

ShakeAlert

Earthquake early warning
for the U.S. West Coast



Coming to a phone near you
this year!

Richard Allen

Professor, Director



Caltech

Berkeley
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UNIVERSITY of
WASHINGTON

GORDON AND BETTY
MOORE
FOUNDATION

Alerts?

Hurricane *Alerts*



August 2004

Hurricane Frances hits Florida

Tornado *Alerts*



Fire *Alerts*



October 2017

Northern California

Mudslide Alerts



January 2018

Southern California

Earthquake *Alerts?*

Northridge
M6.7 – January 17, 1994



Earthquake *Alerts?*

Napa, CA
M6.0 – August 24, 2014



Earthquake *Alerts?*



Napa, CA

M6.0 – August 24, 2014

Earthquake *Alerts?* are possible

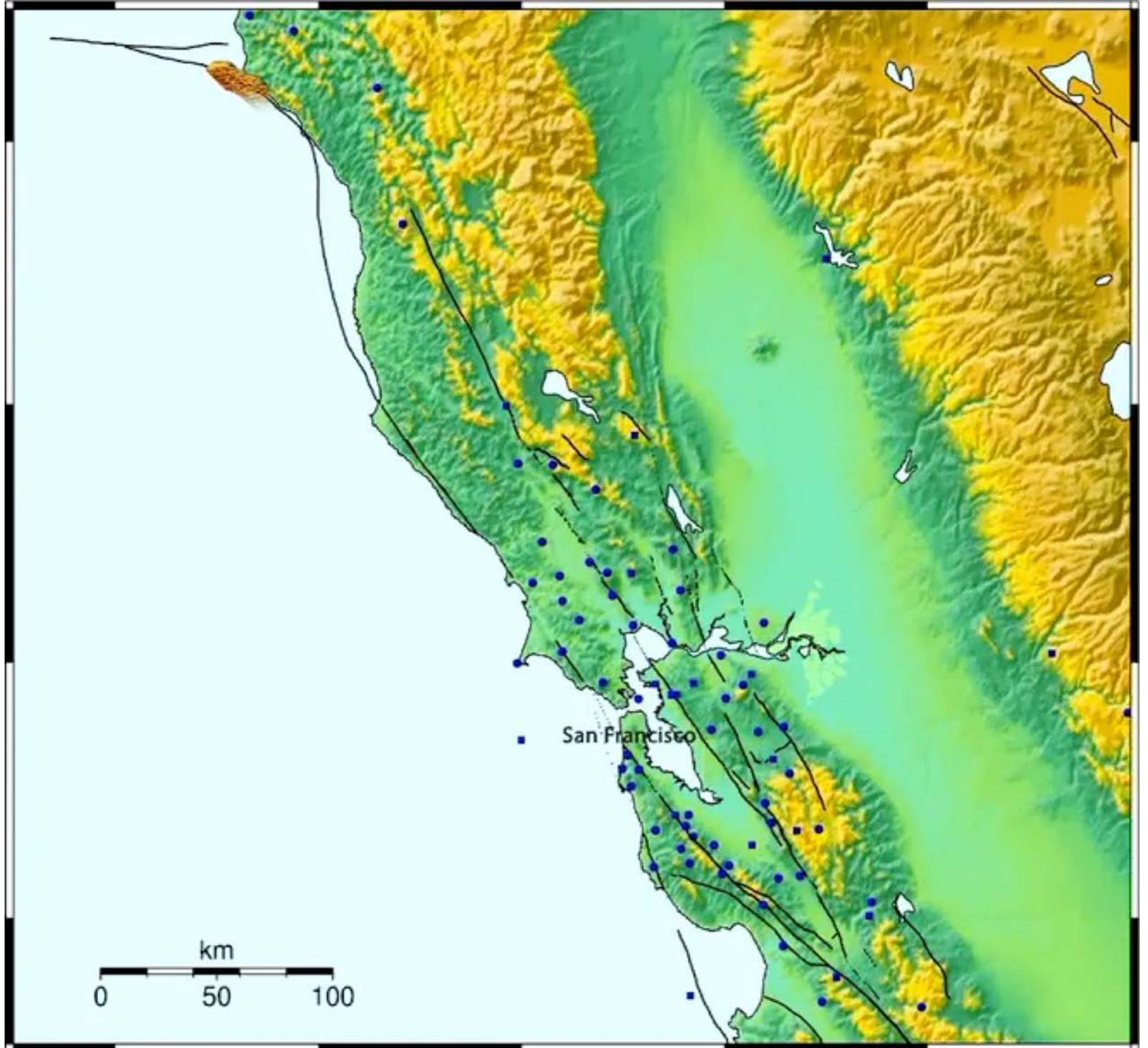
Mexico City

M7.1 – September 19, 2017



What is
earthquake
early
warning?

