GEER- HATTI Reconnaissance Investigation of the 2018 Palu, Indonesia Earthquake

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A unique event?

- Tsunami
- Massive flowslides
M_w 7.4 Palu Earthquake Flowslides

A Tsunami Didn’t Destroy These 1,747 Homes. It Was the Ground Itself, Flowing.

A destroyed neighborhood in Palu, Indonesia, on Wednesday. Hundreds of buildings were destroyed by liquefaction, which causes soil to lose its ability to support structures. Adam Dean for The New York Times

By Fira Abdurachman, Adam Dean and Richard C. Paddock

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The ten most important landslide events of 2018

The ten most important landslide events of 2018

2018 will be remembered as a year of destructive landslide events. This is my personal list of the ten most important ones over the course of the year. There are so many to choose from; comments welcome on whether I have the correct ten:-

The Palu earthquake — three flowslides and a landslide-induced tsunami in Indonesia

The largest landslide disaster of 2018 was undoubtedly the Sulawesi earthquake, and its disastrous impacts on the town of Palu and its suburbs. The jury is still out on whether the tsunami was triggered by underwater landslides; I suspect this will be a hot topic in the months ahead. The three major flowslides caused the highest level of loss, with at least 1,600 fatalities in Palu and 600 in Petobo for example. The old maxim has always been that it is not earthquakes that kill people, it is buildings that cause the loss of life. This event illustrates the folly of taking that too seriously – in 2018 we have seen repeated examples in which landslides have been the major cause of fatalities in earthquakes. I wonder when we will start to learn this lesson?

The Tinggede landslide on the outskirts of Palu. Image via Planet Labs, used with permission.

Sources: NYT, Dave’s landslide blow (AGU)
Joint Geotechnical Extreme Events Reconnaissance (GEER) - Indonesian Society for Geotechnical Engineering (HATTI) Reconnaissance Mission

- Field Survey from November 13 to 17, 2018
- 5 US members and 9 Indonesian members
- Supported by the NHERI RAPID Facility
- GEER-HATTI collaboration remains ongoing
- Data to be made openly available via Designsafe
Reconnaissance Mission Instrumentation

Included: Drones, RApp, Dynamic Cone, Hand Auger, RTK GPS
Spatial Extent of Earthquake Damage
Major Flowslide Sites

- Balaroa
- Petobo
- Jono Oge
- Sibalaya
Reconnaissance
Observations
Reconnaissance Observations

- Limits of slide
- "Marker" buildings
- Sand boils
- Stratigraphy
- Morphology
Post-processing

Displacements (m)
- < 10
- 10 - 25
- 26 - 100
- 101 - 500
- > 500

Sand Boils
Slide Area
Data products: Google Crisis Response
Data products: Google Crisis Response
Data products: Drone-derived orthomosaic
Data Products: Petobo
Major Flowslide Sites

- Balaroa
- Petobo
- Jono Oge
- Sibalaya
Jono Oge: Mudflow
Jono Oge: Canal
Jono Oge: Hypothesized Failure Sequence
In between, a partial mobilization
Balaroa

Groundwater gradient
Thank you!