Highlights → TEM-NIED workshop

SHA issues in the island arc of Taiwan and Japan

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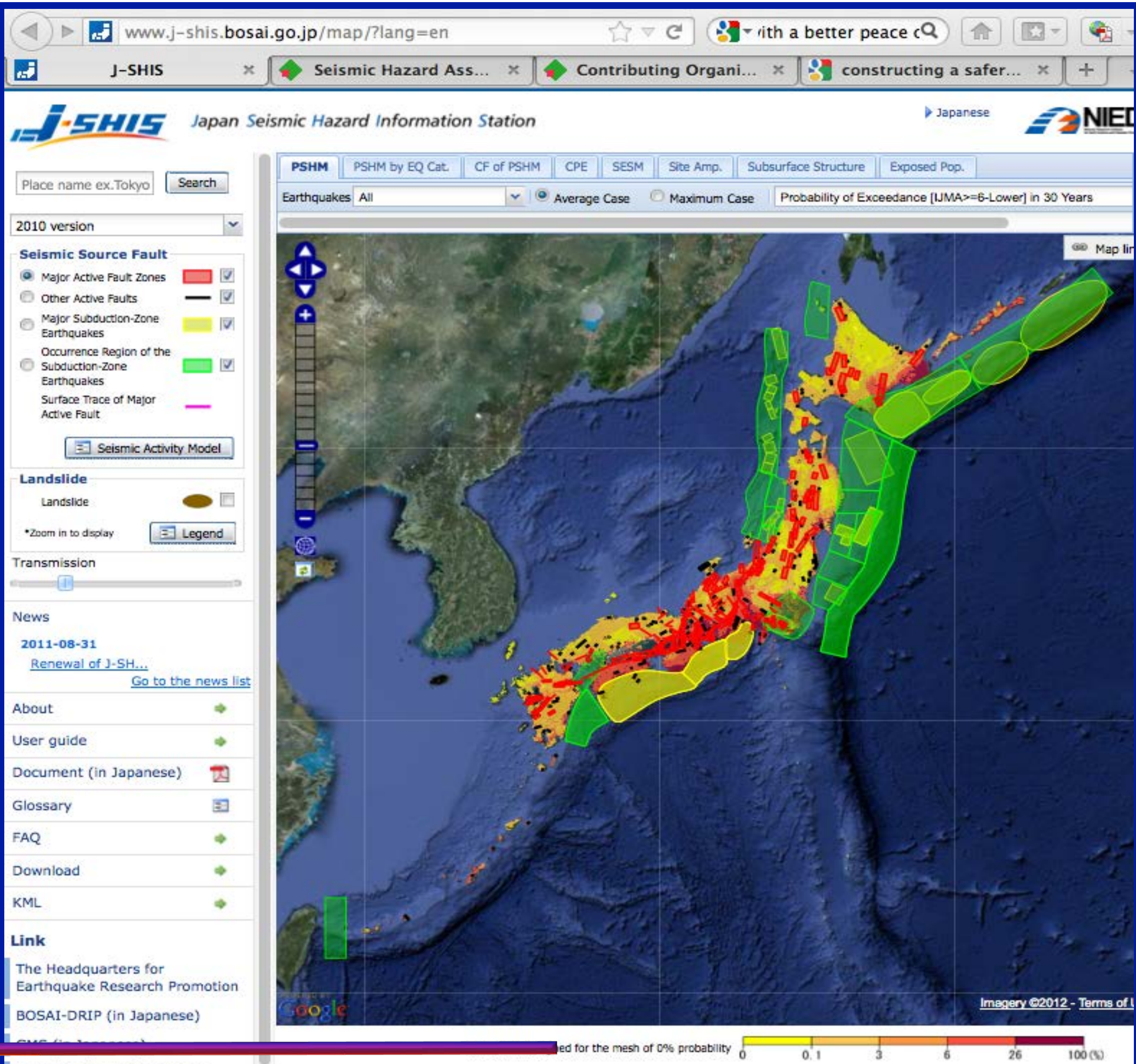
What lessons we have learnt from the Tohuku M9 earthquake.

“The borderless world of Science” → enabling knowledge and data exchange each others.

