CEEWS – System Performance

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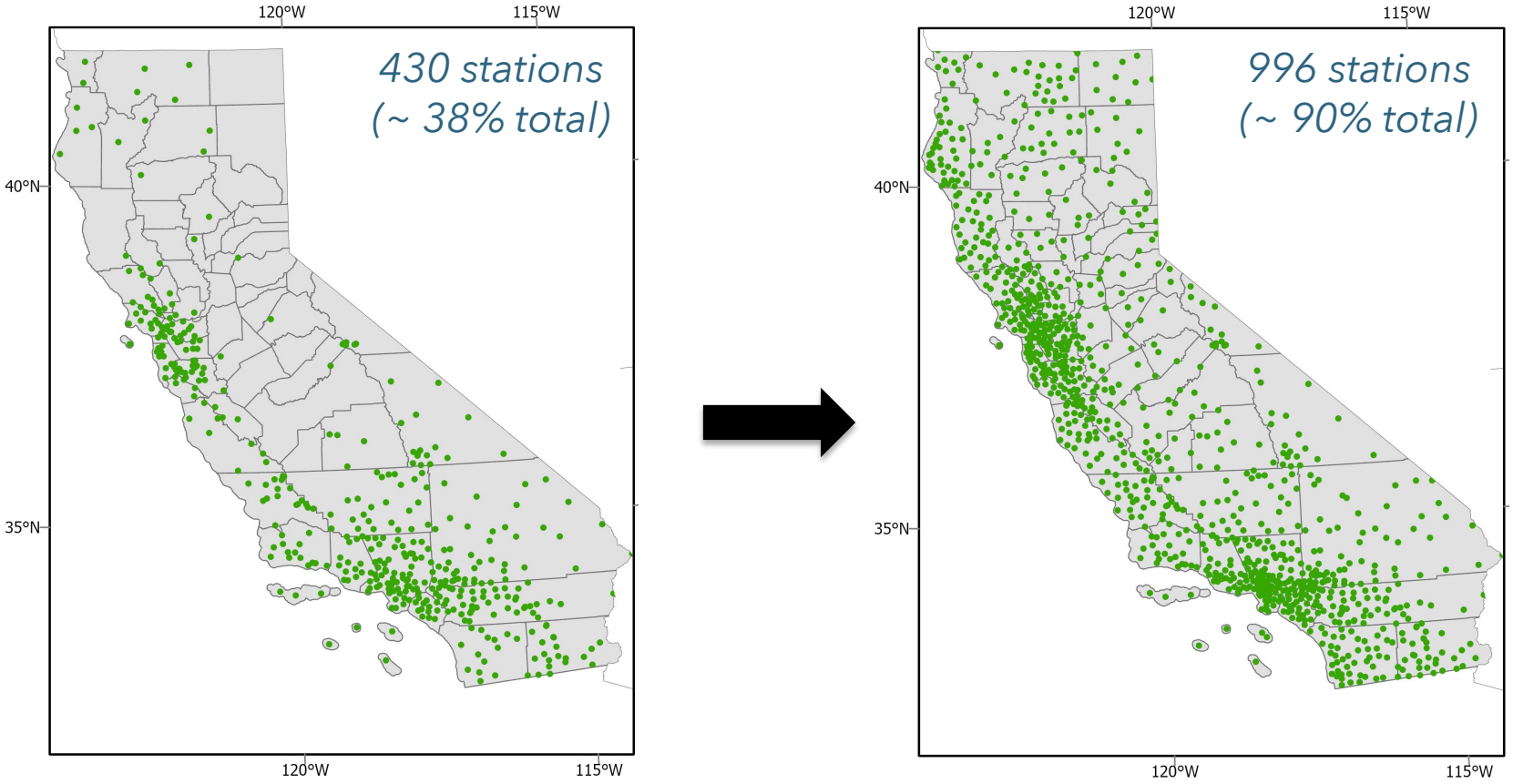
OF EMERGENCY SERVICES

How Do We Currently Monitor System Performance ?

Network Growth



Jan 2015

Aug 2024

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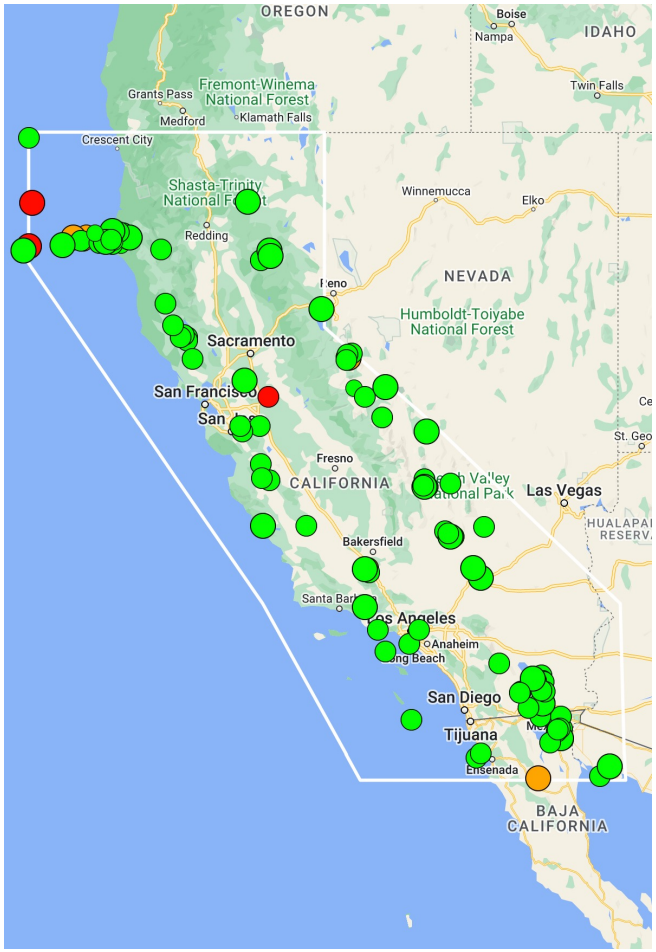
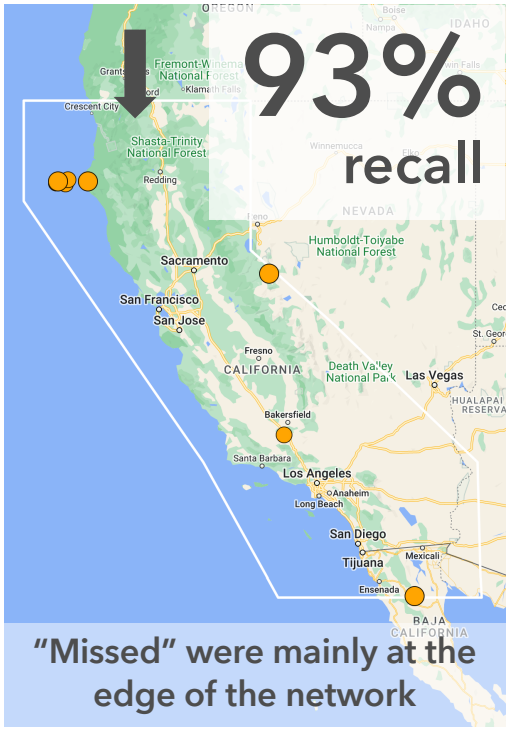
Alerted Earthquakes



