

# **Japan Seismic Hazard Information Station (J-SHIS)**

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(NIED)**

# Background of the Project

- **Headquarters for Earthquake Research Promotion** was established in accordance with **Earthquake Disaster Management Special Measures Act (1995)**.
- **Promotion of Earthquake Research - (April 23, 1999)**
  - Comprehensive and Fundamental Measures for Promotion of Observation, Measurement and Research on Earthquakes

## **Major subjects of Earthquake researches immediately**

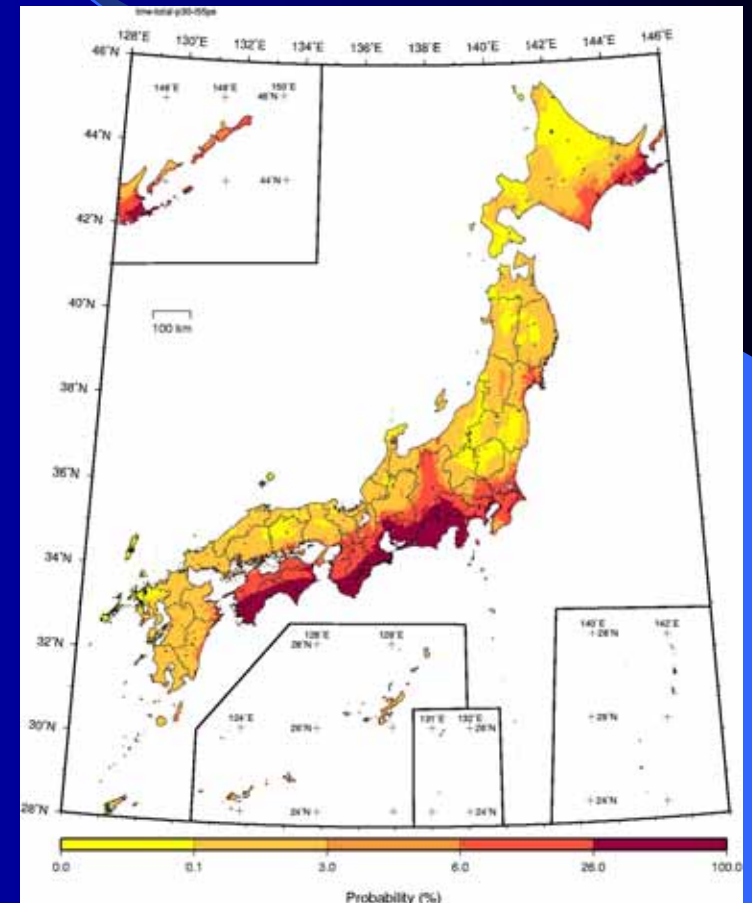
- 1 . **Preparation of seismic hazard maps based on surveys of active faults, long-term evaluations of the probability of earthquake occurrence, and evaluations of strong ground motion**
- 2 . **Promotion of real-time transmission of earthquake information**
- 3 . **Improvement of observation system for earthquake disaster prevention**
- 4 . **Promotion of observation and research for earthquake prediction**

# Probabilistic Seismic Hazard Map

Predicting possibility that a certain area is attacked by strong ground motion in a given years.

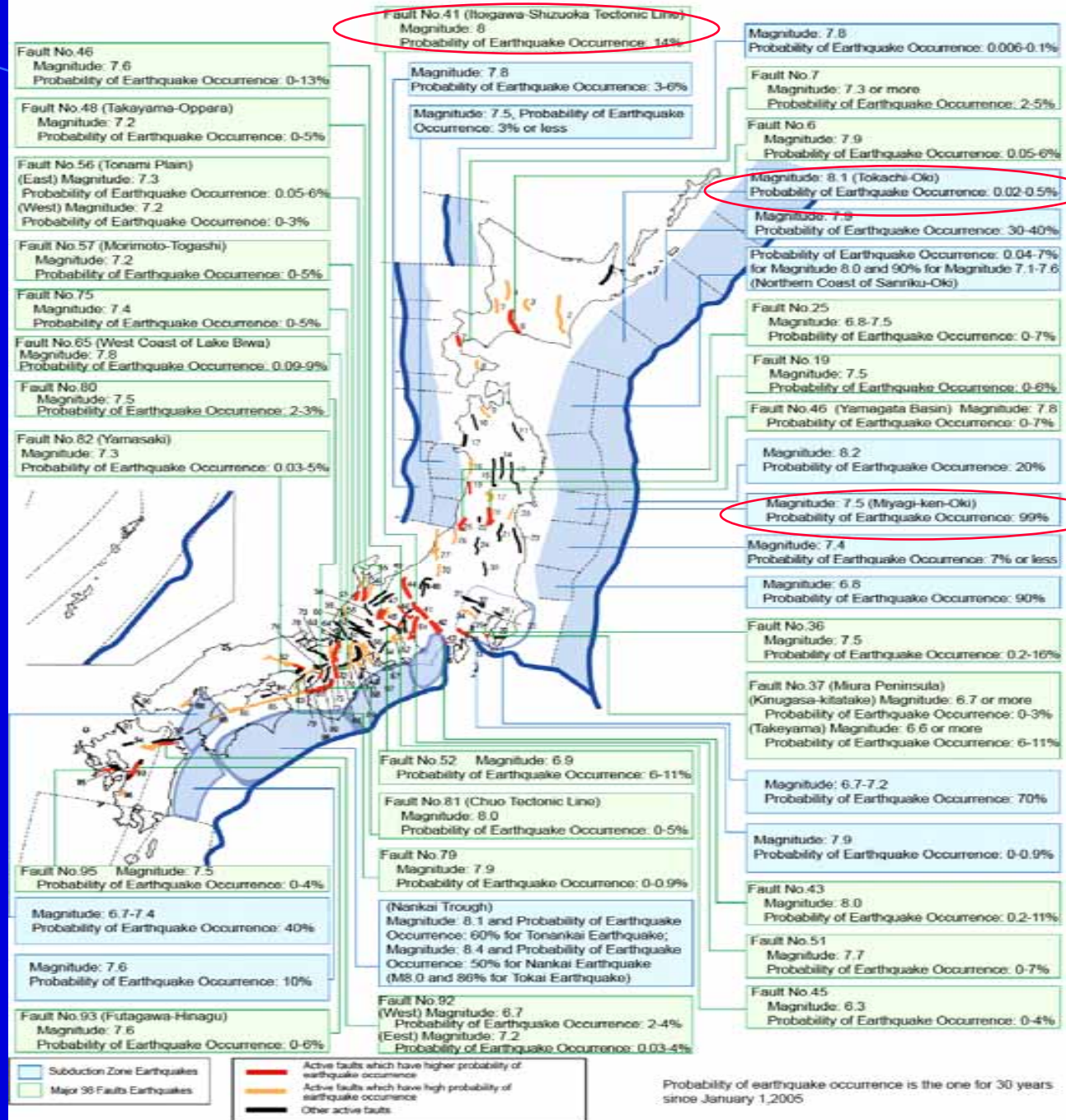
## PSHM Feature

- Showing the strong-motion intensity with a given probability, or the probability with a given intensity.
- Considering all possible earthquakes.
- Showing comprehensive ground motions caused by independent earthquakes



Example of probabilistic map

# Evaluation of occurrence probability of earthquakes by ERCJ



# Flowchart of SHA

Modeling of seismic activity (given by ERCJ)



Evaluation of an EQ occurrence probability  $P(E_i)$



Probabilistic evaluation of an intensity level  $P(Y_i > y | E_i)$

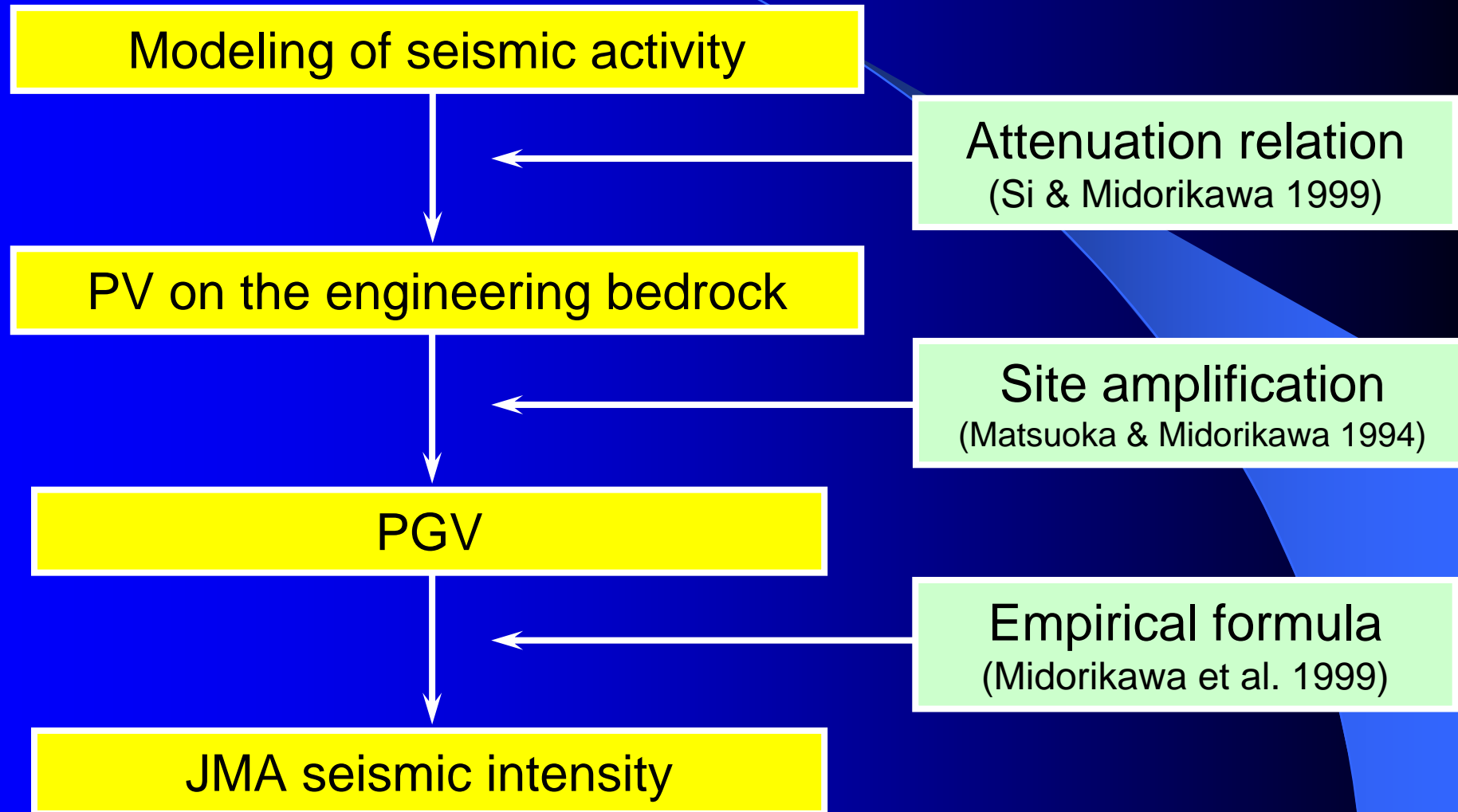


Evaluation of probabilistic seismic hazard  
for **each earthquake**  $P(Y_i > y)$



