



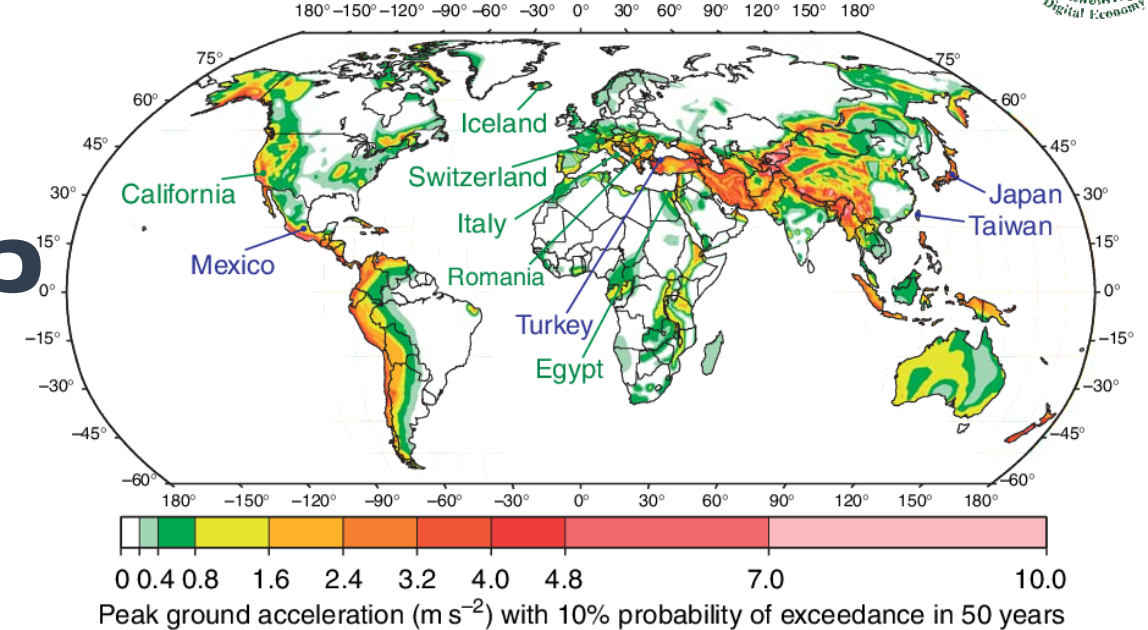
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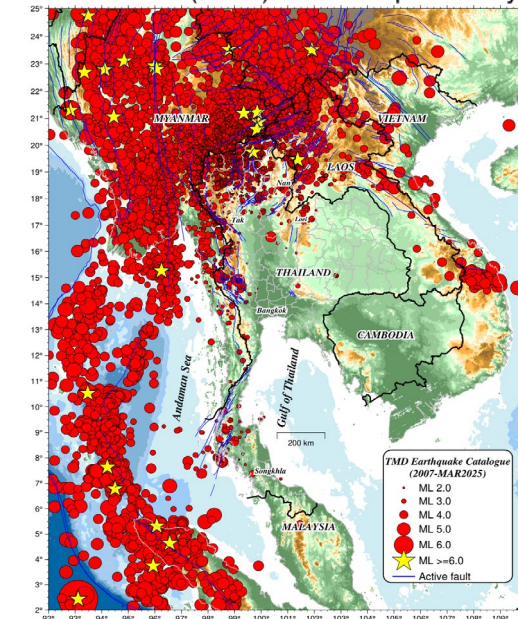
แผนที่โอกาสเสี่ยงภัยแผ่นดินไหว ของประเทศไทย

Probabilistic Seismic Hazard Map of Thailand

ปริญญญา พรโสภิน : Patinya Pornsopin



R. Allen, 2008



Pornsopin, 2024



DISASTER
STRIKES



PREPAREDNESS

- Emergency plans
- Training & Exercises
- Sirens

**DISASTER
MANAGEMENT
CYCLE**

RESPONSE

- Get alerted
- Life safety
- Evacuation & Shelters
- Mass care

 **TMD can do!**

Pre-
disaster

**MITIGATION
(PREVENTION)**

- Public education
- Hazard assessment
- Improved infrastructure

 **TMD can do!**

Post-
disaster

RECOVERY

- Debris management
- Housing
- Health & social services

Earthquake prediction?

(To say that earthquake will happen definitely)



Time of Occurrence

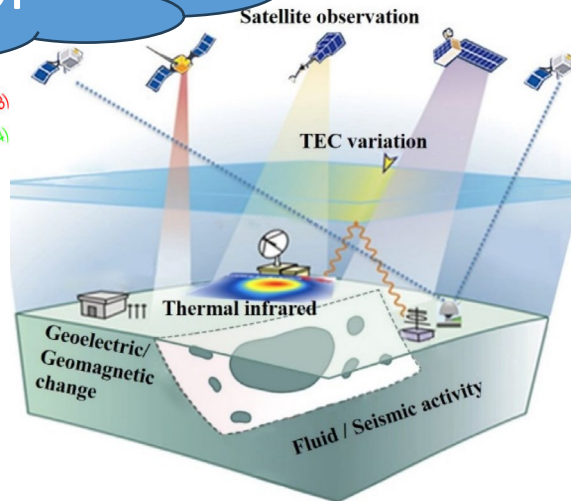
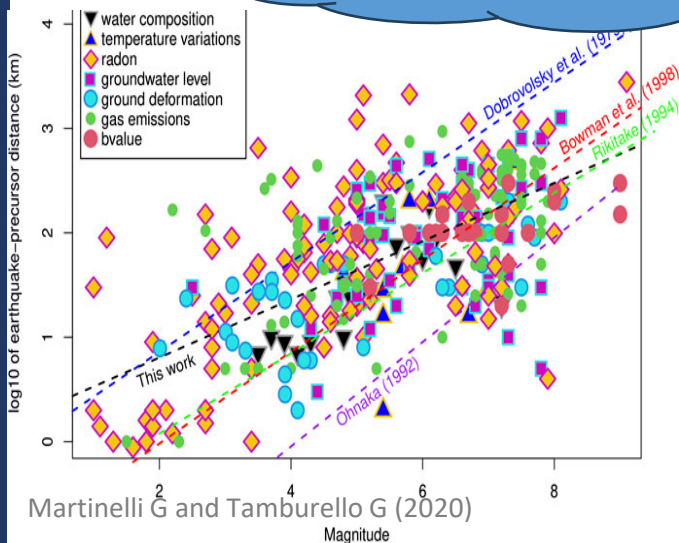


Location of Earthquake



Magnitude of Earthquake

Precursor



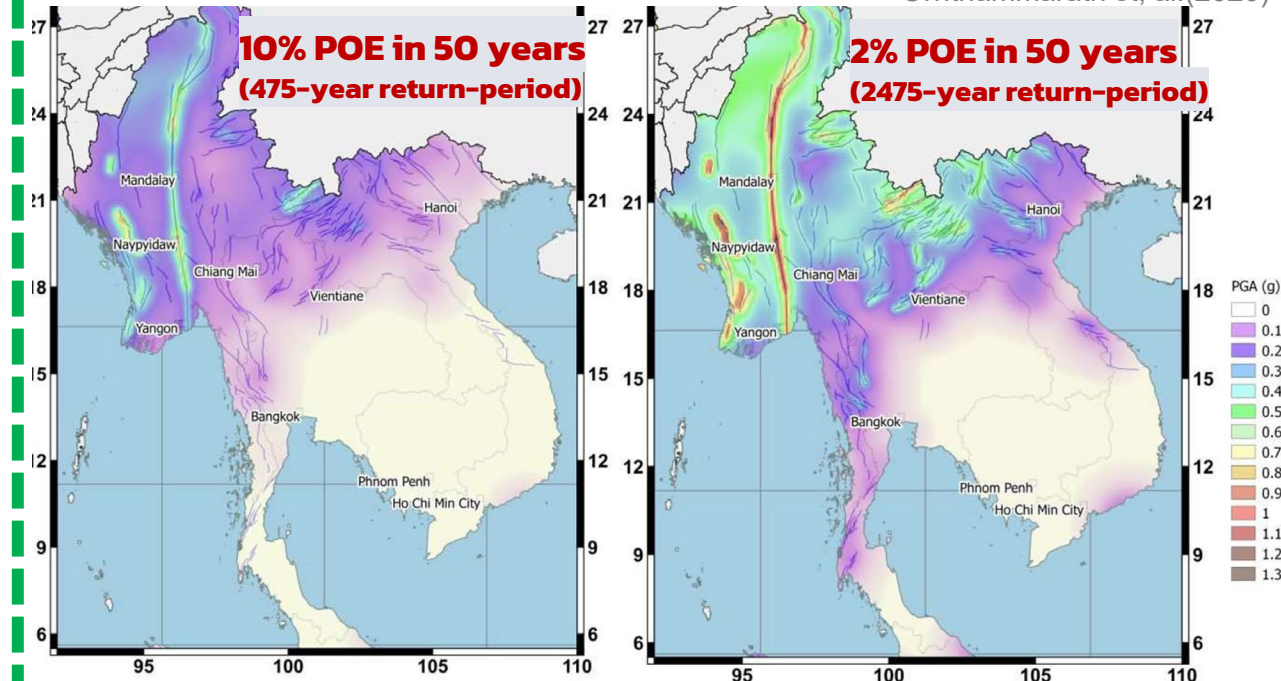
Chen, H., Han, P., & Hattori, K. (2022)

Earthquake forecast?

(To say that earthquake would happen probably)

- Provide the likelihood of earthquakes occurring within a certain timeframe and location.

Ornthammarath et, al.(2020)