← 106 M4.5+ ShakeAlert™ True Alerts in CA
(10/19/19 - 08/19/24)

3 False

8 Missed



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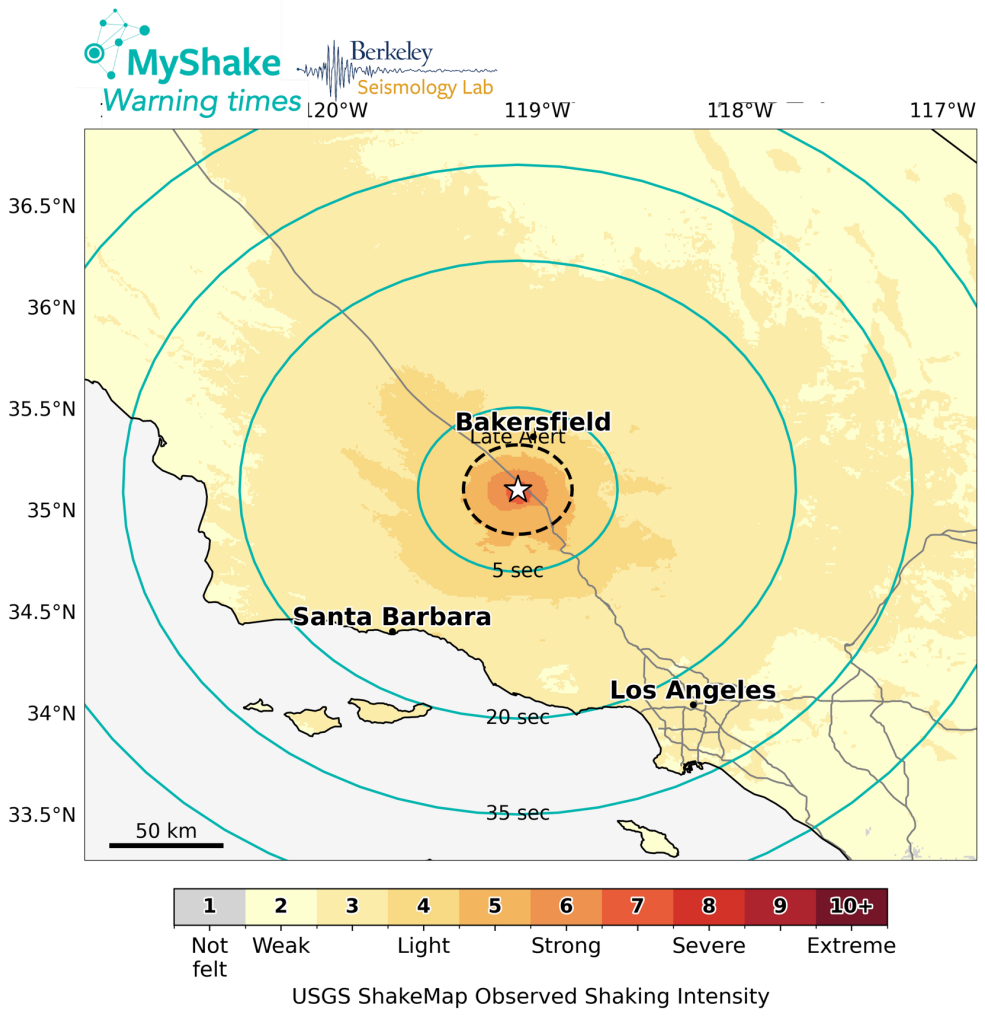
Warning Times to the Public