Subduction zones → Crossing border connect the world



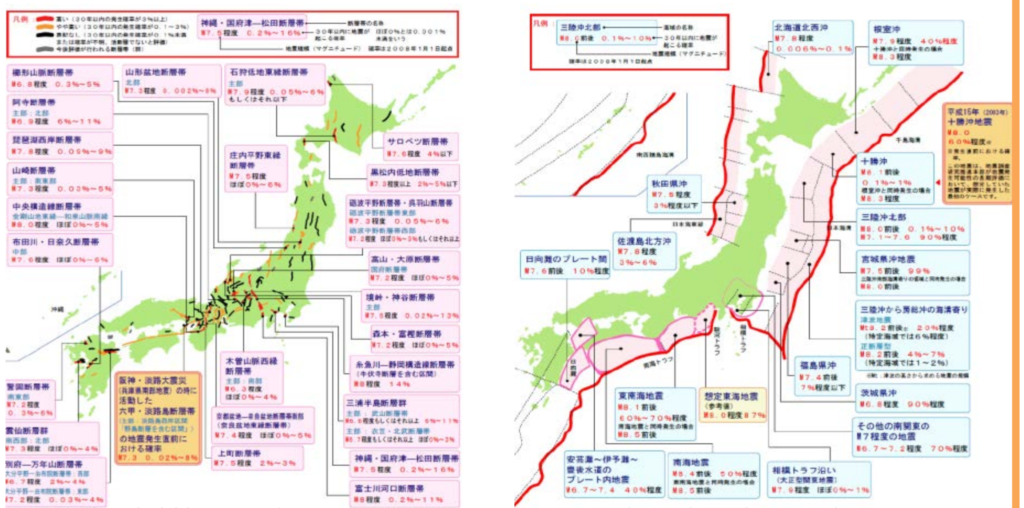
National Research Institute for Earth Science and Disaster Prevention

NIED TEM

H. Fujiwara	: Seismic Hazard Assessment for Japan after the 2011 Tohuku Eq
K. Hao	: Probabilistic seismic hazard assessment in general issues
K. Wen	: Earthquake probability mapping and hazard mitigation program
N. Morikawa	: Scenario earthquake shaking maps in Japan
S. Lee	: 3D waveforms simulation for earthquakes and scenario events
S. Aoi	: Strong motion observation networks in Japan
S. Lu	: Seismic network and earthquake rapid report in Taiwan
H. Matuyama	: Construction of the detail 3D velocity structure
C. Wang	: Seismic profiles from TAIGER project
Li Zhao	: Calibration on the 3D velocity structure of Taiwan
H. Nakamura	: Earthquake Early Warning in Japan
Y. Wu	: Developing of Earthquake Early Warning in Taiwan
T. Maeda	: Long-period ground motion simulation of great Nankai Trough EQ
K. Ma	: Building up Finite-Fault models for ground motion prediction program
Asako Iwaki	: Synthesis of high-frequency ground motion in Kanto area
Y. Yen	: Synthesis of high-frequency ground motion using Empirical G.F.
J. Yeh	: Taiwan Earthquake Loss Estimation

