

Strong Ground Motions

2024 Noto Peninsula Earthquake (Mw7.5)

IISEE, Building Research Institute

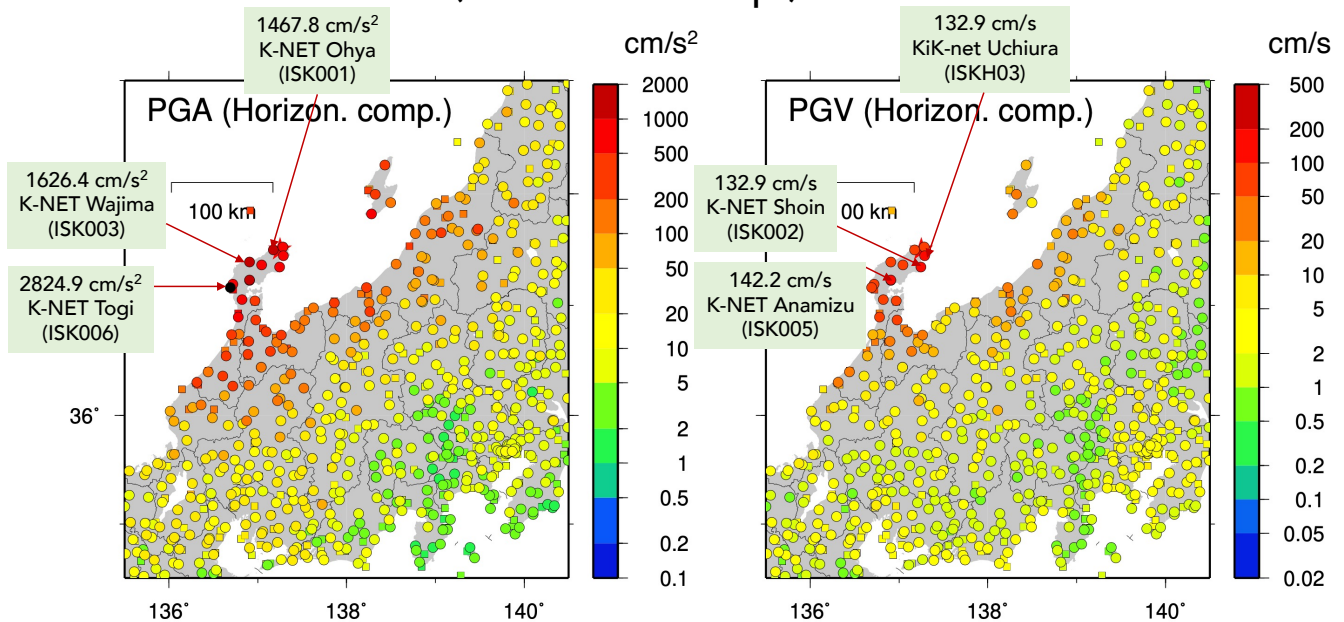
Initial release: January 2, 2024

Last updated: January 9, 2024

This report contains preliminary analysis results.

JMA strong-motion data at stations 42325 (Ushitsu, Noto) and 47600 (Fugeshimachi, Wajima) were not used.