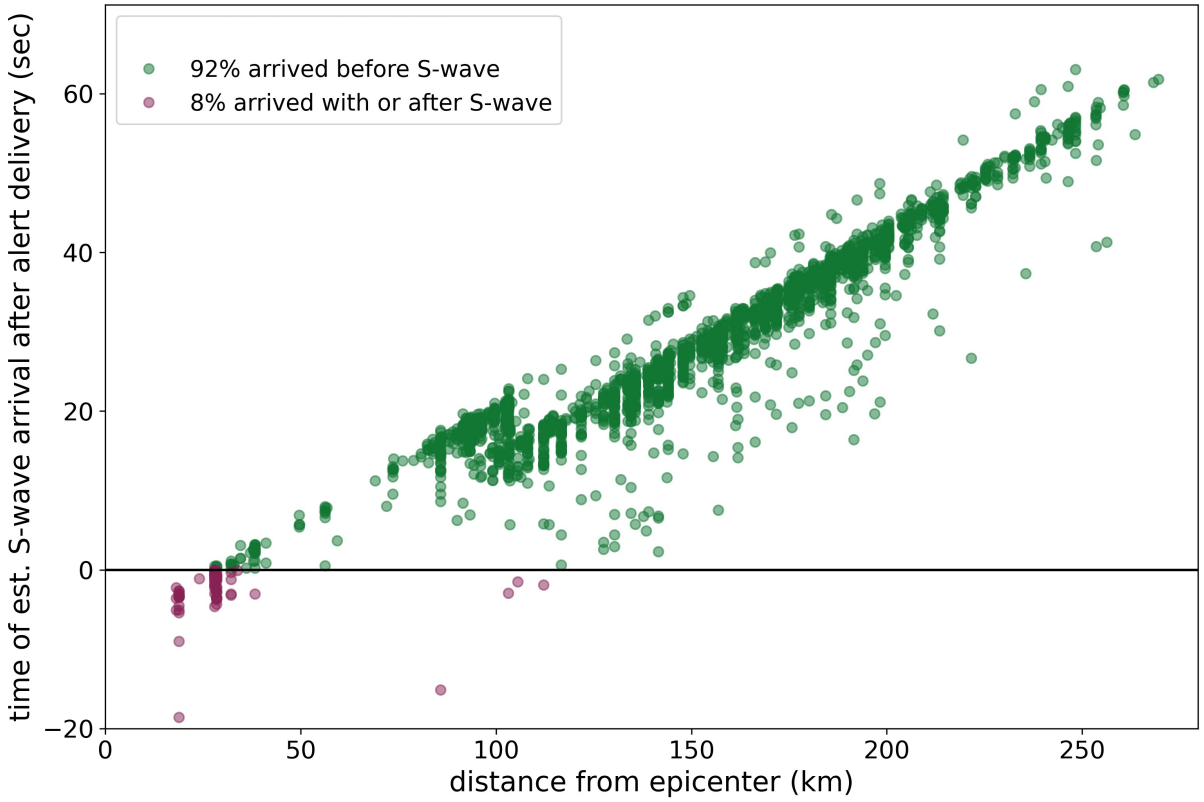
M5.2, Lamont, CA
Aug 7, 2024

500,000+ devices
alerted by MyShake



Population Size Alerted on Time

M5.2, Lamont, CA – Aug 7, 2024



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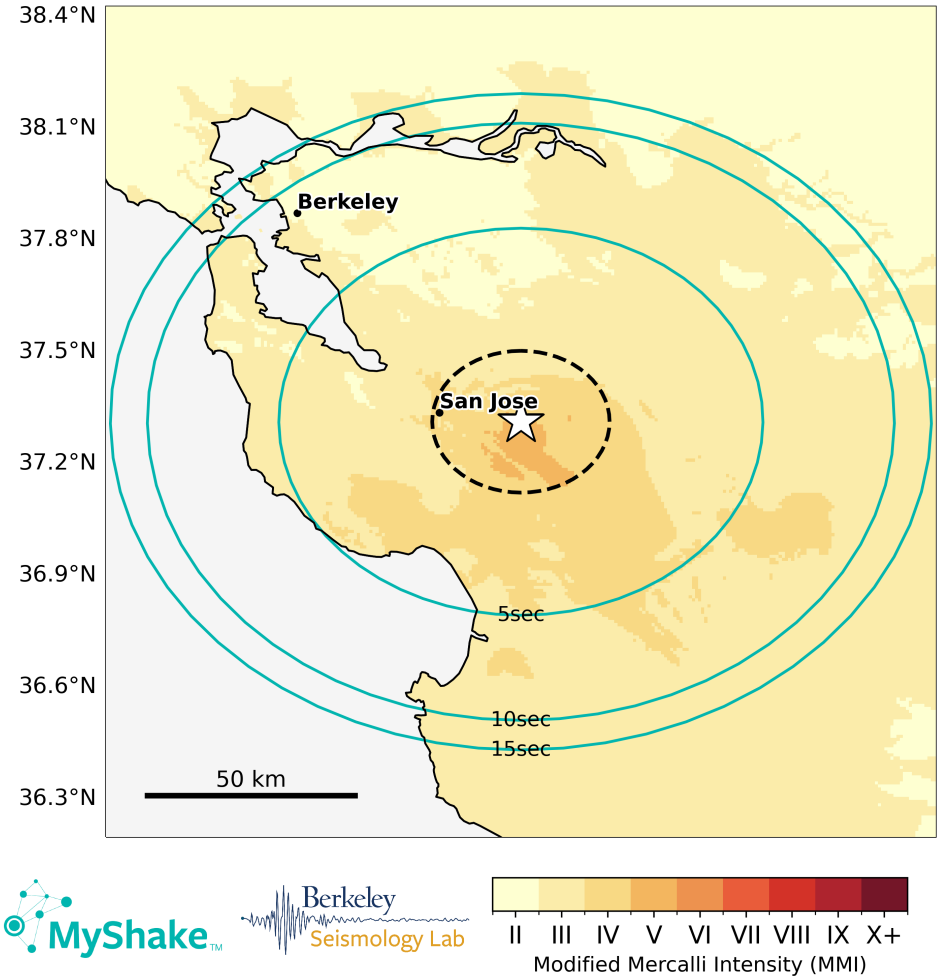
Warning Times to the Public

M5.1, Alum Rock, CA
Oct 25, 2022

~100,000 devices
alerted by MyShake



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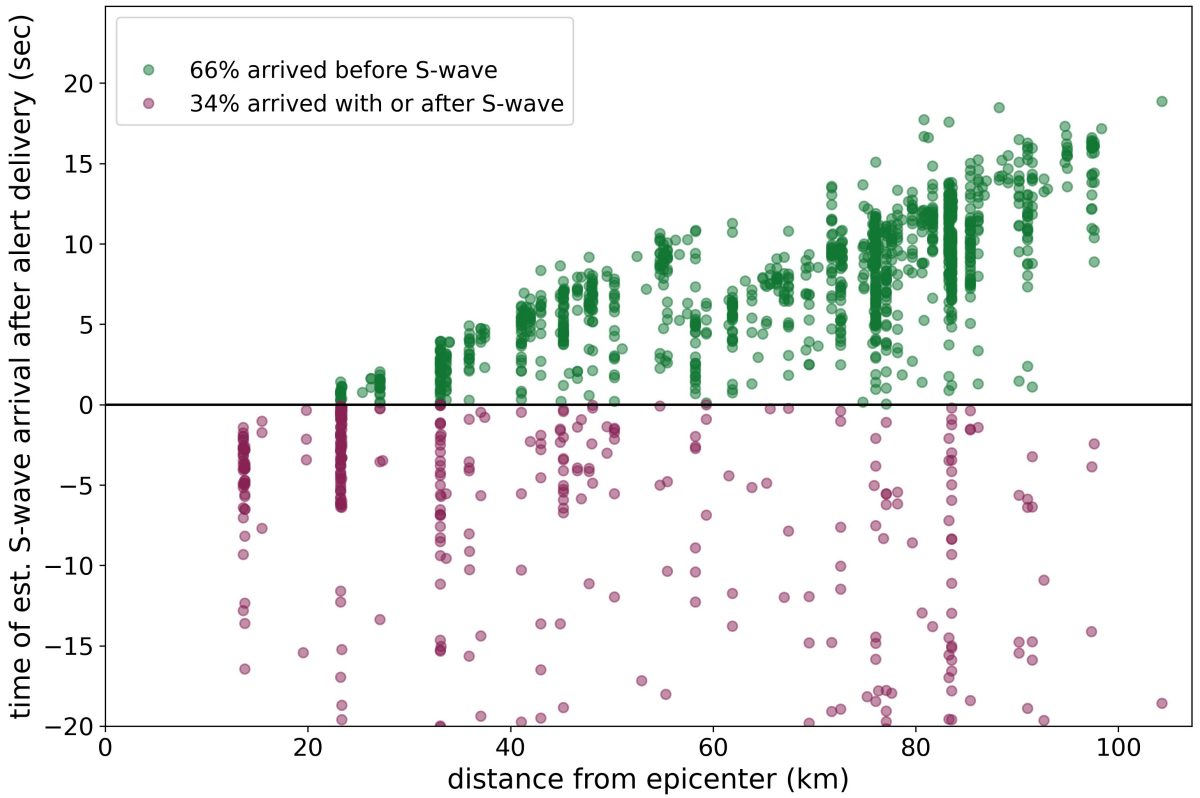
Population Size Alerted on Time

M5.1, Alum Rock, CA – Oct 25, 2022



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MyShake - Feedback from Users

M5.2, Lamont, CA - Aug 7, 2024
Twitter, App Store, Google Play, Emails

Great app for early earthquake warnings! ★★★★★
by Wumpus Hunter – Aug 7, 2024

Reply

I've had the app for awhile and was unsure of its value until the recent earthquake. Centered near Bakersfield, CA. It was 5.2 mag. My phone was set to silent so no sounds during evening. The app over rode that and started alerting/talking to me to get to safe location and take cover. About 10 seconds later, the earthquake hit us and the whole house rolled with the quake. And we are 100 miles away from epicenter!! The app display earthquakes all over the world or nearby you depending on your personal preference. It has a wealth of info and I find it invaluable now that I experienced the early warning for the first time. Kudos to the team that created this great app!

Awesome app, gives warning prior to quake! ★★★★★
by princessLaRue – Aug 6, 2024

Reply

We were alerted a good 15-20 seconds ahead of 5.7 quake centered in Kern County, CA. We're in Burbank and the quake was centered just south of Bakersfield. What an awesome tool! I'm old enough to remember the Northridge quake (1994) and Whittier Narrows quake (1987) whwn we had to wait literal hours to find out magnitude and epicenter. So grateful for this amazing app!