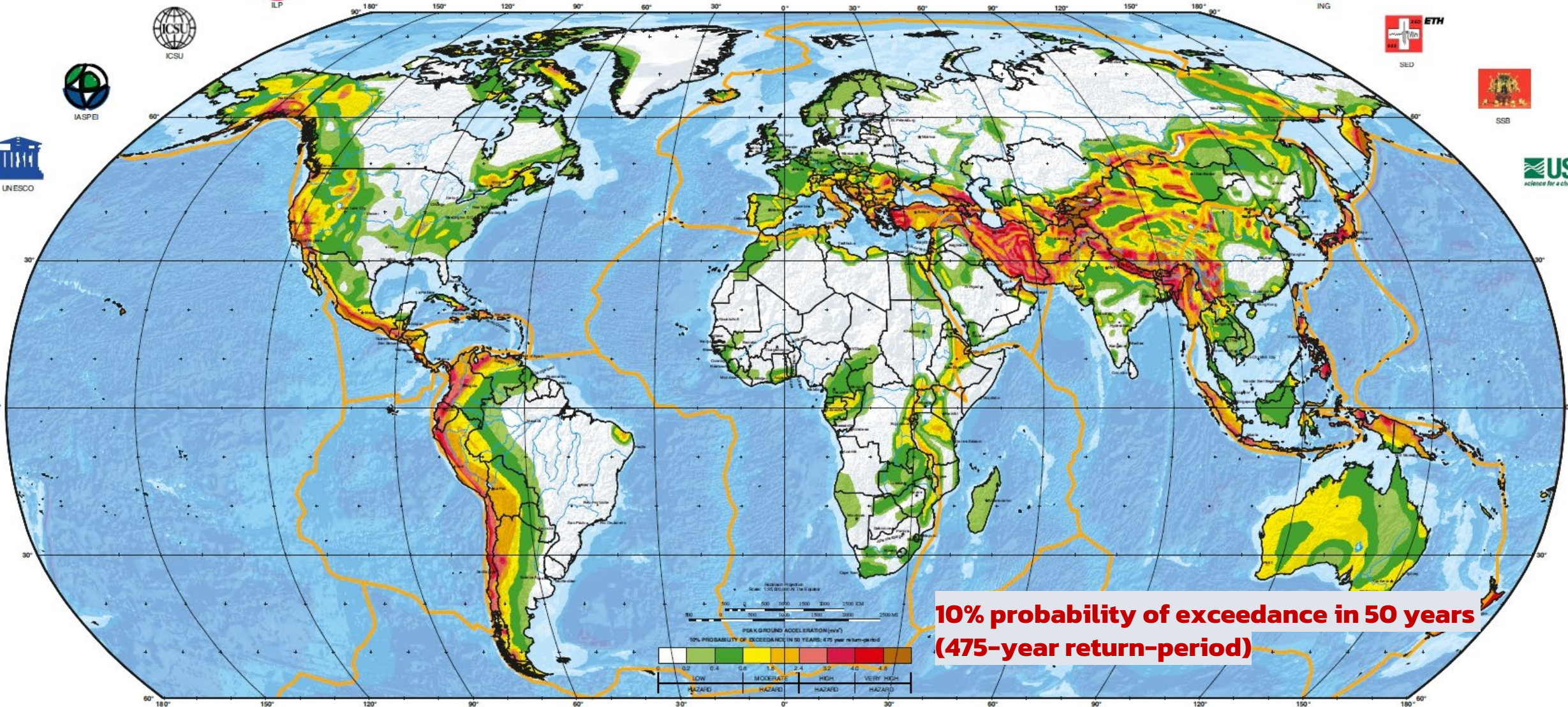


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Produced by the Global Seismic Hazard Assessment Program (GSHAP),
a demonstration project of the UN/International Decade of Natural Disaster Reduction

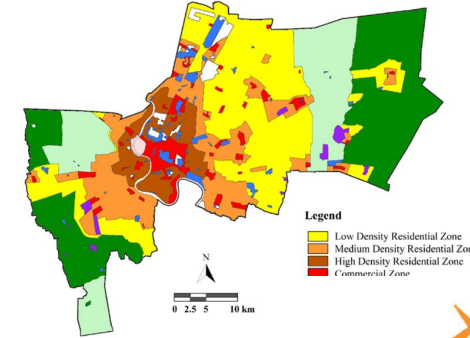
Global map assembled by
D. Giardini, G. Grünthal, K. Shedlock and P. Zhang, 1999



**10% probability of exceedance in 50 years
(475-year return-period)**

Seismic Hazard Maps can be used for:

- **Land-use planning**
- **Prevention & Mitigation (Building codes)**
- **Emergency response**
- **Insurance rate structures**



Facts About Earthquake Insurance

Home and personal property
40+
states are at risk of earthquake damage

Earthquake coverage is **NOT** included in homeowners' insurance

Earthquake insurance must be bought **SEPARATELY** or added to your policy by endorsement

Costs of earthquake insurance varies based on your location

the balance



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Input for Seismic hazard assessment



1. Past faults and earthquakes:

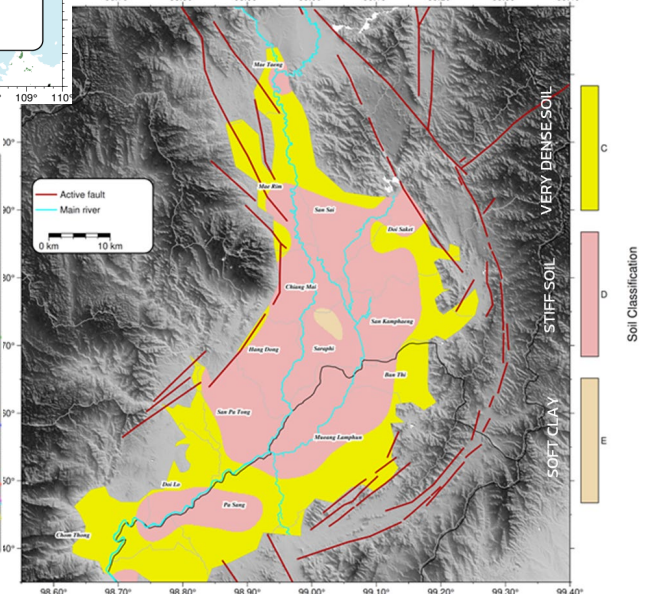
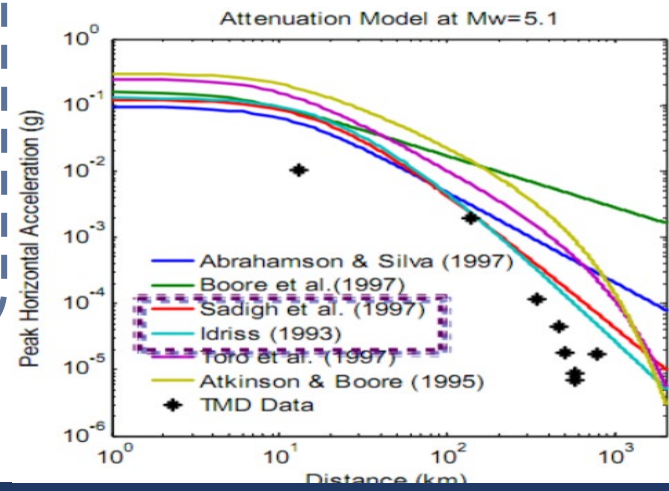
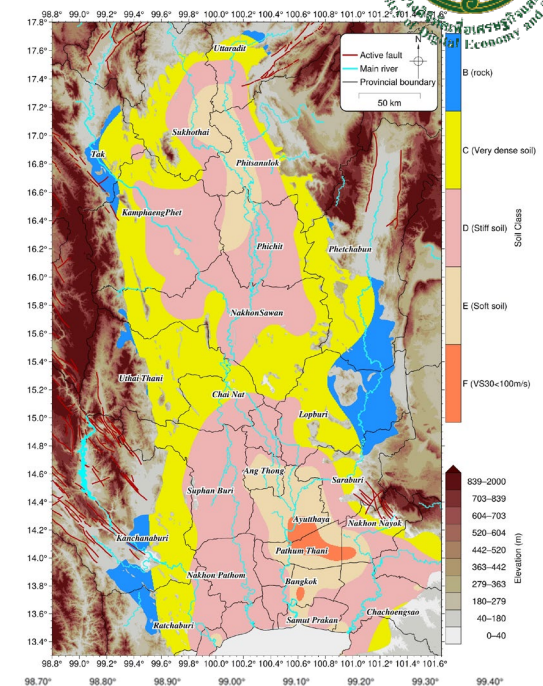
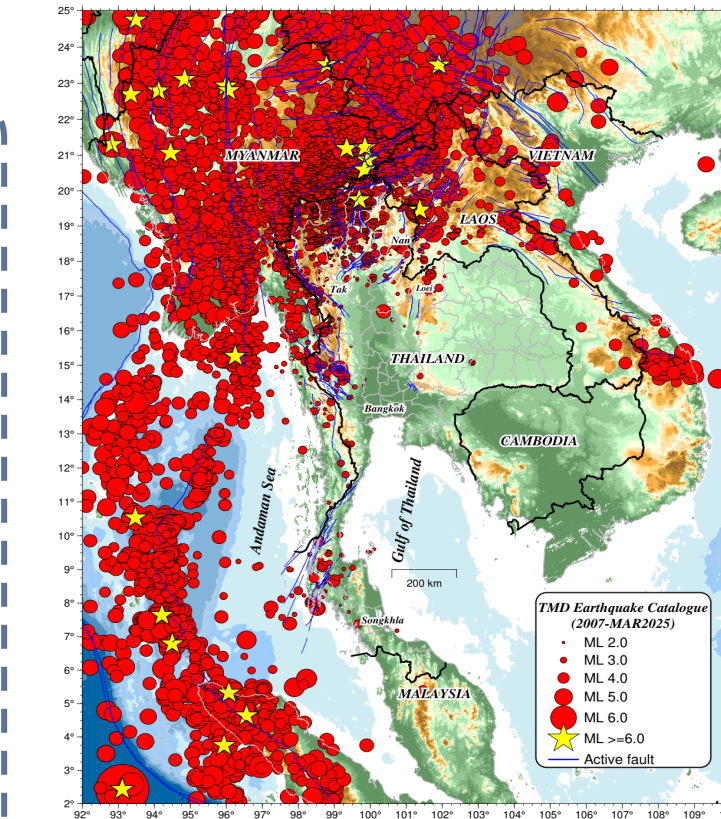
Analyzing historical earthquake data and fault lines helps identify areas with higher seismic activity.

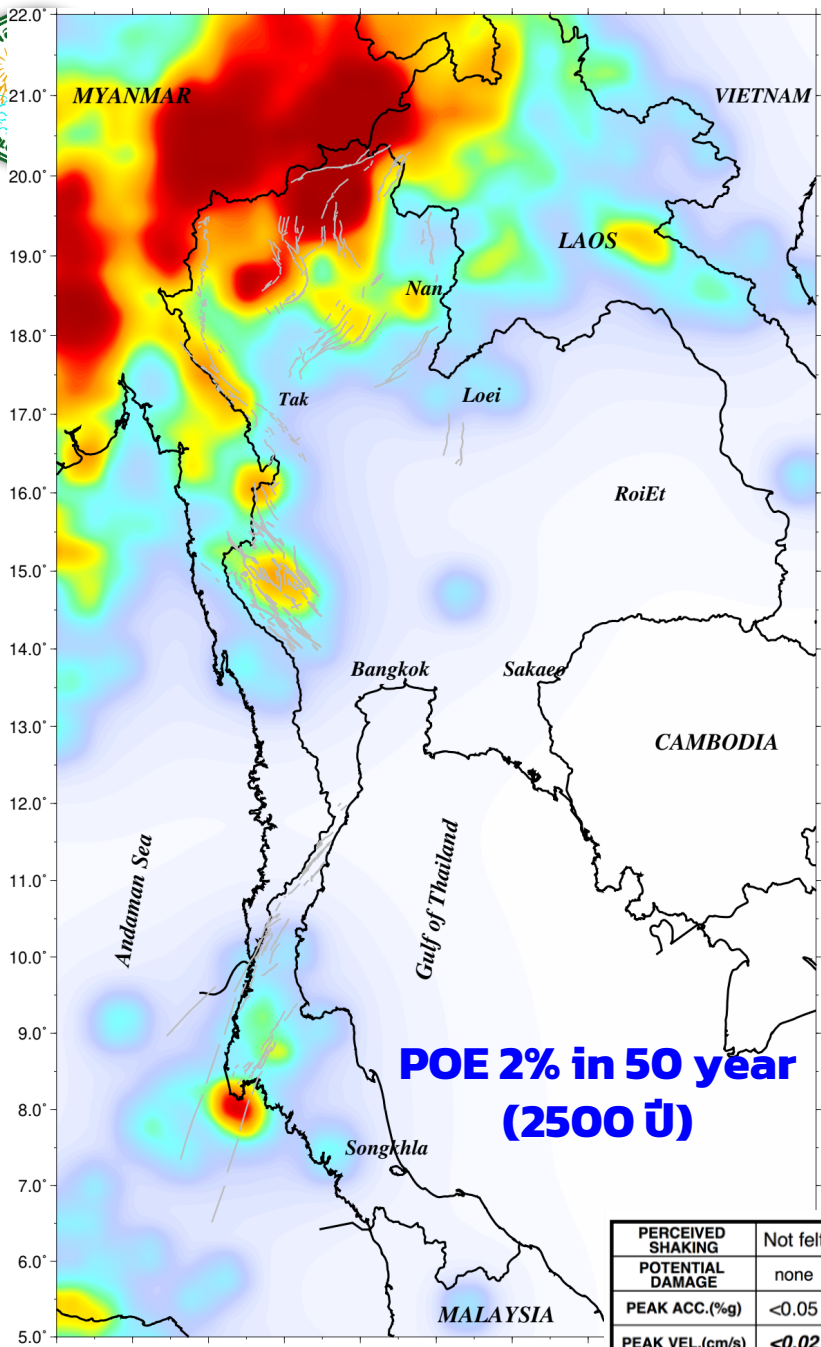
2. Seismic wave behavior:

Understanding how seismic waves travel through different types of ground helps assess the potential for ground shaking.

