Aug. 22 2018 before
Oct. 1 2018 After

Mosque damaged and isolated by water
Area destroyed
Bridge collapsed
Houses destroyed
Subsidence
Tsunami water marks: splash and flow depth
The 2011 Tohoku tsunami at Yamamoto, as shown in the photo and diagram, illustrates the various phenomena associated with coastal tsunamis. The splash wave, which reaches a certain depth, is one of the initial stages of the tsunami's impact. The inundating flow, which can be traced back to the shoreline, extends up to 200–300 meters from the shoreline.

The ground elevation and flow depth are crucial factors in assessing the impact of the tsunami. The runup, which is the maximum height of the tsunami, is observed at the shoreline. The tide sea level at the event, measured from mean sea level (M.S.L.), is also a significant consideration.

The distance from the shoreline varies, with closer distances showing more severe impact. The diagram indicates that the distance from the shoreline for the 2011 Tohoku tsunami ranged from 50 to 100 meters, while further inland, the distance was between 200 and 300 meters.
• Tsunami is preceded by receding water up to \(~2.06\)
• Maximum tsunami

Pantoloan Tidal Data Station:
-0.711605 N 119.857279 E

Tide gauge Mamuju

Pel. Pantoloan - Sulteng
Eyewitness: Tsunami sources in the west of the bay

Analyzed by Prof. Abe, Tokoha University

Same source

Delay a little and source should be small
Outline of the tsunami analysis; ongoing

• Compiling the available data of the tsunami and making the topography and bathymetry data for the numerical simulation.

• The source of the tsunami should be carefully selected by taking account of underwater/coastal landslides and would be proposed as some possible scenario.

• Runup simulation of the tsunami with some scenario are carried out to provide the inundation area and tsunami heights on the coast at the bay.
Bathymetry at Palu bay before earthquake, suggesting underwater landslide.