It worked ★★★★★
by SheevaP – Aug 6, 2024

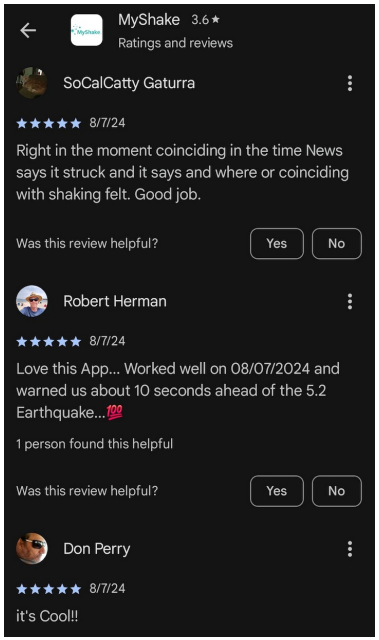
Reply

I was sitting watching TV when my App started going off Seconds before the earthquake actually hit it was amazing I'm so happy to have something that will give me a heads up before it happens. I totally recommend this App.

Accurate ★★★★★
by Megan___A – Aug 7, 2024

Reply

Not sure why there are negative comments, it's an app to save lives. It works well. I've never had any issues with it, warned each time, thank you.



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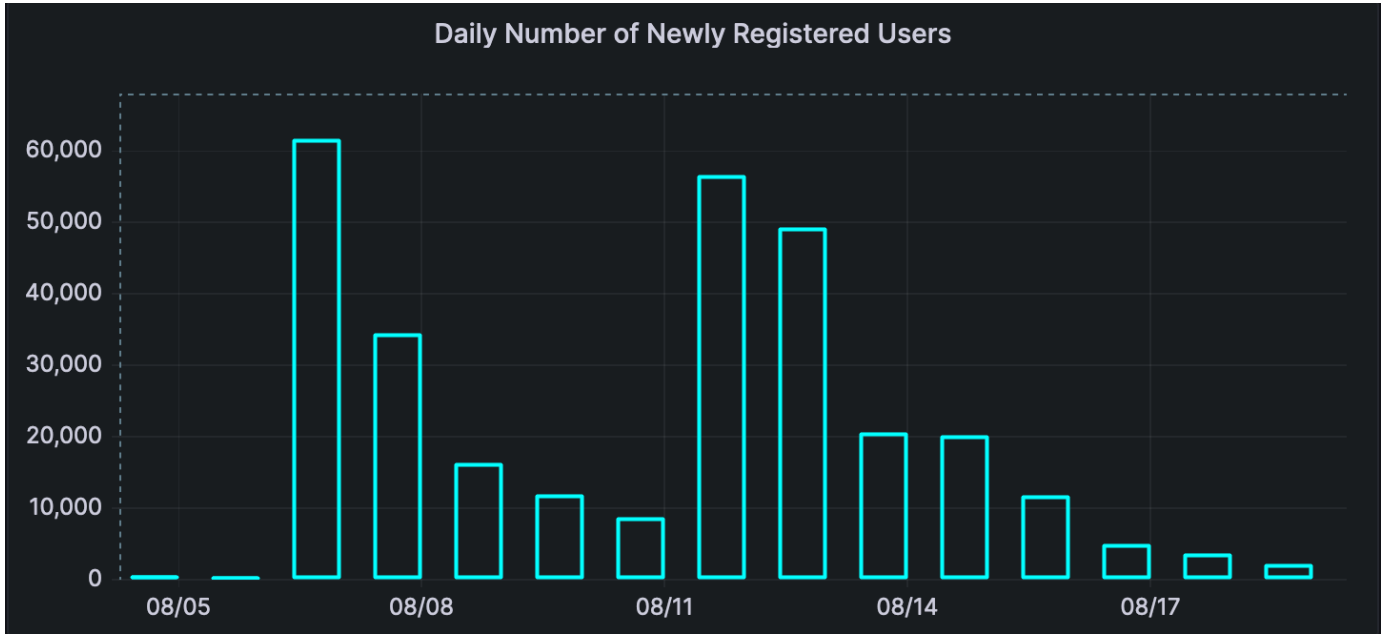
MyShake – Registered Users



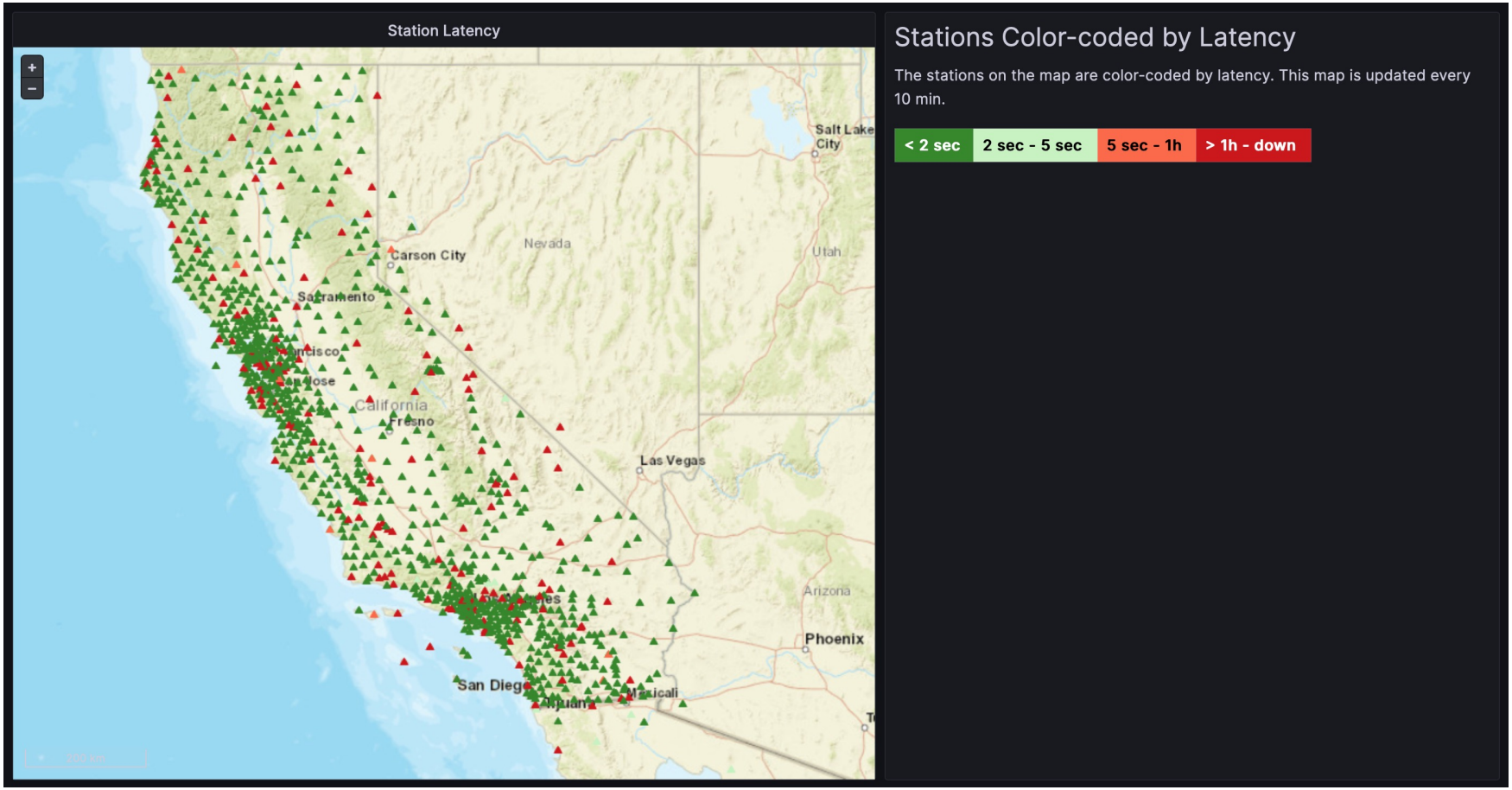
System Performance

- Mainly evaluated through Quality Control (QC) processes thanks to frequent occurrence of earthquakes in California
- Allow identifying issues and implementing necessary changes after events (noise filters, station clusters, alert pause, site corrections, offshore areas, etc.)
- Quality Assurance (QA) processes are also in place at the algorithm level (replays of earthquakes for validation of code changes, including large historical events)
- What QA processes can we implement at the system level to ensure that the system will be perform as expected for any earthquake in California at any time ?
- What QA metrics can we use to monitor these QA processes ?