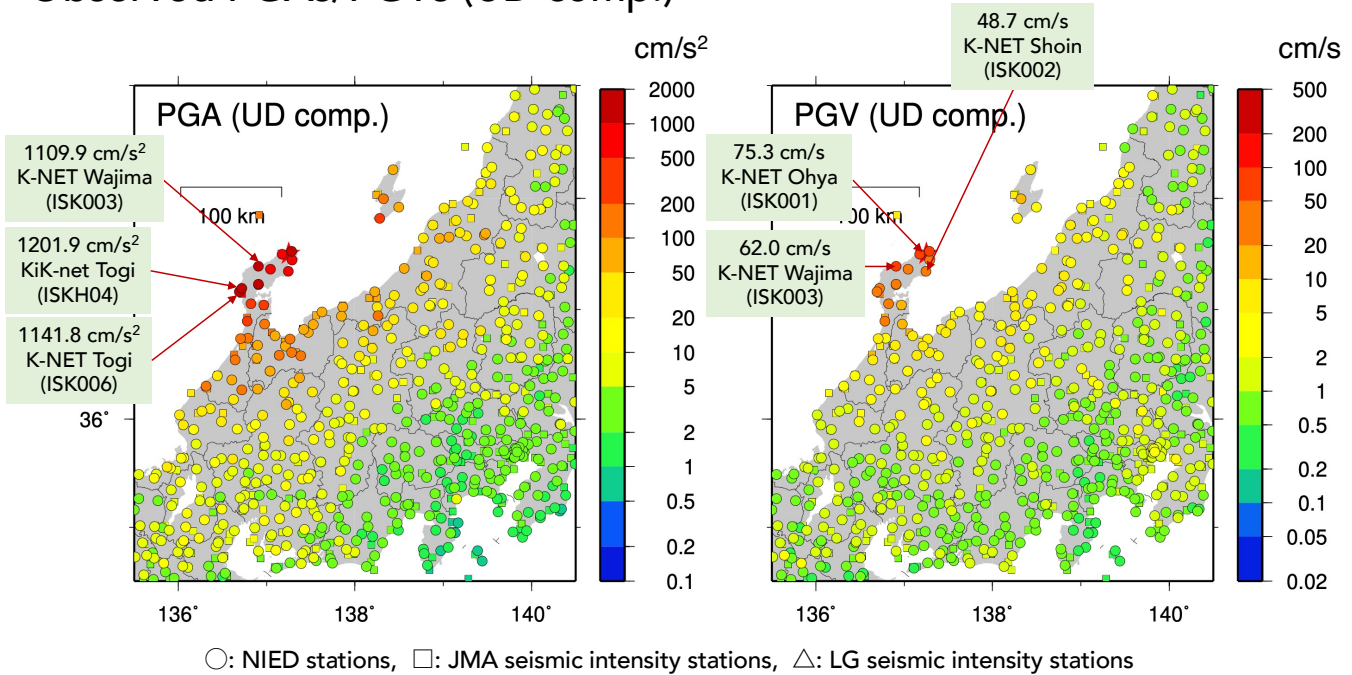
Observed PGAs/PGVs (Horizontal comp.)



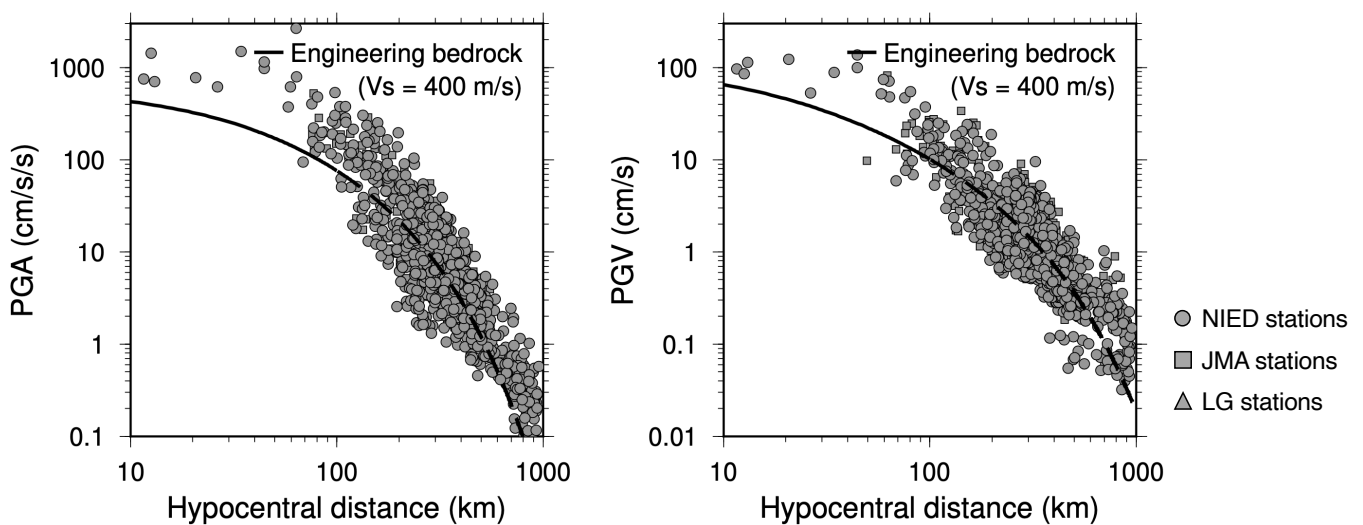
○: NIED stations, □: JMA seismic intensity stations, △: Local Government (LG) seismic intensity stations

※ PGA and PGV are the maximum values of vector summation in the horizontal components.

