Resilience Highlights from Japan, 2022

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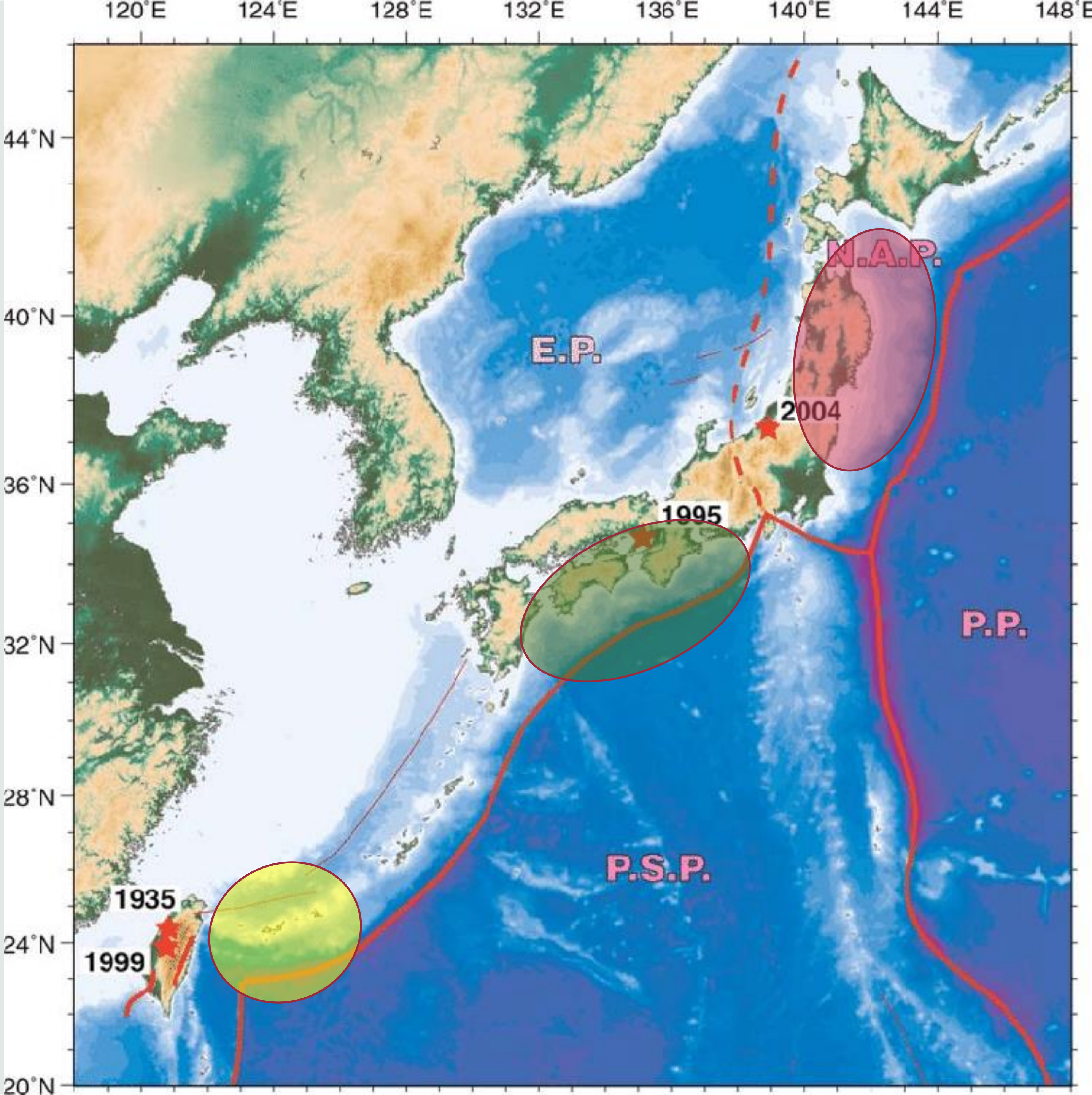
Purposes of Trip

- Visiting appointment at Kyoto University's Disaster Prevention Research Institute, March-June, 2022
- Build connections with researchers in Japan around Disaster Risk Reduction (DRR)
- Be alert to transferrable lessons (both directions)
- Interpretive lenses
  - Researcher
  - OSSPAC member
  - NET (CERT) member

Past, present, future threats

+ Recovery from Great East Japan Earthquake (= Tohoku earthquake)
+ Planning for Nankai Trough earthquake
+ Ryukyu Islands: where recurrence intervals are long



Ota et al., 2009

Dunbar et al., 2011

Reconstruction after GEJE

Reconstruction activities complete

- 32 trillion yen (>200 billion dollars)

Major changes to land-use planning

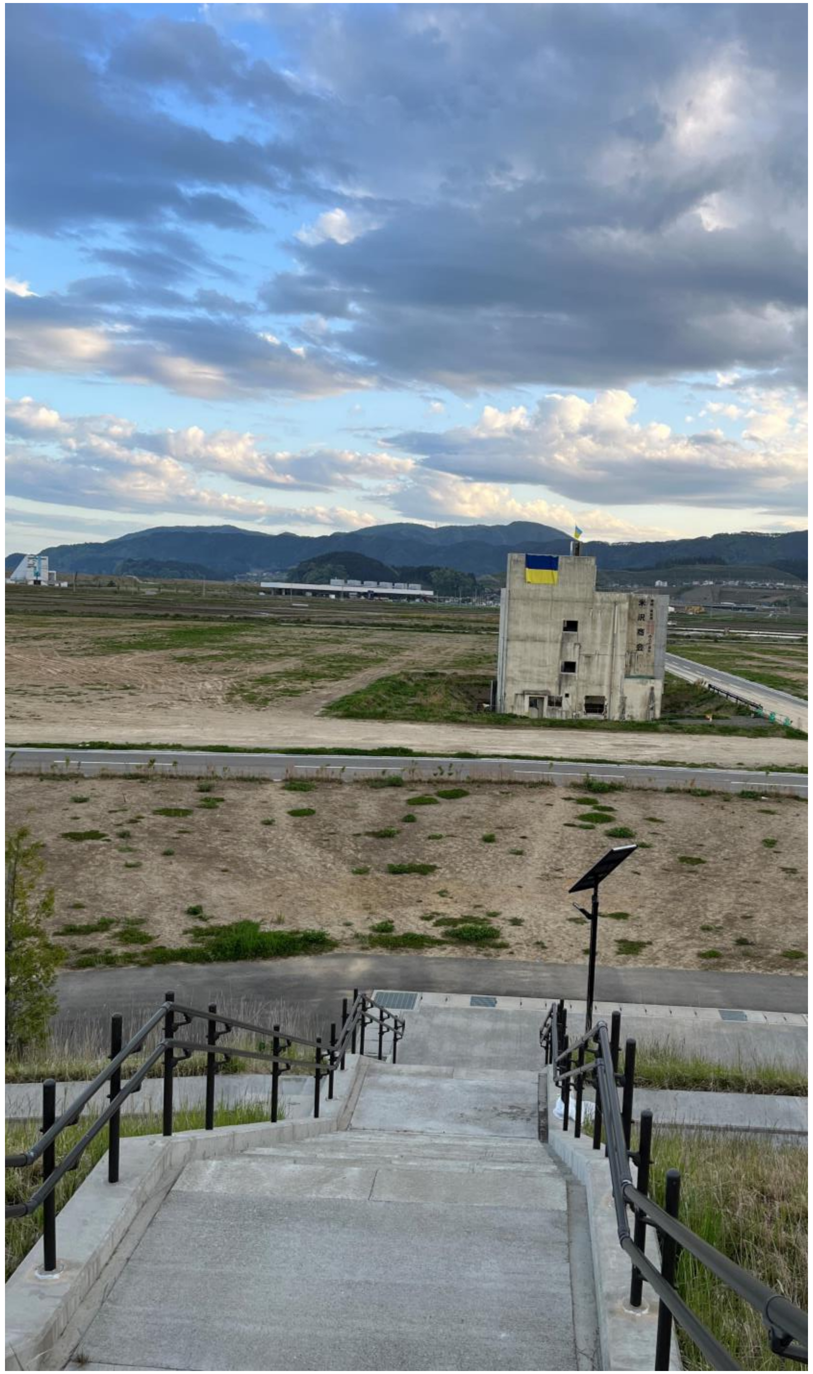
- Exclusion zone
- Buffer zone
- Residential zones

