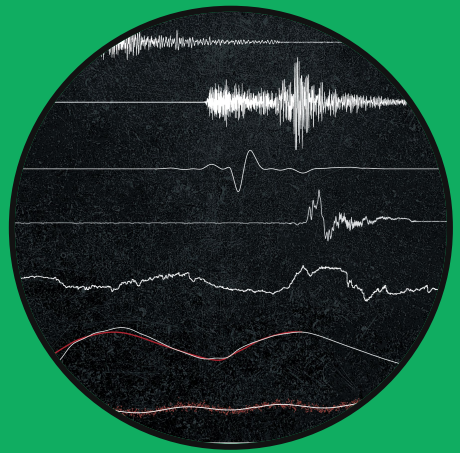
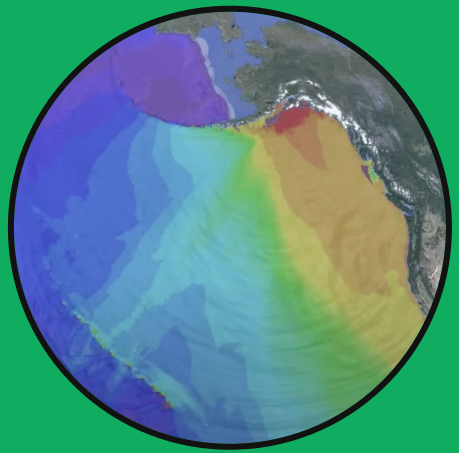
Alaska Earthquake Center

https://earthquake.alaska.edu/



Seismic analysis



Tsunami readiness

Landslide monitoring

Station maintenance

UAF UNIVERSITY OF ALASKA FAIRBANKS

GEOPHYSICAL INSTITUTE University of Alaska Fairbanks

ALASKA EARTHQUAKE CENTER

Elisabeth Nadin

geology, communications

Overview

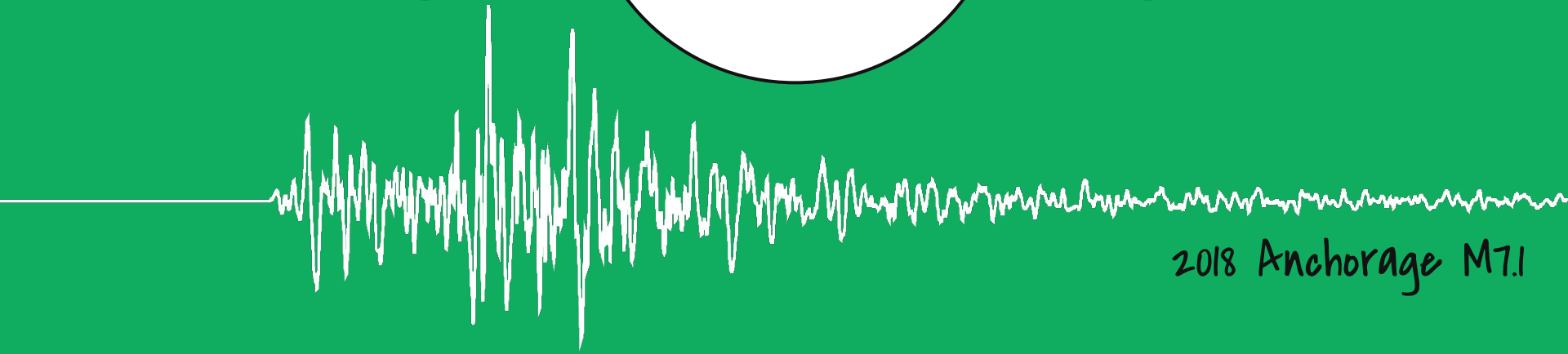
Alaska earthquakes stats

Seismic hazard

Earthquake early warning

Landslides, tsunamis, other

Questions?



2018 Anchorage M7.1

The Alaska State Legislature

HOME | SENATE | HOUSE | BILLS & LAWS | SEARCHES | MEDIA CENTER | PUBLICATIONS | GET STARTED

SEARCH [ ] Display ?

29th Legislature(2015-2016)
Alaska Statutes 2015
AS 14.40.075

Sec. 14.40.075. Alaska Earthquake and Volcanic Hazards Assessment Project; state seismologist.

(a) The University of Alaska shall establish an Alaska Earthquake and Volcano Hazards Assessment Project within the seismology program of the geophysical institute. The project shall

(1) collect, record, process, and archive seismic data on earthquakes and volcanic eruptions in the state;

(2) conduct seismological studies relating to earthquake and volcano hazards assessment;

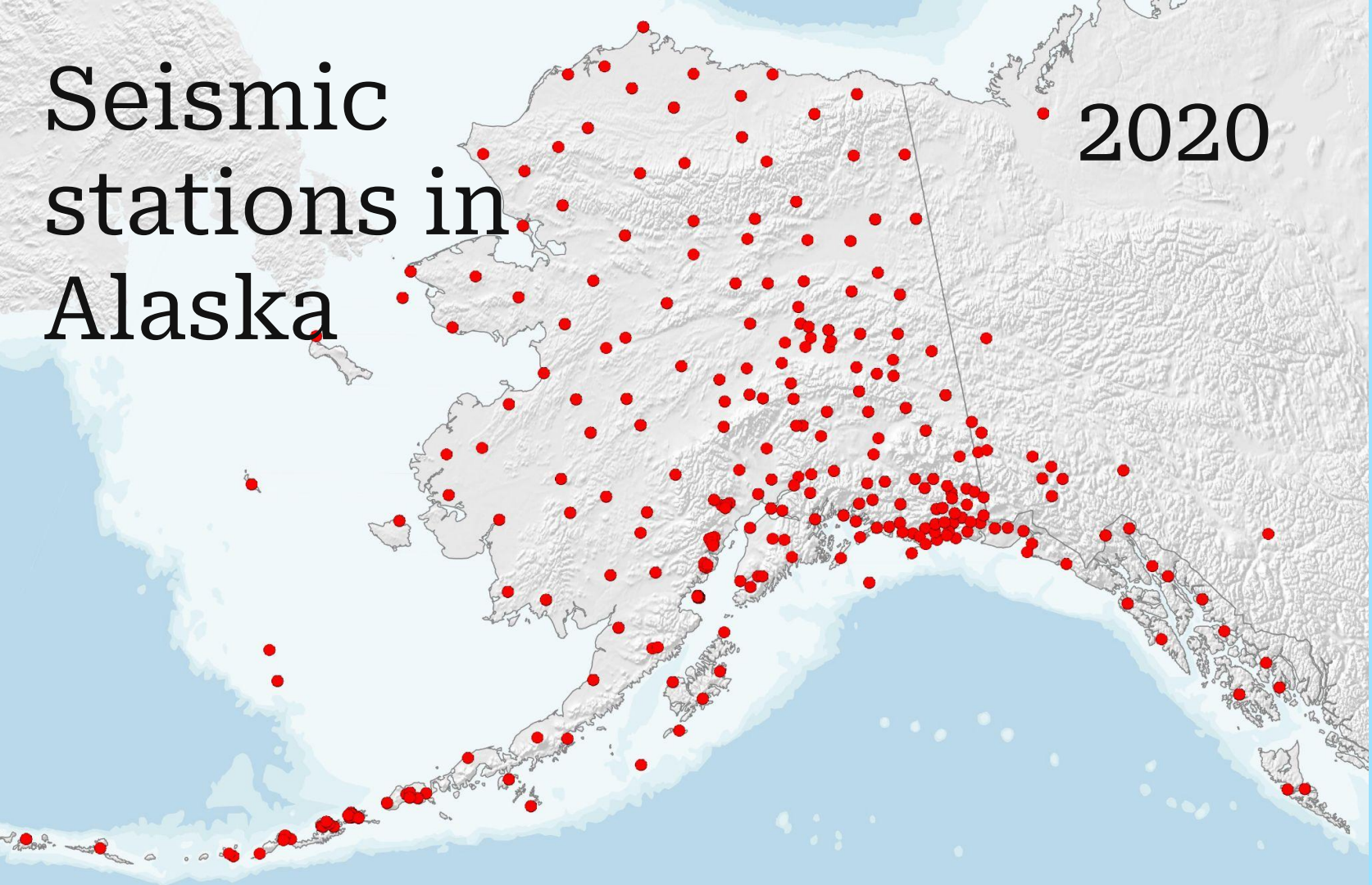
(3) evaluate earthquake and volcanic seismic data to assist in the identification and assessment of earthquake and volcanic hazards that may pose a significant risk to lives and property in the state;

(4) inform public officials, industry, and private citizens of potential earthquake or volcanic risks and assist in planning to reduce risks to lives and property; and

(5) coordinate its activities with other organizations and agencies that monitor, collect, assess, and conduct research on earthquake and volcano hazards in order to avoid duplication of effort.