Magnitude 8 on the San Andreas



Who could use
earthquake early warning?

Reducing Falling hazards



Loma Prieta >50% injuries
were linked to falls



Northridge
>50% injuries
were non-structural
(falling) hazards

if everyone received a few seconds warning
if everyone dropped, took cover, and held on
then early warning could reduce injuries by **50%**

Cost of injuries in **Northridge**: **\$2-3 billion**

Who could use
earthquake early warning?

Automated control



Slowing and stopping trains



Stopping elevators



Isolating hazardous
machinery and chemicals



Data security

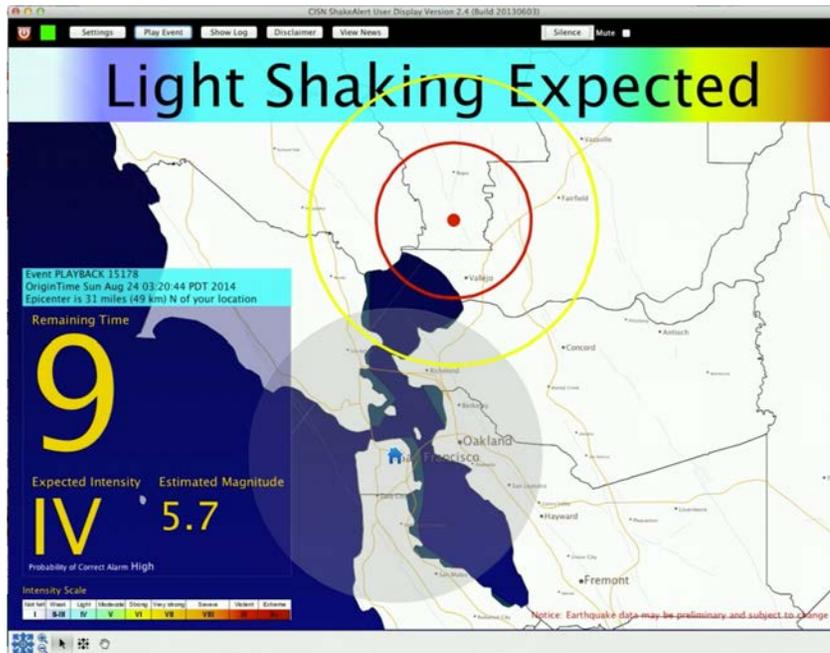
Situation awareness

Preventing
cascading
failures



How do you get the
earthquake early warning?