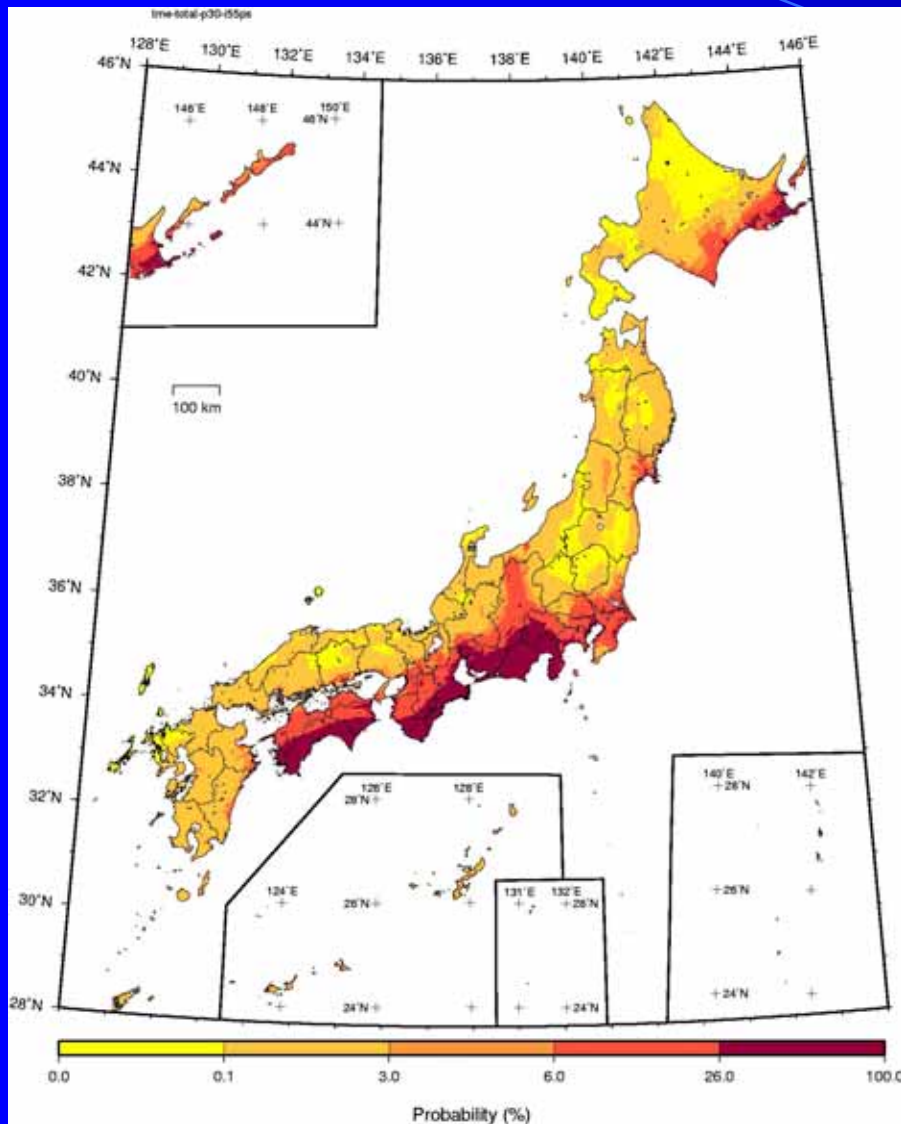
Evaluation of probabilistic seismic hazard  
for **all earthquakes**  $P(Y > y)$

# Strong-motion evaluation in SHA

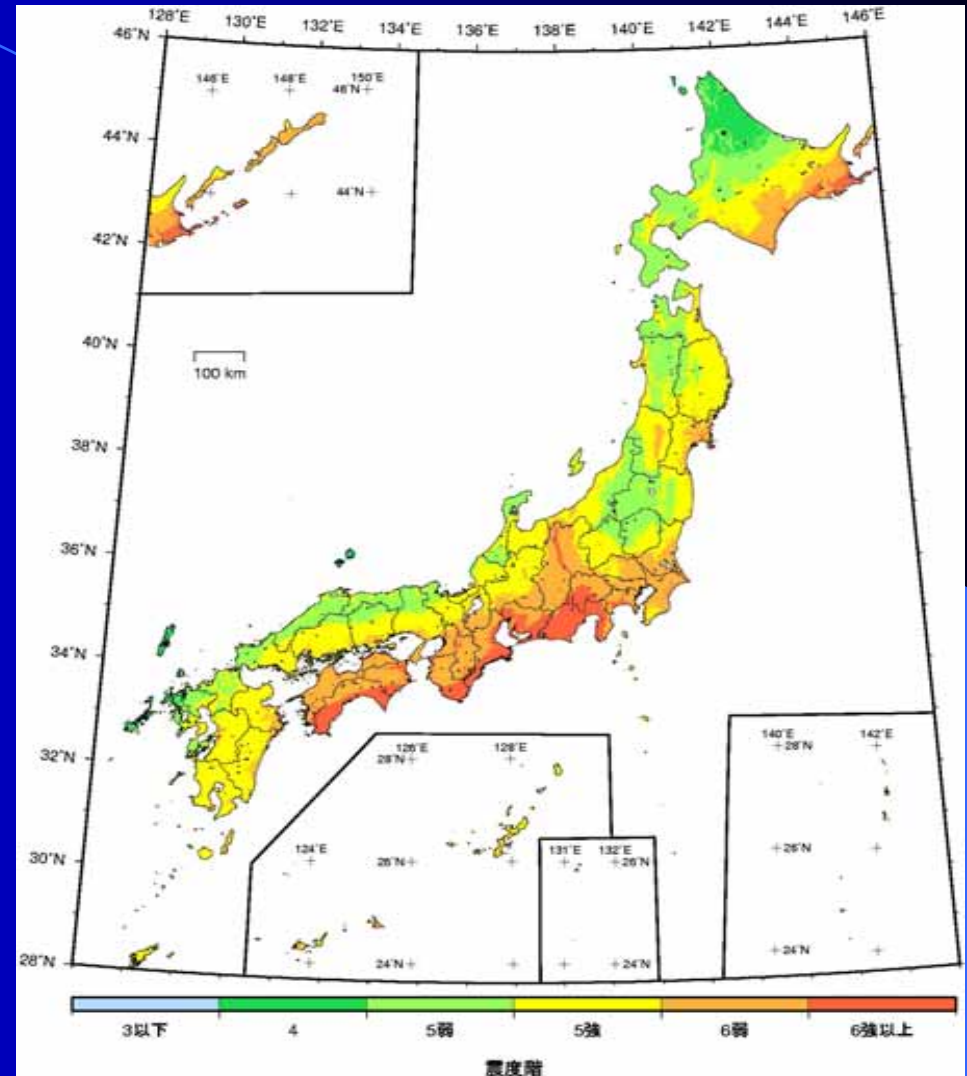




# Probabilistic Seismic Hazard Maps



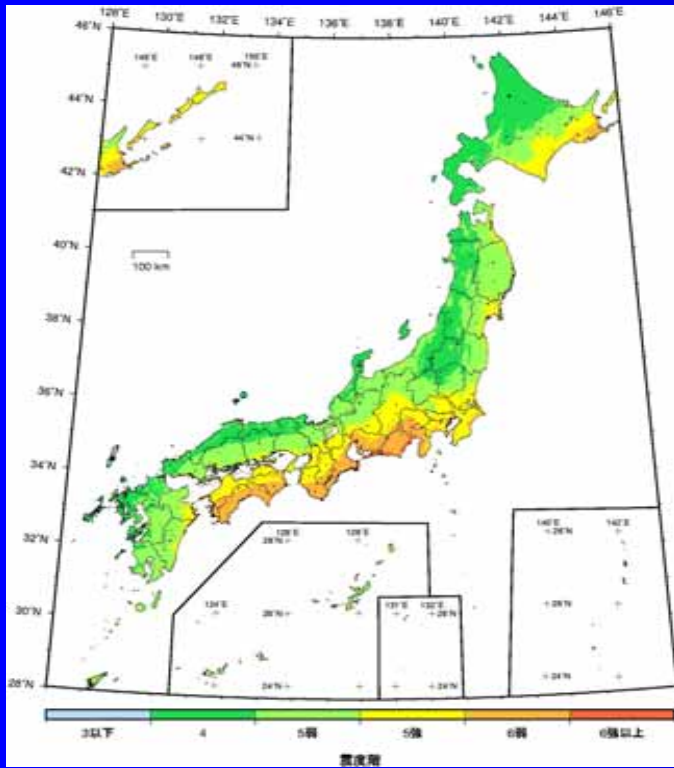
Probability in 30 years.  
( JMA Seismic Intensity 6- )



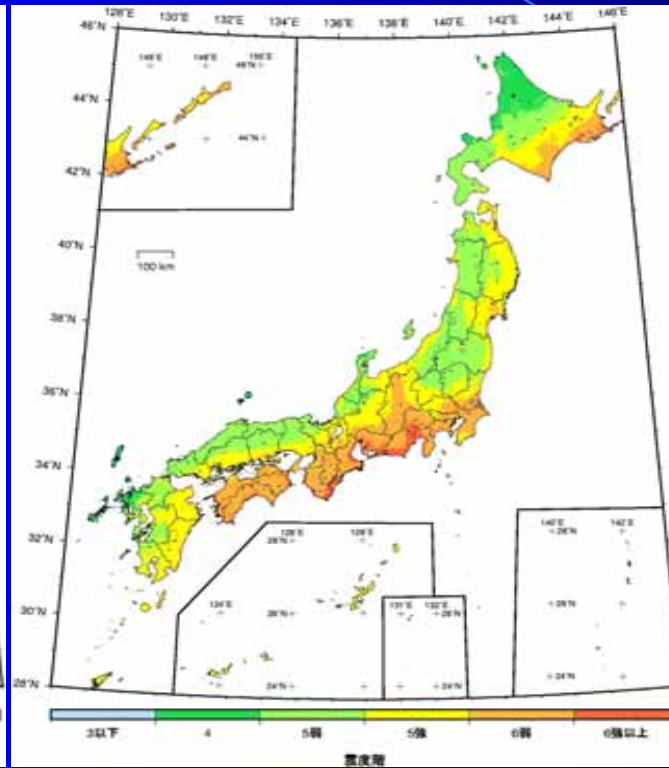
Seismic Intensity with 3% probability  
of exceedance in 30 year.

# Probabilistic Seismic Hazard Maps

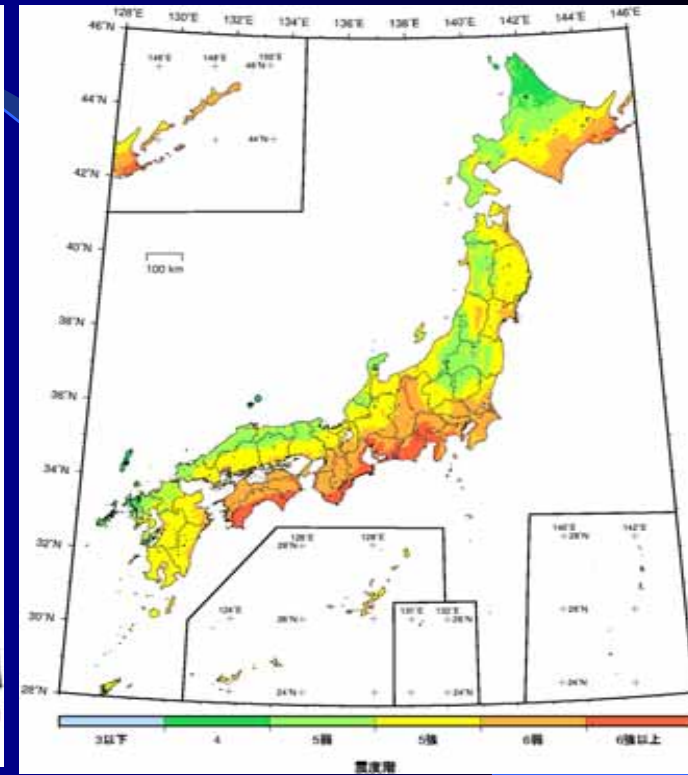
Seismic Intensity in 50 year



39%.