Anticipate System Performance ?

- Objective: Develop a set of maps to provide an indication of the overall system performance in real-time
- Optimally, such a model should consider:
  - Status of the network (stations down, data latency, data quality, etc.)
  - Data packet size, algorithms, and processing time
  - Distribution time to the public
  - Population distribution
  - Earthquake risk

Network Status



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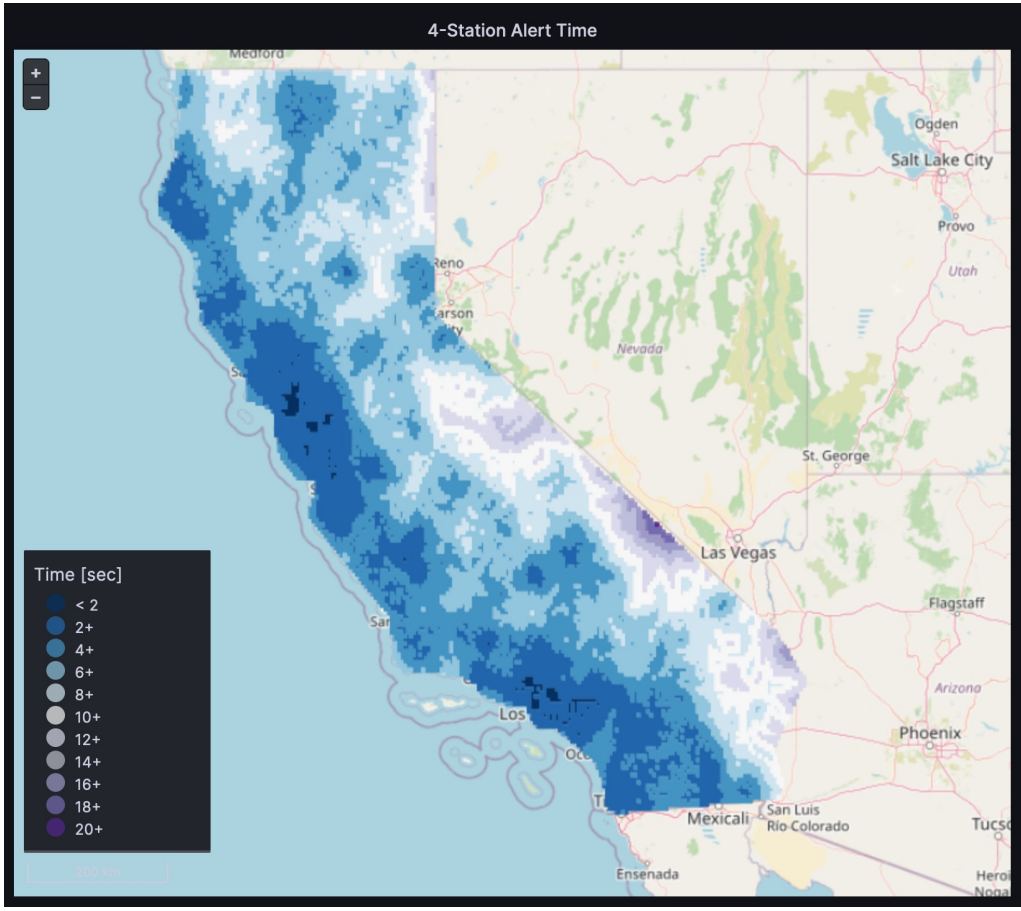
Time to Reach 4 Stations



Predicted Time for the P-wave to Reach 4 Stations

Each square in the image on the left represents the location of an earthquake. The square color is the predicted time (in seconds) for the P-wave to reach the 4 closest operational stations if an earthquake would occur at this location. The earthquake grid size is 0.05 degrees. This map is updated every 10 min.

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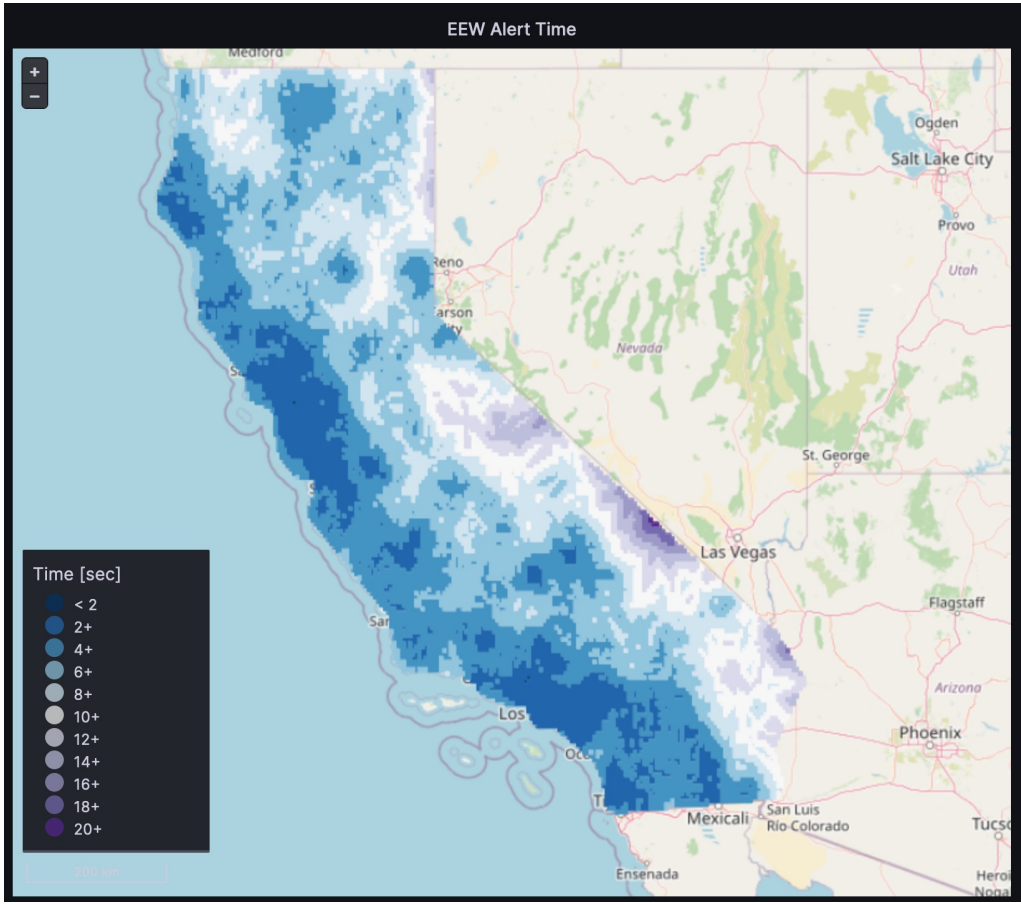
Time to Create Alert



Predicted EEW Alert Time

Each square in the image on the left represents the location of an earthquake. The square color is the predicted EEW Alert time (in seconds) if an earthquake would occur at this location. This time takes into account real-time data latency from the stations, data packet length, and processing. The earthquake grid size is 0.05 degrees. This map is updated every 10 min.