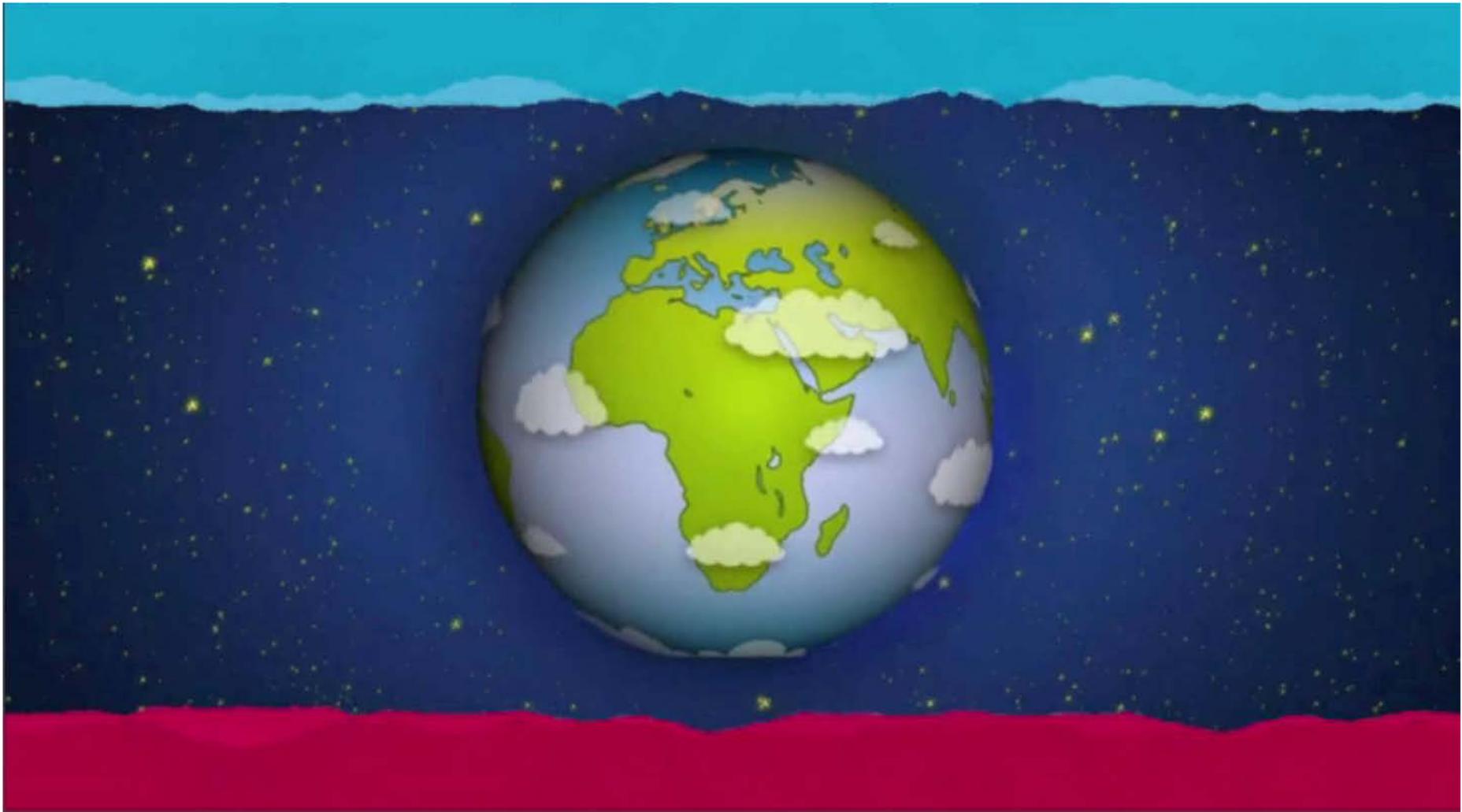
A warning in
your pocket
on your computer



