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# Not My Fault: A look at disaster in Myanmar

Lori Dengler for the Times-Standard

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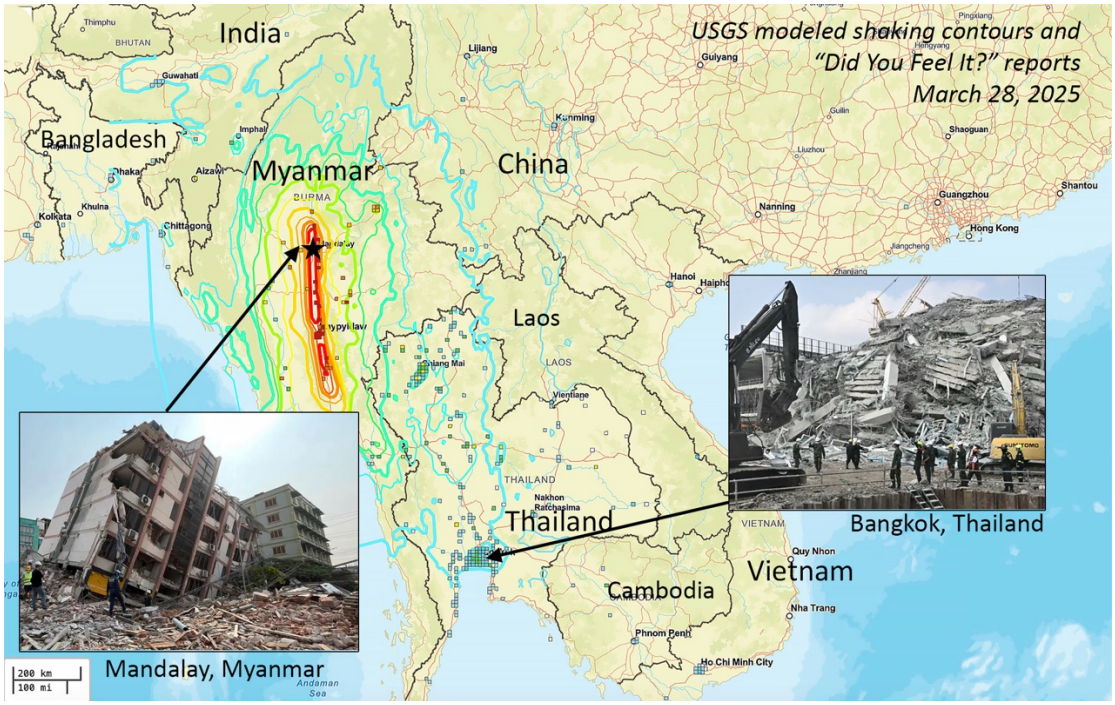


*The USGS modeled shaking area and "Did You Feel It?" reports for the March 28 magnitude 7.7 earthquake in Myanmar. Black star shows the epicenter, and the red contours outline the rupture length. Inset photos show some of the damage in Bangkok and Mandalay.*

Every few years there is an earthquake disaster of such scope and impact it feels like a gut punch. While some of these quakes have hit developed countries with robust infrastructure like Japan and Chile, many are in places where the built environment exacerbates the losses, and political and social instability further increases vulnerability. Ten days ago, it was Myanmar's (formerly known as Burma) turn to join the list.

The March 28th magnitude 7.7 Myanmar earthquake occurred at 12:50 PM local time and was centered only ten miles from the center of Mandalay, Myanmar's second largest city with a population of over 1.2 million people. The USGS PAGER analysis estimates that nearly 25 million people experienced very strong to violent shaking, a number equivalent to nearly two-thirds of the population of California. An additional 233 million spread across Myanmar, Thailand, Laos, Cambodia, Vietnam, Eastern India, Bangladesh, and China experienced mild to moderate shaking, still strong enough to cause damage and inflict casualties in areas where buildings aren't designed to withstand side-to-side earthquake motions. As I write, the death toll is just

under 5,000 but many are still missing and much of the debris remains to be removed. The number will rise.

The earthquake was felt over an astoundingly large area. Mild shaking was reported in Ho Chi Min City (formerly Saigon) in southern Vietnam over 1000 miles to the southeast. It was also felt in central Nepal over 800 miles to the northwest, and in much of Bangladesh. If this same earthquake had been centered near the Salton Sea and produced a similar felt area, people as far away as the Oregon – Washington border would have felt it.