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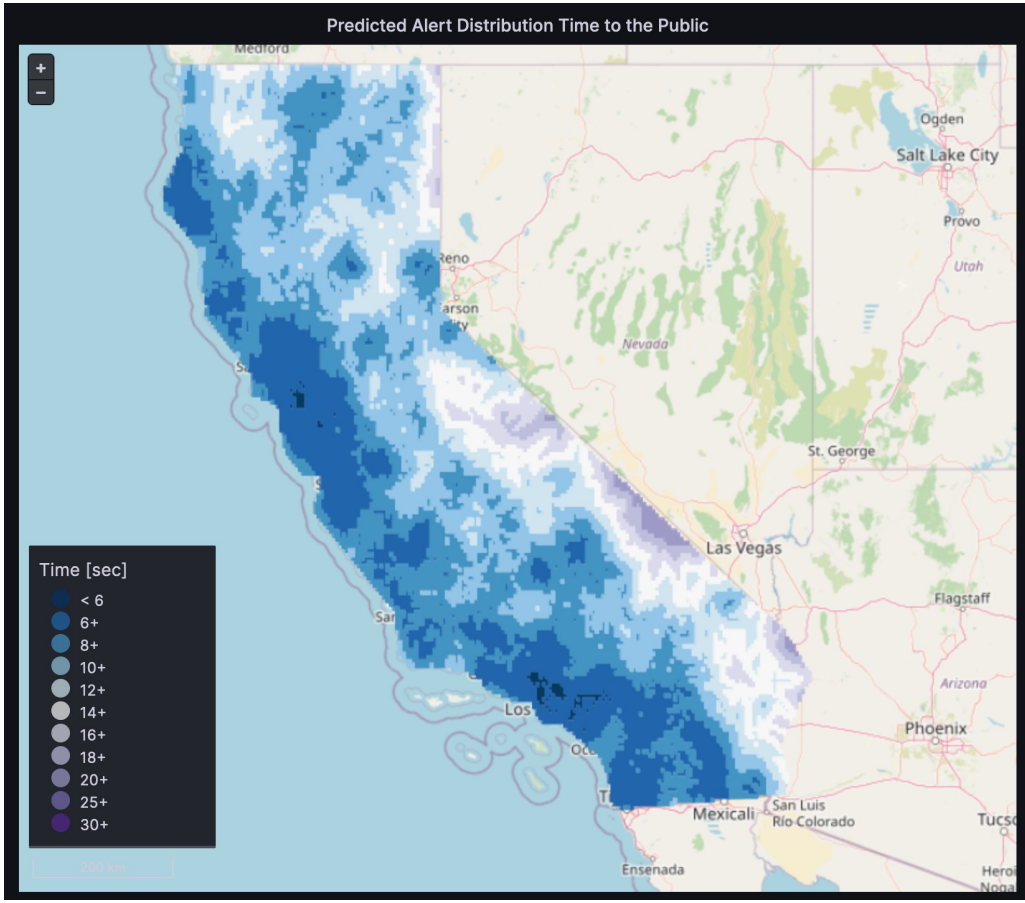
Time to Distribute Alert



Predicted Alert Distribution Time to the Public

Each square in the image on the left represents the location of an earthquake. The square color is the predicted EEW Alert distribution time to the public if an earthquake would occur at this location. This time takes into account real-time data latency from the stations, data packet length, processing, and delivery time by MyShake (estimation for 50% of users). The earthquake grid size is 0.05 degrees. This map is updated every 10 min.

MyShake™

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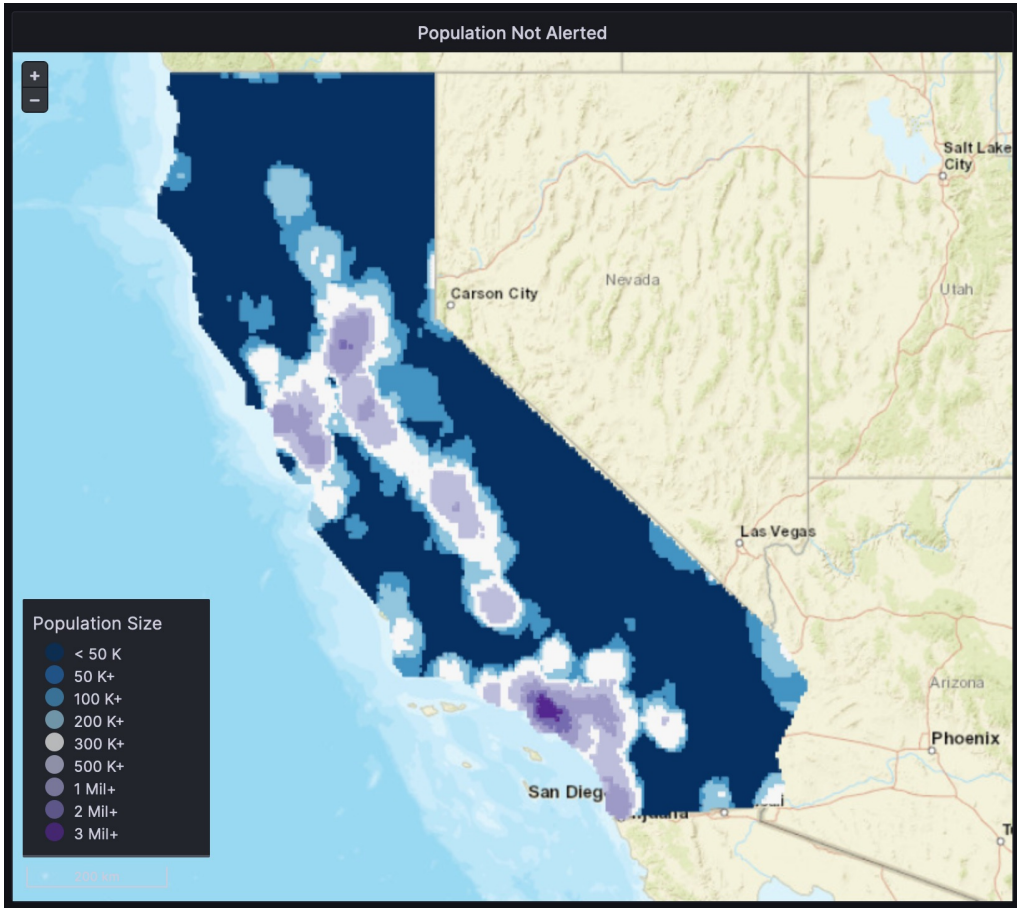
Population Not Alerted on Time



Predicted Population Not Alerted on Time

Each square in the image on the left represents the location of an earthquake. The square color is the predicted size of the population that would not be alerted on time if an earthquake would occur at this location. This time takes into account real-time data latency from the stations, data packet length, processing, and delivery time by MyShake (estimation for 50% of users). The earthquake grid size is 0.05 degrees. This map is updated every 10 min.

