

Not My Fault: March 11, 2011 on the North Coast

Lori Dengler/For the Times-Standard
Posted March 7, 2021

10 PM March 10th, 2011. I was sitting in front of my computer when my phone buzzed with a Tsunami Statement from the West Coast Alaska Tsunami Warning Center. An earthquake had occurred off the coast of Japan. The preliminary magnitude was 7.9.

As I mentioned last week, this caught my eye for several reasons. Preliminary magnitudes are often likely to change. Tsunami Centers and seismic networks use more limited analyses to quickly determine an initial locations and size. It takes time to do the more detailed data processing. Big earthquakes are particularly difficult to get a quick read on.

At first glance, that may seem counterintuitive. A big earthquake has stronger seismic signals and that should make it easier, right? Nope – and it has to do with duration. A big earthquake is bigger because the fault is larger and takes more time to rupture. It's hard to determine the size of something before it is finished. The 2004 earthquake in the Indian Ocean took nearly ten minutes to rupture, starting off the coast of Sumatra and not stopping until 800 miles later near the coast of Burma.

In addition to rupture time, the longer wave train is more difficult to analyze. Normally a quick estimate is made from the first two minutes of the seismic signal. That cutoff is made before reflected and refracted signals begin to arrive, making it much messier to decipher. New techniques are being developed to assist in the process, but in 2011 it was still hard to do.

I am always wary when I see an earthquake in the upper 7- or lower 8-range. Experience has taught me that it could be as much as a whole unit larger. The difference between a 7.9 and an 8.9 is not trivial, especially when it comes to shaking area and tsunami generation.

To further heighten my concern, a few minutes later Troy Nicolini called. Troy was the NWS Eureka Warning Coordination Meteorologist (WCM) at the time. The WCM's job is to coordinate alerts, make sure Emergency Alert System functions and that we all understand what messages mean and what actions are required. In the US,

tsunami alerts are issued through the Weather Service, not by the USGS. We were both part of a post-tsunami survey team to Chile only a year earlier. In 2006, we worked together on a tsunami triggered by a M8.3 north of Japan that caused \$24 million in damages to Crescent City's harbor. We had a reason to be concerned.

A half hour later, my fears are justified when the USGS revises the magnitude to 8.8. A final determination made months later raised it to 9.1. The alarm bells in Troy's and my head are now ringing loudly. There is no question now that vulnerable areas like Crescent Harbor are at risk.

The rest of the night is a blur. I'm on and off the phone to Troy, and communicating with colleagues via text and email. Shortly after 11 PM, we get a forecast from USC that the tsunami could produce surges from two to nine feet along the California coast. Another colleague runs a model suggesting Crescent City could see something comparable to what happened in 1964.

We were fortunate that the US had greatly expanded the tsunami warning system following 2004. A number of ocean bottom pressure sensors (DARTs) were operating and two were not far off the earthquake rupture zone. It's a little after midnight when I view the closest DART. The peak amplitude is nearly three feet. That might not sound like much, but it is huge for a tsunami in deep water and it takes my breath away. There is no question in my mind that we are in for trouble.

It's now an hour and a half after the earthquake and there is a new source of information. Japan's national media agency NHK has a fleet of helicopters stationed all over the country. They are in the air within 30 minutes of the earthquake and begin broadcasting live as tsunami surges approach the coast of Fukushima, Miyagi and Iwate Prefectures. Like many of you, I am transfixed but what I see.

At 12:51 AM Friday morning March 11, WCATC issues a Tsunami Warning for the California coast north of Point Conception. The message estimates arrival times at a number of locations. The ETA for our coast is around 7:30 AM. Water heights of 2.5 meters (8.2 feet) are expected at Crescent City. The good news is that the tide is low. The 1964 tsunami arrived on top of an 8-foot high tide.

Warnings mean means evacuations. Only county officials can order evacuations. Del Norte, Humboldt and Mendocino officials, in coordination with Troy, made the decision for a staged response. In Crescent City, boat

owners were notified to take their boats to deep water and a steady stream of commercial fishing boats exited the harbor from 1:30 until 6 AM. From the forecasts, Humboldt Bay was not likely to be at risk, but harbor officials did examine moorings.

The Emergency Alert System was activated at 4:30 AM, with radio and television messages, sirens triggered and door-to-door notification of people in the tsunami zone. I had nothing to do with the boots on the ground efforts. I spent those early morning hours collecting as much information as I could and spent the rest of the day at the Eureka Weather Service Office interpreting data and doing media interviews so that everyone else could carry out their responsibilities.

We have been collecting video recollections of the March 2011 tsunami. Some are from emergency managers and responders, others from scientists and educators. They provide a glimpse into what happened that day and why it is important to remember. You can listen to their stories at <https://rctwg.humboldt.edu/remembering-great-east-japan-earthquake-march-11-2011>. There is even a place for you to add your own story.

Note: As I write, a small tsunami is lapping at our coast. On Thursday, a M8.1 earthquake occurred north of New Zealand. We were never at threat of damage, but the earthquake did produce a tsunami and it registered on a number of California tide gauges. Even a small tsunami can set up oscillations in bays and harbors and at Crescent City these two to three inch waves have now been arriving for more than 36 hours.

Lori Dengler is an emeritus professor of geology at Humboldt State University, 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://www2.humboldt.edu/kamome/resources> 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 a free copy of the North Coast preparedness magazine "Living on Shaky Ground." <https://www.times-standard.com/2021/03/07/lori-dengler-march-11-2011-on-the-north-coast/>