3. Site conditions:

The geology and soil conditions at a specific location can influence the intensity of ground shaking during an earthquake.



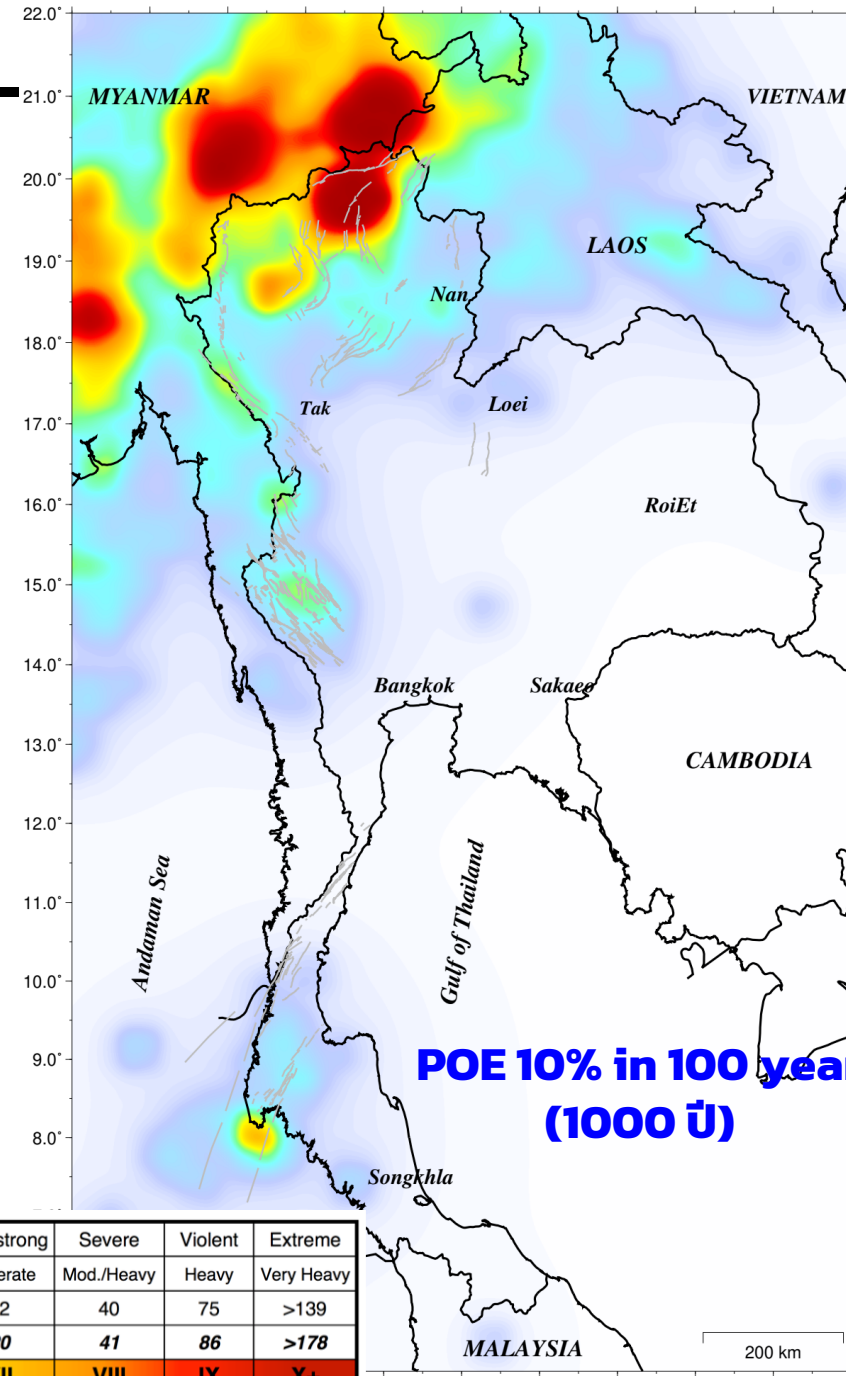


**POE 2% in 50 year
(2500 Ȳ)**

PGA(g) for 2% probability exceedance in 50 years (TMD catalog)

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Mod./Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<0.05	0.3	2.8	6.2	12	22	40	75	>139
PEAK VEL.(cm/s)	<0.02	0.1	1.4	4.7	9.6	20	41	86	>178
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Scale based upon Worden et al. (2012)



**POE 10% in 100 year
(1000 Ȳ)**

PGA(g) for 10% probability exceedance in 100 years (TMD catalog)

200 km

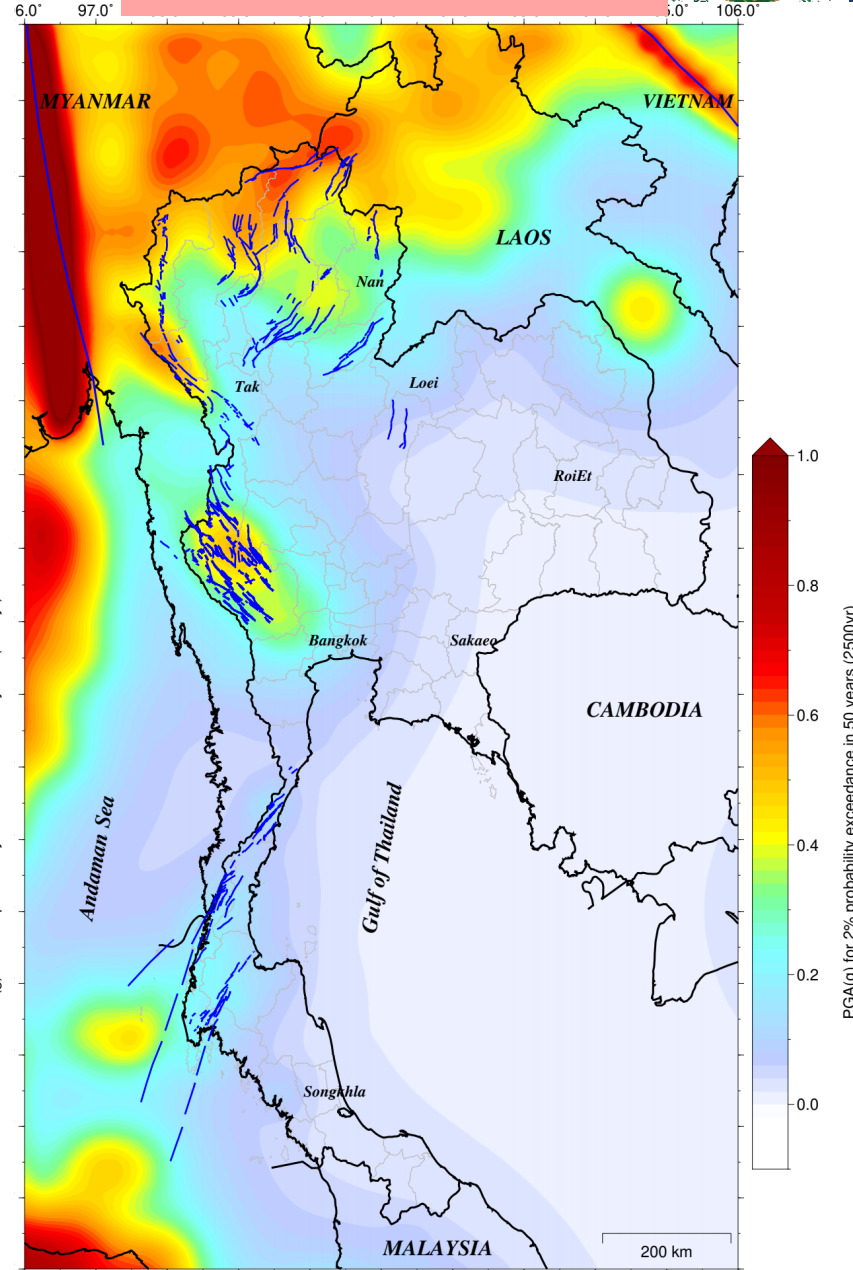
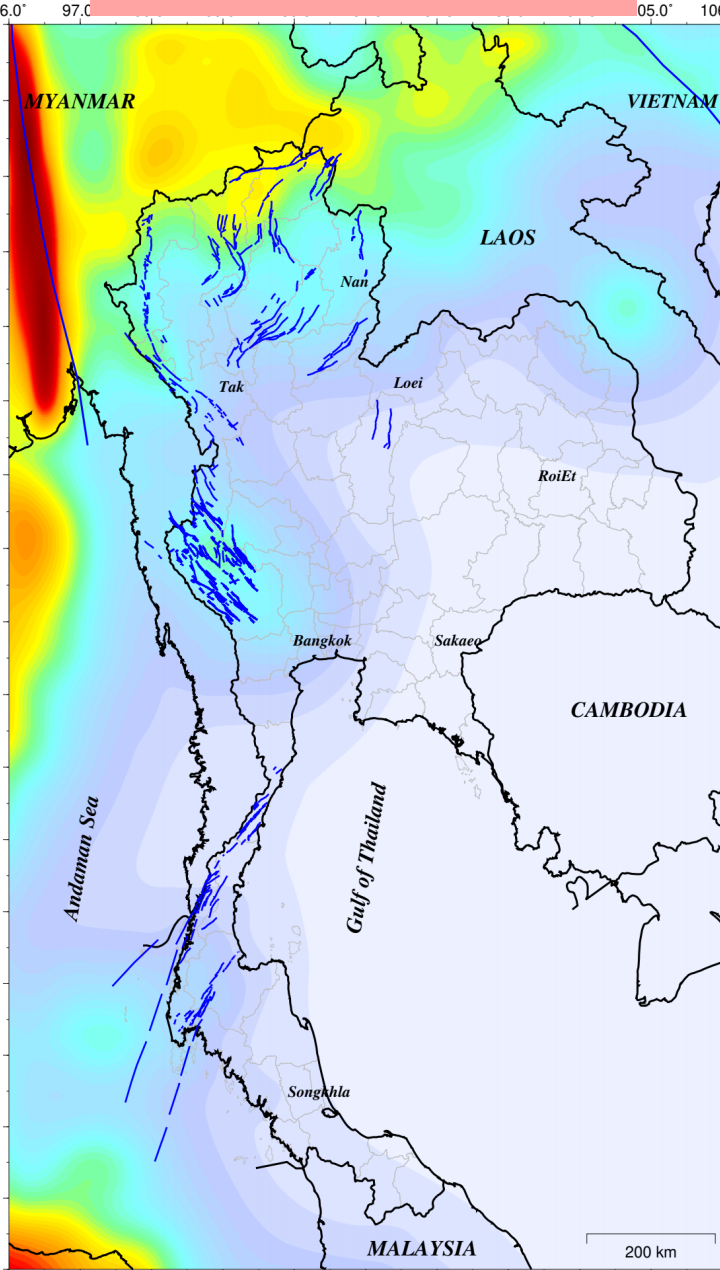
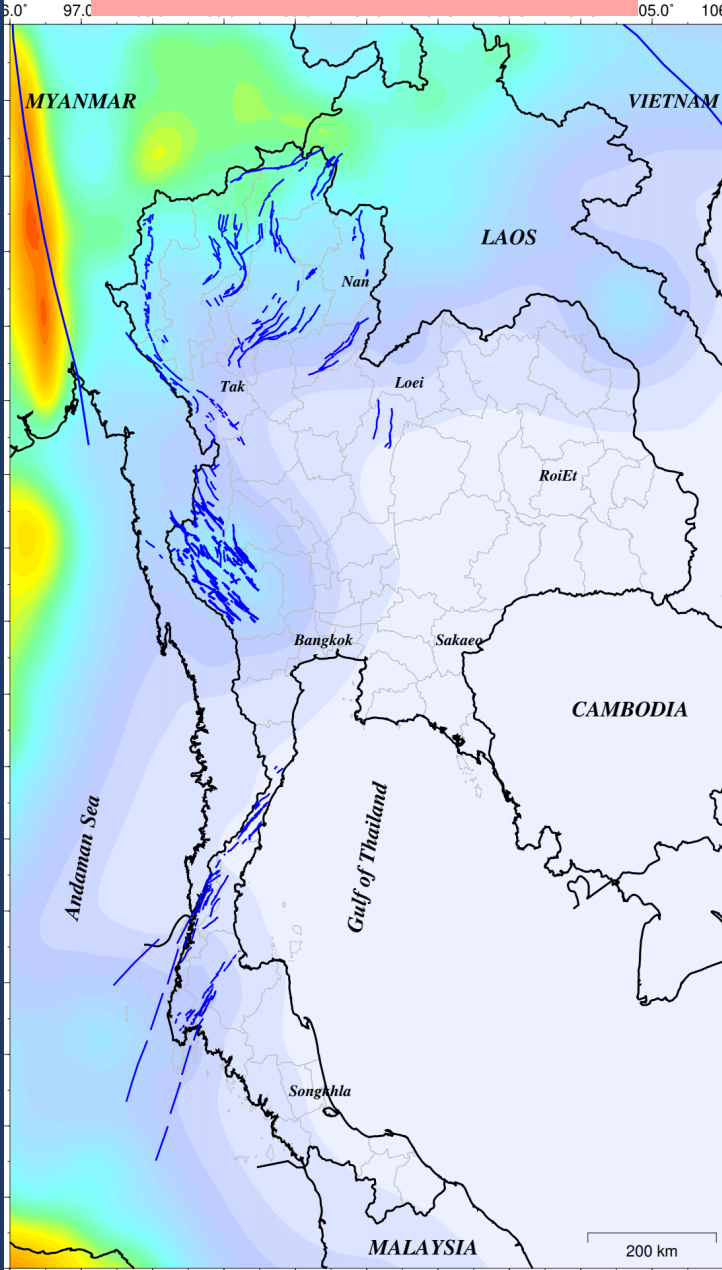


