

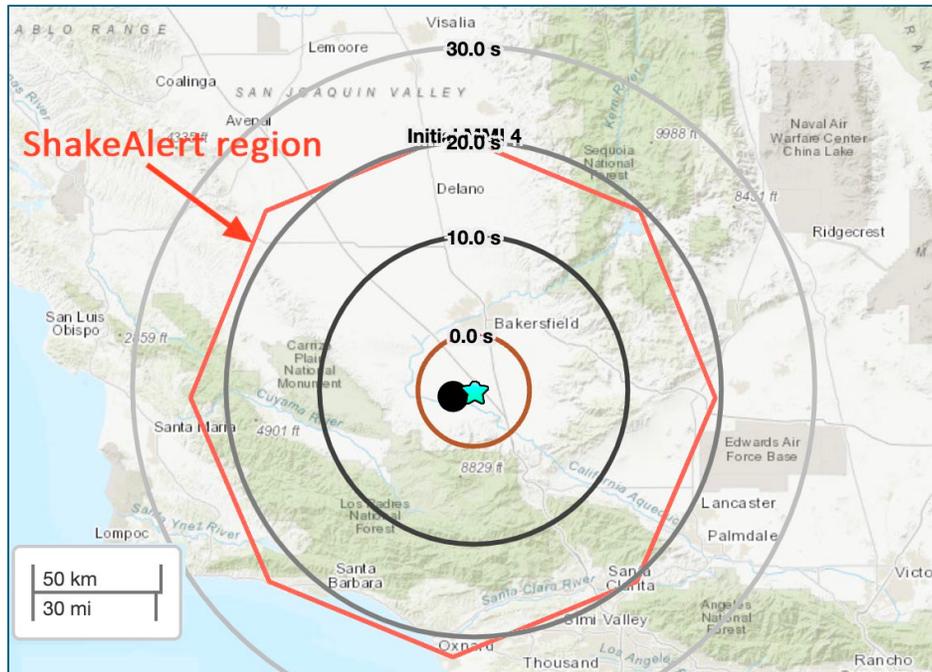
# Times Standard

## Not My Fault: Earthquake wakeup calls in California and Japan

Lori Dengler for the Times-Standard

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USGS ShakeAlert map for last Tuesday's 5.2 (8/6/2024) near Bakersfield. The black dot is the initial epicenter estimate by the ShakeAlert system and areas within the red polygon were sent ShakeAlert notifications. The final epicenter is shown by the star and the concentric circles show the amount of alert time before the stronger shaking arrived. Areas within the brown circle marked zero received the alert during or after the earthquake.

A spurt of earthquakes in south central California asserted California is still in the race with Texas for lower forty-eight earthquake dominance. Across the Pacific an earthquake in Japan triggered the first ever alert that the odds of a much bigger earthquake had increased. What are the implications of each of these events?

Last Tuesday at 9:10 PM PDT, a magnitude 5.2 struck south central California. The earthquake near Bakersfield was felt from the Baja border to Santa Rosa and Sacramento, and by a few as far away as Las Vegas. Reports of items knocked from shelves and small cracks in walls came from the epicentral area but no significant damage or injuries.

This earthquake was on an east-west oriented thrust fault about 7 miles below the surface. It was 17 miles away from the San Andreas fault and was very different than the horizontal strike-slip motion of the San Andreas fault system. It illustrates the complexity of

California faults; we have all kinds. There are plenty of other faults in the region and a long record of non-San Andreas quakes. Tuesday's epicenter was close to the mapped trace of the Wheeler ridge fault zone, faults related to the north – south compression as the plate motion between the North American and Pacific plate navigates the large bend in the main strand of the San Andreas.

Eleven earthquakes in the magnitude 4 to 5 range have been recorded in this area since 2000. They show a mix of faulting types, both strike-slip and thrusting. But one needs to look back further to get a more complete picture of the potential hazards this complex mix of squeezing and shearing poses to California residents.

On July 21, 1952, a magnitude 7.5 earthquake struck about 12 miles SSW of Tuesday's 5.2. Called the Kern County earthquake, it wreaked havoc in the southern and central part of the State, killing 14 and causing 70 million in damages in 1952 dollars. Tehachapi was the hardest hit where 68 homes were heavily damaged. It triggered fires, landslides, and disrupted power and infrastructure over a wide area and is arguably the second largest California earthquake of the 20th century.

There have been plenty of aftershocks following Tuesday's 5.2. As of Saturday morning, 500 smaller earthquakes have been recorded in the epicentral region including three in the magnitude 4 range and 29 M3s, large enough to be felt by many. As I write four days after the 5.2, the USGS forecasts that felt aftershocks are almost a certainty over the next week and estimates a 39% chance of a M4 in this time window.