on TV, radio,
home security system,
office PA system, **and more**



The technology exists



August 25, 2014

ShakeAlert – Spanning the west-coast

800 stations

→ 4 processing centers

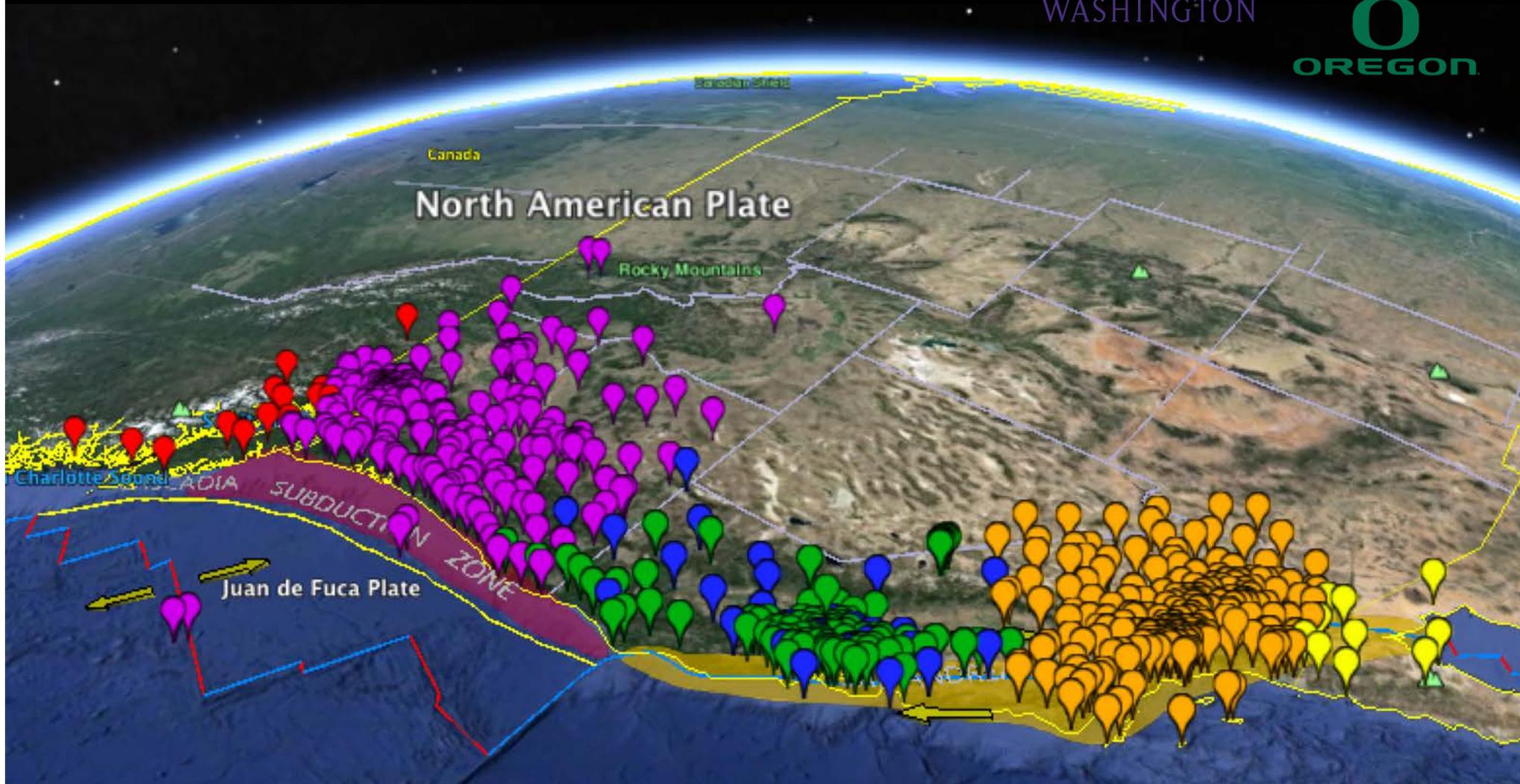
→ 75 institutional users

Berkeley
UNIVERSITY OF CALIFORNIA

USGS
science for a changing world

W
UNIVERSITY of
WASHINGTON

Caltech
OREGON



Building ShakeAlert

Total cost for a west coast system (CA+OR+WA)

\$16 million/year + \$38 million infrastructure upgrade



US Congress



California + Oregon + Washington

50%
funded



Seismic infrastructure: algorithms + sensors

algorithms



sensors



50%
built

ShakeAlert2018?

"Limited" public rollout



SkyAlert



How fast?

ShakeAlert2018?

“Limited” public rollout

ShakeAlert
**on teachers’
smartphones**



ShakeAlert2018

“Limited” public rollout

System ready for testing!