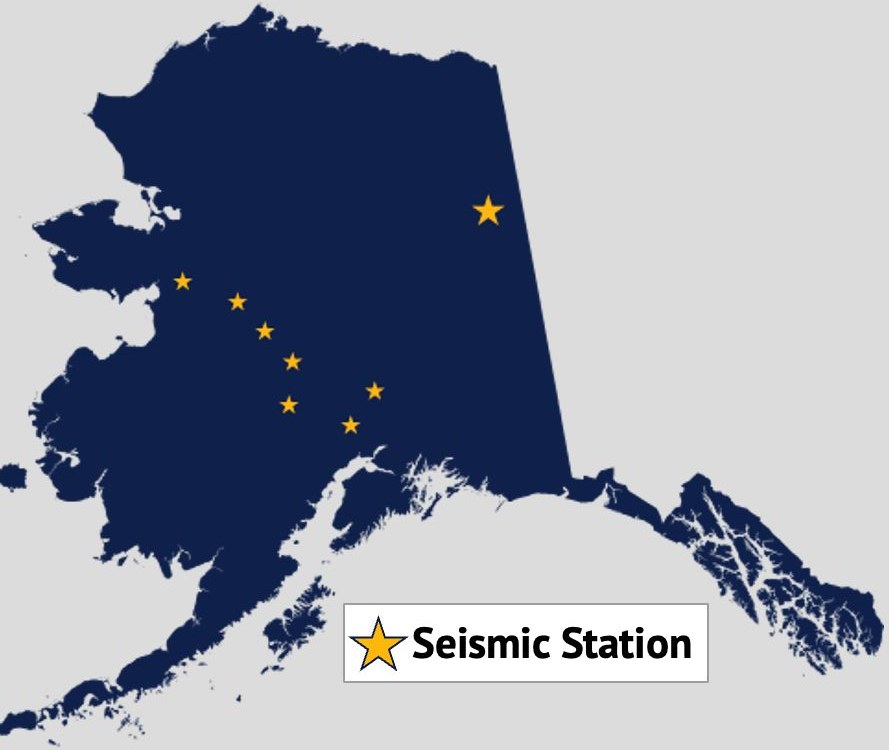
(b) The administration and management of the project are under a university employee designated the state seismologist. The state seismologist shall provide timely information concerning earthquake and volcano hazards to public officials, industry, and private citizens and serve as liaison to state and federal agencies in the event of emergencies due to seismic and volcanic activities.

In 1987, the Alaska legislature established the Alaska Earthquake Center as a partnership between the USGS and the University of Alaska Fairbanks (**Alaska Statute 14.40.075**).

