

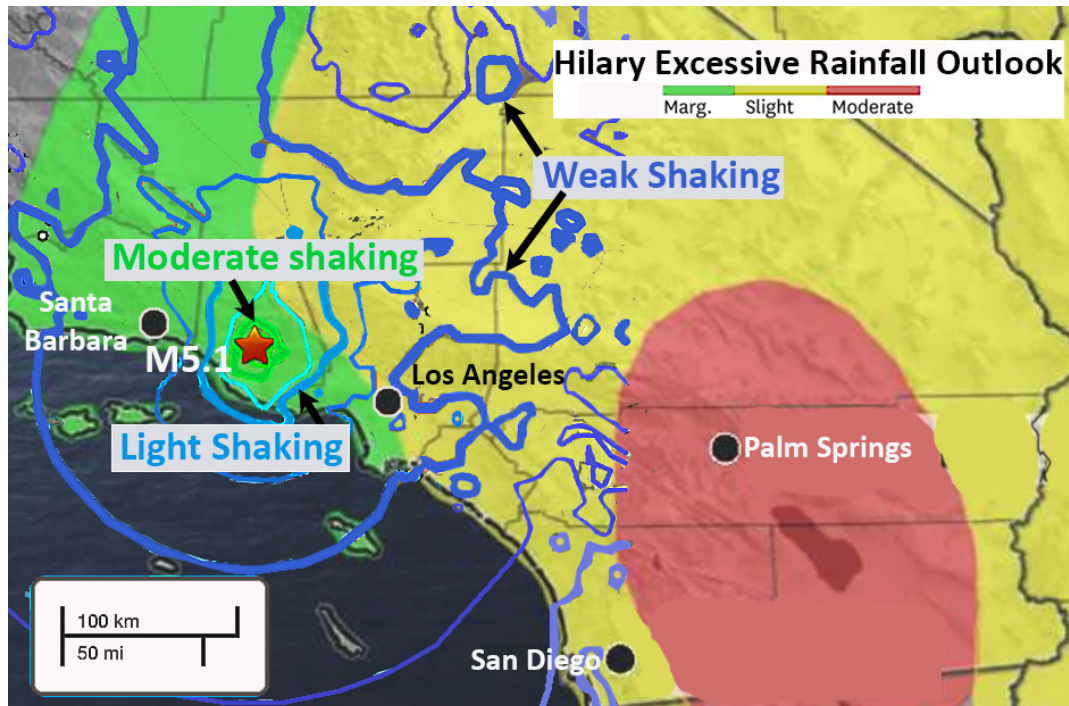
Times Standard

Not My Fault: A wet, windy, shaky, flooded, fiery week for California

Lori Dengler for the Times-Standard

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The August 20th 'hurriquake' - colored background shows the relative rainfall expected from Hilary and the contour lines depict the shaking strength of the M5.1 earthquake in Ventura County.

In emergency management circles, we often call California a natural disaster theme park. In the last week, the State is living up to that reputation with the first tropical storm watch/warning ever issued here, the largest earthquake to strike Ventura County in over 100 years, historic rainfall, flash flooding, and too many fires to count.

Hilary was born as a small disturbance in the Pacific south of Mexico on August 12. Four days later, the pressure anomaly had reached offshore of Manzanillo and the winds became organized and strong enough to become a named tropical storm. Fueled by warm ocean waters, Hilary gained hurricane status on August 17, surging to Category 4 strength the next day with sustained winds of 145 mph.

Hilary continued tracking to the northwest but weakening as the storm encountered cooler waters and less humid air. On August 19th, the National Weather Service issued its first ever tropical storm watch for California, alerting the region of flash flood potential within the next 48

hours. Twelve hours later, the watch was upgraded to a warning, meaning flooding could be imminent.

By the time Hilary made landfall on August 20th on Mexico's Baja Peninsula about 200 miles south of San Diego, winds had diminished to 65 mph, tropical storm status. Six hours after landfall, the eye had reached the California border with sustained winds of 40 to 54 mph and with gusts over 80 mph.