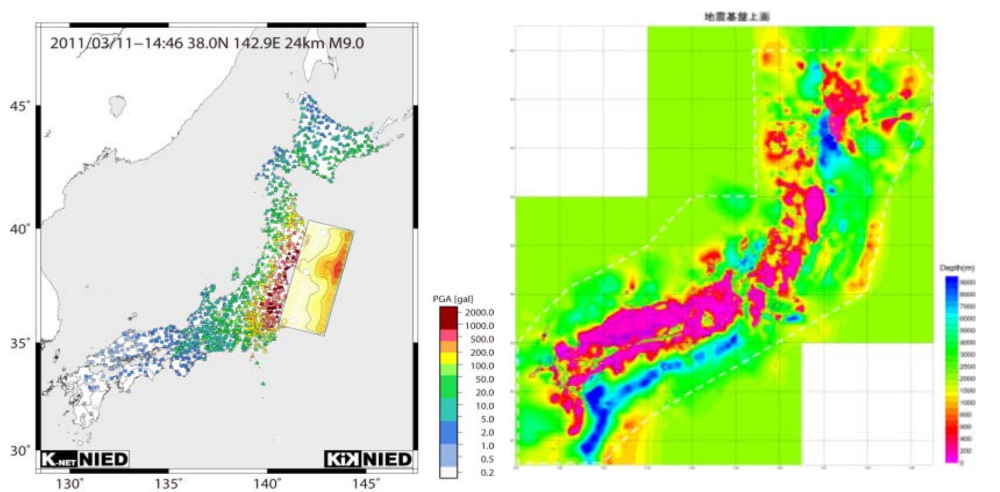
National seismic hazard maps for Japan

Long term evaluation



Probability of occurrence, magnitude, location

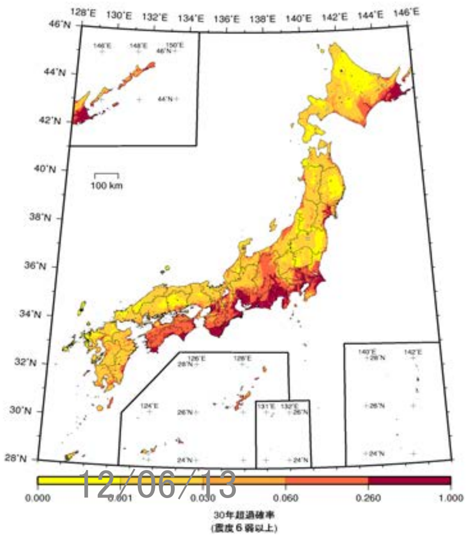
Strong-motion evaluation



Strong-motion, underground

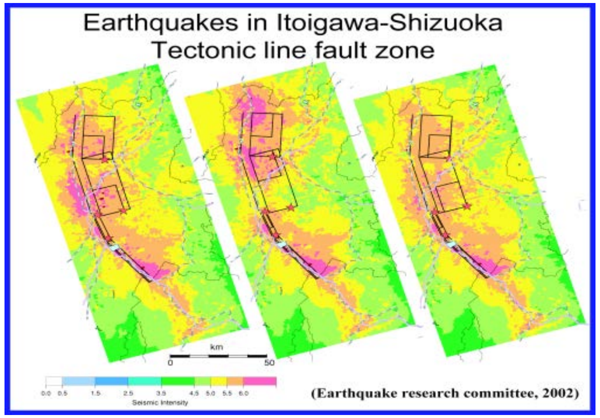
ucture

Probabilistic Seismic Hazard Maps



- Showing the strong-motion intensity with a given probability, or the probability with a given intensity.
- Considering all possible earthquakes.