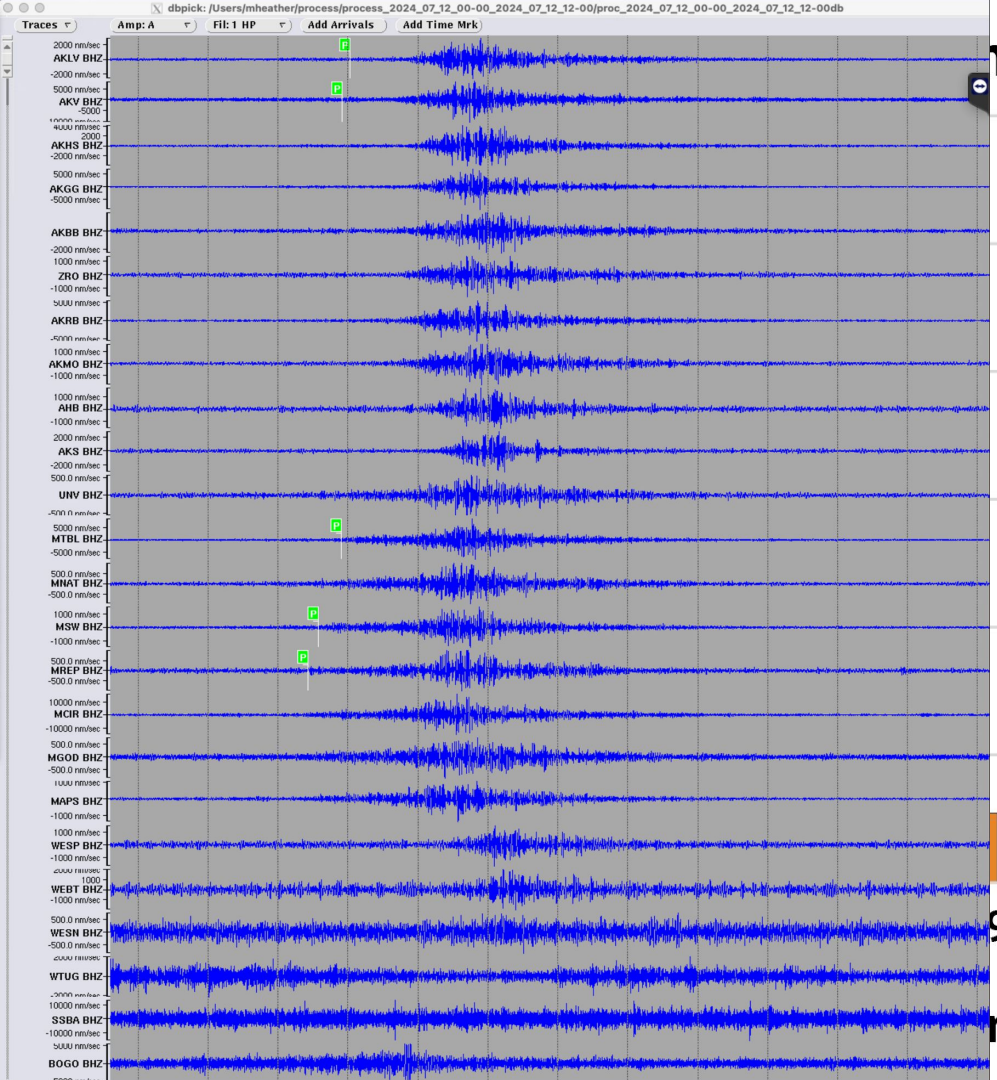

Seismic stations in Alaska
2020

Fundamentals of Event Location with a Seismic Network

ALASKA EARTHQUAKE CENTER



Credit: Sarah Noel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Traces
Amp: A
Fil: 1 HP
Add Arrivals
Add Time Mrk
AKLV BHZ
AKV BHZ
AKHS BHZ
AKGG BHZ
AKBB BHZ
ZRO BHZ
AKRB BHZ
AKMO BHZ
AHB BHZ
AKS BHZ
UNV BHZ
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MSW BHZ
MREP BHZ
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WESP BHZ
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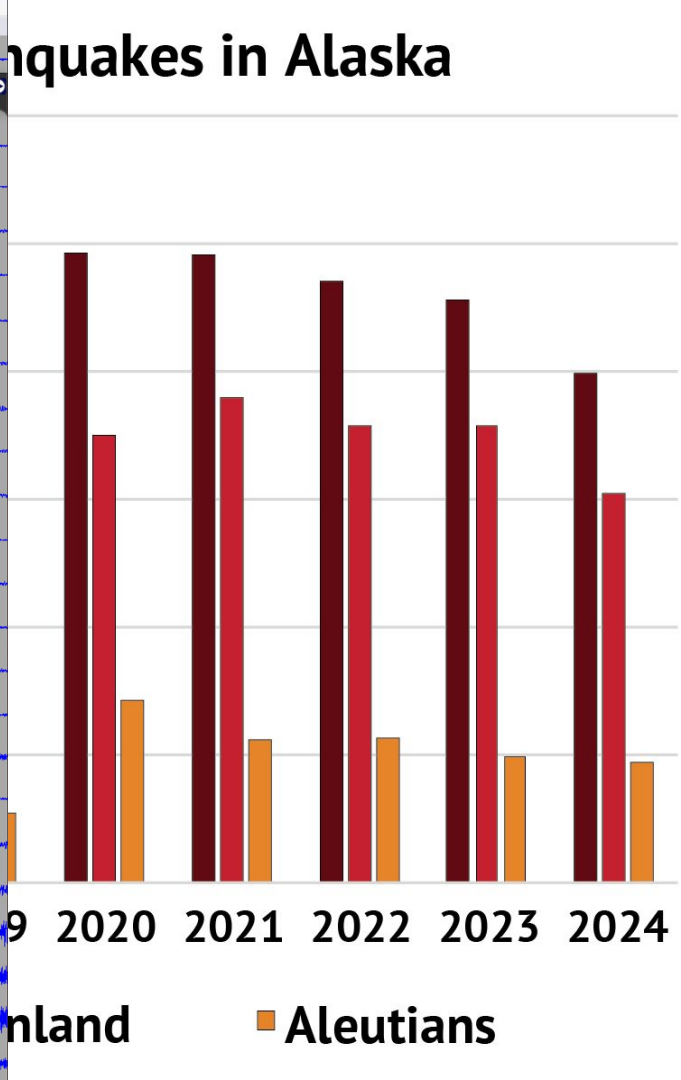
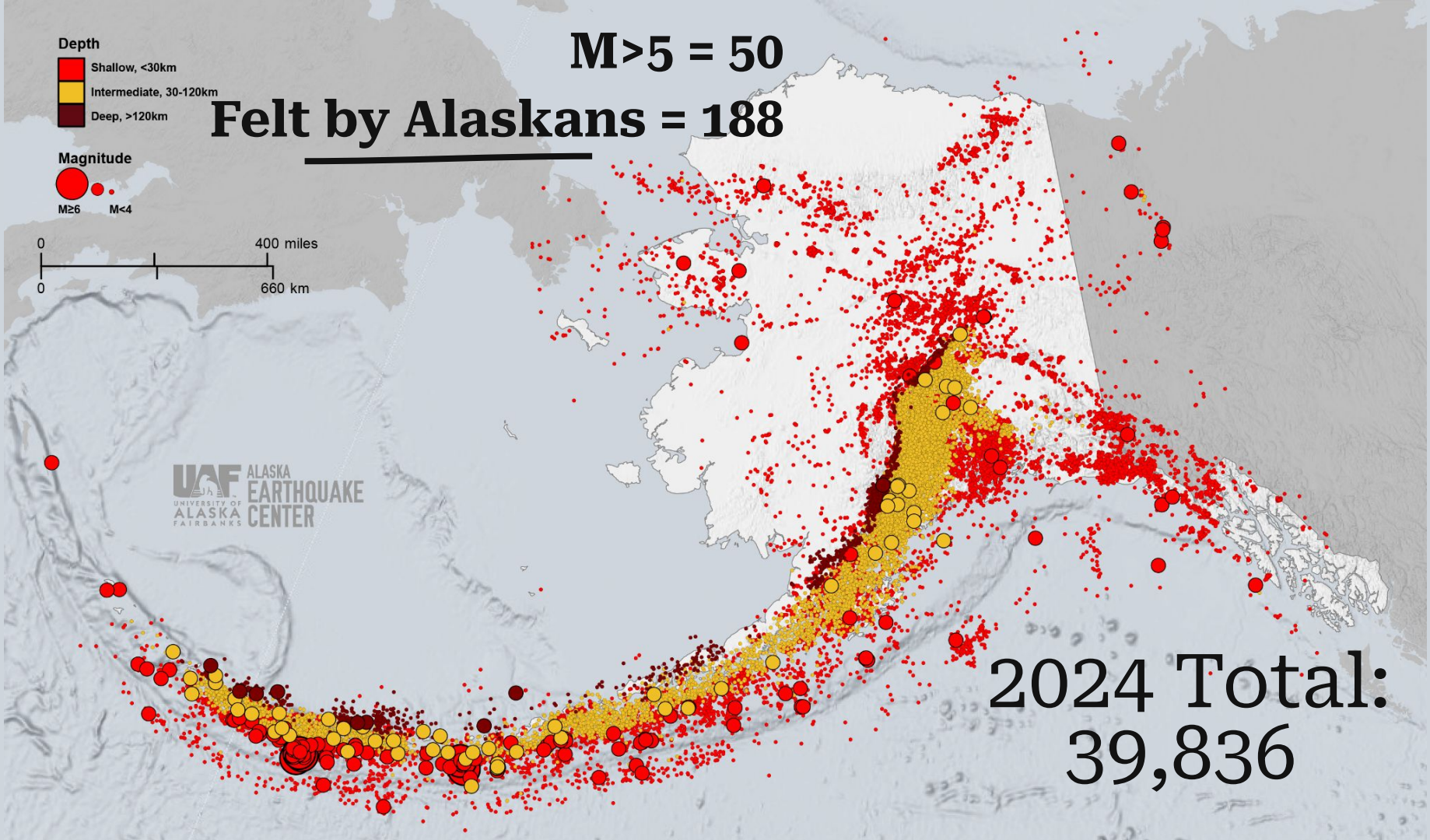
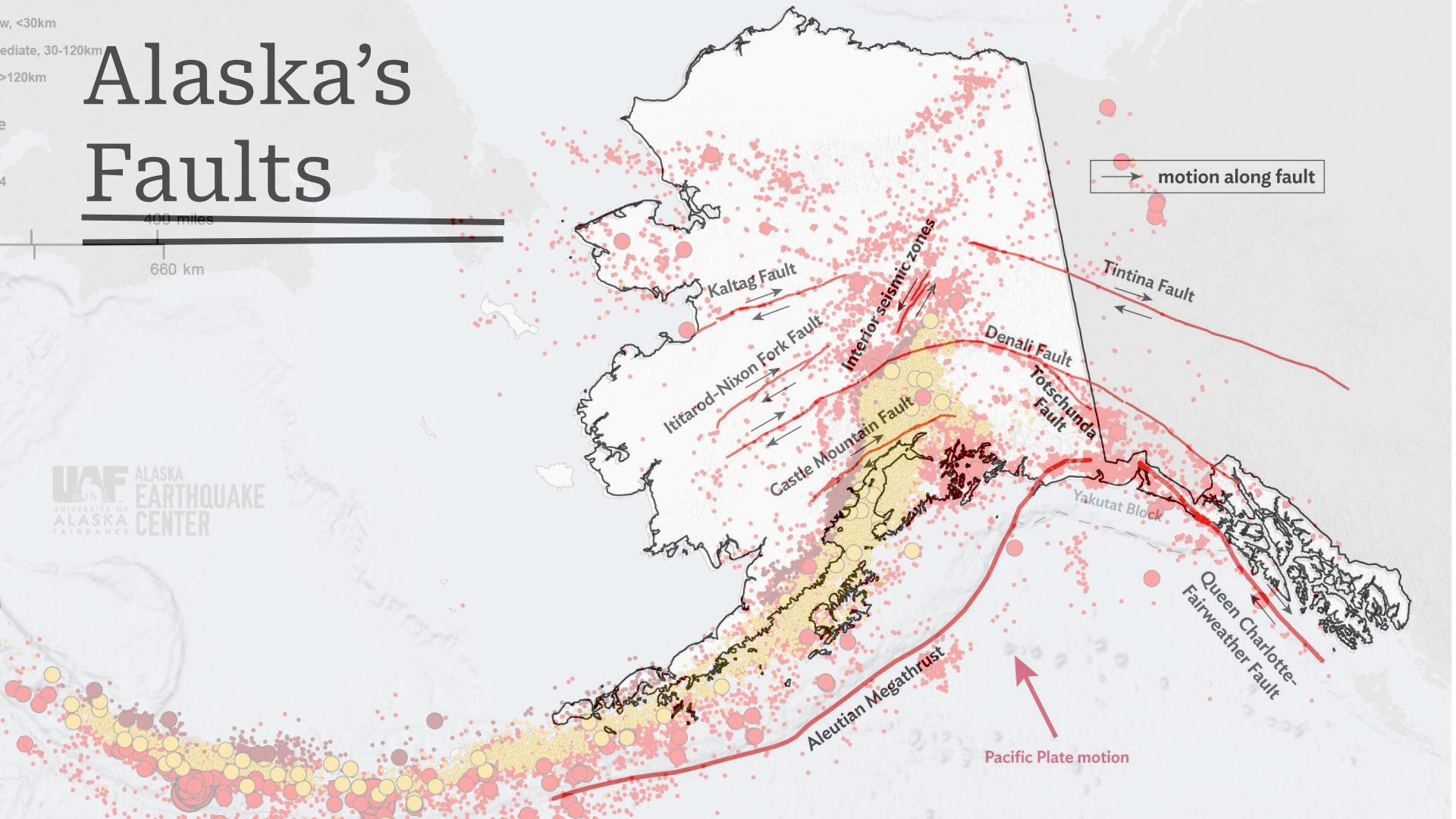
WTUG BHZ
SSBA BHZ
BOGO BHZ

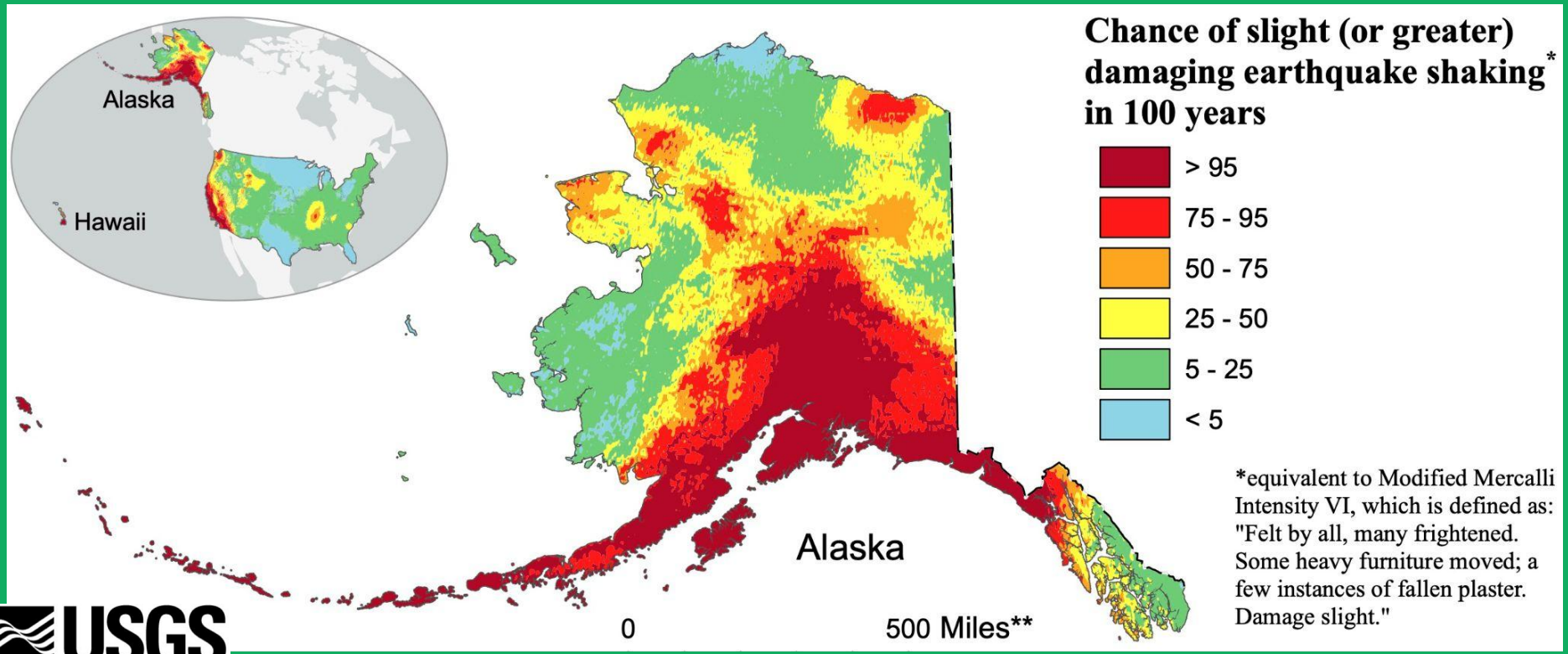

nquakes in Alaska
9
2020
2021
2022
2023
2024
nland
Aleutians


Depth
Shallow, <30km
Intermediate, 30-120km
Deep, >120km
Magnitude
M≥6
M<4
0
400 miles
0
660 km
M>5 = 50
Felt by Alaskans = 188
UAF UNIVERSITY OF ALASKA FAIRBANKS
ALASKA EARTHQUAKE CENTER
2024 Total:
39,836

Alaska's Faults



Seismic Hazard



USGS
science for a changing world

2023

Shakemaps

Because damage comes from shaking

We coordinate with the U.S. Geological Survey to create a suite of “earthquake products.”

