Strong Ground Motions

Noto Peninsula earthquake (Mw7.5) on January 1st, 2024

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Earthquake Summary

2024 Noto Peninsula earthquake
(M7.6, Mw7.5)

Origin time  16:10 on January 1, 2024 (JST GMT+09)
Depth  16 km
Fault type  Reverse fault

Casualty 241
Injury 1295
Residential damage + 40,000
Earthquake Summary

2024 Noto Peninsula earthquake
(M7.6, Mw7.5)

Origin time 16:10 on January 1, 2024 (JST GMT+09)
Depth 16 km
Fault type Reverse fault

- Epicenter is located at the tip of Noto Peninsula
- Aftershocks are distributed along about 150 km in length across the Noto Peninsula from northeast to southwest
- Almost the entire region of the northern Noto Peninsula is located above the source fault.
Earthquake Summary

Seismic activity (2007~2024)

- **M6.9 (Mw6.6) event** in 2007
  “2007 Noto Peninsula earthquake”

Earthquake swarm started from 2020

- **M6.5 (Mw6.2) event** in 2023

- **M7.6 (Mw7.5) event** in 2024

[Nishimura et al., 2023]
### PGA and PGV in horizontal motions

<table>
<thead>
<tr>
<th>Site</th>
<th>PGA</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-NET ISK006</td>
<td>2.78 g</td>
</tr>
<tr>
<td>K-NET ISK003</td>
<td>1.66 g</td>
</tr>
<tr>
<td>K-NET ISK001</td>
<td>1.50 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site</th>
<th>PGV</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-NET ISK005</td>
<td>1.59 m/s</td>
</tr>
<tr>
<td>K-NET ISK002</td>
<td>1.31 m/s</td>
</tr>
<tr>
<td>JMA Wajima</td>
<td>1.23 m/s</td>
</tr>
</tbody>
</table>
PGA and PGV in horizontal motions

Compared with Ground Motion Model [Morikawa and Fujiwara, 2013]

\[(V_{s30} = 350\text{ m/s}, \ D_{1400} = 250\text{ m})\]

The observations almost follow the existing model
Waveform trace

Bilateral rupture propagates. Mainly SW rupture propagates in the Noto Peninsula. At least two (three?) wave groups are observed near the epicenter, the second propagating from SW. This results over 40s of duration at Suzu city.
Bilateral rupture propagates. Mainly SW rupture propagates in the Noto Peninsula. At least two (three?) wave groups are observed near the epicenter, the second propagating from SW. This results over 40s of duration at Suzu city.

Source Model suggests large slips are on the western side of Wajima city. The slip corresponds to the location of large crustal deformation.
Togi site (K-NET ISK006)

- 2.78g of PGA
- Large acceleration response around 0.2s
Togi site (K-NET ISK006)

- 2.78g of PGA
- Large acceleration response around 0.2s
- No major damages
Togi area

**K-NET ISK006** is located on the hill (stiff ground), while **JMA Togi (~3.5km)** is on soft soil ground.

- JMA site amplified longer than 0.8s.
Wajima site (K-NET ISK003)

- Large velocity pulse
- Exceeding design spectra around 1-2s
Wajima site (K-NET ISK003)

- Large velocity pulse
- Exceeding design spectra around 1-2s

Major damage to buildings
Site amplification in Wajima downtown

**K-NET ISK003** is located on stiff soil ground, while **JMA Wajima (~1.0km)** is on soft soil ground.

- JMA site amplified longer than 1s.
Site amplification in Wajima downtown

**K-NET ISK003** is located on stiff soil ground, while **JMA Wajima** (~1.0km) is on soft soil ground.

- JMA site amplified longer than 1s.
- Spectral ratio (JMA/K-NET) suggests **nonlinear site response**.
Anamizu site (K-NET ISK005)

- 1.59 m/s of PGV
- Exceeding design spectra around 1-2s.
Anamizu site (K-NET ISK005)

- 1.59 m/s of PGV
- Exceeding design spectra around 1-2s.

Major damage to buildings
Site amplification in Anamizu downtown

**K-NET ISK005** is located on soft soil ground, while **K-NET ISK015 (~0.7km)** is on stiff soil ground.

- ISK005 site amplified longer than 1s.
Site amplification in Anamizu downtown

K-NET ISK005 is located on soft soil ground, while K-NET ISK015 (~0.7km) is on stiff soil ground.

- ISK005 site amplified longer than 1s.
- Spectral ratio suggests **nonlinear site response**.
Summary

Earthquake

✔ Almost the entire region of the northern Noto Peninsula is located above the source fault.
✔ Multi-wave groups are observed near the epicenter, resulting in over 40s duration.

Ground Motions

✔ 2.78g of PGA and large acceleration response at 0.2s are recorded at K-NET Togi.
   No significant damage was observed in the area.

✔ Wajima and Anamizu downtown observed significant building damages.
   Ground motions amplified the components longer than 1s, resulting in similar response spectra with the Kobe record.
   The amplification includes a nonlinear response.

Note

In Suzu, the ground motion damages were significant, but this report does not present the damage and ground motions in Suzu.

Thank you for your kind attention

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