California emergency officials responded to NWS alerts by issuing evacuations for desert areas susceptible to flash flooding and urged people to leave Catalina. A number of scheduled trains were cancelled. The Dodgers, Angels, and Padres all cancelled major league baseball games and SpaceX postponed launches from Vandenberg Air Force Base. Del Mar track cancelled their August 20th horse racing meet, only the second time they've done so in its 84-year history.

The most important result of the watch/warning is something most of you didn't notice – establishing emergency operations centers at the city, county, and state level. Staffing centers before impacts are felt allows coordination and preplacement of personnel and resources.

Hilary produced record August rainfall in a number of California counties and broke state records in Idaho, Montana, Nevada, and Oregon. But we escaped relatively lightly. Flash flooding damaged roads but caused little other damage. No deaths, injuries or major structural damage was reported in California.

As Hilary was moving north, a sequence of small earthquakes began in Ventura County on August 19th. Starting around 11:30 AM PDT, small earthquakes began clustering near Ojai, Ventura's third largest city. Over the next 14 hours, 19 earthquakes in the magnitude 1 to 2 range were recorded. The largest was a M2.6, reported felt lightly by a few people in the Ojai area. It looked like a typical swarm with earthquake occurring only minutes to tens of minutes apart and all in the same magnitude range. I didn't pay any attention to the sequence as none of the quakes were large enough to warrant an email from the USGS or make much notice among my seismology colleagues.

Just after midnight, the swarm appeared to be over, and all was quiet for 14 hours. At 2:41 PM PDT on the 20th, a M5.1 earthquake occurred. This earthquake definitely got my attention as well as that of the 21 million Californians the USGS estimates felt it. The good news is that other than knocking items off shelves and taking a toll on some pricey liqueur bottles, it did almost no damage.

I wasn't surprised by the location or size of the quake. There is no place in California where an earthquake like this one can occur. But there are a number of reasons this earthquake interests me. It was the largest to be centered in Ventura County since a 6.5 near Oxnard in 1922 and it appears to have been a very successful test of California's earthquake alerting systems.

Ventura County straddles the Transverse Ranges, east to west trending mountains oriented at an angle to the northwest to southeast fabric of much of California. We know why these ranges exist. The San Andreas transform plate boundary makes a big bend in this area and the motion between the North American and Pacific plates creates a broad zone of compression. The big squeeze is causing them to rise at the rate of nearly a tenth of an inch per year.

Given the stress in the region, it is perhaps a surprise that there haven't been more strong earthquakes in historic times. There is plenty of geologic evidence large earthquakes occurred before the relatively recent time of seismographs and written historic accounts. The Transverse Ranges are laced with faults and the 5.1 is near the San Cayetano and Mission Ridge fault systems. The earthquake was on an east-west oriented thrust fault consistent with the Transverse Range trend.

The 5.1 triggered California's early earthquake alert system. Unlike the two North Coast earthquakes I wrote about last week, this earthquake made the threshold for both magnitude and shaking strength to send a "shaking expected" message to smartphones. The first message was issued 5.5 seconds after the earthquake. This didn't help the folks in Ojai or within 15 miles of the epicenter who got the message after the shaking started, but millions of others further away got a several second heads up.

Social media quickly coined the term #hurriquake for the events of August 20th and it is a reasonable question to ask if there was any relationship between the hurricane and earthquake. Could the pressure changes or rainfall associated with Hilary somehow unlock the fault? Extremely unlikely. The Ojai sequence began while Hilary was still nearly 400 miles away off the Baja coast. There was no measurable rainfall in Ventura County at that time. The 5.1 was centered three miles beneath the surface where daily temperature fluctuations don't reach. It was only a coincidence.

Closer to home, the last two weeks brought a roaring entrance to the Northern California Fire season. As I write, there are at least eleven named fires in Humboldt County and five fires have coalesced to become the Smith River Complex in Del Norte County, the smoke a constant reminder of the new August normal in our climate-changed world.

Sadly, more of the world is part of a natural disaster theme park these days. Climate change means the coincidental co-occurrence of two, three, or more disasters at once has become more likely. Preparing beforehand is more important than ever before.

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. Downloadable copies of the North Coast preparedness magazine "Living on Shaky Ground" are posted at <https://rctwg.humboldt.edu/prepare/shaky-ground>.