Mitigation measures

- Seawalls
- Land elevation changes
- Community relocation


abasse
TAKATA
本
100
Can★Do

東日本大震災
慰霊碑

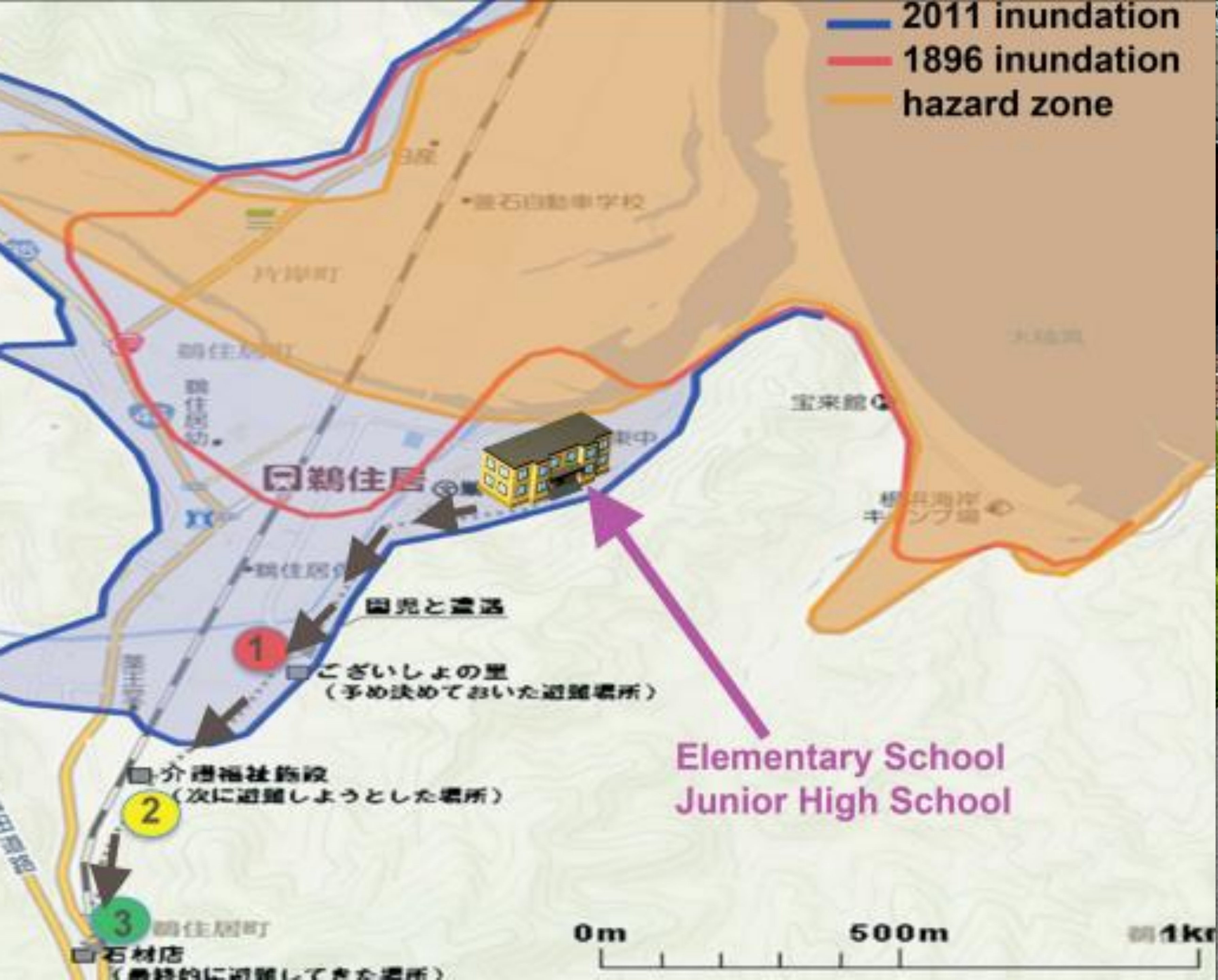



忘れないよ
みんなと暮らしたこの町
米沢商会
のことなら


ぎょっ
エフエム
ラヂオ気仙沼

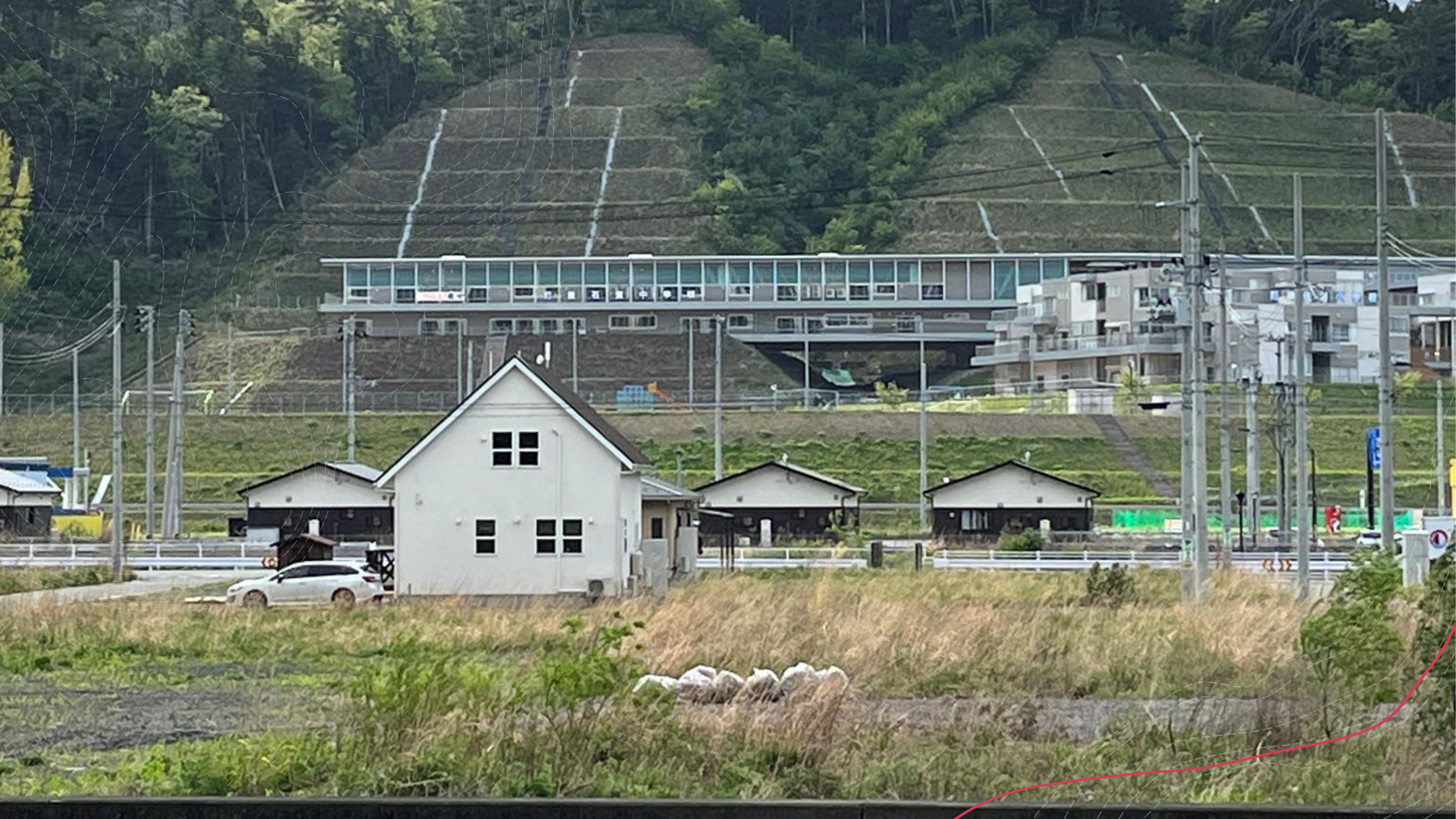

nine one

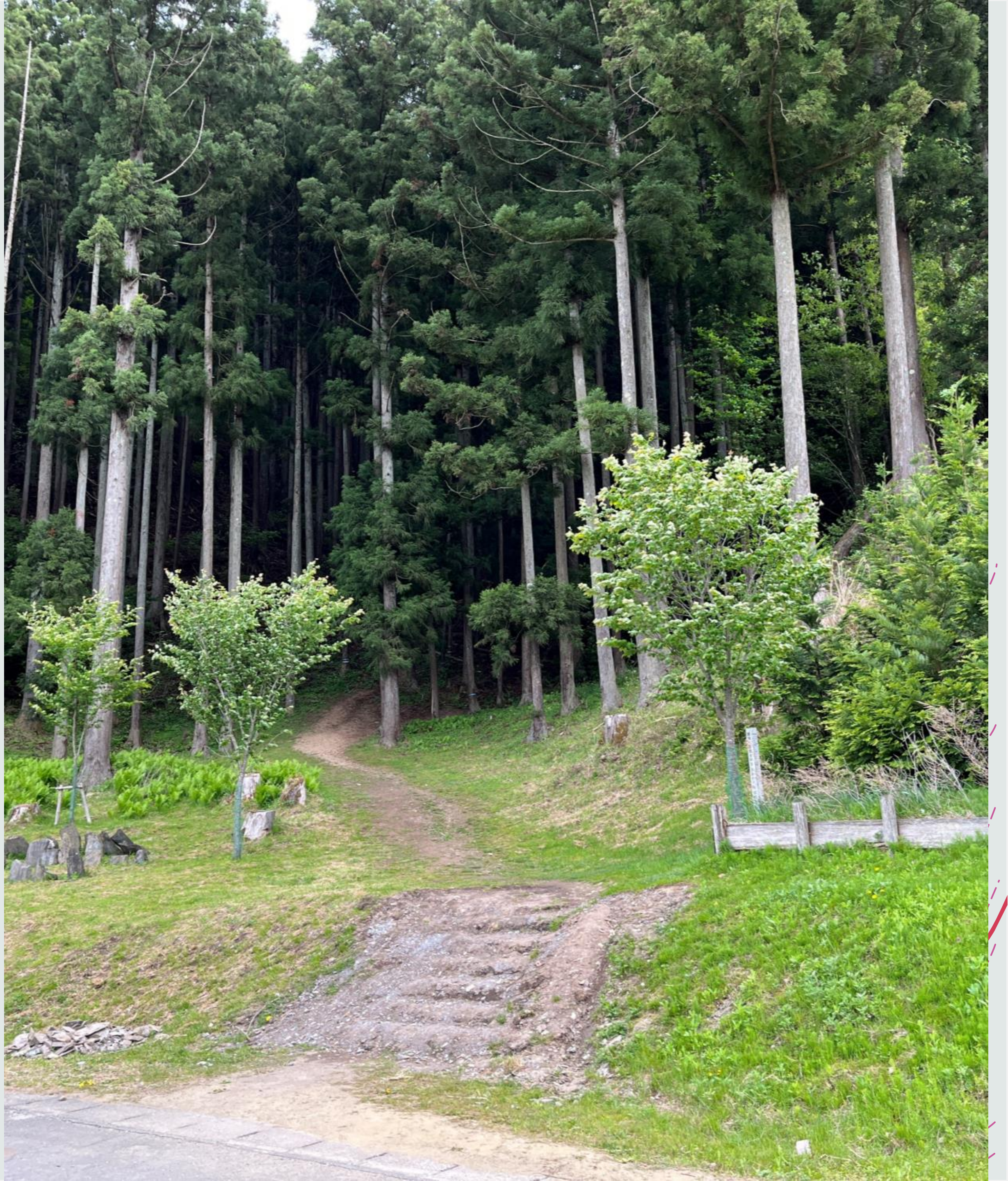

男山
注意
自動閉鎖
Automatic closing
津波注意報警報が発表されると自動的に閉じます！



2011 inundation
1896 inundation
hazard zone
鵜住居
1
ございしょの里
（予め決めておいた避難場所）
介護福祉施設
（次に避難しようとした場所）
2
3
石材店
Elementary School
Junior High School
0m
500m


釜石鵜住居復興スタジアム
Kamaishi Unosumai Memorial Stadium
避難経路図
Evacuation Route Map
避難経路
現在地
You are here
津波注意
係員の指示にしたがってください。


(有) 仲 野 石 材 店





1日 14時46分から15時37分まで

)11.3.11 Okawa Elementary School

14:46 The earthquake occurred (the maximum seismic intensity of 6-upper in Ishinomaki City).

Instructions were given such as to hide under a desk for protection. Then the students evacuated to the schoolyard.

When the students were going to the schoolyard, some teachers told them that they were going to the mountain. Some students started running towards the mountain through the path beside the gym, but they were called back to the schoolyard to line up in order by grade. Teachers made a roll call. They also checked the main school building to make sure that no students were left behind. After the roll call, the students lined up facing to the school building. A radio was placed on the podium (image on the right 1).

