

Earthquake & Tsunami Warnings/Information in JAPAN

- JMA issues many information and warnings about an earthquake / tsunami quickly -

Earthquake Early Warning (EEW)

immediately after occurrence

JMA

Estimating the focus, magnitude and seismic intensities using data from one seismograph

EEW is a new warning that advises of strong motion before they arrive

several ~ few tens of seconds later

JMA

Estimating the focus, magnitude and seismic intensities using data from several seismographs. If Estimated strong motion was over 5Lower, EEW is issued to the general public.

You can know EEW from TV or radio.

Strong motion arrival

JMA

Estimating the focus, magnitude and seismic intensities using data from some seismographs. If Estimated strong motion was over 5Lower at not warning area, updated EEW is issued to the general public.

You are able to take cover from strong motion.

an earthquake occurs!

several ~ few tens of seconds

2 ~ 3 minutes

about 5 minutes

An Example (2008/09/11 Tokachi-oki M7.1)

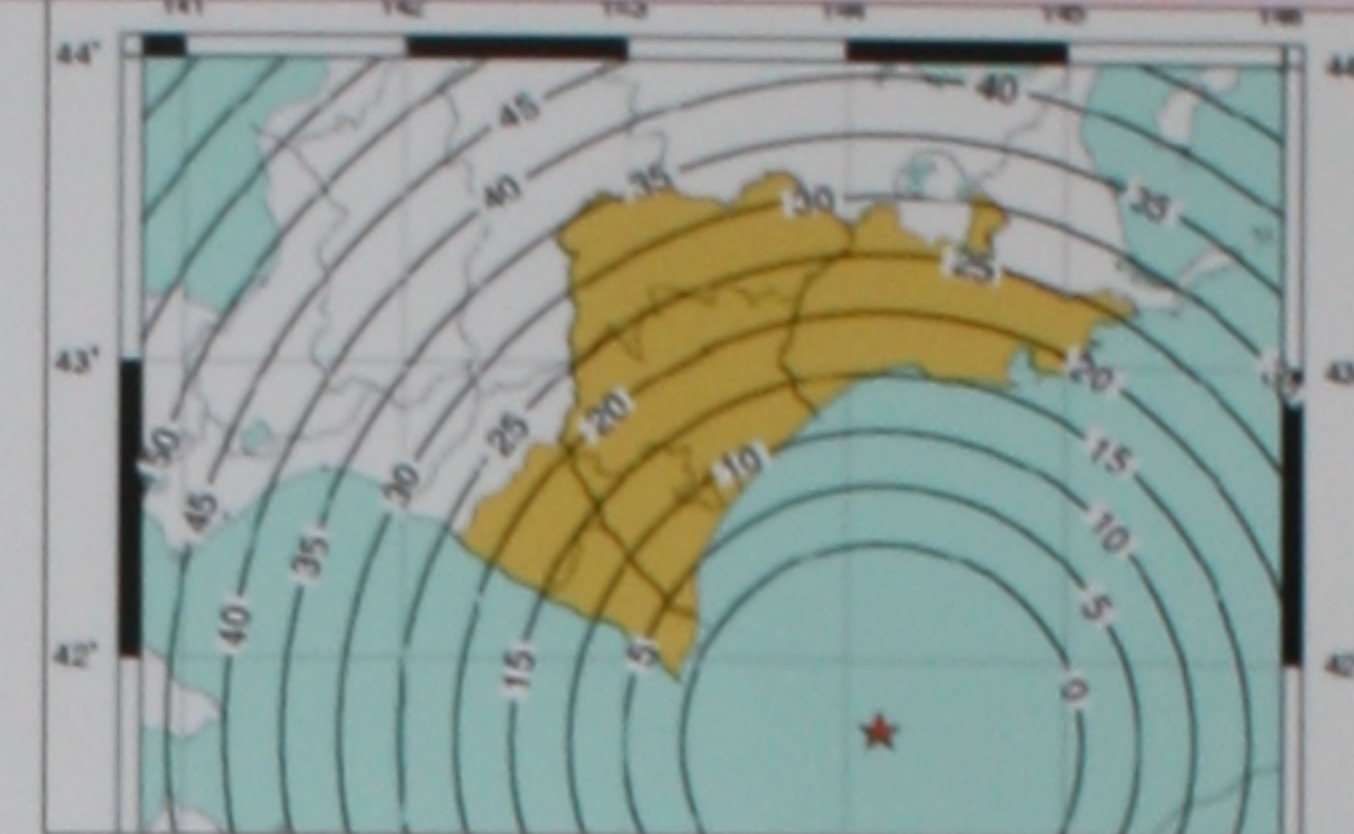
Warning or Information based on forecast data

Information based on observed data

Origin Time : 09:20:51

Fastest Detection: 09:21:03

Earthquake Early Warning: 09:21:13



Warning area

★ epicenter

Contour represents lead time(sec) from EEW to strong motion arrival.