**10% POE in 50 year
(475 ปี)**

แผนดินไหว
OBSERVATION DIVISION

**10% POE in 100 year
(1000 ปี)**

**2% POE in 50 year
(2475 ปี)**

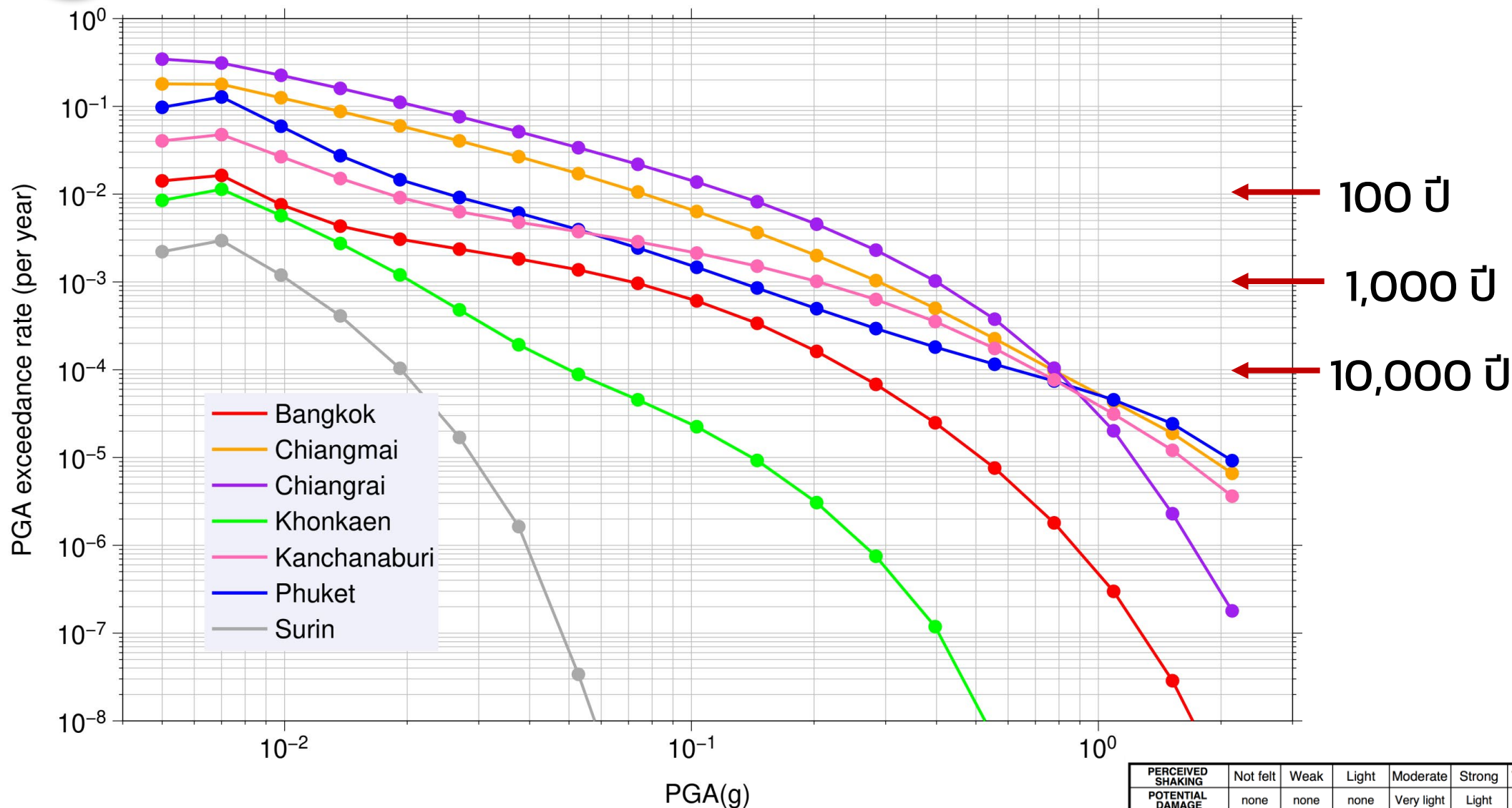




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Seismic hazard curves



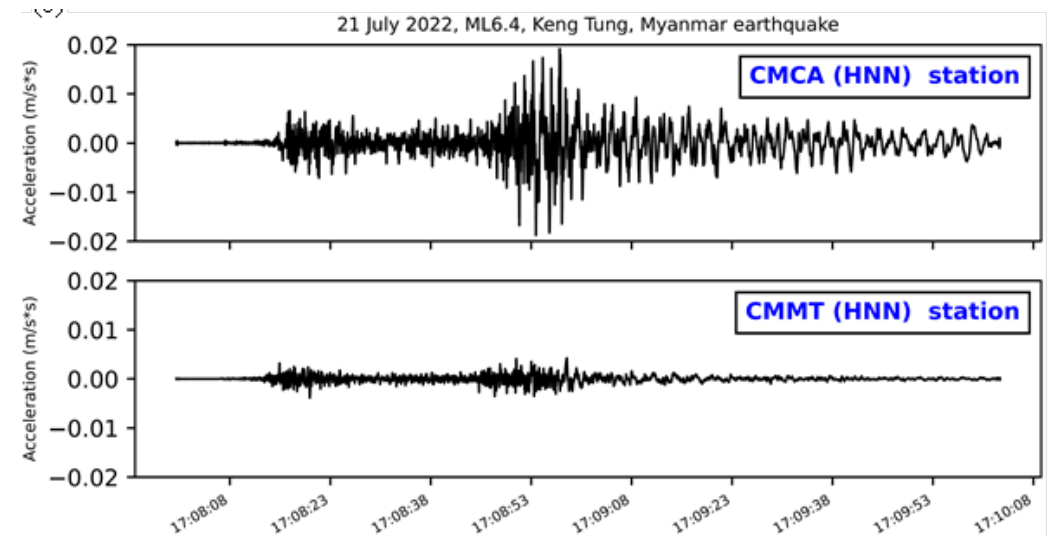
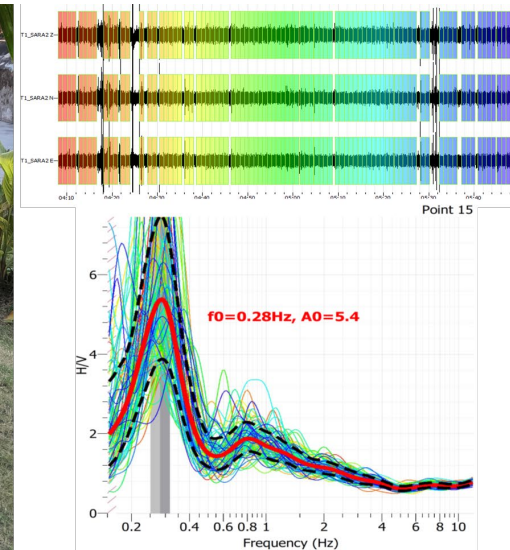
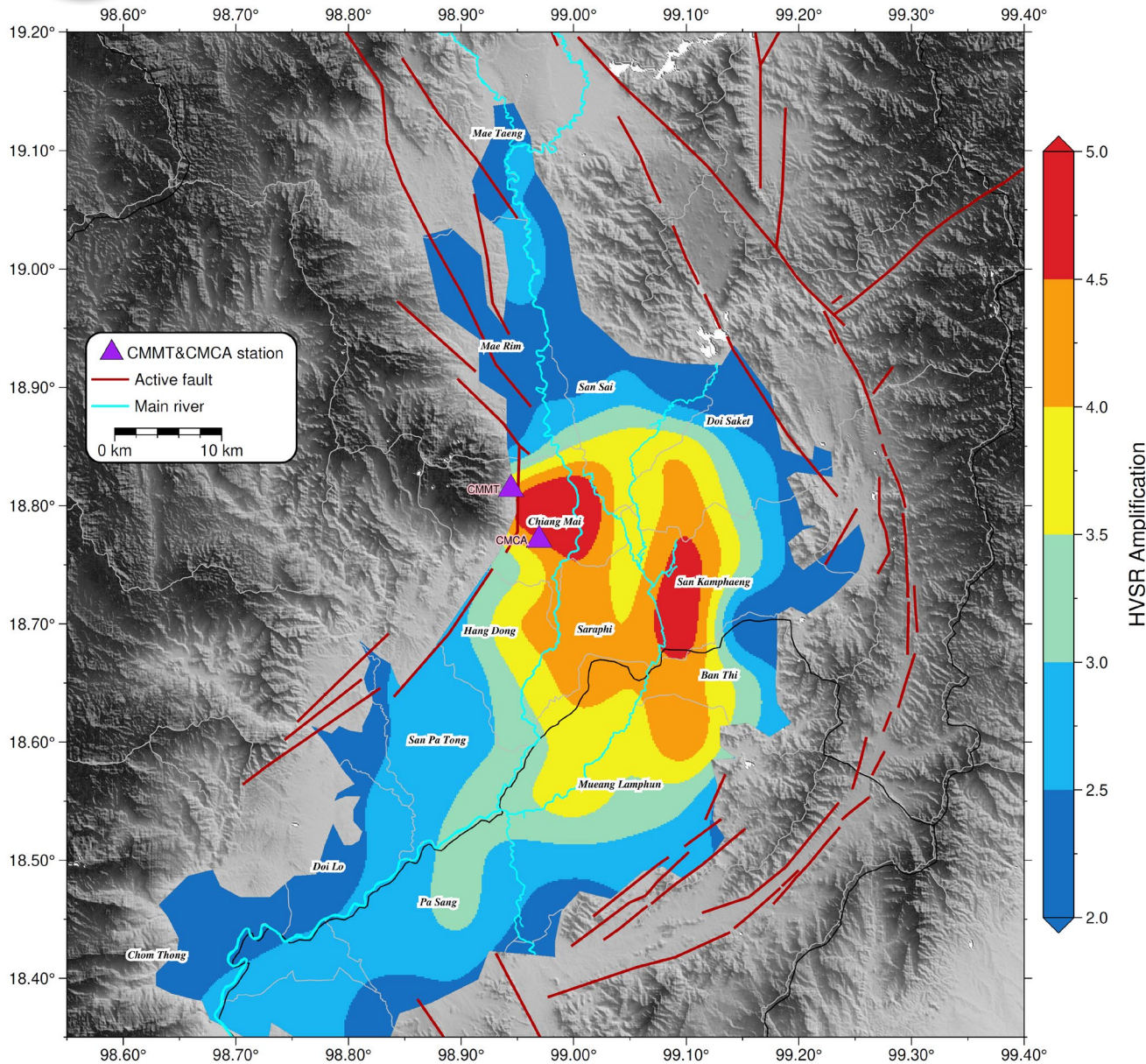
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INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+