Students who were on their way home returned to the school. By just before 15:00, students and teachers had finished evacuating to the schoolyard. Guardians who came to pick the children up and some local residents also gathered in the schoolyard.

14:52 A siren on the disaster management radio communication network sounded, and a major tsunami warning was broadcast (2). The siren sounded only at this time.

"A major tsunami warning has just been issued to the coast of Miyagi Prefecture. I repeat. A major tsunami warning has just been issued to the coast of Miyagi Prefecture. Do not get close to the coast or levees of rivers. I repeat..."

The school bus going in the direction of Nagatsura and Onosaki turned around in front of the lobby so that the bus could depart at any time, and waited for the school to give instructions (3). The bus company encouraged the driver to evacuate via radio.

15:00 Guardians who came to pick children up around 15:00 heard the information "6m-high tsunami" on the radio in a car, and told the teachers to run to the mountain.

Some students heard, "A tsunami is coming," and "A major tsunami warning. Evacuate to higher ground." Some students were wondering if where they were was considered to be "the coast." Some students said, "We'll be fine," "I won't die in a place like this," and "Let's head for the mountain."

Around 15:10 An announcement came via the disaster management radio communication network. "Currently, a major tsunami warning is ongoing. I repeat. Currently, a major tsunami warning is ongoing. Do not get close to the coast or levees of rivers. I repeat..."

15:25-15:30 A broadcast car from Kawakita-Sogo Branch Office of Ishinomaki City passed the school while repeatedly broadcasting a notification that the tsunami had passed the pine forest and urging people to evacuate to higher ground (4).

Out of the students who evacuated to the schoolyard, 27 of them were picked up by their guardians by around 15:30.

Around 15:32 The tsunami overflowed the levees.

It is assumed that driftwood and debris accumulated at the bridge of the Fuji River near the triangle zone (5). The tsunami overflowed all at once a few minutes later.

15:36 Students and teachers began evacuating from the narrow street beside the bicycle shed to the triangle zone (6). Senior students led the line, but the line was in disorder, and all grades were in disarray. Under the instructions of the teachers, students passed through a parking lot of Kamaya Communication Center and headed for the triangle zone in a line on foot, but they encountered a dead end (7).

The tsunami had already overflowed the river, and water was shooting out from the gutters.

Around 15:37 During evacuation, students and teachers encountered the tsunami from the river side. The tsunami reached the school.

After the tsunami came from the overflowed river, the tsunami that came from the land also reached the school. Each tsunami struck the mountain and created a torrent in the schoolyard.