Maximum intensity

5- (5Lower)

Seismic Intensity Information (Local Area Seismic Intensities) : 09:22

Tsunami Warning : 09:24

Tsunami Warning

Major tsunami

Tsunami

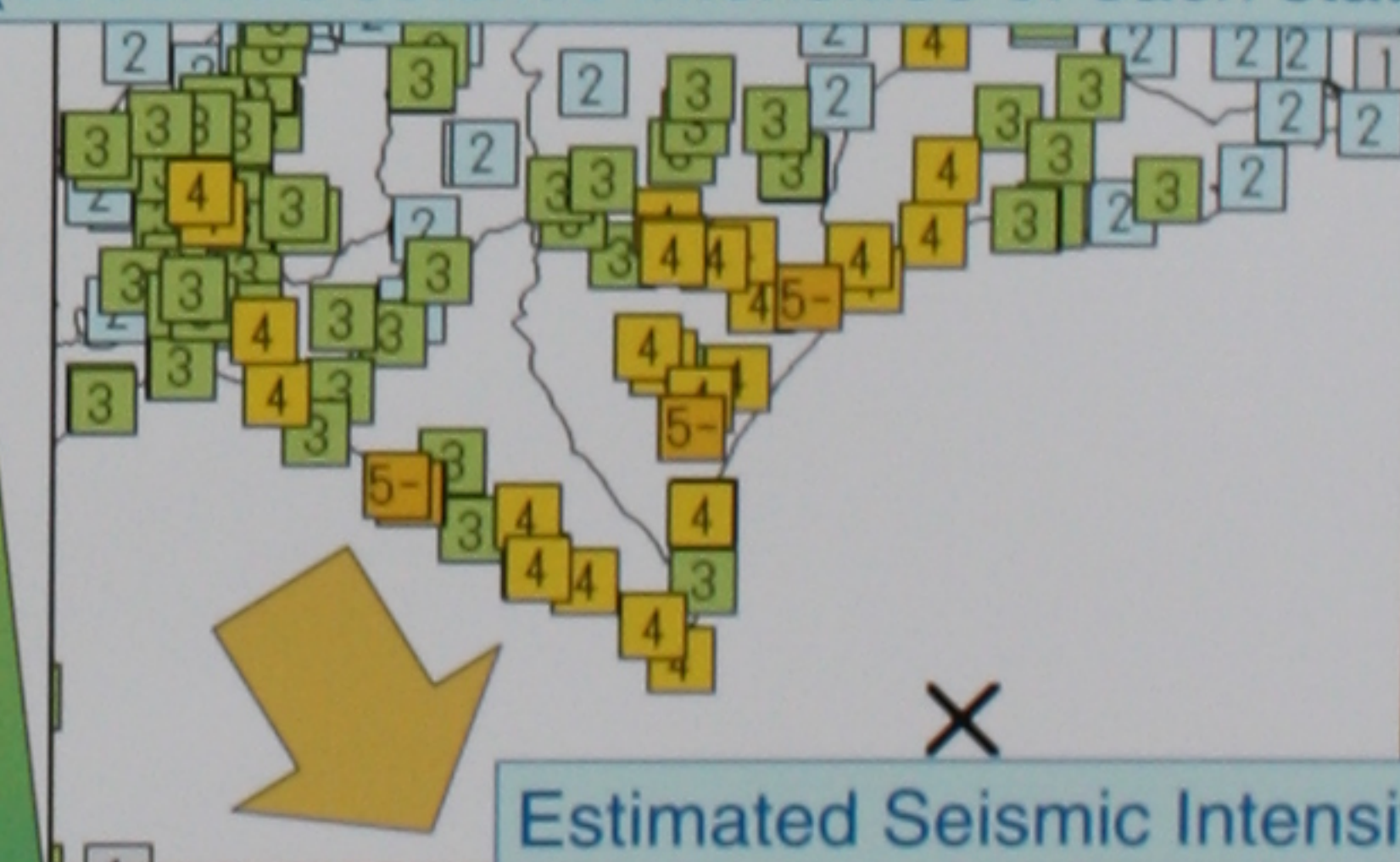
Tsunami Advisory

Tsunami Advisory

| Category | Estimated Tsunami Height |
|-------------------------|------------------------------------|
| Tsunami Major Tsunami | "3m", "4m", "6m", "8m", "over 10m" |
| Tsunami Warning Tsunami | "1m", "2m" |
| Tsunami Advisory | "0.5m" |