10%.

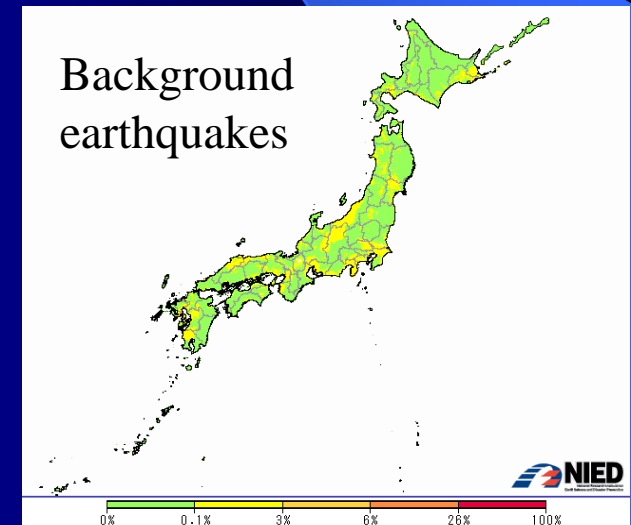
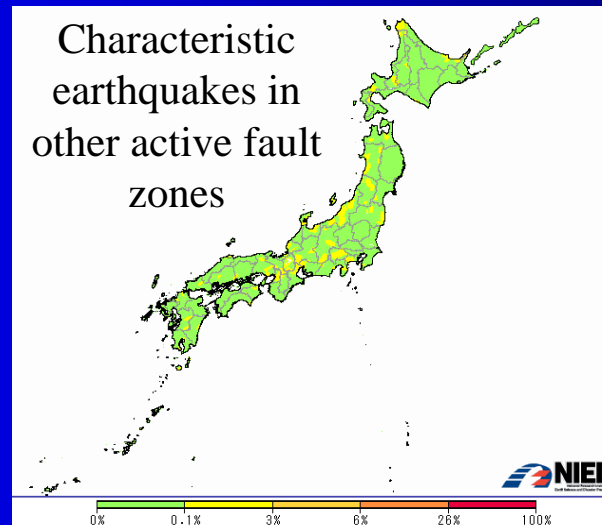
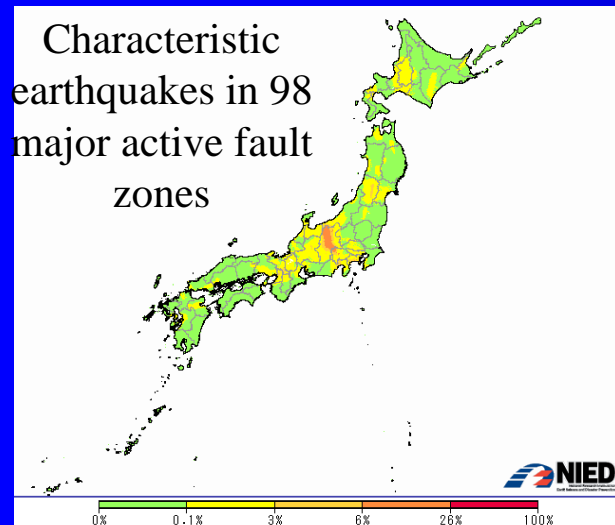
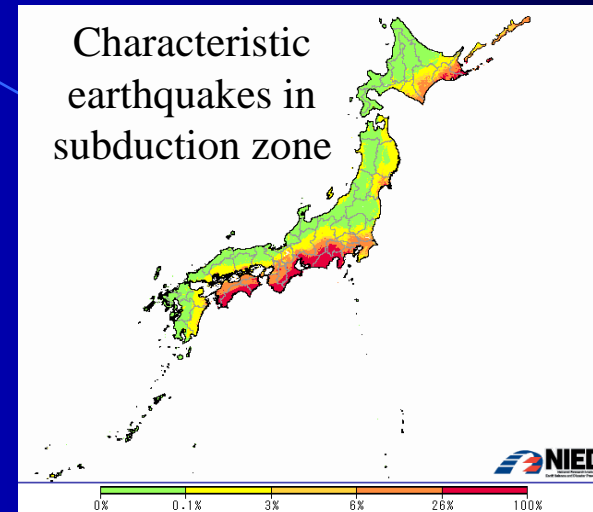
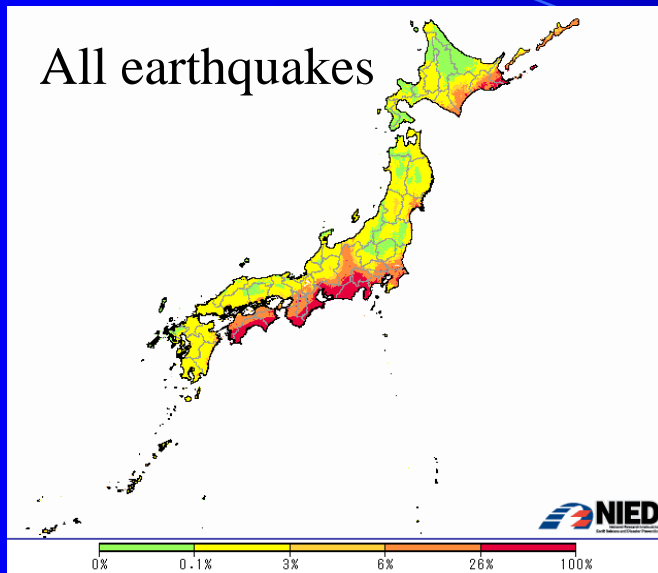


5%.

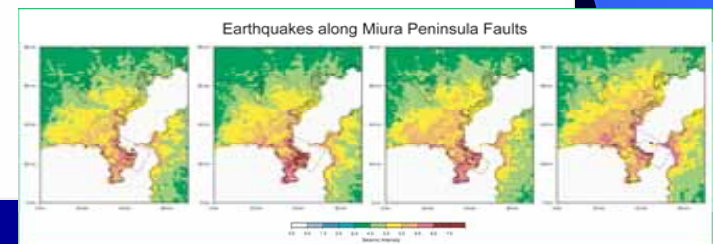
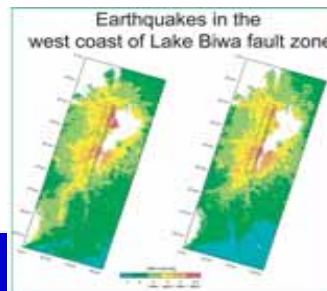
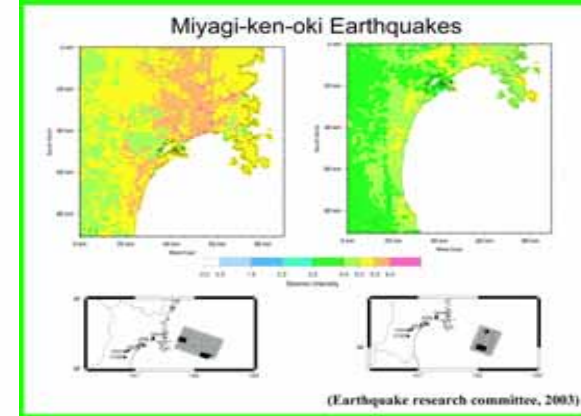
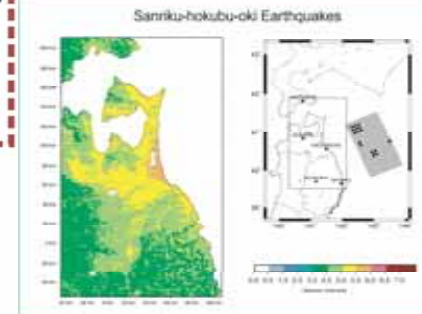
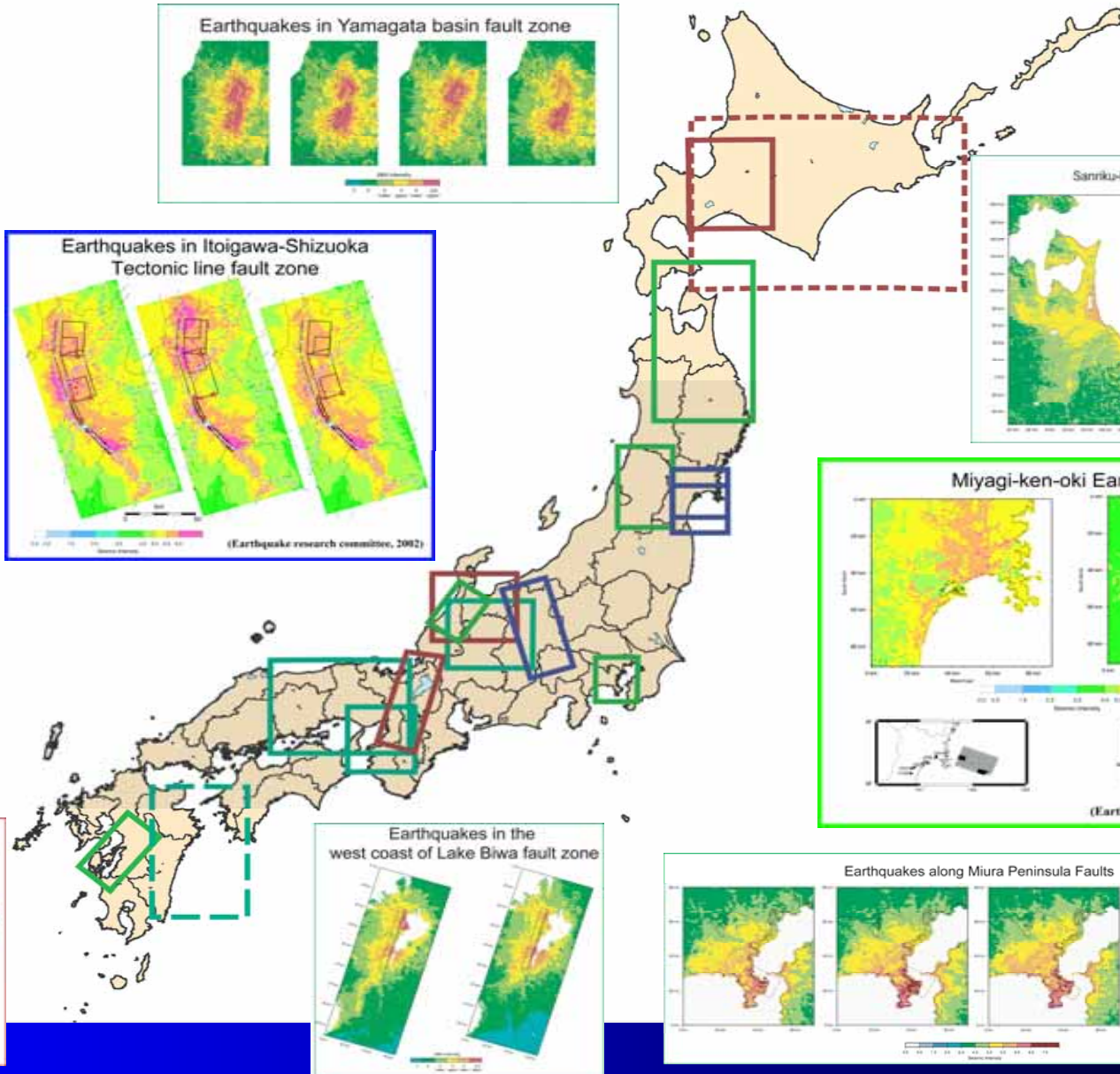
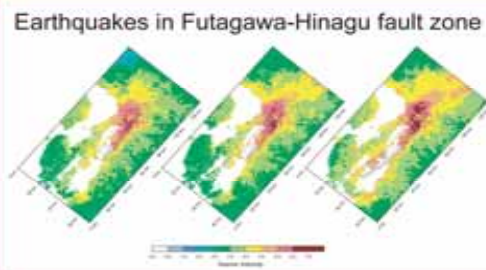
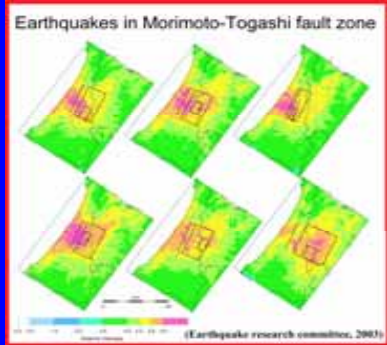
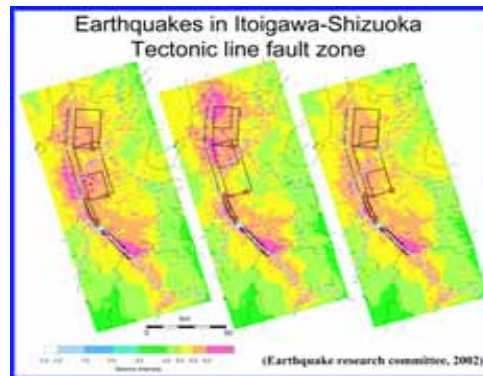
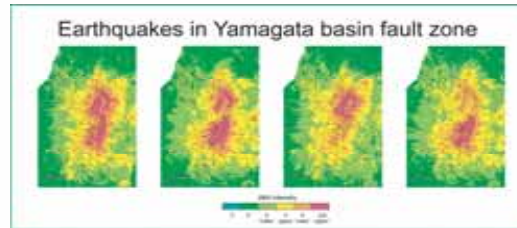
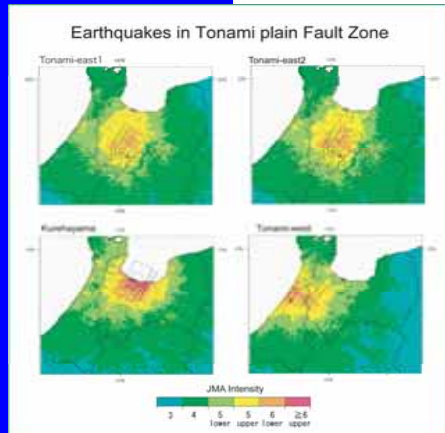
Probability of exceedance