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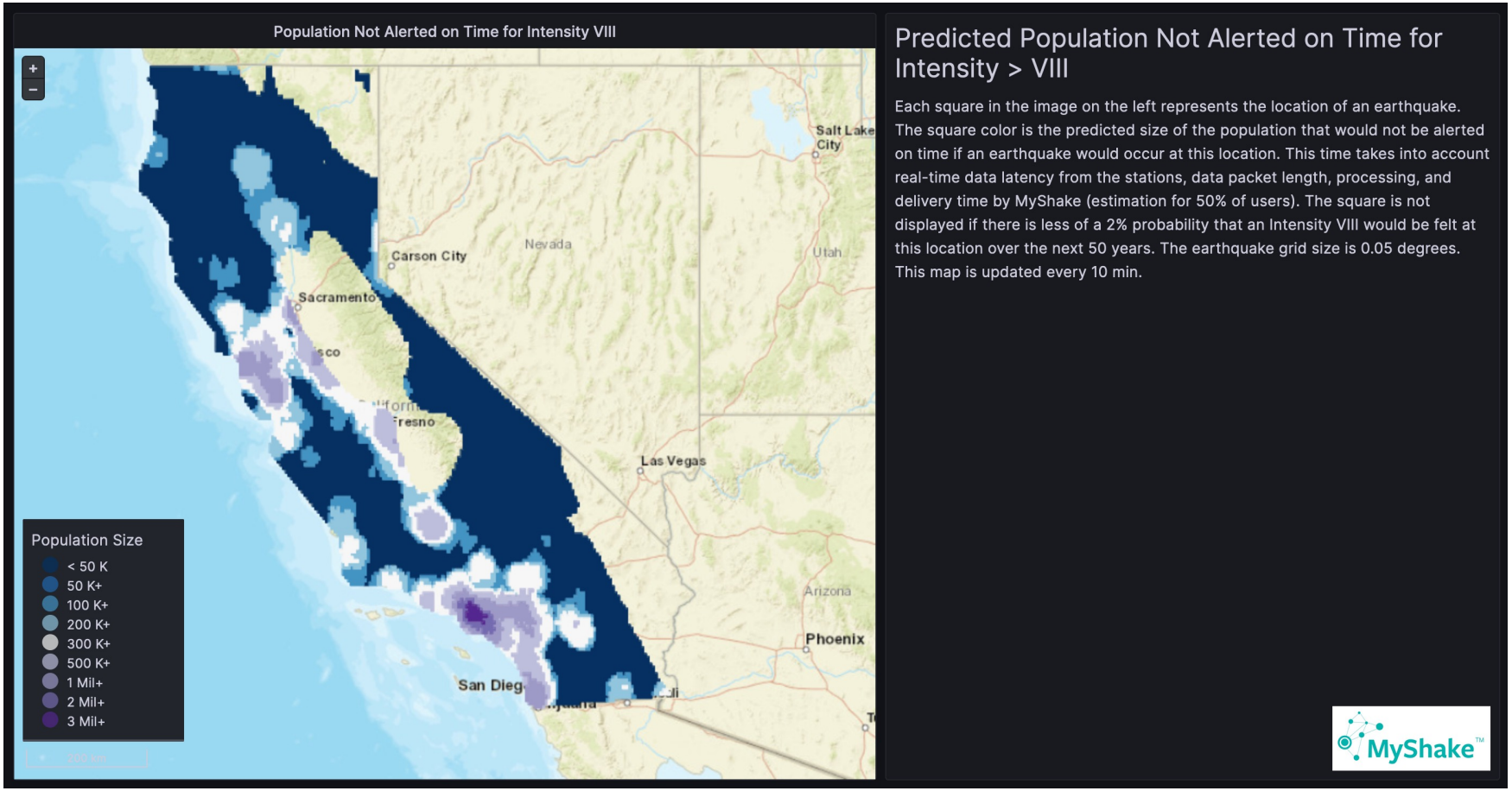
With Anticipated Risk



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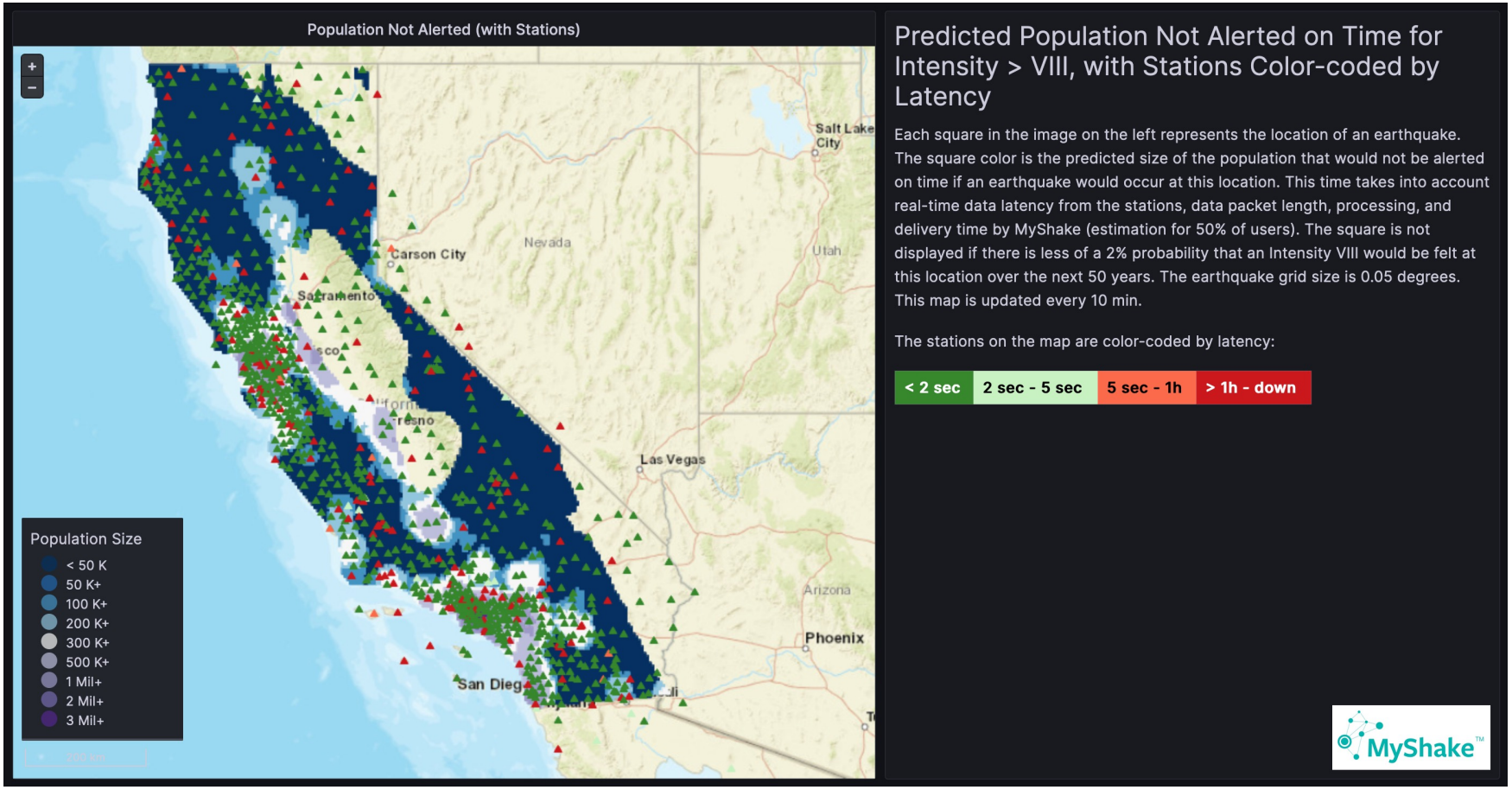
With Network Status