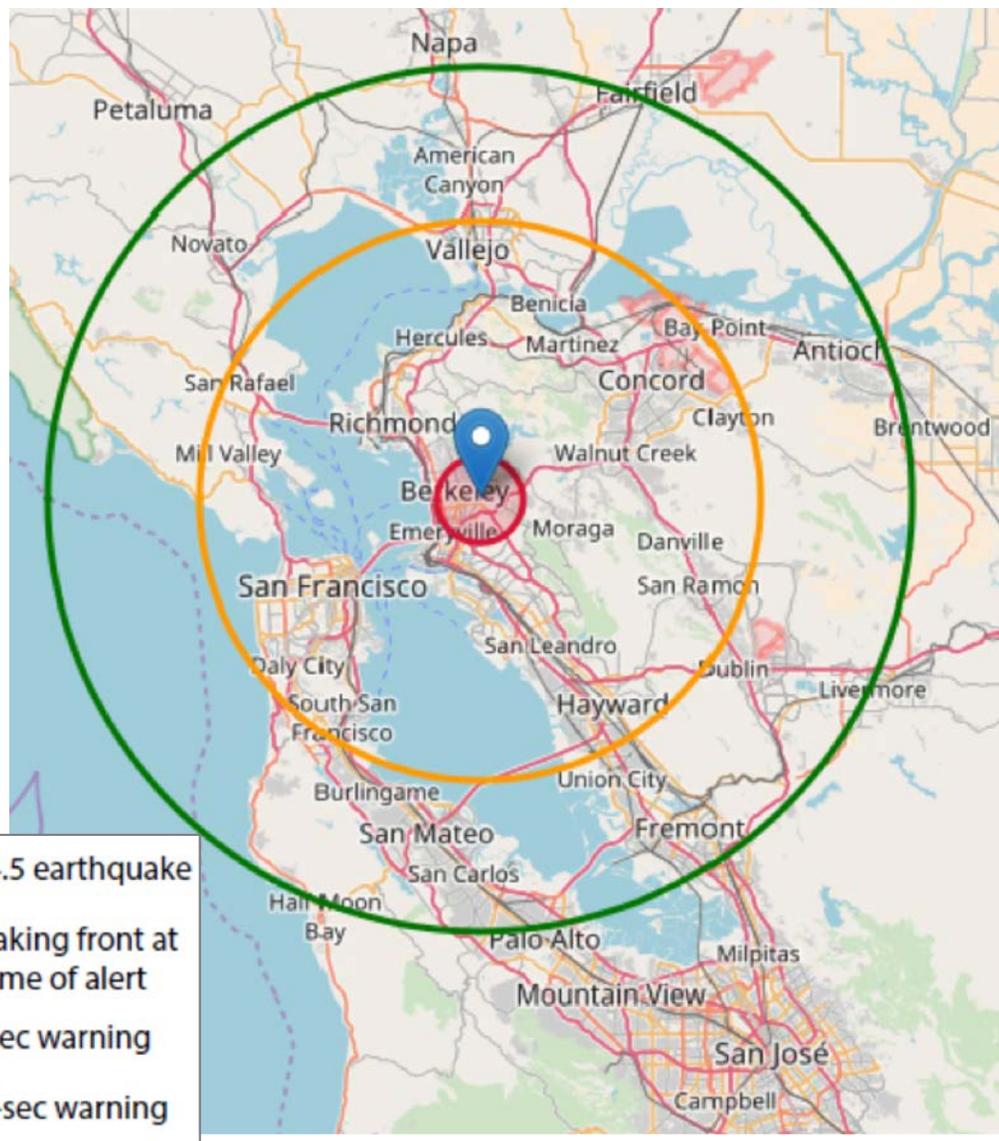
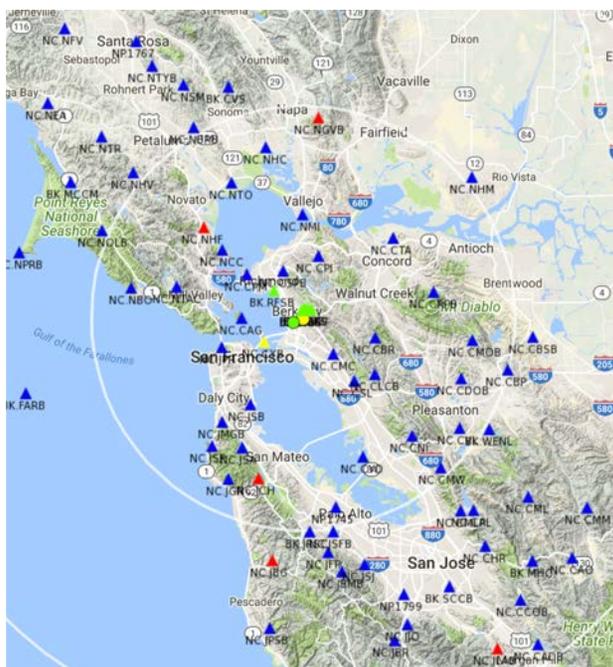
Berkeley earthquake