For each significant event, a model of how the ground shook around the epicenter

—give emergency managers situational awareness about most impactful shaking
—guide building inspections
—guide bridge inspections
—predict where landslides might have occurred
—provide 1st-order assessment of the total impact of an earthquake

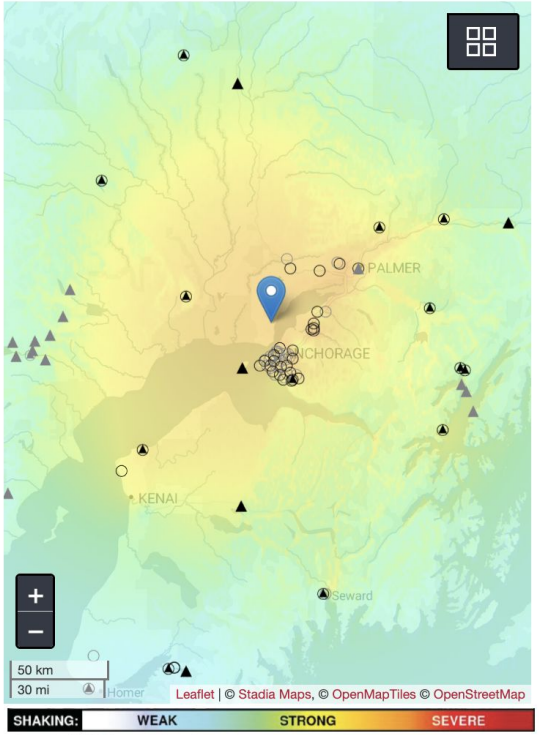
(all within 10–20s of occurrence!!)

Magnitude 7.1 - 9 miles N of Anchorage

November 30, 2018 08:29:29 AKST (November 30, 2018 17:29:29 UTC)
61.3464°N 149.9552°W Depth 29.0 miles (47 km)

This event has been reviewed by a seismologist

Did You Feel It?



view in ANSS combined catalog

9 miles (14 km) NW of Elmendorf AFB
11 miles (17 km) NW of Fort Richardson
13 miles (21 km) W of Eagle River
16 miles (25 km) W of Chugiak
23 miles (37 km) SW of Wasilla
27 miles (43 km) S of Willow
31 miles (50 km) N of Hope
33 miles (53 km) SW of Palmer
36 miles (58 km) SW of Hatcher Pass
39 miles (63 km) NW of Girdwood
43 miles (69 km) SW of Sutton
251 miles (406 km) S of Fairbanks
260 miles (421 km) N of Kodiak

Magnitude type: M_w
Event type: N/A

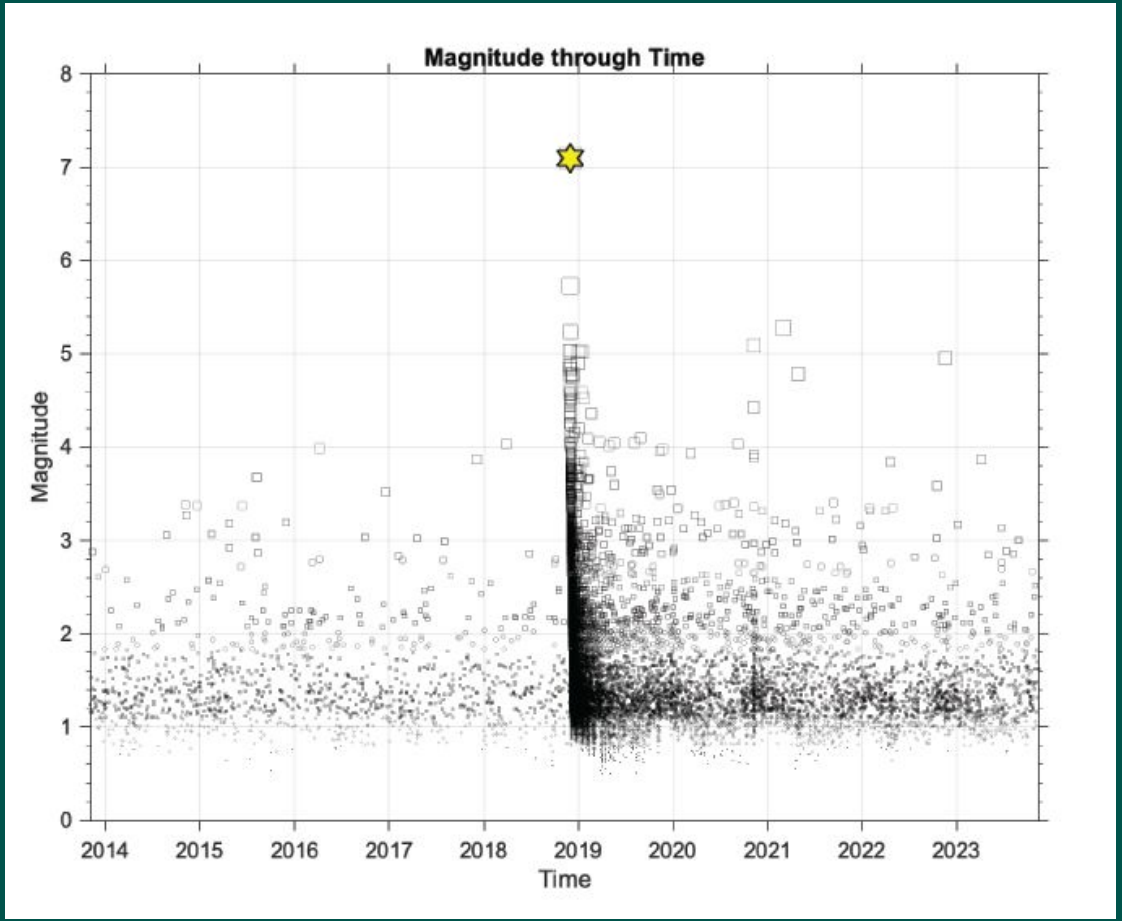
Earthquake damage

DOT, 2018 (Vine Rd – Wasilla)

Anchorage 2018

—Most damaging since 1964
—20 seconds of shaking
—No lives lost (luckily!)
—Damage estimates: several hundred million dollars

Ground cracks, lateral spreading, bluff failures, liquefaction



Each square is an earthquake—background seismicity remained high than average through 2023

Aftershock fatigue

Aftershocks continued for 4 years, keeping people on edge (often they wonder when the next “Big One” will be).

Great Alaska Earthquake (1964)

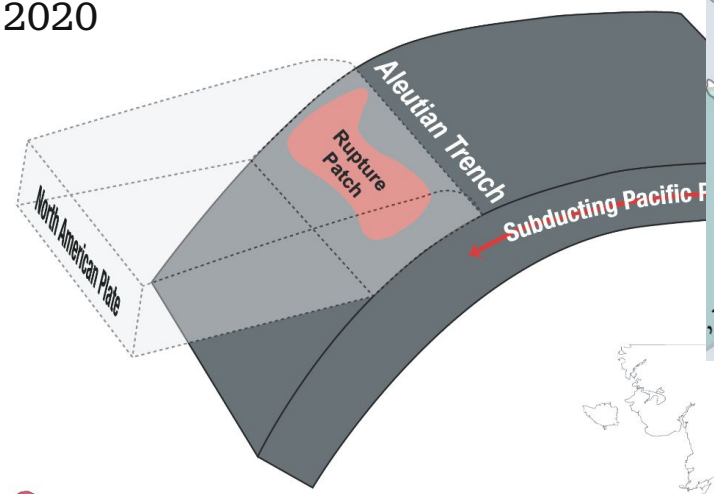
—131 people died
—$45M (would be in the billions today)