# Probabilistic Seismic Hazard Maps

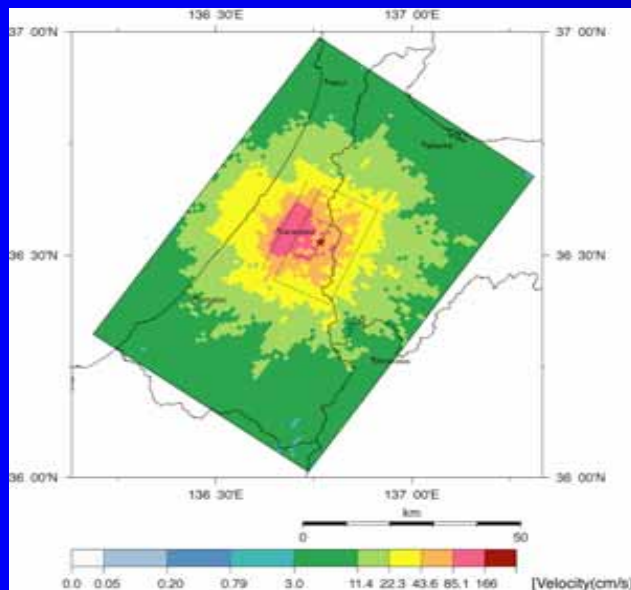


# Scenario Earthquake Shaking Maps

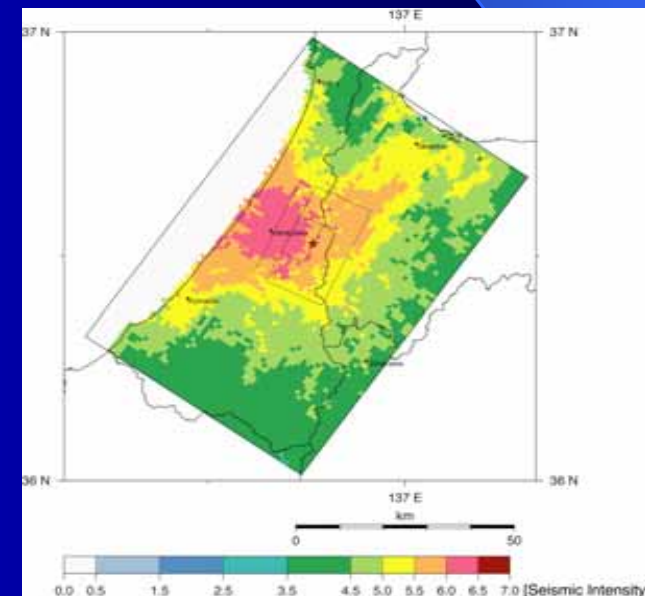


# Scenario Earthquake Shaking Maps for specified seismic-source faults

	on the engineering bedrock	on the ground surface
Mesh size	1 km <sup>2</sup>	1 km <sup>2</sup>
Peak ground acceleration (PGA)		×
Peak ground velocity (PGV)		
Spectral acceleration (SA)		×
JMA seismic intensity	×	
Time history of waveform		×

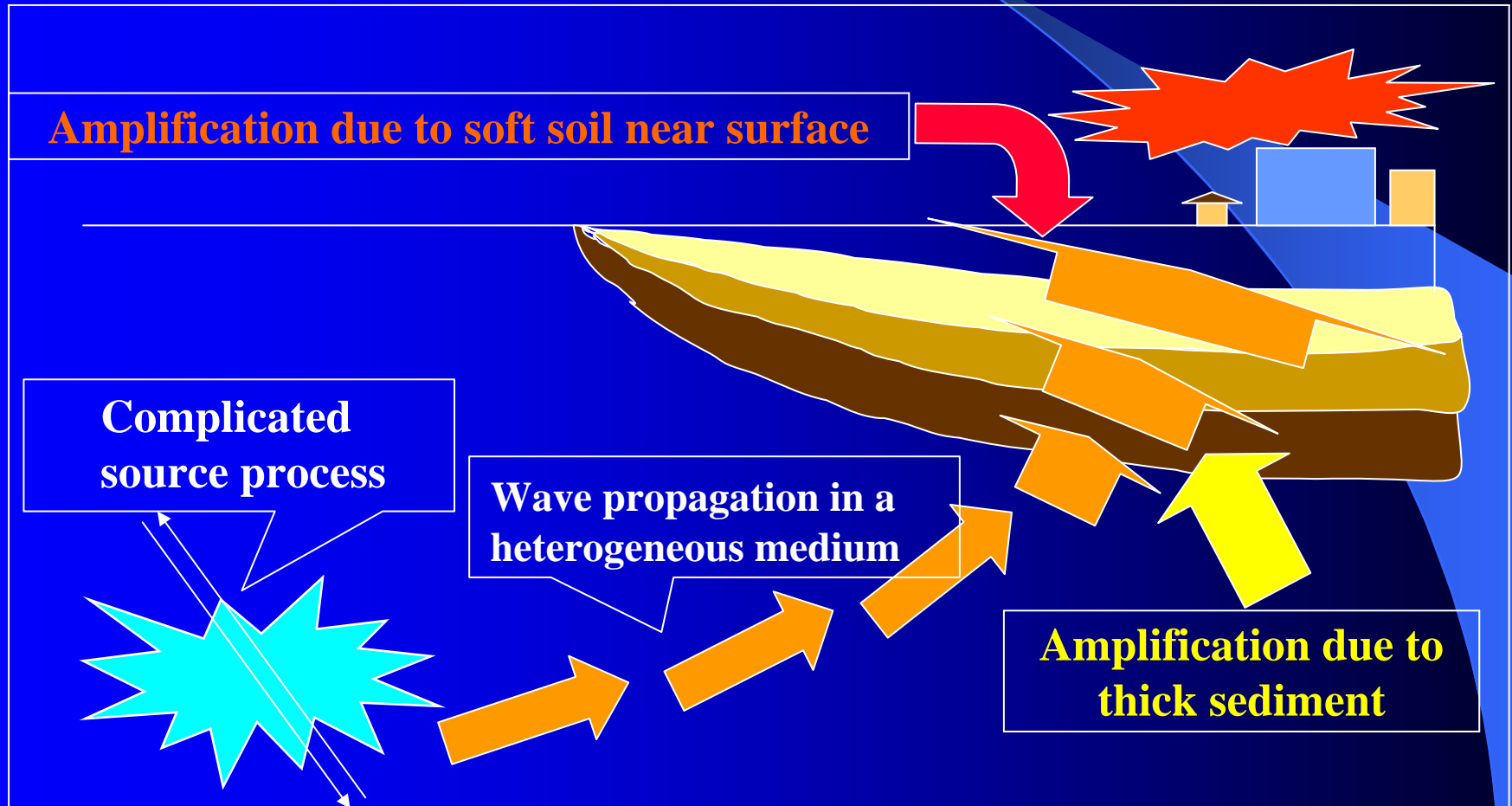


Peak velocity on the engineering bedrock.