Observed PGAs/PGVs (UD comp.)

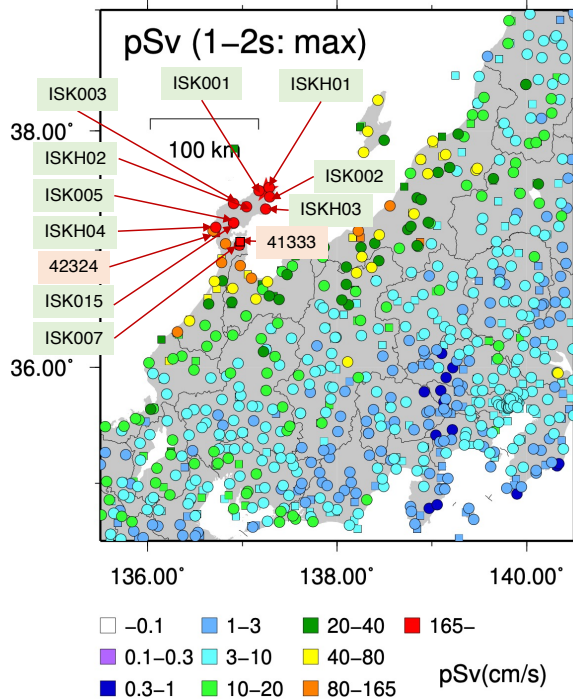


Observed PGAs/PGVs vs GMPE (Si & Midorikawa, 1999)



- ※ Horizontal axis is not the "shortest distance to the fault".
- ※ PGA/PGV values are the larger of the maximum values of NS and EW components.
- ※ Crustal earthquake (depth=10 km) is assumed for the estimation.
- ※ Estimated values beyond 100 km (dashed line) are shown as reference values.

Pseudo-velocity response (pSv: 1–2 s, h=5%)



Responses of pSv > 165 cm/s (T=1–2 s) were observed at following stations.

JMA

41333 (Nanao), 42324 (Shika)