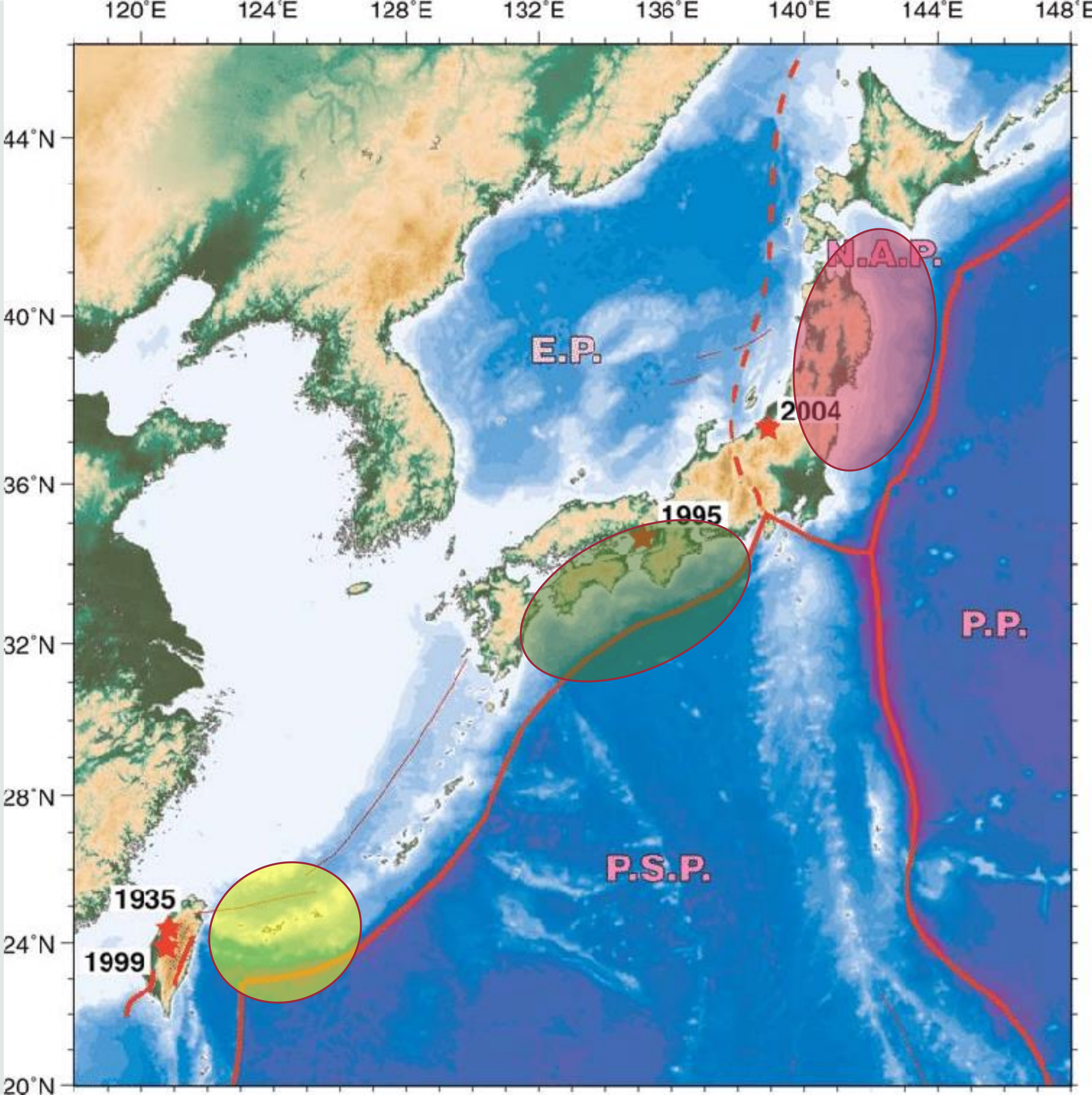
Lessons from GEJE

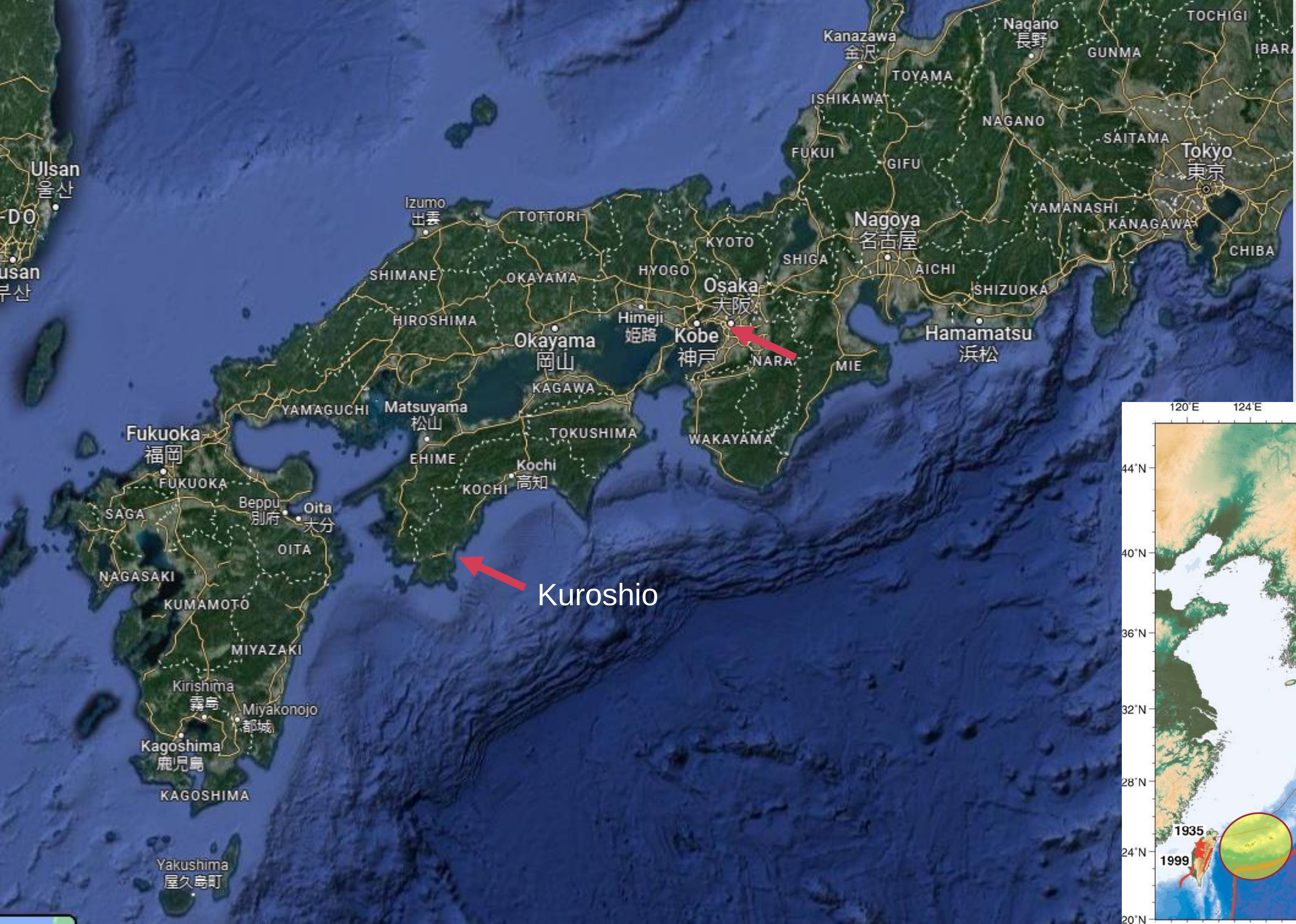
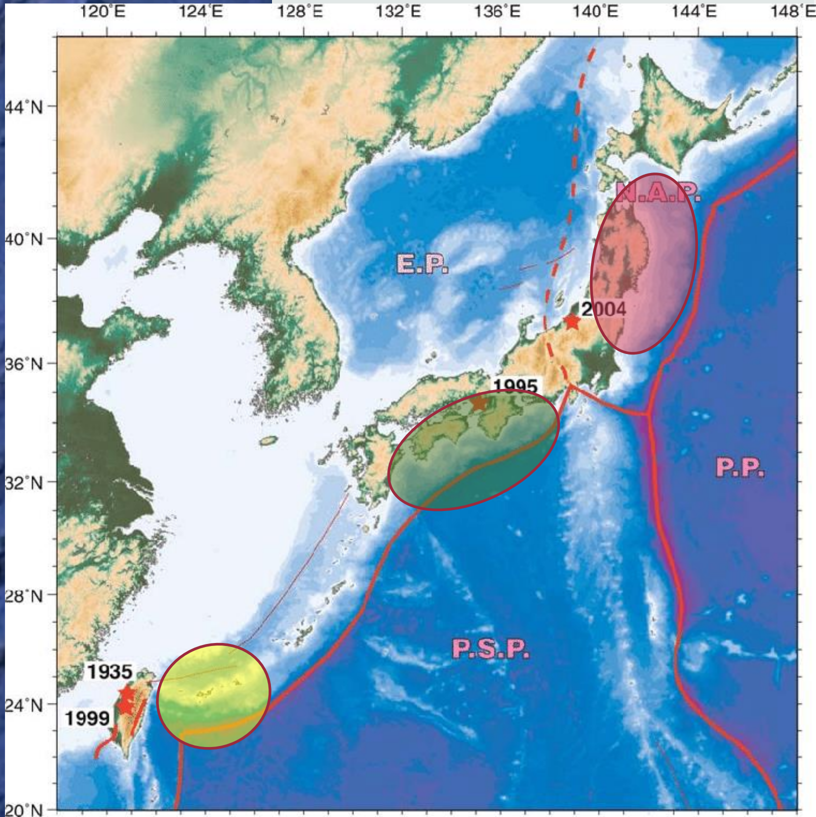
- Role of schools
  - “Kamaishi Miracle” was built on rigorous training
  - Okawa Elementary School tragedy was anomalous
  - Schools are often shelters
  - Schools link communities and emergency managers
- Hazards associated with rivers
- High investment reconstruction strategy has its risks