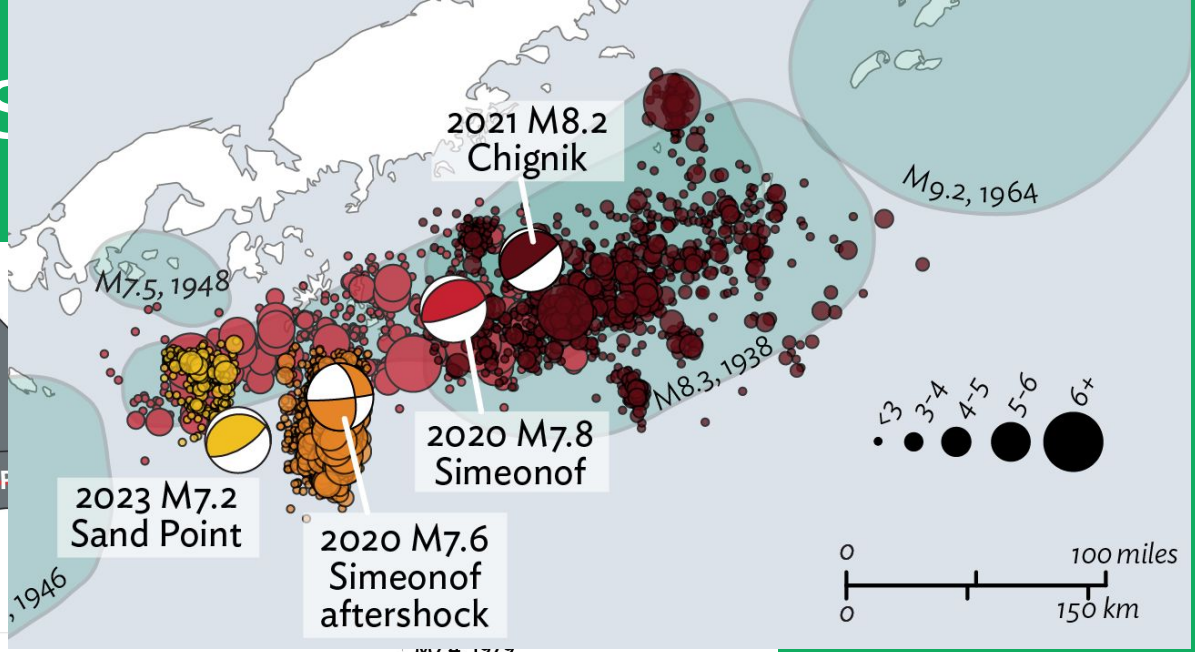
2nd largest ever recorded on Earth

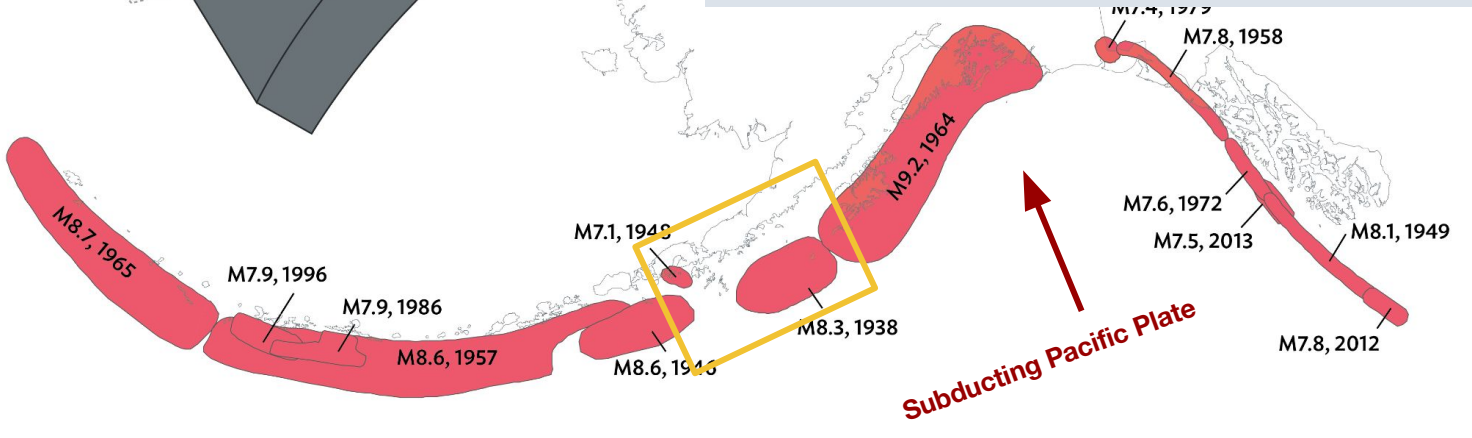
Triggered a seismic tsunami and several local tsunamis

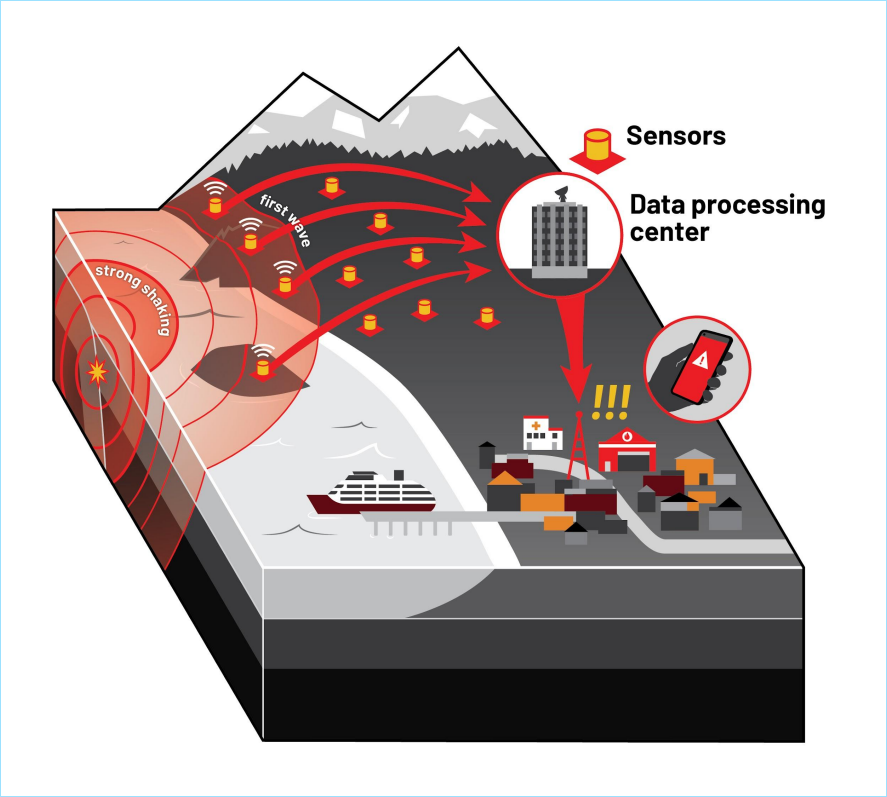
Our Big Ones

2020









1. An established seismic network rapidly detects incoming seismic waves after an earthquake.
2. A data center determines location and magnitude.
3. An alert is issued to a messaging system to warn people before the shaking reaches them.
4. Some automatic actions may happen, such as shutting off gas lines or securing emergency response facilities.
5. This all happens within seconds.

So what is earthquake early warning?

Early Warning in North America

—ShakeAlert®

—Led by the U.S. Geological Survey

—California since 2019

—Oregon & Washington since 2021

—Canada 2024 & 2025 (USGS partnership with Natural Resources Canada)

In other countries

Mexico 1993

Japan 2007

Canada 2024

China 2023

Taiwan 2010

South Korea 2015

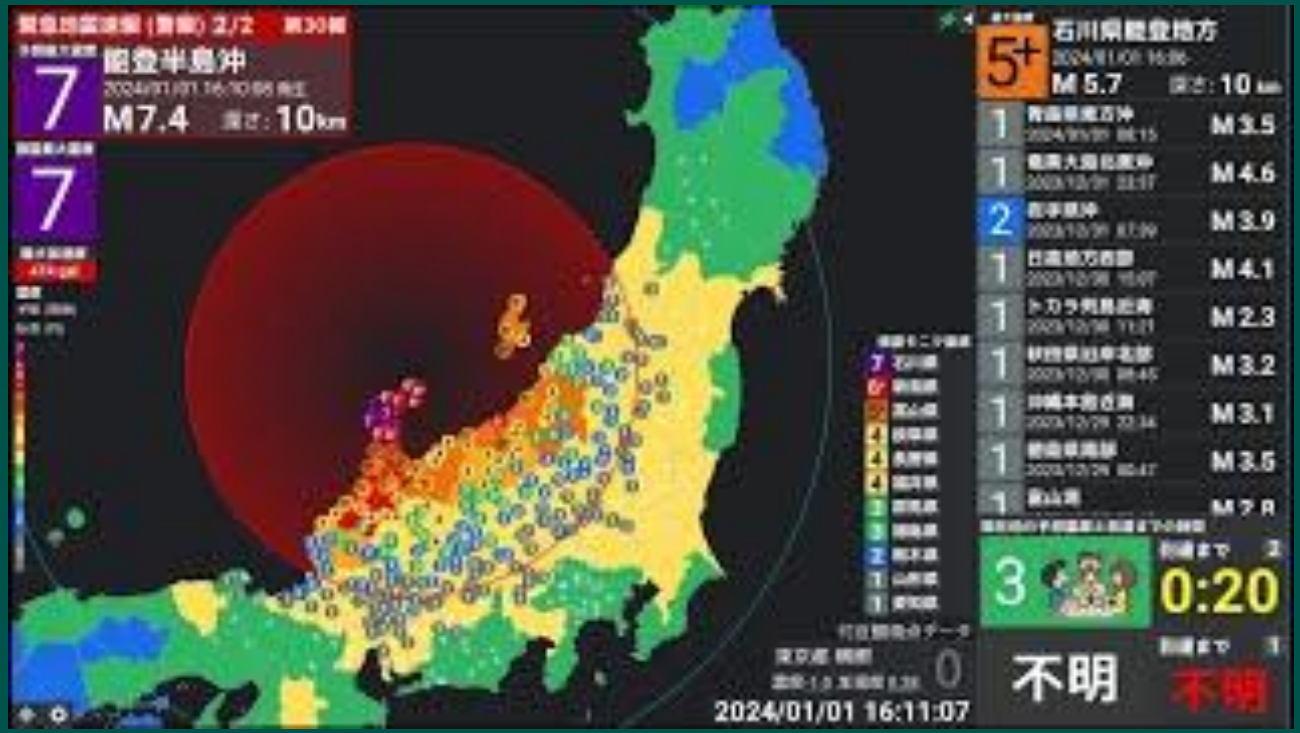
Romania 2007

Israel 2022

Turkey 2008

and more!