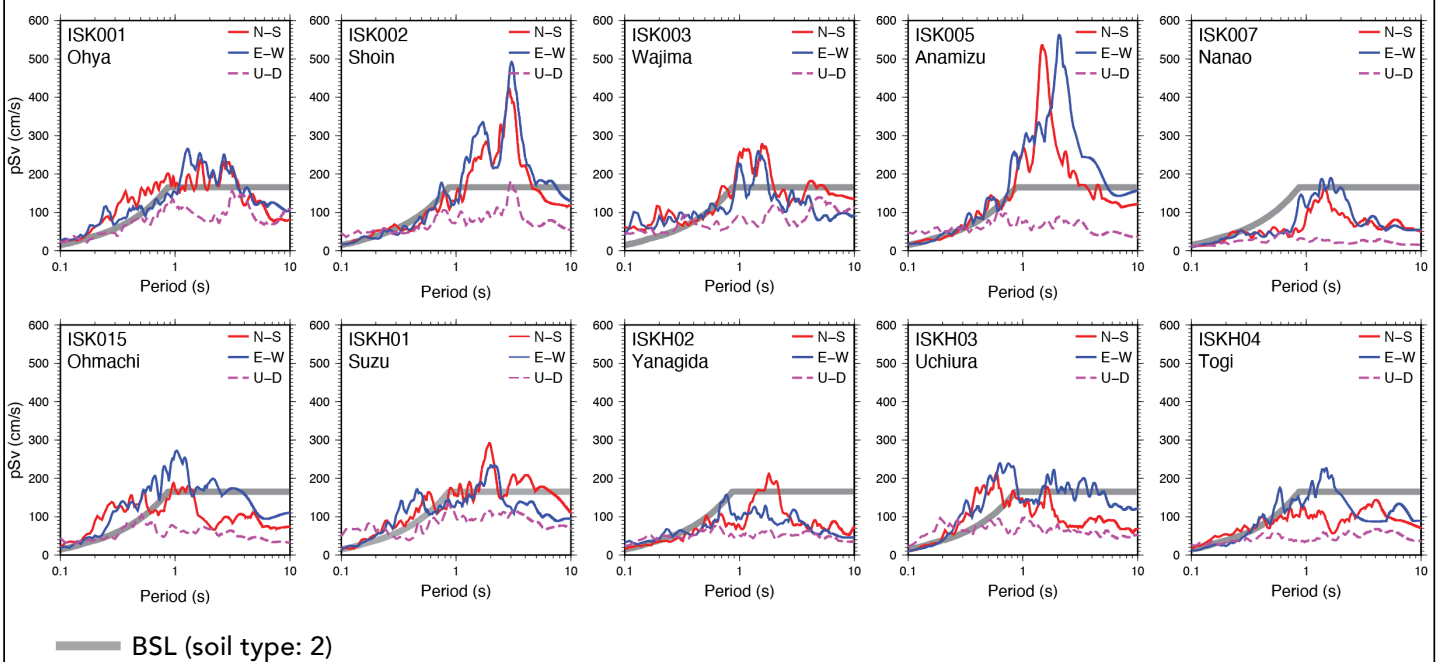
K-NET

ISK001 (Ohya), ISK002 (Shoin), ISK003 (Wajima), ISK005 (Anamizu), ISK007 (Nanao), ISK015 (Omachi)

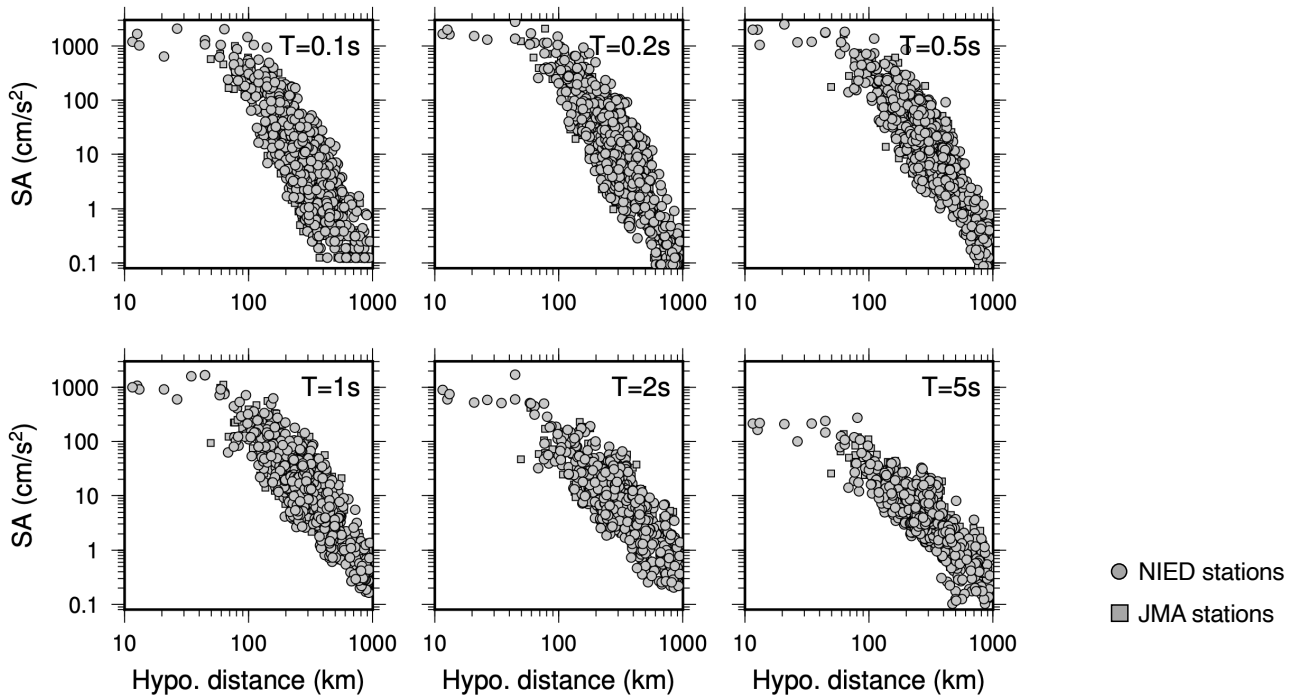
KiK-net

ISKH01 (Suzu), ISKH02 (Yanagida), ISKH03 (Uchiura), ISKH04 (Togi)

