

Times Standard

Not My Fault: 2026 Memorable Earthquakes at the Halfway Point

Lori Dengler for the Times-Standard

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All public schools in the Philippines are required to participate in surprise evacuation drills like these children in the National Capital Region. Drills, education, and outreach are a manifestation of the country's investment in disaster reduction programs, which might have reduced losses in the June M7.8 earthquake.

If I had written this column a month ago, there wouldn't have been much to say. Seismically speaking, it was a very quiet year – until June. More than half of the global seismic energy output for the six-month window came in June, and the June 24 Venezuela earthquakes tipped the casualty numbers from almost none to a catastrophic.

It's not that the world's faults went quiet for five months. We had a typical smattering of earthquakes before June. March had nearly the same number of large quakes as June, but none caused deaths or injuries because the biggest ones were far away from population centers or hit areas like Japan with earthquake resistant construction.

It doesn't take a great earthquake to cause casualties, especially in areas of the world where buildings have little resistance to shaking. Seven earthquakes between January and May were

strong enough to kill people and another 20 caused injuries, but most were in the magnitude 5 range. It doesn't take a great earthquake to cause casualties, especially in areas of the world where buildings have little resistance to shaking but the area of impact will be smaller for lower magnitude events. Those fortuitous circumstances changed in June.

June produced the largest earthquake of 2026 to date and two others in the M7 range. All three were close enough to populated areas to cause significant damage. On the top of the magnitude list is the June 8 M7.8 earthquake just off the south coast of the Philippine Island of Mindanao. When I wrote about the Mindanao earthquake (Not My Fault 6/13/26), the death toll stood at 61. It's now 93 with 20 people still unaccounted for. Since the earthquake, teams of geologists, engineers, and tsunami scientists have surveyed the area. Over 70 landslides have been mapped, some extending over 150 acres. Mindanao is a mountainous island and many of these landslides buried inhabited areas or blocked rivers causing local impoundment and flooding. The majority of casualties and all of the missing are in these landslide areas.

The Mindanao earthquake changed the coastal landscape. Over 60 miles of coastline on the southern tip of Mindanao was uplifted and shifted seaward, in some areas by over six feet. The uplift exposed coral reefs, causing a die off of eel grass and marine organisms. The uplift is a manifestation of the fault dynamics that also caused a tsunami, measured at roughly 5 feet high.

It's been a month since the Philippine earthquake and a bright spot is the performance of response/relief organizations and the effectiveness of pre-event preparedness efforts. The Philippines has invested in monitoring, technology, and education and outreach programs. Much training has focused on orderly evacuation for weather, fire, and tsunami, and includes effective communication of warnings and how to avoid stampedes. All schools and many government organizations participate in evacuation drills. The country uses technology-based situation monitoring programs as advanced as any in the U.S. and our emergency management community can learn much from the Philippine response.

The parameters of the Mindanao earthquake and tsunami are pretty well understood at this point. There is far more uncertainty about the twin Venezuela quakes of June 24th. As I write, the death toll is over 2600, but everyone acknowledges that number will go higher as much of the collapsed building rubble has yet to be removed. Government officials no longer give numbers to the missing, estimating it's in the tens of thousands range.

Venezuela is a very different situation than the Philippines. The country's infrastructure has been weakened by decades of political uncertainty, underinvestment, and failure to follow building codes. The underlying geology of many populated areas is thick unconsolidated sediments that amplify shaking. The fault rupture focused seismic energy towards population centers. A disrupted stretch of beach on the coast of Trinidad and Tobago attests to how strongly the shaking was over 450 miles away.

It is still too early for research teams to work in most of the areas affected by the June 24th earthquakes. The top priority right now is to safely remove rubble and recover the missing. I've participated in six post tsunami field surveys, and as much as we want to get there quickly to record evidence before it disappears, response and relief efforts always take priority. In-country

teams have deployed seismograph networks to study aftershocks and conduct preliminary surveys, but much of the work right now relies on remote imagery.