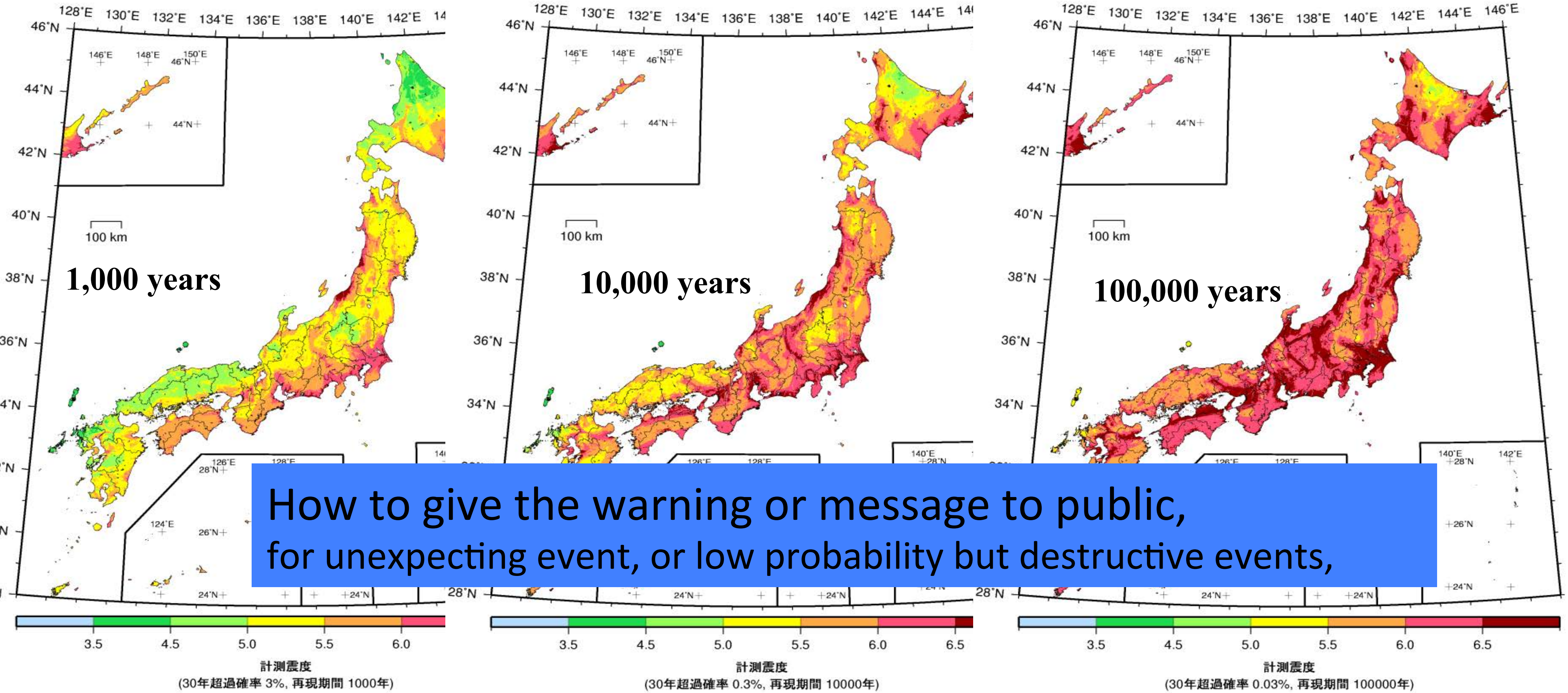
Scenario Earthquake Shaking Maps



(Earthquake research committee, 2002)

- Showing the strong-motio intensity around the fault for a specified earthquake.

Strong-motion maps considering low-probability earthquakes



How to give the warning or message to public,
for unexpecting event, or low probability but destructive events,

Major earthquakes on active faults and subduction zone with low-probability.

Regarding the PSHA for low probability, at presen it is insufficient to evaluate the uncertainty for low probability of M8-class earthquakes and it is necessary to improve techniques for them.

How to reduce the variation of uncertainty

- GMPE => PGA and PGV (now in PSHA, but, large variance in values)

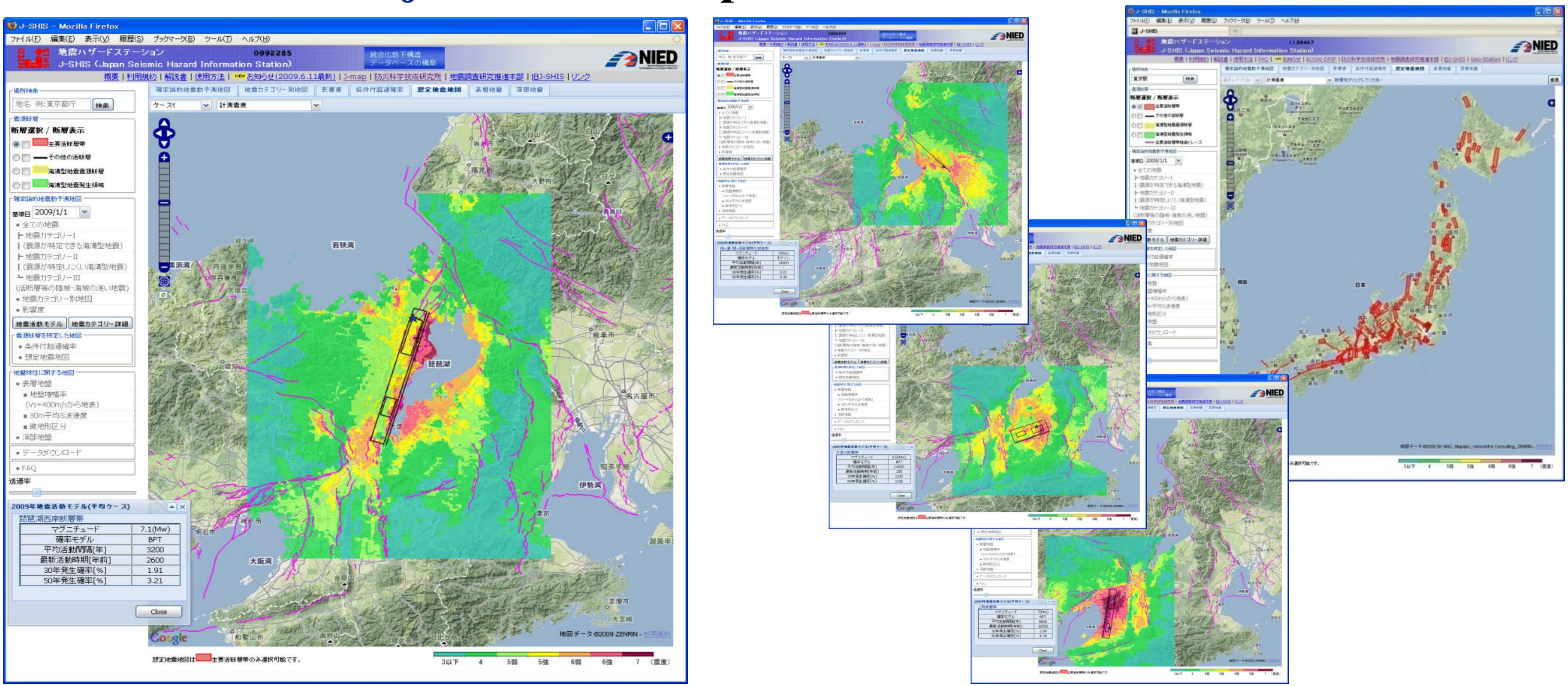
- Requirement of a fine 3D velocity structure for modeling of high frequency.
- Fault Segment, geometry, mechanism