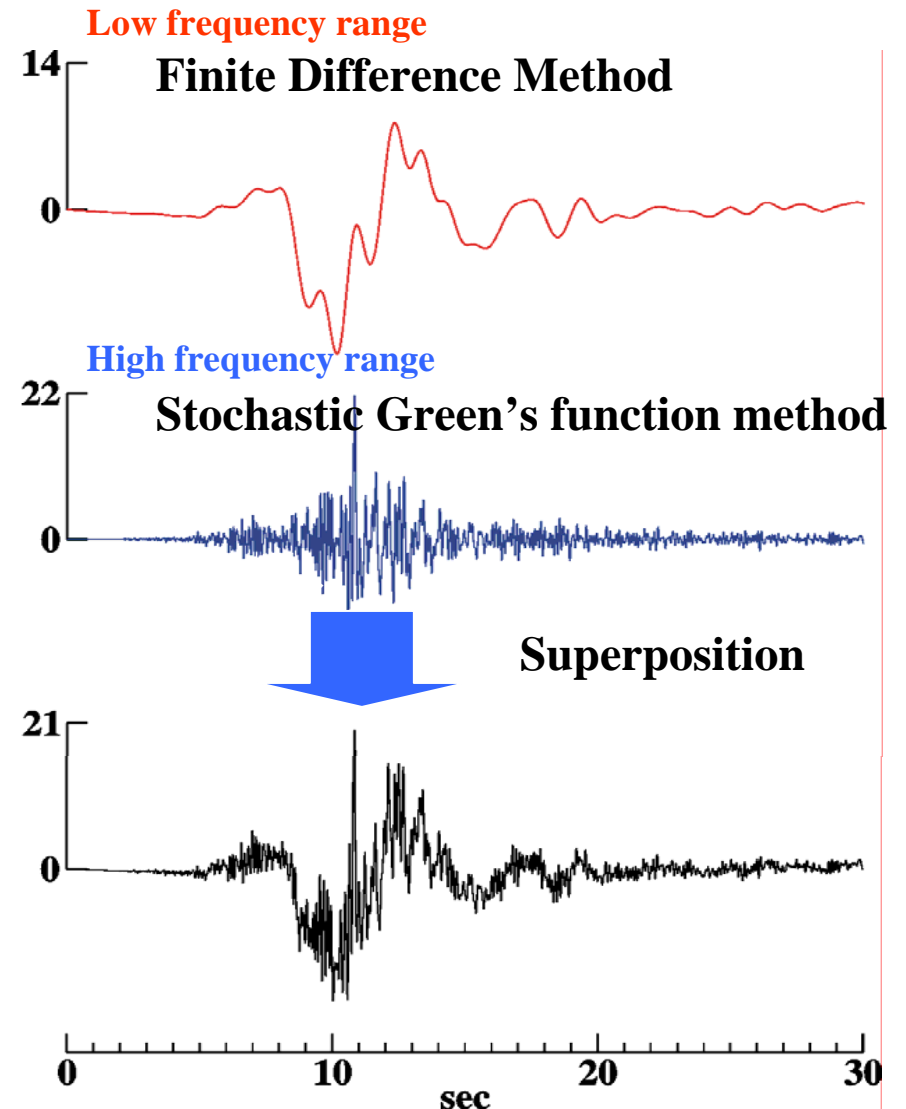
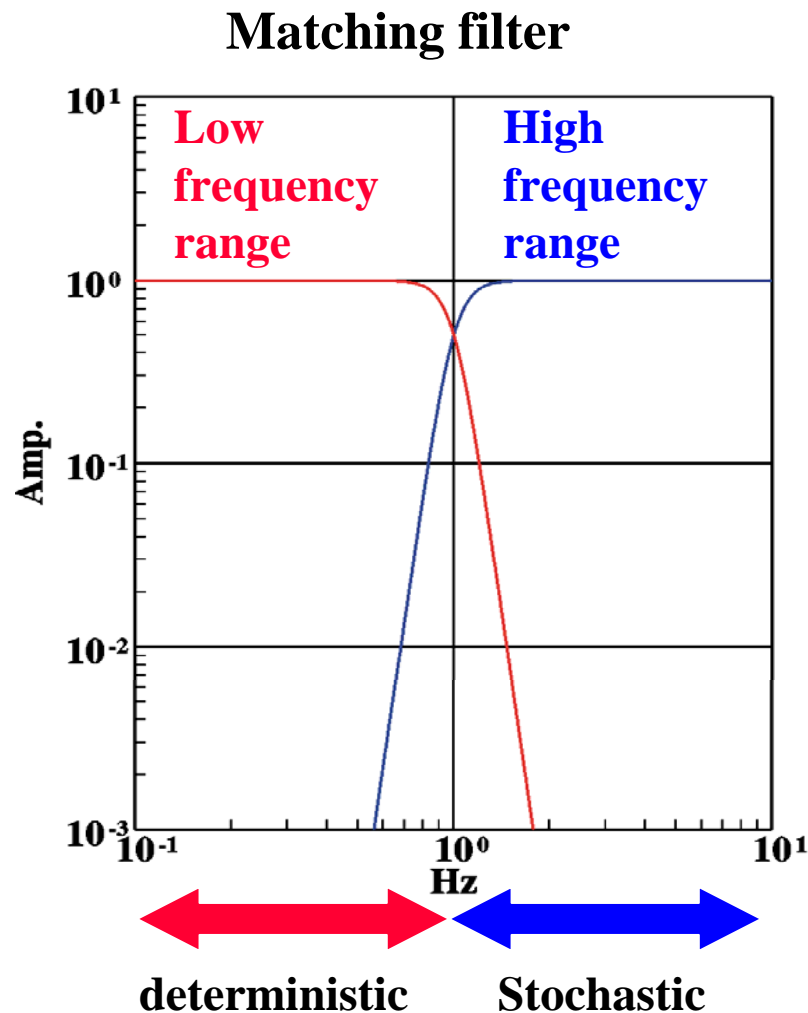


JMA seismic intensity on the ground surface.

# Theoretical approach for evaluation of strong-motion

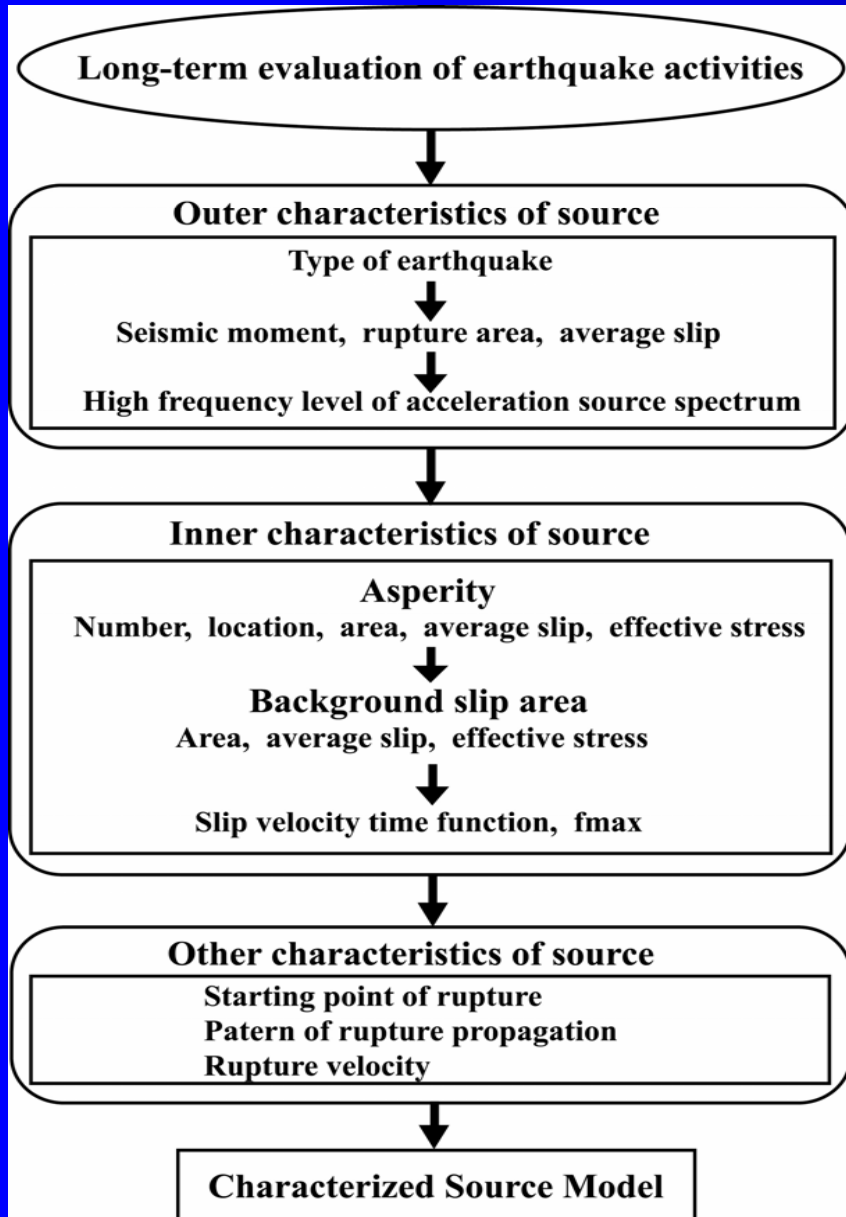


# Hybrid method for evaluation of strong-motion

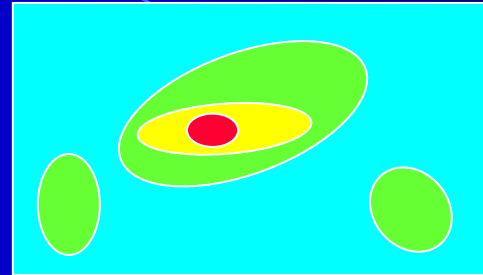




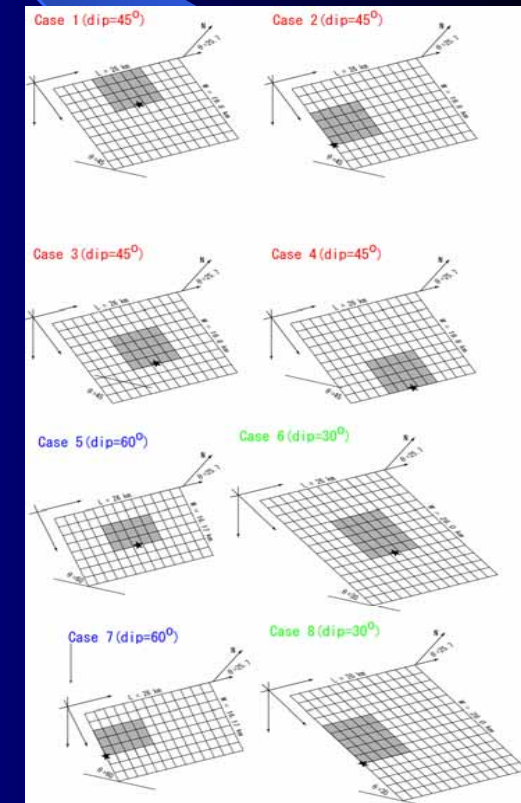
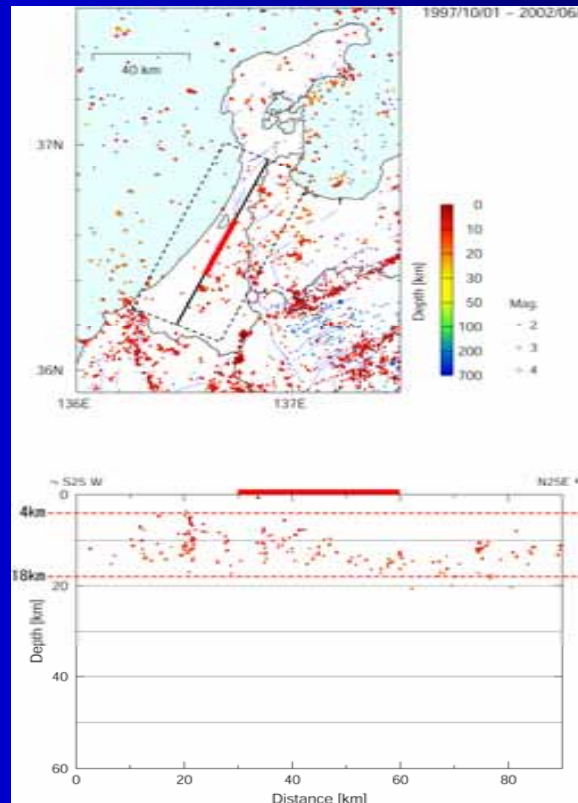
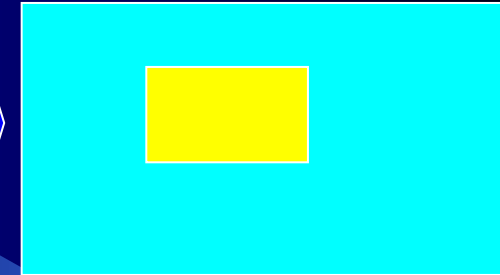
# Characterized Source Model