Tsunami Information (estimated Tsunami Height and Arrival times) : 09:24

Earthquake and Seismic Intensity Information (observed seismic intensities of each stations) : 09:26



Estimated Seismic Intensity Distribution Map

Estimated Seismic Intensity Distribution Map expresses seismic intensity of every 1km grid space which analyzed based on observed data.

Estimated Seismic Intensity

4 5- 5+ 6- 6+ 7

Tsunami arrival 09:56

Tsunami Information (observed Tsunami Height and Arrival times)

Observed Tsunami

Warning 09:24 Tsunami arrival 09:56

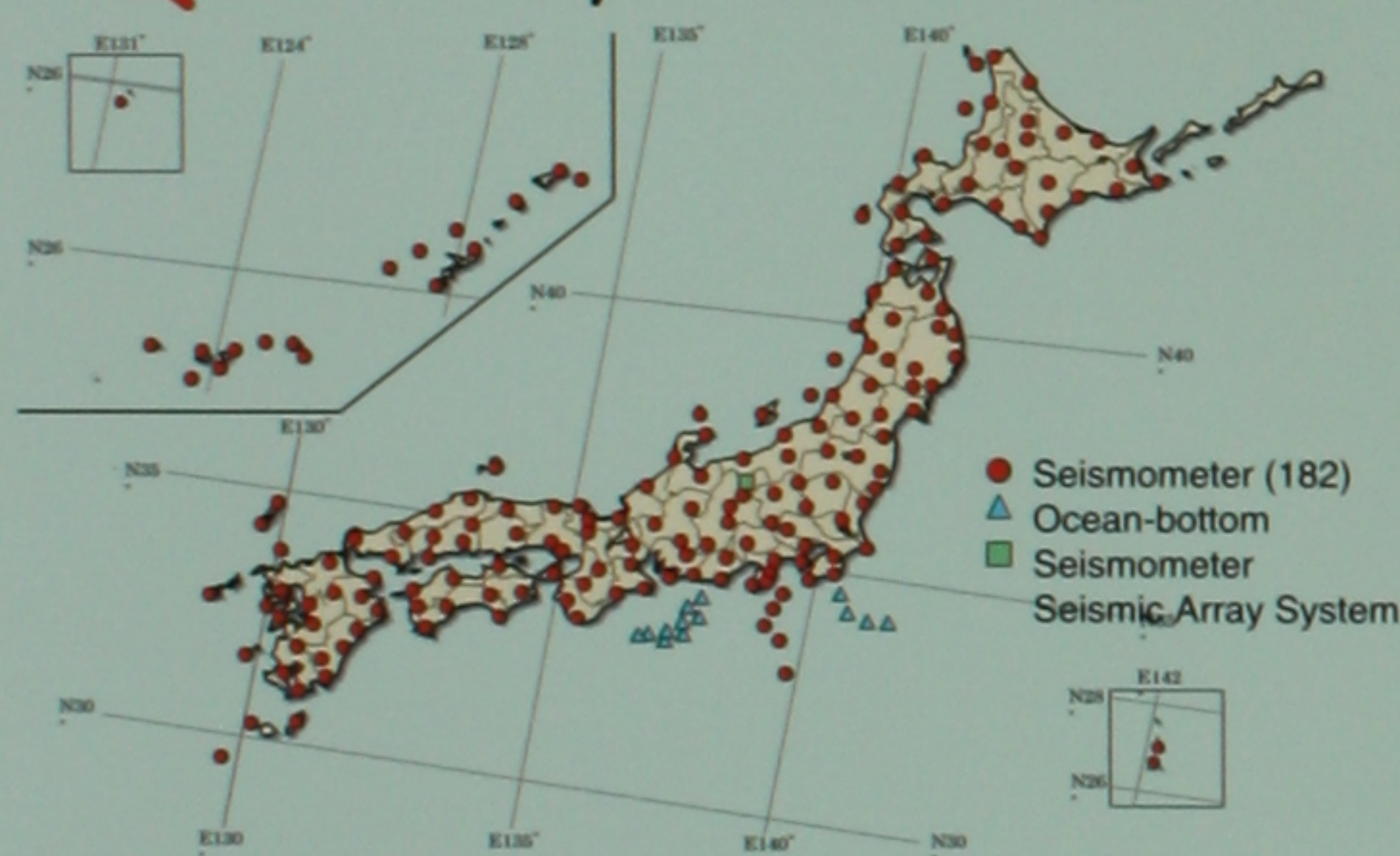
Station map



Cancel 10:45

Tsunami Warning (Cancel) : 10:45

Quick Analysis of seismic data

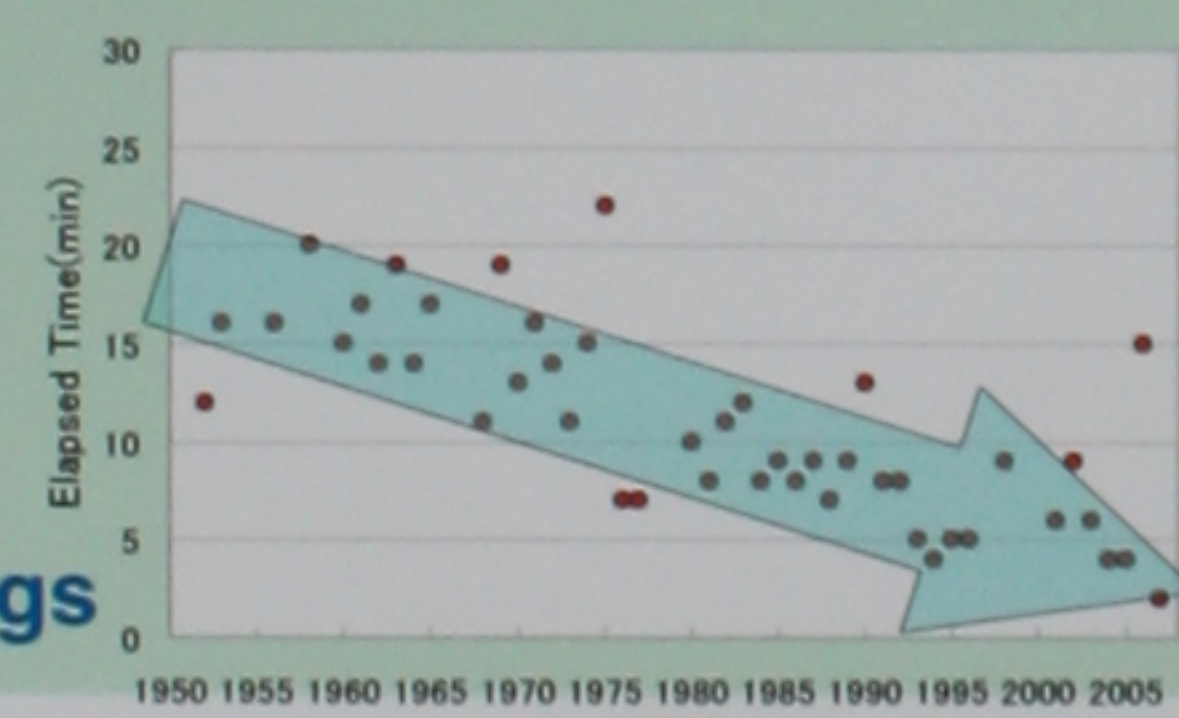


Real-time Seismic Network + EEW Technique

Tsunami Warning System

JMA is the national authority to issue tsunami warnings

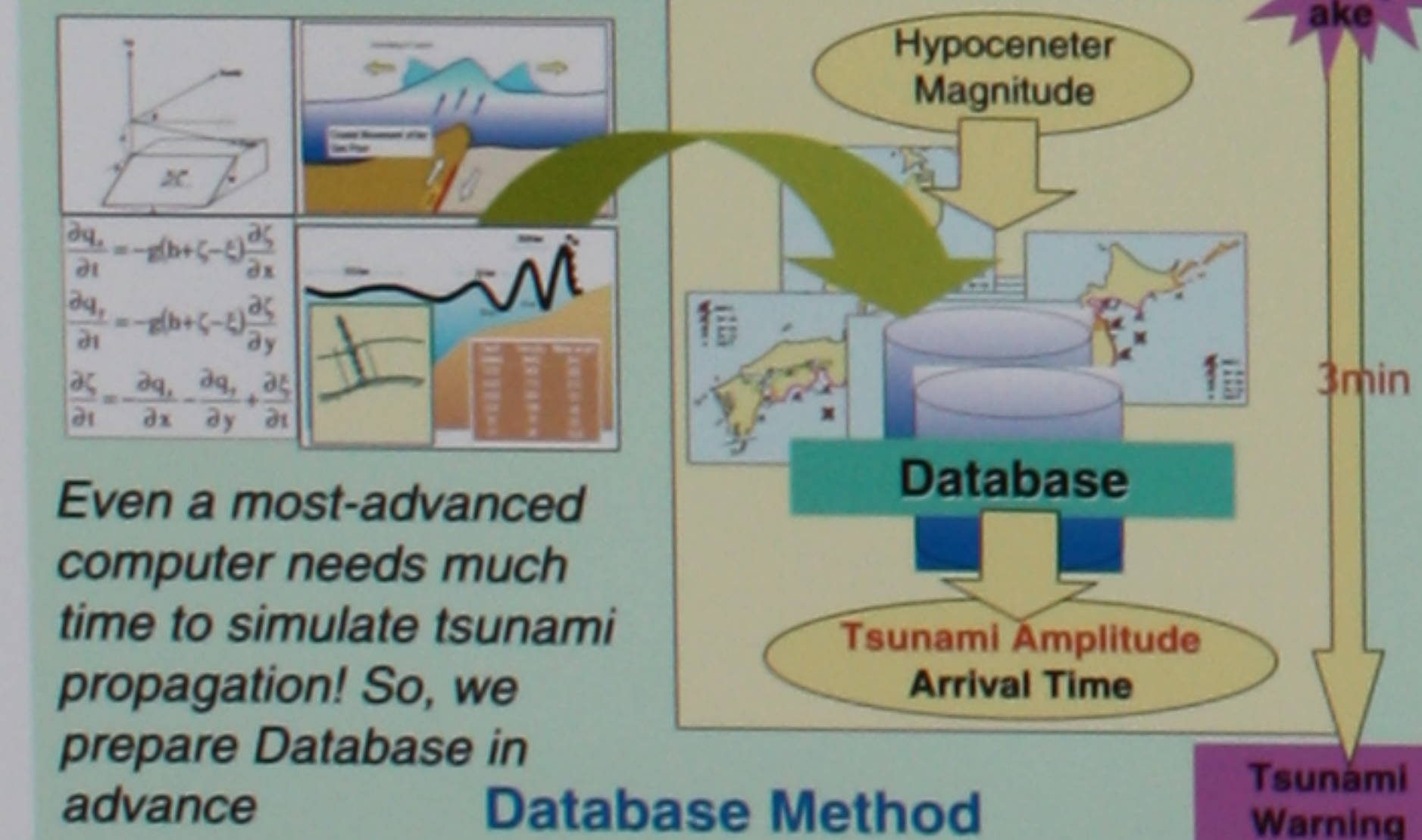
Reducing time to issue Tsunami Warnings



Quantitative Tsunami Forecast

Numerical Simulation

Tsunami Warning Operation



Even a most-advanced computer needs much time to simulate tsunami propagation! So, we prepare Database in advance

Database Method



JMA issues warning messages with estimated tsunami height and arrival time for each tsunami forecast block in the country.

Reliable & Sustainable System

More than 50 Years History

--- Since 1950s

--- Many experiences of tsunamis

Well-trained Op. Staffs

--- We analyze 300 EQs. per day

Continuous Operation even in Trouble

--- Redundant computer system

--- Tokyo & Osaka dual operations (2009-)