Satellite surveys show at least 800 collapsed structures and nearly 200 that were completely flattened. Buildings aren't the only losses. The earthquakes affected every part of Venezuelan society from direct physical losses, indirect economic losses, response, relief, and will eventually incur costs of rebuilding. Total cost estimates are as high as 37 billion (US \$\$) and may approach a third of the country's gross domestic product. Venezuela is in a terrible situation to absorb losses of this magnitude due to pre-existing inflation levels, currency depreciation, and past economic sanctions.

The outpouring of assistance from the international community has been strong. Twenty-seven countries have sent search-and-rescue teams, equipment, and financial aid to assist in the response. Non-Governmental Organizations such as the Red Cross, International Medical Corps, and Doctors Without Borders have sent teams and supplies. But coordination of response and relief efforts has been difficult due to the damaged transportation and health infrastructure, and bureaucratic friction and it will be months before rebuilding can begin.

The Venezuela and Philippine earthquakes exposed a similar number of people to very strong shaking. Both had peak intensities of IX (extreme). The USGS PAGER loss software estimated over 10 million people on Mindanao experienced intensity VI (very strong) or greater shaking. There were important differences. The Philippine earthquake was centered 35 miles beneath the surface and Venezuela was very shallow, only 6 miles deep. We don't know all the reasons why damage was so much greater in Venezuela, but the longer duration caused by the double quakes and the directivity of rupture also likely played a roll.

Scale of a disaster makes a huge difference when it comes to effective response. The Philippines had far more pre-event mitigation efforts in place and were in a better position to respond when their earthquake happened. Why so many buildings collapsed in Venezuela and how construction and building code enforcement exacerbated the disaster is yet to be determined. We have good reasons to pay close attention to both Venezuela and Mindanao as we can have similar quakes and knowing what reduced or magnified impacts is relevant to us.

The U.S. is celebrating its 250th birthday so let's look at a few of the major quakes since 1776. The biggest is no surprise, the M9.2 Good Friday Alaska earthquake of March 1964. Almost all the 131 deaths were caused by the ensuing tsunami, a testimony to the resilience of wood frame buildings and a US tsunami warning system that was still in its infancy and failed to adequately notify and educate people in harms way. There will be more great earthquakes in Alaska, and with rising sea levels, a repeat won't need to be quite as large to have similar impacts on the California coast.

The deadliest in our Nation's history was April 1906 on the San Andreas. There is still some controversy as to how many people died; current consensus is about 3000. But many who died were in San Francisco's Chinatown and were not accounted for at the time. The 1906 earthquake was similar to last month's Venezuela earthquakes, a long shallow rupture that focused shaking energy as it propagated to the north and south. California was barely a state when a similar-sized San Andreas rupture occurred along a central part of the fault. The January 1857 M7.9 Fort Tejon earthquake caused only two deaths, but the area was very sparsely

populated at the time. A repeat of either, or a similar sized quake on the southern San Andreas will be much more costly.

The most widely felt U.S. earthquake wasn't in Alaska or California. It occurred when there were only 17 states in the Union, and the epicenter wasn't in any of them. A magnitude ~7.7 earthquake struck the New Madrid area of what is now Missouri in February 1812. It was felt in Maine and eastern Canada, along the entire eastern seaboard and along the Gulf coast. Three similar-sized quakes had occurred in two preceding months. The New Madrid earthquakes of 1811 – 1812 are a good reminder that there is no part of the Nation that hasn't experienced an earthquake in the past and will do so again sometime in the future. Investing in science, engineering, infrastructure, and emergency response is the only way to reduce future losses.

Lori Dengler is an emeritus professor of geology at Cal Poly Humboldt, and an expert in tsunami and earthquake hazards. The opinions expressed are hers and not the Times--Standard's. All Not My Fault columns are archived online at <https://kamome.humboldt.edu/taxonomy/term/5> and may be reused for educational purposes. Leave a message at (707) 826-6019 or email Kamome@humboldt.edu for questions and comments about this column or to request copies of the preparedness magazine "Living on Shaky Ground."