

Not My Fault: The 1992 Cape Mendocino earthquake and Did You Feel It reporting

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Today marks 29 years since the Cape Mendocino earthquake. The North Coast has rumbled plenty of times since then. Nearly thirty earthquakes were detected in the triple junction region in the past month alone. But the April 25 M7.2 Cape Mendocino earthquake was something else entirely.

If you were in Humboldt County on that Saturday, you remember the moment. I was in our upstairs bedroom getting ready for a family picnic at Big Lagoon. I live in McKinleyville well away from the strongest shaking zone. but there was no question this was a big earthquake and that picnic never happened.

Over the next day, I felt several aftershocks including a 6.5 and a 6.6 in the wee hours of the night. We were far enough away to suffer no impacts. It was different in the Cape Mendocino and Eel River Valley areas. Houses popped off foundations, chimneys fell, windows broke, wood stoves toppled over, and fires destroyed the Petrolia fire station and the Scotia shopping center. The earthquake caused more than \$60 million in property losses and 400 injuries. Fortunately, no lives were lost.

I bring up the Cape Mendocino earthquake because I have been thinking about how earthquake shaking strength is measured. I just finished reviewing a paper about the USGS Did You Feel It (DYFI) website and what is being learned from the data. What most people don't realize, is that DYFI can trace its origins back to our 1992 earthquake.

I started teaching at HSU in 1978. With little geophysical equipment, I needed a new area of research. What HSU lacked in equipment, we made up for in earthquakes and terrific undergrads. Whenever there was a felt earthquake, I'd send students out to collect intensity data collecting boxes full of data.

You might not be familiar with earthquake intensity. Magnitude measures the energy of the source. It is a single number and doesn't vary depending on where you are and,

by itself, gives no information about shaking. Intensity measures how strong the shaking is and varies from place to place. All felt earthquakes will have a range of intensities usually highest near the epicenter and weaker further away.

The standard way to measure intensity before the 1990s was observing damage and questionnaires. The USGS would send out teams to document damage after a significant earthquake. Surveys were sent to postmasters in the felt area and that individual would assess shaking in that community.

I followed the USGS survey form in my first forays into intensity. Some of the questions were qualitative such as "were you frightened by the earthquake?" There were boxes to check about furniture displaced and damage. We sorted the responses by community, and I assigned students to determine intensities of each pile.

It was a qualitative process, and each student would come up with different numbers. By the time of the 1992 earthquake, it dawned on me to revise the questionnaire so all answers could be assigned a numerical value. We asked about everything we could think of including perception of strength, reactions, and damage observed. The questionnaires were distributed to schools and even printed in this newspaper.

I developed a weighting scheme for the responses, added up the total and created an algorithm to correlate them with what the USGS values. We found that some questions like "did you experience nausea" bore little relation to shaking strength and others like "many items knocked over" correlated well.

We modified the survey and in 1994 after the Northridge earthquake, went to work in earnest. In the four months after the earthquake, HSU students made over 18,000 phone calls to randomly selected numbers in communities that felt the earthquake. I worked closely with Jim Dewey, a grad school friend and then head of the USGS Intensity group to refine the weighting scheme. We called our result the Community Decimal Intensity.

It was a slog to convince the USGS that our new approach was valid. That changed quickly in 1999 when Dave Wald of the USGS was looking for an online intensity method. With some tweaks and modifications to our algorithm and lots of internet moxie, it became DYFI site and a staple of the USGS Latest Earthquakes pages

(<https://earthquake.usgs.gov/data/dyfi/>). In 2000, people responded to 32 earthquakes; in 2020 it was over 1900 earthquakes with more than 360,000 DYFI responses.

What is the value of DYFI? It provides important information on the pattern of shaking strength. Instruments can measure intensity and in population centers like Los Angeles, accelerometers provide excellent data. But few places in the United States are as densely instrumented as Southern California and, in many areas, people provide the only data. The accuracy of DYFI reports is dependent upon response rate. If only a few people chime in, I won't put much faith in the numbers. But ten or more per location and the reliability is pretty good.

One of the beauties of DYFI is that it is automatic, requiring no effort on the part of seismologists. We now get felt information on many more earthquakes as in the past when only strong or damaging events were deemed worthy of study.

There is another important benefit in DYFI reporting. It's called Citizen Science and the opportunity for all of us to contribute to understanding seismic hazards. And social science studies show that people who contribute to Citizen Science projects are more engaged in the subject and more likely to prepare. It's another no-brainer. If there's an earthquake in our area, please head to the USGS Latest Earthquakes site and click on the event. It's easy to find the "Felt Report – Tell us" link that will take you to the survey form. And don't worry, the site won't track you or keep any personal information.

Note: Learn more about human perception of earthquakes and why it is important for ALL of us to participate in Citizen Science at

<https://temblor.net/earthquake-insights/representation-matters-in-earthquake-felt-reports-12620/>

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."