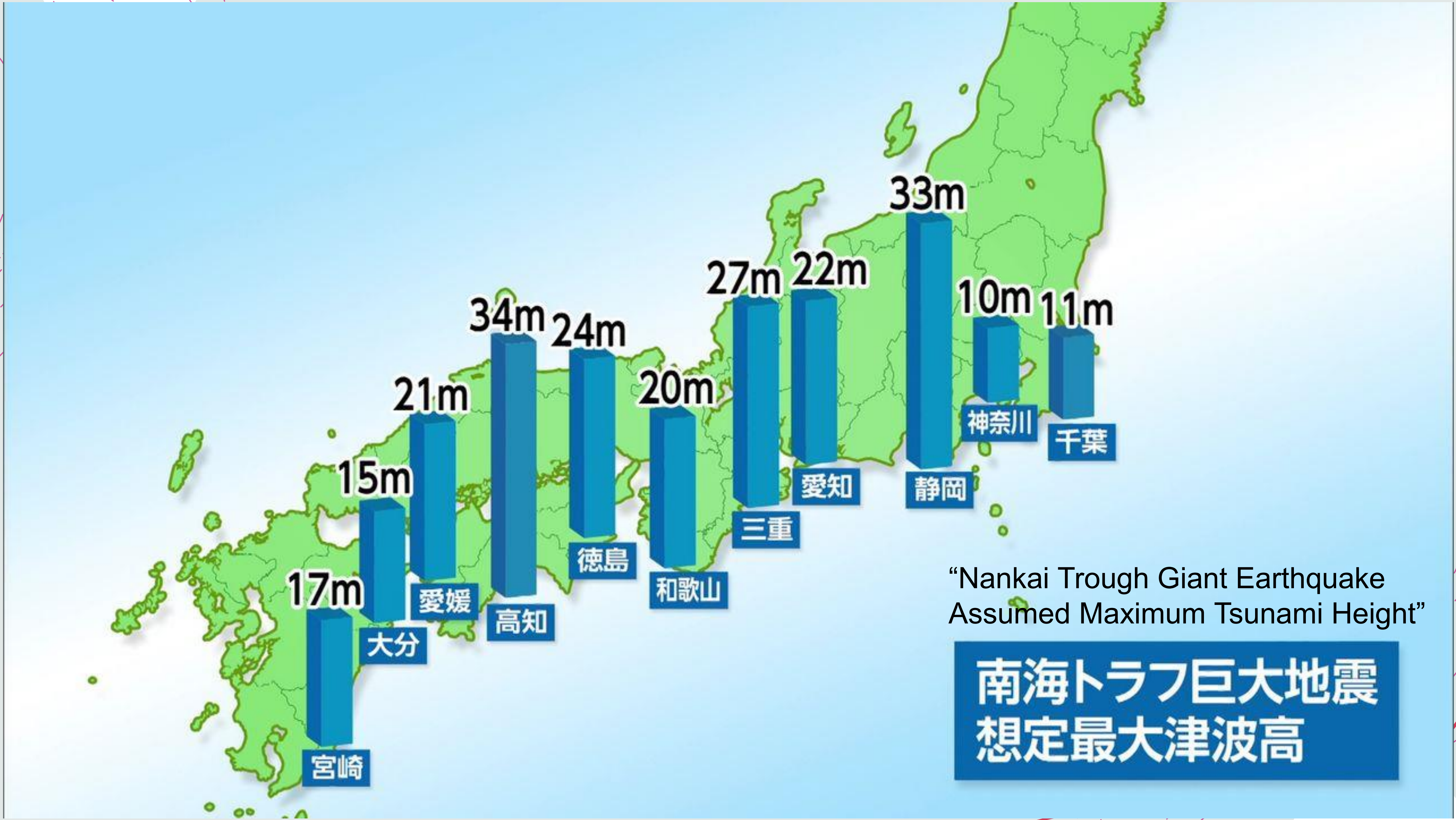
Past, present, future threats

- Recovery from Great East Japan Earthquake (= Tohoku earthquake)
- Planning for Nankai Trough earthquake
- Ryukyu Islands: where recurrence intervals are long

Ota et al., 2009



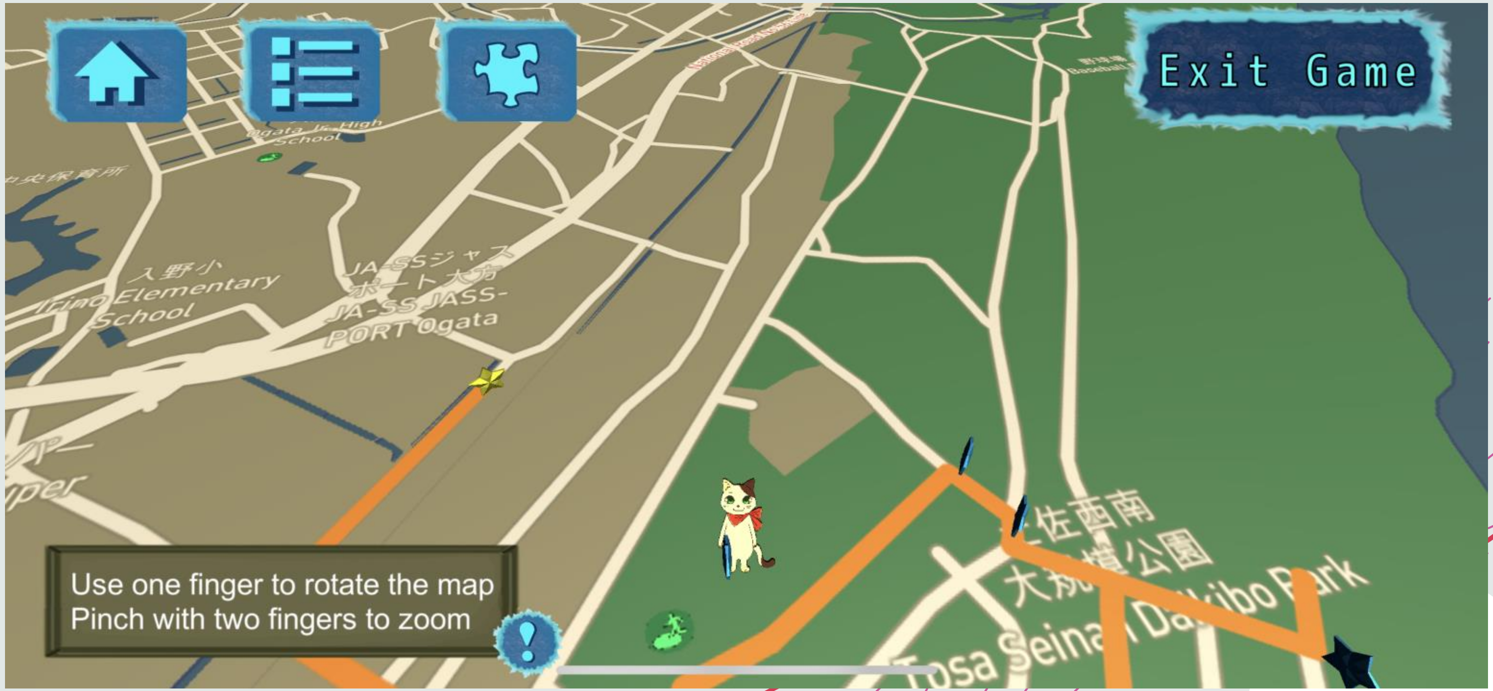

Kanazawa
金沢
Nagano
長野
TOCHIGI
GUNMA
TOYAMA
ISHIKAWA
NAGANO
SAITAMA
Tokyo
東京
FUKUI
GIFU
Ulsan
울산
Izumo
出雲
TOTTORI
YAMANASHI
KANAGAWA
Nagoya
名古屋
KYOTO
SHIGA
CHIBA
usan
부산
SHIMANE
OKAYAMA
HYOGO
Osaka
大阪
AICHI
SHIZUOKA
HIROSHIMA
Himeji
姫路
Okayama
岡山
Kobe
神戸
NARA
MIE
Hamamatsu
浜松
KAGAWA
YAMAGUCHI
Matsuyama
松山
Fukuoka
福岡
TOKUSHIMA
WAKAYAMA
EHIME
Kochi
高知
FUKUOKA
KOCHI
Beppu
別府
Oita
大分
SAGA
OITA
NAGASAKI
Kuroshio
KUMAMOTO
MIYAZAKI
Kirishima
霧島
Miyakonojo
都城
Kagoshima
鹿児島
KAGOSHIMA
Yakushima
屋久島町

120˚E
124˚E
128˚E
132˚E
136˚E
140˚E
144˚E
148˚E
44˚N
40˚N
36˚N
32˚N
28˚N
24˚N
20˚N
N.A.P.
E.P.
2004
1995
P.P.
P.S.P.
1935
1999