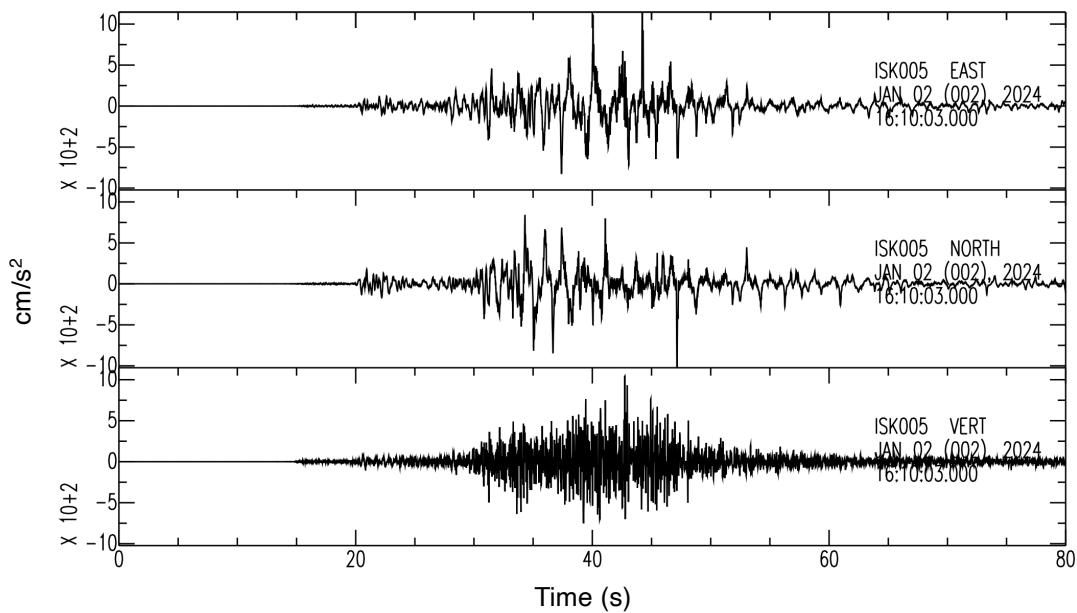
Pseudo-velocity response (pSv: 1–2 s, h=5%)



Attenuation characteristics of response spectra (h=5%)



Recorded accelerograms at K-NET ISK005 (Anamizu)



Station ISK005 shows accelerograms indicative of “cyclic mobility” in the horizontal components, suggesting the occurrence of **liquefaction phenomena**.

Summary (1)

The largest PGA was recorded at K-NET station Togi (**2827.8 cm/s²**), while the largest PGV was recorded at K-NET station Anamizu (142.7 cm/s).

PGAs of >1000 cm/s² were recorded even in the vertical component **at four NIED stations.**