Steps: PSHA => Simulation-based PSHA (Japan)

To reduce the variation.

Scenario Earthquake Shaking Maps

The shaking maps are evaluated for 490 scenario earthquakes of almost all of major faults in Japan.



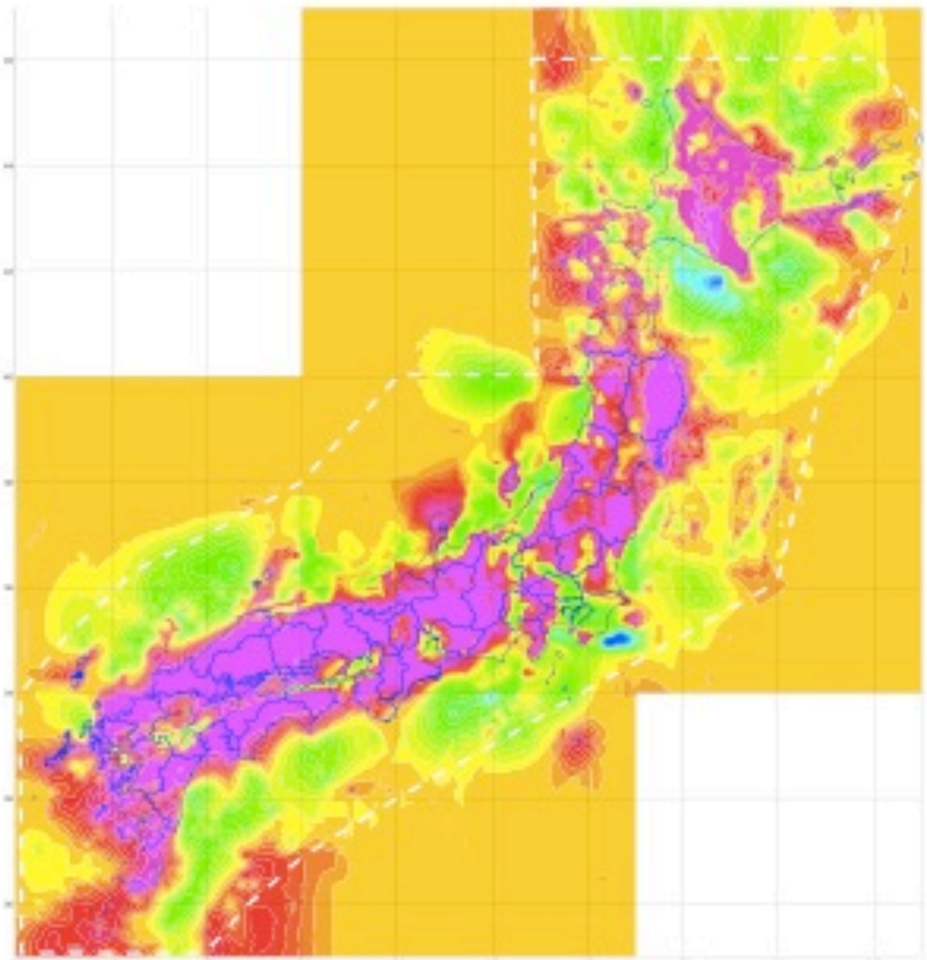
Selection of a specified scenario is essential to make a shaking map. The basic policy of the selection of a scenario earthquake is that we choose the most probable case.