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Site conditions: Chiang Mai Basin

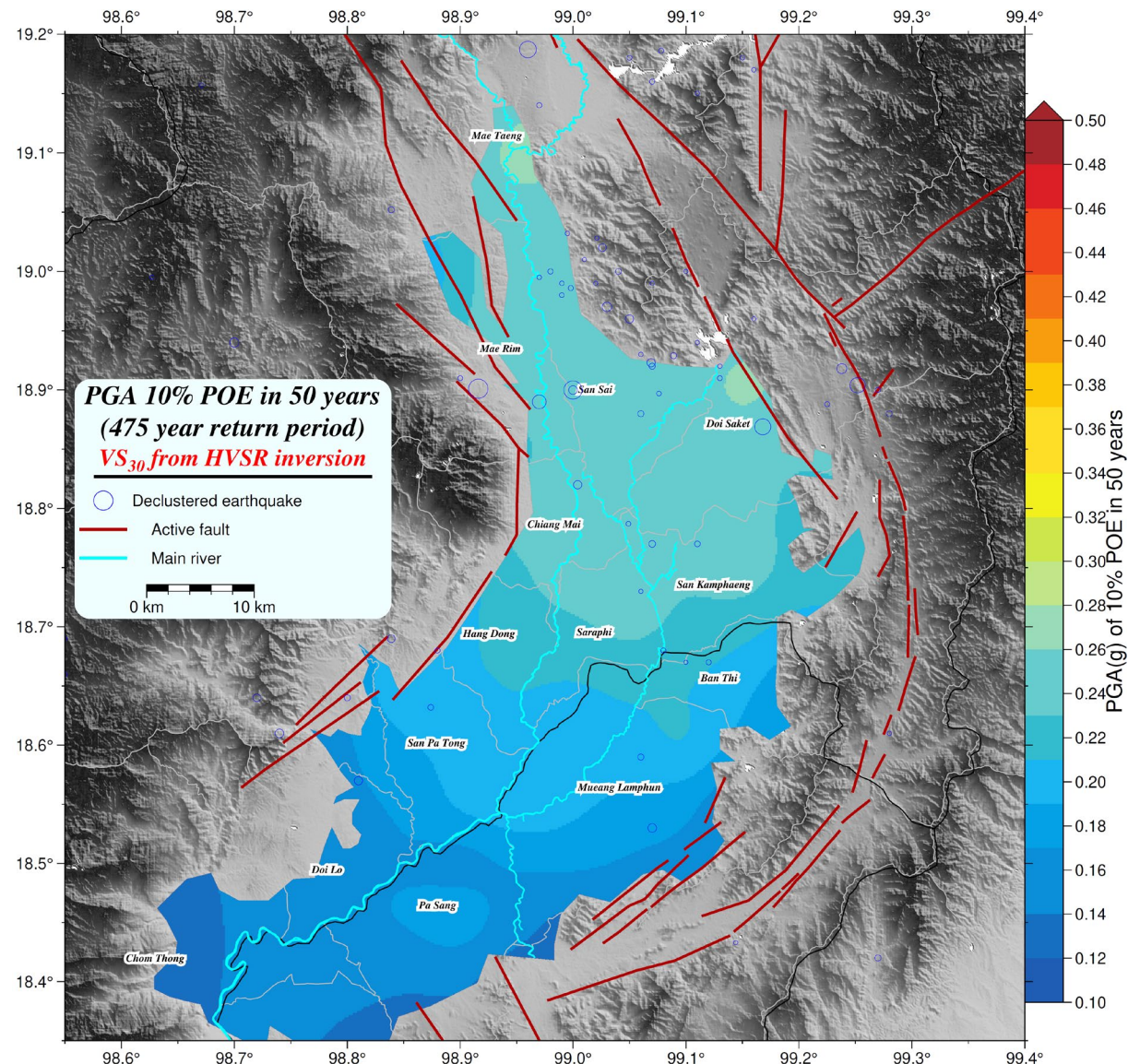
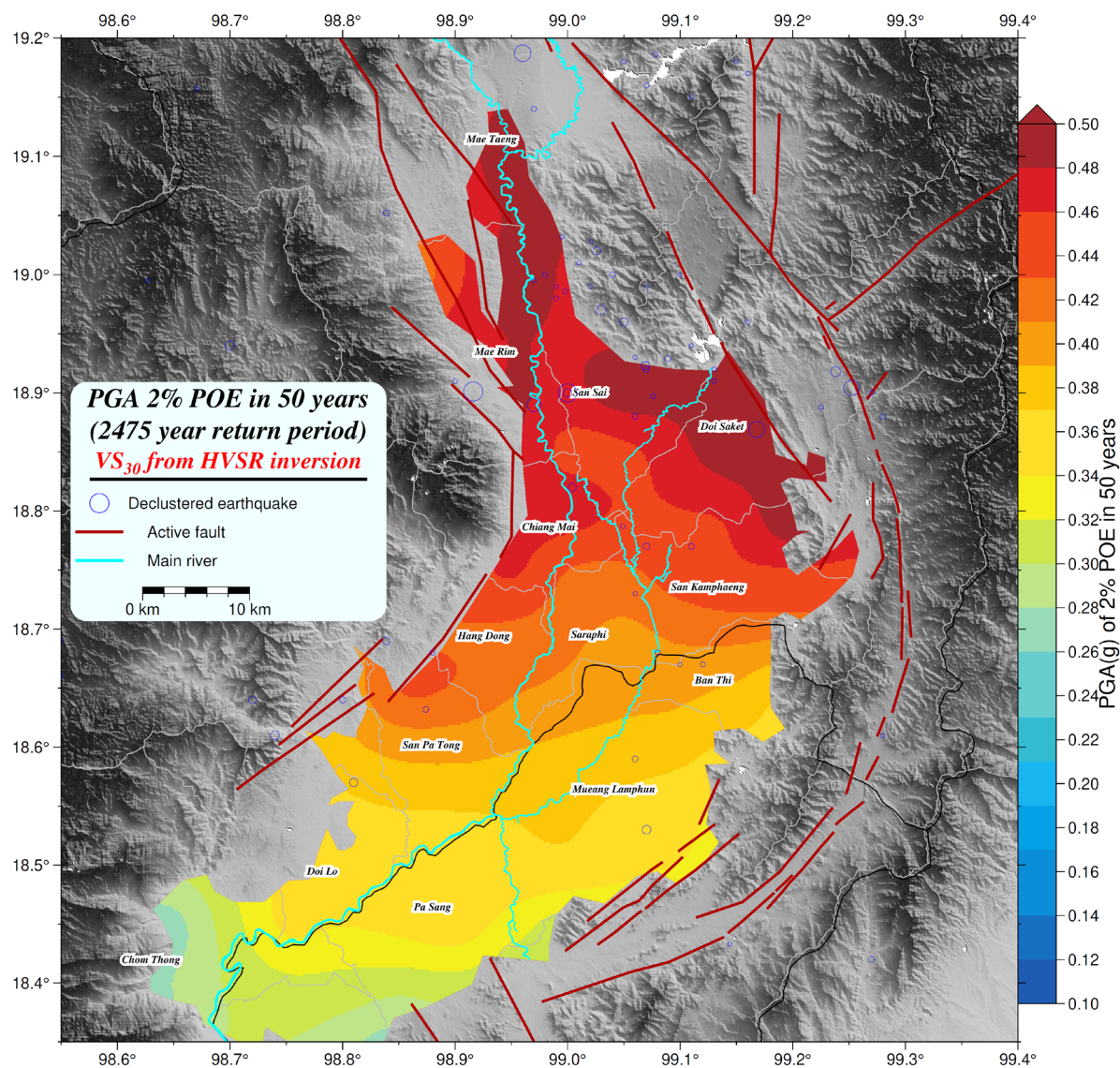




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Seismic Hazard Microzonation: Chiang Mai Basin