"Nankai Trough Giant Earthquake Assumed Maximum Tsunami Height"


4:55
4G
一時停止
避難完了
ふるさと総合センター
Furusato
Sogo Center
ここに津波が来るまであと
00:14:18
ここの津波浸水深
4 m
地震が発生してから
00:21:42
避難を開始してから
00:11:42


Akaba: Or over there:
Next


Exit Game
入野小
Irino Elementary
School
JA-SSジャスポート大方
JA-SS JASS-
PORT Ogata
Use one finger to rotate the map
Pinch with two fingers to zoom


240m
津波避難場所
Tsunami evacuation area
はまのみやちくつなみひなんたわー
浜の宮地区津波避難タワー


大和田山避難広場
KUROSIOCHO
(広場の海抜24.0m)
Tsunami Evacuation Shelter
黒潮町

つなみひなんばしょ
津波避難場所
Tsunami evacuation area
大和田山避難広場
Owadayama Evacuation Area
海抜24.0m
黒潮町
黒潮町
防災倉庫

耐震性貯水槽
貯水槽内に確保した飲料水は、1人1日3リットル分を約4400人に3日間程度供給することが出来ます。
本体材質　鋼製　SUS304
規　模　φ2.6m×8.5m
容量 40㎥（40,000リットル）
給水手順
①
こちらの扉を開けて下さい。
②
一番左の給水口に給水栓を取付けて使用します。

(40㎥)
飲料水兼用

防災 =
bōsai =
disaster
prevention


安政津浪の碑
安政元年(一八五四)十一月五日午後四時すぎ、突如激震が起こりついで大津浪が押しよせ、大被害を受けた。
当時の惨状を物語るものがこの碑である。
安政津浪の碑
Monument of "Ansei-tsunami"
嘉永7年(=安政元年、1854)11月4日の昼、かすかな地震がありました。潮がなぎさに満ちて
きて、俗に鈴波と呼んでいます。これは津波の前兆(前ぶれ)です。
翌日11月5日は何事もなく日常生活に復しましたが、申の刻(午後4時)頃大地震が起こり、
瓦葺きの家も茅葺きの家も倒壊し、見渡す限り建っている家は一軒もありませんでした。土煙が立ち
こめるなか、人は争って山の頂上目指して登りました。牡蛎瀬川、吹上川に潮が漲りました。
津波の来襲です。津波は第1波はゆっくりと進み、第2波、第3波がそれを追いかけました。
第4波で最大となり、夜になるまでに7回波が襲ってきました。庭も水田も海になりました。かつて
宝永4年(1707)10月4日にも同じ事があったと聞いていますが、それ以来148年目に当たりま
した。村人たちは牡蛎瀬川の石を取りこの石碑をつくって後人に警告を残すことにしました。鈴波
は津波の前兆です。今後100年あまりの後の世に生きる人は、この警告を知っておくべきです。
A small earthquake occurred in the middle of the day of the November 4,1854, resulting in a slight rise in
sea level, which local people popularly called "suzu-nami" and saw as a sign of tsunami waves.
This was actually followed by a large earthquake that hit the area at around four o' clock in the afternoon
on the next day, November 5, causing houses, those with tiled roofs and with thatched roofs alike, to collapse
together and dust to fly up, dimming the atmosphere.
People rushed, from both the west and the east, to climb up to the top of the mountain and looked down on
the rivers in the west and the east to find out that both the Kakisegawa River in the west and the Fukiagegawa
River in the east were swelling and flooding with seawater, which was exactly what you call an "aegir."
The first tsunami wave advanced slowly while being chased by the second and third waves.
It was the fourth wave that gained the greatest momentum and scared the living daylights out of the people.
Countless houses were swept away as a total of seven tsunami waves arrived. The water receded at night,
after turning fields into desert and rice paddies into sea.This monument also refers to another tsunami that
hit the area in 1707. The message says: "The purpose of this inscription is to inform the future generations
how suzu-nami is a reliable predictor of tsunami."

And in the middle of Osaka…..


大地震両川口津波記
天下和順 日月清明
風雨以時 災厲不起
南无阿弥陀佛
南無妙法蓮華經
願以此功德 普及於一切
我等與衆生 皆共成佛道
供養燈
供養燈

Nankai Trough

- Get inspired by Kuroshio!
- Focus has been on life preservation: in Kuroshio, everyone can in theory now get to safety
- Now they are working recovery planning (and the event hasn't happened yet!)
- Rivers again: warnings from the past in both Kuroshio and Osaka

Past, present, future threats

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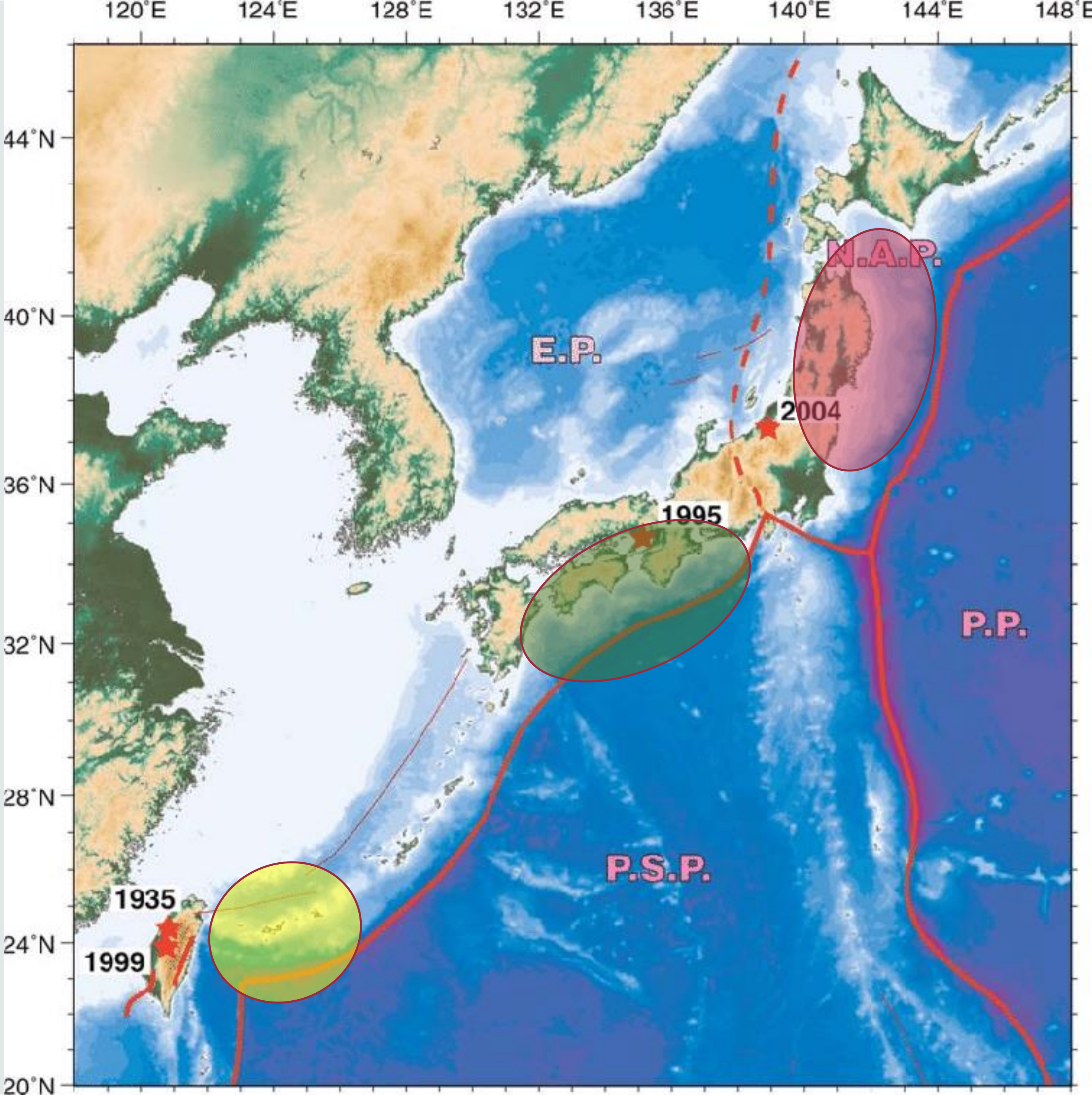
- Ryukyu Islands: where recurrence intervals are long