Japan's live feed

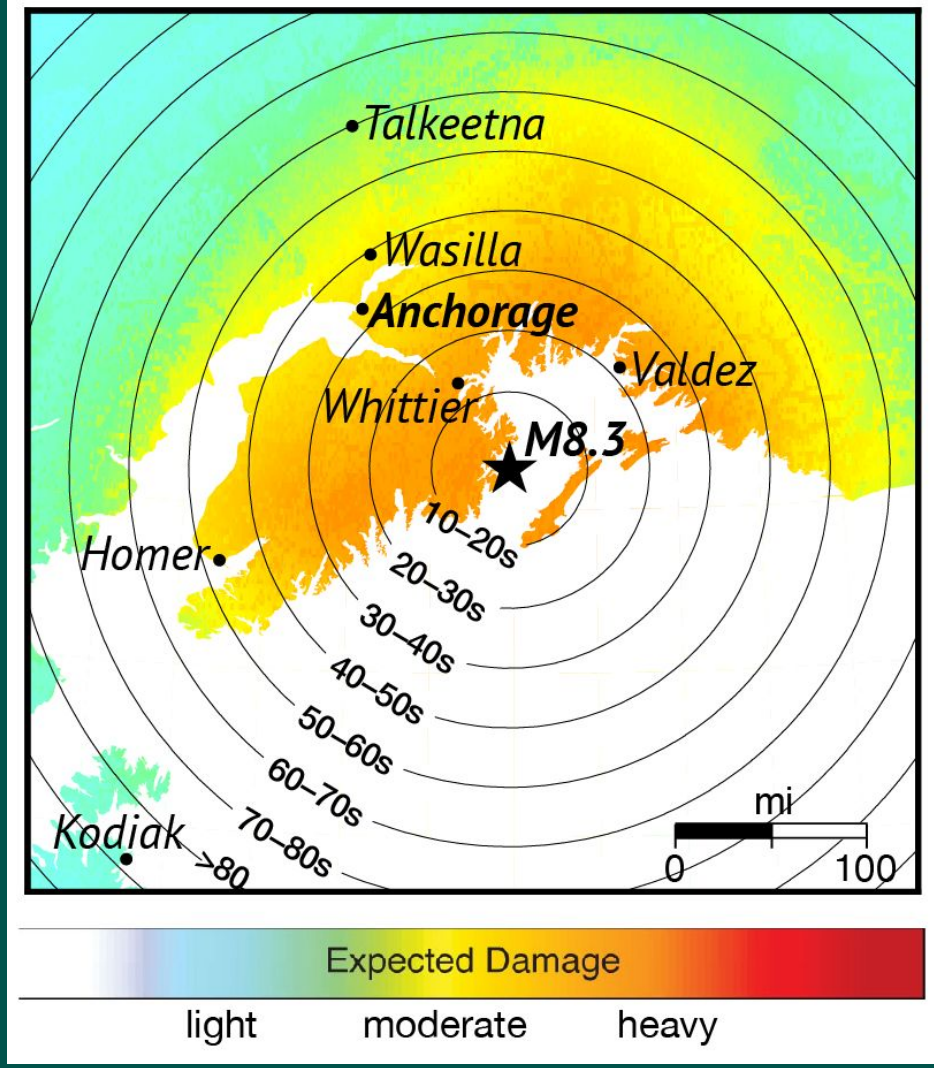


Jan. 2024 Noto M7.6

Interrupts TV programming

Shows shaking level expected, updates as data are received

Alaska Scenario



—Realistic magnitude 8.3 earthquake

—Expected shaking (shakemap)