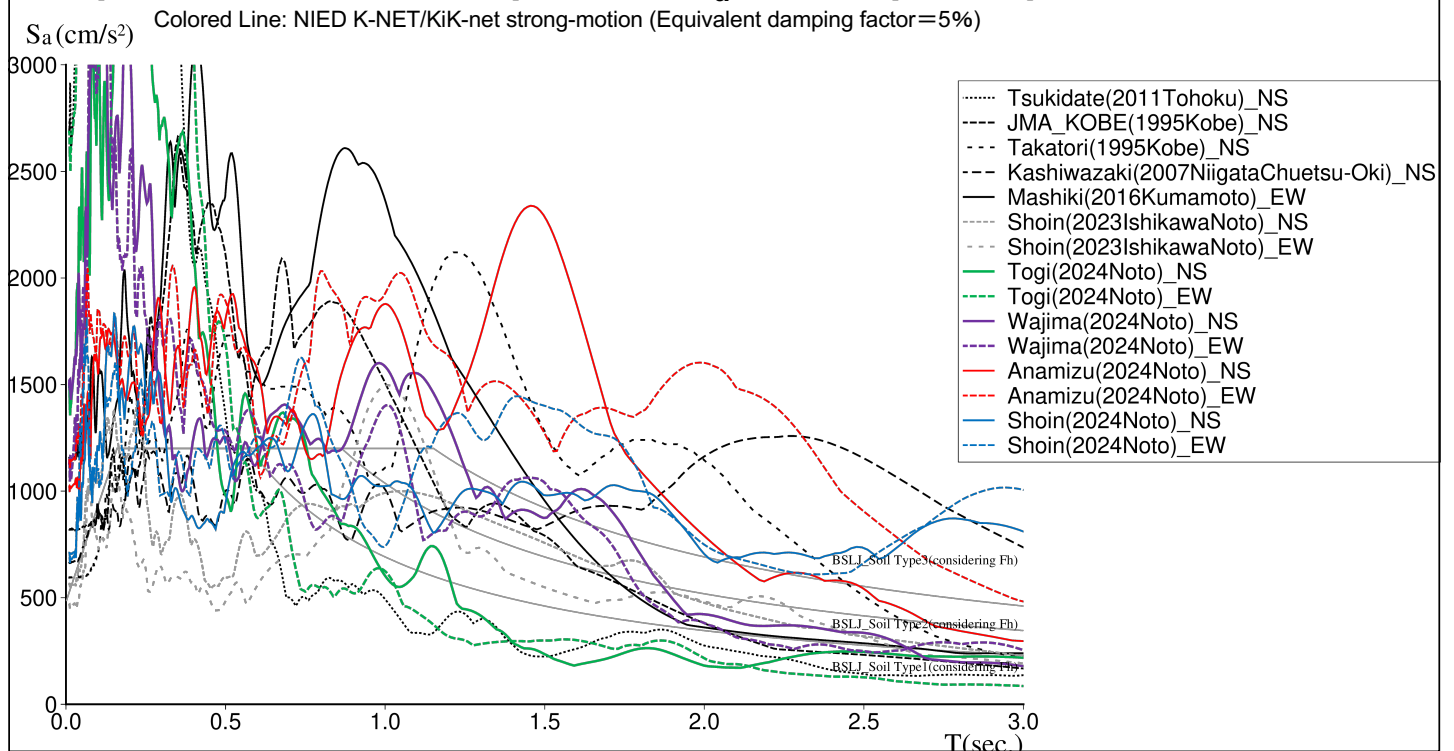
Response of pSv >165 cm/s ($h = 5\%$, $T=1-2$ s) were observed **at least 12 stations.**

Acknowledgments:

We used K-NET and KiK-net strong-motion data provided by the National Research Institute for Earth Science and Disaster Resilience; NIED), Japan (<https://www.doi.org/10.17598/NIED.0004>) We also used strong-motion data from the Japan Meteorological Agency (JMA) seismic intensity stations.