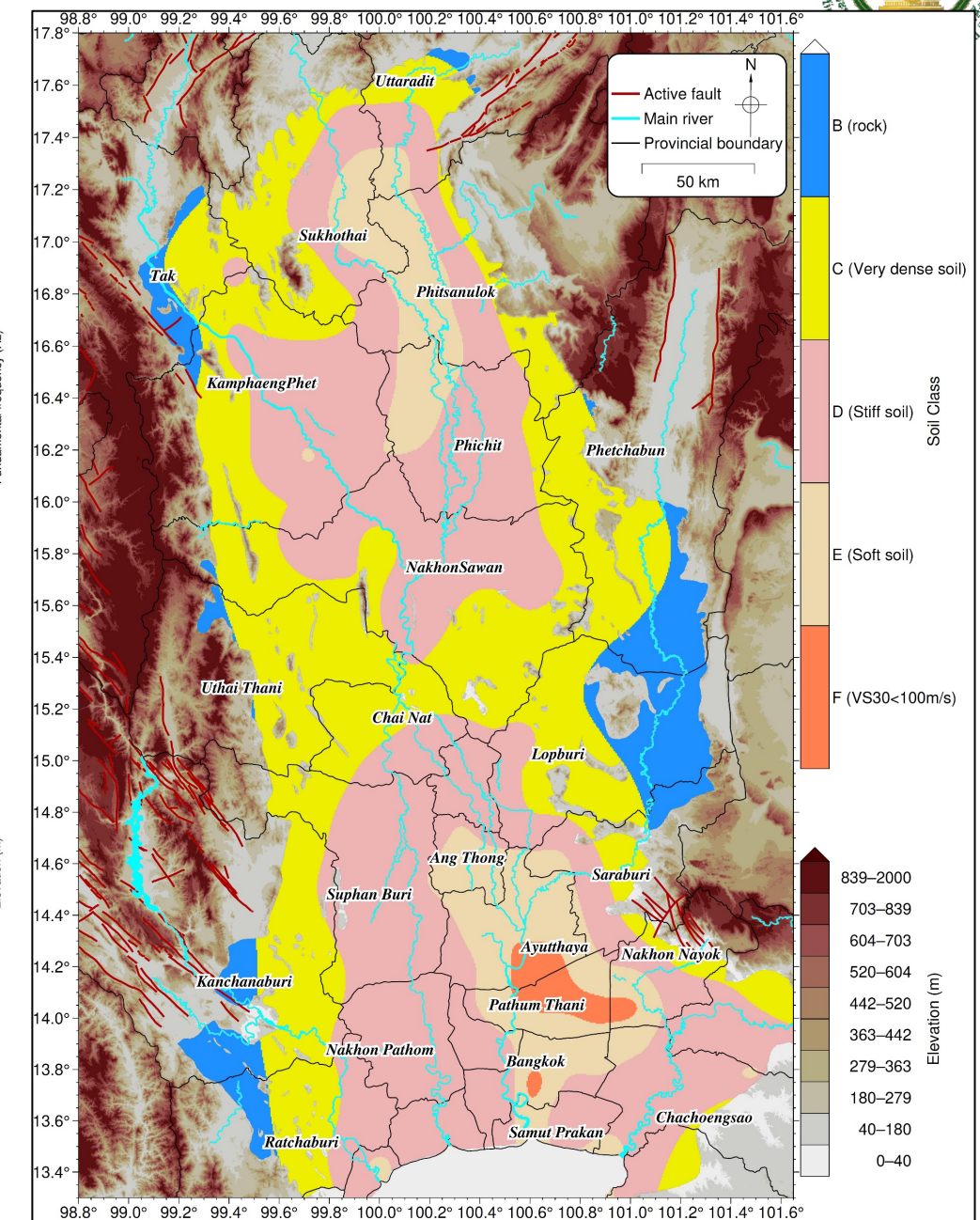
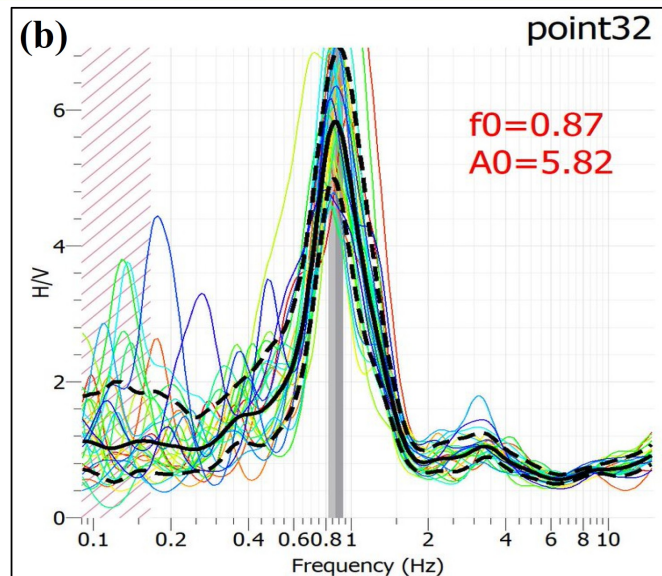
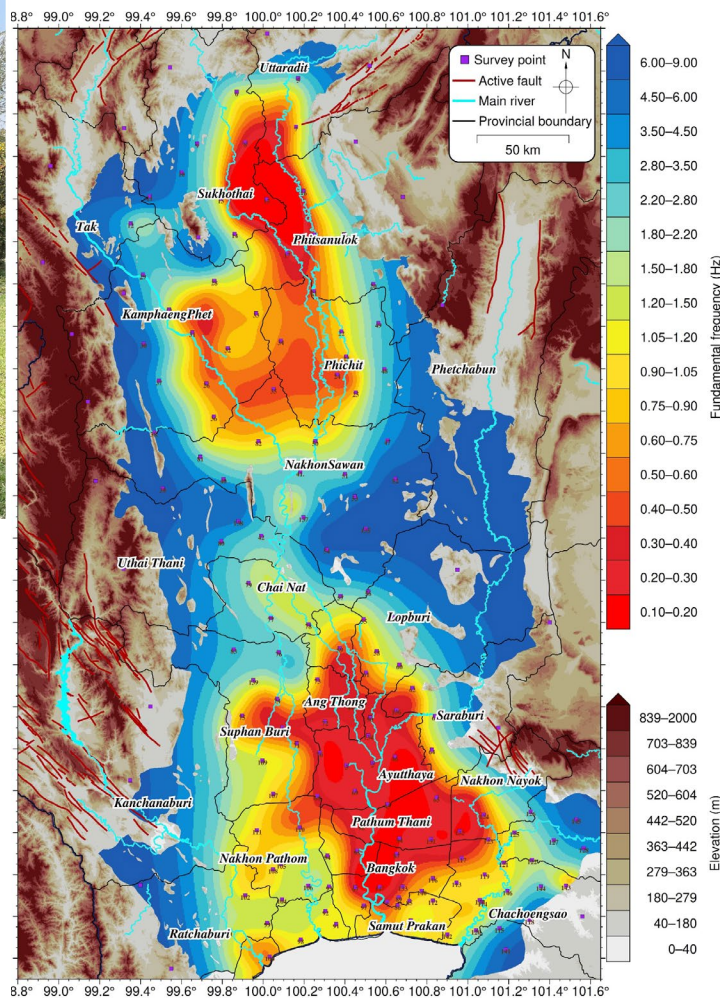




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Site conditions: Central Plain





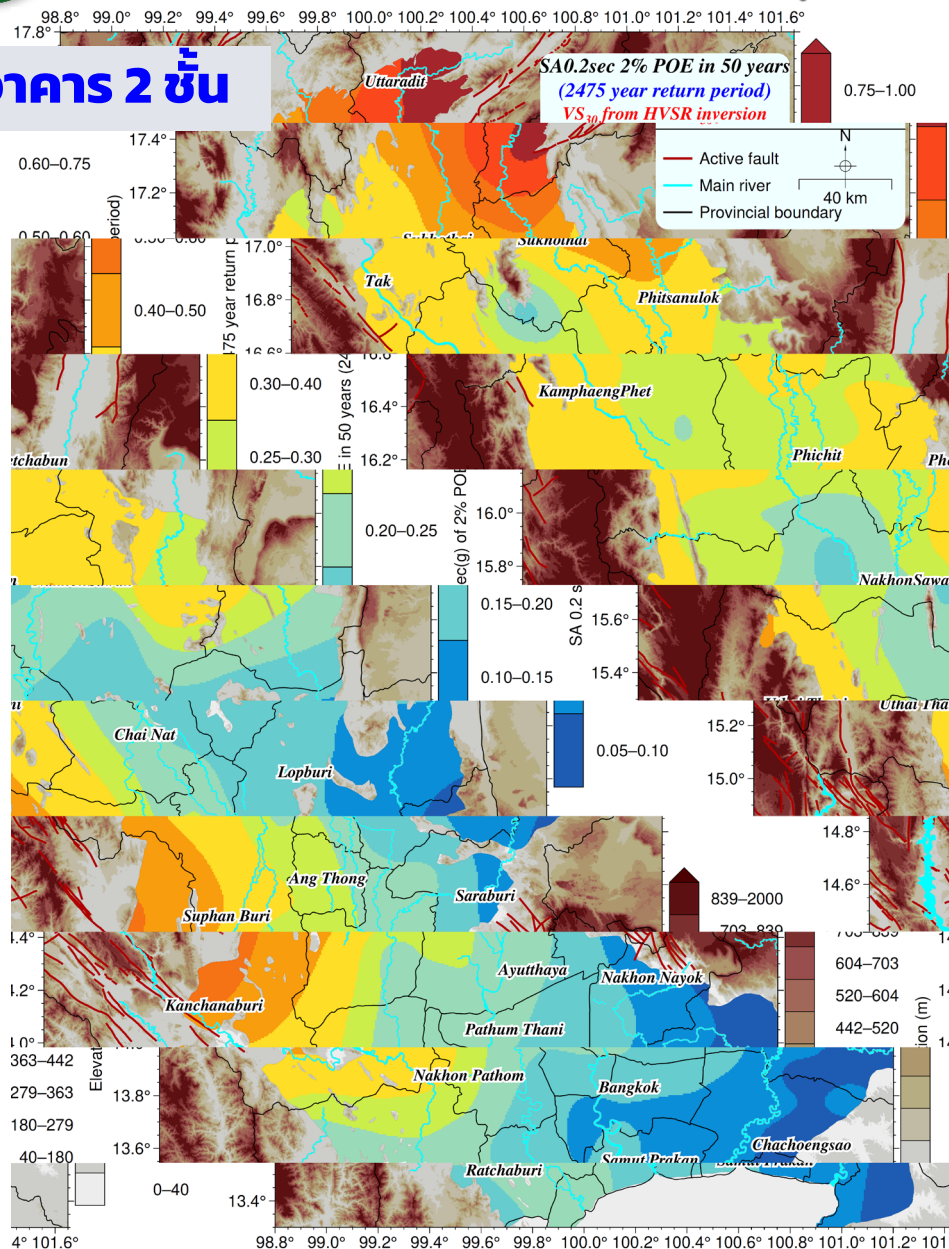
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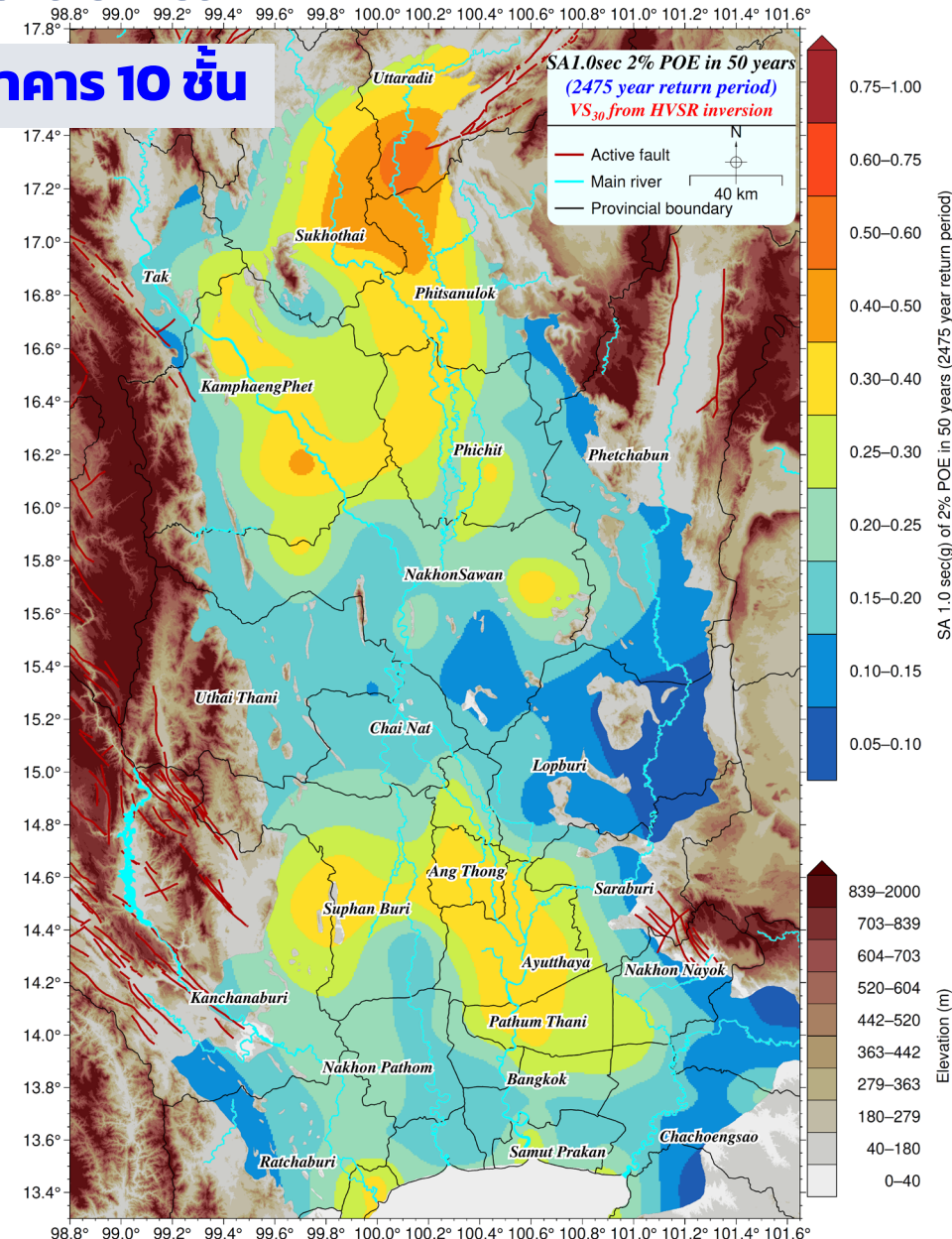
Seismic Hazard Microzonation: Central Plain