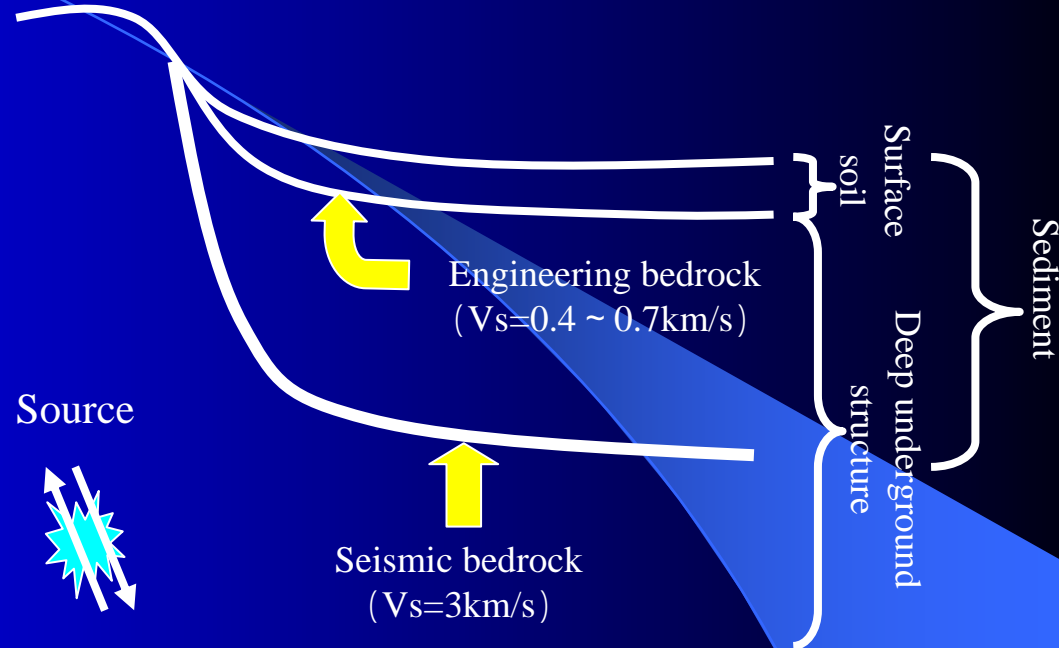
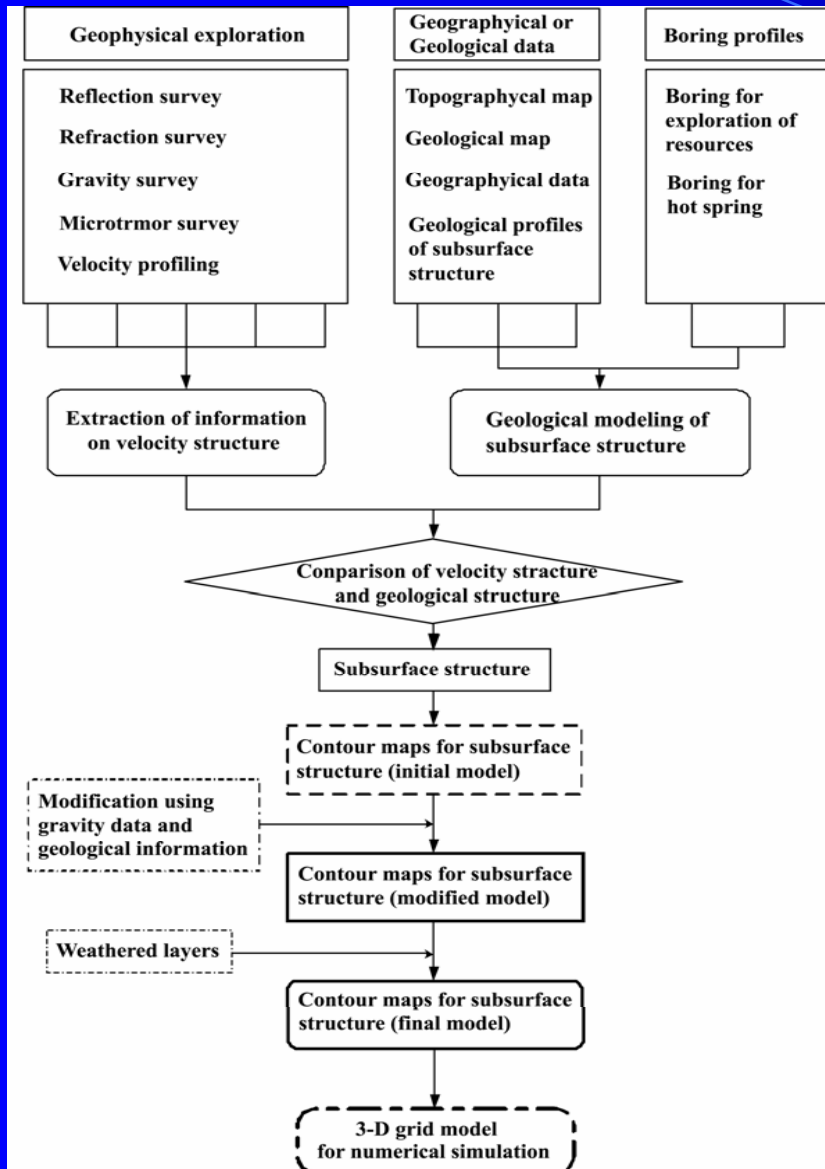
Complicated source model



Characterized source model



# Modeling of underground structure

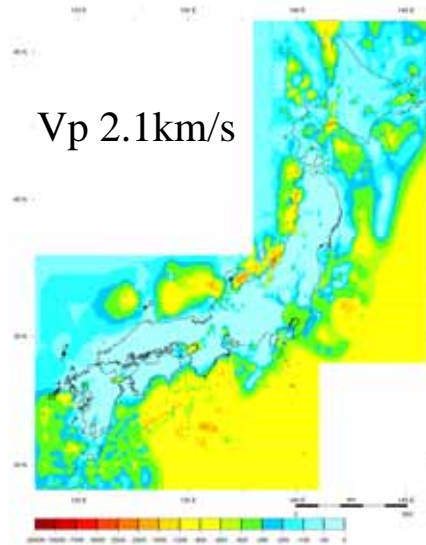


- The deep underground structure from the crust and plates up to seismic bedrock;
- The structure of sediments from the seismic bedrock up to engineering bedrock ( $V_s = 400 \text{ m/s} \sim 700 \text{ m/s}$ );
- The structure of surface soils from the engineering bedrock up to the ground surface.