For treatment of uncertainties, we assume several cases of source model and compare the results of them to show deviation of strong-motion evaluation due to uncertainties.

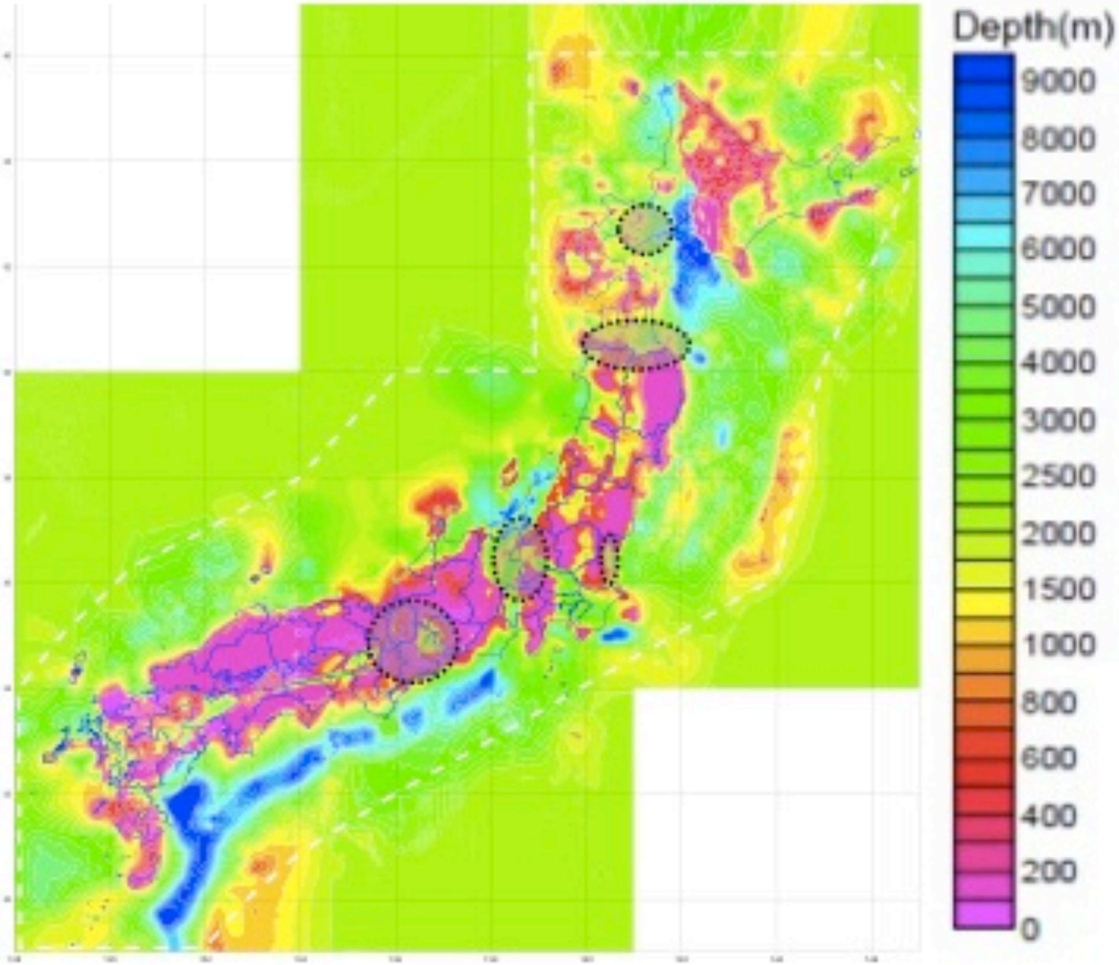
1st-order velocity layered model(1)