อาคาร 2 ชั้น



อาคาร 10 ชั้น

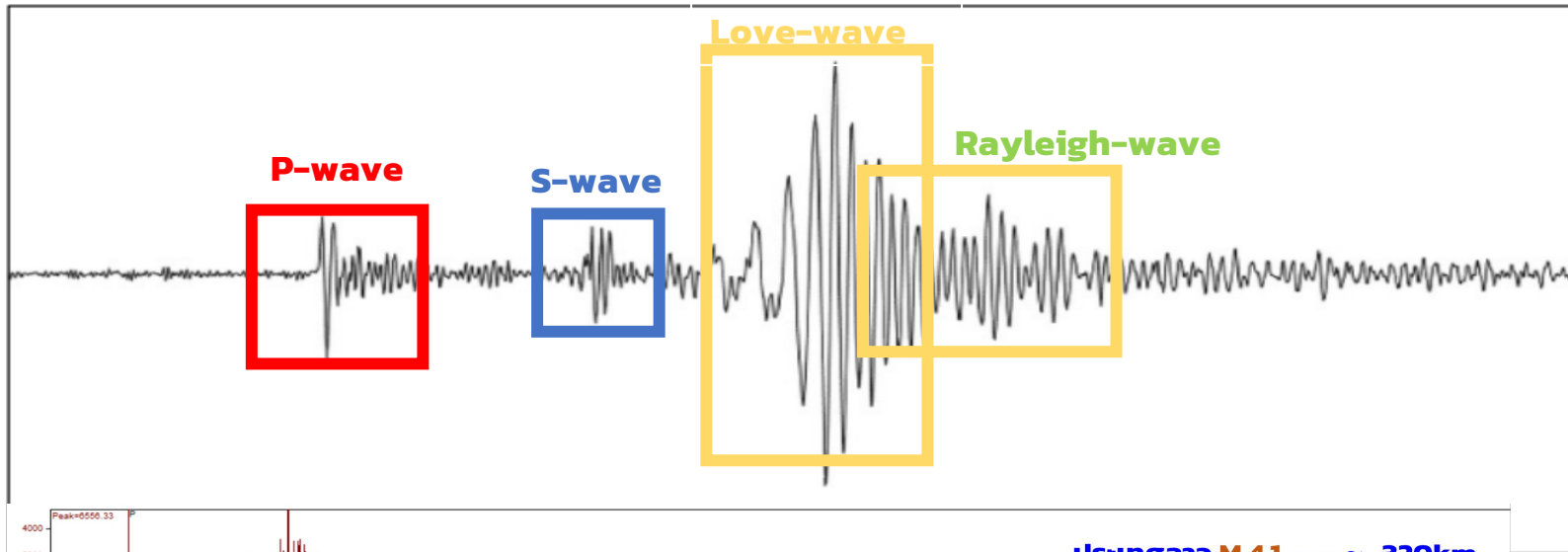




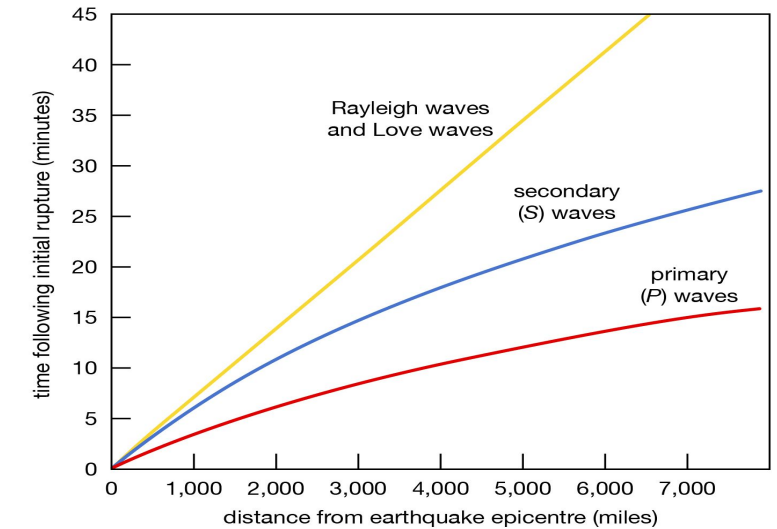
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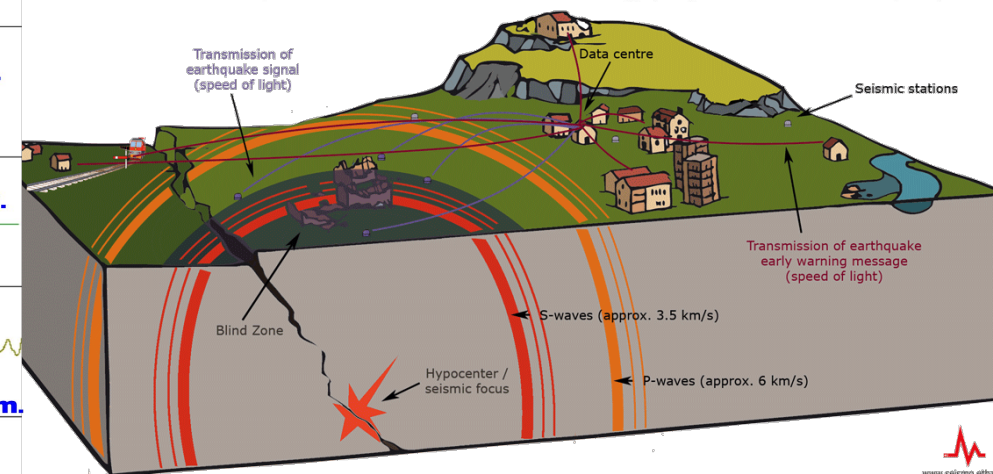
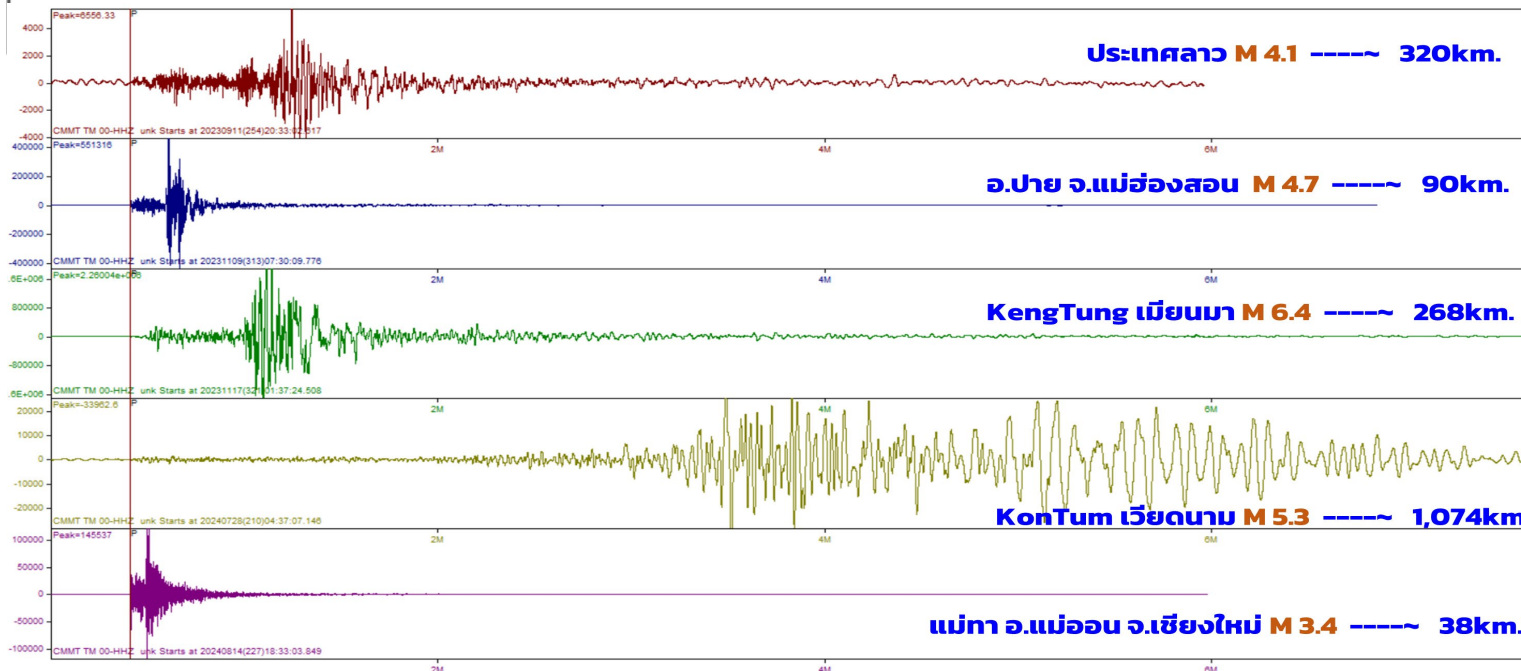
Earthquake Early Warning (EEW)



Generalized travel-time curve for seismic waves



Source: Incorporated Research Institutions for Seismology (IRIS), "Travel Time Curves" (2014).

