How a strike-slip earthquake caused the 2018 Palu tsunami

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Strike-slip faulting is in principle unfavorable to generate damaging tsunamis because of insignificant static vertical ground motion. The devastating tsunami caused by the recent 28 September 2018 Mw 7.5 Sulawesi Indonesia earthquake, which has a nearly pure strike-slip focal mechanism, therefore came as a surprise. In this study, we produce a finite source model of the earthquake using teleseismic waveforms, inSAR and optical remote sensing observations and we explore the possible causes of the unexpectedly large tsunami. We test the hypothesis that, in addition to the potential energy due to the vertical motions of the seafloor (hereafter potential energy), the horizontal motion of the seafloor slope of the Gulf of Palu imparted a large kinetic energy to the water body, which amplified the tsunami. We also test the amplification due to the narrowing of the bay itself. This case example offers the opportunity to test the methods used for tsunami early warning. Over the past years, NASA and NOAA have been collaborating to develop a more reliable tsunami early-detection system for operational applications based on real-time Global Navigation Satellite System (GNSS) and seismic data. The system provides fast earthquake magnitude, finite slip distribution, rupture evolution, and tsunami energy-scale estimation. The prototype system was running at NASA's Jet Propulsion Laboratory (JPL) during the Mw 7.5 Sulawesi Indonesia event. Results were generated from the prototype system within 14 minutes after the earthquake, and forwarded to NOAA's Tsunami Warning Centers. In this presentation, we will show both real-time results and after-event analysis to evaluate the performance of the prototype system in the context of tsunami early warning.