—Potential warning times

—We have created these for many scenarios

ALASKA EARTHQUAKE CENTER

Some things an ***integrated early warning system*** does

Shut off pipelines

Stop transportation

Open doors

Stop delicate procedures

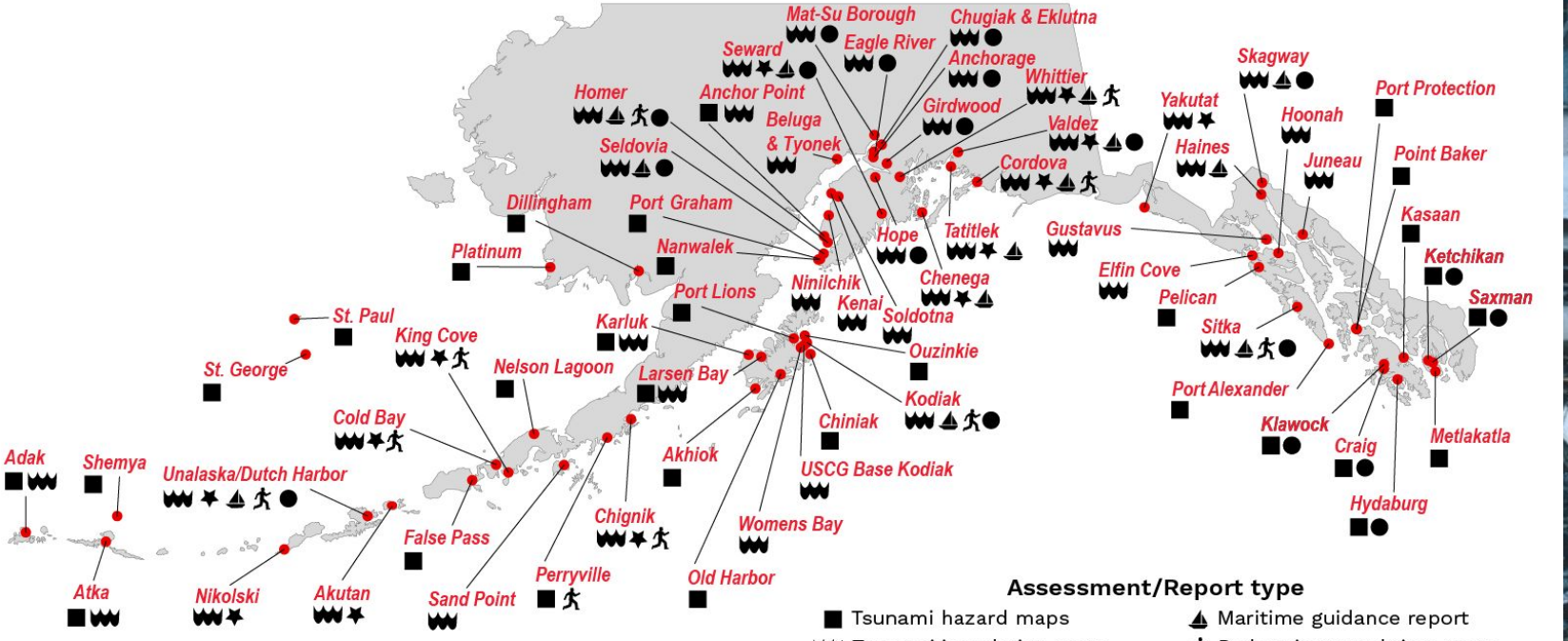
Readiness

Securing

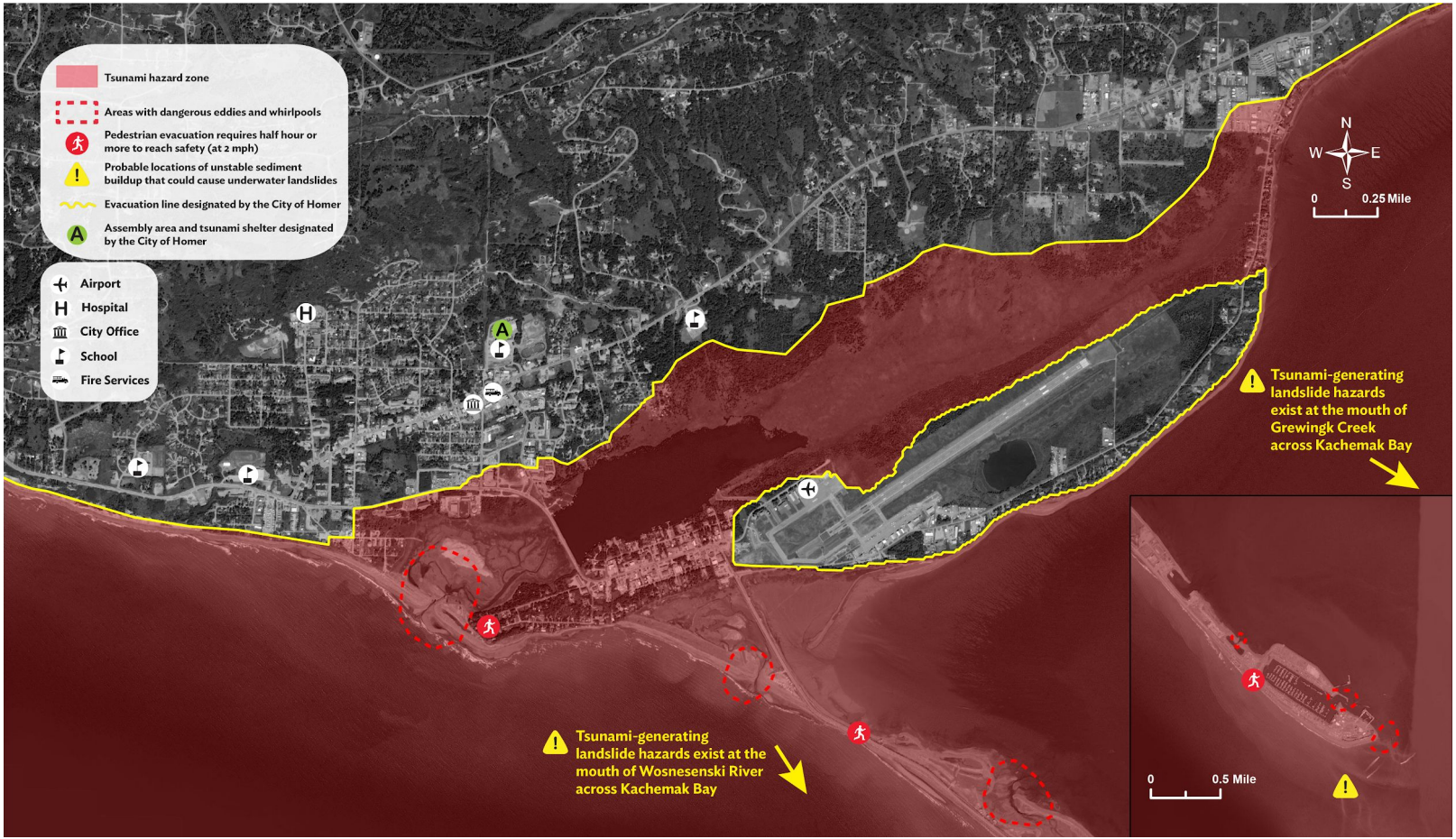
Warning

Noto, Japan 2024

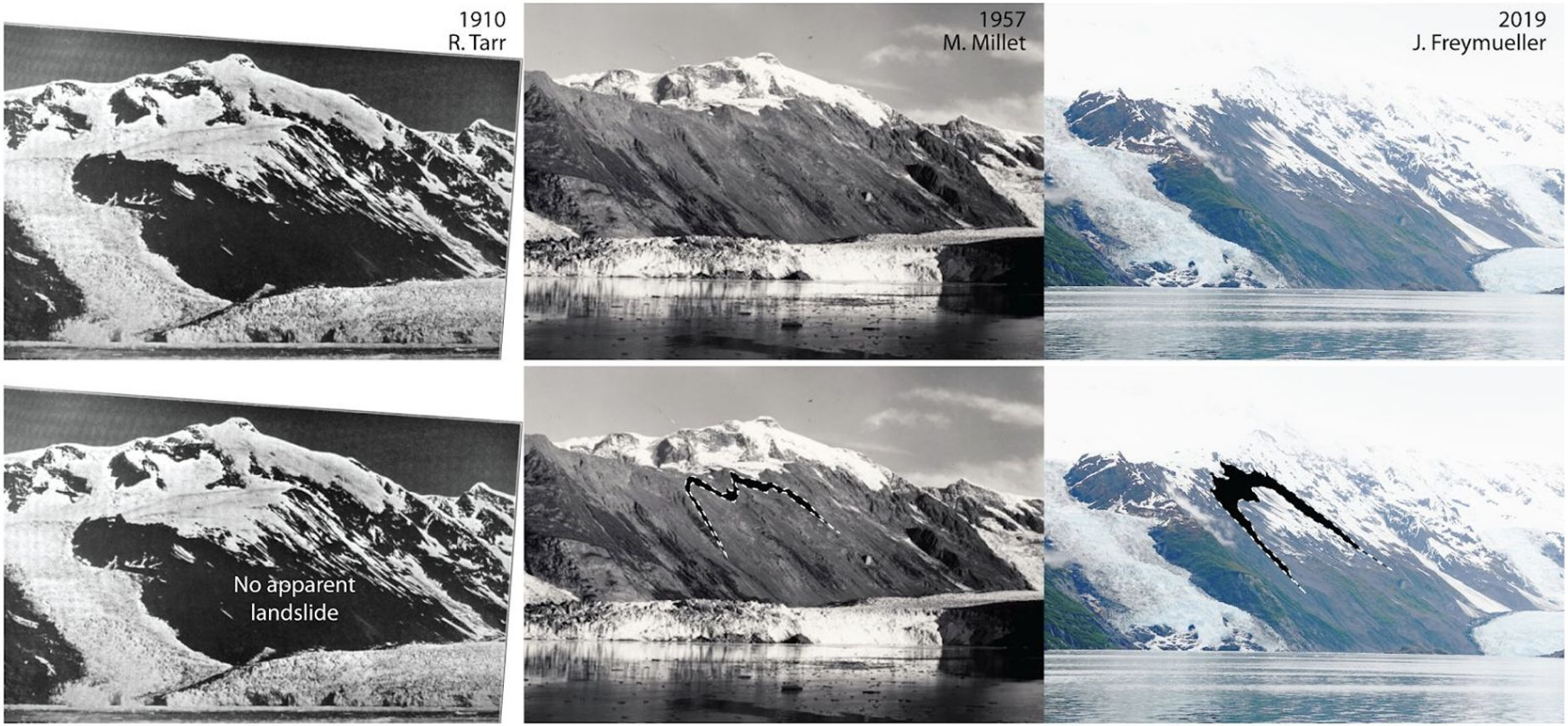
Tsunami Partnerships



Inundation, Homer



Landslide monitoring

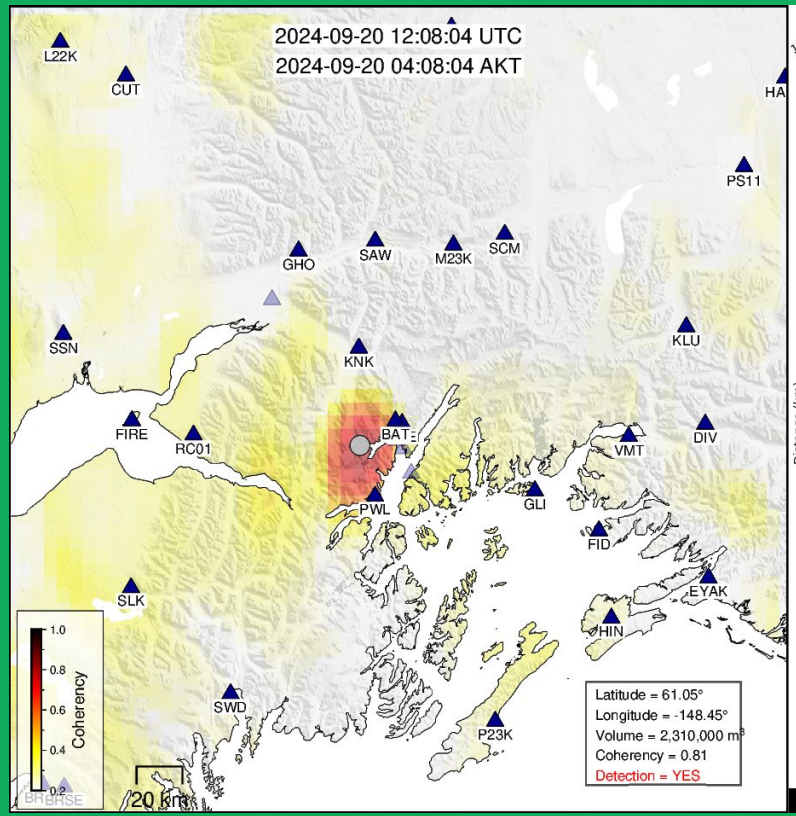


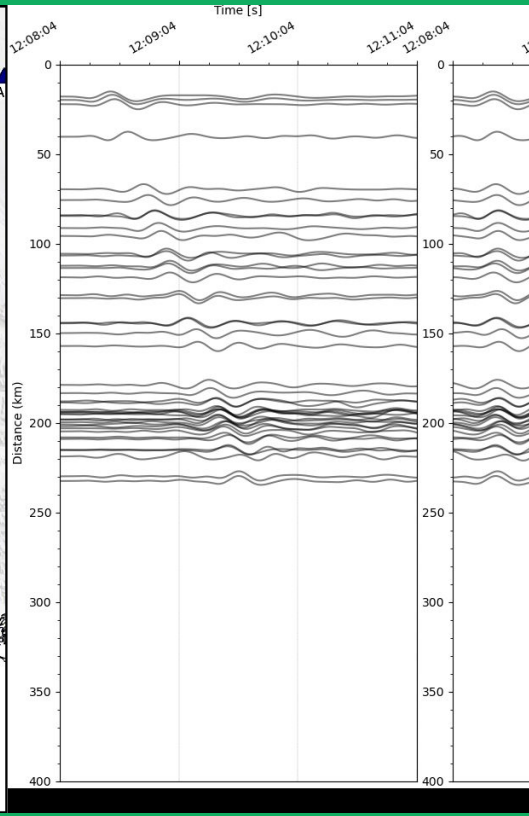
Landslide monitoring

Detects landslides in real time

Working on making an alert system

Important for tsunami alerting





