

Times Standard

Not My Fault: Taiwan earthquake shows preparedness matters, and some excitement in New Jersey

Lori Dengler for the Times-Standard

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The Uranus building in Hualien City tilts after the April 2 earthquake in Taiwan. The building was built in 1986 before more stringent building codes were established.

2024 got off to a shaky start with the M 7.5 Noto earthquake in Japan, but since then it's been a quiet earthquake year - until Monday. A magnitude 7.4 earthquake struck the east coast of Taiwan, causing casualties, significant damage, and a modest tsunami.

The Hualien earthquake, named after the city 11 miles from the epicenter, is newsworthy in itself, but also bears lessons for earthquakes we might have on the North Coast. It's also a reminder that any major quake in the Pacific has the potential to cause a tsunami.

Taiwan's geologic setting is arguably more complex than ours, sandwiched between the southern end of the Ryukyu subduction zone and the Manila trench to the south. Monday's earthquake was centered on a thrust fault near the coast. Thrust faults occur in zone of compression and there is plenty of squeezing happening in Taiwan.

The Hualien earthquake is the second largest of 2024 and considered "shallow" by earthquake standards at 22 miles beneath the surface. It produced strong shaking in the

Hualien City area and was felt as far away as Shanghai on the China mainland over 500 miles away.

Impacts were significant. The Taiwan government reported 780 buildings and 35 bridges damaged, mainly in the Hualien area. Most spectacular of these was the ten-story Uranus building, tilting at an angle of 25° to the ground and trapping dozens inside. All were safely evacuated, and demolition of the structure has begun.

Thirteen deaths are attributed to the earthquake. All deaths are regrettable, but considering over three million people were exposed to very strong ground shaking, the number is modest and far below the 2,415 souls that perished in the 1999 M7.7 Chi-Chi earthquake.

The far lower casualties are in part due to changes following the 1999 quake. Emergency planning and drills were introduced. Building codes were upgraded. The Uranus building was built in 1986, before the code changes were made. The Chi-Chi earthquake was larger and produced stronger ground shaking than this week's temblor, but it was centered only 35 miles to the west and on a similar fault. We will have a better picture in a few weeks after the teams of Taiwanese and international engineers report on field investigations.

This has implications for us. Current building codes in Taiwan are similar to California's and knowing what buildings failed and why has direct bearing on our own built environment. We can and will have earthquakes of similar size and faulting characteristics.

Something that didn't happen after the Hualien earthquake was fire. Fire can be the deadliest earthquake impact, carrying much of the blame for both the 1906 San Francisco and 1923 Great Kanto earthquake casualties. Why no fires this time? Hualien is a concrete city, unlike Japan and California where most residences are wood frame. Wood structures are elastic in resisting strong shaking collapse but can ignite quickly if sparks fly.

Climate change makes fire following earthquakes a bigger problem. The California Seismic Safety Commission recently commissioned a study (<https://peer.berkeley.edu/fire-following-earthquake>) that makes suggestions on how to reduce fire risk. The State is considering mandating shaking-triggered gas shutoff valves. In the meantime, everyone should know where gas valves are and be able to turn them off when gas odors are detected and know when and how to use a fire extinguisher.

Big earthquakes don't only produce strong ground shaking, but also pose tsunami dangers if centered beneath the sea floor or close to the coast. The size of the Hualien quake immediately put tsunami warning centers into alert mode. The Pacific Tsunami Warning Center (PTWC) issued a tsunami threat message ten minutes after the earthquake that "hazardous tsunami waves are possible for coasts within 300 km (~200 miles) of the earthquake epicenter."

Tsunami alert terminology is confusing. PTWC is charged with alerting Hawaii and U.S. territories. These can be Warnings (the highest risk level), Advisories (localized risk), Watches (possible risk but time for further evaluation), and Statements (no risk or still evaluating).

PTWC also has agreements with many countries in the Pacific and Caribbean to issue “threat” messages. The U.S. cannot issue Warnings or Advisories to foreign countries. A threat message gives the particulars of the earthquake and PTWC’s assessment of the likely peak tsunami water heights, arrival times of the first surge, and the countries within areas of high, moderate, or modest threat. It is up to the governments to issue warnings or evacuations of their coastlines.

Last Monday, Taiwan, China, Japan, and the Philippines all issued warnings and evacuations for parts of their coastal areas. Nine tide gauges on Taiwan recorded a tsunami, the highest at Hualien City was 3 feet above the ambient tide level. Smaller waves were recorded in Okinawa. No damage was reported.

What about the U.S. West Coast? The National Tsunami Warning Center (NTWC) in Alaska issued a Statement 12 minutes after the earthquake that they were analyzing risk and would get back to us soon. This Statement was picked up by the California Warning Center and distributed to counties, the media, and other organizations. This is the first time I’ve noticed such wide distribution of a Statement, and I received several call about what this meant. I was pretty sure we had no problem but waited another 45 minutes for NTWC to issue a formal “no tsunami danger” message.

This column was nearly finished when up popped an earthquake in New Jersey. Come again – New Jersey? Yup – a 4.8 on Friday morning north of Trenton. How unusual? Relatively uncommon but not unprecedented. Twenty-eight earthquakes of magnitude 4 or larger have occurred near the eastern seaboard since 1950. The largest a M5.8 in Virginia in August 2011 caused at least \$200 million in damages. The largest New Jersey quake on record occurred in 1783, estimated as a 5.3.

There has been a marked increase in earthquake activity in the Midwest attributed to disposal of drilling waste fluids, but the New Jersey quake is clearly natural. There are no oil fields or drilling operations nearby and the east coast has many mapped fault zones. And it is behaving like a normal earthquake sequence, producing dozens of aftershocks including a 3.8 that was also widely felt.

Over 160,000 people filed felt reports on the USGS "Did You Feel It?" site, some as far away as Alabama, Minnesota, and Nova Scotia. Earthquake energy travels more efficiently in colder crust far from plate boundaries. And it did produce a tsunami of sorts afterwards - a media “tsunami” complete with “I survived” t-shirts for sale. Just a reminder that every part of North America is earthquake country, and the east coast is not as prepared as we are.

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://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 and to request print copies of preparedness magazine “Living on Shaky Ground.”