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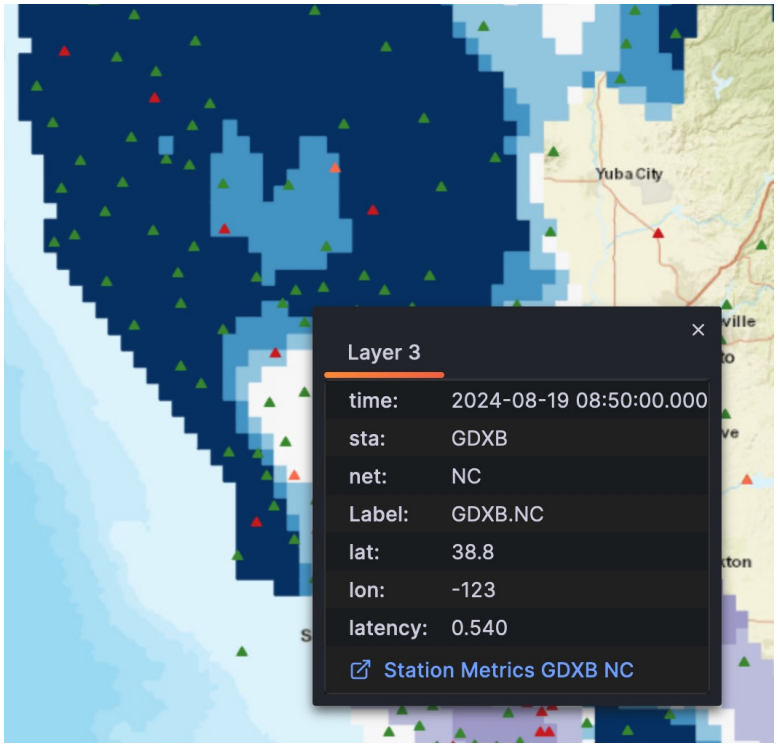
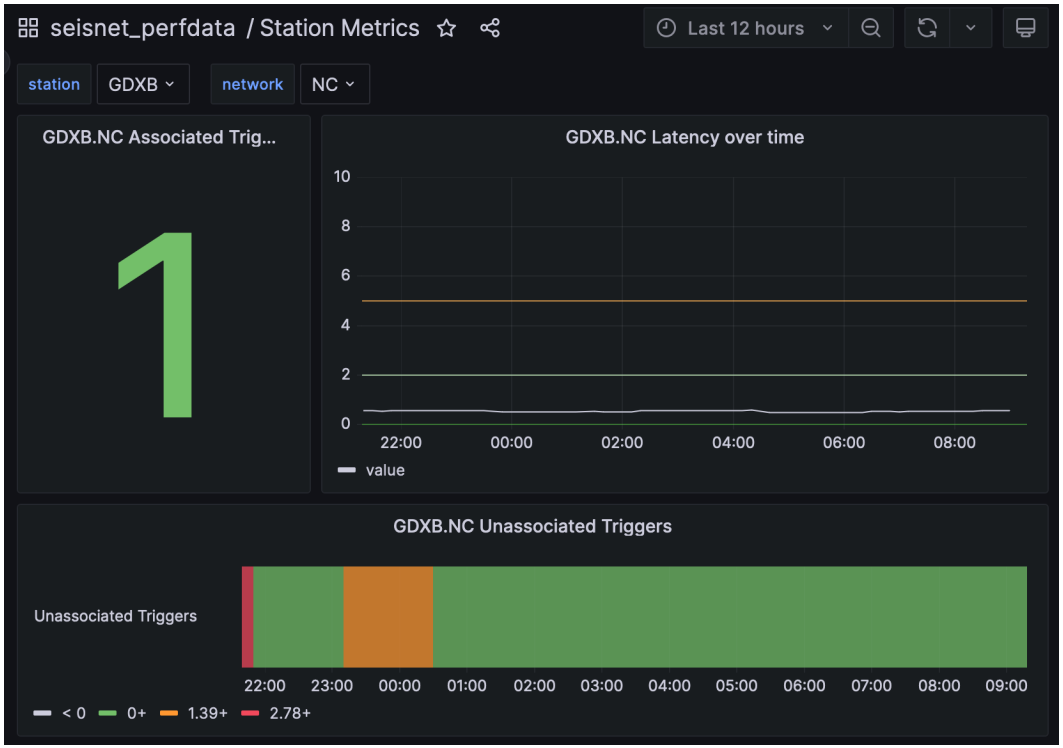
Station Information





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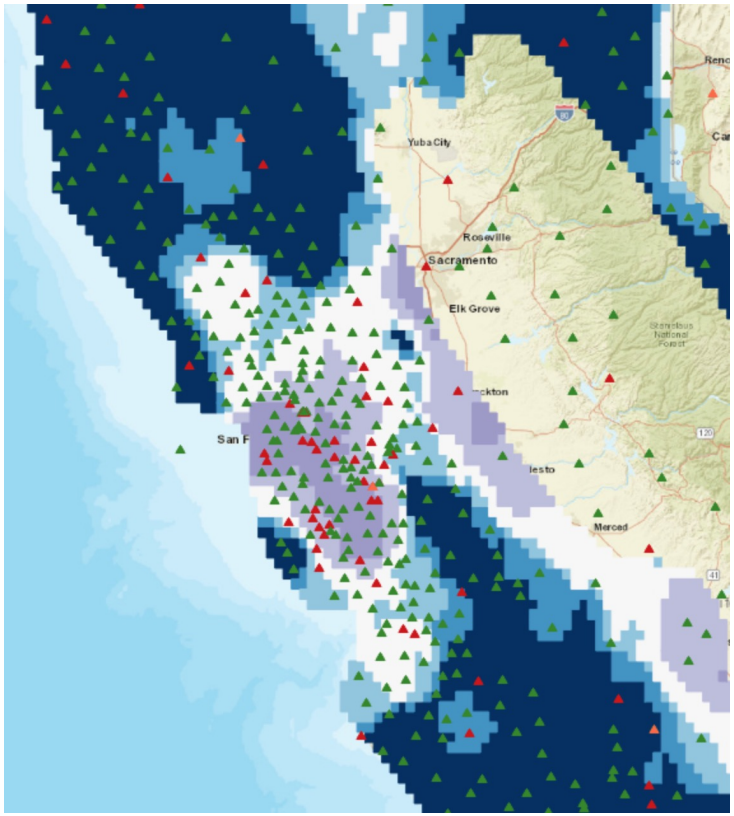
Support Decision-Making Process



- Better understanding of overall system performance in real-time
- Prioritize station maintenance actions
- Support station troubleshooting
- Identify gaps in network coverage
- Optimize station relocations or constructions in the future

Next Steps

- Collect and display additional information from each CEEWS station to support station troubleshooting
- In addition to latency, introduce data quality criteria for selecting 4 closest stations likely to contribute to initial alert
- Display network maps for these data quality criteria (maintenance actions not only based on latency)
- Consider impact of large earthquakes on data latency (especially for after/foreshock sequences)

Thank you !