It wasn't just the felt area that was enormous. Structural damage and injuries were also reported in Yunan China, over 450 miles away. A building under construction in Bangkok, Thailand collapsed from the shaking. It was nearly 650 miles from the epicenter. The collapse was the most spectacular failure in Thailand, but it wasn't the only one. The Bangkok Metropolitan Administration received over 14,000 reports of structural damage. High rises were particularly problematic with nonstructural debris raining down onto streets and rooftop swimming pools cascading water.

Why such a large felt area and the ability to collapse buildings over 650 miles away? While the scale of the damage is in part due to non-earthquake resistant buildings, the felt area is not. The answers aren't all in yet as scientists are only beginning to dig into the recorded data from global instruments, but a few ideas are emerging. Here's what I know about the earthquake at this point.

The Myanmar earthquake was shallow (~ 6 miles depth) and centered on the Sagaing Fault, a nearly 900 mile-long right lateral strike-slip fault that runs north-south through much of the country. The M7.7 epicenter was near the northern end of the fault and ruptured 290 miles primarily to the south according to modeling by the USGS. It was similar in some ways to the 1906 temblor – the same type of fault motion and a long rupture producing very strong shaking along its entire length.

That very long rupture length puts some of the far-field damage into context. Bangkok was about 650 miles from the epicenter, the point where the rupture began, but only 330 miles from the southern terminus of the fault slip. In dealing with very large earthquakes, it's a mistake to consider the earthquake as a spot on the map. The entire rupture zone produces seismic waves. In 1906, Ferndale was over 200 miles from the epicenter but less than 30 miles from where the rupture likely ended. Ferndale and southern Humboldt experienced more wide-spread damage from that quake than any of our more recent ones with epicenters in Humboldt County.

But another factor may have made the Myanmar rupture even more potent. An article was published on April 1 in Nature suggesting that it was a 'supershear' earthquake, one where the fault tip moves much more quickly than normal (https://www.nature.com/articles/d41586-025-00997-1). All earthquakes start at a point (the focus or hypocenter) miles to hundreds of miles deep. It's basically a crack, like what happens when a pebble hits your windshield that grows.

The speed with which that crack tip grows varies from earthquake to earthquake. The rough average speed is a few miles per second, about as fast S-waves travel. S-waves, also called shear or secondary waves, move the ground from side to side, producing what feels the strongest and,

in most cases, produces the most damage. Some ruptures are slower, tending to produce more rolling (longer period) seismic waves. A small number of earthquakes break more quickly, the rupture growing faster than the S-wave speed, and are called supershear earthquakes. The high speed not only amplifies shaking but helps to grow the fault length.

The supershear rupture idea was developed in the 1990s. It's a phenomenon that only applies to long strike-slip fault systems where stress conditions allow fault slip to accelerate and concentrate vibrations at the tip of the propagating rupture, somewhat analogous to a sonic boom. A number of recent large strike-slip earthquakes including the 2018 Palu M7.5 are now thought to be supershear events. In the case of Palu, the speed of the rupture may have also amplified the tsunami impacts in the long narrow Palu Bay (Not My Fault 5/23/2021).

Once thought physically impossible, recognition of the supershear earthquake threat is growing and some seismologists now believe that many major strike-slip ruptures fall into this category. UCLA geophysics professor Lingsen Meng was the leading author in a 2022 Nature Geosciences paper that suggested 14% of magnitude 6.7 and larger of these quakes involve supershear. Some have proposed that extremely long ruptures like 1906 fall into this category helping to explain why the rupture was so long and Ferndale so heavily damaged.

The current assessment of the Myanmar earthquake is based on remote sensing and seismic instruments outside of the country. While there are a handful of seismographs still operating in Myanmar, the system has degraded and access to data is difficult. This is just a small symptom of what is a much bigger problem for Myanmar: the internal chaos caused by civil war.

Even before the earthquake, conditions in Myanmar were dire. With over a half century of internal conflict, the current civil war escalated with a coup d'état in 2021 and subsequent crack down by the military junta on ethnic minorities and opposition groups. In 2023, the United Nations estimated that over 1.8 internally displaced people in the country. The Junta controls less than half of the country and some estimates put it as low as 20% and is still actively conducting operations since the earthquake occurred.

The Junta has requested outside assistance, but aid is in disarray and information about what is happening inside Myanmar is scant. There are few mechanisms in place for reliably delivering needed foods and medicine, especially to areas outside of the Junta's control. While the U.S. has pledged assistance, the contracts for the three U.S. AID workers inside the country were terminated this week. China, India, Vietnam, Singapore, and Russia have all sent teams into Myanmar. Other countries including the U.S. have pledged support but the mechanisms for distribution have yet to be made clear.

It is still early days, and the scientific, political, and humanitarian stories of the Myanmar earthquake have yet to be played out. One thing is clear – the death toll will continue to rise.

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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."