Depth distribution of the upper surface of example layers

modified area

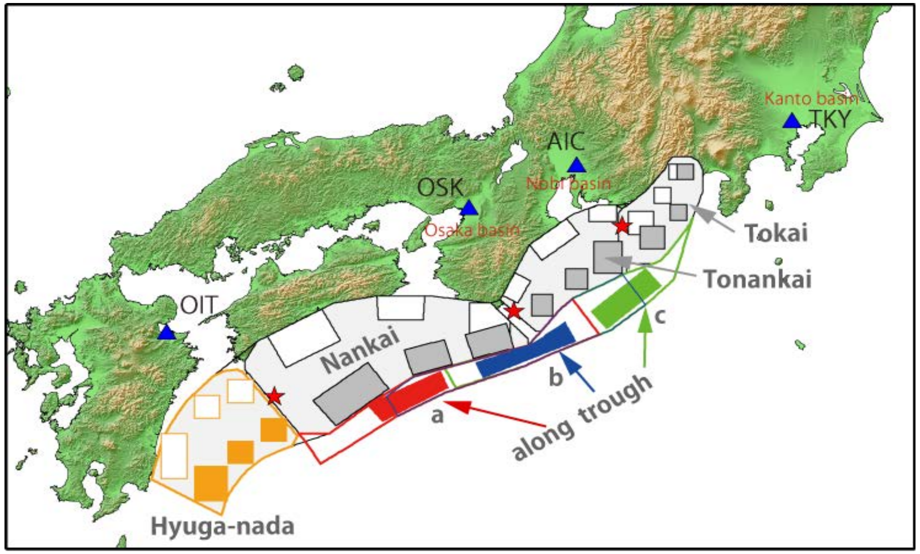


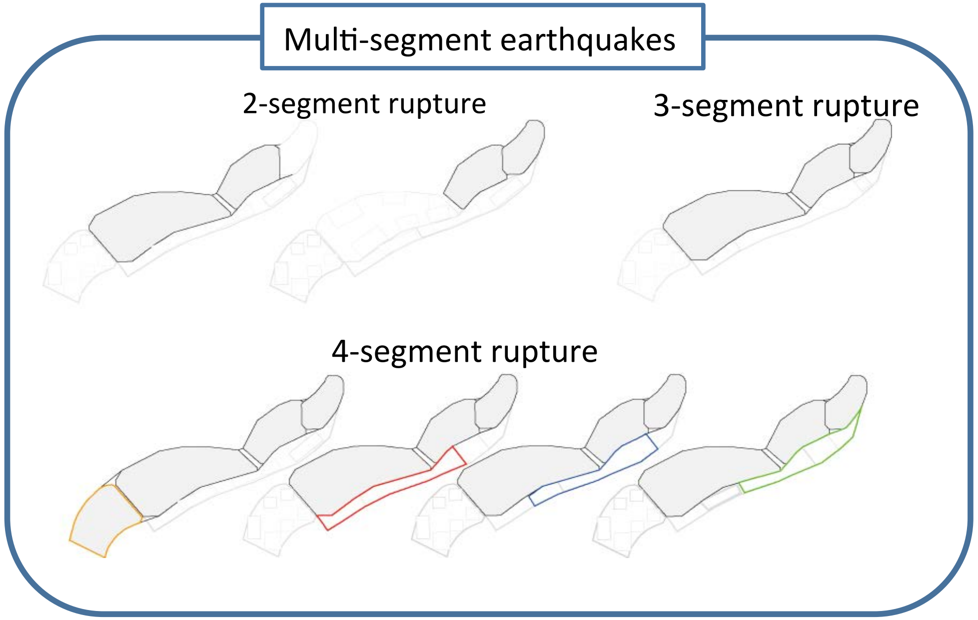
Upper surface of the layer *No.25*
(Vs = 2.1km/s)



Upper surface of the seismic bedrock
(Vs > 3.1km/s)