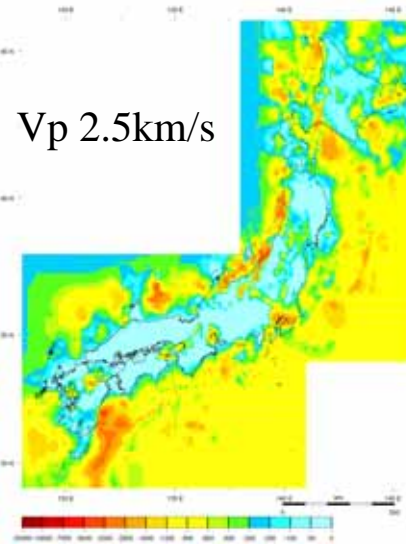
Flowchart of structure modeling

# Subsurface modeling of deep sedimentary layers

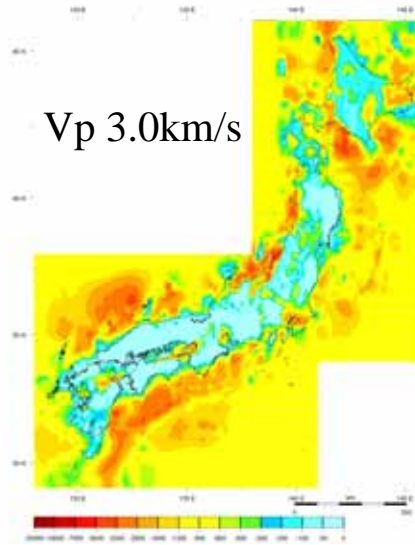
Vp 2.1km/s



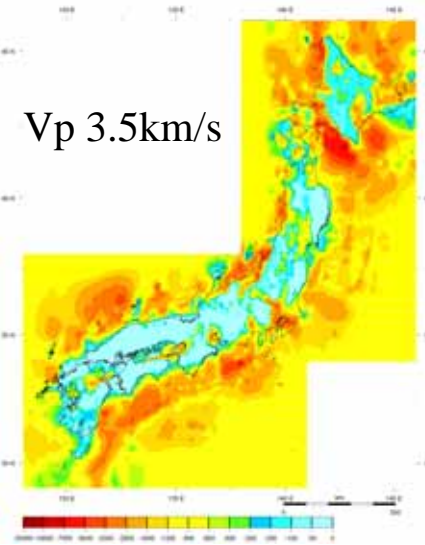
Vp 2.5km/s



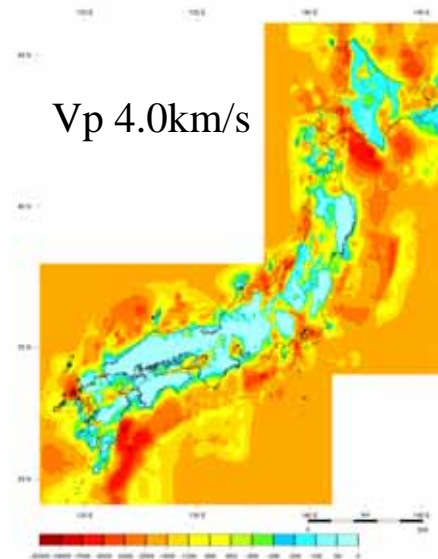
Vp 3.0km/s



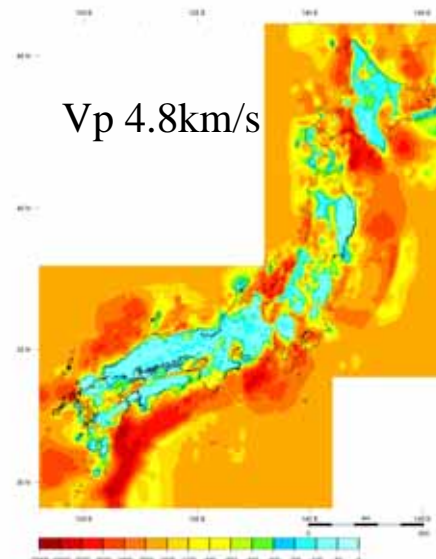
Vp 3.5km/s



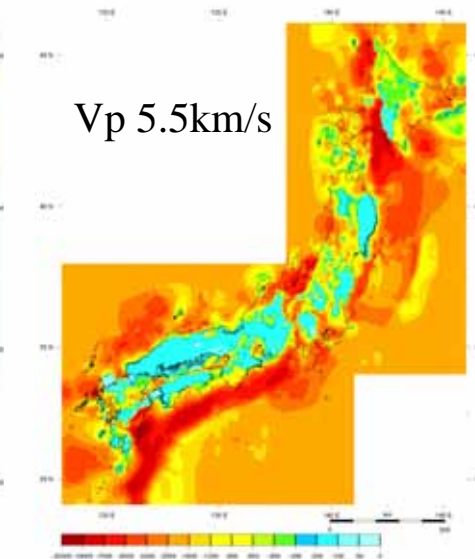
Vp 4.0km/s



Vp 4.8km/s



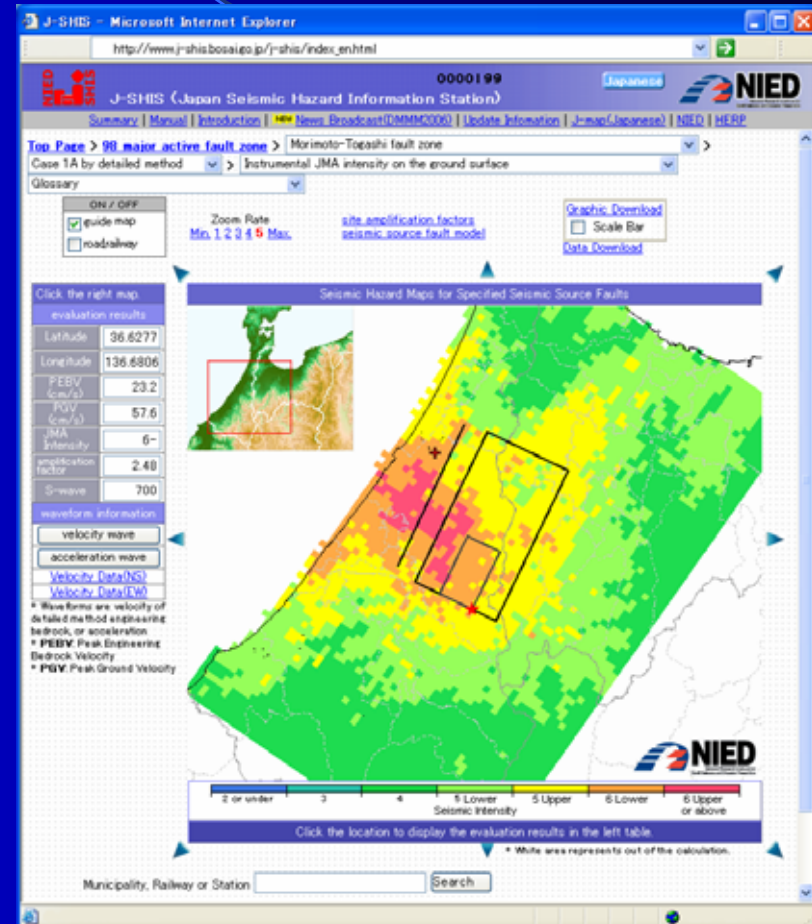
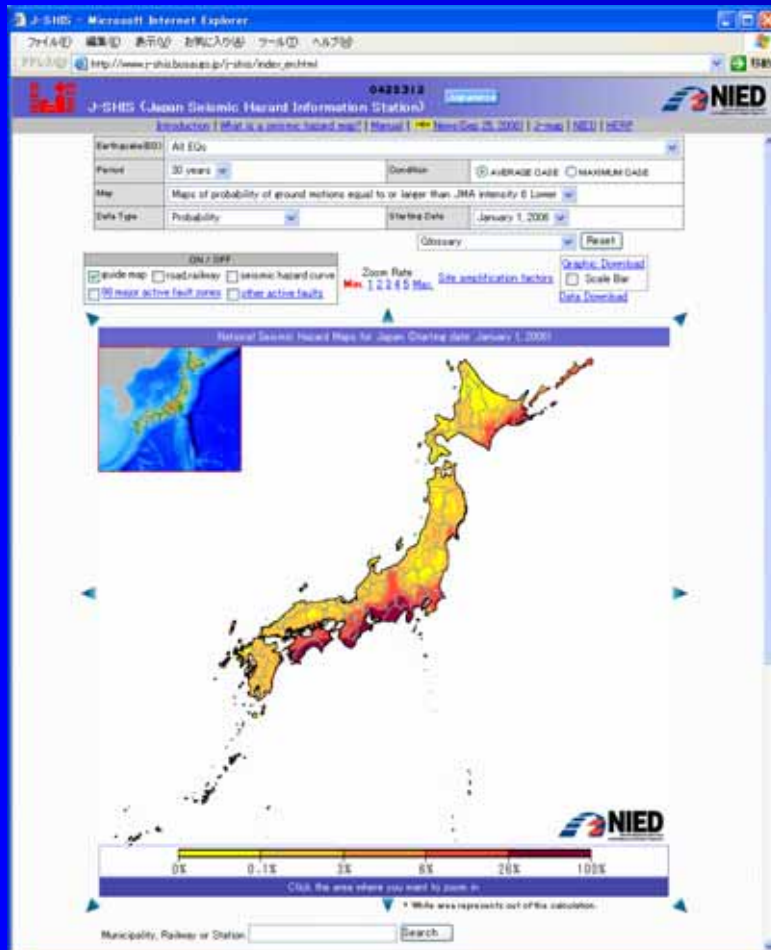
Vp 5.5km/s