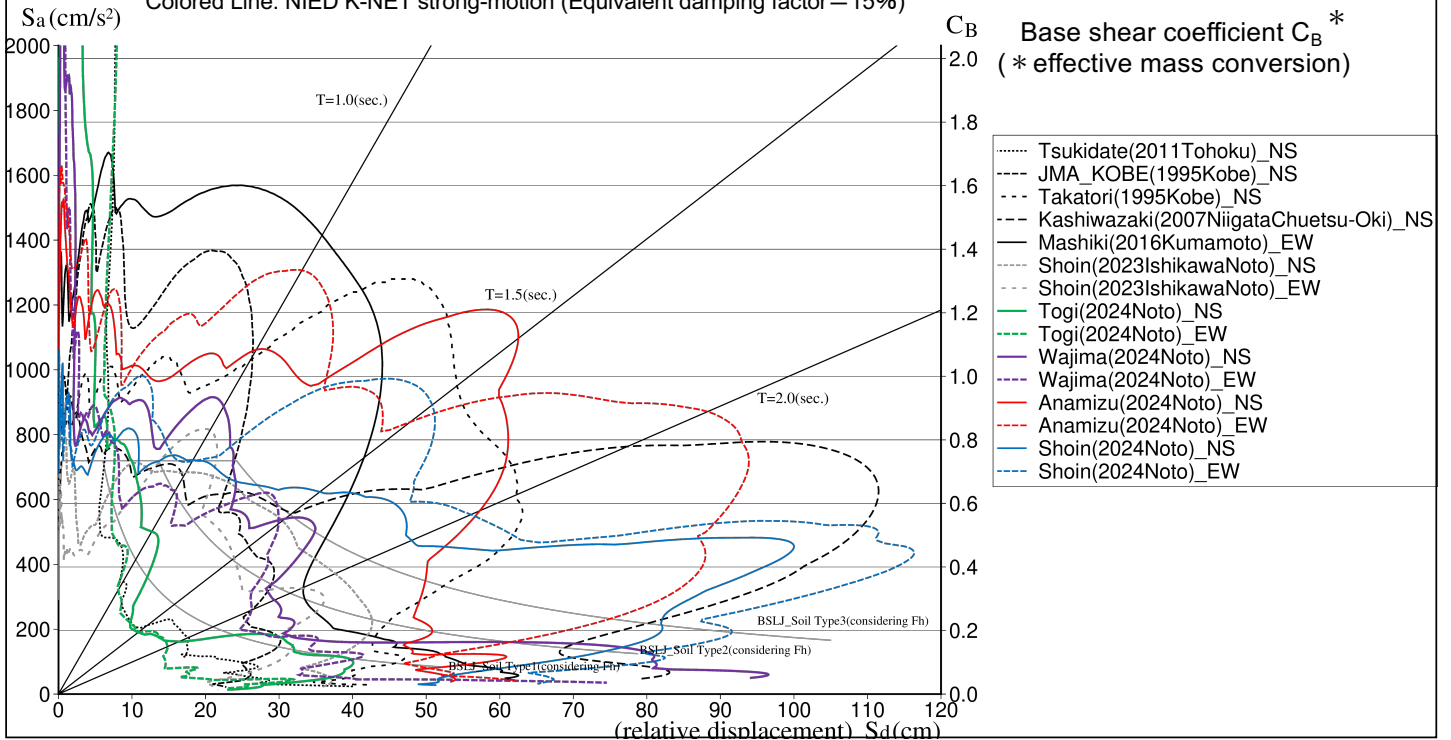
We used hypocenter information determined by NIED Hi-net. Response spectra were calculated using the subroutine program developed by Osaki (1994). Figures were prepared using Generic Mapping Tools (GMT: Wessel and Smith, 1998).

Response acceleration spectrum S_a and response periods



S_a - S_d curve and response periods

Colored Line: NIED K-NET strong-motion (Equivalent damping factor = 15%)



Details of strong ground motions observation

| Year | Month | Date | Earthquake Name | Magnitude | Data Source | Site Name | Site ID | NS/EW |
|------|-------|------|-------------------|-----------|-------------|-------------|---------|-------|
| 2011 | 3 | 11 | Tohoku | 9 | K-NET | Tsukidate | MYG004 | NS |
| 1995 | 1 | 17 | Kobe | 7.3 | JMA | JMA_KOBE | | NS |
| 1995 | 1 | 17 | Kobe | 7.3 | RTRI | Takatori | | NS |
| 2007 | 7 | 16 | NiigataChuetsuOki | 6.8 | K-NET | Kashiwazaki | NIG018 | NS |
| 2016 | 4 | 16 | Kumamoto | 7.3 | KiK-net | Mashiki | KMMH16 | EW |
| 2023 | 5 | 5 | IshikawaNoto | 6.3 | K-NET | Shoin | ISK002 | NS/EW |
| 2024 | 1 | 1 | Noto | 7.6 | K-NET | Togi | ISK006 | NS/EW |
| 2024 | 1 | 1 | Noto | 7.6 | K-NET | Wajima | ISK003 | NS/EW |
| 2024 | 1 | 1 | Noto | 7.6 | K-NET | Anamizu | ISK005 | NS/EW |
| 2024 | 1 | 1 | Noto | 7.6 | K-NET | Shoin | ISK002 | NS/EW |

Summary (2)

- The strong ground motions observed at Anamizu (ISK005) and Shoin (ISK002) have the same or larger amplitudes in the S_a - S_d compared to strong ground motions observed in the recent earthquakes in Japan.
- From the S_a - S_d curve assuming a 15% equivalent damping ratio, the response displacement (S_d) of Anamizu (ISK005) at the period of 1 to 2 seconds was 30 to 90 cm, which was larger than Togi (ISK006), Wajima (ISK003).
- The response acceleration (S_a) of the North-South (NS) components of Anamizu (ISK005) showed large values at around the period of 1.5 second.

Acknowledgement:

We used strong motion data provided by NIED(K-NET, KiK-net), JMA, and, RTRI.
 S_a -T and S_a - S_d were calculated using the View Wave by Kashima, BRI.