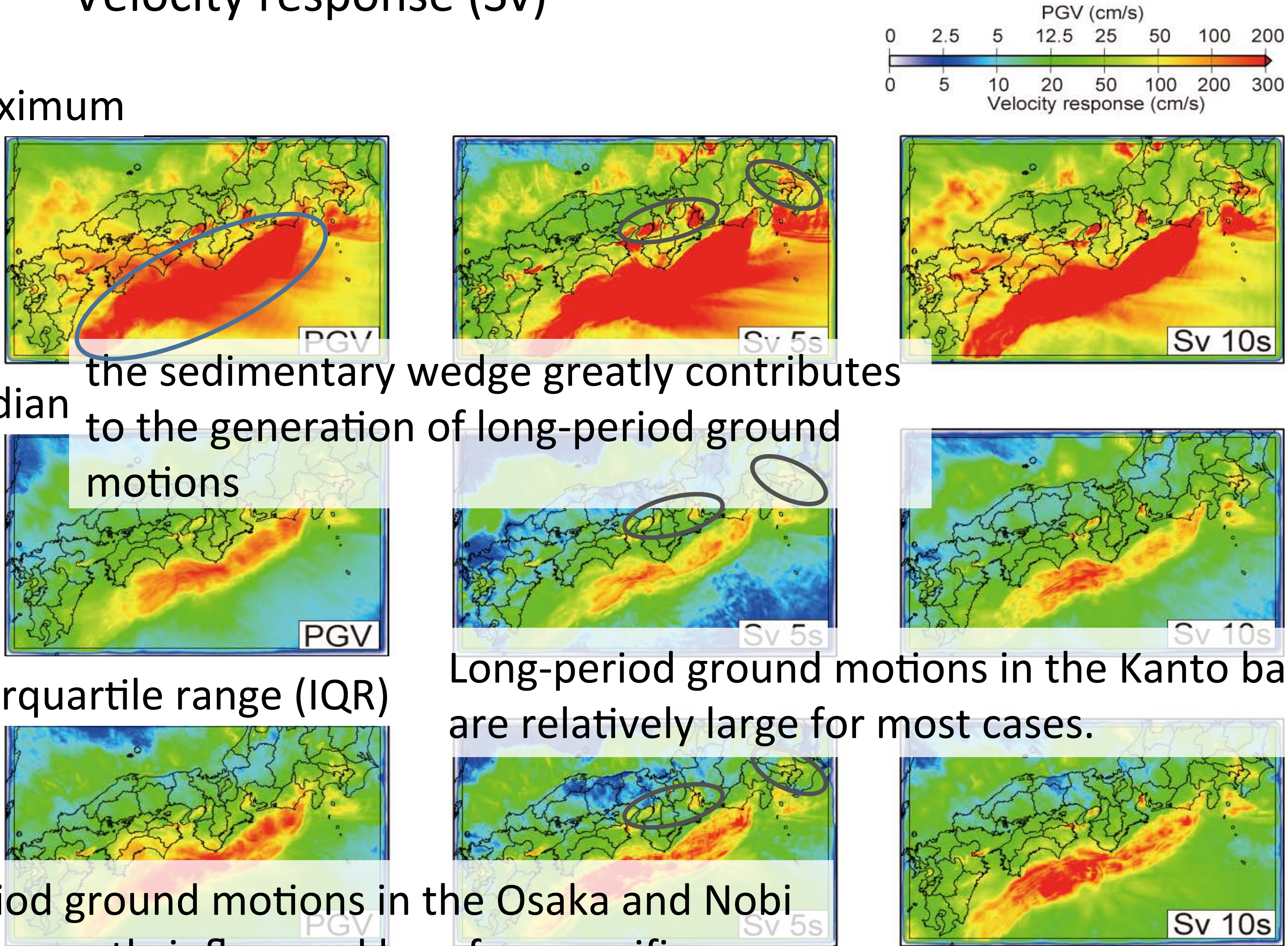
Characterized source model for the Nankai trough earthquakes





- Source areas (14 cases x 3)
  - ◆ Single-segment earthquake
    - Nankai (ANNKI: Mw 8.5),
    - Tonankai (ATNKI: Mw 8.2),
    - Tokai (ATOKI: Mw 8.0),
    - Hyuga-nada (AHGND: Mw 8.3),
    - and along the trough (ATRGH: Mw 8.1) 3 cases (a, b, c).
      - 36 hours/ 1 scenario
      - 60000 steps (120 Hz)
      - Itanium 1.66GHz×256Core
      - Memory 130 GB
  - ◆ Multi-segment rupture simultaneously
    - 2-segment rupture
      - Nankai + Tonankai (ANNI1: Mw 8.7)
      - Tonankai + Tokai (ANNI2: Mw 8.4)
    - 3-segment rupture
      - Nankai + Tonankai + Tokai (ANNI3: Mw 8.8)
    - 4-segment rupture
      - 3-segment + along the trough (ANNI4: Mw 8.9)
      - 3-segment + Hyuga-nada (ANNI5: Mw 8.9)
  - Seismic moment are calculated using scaling model

Maps of Peak ground velocity (PGV) and Velocity response (Sv)



Maximum

the sedimentary wedge greatly contributes to the generation of long-period ground motions

Median

Long-period ground motions in the Kanto basin are relatively large for most cases.

Interquartile range (IQR)

Long-period ground motions in the Osaka and Nobi basins are greatly influenced by a few specific scenarios.

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Continuously Practice →

Trilateral cooperative program enabling knowledge data exchange

Supported by each individual counties

Goal →

Preparation for

Un-expecting events

Thank you for your attention