Social Media Helps Reveal Cause of 2018 Indonesian Tsunami

Videos from Twitter and YouTube helped scientists tease out the physical mechanisms that generated the large tsunami in Palu Bay after a magnitude 7.5 earthquake.

Source: Journal of Geophysical Research: Solid Earth

A tsunami produced by a magnitude 7.5 earthquake in September 2018 caused thousands of fatalities as well as extensive damage in Palu Bay in Indonesia. Credit: Philip Liu

By Aaron Sidder 18 hours ago

On 28 September 2018, a magnitude 7.5 earthquake (https://earthquake.usgs.gov/earthquakes/eventpage/us1000h3p4/executive) shook Sulawesi Island in Indonesia and triggered a tsunami that pummeled Palu, the provincial capital. The quake and the resulting tsunami, with waves that topped 5 meters in Palu Bay, wreaked extensive damage on one of Indonesia's largest and most populous islands. Ultimately, 4,340 people died (https://reliefweb.int/report/indonesia/central-sulawesi-disasters-killed-4340-people-final-count-reveals) as a result of the tsunami, and thousands of buildings were damaged or destroyed.

The region is no stranger to large earthquakes. Eastern Indonesia is characterized by complex tectonics, and Sulawesi rests on the Palu-Koro Fault (https://link.springer.com/article/10.1186/s40562-020-0159-2), a major fault that stretches 220 kilometers. Over the past century, the area has experienced 15 earthquakes larger than magnitude 6.5.

Yet the 2018 tsunami event was an oddity. There was no readily apparent mechanism by which the strike-slip earthquake could generate such a massive tsunami, and simulations repeatedly underestimated the inland thrust of the waves that were reported in posttsunami surveys. Researchers floated two potential explanations—seafloor displacement from the quake and submarine landslides (https://eos.org/science-updates/satellite-sleuthing-detects-underwater-eruptions)—but sparse instrumental data prevented any firm conclusions about the source of the tsunami.

Borrowing an approach used after the 2004 Indonesia and 2011 Japan tsunamis, *Sepúlveda et al.* (https://doi.org/10.1029/2019JB018675) supplemented tide gauge data in Palu Bay with a compilation of 43 videos crowdsourced from social media sites like Twitter and YouTube as well as from local closed-circuit television feeds. In previous work (https://eos.org/editor-highlights/modeling-tsunamis-with-social-media), researchers geotagged the specific locations of the videos by matching features visible in Google maps and then used the videos to pinpoint the timing of the tsunami and the corresponding water level at each location. The video-derived sea level time histories served as pseudo-observations where tide gauge data were lacking.

Using the data derived from social media as well as satellite interferometric synthetic aperture radar data, which measures changes in land surface altitude, the authors of the new study tested the two hypotheses of what caused the tsunami using earthquake models. They found that seafloor deformation played only a minor role. Instead, a handful of landslides in Palu Bay proved to be the major contributors in generating the tsunami.

The 2018 Palu event highlights the shortcomings of using tide gauges alone to document tsunami events, according to the authors, and challenges conventional assumptions about tsunami hazards from strike-slip earthquakes, revealing that landslides caused by strike-slip quakes can produce deadly tsunamis. (*Journal of Geophysical Research: Solid Earth*, https://doi.org/10.1029/2019JB018675 (https://doi.org/10.1029/2019JB018675), 2020)

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Citation: Sidder, A. (2020), Social media helps reveal cause of 2018 Indonesian tsunami, *Eos, 101*, https://doi.org/10.1029/2020EO145966. Published on 26 June 2020.