



The tsunami deposits of the September 28, 2018 Palu earthquake, Sulawesi, Indonesia.

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On 28 September 2018, a large, shallow, magnitude 7.5 earthquake struck north of Palu, Central Sulawesi, Indonesia at 6:03 pm local time. The earthquake generated a tsunami with inundation depths up to 10 m high and inundation distances in excess of 400m. The tsunami was likely generated by a combination of minor fault displacement and multiple submarine landslides. In addition to the tsunami the region experienced co-seismic coastal subsidence that in places exceeded 1m and likely exacerbated the inundation of tsunami waves in some areas including Palu city. During a post tsunami survey in November 2018 we sampled four transects for sediment analysis; two in Palu City and one each on the eastern and western coasts of Palu Bay. The tsunami deposits in Palu City are predominantly massive, fine- to medium-grained sand and were thin (mostly <5cm thick) and patchy. The sedimentology of the Palu samples likely reflects a combination of a tsunami with a relatively short wavelength and a source area with limited sediment availability. In contrast to the Palu city samples sediments found in the transects on the east and especially on the west coast of Palu Bay were coarser (medium- to coarse-grained sand), thicker (>5cm) and more continuous. Particularly well preserved the East Coast sample at Pantoloan showed little reworking and allowed for detailed sediment analysis. Here the deposits fine and thin landward and are identified as a continuous sand sheet that extends more than 250m inland. Grain size ranges from coarse-grained sand to silty-fine-grained sand at the landward extent. This site also contained blocks of a damaged sea wall that together with grain size data suggest that velocities exceeded 5 m.s⁻¹ more than 130m from the beach. The tsunami deposits of Palu Bay generally exhibit massive structure, a coarsening upward sequence, a non-systematic landward fining trend, and a sharp depositional (rarely erosional) basal contact with the underlying substrate. Overall, the Palu Bay deposits have sedimentologic and stratigraphic characteristics that show a hybrid signature common to both storm and tsunami deposits that likely reflect the short wavelength, relatively low power and short-term inundation of the compound tsunami and the limited availability and nearshore source of the sediments.