M4.4 January 4, 2018

Initial alert

M3.5, 3.6 sec after origin time

13 km depth: 2.0 sec till energy reaches surface

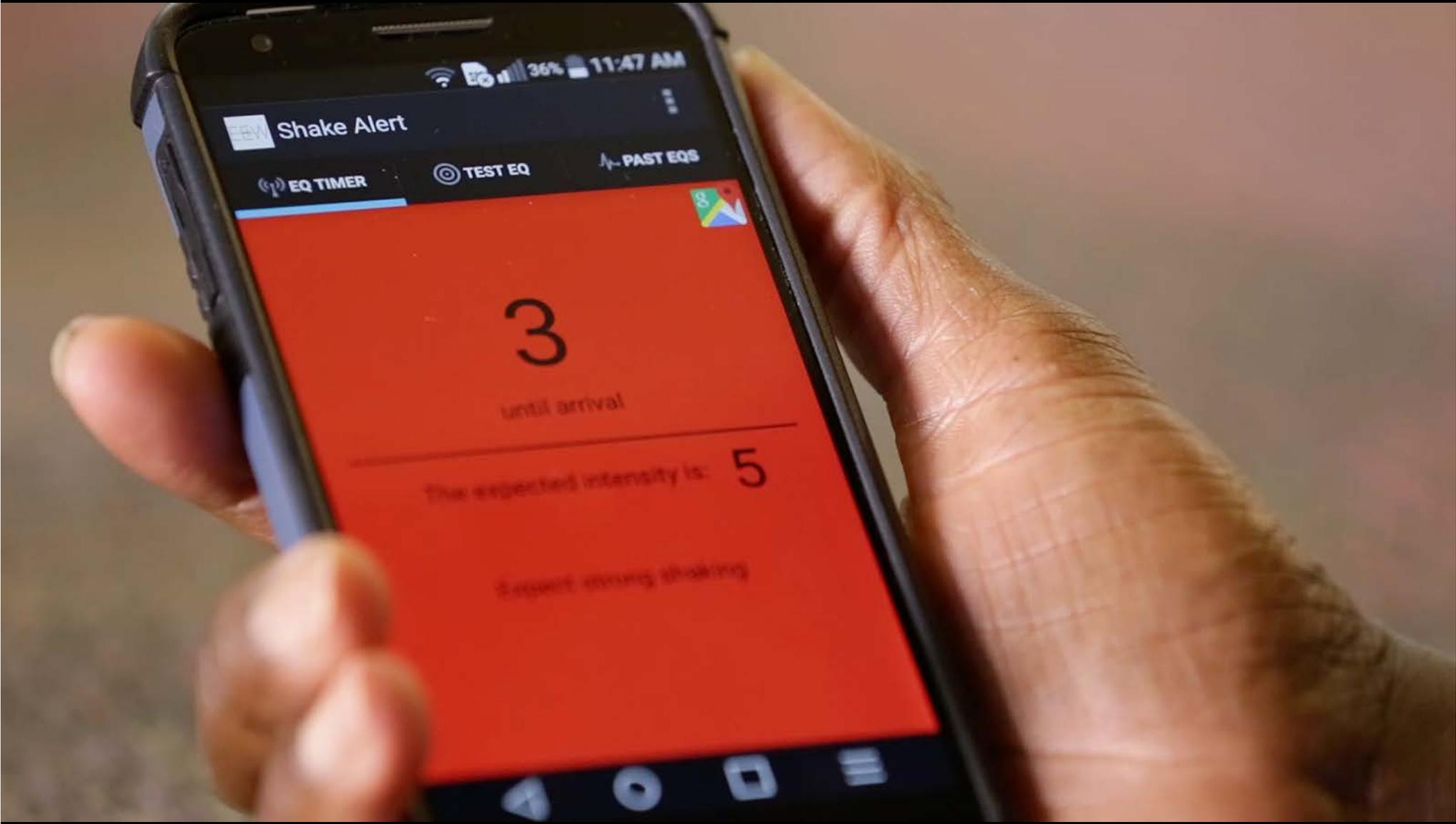


-  M4.5 earthquake
-  Shaking front at time of alert
-  5-sec warning
-  10-sec warning

ShakeAlert

Going beyond the point source...





36% 11:47 AM

Shake Alert

EQ TIMER

TEST EQ

PAST EQS

3

until arrival

The expected intensity is: 5

Report during shaking



Cal OES



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