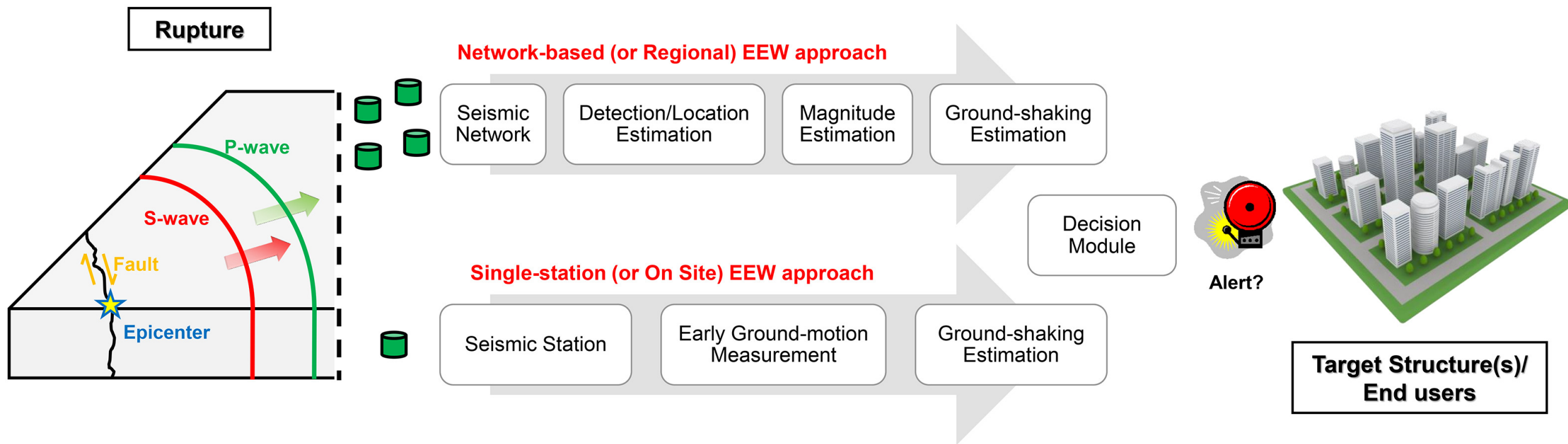




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Earthquake Early Warning (EEW)

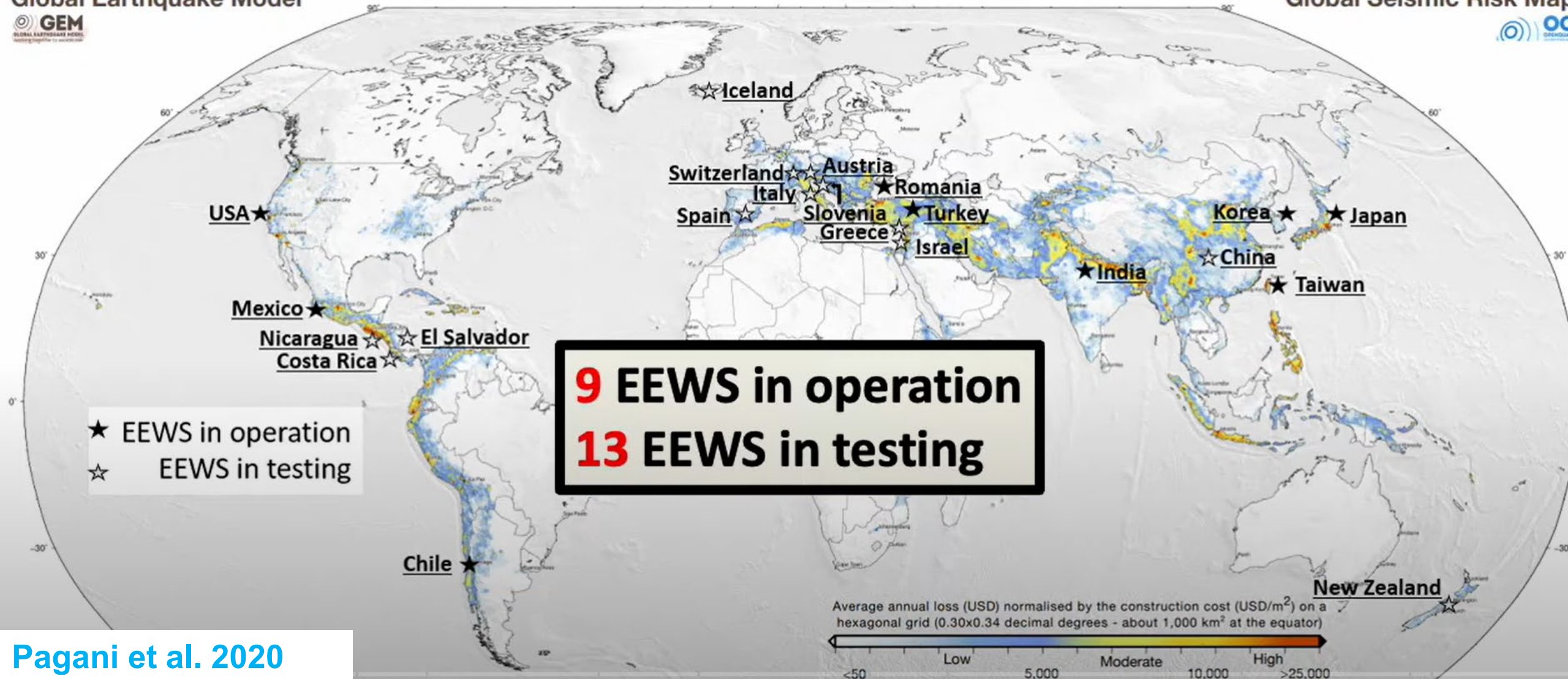


A set of **physical sensors** and **mathematical model / algorithms** designed to process and disseminate real-time information about ongoing earthquakes

EEW Systems (EEWS) around the World

Global Earthquake Model

Global Seismic Risk Map

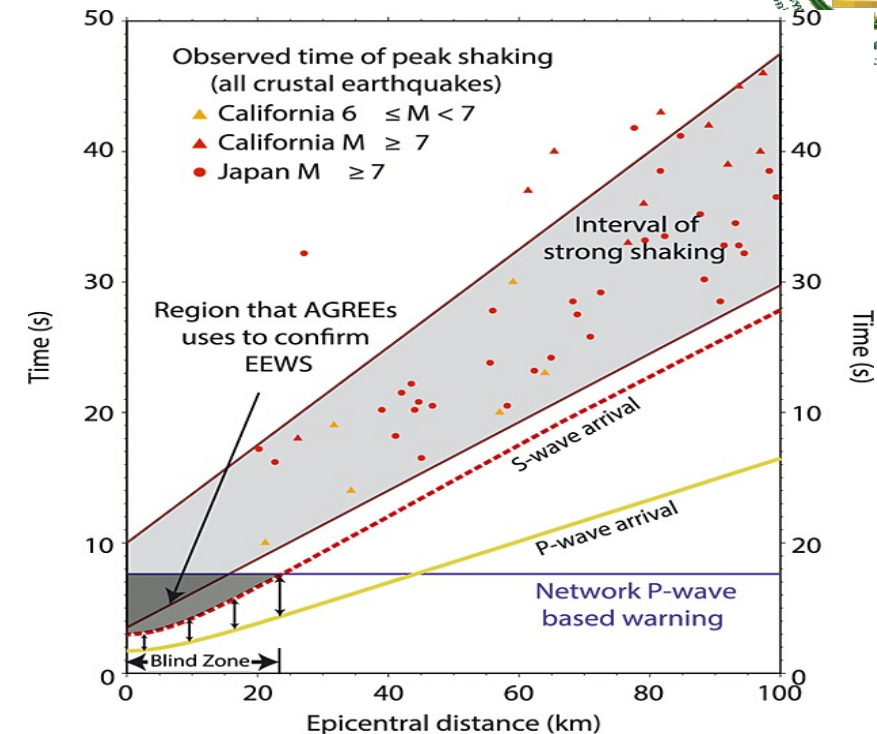
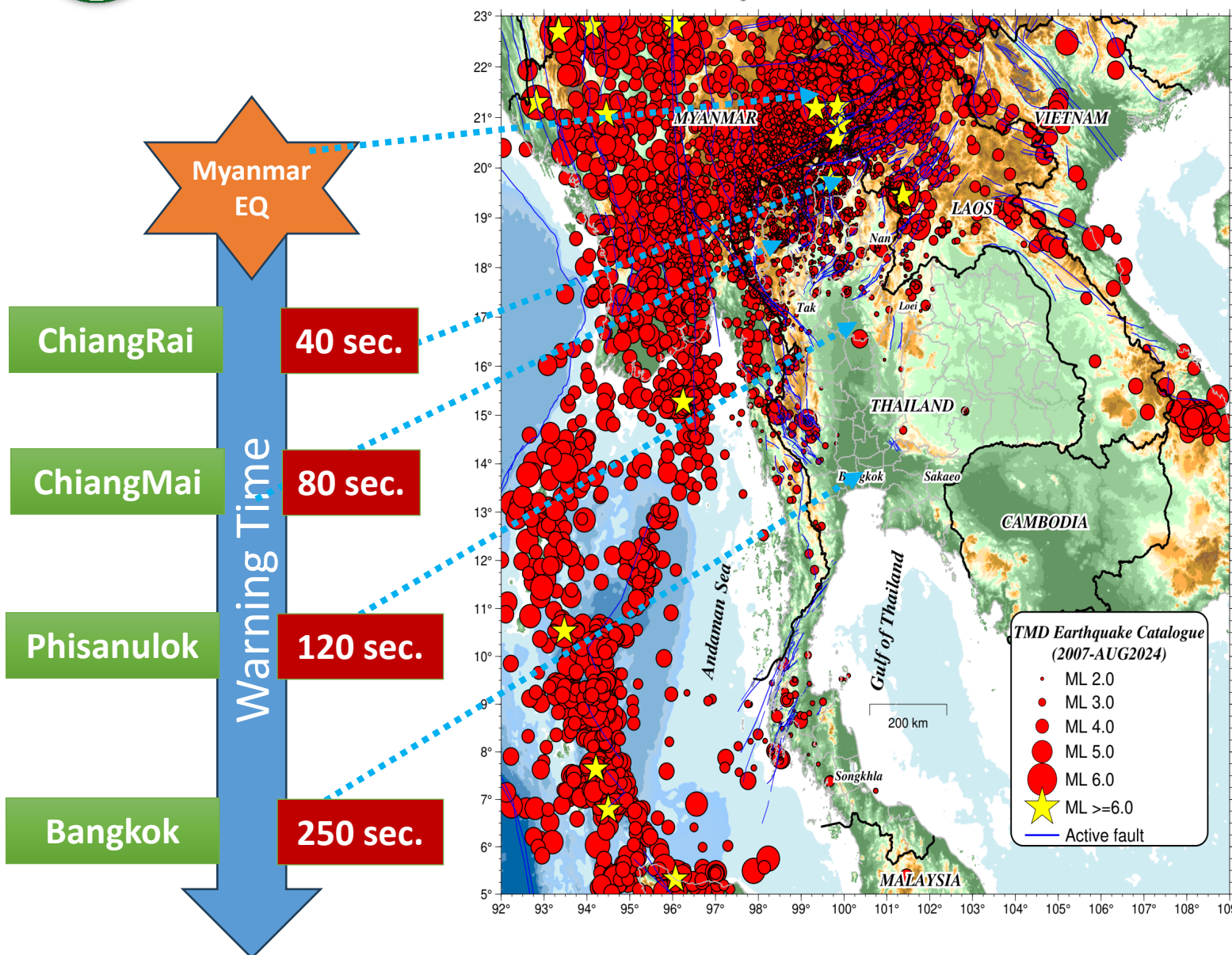




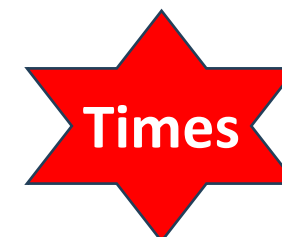
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Earthquake Early Warning



- Communication, Network streaming
- small packet sizes
- Density of seismic station?
- Small sample rates
- EEW software? Fast estimation!
- Direct to EEW server





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End of presentation