For earthquakes of this size, there is concern that it could be the foreshock of something larger. The USGS publishes the likelihood that something as large or larger could follow. On Tuesday, the USGS estimated the odds at 21% that another M5 could follow and a 2% chance of a larger quake. Those odds have now dwindled to 5% for another M5 and less than 1% for something larger. Keep in mind, the odds never go to zero - there is always a small but real chance that a bigger quake could happen anywhere in the State.

An interesting lesson from Tuesday's earthquake is the success of the ShakeAlert® early alerting system. There are over 1,400 West Coast seismic stations continuously monitoring earthquake activity. If four or more are triggered within a few seconds of each other, ShakeAlert algorithms kick in, computing epicenter, magnitude, and shaking area. If that preliminary magnitude is at least 4.5 (for MyShake), or 5.0 (for WEA Wireless Emergency Alerts), and populated areas are likely to feel perceptible shaking, cell phone companies and other delivery systems send a ShakeAlert message.

The process is automated and happens incredibly fast. On Tuesday, it took just under seven seconds for a message to be sent. MyShake, the App developed by Cal Berkeley, delivered 517,000 messages and Google sent 4.9 million over WEA. San Diego County is now delivering the message via their emergency notification system as well. The message is very short: Earthquake - Drop Cover Hold On. It won't tell you where the earthquake is or when the shaking will arrive.

Common ShakeAlert questions:

1) Will I always get an alert before I feel shaking? No. For communities near the epicenter, the alert will arrive during or after the seismic waves. In 7 seconds, seismic S-waves (the stronger shaking) travel about 15 miles. Anyone within that radius will feel shaking first. The further you are away, the more alert time you get. On Tuesday, Arvin (16 miles away) got one second and Tehachapi (36 miles), got nearly 10 seconds.

2) If I get an alert, will I always feel an earthquake? No. If you are driving or outside and active, you won't feel the relatively moderate shaking this earthquake produced. The automated location and magnitude are not always correct. On Tuesday, the initial magnitude was 6.0 meaning the notification area was larger than the actual shaking and some people got alerts but didn't feel it. This is a bigger problem on the North Coast where many of our earthquakes are offshore and we don't have ocean bottom seismographs or as dense an on-land array as other parts of the State. If you get an alert and don't feel anything after a minute, assume the danger window is over and congratulate yourself for exercising what to do if the shaking had been real.

3) A few seconds is not very much time. What can I do and why can't I get a longer warning? A few seconds is enough time to take precautionary measures. Trains can stop and vehicles can slow down and pull over to the curb, fire station doors can automatically open and medical facilities can pause surgeries and switch to emergency power. You can brace yourself for shaking – Drop down where you are (or sit if you have knees like mine), bend over and protect your neck and head with your arms, and for the physically able, get under a table or desk if nearby and hold on. ShakeAlert is not earthquake prediction and only kicks into action AFTER an earthquake starts. We might be able to squeeze out a few a few more seconds as station coverage and algorithms improve, but not much more.

4) How do I get ShakeAlert? Visit <https://www.usgs.gov/faqs/how-do-i-sign-shakealert-earthquake-early-warning-system> and make sure that location is activated on your cell phone.

On Thursday nearly 6000 miles away across the Pacific a much larger earthquake occurred. The magnitude 7.1 struck near the city of Miyazaki on the southeast coast of Kyushu, Japan. The earthquake was felt strongly in the Miyazaki region, damaging 55 homes and injuring 16. The Japanese Meteorological Agency (JMA) issued a tsunami alert for coastal areas of southern Kyushu and a 1.6-foot tsunami was observed at Miyazaki.

Like the USGS, JMA seismologists are also concerned about a larger earthquake soon following. In 2011, a M 7.3 struck off the northeast coast of Honshu, Japan. Two days later it was followed by the 9.1 Great East Japan earthquake. Thursday's 7.1 has some similarities. It was centered in the Nankai trough, a subduction zone that has produced earthquakes in the mid magnitude 8 to low 9 range in the past.

JMA scientists took the unprecedented step of issuing their first ever Foreshock Alert, stating the chance of a bigger earthquake had increased. No evacuations have been ordered but the country mandated that bullet trains in the region would travel more slowly over the next week and Japanese Prime Minister Kishida postponed a scheduled trip to central Asia. JMA cautions that the probabilities are low are low but people in areas vulnerable to tsunami should be prepared for quick evacuations.

Read about the Japan megaquake advisory in the Japan Times

<https://www.japantimes.co.jp/news/2024/08/08/japan/nankai-earthquake-alert/>

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<https://rctwg.humboldt.edu/prepare/shaky-ground>.