Recent case study: Surprise Cove, Sept. 20, 2024

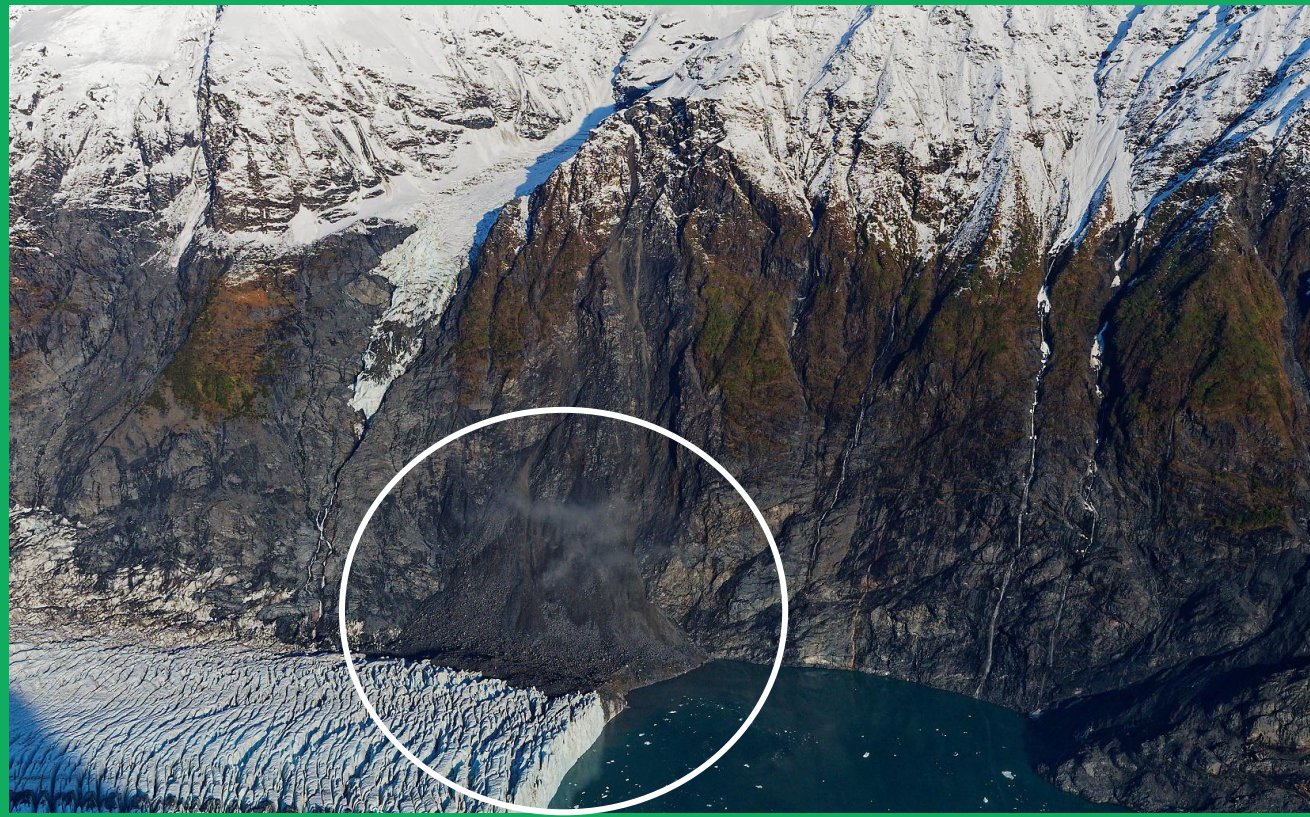
Landslide was detected by AEC in *3 minutes*

Created a small tsunami recorded across western PWS

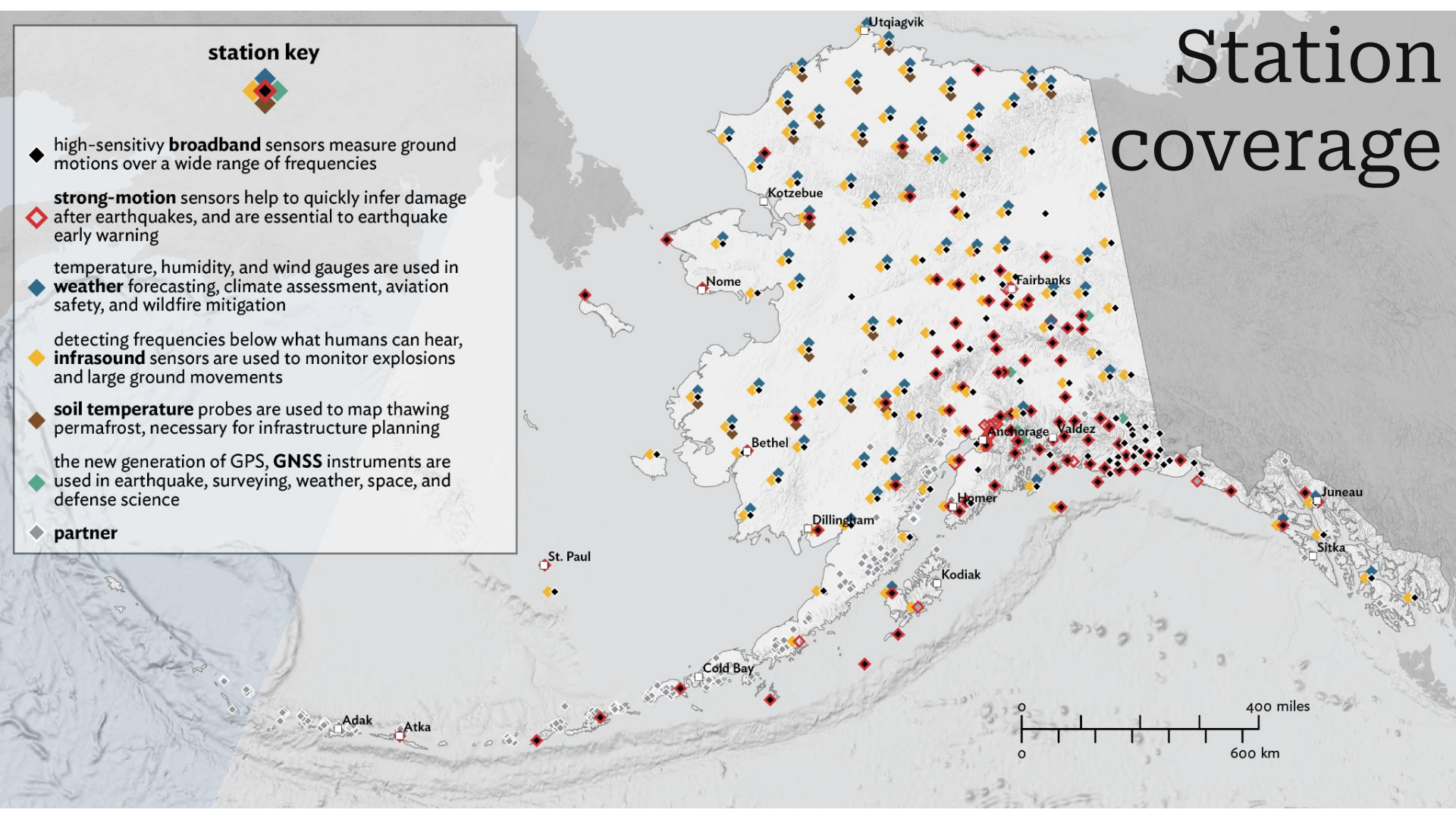
Rock volume: ~2.3 Mm^3 (that's ~2.5 Olympic swimming pools)

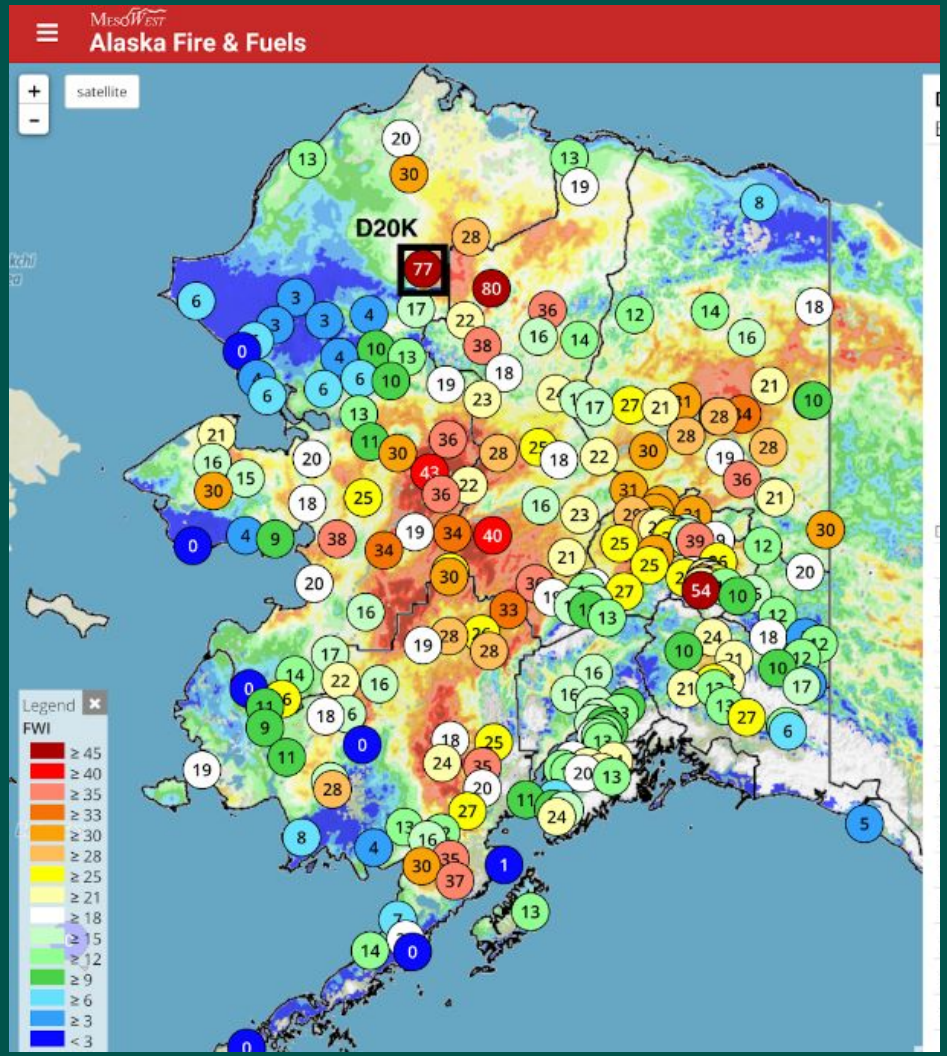
Taan Fjord 2015 was 30x larger (~70 Mm^3)

Barry Landslide could be 100x larger



Station coverage





Weather Stations

Feed temperature, wind speed & direction, humidity to MesoWest fire weather forecasting

Teamwork

None of this is possible without a team of people dedicated to operating and maintaining all of these parts.

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