Osaka Tokyo

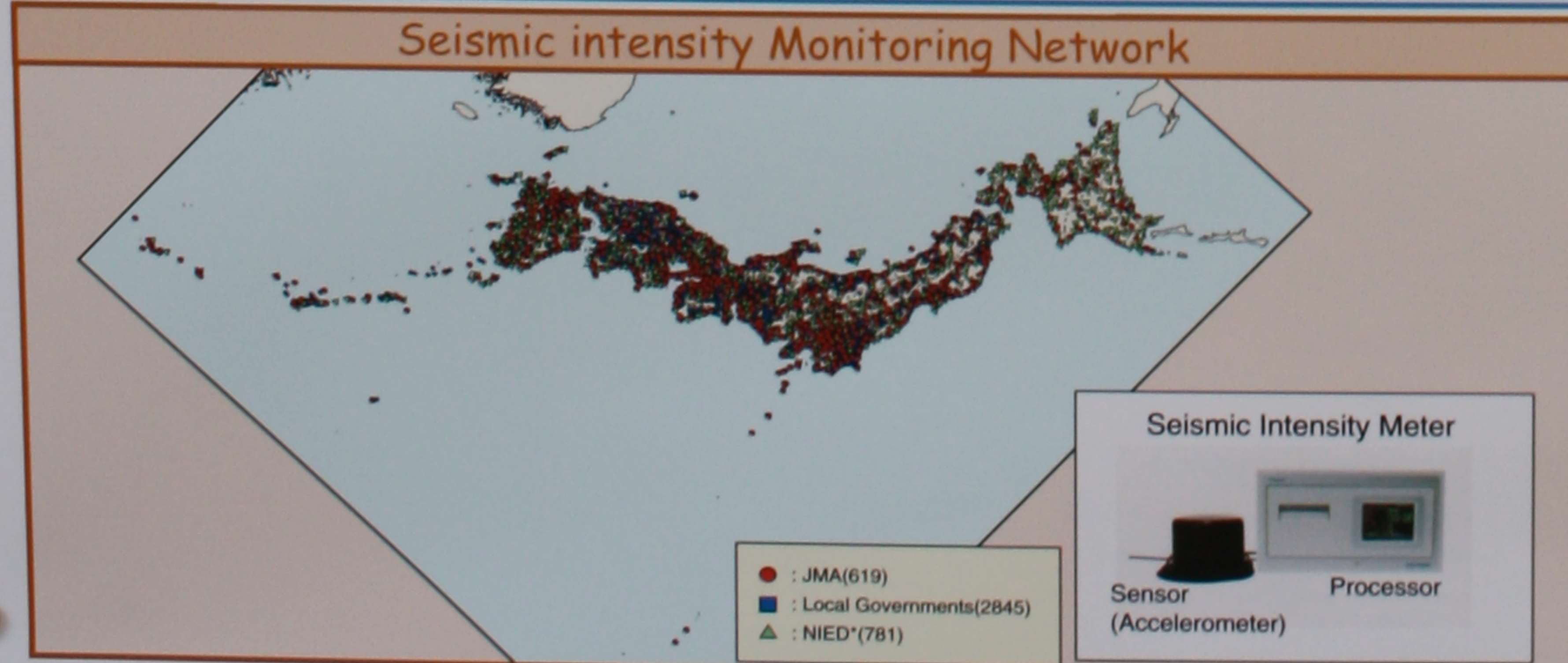
Application of Newly-developed Tech.

--- Earthquake Early Warning

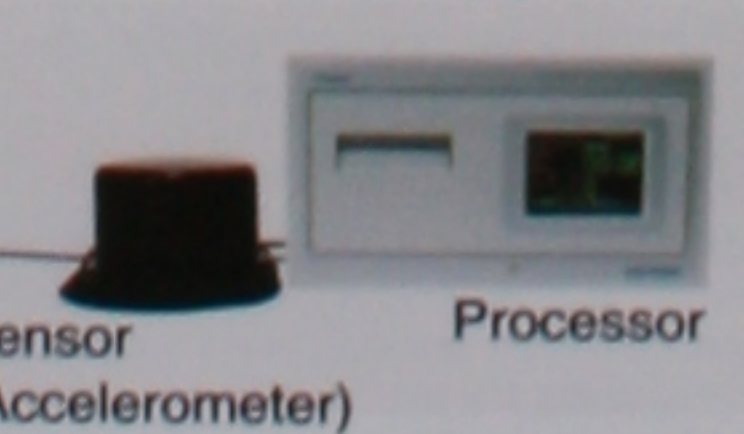
--- CMT solution

--- Off-shore GPS buoy data

Seismic intensity Monitoring Network



Seismic Intensity Meter



● : JMA(619)
■ : Local Governments(2845)
▲ : NIED(781)

(*)NIED: National Research Institute for Earth Science and Disaster Prevention