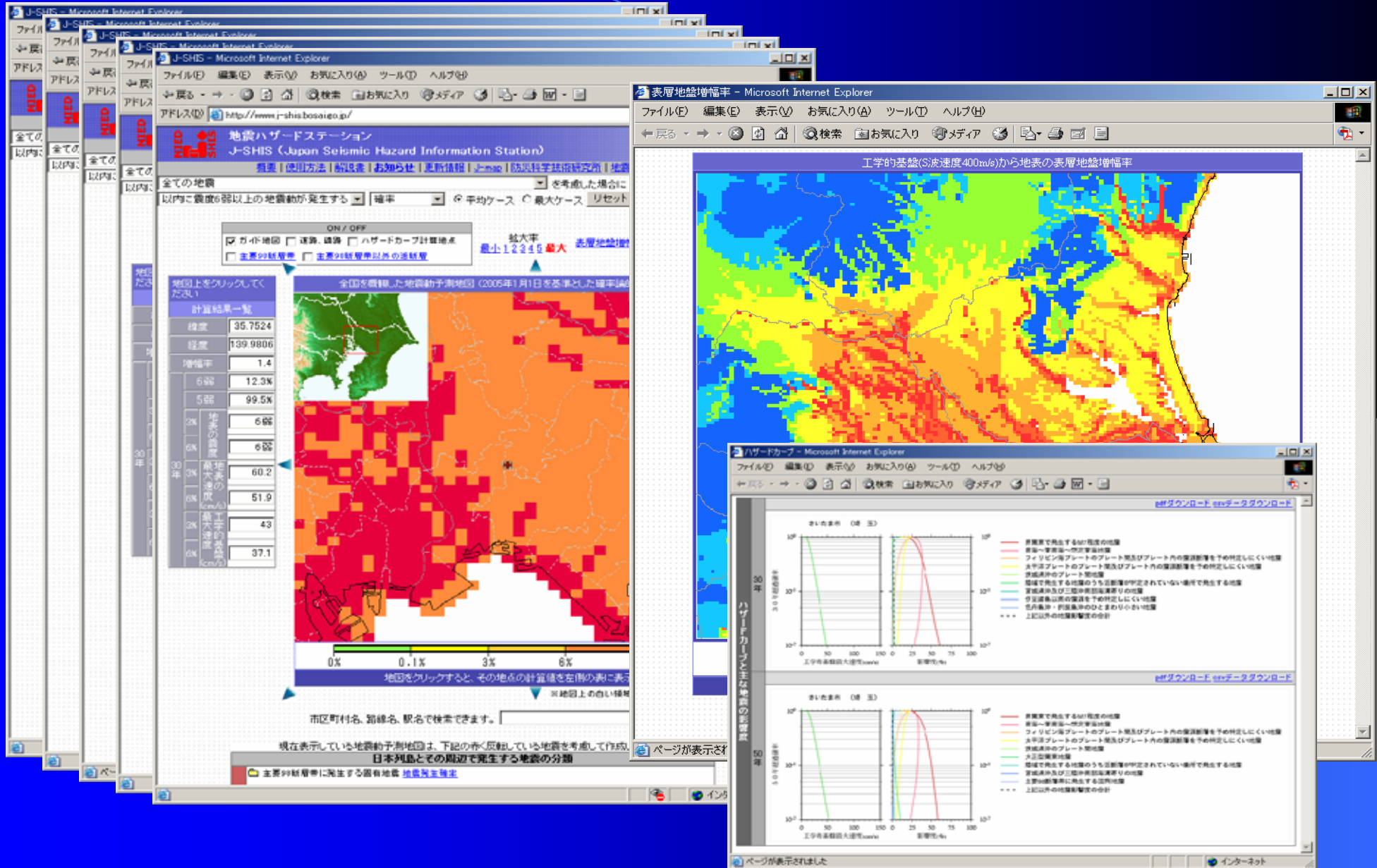


# Japan Seismic Hazard Information Station

<http://www.j-shis.bosai.go.jp>

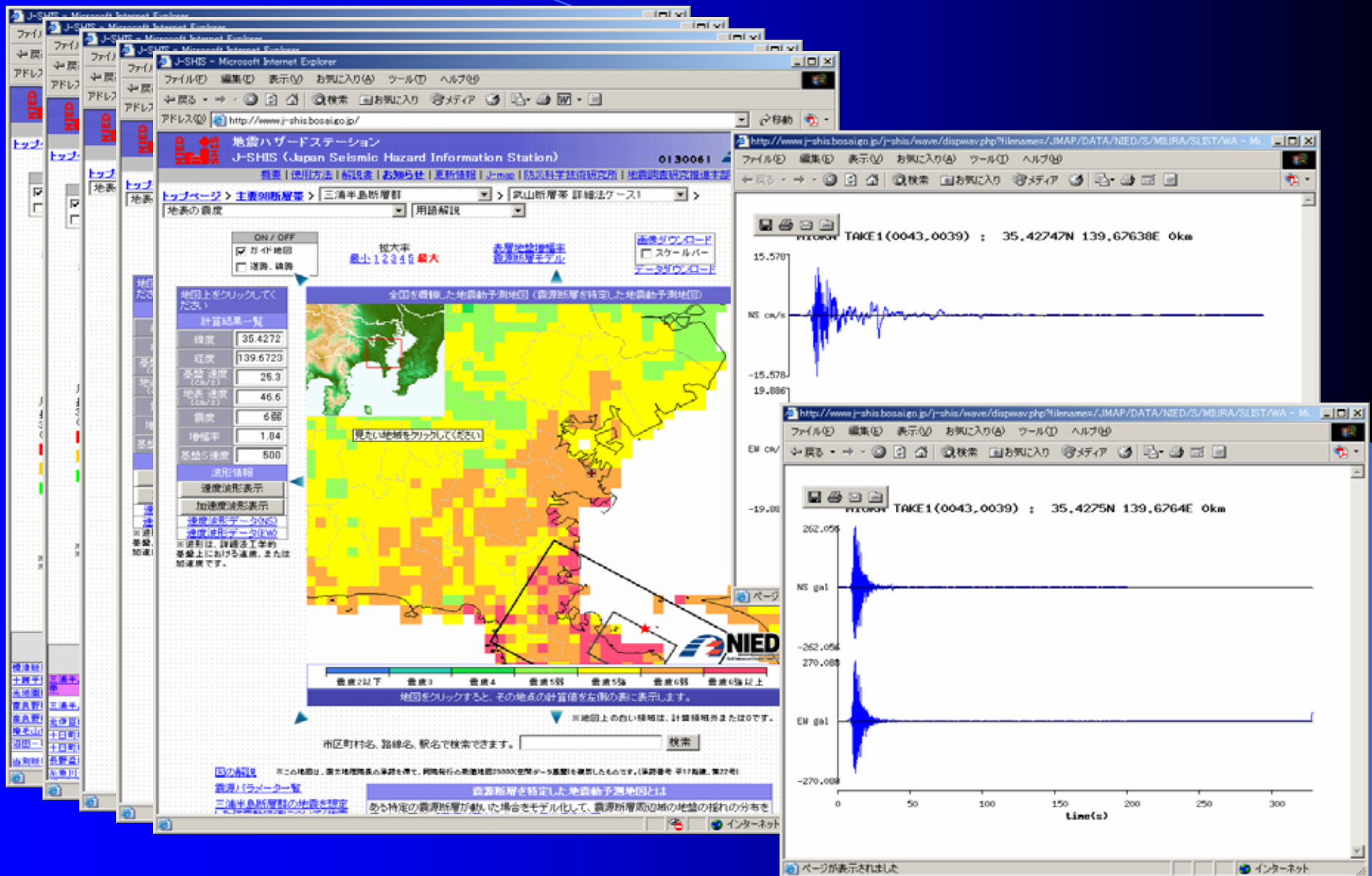


# Probabilistic Seismic Hazard Maps

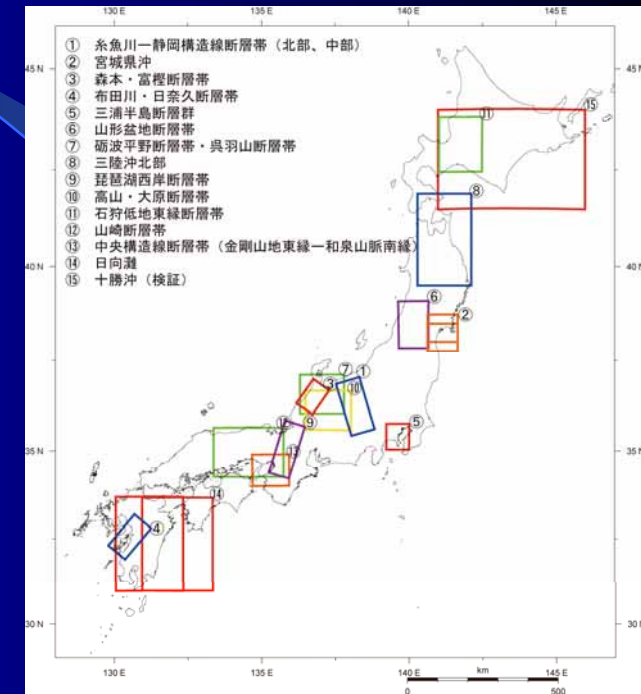
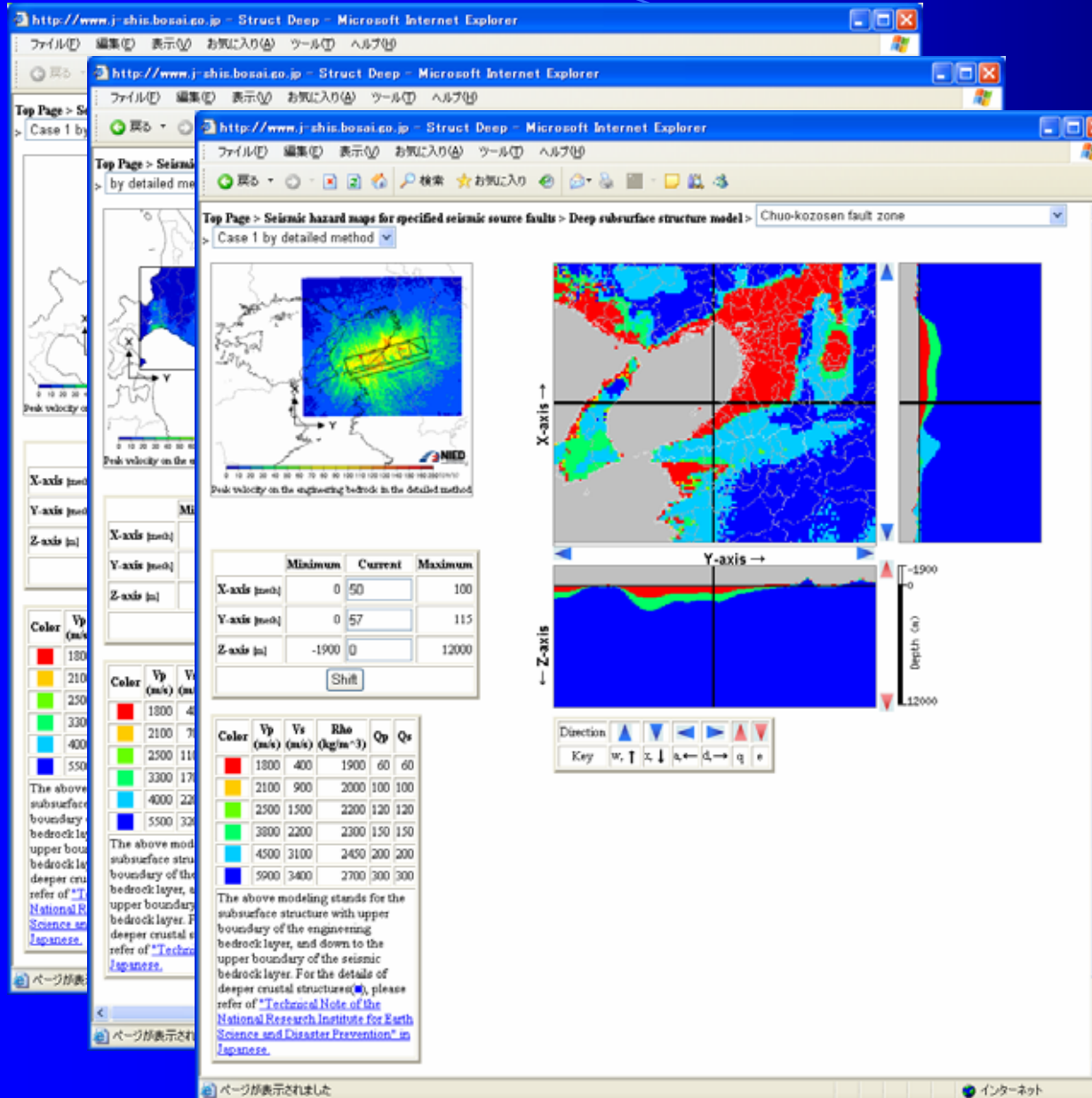




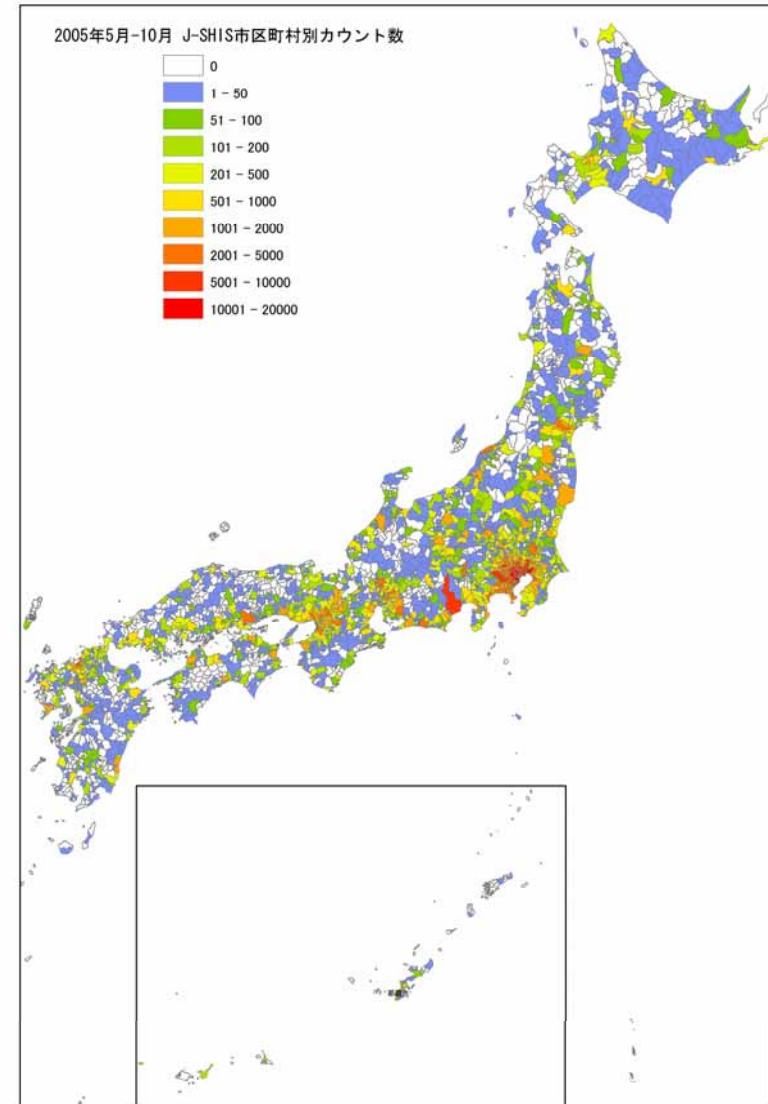
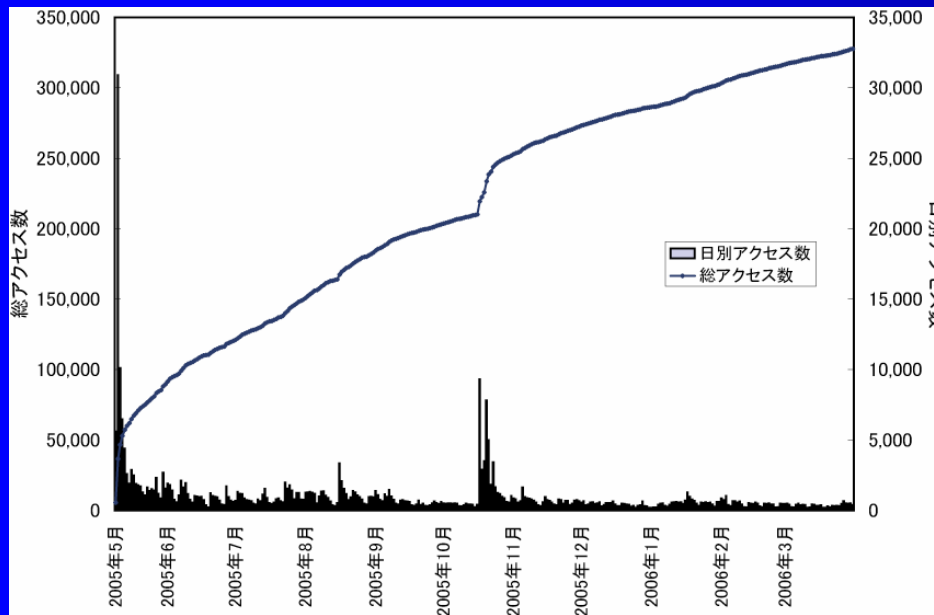
# Scenario Earthquake Shaking Maps



# Velocity structure models for strong-motion evaluation

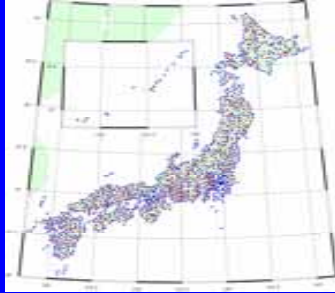


# J-SHIS Access logs



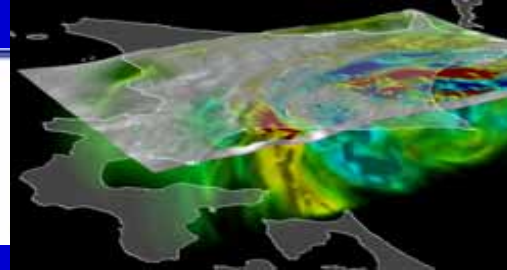
# Seismic Hazard Information Station

Strong-motion Monitoring



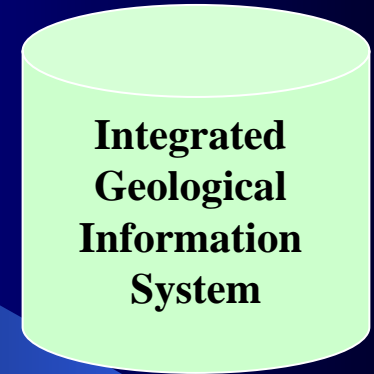
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Strong-motion simulator



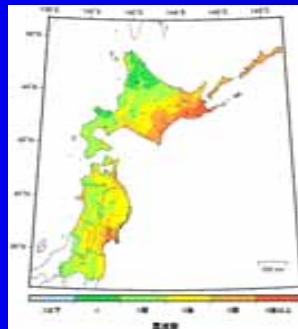
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Integrated  
Geological  
Information  
System

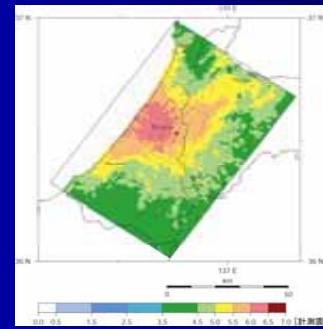


## Seismic Hazard Station

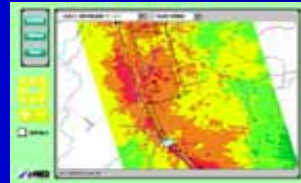
Probabilistic



Scenario



Publication



University  
Research

Local  
government  
Hazard  
Assessment

Seismic Fragility

Seismic Risk  
Assessment

Seismic Risk  
Management