Ota et al., 2009



Ryukyu Islands

- Ishigaki and Miyakojima
- Last major tsunami was in 1771
- Average recurrence interval ≈ PNW's, though details and tsunami mechanisms still being worked out
  - By Kazuhisa Goto (Tokyo University) among others
- Historical records support geologic studies
- Ishigaki and Miyakojima have somewhat different disaster histories and cultures

石垣市観光防災案内図
Ishigaki City Tourism disaster prevention map
石垣市旅遊防災指南
石垣市旅游防灾指南
避難場所一覧
List of evacuation sites
石垣小学校 Ishigaki Elementary School
登野城小学校 Tonoshiro Elementary School
石垣中学校 Ishigaki Junior High School
石垣第二中学校 Ishigaki Second Junior High School
八重山農林高校 Yaeyama Agriculture and Forestry High School
八重山高校 Yaeyama High School
石垣市中央運動公園 Ishigaki City Sports Park
新川公園 Arakawa Park
新栄公園 Shinei Park
真栄里公園 Maesato Park
石垣市健康福祉センター Ishigaki Health and Welfare Center
石垣市総合体育館 Ishigaki City Gymnasium
八重山商工高校 Yaeyama Commercial and Technical High School
平真小学校 Heishin Elementary School
津波一時避難ビル施設一覧
List of Tsunami Temporary Evacuation Building
ホテルルートイングランディア石垣 Hotel Route Inn Grandia Ishigaki
ホテルピースランド石垣島 Hotel Peace Land Ishigakijima
南の美ら花ホテルミヤヒラ Minamino Churahana Hotel Miyahira
石垣島ホテルククル Ishigaki Island Hotel Cucule
ホテルグランビュー石垣 Hotel GranView Ishigaki
ホテルハッピーホリデー石垣島 Hotel Happy Holiday Ishigaki Island
アパホテル石垣島 Apa Hotel Ishigaki Island
蓬莱閣マンション Horaikaku Apartment
東横イン石垣島 Toyoko Inn Ishigaki Island
丸栄タイル商会ビル Maruei Tile Shokai Building
県営平真団地 Prefectural Heishin housing complex
コンフォート真栄里 Comfort Maesato
ブルーシーナリー真栄里 Blue Scenery Maesato
合同宿舎石垣住宅10号棟 Joint Dormitory Ishigaki Residence Building No. 10
合同宿舎石垣住宅11号棟 Joint Dormitory Ishigaki Residence Building No. 11
合同宿舎石垣住宅12号棟 Joint Dormitory Ishigaki Residence Building No. 12
ベッセルホテル石垣島 Vessel Hotel Ishigaki Island
ホテルエメラルドアイル石垣島 Hotel Emerald Isle Ishigaki Island
海上保安庁新栄町宿舎 Japan Coast Guard Shin-Eicho lodgings
ホテルイーストチャイナシー Hotel East China Sea
ホテルチューリップ石垣島 Hotel Tulip Ishigaki Island
南の美ら花ホテルミヤヒラ(美崎館) Minamino Churahana Hotel Miyahira (Misakikan)
石垣漁港
新栄町
字石垣
浜崎町2
浜崎町1
浜崎町3
美崎町
字新川
字大川
字登野城
字平得
字真栄里
石垣港
八島町1
八島町2
登野城漁港
南ぬ浜町
凡例
行政界・公共施設など
避難
AED設置場所
防災倉庫
等高線
津波最大浸水深
石垣島観光なび


津波 Tsunami
Sea Level
9.4m
川商店


津波
20.3


津波避難ビル
Tsunami Evacuation Building
ホテル裏側にP有り


国指定天然記念物
石垣島東海岸の津波石群
つなみうふいし
津波大石
平成25(2013)年3月27日 指定
「津波大石」という名称は、郷土史家である故牧野清によって命名されました。当初、牧野は、1771年に石垣島を中心に大きな被害を出した、明和大津波による津波石と考えていたようです。しかし、表面に付着しているサンゴの年代測定の結果から、約2,000年前の先島津波によって現在の場所に打ち上げられたものであるということが分かってきました。また、古地磁気を専門とする研究では、明和大津波の際、この石は大きくは動かなかったものの、波の力によって回転するなどして地磁気が動いている可能性が指摘されています。
このようにして科学的な検証を重ねた結果、津波石であることは間違いなく、また、明和大津波以前にも大きな津波がこの地を襲ったという、教訓的な要素もある貴重な津波石だということが分かりました。
この津波大石のほか、石垣島の東側に所在する、津波によって打ち上げられた、または移動したとされる、高こるせ石(大浜)、あまたりや潮荒(桃里)、安良大かた(平久保)、バリ石(伊原間)と呼ばれる計5つの巨石が、「石垣島東海岸の津波石群」として、国の天然記念物に指定されています。なお、津波大石以外の4つの巨石は、古文書『大波之時各村之形行書』の記述や、年代測定等の科学分析の結果により、1771年の明和大津波による津波石であることが分かっています。
平成28(2016)年 6月
石垣市教育委員会 文化財課 83-7269


月例接心會
大衆禪堂
桃林禪寺
権現堂
重要文化財
国指定 昭和56年6月5日
石垣市教育委員会

- Annual commemorations since 1980s at site where community gathered after evacuation


太平タクシー
№17


Contributors to preparedness in Ryukyu Islands

+ Vicarious experience from other parts of Japan
+ Rich historical records of (at least one) past event
+ Intense interest in islands' own history and foregrounding of that history
+ Long familial and communal roots in particular locations
+ Frequent first-hand experience with other severe hazards: typhoons

Photo credit: AP. Source: https://www.bbc.com/news/world-asia-19384371

My general take-aways

+ We need to support disaster education in schools
+ We need to tell Cascadia stories in many forms
+ We need to worry more about rivers
+ We need to link earthquake and tsunami preparedness to preparedness for other hazards
+ We need to think a few steps ahead

Yours?